

Power and sensing

Selection guide 2025-2026

www.infineon.com



Adam White,
Division President of
Power and Sensor Systems
电源与传感系统事业部总裁

Dear valued customer,

The semiconductor industry is undergoing a transformation. This transformation is driven by the critical role semiconductors play in decarbonization and digitalization and their ability to enable innovation across fields at an unprecedented scale. Recent advancements in AI, autonomous driving, and our increasingly connected lifestyles are just a few examples of the rapid changes unfolding before our eyes.

At Infineon, we are dedicated to delivering cutting-edge solutions with consistent quality, robustness, reliability, and stable supply. From managing power efficiently and sustainably to equipping devices with intelligence and responsiveness, our technologies are designed to support your innovation journey.

Our extensive portfolio spans power, connectivity, radio frequency, and sensor system technologies, enabling next-generation applications across data centers, smart homes, consumer electronics, robotics, renewable energy, power tools, and beyond. You will find further details in the following pages of this guide.

There are three key topics that are becoming increasingly relevant to our customers' decision-making when considering Infineon's offerings:

- **Si, SiC, or GaN – Selecting the Best Semiconductor Material for Your Application**
  Choosing the right material for a specific device or application is critical. As a leader in the power semiconductor industry, Infineon is uniquely positioned to offer expertise in all three key materials: silicon (Si), silicon carbide (SiC), and gallium nitride (GaN). This comprehensive approach allows us to address diverse customer requirements by providing flexible solutions available as standalone products or as part of system solutions across a broad range of voltage classes and applications. To meet rising performance demands in powering AI, big data, and next-generation energy solutions, we are accelerating our roadmap for wide-bandgap (WBG) technologies or design hybrid solutions with WBG and Si.
- **Pioneering Semiconductor Innovation to Support Customer Success**
  At Infineon, we lead the way in semiconductor innovation to empower our customers' success. With breakthroughs such as the world's first 300 mm GaN wafer, the world's thinnest silicon power wafer (measuring just 20 µm on 300 mm), and the world's most competitive 200 mm silicon carbide power fab, we are setting new standards in all three power semiconductor materials. These advancements ensure that our customers can leverage the most advanced technologies to drive their innovations forward.
- **Sensors: Driving Intelligence Across Industries**
  Sensors represent Infineon's third product pillar serving the automotive, industrial, and consumer markets. Our advanced sensor solutions are enabling new use cases and accelerating innovation across industries. By providing high-quality data for advanced decision-making, our sensors are a critical enabler of AI. From powering AI-enabled edge devices to delivering unmatched safety and reliability in sensor-based solutions for daily life – from vehicles to smart homes, Infineon boasts a diverse portfolio spanning many industries.

The Infineon Power and Sensing Selection Guide 2025–2026 is the most comprehensive guide to our power and sensing portfolio, as well as our latest technological advancements. It is specifically designed to support your product planning and help you achieve design success. This digital version also offers access to technical support. If you have any questions, our experts are readily available to assist you.

Thank you for your continued partnership. Let's drive decarbonization and digitalization. Together.

尊敬的客户，

半导体行业正经历一场变革。这场变革源自半导体在低碳化和数字化进程中发挥的关键作用，以及其推动各领域以空前规模不断创新的能力。人工智能的突破、自动驾驶技术的发展，以及我们日益互联的生活方式，都是这场近在眼前的产业变革的生动范例。

英飞凌始终致力于提供兼具卓越品质、强劲性能、可靠表现及稳定供应能力的尖端解决方案。无论是进行高效、可持续的功率管理，还是为设备赋予智能感知与快速响应能力，我们的技术都旨在为客户的创新之路提供坚实支撑。

我们丰富的产品组合涵盖功率半导体、连接技术、射频以及传感器系统解决方案，能够为数据中心、智能家居、消费电子、机器人、可再生能源、电动工具等领域的下一代应用提供关键支持。本手册后续章节将为您提供更详尽的解析。

在客户评估英飞凌解决方案时，以下三点正日益成为其决策的核心考量因素：

硅、碳化硅还是氮化镓——为您的应用选择最佳半导体材料

特定器件或应用的材料选择至关重要。作为功率半导体行业的领导者，英飞凌在三大关键材料领域——硅（Si）、碳化硅（SiC）和氮化镓（GaN），均拥有独特的技术专长。凭借这一全面布局，无论是作为独立产品提供，还是覆盖多个电压等级和应用场景的系统解决方案组成部分，我们都能够通过灵活的解决方案满足多样化客户需求。为满足人工智能、大数据及下一代能源解决方案日益增长的性能需求，我们正加速推进宽禁带（WBG）技术路线图，并开发宽禁带与硅的混合解决方案。

开创性半导体技术助力客户成功

英飞凌始终引领半导体技术创新，为客户的成功赋能。我们通过多项技术突破在三大材料领域树立行业标杆：全球首款300毫米氮化镓晶圆、全球最薄硅基功率晶圆（300毫米晶圆仅20微米厚）以及全球最具竞争力的200毫米碳化硅功率晶圆厂。这些创新成果确保客户能够运用尖端技术加速其创新进程 。

传感器提升不同行业的智能化水平

作为英飞凌第三大产品支柱，传感器技术服务于汽车、工业及消费电子领域。我们先进的传感器解决方案正催生全新应用场景，并推动跨行业创新。通过为高阶决策系统提供高质量数据，英飞凌传感器为人工智能发展提供关键动力。无论是为AI边缘设备供能，还是在车辆和智能家居等日常场景中打造具备卓越安全性与可靠性的传感解决方案，我们都拥有覆盖众多行业的丰富产品组合。

英飞凌《电源与传感选型手册2025-2026》是最全面的产品技术指南，涵盖功率半导体与传感器产品组合及最新技术突破。本手册专为助力您的产品规划与设计而打造，电子版还提供便捷的技术支持渠道。如您有任何疑问，我们的专家团队随时待命，为您提供帮助。

感谢您一如既往的信任与支持。数字低碳，共创未来。



Adam White,
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Solutions

- Condition monitoring and predictive maintenance
- Battery protection
- Battery monitoring and control
- Class D audio
- Motor control for power tools, robotics, and eForklifts
- Solutions for high-voltage solid-state relays
- Solutions for solid-state circuit breakers



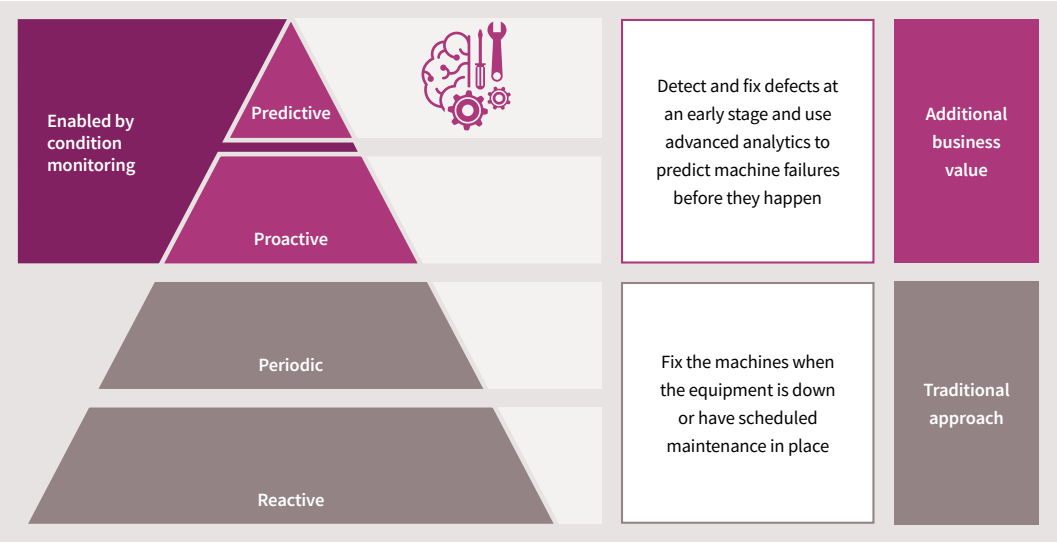
Condition monitoring and predictive maintenance

Cutting-edge predictive maintenance solutions enable assets performance tracking in real-time and transform the maintenance approach

Predictive maintenance is a game-changing offering that proactively empowers businesses to manage assets and devices. By leveraging advanced hardware technologies for data collection and condition monitoring combined with predictive analytics dashboards, you can revolutionize after-sales services and asset performance management. Our solution ensures minimized downtime, optimized maintenance schedules, and operational efficiency, leading to unparalleled customer satisfaction and business success.

Reliably and continuously monitoring the condition of a single asset or a system is the base for predictive maintenance. As one of the most innovative maintenance schemes on the market, it offers numerous benefits to businesses across various industries - especially when critical operational equipment is involved. Predicting the next needed maintenance based on real-time asset health data can reduce unexpected downtime and save costs. It enhances equipment reliability and machinery longevity. Ensuring optimal working conditions for a piece of equipment leads to higher safety and increased efficiency in operations. The collected data processed by the algorithms allows data-driven decision-making and optimized asset performance management.

Infineon's sensors, microcontrollers, connectivity, security, and memory solutions offer all you need to leverage predictive maintenance's full potential. Thanks to our partner network, you can use advanced analytics and artificial intelligence to predict machine failures before they happen, or to anticipate maintenance needs before they become urgent – on the Edge or in the Cloud.



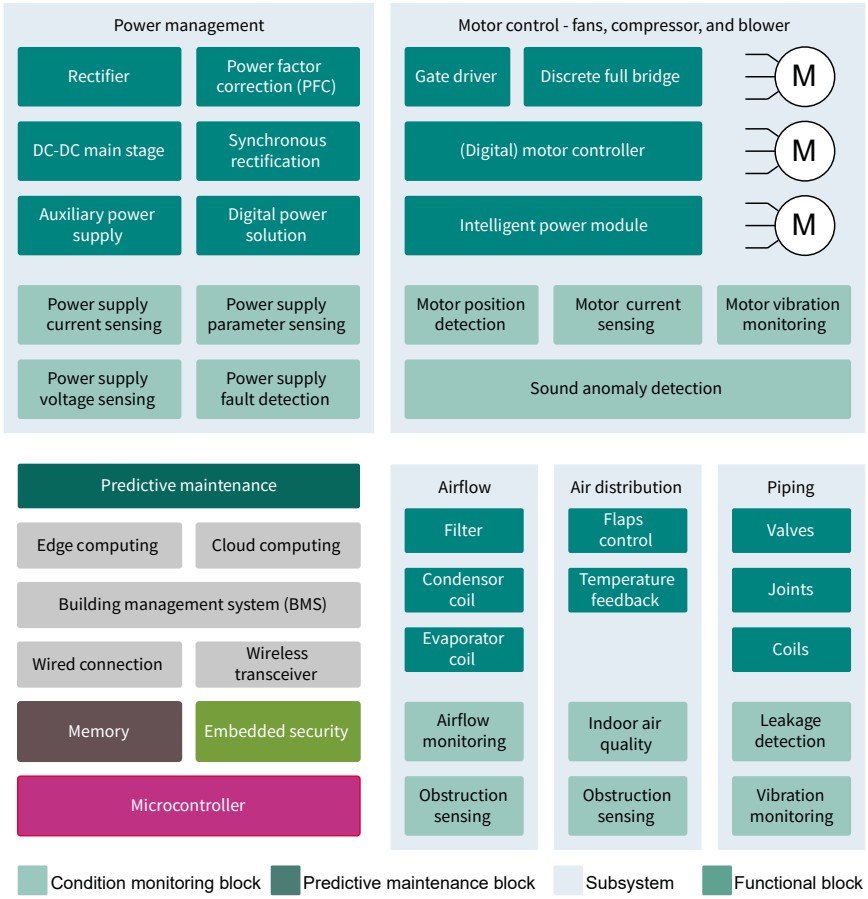
Benefits

- Reduced downtime
- Reduced maintenance costs
- Real-time performance insights and failure pattern data
- Edge and Cloud integration
- Implementation support
- Partner infrastructure
- Increased transparency over operations
- Opportunity for value-adding services (e.g., maintenance)

Click here to learn more:

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www.infineon.com/mems-for-automotive www.infineon.com/c-hvac

Application diagram



XENSIV™ predictive maintenance evaluation kit

Our XENSIV™ predictive maintenance evaluation kit empowers clients to harness the power of predictive maintenance. It is a comprehensive kit designed to give businesses a deeper understanding of the benefits and potential of predictive maintenance's different abling blocks and components. The XENSIV™ predictive maintenance evaluation kit lets you quickly and efficiently evaluate various condition monitoring and predictive maintenance use cases. It utilizes Infineon's XENSIV™ sensor portfolio with the FreeRTOS-enabled XMC™ microcontroller to monitor the condition of any crucial element such as filters, compressors, motors, or fans - even in legacy systems. Based on collected sensor data, e.g., current consumption, airflow, and other system parameters, combined with the power of algorithms and deep learning techniques, system failures can be detected. Solution templates and a FreeRTOS-enabled software stack deliver a full end-to-end solution from the edge to the cloud.

Features and benefits

Key features
– Extension for the XMC4700 XMC™ Relax Kit
– Full software support of the FreeRTOS kernel
– AWS Cloud integration
– Full AWS CloudFormation template and software application stack
– On-board Wi-Fi and ethernet connectivity
– mikroBUS™ ClickBoard interface for extending connectivity
– XENSIV™ sensor satellite boards with a broad range of sensors for data collection and condition monitoring
– Multi-account registration support with OPTIGA™ Trust M

Key benefits
– Current monitoring (up to 120 A), e.g., for overall current anomaly detection
– Vibration and position sensing, e.g., for drives and compressor
– Airflow and pressure measurement, e.g., for filters
– Open/closed lid detection, e.g., for detecting status of service lids
– Hall speed sensors, e.g., for blocked fan and fan speed monitoring
– Sound anomaly detection, e.g., for gears and joints

Click here to learn more:

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www.infineon.com/mems-for-automotive www.infineon.com/c-hvac

Recommended products portfolio

Functional block	Product category	Product family	Benefits
Sensing	XENSIV™ sensors	XENSIV™ DPS368 pressure sensor	Ultrasmall waterproof pressure sensor, environmentally protected against water (IPx8), dust and humidity, ideal for harsh environments
		XENSIV™ TLI4971 magnetic current sensor	Magnetic current sensor for AC and DC measurements in industrial applications with an analog interface and dual fast over-current detection outputs
		XENSIV™ TLI493D-W2BW 3D magnetic sensor	Small WLB-5 package with low current consumption of 7 nA in a power-down mode for compact system designs
		XENSIV™ IM69D128S MEMS microphone	Ultralow power digital XENSIV™ MEMS microphone for building automation and IoT devices with high sensitivity
		XENSIV™ TLE4997E Hall sensor	Hall sensor for highly accurate rotation and position detection, ideally suited to analog-to-digital (A/D) conversion with the supply voltage as a reference
		XENSIV™ TLE4964-3M Hall effect magnetic switch	Hall effect switch dedicated for position detection applications highly accurate applications with superior supply voltage capability
		XENSIV™ TLI4966G double Hall switch	Double Hall switch with two output pins for industrial applications with a rotating pole wheel
Security	OPTIGA™	OPTIGA™ Trust M	A high-end security solution that provides an anchor of trust for connecting IoT devices to the cloud
		OPTIGA™ Trust M Express	Offered with CIRRENT™ Cloud ID – Infineon's cloud service automates IoT device certificate registration and device provisioning in the product cloud at scale with zero manual intervention
Control	XMC™ microcontrollers	XMC4800 microcontroller	32-bit first-ever EtherCAT® node on an Arm® Cortex®-M microcontroller with on-chip flash and analog/mixed-signal capabilities
		XMC4700 microcontroller	32-bit optimized solution to meet the performance challenges of today's embedded control applications, ideal for motor control and SMPS
	PSOC™ microcontrollers	PSOC™ 6 series	Dual-core Arm® Cortex®-M4 and Cortex®-M0+ architecture with ultra-low power consumption purpose-built for IoT applications
		PSOC™ 4 series	32-bit microcontroller tackling some of the complex portions of embedded system design, making it easier and more flexible
Connectivity	Wireless connectivity	AIROC™ Wi-Fi + Bluetooth® Combos	IEEE 802.11a/b/g/n/ac/ax Wi-Fi and Bluetooth® 5.2 in a single-chip for small-factor IoT designs

Click here to learn more:

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Battery protection

Battery protection

Solutions that allow easy design-in ensuring safe charging/discharging

The high power density of lithium-ion batteries has made them very popular. However, the unstable behavior of lithium-ion cells under critical conditions requires them to be handled with care. That means a battery management system (BMS) is needed to monitor the battery state and ensure safe operation. BMS is typically equipped with an electronic switch that disconnects the battery from the charge or load under critical conditions that can lead to dangerous reactions. A battery protection unit (BPU) prevents possible damage to the battery cells and the failure of the battery.

Such critical conditions include:
- Overcharge that occurs when the battery is charged over the allowed maximum capacity
- High and low temperatures when the internal temperature of the battery cells exceeds their safe operational temperature range
- Over-discharge when the battery is discharged under the allowed minimum capacity
- Overcurrent when the battery is exposed to a short circuit condition or a high inrush turn-on current
- Reverse polarity when the battery terminals are wrongly plugged into the device

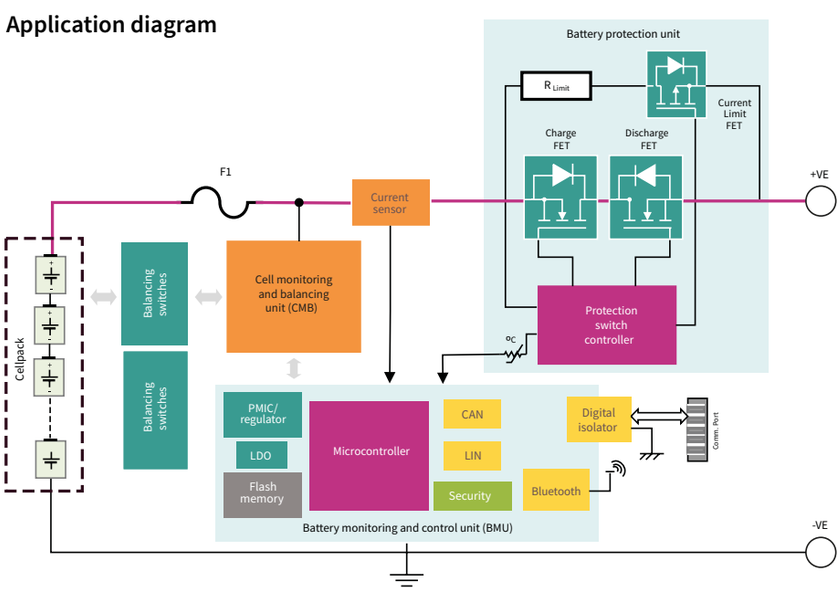
Failing to disconnect the battery during such conditions can lead to the following problems:
- Thermal runaway is often due to overcharging or overheating of the battery. The overheating can be due to a rise in the ambient temperature or to charging/discharging the batteries with high current rates. Thermal runaway damages the battery cells and can lead to fires
- Death of the cell often due to the discharge of batteries below its specified thresholds
- Damage of load device often due to either improper inrush current management or reverse polarity

To prevent these failures, Infineon offers a wide range of battery protection solutions that increase the lifetime and efficiency of lithium-ion batteries under stressful conditions.

Features and benefits

Key features	Key benefits
– $R_{DS(on)}$ and safe operating area (SOA)	– Higher performance with lower $R_{DS(on)}$ and wider safe operating area (SOA)
– Compact bill of material (BOM)	– Cheaper solution with a more compact bill of material and more effective parallelization solutions
– Short circuit protection	– Short circuit protection with higher peak current rates to withstand higher current values
– Turn-on and turn-off capabilities	– Turn-on and turn-off solutions tailored to applications needs
– Solutions for all voltage classes	– Up to 600 V MOSFET protection solutions (including single- and multi-module)

Application diagram



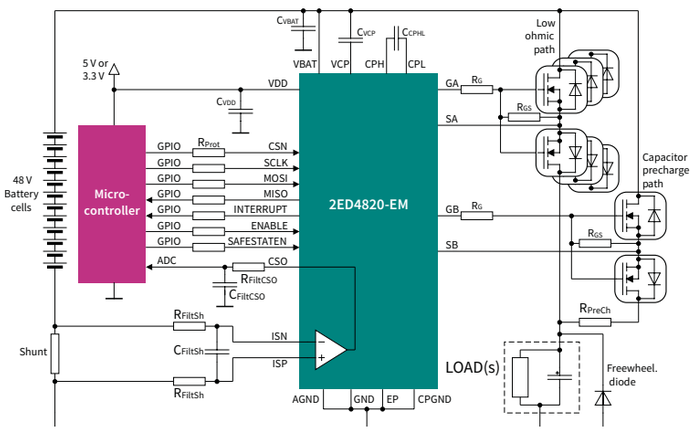
Click here to learn more:
www.infineon.com/battery-protection

Product portfolio

Battery voltage	Application	Recommended power MOSFETs				
18 V	Charge and discharge MOSFET	IST006N04NM6 40 V, 0.6 mΩ, sTOLL	BSZ0500NSI 40 V, 1.25 mΩ D²PAK	BSC005N03LS5I 30 V, 0.55 mΩ, SuperSO8	IQE008N03LM5CG 30 V, 0.85 mΩ, PQFN 3.3x3.3 Source-Down Center-Gate	ISCH42N04LM7 40 V, 0.42 mΩ, SuperSO8
	Balancing MOSFET	ISK024NE2LM5 25 V, 2.4 mΩ, PQFN 2x2	IRLML6244 20 V, 21 mΩ, SOT-23	IRLHS6376 30 V, 63 mΩ, PQFN 2x2-Dual	IRLML2244 -20 V, 54 mΩ, SOT-23	IRFHS9301 -30 V, 37 mΩ, PQFN 2x2
	Pre-charge MOSFET	BSC084P03NS3 G -30 V, 8.4 mΩ, SuperSO8	IRFH9310 -30 V, 4.6 mΩ, SuperSO8	SPD50P03L G -30 V, 7.0 mΩ, DPAK	BSZ180P03NS3E G -30 V, 18 mΩ, PQFN 3.3x3.3	BSZ120P03NS3 G -30 V, 12 mΩ, PQFN 3.3x3.3
24 V	Charge and discharge MOSFET	IST006N04NM6 40 V, 0.6 mΩ, sTOLL	ISCH42N04LM7 40 V, 0.42 mΩ, SuperSO8	ISC007N04NM6 40 V, 0.7 mΩ, SuperSO8	IQE013N04LM6CG 40 V, 1.35 mΩ, PQFN 3.3x3.3 Source-Down Center-Gate	BSZ018N04LS6 40 V, 1.8 mΩ, PQFN 3.3x3.3
	Balancing MOSFET	ISK024NE2LM5 25 V, 2.4 mΩ, PQFN 2x2	IRLML6244 20 V, 21 mΩ, SOT-23	IRLHS6376 30 V, 63 mΩ, PQFN 2x2-Dual	IRLML2244 -20 V, 54 mΩ, SOT-23	IRFHS9301 -30 V, 37 mΩ, PQFN 2x2
	Pre-charge MOSFET	ISC240P06LM -60 V, 24 mΩ, SuperSO8	ISC800P06LM -60 V, 80 mΩ, SuperSO8	IPD650P06NM -60 V, 65 mΩ, DPAK	ISZ810P07LM -60 V, 81 mΩ, PQFN 3.3x3.3	ISP25DP06LM -60 V, 125 mΩ, SOT-223
36 V	Charge and discharge MOSFET	IPT007N06N 60 V, 0.75 mΩ, TOLL	ISC009N06LM5 60 V, 0.9 mΩ, SuperSO8	IPTC007N06NM5 60 V, 0.75 mΩ, TOLT	IPT008N06NM5LF 60 V, 0.8 mΩ, TOLL	IST011N06NM5 60 V, 1.1 mΩ, sTOLL
	Balancing MOSFET	ISK024NE2LM5 25 V, 2.4 mΩ, PQFN 2x2	IRLML6244 20 V, 21 mΩ, SOT-23	IRLHS6376 30 V, 63 mΩ, PQFN 2x2-Dual	IRLML2244 -20 V, 54 mΩ, SOT-23	IRFHS9301 -30 V, 37 mΩ, PQFN 2x2
	Pre-charge MOSFET	ISC240P06LM -60 V, 24 mΩ, SuperSO8	ISC800P06LM -60 V, 80 mΩ, SuperSO8	IPD650P06NM -60 V, 65 mΩ, DPAK	ISZ810P07LM -60 V, 81 mΩ, PQFN 3.3x3.3	ISP25DP06LM -60 V, 125 mΩ, SOT-223
48 V	Charge and discharge MOSFET	IPT017N10NM5LF2 100 V, 1.7 mΩ, TOLL	IPTC011N08NM5 80 V, 1.1 mΩ, TOLT	IPT010N08NM5 80 V, 1.0 mΩ, TOLL	IPT015N10N5 100 V, 1.5 mΩ, TOLL	IPT013N08NM5LF 80 V, 1.3 mΩ, sTOLL
	Balancing MOSFET	ISK024NE2LM5 25 V, 2.4 mΩ, PQFN 2x2	IRLML6244 20 V, 21 mΩ, SOT-23	IRLHS6376 30 V, 63 mΩ, PQFN 2x2-Dual	IRLML2244 -20 V, 54 mΩ, SOT-23	IRFHS9301 -30 V, 37 mΩ, PQFN 2x2
	Pre-charge MOSFET	ISC750P10LM* -100 V, 75 mΩ, SuperSO8	IPD19DP10NM -100 V, 186 mΩ, DPAK	ISZ24DP10LM* -100 V, 245 mΩ, PQFN 3.3x3.3	ISP16DP10LM -100 V, 250 mΩ, SOT-223	BSP322P -100 V, 800 mΩ, SOT-223
72 V	Charge and discharge MOSFET	IPT020N13NM6 135 V, 2 mΩ, TOLL	IPT039N15N5 150 V, 3.9 mΩ, TOLL	IPB044N15N5 150 V, 4.4 mΩ, D²PAK 7-pin	IPB048N15N5 150 V, 4.8 mΩ, D²PAK	IPT017N12NM6 120 V, 1.7 mΩ, TOLL
	Balancing MOSFET	ISK024NE2LM5 25 V, 2.4 mΩ, PQFN 2x2	IRLML6244 20 V, 21 mΩ, SOT-23	IRLHS6376 30 V, 63 mΩ, PQFN 2x2-Dual	IRLML2244 -20 V, 54 mΩ, SOT-23	IRFHS9301 -30 V, 37 mΩ, PQFN 2x2
	Pre-charge MOSFET	ISC16DP15LM -150 V, 160 mΩ, SuperSO8	ISZ56DP15LM -150 V, 560 mΩ, PQFN 3.3x3.3	ISZ75DP15LM -150 V, 750 mΩ, PQFN 3.3x3.3	IPD42DP15LM -150 V, 420 mΩ, DPAK	ISP14EP15LM -150 V, 1380 mΩ, SOT-223
96 V	Charge and discharge MOSFET	IPT039N15N5 150 V, 3.9 mΩ, TOLL	IPB044N15N5 150 V, 4.4 mΩ, D²PAK 7pin	IPB048N15N5 150 V, 4.8 mΩ, D²PAK	IPB060N15N5 150 V, 6 mΩ, D²PAK 7-pin	IPT067N20NM6 200 V, 6.7 mΩ, TOLL
	Balancing MOSFET	ISK024NE2LM5 25 V, 2.4 mΩ, PQFN 2x2	IRLML6244 20 V, 21 mΩ, SOT-23	IRLHS6376 30 V, 63 mΩ, PQFN 2x2-Dual	IRLML2244 -20 V, 54 mΩ, SOT-23	IRFHS9301 -30 V, 37 mΩ, PQFN 2x2
	Pre-charge MOSFET	ISC16DP15LM -150 V, 160 mΩ, SuperSO8	ISZ56DP15LM -150 V, 560 mΩ, PQFN 3.3x3.3	ISZ75DP15LM -150 V, 750 mΩ, PQFN 3.3x3.3	IPD42DP15LM -150 V, 420 mΩ, DPAK	ISP14EP15LM -150 V, 1380 mΩ, SOT-223
144 V	Charge and discharge MOSFET	IPT129N20NM6 200 V, 12.9 mΩ, TOLL	IPF129N20NM6 200 V, 12.9 mΩ, D²PAK 7pin	ISC130N20NM6 200 V, 13 mΩ, SuperSO8	IPB200N25N3 G 250 V, 20 mΩ, D²PAK	IPB107N20N3 G 200 V, 10.7 mΩ, D²PAK
	Balancing MOSFET	ISK024NE2LM5 25 V, 2.4 mΩ, PQFN 2x2	IRLML6244 20 V, 21 mΩ, SOT-23	IRLHS6376 30 V, 63 mΩ, PQFN 2x2-Dual	IRLML2244 -20 V, 54 mΩ, SOT-23	IRFHS9301 -30 V, 37 mΩ, PQFN 2x2
	Pre-charge MOSFET	BSP317P -250 V, 4000 mΩ, SOT-223	BSP92P -250 V, 12000 mΩ, SOT-223	BSR92P -250 V, 12000 mΩ, SC59	BSS192P -250 V, 12000 mΩ, SOT-89	

Click here to learn more:
www.infineon.com/battery-protection

Gate drivers



Main reasons to use 2ED4820-EM in dependable 48 V power supplies

- Faster reaction time (~10 µs)
- Integrated bidirectional high- or low-side current sense amplifier
- High current source or sink support
- Robust against under/overvoltage in the board-net
- Flexible configuration of protection features plus the accessibility of diagnosis information via SPI

Solid state isolators

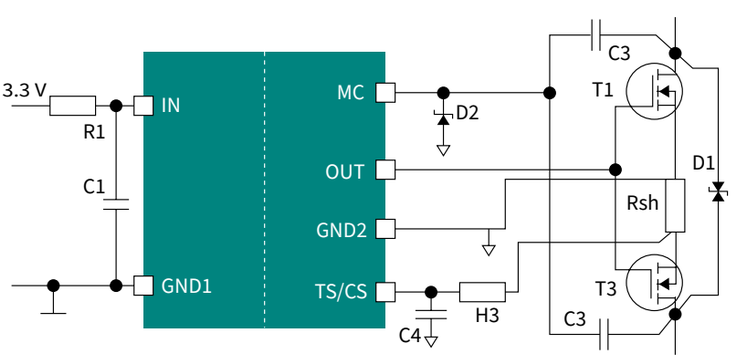
Coreless transformer isolators provide galvanically isolated gate drive for a broad range of MOSFET and IGBT switches in SSR applications

Solid state isolators (SSI) enable the ability to create custom solid state relays capable of controlling loads in excess of 1000 V and 100 A. The CT-based isolators enable energy transfer across the isolation barrier, capable of driving large MOSFETs or IGBTs without the added circuitry of a power supply on the isolated side. The innovative protection features enable the design of reliable and robust Solid State Relays (SSR).

Features

- Solid state isolators using Infineon's coreless-transformer technology
- No isolated gate bias supply required for gate driving
- Perfect match for CoolMOS™, OptiMOS™, and TRENCHSTOP™ IGBT
- Low power, large input voltage range from 2.6 to 3.5 V (internally clamped)
- High-impedance, CMOS input (buffered variants)
- High output voltage up to 18 V - no series or parallel configuration required for powerful gate driving
- High output peak current of 185 µA (direct drive variants) or 400 mA (buffered variants)
- Fast turn-off for safe switches' SOA operation
- Temperature sensor and current sensor protection inputs
- Latch-off in case of a failure event (overcurrent or overtemperature)
- Dynamic Miller clamping protection
- Wide-body package with high creepage and clearance for UL 1577 (planned) and reinforced isolation according to IEC 60747-17 (planned)





Click here to learn more:
www.infineon.com/battery-protection



Battery monitoring and control

Optimize system performance by cell balancing and monitoring key battery parameters

Dedicated cell monitoring controllers are used to keep lithium-ion cells within their allowed operational ranges regarding voltages, currents, and temperatures. They monitor the state of each cell according to pre-adjusted voltages and temperatures using high-precision ADCs. Synchronizing the distributed measurements across all cells inside a battery is key to achieving the best possible insights into the battery's dis/charging state (SOD/SOC) and overall battery health (SOH). The critical battery state assessment becomes less precise if these measurements are spread across wider time windows and the measurement accuracy for each parameter is not high enough. A robust high-speed communication link across multiple daisy-chained monitoring devices supports complex cell topologies for a battery. For additional robustness, the daisy chain realizes a redundant ring, which keeps communication up between all connected ICs in case of a broken link. CRC-protected data frames complement communication robustness. To achieve extremely low-power dedicated housekeeping functions, such as periodically scheduled cell measurements and state analysis required for functional safety, the cell controller can operate independently of the master controller of the BMS. Safety features for signaling over/undervoltage, thermal stress, etc., including emergency alarms, are triggered autonomously. When the number of cells increases, a reliable transfer of information from the cell balancing IC to the BMS controller becomes very important. Digital isolators can be used to ensure that the right data is transferred reliably by isolating the low-voltage side (BMS controller) from the high-voltage battery side.

TLE9012DQU – Li-ion battery monitoring and balancing IC

PRO SIL ISO 26262 compliant

RoHS

AEC Qualified

Features

- Voltage monitoring of up to 12 battery cells connected in series
- Hot plugging support
- Dedicated 16-bit delta-sigma ADC for each cell with selectable measurement mode
- High accuracy measurement for SOC and SOH calculation
- Integrated stress sensor with digital compensation algorithm and temperature-compensated measurements
- Secondary ADC with the same averaging filter characteristics as an advanced end-to-end safety mechanism
- Five temperature measurement channels for external NTCs
- Internal temperature sensors
- Integrated balancing switch allows up to 200 mA balancing current
- Differential robust serial 2 Mbit/s communication interface
- Additional four GPIO pins to connect an external EEPROM, for example
- Internal round-robin cycle routine triggers the majority of diagnostics mechanisms
  - Automatic balancing over- and undercurrent detection scheme
  - Automatic open-load and open-wire detection scheme
  - Automatic NTC measurement unit monitoring scheme
- End to end CRC secured iso UART/UART communication
- Emergency mode for communication
- ISO 26262 safety element out of context for safety requirements up to automotive safety integrity level D
- Green product (RoHS compliant)



Click here to learn more:
www.infineon.com/battery-monitoring

TLE9018DQK – Li-ion battery monitoring and balancing IC

Features

- Voltage monitoring of up to 18 battery cells connected in series
- Hot plugging support
- Dedicated 16-bit delta-sigma ADC for each cell with selectable measurement modes
- High accuracy measurement for SOC and SOH calculation
- Integrated stress sensor with digital compensation algorithm and temperature-compensated measurements
- Secondary ADC with the same averaging filter characteristics as an advanced end-to-end safety mechanism
- Eight temperature measurement channels for external NTCs
- Internal temperature sensors
- Integrated balancing switch allows up to 300 mA balancing current
- Differential robust serial 3 Mbit/s communication interface
- Additional four GPIO pins to connect an external EEPROM, for example
- Internal round-robin cycle routine triggers the majority of diagnostics mechanisms
- Automatic balancing over- and undercurrent detection scheme
- Automatic open-load and open-wire detection scheme
- Automatic NTC measurement unit monitoring scheme
- End to end CRC secured iso UART/UART communication
- Emergency mode for communication
- ISO 26262 safety element out of context for safety requirements up to automotive safety integrity level D
- Green product (RoHS compliant)

PRO SIL ISO 26262 compliant

RoHS

AEC Qualified



Click here to learn more:

www.infineon.com/battery-monitoring
www.infineon.com/cms/en/product/battery-management-ics

TLE9015QU – BMS transceiver IC - UART to iso UART

RoHS

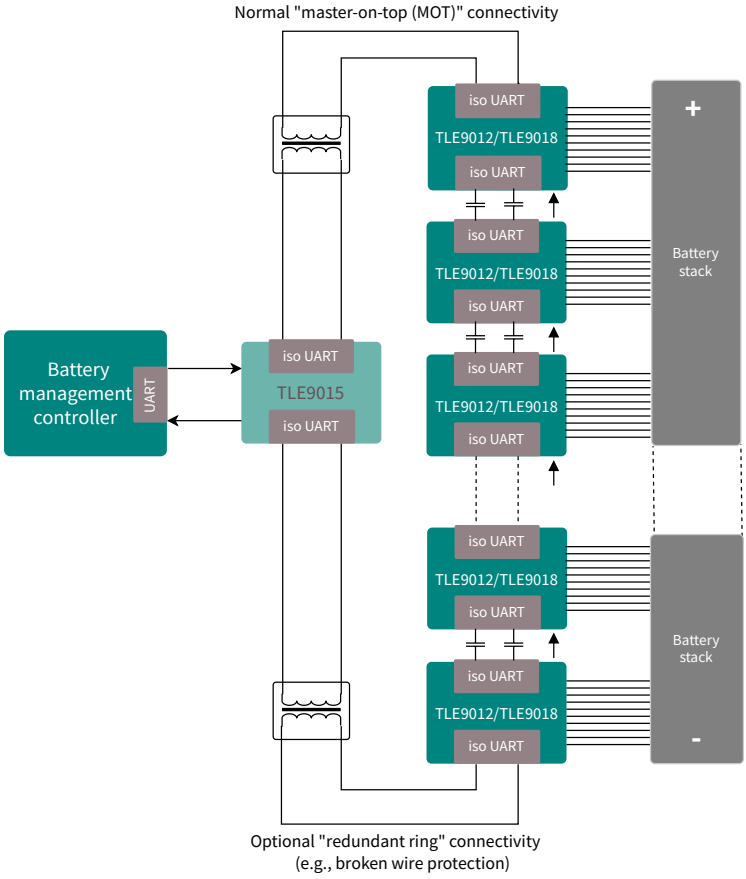
AEC Qualified



Features

- General
  - Two UART ports for serial communication to the host microcontroller
  - Two iso UART interfaces for communication to other BMS ICs
  - 2 Mbit/s data rate for fast communication
  - Fully transparent communication scheme from UART to iso UART
  - Ring mode topology compatible
- Communication ports
  - Integrated internal logic to minimize pin count on the UART side
  - Differential current edge triggered iso UART communication interface
  - High robustness against external noise
- General purpose error pin
  - Two external fault inputs (EMM and ERRQ_ext)
  - Latching error output pin to trigger external microcontroller
- Supporting diagnosis features
  - Internal supply monitoring
  - Green product (RoHS compliant)

Application diagram

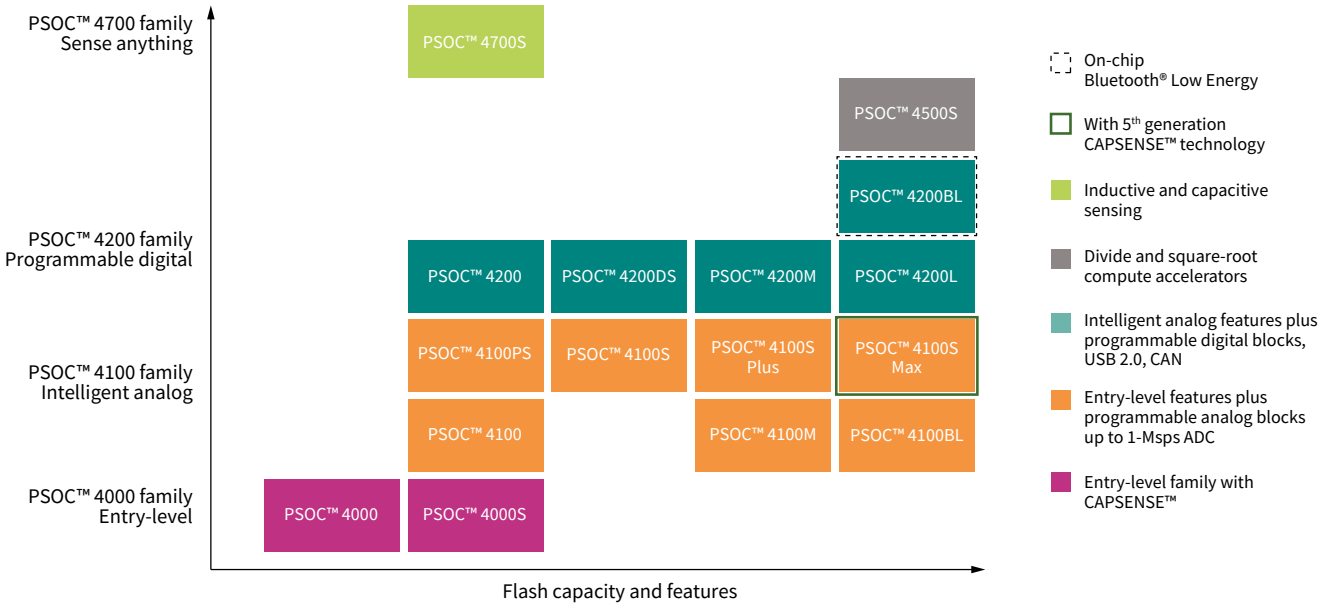


Click here to learn more:
www.infineon.com/battery-monitoring

Digital isolators for battery monitoring

Part number	Isolation ring	Safety certifications	Channel configuration*	Input thresholds	Default output state	Package
2DIB0400F	V_{ISO}=3000 V_{RMS} (UL1577 Ed. 5)	UL1577 (Ed. 5) VDE 0884-11 VDE 0844-17 IEC 62368-1 IEC 60601-1 IEC 61010-1 GB4943.1	2 forward 0 reverse (2+0)	Variable (CMOS)	Low	PG-DSO-8 5 mm × 4 mm
2DIB0401F					High	
2DIB1400F			1 forward 1 reverse (1+1)		Low	
2DIB1401F					High	
2DIB0410F			2 forward 0 reverse (2+0)	Fixed (TTL)	Low	
2DIB0411F					High	
2DIB1410F			1 forward 1 reverse (1+1)		Low	
2DIB1411F					High	

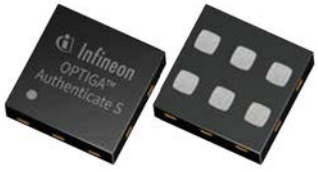
Microcontrollers for BMS



Battery security and authentication

OPTIGA™ Authenticate S provides enhanced device authentication to protect against counterfeits

Rich set of customization options	Effortless implementation	Security to rely on
– 4 authentication modes – 4 separate lifecycle counters to prevent manipulation – 3 temperature ranges – 2 communication profiles – 3 sets of memory	– Full turnkey solution – no security know-how required – Full system integration support including embedded software, host software, and advanced ecosystem support tools	– Enhanced HW security with an extended key length – Asymmetric cryptography – Protection against reverse engineering – Provisioning in a common criteria certified environment



Click here to learn more:
www.infineon.com/battery-monitoring

* Certifications planned



Audio amplifier

Class D audio

No compromise on quality – products for exceptional audio performance

At Infineon, we manufacture power-efficient class D audio amplifier solutions that maintain best-in-class audio quality without heating up the surroundings. Our amplifier solutions help you design robust and flexible products that meet the needs of your customers and the market. Choose from our high-performance class D audio amplifier solutions, ranging from the high-efficiency, high power-density multi-chip modules (MCM) to the highly scalable driver and power MOSFET combinations (for a full portfolio, see Audio amplifier ICs).

Design with Infineon's solutions to benefit from:



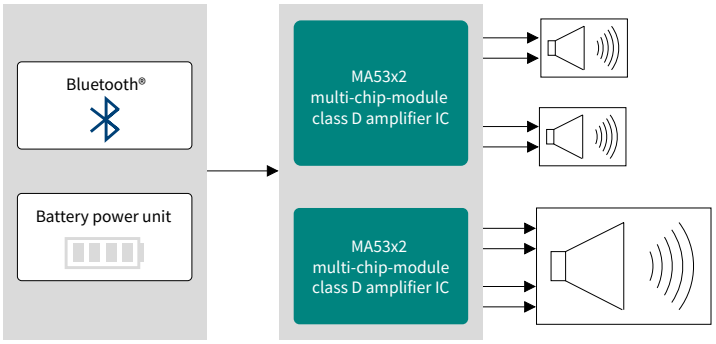
Maximized power efficiency | Maximized output power | Design freedom | Fast time-to-market

Home audio applications	Professional audio applications	Car and marine audio applications
– Multiroom systems	– Audio systems	– After-market car audio
– Audio hub	– Touring amplifiers	– Marine audio
– Sound bar subwoofers	– Active speakers	– Motorcycle audio
– Home theater systems	– Public announcement 70-100 V systems	
	– Music instrument amplifiers	

Home audio

Modern home audio products vary in shape, size, and configuration, but a common requirement is a great sound in combination with outstanding industrial and acoustic design. Infineon's high-performance class D audio amplifier solutions allow the design of new, innovative, and great-sounding home audio products in form factors and shapes that were previously unthinkable.

Solution example: 2.1 configuration (2xBTL + 1xPBTL)



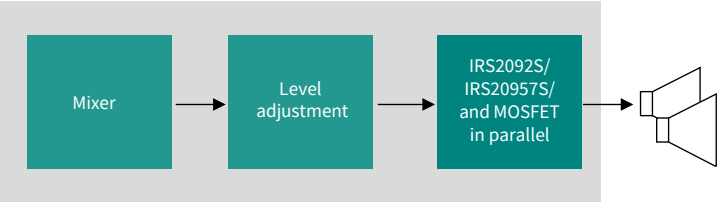
Solution specification
Number of audio channels:
2 single-ended load (SE) and 1 BTL channel
Peak power output: 2x200 W at 4 Ω, 10% THD and 400 W at 2 Ω, 10% THD
Featured audio ICs: MA5302MS, MA5332MS, MA5342MS

Click here to learn more:
www.infineon.com/merus
www.infineon.com/audio

Professional audio

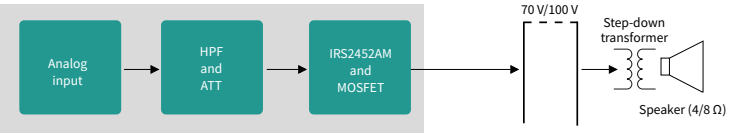
Professional audio equipment is all about maximizing output power and power density. With the conception of Infineon's MERUS™ multilevel class D technology and GaN-based CoolGaN™ HEMTs, it is now possible to design both amplifiers and power supply units with great audio performance and high efficiency in a very compact design. For engineers developing amplifiers, Infineon offers varied chip-set solutions with versatile MOSFET combinations for the scaling of output power.

Solution example: active speakers



Solution specification
Number of audio channels: 2 half-bridge channels
Peak power output: >500 W at 4 Ω, 1% THD
Featured audio ICs: IRS2092S, IRS20957S, IRS2461S, IRS2452AM

Solution example: public announcement 70-100 V system

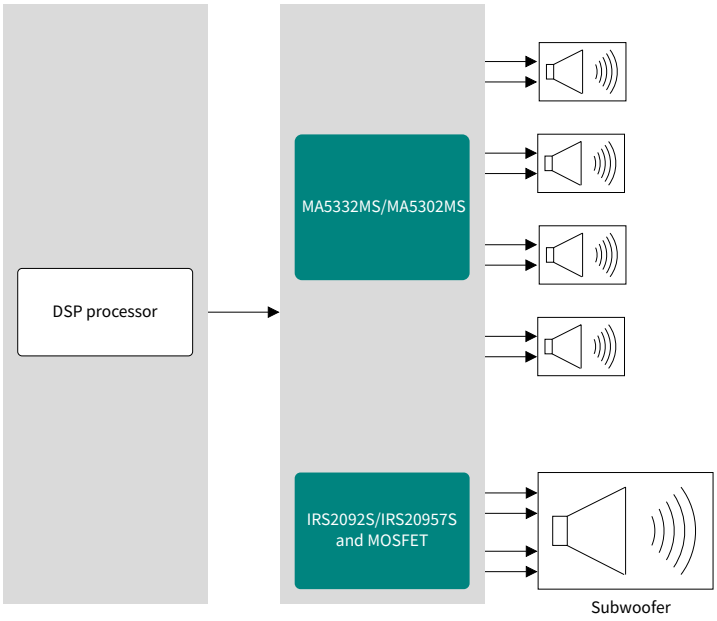


Solution specification
Number of channels: 2 half-bridge channels
Peak power output: 500 W, 70 V_{RMS}/100 V_{RMS}, 1% THD
Featured audio IC: IRS2452AM

Car and marine audio

Car and marine audio systems need to generate powerful and great sound while limiting the system size and heat generation to a minimum level. Infineon's MERUS™ multi-chip module integrated class D amplifiers and class D controller + MOSFETs combinations enable high-level power density and design flexibility to deliver the best music listening experience regardless of where you are, whether it is in your car, on your motorcycle, or the water.

Solution example: 5 channel car audio amplifier



Solution specification
Number of audio channels: 5 half-bridge channels
Peak power output: 150 W at 4/2 Ω, 1% THD; 500 W at 4 Ω, 1% THD
Featured audio ICs: MA5332MS, MA5302MS, IRS2092S, IRS20957S

Click here to learn more:
www.infineon.com/merus
www.infineon.com/audio

Motor control

Motor control for power tools, robotics, and eForklifts

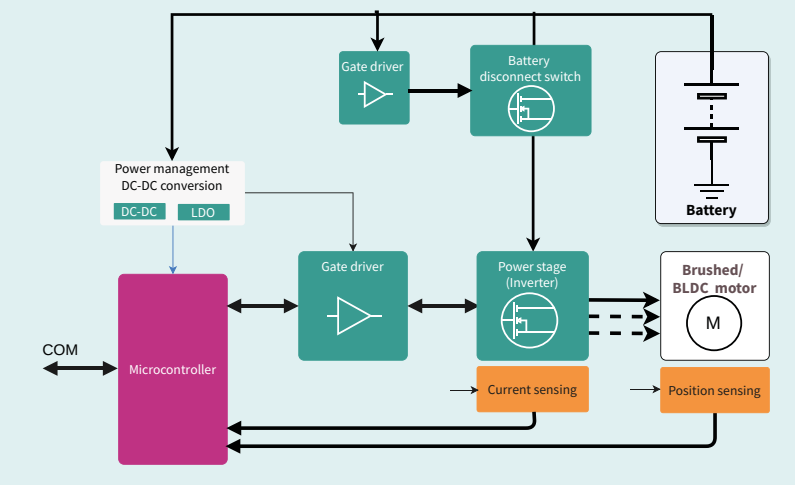
Driving BLDC motors efficiently and precisely

Regarding increased efficiency and durability, brushless DC (BLDC) motors offer the ideal solution for power electric motor applications. Compared to traditional brushed motors, brushless DC motors are quieter, lighter, and offer an overall smaller design footprint while providing increased reliability. These improvements, however, come with an increased need for monitoring and control, requiring significantly more complex electronics and supporting algorithms. This move toward BLDC motors occurs in concert with a continuous push towards higher energy efficiency, resulting in trade-offs between power delivery and battery lifetime. This, in turn, puts a significant burden on semiconductor technologies to deliver high performance in motor control applications. In parallel, shortening life cycles and an increased product diversity put an additional burden on suppliers to provide the same high-performance, cost-efficient solutions across an increasing variety of use cases. With industry-leading technology and reliability, Infineon's extensive portfolio of discrete and integrated circuits offers the breadth and depth of solutions necessary to meet the demands across a wide spectrum of motor control needs.

Features and benefits

Key features	Key benefits
– A complete eco-system of simulations, documentation, and demonstration boards	– Fast time-to-market
– Comprehensive portfolio of products and solutions	– Broad portfolio allows for right product fit to meet application needs
– Best-in-class MOTIX™ gate drivers for OptiMOS™ and StrongIRFET™ MOSFETs offering high efficiency and protection	– Extended battery life and product life span
– World-class broad and deep portfolio of LV FETs with SMD packaging improves capability and reliability while reducing assembly cost	– Reduced overall system size and cost
– Components featuring small form factors and compact design offering the highest power density and BOM savings thanks to the lowest $R_{DS(on)}$	
– High reliability of Infineon components results in prolonged product life spans	
– CoolGaN™ GaN HEMTs feature a smaller form factor and the highest efficiency, especially in FOC	

Application diagram: Motor drive



Key enabling products

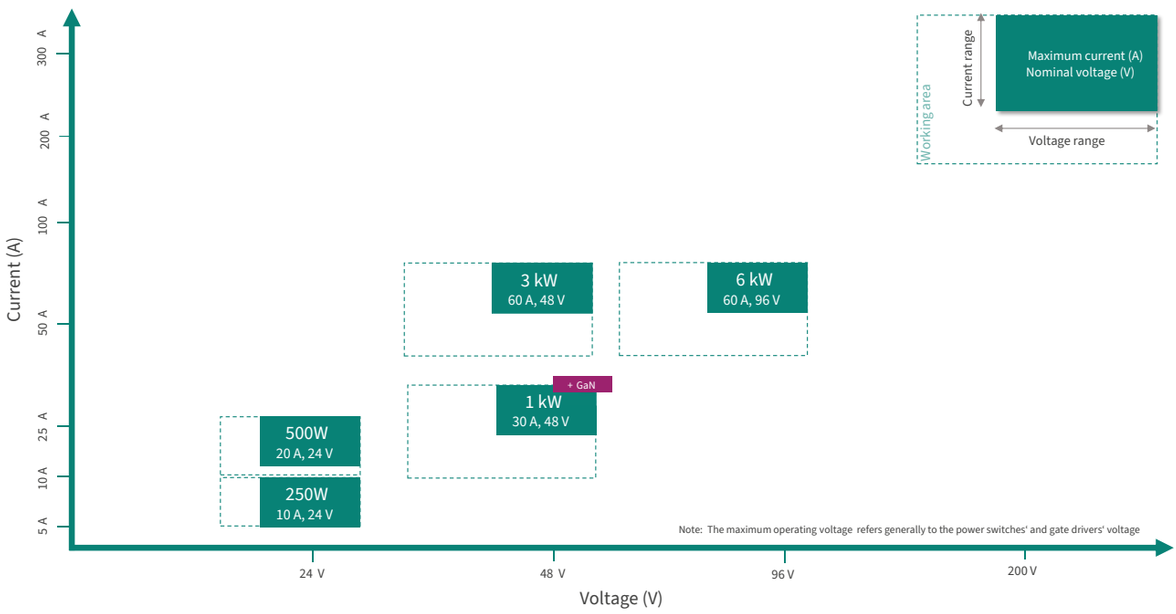
- CoolGaN™ HEMTs
- PSOC™ Control C3 MCUs
- XMC7000 MCUs
- EiceDRIVER™ gate driver ICs
- Power MOSFETs – OptiMOS™, StrongIRFET™
- MOTIX™ low-voltage motor control solutions
- XMC1000 microcontrollers
- XMC4000 microcontrollers
- XENSIV™angle sensor
- XENSIV™ current sensor
- XENSIV™ Hall switch

Target end applications

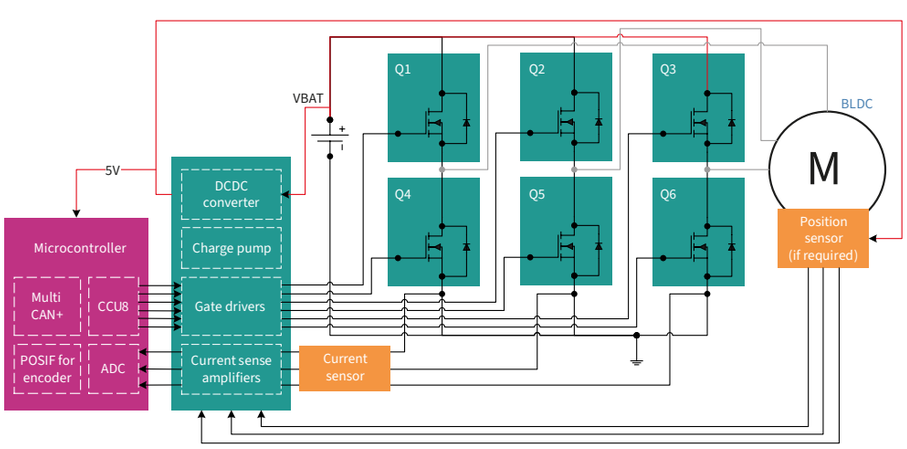
eForklift · Service robots · Collaborative robots · Power tools · Gardening tools · Home & garden · Multicopter · Warehouse / logistics robots · Humanoid robots

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www.infineon.com/bldc
www.infineon.com/bdc

Trusted design proposals and Bill of Material (BOM) for motor drives



Block diagram



250 W: 24 V/10 A

Product type	Part number	Description	Package mm x mm	Qty.	Key features
Microcontroller	PSC3M5FDS2ACQ1	32-bit Arm® Cortex®-M33, Trustzone, ultralow power (<1 µA hibernate, <10 µA sleep), 180 MHz CPU clock 64 KB SRAM and 256 KB flash, 16 channels 12-bit, 12 MS/sec ADC, TCPWM PWM for easy 3-phase inverter implementation and high resolution PWM plus position interface (encoder, sensors support)	LQFP-64 10x10	1	– High performance solution – Firmware available for FOC for BLDC motors with support for Hall, encoder, and sensorless – MCU Cortex®-M33 with high resolution PWM (<100 ps) – Small package MOSFETs – Integrated 6-channel gate driver with integrated OpAmps and DC-DC (Vbat to 3.3 V) and protections reduce the required PCB footprint significantly – Slew-rate control gate driver for optimized switching losses – Advanced current sensing with in-series sensors or use shunts with 6EDL7141 OpAmps+ protections
Gate driver	6EDL7141	3-phase smart gate driver, IO source/sink 1.5 A, operating VS 5.5 V – 60 V, integrated power supplies (Buck+LDO), UVLO and other protections, current sense amplifiers	VQFN48 7x7	1	
	6EDL04N02PR	3-phase gate driver, 200 V HS-offset voltage, IO source 0.165 A/sink 0.375 A, propagation delay 530 ns, OCP, enable, fault, and integrated bootstrap diode	TSSOP28 9.7x6.4	1	
Si - MOSFET	BSZ065N06LS5	60 V OptiMOS™ 5 Power Transistor 6.5 mΩ at 10 V_{GS}, continuous ID 65 A typ. Q_g 10 nC	PQFN 3.3x3.3	6	
Current sensor	TLI4971-A025/050T5-E0001	±25 A (48 mV/A)/±50 A range (24 mV/A) with integrated current rail with typ. 220 µΩ and <1 nH parasitic inductance, 240 kHz bandwidth, 2 outputs of overcurrent detection, ±2% total error	TISON8 8x8	1-3	
Position sensor	TLI4963-1M	VDD 3.0 V - 5.5 V, low current consumption 1.4 mA, ESD protection 4 kV HBM, low-jitter (typ. 0.35 µs), Temp. -40°C to 125°C, JESD47 qualified	SOT23	2-3	

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www.infineon.com/bdc

500 W: 24 V/20 A

Product type	Part number	Description	Package mm x mm	Qty.	Key features
Microcontroller	PSC3M5FDS2ACQ1	32-bit Arm® Cortex®-M33, Trustzone, ultralow power (<1 µA hibernate, <10 µA sleep), 180 MHz CPU clock 64 KB SRAM and 256 KB flash, 16 channels 12-bit, 12 MS/sec ADC, TCPWM PWM for easy 3-phase inverter implementation and high resolution PWM plus position interface (encoder, sensors support)	LQFP-64 10x10	1	– High performance solution – Firmware available for FOC for BLDC motors with support for Hall, encoder, and sensorless (to be requested) – MCU Arm® Cortex®-M4 with high resolution PWM (150 ps) – Small package MOSFETs – Integrated 6-channel gate driver with integrated OpAmps and DC-DC (Vbat to 3.3 V) and protections reduce the required PCB footprint significantly – Slew-rate control gate driver for optimized switching losses – Advanced current sensing with in-series sensors or use shunts with 6EDL7141 OpAmps+ protections
Gate driver	6EDL7141	3-phase smart gate driver, IO source/sink 1.5 A, operating VS 5.5 V – 60 V, integrated power supplies (Buck+LDO), UVLO and other protections, current sense amplifiers	VQFN48 7x7	1	
	6EDL04N02PR	3-phase gate driver, 200 V HS-offset voltage, IO source 0.165 A/sink 0.375 A, propagation delay 530 ns, OCP, enable, fault, and integrated bootstrap diode	TSSOP28 9.7x6.4	1	
Si - MOSFET	BSC039N06NS	60 V OptiMOS™ 5 Power Transistor 3.9 mΩ at 10 V_{GS}, continuous ID 121 A typ. Q_g 27 nC	SSO8 PQFN 5x6	6	
Current sensor	TLI4971-A025/050T5-E0001	±25 A (48 mV/A)/±50 A range (24 mV/A) with integrated current rail with typ. 220 µΩ and <1 nH parasitic inductance, 240 kHz bandwidth, 2 outputs of overcurrent detection, ±2% total error	TISON8 8x8	1-3	
Position sensor	TLI4963-1M	VDD 3.0 V - 5.5 V, low current consumption 1.4 mA, ESD protection 4 kV HBM, low-jitter (typ. 0.35 µs), Temp. -40°C to 125°C, JESD47 qualified	SOT23	2-3	

1 kW: 48 V/20 A - Si MOSFET

Product type	Part number	Description	Package mm x mm	Qty.	Key features
Microcontroller	PSC3M5FDS2ACQ1	32-bit Arm® Cortex®-M33, Trustzone, ultralow power (<1 µA hibernate, <10 µA sleep), 180 MHz CPU clock 64 KB SRAM and 256 KB flash, 16 channels 12-bit, 12 MS/sec ADC, TCPWM PWM for easy 3-phase inverter implementation and high resolution PWM plus position interface (encoder, sensors support)	LQFP-64 10x10	1	– High performance solution – Firmware available for FOC for BLDC motors with support for Hall, encoder, and sensorless (to be requested) – MCU Arm® Cortex®-M4 with high resolution PWM (150 ps) – Small package MOSFETs (2x parallel might bbe required depending on thermal design) – Integrated 6-channel gate driver with integrated OpAmps and DC-DC (Vbat to 3.3 V) and protections reduce the required PCB footprint significantly – Slew-rate control gate driver for optimized switching losses and Vds sensors – Advanced current sensing with in-series sensors or use shunts with 6EDL7141 OpAmps+ protections
Gate driver	6EDL7151	3-phase smart gate driver, IO source/sink 1.5 A, operating VS 5.5 – 70 V, integrated power supplies (Buck+LDO), UVLO and Vds sensors, current sense amplifiers	VQFN48 7x7	1	
	6EDL04N02PR	3-phase gate driver, 200 V HS-offset voltage, IO source 0.165 A/sink 0.375 A, propagation delay 530 ns, OCP, enable, fault, and integrated bootstrap diode	TSSOP28 9.7x6.4	1	
Si - MOSFET	ISC030N10NM6	100 V OptiMOS™ 6 Power Transistor 3.0 mΩ at 10 V_{GS}, continuous ID 103 A at TC 125°C, 10 V_{GS} and typ. Q_g 55 nC	SSO8 FL 5x6	6	
Current sensor	TLI4971-A025/050T5-E0001	±25 A (48 mV/A)/±50 A range (24 mV/A) with integrated current rail with typ. 220 µΩ and <1 nH parasitic inductance, 240 kHz bandwidth, 2 outputs of overcurrent detection, ±2% total error	TISON8 8x8	1-3	
Position sensor	TLI4963-1M	VDD 3.0 V - 5.5 V, low current consumption 1.4 mA, ESD protection 4 kV HBM, low-jitter (typ. 0.35 µs), Temp. -40°C to 125°C, JESD47 qualified	SOT23	2-3	

1 kW: 48 V/20 A - GaN HEMT

Product type	Part number	Description	Package mm x mm	Qty.	Key features
Microcontroller	PSC3M5FDS2ACQ1	32-bit Arm® Cortex®-M33, Trustzone, ultralow power (<1 µA hibernate, <10 µA sleep), 180 MHz CPU clock 64 KB SRAM and 256 KB flash, 16 channels 12-bit, 12 MS/sec ADC, TCPWM PWM for easy 3-phase inverter implementation and high resolution PWM plus position interface (encoder, sensors support)	LQFP-64 10x10	1	– High performance solution – GaN based design. Depending on thermal design might require 2 devices per position. – Firmware available of sensorless FOC for BLDC motors (to be requested) – MCU Arm® Cortex®-M4 with high resolution PWM or MCU with programmable GPIOs and OpAmps – GaN transistor allowing much higher switching frequency and reducing current ripples → reducing motor power loss and improving the thermal and efficiency performance
Gate driver	1EDN71x6G/U	Truly Differential Input (TDI) circuit to block CM voltages up to 150 V_{DC}, 200 V transient; split gate driver outputs with four driving strength variants - up to 2 A source/sink current capability – U version omits adjustable charge pump for -3 V	VSON10 3x3 (G) TSNP7 1.8x1.8 (U)	6	
GaN HEMT	IQC03xG10LS1S C	100 V CoolGaN™ High Electron Mobility Transistor 3.3 mΩ dual side cooling	PQFN 3x5 DSC	6	
Current sensor	TLI4971-A025/050T5-E0001	±25 A (48 mV/A)/±50 A range (24 mV/A) with integrated current rail with typ. 220 µΩ and <1 nH parasitic inductance, 240 kHz bandwidth, 2 outputs of overcurrent detection, ±2% total error	TISON8 8x8	1-3	
Position sensor	TLI4963-1M	VDD 3.0 V - 5.5 V, low current consumption 1.4 mA, ESD protection 4 kV HBM, low-jitter (typ. 0.35 µs), Temp. -40°C to 125°C, JESD47 qualified	SOT23	2-3	

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3 kW: 48 V/60 A – Si-MOSFET

Product type	Part number	Description	Package mm x mm	Qty.	Key features
Microcontroller	PSC3M5FDS2ACQ1	32-bit Arm® Cortex®-M33, Trustzone, ultralow power (<1 µA hibernate, <10 µA sleep), 180 MHz CPU clock 64 KB SRAM and 256 KB flash, 16 channels 12-bit, 12 MS/sec ADC, TCPWM PWM for easy 3-phase inverter implementation and high resolution PWM plus position interface (encoder, sensors support)	LQFP-64 10x10	1	– High performance solution – Firmware available for FOC for BLDC motors with support for Hall, encoder, and sensorless (to be requested) – MCU Arm® Cortex®-M4 with high resolution PWM (150 ps) – Low profile MOSFETs – Integrated 6-channel gate driver with integrated OpAmps and DC-DC (Vbat to 3.3 V) and protections reduce the required PCB footprint significantly – Slew-rate control gate driver for optimized switching losses and Vds sensors – Advanced current sensing with in-series sensors or use shunts with 6EDL7151 OpAmps+ protections and Vds sensors
Gate driver	6EDL7151	3-phase smart gate driver, IO source/sink 1.5 A, operating VS 5.5 – 70 V, integrated power supplies (Buck+LDO), UVLO and Vds sensors, current sense amplifiers	VQFN48 7x7	1	
	6EDL04N02PR	3-phase gate driver, 200 V HS-offset voltage, IO source 0.165 A/sink 0.375 A, propagation delay 530 ns, OCP, enable, fault, and integrated bootstrap diode	TSSOP28 9.7x6.4	1	
Si-MOSFET	IPT015N10N5	100 V OptiMOS™ 5 Power Transistor max 1.5 mΩ at 10 V_{GS}, continuous ID 300 A, 10 V_{GS} and typ. Q_g 169 nC	TOLL	6	
Current sensor	TLI4971-A025/050T5-E0001	±25 A (48 mV/A)/±50 A range (24 mV/A) with integrated current rail with typ. 220 µΩ and <1 nH parasitic inductance, 240 kHz bandwidth, 2 outputs of overcurrent detection, ±2% total error	TISON8 8x8	1-3	
Position sensor	TLI5012B-E1000	360° angle measurement, max. 1.9° angle error, Incremental Interface (IIF) with 12 bit resolution, auto-calibration and prediction	PG-DSO-8	1	

3kW: 48 V/60 A - GaN HEMT

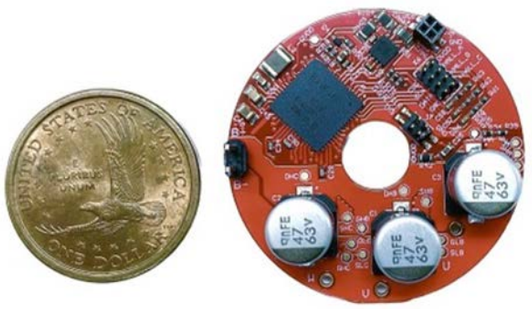
Product type	Part number	Description	Package mm x mm	Qty.	Key features
Microcontroller	PSC3M5FDS2ACQ1	32-bit Arm® Cortex®-M33, Trustzone, ultralow power (<1 µA hibernate, <10 µA sleep), 180 MHz CPU clock 64 KB SRAM and 256 KB flash, 16 channels 12-bit, 12 MS/sec ADC, TCPWM PWM for easy 3-phase inverter implementation and high resolution PWM plus position interface (encoder, sensors support)	LQFP-64 10x10	1	– High performance solution – GaN based design with parallel devices (depending on thermal design) – Firmware available of sensorless FOC for BLDC motors (to be requested) – MCU Arm® Cortex®-M4 with high resolution PWM or MCU with programmable GPIOs and OpAmps – GaN transistor allowing much higher switching frequency and reducing current ripples → reducing motor power loss and improving the thermal and efficiency performance
Gate driver	1EDN71x6G/U	Truly Differential Input (TDI) circuit to block CM voltages up to 150 VDC, 200 V transient; split gate driver outputs with four driving strength variants - up to 2 A source/sink current capability – U version omits adjustable charge pump for -3 V	VSON10 3x3 (G) TSNP7 1.8x1.8 (U)	6	
GaN HEMT	IQC03xG10LS1SC	100 V CoolGaN™ High Electron Mobility Transistor 3.3 mΩ dual side cooling	PQFN 3x5 DSC	3 x 6	
Current sensor	TLI4971-A025 / 050T5-E0001	±25 A (48 mV/A)/±50 A range (24 mV/A) with integrated current rail with typ. 220 µΩ and <1 nH parasitic inductance, 240 kHz bandwidth, 2 outputs of over current detection, ±2% total error	TISON8 8x8	1-3	
Position sensor	TLI4963-1M	VDD 3.0 V - 5.5 V, low current consumption 1.4 mA, ESD protection 4 kV HBM, Low jitter (typ. 0.35 µs), Temp. -40°C to 125°C, JESD47 qualified	SOT23	2-3	

6 kW: 96 V/60 A

Product type	Part number	Description	Package mm x mm	Qty.	Key features
Microcontroller	PSC3M5FDS2ACQ1	32-bit Arm® Cortex®-M33, Trustzone, ultralow power (<1 µA hibernate, <10 µA sleep), 180 MHz CPU clock 64 KB SRAM and 256 KB flash, 16 channels 12-bit, 12 MS/sec ADC, TCPWM PWM for easy 3-phase inverter implementation and high resolution PWM plus position interface (encoder, sensors support)	LQFP-64 10x10	1	– High performance solution – Firmware available for FOC for BLDC motors with support for Hall, encoder, and sensorless (to be requested) – MCU Arm® Cortex®-M4 with high resolution PWM (150 ps) – Low profile MOSFET. Number of devices per position will depend on thermal design – Integrated 6-channel gate driver with integrated OpAmps and DC-DC (Vbat to 3.3 V) and protections reduce the required PCB footprint significantly – Slew-rate control gate driver for optimized switching losses and Vds sensors – Advanced current sensing with in-series sensors or use shunts with 6EDL7141 OpAmps+ protections
Gate driver	6EDL04N02PR	3-phase gate driver, 200 V HS-offset voltage, IO source 0.165 A/sink 0.375 A, propagation delay 530 ns, OCP, enable, fault, and integrated bootstrap diode	TSSOP28 9.7x6.4	1	
MOSFET	IPT067N20NM6	200 V OptiMOSTM 6 Power Transistor max 6.7 mΩ at 10 V_{GS}, continuous ID 137 A, 10 V_{GS} and typ. Q_g 71 nC	TOLL	2x6	
Current sensor	TLI4971-A025/050T5-E0001	±25 A (48 mV/A)/±50 A range (24 mV/A) with integrated current rail with typ. 220 µΩ and <1 nH parasitic inductance, 240 kHz bandwidth, 2 outputs of overcurrent detection, ±2% total error	TISON8 8x8	1-3	
Position sensor	TLI5012B-E1000	360° angle measurement, max. 1.9° angle error, Incremental Interface (IIF) with 12 bit resolution, auto-calibration and prediction	PG-DSO-8	1	

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REF_36V_220W_SLFOC reference board

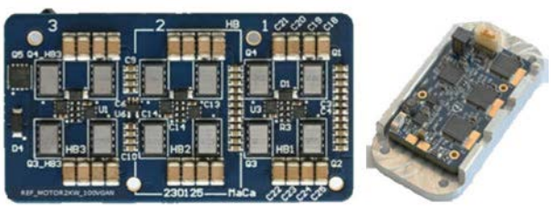


A configurable solution for battery-powered robotic wheel drives. It features the MOTIX™ IMD701A, a motor control IC that combines an XMC1404 MCU with the MOTIX™ 6EDL7141 three-phase gate driver. The addition of the BSC155N06ND from the OptiMOS™ family, which incorporates dual N-channel power MOSFETs in a SuperSO8 package, nearly doubles power density. These components enable a compact, 40 mm diameter board design.

Features and benefits

Key features	Key benefits
– Motor control with speed control scheme	– High efficiency
– Position control scheme	– Compact design
– Equation-based stall detection	– High-power density
– Configurable gate driver	– Low component count
– Integrated power supplies	– Protection and three current sense amplifiers

REF_MTR_48V30A_GaN reference design

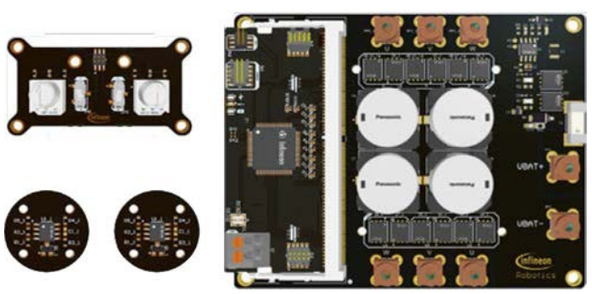


This compact inverter reference design for low-voltage battery applications includes twelve CoolGaN™ Transistors 100 V G3 (IGC033S10S1) in a half-bridge configuration with two devices in parallel for all phases. The transistors are driven by EiceDRIVER™ 1EDN7136U, and the XENSIV™ TLI4971 magnetic current sensor senses the output phase current. In addition, the XMC™ XMC4200 microcontroller is included to run FOC.

Features and benefits

Key features	Key benefits
– Small reference design	– High efficiency (99%)
– Gallium nitride solution	– High power density
– Optimized layout	– Inspiring the next generation of drives
– Top-side cooling	– High switching frequency

REF_48V_2X1KW_ASFOC reference design



Dual motor reference design for AMR/AGVs, professional lawn mowers, consumer lawn mowers, and pool cleaners. Featuring the PSOC™ Control C3 family of MCUs based on Arm® Cortex®-M33, enabling dual motor control. Supporting this functionality are MOTIX™ 6EDL7151 3-phase smart gate driver ICs, which are fully configurable to drive a wide range of MOSFETs and yield the best possible system efficiency. These gate drivers also have a full suite of system protection features including VDS sensors to improve system robustness in severe operating fault conditions.

Features and benefits

Key features	Key benefits
– 2 BLDC motor drive controlled by one microcontroller	– Accurate low speed operation
– Sensored FOC control	– Precise wheel angular position control
– Detachable control card	– Anti-roll on incline (zero speed torque)
– Software configurable gate drive and protection parameters	– Safe Torque Off and braking features
– “7th” MOSFET for safe battery disconnect under short-circuit condition	

Check out all of our demo boards in detail here.

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System specification example

V_{bat} = 36 V, 250 W (continuous power) PMSM motor with dual-core controller and smart gate driver

BoM example

Component	Part numbers	Description
MOSFETs	BSC012N06NS	Small form-factor in a SuperSO8 package, low $R_{DS(on)}$, low Q_{rr}, soft body diode
Microcontroller	XMC7100-F100K1088AA	Single 250 MHz Arm® Cortex®-M7 and 100 MHz Cortex®-M0+; timers up to 12-channel 16-bit motor control, 63-ch 16-bit timer/counter/pulse-width modulation (TCPWM) and 8-channel 32-bit TCPWM
Gate driver	6EDL7141	3-phase configurable gate driver with >50 configurable parameters (slew rate, output voltage etc.); fully integrated programmable buck (7 V, 9 V, 10 V, and 15 V) + LDO (3.3 V and 5 V) power supply; three integrated current sense amplifiers (CSA)
Position/speed sensor	TLI49611MXTMA1	Bipolar Hall latch with 3 V to 32 V operating supply voltage, active error compensation, low jitter (typ. 0.35 µs), high ESD performance
Current sensor	TLI4971-A120T5-U-E0001	120 A measurement range with integrated current rail, high bandwidth of 240 KHz, high robustness to voltage slew rates up to 10 V/ns, two independent fast overcurrent detection (OCD) pins with configurable thresholds





System specification example

V_{bat} = 48 V, 250 W (continuous power) PMSM motor with dedicated motor control MCU

BoM example

Component	Part numbers	Description
MOSFETs	BSC019N08NS5	Small form-factor in a SuperSO8 package, low $R_{DS(on)}$, low Q_{rr}, soft body diode
Microcontroller	XMC1302-T038X-0032	Core: 32 MHz Arm® Cortex®-M0, peripherals clock: 64 MHz; communication: UART, SPI, and I^2C, motor control peripherals: POSIF, MATH, and 1x CCU8
Gate driver	6ED2742S01Q	3-phase gate driver built on silicon on insulator (SOI) technology with integrated BSD, trickle charge pumps, power management, and current sense amplifiers
Position/speed sensor	TLI49611MXTMA1	Bipolar Hall latch with 3.0 to 32 V operating supply voltage, active error compensation, low jitter (typ. 0.35 µs), high ESD performance
Current sensor	TLI4971-A120T5-U-E0001	120 A measurement range with integrated current rail, high bandwidth of 240 KHz, high robustness to voltage slew rates up to 10 V/ns, two independent fast overcurrent detection (OCD) pins with configurable thresholds





System specification example

V_{bat} = 36 V, 250 W (continuous power) PMSM motor with functional safety requirement

BoM example

Component	Part numbers	Description
MOSFETs	BSC016N06NS	Small form-factor in a SuperSO8 package, low $R_{DS(on)}$, low Q_{rr}, soft body diode
Microcontroller	CYT4BB5CEBQ0AESGS	Core: One/two Arm® Cortex®-M7 at 250 MHz + Arm® Cortex®-M0+ at 100 MHz, 4 MB flash, up to 12 16-bit counters for motor control, up TO-220 programmable I/Os
Gate driver	TLE9140EQW	Active LS freewheeling during overvoltage, ASIL-B functional safety, automotive grade 0 qualified
Position/speed sensor	TLI49611MXTMA1	Bipolar Hall latch with 3 V to 32 V operating supply voltage, active error compensation, low jitter (typ. 0.35 µs), high ESD performance
Current sensor	TLE4973-R120T5-U-S0010	132 A measurement range with integrated current rail, UL1577 certified, AEC-Q100, ISO 26262-compliant, digital control interface

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System specification example

V_{bat} = 48 V, 3 kW PMSM motor inverter

Component	Part numbers	Description
MOSFETs	IPTC012N08NM5	OptiMOS™ 5 80 V power MOSFET in TOLT package enabling top-side cooling, high current rating >300 A, low Q_g of 175 nC
Microcontroller	XMC1403-Q048X0200 AA	Core: 48 MHz Arm® Cortex®-M0, peripherals clock: 96 MHz; communication: UART, SPI, I^2C, 2x MultiCAN; motor control peripherals: POSIF, MATH, 4x ACMP and 2x CCU88
Gate driver	2ED2738S01G	2-channel (half-bridge) gate driver with SOI isolation, integrated BSD, UVLO, separate V_{SS}/COM, thermal pad
Position/speed sensor	TLE5012B E1000	Giant magneto resistive (GMR)-based analog sensor with a high magnetic field range of 20 - 100 mT; max. 1.0° angle error over lifetime, discrete bridge with differential sine and cosine output
Current sensor	TLI4971-A120T5-U-E0001	120 A measurement range with Integrated current rail, high bandwidth of 240 KHz, high robustness to voltage slew rates up to 10 V/ns, two independent fast overcurrent detection (OCD) pins with configurable thresholds







System specification example

V_{bat} = 48 V, 20 kW PMSM motor inverter with ASIL-D MCU and AEC-Q 101 MOSFETs

Component	Part numbers	Description
MOSFETs	IAUS300N10S5N015T	Automotive 100 V MOSFET in TOLT package (top-side-cooled), high current rating of 300 A, low Q_g of 166 nC
Microcontroller	SAK-TC377TX-96F300S AB	AURIX™ TC377TX 3x Tricore at 300 MHz; functional safety ASIL-D; HSM (hardware security module); communication: 12-channel CAN-FD, 128-channel DMA
Gate driver	2EDB8259F	Half-bridge gate driver with 3 kV basic isolation based on coreless transformer (CT) technology, (UL1577), UVLO (4 types), DIS, STP/DTC, CMTI >300 V/ns
Position/speed sensor	TLE5014(D)	Giant magneto resistive (GMR) angle sensors with a wide range of selectable interfaces (SPC, SENT, PWM, and SPI), low error rate <1.0°, easy-to-use pre-configured sensors with high flexibility
Current sensor	TLE4973-AE35S5-S0001	High-precision coreless current sensor with full-scale up to 34 mT for high current applications; Diagnostics: overcurrent detection (OCD), overvoltage (OV), undervoltage (UV), diagnosis mode



System specification example

V_{bat} = 96 V, 3 kW PMSM motor

Component	Part numbers	Description
MOSFETs	IPT025N15NM6*	OptiMOS™ 6 150 V power MOSFET in TOLL package, high current rating >261 A, low Q_g of 104 nC
Microcontroller	XMC4700-F100K1536 AA	Core: Arm® Cortex ®-M4 at 144 MHz Communication: channel USIC (configurable to SPI, UART, IIC and IIS) Motor control peripherals: 2x POSIF, 4-channel ΔΣ Demodulator, 4x 12-bit ADC, 18 input channels, 4x parallel sampling and conversion
Gate driver	2EDB8259F	Half-bridge gate driver with 3 kV basic isolation based on coreless transformer (CT) technology, (UL1577), UVLO (4 types), DIS, STP/DTC, CMTI >300 V/ns
Position/speed sensor	TLE5501	Tunnel magneto resistive (TMR) based pre-calibrated sensor with 360° angle measurement; max. 1.0° (1.9°) angle error over lifetime, 16-bit representation of sine/cosine values
Current sensor	TLE4973-AE35S5-S0001	High-precision coreless current sensor with full-scale up to 34 mT for high current applications; Diagnostics: overcurrent detection (OCD), overvoltage (OV), undervoltage (UV), diagnosis mode

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Solutions for high-voltage solid-state relays

Best-in-class $R_{DS(on)}$ x A enables unprecedented low losses in combination with advanced control and diagnostics

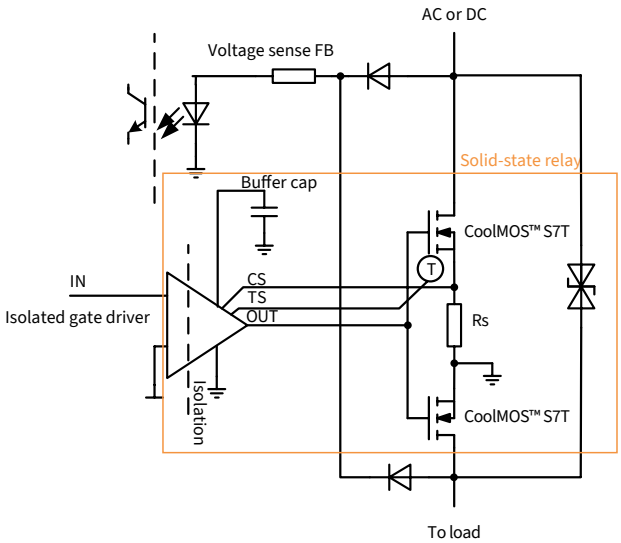
Electromechanical relays are a mature and well-established technology. However, they suffer from some inherent weaknesses. The mechanical movement of metal contacts causes noise. The high voltages can arc before the contacts are completely opened or closed, which leads to contact degradation. An increase in contact resistance over the lifetime causes the behavior to become less predictable. TRIACs (or silicon-controlled rectifiers, SCRs) are widely used as solid-state relays in AC applications. However, their controllability is limited, and they suffer from high power dissipation in the range of 1 W/A.

FET-based solid-state solutions offer many benefits in relay applications. This includes significantly faster switching while eliminating arcing and the noise associated with electromechanical devices. Inherently, this results in higher reliability and more stable performance. When considering the maintenance, repair and operations (MRO) cost, a strong argument can be made for using solid-state relays. Compared to TRIACs, a FET-based solution offers advanced control and protection methods. Built-in temperature and current sensing, along with galvanic isolation and secondary-side internal DC power supply, allow power-dissipation-optimized FETs to work in the safe operating area (SOA) and minimize cooling efforts. The latest CoolMOS™ S7T technology, along with the Infineon solid-state isolator (iSSI family), is a perfect match for solid-state relay applications. They offer sophisticated diagnostics, protection, and control capabilities along with an unprecedentedly low $R_{DS(on)}$ x A figure of merit, addressing contactors, actuators, and print relay applications in industries, which so far have been based on electromechanical relays.

Features and benefits

Key features	Key benefits
– Operational lifetime: tens of millions of operations	– Maintenance-free (no degradation of contacts), MRO cost savings
– No mechanical parts	– Arcing-free operation, no contact bounce, clicking noise is eliminated
– Significantly faster switching	– Advanced control superior to EMR
– No increase in resistance vs. lifetime	– Stable performance, predictable behavior
– Lowest $R_{DS(on)}$ x A in class	– Highest power density, minimized cooling effort, parallelization, and scalability
– Temperature and current sensing	– Protecting FETs
– Minimum activation power	– Less energy consumption, minimized cooling effort

Application diagram using a solid-state isolator driver*



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*SSI requires no isolated power supply



Product portfolio

Product	Product family	Voltage class [V_{DS} max]	$R_{DS(on)}$	Package	Part number
MOSFETs	CoolMOS™ S7T* Industrial	600 V	10-22 mΩ	Q-DPAK top-side cooled (TSC)	IPDQ60T022S7, IPDQ60T017S7 , IPDQ60T010S7
				Q-DPAK bottom-side-cooled (BSC)	IPQC60T022S7, IPQC60T017S7, IPQC60T010S7
			22 mΩ - 65 mΩ	TOLL	IPT60T022S7, IPT60T040S7, IPT60T065S7
	CoolMOS™ S7 Industrial	600 V	22 mΩ - 65 mΩ	TO-220	IPP60R022S7, IPP60R040S7, IPP60R065S7
		600 V	10 mΩ to 65 mΩ	Q-DPAK top-side cooled	IPDQ60R010S7, IPDQ60R022S7, IPDQ60R040S7
		600 V	10 mΩ to 65 mΩ	Q-DPAK bottom-side cooled	IPQC60R010S7, IPQC60R040S7, IPDQ60R017S7
	CoolMOS™ S7TA Automotive	600 V	10 mΩ to 60 mΩ	Q-DPAK top-side cooled	IPDQ60T010S7A, IPDQ60T017S7A, IPDQ50T022S7A, IPDQ60T040S7A
				Q-DPAK bottom-side cooled	IPQC60T010S7A, IPQC60T017S7A, IPQC0T022S7A, IPQC0T040S7A
	CoolMOS™ S7A Automotive	600 V	10 mΩ to 40 mΩ	Q-DPAK top-side cooled	IPDQ60R010S7A, IPDQ60R017S7A, IPDQ60R022S7A IPDQ60R040S7A
IGBTs	IGBT TRENCHSTOP™ 5	650 V	50 A	TO-247-4	IKZ50N65EH5, IKZ75N65EH5

Product	Product family	Output voltage	Output current [typ.]	Isolation certificate	Integrated output-side voltage supply	Protection features	Part number
Gate drivers	EiceDRIVER™	20 V	5 A/9 A	Non-isolated	not applicable	-	1EDN6550B, 1EDN8550B, 1EDN9550B, 1EDN8511B
			5 A/9 A	VDE	no	-	1EDB6275F, 1EDB8275F, 1EB9275F
			±2 A to ±6 A	-	no	AMC [1]	1EDI10I12MF, 1EDI20I12MF, 1EDI30I12MF
		25 V	±2.6 A <<	-	not applicable		1ED44173N01B
		40 V	±3 A to ±6 A	UL	no	DESAT [1], AMC [1]	1ED3431MU12M, 1ED3461MU12M
				VDE, UL	no		1ED3431MC12M, 1ED3461MC12M

Product	Product family	Load voltage	Output/load current	Isolation voltage	Part number
Integrated solid-state relays	CT [1] based solid-state isolator	-	175 µA	5.7 kV	iSSI20R02H, iSSI20R03H
			400 mA	5.7 kV	iSSI20R11H, iSSI30R11H, iSSI30R12H
	Photovoltaic isolators (PVI)	-	8 µA	4 kV	PVI5080N
	Photovoltaic relays (PVR)	60 V	2 A	4 kV	PVG612A
		400 V	240 mA	4 kV	PVT412AS

1) AMC: Active Miller clamp
DESAT: Drain-source voltage monitoring
DMC: Dynamic Miller to Miller clamp
OCP: Overcurrent protection
OTP: Overtemperature protection
CT: Coreless transformer

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*MOSFET with integrated temperature sensor

SSCB

Solutions for solid-state circuit breakers

Smart solid-state circuit breakers integrate advanced functionality into one single device

The first electromechanical circuit breakers emerged a century ago. Fast-forward to today, the demand for a shift towards smart and intelligent solid-state devices is undeniable. In contrast to their traditional counterparts, solid-state solutions offer exceptional control and protection capabilities. In the past, the adoption of solid-state technology faced obstacles such as limited availability and high costs, restricting its usage to niche applications. However, thanks to Infineon's groundbreaking power semiconductors, designers can now deploy cost-effective and advanced solid-state solutions on a broader scale.

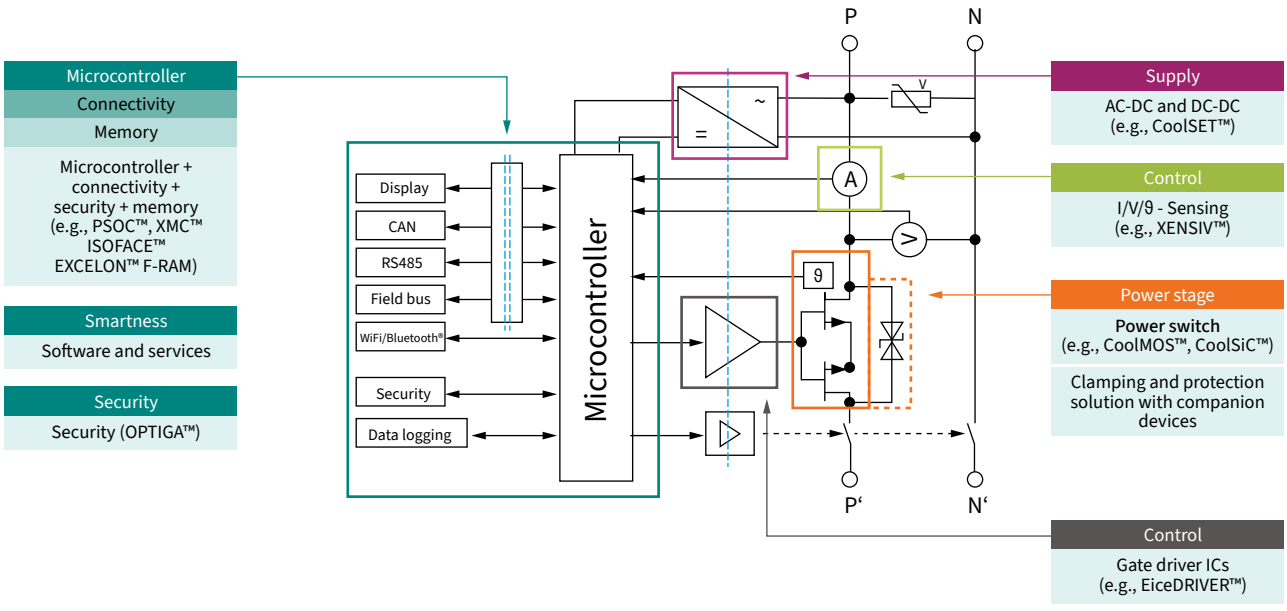
Infineon's comprehensive solutions for solid-state circuit breakers cover all system needs from sense – compute – actuate to the next level of connectivity and security.

Features and benefits

Key features
– Combines protection, actuation, load control, diagnostic, metering, and secure communication
– AC and DC agnostic
– Offers secure web/IoT connectivity
– Captures and logs data in real time
– Enables smart power balancing and control of peak loads
– Detects and isolates faults in sub-µs range

Key benefits
– Provides noise-less and wear-free load switching with real-time control capability
– Enables remote load control and diagnostics in real-time
– Optimized system performance thanks to highly accurate and user programmable tripping characteristics
– Supports smart billing, even for sub-branches by accurately monitoring energy usage
– Provides state-of-health diagnostics of connected loads
– Easy to install and replace, since it matches current MCBs' form factor
– Supports OCP, AFDD/AFCI, and RCD/GFCI, all-in-one, for enhanced safety and protection for both AC and DC grids
– Compliant with industrial certification standards and support ZVS and ZCS for smart and soft switching
– Smart power balancing and peak load control for optimal energy efficiency as it can be applied for AC and DC grids
– Secure web and IoT connectivity, along with state-of-health diagnostics of connected loads, makes solid-state circuit breakers a highly advanced and reliable solution for modern power systems

Application diagram



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Product portfolio

Product	Product family	Voltage class [V_{DS} max]	$R_{DS(on)}$	Package	Part number
SJ MOSFETs	CoolMOS™ S7	600 V	10 mΩ - 22 mΩ	Q-DPAK	IPDQ60R010S7, IPDQ60R017S7, IPDQ60R022S7
	CoolMOS™ S7T				IPDQ60T010S7, IPDQ60T017S7, IPDQ60T022S7
	CoolMOS™ 8		7 mΩ - 16 mΩ	Q-DPAK	IPDQ60R007CM8, IPDQ60R016CM8
SiC MOSFETs	CoolSiC™ G1 discrete	750 V	8 mΩ - 16 mΩ	Q-DPAK	IMDQ75R008M1H, IMDQ75R016M1H
		1200 V	7 mΩ - 20 mΩ	TO247-3	IMW120R007M1H, IMW120R014M1H, IMW120R020M1H
		1200 V	7 mΩ - 20 mΩ	TO247-4	IMZA120R007M1H, IMZA120R014M1H, IMZA120R020M1H
	CoolSiC™ G2 discrete	650 V	7 mΩ - 15 mΩ	D^2PAK	IMBG65R007M2H, IMBG65R015M2H
		650 V	7 mΩ - 20 mΩ	D2PAK	IMBG65R007M2H, IMBG65R010M2H, IMBG65R015M2H, IMBG65R020M2H
		750 V	4 mΩ - 16 mΩ	Q-DPAK	IMDQ75R004M2H, IMDQ75R007M2H, IMDQ75R011M2H, IMDQ75R016M2H
		1200 V	7 mΩ - 20 mΩ	TO247-4	IMZC120R007M2H, IMZC120R012M2H, IMZC120R017M2H, IMZC120R020M2H
		1200 V	8 mΩ - 22 mΩ	D2PAK	IMBG120R008M2H, IMBG120R012M2H, IMBG120R017M2H, IMBG120R022M2H
		1200 V	4 mΩ - 17 mΩ	Q-DPAK	IMCQ120R004M2H, IMCQ120R005M2H, IMCQ120R007M2H, IMCQ120R010M2H, IMCQ120R017M2H
	CoolSiC™ G1 module	1200 V	5.8 mΩ - 16.2 mΩ	Easy 1B module	FF7MR12W1M1H_B17, FF17MR12W1M1H_B17
		1200 V	1.6 mΩ - 3.2 mΩ	62 mm module	FF1MR12KM1H_S, FF3MR12KM1H_S,
		2000 V	2.6 mΩ - 5.2 mΩ	62 mm module	FF3MR20KM1H_S, FF4MR20KM1H_S, FF5MR20KM1H_S

Product	Product family	Output voltage	Output current	Isolation type	Part number
Gate drivers	EiceDRIVER™	20 V	4 A/8 A	Non-isolated	1EDN8550B, 1EDN9550B
		40 V	14 A	Reinforced isolation	1ED3124MU12H
		35 V	6.5 A	Functional isolation	1ED3142MU12F
		20 V	5 A/9 A	Functional isolation	2EDB8259Y

Product	Product family	Current rail	Accuracy	Package	Part number
Current sensors	XENSIV™	internal	2%	PG-TISON 8	TLI4971-A120T5
		external	1.5%	PG-TDSO-16	TLE4972-AE35D5
				PG-VSON-6	TLE4972-AE35S5
				PG-TDSO-16	TLE4973-AE35D5
				PG-VSON-6	TLE4973-AE35S5
			5%	PG-SOT23-6	TLI5570-RE35E1

Product	Product family	Power stage	P_{out} max.	Package	Part number
AC-DC power conversion	CoolSET™	Integrated	15 W	PG-DSO-12	ICEAR4770AG
	Flyback ICs	Non-integrated	>60 W	PG-DSO-8	ICE5GSAG, ICE5ASAG
DC-DC power conversion	Transformer driver IC	Full bridge	5 W	PG-TSSOP-8	2EP130R

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www.infineon.com/sscb



Applications

- Data center and computing
- Telecommunication infrastructure
- Robotics
- Electric forklifts
- Light electric vehicles and electric forklifts
- On-board charger for xEV applications
- Industrial SMPS
- Residential AC EV charging AC wallboxes
- EV Charging - DC
- Solar PV
- Energy storage systems
- Air conditioning systems
- Air purifier
- Ceiling fan
- Coffee maker and grinders
- Cordless vacuum cleaners
- Induction cooking
- Laundry machine and tumble dryers
- Refrigerators and freezers
- Cordless power tools and outdoor power equipment
- Smart TV
- Smartwatches, feature watches, wristbands, and smart rings
- Security camera and video doorbell
- USB-C chargers and adapters
- Battery chargers
- Wireless charging
- LED lighting
- Plug and play LEDs solutions
- Smart lighting solutions

Datacom

Data center and computing

Energy-efficient and high power density solutions to support all power needs from grid to core

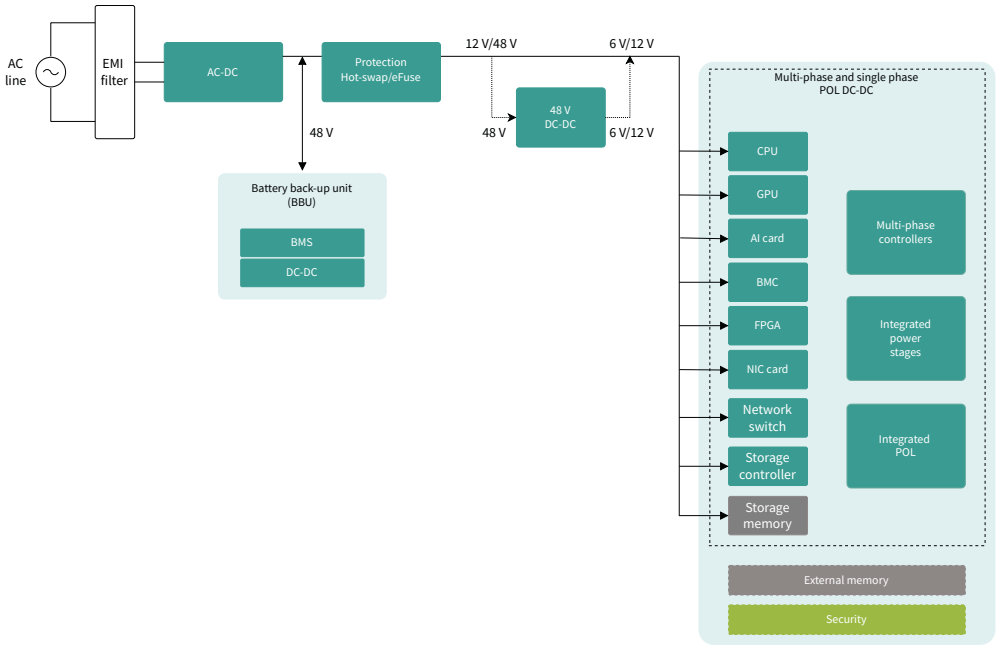
The trend towards digitalization and rapid adoption of generative AI is creating exponential growth in global data generation, substantially impacting data center and computing infrastructure requirements. The chips performing the AI acceleration tasks are expected to complete training cycles faster. With each generation of AI processors, the power requirements are increasing to meet the required computational performances. This drives system power requirements up dramatically, creating significant power density challenges. Effective data center and computing designs must, hence, combine high power density with efficiency: our solutions enable green and efficient computing platforms that reduce the overall power consumption in data centers and actively contribute to the decarbonization of our world.

Infineon's multi-pronged innovation strategy with power semiconductor technologies, including silicon and wide bandgap, advanced packaging technologies with discrete and multi-die, as well as system architectures, smart control and software, offers a unique opportunity to offer a truly optimized system solution from AC-to-core, offering improved data center TCO by saving up to 48.3 TWh per year, ~[2]10 Bn electricity cost, and 34.2 M metric tons CO2 equivalents.

Features and benefits

Key features	Key benefits
– Broad portfolio from AC-to-core	– One-stop-shop, system offerings and deep system competence
– Best-in-class SMPS densities achieved with Si, SiC, and GaN hybrid solutions	– Enables SMPS designs up to 12 kW with 100 W/in³ power density
– Industry-best vertical power delivery solutions for next-gen power processor	– Achieves >2% higher efficiency versus competition and 12% TCO savings versus lateral power delivery solutions
– Broad portfolio of solutions to support 48 V_{DC}-DC and hot-swap	– Solutions support all DC-DC step-down ratios and reliable SOA protection for hot-swap
– Trusted partner with reliable manufacturing capabilities	– Continuous investments in capacity and business continuity

Application diagram



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www.infineon.com/acceleratorcard www.infineon.com/48v-power-distribution www.infineon.com/PSRM



Product portfolio

Functional block	Description	Featured products
Server power supply unit	Infineon's wide portfolio of semiconductors offers a complete system solution to meet the diverse requirements of server and data center SMPS, from high-voltage and low-voltage MOSFETs to gate drivers, microcontrollers, and auxiliary SMPS controllers. A wide portfolio of robust and reliable wide bandgap solutions is available to boost efficiency and density further: SiC is perfect for hard-switching topologies and high-temperature operating conditions, while GaN is better suited for hard- and soft-switching and high frequency. A hybrid approach achieves the best trade-off between efficiency, power density, and system cost.	– CoolMOS™ high voltage MOSFETs – OptiMOS™ low voltage MOSFETs – EiceDRIVER™ gate drivers – XMC™ microcontrollers – CoolSET™ auxiliary SMPS controllers – CoolGaN™: Their low Q_g and Q_{oss} charges ideal for soft-switched and hard-switched high frequencies topologies – CoolSiC™: Their low increase of $R_{DS(on)}$ overtemperature ideal for high-current server PSU applications in hard-switched topologies – ISOFACE™ digital isolators
Battery backup unit (BBU)	The battery management system ensures the high performance and safe operation of Li-ion batteries. It performs actions such as SOC (state of charge) and SOH (state of health) estimations. In BBU systems, the BMS circuit is coupled with a DC-DC converter to ensure a regulated output voltage. The DC-DC stage is bidirectional and usually a buck-boost topology, single or multiphase.	– OptiMOS™ MOSFETs: explore Infineon's portfolio of protection switches preventing damage and failures to meet the necessary telecommunication's safety requirements – Power management ICs: PCIMs support comprehensive power supplies with a small form factor footprint for system solutions using TRAVEO™, AURIX™ and PSOC™ MCU families – Gate drivers: Every switch needs a driver and it is important to select the right one, that is why Infineon has over 500 EiceDRIVER™ gate driver IC solutions covering different output current options and offering different combinations of protection features
Protection and monitoring	With its wide input voltage range (up to 80 V), the hot-swap controller provides an inrush control for the hot plugging of server blades and datacom cards (networking) into the live backplane. The digital SOA control mechanism ensures that the inrush MOSFET is always operated within its safe operating region, thus providing a reliable hot-swap solution. The hot-swap controller also ensures that the system is protected against various faults in normal operation by continuously monitoring voltage, current, power, and temperature and providing the telemetry and fault data via I^2C following PMBus protocol. For non-hot-swappable applications, the V/I monitoring controller can be used, which provides reliable and highly accurate telemetry of voltage, current, power, temperature, and energy via I^2C following PMBus protocol along with warning signals alerting the system for potential fault events about to occur	– XDP™ XDP710 hot-swap controller with a programmable digital SOA control – XDP™ XDP711 digital hot-swap and system monitoring controller* – XDP™ XDM700 V/I Monitor*
48 V_{DC}-DC	The 48 V conversion ecosystem is being driven primarily by high-power applications such as AI, where system-level power distribution losses need to be reduced, and legacy 12 V architectures can no longer meet the requirements. This includes Infineon's new intermediate bus converter (IBC) solutions for HSC and ZSC topologies and high-efficiency and high-power density applications	– XDP™ XDPP1100 Digital power controller – XDP™ XDPP1140/1148 Digital power controller* – OptiMOS™ MOSFETs: Explore Infineon's portfolio of protection switches preventing damage and failures to meet the necessary telecommunication's safety requirements – EiceDRIVER™ gate drivers
Multi-phase and single phase POL DC-DC	**Digital controllers:** – The industry's most mature and advanced controller technology with best-in-class transient response – Flexibility with Arm® Cortex®-M0 microcontroller for faster design cycle and tailored performance – Multiprotocol support with up to 16 phases and support 1500 A+ current levels **Smart power stages:** – Best-in-class efficiency and robustness with OptiMOS™ MOSFETs and superior packaging technologies – Greater current reporting accuracy (±2%) with current-mirror sense technology – Industry-standard footprints with higher electrical and thermal performance **Integrated POL:** – Best-in-class performance and robustness with OptiMOS™ MOSFET and superior packaging technologies – Ease of use with analog and digital smart POL solutions – Industry's best transient performance with fast constant on-time (COT) control	– Digital multiphase controllers: A wide portfolio supporting multiple communication protocols such as Intel SVID, AMD SVI2, AVS bus and PMBus, and offering a variety of programmable features – Integrated power stages: Combining OptiMOS™ MOSFETs with intelligent gate drivers through Infineon's superior packaging technologies – Integrated point of loads: including digital, analog, and constant on-time options – Voltage regulator for Ampere, Intel, and AMD server CPUs – Voltage regulator for AI accelerator card, SmartNIC card, networking and switch platform – Power management solutions for FPGAs – Network switch – Storage controllers – Raid storage solutions
Dual- and Quad-phase power modules	The industry's first common footprint module that enables vertical power delivery. Highest efficiency and superior thermal performance enabled through OptiMOS™ smart power stages, inductor-on-top topology (IFX patented IP) and chip-embedded packaging to enable <1 C°/W.	– TDM22544D and TDM22545D dual-phase power modules integrate two phases of a multiphase buck regulator, lowering the area by 40% compared to an equivalent discrete solutions – TDM2354xD and TDM2354xT dual-phase power modules – TDM2454xx quad-phase power modules

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* Coming soon



Telecom

Telecommunication infrastructure

Cutting-edge semiconductors for mobile communication, network equipment, and beyond

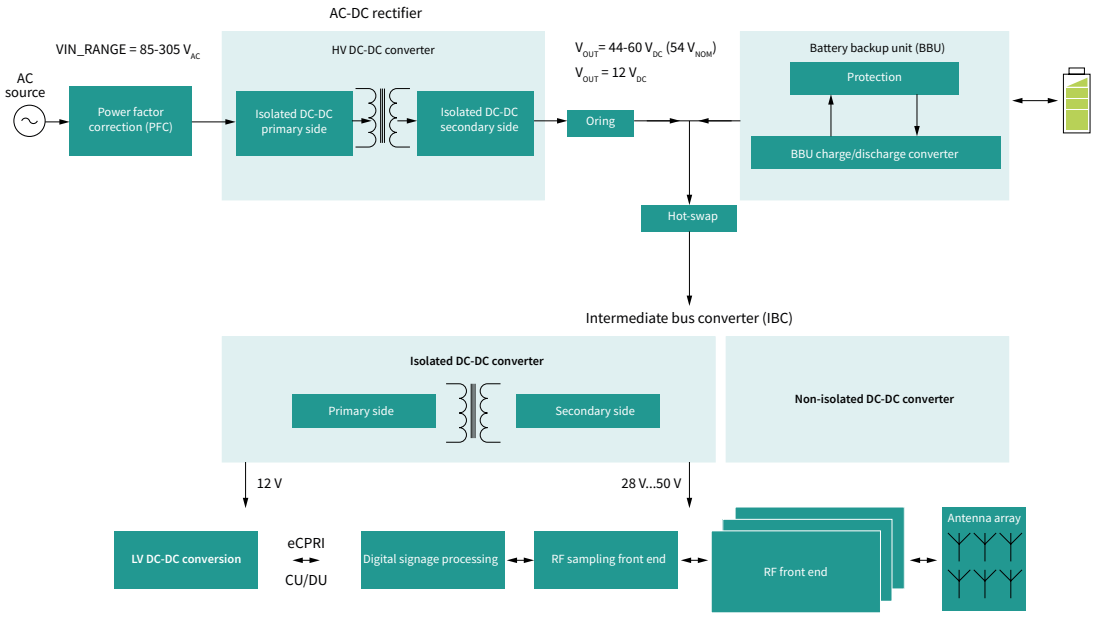
As the global demand for data grows, the call for improved connectivity, performance, and coverage has reached peak significance. Alongside these demands, enhancing energy efficiency has also emerged as a critical factor in our collective journey towards a greener world. A significant step in this direction is the introduction of 5G mobile telecommunications: Known for its high-speed and reliable connectivity, 5G also brings substantial advantages in power consumption, providing a more energy-efficient solution to meet our increasing data needs.

Over the years, Infineon has gathered a wealth of expertise and insights in the telecommunications sector, building an extensive portfolio of high-quality semiconductors spanning from “grid to air” to enable efficient power conversion, robust security, seamless connectivity, and playing a pivotal role in powering a greener and more sustainable world.

Features and benefits

Key features	Key benefits
– Broad portfolio covering the complete power flow and more	– One-stop-shop, complete offering and deep system competence
– Best-in-class power semiconductor solutions based on Si, SiC, and GaN	– High power density, efficiency, and reliability
– 20+ years of quality track record in the telecommunications industry	– Robust solutions, reliable performances
– Trusted partner with reliable manufacturing capabilities	– Continuous investments in capacity and business continuity

Application diagram



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www.infineon.com/telecom-acdc
www.infineon.com/fpga-telecom
www.infineon.com/ict-security



Product portfolio

Functional block	Description	Featured products
Rectifier	The telecom rectifier typically converts the single- or three-phase AC input into 12 V, 48 V, or 54 V_{DC} output. The power factor correction (PFC) shapes the power supply's input current synchronize with the AC input voltage to maximize the real power drawn from the mains. Followed by an isolated DC-DC converter and synchronous rectification stage, the telecom rectifiers achieve the highest efficiency and power density levels.	– CoolMOS™ high voltage MOSFETs – OptiMOS™ low voltage MOSFETs – EiceDRIVER™ gate drivers – XMC™ microcontrollers – ISOFACE™ digital isolators – CoolSET™ auxiliary SMPS controllers – CoolGaN™ GaN HEMTs ideal for soft-and hard-switched high frequencies topologies – CoolSiC™ MOSFETs ideal for high-current applications in hard-switched topologies
Auxiliary power	Telecom rectifiers require an auxiliary SMPS power source that works separately from the main power supply to support, for instance, standby operation. Power ratings can vary from a few to tens of watts for these auxiliary supplies, which can be isolated or non-isolated.	– CoolSET™ AC-DC integrated power stages – XENSIV™ high-precision coreless current sensors
Battery management system (BMS)	The battery management system ensures Li-ion batteries' high performance and safe operation. It performs actions such as estimations of state of charge (SOC) and state of health (SOH). In battery back-up systems, the BMS circuit is coupled with a DC-DC converter to ensure a regulated output voltage. The DC-DC stage is bidirectional and usually has a buck-boost topology, single or multiphase.	– OptiMOS™ low voltage MOSFETs – EiceDRIVER™ gate drivers – PSOC™ microcontrollers for power management
Protection and monitoring	The hot-swap controller, with its wide input voltage range (up to -80 V), provides an inrush control for the hot plugging of radio units and telecom cards into the live backplane. The digital SOA control mechanism ensures the inrush MOSFET is always operated within its safe operating region, thus providing a reliable hot-swap solution. The controller also ensures that the system is protected against faults in regular operation by continuously monitoring voltage, current, power, and temperature and providing accurate telemetry and fault data via I^2C following the PMBus protocol. For not hot-swappable applications, the V/I monitoring controller can be used, which provides reliable and highly accurate telemetry of voltage, current, power, temperature, and energy via I^2C following the PMBus protocol along with warning signals alerting the system for potential fault events about to occur.	– XDP™ XDP700 hot-swap controller with a programmable digital SOA control
DC-DC conversion	Infineon provides DC-DC conversion solutions for radio units, AAS, and DU/CU servers. Infineon's growing portfolio targets all stages of DC-DC conversion, from 48 V intermediate bus converters (IBC) down to point-of-loads used to supply analog front-end (AFE), field-programmable gate arrays (FPGA), or application-specific integrated circuits (ASIC). The multiphase controller plus integrated power stage solutions allow the power designer to address the most stringent dynamic requirements when providing supply to high-performance processors.	– XDP™ XDPP1100 Digital power controller – XDP™ XDPP1140/1148 Digital power controller – XDP™ XDM700 V/I Monitor * – OptiMOS™ MOSFETs: Explore Infineon's portfolio of protection switches preventing damage and failures to meet the necessary data center's safety requirements – EiceDRIVER™ gate drivers – ISOFACE™ digital isolators – XENSIV™ high-precision coreless current sensors – Integrated power stages: Combining OptiMOS™ with intelligent gate drivers through Infineon's superior packaging technologies – Integrated Points-of-Load: Including digital, analog, and constant on-time options – Digital multiphase controllers: A wide portfolio supporting multiple communication protocols such as Intel SVID, AMD SVI2, AVS bus, and PMBus, and offering a variety of programmable features – High performance memory solutions
RF front-end	Discover Infineon's RF front-end components for massive MIMO antenna systems in telecom infrastructure applications. Our portfolio of compact and efficient devices, such as bias and control ICs and driver amplifiers, ensures reliable signal transmission and reception with high quality and top-notch performance.	– RF front-end driver amplifiers: These small yet mighty amplifiers can be used as pre-drivers or drivers in RF applications, such as mMIMO 5G base stations to small cells and access points – RF front-end bias and control ICs: These highly integrated ICs are used to bias radio-frequency power amplifiers by generating accurate voltage with high-precision DACs
Security	Security in 5G networks is vital for data privacy, maintaining network integrity, preventing cyber-attacks, ensuring regulatory compliance, building user trust, securing IoT, and enabling new technologies. It helps protect sensitive data, prevent disruptions, and promotes safe, reliable operations.	– OPTIGA™ TPM - Trusted platform module – OPTIGA™ Authenticate for authenticity verification of devices and systems – OPTIGA™ Trust M high-end security solution offering a wide range of security features
Memory	Reliable and performant NOR flash and RAM memory solutions for code storage, efficient data logging, high-speed cache, and more.	– SEMPER™ NOR Flash – Broad RAM portfolio

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* Coming soon

Service robots

Collaborative robots

Robotics

Superior solutions for smart and safe robots

Disruptive technologies have significantly changed our lifestyle in the past few decades. Now, a new era is on the horizon – the age of robots. Today's robots can identify and navigate through surroundings, work alongside, and even interact with humans. All this would not be possible without the recent advancements in semiconductor solutions. Drawing on Infineon's insights into all facets of the robotics field and with a comprehensive portfolio of power products, microcontrollers, and sensors available, Infineon provides reliable system solutions that address the latest trends in robotics, whether it is Artificial Intelligence, the Internet of Things, smart homes, cloud-based services, human-machine interfaces, or any robotics-related field.

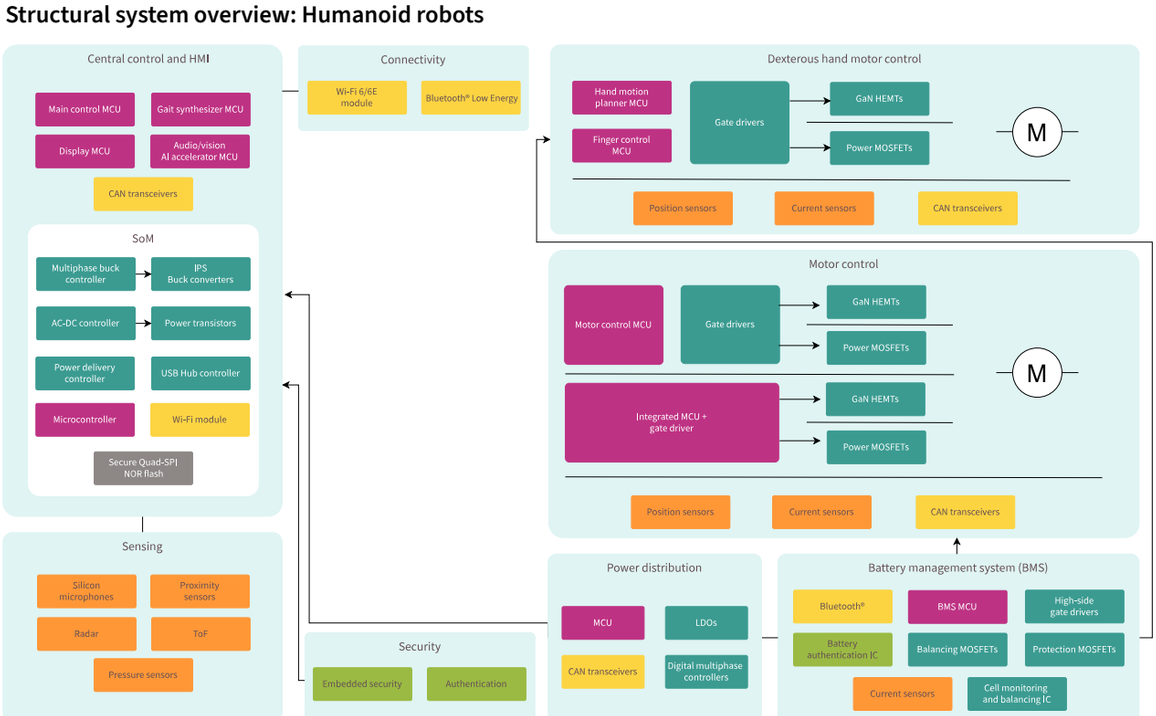
Features and benefits

Key features	Key benefits
– Complete ecosystem of simulations, documentation, development software, and demonstration boards	– Faster time-to-market
– Comprehensive portfolio of products and solutions	– Design flexibility
– High reliability of components	– Prolonged product life spans
– Small form factor and compact design of components	– Reduction of overall system size and cost
– Lowest $R_{DS(on)}$ of the transistors	– BOM savings
– Hardware-based security	– Trustworthy system solution
– Components authentication	– Highest system quality and ease of safety certification process
– Security market leader with a proven track record and outstanding partner network for embedded security	

Humanoid robots

In the near future, humanoid robots will assist, augment, and interact with humans in new ways. When designing these robots, several key considerations come into play. Compactness, energy efficiency, and high-performance motor controls are crucial for enabling robots to perform complex tasks. Additionally, robust sensing and perception capabilities are necessary for navigation and interaction with the environment. Power distribution and management must also be efficient and safe. Infineon's comprehensive portfolio of solutions addresses these design considerations. Our compact and energy-efficient motor control solutions, advanced sensing technologies, and power management solutions enable designers to create humanoid robots that are efficient, reliable, and safe.

Structural system overview: Humanoid robots



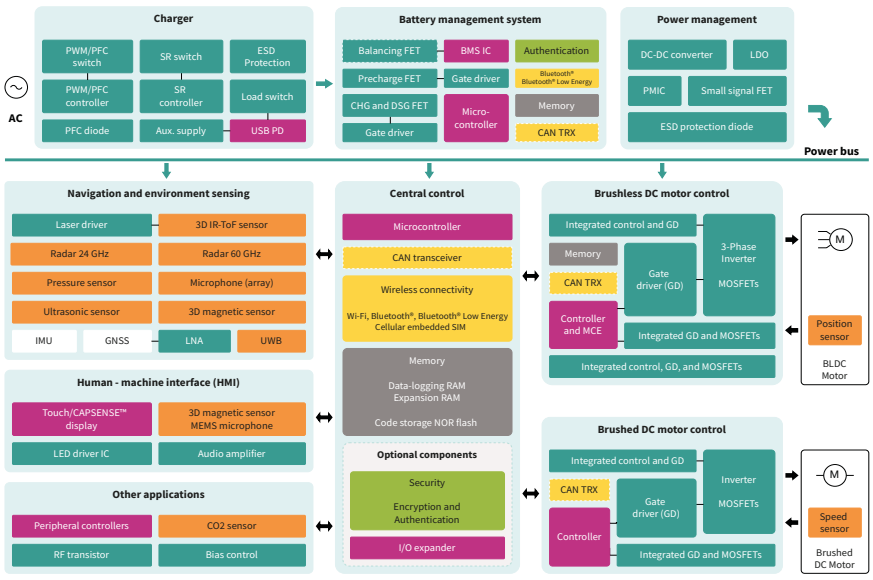
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Your input matters
Share your feedback

Domestic robots - simplifying everyday life and work

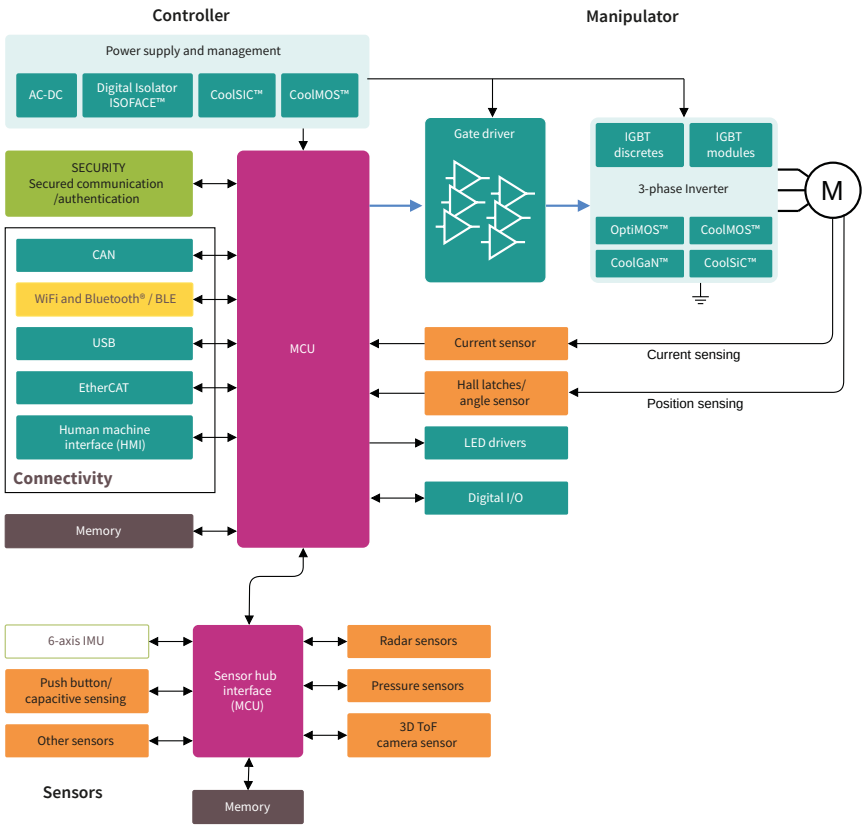
Structural system overview: Domestic robots



The latest generation of domestic robots, e.g., vacuum, lawn, or pool robots, provides a new level of assistance and simplicity in homes and professional environments. They directly interact with humans, which imposes unique design challenges, especially in domestic environments. Energy efficiency, long battery life, security, sensing capabilities, and an intelligent mind are key to user-friendly and safe designs. By choosing Infineon, you get a one-stop semiconductor shop for all your robot design needs.

Industrial robots and cobots – advance through collaboration

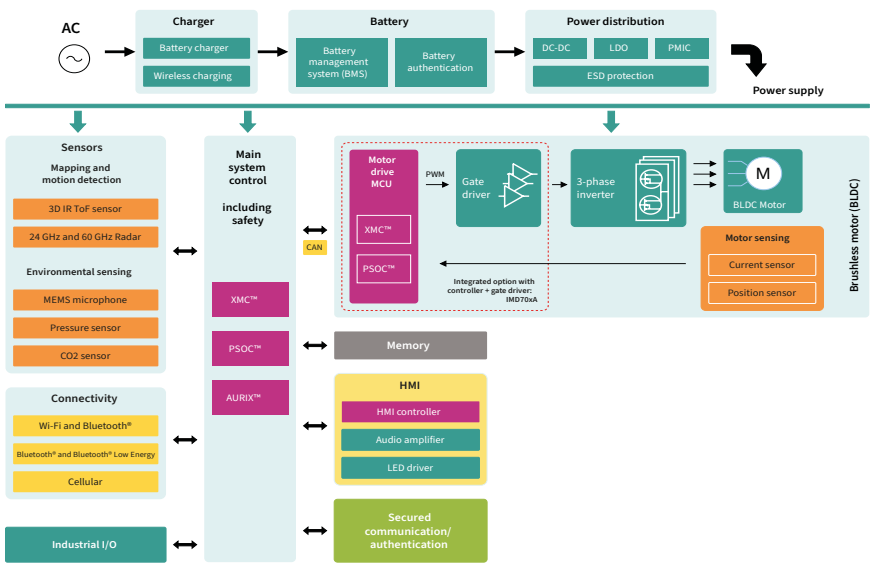
Structural system overview: industrial robots and cobots



With the experience we gained by serving industrial robot manufacturers with the best system solutions for years, Infineon is well set to provide the right-fit products for the next generations of collaborative robots. Cobots, as they are called, work outside the limitation of a safety cell, directly interacting with humans. This setup requires a precise set of design features, especially for workplace safety. With Infineon's semiconductors for cobot systems, you benefit from the expertise of an experienced and reliable partner.

Mobile robots – driving production and automation forward

Structural system overview: Mobile robots (AGV, AMR)



Autonomous mobile robots (AMRs) are a self-driving force behind automated processes and offer the highest degree of flexibility within working environments due to battery-powered systems. With its complete product portfolio for robotics applications- from the power supplies to motor drives and sensors for navigation and environment scanning -Infineon makes it possible for mobile robots to find their way through nearly all environments.

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Recommended products

Humanoid Robot	Domestic Robot	Mobile Robot	Consumer Drone	Commercial Drone	Cobots
SMPS and charger					
24 V, 25 A 48 V, 40 A	20 V, 1.5 A 28 V, 7 A	24 V, 25 A 48 V, 40 A	USB-C/PD 30-65 W	40-60 V 60 A/120 A	48 V, 14 A 24 V, 2 A
Battery management system (BMS)					
LiPo 12S, 14S, 18S	NMC 4S-7S	NMC 7S, 13S LFP 14-16S	LiPo 2S-4S	LiPo 12S, 14S, 18S	None
Motor control (BLDC)					
~40 motors 24-48 V 20 W – 3 kW	1-3 motors 12 -24 V 100 W	2-4 motors 24 V or 48 V 100-1000 W	4 motors 7.5 – 15 V 20 W	4-8 motors 46 V – 54 V 70 V, 1-10 kW	6-7 motors 48 V 300 W to 1500 W

Sensing (e.g., ranging, room mapping, localization, collision avoidance, HMI, air quality, tactile)	Radar	XENSIV™ 60 GHz: BGT60LTR11/BGT60UTR11AIP, BGT60TR13C XENSIV™ 24 GHz: BGT24LTR11N16, BGT24LTR22	
	ToF (Time-of-Flight) 3D image sensors	XENSIV™ REAL3™ 3D image sensor: IRS1125A, IRS2877AS (functional safety ISO26262) XENSIV™ VCSEL Driver: IRS9100C, IRS9102C	XENSIV™ Real 3™ 3D ToF: Hybrid ToF IRS2875C XENSIV™ VCSEL Driver: IRS9100C, IRS9102C
	MEMS microphones	XENSIV™ MEMS microphones: Analog or digital interface, SNR 68 to 73 dB(A)	
	Other sensors	Pressure sensor: XENSIV™ DPS368 (e.g., airflow control), DPS368 (e.g., airflow control, tactile) CO_2 sensor: XENSIV™ PAS CO_2	
Connectivity and human-machine interface (HMI)	Wi-Fi + Bluetooth®	CYW43439 (1x1 2.4 GHz Wi-Fi 4) CYW4373 (1x1 dual-band Wi-Fi 5) CYW55571 (1x1 Tri-band Wi-Fi 6) CYW55571 (1x1 Tri-band Wi-Fi 6E)	
	HMI - Touch sensing	PSOC™ 4000 - entry-level PSOC™ 4100 - more touch buttons PSOC™ 4700 - inductive sensing PSOC™ CAPSENSE™ family	
	Main control MCU	Single/dual-core Arm® Cortex®-M7 and M0+ XMC7000	
	Display and audio/vision AI accelerator	PSOC™ Edge Arm® Cortex®-M33/-M55 family of ML-enabled MCUs	
Security	Authentication and protection	OPTIGA™ Trust M, OPTIGA™ TPM	
Memory	NOR flash	S25FL-L serial NOR flash memories with densities from 64 MB to 256 MB	
Others	Voltage regulator	DC-DC voltage regulator 12 V/5 V or 3.3 V, watchdog, error monitoring, safe state control, BIST, etc.	
	LED Driver	Driving currents from 10 mA to 250 mA – linear driver ICs: BCR3xx, BCR4xx Support currents from 150 mA to 3 A – DC-DC switch-mode: ILD4xxx, ILD6xxx	

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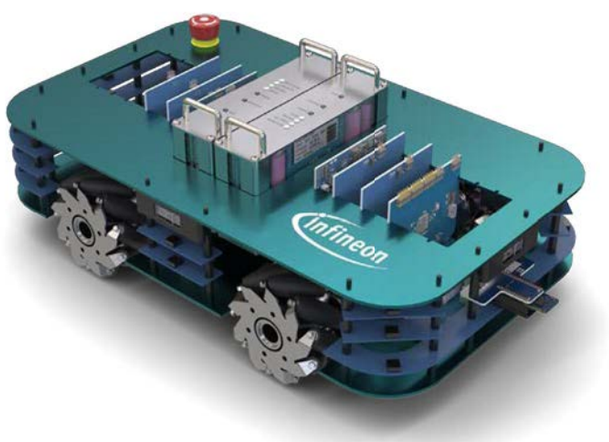
Robotics development platform

Infineon's system solutions for robotics
Get a head start on developing your robot with Infineon's robotics development platform, powered by our state-of-the-art hardware and software.

The Infineon Mobile Robot, or IMR for short, is a robotics development platform that demonstrates the latest robotics application that Infineon offers. Whether you are shopping for one specific sub-system/functional block or looking to build an entire system with Infineon, we have you covered with our powerful, convenient, and efficient hardware and software solutions. The windows below will help guide you to the information most helpful for your expertise level. Visit www.infineon.com/community-robotics for more information.

Features and benefits

Key features	Key benefits
– Broad product portfolio	– Wide variety and flexibility of system designs
– System solutions	– Easy integration
– Reliability and safety	– Ease the process for safety certifications
– One-stop-shop	– Simplify procurement process
– Software	– Reduced development time and therefore faster time-to-market



Fast and efficient robot designs with leading technologies and a broad product portfolio to choose from

Product family	Part number
Main control	DEMO_IMR_MAINCTRL_V1
Power distribution	DEMO_IMR_PWR_V1
Motor control and angle sensing	DEMO_IMR_MTRCTRL_V1 DEMO_IMR_ANGLE_SENS_V1
Battery management system	DEMO_IMR_BMSCTRL_V1 DEMO_IMR_BMSPWR_V1
Time-of-Flight sensor	Hybrid Time of Flight (hToF)
60 GHz Radar	KIT_CSK_BGT60TR13C


DEMO_IMR_MAINCTRL_V1


DEMO_IMR_PWR_V1


DEMO_IMR_ANGLE_SENS_V1


DEMO_IMR_MTRCTRL_V1


DEMO_IMR_BMSCTRL_V1


DEMO_IMR_BMSPWR_V1


KIT_CSK_BGT60TR13C

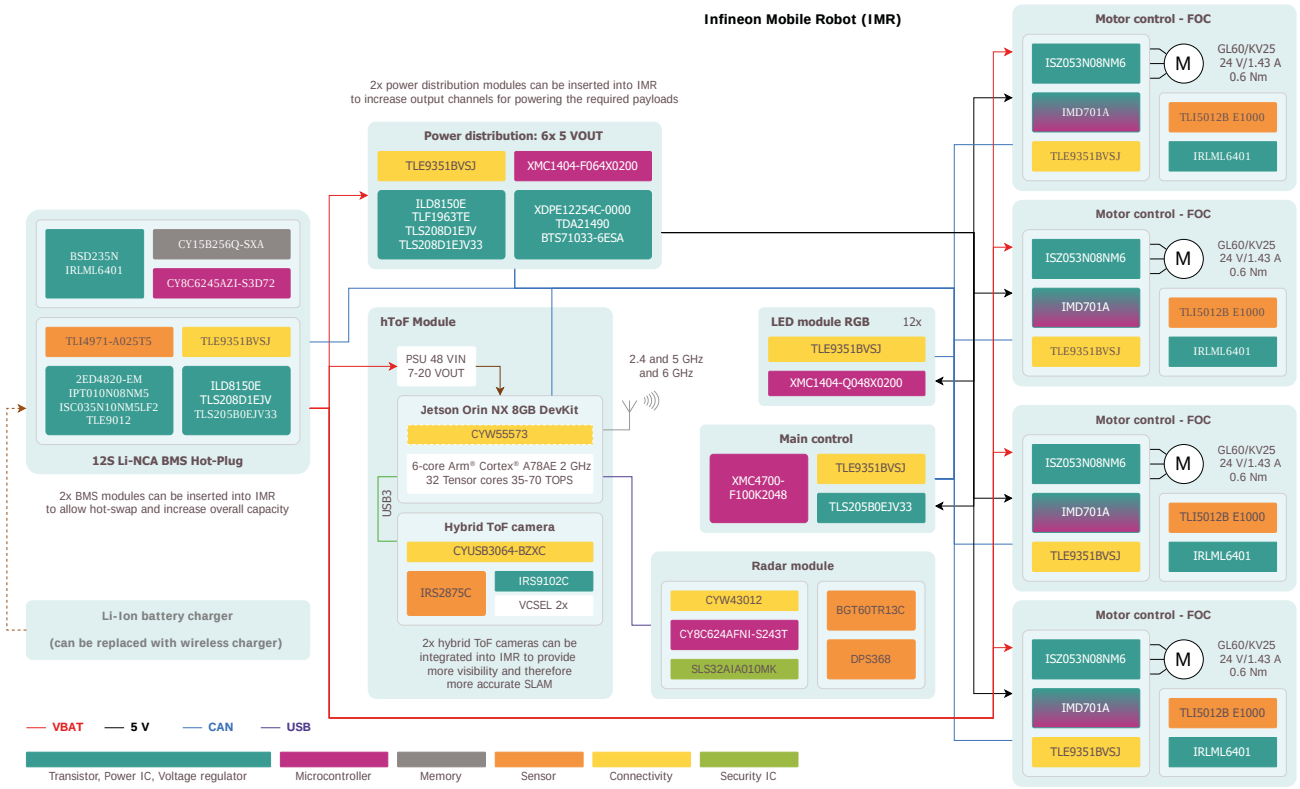


Hybrid Time of Flight (hToF)

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Application diagram



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eForklift

Electric forklifts

Electric forklifts are becoming smarter and autonomous

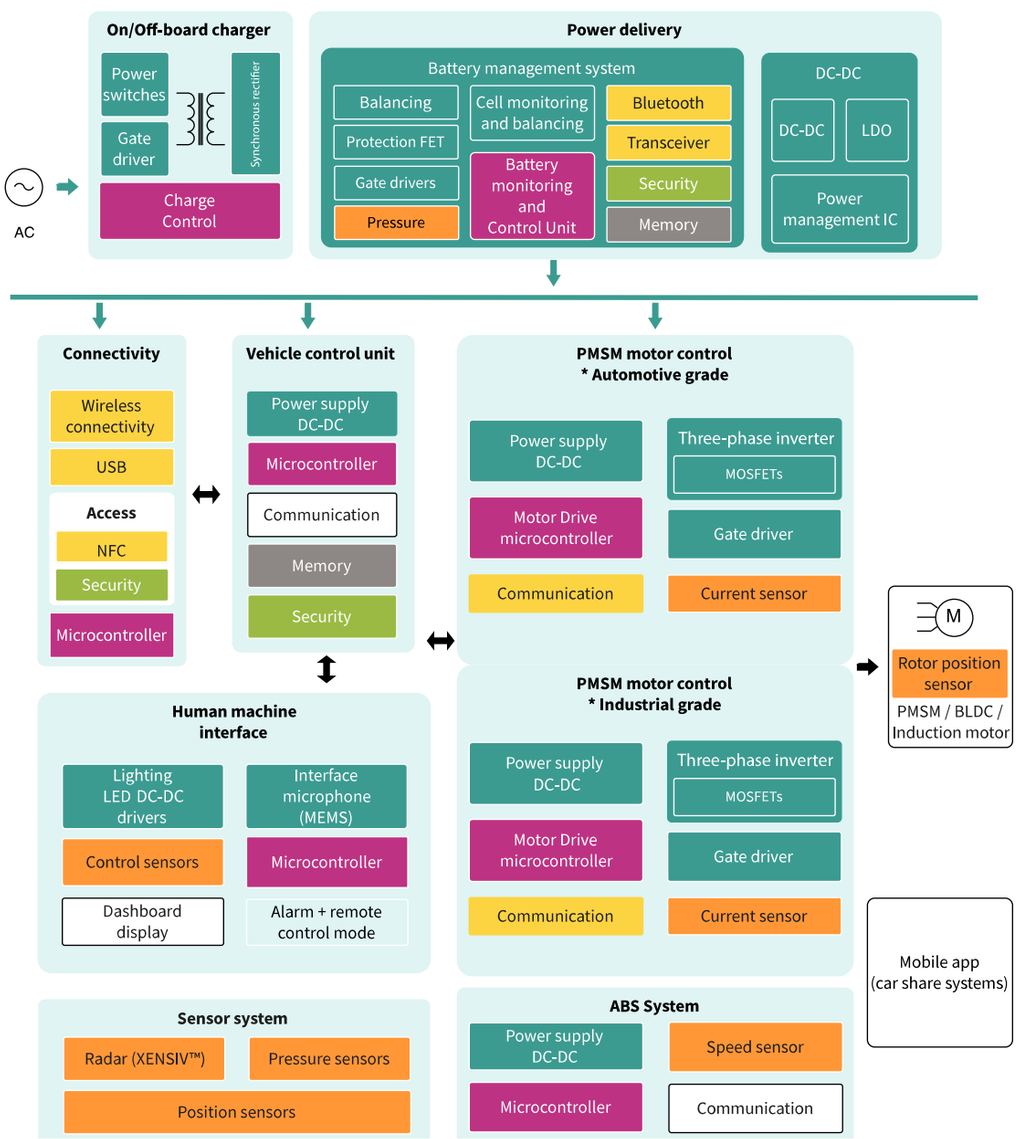
As a leader in power semiconductors, Infineon strives to enable the most efficient, reliable, and smart solutions for electric forklift markets. Keeping up with the latest market trends worldwide, Infineon prepares for the ramp-up of traditional, smart, and connected forklifts.

Infineon considers mission profiles of different applications and offers suitable non-automotive and automotive components for this wide range of use cases. Unlike traditional vehicles with internal combustion engines, these vehicles are powered by battery technology with bus voltages ranging from 28 V to 168 V. The commonalities among these different types of forklifts are motor inverters/drives, battery management systems, and battery chargers/battery charging stations. Additionally, modern forklifts house increasingly popular smart features and electronics, which are possible due to their larger battery sizes.

Features and benefits

Key features	Key benefits
– Leading power MOSFET technology	– Highest power density and increased range
– Track record of reliability and quality	– Prolonged lifetime and low failure rate
– Complete portfolio for drivers, microcontrollers, and sensors	– One-stop shop for designers
– Broad portfolio of connectivity products, compliant with various standards	– Enabling smart features
– Complete design support with simulations, documentation, and demonstration boards for high-end solutions	– Faster time-to-market

Application diagram



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www.infineon.com/robotics

6 kW motor drive with 96 V battery voltage

Functional block	Topology	Product category	Product family	Part number
Motor drive	Three-phase half-bridge (B6)	LV MOSFETs MSIL-relevant	OptiMOS™	IAUTN15S6N025
		Microcontrollers MSIL-relevant	AURIX™	SAK-TC334LP-32F200F MSIL-ready
		Gate driver MSIL-relevant	EiceDRIVER™	2EDB8259F
		Position/speed sensor MSIL-relevant	XENSIV™	TLI5012B
		Current sensor MSIL-relevant	XENSIV™	TLE4973-AE35S5 MSIL-ready

3 kW 48 V battery charger

Functional block	Topology	Product category	Product family	Part number
Battery charger	CCM boost PFC	HV switch	CoolMOS™ 8	IPP60R037CM8
		PFC diode	CoolSiC™ G6	IDH12G65C6
		Gate driver IC	EiceDRIVER™	1EDN8550B
		Controller IC	ICE3x family	ICE3PCS01G
	Resonant FB LLC	HV switch	CoolMOS™ 8	IPT60R037CM8
		Gate driver IC	EiceDRIVER™	2EDS8265H
		Digital controller	XMC™ Industrial MCU	XMC4200-F64k256BA
		Digital isolator	ISOFACE™	4DIR1400H
	HB SR	MV switch	OptiMOS™ 6	IPT047N15NM6
		Gate driver IC	EiceDRIVER™	2EDN7534F
	QR flyback	Auxiliary power controller	CoolSET™	ICE5QR2280G

For additional configurations, please refer to Battery chargers.

Click here to learn more:
www.infineon.com/robotics

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LEV

Light electric vehicles and electric forklifts

eBikes, eScooters, eMotorcycles, eRickshaws, eMicroCars, and eForklifts

As a leader in power semiconductors, Infineon strives to enable the most efficient, reliable, and smart solutions for the e-Mobility, minimobility, and micromobility markets. Keeping up with the latest market trends worldwide, Infineon prepares for the ramp-up of all forms of light electric vehicles (LEVs):

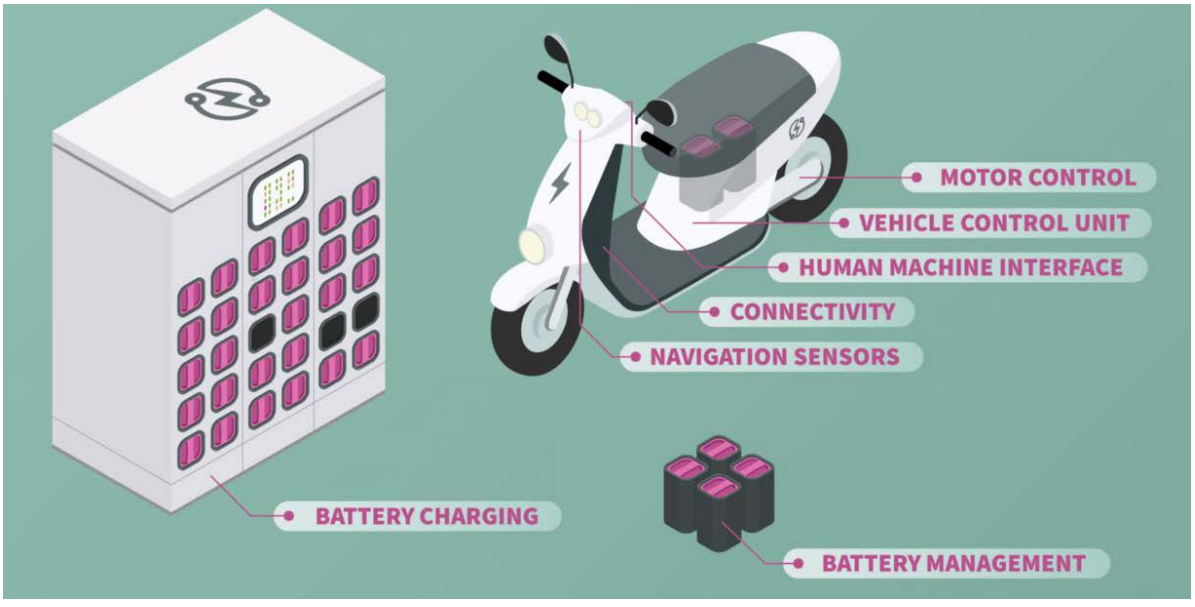
- Micromobility: electric bicycles (e-bikes), electric kick-scooters
- Electric powered 2/3 wheelers (EPTW): e-mopeds, e-scooters, e-rickshaws, e-motorcycles
- MicroEV: electric microcars, low-speed electric vehicles (LSEV), neighborhood EV (NEV), electric quadricycles
- Other electric transporters (e.g., e-forklifts, e-golf carts, e-ATVs) with less than 200 V batteries

In contrast to automotive (passenger car) requirements, L-category (light) vehicles require different sets of safety and qualification standards. For example, the newest motorcycle standards place more responsibility on the operator than the vehicle itself to mitigate risks. Infineon considers mission profiles of different applications and offers suitable non-automotive and automotive components for this wide range of use cases.
Unlike traditional vehicles with internal combustion engines, these vehicles are powered by battery technology with bus voltages ranging from 28 V to 168 V. The commonalities among these different types of light electric vehicles (LEVs) are motor inverters and drives, battery management systems, battery chargers, battery charging stations, and battery swapping stations. Additionally, LEVs house increasingly popular smart features and electronics, which are possible due to their larger battery sizes.

Features and benefits

Key features	Key benefits
– Leading power MOSFET technology	– Highest power density and increased range
– Track record of reliability and quality	– Prolonged lifetime and low failure rates
– Complete portfolio for drivers, microcontrollers, and sensors	– One-stop-shop for designers
– Broad connectivity products compliant with various standards	– Enabling smart features
– Complete design support with simulations, documentation, and demonstration boards for high-end solutions	– Faster time-to-market

Application diagram



Click here to learn more:
www.infineon.com/lev

6 kW motor drive with 96 V battery voltage

Functional block	Topology	Product category	Product family	Part number
Motor drive	3-phase half-bridge (B6)	LV MOSFETs MSIL-relevant	OptiMOS™	IAUTN15S6N025
		Microcontrollers MSIL-relevant	AURIX™	SAK-TC334LP-32F200F MSIL-ready
		Gate driver MSIL-relevant	EiceDRIVER™	2EDB8259F
		Position/speed sensor MSIL-relevant	XENSIV™	TLI5012B
		Current sensor MSIL-relevant	XENSIV™	TLE4973-AE35S5 MSIL-ready

For additional configurations, please refer to Motor control for power tools, robotics, and e-forklifts.

Swappable 48 V 1.2 kWh battery

Functional block	Topology	Product category	Product family	Part number
BMS	Back-to-back with precharge	LV MOSFETs (charge)	OptiMOS™	IPTC015N10NM5
		LV MOSFETs (discharge)	OptiMOS™	IPTC015N10NM5
		LV MOSFETs (precharge)	OptiMOS™	BSC070N10NS5
		Microcontrollers MSIL-relevant	PSOC™	CY8C4146/7AZI-S463
		Gate driver MSIL-relevant	EiceDRIVER™	2ED4820 MSIL-ready
		Current sensor MSIL-relevant	XENSIV™	TLE4972 MSIL-ready
		Cell balancing IC MSIL-relevant	TLE901x	TLE9012/18 MSIL-ready
		Memory (RAM)	NOR flash	S25FL256LAGMFB001
		Bluetooth®	AIROC™	CYW20719B1KUMLG
		Security	OPTIGA™ Authenticate S	SLE95401TSNP6XTSA1

3 kW 48 V battery charger

Functional block	Topology	Product category	Product family	Part number
Battery charger	CCM boost PFC	HV switch	CoolMOS™ 8	IPP60037CM8
		PFC diode	CoolSiC™ G6	IDH12G65C6
		Gate driver IC	EiceDRIVER™	1EDN8550B
		Controller IC	ICE3x family	ICE3PCS01G
	Resonant FB LLC	HV switch	CoolMOS™ 8	IPT60R037CM8
		Gate driver IC	EiceDRIVER™	2EDS8265H
		Digital controller	XMC™ Industrial MCU	XMC4200-F64k256BA
		Digital isolator	ISOFACE™	4DIR1400H
	HB SR	MV switch	OptiMOS™ 6	IPT047N15NM6
		Gate driver IC	EiceDRIVER™	2EDN7534F
	QR flyback	Aux power controller	CoolSET™	ICE5QR2280G

For additional configurations, please refer to Battery chargers.

250 W off-board charger

Functional block	Topology	Product category	Product family	Part number
Battery charger	CrCM PFC	Controller IC	XDP™	XDPS2221E
		HV switch	CoolMOS™ G5	IGLD65R080D2
	Hybrid flyback	HV switch	CoolMOS™ G5	IGI65D1414A3MS
	Active SR	MV switch	OptiMOS™ 6	ISC073N12LM6
	QR flyback	Aux power IC	CoolSET™	ICE5QR2280G

For additional configurations, please refer to Battery chargers.

Click here to learn more:
www.infineon.com/lev

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eMobility

On-board charger for xEV applications

Best solutions for electrified powertrain in xEV applications: on-board chargers and HV-LV DC-DC converters

The electrification of the powertrain enables local emission-free mobility and driving pleasure. The car becomes a part of the energy ecosystem, with smart charging from renewables, efficient driving with electrified mobility, and future energy use cases with V2X. Infineon offers complete and complementing chipsets to develop modular and scalable onboard battery chargers (OBC) and DC-DC units. Our solutions use Si, SiC, and GaN power technologies, leveraging our expertise in power electronics and semiconductors. They are designed to meet the high quality and safety standards in automotive applications. Wide-bandgap (WBG) semiconductors enable future optimizations and highly contribute to sustainable solutions.

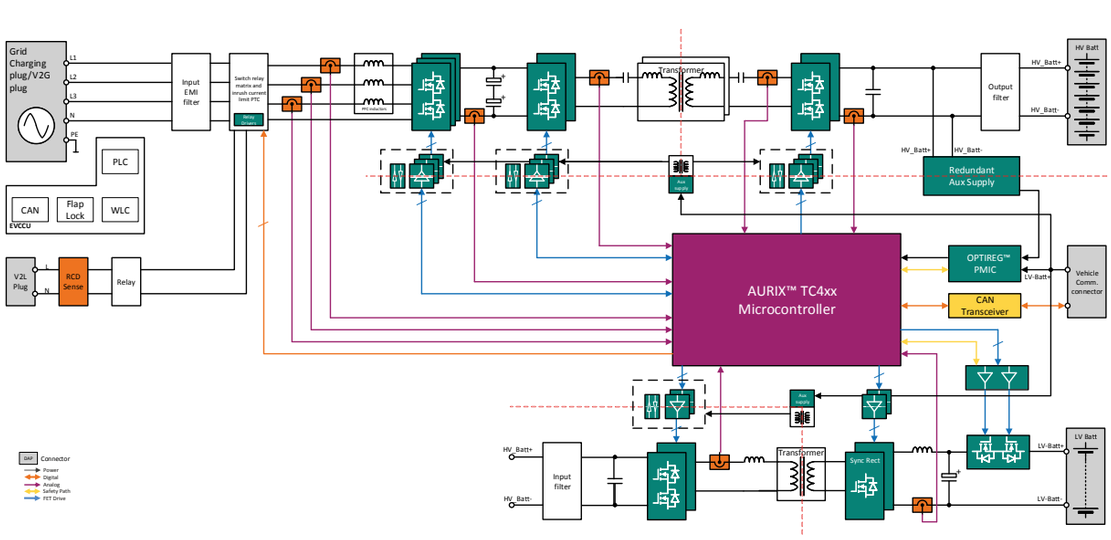
On-board chargers

All plug-in hybrid electric vehicles (PHEV) and pure electric cars are equipped with at least one on-board charger, allowing battery charging from any standard AC power outlet. Available power depends on regional regulations and installation base, typically providing up to 11 kW for PHEVs and up to 22 kW, or even 44 kW maximum power for pure electrical vehicles. System designers face the challenge of supporting varied voltage and current levels while increasing power density efficiency under cost optimizations for strong solutions. The key success factors regarding on-board charging involve efficiency and a high power density for a small form factor. The long-term trend is moving towards bidirectional charging, where the charger feeds power from the car to the homes, smart grid, and smart loads.

High-voltage DC-DC converter

The architecture of electric vehicles includes at least one low-voltage sub-network, featuring low-voltage energy storage systems (such as 12 V, 24 V, and the emerging 48 V). These are essential for powering critical vehicle loads. An auxiliary HV-LV DC-DC converter facilitates bidirectional energy transfer between the high- and low-voltage sections. Designing these systems involves significant challenges, such as maximizing efficiency, increasing power density for air-cooled systems, and managing overall system costs. Given the various architectures used today and anticipated future innovations, there is a strong demand for a scalable portfolio of high-performance components that meet all customer trends. Infineon's product range is engineered to address these challenges effectively, maintaining strong cost efficiency.

HV-LV DC-DC converter: Functional blocks



Click here to learn more:

www.infineon.com/emobility
www.infineon.com/obc
www.infineon.com/hv-DC-DC

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Product portfolio for on-board charger and HV-LV DC-DC applications

Infineon's comprehensive portfolio of semiconductors (sensors, microcontrollers, power semiconductors, etc.) lends itself perfectly to designing compact units for on-board chargers and DC-DC converters. Infineon's power transistors support high-switching frequencies at the lowest possible on-state resistance ($R_{DS(on)}$) to enable compact and efficient designs. Various technology offerings from Si/IGBT to SiC and GaN enable high customer scalability, from cost-efficient to highly power-dense and highly efficient systems. The complete portfolio further simplifies designs enabled by Infineon solutions; thus, our optimized gate drivers, current sensors, safe and highly scalable microcontrollers, and PMIC solutions round up the complete offering and make OBC and DC-DC designs easy to select any scale according to customer needs.

Automotive products for on-board charger units

Product family	Part number	Description
EiceDRIVER™ gate driver SiC	1EDI3038AS	Automotive gate driver optimized for 1200 V SiC, including fast DESAT protection and configurable external soft turn-off feature
650 V CoolMOS™	IPx65RxxxCFD7A	650 V MOSFETs with integrated fast body diode
TRENCHSTOP™ 5 IGBT	AIKW50N, AIKW40N, AIGW40	IGBT discrete dedicated to automotive applications
TRENCHSTOP™ 5 Hybrid Discrete IGBT	AIKW50N65RF5	IGBT and SIC discretes dedicated to automotive applications, offering higher performance
CoolSiC™ 750 V	AIMx750RxM1H	Automotive 750 V discretes SiC MOSFET in TO-247, Q-DPAK, D2PAK
CoolSiC™ 1200 V	AIMW120Rx , AIMCQ120Rx, AIMBG120Rx, AIMZH120Rx	Automotive 1200 V discrete SiC MOSFET in TO-247, Q-DPAK, D2PAK
CoolGaN™ 650 V	IGLT65R0xx*, IGDQ65R0xx*	Automotive qualified GaN power transistors in TOLT and Q-DPAK
EiceDRIVER™ gate driver for Si, IGBT	2EDB7259Q1, 2EDR825xQ1, 2EDB9259Q1	Automotive gate driver for high-voltage silicon MOSFETs and IGBTs
EiceDRIVER™ gate driver for SiC	1EDR3147HQ1, 2EDR3143/7XA	Automotive gate driver optimized for 750 V and 1200 V SiC
EiceDRIVER™ gate driver for LV Si	2EDN7534FQ1 , 2EDBx259KQ1, 2EDFx259KQ1	Automotive gate driver for secondary side of the HV-LV DC-DC converter
EiceDRIVER™ gate driver for GaN	2EDR7259XQ1, 2EDB7259YQ1	Automotive gate driver for HV GaN automotive switches
AURIX™ microcontroller	TX36x*, TC37X* , TC4X*	32-bit lockstep microcontroller optimized for power conversion
OPTIREG™ PMIC	TLF35584, TLF35585	ISO 26262 – system-supply optimized for AURIX™
CAN FD transceiver	TLE9350, TLE9351, TLE9252	High-speed automotive CAN transceiver with 5 Mbps
OPTIREG™ SBC	TLE9461, TLE9471	High integrated solution for microcontroller supply and communication
OPTIREG™ linear and switcher	TLS810, TLS820, TLS850, TLS4120	Automotive linear and DC-DC voltage regulators
XENSIV™ current sensor	TLE4971-3, TLE4978*	Coreless magnetic current sensors for automotive

Modules for on-board charger units

Product family	Part number	Description
650 V CoolMOS™ Easy module	F4-35MR07W1D7S8_B11_A*	650 V MOSFET in H-bridge configuration with integrated capacitor in Easy 1B package
650 V CoolMOS™ Easy module	F4-35MR07W2D7S8_B13_A*	650 V MOSFET in H-bridge configuration with IGBT H5, rapid diode and integrated capacitor in Easy 2B package
650 V CoolMOS™ Easy module	F4-xxMR07WxD7_Bxx_A	650 V MOSFET in H-bridge configuration in Easy package
650 V CoolMOS™ Easy module	FSxxMR07WxD7_Bxx_A	650 V MOSFET in sixpack configuration in Easy package
650 V CoolMOS™ Easy module	FFxxMR07WxD7_Bxx_A	650 V MOSFET in half-bridge configuration in Easy package
1200 V CoolSiC™ Easy module	F4-xxMR12WxM1H_Bxx_A	1200 V SiC MOSFET in H-bridge configuration in Easy package
1200 V CoolSiC™ Easy module	FSxxMR12WxM1H_Bxx_A	1200 V SiC MOSFET in sixpack configuration in Easy package
1200 V CoolSiC™ Easy module	FFxxMR12WxM1H_Bxx_A	1200 V SiC MOSFET in half-bridge configuration in Easy package
1200 V TRENCHSTOP™ Easy module	FSXXR12WXT7_B11_A and FSXXR12WXT4_B11_A	1200 V IGBT 7 in sixpack configuration in Easy package

Get more information about our state-of-the-art demo kits here:
www.infineon.com/cms/en/product/promopages/wbg-for-obc

For more information about off-board chargers, refer to the Fast/wireless EV-charging chapter.

Click here to learn more:

www.infineon.com/emobility
www.infineon.com/obc
www.infineon.com/hv-DC-DC

* Coming soon

Wide-bandgap demo kits



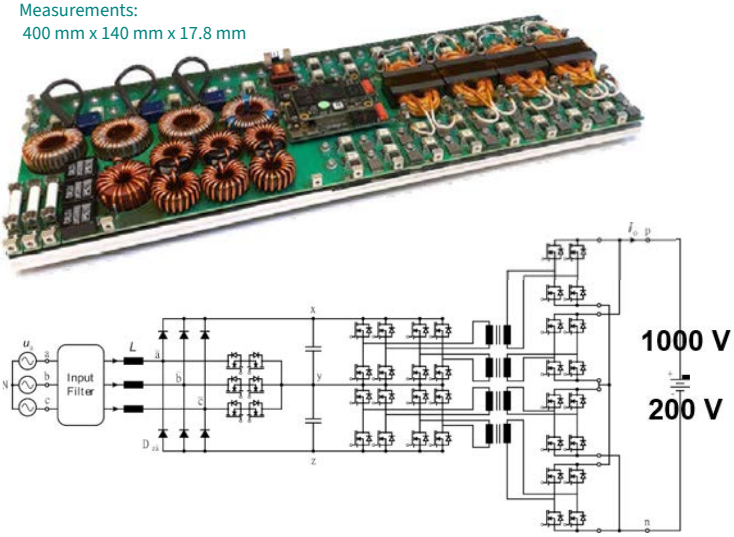
Tiny on-board charger
SiC-based real demonstrator 3.6 kW/L

- 7.0 kW bidirectional OBC
- Integrated HV-LV DC-DC with 2.4 kW
- 97.5% peak total efficiency
- 98.5% peak DC-DC efficiency
- 99.0% peak PFC efficiency
- Top-side cooling power

High power density 10 kW
GaN-based demonstrator

- Wide EV battery voltage range
- Wide input range
- AC-DC: 3-Φ Vienna Rectifier
- 550 kHz: CoolGaN™ GIT +
- Novel Synergetic Control: 1/3 PWM
- DC-DC: 4x dual-active bridges (DABs)
- 40 kHz to 270 kHz: CoolGaN™ power transistor

Measurements:
400 mm x 140 mm x 17.8 mm





Ultra high density HV-LV DC-DC 3.5 kW
GaN based for 400 V/800 V-12 V

- Input voltage 400 V: 250 V – 450 V
- Input voltage 800 V: 550 V – 860 V
- Output voltage: 9 V~15 V
- Output current: up to 270A (RMS)
- Output power: 3.5 kW_{peak}
- Peak efficiency >98.2%
- Switching freqency: 500 kHz
- Dimensions: 135 mm × 30 mm × 96 mm
- Power density: 9 kW/in^3

Click here to learn more:
www.infineon.com/emobility
www.infineon.com/obc



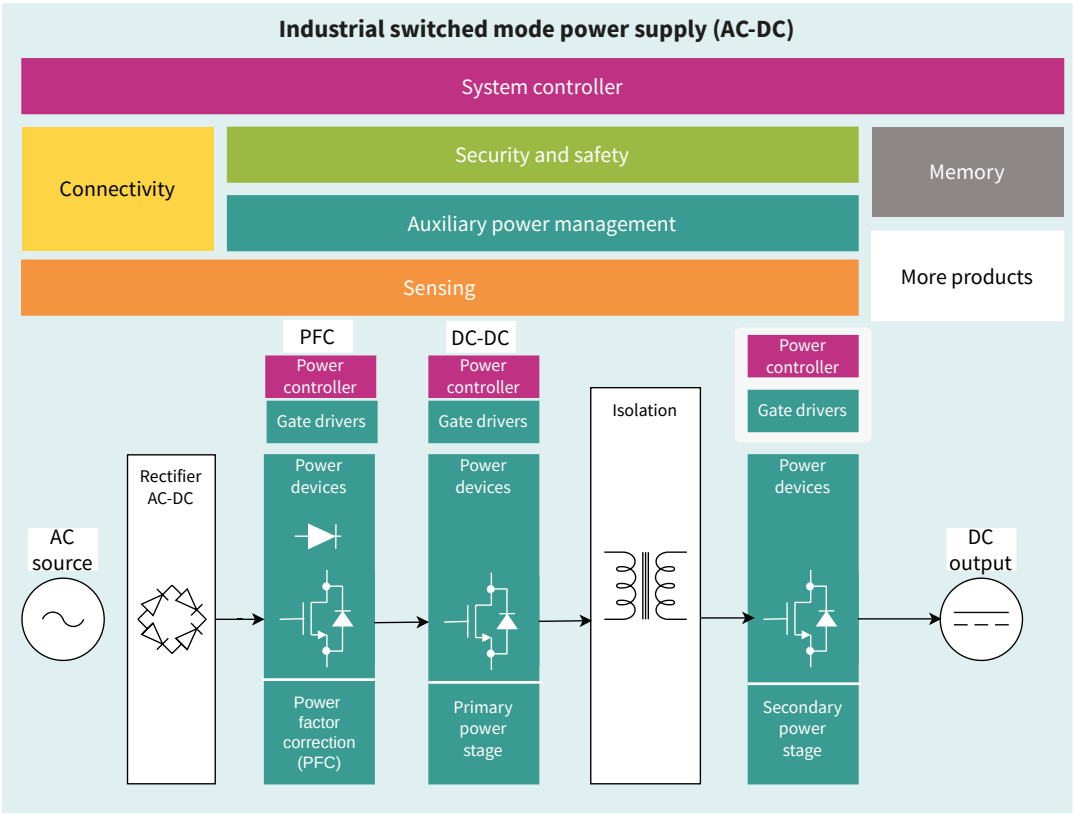
Industrial SMPS

Powering the future of industries

The industrial Switch-Mode Power Supply (SMPS) market is growing rapidly, driven by increasing demand for efficient and reliable power solutions in applications such as industrial automation, renewable energy, and data centers. As the industry continues to evolve, designers face new challenges in creating SMPS that meet the demands of high power density, efficiency, and reliability. When designing industrial SMPS, several key considerations come into play. High efficiency, reliability, and compactness are crucial for enabling SMPS to operate in demanding industrial environments. Additionally, robust protection and control mechanisms are necessary for ensuring safe and efficient operation. Designers must also consider the need for high power density, low noise, and high reliability while minimizing costs and meeting stringent regulatory requirements.

Infineon's comprehensive portfolio of solutions addresses these design considerations. Our high-efficiency power MOSFETs, advanced controller ICs, and protection devices enable designers to create industrial SMPS that are efficient, reliable, and safe. With our solutions, designers can achieve high power density, low noise, and high reliability while minimizing costs and meeting regulatory requirements. Contact us to learn more about our industrial SMPS solutions and how we can help you power the future of industries.

Application diagram



Click here to learn more:
www.infineon.com/industrial-smps



Product portfolio

Functional block	Stage	Functional position	Product family	Specification
AC-DC power conversion	Bridge rectifier	Switch	CoolMOS™	– DPAK, QDPAK, TO220, TO247, TSC, and more – 600 V, 650 V, 700 V, 800 V, and 950 V – $R_{DS(on)MAX\ at\ 25C}$: 7-4500 mΩ
		Gate driver	EiceDRIVER™	– Non-isolated single-channel and dual-channel low-side gate driver ICs for MOSFETs and IGBTs – Single- and dual-channel, isolated gate driver ICs for MOSFETs, SiC MOSFETs, and GaN switches – Level-shift gate driver ICs for MOSFETs or IGBTs
	PFC converter	Switch	CoolMOS™	– DPAK, QDPAK, TO220, TO247, TSC, and more – 600 V, 650 V, 700 V, 800 V, and 950 V – $R_{DS(on)MAX\ at\ 25C}$: 7-4500 mΩ
			CoolGaN™	– DPAK, DFN, TOLL, ThinPak, TSC, and more – 600 V, 650 V, and 700 V – $R_{DS(on)MAX\ at\ 25C}$: 25-500 mΩ
			CoolSiC™	– TO247-3, TO247-4, QDPAK, TSC, and more – 650 V, 750 V, 1200 V, 1700 V, and 2000 V – $R_{DS(on)MAX\ at\ 25C}$: ≤ 4 –350 mΩ(for MOSFETs)
		Gate driver	EiceDRIVER™	– Non-isolated single-channel and dual-channel low-side gate driver ICs for MOSFETs and IGBTs – Single-and dual-channel, isolated gate driver ICs for MOSFETs, SiC MOSFETs, and GaN switches – level-shift gate driver ICs for MOSFETs or IGBTs
		PFC IC	XDP™, XMC™, PSOC™	– CCM CrMPFC controllers, PFC+LLC combo – 32-bit XMC™ Arm® Cortex® Industrial Microcontroller – 32-bit PSOC™ Arm® Cortex® Microcontroller
	HV DC-DC converter	Switch	CoolMOS™	– DPAK, QDPAK, TO220, TO247, TSC, and more – 600 V, 650 V, 700 V, 800 V, and 950 V – $R_{DS(on)MAX\ at\ 25C}$: 7-4500 mΩ
			CoolGaN™	– DPAK, DFN, TOLL, ThinPak, TSC, and more – 600 V, 650 V, and 700 V – $R_{DS(on)MAX\ at\ 25C}$: 25-500 mΩ
			CoolSiC™	– TO247-3, TO247-4, QDPAK, TSC, and more – 650 V, 750 V, 1200 V, 1700 V, and 2000 V – $R_{DS(on)MAX\ at\ 25C}$: ≤ 4 –350 mΩ(for MOSFETs)
		Gate driver	EiceDRIVER™	– Non-isolated single-channel and dual-channel low-side gate driver ICs for MOSFETs and IGBTs – Single-and dual-channel, isolated gate driver ICs for MOSFETs, SiC MOSFETs, and GaN switches – Level-shift gate driver ICs for MOSFETs or IGBTs
		Control IC	Standalone LLC controllers, AHB ICs XMC™, PSOC™	– Half bridge LLC controllers, XDP2201 – 32-bit XMC™ Arm® Cortex® Industrial Microcontroller – 32-bit PSOC™ Arm® Cortex® Microcontroller
	Auxiliary power supply	IC	CoolSET™	– PWM controller with integrated MOSFET – $R_{DS(on)MAX\ at\ 25C}$: ≤ 0.71 –5.44 mΩ
	Synchronous rectification	Switch	OptiMOS™	– TO220, TO247, DPAK, and more – 15-300 V – $R_{DS(on)MAX\ at\ 25C}$: ≤ 0.71 –5.44 mΩ
		Gate driver	EiceDRIVER™	– Non-isolated single-channel and dual-channel low-side gate driver ICs for MOSFETs and IGBTs – Single-and dual-channel, isolated gate driver ICs for MOSFETs, SiC MOSFETs, and GaN switches – Level-shift gate driver ICs for MOSFETs or IGBTs
		Control IC	XMC™	– 32-bit XMC™ Arm® Cortex® Industrial Microcontroller
	Protection	Safety switch	OptiMOS™	– TO220, TO247, DPAK, and more – 15-300 V – $R_{DS(on)MAX\ at\ 25C}$: ≤ 0.71 –5.44 mΩ
	Charge control	MCU	XMC™, PSOC™	– 32-bit XMC™ Arm® Cortex® Industrial Microcontroller – 32-bit PSOC™ Arm® Cortex® Microcontroller

Click here to learn more:
www.infineon.com/industrial-smps

Induction

Residential AC EV charging AC wallboxes

The number of electric vehicles (EV) is steadily increasing due to various reasons, including reduction of our carbon footprint. There are two different methods for charging the electric vehicles. DC fast charging is a very convenient method to charge the EV, especially during long-distance driving, where the battery is discharged to a large extent and the driver wants to reach the target fast. Customers need to pay extra for this 'special service'.

An alternative low-cost method to the DC fast charging that connects directly to the battery management system is AC EV charging. AC EV chargers connect to the on-board charger in the EV, which takes over the power conversion from AC line input to DC current to charge the battery of the EV. Since AC EV chargers do not contain any costly components and cooling for power conversion, their cost is usually much lower compared to DC EV chargers. AC wallboxes offer power levels that are usually at 22 kW or lower for public charging stations and 11 kW or lower for residential AC wallboxes.

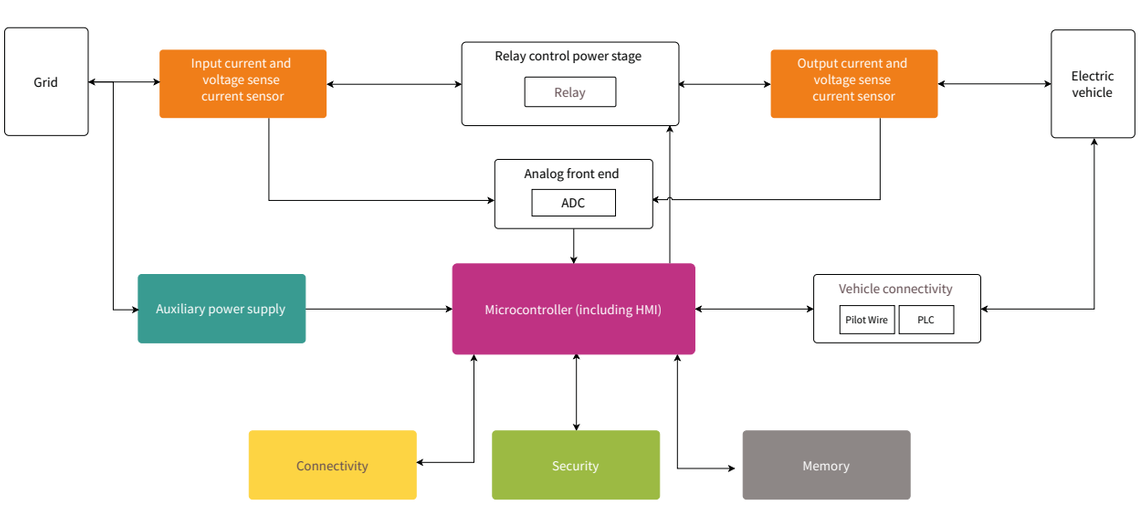
AC EV chargers can be divided into residential AC wallboxes and public or semi-public AC charging stations. In the following, the focus will be on residential AC wallboxes since the volume for these products is much larger than AC charging stations. But with a growing number of EVs, the market for AC charging stations is expected to pick up, e.g., workplace charging. An increasing number of EVs combined with other power-hungry applications like AI servers and heat pumps are bringing our energy infrastructure to its limits. Hence, the future belongs to smart AC wallboxes that avoid charging during peak demand instead charge the EV when the lowest tariffs for electricity are offered. It is even possible for EV users to earn money if they charge their vehicle when there is excess energy available from renewable energy sources.

For smart chargers, connectivity and significant computing power is a must considering all the new protocols like OCPP and ISO15118, just to name a few. Infineon is offering solutions to shorten the development time and component cost of our customers.

Features and benefits

Key features	Key benefits
– Pre-certified third party modules	– Acceleration of time-to-market
– Simplified and highly integrated MCU enabling HMI (CAPSENSE™ and display)	– Simplifying complex mixed architecture of multiple controllers
– Security solutions that enable highly secure systems with OPTIGA™	– Easy implementation of a security architecture
– Current sensors with <1% accuracy in our portfolio	– Reliable and precise current measurement for metering purpose
– CoolSET™ family addresses a large power range	– Avoiding audible noise and addressing a large power range for auxiliary power

Application diagram



Click here to learn more:
www.infineon.com/ev-charging

Product portfolio

Application	Product type	Product/product family	Package
Compute	CY8C624AAZI-S2D44 32-bit	Arm® Cortex®-M4 with 2 MB flash and 1 MB RAM	Dual core enabling high processing capability and CAPSENSE™ for HMI
Connectivity	LBEE5HY2FY	Wi-Fi 6e and BLE connectivity	Long range and reliable, and robust connectivity
Security	SLS32AIA010MMUSON10XTMA2	Secure element, crypto offload	High level of security and reducing development effort
Auxiliary power	ICE5AR0680BZS	Integrated controller and high voltage switch	Addressing wide range of auxiliary power
Sensing	TLE4971A120T5UE0001XUMA1	Current sensing accuracy of <1%	Precise measurement for metering purpose
Memory	S25FL512SAGMFIR10	NOR flash for data logging	Highly reliable for a large number of write and read cycles

Our MCU portfolio includes powerful 32-bit dual-core Arm® Cortex®-M4 and -M0 from the PSOC™ family and cost-effective Arm® Cortex®-M0+ based XMC1000 family depending on customer needs. Our connectivity portfolio includes Wi-Fi and BLE combos for Wi-Fi 6 and Wi-Fi 5. For current sensing, we are offering highly precise current sensors that enable metering. For auxiliary power, our portfolio includes a wide range of integrated controllers with high-voltage MOSFETs, where we put high emphasis on avoiding audible noise. Our memory products are highly reliable, improving the reliability of the AC wallbox. Our ecosystem of security solutions enables highly secure systems with OPTIGA™ security elements.

Click here to learn more:
www.infineon.com/ev-charging

EV charger

EV Charging - DC

Advanced solutions for fast DC EV-charging

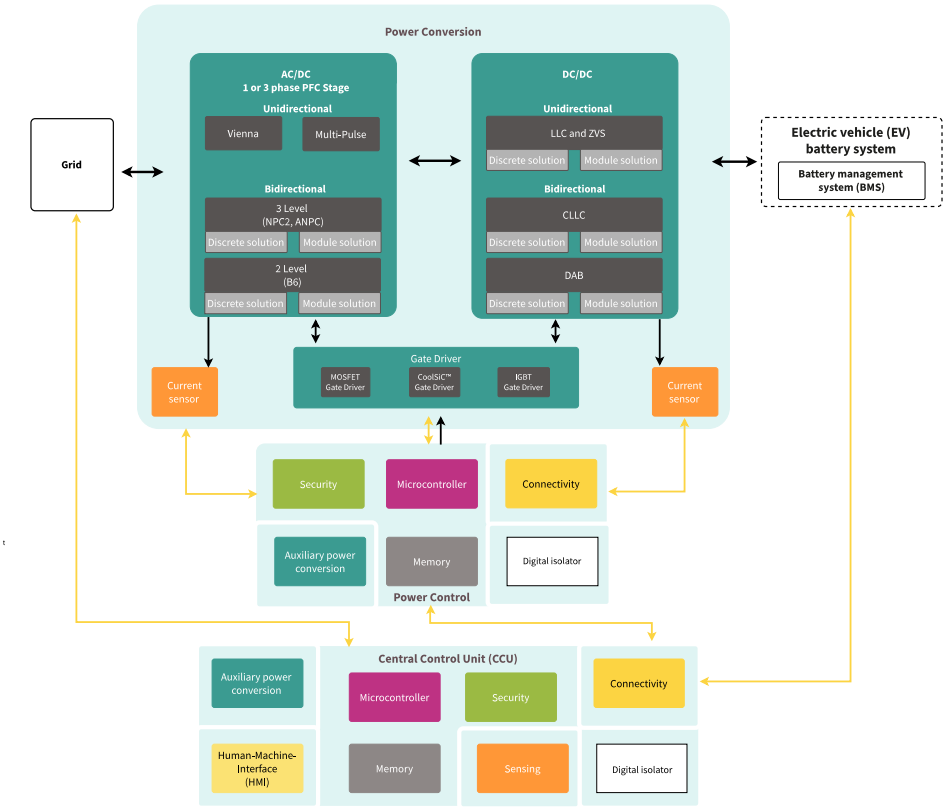
Along with the ever-growing number of electric vehicles on the market and pressure from governments to reduce vehicle emissions to zero latest by 2050, there is a strong need for more efficient charging solutions. As various consumer studies show, the acceptance of electromobility very much depends on the availability and duration of the charging process, high-power DC charging stations are the answer to these market requirements. Already today, a typical EV can charge to about 80 percent of its battery capacity in less than 10 minutes. This is comparable to refueling a conventional car with and internal combustion engine.

As the market leader in power electronics, Infineon helps you bring energy-efficient DC fast charging designs to life. Benefit from one of the most comprehensive, ready-to-implement one-stop product and design portfolios on the market, that covers the entire product range from power conversion, microcontrollers, security, auxiliary power supply, and communication.

Features and benefits

Infineon offering	Customer benefits
– Increase power density	– Reduce charging times up to 80% state of charge (SOC) in 10 minutes
– Enhance efficiency	– Improve cooling efforts and reduce energy losses
– Product reliability	– Increase charger lifetime improves total cost of ownership
– Connectivity	– Secure connection and seamless user interface

Application diagram



Click here to learn more:
www.infineon.com/ev-charging



Product portfolio

Functional block	Product	Specification	Benefits
Power conversion AC-DC (PFC)	600 V/650 V CoolMOS™ P7/C7/CFD7	– Large portfolio with granular $R_{DS(on)}$ selection – Different space-saving and high-performance packages	– Ease of use and fast design-in through low ringing tendency and usage across PFC and PWM stages
	600 V CoolMOS™ 8	– Simplified portfolio compared to previous families with granular $R_{DS(on)}$ selection – TO-47-4 and top-side cooled D-DPAK package options	– Ease of use and fast design-in through low ringing tendency and usage across PFC and PWM stages
	TRENCHSTOP™ IGBT7 650 V/1200 V HighSpeed 3 H3 IGBTs 1200 V	– High speed/high power IGBT – First tailless/low-loss IGBT on market	– Market-proven and recognized quality leader
	CoolSiC™ MOSFET 650 V/750 V/1200 V/2000 V	– CoolSiC™ MOSFETs are built on a state-of-the-art trench semiconductor process – Optimized to allow for both the lowest losses in the application and the highest reliability in operation	– TO-247-4-pin package versions with additional connection to the source, resulting in even lower switching losses than for TO-247-3-pin version, especially at higher currents and higher switching frequencies
	CoolSiC™ Schottky diodes 650 V/1200 V	– CoolSiC™ technology	– CoolSiC™ Schottky diodes operate with better efficiency compared to silicon diode alternatives
	CoolSiC™ MOSFET modules - sixpack 1200 V CoolSiC™ MOSFET modules - halfbridge 1200 V	– Integrated NTC temperature sensor – Versions with pre-applied thermal interface material (TIM) – Optional AlN substrate with low thermal resistance versions – Enlarged gate drive voltage window	– Enlarged gate drive voltage window – CoolSiC™ MOSFET modules with PressFIT contact technology and optimal pinout
	1200 V HighSpeed 3 H3 IGBTs modules- 3-level	– Large portfolio with granular $R_{DS(on)}$ selection – Different space-saving and high-performance packages	– Ease of use and fast design-in through low ringing tendency and usage across PFC and – PWM stages
Power conversion DC-DC	600 V/650 V CoolMOS™ P7/C7/CFD7	– Large portfolio with granular $R_{DS(on)}$ selection – Different space-saving and high-performance packages	– Ease of use and fast design-in through low ringing tendency and usage across PFC and PWM stages
	600 V CoolMOS™ 8	– Simplified portfolio compared to previous families with granular $R_{DS(on)}$ selection – TO-247-4 and top-side cooled D-DPAK package options	– Ease of use and fast design-in through low ringing tendency and usage across PFC and PWM stages
	CoolSiC™ MOSFET 650 V/750 V/1200 V/2000 V	– CoolSiC™ MOSFETs are built on a state-of-the-art trench semiconductor process – Optimized to allow for both the lowest losses in the application and the highest reliability in operation	– TO-247-4-pin package versions with additional connection to the source, resulting in even lower switching losses than for TO-247-3-pin version, especially at higher currents and higher switching frequencies
	CoolSiC™ Schottky diodes 1200 V	– CoolSiC™ technology	– CoolSiC™ Schottky diodes convince with better efficiency compared to Silicon diode alternatives
	1200 V CoolSiC™ MOSFET modules - fourpack 1200 V CoolSiC™ MOSFET modules - halfbridge	– Integrated NTC temperature sensor – Versions with pre-applied thermal interface material (TIM) – Optional AlN substrate with low thermal resistance versions	– Enlarged gate drive voltage window – CoolSiC™ MOSFET modules with PressFIT contact technology and optimal pinout
	1200 V CoolSiC™ EasyBRIDGE diode module	– 1200 V diode bridge module with CoolSiC™ Schottky diode	– PressFIT contact technology with optimal pinout – Integrated NTC temperature sensor
Power conversion gate driver	EiceDRIVER™ 2EDB gate driver EiceDRIVER™ 2EDR gate driver	– Dual-channel basic and reinforced (safe) isolated versions – 650 V and 1200 V voltage class versions – For Si, SiC, and GaN	– Best fit for Si, SiC, and GaN – Precise control of power switches
	EiceDRIVER™ Compact gate driver EiceDRIVER™ Enhanced gate driver	– Single-channel isolated driver with versions comprising active Miller clamp or separate output (Compact) and DESAT, soft-off and active Miller Clamp (Enhanced) – Variants with different isolation levels and optional two-level slew-rate control	– Best fit for Si, SiC, and GaN – Precise control of power switches
Power conversion current sensor	XENSIV™ - high-precision coreless current sensors	– High-precision coreless open-loop current sensors for current ranges up to ±132 A – Variants with integrated and for external current rail – UL variants	– Less bulky and cost less compared to core-based current sensors
Power conversion auxiliary power supply	PWM-FF (fixed frequency) Flyback ICs PWM-QR (quasi resonant) Flyback ICs	– Fixed frequency and quasi-resonant versions available – Rapid start-up performance with cascode configuration	– Extensive protection coverage to increase system robustness
	OPTIREG™ PMIC	– Multichannel power supply IC, up to ASIL-D rated	– Optimized for AURIX™ MCU
	1700 V CoolSiC™ MOSFET discrete	– Perfect voltage class and $R_{DS(on)}$ fit for flyback based auxiliary power supplies	– Reliable and high performance
	800 V/950 V CoolMOS™ P7 MOSFET	– Perfect voltage class and $R_{DS(on)}$ fit for flyback based auxiliary power supplies	– Reliable and high performance

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Product category	Product family	Product	Additional information
Power control Microcontroller	XMC™ families XMC1400 (for PFC)/XMC4000/ XMC7000	– 32-bit MCU subsystem48/144/250/350MHz – Arm® Cortex®-M0+, -M4 or -M7 CPU – Single or dual core versions – Up to up to 8 MB flash – 32 kB SRAM – Up to 10-ch CAN, 11-ch SCB and up to 2x Ethernet and USB/ up to 4 serial channels	– Easier control implementation
	32-bit TriCore™ AURIX™ TC3xxx MCU	– TriCore™ microcontroller to control PFC + DC-DC stage with one device hardware secure module (HSM) full EVITA compliance	– Easier control implementation
Power control memory	Serial SPI F-RAM EXCELON™ F-RAM	– 1014 read/write cycles – 10-year data retention at +85°C temperature – No complex wear-leveling overheads	– 200x lower energy than EEPROM – Zero-delay writes – Radiation tolerant - Immune to soft errors caused by radiation that can produce bit flips
Power control connectivity	CAN Transceivers	– Broad portfolio with scalable feature set like – With/without bus wake up – Sleep mode versions – Different CAN Speeds from 1 Mbit/s to 8 Mbit/s	– Reliable and fast wired communication
Power control Auxiliary power supply	CoolSET™ AC-DC integrated power stages	– Fixed frequency and quasi-resonant versions available	– Compact, robust, and easy to use solution
Central control unit microcontroller	XMC™ families XMC1400 (for PFC)/XMC4000/ XMC7000	– 32-bit MCU subsystem48/144/250/350 MHz – Arm® Cortex®-M0+, -M4 or -M7 CPU – Single or dual core versions – Up to up to 8 MB flash – 32 kB SRAM – Up to 10-ch CAN, 11-ch SCB and up to 2x Ethernet and USB/ up to 4 serial channels	– Easier control implementation
	32-bit PSOC™ 4/PSOC™ 6	– PSOC™ 4 portfolio includes a customizable analog front end through programmable analog blocks as well as wired and wireless connectivity options such as USB, CAN, and Bluetooth® Low Energy – PSOC™ 6 MCU delivers the highest level of protection defined by the Platform Security Architecture (PSA) from Arm® – Both families with the industry-leading CAPSENSE™ capacitive-sensing technology, enabling modern touch and gesture-based interfaces that are robust and reliable	– Easier control implementation for HMI
Central control unit memory	Serial SPI F-RAM EXCELON™ F-RAM	– 1014 read/write cycles – 10-year data retention at +85°C temperature – No complex wear-leveling overheads	– 200x lower energy than EEPROM – Zero-delay writes – Radiation tolerant - Immune to soft errors caused by radiation that can produce bit flips
	SEMPER™ NOR Flash	– SafeBoot and error checking to ensure safe and reliable operation – Read bandwidth of up to 400 MB/s for direct program execution from long-term storage instead of code shadowing to RAM	– Enhanced reliability: Supports ECC (SECDED) along with CRC protection over interface – and memory data – Endurance flex architecture: up to 25 years of data retention or 1+ million cycles endurance
Central control unit connectivity	AIROC™ Wi-Fi + Bluetooth® Combos	– Wi-Fi® and Bluetooth® combos – Bluetooth® and Bluetooth® Low Energy	– Reduced power consumption, including very low sleep
	CAN Transceivers	– Broad portfolio with scalable feature set like – With/without bus wake up – Sleep mode versions – Different CAN Speeds from 1 Mbit/s to 8 Mbit/s	– Reliable and fast wired communication
Central control unit security	OPTIGA™ Trust	– The OPTIGA™ Trust family includes turnkey products for smaller platforms as well as programmable solutions	– Asymmetric ECC authentication with individual certificate key pair and an extended temperature range of -40 to 110°C
	OPTIGA™ TPM	– The OPTIGA™ TPM family offers a broad portfolio of standardized security controllers to protect the integrity and authenticity of embedded devices and systems	– Fully TCG TPM 2.0 standard compliant module with the SPI interface
Central control unit Auxiliary power supply	CoolSET™ AC-DC integrated power stages	– Fixed frequency and quasi-resonant versions available	– Compact, robust, and easy to use solution

Our solutions have been designed for harsh environmental conditions and long lifetime thanks to Infineon's deep understanding of quality requirements. Take the next step by exploring our product portfolio for DC EV Charging systems and EV wireless systems.

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Solar

Solar PV

High efficient solutions for photovoltaic energy systems

Infineon provides a comprehensive portfolio to deliver the best efficiency and reliability for solar applications: Cutting-edge technologies such as CoolMOS™ SJ MOSFETs, CoolSiC™ Schottky diodes, CoolSiC™ MOSFETs, CoolGaN™ HEMTs, and TRENCHSTOP™ IGBTs. EiceDRIVER™ coreless transformer gate drivers can safely operate all these power transistors. Beyond the power stage, the rich experience and highest quality ensure Infineon's unique supplier position, enabling a one-stop-shop for solar applications. 32-bit Arm® Cortex® MCU families enable easy and high-efficiency design for power conversion blocks. Our Arm® Cortex®-M0-PSOC™ 4 entry-level family can also be used for power line communication (PLC). Our AIROC™ family of devices can provide Wi-Fi connectivity.

	Power optimizer 250 W - 1300 W	Micro inverter 250 W - 1500 W		String inverter 2 kW - 350 kW		Central inverter 500 kW - 5000 kW
Si MOSFETs	OptiMOS™ SuperSO8/TOLL/TOLT 60 - 200 V	OptiMOS™ SuperSO8/TOLL/TOLT 60 - 150 V		OptiMOS™ SuperS08/TOLL/TOLG/TOLT 150 - 300 V		-
	-	CoolMOS™ TOLL/D²PAK 600 - 950 V		CoolMOS™ TO-247-3/TO-247-4/D²PAK/TOLL/Q-DPAK 600 - 950 V		-
SiC MOSFETs - discrete	-	CoolSiC™ MOSFET discrete D²PAK-7/TOLL/TOLT/ThinTOLL 400 V/650 V/1200 V		CoolSiC™ MOSFET discrete TO-247-3/TO-247-4/D²PAK-7/TOLL /TOLT 400 V/650 V/750 V/1200 V/1700 V 2000 V		-
SiC MOSFETs - power modules	-	-		CoolSiC™ hybrid modules Easy 1B/2B/3B 650 to 1200 V		-
GaN HEMT	-	CoolGaN™ DSO-20/TOLL 100 - 700 V	CoolGaN™ BDS 650 V DSO-20/TOLT	CoolGaN™ DSO-20/TOLL 100 - 700 V	CoolGaN™ BDS 650 V DSO-20/TOLT	-
IGBTs - discrete	-	-		650 V/1200 V TRENCHSTOP™ 7 H7 TO-247-3/TO-247-4/TO-247PLUS 600 V/650 V/1200 V		CoolSiC™ hybrid modules 650 V to 1200 V
IGBTs - power modules	-	-		Easy 1B/2B/3B/4B		PrimePACK™ 3+/EconoDUAL™ 3/62 mm
Gate driver ICs	EiceDRIVER™ 2EDi/1ED Compact/2EDL/1EDN	EiceDRIVER™ 2EDi/1EDB/2EDL/ 1ED Compact (1ED-AF) 650 V SOI/1EDB		EiceDRIVER™ 2EDi/650 V SOI/ X3 Compact (1ED31xx) X3 Analog (1ED34xx) 1ED-F3/1EDB/IRS2011		EiceDRIVER™ High-side isolated (1ED020I12-xx) Single-channel isolated (1ED3890, 1ED3491) Driver boards (2ED300C17-xx)
SiC diodes	-	CoolSiC™ Schottky diodes DPAK/D²PAK 650 V/1200 V		CoolSiC™ Schottky diodes TO-220/TO-247/D²PAK 650 V/1200 V		-
	-	-		BAT165 Schottky diode		
Si diodes				650 V/1200 V Emitter Controlled 7		
Connectivity	AIROC™ Wi-Fi + Bluetooth® Combos/PLC	AIROC™ Wi-Fi + Bluetooth® Combos/PLC		AIROC™ Wi-Fi + Bluetooth® Combos		XMC4400 Arm® Cortex®-M4
Auxiliary power supply	-	CoolSET™		CoolSET™/CoolSiC™		CoolSIC™
Memory	EXCELON™ F-RAM	EXCELON™ F-RAM		EXCELON™ F-RAM/Asynchronous SRAM		EXCELON™ F-RAM F-RAM/Asynchronous SRAM
Current sensing	XENSIV™	XENSIV™		XENSIV™		XENSIV™
Microcontrollers	XMC1000 Arm® Cortex®-M0	32-bit PSOC™ 4 Arm® Cortex®-M0/M0+		32-bit XMC7000 Industrial Microcontroller Arm® Cortex®-M7		32-bit XMC7000 Industrial Microcontroller Arm® Cortex®-M7
	XMC4000 Arm® Cortex®-M4	XMC4000 Arm® Cortex®-M4		XMC4000 Arm® Cortex®-M4		XMC4000 Arm® Cortex®-M4

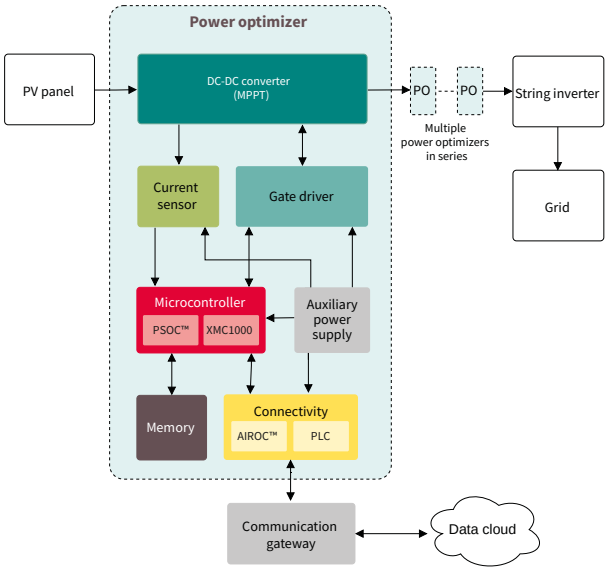


Infineon's product portfolio supports a full solar ecosystem, including energy storage and EV charging. Solar power optimizers and microinverters find their place on the roof under PV panels. They are exposed to very high ambient temperatures and high thermal cycling and must meet a 25-year lifetime, equivalent to PV panels. With Infineon's stringent quality measures and production screening processes, all these can be met.

In the picture (left), a string inverter is installed on the wall. The product offering for single-phase and three-phase configurations is shown below. This selection guide places energy storage systems (ESS) and EV charging solutions in respective application chapters.

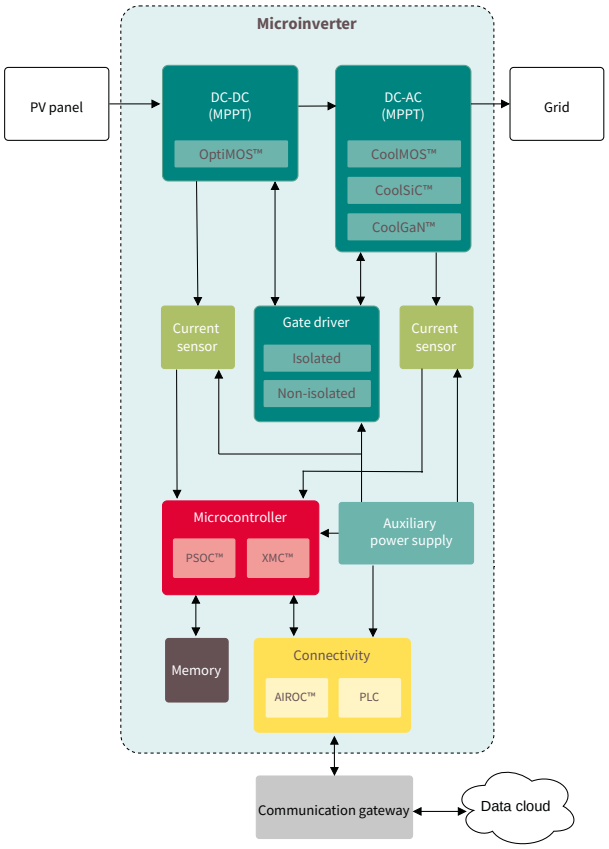
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Power optimizer



Functional block	Product family	Voltage class [V_{DS} max]	Package	Part number	$R_{DS(on)}$
DC-DC converter	OptiMOS™	60 V	SuperSO8	ISC058N04NM5	5.8 mΩ
				ISC060N06NM6*	6.0 mΩ
			SuperSO8 SC	BSC028N06NSSC	2.8 mΩ
		80 V	SuperSO8	BSC021N08NS5	2.1 mΩ
				ISC031N08NM6*	3.1 mΩ
		100 V	SuperSO8	ISC060N10NM6	6.0 mΩ
			SuperSO8 SC	BSC040N10NS5SC	4.0 mΩ
		120 V	SuperSO8	ISC030N12NM6	3.0 mΩ
		150 V	SuperSO8	BSC093N15NS5	9.3 mΩ
			TOLT	IPTC044N15NM5	4.4 mΩ
		200 V	SuperSO8	ISC130N20NM6	11.9 mΩ
			TOLL	IPT067N20NM6	6.7 mΩ
Gate driver	EiceDRIVER™	Single channel	PG-SOT23-6	1EDN8550	
			SON-10	1EDN7116G	
		Dual channel	SON-8	2EDL8024G	
			DSO	IRS2011	
				2EDL8034F5B	
Microcontroller	XMC™/PSOC™	XMC1000 for control loop/PSOC™ 4 for PLC communication			
Memory	EXCELON™	CY15B102QN-50SXE (F-RAM)			
Auxiliary power supply	-	TLE8366EV (PWM step-down DC/DC converter)			
Current sensor	XENSIV™	TLI4971-A025T5 (highest accuracy), TLI5571 (highest bandwidth), TLI5570 (shunt replacement)			

Microinverter



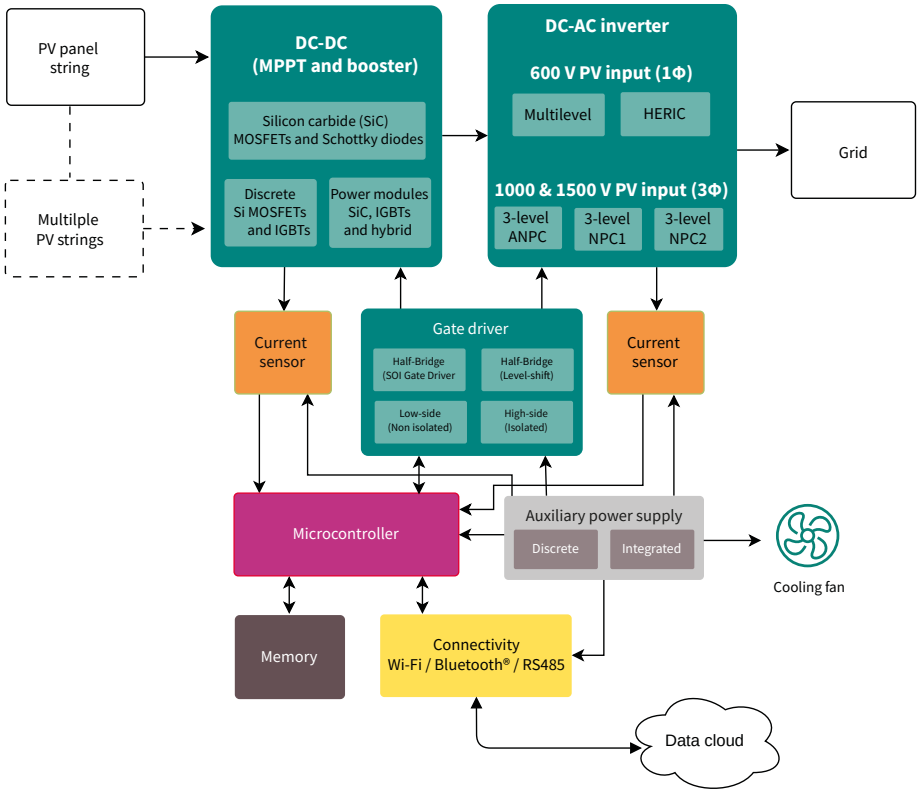
Functional block	Product family	Voltage class [V_{DS} max]	Package	Part number	$R_{DS(on)}$
MPPT – Boost stage	OptiMOS™	60 V	SuperSO8	BSC066N06NS	6.6 mΩ
				ISC060N06NM6	6.0 mΩ
			SuperSO8 SC	BSC028N06NSSC	2.8 mΩ
		80 V	SuperSO8	BSC026N08NS5	2.6 mΩ
				ISC031N08NM6	3.1 mΩ
			SuperSO8 SC	IQD016N08NM5CG	1.6 mΩ
		100 V	SuperSO8	ISC060N10NM6	6.0 mΩ
			SuperSO8 SC	BSC040N10NS5SC	4.0 mΩ
		120 V	SuperSO8	ISC030N12NM6	3.0 mΩ
		150 V	SuperSO8	BSC093N15NS5	9.3 mΩ
			TOLT	IPTC044N15NM5	4.4 mΩ
		200 V	SuperSO8	ISC130N20NM6	11.9 mΩ
			TOLL	IPT067N20NM6	6.7 mΩ
	CoolSiC™ Schottky diode	1200 V	DPAK	IDM02G120C5	2 A
				IDM05G120C5	5 A
	Gate driver: EiceDRIVER™		DSO	2EDN7524F	
				2ED24427N01F	
				IRS2011S, IRS2005S, IRS2007S, IRS2008S	
				2EDL8034F5B	
Inverter stage	CoolMOS™	600 V	TO-Leadless	IPT60R102G7	102 mΩ
			D^2PAK	IPB60R145CDF7	145 mΩ
			D-DPAK	IPDD60R105CFD7	105 mΩ
		650 V	D^2PAK	IPB65R125CFD7	125 mΩ
			D^2PAK	IPB65R041CFD7	41 mΩ
	CoolGaN™	600 - 700 V	DSO-20-87	IGOT60R070D1	70 mΩ
			TO-Leadless	IGT60R070D1	70 mΩ
		650 V	TOLT	IGLT65R110B2	110 mΩ
				IGLT65R055B2	55 mΩ
			DSO	IGOT65R035B3	35 mΩ
				IGOT65R025B3	25 mΩ
	CoolSiC™ MOSFET	650 V	TO-Leadless	IMT65R163M1H	163 mΩ
			D^2PAK-7	IMBG65R163M1H	163 mΩ
		1200 V	D^2PAK-7	IMBG120R181M2H	181 mΩ
	Gate driver: EiceDRIVER™	650 V	DSO	2EDS8165H	
				2EDR8259X	
				2EDS9265H	
		1200 V		1EDI60I12AF, 1EDI30I12MF	
Microcontroller	XMC™/PSOC™	PSOC™ Control C3M/PSOC™ 4 for PLC communication			
Memory	EXCELON™ F-RAM	CY15B102QN-50SXE			
Auxiliary power supply	CoolSET™	ICE5QR4780BG (800 V, 15 W, quasi-resonant)			
		ICE5GR4780AG (800 V, 15 W, fixed-frequency)			
Connectivity	AIROC™	AIROC™ Bluetooth® LE 5.4 MCU CYW20829 and AIROC™WiFi 6/6E tri-band 2x2 Wi-Fi and Bluetooth® 5.3 SoC			
	PLC	CY8CPLC20-48LTXIT			
Current sensor	XENSIV™	TLI4971-A025T5 (highest accuracy), TLI5571 (highest bandwidth), TLI5570 (shunt replacement)			

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*Coming soon

Your input matters
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Single- and three-phase string inverter



Inverter type	Functional block	Product category	Product technology	Voltage	Package	Part number	$R_{DS(on)}$	[A]
Single-phase	MPPT – Boost stage	Si MOSFET	CoolMOS™ C7	650 V	TO-247-3	IPW65R019C7	19 mΩ	-
					TO-247-4	IPZ65R019C7	19 mΩ	-
		SiC MOSFET	CoolSiC™ MOSFET	750 V	TO-247-4	IMZA75R008M1H	7.8 mΩ	-
					QDPAK TSC	IMDQ75R020M1H	20 mΩ	-
				650 V	TO-247-4	IMZA65R015M2H	15 mΩ	-
					TO-263-7	IMBG65R015M2H	15 mΩ	-
					TO-TOLT	IMLT65R015M2H	22 mΩ	-
				400 V	TO-Leadless	IMT40R011M1H	11 mΩ	-
		Diode	CoolSiC™ diode	650 V	TO-247	IDW20G65C5	-	20 A
						IDW32G65C5B	-	32 A
	Inverter 5-level	Si MOSFET	OptiMOS™ 6	200 V	TOLL	IPT067N20NM6	6.7mΩ	-
			OptiMOS™ 5	150 V	SuperSO8	BSC093N15NS5	9.3 mΩ	-
	Inverter 2-level, e.g., Heric	Si MOSFET	CoolMOS™ CFD7	650 V	TO-247-3	IPW65R018CFD7	18 mΩ	-
					TO-247-4	IPZA65R018CFD7	18 mΩ	-
					TO-247-4	IPZA65R029CFD7	29 mΩ	-
					Q-DPAK	IPDQ65R017CFD7	17 mΩ	-
		SiC MOSFET	CoolSiC™ MOSFET	650 V	TO-247-4	IMZA65R015M2H	15 mΩ	-
					TO-247-3	IMW65R020M2H	20 mΩ	-
					TO-263-7	IMBG65R015M2H	15 mΩ	-
					TO-Leadless	IMT65R022M1H	22 mΩ	-
		IGBT	TRENCHSTOP™ 7 H7	650 V	TO-247-4	IKZA50N65EH7	-	50 A
					TO-247-3	IKWH50N65EH7	-	50 A
Three-phase	MPPT – Boost stage	IGBT	TRENCHSTOP™ 7 H7	1200 V	TO-247-3	IKW40N120CH7	-	40 A
					TO-247PLUS-3	IKQ75N120CH7	-	75 A
						IKQ100N120CH7	-	100 A
		SiC MOSFET	CoolSiC™ MOSFET	1200 V	TO-247-3/-4	IMW120R030M1H, IMZ120R030M1H	30 mΩ	-
						IMW120R040M1H, MZA120R040M1H	40 mΩ	-
						IMW120R060M1H, IMZ120R060M1H	60 mΩ	-
		Silicon carbide MOSFET module	CoolSiC™ MOSFET	2000 V	Easy 3B	DF4-19MR20W3M1HF_B11	19 mΩ	120 A
	Inverter	IGBT	TRENCHSTOP™ 7 H7	1200 V	TO-247-3	IKW40N120CH7	-	40 A
					TO-247PLUS-3	IKQ75N120CH7	-	75 A
			TRENCHSTOP™ 7 H7			IKQ140N120CH7	-	140 A
		SiC MOSFET	CoolSiC™ MOSFET	1200 V	TO-247-3/-4	IMW120R030M1H, IMZ120R030M1H	30 mΩ	-
						IMW120R040M1H, MZA120R040M1H	40 mΩ	-
						IMW120R060M1H, IMZ120R060M1H	60 mΩ	-
				1700 V	D^2PAK-7	IMBF170R650M1	650 mΩ	-
				2000 V	TO-247-4-PLUS	IMYH200R012M1H	12 mΩ	-
		Silicon carbide MOSFET module	CoolSiC™ MOSFET	1200 V	Easy 2B	IF3L8MR12W2M1HP_B11	8.1 mΩ	-
Gate driver ICs		EiceDRIVER™		650 V	DSO-16	2EDS7165H		
				650 V		2ED2181S06F		
				1200 V		IR2214SS, IR2213S		
				1200 V		1EDI60I12AF, 1EDI30I12MF		
				2300 V		1ED3124MU12H, 1ED3122MU12H		
				2300 V		1ED3322MC12N, 2ED020I12-F2		
				2300 V		1ED3491MU12M, 1ED3890MU12M		
		EiceDRIVER™ 2EDN family, EiceDRIVER™ 1EDB						
Microcontroller		XMC4000 and XMC7000, PSOC™ Control C3M						
Memory		EXCELON™ F-RAM/Asynchronous SRAM						
Auxiliary power supply		Integrated: CoolSET™ Quasiresonant (QR)/CoolSET™ with Fixed Frequency (FF)						
		Discrete: CoolSET™ (QR or FF) + CoolMOS™ P7						
Connectivity		AIROC™ Bluetooth® LE 5.4 MCU CYW20829 and AIROC™ WiFi 6/6E tri-band 2x2 Wi-Fi and Bluetooth® 5.3 SoC						
		ISOFACE™ digital isolators for RS485						
Sensing		TLI4971 (high accuracy), TLE4971 (basic isolation 1700 V), TLE4978 (5 MHz bandwidth), TLI5570 (shunt replacement)						

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Battery

Energy storage systems

Make energy storage systems the backbone of the new energy era with our semiconductor system solutions

Facing diminishing fossil reserves, the world needs to manage the rising demand for electrical energy while meeting the growing call for urgent climate action. The transition to renewable energies has become inevitable.

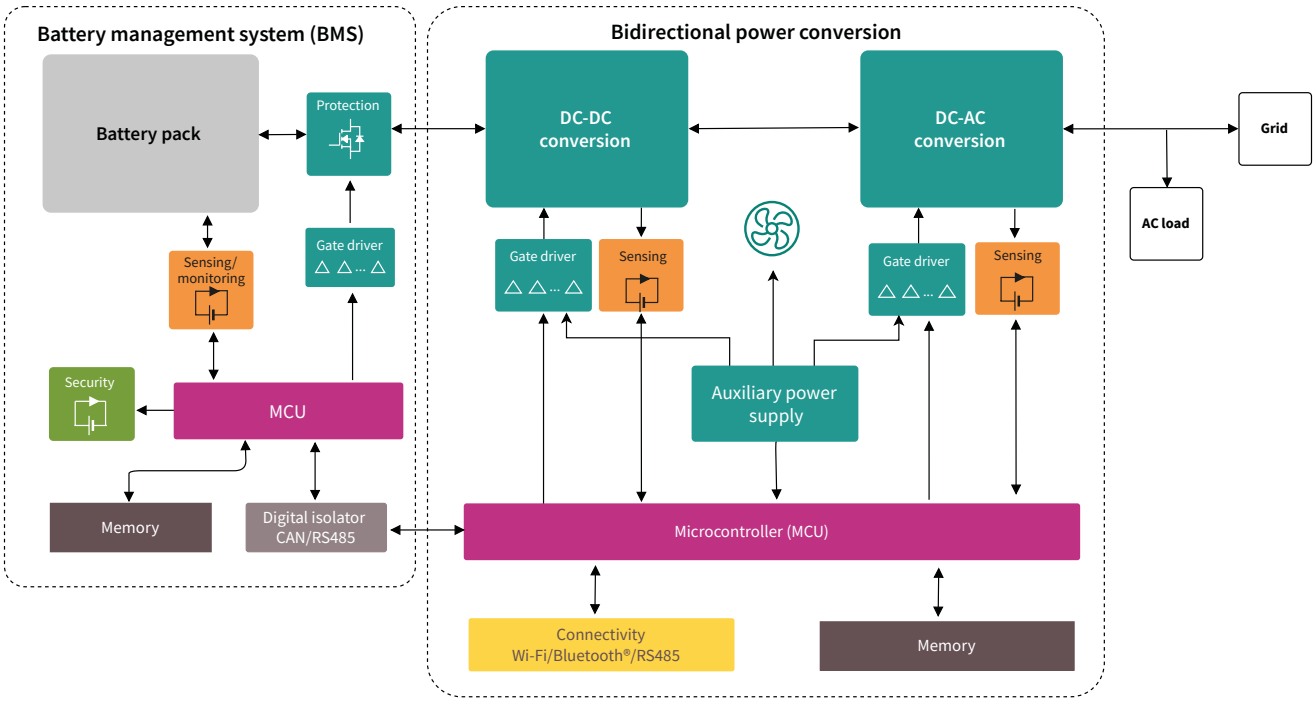
Energy storage systems play a vital role in managing this transition successfully. Our system solutions help to make energy storage the backbone of the new energy era. Our unique application expertise and comprehensive offerings make us the natural choice to advance energy storage solutions in efficiency, performance, optimal cost, and innovation.

Features and benefits

Key features
– Efficient power conversion in DC-DC and AC-DC stage
– Power-dense design
– Bidirectional power flow
– Li-ion battery safety and predictive maintenance
– Long battery lifetime
– Safe data transfer is essential

Key benefits
– Improvement of system performance with industry-leading semiconductors
– Offerings such as OptiMOS™, CoolMOS™, CoolSiC™ MOSFETs, CoolGaN™ HEMT but also best-in-class modules and matching EiceDRIVER™ gate drivers
– Trust in a true partnership during the whole system's lifetime
– Full system provider from power conversion stage (PCS) to the battery management system (BMS), monitoring of battery's SOC, SOH, and cell capacity through constant logging of critical parameters to measure the battery health
– OPTIGA™ Trust family protects BMS and inverters against cyber attacks
– Ultralow-energy data-logging of key battery health parameters in F-RAM
– XMC7000, XMC4000 and PSOC™ 4 Arm® Cortex®-M7, Arm® Cortex®-M4 and Cortex®-M0 MCU families enable easy-to-design and stable control over the system
– ISOFACE™ digital isolators, AIROC™ Wi-Fi + Bluetooth® Combos

Application diagram



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Highlight/recommended product portfolio

Functional block	Power/battery voltage	Voltage class [V_{DS} max]	Product family	Package	Benefits
Power conversion systems (PCS)	<10 kW	40 - 300 V	OptiMOS™ and StrongIRFET™	SuperSO8, TOLL, TOLT, TO-220, D^2PAK	– High power density and system cost reduction
		600 V/650 V	CoolMOS™ CFD7 CoolMOS™ 8	TO-220/247, TOLL, Q-DPAK	– Highest efficiency, enabling increased power density/more compact and easier design
		650 V	CoolSiC™ Schottky diode	TO-220, D^2PAK, D-DPAK	– Improved system efficiency and extremely fast switching
		650 V	CoolSiC™ MOSFET	TO-247. D^2PAK, TOLL*	– Combination of high performance, high reliability, and ease of use
		600 V/650 V	CoolGaN™ HEMT	DSO-20/TOLL	– Ultrahigh-power density and efficiency
		650 V	TRENCHSTOP™ 5 H5/ CoolSiC™ hybrid devices	TO-247	– Conventional designs, high current operations
		650 V	CoolGaN™ BDS	DSO-20, TOLT	– Cost-effective high performance solution for minimized system size
	10-100 kW	40 - 300 V	OptiMOS™ and StrongIRFET™	TOLL, TOLT, TO-220, D^2PAK	– High power density and system cost reduction
		600 - 950 V	CoolMOS™ C7/P7	TO-247, Q-DPAK, TOLL	– Ease of use and fast design-in
		650 V	CoolSiC™ MOSFET	TO-247, D^2PAK, TOLL*	– Combination of high performance, high reliability, and ease of use
		650 V	TRENCHSTOP™ 7 H7	TO-247, TO-247PLUS, TO-247-HCC, TO-247-asymetric (3 and 4 pin)	– Best-in-class performance and controllability
		600 V/650 V	CoolSiC™ Schottky diode	TO-220, D^2PAK, D-DPAK	– Higher frequency and increased power density
		1200 - 2000 V	CoolSiC™ MOSFET	TO-247, TO-247-HCC	– Highest efficiency and increased power density
		650 - 1200 V	TRENCHSTOP™ 7 H7	TO-247, TO-247PLUS, TO-247-HCC, TO-247-asymetric (3 and 4 pin)	– Best-in-class performance and controllability
		200 V	EiceDRIVER™ 1EDN gate driver 1EDN7550 1EDN7116	PG-SOT23-6/ PG-SOT23-5 WSON-6 / TSNP	– Single-channel non-isolated
		650 V	EiceDRIVER™ 2EDR gate driver 2EDR8259X	PG-DSO-14-WB	– Dual-channel reinforced (safe) isolated
		650 V	EiceDRIVER™ 2EDB gate driver 2EDB8259Y	PG-DSO-14-NB	– Dual-channel functional isolated
		2300 V	EiceDRIVER™ Compact gate driver	DSO-8	– Single-channel isolated driver with Miller clamp/separate output
		1200 V/2300 V	EiceDRIVER™ Enhanced gate driver	DSO-16	– Single-channel isolated driver with DESAT and Miller clamp
BMS – battery protection	40 - 100 V	60 - 200 V	OptiMOS™ Linear FET	TOLL, D^2PAK	– Minimize parallelization of MOSFETs – Market-leading MOSFETs with lowest $R_{DS(on)}$ enabling low conduction losses – Widest SOA area with LinearFET™
	150 - 400 V	600 V	CoolMOS™ S7	TOLL, Q-DPAK	– Lowest $R_{DS(on)}$ MOSFET
BMS monitoring and balancing	-	-	Battery management IC (TLE9012DQU)	PG-TQFP-48	– ASIL-D compliant – Cell balancing with integrated switches with up to 150 mA using external resistors to reduce chip power consumption – 12x delta-sigma ADCs ensure that the voltage of all cells is measured synchronously – ISO UART includes an 8-bit CRC to ensure data integrity until microcontroller register
BMS transceiver	-	-	Battery management IC (TLE9015QU)	PG-TQFP-48	– UART to ISO UART communication – General purpose error pin – Support diagnosis feature
Digital isolators	-	-	ISOFACE™ digital isolators 2DIB1401F/4DIR1401H	PG-DSO-8-8 PG-DSO-8-16	– Isolated CAN/UART communication – Support diagnosis feature, general purpose error pin
Current sensors	-	-	XENSIV™ - high-precision coreless current sensors	PG-TISON-8	– High accuracy of current sensing – Noise robustness
Auxiliary power supply	-	650 - 950 V	CoolSET™ ICE5QR0680BG (800 V, 42 W, Quasi Resonant) ICE5AR0680AG (800 V, 40 W, Fixed Frequency)	DSO-12	– Compact, robust, and easy-to-use solution
Microcontroller	-	-	XMC™ families XMC4000/XMC7000 PSOC™ 4	PG-VQFN-40 PG-VQFN-56 PG-TSSOP-16 PG-TSSOP-38	– 32-bit MCU subsystem – 48/144/350 MHz Arm® Cortex®-M0+ CPU – Up to 8 MB flash – 32 kB SRAM – Up to 2 CAN – USB/up to 4 serial channels
Memory	-	-	Serial SPI F-RAM EXCELON™ F-RAM	PG-DSO-8	– Zero-delay writes – 1014 read/write cycles – 10-year data retention at +85°C temperature – 200x lower energy than EEPROM – No complex wear-leveling overheads
Security	-	-	OPTIGA™ Trust family	PG-USON-10-2	– The OPTIGA™ Trust family includes turnkey products for smaller platforms as well as programmable solutions
Connectivity	-	-	AIROC™ Wi-Fi + Bluetooth® Combos	WLBGA	– High integration, quick implementation – Supports Wi-Fi 4, Wi-Fi 5

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*Coming soon

Aircon

Air conditioning systems

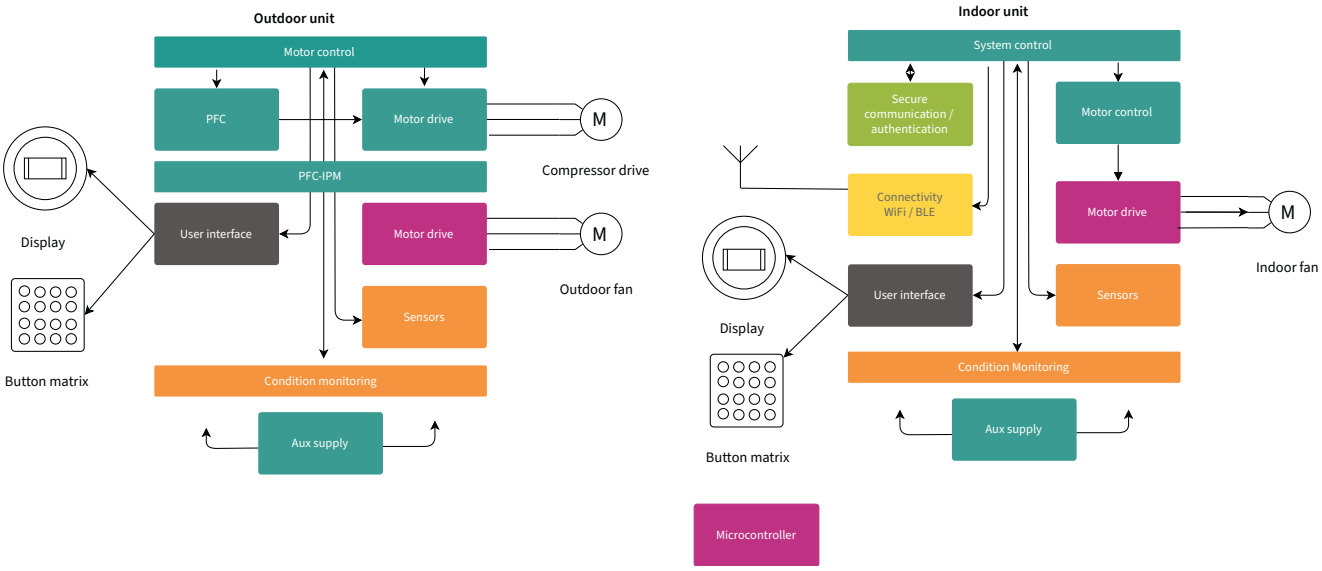
Reliable semiconductors for smart and efficient HVAC systems

Smarter, smaller, more powerful, and energy-efficient: Today's air conditioning systems must meet growing demands. Quiet air conditioning systems are in high demand since they are used in private households. Functions such as smooth starting, a wide range of operating speeds, and vibration suppression are necessary. In addition, they must be able to integrate easily and securely into a smart home to support remote control and condition monitoring. Moreover, innovative features like people tracking and CO2 sensing help them stand out. By integrating IoT capabilities, our HVAC systems offer enhanced functionality and greater efficiency while enabling seamless integration with other smart home devices.

Designing air conditioning systems that boast such capabilities requires highly reliable power semiconductors. The enabling semiconductor solutions must be energy-efficient and reflect new form factors. Infineon's solutions offer high integration, comprehensive features, and robust protection while reducing time-to-market. Infineon offers the entire portfolio to develop inverters and active PFC for compressors, fans, and pumps. Our extensive portfolio of motor controllers, intelligent power modules, power integrated modules, discrete IGBTs, MOSFETs, and gate drivers provide you with everything you need to innovate. Go for ultimate efficiency with silicon carbide (SiC), high-frequency PFC topologies, and your algorithms.

The block diagram of an air conditioning system is shown below, and the product selection table on the next page provides an effective recommendation for engineers to select the right component for each power management stage.

Application diagram



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Recommended products

Functional block	Product family	Voltage class	Technology/product family	Selection/benefit
Outdoor unit (ODU) PFC	iMOTION™ controller	-	IMC302A-F064	Motor/PFC controller incl. software
	Non-isolated EiceDRIVER™	25 V	1ED44175N01B	Integrated overcurrent protection
	Non-isolated EiceDRIVER™	25 V	1ED44171N01B	Cost/performance
	Level-shift EiceDRIVER™	600 V	6EDL04I06PT	Infineon SOI with integrated bootstrap diode
	TRENCHSTOP™ 5 IGBT WR5/WR6	650 V	IKW30N65WR5, IKWH30N65WR6	Recommended
	TRENCHSTOP™ 5 IGBT advanced isolation	650 V	IKFW40N65DH5	Easy to use
	TRENCHSTOP™ IGBT7	670 V	IKWH30N67PR7	Recommended
	EC7	650 V	IDWD60E65E7	Recommended
	CIPOS™ Mini	600 V	CIPOS™ Mini PFC interleaved IPM series IFCM20T60GD/ IFCM20U60GD/IFCM30T60GD/IFCM30U60GD CIPOS™ Mini PFC integrated IPM series IFCM10P60GD/ IFCM10S60GD/IFCM15P60GD/IFCM15S60GD IM564-X6D	Easy to use/system size saving
	CoolMOS™ SJ MOSFETs	600 V	IPP60R120P7	Recommended
ODU motor drive (compressor)	iMOTION™ controller	-	IMC302T-F064	Motor/PFC controller incl. software
	CIPOS™ IPM	-	CIPOS™ Mini	Easy to use/system size saving
	Level-shift EiceDRIVER™	600 V	6EDL04I06PT	Infineon SOI with integrated bootstrap diode
	RC-D2 IGBT	600 V	IKD15N60RC2	Recommended
	Easy IGBT Power Modules	600 V 650 V 1200 V	EasyPIM™	Recommended
	Econo IGBT Power Modules	650 V 1200 V	EconoDUAL™, EconoPIM™	Recommended
ODU motor drive (outdoor fan)	iMOTION™ controller	-	IMC101T-T038	Motor controller incl. software
	CIPOS™ IPM	600 V	CIPOS™ Micro IM241 series	Easy to use/system size saving
	Level-shift EiceDRIVER™	600 V	6EDL04I06PT	Infineon SOI with integrated bootstrap diode
	RC-D2 IGBT	600 V	IKD06N60RC2	Recommended
	CoolMOS™ SJ MOSFETs	600 V	IPD60R1K0PFD7S	Recommended
Condition monitoring and predictive maintenance	XENSIV™ Hall switches	-	TLI4963-2M	Recommended
	XENSIV™ pressure sensor	-	DPS368	Recommended
	XENSIV™ MEMS microphone	-	IM69D130	Recommended
	XENSIV™ Hall sensors	-	TLE4961, TLE4964, TLE4913, TLI4966G	Recommended
	XENSIV™ 3D magnetic sensor	-	TLI493D-W2BW	Vibration and position monitoring
	XMC4000 microcontroller	-	XMC4700	Recommended
Indoor unit (IDU)	XMC™ microcontroller	-	XMC1400, XMC4100	Recommended
	iMOTION™ controller	-	IMC302A-F064	Motor/PFC controller incl. software
	PSOC™ 6	-	CY8C62x4/5	Recommended
	PSOC™ Control C3	-	PSC3M5FDS2ACQ1	Recommended
IDU motor control	XMC™ microcontroller	-	XMC1300, XMC1400	Recommended
	iMOTION™ controller	-	IMC101T-T038	Motor controller incl. software
	CIPOS™ IPM	600 V	CIPOS™ Nano	Easy to use/system size saving
IDU motor drive	iMOTION™ IPM	-	IMI111T-026H, IMI111T-046H	Motor controller incl. software, driver and power stage
	Level-shift EiceDRIVER™	-	6EDL04I06PT	Infineon SOI with integrated bootstrap diode
	RC-D2 IGBT	600 V	IKN03N60RC2, IKD04N60RC2	Recommended
	CoolMOS™ SJ MOSFETs	600 V	IPN60R1K5PFD7S	Recommended
Security	OPTIGA™ Trust family	-	OPTIGA™ Trust M SLS32AIA	Recommended
Connectivity Wi-Fi/BLE	AIROC™	-	CYW43439	Recommended
User interface	PSOC™ 6	-	CY8C62x4/5	Recommended
Sensors	XENSIV™ radar	-	BGT60LTR11AIP	Recommended
	XENSIV™ PAS CO2	-	PASCO2V01	Recommended
	XENSIV™ MEMS microphone	-	IM69D130	Recommended
	XENSIV™ Hall switches	-	TLI4963-2M	Recommended
	XENSIV™ current sensors	-	TLI4971	Recommended
Auxiliary supply	CoolMOS™ SJ MOSFETs	800 V	IPN80R4K5P7	Recommended
	CoolSET™	700 V	ICE5AR4770BZS	Flyback with error amplifier
UV-C LED for health	LED driver ICs	42 V	BCR43x	Recommended

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Air purifier

Air purifier

Smart and efficient air quality improvement

Breathing in fresh, clean air has never been more vital for our health — and the next generation of air purifiers lets you take air quality to a whole new level. Today, the best smart air purifiers boast intelligent features like voice control apps that allow you to monitor particle levels and schedule cleanings days in advance.

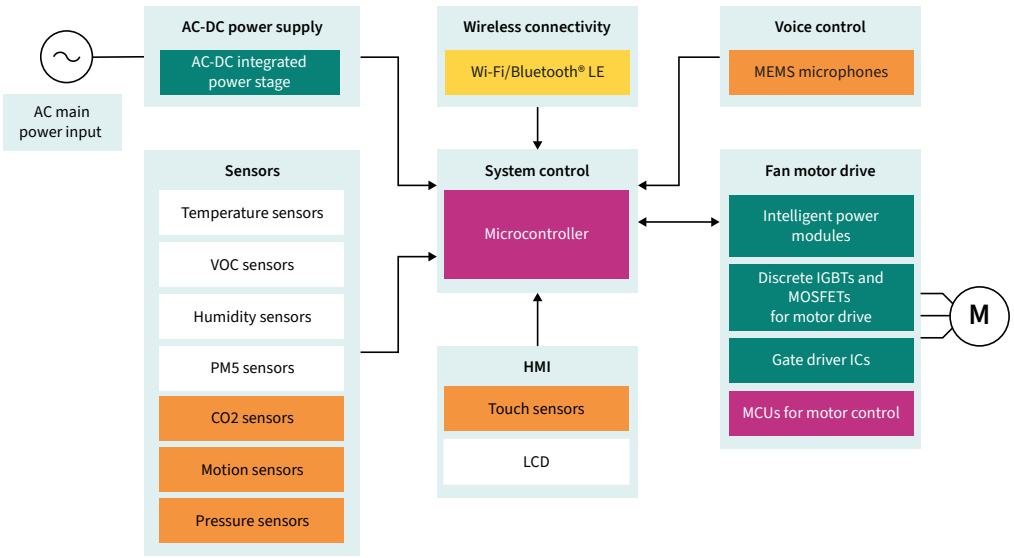
It takes time to filter all the air in a room, meaning these units usually operate continuously, making low energy consumption essential. Also, since they operate in living spaces, low noise and vibration are significant factors to consider. Sensors measure air quality, detect presence, and recognize gestures. Connectivity to integrate the air purifier into a smart home remote control can be achieved through Wi-Fi. At the same time, the user can interact with the device through a modern human machine interface (HMI) or voice control.

Highly integrated Infineon components for air purifiers provide high efficiency, low noise, and low energy consumption in motor drivers. A reliable wireless connectivity solution combined with high-accuracy sensing provides environmental intelligence and a seamless connection with smart homes.

Features and benefits

Key features	Key benefits
– Wide portfolio of highly integrated solutions	– Reduced BOM cost and development effort, increased space saving
– Robust IPM motor control solutions	– Optimized system performance and reliability compared to discretes
– Broad portfolio of innovative sensor solutions	– Measures air quality, turns off when not needed, saves energy
– Reliable connectivity with Wi-Fi/BLE	– Smart home appliance
– Highly reliable and market-proven Infineon products	– Extends system lifetime

Application diagram



Click here to learn more:
www.infineon.com/air-purifier



Product portfolio

Functional block	Product	Product family	Specification	Benefits
AC-DC power supply	AC-DC integrated power stage	CoolSET™ AC-DC integrated power stages	ICE5AR4770BZS	– Reduce BOM count and cost with integrated error amplifier – Increase mid- and light-load efficiency with digital frequency reduction – High power delivery with slope compensation for CCM operation
Sensing	CO2 sensor	XENSIV™ PAS CO2 sensors	PASCO2V01BUMA1	– Superior accuracy, providing a direct readout of the real CO_2 level, not simply a correlation – Size and cost advantages
	Motion sensing	XENSIV™ Radar	BGT60TR13C	– Accurate presence detection and vibration detection, tracking sub-millimeter motion at high speed and accuracy – Both stand-alone chip and system solutions available
	Pressure sensor	XENSIV™ pressure sensors for IoT	DPS368	– Fast, ultralow noise read-out allows for precise measurement of air flow – Ideal for harsh environments with water, dust, or humidity
Wireless connectivity	Wi-Fi + Bluetooth® Combos	AIROC™ Wi-Fi + Bluetooth® Combos	CYW43439	– Best-in-class interoperability to the widest deployed wireless IP – Whole home range with high throughput for multi-channel audio and RSDB – Ultralow-power technology designed with battery operation in mind
Central control	Microcontroller	PSOC™ 6 microcontrollers with Arm® Cortex®-M4/M0+	CY8C6116BZI-F54, CY8C6145LQI-S3F42	– Highly integrated HMI solution with capacitive touch sensing and TFT display – Provides the complete solution of IoT connectivity and security (cloud service, mesh gateway)
Voice control	MEMS microphone	XENSIV™ MEMS microphones for consumer	Multiple, depends on the design here	– High-performance microphone with low self-noise (high SNR) and low distortions – Various packaging options and sensitivity as well as official partner software enabling solutions for voice commands
HMI	Capacitive touch sensing controller	CAPSENSE™ capacitive touch sensing controllers	here	– State-of-the-art noise immunity (SNR >100:1) and water rejection – Advanced inductive touch sensors make sleek, futuristic user interfaces possible
Motor control and drive (fan)	Intelligent power module	CIPOS™ Nano ultra compact three-phase MOSFET IPMs	IRSM836-045MA, IRSM836-035MB	– Optimal solution for highly integrated fan motor drives – Made for space-constrained applications with ultra compact footprint
		iMOTION™ highly integrated motor control IPMs	IMM101T-046M	– Fastest time-to-market with no software development required, no inverter hardware design needed, and easy motor parametrization and tuning – Lowest BOM cost with reduced BOM count and PCB size, sensorless FOC algorithm, and no need for an additional PFC controller – Smallest PCB footprint for 3-phase inverter with PQFN 12 mm x 12 mm, and no need for heatsink up to 80 W
		iMOTION™ highly integrated motor controllers (IMC)	IMC101T-T038	– Fastest time-to-market with no programming required and easy motor parametrization and tuning – No external OPAMP or comparators required and single shunt sensorless FOC operation – Full protection for power stage and motor; full flexibility on gate driver and power stage
	Discrete IGBT	600 V reverse conducting drives 2 RC-D2	IKN03N60RC2, IKN04N60RC2	– Low switching losses and competitive price – Improved controllability; humidity ruggedness; high system reliability – Easy to design in products, drop-in SMD replacement in DPAK and SOT-223
	MOSFET	600 V CoolMOS™ PFD7 superjunction MOSFETs	IPN60R1K5PFD7S, IPN60R1K0PFD7S	– Power density improvement compared to latest CoolMOS™ charger technology – Increased efficiency and improved thermal behavior compared to CoolMOS™ CE technology for low power drives applications – BOM cost reduction and easy manufacturing; robustness and reliability
	Gate driver IC	EiceDRIVER™ 600 V full-bridge three-phase gate driver ICs	6EDL04I06PT	– Excellent ruggedness and noise immunity – Integrated bootstrap diode, overcurrent protection, enable and fault reporting
		EiceDRIVER™ 650 V Infineon SOI half-bridge gate driver ICs	2ED2304S06F	– Integrated bootstrap diode for reduced BOM cost – 50% lower level shift losses lead to lower temperature operation and higher reliability – Flexible, small PCB footprint
	Microcontroller	XMC™ 32-bit XMC1000 industrial microcontrollers with Arm® Cortex®-M0	XMC1301-T038F0032 AB	– Easy 3-phase inverter implementation with a single CCU8 PWM unit, offering shadow register transfer, external input for fault control, binary and floating pre-scaler, 16-bit to 64-bit width – POSIF interface to directly connect hall sensors and incremental encoder – 12-bit ADC with on-chip adjustable gain of x1, x3, x6, or x12

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Ceiling Fan

Ceiling fan

Energy-efficient and cost-effective solutions with high integration for system size reduction

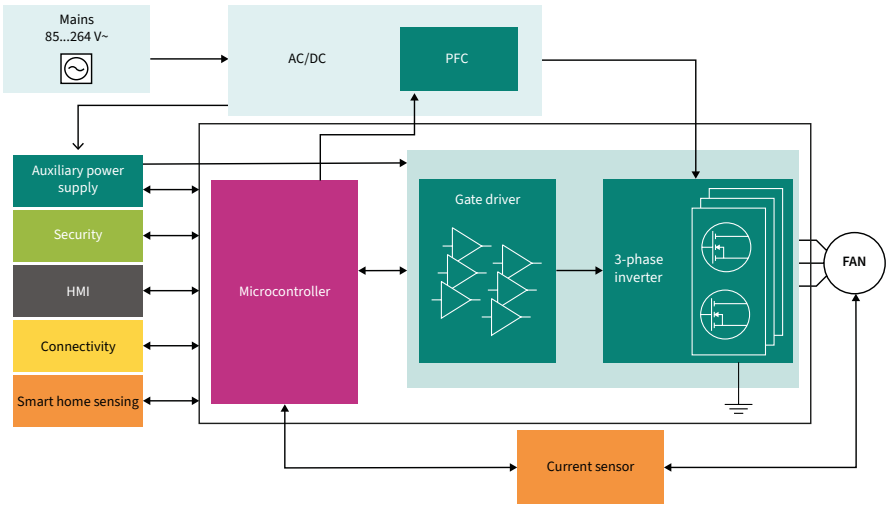
Ceiling fan manufacturers face more stringent regulations regarding the application's form factor and are under constant pressure to reduce costs. Infineon is here to help with a compact, energy-efficient, cost-effective motor drive solution. We propose a competitive solution with an extensive portfolio, high integration for system size reduction, and at a low cost.

Infineon is your ideal partner for all ceiling fan designs. In our portfolio, you will find a wide range of solutions for inventoried fan motor control – whether your priority is achieving the highest level of integration, using our IPMs, or showcasing ultimate flexibility with the right price-to-performance ratio using our discrete IGBTs or MOSFETs. No matter your target, our power semiconductors, drivers, IPMs, MCUs, sensors, connectivity combos, security solutions, and iMOTION™ motor controllers are designed to work together seamlessly. This means you can effortlessly realize a smoother-running, quieter, more connected system with low energy consumption and a small form factor, all the while getting to market even faster.

Features and benefits

Key features	Key benefits
– Reference design for ready-to-copy PCB	– Compact and cost-effective system solution
– Turnkey PFC and motor control with MCE	– Eliminate the need for motor control software development
– Integrated infrared remote control	– Easy evaluation and system verification
– Suitable for single-sided PCB assembly process	– Reduce design-in effort and speed up time-to-market
– Compatible with low- and high-voltage motors	– Achieve maximum system cost-performance
– MCU design option for higher flexibility	– Higher system reliability
– IEC61000-4-5 4 kVs surge compliant and EN55032 class B EMI compliant	– One-stop-shop for simplified development to ensure a fast time-to-market

Application diagram

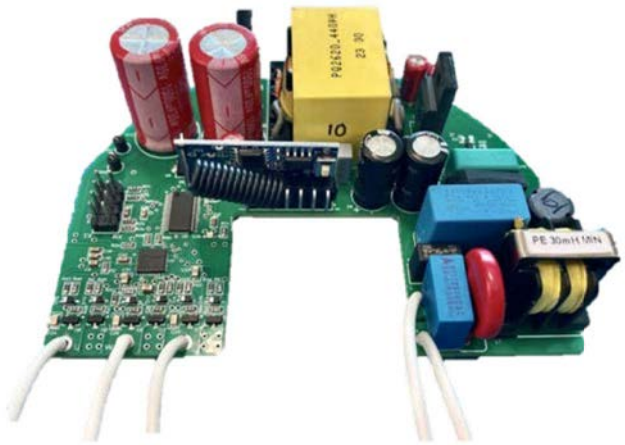


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REF_36W_SLFOC_XMC13_CF reference design

The reference design is a 36 W low-voltage ceiling fan solution. Powered by the integrated controller at the AC-DC PFC flyback stage for constant voltage output, REF_36W_SLFOC_XMC13_CF is a turn-key plug-in low-voltage solution with UI configuration, enabling a smoother and faster implementation process.

The reference design is powered by an ICL8810 integrated controller (IC) at the AC-DC PFC flyback stage for constant voltage output along with an IPA80R750P7 MOSFET. XMC1302 microcontroller from the XMC series is used for brushless direct current (BLDC) sensorless field-oriented control (FOC) motor drive. It also includes the 160 V 6ED2742S01Q 6-channel gate driver and IRLML0040TRPBF (SOT23) as the motor inverter MOSFET, which provides a cost-effective, high-performance, and flexible system.



Summary of features

- 230 VAC nominal operating input
- Efficiency of at least 85% full load
- Standby power <0.85 W at input 90~300 VAC
- Flyback input/output OVP

Benefits

- Single-shunt sensorless FOC
- Stall detection
- Catch-free running
- IR/RF remote speed control
- GUI interface Tuning
- Motor driver HW/SW OCP, DC-link OVP/UVP

Click here to learn more:

www.infineon.com/ceiling-fan REF_36W_SLFOC_XMC13_CF



Product portfolio

Functional block	Product category	Product family	Part number	Benefits
AC-DC power supply	PFC	AC-DC LED driver	ICL8810	– Low BOM for 2-stage topologies; cost-effective with optimal efficiency – DCM for frequency foldback; QR operation for high efficiency
Aux power	Integrated power stage	Fixed frequency CoolSET™	ICE5GR4780AG	– Reduce BOM count and cost with integrated line input overvoltage protection and error amplifier – Increase mid-and light-load efficiency with digital frequency reduction
	PWM-PFC Controller	Quasi Resonant CoolSET™	here	– Fifth-generation controller that combines the industry's benchmark for thermal performance with the latest innovation in quasi-resonant technology for unparalleled performance and efficiency
Motor control and drive	Intelligent power module	CIPOS™ Nano IPMs	here	– Innovative Power QFN package, utilizing PCB copper traces to dissipate heat from the module – Small form factor offering up to 60% smaller footprint than existing 3-power motor control power IPMs
	Discrete IGBT	600 V Reverse Conducting Drive 2	IKD04N60RC2, IKD06N60RC2, IKN03N60RC2, IKA08N65H5,	– Adequate performance at a competitive price – Good enough di/dt controllability in order to reduce electromagnetic noise – Improved humidity robustness (HV-H3TRB test passed) – Wide portfolio with current classes raging from 4 A-15 A and 1 A-6 A in SOT-223
	MOSFET	CoolMOS™	IPA80R1K4P7	– 0.1% to 0.6% efficiency gain and 2°C to 8°C lower MOSFET temperature as compared to CoolMOS™ C3 – Enabling higher power density designs, BOM savings, and lower assembly cost
	Gate driver IC	160 V SOI-based gate driver	6ED2742S01Q	– High power density, durability, and reliability with smaller footprints – Excellent thermal management, scalability, and simplicity of usage
		EiceDRIVER™ 500 - 700 V Level Shift Gate Driver ICs	6EDL04I06PT	– 500 – 700 V level shift gate driver – Space-saving package and improved energy efficiency
		600 V half-bridge gate driver IC	2EDL23I06PJ	– 600 V half-bridge gate driver IC
		650 V, 0.7 A high-side and low-side gate driver	2ED2106S06F	– 650 V, 0.7 A high-side and low-side gate driver – Integrated bootstrap diode; reduced BOM cost and 50% lower level-shift losses – Excellent ruggedness and noise immunity against negative transient voltages on the VS pin
		650 V, 2.5 A high current half-bridge gate driver IC	2ED2184S06F	– 650 V, 2.5 A high-current half-bridge gate driver – High-current gate driver - suitable for high-current power device, and high frequency application – Integrated bootstrap diode (BSD)
	Microcontroller	32-bit XMC™ Industrial Microcontroller Arm® Cortex®-M0	XMC1302-T038X0032AB	– Significant CPU performance, integrated peripheral functionality, and rapid development environment enabling a short time-to market, without compromising cost efficiency
		iMotion™ series	IMC102T-F064, IMD111T-6F040	– Features all the control and analog interface functions required for sensorless field-oriented control (FOC) of PM – Motors using DC link or leg shunt current measurements – Patented and field proven motion control engine (MCE) eliminating software coding – tool available – iMOTION™ Solution Designer (iSD) for faster development
	Sensor system	Current sensors	here	– High-precision coreless open-loop current sensors are less bulky and cost less compared to core-based current sensors
Security	Authentication/ security	OPTIGA™ Trust	OPTIGA™ Trust M SLS32AIA	– Easiest way to add security, works with any MCU/MPU – Robust, future-proof security solution
HMI	InfraRED interface	32-bit PSOC™ 4 Arm®Cortex®-M0 MCU	here	– The most flexible and scalable low-power mixed-signal architecture
Connectivity	WiFi + Bluetooth®	AIROC™ Wi-Fi + Bluetooth® Combos	here	– A single-chip solution to enable small-form-factor IoT designs
Smart home sensing	MEMS microphones	XENSIV™ MEMS microphones	here	– Capturing audio signals with unprecedented precision and quality
	Radar sensor	XENSIV™ Radar	BGT60LTR11AIP, BGT60UTR11AIP, BGT60TR13C	– First completely autonomous radar sensor for motion sensing – Energy and lifetime saving, and small form factor with integrated antennas – Enabling presence detection, segmentations and other unique features
	CO_2 sensor	XENSIV™ Environmental sensor	PASCO2V01	– High-quality data and compliance with the most stringent regulations for indoor air quality (e.g., title 24 in California) – Cost-effective high-volume assembly and easy system integration – High-speed pick and place for fast and automatic assembly - No need for post calibration

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Your input matters
Share your feedback

Coffee maker

Coffee maker and grinders

Inverter-driven, highly efficient and intuitive coffee machines

Modern coffee machines are beautiful and smart – minimalistic design and a bunch of inteligent functionalities are must-haves. Hence, electrical engineers are on the lookout for the latest innovations in human-machine interface (HMI) functions, interoperability, and connectivity. Infineon enables button-less designs with our capacitive touch sensors and reliable liquid-level sensing with CAPSENSE™.

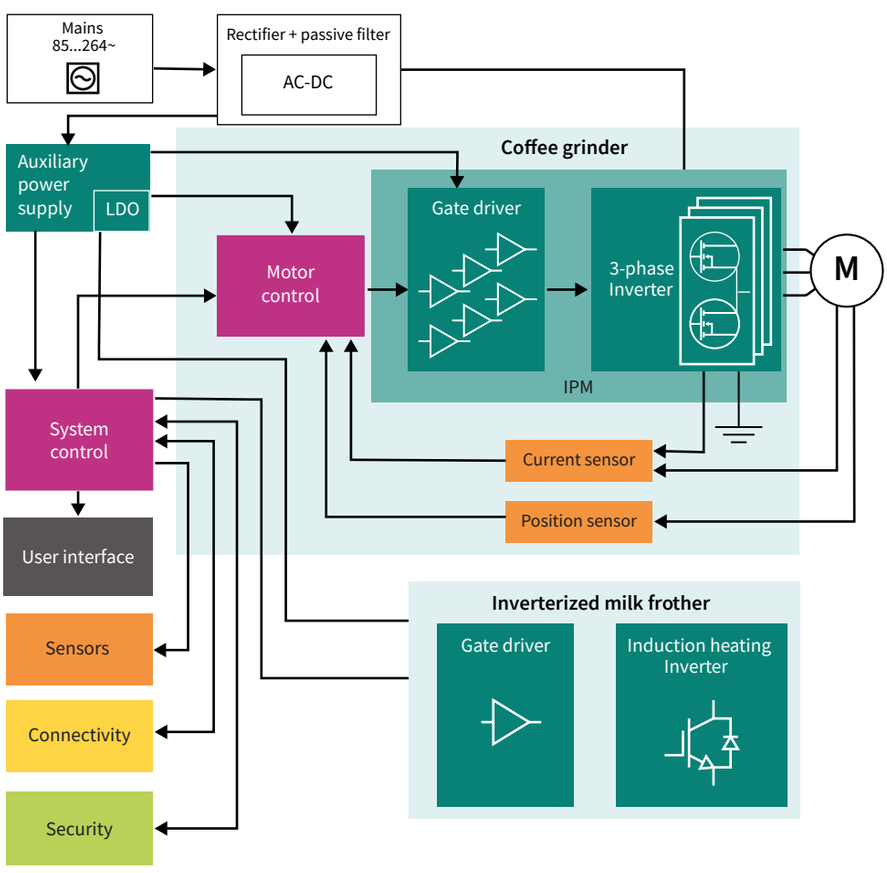
Today's consumers expect fast and responsive machine inputs often paired with displays. Modern HMI offers a cost-effective integration of a graphical user interface, presenting machine information and smoothly animated instructions – to guide your customer to the best coffee directly on the machine. Infineon's PSOC™ Edge technology is at the forefront of this movement, providing robust solutions for AI market entry. Infineon provides end-to-end software solutions for easy training and deployment. These solutions and the right hardware ensure seamless integration of edge AI models into your coffee machines and grinders, enhancing functionality and user experience.

Build a stronger customer relationship by seamlessly integrating the coffee machine into your smart appliance ecosystem using Matter or improve your device with AIROC™ wireless connectivity solutions. Manufacturers can push new functionalities with over-the-air updates.

Features and benefits

Key features	Key benefits
– Cutting-edge touch-sensing technologies with CAPSENSE™	– Fast and responsive, reliable, easy to clean
– PSOC™ Edge and PSOC™ 6 for modern graphical user interface on display	– Liquid level sensing
– Robust and reliable connectivity AIROC™ solutions for Wi-Fi, BL/BLE, Matter	– Higher system reliability and best performance with proven flexibility
– Auxiliary power supply solutions for low standby power	– Ease of use and full compatibility within the smart home domain
– Power portfolio for motor control pump for water pressure, actuators	– Delivering best-in-class price/performance ratio with excellent ease-of-use
– XENSIV™ sensors Hall sensors to understand the position in automatic coffee makers	– Energy-efficient and reliable designs with highest power density
	– Condition monitoring and predictive maintenance enablement

Block diagram



Click here to learn more:
www.infineon.com/coffee-machine

Product portfolio

Functional block	Product category	Product Family	Part number	Specification and benefits
Liquid level sensing and water hardness		PSOC™ 4000T microcontroller	4000T (MSCv3-LP sensing)	– PSOC4™ MCU based solutions for accurate water level measurement and water hardness continuous analysis powered by new CAPSENSE™ and AI/ML algorithms 32-bit MCU subsystem – Inductive – Liquid level sensing and hover touch
Main MCU	Microcontroller	32-bit PSOC™ Arm® Cortex® microcontroller	PSOC™ -series	– PSOC™ software delivers easy-to-use tools to get your ideas to market quickly and easily – ModusToolbox™ comprises Infineon's latest development tools including an IDE
User interface	Control and HMI	32-bit PSOC™ Arm® Cortex® microcontrollers	PSOC™ 4000T, PSOC™ Edge E83	– PSOC™ 4000T for CAPSENSE™ and touch on metal inductive sensing – PSOC™ Edge E83 for display control and advanced modern user interface
	Protection	Solid state isolators	ISSI20R02H	– Coreless-transformer advanced solid-state isolator – Galvanic isolation up to 5.7 kV rms
	Magnetic sensor for knob control	XENSIV™ 3D magnetic sensor	TLI493D-W2BW A1	– Extremely small form factor with low power consumption due to wake-up mode – Component reduction due to 3D magnetic measurement principle
Connectivity	Wi-Fi + Bluetooth® Combos	AIROC™ Wi-Fi + Bluetooth® Combos	selected products	– Ultralow power single-chip, combo device – Best in class connectivity, range, and robustness – Wi-Fi 4, 5, 6/6E and Bluetooth® 5.x combo family expands our Wi-Fi leadership into 802.11ax including tri-band (2.4 GHz, 5 GHz, 6 GHz) capability.
Security	Embedded security solutions	OPTIGA™ security solutions	OPTIGA™ Trust M	– Based on CC EAL 6+ (high) certified tamper-resistant hardware which can be used with any MCU/MPU or application processor
Auxiliary power supply	AC-DC power conversion	PWM-FF (fixed frequency) flyback ICs	ICE5ASAG	– Fith-generation fixed frequency flyback PWM controller, increase mid-and light-load efficiency with digital frequency reduction
		PWM-QR (quasi resonant) flyback ICs	ICE5QSBG	– Inherently low gate charge (Q_G) of the CoolMOS™ seventh generation platform – High efficiency
		CoolSET™ Quasi Resonant	ICE5QR4780BG	– Fith-generation quasi-resonant CoolSET™ with integrated 800 V CoolMOS™ SJ MOSFET in SMD package – Auto-restart recovery scheme to minimize interruption to system operation
		CoolSET™ Fixed Frequency ICE5 Plus	ICE3RBR1765JG	– Wide power range with low standby power levels – Highest power delivery without heatsink in the market with standard DIP7 package up to 41 W – Supports non-isolated buck output current up to 700 mA
Motor control	Motor control	iMOTION™ driver integrating motor controller	PSOC™ Control C3M	– Specially designed for motor control, integrated programmable analog sub-systems such as the 12-bit, 12-Msps high-performance ADC, and CORDIC Accelerator
		32-bit XMC1000 Industrial Microcontroller Arm® Cortex®-M0	XMC1300	– Focus on low-cost embedded control applications, 8-200 KB Flash, 16 KB RAM, supply voltage range: 1.8 to 5.5 V, in PG-VQFN/TSSOP, temperature range: -40 - 105°C
Gate driver	Gate driver ICs for grinder	EiceDRIVER™ gate driver	6EDL04I06PT	– 600 V full-bridge three-phase gate driver IC for MOSFETs or IGBTs in PG-DSO-28 package with LS-SOI technology
			IRS2007S	– 200 V half-bridge gate driver IC with typical 0.29 A source and 0.6 A sink currents in SOIC-8 package for MOSFETs
			2ED2304S06F	– 650 V Infineon SOI half-bridge gate driver IC with integrated bootstrap diode for IGBTs and MOSFETs with 0.36 A source and 0.7 A sink currents in DSO-8 package
	Gate driver ICs for inverterized milk frother	EiceDRIVER™ gate driver	1ED44176N01F	– 25 V single-channel low-side non-inverting gate driver for MOSFET and IGBT with typical 0.8 A source and 1.75 A sink currents in a small 8-lead PG-DSO8 package
			1ED44173N01B, 1ED44175N01B	– 25 V single-channel low-side non-inverting gate driver for MOSFET with typical 2.6 A source and sink currents in a tiny 6-lead PG-SOT23 package
	Gate driver for induction heating	EiceDRIVER™ gate driver	1ED44171N01B	– 25 V single-channel low-side, integrated fault reporting, robust against V_{CC} spikes in harsh circuit applications
Induction heating inverter	IGBTs	IGBT discrete with anti-parallel diode	IHW20N140R5L	– 1400 V, 20 A IGBT discrete with reverse conducting diode in TO-247 3-pin package
			IHW25N140R5L	– 1400 V, 25 A IGBT discrete with reverse conducting diode in TO-247 3-pin package
Motor drive interter (Discretes)	IGBTs	RC drives 2	IKD10N60RC2	– 600 V, 10 A IGBT discrete with reverse conducting drive 2-diode in TO-252 package
			IKD06N60RC2	– 600 V, 6 A IGBT discrete with reverse conducting drive 2-diode in TO-252 package
		CoolMOS™ 7	IPD60R600PFD7S	– 600 V CoolMOS™ PFD7 superjunction MOSFET in TO-252 DPAK package, minimized switching losses, ~500 mΩ
Motor drive inverter (IPM)		CIPOS™ Intelligent Power Modules (IPM)	CIPOS™ Series	– The modules improve system performance and energy efficiency by delivering increased power density, enhanced system ruggedness and reliability in any consumer application
		CoolGaN™ transistors, half bridge + gate driver and flyback diode	IGI60L5050B1M	
Sensing	Current sensor	XENSIV™ sensors	TLI5570-AE35E1-E0001	– Robust, highly linear monolithic tunnel magnetoresistance technology with a bandwidth of a more than >1.1 MHz
	Position sensor	XENSIV™ 3D magnetic sensor	TLE4913	– Unchopped omnipolar hall switch for low power applications with high reliability for position sensing – Battery operating voltages of 2.4 to 5.5 V – Precise magnetic switching points and high temperature stability
			TLE4961-1M	
	Pressure sensor	XENSIV™ pressure sensors for IoT	DPS368	– Pressure sensors for predictive maintenance or vibration monitoring – Ideal for harsh environment (water, dust and humidity) – Rel. accuracy: ± 0.06 hPa (or ±0.5 m) – Precision: ± 0.002 hPa (or ±0.02 m)
	Mircophones	XENSIV™ MEMS microphones for IoT	IM69D127, IM72D128, IM73A135, MEMS Mic packaging partners	– Ultralow self-noise/ultrahigh SNR – Sealed Dual Membrane (SDM) technology with IP57 ingress protection at microphone level – Ultrahigh dynamic range and high acoustic overload point (AOP) of 128 dBSPL
	Radar sensor	XENSIV™ radar sensor	24 GHz radar sensor	– Next generation motion/presence sensing: Small form factor and low power consumption, highly integrated mmWave radar sensor solutions bring intuitive sensing capabilities
			60 GHz radar sensor	

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Cordless vacuum cleaner

Cordless vacuum cleaners

Efficient, compact, and quieter motor control solutions for designing next-generation cordless vacuum cleaners

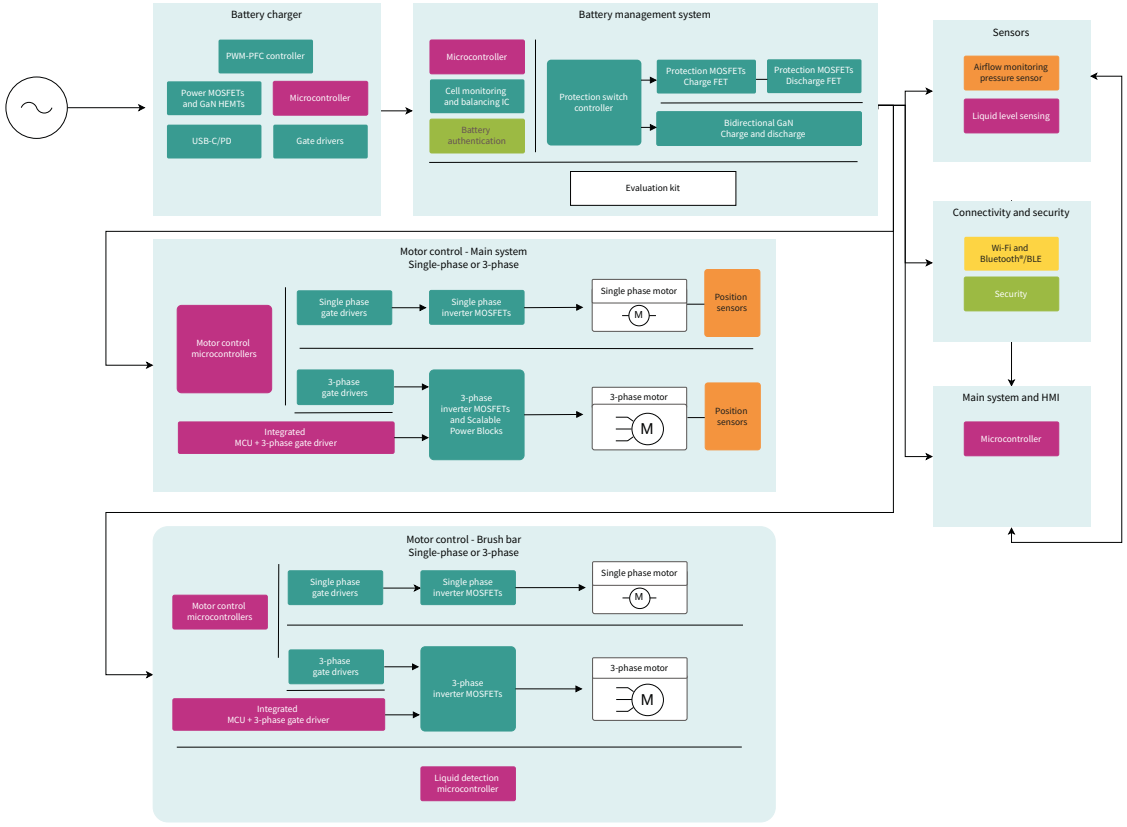
It is a common misconception that cordless vacuum cleaners are less powerful than their corded counterparts. With Infineon's solution, we help to create a battery-powered cordless vacuum that delivers as much suction power as a corded vacuum and maintains the convenience and flexibility of moving in the room.

Our products aim to revolutionize the cleaning experience with
- Efficient and compact motor control to deliver optimal cleaning performance
- Fast battery charger with USB-C charging and wireless charging to reduce charging time
- Advanced battery management system (BMS)
- Reliable HMI, wireless connectivity, and a variety of sensors

Features and benefits

Key features	Key benefits
– Highly reliable and market-proven Infineon products	– Extend system lifetime
– Comprehensive product/solution portfolio for motor drives and charging	– Convenient selection of the right-fit products
– Complete selection for connectivity and sensors	– One-stop-shop for building smart home appliances
– Overall system size and BOM reduction	– Compact design reducing system size and cost for the highest power density
– Highly complete design support with documentation and demo boards	– Fast time-to-market

Application diagram



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www.infineon.com/vacuumcleaner

Product portfolio

Functional Block	Product category	Product Family	Part number	Specification and benefits
Batterry chargers	PWM-PFC controller	Half-bridge and LLC controller	XDPS2201	– High efficiency of >93% and low standby power to meet international efficiency regulatory standards
			Controller	– The broadest range of AC-DC pulse-width modulation controllers to meet current and future industry requirements
	Power MOSFETs and GaN HEMTs	OptiMOS™ 5 Power MOSFET	BSC040N10NS5	– Industrial power MOSFET devices in 80 V and 100 V in a SuperS08 5x6
		CoolMOS™ P7 Superjunction (SJ) MOSFET	IPD60R280P7S	– 600 V, excellent FOMs $R_{DS(on)}xQ_G/R_{DS(on)}xE_{oss}$ enable higher efficiency
	Microcontroller	32-bit XMC1000 Industrial Microcontroller Arm® Cortex®-M0	XMC1401-Q048F0064 AA	– 64 KB Flash, 16 KB RAM, core frequency: 48 MHz
	USB-PD IC	EZ-PD™ PMG1-XX	CYPM1115-48LQXI	– Integrated buck-boost controller with 5.5 to 24 V input and 3.3 to 21.5 V output voltage range, R_p and R_d termination resistors and the tray packing
	Gate drivers	EiceDRIVER™	1EDB9275F	– Single-channel isolated gate-driver IC in 150 mil DSO-8 package
Battery management system	Microcontroller	32-bit PSOC™ 4 Arm® Cortex®-M0	CY8C4025AZI-S413	– Low-power, programmable mixed-signal hardware IP, Bluethooth® and industry leading CAPSENSE™ capacitive touch
	Cell monitoring and Balancing IC	Li-Ion battery monitoring and balancing IC	TLE9012DQU	– Cell voltage measurement, temperature measurement, cell balancing, and isolated communication to the main battery controller
	Battery authentication	OPTIGA™ Authenticate embedded security solution	OPTIGA AUTHENTICATE S	– Four authentication modes, four lifecycle counters with independent kill structures, effortless implementation with PSOC™
	Protection MOSFET	OptiMOS™ 5 Power MOSFET	BSC014N06NS, BSZ042N06NS	– Industrial power MOSFET device in 60 V in a SuperS08 or PQFN 3.3x3.3
		StrongIRFET™ Power MOSFET	IRLML0040	– 40 V Single N-Channel MOSFET In a SOT-23 package, standard pinout allows for drop in replacement
	Protection switch controller	OptiMOS™ 5 Power MOSFET	1EDL8011	– 125 V high-side gate driver with single output in DSO-8 package for battery-powered applications
	Protection MOSFETs discharge FET	OptiMOS™ 6 40 V	BSZ018N04LS6, BSC007N04LS6	– OptiMOS™ 6 40 V power MOSFETs combining best-in-class $R_{DS(on)}$ with superior switching performance in SuperS08 or PQFN 3.3x3.3
	Bidirection GaN Charge and discharge	CoolGaN™ HEMT	here	– Discrete and integrated solutions delivering highest efficiency and power densitiy for power conversion in the voltage range up to 700 V
Motor control - Main system Single-phase or 3-phase	Microcontroller	PSOC™ Control Arm® Cortex®-M33 main	PSC3M5FDS2AFQ1, PSOC™ Control C3M	– Newest MCUs developed specifically for motor control applications integrating advance real-time control peripherals to provide designers the ability to improve performance of their next motor control products
		32-bit XMC1000 Industrial microcontroller Arm® Cortex®-M0	XMC1401-Q048F0064 AA	– 64 KB Flash, 16 KB RAM, core frequency: 48 MHz
	Integrated MCU + gate driver	MOTIX™ Battery Supplied BLDC Motor Controller Ics	IMD700A-Q064X128-AA, IMD701A-Q064X128-AA	– Fully programmable motor controller integrating XMC1404 microcontroller with 6EDL7141 3-phase gate driver IC in one package, adjustable supply voltage: 7 V, 10 V, 12 V and 15 V
	Position sensor	XENSIV™ Magnetic sensor	TLE4966L	– Double Hall-effect sensor with 2.7 to 24 V supply voltage operation
			TLI493D-W2BW A0	– Extremely small WLB-5 package (1.13 mm x 0.93 mm x 0.59 mm), low current consumption of 7 nA in power-down mode
			TLI5012B E1000	– Pre-calibrated angle sensor iGMR, economic with SPI compatible interface
		XENSIV™ Current sensor	TLI4971-A120T5-U-E0000	– High precision miniature coreless magnetic current sensor for AC and DC measurements, 120 A, 3.45%, 3.1-3.5 V
	Single phase gate drivers	EiceDRIVER™	2EDL05N06PF	– 600 V half-bridge gate driver IC with integrated bootstrap diode
	Single phase inverter MOSFETs	OptiMOS™ Power MOSFET	OptiMOS™ 5 25 V/30 V	– Industry's lowest $R_{DS(on)}$ for 25 V and 30 V, boost system performance with best-in-class technology
			OptiMOS™ 5 40 V/60 V	– OptiMOS™ 5 40 V and 60 V families feature 15% lower $R_{DS(on)}$ and 31% lower figure of merit ($R_{DS(on)}$ x Q_g), enabling shrinked design and boosted efficiency
			OptiMOS™ 6 40 V	– Benchmark solution for applications requiring lower gate drive capability

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Functional Block	Product category	Product Family	Part number	Specification and benefits
Motor control - Main system Single-phase or 3-phase	3-phase gate drivers	MOTIX™	6ED2742S01Q	– 160 V SOI-based gate driver, 100% duty cycle operation with trickle charge pump per high-side
			6EDL7141	– 60 V, over 50 programmable parameters using a built-in digital SPI interface
			6EDL7151	– 5.5 V to 70 V operating range, with integrated buck converter and LDO
		EiceDRIVER™	6EDL04N02PR	– 200 V three-phase gate driver IC with integrated bootstrap diode, overcurrent protection, enable and fault reporting
	3-phase inverter MOSFETs	OptiMOS™ 6 Power MOSFET	BSC010N04LS6	– 40 V power MOSFETs combining best-in-class $R_{DS(on)}$ with superior switching performance
			ISG0613N04NM6HSC	– Dual N-channel 40 V MOSFETs in scalable power block with dual-side cooling capability
		OptiMOS™ 5 Power MOSFET	ISC058N04NM5	– 40 V, PG-SuperSO8 with reduced switching losses leading to greater system efficiency and power density
			BSC0501NSI	– 25 V and 30 V, highest power density with S3O8 or Power Block package
		StrongIRFET™ Power MOSFET	IRF7480M	– 40 V Single N-Channel in a DirectFET™ ME package, dual-side cooling capability, low package height of 0.7 mm
	Evaluation kit	PSOC™ Control C3M5 Motor Drive Control Card	KIT_PSC3M5_CC2	– Out of the box configuration, featuring an isolated onboard debugger for programming and debugging over a USB interface
Motor control Brush bar Single-phase or 3-phase	Microcontroller	32-bit XMC1000 Industrial Microcontroller Arm® Cortex®-M0	XMC1301-T038F0032 AB	– Focus on low-cost embedded control applications, 32 KB flash, 16 KB RAM, supply voltage range: 1.8 to 5.5 V, in PG-TSSOP-38, temperature range: -40 - 85°C
			XMC1401-Q048F0064 AA	– Core frequency: 48 MHz, 64 KB flash, 16 KB RAM, supply voltage range: 1.8 to 5.5 V, in PG-VQFN-48, temperature range: -40°C to 85°C
	Integrated MCU + gate driver	MOTIX™ Battery Supplied BLDC Motor Controller Ics	IMD700A-Q064X128-AA, IMD701A-Q064X128-AA	– Fully programmable motor controller integrating XMC1404 microcontroller with 6EDL7141 3-phase gate driver IC in one package, adjustable supply voltage: 7 V, 10 V, 12 V, and 15 V
	Single phase gate drivers	EiceDRIVER™	IRS44273L	– 25 V single-channel low-side gate driver IC with 1.5 A source and 1.5 A sink currents in 5-lead SOT23 package
	Single phase inverter MOSFETs	OptiMOS™ Power MOSFET	BSZ105N04NS G	– 40 V, perfect choice for synchronous rectification in switched mode power supplies (SMPS)
	3-phase gate drivers	EiceDRIVER™	6EDL7141	– 60 V, over 50 programmable parameters using a built-in digital SPI interface
			6EDL7151	– 5.5 V to 70 V operating range, with integrated buck converter and LDO
			6ED2742S01Q	– 160 V SOI-based gate driver, 100% duty cycle operation with trickle charge pump per high-side
	3-phase inverter MOSFETs	OptiMOS™ 5 25V/30V	here	– OptiMOS™, StrongIRFET™, and CoolMOS™, low, medium, and high voltage power MOSFETs for low-, medium-, and high-power application
		OptiMOS™ 5 40V/60V	here	
		OptiMOS™ 6 40V	here	
		StrongIRFET™ 2	here	
	Liquid detection microcontroller	PSOC™ 4000T Multi-Sense microcontroller	CY8C4045LQI-T412	– Capacitive sensing, inductive sensing, liquid level sensing solution with ultralow power and best in class signal-to-noise ratio
Sensing	Airflow monitoring	XENSIV™ Pressure sensors	DPS368	– Fast, ultralow noise read-out allows for precise measurement of air flow, ideal for harsh environments with water, dust, or humidity
	Liquid level sensing	PSOC™ 4000T Multi-Sense microcontroller	CY8C4045LQI-T412	– Capacitive sensing, Inductive sensing, liquid level sensing solution with ultralow power and best in class signal-to-noise ratio
Connectivity and security	Wi-Fi and Bluetooth®/ Bluetooth® Low Energy	AIROC™ Wi-Fi + Bluetooth® Combos	CYW43439	– 1x1 single-band 2.4 GHz Wi-Fi 4 and Bluetooth® 5.4, a reliable entrylevel solution for low-cost applications
			CYW55913	– Ultralow power single-chip connected MCU that supports 1x1 2.4+5+6 GHz Wi-Fi 6E, Bluetooth® Low Energy 5.4, and Matter
			CYW55912	– Ultralow power single-chip connected MCU that supports 1x1 2.4+5 GHz Wi-Fi 6, Bluetooth® Low Energy 5.4, and Matter
	Security	OPTIGA™ Trust Security solutions	OPTIGA™ TRUST M SLS32AIA	– Based on CC EAL 6+ (high) certified tamper-resistant hardware, can be used with any MCU/MPU or application processor to perform various security-related tasks autonomously
			OPTIGA™ TRUST M MTR	– discrete security solution combined with a Matter-certified provisioning service late-stage personalized Device Attestation Certificate (DAC) for download
			OPTIGA™ TRUST M EXPRESS	– pre-provisioned Secure Element, ready to connect to Azure and AWS Automated device and product-to-cloud provisioning
Main system and HMI	HMI Microcontroller	PSOC™ 4000T Multi-Sense microcontroller	CY8C4045LQI-T412	– Capacitive sensing, inductive sensing, liquid level sensing solution with ultralow power and best in class signal-to-noise ratio

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Induction cooking

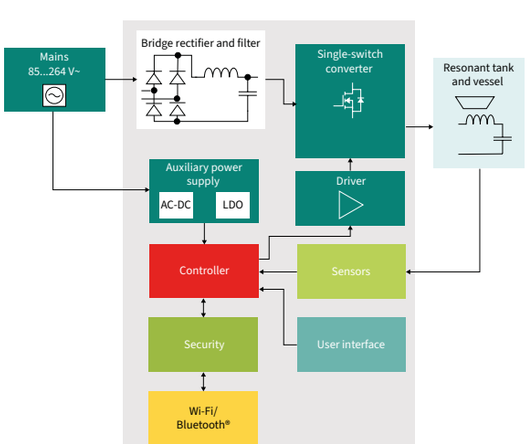
Enabled by Infineon's high-efficiency power switches, secured connectivity, and touch sensor technology for the best cooking experience

The huge global market for induction cooking appliances, such as induction ranges, microwave ovens, and rice cookers, is characterized by great competition and price pressure. Along with this, manufacturers must meet rising consumer expectations and produce more reliable, energy-efficient appliances that offer a wide range of functions. Benefits such as faster cooking, advanced functionalities, easy cleaning, and safety features play a crucial role. Infineon products are well-equipped to help you overcome all the challenges common to induction cooking appliances. Our solutions target the increased consumer expectations regarding modern home appliances: appliances must be energy-efficient and fully integrable, ensuring a high level of safety and reliability. An intelligent, user-friendly, and secure user interface is essential. We support you in creating intuitive devices with an intelligent touch interface.

Features and benefits

Key features	Key benefits
– Complete system solution offerings for inverter, system control, auxiliary power, HMI, connectivity, sensor, and security blocks	– One-stop-shop: Faster time-to-market and reduced system design efforts
– Highly reliable and market-proven Infineon products	– Extend system lifetime and product life spans
– Evaluation and reference boards	– Fast prototyping and system verification
– Innovative reverse conducting IGBT technology	– Higher efficiency and better reliability
– Cutting-edge touch-sensing technologies	– "Just work" and deliver robustness and intelligence
– Next generation CAPSENSE™ touch-sensing technology	– Fast user feedback even with wet interface

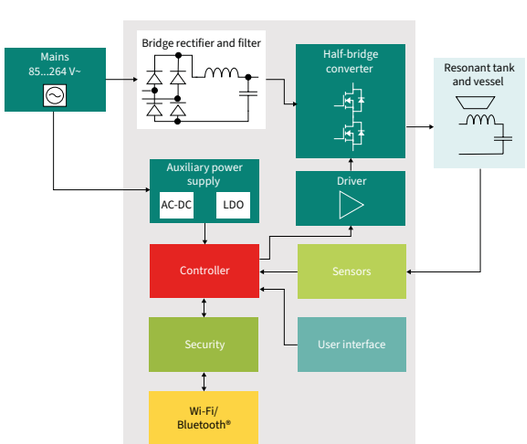
Induction heating inverter (voltage resonance)
Single-switch



– Voltage: ≥1200 V used due to voltage resonance
– Typ. switching frequency range: 20 to 36 kHz (resonator)
– Power: Typically limited to 2 kW due to voltage on IGBT
– Typical application: Single pot induction cooktops and rice cookers (Tabletop cookers)

Key benefit:
Less components → cost optimized

Induction heating inverter (current resonance)
Half-bridge



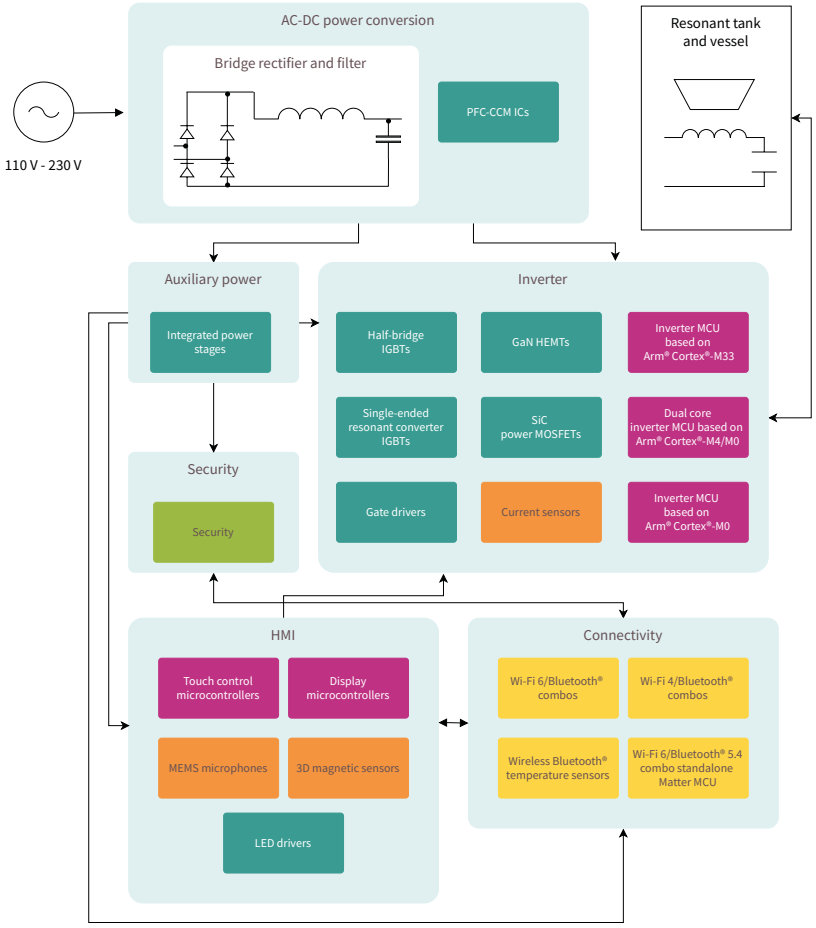
– Voltage: 650 V is used (typ. bus voltage up to 400 V due to grid fluctuation)
– Precise controlled switching frequency: 25 to 75 kHz
– Power: Single hobs up to 3.6 kW
– Typical application: Multi-hob induction cooktops

Key benefit:
Lower voltages and switching losses → energy efficiency and lower temperature

Click here to learn more:
www.infineon.com/induction-cooking
www.infineon.com/rch5
www.infineon.com/psoc64

Your input matters
Share your feedback

Block diagram





Induction cooking reference design REF-SHA3K3IHWR5SYS

The REF-SHA3K3IHWR5SYS Infineon induction cooktop reference design is a ready-to-go solution that offers a modern high-performance half-bridge topology, next-generation CAPSENSE™ user interface and PSOC™ 6 AI connectivity module.

Feature	Benefit
– PSOC™ 4100S MAX MCU with two independent CAPSENSE™ blocks	– CAPSENSE™ 5 – fast, responsive, and robust against water
– World-leading induction heating IGBTs like the R6 reverse conductive IGBT	– Reliable power delivery at low power dissipation and EMI emissions
– Connectivity with Wi-Fi 5 and Bluetooth® 5.2 combo and Matter support	– Easy smart home integration with smarter and connected devices that keep up-to-date with over-the-air updates
– Edge AI voice command solution with Infineon MEMS microphones and PSOC™ 6 controller	– Privacy meets high sensitivity microphones and cost-efficient compute
– Class B compliant SW and HW design	– Faster time-to-market for customer with open software and hardware solution

Click here to learn more:

www.infineon.com/induction-cooking
www.infineon.com/rch5
www.infineon.com/psoc64

Product portfolio

Functional block	Product category	Product family	Part number	Specification & benefits
Auxiliary power	Intergrated power stages	CoolSET™ Fixed Frequency	ICE5AR4770AG	– Increases mid-and light-load efficiency with digital frequency reduction
		CoolSET™ Quasi Resonant	ICE5QR2280BG	– High efficiency thanks to the integrated 800 V CoolMOS™ P7 SJ MOSFET family and quasi-resonant switching scheme
		CoolSET™ AC-DC integrated power stages	here	– Specifically designed for high-performance applications, increased reliability, and outstanding performance
AC-DC power conversion	AC-DC PWM-PFC controllers	PFC-CCM ICs	ICE3PCS02G	– 8-pin wide input range (85 to 265 VAC) controller IC for active CCM power factor correction converter for simple design procedure – Built-in protection features reduce system BOM cost and enhance system safety
		PWM-PFC controller	PFC-CCM (continuous conduction mode) ICs	– High efficiency and very low system cost – Programmable switching (20 kHZ-100 kHz) and external synchronization (~50 kHz to ~100 kHz)
Human-Machine-Interface (HMI)	Touch control microcontrollers	PSOC™ 4100 - Intelligent Analog	CY8C4124AXI-443T CY8C4025FNI-T442T	– Features CAPSENSE™, the industry-leading capacitive-sensing solution for touch buttons and sliders, proximity sensing, and liquid-level sensing applications
	Display controllers	32-bit PSOC™ Edge Arm®	here	– Based on high performance Arm® Cortex®-M55, including Helium™ DSP support paired with Arm® Ethos™-U55 and Cortex®-M33 paired with Infineon's ultralow power NNLite neural network accelerator
	Voice control	XENSIV™ MEMS microphones	IM69D130	– High SNR microphone with 105 dB dynamic range and high output linearity up to 130 dBSPL
		XENSIV™ 3D Magnetic sensors	TLI493D-W2BW A0	– Extremely small WLB-5 package (1.13 mm x 0.93 mm x 0.59 mm), low current consumption of 7 nA with 3D magnetic flux density sensing of ±160 mT
			TLI493D-A2B6	– 3D magnetic flux density sensing of ±160 mT, magnetic Hall sensor for any kind of industrial or consumer applications
	LED drivers	Driver ICs	BCR431U	– Linear LED driver IC, small SOT23-6 package regulating the LED current in standalone operation without external power transistor, flexible for 12 V/24 V/36 V designs
Inverter	Half-bridge IGBTs	Reverse conducting IGBT	IHW30N65R6, IHW50N65R6	– 650 V/1200 V/1350 V/1600 V next-generation reverse conducting IGBT – 650 V, 30 A/50 A IGBT with monolithically integrated diode in TO-247 package
	Single-ended resonant converter IGBTs	IGBT Discretes	IHW25N140R5L, IHW20N140R5L	– RC soft-switching 1400 V, 20 A/25 A IGBT discrete with reverse conducting diode in TO-247 3-pin package – Narrow power loss distribution and advanced thermal performance
	SiC power MOSFETS	CoolSiC™ MOSFET	IMZA65R026M2H	– CoolSiC™ MOSFET 650 V, 26 mΩ G2 in a TO-247-4 package, maximizes the system performance per dollar
	GaN HEMTs	CoolGaN™ Transistors	IGT65R035D2	– 650 V G5 e-mode, high ESD robustness: 2 kv HBM - 1 kv CDM, supporting high operating frequency – Enables ultrahigh power density designs and BOM-costs savings
	Gate drivers	EiceDRIVER™	2ED21844S06J	– 650 V, 2.5 A high current half-bridge gate driver IC with integrated bootstrap diode and shutdown in DSO-14 package
		Level-shift	2ED2101S06F	– 650 V high speed, high-side and low-side gate driver with typical 0.29 A source and 0.7 A sink currents in DSO-8 package for driving power MOSFETs and IGBTs, 50% lower level-shift losses
			1ED44175N01B	– 25 V single-channel low-side non-inverting gate driver IC for IGBTs with typical 2.6 A source and sink currents in a tiny 6-lead PG-SOT23 package
	Arm® Cortex®-M33 inverter microcontrollers	PSOC™ Control C3P	PSC3P2EDACQ1	– Newest MCUs developed specifically for power conversion applications, real-time analog peripherals to enable designers to improve the efficiency and reliability of their new designs
	Arm® Cortex®-M0 inverter microcontrollers	32-bit PSOC™ 4 Arm® Cortex®-M0 MCU	CY8C4247AZA-M475T, CY8C4147AZI-S463	– Customizable analog front end through programmable analog blocks
	Arm® Cortex®-M4/M0 dual core inverter microcontrollers	32-bit PSOC™ 6 Arm® Cortex®-M4 MCU	CY8C6244AZI-S4D82	– PSOC™ 62x4, DAC 1, 12-bit at 200 ksps – Built on an ultralow-power architecture featuring low-power design techniques, ideal for battery powered applications
	Current sensor	XENSIV™ Current sensor	TLI5570-RE35E1-E0001	– High precision coreless current sensor, differential analog interface, 1-5 V supply voltage, ±35 mT magnetic measurement range
Connectivity	Wi-Fi 6/Bluetooth® combos	AIROC™ Wi-Fi 6/6E	CYW55572	– Wi-Fi 6, dual-band, 2x2 MIMO, release 1 and 2 features: OFDMA, MU-MIMO, TWT, DCM
	Wi-Fi 4/Bluetooth® combos	AIROC™ Wi-Fi 4 and Bluetooth® 5.x	CYW43439	– 1x1 single-band 2.4 GHz Wi-Fi 4 and Bluetooth® 5.4, a reliable entry-level solution for low-cost applications
	Wireless Bluetooth® temperature sensing	AIROC™ Bluetooth® LE	CYW20829	– Bluetooth® LE 5.4 MCU with industry's best range, Dual Arm® Cortex®-M33 dedicated for applications and CAN FD
	Wi-Fi 6/Bluetooth® 5.4 Matter MCU	AIROC™ Connected MCU	CYW55913	– Ultralow power single-chip connected MCU that supports 1x1 2.4+5+6 GHz Wi-Fi 6E, Bluetooth® Low Energy 5.4, and Matter
Security	Security solutions	OPTIGA™ embedded security solutions	OPTIGA™ TRUST M SLS32AIA	– Based on CC EAL 6+ (high) certified tamper-resistant hardware, can be used with any MCU/MPU or application processor to perform various security-related tasks autonomously
			OPTIGA™ TRUST M MTR	– Discrete security solution combined with a matter-certified provisioning service – Late-stage personalized Device Attestation Certificate (DAC) for download
			OPTIGA™ TRUST M EXPRESS	– Pre-provisioned Secure Element, ready to connect to Azure and AWS – Automated device and product-to-cloud provisioning
	Authentification solutions	OPTIGA™ Authenticate	OPTIGA™ AUTHENTICATE S	– Effortless implementation with full system integration support including embedded software, host software, full reference board based on PSOC™ 6, with demo software and full documentation

Click here to learn more:

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www.infineon.com/psoc64
www.infineon.com/rch5

Laundry machine

Tumble dryer

Laundry machine and tumble dryers

Elevating performance with efficient, intelligent, and secure trusted solutions

Modern laundry machines and tumble dryers have seen significant advancements, enhancing their efficiency and functionality for commercial and residential use.

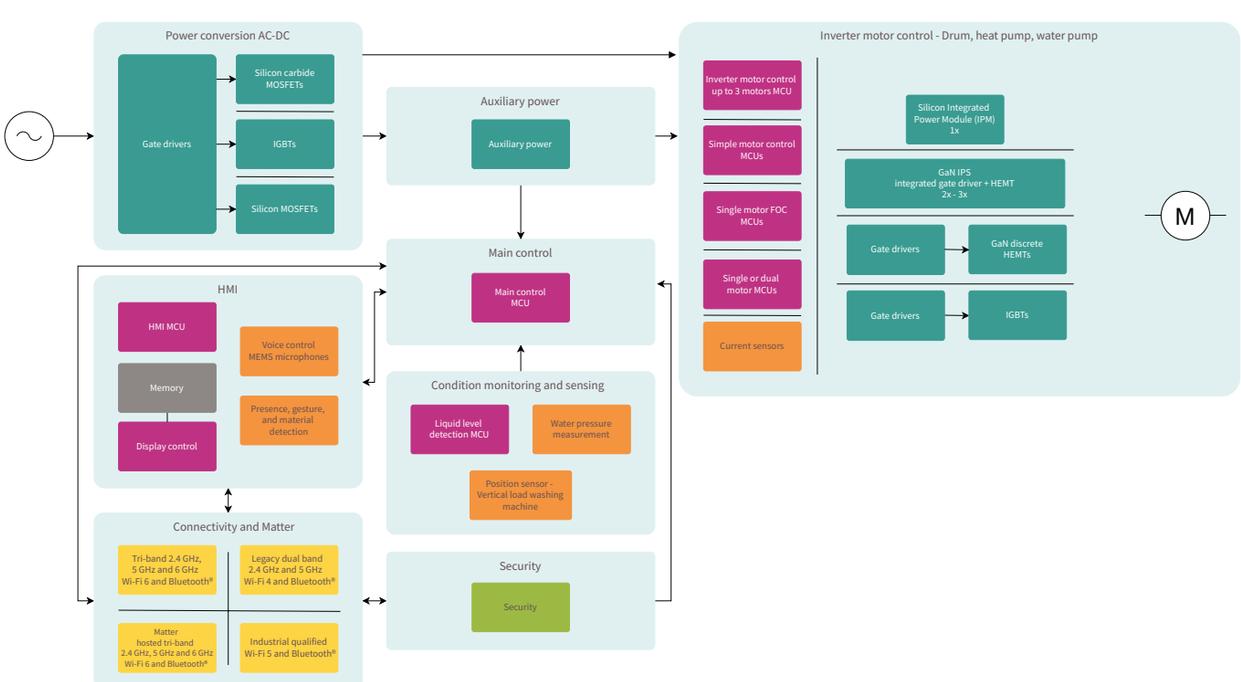
Laundry machine models feature improved energy efficiency, low noise, water and detergent savings, and smart operating cycles. Infineon's comprehensive product portfolio supports various types, including fully automatic front- and top-loading machines, semi-automatic top-loading machines, washer-dryer combinations, and twin-type washing machines. Smart dryers, on the other hand, now include wireless connectivity, voice recognition, advanced sensing, predictive maintenance, and energy-efficient heat pump systems. Infineon's solutions help design energy-efficient, reliable dryers seamlessly integrated into IoT ecosystems, providing advanced control, connectivity, and security features.

Infineon provides complete system solutions for all major components required in laundry machines and tumble dryers. This includes solutions for AC-DC power supply, advanced motor control systems, embedded microcontroller units (MCUs), connectivity, security, power management systems, and interfacing with home networking solutions. Infineon's new machine learning (ML) and artificial intelligence (AI) edge-based MCUs and broad sensors portfolio offer cost-effective ways to improve the user experience and appeal, making them more intuitive and user-friendly.

Features and benefits

Key features	Key benefits
– Infineon offers a comprehensive product portfolio, featuring advanced switching technologies in Si, SiC, and GaN	– One-stop-shop for WBG solutions enables greater energy efficiency, higher power density, and system cost savings
– Leading position and proven expertise in motor control power solutions	– Enablement of reliable, efficient, and quieter operation, OEMs gain system-level optimization and reduced time-to-market
– Robust and reliable wireless connectivity ranges from Wi-Fi 4 to Wi-Fi 6/6E, compliant with Matter over Wi-Fi and Matter over Thread	– Flexible usage, future-proof, and full compatibility
– XENSIV™ sensor solutions cover a wide range of use cases, enabling smart features	– Contextual awareness and advanced sensing solutions for holistic condition monitoring
– State-of-the-art microcontroller with mature CAPSENSE™ capacitive touch sensor	– Great UX for robust and effortless interactions
– OPTIGA™ Trust M hardware cryptographic accelerators support host MCUs with Matter onboarding	– Enhanced robust security for higher cryptographic operations

Application diagram



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www.infineon.com/tumble-dryer

Product portfolio

Functional block	Product category	Product family	Part number	Specification and benefits
Main control	Main control MCU	32-bit XMC1000 Industrial Microcontroller Arm® Cortex®-M0	XMC1302-Q040X0016 AB	– 6 KB Flash, 16 KB RAM, supply voltage range: 1.8 to 5.5 V, in PG-TSSOP-38, temperature range: -40°C to 105°C
			XMC1402-Q048X0032 AA	– Core frequency: 48 MHz, 34 KB flash, 16 KB RAM, supply voltage range: 1.8 to 5.5 V, in PG-VQFN-48, temperature range: -40°C to 105°C
		PSOC™ 4 Arm® Cortex®-M0/M0+	CY8C4128FNI-BL563T	– Low-power, programmable mixed-signal hardware IP, Bluetooth® and industry leading CAPSENSE™
Condition monitoring and sensing	Liquid level detection MCU	PSOC™ 4000T Multi-Sense microcontroller	CY8C4045LQI-T412	– Capacitive and inductive sensing, liquid level sensing solution with ultra-low power, and best in class signal-to-noise ratio
	Water pressure measurement	XENSIV™ Pressure sensors	DPS368	– Fast, ultralow noise read-out, precise measurement of air flow, ideal for harsh environments with water, dust, or humidity
	Position sensor: Vertical load washing machine	XENSIV™ Magnetic sensor	TLE5012B E5000	– Precalibrated angle sensor iGMR; economic with SPI compatible interface
			TLI493D-W2BW A3	– Extremely small WLB-5 package (1.13 mm x 0.93 mm x 0.59 mm), low current consumption of 7 nA in power-down mode
Power conversion AC-DC	Gate drivers	EiceDRIVER™	2EDB9259Y	– Up to 3000 V_{rma} V_{ISO} robust input-to-output isolation meeting UL1577 components standard, narrow-body 150 mil DSO-14 package
	Silicon carbide MOSFETs	CoolSiC™ MOSFET	IMBG65R050M2H	– 650 V, 50 mΩ G2 in a D^2PAK-7 (TO-263-7) package, enabling BOM savings and system performance with highest reliability
	IGBT	TRENCHSTOP™ IGBT3	IKB06N60T	– 600 V, 6 A IGBT discrete with anti-parallel diode, TO263 package, highest efficiency – low conduction and switching losses
	Silicon MOSFETs	CoolMOS™ 8 Super-junction (SJ) MOSFET	IPD60R600CM8	– 600 V, reduced gate charge (Q_g) of 20% , turn-off losses (E_{oss}) further improved by 12%, reverse recovery charge (Q_{rr}) is 3% lower compared to CFD7
Inverter motor control - Drum, heat pump, water pump	Inverter motor control up to 3 motors MCU	32-bit XMC7000 Industrial Microcontroller Arm® Cortex®-M7	XMC7100D-F144K2112AA	– Single/Dual 250 MHz Arm® Cortex®-M7 and 100 MHz Cortex®-M0, up to 4 MB Flash, up to 768 kB SRAM, 7 V to 5.5 V supply voltage
	Simple motor control MCUs	PSOC™ Control Arm® Cortex®-M33 Main	PSC3M5FDS2ACQ1	– Integrating advance real-time control peripherals to provide designers the ability to improve performance of their next motor control products
	Single motor FOC MCUs	32-bit XMC1000 Industrial Microcontroller Arm® Cortex®-M0	XMC1302-Q040X0128 AB	– 128KB Flash, 16KB RAM, supply voltage range: 1.8 to 5.5 V, in PG-TSSOP-38, temperature range: -40°C to 105°C
			XMC1404-Q064X0128 AA	– Core frequency: 48 MHz, 128 KB flash, 16 KB RAM, supply voltage range: 1.8 to 5.5 V, in PG-VQFN-48, temperature range: -40°C to 105°C
		PSOC™ 4 Arm® Cortex®-M0/M0+	CY8C4146AZS-S265	– ISO 26262-ready, core frequency: 48[MHZ], 64KB Flash, 8KB RAM, supply voltage range: 1.71 to 5.5 V, temperature range: -40 - 105°C. With CAPSENSE™
			CY8C4127AZI-S443	– Core frequency: 24 MHz, 128 KB flash, 16 KB RAM, supply voltage range: 1.71 to 5.5 V, temperature range: -40°C to 85°C
	Single or dual motor MCUs	PSOC™ Control Arm® Cortex®-M33 Main	PSC3M5FDS2AFQ1	– Newest MCUs developed specifically for motor control applications – Integrating advanced real-time control peripherals to provide designers the ability to improve performance of their next motor control products
	Current sensors	XENSIV™ Current sensor	TLI4971-A120T5-U-E0001	– High precision miniature coreless magnetic current sensor for AC and DC measurements, 120 A, 3.45%, 3.1 to 3.5 V
	Silicon Integrated Power Module (IPM) 1x	CIPOS™ Micro IPMs	here	– Family of compact, three-phase, intelligent power modules for low-power (i.e., up to 450 W with heatsink) motor drive applications
		CIPOS™ Mini IPMs	here	– Family of high efficient intelligent power modules that has the highest power density with 4 to 30 A rated products built into single package platform
	GaN IPS integrated gate driver + HEMT 2x-3x	Coming soon		
	GaN discrete HEMTs	CoolGaN™ Transistors	IGT65xxx	
			IGLR70R140D2S	– 700 V G5 GaN power transistor, ultrafast switching, high operating frequency support, PG-ThinPAK
	Gate drivers	EiceDRIVER™ drivers	2EDB7259Y	– 5 A/9 A source/sink dual-channel gate driver with a very high 150 V/ns CMTI for robust operation with CoolMOS™ and CoolGaN™ GIT HEMTs in high-power switching noise environment
			2ED21064S06J	– 650 V, 0.7 A high- and low-side gate driver with integrated bootstrap diode, space-saving PG-DSO-14, excellent ruggedness
			2EDF7275F	– 4 A/8 A source/sink dual-channel gate drivers that provide a fast turn on/off when driving high- and medium-voltage MOSFETs such as CoolMOS™ or OptiMOS™, PG-DSO-16 narrow body with 4 mm creepage distance
			2EDF7175F	
			2ED2388S06F	– 650 V high speed, half-bridge gate driver with a typical 0.29 A source, 0.7 A sink currents, PG-DSO-8 for driving power MOSFETs and IGBTs
			6EDL04I06NT	– 600 V three-phase gate driver IC with integrated bootstrap diode, over-current protection, enable and fault reporting, PG-DSO-28
	Gate drivers + IGBT	RC Drivers 2	IKD06N60RC2	– 600 V, 6 A IGBT discrete with Reverse Conducting Drive 2-diode, PG-TO-252
			2ED2304S06F	– 650 V SOI half-bridge gate driver IC, integrated bootstrap diode for IGBTs and MOSFETs with 0.36 A source and 0.7 A sink currents, PG-DSO-8
	IGBTs	600 V Reverse Conducting Drive 2	here	– RC-D2 with the monolithically integrated diode offers improvements of the performance, controllability and reliability compared to RC-DF
		TRENCHSTOP™ IGBT6	here	– 1200 V IGBT technology is optimized for high-speed switching applications operating in the range from 15 kHz to 40 kHz
		TRENCHSTOP™ IGBT7	here	– A high voltage IGBTs, specially designed for variable speed drives, offering a high level of controllability
		TRENCHSTOP™ IGBT3	IKW20N60H3	– 600 V, 20 A hard-switching TRENCHSTOP™ IGBT3 co-packed with free-wheeling diode, TO247 package, low switching and conduction losses
	Security	OPTIGA™ Trust Security solutions	OPTIGA™ TRUST M SLS32AIA	– Based on CC EAL 6+ (high) certified tamper-resistant hardware, can be used with any MCU/MPU or application processor to perform various security-related tasks autonomously
			OPTIGA™ TRUST M MTR	– Discrete security solution combined with a Matter-certified provisioning service late-stage personalized Device Attestation Certificate (DAC) for download
			OPTIGA™ TRUST M EXPRESS	– Pre-provisioned Secure Element, ready to connect to Azure and AWS Automated device and product-to-cloud provisioning
Connectivity & Matter	Dual/tri-band (2.4 GHz, 5 GHz, and 6 GHz) Wi-Fi 6 and Bluetooth®	AIROC™ Wi-Fi + Bluetooth® Combos	CYW55513	– Wi-Fi 6/6E tri-band Wi-Fi and Bluetooth®/Bluetooth® Low-Energy 5.4 Combo IC, greenfield 6 GHz band for expanded channels
			CYW55571	– Wi-Fi 6E tri-band Wi-Fi and Bluetooth® 5.3 SoC, high-performance beyond Wi-Fi 6/6e requirements
			CYW55572	– Wi-Fi 6 dual-band 2x2 Wi-Fi and Bluetooth® 5.3 SoC, Bluetooth® LE audio delivers high-quality audio
			CYW55573	– Wi-Fi 6/6E tri-band 2x2 Wi-Fi and Bluetooth® 5.3 SoC, multi-layer security and network intelligence for greater protection
	Legacy dual-band (2.4 GHz and 5 GHz) Wi-Fi 4 and Bluetooth®		CYW43022	– Ultralow power 1x1 Dual-band Wi-Fi 5 (802.11ac) + Bluetooth® 5.4 combo, best-in-class power consumption
	Matter-hosted tri-band (2.4 GHz, 5 GHz, and 6 GHz) Wi-Fi 6 and BT®		CYW55913	– Ultralow power single-chip connected MCU that supports 1x1 2.4+5+6 GHz Wi-Fi 6E, Bluetooth® Low Energy 5.4, and Matter
	Industrial qualified Wi-Fi 5 and Bluetooth®		CYW4373	– 1x1 Dual-band Wi-Fi 5 (802.11ac) + Bluetooth® 5.4 combo, 2.4 GHz and 5 GHz Wi-Fi 5 (802.11ac)
HMI	HMI MCU	PSOC™ 4000 - Entry-Level	CY8C4045LQI-T412	– Capacitive sensing, inductive sensing, liquid level sensing solution with ultralow power and best in class signal-to-noise ratio
	Memory	SEMPER™ Nano NOR Flash	here	– Family of NOR flash for hearables, wearables, and IoT endpoints with solutions hub including software development kits, hardware development platforms, and more
	Display control	PSOC™ Edge Arm® Cortex® Multicore Microcontroller	here	– High performance Arm® Cortex®-M55, including Helium™ DSP support paired with Arm® Ethos™-U55 and Cortex®-M33 paired Infineon's ultra-low power NNLite neural network accelerator
	Voice control MEMS microphones	XENSIV™ MEMS microphone	IM72D128V	– Ultrahigh performance, high SNR of 71.5 dB(A), far-field and low volume audio pick-up, clear audio signals even for highest SPL
	Presence, gesture, and material detection	XENSIV™ 60GHz radar sensor	BGT60TR13C	– 60 GHz radar sensor with integrated antennas, ultrawide bandwidth of 5.5 GHz a very low range resolution down to ~3cm

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Fridge

Refrigerators and freezers

High-performance system solutions for better efficiency and lower costs

Consumers demand refrigerators and freezers with low energy consumption, minimal noise, compact designs, and maximum storage space. They also seek intelligent appliances that integrate seamlessly into home networks. Manufacturers must balance stricter energy efficiency regulations while achieving smaller system designs, lower costs, and smarter features.

Infineon offers the needed components to make state-of-the-art motor control solutions for refrigerator compressors, from power devices including IPMs, discrete (IGBTs, MOSFETs) and advanced GaN devices to high-performance MCUs and gate drivers.

For motor control, Infineon is a leader in power and offers a wide range of power components for motor inverter design. Both TRENCHSTOP™ IGBTs and CoolMOS™ MOSFETs are recommended as discrete, while CoolMOS™ enables higher efficiency at light load under which conditions of refrigerators typically operate. EiceDRIVER™ gate driver is a good fit here to drive various power discrete. CIPOS™ modules integrate power and control components to improve reliability, optimize board size, and accelerate time-to-market. For designs aiming for the best system performance, CoolGaN™ based motor inverter design is a new option. As for motor controllers, Infineon's PSOC™ and XMC™ microcontroller families are recommended. The CoolSET™ family supports Auxiliary power supply with increased robustness.

Infineon's components, including PSOC™ microcontrollers, AIROC™ Wi-Fi + Bluetooth® Combos, XENSIV™ sensors and OPTIGA™ security ICs, enhance smart refrigerator capabilities. They enable smart, connected refrigerators and freezers to sense the environment, provide user and manufacturer data for remote analysis, and ensure secured communication.

These solutions enhance efficiency, compactness, and carbon footprint, leveraging a robust product portfolio to meet diverse application needs.

Features and benefits

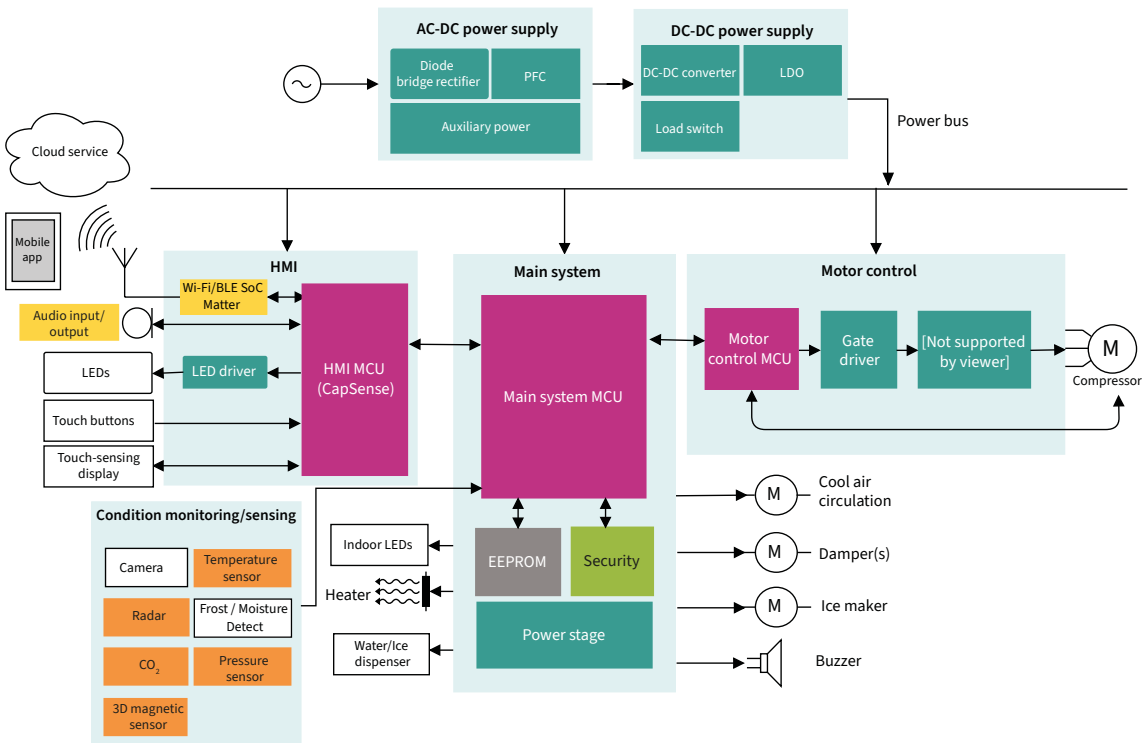
Key features

- Comprehensive compressor motor control solutions ranging from cost-optimized designs to high-performance designs
- Broad range of power solutions ranging from discrete to integrated modules, from Si to GaN
- State-of-the-art microcontrollers with mature CAPSENSE™ capacitive touch sensors and MCUs for AI/ML capabilities with PSOC™
- Robust and reliable wireless connectivity ranges from Wi-Fi 4 to Wi-Fi 6/6E, compliant to Matter over Wi-Fi and Matter over Thread
- XENSIV™ sensor solutions cover a wide range of use cases, enabling smart features
- OPTIGA™ Trust M hardware cryptographic accelerators support host MCUs with Matter onboarding

Key benefits

- Different system designs enable high energy efficiency, compact design, and system cost savings
- Enhanced energy efficiency, higher power density, and optimized system design at reduced BOM cost
- Enhance responsiveness and reliability, ultralow power operation, liquid immunity functionalities
- Flexible usage, future-proof and full compatibility and wireless connectivity integration
- Contextual awareness and advanced sensing solutions such as presence detection, voice control, food freshness monitoring
- Enhanced robust security for higher cryptographic operations

Block diagram



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Product portfolio

Functional block	Product category	Product family	Part number	Specification nd benefits
AC-DC power supply	Diode bridge rectifier	CoolSiC™ diodes	here	– Family of silicon carbide CoolSiC™ Schottky Diode solutions 600 V, 650 V, 1200 V, and 2000 V
	PWM-PFC	TRENCHSTOP™ 5 IGBT	IKP08N65H5	– 650 V, 8 A IGBT with anti-parallel diodes, TO-220 package, copacked with a fast and soft RAPID 1 anti-parallel diode
		EiceDRIVER™ Gate driver	1ED44173N01B	– 25 V single-channel low-side MOSFET gate driver with integrated fast overcurrent protection (OCP), 2.6 A, PG-SOT23
		Silicon diodes	IDP08E65D1	– 650 V silicon power diode, for applications switching between 18 kHz and 40 kHz, PG-TO-220 real2pin
		CIPOS™ Mini IPMs	here	– Family of high efficient intelligent power modules that has the highest power density with 4 to 30 A rated products built into a single package platform
		CoolSET™ Quasi Resonant	ICE5QR1680BG	– Fifth generation quasi-resonant CoolSET™ with integrated 800 V CoolMOS™ SJ MOSFET, PG-SMD
		PWM-QR (quasi resonant) Flyback ICs	ICE5QSBG	– High performance and comprehensive suite of protection to increase system robustness, PG-DSO-8
		CoolMOS™ MOSFET	IPA80R600P7	– 800 V, up to 0.6% efficiency gain and 2°C to 8°C lower MOSFET , PG-TO220 FullPAK
DC-DC power supply	LDO	OPTIREG™ linear LDO	here	– Family of robust linear voltage regulators
Connectivity and Matter	Wi-Fi/Bluetooth® Low Energy SoC Matter	AIROC™ Wi-Fi + Bluetooth® Combos Wi-Fi 4 (802.11n)	CYW43437, CYW43438	– 1x1 single-band 2.4 GHz Wi-Fi 4 (802.11n) and Bluetooth® 5.1, 20 MHz channels, up to 96 Mbps PHY data rate including ModusToolbox™ with libraries and more
			CYW43012	– 1x1 dual-band 2.4 GHz and 5 GHz Wi-Fi 4 (802.11n) and Bluetooth® 5.4, MCS8 (256-QAM) for 20 MHz channels, up to 78 Mbps PHY data rate
		AIROC™ Wi-Fi + Bluetooth® Combos Wi-Fi 5 (802.11ac)	CYW4373	– 1x1 dual-band Wi-Fi 5 (802.11ac) + Bluetooth® 5.4 combo, 2.4 GHz and 5 GHz Wi-Fi 5 (802.11ac)
		AIROC™ Wi-Fi + Blue-tooth® Combos Wi-Fi 6/6E (802.11ax)	CYW55513	– Wi-Fi 6/6E Tri-Band Wi-Fi and Bluetooth®/Bluetooth® Low Energy 5.4 Combo IC, greenfield 6 GHz band for expanded channels
		AIROC™ Bluetooth® LE	CYW20829	– Bluetooth® LE 5.4 MCU with industry's best range, dual Arm® Cortex®-M33 dedicated for applications and CAN FD
HMI	Capacitive touch sensing controller	32-bit PSOC™ 4 Arm® Cortex®-M0 MCU	CY8C4046LQI-T452	– MCU with capacitive and inductive sensing, liquid level sensing solution with ultralow power and best-in-class signal-to-noise ratio
		32-bit PSOC™ 6 Arm® Cortex®-M4 MCU	CY8C6244LQI-S4D82	– 62x4 product family offers 256 KB of flash, 128 KB of SRAM, rich set of analog peripherals operating in device's deep sleep mode
Condition monitoring and sensing	Audio input/ output	XENSIV™ MEMS microphone	IM73A135	– Ultrahigh performance, high SNR of 73 dB, high ingress protection (IP57) at a microphone level, clear audio pick up of the quitest/loudest sounds
	Radar	XENSIV™ 60 GHz radar sensor	BGT60LTR11AIP	– 60 GHz, small, 3.3 × 6.7 × 0.56 mm^3 MMIC with integrated antennas, configurable detection range from 0.5 m up to 7 m with a typical human target radar cross section (RCS)
	Environmental sensor	XENSIV™ PASCO2	PASCO2V01	– CO2 sensor based on photoacoustic spectroscopy (PAS), highest accuracy and robust performance at ppm level (±30 ppm ±3% of reading), small form factor
	Pressure sensor	XENSIV™ Pressure sensor	DPS368	– Fast, ultralow noise read-out allows for precise measurement of air flow, ideal for harsh environments with water, dust, or humidity
	3D magnetic sensor	XENSIV™ Magnetic sensor	TLE4961-1L	– Hall latch, for superior supply voltage capability requiring applications, 3 to 32 V operating supply voltage, PG-SSO3-2
Main system	Microcontroller	32-bit PSOC™ 4 Arm® Cortex®-M0 MCU	CY8C4146AZI-S423	– MCU with low-power, programmable mixed-signal hardware IP, 24 MHz, 64 KB flash, 8 KB RAM, supply voltage range: 1.71 to 5.5 V, temperature range: -40-85°C
		32-bit PSOC™ 6 Arm® Cortex®-M4 MCU	CY8C6244LQI-S4D82	– 62x4 product family offers 256 KB of flash, 128 KB of SRAM, rich set of analog peripherals operating in device's deep sleep mode
		PSOC™ PSOC™ Edge Arm® Cortex® Multicore E8x for Edge computing functions	here	– Based on high performance Arm® Cortex®-M55, including Helium™ DSP support paired with Arm® Ethos™-U55 and Cortex®-M33 paired Infineon's ultralow power NNLite neural network accelerator
	Memory	SEMPER™ Nano NOR Flash	S25FS256TDA-WEC118	– 256 Mb SEMPER™ Nano 1.8 V QSPI Flash in a known good-wafer format, compact footprint, and built-in ECC
	Security	OPTIGA™ Trust Security solutions	OPTIGA™ Trust M SLS32AIA	– Based on CC EAL 6+ (high) certified tamper-resistant hardware, can be used with any MCU/MPU or application processor to perform various security-related tasks autonomously
Motor control	Motor control MCU	32-bit XMC1000 Industri-al Microcontroller Arm® Cortex®-M0	here	– Family of MCU Arm® Cortex®-M0 core, up to 48 MHz and 80 CoreMark, control peripherals like PWM timers run on a up to 96 MHz
		32-bit PSOC™ 4 Arm® Cortex®-M0 MCU	CY8C4146AZI-S423	– MCU with low-power, programmable mixed-signal hardware IP, 24 MHz, 64 KB Flash, 8 KB, supply voltage range: 1.71 to 5.5 V, temperature range: -40°C to 85°C
	Gate driver	EiceDRIVER™	2ED2304S06F	– 650 V half-bridge gate driver IC with integrated bootstrap diode, 0.36 A source and 0.7 A sink currents, PG-DSO-8
			6EDL04I06PT	– 600 V full-bridge three-phase gate driver IC for MOS-transistors or IGBTs, PG-DSO-28 with LS-SOI technology
	Discrete (MOSFET/IGBT/ IPM/GaN)	CoolMOS™ PFD7 superjunction MOSFET	IPD60R600PFD7S	– 600 V, features $R_{DS(on)}$ of 600 mΩ, minimized switching losses, PG-TO-252 DPAK
			IPD60R360PFD7S	– 600 V, features $R_{DS(on)}$ of 360 mΩ, minimized switching losses, PG-TO-252 DPAK
			IPN60R600PFD7S	– 600 V, features $R_{DS(on)}$ of 600 mΩ, SOT-223
			IPN60R360PFD7S	– 600 V, features $R_{DS(on)}$ of 360 mΩ, SOT-223
		600 V CoolMOS™ 8	IPD60R600CM8	– 600 V, reduced gate charge (Q_g) of 20%, reduction in turn-off losses (E_{oss}) improved by 12%, reverse recovery charge (Q_{rr}) 3% compared to CFD7
		CoolGaN™ Transistors	IGI60L5050B1M	– 500 mΩ/600 V GaN transistor in a half-bridge configuration with integrated level-shift gate driver and bootstrap diode, 6x8 mm PG-TFLGA-27
		600 V/1200 V TRENCHSTOP™	IKD06N60RC2	– 600 V, 6 A IGBT discrete with Reverse Conducting Drive 2-diode, low switching losses on competitive price, PG-TO-252
			IKD04N60RC2	– 600 V, 4 A IGBT discrete with Reverse Conducting Drive 2-diode, low switching losses on competitive price, PG-TO-252
		CIPOS™ Micro	IM241-L6S1B	– 600 V, 6 A three-phase RCD2 IGBT, open emitter, PG-SOP 29x12, fully-featured with multiple protection functions
		CIPOS™ Mini	IM523-S6A	– 600 V, 6 A three-phase TRENCHSTOP™ RCD2 IGBT, pen emitter in PG-DIP 36x21, control three-phase motors in variable speed drive in low and medium power

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Power tools

Cordless power tools and outdoor power equipment

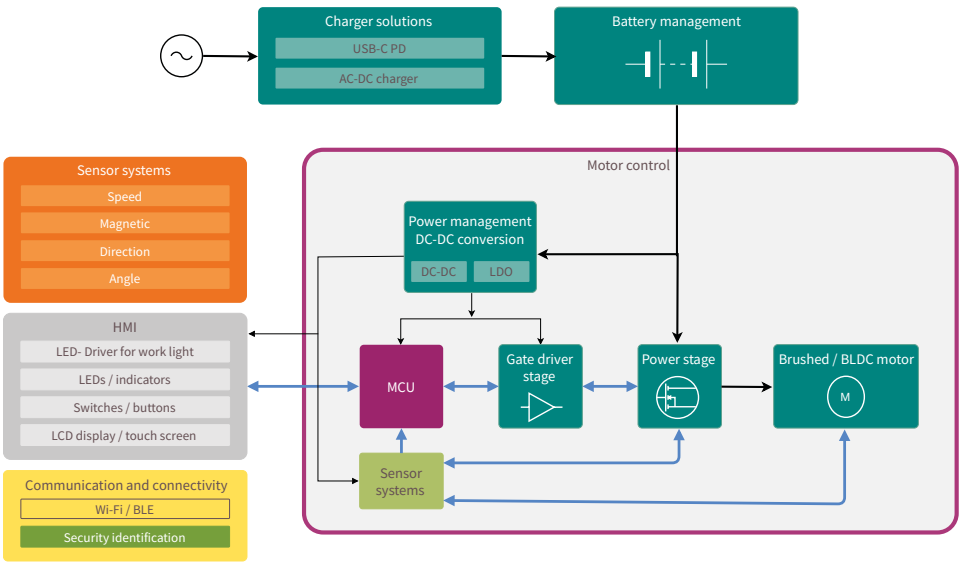
Battery-powered devices for home and professional applications

Millions of households worldwide rely on power tools to complete daily tasks or creative projects around the home. Consumers want robust, reliable, and easy-to-use portable power tools with low prices and long battery life as the key selection criteria. High quality standards to earn the trust of the consumer also require diagnostic and safety features. Infineon's product portfolio is made to bring performance, safety, and reliability to consumer projects. We help our customers meet all consumer needs at a reduced total cost. In addition to the extensive product portfolio, we offer wireless charging reference designs. They deliver high performance and are easily optimized in our DAVE™ development platform. Configure your BOM and exceed expectations with Infineon components in your cordless power tool designs.

Features and benefits

Key features	Key benefits
– Comprehensive product and solution portfolio, easy to tailor to any design specification	– Convenient selection of the right-fit products thanks to broad portfolio and complete solutions
– Infineon offers complete solutions for power supplies, chargers, and motor drives	– Extended battery lifetime and product life span
– Best-in-class MOTIX™ and EiceDRIVER™ gate drivers	– Increased production capability
– High reliability of Infineon components	– Overall system size and cost reduction
– Offering LV FETs with SMD packaging, improves the productive capability by automatic production, improves reliability, and reduces assembly cost	– Security, quality, and safety
– Components featuring small form factor and compact design offering highest power density and BOM savings thanks to lowest $R_{DS(on)}$	– Authentication
– Trustworthy hardware-based security	– Short time-to-market
– Highest quality standards and a safety-certified development process	
– Proven track record and outstanding partner network for embedded security	
– OPTIGA™ Trust enables authentication of components connected to the system (e.g., battery pack recognition to avoid second-party batteries etc.)	
– Evaluation and demonstration boards for fast prototyping	
– Simulations, documentation, and system support available to reduce development time and cost	

Application block diagram example: cordless power tools



Click here to learn more:

www.infineon.com/powertools
www.infineon.com/motorcontrol
www.infineon.com/gatedriver
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Product portfolio

Functional block	Topology	Product category	Product family	Part number
Motor control	12 V, 15 V, 18 V, 22 V	MOSFET	OptiMOS™ 5 OptiMOS™ 6 StrongIRFET™	BSC005N03, IQE006NE2, IPT004N, IPP055N, ISZ015N04NM7V, ISCH54N04NM7V
				IRL40DM2, BSC010N04, IST011N06, BSZ097N04, IRF40SC, IPB011N04, IRL40B215, ISZ028N03LF2S, ISC009N03LF2S
		Gate drivers	MOTIX™	IDM700A, ED2744S01G, ED2748S01G, ED2732S01G, ED2734S01G, ED2738S01G, 1ED44173, 6EDL7141, 6EDL7151, TLE9140EQW, IFX9201SG
			EiceDRIVER™	1ED44173N01B
		Microcontroller	XMC™ series	XMC1400. XMC1400, XMC4400
			PSOC™	PSOC™ 4100, PSOC™ 62, PSOC™ C3
		Sensor systems	Hall switches	TLV4963
			Angle	TLI5012
			3D magnetic	TLV493D
			Magentic coreless current	TLI4971
	36 V	MOSFET	OptiMOS™ 5 OptiMOS™ 6 StrongIRFET™	IRL40DM2, BSC010N04, IST011N06, BSZ097N04, IRF40SC, IPB011N04, IRL40B215, IPT009N08NM6, IPB016N08NF2S
		Gate drivers	MOTIX™	6EDL7141, IDM 700A, 1ED44173, 6EDL7141, 6EDL7151, TLE9140EQW, IFX9201SG
			EiceDRIVER™	1ED44173N01B
		Microcontroller	XMC™ series	XMC1400, XMC1400, XMC4400
			PSOC™	PSOC™ 4500S
				PSOC™ 6, PSOC™ C3
		Sensor systems	Hall switches	TLV4963
			Angle	TLI5012
			3D magnetic	TLV493D
			Magnetic coreless current	TLI4971
	48 V, 56 V, 72 V	MOSFET	OptiMOS™ 3 OptiMOS™ 5 OptiMOS™ 6 StrongIRFET™	BSC021N08N, BSC030N08N, IPT010N08N, IPTG011N08N, IPP040N08N, IPB049N08N, IPT009N08NM6, IPB016N08NF2S
				BSC035N10N, ISZ080N10N, IPT015N10N, IPTC030N12N, IPB036N12N, IPP050N10N
		Gate drivers	MOTIX™	TLE9140EQW, 1EDN755X, 2ED2734, 2ED2748
		Microcontroller	XMC™ series	XMC1400, XMC1400, XMC4400
			PSOC™	PSOC™ 4500S
				PSOC™ 6, PSOC™ C3
		Sensor systems	Hall switches	TLV4963
			Angle	TLI5012
			3D magnetic	TLV493D
			Magnetic coreless current	TLI4971
Charging		MOSFET	CoolMOS™ P7	IPA60R280P7S, IPD60R080P7, IPD60R280P7S, IPD60R360PFD7S, IPN70R450P7S
		Controller IC	-	ICC80QSG, XDPS2201, XDPS2221, ICE3PCS01G
		HEMTs	CoolGaN™	IGI60F1414A1L IGI60F200A1L, IGLD60R190D1
		Gate drivers	EiceDRIVER™	1EDB9275F, 2EDB7259Y, 2EDF9275F, 2EDL05N06PF, 2EDR8259X, 2EDS9265H
		Schottky diodes	CoolSiC™ G5 CoolSiC™ G6	IMZA65R027M1H, IMZA65R048M1H, IMW65R027M1H, IMW65R048M1H
		SR switch	OptiMOS™ 5	BSC040N10NS5, BSC160N15NS5, IPP200N15N3
		Load switch	OptiMOS™ 5	BSC040N10NS5, BSC0902NSI, IPP034N08N5
		USB-PD	EZ-PD™ PMG1-B1	CYPM1115-48LQXI, CYPM1116-48LQXI
			EZ-PD™ PAG1	PAG1P, PAG1S
			EZ-PD™ BCR	CYPD3177-24LQXQ, CYPD3177-24LQXQT
		Microcontroller	XMC™	XMC1400
BMS	12 V	Protection MOSFET	OptiMOS™ StrongIRFET™	BSC004NE2LS5, IQE006NE2LM5, BSB008NE2LX, BSZ009NE2LS5, IRFH6200, IRF6200, IRF1324, ISZ015N04NM7V, ISCH54N04NM7V
	18 V			IPT004N03L, BSC005N03LS5, BSZ0500NSI, IRF6726M, IRLS3813, IRLB3813, BSC079N03LSCG, ISZ015N04NM7V, ISCH54N04NM7V
	24 V			IRL7472L1, IRL40SC228, BSC007N04LS6, IRL40T209, IRFS7430, IRL40B209, BSZ018N04LS6, ISZ015N04NM7V, ISCH54N04NM7V
	36 V			IPT007N06N, IRF60SC241, BSC014N06NS,IRF7749L1, IRL60B216, IRL60S216
	48 V			IPT012N08N5, IPP020N08N5, BSC025N08LS5, BSB044N08NN3G, BSZ070N08LS5, BSZ096N10LS5,
	72 V			IPP041N12N3G, BSC077N12NS3G, BSZ240N12NS3G, IRF135SA204, IRF135S203, IRF135B203
		Monitoring balancing IC	-	TLE9012
		Cell balancing MOSFETs	StrongIRFET™	IRLML9303, IRFTS9342, IRLML9301
		Microcontrollers	XMC™, PSOC™	XMC1100, XMC1200, XMC1400, XMC1400, XMC4100, CY8C41x4/5/65, CY8C41x6/75, CY8C4147-S5
Communication and HMI		Authentication/security	OPTIGA™ Trust	SLE 95250, SLS 32AIA010MH
		Bluetooth®	AIROC™	CYBT-213043-02, CYW20736,CYW20706, CYW20704
		Wi-Fi	AIROC™	CYW43907, CYW43439, CYW954907
		Pressure sensor	XENSIV™	DPS368

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Smart TV

Smart TV

System solutions for smarter, slimmer, more powerful, and more energy-efficient smart TVs

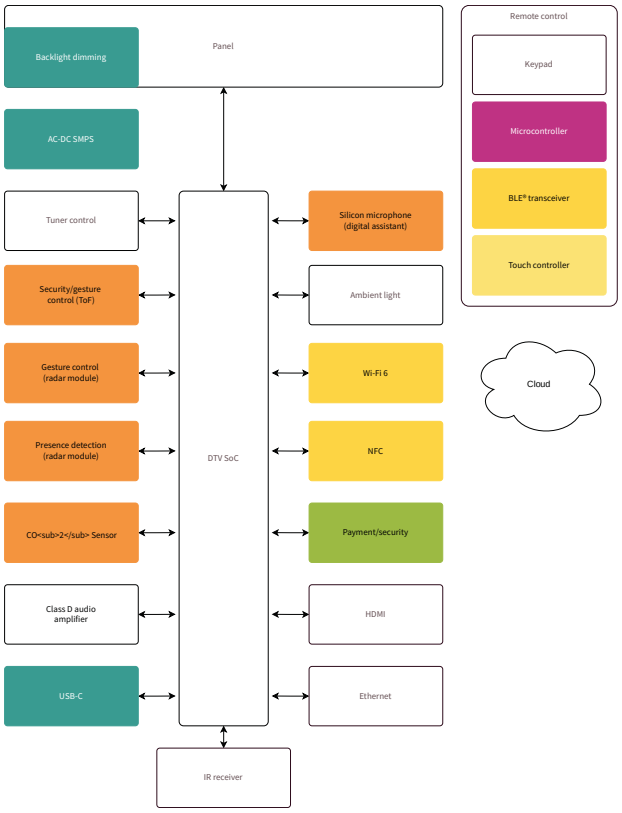
The requirements for new generations of TVs and smart TVs are increasing with the growing access to massive amounts of streaming content, the need for superior pictures, and the highest audio quality. Designers face a great challenge combining all the required features in smart TV designs while keeping the system compact, secure, and power efficient. In Infineon's wide portfolio of semiconductors, sensors, MCUs, connectivity solutions, and security, we offer a complete system solution to cover all the needs and enable a design of highly efficient, compact, easy-to-use, and powerful systems. Complementary to our wide product portfolio, we offer evaluation boards, enabling an even faster time-to-market. For example, our digital PFC-LLC converter evaluation board specifically for TV power systems, DEMO-IDP2308-120W, contains a 120 W digital PFC-LLC converter with 8 x 5 V AC~265 V AC input and 12 V/24 V output. It is controlled by Infineon's 2nd generation XDP™ SMPS digital multi-mode PFC-LLC combo controller IDP2308 and is the perfect solution to reduce the complexity of TV power system design.

Features and benefits

Key features
– Smart TV system solution
– Presence detection radar
– Powerful SMPS
– IoT security and authentication
– HMI and sensor fusion solutions

Key features
– One-stop-shop for the complete system
– Energy saving by switching off the TV when not in the room
– High energy efficiency
– Protection against unauthorised connection to the device
– Ease of use, allowing responsive touch control

Application diagram



Click here to learn more:
www.infineon.com/smart-tv



Recommended products

Functional block	Product category	Topology	Product family	Benefits
Main stage/PFC combo non-AUX	High-voltage MOSFETs	Active bridge	600 V CoolMOS™ S7	– Body diode robustness at AC line commutation – Improved thermal resistance – Absolute lowest $R_{DS(on)}$ in the market – Enables top-side cooling with D-DPAK and Q-DPAK – Ideal fit for solid-state and hybrid relays and circuit breakers
		Active bridge DCM PFC HB LLC	600 V CoolMOS™ P7	– Fast-switching speed for improved efficiency – Low gate charge for enhanced light-load efficiency and low power consumption at no-load condition – Optimized V_{GS} threshold for lower turn-off losses – Rugged body diode for HB LLC application
		DCM PFC, HB LLC	600 V CoolMOS™ PFD7	– Robustness and reliability with integrated robust, fast body diode and up to 2 kV ESD protection in gate – Reduced gate charge for enhanced light-load efficiency, and lower hysteresis loss
			600 V CoolMOS™ 8	– Best price/performance, integrating fast body diode – Simplified product portfolio – Highest quality and reliability – Better energy efficiency and cost targets with providing an acceptable power density – TSC package offerings with 7 mΩ available
	Gate driver IC	HB LLC	EiceDRIVER™ level shift: 2ED2181S06F, 2ED21814S06J	– 650 V half-bridge SOI driver with integrated bootstrap diode – High-frequency switching (500 kHz)
	Control ICs	IDP2308	PFC-LLC non-AUX digital IC for TV embedded PSU	– Low BOM count/system cost due to high integration – Low standby power – High system reliability – Shorter development cycles and higher design and production flexibility
Synchronous rectification	Low-voltage MOSFETs	Synchronous rectification	OptiMOS™ 5 100-150 V StrongIRFET™ 2 100 V	– Low conduction losses, reduced overshoot – FullPAK package available
PFC	Boost diodes	DCM PFC	650 V Rapid diode	– Low conduction losses
	Control ICs	CCM PFC ICs	ICE3PCS0xG	– High PFC anf low THD
	WBG	PFC	CoolGaN™ 600 V e-mode HEMTs	– Highest efficiency contribution via less parasitic parameter – Space saving with SMD smaller package
	Gate driver IC	PFC	1ED44173N01B	– Single-channel with fast, accurate (± 5%), integrated overcurrent protection (OCP)
High voltage MOSFETs	Active bridge DCM PFC HB LLC		600 V CoolMOS™	– Fast switching speed for improved efficiency – Low gate charge for enhanced light load efficiency and low power consumption at no-load condition – Optimized V_{GS} threshold for lower turn-off losses – Rugged body diode for HB LLC application
Main stage	Control ICs	HB LLC ICs	ICE1HS01G-1/ICE2HS01G	– High efficiency and low EMI
		HB ICs	XDP2201	– High efficiency, low BOM cost, and optimized transformer design
	WBG	HB LLC	CoolGaN™ 600 V Integrated Power Stage	– Highest efficiency, highest power density – High reliability – Isolated gate driver integrated
	High-voltage MOSFETs	HB LLC	600 V CoolMOS™ P7	– Fast-switching speed for improved efficiency – Low gate charge for enhanced light-load efficiency and low power consumption at no-load condition – Optimized V_{GS} threshold for lower turn-off losses – Rugged body diode for HB LLC application
Auxiliary power supply	Control ICs	QR/FF flyback CoolSET™	QR CoolSET™ - ICE5QRxx80BG FF CoolSET™ - ICE5xRxxxxXX	– Low standby power, high efficiency and robustness
Flyback	Control ICs	QR flyback	ICE2QS03G	– Forced resonant ZVS control reduces the switching loss – Multilevel protection enables the robust design – Flexible firmware provides more differentiation for OEMs
	High-voltage MOSFETs	Flyback	700 V CoolMOS™ P7	– Optimized for flyback topologies – Best price competitive CoolMOS™ SJ MOSFET family – Lower switching losses versus standard MOSFET – Controlled dV/dt and di/dt for better EMI

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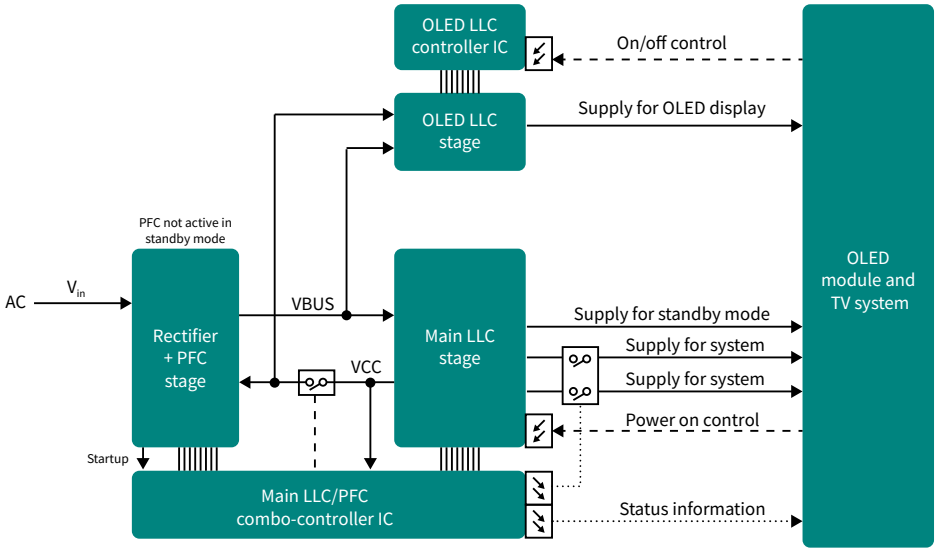
Product portfolio

Functional block	Product	Product family	Benefits
Gesture control	Sensor	XENSIV™ 24 GHz radar sensors for IoT	– Infineon's XENSIV™ 24 GHz radar transceiver family offers multiple variants – Low-power motion sensing and distance measurements – >100 m detection range
		XENSIV™ 60 GHz radar sensors for IoT	– Detection of submilimeter movements – Up to 10 m detection range
	Microcontroller	32-bit XMC4000 industrial microcontroller Arm® Cortex®-M4	– Arm® Cortex®-M4 with floating point unit (FPU), single-cycle DSP MAC, 80-144 MHz CPU frequency
		32-bit XMC1000 industrial microcontroller Arm® Cortex®-M0	– Arm® Cortex®-M0 core, up to 48 MHz and 80 CoreMark
Presence detection	Sensor	XENSIV™ 24 GHz radar sensors for IoT	– Multiple variants in the family – Low-power radar chip options
		XENSIV™ 60 GHz radar sensors for IoT	– Detection of people up to 15 m – Accurate measurments down to distances of ~1 cm and higher doppler velocity
	Microcontroller	32-bit XMC4000 industrial microcontroller Arm® Cortex®-M4	– 4-channel high-resolution, PWM (150 ps) (XMC4400, XMC4200, XMC4100) – Up to 6 multi-functional serial interface modules configurable to SPI, I²C, I2S, or UART
		32-bit XMC1000 industrial microcontroller Arm® Cortex®-M0	– The MATH co-processor boosts standard Arm® Cortex®-M0 computing performance enabling divisions and trigonometric operations like SIN and COS
CO_2 sensor	CO_2 sensor	XENSIV™ PAS CO_2 sensor	– Space savings in customers' end products – High-quality data and compliance with smart building standards – Cost-effective high-volume assembly and easy system integration – Plug and play for fast design-to-market
		PASCO2V01	– Exceptionally small form factor – Highest accuracy and robust performance at ppm level (±30 ppm ±3% of reading) – Advanced compensation and self-calibration algorithms
USB-C	USB-C power delivery controller	EZ-PD™	– Reversible connector, measuring only 2.4 mm in height – Compliant with USB Power Delivery 2.0, providing up to 100 W – Double the bandwidth of USB 3.0, increasing to 10 Gbps with SuperSpeed+ USB 3.1 – Combines multiple protocols in a single cable, including DisplayPort, PCIe, or Thunderbolt
Silicon microphone	MEMS microphone	IM69D127	– Very-low self-noise/very-high SNR (69 dB) – Selectable power modes for battery-critical applications – Sealed Dual Membrane (SDM) technology with IP57 ingress protection at microphone level
		IM72D128	– Ultrahigh dynamic range and high acoustic overload point (AOP) of 128 dBSPL – Very tight part-to-part phase and sensitivity matching (±1 dB) – Flat frequency response with a very low LFRO (low frequency roll-off) of 20 Hz
		IM73A135	– Crystal clear audio pick up of the quietest and the loudest sounds – High ingress protection (IP57) at a microphone level – Enablement of advanced audio features (ANC, transparent hearing, audio zoom, beamforming)
Security	Security and smart card solutions	OPTIGA™ TPM - Trusted Platform Module	– High-end security controller with advanced cryptographic algorithms implemented in hardware (e.g., RSA and ECC256, SHA-256) – Common Criteria (EAL4+) and FIPS security certification – Flexible integration thanks to SPI, I²C, or LPC interface support – Extended temperature range (-40 to +85°C) for a variety of applications
		OPTIGA™ Trust	– Full range of security chips
		OPTIGA™ Authenticate	– Strong turnkey solutions combining robust hardware security and genuine user experience – Suited to all anti-counterfeit challenges – Combination of robust authentication with unprecedented levels of configuration flexibility
		OPTIGA™ Authenticate NFC solutions	– Contactless communication technology based on 13.56 MHz RF field – Standalone plain tags and secured NFC tags for stickers – Embedded NFC-I²C bridge tags for IoT devices – Multiple user memory options for NDEF data storage – On-chip high capacitance to enable small antenna designs and improved RF performance
Bluetooth® LE transceiver	Wireless connectivity	AIROC™ CYW20835 Bluetooth® LE system on chip	– High levels of integration to minimize external components – Supports the entire spectrum of Bluetooth® Low Energy use cases – Fully integrated modules with onboard crystal oscillator, passive components, flash memory, and the CYW20835 system on chip – Globally certified to support fast time-to-market
Touch controller	Microcontroller	32-bit PSOC™ 4 Arm® Cortex®-M0/M0+	– Industry-leading capacitive-sensing solution for touch buttons and sliders – State-of-the-art noise immunity and water rejection
		32-bit PSOC™ 6 Arm® Cortex®-M4/M0+	– Ultralow-power architecture – Highest level of protection defined by the Platform Security Architecture (PSA) from Arm® – Enabling modern touch and gesture-based interfaces that are robust and reliable

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OLED TV power block diagram



OLED TVs improve user experience being thinner, lighter, more flexible, and consuming less power than LCD/LED TVs.

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Wearables

Smartwatches, feature watches, wristbands, and smart rings

All in one marketplace for wearable devices with Infineon's excellent computing, connectivity, security, sensing, RF, and memory solutions

With its broad product portfolio, Infineon enables enhanced intelligent devices that are both "always-on" with low power consumption and high performance.

We help manufacturers overcome design challenges across all wearable device categories:

- Powerful computing, advanced graphics, responsive machine learning accelerated with neural net compute, audio and sound processing
- Ultralow power wireless connectivity (Wi-Fi, Bluetooth®, and Bluetooth® Low Energy), with a reliable and robust RF connection
- Need for strong, yet easy to implement, device and data security to protect personal and sensitive information
- Highly sensitive microphones for powerful audio and acoustic event detection
- Accurate sensing for surrounding awareness, precise detection, and recognition
- Longer battery life and small form factor for elegant, unobtrusive designs



A smartwatch runs an operating system that enables third-party apps (e.g., Wear OS). Its Arm® Cortex®-A application processor is based on multi-wireless connectivity, such as Bluetooth®, Wi-Fi, cellular, and UWB. The smartwatch monitors user health with advanced sensing technology. Its battery life is limited usually 1-2 days.



A feature watch, including a sports watch, is RTOS-based with limited customized third-party apps. An Arm® Cortex®-M processor with low power consumption powers it. The battery life is usually 1 or 2 weeks. More and more feature watches provide a two-way connection via Bluetooth®. Fitness, health tracking, payments, communication, and other main use cases are covered.



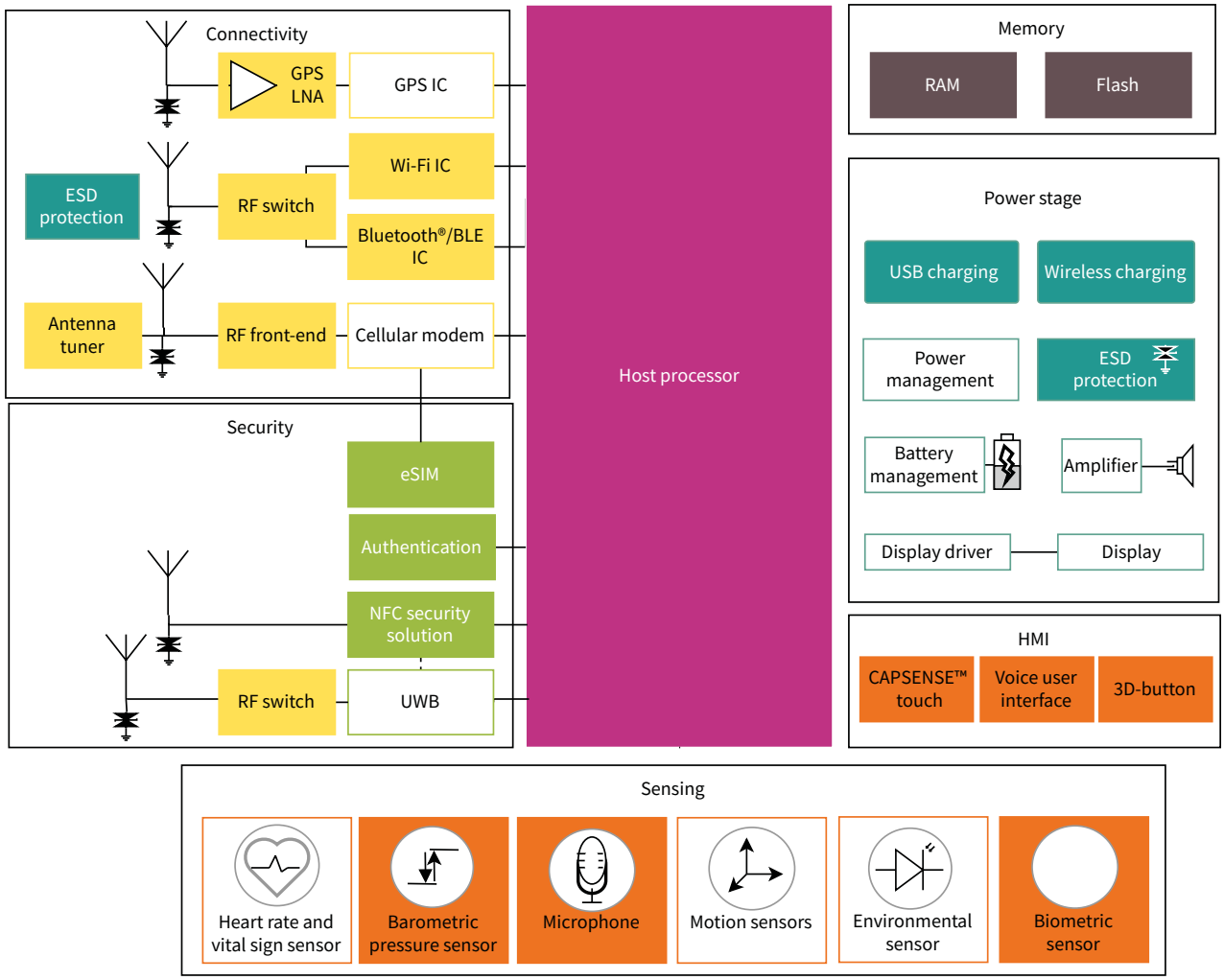
A wristband or fitness band offers limited functionality. Compared to a watch, it just covers a selected amount of use cases (e.g. step counting, sleep monitoring, location tracking, access control, etc.)



A smart ring is a jewelry-like tracker of personal vitals, payments, voice, or other digital activities. It is an alternative to a watch or wristband for monitoring fitness.

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Block diagram for smartwatches, feature watches, wristbands, and smart rings



Functional block	Product family	Functional block	Recommended products and solutions
Host processor	– PSOC™ Edge 84 with Arm® Cortex®-M55 and Ethos U55 NPU for machine learning – PSOC™ 6 Arm® Cortex®-M4 and -M0+microcontroller with BLE	Security	– OPTIGA™ Connect Consumer eSIM solution (e.g., OC1230) – SECORA™ Connect X payment (NFC booster)
Connectivity	– AIROC™ Wi-Fi and Bluetooth® Combos (CYW43022, CYW55512) – AIROC™ dual mode Bluetooth® (CYW20721)	Human-machine interface	– PSOC™ 4000T with CAPSENSE™ technology for touch
Connectivity RF	– GPS LNA (e.g., BGA123L4, BGA524N6) – 4G/5G LTE LNAs (e.g., BGA5x1BN6 family) – Antenna tuners (e.g., BGSA12UGL8, BGSA14GN10) – RF switches (e.g., BGS12WN6, BGS14WMA9)	Sensing	– XENSIV™ pressure sensor (e.g., DPS368) – XENSIV™ MEMS microphones (e.g., IM69D120/D130/D128S)
Memory	– SEMPER™ Nano NOR flash	Power stage	– USB type-C controller (e.g., EZ-PD™ CCG2) – ESD protection (e.g., ESD119-B1, ESD131-B1, ESD307-U1)

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Features and benefits

Key features	Key benefits
– High performance MCU with machine learning	– Synchronized multi-modal HMI, situation awareness
– Mature dual mode Bluetooth®	– Audio/voice/music function support with high reliability
– Ultralow power Wi-Fi combo	– Bulk data transmission with low power, co-existence solution
– Options for hardware integration	– Flexible integration option to customer due to wide portfolio
– Total solution provider	– One-stop-shop supplier (MCU, connectivity, sensor, payment, etc.)

Infineon, the right partner to solve your design challenges

Strong computing capability with machine learning in edge for autonomous operation and situation awareness

2.5D graphic capability to drive fancy displays

High reliability and data throughput with Wi-Fi connectivity

Integrated lowest power compute, Bluetooth® LE connectivity, and the most robust capacitive touch

Low power consumption to increase battery lifetime

Easy, convenient, and secure payment by NFC

Bluetooth® audio streaming with Bluetooth®/ Bluetooth® LE SoC and Wi-Fi combo

Secure cellular network connection

Best performance for voice call and voice assistant with MEMS microphones

Highest accuracy and fast signal pick-up for location tracking and altitude measurement

Reliable and low-power code and data storage in a tiny footprint

Products with smallest form factors enable high functional integration

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Surveillence camera

Security camera and video doorbell

Make your wire-free camera smarter

Advancements in video surveillance technology take indoor and outdoor security solutions to the next level. Smart cameras connected to management systems and cloud platforms can detect intruders more easily and alert users when they sense danger. By equipping cameras and doorbells with reliable connectivity and accurate sensor solutions, security-enhancing IoT features can be implemented, significantly improving the detection of intrusions and other unusual behavior.

Camera hardware improvement enables differentiated features to move from the cloud to the edge. Cameras become an active component in smart homes, not just passive observers. Wireless cameras and doorbells often demand low power with high integration features.

Infineon offers a broad range of products to make security cameras and video doorbells smart and connected. The ultralow power, high-performance AIROC™ wireless connectivity solution portfolio for Matter-enabled Wi-Fi and Bluetooth® solutions offers reliable, secure connections to cloud and management systems at all times, while linking cameras and doorbells to the whole smart home. Sensors such as Infineon's XENSIV™ radar sensors can help overcome bandwidth limitations, for example, by the waking-up function and reducing false positives when motion near the camera is detected. The XENSIV™ MEMS Microphone enables sound or voice and notification. At the same time, Infineon's embedded security solutions make connected cameras more robust against cyberattacks.

Infineon's best-in-class low-power MCU and wireless support for cameras and doorbells, often are battery-operated and rely on a persistent connection to the cloud with low-latency wakeup capability.

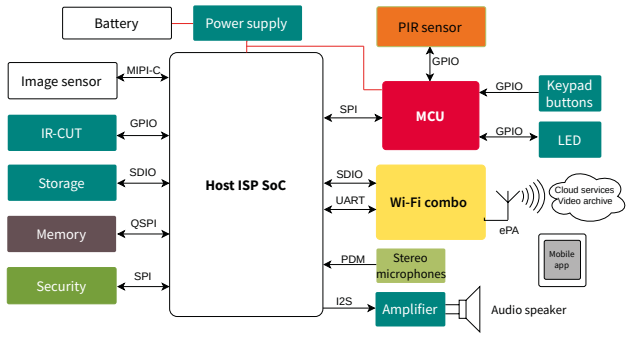
Features and benefits

Key features	Key benefits
– Reliable and robust connectivity with Wi-Fi 6/6E	– Improvement in coverage, deploy density, latency, throughput, etc.
– Low-power Wi-Fi and MCU	– Longer battery life
– Connectivity processor in wireless solution	– Offloading host burden for power saving; BOM reduction
– Matter-enabled for easy interoperability	– Interoperability between devices in smart homes
– Highly accurate set of sensors with low power consumption	– Accurate data collection for new use cases, e.g., wake-up functions with radar sensor
– Turnkey embedded security solutions	– Ensuring device integrity and robust design against cyber attacks

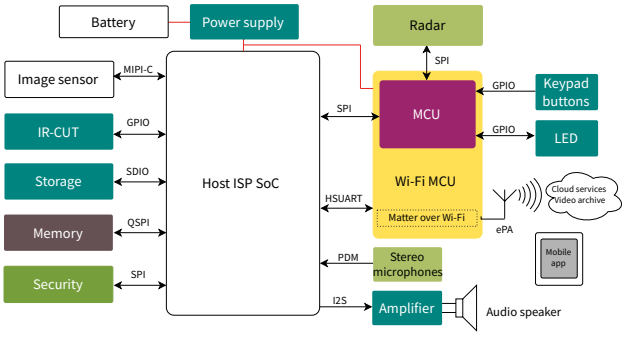
Click here to learn more:
www.infineon.com/doorbell-camera



Current generation block diagram – battery powered



Next generation block diagram – battery powered



Sensing		Security	MCU	Memory
MEMS Microphone – IM69D128S (low power) – IM72D128 (high SNR) – IM68A130 (low power) – IM73A135 (high SNR/AOP)	**Radar IC** – BGT60LTR11AIP (60 GHz) – BGT60UTR11AIP (60 GHz) – BGT60TR13C (60 GHz)	**OPTIGA™ Trust M** **OPTIGA™ TPM** – SLB 9670 TPM	– PSOC™ 4 M0/M0+ processor – PSOC™ 6 M4/M0+ processor	– SEMPER™ Nano flash

Wi-Fi			
Good	**Better**	**Best**	**Wi-Fi 6/6E**
CYW43439 – Single band, 1x1 11 n, iPA. SDIO – Low power – BT/BLE 5.0 UART – TCP/IP keep alive – WPA3 – Antenna diversity – Cost-effective connectivity	**CYW4373** – 1x1 11 ac dual-band, USB and SDIO – TCP/IP keep alive – WPA3 – Antenna diversity – External PA for long range **CYW43012 for low power** – Ultralow-power, 28 nm – 802.11a/b/g/n-compliant, dual-band – TCP/IP keep a live – High volume production, field-proven in battery cameras – No capacity constraints	**CYW5459x for high performance** – RSDB, MU-MIMO, 2x2 11 ac – 80 MHz channel, up to 867 Mbps – PCIe 3.0 and SDIO 2.0 Wi-Fi – BT/BLE 5.1 – 2- and 3-antenna configurations **CYW43022 for ultralow power** – 43012 pin-compatible “drop-in” replacement with no RBOM change – New Deep Sleep mode enabling improved DTIM power states – ROM update frees up run-time RAM space for features and patches	**CYW5557x** – 2x2 11 ax, tri-band capable – Integrated high-power front end – Highest throughput -1.2 Gbps max. – Advanced coexistence – Novel long-range extension modes for devices **CYW5551x for low power** – 1x1 11 ax, tri-band, 20 MHz for IoT – Improved transmit power and sensitivity for long range – Ultralow power, extended battery life – Low power networking offloads **CYW5591x for Wi-Fi MCU** – 1x1 SISO 20 MHz for IoT – Tri band 2.4/5/6 GHz – Wi-Fi connected MCU (CM33 192 MHz) – Bluetooth® LE 5.4 – Full host offloading SW package – System level power saving and BOM reduction

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www.infineon.com/doorbell-camera



USB PD charger

USB-C chargers and adapters

Outstanding solutions offering for mobile chargers and laptop adapters

USB-C power delivery (USB-PD) has become the standard for charger and adapter solutions. Furthermore, from smartphones to laptops, smart speakers to TVs - USB-PD is now the go-to power supply and the enabler of fast charging. USB-C power delivery (USB-PD) has revolutionized how we charge our mobile devices, providing a unified and speedy charging experience. The implementation of USB-C technology has significantly enhanced the convenience for end-users. In addition, with the incorporation of GaN power transistors and higher switching frequencies, it is now possible to produce chargers and adapters that are both compact and lightweight.

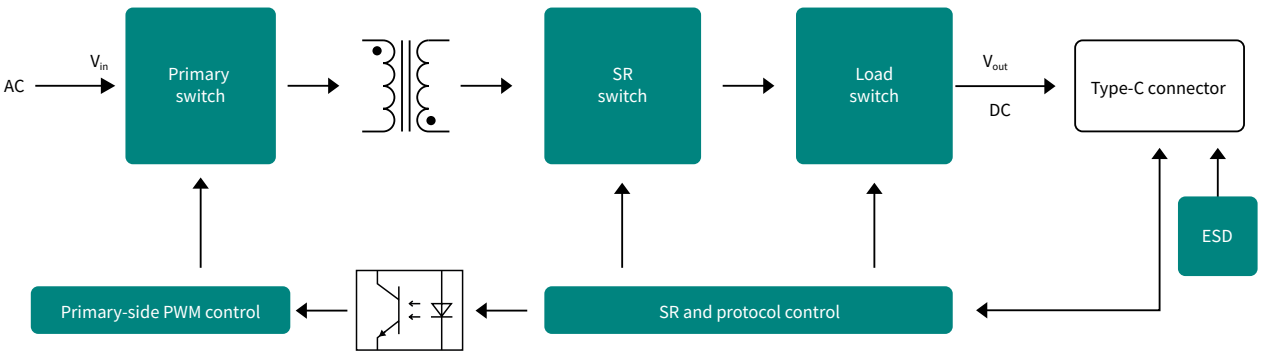
Infineon offers a leading portfolio of power controllers, flexible and programmable USB Type-C controllers, high-voltage CoolMOS™ superjunction MOSFETs, medium- and low-voltage OptiMOS™ MOSFETs as well as CoolGaN™ discretes and integrated power stages.

Our USB-C reference and demo designs are based on quasi-resonant (QR), zero-voltage switching (ZVS), and hybrid flyback (HFB) operation for different power levels and power density requirements, and for single- and dual-output chargers.

Features and benefits

Key features	Key benefits
– Ready-to-use reference designs – Comprehensive offering of power and protocol controllers, high- and low-voltage switches and TVS diodes allow customers to source all components from a single supplier – Highly integrated solutions	– Ease of use and reduced complexity
– Smallest form factor, low $R_{DS(on)}$ and low parasitic capacitances, Kelvin-source engaged Thin-PAK and PQFN packages – Digital controllers enabling high-efficiency designs	– High-efficiency designs
– Fully programmable USB-C PD port controllers – Configurability and upgradability	– Differentiation and short time-to-market
– Infineon has the largest installed in-house power semiconductor capacity with 12-inch wafer production for discretes for maximum supply security – Dedicated supply chain programs to secure capacity and enable flexibility to demand fluctuations	– Secured supply chain

Application diagram



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Recommended products

Functional block	Product category	Topology	Product family	Benefits
Flyback converter	High-voltage power devices (Si MOSFETs and GaN transistors)	Quasi-resonant flyback (QR)	600 V/700 V/800 V CoolMOS™ P7	– Fast switching speed for improved efficiency and thermals – Reduced gate charge for enhanced light-load efficiency – Optimized gate-to-source voltage (V_{GS}) threshold for lower turn-off losses
			600 V/650 V CoolMOS™ C7	– High switching performance enabling highest efficiency – Ease of use level high – Optimized devices for highest efficiency switched-mode power supplies
		Active clamp flyback (ACF) Hybrid flyback (HFB)	600 V CoolMOS™ PFD7	– Robustness and reliability with integrated robust fast body diode and up to 2 kV ESD protection – Reduced gate charge for enhanced light-load efficiency – Lower hysteresis loss
		Flyback (QR, ZVS, ACF, HFB)	CoolGaN™ Transistor 650 V/700 V	– Highest efficiency – Highest power density
	Controller	Hybrid flyback controller	XDPS2201	– Asymmetrical half-bridge ZVS control to maximize efficiency – Supports a wide range of configurable parameters – Supports ultrahigh power density (20 W/in^3) design
		QR flyback controller	EZ-PD™ PAG1P/S	– Secondary-side-controlled flyback solution – Dual-chip flyback solution with integrated SR+PD controller
			EZ-PD™ PAG2P/S	– Secondary-side-controlled flyback solution – Dual-chip flyback solution with integrated SR+PD controller supports 28 V EPR and SPR – ACF topology supported – Leakage energy recycling and ZVS switching
	Gate driver IC	Active clamp flyback (ACF)	IRS25752L	– High-side gate driver enables active clamp mode of operation – Cost-effective, 600 V, single-channel driver in SOT23 package
			IRS21271S	– High-side gate driver enables active clamp mode of operation – 600 V, single-channel driver with overcurrent protection (OCP)
PFC DC-DC	High-voltage power devices (Si MOSFETs and GaN HEMTs)	DCM PFC	600 V CoolMOS™ P7	– Fast switching speed for improved efficiency – Reduced gate charge for enhanced light load efficiency – Optimized gate-to-source voltage (V_{GS}) threshold for lower turn-off losses
		DCM/CCM PFC	CoolGaN™ Transistors 650 V/700 V	– Highest efficiency contribution via less parasitic parameter – Space saving with SMD smaller package
	Boost diode	DCM/PFC	650 V Rapid 1 diodes	– Low conduction losses
	Controller	PFC/LLC combo	IDP2308	– Digital multimode PFC and LLC combined controller with a floating – High-side driver and a startup cell – Comprehensive and configurable protection features – Wide set of configurable parameters
	Controller	PFC/HFB combo	XDPS2221	– Digital multimode PFC and HFB combined controller – High-side driver and a 600 V startup cell – Integrated gate drivers supporting GaN switches – Configurability for protections and system performance
			XDPS2222	– Digital multimode PFC and HFB combined controller – High-side driver and a 600 V startup cell – Integrated gate drivers supporting GaN switches – Configurability for protections and system performance – Supports extra wide output voltage range with MFIO switching depending on output voltage
	High-voltage power devices (Si MOSFETs and GaN HEMTs)	HB LLC	600 V CoolMOS™ P7	– Fast switching speed for improved efficiency and thermals – Reduced gate charge for enhanced light load efficiency – Optimized gate-to-source voltage (V_{GS}) threshold for lower turn-off losses
			CoolGaN™ integrated power stages	– Highest efficiency and highest power density – Isolated gate driver integrated
	Gate driver IC	HB LLC	EiceDRIVER™ Compact: 1EDI60N12AF, 1ED3124MU12F	– Isolated gate driver, up to 14 A, 100 ns propagation delay
Synchronous rectifier	Low-voltage MOSFETs	Synchronous rectification	OptiMOS™ PD 60-150 V	– Low conduction losses, reduced overshoot – Adapter-oriented synchronous rectification MOSFETs
	Control ICs	Synchronous rectification	EZ-PD™ PAG1S	– Integration of synchronous rectification and PD controller – Configurable protection, like OTP, OCP, OVP, UVP, short circuit, etc.
			EZ-PD™ PAG2S	– Integration of synchronous rectification and PD 3.1 controller – Configurable protection, like OTP, OCP, OVP, UVP, short circuit, etc.
Protocol controller	USB-C ICs	Protocol controller	EZ-PD™ PAG1S	– Supports USB PD 2.0, PD 3.1 with PPS, QC4+, QC 4.0, QC 3.0, QC 2.0, Samsung AFC, Apple charging, and BC v1.2 charging protocols
			EZ-PD™ PAG2S	– Supports PD 3.1 28 V EPR and SPR
		PD controller	EZ-PD™ CCG3PA-NFET	– Supports USB PD 3.1 with Programmable Power Supply (PPS) – Independent constant current (CC) and constant voltage (CV) modes – Configurable OVP, OCP, and OTP – Integrates NFET gate driver to drive the load switch 64 kB flash memory
			EZ-PD™ CCG3PA	– Supports USB PD 3.1 with PPS, QC4, Apple 2.4 A charging, AFC, – BC1.2 etc. – Supports 1C and 1A port – 64 kB flash memory
		Multiport controller	EZ-PD™ CCG7DC	– Integrates 2 USB-C PD controllers + 2 DC-DC controllers in one single chip – Supports latest USB-C PD v3.0 with PPS, QC4+, QC4.0, Samsung AFC, Apple 2.4 A, Cv1.2 – Configurable switching frequency of 150 kHz to 600 kHz – Arm® Cortex®-M0 with flash allows users to implement custom features
Connector	ESD	ESD protection	Multipurpose diodes for ESD protection	– Small packaging to support minimum board space consumption – High linearity - reducing harmonic generation/enabling suppression EMC problems – Exceptional quality and reliability

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Battery chargers

Complete offering for consumer, industrial, and light e-mobility chargers

Infineon's battery charger solutions are designed to fit various topologies and power ratings for applications like e-bikes, e-scooters, and e-forklifts. Whether the design requires ultrahigh efficiency or a cost-performance-oriented implementation, we help you simplify the design process and accelerate the time-to-market.

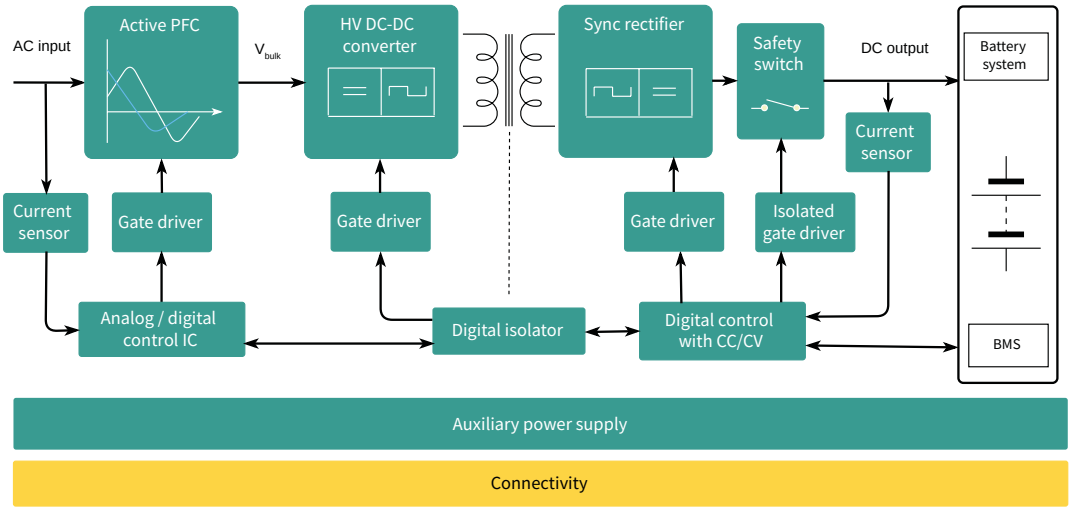
The XDP™ XDPS2221 controller is a highly integrated digital IC that combines a multimode PFC controller and a DC-DC hybrid-flyback (HFB) controller, offering harmonized operation of the two power stages. Further integrating all gate drivers and a 600 V high-voltage start-up cell for the initial IC voltage supply enables a low external component count. Infineon's reference designs, such as REF_XDPS2201_170W_BPA2, feature a very wide output voltage and a smaller transformer size, one of the topology's key advantages.

Features and benefits of HFB topology enabled by XPD™ controllers

Key features	Key benefits
– Very wide output voltage range	– Support of extended charging profiles and multi-voltage designs
– Superior efficiency over the entire voltage and load ranges	– High power density and fanless operation
– Compact transformer size	– Compact form factor and reduced system cost
– Optimized for a low system stand-by power	– Ready to meet most stringent efficiency standards

GaN technology, when paired with the zero voltage switching (ZVS) operation of a hybrid flyback topology, enables the design of highly efficient and compact battery chargers. Specifically, fast-switching of GaN transistors, combined with their low gate charge Q_g and zero recovery loss Q_{rr}, drastically reduces switching losses. This loss reduction is further enhanced by the ZVS technique, which minimizes EMI filter losses, leading to higher efficiency and less power dissipation. Infineon's CoolGaN™ portfolio of 650 V GaN power transistors, available in a variety of packages and $R_{DS(on)}$ ratings, allows for optimized designs tailored to specific power and thermal requirements. Ultimately, this translates to smaller, more cost-effective chargers with increased power density.

Application diagram





Click here to learn more:

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www.infineon.com/XDPS2221
www.infineon.com/ICC80QSG
www.infineon.com/ICL8810
www.infineon.com/CoolSET-FF



For higher power applications like 1.5 kW e-scooter chargers, Infineon offers a complete ecosystem of components for designs based on the totem-pole PFC and half-bridge LLC converter, enabling accelerated time-to-market. The totem pole PFC stage, known for its high efficiency due to eliminating the bridge rectifier losses compared to the traditional boost PFC, benefits significantly from wide bandgap devices. Infineon provides all the key components for this stage, including high-performance CoolSiC™ G2 SiC MOSFETs optimized for the high-frequency operation and demanding switching requirements in the topology, as well as the necessary XMC™ 1400 MCU series for digital control, complete with reference firmware to speed up the development. For the half-bridge LLC DC-DC stage, Infineon offers a choice of either CoolGaN™ Transistors 650 V G5 or 600 V CoolMOS™ 8 Si superjunction power switches in a variety of package options, allowing designers to achieve their design goals. Yet again, Infineon provides reference firmware tailored to the LLC stage, further streamlining the design process and ensuring a fast path to a production-ready charger for light e-mobility applications.

1.5 kW 48 V Li-ion charger BOM example

Application	Product type	Product/product family	Package
Totem-pole PFC	Fast leg switch	CoolSiC™ MOSFETs Generation 2	IMDQ75R040M1H
	Slow leg switch	CoolMOS™ 8	IPDQ60R016CM8
	Gate driver IC	EiceDRIVER™ Gen 2	2EDB9259Y, 2EDB8259Y
	Control MCU	XMC™	XMC1404-F064X0128 AA
	Auxiliary supply	CoolSET™ Gen 5	ICE5QSBG
Resonant HB LLC	PWM switch	CoolMOS™ 8	IPDQ60R037CM8
	Gate driver IC	EiceDRIVER™ Gen 2	2EDR8259X
	Digital isolator	ISOFACE™	4DIR1400H
	Control MCU	XMC™	XMC4200-F64K256 BA
Synchronous rectifier	PWM switch	OptiMOS™ 6	ISC055N15NM6
	Gate driver IC	EiceDRIVER™ Gen 2	2EDB7259Y
Main controller	Control MCU	XMC™	XMC4200-F64K256 BA

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www.infineon.com/batterychargers
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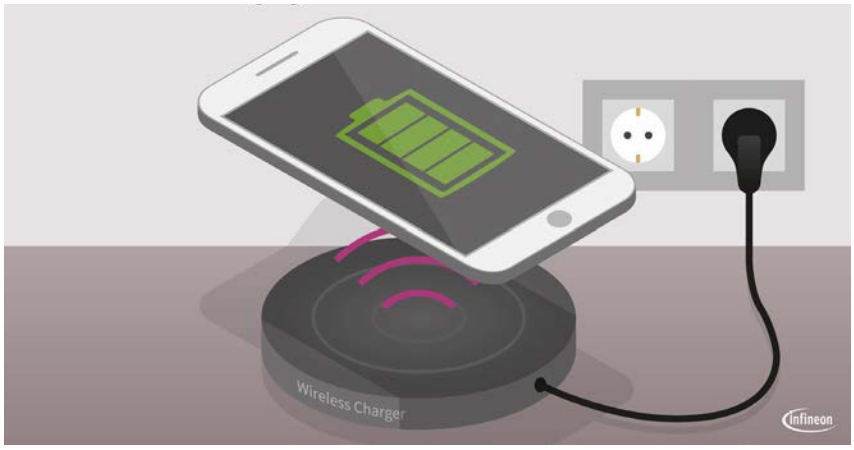


Wireless charging

Cost-effective and secure system solutions for consumer, industrial and automotive applications

Infineon offers a broad portfolio of efficient, high-quality products and solutions to serve the key requirements of the dominant market standards: inductive (Qi (WLC)) and resonant (AirFuel) in consumer, industrial, and automotive.

Overcome common design challenges with Infineon



- Compatibility issues
- Safety issues
- Smart heat management
- Increasing efficiency and reducing charging times
- Preventing device and battery damage

Applications that benefit from wireless charging



Infineon's key enabling products for wireless charging

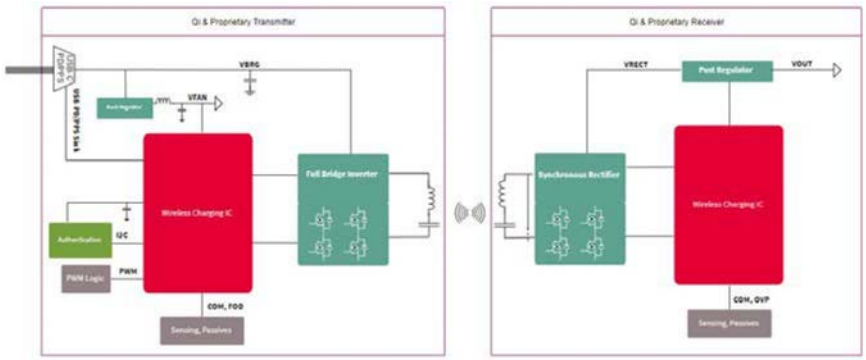
- Wireless charging ICs (WLC)
- Power MOSFETs – OptiMOS™, StrongIRFET™, and CoolMOS™
- P-channel and N-channel small signal power MOSFETs
- Gate driver ICs – EiceDRIVER™: MOTIX™ 3-phase gate driver IC
- Authentication - OPTIGA™ Trust Automotive, OPTIGA™ trust auto
- XMC™, XMC™-SC (including software IP), TRAVEO™ MCU Automotive, AURIX ™, PSOC™
- USB-C and power delivery (PD): EZ-PD™ CCG3PA, EZ-PD™ PAG1, EZ-PD™ PAG2, EZ-PD™ CCG7S, EZ-PD™ CCG7D
- PWM/flyback controllers and integrated power stage ICs – CoolSET™
- GaN GIT HEMT - CoolGaN™
- Voltage and buck regulators for component and bridge supply
- Reverse Conducting IGBTs R5/R6 - 650 V

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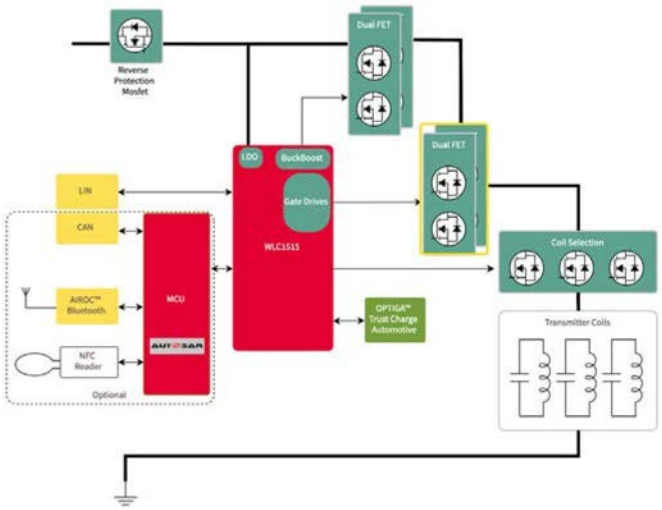
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Inductive wireless charging for consumer and industrial

Example: 50 W inductive system solution



Inductive wireless charging for automotive



Key components for inductive designs for consumer, industrial and automotive

Wireless charging product portfolio for inductive

Sub-application	Products	
Wireless charging IC	WLC1115-68LQXQ transmitter IC WLC1150-68LQXQ transmitter IC WLC1515-68LQXQ transmitter IC for automotive	
MOSFETs*	30 V	BSC0996NS, BSC0993ND, BSZ0909NS, BSZ0909ND, BSZ0910ND, IRFHS8342
	40 V	BSZ097N04LS, BSZ063N4LS6, BSC035N04LSG, BSC072N04LD
	60 V	BSZ099N06LS5, BSZ065N06LS5, BSZ040N06LS5
	80 V	IRL80HS120
	100 V	IRL100HS121, BSZ146N10LS5, BSZ096N10LS5
Driver IC	WCDSC006, PX3519, IRS2301S, 1EDN7512B, 1ED44173N01B, 1EDI60N12AF, 2EDN7524G, IRS2007M, 2ED2182S06F, 6EDL7141	
Microcontroller	XMC™, AURIX™ XMC™-SC (including software IP), PSOC™ family 4, TRAVEO™ (automotive)	
Voltage regulators	TLE4296G V33, TLF50211EL, TLE8366EV	
MCU + BLE controller	PSOC™ 4 Bluetooth® Low Energy (Bluetooth® Smart): CY8C4248LQI-BL573 (QFN)	
AIROC™ Bluetooth® LE and Bluetooth®	CYW20719B2/CYW20721B2	
USB-C and power delivery (PD)	EZ-PD™ PAG1, EZ-PD™ PAG2, EZ-PD™ CCG3PA, EZ-PD™ CCG3, EZ-PD™ PMG1, EZ-PD™ barrel connector replacement (BCR)	
Small signal MOSFETs	See the portfolio on our webpage small signal MOSFETs	
Authentication	SLS32AIA020Ux – OPTIGA™ Trust Charge (USON10 3x3 package) OPTIGA™ Trust Charge automotive	
Reverse conducting IGBTs R5/R6 - 650 V	Package TO-247 IHW30N65RS (30 A), IHW40N65R5 (40 A), IHW50N65R5 (50 A)	
Reference designs and kits	REF_WLC_TX15W_C1 – 15 W Qi power transmitter solution REF_WLC_TX50W_N1 – 50 W transmitter solution REF_WLCAUTO_TX15W_C1	

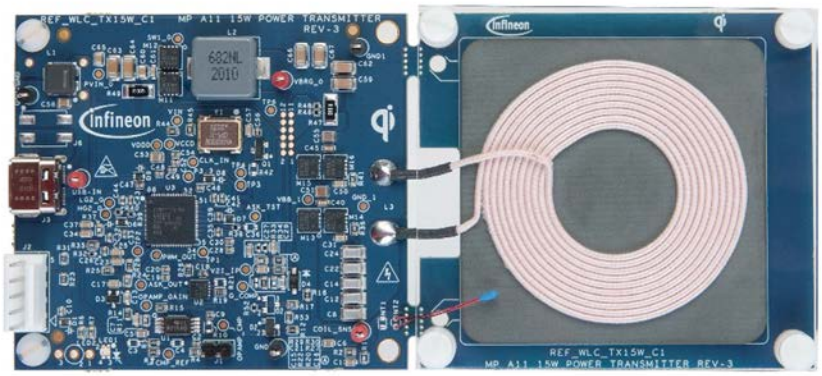
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* Explore more MOSFET offerings on our webpage

15 W Qi transmitter solution with Infineon's wireless charging IC WLC1115

The REF_WLC_TX15W_C1 MP A11 power transmitter solution board is a highly integrated, Qi v1.3 compliant extended power profile (EPP) transmitter design. This reference board is powered using a USB PD 3.0-compliant USB-C power adapter and can support DC connector input of 9 - 20 V through firmware option. Combined with the OptiMOS™ power MOSFETs and OPTIGA™ Trust Charge, this solution offers a highly efficient and secure wireless charging platform. The solution board supports firmware upgrades using USB-C or I²C interface the included dongle and the wireless charging configuration graphical user interface (GUI). There are additional options provided for firmware updates using serial wire debug (SWD) while using the ModusToolBox™ and programmer.



Key components

- Wireless charging IC – WLC1115-68LQXQ
- OptiMOS™ power MOSFETs – BSZ0910LS
- OPTIGA™ Trust Charge – SLS32AIA020Ux
- Small Signal MOSFETs



Features and benefits

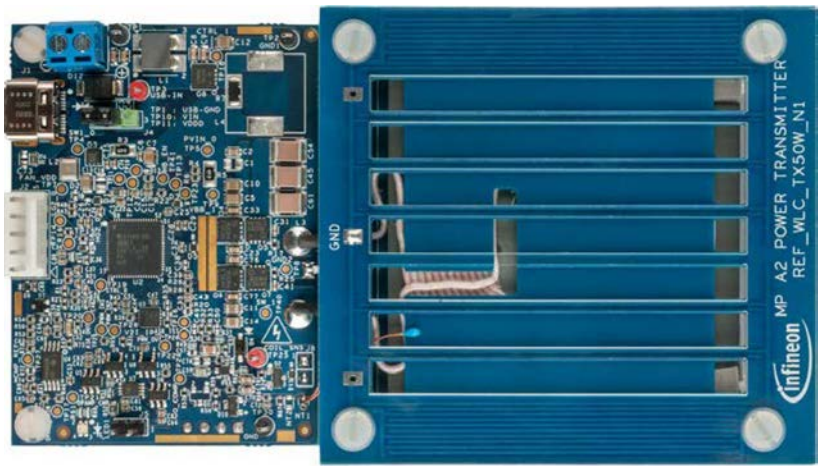
Key features	Key benefits
– Qi v1.3 compliant transmitter	– Compliant Qi stack with library support
– UDB-PD/legacy protocol input >9 V_{DC}	– Programmable solution for evolving Qi standard
– Peak system efficiency >83%	– Zero voltage switching for high efficiency
– Typical active charging area ±10 mm	– Configurable gate drivers for EMC
– Serial communication ports: I²C, UART	– Configurable thresholds for FOD, protection
– Programming, EXT clock option	
– Foreign object detection with LEDs	
– Configurable using wireless charging GUI	

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50 W transmitter solution with Infineon's wireless charging IC WLC1150

The REF_WLC_TX_50W_N1 transmitter solution board using WLC1150 enables high-performance and low-cost wireless charging solutions for various applications up to 50 W output power. The configurable WLC1150 solution, with Infineon's OptiMOS™ power devices offer highly efficient charging with flexible thermal management options. Combined with Infineon's USB-C charger solutions, it offers a complete product package that can help meet stringent regulatory and compliance requirements. The WLC1150 uses Infineon high power proprietary protocol to deliver 50 W power. It is also compatible to Qi 1.3.x specification with extended power profile (EPP), basic power profile (BPP), and proprietary power delivery extension (PPDE). The controller is offered with both configuration utility and ModusToolbox™ software options to develop your wireless charging solutions for proprietary charging protocols as well as Qi latest specification.



Key components

- Wireless charging IC – WLC1150-68LQXQ
- OptiMOS™ power MOSFETs – BSZ0910LS
- OPTIGA™ Trust Charge – SLS32AIA020Ux (optional)
- Small signal MOSFETs



Features and benefits

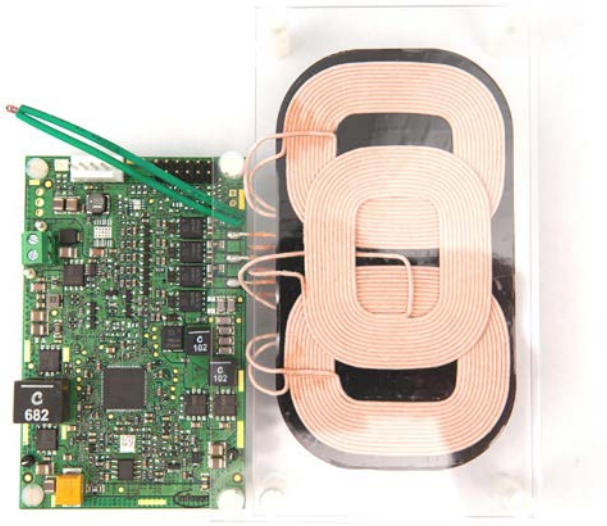
Key features	Key benefits
– High power proprietary charging up to 50 W	– 50 W transmitter with software included
– Qi v1.3.x compliant transmitter (MP-A2 and similar)	– Adaptive foreign object detection (FOD)
– Integrated USB-PD/PPS sink functionality	– Adjustable protection – OVP, OCP, OTP
– Integrated DC-DC controller for fan that enables thermal management	– Graphical utility tool for ease of configuration, debug without code
– Integrated gate drivers for buck-boost, inverter	– ModusToolbox™ Software Library for Infineon Proprietary, Qi Stack
– Input voltage range: 4.5 - 24 V	
– Communication ports: I²C, UART	
– Temperature range: -40°C - 105°C	
– Packing type: tray	

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15 W automotive transmitter solution with Infineon's wireless charging IC WLC1515

The REF_WLCAUTO_TX15W_C1 MP A13 power transmitter solution board using WLC1515 is a highly integrated, Qi v1.3 compliant Extended Power Profile (EPP) transmitter design ideal as a scalable platform for automotive in-cabin charger. It can also support basic power profile (BPP), Proprietary power delivery Extensions (PPDE), and custom protocols. This reference board operates with variable automotive battery input voltage of 9 - 18 V, supporting reverse polarity protection and auto transients. Its integrated buck-boost controller enables a low EMI fixed frequency mode of operation. On-chip LIN or serial communication interfaces with the Host system for additional functionality. With an optional external automotive MCU such as TRAVEO™ T2G, it is possible to add AUTOSAR, CAN, and NFC interface functionality. The solution board supports firmware updates using Serial Wire Debug (SWD) while using the ModusToolbox™ and programmer.



Key components

- Wireless charging IC - WLC1515-68LDXS
- OptiMOS™ automotive MOSFETs
- OPTIGA™ Trust Charge auto

Features and benefits

Key features	Key benefits
– Integrated Qi controller	– Qi stack with library support
– Input voltage range: 4.5 - 24 V (40 V tolerant)	– Fixed frequency operation for low EMI
– Output power: 15 W Qi EPP free position	– Configurable gate drivers for EMC
– Programmable high-side current sense amplifier	– Configurable thresholds for FOD, protections
– Gate drivers for full-bridge inverter	– ModusToolbox™ code examples
– Coil selection control	
– Integrated buck-boost controller	
– 150 - 600 kHz switching frequency for synchronous buck-boost	
– Integrated gate drivers with slew rate and dithering controls	
– Comprehensive protection: UVLO, OVP, OCP, and OTP	
– LIN and Host Interface	
– In-built LIN interface to LIN transceiver	
– Interface for external MCU over I^2C	
– Configurable firmware registers	

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Key components for resonant designs for consumer and industrial

Wireless charging product portfolio for resonant

Sub-application	Products	
MOSFETs**	30 V	IRLHS6376PBF, BSZ0909ND, BSZ0910ND, IRLML0030PBF
	40 V	IRLML0040
	60 V	IRLML0060
	80 V	IRL80HS120
	100 V	IRL100HS121
	150 V	BSZ900N15NS3, BSZ520N15NS3
	200 V	BSZ900N20NS3, BSZ22DN20NS3, BSZ12DN20NS3
	250 V	BSZ42DN25NS3
Driver ICs	EiceDRIVER™ 2EDL71, 1EDN7512, 2EDN7524, 2ED2182S06F, 2ED24427N01F, 1EDI60N12AF, 1ED44173N01B	
	EiceDRIVER™ for CoolGaN™ GIT HEMTs 1EDS5663H, 1EDF5673F, 1EDF5673K	
GaN e-mode HEMTs	CoolGaN™ GIT HEMT 600 V IGT60R190D1 (HDSOF-8-3)	
Microcontroller	XMC™, AURIX™ MCU and wireless power controller XMC™-SC (including software IP), PSOC™ family 4	
MCU + BLE Controller	PSOC™ 4 Bluetooth® Low Energy (Bluetooth® Smart): CY8C4248LQI-BL573 (QFN)	
AIROC™ Bluetooth® LE & Bluetooth®	CYW20719B2/CYW20721B2	
USB-C and power delivery (PD)	EZ-PD™ PAG1, EZ-PD™ PAG2, EZ-PD™ CCG7S, EZ-PD™ CCG7D, EZ-PD™ CCG3PA, EZ-PD™ CCG3, EZ-PD™ PMG1, EZ-PD™ barrel connector replacement (BCR)	
Voltage regulators	TLE4296G V33, TLE4296G V50, TLE4296-2G V33, TLE4296-2G V50, TLF50211EL, TLE8366EV, TLE8366EV33, TLE8366EV50	
Small signal MOSFETs	See the portfolio on our webpage small signal MOSFETs	

Are you searching for a turnkey solution for your application?



Wireless power has become an important part of our connected lifestyles. Infineon emphasizes the development of next-generation technologies and standards that allow easy charging without the limitation of wires. What started with phones will quickly evolve - applications such as tablets, laptops, robots, drones, power tools, handheld gaming devices, medical devices, infrastructure, and applications around Industry 4.0 will include wireless charging. For more information, please get in touch with us via www.infineon.com/support to get your customized system solution.

Click here to learn more:

www.infineon.com/wirelesscharging
www.infineon.com/wirelesscharging-ics
www.infineon.com/usb-charging-solutions
www.infineon.com/gan
www.infineon.com/optimos
www.infineon.com/optiga

** Explore more MOSFET offerings on our webpage



LED lighting

Solutions for cost-sensitive applications as well as for smart lighting

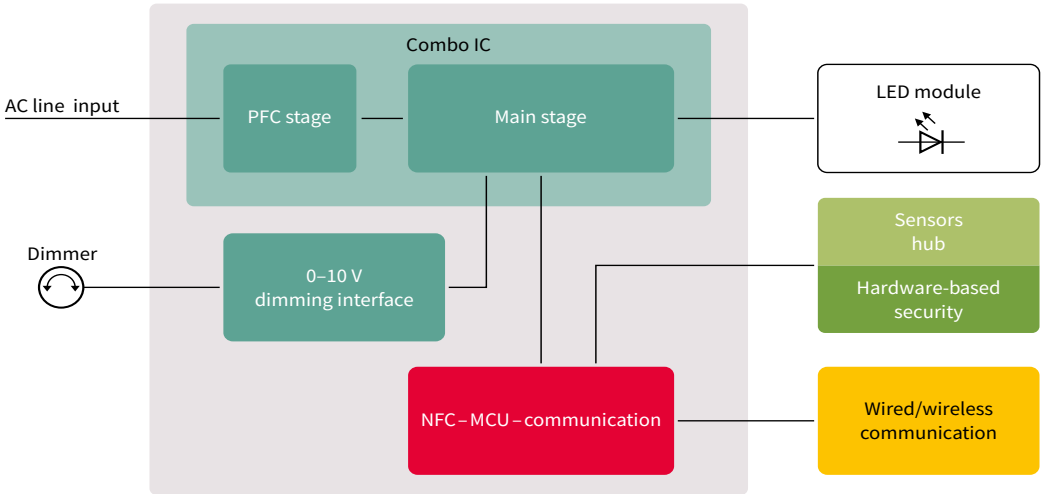
Infineon supplies tailored products for LED drivers, LED strips, horticultural, and smart lighting. Our broad portfolio of LED lighting comprises LED driver ICs, MOSFETs, and microcontrollers suited for LED drivers, sensors, and dedicated ICs for secure communication. In addition to offering products of proven quality, a competent global lighting team supports our lighting customers in designing LED lighting products and systems in collaboration with our channel partners.



Key trends and challenges in LED lighting and our offering:

- Human-centric lighting (HCL)
  - The lowest cost implementation of tunable white with single-stage flyback constant voltage and smart linear regulators with advanced headroom control ensuring high efficiency
- Configuration of output current and some further parameters
  - Our NFC controller allows the configuration of the output current without the need for an additional microcontroller
  - Our XDPL lighting IC family allows, besides output current, also adjustment of other features like protection, dimming curves, etc.
- Cost reduction combined with efficiency increase
  - Integration of resonance inductor for PFC + resonant topology enables highest efficiency at low cost
  - Integration is enabled by the coreless transformer technology that enables high switching frequencies
- Higher performance in efficiency and power density
  - Infineon GaN solutions enable innovative system designs that meet the highest standards and deliver outstanding performance

LED drivers



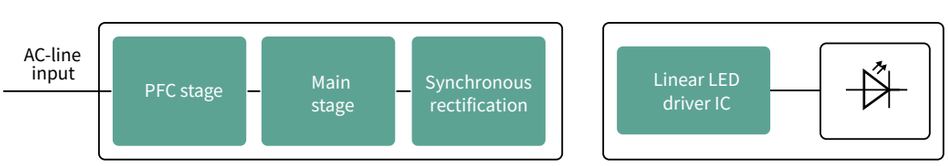
Click here to learn more:
www.infineon.com/lighting



Recommended LED driver products

Functional block	Product type	Product family	MOSFET technology	Voltage class
PFC stage	PFC	IRS2505	CoolMOS™ P7 CoolMOS™ 8	600 V/700 V/800 V/950 V [1] 600 V
Main stage	PFC + LCC (constant current) PFC + LLC (constant current)	ICL5102 [2]	CoolMOS™ P7 (up to 600 mΩ) CoolMOS™ PFD7 CoolMOS™ 8	600 V/600 V 600 V
			CoolMOS™ CE (above 600 mΩ) CoolMOS™ 8	600 V 600 V
		ICL5102HV [2]	CoolMOS™ PFD7 CoolMOS™ 8	950 V 600 V
	PFC + flyback (dual-stage)	XDPL8221 [3]	CoolMOS™ P7 CoolMOS™ 8	800 V/950 V 600 V
	PFC/flyback (single-stage constant current)	XDPL8105	CoolMOS™ P7 CoolMOS™ 8	800 V/950 V 600 V
	PFC/flyback (single-stage constant voltage)	XDPL8219	CoolMOS™ P7 CoolMOS™ 8	800 V/950 V 600 V
	PFC/flyback (single-stage constant voltage)	ICL8800/ICL8810/ ICL8820/ICL8830	CoolMOS™ P7 CoolMOS™ 8	800 V/950 V 600 V
	PFC, flyback low-side gate driver	1EDN7550B	any CoolMOS™ SJ MOSFETs	-
		2EDN8524F	any CoolMOS™ SJ MOSFETs	-
	Half-bridge LLC gate driver	2ED2101S06F	any CoolMOS™ SJ MOSFETs	650 V (SOI)
		1EDI20N12AF	any CoolMOS™ SJ MOSFETs	1200 V (coreless transformer/CT)
		2EDF7275F	any CoolMOS™ SJ MOSFETs	650 V (coreless transformer/CT)
	GaN transistors	CoolGaN™	-	600 V - 700 V
	DC-DC multi-topology controller	LITIX Power - TLD6098-1EP	any CoolMOS™ SJ MOSFETs	60 V
	DC-DC 4-switch buck boost controller	LITIX Power - TLD5191ES	any CoolMOS™ SJ MOSFETs	45 V
Buck/linear solutions	Secondary buck (single-channel) Secondary buck (multichannel)	ILD8150	integrated	80 V
	High-side buck gate driver	1EDB8275F	any CoolMOS™ SJ MOSFETs	650 V
	Low-side buck gate driver	1EDN8511B	any CoolMOS™ SJ MOSFETs	-
	Secondary linear controller with feedback	BCR601	small signal MOSFETs	75 V/100 V
	Tunable white with linear LED driver	BCR601, BCR602	small signal MOSFETs	75 V/100 V
Dimming	0-10 V dimming interface IC	CDM10V	-	-
		CDM10VD	-	-
Microcontroller	XMC™ microcontroller	XMC1100, XMC1200, XMC1300, XMC1400	-	-
	PSOC™ microcontroller	PSOC™ C3	-	-

LED driver with constant voltage output and linear/switch mode LED driver ICs



Linear LED driver IC product portfolio

Functional block	Topology	IC product family	MOSFET technology
Lowest cost LED driver IC	Linear	BCR400W series	Integrated
Low voltage drop LED driver IC		BCR430U/BCR431U	
Robust LED driver IC		BCR40xU/BCR42xU	

For additional portfolio, take a look at Lighting ICs.

1) 700 V, 800 V, and 950 V CoolMOS™ P7 are optimized for PFC and flyback topologies. 600 V CoolMOS™ P7 is suitable for hard- and soft-switching topologies (flyback, PFC and LLC)

2) PFC and resonant combo controllers
3) Higher input voltage
4) In addition to current configuration, also constant lumen output (CLO) feature included

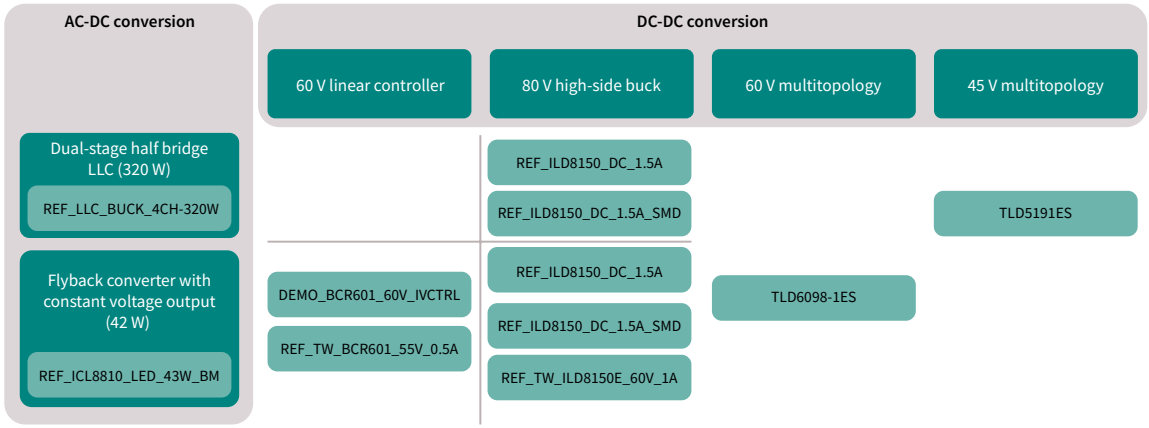
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LEDs
plug & play

Plug and play LEDs solutions

Modular LED lighting reference designs for LLC, buck, and PFC flyback topologies

LED lighting has become a mature technology with stringent requirements on light quality. In order to achieve high light quality, there is a strong trend towards two-stage topologies. These two-stage topologies ensure that the light flicker, also called light ripple, remains at low levels according to the IEEE 1789 standard and other new upcoming regulations. Primary constant voltage output, followed by a DC-DC buck, enables dimming, efficiency, cost, and scalability benefits. Infineon has solutions for both the primary AC-DC stage and the secondary DC-DC buck stage. These solutions can be combined in a plug-and-play concept. In other words, the suitable AC-DC stage and the best-fitting DC-DC stage can be selected and tested depending on the requirements.



Our solutions include but are not limited to:

Low- to medium-power platforms promising tunable white at a low cost



REF_ICL8810_LED_43W_BM



REF_TW_BCR601_55V_0.5A

320 W DCM PFC cost-effective and scalable platform design with up to 4 DC-DC channels



REF_LLC_BUCK_4CH_320W



REF_ILD8150_DC_1.5A

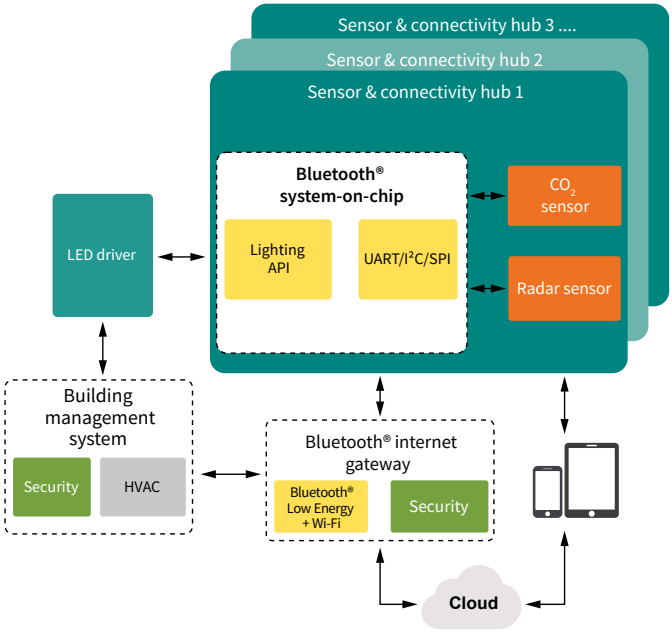
Click here to learn more:
www.infineon.com/leddriver-reference-solutions

Smart lighting

Smart lighting solutions

Connectivity and sensor solutions for connected and smart lighting to facilitate everyday life

In the last few years, connected and smart lighting have gained high momentum in the lighting industry. In this application field, sensing and connectivity play an essential role. Besides helping realize energy savings, they also enable new use cases beyond lighting controls.

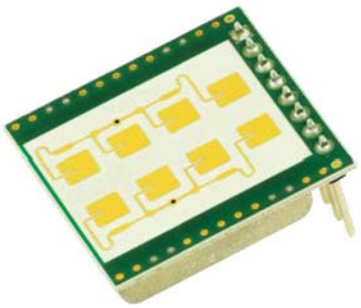


Radar sensor solutions

Passive infrared (PIR) sensors are used to save energy. Novel sensors like radar can overcome weaknesses of PIR sensors, such as poor design, limited detection of micro-movements, and limited area coverage, to name a few. Radar sensors can be seamlessly integrated into the luminaires, enabling a nice design and platform design of luminaires since there is no need for drilling holes as in the case of PIR sensors. Advanced use cases like people counting and tracking can also be ensured with radar technology. In order to add more intelligence to the entire system, connectivity is a key element.

Our partners:
Our system design house partners deliver standard products and customized solutions to fit specific lighting applications, from movement detection through automatic light activation to person counting. In addition, they offer all levels of support to get your intelligent lighting system up and running as quickly and efficiently as possible. See below a list of some of our partner solutions:

Functional block	Topology	IC product family
RF Beam	K-LD2	Presence detection including slight movements
	K-LD7	
InnoSent	INS-313x	Motion detection range up to 5 m
	INS-333x	Motion detection range up to 10 m
Novelic	RIOT100 – NRM302	Turnkey motion and presence sensor solution up to 15 m



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www.infineon.com/makeradar

Bluetooth® Mesh devices and modules for connected and smart lighting applications

Embedding Bluetooth® Mesh networking in lighting systems, including luminaires, fixtures, and wall switches, opens a range of system applications to manage lighting brightness or color, efficiency based on occupancy movements, and correlation of lighting ecosystem components. The range and coverage of Bluetooth® Mesh devices allow for low latency, whole building coverage of automation and occupancy interaction via smartphone and tablet applications, and cloud applications for building management. Infineon provides a range of Bluetooth® Mesh MCUs and certified modules that enable lighting control functionality, safety and occupancy sensor management, and robust, secure, reliable networked managed solutions.

Bluetooth® Mesh SoCs and certified modules: Solutions and benefits

Bluetooth® Mesh system-on-a-chip (SoCs) and certified modules offer a range of efficient and future-proof upgradeable solutions:

Solutions	Benefits
– Module diversity with integrated components ranging from the basic battery-powered sensor to the most sophisticated detection and safety devices	– Accommodating different needs now and in the future
– Fully-integrated modules	– Accelerate time-to-market – Reducing development and manufacturing costs
– Ultrahigh-transmit power designs with integrated antennas	– Enabling long range and unfailing node-node connections
– Integrated CPU, memory (flash and RAM), and I/O	– Suiting all foreseeable applications hosting

Bluetooth® Mesh evaluation kit CYBT-213043-MESH

The Bluetooth® Mesh evaluation kit (CYBT-213043-MESH) enables you to evaluate SIG Mesh functionality and features using the CYBT-213043-02 module. The CYBT-213043-02 module is an integrated, fully certified, 12.0 mm x 16.61 mm x 1.70 mm, programmable Bluetooth® Smart Ready module designed to reduce your time-to-market.

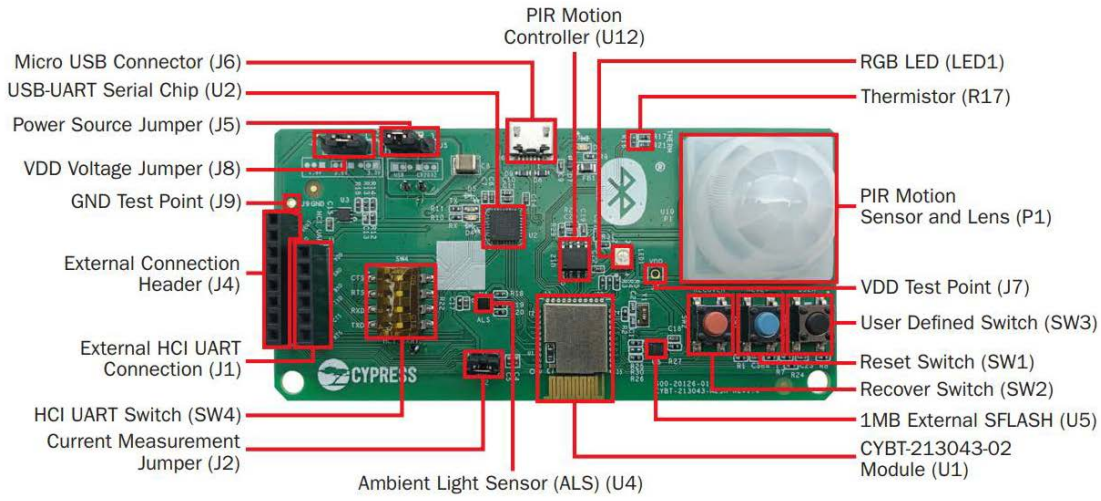
Utilized device: CYW20819

Kit contents:

4x mesh evaluation boards

4x USB A to micro-B cables

1x quick-start guide



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Mesh-enabled, silicon, dual-mode Bluetooth® 5.0 AIROC™ MCUs

	CYW20706	CYW20735	CYW20819	CYW20820	CYW20829
Product features					
TBA processor	CM3	CM4 w/FPU	CM4	CM4	CM33
TBA radio	–	ULP RF	ULP RF	ULP RF	ULP RF
Operating temperature	105°C	85°C	125°C planned	125°C planned	85°C
Transmit power	10 dBm Tx	10 dBm Tx	4 dBm Tx	10 dBm Tx	10 dBm TX
Memory	–	–	256 kB flash	256 kB flash	256 kB flash

Features/integration

Interested in more? We offer a broad silicon portfolio to support your Bluetooth® Mesh design.

Fully-certified Bluetooth® modules (FCC, ISED, MIC, CE)



Load range
Up to 20 dBm transmit power



CYBT-483056-02

Size and simplicity
EZ-Serial support enables fast time-to-market and 9x9 mm size for small form factor application



CYBT-353027-02





Value
Balance of features for cost sensitive applications



CYBT-343052-02

Integration
Fully integrated SoC with lowest power and extended range



CYBT-273063-02



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Wi-Fi enterprise networking and internet connectivity

Wi-Fi networking is the backbone of enterprise, retail, and home internet connectivity. Wi-Fi is the bridging medium for Bluetooth® Mesh networks to enterprise networks and cloud applications, capturing messaging across the lighting installation for secure enterprise building management applications. Wi-Fi can connect sensors and fixtures directly to enterprise or home access points for long-range or integrated solutions, including security lighting and cameras. Infineon offers a range of secure, high-performance, enterprise-ready Wi-Fi solutions that can be added to switches, panels, and lighting bays. These solutions can be stand-alone network nodes or offer Bluetooth® Mesh Gateway services bridging Mesh-networked devices to cloud applications.

IoT Wi-Fi portfolio

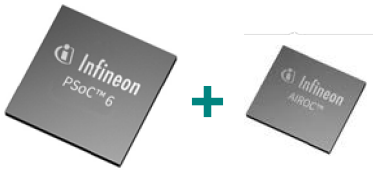
Technology	Wi-Fi	Wi-Fi + MCU	Wi-Fi + Bluetooth® Combos
Wi-Fi 4 (802.11n)	**CYW43364** SB 1x1 11n | SDIO		**CYW43439** SB 1x1 11n + BT5.2 SDIO/SPI
		CYW43903 SB 1x1 11n + 160 MHz R4	**CYW43012** ULP DB 1x1 11n + BT5.1 SDIO/SPI WLBGA/WLCSP
		CYW43907 1x1 DB 11n + 320 MHz R4	
Wi-Fi 5 (802.11ac)		**CYW54907** 1x1ac DB + 320 MHz R4	**CYW54590** DB 2x2 11ac + BT5.1 PCIe/SDIO
			CYW4373 DB 1x1 11ac + BT5.0 USB/SDIO/PCIe
			CYW54591 DB 2x2 11ac, RSDB, BT5.1 PCIe/SDIO

Infineon's Wi-Fi portfolio provides high-performance, flexible connectivity for Linux, Android, and RTOS.
Many of the Wi-Fi + Bluetooth® Combos are supported on Infineon's WICED Wi-Fi and ModusToolbox™ Software Development Kits (SDK) which provide code examples, tools, and development support.

Infineon's Wi-Fi and Bluetooth® Combos use production-ready, fully-certified Wi-Fi + Bluetooth® Combo modules based on both Linux and RTOS based platforms. Many of the Wi-Fi + Bluetooth® Combos are supported on Infineon's WICED Wi-Fi and ModusToolbox™ Software Development Kits (SDK), which provide code examples, tools, and development support for **easier and faster development.**

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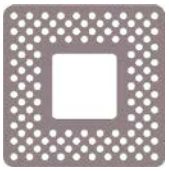
Wi-Fi enterprise networking and internet connectivity

		
CYW43907: MCU + Wi-Fi	PSOC™: PSOC™ running RTOS 3rd-party SoC running Linux OS	P/N: CY8CKIT-06S2-43012 PSOC™ 6: Ultralow-power dual-core MCU
CYW20829: Dedicated Bluetooth® LE 5.4 MCU	CYW43439*: 1x1n Wi-Fi + Bluetooth® Combo SoC	CYW43012 (Murata Type 1LV): Dedicated low-power Wi-Fi + Bluetooth® 5 Combo SoC

We offer a broad platform portfolio to support your Bluetooth® Mesh gateway.

IoT Wi-Fi portfolio

A global Wi-Fi module partner ecosystem enables support and development for your IoT application.

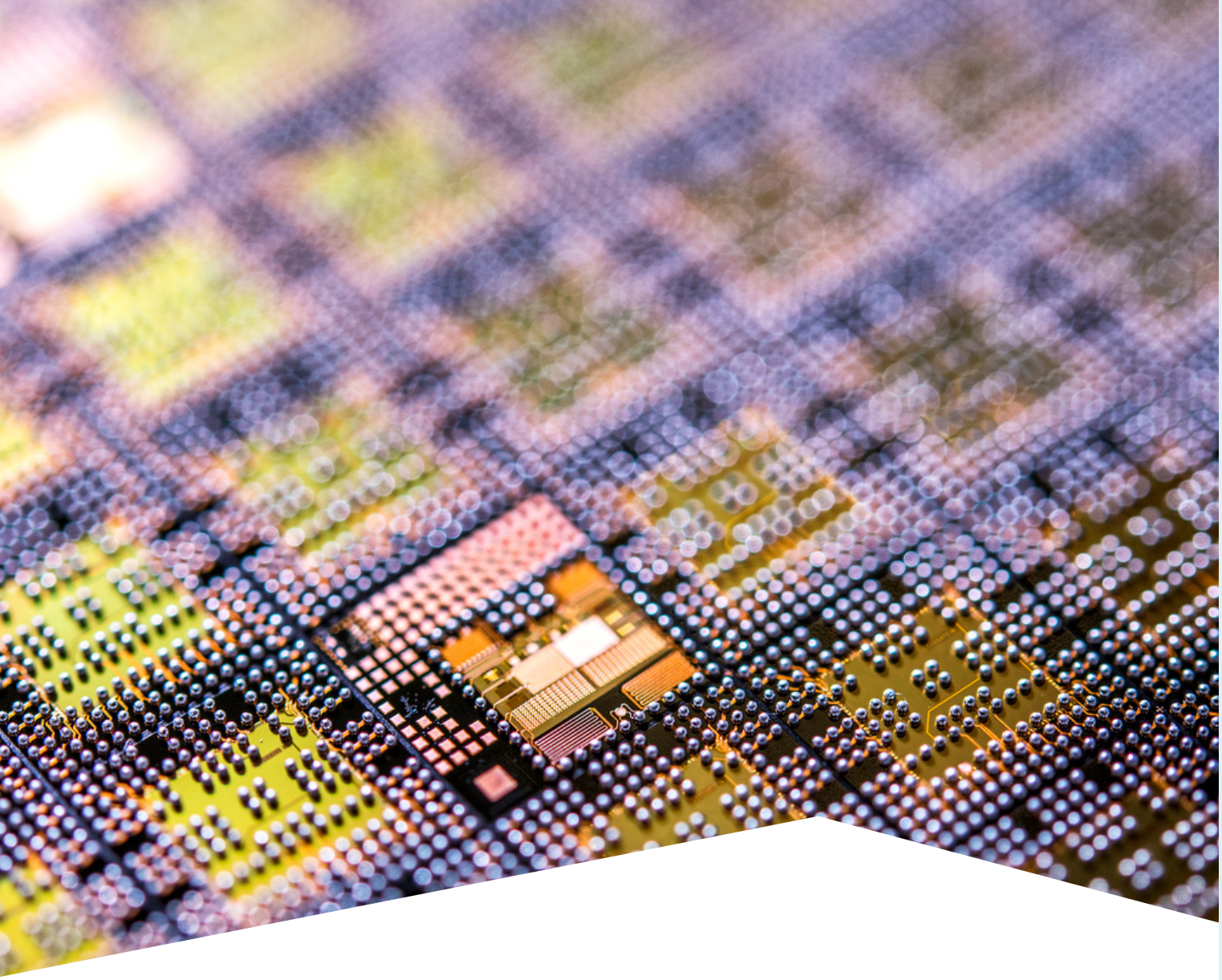


Design, build, and sell RF Modules
with limited software and hardware
certification support

Module makers

muRata INNOVATOR IN ELECTRONICS AzureWave USI

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www.infineon.com/smart-lighting
www.infineon.com/makeradar



Products

- 15-300 V MOSFETs
- 500-950 V MOSFETs
- Gate driver ICs
- Digital Isolators
- Discrete IGBTs and silicon power diodes
- Intelligent power switches and modules
- Microcontrollers
- USB-C controllers and peripherals
- Power management ICs
- Wide-bandgap semiconductors
- XENSIV™ sensor technologies for automotive, industrial and consumer applications
- Infineon powerful support



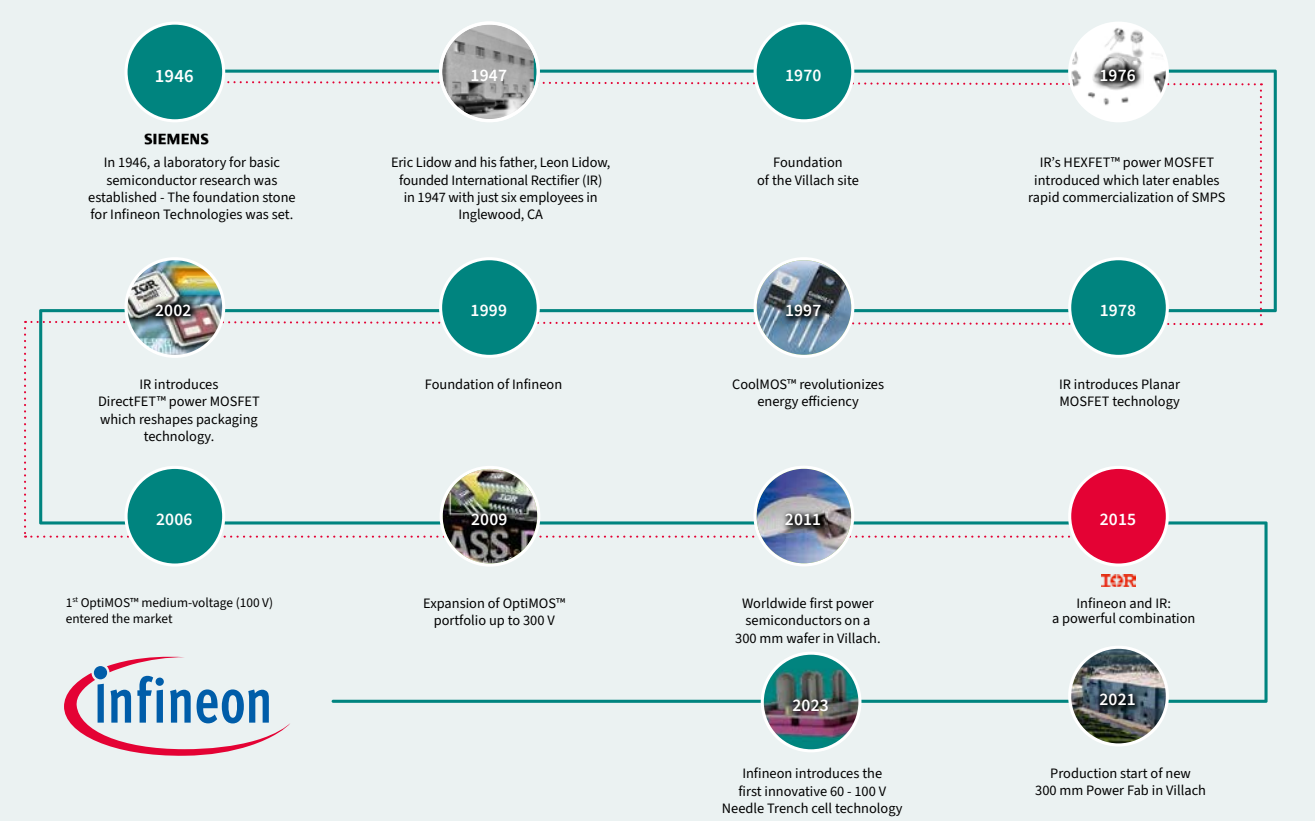
15-300 V MOSFETs

- 15-300 V MOSFETs N-channel power MOSFETs
- Guidance for applications and voltage classes
- Space-saving and high-performance packages
- Discrete packages
- OptiMOS™ 7 15 V
- OptiMOS™ 7 25 V*
- OptiMOS™ 7 40 V – $R_{DS(on)}$ optimized
- OptiMOS™ 7 40 V Motor-drive optimized
- OptiMOS™ dual MOSFETs 30 V and 40 V in SO-8
- OptiMOS™ scalable power block
- StrongIRFET™ 2 MOSFETs –30 V/40 V/60 V/80 V/100 V
- OptiMOS™ 5 Linear FET 2 100 V
- OptiMOS™ 6 120 V
- OptiMOS™ 6 135 V and 150 V
- OptiMOS™ 6 200 V
- OptiMOS™ 40 V in PQFN 8x6
- Small signal/small power MOSFETs -250 to 600 V
- OptiMOS™ power MOSFETs 15-150 V Source-Down
- OptiMOS™ PD
- TOLx family
- Product portfolio
- Nomenclature

Your input matters
Share your feedback

Infineon shapes power for growth through MOSFET innovation

With more than 40 years of experience in power MOSFET innovation, Infineon has led the way in solving the challenges design engineers face daily while enabling them to achieve their targets. Although these targets may have changed over the years, the innovative spirit behind Infineon's product offering has persisted – from device design, technology, package and product development through manufacturing. Looking at the evolution of MOSFETs in the industry, numerous advancements in MOSFET technology have enabled the applications and trends that have become an indispensable part of our lives. Infineon power MOSFET innovation has proven that optimization at the component level brings significant system-level performance advantages and contributes to an easier, safer, and greener future.



Click here to learn more:

www.infineon.com/powermosfet-12V-300V
www.infineon.com/smallsignal
www.infineon.com/optimos-strongirfet-packages

Your input matters
Share your feedback

OptiMOS™ and StrongIRFET™

15-300 V N-channel power MOSFETs

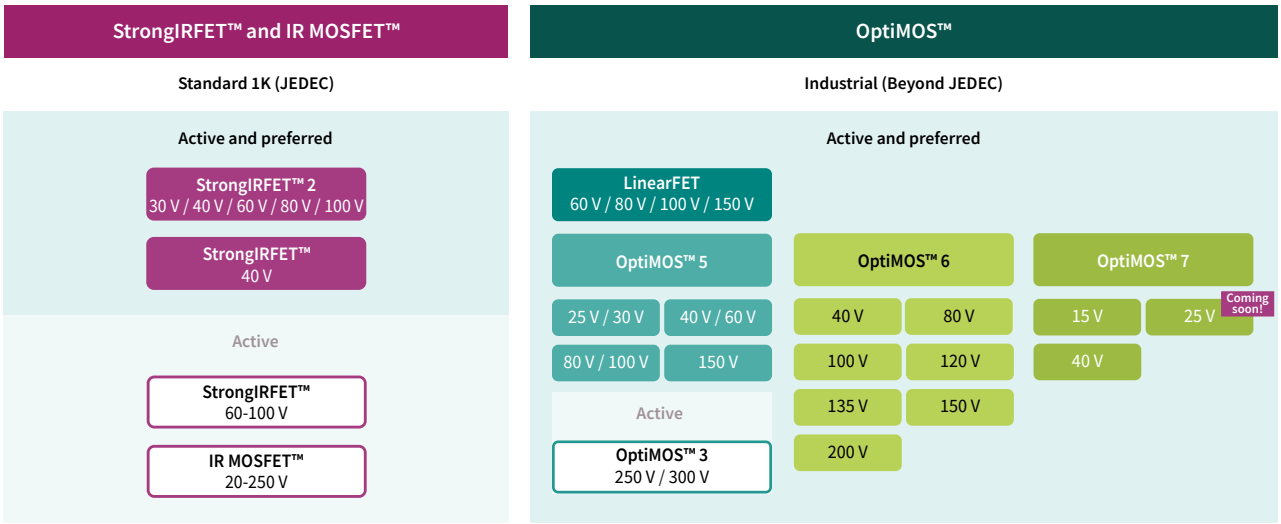
Infineon's semiconductors are designed to bring greater efficiency, power density, and cost-effectiveness. The full range of OptiMOS™ and StrongIRFET™ power MOSFETs enables innovation and performance in applications such as switch mode power supplies (SMPS), battery powered applications, motor control, drives, inverters, and computing.

Infineon's highly innovative OptiMOS™ and StrongIRFET™ families consistently meet the highest quality and performance demands in key specifications for power system designs such as on-state resistance ($R_{DS(on)}$) and figure of merit (FOM).

OptiMOS™ power MOSFETs provide best-in-class performance. Features include ultralow $R_{DS(on)}$ and charge for high switching frequency applications. StrongIRFET™ power MOSFETs are designed for drives applications and are ideal for designs with a low switching frequency and those that require a high current carrying capability.

Technology development and product family positioning

StrongIRFET™	OptiMOS™
Robust and excellent price/performance ratio – Optimized for switching frequency <100 kHz – Designed for industrial applications – High current carrying capability – Rugged silicon	**Best-in-class technology** – Optimized for broad switching frequency – Designed for high performance applications – Industry's best figure of merit – High efficiency and power density



Click here to learn more:

www.infineon.com/powermosfet-12V-300 V
www.infineon.com/optimos6
www.infineon.com/smallsignal
www.infineon.com/optimos-strongirfet-packages
www.infineon.com/strongirfet2



With over 40 years of experience in power MOSFET innovation, Infineon offers a broad portfolio of products. The product portfolio is divided into “active and preferred”, referring to the latest technology available offering best-in-class performance, and “active”, consisting of well-established technologies that complete this broad portfolio.

StrongIRFET™ 2 power MOSFETs are the latest generation to be added to the family. Available in 30 V, 40 V, 60 V, 80 V, and 100 V , this family offers broad availability and an excellent price/performance ratio and is suitable for a broad range of applications.

Building on its legacy of innovation, Infineon now unveils the industry’s premier 15 V trench power MOSFETs, using the brand-new OptiMOS™ 7 technology. The OptiMOS™ 7 15 V series primarily targets optimized DC-DC conversion for servers, computing, data centers, and artificial intelligence applications. OptiMOS™ 7 is also now available in 40 V, targeting BMS applications, and will soon be available in 25 V, enabling high power efficiency and power density for data center and AI applications.

OptiMOS™ 6 power MOSFETs 40 V, 100 V, 120 V, 135 V, 150V and 200 V are the newest addition to the OptiMOS™ product family. They are the perfect solution when best-in-class (BiC) products and high efficiency over a wide range of output power are required. For other voltage classes, from 15 V up to 150 V, OptiMOS™ 5 represents the latest generation in the market, offering low conduction losses and high switching performance.

For high and low frequency applications, OptiMOS™ 3 power MOSFETs is our largest OptiMOS™ family. It complements our existing product portfolio and provides additional options when best-in-class is not required. StrongIRFET™ is recommended for 20-300 V applications when the high performance is not essential and the cost is a more significant consideration.

Click here to learn more:

www.infineon.com/powermosfet-12V-300 V
www.infineon.com/optimos6
www.infineon.com/smallsignal
www.infineon.com/optimos-strongirfet-packages
www.infineon.com/strongirfet2

Guidance for applications and voltage classes

OptiMOS™ and StrongIRFET™ portfolio, covering 15 up to 300 V MOSFETs, can address a broad range of needs from low to high switching frequencies. The tables below provide guidance on the recommended OptiMOS™ or StrongIRFET™ products for each major sub-application and voltage class.

Recommended voltage			15 V to 30 V	40 V	60 V	75 V to 80 V	100 V	120 V to 150 V	200 V	250 V	300 V
Battery powered	Low power Power tools, multicopter, battery, industrial drives	OptiMOS™	✓	✓	✓	✓					
		StrongIRFET™	✓	✓	✓	✓					
	High power (LEV, LSEV)	OptiMOS™			✓		✓	✓	✓		
		StrongIRFET™			✓	✓	✓	✓	✓		
Inverters	Solar	OptiMOS™			✓	✓	✓	✓			
		StrongIRFET™			✓	✓	✓				
	Online UPS	slow switching									
		OptiMOS™	✓	✓	✓	✓	✓	✓	✓	✓	✓
		StrongIRFET™	✓	✓	✓	✓	✓	✓	✓	✓	✓
		fast switching									
		OptiMOS™	✓	✓	✓	✓	✓	✓	✓	✓	✓
		StrongIRFET™	✓	✓	✓	✓	✓	✓	✓	✓	✓
	Offline UPS	OptiMOS™		✓	✓						
		StrongIRFET™		✓	✓						
SMPS	Adapter / Charger	OptiMOS™		✓	✓	✓	✓				
		StrongIRFET™		✓	✓	✓	✓				
	PC Power	OptiMOS™		✓	✓						
		StrongIRFET™		✓	✓						
	LCD TV	OptiMOS™			✓	✓	✓				
		StrongIRFET™			✓	✓	✓				
	Server	OptiMOS™	✓	✓	✓	✓					
		StrongIRFET™	✓	✓	✓	✓					
	AC-DC	OptiMOS™	✓	✓		✓	✓	✓	✓		
		StrongIRFET™	✓			✓	✓				
	Telecom	OptiMOS™	✓	✓	✓	✓	✓	✓			
		StrongIRFET™	✓	✓	✓	✓	✓				

StrongIRFET™ recommended	OptiMOS™ recommended
StrongIRFET™ available	OptiMOS™ available

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Space-saving and high-performance packages

	TO-247	TO-220	TO-220 FullPAK	D²PAK	D²PAK 7-pin	TO-Leadless	TOLT (Top-side cooling)	TOLG (Gullwing leads)	sTOLL
									
Special features	Optimized for high power applications and high current capability						Optimized for top-side cooling	Optimized for TCoB[1] robustness	Optimized for high power in small form factor
Height [mm]	5.0	4.4	4.5	4.4	4.4	2.3	2.3	2.3	2.3
Outline [mm]	40.15 x 15.9	29.5 x 10.0	29.5 x 10.0	15.0 x 10.0	15.0 x 10.0	11.7 x 9.9	15.0 x 9.9	11.7 x 9.9	8.0 x 7.0
Thermal resistance R_{thJC} [K/W]	2.0	0.5	2.5	0.5	0.5	0.4	0.4	0.4	0.6

	PQFN 2x2	PQFN 3.3x3.3	PQFN 3.3x3.3 Source-Down	PQFN 3.3x3.3 Source Down dual-side cooling (DSC)	SuperSO8 5x6	PQFN 5x6 Source-Down	SuperSO8 dual-side cooling (DSC)	PQFN 5x6 Source-Down dual-side cooling (DSC)	Power Block	PQFN 8x6	DirectFET™	SO-8 Dual
												
	Enables significant space saving	High efficiency in small form factor	Highest power density per area	Optimized thermal performance	For highest efficiency and power management	Highest power density per area	Optimized for dual-side cooling	Optimized thermal performance	Significant design shrink	Highest power density in the industry	Optimized for dual side cooling	Enabling small PCB footprint
Height [mm]	0.9	1.0	1.0	1.0	1.0	1.0	0.75	0.7	5.0 x 6.0: 1.0 6.3 x 6.0: 0.9 6.3 x 6.0 DSC: 0.7	1.0	Small: 0.65 Medium: 0.65 Large: 0.71	1.55
Outline [mm]	2.0 x 2.0	3.3 x 3.3	3.3 x 3.3	3.3 x 3.3	5.0 x 6.0	5.0 x 6.0	5.0 x 6.0	5.0 x 6.0	5.0 x 6.0 6.3 x 6.0	8.0 x 6.0	Small: 4.8 x 3.8 Medium: 6.3 x 4.9 Large: 9.1 x 6.98	4.8 x 5.8
Thermal resistance R_{thJC} [K/W]	11.1	3.2	1.4	1.4	0.8	0.45	0.5	0.45	1.5	0.5	0.5	50

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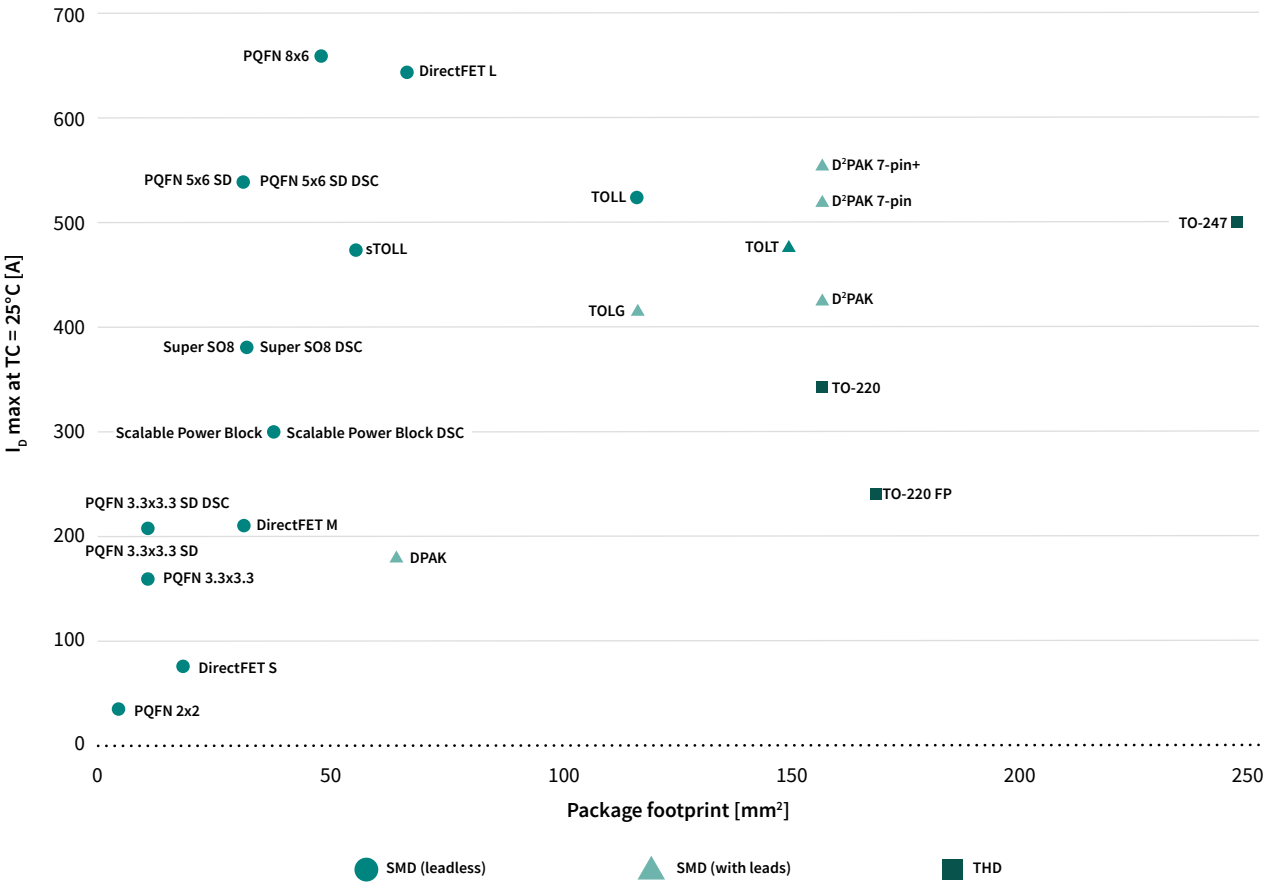
1) Temperature cycling on board

Discrete packages

Infineon has been making an impact in the MOSFET industry with innovation in MOSFET manufacturing techniques and processes and pioneering new packages to meet the changing demands of cutting-edge designs in various applications. OptiMOS™ and StrongIRFET™ technologies are available in different packages to address demands for high current carrying capability and significant space saving. The broad portfolio enables footprint reduction, boosts current rating, and optimizes thermal performance. While the surface mount leadless devices are enabled for footprint reduction, through-hole packages are characterized by a high-power rating.

Infineon offers innovative packages such as DirectFET™ and TO-Leadless (TOLL). DirectFET™ is designed for high-frequency applications and offers the lowest parasitic resistance. This package is available in three different can sizes: small, medium, and large. TO-Leadless is optimized to dissipate power up to 375 W, increasing power density substantially reducing footprint.

New package innovations include the SuperSO8 Source-Down package, which offers high power density and performance; the TOLG (Gullwing leads), which is optimized for TCoB (Thermal cycling on board) robustness; the TOLT (top-side cooling), which is optimized for superior thermal performance; the sTOLL, which is optimized for high power in a small form factor; and the SuperSO8 dual-side cooling (DSC), which is optimized for dual-side cooling in a standard 5x6 mm² footprint.



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OptiMOS™ 7 15 V

Infineon's latest technology with the industry's first 15 V trench power MOSFETs provides the next level of system efficiency and performance

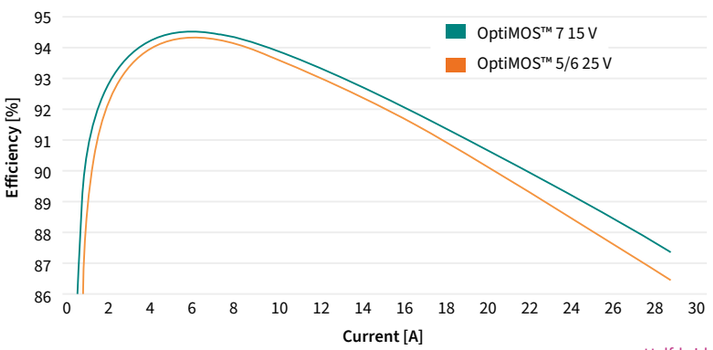
Infineon introduced the industry's first 15 V trench power MOSFETs, utilizing the brand-new OptiMOS™ 7 technology. This system and application-optimized technology target DC-DC conversion with low server and computing applications output voltages.

Compared to OptiMOS™ 5 25 V, the OptiMOS™ 7 15 V MOSFET family offers a lower breakdown voltage, significantly reducing $R_{DS(on)}$ and $FOMQ_g/FOMQ_{OSS}$. The best-in-class product portfolio comprises Source-Down PQFN 3.3x3.3 packages with bottom and dual-side cooling variants in Standard and Center-Gate footprints for flexible and optimal PCB design and a PQFN 2x2 package with a reinforced clip. The latter offers a pulsed current capability of more than 500 A, with an RthJC of 1.6 K/W. Reducing conduction and switching losses in combination with the Source-Down package simplifies thermal management, pushing power density and efficiency to the next level.

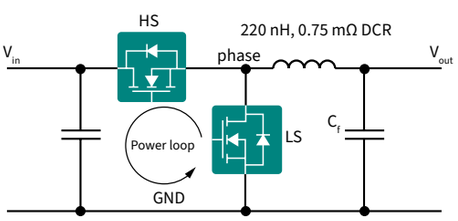
The high-side MOSFET uses the PQFN 2x2 (taking advantage of the lower switching losses) and the low-side MOSFET uses the Source-Down (taking advantage of the low conduction losses).

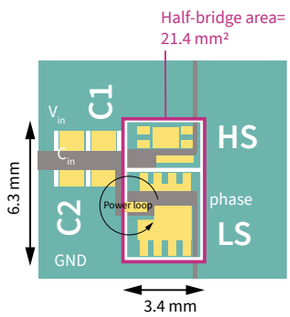
OptiMOS™ 7 15 V vs. OptiMOS™ 5/6 25 V

- Outstanding $FOMQ_g/FOMQ_{OSS}$ improves peak efficiency by 0.2 percent while enabling high frequency operation
- Lower $R_{DS(on)}$ improves full load efficiency by 0.85 percent while enabling output power increase



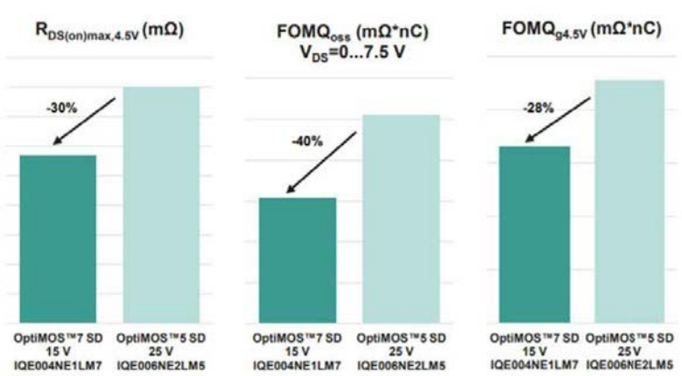
High-side: PQFN 2 x 2 Drain-down
Low-side: PQFN 3.3 x 3.3 Source-down





Features and benefits

Key features	Key benefits
– First 15 V trench power MOSFETs	– Improved efficiency in sub 12 V_{DC}-DC output stages where 25 V MOSFETs are used
– Benchmark $R_{DS(on)}$ compared to 25 V node	– Reduced conduction losses
– Outstanding $FOMQ_g/FOMQ_{OSS}$	– Highest efficiency with best switching performance
– Ultralow package parasitics	– Center-Gate for ideal parallelization, Standard-Gate for easy layout fit-in
– Standard and Center-Gate footprints with dual-side cooling variants	– Better thermal management with significant space saving enablement



The OptiMOS™ 7 15 V product family offers a leap forward in technology supporting new trends in power distribution architectures, e.g., high ratio DC-DC conversion, enabling further advancements in server, datacom, and artificial intelligence applications while minimizing CO_2 footprint.

SMPS · Server · Datacom · AI Artificial intelligence

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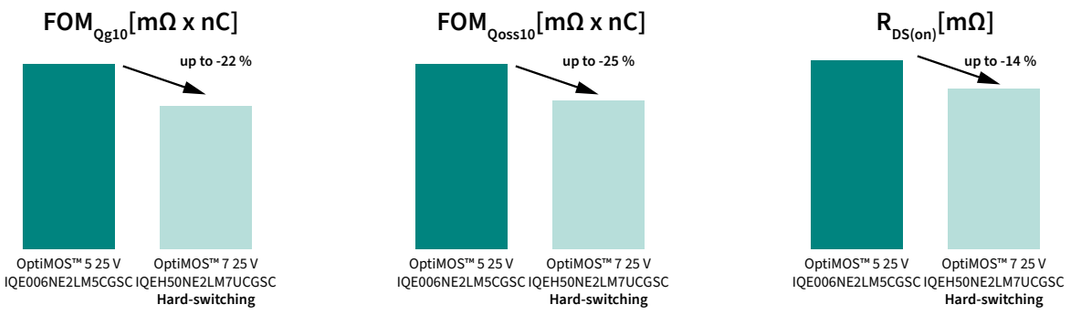
OptiMOS™ 7 25 V*

A new level of application optimization enabling peak performance

OptiMOS™ 7 25 V represents Infineon's latest generation of switching-optimized power MOSFETs, designed to meet application-specific requirements, shifting from the conventional one-size-fits-all approach. The innovative portfolio is designed to target applications, including intermediate bus converters (IBCs) utilizing various topologies for 48 V conversion to power AI cores and switched-mode power supplies (SMPS) for telecom and traditional server applications.

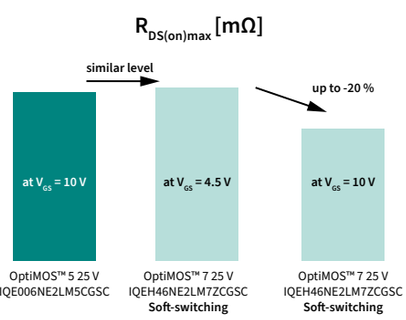
The OptiMOS™ 7 25 V is available in two technology flavors, including products optimized for hard-switching and soft-switching topologies. This approach allows for optimizing performance in specific topologies, mitigating power losses, thereby increasing overall efficiency and power density.

Features and benefits: Hard-switching optimized portfolio



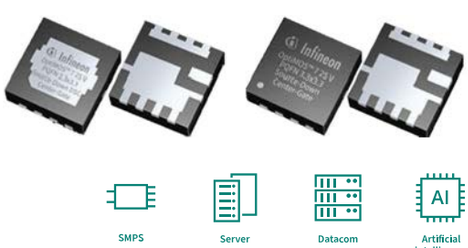
Key features	Key benefits
– Excellent Miller ratio Q_{gd}/Q_{gs}	– Advanced induced turn on ruggedness and reduced switching losses
– $R_{DS(on)}$ improvement well balanced to the input and output capacitances	– Reduced driver losses through optimized $FOMQ_{oss}$ and FOM_{Qg10}
– ±16 V extended gate voltage rating	– Gate voltage overdrive to reduce conduction and switching losses

Features and benefits: Soft-switching optimized portfolio



Key features	Key benefits
– Ultralow $R_{DS(on)}$	– Reduced conduction losses
– Reduced threshold voltage	– Higher efficiency and reliability; 5 V gate drive compatibility

The OptiMOS™ 7 25 V portfolio comprises Source-Down PQFN 3.3x3.3 packages with bottom and dual-side cooling variants in a Center-Gate footprint for flexible and optimal PCB design. In combination with a junction temperature rating of up to +175°C, this not only enables a further boost in power density and efficiency but also increases reliability.



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*Coming soon

OptiMOS™ 7 40 V – $R_{DS(on)}$ optimized

Unleash maximum power with the next best-in-class OptiMOS™ 7 $R_{DS(on)}$ optimized 40 V power MOSFET in a PQFN 5x6

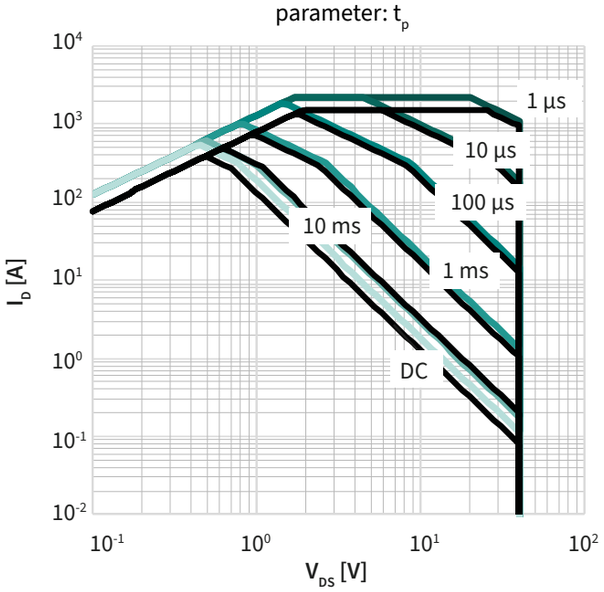
Infineon introduces the best-in-class 40 V power MOSFET in the latest OptiMOS™ 7 $R_{DS(on)}$ optimized technology. This new product expands the OptiMOS™ 7 portfolio from the industry's first 15 V power MOSFETs to the lowest $R_{DS(on)}$ in a SuperSO8 5x6 40 V power MOSFET, minimizing the energy loss in the system and making it best fit in BMS applications. The $R_{DS(on)}$ is improved by 40 percent compared to the existing OptiMOS™ 6 40 V products. In addition, the SuperSO8 5x6 package makes a 50 percent PCB real estate area reduction possible when compared to the DirectFET™ (L) solution while making the need for parallelization obsolete.

The new OptiMOS™ 7 $R_{DS(on)}$ optimized 40 V power MOSFET offers a leap forward in terms of $R_{DS(on)}$ reduction, a product feature highly beneficial in BMS applications. It facilitates increased power density, improved system efficiency, and cost reduction.

ISCH42N04LM7 (ocean) has a higher DC current capability than the BSC007N04LS6 (black) mainly driven by the lower $R_{DS(on)}$:
- At 0.1 V_{DC} >40%
- At 40 V_{DC} >30%

Also in short pulse regime and high VDS there is noticeable current capability improvement:
- At 40 V 1 ms >20%
- At 40 V 100 µs >10%

Safe operating area
$I_D=f(V_{DS})$; $T_C=25°C$; D=0
parameter: t_p



Features and benefits

Key features	Key benefits
– Best-in-class 40 V power MOSFET in a SuperSO8 in the market	– Best fit in BMS applications
– Outstanding $R_{DS(on)}$	– Energy loss minimization with the highest power density
– Industry standard footprint	– Multiple sourcing possibility
– Wide safe operating area	– Increased reliability and robustness

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OptiMOS™ 7 40 V Motor-drive optimized

Application-optimized solutions for efficient power conversion in drives

The new OptiMOS™ 7 drives optimized 40 V portfolio is specifically designed to enhance motor drive applications, delivering up to 20 percent lower RDS(ON), 10 max compared to the previous generation. This breakthrough enables best-in-class (BiC) products, with RDS(ON), 10 max values as low as 0.5 mΩ, setting a new standard in efficiency.

These advancements come without compromising robustness. The OptiMOS™ 7 drives optimized family offers up to three times wider safe operating area (SOA) compared to OptiMOS™ 6, ensuring greater reliability in harsh conditions. Additionally, its enhanced immunity against parasitic turn-on events further supports the ruggedness required for motor drive systems.

To further elevate performance, the OptiMOS™ 7 includes an intrinsic short-circuit current limitation, achieved through a 70 percent reduction in transconductance and a higher threshold voltage (Vth) of up to 3.2 V. This innovative design delivers both superior efficiency and reliability for the most demanding drive applications.

Up to 70%* improved controllability
Enhanced current sharing capability.
Better tunability of switching and
EMI performance.



*vs. OptiMOS™ 6

Up to 20%* improved conduction loss
Best-in-class 0.5 mΩ
Price|Performance optimized 0.7 - 1.6 mΩ

Up to 3x wider SOA*
Improved pulse current handling
Intrinsic short-circuit current limitation

Features and benefits

Key features	Key benefits
– Improved $R_{DS(ON)}$	– Enhanced efficiency and superior performance, reducing power losses
– 3x wider SOA	– Improved robustness under harsh conditions
– Short-circuit current limitation	– Improved immunity against short-circuit events
– Higher threshold voltage V_{th} up to 3.2 V	– Improved Immunity against parasitic turn-on events
– Controlled transconductance g_{fs}	– Improved Slew-rate control /Better EMI behavior and ease of use

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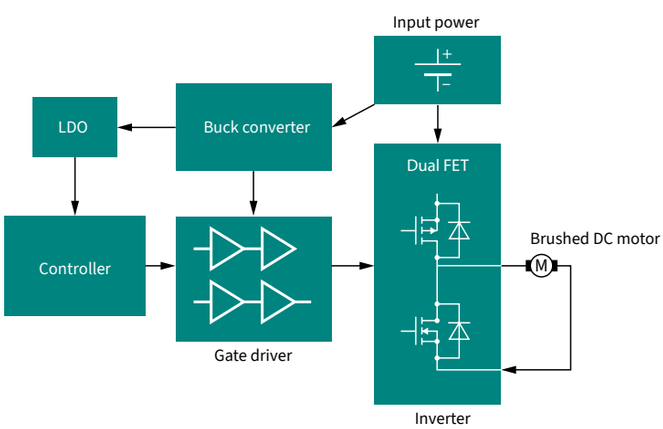
OptiMOS™ dual MOSFETs 30 V and 40 V in SO-8

Enabling smaller PCB footprint, more compact and efficient designs

Infineon is expanding the OptiMOS™ dual 30 V and 40 V portfolio in a compact SO-8 package with two MOSFETs in one package. The compact package requires a smaller PCB footprint, allowing for a small and efficient design. Compared to the previous generation, the new OptiMOS™ dual MOSFETs 30 V offers a significantly reduced $R_{DS(on)}$ of up to 63 percent and an improvement on I_D of up to 91 percent.

N + P and N + N dual channel MOSFETs are perfect solutions for applications such as lawn mower robots, vacuum cleaner robots, drones, and many other low-power DC-DC applications.

Block diagram



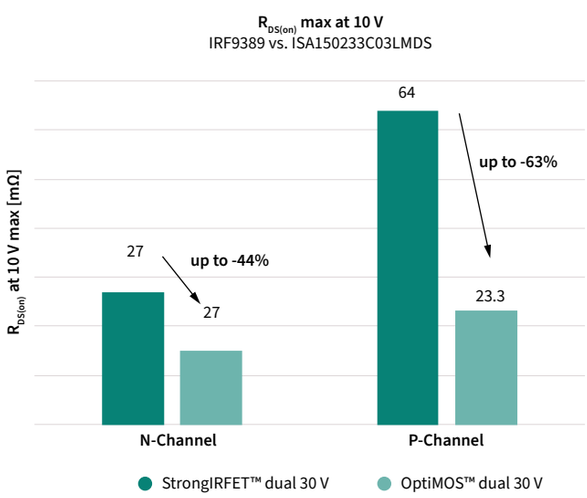
SO-8

5.8 mm² x 4.8 mm²



Features and benefits

Key features	Key benefits
– Best price/performance	– Competitive price
– $R_{DS(on)}$ max and FOMQg optimization	– Right-fit products, flexible use
– Standardization of packages: SO-8	– Convenient selection and purchasing
– Ease of use (LL target)	– Ease of design
	– Simplified product services



- Improved of $R_{DS(on)}$ compared to previous generations
- Enhanced thermal performance
- Excellent price/performance
  - Reduced system costs
  - PCB footprint reduction
  - Compact design

Drives · Home & garden · Vacuum cleaner · Multicopter · Multisource

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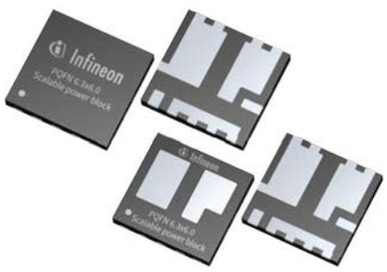
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OptiMOS™ scalable power block

Symmetric half-bridge solution enabling 50 percent improvement in power density

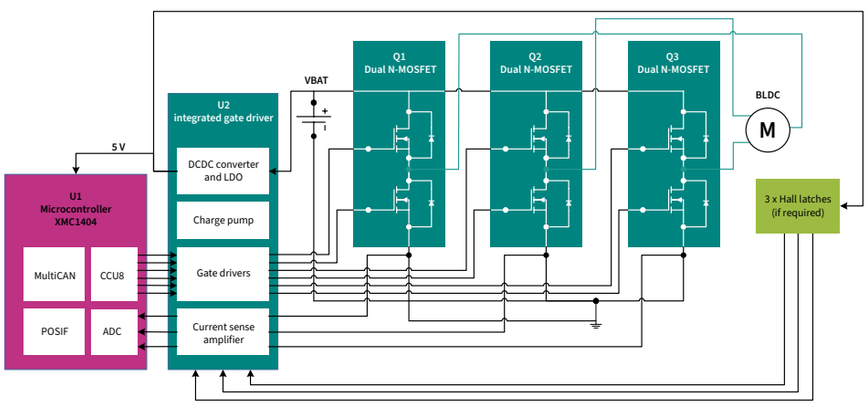
OptiMOS™ 6 40 V and OptiMOS™ 5 100 V symmetric power block (Q1 and Q2 of similar $R_{DS(on)}$) integrates a low-side and a high-side MOSFET in a compact leadless SMD 6.3x6.0 mm² package targeting a variety of applications (drives, SMPS). By replacing two separate discrete packages, e.g., SuperSO8 (PQFN 5x6), customers can shrink the board's power section by at least 50 percent.

The MOSFET half-bridge family features Infineon's proven OptiMOS™ 5 and 6 technologies, offering very low on-state resistance ($R_{DS(on)}$) and figure of merits (Q_g, Q_{gd}). The reduction in the package's parasitic inductance results in improved switching performance and EMI and reduced overall BOM cost. Optimized lead-frame and Cu-clip significantly improves the package's thermal performance. The dual-side cooling version of the package boosts the power throughput by an additional 25 percent.

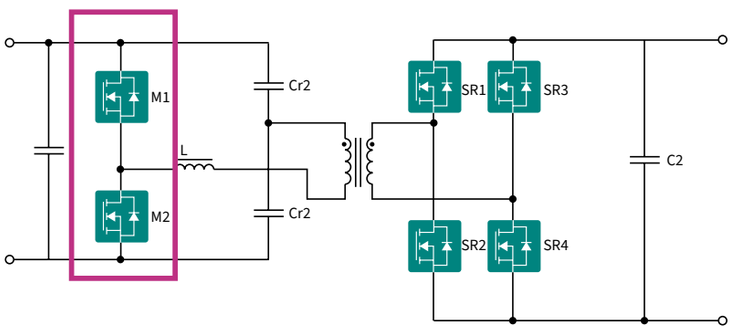


Integrated symmetric half-bridge solution using the latest OptiMOS™ silicon technology offered in both over-molded and dual-side cooling options for supreme power density and performance advantage.

Half-bridge replacement in Inverter circuit for drives



Power switches in LLC circuit



Features and benefits

Key features	Key benefits
– High chip/package ratio	– High power capability
– Optimized lead-frame and Cu-clip design	– Optimum thermal performance
– Internally connected low-side and high side (lowest loop inductance)	– Compact and simplified layout design
– Dual-side cooling available	– Superior switching performance/EMI

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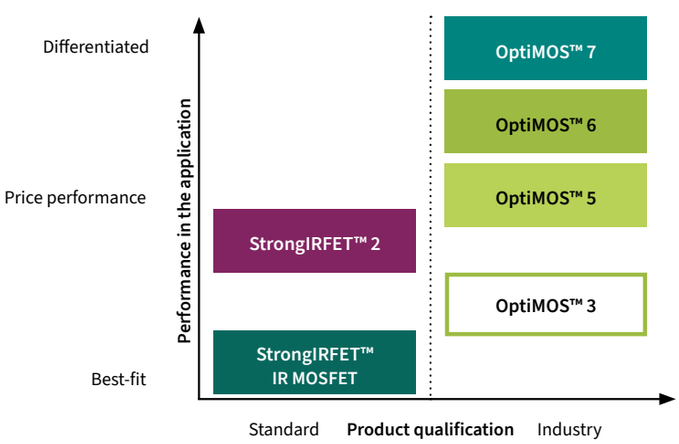
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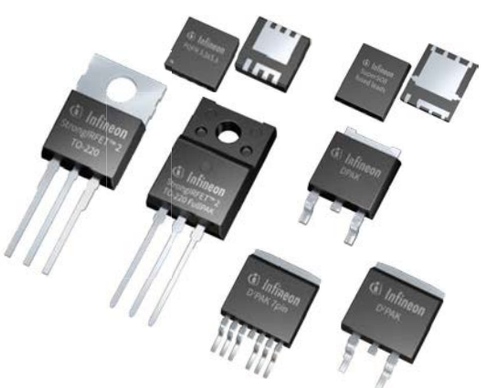
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StrongIRFET™ 2 MOSFETs – 30 V/40 V/60 V/80 V/100 V

Right-fit products for a broad range of applications

The new StrongIRFET™ 2 power MOSFETs are the latest generation of MOSFETs addressing a wide range of applications such as adapters, motor drives, e-scooters, battery management systems, light electric vehicles, robotics, power and gardening tools, and other consumer applications. Featuring broad availability, excellent price/performance ratio, and robustness, this new technology offers right-fit products that are an easy choice for designers interested in convenient selection and purchasing. Optimized for both low- and high-switching frequencies, the family supports a broad range of applications, enabling flexibility in design.

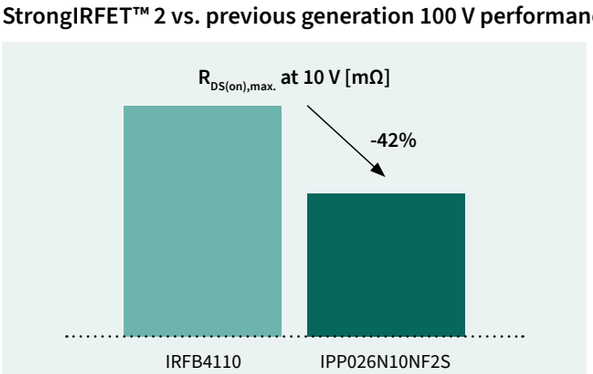


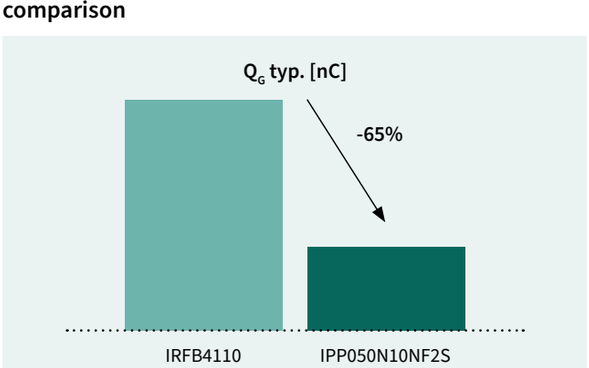


Features and benefits

Key features	Key benefits
– Broad availability from distribution partners	– Increased security of supply
– Excellent price/performance ratio	– Right-fit products
– Ideal for high and low switching frequency	– Supports wide variety of applications
– Industry standard footprint	– Standard pin out allows for drop-in replacement
– High current rating	– Increased product ruggedness

StrongIRFET™ 2 vs. previous generation 100 V performance comparison





Compared to the previous StrongIRFET™ generation in 100 V TO-220 package, StrongIRFET™ 2 shows significant improvements such as ~40 percent lower $R_{DS(on)}$ and ~65 percent reduced Q_G. This results in better efficiency and longer life time.

Drives · LSEV · eScooter · Power tools · Gardening tools · Battery · Multicopter · LEV · Automated guided vehicles · SMPS · Adapter · Consumer

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OptiMOS™ 5 Linear FET 2 100 V

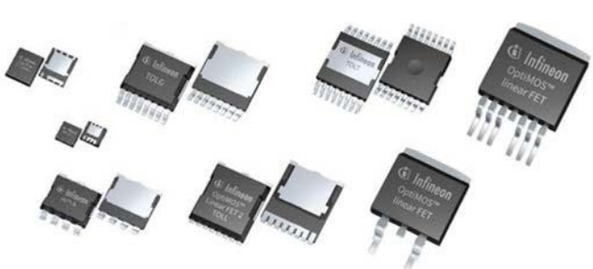
Enabling optimal protection in BMS and hot-swap

The OptiMOS™ 5 Linear FET 2 is designed to combine a wide safe operating area (SOA) and low on-resistance, providing high robustness for fault protection while enabling highest power density and efficiency. Additionally, the OptiMOS™ 5 Linear FET 2 features improved current sharing due to an optimized transfer character, which increases reliability and decreases overdesign. Furthermore, the OptiMOS™ 5 Linear FET 2 features reduced leakage current compared to the previous generation, the OptiMOS™ Linear FET, which results in improved FET/controller ratios, improving the bill of material.

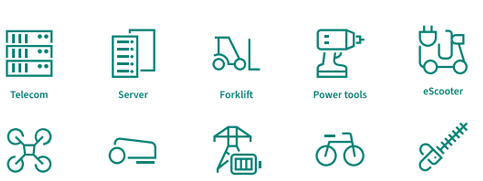
In the battery protection section of battery management systems found in a wide range of applications such as LEVs, forklifts, telecoms, servers, and power tools, these benefits lead to part count reduction compared to OptiMOS™ 5, enabling higher power density and improved bill of material (BOM). For hot-swap applications, the OptiMOS™ 5 Linear FET 2 provides higher SOA at operating temperature, a better price/performance ratio, and a wide package selection, enabling higher power-dense designs.

Features and benefits

Key features	Key benefits
– Wide safe operating area (SOA)	– Rugged linear mode operation
– Low $R_{DS(on)}$	– Low conduction losses
– Lower IGSS compared to OptiMOS™ Linear FET	– Improved gate driver compatibility
– Optimized transfer characteristic	– Improved current sharing



BMS target applications



Hot-swap target applications



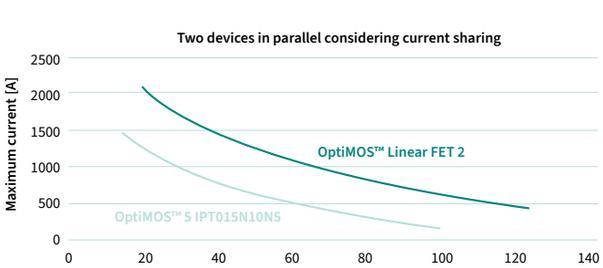
Application test results

OptiMOS™ 5 vs. OptiMOS™ 5 Linear FET 2 in 100 V

At a comparable $R_{DS(on)}$:

Up to 12 x higher SOA current in linear mode

Up to 3.5 x higher SOA current for short pulses



Battery protection turn-off test

The difference in energy during the turn-on and off event of the two simulated MOSFETs indicates the quality of the current sharing.

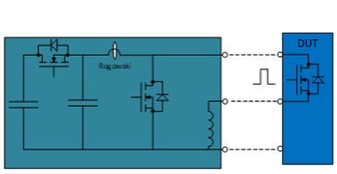
Testing conditions

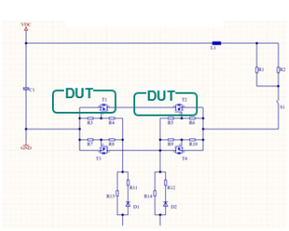
Input voltage: 56 V

Overshoot: 30 V

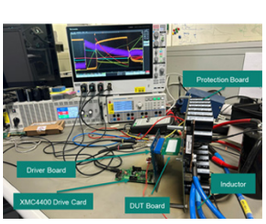
Inductor: 3 µH

Current: 300 A





Turn-off network



Devices tested to failure
– operating outside of SOA

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OptiMOS™ 6 120 V

Fully optimized best-in-application performance power MOSFET at 120 V

Infineon's extensive experience in trench MOSFET technology development and the knowledge gained from customer support are the key motivators for developing the new OptiMOS™ 6 120 V MOSFETs. The new OptiMOS™ 6 120 V power MOSFET technology offers devices with extremely low on-state resistance and gate charges, yielding the industry's best figure of merit (FOM). These features make the OptiMOS™ 6 the best fit for high-switching frequency applications, such as battery-powered power tools, solar applications, and SMPS.

Features and benefits

Key features	Key benefits
– Industry's lowest $R_{DS(on)}$ in 120 V	– Highest efficiency
– Best balance between switching and conduction losses	– Less paralleling required
– Significantly improved FOMs compared to OptiMOS™ 3	– High power density

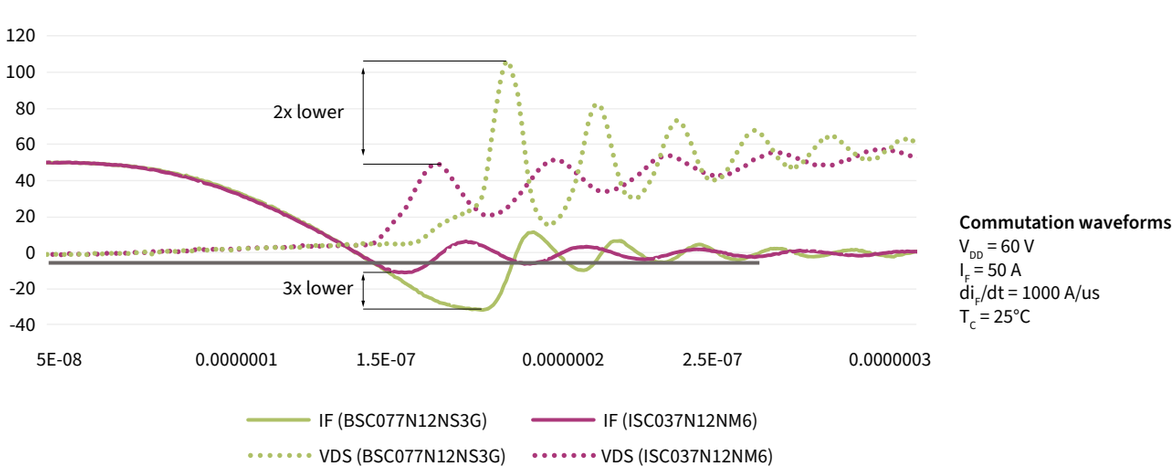
Key applications

OptiMOS™ 6 120 V is available in logic level and normal level versions to accommodate different application requirements. It includes the following packages: PQFN 3.3x3.3, SuperSO8, D²PAK, D²PAK-7, TO-220, TOLL, TOLT, TOLG

– Gardening tools
– Power tools
– eScooters
– USB PD chargers
– Solar



Lower reverse recovery voltage peak, resulting in significantly improved safety margins for your system design



Commutation waveforms
V_{DD} = 60 V
I_F = 50 A
di_F/dt = 1000 A/us
T_C = 25°C

– OptiMOS™ 6's reverse recovery voltage peak is two times lower compared to its predecessor resulting in much better safety margins in system design.
– Lower Q_{rr} decreases voltage overshoot and switching loss

Gardening tools | Power tools | eScooter | USB PD charger | Solar

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OptiMOS™ 6 135 V and 150 V

Best-in-application offering with the latest OptiMOS™ 6 products

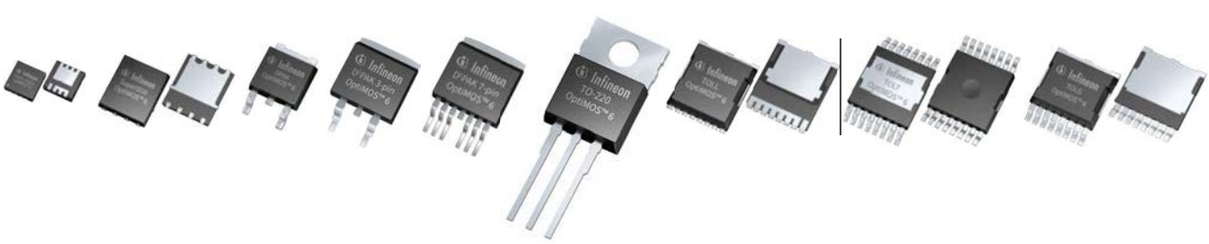
The new OptiMOS™ 6 135 V and 150 V technologies were designed to fulfill the requirements of various applications, from synchronous rectification sockets in telecom and server SMPS to motor inverters in eForklifts and light electric vehicles (LEV), solar optimizers, and high-power USB chargers. With the industry's lowest $R_{DS(on)}$, improved switching performance and excellent EMI behavior, both technologies bring unparalleled efficiency, power density, and reliability into the highly competitive 150 V market. Both newly released product families bring significant improvements upon their predecessor OptiMOS™ 5 150 V. This offering provides the customer with best-in-application products with different possibilities. Our ability to scale sets us apart as the industry's leading supplier of power MOSFETs.

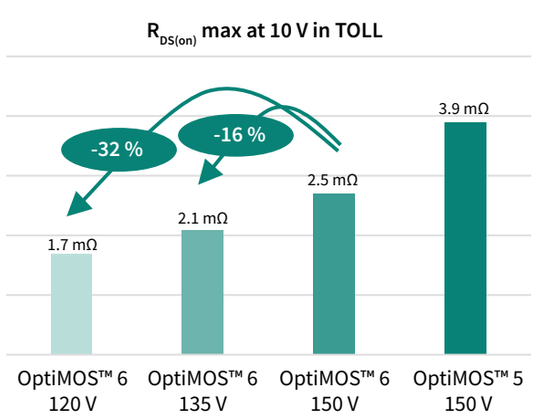
Features and benefits

Key features	Key benefits
– Best-in-class $R_{DS(on)}$ and FOMg in 135 V and 150 V	– Low conduction and switching losses in hard and soft switching
– Lower $Q_{rr(typ)}$ and improved diode softness compared to OptiMOS™ 3	– Stable operation with improved EMI enabling less overshoot
– Tight $V_{GS(th)}$ spread	– Better paralleling performance
– High avalanche ruggedness	– Enhanced robustness
– Maximum junction temperature of 175°C and MSL1	– Longer lifetime and improved reliability

Key applications

– Forklifts
– eScooters
– Telecom and servers
– Solar
– Power and gardening tools
– Chargers
– UPS





Which is the right MOSFET voltage for your application?
OptiMOS™ 6 135 V and 150 V new product families complement the recently released OptiMOS™ 6 120 V. With a complete portfolio, we offer our customers alternatives to choose between higher breakdown voltage margin and lower losses.

Forklift eScooter Telecom Solar Gardening tools Charger UPS

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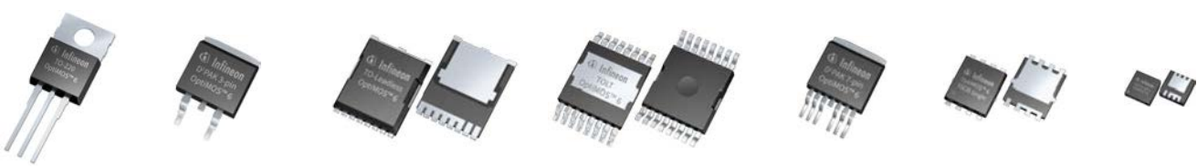
OptiMOS™ 6 200 V

Setting the new industry standard

The OptiMOS™ 6 200 V employs an advanced cell design to set the new technology standard in its voltage class. It addresses the need for high power density, efficiency, and reliability. The OptiMOS™ 6 200 V technology was designed for optimal performance in motor drive applications such as light electric vehicles (LEVs), forklifts, and drones. It features industry-leading $R_{DS(on)}$, improved switching and current sharing capability, enabling high power density, less paralleling, and excellent EMI performance. The improved switching behavior makes the OptiMOS™ 6 200 V family ideal for switching applications such as telecom, server, or audio. Additionally, the combination of wide SOA and industry-leading $R_{DS(on)}$ is a perfect fit for static switching applications such as battery management systems (BMS).

Features and benefits

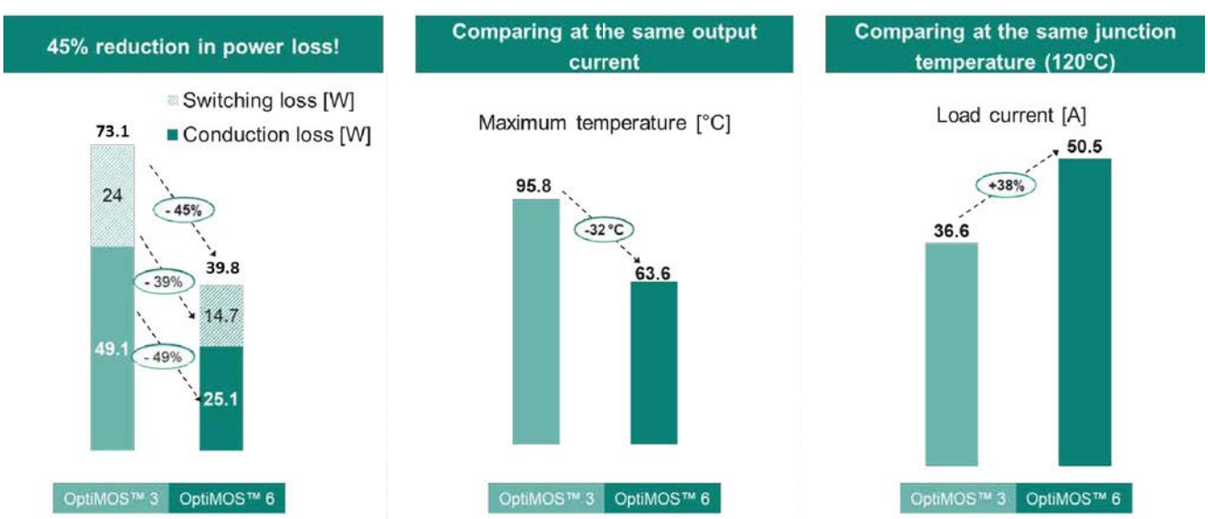
Key features	Key benefits
– Best-in-class $R_{DS(on)}$ in 200 V	– Low conduction lossses
– Lower $Q_{rr(typ)}$ and improved diode softness compared to OptiMOS™ 3	– Low switching losses
– Improved capacitance linearity	– Stable operation with improved EMI
– Wide SOA	– Enhanced robustness
– Tight $V_{GS(th)}$ parametric spread	– Less paralleling required and better current sharing



Application test results

OptiMOS™ 6 vs. OptiMOS™ 3 in 200 V

– 42 percent lower $R_{DS(on)}$ enables reduced conduction losses
– Improved switching behavior enables reduced switching losses



– At the same output power, the maximum device temperature reduction of 32°C was achieved.
– At the same junction temperature, 38 percent higher load current was achieved.

SMPS Audio BMS Drives Solar

Click here to learn more:

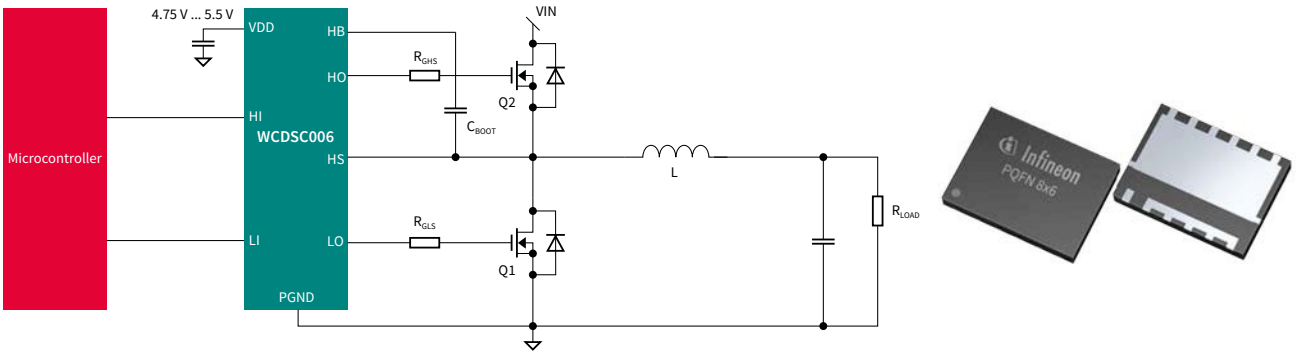
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Your input matters
Share your feedback

OptiMOS™ 40 V in PQFN 8x6

A high-power density package family

Infineon's family of OptiMOS™ N-channel power MOSFETs in PQFN 8x6 packages are benchmark products optimized for very low $R_{DS(on)}$ and high-current capability, alongside Infineon's renowned quality standard for robust industry designs. This makes the PQFN 8x6 MOSFET package the ideal solution for battery-powered, battery protection, and battery formation applications requiring low package resistance and high-current handling MOSFETs. The PQFN 8x6 family of MOSFETs is available in a small 8x6 mm leadless package to reduce end products' physical footprint and overall BOM. The improved $R_{DS(on)}$ and I_D ratings, continuous and pulsed, enable increased battery run time and higher power density.



Features and benefits

Key features	Key benefits
– More than 50% reduction in footprint compared to TOLL	– Power density increase enabling higher power designs while maintaining the space contraints
– Best-in-class continuous current rating and competitive avalanche energy rating	– Good design martin in worst case conditionals (e.g., in-rush motor stall/short)
– Excellent package area utilization	– Ultralow $R_{DS(on)}$ with good thermal resistance R_{thJC}
– Ultralow package parasitics	– EMI improvement due to lower device parasitics
– Footprint compatability with SuperSO8 5x6	– Simple PCB design change based on SuperSO8 provides scalability across varying power requirements

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Small signal/small power MOSFETs -250 to 600 V

Combining latest high-performance silicon technology with small and innovative packaging

Small signal/small power products are ideally suited for space-constrained automotive and non-automotive applications. With an optimal price/performance ratio and small footprint packages, Infineon's small signal and small power MOSFETs best fit a wide range of applications and circuits. These include low-voltage drives, linear battery chargers, battery protection, load switches, DC-DC converters, reverse polarity protection, and many more.

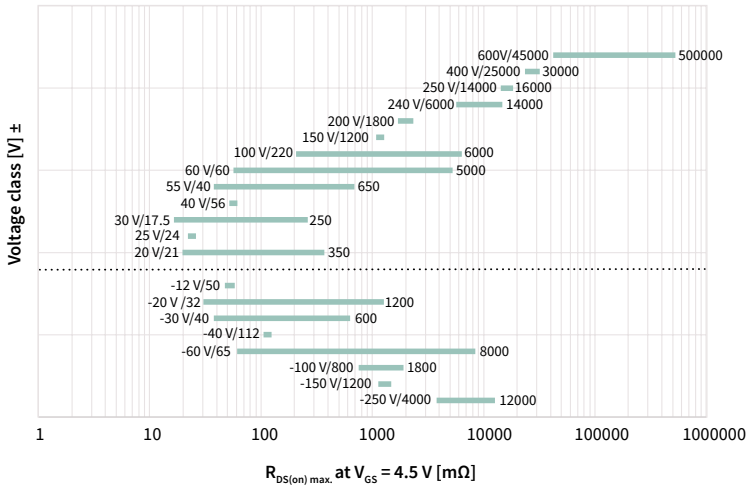
The entire family includes different packages:
SOT-223, SOT-23, SOT-323, SOT-363, SOT-89, TSOP-6, and SC59

The product portfolio covers N-channel and P-channel enhancement mode MOSFETs as well as N-channel depletion mode products:

- -250 to -12 V P-channel enhancement mode (available in single and dual configurations)
- 20 to 600 V N-channel enhancement mode (available in single and dual configurations)
- -20/+20 V and -30/+30 V complementary (N and P-channel) enhancement mode
- 60 to 600 V N-channel depletion mode

Features and benefits

Key features	Key benefits
– Products available in automotive, industrial, and standard qualification levels	– Suitable for automotive and high quality demanding applications
– Four $V_{GS(th)}$ classes available for 1.8 V, 2.5 V, 4.5 V, and 10 V gate drives	– Easy interface to MCU
– ESD protected P-channel parts	– Reduction of design complexity
– V_{DS} range from -250 to 600 V	– Wide selection of products available
– RoHS compliant and halogen free	– Environment-friendly



Small signal/small power MOSFETs are available in seven industry-standard package types ranging from the largest SOT-223 to the smallest SOT-323.

Products are offered in single, dual, and complementary configurations and are suitable for a wide range of applications, including battery protection, LED lighting, low-voltage drives, and DC-DC converters.

SOT-363	SOT-323	SOT-23	TSOP-6	SC59	SOT-89	SOT-223
						

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OptiMOS™ power MOSFETs 15-150 V Source-Down

An innovative PQFN 3.3x3.3 mm² and PQFN 5.0x6.0 mm² product family

Infineon continues to redefine MOSFET performance with its innovative Source-Down (SD) package, designed to meet the demands for high power density and optimized system-level efficiency. Unlike conventional Drain-Down devices, the Source-Down technology connects the source potential directly to the thermal pad, enhancing thermal management and electrical performance. The OptiMOS™ power MOSFETs are now available in PQFN 3.3x3.3 mm² and 5.0x6.0 mm² SD packages, with voltage ratings ranging from 15 to 150 V. These packages come both in bottom-side cooling (BSC) and in dual-side cooling (DSC) configurations. Additionally, Center-Gate and Corner-Gate footprints are available for both package families. The Center-Gate footprint relocates the gate pin to the center, facilitating the easy paralleling of multiple MOSFETs. With an increased drain-to-source creepage distance, designers can conveniently connect the gate connections of multiple devices on a single PCB layer, enhancing design flexibility.

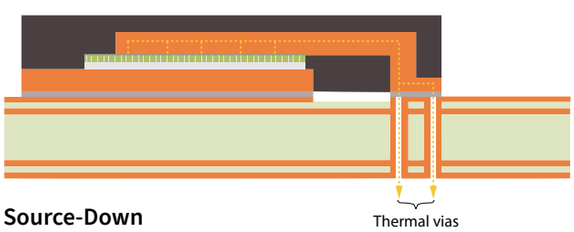
	Standard Drain-Down	New Source-Down bottom-side cooling	New Source-Down dual-side cooling	Standard Drain-Down	PQFN 5x6 Source-Down	PQFN 5x6 Source-Down dual-side cooling (DSC)
						
	PQFN 3.3 x 3.3 mm standard Drain-Down footprint	PQFN 3.3 x 3.3 mm Available in Standard and Center-Gate Source-Down footprint	PQFN 3.3 x 3.3 mm Available in Standard and Center-Gate Source-Down footprint	PQFN 5.0 x 6.0 mm standard Drain-Down footprint	PQFN 5.0 x 6.0 mm Available in Standard and Center-Gate Sour-ce-Down footprint	PQFN 5.0 x 6.0 mm Available in Standard and Center-Gate Sour-ce-Down footprint
R_{thJC} [C/W]	1.8°C/W	1.4°C/W	1.4°C/W	0.8°C/W	0.45°C/W	0.45°C/W

Features, benefits and value

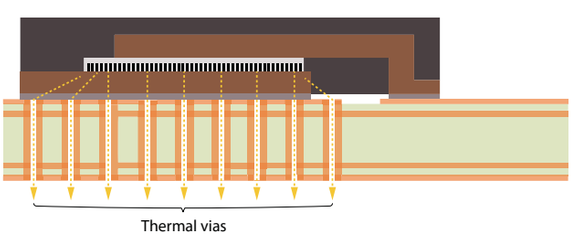
Key features	Key benefits	Value
– Cutting-edge silicon technology – OptiMOS™ 25 - 150 V with outstanding FOMs	– Minimized conduction losses	– Improved efficiency
– Source-Down package with improved thermal performance and ultra low parasitics	– Fast switching for reduced switching losses	– Easy thermal management
– Source-Down package with maximized chip/ package ratio	– Increased maximum current capability	– System cost reduction bill of material (BOM)
– Source-Down package in Center-Gate footprint	– Increased maximum current capability	– System form factor reduction for highest power density
	– Center-Gate footprint enables optimized paral-lelization	– More flexibility for PCB layout (easy to use)

Optimized thermal management

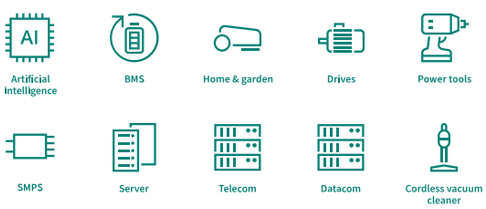
Drain-Down



Source-Down



In most cases, thermal vias cannot be used on the thermal pad if connected to the noisy switch node potential. With the SD package, the low-side MOSFET's thermal pad is now on the ground, potentially enabling the use of thermal vias right underneath the device. Heat is effectively dissipated into the PCB directly through the thermal pad in the SD package technology. The SD package significantly improves the product family's thermal resistance (R_{thJC}), which in turn considerably improves the end application's thermal performance and power density.



Click here to learn more:

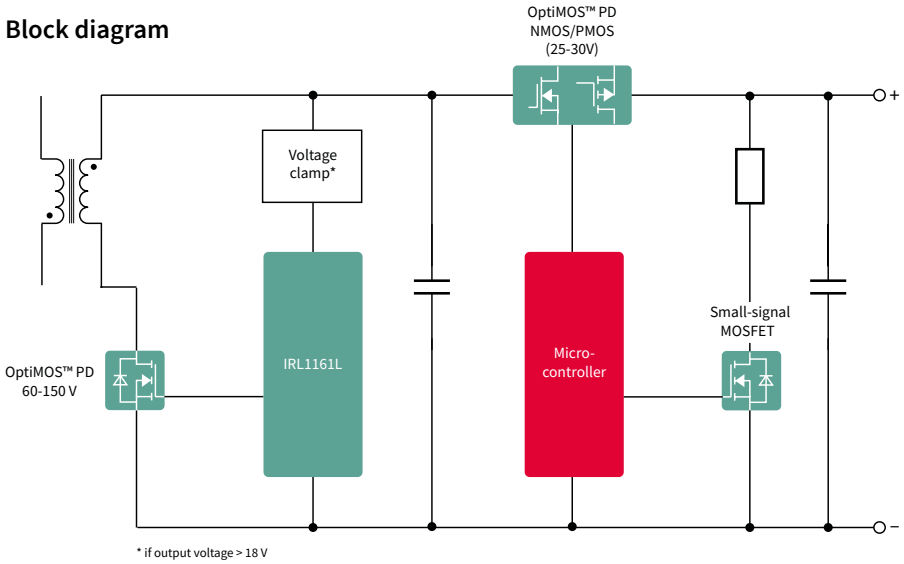
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OptiMOS™ PD

The best fit for USB-PD and fast charger designs

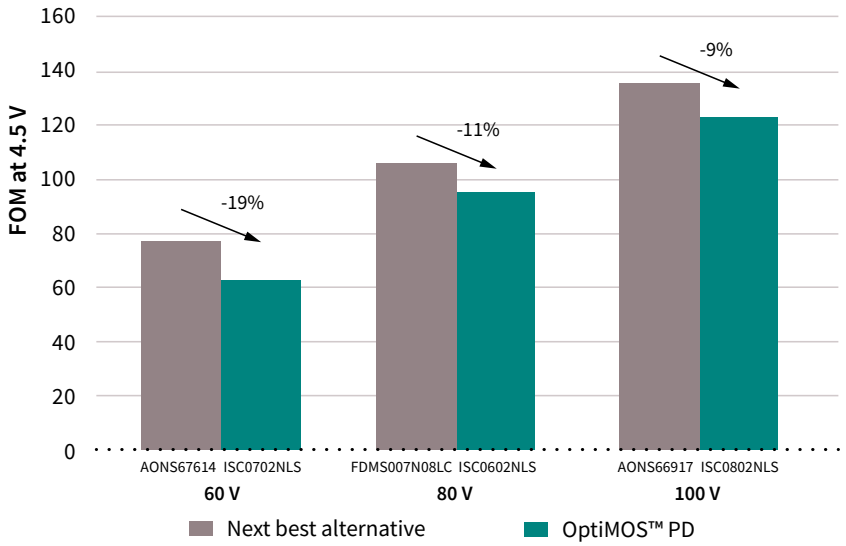
OptiMOS™ PD is Infineon‘s new MOSFET portfolio that best fits USB-PD and fast charger designs and is available in 2 small standard packages: PQFN 3.3x3.3 and SuperSO8. Logic level availability enables parts to be fully driven from 4.5 V or directly from microcontrollers, resulting in a lower part count in the application. The portfolio ranges from 25 V up to 150 V MOSFETs, where 25 V and 30 V products represent the fit as load switch, and 60 to 150 V parts are the optimal choice to function as synchronous rectification FETs in charger and adapter designs.

Block diagram





OptiMOS™ PD comparison of $R_{DS(on)}$ in 60 V, 80 V, and 100 V



The OptiMOS™ PD family features MOSFETs offering a low on-state resistance ($R_{DS(on)}$), less switching losses, and low gate-, output and reverse-recovery charges. The reduction in overall losses results in an excellent price/performance ratio leading to a decrease in total system BOM cost.

USB PD charger | Adapter | Consumer | Smartphone charger

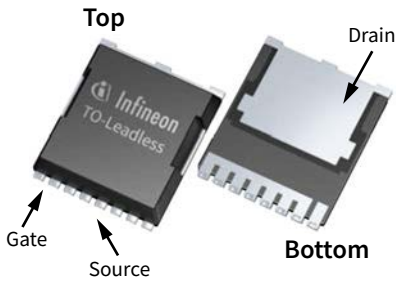
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TOLx family

TO-Leadless (TOLL)

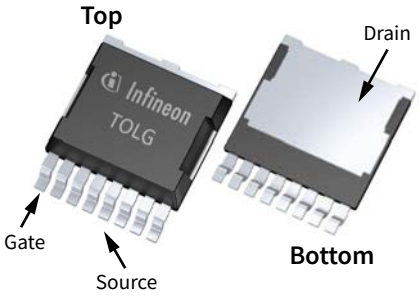


Optimized for high power applications

TO-Leadless is optimized to handle currents up to 500 A, increasing power density with a substantial footprint reduction. A footprint reduction of 30 percent compared to D²PAK, together with a height reduction of 50 percent, results in an overall space saving of 60 percent, enabling much more compact designs.

Key features	Key benefits
– Best-in-class technology	– High performance capability
– High current rating >500 A	– High system reliability
– 60% space reduction compared to D²PAK 7-pin	– Optimized board utilization

TOLG (Gullwing leads)

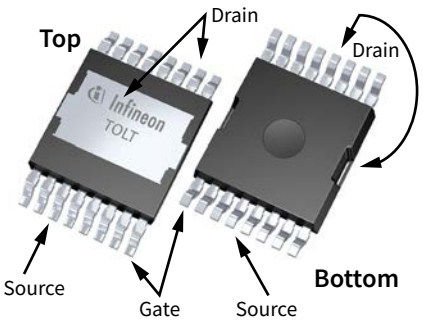


Optimized for better TCoB robustness

TOLG package offers a compatible footprint to the TO-Leadless with the additional feature of Gullwing leads, resulting in two times higher TCoB performances compared to TO-Leadless. This package is excellent on aluminum insulated metal substrate boards (Al-IMS).

Key features	Key benefits
– Best-in-class technology	– High performance capability
– High current rating >450 A	– High system reliability
– Low ringing and voltage overshoot	– High efficiency and lower EMI
– 60% space reduction compared to D2PAK 7-pin	– Optimized board utilization
– Gullwing leads	– High thermal cycling on board performance

TOLT (Top-side cooling)



Optimized for superior thermal performance

TOLT is the new top-side cooling package within the TOLx family. With top-side cooling, the drain is exposed at the surface of the package allowing for 95 percent of the heat to be dissipated directly to the heatsink, achieving 20 percent better R_{thJA} and 50 percent improved R_{thJC} compared to the TOLL package. With bottom-side cooling packages, like the TOLL or the D²PAK, the heat is dissipated via the PCB to the heatsink, resulting in high power losses.

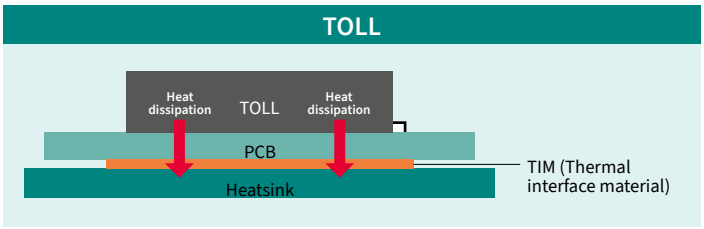
Key features	Key benefits
– Low $R_{DS(on)}$	– Reduction in conduction losses
– High current rating	– Increased product ruggedness
– Top-side cooling	– Superior thermal performance
– Negative standoff	– Minimize thermal resistance to heatsink

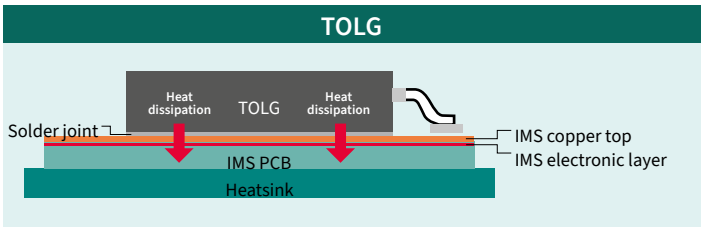
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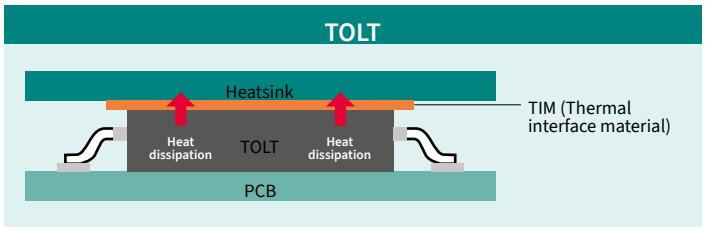
TOLx family – cooling concept





With TOLL/TOLG board mounting, the heat is dissipated through the PCB to the heatsink.
Due to the PCB thermal resistance, power losses occur.

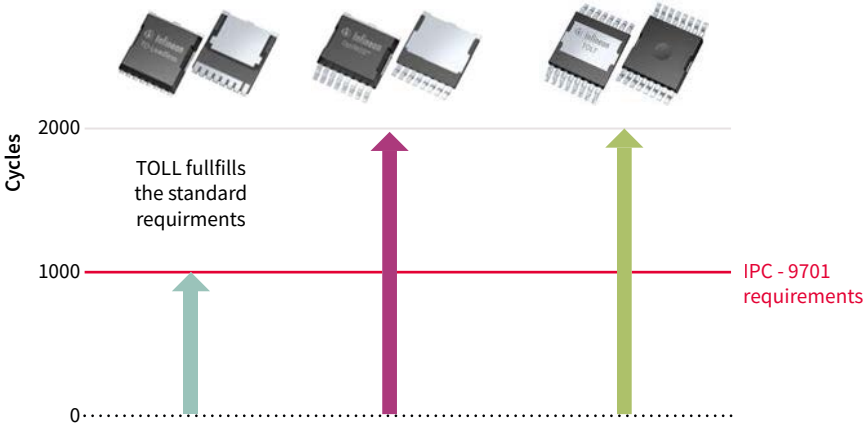




With a top-side cooling setup, the drain pad is exposed on the top of the package, allowing the majority of the heat to be dissipated into the top-mounted heatsink. This pulls heat away from the PCB, resulting in at least 20 percent better $R_{(thJA)}$ than standard over-molded TOLL.



Thermal cycling on IMS board (TCoB) performance



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OptiMOS™ 7 15 V logic level

DC-DC LED Mainboard Notebook Onboard VRD/VRM

$R_{DS(on),max}$ at V_{GS}=4.5 V [mΩ]	PQFN 3.3x3.3 Source-Down	PQFN 3.3x3.3 Source-Down dual-side cooling (DSC)	PQFN 2x2
<1	IQE004NE1LM7 $R_{DS(on)}$=0.57 mΩ	IQE004NE1LM7SC $R_{DS(on)}$=0.57 mΩ	
	IQE004NE1LM7CG $R_{DS(on)}$=0.57 mΩ	IQE004NE1LM7CGSC $R_{DS(on)}$=0.57 mΩ	
2-4			ISK018NE1LM7 $R_{DS(on)}$=2.15 mΩ

OptiMOS™ and StrongIRFET™ 20 V (super) logic level

DC-DC LED Mainboard Notebook Onboard VRD/VRM

$R_{DS(on),max}$ at V_{GS}=4.5 V [mΩ]	PQFN 2x2	PQFN 3.3x3.3	SuperSO8
<1			IRFH6200TRPBF $R_{DS(on)}$=0.99 mΩ
2-4		IRLHM620TRPBF** $R_{DS(on)}$=2.5 mΩ	
>10	IRLHS6242TRPBF $R_{DS(on)}$=11.7 mΩ		

OptiMOS™ 7 25 V hard-switching optimized

AI Artificial intelligence SMPS Datacom Server

$R_{DS(on),max}$ at V_{GS}=10 V [mΩ]	PQFN 3.3 x 3.3 Source-Down; Dual-side cooling ; Center gate	PQFN 3.3 x 3.3 Source-Down; Center gate
<1	IQEH50NE2LM7UCGSC $R_{DS(on)}$=0.50 mΩ	IQEH54NE2LM7UCG $R_{DS(on)}$=0.54 mΩ
	IQEH64NE2LM7UCGSC $R_{DS(on)}$=0.64 mΩ	IQEH68NE2LM7UCG $R_{DS(on)}$=0.68 mΩ
	IQEH80NE2LM7UCGSC $R_{DS(on)}$=0.80 mΩ	IQEH84NE2LM7UCG $R_{DS(on)}$=0.84 mΩ

OptiMOS™ 7 25 V soft-switching optimized

AI Artificial intelligence SMPS Datacom Server

$R_{DS(on),max}$ at V_{GS}=10 V [mΩ]	PQFN 3.3 x 3.3 Source-Down; Dual-side cooling ; Center gate	PQFN 3.3 x 3.3 Source-Down; Center gate
<1	IQEH46NE2LM7ZCGSC $R_{DS(on)}$=0.46 mΩ	IQEH50NE2LM7ZCG $R_{DS(on)}$=0.50 mΩ

OptiMOS™ and StrongIRFET™ 25 V logic level

DC-DC LED Mainboard Motor control Notebook Onboard VRD/VRM

$R_{DS(on),max}$ at V_{GS}=10 V [mΩ]	PQFN 2x2	PQFN 3.3x3.3	SuperSO8	PQFN 3.3x3.3 Source-Down	PQFN 3.3x3.3 Source-Down DSC (dual-side cooling)	PQFN 5x6 Source-Down	PQFN 5x6 Source-Down DSC (dual-side cooling)
<1			BSC004NE2LS5 $R_{DS(on)}$=0.45 mΩ	IQE006NE2LM5 $R_{DS(on)}$=0.65 mΩ	IQE006NE2LM5CGSC $R_{DS(on)}$=0.58 mΩ	IQDH29NE2LM5CG $R_{DS(on)}$=0.29 mΩ	IQDH29NE2LM5SC $R_{DS(on)}$=0.29 mΩ
				IQE006NE2LM5CG $R_{DS(on)}$=0.65 mΩ	IQE006NE2LM5SC $R_{DS(on)}$=0.58 mΩ	IQDH29NE2LM5 $R_{DS(on)}$=0.29 mΩ	IQDH29NE2LM5CGSC $R_{DS(on)}$=0.29 mΩ
		BSZ009NE2LS5 $R_{DS(on)}$=0.9 mΩ	BSC009NE2LS5I* $R_{DS(on)}$=0.95 mΩ			IQDH29NE2LM5SC $R_{DS(on)}$=0.29 mΩ	
		BSZ011NE2LS5I $R_{DS(on)}$=1.1 mΩ				IQDH29NE2LM5CGSC $R_{DS(on)}$=0.29 mΩ	
		BSZ013NE2LS5I* $R_{DS(on)}$=1.3 mΩ					
		BSZ014NE2LS5IF** $R_{DS(on)}$=1.45 mΩ	BSC015NE2LS5I* $R_{DS(on)}$=1.5 mΩ				
			BSC018NE2LS $R_{DS(on)}$=1.8 mΩ				
		BSZ018NE2LS $R_{DS(on)}$=1.8 mΩ					
2-4	ISK024NE2LM5 $R_{DS(on)}$=2.4 mΩ	BSZ031NE2LS5 $R_{DS(on)}$=3.1 mΩ					
			BSC026NE2LS5 $R_{DS(on)}$=2.6 mΩ				
			BSC032NE2LS $R_{DS(on)}$=3.2 mΩ				
4-10		BSZ060NE2LS $R_{DS(on)}$=6.0 mΩ	BSC050NE2LS $R_{DS(on)}$=5.0 mΩ				

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* Optimized for resonant applications (e.g., LLC converter) ** Monolithically-integrated Schottky-like diode *** $R_{DS(on),max}$ at V_{GS}=4.5 V 1) 2.5 V_{GS} capable

OptiMOS™ 25 V in Power Block 5x6



Part number	Package	Monolithically-integrated Schottky-like diode	BV_{DSS} [V]	$R_{DS(on),max.}$ [mΩ] at V_{GS}=4.5 V max.		Q_G [nC] at V_{GS}=4.5 V typ.	
				High-side	Low-side	High-side	Low-side
BSG0810NDI	SuperSO8	✓	25	4.0	1.2	5.6	16.0
BSG0811ND	SuperSO8	–	25	4.0	1.1	5.6	20.0
BSG0813NDI	SuperSO8	✓	25	4.0	1.7	5.6	12.0

OptiMOS™ 25/30 V symmetrical and asymmetrical dual N-channel MOSFETs in 5x6 and 3x3 PQFN

Integrates the low-side and high-side MOSFET of a synchronous DC-DC converter into a single package.
The small outline and the interconnection of the two MOSFETs within the package minimize the loop inductance which boosts efficiency.

Part number	Package	Monolithically-integrated Schottky-like diode	BV_{DSS} [V]	$R_{DS(on),max.}$ [mΩ] at V_{GS}=4.5 V max.		Q_G [nC] at V_{GS}=4.5 V typ.	
				High-side	Low-side	High-side	Low-side
BSC0911ND*	asymmetrical dual 5x6	–	25	4.8	1.7	7.7	25
BSC0921NDI*	asymmetrical dual 5x6	✓	30	7	2.1	5.8	21
BSC0923NDI*	asymmetrical dual 5x6	✓	30	7	3.7	5.2	12.2
BSC0924NDI*	asymmetrical dual 5x6	✓	30	7	5.2	5.2	8.6

OptiMOS™ 40 V and 100 V in symmetrical Power Block 6.3x6.0

Part number	Package	Dual-side cooling	BV_{DSS} [V]	$R_{DS(on)}$ [mΩ] at V_{GS} = 10 V max	Q_G [nC] at V_{GS} = 10 V typ.
ISG0613N04NM6H	Power Block 6.3x6.0	–	40 V	0.88	69
ISG0613N04NM6HSC	Power Block 6.3x6.0	✓	40 V	0.88	69
ISG0616N10NM5HSC	Power Block 6.3x6.0	✓	100 V	3.4	52

OptiMOS™/StrongIRFET™ 30 V - 100 V dual N-channel MOSFETs



Integrates two independent N-channel MOSFETs into a single package for high power density and compact design.
Ideal for DC motors with power rating <200 W

Part number	Package	Monolithically integrated Schottky like diode	BV_{DSS} [V]	$R_{DS(on),max.}$ [mΩ] at V_{GS}=10 V max.		Q_G [nC] at V_{GS}=10 V typ.	
				High-side	Low-side	High-side	Low-side
IRF7907*	asymmetrical dual SO8	–	30	16.4	11.8	6.7**	14**
IRLHS6376*	symmetrical dual PQFN 2x2	–	30	63**	63**	2.8**	2.8**
BSC072N04LD*	symmetrical dual 5x6	–	40	7.2	7.2	39	39
BSC076N04ND	symmetrical dual 5x6	–	40	7.6	7.6	28	28
BSC155N06ND	symmetrical dual 5x6	–	60	15.5	15.5	21	21
IRF7351	symmetrical dual SO8	–	60	17.8	17.8	24	24
ISA170170N04LMDS*	symmetrical dual SO8	-	40	17	17	13	13
ISA250250N04LMDS*	symmetrical dual SO8	-	40	25	25	7.9	7.9

Dual N-channel audio MOSFETs

Digital audio MOSFET half-bridges are specifically designed for class D audio amplifier applications.
They consist of two power MOSFET switches connected in half-bridge configuration.

Part number	Package	Monolithically-integrated Schottky like diode	BV_{DSS} [V]	$R_{DS(on),max.}$ [mΩ] at V_{GS}=4.5 V max.		Q_G [nC] at V_{GS}=4.5 V typ.	
				High-side	Low-side	High-side	Low-side
IRFI4212H-117P	half-bridge in TO220FP	–	100	72.5	72.5	12	12

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* Logic level (capable of 4.5 V gate drive)

** $R_{DS(on)}$ at V_{GS}=4.5V

OptiMOS™ and StrongIRFET™ 30 V normal level

DC-DC Mainboard Motor control Notebook Onboard VRD/VRM

$R_{DS(on),max.}$ at V_{GS}=10 V [mΩ]	SO8	TOLL (TO-Leadless)
<1		IPT004N03L $R_{DS(on)}$=0.04 mΩ
2-4	IRF8788TRPBF $R_{DS(on)}$=2.8 mΩ	
	IRF7862TRPBF $R_{DS(on)}$=3.3 mΩ	
	IRF7832TRPBF $R_{DS(on)}$=4.0 mΩ	
4-10	IRF8736TRPBF $R_{DS(on)}$=4.8 mΩ	

OptiMOS™ and StrongIRFET™ 2 30 V logic level

DC-DC Mainboard Motor control Notebook Onboard VRD/VRM

$R_{DS(on),max.}$ at V_{GS}=10 V [mΩ]	PQFN 3.3x3.3	TO-252 (DPAK)	TO-220	SuperSO8	TO-263 (D^2PAK)
1-2			IPP011N03LF2S $R_{DS(on)}$=1.1 mΩ	ISC009N03LF2S $R_{DS(on)}$=0.9 mΩ	IPB010N03LF2S $R_{DS(on)}$=1.0 mΩ
		IPD020N03LF2S $R_{DS(on)}$=2.0 mΩ	IPP018N03LF2S $R_{DS(on)}$=1.8 mΩ	ISC012N03LF2S $R_{DS(on)}$=1.2 mΩ	IPB018N03LF2S $R_{DS(on)}$=1.8 mΩ
		IPD023N03LF2S $R_{DS(on)}$=2.3 mΩ	IPP020N03LF2S $R_{DS(on)}$=2.0 mΩ	ISC015N03LF2S $R_{DS(on)}$=1.5 mΩ	IPB020N03LF2S $R_{DS(on)}$=2.0 mΩ
2-4	ISZ028N03LF2S $R_{DS(on)}$=2.8 mΩ	IPD030N03LF2S $R_{DS(on)}$=3.0 mΩ	IPP023N03LF2S $R_{DS(on)}$=2.3 mΩ	ISC023N03LF2S $R_{DS(on)}$=2.3 mΩ	IPB023N03LF2S $R_{DS(on)}$=2.3 mΩ
	ISZ033N03LF2S $R_{DS(on)}$=3.3 mΩ	IPD031N03L G $R_{DS(on)}$=3.1 mΩ	IPP033N03LF2S $R_{DS(on)}$=3.3 mΩ	ISC028N03LF2S $R_{DS(on)}$=2.8 mΩ	
				ISC033N03LF2S $R_{DS(on)}$=3.3 mΩ	
4-10	ISZ056N03LF2S $R_{DS(on)}$=5.6 mΩ	IPD040N03LF2S $R_{DS(on)}$=4.0 mΩ	IPP044N03LF2S $R_{DS(on)}$=4.4 mΩ	ISC052N03LF2S $R_{DS(on)}$=5.2 mΩ	
		IPD047N03LF2S $R_{DS(on)}$=4.7 mΩ	IPP050N03LF2S $R_{DS(on)}$=5.0 mΩ		

OptiMOS™ and StrongIRFET™ 30 V logic level

DC-DC Mainboard Motor control Notebook Onboard VRD/VRM

$R_{DS(on),max.}$ at V_{GS}=10 V [mΩ]	PQFN 3.3 x 3.3 Source-Down	PQFN 3.3x3.3 Source-Down DSC (dual-side cooling)	PQFN 5x6 Source-Down	PQFN 5x6 Source-Down DSC (dual-side cooling)	PQFN 3.3 x 3.3	SuperSO8
<1	IQE008N03LM5 $R_{DS(on)}$=0.85 mΩ	IQE008N03LM5CGSC $R_{DS(on)}$ = 0.85 mΩ	IQDH35N03LM5 $R_{DS(on)}$ = 0.35 mΩ	IQDH35N03LM5SC $R_{DS(on)}$=0.35 mΩ		BSC005N03LS5 $R_{DS(on)}$=0.55 mΩ
	IQE008N03LM5CG $R_{DS(on)}$=0.85 mΩ	IQE008N03LM5SC $R_{DS(on)}$ = 0.85 mΩ	IQDH35N03LM5CG $R_{DS(on)}$ = 0.35 mΩ	IQDH35N03LM5CGSC $R_{DS(on)}$=0.35 mΩ		BSC005N03LS5I* $R_{DS(on)}$=0.5 mΩ
1-2						BSC011N03LS $R_{DS(on)}$=1.1 mΩ
						BSC011N03LSI* $R_{DS(on)}$=1.1 mΩ
					BSZ0500NSI* $R_{DS(on)}$=1.5 mΩ	
					BSZ019N03LS $R_{DS(on)}$=1.9 mΩ	
					BSZ0501NSI* $R_{DS(on)}$=2.0 mΩ	BSC0901NS $R_{DS(on)}$=1.9 mΩ
						BSC0501NSI** $R_{DS(on)}$=1.9 mΩ

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*Monolithically-integrated Schottky-like diode **For more information on the product, contact our product support
1) Coming soon

OptiMOS™ and StrongIRFET™ 30 V logic level



$R_{DS(on),\ max.}$ at V_{GS}=10 V [mΩ]	PQFN 3.3x3.3	SuperSO8	PQFN 2x2
2-4			ISK036N03LM5 $R_{DS(on)}$=3.6 mΩ
	BSZ0902NS $R_{DS(on)}$=2.6 mΩ		
	BSZ0502NSI** $R_{DS(on)}$=2.8 mΩ	BSC0902NS $R_{DS(on)}$=2.6 mΩ	
		BSC0902NSI* $R_{DS(on)}$=2.8 mΩ	
		BSC030N03LS G $R_{DS(on)}$=3.0 mΩ	
		BSC0504NSI* $R_{DS(on)}$=3.7 mΩ	
	BSZ0904NSI** $R_{DS(on)}$=4.0 mΩ		
4-10	BSZ0506NS $R_{DS(on)}$=4.4 mΩ	BSC0906NS $R_{DS(on)}$=4.5 mΩ	
	BSZ065N03LS $R_{DS(on)}$=6.5 mΩ		

OptiMOS™ and StrongIRFET™ 40 V normal level



$R_{DS(on),\ max.}$ at V_{GS}=10 V [mΩ]	TO-252 (DPAK)	TO-263 (D^2PAK)	TO-263 (D^2PAK 7-pin)	TO-220	PQFN 5.x6 Source-Down	PQFN 5x6 Source-Down DSC (dual-side cooling)	sTOLL	SuperSO8	PQFN 3.3x3.3	TOLL (TO-Leadless)
<1					IQD005N04NM6CG $R_{DS(on)}$ = 0.49 mΩ	IQD005N04NM6SC $R_{DS(on)}$=0.49 mΩ	IST006N04NM6 $R_{DS(on)}$=0.6 mΩ	ISCH54N04NM7V $R_{DS(on)}$=0,54 mΩ		IRL40T209 $R_{DS(on)}$=0.72 mΩ
					IQD005N04NM6 $R_{DS(on)}$ = 0.49 mΩ	IQD005N04NM6CGSC $R_{DS(on)}$=0.47 mΩ		ISCH69N04NM7V $R_{DS(on)}$=0,69 mΩ		
			IPF009N04NF2S $R_{DS(on)}$ = 0.9 mΩ					ISC007N04NM6 $R_{DS(on)}$=0.7 mΩ		
								ISCH9N04NM7V $R_{DS(on)}$=0,99 mΩ		
								ISC010N04NM6 $R_{DS(on)}$=1.0 mΩ		
1-2								ISC011N04NM7V $R_{DS(on)}$=1,1 mΩ		
		IPB012N04NF2S $R_{DS(on)}$ = 1.25 mΩ		IPP011N04NF2S $R_{DS(on)}$ = 1.15 mΩ				ISC012N04NM6 $R_{DS(on)}$ =1.2 mΩ		
				IPP013N04NF2S $R_{DS(on)}$ = 1.3 mΩ				ISC012N04NM7V $R_{DS(on)}$=1,25 mΩ		
		IPB014N04NF2S $R_{DS(on)}$ = 1.45 mΩ	IPF013N04NF2S $R_{DS(on)}$ = 1.35 mΩ	IPP015N04NF2S $R_{DS(on)}$ = 1.5 mΩ				ISC015N04NM5 $R_{DS(on)}$=1.5 mΩ		
		IRFS7437TRLPBF $R_{DS(on)}$ =1.8 mΩ						ISZ015N04NM7V $R_{DS(on)}$=1.55 mΩ		
								ISC016N04NM7V $R_{DS(on)}$=1,63 mΩ		
									ISC017N04NM5 $R_{DS(on)}$=1.7 mΩ	
								ISC019N04NM5 $R_{DS(on)}$=1.9 mΩ		
2-4	IPD023N04NF2S $R_{DS(on)}$ = 2.3 mΩ			IRFB7440PBF $R_{DS(on)}$ = 2.5 mΩ				IRFH7440TRPBF $R_{DS(on)}$ =2.4 mΩ		
	IPD029N04NF2S $R_{DS(on)}$ = 2.9 mΩ							ISC028N04NM5 $R_{DS(on)}$=2.8 mΩ		
4-10								ISC046N04NM5 $R_{DS(on)}$=4.6 mΩ		
								ISC058N04NM5 $R_{DS(on)}$=5.8 mΩ		

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** Monolithically-integrated Schottky-like diode

*** $R_{DS(on)}$, max. at V_{GS}=4.5 V

**** Normal level

1) 2.5 V_{GS} capable

AC-DC | Battery | Consumer | DC-DC | Electric toys | Industrial drives | LED
Motor control | Offline | PC power | Power tools | Server | SMPS | Solar | UPS

OptiMOS™ and StrongIRFET™ 40 V logic level

$R_{DS(on),max.}$ at V_{GS}=10 V [mΩ]	TO-263 (D^2PAK)	PQFN 5x6 Source-Down	PQFN 2x2	PQFN 5x6 Source-Down DSC (dual-side cooling)	PQFN 3.3x3.3 Source-Down	PQFN 3.3x3.3 Source-Down DSC (dual-side cooling)	PQFN 3.3x3.3	SuperSO8	SuperSO8 dual-side cooling (DSC)
<1		IQDH45N04LM6CG $R_{DS(on)}$ = 0.45 mΩ		IQDH45N04LM6SC $R_{DS(on)}$=0.45 mΩ				ISCH42N04LM7 $R_{DS(on)}$=0.42 mΩ	BSC007N04LS6SC $R_{DS(on)}$=0.7 mΩ
		IQDH45N04LM6 $R_{DS(on)}$ = 0.45 mΩ		IQDH45N04LM6CGSC $R_{DS(on)}$=0.45mΩ				BSC007N04LS6 $R_{DS(on)}$=0.7 mΩ	BSC009N04LSSC $R_{DS(on)}$ = 0.94 mΩ
1-2					IQE013N04LM6 $R_{DS(on)}$ = 1.35 mΩ	IQE013N04LM6CGSC* $R_{DS(on)}$ =1.35 mΩ			
	IRL40S212 $R_{DS(on)}$ =1.9 mΩ				IQE013N04LM6CG $R_{DS(on)}$ = 1.35 mΩ	IQE013N04LM6SC* $R_{DS(on)}$ = 1.35 mΩ		BSC010N04LS6 $R_{DS(on)}$ =1.0 mΩ	
								BSC010N04LSI $R_{DS(on)}$ =1.05 mΩ	
								ISC012N04LM6 $R_{DS(on)}$ =1.2 mΩ	
								BSC014N04LS $R_{DS(on)}$ =1.4 mΩ	
							BSZ018N04LS6 $R_{DS(on)}$ =1.8 mΩ	BSC014N04LSI $R_{DS(on)}$ =1.45 mΩ	
								BSC019N04LS $R_{DS(on)}$ =1.9 mΩ	
2-4							BSZ021N04LS6 $R_{DS(on)}$ =2.1 mΩ		
							BSZ024N04LS6 $R_{DS(on)}$ =2.4 mΩ		
								BSC026N04LS $R_{DS(on)}$ =2.6 mΩ	
							BSZ028N04LS $R_{DS(on)}$ =2.8 mΩ		
							BSZ034N04LS $R_{DS(on)}$ =3.4 mΩ	BSC032N04LS $R_{DS(on)}$ =3.2 mΩ	
4-10			ISK057N04LM6 $R_{DS(on)}$ = 5.75 mΩ						
							BSZ063N04LS6 $R_{DS(on)}$ =6.3 mΩ		
								BSC059N04LS6 $R_{DS(on)}$ =5.9 mΩ	

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OptiMOS™ and StrongIRFET™ 60 V normal level

$R_{DS(on),max.}$ at V_{GS}=10 V [mΩ]	TO-252 (DPAK)	TO-263 (D^2PAK)	TO-263 (D^2PAK 7-pin)	TO-262 (I^2PAK)	PQFN 5x6 Source-Down	TO-220	TO-220 FullPAK	TO-247	SuperSO8 DSC (dual-side cooling)
>1					IQD009N06NM5CG $R_{DS(on)}$ = 0.9 mΩ				
					IQD009N06NM5 $R_{DS(on)}$ = 0.9 mΩ				
1-2			IPB010N06N [1] $R_{DS(on)}$=1.0 mΩ						
			IPF010N06NF2S $R_{DS(on)}$ = 1.05 mΩ						
			IPF012N06NF2S $R_{DS(on)}$ = 1.2 mΩ						
		IPB013N06NF2S $R_{DS(on)}$ = 1.3 mΩ	IPB014N06N $R_{DS(on)}$ = 1.4 mΩ						
						IPP014N06NF2S $R_{DS(on)}$=1.4 mΩ			BSC014N06NSSC $R_{DS(on)}$ = 1.4 mΩ
						IPP016N06NF2S $R_{DS(on)}$=1.6 mΩ			BSC016N06NSSC $R_{DS(on)}$ = 1.6 mΩ
						IPP019N06NF2S $R_{DS(on)}$=1.9 mΩ			
		IPB015N06NF2S $R_{DS(on)}$ = 1.5 mΩ							
			IPF016N06NF2S $R_{DS(on)}$ = 1.7 mΩ						
		IPB018N06NF2S $R_{DS(on)}$ = 1.8 mΩ							
						IPP020N06N [1] $R_{DS(on)}$ =2.0 mΩ		IRFP7530PBF $R_{DS(on)}$ =2.0 mΩ	
2-4	IPD025N06N [1] $R_{DS(on)}$ =2.5 mΩ								BSC028N06NSSC $R_{DS(on)}$ = 2.8 mΩ
	IPD028N06NF2S $R_{DS(on)}$ = 2.85 mΩ			IPI029N06N [1] $R_{DS(on)}$ =2.9 mΩ					
		IPB026N06N [1] $R_{DS(on)}$ =2.6 mΩ				IPP029N06N [1] $R_{DS(on)}$ =2.9 mΩ			
		IPB029N06NF2S $R_{DS(on)}$ = 2.9 mΩ					IPA029N06N [1] $R_{DS(on)}$ =2.9 mΩ		
						IPP030N06NF2S $R_{DS(on)}$=3.05 mΩ			
	IPD033N06N [1] $R_{DS(on)}$=3.3 mΩ								
	IPD038N06NF2S $R_{DS(on)}$ = 3.85 mΩ	IRFS7537TRLPBF $R_{DS(on)}$ =3.3 mΩ				IPP040N06NF2S $R_{DS(on)}$=4.00 mΩ		IRFP7537PBF $R_{DS(on)}$ =3.3 mΩ	
							IPA040N06N [1] $R_{DS(on)}$ =4.0 mΩ		
4-10						IPP040N06N [1] $R_{DS(on)}$ =4.0 mΩ			
	IPD053N06N [1] $R_{DS(on)}$ =5.3 mΩ								
		IPB057N06N [1] $R_{DS(on)}$ =5.7 mΩ				IRFB7545PBF $R_{DS(on)}$ =5.9 mΩ			
							IPA060N06N [1] $R_{DS(on)}$ =6.0 mΩ		

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1) 6 V rated ($R_{DS(on)}$ also specified at V_{GS}=6 V)

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OptiMOS™ and StrongIRFET™ 60 V normal level

$R_{DS(on),max.}$ at V_{GS}=10 V [mΩ]	PQFN 3.3x3.3	PQFN 3.3x3.3 Source-Down	PQFN 3.3x3.3 Source-Down DSC (dual-side cooling)	PQFN 5x6 Source-Down dual-side cooling (DSC)	SO8	SuperSO8	TOLT	TO-Leadless	sTOLL
<1				IQD009N06NM5SC $R_{DS(on)}$=0.9 mΩ			IPTC007N06NM5 $R_{DS(on)}$ = 0.7 mΩ	IPT007N06N [1] $R_{DS(on)}$ =0.7 mΩ	IST011N06NM5 $R_{DS(on)}$ = 1.1 mΩ
				IQD009N06NM5CGSC $R_{DS(on)}$=0.9 mΩ					
1-2						ISC010N06NM5 $R_{DS(on)}$ =1.05 mΩ	IPTC012N06NM5 $R_{DS(on)}$ = 1.2 mΩ		IST015N06NM5 $R_{DS(on)}$ = 1.5 mΩ
						BSC012N06NS $R_{DS(on)}$ =1.2 mΩ		IPT012N06N [1] $R_{DS(on)}$ =1.2 mΩ	
								IPT008N06NM5LF $R_{DS(on)}$ = 0.8 mΩ	
						BSC019N06NS [1] $R_{DS(on)}$ =1.9 mΩ			
2-4		IQE030N06NM5CG $R_{DS(on)}$ = 3 mΩ	IQE030N06NM5CGSC * $R_{DS(on)}$=3.0 mΩ			BSC028N06NS [1] $R_{DS(on)}$ =2.8 mΩ			
		IQE030N06NM5 $R_{DS(on)}$ = 3 mΩ	IQE030N06NM5SC * $R_{DS(on)}$=3.0 mΩ			ISC0702NLS $R_{DS(on)}$=2.8 mΩ			
						BSC034N06NS [1] $R_{DS(on)}$ =3.4 mΩ			
						BSC039N06NS [1] $R_{DS(on)}$ =3.9 mΩ			
	BSZ042N06NS [1] $R_{DS(on)}$ =4.2 mΩ				IRF7855TRPBF $R_{DS(on)}$ =9.4 mΩ	IRFH7545TRPBF $R_{DS(on)}$ =5.2 mΩ			
						BSC066N06NS [1] $R_{DS(on)}$ =6.6 mΩ			
	BSZ068N06NS [1] $R_{DS(on)}$ =6.8 mΩ								
	BSZ100N06NS [1] $R_{DS(on)}$ =10.0 mΩ								
5-20						BSC097N06NS [1] $R_{DS(on)}$ =9.7 mΩ			
					IRF7351TRPBF $R_{DS(on)}$ =17.8 mΩ	BSC155N06ND $R_{DS(on)}$ =15.5 mΩ			

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1) 6 V rated ($R_{DS(on)}$ also specified at V_{GS} = 6 V) * Coming soon



OptiMOS™ and StrongIRFET™ 60 V logic level

$R_{DS(on),\ max.}$ at V_{GS}=10 V [mΩ]	TO-252 (DPAK)	PQFN 5x6 Source-Down	PQFN 5x6 Source-Down dual-side cooling (DSC)	PQFN 3.3x3.3 Source-Down	TO-263 (D^2PAK 7-pin)	TO-220	PQFN 2x2	PQFN 3.3x3.3	SuperSO8
<1		IQDH88N06LM5CG $R_{DS(on)}$ = 0.86 mΩ	IQDH88N06LM5SC $R_{DS(on)}$ =0.86 mΩ						ISC009N06LM5 $R_{DS(on)}$ = 0.9 mΩ
		IQDH88N06LM5 $R_{DS(on)}$ = 0.86 mΩ	IQDH88N06LM5CGSC $R_{DS(on)}$ =0.86 mΩ						
1-2									ISC011N06LM5 $R_{DS(on)}$ = 1.1 mΩ
					IRLS3036TRL7PP $R_{DS(on)}$ =1.9 mΩ				
					IRLS3036TRL7PP $R_{DS(on)}$ =1.9 mΩ			ISZ034N06LM5 $R_{DS(on)}$ = 3.4 mΩ	
2-4				IQE022N06LM5 $R_{DS(on)}$ = 2.2 mΩ		IRLB3036PBF $R_{DS(on)}$ =2.4 mΩ			BSC027N06LS5 $R_{DS(on)}$ =2.7 mΩ
				IQE022N06LM5CG $R_{DS(on)}$ = 2.2 mΩ					
				IQE022N06LM5SC $R_{DS(on)}$ = 2.2 mΩ					
				IQE022N06LM5CGSC $R_{DS(on)}$ = 2.2 mΩ					
4-10	IPD048N06L3 G $R_{DS(on)}$ = 4.8 mΩ							BSZ040N06LS5 $R_{DS(on)}$ =4.0 mΩ	BSC065N06LS5 $R_{DS(on)}$ =6.5 mΩ
	IRLR3636TRPBF $R_{DS(on)}$ =6.8 mΩ							BSZ065N06LS5 $R_{DS(on)}$ =6.5 mΩ	BSC094N06LS5 $R_{DS(on)}$ =9.4 mΩ
	IPD079N06L3 G $R_{DS(on)}$ = 7.9 mΩ							BSZ099N06LS5 $R_{DS(on)}$ =9.9 mΩ	
	IPD088N06N3 G $R_{DS(on)}$ = 8.8 mΩ								
>10	IPD220N06L3 G $R_{DS(on)}$ = 22 mΩ						IRL60HS118 $R_{DS(on)}$ =17.0 mΩ		

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1) Linear FET

*Coming soon

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OptiMOS™ and StrongIRFET™ 75 V normal level

$R_{DS(on),\ max.}$ at V_{GS}=10 V [mΩ]	TO-252 (DPAK)	TO-263 (D^2PAK)	TO-263 (D^2PAK 7-pin)	TO-220	TO-247
1-2			IRFS7730TRL7PP $R_{DS(on)}$ =2.0 mΩ		
					IRFP4368PBF $R_{DS(on)}$ =1.85 mΩ
2-4		IRFS7730TRLPBF $R_{DS(on)}$ =2.6 mΩ			IRFP3077PBF $R_{DS(on)}$ =3.3 mΩ
				IRFB7730PBF $R_{DS(on)}$ =2.6 mΩ	
5-10	IRFR3607PBF $R_{DS(on)}$ =9.0 mΩ	IRFS3607TRLPBF $R_{DS(on)}$=9.0 mΩ			



OptiMOS™ and StrongIRFET™ 80 V normal level/logic level

$R_{DS(on),\ max.}$ at V_{GS}=10 V [mΩ]	TO-252 (DPAK)	TO-263 (D^2PAK)	TO-263 (D^2PAK 7-pin)	TO-220	TO-220 FullPAK	SuperSO8 DSC (dual-side cooling)	PQFN 5x6 Source-Down	PQFN 5x6 Source-Down dual-side cooling (DSC)	PQFN 3.3x3.3 Source-Down	PQFN 2x2	PQFN 3.3x3.3	SuperSO8	TO-Leadless
1-2							IQD016N08NM5CG $R_{DS(on)}$ = 1.57 mΩ	IQD016N08NM5SC* $R_{DS(on)}$=1.57 mΩ					
		IPB016N08NF2S $R_{DS(on)}$ = 1.65 mΩ	IPB015N08N5 $R_{DS(on)}$ =1.5 mΩ	IPP016N08NF2S $R_{DS(on)}$=1.6 mΩ			IQD016N08NM5 $R_{DS(on)}$ = 1.57 mΩ	IQD016N08NM5CGSC $R_{DS(on)}$=1.57 mΩ					
			IPF014N08NF2S $R_{DS(on)}$ = 1.4 mΩ	IPP019N08NF2S $R_{DS(on)}$=1.9 mΩ									IPT010N08NM5 $R_{DS(on)}$=1.0 mΩ
		IPB019N08NF2S $R_{DS(on)}$ = 1.95 mΩ	IPF017N08NF2S $R_{DS(on)}$ = 1.7 mΩ										IPT012N08N5 $R_{DS(on)}$ =1.2 mΩ
													IPT012N08NF2S $R_{DS(on)}$ = 1.23 mΩ
2-4		IPB020N08N5 $R_{DS(on)}$ =2.0 mΩ		IPP024N08NF2S $R_{DS(on)}$=2.4 mΩ		BSC023N08NS5SC $R_{DS(on)}$ = 2.3 mΩ							IPT013N08NM5LF $R_{DS(on)}$ = 1.3 mΩ
			IPF023N08NF2S $R_{DS(on)}$ = 2.3 mΩ	IPP023N08N5 $R_{DS(on)}$ =2.3 mΩ		BSC033N08NS5SC $R_{DS(on)}$ = 3.3 mΩ						BSC025N08LS5 $R_{DS(on)}$ =2.5 mΩ	IPT014N08NM5 $R_{DS(on)}$=1.4 mΩ
		IPB024N08NF2S $R_{DS(on)}$ = 2.4 mΩ	IPF039N08NF2S $R_{DS(on)}$ = 3.9 mΩ									BSC026N08NS5 $R_{DS(on)}$ =2.6 mΩ	IPT019N08N5 $R_{DS(on)}$ =1.9 mΩ
												BSC030N08NS5 $R_{DS(on)}$ =3.0 mΩ	
		IPB031N08N5 $R_{DS(on)}$ =3.1 mΩ		IPP034N08N5 $R_{DS(on)}$ =3.4 mΩ									
4-10		IPB040N08NF2S $R_{DS(on)}$ = 4 mΩ		IPP040N08NF2S $R_{DS(on)}$=4.0 mΩ					IQE046N08LM5 $R_{DS(on)}$ = 4.6 mΩ			BSC037N08NS5 $R_{DS(on)}$ =3.7 mΩ	
									IQE046N08LM5CG $R_{DS(on)}$ = 4.6 mΩ			BSC040N08NS5 $R_{DS(on)}$ =4.0 mΩ	
	IPD040N08NF2S $R_{DS(on)}$ = 4 mΩ	IPB055N08NF2S $R_{DS(on)}$ = 5.5 mΩ			IPA052N08NM5S $R_{DS(on)}$ =5.2 mΩ				IQE046N08LM5SC $R_{DS(on)}$ = 4.6 mΩ			BSC052N08NS5 $R_{DS(on)}$ =5.2 mΩ	
	IPD055N08NF2S $R_{DS(on)}$ = 5.5 mΩ			IPP055N08NF2S $R_{DS(on)}$ =5.5 mΩ					IQE046N08LM5CGSC $R_{DS(on)}$ = 4.6 mΩ		BSZ070N08LS5 $R_{DS(on)}$ =7.0 mΩ		
											BSZ075N08NS5 $R_{DS(on)}$ =7.5 mΩ	BSC061N08NS5 $R_{DS(on)}$ =6.1 mΩ	
												BSC072N08NS5 $R_{DS(on)}$ =7.2 mΩ	
											BSZ084N08NS5 $R_{DS(on)}$ =8.4 mΩ		
>10												BSC117N08NS5 $R_{DS(on)}$ =11.7 mΩ	
										IRL80HS120 $R_{DS(on)}$ =32.0 mΩ	BSZ110N08NS5 $R_{DS(on)}$ =11.0 mΩ		

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* Coming soon

OptiMOS™ and StrongIRFET™ 80 V normal level/logic level



$R_{DS(on),\ max.}$ at V_{GS}=10 V [mΩ]	TOLT (TO-Leaded top-side cooling)	sTOLL	PQFN 3.3x3.3 Source-Down	PQFN 3.3x3.3 Source-Down DSC (dual-side cooling)	SuperSO8
1-2	IPTC011N08NM5 $R_{DS(on)}$= 1.2 mΩ				
	IPTC014N08NM5 $R_{DS(on)}$ = 1.4 mΩ				
3-5			IQE050N08NM5 $R_{DS(on)}$ = 5 mΩ	IQE050N08NM5SC $R_{DS(on)}$ = 5 mΩ	
			IQE050N08NM5CG $R_{DS(on)}$ = 5 mΩ	IQE050N08NM5CGSC $R_{DS(on)}$ = 5 mΩ	
5-20					IRF7854TRPBF $R_{DS(on)}$ = 13.4 mΩ

OptiMOS™ and StrongIRFET™ 100 V normal level



$R_{DS(on),\ max.}$ at V_{GS}=10 V [mΩ]	TO-252 (DPAK)	TO-263 (D^2PAK)	TO-263 (D^2PAK 7-pin)	TO-220	TO-220 FullPAK	TO-247
1-2						IRF100P218 $R_{DS(on)}$=1.28 mΩ
			IPF016N10NF2S $R_{DS(on)}$ =1.6 mΩ			IRF100P219 $R_{DS(on)}$=1.7 mΩ
			IPB017N10N5 $R_{DS(on)}$=1.7 mΩ			IRF100PW219XKSA1 $R_{DS(on)}$=1.7 mΩ
			IPB017N10N5LF $R_{DS(on)}$=1.7 mΩ			IRF100PW219 [1] $R_{DS(on)}$ = 1.7 mΩ
			IPF018N10NM5LF2 $R_{DS(on)}$ = 1.8 mΩ			
			IPB018N10N5ATMA1 $R_{DS(on)}$=1.83 mΩ			
2-4		IPB020N10N5 $R_{DS(on)}$ =2.0 mΩ	IPF024N10NF2S $R_{DS(on)}$ =2.4 mΩ	IPP023N10N5 $R_{DS(on)}$ =2.3 mΩ	IPA030N10NF2S $R_{DS(on)}$=3.0 mΩ	IRFP4468PBF $R_{DS(on)}$ =2.6 mΩ
		IPB020N10N5LF $R_{DS(on)}$=2.0 mΩ	IPB024N10N5 $R_{DS(on)}$ =2.4 mΩ	IPP026N10NF2S $R_{DS(on)}$=2.6 mΩ		IRFPW4468PBFXKSA1 $R_{DS(on)}$ =2.6 mΩ
		IPB021N10NM5LF2ATMA1 $R_{DS(on)}$=2.1 mΩ	IPB032N10N5 $R_{DS(on)}$ =3.2 mΩ	IPP030N10N5 $R_{DS(on)}$=3.0 mΩ		IRFPW4468PBF [1] $R_{DS(on)}$ = 2.6 mΩ
		IPB021N10NM5LF2 $R_{DS(on)}$ = 2.1 mΩ		IPP030N10NF2SAKMA1 $R_{DS(on)}$=3.0 mΩ		
		IPB026N10NF2S $R_{DS(on)}$ = 2.65 mΩ		IPP030N10NF2S $R_{DS(on)}$ = 3.0 mΩ		
		IPB027N10N5 $R_{DS(on)}$ =2.7 mΩ		IPP039N10N5 $R_{DS(on)}$=3.9 mΩ		
		IPB033N10N5LF $R_{DS(on)}$ =3.3 mΩ				
		IPB035N10NF2S $R_{DS(on)}$ =3.5 mΩ				
		IPB035N10NF2SATMA1 $R_{DS(on)}$ =3.5 mΩ				
4-10	IPD050N10N5 $R_{DS(on)}$=5.0 mΩ	IPB043N10NF2S $R_{DS(on)}$ = 4.35 mΩ	IPF042N10NF2S $R_{DS(on)}$ = 4.25 mΩ			IRFP4110PBF $R_{DS(on)}$ =4.5 mΩ
	IPD052N10NF2S $R_{DS(on)}$ = 5.2 mΩ	IPB050N10NF2S $R_{DS(on)}$ = 5.05 mΩ	IPF050N10NF2S $R_{DS(on)}$ = 5.05 mΩ	IRFB4110PBF $R_{DS(on)}$ =4.5 mΩ	IPA050N10NM5S $R_{DS(on)}$ =5.0 mΩ	IRFP4310ZPBF $R_{DS(on)}$ =6.0 mΩ
				IPP050N10NF2S $R_{DS(on)}$=5.0 mΩ		
					IPA082N10NF2S $R_{DS(on)}$=8.2 mΩ	
				IPP082N10NF2S $R_{DS(on)}$=8.2 mΩ	IPA083N10N5 $R_{DS(on)}$ =8.3 mΩ	
				IPP083N10N5 $R_{DS(on)}$ =8.3 mΩ		
		IRFS4410ZTRLPBF $R_{DS(on)}$ =9.0 mΩ		IRFB4410ZPBF $R_{DS(on)}$ =9.0 mΩ		
10-25	IPD130N10NF2S $R_{DS(on)}$ = 13.0 mΩ			IPP129N10NF2S $R_{DS(on)}$=12.9 mΩ		
>25	IPD78CN10N G $R_{DS(on)}$ =78.0 mΩ					

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OptiMOS™ and StrongIRFET™ 100 V normal level

AC-DC · Adapter · Consumer · DC-DC · LED · LEV · Motor control · SMPS · Solar · UPS

$R_{DS(on),max.}$ at V_{GS}=10 V [mΩ]	DirectFET™	PQFN 3.3x3.3	PQFN 3.3x3.3 Source-Down	PQFN 3.3x3.3 Source-Down DSC (dual-side cooling)	PQFN 5x6 Source-Down	PQFN 5x6 Source-Down DSC (dual-side cooling)	SuperSO8	SuperSO8 DSC (dual-side cooling)	SO8	TOLL (TO-Leadless)	TOLT (TO-Leaded top-side cooling)	TOLG (TO-Leaded Gullwing)	sTOLL	mTOLG
1-2		ISZ080N10NM6 $R_{DS(on)}$ = 8.0 mΩ									IPTC014N10NM5 $R_{DS(on)}$ = 1.4 mΩ	PTG014N10NM5 $R_{DS(on)}$ = 1.4 mΩ		IPM018N10NM5LF2* $R_{DS(on)}$ = 1.85 mΩ
							ISC022N10NM6 $R_{DS(on)}$ = 2.2 mΩ			IPT015N10N5 $R_{DS(on)}$ =1.5 mΩ	IPTC017N10NM5LF2 $R_{DS(on)}$ = 1.7 mΩ	IPTG018N10NM5 $R_{DS(on)}$ = 1.8 mΩ		
							ISC027N10NM6 $R_{DS(on)}$ = 2.7 mΩ			IPT015N10NF2S $R_{DS(on)}$ = 1.5 mΩ		IPTG025N10NM5 $R_{DS(on)}$ = 2.5 mΩ		
							ISC030N10NM6 $R_{DS(on)}$ = 3.0 mΩ			IPT017N10NF2S $R_{DS(on)}$ = 1.75 mΩ	IPTC019N10NM5 $R_{DS(on)}$ = 1.9 mΩ			
										IPT017N10NM5LF2 $R_{DS(on)}$ = 1.75 mΩ				
2-4					IQD020N10NM5 $R_{DS(on)}$ = 2.05 mΩ	IQD020N10NM5SC $R_{DS(on)}$ =2.05 mΩ	ISC035N10NM5LF2 $R_{DS(on)}$ = 3.5mΩ	BSC030N10NS5SC $R_{DS(on)}$ = 3.0 mΩ		IPT020N10N5 $R_{DS(on)}$ =2.0 mΩ				
					IQD020N10NM5CG $R_{DS(on)}$ = 2.05 mΩ	IQD020N10NM5CGSC $R_{DS(on)}$ =2.05 mΩ				IPT022N10NF2S $R_{DS(on)}$ = 2.25 mΩ				
	IRF7769L1TRPBF $R_{DS(on)}$ =3.5 mΩ							BSC040N10NS5SC $R_{DS(on)}$ =4.0 mΩ		IPT023N10NM5LF2 $R_{DS(on)}$ = 2.3 mΩ			IST026N10NM5 $R_{DS(on)}$ = 2.6 mΩ	
							BSC040N10NS5 $R_{DS(on)}$ =4.0 mΩ			IPT026N10N5 $R_{DS(on)}$ =2.6 mΩ				
4-10			IQE057N10NM6 $R_{DS(on)}$ = 5.7mΩ	IQE057N10NM6SC $R_{DS(on)}$ = 5.7mΩ			BSC050N10N5 $R_{DS(on)}$ =5.0 mΩ							
			IQE057N10NM6CG $R_{DS(on)}$ = 5.7mΩ	IQE057N10NM6CGSC $R_{DS(on)}$ = 5.7mΩ			ISC060N10NM6 $R_{DS(on)}$ = 6.0 mΩ							
							BSC070N10NS5 $R_{DS(on)}$ =7.0 mΩ	BSC070N10NS5SC $R_{DS(on)}$ =7.0 mΩ						
							ISC080N10NM6 $R_{DS(on)}$ = 8.0 mΩ							
		ISZ113N10NM5LF2 $R_{DS(on)}$ =11.3 mΩ					BSC098N10NS5 $R_{DS(on)}$ =9.8 mΩ							
10-25	IRF6644TRPBF $R_{DS(on)}$ =13.0 mΩ	ISZ230N10NM6 $R_{DS(on)}$ = 23.0 mΩ					BSC160N10NS3 G $R_{DS(on)}$ = 16.0 mΩ							
							ISC230N10NM6 $R_{DS(on)}$ =23.0 mΩ		IRF7853TRPBF $R_{DS(on)}$ =18.0 mΩ					
>25	IRF6645TRPBF $R_{DS(on)}$ =35.0 mΩ	BSZ440N10NS3 G $R_{DS(on)}$ = 44.0 mΩ												

OptiMOS™ and StrongIRFET™ 100 V logic level

Consumer · DC-DC · LED · Motor control

$R_{DS(on),max.}$ at V_{GS}=10 V [mΩ]	TO-252 (DPAK)	TO-263 (D^2PAK)	TO-220	PQFN 2x2	PQFN 3.3x3.3	SuperSO8
1-4						BSC034N10LS5 $R_{DS(on)}$ =3.4 mΩ
4-10			IRLB4030PBF $R_{DS(on)}$ =4.3 mΩ		BSZ096N10LS5 $R_{DS(on)}$ =9.6 mΩ	BSC070N10LS5 $R_{DS(on)}$ =7.0 mΩ
						BSC096N10LS5 $R_{DS(on)}$ =9.6 mΩ
10-25					BSZ146N10LS5 $R_{DS(on)}$ =14.6 mΩ	
	IRLR3110ZTRPBF $R_{DS(on)}$ =14.0 mΩ					BSC146N10LS5 $R_{DS(on)}$ =14.6 mΩ

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* Coming soon
1) Long leads



AC-DC Adapter Consumer DC-DC LED
Motor control SMPS Solar Telecom

OptiMOS™ and StrongIRFET™ 120 V normal level/logic level

$R_{DS(on),\ max.}$ at V_{GS}=10 V [mΩ]	TO-220	TO-263 (D^2PAK)	TO-263 (D^2PAK 7-pin)	PQFN 3.3x3.3	SuperSO8	TOLG (TO-Leaded Gullwing)	TOLL (TO-Leadless)	TOLT (TO-Leaded top-side Cooling)
1-2			IPF019N12NM6 $R_{DS(on)}$ = 1.9 mΩ			IPTG017N12NM6 $R_{DS(on)}$ = 1.7 mΩ		IPTC017N12NM6 $R_{DS(on)}$ = 1.7 mΩ
2-4	IPP022N12NM6 $R_{DS(on)}$ = 2.2 mΩ	IPB022N12NM6 $R_{DS(on)}$ = 2.2 mΩ			ISC030N12NM6 $R_{DS(on)}$ = 3.04 mΩ		IPT017N12NM6 $R_{DS(on)}$ = 1.7 mΩ	IPTC026N12NM6 $R_{DS(on)}$ = 2.6 mΩ
		IPB035N12NM6 $R_{DS(on)}$ = 3.5 mΩ			ISC032N12LM6 $R_{DS(on)}$ = 3.2 mΩ		IPT026N12NM6 $R_{DS(on)}$ = 2.6 mΩ	
					ISC037N12NM6 $R_{DS(on)}$ = 3.7 mΩ			
4-10	IPP041N12N3 G $R_{DS(on)}$ = 4.1 mΩ				ISC073N12LM6 $R_{DS(on)}$ = 7.3 mΩ			
	IPP076N12N3 G $R_{DS(on)}$ = 7.6 mΩ				ISC078N12NM6 $R_{DS(on)}$ = 7.8 mΩ			
10-25	IPP147N12N3 G $R_{DS(on)}$ = 14.7 mΩ	IPB133N12NM6 $R_{DS(on)}$ = 13.3 mΩ		ISZ106N12LM6 $R_{DS(on)}$ = 10.6 mΩ	ISC104N12LM6 $R_{DS(on)}$ = 10.4 mΩ			
				ISZ330N12LM6 $R_{DS(on)}$ = 33.0 mΩ	ISC110N12NM6 $R_{DS(on)}$ =11.0 mΩ			
					ISC320N12LM6 $R_{DS(on)}$ = 32.0 mΩ			

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$R_{DS(on),\ max.}$ at V_{GS}=10 V [mΩ]	DirectFET™	PQFN 3.3x3.3	PQFN 3.3x3.3 Source Down	PQFN 3.3x3.3 Source-Down DSC (dual-side cooling)	PQFN 5x6 Source-Down	PQFN 5x6 Source-Down DSC (dual-side cooling)	SuperSO8 DSC (dual-side cooling)	SuperSO8
2-5								ISC037N13NM6 $R_{DS(on)}$=3.7 mΩ
								ISC044N15NM6 $R_{DS(on)}$= 4.4 mΩ
								ISC046N13NM6 $R_{DS(on)}$=4.6 mΩ
5-10					IQD063N15NM5 $R_{DS(on)}$= 6.32 mΩ	IQD063N15NM5SC $R_{DS(on)}$=6.32 mΩ	BSC093N15NS5SC $R_{DS(on)}$= 9.3 mΩ	ISC055N15NM6 $R_{DS(on)}$= 5.5 mΩ
					IQD063N15NM5CG $R_{DS(on)}$= 6.32 mΩ	IQD063N15NM5CGSC $R_{DS(on)}$=6.32 mΩ		BSC074N15NS5 [2] $R_{DS(on)}$=7.4 mΩ
								ISC079N15NM6 $R_{DS(on)}$= 7.9 mΩ
								BSC088N15LS5 $R_{DS(on)}$= 8.8 mΩ
								BSC093N15NS5 $R_{DS(on)}$=9.3 mΩ
10-25	IRF7779L2TRPBF [2] $R_{DS(on)}$=11.0 mΩ	ISZ143N13NM6 $R_{DS(on)}$=14.3 mΩ	IQE220N15NM5 $R_{DS(on)}$= 22.0 mΩ	IQE220N15NM5SC $R_{DS(on)}$= 22.0 mΩ			BSC110N15NS5SC $R_{DS(on)}$= 11.0 mΩ	BSC105N15LS5 $R_{DS(on)}$= 10.5 mΩ
	IRF150DM115 $R_{DS(on)}$= 11.3 mΩ	ISZ173N15NM6 $R_{DS(on)}$= 17.3 mΩ	IQE220N15NM5CG $R_{DS(on)}$= 22.0 mΩ	IQE220N15NM5CGSC $R_{DS(on)}$= 22.0 mΩ			BSC160N15NS5SC $R_{DS(on)}$= 16.0 mΩ	BSC110N15NS5 $R_{DS(on)}$=11.0 mΩ
								BSC152N15LS5 $R_{DS(on)}$= 15.2 mΩ
								BSC160N15NS5 $R_{DS(on)}$=16.0 mΩ
								ISC165N15NM6 $R_{DS(on)}$= 16.5 mΩ
>25	IRF6775MTRPBF $R_{DS(on)}$=56.0 mΩ	BSZ520N15NS3 G $R_{DS(on)}$= 52.0 mΩ						BSC520N15NS3 G $R_{DS(on)}$= 52.0 mΩ
		BSZ900N15NS3 G $R_{DS(on)}$= 90.0mΩ						

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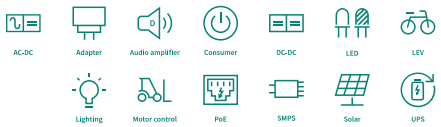
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$R_{DS(on),\ max.}$ at V_{GS}=10 V [mΩ]	TO-220	TO-252 (DPAK)	TO-263 (D^2PAK)	TO-263 (D^2PAK 7-pin)	TO-262 (I^2PAK)	TOLL (TO-Leadless)	TOLT (TO-Leaded top-side cooling)	TOLG (TO-Leaded Gullwing)	TO-247
2-5	IPP029N15NM6 $R_{DS(on)}$= 2.9 mΩ		IPB029N15NM6 $R_{DS(on)}$= 2.9 mΩ	IPF021N13NM6 $R_{DS(on)}$= 2.1 mΩ		IPT020N13NM6 $R_{DS(on)}$ = 2.0 mΩ	IPTC020N13NM6 $R_{DS(on)}$ = 2.0 mΩ	IPTG020N13NM6 $R_{DS(on)}$ = 2.0 mΩ	IRF150P220 $R_{DS(on)}$=2.5 mΩ
	IPP038N15NM6 3.8 mΩ		IPB038N15NM6 $R_{DS(on)}$=3.8 mΩ	IPF026N15NM6 $R_{DS(on)}$= 2.6 mΩ		IPT025N15NM6 $R_{DS(on)}$= 2.5 mΩ	IPTC025N15NM6 $R_{DS(on)}$= 2.5 mΩ	IPTG025N15NM6 $R_{DS(on)}$= 2.5 mΩ	IRF150P221 $R_{DS(on)}$=4.8 mΩ
			IPB048N15N5 $R_{DS(on)}$=4.8 mΩ	IPF031N13NM6 $R_{DS(on)}$= 3.1 mΩ		IPT034N15NM6 $R_{DS(on)}$ = 3.4 mΩ	IPTC034N15NM6 $R_{DS(on)}$ = 3.4 mΩ	IPTG029N13NM6 $R_{DS(on)}$ = 2.9 mΩ	IRFP4568PBF $R_{DS(on)}$=5.9 mΩ
			IPB048N15N5LF $R_{DS(on)}$=4.8 mΩ	IPF036N15NM6 $R_{DS(on)}$=3.6 mΩ		IPT039N15N5 $R_{DS(on)}$ = 3.9 mΩ	IPTC039N15NM5 $R_{DS(on)}$ = 3.9 mΩ	IPTG039N15NM5 $R_{DS(on)}$ = 3.9 mΩ	
				IPB044N15N5 $R_{DS(on)}$=4.4 mΩ		IPT044N15N5 $R_{DS(on)}$ = 4.4 mΩ	IPTC044N15NM5 $R_{DS(on)}$ = 4.4 mΩ	IPTG044N15NM5 $R_{DS(on)}$ = 4.4 mΩ	
				IPF048N15NM6 $R_{DS(on)}$=4.8 mΩ		IPT047N15NM6 $R_{DS(on)}$ = 4.7 mΩ			
5-10	IPP051N15N5 [2] $R_{DS(on)}$=5.1 mΩ		IPB051N15NM6 $R_{DS(on)}$=5.1 mΩ		IPI051N15N5 $R_{DS(on)}$=5.1 mΩ	IPT054N15N5 $R_{DS(on)}$ = 5.4 mΩ	IPTC054N15NM5 $R_{DS(on)}$ = 5.4 mΩ	IPTG054N15NM5 $R_{DS(on)}$ = 5.4 mΩ	
	IPP057N15NM6 $R_{DS(on)}$=5.7 mΩ		IPB057N15NM6 $R_{DS(on)}$=5.7 mΩ		IPI076N15N5 $R_{DS(on)}$=7.6 mΩ	IPT063N15N5 $R_{DS(on)}$ = 6.3 mΩ	IPTC063N15NM5 $R_{DS(on)}$ = 6.3 mΩ	IPTG063N15NM5 $R_{DS(on)}$ = 6.3 mΩ	
	IPP073N13NM6 $R_{DS(on)}$=7.3 mΩ		IPB073N15N5 $R_{DS(on)}$=7.3 mΩ	IPB060N15N5 $R_{DS(on)}$=6.0 mΩ					
	IPP076N15N5 $R_{DS(on)}$=7.6 mΩ		IPB085N15NM6 $R_{DS(on)}$=8.5 mΩ						
	IPP089N15NM6 $R_{DS(on)}$= 8.9 mΩ								
10-25	IRFB4115PBF $R_{DS(on)}$ =11.0 mΩ	IPD200N15N3 G $R_{DS(on)}$=20.0 mΩ	IRFS4115TRLPBF $R_{DS(on)}$ =12.1 mΩ						
	IRFB4321PBF $R_{DS(on)}$ =15.0 mΩ		IRFS4321TRLPBF $R_{DS(on)}$ =15.0 mΩ						IRFP4321PBF $R_{DS(on)}$ =15.5 mΩ
>25			IRFS4615TRLPBF $R_{DS(on)}$ =42.0 mΩ						
	IRFB5615PBF $R_{DS(on)}$ =39.0 mΩ	IRFR4615TRLPBF $R_{DS(on)}$ =42.0 mΩ							
	IRFB4019PBF $R_{DS(on)}$ =95.0 mΩ								

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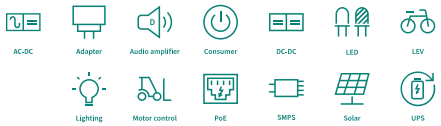
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OptiMOS™ and StrongIRFET™ 200 V normal level

$R_{DS(on),max.}$ at V_{GS}=10 V [mΩ]	TO-252 (DPAK)	TO-263 (D^2PAK)	TO-263 (D^2PAK 7-pin)	TO-220	TO-247
4-10		IPB068N20NM6 $R_{DS(on)}$ = 6.8 mΩ	IPF067N20NM6 $R_{DS(on)}$ = 6.7 mΩ	IPP069N20NM6 $R_{DS(on)}$ = 6.9 mΩ	
		IPB095N20NM6 9.5 mOhm		IPP095N20NM6 9.5 mOhm	IRFP4668PBF $R_{DS(on)}$ =9.7 mΩ
10-25		IPB107N20N3 G $R_{DS(on)}$ =10.7 mΩ	IPF129N20NM6 $R_{DS(on)}$ = 12.9 mΩ	IPP110N20N3 G $R_{DS(on)}$ =11.0 mΩ	
		IPB167N20NM6* 16.7 mOhm		IPP130N20NM6 13.0 mOhm	IRFP4227PBF $R_{DS(on)}$ =25.0 mΩ
		IRFS4127TRLPBF $R_{DS(on)}$ =22.0 mΩ		IPP169N20NM6* 16.9 mOhm	
>25		IRFS4227TRLPBF 26.0 mOhm		IRFB4127PBF $R_{DS(on)}$ =20.0 mΩ	
	IPD320N20N3 G $R_{DS(on)}$ =32.0 mΩ	IPB320N20N3 G $R_{DS(on)}$ =32.0 mΩ		IRFB4227PBF $R_{DS(on)}$ =26.0 mΩ	
		IPB339N20NM6 $R_{DS(on)}$ = 33.9 mΩ		IPP320N20N3 G $R_{DS(on)}$ =32.0 mΩ	
	IRFR4620TRLPBF $R_{DS(on)}$ =78.0 mΩ	IRFS4620TRLPBF $R_{DS(on)}$ =78.0 mΩ		IPP339N20NM6 $R_{DS(on)}$ = 33.9 mΩ	
				IRFB5620PBF $R_{DS(on)}$ =72.5 mΩ	
				IRFB4020PBF $R_{DS(on)}$ =100.0 mΩ	



OptiMOS™ and StrongIRFET™ 200 V normal level

$R_{DS(on),max.}$ at V_{GS}=10 V [mΩ]	DirectFET™	PQFN 3.3x3.3	SuperSO8	TOLL (TO-Leadless)	TOLG (TO-Leaded Gullwing)	TOLT
1-25				IPT067N20NM6 $R_{DS(on)}$ = 6.7 mΩ		IPTC068N20NM6 $R_{DS(on)}$ =6.8 mΩ
			ISC130N20NM6 $R_{DS(on)}$ = 13.0 mΩ			
			ISC151N20NM6 $R_{DS(on)}$ = 15.1 mΩ	IPT129N20NM6 $R_{DS(on)}$ = 12.9 mΩ		
>25			ISC300N20NM6* $R_{DS(on)}$ =30 mΩ			
			BSC320N20NS3 G $R_{DS(on)}$ =32.0 mΩ			
		ISZ520N20NM6 $R_{DS(on)}$ = 52.0 mΩ	BSC500N20NS3G $R_{DS(on)}$ =50.0 mΩ			
		BSZ900N20NS3 G $R_{DS(on)}$ =90.0 mΩ				
	IRF6785MTRPBF $R_{DS(on)}$ =100.0 mΩ		BSC900N20NS3 G $R_{DS(on)}$ =90.0 mΩ			
		BSZ22DN20NS3 G $R_{DS(on)}$ =225.0 mΩ	BSC12DN20NS3 G $R_{DS(on)}$ =125 mΩ			

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OptiMOS™ and StrongIRFET™ 250 V normal level

$R_{DS(on),max.}$ at V_{GS}=10 V [mΩ]	TO-252 (DPAK)	TO-263 (D^2PAK)	TOLG (TO-Leaded Gullwing)	TO-220	TO-247	PQFN 3.3x3.3	SuperSO8	TOLL (TO-Leadless)
10-25		IPB200N25N3 G $R_{DS(on)}$ =20.0 mΩ		IPP200N25N3 G 20.0 mOhm				
					IRFP4768PBF $R_{DS(on)}$ =17.5 mΩ			
		IRFS4229TRLPBF $R_{DS(on)}$ =48.0 mΩ		IRFB4332PBF $R_{DS(on)}$ =33.0 mΩ	IRFP4332PBF $R_{DS(on)}$ =33.0 mΩ		BSC600N25NS3 G $R_{DS(on)}$ =60.0 mΩ	
	IPD600N25N3 G $R_{DS(on)}$ =60.0 mΩ	IPB600N25N3 G $R_{DS(on)}$ =60.0 mΩ		IRFB4229PBF $R_{DS(on)}$ =46.0 mΩ				
				IPP600N25N3 G $R_{DS(on)}$ =60.0 mΩ	IRFP4229PBF $R_{DS(on)}$ =46.0 mΩ	BSZ16DN25NS3 G $R_{DS(on)}$ =165.0 mΩ		
						BSZ42DN25NS3 G $R_{DS(on)}$ =425.0 mΩ	BSC16DN25NS3 G $R_{DS(on)}$ =165.0 mΩ	

OptiMOS™ and StrongIRFET™ 300 V normal level



$R_{DS(on),max.}$ at V_{GS}=10 V [mΩ]	TO-220	TO-247
>25	IRFB4137PBF $R_{DS(on)}$ =69.0 mΩ	IRFP4868PBF $R_{DS(on)}$ =32.0 mΩ

Power MOSFETs complementary



Voltage [V]			PQFN 3.3x3.3	SO8
Complementary	-20/20	>50 mΩ	BSZ15DC02KD H*/** N: 55 mΩ, 5.1 A P: 150 mΩ, -3.2 A	
			BSZ215C H*/** N: 55 mΩ, 5.1 A P: 150 mΩ, -3.2 A	
	-30/30	27-64 mΩ		IRF9389TRPBF N: 27 mΩ, 6.8 A P: 64 mΩ, -4.6 A
				ISA150233C03LMDS N:15mΩ, 10.2 A P: 23.3mΩ, -8.8 A
				ISA220280C03LMDS N:22mΩ, 8.4 A P:28mΩ, -8.1 A
	-40/40	17-30 mΩ		ISA170230C04LMDS N:17mΩ, 9.6 A P:23mΩ, -8.8 A
				ISA250300C04LMDS N:25mΩ, 7.9 A P:30 mΩ, -7.8 A

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Power P-channel MOSFETs

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	Voltage [V]	TO-252 (DPAK)	TO-263 (D^2PAK)	TO-220	PQFN 3.3x3.3	SuperSO8	SO8	PQFN 2x2
P-channel MOSFETs	-20						BSO201SP H $R_{DS(on)}$ =7.0 mΩ	
								IRLHS2242TRPBF** $R_{DS(on)}$ =31.0 mΩ
	-30					BSC030P03NS3 G $R_{DS(on)}$ =3.0 mΩ	IRF9310 $R_{DS(on)}$ =4.6 mΩ	
		IPD042P03L3 G $R_{DS(on)}$ =4.2 mΩ				BSC060P03NS3E G $R_{DS(on)}$ =6.0 mΩ; ESD	IRF9317 $R_{DS(on)}$ =6.6 mΩ	
					BSZ086P03NS3 G $R_{DS(on)}$ =8.6 mΩ		IRF9321 $R_{DS(on)}$ =7.2 mΩ	
		SPD50P03L G [1)]* $R_{DS(on)}$ =7.0 mΩ			BSZ086P03NS3E G $R_{DS(on)}$ =8.6 mΩ			
						BSC084P03NS3 G $R_{DS(on)}$ =8.4 mΩ		
					BSZ120P03NS3 G $R_{DS(on)}$ =12.0 mΩ		BSO301SP H $R_{DS(on)}$ =8.0 mΩ	
							IRF9388TRPBF $R_{DS(on)}$ =11.9 mΩ	
							IRF9358 $R_{DS(on)}$ =16 mΩ; dual	
					BSZ180P03NS3 G $R_{DS(on)}$ =18.0 mΩ			
					BSZ180P03NS3E G $R_{DS(on)}$ =18.0 mΩ; ESD			
							IRF9362 $R_{DS(on)}$ =21 mΩ; dual	
							IRF9335 $R_{DS(on)}$ =59 mΩ	
	-60	IPD380P06NM $R_{DS(on)}$ = 38 mΩ	IPB110P06LM $R_{DS(on)}$ = 11 mΩ	SPP80P06P H* $R_{DS(on)}$ =23.0 mΩ	ISZ810P06LM $R_{DS(on)}$ = 81 mΩ	ISC240P06LM $R_{DS(on)}$ = 24 mΩ		
		IPD650P06NM $R_{DS(on)}$ = 65 mΩ	SPB80P06P G* $R_{DS(on)}$ =23.0 mΩ			ISC800P06LM $R_{DS(on)}$ = 80 mΩ		
		SPD30P06P G* $R_{DS(on)}$ =75.0 mΩ						
		IPD900P06NM $R_{DS(on)}$ = 90 mΩ						
		SPD18P06P G* $R_{DS(on)}$ =130.0 mΩ						
		SPD09P06PL G* $R_{DS(on)}$ =250.0 mΩ						
		IPD25DP06NM $R_{DS(on)}$ = 250 mΩ						
		SPD08P06P G* $R_{DS(on)}$ =300.0 mΩ						
		IPD40DP06NM $R_{DS(on)}$ = 400 mΩ						
	-100	SPD15P10PL G* $R_{DS(on)}$ =200.0 mΩ	IPB320P10LM $R_{DS(on)}$ = 32 mΩ		ISZ24DP10LM $R_{DS(on)}$ = 245 mΩ	ISC750P10LM $R_{DS(on)}$ =75 mΩ		
		SPD15P10P G* $R_{DS(on)}$ =240.0 mΩ	IPB330P10NM $R_{DS(on)}$ = 33 mΩ	IPP330P10NM $R_{DS(on)}$ =33 mΩ				
		SPD04P10PL G* $R_{DS(on)}$ =850.0 mΩ	IPB19DP10NM $R_{DS(on)}$ = 185 mΩ					
		IPD11DP10NM $R_{DS(on)}$ =111 mΩ						
		IPD18DP10LM $R_{DS(on)}$ = 178 mΩ						
		IPD19DP10NM $R_{DS(on)}$ = 186 mΩ						
	-150	IPD42DP15LM $R_{DS(on)}$ = 420 mΩ	IPB720P15LM $R_{DS(on)}$ = 72 mΩ		ISZ56DP15LM $R_{DS(on)}$ = 560 mΩ	ISC16DP15LM $R_{DS(on)}$ = 160 mΩ		
					ISZ75DP15LM $R_{DS(on)}$ = 750 mΩ			
					ISZ15EP15LM $R_{DS(on)}$ = 1500 mΩ			

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Small signal/small power N-channel

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	Voltage [V]	SOT-223	TSOP-6	SOT-89	SC59	SOT-23	SOT-323	SOT-363
N-channel	20 V		BSL202SN [4] 36 mΩ, 7.5 A, SLL		BSR802N [5] 32 mΩ, 3.7 A, ULL	IRLML6244 [1] [4] 27 mΩ, 6.3 A, SLL	BSS816NW [5] 240 mΩ, 1.4 A, ULL	BSD214SN [4] 250 mΩ, 1.5 A, SLL
			IRLMS2002 [1] [4] 45 mΩ, 6.5 A, SLL			IRLML6246 [1] [4] 66 mΩ, 4.1 A, SLL	BSS214NW [4] 250 mΩ, 1.5 A, SLL	BSD840N [5] 560 mΩ, 0.88 A, ULL, dual
			BSL806N [5] 82 mΩ, 2.3 A, ULL, dual			IRLML2502 [1] [4] 80 mΩ, 4.2 A, SLL		BSD235N [4] 600 mΩ, 0.95 A, SLL, dual
						BSS806N [5] 82 mΩ, 2.3 A, ULL		
						BSS806NE [5] 82 mΩ, 2.3 A, ULL, ESD		
						BSS205N [4] 85 mΩ, 2.5 A, SLL		
						BSS214N [4] 250 mΩ, 1.5 A, SLL		
	25 V					IRFML8244 [1] [3] 41 mΩ, 5.8 A, LL		
	30 V		IRLTS6342 [1] [4] 22 mΩ, 8.3 A, SLL			IRLML6344 [1] [4] 37 mΩ, 5.0 A, SLL		
						IRLML0030 [1] [3] 40 mΩ, 5.3 A, LL		
						IRLML6346 [1] [4] 80 mΩ, 3.4 A, SLL		
						BSS306N [3] 93 mΩ, 2.3 A, LL		
						IRLML2030 [1] [3] 154 mΩ, 2.7 A, LL		
						BSS316N [3] 280 mΩ, 1.4 A, LL		
						IRLML2803 [3] 400 mΩ, 1.2 A, LL		
	40 V					IRLML0040 [1] [3] 78 mΩ, 3.6 A, LL		
	55 V	IRFL024Z [1] [2] 57.5 mΩ, 5.1 A, NL				BSS670S2L [3] 825 mΩ, 0.54 A, LL		
		IRLL2705 [1] [3] 65 mΩ, 3.8 A, LL						
		IRLL024N [1] [3] 100 mΩ, 3.5 A, LL						
		IRLL014N [1] [3] 280 mΩ, 2.0 A, LL						
	60 V	BSP295 [3] 500 mΩ, 1.8 A, LL	BSL606SN [3] 95 mΩ, 4.5 A, LL	BSS606N [3] 90 mΩ, 3.2 A, LL		IRLML0060 [1] [3] 116 mΩ, 2.7 A, LL	BSS138W [3] 4 Ω, 0.28 A, LL	2N7002DW [3] 4 Ω, 0.3 A, LL, dual
						IRLML2060 [1] [3] 640 mΩ, 1.2 A, LL	SN7002W [3] 7.5 Ω, 0.23 A, LL	
						2N7002 [1] [3] 4 Ω, 0.3 A, LL		
						BSS138I [1] [3] 4 Ω, 0.23 A, LL		
						BSS138N [3] 4 Ω, 0.23 A, LL		
						SN7002I [1] [3] 7.5 Ω, 0.2 A, LL		
						SN7002N [3] 7.5 Ω, 0.2 A, LL		
						BSS159N [6] 8 Ω, 0.13 A, depletion		
	100 V	IRFL4310 200 mΩ, 1.6 A, NL				IRLML0100 235 mΩ, 1.6 A, LL		
		BSP373N [2] 240 mΩ, 1.8 A, NL				BSS119N [3] 10 Ω, 0.19 A, LL		
		BSP372N [3] 270 mΩ, 1.8 A, LL				BSS123I [1] [3] 10 Ω 0.19 A, LL		
		BSP296N [3] 800 mΩ, 1.2 A, LL				BSS123N [3] 10 Ω 0.19 A, LL		
						BSS169I [1] [6] 12 Ω, 0.09 A, depletion		
						BSS169 [6] 12 Ω, 0.09 A, depletion		
	150 V	IRFL4315 [1] [2] 185 mΩ, 2.6 A, NL	IRF5802 [1] [2] 1.2 Ω, 0.9 A, NL					
	200 V	BSP297 [3] 3 Ω, 0.66 A, LL	IRF5801 [1] [2] 2.2Ω, 0.6 A, NL					
		BSP149 [6] 3.5 Ω, 0.14 A, LL, depletion						
	240 V	BSP88 [3] 7.5 Ω, 0.35 A, SLL		BSS87 [3] 7.5 Ω, 0.26 A, LL		BSS131 [3] 20 Ω, 0.11 A, LL		
		BSP89 [3] 7.5 Ω, 0.35 A, LL				BSS131I* 14 Ω, 0.121 A, LL		
		BSP129 [6] 20 Ω, 0.05 A, LL, depletion						
	250 V					BSS139I [1] [6] 30 Ω, 0.10 A, LL, depletion		
						BSS139 [6] 30 Ω, 0.10 A, LL, depletion		
	400 V	BSP324 [3] 22 Ω, 0.17 A, LL						
	600 V	BSP125 [3] 60 Ω, 0.12 A, LL		BSS225 [3] 45 Ω, 0.09 A, LL		BSS127I [1] [3] 600 Ω, 0.021 A, LL		
		BSP135I [1] [6] 60 Ω, 0.02 A, LL, depletion				BSS127 [3] 600 Ω, 0.021 A, LL		
		BSP135 [6] 60 Ω, 0.02 A, LL, depletion				BSS126I [1] [6] 700 Ω, 0.021 A, LL, depletion		
						BSS126 [6] 700 Ω, 0.021 A, LL, depletion		

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www.infineon.com/strongirfet2

1) not qualified to Automotive AEC-Q101
2) $R_{DS(on)}$ specified at 10 V
3) $R_{DS(on)}$ specified at 4.5 V
4) $R_{DS(on)}$ specified at 2.5 V
5) $R_{DS(on)}$ specified at 1.8 V
6) $R_{DS(on)}$ specified at 0 V
*Coming soon

Small signal/small power P-channel

Automotive · Consumer · DC-DC · eMobility · Industrial drives · Notebook · Onboard

Voltage [V]		SOT-223	TSOP-6	SOT-89	SC59	SOT-23	SOT-323	SOT-363
P-channel MOSFETs	-250 V	BSP317P [3] 5 Ω, -0.43 A, LL		BSS192P [3] 15 Ω, -0.19 A, LL	BSR92P [3] 13 Ω, -0.14 A, LL			
		BSP92P [3] 15 Ω, -0.26 A, LL						
	-150 V	ISP14EP15LM [1] [3] 1.4 Ω, -1.29 A, LL						
	-100 V	ISP16DP10LMA 167 mΩ, 2.2 A, LL			BSR316P [3] 2.2 Ω, -0.36 A, LL			
		BSP322P [3] 1 Ω, -1.0 A, LL						
		BSP316P [3] 2.3 Ω, -0.68 A, LL						
		ISP16DP10LM [1] [3] 190 mΩ, -3.9 A, LL						
		ISP98DP10LM [1] [3] 1.05 Ω, -1.55 A, LL						
		ISP20EP10LM [1] [3] 2.2 Ω, -0.99 A, LL						
	-60 V	ISP650P06NM [1] [2] 65 mΩ, -3.7 A, NL			BSR315P [3] 1.3 Ω, -0.62 A, LL	ISS17EP06LM [1] [3] 2.2 Ω, -0.3 A, LL	BSS84PW [3] 12 Ω, -0.15 A, LL	
		ISP670P06NMA 67 mΩ, 3.7 A, NL				BSS83P [3] 3 Ω, -0.33 A, LL		
		ISP12DP06NM [1] [2] 125 mΩ, -2.8 A, NL				ISS55EP06LM [1] [3] 7 Ω, -0.18 A, LL		
		BSP613P [2] 130 mΩ, -2.9 A, NL				BSS84P [3] 12 Ω, -0.17 A, LL		
		ISP25DP06NM [1] [2] 250 mΩ, -1.9 A, NL						
		BSP171I* 250 mΩ,-3,2A,LL						
		BSP170I* 260 mΩ,-3,2A,NL						
		BSP170P [2] 300 mΩ, -1.9 A, NL						
		ISP25DP06LM [1] [3] 310 mΩ, -1.9 A, LL						
		BSP171P [3] 450 mΩ, -1.9 A, LL						
		ISP75DP06LM [1] [3] 1 Ω, -1.1 A, LL						
		BSP315P [3] 1.4 Ω, -1.17 A, LL						
		BSS83I* 1,7Ω,-0,55A,LL						
		BSS84I* 5,5Ω,-0,29A,LL						
	-40 V		IRF5803 [1] [2] 112 mΩ, -3.4 A, NL					
	-30 V		IRFTS9342 [1] [2] 40 mΩ, -5.8 A, NL			IRLML9301 [1] [3] 103 mΩ, -1.3 A, LL		
			BSL307SP [3] 74 mΩ, -5.5 A, LL			BSS308PE [3] 130 mΩ, -2.1 A, LL, ESD		
			BSL308PE [3] 130 mΩ, -2.1 A, LL, dual, ESD			IRLML5203 [1] [3] 165 mΩ, -3.0 A, LL		
						BSS314PE [3] 230 mΩ, -1.5 A, LL, ESD		
						BSS315P [3] 270 mΩ, -1.5 A, LL		
						IRLML9303 [1] [3] 270 mΩ, -2.3 A, LL		
						IRLML5103 [1] [3] 1000 mΩ, -0.76A, LL		
	-20 V		BSL207SP [4] 41 mΩ, -6.0 A, SLL			IRLML2244 [1] [4] 95 mΩ, -4.3 A, SLL	BSS209PW [4] 900 mΩ, -0.58 A, SLL	BSV236SP [4] 285 mΩ, -1.5 A, SLL
			IRLTS2242 [1] [4] 55 mΩ, -6.9 A, SLL			IRLML6402 [1] [4] 135 mΩ, -3.7 A, SLL	BSS223PW [4] 2.1 Ω, -0.39 A, SLL	BSD223P [4] 2.1 Ω, -0.39 A, SLL, dual
			IRLMS6802 [1] [4] 100 mΩ, -5.6 A, SLL			IRLML2246 [1] [4] 236 mΩ, -2.6 A, SLL		
			BSL211SP [4] 110 mΩ, -4.7 A, SLL			BSS215P [4] 280 mΩ, -1.5 A, SLL		
	-12 V					IRLML6401 [1] [4] 125 mΩ, -4.3 A, ULL		

Small signal/small power complementary

Automotive · Consumer · DC-DC · Industrial drives · Notebook · Onboard

Voltage [V]		TSOP-6	SOT-363
Complementary	-20/20	BSL215C [4] N: 250 mΩ, 1.5 A, SLL P: 280 mΩ, -1.5 A, SLL	BSD235C [4] N: 600 mΩ, 0.95 A, SLL P: 2.1 Ω, -0.53 A, SLL
	-30/30	BSL308C [3] N: 93 mΩ, 2.3 A, LL P: 130 mΩ, -2.0 A, LL	
		BSL316C [3] N: 280 mΩ, 1.4 A, LL P: 270 mΩ, -1.5 A, LL	

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1) not qualified to Automotive AEC-Q101
2) $R_{DS(on)}$ specified at 10 V
3) $R_{DS(on)}$ specified at 4.5 V
4) $R_{DS(on)}$ specified at 2.5 V
5) $R_{DS(on)}$ specified at 1.8 V
6) $R_{DS(on)}$ specified at 0 V
*Coming soon

Your input matters
Share your feedback

Nomenclature

OptiMOS™



Package type
BSB = DirectFET™ (M Can)
BSC = SuperSO8
BSF = DirectFET™ (S Can)
BSK = PQFN 2x2
BSO = SO-8
BSZ = PQFN 3.3x3.3
IPA = FullPAK
SPB/IPB = D²PAK
IPC = Chip product
SPD/IPD = DPAK
IPI = I²PAK
SPP/IPP = TO-220
IPS = IPAK Short Leads
IPT = TO-Leadless

$R_{DS(on)}$ [mΩ]
Divide by 10 to get $R_{DS(on)}$ value e.g. 014 = 1.4 mΩ

However, if the sixth character is a C, the fourth and the fifth character indicate the $R_{DS(on)}$
e.g. 12C = 12 mΩ
For chip products chip area in mm² multiplied by 10

N = N-channel
P = P-channel
C = Complementary

Breakdown voltage [V]
Multiply by 10 to get voltage class e.g. 03 = 30 V
E = Extended, +5 V, e.g. E2 = 25 V

RoHS compliant

Features
F = Fast switching
R = Integrated gate resistor
E = ESD protection
A = Qualified according to Automotive AEC Q101

3 = Technology generation
I = Monolithically-integrated Schottky-like diode
FD = Fast diode
LF = Linear mode capability

Package options
SO-8/SuperSO8/PQFN 3.3x3.3/PQFN 2x2
S = Single chip
D = Dual chip

DirectFET™
X = MX footprint
N = MN footprint
Z = MZ footprint
Q = SQ footprint
T = ST footprint
H = SH footprint
J = SJ footprint

Level

		to be used from V_{GS}
N = Normal level	(NL)	10.0
M = Logic level 5 V opt.	(LL)	4.5
L = Logic level	(ELL)	4.5
K = Super logic level	(SLL)	2.5
J = Ultra logic level	(ULL)	1.8

OptiMOS™ 30 V



Package type

Consecutive number
without any correlation to product specification

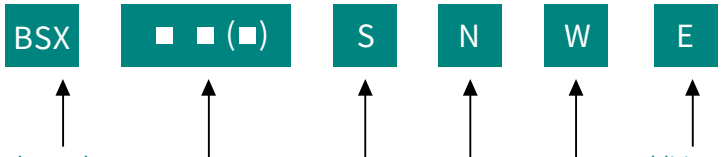
Channels
N = N-channel
P = P-channel

I = Monolithically-integrated Schottky-like diode

D = Dual
E = ESD
S = Single

Your input matters
Share your feedback

Small signal



"X" indicates the package
D = SOT-363
P = SOT-223
R = SC59
S = SOT-89, SOT-23, SOT-323
L = TSOP-6

2-3 digits product identifier
meaning dependent on
product generation

Only present in following case
S = Single (only for packages which
are also used for multichip products)

Additional features
E = ESD-protected MOSFET

Only present in following case
W= to distinguish SOT-323 from SOT-23

Polarity
N = N-channel
P = P-channel
C = Complementary
(N-ch + P-ch)

StrongIRFET™ (from May 2015 to 2019)



3 sequential digits
3 digits issued sequentially

Drive voltage
F = 4.5 V_{GS} capable for BV ≤ 30 V
L = 2.5 V_{GS} capable for BV ≤ 30 V, 4.5 V_{GS} capable for BV ≥ 40 V

2 to 3 digit voltage
For example:
25 = 25 V
135 = 135 V

Package
1 or 2 letters
B = TO-220
BA = Super220
C = Bare die or wafer
DL = DirectFET™ 1.5 Large Can
DM = DirectFET™ 1.5 Medium Can
Can DS = DirectFET™ 1.5 Small Can
Can FF = TO-220 FullPAK
H = PQFN 5x6
HB = Power Block 5x6
HM = PQFN 3.0x3.0 or 3.3x3.3
HS = PQFN 2x2
I = TO-220 FullPAK
K = SO-8
L = SOT-223
ML = SOT-23
P = TO-247
PS = Super247
R = DPAK
S = D^2PAK
SL = TO-262
SA = D2 7-pin with pin 2 void
SN = D2 7-pin with pins void
SC = D2 7-pin with pin 4 void
T = TollFET
TS = TSOP-6
U = IPAK

Your input matters
Share your feedback

New nomenclature for OptiMOS™ and StrongIRFET™ MOSFETs (2019 onward)



Infineon

Package type
SC = SuperSO8
SD = SOT-363
SL = TSOP-6
SK = PQFN 2x2
SA = SO8
SP = SOT-223
SQ = CE2
SR = SC59
SS = SOT-89, SOT-23, SOT-323
ST = sTOLL
SZ = PQFN 3.3x3.3
PA = TO-220 FullPAK
PB = D²PAK
PC = Chip Product
PD = DPAK
IPF = D²PAK-7-pin
PI = I²PAK
PP = TO-220
PS = IPAK Short Leads
PT = TO-Leadless
PW = TO-247
QA = PQFN 5x6
QB = PQFN 3x2
QC = PQFN 3x5
QD = PQFN 5x6 Source-Down
QE = PQFN 3.3x3.3 Source-Down
WS = DirectFET™ (S)
WM = DirectFET™ (M)
WL = DirectFET™ (L)
QF = PQFN 8x6

$R_{DS(on)}$ [mΩ]
Divide by 10 to get $R_{DS(on)}$ value e.g.,
012 = 1.2 mΩ

However, if the sixth character is D or E the fourth and the fifth characters indicate the $R_{DS(on)}$ e.g.,
12D = 120 mΩ
12E = 1200 mΩ
For chip products chip area in mm² multiplied by 10

Version
N = N-channel
P = P-channel
C = Complementary
G = GaN

M|F = Product brand – family
(M = OptiMOS™, F = StrongIRFET™)
U = High switching frequency | Hard switched
Z = High switching | Soft switched
V = Motor-drives-optimized

Features
D = Dual
H = Half-bridge
3 = Marketing generation with branding strategy
CG = Center gate
E = ESD protection
F = Fast switching
FD = Fast diode
SC = Dual-side cooling
I = Monolithically-integrated Schottky-like diode
LF = Linear mode
R = Integrated gate resistor

Last letter – requirement category:
A = Qualified according to AECQ 101
S = Standard
None = Industrial

Level to be used for V_{GS}

N = Normal level	(NL)	10.0 V
L = Logic level	(LL)	4.5 V
M = Logic level 5 V opt.	(ELL)	4.5 V
K = Super logic level	(SLL)	2.5 V
J = Ultra logic level	(ULL)	1.8 V

Breakdown voltage [V]
Divide by 10
e.g., E2 = 25 V
10 = 100 V
25 = 250 V



Infineon support for low voltage MOSFETs

Useful links and helpful information

Further information, data sheets and documents
www.infineon.com/pchannel
www.infineon.com/depletion
www.infineon.com/complementary
www.infineon.com/source-down
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MOSFET Community
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For more information regarding StrongIRFET™ and OptiMOS™ power MOSFET bare die products, please contact the Infineon Service Center or your local sales counterpart.

Support | Evaluation board | Tools | Simulation



500-950 V MOSFETs

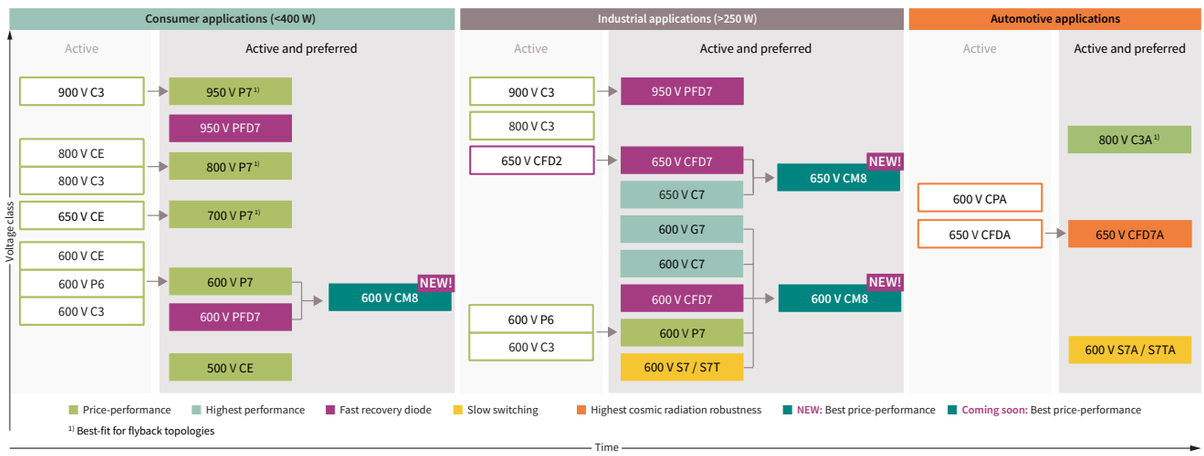
- CoolMOS™ SJ MOSFETs
- 950 V CoolMOS™ PFD7 SJ MOSFETs
- 950 V CoolMOS™ P7 SJ MOSFETs
- 800 V CoolMOS™ P7 SJ MOSFETs
- 700 V CoolMOS™ P7 SJ MOSFETs
- 650 V CoolMOS™ 8 SJ MOSFETs
- 600 V CoolMOS™ 8 SJ MOSFETs
- 600 V CoolMOS™ P7 SJ MOSFETs
- 600 V CoolMOS™ PFD7 SJ MOSFETs
- 600 V and 650 V CoolMOS™ C7 and 600 V C7 Gold (G7) SJ MOSFETs
- 600 V CoolMOS™ S7 SJ MOSFETs
- 600 V CoolMOS™ S7T SJ MOSFETs
- 600 V CoolMOS™ CFD7 SJ MOSFETs
- 650 V CoolMOS™ CFD7 SJ MOSFETs
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- CoolMOS™ SJ MOSFETs for automotive
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- 600 V CoolMOS™ S7TA SJ MOSFETs
- CoolMOS™ SJ MOSFET package innovations
- CoolMOS™ product portfolio
- CoolMOS™ nomenclature

CoolMOS™ SJ MOSFETs

Trusted leader in high-voltage MOSFETs

Infineon's CoolMOS™ products offer a significant reduction of conduction, switching and driving losses, and enable high power density as well as efficiency for superior power conversion systems.

CoolMOS™ SJ MOSFETS overview*



High-voltage superjunction MOSFETs address consumer applications, such as home appliance drives, smartphone/tablet chargers, notebook adapters, LED lighting, PC power, and audio and TV power supplies. Customers are increasingly replacing standard MOSFETs with superjunction MOSFETs to benefit from higher efficiency and lower power consumption for end users. CoolMOS™ P7 offers high performance and a competitive price. The CoolMOS™ PFD7 series is a state-of-the-art solution for high-density chargers/adapters, lighting applications and home appliance drives (e.g., refrigerator compressors).

Also, for industrial applications such as server, telecom, PC power, solar, ESS, UPS, EV charging and others, Infineon's CoolMOS™ 7 superjunction MOSFETs with the C7, G7, CFD7, P7, and S7(T) product families offer what you need. The S7 product family specifically addresses slow-switching applications such as solid state relays and solid state circuit breakers offering the best-in-class $R_{DS(on)}$ within the industry. The new 600 V and 650 V CoolMOS™ 8 supersede the CoolMOS™ 7 MOSFET family, offering the best price-performance. The series has an integrated fast body diode, making it suitable for a wide range of applications like server and industrial SMPS, EV charging, and micro solar. Complementary to the silicon CoolMOS™ portfolio, Infineon offers a broad wide-bandgap (WBG) portfolio of CoolGaN™ GIT HEMTs, CoolGaN™ IPS, and CoolSiC™ MOSFETs to further optimize efficiency and system cost (see Wide-bandgap semiconductors chapter).

Infineon's industrial- and consumer-qualified CoolMOS™ superjunction MOSFET offering is complemented by the automotive-qualified series 600 V CPA, 650 V CFDA, 800 V C3A, and the latest 650 V CFD7A as well as 600 V S7A/S7TA. Infineon's excellent-performing automotive series addresses on-board chargers, DC-DC converters, active pre-charge and discharge function, insulation monitor, HV eFuse, and HV eDisconnect with proven outstanding quality standards going well beyond the AEC-Q101, supporting customers in gaining momentum in the rapidly growing xEV market.

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* Subject to change and exceptions possible. For more details on product status check out the individual product pages online.

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950 V CoolMOS™ PFD7 SJ MOSFETs

Perfect fit for soft- and hard-switching topologies

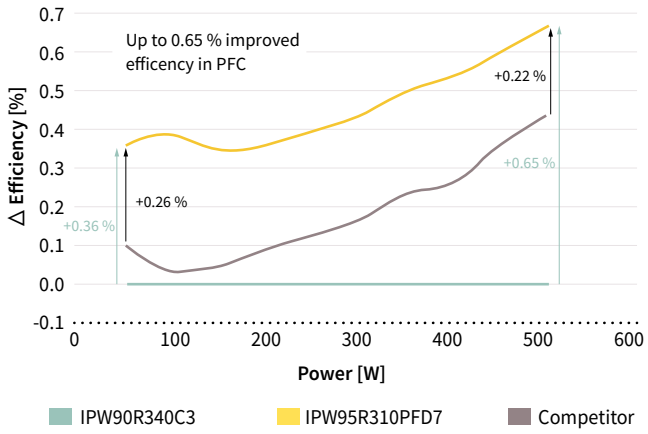
The 950 V CoolMOS™ PFD7 is a revolutionary superjunction technology for high-voltage power MOSFETs, with an integrated fast body diode to address lighting and industrial SMPS applications. The new series is tailor-made for usage across several topologies, such as PFC, LLC, and flyback.

Features and benefits

Key features
– Integrated ultrafast body diode with best-in-class (BIC) Q_{rr}
– Best-in-class FOM $R_{DS(on)}$ x E_{oss}; reduced Q_G, C_{iss} and C_{oss}
– BiC $R_{DS(on)}$ in various packages like 450 mΩ in DPAK and 60 mΩ in TO-247
– $V_{(GS)th}$ of 3 V and smallest $V_{(GS)th}$ variation of ±0.5 V
– ESD protection up to Class 2 (HBM)
– Offering the highest quality and reliability
– Price competitiveness over previous CoolMOS™ families

Key benefits
– Hard commutation ruggedness that enables the usage of PFD7 in different circuit topologies
– Improved efficiency and thermal behavior over internal and external comparable products
– Enabling higher power density designs and BOM savings
– Easy to drive and design-in
– Improved production yield by reducing ESD-related failures and reduced field returns
– Cost-competitive designs with superjunction

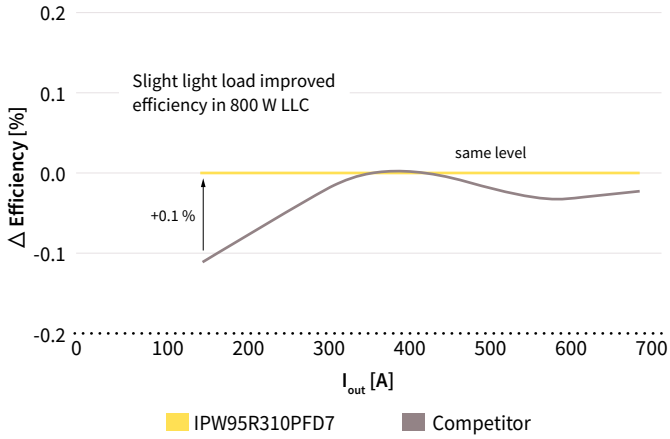
Efficiency measurements for 310 mΩ devices at 90 V_{AC} ($R_{g,ext}$ = 10 Ω)



950 V CoolMOS™ PFD7 outperforms previous CoolMOS™ families as well as the main competition concerning PFC efficiency:

- Improvement of 0.26 percent in light-load and 0.22 percent in full-load efficiency compared to the main competition
- Improvement of 0.36 percent in light-load and 0.65 percent in full-load efficiency compared to 900 V CoolMOS™ C3

Efficiency measurements for 310 mΩ in 880 W ZVS FB set up



950 V CoolMOS™ PFD7 closes the gap and matches the performance of the main competition regarding LLC efficiency:

- Improvement of 0.1 percent in light-load efficiency compared to the main competition

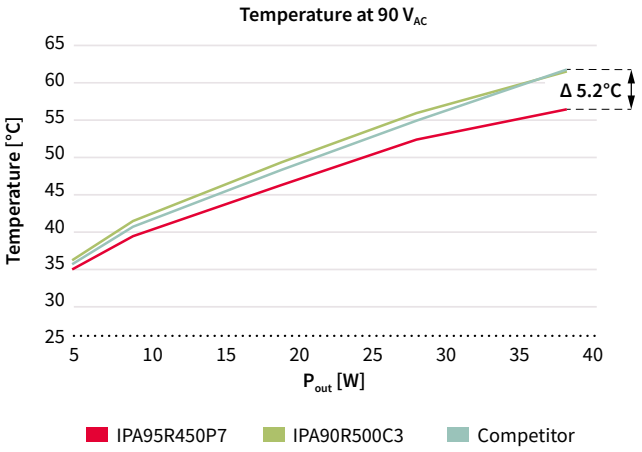
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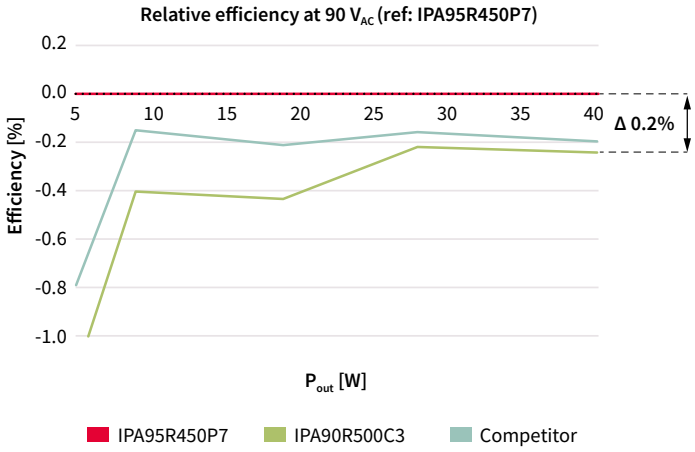
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950 V CoolMOS™ P7 SJ MOSFETs

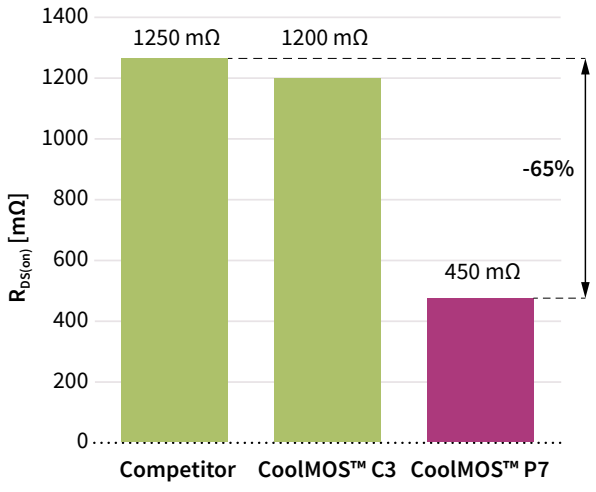
Perfect fit for PFC and flyback topologies

Designed to meet the growing consumer needs in the high-voltage MOSFETs arena, the 950 V CoolMOS™ P7 technology focuses on the low-power SMPS market. The P7 family addresses applications ranging from lighting, smart meters, mobile phone chargers, and notebook adapters to AUX power supplies and industrial SMPS. Offering 50 V more blocking voltage than its predecessor, 900 V CoolMOS™ C3, the 950 V CoolMOS™ P7 series delivers outstanding performance, efficiency, thermal behavior, and ease of use. Like all other P7 family members, the 950 V CoolMOS™ P7 series has an integrated Zener diode ESD protection. The integrated diode considerably improves ESD robustness, thus reducing ESD-related yield loss and reaching exceptional ease-of-use levels. CoolMOS™ P7 is developed with a best-in-class threshold voltage ($V_{GS(th)}$) of 3 V and a narrow tolerance of only ± 0.5 V, which makes it easy to drive and design-in.





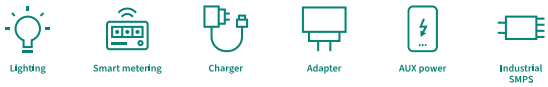
Compared to the competition, the 950 V CoolMOS™ P7 delivers best-in-class efficiency and thermal performance. Plug-and-play at 90 V_{AC} in a 40 W adapter reference design, featuring the snubberless concept, demonstrates excellent efficiency gains of up to 0.2 percent and lower MOSFET temperature of up to 5.2°C compared to similar competitor technology. With over 20 years of experience in superjunction technology, Infineon introduces 950 V CoolMOS™ P7 with best-in-class DPAK on-resistance ($R_{DS(on)}$). This SMD device comes with an $R_{DS(on)}$ of 450 mΩ - more than 60 percent lower $R_{DS(on)}$ compared to the nearest competitor. Low $R_{DS(on)}$ value enables higher density designs while decreasing BOM and assembly costs.



Best-in-class DPAK $R_{DS(on)}$

Customer benefits:

- Possible change from leaded to SMD packages
- High power density
- Lower BOM cost
- Lower production cost



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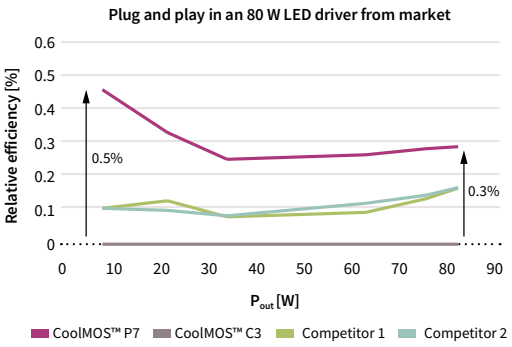
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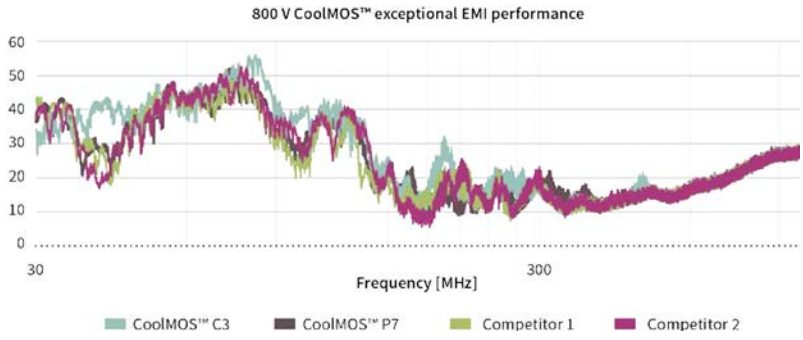
800 V CoolMOS™ P7 SJ MOSFETs

A benchmark in efficiency and thermal performance

With the 800 V CoolMOS™ P7 series, Infineon sets a benchmark in 800 V superjunction technologies and combines best-in-class performance with the remarkable ease of use. This product family is a perfect fit for flyback-based consumer and industrial SMPS applications. In addition, it is also suitable for PFC stages within consumer and solar applications, fully covering the market needs in terms of its price/performance ratio.

The technology offers fully optimized key parameters to deliver best-in-class efficiency and thermal performance. As demonstrated on an 80 W LED driver bought on the market, themore than 45 percent reduction in switching losses (E_{oss}) and output capacitance (C_{oss}), as well as the significant improvement in input capacitance (C_{iss}) and gate charge (Q_G), compared to competitor technologies, lead to 0.5 percent higher efficiency at light load which helps to reduce standby power in the end application. At full load, the observed improvement is up to 0.3 percent higher efficiency and 6°C lower device temperature.

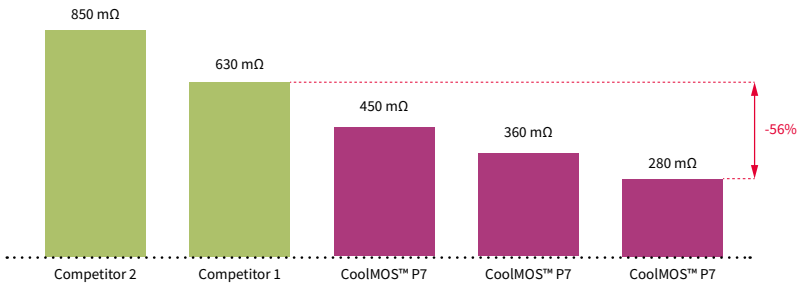




EMI is a system-level topic, and the optimization needs to be done only on the system level. Nevertheless, a pure plug-and-play measurement on Infineon's 45 W adapter reveals that 800 V CoolMOS™ P7 shows similar EMI performance to Infineon's previous technologies and to competitors' technologies.

Compared to the competition, the 800 V CoolMOS™ P7 technology allows for the integration of lower $R_{DS(on)}$ values into small packages, such as a DPAK. This finally enables high-power density designs at highly competitive price levels.

Overview of lowest DPAK $R_{DS(on)}$ for 800 V superjunction MOSFET



CoolMOS™ P7 sets a new benchmark in best-in-class DPAK $R_{DS(on)}$

Customer benefits:
- High power density
- Lower BOM cost
- Lower production cost

The complete P7 platform has been developed with an integrated Zener diode that is used as an electrostatic discharge (ESD) protection mechanism, which increases the overall device ruggedness up to human body model (HBM) Class 2 level.



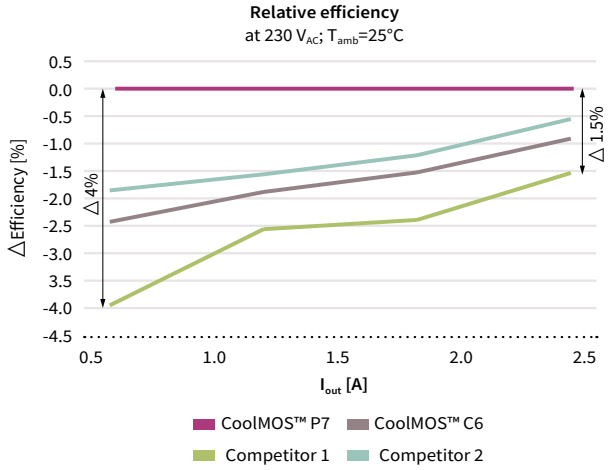
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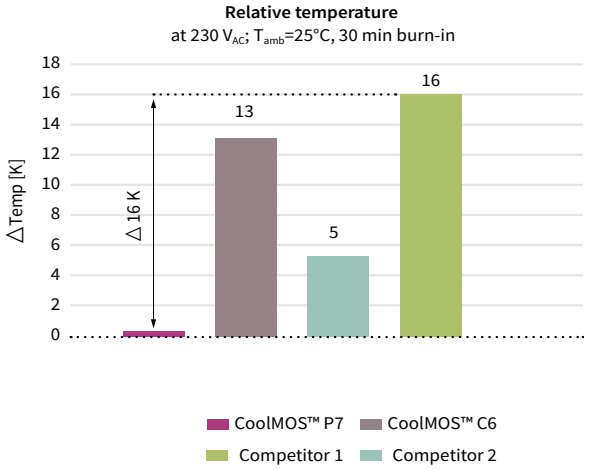
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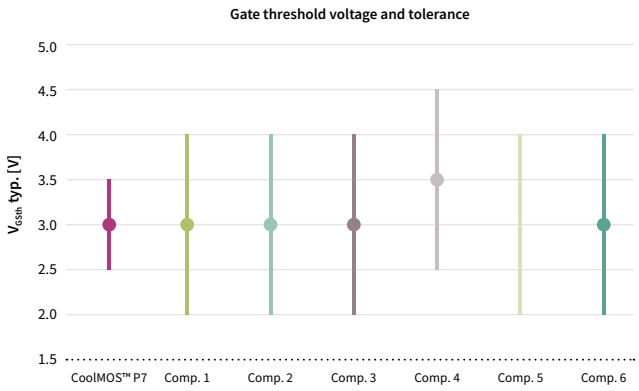
700 V CoolMOS™ P7 SJ MOSFETs

Infineon's solution for flyback topologies

The 700 V CoolMOS™ P7 family has been developed to serve today's and, especially, tomorrow's trends in flyback topologies. The products address the low-power SMPS market, mainly focusing on mobile phone chargers and notebook adapters, but are also suitable for power supplies used within lighting applications, home entertainment (TV, game consoles, or audio), and auxiliary power supplies. 700 V CoolMOS™ P7 achieves outstanding efficiency gains of up to 4 percent and a decrease in device temperature of up to 16 K compared to the competition. In contrast with the previous 650 V CoolMOS™ C6 technology, 700 V CoolMOS™ P7 offers a 2.4 percent gain in efficiency and 12 K lower device temperature, measured in a flyback-based charger application, operated at 140 kHz switching speed.







Keeping the ease of use in mind, Infineon has developed the technology with a low threshold voltage ($V_{GS(th)}$) of 3 V and a very narrow tolerance of ±0.5 V. This makes the CoolMOS™ P7 easy to design-in and enables the usage of lower gate source voltage, which facilitates its driving and leads to lower idle losses. To increase the ESD ruggedness up to the HBM Class 2 level, 700 V CoolMOS™ P7 has an integrated Zener diode. This helps to support increased assembly yield, reducing production-related failures and, finally, manufacturing cost savings on the customer side.

Features and benefits

Key features	Key benefits
– High performance technology - Low switching losses (E_{oss}) - Highly efficient - Excellent thermal behavior	– Cost-competitive technology
– Supports high-speed switching	– Further efficiency gain at higher switching speeds
– Integrated Zener diode for protection	– Supporting smaller-sized magnetics with lower BOM costs
– Optimized $V_{GS(th)}$ of 3 V with very narrow tolerance of ±0.5 V	– High ESD ruggedness up to HBM Class 2 level
– Finely graduated portfolio	– Easy to drive and design-in
	– Enabler for smaller form factors and high power density designs
	– Excellent choice in selecting the best-fitting product



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650 V CoolMOS™ 8 SJ MOSFETs

High voltage super-junction MOSFET family for high power applications

With the increase of AC-line input requirements and additional surge needed for high-power applications, Infineon is offering a solution with the new 650 V CoolMOS™ 8 SJ MOSFETs family. Compared to 600 V CoolMOS™ 8, the additional 50 V breakdown voltage increases the variety of applications it can be used in, for example, telecom and data centers with higher AC-line input. Besides that, the 50 V additional breakdown voltage could give extra surge protection for EV-charger and solid-state circuit breaker applications. It can be used in both hard and soft switching topologies.

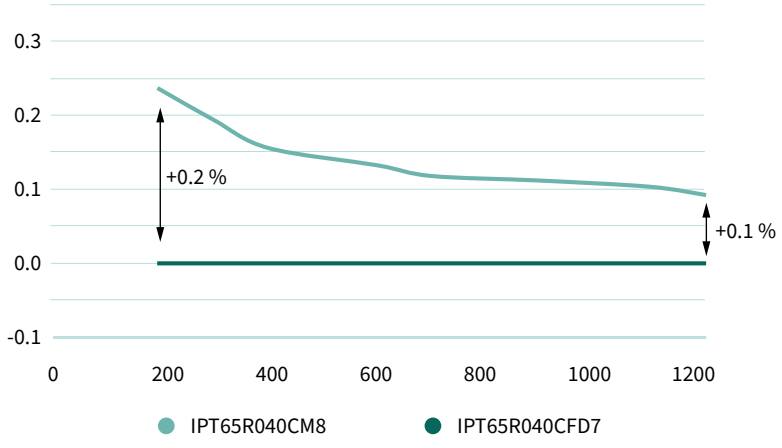
The 650 V CoolMOS™ 8 is the successor of the well-established 650 V CoolMOS™ CFD7 and 650 V CoolMOS™ C7, which comes with a crisp portfolio that combines the best high-power packages. Additionally, this family offers best-in-class (BiC) products with $R_{DS(on)}$ down to a single digit, as low as 8 mΩ in Si-based super-junction (SJ) technology. The 650 V CoolMOS™ 8 family is equipped with an integrated fast body diode, better efficiency, and better thermal performance compared to previous CoolMOS™ generations.

The best-in-class $R_{DS(on)}$ in Q-DPAK enables customers to increase the power density level of their design. In addition, the portfolio is offering another innovative SMD TOLL package. Q-DPAK and TOLL packages support customers to simplify their design and reduce assembly costs.

Features and benefits

Key features	Key benefits
– 650 V blocking voltage	– 50 V extra margin
– Integrated fast body diode	– Ease of use and fast design-in
– Advance die-interconnect technology	– Provide state-of-the-art thermal performance
– Available in TO-247, TOLL, and Q-DPAK packages	– Provide power density in applications
– Best-in-class products with $R_{DS(on)}$ down to 8 mΩ	– Simplified portfolio

Relative efficiency in 1200 W PFC for 90 V_{AC} (PFC CCM, 1.150 W at 110 kHz)



The key benefit of 650 V CoolMOS™ 8 is that it provides a fast design-in and cost reduction on the customer's side. With the same package, 650 V CoolMOS™ 8 increases efficiency by 0.1 percent at 1100 W and 0.2 percent at 300 W compared to the previous generation 650 V CoolMOS™ CFD7.

Telecom Server SMPS UPS EV charging SSCB Solar

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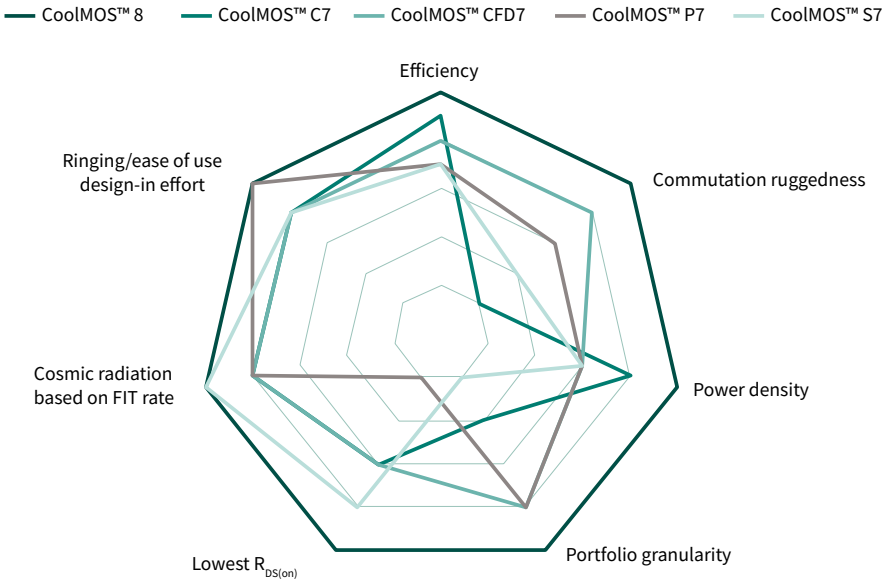
600 V CoolMOS™ 8 SJ MOSFETs

The high voltage super-junction MOSFET family combines the best out of the 600 V CoolMOS™ 7 families

Infineon's newest CoolMOS™ 8 at 600 V is leading the way in high-voltage super-junction MOSFET technology worldwide, setting the standard for both technology and price performance on a global scale. The series is equipped with an integrated fast body diode, making it suitable for a wide range of applications. It enhances Infineon's WBG offering and is the successor of the 600 V CoolMOS™ 7 MOSFET family, including P7, PFD7, C7, CFD7, G7, and S7.

The 600 V CoolMOS™ 8 SJ MOSFET comes with reduced gate charge (Q_g) of 18 percent over CFD7 and 33 percent over P7 at 10 V, 50 percent lower C_{OSS} than CFD7 and P7 at 400 V, reduction in turn-off losses (E_{oss}) is further improved by 12 percent over CFD7 and P7, reverse recovery charge (Q_{rr}) is 3 percent lower compared to the CFD7, as well as the lowest reverse recovery time (t_{rr}) in the market. The $R_{(th)}$ thermal performance also improved by 14-42 percent compared to the previous generation. Due to these features, the devices offer the highest efficiency and best-in-class reliability in soft-switching topologies such as LLC and ZVS phase-shift full-bridge. Furthermore, it provides an outstanding level of performance in PFC, TTF, and other hard-switching topologies. In addition, the 600 V CoolMOS™ 8 SJ MOSFETs enable higher power density thanks to its optimized $R_{DS(on)}$, which allows us to bring our best-in-class (BiC) products down to a single digit of 7 mΩ in a Si-based super-junction (SJ) technology.

The portfolio offers innovative SMD Q-DPAK, TOLL, and Thin-TOLL 8x8 package offerings to simplify and reduce assembly costs.



Features and benefits

Key features	Key benefits
– World class $R_{DS(on)}$ x A	– 0.17% efficiency gain over P7, and 0.05% over C7
– Integrated fast body diode	– Ease of use and fast design-in
– Excellent commutation ruggedness	– Low ringing tendency
– Advanced interconnect technology	– 14-42% lower R_{th}
– Gradual portfolio including from 7 mΩ	– Simplified portfolio
– Top-side cooling packages	– System level innovation

Server · Telecom · SMPS · Solar · EV charging · SSCB · UPS · Consumer

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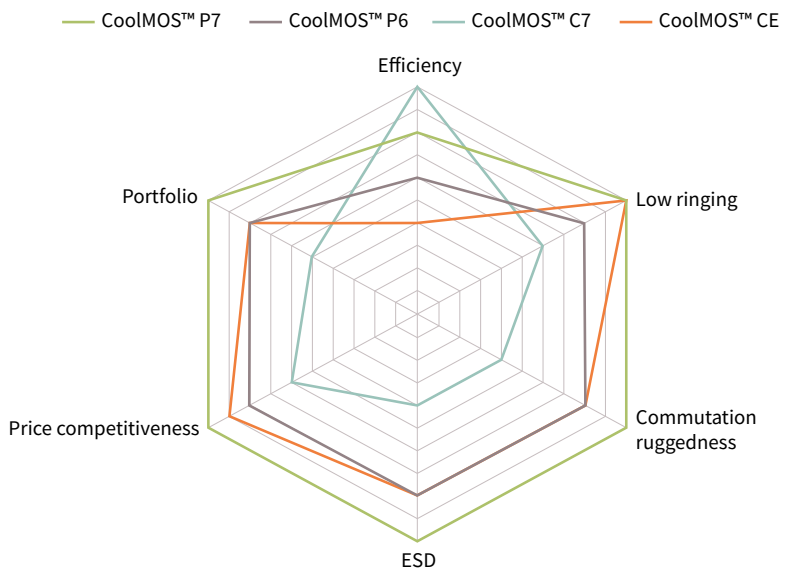
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600 V CoolMOS™ P7 SJ MOSFETs

Perfect combination of high efficiency and ease of use

The 600 V CoolMOS™ P7 is a general-purpose series, targeting various of applications, ranging from low-power SMPS to the highest power levels. In the low-power arena, it is the successor of the 600 V CoolMOS™ CE. For high-power SMPS applications, it is the replacement for the 600 V CoolMOS™ P6, which makes it the perfect choice for applications such as chargers, adapters, lighting, TV and PC power supplies, solar, small light electric vehicles, server and telecom power supplies, and electric vehicle (EV) charging.

The 600 V CoolMOS™ P7 is Infineon's most well-balanced CoolMOS™ technology combining ease of use and excellent efficiency performance. Compared to its predecessors, it offers higher efficiency and improved power density due to the significantly reduced gate charge (Q_G) and switching losses (E_{OSS}) levels, as well as optimized on-state resistance ($R_{DS(on)}$). The carefully selected integrated gate resistors enable very low ringing tendency, and thanks to their outstanding robustness of body diode against hard commutation, they are suitable for hard- and soft-switching topologies, such as LLC. In addition, an excellent ESD capability helps improve manufacturing quality. The 600 V CoolMOS™ P7 family offers a wide range of on-resistance ($R_{DS(on)}$)/package combinations, including THD, as well as SMD devices, at an $R_{DS(on)}$ granularity from 24 to 600 mΩ and comes along with the most competitive price/performance ratio of all 600 V CoolMOS™ offerings.



Features and benefits

Key features	Key benefits
– Suitable for hard- and soft-switching (PFC and LLC) due to an outstanding commutation ruggedness	– Ease of use and fast design-in through low ringing tendency and usage across PFC and PWM stages
– Optimized balance between efficiency and ease of use	– Improved efficiency and simplified thermal management due to low switching and conduction losses
– Significant reduction of switching and conduction losses leading to low MOSFET temperature	– Higher manufacturing quality due to >2 kV ESD protection
– Excellent ESD robustness >2 kV (HBM) for all products	– Increased power density solutions enabled by using products with smaller footprint
– Better $R_{DS(on)}$/package products compared to competition	– Suitable for a wide variety of applications and power ranges
– Large portfolio with granular $R_{DS(on)}$ selection qualified for a variety of industrial and consumer applications	



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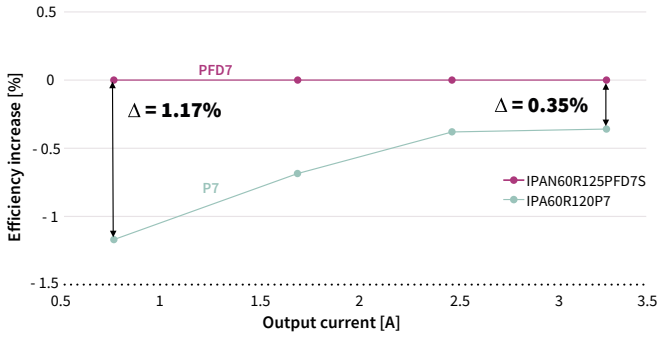
600 V CoolMOS™ PFD7 SJ MOSFETs

The next level for ultrahigh power density designs and energy-efficient home appliance drives

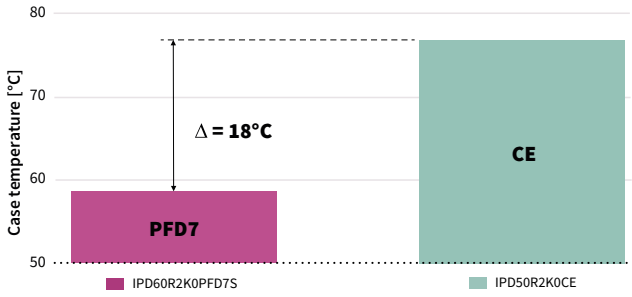
The 600 V CoolMOS™ PFD7 MOSFET series set the benchmark in 600 V superjunction (SJ) technologies, shaped by Infineon's experience of more than 20 years in pioneering superjunction technology innovation. The series combines best-in-class performance with state-of-the-art ease of use and features an integrated fast body diode, ensuring a robust device and, in turn, reduced BOM for the customer. This product family offers up to 1.17 percent efficiency increase compared to the CoolMOS™ P7 technologies, which leads to a power density increase of 1.8 W/in^3. CoolMOS™ PFD7 pushes the SJ MOSFET technology to new limits leading to outstanding improvement of lower conduction and charge/discharge losses as well as a reduced turn-off and gate-driving losses.

A broad range of $R_{DS(on)}$ values in combination with a variety of packages helps in selecting the right part to optimize designs. Furthermore, an integrated ESD protection of up to 2 kV eliminates ESD-related yield loss. Infineon's industry-leading SMD package offering contributes to bill-of-material and PCB space savings and simplifies manufacturing. This unique set of product features and their resulting benefits position the CoolMOS™ PFD7 superjunction MOSFET family exceptionally well for ultrahigh density applications like chargers and adapters, USB power delivery, but also for home appliance drives (e.g., refrigerator compressors) and specific lighting SMPS applications.

65 W delta efficiency at 90 V_{AC} input voltage
with IPAN60R125PFD7S as reference



Low-side MOSFET temperature
100 W motor drive at high line 230 V_{AC}



600 V CoolMOS™ PFD7 increases efficiency in light- and full-load conditions. This results in a power density increase of 1.8 W/in^3 for ultrahigh power chargers and adapters.

600 V CoolMOS™ PFD7 provides up to 2 percent higher efficiency at 100 W, which results in an 18°C thermal improvement. Its excellent commutation ruggedness makes it the perfect fit for low-power drives.

Features and benefits

Key features	Key benefits
– Very low FOM $R_{DS(on)}$ x E_{oss}	– Minimized switching losses
– Integrated robust fast body diode	– Power density improvement compared to latest CoolMOS™ charger technology
– Ultralow Q_{rr} and industry's fastest recovery time (T_{rr})	– Increased efficiency (especially at light-load operation) and improved thermal behavior compared to CoolMOS™ CE technology for home appliance motor drives
– Up to 2 kV ESD protection (HBM Class 2)	– BOM cost reduction and easy manufacturing
– Wide range of $R_{DS(on)}$ values and broad package portfolio	– Robustness and reliability
– Excellent commutation ruggedness	– Easy to select right parts for design fine-tuning



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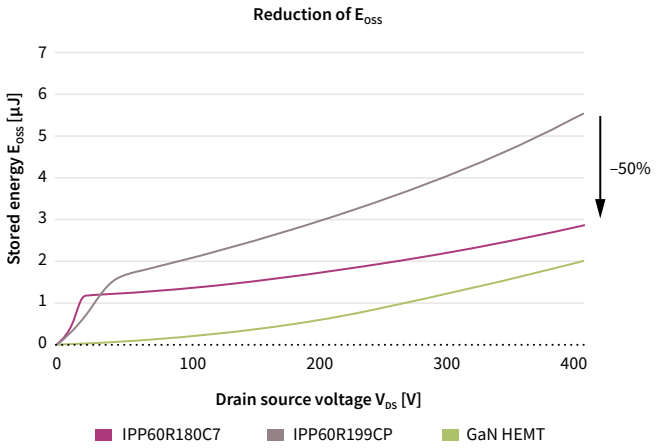
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600 V and 650 V CoolMOS™ C7 and 600 V C7 Gold (G7) SJ MOSFETs

Infineon's superjunction MOSFET series for highest efficiency

The 600 V and 650 V CoolMOS™ C7 and 600 V C7 Gold (G7) superjunction MOSFET series are designed to achieve record-level efficiency performance – they offer substantial efficiency benefits over the whole load range in hard-switching applications compared to previous series and competition. This is achieved by minimizing switching losses via ultralow levels of switching losses (E_{OSS}) (approximately 50 percent reduction compared to the CoolMOS™ CP), reduced gate charge (Q_G) and a careful balance of other relevant product key parameters. The low E_{oss} and Q_g also enable operation at a higher switching frequency and related size reduction of the circuit magnetics.

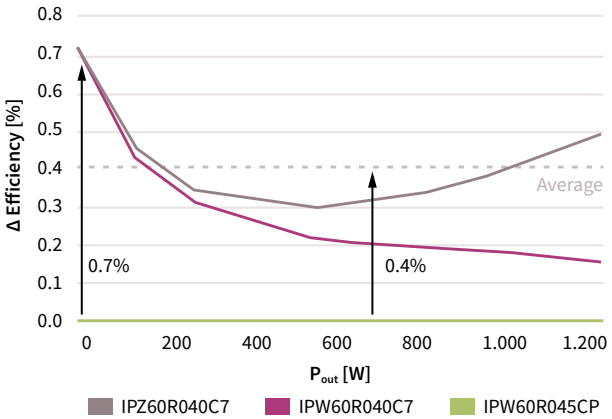


The outstanding figures of merit (FOM) and the best-in-class on-state resistance ($R_{DS(on)}$) offerings make the CoolMOS™ C7 and C7 Gold series key enablers for the highest efficiency and power density. While the 650 V CoolMOS™ C7 and 600 V C7 Gold (G7) superjunction MOSFETs are solely designed for hard-switching applications such as PFC, the 600 V version is also well suited for high-end LLC stages due to its rugged body diode that withstands slew rates up to 20 V/ns. The product portfolio contains TO-247 4-pin, Thin-PAK 8x8, TO-Leadless and top-side cooled Double DPAK (D-DPAK) packages which come with additional Kelvin source contacts enabling further efficiency advantages over the classical 3-pin approach.

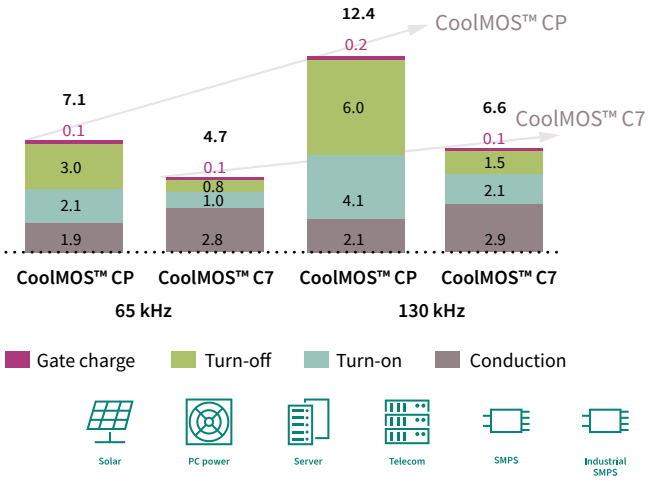
Features and benefits

Key features	Key benefits
– Reduced switching loss parameters such as Q_g and C_{oss}, enabling higher switching frequency	– Increased efficiency in hard-switching topologies such as PFC and TTF
– 50% E_{oss} reduction compared to older CoolMOS™ CP	– Reduced size and cost of magnetic components by increased switching frequency (e.g., 65 -130 kHz)
– Suitable for hard-switching topologies (650 V and 600 V)	– Increased power density by smaller packages for the same $R_{DS(on)}$
– Suitable for high-end resonant (600 V only) topologies	

PFC CCM 1200 W efficiency difference for 90 V_{AC} (PFC CCM, 1.150 W at 65 kHz)



MOSFET losses [W]
IPW60R045CP vs. IPZ60R060C7, highline 2.5 kW



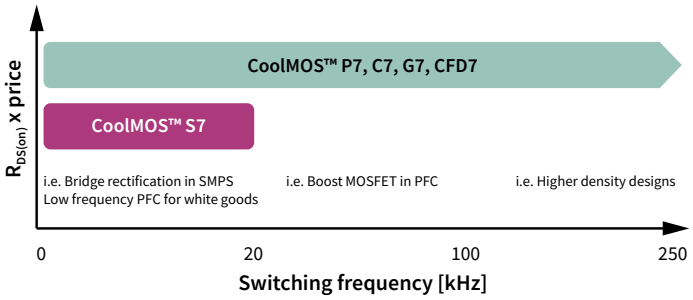
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600 V CoolMOS™ S7 SJ MOSFETs

The best price/performance SJ MOSFET for low frequency switching applications

The 600 V CoolMOS™ S7 superjunction MOSFET is the perfect fit for applications where MOSFETs are switched at low frequency, such as active bridge rectification, inverter stages, in-rush relays, PLCs, power solid state relays, and solid state circuit breakers. The new MOSFET design with the best conduction performance allows the CoolMOS™ S7 to offer cost-optimized distinctively low on-resistance ($R_{DS(on)}$) values, ideally suited for applications looking to minimize conduction losses at the best price.



The CoolMOS™ S7 leads the way for power density, uniquely fitting a 22 mΩ $R_{DS(on)}$ chip into an innovative small TO-leadless (TOLL) SMD package.

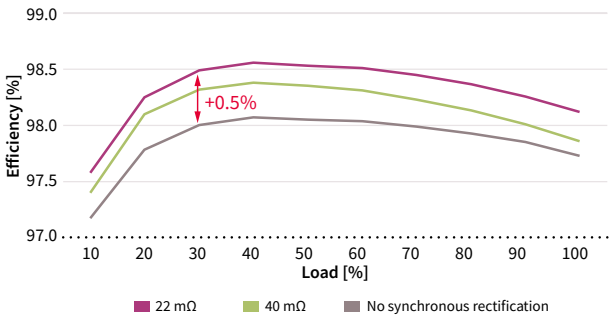
Use cases

Typically, CoolMOS™ S7 is used in active rectification bridges, where diodes are replaced or paralleled with MOSFETs, increasing efficiency without the need for extensive system redesign. In this application, the TO-leadless (TOLL) package in low $R_{DS(on)}$ allows the most efficient and compact modular design based on daughter cards.
The CoolMOS™ S7 also delivers tremendous value to solid state relay (SSR) and solid state circuit breaker (SSCB) designs, by bringing the advantages of superjunction MOSFETs to a system-level cost comparable to other silicon alternatives. In addition, any socket or topology switching at low frequency can greatly benefit from the leading low $R_{DS(on)}$ x price.

Features and benefits

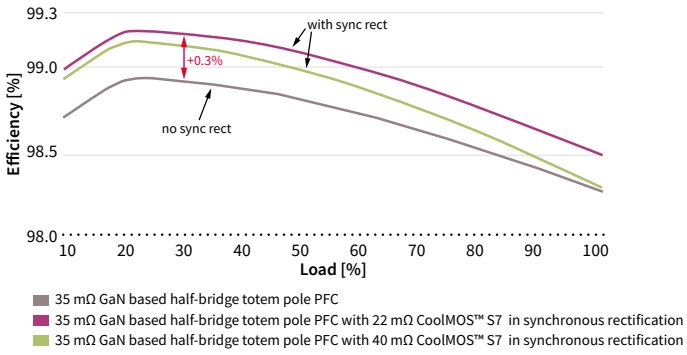
Key features	Key benefits
– Best-in-class $R_{DS(on)}$ in SMD packages	– Minimizes conduction losses
– Optimized for conduction performance, reaching the lowest $R_{DS(on)}$ values	– An easy step into titanium level SMPS
– High pulse current capability	– Modular, more compact, and easier designs
– Improved thermal resistance	– Eliminates or reduces heatsink in solid state relays and circuit breakers
	– Lower TCO cost or BOM cost

Efficiency in 2400 W PFC at V_{in} = 230 V_{AC}
Difference between using or not using the active-bridge rectification



CoolMOS™ S7 brings more efficiency to power supplies when used in an active rectification bridge.

3 kW GaN-based totem pole PFC efficiency calculation with and without synchronous rectification when V_{in} = 230 V_{AC}, V_{out} = 400 V, f_{sw} = 65 kHz



CoolMOS™ S7 is the perfect complement for CoolSiC™ MOSFETs and CoolGaN™ Transistors in totem pole PFC topologies.

SMPS Solar UPS LSEV PLC

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600 V CoolMOS™ S7T SJ MOSFETs with integrated temperature sensor

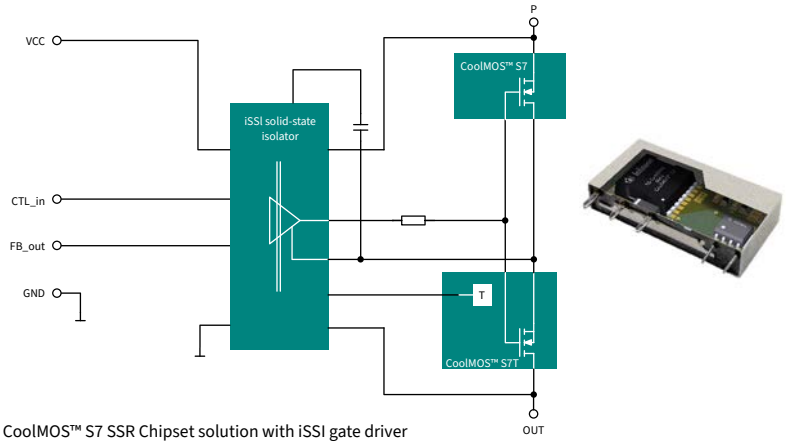
The best fit for solid-state applications

As an addition to our 600 V CoolMOS™ S7 product family, the 600 V CoolMOS™ S7T is introduced as an optimized low-frequency and high-current switching applications with an integrated temperature measuring functionality, which is an ideal fit for solid-state relay, circuit breaker designs, and line rectification in SMPS. The 600 V CoolMOS™ S7T has a monolithically embedded temperature sensor, which increases junction temperature sensing accuracy and robustness while enabling easy implementation. It optimizes the thermal utilization of power transistor design, simplifies heatsink design, and reduces external sensing elements. Essentially, this lowers overall system complexity and reduces system cost.

The CoolMOS™ S7T comes in TOLL and Q-DPAK top-side cooled (TSC) package, with a compatible $R_{DS(on)}$ matching those of the S7 portfolio offerings. The best-in-class silicon base 10 mΩ comes in the Q-DPAK TSC and BSC. The top-side cooling concept enables thermal decoupling between the PCB material and semiconductor to overcome the thermal limit, making it a compelling solution for addressing higher power levels. Combined with the low $R_{DS(on)}$, the SMD package can drive the efficiency and power density to the next level.

The solid state isolator (iSSI) gate driver is a dedicated pin-to-pin gate driving solution that complements the S7T MOSFET. It offers customers ease of use as a complete system solution. More information about the iSSI gate drive can be found in Infineon Solid State Isolators (iSSI).

A back-to-back configuration, using CoolMOS™ S7 on the high side and the S7T at the low side



CoolMOS™ S7 SSR Chipset solution with iSSI gate driver

Features and benefits

Key features	Key benefits
– Enables the lowest $R_{DS(on)}$ in the smallest footprint	– Minimized conduction losses
– High pulse current capability	– Increased system performance
– Seamless diagnostics at the lowest system cost	– Reduction of external sensing elements
– Temperature-sense feature for protection and optimized thermal device utilization	– Lower BOM or/and TCO over a prolonged lifetime
	– More compact and simplified design

SSCB · EV charging · Lighting · SMPS · Solar · Telecom · UPS

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600 V CoolMOS™ CFD7 SJ MOSFETs

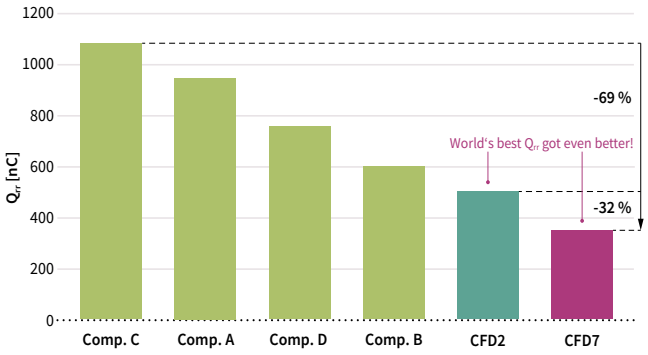
Infineon's solution for resonant switching high-power applications

The 600 V CoolMOS™ CFD7 is one of Infineon's high-voltage superjunction MOSFET series with an integrated fast body diode. It is the ideal choice for resonant topologies, such as LLC and ZVS PSFB, and targets the high SMPS market.

As a result of significantly reduced gate charge (Q_G), improved turn-off behavior, a reverse recovery charge (Q_{rr}) up to 69 percent lower compared to the competition, as well as the lowest reverse recovery time (t_{rr}) in the market, it combines the highest efficiency and best-in-class reliability in soft-switching applications, without sacrificing easy implementation in the design-in process.

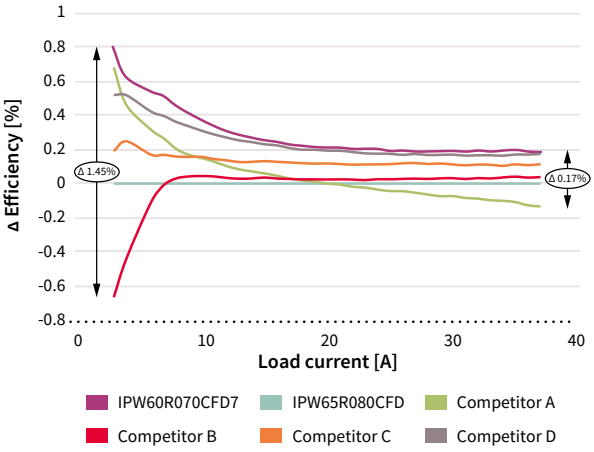
In addition, the 600 V CoolMOS™ CFD7 enables higher power density solutions by offering the best-in-class on-state resistance ($R_{DS(on)}$) package combinations in through-hole devices and in surface mount devices. In Thin-PAK 8x8 and TO-220 with CoolMOS™ CFD7, an $R_{DS(on)}$ of around 30 percent below the next best competitor offering can be achieved. All this together makes CoolMOS™ CFD7 the perfect fit for server and telecom applications, and it is also suitable for EV charging stations.

Q_{rr} comparison of 170 mΩ CFD vs. 190 mΩ range competition*



*Comparison based on datasheet values

Efficiency comparison of CFD7 vs. CFD2 and competition in 2 kW ZVS



Features and benefits

Key features	Key benefits
– Ultrafast body diode	– Best-in-class hard commutation ruggedness
– Best-in-class reverse recovery charge (Q_{rr})	– Highest reliability for resonant topologies
– Improved reverse diode dv/dt and dif/dt ruggedness	– Highest efficiency with outstanding ease of use/performance trade-off
– Lowest figure of merit ($R_{DS(on)}$ x Q_g x E_{oss})	– Enabling increased power density solutions
– Best-in-class $R_{DS(on)}$/package combinations	

Solar SMPS Server Telecom EV charger

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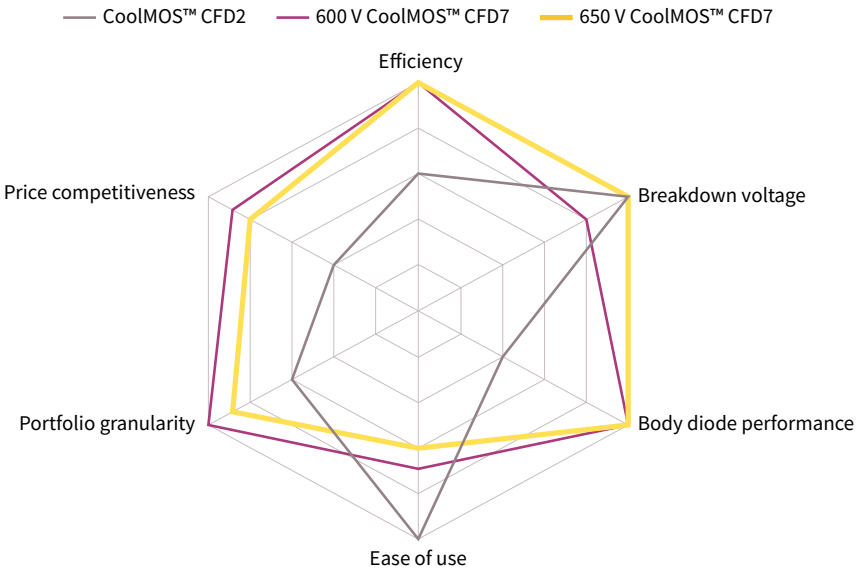
650 V CoolMOS™ CFD7 SJ MOSFETs

Tailored to win in resonant topologies

The need for improved efficiency and higher power density in industrial SMPS applications is driven by the megatrends of the 21st century such as big data, digitalization, and e-mobility. Furthermore, over the last few years, due to the higher nominal input voltages in the US, a trend towards 450 V bus voltage, and the need for worldwide applicable designs, the demand for 650 V breakdown voltage has increased significantly - also for resonant topologies.

The 650 V device family is the voltage-range extension of Infineon's renowned CoolMOS™ CFD7 family, the successor to the well-established CoolMOS™ CFD2. It comes with an additional 50 V breakdown voltage, integrated fast body diode, improved switching performance (compared to previous generations), and excellent thermal behavior. Thanks to these features, the 650 V CoolMOS™ CFD7 allows for the highest efficiency and power density levels in soft-switching applications such as LLC and ZVS phase-shift full-bridge.

The best-in-class $R_{DS(on)}$ in TO-247, TO-220, and D^2PAK enables customers to increase the power density level of their designs primarily addressing telecom, server, solar, and (off-board) EV charging applications.



Features and benefits

Key features	Key benefits
– 650 V blocking voltage	– 50 V extra margin for increased bus voltage
– Ultrafast body diode	– Excellent hard commutation ruggedness
– Reduced switching losses	– Outstanding light load efficiency
– Low $R_{DS(on)}$ dependency overtemperature	– High full-load efficiency

Telecom Server EV charger Solar

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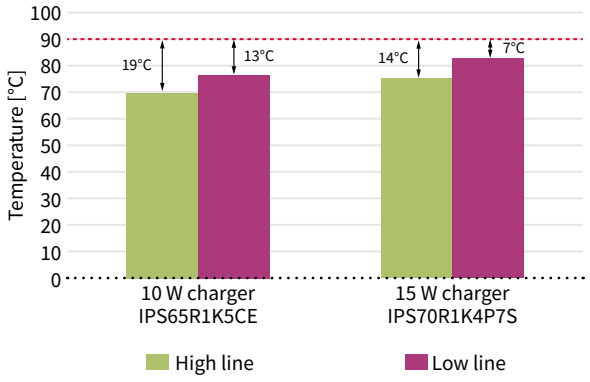
CoolMOS™ CE SJ MOSFETs

High-voltage superjunction MOSFETs for consumer applications

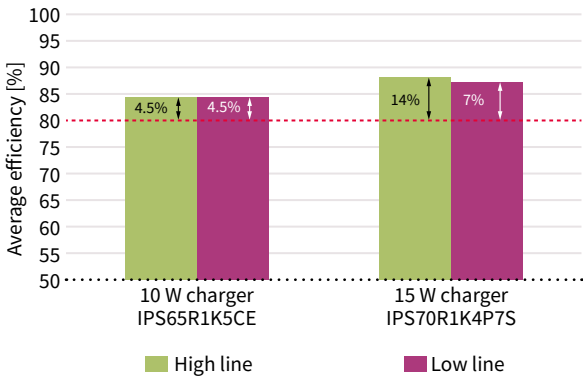
Infineon's CoolMOS™ CE is a product family that addresses consumer and lighting applications. It offers benefits in efficiency and thermal behavior versus standard MOSFETs and is optimized for ease of use and cost-competitiveness, while delivering the right-fit performance and excellent Infineon quality.

Application example: 10 W and 15 W smartphone charger

CoolMOS™ CE meets typical MOSFET
case temperature requirements in charger applications



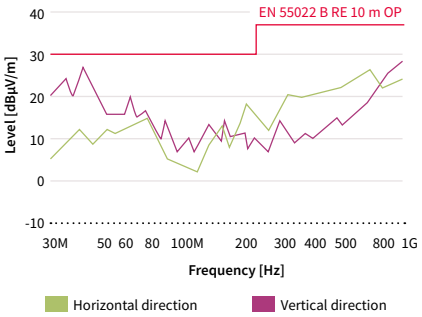
CoolMOS™ CE meets the standard
efficiency requirements in charger application



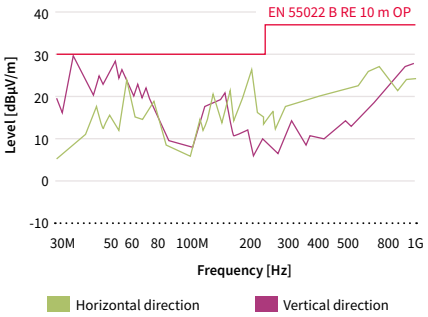
CoolMOS™ CE case temperature:
The maximum MOSFET case temperature is required to be below 90°C. CoolMOS™ CE meets this requirement and offers enough margin required for design-in flexibility.

CoolMOS™ CE efficiency performance:
CoolMOS™ CE meets the 80 percent standard efficiency requirement and offers enough margin required for design-in flexibility.

10 W design: IPS65R1K5CE
EN 55022 B radiated HF-field
30 MHz – 1 GHz position



15 W design: IPS65R1K0CE
EN 55022 B radiated HF-field
30 MHz – 1 GHz position



The performance of CoolMOS™ CE in the 10 W and 15 W design demonstrates that the series meets common EMI requirements for charger applications and thus, is also offering design-in flexibility.

CoolMOS™ CE customer benefits	
Product portfolio	Broad portfolio covering five voltage classes in both through-hole and SMD packages
Quality	Field failure rates are as low as 0.1 DPM
Design-in support	Large field application engineering team to provide professional and flexible support for your design



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CoolMOS™ SJ MOSFETs for automotive

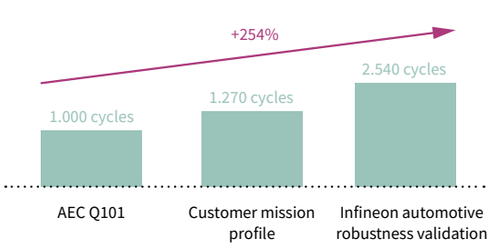
On the fast lane in automotive applications

The highest system performance in a size- and weight-constrained environment, outstanding and proven product quality and reliability, and 100 percent reliable delivery are key requirements for manufacturers in the automotive market. With the high-voltage automotive MOSFET series 600 V CoolMOS™ CPA and 650 V CoolMOS™ CFDA, 800 V CoolMOS™ C3A, 650 V CoolMOS™ CFD7A and 600 V CoolMOS™ S7A/S7TA, Infineon is perfectly prepared to take the challenges in the strongly growing automotive market.

Product series	Key features	Applications	Quality
600 V CoolMOS™ CPA	**Best choice for demanding hard-switching applications** – Lowest $R_{DS(on)}$ per package – Lowest gate charge value Q_g	– Hard-switching topologies (with SiC diode) – PFC boost stages in on-board charger	**Quality level well beyond the formal requirements of the AEC Q101 standard through** special screening measures in the front and back end Mission-profile based qualification procedures
650 V CoolMOS™ CFDA	**Easy implementation of layout and design** – Integrated fast body diode – Limited voltage overshoot during hard commutation – self-limiting dI/dt and dV/dt – Low Q_{rr} at repetitive commutation on body diode and low Q_{oss}	– Resonant-switching topologies – DC-DC stage of OBC – LLC or full-bridge phase shift (ZVS) in DC-DC converter – HID lamp – Active DC link discharge – Pre-charge	
800 V CoolMOS™ C3A	– Outstanding performance in terms of efficiency, thermal behavior, and ease of use – High blocking voltage	– Flyback low-power auxiliaries – On-board charger – HV-LV DC-DC converter – Battery disconnect unit – Traction inverter auxiliaries – DC-link pre-charge – DC-link active discharge – Isolation monitoring	
650 V CoolMOS™ CFD7A	– Improved 650 V CoolMOS™ CFDA – Higher application voltage possible (at the same proven reliability level) – D^2PAK 7-pin with increased creepage distance and Kelvin source – Considerable improvement in key parameters (higher efficiency)	– On-board charger – Hard-switching topologies (with SiC diode) – PFC boost stages – DC-DC stage of OBC – HV-LV DC-DC converter – LLC or full-bridge phase shift (ZVS) – Auxiliary power supplies	
600 V CoolMOS S7A/S7TA	– Optimized for low frequency and high-current switching applications with or without integrated temperature sensor	– On-board charger – Slow leg totem pole PFC – eFuse applications – Solid-state relay	

CoolMOS™ SJ MOSFET automotive – benchmark in quality and reliability

Robustness validation – example for thermal cycling test



Focus on top-notch quality and reliability without compromise – that is the principle Infineon applies during the development and qualification of all CoolMOS™ superjunction technologies. For our automotive-grade derivatives, the great quality levels of the industrial-based technologies are further boosted by special screening measures in the front and back end, as well as by extended qualification procedures. The Infineon robustness validation approach with extended stress-test procedures, doubling the real application requirements, is one of our key measures to ensure a quality level well beyond the formal requirements of the AEC Q101 standard. Aside from extended stress times on standard qualification tests, it comprises test procedures specially developed by Infineon to ensure highest quality of such as the power metallization of our devices. Usage of robust package technologies, 100 percent gate oxide screening, and top-notch production monitoring, including yield screening measures, part average testing (PAT), statistical bin alarm (SBA), and pattern recognition procedures, complete our package to guarantee the highest automotive quality. This holistic approach results in an unrivaled quality position of Infineon's CoolMOS™ SJ MOSFETs for automotive.

On-board charger · eMobility · HV-LV DC-DC converter · Lighting

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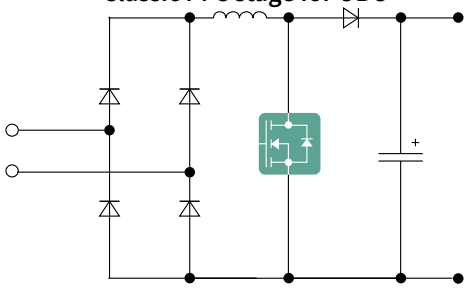
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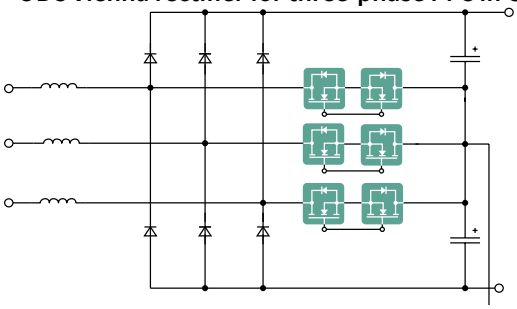
CoolMOS™ SJ MOSFET automotive – ready to support future application trends

Driven by the carbon dioxide (CO_2) reduction initiatives, the plug-in hybrid PHEV and pure EV market is strongly growing. Higher ranges of electric vehicles are realized by increasing the battery capacity and the energy efficiency of the used electric components. The used battery voltage classes tend to become standardized at approximately 450 V with a trend towards higher voltages, as this supports faster charging times and enables lighter cabling within the vehicle. Discrete high-voltage components are widely used for on-board charger (OBC) and DC-DC converter (LDC) applications as price pressure increasingly displaces module-based solutions. The trend towards fast charging impacts the power range demanded from OBC topologies. Presently, as well as in the past, a vast majority of OBC topologies have been found in the range of up to 7.2 kW, whereas the future tends to stir the trend towards 11 kW or even up to 22 kW. This development, paired with a demand for high efficiency and power density at low system cost, is a strong driver for using three-phase solutions.

Classic PFC stage for OBC



OBC Vienna rectifier for three-phase PFC in OBC



While the classic PFC approaches are well-established in the market for lower-power OBC solutions, the Vienna rectifier is the optimal solution for higher power levels. As a true three-phase topology, it delivers full power if attached to a three-phase input but is flexible enough to run on a single-phase if required. The three-level topology minimizes the filter effort compared to other solutions. Using doubled frequency on the magnetic components also helps significantly reduce the size of the passives. As a three-level topology, the Vienna rectifier, followed by two parallel DC-DC stages, further leads to a relaxed voltage stress level on the power MOSFETs. This way, it enables to handle upcoming higher battery voltage levels. The $R_{DS(on)}$, required to yield a desired efficiency level in a Vienna rectifier, is a function of the applied switching frequency and demanded power level. With our 600 V CoolMOS™ CPA and 650 V CoolMOS™ CFDA portfolio, covering an $R_{DS(on)}$ range from 45 to 660 mΩ, we are well prepared to support your next-generation three-phase Vienna rectifier design. With CoolMOS™, you are ready to seize your share in the emerging high-power on-board charger markets.

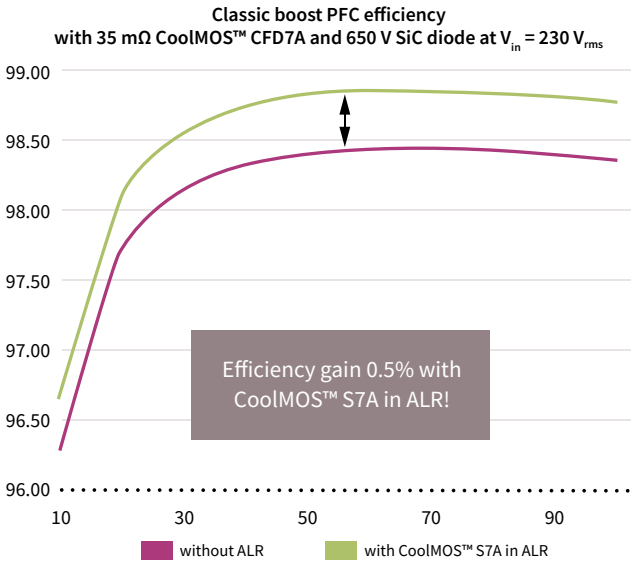
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600 V CoolMOS™ S7A

Best-in-class $R_{DS(on)}$ x A SJ MOSFET for slow-switching automotive applications

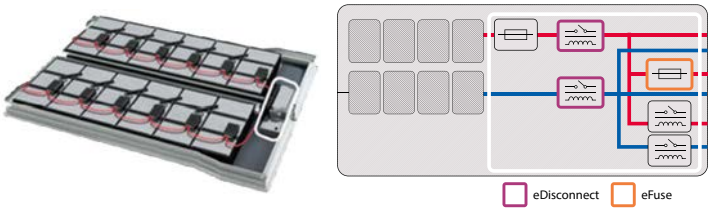
The automotive-grade 600 V CoolMOS™ S7A superjunction MOSFET addresses xEV applications where MOSFETs are switched at low frequency, such as HV eFuse, HV eDisconnect, and on-board chargers in the slow-switching leg of the PFC stage. The more stringent requirements for increased power density, safety, and reliability in these applications are met by combining the superior robustness and performance of the S7A MOSFET with the innovative package concept offered by the Q-DPAK TSC. The new MOSFET design offers a cost-optimized, distinctively low on-resistance $R_{DS(on)}$ of 10 mΩ, enabling increased power density and minimized conduction losses. The top-side cooled Q-DPAK package offers increased efficiency and controllability thanks to its intrinsic Kelvin source, high power dissipation capability, and innovative cooling concept.



CoolMOS™ S7A is the ideal device for the active line rectification (ALR) in a classic boost PFC topology, which offers a power loss reduction of up to 30 percent and an overall PLC efficiency improvement of 0.5 percent.

CoolMOS™ S7A is the semiconductor solution for HV eDisconnect and HV eFuses. It answers eMobility needs concerning reliability (maintenance-free), flexible and cost-optimized system integration, scalability, and minimized failure propagation.

HV power distribution unit



Features and benefits

Key features	Key benefits
– Best-in-class $R_{DS(on)}$: 10 mΩ	– Minimized conduction losses
– Smallest $R_{DS(on)}$ in SMD packages	– Increased energy efficiency
– Optimized for conduction performance	– More compact and easier designs
– Industry‘s leading heat-sinking capability	– Increased power density
– High pulse current capability	– Lower TCO cost or BOM cost
– Body diode robustness at AC line commutation	– Flexible system integration
– Kelvin source concept	– Variable cooling strategy

On-board charger · eMobility · Battery disconnect · Fuses and relay

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600 V CoolMOS™ S7TA SJ MOSFETs with integrated temperature sensor

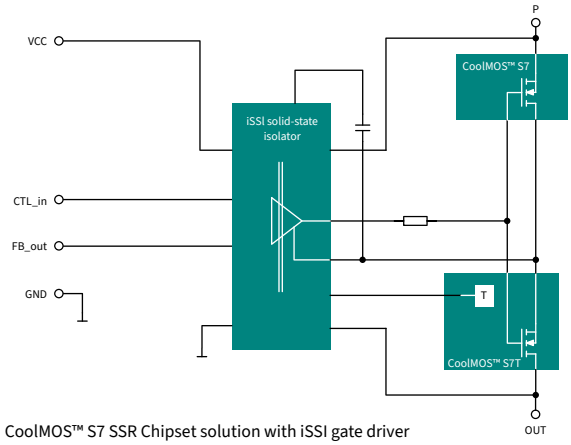
Pioneering solid-state applications in automotive

In addition to our 600 V CoolMOS™ S7A product family, the 600 V CoolMOS™ S7TA is introduced as an optimized solution for the automotive sector's low-frequency and high-current switching applications. Featuring an embedded temperature sensor, the S7TA enhances junction temperature sensing accuracy and robustness, ensuring easy and seamless implementation. This monolithically embedded temperature sensor optimizes power transistor design and simplifies heatsink design, lowering system complexity and cost. The temperature sense feature also provides protection and optimized thermal device utilization, resulting in a more compact design than electromechanical devices.

The 600 V CoolMOS™ S7TA is well-suited for applications such as circuit breakers (HV eDisconnect switch, DC and AC low-frequency switch, HV eFuse, on-board charger) and line rectification in high-power/performance automotive applications.

Available in the Q-DPAK package in both TSC and BSC configurations, the CoolMOS™ S7TA offers a compatible $R_{DS(on)}$ matching those of the 600 V CoolMOS™ S7A portfolio offerings. Its silicon base's best-in-class 10 mΩ in Q-DPAK, in both TSC and BSC configurations, combined with the top-side cooling concept, enables thermal decoupling between the PCB material and semiconductor. This feature overcomes thermal limits and addresses higher power levels, driving efficiency and power density to the next level.

A back to back configuration, using CoolMOS™ S7 on the high side and the S7T at the low side



CoolMOS™ S7 SSR Chipset solution with iSSI gate driver



CoolMOS™ S7 SSR Chipset solution with iSSI gate driver

Features and benefits

Key features	Key benefits
– Optimized price performance in low-frequency switching applications	– Reduction of external sensing elements, hence a more compact design compared to electromechanical devices
– High pulse current capability	– Increased system performance
– Seamless diagnostic at the lowest system cost	– Minimized conduction losses
– Temperature-sense feature for protection and optimized thermal device utilization	– More reliability and longer system lifetime
	– Shock and vibration resistance with no contact arcing or bouncing

On-board charger · eMobility · Battery disconnect · Fuses and relay

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CoolMOS™ SJ MOSFET package innovations



Innovative top-side cooled SMD solution for high-power applications

Top-side cooled Quadruple DPAK (Q-DPAK) and TOLT

These top-side cooled surface mount device (SMD) packages (available today in 600 V CFD7, G7, S7, CM8, CoolSiC™ MOSFET 650 V and 750 V) address high-power SMPS applications such as PC power, solar, telecom, solid state circuit breaker as well as automotive applications like HV eDisconnect, HV eFuse, and on-board charger. SMD-based SMPS designs support fast switching and help to reduce the parasitic inductance associated with long leaded packages such as the TO-247 package. In today's SMD-based designs, the output power is restricted by the thermal limit of the PCB material because the heat must be dissipated through the board. Thanks to the top-side cooling concept of TOLT and Q-DPAK, the thermal decoupling of board and semiconductor is possible, enabling higher power density or improved system lifetime.



Innovative bottom-side cooled SMD solution for high-power applications

Bottom-side cooled Q-DPAK

The bottom-side cooled (SMD) packages address high-power SMPS applications such as solar, server, telecom, automotive. SMD-based SMPS designs support fast switching and help to reduce the parasitic inductance associated with long leaded package. Furthermore, SMD packages simplify assembly and reduce costs while minimizing space requirements for the overall packages. The bottom-side cooled variant of Q-DPAK allows designers to benefit from these advantages while implementing a more traditional cooling scheme for high power switches compared to the novel top-side cooled variants. Tried and tested PCB materials and assemblies can be used while improving the power path routing thanks to multiple source pins, and advanced features such as multiple gate pins for safety applications can be benefited from.



Optimized for high-power applications

TO-Leadless

Combined with the CoolMOS™ C7 Gold (G7) technology, the TO-Leadless (TOLL) package is Infineon's flagship SMD package for high power/high current SMD solutions. Compared to D^2PAK 7-pin, TO-Leadless shows a 30 percent reduction in footprint yet offers improved thermal performance. This, along with the 50 percent height reduction, results in a significant advantage whenever the highest power density is demanded. Equipped with 4-pin Kelvin source connection and low parasitic inductances, the package offers best efficiency and ease of use. The package is MSL1 compliant and reflow solderable.



Cost-effective drop-in replacement for DPAK

SOT-223

The SOT-223 package without a middle pin is a cost-effective alternative to DPAK, addressing the need for cost reductions in price-sensitive applications. It offers a smaller footprint, while still being pin-to-pin compatible with DPAK, thus, allowing a drop-in replacement for DPAK and second sourcing. Moreover, SOT-223 achieves comparable thermal performance to DPAK and enables customers to achieve improved form factors or space savings in low-power dissipation designs.



Thin-TOLL 8x8

Infineon's Thin-TOLL 8x8 is a clever cross between a Thin-PAK 8x8 and a TOLL package. While maintaining a small footprint and the pin-to-pin compatibility with Thin-PAK 8x8 and similar 8x8 packages, the thicker Thin-TOLL leadframe allows tolerating a higher number of TCoB (thermal cycles on board) - up to 4 times than other 8x8 packages. The support for .XT enables a T_j of 175°C, when a CoolSiC™ die is used. Overall, the TT 8x8 is the next evolutionary step into more power density for mid to high power applications.

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950 V CoolMOS™ PFD7



$R_{DS(on)}$ [mΩ]	TO-220 FullPAK	TO-247	TO-252 (DPAK)	TO-263 (D^2PAK)
60		IPW95R060PFD7		
130	IPA95R130PFD7	IPW95R130PFD7		IPB95R130PFD7
310	IPA95R310PFD7	IPW95R310PFD7		IPB95R310PFD7
450	IPA95R450PFD7		IPD95R450PFD7	IPB95R450PFD7

950 V CoolMOS™ P7



$R_{DS(on)}$ [mΩ]	TO-220	TO-220 FullPAK	SOT-223	TO-251 long leads	TO-252 (DPAK)
450		IPA95R450P7			IPD95R450P7
750		IPA95R750P7		IPU95R750P7	IPD95R750P7
1200		IPA95R1K2P7	IPN95R1K2P7		IPD95R1K2P7
2000					IPD95R2K0P7
3700			IPN95R3K7P7		

800 V CoolMOS™ P7



$R_{DS(on)}$ [mΩ]	TO -220	TO-220 FullPAK	TO-247	TO-252 (DPAK)	TO-251 (IPAK)	SOT-223	TO-220 FullPAK narrow lead	Thin-PAK 5x6
280		IPA80R280P7		IPD80R280P7				
360		IPA80R360P7		IPD80R360P7			IPAN80R360P7	
450		IPA80R450P7		IPD80R450P7				
600		IPA80R600P7		IPD80R600P7	IPU80R600P7			
750		IPA80R750P7		IPD80R750P7				
900		IPA80R900P7		IPD80R900P7	IPU80R900P7			IPLK80R900P7
1200				IPD80R1K2P7				
1400	IPP80R1K4P7	IPA80R1K4P7		IPD80R1K4P7		IPN80R1K4P7		
2000				IPD80R2K0P7	IPU80R2K0P7			
2400				IPD80R2K4P7		IPN80R2K4P7		
3300				IPD80R3K3P7				
4500				IPD80R4K5P7	IPU80R4K5P7	IPN80R4K5P7		

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800 V CoolMOS™ C3



$R_{DS(on)}$ [mΩ]	TO-220	TO-263 (D^2PAK)	TO-220 FullPAK	TO-247	TO-252 (DPAK)
85				SPW55N80C3	
290					
450					
650	SPP08N80C3				
900					
1300					
2700					

700 V CoolMOS™ P7



$R_{DS(on)}$ [mΩ]	TO-251 (IPAK short lead)	TO-220 FullPAK	TO-252 (DPAK)	TO-220 FullPAK narrow lead	SOT-223
360		IPA70R360P7S	IPD70R360P7S	IPAN70R360P7S	IPN70R360P7S
450					IPN70R450P7S
600		IPA70R600P7S	IPD70R600P7S	IPAN70R600P7S	IPN70R600P7S
750					
900			IPD70R900P7S		
1200					
1400			IPD70R1K4P7S		IPN70R1K4P7S
2000					IPN70R2K0P7S

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650 V CoolMOS™ C7



$R_{DS(on)}$ [mΩ]	TO-220	TO-263 (D^2PAK)	TO-220 FullPAK	TO-247	TO-247 4-pin	TO-252 (DPAK)	Thin-PAK 8x8
19				IPW65R019C7	IPZ65R019C7		
45	IPP65R045C7	IPB65R045C7	IPA65R045C7	IPW65R045C7	IPZ65R045C7		
65	IPP65R065C7	IPB65R065C7	IPA65R065C7	IPW65R065C7	IPZ65R065C7		
70							IPL65R070C7
95	IPP65R095C7	IPB65R095C7		IPW65R095C7			
99							IPL65R099C7
125	IPP65R125C7		IPA65R125C7				
130							IPL65R130C7
190		IPB65R190C7	IPA65R190C7	IPW65R190C7		IPD65R190C7	
195							IPL65R195C7
225	IPP65R225C7					IPD65R225C7	
230							IPL65R230C7

650 V CoolMOS™ CFD2



$R_{DS(on)}$ [mΩ]	TO-220	TO-262 (I^2PAK)	TO-263 (D^2PAK)	TO-220 FullPAK	TO-247	TO-252 (DPAK)	Thin-PAK 8x8
41					IPW65R041CFD		
80					IPW65R080CFD		
110	IPP65R110CFD		IPB65R110CFD	IPA65R110CFD	IPW65R110CFD		
150	IPP65R150CFD		IPB65R150CFD	IPA65R150CFD	IPW65R150CFD		
165							IPL65R165CFD
190	IPP65R190CFD		IPB65R190CFD	IPA65R190CFD	IPW65R190CFD		
210							
310	IPP65R310CFD		IPB65R310CFD	IPA65R310CFD			
420	IPP65R420CFD					IPD65R420CFD	
660						IPD65R660CFD	
950						IPD65R950CFD	

650 V CoolMOS™ CFD7



$R_{DS(on)}$ [mΩ]	TO-220	TO-263 (D^2PAK)	TO-247	TO-247 4-pin (asymmetric leads)	TO-Leadless (TOLL)	Thin-PAK 8x8	Q-DPAK BSC	Q-DPAK TSC
17							IPQC65R017CFD7	IPDQ65R017CFD7
18			IPW65R018CFD7	IPZA65R018CFD7				
29			IPW65R029CFD7	IPZA65R029CFD7				IPDQ65R029CFD7
40					IPT65R040CFD7		IPQC65R040CFD7	IPDQ65R040CFD7
41	IPP65R041CFD7	IPB65R041CFD7	IPW65R041CFD7					
60	IPP65R060CFD7				IPT65R060CFD7			IPDQ65R060CFD7
65						IPL65R065CFD7		
80					IPT65R080CFD7			IPDQ65R080CFD7
90		IPB65R090CFD7						
95						IPL65R095CFD7		
99					IPT65R099CFD7			IPDQ65R099CFD7
110								
115						IPL65R115CFD7		
125					IPT65R125CFD7			IPDQ65R125CFD7
130						IPL65R130CFD7		
155		IPB65R155CFD7			IPT65R155CFD7			
160						IPL65R160CFD7		
190					IPT65R190CFD7			
200						IPL65R200CFD7		

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650 V CoolMOS™ 8



$R_{DS(on)}$ [mΩ]	Q-DPAK TSC	TOLL	TO-247	TO-247 4-pin (asymmetric leads)
8	IPDQ65R008CM8			
18	IPDQ65R018CM8	IPT65R018CM8	IPW65R018CM8	IPZA65R018CM8
25		IPT65R025CM8	IPW65R025CM8	IPZA65R025CM8
40		IPT65R040CM8	IPW65R040CM8	IPZA65R040CM8
60			IPW65R060CM8	

600 V CoolMOS™ 8



$R_{DS(on)}$ [mΩ]	Q-DPAK TSC	D-DPAK	TOLL	Thin-TOLL 8x8	DPAK	TO-247	TO-247 4-pin (asymmetric leads)	TO-220	TO-220 FullPAK narrow lead
7	IPDQ60R007CM8								
16	IPDQ60R016CM8		IPT60R016CM8			IPW60R016CM8	IPZA60R016CM8	IPP60R016CM8	
24	IPDQ60R024CM8		IPT60R024CM8			IPW60R024CM8	IPZA60R024CM8		
37	IPDQ60R037CM8	IPDD60R037CM8	IPT60R037CM8			IPW60R037CM8	IPZA60R037CM8	IPP60R037CM8	
40				IPTA60R040CM8*					
55	IPDQ60R055CM8		IPT60R055CM8	IPTA60R055CM8*		IPW60R055CM8	IPZA60R055CM8		
70	IPDQ60R070CM8		IPT60R070CM8	IPTA60R070CM8*		IPW60R070CM8	IPZA60R070CM8		
99			IPT60R099CM8	IPTA60R099CM8*		IPW60R099CM8	IPZA60R099CM8		
120			IPT60R120CM8	IPTA60R120CM8*		IPW60R120CM8			
160			IPT60R160CM8	IPTA60R160CM8*					
180		IPDD60R180CM8	IPT60R180CM8	IPTA60R180CM8	IPD60R180CM8			IPP60R180CM8	IPAN60R180CM8
280				IPTA60R280CM8*					
600					IPD60R600CM8				

600 V CoolMOS™ PFD7



$R_{DS(on)}$ [mΩ]	TO-220 FullPAK narrow leads	TO-252 (DPAK)	SOT-223	Thin-PAK 5x6
125	IPAN60R125PFD7S			
210		IPD60R210PFD7S		
280		IPD60R280PFD7S		
360		IPD60R360PFD7S	IPN60R360PFD7S	IPLK60R360PFD7
600		IPD60R600PFD7S	IPN60R600PFD7S	
1000			IPN60R1K0PFD7S	
1500		IPD60R1K5PFD7S	IPN60R1K5PFD7S	
2000			IPN60R2K0PFD7S	

600 V CoolMOS™ P7 industrial grade



$R_{DS(on)}$ [mΩ]	TO -220	TO-220 FullPAK	TO-247	TO-247 4-pin (asymmetric leads)	TO-252 (DPAK)	Thin-PAK 8x8	TO-263 (D^2PAK)
24			IPW60R024P7				
37			IPW60R037P7	IPZA60R037P7			
45			IPW60R045P7	IPZA60R045P7			IPB60R045P7
60	IPP60R060P7	IPA60R060P7	IPW60R060P7	IPZA60R060P7			IPB60R060P7
65						IPL60R065P7	
80/85	IPP60R080P7	IPA60R080P7	IPW60R080P7	IPZA60R080P7		IPL60R085P7	IPB60R080P7
99	IPP60R099P7	IPA60R099P7	IPW60R099P7	IPZA60R099P7			IPB60R099P7
105						IPL60R105P7	
120	IPP60R120P7	IPA60R120P7	IPW60R120P7				IPB60R120P7
125						IPL60R125P7	
160	IPP60R160P7	IPA60R160P7					
180	IPP60R180P7	IPA60R180P7	IPW60R180P7		IPD60R180P7		IPB60R180P7
185						IPL60R185P7	
280	IPP60R280P7	IPA60R280P7			IPD60R280P7		IPB60R280P7
285						IPL60R285P7	
360	IPP60R360P7	IPA60R360P7*			IPD60R360P7		IPB60R360P7
600		IPA60R600P7			IPD60R600P7		

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*Coming soon

600 V CoolMOS™ P7 standard grade



$R_{DS(on)}$ [mΩ]	TO-220 FullPAK	TO-220 FullPAK narrow lead	TO-252 (DPAK)	SOT-223
180	IPA60R180P7S	IPAN60R180P7S	IPD60R180P7S	
280	IPA60R280P7S		IPD60R280P7S	
360	IPA60R360P7S		IPD60R360P7S	IPN60R360P7S
600	IPA60R600P7S		IPD60R600P7S	IPN60R600P7S

600 V CoolMOS™ CFD7



$R_{DS(on)}$ [mΩ]	TO-220	TO-263 (D^2PAK)	TO-220 FullPAK	TO-247	TO-252 (DPAK)	Thin-PAK 8x8	D-DPAK	TO-Leadless (TOLL)	Q-DPAK
15									IPDQ60R015CFD7
18				IPW60R018CFD7					
20									IPDQ60R020CFD7
24				IPW60R024CFD7					
25									IPDQ60R025CFD7
31/35				IPW60R031CFD7				IPT60R035CFD7	IPDQ60R035CFD7
37				IPW60R037CSFD					
40/45		IPB60R040CFD7		IPW60R040CFD7			IPDD60R045CFD7	IPT60R045CFD7	IPDQ60R045CFD7
55				IPW60R055CFD7				IPT60R055CFD7	IPDQ60R055CFD7
60						IPL60R060CFD7			
70	IPP60R070CFD7	IPB60R070CFD7		IPW60R070CFD7					
75						IPL60R075CFD7	IPDD60R075CFD7	IPT60R075CFD7	IPDQ60R075CFD7
90/95	IPP60R090CFD7			IPW60R090CFD7		IPL60R095CFD7	IPDD60R090CFD7	IPT60R090CFD7	
105/115		IPB60R105CFD7				IPL60R115CFD7		IPT60R105CFD7	
125/140	IPP60R125CFD7		IPA60R125CFD7	IPW60R125CFD7			IPDD60R125CFD7	IPT60R125CFD7	
145/160	IPP60R145CFD7				IPD60R145CFD7	IPL60R160CFD7	IPDD60R145CFD7		
170	IPP60R170CFD7		IPA60R170CFD7		IPD60R170CFD7				
185						IPL60R185CFD7			
210/225									
280	IPP60R280CFD7		IPA60R280CFD7						
360									

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600 V CoolMOS™ S7



$R_{DS(on)}$ [mΩ]	TO-220	TO-Leadless (TOLL)	TO-Leadless (TOLL) incl. temperature sensor	Q-DPAK BSC incl. temperature sensor	Q-DPAK TSC incl. temperature sensor	Q-DPAK TSC	Q-DPAK BSC
10				IPQC60T010S7	IPDQ60T010S7	IPDQ60R010S7	IPQC60R010S7
17				IPQC60T017S7	IPDQ60T017S7	IPDQ60R017S7	IPQC60R017S7
22	IPP60R022S7	IPT60R022S7	IPT60T022S7	IPQC60T022S7	IPDQ60T022S7	IPDQ60R022S7	
40		IPT60R040S7	IPT60T040S7			IPDQ60R040S7	IPQC60R040S7
65	IPP60R065S7	IPT60R065S7	IPT60T065S7			IPDQ60R065S7	

600 V CoolMOS™ C7 Gold (G-series)



$R_{DS(on)}$ [mΩ]	TO-Leadless (TOLL)	TO-252 (Double DPAK)
28	IPT60R028G7	
50	IPT60R050G7	IPDD60R050G7
80	IPT60R080G7	IPDD60R080G7
102	IPT60R102G7	
125		IPDD60R125G7
150		
190		IPDD60R190G7

600 V CoolMOS™ C7



$R_{DS(on)}$ [mΩ]	TO-220	TO-263 (D^2PAK)	TO-220 FullPAK	TO-247	TO-247 4-pin	TO-252 (DPAK)	Thin-PAK 8x8
17				IPW60R017C7	IPZ60R017C7		
40	IPP60R040C7	IPB60R040C7		IPW60R040C7	IPZ60R040C7		
60	IPP60R060C7	IPB60R060C7	IPA60R060C7	IPW60R060C7	IPZ60R060C7		
65							IPL60R065C7
99	IPP60R099C7	IPB60R099C7	IPA60R099C7	IPW60R099C7	IPZ60R099C7		
104							IPL60R104C7
120	IPP60R120C7		IPA60R120C7	IPW60R120C7			
125							IPL60R125C7
180	IPP60R180C7	IPB60R180C7	IPA60R180C7	IPW60R180C7		IPD60R180C7	
185							IPL60R185C7

600 V CoolMOS™ P6



$R_{DS(on)}$ [mΩ]	TO-220	TO-220 FullPAK	TO-263 (D^2PAK)	TO-247	TO-247 4-pin	TO-252 (DPAK)	Thin-PAK 8x8
41				IPW60R041P6			
70				IPW60R070P6			
99	IPP60R099P6	IPA60R099P6		IPW60R099P6	IPZ60R099P6		
125	IPP60R125P6	IPA60R125P6		IPW60R125P6			
160	IPP60R160P6	IPA60R160P6	IPB60R160P6	IPW60R160P6			
180							IPL60R180P6
190	IPP60R190P6	IPA60R190P6		IPW60R190P6			
210							IPL60R210P6
230		IPA60R230P6					
280		IPA60R280P6					
380		IPA60R380P6				IPD60R380P6	
600		IPA60R600P6				IPD60R600P6	

500 V CoolMOS™ CE



$R_{DS(on)}$ [mΩ]	TO-220	TO-220 FullPAK	TO-252 (DPAK)	SOT-223
190	IPP50R190CE	IPA50R190CE		
280	IPP50R280CE	IPA50R280CE	IPD50R280CE	
380		IPA50R380CE	IPD50R380CE	
500		IPA50R500CE	IPD50R500CE	
800		IPA50R800CE		
950		IPA50R950CE	IPD50R950CE	
1400				IPN50R1K4CE
2000				IPN50R2K0CE

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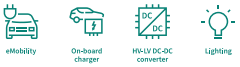
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800 V CoolMOS™ C3A



$R_{DS(on)}$ at T_J = 25°C V_{GS} = 10 V [mΩ]	TO-247	TO-252 (DPAK)	TO-263 (D^2PAK)
290	IPW80R290C3A		IPB80R290C3A
2700		IPD80R2K7C3A	

650 V CoolMOS™ CFDA



$R_{DS(on)}$ at T_J = 25°C V_{GS} = 10 V [mΩ]	TO-220	TO-247	TO-252 (DPAK)	TO-263 (D^2PAK)
48		IPW65R048CFDA		
80		IPW65R080CFDA		
110	IPP65R110CFDA	IPW65R110CFDA		IPB65R110CFDA
150		IPW65R150CFDA		
190				IPB65R190CFDA
310				IPB65R310CFDA
420			IPD65R420CFDA	
660			IPD65R660CFDA	IPB65R660CFDA

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650 V CoolMOS™ CFD7A



$R_{DS(on)}$ at T_j = 25°C V_{GS} = 10 V [mΩ]	TO-220	TO-247	TO-247 short leads	TO-263-3 (D^2PAK 3-pin)	TO-263-7 (D^2PAK 7-pin)	Q-DPAK BSC	Q-DPAK TSC
17						IPQC65R017CFD7A	IPDQ65R017CFD7A
22		IPW65R022CFD7A	IPWS65R022CFD7A				
29							IPDQ65R029CFD7A
35		IPW65R035CFD7A	IPWS65R035CFD7A				
40						IPQC65R040CFD7A	IPDQ65R040CFD7A
50	IPP65R050CFD7A	IPW65R050CFD7A	IPWS65R050CFD7A	IPB65R050CFD7A	IPBE65R050CFD7A		
60							IPDQ65R060CFD7A
75	IPP65R075CFD7A	IPW65R075CFD7A	IPWS65R075CFD7A	IPB65R075CFD7A	IPBE65R075CFD7A		
80							IPDQ65R080CFD7A
99	IPP65R099CFD7A	IPW65R099CFD7A		IPB65R099CFD7A	IPBE65R099CFD7A		IPDQ65R099CFD7A
115	IPP65R115CFD7A	IPW65R115CFD7A		IPB65R115CFD7A	IPBE65R115CFD7A		
125						IPQC65R125CFD7A	IPDQ65R125CFD7A
145	IPP65R145CFD7A	IPW65R145CFD7A		IPB65R145CFD7A	IPBE65R145CFD7A		
190	IPP65R190CFD7A	IPW65R190CFD7A		IPB65R190CFD7A	IPBE65R190CFD7A		
230		IPW65R230CFD7A		IPB65R230CFD7A	IPBE65R230CFD7A		

600 V CoolMOS™ CPA



$R_{DS(on)}$ at T_j = 25°C V_{GS} = 10 V [mΩ]	TO-247	TO-263 (D^2PAK)
45	IPW60R045CPA	
99	IPW60R099CPA	IPB60R099CPA

600 V CoolMOS™ S7A



$R_{DS(on)}$ at T_j = 25°C V_{GS} = 10 V [mΩ]	Q-DPAK TSC	Q-DPAK BSC
40	IPDQ60R040S7A	IPQC60R040S7A
22	IPDQ60R022S7A	
17	IPDQ60R017S7A	IPQC60R017S7A
10	IPDQ60R010S7A	IPQC60R010S7A

600 V CoolMOS™ S7TA with integrated temperature sensor



$R_{DS(on)}$ at T_j = 25°C V_{GS} = 10 V [mΩ]	Q-DPAK TSC	Q-DPAK BSC
40	IPDQ60T040S7A	IPQC60T040S7A
22	IPDQ60T022S7A	IPQC60T022S7A
17	IPDQ60T017S7A	IPQC60T017S7A
10	IPDQ60T010S7A	IPQC60T010S7A

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CoolMOS™ SJ MOSFETs – packages



SOT-223

		$R_{DS(on)}$ [mΩ]									
Voltage [V]	Series	0-59	60-89	90-149	150-199	200-299	300-400	401-600	601-899	900-1500	>1500
500	CE									1400	2000
600	P7						360	600			
	PFD7						360	600		1000/1500	2000
700	P7						360	450/600		1400	2000
	CE										
800	P7									1400	2400/4500
950	P7									1200	3700



TO-247

		$R_{DS(on)}$ [mΩ]									
Voltage [V]	Series	0-59	60-89	90-149	150-199	200-299	300-400	401-600	601-899	900-1500	>1500
600	P7	24/37/45	60/80	99/120	180						
	C7	17/40	60	99/120	180						
	P6	41	70	99/125	160/190						
	CFD7	18/24/31/37/40/55	70	90/125							
	CPA	45		99							
	CM8	16/24/37/55	70	99/120							
650	CFD7	18/29/41									
	C7	19/45	65	95	190						
	CFD2				190						
	CFDA	48	80	110	150						
	CFD7A	22/35/50	75	99/115/145	190	230					
	CM8	18/25/40	60								
800	P7										
	C3		85			290					
	C3A					290					
950	PFD7		60	130			310				



TO-247 short leads

		$R_{DS(on)}$ [mΩ]									
Voltage [V]	Series	0-59	60-89	90-149	150-199	200-299	300-400	401-600	601-899	900-1500	>1500
650	CFD7A	22/35/50	75								



TO-247 4-pin

		$R_{DS(on)}$ [mΩ]									
Voltage [V]	Series	0-59	60-89	90-149	150-199	200-299	300-400	401-600	601-899	900-1500	>1500
600	C7	17/40	60	99							
	P6			99							
650	C7	19/45	65	95							



TO-247 4-pin asymmetric leads

		$R_{DS(on)}$ [mΩ]									
Voltage [V]	Series	0-59	60-89	90-149	150-199	200-299	300-400	401-600	601-899	900-1500	>1500
600	P7	37/45	60/80	99							
	CM8	16/24/37/55	70	99							
650	CFD7	18/29									
	CFD7A	35									
	CM8	18/25/40									

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IPAK

		$R_{DS(on)}$ [mΩ]									
Voltage [V]	Series	0-59	60-89	90-149	150-199	200-299	300-400	401-600	601-899	900-1500	>1500
800	P7							**600**		**900**	**2000/4500**
950	P7								**750**		



DPAK

		$R_{DS(on)}$ [mΩ]									
Voltage [V]	Series	0-59	60-89	90-149	150-199	200-299	300-400	401-600	601-899	900-1500	>1500
500	CE					280	380	500		950	
	CP						399				
600	P7				180	**280**	**360**	600			
	C7				180						
	P6						380	600			
	CFD7			145	170						
	PFD7					210/280	**360**	600		**1500**	
	CM8				**180**			**600**			
650	C7				**190**	**225**					
	CFD2							420	660	950	
	CFDA							420	660		
700	P7						**360**	**600**		**900/1400**	
800	P7					**280**	**360**	**450/600**	**750**	900/**1200/1400**	2000/**2400 3300/4500**
	C3A										2700
950	P7							**450**	**750**	**1200**	**2000**
	PFD7							**450**			



D²PAK

		$R_{DS(on)}$ [mΩ]									
Voltage [V]	Series	0-59	60-89	90-149	150-199	200-299	300-400	401-600	601-899	900-1500	>1500
500	C3	50									
	CP			140	199						
600	P6				160						
	C7	40	60	**99**	180						
	P7	45	**60/80**	**99/120**	**180**	**280**	**360**				
	CPA			99							
	CFD7	40/55	**70**	**105**							
650	CFD7	**41**		**90**	155						
	C7	**45**	**65**	**95**	**190**						
	CFD2			110	190						
	CFDA			110	190		310		660		
	CFD7A	**50**	**75**	**99 /115/145**	**190**	**230**					
800	C3A					290					
950	PFD7			**130**			**310**	**450**			

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D²PAK 7-pin

		$R_{DS(on)}$ [mΩ]									
Voltage [V]	Series	0-59	60-89	90-149	150-199	200-299	300-400	401-600	601-899	900-1500	>1500
650	CFD7A	**50**	**75**	**99** /**115**	**145**/**190**	**230**					



Double DPAK (D-DPAK)

		$R_{DS(on)}$ [mΩ]									
Voltage [V]	Series	0-59	60-89	90-149	150-199	200-299	300-400	401-600	601-899	900-1500	>1500
600	CFD7	45	**75**	90/125/**145**							
	G7	50	80	125	190						
	CM8	**37**			**180**						



Q-DPAK TSC

		$R_{DS(on)}$ [mΩ]									
Voltage [V]	Series	0-59	60-89	90-149	150-199	200-299	300-400	401-600	601-899	900-1500	>1500
600	S7	**10**/**17**/22/40	65								
	S7T	**10**/**17**/22									
	S7A	**10**/**17**/22/40									
	S7TA	**10**/**17**/22/40									
	CM8	**7**/**16**/**24**/**37**/**55**	**70**								
650	CFD7	**17**/**29**/**40**	**60**/**80**	**99**/**125**							
	CFD7A	**17**/**29**/**40**	**60**/**80**	**99**/**125**							
	CM8	**8**/**18**									



Q-DPAK BSC

		$R_{DS(on)}$ [mΩ]									
Voltage [V]	Series	0-59	60-89	90-149	150-199	200-299	300-400	401-600	601-899	900-1500	>1500
600	S7	**10**/**17**/**40**									
	S7T	**10**/**17**/22									
	S7A	**10**/**17**/**40**									
	S7TA	**10**/**17**/22/40									
650	CFD7	**17**/**40**									
	CFD7A	**17**/**40**		**125**							

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TO-220 FullPAK

		$R_{DS(on)}$ [mΩ]									
Voltage [V]	Series	0-59	60-89	90-149	150-199	200-299	300-400	401-600	601-899	900-1500	>1500
500	**CE**				190	280	380	500	800	950	
	CP			140							
600	**P7**		**60/80**	**99/120**	**160/180**	**280**	**360**	**600**			
	P7S				180	**280**	**360**	**600**			
	C7		**60**	**99/120**	180						
	CFD7			**125**	**170**	**280**					
	P6			99/125	160/190	230/280	380	600			
650	**C7**	**45**	**65**	**125**	**190**						
	CFD2			110	150/190		310				
700	**P7S**						**360**	**600**			
800	**P7**					**280**	**360**	**450/600**	**750**	**900/1400**	
950	**P7**							**450**	**750**	**1200**	
	PFD7			**130**			**310**	**450**			



TO-220 FullPAK narrow lead

		$R_{DS(on)}$ [mΩ]									
Voltage [V]	Series	0-59	60-89	90-149	150-199	200-299	300-400	401-600	601-899	900-1500	>1500
600	P7				180						
	PFD7			125							
	CM8				**180**						
700	P7						**360**	**600**			
800	P7						**360**				



TO-Leadless

		$R_{DS(on)}$ group [mΩ]									
Voltage [V]	Series	0-59	60-89	90-149	150-199	200-299	300-400	401-600	601-899	900-1500	>1500
600	**CFD7**	35/45/**55**	**75**	**90**/105/**125**							
	G7	**28/50**	**80**	**102**							
	S7	22/40	**65**								
	S7T	**22/40**	**65**								
	CM8	**16/24** **37/55**	**70**	**99/120**	**160/180**						
650	**CFD7**	**40**	**60/80**	**99/125**	**155/190**						
	CM8	**18/25/40**									

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TO-220

		$R_{DS(on)}$ [mΩ]									
Voltage [V]	Series	0-59	60-89	90-149	150-199	200-299	300-400	401-600	601-899	900-1500	>1500
500	CE				190	280					
	CP					250					
600	P7		60/80	99/120	160/180	280	360				
	C7	40	60	99/120	180						
	P6			99/125	160/190						
	CFD7		70	90/125/145	170	280					
	S7	22	65								
	CM8	16/37			180						
650	CFD7	41	60			190					
	C7	45	65	95/125		225					
	CFD2			110	150/190		310	420			
	CFDA			110							
	CFD7A	50/75		99 /115 /145	190						
800	P7									1400	
	C3								650		



Thin-PAK 5x6

		$R_{DS(on)}$ [mΩ]									
Voltage [V]	Series	0-59	60-89	90-149	150-199	200-299	300-400	401-600	601-899	900-1500	>1500
600	PFD7						360				
700	P7										
800										900	



Thin-PAK 8x8

		$R_{DS(on)}$ [mΩ]									
Voltage [V]	Series	0-59	60-89	90-149	150-199	200-299	300-400	401-600	601-899	900-1500	>1500
600	P7		65/85	105/125	185	285					
	C7		65	104/125	185						
	CFD7		60/75	95/115/140	160/185						
	P6				180	210					
650	CFD7		65	95/115/130	160	200					
	C7		70	99/130	195	230					
	CFD2										



Thin-TOLL 8x8

		$R_{DS(on)}$ [mΩ]									
Voltage [V]	Series	0-59	60-89	90-149	150-199	200-299	300-400	401-600	601-899	900-1500	>1500
600	CM8	40*/55*	70*	99*/120*	160*/180	280*					

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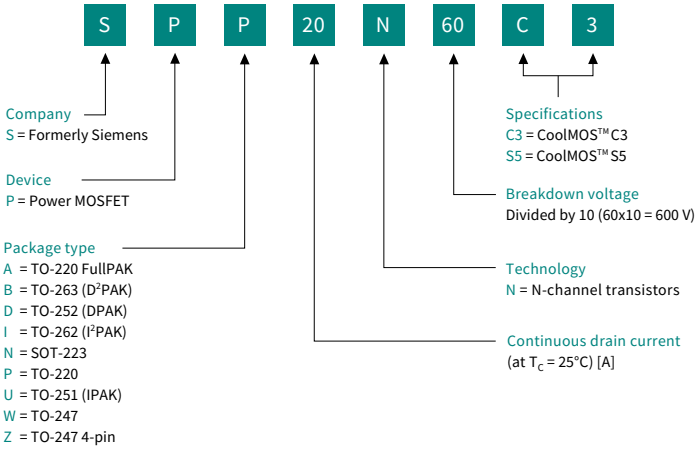
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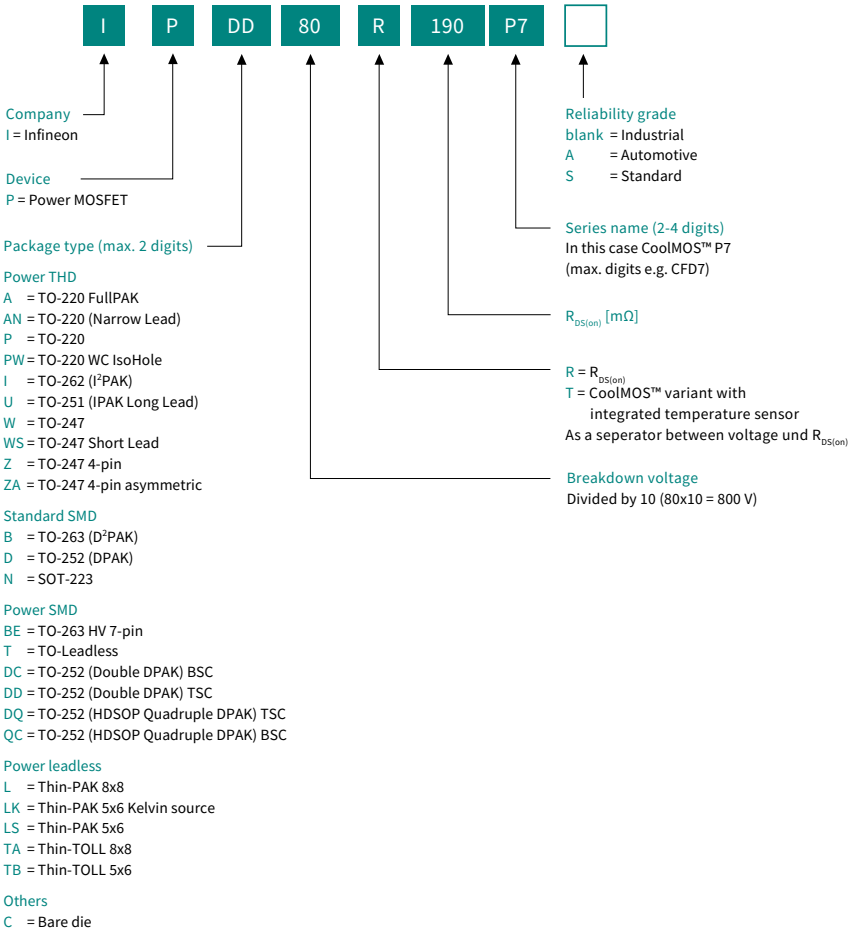
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Nomenclature

Power MOSFETs (until 2005)



Power MOSFETs (from October 2015 onwards)

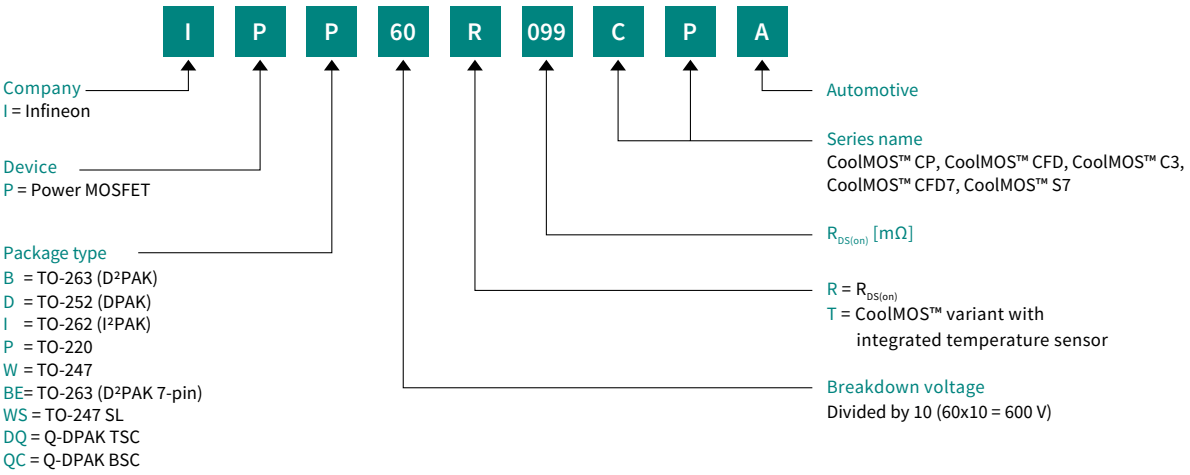


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Infineon support for high-voltage MOSFETs

Useful links and helpful information

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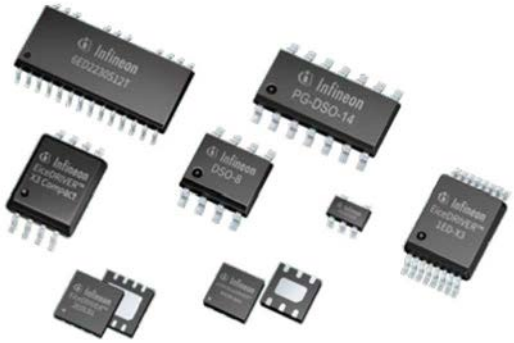


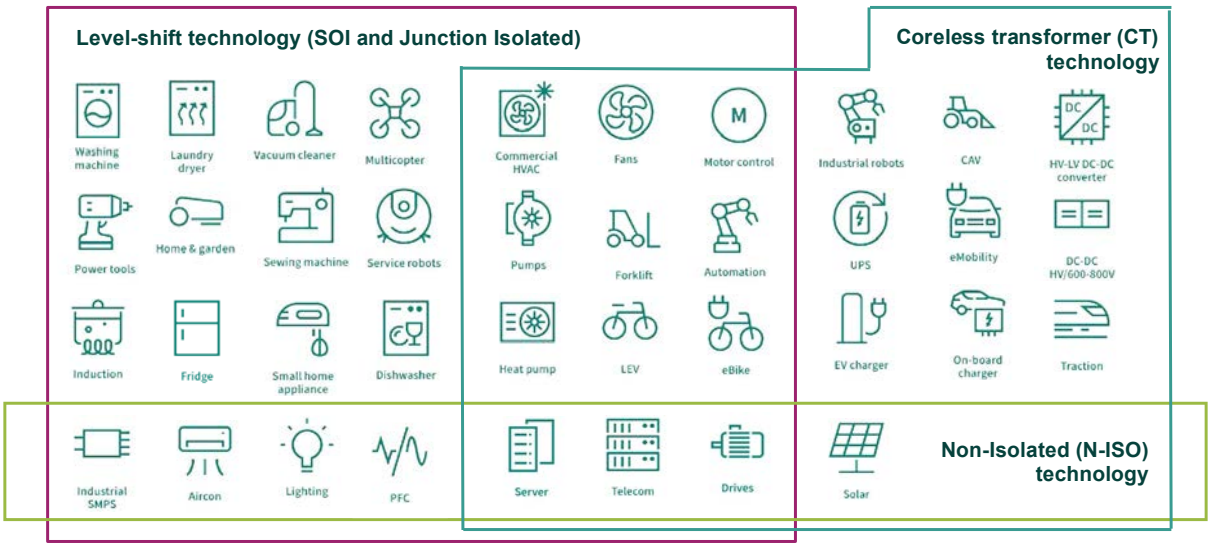
Gate driver ICs

- Infineon gate driver IC applications
- Driver configuration overview
- EiceDRIVER™ and MOTIX™ gate driver IC
- Choosing a gate driver IC
- Infineon gate driver IC package options
- Infineon solid state relay and isolators package package options
- Infineon Solid State Relays (SSR) technologies
- Gate driver ICs for SiC MOSFETs
- Gate driver ICs for GaN HEMTs
- EiceDRIVER™ non-isolated low-side gate drivers
- 2EDN EiceDRIVER™ family
- EiceDRIVER™ 1EDN71x6G/U family
- EiceDRIVER™ 1EDL8011, 125 V high-side driver
- EiceDRIVER™ 2EDL8x2x family
- MOTIX™ 6EDL7141 high performancemotor control
- MOTIX™ 6EDL7151 3-phase smart gate drive controller IC
- MOTIX™ 160 V SOI gate driver family
- EiceDRIVER™ 650 V level-shift SOI gate driver family
- New EiceDRIVER™ 650 V high-side single-channel in DSO-8
- New EiceDRIVER™ 650 V and 300 V 6ED family in TSSOP-25
- EiceDRIVER™ 1200 V level-shift SOI gate driver family
- 2EDi EiceDRIVER™ family
- EiceDRIVER™ X3 Compact and 2L-SRC Compact
- EiceDRIVER™ X3 Compact Gen 2 product family
- EiceDRIVER™ X3 Compact 2ED314xMC12H
- EiceDRIVER™ Enhanced 1ED-F3 and X3 Analog
- EiceDRIVER™ Enhanced X3 Digital
- EiceDRIVER™ Full-bridge transformer driver
- EiceDRIVER™ APD 2ED4820-EM
- EiceDRIVER™ 1EDI30xxAS for electric vehicles (EV)
- Gate driver ICs nomenclature

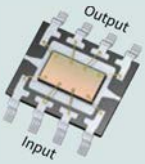
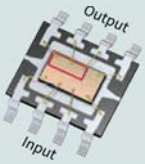
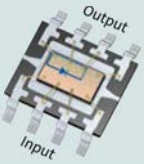
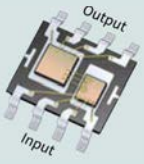
Infineon gate driver IC applications

Leveraging the application expertise and advanced technologies of Infineon and International Rectifier, EiceDRIVER™ gate driver ICs are well-suited for many applications such as industrial motor drives, home appliances, solar inverters, automotive applications, EV-charging, UPS, switch-mode power supplies (SMPS), high-voltage lighting, battery-powered applications, and so on.





Infineon gate driver IC technologies

Non-isolated GD	Level-shift GD		Isolated GD
Non-isolated (N-ISO)	Junction isolation (JI)	Silicon on insulator (SOI)	Coreless transformer (CT)
			
Monolithic construction of ground-reference gate drivers for 20 to 25 V supply voltage applications Comprehensive families of single- and dual-low-side drivers with flexible options for output current, logic configurations and UVLOs (plus non-isolated TDI) Uses rugged and high-performance technologies of HVIC process or state-of-the-art 130 nm process	Monolithic construction of one to six gate drive channels up to 1200 V rating Industrial pioneering high-voltage IC (HVIC) technology used in all high-voltage gate drive applications Gen 2 technology (IR prefix): Industrial pioneering HVIC process Gen 5 technology (IRS prefix): Cost-effective pin-to-pin versions of Gen 2	Monolithic construction of two to six gate drive channels up to 1200 V rating Built-in PN-based bootstrap diode (36 Ω typ.) for simplified bootstrap operation and reduced PCB area Negative transient immunity to prevent latch-up: -100 V for 300 ns >50 percent lower level-shift losses for higher efficiency, higher frequency operation, smaller heat sinks, and higher reliability	Two separate chips solution with magnetic coupling providing galvanically isolated single- and dual channel gate drivers IEC 60747-17 isolation technology providing isolation up to 8 kVpk V_{IOTM} and up to ±2300 V functional isolation CMTI of more than 300 V/ns Strongest gate-drive output currents (up to ±18 A) reducing need for external booster

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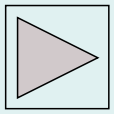
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Driver configuration overview

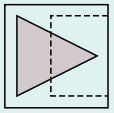
1-channel low-side driver

Allows low offset of the voltage between input and output



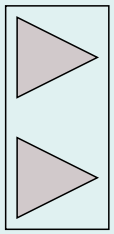
1-channel high-side driver

Allows high voltage offset between input and output



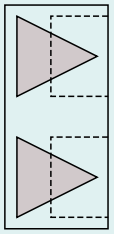
2-channel low-side driver

Both channels allow individual low voltage offsets, no interlock



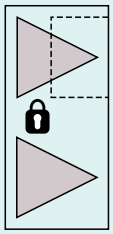
2-channel high-side driver

Both channels allow individual high voltage offsets, no interlock



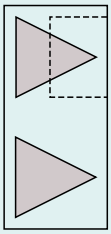
Half-bridge driver

Two interlocked channels for shoot through protection where one of the channels allows a high voltage offset.



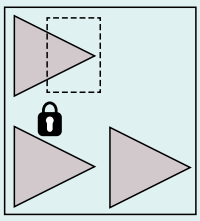
High- and low-side driver

Two non-interlocked channels, one for high voltage, one for low voltage offsets. The industry may also refer this as half-bridge.



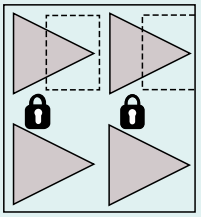
Half-bridge plus single low-side driver

Half-bridge with one additional low-side driver.



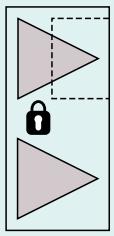
Full-bridge driver

Four channels in a package with two independent half bridges.



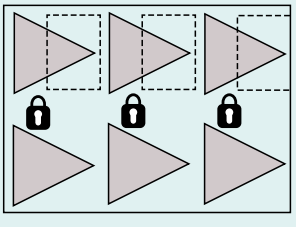
Synchronous-buck drivers

High speed drivers for dual high side and low side MOSFETs in synchronous rectified buck converters.



Three-phase bridge

Six channels in a package with three independent half bridges



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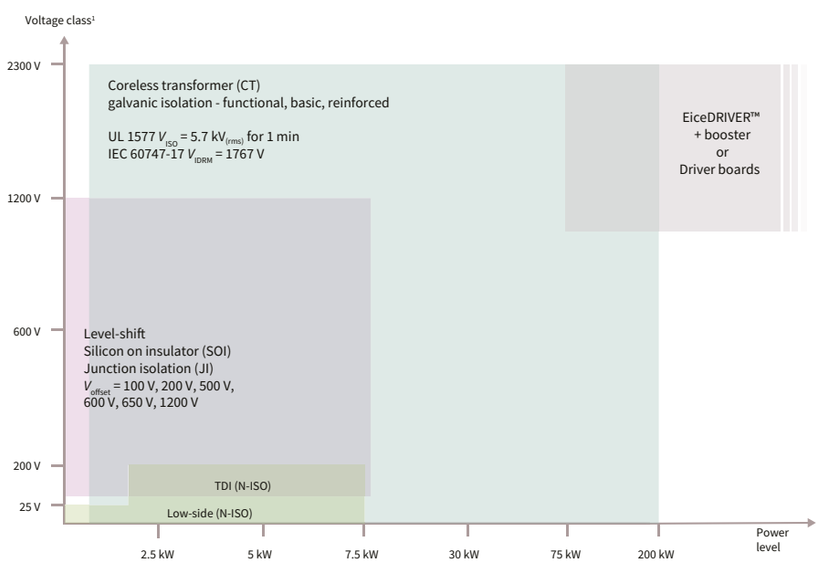
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EiceDRIVER™ and MOTIX™ gate driver IC

Gate driver ICs serve as the interface between control signals (digital or analog controllers) and power switches (IGBTs, MOSFETs, SiC MOSFETs, and GaN HEMTs). Integrated gate driver solutions reduce design complexity, development time, bill of materials (BOM), and board space while improving reliability over discretely-implemented gate-drive solutions.

Every switch needs a driver, the right driver makes a difference. Infineon offers a comprehensive portfolio of EiceDRIVER™ gate driver ICs with a variety of configurations, voltage classes, isolation levels, protection features, and package options. EiceDRIVER™ gate driver ICs are complementary to Infineon IGBT discretes and modules, silicon (CoolMOS™, OptiMOS™, and StrongIRFET™) and silicon carbide MOSFETs (CoolSiC™), gallium nitride HEMTs (CoolGaN™), or as part of integrated power modules (CIPOS™ IPM and iMOTION™ IPM).

In addition, MOTIX™ motor gate driver ICs are part of the MOTIX™ scalable product portfolio for low-voltage motor control solutions, which includes MOTIX™ Driver, MOTIX™ Bridge, MOTIX™ SBC, and MOTIX™ MCU (SoC/SiP).



Gate driver configuration			25 V	25 - 105 V	200 V	500 V	600 V	650 V	1200 V	2300 V
Gate drivers	1-channel	Isolated			●	●	●	●	●	●
		High-side		● ●	● ●	●	●	●		
		Low-side	●							
	2-channel	Isolated			●	●	●	●	●	
		High-side		●						
		Low-side	●							
		High-side + Low-side			● ●	●	● ●	●	●	
		Half-bridge		●	● ●		● ●	●	●	
	4-channel	Half-bridge		●			●			
	6-channel	Three-phase			●		● ●	●	● ●	

● Non-isolated (N-ISO) ● Junction isolation (JI) ● Silicon on insulator (SOI) ● Coreless transformer (CT)

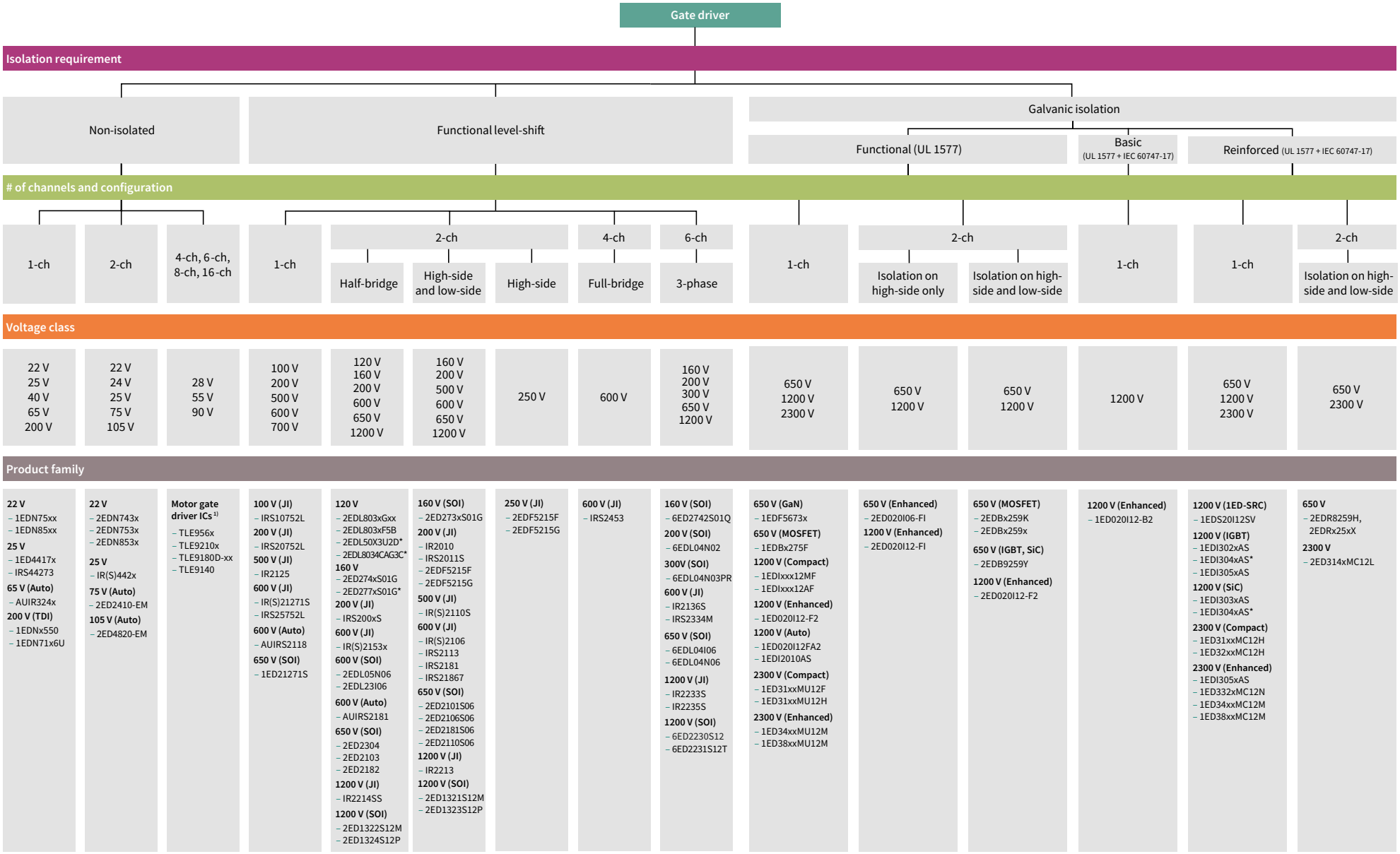
Note 1 Voltage class on the top row is defined base on different driver configurations for the maximum Voltage class.
1. For single high-side, high-side and low-side, half bridge and three phase gate drivers, voltage class is defined as switch break down voltage in applications.
2. For low side drivers (N-ISO), voltage class is defined as maximum operating range supply voltage.
3. For special cases as 1EDNx550 (1EDN-TDI, N-ISO), voltage class is defined as maximum bus voltage (highest floating voltage it can manage).

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Your input matters
Share your feedback

Choosing a gate driver IC

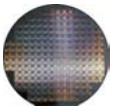


*Coming soon

1) Find out more on Motor gate driver ICs on page 455

Your input matters
Share your feedback

Infineon gate driver IC package options

DSO-8 (SOIC-8N)		DSO-24 (DSO-28 without 4 pins)		TSSOP-8	
TSSOP-25		DSO-8 with power pad		DSO-28 (SOIC-28WB)	
TSSOP-28		DSO-8 300 mil (SOIC-8WB)		DSO-36	
VDSON-8		DSO-14 (SOIC-14N)		LCC-32 (PLCC-44)	
VQFN-14 (MLPQ 4X4 14L)		DSO-14* 150 mil		SOT23-5	
VQFN-28 (MLPQ 5x5 28L)		DSO-14* 300 mil		SOT23-6	
VQFN-32 5x5 mm		DSO-16		SSOP-24	
VQFN-34 (MLPQ 7Xx7 48L)		DSO-16 300 mil (SOIC-16WB)		TFLGA-13	
VQFN-48		DSO-16 (fine pitch)		TQFN-48	
VSON-10 3x3 mm		DSO-18		TSDSO-24	
WSON-6		DSO-19		TSNP-7	
WSON-8		DSO-20 (SOIC-20WB)			
CHIP		TSNP-6			
DSO-20 (fine pitch)		DSO-20 300 mil			

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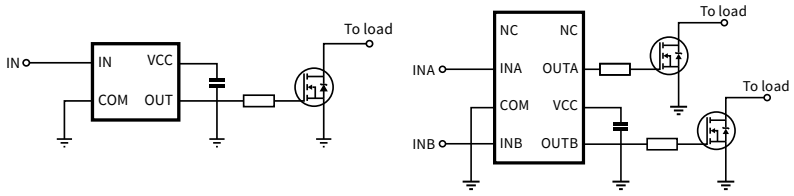
*DSO-16 without 2 pins

Product overview

Infineon's gate driver IC solutions are the expert's choice. With more than 400 reliable and efficient gate driver solutions, we provide a comprehensive portfolio for virtually any application. To ease the selection process, this overview is structured along the configurations of the gate driver ICs, as opposed to application topology.

Non-isolated low-side gate driver IC

Typical connection



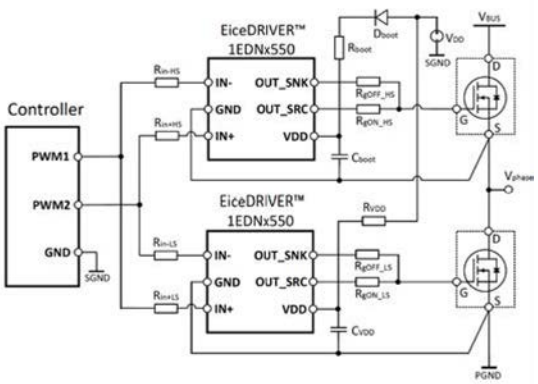
Configu-ration	Voltage class [V]	I_{o+}/I_{o-} typ. [A]	UVLO on/off typ. [V]	Prop delay off/on typ. [ns]	Base PN		Technology	Features						Package							
								Disable	Enable	Fault reporting	Overcurrent protection	Programmable fault clear time	Separate sink/source outputs	DSO-8	DIP-8	SOT23-5	SOT23-6	WSON-6	WSON-8	TSSOP-8	TSNP-6
1-channel	25	2.6/2.6	8.0/7.3	34/34	1ED44173N01B	NEW	N-ISO		✓	✓	✓						✓				
		2.6/2.6	11.9/11.0	50/50	1ED44175N01B	NEW	N-ISO		✓	✓	✓						✓				
		0.8/1.75	11.9/11.4	50/50	1ED44176N01F	NEW	N-ISO		✓	✓	✓	✓		✓							
		2.6/2.6	11.9/11.0	50/50	1ED44171N01B	NEW	N-ISO		✓	✓						✓					
		1.5/1.5	10.2/9.2	50/50	IRS44273L		N-ISO									✓					
	22	4/8	4.2/3.9	19/19	1EDN7511B		N-ISO	✓					✓				✓				
		4/8	4.2/3.9	19/19	1EDN7512B		N-ISO	✓								✓					
		4/8	4.2/3.9	19/19	1EDN7512G		N-ISO	✓					✓					✓			
		4/8	8.0/7.0	19/19	1EDN8511B		N-ISO	✓					✓				✓				
	5	1.6/3.3	8.9/8	200/150	IR2121		N-ISO			✓	✓				✓						
2-channel	25	2.3/3.3	10.2/9.2	50/50	IRS44262S		N-ISO							✓							
		2.3/3.3	N.A.	50/50	IRS4426S		N-ISO							✓							
		2.3/3.3	N.A.	50/50	IRS4427S		N-ISO							✓							
		2.3/3.3	N.A.	65/85	IR4426S		N-ISO							✓							
		2.3/3.3	N.A.	65/85	IR4427S		N-ISO							✓							
	22	5/5	4.2/3.9	19/19	2EDN7523F		N-ISO		✓					✓							
		5/5	4.2/3.9	19/19	2EDN7524F		N-ISO		✓					✓							
		5/5	4.2/3.9	19/19	2EDN7524G		N-ISO		✓										✓		
		5/5	4.2/3.9	19/19	2EDN7524R		N-ISO		✓											✓	
		5/5	8.0/7.0	19/19	2EDN8524F		N-ISO		✓					✓							
		4/4	4.2/3.9	19/19	2EDN7424F		N-ISO		✓					✓							
		4/4	4.2/3.9	19/19	2EDN7424R		N-ISO		✓											✓	
		4/4	4.2/3.9	19/19	2EDN7434F		N-ISO		✓					✓							
		4/4	4.2/3.9	19/19	2EDN7434R		N-ISO		✓											✓	
		5/5	4.2/3.9	19/19	2EDN7533B		N-ISO										✓				
		5/5	4.2/3.9	19/19	2EDN7533F		N-ISO		✓					✓							
		5/5	4.2/3.9	19/19	2EDN7533R		N-ISO		✓											✓	
		5/5	4.2/3.9	19/19	2EDN7534U		N-ISO														✓
		5/5	4.2/3.9	19/19	2EDN7534B		N-ISO										✓				
		5/5	4.2/3.9	19/19	2EDN7534F		N-ISO		✓					✓							
		5/5	4.2/3.9	19/19	2EDN7534R		N-ISO		✓											✓	
		5/5	4.2/3.9	19/19	2EDN7534G		N-ISO		✓										✓		
		5/5	8.0/7.0	19/19	2EDN8533F		N-ISO		✓					✓							
		5/5	8.0/7.0	19/19	2EDN8533R		N-ISO		✓											✓	
		5/5	8.0/7.0	19/19	2EDN8534F		N-ISO		✓					✓							
		5/5	8.0/7.0	19/19	2EDN8534R		N-ISO		✓											✓	

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Non-isolated TDI gate driver IC

Typical connection



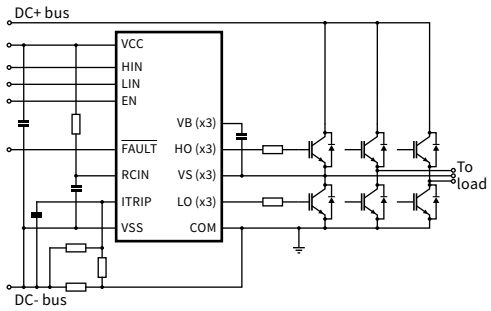
Configuration	Voltage class [V]	I_{O+}/I_{O-} typ. [A]	UVLO on/off typ. [V]	Prop delay off/on typ. [ns]	Base PN	Technology	Features				Package			
							Adustable negative charge pump	Active Miller clamp	Separate sink/source outputs	Truly differential inputs	SOT23-6	TSNP-6	TSNP-7	VSON-10
1-channel	200	4/8	4.2/3.9	45/45	1EDN7550U	N-ISO			✓	✓		✓		
		4/8	4.2/3.9	45/45	1EDN7550B	N-ISO			✓	✓	✓			
		4/8	8.0/7.0	45/45	1EDN8550B	N-ISO			✓	✓	✓			
		4/8	12.2/11.5	45/45	1EDN6550B	N-ISO			✓	✓	✓			
		4/8	14.9/14.4	45/45	1EDN9550B	N-ISO			✓	✓	✓			
		2/2	3.85/3.75	55/55	1EDN7116G	N-ISO	✓	✓		✓				✓
		2/2	3.85/3.75	55/55	1EDN7116U	N-ISO		✓		✓			✓	
		1.5/1.5	3.85/3.75	75/75	1EDN7126G	N-ISO	✓	✓		✓				✓
		1.5/1.5	3.85/3.75	75/75	1EDN7126U	N-ISO		✓		✓			✓	
		1/1	3.85/3.75	105/105	1EDN7136G	N-ISO	✓	✓		✓				✓
		1/1	3.85/3.75	105/105	1EDN7136U	N-ISO		✓		✓			✓	
		0.5/0.5	3.85/3.75	125/125	1EDN7146G	N-ISO	✓	✓		✓				✓
		0.5/0.5	3.85/3.75	125/125	1EDN7146U	N-ISO		✓		✓			✓	

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Three-phase gate driver ICs

Typical connection



Voltage class [V]	I_{o+}/I_{o-} typ. [A]	UVLO on/off typ. [V]	Prop delay off/on typ. [ns]	Base PN	Tech-nology	Enable	Fault reporting	Integrated bootstrap diode	Operational amplifier	Overcurrent protection	Power management unit	Programmable deadtime	Programmable fault clear/Reset	Programmable OCP reference threshold	Programmable Op-amp voltage gain	Trickle Charge pumps (100% duty cycle)	Separate pin for logic ground	Shoot-through protection	Shutdown	Two stage turn-on	Package: DSO-20 WB	DSO-24	DSO-28 WB	LCC-32	TSSOP-25	TSSOP-28	VQFN-28	VQFN-32	VQFN-48	CHIP
1200	0.35/0.65	12.2/11.3	600/600	6ED2231S12T NEW	SOI	✓	✓	✓		✓			✓				✓	✓				✓								✓
	0.35/0.65	11.4/10.4	600/600	6ED2230S12T	SOI	✓	✓	✓		✓			✓				✓	✓				✓								✓
	0.25/0.5	8.6/8.2	700/750	IR2233S	JI		✓		✓	✓							✓	✓	✓				✓							
	0.25/0.5	8.6/8.2	700/750	IR2233J	JI		✓		✓	✓							✓	✓	✓					✓						
	0.25/0.5	10.4/9.4	700/750	IR2235S	JI		✓		✓	✓							✓	✓	✓				✓							
	0.25/0.5	10.4/9.4	700/750	IR2235J	JI		✓		✓	✓							✓	✓	✓					✓						
650	0.165/0.375	9.0/8.1	490/530	6EDL04N065PR NEW	SOI	✓	✓	✓		✓							✓								✓					
	0.165/0.375	11.7/9.8	490/530	6EDL04I065PR NEW	SOI	✓	✓	✓		✓							✓								✓					
	0.165/0.375	11.7/9.8	490/530	6EDL04I065NR NEW	SOI	✓	✓	✓		✓							✓								✓					
	0.165/0.375	9.0/8.1	490/530	6EDL04N065NT NEW	SOI	✓	✓	✓		✓							✓						✓							
	0.165/0.375	11.7/9.8	490/530	6EDL04I065PT NEW	SOI	✓	✓	✓		✓							✓						✓							
600	0.165/0.375	11.7/9.8	490/530	6EDL04I06NT	SOI	✓	✓	✓		✓							✓						✓							✓
	0.165/0.375	11.7/9.8	490/530	6EDL04I06PT	SOI	✓	✓	✓		✓							✓						✓							✓
	0.165/0.375	9/8.1	530/530	6EDL04N06PT	SOI	✓	✓	✓		✓							✓						✓							✓
	0.2/0.35	8.9/8.2	400/425	IR2136S	JI	✓	✓			✓							✓						✓	✓						
	0.2/0.35	11.1/10.9	400/425	IR21363S	JI	✓	✓			✓							✓						✓							
	0.2/0.35	10.4/9.4	530/500	IR21364S	JI	✓	✓			✓							✓						✓							
	0.2/0.35	11.1/10.9	530/530	IRS2334M	JI																					✓				
	0.2/0.35	11.1/10.9	530/530	IRS2334S	JI																✓									
	0.2/0.35	8.9/8.2	530/530	IRS2336DJ	JI	✓	✓	✓		✓							✓							✓						
	0.2/0.35	8.9/8.2	530/530	IRS2336DS	JI	✓	✓	✓		✓							✓						✓							
	0.2/0.35	8.9/8.2	530/530	IRS23364DS	JI	✓	✓	✓		✓							✓						✓							
	0.25/0.5	9/8.7	425/675	IR2130S	JI		✓		✓	✓							✓						✓							
	0.25/0.5	9/8.7	425/675	IR2130J	JI		✓		✓	✓							✓							✓						
	0.25/0.5	9/8.7	425/675	IR2132S	JI		✓		✓	✓							✓						✓							
	0.25/0.5	9/8.7	425/675	IR2132J	JI		✓		✓	✓							✓							✓						
	0.25/0.5	8.6/8.2	700/750	IR2133S	JI		✓		✓	✓							✓		✓				✓							
	0.25/0.5	8.6/8.2	700/750	IR2133J	JI		✓		✓	✓							✓		✓					✓						
	0.25/0.5	10.4/9.4	700/750	IR2135J	JI		✓		✓	✓							✓		✓					✓						
300	0.165/0.375	9.0/8.1	530/530	6EDL04N03PR NEW	SOI	✓	✓	✓		✓							✓								✓					
200	0.165/0.375	11.7/9.8	490/530	6ED003L02-F2	SOI	✓	✓			✓							✓									✓				
	0.165/0.375	9/8.1	530/530	6EDL04N02PR	SOI	✓	✓	✓		✓							✓	✓								✓				
160	1/2	7.5/6.8	100/100	6ED2742S01Q NEW	SOI	✓	✓	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓										✓			
60	1.5/1.5	5.8/4.5	140/140	6EDL7141	SOI	✓	✓		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓									✓	

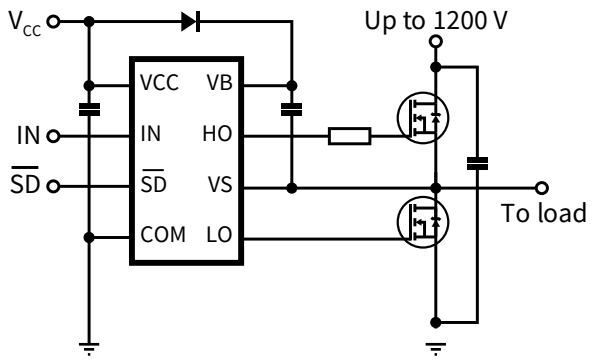
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Half-bridge and high- and low-side gate driver IC

Typical connection



Voltage class [V]	I_{o+}/I_{o-} typ. [A]	UVLO on/off typ. [V]	Prop delay off/on typ. [ns]	Base PN	Technology	Features																Package										
						Comparator	Operational amplifier	Desaturation protection	Enable	Fault reporting	Integrated bootstrap diode	Overcurrent protection	Programmable deadtime	Programmable fault clear/Reset	Programmable shutdown	Self-oscillating	Separate pin for logic ground	Shoot-through protection	Shutdown	Soft overcurrent shutdown	Two stage turn-on	DSO-8	DSO-14	DSO-16	DSO-16 WB	DSO-18	DSO-20WB (20 fine pitch leads)	SSOP-24	VDSON-8	VSON-10	VQFN-14	CHIP
1200	1.5/2.5	12.2/11.2	85/85	2ED020I12-FI	CT	✓	✓										✓	✓								✓							
	2/2.5	10.2/9.3	225/280	IR2213S	JI											✓		✓						✓								✓
	2/3	10.2/9.3	440/440	IR2214SS	JI			✓		✓				✓			✓	✓	✓	✓	✓								✓				✓
	2.3/2.3	12.2/11.3	500/500	2ED1324S12P NEW	SOI				✓	✓	✓	✓		✓			✓	✓									✓						
	2.3/2.3	12.2/11.3	350/350	2ED1323S12P NEW	SOI				✓	✓	✓	✓		✓			✓								✓		✓						
	2.3/4.6	12.2/11.3	500/500	2ED1322S12M NEW	SOI				✓	✓	✓	✓		✓			✓	✓							✓								
	2.3/4.6	12.2/11.3	350/350	2ED1321S12M NEW	SOI				✓	✓	✓	✓		✓			✓								✓								
	0.29/0.7	8.9/8.0	90/90	2ED2101S06F NEW	SOI						✓											✓											
	0.29/0.7	8.9/8.0	90/90	2ED2103S06F NEW	SOI						✓							✓				✓											
	0.29/0.7	8.9/8.0	90/90	2ED2104S06F NEW	SOI						✓							✓	✓			✓											
	0.29/0.7	8.9/8.0	90/90	2ED2388S06F NEW	SOI						✓							✓				✓											
	0.29/0.7	9.1/8.2	200/200	2ED2106S06F	SOI						✓											✓											
	0.29/0.7	9.1/8.2	200/200	2ED21064S06J	SOI						✓												✓										
	0.29/0.7	9.1/8.2	200/200	2ED2108S06F	SOI						✓							✓				✓											
	0.29/0.7	9.1/8.2	200/200	2ED21084S06J	SOI						✓		✓				✓	✓					✓										
	0.29/0.7	9.1/8.2	200/200	2ED2109S06F	SOI						✓							✓	✓			✓											
650	0.29/0.7	9.1/8.2	200/200	2ED21094S06J	SOI						✓		✓				✓	✓	✓				✓										
	0.29/0.7	9.1/8.2	200/200	2ED21091S06F	SOI						✓		✓					✓	✓			✓											
	0.36/0.7	9.1/8.3	300/310	2ED2304S06F	SOI						✓							✓				✓											
	2.5/2.5	9.1/8.2	200/200	2ED2181S06F	SOI						✓											✓											
	2.5/2.5	9.1/8.2	200/200	2ED21814S06J	SOI						✓												✓										
	2.5/2.5	9.1/8.2	200/200	2ED2182S06F	SOI						✓							✓				✓											
	2.5/2.5	9.1/8.2	200/200	2ED21824S06J	SOI						✓		✓				✓	✓					✓										
	2.5/2.5	9.1/8.2	200/200	2ED2183S06F	SOI						✓							✓				✓											
	2.5/2.5	9.1/8.2	200/200	2ED21834S06J	SOI						✓		✓				✓	✓					✓										
	2.5/2.5	9.1/8.2	200/200	2ED2184S06F	SOI						✓							✓	✓			✓											
	2.5/2.5	9.1/8.2	200/200	2ED21844S06J	SOI						✓		✓				✓	✓	✓				✓										
	1.5/2.5	12.2/11.2	85/85	2ED020I06-FI	CT	✓	✓										✓	✓							✓								
600	0.078/0.169	8.9/8.2	220/220	IR2304S	JI												✓					✓										
	0.078/0.169	8.9/8.2	220/220	IR25601S	JI												✓					✓										
	0.18/0.26	9/8	N.A.	IR21531S	JI									✓	✓		✓	✓				✓										
	0.18/0.26	9/8	N.A.	IR25603S	JI									✓	✓		✓	✓				✓										
	0.18/0.26	11/9	N.A.	IRS2153DS	JI						✓			✓	✓		✓	✓				✓										
	0.18/0.26	11/9	N.A.	IRS21531DS	JI						✓			✓	✓		✓	✓				✓										
	0.2/0.35	8.9/8.2	200/220	IR2106S	JI																	✓										
	0.2/0.35	8.9/8.2	200/220	IR21064S	JI											✓							✓										
	0.2/0.35	8.9/8.2	200/220	IR2108S	JI												✓					✓										
	0.2/0.35	8.9/8.2	200/220	IR21084S	JI								✓			✓	✓						✓										
	0.2/0.35	8.9/8.2	200/750	IR2109S	JI												✓	✓				✓										
	0.2/0.35	8.9/8.2	200/750	IR21094S	JI								✓			✓	✓	✓					✓										
	0.2/0.35	8.9/8.2	200/220	IR2308S	JI												✓					✓										
	0.2/0.35	8.9/8.2	200/220	IR25606S	JI												✓					✓										
	0.2/0.35	8.9/8.2	200/220	IR25604S	JI																	✓										
	0.2/0.35	4.1/3.8	200/220	IR2301S	JI																	✓										
	0.2/0.35	4.1/3.8	200/220	IRS2301S	JI																	✓										
	0.2/0.35	4.1/3.8	200/750	IR2302S	JI												✓	✓				✓										
	0.21/0.36	8.9/8.2	150/160	IR2101S	JI																	✓										
	0.21/0.36	8.9/8.2	150/160	IRS2101S	JI																	✓										
	0.21/0.36	8.9/8.2	150/160	IR2102S	JI																	✓										
	0.21/0.36	8.9/8.2	150/680	IR2103S	JI												✓					✓										
	0.21/0.36	8.9/8.2	150/680	IR2104S	JI												✓	✓				✓										
	0.21/0.36	8.9/8.2	150/680	IR25602S	JI												✓	✓				✓										
	0.21/0.36	8.9/8.2	200/220	IRS2106S	JI																	✓										
	0.21/0.36	8.9/8.2	200/220	IRS21064S	JI											✓							✓										
	0.22/0.48	8.9/7.7	500/500	IRS2890DS	JI					✓	✓	✓					✓						✓										
	0.25/0.5	8.6/8.2	150/750	IR2111S	JI												✓					✓										
	0.25/0.5	8.6/8.2	105/125	IR2112S	JI													✓						✓									
	0.25/0.5	8.6/8.2	130/135	IRS2112S	JI											✓		✓						✓									
	0.29/0.6	8.9/8.2	150/680	IRS2103S	JI												✓					✓										
	0.29/0.6	8.9/8.2	150/680	IRS2104S	JI												✓	✓				✓										
	0.29/0.6	8.9/8.2	200/220	IRS2108S	JI												✓					✓										
	0.29/0.6	8.9/8.2	200/750	IRS2109S	JI												✓	✓				✓										
	0.29/0.6	8.9/8.2	200/750	IRS21091S	JI								✓				✓					✓										
	0.29/0.6	8.6/8.2	150/750	IRS2111S	JI												✓					✓										
	0.29/0.6	8.9/8.2	150/150	IRS2304S	JI												✓					✓										
	0.29/0.6	8.9/8.2	200/220	IRS2308S	JI												✓					✓										
	0.36/0.7	9.1/8.3	300/310	2EDL05N06PF	SOI						✓						✓					✓										
	0.36/0.7	9.1/8.3	300/310	2EDL05N06PJ	SOI						✓						✓						✓										
	0.36/0.7	12.5/11.6	400/420	2EDL05I06PF	SOI						✓						✓					✓										
	0.36/0.7	12.5/11.6	400/420	2EDL05I06PJ	SOI						✓						✓						✓										
	0.36/0.7	12.5/11.6	400/420	2EDL05I06BF	SOI						✓											✓										
	1.9/2.3	8.9/8.2	220/180	IRS2181S	JI																	✓										
	1.9/2.3	8.9/8.2	220/180	IR2181S	JI																	✓										
	1.9/2.3	8.9/8.2	220/180	IR21814S	JI											✓							✓										
	1.9/2.3	8.9/8.2	220/180	IRS21814S	JI											✓							✓										
	1.9/2.3	8.9/8.2	220/180	IRS21814M	JI											✓																✓	
	1.9/2.3	8.9/8.2	220/180	IRS2183S	JI												✓					✓										
	1.9/2.3	8.9/8.2	220/180	IR2183S	JI												✓					✓										
	1.9/2.3	8.9/8.2	220/180	IR21834S	JI								✓			✓	✓						✓										
	1.9/2.3	8.9/8.2	220/180	IRS21834S	JI								✓			✓	✓						✓										
	1.9/2.3	8.9/8.2	270/680	IRS2184S	JI													✓	✓			✓										
	1.9/2.3	8.9/8.2	270/680	IR2184S	JI													✓	✓			✓										
	1.9/2.3	8.9/8.2	270/680	IR21844S	JI								✓				✓	✓	✓				✓										
	1.9/2.3	8.9/8.2	270/680	IRS21844S	JI								✓				✓	✓	✓				✓										
	1.9/2.3	8.9/8.2	270/680	IRS21844M	JI								✓				✓	✓	✓													✓	
	2.5/2.5	8.6/8.2	94/120	IR2113S	JI												✓		✓					✓								
	2.5/2.5	8.6/8.2	94/120	IR25607S	JI												✓		✓					✓								
	2.5/2.5	8.5/8.2	120/130	IRS2113S	JI												✓		✓					✓								
	2.5/2.5	8.5/8.2	120/130	IRS2113M	JI												✓		✓													✓	
	2/3	10.2/9.3	440/440	IR2114SS	JI			✓		✓							✓	✓		✓								✓					
	2.3/2.8	9.1/8.3	300/310	2EDL23N06PJ	SOI				✓	✓	✓	✓					✓	✓					✓										
	2.3/2.8	12.5/11.6	400/420	2EDL23I06PJ	SOI				✓	✓	✓	✓					✓	✓					✓										
	4/4	8.9/8.2	170/170	IRS2186S	JI																	✓										
	4/4	8.9/8.2	170/170	IRS21864S	JI												✓						✓										
	4/4	6/5.5	170/170	IRS21867S	JI																	✓										
500	2.5/2.5	8.6/8.2	94/120	IR2110S	JI												✓		✓					✓								
	2.5/2.5	8.5/8.2	120/130	IRS2110S	JI												✓		✓					✓								
200	0.29/0.6	8.9/8.2	150/160	IRS2005S	JI																	✓										
	0.29/0.6	8.9/8.2	150/160	IRS2005M	JI																											✓
	0.29/0.6	8.9/8.2	150/160	IRS2007S	JI												✓					✓										
	0.29/0.6	8.9/8.2	150/160	IRS2007M	JI												✓															✓
	0.29/0.6	8.9/8.2	150/680	IRS2008S	JI												✓	✓				✓										
	0.29/0.6	8.9/8.2	150/680	IRS2008M	JI												✓	✓														✓
	1/1	9/8.2	75/80	IR2011S	JI																	✓										
	1/1	9/8.2	60/60	IRS2011S	JI																	✓										
	3/3	8.6/8.2	65/95	IR2010S	JI												✓		✓					✓								
160	1/2	5/4.5	50/50	2ED2732S01G	SOI						✓						✓														✓	
	1/2	5/4.5	50/50	2ED2742S01G	SOI						✓						✓	✓													✓	
	2/4	5/4.5	65/65	2ED2734S01G	SOI						✓						✓														✓	
	2/4	5/4.5	65/65	2ED2744S01G	SOI						✓						✓	✓													✓	
	4/8	5/4.5	65/65	2ED2738S01G	SOI						✓						✓														✓	
	4/8	5/4.5	65/65	2ED2748S01G	SOI						✓						✓	✓													✓	
	1.0/2.0	8.2/7.7	50/50	2ED2772S01G	SOI						✓						✓	✓													✓	
	4.0/8.0	8.2/7.7	65/65	2ED2778S01G	SOI						✓						✓	✓													✓	
120	3/6	7/6.5	47/47	2EDL8033G4B	JI						✓																		✓			
	4/6	7/6.5	47/47	2EDL8034G4B	JI						✓																		✓			
	3/6	7/6.5	47/47	2EDL8033G4C	JI						✓																				✓	
	4/6	7/6.5	47/47	2EDL8034G4C	JI						✓																				✓	
	3/6	7/6.5	47/47	2EDL8033G3C	JI						✓																				✓	
	4/6	7/6.5	47/47	2EDL8034G3C	JI						✓																				✓	
	3/6	7/6.5	47/47	2EDL8033F5B NEW	JI						✓											✓										
	4/6	7/6.5	47/47	2EDL8034F5B NEW	JI						✓											✓										

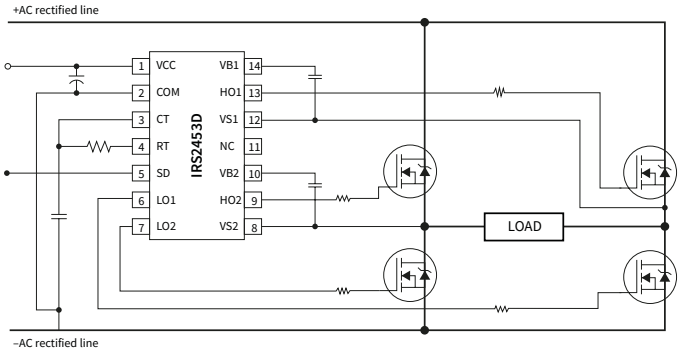
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Full-bridge gate driver ICs

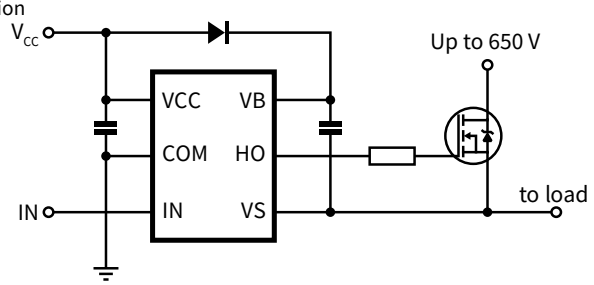
Typical connection



Voltage class [V]	I_{o+}/I_{o-} typ. [A]	UVLO on/off typ. [V]	Base PN	Technology	Features			Package
					Integrated bootstrap diode	Shoot-through protection	Shutdown	DSO-14
600	0.18/0.26	11/9	IRS2453DS	JI	✓	✓	✓	✓

Single high-side gate driver ICs

Typical connection



Voltage class [V]	I_{o+}/I_{o-} typ. [A]	UVLO on/off typ. [V]	Prop delay off/on typ. [ns]	Base PN		Technology	Features			Package			
							Integrated bootstrap diode	Fault reporting	Overcurrent protection	DSO-8	DSO-16 WB	SOT23-6	TSNP-6
650	4.0/4.0	10.3/9.0	55/55	1ED2127S65F	NEW	SOI	✓	✓	✓	✓			
	4.0/4.0	7.2/6.8	55/55	1ED21271S65F	NEW		✓	✓	✓	✓			
	4.0/4.0	7.2/6.8	55/55	1ED2147S65F	NEW		✓	✓	✓	✓			
	4.0/4.0	10.3/9.0	55/55	1ED21471S65F	NEW		✓	✓	✓	✓			
600	0.16/0.24	9/8	215/140	IRS25752L		JI						✓	
	0.25/0.5	8.6/8.2	105/125	IR2117S		JI				✓			
	0.25/0.5	8.6/8.2	105/125	IR2118S		JI				✓			
	0.25/0.5	10.3/9	150/200	IR2127S		JI		✓	✓	✓			
	0.25/0.5	10.3/9	150/200	IR2128S		JI		✓	✓	✓			
	0.25/0.5	7.2/6.8	150/200	IR21271S		JI		✓	✓	✓			
	0.29/0.6	8.6/8.2	105/125	IRS2117S		JI				✓			
	0.29/0.6	8.6/8.2	105/125	IRS2118S		JI				✓			
	0.29/0.6	10.3/9	150/150	IRS2127S		JI		✓	✓	✓			
	0.29/0.6	7.2/6.8	150/150	IRS21271S		JI		✓	✓	✓			
500	1.6/3.3	9.2/8.3	200/170	IR2125S		JI		✓	✓		✓		
200	0.16/0.24	9/8	215/140	IRS20752L		JI						✓	
	4/8	4.2/3.9	5/45	1EDN7550B		TDI						✓	
	4/8	8/7	45/45	1EDN8550B		TDI						✓	
	4/8	12.2/11.5	45/45	1EDN6550B		TDI						✓	
	4/8	14.9/14.4	45/45	1EDN9550B		TDI						✓	
	4/8	4.2/3.9	45/45	1EDN7550U		TDI							✓
100	0.16/0.24	9/8	215/140	IRS10752L		JI						✓	

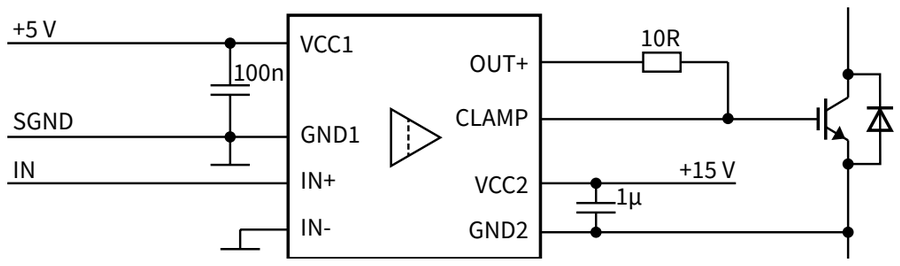
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Galvanic isolated gate driver ICs



Configuration	Voltage class [V]	Isolation type	Isolation rating	I_{o+}/I_{o-} typ. [A]	UVLO on/off typ. [V]	Prop delay off/on typ. [ns]	Base PN	Technology	Features																				Package														
									Active Miller clamp	Analog configurability (Desat, soft-off)	Comparator	Deadtime control	Desaturation protection	Digital I²C configurability	Disable	Enable	Fast output clamping for supply below UVLO	Fault reporting	Fault reset	Operational amplifier (OPAMP)	Overcurrent protection	Separate pin for logic ground	Separate sink/source outputs	Shoot-through protection	Shutdown	Soft off	Two-level turn-off	Two-level Slew-rate control	UL 1577	VDE 0884-10/11	DSO-8 150mil	DSO-8 300mil	DSO-14 150mil	DSO-14 300 mil (DSO-16 without 2pin)	DSO-16 150mil	DSO-16 fine pitch 300 mil	DSO-16 300 mil	DSO-18	DSO-36	TFLGA-13 (4x4)	TFLGA-13 (5x5)	VSON-8
1-channel	2300	Reinforced	V_{IORM} = 1.7 kV(rms); V_{IOTM}=8 kV; V_{ISO} = 5.7 kV(rms)	5.5/5.5	10/8	90/90	1ED3120MC12H NEW	CT														✓	✓					✓	✓		✓											
		Functional	V_{ISO} = 5.7 kV(rms)	5.5/5.5	10/8	90/90	1ED3120MU12H NEW	CT														✓	✓					✓			✓											
		Reinforced	V_{IORM} = 1.7 kV(rms); V_{IOTM}=8 kV; V_{ISO} = 5.7 kV(rms)	5.5/5.5	12.5/10.5	90/90	1ED3121MC12H NEW	CT														✓	✓					✓	✓		✓											
		Functional	V_{ISO} = 5.7 kV(rms)	5.5/5.5	12.5/10.5	90/90	1ED3121MU12H NEW	CT														✓	✓					✓			✓											
		Reinforced	V_{IORM} = 1.7 kV(rms); V_{IOTM}=8 kV; V_{ISO} = 5.7 kV(rms)	5.5/5.5	12.5/10.5	280/280	1ED3131MC12H NEW	CT														✓	✓					✓	✓		✓											
		Functional	V_{ISO} = 5.7 kV(rms)	5.5/5.5	12.5/10.5	280/280	1ED3131MU12H NEW	CT														✓	✓					✓			✓											
		Reinforced	V_{IORM} = 1.7 kV(rms); V_{IOTM}=8 kV; V_{ISO} = 5.7 kV(rms)	10/9	10/8	90/90	1ED3122MC12H NEW	CT	✓													✓							✓	✓		✓											
		Functional	V_{ISO} = 5.7 kV(rms)	10/9	10/8	90/90	1ED3122MU12H NEW	CT	✓													✓							✓			✓											
		Functional	V_{ISO} = 3 kV(rms)	10/9	12.5/10.5	90/90	1ED3125MU12F NEW	CT	✓													✓							✓		✓											
		Functional	V_{ISO} = 3 kV(rms)	10/9	12.5/10.5	90/90	1ED3127MU12F NEW	CT	✓													✓							✓		✓											
		Reinforced	V_{IORM} = 1.7 kV(rms); V_{IOTM}=8 kV; V_{ISO} = 5.7 kV(rms)	13.5/14	10/8	90/90	1ED3123MC12H NEW	CT														✓	✓					✓	✓		✓											
		Functional	V_{ISO} = 5.7 kV(rms)	13.5/14	10/8	90/90	1ED3123MU12H NEW	CT														✓	✓					✓			✓											
		Reinforced	V_{IORM} = 1.7 kV(rms); V_{IOTM}=8 kV; V_{ISO} = 5.7 kV(rms)	13.5/14	12.5/10.5	90/90	1ED3124MC12H NEW	CT														✓	✓					✓	✓		✓											
		Functional	V_{ISO} = 5.7 kV(rms)	13.5/14	12.5/10.5	90/90	1ED3124MU12H NEW	CT														✓	✓					✓			✓											
		Functional	V_{ISO} = 3 kV(rms)	13.5/14	12.5/10.5	90/90	1ED3124MU12F NEW	CT														✓	✓					✓		✓											
		Functional	V_{ISO} = 3 kV(rms);	6/6.5	8.5/9.3	45/45	1ED3140MU12F NEW	CT														✓	✓					✓		✓											
		Functional	V_{ISO} = 3 kV(rms);	6/6.5	11/12	45/45	1ED3141MU12F NEW	CT														✓	✓					✓		✓											
		Functional	V_{ISO} = 3 kV(rms);	6/6.5	12.5/13.6	45/45	1ED3142MU12F NEW	CT														✓	✓					✓		✓											
		Reinforced	V_{IORM} = 1.767 kV(rms); V_{IOTM} = 8 kV(rms); V_{ISO} = 5.7 kV(rms)	6.5/6.5	11.0/12.0	45/45	1ED3141MC12H*	CT													✓	✓	✓					✓	✓		✓											
		Reinforced	V_{IORM} = 1.767 kV(rms); V_{IOTM} = 8 kV(rms); V_{ISO} = 5.7 kV(rms)	6.5/6.5	12.5/13.6	45/45	1ED3142MC12H*	CT													✓	✓	✓					✓	✓		✓											
		Reinforced	V_{IORM} = 1.767 kV(rms); V_{IOTM} = 8 kV(rms); V_{ISO} = 5.7 kV(rms)	6.5/6.5	11.0/12.0	45/45	1ED3143MC12H*	CT													✓							✓	✓		✓											
		Reinforced	V_{IORM} = 1.767 kV(rms); V_{IOTM} = 8 kV(rms); V_{ISO} = 5.7 k Vrms	6.5/6.5	12.5/13.6	45/45	1ED3144MC12H*	CT													✓							✓	✓		✓											
		Reinforced	V_{IORM} = 1.767 kV(rms); V_{IOTM} = 8 kV(rms); V_{ISO} = 5.7 k Vrms	6.5/6.5	Adjustable	45/45	1ED3145MC12H*	CT													✓							✓	✓		✓											
		Reinforced	V_{IORM} = 1.7 kV(rms); V_{IOTM}=8 kV; V_{ISO} = 5.7 kV(rms)	10/10	12.5/10.4	110/110	1ED3240MC12H NEW	CT														✓						✓	✓	✓		✓										
		Reinforced	V_{IORM} = 1.7 kV(rms); V_{IOTM}=8 kV; V_{ISO} = 5.7 kV(rms)	10/10	12.5/10.4	110/110	1ED3250MC12H NEW	CT														✓						✓	✓	✓		✓										
		Reinforced	V_{IORM} = 1.7 kV(rms); V_{IOTM}=8 kV; V_{ISO} = 5.7 kV(rms)	18/18	12.5/10.4	110/110	1ED3251MC12H NEW	CT	✓													✓						✓	✓	✓		✓										
		Reinforced	V_{IORM} = 1.7 kV(rms); V_{IOTM}=8 kV; V_{ISO} = 5.7 kV(rms)	18/18	12.5/10.4	110/110	1ED3241MC12H NEW	CT	✓													✓						✓	✓	✓		✓										
		Reinforced	V_{IORM} = 1.7 kV(rms); V_{IOTM}=8 kV; V_{ISO} = 5.7 kV(rms)	3.3/6	12.6/10.4	86/80	1ED3320MC12N NEW	CT	✓			✓				✓	✓			✓	✓			✓				✓	✓													
		Reinforced	V_{IORM} = 1.7 kV(rms); V_{IOTM}=8 kV; V_{ISO} = 5.7 kV(rms)	6/8.5	12.6/10.4	86/80	1ED3321MC12N NEW	CT	✓			✓				✓	✓			✓	✓			✓				✓	✓													
		Reinforced	V_{IORM} = 1.7 kV(rms); V_{IOTM}=8 kV; V_{ISO} = 5.7 kV(rms)	6/8.5	14.2/11.9	86/80	1ED3322MC12N NEW	CT	✓			✓				✓	✓			✓	✓							✓	✓													
		Reinforced	V_{IORM} = 1.7 kV(rms); V_{IOTM}=8 kV; V_{ISO} = 5.7 kV(rms)	6/8.5	12.6/10.4	86/80	1ED3323MC12N NEW	CT	✓			✓				✓	✓			✓								✓	✓													
		Reinforced	V_{IORM} = 1.7 kV(rms); V_{IOTM}=8 kV; V_{ISO} = 5.7 kV(rms)	3.8/2.5	12.6/10.4	236/244	1ED3431MC12M NEW	CT	✓	✓		✓				✓	✓			✓	✓			✓				✓	✓							✓						
		Functional	V_{ISO} = 5.7 kV(rms)	3.8/2.5	12.6/10.4	236/244	1ED3431MU12M NEW	CT	✓	✓		✓				✓	✓			✓	✓			✓				✓								✓						
		Reinforced	V_{IORM} = 1.7 kV(rms); V_{IOTM}=8 kV; V_{ISO} = 5.7 kV(rms)	3.8/2.5	Adjustable	236/244	1ED3830MC12M NEW	CT	✓			✓	✓			✓	✓			✓	✓			✓	✓			✓	✓							✓						
		Functional	V_{ISO} = 5.7 kV(rms)	3.8/2.5	Adjustable	236/244	1ED3830MU12M NEW	CT	✓			✓	✓			✓	✓			✓	✓			✓	✓			✓								✓						
		Reinforced	V_{IORM} = 1.7 kV(rms); V_{IOTM}=8 kV; V_{ISO} = 5.7 kV(rms)	7.5/5	12.6/10.4	236/244	1ED3461MC12M NEW	CT	✓	✓		✓				✓	✓			✓	✓			✓				✓	✓							✓						
		Functional	V_{ISO} = 5.7 kV(rms)	7.5/5	12.6/10.4	236/244	1ED3461MU12M NEW	CT	✓	✓		✓				✓	✓			✓	✓			✓				✓								✓						
		Reinforced	V_{IORM} = 1.7 kV(rms); V_{IOTM}=8 kV; V_{ISO} = 5.7 kV(rms)	7.5/5	Adjustable	236/244	1ED3860MC12M NEW	CT	✓			✓	✓			✓	✓			✓	✓			✓	✓			✓	✓							✓						
		Functional	V_{ISO} = 5.7 kV(rms)	7.5/5	Adjustable	236/244	1ED3860MU12M NEW	CT	✓			✓	✓			✓	✓			✓	✓			✓	✓			✓								✓						
		Reinforced	V_{IORM} = 1.7 kV(rms); V_{IOTM}=8 kV; V_{ISO} = 5.7 kV(rms)	11/7.5	12.6/10.4	236/244	1ED3491MC12M NEW	CT	✓	✓		✓				✓	✓			✓	✓			✓				✓	✓							✓						
		Functional	V_{ISO} = 5.7 kV(rms)	11/7.5	12.6/10.4	236/244	1ED3491MU12M NEW	CT	✓	✓		✓				✓	✓			✓	✓			✓				✓								✓						
		Reinforced	V_{IORM} = 1.7 kV(rms); V_{IOTM}=8 kV; V_{ISO} = 5.7 kV(rms)	11/7.5	Adjustable	236/244	1ED3890MC12M NEW	CT	✓			✓	✓			✓	✓			✓	✓			✓	✓			✓	✓							✓						
		Functional	V_{ISO} = 5.7 kV(rms)	11/7.5	Adjustable	236/244	1ED3890MU12M NEW	CT	✓			✓	✓			✓	✓			✓	✓			✓	✓			✓								✓						
	1200	Basic	V_{IORM} = 1.4 kV; V_{IOTM}=6 kV; V_{ISO} = 3.7 kV(rms)	2/2	12/11	165/170	1ED020I12-B2	CT	✓			✓				✓	✓			✓							✓	✓												✓	
		Basic	V_{IORM} = 1.4 kV; V_{IOTM}=6 kV; V_{ISO} = 3.7 kV(rms)	2/2	12/11	1750/1750	1ED020I12-BT	CT	✓			✓				✓	✓			✓					✓		✓	✓												✓	
		Functional	V_{ISO} = ± 1.2 kV	2/2	12/11	165/170	1ED020I12-F2	CT	✓			✓				✓	✓			✓																				✓	
		Functional	V_{ISO} = ± 1.2 kV	2/2	12/11	1750/1750	1ED020I12-FT	CT	✓			✓				✓	✓			✓					✓															✓	
		Functional	V_{IOTM} = 4.2 kV(peak); V_{ISO} = 3 kV(rms)	5.4/9.8	12.2/11.5	45/45	1EDB6275F	CT						✓		✓						✓						✓		✓											
		Functional	V_{IOTM} = 4.2 kV(peak); V_{ISO} = 3 kV(rms)	5.4/9.8	4.2/3.9	45/45	1EDB7275F	CT						✓		✓						✓						✓		✓											
		Functional	V_{IOTM} = 4.2 kV(peak); V_{ISO} = 3 kV(rms)	5.4/9.8	8/7	45/45	1EDB8275F	CT						✓		✓						✓						✓		✓											
		Functional	V_{IOTM} = 4.2 kV(peak); V_{ISO} = 3 kV(rms)	5.4/9.8	14.9/14.4	45/45	1EDB9275F	CT						✓		✓						✓						✓		✓											
		Functional	V_{ISO} = ± 1.2 kV	1.3/0.9	12/11.1	300/300	1EDI05I12AF	CT															✓	✓						✓											
		Functional	V_{ISO} = ± 1.2 kV	1.3/0.9	12/11.1	300/300	1EDI05I12AH	CT															✓	✓							✓										
		Functional	V_{ISO} = 2.5 kV(rms)	1.3/0.9	12/11.1	300/300	1EDC05I12AH	CT															✓	✓					✓		✓										
		Functional	V_{ISO} = ± 1.2 kV	2.2/2.3	12/11.1	300/300	1EDI10I12MF	CT	✓														✓								✓										
		Functional	V_{ISO} = ± 1.2 kV	2.2/2.3	12/11.1	300/300	1EDI10I12MH	CT	✓														✓									✓										
		Functional	V_{ISO} = 2.5 kV(rms)	2.2/2.3	12/11.1	300/300	1EDC10I12MH	CT	✓														✓						✓			✓										
		Functional	V_{ISO} = ± 1.2 kV	4/3.5	9.1/8.5	120/115	1EDI20N12AF	CT															✓	✓							✓										
		Functional	V_{ISO} = ± 1.2 kV	4/3.5	12/11.1	125/120	1EDI20H12AH	CT															✓	✓								✓									
		Functional	V_{ISO} = 2.5 kV(rms)	4/3.5	12/11.1	125/120	1EDC20H12AH	CT															✓	✓					✓			✓									
		Functional	V_{ISO} = ± 1.2 kV	4/3.5	12/11.1	300/300	1EDI20I12AF	CT															✓	✓							✓										
		Functional	V_{ISO} = ± 1.2 kV	4/3.5	12/11.1	300/300	1EDI20I12AH	CT															✓	✓								✓									
		Functional	V_{ISO} = 2.5 kV(rms)	4/3.5	12/11.1	300/300	1EDC20I12AH	CT															✓	✓					✓			✓									
		Functional	V_{ISO} = ± 1.2 kV	4.4/4.1	12/11.1	300/300	1EDI20I12MF	CT	✓														✓								✓										
		Functional	V_{ISO} = ± 1.2 kV	4.4/4.1	12/11.1	300/300	1EDI20I12MH	CT	✓														✓									✓										
		Functional	V_{ISO} = 2.5 kV(rms)	4.4/4.1	12/11.1	300/300	1EDC20I12MH	CT	✓														✓						✓			✓										
		Functional	V_{ISO} = ± 1.2 kV	5.9/6.2	12/11.1	300/300	1EDI30I12MF	CT	✓														✓								✓										
		Functional	V_{ISO} = ± 1.2 kV	5.9/6.2	12/11.1	300/300	1EDI30I12MH	CT	✓														✓									✓										
		Functional	V_{ISO} = 2.5 kV(rms)	5.9/6.2	12/11.1	300/300	1EDC30I12MH	CT	✓														✓						✓			✓										
		Functional	V_{ISO} = ± 1.2 kV	7.5/6.8	12/11.1	300/300	1EDI40I12AF	CT															✓	✓							✓										
		Functional	V_{ISO} = ± 1.2 kV	7.5/6.8	12/11.1	300/300	1EDI40I12AH	CT															✓	✓								✓									
		Functional	V_{ISO} = 2.5 kV(rms)	7.5/6.8	12/11.1	300/300	1EDC40I12AH	CT															✓	✓					✓			✓									
		Functional	V_{ISO} = ± 1.2 kV	10/9.4	9.1/8.5	120/115	1EDI60N12AF	CT															✓	✓							✓										
		Functional	V_{ISO} = ± 1.2 kV	10/9.4	12/11.1	125/120	1EDI60H12AH	CT															✓	✓								✓									
		Functional	V_{ISO} = 2.5 kV(rms)	10/9.4	12/11.1	125/120	1EDC60H12AH	CT															✓	✓					✓			✓									
		Functional	V_{ISO} = ± 1.2 kV	10/9.4	12/11.1	300/300	1EDI60I12AF	CT															✓	✓							✓										
		Functional	V_{ISO} = ± 1.2 kV	10/9.4	12/11.1	300/300	1EDI60I12AH	CT															✓	✓								✓									
		Functional	V_{ISO} = 2.5 kV(rms)	10/9.4	12/11.1	300/300	1EDC60I12AH	CT															✓	✓					✓			✓									
		Reinforced	V_{IORM} = 1.4 kV(rms); V_{IOTM}=8 kV; V_{ISO} = 5 kV(rms)	SRC/2	11.9/11	460/460	1EDS20I12SV	CT				✓		✓		✓	✓		✓	✓			✓	✓			✓	✓										✓			
		Functional	V_{ISO} = 5 kV(rms)	SRC/2	11.9/11	460/460	1EDU20I12SV	CT				✓		✓		✓	✓		✓	✓			✓	✓			✓										✓			
		Functional	V_{ISO} = ± 1.2 kV	SRC/2	11.9/11	460/460	1EDI20I12SV	CT				✓		✓		✓	✓		✓	✓			✓	✓			✓	✓										✓			
		Reinforced	V_{IORM} = 1.767 kV(rms); V_{IOTM} = 8 kV(rms); VISO = 5.7 kV(rms)	6.5/6.5	8.5/9.3	50/50	2ED3140MC12L*	CT				✓		✓						✓		✓				✓				✓											
		Reinforced	V_{IORM} = 1.767 kV(rms); V_{IOTM} = 8 kV(rms); VISO = 5.7 kV(rms)	6.5/6.5	11.0/12.0	50/50	2ED3141MC12L*	CT				✓		✓						✓		✓				✓	✓			✓											
		Reinforced	V_{IORM} = 1.767 kV(rms); V_{IOTM} = 8 kV(rms); VISO = 5.7 kV(rms)	6.5/6.5	12.5/13.6	50/50	2ED3142MC12L*	CT				✓		✓						✓		✓				✓	✓			✓											
		Reinforced	V_{IORM} = 1.767 kV(rms); V_{IOTM} = 8 kV(rms); VISO = 5.7 kV(rms)	6.5/6.5	14.7/16.0	50/50	2ED3143MC12L*	CT				✓		✓						✓		✓				✓	✓			✓											
		Reinforced	V_{IORM} = 1.767 kV(rms); V_{IOTM} = 8 kV(rms); VISO = 5.7 kV(rms)	6.5/6.5	8.5/9.3	50/50	2ED3144MC12L*	CT				✓			✓					✓		✓				✓	✓			✓											
		Reinforced	V_{IORM} = 1.767 kV(rms); V_{IOTM} = 8 kV(rms); VISO = 5.7 kV(rms)	6.5/6.5	11.0/12.0	50/50	2ED3145MC12L*	CT				✓			✓					✓		✓				✓	✓			✓											
		Reinforced	V_{IORM} = 1.767 kV(rms); V_{IOTM} = 8 kV(rms); VISO = 5.7 kV(rms)	6.5/6.5	12.5/13.6	50/50	2ED3146MC12L*	CT				✓			✓					✓		✓				✓	✓			✓											
		Reinforced	V_{IORM} = 1.767 kV(rms); V_{IOTM} = 8 kV(rms); VISO = 5.7 kV(rms)	6.5/6.5	14.7/16.0	50/50	2ED3147MC12L*	CT				✓			✓					✓		✓				✓	✓			✓											
		Functional	V_{ISO} = ± 1.2 kV	2/2	12/11	165/170	2ED020I12-F2	CT	✓				✓				✓	✓			✓																			✓	
		Reinforced	V_{IORM} = 1.4 kV(rms); V_{IOTM}=8 kV; V_{ISO} = 5.7 kV(rms)	1/2	4.2/3.9	37/37	2EDS7165H	CT						✓		✓												✓	✓										✓		
		Reinforced	V_{IORM} = 1.4 kV(rms); V_{IOTM}=8 kV; V_{ISO} = 5.7 kV(rms)	1/2	8/7	37/37	2EDS8165H	CT						✓		✓												✓	✓										✓		
		Reinforced	V_{IORM} = 1.4 kV(rms); V_{IOTM}=8 kV; V_{ISO} = 5.7 kV(rms)	4/8	8/7	37/37	2EDS8265H	CT						✓		✓												✓	✓										✓		
		Reinforced	V_{IORM} = 1.4 kV(rms); V_{IOTM}=8 kV; V_{ISO} = 5.7 kV(rms)	4/8	14.9/14.4	37/37	2EDS9265H	CT						✓		✓												✓	✓										✓		
2-channel	1200**	Reinforced	V_{IOTM} = 4.2 kV(peak); V_{ISO} = 5.7 kV(rms)	5/9	4.2/3.9	38/36	2EDR7259X	CT				✓			✓		✓							✓					✓	✓			✓									
		Reinforced	V_{IOTM} = 4.2 kV(peak); V_{ISO} = 5.7 kV(rms)	5/9	8/7	38/36	2EDR8259H	CT				✓			✓		✓							✓					✓	✓						✓						
		Reinforced	V_{IOTM} = 4.2 kV(peak); V_{ISO} = 5.7 kV(rms)	5/9	8/7	38/36	2EDR8259X	CT				✓			✓		✓							✓					✓	✓			✓									
		Reinforced	V_{IOTM} = 4.2 kV(peak); V_{ISO} = 5.7 kV(rms)	5/9	14.9/14.4	38/36	2EDR9259X	CT				✓			✓		✓							✓					✓	✓			✓									
		Reinforced	V_{IOTM} = 4.2 kV(peak); V_{ISO} = 5.7 kV(rms)	5/9	8/7	38/36	2EDR8258X	CT				✓				✓	✓							✓					✓	✓			✓									
		Reinforced	V_{IOTM} = 4.2 kV(peak); V_{ISO} = 5.7 kV(rms)	5/9	12.2/11.5	38/36	2EDR6258X	CT				✓				✓	✓							✓					✓	✓			✓									
		Reinforced	V_{IOTM} = 4.2 kV(peak); V_{ISO} = 5.7 kV(rms)	5/9	14.9/14.4	38/36	2EDR9258X	CT				✓				✓	✓							✓					✓	✓			✓									
		Basic	V_{IORM} = 800 V(rms); V_{IOTM}=3.5 kV; V_{ISO} = 2.5 kV(rms)	5/9	4.2/3.9	38/36	2EDB7259K	CT				✓			✓		✓							✓					✓												✓	
		Basic	V_{IORM} = 800 V(rms); V_{IOTM}=3.5 kV; V_{ISO} = 2.5 kV(rms)	5/9	8/7	38/36	2EDB8259K	CT				✓			✓		✓							✓					✓												✓	
		Basic	V_{IORM} = 1 kV(rms); V_{IOTM}=4.2 kV; V_{ISO} = 3 kV(rms)	5/9	8/7	38/36	2EDB8259F	CT							✓		✓																			✓						
		Basic	V_{IORM} = 1 kV(rms); V_{IOTM}=4.2 kV; V_{ISO} = 3 kV(rms)	5/9	4.2/3.9	38/36	2EDB7259Y	CT							✓		✓																				✓					
		Basic	V_{IORM} = 1 kV(rms); V_{IOTM}=4.2 kV; V_{ISO} = 3 kV(rms)	5/9	8/7	38/36	2EDB8259Y	CT			

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Automotive gate driver ICs

Configuration	Voltage class [V]	I_{o+}/I_{o-} typ. [A]	UVLO on/off typ. [V]	Prop delay off/on typ. [ns]	Base PN		Technology	Features																			Package			
								Buffer	Desaturation protection	Enable	Fault reporting	Overcurrent protection	Programmable deadtime	Separate pin for logic ground	Shoot-through protection	SPI Interface	Two-level turn-off	Soft-off	SAR ADC	ΔΣ - ADC	Slew rate	Integrated flyback controller	UL 1577	VDE 0884-11	ISO 26262 ready	ISO 26262 compliant	DSO-8	DSO-20 (sine pitch)	DSO-36	TSDSO-24
1-channel isolated	1200	20/20	12/12.4	60/60	1EDI3025AS	NEW	CT (SiC)	✓	✓	✓	✓			✓	✓			✓		✓				✓	✓		✓		✓		
		15/15	12/12.4	60/60	1EDI3028AS	NEW	CT (IGBT)	✓	✓	✓	✓			✓	✓			✓		✓				✓	✓		✓		✓		
		20/20	12/12.4	60/60	1EDI3035AS	NEW	CT (SiC)	✓	✓	✓	✓			✓	✓			✓		✓				✓	✓		✓		✓		
		15/15	12/12.4	60/60	1EDI3038AS	NEW	CT (SiC)	✓	✓	✓	✓			✓	✓			✓						✓	✓		✓		✓		
		20/20	configurable	60/60	1EDI3050AS		CT (IGBT & SiC)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓			✓		✓	✓	✓	✓		✓			✓	
		20/20	configurable	60/60	1EDI3051AS		CT (IGBT & SiC)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓			✓		✓	✓	✓	✓		✓			✓	
		20/20	configurable	60/60	1EDI3040AS*		CT (IGBT & SiC)	✓	✓	✓	✓			✓	✓	✓		✓	✓		✓	✓	✓	✓	✓		✓			✓	
		20/20	configurable	60/60	1EDI3041AS*		CT (IGBT & SiC)	✓	✓	✓	✓			✓	✓	✓		✓	✓		✓	✓	✓	✓	✓		✓			✓	
Single high-side	65	0.3/0.3	10/6.5	2500/2500	AUIR3241stR		N-ISO			✓	✓																✓			
	65	0.3/0.3	10/6.5	2500/2500	AUIR3242STR		N-ISO			✓	✓																✓			
Dual high-side	75	0.3/1.4	12.5/10.0	4000/7000	2ED2410-EM	NEW	N-ISO			✓	✓	✓													✓					✓
	105	0.3/1.0	7.0/6.6	3000/3000	2ED4820-EM	NEW	N-ISO			✓	✓	✓				✓									✓					✓

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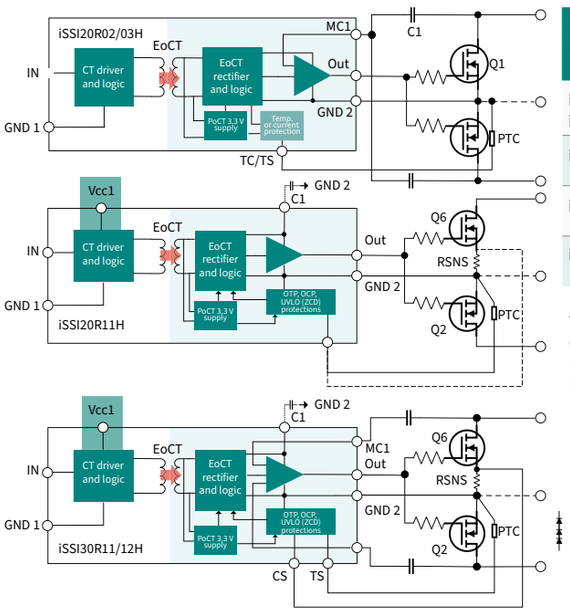
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Coreless Transformer Solid State Isolators

ISSI20RXXH, ISSI30RXXH

The new Infineon Solid State Isolator (SSI) family of products uses Infineon's coreless transformer technology for a high-performance isolator. They allow driving high power and low on-state resistance MOSFETs, thus allowing to replace SCRs and TRIACs with the advantage of dramatically reducing the power dissipation and extending the field application range of the SSR. Solid state relays (SSR) built using the SSI can easily replace most electromechanical relays (EMR) used in a wide range of power applications. In contrast, conventional SSR has had no success until today. The new SSI also comes with precise and fast-acting protection functions such as Miller clamp, overcurrent, and overtemperature protections to achieve unprecedented reliability and availability of SSR designs.

Typical connection diagram



Product specifications at a glance

Part Number	V_{in} range	V_{CC} range	I_{out} peak	V_{out} typ	Features	Package
iSSI20R02H iSSI20R03H	TTL /CMOS	2.85 V –3.5 V	175 uA	13 V at Vin = 2.6 V 15 V at Vin= 3.3 V	TS/CS + MC	DSO-8-66
iSSI20R11H	TTL /CMOS	2.85 V –3.5 V	400 mA	13 V at Vin = 2.6 V >15 V at Vin= 3.3 V	TS, CS	DSO-8-66
iSSI30R11H	TTL /CMOS	2.85 V –3.5 V	400 mA	13 V at Vin = 2.6 V >15 V at Vin= 3.3 V	CS, TS, MC (2)	DSO-16-33
iSSI30R12H	TTL /CMOS	2.85 V –3.5 V	400 mA	13 V at Vin = 2.6 V >15 V at Vin= 3.3 V	CS, TS, MC (2), D-Sense (30R12H)	DSO-16-33

TS: Temperature Sense (input pin for overtemperature protection)
CS: Current Sense (input pin for overcurrent protection)
MC: Miller Clamp
D-Sense: Diode Sense (30R12H Only)



Features and benefits

Product features
– Large input voltage range, compatible with photovoltaic isolators.
– Self-supplied output stage with very high output short circuit
– Very high output voltage, suitable for MOSFETs and IGBTs
– Thermal protection
– Overcurrent protection
– Miller Clamp
– Fast turn-off /-on of output devices
– Power on reset and safety clamp on input stage

Product benefits
– Replaces PVI and improves circuit performances
– No need for isolated supply for the output stage, smaller BOM
– Direct drive of switches' gate, no need for series/parallel
– Switches protection in temperature and current, avoids CdV/dT effect by Miller Clamp
– Ensures safe switching transition of MOSFETs

Full featured evaluation board: EVAL-iSSI30R12H



- Evaluation board with iSSI30R12H and two CoolMOS™ IPT60T022S7 MOSFETs in an AC switch configuration
- Ultrafast overcurrent detection that is triggered at the typical peak current of 35 A
- Direct-chip temperature measurement of CoolMOS™ with shutdown at 155°C

Evaluation board options:

Product type	Voltage range	Current range	Features
EVAL-ISSI20R02HCS	40 V d.c. or 24 V a.c.	10 A d.c. or 7A a.c	– Overcurrent protection at 20 A peak by shunt monitoring, Fast turn-off (<5 µs typ), dynamic Miller clamping
EVAL-ISSI20R02HTS	60 V d.c. or 48 V a.c.	10 A d.c. or 6.5 A a.c.	– Overcurrent protection at 20 A peak by shunt monitoring, Fast turn-off (<5 µs typ), dynamic Miller clamping
EVAL-ISSI20R03H	60 V d.c. or 48 V a.c.	10 A d.c. or 7 A a.c	– Overcurrent protection at 20 A peak by shunt monitoring – PTC Temperature measurement Fast turn-off (<5 µs typ)
EVAL-ISSI20R11H	320 V d.c. or 230 V a.c.	2 A d.c. or a.c.	– Overcurrent protection at 9 A peak by shunt monitoring – Fast turn-off (<5 µs typ)
EVAL-ISSI30R11H	320 V d.c. or 230 V a.c.	10 A d.c. or a.c., 45 A_{Peak}	– PTC Temperature measurement – Fast turn-off of CoolMOS™ (<5 µs typ)
EVAL-ISSI30R12H	320 V d.c. or 230 V a.c.	7 A d.c. or a.c., 45 A_{Peak}	– On-chip junction temperature measurement of CoolMOS™, Fast turn-off of CoolMOS™ (<5 µs typ)
REF_SSR_AC_DC_2A	350 V d.c. or 250 V a.c.	2 A d.c. or a.c.	– On-chip junction temperature measurement of CoolMOS™, Fast turn-off of CoolMOS™ (<5 µs typ)

PD · SSR · UPS · BMS · Battery disconnect · Energy storage · LEV · Commercial HVAC · PLC · Solar

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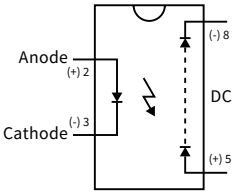
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Infineon solid state relay and isolators package package options



Complementary: Opto-isolated solid state isolators

Typical connection



Photovoltaic isolators generate an electrically isolated DC voltage upon receipt of a DC input signal and are capable of directly driving MOSFET or IGBT gates. The output is controlled by radiation from a GaAlAs light emitting diode (LED) optically isolated from the output

Output voltage DC [V]	Short current [µA]	Nominal control current (DC) [mA]	Isolation voltage [V_{RMS}]	Base PN	Package			
					DIP-8	SMT-8	DIP-8 (with 4 pins)	SMT-8 (with 4 pins)
5/10	10/5	5	3570	PVI5033R	✓	✓		
5/10	10/5	10	2500	PVI1050N	✓	✓		
5	8	10	4000	PVI5080N			✓	✓
5	5	10	4000	PVI5050N				✓

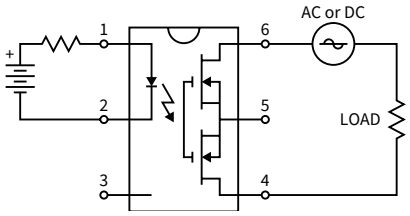
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Complementary: Opto-isolated solid state relays

Typical connection



Microelectronic relays (MER) are power MOSFET or IGBT output photovoltaic relays where the output switch is controlled by radiation from a GaAlAs light emitting diode (LED) optically isolated from the output. MERs are a good choice to replace mechanical relays.

Load voltage [V]	Load current [mA]	$R_{DS(on)}$ [Ω]	Isolation voltage [V_{RMS}]	Base PN	DIP-6	SMT-6	DIP-8	SMT-8	DIP - 4	SMT-8 (with 4 pins)
400	140 AC-DC	27/7	4000	PVU414		✓				
	240 AC-DC	6/2	4000	PVT412A	✓	✓				
	140 AC-DC	27/7	4000	PVT412	✓	✓				
	120 AC-DC	35	4000	PVT422			✓	✓		
300	150 AC-DC	24	4000	PVA3354N					✓	✓
				PVA3324N					✓	
	50 AC-DC	160	4000	PVA3054N						✓
250	170 AC-DC	15/4.25	4000	PVT312L	✓	✓				
	190 AC-DC	10/3	4000	PVT312		✓				
	170 AC-DC	8	4000	PVT322A				✓		
	170 AC-DC	10	4000	PVT322			✓	✓		
200	150 AC-DC	24	4000	PVA2352N					✓	
100	550 DC	1.5	4000	PVD1354N					✓	✓
				PVD1352N					✓	✓
	375 AC-DC	5	4000	PVA1354N					✓	
				PVA1352N					✓	✓
60	2000 AC/4000 DC	0.1/0.035	4000	PVG612A	✓	✓				
	1000 AC/2000 DC	0.5/0.15	4000	PVG612	✓	✓				

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Infineon Solid State Relays (SSR) technologies

Using Infineon power-switch technologies, Infineon Solid State Relays (SSRs) are remotely controlled switches (on/off) with complete galvanic isolation from input to output. No power supply is needed on the output.

Two main sub-groups:

- Isolated: Photovoltaic (PVI) And Coreless Transformer (Solid State Isolators-SSI)
  - Isolated, low-power DC voltage sources capable of driving MOSFET or IGBT gates directly
- Photovoltaic relays (PVR)
  - PVI plus internal power MOSFET

Main benefits of Infineon SSR technology:

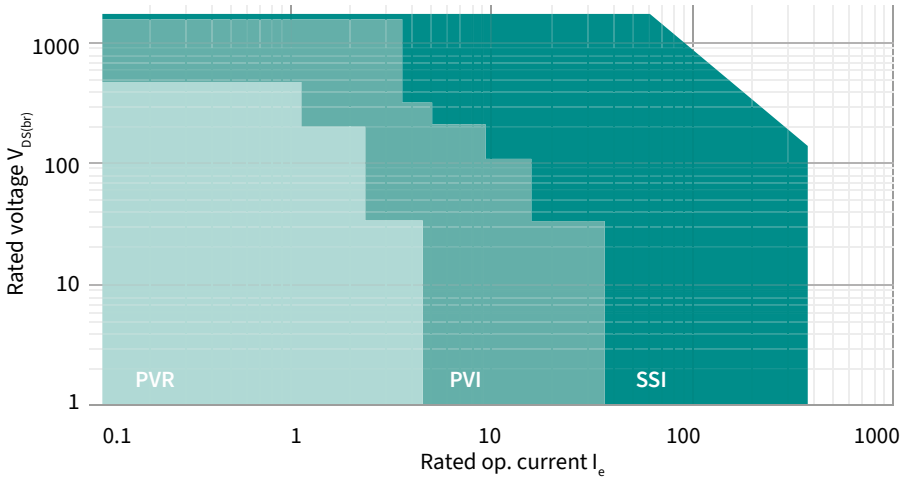
- Optically isolated and Coreless Transformer – based technology provides galvanic isolation for safety applications
- Wide range of applications from industrial automation to test equipment
- Established and reliable products with over 20 years of history

Key advantages over electromechanical relays:

- Low total cost of ownership
- Silent operation
- No contact bounce
- Compact solution
- Fast response time
- High input sensitivity
- High reliability with long operational life
- Insensitivity to stray EMF, shock, and vibration
- Stable contact resistance over life

Infineon SSRs can be used in a wide range of applications:

- Electro-mechanical relay (EMR) replacement
- Battery management systems
- UPS
- Automatic test equipment
- Instrumentation systems
- Industrial automation
- Thermostats
- Programmable logic controller
- Power Distribution Units (PDU)
- Building Automation
- HVAC Controllers



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Features

Addressing various application requirements, Infineon delivers solutions with an assortment of features intended to optimize performance, minimize size and reduce cost. Below is a table of additional gate driver IC features available in the current portfolio.

Features	Abbreviation	Benefits
Active Miller clamp	M-CLAMP	Protection against inadvertent dynamic turn-on because of parasitic Miller effects
Active shutdown	SD-ACT	Ensures a safe IGBT off-state in case the output chip is not connected to the power supply or an undervoltage lockout is in effect
Brake chopper	BRAKE	Integrated brake IGBT driver with protection
Comparator	CMP	General purpose comparator included
Desaturation protection	DESAT	Protects the IGBT at short circuit
Enable	EN	Dedicated pin terminates all outputs
Fault reporting	FAULT-RPT	Indicates an overcurrent or undervoltage shutdown has occurred
Fault reset	FAULT-RST	Dedicated pin resets the DESAT-FAULT-state of the chip
High-voltage start-up	HVSTART	Provides easy and fast circuit start-up while enabling low circuit standby losses
Integrated bootstrap diode	BSD	Integrated bootstrap reduces BOM
Operational amplifier	OPAMP	An independent op-amp for current measurement or overcurrent detection
Oscillator	OSC	Integrated front end oscillator
Overcurrent protection (ITRIP)	OCP	Ensures safe application operation in case of overcurrent
Programmable deadtime	DT-PROG	Deadtime is programmable with external resistor for flexible design
Programmable fault clear time	FLTC	The length of the fault clear time period (t_{FLTC}) is programmed by external capacitor which connected between FLTC and V_{SS} (C_{FLTC}).
Programmable shutdown	SD-PROG	A shutdown feature has been designed into a pin
Separate pin for logic ground	SEP-GND	Dedicated pin or logic ground for improved noise immunity
Separate sink/source outputs	SEP-OUT	Simplifies gate resistor selection, reduces BOM, and improves dV/dt control
Shoot-through protection	STP	Additional shoot-through protection logic such as interlock
Short-circuit clamping	SC-CLAMP	During short circuit the IGBT's gate voltage tends to rise because of the feedback via the Miller capacitance. An additional protection circuit connected to OUT+ limits this voltage to a value slightly higher than the supply voltage.
Shutdown	SD	Dedicated pin disables the IC outputs
Soft overcurrent shutdown	SD-SOFT	Dedicated pin turns off the desaturated transistor, preventing overvoltages
Truly Differential Inputs	TDI	Control inputs independent from gate driver GND, robust against ground shifts from power MOSFET switching
Two-level turn-off	TLTO	Lowers VCE overshoots at turn-off during short circuits or overcurrent events
UL 1577	UL	Double galvanic isolation certification
Undervoltage lockout	UVLO	Ensures safe application operation by avoiding unexpected driver behavior at low voltages
VDE 0884-10 or VDE 0884-11	VDE	Reinforced galvanic isolation certifications for non-optical couplers

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Gate driver ICs for SiC MOSFETs

Ultrafast switching from 650 to 2000 V power transistors, such as CoolSiC™ SiC MOSFETs, can be more easily handled by isolated gate driver solutions.

The following EiceDRIVER™ gate driver ICs incorporate the most important key features for driving SiC MOSFET such as tight propagation delay matching, precise input filters, wide output supply voltage range, negative gate voltage capability, extended CMTI capability, Miller clamp, and DESAT protection.

Product family	Part number	Typ. current	V_{CC2} -V_{EE2}	UVLO	Prop. delay (accuracy)	CMTI	Isolated	Other key features	Package
Achieve high efficiency and power density: take advantage of low propagation delay and high CMTI									
EiceDRIVER™ 1EDB 1-channel family	1EDB9275F 1EDB6275F	5/9 A	20 V	14.9/14.4 V 12.2/11.5 V	45 ns (+6/-4 ns)	300 V/ns	✓	Separate source/sink outputs, fast start-up times and fast recovery, basic isolation, UL 1577	DSO-8, 150 mil
EiceDRIVER™ 2EDi 2-channel family	2EDR9259X 2EDR9258X 2EDR6258X	5/9 A	20 V	14.9/15.4 V 14.9/15.4 V 12.5/11.5 V	38 ns (+9/-5 ns)	150 V/ns	✓	2EDi Gen 2, deadtime control, disable/enable, reinforced isolation, UL 1577, VDE-11, IEC 62368-1, GB4943.1	DSO-14, 300 mil
	2EDB9259Y			14.9/15.4 V			✓	2EDi Gen 2, deadtime control, basic isolation, UL 1577, GB4943.1	DSO-14, 150 mil
EiceDRIVER™ 1EDN-TDI 1-channel family	1EDN6550B 1EDN9550B	4/8 A	20 V	12.2/11.5 V 14.9/14.4 V	45 ns (+10/-7 ns)	N/A	–	Separate source/sink outputs	SOT23-6
EiceDRIVET™ X3 Compact 2-channel family	2ED3146MC12L	6.5/6.5 A	35 V	12.5/13.6 V	50 ns (± 8 ns)	300 V/ns	✓	Active shutdown, deadtime (DT) control with arm shoot-through prevention in half-bridge operation, Individual channel control operation (DT: open or tied to VCC1), enable, Reinforced isolation IEC 60747-17, UL 1577	DSO-14, 300 mil
EiceDRIVER™ 1200 V 6-channel gate driver family	6ED2231S12T	0.35/0.65 A		12.2/11.3 V			–	Integrated bootstrap diodes, integrated overcurrent protection and fault reporting	DSO-24
Avoid parasitic turn-on: take advantage of Miller clamp options									
EiceDRIVER™ 1ED Compact 1-channel family	1EDI20I12MF	4 A	20 V	12.7/10.5 V	300 ns	100 V/ns	✓	Miller clamp, functional isolation	DSO-8, 150 mil
	1EDI60N12AF	10 A	35 V	10/8 V	125 ns	100 V/ns	✓	Separate source/sink outputs, functional isolation	
EiceDRIVER™ X3 Compact 1-channel family	1ED1342MU12F	6.5/6.5 A	35 V	12.5/13.6 V	45 ns (± 7 ns)	300 V/ns	✓	Active shutdown, functional isolation UL 1577	DSO-8, 150 mil
EiceDRIVER™ 2L-SRC Compact 1-channel family	1ED3145MC12H	6.5/6.5 A	35 V	12.5/13.6 V	45 ns (± 7 ns)	300 V/ns	✓	Active shutdown, reinforced isolation IEC 60747-17, UL 1577	DSO-8, 300 mil
	1ED32xxMC12H	10/18 A	35 V	12.5/10.4 V	110 ns (± 15 ns)	200 V/ns	✓	Two-level slew-rate control, Miller clamp, reinforced isolation, UL 1577 and VDE-11	DSO-8, 300 mil
Short-circuit protect your CoolSiC™: take advantage of the fast and accurate DESAT protection									
EiceDRIVER™ 1ED-F3 1-channel family	1ED332xMC12N	3/6 A	35 V	12.6/10.4 V 13.6/12.6 V	85 ns	300 V/ns	✓	Miller clamp, short circuit protection, soft-off, reinforced isolation, UL 1577 and VDE-11	DSO-16, 300 mil
EiceDRIVER™ X3 Analog 1-channel family	1ED34x1MC12M	3/6/9 A	35 V	12.6/10.4 V	244 ns (± 30 ns)	200 V/ns	✓	Analog configurable, fast and accurate short circuit protection and soft turn-off Miller clamp, reinforced isolation, UL 1577 and VDE-11	DSO-16, 300 mil
EiceDRIVER™ X3 Digital 1-channel family	1ED38x0MC12M	3/6/9 A	35 V	12.6/10.4 V default, but adjustable	244 ns (± 30 ns)	200 V/ns	✓	Digital configurable (I^2C), fast and accurate short circuit protection, rich monitoring functionality (predictive maintenance) Miller clamp, reinforced isolation, UL 1577 and VDE-11	DSO-16, 300 mil
EiceDRIVER™ 2ED-F2 2-channel family	2ED020I12-F2	2 A	28 V	12.6/10.4 V	170 ns	50 V/ns	✓	Miller clamp, short circuit protection	DSO-36, 300 mil

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Gate driver ICs for GaN HEMTs

GaN HEMTs represent a key technology for modern power electronics systems, providing high efficiency and power density. Infineon's CoolGaN™ HEMT families and EiceDRIVER™ gate driver ICs are designed to provide the best possible performance in GaN-based systems, minimizing R&D effort and cost. Infineon offers a broad range of EiceDRIVER™ gate driver ICs optimized for driving GaN GIT (gate injection transistor) and SG (Schottky gate) HEMTs.

Recommended drivers for GaN GIT HEMTs and 650 V GaN HEMTs

Infineon's CoolGaN™ GIT technology is based on a hybrid-drain HEMT with a p-GaN gate, resulting in a robust normally-off power switch. To deal with the particularities of this concept, an innovative differential gate-drive concept has been implemented in tailor-made gate driver ICs of the EiceDRIVER™ 1EDx56x3 product family optimized for CoolGaN™ GIT HEMTs. These drivers ensure robust and highly efficient operation of the high-voltage GaN switch while simultaneously minimizing R&D efforts and shortening time-to-market. Infineon's EiceDRIVER™ 1EDx56x3 provides negative V_{GS} voltage, which leads to safe off-states during switching transients. Additionally, it protects the GaN switch against spurious turn-on, even for the first pulse or after a burst mode operation. Thanks to the integrated galvanic isolation, Infineon's EiceDRIVER™ GaN gate driver ICs are best suited to drive high-voltage GaN HEMTs in hard-switching half-bridge applications, such as the totem-pole PFC topology. In many applications, standard gate driver ICs with right fit UVLO protection can also be employed when coupled to an RC circuit to generate both the required small steady-state current and the turn-on/turn-off peak currents. Dual-channel drivers of the EiceDRIVER™ 2EDxx259 product family feature deadtime control (DTC) and shoot-through protection (STP) to ensure safe operation in half-bridge topologies using a single IC. A hybrid gate driving configuration for half-bridge topologies, composed of two single-channel gate driver ICs of the EiceDRIVER™ 1EDBx275F and 1EDNx550B, allows optimizing the driver IC placement on the PCB to minimize the gate loop parasitic inductances. This results in a PCB area saving (compared with a dual-channel gate driver IC), and it comes with a highly competitive bill-of-material (BOM).

To summarize, the 1-channel and 2-channel gate driver ICs of the EiceDRIVER™ family are the best choices to match with Infineon's CoolGaN™ GIT HEMTs and other 650 GaN HEMTs technologies (e.g., Schottky gate, Cascode) to achieve an optimum combination of efficiency, power density, and robustness in high-performance power conversion applications.

Product family	Part number	Current peak sink/ source	VCC2 (-Vee2)	UVLO*	Prop delay	CMTI	Other features	Package
1EDB	1EDB7275F	5 A/-9 A	20 V	4 V	45 ns	300 V/ns	Separate source/sink outputs, fast start-up times and fast recovery, basic isolation, UL 1577	DSO-8 150 mil
	1EDB8275F			8 V				
1EDN-TDI	1EDN7550B	5 A/-9 A	20 V	4 V	45 ns	n. a.	Truly differential inputs to provide high common-mode robustness	SOT23 6-pin
	1EDN8550B	5 A/-9 A		8 V				
2EDB	2EDB7259Y	5 A/-9 A	20 V	4 V	38 ns	150 V/ns	Fast start-up times and fast output clamping, basic isolation, UL 1577	DSO-14 150 mil
	2EDB8259Y			8 V				
2EDR	2EDR7259X	5 A/-9 A	20 V	4 V	38 ns	150 V/ns	Fast start-up times and fast output clamping, reinforced isolation, UL 1577, VDE 0884-17, IEC 60747-17	DSO-14 300 mil
	2EDR8259X			8 V				

Product family	Voltage class	Part number	Output current	Prop. delay	Input logic	Configuration	Package
EiceDRIVER™ general purpose SOI	650 V	2ED21064S06J	0.29/0.7 A	200/200 ns	HIN, LIN	High- and low-side	DSO-14
		2ED21814S06J	2.5/2.5 A		HIN, LIN	High- and low-side	DSO-14
		2ED21824S06J			HIN, LIN	Half-bridge	DSO-14

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* 8 V UVLO parts recommended for bipolar driving or for unipolar driving with V_{DD} ≥10V

Evaluation boards with gate driver ICs for GaN GIT HEMTs and 650 V GaN HEMTs

Our evaluation board helps you to set up and test GaN driving solutions quickly and easily.

EVAL_1EDF_G1B_HB_GAN	EVAL_2EDB_HB_GAN	KIT_1EDB_AUX_GAN
		
High-frequency half-bridge evaluation board featuring EiceDRIVER™ 1EDi-G1.	CoolGaN™ GIT HEMT half-bridge evaluation board with EiceDRIVER™ 2EDB.	Complete driving solution for GaN HEMTs including an isolated gate driver IC with a configurable floating auxiliary supply supporting unipolar and bipolar driving.
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Recommended drivers for GaN SG HEMTs

The 1EDN71x6Gx is a single-channel gate driver IC product family optimized for driving Infineon CoolGaN™ SG HEMTs, as well as other GaN SG HEMTs and Si MOSFETs. This gate driver includes several key features that enable a high-performance system design with fast-switching transistors, including truly differential input (TDI), four driving strength options, active Miller clamp, bootstrap voltage clamp, and with or without adjustable charge pump in PG-SON-10 and PG-TSNP-7 package, respectively.

Product family	PN	Current peak sink/ source	CMR_{static} / $CMR_{dynamic}$	UVLO	Prop delay	CMTI	Other features	Package
1EDN71x6x	1EDN7116G	2.0 A/2.0 A	150 V/200 V	4 V	55 ns	100 V/ns	Negative charge pump, Miller clamp	PG-VSON-10
	1EDN7126G	1.5 A/1.5 A			75 ns			
	1EDN7136G	1.0 A/1.0 A			105 ns			
	1EDN7146G	0.5 A/0.5 A			125 ns			
	1EDN7116U	2.0 A/2.0 A	150 V/200 V	4 V	55 ns	100 V/ns	Miller clamp	PG-TSNP-7
	1EDN7126U	1.5 A/1.5 A			75 ns	100 V/ns		
	1EDN7136U	1.0 A/1.0 A			105 ns	100 V/ns		
	1EDN7146U	0.5 A/0.5 A			125 ns	100 V/ns		
1EDB	1EDB7275F	5 A/-9 A	20 V	4 V	45 ns	300 V/ns	Separate source/sink outputs, fast start-up times and fast recovery, basic isolation, UL 1577	DSO-8 150 mil
	1EDB8275F			8 V				
1EDN-TDI	1EDN7550B	5 A/-9 A	20 V	4 V	45 ns	n. a.	Truly differential inputs to provide high common-mode robustness	SOT23 6-pin
	1EDN8550B	5 A/-9 A		8 V				
2EDB	2EDB7259Y	5 A/-9 A	20 V	4 V	38 ns	150 V/ns	Fast start-up times and fast output clamping, basic isolation, UL 1577	DSO-14 150 mil
	2EDB8259Y			8 V				
2EDR	2EDR7259X	5 A/-9 A	20 V	4 V	38 ns	150 V/ns	Fast start-up times and fast output clamping, reinforced isolation, UL 1577, VDE 0884-17, IEC 60747-17	DSO-14 300 mil
	2EDR8259X			8 V				

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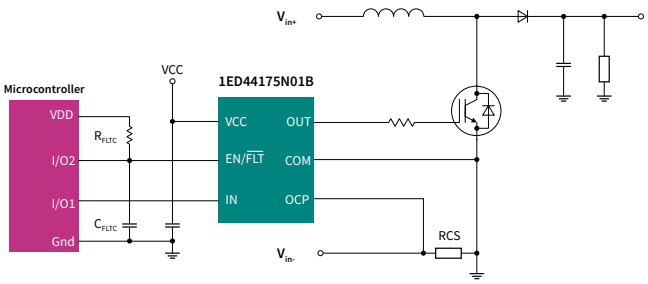
EiceDRIVER™ non-isolated low-side gate drivers

1ED4417x, 1-ch, low-side drivers with integrated protection features

EiceDRIVER™ 1ED4417x family are 25 V, 1-channel low-voltage, non-inverting, low-side gate drivers designed for ground-referenced applications such as power factor correction (PFC) circuits. Typically, overcurrent protection (OCP) is implemented by a current measurement with a comparator, multiple resistors, and capacitors. The 1ED44176N01F, 1ED44175N01B, and 1ED44173N01B provide up to 20 percent cost and 50 percent space savings by integrating a fast and accurate OCP. The new family of low-side gate drivers utilizes Infineon's proprietary latch-immune CMOS technologies to enable a rugged monolithic construction while realizing best-in-class fault reporting accuracy with an OCP threshold tolerance of ±5 percent. In addition, Infineon's IC technology enables a tiny PG-SOT23 package (or DSO-8 for 1ED44176N01) by combining the fault output and enable functions into a single pin.

The family also includes 1ED44171N01B, a cost-effective, simple driver with enable and fault reporting functions. With a single PCB layout, 1ED44171N01B can be a second source option for the popular IRS44273L. Enabling a single-supplier, dual-sourcing strategy for fast-reacting supply flexibility.

Simplified application diagram



Part number	Package	$I_{O\pm}$ [A]	UVLO [V]	V_{OCTH} [mV]	$T_{on/off}$ [ns]	Ground pins	Feature
1ED44171N01B	SOT23-5	2.6/2.6 A	11.9/11.4 V	N/A	50/50 ns	COM	Enable, fault, cost-effective
1ED44173N01B	SOT23-6	2.6/2.6 A	8/7 V	-250 mV	34/34 ns	COM	OCP (negative current sensing), enable, fault
1ED44175N01B	SOT23-6	2.6/2.6 A	11.9/11.4 V	-250 mV	50/50 ns	COM	
1ED44176N01F	DSO-8	0.8/1.75 A	11.9/11.4 V	500 mV	50/50 ns	V_{SS}/COM	OCP (positive current sensing), enable, fault, Programmable fault clear time

Evaluation and reference board

- EVAL-1ED44176N01F
- EVAL-1ED44175N01B
- EVAL-1ED44173N01B
- EVAL-PFC5KIKWWR5SYS
- REF-SHA35WRC2SYS
- REF-AIRCON-C302A-IM564
- EVAL-IHW25N140R5L







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2EDN EiceDRIVER™ family

Rugged, fast, dual-channel low-side 4 A/5 A gate driver ICs

EiceDRIVER™ 2EDN family overview

Dual-channel driver ICs are the crucial link between control ICs and powerful MOSFET, wide bandgap (WBG) switching devices. Driver ICs enable high system level efficiencies, excellent power density, and consistent system robustness.

EiceDRIVER™ 2EDN family: Fast, precise, and compatible

- Highly efficient SMPS enabled by 19 ns propagation delay and 2 ns channel-to-channel mismatch precision for fast MOSFET and WBG switches
- Diversified applications driven by strong output current 4 A/5 A per channel
- Unique designs are supported by the availability of numerous packages

EiceDRIVER™ 2EDN family: The new reference in ruggedness and low power dissipation

- 4 V and 8 V UVLO options for instant FETs protection under abnormal conditions, further improved with active output voltage clamping
- -10 V robustness of control and enable inputs provides crucial safety margin when driving pulse transformers or driving FETs in various packages
- 5 A reverse output current robustness eliminates the need for Schottky switching diodes and reduces bill-of-material
- Cool driver ICs from true rail-to-rail low impedance output stages

Applications

- Servers
- Telecoms
- DC-DC Converters
- Power tools
- Industrial SMPS
- Low speed electrical vehicles
- Solar power inverters
- LED lighting



Key features	Product benefits	System benefits
– 5 A source/sink current – 2 ns channel-to-channel mismatch – 10 ns minimum input pulse width	– Fast Miller plateau transition – Precise timing	– High power efficiency – in hard switching PFC with SiC diode – in half-bridges and synchronous rectifications
– True rail-to-rail low impedance output stages	– Low power dissipation in driver IC	– Cooler driver IC operation – Higher FETs drive capability
– 4 V and 8 V UVLO options, with active output voltage clamping – 19 ns propagation delay for both control and enable	– Fast and reliable FETs turn-off, independent of control IC	– Instant FETs protection under abnormal operation
– -10 V robustness of control and enable inputs	– Increased GND-bounce robustness	– Crucial safety margin to drive pulse transformer
– 5 A reverse output current robustness	– Saves switching diodes	– Increases power density – BOM savings
– Two independent channels	– Option to increase drive current by truly concurrent switching of two channels	– One IC covering many applications
– Industry standard pinout and packages	– Straight forward design upgrades	– Short time-to-market

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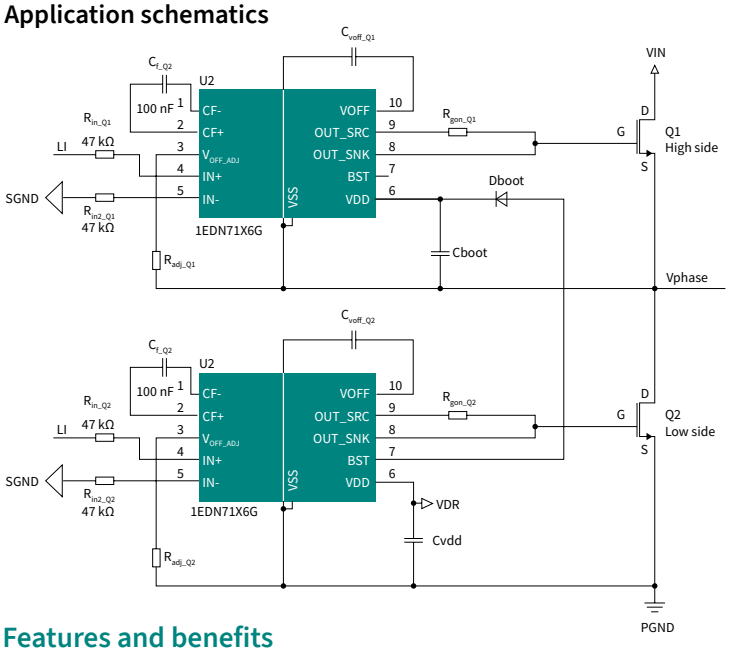
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EiceDRIVER™ 1EDN71x6G/U family

200 V 1-ch gate drivers with truly differential input (TDI)

The 1EDN71x6G/U is a 1-channel gate driver family optimized for Infineon CoolGaN™ Schottky-gate (SG) HEMT and compatible with other GaN SG HEMTs and silicon MOSFETs. The TDI feature eliminates the risk of false triggering due to ground bounce in low-side applications and enables 1EDN71x6G/U to address even high-side applications. The TDI feature works by controlling the gate driver output state exclusively by the voltage difference between the two inputs, completely independent of the driver's reference (ground) potential, as long as the common-mode voltage is below 150 V (static) and 200 V (dynamic).

Application schematics



Features and benefits

Product features	Product benefits
– Truly differential logic input (TDI)	– High-side driving and low-side ground bounce immunity
– Four driving strengths	– Optimize switching speed without external gate resistors
– Active Miller clamp	– Prevent induced turn-on
– Optional negative charge pump	– Additional induced turn-on immunity
– Active bootstrap capacitor	– No overcharging the bootstrap capacitor during deadtime

Product family

Product	Ourput current	Source/sink resistance	Input pulse blanking time	Package
1EDN7116G	2 A	0.8 Ω	20 ns	VSON-10
1EDN7126G	1.5 A	1.0 Ω	40 ns	VSON-10
1EDN7136G	1 A	1.5 Ω	60 ns	VSON-10
1EDN7146G	0.5 A	3.0 Ω	80 ns	VSON-10
1EDN7116U	2 A	0.8 Ω	20 ns	TSNP-7
1EDN7126U	1.5 A	1.0 Ω	40 ns	TSNP-7
1EDN7136U	1 A	1.5 Ω	60 ns	TSNP-7
1EDN7146U	0.5 A	3.0 Ω	80 ns	TSNP-7



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EiceDRIVER™ 1EDL8011, 125 V high-side driver

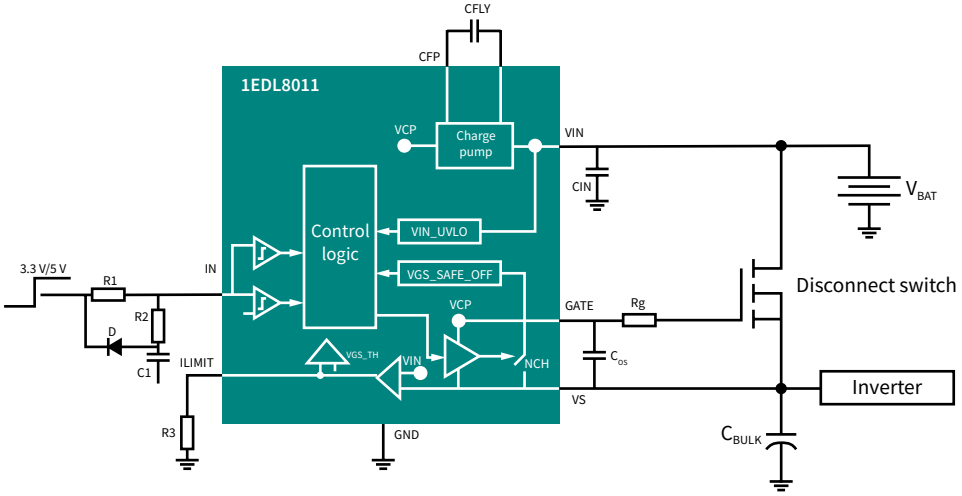
Integrated high-side driver with strong gate drive and integrated charge pump

Infineon's EiceDRIVER™ 1EDL8011 high-side gate driver provides a simple and highly robust solution to drive a disconnect switch to protect battery-operated systems during potential short conditions. 1EDL8011 enables fast turn-on/off control of high-side N-channel MOSFETs due to the powerful internal gate sourcing and sinking current capabilities. It comprises an integrated charge pump with an external capacitor to support strong start-up, turn-off, and scalable FETs in parallel application scenarios. The internal charge pump provides proper MOSFET gate voltage during low operating input voltage conditions. High-side protection avoids faulty shorting conditions in the load and the dangerous presence of in-rush currents for battery-powered applications.

1EDL8011 features include OCP protection, an adjustable current setting threshold, a time delay, and a safe start-up mechanism with flexible blanking during the MOSFET turn-on transition. Input voltage undervoltage lockout (UVLO) avoids operation under hazardous conditions and ensures the right to enhance the MOSFET fully.

The 1EDL8011 gate driver addresses two main use cases in battery-operated systems:

- In-rush current control: allows controlled turn-on of the disconnect switch by using an external R_g combined with a safe start-up and blanking mechanism.
- Short circuit protection: whenever a short occurs at the load side, the load can be disconnected from the source by quickly turning off the disconnect switch. This is made possible by the strong pull-down inside the 1EDL8011, therefore protecting the whole system.





Features and benefits

Product features	Product benefits
– Operating voltage: 7-125 V	– Wide voltage operating range
– Powerful gate sinking current up to 1 A	– Fast turn-off for proper protection
– Off-mode quiescent current 1 µA	– Efficiency and long battery life

Product family

Product	Package	Voltage [A]
1EDL8011	DSO-8	7-125 V

Power tools · Gardening tools · Multicopter · Service robots · eBike · Vacuum cleaner

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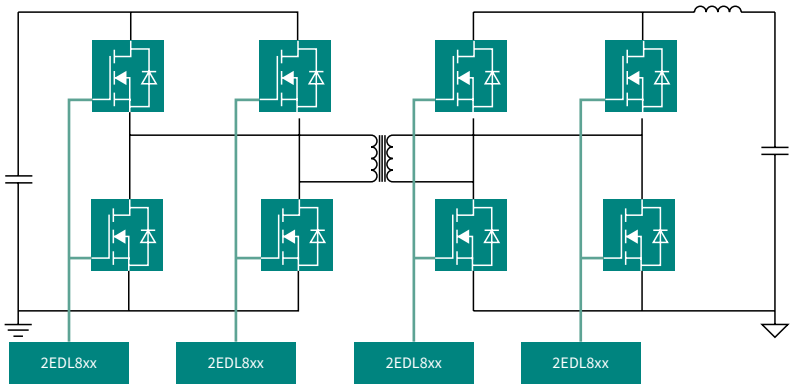
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EiceDRIVER™ 2EDL8x2x family

120 V, 3/4 A, junction-isolated high- and low-side gate drivers

The 2EDL8x2x is a family of high- and low-side gate drivers designed for advanced switching DC-DC converters. The 2EDL802x takes in independent inputs, while the 2EDL812x takes in differential inputs. Both have built-in hysteresis for enhanced noise immunity. The gate driver family comes in two packages: VDSON-8 4x4 mm and VSON-10 3x3 mm.

Application schematics





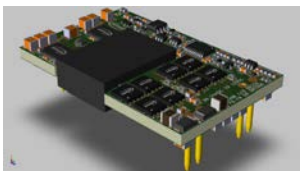
Features and benefits

Product features	Product benefits
– 120 V integrated boot-strap diode with 10 ns reverse recovery time	– Drive strength for fast Miller plateau transition
– 2 to 4 A output source currents	– Fast and robust
– 6 A output sink currents	– Immunity against false triggering from ground bounce
– -8 V/+ 15 V differential input robustness	– No need for Schottky clamping diodes
– 5 A reverse current output robustness	
– ±1 ns (typ.) channel-to-channel delay matching	

Product family

Part number	Input	Source current	Sink current	Min. input pulse width	Propagation delay (typ.)	Matching delay (typ)	ESD	Package
2EDL8123G	Differential	3 A	6 A	40 ns	45 ns	2 ns	2 kV	VDSON-8 4x4 mm
2EDL8124G		4 A						
2EDL8023G	Independent	3 A						
2EDL8024G		4 A						
2EDL8123G3C	Differential	3 A						VSON-10 3x3 mm
2EDL8124G3C		4 A						
2EDL8023G3C	Independent	3 A						
2EDL8024G3C		4 A						

Evaluation board:
EVAL_HB_2EDL8x2xG*
REF_600W_FBFB_QB*



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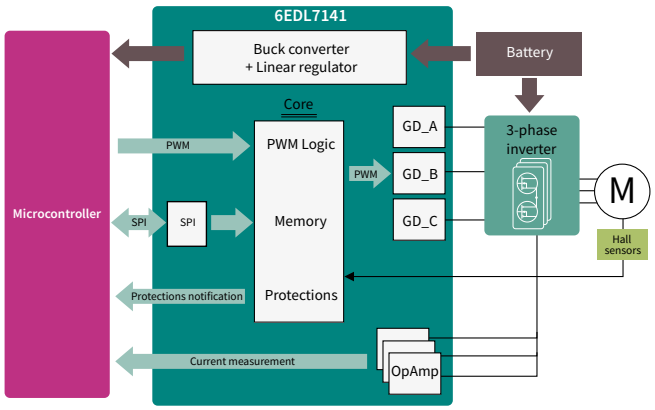
MOTIX™ 6EDL7141 high performance motor control

Next-generation fully programmable three-phase gate driver

6EDL7141, Infineon's latest three-phase motor control gate driver IC, allows our customers to develop their next generation of high-performance battery-operated products using BLDC or PMSM motors. Ideal applications include cordless power tools, gardening products, and automated guided vehicles. With over 50 fully programmable parameters using a built-in digital SPI interface, 6EDL7141 is fully configurable to drive a wide range of MOSFETs to yield the best possible system efficiency. The integrated buck regulator provides power to the microcontroller and the Hall sensors in the motor, further reducing peripheral components and the required PCB area. In addition, with a full suite of system protection features such as OCP, UVLO, overtemperature, and locked rotor detection, this dedicated motor controller will increase reliability and robustness in severe operating fault conditions.

Block diagram

Three-phase BLDC battery-powered motor control





Features and benefits

Key features	Key benefits
– Integrated power supply	– Reduced external components and PCB area
– Programmable slew rate	– Optimized efficiency and EMI
– Programmable gate drive supply	– Maximum flexibility to use different inverter FETs
– 3x current shunt amplifier	– Highly accurate current sense while saving external components
– ADC ref. of 5 V	– Higher dynamic range to increase signal resolution
– Complete dedicated motor control protection suite	– Improve reliability and fault detection



EVAL_6EDL7141_TRAP_1SH

BC 1 shunt evaluation board

Parallel 40 V OptiMOS™ 5 PQFN

XMC1404 MCU

On-board programming dongle

Featured module IC: 6EDL7141

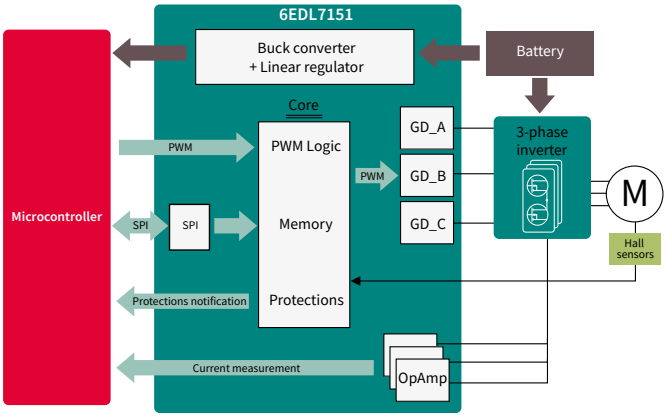
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MOTIX™ 6EDL7151 3-phase smart gate drive controller IC

Three-phase motor control gate driver IC for battery supplied BLDC motor control

The 6EDL7151 is Infineon's latest 3-phase gate driver, which includes an added V_s sensor to allow additional hardware system protection for battery-supplied motor control products. Ideal applications include cordless power tools, gardening products, and automated guided vehicles. With over 50 programmable parameters using a built-in digital SPI interface, 6EDL7151 is fully configurable to drive a wide range of MOSFETs to yield the best possible system efficiency. 6EDL7151 is also designed for maximum performance. Features include programmable deadtime delays for preventing current shoot through between HS and LS switches in normal operation and separate charge pumps for low and high side gate drivers to support 100 percent duty cycle and low voltage supply operation. Supplies for the gate drivers are programmable to one of the following levels: 7 V, 10 V, 12 V, or 15 V. Additionally, the slew rate of the driving signal can be programmed with fine granularity to reduce EMI emissions. An integrated synchronous buck converter provides an efficient current supply to the rest of the system. The 6EDL7151 also integrates a linear voltage regulator (up to 300 mA) powered by the buck converter to supply the MCU and other sensitive components in the system. 6EDL7151 includes three current sense amplifiers for accurate current measurements that support Bidirectional low-side current sensing with programmable gain. $R_{DS(on)}$ sensing is supported through the internal connection of the phase nodes to the current sense amplifier inputs. Temperature compensation, if needed, shall be provided by the user application. 6EDL7151 also includes highly programmable V_{DS} sensors for inverter MOSFET protection. In addition, 6EDL7151 provides numerous protection features for improving application robustness during adverse conditions like monitoring power supply voltages and system parameters. The failure behavior, threshold voltages, and filter times of the device's supervision are adjustable via SPI. Monitored aspects include inverter currents, gate drive voltages and currents, device temperature, and rotor lock.





Features and benefits

Product features	Product benefits
– Integrated power supplies	– Reduced external component count and PCB area
– Adjustable slew rate	– Lower voltage overshoots and EMI reduction
– 3x current shunt amplifier	– Maximum flexibility to use different inverter MOSFET's
– Complete dedicated motor control protection suite	– Highly accurate integrated current sense saves external components
– V_{DS} sensing	– Improved reliability and fault detection

Product family

Product	Package	Voltage [V]	DVDD regulator output [V]
6EDL7151	VQFN 48 7mm x 7mm	5.5-70 V	5.0 V

Power tools · Gardening tools · Multicopter · Service robots · eBike · Vacuum cleaner

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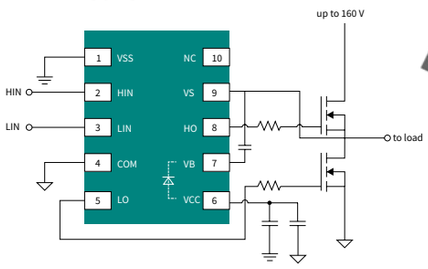
MOTIX™ 160 V SOI gate driver family

2ED27xxS01G half-bridge and high- and low-side gate driver family with integrated bootstrap diode
6ED2742S01Q three-phase driver with charge pump, current sense amplifier, OCP, and bootstrap diode

MOTIX™ 160 V SOI gate driver family is designed for the BLDC motor drive applications. The SOI technology enables integrated bootstrap diodes, which can be used to supply the external high-side bootstrap capacitor. The output drivers feature a high-pulse current buffer stage designed for minimum driver cross-conduction. MOTIX™ 2ED27xxS01G family consists of three half-bridge and three high- and low-side 160 V SOI gate drivers. The UVLO protection is on both V_{CC} and V_B pins. Fast propagation delays (50 ns) are suitable for motor drive and power conversion applications in VSON-10 (3x3 mm) package with an exposed ground pad. MOTIX™ 6ED2742S01Q is a 160 V three-phase SOI gate driver, which supports 100 percent duty cycle operation by a trickle charge pump. Protection features include UVLO, OCP with configurable threshold, fault, and automatic fault clear. A current sense operational amplifier (CSA) with a selectable gain is integrated between the V_{SS} and COM.

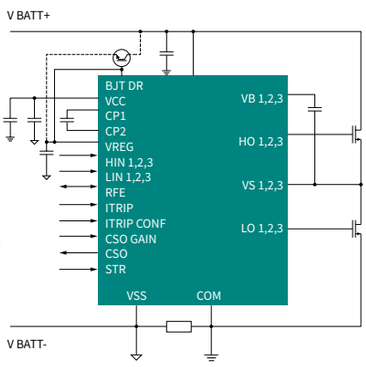
Simplified application diagram

2ED27xxS01G





6ED2742S01Q





Product		Package	Output current	Configuration	Deadtime	Propagation delay
2ED2732S01G	NEW	VSON-10 3x3 mm	1/2 A	High- and low-side (HS+LS)	None	50 ns
2ED2734S01G*			2/4 A			65 ns
2ED2738S01G	NEW		4/8 A			65 ns
2ED2742S01G	NEW		1/2 A	Half-bridge	50 ns	50 ns
2ED2744S01G*			2/4 A			65 ns
2ED2748S01G	NEW		4/8 A			65 ns
6ED2742S01Q		VQFN-32 5x5 mm	1/2 A	Three-phase	100 ns	100 ns
2ED772S01G*		VSON-10 3x3 mm	1/2 A	Half-bridge	30 ns	50 ns
2ED2778S01G*		VSON-10 3x3 mm	4/8 A	Half-bridge	30 ns	65 ns

Applications for MOTIX™ 160 V SOI gate driver family

- Servo/stepper drives in robotics and factory automation
- General purpose low-voltage drives
- Battery-operated small home appliances (SHA)
- Professional and consumer service robotics
- Logistics vehicles (e-forklifts, autonomous warehouse robotics)
- Commercial and agricultural drones
- Hand-held battery-operated power tools
- Garden or outdoor power equipment (OPE) tools
- e-scooters, e-bikes, and other e-vehicles that do not require automotive qualification (LSEV)

6ED2742S01Q key features

- Integrated power management with charge pump and pre-regulator supports wide input voltage range of 6 to 140 V
- Integrated overcurrent protection comparator for single-shunt low side operation with programmable ±5% reference threshold
- Integrated current sense amplifier with programmable voltage gain and ability to read output voltage offset during zero phase current
- Always positive output voltage offset to reduce need for ± V_{REF} for downstream ADC in microcontroller.
- Integrated, per phase, high-side trickle charge pumps to enable 100% duty cycle operation
- Integrated, multi-function RFE pin combines FAULT, FAULT clear, and enable functionality

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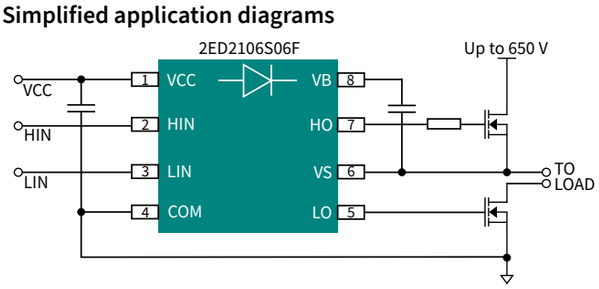
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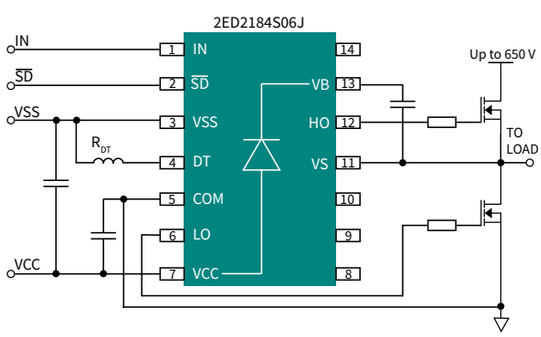
EiceDRIVER™ 650 V level-shift SOI gate driver family

2ED2101/3/4 and 2ED2110: EiceDRIVER™ fast level-shift SOI family with 90 ns prop delay
2ED2106/8/9 and 2ED2181/2/3/4: EiceDRIVER™ general purpose SOI family

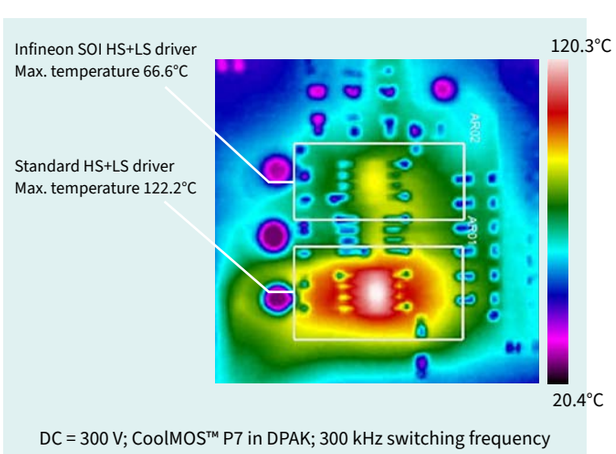
EiceDRIVER™ 650 V SOI is a family of high-voltage, high-speed MOSFET and IGBT gate drivers. Based on Infineon's SOI technology, this family features an integrated, ultrafast, low $R_{DS(on)}$ bootstrap diode and offers excellent ruggedness and noise immunity with tolerance to negative transient voltages of up to -100 V. The absence of parasitic thyristor structures ensures superior latch-up immunity. The level-shift loss is significantly reduced on the EiceDRIVER™ SOI gate drivers compared to other technologies.

Simplified application diagrams





Power dissipation of Infineon SOI

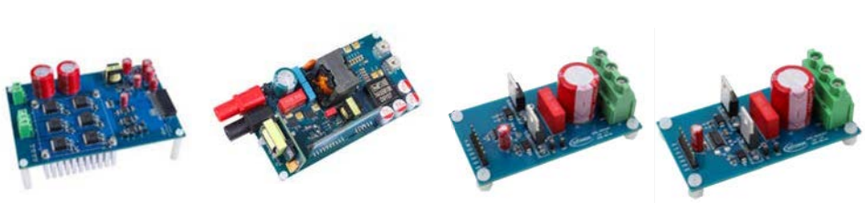


DC = 300 V; CoolMOS™ P7 in DPAK; 300 kHz switching frequency



Evaluation board

EVAL-M1-2ED2106S
EVAL-2ED2101 HB-LLC
EVAL-2ED2184
EVAL-2ED21814



Product family	Part number	Output current	Prop. delay	Input logic	Configuration	Package
EiceDRIVER™ fast level-shift SOI	2ED2101S06F	0.29/0.7 A	90 ns	HIN, LIN	High- and low-side	DSO-8
	2ED2103S06F			HIN, LIN	Half-bridge	
	2ED2104S06F			IN, SD	Half-bridge	
	2ED2388S06F	0.29/0.7 A		HIN, LIN	Half-bridge	
	2ED2110S06M	2.5/2.5 A		HIN, LIN	High- and low-side	DSO-16 WB
EiceDRIVER™ general purpose SOI	2ED2106S06F	0.29/0.7 A	200/200 ns	HIN, LIN	High- and low-side	DSO-8
	2ED21064S06J			HIN, LIN		DSO-14
	2ED2108S06F			HIN, LIN	Half-bridge	DSO-8
	2ED21084S06J			HIN, LIN		DSO-14
	2ED2109S06F		740/200 ns	IN, SD		DSO-8
	2ED21094S06J			IN, SD		DSO-14
	2ED21091S06F			IN, DT/SD		DSO-8
	2ED2181S06F	2.5/2.5 A	200/200 ns	HIN, LIN	High- and low-side	DSO-8
	2ED21814S06J			HIN, LIN		DSO-14
	2ED2182S06F			HIN, LIN	Half-bridge	DSO-8
	2ED21824S06J			HIN, LIN		DSO-14
	2ED2183S06F			HIN, LIN		DSO-8
	2ED21834S06J			HIN, LIN		DSO-14
	2ED2184S06F		600/200 ns	IN, SD		DSO-8
	2ED21844S06J			IN, SD		DSO-14

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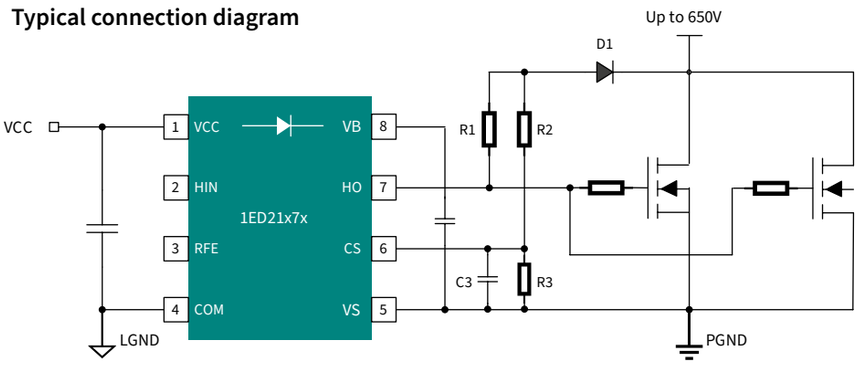
New EiceDRIVER™ 650 V high-side single-channel in DSO-8

1ED2127S65F, 1ED21271S65F, 1ED2147S65F, 1ED21471S65F

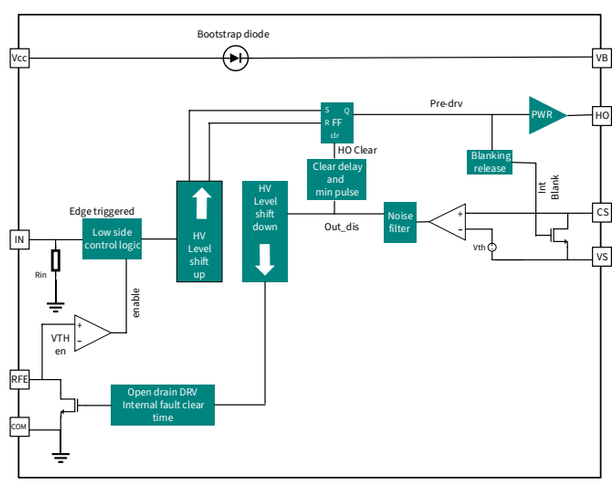
The 1ED21x7x family is a high-voltage, high-current and high-speed gate driver for Si/SiC power MOSFETs and IGBTs. The floating channel can drive a Si/SiC power MOSFET or IGBT in the high-side or low-side configuration, operating up to 650 V, with an output current of ±4 A and a propagation delay of less than 100 ns.

Based on Infineon's SOI technology, there is excellent ruggedness and noise immunity, which can maintain operational logic at negative transient voltages up to -100 V. The overcurrent protection and undervoltage lockout circuit detects overcurrent or undervoltage in the driven power transistor and terminates the gate drive voltage. An open drain FAULT signal indicates that an overcurrent shutdown has occurred.

Typical connection diagram



Typical connection diagram



Sales name	Breakdown voltage	Switches	UVLO (typ.)	CS/OCP current sensitivity
1ED2127S65F	650 V	IGBT	10.3V/9.0V	0.25V
1ED21271S65F	650 V	MOSFET	7.2V/6.8V	1.8V
1ED2147S65F	650 V	MOSFET	7.2V/6.8V	0.25V
1ED21471S65F	650 V	IGBT	10.3V/9.0V	1.8V

Full featured evaluation board: EVAL-1EDSIC-PFC-5KW



The EVAL-1EDSIC-PFC-5KW is a complete system solution for a 5 kW interleaved totem pole power factor correction (PFC). It has been designed to address the growing need for enhanced efficiency in power supply units for home appliances. The overall board's dimensions are 218 mm x 170 mm x 60 mm with a power density of (36 W/in^3).

Forklift LEV Drives Battery disconnect High power

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New EiceDRIVER™ 650 V and 300 V 6ED family in TSSOP-25

6EDL04I065NR, 6EDL04I065PR, 6EDL04N065PR, 6EDL04N03PR

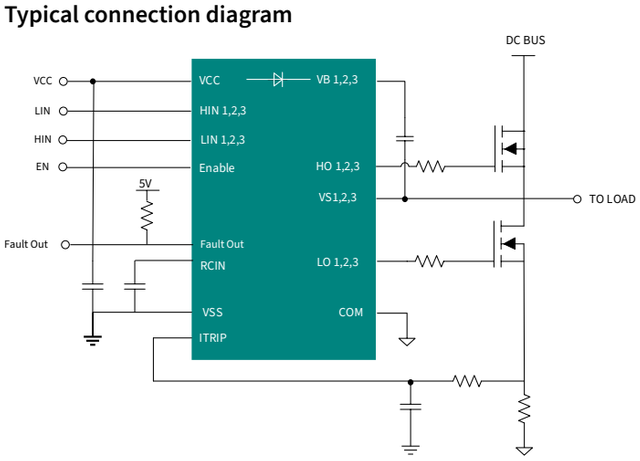
Infineon's next-generation 6ED family is now available in a compact TSSOP-25 package. Compared to standard DSO-28 3-phase gate drivers, the TSSOP-25 package offers a 65 percent reduction in footprint size, enabling PCB space and cost savings. Two pins are removed to support a sufficient creepage distance of 1 mm.

The EiceDRIVER™ 6ED family of high-voltage gate driver ICs is designed to drive power MOSFETs or IGBTs in 3-phase motor drive applications such as home appliances, fans, pumps, and more. The new 6-channel family offers a higher maximum blocking voltage of up to +650 V compared to the industry-standard competition and source/sink current +0.165 A/-0.375 A.

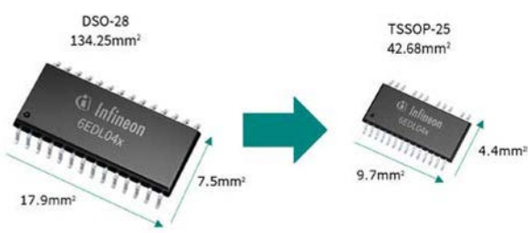
Because the 6ED family utilizes Infineon's unique silicon-on-insulator (SOI) technology, they offer excellent ruggedness on transient voltages. No parasitic thyristor structures are present in the device. Hence, no parasitic latch-up may occur at all temperatures and voltage conditions. Infineon's SOI technology also enables the integration of ultrafast, low ohmic bootstrap diode (40 Ω).

The 6ED family offers additional integrated protection features such as undervoltage lockout (UVLO), accurate overcurrent protection, programmable fault communication, and signal interlocking of every phase to prevent cross-conduction.

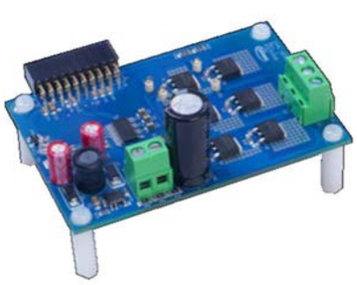
Typical connection diagram



Package comparison:
TSSOP-25 offers 65% shrink compared to DSO-28



Sales name	Breakdown voltage	Control logic	Io ± (typ.)	UVLO (typ.)	Deadtime	Integrated bootstrap diode
6EDL04I065NR	650 V	Negative	+0.165 A/ -0.375 A	11.7 V/9.8 V	310 ns	✓ (40 Ω)
6EDL04I065PR	650 V	Positive				
6EDL04N065PR	650 V	Positive		9 V/8.1 V		
6EDL04N03PR	300 V	Positive				



Full featured evaluation board: EVAL-6EDL04I065PR

EVAL-6EDL04I065PR is intended to drive a brushless direct current (BLDC) motor by connecting it to an external controller board such as iMOTION™ EVAL-M1-101T. The evaluation board for the device is coming soon. It is designed to evaluate the 650 V SOI three-phase gate driver 6EDL04I065PR along with six TRENCHSTOP™ IGBTs IKD06N60RC2.

Home appliance · Sewing machine · Motor · LV-drives

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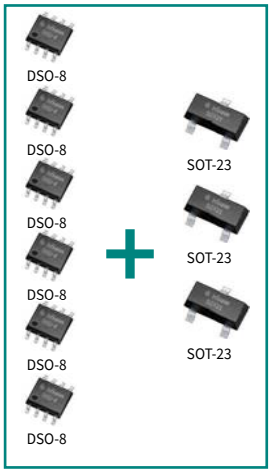
EiceDRIVER™ 1200 V level-shift SOI gate driver family

6ED223x: 1200 V three-phase SOI driver with OCP and bootstrap diode
2ED132x: 1200 V half-bridge and high- and low-side SOI driver with OCP, Miller clamp, and bootstrap diode

The 6ED2231S12T is a 1200 V three-phase SOI gate driver with 0.35 A/0.65 A current in a DSO-24 package (DSO-28 with four pins removed). The 2ED132x family consists of four 1200 V SOI gate drivers in half-bridge or high- and low-side configurations. The 2ED132x family offers a 2.3 A output current in the high creepage (8 mm)/ clearance DSO-20 wide body package or a higher sink option (4.6 A) in the DSO-16 wide body package. Both 6ED2231S12T and the 2ED132x family integrate ultrafast overcurrent protection (OCP) with ± 5 percent accuracy and bootstrap diode. In addition, the 2ED132x family also integrates an active Miller clamp.



Current solutions
6 x opto-isolated drivers +
3 x 1200 V bootstrap diodes



- Space savings
- Cost savings
- Easy to design
- Higher reliability
- Faster time-to-market

New 6ED2231S12T
Integrates 6x gate driver functionality and
3x boot-strap diodes
Overcurrent protection
IGBT/SiC MOSFET UVLOs



6ED2231S12T easily fits within EasyPIM™ 1B module footprint



EVAL-M1-6ED2231-B1

Features and benefits

Key features	Key benefits	Customer value
– Leading negative VS immunity	– Increased robustness and reliability resulting in reduced manufacturing and field failures	– Increased profitability from lower lifecycle costs
– >50% lower level-shift switching losses	– Reduced power dissipation, lower temperature	– Faster time-to-market for higher share capture
– Integrated bootstrap diode	– Faster frequency switching	– Enables new applications
– 1200 V breakdown voltage	– Smaller PCB footprints	– Increased flexibility
– Integrated input filters	– Reduced BOM costs	– Increased reliability
	– Improved noise sensitivity	
	– Latch-up immunity	

Product name		Configuration	Package	Output current	Key features	Deadtime	T_{ON}/T_{OFF}
6ED2231S12T	NEW	Three-phase	DSO-24 (DSO-28 with 4 pins removed)	0.35/0.65 A	OCP, RFE	460 ns	700/650 ns
2ED1324S12P	NEW	Half-bridge	DSO-20WB (20 fine pitch leads)	2.3/2.3 A	OCP, SOFF, AMC, RFE	380 ns	500 ns
2ED1323S12P	NEW	HS+LS	DSO-20WB (20 fine pitch leads)	2.3/2.3 A	OCP, SOFF, AMC, RFE	None	350 ns
2ED1322S12M	NEW	Half-bridge	DSO-16WB (300mil)	2.3/4.6 A	OCP, SOFF, RFE	400 ns	500 ns
2ED1321S12M	NEW	HS+LS	DSO-16WB (300mil)	2.3/4.6 A	OCP, SOFF, RFE	None	350 ns

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2EDi EiceDRIVER™ family

Fast, robust, dual-channel galvanic isolated gate-river ICs

Galvanic isolated EiceDRIVER™ family overview

The 2EDi is a family of dual-channel isolated gate driver ICs designed to drive Si MOSFETs, SiC MOSFETs, and GaN power switches. Isolation is achieved by using Infineon's coreless transformer (CT) technology, which guarantees robust operation and industry benchmark common-mode rejection (CMTI). The high propagation delay accuracy and low channel-to-channel mismatch make the product ideal for fast-switching power systems. In addition, high CMTI, high reverse current capability and fast clamping of the output below UVLO guarantees reliable operation in the application.

2EDi Gen 2: What is new?

- New DSO-8 4x4 package
- DSO-14 packages with increased channel-to-channel creepage to easier the layout easier or enable the use with higher working voltages or worst pollution layout
- Fulfills the latest component standard for magnetic couplers (IEC 60747-17)
- Programmable deadtime and shoot-through functionality

Applications

- Servers
- Telecoms
- DC-DC converters
- Power tools
- Industrial SMPS
- Low speed electrical vehicles
- Solar power inverters
- LED lighting
- Home appliances air conditioner
- Motor drivers
- Battery chargers
- EV chargers
- OBC-DC-DC
- Microinverters



Features and benefits

Key features	Key benefits	Customer value
– Fast power switching with accurate timing – 5 A/9 A source/sink currents – Propagation delay typ. 38 ns with 6 ns channel-to-channel precision	– Efficiency gain and lower losses – Strong driving enables reduced switching losses – Accurate timing enables deadtime optimization or synchronized driving in case of parallel MOSFETs	– Enabling higher system efficiency and higher power density designs
– Optimized for area and system BOM – <1 Ω source and sink output resistance – Output stages with 5 A reverse current capability	– Improved thermal behavior at smaller form factor – Most of the driving power is dissipated externally with reduced thermal stress on the driver – Eliminates two costly protection diodes on the gate driver outputs	– Improving long term competitive cost position, integration and mass manufacturability
– Robust – CMTI >150 V/ns – Undervoltage lockout function for switch protection – Deadtime control and shoot through protection	– Protection and safe operation – Reliable driver operation against fast switching transients – MOSFET is protected from thermal stress in abnormal conditions – Protection against noise and spurious pulses	– Extending end-product lifetime by improving safe operation of power switches in normal and abnormal field (grid) conditions
– Output-to-output channel isolation – Functional level galvanic isolation	– Flexible configurations – High-side + low-side, high-side + high-side, low-side + low-side	– Lower EMI by ground isolation
– Input-to-output channel isolation – Functional, basic, and reinforced galvanic isolation	– Regulatory safety – Functional for level-shifting and ground bounce immunity – Reinforced for control of primary-side MOSFETs from secondary-side controller	– Simplified safety approval through component standards (UL1577, IEC60747-17) and system standards (IEC62368) certificates

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EiceDRIVER™ X3 Compact and 2L-SRC Compact

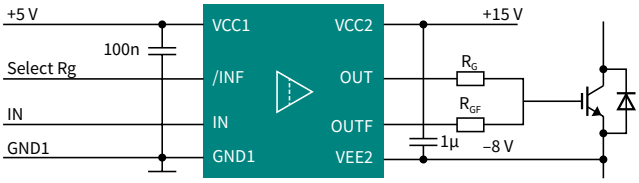
5.7 kV, 18 A, 1-ch, isolated drivers with Miller clamp and two-level Slew-rate control

The EiceDRIVER™ X3 Compact family (1ED31xx) provides Miller clamp or separate output options with up to 14 A currents in DSO-8 150 mil and 300 mil packages. The EiceDRIVER™ 2L-SRC Compact family (1ED32xx) provides Miller clamp or two-level Slew-rate control options with up to 18 A current in DSO-8 300 mil package. The Miller clamp function is highly recommended for SiC MOSFET 0 V turn-off and TRENCHSTOP™ IGBT7 against parasitic turn-on. The two-level Slew-rate control function allows customers to change the output current on the fly. It is highly recommended for industrial drive applications where customers suffer from EMI and switching loss optimization. Both EiceDRIVER™ X3 Compact and 2L-SRC Compact families are rated up to 2300 V functional isolation and 200 kV/µs CMTI. They are ideal for IGBTs, Si MOSFETs, and SiC MOSFETs in applications like solar inverter, EV-charging, industrial drives, CAC, industrial induction cooking, CAV, UPS, server and telecom SMPS, etc.

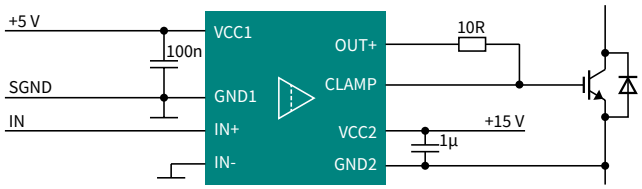


Simplified application diagram

Two-level Slew-rate control (1ED3241MC12H)



Active Miller clamp (1ED3122MC12H)



Evaluation board

EVAL-1ED3121MX12H
EVAL-1ED3122MX12H
EVAL-1ED3124MX12H
EVAL-1ED3241MC12H
EVAL-1ED3251MC12H
REF-22K-GPD-INV-EASY3B





Family	Part number	Typ. output current	Feature	Prop. delay	Input filter	UVLO	Prop.delay matching	Package	Isolation rating
EiceDRIVER™ X3 Compact	1ED3127MU12F	10 A	Miller clamp	90 ns	30 ns	12 V	7 ns	DSO-8 150 mil	UL 1577: VISO = 3 kV_{RMS}
	1ED3125MU12F	10 A				10.5 V			
	1ED3140MU12F	6.5 A	Separate output	45 ns	15 ns	8.5 V			
	1ED3141MU12F	6.5 A				11 V			
	1ED3142MU12F	6.5 A				12.5 V			
	1ED3124MU12F	14 A		90 ns	30 ns	10.5 V			
	1ED3141MC12H*	6.5 A		45 ns	15 ns	11 V		DSO-8 300 mil	UL 1577: V_{ISO} = 5.7 kV_{rms} IEC 60747-17 V_{IORM} = 1.767 kVrms
	1ED3142MC12H*	6.5 A		45 ns	15 ns	12.5 V			
	1ED3143MC12H*	6.5 A	UVLO2 refers GND2	45 ns	15 ns	11 V			
	1ED3144MC12H*	6.5 A		45 ns	15 ns	12.5 V			
	1ED3145MC12H*	6.5 A	UVLO2 adjustable	45 ns	15 ns	Adjustable			
	1ED3122MC12H	10 A	Miller clamp	90 ns	30 ns	8 V			UL 1577: V_{ISO} = 5.7 kV_{RMS} VDE 0884-11: V_{IORM} = 1767 V (reinforced)
	1ED3123MC12H	14 A	Separate output			8 V			
	1ED3124MC12H	14 A				10.5 V			
EiceDRIVER™ 2L-SRC Compact	1ED3240MC12H	10 A	Turn-on and turn-off Slew-rate control	110 ns	30 ns	10.5 V	15 ns		
	1ED3241MC12H	18 A				10.5 V			
	1ED3250MC12H	10 A	Turn-on Slew-rate control and Miller clamp			10.5 V			
	1ED3251MC12H	18 A				10.5 V			

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* Coming soon

EiceDRIVER™ X3 Compact Gen 2 product family

Single-channel isolated gate driver for functional or reinforced isolation

1ED3140MU12F, 1ED3141MU12F, 1ED3142MU12F, 1ED3141MC12H 1ED3142MC12H, 1ED3143MC12H, 1ED3144MC12H, 1ED3145MC12H

The EiceDRIVER™ Compact 1ED314x products are high-performance single-channel galvanically isolated gate driver ICs. This family is available in either a 150 mil DSO-8 package with 4 mm creepage and clearance or a 300 mil DSO-8 package with 8 mm creepage and clearance suitable for most industrial applications. The creepage and clearance offered by these packages meet the requirements for fulfilling applications' functional or reinforced isolation. The excellent part-to-part propagation delay matching of only 7 ns reduces the required deadtime during switching, and the strong output stage provides driving currents up to 6.5 A. These features enable high-efficiency power conversion when using IGBTs or SiC MOSFETs in high-switching frequency applications. The best-in-class common mode transient immunity (CMTI) rating of 300 kV/µs ensures smooth operation of the gate driver and the system even under very fast switching conditions. The high absolute maximum rating of the output supply voltage enables the straightforward driving of SiC MOSFET and IGBT with unipolar and bipolar voltage configurations. Undervoltage lockout (UVLO) options in the 1ED314x family cater to the driving voltage requirements of silicon MOSFETs, IGBTs, and SiC MOSFETs. The isolation capabilities of the gate drivers are planned to be certified under UL 1577 and IEC 60747-17. The 1ED314x product family is an excellent choice for applications such as electric vehicle charging stations, solar inverters, energy storage systems, uninterruptible power supplies, high-voltage air-conditioners, switched-mode power supplies, and industrial drives.

Features

Product features
– 35 V absolute maximum output supply voltage
– 6.5 A peak output driving current
– Very short propagation delay (40 ns) and part-to-part tolerance (7 ns)
– UVLO options for Si MOSFETs, IGBTs, and SiC MOSFETs
– Active shutdown
– 150 mil and 300 mil DSO 8-pin standard packages
– Certified according to UL 1577 and IEC 60747-17 (planned) standards



DSO-8 150 mil package



DSO-8 300 mil package

150 mil product family

Product name	Package information			Typical UVLO2 (VUVLOL2/VUVLOH2)	UVLO ref.	Output type	Certification	Isolation voltage
	Type	CTI	CLR/CPG					
1ED3140MU12F	DSO-8, 150 mil	400	4 mm/4 mm	8.5 V/9.3 V	VEE2	Separate	UL 1577	V_{ISO} = 3000 V (rms)
1ED3141MU12F				11.0 V/12.0 V				
1ED3142MU12F				12.5 V/13.6 V				

300 mil product family

Product Name	Package information			Typical UVLO2 (VUVLOL2/VUVLOH2)	UVLO ref.	Output type	Certification	Isolation voltage
	Type	CTI	CLR/CPG					
1ED3141MC12H	DSO-8, 300 mil	600	8 mm/8 mm	11.0 V/12.0 V	VEE2	Separate	UL 1577 (pending) IEC 60747-17 (planned)	V_{ISO} = 5700 V (rms) V_{IORM} = 1767 V (pk)
1ED3142MC12H				12.5 V/13.6 V	VEE2	Separate		
1ED3143MC12H				11.0 V/12.0 V	GND2	Combined		
1ED3144MC12H				12.5 V/13.6 V	GND2	Combined		
1ED3145MC12H				Adjustable	VCC2	Combined		

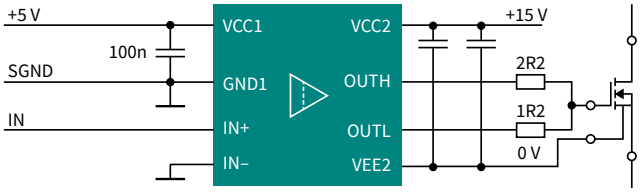
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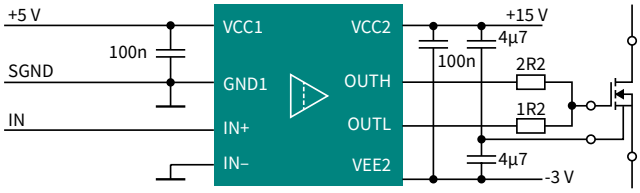
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Typical application schematic

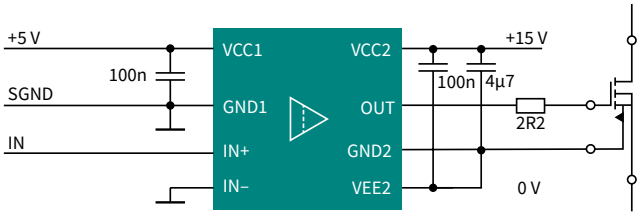
Separate output for unipolar driving,
UVLO2 referred to VEE2



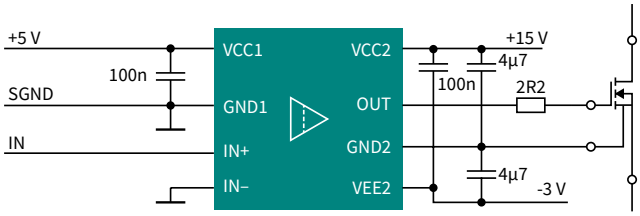
Separate output for bipolar driving,
UVLO2 referred to VEE2



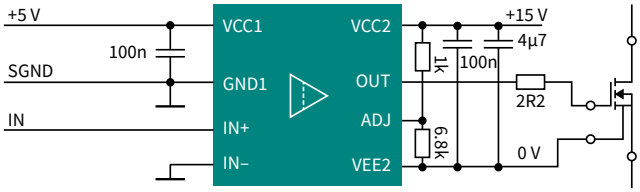
Combined output for unipolar driving,
UVLO2 referred to GND2



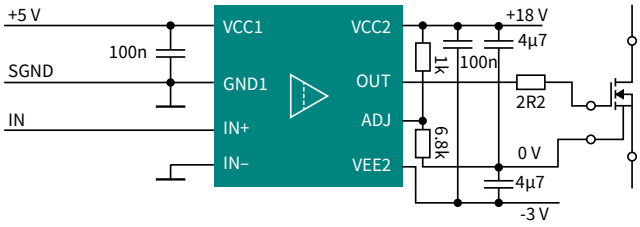
Combined output for bipolar driving,
UVLO2 referred to GND2



Combined output for unipolar driving,
UVLO2 adjustable



Combined output for bipolar driving,
UVLO2 adjustable



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EiceDRIVER™ X3 Compact 2ED314xMC12H

Dual-channel isolated gate driver with reinforced isolation

2ED3140MC12L, 2ED3141MC12L, 2ED3142MC12L, 2ED3143MC12L, 2ED3144MC12L, 2ED3145MC12L, 2ED3146MC12L, 2ED3147MC12L

The EiceDRIVER™ Compact 2ED314x products are high-performance dual-channel galvanically isolated gate driver ICs. The 300 mil DSO-14 package offers an input-to-output creepage and clearance of 8 mm and an output channel-to-channel distance of 3.3 mm. The reinforced isolation between input and output and the functional isolation between the outputs meet the requirements of most industrial applications. With only a 39 ns propagation delay and 8 ns channel-to-channel mismatch, the gate drivers support all high-frequency switching applications. The 6.5 A output current allows these ICs to be used with many IGBT and SiC MOSFETs in discrete and power module packages. The deadtime control pin (DT) enables the dual-channel or the half-bridge mode. In half-bridge mode, the gate driver implements a shoot-through protection with configurable deadtime. The established coreless transformer isolation technology offers high common mode transient immunity (CMTI) for robust signal transmission in high dV/dt application conditions. The maximum output supply rating of 35 V is optimized to drive SiC MOSFET and IGBT with unipolar or bipolar gate voltages. The 2ED314x has UVLO options for Si MOSFETs, IGBTs, and SiC MOSFETs. The products are planned with UL 1577 and IEC 60747-17 certifications to support a broad range of applications, such as electric vehicle charge stations, solar inverters, energy storage systems, uninterruptible power supplies, high voltage air-conditioners, and switched-mode power supplies.

Features

Product features
– 35 V absolute maximum output supply voltage
– 6.5 A peak output driving current
– Short propagation delay (39 ns) and part-to-part tolerance (8 ns)
– UVLO options for Si MOSFETs, IGBTs, and SiC MOSFETs
– Active shutdown
– Output enable or disable logic control pin
– Selectable dual-channel (non-interlocked) or half-bridge (interlocked) mode
– Shoot-through protection with configurable deadtime in half-bridge mode
– 300 mil DSO-14 package
– UL1577 (pending) and IEC 60747-17 certified (planned)

Product family

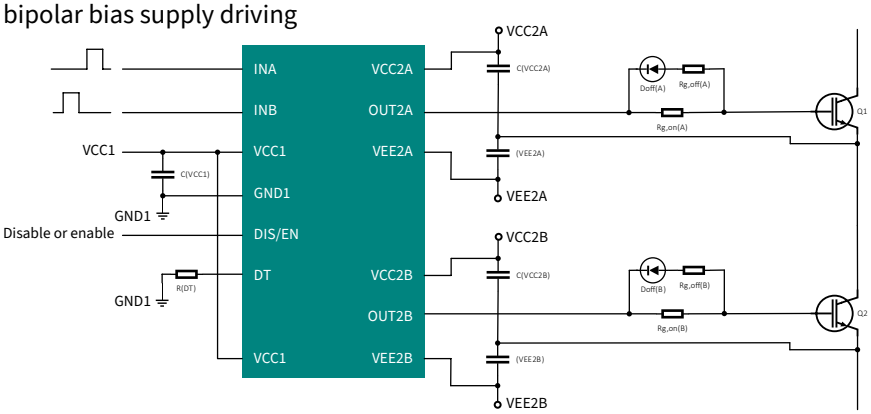
Product name	Package information			Typical UVLO2 (VUVLOL2/VUVLOH2)	UVLO ref.	Output type	Certification	Isolation voltage
	Type	CTI	CLR/CPG					
2ED3140MC12L	DSO-14, 300 mil	400	8 mm/8 mm	3.3 mm/3.3 mm	8.5 V/9.3 V	DIS	UL 1577 (pending) IEC 60747-17 (planned)	V_{ISO} = 5700 V (rms) V_{IORM} = 1767 V (pk)
2ED3141MC12L					11.0 V/12.0 V	DIS		
2ED3142MC12L					12.5 V/13.6 V	DIS		
2ED3143MC12L					14.7 V/16.0 V	DIS		
2ED3144MC12L					8.5 V/9.3 V	EN		
2ED3145MC12L					11.0 V/12.0 V	EN		
2ED3146MC12L					12.5 V/13.6 V	EN		
2ED3147MC12L					14.7 V/16.0 V	EN		

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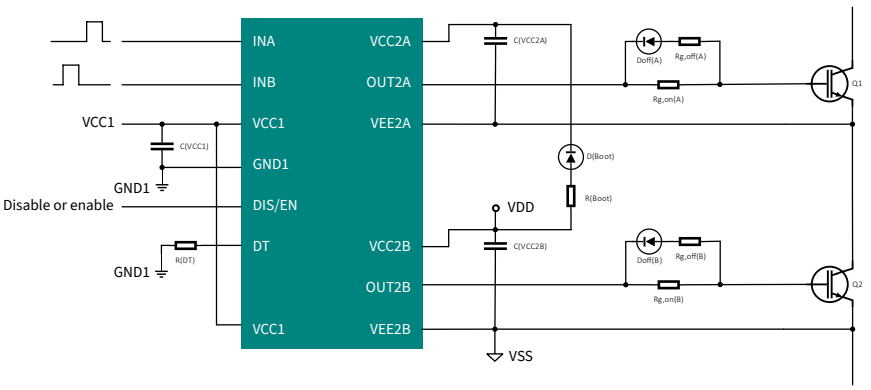
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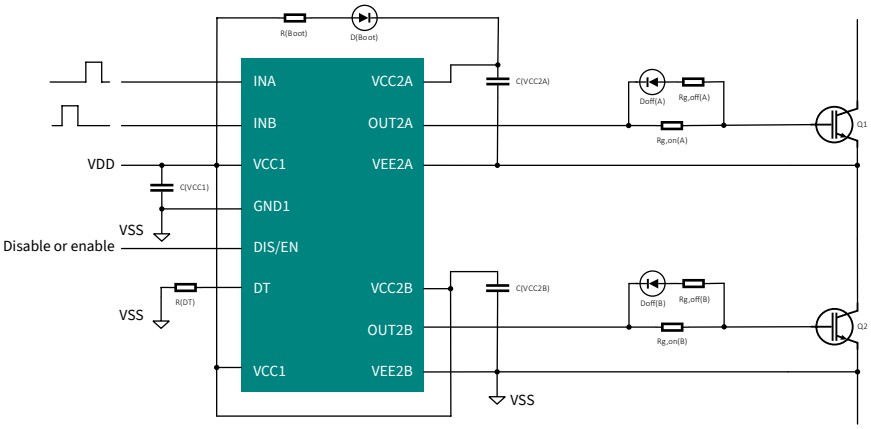
Half-bridge, full isolation configuration of input, output, and Ch-to-Ch with bipolar bias supply driving



Half-bridge, isolation configuration of input and output only, Ch-to-Ch with unipolar bootstrap bias supply driving



Half-bridge, non-isolation configuration of input, output, and Ch-to-Ch with unipolar bootstrap bias supply driving



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EiceDRIVER™ Enhanced 1ED-F3 and X3 Analog

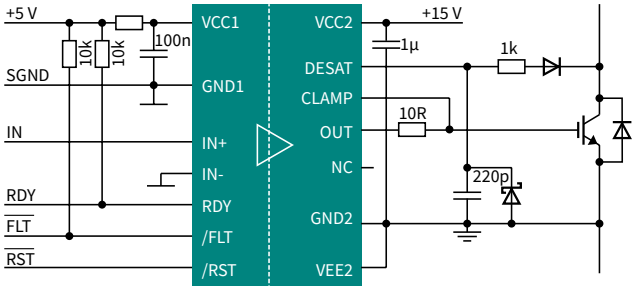
5.7 kV, 9 A, 1-ch, isolated drivers with DESAT, Miller clamp, and soft-off

The EiceDRIVER™ Enhanced 1ED-F3 family (1ED332x) provides DESAT, Miller clamp and soft-off features with up to 6 A current in a DSO-16 300 mil package. The EiceDRIVER™ Enhanced X3 Analog family (1ED34xx) provides a Miller clamp, resistor configurable DESAT, and soft-off function with up to 9 A current in a DSO-16 300 mil fine pitch package. The 1ED-F3 family (1ED332x) is pin-to-pin with our previous generation 1ED020I12-F2 (1ED-F2), with higher current, shorter propagation delay, higher isolation ratings, and additional soft-off function. The X3 Analog family (1ED34xx) offers best-in-class DESAT protection accuracy with the resistor configurability on the DESAT filter and leading edge blanking time and soft-off current. Both EiceDRIVER™ Enhanced 1ED-F3 and X3 Analog families are rated up to 2300 V functional isolation and 200 kV/µs CMTI. They are ideal for IGBTs, Si MOSFETs, and SiC in applications like solar inverters, EV-charging, industrial drives, CAC, industrial induction cooking, CAV, UPS, server and telecom SMPS, etc.

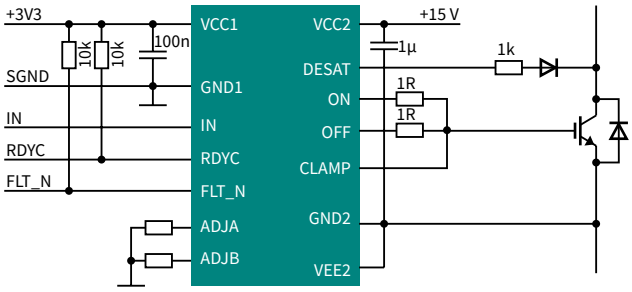


Simplified application diagram

1ED-F3 (1ED332x)



X3 Analog (1ED34xx)



Evaluation board



EVAL-1ED3321MC12N
EVAL-1ED3491MX12M

Family	Part number	Typ. output current	Feature	Prop. delay	Input filter	UVLO	Prop.delay matching	Package	Isolation rating
EiceDRIVER™ Enhanced 1ED-F3	1ED3320MC12N	3/6 A	Miller clamp, DESAT, soft-off	80 ns	35 ns	10.5 V	15 ns	DSO-16 300mil	UL 1577: V_{ISO} = 5.7 kV_{RMS} VDE 0884-11: V_{IORM} = 1767 V (reinforced)
	1ED3321MC12N	6/8.5 A				10.5 V			
	1ED3322MC12N	6/8.5 A	Miller clamp, DESAT			12 V			
	1ED3323MC12N	6/8.5 A				10.5 V			
EiceDRIVER™ Enhanced X3 Analog	1ED3431MC12M	3 A	Miller clamp, resistor adjustable DESAT, and soft-off	236 ns	100 ns	10.5 V	30 ns	DSO-16 300mil fine pitch	
	1ED3461MC12M	6 A	Clamp driver, resistor adjustable DESAT, and soft-off			10.5 V			
	1ED3491MC12M	9 A				10.5 V			

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EiceDRIVER™ Enhanced X3 Digital

5.7 kV, 9 A, 1-ch, isolated drivers with I²C configurability for DESAT, Miller clamp, soft-off, and many more

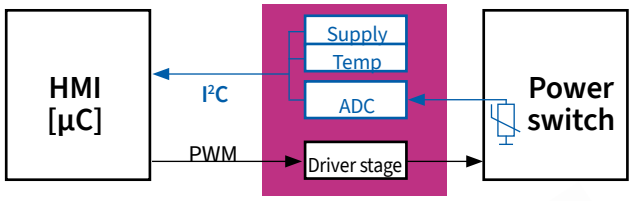
The EiceDRIVER™ Enhanced X3 Digital family (1ED38xx) provides I²C configurability for DESAT, soft-off, UVLO, Miller clamp, two-level turn-off (TLTO), and fault function to simplify the design of highly reliable systems. All adjustments are done from the input side via the I²C interface (pin SDA and SCL). The 1ED38xx offers up to 9 A current in a DSO-16 300 mil fine-pitch package. The EiceDRIVER™ Enhanced X3 Digital family is rated up to 2300 V functional isolation and 200 kV/µs CMTI. They are ideal for IGBTs, Si MOSFETs, and SiC MOSFETs, especially due to the configurability of DESAT and UVLO. This family is recommended in applications like solar inverters, EV-charging, industrial drives, CAC, industrial induction cooking, CAV, UPS, server and telecom SMPS, etc. Two noticeable advantages of the digitally configurable approach for customers are predictive maintenance in sophisticated industrial systems and rapid prototyping for fast solution development.

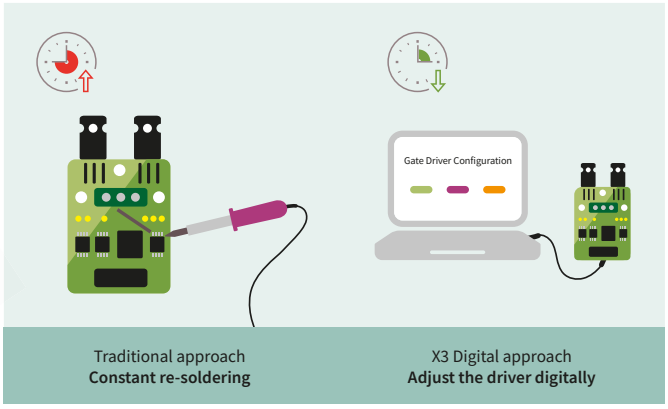
Predictive maintenance

Using the I²C interface, the 1ED38xx can register the counts of UVLO spikes and monitor the increase in supply voltage and temperature. By analyzing the collected data long-term, customers can decide the best time to schedule a maintenance cycle before the system fails.

Rapid prototyping

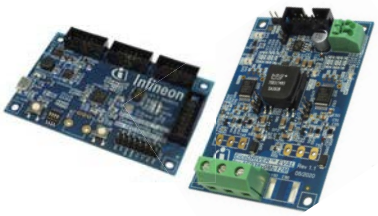
The I²C interface enables rapid prototyping without hardware changes. Using a traditional gate driver, customers must first design an initial PCB board and then adjust and replace the components on the board during evaluation. However, with the 1ED38xx I²C interface, customers can configure up to 27 parameters to optimize the board without replacing the components. This feature extremely shortens the development flow.





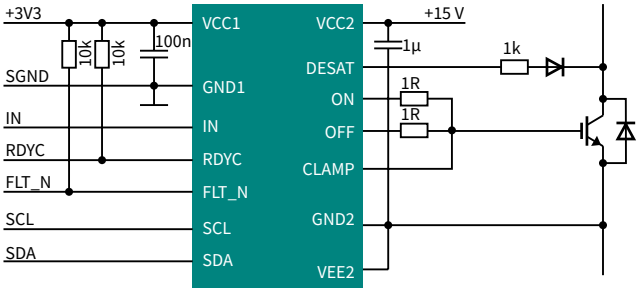
Evaluation board

EVAL-1ED3890Mx12M
EVAL-1ED38x0DCT



Simplified application diagram

X3 Digital (1ED38xx)



Family	Part number	Typ. output current	Feature	Isolation rating
EiceDRIVER™ Enhanced X3 Digital	1ED3830MC12M	3 A	I²C configurability, Miller clamp, DESAT, soft-off, two-level turn-off, integrated ADC	UL 1577: VISO = 5.7 kV_{RMS} VDE 0884-11: VIORM = 1767 V (reinforced)
	1ED3860MC12M	6 A		
	1ED3890MC12M	9 A		

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EiceDRIVER™ Full-bridge transformer driver

Isolated power supply for IGBT and SiC MOSFET gate driver supply

2EP100R, 2EP101R, 2EP110R, 2EP130

The 2EP is a full-bridge transformer driver that enables customers to build an isolated gate driver power supply. The highly integrated and resistor-configurable 2EP reduces the external component count. The open-loop controller drives the integrated full-bridge power MOSFETs and can offer various protection features. These features include overcurrent protection, thermal shutdown, and a ready signal. The adjustable duty cycle and switching frequency allow customers to customize the operation to the gate voltage requirements of various power switches like IGBT and SiC MOSFETs. The EiceDRIVER™ Power 2EP products come in a small TSSOP-8 package with an exposed pad for optimized thermal behavior. The small footprint additionally allows for space-saving PCB designs in area-constrained applications. The broad frequency range of up to 695 kHz and the output power capability of 5 W or more enable isolated gate driver supply designs for a wide range of discrete and power modules. This flexibility allows the product to be used in many applications, such as uninterruptible power supply, solar inverters, energy storage systems, electric vehicle charge stations, and motor drive inverters.

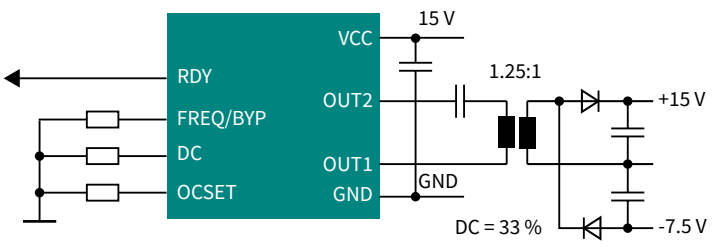
Features

Product features
– Wide input voltage range 4.5 to 20 V
– Wide range of switching frequency from 50 to 695 kHz
– Higher accuracy duty cycle adjustment from 10% to 50%
– Peak-current controlled soft start
– Overcurrent and overtemperature protection
– Ready signal to indicate successful completion of soft start
– 3x3 mm² TSSOP-8 package with exposed pad

Product family

Product name	Package	Switching frequency	Duty cycle	Bypass mode	Overcurrent protection
2EP100R	TSSOP-8	65 kHz, 103 kHz	33%, 50%	No	Fixed
2EP101R	TSSOP-8	50 kHz, 65 kHz	12%, 17%	No	Fixed
2EP110R	TSSOP-8	50 kHz, 65 kHz	10% to 50%	No	Fixed
2EP130R	TSSOP-8	50 kHz to 695 kHz	10% to 50%	Yes	Adjustable

Application schematic



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EiceDRIVER™ APD 2ED4820-EM

48 V smart high-side MOSFET gate driver with SPI for automotive applications

The EiceDRIVER™ 2ED4820-EM is a smart high-side N-channel MOSFET gate driver with two outputs controlled via SPI. The integrated powerful charge pump allows external MOSFETs to stay continuously on. Thanks to the driver's enhanced turn-on and turn-off ability, the number of MOSFETs could be easily scaled up to manage large currents in several hundred amps while ensuring fast switch on and off. The MOSFETs could be controlled in a back-to-back configuration, either common mode or common source. The integrated current sense amplifier supports high-side and even load-side current measurement with a dedicated monitoring output. The 2ED4820-EM comes with several latching failure detections to implement protections for the external MOSFETs, the load and the power source. SPI can adjust parameters; monitoring data, configuration, warning and failure detection registers can be read.

Summary of features

- Extended supply voltage range: 20 - 70 V
- Two independent high-side gate driver outputs with 1 A pull down, 0.3 A pull up for fast switch off/on
- Low supply current in sleep mode IBAT_Q <5 µA
- Device control, configuration, and diagnostic via SPI
- Configurable overcurrent/short circuit protection
- Configurable Drain-Source overvoltage protection
- Gate undervoltage lockout (V_{GS})
- Ground loss detection
- AEC-Q100 qualification

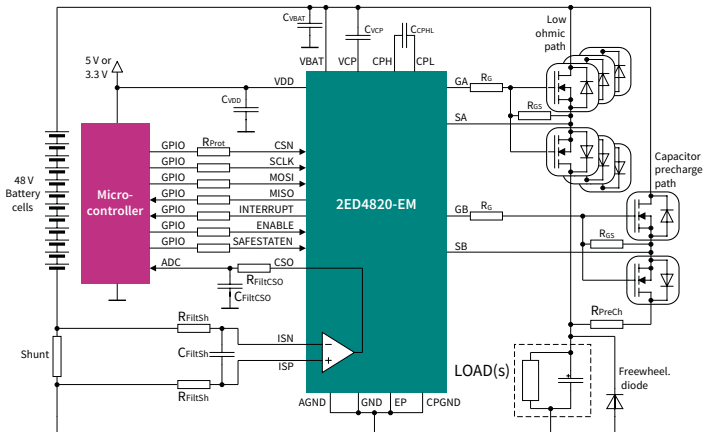
Pb Hal RoHS

Benefits

- Supports back-to-back MOSFET topologies (common drain or common source)
- SAFESTATEN input to trigger safe state mode in case of µC failure
- One bidirectional high or low side analog current sense interface with configurable gain to optimize power losses
- Robust against V_{bat} voltages up to 105 V and V_{source} voltages versus V_{bat} of -90 V

Potential applications

- Battery protection switch
- Input protection switch
- Static load and supply switch for high currents





Products and evaluation boards

Product	Description	Ordering code	Package
2ED4820-EM	48 V smart high-side MOSFET gate driver with SPI	SP005629911	PG-TSDSO-24
2ED4820 EB2 2HSV48	2ED4820 dual high-side switch – 48 V evaluation board	SP005353778	BOARD
R 48V BATT Switch10	48 V battery disconnect switch - reference design	SP005595834	BOARD

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EiceDRIVER™ 1EDI30xxAS for electric vehicles (EV)

1200 V galvanically isolated automotive gate driver IC family

EiceDRIVER™ 1EDI30xxAS products are automotive-qualified single-channel high-voltage gate drivers optimized for IGBT and SiC technologies. They are galvanically isolated using Infineon coreless transformer (CT) technology. Comprehensive safety features and ISO 26262 compliance enables ASIL D classification on the system level. Accompanying safety documents eases and speeds up FMEDA analysis in the application.

The EiceDRIVER™ 1EDI302x (IGBT) /1EDI303xAS (SIC) product family offers a compact package design. Its high level of feature integration saves valuable PCB space and system cost, while the pre-configured settings reduce design efforts. Pin-compatible product variants make switching between variants easy and swiftly adjust ECUs to different application needs (e.g., SiC MOSFET vs. IGBT).

EiceDRIVER™ 1EDI305xAS* gate driver ICs offer full configurability via SPI, which enables platform development. The integrated high-accurate flyback controller can optimize the supply architecture and reduce conduction losses in power devices.

The new EiceDRIVER 1EDI304xAS* gate driver ICs is the most advanced Infineon isolated gate driver for traction inverters, combining the highest performance with the lowest system cost. The ISO-26262 ASIL-D compliant gate driver with on-the-fly Slew-rate control and dynamic boost modes maximizes partial load efficiency and reduces switching losses at high/peak currents, thus saving SiC chip area.

Potential applications

– Traction inverters for EV, HEV (e.g., PHEV/REEV) and light electric vehicles (LEV with >96 V)
– Auxiliary inverters for HEV and EV
– High-power DC-DC converters
– EESM exciter
– HV suspension

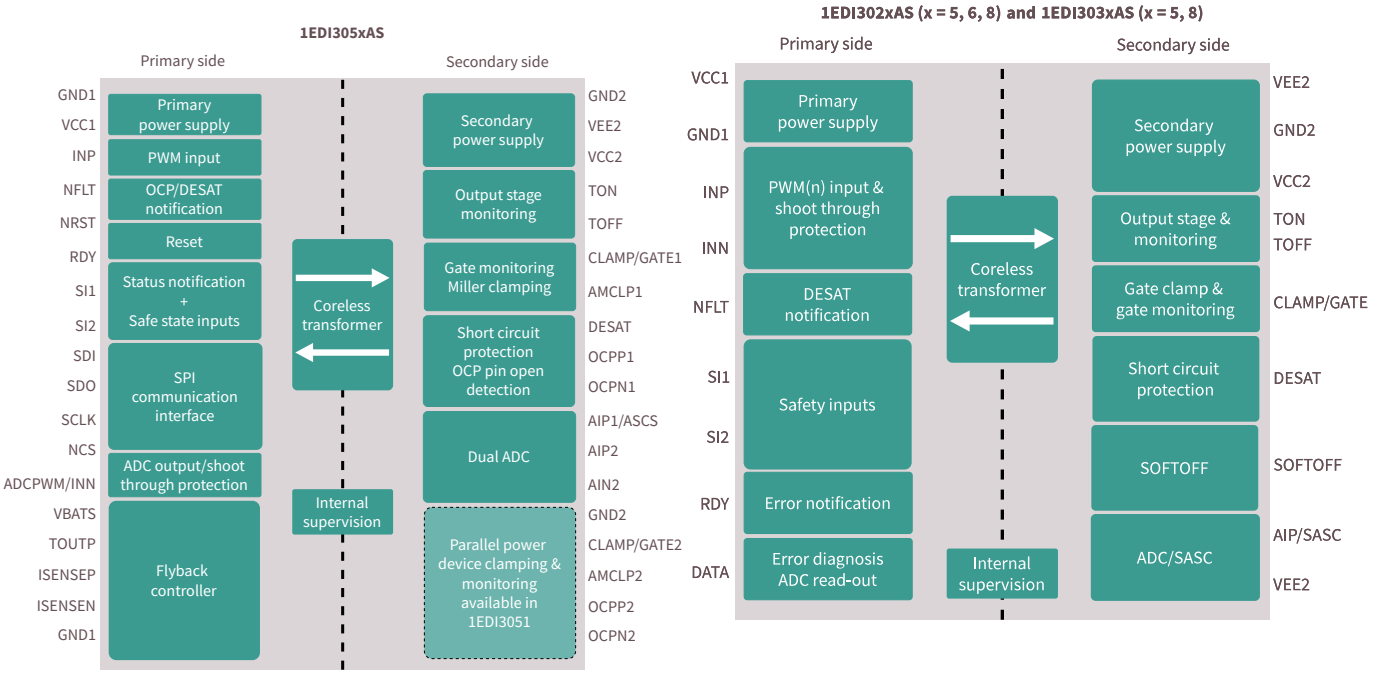
Product feature	1EDI302xAS (IGBT) and 1EDI303xAS (SiC) (x=5,8)	1EDI305xAS (x=0,1)	1EDI304xAS (x=0,1)
Isolation and CMTI	Reinforced 8 kV, CMTI >150 V/ns		
Interface	Fast pins and PWM data stream	Fast Pins and SPI	
Power technology	Variants either for SiC or IGBT	SPI to configure for SiC or IGBT	
Drive stage strength	20 A (15 A for 3028/38)	20 A	
Drive stage	Split output (TON and TOFF)	Split output (TON and TOFF)	Adjustable slew rate with 5 ON and 5 OFF options
Active Miller clamp	Yes, internal	Yes, internal and external	
STP1 and deadtime	Yes	Yes, configurable via SPI	
SC Detection	DESAT (incl. BIST) or OCP (only 3026)	DESAT and OCP (both incl. BIST)	
SC reaction	SOFTOFF pin (1µs SC detection and reaction)	Programable internal soft-off ramp (<1.5 µs SC detection and reaction)	SOFTOFF pin (<1 µs SC detection and re-action)
ISO-26262 compliant	Yes, ASIL-B (D)	Yes, ASIL-D	
Additional safety features	Gate and output stage monitoring Supply monitoring (VCC1/VCC2/VEE2) Internal pri. to sec. supervision Internal supply rail monitoring	Gate and output stage monitoring Supply monitoring (VCC1/VCC2/VEE2) Internal pri. to sec. supervision Internal supply rail monitoring	Gate and output stage monitoring Supply monitoring (VCC1/VCC2/VEE2) Internal pri. to sec. supervision Internal supply rail monitoring DOUT monitoring
Safe state pin (ASC)	Yes, on primary and secondary side		
Integrated flyback	No	Yes, with 2% accuracy	Yes, with 2% accuracy (only 3040)
ADC	Yes, 12-Bit DS-ADC (except 3038)	Yes, 12-Bit DS-ADC, 2 ext. channels	Yes, fast 11-Bit SAR-ADC 4 int. and 2 ext. channels
Package	DSO-20 (10.3 mm x 6.4 mm)	DSO-36 (10.3 mm x 10.3 mm)	DSO-36 (10.3 mm x 10.3 mm)
Status	In production (active and preferred)	In production (active and preferred)	In development (samples available)

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*Coming soon

Block diagrams



Design support

Infineon supports its customers during the design-in process with comprehensive support materials. These include a wide range of technical documentation like application notes, design files, or simulation models. Configuration tools and software for selected devices (complex device drivers) are available on request.

The following evaluation boards are available:

Available evaluation boards	For the following products
1EDI302YAS EVALBOARD	high side: 1EDI3020AS low side: 1EDI3021AS
1EDI303xAS EVALBOARD	high side: 1EDI3031AS low side: 1EDI3033AS
1EDI302YAS EVALBOARD	high side: 1EDI3025AS low side: 1EDI3026AS
1EDI3028 EVALBOARD	1EDI3028AS
1EDI303YAS EVALBOARD	1EDI3035AS
1EDI3038 EVALBOARD	1EDI3038AS
1EDI3050 EVALBOARD	1EDI3050AS
1EDI3051 EVALBOARD	1EDI3051AS
1EDI3040 EVAL BOARD*	1EDI3040AS



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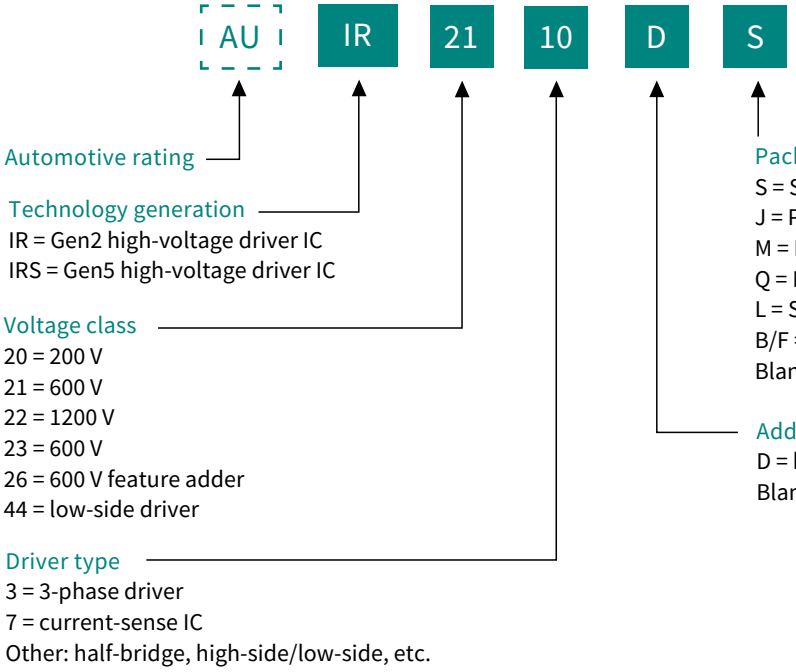
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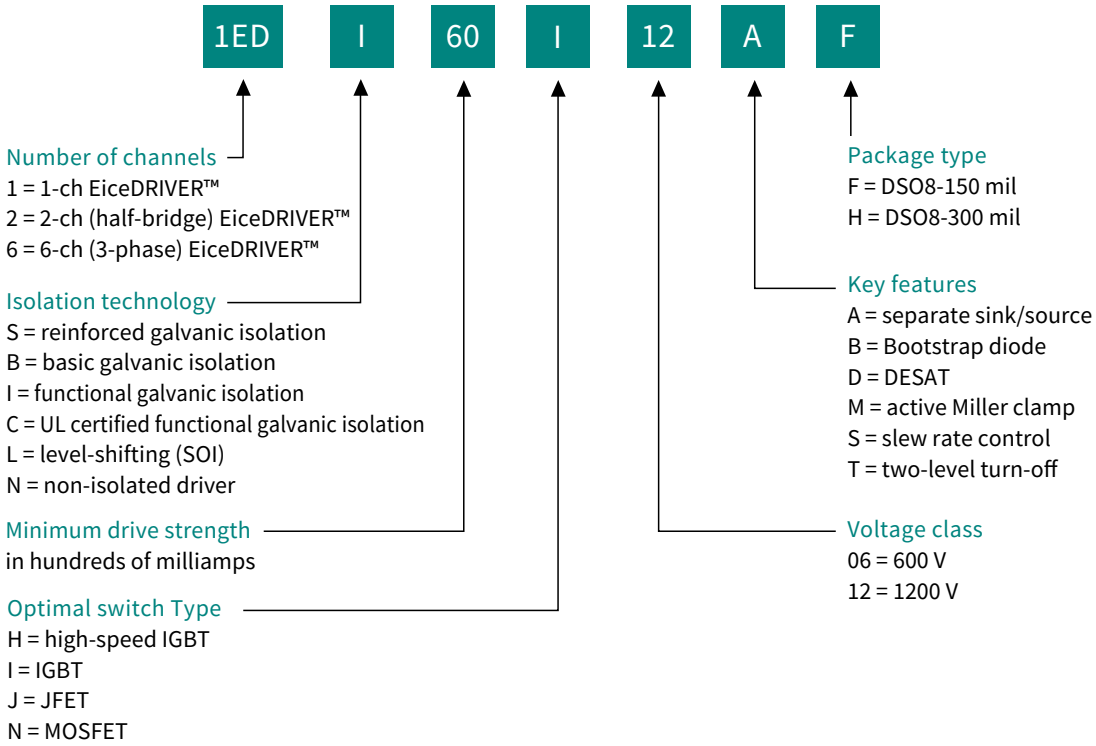
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Nomenclature

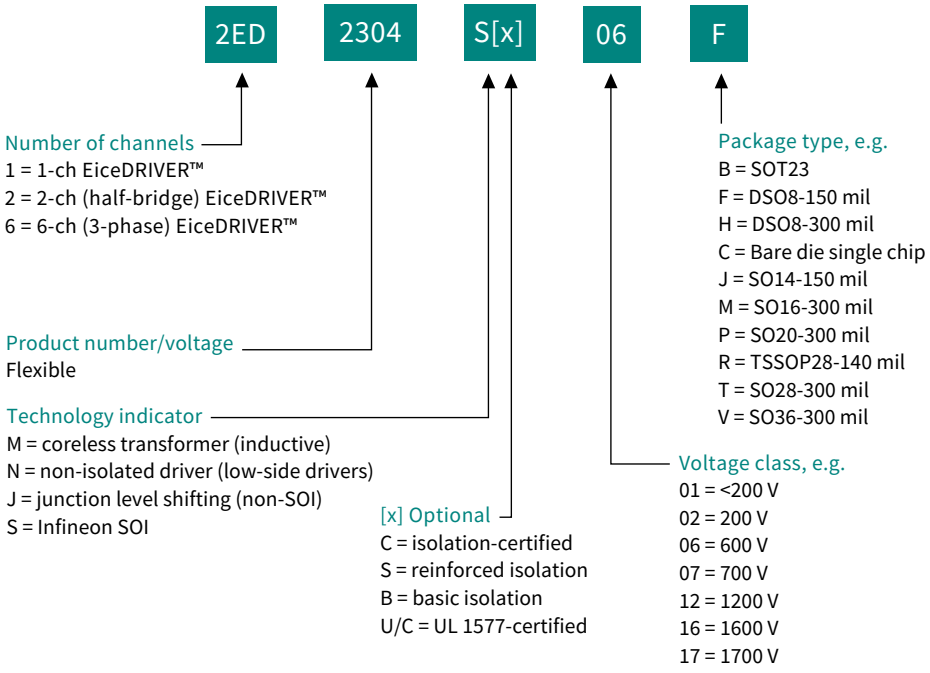
Naming convention for existing families of gate driver ICs

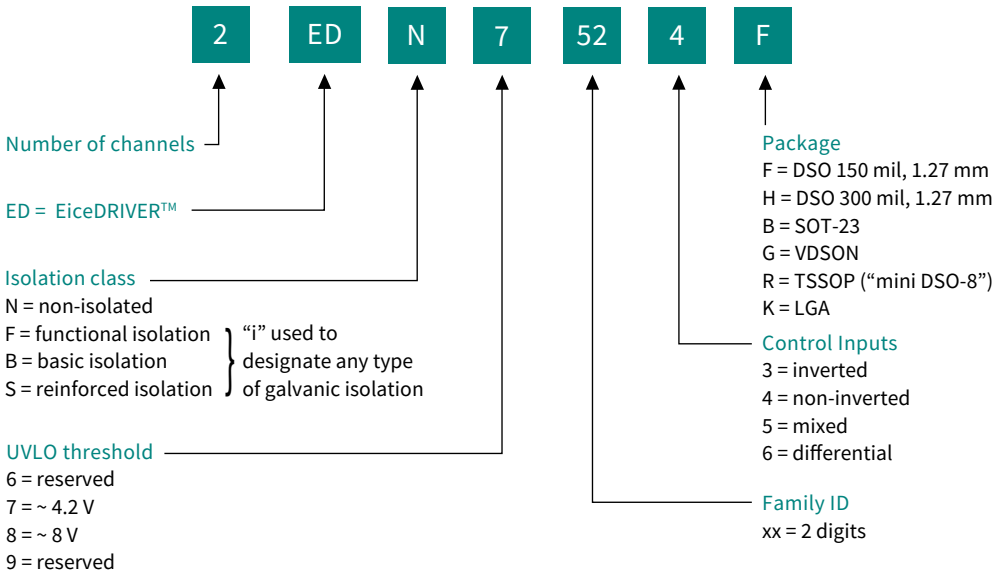




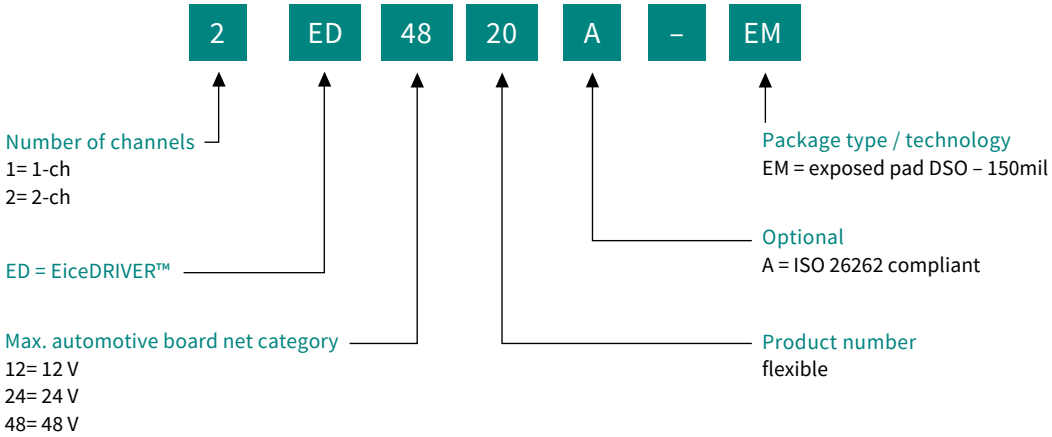
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Naming convention for existing and upcoming families of gate driver ICs



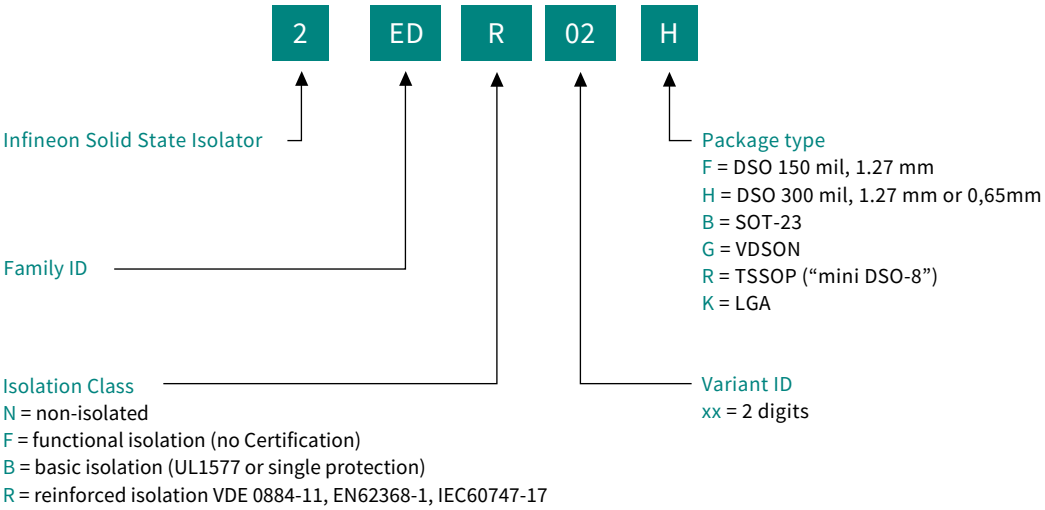


Naming convention for existing and upcoming families of gate driver ICs



Your input matters
Share your feedback

Naming convention for Infineon Solid State Isolators (ISSI)





Infineon support for gate driver and SSR ICs

Useful links and helpful information

Further information, datasheets, and documents

www.infineon.com/200Vhvic
www.infineon.com/700Vhvic
www.infineon.com/1200Vhvic
www.infineon.com/soi
www.infineon.com/JI
www.infineon.com/gdsic
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www.infineon.com/gdcompact
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www.infineon.com/gatedriver-automotive

Gate driver IC community FAQs
www.infineon.com/gdforum

Gate driver selection tools
www.infineon.com/gdfinder

Gate driver simulation (SPICE) models
www.infineon.com/gdmodel

Cross reference tool
www.infineon.com/crs

Support Evaluation board Tools



Digital isolators

– ISOFACE™ dual-channel digital isolators

ISOFACE™ dual-channel digital isolators

Robust digital isolators with precise timing and low power consumption

ISOFACE™ digital isolators are based on Infineon's coreless transformer (CT) technology and provide robust isolation for high voltage applications. They are the preferred choice for isolated gate signal transfer in high-density power designs and isolated communication such as UART or CAN.

The 2DIBx4xxF family features

- Dual-channel digital isolators with eight variants and data rates up to 40 Mbits/s
- 3 kV_{RMS} isolation voltage
- CMOS/TTL input thresholds
- High common-mode transient immunity (CMTI)
- Accurate timing performance
- Wide operating supply voltage from 2.7 to 6.5 V

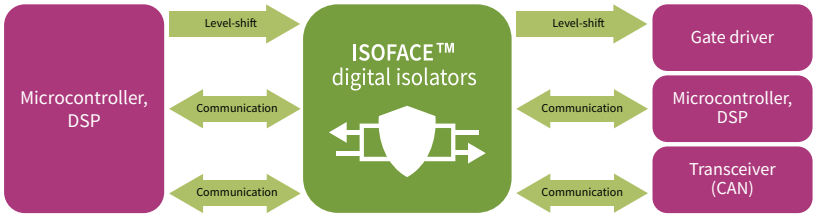


Product variants

Part number	Isolation rating	Channel configuration	Input thresholds	Default output state	Package
2DIB0400F	V_{ISO} = 3000 V_{RMS} (UL1577 Ed. 5)	2 forward 0 reverse (2+0)	Variable (CMOS)	Low	PG-DSO-8 5 x 4 mm
2DIB0401F				High	
2DIB1400F		1 forward 1 reverse (1+1)		Low	
2DIB1401F				High	
2DIB0410F		2 forward 0 reverse (2+0)	Fixed (TTL)	Low	
2DIB0411F				High	
2DIB1410F		1 forward 1 reverse (1+1)		Low	
2DIB1411F				High	

Features and benefits

Key features	Key benefits
– High CMTI >100 V/ns	– High immunity against system noise or high dv/dt
– Wide supply voltage range 2.7 - 6.5 V (abs. max. 7.5 V)	– Reliable performance in SMPS with switching noise on IC power supply
– TTL or CMOS input threshold	– Optimized noise margin for different applications
– Typical propagation delay 26 ns with -4/+6 ns spread	– For high system power efficiency
– Both high and low fail-safe default output state	– Reliable high or low default output state in case of failures
– Both component and system level certification	– Simplified system certification process
– Pin-to-pin compatibility	– For easy device replacement and alternative sourcing



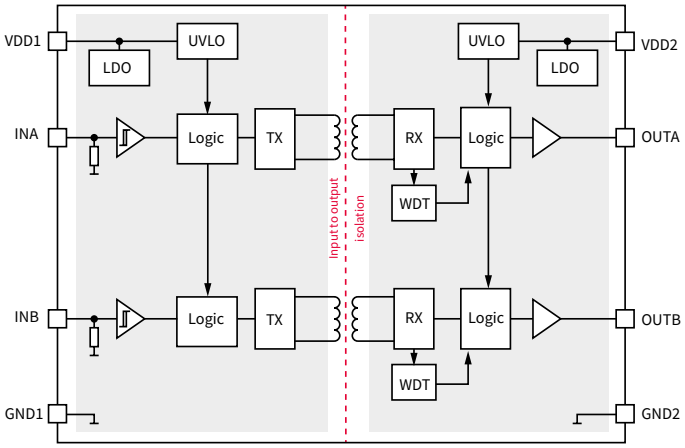
Infineon ISOFACE™ dual-channel digital isolators are used to transfer gate driving and communication signals like CAN and UART over the isolation barrier. With high robustness and accurate switching characteristics, they are suitable for high power density designs and isolated communication systems.

Click here to learn more:
www.infineon.com/digitalisolators

Dual-channel digital isolator 2DIB0410F in SOIC-8 narrow body package

Infineon ISOFACE™ dual-channel digital isolator 2DIB0410F (with two forward channels) provides robust isolation for high-voltage applications. With a wide supply voltage range, TTL input thresholds, and low default output state, it fits high-power density DC-DC brick applications perfectly.

Block diagram of 2DIB041xF with two forward data channels

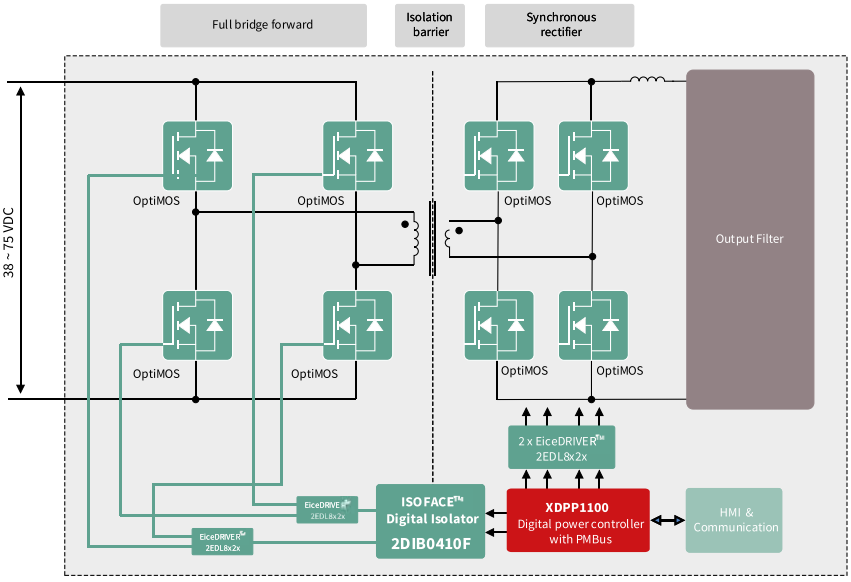




Features and benefits

Key features	Key benefits
– High CMTI >100 V/ns	– High immunity against system noise
– Wide operating supply voltage range 2.7 - 6.5 V (abs. max. 7.5 V)	– Reliable performance in SMPS with switching noise on IC power supply
– TTL input threshold	– Optimized noise margin for SMPS applications
– Integrated glitch filter	– Effective noise suppression in SMPS applications
– Default low fail-safe output state	– Reliable low output state in case of failures
– Both component and system-level certification	– Simplified system certification process

2DIB0410F used in isolated DC-DC brick application



Infineon ISOFACE™ dual-channel digital isolator 2DIB0410F is a perfect fit for isolated DC-DC brick applications to transfer half- or full-bridge gate driving signals. The two-channel configuration allows transfer of low- and high-side gate-signals over the isolation barrier.

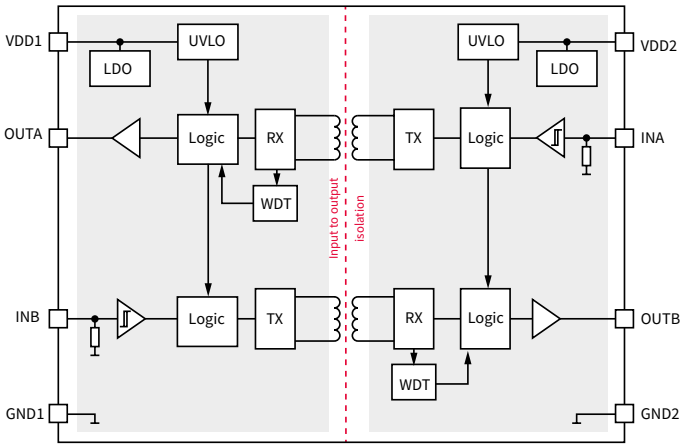
Server SMPS
Telecom DC-DC brick
Telecom SMPS

Click here to learn more:
www.infineon.com/digitalisolators

Dual-channel digital isolator 2DIB1410F in SOIC-8 narrow body package

Infineon ISOFACE™ dual-channel digital isolator 2DIB1410F (with one forward and one reverse channel) provides robust isolation for high-voltage applications. With high common-mode transient immunity (>100 V/ns), TTL input threshold, and default low output state, it is the perfect match for GaN-IPS with high dv/dt in high-density power designs (GaN with integrated non-isolated gate driver).

Block diagram of 2DIB14xxF with one forward and one reverse data channel

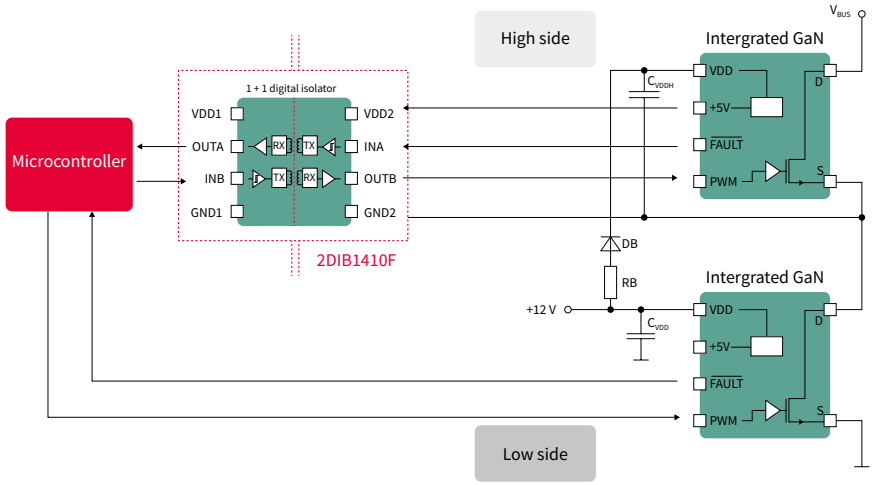




Features and benefits

Key features	Key benefits
– High CMTI >100 V/ns	– For GaN with integrated non-isolated gate driver with high dv/dt
– Wide supply voltage range 2.7 - 6.5 V (abs. max. 7.5 V)	– Reliable performance in SMPS with switching noises on IC power supply
– TTL input threshold	– Optimized noise margin for SMPS applications
– Integrated glitch filter	– Effective noise suppression in SMPS applications
– Default low fail-safe output state	– Reliable low output state in case of failures
– Both component and system-level certification	– Simplified system certification process

2DIB1410F used in totem-pole PFC with GaN IPS



Infineon ISOFACE™ dual-channel digital isolator 2DIB1410F can be used together with GaN IPS for high-side floating drive. One forward channel is used to transfer the gate signal. The reverse channel can be used for protection signal.

Server SMPS
Telecom DC-DC brick
Telecom SMPS

Click here to learn more:
www.infineon.com/digitalisolators



Infineon support for digital isolators

Useful links and helpful information

Further information, datasheets, and documents

www.infineon.com/digitalisolators

Support

Evaluation board

Tools



Discrete IGBTs and silicon power diodes

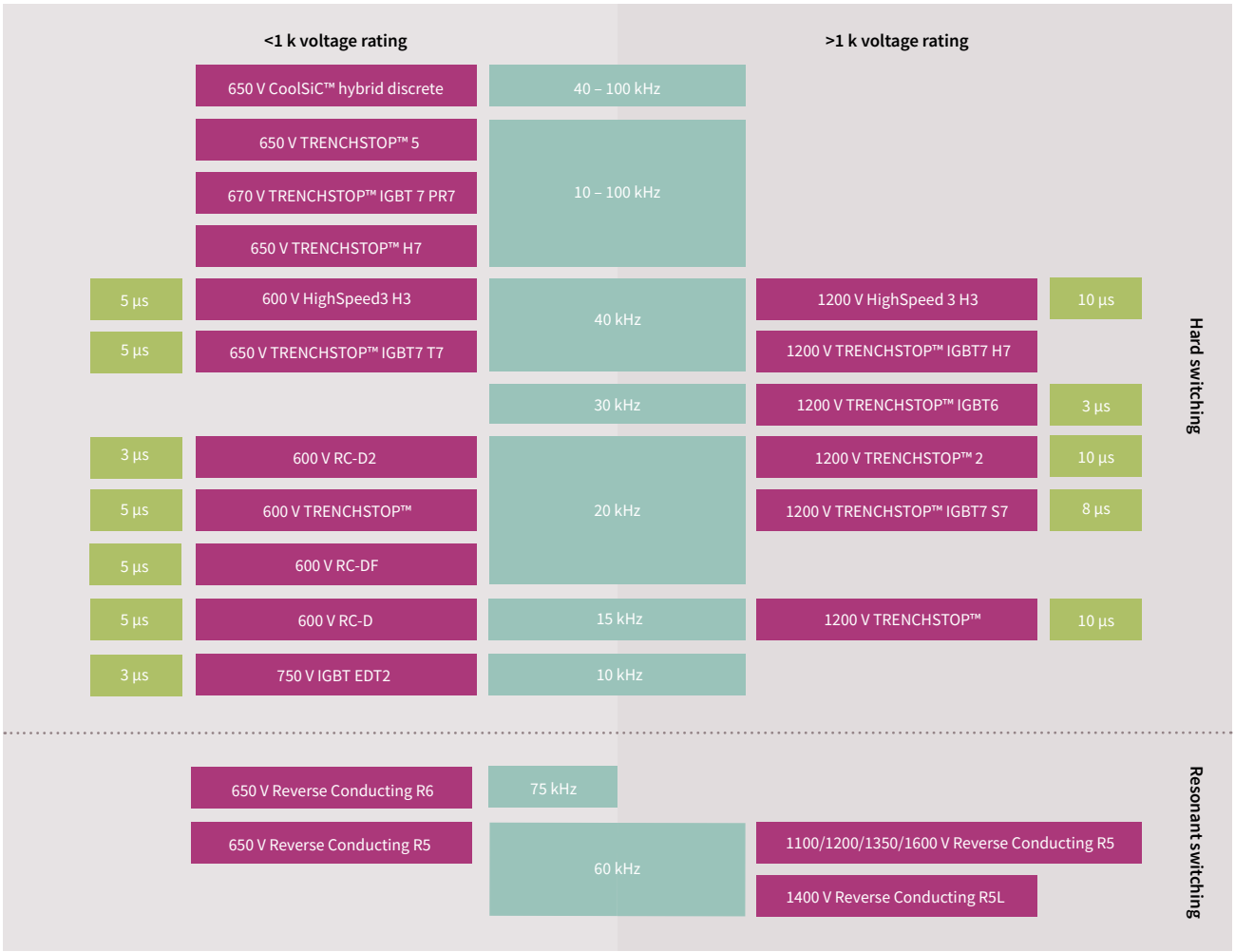
- Discrete IGBTs
- 650 V - 1200 V TRENCHSTOP™ IGBT7 T7, H7, and S7
- 1200 V and above IGBT families
- 650 V TRENCHSTOP™ IGBTs
- Lower power drive IGBT portfolio
- 650 V Reverse Conducting R6 IGBT
- TRENCHSTOP™ advanced isolation
- TRENCHSTOP™ 5 selection tree
- Discrete IGBT selection tree
- Discrete IGBTs product portfolio
- Discrete silicon power diodes
- Discrete CoolSiC™ hybrid devices portfolio
- Discrete IGBT nomenclature
- Discrete silicon power diodes nomenclature

Your input matters
Share your feedback

Discrete IGBTs

Market leadership through groundbreaking innovation and application focus

Resolute to achieve the highest standards in performance and quality, Infineon offers a comprehensive portfolio of application-specific discrete IGBTs. From 600 V up to 1600 V, we offer a wide range of IGBT voltage classes to meet different voltage requirements in each application.



kHz f_{sw} [kHz] (typicallyused up to) µs Short circuit withstand time [µs]

Click here to learn more:

www.infineon.com/gatedriver
www.infineon.com/trenchstop5
www.infineon.com/rapiddiodes
www.infineon.com/igbtdiscretes
www.infineon.com/advanced-isolation

Your input matters
Share your feedback

It’s time to SWITCH!

Infineon has revolutionized the world of IGBTs with the 7th generation of TRENCHSTOP™ IGBTs, designed with the latest micro-pattern trench technology. This advanced technology offers unparalleled control and performance, resulting in significant loss reduction, improved efficiency, and increased power density in your applications.

650 V - 1200 V TRENCHSTOP™ IGBT7 T7, H7, and S7

The 7th generation of TRENCHSTOP™ IGBTs sets a new benchmark in the world of discrete IGBT and diode technology. With its outstanding performance, it is the fastest IGBT on the market and boasts the highest power density with current rating devices from 3 to 150 A. For the first time ever, this technology is now available for the 650 V and 1200 V discrete IGBT market.

Fulfilling the needs of decarbonization and industry 4.0



IGBT7

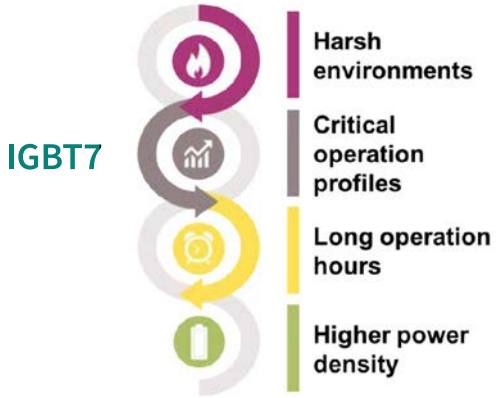
2 voltage classes 650 V and 1200 V
3 flavors T7, H7, and S7
7 packages



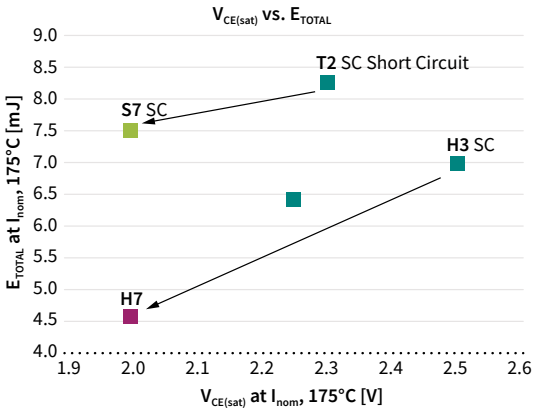
Produced in 300 mm fab
Enabling future growth

The extensive portfolio of 650 V/1200 V TRENCHSTOP™ IGBT7 T7, H7, and S7 is specifically designed to meet the demands of various applications, including solar photovoltaic, uninterruptible power supplies, battery chargers, and industrial drives. This unique discrete offering provides a high current rating portfolio up to 150 A in four different package types, with conduction parameter $V_{(CE)sat}$ 50 percent lower compared to previous generations and switching losses up to 84 percent lower.

Dynamic requirements



1200 V IGBTs key parameters



Make the switch today and revolutionize your applications!

Don’t miss out on this opportunity to upgrade your applications with the latest and greatest in IGBT technology. The 7th generation of TRENCHSTOP™ IGBTs offers unparalleled performance and efficiency, making it the perfect choice for any application looking to take their power and performance to the next level. Make the switch today!

Click here to learn more:

www.infineon.com/gatedriver
www.infineon.com/trenchstop5
www.infineon.com/rapiddiodes
www.infineon.com/igbtdiscretes
www.infineon.com/advanced-isolation

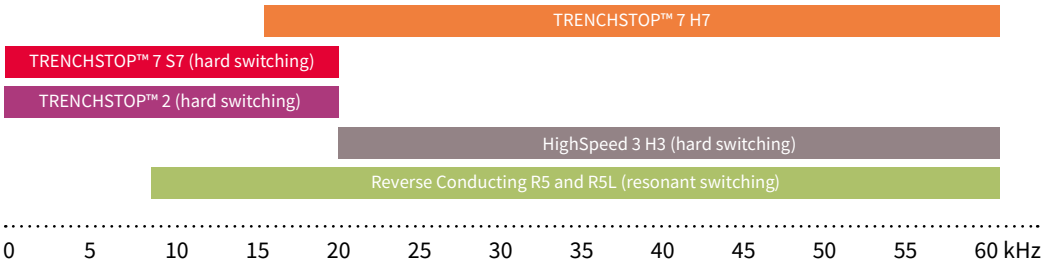
Your input matters
Share your feedback

1200 V and above IGBT families

The 7th generation of TRENCHSTOP™ IGBTs, known as 650 V IGBT T7 and H7, and 1200 V IGBT7 H7 and S7, are setting new standards in the market. With its unparalleled speed, it is the fastest IGBT currently available. Furthermore, the IGBT7 boasts a remarkable power density, making it a top performer in terms of efficiency and performance. As a direct replacement for all previous industrial IGBT generations, including the high-voltage TRENCHSTOP™ T2 and HighSpeed 3 H3 series, these devices are an excellent choice for those looking to upgrade their technology and improve their system's overall performance.

The Reverse Conducting R5 and R5L are the latest generations in the RC-H series of reverse conducting IGBT. With a monolithically integrated diode, they offer optimized performance for resonant switching applications such as induction cooking. R5 devices are available in 1100 V, 1200 V, 1350 V, and 1600 V blocking voltages while R5L devices are available in a 1400 V blocking voltage.

EiceDRIVER™ isolated gate drivers, like the X3 Compact family and EiceDRIVER™ 1200 V level-shift gate driver family, are perfect matches for the 1200 V IGBT in motor control, general-purpose inverter, solar, and UPS applications. EiceDRIVER™ low-side gate driver with overcurrent protection is widely used in induction cooking applications.



Reverse Conducting R5 and R5L	– World-class Reverse Conducting RC-H products – High performance and low losses	– Induction cooking – Resonant switching – Medium to high frequency converters
TRENCHSTOP™ 7 H7	– High speed/high power IGBT – First tailless/low-loss IGBT on market – Market proven and recognized quality leader	– Solar, ESS, UPS, welding – Medium frequency converters
TRENCHSTOP™ IGBT7 S7	– New low switching losses and high power IGBTs – Optimized for operation up to 20 kHz – Best-in-class $V_{CE(sat)}$ and low switching losses	– Industrial drives, solar, HVAC – Low/medium frequency converters

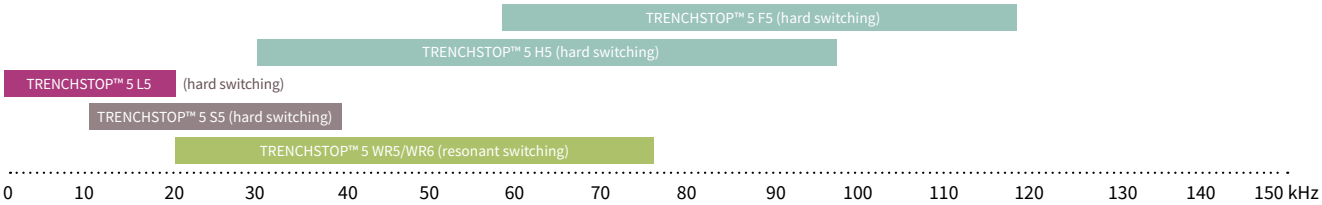
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www.infineon.com/gatedriver www.infineon.com/trenchstop5 www.infineon.com/rapiddiodes
www.infineon.com/igbtdiscretes www.infineon.com/advanced-isolation

Your input matters
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650 V TRENCHSTOP™ 5 IGBT

Ideally suited for customers who are looking for outstanding efficiency and power density, the TRENCHSTOP™ 5 is optimized to comprehend various switching frequencies. Wafer thickness has been reduced by more than 25 percent, which enables a dramatic improvement in both switching and conduction losses while providing an increased breakthrough voltage of 650 V. Based on the TRENCHSTOP™ 5 IGBT technology, Infineon has developed six different product families targeting specific applications, allowing designers to optimize for high efficiency, system cost, or reliability demands of the market. The quantum leap of efficiency improvement provided by the TRENCHSTOP™ 5 IGBT families opens up new opportunities for designers to explore. EiceDRIVER™ isolated gate driver, such as the X3 Compact family, is perfect for 650 V IGBTs in solar and UPS applications. EiceDRIVER™ low-side gate driver with overcurrent protection is widely used in induction cooking applications and PFC stage.



TRENCHSTOP™ 5 L5	**Best-in-class IGBT** **Low $V_{CE(sat)}$ IGBT** – $V_{CE(sat)}$ IGBT – 1.05 V – Best trade-off among $V_{CE(sat)}$, V_{SS}, and E_{ts} for frequencies below 20 kHz	**Solar, UPS, welding** – Ultralow frequency converters – Three-level inverter type I NPC 1 and NPC 2 – Modified HERIC inverter – AC output (aluminum/magnesium welding)
TRENCHSTOP™ 5 S5	**Best-in-class ease-of-use IGBT** Elimination of: – Collector-emitter snubber capacitor and gate capacitor in low inductance designs (<100 nH) – Softer switching than TRENCHSTOP™ 5 H5	**UPS, battery charger, solar, welding** – Medium frequency converters – Multilevel inverter stages – Output stages – PFC
TRENCHSTOP™ 5 H5/F5	**Best-in-class high frequency IGBT** – Bridge to SJ MOSFET performance – Highest efficiency, especially under light load conditions	**UPS, solar, welding** – High frequency converters – Multilevel inverter stages – Output stages – PFC
TRENCHSTOP™ 5 WR5	**Price-optimized reverse conducting TRENCHSTOP™ 5 with an optimized monolithically integrated diode tailored for specific hard switching applications** – Monolithic diode optimized for PFC and welding applications – Excellent R_G controllability – Perfect fit to mainstream design for 20 kHz <fsw <60 kHz	**Air conditioning, welding** – RAC/CAC PFC outdoor compressor – Compact/portable welding – Light-medium industrial welding
TRENCHSTOP™ 5 WR6	**Outstanding price/performance ratio with the latest 650 V reverse-conducting IGBT in the new high creepage TO-247-3 package** – Very low $V_{CE(sat)}$ of 1.45 V at 25°C – High creepage and clearance TO-247 package – Optimized for full-rated hard switching turn-off	**Air conditioning, welding** – RAC/CAC PFC outdoor compressor – Compact/portable welding – Light-medium industrial welding

Click here to learn more:

www.infineon.com/gatedriver
www.infineon.com/trenchstop5
www.infineon.com/rapiddiodes
www.infineon.com/igbtdiscretes
www.infineon.com/advanced-isolation

Your input matters
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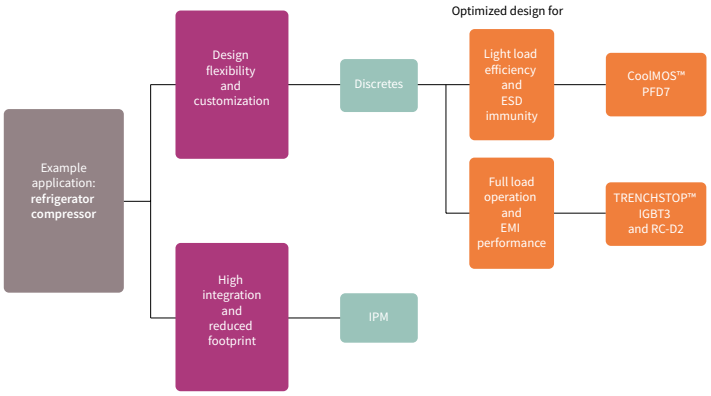
Lower power drive IGBT portfolio

600 V TRENCHSTOP IGBT 3 and 600 V RC-D2

Motor drives up to 1 kW are used in a wide variety of applications, from home appliance fans and compressors to pumps. The market for these products demands design flexibility, EMI performance, and easy controllability. Therefore, these compact motors require power electronics with the lowest losses and best thermal performance. The TRENCHSTOP™ IGBT3 family of discrete devices has been designed for low switching losses, which is particularly important in systems with higher switching frequencies (up to 20 kHz). Additionally, the IGBTs are co-packed with the soft, fast-recovery, full-rated external Rapid 1 free-wheeling diode, soft, fast-recovery, anti-parallel Emitter Controlled Diode for reduced total losses. With a blocking voltage of 600 V and a short-circuit rating of 5 µs, TRENCHSTOP™ IGBT3 is a key contributor to robust motor designs.

The RC-D2 family of discrete devices has been cost-optimized in surface-mounted packages. The device contains a monolithically integrated diode and has HV-H3TRB ruggedness capability. With a blocking voltage of 600 V and a 3 µs short-circuit rating, the RC-D2 is a key contributor to cost-effective motor designs.

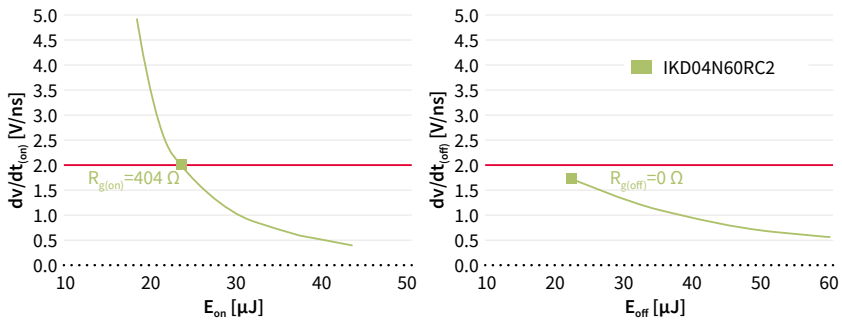
Switch selection for low power drives <300 W



Features and benefits

Key features	Key benefits
– Available in surface-mounted packages	– Enable space limited application
– IGBT3 co-packed with and without diodes (D^2PAK, TO-220, TO-220 FullPAK)	– Performance improvement
– RC-D2 monolithically integrated diode (DPAK, SOT-223)	– Cost-optimized solution
– SC rating up to 5 µs	– Short-circuit protection
– Low EMI due to easy controllability	– No need for additional components on PCB

EMI performance



- $R_{g(on)}$ and $R_{g(off)}$ are selected to meet dv/dt of 2 V/ns at 500 mA and T_j of 100°C
- IGBTs (IKD04N60RC2) are easily controllable by optimizing R_g values
- EMI performance can be enhanced with additional passive components

Click here to learn more:

www.infineon.com/gatedriver
www.infineon.com/trenchstop5
www.infineon.com/rapiddiodes
www.infineon.com/igbtdiscretes
www.infineon.com/advanced-isolation

Reverse Conducting for soft-switching applications

650 V Reverse Conducting R6 IGBT in TO-247 package

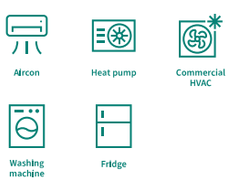
The 650 V R6 IGBT offers the lowest $V_{CE(sat)}$ and optimized E_{off} for best efficiency, minimized power losses, and cooling effort. The good EMI behavior simplifies filtering design, reduces system costs, and effort for the designers. Thanks to the best system performances and high compatibility with the existing gate driver solution, 650 V R6 IGBT represents the optimal choice for soft-switching topologies.

Features and benefits

Key features	Key benefits
– Very low $V_{CE(sat)}$ and low E_{off}	– Lowest losses on IGBT, high system efficiency for higher power output
– High ruggedness and stable temperature behavior	– Fast and easy replacement of predecessor R5 portfolio
– Maximum operating T_j of 175°C	– High device reliability
	– Good EMI behavior

670 V TRENCHSTOP™ IGBT 7 PR7

TRENCHSTOP™ IGBT 7 PR7 Reverse Conducting IGBT for boost PFC stage with improved EMI characteristics offering the best-in-class performance for high-power and high-switching frequency applications.



Features and benefits

Key features	Key benefits
– TRENCHSTOP™ 7 with optimized monolithic diode for better trade-off between price and performance	– Cost-effective solution for target applications with reverse conducting IGBT
– Reduced $V_{CE(sat)}$ and E_{on} and E_{off} result in low power losses – Improved dv/dt and di/dt controllability for better EMI performance	– Efficient cooling in residential aircon and HVAC applications
– TO-247-3-HCC package increased pin-to-pin clearance and creepage distance with improved isolation voltage rating to ensure longer lifetime – 2kV ESD HBM compliant available	– High robustness against system failure in harsh environment – Enhanced reliability against humidity
– Use of standard TO-247-3 package with pin-to-pin compatibility – Evaluation board available	– Drop-in replacement for previous generation and competition

Package innovations

Discrete IGBT package overview

Infineon discrete IGBT package portfolio contains SMD (surface mount device) packages, for example, D^2PAK, DPAK, SOT-223, and through-hole packages, for example, TO-220, TO-220 FullPAK, TO-247, TO-247-3-HCC, TO-247-4, TO-247-4 asymetric (650 V, 1200 V; 76-136 A), TO-247PLUS, TO-247PLUS-4, and TO-247 advanced isolation packages. It provides discrete IGBTs solutions with and without anti-parallel diode, which is an excellent fit to use in industrial, home appliance, and automotive applications.

	SOT-223 SMD	TO-252 (DPAK)	TO-263 (D^2PAK)	TO-220	TO-220 FullPAK	TO-247	TO-247 4-pin	TO-247PLUS	TO-247PLUS 4-pin	TRENCHSTOP™ advanced isolation TO-247	TO-247-3-HCC
Package options											
Voltage class	600 V, 650 V, 1100 V, 1200 V, 1350 V, 1400 V, 1600 V									600 V, 650 V	650 V
Configuration	DuoPack (with diode), single IGBTs									DuoPack IGBTs with diode and single diodes	
Continuous collector current T_c = 100°C	3-120 A									40-90 A	20 -70 A

Click here to learn more:

www.infineon.com/gatedriver
www.infineon.com/trenchstop5
www.infineon.com/rapiddiodes
www.infineon.com/igbtdiscretes
www.infineon.com/advanced-isolation

Your input matters
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TRENCHSTOP™ advanced isolation

Fully isolated TO-247 package with industry leading IGBTs

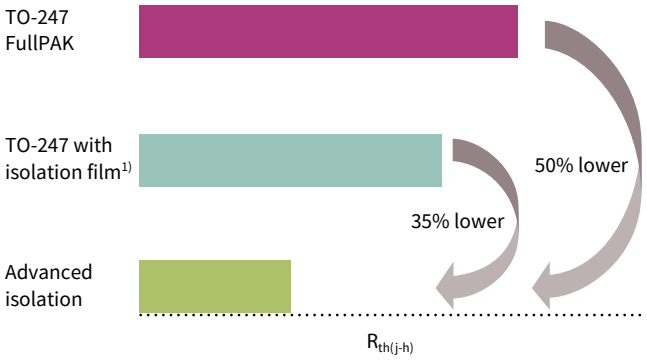
TRENCHSTOP™ advanced isolation solution breaks the limits reached by traditional packaging and isolation techniques. This new isolated package enables the highest power density, the best performance, and the lowest cooling effort thanks to an effective and reliable thermal path from the IGBT die to the heatsink.

In addition to providing 100 percent electrical isolation, TRENCHSTOP™ advanced isolation also eliminates the need for thermal grease or thermal interface sheets. The new package delivers at least 35 percent lower thermal resistivity, helping designers to increase power density, as well as lower system complexity and assembling costs.
This new package solution allows industrial and home appliance designs to fully utilize the high performance of TRENCHSTOP™ IGBTs without compromises for isolation and cooling.

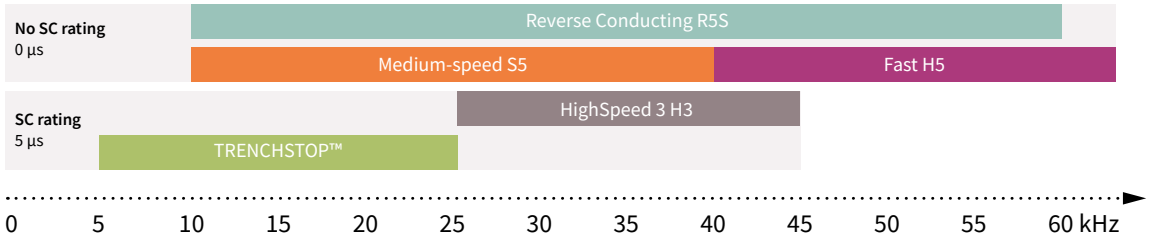
Features and benefits

Key features	Key benefits
– 2500 V_{RMS} electrical isolation, 50/60 Hz, t = 1 min	– Up to 35% reduction in assembly time reduces manufacturing cost
– 100% tested isolated mounting surface	– Increased power density
– Lowest $R_{th(j-h)}$	– Improved reliability from higher yield and no isolation film misalignment
– Low coupling capacitance, 38 pF	– Less EMI filter design effort
– No need for isolation film or thermal interface material	– Decreased heatsink size

Thermal resistivity of package and isolation types



1) Isolation material: Standard polyimide-based reinforced carrier insulator film with 152 µm thickness, 1.3 W/mK thermal conductivity



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TRENCHSTOP™ 5 selection tree

650 V

No — **Free wheeling diode (FWD)** — **Yes**

50 Hz-20 kHz low speed	30 kHz-120 kHz high speed	50 Hz-20 kHz low speed	10 kHz-40 kHz high speed	20 kHz-75 kHz high speed	30 kHz-100 kHz high speed	60 kHz-120 kHz ultrahigh speed
Low $V_{CE(sat)}$ TRENCHSTOP™ 5 L5	TRENCHSTOP™ 5 H5/F5/S5	Low $V_{CE(sat)}$ TRENCHSTOP™ 5 L5	"Soft" TRENCHSTOP™ 5 S5	RC TRENCHSTOP™ 5 WR5 / WR6	TRENCHSTOP™ 5 H5	TRENCHSTOP™ 5 F5
Corresponding best fit IGBT		Corresponding best fit IGBT				
IGW30N65L5 IGW75N65H5	IGB15N65S5 IGB20N65S5 IGB50N65S5 IGB50N65H5 IGP20N65H5/F5 IGP30N65H5/F5 IGP40N65H5/F5 IGW40N65H5/F5 IGW50N65H5/F5 IGW75N65H5	IKW30N65EL5 IKW75N65EL5 IKZ75N65EL5	IKW30N65ES5 IKW40N65ES5 IKW50N65ES5 IKW75N65ES5 IKW50N65SS5 IKW75N65SS5 (Discrete with SiC Schottky Diode) IKZ50N65ES5 IKZ75N65ES5 IKZA50N65SS5 IKZA75N65SS5 (Discrete with SiC Schottky Diode) IKB30N65ES5 IKB40N65ES5	IKW30N65WR5 IKW40N65WR5 IKW50N65WR5 IKWH30N65WR5 IKWH20N65WR6 IKWH30N65WR6 IKWH40N65WR6 IKWH50N65WR6 IKWH60N65WR6 IKWH70N65WR6	IKP08N65H5 IKP15N65H5 IKP20N65H5 IKP30N65H5 IKP40N65H5 IKA08N65H5 IKA15N65H5 IKW30N65H5 IKW40N65H5 IKW50N65H5 IKW50N65EH5 IKW75N65EH5 IKW40N65RH5 IKW50N65RH5 IKW75N65RH5 IKZ50N65EH5 IKZ75N65EH5 IKZA40N65RH5 IKZA50N65RH5 IKZA75N65RH5 IKB15N65EH5 IKB20N65EH5 IKB30N65EH5 IKB40N65EH5	IKP08N65F5 IKP15N65F5 IKP20N65F5 IKP30N65F5 IKP40N65F5 IKA08N65F5 IKA15N65F5 IKW40N65F5 IKW50N65F5 IKB40N65EF5
Solar, UPS, Welding	UPS, Solar, EV charger, Welding	Solar, UPS, Welding	Aircon, Welding, PFC	Aircon, Commercial HVAC, Heat pump	Aircon, UPS, Solar, EV charger, Welding	UPS, Solar, EV charger, Welding

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Discrete IGBT selection tree

IGBT

Diode commutation

- **Soft**
- **Hard/no diode for IG** parts**

Frequency range

8 kHz-75 kHz RC-H series (monolithic)	2-40 kHz			10-40 kHz medium speed	18-60 kHz 20-100 kHz high speed	10-100 kHz high speed	20-75 kHz high speed	50 Hz-20 kHz low speed
	RC-drives (monolithic)	TRENCHSTOP™ 7	TRENCHSTOP™ IGBT7 PR7	Soft turn-off TRENCHSTOP™ 5 S5	HighSpeed 3 H3	TRENCHSTOP™ 5 H5/F5	TRENCHSTOP™ 5 WR5/WR6	Low $V_{CE(sat)}$ TRENCHSTOP™ 5 L5

Voltage range

650 V, 1100 V, 1200 V, 1350 V, 1400 V, 1600 V	600 V	650 V, 1200 V	670 V	650 V	600 V, 1200 V	650 V	650 V	650 V

Part number

IHWccNvvvR5 IHWccN65R6 IHWccN140R5L	IKpccN60RC2 IKpccN60R	IKpccN65ET7 IKpccN120CS7 IKpccN120CH7 IGpccN120S7*	IKWHccN67PR7	IKpccN65dS5	IKpccN60H3 IKpccN120H3 IGpccN60H3	IKpccN65H5 IKpccN65F5 IGpccN65H5 IGpccN65F5	IKpccN65WR5 IKWHccN65WR6	IKpccN65EL5 IGW30N65L5

Applications

Induction cooking **Rice cookers** **Microwaves** **Multifunction printers** **Half-bridge resonant (Voltage resonance <650 V)** **Single switch (Voltage resonance > 650 V)**	Conduction loss optimized **Solar inverter** Asymmetrical bridge Symmetrical full-bridge Three-level type I or three-level type II converter **Motor control** Three-phase inverter Full-bridge inverter Single-phase inverter **Uninterruptable power supply** UPS bridge Three-level type II converter **Major and small home appliances** Symmetrical full-bridge Single-phase inverter	**UPS** **Energy storage** **Battery charger** **Welding** **Solar inverter**	**PFC** **Battery charger** **Welding** **UPS** **Solar** **Energy storage** **SMPS** **Air conditioning HVDC (telecom/data centers)** **Totem pole PFC**	**PFC** **RAC/CAC PFC outdoor compressor** **Welding inverter** Full-brigde Half-bridge Two transistor forward	**UPS** Three-level NPC1 and NPC2 topology, inner switches **Solar** Three-level NPC1 and NPC2 topology, inner switches **Welding** AC output (Al/Mag welding)

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*Coming soon

TRENCHSTOP™ and RC-Drives

600 V/650 V product family together with 650 V SOI gate driver family

Home appliance | Small home appliance | Industrial drives | Solar | Drives | LV-drives

Continuous collector current at T_c=100°C [A]		TO-251 (IPAK) Hal	TO-252 (DPAK) Hal	TO-263 (D^2PAK) Hal	TO-220 Hal	TO-247 advanced isolation Hal	TO-220 FullPAK Hal	TO-247 Hal	TO-247PLUS/ Super 247 (TO-247AA) Hal	SOT-223 Hal
Single IGBT	4	IGU04N60T								
	6		IGD06N60T		IGP06N60T					
	10			IGB10N60T	IGP10N60T					
	15			IGB15N60T	IGP15N60T					
	30			IGB30N60T				IGW30N60T		
	40									
	50			IGB50N60T	IGP50N60T			IGW50N60T		
	75							IGW75N60T		
IGBT and diode	1									IKN01N60RC2
	3									IKN03N60RC2
	4		IKD04N60RC2 IKD04N60R		IKP04N60T					IKN04N60RC2
	6		IKD06N60RC2 IKD06N60R	IKB06N60T	IKP06N60T		IKA06N60T			IKN06N60RC2
	10		IKD10N60RC2 IKD10N60R	IKB10N60T	IKP10N60T		IKA10N60T			IKN10N60RC2
	15		IKD15N60RC2 IKD15N60R	IKB15N60T	IKP15N60T		IKA15N60T			
	20			IKB20N60T	IKP20N60T			IKW20N60T		
	30							IKW30N60T		
	40									
	50					IKFW50N60ET		IKW50N60T		
	75					IKFW75N60ET		IKW75N60T		
	100								IKQ100N60T	
	120								IKQ120N60T	

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TRENCHSTOP™ IGBT7 S7

1200 V product family together with isolated driver and 1200 V level-shift driver family

Continuous collector current at T_C=100°C [A]		TO-247 (Hal)	TO-247PLUS 3-pin (Hal)	TO-247 4-pin (Hal)	D²PAK (Hal)	DPAK (Hal)
Single IGBT	40			IKZA40N120CS7		
	75		IGQ75N120S7			
	100		IGQ100N120S7			
	120		IGQ120N120S7			
	3				IGB03N120S7	IGD03N120S7
DuoPack	8	IKW08N120CS7			IGB08N120S7	IGD08N120S7
	15	IKW15N120CS7			IGB15N120S7	
	25	IKW25N120CS7				
	40	IKW40N120CS7				
	50	IKW50N120CS7				
	75		IKQ75N120CS7			
	100		IKQ100N120CS7			
	120		IKQ120N120CS7			

TRENCHSTOP™ IGBT7 T7

Together with isolated driver, 650 V SOI driver, and low-side driver family

Continuous collector current at Tc=100°C [A]		TO-247-3 (Hal)
DuoPack	20	IKW20N65ET7
	30	IKW30N65ET7
	40	IKW40N65ET7
	50	IKW50N65ET7
	75	IKW75N65ET7

TRENCHSTOP™ IGBT7 H7

1200 V product family together with isolated driver and 1200 V level-shift driver family

Continuous collector current at Tc=100°C [A]	TO-247-3 (Hal)	TO-247 4-pin assymetric (Hal)	TO-247PLUS 3-pin (Hal)	TO-247PLUS 4-pin (Hal)
40	IKW40N120CH7	IKZA40N120CH7		
50	IKW50N120CH7	IKZA50N120CH7	IKQ50N120CH7	IKY50N120CH7
75	IKW75N120CH7	IKZA75N120CH7	IKQ75N120CH7	IKY75N120CH7
100			IKQ100N120CH7	IKY100N120CH7
120			IKQ120N120CH7	IKY120N120CH7
140			IKQ140N120CH7	IKY140N120CH7

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*Coming soon

Reverse Conducting IGBTs



Continuous collector current at T_c=100°C [A]	TO-247 (Hal)					
	650 V	1100 V	1200 V	1350 V	1400 V	1600 V
20	IHW20N65R5				IHW20N140R5L	
			IHW20N120R5	IHW20N135R5		
25					IHW25N140R5L	
30	IHW30N65R6 IHW30N65R5	IHW30N110R5	IHW30N120R5	IHW30N135R5	IHW30N140R5L	IHW30N160R5
40	IHW40N65R6 IHW40N65R5		IHW40N120R5	IHW40N135R5	IHW40N140R5L	
50	IHW50N65R6 IHW50N65R5					

600 V HighSpeed 3 H3



Together with isolated driver, 650 V SOI driver, and low-side driver family

Continuous collector current at T_c=100°C [A]		TO-263 (D^2PAK) (Hal)	TO-220 (Hal)	TO-247 advanced isolation (Hal)	TO-247 (Hal)
IGBT	20	IGB20N60H3	IGP20N60H3		IGW20N60H3
	30	IGB30N60H3	IGP30N60H3		IGW30N60H3
	40				IGW40N60H3
	50				IGW50N60H3
	60				IGW60N60H3
	75				IGW75N60H3
	100				IGW100N60H3
Duo-Pack	20	IKB20N60H3	IKP20N60H3		IKW20N60H3
	30				IKW30N60H3
	40			IKFW40N60DH3E	IKW40N60H3
	50			IKFW50N60DH3E IKFW50N60DH3	IKW50N60H3
	60			IKFW60N60DH3E IKFW60N60EH3	IKW60N60H3
	75				IKW75N60H3
	90			IKFW90N60EH3	

CoolSiC™ hybrid discrete

Continuous collector current at T_c=100°C [A]			TO-247 3-pin	TO-247-4pin
DuoPack	TRENCHSTOP™ 5 H5 + "half" rated diode	40	IKW40N65RH5	IKZA40N65RH5
		50	IKW50N65RH5	IKZA50N65RH5
		75	IKW75N65RH5	IKZA75N65RH5
	TRENCHSTOP™ 5 S5 + "full" rated diode	50	IKW50N65SS5	IKZA50N65SS5
		75	IKW75N65SS5	IKZA75N65SS5

For the CoolSiC™ MOSFET portfolio and our broad WBG offering, please check the Wide-bandgap semiconductors chapter.

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TRENCHSTOP™ 5 F5, H5, and S5

Aircon PFC UPS Solar Welding Charger SMPS Corded power tools

Together with isolated driver, 650 V SOI driver, and low-side driver family

	Continuous collector current at T_c=100°C [A]	TO-263 (D^2PAK) Hal	TO-220 Hal	TO-247 advanced isolation Hal	TO-220 FullPAK Hal	TO-247 Hal	TO-247 4-pin Hal
IGBT	15	IGB15N65S5					
	20	IGB20N65S5	IGP20N65F5/IGP20N65H5				
	30		IGP30N65F5/IGP30N65H5				
	40		IGP40N65F5/IGP40N65H5			IGW40N65F5/IGW40N65H5	
	50	IGB50N60H5				IGW50N65F5/IGW50N65H5	
		IGB50N60S5					
	75					IGW75N65H5	
	100						
DuoPack	8		IKP08N65F5/IKP08N65H5		IKA08N65F5/IKA08N65H5		
	15	IKB15N65EH5	IKP15N65F5/IKP15N65H5		IKA15N65F5/IKA15N65H5		
	20	IKB20N65EH5	IKP20N65H5/IKP20N65F5				
	28		IKP28N65ES5				
	30	IKB30N65EH5	IKP30N65H5/IKP30N65F5			IKW30N65H5	
		IKB30N65ES5				IKW30N65ES5	
	39		IKP39N65ES5				
	40	IKB40N65ES5	IKP40N65F5/IKP40N65H5	IKFW40N65DH5		IKW40N65F5/IKW40N65H5	
		IKB40N65EH5				IKW40N65ES5	
		IKB40N65EF5					
	50			IKFW50N65ES5		IKW50N65F5/IKW50N65H5	IKZ50N65EH5
				IKFW50N65DH5 IKFW50N65EH5		IKW50N65EH5 IKW50N65ES5	IKZ50N65ES5
	60			IKFW60N65ES5			
	75			IKFW75N65ES5		IKW75N65EH5	IKZ75N65EH5
				IKFW75N65EH5		IKW75N65ES5	
	90			IKFW90N65ES5			

TRENCHSTOP™ 5 L5 low $V_{CE(sat)}$

Solar UPS Welding

650 V product family together with low-side driver family

	Continuous collector current at T_c=100°C [A]	TO-251 (IPAK)	TO-252 (DPAK) Hal	TO-263 (D^2PAK) Hal	TO-220 Hal	TO-262 (I^2PAK) Hal	TO-220 FullPAK Hal	TO-247 Hal	TO-247 4-pin Hal
IGBT	30							IGW30N65L5	
Duo-Pack	30							IKW30N65EL5	
	75							IKW75N65EL5	IKZ75N75EL5

TRENCHSTOP™ 5 WR5/WR6

Aircon PFC Welding

650 V product family together with low-side driver family

	Continuous collector current at T_c=100°C [A]	TO-247 Hal	TO-247 HCC Hal
DuoPack	20		IKWH20N65WR6
	30	IKW30N65WR5	IKWH30N65WR5/IKWH30N65WR6
	40	IKW40N65WR5	IKWH40N65WR6
	50	IKW50N65WR5	IKWH50N65WR6
	60		IKWH60N65WR6
	70		IKWH70N65WR6

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Discrete silicon power diodes

Discrete Emitter Controlled 7 silicon diodes

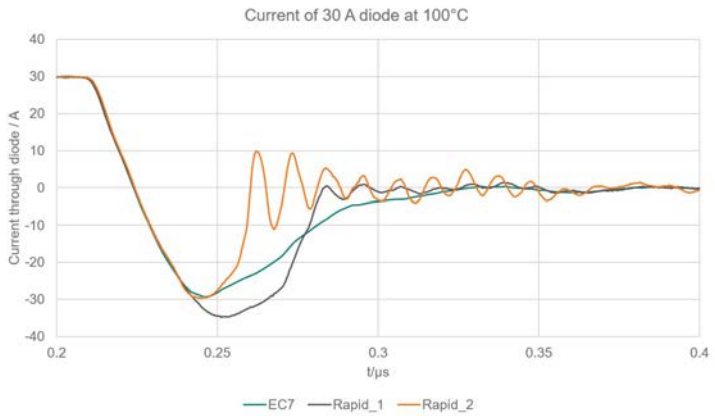
Emitter Controlled (EC) 7 is Infineon's latest single-packed standalone diode in a discrete TO-247 2-lead package. The EC7 diode technology has been developed in two different voltage classes for specific reasons

- 650 V to enhance softness (as indicated in the diagram below), compared to previous generations of discrete diodes such as EC3, Rapid 1, and Rapid 2
- 1200 V, Infineon introduces a power diode in a discrete TO-247 Package for the first time, offering an alternative to wide-bandgap silicon carbide diodes



The EC7 Families also offer enhanced reliability through the TO-247-2 package, reducing discharge-related failure modes. Their unique high current ratings (up to 150 A) increase power density in the discrete package, enabling smaller and lighter designs. These diodes are qualified for industrial applications according to the relevant tests of JEDEC47/20/22. A standout feature unique to the EC7 is its HV-H3TRB robustness, ensuring higher system reliability in challenging operating conditions.

Diode dynamic waveforms at 30 A, 10 Ω, 100°C



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Rapid 1 diodes

650 V product family



Continuous current I_F at T_C=100°C [A]	TO-220	TO-220 FullPAK	TO-247	TO-247 common cathode	TO-247 advanced isolation
8	IDP08E65D1				
15	IDP15E65D1				
20		IDV20E65D1			
30	IDP30E65D1		IDW30E65D1	IDW30C65D1	
40			IDW40E65D1		IDFW40E65D1E
60				IDW60C65D1	IDFW60C65D1
75				IDW75D65D1	
80				IDW80C65D1	IDFW80C65D1

Rapid 2 diodes

650 V product family



Continuous current I_F at T_C=100°C [A]	TO-220	TO-220 FullPAK	TO-220 common cathode	TO-247	TO-247 common cathode
8	IDP08E65D2	IDV08E65D2			
15	IDP15E65D2	IDV15E65D2		IDW15E65D2	
20	IDP20E65D2		IDP20C65D2		IDW20C65D2
30	IDP30E65D2	IDV30E65D2	IDP30C65D2		IDW30C65D2
40	IDP40E65D2			IDW40E65D2	
80					IDW80C65D2

Emitter controlled diodes

600 V and 1200 V product families



	Continuous current I_F at T_C=100°C [A]	TO-263 (D^2PAK)	TO-220 Real 2-pin	TO-247
600 V	30			IDW30E60
	50			IDW50E60
	75			IDW75E60
	100			IDW100E60
1200 V	12		IDP12E120	
	18		IDP18E120	
	30	IDB30E120	IDP30E120	

Emitter controlled 7 diodes

650 V and 1200 V product families



	Continuous current I_F at T_C=100°C [A]	TO-247-2pin
650 V	20	IDWD20E65E7
	30	IDWD30E65E7
	40	IDWD40E65E7
	50	IDWD50E65E7
	60	IDWD60E65E7
	75	IDWD75E65E7
	100	IDWD100E65E7
	120	IDWD120E65E7
	150	IDWD150E65E7
1200 V	30	IDWD30E120D7
	40	IDWD40E120D7
	50	IDWD50E120D7
	60	IDWD60E120D7
	75	IDWD75E120D7
	100	IDWD100E120D7
	120	IDWD120E120D7
	140	IDWD140E120D7

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Nomenclature

IGBT (after 03/2013)



Company
I = Infineon
S = Formerly Siemens

Device
E = Enhanced
G = Single IGBT
H = Reverse conducting
K = DuoPack

Package type
A = TO-220-3 FullPAK
B = TO-263-3 (D^2PAK)
D = TO-252-3 (DPAK)
N = SOT-223
P = TO-220-3
Q = TO-247PLUS
QB = TO-247PLUS 3-pin SMD
U = TO-251-3 (IPAK)
W= TO-247-3
Y = TO-247PLUS 4-pin
Z = TO-247-4
FW = TO-247-3 advanced isolation
WH =TO-247-3 high creepage
WS = TO-247 6-pin
ZA = TO-247 4-pin asymmetric

Nominal current
[A] at 100°C
[A] Equivalent collector current for advanced isolation

Technology
N = N-channel
P = P-channel

E = replacement for TO-247 with medium performance insulator or FullPAK
Blank = best in class, replacement for TO-247 with high performance insulator or FullPAK

Optimization
CP2 = EDT2™ series
E1 = Reverse conducting E-series
F5 = TRENCHSTOP™ 5 ultra fast
H3 = HighSpeed 3
H5 = TRENCHSTOP™5 fast
H6 = 1200 V TRENCHSTOP™ IGBT6
H7 = TRENCHSTOP™ IGBT7 H7
IPD = Integrated Power Device Protect
L5 = TRENCHSTOP™ 5 low $V_{CE(sat)}$
R = Reverse conducting Drives (RC-D)
R3 = Reverse conducting R3 series
R5 = Reverse conducting R5 series
R5L = Reverse Conduting R5L series
R6 = Reverse conducting R6 series
RC2 = Reverse conducting Drives Gen2
RF = Reverse conducting Drives Fast
S5 = TRENCHSTOP™ 5 medium speed
S6 = 1200 V TRENCHSTOP™ IGBT6
S7 = 1200 V TRENCHSTOP™ IGBT7
T = TRENCHSTOP™
T2 = TRENCHSTOP™ 2
T6 = 650 V TRENCHSTOP™ IGBT6
T7 = TRENCHSTOP™ IGBT7
TP = TRENCHSTOP™ Performance
WR5 = TRENCHSTOP™ 5 WR5
WR6 = TRENCHSTOP™ 5 WR6

Diode (for DuoPack only)
B = Emitter controlled 1200 V half rated diode
C = Emitter controlled 1200 V full rated diode
D = Rapid 1 650 V half rated diode
E = Rapid 1 650 V full rated diode
R = CoolSiC™ 650 V half rated diode
S = CoolSiC™ 650 V full rated diode

Nominal voltage
Divided by 10 (650 V/10 = 65)

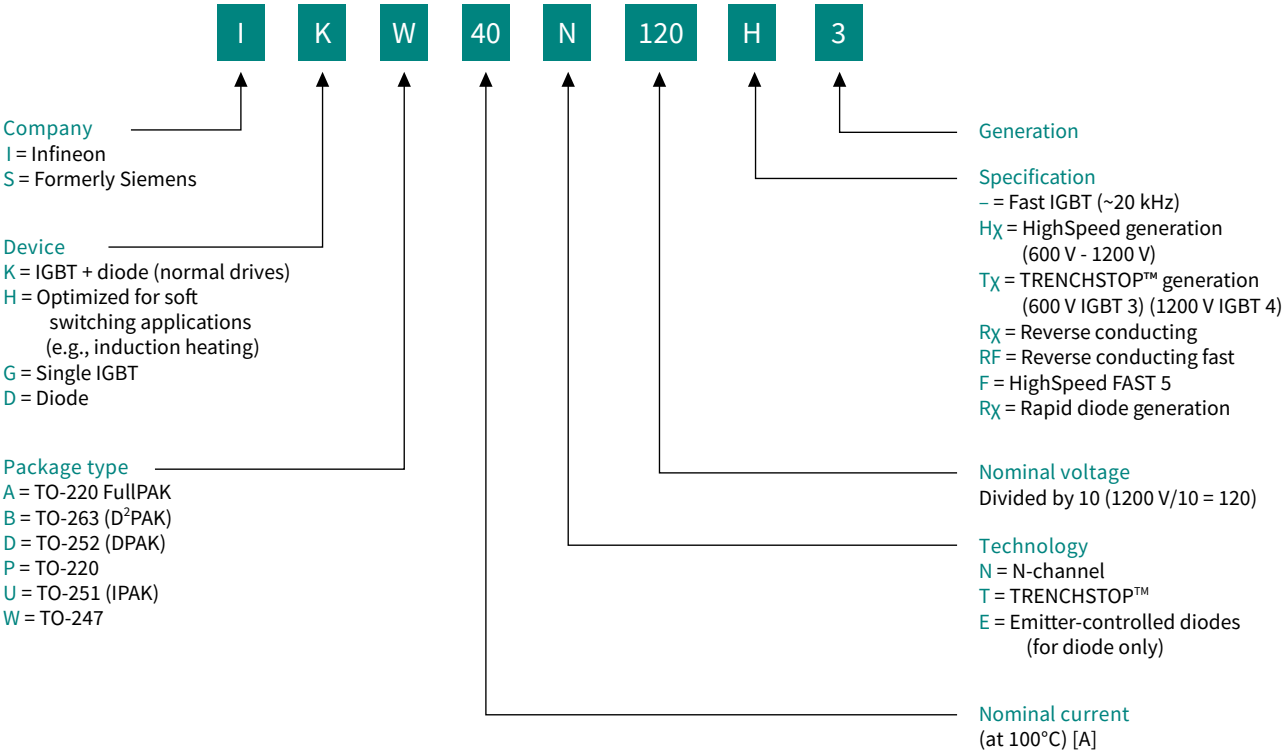
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* Only for advanced isolation

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IGBT (before 03/2013)



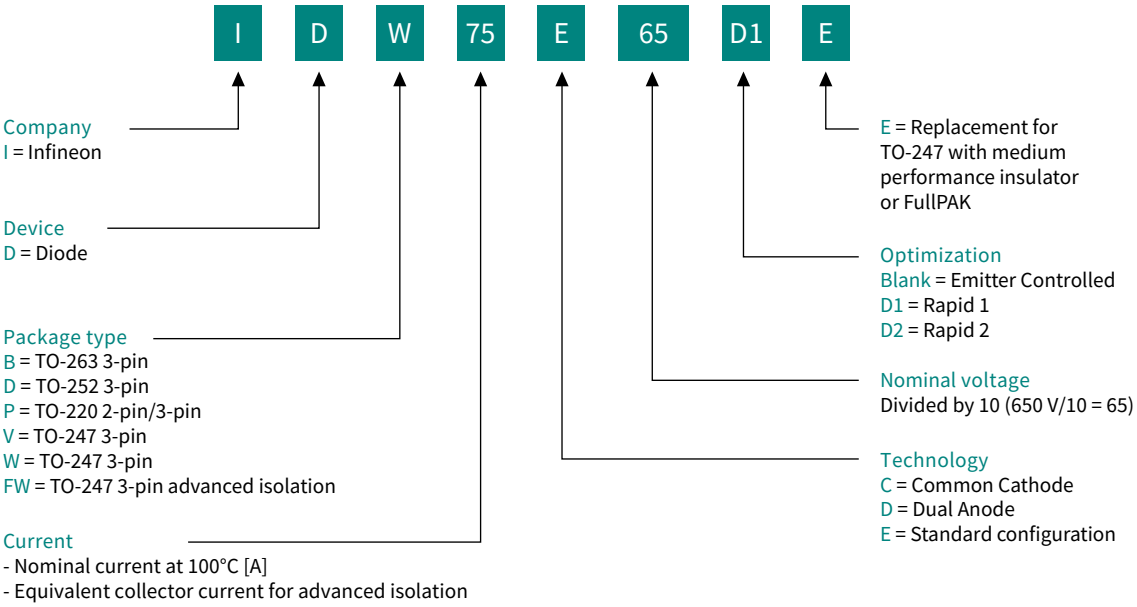
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Nomenclature

Discrete Silicon power diodes



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* Only for advanced isolation



Infineon support for discrete IGBTs and silicon power diodes

Useful links and helpful information

Further information, datasheets, and documents

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Intelligent power switches and modules

- CIPOS™ IPM family
- iMOTION™ IPM
- ISOFACE™ isolated industrial interface
- PROFET™ Industrial
- Power PROFET™ +24/48V
- HITFET™
- CIPOS™, ISOFACE™, PROFET™ Industrial, Power PROFET +24/48V and HITFET™ product portfolio

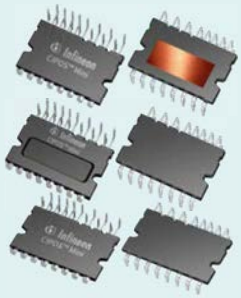
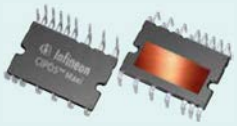
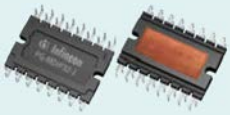
CIPOS™ IPM family

CIPOS™ intelligent power modules in different packages, voltage, and current classes

Infineon has a broad portfolio of intelligent power modules (IPMs) with different semiconductors combined in various packages in varying voltage and current classes. These IPMs are separated into Compact, Standard, and Performance families.

Part of the IPMs is divided into CIPOS™ Nano, CIPOS™ Micro, CIPOS™ Mini, CIPOS™ Maxi, and CIPOS™ Prime families. CIPOS™ IPMs are families of highly integrated, compact power modules designed to drive motors in applications ranging from home appliances, fans, pumps, HVACs to industrial drives. These energy-efficient intelligent power modules integrate the latest power semiconductor and ICs technologies from Infineon.

CIPOS™ product overview

CIPOS™ Nano	CIPOS™ Micro	CIPOS™ Mini	CIPOS™ Maxi	CIPOS™ Prime
MOSFET 100/250/500/600 V	IGBT: 600 V, 2/4/6 A	IGBT: 600 V, 4-50 A	IGBT: 1200 V, 5-20 A CoolSiC™ MOSFET: 1200 V , 90/60 mΩ	CoolSiC MOSFET: 18 ~ 62 mΩ
				
7 x 8 x 0.9 mm 8 x 9 x 0.9 mm 12 x 10 x 0.9 mm 12 x 12 x 0.9 mm	29 x 12 x 2.9 mm	36 x 21 x 3.1 mm	36 x 23 x 3.1 mm	44 x 27.4 x 5.7 mm
Compact IPM	Standard IPM	Performance IPM		

Key benefits

- Fast time-to-market
- Increased reliability
- Reduced system design complexity
- Improved manufacturability

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CIPOS™ Nano

Smallest IPM in the world with various topology and voltage options

The ultra-compact CIPOS™ Nano is a family of highly integrated power modules for high-efficiency consumer and light industrial applications. CIPOS™ Nano is designed for the rectifier, converter, and inverter stages in power management circuits and motor drives for applications like fans, hair dryers, air purifiers, and circulation pumps. By implementing an innovative Power QFN package, which utilizes PCB copper traces to dissipate heat from the module, the CIPOS™ Nano family delivers a new benchmark in device size, offering up to a 60 percent smaller footprint than existing three-phase motor control power IPMs.

The family is comprised of a series of fully integrated three-phase, half-bridge, and H-bridge surface-mount motor control circuit solutions. The new alternative approach utilizes PCB copper traces to dissipate heat from the module, providing cost savings through a smaller package design and even eliminating the need for an external heat sink.

Features and benefits

Key benefits	Key advantages
– Various switch technologies such as HEXFETs, Trench FREDFETs, Trench MOSFETs, and CoolMOS™ apply to motor drivers	– Smallest modules in the market
– Multiple package platforms with various topologies to suitable for a variety of application scenarios	– Cost savings from a smaller footprint and a reduced PCB space
– Integrated bootstrap functionality and gate drivers	– Easy implementation of two- or three-phase motor drives
– Realize a variety of protection (overcurrent protection, undervoltage lockout, overtemperature protection, fault reporting, and etc.)	– Half-bridge configuration enables more flexible board design with better thermal performance
– Accessible for heat sink-less operation	– Same PCB footprint to address multiple application markets (100 VAC – 230 VAC)

Key applications

- Hair dryers
- Fan motors
- Pumps
- Air conditioner indoor units
- Air purifiers
- Small kitchen appliances

Package overview

QFN 7x8 7 x 8 x 0.9 mm	QFN 8x9 8 x 9 x 0.9 mm	QFN 12x10 12 x 10 x 0.9 mm	QFN 12x12 12 x 12 x 0.9 mm
			

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CIPOS™ Micro

Solution for low-power motor drive applications

CIPOS™ Micro is a family of compact, three-phase IPMs (intelligent power modules) for low-power (i.e., up to 500 W with heatsink) motor drive applications, including ventilation fans, circulation pumps, air purifiers, dish washer, refrigerator compressor drives, and outdoor fans of air conditioners. CIPOS™ Micro has several protection features, including precise overcurrent protection and a UL-certified temperature sensor. Available in both surface-mount and through-hole configurations, the family features rugged and efficient high-voltage IGBTs specially optimized for variable frequency drives with a 600 V rating. Also, these IPMs utilize high-voltage gate drivers tuned to achieve an optimal balance between EMI and switching losses.

Features and benefits

Key features	Key benefits
– Wide range of product coverage	– Save system space and cost through the enhanced power capability
– Optimized dv/dt for loss and EMI trade offs	– Offer an application-optimized solution for both fast-switching and low-EMI versions
– HV H3TRB qualified	– Improve system ruggedness through enhanced protection features and isolation voltage
– Compatible with mass-market TO-2xx heat-sinks and clips	
– Power capability up to 500 W at isolation 2000 V_{RMS}, 1 min	

Key applications

- RAC outdoor fan
- Dish washer
- Fan motor and pump
- Washing machine
- Refrigerator
- General purpose drive

Package overview

DIP 29x12 29 x 12 x 3.1 mm	SOP 29x12 29 x 12 x 3.1 mm
	

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CIPOS™ Mini

Broad range of configurations from PFC to inverter

CIPOS™ Mini is a family of highly efficient intelligent power modules that has the highest power density with 4 A to 50 A rated products built into a single package platform. It integrates various power and control components to increase reliability, and optimize PCB size and system costs. Utilizing multiple configurations, CIPOS™ Mini IPMs apply to a wide range of applications to control variable speed drives, such as air conditioners, washing machines, refrigerators, vacuum cleaners, compressors, and industrial drives up to 8 kW.

The configurations offered within the CIPOS™ Mini family are IGBT three-phase inverter, integrated PFC, and two-phase and three-phase interleaved PFC. All options include an integrated gate driver and a built-in temperature sensor. CIPOS™ Mini provides optimized performance for power applications, which need good thermal conduction and electrical isolation, but also EMI-safe control, innovative FAULT indication, and overload protection.

Infineon's TRENCHSTOP™ IGBTs and reverse-conducting IGBTs are combined with newly optimized Infineon SOI gate driver ICs for excellent electrical performance. Also, CIPOS™ Mini family offers IPMs with DCB substrates, improving heat dissipation to provide higher power capability.

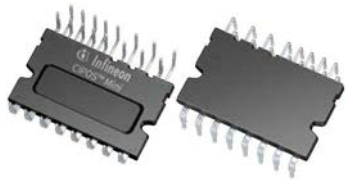
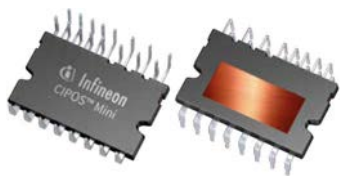
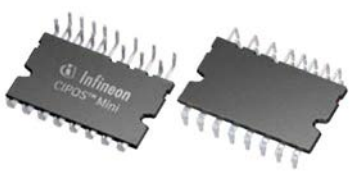
Features and benefits

Key features	Key benefits
– Wide range of current rating: 4 to 50 A	– Lower PCB size and system cost
– High integration (bootstrap circuit, thermistor, single boost PFC)	– Easy power extension from 300 W to 8 kW
– Optimized for target application requirements (separate versions for washing machines and air conditioners)	– Optimized performance for each application
	– UL-certified package and temperature sensor

Key applications

- Refrigerators
- Washing machines
- Room air conditioning
- Fans and pumps
- HVAC outdoor fans
- General purpose drives

Package overview

DIP 36x21 36 x 21 x 3.1 mm	DIP 36x21D 36 x 21 x 3.1 mm	DIP 36x21 36 x 21 x 3.1mm
		

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CIPOS™ Maxi

Smallest package in 1200 V IPM class while still offering high power density and best performance

The high-performance CIPOS™ Maxi intelligent power modules (IPMs) integrate various switching devices and control components to increase reliability, optimize PCB size and system costs. CIPOS™ Maxi IPMs are designed to control three-phase AC motors and permanent magnet motors in variable speed drive applications such as low-power industrial motor drives, pumps, fan drives, and active filters for HVAC (heating, ventilation, and air conditioning). The product concept is specially adapted to power applications, which need excellent thermal performance and electrical isolation as well as meeting EMI requirements and overload protection.
The existing IGBT 4-based portfolio IM818 series offers 5 A, 10 A, and 15 A in 1200 V class up to a 3.0 kW power rating, while the newly IGBT 7-based IM12BxxxC1 series offers 10 A, 15 A, and 20 A to extend the power rating up to 4.0 kW. IM12SxxEA2 series offers superior efficiency up to 99 percent and optimal reliability up to 4.8 kW power rating through the six revolutionary CoolSiC™ MOSFETs with an optimized 1200 V 6-channel SOI gate driver. IM12SxxEA2 series provides exceptional power density with a wide switching speed range of up to 40 kHz, which allows it to adapt to fast-switching applications with superior lower power losses.

Features and benefits

Key benefits
– Fully isolated dual in-line molded module with DCB
– 1200 V TRENCHSTOP™ IGBT 4, IGBT 7
– 1200 V CoolSiC™ MOSFET
– Rugged 1200 V SOI gate driver technology
– Integrated booststrap functionality
– Overcurrent shutdown
– Undervoltage lockout at all channels
– All of six switches turn-off during protection
– Cross-conduction prevention
– Independent NTC for temperature monitoring
– Allowable negative VS potential up to -11 V for signal transmission at V_{BS} of 15 V
– Low-side emitter pins accessible for all phase current monitoring (open emitter)
– Programmable fault clear timing
– Enable input

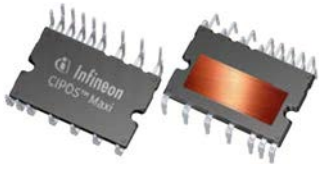
Key advantages
– The smallest package size in 1200 V IPM class with high power density and best performance
– Enhanced robustness of gate driver technology for excellent protection
– High efficiency
– Adapted to high switching application with lower power loss
– Simplified design and manufacturing
– Time-to-market

Key applications

- Fan and pumps
- HVAC outdoor fans
- Heat pumps
- Low-power general purpose drives (GPI, servo drive)
- Active filter (active power factor correction) for HVAC

Package overview

DIP36x23D
36 x 22.7 x 3.1 mm



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CIPOS™ Prime

Top-side cooled dual in-line power module for automotive and industrial applications

Introducing the CIPOS™ Prime, a state-of-the-art top-side cooled dual in-line, through-hole, 32-pin transfer molded power module designed for battery electric vehicle (BEV) and hybrid electric vehicle (HEV) automotive applications and a broad range of industrial applications. This power module is expertly tailored to manage diverse applications, including on-board chargers (OBC), DC-DC converters, fluid pumps, air conditioning systems, and various industrial power conversion and motor drive applications.

Key features

- 2nd generation CoolSiC™ MOSFETs: CIPOS™ Prime modules utilize advanced CoolSiC™ MOSFET technology, renowned for superior electrical characteristics and thermal behavior. This ensures low $R_{DS(on)}$ and minimized switching energies, translating to high efficiency and performance.
- Enhanced thermal conductivity: The direct bonded copper (DBC) packaging based on aluminum nitride provides exceptional thermal conductivity, resulting in very low thermal resistance and high electrical isolation.
- High operating junction temperature: Capable of operating at junction temperatures up to 175°C, CIPOS™ Prime modules allow for greater power dissipation and improved thermal management.
- Robust and flexible design: Featuring a unique molding design with grooves, these modules ensure high creepage distance, making them ideal for high-power density and high-efficiency applications. The staggered pin-out design enhances flexibility at the PCB layout level, ensuring proper alignment and assembly.
- Automotive grade reliability: Qualified to AEC-Q101 and AQG 324 standards, these modules are designed to endure harsh automotive environments, including high temperatures, humidity, and vibration.

Features and benefits

Key benefits
– Simplified design: Integrates multiple components into a single package
– Improved reliability: Designed for harsh automotive environments
– Superior thermal management: Efficient heat dissipation with embedded NTC thermistor
– Enhanced performance: Higher efficiency and reduced power losses
– Higher engineering efficiency: Minimized PCB size and faster time-to-market

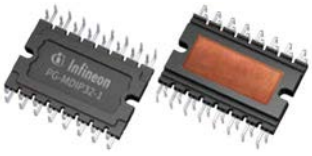
Key advantages
– Best-in-class solution: Market-compatible with zig-zag pin-out
– Versatile portfolio: Covers 11 kW and 22 kW topologies with three modules
– Drop-in replacement: For competitor "S" with improved groove design
– Advanced CoolSiC™ technology: Ensures unmatched quality and reliability
– Optimized thermal path: High-performance AlN material, no isolation foil needed
– Compact design: Small PCB footprint and simplified mechanical design

Key applications

- Automotive: On-board chargers (OBC), DC-DC converters, auxiliary power supplies, fluid pumps, generator, fuel cell compressor, and air conditioning systems
- Industrial: HVAC, power conversion, EV-charging, industrial motor control, power supply, and converter applications

Package overview

DIP44x28D
44 x 27.4 x 5.7 mm



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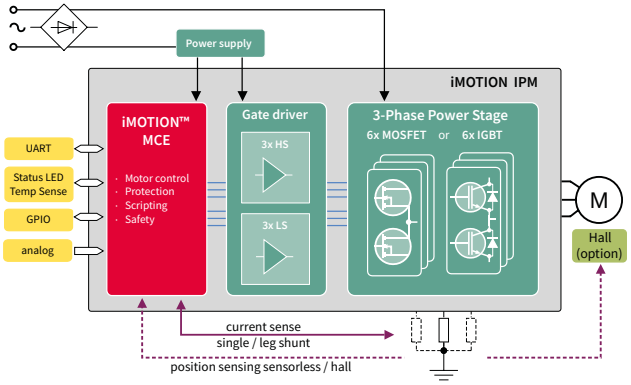
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iMOTION™ IPM

Fully integrated iMOTION™ IPM for BLDC motor control

iMOTION™ IPM is a family of fully integrated modules for the control of three-phase motors, optimized for low-power devices. Within the iMOTION™ IPM family are two different series: The IMM100 and IMI110 combine the motor controller IC and a three-phase inverter stage in a single package, minimizing the number of external components and the PCB area. The three-phase inverter stage is based on either six MOSFETs or six IGBTs. These iMOTION™ IPMs offer the highest integration level by using the field-proven iMOTION™. Motion Control Engine (MCE) in combination with providing all required hardware functions: From single shunt current sensing to bootstrap capability, signal filtering, and several hardware protections like dead-time insertion and shoot-through prevention. An iMOTION™ IPM does not require a heatsink and addresses motor drives with a rated output power between 30 W and 80 W with a 600 V maximum DC blocking voltage, depending on the chosen product variant.

All IMM100 and IMI110 devices support the functional safety requirements according to the IEC/UL 60730-1 (“class B”).





Features and benefits

Key benefits
– Completely self-sustaining Motion Control Engine with an identical feature set as the IMC100 series
– Up to 80 W without heatsink
– Support for IEC 60335-1 (‘Class B’)
– Controller, gate driver, and power stage in one package
– IMI in DSO-22 package with single layer layout option

Key advantages
– Fastest time-to-market with easy parametrization and tuning of motor control
– Applicable for fans and small pumps
– Support for functional safety integrated
– Minimizing BOM count and PCB area
– Reducing PCB and production costs



EVAL-IMM101T-046 is a starter kit for iMOTION™ IMM101T-046M IPMs. Together with the iMOTION™ Solution Designer the board can be used for an easy system configuration, controlling, tuning, and monitoring. EVAL-IMM101T-046 enables rapid prototyping of various inverterized motor control systems, for example fans, pumps, and compressors.

Product portfolio

Product	Function	Integration	Description	Package
IMI111T-026H	Motor inverter	MCE incl. scripting, gate driver, IGBT based inverter	Output rating: 600 V/2 A, single shunt sensorless operation	PG-DSO-22-1
IMI111T-046H	Motor inverter	MCE incl. scripting, gate driver, IGBT based inverter	Output rating: 600 V/4 A, single shunt sensorless operation	PG-DSO-22-1
IMM101T-046M	Motor inverter	MCE incl. scripting, gate driver, MOSFET based inverter	Output rating: 600 V/1.4 Ω $R_{DS(on)}$, single/leg shunt, sensorless/Hall	PG-IQFN-38-1
IMM101T-056M	Motor inverter	MCE incl. scripting, gate driver, MOSFET based inverter	Output rating: 600 V/0.95 Ω $R_{DS(on)}$, single/leg shunt, sensorless/Hall	PG-IQFN-38-2

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ISOFACE™ isolated industrial interface

Galvanic-isolated output switch and digital input ICs offers unmatched system uptime, high reliability, and up to 50 percent shorter product launch time

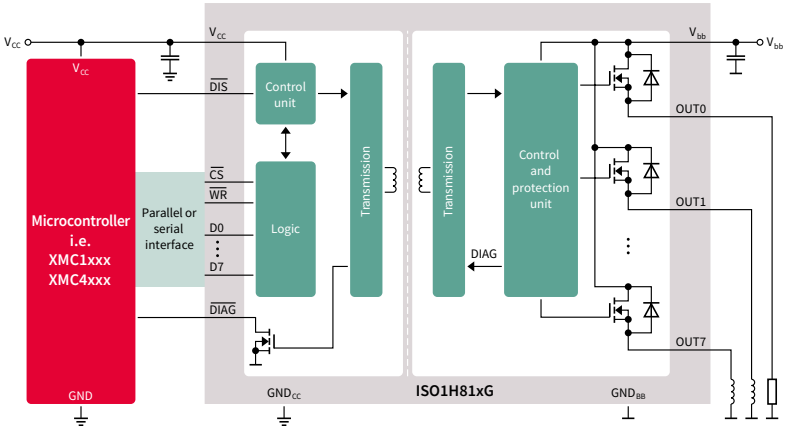
The ISOFACE™ product family provides robust and intelligent galvanic-isolation for various industrial control applications such as programmable logic controllers, sensor input modules, distributed control systems, control panels, and general control equipment. The output switches are compact in design, enabling robust and reliable operation at a low system cost. The input ICs are equally robust, offers reliable operation in a compact form factor and offers industry leading superior EMI robustness setting a new standard in diagnostics.

ISOFACE™ galvanic-isolated 8-channel output switches

The ISO1H81xG product family integrates:

- Robust galvanic isolation (UL508 and C22.2 NO14 certified) to protect the 3.3 V/5 V control domain of an industrial control system from the harsh 24 V process side
- 8-channel high-side power-switching capabilities of up to 1.2 A per channel
- Active current limitation and overtemperature protection
- Common diagnostic feedback for overtemperature and for V_{bb} undervoltage

Isolated output switch block diagram



Isolated output switches



Features and benefits

Key features	Key benefits
– Integrated galvanic isolation (500 V_{AC})	– Robust and reliable
– Eight channels (0.6 or 1.2 A, each)	– Compact system solution
– Inductive load switching	– Lower system cost
– Diagnostic feedback (overtemperature, overload)	– System status feedback
– Serial and parallel MCU interface	– Directly interfacing with all MPUs and MCUs

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ISOFACE™ galvanic-isolated 8-channel high-side switch with 10-fold diagnostics

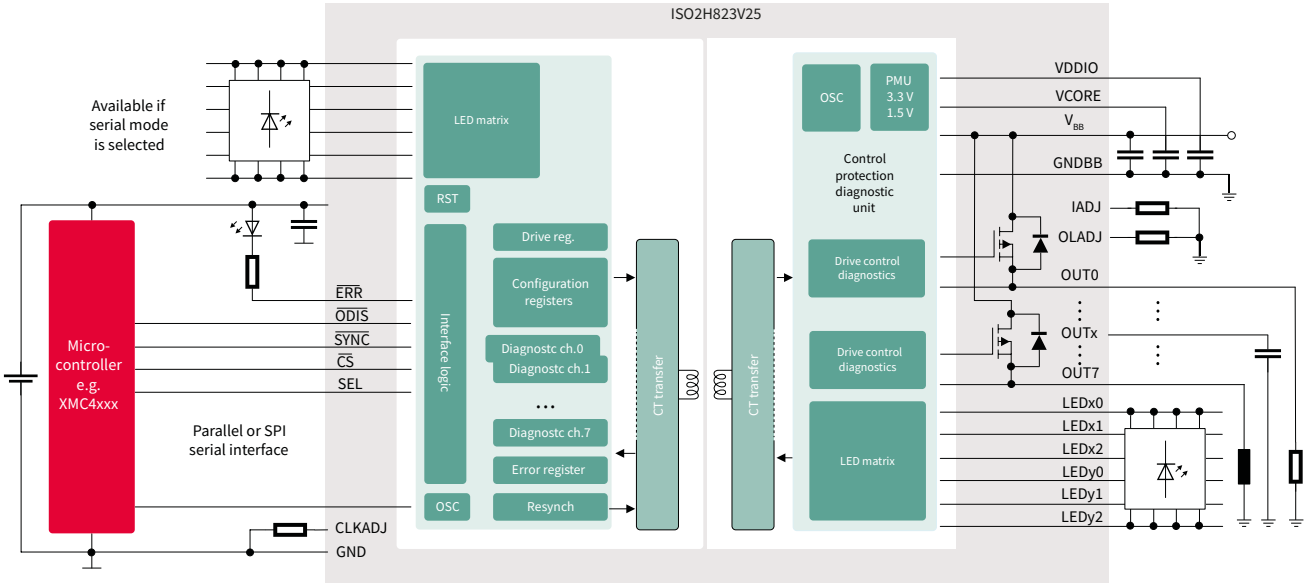
The ISO2H823V establishes a new standard in diagnostics for industrial control applications. For example, in industrial plants with capital-intensive single-tool equipment at work or with time-critical chemical processes running, obtaining in real-time differentiated feedback from the factory floor enables both, preventive maintenance and drastic reduction of the time to fix a problem. This is why the ISO2H823V is a highly desirable system solution. System designers benefit from the ISO2H823V through short time-to-market, reduced PCB area, and uncompromised product reliability.

The ISO2H823V integrates:

- Robust 2.5 kV AC galvanic isolation:
  - UL508 and CSA C22.2 No.14 certified
  - Protecting the 3.3 V control domain of an industrial control system from the harsh 24 V process side
  - Exceeding the IEC 61131-2 requirements for reinforced isolation
- 8-channel high-side power-switching capabilities of up to 0.6 A per channel with active current limitation and overtemperature protection
- 10-fold diagnostic feedback
  - Five types of feedback which are available individually for each of the eight outputs
  - Five types of IC-level feedback
- Common diagnostic feedback for overtemperature and for V_{bb} undervoltage



Typical application



Features and benefits

Key features	Key benefits
– Robust 2.5 kV AC galvanic isolation	– Reliable and UL-certified
– Eight channels (up to 0.6 A per channel)	– Small form factor solution
– 10-fold diagnostic feedback (overtemperature, overload)	– Preventive maintenance and short down-times

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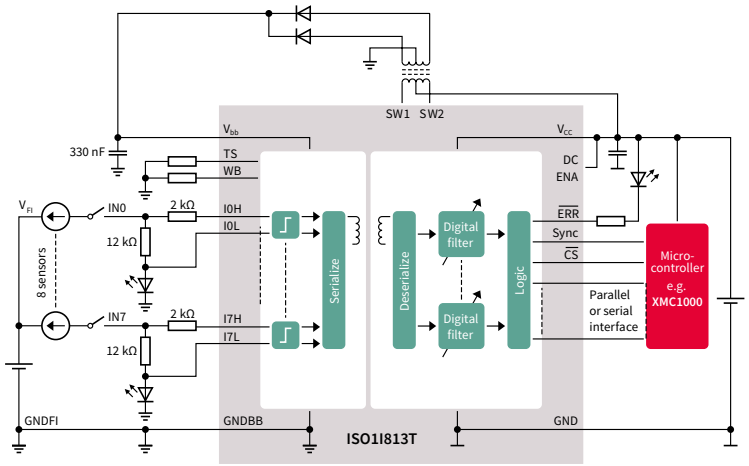
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ISOFACE™ galvanic-isolated digital input ICs

The UL1577 certified ISO1I81xT digital input IC family is an intelligent system solution offering robust galvanic isolation between the microcontroller on the “control side” and the 24 V factory floor environment, frequently referred to as the “process side”.

Digital input switch block diagram



Galvanic-isolated digital input ICs



Features and benefits

Key features	Key benefits
– Integrated galvanic isolation (500 V_{rms})	– Robust and reliable
– Eight channels (IEC type 1/2/3)	– Compact system solution
– Up to 500 kHz sampling speed	– High-speed applications
– Programmable input filters	– Superior EMI robustness
– Channel-resolved diagnostics (wire-break, undervoltage)	– System status feedback
	– Valuable maintenance support

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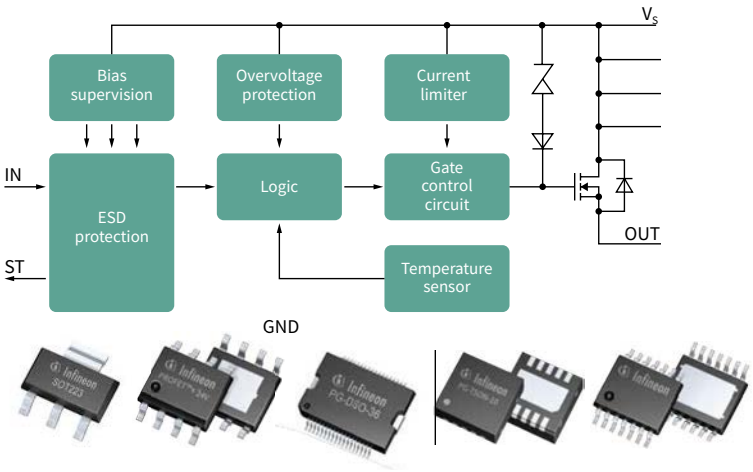
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Share your feedback

PROFET™ Industrial

Protected high-side switches

Infineon's market-proven high-side switch PROFET™ Industrial products have been designed to target various industrial applications that drive all types of resistive, inductive, and capacitive loads. Due to their outstanding energy robustness, they are perfectly suitable for switching challenging inductive loads and driving relays. Their main application areas include high-voltage and (V_{supply} up to 60 V) and PWM applications up to 1 kHz. PROFET™ Industrial can be applied to drive any kind of sensor units, indicators, displays, LEDs, relays, valves, and magnetic actuators or replace electromechanical relays, fuses, and discrete circuitry. PROFET™ Industrial products are also perfect for applications with long wiring or any other kind of inductive loads or applications with space constraints. Failsafe systems do make use of them as well.

PROFET™ typical block diagram



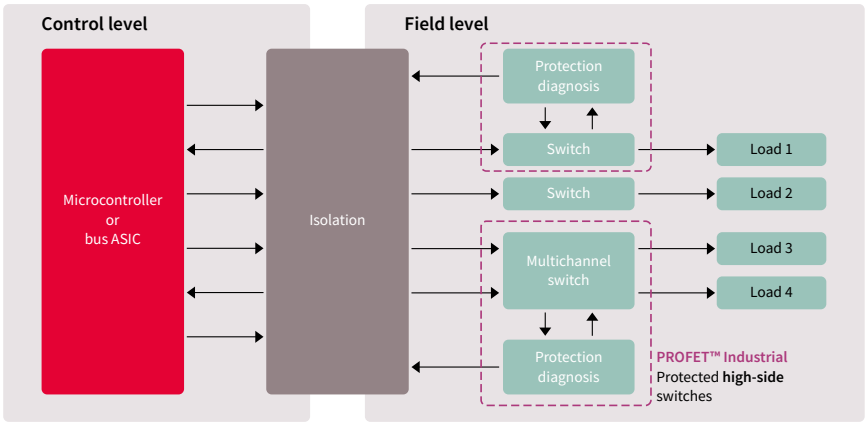
Key applications

- Industrial automation
- Programmable logic controller (PLC)
- Digital DCS and PC I/O modules
- Robotics
- Building and home automation
- Solar applications
- Wind energy systems
- Failsafe systems
- Smart grid
- Motor control and drives
- Power supplies

Features and benefits

Key features	Key benefits
– Right fit for digital output modules, motor or robot control, protected switching of decentralized loads like sensors or auxiliary supply	– Small system form factor
– Outstanding robustness and reliability as required by industrial mission profiles	– No/little downtime of system in operation
– Thermally optimized products with low $R_{DS(on)}$ to deal with the high ambient temperatures in applications with limited or even no cooling	– Low heating up of a system
– Diagnosis and protection for safe system operation	– System cost saving by built-in protection and tailored featureset
– Small and compact design for higher integration and applications with space constraints	– Reduced system maintenance efforts by providing optimized diagnostics

PLC – programmable logic controller digital output modules



PROFET™ as actuators typically address I/O modules supplying nominal currents of 2 A or 0.5 A. However, PROFET™ portfolio also provides devices for lower and higher currents. PROFET™ parts are suitable for switching resistive, capacitive and, by featuring high EAS, inductive loads.

Corresponding PROFET™ evaluation boards are available on request.

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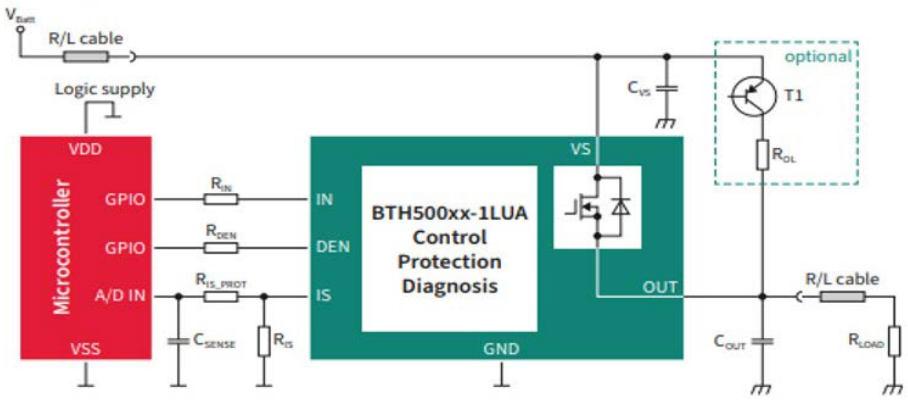
Power PROFET™ +24/48V

PRO SIL
ISO 26262 ready

Lowest ohmic and smart power switch

Power PROFET™ +24/48V family offers three new single-channel smart high-side power switches embedded in an 8-pin TO-leadless package, providing protective functions and diagnosis. This new family includes three high-side switch variants: The BTH50030-1LUA with an $R_{DS(on)}$ of 3.0 mΩ, the BTH50015-1LUA with an $R_{DS(on)}$ of 1.5 mΩ and the BTH50060-1LUA with an $R_{DS(on)}$ of 6.0 mΩ ensuring minimal power losses in 24 V and 48 V applications. One of the key advantages of the Power PROFET™ +24/48V switch family is its efficiency and space-saving capabilities. These switches are highly integrated, conserving space and offering resettable and diagnostic features. They are designed to perform optimally in demanding environments, with on-resistances as low as 1.5 mΩ, making them ideal for high-current applications in automotive and industrial applications.

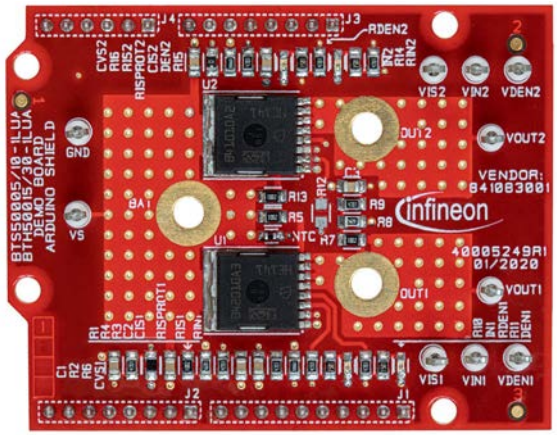
Application diagramm example for Power PROFET™ +24/48V





Features and benefits

Key features	Key benefits
– $R_{DS(on)}$ range 1.5-6 mΩ	– Reliable power distribution
– Up to 54 V operating voltage	– Accurate current sensing
– PRO-SIL™ ISO 26262-ready	– Supports long wires
– Current trip	– Ideal for limited board space
– Analog current sense	– Leadless power package
– Basic self-protection and diagnosis	



The 48 V protected switch shield for Arduino is a flexible evaluation board that drive loads. It comes with two devices that can be evaluated: BTH50015-1LUA ($R_{DS(on)}$ 1.5 mΩ) and BTH50030-1LUA ($R_{DS(on)}$ 3.0 mΩ), the lowest ohmic smart high-side power switches available in the market for 24 V and 48 V power nets.

OPN: BOARD BTH50015-1LUA

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HITFET™

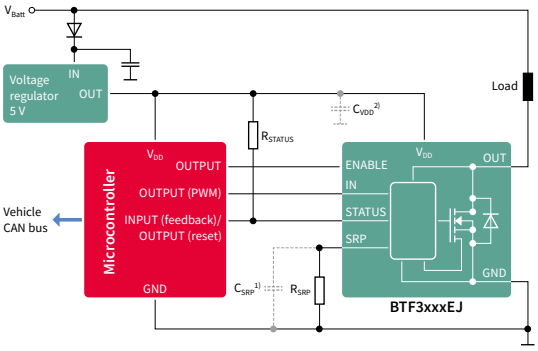
PRO SIL

ISO 26262 ready

Low-side smart protected switches

HITFET™ stands for highly-integrated temperature-protected MOSFET. These well-established low-side switches offer a compelling feature set with protection against overtemperature, short circuit and overload conditions as well as ESD robustness. The HITFET™ + family is the new generation based on new technology, enabling a significant shrink compared to the existing classic HITFET™ portfolio (up to 50 percent shrink). This novel generation consists of standard and fully-featured protected low-side switches (11 to 125 mΩ) in the TO-252-3 DPAK/TO-252-5 DPAK and TDSO-8 packages. Classic HITFET™ and HITFET™ + devices address a wide range of applications, including resistive, inductive, and capacitive loads.

Application diagramm example for HITFET™ +



1) C_{SRP}-GND <100 pF – maximum permitted parasitic capacitance at the SRP-pin
2) Filter capacitor on supply, recommended 100 nF

Key applications

- Industrial automation
- Programmable logic controller (PLC)
- Digital I/O modules
- Building and home management
- All kind of solenoid or valve driving
- Power modules
- Solar power inverters

Features and benefits

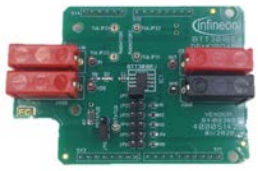
Key features	Key benefits
– Low-side switches with integrated protection features	– High design flexibility with scalable $R_{DS(on)}$ and package
– Scalable in $R_{DS(on)}$ ranges from 800 mΩ down to 11 mΩ	– Driving applications with high switching speed requirements up to 25 kHz (e.g., valve, solenoid)
– Adjustable Slew-rate control (BTFxxx and BTT30xxEJ)	– Easy to design
– Thermal shutdown with auto restart or latch behavior	– Choice of packages to match individual application needs
– Status feedback via increased input current (HITFET™ +12 V/24 V) – Digital readout via SRP (BTF3050TE) via status pin (BTF3xxxEJ)	

Low-side switch shield with BTF3050TE for Arduino



Featured products: Three BTF3050TE low-side switches of the HITFET™ +12 V family
Combatible with: Microcontroller boards using the Arduino form factor and the corresponding Infineon's kits with Arm®-powered XMC™ microcontroller
Orderable part number: SHIELDBTF3050TETOBO1

Evaluation board based on BTT3050EJ



Featured products: One single-channel low-side switch of BTT3050EJ a device of the HITFET™ +24 family
Combatible with: Can be used as single stand and is also pin-compatible with microcontroller boards using the Arduino form factor (e.g., XMC1100 Boot Kit, Arduino Uno)
Orderable part number: BTT3050EJDEMOBOARDTOBO1

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ISOFACE™ product portfolio

ISOFACE™ output switches

Product overview		ISO1H801G	ISO1H811G	ISO1H812G	ISO1H815G	ISO1H816G	ISO2H823V
Switch	V_{bb} operational range: 11 V to 35 V	✓	✓	✓	✓	✓	✓
	Max. continuous load current per channel	0.6 A	0.6 A	0.6 A	1.2 A	1.2 A	0.6 A
	Load current increase by using outputs in parallel	✓	✓	✓	✓	✓	✓
	Inductive clamping energy per channel: 1 Joule	✓	✓	✓	✓	✓	150 mJ
Microcontroller interface	Type	Parallel	Parallel	Serial	Parallel	Serial	Serial/Parallel
	Nominal voltages	5 V	3.3 V/5 V	3.3 V/5 V	3.3 V/5 V	3.3 V/5 V	3.3 V
Safety features	Isolation voltage: V_{ISO} = 500 VAC UL508 and EN 61131-2 certified	✓	✓	✓	✓	✓	2.5 kV AC
	Active current limitation	✓	✓	✓	✓	✓	✓
	Thermal shutdown	✓	✓	✓	✓	✓	✓
	Common output disable pin	✓	✓	✓	✓	✓	✓
Diagnostics feedback	Overtemperature		✓	✓	✓	✓	✓
	V_{bb} undervoltage		✓	✓	✓	✓	✓
Package DSO-36 (16x14 mm)		✓	✓	✓	✓	✓	VQFN-70
Ordering code		ISO1H801GAUMA1	ISO1H811GAUMA1	ISO1H812GAUMA1	ISO1H815GAUMA1	ISO1H816GAUMA1	ISO2H823V25XUMA1

ISOFACE™ digital input IC

Product overview		ISO1I811T	ISO1I813T
Input characteristics	IEC type: I, II, III	✓	✓
	Input status LED	✓	✓
	Max. sampling frequency	125 kHz	500 kHz
	Deglitching filter setting	Hardwired	Software, individual per channel
	Synchronous data acquisition	–	✓
µC interface	3.3 V/5 V	✓	✓
	Serial and parallel	✓	✓
Safety features	500 VAC isolation voltage	✓	✓
Diagnostic feedback	Wire break, channel-specific	–	✓
	V_{bb} undervoltage	✓	✓
Support for external V_{bb} supply		–	✓
Package TSSOP-48 (8x12.5 mm)		✓	✓
Ordering code		ISO1I811TXUMA1	ISO1I813TXUMA1

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PROFET™ Industrial high-side switch

Feature/Product	ITS6035S-EP-K	ITS6080S-EP-D	ITS4035S-EP-D	ITS4080S-EP-D	ITS4040/ITS4075 ITS4090/ITS4130
Status	Active and preferred	Active and preferred**	Active and preferred	Active and preferred**	Active and preferred
Max. supply voltage	60 V	60 V	45 V	45 V	45 V
Adj. current limit	3 – 13.2 A	0.8 – 5 A	3 – 13.2 A	0.8 – 5 A	–
Digital diagnosis	✓	✓	✓	✓	✓
Overvoltage lockout	✓	✓	–	–	–
Synchronized discharge functionality	✓	✓	–	–	–
Analog diagnosis	✓	–	–	–	–
Analog current sense	✓	–	–	–	–
Open load in Off-state	✓	✓	✓	✓	–
Open load in On-state	–	✓	–	–	–

Product	Number of channels	$R_{DS(on)}$ (typ) [mΩ]	Nominal load current [A]	E_{AS} [mJ]	Recommended operating voltage range [V]	$I_{L(SC)}$ (typ) [A]	Diagnosis	Package
ITS4035S-EP-D	1	35	5.0	350 at 2.0 A	8.0 … 36.0 [ext. V up to 45 V]	3 – 13	Digital and analog	TSDSO-14
ITS6035S-EP-K	1	35	5.0	350 at 2.0 A	8.0 … 36.0 [ext. V up to 60 V]	3 – 13	Digital	TSDSO-14
ITS4060S-SJ-N	1	50	3.10	900 at 1.50 A	5.00 … 34.00	17.0	n/a	DSO-8
ISP772T	1	50	2.60	900 at 1.50 A	5.00 … 34.00	17.0	n/a	DSO-8
ITS428L2	1	60	7.00	190 at 7.00 A	4.75 … 41.00	22.0	Digital	TO-252-5
ITS4100S-SJ-N	1	70	2.40	870 at 1.00 A	5.00 … 34.00	10.0	n/a	PG-DSO-8
ISP762T	1	70	2.00	870 at 1.00 A	5.00 … 34.00	10.0	n/a	DSO-8
ITS4080S-EP-D	1	75	2.50	300 at 0.5 A	8.0 .. 36.0 [ext. V up to 45 V]	0.8 – 5.0	Digital	TSDSO-14
ITS6080S-EP-D	1	75	2.50	300 at 0.5 A	8.0 .. 36.0 [ext. V up to 60 V]	0.8 – 5.0	Digital	TSDSO-14
ITS4200S-ME-O	1	150	1.10	700 at 0.50 A	11.00 … 45.00	1.4	n/a	SOT-223-4
ITS4141N	1	150	1.10	700 at 0.50 A	12.00 … 45.00	1.4	n/a	SOT-223-4
ITS4200S-ME-P	1	150	2.20	160 at 1.00 A	11.00 … 45.00	3.0	n/a	SOT-223-4
ITS4142N	1	150	2.20	160 at 1.00 A	12.00 … 45.00	3.0	n/a	SOT-223-4
ITS4200S-ME-N	1	160	1.20	500 at 0.50 A	5.00 … 34.00	1.5	n/a	DSO-8
ISP452	1	160	1.20	500 at 0.50 A	5.00 … 34.00	1.5	n/a	SOT-223-4
ITS4200S-SJ-D	1	150	1.70	125 at 1.00 A	6.00 … 52.00	6.5	Digital	DSO-8
ISP752R	1	200	1.70	125 at 1.00 A	6.00 … 52.00	6.5	Digital	DSO-8
ISP752T	1	200	1.70	125 at 1.00 A	6.00 … 52.00	6.5	n/a	DSO-8
ITS4300S-SJ-D	1	250	0.80	800 at 0.30 A	5.00 … 34.00	1.2	Digital	DSO-8
ISP742RI	1	350	0.80	800 at 0.30 A	5.00 … 34.00	1.2	Digital, inverted	DSO-8
ITS41K0S-ME-N	1	1000	0.55	1000 at 0.15 A	4.90 … 60.00	0.9	n/a	SOT-223-4
ITS4140N	1	1000	0.55	1000 at 0.15 A	4.90 … 60.00	0.9	n/a	SOT-223-4
ITS4040D-EP-D	2	40	2 x 2.00	185 at 2 A	5.00 … 45.00	4.1	Digital	TSDSO-14
ITS5215L	2	90	2 x 2.00	178 at 3.50 A	5.50 … 40.00	15.0	Digital	DSO-12
ITS4075Q-EP-D	4	75	4 x 2.00	60 at 2 A	5.00 … 45.00	4.1	Digital	TSDSO-14
ITS4090Q-EP-D	4	90	4 x 0.50	410 at 0.5 A	5.00 … 45.00	1.5	Digital	TSDSO-14
ITS724G	4	90	4 x 2.00	120 at 3.30 A	5.50 … 40.00	15.0	Digital	DSO-20
ITS4130Q-EP-D	4	130	4 x 0.50	380 at 0.5 A	5.00 … 45.00	1.25	Digital	TSDSO-14
ITS716G	4	140	4 x 1.00	76 at 2.30 A	5.50 … 40.00	9.0	Digital	DSO-20
ITS711L1	4	200	4 x 1.00	150 at 1.90 A	5.00 … 35.00	7.5	Digital	DSO-20
ITS42008-SB-D	8	200	8 x 0.60	10,000 at 625 mA	11.00 … 45.00	3.0	Digital	DSO-36
ITS4880R	8	200	8 x 0.60	10,000 at 625 mA	11.00 … 45.00	3.0	Digital	DSO-36



Evaluation board

- ITS4035S-EP-D
- ITS4080S-EP-D
- ITS6035S-EP-K
- ITS6080S-EP-D

Power PROFET™ +24/48V product portfolio

Product name	$R_{DS(on)}$ (typ) [mΩ]	$R_{DS(on)}$ (max) at TJ = 150°C [A]	Nominal current (typ) [A]	Extended voltage [V]	ICL(0) (min) [A]	Package	SP number
BTH50060-1LUA	6.0	14.0	17.7	8 … 60	40	TOLL (HSOF-8)	SP005578499
BTH50015-1LUA	1.5	3.5	35	8 … 60	90	TOLL (HSOF-8)	SP005346648
BTH50030-1LUA	3.0	7.0	25	8 … 60	55	TOLL (HSOF-8)	SP005346650

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* Per one channel

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HITFET™ low-side switch

Product type	Product family	Channels	$R_{DS(on)}$ at 25°C [mW]	Nominal load current [A]	EAS [mJ]	Operating voltage range [V]	$I_{L(lim)}$ (typ) [A]	$I_{L(lim)_TRIGGER}$ (typ) [A]	Diagnosis	Package
BTS3011TE	HITFET™ +	1	10.7	10	300 at 5 A	up to 28	35	70	Status pin	TO-252-5 (DPAK 5-leg)
BTT3018EJ	HITFET™ +	1	16	7.0	150	up to 36	45	–	Status pin	TDSO-8
BTS3035EJ	HITFET™ +	1	28	5.00	105 at 5 A	up to 31	20.00	–	Status pin	TDSO-8
BTS3035TF	HITFET™ +	1	30	5.00	106 at 5 A	up to 31	20.00	–	–	TO-252-3 (DPAK 3-leg)
BTF3035EJ	HITFET™ +	1	28	5.00	95 at 5 A	up to 32	14.00	41.00	Status pin	TDSO-8
BTF3050TE	HITFET™ +	1	40	3.00	120 at 3 A	up to 28	8.00	30.00	Through SRP pin	TO-252-5 (DPAK 5-leg)
BTS3050EJ	HITFET™ +	1	40	4.00	62 at 3 A	up to 31	15.00	–	Status pin	TDSO-8
BTS3050TF	HITFET™ +	1	44	4.00	64 at 4 A	up to 31	15.00	–	–	TO-252-3 (DPAK 3-leg)
BTF3050EJ	HITFET™ +	1	40	4.00	62 at 4 A	up to 32	10.00	29.00	Status pin	TDSO-8
BTS3060TF	HITFET™ +	1	50	3.00	55 at 3 A	up to 35	10.50	–	–	TO-252-3 (DPAK 3-leg)
BTS3080EJ	HITFET™ +	1	64	3.00	35 at 3 A	up to 31	10.00	–	Status pin	TDSO-8
BTS3080TF	HITFET™ +	1	69	3.00	38 at 3 A	up to 31	10.00	–	–	TO-252-3 (DPAK 3-leg)
BTF3080EJ	HITFET™ +	1	64	3.00	33 at 3 A	up to 32	7.00	18.00	Status pin	TDSO-8
BTS3125EJ	HITFET™ +	1	100	2.00	30 at 2 A	up to 31	7.00	–	Status pin	TDSO-8
BTS3125TF	HITFET™ +	1	108	2.00	24 at 2 A	up to 31	7.00	–	–	TO-252-3 (DPAK 3-leg)
BTF3125EJ	HITFET™ +	1	100	2.00	23 at 2 A	up to 32	5.00	12.00	Status pin	TDSO-8
BTS3018TC	Classic HITFET™	1	14	6.00	1900	up to 36	30.00	–	Through input pin	TO-263-3-2 (TO-220-3 (SMD))
BTS3028SDL	Classic HITFET™	1	28	5.00	350	up to 36	18.00	–	Through input pin	TO-252-3 (DPAK 3-leg)
BTS3028SDR	Classic HITFET™	1	28	5.00	350	up to 36	18.00	–	Through input pin	TO-252-3 (DPAK 3-leg)
BTS3046SDL	Classic HITFET™	1	46	3.60	140	up to 36	10.00	–	Through input pin	TO-252-3 (DPAK 3-leg)
BTS3046SDR	Classic HITFET™	1	46	3.60	140	up to 36	10.00	–	Through input pin	TO-252-3 (DPAK 3-leg)
BTS3104SDL	Classic HITFET™	1	104	2.00	50	up to 36	6.00	–	Through input pin	TO-252-3 (DPAK 3-leg)
BTS3104SDR	Classic HITFET™	1	104	2.00	50	up to 36	6.00	–	Through input pin	TO-252-3 (DPAK 3-leg)
BSP75N	Classic HITFET™	1	490	0.70	550	up to 36	1.00	–	Through input pin	SOT-223

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CIPOS™ IPM product portfolio

MOSFET based CIPOS™ IPMs					
Product family	Voltage [V]	Configuration	$R_{DS(on),max.}$ [Ω]	Package	Product name
CIPOS™ Nano	100	Half-bridge	21	QFN 7x8	IRSM005-301MH
	250	Half-bridge	0.15	QFN 8x9	IRSM808-204MH
		3-phase inverter	0.45 ~ 2.40	QFN 12x12	IRSM836-044MA IRSM836-084MA
	500	Half-bridge	0.80/1.70	QFN 8x9	IRSM808-105MH/IRSM807-045MH
		3-phase inverter	1.70 ~ 6.00	QFN 12x12	IRSM836-025MA/IRSM836-035MA IRSM836-045MA IRSM836-035MB
	600	H-bridge	0.28	QFN 12X10	IM111-X6Q1B
CIPOS™ Maxi	1200	3-phase inverter	0.06 ~ 0.09	DIP 36x23D	IM12S60EA2/IM12S90EA2

IGBT based CIPOS™ IPMs					
Product family	Voltage [V]	Configuration	Rated current [A]	Package	Product name
CIPOS™ Micro	600	3-phase inverter	2.0/4.0/6.0	DIP 29x12	IM241-S6T2B/IM241-M6T2B/IM241-L6T2B IM241-S6T2J/IM241-M6T2J
			2.0/4.0/6.0	SOP 29x12	IM241-S6S1B/IM241-M6S1B/IM241-L6S1B IM241-S6S1J/IM241-M6S1J
CIPOS™ Mini	600	PFC integrated	10.0 ~ 20.0	DIP 36x21D	IFCM10S60GD/IFCM10P60GD IFCM15S60GD/IFCM15P60GD IM564-X6D
		3-phase inverter	4.0 ~ 30.0	DIP 36x21	IGCM04F60GA/IGCM04G60GA/IGCM06F60GA/IGCM06G60GA IGCM10F60GA/IKCM10H60GA/IKCM10L60GA IGCM15F60GA/IKCM15L60GA/IKCM15F60GA/IKCM15H60A IGCM20F60GA/IKCM20L60GA IKCM30F60GA IM523-S6A/IM523-M6A/IM523-L6A/IM523-X6A IM06B15AC1/IM06B20AC1/IM06B30AC1
			15.0 ~ 50.0	DIP 36x21D	IKCM15L60GD/IKCM20L60GD/IKCM30F60GD IM535-U6D/IM06B50GC1
	650	3-phase interleaved PFC	20.0/30.0	DIP 36x21D	IFCM20T65GD/IFCM30T65GD
		2-phase interleaved PFC	30.0	DIP 36x21D	IFCM30T65GD/IFCM30U65GD
CIPOS™ Maxi	1200	3-phase inverter	5.0 ~ 20.0	DIP 36x23D	IM818-SCC/IM818-MCC/IM818-LCC IM12B10CC1/IM12B15CC1/IM12B20EC1

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XMC™ MCU portfolio

- RAM: 8 kB up to 1 MB
- Flash: 16 kB up to 8 MB
- Accurate analog mixed-signal peripherals
- Fast timer/PWM peripherals
- Rich communication interfaces
- 16-pin to 272-pin count packages

XMC1000 family

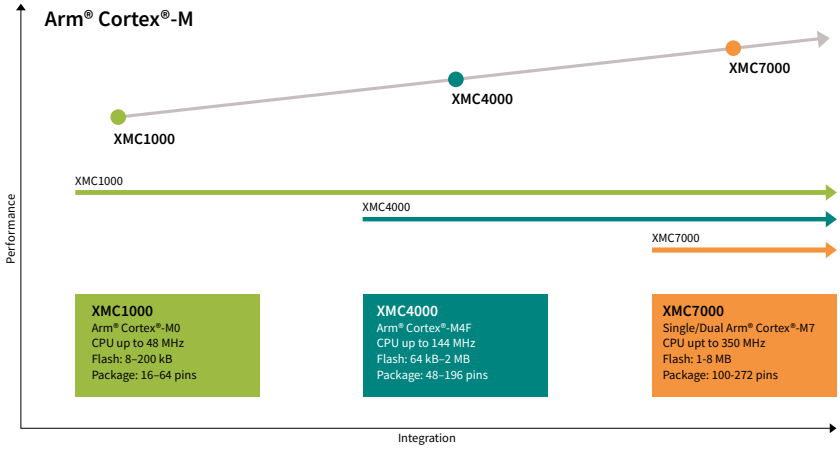
- Arm® Cortex®-M0 up to 48 MHz
- Peripherals up to 96 MHz
- One-time event request unit (ERU)
- V_{DD}: 1.8 to 5.5 V
- $T_{Ambient}$: -40°C to 105°C

XMC4000 family

- Arm® Cortex®-M4 up to 144 MHz
- Built-in DSP, SFPU
- EtherCAT®
- Event request unit (ERU)
- $T_{Ambient}$: -40°C to 125°C

XMC7000 family

- Single or dual core Arm® Cortex®-M7 and Cortex®-M0+
- Up to 8 MB flash
- Up to 10x CAN FD and 2x Ethernet
- $T_{Ambient}$: -40°C to 125°C

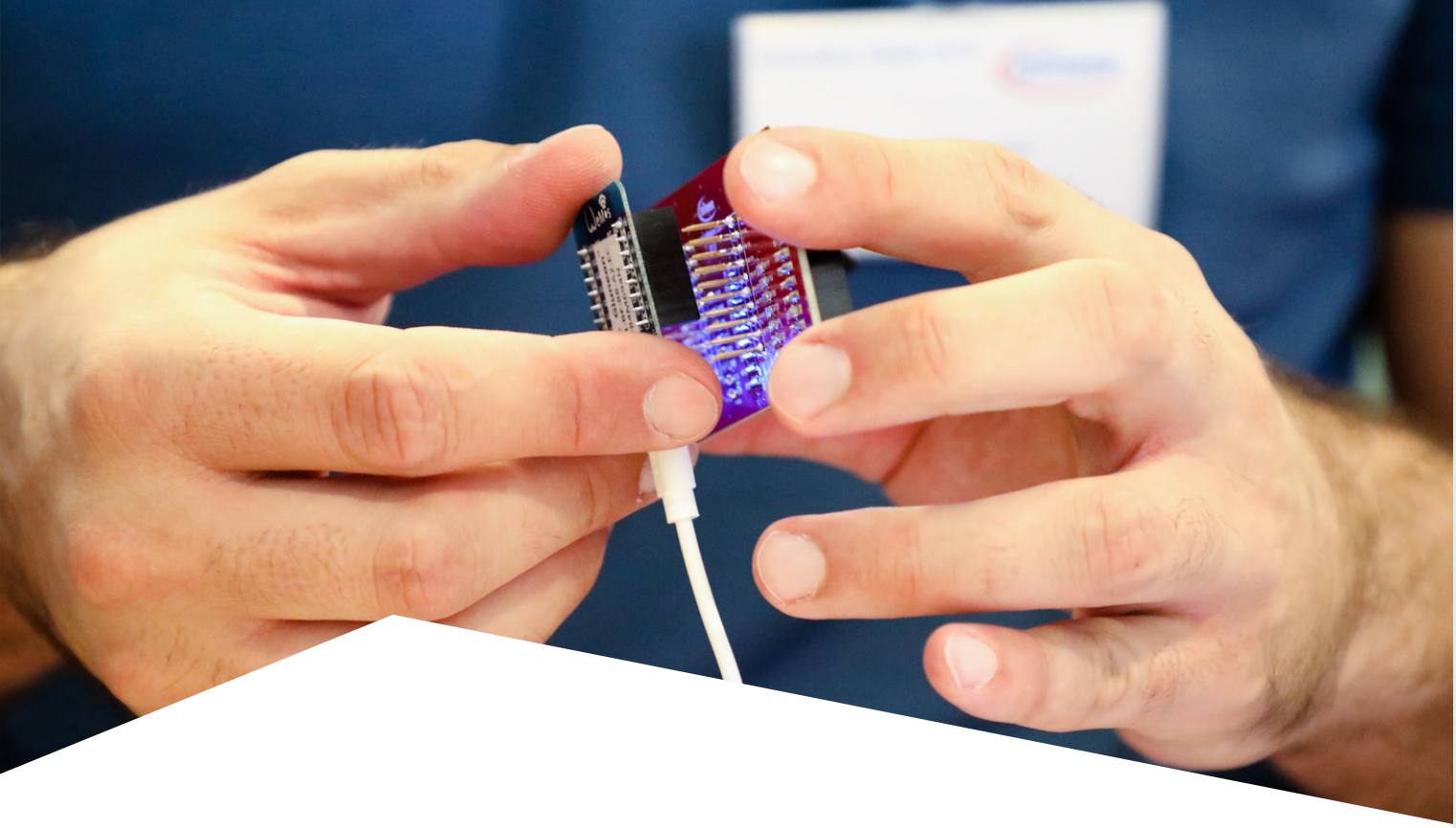




XMC™ entry	LED lighting	Digital power	Motor control	Industrial I/O
XMC7000 Dual Arm® Cortex®-M7 up to 350 MHz core, 1 - 8 MB Flash, up to 125°C Tamb 2.7 - 5.5V			**XMC7100/7200** Industrial Drives, TCPWM, CAN-FD, up to 125°C Tamb TQFP-176, LFBGA-272	**XMC7200** GB Ethernet, ADCs with 1Msps, TCPWM, CAN-FD TQFP-176, LFBGA-272
XMC7100 Basic control and connectivity single core at 250 MHz TQFP-100/144		**XMC7100/7200** EV-Charging, TCPWM, CAN-FD TQFP-144/176, LFBGA-272		
XMC4000 Arm® Cortex®-M4F up to 144 MHz core 64 kB-2 MB Flash up to 125°C			**XMC4700/4800** Industrial drives, Hall and encoder I/F, ΔΣ demodulator, LQFP-100/144 LFBGA-196	**XMC4800, XMC4300** EtherCAT®, +drives MultiCAN - 6 nodes LQFP-100/144 LFGBGA-196
XMC4100 Basic control and connectivity VQFN-48 LQFP-64		**XMC4200** Server power 150 ps HRPWM LQFP-64/100	**XMC4100/XMC4400** Industrial drives, Hall and encoder I/F, ΔΣ demodulator, LQFP-64/100/144 LFBGA-144	**XMC4500** MultiCAN - 3 nodes, Ethernet, +drives ext. memory, SD/MMC LQFP-100/144 LFBGA-144
XMC1000 Arm® Cortex®-M0 up to 48 MHz core/ 96 MHz peripheral 8-200 KB Flash up to 105°C 1.8-5.5 V	**XMC1400** Flicker-free, 4-Ch LED, SMPS, connectivity VQFN-40/64 LQFP-48/64	**XMC1400** SMPS control, connectivity VQFN-40/64 LQFP-48/64	**XMC1400** Hall and encoder I/F, MATH co-processor, CAN VQFN-40/64 LQFP-48/64	**XMC1400** Multi CAN - 2 nodes VQFN-48/64 LQFP-48/64
XMC1100 Basic control and connectivity TSSOP-16/38 VQFN-24/40	**XMC1200, XMC1300** Flicker-free, 4-Ch LED, SMPS, connectivity TSSOP-16/28/38 VQFN-24, -40	**XMC1300** SMPS control, connectivity, TSSOP-16/38 VQFN-24/40	**XMC1300** Hall and encoder I/F, MATH co-processor, TSSOP-16/38 VQFN-24/40	

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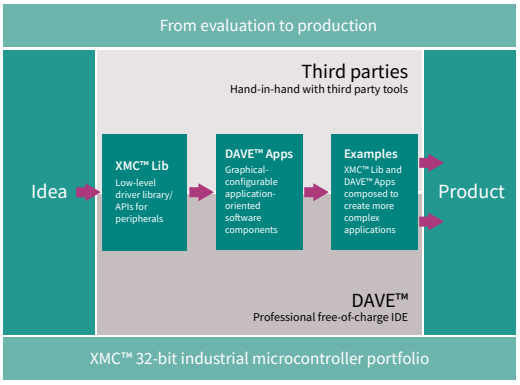


XMC™ ecosystem, enablement and partners

A comprehensive set of tools, products, components, and services are available for fast and efficient design with XMC™ microcontrollers.

Infineon enablement for XMC™ MCUs

- ModusToolbox™ Software – www.infineon.com/mtb
  Modern and extensible development enviroment supporting a wide range of Infineon microcontroller devices
- **DAVE™** – www.infineon.com/dave
  Professional and free-of-charge development platform
  XMC™ **library for Embedded Coder®** – www.infineon.com/matlab
  Model-based design from MATLAB® and Simulink® environment, download free of charge
  IEC60730 class B library for XMC™ – www.infineon.com/iec60730
  Available for XMC™ industrial microcontrollers free of charge
  Microcontroller/Probe™ XMC™ – www.infineon.com/ucprobexmc
  Free-of-charge version of microcontroller/Probe™ for XMC™ MCUs to build user interfaces for visualizing, observing, and control of the internals of XMC™ MCUs
  XMC™ **link** – www.infineon.com/xmclink
  Functional isolated debug probe, based on SEGGER J-Link technology



In addition to a rich third party ecosystem and enablement landscape, which support the entire development cycle from evaluation to production. For more click here.

Click here to learn more:

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Infineon's XMC™ 32-bit industrial microcontroller portfolio is designed for system cost and efficiency in demanding industrial applications. It comes with the most advanced peripheral set in the industry. Fast and largely autonomous peripherals can be configured to support individual needs.

Highlights include analog mixed-signal, timer/PWM, and communication peripherals powered by either an Arm® Cortex®-M0 core (XMC1000 family) or an Arm® Cortex®-M4 core with a floating point unit (XMC4000 family).

Arm® Cortex®-M0	Co-processor	Clocks		Memory		Analog			Timer/PWM				Connectivity		Package
		Frequency	Peripherals			ADC1 2-bit/S&H	Number of channels	Analog comparators	CCU4 (4 ch)	CCU8 (4 ch)	POS IF	BCCU	US IC	CAN 2.0B	
XMC11x	-	32	64	Flash	8-200 kB	1/1	Up to 12	-	1x	-	-	-	2x	-	VQFN 24/40 TSSOP 16/38
				RAM	16 kB										
XMC12x	-	32	64	Flash	16-200 kB	1/2	Up to 12	Up to 3	1x	-	-	✓	2x	-	VQFN 24/40 TSSOP 16/28/38
				RAM	16 kB										
XMC13x	✓	32	64	Flash	8-200 kB	1/2	Up to 12	Up to 3	1x	1x	✓	✓	2x	-	VQFN 24/40 TSSOP 16/38
				RAM	16 kB										
XMC14x	✓	48	96	Flash	32-200 kB	1/2	Up to 12	Up to 4	2x	2x	✓	✓	4x	✓	VQFN 40/48/64 LQFP 64
				RAM	16 kB										
Supply voltage range 1.8-5.5 V															
Temperature range -40°C … 85°C/105°C															

Arm® Cortex®-M0	Frequency [MHz]	Memory		Analog			Timer/PWM					Connectivity					SDIO/SD/MMC	External BUS Unit (EBU)	Package
				ADC1 2-bit/S&H	Number of channels	DAC1 2-bit	CCU4 (4 ch)	CCU8 (4 ch)	HRPWM (150 ps)	POSIF	Σ Demodulator	US IC	CAN 2.0B	USB	Ethernet	EtherCAT®			
XMC41x	80	Flash	64-128 kB	2/2	Up to 9	2 ch	2x	1x	✓	✓	-	4x	Up to 2	✓	-	-	-	-	VQFN 48 TQFP 64
		RAM	20 kB																
XMC42x	80	Flash	256 kB	2/2	Up to 9	2 ch	2x	1x	✓	✓	-	4x	2x	✓	-	-	-	-	VQFN 48 TQFP 64
		RAM	40 kB																
XMC43x	144	Flash	256 kB	2/2	14	2 ch	2x	1x	-	-	-	4x	2x	✓	✓	✓	✓	-	LQFP 100
		RAM	128 kB																
XMC44x	120	Flash	256-512 kB	4/4	Up to 18	2 ch	4x	2x	✓	2x	4 ch	4x	2x	✓	✓	-	-	-	TQFP 64 LQFP 100
		RAM	80 kB																
XMC45x	120	Flash	512 kB-1 MB	4/4	Up to 26	2 ch	4x	2x	-	2x	4 ch	4x	Up to 3	✓	✓	-	✓	✓	LQFP 100/144 LFBGA 144
		RAM	128-160 kB																
XMC47x	144	Flash	1.5-2 MB	4/4	Up to 26	2 ch	4x	2x	-	2x	4 ch	6x	6x	✓	✓	-	✓	✓	LQFP 100/144 LFBGA 196
		RAM	276-352 kB																
XMC48x	144	Flash	1-2 MB	4/4	Up to 26	2 ch	4x	2x	-	2x	4 ch	6x	6x	✓	✓	✓	✓	✓	LQFP 100/144 LFBGA 196
		RAM	276-352 kB																
Supply voltage range 3.1-3.6 V																			
Temperature range -40°C … 85°C/125°C																			

Arm® Cortex®-M7	Frequency [MHz]	Memory		Analog		Timer/TCPWM			Connectivity					Package
				ADC 12bit	Number of Channels	16 bit motor-control	16 bit general-purpose	32 bit general-purpose	SCB	CAN-FD	Ethernet	Gb Ethernet	SDHC (eMMC, SD, SDIO)	
XMC71xx	250	Flash	4 MB	3	18 ch	12 ch	63 ch	8 ch	up to 11 ch	up to 8	✓	-	✓	QFP-100, QFP-144, QFP-176, BGA-272
		RAM	768 kB											
XMC72xx	350	Flash	8 MB	3	18 ch	15 ch	87 ch	16 ch	up to 11 ch	up to 10	✓	✓	✓	QFP-176, BGA-272
		RAM	1 MB											
Supply voltage range 2.7-5.5V														
Temperature range -40 ...125°C														

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Share your feedback

XMC™ 7000 microcontrollers

High-quality grade MCU platform for industrial applications

The XMC7000 is the latest entry in Infineon's industrial microcontroller portfolio, equipped with peripherals such as CAN-FD, TCPWM and Gb Ethernet, which increase flexibility and offer added value. The XMC7000 architecture is built on a low-power 40-nm process technology, and the MCUs offer best-in-class compute performance, addressing high-end industrial applications.

The XMC7000 offers both single and dual-core Arm® Cortex®-M7 options, supported by an Arm® Cortex®-M0+, enabling designers to optimize their end products to meet the dynamic and demanding business conditions of industrial applications. The advanced peripheral set and robust security features make it attractive to customers needing a high-quality MCU platform. The MCU can operate in harsh environments with a temperature range of -40°C to 125°C, and it is ideal for power-critical applications based on its low-power modes, which go down to 8 µA. The flexible XMC7000 comes in four package/pin types with 17-part number variants to meet many design requirements.

XMC7100/7200
4 MB flash/768 kB RAM,
250 MHz single/dual core
100 – 272 pin (QFP/BGA)

XMC7200
8 MB flash/1 MB RAM,
350 MHz single/dual core
176 – 272 pin (QFP/BGA)

- Single or dual core Arm® Cortex®-M7 and Cortex®-M0+
- M7 CPU core frequency up to 350 MHz
- Temperature range: Ta = -40 to 125°C
- Memory up to 8 MB flash, 1 MB RAM
- TCPWM timers of 102Ch 16-bit and 16Ch 32-bit
- Cryptography Engine support
- Interfaces such as CAN-FD, Gb Ethernet
- SMIF and SDHC interface supported
- Extended voltage operating range: 2.7 to 5.5 V
- Low power modes(LP/deep sleep, hibernate)
- Read While Write (RWW) Flash capability



BGA-272



QFP-176

Features and benefits

Key benefits
– Best-in-class computing performance
– Low power to support electrification and digitization
– Optimal solution for motor control and power conversion applications
– Advanced security options
– Ability to operate in high ambient environments
– XMC7000 is easy to adapt to existing PCB
– Different core/memory/package combinations

Click here to learn more:

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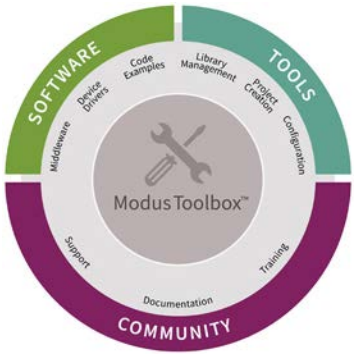
XMC™ 7000 part numbers

Type	Description
XMC7100-F100K1088AA	Single Core Arm® Cortex®-M7 (+Arm® Cortex®-M0+), TQFP 100 pins, 1 MB flash
XMC7100-F100K2112AA	Single Core Arm® Cortex®-M7 (+Arm® Cortex®-M0+), TQFP 100 pins, 2 MB flash
XMC7100-F100K4160AA	Single Core Arm® Cortex®-M7 (+Arm® Cortex®-M0+), TQFP 100 pins, 4 MB flash
XMC7100D-F100K2112AA	Dual Core Arm® Cortex®-M7 (+Arm® Cortex®-M0+), TQFP 100 pins, 2 MB flash
XMC7100D-F100K4160AA	Dual Core Arm® Cortex®-M7 (+Arm® Cortex®-M0+), TQFP 100 pins, 4 MB flash
XMC7100-F144K2112AA	Single Core Arm® Cortex®-M7(+ Arm® Cortex®-M0+), TQFP 144 pins, 2 MB flash
XMC7100-F144K4160AA	Single Core Arm® Cortex®-M7(+ Arm® Cortex®-M0+), TQFP 144 pins, 4 MB flash
XMC7100D-F144K2112AA	Dual Core Arm® Cortex®-M7 (+Arm® Cortex®-M0+), TQFP 144 pins, 2 MB flash
XMC7100D-F144K4160AA	Dual Core Arm® Cortex®-M7 (+Arm® Cortex®-M0+), TQFP 144 pins, 4 MB flash
XMC7100-F176K4160AA	Single Core Arm® Cortex®-M7(+ Arm® Cortex®-M0+), TQFP 176 pins, 4 MB flash
XMC7100D-F176K4160AA	Dual Core Arm® Cortex®-M7 (+Arm® Cortex®-M0+), TQFP 176 pins, 4 MB flash
XMC7100-E272K4160AA	Single Core Arm® Cortex®-M7(+ Arm® Cortex®-M0+), LBGA 272 pins, 4 MB flash
XMC7100D-E272K4160AA	Dual Core Arm® Cortex®-M7(+ Arm® Cortex®-M0+), LFBGA 272 pins, 4 MB flash
XMC7200-F176K8384AA	Single Core Arm® Cortex®-M7 (+Arm® Cortex®-M0+), TQFP 176 pins, 8 MB flash
XMC7200D-F176K8384AA	Dual Core Arm® Cortex®-M7 (+Arm® Cortex®-M0+), TQFP 176 pins, 8 MB flash
XMC7200-E272K8384AA	Single Core Arm® Cortex®-M7 (+Arm® Cortex®-M0+), LFBGA 272 pins, 8 MB flash
XMC7200D-E272K8384AA	Dual Core Arm® Cortex®-M7 (+Arm® Cortex®-M0+), LFBGA 272 pins, 8 MB flash

Software

ModusToolbox™ Software Environment





ModusToolbox™ software supports application development using the XMC7200 evaluation kit by providing board support package (BSP) and validated code examples to help you get started. To download the latest version of the software, please visit the ModusToolbox™ webpage.

Click here to learn more:

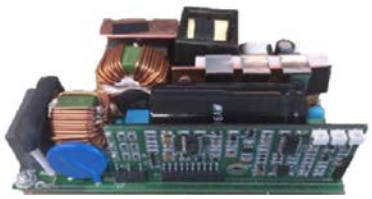
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High power density 800 W 130 kHz platinum server design with XMC1300

The 800 W PFC CCM evaluation board demonstrates the design and practical results of an 800 W 130 kHz platinum server PFC evaluation board based on Infineon devices in terms of power semiconductors, non-isolated gate drivers, analog and digital controllers for the PFC converter, as well as flyback controllers for the auxiliary supply. This evaluation board verifies the performance of the latest 600 V CoolMOS™ C7 superjunction MOSFET technology working at 130 kHz in a PFC CCM boost converter along with EiceDRIVER™ ICs and CoolSiC™ Schottky diode 650 V G5 using digital control.

Features and benefits

Key features	Customer benefits
– Classic PFC boost stage digitally controlled with XMC1302 including voltage and current loops	– Highly efficient PFC stage with a complete system solution from Infineon
– Protections, including cycle-by-cycle current protection	– Hardware and software available
– Run time debug with isolated UART to PC interface and PC software	– Higher switching frequency permits higher power density

800 W PFC CCM with XMC1300	Specification		Infineon components	
	V_{in}	90-265 V_{AC}	MCU	XMC1302 (TSSOP38)
	V_{out_nom}	380 V_{DC}	MOSFET	600 V CoolMOS™ C7
	I_{out}	2 A	MOSFET driver	EiceDRIVER™ 2EDN7524F non-isolated
	PWM frequency	130 kHz	Diode	CoolSiC™ Schottky diode 650 V G5
	THD	<10%	Auxiliary PSU	ICE2QR4780Z
	Power factor	>0.9 from 20% load		
	Efficiency	97% (peak)		

600 W half-bridge LLC evaluation board with 600 V CoolMOS™ C7 SJ MOSFET with digital control

The 600 W LLC digital control evaluation board shows how to design the half-bridge LLC stage of a server SMPS with the target to meet 80+ Titanium standard efficiency requirements. For this purpose, the latest CoolMOS™ technologies, 600 V CoolMOS™ C7 or P6 superjunction MOSFETs, have been used on the primary side, and OptiMOS™ low-voltage power MOSFET in SuperSO8, BSC010N04LS, in the synchronous rectification secondary stage in combination with QR CoolSET™ ICE2QR2280Z, high- and low-side driver 2EDL05N06PF, low-side gate driver 2EDN7524F, and an XMC4200 microcontroller.

Features and benefits

Key features	Customer benefits
– 600 W LLC half-bridge stage with synchronous rectification (SR)	– Learn LLC topology with a complete system solution from Infineon – HW and- SW available
All controlled with XMC4200 including: – Start up (PWM to PFM) and burst-mode algorithms – Adaptive deadtime and capacitive-mode detection – No hard commutation at any condition	– Close to customer solution – High efficiency → 97.8% – Reliability and power density

600 W LLC digital control	Specification		Infineon components	
	V_{in}	350-410 V_{DC}	MCU	XMC4200 (VQFN48)
	V_{out_nom}	12 V_{DC}	MOSFET SR	BSC010N04LS
	I_{out}	50 A	HB driver	2EDL05N06PF
	P_{out}	600 W	LLC HB MOSFET	CoolMOS™ IPP60R190P6
	f_{res}	157 kHz	Auxiliary PSU	ICE2QR2280Z

Click here to learn more:

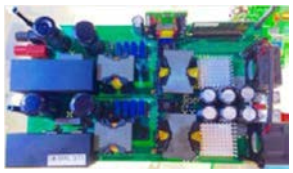
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3 kW dual-phase LLC converter using XMC4400

The 3 kW dual-phase LLC demonstration board is an example of a high-efficiency isolated DC-DC converter using the state-of-the-art Infineon components, both power devices and controller/driver ICs. Using an advanced digital control using the XMC4400 microcontroller, together with the latest generation of CoolMOS™ and OptiMOS™ devices, achieves a very flat efficiency curve in the entire load range. The demonstration board targets the high-voltage DC-DC stage of high-end telecom rectifiers.

Features and benefits

Key features	Customer benefits
– Full digital control by XMC4400 on the secondary side	– Full digital control by XMC4400 on the secondary side
– Digital current sharing with phase shedding	– Efficiency peak of 98.5% and more than 97.2% in the entire load range
– Accurate algorithm able to prevent hard commutation and capacitive load mode in LLC operation	– Easy monitoring and parameter setting via a graphic user interface

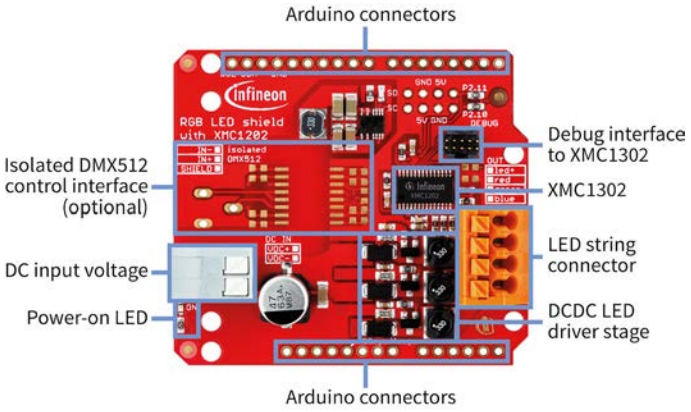
3 kW dual-phase LLC converter using XMC4400	Specification		Infineon components	
	V_{in}	350-410 V_{DC}	MCU	XMC4400 (LQFP64)
	V_{out_nom}	54.3 V_{DC}	SR MOSFET	OptiMOS™ BSC093N15NS5
	I_{out_max}	55 A	Drivers	1EDI60N12AF 2EDN7524R
	P_{out}	3000 W	LLC Half-bridge MOSFET	CoolMOS™ P6 IPW60R041P6
	f_{range}	90-200 kHz	Auxiliary PSU	ICE2QR2280Z
	Peak efficiency	>98.4%		

RGB LED lighting shield with XMC1302 for Arduino

The RGB LED lighting shield with XMC1302 for Arduino uses a DC-DC buck topology to drive up to three LED channels with a constant current. A programmable XMC™ 32-bit Arm® MCU powers the shield with an embedded brightness color control unit (BCCU, XMC1302 MCU series), for flicker-free LED dimming and color control.

Features

- Compatible with Arduino Uno R3 and XMC1100 boot kit from Infineon
- Easily configurable for various light engines and any input voltage (within operating conditions)
- Wide DC input voltage range
- Simple I^2C interface



Operating conditions

- Nominal: 12-48 V input voltage (max. 6-60 V)
- Average LED current up to 700 mA (max. peak current 1 A)

The Infineon shields mentioned above are hardware compatible with Arduino and Infineon's XMC™ boot and relax kits.

Click here to learn more:

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3 kW dual-phase LLC converter

XMC4800 automation board V2 – explore XMC4800 microcontroller based on Arm® Cortex®-M4

The XMC4800 automation board V2 uses Infineon's industry-leading XMC™ Arm® Cortex®-M4 microcontroller in combination with Infineon's supply, interface, communication, and safety products. The XMC4800 automation board V2 is designed to evaluate the capabilities of the XMC4800 microcontroller, especially in EtherCAT® slave applications, and can be used with a wide range of development tools, including Infineon's free-of-charge ModusToolbox™ Software.

Features and benefits

Key features	Customer benefits
– XMC4800-E196 MCU based on Arm® Cortex®-M4 at 144 MHz	– Complete automation kit gateway
– EtherCAT® slave controller, 2 MB Flash and 352 kB RAM	– Combined MCU with EtherCAT® slave application
– OPTIGA™ Trust E embedded security solution (CC EAL6+)	– Isolated interfaces with diagnose
– Real time clock crystal	– Ethernet connectivity with software examples available
– SPI FRAM (64 kB non-volatile memory)	– 24 V supply
– EtherCAT® slave node (2 EtherCAT® PHY and RJ45 Jacks)	– CAN connectivity
– 24 V ISOFACE™ 8-channel inputs and 8-channel outputs CAN transceiver	– Full software DAVE™ examples
– CAN transceiver	

XMC4800 automation board V2	Type	Description	OPN
	KIT_XMC48_AUT_BASE_V2	The XMC4800 automation board V2 utilizes Infineon's industry-leading XMC™ Arm® Cortex®-M4 microcontroller in combination with Infineon's supply, interface/communication, and safety products	KITXMC48AUTBASEV2TOBO1
	XMC4800-E196K2048	Arm® Cortex®-M4 microcontroller	XMC4800E196K2048AAXQMA1
	ISO2H823V2.5	24 V 8-channel isolated output	ISO2H823V25XUMA1
	ISO1I813T	24 V 8-channel isolated input	ISO1I813TXUMA1
	SLS 32AIA020A4 USON10	OPTIGA™ Trust E – embedded security solution	SLS32AIA020A4USON10XTMA2
	TLE6250GV33	Infineon CAN transceiver	TLE6250GV33XUMA1
	IFX54441LDV	Infineon voltage regulator	IFX54441LDVXUMA1

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XMC™ starter kits

Kits and evaluation boards

XMC1400 2Go

Order number: KIT_XMC14_2GO

- This XMC1400 low-cost starter kit provides a USB connector, interface to Infineon sensor shields, and a CAN bus interface.
- The kit is fully supported in ModusToolbox™ and the Arduino IDE, providing easy access to all peripheral modules of the XMC1000 MCU family.

Click on the following link to find/purchase the kit:
www.infineon.com/KIT_XMC14_2GO

Platform2Go XMC4400

Order number: KIT_XMC_PLT_2GO_XMC4400

- Equipped with an Arm® Cortex®-M4 based XMC™ microcontroller, the XMC4400 Platform2Go is designed to evaluate the capabilities of Infineon's XMC4400 microcontroller. It can be used with a wide range of development tools including Infineon's free-of-charge ModusToolbox™ Software.
- This kit has the XMC4400 device with debugger plus Ethernet, CAN, Arduino, mikroBUS™, and Shields2Go form factor.

Click on the following link to find/purchase the kit:
www.infineon.com/XMC4400patform2go

XMC1400 Arduino

Order number: KIT_XMC1400_ARDUINO

- This kit utilizes Infineon's industry-leading Arm® Cortex®-M0 microcontroller in combination with the Arduino form factor.
- It can be used with a wide range of development tools, including Infineon's free-of-charge ModusToolbox™ Software and much more.

Click on the following link to find/purchase the kit:
www.infineon.com/xmc1400_ARDUINO

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Platform2Go XMC4200

Order number: KIT_XMC_PLT 2GO_XMC 4200

- Equipped with an Arm® Cortex®-M4 based XMC™ microcontroller from Infineon Technologies AG, the XMC4200 Platform2Go is designed to evaluate the capabilities of Infineon's XMC4200 microcontroller.
- It can be used with a wide range of development tools, including Infineon's free-of-charge ModusToolbox™ Software.
- This kit has the XMC4200 device with debugger plus CAN, Arduino, mikroBUS™, and Shields2Go form factor.

Click on the following to find/purchase the kit:
www.infineon.com/XMC4200patform2go

RGB LED Lighting Shield



Order number: KIT_XMC_LED_DALI_20_RGB

- One of the first intelligent evaluation boards compatible with Arduino, as well as Infineon's XMC1100 BOOT KIT.
- Designed to be easily configurable and combinable for different LED light engines and lamps for fast prototyping and inexpensive evaluation of LED lighting applications.
- The RGB LED lighting shield with XMC1302 uses a DC-DC buck topology.

Click on the following to find/purchase the kit:
www.infineon.com/cms/en/product/evaluation-boards/kit_xmc_led_dali_20_rgb/

XMC7000 evaluation kits

KIT_XMC71_EVK_LITE_V1

The XMC7100 Evaluation Board (KIT_XMC71_EVK_LITE_V1) enables you to evaluate and develop your applications using the XMC7100D microcontroller. The XMC7100D is designed for industrial applications and is a true programmable embedded system-on-chip, integrating up to two 250-MHz Arm® Cortex®-M7 as the primary application processor, 100-MHz Arm® Cortex®-M0+ that supports the following:

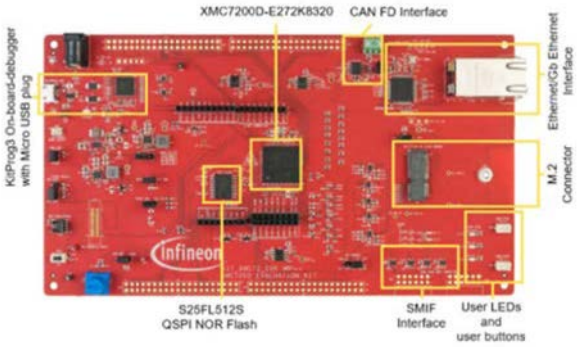
- Low-power operations
- CAN-FD interface
- Programmable analog and digital peripherals that allow faster time-to-market



KIT_XMC72_EVK

The XMC7200D is a true programmable embedded system-on-chip, integrating up to two 350-MHz Arm® Cortex®-M7 as the primary application processor, a 100-MHz Arm® Cortex®-M0+ and is designed for industrial applications. This kit enables you to evaluate and develop your applications using the XMC7200D microcontroller. Some of the features of this kit include:

- High performance
- Gigabit Ethernet
- Secure Digital Host Controller (SDHC) supporting SD/SDIO/ eMMC interfaces



Software Technology Partners

Software stacks, UI/UX, compilers, debuggers

Independent Design House Partners

Designs and builds solutions for customers using Infineon products

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XMC™ peripherals

IEC60730 class B library for XMC™

Supporting the XMC1xxx and XMC4xxx families

In collaboration with the Hitex consultancy, Infineon developed the IEC60730 – class B software library for XMC™ industrial microcontrollers used in household electrical appliances. This is a dedicated software library for XMC™ MCUs with routines for internal supervisory functions and self-diagnostics.

Extended documentation and pre-certified software libraries to XMC™ Cortex® Arm®-based controllers are free.
For more information, please check: www.hitex.com/classb

Documentation	Consultancy
Safety application note Failure mode report FMEDA tool by Infineon, revised in workshops by TÜV Süd	hitex EMBEDDED TOOLS & SOLUTIONS Implementation support by Hitex

Click here to learn more:

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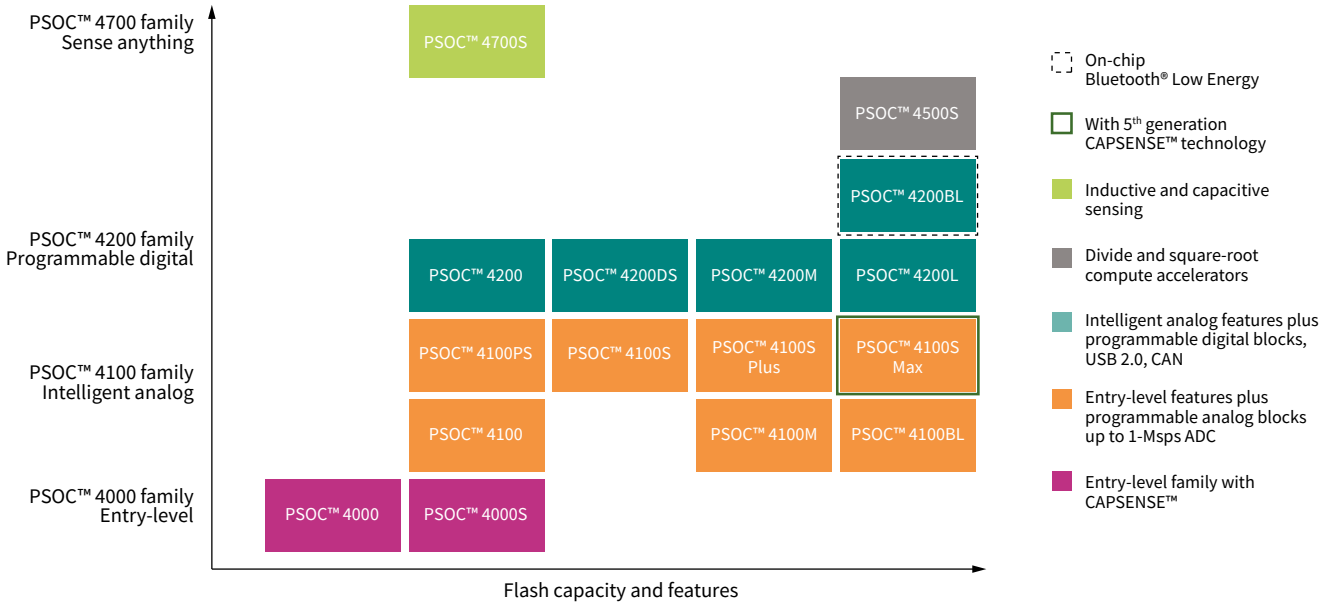
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PSOC™ 4 microcontrollers

Your problem solver on chip

PSOC™ 4 has tackled some of the complex portions of embedded system designs, making it easier for you to get your product to market. Functions such as analog sensor integration, capacitive touch, and wireless connectivity have been integrated and optimized in PSOC™ 4 just to work.

The PSOC™ 4 portfolio consists of several families of Arm® Cortex®-M0 and Cortex®-M0+ microcontrollers. Most devices in the portfolio include Infineon's CAPSENSE™ technology for capacitive-sensing applications. Other key features in the PSOC™ 4 portfolio include a customizable analog front end through programmable analog blocks and wired and wireless connectivity options such as USB, CAN, and Bluetooth® Low Energy. These unique features make PSOC™ 4 the industry's most flexible and scalable low-power mixed-signal architecture.



Features and benefits

Sense anything

Programmable analog and digital blocks in PSOC™ 4 enable you to customize your analog front-end, apply simple glue logic, and easily integrate intelligent analog sensors into an application

Intelligent sensor integration

Easy-to-use HMI

PSOC™ 4 simplifies complex HMI interfaces such as capacitive and inductive sensing enabling sleek, robust, and easy-to-use interfaces

Capacitive and inductive sensing

Connected

Bluetooth® Low Energy (BLE) integrated into some PSOC™ 4 devices simplifies RF design. Additional wired interfaces, such as USB and CAN, are also available

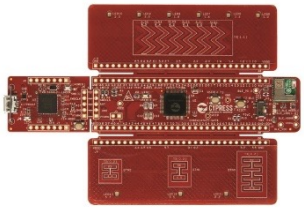
Wired and wireless connectivity

Click here to learn more:

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Evaluation kits

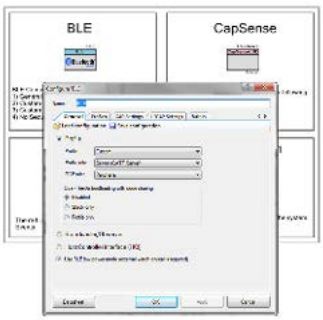
Make it smarter	Make it connected	Make it easy to use
 PSOC™ 4100S Plus prototyping kit (CY8CKIT-149)	**Bluetooth® Low Energy kits**  CY8CKIT-143-A  CY8CKIT-141	**HMI kits for capacitive/inductive sensing**  PSOC™ 4000S prototyping kit (CY8CKIT-145-40xx)
 PSOC™ 4100PS prototyping kit (CY8CKIT-147)	**PSOC™ 4 Bluetooth® LE modules with PCB or external antenna**  PSOC™ 4 Bluetooth® LE Pioneer kit (CY8CKIT-042-BLE-A)	 PSOC™ 4700S Inductive Sensing Evaluation kit (CY8CKIT-148)
 PSOC™ 4100S Max pioneer kit (CY8CKIT-041S-MAX)	 CySmart BLE USB Dongle (CY5677)	

Software

ModusToolbox™ Software Environment



PSOC™ Creator IDE with graphical front ends



Click here to learn more:

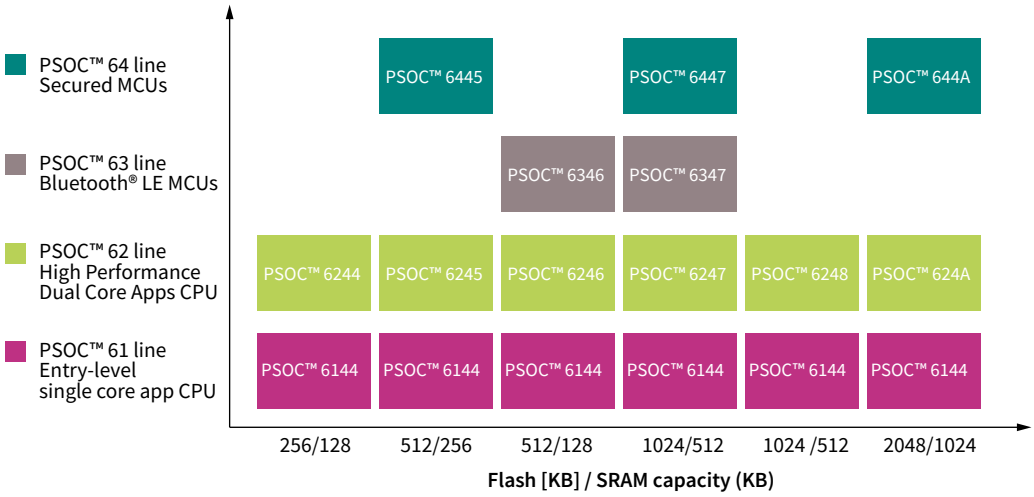
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PSOC™ 6 microcontrollers

Purpose-Built for IoT

The PSOC™ 6 family is built on an ultralow-power architecture, and the MCUs feature low-power design techniques ideal for battery-powered applications. The dual-core Arm® Cortex®-M4 and Cortex®-M0+ architecture lets designers optimize power and performance simultaneously. Using its dual cores combined with configurable memory and peripheral protection units, the PSOC™ 6 MCU delivers the highest level of protection defined by the Platform Security Architecture (PSA) from Arm®. Designers can use the MCU's rich analog and digital peripherals to create custom analog front ends (AFEs) or digital interfaces for innovative system components such as MEMS sensors and electronic ink displays. The PSOC™ 6 MCU features the latest generation of industry-leading CAPSENSE™ capacitive-sensing technology, enabling modern touch and gesture-based interfaces that are robust and reliable. PSOC™ 6 MCU, paired with Infineon's AIROC™ Wi-Fi, AIROC™ Bluetooth®, or AIROC™ combo radio modules, is the perfect solution for secure, low-power, feature-rich IoT products.



Features and benefits

Lowest power

IoT devices are often portable, making battery life a critical factor. The PSOC™ 6 MCU architecture is built on a cutting-edge, ultralow-power, 40-nm process technology with a dual Arm® Cortex®-M core architecture. Active power consumption is as low as 22 µA/MHz for the M4 core and 15 µA/MHz for the M0+ core. PSOC™ 6 delivers extended battery life without sacrificing performance.

Most flexibility

The PSOC™ 6 MCU architecture's best-in-class flexibility enables adding new features and addresses the need for unique IoT products with multiple connectivity options, such as USB and BLE. PSOC™ 6 also offers software-defined peripherals to create custom analog and digital circuits, and the industry's best capacitive-sensing solution, CAPSENSE™. In addition, a flexible dual-core architecture optimizes for system power consumption and performance. The possibilities are endless.

Built-in security

The PSOC™ 6 MCU architecture supports multiple, simultaneous, secure environments without needing external memories or secure elements. It offers scalable, secure memory for multiple, independent user-defined security policies, preventing your IoT device from becoming a security liability. PSOC™ 6 provides a new standard for IoT security.

Click here to learn more:

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PSOC™ 6 Kits

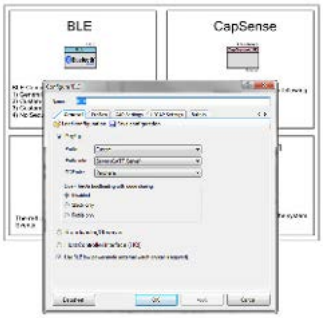
Product family	Kit type	Kit MPN	Selection factors
PSOC™ 61, PSOC™ 62 product family			
PSOC™ 62xA, 62x8, 61xA, 61x8	Prototyping	CY8CPROTO-062-4343W	Highest-end MCU, single-band Wi-Fi
	Pioneer	CY8CKIT-062S2-43012	Highest-end MCU, machine learning, graphics, dual-band/low power Wi-Fi, Arduino shield capability
	Evaluation	CY8CEVAL-062S2	Highest-end MCU, machine learning, graphics, flexible M.2 card-based Wi-Fi module evaluation (single-band, dual-band), Arduino shield capability, mikroBUS™ interface
PSOC™ 62x7, 62x6, 61x7, 61x6	Pioneer	CY8CKIT-062-WIFI-BT	Standalone MCU, graphics, single-band Wi-Fi, analog rich, Arduino shield capability
PSOC™ 62x5, 61x5	Prototyping	CY8CPROTO-062S3-4343W	Standalone MCU, single-band Wi-Fi connectivity processor, industrial (CAN-FD)
PSOC™ 62x4, 61x4	Pioneer	CY8CKIT-062S4	Standalone MCU, low power analog, sensor coprocessor, Arduino shield capability
PSOC™ 64 Product Family			
PSOC™ 64xA	Pioneer	CY8CKIT-064B0S2-4343W	Standalone secured MCU, trusted firmware-M, single-band Wi-Fi, Arduino shield capability
PSOC™ 64x7	Prototyping	CY8CPROTO-064S1-SB	Standalone secured MCU
PSOC™ 64x5	Prototyping	CY8CPROTO-064B0S3	Standalone secured MCU, industrial (CAN-FD)

Software

ModusToolbox™ Software Environment



PSOC™ Creator IDE with graphical front ends



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PSOC™ Automotive 4xxx

PSOC™ Automotive 4: Your problem-solver on chip

PSOC™ Automotive 4 integrates Infineon's best-in-class capacitive sensing technology for Human Machine Interface(HMI) applications with an Arm® Cortex®-M0/M0+ CPU, flash and memory. The analog peripherals (analog front-end, ADC, operational amplifiers, low- power comparators) combine with digital peripherals and communication interfaces (SENT, LIN, CAN, and CAN-FD) to provide a single-chip smart sensor with high integration and a small footprint. You can achieve ultimate flexibility in your design with Infineon software defined peripherals embedded in the PSOC™ Automotive 4 architecture. All PSOC™ devices are supported in 3rd party IDE and either PSOC™ Creator and or the ModusToolbox™ IDE.

PSOC™ Automotive 4 (5.5 V)			
ISO 26262 Ready Entry level MCU with CAPSENSE™	**PSOC™ 4200L** 48 MHz, 256 KB/32 KB, VFBGA-124, USB full speed 3rd Gen. CAPSENSE™ (×2), UDB (×8),CAN (×2)	**PSOC™ 4100S Max** 48 MHz, 384 KB/32 KB, QFN-48,TQFP-64,TQFP-100 5th Gen. CAPSENSE™ (×2), Crypto, CAN-FD, LCD	
	PSOC™ 4100/4200M 48 MHz, 128 KB/16 KB, QFN-56,TQFP-48, TQFP-64, LCD Drive, 3rd Gen. CAPSENSE™ (×2), CAN (×2), UDB (×4)	**PSOC™ 4100S Plus** 48 MHz, 128 KB/16 KB, QFN-40/48/64,TQFP-64,SCB (×5) 4th Gen. CAPSENSE™, CAN, LCD Drive **PSOC™ 4100S** 48 MHz, 64 KB/8 KB, QFN-40,SSOP-28,LCD Drive, 4th Gen. CAPSENSE™, SCB (×3)	**PSOC™ 4700S Plus** 48 MHz, 128 KB/16 KB, QFN-40,4th Gen. CAPSENSE™, CAN Inductive Sensing, LCD Drive
	PSOC™ 4100/4200 48 MHz, 32 KB/4 KB, SSOP-28, UDB (×4), LCD Drive 3rd Gen. CAPSENSE™, SCB (×2) **PSOC™ 4000** 16 MHz, 16 KB/2 KB, QFN-24, SOIC-16 3rd Gen. CAPSENSE™, SCB(×2)	**PSOC™ 4000S** 48 MHz, 32 KB/4 KB, QFN-24,QFN-40,SSOP-28 4th Gen. CAPSENSE™, SCB (×2)	

SCB: Serial communication block
UDB: Universal digital block
CAN: Controller area network
CAN-FD: Controller Area Network Flexible Data-Rate

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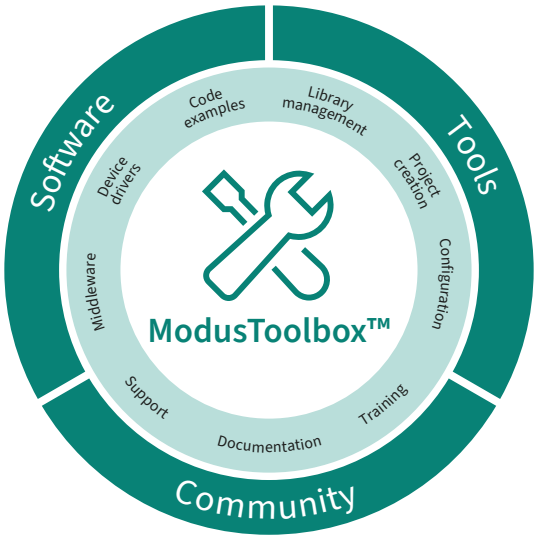
Features and benefits

Key features

- Up to 384 KB Flash and 32 KB SRAM
- Support multiple data collection methods such as capacitive to resistive, inductive, and current sensing
- Low-power compute, optimized at a hardware level
- Up to 84 GPIO pins supporting both analog and digital signals
- CAN,CAN-FD, TX I2S, Fast I²C, Segment LCD, TCPWM x8, SCB x5
- Dedicated HW security block to support AES, SHA, TRNG, PRNG, and CRC functions
- ModusToolbox™ support

Key benefits

- Differentiated HMI features/algorithms running in the MCU (e.g., water rejection)
- High-speed communications from Fast I²C to CAN-FD
- Increased security with encryption support for in-vehicle communication
- Easy-to-use software for prototyping and productizing end applications



PSOC™ Automotive 4 devices are supported by ModusToolbox™

- Variety of code repositories on GitHub that are comprehensive and flexible
- Repositories include board support packages (BSPs), low-level resources like a hardware abstraction layer (HAL) and peripheral driver library (PDL), and middleware that enables industry-leading features such as CAPSENSE™

(Explanation of the graph or the board)

Click here to learn more:

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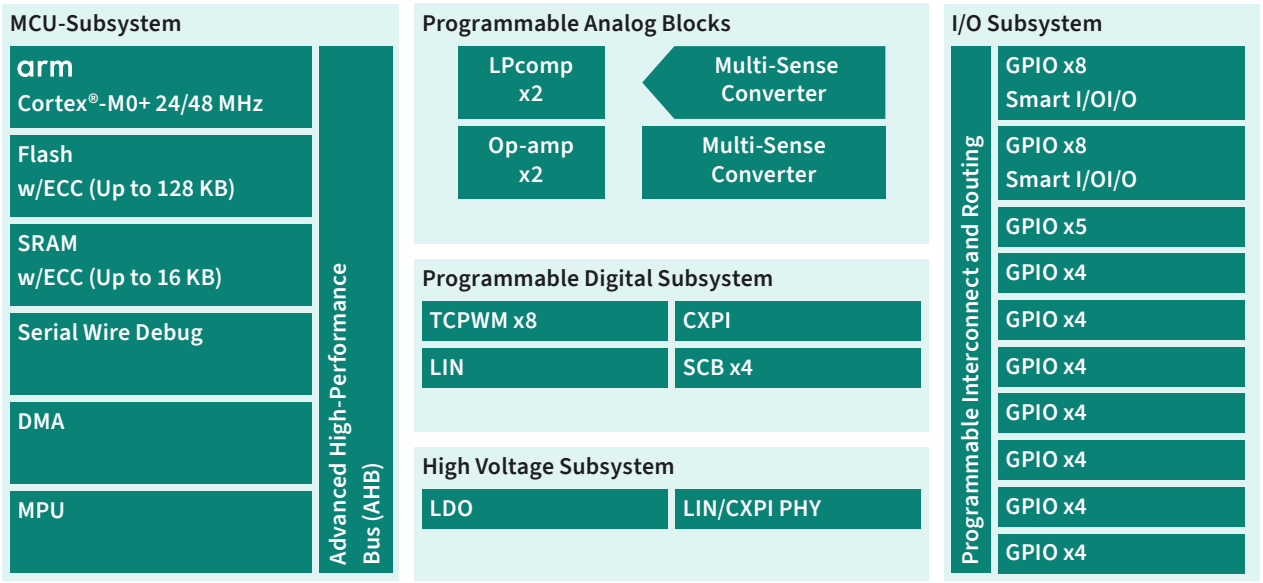
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PSOC™ 4 HVMS (High Voltage Mixed Signal)

Small footprint solution for smart sensing applications

The PSOC™ 4 High Voltage Mixed Signal (HVMS) series of products, provide a single-chip solution for automotive smart edge-sensing by integrating a multi-sense converter, programmable analog, high-voltage (12 V) LDO, LIN PHY and an Arm® Cortex® CPU. This solution fits HMI/sensing applications such as steering wheel switches, Hands on detection, or door handles, as well as general purples applications like PTC heaters or LED-lighting. The device is developed compliant to ISO 26262, meeting all process requirements for ASIL B and hardware architectural metrics for ASIL B.

Block Diagram – PSOC HVMS 128 k



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Features and benefits

Key features

- The HV subsystem integrates high voltage LDO (42 V tolerant), and a LIN or CXPI PHY
- Developed according to ISO 26262 for ASIL-B as a safety element out of context
- Multi-sense converter integrating 5th generation CAPSENSE™

Key benefits

- Connects directly to a 12 V battery supply and to the LIN/CXPI network, offering foot-print optimized designs
- Helps design safe automotive sensors with integrated functional safety (up to ASIL-B) features
- Robust capacitive-sensing performance with best-in-class SNR enabling elegant automotive HMI designs



Lite kits and software are available to get started

- Low cost lite kits (KIT_PSOC4-HVMS-128K_LITE/ KIT_PSOC4-HVMS-64K_LITE) allows quick getting started
- PSOC™ 4 HVMS is supported by Automotive quality software (PDL, SafeTlib, CAPSENSE™ MW). The users can trial with an evaluation license
- Free of charge software ModusToolbox™ also supports PSOC™ 4 HVMS

Click here to learn more:

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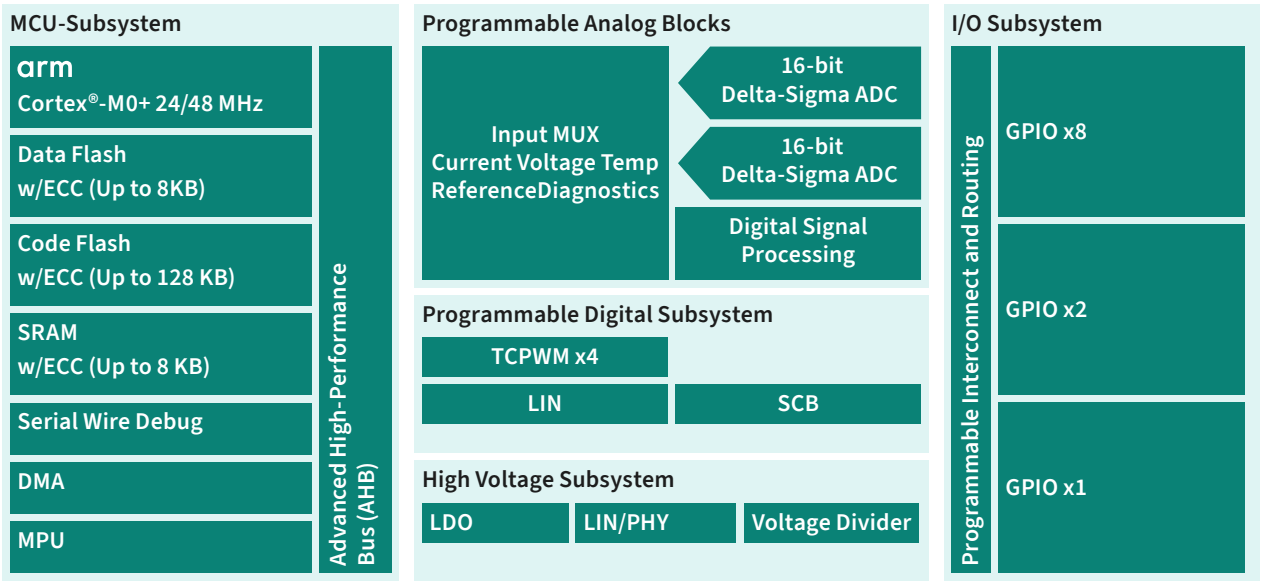
Your input matters
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PSOC™ 4 HVPA (High Voltage Precision Analog)

One-chip solution for high precision current sensing

The PSOC™ 4 HVPA series of products, provide a single-chip solution for battery management systems integrating high precision analog, high-voltage (12 V) LDO, LIN PHY and an Arm® Cortex®™ CPU which are the required functions for Intelligent battery management system (IBS). The device is developed compliant to ISO 26262, meeting all process requirements for ASIL C and hardware architectural metrics for ASIL B.

Block Diagram – PSOC™ HVPA 144 k



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Your input matters
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Features and benefits

Key features

- High-precision analog subsystem features two 16-bit delta-sigma ADC and Programmable Gain Amplifier (PGA) with automatic gain control
- PSOC™ 4 device is developed compliant to ISO 26262, meeting all process requirements up to ASIL C and hardware architectural metrics up to ASIL B
- Integrated LIN PHY transceiver and high voltage LDO (42 V tolerant) for direct 12 V operation

Key benefits

- Enable precise State of Charge (SOC) and State of Health (SOH) tracking with high accuracy
- Integrated MCU and software support allow autonomous operation, data storage, and fast time-to-market with flexibility
- Complete solution fits into a compact small foot-print package, enabling smaller PCB area and lower power consumption compared to a multi-chip solution



LITE Kit and software available to get started

- The Low cost lite kit (KIT_PSOC4-HVPA-144K_LITE) allows quick getting started
- Evaluation kit (CYHVPA-128K-32-001) is also available for full function evaluation
- PSOC™ 4 HVPA is supported by Automotive quality software (PDL, SafeTlib). The users can trial with an evaluation license
- Will be supported with a free of charge by ModusToolbox™ software in the near future with a date by Q2 2025

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PSOC™ Automotive Multitouch

Exceptional User Experiences with Cutting-Edge Multitouch solutions

PSOC™ Automotive Multitouch controller provides car manufactures with the ability to design a perfect user experience with their touchscreen HMI systems. Touchscreens that work reliably despite water droplets, condensation or sweat and which enable users to perform touch operations with gloves. All our Multitouch products are supported by an EMC report confirming compliance to automotive electromagnetic conduction/emmissions (EMC) requirements.

Portfolio

	Sliders	Touchpad	Touchscreen		
Configurable Sense	PSOC™ Multitouch Gen6L-Slider 41/48 I/O, 200 Hz RR	PSOC™ Multitouch Gen6L-Trackpad 41/48 I/O, 120 Hz RR	Small Touchscreen up to 8.5” PSOC™ Multitouch Gen6L 48 I/O, 120 Hz RR	PSOC™ Multitouch Gen7L 72 I/O, 100 Hz RR	Medium Touchscreen up to 12.3”
			Large Touchscreen up to 15” PSOC™ Multitouch Gen6XL 61-88 I/O, 120 Hz RR		
			Large Touchscreen up to 15” Hover, Force, Haptic, CRYPTO, CAN PSOC™ Multitouch Gen7XL 61-103 I/O, 120 Hz RR		
			Ultralarge Touchscreen up to 35” Multi-chip PSOC™ Multitouch Gen7XL Multi-Chip 298 I/O, 120 Hz RR		
Programmable Sense and MCU				PSOC™ Multitouch Gen7L+MCU 72 I/O, 100 Hz RR	MCU Integration

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www.infineon.com/psoc
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Features and benefits

Key features

- Scalable portfolio from 6” up to 35” touch display with multi-chip architectures
- Best in class, working robustly under wet conditions (e.g., droplets, condensation and sweat)
- Tracking with up to 5-mm-thick gloves or thick overlay
- Hover, Force Sensing, Haptics, and Acoustic feedback are supported

Key benefits

- Wide displays (>13”) are supported
- Better display image quality, requiring thinner module stack-up
- Free form and curved overlay support
- Enable finger tracking under harsh environmental conditions such as with 2/3 wheelers



PSOC™ Multitouch Evalution kits

- Evaluation kits for each product family are available with touch panels and supporting software (CY3290-CYAT8168X for Gen6XL and CY3290-CY-AT817X for Gen7XL)

PSOC™ Touch Tuning Host Emulator

- The PSOC™ Touch Tuning Host Emulator is the official front-end tool used to configure, tune, debug, and demonstrate touchscreen devices

Click here to learn more:

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PSOC™ Automotive Fingerprint

Best-in-class fingerprint authentication and user experience

Fingerprint based biometric user authentication provides the most convenient and secure method for personal identification and authentication. The PSOC™ Automotive Fingerprint device provides fingerprint technology in conjunction with a TRAVEO™ T2G or AURIX™ MCU that include Precise Biometrics' proprietary fingerprint algorithm, Precise Bio Match. Fingerprint enables various applications such as secure payment or automated adjustment of driver settings in-vehicle. The controllers also incorporate: field upgradable firmware, on-sensor image optimization and low power programmable finger detection. The firmware is optimized for both the TRAVEO™ T2G and AURIX™ MCU with an automotive-qualified 8 mm × 8 mm fingerprint sensor.

Application Benefits	Infineon Solution	All-in-One Fingerprint Solution
Peace of Mind: Provides additional access method in case of forgotten key/smartphone **Personalization:** Identifies who is entering the car, activating personalized interior settings before driving **Convenient and secure:** Fingerprint usage in phones and devices has been used extensively. Fingerprint provides the high-security identification without cost and intrusiveness of facial detection technology	32-bit Arm® Cortex®-M0 CPU with 200 KB of flash and 64KB of RAM 340 DPI 107×107 pixel array at 8-bits per pixel resolution 8.0 × 8.0 mm Sensing Area ODM adds surface coating Verification and identification up to 15 users	**Fingerprint Sensor IC (Infineon):** A Cortex® M0+ device with on- chip analog and digital peripherals for FP sensing **Match Processor IC (Infineon):** A Cortex® M4 device which receives image from the sensor. Runs biometric algorithms from Precise Bio. Determines the approved user/ imposter. **Mechanical Coating (3rd Party):** A thin layer of material that goes over the bare sensor surface providing mechanical and ESD protection **Biometric Matching Software:** Precise Biometrics AB is a global supplier of identification software. Infineon is partnered with precise to provide best-in-class Fingerprint Authentication.

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Features and benefits

Key features

- Field-upgradable firmware.
- On-sensor image optimization
- Low-power programmable finger detection
- Optimized for TRAVEO™ T2G/AURIX™ MCUs
- Automotive-qualified sensor

Key benefits

- Sensing area is decoupled from the silicon
- Ability to create different size sensors with the same silicon
- No need to reduce active area; saves cost
- Customized coatings and covers can be applied on the sensing surface
- Substrate based sensor silicon size can be smaller than the image area vs. in silicon sensor with fixed image area
- Lower cost and less intrusive than face detection



Evaluation Kits for FPG1

- The EVK mounts the fingerprint match module (FPMM), Fingerprint Sensor module (FPSM), and a plastic finger guide onto an easy-to-use demo board that connects via micro-USB to IFXSC + Windows SW
- Today the KIT-FPG1-T2G-B-E-2M kit is available with a TRAVEO™ T2G MCU for initial evaluation

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PSOC™ Automotive Package lineup

	PSOC™ 4100S Max	PSOC™ 4700S Plus	PSOC™ 4100S Plus	PSOC™ 4100S	PSOC™ 4000S	PSOC™ 4200	PSOC™ 4100	PSOC™ 4000	PSOC™ 4200M	PSOC™ 4100M	PSOC™ 4200L	PSOC™ 4 HVMS	PSOC™ 4 HVPA	Multitouch Gen7XL	Multitouch Gen7L	Multitouch Gen6XL	Multitouch Gen6L	Fingerprint
SOIC-16								•										
QFN-24								•										
QFN-24 (Wettable Flank)					•													
SSOP-28				•	•	•	•											
QFN-32 (Wettable Flank)												•	•					
QFN-40 (Wettable Flank)		•	•	•	•													
QFN-48 (Wettable Flank)	•		•									•						
TQFP-48									•	•								
QFN-56																	•	
QFN-56 (Wettable Flank)									•			•						
QFN-64 (Wettable Flank)			•									•						
TQFP-64	•		•						•	•							•	
BGA-73																		•
TQFP-100	•													•	•	•	•	
VFBGA-124											•							
TQFP-128														•	•	•		

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AURIX™ TC4x family system architecture

Infineon's AURIX™ TC4x family of microcontrollers – a leader in real-time safety and security performance is coming!

Major disrupters have emerged in the automotive market:

- Innovation in automotive E/E architecture microcontrollers (MCUs) in the areas of domain and zone control
- Accelerated shift from conventional powertrain to xEV
- Increased safety and automated driving

Infineon's AURIX™ TC4x family addresses these challenges, pushing the boundaries in automotive MCU usage for safe and secure processing. These microcontrollers are designed for next generation eMobility, ADAS, Chassis and automotive E/E architectures and affordable artificial intelligence (AI) applications. AURIX™ TC4x has already been chosen by major OEM and Tier 1 for their upcoming platform.

The new scalable microcontroller TC4x family provides an upward migration path from Infineon's leading AURIX™ TC3x family of ASIL-compliant automotive MCUs.

Performance is boosted by the next-generation TriCore™ 1.8 and the scalable AURIX™ accelerator suite, including the new Parallel Processing Unit (PPU) and multiple smart accelerators.

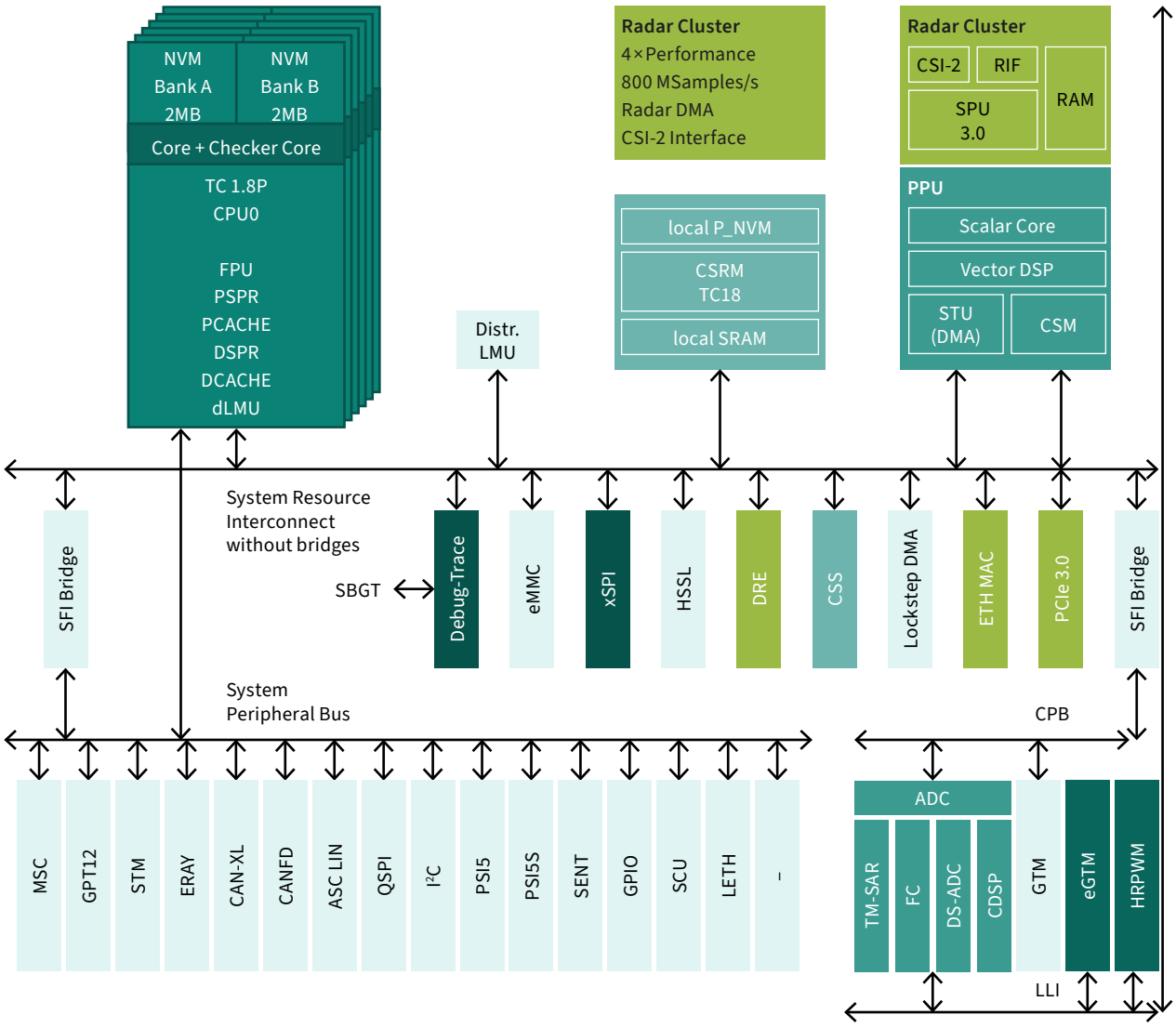
Support for high-speed communication interfaces like 5G-bit Ethernet and PCIe along with new interfaces such as CAN-XL and 10BASE T1S Ethernet gives customers the performance, throughput and flexibility needed to implement new automotive-specific microcontrollers with E/E architectures.

The scalable family concept enables a common software architecture supporting significant platform software savings and the feature-rich concept gives plenty of headroom to grow for both Tier 1's and OEMs.

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Performance ASIL-D
- Enhanced TriCore™
- With up to 6CPUs at 500 MHz
- Bigger Tightly Coupled SRAM for increased performance
- Full AB-Swap Support

Debug and Trace
- Safe and the secure in field

xSPI
- External Memory Interface

ADC
- Dedicated DSPs
- Enhanced ADCs

CSRM
- New high performance Security Modules with QM support

CSS
- Dedicated communication security satellites

New Programmable HW
- Accelerator – PPU
- SIMD Vector DSP + Scalar Core for Modelling and Precise Control – ASIL D

New high-speed comm Interfaces
- PCIe 3.0
- 100 MB- 5 Gbps Ethernet
- New 10 Mbit Ethernet and CAN-XL
- New communication routing accelerator:
- DRE- Data Routing Engine

New eGTM
- New eGTM timers and High Resolution PWM with low latency interconnect (LLI)

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AURIX™ TC4x enhancements

Accelerator Suite

- Each peripheral and shared SRAM has a resource management unit that works as a local access protection mechanism to grant or deny access
- When combined with the memory protection system, this hardware can be used to prevent selected direct access from certain tasks or cores to peripherals or regions of SRAMs and instead redirect the attempted access to a hypervisor function

Memory Upgrade

- Up to 25 MB on-chip Flash
- Zero downtime SOTA support with optimized A/B swap partitioning and external memory interfaces

Broad Connectivity

- Scalable high-speed communication interfaces:
  - 5 Gbps Ethernet
  - PCIe
  - 10BASE T1S Ethernet
  - CAN-XL
- Data Routing Engine (DRE) – communication accelerator

Advanced Timers and ADCs for real-time control

- New eGTM timers and high-resolution PWM with low latency interconnect (LLI). Faster control loops for e-motors & power conversion
- GTM for compatibility with AURIX™ TC3x
- ADC Converters TM/FC/DS/
- CDSP/DSEX accelerator

Safety and security performance boost

- Each security cluster including CSRM and CSS offers enhanced security performance
- ISO 21434 compliant
- Safe DMA
- ASIL-D compliant

Extensive development ecosystem

- Infineon MCAL drivers
- Re-use of existing AURIX™ TC3x algorithms and ecosystem possible
- Rapid prototyping support from Virtual Prototyping using Synopsys – Virtualizer Development Kit for AURIX™ TC4x
- Software Development Kit (SDK)
- Simplify PPU software development using the Synopsys – MetaWare Toolkit for AURIX™ which includes MATLAB and Simulink, DSP and math libraries, Neural Network Software Development Kit, and AUTOSAR Complex Device Driver

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AURIX™ TC4x SW application architecture

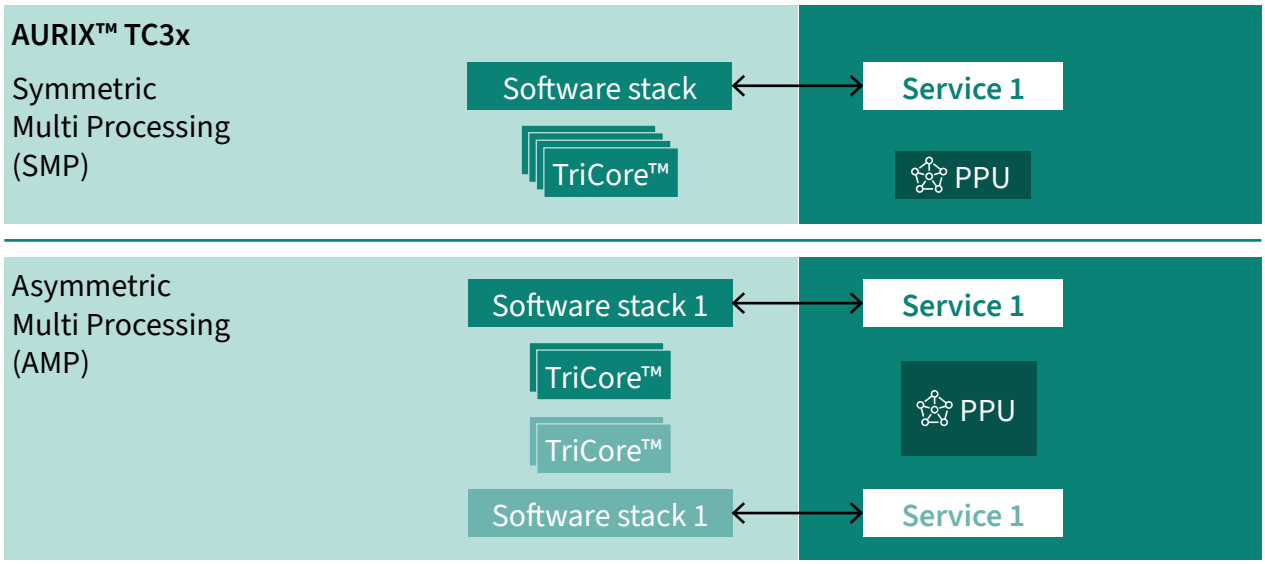
Next generation AURIX™ is a heterogeneous architecture providing new computing abilities for new implementations

AURIX™ TC3x

– Enables SMP and AMP

Next-generation AURIX™ TC4x

– Offers heterogeneous variant of SMP and AMP
– PPU can accelerate any functional block stack
– PPU is service provider
– Opens new computational opportunities function



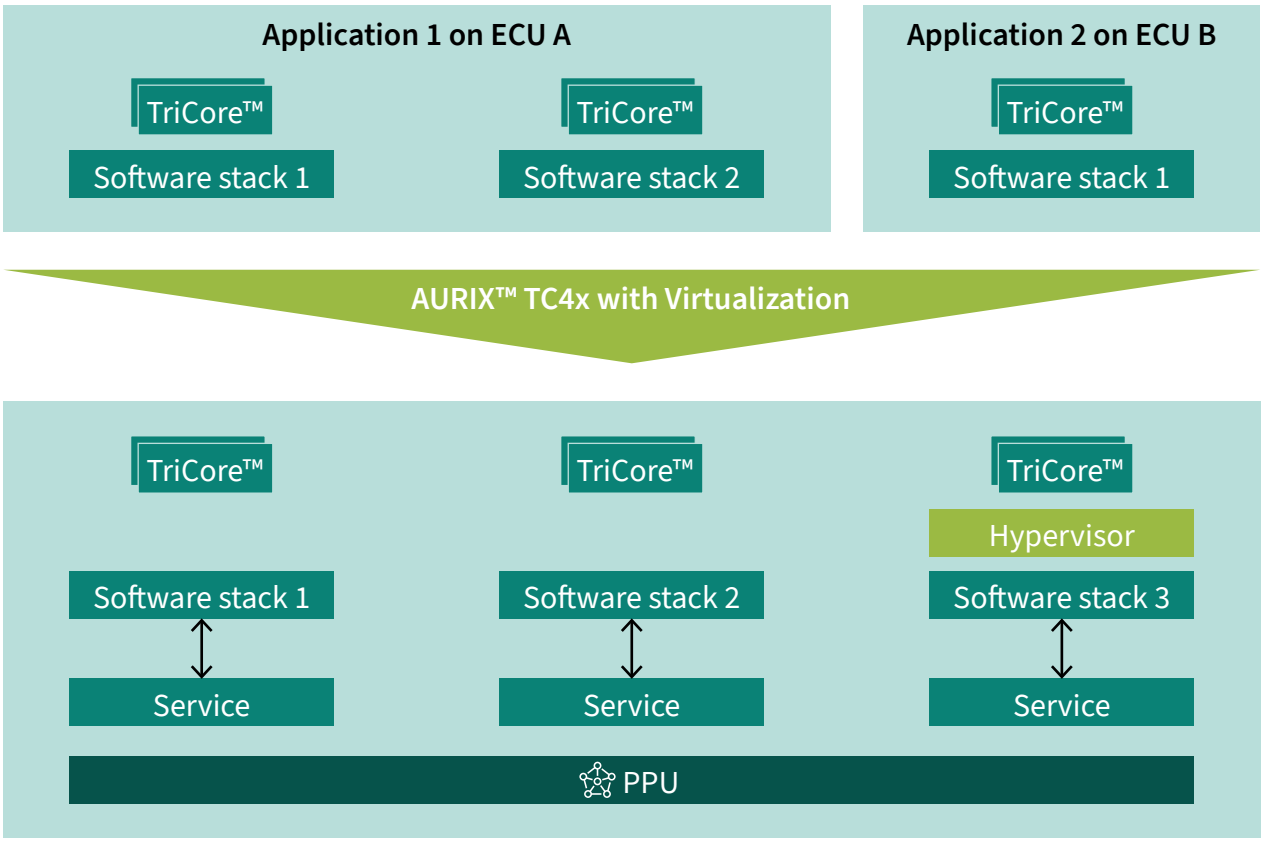
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AURIX™ TC4x offers TriCore™ virtualization

- Seamless integration of functions, reducing standalone ECUs
- PPU does not distinguish between virtualized and non-virtualized clients
- Benefits for new and legacy application stacks



AURIX™ TC4x offers a tremendous computational power boost compared to the previous generation deploying new applications with complex computing needs. The demonstration shows that the PPU:

- Middleware detects requests by dedicated AUTOSAR stacks and handles prioritized execution
- All forms of computations are preserved – traditional AMP and SMP
- They are extended in their topologies by heterogeneous computing
- SW ecosystem will support AUTOSAR and tool-chain enabling high-level programming languages

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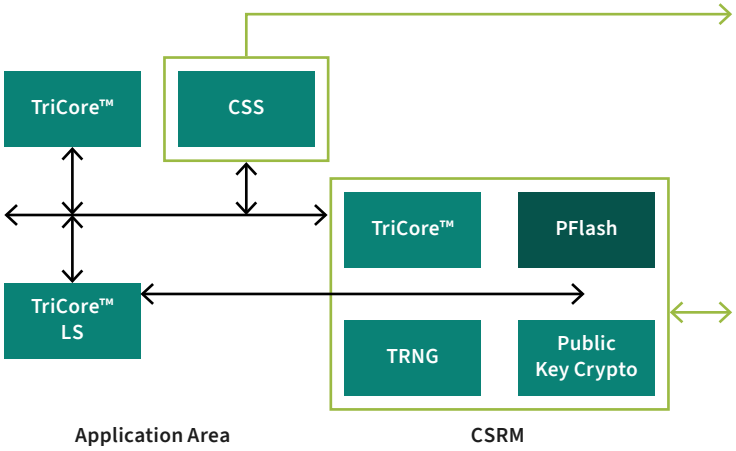
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AURIX™ TC4x innovative cybersecurity architecture

How to secure the future car?

Future cars, with their increasing communication capabilities, will need protection from the ever-changing cybersecurity landscape. In order to adapt to these new challenges, we have developed a new concept to address upcoming car-related cybersecurity threats. AURIX™ TC4x comes with a new and innovative cybersecurity cluster, which includes two main modules, the cyber security real time module (CSRM) and the cybersecurity satellite (CSS).



Cyber Security Satellite (CSS)
- Parallelization of HW accelerators is service provider to application area
- Multiple channels to be used by independent applications with different trust levels
- Multiple HW accelerators to increase through put avoid performance bottlenecks
- Providing freedom of interference
- Providing support to ASIL-D use-case

Cyber Security Real-time Module (CSRM)
- CSRM as trusted secure HW environment
- Providing ~ 5–15x more performance vs. previous generation
- Support individual security SW updates independent of application core
- Enable realization of multiple security use cases for wide ranging applications

The CSRM is the root of trust in AURIX™ TC4x for a secure hardware environment. It supports individual security software updates independent from the application core and enables the implementation of multiple security use cases for wide-ranging applications.

CSS is the novel addition to the cluster. It enables the parallelization of hardware accelerators as a service provider to the application area, allowing for multiple channels to be used by independent applications with different trust levels.

One of the key features of the CSx is that it supports a variety of use cases with a specific focus on communication requirements, as well as vehicle-to-infrastructure (V2X)use cases:
- Intrusion Detection System
- Intrusion Detection Prevention System
- Firewall: feasible with hardware filters in MAC and software
- Authenticated Encryption with Associated Data
- Authentication with Associated Data
- Combined modes

All these allow:
- Minimizing latency and maximizing throughput, as an increasing number of security use cases are expected in the future
- Your system to comply with the newest security standards, namely ISO 21434 and UNECE WP.29
- Enabling software-over-the-air use cases, which require secure and safe distribution of software updates from the cloud or within the vehicle network
- Serving Authenticated Encryption with Associated Data and Authentication with Associated Data solutions, which are expected to gain importance in the future

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AURIX™ TC3x family system architecture

Scalable 2nd generation AURIX™ TC3x system architecture

The latest AURIX™ TC3x microcontrollers are also well-suited for safety-critical applications to support clean, autonomous and connected cars. Ranging from classic airbag, braking and power steering to fail-operational systems supported by sensor-based systems using radar, LIDAR or camera technologies.

The implemented connectivity features, in combination with the highest level of security, enable connected cars with applications such as a telematics unit, connected gateway or in-vehicle wireless charging for portable devices.

To make the car clean, the new family is well-suited to new systems in electrical and hybrid drives – specifically hybrid domain control, inverter control, battery management, on-board charger and DC-DC converters, in addition to engine management and transmission control systems.

The AURIX™ TC3x combines performance with a powerful safety architecture and offers enhanced security with the second-generation HSM with asymmetric cryptography accelerators and Full EVITA support. This combination makes the family the ideal fit for domain control and data fusion applications supporting the next levels of autonomous driving.

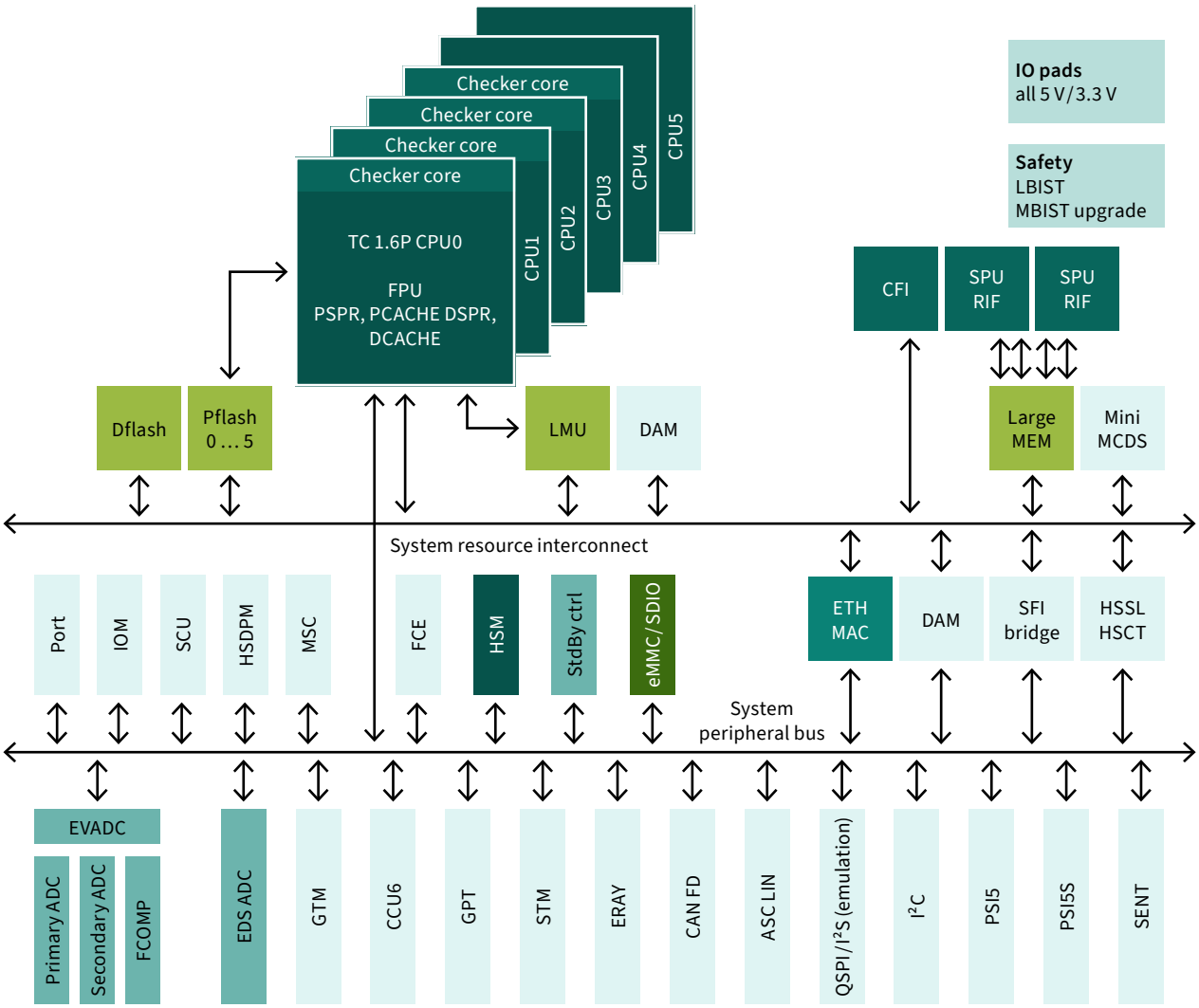
The AURIX™ TC3x family is pin compatible with the AURIX™ TC2x family and offers increased flash memory sizes of up to 16 MB, over 6 MB of integrated RAM and up to six TriCore™ 1.62 embedded cores, each with a full clock frequency of 300 MHz. New features include a new radar processing sub-system with up to two dedicated Signal Processing Units (SPU), Gigabit Ethernet, additional CAN FD and LIN interfaces and an eMMC interface for external flash.

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AURIX™ TC3x – scalable family – from low-cost to high-performance applications



Performance
- New TriCore™ 162 generation
- New instructions
- Up to 6 CPUs at 300 MHz
- New direct flash access path

HSM: Full EVITA compliance
- New accelerators ECC256/SHA256
- Available on all devices

ADAS
- LVDS IF
- Signal processing unit

ADC
- Improvement of existing ADC
- Reduction of capacitive load

Delta-sigma
- Enhanced concept

Memories
- Larger SRAM
- SRAM/flash ratio increased
- Enhanced MPU
- A/B swap support

Stand-by control unit
- Low-power modes

Ethernet
- 1 Gbit/s ETH
- QoS services
- Remote DMA

eMMC/SDIO
- External NAND flash IF

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AURIX™ TC3x family package scalability

Cores	Flash	TQFP-80	TQFP-100	LQFP-144 TQFP-144	BGA-180	LQFP-176	BGA-233	LFB-GA-292	LFB-GA-516
		Package							
6×300 MHz	16 MB							TC397XA	
6×300 MHz	16 MB							TC397X	TC399X
4×300 MHz	12 MB							TC3E7Qx	
4×300 MHz	10 MB							TC387Q	TC389Q
3×300 MHz	6 MB							TC377TX	
3×300 MHz	6 MB					TC375T		TC377T	
2×300 MHz	4 MB			TC364D	TC366D	TC365D		TC367D	
4×300 MHz	4 MB						TC3A8Q	TC3A7Q	
3×300 MHz	4 MB				TC356TA			TC357TA	
2×300 MHz	2 MB				TC336DA			TC337DA	
1×300 MHz	2 MB	TC332L	TC333L	TC334L	TC336L			TC337L	
1×160 MHz	1 MB	TC322L	TC323L	TC324L				TC327L	

Control and actuate Sense and compute

- Advanced package technologies deliver the best price/performance ratio
- Customers can choose between different devices in the same pin-compatible package

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MCU scalability

- Performance and flash
- Pin compatibility
- Binary-compatible cores

Functional Safety / security concept

- ISO26262 and IEC61508 certified by TÜV
- Performance and flash
- Pin compatibility
- Binary-compatible cores

PRO SIL

AURIX™ TC3x

Power consumption

- On-chip SC DC-DC high-efficiency power supply
- Integrated stand-by controller

Connectivity

- Ethernet: up to 2×1 GB
- CAN FD: up to 20 channels
- LIN: up to 24 channels
- eMMC IF



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AURIX™ TC2x family system architecture

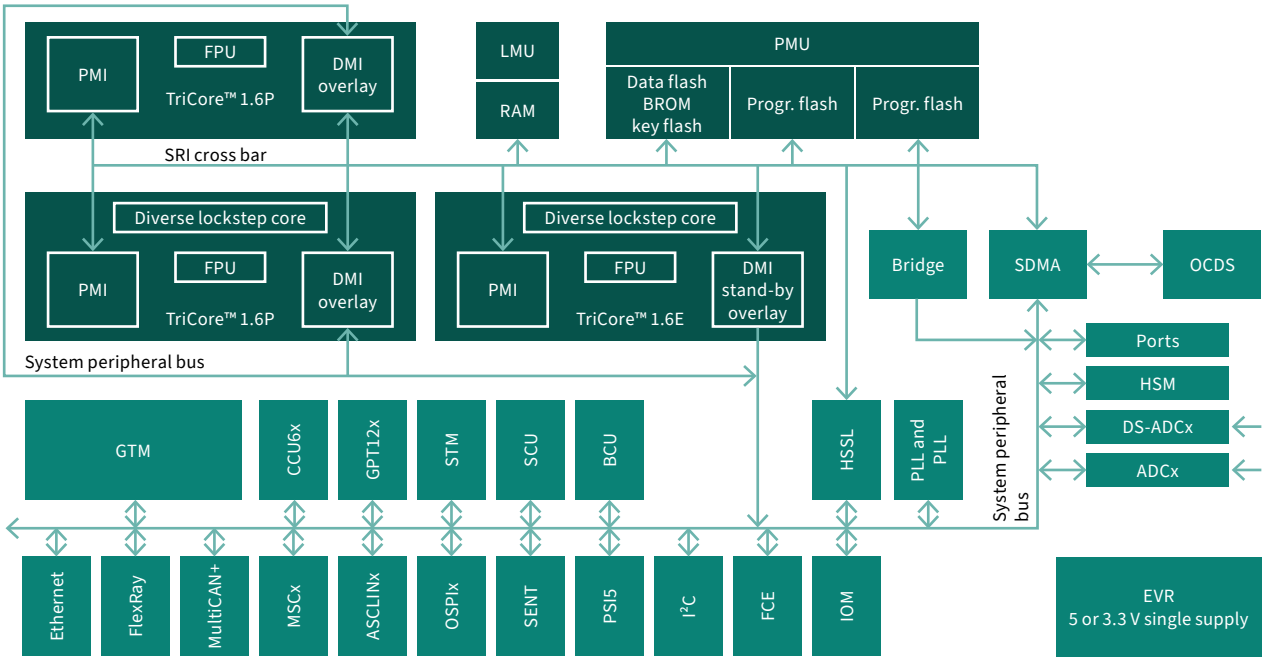
Powerful 1st generation AURIX™ TC2x system architecture

AURIX™ is Infineon's current family of microcontrollers that serve the precise needs of the automotive industry in terms of performance and safety.
Its innovative multicore architecture, based on up to three independent 32-bit TriCore™ CPUs, has been designed to meet the highest safety standards, while simultaneously increasing performance significantly.

Using the AURIX™ platform, automotive developers will be able to control powertrain and safety applications with one single MCU platform. Developments using AURIX™ will require less effort to achieve the ASIL-D standard than with a classical lockstep architecture.

Customers wanting to reduce their time-to-market can now cut down their MCU safety development by 30 percent. By the same token, a performance surplus of 50 percent up to 100 percent allows for more functionality and offers a sufficient resource buffer for future requirements, keeping the power consumption on the single-core microcontroller level. While protecting IP, and preventing theft and fraud, AURIX™ provides an already built-in hardware security module.

Thanks to its special feature set, AURIX™ is the perfect match for powertrain applications (including hybrid and electrical vehicles) as well as safety applications (such as steering, braking, airbag and advanced driver assistance systems).



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AURIX™ TC2x family package scalability

Cores	Flash	TQFP-80	TQFP-100	TQFP-144 LQFP-144	LQFP-176	LFB-GA-292	BGA-416	LFB-GA-516
		Package						
300 MHz	up to 8 MB					TC297	TC298	TC299
200 MHz	up to 4 MB				TC275	TC277		
200 MHz	up to 2.5 MB			TC264	TC265	TC267		
200 MHz	up to 2 MB		TC233	TC234		TC237		
133 MHz	up to 1 MB	TC222	TC223	TC224				
133 MHz	up to 512 KB	TC212	TC213	TC214				

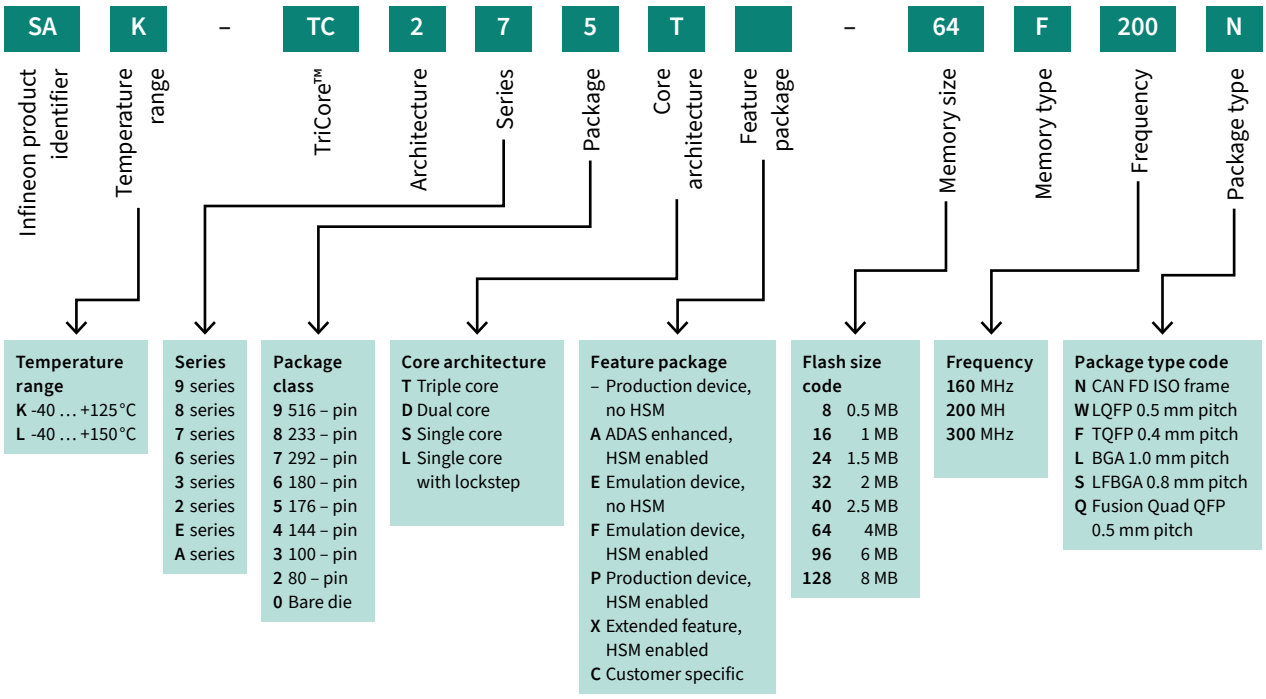
- The LFBGA-516 package is a superset of the LFBGA-292
- Combination PCBs can be designed for I/O and feature upgrades
- Advanced package technologies deliver the best price/performance ratio
- Customers can choose between different devices in the same pin-compatible package

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AURIX™ TC2x family product naming system

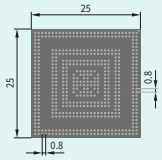


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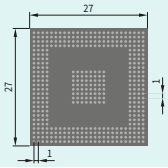
AURIX™ family housing options

Package information for maximum scalability

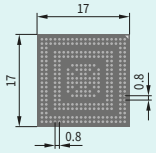
LFBGA-516



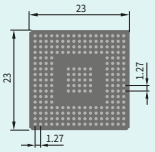
BGA-416



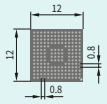
LFBGA-292



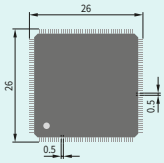
BGA-233



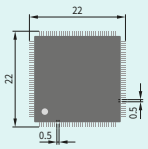
BGA-180



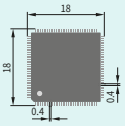
LQFP-176



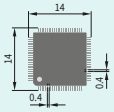
LQFP-144



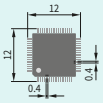
TQFP-144



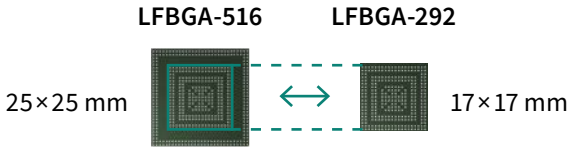
TQFP-100



TQFP-80



TriCore™ upgrade paths



BGA scalability

LFBGA-292 and LFBGA-516 are ball compatible so that customers can build one PCB for both packages

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AURIX™ TC4x – starter kits

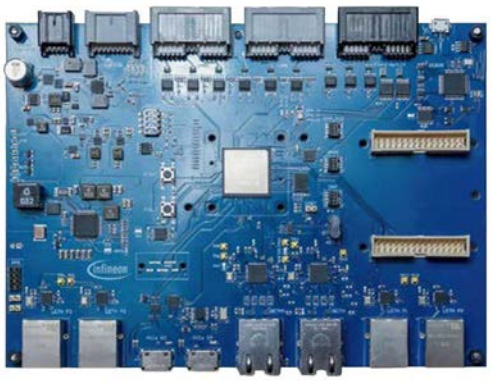
AURIX™ TC4x TriBoards

- Full evaluation board for development to write and debug your 1st programs
- Includes getting started advice, free TriCore™ entry tool chain, technical documentation, compiler and debugger



AURIX™ TC4xD Application Gateway Board

- Includes high-performance AURIX™ TC4D9x Microcontroller
- Rich connectivity: 2x 5GBase-T, 4x 100Base-TX /10Base-T, PCIe Gen3 interface via OcuLink (Root Complex/Endpoint), 12x CAN-FD, 4x LIN and 2x FlexRay ↗ interfaces on board
- Add-on board-to-board connector support for the latest communication interfaces like CAN-XL and 10BASE-T1S
- Up to 6x Power distribution channels for local actuation and body domain applications available



AURIX™ TC4x Lite Kit

- AURIX™ TC4x starter kit with TC4Dx in BGA-292 package
- USB-C powered
- FTDI based debugger via micro USB-C
- Arduino compatible connectors
- Support Motor Control Kit via X1, X2 Connectors
- 10/100 Mbit/s Ethernet support



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AURIX™ TC3x – starter kits

AURIX™ TC3x TriBoards



- Full evaluation board for development to write and debug your 1st programs
- Includes getting started advice, free TriCore™ entry tool Chain, technical documentation, compiler and debugger
- TriBoard available for all productive silicon (TC38x, TC39x)
- Learn more

AURIX™ TC3x TFT kits



- Low cost board for early evaluation with limited access to signals
- Additional touchscreen display for convenient handling
- Available for standard and ADAS pinout's for selected devices
- TriBoard available for all productive silicon (TC38x, TC39x)
- Learn more

AURIX™ TC3x Arduino ShieldBuddy kit



- The Hitex TC375 ShieldBuddy follows the Arduino standard
- Compatible with 100's of Arduino application shields
- Evaluation licenses available
- Launched at embedded world
- Learn more

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AURIX™ TC3x – starter kits

AURIX™ TC3x lite kit

- AURIX™ TC375 device in LQFP-176 package
- FTDI based debugger with micro USB
- Learn more



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AURIX™ TC2x – starter kits

AURIX™ TC2x TriBoards

- Full evaluation board for development to write and debug your 1st programs
- Includes getting started advice, free TriCore™ entry tool chain, technical documentation, compiler, and debugger
- TriBoard available for every silicon
- Learn more



AURIX™ TC2x TFT kits

- Low cost board for early evaluation with limited access to signals
- Additional touchscreen display for convenient handling
- TFT board available for every silicon
- Learn more



AURIX™ TC2x Arduino ShieldBuddy kit

- The Hitex TC275 ShieldBuddy follows the Arduino standard
- Compatible with 100's of Arduino application shields
- Evaluation licenses available
- Ideal for getting started on a high-end real time embedded industrial or automotive application as well as students and hobbyists
- Learn more



AURIX™ TC2x lite kit

- AURIX™ TC275 device in LQFP-176 package
- FTDI based debugger with micro USB
- Use of Arduino Uno/compatible platform
- Learn more



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AURIX™ TC3x – application kits

Hybrid kit for inverter applications

- IFX system offering: such as power modules, gate drivers, current and position sensors to develop inverter systems
- Software to start development of inverter for 3-phase motors
- AURIX™ TC3x hardware optimized logic board for testing different hybrid kits for inverter applications
- Learn more

Gateway 24 V board for CAV, bus, truck



- Includes AURIX™ TC397 x2 with & automotive Ethernet switch Realtek RTL9047AA switch available for standard and ADAS pinout's
- Rich connectivity: connect up to: 1000Base-TI, 100Base-T1 x5, CAN-FD x12, LIN x4, and FlexRay devices x4
- Learn more

Automotive secure gateway 12 V



- Includes AURIX™ TC377TX with & automotive Ethernet switch Marvell 88Q5050
- Rich connectivity: connect up to: 1000Base-T1 x2, 100Base-T1 x5, CAN-FD x12, LIN x2 , and FlexRay devices x2
- Learn more

Motor control board TC3x



- Based on TC397
- Software FOC (Field Oriented Control) algorithm: encoder as position sensor (GPT12)
- 3-phase current sensing (EVADC), PWM generation (GTM), communication with drive board (QSPI) commands via TFT display (QSPI)
- Learn more

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AURIX™ TC3x – application kits

APPKIT_A2G_SAFETY

- Combination of Application Kit AURIX™ TC397 TFT + Evaluation Board AURIX™-TC3x Safety
- Explore the full potential of AURIX™ TC3x ASILB/D's safety
- Features:
  - Suitable to build an ISO26262 complaint application on system level
- Learn more



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AURIX™ TC2x – application kits

Motor control
KIT_AURIX™_TC234_MOTORCTR



- TC234 application kit with TFT display including safety supply TLF35584
- Driving of a 3-phase PMSM/BLCD (12 V/max. 50 W)
- BLDC motor from Nanotec integrated
- Software available with flexible configuration
- Learn more

24 GHz radar
KIT_ATV_24GHZ_RADAR



- Range-Doppler radar system with two Rx antennas and one Tx antenna based on AURIX™ TC264DA and BGT24ATR12
- Allows implementation and testing of 24 GHz radar applications as Doppler movement detectors, FSK or FMCW range/position measurement
- Learn more

AURIX™ kits by application

- The AURIX™ Application kits can be used for the following four applications: Gateway, Motor Control, Radar, and Wireless Charging.
- Learn more

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Microcontroller PDH partner

Preferred Design Houses (PDH) and software resellers – AURIX™ Traveo and PSOC™, AURIX™ tools and software

AURIX™ Tools and Software

To enable customers to achieve optimal performance when using the powerful AURIX™ architecture, Infineon has built a network of strong partnerships with companies highly specialized in multicore software development. Infineon's multicore partners can offer the best multicore expertise and tools on the market for each stage of the software design process, covering everything from the initial multicore knowledge acquisition phase to the final optimization of the multicore software.

AURIX™ Embedded Software



- AURIX™ Applications software
- Autosar
- Non-Autosar OS/RTOS
- Middleware
- Communication and connectivity
- Bootloader/OTA
- Safety

AURIX™ Tools



- AURIX™ Free Tools
- Calibration/Measurement/Prototyping
- Compilers
- Debugger, Test Tools
- Flash Tools
- Simulation/Modelling
- SW Automation/Autocoding

Discover our new AURIX™ Tools and Software ecosystems where you can find everything you need within easy reach **www.infineon.com/aurixtools and www.infineon.com/aurixsoftware**

Classic (Free of charge)	– First level customer support covering Infineon products/solutions – Technical interface and support to the customer	– Driving design at customer – Basic training for design teams at customer – 24 h response time to the customer
Premium (Consultancy mode) To be agreed between customers and PDH	– Project management and project-specific application support – Specification of general software architecture, defining required layers, control and data flow structure etc. – Specification and implementation of custom device drivers – Optimization of software components with regard to speed/code size	– Software testing – Support for project-specific functional safety engineering – Project-specific support for security solution – Safety support – Security support – Multicore support

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Preferred Design Houses – PDH

Empower your innovations with MCU experts.

Our microcontroller preferred design houses are a trusted partners' ecosystem that extends the support force by tailoring their know-how to meet your specific needs. By partnering with one of our qualified preferred design houses, you can be assured that you will receive expert advice and customized support to help you achieve your goals. Our team of professionals brings added value to customer service, working together to optimize your design and help you succeed in your business objectives. We understand every customer is unique, so we offer tailored solutions to meet your needs. From product-specific support to application-specific advice, our preferred design house is fully trained to use AURIX™, TRAVEO™ T2G, and automotive PSOC™ and provides a wealth of knowledge and expertise to help you succeed. Together with our partners, we offer optimized customer support for systems using our products. Our preferred design houses are committed to delivering exceptional service and support to ensure your success. So why wait? Contact us today to learn more about how our preferred design house can help you achieve your goals and take your business to the next level.

	Product Family						Supported Region(s)					
	AURIX™	TRAVEO™ T2G Body	TRAVEO™ T2G Cluster	PSoC™ Automotive	PSoC™ High Voltage	PSoC™ Multitouch & Fingerprint	Global	EMEA	AMR	JP	GC	AP
Alba			●				●					
Amarakosha Technologies	●										●	●
Avin Systems	●						●					●
AVL	●				●		●					
Bluewind	●							●				
Candera			●				●					
CATARC	●										●	
ClicMtouch				●		●		●				
Colorado Engineering/CEI Colorado Engineering	●								●			
Crevaut	●	●					●					
D3 Engineering	●								●			
Digital Edge Solutions	●											●
DriveXpert/Drive Expert	●	●						●				
Eagle Wings Design	●	●	●	●	●				●			
Ebeeta											●	
elnfochip	●	●	●	●	●		●					
Embedded Office	●	●	●	●				●				
Embien Technologies			●									●
Elektrobit Automotive GmbH	●	●	●				●					
FESCARO	●											●
Frobas	●						●					
Galaxi Engineering Technology Services	●											●
G-Pulse	●	●	●	●	●						●	
GRINN	●							●				
Hamyo				●			●					
Highter	●	●	●	●	●		●					
Hitachi Industry & Control Solutions, Ltd.										●		
Hitex	●	●	●	●	●		●					
IAV	●							●				
IMST	●							●				
Intecs Solutions	●							●				
Integra Sources	●							●				
Jingwei Hitain	●	●		●							●	
KPIT Technologies Ltd.	●						●					
L4B software			●					●				
Leadmove	●										●	
Macnica	●	●	●	●						●		
MecTronic	●							●				
Microfuzzy	●	●		●				●				
Mixed Mode	●							●				
Neutron Controls	●	●	●	●	●				●			
NEXTY Electronics Corporation	●									●		
Ohla	●							●				
PiNTeam	●							●				
Precise Biometric						●		●				
QianQin	●										●	
QT			●				●					
Revotech	●	●	●									●
RIM Group/RDM Automotive	●							●				
Semcotec				●	●	●		●				
Seasidetech	●							●				
Sigma Connectivity						●	●					
SiliAuto			●					●				
T & S Engineering	●							●				
Tbench Solutions	●							●				
Technoin	●	●	●									●
Tongji	●										●	
Tresa Energy	●											●
ULMA Embedded Solutions	●							●				
Vitesse Technologies	●	●										●
VECEN TEK	●										●	
Wakiio			●				●					

Features and benefits

Key features
– To be agreed between customers and PDH
– First level customer support covering Infineon products and solutions
– Technical interface and support to the customer
– Driving design at customer
– Basic training for design teams at customer
– 24 h response time to the customer

Customer benefits
– Project management and project-specific application support
– Specification of general software architecture, defining required layers, control and data flow structure etc.
– Specification and implementation of custom device drivers and project-specific application support
– Optimization of software components with regards to speed/code size
– Software testing
– Functional safety engineering and project-specific support for security solution – Project-specific support for security solution
– Safety, security, Multicore, and Arm® support – Project-specific support for security solution

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TRAVEO™ T2G Product highlights

High performance Body and Driver information Microcontroller

The Infineon TRAVEO™ T2G microcontrollers, based on the Arm® Cortex®-M4/M7 core, offer high performance, advanced human-machine interfaces, and robust security for various automotive applications.

They provide state-of-the-art real-time performance, safety, and security features, and are used in motor control for hybrid and electric vehicles, as well as body electronics. The family supports the latest in-car networks, with a focus on high performance and data security.

TRAVEO™ T2G Body

- Low power consumption
- Deepsleep 35 uA ~
- True FOTA support
- Function Safety
- ISO 26262 ASIL-B support and IEC 61508 SIL 2 support
- Full Evita support with ISO 21434-ready
- Widely product portfolio with various communication (Ethernet, CAN FD, LIN, CXPI, FlexRay, SPI, UART, I^2C)
- High performance motor control
- Media interface
- Audio I^2S/TDM 96kHz high resolution support
- SD host controller and eMMC interface
- AUTOSAR software platform

TRAVEO™ T2G Cluster

- Low power consumption
- Deepsleep 50 uA ~
- True FOTA support
- Function Safety
- ISO 26262 ASIL-B support and IEC 61508 SIL 2 support
- Full Evita support with ISO 21434-ready
- Widely product portfolio with various communication (Ethernet, CAN FD, LIN, CXPI, SPI, UART, I^2C)
- High pereformance harware graphic engine
- Media interface
- Audio I^2S/TDM 48 kHz and Audio D/A converter embedded
- SD host controller and eMMC interface
- AUTOSAR software platform

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TRAVEO™ T2G Body

High performance body and driver information microcontroller

The TRAVEO™ T2G connected ready MCU family is designed for the smart world. The family offers wide scalability and network connectivity built into a single Arm® Cortex®- M4 and dual Cortex®- M7. Performance has also been enhanced from 400 DMIPS in TRAVEO™ T1G, to 1500 DMIPS in TRAVEO™ T2G. The TRAVEO™ T2G for body electronics applications also provides scalability across memory size and pin count. The IP compatibility enables customers to design and develop their systems with a single-platform MCU solution. TRAVEO™ T2G devices have advanced security features with the introduction of HSM (Hardware security module), dedicated Cortex®-M0+ for secure processing, and embedded flash in dual bank mode for FOTA requirements. The body family also features six power modes that enable ECUs to minimize overall power consumption. Our MCUs come with an optimized software platform that is available for AUTOSAR MCAL (Microcontroller Abstraction Layer), self-test libraries, Flash EEPROM emulation, as well as security low-level drivers, combined with third-party firmware. re provides a flexible and comprehensive development experience for the TRAVEO™ T2G devices.



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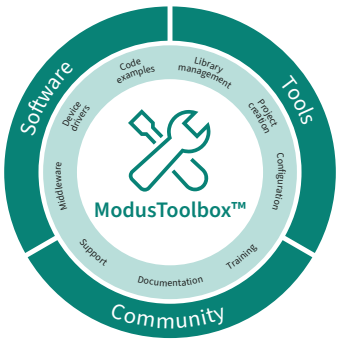
Features and benefits

Key features

Up to dual 350 MHz 32-bit Arm® Cortex®-M7 CPUs, each with
- Single/double-precision floating point unit (FPU)
- Up to 8384 KB of code-flash with an additional up to 256 KB of work-flash
- Up to 1024 KB of SRAM with selectable retention granularity
- Cryptography engine. Supports Enhanced Secure Hardware Extension (eSHE) and Hardware Security Module (HSM)
- Functional safety for ASIL-B
- Low-Power 2.7-V to 5.5-V operation
- Up to 10 CAN FD channels, Up to 20 independent LIN channels
- Up to two 10/100/1000 Mbps Ethernet MAC interfaces conforming to IEEE-802.3az
- FlexRay interface (V2.1) configurable for single or dual data-channels for fault tolerance, supporting data rates up to 10 Mbps
- External memory interface: SPI and HYPERBUS™ interface
- SDHC (Secure Digital High Capacity) and MultiMediaCard (eMMC) interface
- Audio interface: Inter-IC Sound (I2S) Interfaces and Time division multiplexed (TDM) audio formats
- Three SAR 12 bit-A/D converters
- Debug interface: JTAG controller and interface compliant to IEEE-1149.1-2001 and SWD
- Packages: LQFP 64 to T/LQFP 176, 272-BGA and 320-BGA (CYT4BF)
- Qualified for automotive application according to AEC-Q100

Key benefits

The TRAVEO™ T2G for body electronics applications also provides scalability across memory size and pin count. The IP compatibility enables customers to design and develop their systems with a single-platform MCU solution.
TRAVEO™ T2G devices have advanced security features with the introduction of HSM (Hardware security module), dedicated Cortex®-M0+ for secure processing, and embedded flash in dual bank mode for FOTA requirements.
Our MCUs come with an optimized software platform that is available for AUTOSAR MCAL (Microcontroller Abstraction Layer), self-test libraries, Flash EEPROM emulation, as well as security low-level drivers, combined with third-party firmware.
ModusToolbox™ software provides a flexible and comprehensive development experience for the TRAVEO™ T2G devices.



The TRAVEO™ T2G devices are fully supported by ModusToolbox™
- Variety of code repositories on GitHub that are comprehensive, flexible, and atomic
- Repositories include board support packages (BSPs), low-level resources like a hardware abstraction layer (HAL) and peripheral driver library (PDL)

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TRAVEO™ T2G Cluster

Providing unparalleled excellence for automotive cluster and graphic

TRAVEO™ T2G automotive MCU family for Instrument Cluster with its new graphics architecture enables a more robust and feature-rich graphics engine for automotive display systems. The product families provide the most extensive scalability, covering the conventional gauge instrument cluster, hybrid instrument cluster, and virtual instrument cluster.

The option of line-based operation of the graphics engine within the microcontroller minimizes the memory required for graphics processing. With the optimized 2.5D graphics engine and extended density of embedded Flash and Video RAM, TRAVEO™ T2G graphic MCU can support the virtual instrument cluster with high resolution up to 2880 × 1080.



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Features and benefits

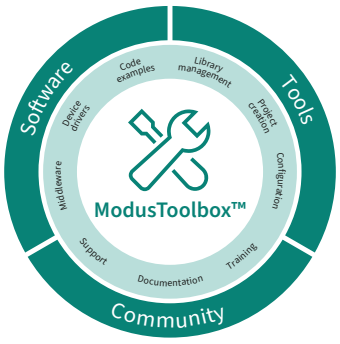
Key features

- Up to dual 320 MHz 32-bit Arm® Cortex®-M7 CPUs, each with
- Single/double-precision floating point unit (FPU)
- Up to 6336 KB of code-flash with an additional up to 128 KB of work-flash
- Up to 640 KB of SRAM with selectable retention granularity
- Cryptography engine. Supports Enhanced Secure Hardware Extension (eSHE) and Hardware Security Module (HSM)
- Functional safety for ASIL-B
- Low-Power 2.7-V to 5.5-V operation
- Supports 2D and 2.5D (perspective warping, 3D effects) graphics rendering
- One Capture engine for video input processing for ITU 656 or parallel RGB/YUV or MIPI CSI-2 input
- Up to 2 video output interfaces supporting two displays from Parallel RGB and FPD-link single/dual
- JPEG decoder (CYT4DN/CYT4EN)
- Up to 4 CAN FD channels, up to 2 independent LIN channels
- Up to two 10/100/1000 Mbps Ethernet MAC interfaces conforming to IEEE-802.3az
- Up to 2 SMIF interface (Single SPI/Dual SPI/Quad SPI/Octal SPI/xSPI)
- External memory interface: SPI and HYPERBUS™ interface
- SDHC (Secure Digital High Capacity) and MultiMediaCard (eMMC) interface
- Audio interface: Inter-IC Sound (I2S) Interfaces and Time division multiplexed (TDM) audio formats
- An SAR 12 bit-A/D converters
- Packages: 144-LQFP (0.4 mm/0.5 mm pitch) and 176-LQFP (CYT2CL), 216-TEQFP and 272-BGA (CYT3DL), 327-BGA (CYT4DN), 500-BGA (CYT4EN)

Key benefits

The TRAVEO™ T2G for cluster electronics applications also provides scalability across memory size and pin count. The IP compatibility enables customers to design and develop their systems with a single-platform MCU solution.
TRAVEO™ T2G devices have advanced security features with the introduction of HSM (Hardware security module), dedicated Cortex®-M0+ for secure processing, and embedded flash in dual bank mode for FOTA requirements.

Our MCUs come with an optimized software platform that is available for AUTOSAR MCAL (Microcontroller Abstraction Layer), self-test libraries, Flash EEPROM emulation, as well as security low-level drivers, combined with third-party firmware.
ModusToolBox™ software provides a flexible and comprehensive development experience for the TRAVEO™ T2G devices.



The TRAVEO™ T2G devices are fully supported by ModusToolBox™
- Variety of code repositories on GitHub that are comprehensive, flexible, and atomic
- Repositories include board support packages (BSPs), low-level resources like a hardware abstraction layer (HAL) and peripheral driver library (PDL)

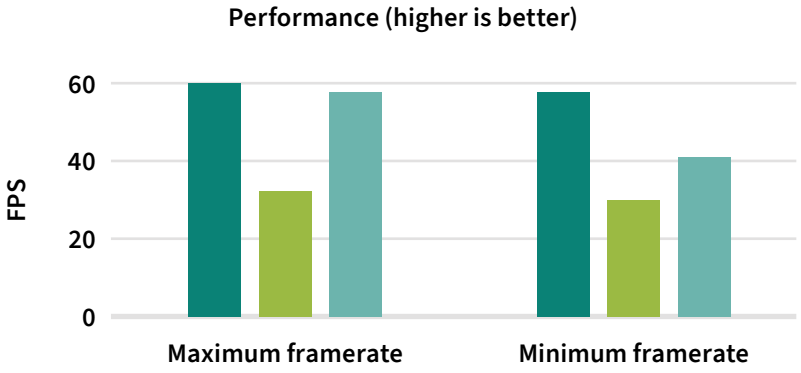
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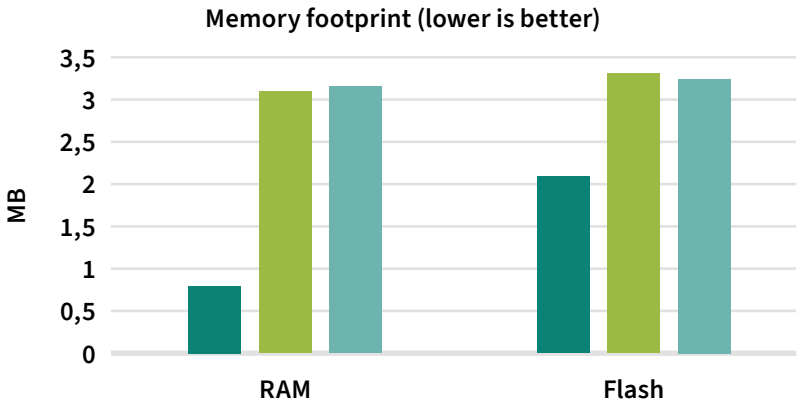
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TRAVEO™ T2G Cluster

Unrivalled Performance
Highest frame rate, lowest footprint



TRAVEO™ T2G™ is the only MCU-based solution for 60 fps at resolutions up to full HD



Highest level of design freedom

Up to 5x less RAM usage compared to the competition

Fast boot time

Infineon and Qt Group take UIs on MCUs to the next level, ensuring maximum performance using minimal resources.

- TRAVEO™ T2G is the only MCU-based solution for 60 fps at resolutions up to **full HD**
- **Up to 5x less RAM** on the same design with Infineon's smart rendering technology
- Significantly **lower boot time** than with an MPU-based solution
- Qt for MCUs on TRAVEO™ T2G empowers the highest level of **design freedom**

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Unrivalled Performance



Key Metrics			Infineon CYT3DL series	Competitor 1	Competitor 2
Display		Resolution	800 × 480	800 × 480	800 × 480
		Pixel Depth	32-bit color	32-bit color	32-bit color
RAM Usage	**Internal**	Qt runtime[1]	143 kB (SRAM + VRAM)	119 kB (LRAM + VRAM)	154 kB (SRAM)
		Framebuffer	638 kB[2] (VRAM)	–	_
		Total	**781 kB**	**119 kB**	**154 kB**
	External	Framebuffer	–	3000 kB (SDRAM)	3000 kB (SDRAM)
		Total	**0 kB**	**3 MB**	**3 MB**
		Total	**781 kB**	**3.1 MB**	**3.1 MB**
Flash Usage	**Internal**	Qt Applicatuions[3]	758 kB (code flash)	846 kB (code flash)	–
		Assets[4]	1317 kB (code flash)	2472 kB (code flash)	–
		Total	**2.08 MB**	**3.32 MB**	**0 MB**
	External	Qt Applicatuions[3]	–	–	593 kB (hyper flash)
		Assets[4]	–	–	2643 kB (hyper flash)
		Total	**0 MB**	**0 MB**	**3.24 MB**
		Total	**2.08 MB**	**3.32 MB**	**3.24 MB**
Frame rate	Max		60	32	58
	Min		58	30	41

1 Includes static allocations plus dynamic allocations (heap, stack, caches)
2 Line buffer for On-The-Fly rendering mode
3 Includes Qt application, library, and platform code, and all its dependencies (drivers, HW libraries)
4 Includes images and fonts. Direct addressing from flash, not cached in RAM on all platforms

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Share your feedback

TRAVEO™ T2G Kits ecosystem

Something for every design adventure and budget

TRAVEO™ T2G Body Entry

- Develop and test the key functionalities provided by TRAVEO™ T2G such as User **Switch**, User **LED**, and **UART** communication
- **Socket** and **solded** version available

- CYTVII-B-E-100-SO
- CYTVII-B-E-176-SO
- CYTVII-B-E-1M-100-CPU
- CYTVII-B-E-1M-176-CPU
- CYTVII-B-E-2M-100-CPU
- CYTVII-B-E-2M-176-CPU
- CYTVII-B-E-4M-176-CPU



TRAVEO™ T2G Body High

- Develop and test functionalities such as **Audio Interface**, Automotive **Ethernet**, **SD Card**, **SMIF**, **Dual QSPI** User **Switch**, User **LED**, and **UART** communication
- **Socket** and **solded** version available

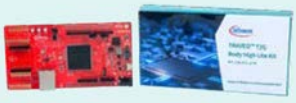
- CYTVII-B-H-176-SO
- CYTVII-B-H-272-SO
- CYTVII-B-H-320-SO
- CYTVII-B-H-4M-176-CPU
- CYTVII-B-H-4M-272-CPU
- CYTVII-B-H-8M-176-CPU
- CYTVII-B-H-8M-272-CPU
- CYTVII-B-H-8M-320-CPU
- CYTVII-B-H-16M-176-CPU
- CYTVII-B-H-16M-320-CPU



TRAVEO™ T2G Body Low cost kits

- **Low-cost**
- **Easy to use** evaluation board based on the TRAVEO™ T2G body **Entry**/**High** families **Ethernet**, **Arduino**, **mikroBUS**
- **ModusToolbox™ compatibility**

- CYTVII-B-E-1M-SK
- **NEW:** KIT_T2G-B-E_LITE
- **NEW:** KIT_T2G-B-H_LITE



www.infineon.com/traveo-kits

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Share your feedback

TRAVEO™ T2G Cluster Entry

- Develop and test the key functionalities provided by TRAVEO™ T2G Cluster entry such as User **Switch**, User **LED**, and **UART** communication

- CYTVII-C-E-4M-176-CPU



TRAVEO™ T2G Cluster High

- Design and Debug easily the T2G-C 2D devicese
- **Graphics** Driver
- **MJPEG**, **Ethernet**, **Audio** interface, **Display** interface, HyperFlas/RAM
- Purchasable as **SET** or independently

- CYTVII-C-2D-4M-216-CPU
- CYTVII-C-2D-4M-216-SET
- CYTVII-C-2D-6M-327-CPU
- CYTVII-C-2D-6M-327-SET
- CYTVII-C-2D-6M-DDR-CPU
- CYTVII-C-2D-6M-DDR-SET



TRAVEO™ T2G Cluster Low cost kits

- **Low-cost**
- Easy to use evaluation board based on the TRAVEO™ T2G cluster families **Ethernet**, **Arduino**, **mikroBUS**
- Supported by our **Certified HMI tool partners** (only for the high)

- **NEW:** KIT_T2G_C-2D-4M_LITE
- **NEW:** KIT_T2G_C-2D-6M_LITE



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MOTIX™ 32-bit motor control SoC

System-on-chip solution for motor control applications

Infineon's MOTIX™ 32-bit motor control SoC includes a 32-bit Arm® Cortex®-M microcontroller, a voltage regulator, the communication interfaces, and the driving stages for motor control applications. These system-on-chip solutions offer an unmatched level of integration of all functions required to sense, control, and actuate a motor. They save space and energy, improve the overall system reliability through advanced diagnosis features, and reduce the overall cost due to a minimum number of external components. They perfectly fit a range of BDC and BLDC motor control applications where a small package form factor and a minimum number of external components are essential.

	MOTIX™ MCU (SoC) with integrated relay driver	MOTIX™ MCU (SoC) with integrated half-bridge driver	MOTIX™ MCU (SoC) with integrated H-bridge driver	MOTIX™ MCU (SoC) with integrated 3-phase bridge driver
Product families	TLE984x	TLE985x	TLE985x, TLE986x, TLE988x, TLE994x*	TLE987x, TLE989x, TLE995x*
Controller	Arm® Cortex®-M0	Arm® Cortex®-M0	Arm® Cortex®-M0/M3/M23	Arm® Cortex®-M3/23
Core frequency	25/40 MHz	40 MHz	20-60 MHz	24-60 MHz
Flash size	36-64 kB	48-64 kB	36-256 kB	36-256 kB
Driver stage	Relay driver	Half-bridge for NFET	H-bridge for NFET	B6 brigde for NFET
Communication interface	PWM, LIN	PWM, LIN	PWM, LIN, CAN (FD)	PWM, LIN, CAN (FD)
Temperature	≤ 150°C	≤ 175°C	≤ 175°C	≤ 175°C
ISO 26262-compliance	QM	QM	QM, ASIL B	QM, ASIL B
Packages	VQFN-48	VQFN-48	VQFN-48, TQFP-48, TSDSO-32	VQFN-48, TQFP-48, LQFP-64, TSDSO-32

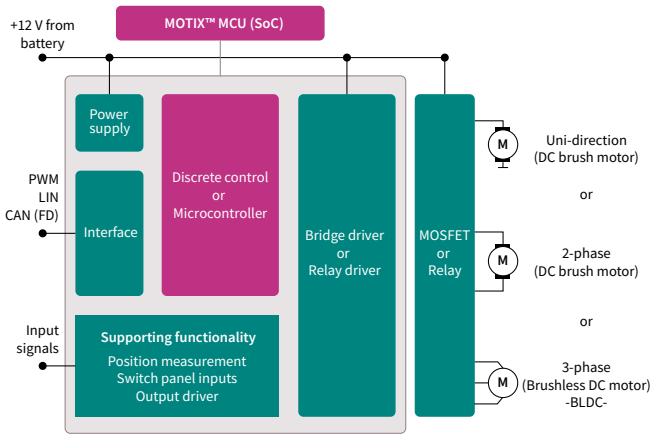
Features and benefits

Key features

- Extensive diagnostics and protections are embedded within the system-on-chip
- Platform-based approach with compatible software between the product families
- Data processing, actuation, and sensing integrated into the product with 32-bit Arm® Cortex®-M
- Compact package with 7x7 mm (VQFN-48/TQFP-48) or 9x9 mm footprint (TSDSO-32)
- Intelligent power saving modes, including stop and sleep mode, and energy management for external sensors (on demand)

Customer benefits

- High level of system reliability, safe and secure motor control
- Reduced cost
- Supports multiple and flexible designs with minimal effort
- Space saving
- Energy saving
- Premium design-in experience





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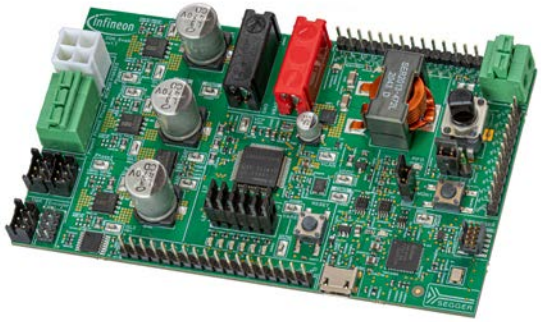
*Coming Q3 2025

MOTIX™ MCU (SoC) design support

MOTIX™ 32-bit motor control (SoC) solutions are supported by a complete development toolchain provided by Infineon and third-party vendors. Infineon's design-in tools include configuration, simulation, modeling, finder and selection tools, and utilities, free of charge.

With MOTIX™ Software, Infineon offers a modular and highly scalable platform of software and tools, reducing efforts for motor control system development. It features a combination of comprehensive motor control SW components a nd SW device drivers, all optimized for the use across Infineon device families and designed to meet most stringent sy stem safety requirements.

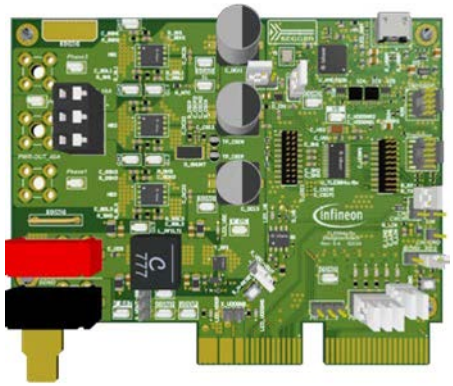
Learn more about the MOTIX™ portfolio and software at **www.infineon.com/motix-software**



TLE9893-2QK Evaluation Kit

BLDC motor control kit with MOTIX™ TLE9893-2QKW62S
The TLE9893-2QK Evaluation Kit allows a complete evaluation of all functions and peripherals of the TLE9893-2QKW62S, allowing a direct connection of a BLDC motor over MOSFETs in a B6-bridge configuration. The TLE9893-2QKW62S is a super set device which features all the functionalities of the MOTIX™ TLE989x family.

Order number: TLE98932QKEVALKITTOBO1



TLE995x Evaluation Board

TLE995x Evaluation Board
This board is designed to provide a simple, easy-to-use setup for getting started with Infineon's MOTIX™ TLE994x/5x family. The board features three Infineon MOSFET half-bridges designed for motor driving. It is ready to connect to a car supply or similar power sources and includes a connector for the debugger.

Available on request now; order online Q3/2025

Use Infineon Developer Center (IDC) to find helpful information such as data sheets, user manuals, getting startguides, application notes, design-in tools like MOTIX™ MCU Configuration Wizard and PCB design files.

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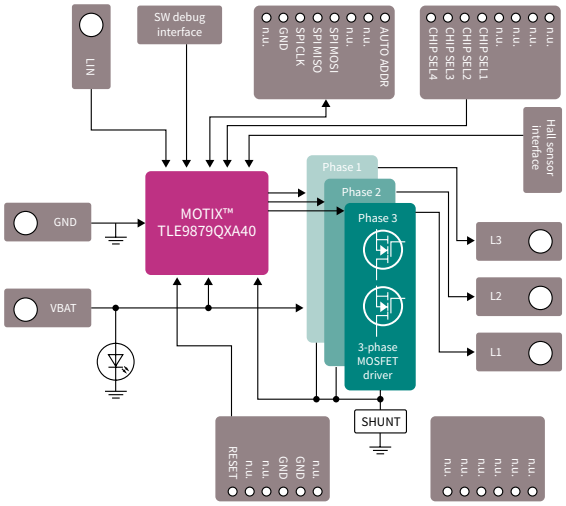
BLDC Motor Control Shield for Arduino

3-phase motor control shield with MOTIX™ TLE9879QXA40

The BLDC Shield for Arduino uses TLE9879QXA40, a part of the MOTIX™ TLE987x family of the Infineon MOTIX™ MCU (SoC) portfolio. It enables the shield to drive 3-phase BLDC motors with a variety of different features. One Arduino base board can control up to four BLDC shields via SPI. The BLDC Shield firmware provides auto-addressing functionality. Every shield in the stack can be controlled independently and run completely different motor control algorithms if desired.

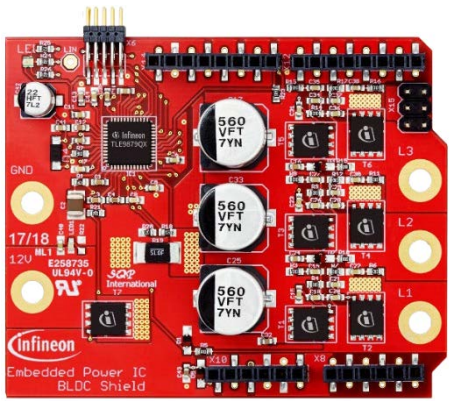
The shield implements three different advanced motor control algorithms:
- Sensorless field-oriented control (FOC)
- Block commutation with back EMF (BEMF)
- Hall-based block commutation (HALL)

The firmware can be changed using the SWD Interface. Additional connectors for voltage supply, motor phases, and hall sensors speed up the evaluation.



Features and benefits

Key features	Customer benefits
– Implemented motor control algorithms (FOC, BEMF, Hall)	– Easy-to-use API, allowing the user to quickly setup an application
– Controlled over Arduino via SPI	– High performance BLDC motor control in form of the TLE987x chip
– Compatible with the Arduino Uno or the Infineon XMC™ baseboard	
– Up to four shields can be used simultaneously	
– Each shield can be controlled independently	
– Motor parameters can be set for each shield individually	



Our BLDC Shield for Arduino has a library that includes a collection of code that makes running your project easy. The Arduino library offers an intuitive API to set up and configure an application quickly.

Order number: BLDCSHIELDTLE9879TOBO1
More information: www.infineon.com/bldcmotorshield

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CAN-FD transceivers

High- and low-speed CAN-FD transceivers for automotive and many other applications

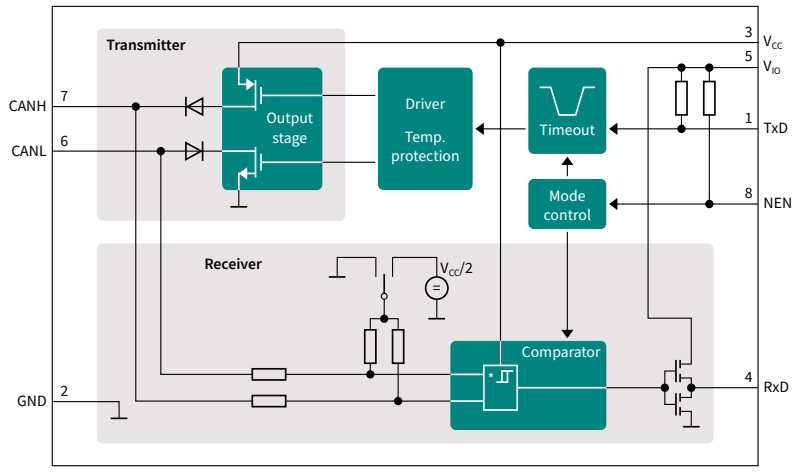
The automotive industry recently established the CAN-FD (Flexible data rate) protocol for faster CAN communication up to 5 Mbps and CAN PN (Partial Networking) for improved energy efficiency.

Different transceiver types depend on the network architecture and the related ECU supply path. Infineon transceivers ensure reliable communication and help minimize the current consumption. The products provide the best value through high performance, ruggedness, and reliability.

Features and benefits

Key features	Key benefits
– Transmission rates up to 5 Mbps ISO11898 compliant	– Low current consumption
– Low-power modes	– Excellent EMI performance and robustness
– Receive-only mode	– Pin-to-pin replacements for industry-standard parts
– Standby/sleep mode	
– Bus wake up	
– Thermal protection	
– CAN FD compliance	

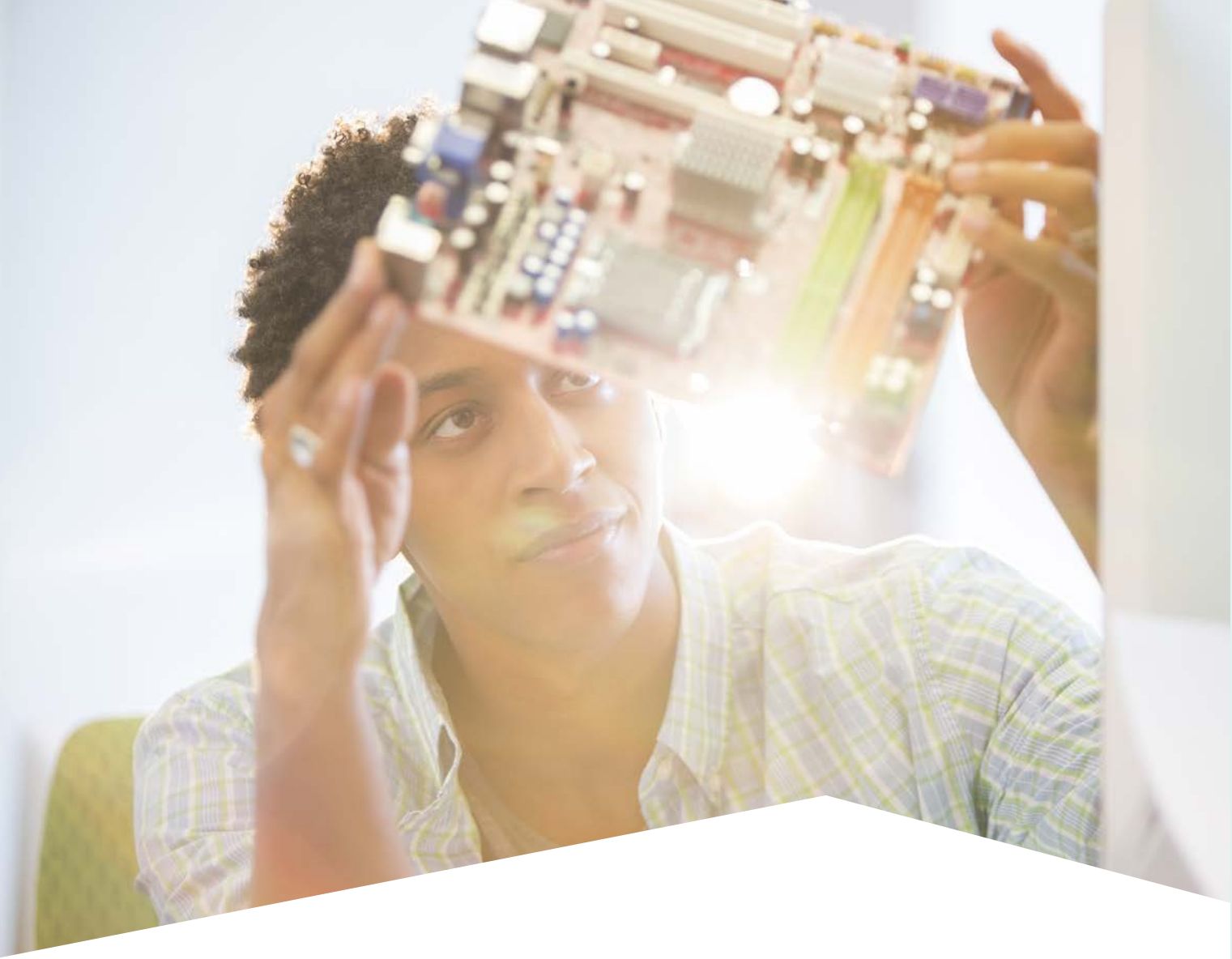
Block diagram TLE9250V



PG-DSO-8-80	PG-TSON-8-1
TLE9350BSJ	TLE9250LE_GRN
TLE9350BVSJ	TLE9250VLE_GRN
TLE9350BXSJ	TLE9250XLE_GRN
TLE9351BSJ	TLE9251LE_GRN
TLE9351BVSJ	TLE9251VLE_GRN
	TLT9251VLE

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Evaluation board Tools



USB-C controllers and peripherals

- Moving to USB-C with EZ-PD™ family
  - USB-C charging port controllers
  - USB-C high voltage microcontrollers
- USB-C power delivery controllers
  - EZ-PD™ CCG8 – USB-C PD controller
  - EZ-PD™ CMG2 – USB-C EMCA controller
- USB-C AC-DC and DC-DC charging solutions
  - EZ-PD™ CCG7SC and CCG7DC
  - EZ-PD™ PAG2 – USB-C PD and DC-DC controller
- Peripheral controllers for USB 5Gbps
  - EZ-USB™ CX3 - MIPI CSI-2 to USB 5Gbps camera controllers
  - EZ-USB™ FX3 - USB 5Gbps peripheral controllers
  - EZ-USB™ SX3 - FIFO to USB 5Gbps controllers
- USB 2.0 peripheral controllers
  - EZ-USB™ serial bridge controller
- USB hubs and USB Type-C port controllers
  - EZ-USB™ HX3
  - EZ-USB™ HX2LP and HX2VL
  - EZ-USB™ HX3PD

Moving to USB-C with EZ-PD™ family

A wide portfolio for your easy transition to the new universal connector

More and more products in consumer, industrial, and communications segments are adopting USB-C ports to source power. Infineon offers dedicated solutions to integrate USB-C ports into customers' embedded applications. Typical use cases include smart speakers, cameras, headphones, game consoles, power tools, VR headsets, and other portable electronics and home appliances. As the leader in USB-C end-to-end solutions, Infineon provides a comprehensive portfolio of solutions for USB-C chargers and power adapters.

System approach:

- Market-proven USB-C power delivery stack (USB-C PD)
- Complete and easy-to-use design portfolio to build robust, efficient, and cost-effective system solutions
- Robust evaluation kits for quick prototyping

The EZ-PD™ portfolio includes two different families of solutions to help you easily integrate USB-C into your embedded application: EZ-PD™ PMG1 (Power Delivery Microcontroller Gen 1) and EZ-PD™ BCR (Barrel Connector Replacement).

Are you looking for a plug-and-play solution to replace an old barrel connector or legacy USB connector with USB-C?

EZ-PD™ BCR

Or do you need additional control and want to add some extra functions to your device with a USB-C port controller + MCU in a single-chip solution?

EZ-PD™ PMG1


Smart speaker


Smartwatch


Power tools


Body care

Click here to learn more:

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USB-C charging port controllers

EZ-PD™ BCR: the easiest solution for moving to USB-C

EZ-PD™ BCR is a highly-integrated pre-programmed USB Type-C charging port controller targeting all electronic devices with legacy barrel connectors up to 100 W or USB micro-B connectors. It easily adds USB-C power consumer capability to a device, allowing it to be powered by any USB-C power source including USB-C chargers, power adapters, power banks, and in-wall or in-car charging ports.

EZ-PD™ BCR is compliant with the latest Type-C and USB PD 3.0 standards, it allows designers to quickly convert their devices' power input from a barrel connector to a USB-C connector without invasive changes to their existing designs. It contains a market-proven, fully-automated USB power delivery policy manager that interoperates with virtually any USB-C power source. To safeguard against system-level fault conditions, EZ-PD™ BCR controllers integrate various protection circuitries including V_{Bus}-to-CC short, overvoltage, overcurrent, and ESD.

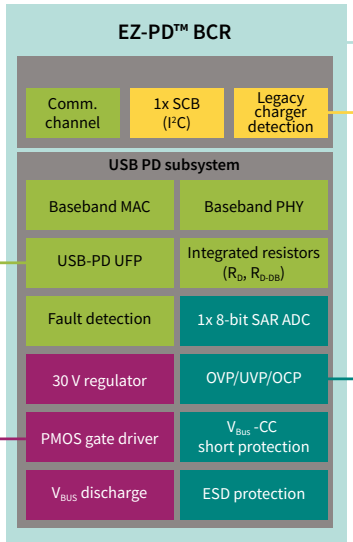
No expert knowledge of the USB-C and power delivery standards or firmware development is required to develop a robust USB-C powered system with EZ-PD™ BCR.

Features and benefits

Key features	Key benefits
– Highly integrated one-chip solutions	– Area and BOM saving
– No firmware programming required	– Shorter development cycle, faster time-to-market
– Market-proven solution with mature design tools	– No implementation risk
– Availability of software utilities	– Configurability, product differentiation
– USB-IF compliant and certified	– Pre-certified silicon to support USB logo certification
– No expert knowledge of USB-C or USB-PD required	– No steep learning curve
– Extended industrial temperature -40°C to 105°C	– Suitable for virtually any commercial or industrial application

A complete USB-C subsystem – transceiver, protocol stack, USB-PD policy manager – runs autonomously without a need to develop firmware

High-power analog components included on chip – LDO, gate driver, discharge FET – save BOM cost and reduce solution footprint



Offered in a space-saving 16-mm² package and supports extended temperatures -40°C to 105°C

Optional legacy charger detection and host programming interface offer additional solution value and design flexibility

All protection circuity integrated – overvoltage, undervoltage, overcurrent, V_{Bus}-short, ESD – provide a robust, fault-tolerant USB-C system solution

Click here to learn more:

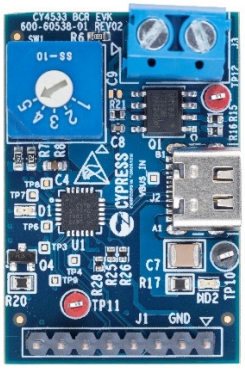
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www.infineon.com/ez-pd-pmg1
www.infineon.com/ez-pd-bcr
www.infineon.com/superspeed
www.infineon.com/usbhubs

The wide portfolio offers different combinations of flash/RAMs sizes and features to address all possible needs:

Features	EZ-PD™ BCR family		
Product name	EZ-PD™ BCR-Plus	EZ-PD™ BCR	EZ-PD™ BCR-Lite
Part number	CYPD3176-24LQXQ CYPD3176-24LQXQT	CYPD3177-24LQXQ CYPD3177-24LQXQT	CYPD3178-24LQXQ CYPD3178-24LQXQT
USB PD role	UFP (power sink)	UFP (power sink)	–
Programmable power supply (PPS)	✓	–	–
USB Type-C charging (5 V at 0.5 A, 0.9 A, 1.5 A, 3 A)	✓	✓	✓
Legacy charging support (BC 1.2 and others)	✓	–	✓
USB data compatible	✓	✓	✓
V_{Bus} gate driver	PFET	PFET	PFET
Supply voltage	3.0 V – 24.5 V	3.0 V – 24.5 V	3.0 V – 24.5 V
V_{Bus} to CC short protection (20 V)	✓	✓	✓
OVP/UVP	✓	✓	✓
OCP	✓	–	–
ESD protection on CC, D+/D-, ±8 kV (contact), ±15 kV (air)	✓	✓	✓
I²C Interface	1	1	1
EZ-PD™ BCR HPI utility	✓	✓	✓
EZ-PD™ configuration utility	✓	–	–

Boards

Once the preferred characteristics are identified, it is possible to get started with the product of choice by utilizing the available evaluation kits: they provide a USB Type-C receptacle to consume power from a charger and then supply it over a terminal block. A barrel connector can be attached to this block using wires to convert a barrel input to USB-C. In addition, selective GPIOs and I²C interface are available on headers to easily control or monitor the BCR chip from an external microcontroller.

EZ-PD™ BCR-Lite EVK CY4535	EZ-PD™ BCR EVK CY4533	EZ-PD™ BCR-Plus EVK CY4534
		

Click here to learn more:

www.infineon.com/usb
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www.infineon.com/usbhubs
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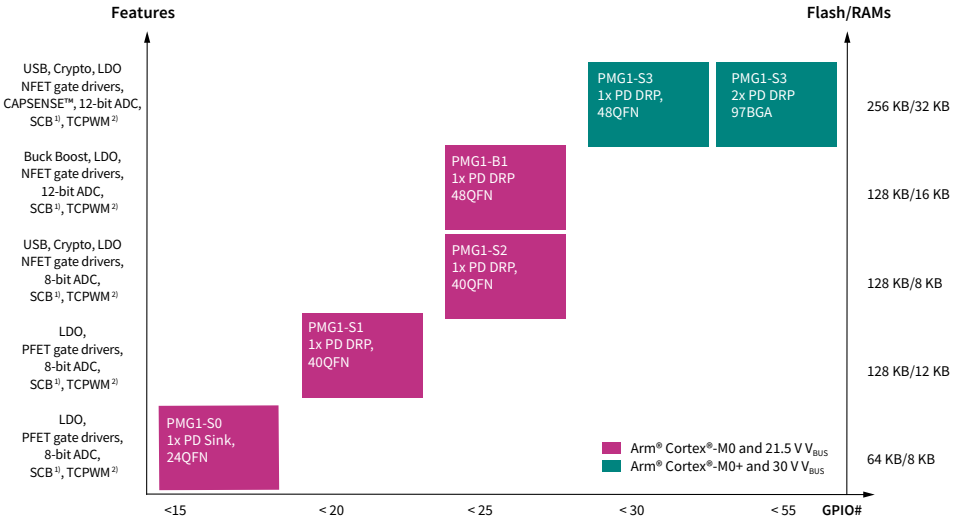
USB-C high voltage microcontrollers

EZ-PD™ PMG1: The single-chip solution for moving to USB-C

Power Delivery Microcontroller Gen 1 (EZ-PD™ PMG1) is a high-voltage USB-C power delivery microcontroller (PD MCU) targeted to any embedded system that provides/consumes power to/from a high-voltage USB-C PD port and leverages the microcontroller to provide additional control capability.

The EZ-PD™ PMG1 family of devices has a market-proven USB power delivery stack, ensuring spec compliance and interoperability. It is the only high-voltage, programmable USB power delivery solution on the market today, and comes with an integrated Arm® Cortex®-M0/M0+, up to 256 kB flash and 32 kB RAM, a USB full-speed device, and analog and digital peripherals. With an SDK supported in ModusToolbox™, the EZ-PD™ PMG1 family provides customers with a unified firmware view, facilitating seamless migration between all EZ-PD™ PMG1 devices.

The wide portfolio offers different combinations of flash/RAMs sizes and features to address all possible needs:





[1] SCB stands for Serial Communication Block [2] TCPWM stands for Timer Counter Pulse Width Modulator

Features and benefits

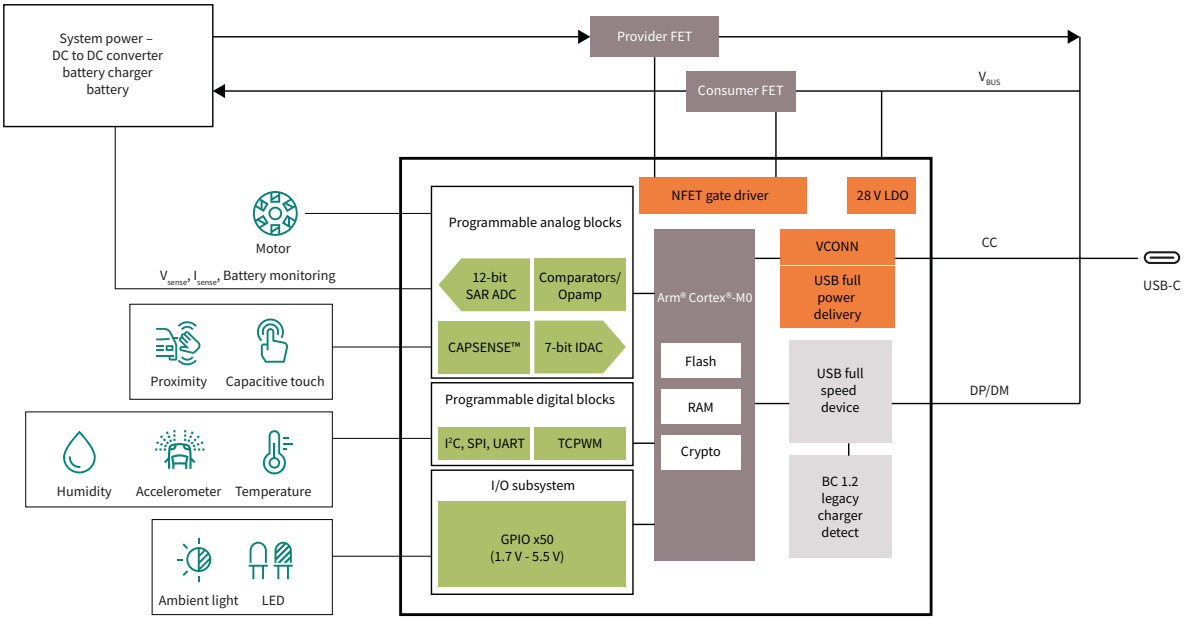
Key features	Key benefits
– Highly-integrated single-chip solution, including high voltage protection	– Area and BOM saving
– Configuration utility and wide support material available	– Faster time-to-market
– Market-proven solution with mature design tools	– No implementation risk
– Integrated flash/MCU	– Programmability, product differentiation
– USB-IF compliant and certified	– Interoperability
– Extended industrial temperature -40°C to 105°C	– Suitable for virtually any commercial or industrial application

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Block diagram



Product portfolio

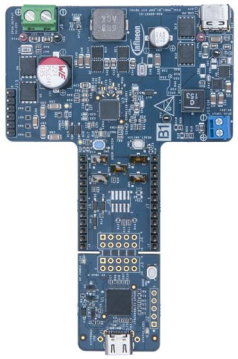
Part number	Product name	CPU	Flash [kB]	GPIOs	I/O Pins	Operating temperature range [°C]	Operating voltage min [V]	Operating voltage max [V]	Serial communication blocks	Termination resistor	Type-C ports
CYPM1011-24LQXI	PMG1-S0	Arm® Cortex®-M0	64	12	12	-40 to 85	2.7	5.5	2	Rd, Rd-db	1
CYPM1011-24LQXIT	PMG1-S0	Arm® Cortex®-M0	64	12	12	-40 to 85	2.7	5.5	2	Rd, Rd-db	1
CYPM1111-40LQXI	PMG1-S1	Arm® Cortex®-M0	128	17	17	-40 to 85	2.7	5.5	4	Rp,Rd, Rd-db	1
CYPM1111-40LQXIT	PMG1-S1	Arm® Cortex®-M0	128	17	17	-40 to 85	2.7	5.5	4	Rp,Rd, Rd-db	1
CYPM1115-48LQXI	PMG1-B1	Arm® Cortex® -M0	128	21	21	-40 to 105	4	24	3	Rp, Rd	1
CYPM1115-48LQXIT	PMG1-B1	Arm® Cortex® -M0	128	21	21	-40 to 105	4	24	3	Rp, Rd	1
CYPM1116-48LQXI	PMG1-B1	Arm® Cortex® -M0	128	21	21	-40 to 105	4	24	3	Rp, Rd, Rd-db	1
CYPM1116-48LQXIT	PMG1-B1	Arm® Cortex® -M0	128	21	21	-40 to 105	4	24	3	Rp, Rd, Rd-db	1
CYPM1211-40LQXI	PMG1-S2	Arm® Cortex®-M0	128	20	20	-40 to 85	2.7	5.5	4	Rp,Rd, Rd-db	1
CYPM1211-40LQXIT	PMG1-S2	Arm® Cortex®-M0	128	20	20	-40 to 85	2.7	5.5	4	Rp,Rd, Rd-db	1
CYPM1211-42FNXI	PMG1-S2	Arm® Cortex®-M0	128	20	20	-40 to 85	2.7	5.5	4	Rp, Rd	1
CYPM1211-42FNXIT	PMG1-S2	Arm® Cortex®-M0	128	20	20	-40 to 85	2.7	5.5	4	Rp, Rd	1
CYPM1311-48LDXI	PMG1-S3	Arm® Cortex®-M0+	256	26	26	-40 to 85	2.7	5.5	7	Rp,Rd, Rd-db	1
CYPM1311-48LDXIT	PMG1-S3	Arm® Cortex®-M0+	256	26	26	-40 to 85	2.7	5.5	7	Rp,Rd, Rd-db	1
CYPM1321-97BZXI	PMG1-S3	Arm® Cortex® -M0+	256	50	50	-40 to 85	4	30	8	Rp, Rd, Rd-db	2
CYPM1321-97BZXIT	PMG1-S3	Arm® Cortex® -M0+	256	50	50	-40 to 85	4	30	8	Rp, Rd, Rd-db	2
CYPM1322-97BZXI	PMG1-S3	Arm® Cortex®-M0+	256	50	50	-40 to 85	2.7	5.5	8	Rp,Rd, Rd-db	2
CYPM1322-97BZXIT	PMG1-S3	Arm® Cortex®-M0+	256	50	50	-40 to 85	2.7	5.5	8	Rp,Rd, Rd-db	2

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Boards

Once the preferred characteristics are identified, it is possible to start with the product of choice using the available evaluation kits: they provide a USB Type-C receptacle to consume power from a charger and then supply it over a terminal block. A barrel connector can be attached to this block using wires to convert a barrel input to USB-C. In addition, all the GPIOs and serial interfaces (UART, I²C, SPI) are available on connectors, making it easy to integrate external sensors and test the microcontroller's functions.

EZ-PD™ PMG1-S0 CY7110 EVK	EZ-PD™ PMG1-S1 CY7111 EVK	EZ-PD™ PMG1-S2 CY7112 EVK	EZ-PD™ PMG1-S3 CY7113 EVK	EZ-PD™ PMG1-B1 EVAL_PMG1_B1_DRP	EZ-PD™ PMG1-S1 EVAL_PMG1_S1_ DRP	EZ-PD™ PMG1-S3 EVAL_PMG1_S3_DUALDRP
						

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USB-C power delivery controllers

Leading the industry with over one billion USB-C devices shipped

USB-C is the universal connector of choice and has gained rapid industry support thanks to its flexibility to transmit multiple data protocols such as USB4, Thunderbolt, and HDMI and simultaneously provide up to 240 W of power via USB PD, the possibility to enable slim industrial designs and its easy-to-use connectors and cables. Its adoption significantly impacts the environment, dramatically reducing the e-waste produced by the more than one million tons of proprietary chargers shipped every year. Infineon's EZ-PD™ portfolio is the industry's most complete portfolio of USB-C power delivery solutions, enabling more robust end-to-end power delivery and charging solutions for laptop and mobile devices. USB-C power delivery standard supports fast charging up to 240 W, USB4 data speeds, and DisplayPort connectivity over an industry-standard USB-C connector for transmitting data and power on a single cable.

Infineon also offers AEC-Q100 certified versions of its controllers for automotive-grade performance. As the leader in USB-C end-to-end solutions, Infineon also provides a comprehensive portfolio of solutions for USB-C adapters and chargers.

Features and benefits

Key features	Key benefits
– Supports latest USB-C power delivery protocols	– Interoperability
– Offers programmable USB-C PD solution	– Easy customization using software development kit (SDK)
– Offers firmware upgradability with in-built flash	– Easy integration into your application
– Support secure firmware update with hardware crypto	– Programmability for higher flexibility and shorter time-to-market
– Integrates high-voltage circuits	– Highly integrated dual/single port USB-C PD controllers for optimized are and BOM
– Integrates V_{Bus} fault protections	
– Offered in QFN, BGA, and WLCSP packages	

Power source	Power source (auto)	Cable	Dock	Notebook/PC	Broad market electronics
USB-PD controllers: EZ-PD™ CCG3PA EZ-PD™ CCG3PA-NFET EZ-PD™ PAG2-PD USB-PD + DC-DC controllers: EZ-PD™ CCG7DC EZ-PD™ CCG7SC EZ-PD™ CCG7SCF USB-PD + AC-DC controllers: EZ-PD™ PAG1 EZ-PD™ PAG2	EZ-PD™ CCG3PA USB-C PD controller EZ-PD™ CCG7D Dual-port USB-C PD + DC-DC controller EZ-PD™ CCG7S Single-port USB-C PD + DC-DC controller Wireless charging: WLC1515	EZ-PD™ CCG2 USB-C port controller (active cable) EZ-PD™ CMG1 USB-C EMCA controller EZ-PD™ CMG2 USB-C EMCA controller with EPR (passive cable)	EZ-PD™ CCG3 USB-C PD port controller EZ-PD™ CCG4 Two-port USB-C & PD EZ-PD™ CCG5 Two-port USB-C PD EZ-PD™ CCG5C One-port USB-C PD EZ-USB™ HX3PD 10 Gbps hub controller with USB PD EZ-PD™ PMG1-S3 EZ-PD™ CCG6_CFP and EZ-PD™ CCG8_CFP Dual-Single-Port USB-C PD	EZ-PD™ ACG1F Dual-single port USB-C PD EZ-PD™ CCG5 Two-port USB-C & PD EZ-PD™ CCG5C One-port USB-C PD EZ-PD™ CCG6DF Dual-port USB-C PD EZ-PD™ CCG6SF Single-port USB-C PD EZ-PD™ CCG8 Dual-single port controller EZ-PD™ CCG6_CFP and EZ-PD™ CCG8_CFP Dual-Single-Port USB-C PD	Move to USB-C: EZ-PD™ BCR EZ-PD™ PMG1 Wireless charging: WLCx

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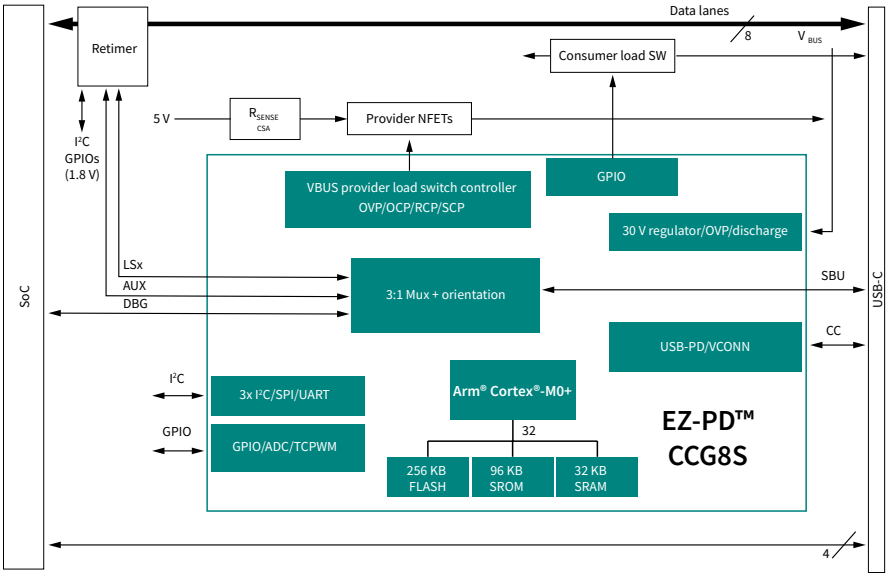
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EZ-PD™ CCG8 – USB-C controller

USB-C power delivery solution for PC host with EPR

EZ-PD™ CCG8 is the industry's first dual/single-port USB Type-C controller compliant with the latest USB-C and power delivery (PD) specifications, offering a complete USB-C and PD port control solution for PCs and notebooks. It integrates a discrete N-channel field effect transistor (NFET) gate driver with fault protection and slew rate, a 32-bit 48 MHz Arm® Cortex®-M0 Plus processor and a complete Type-C transceiver including termination resistors Rp, Rd, and dead battery Rd. While EZ-PD™ CCG8D (dual port) is available in a 97-BGA package, EZ-PD™ CCG8S (single port) is only available in a 48-pin QFN package. Both can be requested in tray or tape and reel packing options and support extended power range (EPR) up to 28 V without needing external components.

Block diagram



Features and benefits

Key features	Key benefits
– USB-C and PD 3.1 with EPR up to 28 V supporting USB3 and USB4, Thunderbolt, and display port alternate mode platforms	– Reduced area and BOM thanks to the high degree of integration
– 32-bit, 48 MHz Arm® Cortex®-M0+ processor	– Ideal for EPR-based DRP solutions
– Integrates a complete Type-C transceiver and a load switch controller for driving NFETs on V_{Bus} provider path	– Programmable solution which allows the implementation of custom features
– Slew-rate controller to turn on the V_{Bus} provider path	
– Configurable hardware-controlled V_{Bus} overvoltage, undervoltage, overcurrent, short circuit, reverse current protection, and thermal shutdown	
– Integrated 3:1 SBU Muxes for alternate modes and closed chassis debug	
– Integrated digital and analog blocks	

Desktop Notebook

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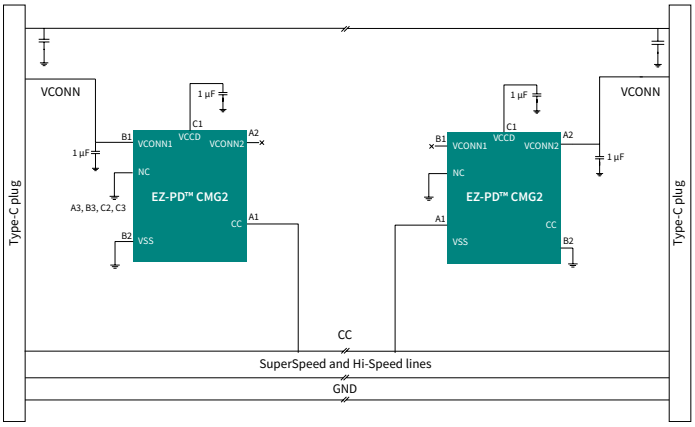
EZ-PD™ CMG2 – USB-C EMCA controller

EMCA controller with V_{Bus} to CC short protection for passive USB-C cables

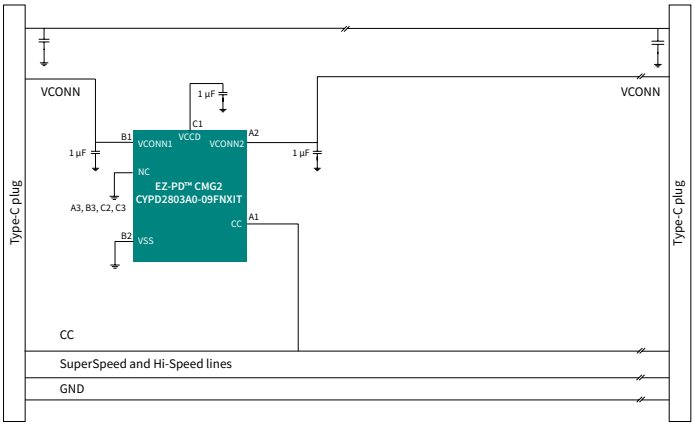
EZ-PD™ CMG2 is Infineon's dedicated electronically marked cable assembly (EMCA) controller targeting passive non-Thunderbolt and Thunderbolt Type-C cables. It offers integrated V_{Bus}-CC short protection up to 54 V, V_{Bus}-VCONN short protection up to 54 V, power delivery 3.1, Type-C 2.1, and ESD protection in a compact 9-ball WLCSP package. EZ-PD™ CMG2 has a 47-byte storage space for vendor- and cable-specific configuration data and is designed to operate from a 2.7 to 5.5 V VCONN supply range.

Block diagram

Passive EMCA application - Single EZ-PD™ CMG2 chip per plug:



Passive EMCA application - Single EZ-PD™ CMG2 chip per cable:



Features and benefits

Key features	Key benefits
– Supports USB PD 3.1 specification and USB Type-C specification version 2.1	– No programming required
– Supports USB4, TBT4, and extended power range (EPR)	– Easy to use, faster design cycle
– PD protocol	– Robust solution with short protection up to 54 V
– Integrated high-voltage protection on CC, VCONN1, and VCONN2 pins to protect against accidental shorts to the V_{Bus} pin on the Type-C connector up to 54 V	
– Integrated 47 bytes for storing vendor- and cable-specific configuration data termination resistor RA on VCONN1 and VCONN2	
– IEC ESD protection on VCONN and CC	
– Package: 9-ball WLCSP	

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USB-C AC-DC and DC-DC charging solutions

The one-stop shop for charger and adapter designs

Infineon offers a one-stop shop for a wide variety of USB PD AC-DC and DC-DC conversion solutions for charger adapters from 18 to 140 W. The portfolio includes a scalable PD controller architecture supporting single-port and multi-port charger configurations. Our reference designs allow the quick and easy development of prototypes, meaning customers can benefit from new, fast-charging adapter technology while reducing development costs and time-to-market. Moreover, the high degree of programmability and the ability to support custom protocols and updates enables customers a high degree of flexibility. With decades of experience in the electronics industry, Infineon drives the trend of adapter miniaturization without compromising product efficiency and performance.

As the leader in USB-C end-to-end solutions, Infineon also provides a comprehensive portfolio of USB-C adapters and chargers solutions.

Product	Category	Product family	CPU	Flash [kB]	SRAM [kB]	GPIOs	Serial communication blocks	#Type-C ports	Operating temperature range [°C]
CYPAP211A1-14SXI/T	Primary PWM controller	PAG2-P	N/A	N/A	N/A	0	N/A	N/A	-40 to 85
CYPAP212A1-14SXI/T	Primary PWM controller	PAG2-P	N/A	N/A	N/A	0	N/A	N/A	-40 to 85
CYPAP212A1-14SXIT	Primary PWM controller	PAG2-P	N/A	N/A	N/A	0	N/A	N/A	-40 to 85
CYPET121	Pulse edge transformer	PAG2-P	N/A	N/A	N/A	0	N/A	N/A	N/A
CYPAS212A1-32LQXQ/T	USB-PD + SR + PWM controller	PAG2S-AC	Arm® Cortex®- M0	64	8	10	0	1	-40 to 105
CYPAS213A1-24SXQ/T	USB-PD + SR controller	PAG2S-PS	Arm® Cortex®- M0	64	8	4	0	1	-40 to 105
CYPAS213A1-32LQXQ/T	USB-PD + SR controller	PAG2S-PS	Arm® Cortex®- M0	64	8	10	0	1	-40 to 105
CYPAS211A1-32LQXQT/T	USB-PD + SR + PWM controller	PAG2S-QZ	Arm® Cortex®- M0	64	8	10	0	1	-40 to 105
CYPET131	Pulse edge transformer	PAG1P	N/A	N/A	N/A	0	N/A	N/A	N/A
CYPAP111A3-10SXQ/T	Primary PWM startup controller	PAG1P	N/A	N/A	N/A	0	N/A	N/A	-40 to 105
CYPAP112A3-10SXQ/T	Primary PWM startup controller	PAG1P	N/A	N/A	N/A	0	N/A	N/A	-40 to 105
CYPAS111A1-24LQXQ/T	USB-PD + SR + PWM controller	PAG1S	Arm® Cortex®- M0	64	4	6	0	1	-40 to 105
CYPD3184A1-24LQXQ/T	USB-PD + SR + PWM controller	PAG1S	Arm® Cortex®- M0	64	4	6	0	1	-40 to 105
CYPAS2174A1-32LQXQ/T	USB-C PD controller	PAG2-PD	Arm® Cortex®- M0	64	8	10	0	1	-40 to 105
CYPD3135-32LQXQ/T	USB-PD controller	CCG3	Arm® Cortex®- M0	128	8	14	4	1	-40 to 105
CYPD3135-40LQXI/T	USB-PD controller	CCG3	Arm® Cortex®- M0	128	8	20	4	1	-40 to 105
CYPD3135-40LQXQ/T	USB-PD controller	CCG3	Arm® Cortex®- M0	128	8	20	4	1	-40 to 105
CYPD3171-24LQXQ/T	USB-PD controller	CCG3PA	Arm® Cortex®- M0	64	8	12	2	1	-40 to 105
CYPD3172-24LQXQ/T	USB-PD controller	CCG3PA-NFET	Arm® Cortex®- M0	64	4	6	0	1	-40 to 105
CYPD3172P-24LQXQ/T	USB-PD controller	CCG3PA-NFET	Arm® Cortex®- M0	64	4	6	0	1	-40 to 105
CYPD3173-24LQXQ/T	USB-PD controller	CCG3PA-NFET	Arm® Cortex®- M0	64	4	6	0	1	-40 to 105
CYPD3173P-24LQXQ/T	USB-PD controller	CCG3PA-NFET	Arm® Cortex®- M0	64	4	6	0	1	-40 to 105
CYPD3174-16SXQT	USB-PD controller	CCG3PA	Arm® Cortex®- M0	64	8	6	1	1	-40 to 105
CYPD3174-24LQXQ/T	USB-PD controller	CCG3PA	Arm® Cortex®- M0	64	8	12	2	1	-40 to 105
CYPD3175-24LQXQ/T	USB-PD controller	CCG3PA	Arm® Cortex®- M0	64	8	12	2	1	-40 to 105
CYPD7271-68LQXQ/T	USB-PD + DC-DC controller	CCG7DC	Arm® Cortex®- M0	128	16	19	4	2	-40 to 105
CYPD7272-68LQXQ/T	USB-PD + DC-DC controller	CCG7DC	Arm® Cortex®- M0	128	16	19	4	2	-40 to 125
CYPD7171-40LQXQ/T	USB-PD + DC-DC controller	CCG7SC	Arm® Cortex®- M0	128	16	13	3	1	-40 to 125

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EZ-PD™ CCG7SC, CCG7SCF, and CCG7DC

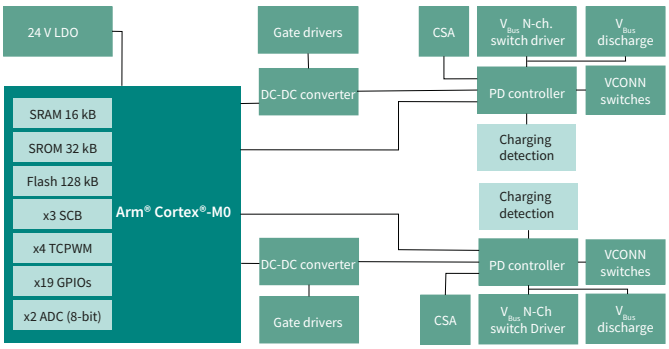
Single- and dual-port USB-C PD and DC-DC controller USB-C charging solutions, with or without FETs

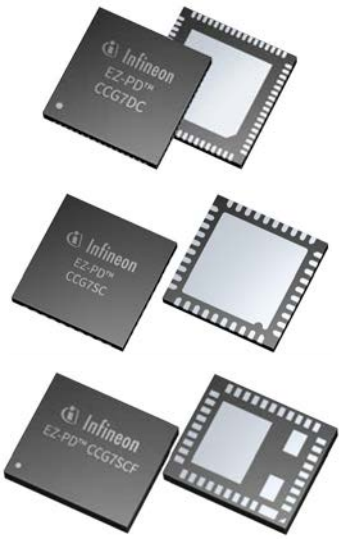
Infineon's EZ-PD™ CCG7x consumer are highly integrated single- and dual-port USB Type-C power delivery (PD) solutions with built-in buck-boost controllers; they are designed for multi-port consumer charging applications and comply with the most recent USB Type-C and PD specifications. With an on-chip 32-bit Arm® Cortex®-M0 processor, 128 kB flash, 16 kB RAM, and 32 kB ROM, EZ-PD™ CCG7x is the most programmable USB-PD solution for DC-DC applications, leaving the flash available for user application's use. Custom system management features, like dynamic load sharing and temperature monitoring, are part of the feature set thanks to the inclusion of this fully programmable MCU with analog and digital peripherals. EZ-PD™ CCG7x also integrates gate drivers for V_{Bus} NFET on the provider path and hardware-controlled protection features on the Vbus. The high degree of integration lowers the system BOM and provides a footprint-optimized solution to support higher power-density designs.

Features and benefits

Key features	Key benefits
– One/two USB-C PD controllers + DC-DC controllers	– Enables high power density designs
– Supports the latest USB-C PD 3.1 with PPS, QC4+, Samsung AFC, Apple 2.4 A, BCv1.2	– Dynamic load sharing enables intelligent redistribution of power among ports
– Arm® Cortex®-M0 with flash for custom features implementation	– Capable of support 2-port, 3-port, 4-port, or more configurations
– Integrated V_{Bus} NFET gate drivers, buck-boost NFET gate drivers, VCONN FETs and high-side current sense amplifier (HSCSA)	– Does not require additional MCU externally for system peripheral
– DC-DC controller: Configurable switching frequency of 150 – 600 kHZ, PSM/ FCCM mode of operation, wide input voltage range of 4 – 24 V (40 V tolerant), and programmable spread spectrum frequency for low EMI	
– Protection features: OVP, UVP, SCP, OCP, OTP, and V_{Bus}-CC short	
– Advanced features: Dynamic load sharing, power throttling, field firmware upgrade, optimized-efficiency control methods for flyback converter, and buck-bypass	

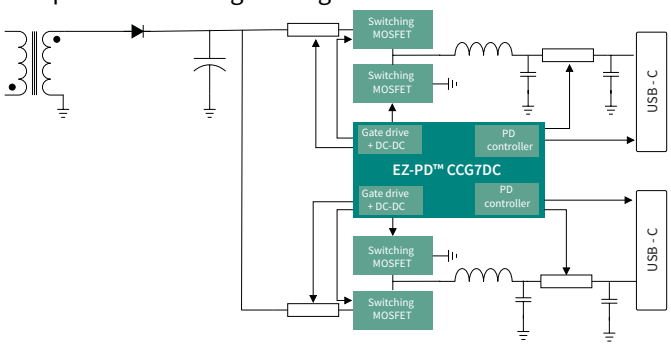
Block diagram





Application example

Two-port USB-C charger using EZ-PD™ CCG7DC





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EZ-PD™ PAG2 - USB-C PD and DC-DC controller

ZVS flyback converter chipset with integrated USB PD, synchronous rectification (SR), and PWM

EZ-PD™ PAG2 is a complete AC-DC charger and adapter solution with integrated USB PD. It is a two-chip secondary-side controlled flyback converter chipset (EZ-PD™ PAG2P and EZ-PD™ PAG2S) with integrated USB PD, synchronous rectifier (SR), and PWM controllers. EZ-PD™ PAG2 supports quasi-resonance flyback with zero voltage switching (QR-ZVS) and active clamp flyback (ACF). Its design supports PD 3.1 SPR and 28 V EPR. EZ-PD™ PAG2S standalone can pair with PWM controllers through an optocoupler by acting as USB PD and SR.

EZ-PD™ PAG2P



EZ-PD™ PAG2P is a primary start-up controller designed to receive PWM signals from EZ-PD™ PAG2S, which performs the PWM regulation. It provides HV start-up, PET receiver via CYPET121, boosts V_{CC}, low-side NFET gate driver, and high-side logical driver. EZ-PD™ PAG2P supports both X-cap discharge and non-X-cap discharge modes. It pairs with EZ-PD™ PAG2S-AC to support ACF converters and EZ-PD™ PAG2S-QZ to support QR-ZVS flyback converters.

Key features
– Integrated high-voltage start-up
– Integrated low-side gate driver
– Integrated high-side logical driver
– Integrated V_{CC} boost switch
– Support x-cap discharge mode
– Brown-in/out and line OVP/UVP
– Support OCP and SCP
– Startup secondary V_{Bus} OVP
– Programmable soft-start
– Integrated PET receiver

EZ-PD™ PAG2S



EZ-PD™ PAG2S supports secondary-side controlled flyback converters by pairing with EZ-PD™ PAG2P. PAG2S-AC is a secondary-side ACF controller enabling leakage energy recycling and ZVS operation. PAG2S-QZ is a secondary-side QR-ZVS controller achieving ZVS using an SR control scheme. EZ-PD™ PAG2S-PS standalone acts as a USB PD and SR-integrated secondary-side controller by pairing with third-party primary-side PWM controllers via an optocoupler.

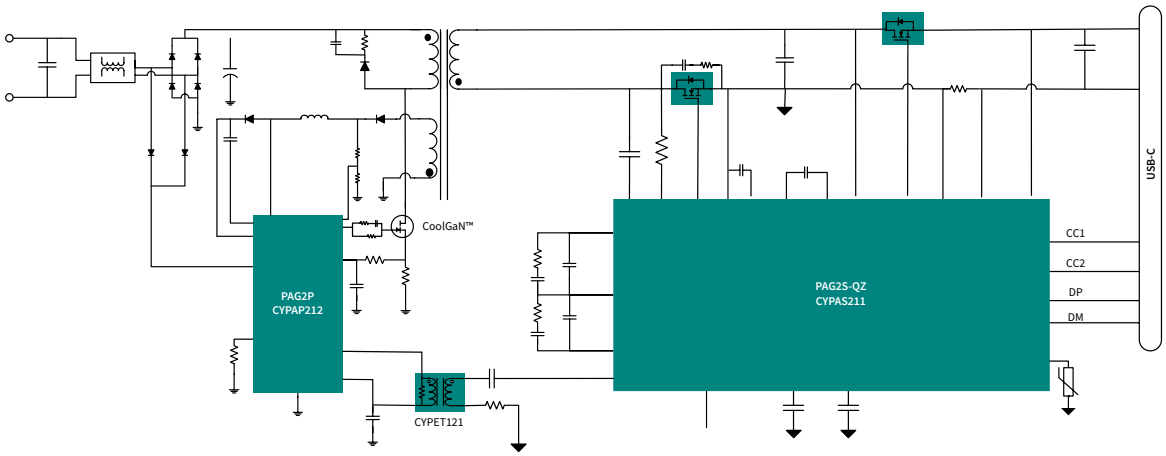
Key features
– Support PD 3.1 SPR and 28 V EPR
– 20-300 kHz switching frequency
– Support DCM, CCM, and CrCM
– Support PSR and SSR PWM regulation
– BC1.2, QC5, Apple 2.4 A, and AFC
– Support V_{Bus} fault protection
– Support V_{conn} current limit
– Supports V_{Bus}-CC short
– Short SR turn-on and -off delay
– Support non-logical level MOSFETs

Notebook Communication Charger

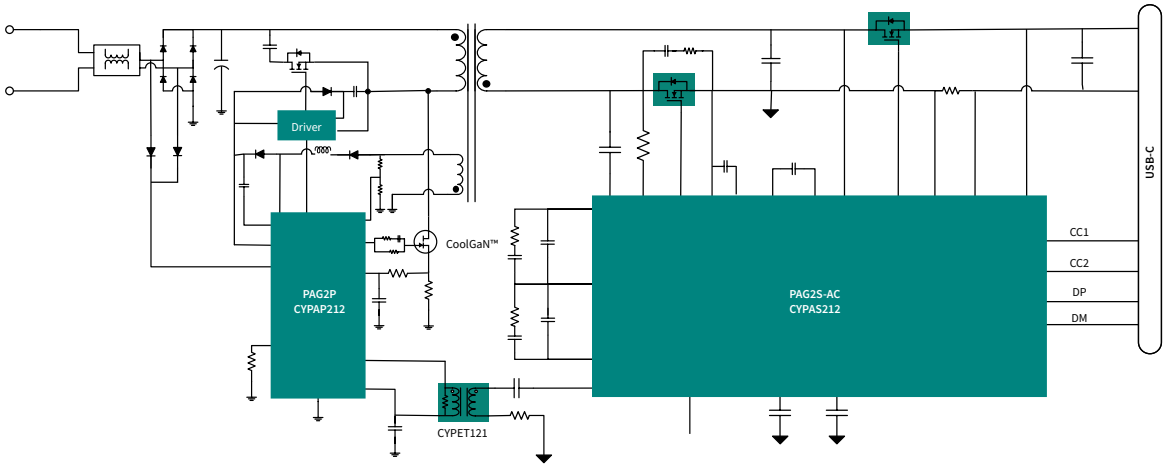
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EZ-PD™ PAG2-QZ chipset: Secondary-side controlled QR-ZVS



EZ-PD™ PAG2-AC chipset: Secondary-side controlled ACF



Comparison table: EZ-PD™ PAG1 vs EZ-PD™ PAG2

Feature		EZ-PD™ PAG1 Quasi-Resonant (QR)	EZ-PD™ PAG2 QR-ZVS	EZ-PD™ PAG2 ACF
USB-PD, subsystem and peripheral	Arm® Cortex®-M0 USB-PD MCU, Memory (Flash/SRAM)	Yes, 64 KB/4 KB	Yes, 64 KB/8 KB	Yes, 64 KB/8 KB
	PD compliance spec	PD 3.1 SPR with PPS	PD 3.1 SPR with PPS/28 V EPR	PD 3.1 SPR with PPS/28 V EPR
	VCONN switches and LDO	No	Yes	Yes
LP-SMPS features	Switching frequency range	20-150 kHz	20-300 kHz	20-300 kHz
	Zero voltage switching (ZVS)	Yes, 1st valley through SR off delay	Yes, any valley through SR turn on/off	Yes, through ACF operation
	Recycle leakage energy	No	No	Yes
	Primary side protection	– Brown in/out, line UV/OP – Secondary start-up V_{Bus} OVP – OCP (single level)	– Brown in/out, line UV/OP – Secondary start-up V_{Bus} OVP – OCP (dual level), SCP	– Brown in/out, line UV/OP – Secondary start-up V_{Bus} OVP – OCP (dual level). SCP
	Primary VCC supply	– Supply through external LDO – Single/Dual AUX winding	– Integrated V_{CC} bost switch – Without external LDO circuit	– Integrated VCC boost switch – Without external LDO circuit
	Secondary side protection	– V_{Bus} OVP, UVP, OCP, SCP – CC1/CC2 OVP	– V_{Bus} OVP, UVP, OCP, SCP – Rsense short protection – CC1/CC2/DP/DM OVP	– V_{Bus} OVP, UVP, OCP, SCP – Rsense short protection – CC1/CC2/DP/DM OVP
	Digital control feature	– Digital valley table – Deadtime	– Digital valley table – Deadtime and ZVS pulse width	– Digital valley table – Deadtime and ACF pulse width
	Efficiency compliant standard	Standby <30 mW; DoE VI; CoC tier 2	Standby <30 mW; DoE VI; CoC tier 2; EuP Lot6	Standby <30 mW; DoE VI; CoC tier 2; EuP Lot6
Others	Packaging	PAG1S: 24-QFN/PAG1P: 10-SOIC	PAG2S: 32-QFN/PAG2P: 14-SOIC	PAG2S: 32-QFN/PAG2P: 14-SOIC

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Peripheral controllers for USB 5Gbps

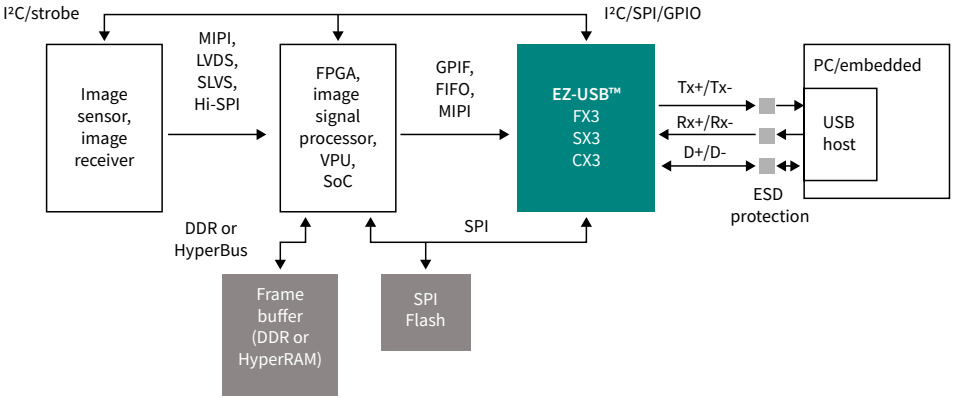
From USB 1.1 to USB 5Gbps innovation, heading towards 20Gbps

Infineon's EZ-USB™ peripheral controllers family offers the most comprehensive USB product portfolio in the industry. Since 1996, EZ-USB™ has set the industry's standard by improving the capabilities of programmable USB peripheral controllers, enabling designers to build USB devices that can handle the most demanding performance requirements in industrial and medical imaging applications. Machine vision, medical imaging, 3D scanners, biometric scanners, and many other applications requiring safe and dependable high-speed plug-and-play connectivity can benefit from the high-performance EZ-USB™ 5Gbps controllers.

Infineon's EZ-USB™ peripheral controllers provide 5Gbps bandwidth today, and will soon move forward to 10 and then 20Gbps. Learn more here.

	EZ-USB™ FX3	EZ-USB™ CX3	EZ-USB™ SX3
Function	Programmable peripheral	MIPI CSI-2 to USB3 bridge	FIFO-USB3 bridge
Part numbers	CYUSB3011 CYUSB3012 CYUSB3013 CYUSB3014	CYUSB3064 CYUSB3065	CYUSB3015 CYUSB3016 CYUSB3017
Transfer rate	5Gbps	5Gbps	5Gbps
System interface	32-bit GPIF, 100 MHz	4x MIPI CSI-2	32-bit FIFO, 100 MHz
USB-C Mux	-	-	-
Processor	Arm9™	Arm9™	Arm9™
RAM/flash	512 KB/0 KB	512 KB/0 KB	512 KB/0 KB
USB endpoints	32	2	2
Hardware DVK	SuperSpeed Explorer Kit	CX3 Camera RDK	SX3 Explorer it
SDK	EZ-USB™ FX3 SDK	EZ-USB™ FX3 SDK	-
Configuration utility	-	-	EZ-USB™ SX3 configuration utility

Block diagram



The block diagram shows a typical USB3 Vision-based machine vision camera. An image sensor using one of many different interface standards is connected to an FPGA or an image signal processor (ISP), which processes and optimizes the image and translates data into parallel data (or MIPI CSI-2) connected to an EZ-USB™ controller (FX3, SX3, or CX3). The EZ-USB™ controllers transfer uncompressed video in USB3 Vision standard to a PC or an embedded system via a standard USB cable.

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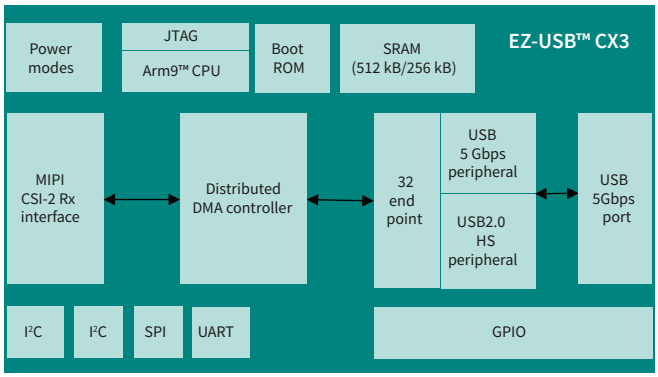
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EZ-USB™ CX3 - MIPI CSI-2 to USB 5Gbps camera controllers

Adding USB 5Gbps connectivity to image sensors with MIPI CSI-2 interface

Infineon's EZ-USB™ CX3 enables USB 5Gbps connectivity to any image sensor compliant with the mobile industry processor interface (MIPI) camera serial interface Type 2 (CSI-2) standard. It is based on the proven EZ-USB™ FX3 platform and comes with a 200 MIPS fully accessible Arm9™ CPU and 512 kB SRAM. For configuring image sensors, EZ-USB™ CX3 also supports a camera control interface (CCI). Pan, tilt, and zoom functions, as well as other camera control functions, can be supported by programming the EZ-USB™ CX3's numerous peripheral interfaces, including I²C, SPI, and UART.

Block diagram





Features and benefits

Key features	Key benefits

– Capable of streaming uncompressed video, including:
  – 4K UHD video at 15 fps
  – 1080p video at 30 fps
  – 720p video at 60 fps
	– Adds USB 5Gbps connectivity to any MIPI CSI-2 based camera

– Connectivity: MIPI CSI-2 to USB 5 Gbps bridge controller with an integrated USB 5Gbps PHY	– Turnkey solutions on industrial standards
– Bandwidth: 4x CSI-2 lanes, 1 Gbps per lane	– Quick time-to-market with low development costs
– Color format support: RAW8/10/12/141, YUV422/4442, RGB888/666/5653	
– Camera protocol: UVC or proprietary	
– Programmability: Fully accessible Arm9™ CPU with 200 MHz operation and 512 kB SRAM	

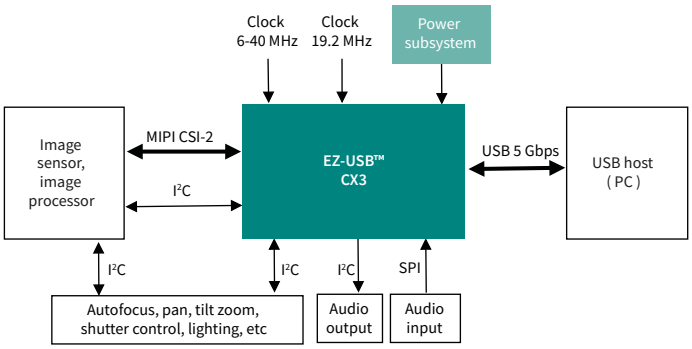
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Application diagram



In the block diagram a typical EZ-USB™ CX3-based camera is depicted. The EZ-USB™ CX3 is connected to an image sensor with a MIPI CSI-2 (up to four lanes) interface. A standard USB cable is then used by the peripheral controller to transfer uncompressed video in compliance with the USB video class standard to a PC or an embedded system.

Product portfolio

Product	USB standard	USB speed [GBit/s]	I/O type	Operating temperature range [°C]	Operating voltage min [V]	Operating voltage max [V]
CYUSB3064-BZXC	USB 3.0	5	2/4-Lanes MIPI CSI-2, GPIO, I²C, SPI, I2S, UART	0 to 70	1.15	1.25
CYUSB3064-BZXI	USB 3.0	5	2/4-Lanes MIPI CSI-2, GPIO, I²C, SPI, I2S, UART	-40 to 85	1.15	1.25
CYUSB3065-BZXC	USB 3.0	5	2/4-Lanes MIPI CSI-2, GPIO, I²C, SPI, I2S, UART	0 to 70	1.15	1.25
CYUSB3065-BZXI	USB 3.0	5	2/4-Lanes MIPI CSI-2, GPIO, I²C, SPI, I2S, UART	-40 to 85	1.15	1.25

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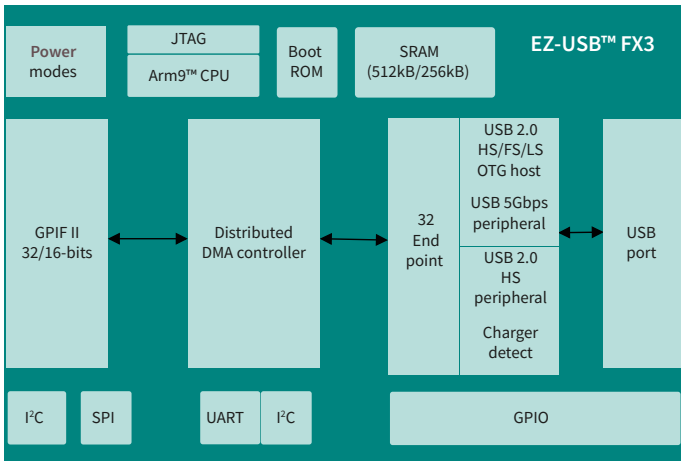
EZ-USB™ FX3 - USB 5Gbps peripheral controllers

USB 5Gbps to 32-bit data bus with Arm9™

Infineon's EZ-USB™ FX3 is the industry's most adaptable USB peripheral controller, which can add USB 5Gbps connectivity to any system. A processor, an image sensor, an FPGA, or an ASIC can all be connected using the EZ-USB™ FX3's second-generation general programmable interface (GPIF II). Users can configure the general programmable interface (GPIF) to operate like a FIFO, an asynchronous SRAM, an address/data multiplexed interface, a CompactFlash, or a custom interface.

EZ-USB™ FX3 will enable applications like machine vision and medical imaging to achieve higher quality at a lower cost because USB 5Gbps and USB-C are now standard connectivity in all PCs.

Block diagram





Features and benefits

Key features	Key benefits
– Full accessible 32-bits, 200 MHz, Arm9™ core with up to 512 kB of embedded SRAM	– Adds USB 5Gbps capability to any system
– Hi-speed on-the-go (HS-OTG) host and peripheral compliant with on-the-go Supplement Version 2.0	– Quick time-to-market with low development costs
– USB 2.0 OTG compliance	– Turnkey solutions on industrial standards
– Compliant with USB BC v1.1	– Easy code development and integration
– Additional connectivity to peripherals	– Easy connectivity to peripherals such as I²C, I2S, UART, SPI, and GPIOs
– Improved battery charging capabilities	

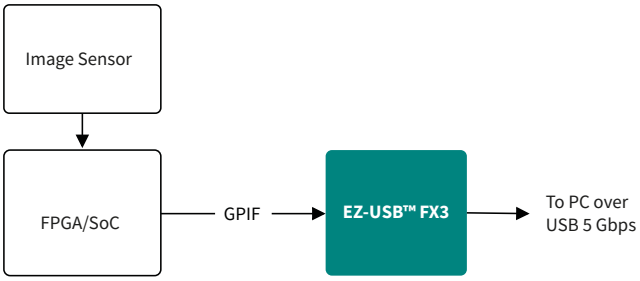
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Application diagram

EZ-USB™ FX3 HD video/3D imaging



USB 3.0 provides 5 Gbps bandwidth and supports HD video streaming without the need for compression. EZ-USB™ FX3 connects directly with a variety of image sensors, enabling USB 5 Gbps camera and 3D imaging designs while saving bill of material cost and PCB footprint.

Product portfolio

Product	USB standard	USB speed [GBit/s]	I/O type	Operating temperature range [°C]	Operating voltage min [V]	Operating voltage max [V]
CYUSB3011-BZXC	USB 3.0	5	8/16-bit GPIF, DMA, GPIO, I²C, UART, I2S, SPI	0 to 70	1.7	3.6
CYUSB3012-BZXC	USB 3.0	5	8/16/32-bit GPIF, DMA, GPIO, I²C, UART, I2S, SPI	0 to 70	1.7	3.6
CYUSB3013-BZXC	USB 3.0	5	8/16-bit GPIF, DMA, GPIO, I²C, UART, I2S, SPI	0 to 70	1.7	3.6
CYUSB3014-BZXC	USB 3.0	5	8/16/32-bit GPIF, DMA, GPIO, I²C, UART, I2S, SPI	0 to 70	1.7	3.6
CYUSB3014-BZXCT	USB 3.0	5	8/16/32-bit GPIF, DMA, GPIO, I²C, UART, I2S, SPI	0 to 70	1.7	3.6
CYUSB3014-BZXI	USB 3.0	5	8/16/32-bit GPIF, DMA, GPIO, I²C, UART, I2S, SPI	-40 to 85	1.7	3.6
CYUSB3014-BZXIT	USB 3.0	5	8/16/32-bit GPIF, DMA, GPIO, I²C, UART, I2S, SPI	-40 to 85	1.7	3.6

Boards

EZ-USB™ FX3 DEMO_FX3_U3V_CAM01	EZ-USB™ FX3 CY-RB4111	EZ-USB™ FX3 CYUSB3KIT-003	EZ-USB™ FX3 DEMO_FX3_LVDS_CAM01
			
The EZ-USB™ FX3 DEMO_FX3_U3V_CAM01 Camera Kit is based on the EZ-USB™ FX3. The kit includes a MIPI CSI-2 camera module connected to an FPGA on one PCB mounting on an updated EZ-USB™ FX3 Explorer kit.	The EZ-USB™ FX3 CYRB4111 USB3 vision solution demo kit is based on the EZ-USB™ FX3. This kit enables users to stream 4K 30 fps videos from an external HDMI source to PC via USB-C interface in USB3 Vision standard.	The EZ-USB™ FX3 CYUSB3KIT-003 is an easy-to-use and inexpensive development platform enabling developers to add USB 3.0 device functionality to any system.	The EZ-USB™ FX3 DEMO_FX3_LVDS_CAM01 consists of a MIPI CSI-2 camera module connected to an FPGA on one PCB mounting on an updated EZ-USB™ FX3 Explorer kit.

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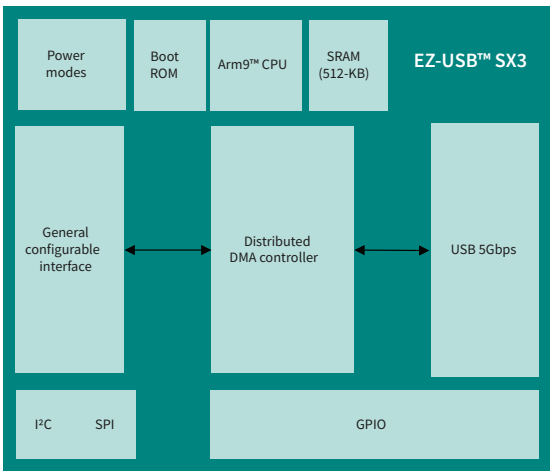
EZ-USB™ SX3 - FIFO to USB 5Gbps controllers

USB 5Gbps easily configured for UVC/UAC or USB3 Vision applications

Infineon's EZ-USB™ SX3 can be configured by tuning a wide range of parameters such as VID/PID, product strings, serial numbers, FIFO settings, GPIOs, USB endpoints and auxiliary interface via its easy-to-use Graphic User Interface (GUI) utility. The utility can also produce USB video class (UVC) and USB audio class (UAC) configurations that are specification compliant without requiring firmware development, significantly shortening the time-to-market for end products. In addition to the configurable parameters, developers can utilize the integrated 32-bit Arm9™ processor to customize their devices further, differentiating in the market and gaining a competitive advantage.

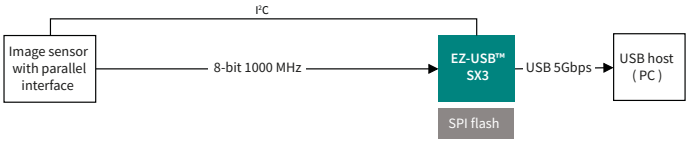
Additionally, Infineon provides a wide range of USB Type-C port controllers that can be used with the EZ-USB™ SX3 to enhance cameras, video capturing, and other data acquisition applications with USB-C and USB power delivery features.

Block diagram

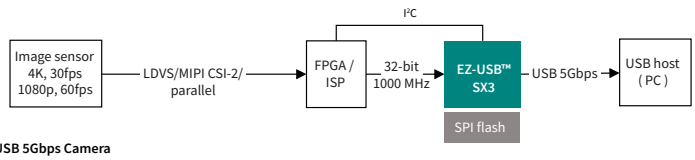




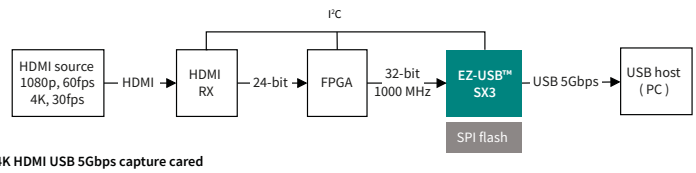
Application diagram



Direct image sensor interface to EZ-USB™ SX3



USB 5Gbps Camera



4K HDMI USB 5Gbps capture cared

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Features and benefits

Key features

- Universal Serial Bus (USB) integration
  - USB 3.2, Gen 1 and USB 2.0 peripherals compliant with USB 3.2 specification revision 1.0
  - 5 Gbps PHY compliant with USB 3.2 Gen 1
  - Three physical endpoints
  - Supports UVC, UAC, and USB vendor class protocol
- 32-bit CPU Arm926EJ-S™ core with 200 MHz operation with 512 kB embedded SRAM
- General configurable interface (supports up to 100 MHz; 8-, 16-, 24-, and 32-bit data bus; slave FIFO, parallel camera interface)
- Additional connectivity to SPI boot flash and I²C slaves at 100/400 kHz and 1 MHz
- Firmware ready for USB video class (UVC), USB3 Vision, and many standard USB class applications
- Less than 60 µA with V_{BATT} on and 20 µA with V_{BATT} off

Key benefits

- Lowest total cost (bandwidth per dollar) solution for any high-speed system
- Turnkey solutions on industrial standards
- Quick time-to-market with low development costs
- Industry gold standard with highly integrated features
- Easy customization via configuration utility

Product portfolio

Product	USB standard	USB speed [GBit/s]	I/O type	Operating temperature range [°C]	Operating voltage min [V]	Operating voltage max [V]
CYUSB3015-BZXC	USB 3.0	5	8/16/24/32-bit GPIF, DMA, GPIO, I²C, SPI	0 to 70	1.7	3.6
CYUSB3015-BZXCT	USB 3.0	5	8/16/24/32-bit GPIF, DMA, GPIO, I²C, SPI	0 to 70	1.7	3.6
CYUSB3015-BZXI	USB 3.0	5	8/16/24/32-bit GPIF, DMA, GPIO, I²C, SPI	-40 to 85	1.7	3.6
CYUSB3015-BZXIT	USB 3.0	5	8/16/24/32-bit GPIF, DMA, GPIO, I²C, SPI	-40 to 85	1.7	3.6
CYUSB3016-BZXC	USB 3.0	5	8/16/24/32-bit GPIF, DMA, GPIO, I²C, SPI	0 to 70	1.7	3.6
CYUSB3016-BZXCT	USB 3.0	5	8/16/24/32-bit GPIF, DMA, GPIO, I²C, SPI	0 to 70	1.7	3.6
CYUSB3016-BZXI	USB 3.0	5	8/16/24/32-bit GPIF, DMA, GPIO, I²C, SPI	-40 to 85	1.7	3.6
CYUSB3016-BZXIT	USB 3.0	5	8/16/24/32-bit GPIF, DMA, GPIO, I²C, SPI	-40 to 85	1.7	3.6
CYUSB3017-BZXC	USB 3.0	5	8/16/24/32-bit GPIF, DMA, GPIO, I²C, SPI	0 to 70	1.7	3.6
CYUSB3017-BZXCT	USB 3.0	5	8/16/24/32-bit GPIF, DMA, GPIO, I²C, SPI	0 to 70	1.7	3.6
CYUSB3017-BZXI	USB 3.0	5	8/16/24/32-bit GPIF, DMA, GPIO, I²C, SPI	-40 to 85	1.7	3.6
CYUSB3017-BZXIT	USB 3.0	5	8/16/24/32-bit GPIF, DMA, GPIO, I²C, SPI	-40 to 85	1.7	3.6

Boards

CY-SD4210 EZ-USB™ SX3 HDMI 4K to USB 5Gbps demo kit



EZ-USB™ SX3 HDMI 4K to USB 5Gbps demonstration kit is based on Infineon's EZ-USB™ SX3. An FPGA captures a video stream from the HDMI interface and transfers it via USB 5Gbps connection to a PC. The kit can be configured as a USB video class (UVC) device or a USB3 Vision device easily via EZ-USB™ SX3 Configuration Utility and supports up to 4K 30 frames-per-second video stream.

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USB 2.0 peripheral controllers

Solutions for low-speed, full-speed, and high-speed devices

Since 1996, EZ-USB™ has been setting the standard for the industry by enhancing the capabilities of programmable USB peripheral controllers, enabling developers to design USB devices that can meet the most stringent performance requirements in industrial and imaging applications. More significantly, Infineon's first-rate customer service and long-term supply guarantees your successful product life cycles last for more than ten years. The complete portfolio of USB programmable peripheral controllers supports low-speed and full-speed options with EZ-USB™ encore and high-speed options with EZ-USB™ FX2LP, EZ-USB™ FX2G2, and the latest dual-core Arm® Cortex® -M4/M0 addition, EZ-USB™ FX2G3.

EZ-USB™ FX2LP/FX2G2/FX2G3 are highly integrated USB microcontrollers that are the basis for any USB high-speed peripheral device. To take full advantage of the USB 2.0 480 Mbps signaling rate, EZ-UBS™ FX2LP and EZ-USB™ FX2G2 contain specialized hardware to buffer USB data and to connect seamlessly to a variety of high-bandwidth external devices such as MCUs, ASICs, and FPGAs.

EZ-USB™ encore is a family of full-speed USB controllers based on Infineon's flexible PSOC™ architecture. These USB controllers have configurable analog and digital blocks, allowing you to customize the part based on your target application. Moreover, the EZ-USB™ encore also integrates components such as RAM, clock generator, and USB termination resistors, reducing the overall system cost and area.

	EZ-USB™ encore	EZ-USB™ FX2LP	EZ-USB™ FX2G2
Function	Device controller	Device controller	Device controller
USB specifications (Speed)	USB2.0 Full speed (12 Mbps)	USB2.0 High speed (430 Mbps)	USB2.0 High speed (430 Mbps)
Interfaces	I²C, SPI, UART, PS/2, ADC	Parallel 8/16-bit GPIF* [48 MHz) I²C, USART	Parallel 16/32-bit GPIF* (100 MHz) I²C, UART, SIN
MCU subsystem	M8C	8051	Arm9™
RAM	1 kB	16 kB	512 kB
Hardware DVK	NA	CY3539	CYUSB3KIT-003
Software SDK	SuiteUSB	SuiteUSB	EZ-USB™ FX3 SDK
Package	28-SOP/32-QFN/56-QFN/16-COLQFN	56-SSOP/VFBGA/QFN, 100-TQFP/128-TQFP	121-BGA
Temperature	0°C to 70°C -40°C to +85°C	0°C to 70°C -40°C to +105°C	0°C to 70°C -40°C to +85°C

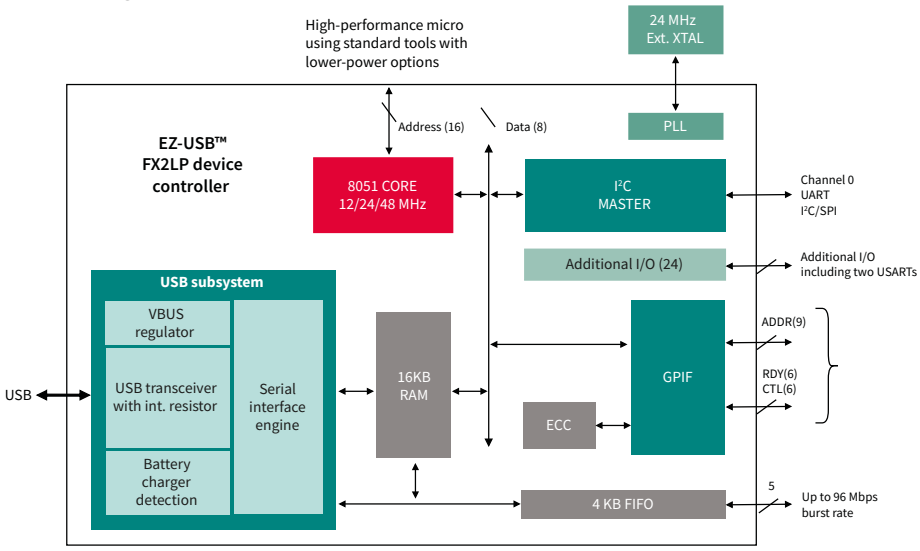
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* general programmable interface

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Block diagram





Features and benefits

Key features	Key benefits
– USB 2.0 USB IF high speed certified (TID # 40460272)	– Wide portfolio of peripheral controllers supporting low-speed, full-speed, and high-speed options
– GPIF supports 8-bit/16-bit external data interface	– Quick time-to-market with hardware and software development kit
– Ultralow power: ICC no more than 85 mA in any mode	– Market-proven solutions since 1996
– Ideal for bus- and battery-powered applications	– Premium customer support and long-term supply commitment
– Configurability for VID/PID using EPROM	
– Single-chip integrated USB 2.0 transceiver, smart SIE, and enhanced 8051 microprocessor	
– Integrated FIFOs, integrated I²C controller	
– Commercial and industrial temperature grade	

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EZ-USB™ serial bridge controller

Discover a wide portfolio of full-speed bridge controllers with configurable and fixed functions

EZ-USB™ serial bridge controller is a full-speed bridge controller family offering configurable and fixed-function options that provide connectivity between USB and serial interfaces UART, SPI, and I²C. With the lowest power consumption in standby mode (5 µA), these bridge controllers are the first in the market to offer programmable serial channels for UART/I²C/SPI interfaces. With the latest addition of fixed-function controllers, they can be easily configured to work as USB to UART, USB to I²C, or USB to SPI bridges without requiring any firmware development by the user. The EZ-USB™ Serial Bridge Controller family integrates the industry-leading CAPSENSE™ capacitive-touch sensing technology (for touch-sensitive key switches) and battery charger detection compliant with USB-IF battery charging specification ver. 1.2 to detect the source of power on the USB port.

	USB-UART bridge controller			USB-I²C bridge controller	USB-SPI bridge controller	USB-Serial configurable bridge controller			USB-billboard controller		
	CY7C65213/A	CY7C65223/D	CY7C65223-24LQXS/T	CY7C65216/D	CY7C652148/214D	CY7C65211/A	CY7C65215/A	CY7C65211A-24LQXS/T	CY7C65210/A	CY7C65217/217A1	CY7C65210A-24LQXS/T
Application	Industrial, consumer	Industrial, consumer	Automotive	Industrial, consumer	Industrial, consumer	Industrial, consumer	Industrial, consumer	Automotive	Industrial, consumer	Industrial, consumer	Automotive
Number of channels	Single	Single/dual	Single	Single/dual	Single/dual	Single	Dual	Single	Single	Dual	Single
GPIOs	8	4/7	4	8/12	6/8	10	17	10	9/11	7/9	11
Interface supported	UART	UART	UART	I²C	SPI	SPI I²C UART	SPI I²C UART	SPI I²C UART	I²C	I²C	I²C
SPI width	–	–	–	–	4–16 bit	4–16 bit	4–16 bit	4–16 bit	–	–	–
Main/replica	–	–	–	main/replica	main	main/replica	main/replica	main/replica	main	main	main
UART speed, pins	3 Mbps, 8	3 Mbps, 4	3 Mbps, 2/4/6	–	–	3 Mbps, 2/4/6	3 Mbps, 2/4/6	3 Mbps, 2/4/6	–	3 Mbps, 2	
Battery charger detection (BCD)	✓	✓	✓	✓	✓	✓	✓	✓	–	–	✓
CAPSENSE™ buttons	–	–	–	–	–	8	5	5	–	–	–
Flow control	HW	HW, SW	HW, SW	–	–	HW	HW	HW	–	–	–
Packages	32-QFN/28-SSOP	24-QFN/32-QFN	24-QFN	24-QFN/32-QFN	24-QFN/32-QFN	24-QFN	32-QFN	24-QFN	24-QFN	24-QFN	24-QFN

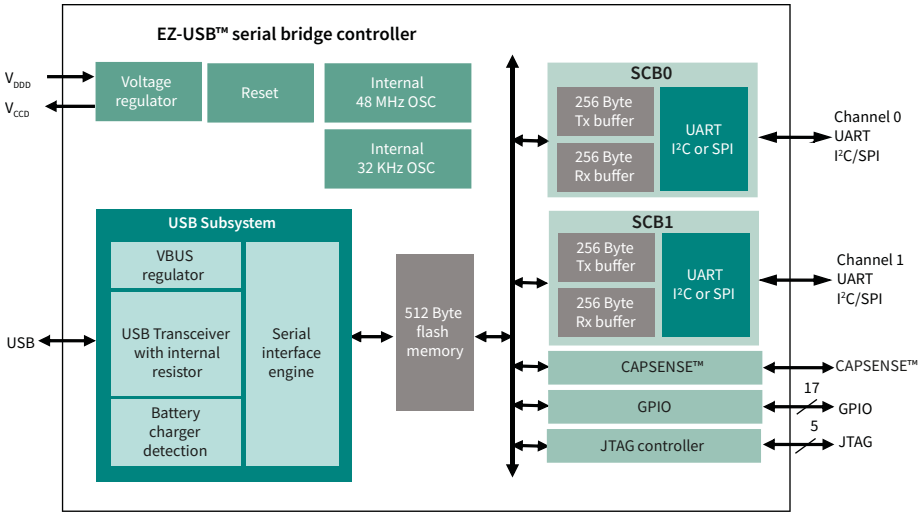


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Block diagram





Features and benefits

Key features	Key benefits
– Dual-channel UART, I²C, or SPI to USB bridge	– Easy to design, without firmware nor software development
– Supports up to 8 CAPSENSE™ buttons	– Industry's lowest power consumption in standby mode
– Configurable and fixed function options	– Ideal for low-power devices
– BCD compliant to USB-IF battery charging revision 1.2	– Compatibility
– Integrated regulator, oscillator, and termination resistors	– Minimization of switching costs
– Driver support for major operating systems	
– Configuration utility for VID/PID and serial interfaces	
– Support multiple USB device classes: CDC, PHDC, HID, and vendor specific device classes	

Boards

EZ-USB™ serial bridge controller CYUSBS234	EZ-USB™ serial bridge controller CYUSBS236	EZ-USB™ serial bridge controller CYUSBS232
		
CYUSBS234 development kit (DVK) helps evaluate the features of the single-channel EZ-USB™ Serial Bridge Controller CY7C65211. The kit provides a copper pad on PCB to test CAPSENSE™ feature, a set of EEPROMs to test I²C and SPI interfaces, a RS232 line driver to test UART interfaces.	CYUSBS236 development kit (DVK) helps evaluate the features of the dual-channel EZ-USB™ serial bridge controller CY7C65215. The kit provides two copper pads on the PCB to test CAPSENSE™ feature, two pairs of EEPROMs to test I²C and SPI interfaces, two RS232 line drivers to test UART interfaces.	CYUSBS232 reference design kit (RDK) is a low-cost kit to evaluate EZ-USB™ serial bridge controller CY7C65213. The kit, along with its hardware documentation, serves as a reference design for applications like USB-to-UART cables.
Kit based on CY7C65211-24LTXI	Kit based on CY7C65215-32LTXI	Kit based on CY7C65213-32LTXI

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USB hubs and USB Type-C port controllers

Robust interoperability, extensive charging support, and full configurability

Infineon offers a broad portfolio of hub controllers supporting USB 2.0, USB 3.x 5Gbps, 10Gbps and USB Type-C ports with robust backward interoperability with legacy USB speeds. The USB 3.x hub controllers provide advanced USB-PD and battery charging capabilities, featuring up to eight downstream ports for full configurability and flexible design.

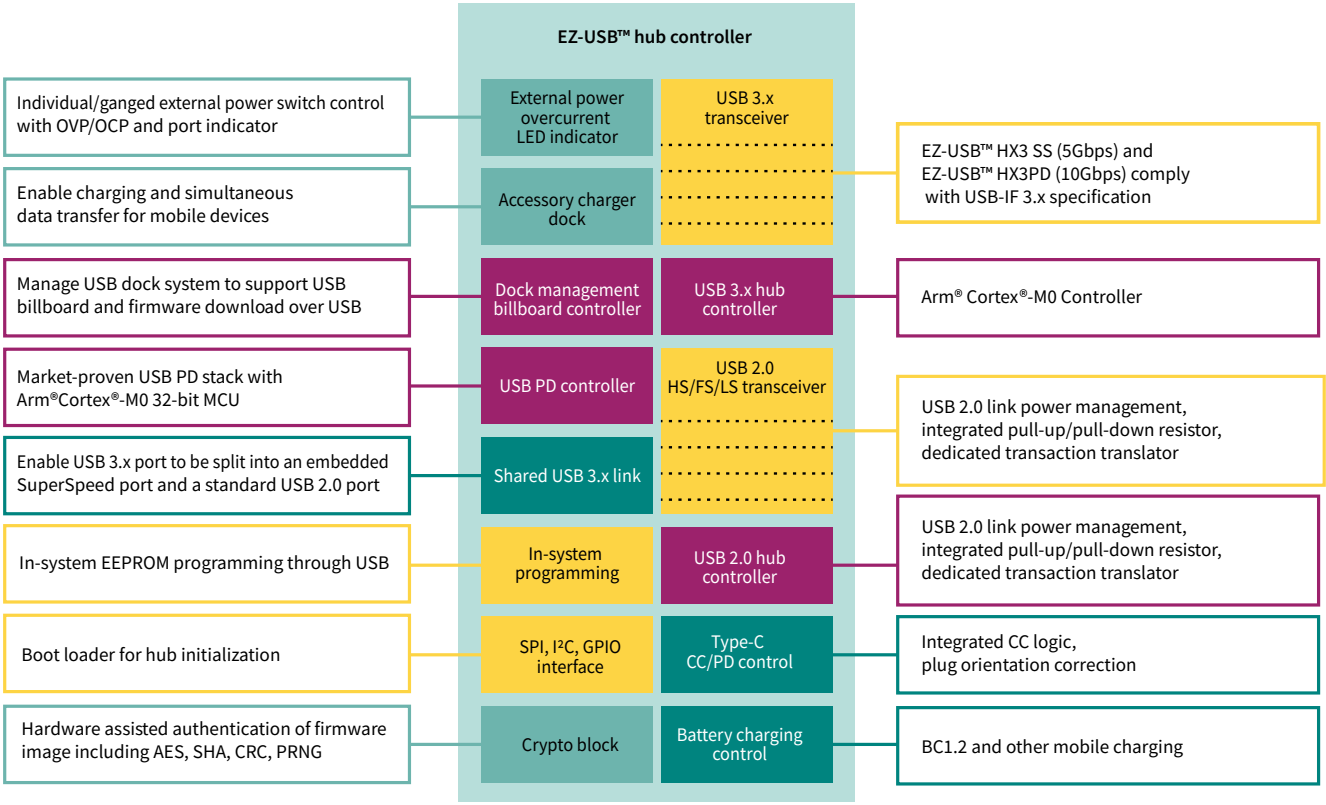
The wide portfolio offers different combinations of features to address all possible needs for notebook PCs, docking stations, TV, STB, DVR, gaming, home gateways, Wi-Fi routers, and automotive and industrial applications:

USB hub family		EZ-USB™ HX2LP	EZ-USB™ HX2VL	EZ-USB™ HX3	EZ-USB™ HX3 automotive	EZ-USB™ HX3PD
USB standard		USB 2.0 480Mbps	USB 2.0 480Mbps	USB 3.x 5Gbps	USB 3.x 5Gbps	USB 3.x 10Gbps
Part numbers		CY7C6562x CY7C6563x	CY7C6563x CY7C65642	CYUSB330X CYUSB331X CYUSB332X CYUSB230X	CYUSB332x CYUSB330x	CYUSB4347 CYUSB4357
Nr. of downstream ports		2/4	2/4	2/4	2/4	7 (5x SS, 2x USB 2.0)
USB Type-C						✓
USB power delivery						2 PD ports
Battery charging v1.2				✓	✓	✓
ACA-dock				✓	CYUSB3324	
USB billboard						✓
Dock management controller (DMC)						✓
Multi-TT (one TT per port)			✓	✓	✓	✓
Serial interface		SPI	SPI/I²C	I²C	I²C	2x I²C/SPI
MCU				Arm® Cortex®-M0	Arm® Cortex®-M0	Arm® Cortex®-M0
Flash						2x 128KB
Multi-TT (one TT per port)			✓	✓	✓	✓
In system programming (ISP)		✓	✓	✓	✓	✓
Configurable USB PHYs				✓	✓	✓
Shared link				✓	✓	✓
Vendor command				✓	✓	
External power switch control	Individual			CYUSB3326		✓
	Ganged			CYUSB330x	CYUSB3304	
	Both			CYUSB3324	CYUSB3324	
Pin-strap				CYUSB332x	CYUSB3324	
Port indicator				CYUSB3324	CYUSB3324	
Packages		56QFN	48TQFP, 28QFN	88QFN, 68QFN	100BGA	192BGA
Temperature (-40°C to 85°C)		✓		✓	Automotive	✓

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EZ-USB™ HX3

USB 3.x 5Gbps 4-port hub controller with SS/USB 2.0 PHY shared link, DS ports charging, and automotive grade

EZ-USB™ HX3 is Infineon's USB-IF-certified 4-port hub controller. It has been repeatedly tested at every USB plug-fest and in independent labs, demonstrating compatibility with all recognized host controllers, device classes, and operating systems. It supports most USB charging standards, including battery charging specification v1.2, Apple charging standard, YD/T 1591-2006, and ACA-dock. This last feature of the EZ-USB™ HX3 enables simultaneous use of USB devices connected to the downstream ports and charging of a smartphone or tablet that supports USB OTG. It also supports battery charging on the downstream ports without a host attached to the upstream port.

The configurable USB 5Gbps and USB 2.0 PHY of the EZ-USB™ HX3 enhance signal quality, giving board designers more flexibility and simplifying USB-IF compliance. EZ-USB™ HX3 also supports shared USB links, a proprietary feature that doubles the number of USB ports, creating eight ports from a 4-port hub controller.

Features/Part	CYUSB3302	CYUSB3304	CYUSB3312	CYUSB3314	CYUSB3324	CYUSB3326	CYUSB3328	CYUSB2302	CYUSB2304
Number of DS ports	2 (USB 3.0)	4 (USB 3.0)	2 (USB 3.0)	4 (USB 3.0)	4 (USB 3.0)	6 (4 SS , 2 USB 3.0, 2 USB 2.0)	8 (4 SS , 4 USB 2.0)	2 (USB 2.0)	4 (USB 2.0)
Number of shared links ports	0	0	0	0	0	2	4	0	0
BC v1.2	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
ACA-dock	No	No	No	No	Yes	No	Yes	No	No
External power switch control	Ganged	Ganged	Individual and ganged	Individual and ganged	Individual and ganged	Individual	Individual	Ganged	Ganged
Pin-strap support	No	No	Yes	Yes	Yes	Yes	Yes	No	No
I²C	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Vendor command	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Port indicators	No	No	Yes	Yes	Yes	No	No	No	No
Packages	68-QFN, 100-ball BGA	68-QFN, 100-ball BGA	88-QFN, 100-ball BGA	88-QFN, 100-ball BGA	88-QFN, 100-ball BGA	88-QFN, 100-ball BGA	88-QFN, 100-ball BGA	68-QFN, 100-ball BGA	68-QFN, 100-ball BGA
Temperature range	Industrial, commercial, and automotive	Industrial, commercial, and automotive	Industrial and commercial	Industrial, commercial, and automotive	Industrial, commercial, and automotive	Industrial and commercial	Industrial (88-QFN only) and commercial	Industrial, commercial, and automotive	Industrial, commercial, and automotive

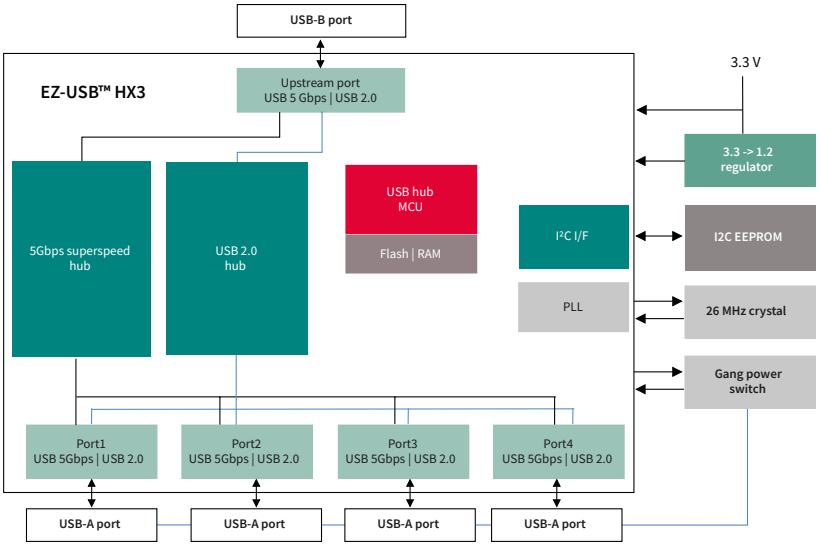
Automotive Desktop Dock

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Block diagram





Features and benefits

Key features	Key benefits
– Compliance with USB 3.2 Gen 1 (USB-IF and WHQL certified)	– Supports up to 4 USB 3.0 compliant DS ports
– Shared link feature (supports simultaneous USB 2.0 and SuperSpeed USB devices on the same port)	– Enables extra downstream (DS) ports for on-board connections in embedded applications
– Enables USB charging while the hub is disconnected from a hub host	– Enables charging of devices connected to the DS ports when no host is connected on the upstream (US) port
– Supports BC v1.2 and Apple charging	– Easy-to-customize configuration parameters
– Allows firmware upgrades using I²C EEPROM or an external I²C master	– High quality and reliability
– Integrated Arm® Cortex®-M0 CPU	
– LED status indicators – suspend, SS, and USB 2.0 operation	

Boards

EZ-USB™ HX3 CY4613	EZ-USB™ HX3 CY4609	EZ-USB™ CY4603
		
It is a development kit aimed to demonstrate EZ-USB™ HX3's shared link feature in a 6-port configuration supporting ACA-dock functionality.	It is a reference design kit that can be used as a reference design for standalone USB 3.0 hub applications.	It is a development kit that demonstrates EZ-USB™ HX3's application in a 4-port 3.0 USB hub.

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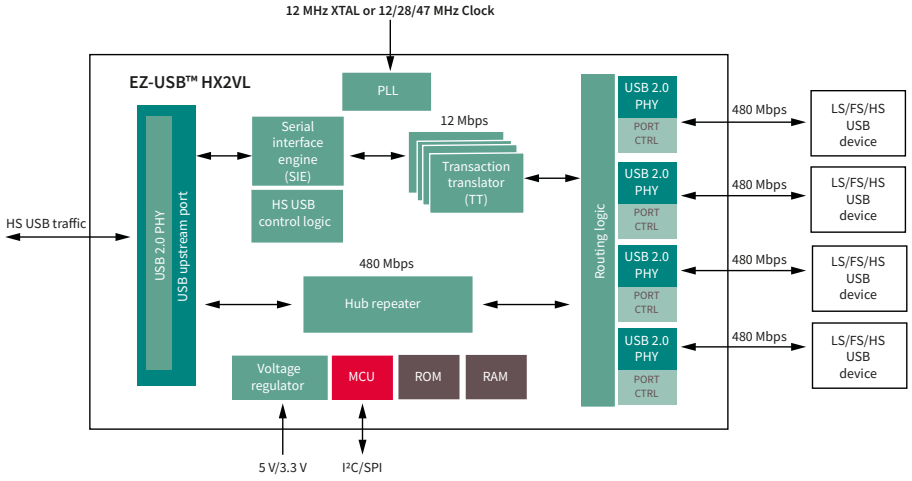
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EZ-USB™ HX2LP and HX2VL hub controllers

4-port single- and multi-TTs hub USB controllers

Infineon's EZ-USB™ HX2LP and HX2VL are Infineon's first-generation high-speed hub controllers available in 2-port and 4-port versions. These USB 2.0 hub controllers have integrated upstream and downstream transceivers, a USB serial interface engine (SIE), USB hub control and repeater logic, and TT logic. Many of its external passive components, such as pull-ups and pull-down resistors, are integrated into the chip, significantly reducing the overall bill of materials required to implement a hub design.

Family	Part number	Number of ports	Number of TTs	I/O options	Temperature grade
EZ-USB™ HX2VL	CY7C65634	2	Single	SPI, I²C, GPIO	Commercial
	CY7C65632	4	Single		
	CY7C65642	4	Multi		
EZ-USB™ HX2LP	CY7C65620/1	2	Single	SPI	Commercial, industrial
	CY7C65630/1	4	Single		



Features and benefits

Key features	Key benefits
– Up to four downstream ports	– Reduced area
– Very low power consumption (82 mA)	– Reduced BOM
– Integrated internal regulator, pull-up and pull-down resistors for all downstream ports	
– Selectable XTAL/CLK inputs, power switch polarity, EEPROM interface	
– VID, PID configurable through external EEPROM	
– Integrated Arm® Cortex®-M0 CPU	
– LED status indicators – suspend, SS, and USB 2.0 operation	

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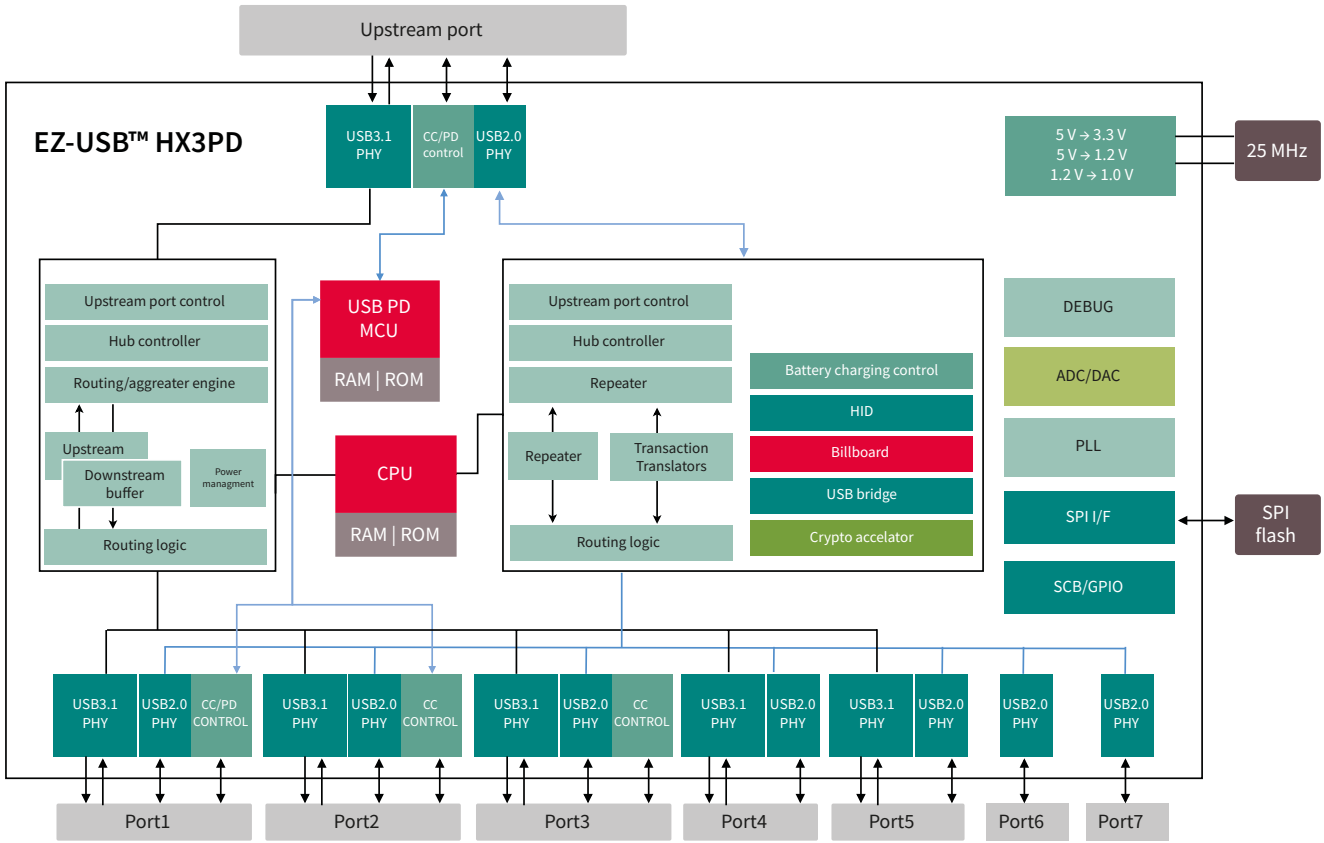
EZ-USB™ HX3PD

Industry's first 7-port USB 10Gbps hub controller with power delivery

EZ-USB™ HX3PD is the industry's first 7-port USB 10Gbps Type-C hub controller with power delivery. It supports two USB-C + PD ports (one upstream and one downstream) and five downstream USB 10Gbps ports.

With five chips (two 4-port USB hub controllers, two USB PD controllers, and a dock management controller) integrated into one, EZ-USB™ HX3PD is the most integrated USB 10Gbps hub in the market. This significantly reduces BOM component cost and PCB footprint, making EZ-PD™ HX3PD a perfect fit for USB-C dongles, docks, and monitors. Configurable shared USB 10 Gbps and USB 2.0 PHY functionality can improve USB 10Gbps signal transmission quality, allowing board designers more freedom and simplifying USB-IF compliance.

Block diagram



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Features and benefits

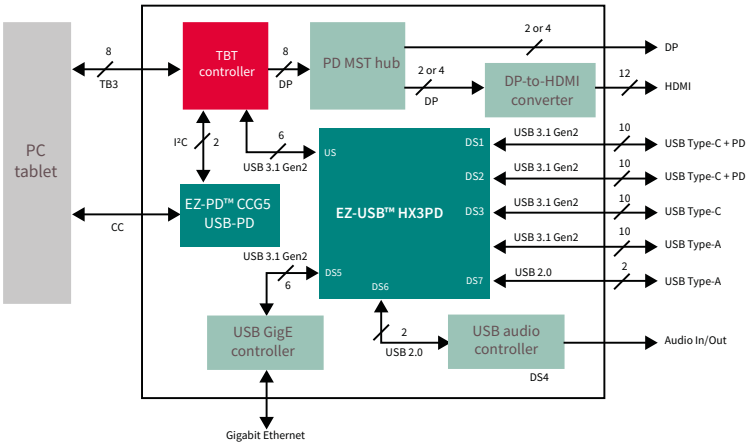
Key features	Key benefits

– Compliant with USB 3.1 gen 2
  – Upstream (US): 10Gbps; Type-A or Type-C plus PD
  – Downstream (DS): 7 ports; 5x 10Gbps, 2x 480Mbps; 1 Type-C Plus PD, 2 Type-C only and 4 Type-A ports
	– USB-IF compliant 2x 4-port USB hubs with 2x USB-PD 3.0

– Integrated DFP (RP) and UFP (RD) termination resistors	– Integrated total five chips into a single chip for BOM components and PCB board size reduction
– Integrated billboard controller	– Integrated Crypto AES/SHA/CRC blocks for secured firmware upgrades via dock management controller
– Charging support: BC v1.24, Apple Charging standard	– Intel USB4/Thunderbolt 4 Dock reference design available
– PD policy engine configures power profiles dynamically	– Support USB PD 3.0, BC1.2, Apple, Samsung, and QC 4.0 charging standards
– Charging DS without US connection	– Provides USB PHY configurability to compensate signal loss over PCB traces
– Optional signed firmware upgradable via dock management controller (DMC)	

Application diagram

Thunderbolt4 Dock



EZ-USB™ HX3PD allows to solve several challenges in the development of Thunderbolt dock designs such as:

- Thunderbolt dock design is complex, requiring many discrete components
- Thunderbolt dock requires pre-approved USB-PD controller and a large BOM
- USB-C dock must support USB PD and all legacy charging standards
- USB 3.1 Gen2 signal integrity is difficult to handle at 10Gbps
- USB 3.1 Gen2 and PD need FW upgrade to keep pace with USB specification changes

Boards

EZ-USB™ HX3PD CY6611

This evaluation kit is based on the CYUSB4347-BZXC, a 7-port evaluation kit designed to demonstrate the USB 3.1 Gen 2 hub, USB PD 3.0, and USB battery charging (BC 1.2) functionalities.



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Infineon support for USB-C controllers and peripherals

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AC-DC power management ICs

Technology leadership in power supply

By offering a wide variety of highly efficient control ICs, we enable our customers to meet new demands like PFC regulations and ultralow standby power requirements cost-effectively. A comprehensive array of safety features helps to minimize the number of external components, reduce design in time, and improve the reliability of the SMPS.

AC-DC power management ICs

PFC controller

Continuous conduction mode (CCM) PFC

Fixed-frequency
ICE2PCS02G (65 kHz)
ICE2PCS03G (100 kHz)

Adjustable frequency
ICE2PCS01G (50-250 kHz)
ICE2PCS05G (20-250 kHz)
ICE3PCS01G (OVP+brown-out)
ICE3PCS02G (OVP)
ICE3PCS03G (Brown-out)

Critical conduction mode (CrCM) PFC

IRS2505L

PWM controller

Stand-alone PWM

Fixed-frequency
ICE5GSAG (125 kHz)
ICE5ASAG (100 kHz)
ICE3AS03LJG (100 kHz)
ICE3BS03LJG (65 kHz)

Quasi-resonant
ICE5QSBG
ICE2QS02G
ICE2QS03G
ICC80QSG

Half-bridge and LLC resonant
ICE1HS01G-1
ICE2HS01G

Hybrid-flyback
XDPS2201E

CoolSET™ SIP
ICE184LM
ICE184EM
ICE186EM

CoolSET™ SiP

ICE184LM
ICE184EM
ICE186EM

Combo (PFC+PWM)

CrCM + LLC
XDP™ SMPS IDP2308 (DSO-14)
XDP™ SMPS IDP2303A (DSO-16)

CrCM + Hybrid-flyback
XDPS2221E
XDPS2222

Fixed-frequency (FF) CoolSET™

650 V F3/F3R CoolSET™
ICE3Axx65ELJ
ICE3RBRxx65JZ
ICE3RBRxx65JG

700 V Gen5 CoolSET™
ICE5AR4770AG
ICE5AR4770AG-1
ICE5AR4770BZS
ICE5AR4770BZS-1

800 V CoolSET™
ICE5A/GRxx80AG
ICE5xRxx80AG-1
ICE5xRxx80xZ
ICE3A/BRxx80JZ
ICE3ARxx80CJZ
ICE3ARxx80VJZ
ICE3ARxx80JG
ICE5AR4780BZS-1
ICE5BR4780BZ-1
ICE5BR2280BZ-1
ICE5AR0680BZS-1

950 V CoolSET™
ICE5xR3995xZ
ICE5BR3995AG-1
ICE5AR3995BZ-1
ICE5BR3995BZ-1

Quasi-resonant (QR) CoolSET™

650 V CoolSET™
ICE2QRxx65(Z)/(G)

800 V CoolSET™
ICE2QRxx80Z/G
ICE5QRxx80BG
ICE5QRxx80BG-1

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XDP™ Hybrid flyback controller ICs

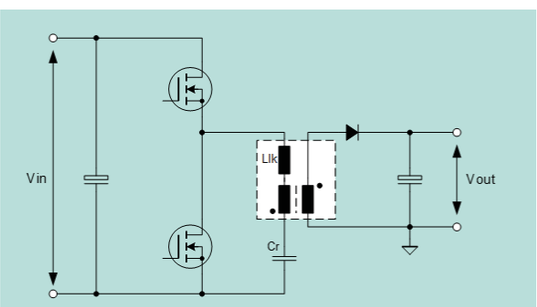
Infineon's innovative approach to asymmetrical half-bridge controller topology – hybrid flyback controller for ultrahigh power density designs

Hybrid flyback controllers combine the simplicity of a flyback with the performance of a resonant converter. They can drive both high-and low-side switches in an asymmetric half-bridge flyback topology. Thanks to this innovative approach, ultrahigh power density designs with very low standby power consumption are achieved.

Infineon's XDP™ digital power XDPS22xE controller family supports the innovative hybrid flyback topology. This topology, also known as the asymmetrical half-bridge flyback converter, merges the features of flyback and forward converters. It addresses the main problems of high-density adapters operating at moderate switching frequencies. The hybrid topology can ensure zero-voltage switching (ZVS) and zero-current switching (ZCS) over line and load. It lays the foundation for the highest conversion efficiency by using the magnetization current to achieve ZVS on the primary-side half-bridge and ZCS on the synchronous rectification switch. The parasitic leakage inductance is an integral part of the converter. Unlike other topologies, hybrid flyback transformers do not need to store all the energy, thus reducing the charger's size. Hybrid flyback can achieve full ZVS operation on the primary side, and full ZCS operation on the secondary side, and the leakage energy is recycled, thereby achieving high efficiency. The duty cycle directly influences the output voltage, offering a solution to the limitations of the LLC topology in applications requiring a wide range of output voltage output.

Hybrid flyback controller ICs can be used in many SMPS applications. E-series hybrid flyback controller ICs are optimized for USB-PD and non-USB-PD chargers in compliance with the latest energy-saving and efficiency standards from CoC and DoE. They have proven compatibility with inbox and aftermarket chargers, notebook adapters, cordless power tools, eBike chargers, LED drivers, and ultrahigh density PSU solutions such as TVs.

Infineon's novel asymmetrical half-bridge (AHB)



Features and benefits

Key features	Key benefits
– 600 V high voltage start-up cell	– Fast VCC charging for quick power-up sequences and maintaining efficiency
– Burst mode operation control	– Achieving lowest no-load standby power, critical for enhanced efficiency
– HFB ZVS operation	– Minimized energy dissipation and optimum efficiency
– Harmonized PFC and hybrid flyback operation	– Optimized efficiency during average and light-load operations
– Integrated gate drivers for Si and GaN switches	– Flexibility in choosing power components based on performance & cost
– Enhanced jitter functionality	– EMI reduction

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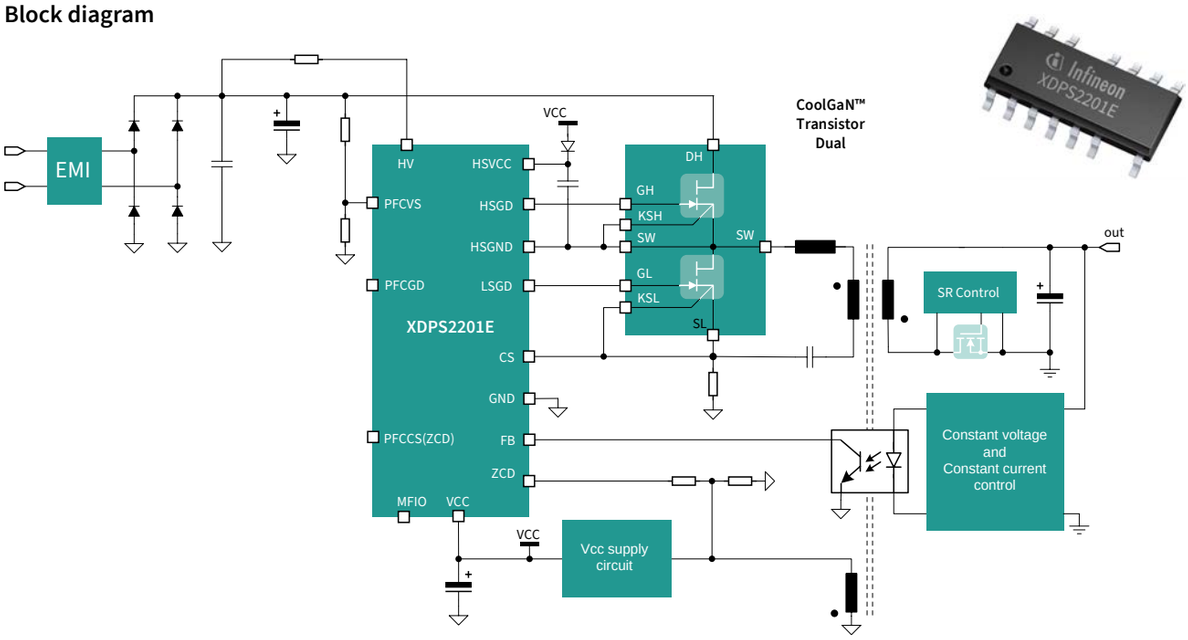
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XDP™ XDPS2201E Hybrid flyback controller

Highly integrated, multimode hybrid flyback controller supporting extra wide output voltage range designs

Infineon's XDP™ XDPS2201E PWM controller is the new member of the E-series Hybrid Flyback Controller (HFB) family. XDPS2201E is a highly integrated, multimode HFB controller, which enables the reduction of external parts and optimizes overall system performance. It targets applications with a fixed output voltage and offers even more benefits for applications with a wide output voltage range. XDPS2201E incorporates a 600 V high-voltage start-up cell for fast VCC charging, essential for quick power-up sequences and maintaining efficiency under variable load conditions. In addition, it provides burst mode operation control for the lowest no-load standby power. This is especially critical to enhance energy efficiency across operational conditions. The HFB peak current control enables robust and fast control, and the HFB Zero-Voltage-Switching (ZVS) operation of the high-side and low-side switch combined with the ease of ZVS realization leads to increased efficiency. XDPS2201E provides an improved mode transition for high stability and low audible noise. Its integrated gate drivers support the latest Silicon (Si) and Gallium Nitride (GaN) switches. Furthermore, the XDPS2201E HFB controller enables flexibility to support the option of an external PFC while offering configurability for protection and system performance. Overall, inherent HFB topology advantages are realized using XDPS2201E, such as reduced magnetic energy storage for transformer size reduction and a lower breakdown voltage rating for switches or output rectifiers. The controller is offered in a DSO-14 (150mil) package.

Block diagram



Features and benefits

Key features	Key benefits
– High voltage start-up cell	– Efficiency of more than 95% and low standby power
– Integrated gate drivers for Si/GaN FETs	– Complies with DoE-7 and CoC-2 standards
– Supports wide AC input voltage range	– Ultrahigh power for compact designs
– Lowest standby power via burst mode	– Flexibility to support an external PFC
– ZVS operation at high/low-side switch	– High stability and low audible noise
– HFB peak current control for robust control	– Simplified design with tools and guide



Reference board REF_XDPS2201E_170W_BPA

The 170 W battery charger reference board has a wide output voltage range and a control interface. It is targeted for eBike or power tool charging. It enables 95 percent peak efficiency and a low system-cost single-stage design.

eBike · Gardening tools · Power tools · SMPS

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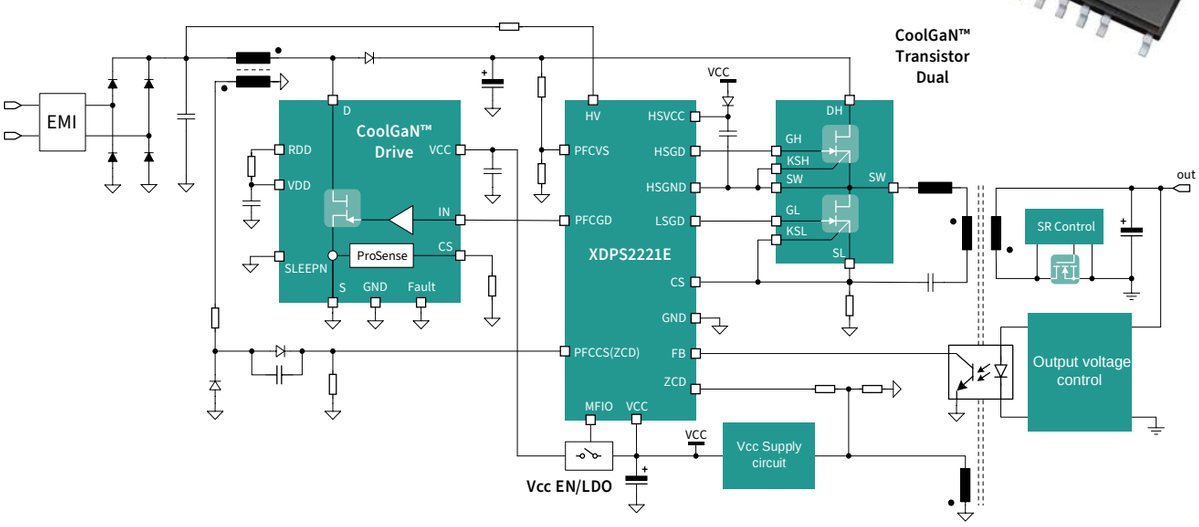
XDP™ XDPS2221E PFC+HFB combo controller

Combines multimode AC-DC PFC and DC-DC hybrid flyback controller targeted for wide output voltage range designs

Infineon's XDP™ XDPS2221E is a new member of the E-series Hybrid Flyback Controller (HFB) family. It is a digital combo controller with configurable parameters for protection modes and maximized system performance. The novel Zero-Voltage-Switching (ZVS) HFB, also known as asymmetrical half-bridge topology, enables ultra-high system efficiency. Integrating PFC and HFB into a single package optimizes the system performance by harmonizing the two stages and reduces the external bill of material (BOM) components. XDPS2221E incorporates a 600 V high-voltage start-up cell for fast VCC charging, essential for quick power-up sequences and maintaining efficiency under variable load conditions. In addition, it provides burst mode operation control for the lowest standby power. This is especially critical to enhance energy efficiency across operational conditions. The HFB peak current control enables robust and fast control, and the HFB Zero-Voltage-Switching (ZVS) operation of the high-side and low-side switches leads to increased efficiency. XDPS2221E provides a PFC QRM multimode operation for high efficiency and enhanced PFC dynamics, leading to bulk cap minimization and improved load transient response. Additionally, the controller offers a harmonized PFC and HFB control. Its integrated gate drivers support the latest Silicon (Si) and Gallium Nitride (GaN) switches. Furthermore, XDPS2201E offers configurability for protection and system performance. The combo controller is offered in a DSO-14 (150mil) package.

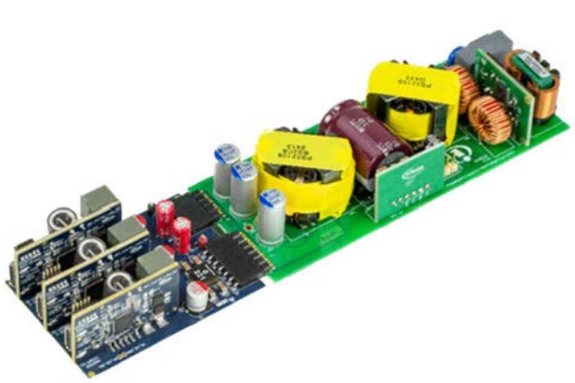


Block diagram



Features and benefits

Key features	Key benefits
– High voltage start-up cell	– Efficiency of more than 95% and low stand-by power
– Integrated gate drivers for Si/GaN FETs	– Complies with DoE-7 and CoC-2 standards
– Supports wide AC input voltage range	– Ultrahigh power for compact designs
– Harmonized control of PFC and HFB	– Bulk capacitance reduction
– PFC QRM multimode operation and enhanced PFC dynamics	– Improved load transient response, high stability, and low audible noise
– Lowest standby power via burst mode	– Simplified design with tools and guide



Evaluation board EVAL_XDPS2221E_120W_3C

The 120 W 3-port USB-PD evaluation board with PFC, hybrid flyback, DC-DC Buck, and a peak efficiency of more than 95.5 percent enables minimized standby power consumption and maximized efficiency. It is scalable from single-port to multi-port solutions.

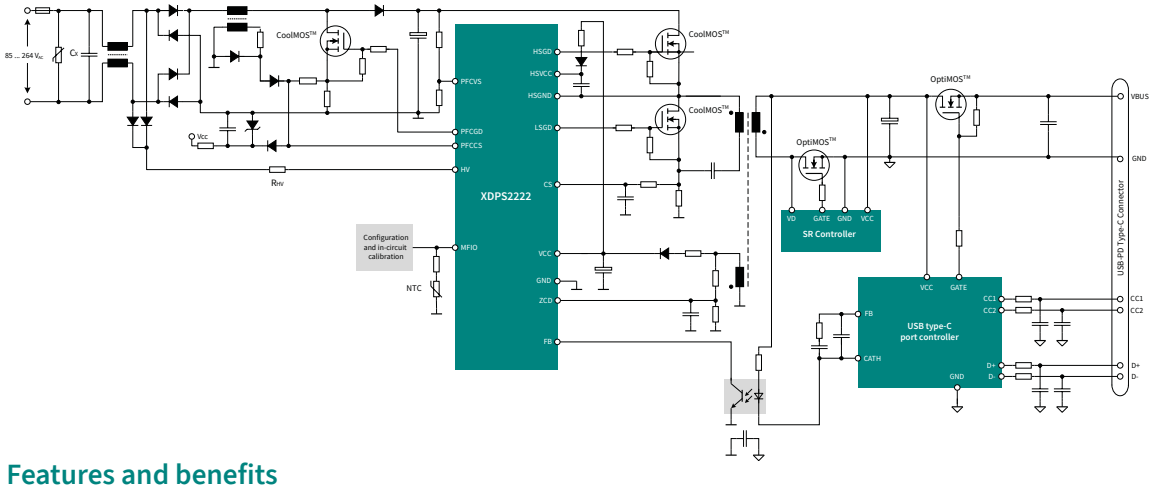
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XDP™ XDPS2222 PFC+HFB combo controller

XDPS2222 – digital hybrid flyback combo controller

The XDP™ digital power XDPS2222 is a highly integrated device combining PFC boost and hybrid flyback (HFB) (asymmetrical half-bridge as from literature) conversion features. The high level of integration allows for seamless operation and optimal control of the two conversion stages, delivering class-leading performance. This innovative controller enables high power density designs and high system efficiency, meeting international regulatory standards on power efficiency (such as EU CoC Version 5 Tier 2 and DoE Level VI) as well as effective control of the wide output voltage up to 48 V for the latest USB-PD extended power range (EPR) standard V 3.1.



Features and benefits

Key features	Key benefits
– High-performance multi-mode PFC with critical conduction mode operation	– Low no-load input standby power performance, meets DoE-7 standards
– High-efficiency multi-mode hybrid-flyback topology	– Low BOM cost and count
– Combo controller including a 600 V start-up cell	– Low standby and high efficiency across various line/load conditions
– DSO-14 (150-mil) package	– High power density and high switching frequency
	– Easily configurable

REF_XDPS2222_240W1



XDP™ XDPS2222: PFC + hybrid flyback combo IC for 240 W USB PD form factor reference design:

- HFB ZVS operation of high- and low-side
- Fast responding HFB peak current control
- Harmonized PFC and HFB operations
- 240 W output power
- High system efficiency and high-power density design

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Hybrid flyback portfolio

Product family	XDPS2201E	XDPS2221E	XDPS2222	XDPS2201	XDPS2221
Status	Active and preferred	Active and preferred	Active and preferred	Active - replacement available: XDPS2201E	Active - replacement available: XDPS2201E
Topology	Asymmetrical Half-Bridge (AHB) Controller	PFC + AHB Combo Controller	PFC + AHB Combo Controller	AHB Controller	AHB Controller
Digital programmable controller	✓	✓	✓	✓	✓
Integrated high voltage startup cell	✓(600 V)	✓(600 V)	✓(600 V)	✓(600 V)	✓(600 V)
Integrated gate drivers for Si and GaN	✓	✓	✓	✓	✓
Burst mode operation	✓ Optimized for audible noise	✓ Optimized for audible noise	✓	✓	✓
Zero voltage switching	✓ Ease of realization with pseudo adaptive deadtime based on ZCD	✓ Ease of realization with pseudo adaptive deadtime based on ZCD	✓	✓	✓
Enhanced PFC dynamics for bulk capacitance size reduction	Not relevant	✓	-	Not relevant	-
Design tool and design guide availability	✓	✓	-	-	-

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XDP™ PFC+LLC Combo Controller IC

IDP2308 – digital multimode PFC+LLC combo controller

The IDP2308 is a high-performance digital combo controller with integrated drivers and a 600 V depletion cell designed for boost PFC and half-bridge LLC targeting switched mode power supplies (SMPS) from 75 to 300 W.

- Support non-AUX operation with the lowest standby performance and start-up cell
- Support multimode PFC operation for optimized efficiency curve
- Configurable frequency setting for LLC soft-start and normal operation
- Synchronous PFC and LLC burst mode control with soft-start to prevent acoustic noise
- Excellent dynamic response by adaptive LLC burst mode
- Configurable and comprehensive protections for PFC/LLC/IC temperature
- IEC62368-1 certified active X-cap discharge function
- Flexible IC parameter setting with digital UART interface supports PSU platform approach



Key benefits

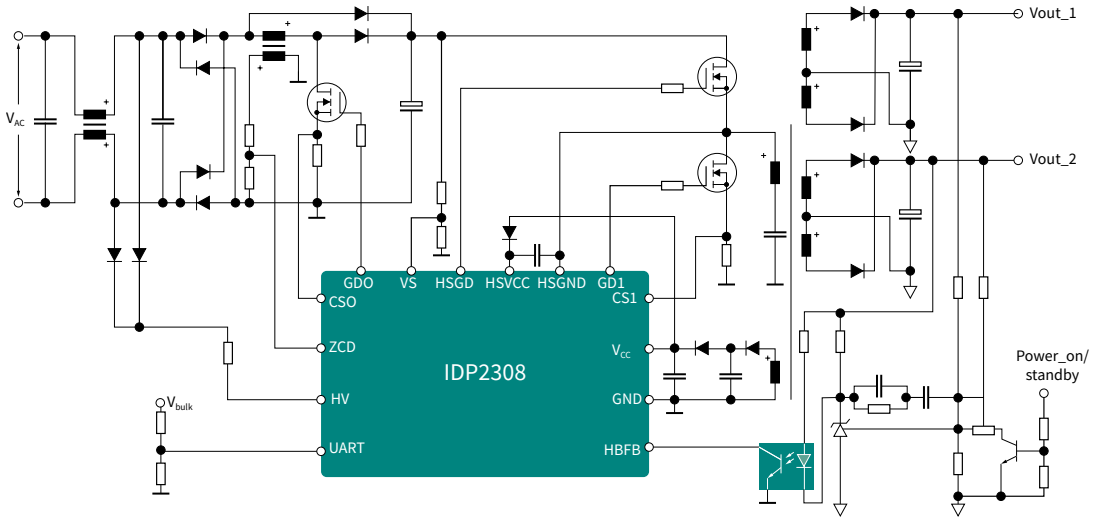
- Low BOM count due to high integration of digital control
- No Auxiliary power supply needed
- Easy design of system schematic and PCB layout
- Small form factor design
- Higher system reliability
- Shorter development cycles and higher design and production flexibility

Target applications

- LCD TV power supply
- General SMPS
- Power adapter

Product	Target application	Major difference	Package
IDP2308	TV embedded PSU	2nd redundant PFC output overvoltage protection	DSO-14 (with enhanced HV creepage distance)

IDP2308 – embedded PSU



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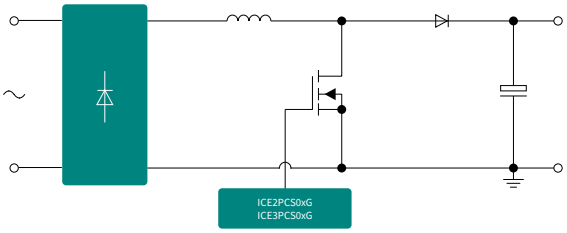
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Continuous conduction mode (CCM) PFC ICs

High efficiency and very low system cost

Compared to the first generation of ICE1PCS01/02, the second generation of CCM PFC controller ICs, ICE2PCS01/02, have lower internal reference trimmed at 3 V. They also have other advantages such as a wider V_{CC} operating range, an improved internal oscillator, and additional direct bulk capacitor overvoltage protection. Compared to the first and second generations of ICE1PCS0x and ICE2PCS0x, the third generation of CCM PFC has the lowest internal reference trimmed at 2.5 V and integrated digital control voltage loop. The third generation also features a low peak current limit at 0.2 V, an adjustable gate switching frequency range from 21 to 100 KHz, and can synchronize with an external frequency range from 50 to 100 kHz. The third generation can now achieve 95 percent efficiency at full load for the entire input voltage range.

Application diagram



2nd generation continuous conduction mode PFC IC features

- Fulfills class D requirements of IEC 61000-3-2
- Lowest count of external components
- Adjustable and fixed switching frequencies
- Frequency range from 20 to 250 kHz
- Versions with brown-out protection available
- Wide input range supported
- Enhanced dynamic response during load jumps
- Cycle-by-cycle peak current limiting
- Integrated protections OVP, OCP
- DIP-8 and DSO-8
- Lead-free, RoHS compliant

3rd generation continuous conduction mode PFC IC features

- Fulfills class D requirements of IEC 61000-3-2
- Integrated digital voltage loop compensation
- Boost follower function
- Bulk voltage monitoring signals, brown-out
- Multi protections such as double OVP
- Fast output dynamic response during load jump
- External synchronization
- Extra-low peak current limitation threshold
- SO8 and SO-14
- Lead-free, RoHS compliant

	ICE2PCS01G ICE2PCS05G	ICE2PCS02G ICE2PCS03G	ICE3PCS03G	ICE3PCS02G	ICE3PCS01G
Digital control voltage loop	–		✓	✓	✓
Variable frequency	✓	–	✓	✓	✓
Synchronous frequency	–		✓	✓	✓
Open loop protection	✓	✓	✓	✓	✓
Low peak current limit	-1 V	-1 V	-0.4 V	-0.4 V	-0.2 V
Brown-out protection	–	✓	✓	–	✓
Overvoltage protection	✓	✓	✓	✓	✓
Second overvoltage protection	–			✓	✓
PFC enable function	–				✓
Boost follower mode	–				✓
5 V regulator	–				✓

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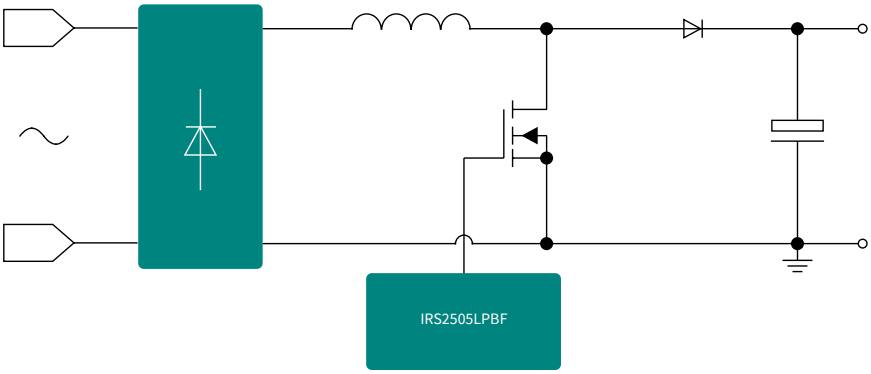
Your input matters
Share your feedback

Critical conduction mode (CrCM) PFC

Easy design and lowest system cost

Fully compatible with the world standard, these devices are optimized to offer extremely compact and cost-effective PFC solutions for electronic ballast and offline SMPS.

Application diagram



IRS2505LPBF

- Critical conduction mode PFC control
- High power factor and ultralow THD
- Wide load and line range
- Regulated and programmable DC bus voltage
- No secondary winding required
- MOSFET cycle-by-cycle overcurrent protection
- DC bus overvoltage protection
- Low EMI gate drive
- Ultralow start-up current
- 20.8 V internal Zener clamp on V_{CC}
- Excellent ESD and latch immunity
- RoHS compliant
- 5-pin SOT-23 package

SMPS | PC power | Desktop | Server | Adapter | Lighting | TV

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PFC controller portfolio

Critical conduction mode (CrCM) PFC IC portfolio

Product	V_{cc} min.	V_{cc} max.	Package
IRS2505L	9 V	20.8 V	SOT-23

Continuous conduction mode PFC ICs

2nd generation continuous conduction mode PFC IC product portfolio

Product	Frequency – f_{sw}	Current drives	Package
ICE2PCS01G	50-250 kHz	2.0 A	DSO-8
ICE2PCS02G	65 kHz	2.0 A	
ICE2PCS03G	100 kHz	2.0 A	
ICE2PCS05G	20-250 kHz	2.0 A	

3rd generation continuous conduction mode PFC IC product portfolio

Product	Frequency – f_{sw}	Current drives	Features	Package
ICE3PCS01G	Adjustable	0.75 A	OVP+brown-out	SO-14
ICE3PCS02G		0.75 A	OVP	SO-8
ICE3PCS03G		0.75 A	Brown-out	SO-8

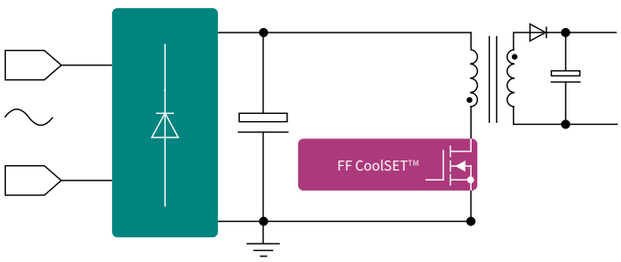
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CoolSET™ fixed-frequency flyback and buck ICs

In DIP-7 and DSO-12 packages

The CoolSET™ fixed-frequency power ICs are optimized for off-line switch mode power supply in cascode configuration, combining the controller and high-voltage MOSFET in DIP-7 and DSO-12 packages. The frequency reduction with soft gate driving and frequency jitter operation offers lower EMI and better efficiency. The product in the DIP-7 package integrates an error amplifier to support direct feedback in isolated flyback, non-isolated flyback and buck topologies. In contrast, the DSO-12 package variants integrate an error amplifier for direct feedback in isolated and non-isolated flyback.



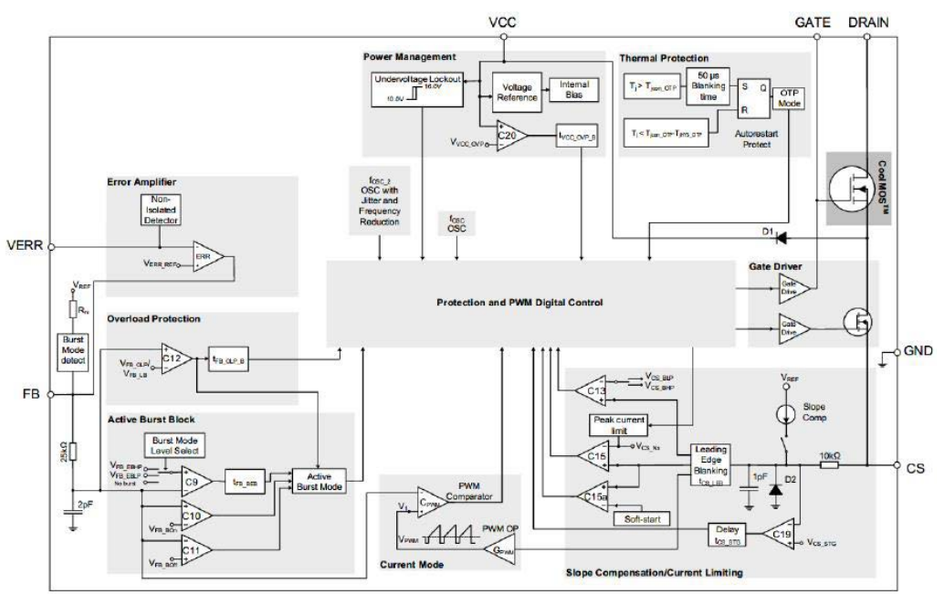


DIP-7 package **DSO-12 package**

Features and benefits

Key features	Key benefits
– Integrated avalanche-rated CoolMOS™ in 700 V, 800 V, and 950 V MOSFETS	– Ease of power scaling and high reliability
– Available in 65 kHz, 100 kHz, and 125 kHz fixed switching frequency	– Fast and robust start-up
– Auto restart protection mode and adjustable burst mode	– Improved overall system efficiency
– Start-up with cascode configuration	– Flexibility of design
– Frequency reduction in tandem with load reduction and jitter	– Optimize standby power and disable burst mode to eliminate audible noise
– Integrated error amplifier	– Minimize interruption of operation
– Integrated pin voltage rating	– Stable operation ensuring higher power delivery
– Comprehensive protections without latching	– Low EMI

Block diagram of CoolSET™ 5th Generation Plus fixed-frequency in DIP-7 package

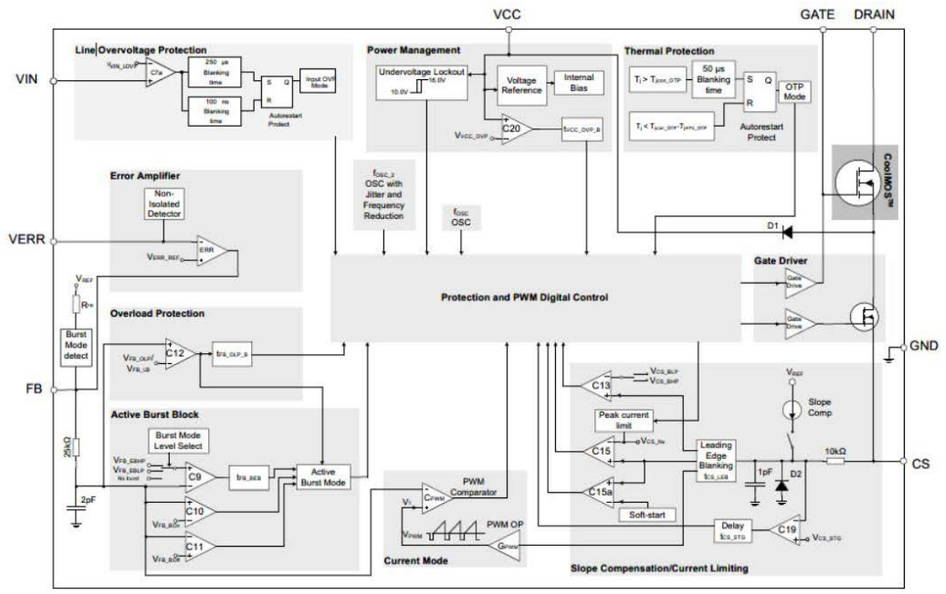


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Block diagram of CoolSET™ 5th Generation Plus fixed-frequency in DSO-12 package



5th generation Plus fixed-frequency CoolSET™

Output power[1] 85 V_{AC}~300 V_{AC} T_a=50°C		16 W	18 W	24 W	28 W	41~42 W
$R_{DS(on),max.}$		5.18 Ω/4.85 Ω	4.05 Ω	2.35 Ω	1.75 Ω	0.80 Ω
700 V	DIP-7	ICE5AR4770BZS-1				
	DSO-12	ICE5AR4770AG-1				
800 V	DIP-7	ICE5AR4780BZS-1 ICE5BR4780BZ-1		ICE5BR2280BZ-1		ICE5AR0680BZS-1
	DSO-12	ICE5GR4780AG-1 ICE5BR4780AG-1		ICE5GR2280AG-1	ICE5GR1680AG-1	ICE5AR0680AG-1
950 V	DIP-7		ICE5AR3995BZ-1 ICE5BR3995BZ-1			
	DSO-12		ICE5BR3995AG-1			

5th generation fixed-frequency CoolSET™

Output power[1] 85 V_{AC}~300 V_{AC} T_a=50°C		15 W	17 W	23 W	27 W	40 W
$R_{DS(on),max.}$		5.18 Ω/4.85 Ω	4.05 Ω	2.35 Ω	1.75 Ω	0.80 Ω
700 V	DIP-7	ICE5AR4770BZS				
	DSO-12	ICE5AR4770AG				
800 V	DIP-7	ICE5AR4780BZS ICE5BR4780BZ		ICE5AR2280CZ ICE5BR2280BZ		ICE5AR0680BZS
	DSO-12	ICE5GR4780AG		ICE5GR2280AG	ICE5GR1680AG	ICE5AR0680AG
950 V	DIP-7		ICE5AR3995BZ ICE5BR3995BZ ICE5BR3995CZ			

3rd generation fixed-frequency CoolSET™

Output power[1] 85 V_{AC}~300 V_{AC} T_a=50°C		10~15 W	19~21 W	23~26 W	30~34 W	37~41 W
$R_{DS(on),max.}$		11.1~5.44 Ω	3.42~2.62 Ω	1.96~1.71 Ω	1.11~1.05 Ω	0.75~0.71 Ω
650 V	DIP-7	ICE3RBR4765JZ		ICE3RBR1765JZ		ICE3RBR0665JZ
	DIP-8	ICE3BR4765J	ICE3A1065ELJ	ICE3BR1765J	ICE3A2065ELJ	ICE3BR0665J
	DSO-12	ICE3RBR4765JG		ICE3RBR1765JG		ICE3RBR0665JG
800 V	DIP-7	ICE3AR4780JZ	ICE3AR2280JZ	ICE3AR1580VJZ	ICE3AR1080VJZ	ICE3AR0680JZ
		ICE3AR4780VJZ	ICE3BR2280JZ			ICE3BR0680JZ
		ICE3AR4780CJZ	ICE3AR2280VJZ			ICE3AR0680VJZ
		ICE3AR10080CJZ	ICE3AR2280CJZ			
	DSO-12	ICE3AR4780JG	ICE3AR2280JG		ICE3AR1080JG	

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Fixed-frequency CoolSET™

	700 V CoolSET™ Gen5 Plus ICE5AR4770AG(BZS)-1	700 V CoolSET™ Gen5 ICE5ARxx70AG(BZS)	650 V CoolSET™ Gen3 ICE3Axx65ELJ	Gen3R ICE3BRxx65J	cGen3R ICE3RBRxx65JZ(G)
Package	DIP-7, DSO-12	DIP-7, DSO-12	DIP-8		DIP-7, DSO-12
Output power range	15 W	15 W	19 W~34 W	15 W~41 W	14 W~39 W
Operating temperature range	-40°C~130°C	-40°C~129°C	-25°C~130°C		-40°C~130°C
Switching frequency	100 kHz	100 kHz	100 kHz	65 kHz	65 kHz
Frequency reduction	✓	✓	–		
Integrated error amplifier	✓	✓	–		
Slope compensation for CCM mode	✓	✓	–		
V_{cc} on/off threshold	16 V/10 V	16 V/10 V	18 V/10.5 V		
Soft-start time	12 ms	12 ms	20 ms		
Active burst mode selection	3 level	3 level	1 level		
V_{cc} pin short-to-ground protection	No start-up	No start-up	–		
V_{cc} overvoltage protection	Auto restart	Auto restart	Latch	Auto restart	
Overtemperature protection	Auto restart with hysteresis	Auto restart with hysteresis	Latch	Auto restart	
External protection enable pin	-	-	Latch	Auto restart	
Adjustable brown-in/-out protection	-	-	–		
Adjustable line input overvoltage protection	Only ICE5AR4770AG-1	Only ICE5ARxx70AG	–		
Fast AC reset	–				
Product available	ICE5AR4770AG-1 ICE5AR4770BZS-1	ICE5AR4770AG ICE5AR4770BZS	ICE3A1065ELJ ICE3A2065ELJ	ICE3BR4765J ICE3BR1765J ICE3BR0665J	ICE3RBR4765JZ ICE3RBR1765JZ ICE3RBR0665JZ ICE3RBR4765JG ICE3RBR1765JG ICE3RBR0665JG

	800 V CoolSET™ Gen3R ICE3A(B)Rxx80JZ	Gen3R ICE3ARxx80CJZ	Gen3R ICE3ARxx80JG	Gen3R ICE3ARxx80VJZ	Gen5 ICE5BRxx80BZ	Gen5 ICE5ARxx80AG(BZS)	Gen5 ICE5GRxx80AG	Gen5 Plus ICE5BRxx80AG(BZ)-1	Gen5 Plus ICE5ARxx80AG(BZS)-	Gen5 Plus ICE5GRxx80AG-1	950 V CoolSET™ Gen5 ICE5BRxx95xZ	Gen5 ICE5ARxx95xZ	Gen5 Plus ICE5BR3995AG(BZ)-1	Gen5 Plus ICE5AR3995BZ-1
Package	DIP–7		DSO–12	DIP–7	DIP–7	DIP–7, DSO–12	DSO–12	DIP-7, DSO-12	DIP-7, DSO-12	DSO-12	DIP-7		DIP-7, DSO-12	DIP-7
Output power range	10 W~40 W	11 W~23 W	14 W~30 W	15 W~39 W	15 W~22 W	15 W~40 W	15 W~27 W	17 W			17 W		17 W	
Non-isolated buck output current range					450 mA~700 mA						550 mA	-		
Operating temperature range	–25°C~130°C		–40°C~130°C		–40°C~129°C			-40°C~130°C			-40°C~129°C		-40°C~130°C	
Switching frequency	100 kHz/65 kHz	100 kHz	100 kHz		65 kHz	100 kHz	125 kHz	65 kHz	100 kHz	125 kHz	65 kHz	100 kHz	65 kHz	100 kHz
Frequency reduction	–				✓			✓			✓		✓	
Integrated error amplifier	–				✓	✓ (except ICE5ARxx80CZ)		✓			Only ICE5BRxx95BZ	✓	✓	
Slope compensation for CCM mode	–	✓	–		✓			✓			✓		✓	
V_{cc} on/off threshold	17 V/10.5 V				16 V/10 V			16 V/10 V			16 V/10 V		16 V/10 V	
Soft-start time	10 ms				12 ms			12 ms			12 ms		12 ms	
Active burst mode selection	4-level	3-level	4-level		3-level			3 level			3-level		3 level	
V_{cc} pin short-to-ground protection	–				No start–up			No start-up			No start-up		No start-up	
V_{cc} overvoltage protection	Auto restart							Auto restart			Auto restart		Auto restart	
Overtemperature protection	Auto restart with hysteresis							Auto restart with hysteresis			Auto restart with hysteresis		Auto restart with hysteresis	
External protection enable pin	Auto restart	Latch	Auto restart	–				-			-		-	
Adjustable brown-in/-out protection	Auto restart			–	Brown-in only			-	-	-	Brown-in		-	-
Adjustable line input overvoltage protection	–			Auto restart		Yes (except ICE5ARxx80BZS)	Auto restart	Only ICE-5BR4780AG-1	Only ICE-5AR0680AG-1	Auto restart	Only ICE5BRxx95CZ	-	Only ICE-5BR3995AG-1	-
Fast AC reset	–	✓	–					-			-		-	
Product available	ICE3AR10080JZ ICE3AR4780JZ ICE3AR2280JZ ICE3AR0680JZ ICE3BR2280JZ ICE3BR0680JZ	ICE3AR10080CJZ ICE3AR4780CJZ ICE3AR2280CJZ	ICE3AR4780JG ICE3AR2280JG ICE3AR1080JG	ICE3AR4780VJZ ICE3AR2280VJZ ICE3AR1580VJZ ICE3AR1080VJZ ICE3AR0680VJZ	ICE5BR4780BZ ICE5BR2280BZ	ICE5AR0680AG ICE5AR4780BZS ICE5AR2280CZ ICE5AR0680BZS	ICE5GR4780AG ICE5GR2280AG ICE5GR1680AG	ICE5BR4780AG-1 ICE5BR4780BZ-1 ICE5BR2280BZ-1	ICE5AR0680AG-1 ICE5AR4780BZS-1 ICE5AR3995BZ-1 ICE5AR0680BZS-1	ICE5GR4780AG-1 ICE5GR2280AG-1 ICE5GR1680AG-1	ICE5BR3995BZ ICE5BR3995CZ	ICE5AR3995BZ	ICE5BR3995AG-1 ICE5BR3995BZ-1	ICE5AR3995BZ-1

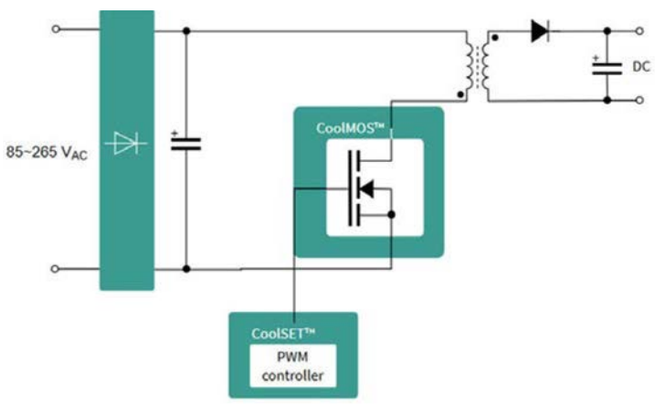
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PWM fixed-frequency flyback ICs

In DSO-8 package

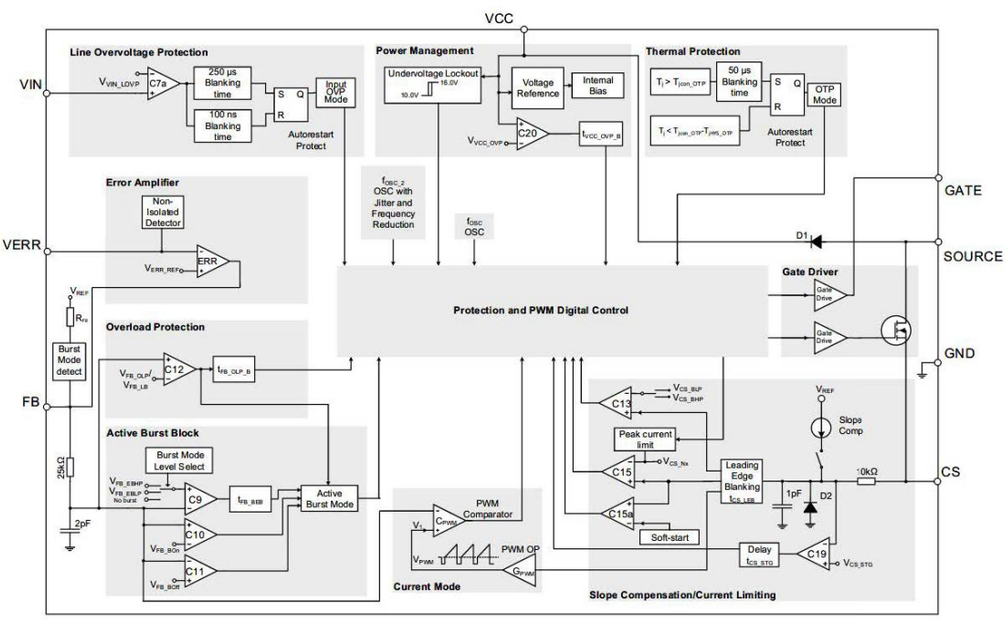
The PWM fixed-frequency controller is optimized for off-line switch mode power supply in cascode configuration and is available in a DSO-8 package. The frequency reduction with soft gate driving and frequency jitter operation offers lower EMI and better efficiency. The product has a wide operating range of IC power supply and lower power consumption. It has numerous protection functions, including robust line protection, to support the protection of the power supply system in failure situations.





Features and benefits

Key features	Key benefits
– Integrated line input overvoltage protection and error amplifier	– Reduce BOM count and cost
– Digital frequency reduction with decreasing load	– Increase mid-and light-load efficiency
– Support both DCM and CCM operations with slope compensation	– High power delivery with slope compensation
– Brown-in protection and operation with cascode configuration	– Fast and robust start-up
– Enhanced active burst mode with selectable entry and exit standby power	– Flexibility and ultralow power consumption
– All protections are in auto-restart mode	– Low EMI



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Fixed-frequency PWM IC

	Gen5		Gen3	
FF PWM IC	ICE5ASAG	ICE5GSAG	ICE3AS03LJG	ICE3BS03LJG
Package	DSO–8		DSO–8	
Switching frequency	100 kHz	125 kHz	100 kHz	65 kHz
Operating temperature	-40°C~129°C		-25°C~130°C	
Start-up cell	Cascode		✓	
V_{cc} on/off threshold	16 V/10 V		18 V/10.5 V	
Soft-start time	12 ms		10 ms	20 ms
Frequency jittering	✓		✓	
Modulated gate drive	✓		✓	
Active burst mode	✓ (3-level selectable)		✓	
Slope compensation for CCM	✓		–	
Frequency reduction	✓		–	
Integrated error amplifier for direct feedback	✓		–	
Adjustable line input overvoltage protection	✓ with auto restart		–	
Adjustable brown-in protection	✓ with auto restart		–	
V_{cc} pin short-to-ground protection	✓ (no start–up)		–	
V_{cc} undervoltage protection	✓ with auto restart		✓ with auto restart	
V_{cc} overvoltage protection	✓ with auto restart		✓ with latch–up	
Overload/open loop protection	✓ with auto restart		✓ with auto restart	
Overtemperature protection	✓ with auto restart and hysteresis		✓ with latch–up	
External blanking time extension	–		✓ with auto restart	
External protection enable pin	–		✓ with latch–up	

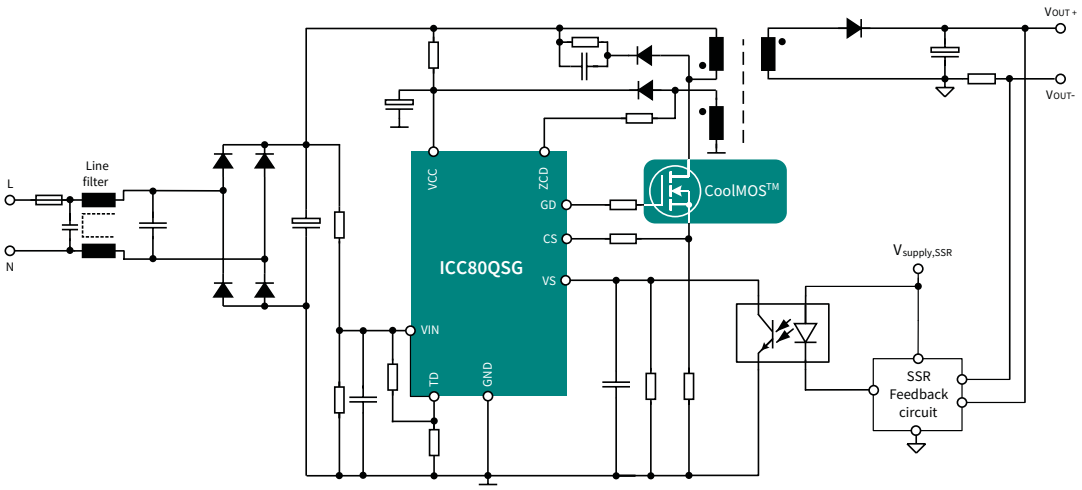
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ICC80QSG

Single-stage flyback controller IC for battery charging

The ICC80QSG is a PWM controller for flyback topologies operating in quasi-resonant mode and valley-switching DCM to achieve high power transfer efficiency across a wide operating range. The IC offers a wide power range and a comprehensive set of protections for battery charging applications. It is easy to design and requires a minimum number of external components. The gate driver current enables reasonable designs up to 130 W with state-of-the-art MOSFETs. System performance and efficiency can be optimized using Infineon CoolMOS™ P7 power MOSFETs.





Features and benefits

Key features	Key benefits
– Quasi-resonant mode (QRM) operation with continuous conduction mode (CCM)-prevention and valley-switching discontinuous conduction mode (DCM) in mid to light load	– Ideal for battery charging current control
– Secondary-side regulation (SSR)	– BoM cost reduction
– Burst mode for very light loads	– High efficiency and low electromagnetic interference (EMI)
– Adjustable maximum on-time	– Low power consumption in standby mode
– Comprehensive set of protections	– Design flexibility with adjustable maximum switching frequency and configurability of brown-in and brown-out
– Externally configurable hysteresis of brown-in and brown-out	– Protection of primary components from overheating and saturation with higher brown-out level at higher input/output power
– Soft start	– Safe, robust, and reliable operation

Applications

The ICC80QSG is tailored for battery charger applications up to 130 W, such as cordless appliances, e-bike chargers, power tools, consumer drones, and gardening tools.

eBike | Power tools | Gardening tools | Cordless vacuum cleaner | Multicopter

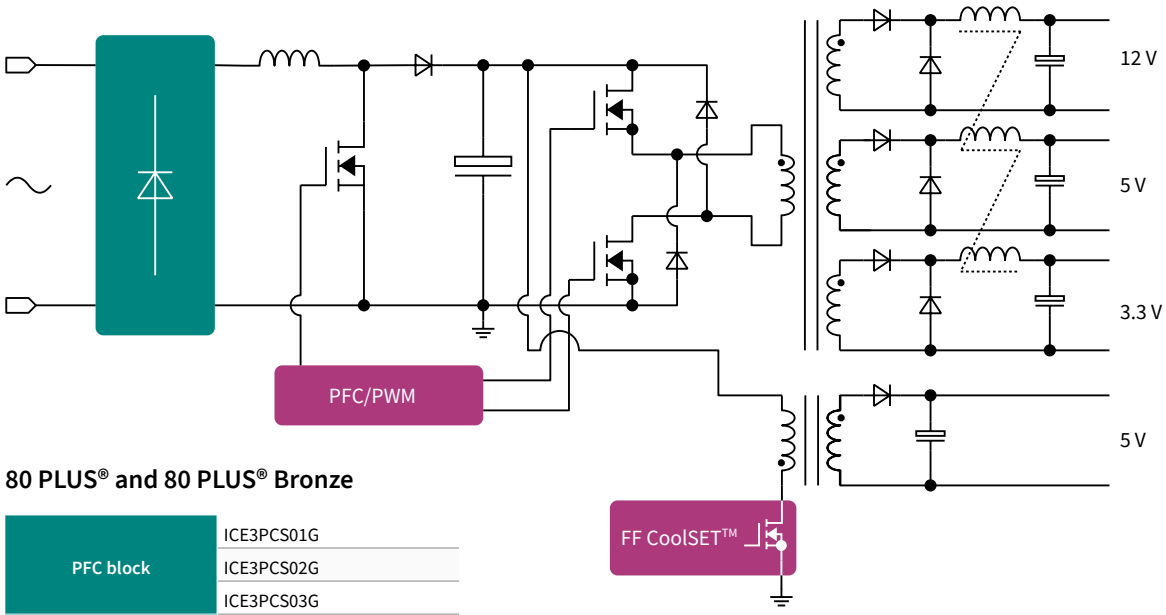
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Climate saver systems

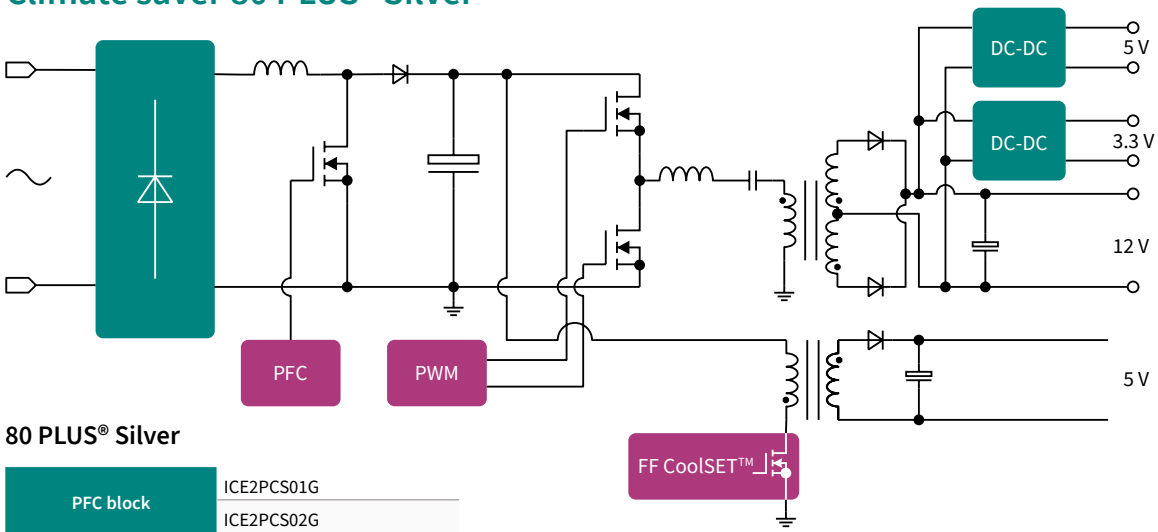
Climate saver 80 PLUS® and 80 PLUS® Bronze



80 PLUS® and 80 PLUS® Bronze

PFC block	ICE3PCS01G
	ICE3PCS02G
	ICE3PCS03G
PWM block	ICE2HS01G
Standby block FF CoolSET™	ICE5GR4780AG-1
	ICE5GR2280AG-1
	ICE5GR1680AG-1
	ICE3AR1080JG
	ICE5AR0680AG-1

Climate saver 80 PLUS® Silver



80 PLUS® Silver

PFC block	ICE2PCS01G
	ICE2PCS02G
PWM block	ICE1HS01G-1
Standby block FF CoolSET™	ICE5GR4780AG-1
	ICE5GR2280AG-1
	ICE5GR1680AG-1
	ICE3AR1080JG
	ICE5AR0680AG-1

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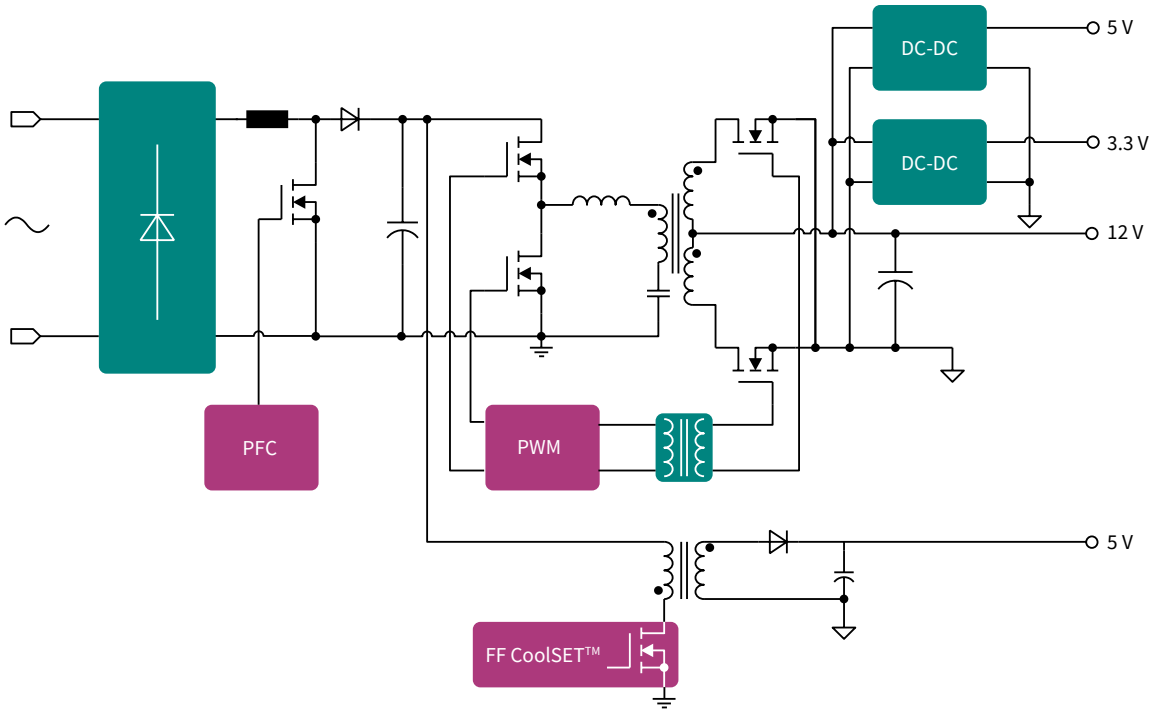
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Climate saver 80 PLUS® Gold

Climate saver 80 PLUS® Platinum

Certification for Infineon's PC power reference design



80 PLUS® Gold

PFC block	ICE3PCS01G
	ICE3PCS02G
	ICE3PCS03G
PWM block	ICE2HS01G
Standby block FF CoolSET™	ICE5GR4780AG-1
	ICE5GR2280AG-1
	ICE5GR1680AG-1
	ICE3AR1080JG
	ICE5AR0680AG-1

80 PLUS® Platinum

Certification for Infineon's PC power reference design

PFC block	ICE3PCS01G
	ICE3PCS02G
	ICE3PCS03G
PWM block	ICE2HS01G
Standby block QR CoolSET™	ICE5QR4780BG-1
	ICE5QR2280BG-1
	ICE5QR1680BG-1
	ICE2QR1080G
	ICE5QR0680BG-1

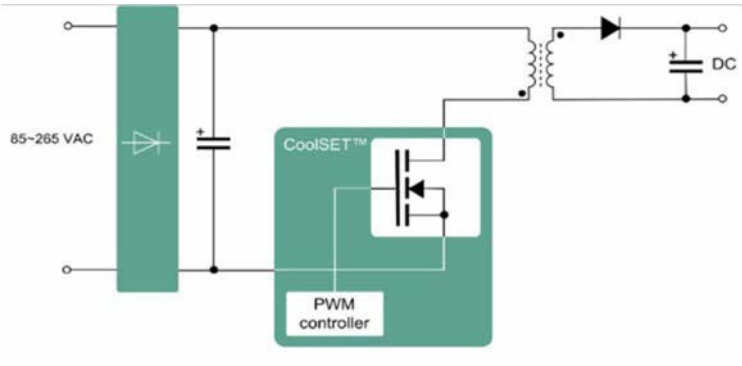
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CoolSET™ quasi-resonant flyback ICs

In DSO-12 package

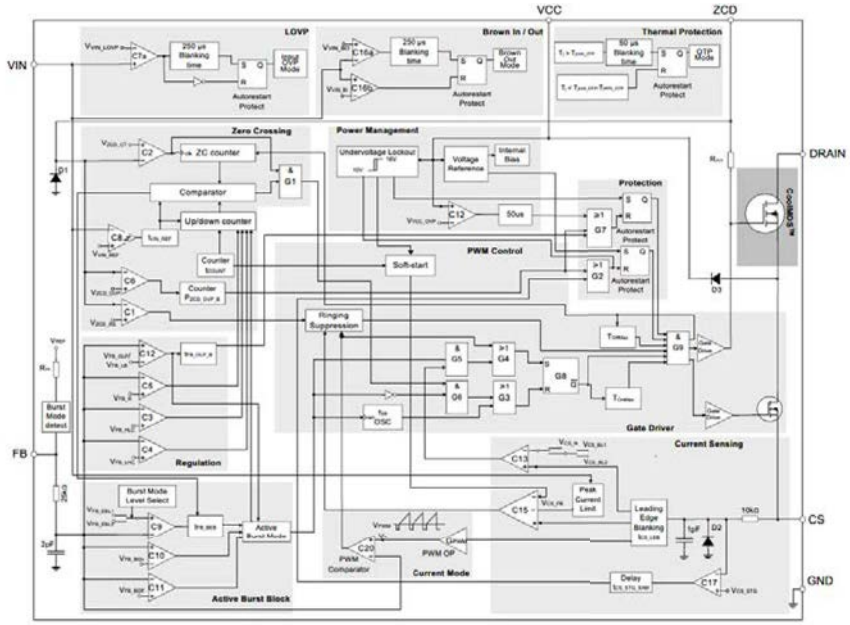
The CoolSET™ quasi-resonant power ICs are optimized for off-line switch mode power supply in cascode configuration and combine the industry's benchmark for unparalleled performance and efficiency. The CoolSET™ quasi-resonant power ICs are available as integrated ICs, combining the controller and high-voltage MOSFET in a single DSO-12 package. The IC can achieve lower EMI and higher efficiency with improved digital frequency reduction through the proprietary novel quasi-resonant operation. The product is easy to design and requires a minimum number of external components.





Features and benefits

Key features	Key benefits
– Integrated 800 V CoolMOS™	– Ease of system design and high reliability
– Avalanche rugged CoolMOS™	– Supports isolated/non-isolated topology
– Start-up with Cascode configuration	– Improved overall system efficiency
– Increased pin voltage rating	– Auto restart recovery scheme
– Comprehensive protections without latching	– Fast startup time
– Selectable burst mode	– Low EMI and low standby power



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5th generation Plus quasi-resonant CoolSET™

Output power[1] 85 V_{AC}~300 V_{AC} T_a=50°C		15 W	23 W	27 W	42 W
$R_{DS(on),max.}$		4.85 Ω	2.35 Ω	1.75 Ω	0.80 Ω
800 V	DSO-12	ICE5QR4780BG-1	ICE5QR2280BG-1	ICE5QR1680BG-1	ICE5QR0680BG-1

5th generation quasi-resonant CoolSET™

Output power[1] 85 V_{AC}~300 V_{AC} T_a=50°C		15 W	23 W	27 W	42 W
$R_{DS(on),max.}$		4.85 Ω	2.35 Ω	1.75 Ω	0.80 Ω
800 V	DSO-12	ICE5QR4780BG	ICE5QR2280BG	ICE5QR1680BG	ICE5QR0680BG

2nd generation quasi-resonant CoolSET™

Output power[1] 85 V_{AC}~300 V_{AC} T_a=50°C		14 W~15 W	20 W~21 W	23 W~26 W	31 W	38 W~42 W
$R_{DS(on),max.}$		5.44 Ω~5.18 Ω	2.62 Ω	1.96 Ω	1.11 Ω	0.75 Ω~0.71 Ω
650 V	DIP-7	ICE2QR4765Z		ICE2QR1765Z		ICE2QR0665Z
	DIP-8	ICE2QR4765		ICE2QR1765		ICE2QR0665
	DSO-12	ICE2QR4765G		ICE2QR1765G		ICE2QR0665G
800 V	DIP-7		ICE2QR2280Z			ICE2QR0680Z
	DSO-12	ICE2QR4780G	ICE2QR2280G ICE2QR2280G-1		ICE2QR1080G	

Quasi-resonant CoolSET™

Feature	2nd generation ICE2QRxxxxZ/G	2nd generation ICE2QRxx80G-1	5th generation ICE5QRxx80BG	5th generation Plus ICE5QRxx80BG-1
Switching scheme	QR with 7 zero crossing counters		Novel QR with 10 zero crossing counters	
Integrated MOSFET	650 V and 800 V	800 V	800 V	800 V
High-voltage start-up cell	✓		Cascode	
Power saving during standby	Active burst mode f_{sw} at 52 kHz		2 level selectable active burst mode quasi-resonant	
V_{CC} on/off threshold (typ.)	18 V/10.5 V	18 V/9.85 V	16 V/10 V	16 V/10 V
Adjustable output overvoltage protection	✓ with latch		✓ with auto restart	
V_{CC} over/undervoltage protection	✓ with auto restart		✓ with auto restart	
Overload/open loop protection	✓ with auto restart		✓ with auto restart	
Overtemperature protection	✓ with auto restart		✓ (Auto restart with hysteresis)	
Adjustable line input overvoltage protection	–		✓ with auto restart	
Brown-out	–		✓ with auto restart	
V_{CC} pin short-to-ground	–		✓ (No start-up)	
Package	DIP-7 DIP-8 DSO-12	DIP-7 DSO-12	DSO-12	DSO-12

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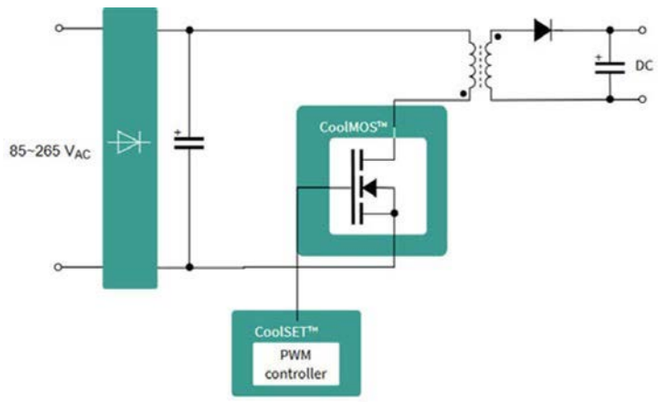
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1) Calculated maximum output power rating in an open frame design at T_a = 50°C, T_j = 125°C (integrated high voltage MOSFET)

PWM quasi-resonant flyback ICs

In DSO-8 package

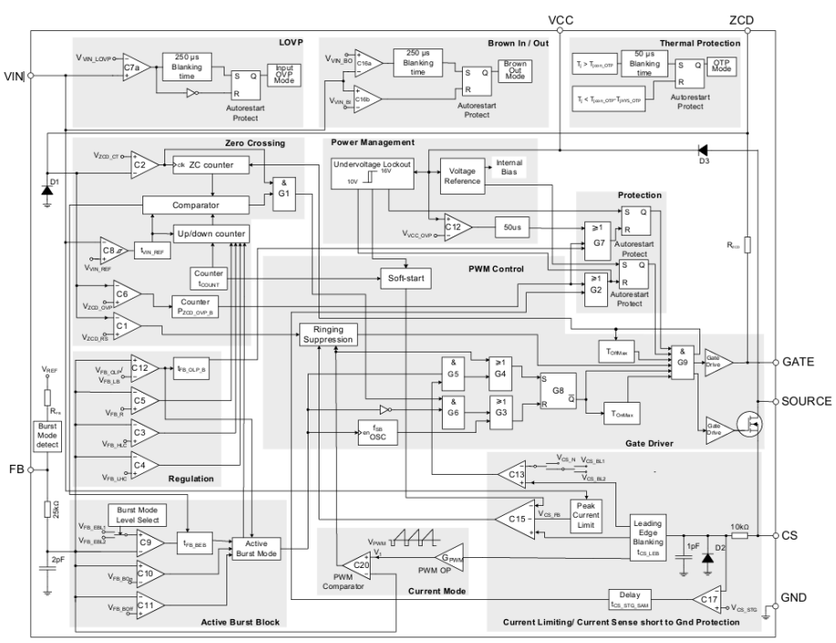
The PWM quasi-resonant controller is optimized for off-line switch mode power supply in cascode configuration and is available in a DSO-8 package. The improved digital frequency reduction with proprietary novel quasi-resonant operation offers lower EMI and higher efficiency for a wide AC range by reducing the switching frequency difference between the low and high lines. The product has a wide operating range of IC power supply and lower power consumption. The numerous protection functions, including the robust line protection, to support the protection of the power supply system in failure situations.





Features and benefits

Key features	Key benefits
– Auto-restart recovery scheme	– Minimize interruption to system operation
– Minimum switching frequency difference between low and high line	– Lower EMI and higher efficiency
– –Adjustable line input overvoltage and brown IN/OUT protection	– System robustness
– Rapid and adjustable start-up with cascode configuration	– Rapid start-up performance
– Enhanced active burst mode with selectable entry and exit standby power	– Flexibility in standby power range selection
– All protections are in auto-restart mode	– Lower power consumption



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Quasi-resonant PWM IC

Feature	ICE5QSBG	ICE2QS02G	ICE2QS03G
Package	DSO-8	DSO-8	DSO-8
Switching scheme	Novel QR with 10 zero crossing counters	QR with 7 zero crossing counters	QR with 7 zero crossing counters
Operating temperature	-40°C~129°C	-25°C~130°C	-25°C~130°C
Start-up cell	Cascode	–	✓
V_{CC} on/off	16 V/10 V	12 V/11 V	18 V/10.5 V
Power saving during standby	✓ active burst mode in QR switching 2-level selectable burst mode entry/exit level	–	✓ active burst mode 52 kHz
Digital frequency reduction for high average efficiency	✓	✓	✓
OLP blanking time	Fixed	Adjustable	Fixed
Auto restart timer	Through V_{CC} charging/discharging	Setting with external components	Through V_{CC} charging/discharging
Maximum input power limitation	V_{in} pin voltage dependent	Adjustable through ZC resistor	Adjustable through ZC resistor
V_{CC} undervoltage protection	✓ with auto restart	✓ with latch	✓ with auto restart
Adjustable output overvoltage protection	✓ with auto restart	✓ with latch	✓ with latch
Adjustable line input overvoltage protection	✓	–	–
Brown-out feature	✓	✓	–
V_{CC} pin short-to-ground protection	✓	–	–
Target application	Home appliances, set-top-box, AUX SMPS	AUX power supply to V_{CC} eg., LCD TV multi/main, audio main, PDP TV multi/address	Self-power supply to V_{CC} eg., smart meter, industrial applications

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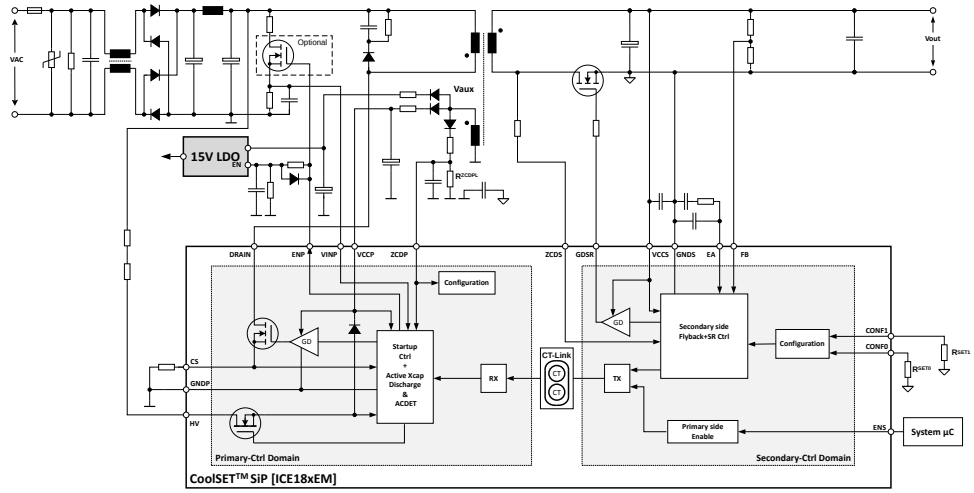
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CoolSET™ System-in-Package (SiP)

in DSO-27 package

The newly launched CoolSET™-SiP family products support a highly effective reduction in system complexity. The System-in-Package (SiP) integration includes an HV MOSFET with low RDS(on), a 950V startup cell, a ZVS primary flyback controller, a secondary side SR controller, and reinforced isolated communication enabled by Infineon's proprietary CT Link technology. This high level of integration supports the development of more sophisticated end products. This results in a high reduction of discrete system components, lower BOM, and minimizes PCB space requirements. A comprehensive set of advanced protection features supports ease of design-in, allowing our customers more flexibility to optimize their solutions and enhance the overall user experience. The product is qualified for industrial applications according to the relevant tests of JEDEC47/20/22 and is used for auxiliary power supplies in consumer and industrial applications.

Application schematic



Features and benefits

Key features	Key benefits
– Integrated 800 V avalanche rugged CoolMOS™ P7	– Reduction of component count, system complexity, space, and cost
– Integrated 950 V high voltage startup-cell	– Fast and robust start-up
– Novel ZVS flyback operation	– Low switching losses and low EMI signature
– Built-in primary side power switch control and secondary side feedback control	– High reliability, robust operation, and high performance
– External resistor readout for adjusting the hardware configuration	– Extended design-in flexibility
– Integrated primary and secondary functionality with a robust CT Link technology for reinforced isolation	– High magnetic field immunity

CoolSET™ – SiP

Output power [1] 85 V_{AC}~300 V_{AC} T_a=50°C		30 W [2]	45 W [2]	60 W [2]
$R_{DS(on)}$		2.03 Ω	0.84 Ω	0.48 Ω
950 V	PG-DSO-27-1	ICE193LM*		
800 V	PG-DSO-27-1	ICE183LM* ICE183EM*	ICE184LM ICE184EM	ICE186LM* ICE186EM

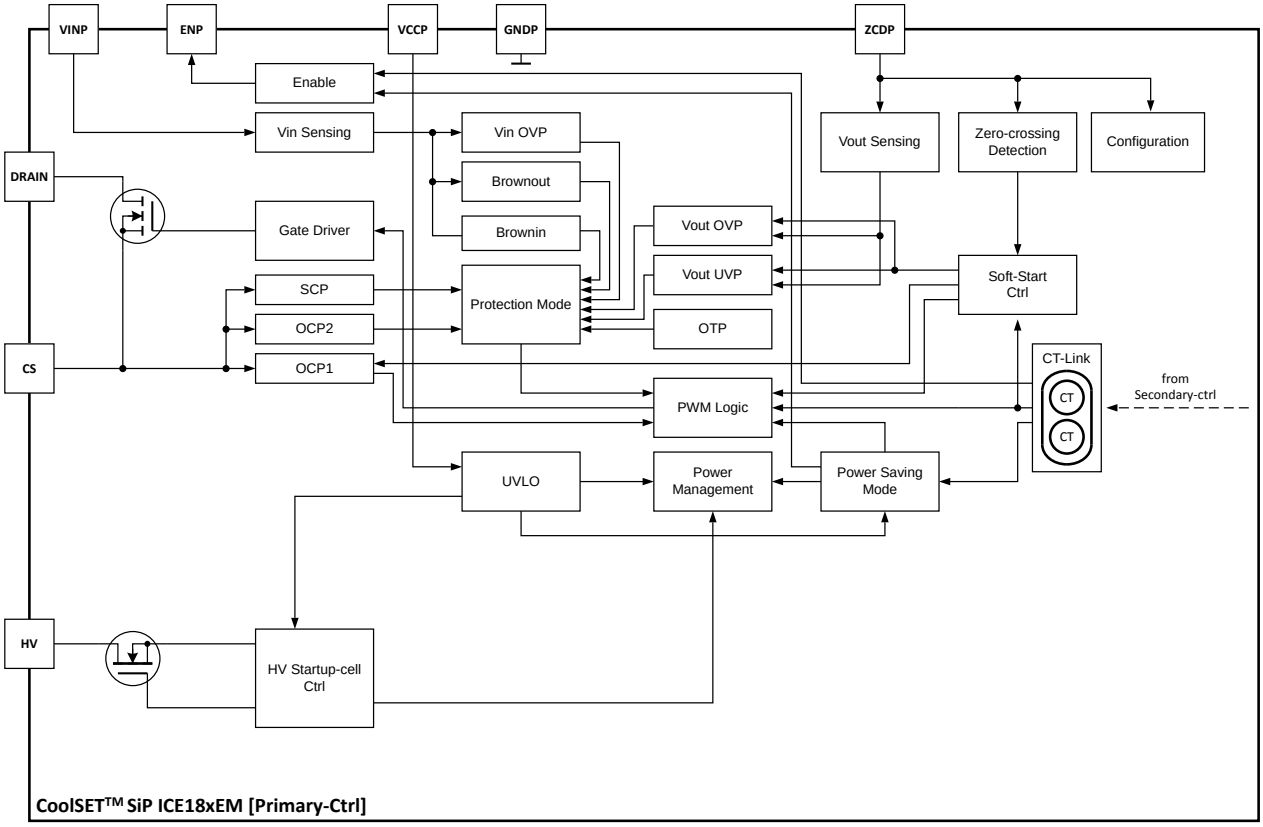
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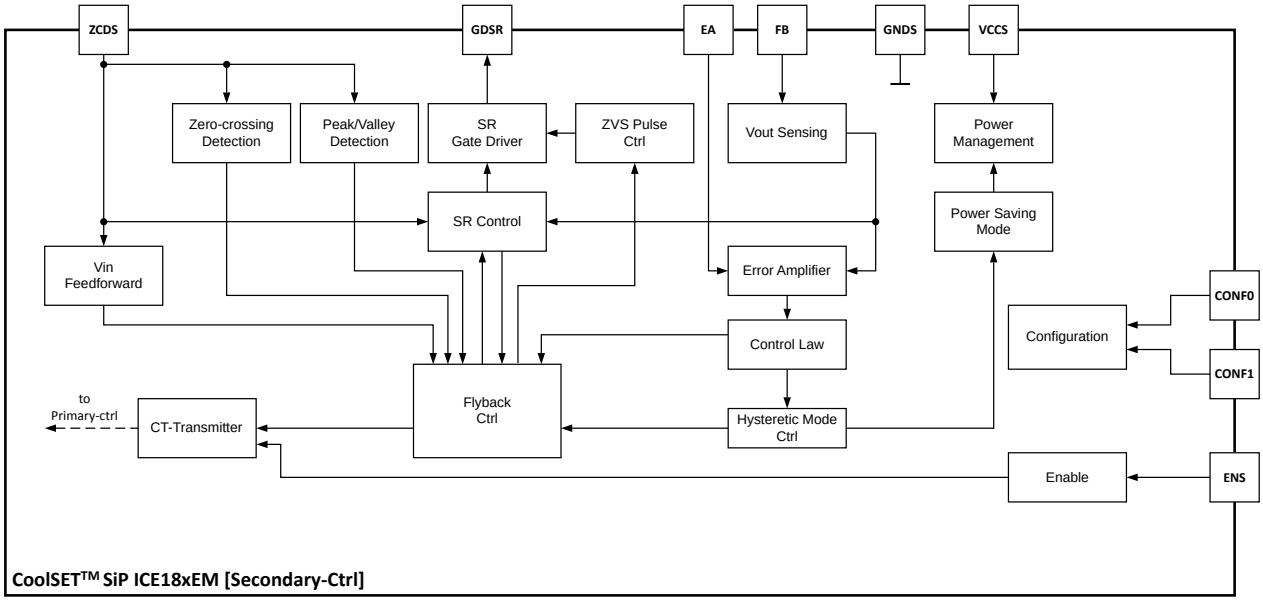
1) Calculated maximum output power rating in an open frame design at Ta = 50°C, Tj = 125°C (integrated high voltage power switch)
2) Using CoolMOS™ 800V/950V
* Coming soon

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CoolSET™ - SIP ICE18xEM (Primary-Ctrl)



CoolSET™ - SIP ICE18xEM (Secondary-Ctrl)



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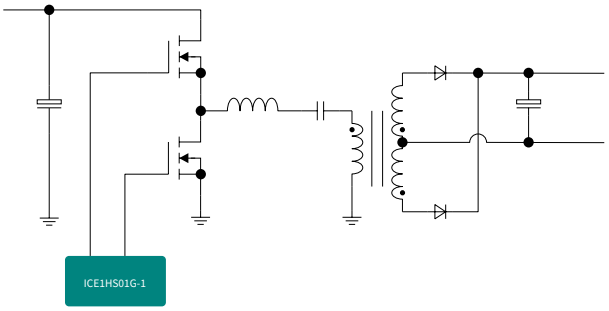
Resonant LLC half-bridge controller ICs

Best-in-class converters and controllers to support LLC HB resonant mode topology

Resonant mode power supplies vary over SMPS circuits where the switching losses are significantly reduced by adapting zero-voltage or zero-current switching techniques, also known as soft-switching techniques. In non-resonant mode SMPS circuits, the switches are subjected to hard switching. LLC HB resonant operates in ZVS mode, whereby switching loss is reduced to operate the converter at a higher switching frequency. In addition, the converter can be further optimized at a high input voltage. This topology eliminates the secondary filter inductor, adopts better rectifier diodes, and reduces secondary conduction loss. The magnetic integration concept can build all magnetic components into one magnetic core.

LLC resonant (no SR)

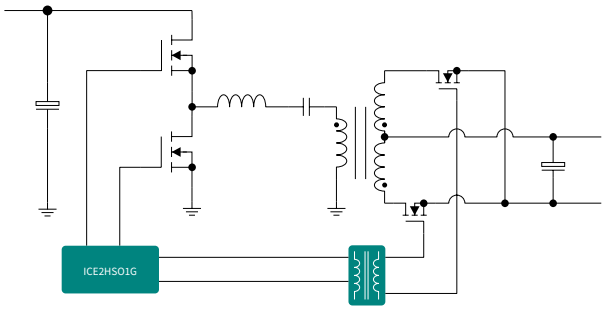
Application diagram – LLC resonant (no SR)



- Novel and simple design (12 components + HB driver)
- Minimum operating frequency is adjustable externally
- Burst mode operation for output voltage regulation during no load and/or bus overvoltage
- Multiple protections in case of fault
- Input voltage sense for brown-out protection
- Open loop/overload fault detection by FB pin with auto restart and adjustable blanking/restart time
- Frequency shift for overcurrent protection
- Lead-free, RoHS-compliant package
- DSO-8 package

Resonant LLC half-bridge controller IC with integrated synchronized rectifier control

LLC resonant + SR



- Novel LLC/SR operation mode and controlled by primary-side controller controller
- Multiple protections for SR operation
- Tight tolerance control
- Accurate setting of switching frequency and deadtime
- Simple system design
- Optimized system efficiency
- Multiple converter protections: OTP, OLP, OCP, and latch-off enable
- External disable for either SR switching or HB switching
- Lead-free, RoHS-compliant package
- DSO-20 package

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Your input matters
Share your feedback

LLC half-bridge controller IC	ICE1HS01G-1	ICE2HS01G
Package	DSO-8	DSO-20
Switching frequency range	up to 600 kHz	up to 1 MHz
LLC soft-start	✓	✓
LLC burst mode	✓	✓
Adjustable minimum frequency	✓	✓
Overload/open loop protection	✓	✓
Mains undervoltage protection with hysteresis	✓	✓
Overcurrent protection	2-level	3-level
Drive signal for synchronous rectification	–	✓
Adjustable deadtime	–	✓
External latch-off and OTP	–	✓
Target application	LCD-TV, audio, etc.	Server, PC, LCD-TV, etc.

Product		Frequency – f_{sw}	Deadtime	Current drives	Package
ICE1HS01G-1	LLC resonant (no SR)	30 kHz~600 kHz	380 ns	1.5 A	DSO-8
ICE2HS01G	Resonant LLC half-bridge controller IC with integrated synchronized rectifier control (LLC resonant + SR)	30 kHz~1 MHz	100 ns~1000 ns	0.3 A	DSO-20

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DC-DC converters

Highest density end-to-end power management solutions

As the innovation leader for power semiconductor and energy efficiency technologies, we continually develop and work on the best solutions for your applications. Our DC-DC converter portfolio includes integrated power stages, switching regulators, integrated POL converters and integrated POL voltage regulators, Protection ICs, digital multiphase controllers, and digital power controllers (see XDPP1100 digital power controller family).

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Digital power controller (DPC)

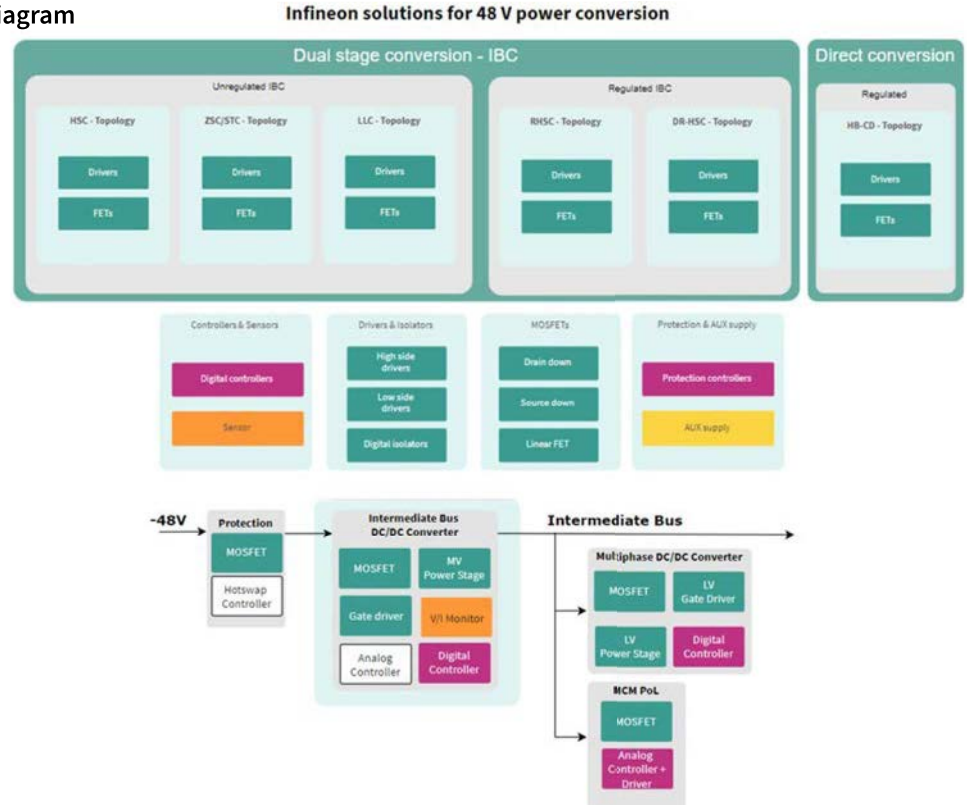
The smallest DPC with PMBus™ interface

Infineon supplies the XDPP11xx family of highly integrated, programmable, and configurable digital power controllers that enable the design of high-density and high-power intermediate bus DC-DC converters with isolated and non-isolated topologies requiring minimum external components. The XDPP11xx architecture consists of a low-latency state-machine-based digital control loop with associated firmware, a high-performance analog-front-end (AFE) for control loop feedback, a Power Management Bus (PMBus 1.3) interface for system communication, GPIOs, and an Arm® Cortex®-M0 subsystem for housekeeping, telemetry, and blackbox functions. With the onboard OTP and provided Graphic User Interface (GUI), firmware customization, optimization, and configuration make it easy to develop differentiated solutions. For ease of design and fast time-to-market with minimum R&D cost, XDPP11xx products are supported by evaluation boards and several reference designs optimized for 48 V IBC. The 48 V architecture can be found in AI server data centers and telecom infrastructure, such as base and radio units. In addition to offering products of proven quality, a competent global power supply team supports our customers in designing telecom/AI server products and systems in collaboration with our channel partners.

Features and benefits

Key features	Key benefits
– Application-optimized	– Pre-programmed advanced digital control reduces firmware development
– State machine-based digital control for up to two independent voltage loops	– Allows design differentiation and customization
– Configurable feedback control dedicated hardware peripherals	– Optimized for converter topologies and brick applications for superior performance
– Arm® Cortex®-M0 processor	– Enhanced control and excellent dynamic transient performance
– Accurate current sense through high-performance ADCs	– No external comparator allows lower BOM and denser design information
– Small footprint	– 4x4 mm package makes high-density design possible

Application diagram



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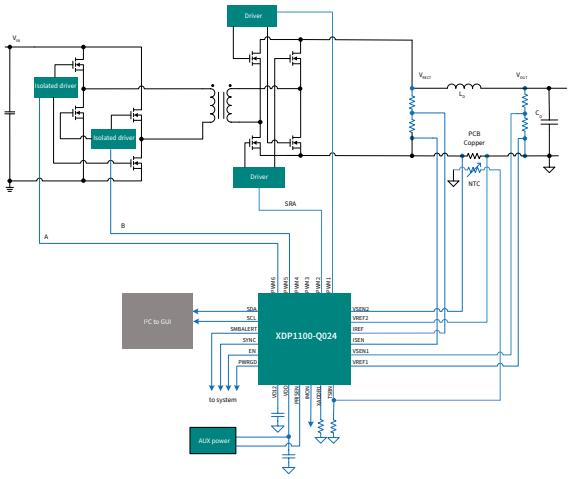
XDPP1100 digital power controller

The smallest DPC with PMBus™ interface

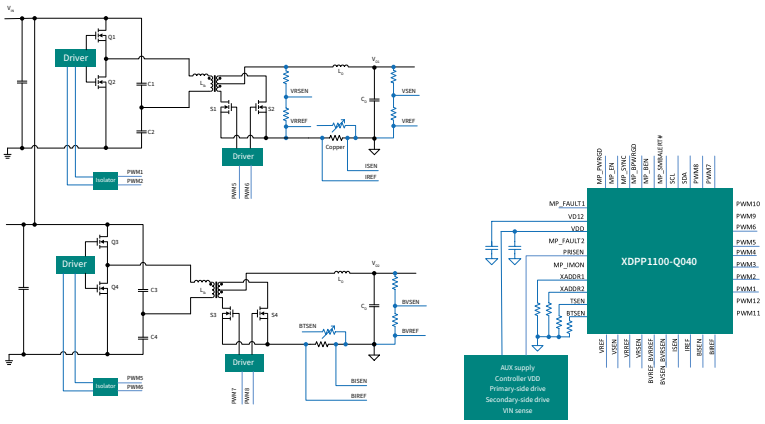
The XDPP1100, the first member of Infineon's feature-rich digital power controller product family, is a highly programmable and versatile device with advanced features that is an ideal power controller for isolated and non-isolated modern high-density, high-power systems deployed in AI servers, 48 V server motherboards, telecom infrastructure, and industrial 4.0 applications. A combination of low-latency state machine-based digital control loop with associated firmware, high-performance AFE for current and voltage sensing and feedback, Power Management Bus (PMBus™1.3) interface for system communication and an Arm® Cortex®-M0 sub-system for housekeeping integrated into a single chip, supplemented by Graphical User Interface (GUI) and EVB, enables the design of a family of DC-DC power solution for the targeted application with a fast time-to-market. Built-in non-volatile memory provides extensive programming and customization of functions such as frequency dithering, GPIO signal timing, non-linear transient suppression schemes, soft start timing and sequencing, and feature-rich protection response. The XDPP1100 architecture allows maximum design flexibility and provides excellent digital control for transformer-based isolated DC-DC converters and non-isolated topologies. All the major fixed frequency topology designs, such as pulse width modulation (PWM) half-bridge (HB), PWM full-bridge (FB), phase-shift full-bridge (PSFB), active clamp forward (ACF), open loop fix-frequency resonant half-bridge or full-bridge (FF open-loop LLC), non-isolated Buck, Boost and Buck-boost, may be achieved in compact 4x4 mm 24-pin VQFN Package. The XDPP1100 supports interleaved operation of any of the topologies mentioned. To support post-buck or post–boost regulation, XDPP1100 is also offered in a 6x6 mm 40-pin VQFN package. XDPP1100 is supported by several reference designs in various topologies ideal for AI servers, 48 V server motherboards, and telecom infrastructure for a faster time-to-market and reduced development cost.

Application schematic

XDPP1100 full-bridge to full-bridge



XDPP1100 dual loop half-bridge center tap



Features and benefits

Key features	Key benefits
– State machine-based digital control for up to two independent voltage loops	– Digital compensator increases stability and saves external BOM cost
– Configurable feedback control	– Flexible mode: voltage mode, peak current mode, and constant current and power mode
– Arm® Cortex®-M0 processor	– Fast process and control
– Up to 16 configurable GPIOs, 12 high-resolution digital modulated PWM outputs	– Easy to use and fast time-to-market with digital interface
– Input voltage feed-forward control scheme	– Fully manageable and controllable with both input and output information
– Small footprint	– 4x4 mm package makes high-density design possible

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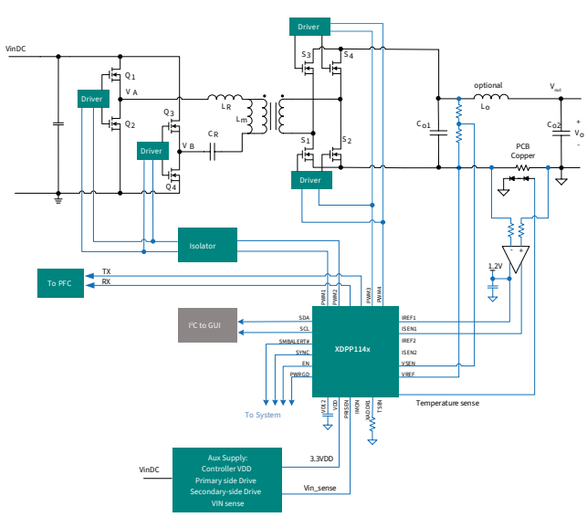
XDPP1140/XDPP1148 digital power controllers

The smallest DPC with PMBus™ Interface

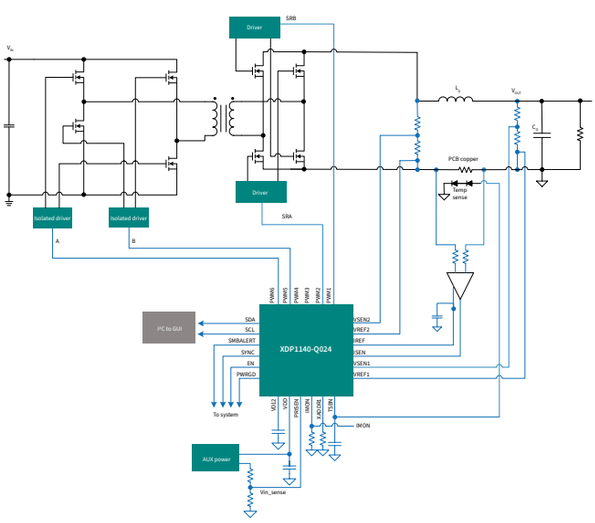
The XDPP1140/XDPP1148 are new members of Infineon's feature-rich Digital Power Controller product family that are highly programmable and versatile devices with advanced features that make them an ideal power controller for isolated and non-isolated modern high-density, high-power systems deployed in AI servers, 48 V server motherboards, telecom infrastructure, and industrial 4.0 applications. A combination of low-latency state machine-based digital control loop with associated firmware, high-performance AFE for current and voltage sensing and feedback, Power Management Bus (PMBus™1.3) interface for system communication, and an Arm® Cortex®-M0 sub-system for housekeeping integrated in a single chip, supplemented by Graphical User Interface (GUI) and eval board enables a DC-DC power design platform for targeted applications with fast time-to-market support. Built-in non-volatile memory provides extensive programming and customization of functions such as frequency dithering, GPIO signal timing, non-linear transient suppression schemes, soft start timing and sequencing, and feature-rich protection response. Both XDPP1148 and XDPP1140 are provided in a 4x4 mm 24-pin VQFN package and are backward compatible with XDPP1100; however, enhanced features are designed to provide excellent digital control for resonant LLC topologies, including half-bridge (HB) LLC, full-bridge (FB) LLC, phase-shift full-bridge (PSFB) LLC. XDPP1140/XDPP1148 also supports all the major fixed frequency topologies such as pulse width modulation (PWM) HB, PWM FB, PWM PSFB, active clamp forward (ACF), non-isolated Buck, Boost, and Buck-boost. The XDPP1148 supports the interleaved operation of Buck, Boost, and Buck-boost.

Block diagram

FB LLC, 48 V to 12 V, XDPP114x, Datacom



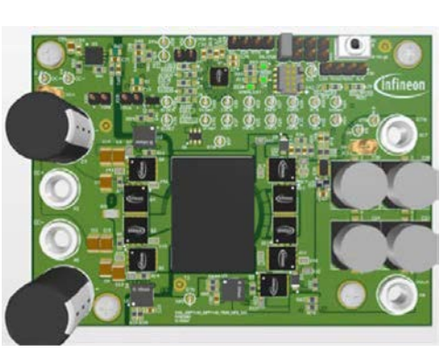
FB-FB, -48 V to 50 V, XDPP1140, Telecom



Features and benefits

Key features
– High-performance (100 MHz) current and voltage ADCs
– Configurable feedback control
– Frequency modulation
– Hardware-based feed-forward
– Current sense with high tracking slew rate
– Fast GPIO input

Key benefits
– Supports Resonant LLC Topologies
– Flexible mode: voltage mode, peak current mode, and constant current and power
– Supports close loop LLC; Hybrid soft-start for LLC
– Supports Buck-boost, Boost Topologies
– Supports symmetric input for primary current sense
– Configurable offset for secondary current sense
– Allows using external signal to define SR rising or falling edge



EVAL_XDPP1140_FBFB_50 V

Infineon evaluation board DC-DC digital IC controllers for telecom and server applications

- XDPP1140-100B
- 6x BSC110N15NS5
- 8x ISC031N08NM6
- 5x 2EDF7275K

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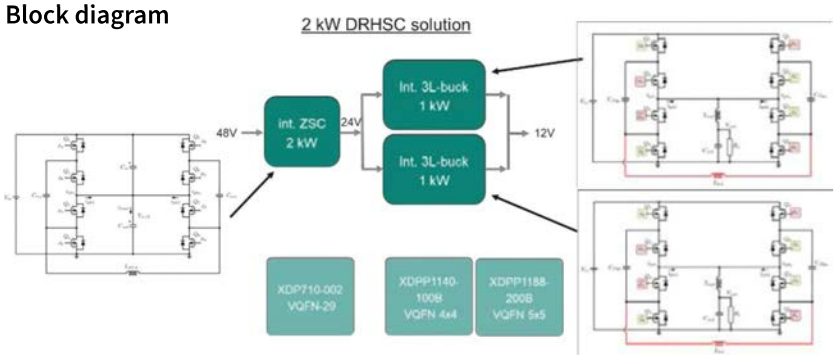
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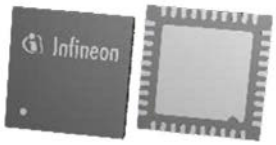
XDPP1188* digital power controller

The smallest DPC with 8 DPWM outputs and PMBus™ interface

The XDPP1188 is the new member of Infineon's feature-rich Digital Power Controller XDPP11xx product family ideal for isolated and non-isolated modern high-density, high-power systems deployed in AI servers, 48 V server motherboards, telecom infrastructure, and industrial 4.0 applications. It combines many features of XDPP1148, such as a low-latency state machine-based digital control loop with associated firmware, a high-performance AFE for current and voltage sensing and feedback, a Power Management Bus (PMBus™1.3) interface for system communication, and an Arm® Cortex®-M0 sub-system for housekeeping integrated in a single chip. The built-in non-volatile memory provides extensive programming and customization of functions such as frequency dithering, GPIO signal timing, non-linear transient suppression schemes, soft start timing and sequencing, and feature-rich protection response. Specifically, XDPP1188 is offered in a 5x5 mm² 40-pin VQFN package with a 0.4 mm pitch. It incorporates one 4-channel general purpose ADC, two voltage ADCs and two current ADCs, making it ideal for complex applications requiring comprehensive control capability. Furthermore, 8 DPWM outputs are provided to support up to 2-phase power conversion and enable system designers to implement a wide range of power conversion topologies and configurations with a single DPC. XDPP1188 is designed to deliver excellent digital control for resonant LLC topologies, including half-bridge (HB) LLC, full-bridge (FB) LLC, and phase-shift full-bridge (PSFB) LLC. It also supports all the major fixed frequency topologies such as pulse width modulation (PWM) HB, PWM FB, PWM PSFB, active clamp forward (ACF), non-isolated Buck, Boost, and Buck-boost as well as the interleaved operation of Buck, Boost, and Buck-Boost.

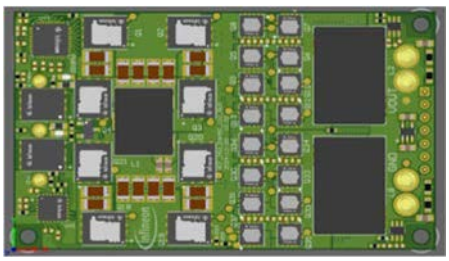
Block diagram





Features and benefits

Key features	Key benefits
– High-performance (100 MHz) current and voltage ADCs	– Allows FW based customization
– Up to 8 high-resolution PWM outputs	– Accurate V/I/Temperature monitoring
– Frequency modulation and pulse-width modulation	– Pre-programmed control providing fast time-to-market
– Hardware-based feed-forward	– Pre-bias startup with SR or DE mode
– Current sense with high tracking slew rate	– Compliance with industry standards
– Fast GPIO input	



Reference design REF_2kW_DRHSC_12V *

Infineon 48 V to 12 V 2 kW DR-HSC reference design

- 1x XDPP1188-200B
- 1x XDPP1140-100B
- 24x 1EDN7550U
- 8x BSC007N04LS6
- 16x IQE006NE2LM5

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*Coming soon

Digital power controller portfolio

Product Feature	XDPP1100-Q024	XDPP1100-Q040	XDPP1140-100B	XDPP1148-100B	XDPP1188-200B *
Arm®-M0 core processor	100 MHz	100 MHz	100 MHz	100 MHz	100 MHz
High-resolution DPWM outputs (78.125ps resolution)	6	12	6	6	8
Number of high-speed independent feedback rails	1	2	1	1	1
Number of voltage sense ADC	2	3	2	1	2
Number of current sense ADC	1	2	1	2	2
General purpose ADC channels	4	6	4	4	4
OTP	64 kB	64 kB	64 kB	64 kB	64 kB
RAM	32 kB	32 kB	32 kB	32 kB	32 kB
ROM	80 kB	80 kB	80 kB	80 kB	80 kB
DPWM switching frequency	Up to 2 MHz	Up to 2 MHz	Up to 2 MHz	Up to 2 MHz	Up to 2 MHz
Secondary serial bus (I^2C M/S)	-	✓	-		
SPI Serial bus	-	-	✓	✓	✓
UART	✓	✓	✓	✓	✓
PMBus	✓	✓	✓	✓	✓
Watchdog	✓	✓	✓	✓	✓
On chip oscillator	✓	✓	✓	✓	✓
Sync in and sync out functions	✓	✓	✓	✓	✓
Temperature sense inputs	1	2	1	1	1
Enable inputs	1	2	1	1	1
Power good outputs	1	2	1	1	1
Total GPIO (General purpose I/O pins)	11	16	11	11	13
Package offering	VQFN-24 (4x4 mm^2)	VQFN-40 (6x6 mm^2)	VQFN-24 (4x4 mm^2)	VQFN-24 (4x4 mm^2)	VQFN-40 (5x5 mm^2)
Number of ramps	2	2	2+1	2+1	2+1
Topology					
HB/CT; HB/FB	✓	✓	✓	✓	✓
FB/CT; FB/FB (VMC with Flux balance)	✓	✓	✓	✓	✓
FB/CT; FB/FB (PCMC)		✓		✓	✓
ACF	✓	✓	✓	✓	✓
PSM-FB/CT; PSM-FB/FB	✓	✓	✓	✓	✓
LLC-HB; LLC-FB; LLC-PSFB; secondary CT or FB			✓	✓	✓
Buck	✓	✓	✓	✓	✓
Buck-Boost	✓	✓	✓	✓	✓
Boost	✓	✓	✓	✓	✓
Interleaved Buck		✓		✓	✓
Interleaved Buck-Boost		✓		✓	✓
Interleaved Boost		✓		✓	✓
Interleaved PSM-FB/CT; PSM-FB/FB		✓			
Interleaved FB/FB; HB/CT; HB/FB; FB/CT		✓			✓
Interleaved ACF		✓		✓	✓
Dual loop (single phase of each loop)		✓			
Interleaved Buck + open loop converter		✓		✓	✓
Interleaved 3-level Buck + open loop converter				✓	✓

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Boards and designs

Product Feature	XDPP1100-Q024	XDPP1148-100B	XDPP1188-200B *
Reference designs	VD_1000W_GAN_PSFB_XDP	XDPP1100-Q040 IFX1117ME 2EDS8265H 2EDN7524G ICE5GR2280AG BSC028N06NS	– Power supply – Telecom
	REF_IBC_1600W_GAN	IGC033S10S1 XDPP1148-100B 1EDN7136U TLS202B1MBV33	– 48 V power distribution – Data center and computing solutions – DC-DC power conversion for telecom infrastructure – Server power supplies
	REF_LLC_500W_FULLGAN	1EDN7136U 2EDS8265H IGC033S101 IGLD65R110D2 XDPP1148-100B	– Complete system solutions for smart TVs
	REF_1100W_4TO1_ZSC_QB	BSZ011NE2LS5I IPT013N08NM5LF IQE013N04LM6 XDPP1100-Q024	– 48 V power distribution – Data center and computing solutions – Voltage regulation solutions for AI accelerator card – ZSC topology
	REF_1KW_LLC_12V	ISC031N08NM6 IQE006NE2LM5 2EDL8034-G3C 2DIB0401F XDPP1100-Q024	– 48 V power distribution – DC-DC power conversion for telecom infrastructure
	REF_500W_HSC_6V	2EDF7275K 2EDN7524G BSZ040N06LS5 BSZ070N08LS5 IQE006NE2LM5 XDPP1100-Q024	– 48 V power distribution for data center and AI
	REF_600W_DRHSC_XDP	IPT012N08N5 IQE013N04LM6 BSZ011NE2LS5I 1EDN7550B XDP710-002 XDPP1100-Q024	– 48 V power distribution – DC-DC power conversion for telecom infrastructure
	REF_780W_IBB_XDPP1100	2EDF7275K BSC110N15NS5 BSZ300N15NS5 XDPP1100-Q040	– DC-DC power conversion for telecom infrastructure
	REF_2200W_DRHSC_XDP	IPT010N08NM5 BSC005N03LS5I BSC007N04LS6 1EDN7550B XDP710-002 XDPP1100-Q040 XMC1302-Q024X0064 AB	– 48 V power distribution
	REF_750W_FBFB_50V	ISC031N08NM6 BSC110N15NS5 2EDF7275K XDPP1100-Q024	– DC-DC power conversion for telecom infrastructure – Power conversion
	REF_600W_FBFB_XDPP1100	XDPP1100-Q040 BSC050N10NS5 BSC010N04LS6 2EDF7275K	– Isolated DC-DC brick module – Telecom infrastructure – Server motherboard – 48 V computing and datacenter SMPS – Industrial 4.0
	REF_2kW_DRHSC_12V *	XDPP1188-200B XDPP1140-100B 1EDN7550U BSC007N04LS6 IQE006NE2LM5	– AI server – Data center
Evaluation boards	EVAL_XDPP1100_Q024_DB	XDPP1100-Q024	– SMPS (switch mode power supply) – Telecom – Server
	EVAL_XDPP1100_Q040_DB	XDPP1100-Q040	– SMPS (switch mode power supply)
	EVAL_600W_FBFB_XDPP	2EDL8024G 2EDL8124G BSC010N04LS6 BSC050N10NS5 EVAL_XDPP1100_Q024_DB	– SMPS (switch mode power supply) – Telecom – Server
	EVAL_XDPP1140_FBFB_50V	XDPP1140-100B BSC110N15NS5 ISC031N08NM6 2EDF7275K	– 48 V power distribution – DC-DC power conversion for telecom infrastructure
	EVAL_XDPP1140_1148_DB	XDPP1140-100B	– 48 V power distribution – DC-DC power conversion for telecom infrastructure

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Share your feedback

Protection and monitoring IC

XDP™ hot-swap controller and monitoring ICs with PMBus 1.3 interface

Infineon's XDP™ XDP7xx family is the industry's first wide input voltage range digital hot-swap and system monitoring controller IC family for positive and negative rails designed to meet the reliability and high availability requirements of pluggable Artificial Intelligence (AI) accelerator cards and baseboards (XDP710-002, XDP711-001*) as well as a spectrum of telecom applications including remote radio head power, base station power distribution, and live and passive antenna systems of 5G and telecom UPS (XDP700-002). The XDP7xx family employs a three-block architecture that combines high-precision telemetry for monitoring and fault detection, digital SOA control optimized for power MOSFETs, and integrated gate drivers for n-channel power MOSFETs. The advanced closed-loop SOA control and the fully digital operating mode of XDP7xx result in lower bill-of-material (BOM) costs due to a minimized number of external components required and a reduced design time, allowing faster time-to-market. XDP7xx can also support legacy systems in Analog-Assisted Digital Mode.

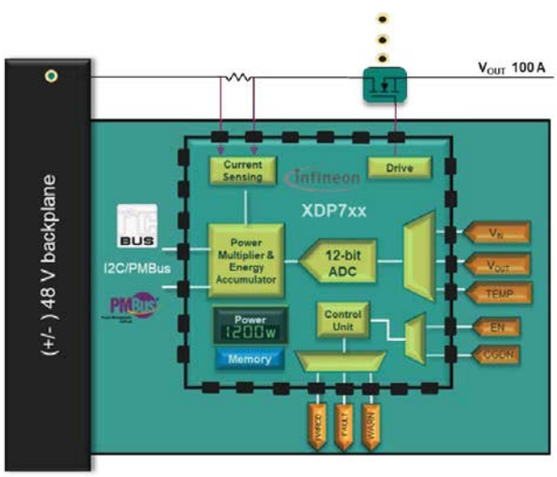
Infineon will introduce a family of eFuses optimized for AI server applications, utilizing the XDP7xx controller core and SFET8 in a single package. For further information, contact marketing.

XDP™ XDM700-001* is Infineon's first digital V/I/P/E/T monitoring IC that can be used for multiple applications, such as servers and data centers, ± 48 V DC-DC telecom infrastructure, power distribution systems, network routers and switches, power supplies and test equipment. With its wide operating input voltage range of up to 80 V and its small 4x4 mm^2 VQFN-24 package, it provides reliable and highly accurate telemetry of voltage, current, power, temperature, and energy via I^2C following the PMBus 1.3 protocol. Warning signals alert the system to potential fault events about to occur.

Features and benefits

Key features	Key benefits
– Wide input voltage range of 5 to 80 V	– Reduced external components and system BOM
– Digital configuration and analog-assisted mode	– Increased system reliability, performance, and flexibility
– Analog current (IMON) and power (PMON) monitoring pin	– Robust design due to extensive protection features
– Telemetry with PMBus 1.3 interface at 1 MHz	– Supports legacy systems; external MOSFET selection using resistor strapping
– Multiple SOA configuration profiles in NVM	– Reduced design time and improved time-to-market

Application diagram



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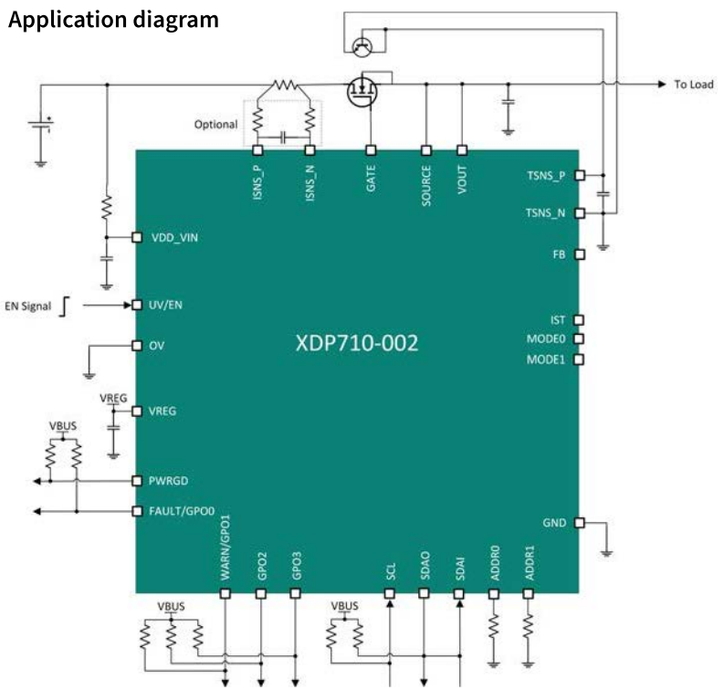
* Coming soon, for more information contact product support

XDP710-002 hot swap for data center

5.5 to 80 V input range with a programmable digital SOA Control

The XDP™ XDP710-002 is the next generation IC of XDP710-001 industry's first wide input voltage hot swap and system monitoring Controller IC with digital SOA control with improvements and enhancement to meet the high-availability and protection requirements of AI Servers while maintaining backward compatibility. A detailed list of feature enhancements and improvements is provided in its datasheet. XDP710-002 drives single or multiple parallel N-Channel MOSFETs. In addition to a controlled turn ON, continuous system health monitoring such as OCP, OVP, UVLO, and communication to the main MCU via PMBus interface. The high-speed communication through PMBus allows system designers to disable the downstream sub-systems fully or partially. XDP710-002 incorporates a wide variety of system protections for safety operations and generates various protection responses depending on the severity of the incidents. Latch-off and auto-retry are some examples of response types. Its SOA protection effectively ensures that the system FET always operates under safe conditions. Additional features of XDP710-002 are fast shut-down in catastrophic failures and onboard non-volatile memory, making multi-level system configuration possible.

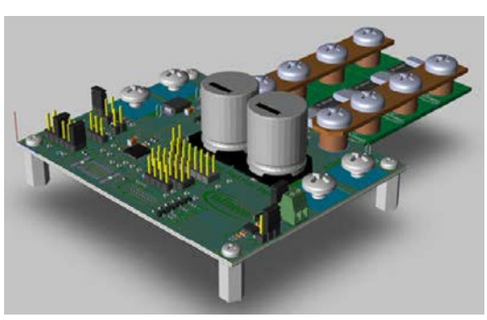
Application diagram





Features and benefits

Key features	Key benefits
– Integrated gate driver: 0 to 250 µA	– Drives single or multiple parallel N-channel MOSFETs; Scalable designs
– Dedicated high-precision 12-bit current and voltage ADCs	– Active monitoring: V ≤ 0.4%, I ≤ 0.75%, P ≤ 1.15%, E ≤ 5%
– Programmable two-step gate shutdown: ~1.5 A (typ.)	– Fast shutdown of <1 µs in catastrophic events
– Non-volatile OTP memory	– Multi-configuration allows multi-platform design
– Telemetry with I²C, PMBus Interface: 1 MHz	– Dynamic configuration of fault and warnings, remote load and power monitoring and diagnostics
– Programmable and pre-set FET active SOA protection	– Pre-configured SOA profiles of Infineon's OptiMOS™ and OptiMOS™ Linear FET families reduce design time



XDP710-002 evaluation board IPT015N10N5

- Server and data center
- 24-48 V industrial systems
- Power distribution systems
- Intelligent e-fuse
- Network router and switches

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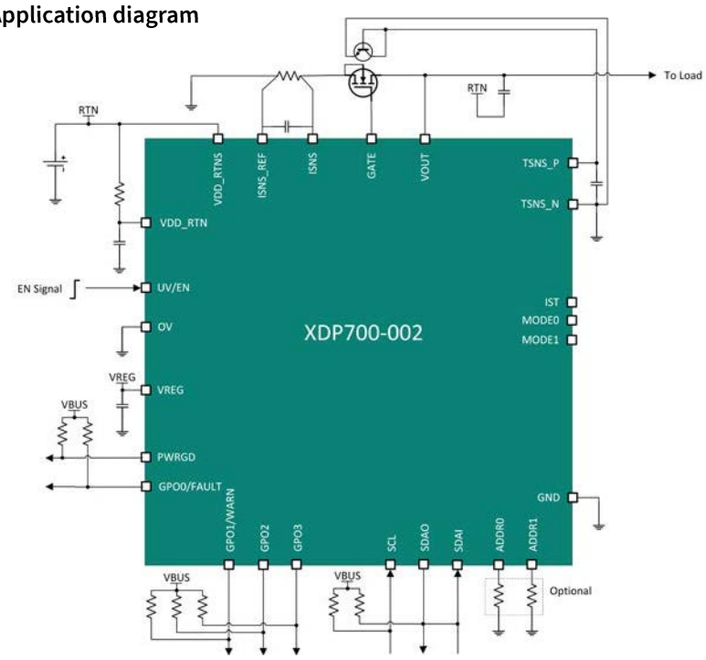
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XDP700-002 hot swap for telecom

Industry's first -6.5 to -80 V input range with a programmable digital SOA

The XDP™ XDP700-002 is a new member of the XDP™ XDP7x0 family and is the industry's first wide voltage range hot-swap controller with a programmable digital SOA control ideal for -48 V pre-isolated DC-DC telecom infrastructure, network routers, switches, or applications requiring -24 V/-48 V input voltage support. XDP700-002 drives single or multiple parallel N-Channel MOSFETs. In addition to a controlled turn ON, XDP700 provides continuous system health monitoring such as OCP, OVP, UVLO, and communication to the main MCU via the PMBus interface. The high-speed communication through PMBus allows system designers to disable the downstream sub-systems fully or partially. XDP700-002 incorporates an extensive variety of system protections for safety operations and generates various protection responses depending on the severity of the incident. Latch-off and auto-retry are some examples of response types. Its SOA protection effectively ensures that the system FET always operates under safe conditions. Additional features of XDP700-002 are fast shutdown in catastrophic failures and onboard non-volatile memory, making multi-level system configuration possible.

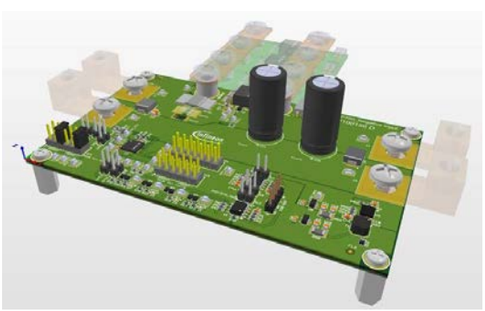
Application diagram





Features and benefits

Key features	Key benefits
– Integrated gate driver: 0 to 250 µA	– Drives single or multiple parallel N-channel MOSFETs; Scalable designs
– Dedicated high-precision 12-bit current and voltage ADCs	– Active monitoring: V ≤ 0.4%, I ≤ 0.75%, P ≤ 1.15%, E ≤ 5%
– Programmable two-step gate shutdown: ~1.5 A (typ.)	– Fast shutdown of <1 µs in catastrophic events
– Non-volatile OTP memory	– Multi-configuration allows multi-platform design
– Telemetry with I²C, PMBus Interface: 1 MHz	– Dynamic configuration of fault and warnings, remote load and power monitoring and diagnostics
– Programmable and pre-set FET active SOA protection	– Pre-configured SOA profiles of Infineon's OptiMOS™ and OptiMOS™ Linear FET families reduce design time



XDP700-002 evaluation board IPB017N10N5

- -48 V pre-isolated DC-DC telecom infrastructure
- -24 V/-48 V industrial systems
- Power distribution systems
- Intelligent e-fuse
- Network router and switches

Telecom Server Router

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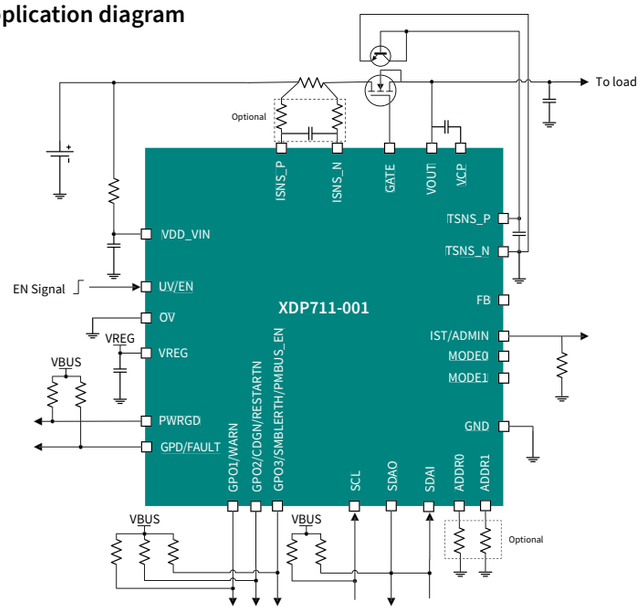
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XDP711-001* hot swap for data center

Wide input voltage range and a programmable digital SOA control

XDP™ XDP711-001 is the new member of Infineon's wide input voltage range hot swap and system monitoring controller IC with programmable digital SOA control with added features over XDP710-002, which includes enhanced input voltage surge immunity, IMON, and extended 40-bit energy readings. It meets the high availability and protection requirements of AI servers while maintaining backward compatibility with its predecessor. XDP711-001 drives single or multiple parallel N-Channel MOSFETs. It enables a controlled turn-on, continuous system and FET health monitoring such as OCP, OVP, UVLO, and high-speed communication to the main MCU via PMBus interface, which allows system designers to disable the downstream sub-systems fully or partially. The pulsed SOA current control technology feature allows safer turn-on of field-effect transistors (FETs) in systems with non-optimal SOA for a lower system BOM cost where multiple MOSFETs in parallel are used supporting high-power designs, which is becoming a key requirement for AI Servers. XDP711-001 incorporates a variety of system protection features for a safe operation and generates various protection responses depending on the severity of the incidents. Latch-off and auto-retry are some examples of response types. Its SOA protection effectively ensures that the system FET always operates under safe conditions. Additional features are a fast shut-down in catastrophic failures and onboard non-volatile memory, making multi-level system configuration possible.

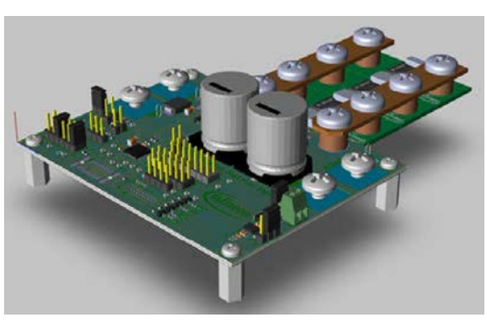
Application diagram





Features and benefits

Key features	Key benefits
– Wide input voltage range: 7 to 80 V	– Increased system reliability and performance due to <1% telemetry accuracy
– Input voltage Surge Immunity (Gate boost for fast recovery)	– Cost effective, easy and flexible to design with minimum external components
– 12-bit dedicated high-precision current and voltage ADCs: V ≤ 0.4%, I ≤ 0.75%	– Robust design with fault flag for fast interruption of board controller
– Programmable and pre-set FET SOA profiles	– System scalability enabled through capability to drive multiple parallel FETs
– Analog current and power reporting at AMON pin	– Programmability of configuration on non-volatile memory
– FET fault (VDS) detection before FET's start-up	– Small footprint



Evaluation board EVAL_XDP711-001*

The modular Eval Board EVAL_XDP711-001 features XDP711-001 hot-swap controller to evaluate operation for various design scenarios. In conjunction with EVAL_XDP7xx_FET_BD_X, it allows for testing FET footprints with the option to parallel them for high power.

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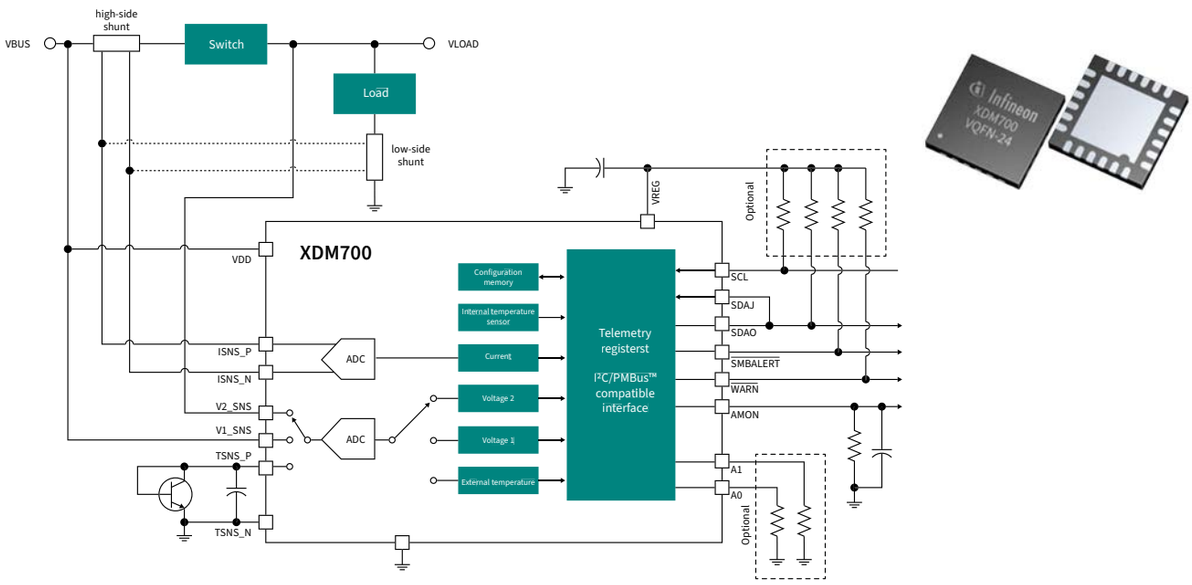
* Coming soon

XDM700-001* V/I Monitor

Wide input voltage range and PMBus 1.3 interface

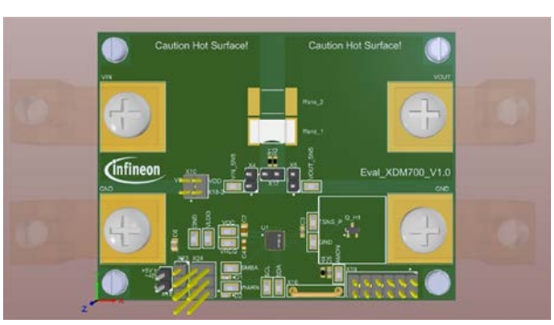
XDP™ XDM700-001 is Infineon's first high-side or low-side current sensing and system monitoring IC with a wide input voltage range of up to 80 V. In addition to current sensing, XDM700-001 provides continuous monitoring of input voltage, input power, output voltage, on-chip and external temperature using a dedicated 12-bit ADC. Its 4-level programmable current sense range and the 12-bit current ADC provide up to one percent accuracy for current measurements. The analog current or power can be reported at the AMON pin for post-processing. Furthermore, the in-built power accumulator ensures reliable energy monitoring and reporting over time. XDM700-001 incorporates several warnings for a safe operation and generates various protection responses through WARN and SMBALERT outputs. A 5 V internal voltage regulator can be used for low-power peripheral circuitry. Compliance with industry standards is guaranteed due to its PMBus 1.3 interface with up to 1 MHz and at least 16 unique programmable device addresses, thus enabling high-speed communication. Overall, XDM700-001 is the ideal monitoring IC targeting a broad range of applications such as servers and data centers, ±48 V_{DC}-DC telecom infrastructure, power distribution systems, power supplies, network routers and switches.

Block diagram



Features and benefits

Key features	Key benefits
– Wide input voltage range: 5.5 to 80 V	– Optimized system performance due to accurate real-time monitoring
– High-side or low-side current sensing, voltage sensing from 0 to 80 V	– Early fault detection and high-accuracy monitoring improve system reliability
– 12-bit dedicated high-precision current and voltage ADCs	– Increased flexibility and easy-to-integrate with high-speed systems
– 4-level programmable current sense differential range (12.5/25/50/100 mV)	– Small footprint
– Analog current and power monitor pin (AMON)	– Compliance with industry standards
– Precision monitoring and reporting: V≤0.4%/I≤1.0%/P≤1.5%/E≤3.0%	



Evaluation board EVAL_XDM700-001*

The modular Eval Board EVAL_XDM700-001 features V/I Monitor XDM700-001 to evaluate and monitor voltage, current, and external temperature channels and provides telemetry data via PMBus. The current shunts can be modified according to the application, and they can be sensed on either the high or low side of the input or output.

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Hot-swap controller and monitoring IC portfolio

Product family	Product name	Package	Product MOSFET technlogy and voltage class
Positive rail	XDP™ XDP711-001*	29-lead 6 x 6 mm² VQFN package	OptiMOS™ 100 V, 80 V LinearFET 100 V, 80 V
	XDP™ XDP710-002	29-lead 6 x 6 mm² VQFN package	
Negative rail	XDP™ XDP700-002	29-lead 6 x 6 mm² VQFN package	

Monitoring IC

Product family	Product name	Package	Product MOSFET technlogy and voltage class
V/I Monitor	XDP™ XDM700-001*	24-lead 4 x 4mm2 VQFN package	

eFuse*

Product family	Product name	Package	Product MOSFET technlogy and voltage class
Positive rail	XDP™ XDP7xx (contact marketing)		

Boards

Board type	Board name	Components	Potential applications
Evaluation boards	EVAL_XDP711-001*	– XDP711-001 – IPM018N10NM5LF2 – 2N7002 – BSR315P	– Servers and data centers – AI, ML, GPU accelerator cards – Power distribution systems – Intelligent e-fuses – 24-48 V industrial systems – Robotics
	PRG_XDP711_BRD*	– XDP711-001	– Offline programming of up to 4x parts simultaneously
	EVAL_XDM700-001*	– XDM700-001	– Servers and data centers – AI, ML, GPU accelerator cards – 24-48 V industrial systems – Switches and routers
	EVAL_XDP710_V2	– XDP710-002 – IPT017N10NM5LF2 – 2N7002 – BSR315P	– AI, ML, GPU accelerator cards – Power distribution systems – Servers – Switch mode power supply (SMPS) – Telecom
	EVAL_XDP700	– XDP700-002 – 2DIB1410F – BSR315P H6327 – IPB017N10N5LF	– Telecom – Power distribution systems – Switch mode power supply (SMPS)
	PRG_XDP700_BRD	– XDP700-002 – PSOC 6	– 48 V power distribution – Data center and computing solutions – DC-DC power conversion for telecom infrastructure
MOSFET boards	EVAL_XDP7xx_FET_BD_PG-HSOF-8-1*	Evaluating up to 8x TOLL FETs in parallel Example: IPT017N10NM5LF2, IPT023N10NM5LF2	
	EVAL_XDP7xx_FET_BD_TDSON-8-1*	Evaluating up to 12x Super SO8 FETs in parallel Example: ISC035N10NM5LF2	
	EVAL_XDP7xx_FET_BD_HSOF-4*	Evaluating up to 8x mTOLL FETs in parallel Example: IPM018N10NM5LF2	
	EVAL_XDP7xx_FET_BD_D2PAK-7*	Evaluating up to 8x D²PAK-7 FETs in parallel Example: IPF018N10NM5LF2	
	EVAL_XDP7xx_FET_BD_D2PAK-3*	Evaluating up to 8x D²PAK-3 FETs in parallel Example: IPB021N10NM5LF2	
	EVAL_XDP7xx_FET_BD*	Evaluating different FET footprints like Super SO8, TOLL, D²PAK-7, TOLT	

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Integrated POL voltage regulators

Highest density high efficiency integrated POL (IPOL) for smart enterprise systems

Infineon's integrated POL switching converters deliver benchmark efficiency and dramatically reduce system size. Solutions up to 40 A are available in compact PQFN packages. Target applications include servers, AI, storage, routers and switches, telecom base stations, digital home media, mobile computing, and embedded data processing. PMBus digital communication is available in a single output format.

Point-of-load products – how to choose

DC-DC products
1 to 35 A

PMBus digital IPOL

IPOL with digital interface

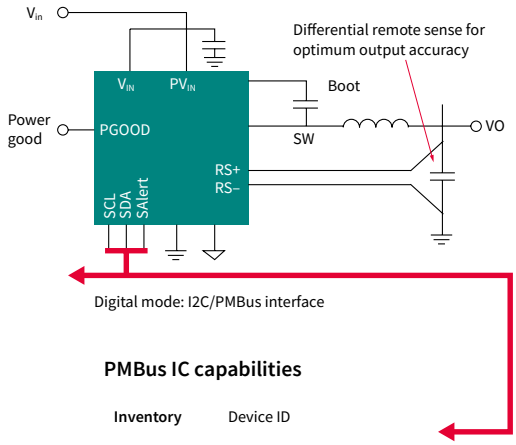
- Telemetry
- Margining
- Intel SVID support

- TDA387xx: 40 A/25 A PMBus
- TDA3864x: 40 A with PMBus and Intel SVID
- IR3806x: 6-35 A with PMBus
- IRPS5401M: PMBus I²C

Analog POL

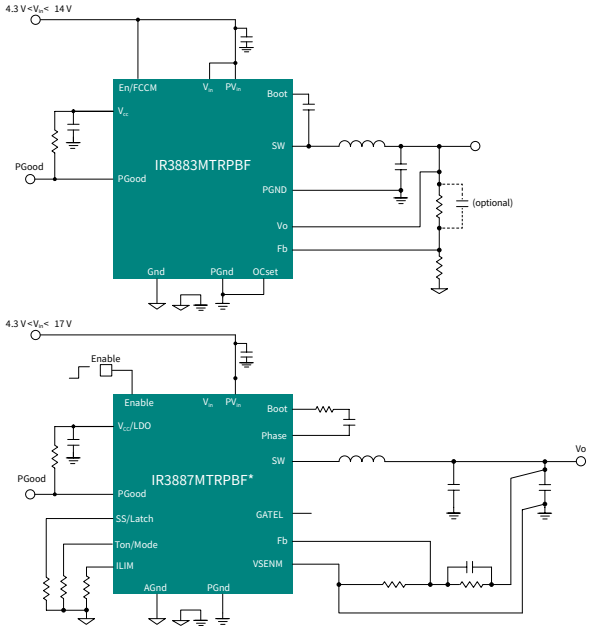
Ease of use/light-load efficiency

- IR3883MTRPBF, IR3823AMTRPBF (3 A)
- IR3888BMTRPBF (16 A)
- IR3888AMTRPBF (20 A)
- IR3888MTRPBF, IR3447AMTRPBF (25 A),
- IR3889MTRPBF, IR3887MTRPBF (30 A)
- IR3846AMTRPBF (40 A)
- TDA38825/6 (20 A)
- TDA38827 (25 A)
- TDA38812/3 (12 A)
- TDA38540 (40 A, stackable)
- TDA38806/7 (6 A)
- TDA38840 (40 A)
- TDA38820 (20 A)



PMBus IC capabilities

Inventory	Device ID
Configuration	On/off configuration fault/warnings
Control	Sequencing delay/ramp fault response
Telemetry	V_{out}, I_{out}, power temperature, peak values
Status	Comms, data, temps



Ready-to-go reference designs and the online PowerDesk simulator simplify the task of designing regulated voltage rails. Different control topologies are available to meet an application's specific requirements.

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Digital IPOL voltage regulators

For the next generation of computing applications

The digital interface IPOL devices are easy-to-use, fully integrated, and highly efficient DC-DC regulators offering I²C/PMBus and Intel SVID. The on-board PWM controller and MOSFETs make the family a space-efficient solution, providing accurate power delivery for low output voltage and high current applications.

The latest generation of digital POL regulators, TDA3864X/TDA387XX, use Best-in-class OptiMOS™ FETs with integrated bootstrap diode providing high-efficiency power delivery. Furthermore, it uses a fast Constant-on-time (COT) control scheme, simplifying design efforts and achieving fast transient response.

TDA3864X/TDA387XX supports wide input and output voltage ranges, offering programmable switching frequencies from 400 kHz to 2 MHz. The programmable DC load line feature provides an additional tool for managing the transient response.

Features and benefits

Key features	Key benefits
– OptiMOS™ MOSFET	– Best-in-class efficiency and thermals
– PMBus 1.3 compliance	– Comprehensive telemetry features
– Proprietary Fast COT Architecture	– Improved transient response
– Digitally programmable loadline	– Voltage setting and margining
– Comprehensive protection features	– Stable and reliable design
– No external compensation	– Minimizes passives and component count

Digital interface IPOL

Part number	Max. current [A]	Package size [mm]	Max. V_{in} [V]	Max. f_{sw} [kHz]	Distinctive features
IR38060M	6	5 x 6	16	1500	PMBus
IR38062M	15	5 x 7	21	1500	
IR38063M	25	5 x 7	21	1500	
IR38064MTRPBF	35	5 x 7	21	1500	
IRPS5401M	4+4+2+2+0.5	7 x 7	14	1500	5 output PMIC, PMBus
TDA38640/A-0000	40	5 x 6	5	2000	OptiMOS™ 5, SVID
TDA38725/A-0000	25	5 x 6	16	2000	OptiMOS™ 5 + PMBus
TDA38740/A-0000	40	5 x 6	16	2000	OptiMOS™ 5 + PMBus
TDA38641/A-0000	40	5 x 6	16	2000	OptiMOS™ 5 + PMBus

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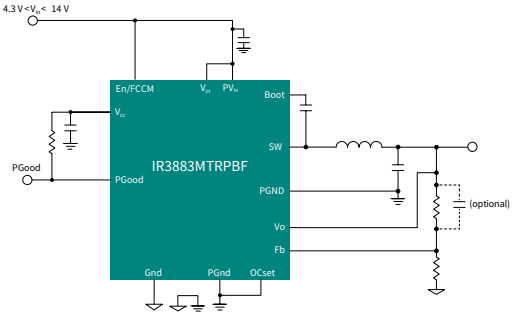
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Analog IPOL voltage regulators with fast COT

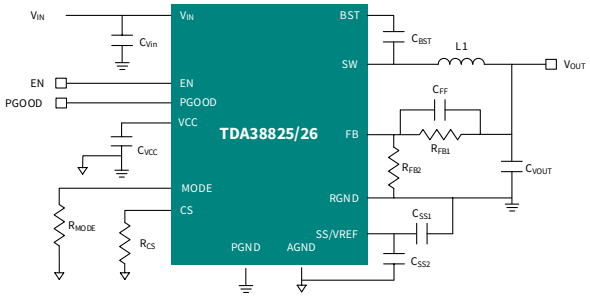
3 to 40 A-rated, easy-to-use with no external compensation and smallest BOM

A broad portfolio of analog voltage regulator products supports a wide range of computing application requirements. Featuring a proprietary fast COT architecture, these regulators enable ease of use and provide excellent transient response while minimizing passive count, creating a very compact and cost-effective solution. The devices increase efficiency and power density and simplify design for POL applications in servers, AI, enterprise storage, netcom routers and switches, datacom, and telecom base stations.

Block diagram IR3883M



Block diagram IR3887M (30 A)



Features and benefits

Key features	Key benefits
– Fast COT control engine	– Ease of use, improved transient response, optimized BOM, cost effective
– No external compensation	– Small solution size
– Feature rich: programmable Fsw, supports FCCM/DEM modes	– Stable with all ceramic caps, flexible design, and easy tuning
– Comprehensive protection features	– Enabling stable design and long term reliability
– Industry common footprints available	

Analog interface IPOL

Part number	Max. current [A]	Package size [mm]	Max. V_{in} [V]	Max. f_{sw} [kHz]	Distinctive features
IR3447AMTRPBF	25	5 x 6	17	600	Costant-on-time (COT)
IR3823AMTRPBF	3	3.5 x 3.5	17	2000	Costant-on-time (COT)
IR3846AMTRPBF	40	5 x 7	17	600	Costant-on-time (COT)
IR3883MTRPBF	3	3 x 3	14	800	Costant-on-time (COT)
IR3887MTRPBF	30	4 x 5	17	2000	Costant-on-time (COT)
IR3888MTRPBF	25	5 x 6	17	2000	Costant-on-time (COT)
IR3889MTRPBF	30	5 x 6	17	2000	Costant-on-time (COT)
IR3899AMTRPBF	9	4 x 5	17	2000	Costant-on-time (COT)
TDA38812	12	3 x 4	16	1000	
TDA38813	12	3 x 4	16	1000	
TDA38820	20	4 x 5	17	2000	Costant-on-time (COT)
TDA38825	20	3 x 4	16	1000	
TDA38826	20	3 x 4	16	1000	
TDA38827	25	5 x 6	17	2000	
TDA38840	40	5 x 6	17	2000	Costant-on-time (COT)
TDA38806	6	2 x 3	16	2000	
TDA38807	6	2 x 3	16	2000	

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DC-DC digital multiphase controllers

Point-of-load power management

Infineon's digital multiphase and multi-rail controllers provide power for today's medium- and high-current POL applications in telecom, datacom, server, and storage environments. The digital controller family enables OEMs and ODMs to improve efficiency and total cost of ownership while increasing power density and optimizing the total system footprint of the voltage regulator. The products highlighted in the table below represent our seventh-generation digital controller family and support up to two rails with 1-16 phases on individual rails. The I^2C/PMBus interface connects the digital controllers to the application system and provides real-time telemetry information, monitoring, and control capabilities. The digital controllers are fully configurable through our graphical user interfaces, enabling ease of use and simplified design optimization.

Feature controller family									
Configurable output rails		Dual rail	Dual rail	Dual rail	Dual rail	Dual rail	Dual rail	Dual rail	Dual rail
Part number	**PMBus**	XDPE15284D	XDPE152C4D	XDPE19283B	XDPE192C3B	XDPE19284C	XDPE192C4C	XDPE1A2G5B	XDPE132G5C
Phase configuration	**Main**	8 ph	12 ph	8 ph	12 ph	8 ph	12 ph	16 ph	16 ph
	Subconfigurations	N+M=8	N+M=12	N+M=8	N+M=12	N+M=8	N+M=12	N+M=16	8+8
Vout_max		3.3 V	3.3 V	3.3 V	3.3 V	3.3 V	3.3 V	3.3 V	3.3 V
Switching frequency		Up to 3 MHz	Up to 3 MHz	Up to 3 MHz	Up to 3 MHz	Up to 3 MHz	Up to 3 MHz	Up to 3 MHz	Up to 2 MHz
Operating temperature range		- 40°C to 85°C	- 40°C to 85°C	- 40°C to 85°C	- 40°C to 85°C	- 40°C to 85°C	- 40°C to 85°C	- 40°C to 85°C	- 40°C to 120°C
VQFN package		40-lead (5x5) 0.4 mm pitch	48-lead (6x6) 0.4 mm pitch	40-lead (5x5) 0.4 mm pitch	48-lead (6x6) 0.4 mm pitch	40-lead (5x5) 0.4 mm pitch	48-lead (6x6) 0.4 mm pitch	56-lead (7x7) 0.4 mm pitch	56-lead (7x7) 0.4 mm pitch
Typical application		Intel server, workstation, high-end desktop	Intel server, workstation, high-end desktop	AMD server, workstation, high-end desktop	AMD server, workstation, high-end desktop	Intel server, workstation, high-end desktop	Intel server, workstation, high-end desktop	GPU, ASIC, networking	AMD server, GPU, ASIC, networking

Advantages of a digital controller

The protection features include a set of sophisticated overvoltage, undervoltage, overtemperature, and overcurrent protection. Each controller in the table above also detects and protects against an open circuit on the remote sensing inputs. These attributes provide a complete and advanced protection feature for microprocessor, DSP, FPGA, or ASIC power systems. Accurate current sense telemetry is achieved through internal calibration that measures and corrects current sense offset error sources upon start-up.

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OptiMOS™ power stages

High current integrated power stages with current and temperature telemetry

Infineon's integrated OptiMOS™ power stage family contains a synchronous buck gate driver IC co-packed with control and synchronous MOSFETs and a Schottky diode to improve efficiency further. When layout guidelines are followed, the packages are optimized for PCB layout, heat transfer, driver/MOSFET control timing, and minimal switch node ringing. The paired gate driver and MOSFET combination enables higher efficiency at lower output voltages required by cutting-edge CPU, GPU, ASIC, and DDR memory designs. The integrated power stage's internal MOSFET current sense algorithm, with integrated temperature compensation, achieves superior current sense accuracy versus best-in-class controller-based inductor DCR sense methods. Switching frequency up to 1.5 MHz enables high-performance transient response and allows the miniaturization of output inductors and input and output capacitors while maintaining industry-leading efficiency. The integrated power stage family is optimized for GPU and CPU core power delivery in AI, server, cloud, and data center applications. The ability to meet the stringent requirements of the server market also makes them ideally suited for powering GPU, ASIC, DDR memory, and other high-current designs.

Features

- Integrated driver, Schottky diode, control MOSFET, and synchronous MOSFET
- 5 mV/A or 5 µA/A on-chip MOSFET current sensing with temperature-compensated reporting
- Input voltage (Vin) range of 4.5 to 15 V VCC and VDR V supply of 4.5 to 7 V
- Output voltage range from 0.25 up to 5.5 V
- Output current capability of 90 A
- Operation up to 2.0 MHz
- VCC under-voltage lockout (UVLO)
- 8 mV/°C temperature analog output and thermal flag pull-up to 3.3 V
- Overtemperature protection (OTP)
- Cycle-by-cycle self-preservation overcurrent protection (OCP)
- MOSFET phase fault detection and flag
- Preliminary overvoltage protection (pre-OVP)
- Compatible with 3.3 V tri-state PWM input
- Body-braking load transient support through PWM tri-state
- Diode emulation mode (DEM) for improved light-load efficiency
- Thermally enhanced packages

Part type	Package	Iout [A]	Vin [V]	Vout [V]	Switching frequency [MHz]
TDA21470	5x6 x 0.9 mm PQFN	70	4.5 to 15	0.25 to 5.5	1.0
TDA21490	5x6 x 0.9 mm PQFN	90	4.5 to 15	0.25 to 5.5	1.0
TDA21570	5x6 x 0.9 mm PQFN	70	4.5 to 15	0.25 to 5.5	1.2
TDA21590	5x6 x 0.9 mm PQFN	90	4.5 to 15	0.25 to 5.5	1.2
TDA21435	4x5 x 0.9 mm PQFN	35	4.5 to 15	0.25 to 5.5	1.2
TDA21550	4x5 x 0.9 mm PQFN	50	4.5 to 15	0.25 to 5.5	1.5
TDA22590	4x6 x 0.47 mm Chip Embedded	90	4.5 to 15	0.25 to 5.5	1.5

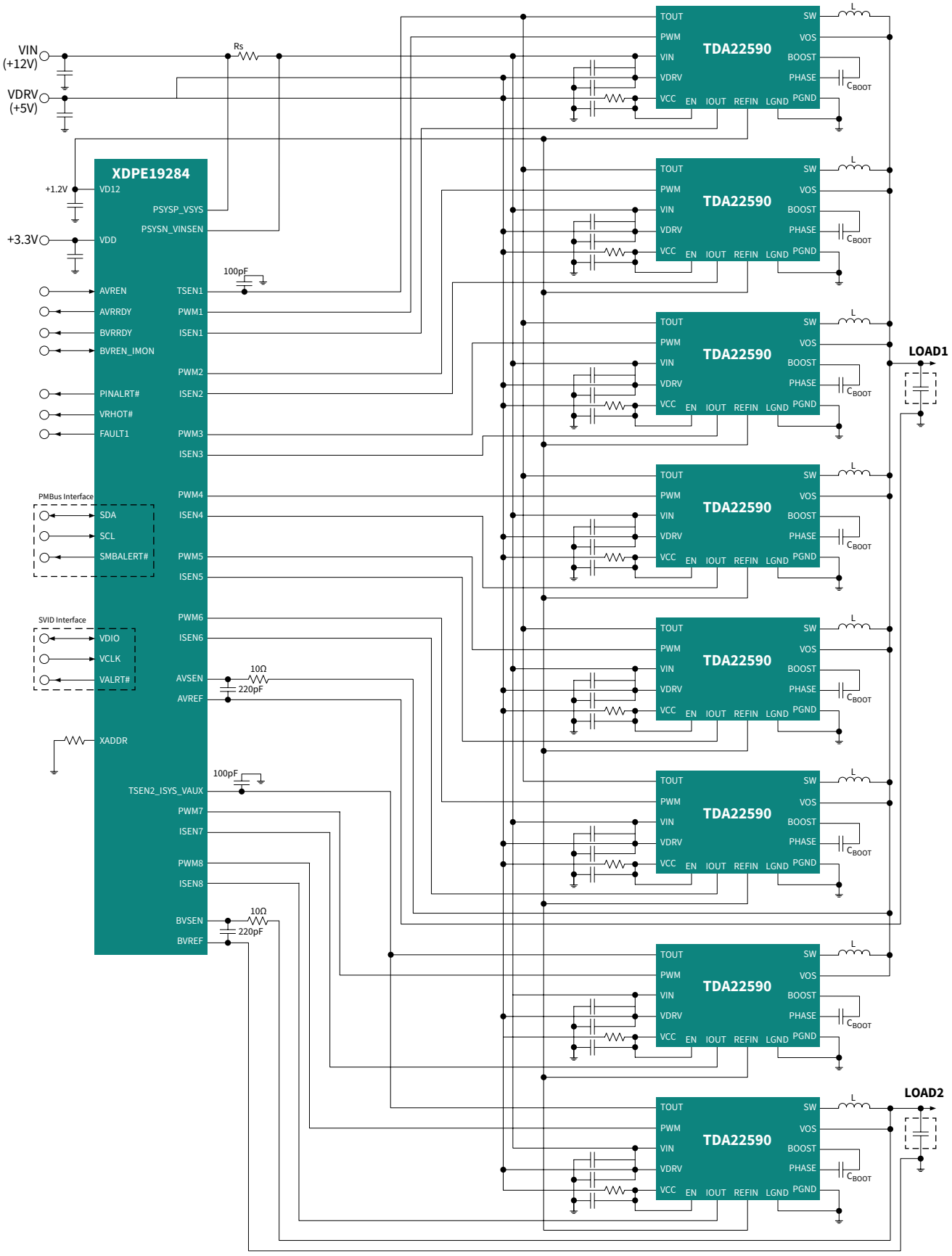
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Your input matters
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Typical multiphase application circuit



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Dual-phase power modules

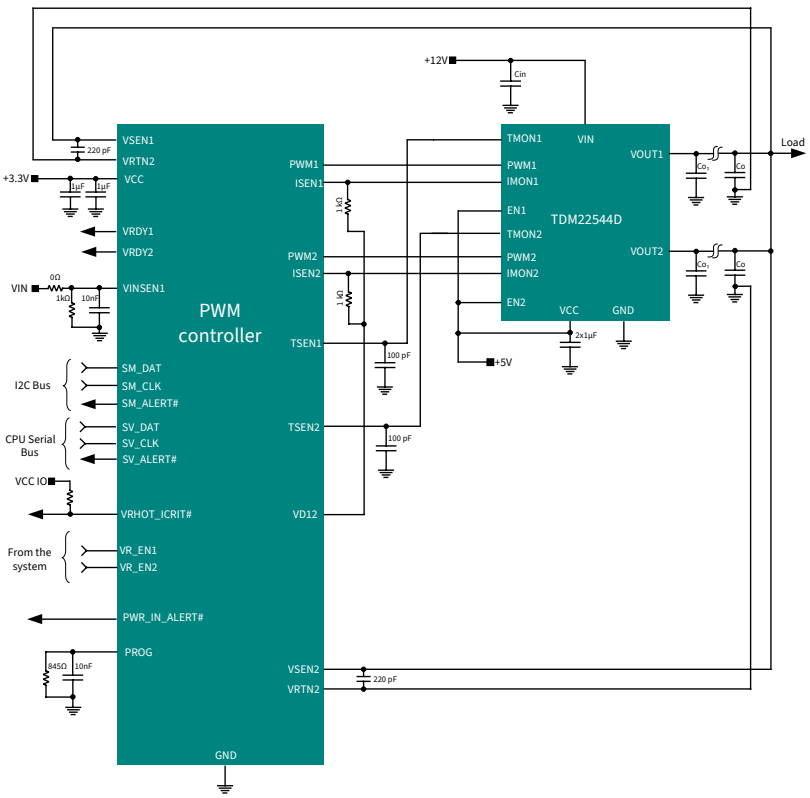
120-A OptiMOS™ TDM22544D and TDM22545D

Artificial intelligence is driving an exponential increase in global data generation and consequently increasing the energy demand of the chips that support this enormous data growth, now approaching a thermal design power of more than 1000 W. As AI servers require three times more energy than traditional servers, and as data centers are already consuming more than two percent of the global energy supply, it is essential to find innovative power solutions and architecture designs that can lead to a measurable impact on global energy savings, as well as better total cost of ownership for data centers.

To meet this demand, TDM2254xD dual-phase power modules offer a best-in-class power density and efficiency, contributing to a substantial decrease in the total cost of ownership of data centers and, hence, a greener AI.

Block diagram

Dual phase 120 A power stage module





Features and benefits

Key features	Key benefits
– 10x9x8 mm + 10x9x5 mm for 160 A peak	– High power density solution (>1A/mm²)
– +2% higher efficiency than competition at full load	– Best-in-class efficiency and TCO
– -5°C cooler than competition at full load	– Optimal thermal management
– Minimized PDN losses	– Enabling vertical power delivery
– 70 A per phase thermally managed	– Improved signal integrity

AI Artificial intelligence

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OptiMOS™ dual- and quad-phase power modules

Reducing the TCO of AI data centers

Data centers are experiencing unprecedented growth, primarily driven by increased investments in artificial intelligence (AI). Data centers are responsible for more than two percent of global energy consumption. The power demands within data centers, fueled by AI, are expected to grow by 165 percent between 2023 and 2030. Continually improving the efficiency and power densities of power conversion from grid to core is vital to enable further advancements in compute performance while reducing the total cost of ownership (TCO).

Infineon's answer to such demands is OptiMOS™ dual-phase power modules 160 A (TDM2354xD and TDM2354xT) and 140 A (TDM22545D and TDM22544D) and the latest OptiMOS™ quad-phase power module 280 A (TDM2454xx).

Please get in touch with your local sales representative for a complete datasheet and further information about this product family.

Features and benefits

Key features	Key benefits
– Switching frequency up to 2.0 MHz	– Infineon patented cool core magnetics + OptiMOS™ SPS, magnetic design and packaging technologies offer up to 6% more efficiency and 11°C lower temp than competitors core
– Integrated decoupling capacitors and inductors	– >100 psi enables good compression of TIM and high thermal coupling
– ±2% Output current telemetry	– Proprietary inductor designed to transfer current and heat efficiently
– Cycle-by-cycle overcurrent protection (OCP) and flag	– Simpler construction enables manufacturing at scale
– On-chip MOSFET current sensing and reporting at 5 µA/A	

Infineon is addressing the growing power demands of AI data centers with a complete portfolio of high-density power modules

TDM2254x
- Dual phase
- 9x10 mm
- 5/8 mm height
- 1.0 A/mm²



TDM2354x
- Dual phase
- 8x8 mm
- 4 mm height
- 1.6 A/mm²



TDM2454x
- Quad phase
- 10x9 mm
- 5 mm height
- 2.0 A/mm²



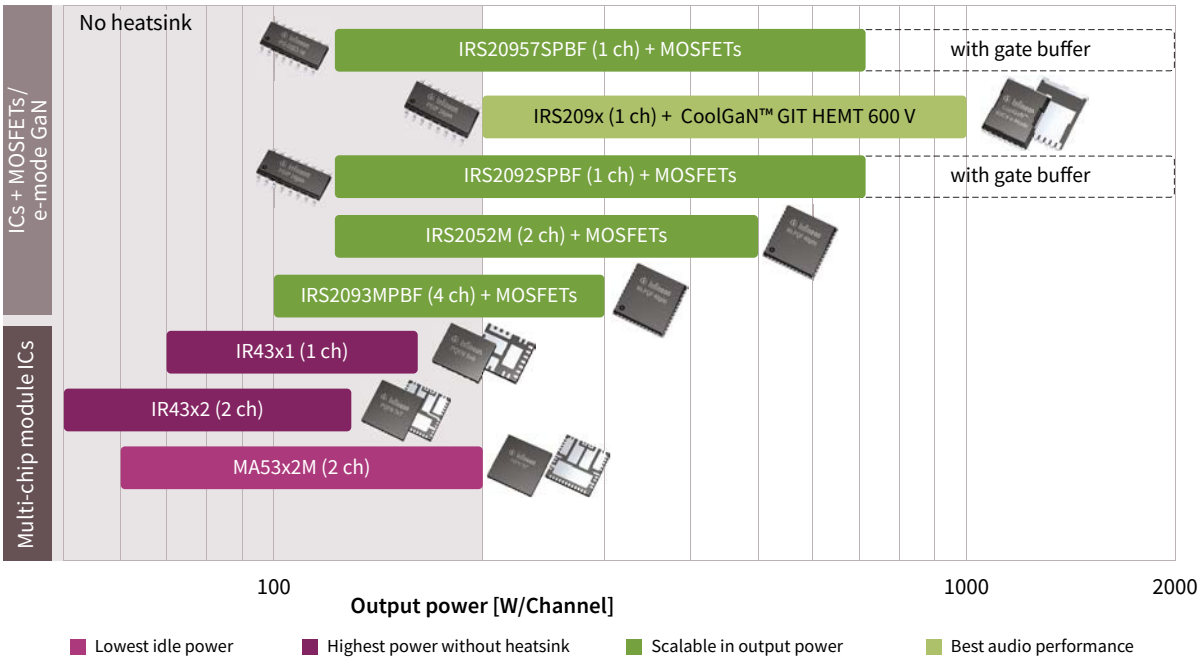
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Your input matters
Share your feedback

Integrated class D audio amplifier ICs

Cooler, smaller, and lighter class D audio amplifiers for great sounding products

Infineon's MERUS™ audio solutions enable audio designers to improve the performance of their products while increasing efficiency and reducing solution size. In combination with new innovative architectures, advances in semiconductor processes are behind a portfolio of class D technologies that allow professional, commercial/home, and portable audio applications to benefit from unparalleled performance, power density, and reliability. The broad portfolio covers power ranges from 100 W to 2 kW per channel, from the multi-chip modules (MCMs) to highly scalable discrete audio amplifier solutions consisting of powerful MOSFET/CoolGaN™ HEMT and driver ICs combinations.



By combining our core principles, competencies, and leadership in groundbreaking power semiconductors with revolutionary audio amplifier technologies, such as MERUS™, we provide smaller, lighter, more robust, and flexible solutions that run with less heat dissipation. In addition to outstanding quality and reliability, Infineon's amplifier solutions are designed to maximize power efficiency and dynamic range while providing best-in-class performance in product form factors that make them an optimal fit for any high-end application.

Design with Infineon's solutions to benefit from:

- Maximized power efficiency
- Maximized output power
- Design freedom
- Fast time-to-market

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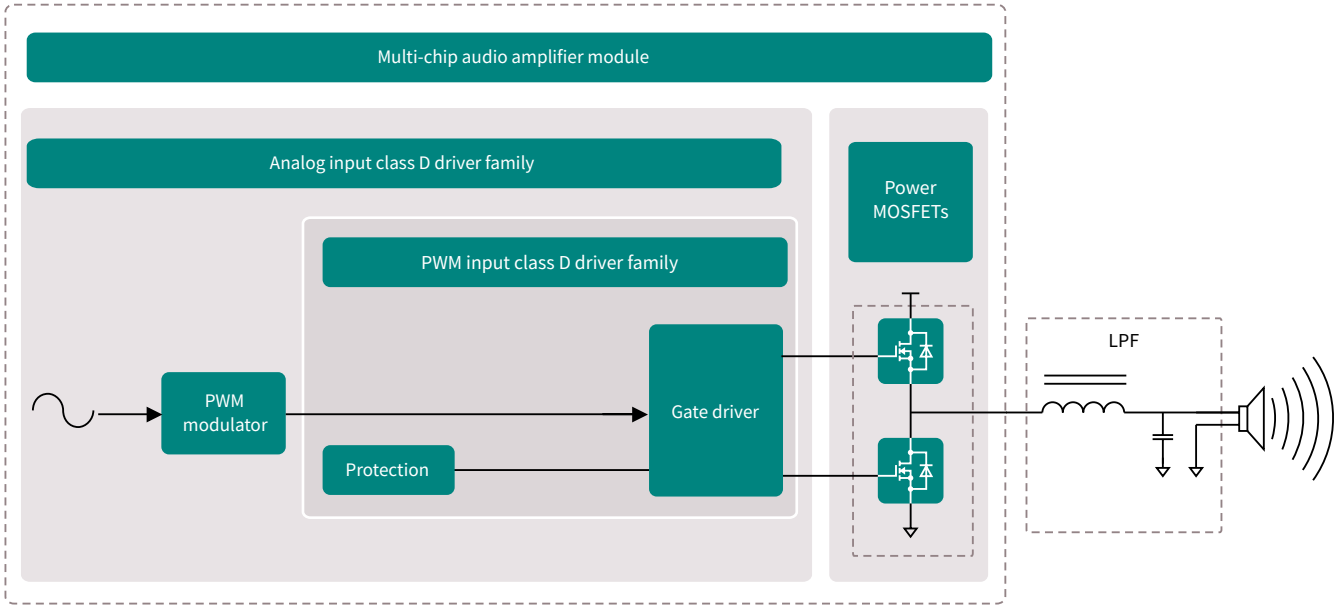
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MERUS™ integrated audio amplifier multi-chip modules (MCM)

Integrated components for scalable output power and superb audio performance

Multi-chip modules integrate PWM controller and power MOSFETs in a single package to offer a highly efficient, compact solution that reduces component count, shrinks PCB size up to 70 percent, and simplifies class D amplifier design.

Multi-chip audio amplifier module



Features and benefits

Key features
– Single package with integrated PWM controller and audio-performance-optimized power MOSFET
– Overcurrent protection
– Thermal shutdown
– Floating differential input
– Clip detection
– Best-in-class power efficiency and audio performance
– Lower component count, leading to design simplification
– Compatible with single supply or split rail configuration
– Click noise reduction

Key benefits
– Extended battery playback time
– Unrivaled audio performance
– Smaller solution size (BOM reduction, system level cost savings)
– Eliminated need for heatsink
– High noise immunity
– Reliable operation
– Thermal efficiency

Audio amplifier · Wireless audio · Audio · PoE · Audio

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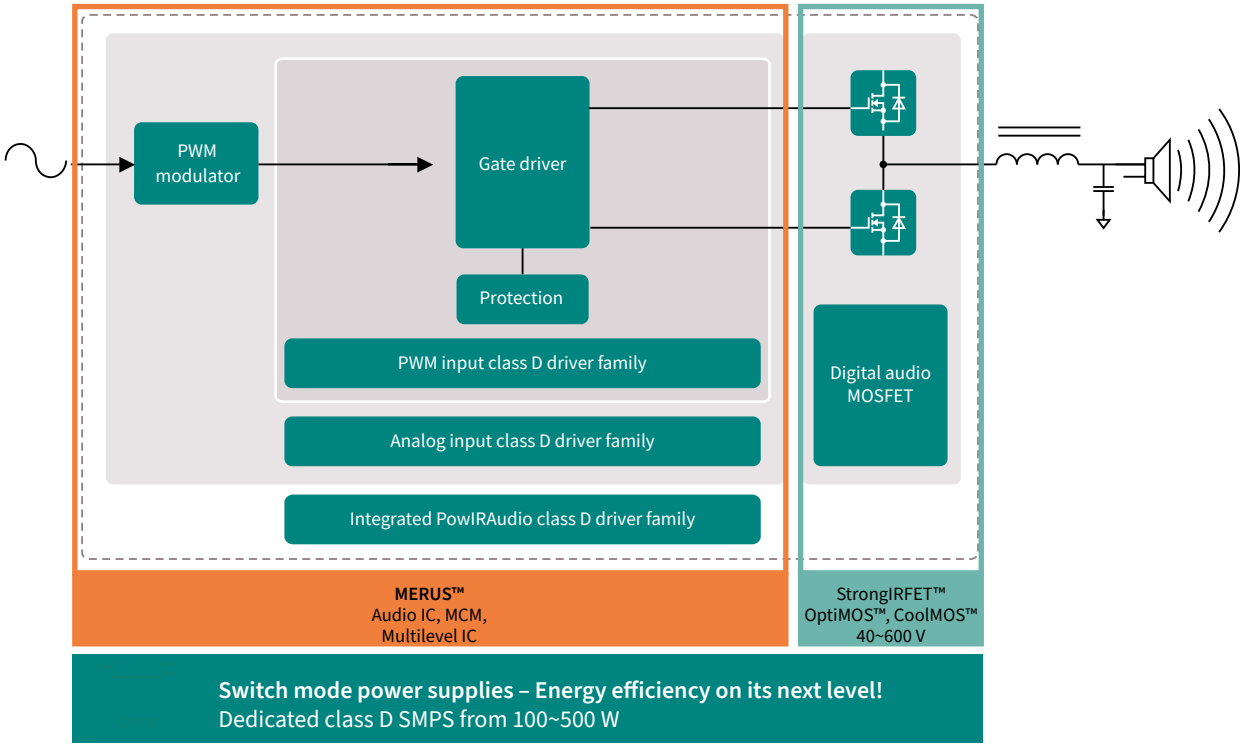
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Discrete MERUS™ audio amplifier driver ICs with MOSFET and gallium nitride CoolGaN™ HEMT

Scalable output power with a unified design platform

Infineon's discrete audio solutions are scalable to various output power levels by replacing the driver-transistor combinations' external MOSFETs or CoolGaN™ HEMTs. Key parameters for the transistors used in discrete class D audio applications include on-state resistance ($R_{DS(on)}$), gate charge (Q_G), and reverse recovery charge (Q_{rr}). Our products are specifically suitable for class D audio applications and optimized for these parameters to achieve maximized efficiency, THD, and EMI amplifier performance. The CoolGaN™ HEMT portfolio is specifically built for class D audio requirements, with high-performing SMD packages to utilize gallium nitride's benefits fully.

Audio solution overview



Features and benefits

Key benefits	Key advantages
– Unified design platform	– Superior audio performance
– Scalable output power up to over 2 kW per channel	– Increased reliability
– Simple yet effective - exchange of external MOSFET triggers alteration in output power level	– Unique audio experience
– Best-in-class power efficiency	

Audio amplifier · Wireless audio · Audio · PoE · Audio

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Integrated class D audio amplifier IC portfolio

MERUS™ integrated audio amplifier multi-chip modules (MCMs)

		IR4321M	IR4301M	IR4322M	IR4302M	MA5302MS	MA5332MS	MA5342MS
Specifications	Number of audio channels	1	1	2	2	2	2	2
	Max. power per channel	90 W	160 W	100 W	130 W	200 W	200 W	200 W
	Supply voltage	~ ±25 V or 50 V	~ ± 31 V or 62 V	~ ±25 V or 50 V	~ ± 31 V or 62 V	~±32 V or 64 V	~±40 V or 80 V	~±60 V or 120 V
	Max. PWM frequency	500 kHz	500 kHz	500 kHz	500 kHz	500 kHz	500 kHz	500 kHz
Features	Differential audio input	✓	✓	✓	✓	✓	✓	✓
	Overcurrent protection	✓	✓	✓	✓	✓	✓	✓
	Integrated power MOSFET	✓	✓	✓	✓	✓	✓	✓
	Abs. max voltage	60 V	80 V	60 V	80 V	80V	100 V	150 V
	PWM controller	✓	✓	✓	✓	✓	✓	✓
	Thermal shutdown	✓	✓	✓	✓	✓	✓	✓
	Click noise reduction	✓	✓	✓	✓	✓	✓	✓
	Clip detection			✓	✓	✓	✓	✓
	Package type	5x6 mm QFN	5x6 mm QFN	7 x 7 mm QFN	7 x 7 mm QFN	7 x 7 mm QFN	7 x 7 mm QFN	7 x 7 mm QFN
	Evaluation boards	IRAUDAMP21	IRAUDAMP12 IRAUDAMP19	IRAUDAMP22	IRAUDAMP16 IRAUDAMP17	EVAL_MA5302MS_200Wx2 REF_MA5302BTLSPS_400W	EVAL_AUDAMP25 REF_MA5332BTLSPS	EVAL_MA5342MS_200Wx2

MERUS™ discrete audio amplifier driver IC product portfolio

		IRS20957SPBF	IRS2092SPBF	IRS2052M	IRS2093MPBF	IRS2452AM	IRS2461S
Specifications	Number of audio channels	1	1	2	4	2	1
	Max. power per channel	500 W	500 W	300 W	300 W	500 W	500 W
	Supply voltage	± 100 V	± 100 V	± 100 V	± 100 V	± 200 V	± 200 V
	Gate sink/source current	1.2/1.0 A	1.2/1.0 A	0.6/0.5 A	0.6/0.5 A	0.6/0.5 A	0.6/0.5 A
Features	Overcurrent protection	✓	✓	✓	✓	✓	✓
	PWM input	✓	✓				
	Floating input	✓	✓	✓	✓	✓	✓
	Deadtime		✓	✓	✓	✓	✓
	Protection control logic	✓	✓	✓	✓	✓	✓
	PWM controller		✓	✓	✓	✓	✓
	Clip detection			✓			
	Click noise reduction		✓	✓	✓	✓	✓
	Temperature sensor input			✓		✓	✓
	Thermal shutdonw			✓			
	Clock input			✓		✓	
	Package type	16-pin SOIC narrow	16-pin SOIC narrow	MLPQ48	MLPQ48	MLPQ32	20-lead SOIC wide
	Evaluation boards	IRAUDAMP4A IRAUDAMP6 REF_Audio_ GaNb_750W	IRAUDAMP5 IRAUDAMP7S IRAUDAMP9	IRAUDAMP10	tbd	IRAUDAMP23	REF_IRS2461S_5KW

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Recommended MOSFET (through-hole) product portfolio

Output power	Recommended discrete audio driver IC	Speaker resistance		
		2 Ω	4 Ω	8 Ω
150 W	IRS2093MPBF	IRFB4019	IRFB4019	IRFI4020H-117P
200 W	IRS2052M	IRFB5615	IRFB4019	IRFI4020H-117P
300 W	IRS2092SPBF	IRFB4228PBF	IRFB4227	IRFB4229
500 W	IRS20957SPBF	IRFB4228PBF	IRFB4227	IRFB4229
750 W		IRFB4227	IRFB4229	
1000 W		IRFP4668	IRFB4229 x 2	

IRS2093MPBF works up to 150 W and IRS2052M works up to 300 W.
IRS2092SPBF and IRS20957SPBF work with all power levels listed above.

Recommended MOSFET (DirectFET™) product portfolio

Output power	Recommended discrete audio driver IC	Speaker resistance		
		2 Ω	4 Ω	8 Ω
150 W	IRS2093MPBF	IRF6645		IRF6775M
200 W	IRS2052M		IRF6775M	IRF6775M
300 W	IRS2092SPBF	IRF6644	IRF6775M	IRF6785
500 W	IRS20957SPBF			

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Recommended audio evaluation boards

Enabling fast time-to-market and device performance evaluation



KIT_ARDMKR_AMP_40W
Kit board MA12070P audio amplifier - compatible with Arduino MKR boards

Summary of features
- Equipped with MERUS™ MA12070P proprietary multilevel amplifier
- Power input: 5 V/2.5 A - sourced from the same single USB-C power supply or battery pack
- No need for external or extra power supplies
- Up to 40 W instantaneous peak output power with a USB-C power supply or battery pack

Benefits
- Compatible with Arduino MKRZERO and MKR1000 WIFI
- Full hardware control and customization
- Error monitoring through Arduino programming framework



REF_MA5332BTLSPS
Number of audio channels: 1
Output power per channel [RMS]: 200 W
Featured class D IC: MA5332MS
Input: analog
OPN: REFMA5332BTLSPSTOBO1

Summary of Features
- Output power: 200 W x 1 channels (10 percent THD+N, 4 Ω at 40 V)
- Multiple protection features: Overcurrent Protection (OCP) for high-side and low-side and overtemperature Protection (OTP)
- PWM modulator: Self-oscillating half-bridge topology with optional clock synchronization

Benefits
- Single power supply
- Full-bridge output
- High audio quality
- Low noise
- High efficiency



EVAL_AUDAMP25
Number of audio channels: 2
Output power per channel [RMS]: 200 W
Featured class D IC: MA5332MS
Input: analog
OPN: EVALAUDAMP25TOBO1



EVAL_MA5302MS_200WX2
Number of audio channels: 2
Output power per channel [RMS]: 200 W
Featured class D IC: MA5302MS
Input: analog
OPN: EVALMA5302MS200WX2TOBO1

EVAL_MA5342MS_200WX2
Number of audio channels: 2
Output power per channel [RMS]: 200 W
Featured class D IC: MA5342MS
Input: analog
OPN: EVALMA5342MS200WX2TOBO1

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MERUS™ integrated audio amplifier multi-chip module (MCM) evaluation boards







IRAUDAMP12
Number of audio channels: 2
Output power per channel [RMS]: 130 W
Featured class D IC: IR4301M
Input: Analog
OPN: IRAUDAMP12

IRAUDAMP17
Number of audio channels: 2
Output power per channel [RMS]: 100 W
Featured class D IC: IR4302M
Input: Analog
OPN: IRAUDAMP17

IRAUDAMP19
Number of audio channels: 2
Output power per channel [RMS]: 100 W
Featured class D IC: IR4301M
Input: Analog
OPN: IRAUDAMP19

IRAUDAMP21
Number of audio channels: 2
Output power per channel [RMS]: 135 W
Featured class D IC: IR4321M
Input: Analog
OPN: IRAUDAMP21

IRAUDAMP22
Number of audio channels: 2
Output power per channel [RMS]: 100 W
Featured class D IC: IR4322M
Input: Analog
OPN: IRAUDAMP22

Discrete MERUS™ audio amplifier driver IC and MOSFET evaluation boards






IRAUDAMP4A
Number of audio channels: 2
Output power per channel [RMS]: 120 W
Featured driver IC: IRS20957S
Featured MOSFET: IRF6645TRPbF
OPN: IRAUDAMP4A

IRAUDAMP5
Number of audio channels: 2
Output power per channel [RMS]: 120 W
Featured driver IC: IRS2092S
Featured MOSFET: IRF6645TRPbF
OPN: IRAUDAMP5

IRAUDAMP6
Number of audio channels: 2
Output power per channel [RMS]: 250 W
Featured driver IC: IRS20957S
Featured MOSFET: IRF6785MTRPbF
OPN: IRAUDAMP6

IRAUDAMP7S
Number of audio channels: 2
Output power per channel [RMS]: 500 W
Featured driver IC: IR-S2452AM
Featured MOSFET: IRFI4019H-117P
OPN: IRAUDAMP7S






IRAUDAMP9
Number of audio channels: 1
Output power per channel [RMS]: 1700 W
Featured driver IC: IRS2092S
Featured MOSFET: IRFB4227PbF
OPN: IRAUDAMP9

IRAUDAMP10
Number of audio channels: 2
Output power per channel [RMS]: 370 W
Featured driver IC: IRS2052M
Featured MOSFET: IRF6775MTRPbF
OPN: IRAUDAMP10

IRAUDAMP23
Number of audio channels: 2
Output power per channel [RMS]: 500 W
Featured driver IC: IRS2452AM
Featured MOSFET: IPP60R180C7
OPN: IRAUDAMP23

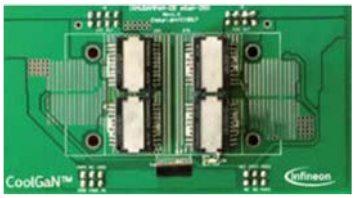
REF_MA5302BTLSPS_400W
Number of audio channels: 1
Output power per channel [RMS]: 400 W
Featured class D IC: MA5302MS
Input: analog
OPN: REFMA5302BTLSP-S400WTOBO1

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Discrete audio amplifier driver IC and CoolGaN™ GIT HEMT 400 V evaluation board



EVAL_AUDAMP24
Number of audio channels: 2
Output power per channel [RMS]: 300 W at 1%
Featured driver IC: IRS20957S
Featured HEMT:
IGOT40R070D1
IGT40R070D1
OPN: EVAL_AUDAMP24

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AC-DC LED driver ICs

Digital and mixed-signal, single- and dual-stage high-voltage control ICs for LED drivers

XDP™ digital power – digital single- and dual-stage flyback combo controllers
The XDP™ portfolio of high-performance digital power control ICs addresses today's challenges, such as smart or connected lighting, meeting demanding LED driver requirements with unique features.

Mixed-signal control ICs for solid-state lighting luminaires
Infineon's mixed-signal control ICs for LED drivers deliver excellent power quality and high efficiency for LED lighting applications, supporting down to 1 percent dimming levels. The integration of advanced functions saves external components and minimizes system costs. The wide variety of features and functions gives the option to choose the best-fitting part for the application.

LEDs plug & play

LED

Lighting

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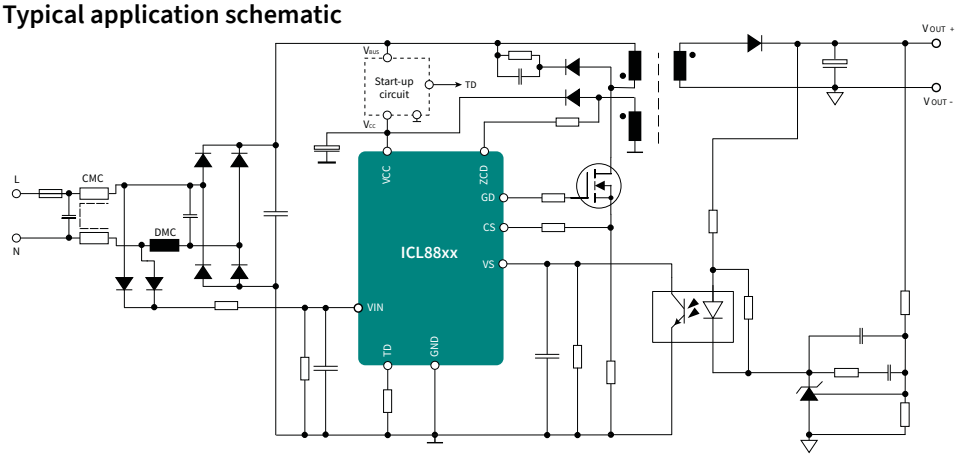
ICL8800/ICL8810/ICL8820

Single-stage flyback LED controllers for constant voltage output

The ICL88xx family of single-stage flyback controllers for constant voltage output is tailored for LED lighting applications to meet the required performance cost-effectively. All three ICs offer benchmarking performance for power factor correction and total harmonic distortion at full-load and low-load conditions. Their comprehensive protection features (see table below) and bottom-up design make them easy to design and require a minimum number of external components. The controllers are optimized as secondary-side regulated (SSR) constant voltage (CV) output flyback controllers and are also well suited for primary-side regulation (PSR).

Additionally, the controllers' low standby power due to the integrated BM (in ICL8810, ICL8820) is ideally suited for smart lighting systems' requirements. The jitter function (in ICL8820) eases the design of emergency lighting LED drivers without additional circuitry. It fulfills EMI requirements in DC operations and improves EMI performance.

Typical application schematic





Features and benefits

Key benefits
– Optimized for SSR CV output flyback operation, additionally suited for PSR
– PF>0.9 and THD<10% across a wide load range (AC input up to 277 V_{RMS})
– CCM and QRM with smart valley hopping
– ICL8810 also contains burst mode (BM) to ensure low standby power (<100 mW)
– ICL8820 also contains built-in jitter function

Key advantages
– Low BOM for wide range of applications with PFC functionality where dual-stage topologies are required
– Enables platform design and window drivers
– Optimum efficiency and low EMI at low BOM without compromising light quality
– ICL8810 **enables in addition:** smart lighting in connection with microcontrollers (standby power <500 mW, i.e., more power budget for additional components)
– ICL8820 **enables in addition:** Fulfillment complying with EMI regulations in DC operation at low cost and effort

Order information for ICL88xx

Board name	Description	Ordering code
ICL8800	Single-stage flyback controller for constant voltage output	ICL8800XUMA1
REF_ICL8800_LED_43W*	Demoboard with ICL8800	REFICL8800LED43W
ICL8810	Single-stage flyback controller for constant voltage output with low standby power	ICL8810XUMA1
REF_ICL8810_LED_43W_BM*	Demoboard with ICL8810 with burst mode	REFICL8810LED43WBM
REF_ICL8810_LED_42W_PSR	Demoboard with ICL8810 for primary side regulation	REFICL8810LED42WPSR
ICL8820	Single-stage flyback controller for constant voltage output with low standby power and jitter function	ICL8820XUMA1
REF_ICL8820_LED_43W_JT*	Demoboard with ICL8820 with jitter function	REFICL8820LED43WJT

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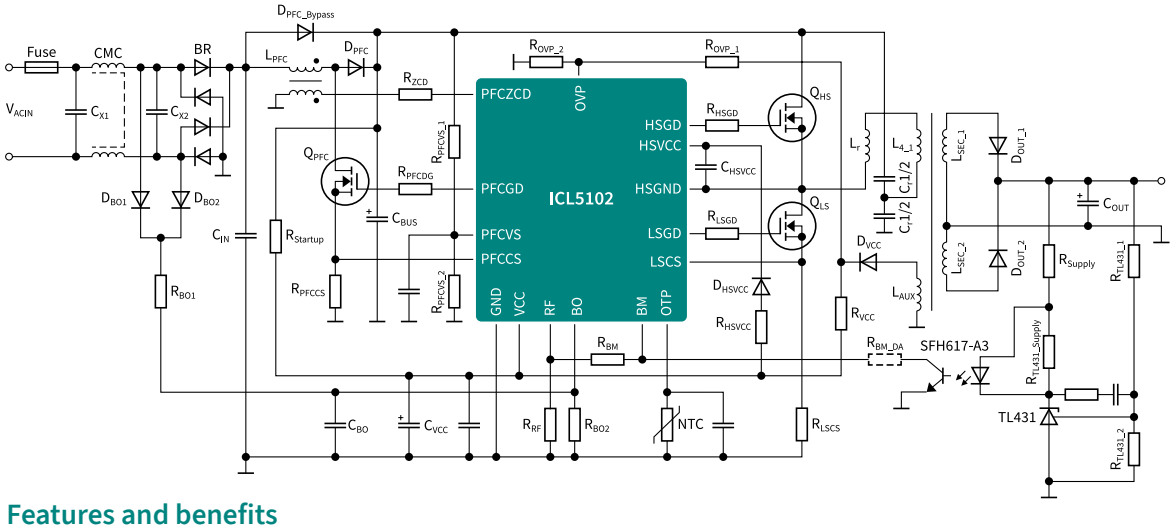
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ICL5102

High-performance PFC + resonant controller for LCC and LLC

With ICL5102, Infineon offers a highly integrated combo controller IC with a universal input of 70 to 325 V. This allows manufacturers to realize global designs, keeping the cost for product variety and stock low. The highest efficiency of up to 94 percent by resonant topology, a THD factor less than 3.5 percent, and a high power factor of more than 0.95 allow for more lumen output and less thermal load, enabling cost-effective designs and keeping the cost for LEDs and heat sink low. Thanks to the high integration, there is no need for additional expensive components in the PFC and LLC stage, reducing the overall BOM cost. In addition, integrated protection features complement the ICL5102 features.

Typical application schematic



Features and benefits

Key features and benefits
– **Small form factor LED driver and low BOM** The high level of integration assures a low count of external components, enabling small form factor designs and making them ideal for compact and slimline power supplies for lighting, such as LED drivers for indoor and outdoor applications
– **High performance, digital PFC, and advanced HB driver** The high-performance digital PFC stage achieves power factor of 99 percent, through operation in CrCM and DCM mode, in a frequency range of 22 to 500 kHz. This supports stable operation even at low-load conditi-ons down to 0.1 percent of the nominal power without audible noise
– **Fast time-to-light and low standby** With a start-up current of less than 100 µA, the controller provides very fast time-to-light within less than 300 ms, while in standby, the controller changes into active burst mode, which reduces power consumption to less than 300 mW
– **Safety first** The controller has comprehensive protection features built to increase the system's safety. In run mode, it monitors the complete system regarding bus over- and undervoltage, open loop, overcurrent of PFC and/or inverter, output overvoltage, overtemperature, and capacitive load operation



Order information for ICL5102

Type	Description	Ordering code
ICL5102	PFC and resonant controller for LCC and LLC	ICL5102XUMA2
REF-ICL5102-U130W-CC	PFC/LLC-CC constant current evaluation board 130 W LED driver	REFICL5102U130WCCTOBO1
REF-ICL5102-U52W-CC	Low-cost PFC/LCC reference design 52 W LED driver, non-dimmable	REFICL5102U52WCCTOBO1
REF_ICL5102_U100W_LCC	Low-cost PFC/LCC reference design 100 W, dimmable	REFICL5102U100WLCC
REF_LLC_BUCK_4CH_320W*	Scalable 320 W multichannel high-power LED driver (using ICL5102 board and ILD8150E board)	REFLLCBUCK4CH320WTOBO1

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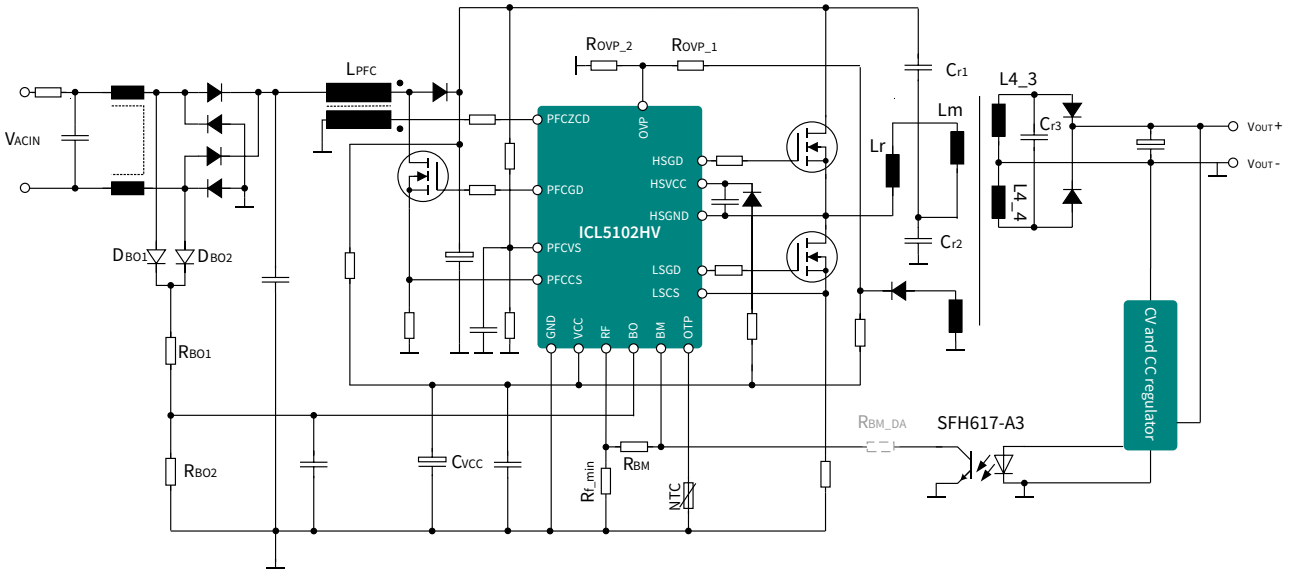
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ICL5102HV

High-performance PFC + resonant controller for LCC and LLC, supporting 980 V high side

ICL5102HV control IC for LED drivers offers a unique one-package solution for up to 350 W lighting applications, supporting LLC/LCC topology. It is designed to deliver the best total harmonic distortions (THD) and power factor (PF) performance. Compared to level-shifter technology, the integrated coreless transformer further reduces the loss at high operation frequency and enhances the capability of handling a huge negative voltage (-600 V on HSGND). Reduce the number of external components to optimize the form factor and reduce the bill of materials (BOM) with the integrated two-stage combination controller (PFC + LLC/LCC) for lighting applications. Simplify your design and shorten time-to-market.

Typical application schematic



Features and benefits

Key features and benefits
– **Small form factor LED driver and low BOM** The high level of integration assures a low count of external components, enabling small form factor designs and making them ideal for compact and slimline power supplies for lighting, such as LED drivers for indoor and outdoor applications
– **High performance, digital PFC, and advanced HB driver** The high-performance digital PFC stage achieves power factor of 99 percent, through operation in CrCM and DCM mode, in a frequency range of 22 to 500 kHz. This supports stable operation even at low-load conditi-ons down to 0.1 percent of the nominal power without audible noise
– **Fast time-to-light and low standby** With a start-up current of less than 100 µA, the controller provides very fast time-to-light within less than 300 ms, while in standby, the controller changes into active burst mode, which reduces power consumption to less than 300 mW
– **Safety first** The controller has comprehensive protection features built to increase the system's safety. In run mode, it monitors the complete system regarding bus over- and undervoltage, open loop, overcurrent of PFC and/or inverter, output overvoltage, overtemperature, and capacitive load operation



Order information for ICL5102HV

Type	Description	Ordering code
ICL5102HV	PFC and resonant controller for LCC and LLC	ICL5102HVXUMA1
REF-ICL5102HV-U150W	PFC/LCC evaluation board 150 W, CC LED driver	REFICL5102HVU150WTOBO1

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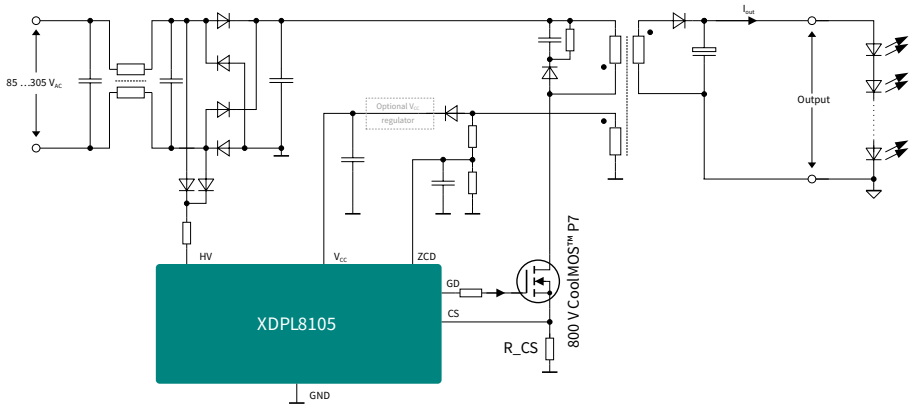
XDP™ LED

The IC family XDP™ is the first all-in-one package solution combining a digital controller with key power peripherals. Such integration provides exceptional flexibility and performance. The XDP™ family addresses essential features for an advanced LED driver.

XDPL8105 – digital flyback controller IC for LED driver

The XDPL8105 is a digital, single-stage flyback controller with a high power factor for a constant current LED driver. The IC is available in a DSO-8 package and provides a wide feature set, requiring a minimum of external components. The advanced control algorithms in the digital core of the XDPL8105 provide multimode operation for high efficiency. Configurable parameters allow last-minute changes, shorten the product development time, and reduce hardware variants. The extensive configurable standards and sophisticated protection mechanisms ensure a safe, reliable, and robust LED driver device for diverse use cases.

Typical application schematic



Features and benefits

Key features and benefits
– Constant current with primary-side regulation
– Supports AC and DC input
– Nominal input voltage range 90-305 V_{AC} or 120-350 V_{DC}
– Integrated 600 V start-up cell
– PF>0.9 and THD<15% over wide load range
– Highly accurate primary-side control output current typ. ± 3%
– Reference board efficiency of more than 90%
– Internal temperature guard with adaptive thermal management
– Multimode operation – QRM (quasi-resonant mode) – DCM (discontinuous conduction mode) – ABM (active burst mode)
– Digital parameters
– Relevant error conditions are monitored and protected – Undervoltage – Overvoltage – Open load – Output shorted

Order information for XDPL8105

Type	Description	Ordering code
XDPL8105	Digital flyback constant current controller IC	XDPL8105XUMA1
REF-XDPL8105-CDM10V	40 W reference design with CDM10V isolated 0 V-10 V dimming interface	REFXDPL8105CDM10VTOBO1

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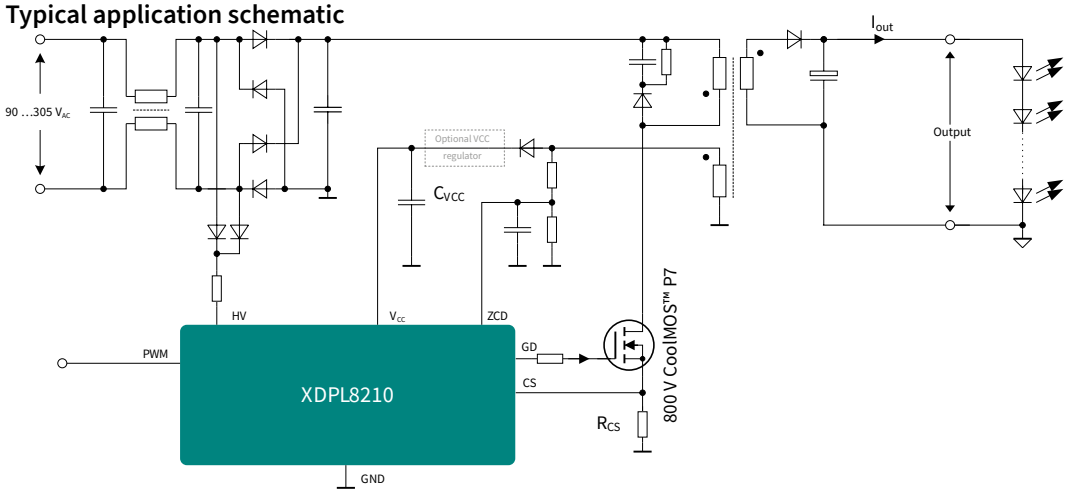
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XDPL8210 – digital flyback constant current controller IC for LED driver with 1 percent dimming

The XDPL8210 is a digital, single-stage, quasi-resonant flyback controller with a high power factor and high precision primary-side controlled constant current output. The IC is available in a DSO-8 package and provides a wide feature set, which requires only a small number of external components. Sophisticated algorithms provide flicker-free dimming below 1 percent. The driver fully supports IEC61000-3-2 class C designs. The limited power mode improves functional safety, while configurable parameters allow last-minute changes, shorten product development time, and reduce hardware variants. The extensive configurable standards and sophisticated protection mechanisms ensure a safe, reliable, and robust LED driver for many use cases.

Typical application schematic



Features and benefits

Key features and benefits
– Constant current with primary-side regulation
– Supports AC and DC input
– Nominal input voltage range 90-305 V_{AC} or 90-430 V_{DC}
– Reference board efficiency >90 percent
– PF>0.9 and THD<15% over wide load range
– Standby power <100 mW
– Internal temperature guard with adaptive thermal management
– Multimode operation – QRM (quasi-resonant mode) – DCM (discontinuous conduction mode) – ABM (active burst mode)
– Digital parameters
– Relevant error conditions are monitored and protected – Undervoltage – Overvoltage – Open load – Output shorted



Order information for XDPL8210

Type	Description	Ordering code
XDPL8210	Digital flyback constant current controller IC	XDPL8210XUMA1
REF-XDPL8210-U35W	35 W reference design with CDM10V isolated 0 V-10 V dimming interface	REFXDPL8210U35WTOBO1

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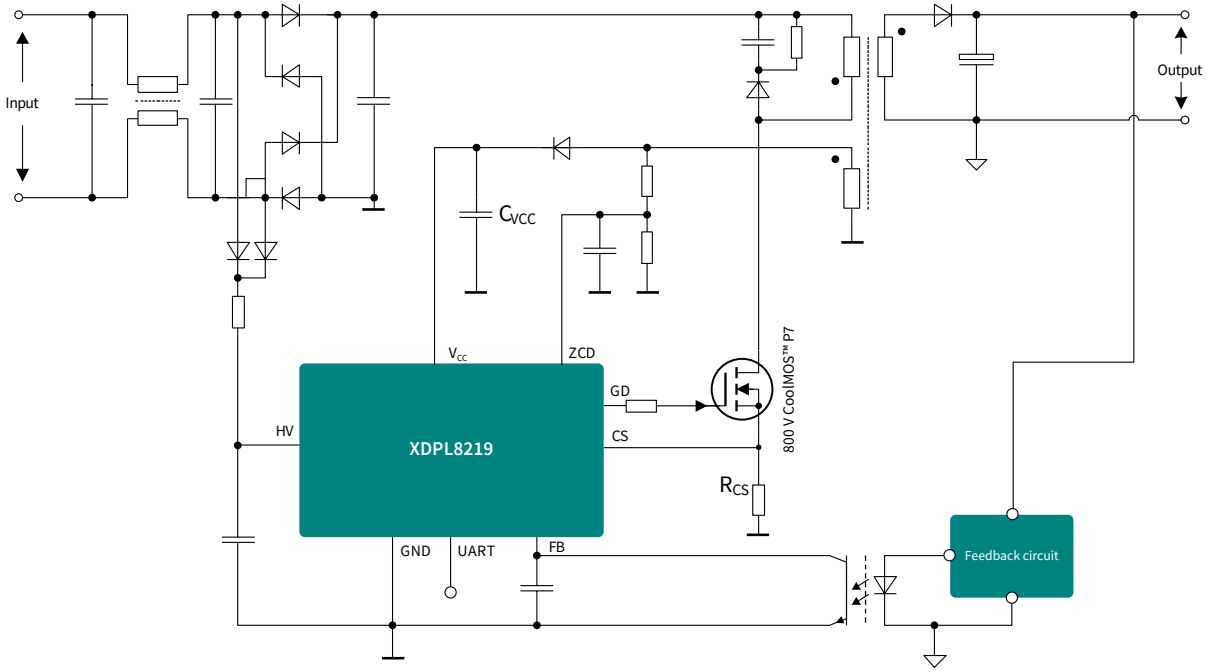
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XDPL8219 – PFC/flyback controller with enhanced total harmonic distortion

The XDPL8219 is a digital high-performance secondary-side regulated flyback controller with constant voltage output. With its high power factor, the controller is the perfect fit for cost-effective, dual-stage LED drivers and enables smart lighting applications. The device operates in quasi-resonant mode (QRM) to maximize efficiency and minimize electro-magnetic interference (EMI) over a wide load range. It enters active burst mode (ABM) at light load to prevent audible noise from being heard while achieving no-load standby power as low as <100 mW. The XDPL8219 is available in a DSO-8 package.

Typical application schematic



Features and benefits

Key benefits
– Secondary-side-regulated (SSR) constant voltage (CV) output
– Flyback controller with power factor correction
– Depending on load condition, either quasi-resonant, discontinuous conduction mode, or active burst mode (ABM)
– Integrated 600 V start-up cell

Key benefits
– Supports wide load range and fast and stable reaction to dynamic load changes
– PF >0.9 and THD <10 percent across a wide load range (AC input up to 277 V_{RMS})
– Optimal efficiency, power factor, and THD can be achieved by best-suited mode. In addition, DCM eases compliance with EMI at low-load condition
– Very low standby power <100 mW can be achieved
– Integrated start-up cell enables very high efficiency

Order information for XDPL8218

Type	Description	Ordering code
XDPL8219	Digital flyback CV output controller IC	XDPL8219XUMA1
REF-XDPL8219-U40W*	Efficient 40 W reference circuit design for XDPL8219 with high power factor and low THD. It is built for universal input voltage 120–277 V AC or 127–432 V_{DC}	REFXDPL8219U40WTOBO1

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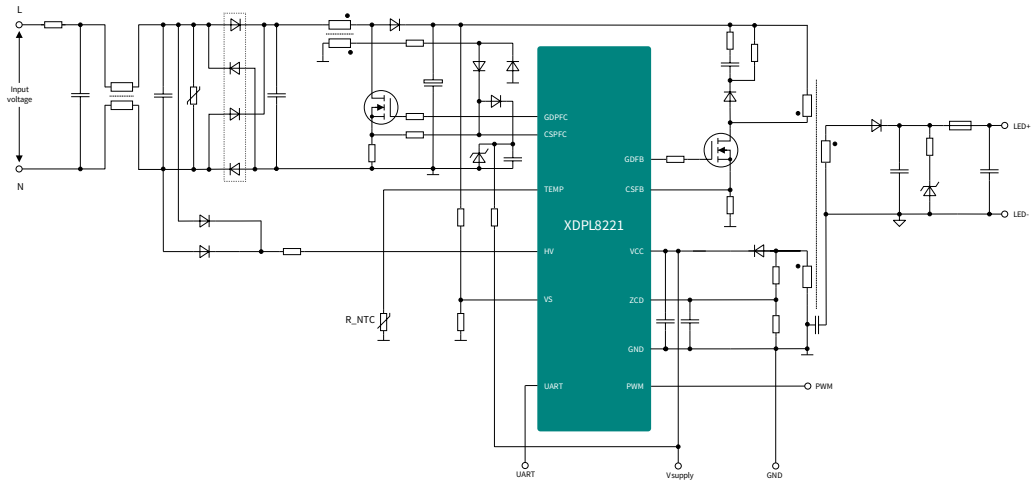
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XDPL8221 - digital dual-stage multimode flyback controller for CC, CV, LP with 1 percent dimming and serial interface

The XDPL8221 is a digital, highly integrated, future-proof device combining a quasi-resonant PFC with a quasi-resonant flyback controller with primary-side regulation. A serial communication interface supports direct communication with an external microcontroller unit (MCU). The XDPL8221 is specially designed for advanced LED drivers in smart lighting or IoT applications, featuring flicker-free dimming down to 1 percent of the nominal current. The device enables a customizable LED driver and simplifies the generation and maintenance of different variants without increasing the number of stock-keeping units. The IC is available in a DSO-16 package.

Typical application schematic



Features and benefits

Key features and benefits
– Nominal input voltage range 100-305 V_{AC} or 90-430 V_{DC}
– Reference board efficiency >90%
– PF>0.9 and THD<15% over wide load range
– UART interface for control and real-time monitoring
– Constant current, constant voltage, limited power with primary-side regulation
– 1 percent dimming
– Dim-to-off with low standby power <100 mW
– Internal temperature guard with adaptive thermal management
– The UART interface and the command set enable to control the function of the XDPL8221 or inquire status information
– Multimode operation – QRM (quasi-resonant mode) – DCM (discontinuous conduction mode) – ABM (active burst mode)
– Digital parameters
– Relevant error conditions are monitored and protected – Undervoltage – Overvoltage – Open load – Output shorted



Order information for XDPL8221

Type	Description	Ordering code
XDPL8221	Digital dual-stage multimode flyback controller for CC, CV, LP with 1 percent dimming	XDPL8221XUMA1
REF-XDPL8221-U50W	50 W reference board with CDM10V isolated 0 V-10 V dimming interface	REFXDPL8221U50WTOBO1
REF-XDPL8221-U100W	100 W reference board with CDM10V isolated 0 V-10 V dimming interface	REFXDPL8221U100WTOBO1

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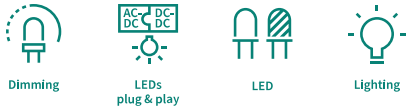
DC-DC LED driver ICs

DC-DC switch mode LED driver ICs with efficiencies up to 98 percent, dimming level down to 0.5 percent

Infineon offers highly integrated DC-DC LED driver ICs that support currents up to 1.5 A, making them ideal for high- and ultrahigh-power LEDs. These highly integrated DC-DC driver ICs achieve efficiency levels as high as 98 percent across a wide range of operation conditions. Integrated smart thermal protection, overvoltage, and overcurrent protection contribute to a longer LED lifetime.

Go for quality with Infineon's cost-efficient linear LED driver ICs

Infineon's BCR linear driver ICs are the best choice for driving LED strings supplied by a DC voltage source. The BCR regulators are suitable for driving currents from 10 to 250 mA, making them the best solution for low—and mid-power LEDs. The linear controller ICs and an external power stage allow for the greatest design flexibility for high-power LEDs.



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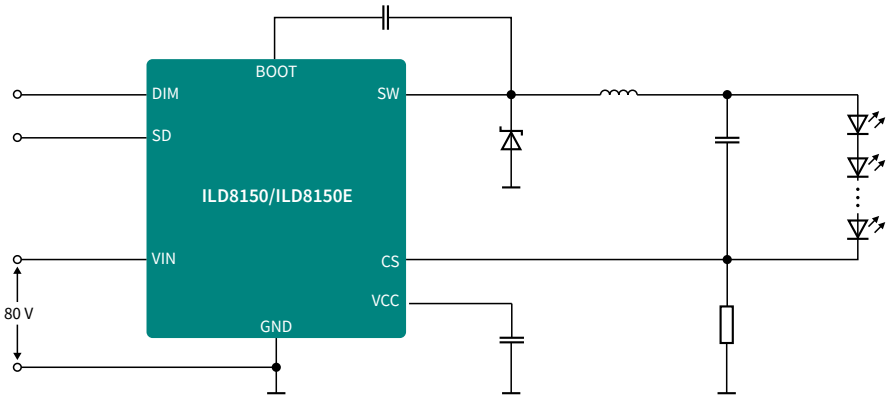
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ILD8150/ILD8150E – 80 V_{DC}-DC buck LED driver IC for high-power LEDs and high-performance hybrid dimming

The ILD8150 is an 80 V_{DC}-DC converter IC designed to drive high-power LEDs in LED applications. It provides a high safety voltage margin for applications operating close to safe extra low voltage (SELV) limits. The buck LED driver IC is tailored for LEDs in general lighting applications with average currents up to 1.5 A using a high-side integrated switch. Several performance and protection features provide the right fit for professional LED lighting.

The hysteretic current control provides extremely fast regulation, stable LED current, and good EMI performance. The efficiency of the LED driver IC is remarkably high, reaching more than 95 percent efficiency over a wide range. A PWM input signal between 250 Hz and 20 kHz controls the dimming of the LED's current in analog mode from 100 to 12.5 percent and 12.5 to 0.5 percent in PWM mode with a flicker-free modulation frequency of 3.4 kHz.

Digital PWM dimming detection with high resolution makes ILD8150/E the perfect LED driver IC for use with microcontrollers. Its precise output current accuracy from device to device under all loads and input voltage conditions makes it perfect for tunable white and flat panel designs where the current must be identical string to string.





Features and benefits

Key benefits
– Wide input voltage ranging from 8–80 V_{DC}
– Up to 1.5 A average output current, adjustable via shunt resistor
– Efficiency >95%
– Up to 2 MHz switching frequency
– Soft-start
– PWM dimming input, with 250 Hz to 20 kHz PWM dimming frequency

Key advantages
– Hybrid dimming for flicker-free light down to 0.5% – Analog dimming from 100% to 12.5% – PWM dimming from 12.5% to 0.5% with 3.4 kHz flicker-free modulation, dim-to-off
– Typical 3 percent output current accuracy
– Overtemperature protection
– Pull-down transistor to avoid LED glowing in dim-to-off
– DSO-8 package to enable wave soldering
– DSO-8 with exposed pad for higher thermal performance (ILD8150E)

Type	Description	Package	Ordering code
ILD8150	80 V_{DC}-DC buck LED driver IC	DSO-8	ILD8150XUMA1
ILD8150E	80 V_{DC}-DC buck LED driver IC	DSO-8 exposed pad	ILD8150EXUMA1
REF_ILD8150_DC_1.5A*	Reference design board 1.5 A with through hole inductor	Board with ILD8150E	REFILD8150DC15ATOBO1
REF_ILD8150_DC_1.5A*	Reference design board 1.5 A	Board with ILD8150E	REFILD8150DC15ATOBO1
REF_TW_ILD8150E_60V_1A*	Reference board for professional tunable white and multichannel applications	Board with 2x ILD8150E	REFTWILD8150E60V1ATOBO1
REF_ILD8150_DC_1.5A_SMD*	Reference design board 1 A with SMD inductor	Board with 2x ILD8150E	REFILD8150DC15ASMDTOBO1

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Linear current regulators

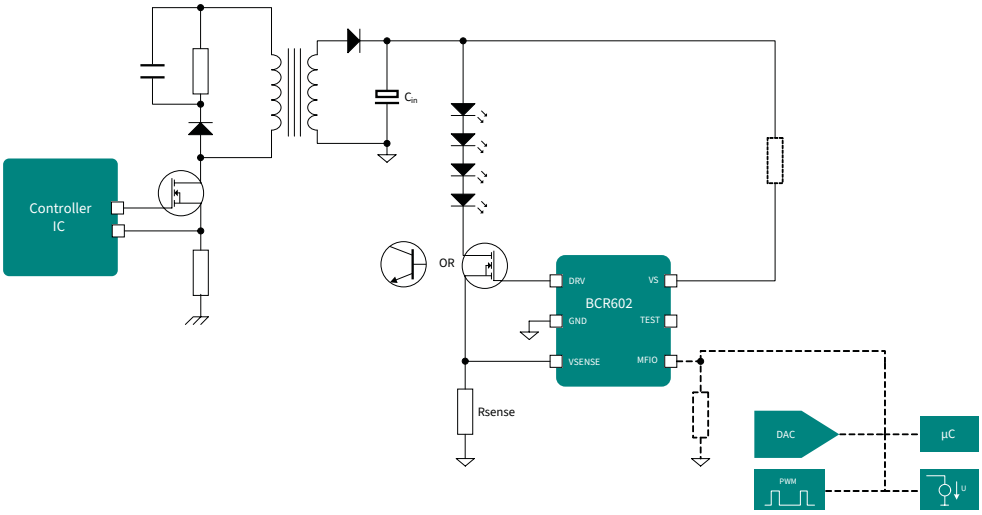
60 V linear LED controller IC for dimmable LED

BCR602 is a linear LED controller IC regulating the LED current using an external driver transistor. It supports the use of NPN bipolar transistors and N-channel MOSFETs to cover a wide LED current and power range of up to several hundred mA. The LED current is fully scalable by dimensioning an external current sense resistor. BCR602 suppresses the power supply's voltage ripple, driving a constant LED current for better light quality. The LED current can be dimmed by resistors as well as analog or digital PWM voltages connected to the Multi-Function Input Output (MFIO) pin. The embedded hot plug protection allows plug-in and plug-out of any LED load during operation.

The BCR602 in the SOT23-6 package is a perfect fit for LED applications, combining a small form factor with low cost. This controller has many advantages compared to discrete solutions, including higher integration, BOM savings, and long LED lifetime.



Typical application schematic



Features and benefits

Key features	Key benefits
– Supply voltage: 8 V to 60 V	– Lower BOM count compared to discrete solutions
– Supports the use of NPN bipolar transistors and N-channel MOSFETs	– Smaller form factor
– AC supply voltage ripple suppression	– Higher reliability due to less parts and soldering joints
– R_{set} functionality at pin MFIO	
– LED current precision ±3%	

Order information for BCR602

Type	Description	Ordering code
BCR602	60 V linear LED controller IC	BCR602XTSA1
DEMO_BCR602_60V_ICTRL	Demoboard for design evaluation of cost-efficient, highly reliable, dimmable LED engines/modules, 60 V, 200 mA	DEMOBCR60260VICTRLTOBO1

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BCR43x linear LED driver ICs for low-power LEDs

The BCR3x family is the smallest and lowest-cost series of LED drivers. These products are perfectly suited for driving low-power LEDs in general lighting applications.

The advantages over resistor biasing are:

- Long lifetime of LEDs due to constant current in each LED string
- Homogenous LED light output independent of LED forward voltage binning, temperature increase, and supply voltage variations

The advantages over discrete semiconductors are:

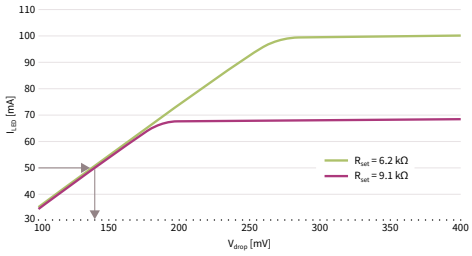
- Reduced part count and assembly effort
- Pretested output current
- Defined negative temperature co-efficient protection

Features and benefits

Key features and benefits
– Output current from 8 to 100 mA (adjustable by external resistor)
– Supply voltage up to 40 V (BCR430U, BCR431U*)
– Reduction of output current at high temperature, contributing to long lifetime LED systems
– Extra low voltage drop for more voltage headroom and flexibility in designs (BCR430U, BCR431U)
– Excellent ESD performance on device and system level for BCR43xU
– Very small form factor packages with up to 600 mW max. power handling capability



LED current versus voltage drop (V_S = 24 V)



The voltage drop at the integrated LED driver stage can go down to 135 mV at 50 mA or less, improving the overall system efficiency and providing extra voltage headroom to compensate for LED forward voltage or supply voltage tolerances. With the BCR430U and BCR431U, additional LEDs can be added to lighting designs or longer LED strips can be created without changing the supply voltage.

Low-power LED driver ICs (5-100 mA)

Type	Group	Topology	V_s (min.) [V]	V_s (max.) [V]	I_{out} (typ.) [mA]	I_{out} (max.) [mA]	Dimming	Package	P_{tot} (max.) [mW]	Ordering code
BCR430U*	LED drivers for low-power LEDs	Linear	6	42	Defined by R_{set}	100	PWM by external transistor	SOT-23	600	BCR430UXTSA2
BCR431U**	LED drivers for low-power LEDs	Linear	6	42	Defined by R_{set}	42		SOT-23	600	BCR431UXTSA1

Type	Description	Ordering code
BCR430U LED BOARD	Low-power demoboard with 8 LEDs, 50 mA	BCR430ULEDBOARDTOBO11
DEMO_BCR431U_LVDROP	Low-power demoboard with 8 LEDs, 15 mA	DEMOBCR431ULVDROPTOBO1

Lighting

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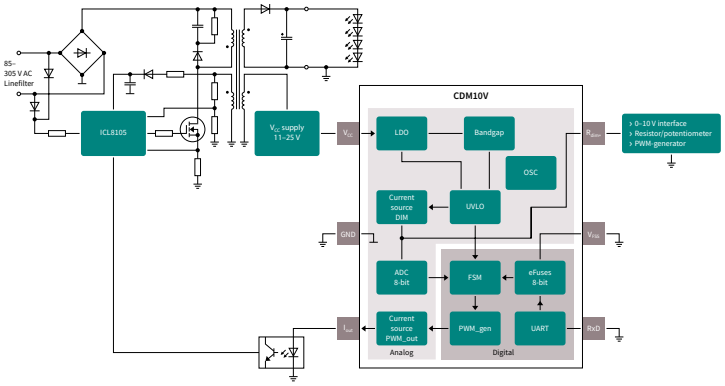
* Ultralow voltage drop version BCR430U with only 135 mV at 50 mA
** Ultralow voltage drop version BCR431U with only 115 mV at 15 mA

CDM10V and CDM10VD – most flexible dimming interface ICs for 0-10 V input

Infineon's fully integrated dimming solutions

Infineon's CDM10V and CDM10VD are the industry's first single-chip lighting interface ICs. They can transform an analog 0–10 V input into a PWM or dimming input signal required by a lighting controller IC. CDM10V and CDM10VD devices are dedicated to commercial and industrial LED lighting applications. Compact and highly integrated devices allow designers to replace up to 25 discrete components with a single device used in conventional 0–10 V dimming schemes. Supplied in an ultra-miniature 6-pin SOT package, the CDM10Vx and CDM10VDx perfectly match small PCBs with high component densities.

Typical application schematic using CDM10V





Features and benefits

Key benefits
– Active dimming (0–10 V) and passive dimming (resistor)
– Embedded digital signal processing which maintains minimum variations from device to device
– PWM input
– One-time configurable device: CDM10V and preconfigured devices with various feature sets

Key advantages
– Single-device solution leading to low BOM and PCB savings
– Dimming ICs in small SOT-23 package for high power density designs
– Granular portfolio for highest flexibility and easy design-in
– Wide input V_{CC} range 11–25 V, extended range down to 6 V for CDM10V
– Attractive pricing and faster time-to-market

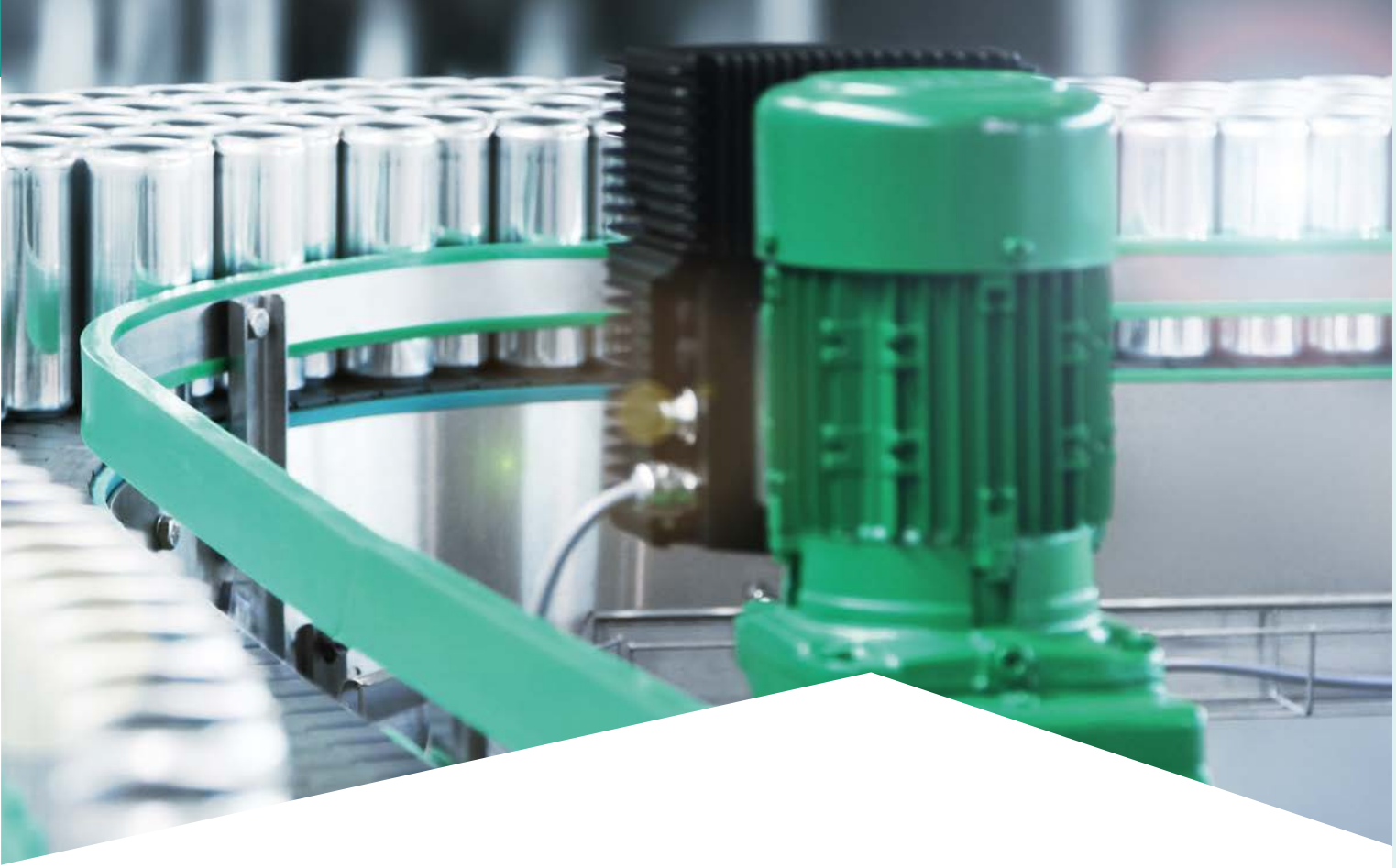
Product type	I_{out} [mA]	Min. duty cycle [%]	PWM output frequency [kHz]	Dimmer/resistor bias current [µA]	Dim-to-off	Ordering code
CDM10V	5	1/2/5/10	0.2/0.5/1/2	50/100/200/500	Disabled/enabled	CDM10VXTSA1
CDM10V-2	5	n.a.	1	200	Enabled	CDM10V2XTSA1
CDM10V-3	5	1	1	200	Disabled	CDM10V3XTSA1
CDM10V-4	5	n.a.	2	100	Enabled	CDM10V4XTSA1
CDM10VD	5	5	1	120	Enabled	CDM10VDXTSA1
CDM10VD-2	5	10	1	120	Enabled	CDM10V2DXTSA1
CDM10VD-3	1	5	1	120	Enabled	CDM10V3DXTSA1
CDM10VD-4	1	10	1	120	Enabled	CDM10V4DXTSA1

Board name	Description	Ordering code
REF-XDPL8105-CDM10V	40 W single-stage PFC FB digital power reference design with CDM10V	REFXDPL8105CDM10VTOBO1

Dimming

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iMOTION™ integrated motor control solutions

A family of highly integrated products for the control of a variable speed drive

iMOTION™ products are offered in several integration levels, including hardware and software. The hardware integration comprises stand-alone motor controllers (iMOTION™ controller), motor controllers with integrated gate drivers (iMOTION™ driver), and fully integrated inverters-in-a-package (iMOTION™ IPM). In terms of software, Infineon offers full turnkey solutions as well as freely programmable modules.

Infineon's field-proven Motion Control Engine (MCE) eliminates software coding from the motor control development process, reducing the effort required to configure the respective motor and power stage.

The MCE implements highly efficient motor control and an optional power factor correction (PFC) and integrates all necessary protections and a flexible scripting engine. Assisted by powerful tools like the iMOTION™ Solution Designer (iSD), the motor can be up and running in less than an hour. Integrated support for functional safety for home appliances paves the way to meeting regulations in the global market.

Infineon provides complete solutions for motor control with its combined offering of iMOTION™ together with EiceDRIVER™ gate drivers, TRENCHSTOP™ IGBTs, CoolMOS™ MOSFETs, and CIPOS™ IPMs.

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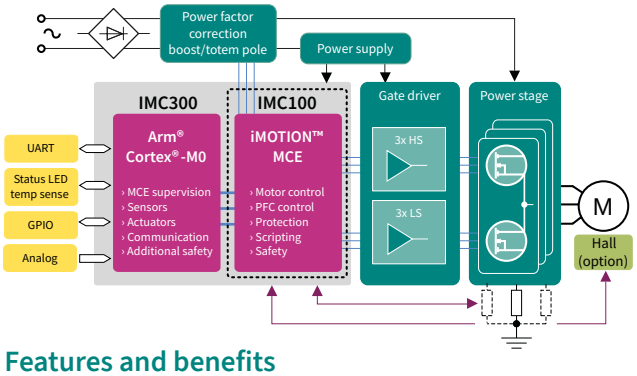
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iMOTION™ controller

Motor/PFC controller plus optional MCU for maximum flexibility

The iMOTION™ controllers consist of two families: iMOTION™ IMC100 is a series of highly integrated ICs for controlling variable speed drives. Integrating the required hardware and algorithm to perform control of a three-phase motor provides the shortest time-to-market for any motor system at the lowest system and development cost. Combining the iMOTION™ IMC100 with an additional microcontroller based on the Arm® Cortex®-M0 core, the iMOTION™ IMC300 series perfectly fits applications requiring application flexibility beyond pure motor and PFC control.

Infineon's field-proven Motion Control Engine (MCE) implements field-oriented control (FOC) using single or leg shunt current feedback. It uses space vector PWM with sinusoidal signals to achieve the highest energy efficiency. The MCE can run sensorless and use Hall sensors for low-speed operation. It also integrates multiple protection features like over- and undervoltage, overcurrent, rotor lock etc. The integrated scripting engine grants flexibility for a wide range of applications. The IMC100/300 series is offered in several device variants. All devices can be used in applications requiring functional safety according to IEC/UL 60730 ('Class B'). With this wide application scope, the iMOTION™ controller is the perfect choice for any highly efficient variable speed drive, from low to high voltage.





Features and benefits

Key features	Key benefits
– Completely self-sustaining Motion Control Engine	– Easy motor parametrization and tuning
– Option for boost PFC	– Low BOM cost for active PFC applications
– Integrated protection features	– Safeguard power stage and motor
– Scripting engine for application flexibility	– Maximum flexibility for customer functions
– Additional independent microcontroller	– Full flexibility for custom functions or communication
– Support for IEC 60335-1 ('Class B')	– Support for functional safety integrated



The REF-VACUUM_C101_2ED is a reference design kit featuring IMC101T iMOTION™ controller, 2ED2304 SOI half-bridge gate driver, and BSC030N04NS OptiMOS™. It demonstrates our thin-film-SOI and advanced MCE technologies for low-voltage, permanent-magnet motor drives up to 120 KRPM speed and inverter section ratings of 30 V and 25 A. It is optimized for major low-voltage home appliances like vacuums, fans, pumps, and compressors.

Home appliance · Aircon · Fans · Pumps

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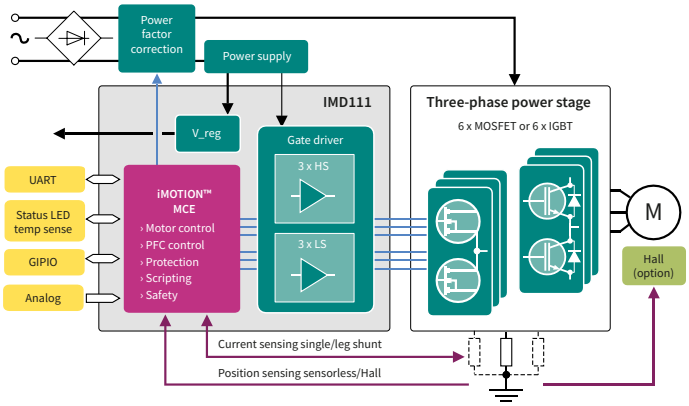
iMOTION™ driver

Motor/PFC controller with gate driver and voltage regulator

The iMOTION™ IMD110 is a series of highly integrated ICs for controlling three-phase motors. The IMD110 drivers are an optimal combination of a ready-to-use motor controller with a high-voltage three-phase SOI gate driver and a voltage regulator. They can be combined with almost any low- to high-voltage MOSFET or IGBT to create a very compact yet highly flexible drive solution. The full set of protections, improved clearance, and creepage make the IMD110 a highly robust and reliable driver family.

The family implements the identical field-proven Motion Control Engine (MCE) as the iMOTION™ controller family. There is flexibility for a wide range of applications due to the scripting engine that executes customer scripts with access to the MCE, a high number of GPIOs, analog inputs, and a configurable UART. Based on Infineon's latest SOI technology, the three-phase gate driver exhibits market-leading robustness and the lowest failure rates. The very low level-shift losses reduce thermal stress and allow high-frequency operation, while the built-in bootstrap diodes help to reduce PCB space and cost. Protections like over- and undervoltage lockout and cross-conduction prevention safeguard the power stage during erroneous conditions. All IMD110 devices support the functional safety requirements according to the IEC/UL 60730-1 (Class B).

Block diagram





Features and benefits

Key features	Key benefits
– Completely self-sustaining Motion Control Engine with identical feature set as the IMC100 series	– Fastest time-to-market with easy parametrization and tuning of motor
– High-voltage three-phase gate driver and built-in bootstrap diodes	– Reduces BOM and PCB space
– Single layer design possible	– Reduces PCB and production costs
– Support for IEC 60335-1 (‘Class B’)	– Support for functional safety integrated



The REF_FRIDGE_D111T_MOS board is a ready-to-use three-phase inverter designed for refrigerator compressors featuring the iMOTION™ driver. The 600 V CoolMOS™ PFD7 super junction MOSFET demonstrates market-leading light-load efficiency. The board provides a single-phase AC connector, rectifier, and three-phase output for the motor. The motor is run with sensorless field-oriented control (FOC) using single-shunt current sensing which targets low-cost applications. The direct sensing of all voltages and currents does not require any OpAmp.

Home appliance · Fridge · Fans · Pumps

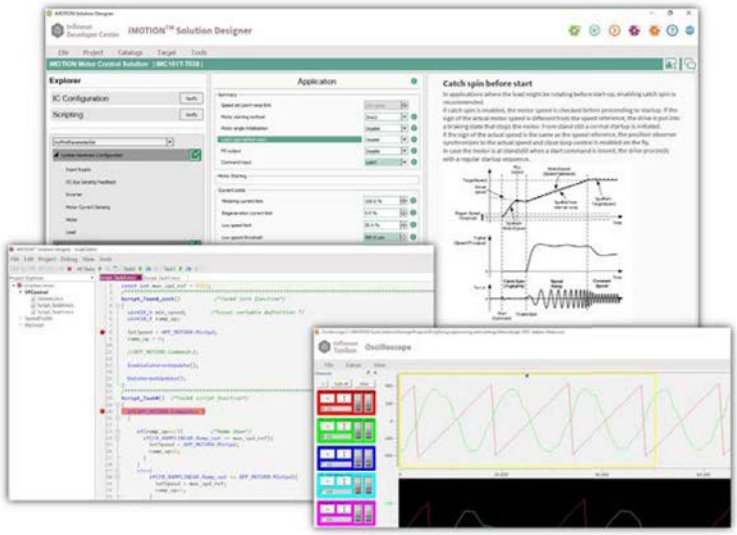
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iMOTION™ tools and development support

The easy way to get started with motor control



The iMOTION™ Solution Designer is the new all-in-one PC tool that supports the iMOTION™ products in all stages of a motor control project. A new project can be started by choosing one of the preconfigured applications, an evaluation board, or a specific device. Solution Designer offers individual views for all design steps, from configuration to the final tuning of the control loop.

The integrated help, which describes all parameters in detail, assists in drive configuration. After downloading the parameter sets into the iMOTION™ device, customer-configurable dashboards help start and run the motor and tune the control loop parameters to the desired behavior. All relevant parameters, like voltages, currents, torque, and speed, can be visualized on the 8-channel oscilloscope in real-time. Going one step beyond the configuration of the motor and PFC, the integrated editor, compiler, and debugger help develop scripts for the iMOTION™ script engine.

Features and benefits

Key features	Key benefits
– Integrated PC tool for all devices in all project phases	– One common tool and consistent workflow for all iMOTION™ products
– Configuration wizard for motor and PFC parameter sets	– Easy handling of parameter sets with fully integrated help system
– Dashboards for typical design steps, customer configurable	– Fully configurable for individual testing and tuning stages
– Oscilloscope with 8 channels	– Real-time insight into all motor and PFC parameters
– Full IDE for editing, compiling, and debugging of scripts	– Assisted creation of scripts and live debugging including breakpoints
– Programmer for firmware, parameter sets, and scripts	– Unified data handling from project to device
– Catalogs for devices, boards, loads, and projects	– Project centric work and ease of creating derived projects

iMOTION2Go

Getting familiar with iMOTION™ firmware, features, and tools



The iMOTION2Go kit is powered via USB and contains a complete motor control system on a small form factor board. It is particularly useful for evaluating the iMOTION™ firmware and tools like the iMOTION™ Solution Designer first. This combination of the IMC101 motor control IC with the Solution Designer supports all project stages, from drive configuration to optimization and tuning using dashboards and oscilloscopes. Scripting can be practiced by downloading and debugging via the IDE integrated into the Solution Designer.

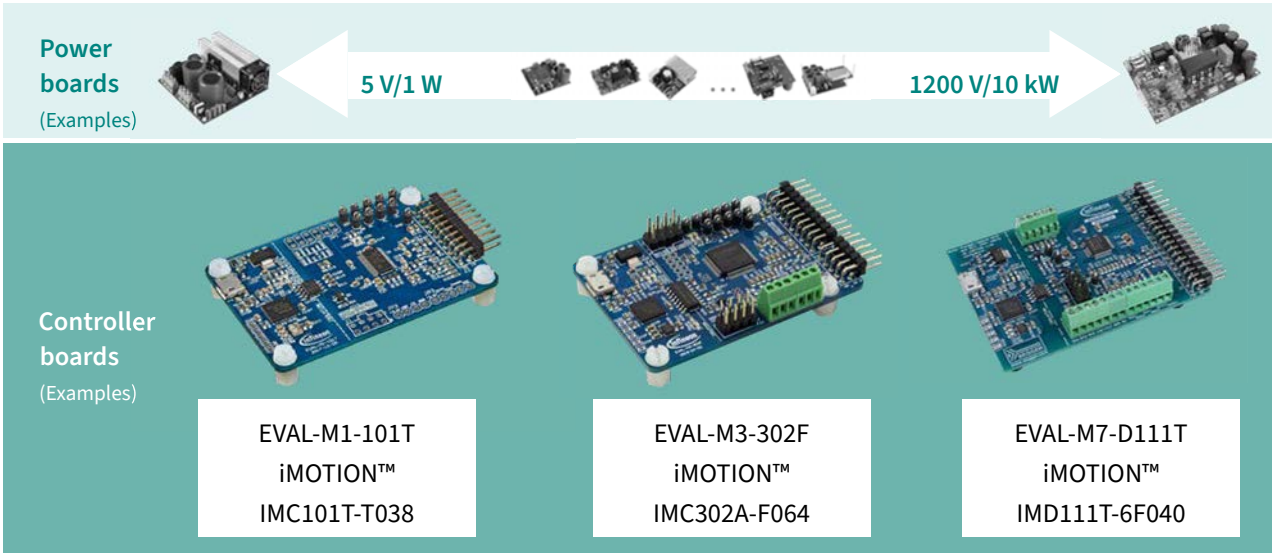
Drives Pumps Fans Cooling compressors Motor control

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iMOTION™ Modular Application Design Kit

Get a motor running in less than 1 hour!



The iMOTION™ Modular Application Design Kit (MADK) is an evaluation platform targeting variable speed-drive applications up to 10 kW. The platform offers a modular and scalable system solution with different control board options and a wide range of power boards. Using the iMOTION™ MADK standardized platform interfaces, different control and power boards can be combined into a system that perfectly meets the requirements of the final application. This modular approach allows developers maximum flexibility and scalability during the evaluation and development phase at affordable costs.

While the M1 platform provides control of a permanent magnet synchronous motor (PMSM), the M3 platform additionally includes an active power factor correction (PFC) implemented as a CCM boost PFC.
The M7 platform is based on the iMOTION™ driver series IMD110. The gate driver is contained on the control board, and the power boards use different types of discrete power devices, either MOSFETs or IGBTs, covering a wide voltage range from 20 to 600 V.

iMOTION™ Link

Isolated debug interface for final application boards



iMOTION™ Link is an isolated debug probe for all iMOTION™ motor control products. It connects to the user's target board (final application board) or any other evaluation or reference board via a galvanically isolated interface. iMOTION™ Solution Designer is then used for configuring, parameterizing, and tuning the respective iMOTION™ device. In addition to the serial interface, iMOTION™ Link provides a standard Arm® SWD debug connection for programming the MCU core in devices like the IMC300 series.

Drives · Pumps · Fans · Cooling compressors · Motor control

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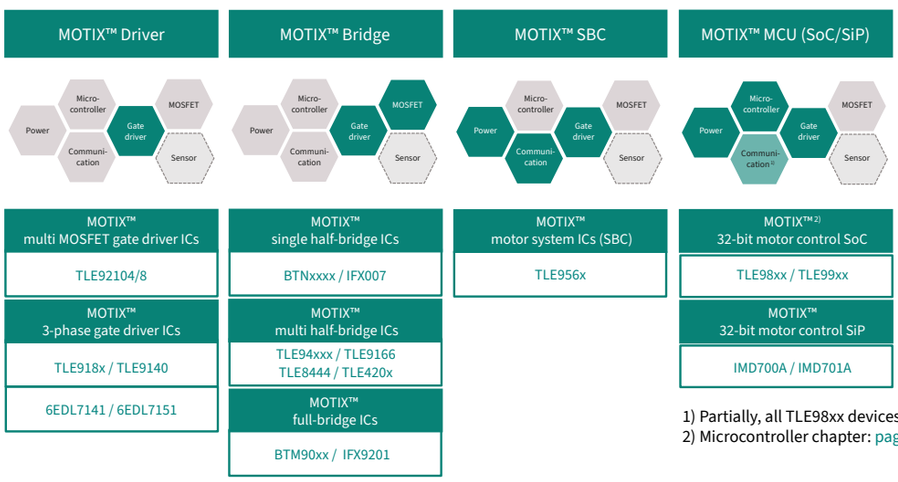
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MOTIX™ motor control ICs

A scalable product portfolio from low to high levels of integration

Infineon is your trusted partner and one-stop-shop for motor control solutions. With MOTIX™, we offer a wide selection of motor control ICs. Customers can choose from a scalable product portfolio with low—to high-integration levels and benefit from a well-rounded support ecosystem with tools and software.



1) Partially, all TLE98xx devices with LIN or CAN (FD)
2) Microcontroller chapter: page 289

MOTIX™ Software

MOTIX™ Software is a modular and highly scalable platform of software and tools that reduces efforts for motor control system development. It features a unique combination of common motor control middleware components and low-level device drivers, all optimized for use across Infineon device families and designed to meet the most stringent system safety requirements.

MOTIX™ Software customization and integration with application or third-party software is supported by APIs, leveraging the best Infineon device features. Our tools help you in device configuration, evaluation and MOTIX™ motor control software parametrization to accelerate your success.

Key features

- High scalability and re-use-ability across devices by unique architecture and platform approach
- Right fit low-level software and motor control middleware for industry-leading hardware from Infineon
- Unit and integration tested software building blocks, including quality reports and safety documentation for eased system integration according to industry standards up to ASIL D

Key benefits

- Significant reduction of development efforts related to common or non-differentiating functions
- Easy initial device evaluation
- One-stop-shop SW/HW incl. MOTIX™, EiceDRIVER™ and AURIX™ key system components
- Premium support partner MOTEON

Key applications

- Water and oil pumps
- HVAC blower fans, engine cooling fans
- Pneumatic suspension compressor
- Thermal management valve control
- Actuators in drives in body, comfort, and ASIL D braking and steering systems

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MOTIX™ Software key building blocks

MOTIX™ Motor Control Library
- High scalability and reusability with MOTIX™ MCU device family by unique modular and layered architecture
- Optimized for single-leg-shunt FOC solutions
- Automotive SPICE assessed, MISRA C:2012 compliant
- Unit and integration tested
- Configurable with static and dynamic (runtime) motor parameters, enabled by MOTIX™ Solution Designer GUI tool

MOTIX™ Complex Device Driver
- Hardware abstraction for MOTIX™ Driver and EiceDRIVER™
- Support HW safety mechanisms, optimized for integration with AURIX™ MCAL
- APIs for device initialization and configuration
- ISO 26262 ASIL D, AUTOSAR compliant, Automotive SPICE assessed
- EB tresos Studio support for device configuration

MOTIX™ Device Driver
- Hardware abstraction for MOTIX™ Driver, Bridge, SBC and EiceDRIVER™
- APIs for device initialization and configuration

MOTIX™ Low-level Driver (LLD/PDL)
- Low-level/Peripheral driver for MOTIX™ MCUs, optimized for MOTIX™ motor control middleware
- GUI tool for device initialization and configuration, supported by KEIL µVision and IAR Embedded Workbench

MOTEON motor control design-house

MOTEON is an Infineon Preferred Design House (PDH) and your global design house partner for motor control software and system solutions. End-to-end solutions and services for auxiliary motor control applications, from software and engineering to testing and tools, include:

- Motor analysis, software parametrization and tuning services
- MOTIX™ Motor Control Library, LLD/PDL resell and customization
- Application software development
- Mechatronic simulation and development
- Testing as a service
- Validation and data tracing tool
- Test automatization with mobile motor test bench (mMTB)



For more information, visit www.moteon.com or email info@moteon.com.

Availability

We offer various free evaluation and payable license models for development and productive use, as well as maintenance and support contracts. For more information, please contact your local Infineon sales partner and check out the Infineon Developer Center (IDC) at www.infineon.com/idc.

Software	Description	License models
SDK	Software Development Kit for MOTIX™ MCUs incl. LLD/PDL, example code and tool config files, IDE support KEIL µVision and IAR Embedded Workbench	Free evaluation
LLD/PDL	Low-level driver/Peripheral driver libraries for MOTIX™ MCUs	Payable
Motor Control Library	Modular library of motor control middleware for FOC solutions	Free evaluation Payable
Complex Device Driver	AUTOSAR compliant ASIL D complex device driver, optimized for integration in AURIX™	Free evaluation Payable
Device Driver	HW abstraction and API for MOTIX™ Driver, bridge, SBC and EiceDRIVER™	Free evaluation
Tools & Utilities	PC tools for device configuration and SW parametrization Motor control application examples, adaptive MOSFET control, etc.	Free evaluation

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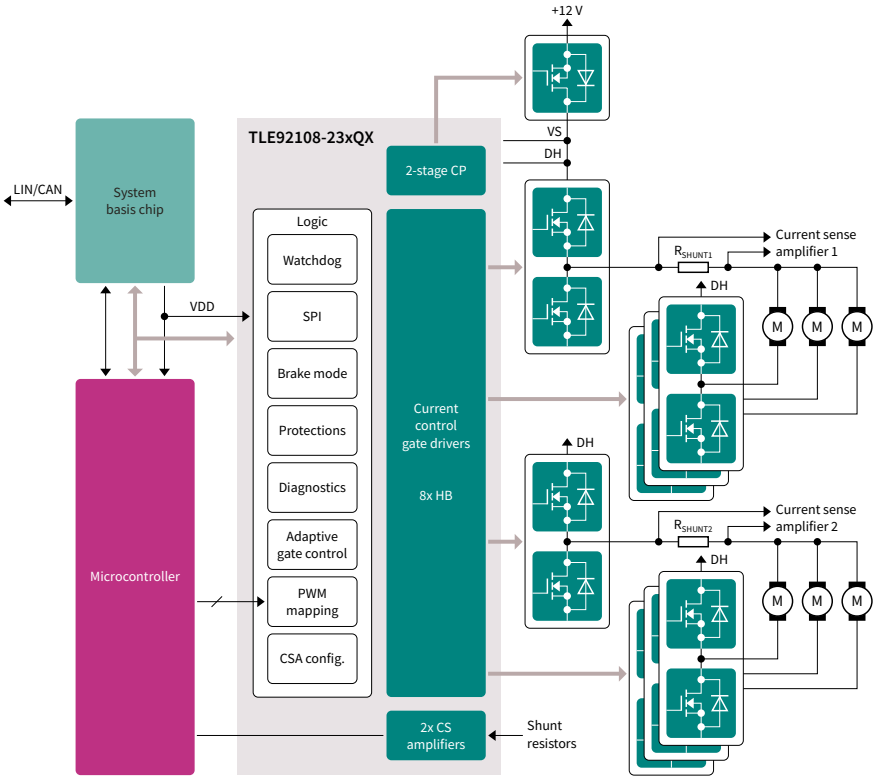
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MOTIX™ multi MOSFET gate driver ICs

Multiple half-bridge drivers designed to control up to eight half-bridges

Infineon's MOTIX™ TLE9210x is a family of multi-MOSFET gate driver ICs designed to control up to eight half-bridges (up to 16 N-channel MOSFETs) with one packaged device. Having only one device for several half-bridges enables further savings, such as less pick-and-place costs and less required PCB area than discrete solutions.
The MOTIX™ TLE92108 and MOTIX™ TLE92104 multiple MOSFET drivers offer a reliable, cost-optimized solution with state-of-the-art diagnostics and protection. The devices of the MOTIX™ TLE9210x family are pin and software-compatible. Furthermore, the product family allows motor cascading: with TLE92108 (eight half-bridges), up to seven bidirectional DC motors can be driven.



Product table

Type	Description	Brake mode	Package	Ordering code
TLE92108-231QX	8-fold MOTIX™ multi MOSFET gate driver ICs	No	PG-VQFN-48	TLE92108231QXXUMA1
TLE92108-232QX	8-fold MOTIX™ multi MOSFET gate driver ICs	Yes	PG-VQFN-48	TLE92108232QXXUMA1
TLE92104-131QX	4-fold MOTIX™ multi MOSFET gate driver ICs	No	PG-VQFN-48	TLE92104131QXXUMA1
TLE92104-232QX	4-fold MOTIX™ multi MOSFET gate driver ICs	Yes	PG-VQFN-48	TLE92104232QXXUMA1

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MOTIX™ TLE92104-23QX APPKIT and MOTIX™ TLE92108-23QX APPKIT

Infineon's evaluation boards to measure and evaluate the hardware and software functionalities of the MOTIX™ multi-MOSFET gate driver family.

The TLE92104-23QX APPKIT contains the multi-MOSFET gate driver IC TLE92104-232QX, and a typical application circuit, including 4 MOSFET half-bridges (OptiMOS™ 40 V MOSFETs in S3O8 package) to drive up to 3 bidirectional DC motors.

The TLE92108-23QX APPKIT contains the multi-MOSFET gate driver IC the TLE92108-232QX and a typical application circuit, including eight MOSFET half-bridges (OptiMOS™ 40 V in S3O8 package) to drive up to seven bidirectional DC motors.

The application boards can be connected to the computer via a UIO stick to evaluate their features using the config wizard (a graphical user interface), which can be found in the Infineon Developer Center.



Ordering code: TLE9210423QXAPPKITTOBO1
Ordering code: TLE9210823QXAPPKITTOBO1

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MOTIX™ TLE9140

Gate driver IC for BLDC motor control applications

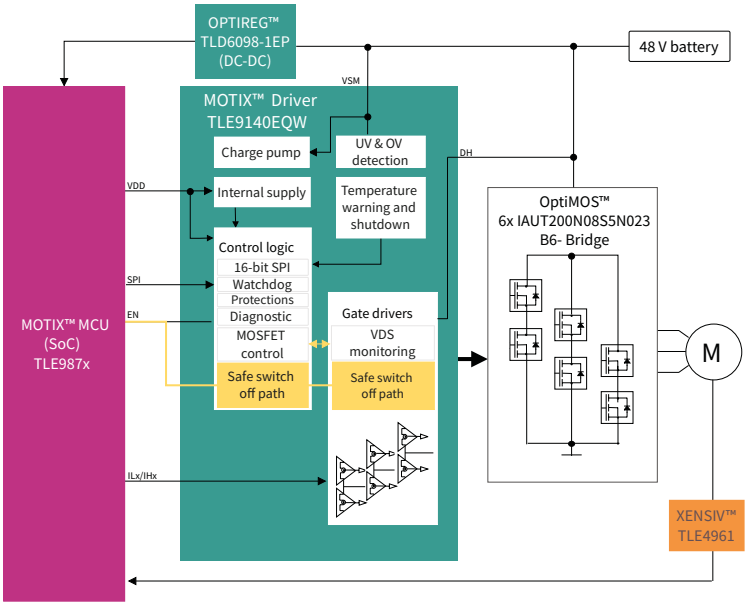
MOTIX™ TLE9140 is a 3-phase motor gate drive IC targeting 24/48 V battery-supplied applications where higher system reliability and faster switching behavior are necessary. The IC is the ideal complement to Infineon's MOTIX™ MCU TLE987x and TLE989x 32-bit motor control SoC solutions but is also suitable as a 48 V BLDC driver with common MCUs on the market. TLE9140 is applied as a 3-phase motor gate driver for applications in automotive, commercial, construction, and agricultural (CAV) vehicles as well as in light electric vehicles (LEV) such as eBikes, eScooters, or eMotorcycles.

The MOTIX™ TLE9140 gate driver IC for BLDC motors is ISO 26262-compliant (ASIL B) and has comprehensive protection and diagnosis features. The IC enables SPI communication and has an active low-side (LS) freewheeling function during VSM overvoltage (OV). The integrated adaptive MOSFET control feature can help improve EME, reduce power losses, and save on external components needed in the application. Furthermore, the small TS-DSO-32 packing enables space and weight reduction on the PCB.

Features and benefits

Key features	Key benefits
– Gate driving capability: ~230 nC/MOSFET up to 20 kHz	– Easy approach and scaling for 24 V/48 V applications in conjunction with our MOTIX™ MCU TLE987x/TLE989x or with any other open market MCU
– Adaptive MOSFET control feature integrated into the gate driver	– Can assist customers in achieving improved EMC performance and reduced power dissipation
– Comprehensive protection and diagnostic features integrated	– Allows for active monitoring of device state and protects system from damage
– Designed in a compact package TS-DSO-32 (8.65 x 3,9 mm²)	– Able to reduce PCB space requirements
– Automotive grade 0 qualified and ASIL B compliant	– High system reliability and meets challenging mission profiles

Block diagram





The MOTIX™ TLE9140 Evaluation Board contains the TLE9140EQW, TLE987x, and their typical application circuits including three half-bridges to drive a BLDC motor.

Evaluate TLE9140EQW in two scenarios:

- MOTIX™ 48 V gate driver TLE9140EQW controlled by MOTIX™ MCU (SoC) device TLE987x
- Evaluate MOTIX™ 48 V gate driver TLE9140EQW with Configuration Wizard in the Infineon Developer Center (IDC)

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MOTIX™ 6EDL7141

Three-phase smart gate drive controller IC

The MOTIX™ 6EDL7141 is Infineon's latest three-phase motor control gate driver IC, enabling the development of high-performance battery-operated products using BLDC or PMSM motors. Ideal applications include cordless power tools, gardening products, and automated guided vehicles. With over 50 programmable parameters using a built-in digital SPI interface, the MOTIX™ 6EDL7141 is fully configurable to drive a wide range of MOSFETs to yield the best possible system efficiency. The MOTIX™ 6EDL7141 is also designed for maximum flexibility. With an operating voltage from 5.5-70 V and configurable gate drive sink and source current up to 1.5 A, it can effectively drive a wide range of MOSFETs to fit the application best. Thanks to built-in dual charge pumps, it has an adjustable gate driver supply voltage setting between even at low battery voltage, 7 V, 10 V, 12 V, and 15 V. The MOTIX™ 6EDL7141 also has adjustable gate driver parameters to enable control of the slew rate to minimize system EMI. The MOTIX™ 6EDL7141 settings can be quickly changed with the available easy-to-use GUI. The integrated buck regulator requires only an external capacitor and inductor to provide power for the microcontroller and the Hall sensors in the motor, further reducing fault conditions.

EVAL_6EDL7141_TRAP_1SH

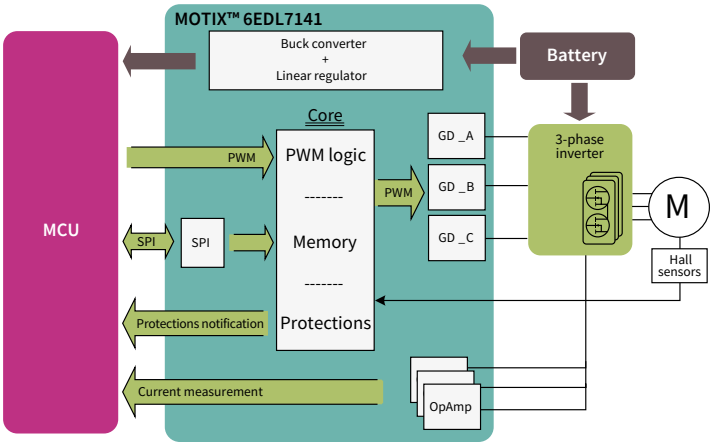
- Single shunt evaluation board for trapezoidal commutation of BLDC motors with 40 V OptiMOS™ 5 PQFN and XMC1404 MCU
- On-board programming dongle
- Featured IC: MOTIX™ 6EDL7141



Features and benefits

Key features	Key benefits
– Integrated power supplies	– Reduced external components and PCB area
– Adjustable slew rate	– Optimized efficiency and EMI
– Programmable gate drive parameters	– Maximum flexibility to use different inverter FETs
– 3x current shunt amplifier	– Highly accurate current sense while saving external components
– Complete dedicated motor control protection suite	– Higher dynamic range to increase signal resolution
	– Improve reliability and fault detection

Block diagram



Product portfolio

Part number	Package	Voltage [V]	$R_{DS(on),max}$, [mΩ]
6EDL7141	PG-VQFN-48-78	5.5 – 70 V	2.2

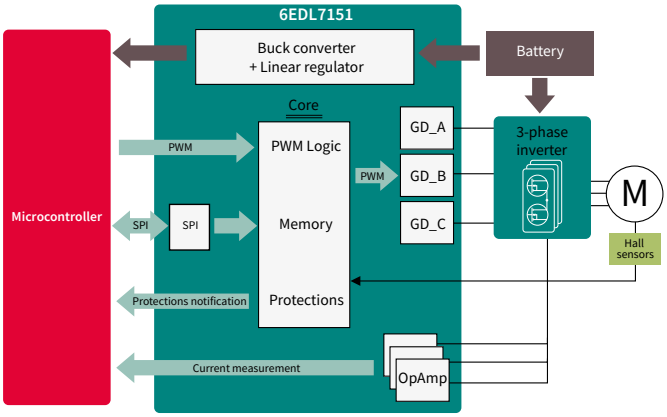
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MOTIX™ 6EDL7151 3-phase smart gate drive controller IC

Three-phase motor control gate driver IC for battery supplied BLDC motor control

The 6EDL7151 is Infineon's latest 3-phase gate driver, which includes an added V_s sensor to allow additional hardware system protection for battery-supplied motor control products. Ideal applications include cordless power tools, gardening products, and automated guided vehicles. With over 50 programmable parameters using a built-in digital SPI interface, 6EDL7151 is fully configurable to drive a wide range of MOSFETs to yield the best possible system efficiency. 6EDL7151 is also designed for maximum performance. Features include programmable deadtime delays for preventing current shoot through between HS and LS switches in normal operation and separate charge pumps for low and high side gate drivers to support 100 percent duty cycle and low voltage supply operation. Supplies for the gate drivers are programmable to one of the following levels: 7 V, 10 V, 12 V, or 15 V. Additionally, the slew rate of the driving signal can be programmed with fine granularity to reduce EMI emissions. An integrated synchronous buck converter provides an efficient current supply to the rest of the system. The 6EDL7151 also integrates a linear voltage regulator (up to 300 mA) powered by the buck converter to supply the MCU and other sensitive components in the system. 6EDL7151 includes three current sense amplifiers for accurate current measurements that support Bidirectional low-side current sensing with programmable gain. $R_{DS(on)}$ sensing is supported through the internal connection of the phase nodes to the current sense amplifier inputs. Temperature compensation, if needed, shall be provided by the user application. 6EDL7151 also includes highly programmable V_{DS} sensors for inverter MOSFET protection. In addition, 6EDL7151 provides numerous protection features for improving application robustness during adverse conditions like monitoring power supply voltages and system parameters. The failure behavior, threshold voltages, and filter times of the device's supervision are adjustable via SPI. Monitored aspects include inverter currents, gate drive voltages and currents, device temperature, and rotor lock.





Features and benefits

Product features	Product benefits
– Integrated power supplies	– Reduced external component count and PCB area
– Adjustable slew rate	– Lower voltage overshoots and EMI reduction
– 3x current shunt amplifier	– Maximum flexibility to use different inverter MOSFET's
– Complete dedicated motor control protection suite	– Highly accurate integrated current sense saves external components
– V_{DS} sensing	– Improved reliability and fault detection

Product family

Product	Package	Voltage [V]	DVDD regulator output [V]
6EDL7151	VQFN 48 7mm x 7mm	5.5-70 V	5.0 V

Power tools · Gardening tools · Multicopter · Service robots · eBike · Vacuum cleaner

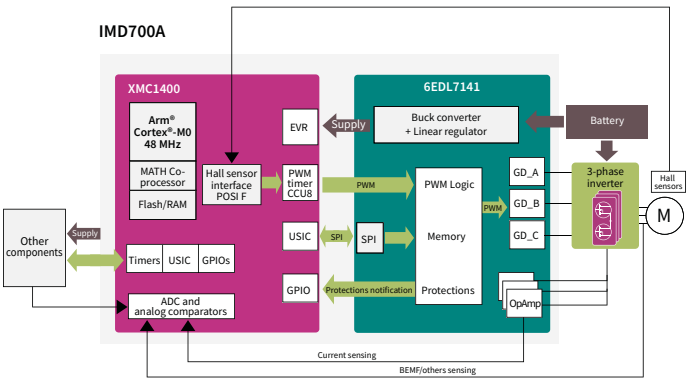
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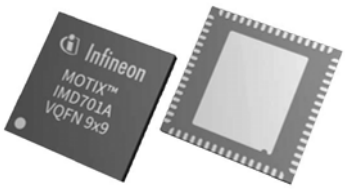
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MOTIX™ IMD700A/IMD701A integrated controller

Fully programmable motor controller combining microcontroller and gate driver IC

Today's newest battery-operated motor drive applications require increased power density and longer run-time, which needs higher efficiency. MOTIX ™ IMD700A and IMD701A are Infineon's latest fully programmable motor controllers integrating XMC1404 microcontroller with MOTIX™ 6EDL7141 3-phase gate driver IC in one package to enable the development of next-generation battery-operated products using BLDC or PMSM motors. These controllers are ideal for applications such as professional cordless power tools, gardening products, e-bikes, and automated guided vehicles. With integrated precision power supply and current shunt amplifiers, much of the peripheral circuitry is no longer necessary, reducing PCB space and improving system packaging possibilities. XMC1404, Arm® Cortex®-M0 based microcontroller, incorporates dedicated features to improve motor drive control. A hardware MATH Co-Processor clocked at 96 MHz enhances calculations, including division and trigonometric functions commonly used in Field Oriented Control of PMSM. Additionally, XMC1404 inherits most of the high-end peripherals found in the XMC4000 family (Arm® Cortex®-M4), including PWM timers -CCU8 and CCU4-, position interface (POSIF) or serial communication modules, including CAN, ensuring Best-in-class control. The integrated 3-phase gate driver (6EDL7141) includes a configurable gate drive sink and source currents up to 1.5 A, enabling the ability to drive a wide range of MOSFETs effectively to minimize losses and increase efficiency. Thanks to built-in high and low side charge pumps, it has adjustable gate driver supply voltage settings between 7 V, 10 V, 12 V, and 15 V, even at low battery voltage. The 6EDL7141 also has dynamically adjustable gate driver parameters to enable control of the slew rate to minimize system EMI and voltage overshoots. In addition, with a full suite of system protection features such as OCP, UVLO, overtemperature, and locked rotor detection, this dedicated motor controller will increase reliability and robustness in severe operating fault conditions.





Features and benefits

Key features	Key benefits
– Integrated power supplies	– Reduced external component count and PCB area
– Adjustable slew rate	– Lower voltage overshoots and EMI reduction
– Programmable gate drive parameters	– Maximum flexibility to use different inverter MOSFETs
– 3x current shunt amplifier	– Highly accurate integrated current sense saves external components
– Complete dedicated motor control protection suite	– Improved reliability and fault detection

Part number	Package	Voltage [V]	D_{VDD} regulator output [V]
IMD700A-Q064X128-AA	PG-VQFN-64-8 9 x 9 mm	5.5 V – 60 V	3.3 V
IMD701A-Q064X128-AA	PG-VQFN-64-8 9 x 9 mm	5.5 V – 60 V	5.0 V

Power tools · Gardening tools · Multicopter · Service robots · eBike · Vacuum cleaner

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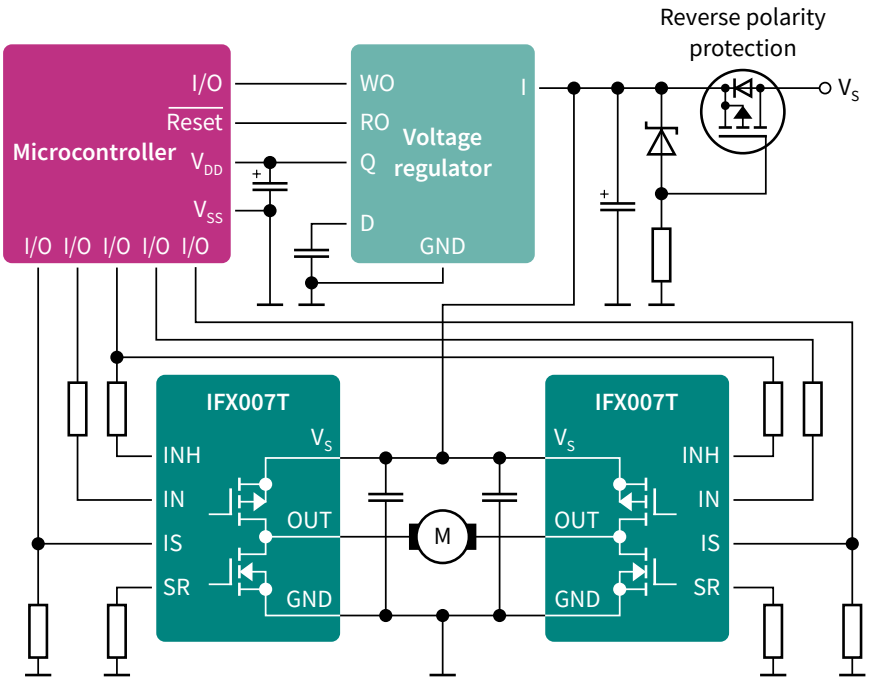
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MOTIX™ single half-bridge IC

Protected high-current half-bridge for industrial applications

MOTIX™ single half-bridge IC provides a complete, low-ohmic protected half-bridge in a single package (typical path resistance at 25°C down to 10 mΩ). It can also be combined with an additional MOTIX™ single half-bridge IC to create an H-bridge or three-phase bridge. It can switch high-frequency PWM while providing overcurrent, overvoltage, and overtemperature protection. The MOTIX™ single half-bridge ICs family offers cost-optimized, scalable solutions for protected high-current PWM motor drives with very restrictive board space. The P-channel high-side switch eliminates the need for a charge pump, thus minimizing EMI. The latest addition to the single half-bridge IC family is the IFX007T, optimized for industrial applications.

Application example for high-current PWM motor drives



High-current H-bridge



Features

Basic features
– Low quiescent current
– Capable for high PWM frequency
– Logic level input
– Adjustable slew rate
– Cross-current protection

Protection features
– Overtemperature shutdown
– Overvoltage shutdown
– Undervoltage
– Overcurrent

Diagnostic features
– Overtemperature
– Overvoltage
– Current sense and status

Product number	Operating range [V]	$R_{DS(on)}$ path (typ.) [mΩ]	$I_{D(lim)}$ (typ.) [A]	I_q (typ.) [µA]	Switch time (typ.) [µs]	Diagnosis	Protection	Package	Qualification
IFX007T	5.5 ... 40.0	10.0	70	7	0.25	OT, OC, CS	UV, OT, OC	PG-TO-263-7	JESD471

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CS = Current sense OC = Overcurrent OT = Overtemperature UV = Undervoltage

BLDC motor control shield with IFX007T for Arduino

The BLDC motor control shield is a high-current motor control board compatible with Arduino and Infineon's XMC4700 boot kit. It is equipped with three smart MOTIX™ IFX007T single half-bridge ICs. The BLDC motor control shield can drive one BLDC motor. Alternatively, it can drive one or two bidirectional DC motors (H-bridge configuration, cascaded to support a second motor) or up to three unidirectional DC motors (half-bridge configuration). A PWM can control the implemented MOTIX™ IFX007T half-bridges via the IN-pin.

Features

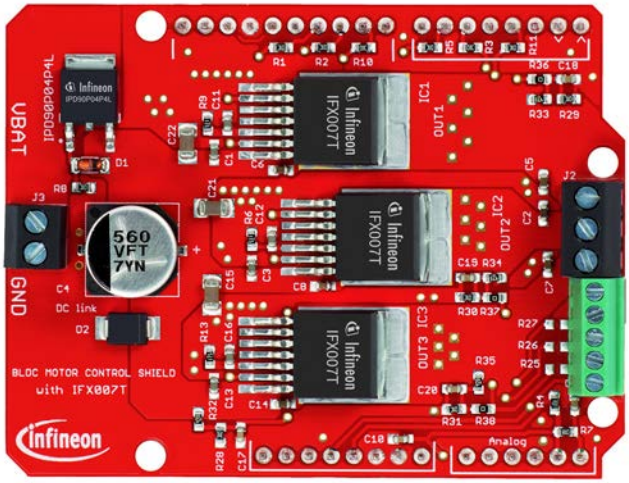
Key features
– Capable of high-frequency PWM, e.g., 30 kHz
– Adjustable slew rates for optimized EMI by changing external resistor
– Driver circuit with logic level inputs
– Diagnosis with current sense

Target applications

– Brushed DC motor control up to 250 W continuous load
– 24 V nominal input voltage (max. 6 - 40 V)
– Average motor current 30 A restricted due to PCB (IFX007T current limitation at 55 A min.)

BLDC-SHIELD_IFX007T

BLDC motor control with MOTIX™ IFX007T single half-brigde IC.
Infineon's shields for Arduino are compatible with microcontroller boards using the Arduino-compatible form factor, e.g., Infineon's XMC™ microcontroller kits.
Ordering code: BLDCSHIELDIFX007TTOBO1



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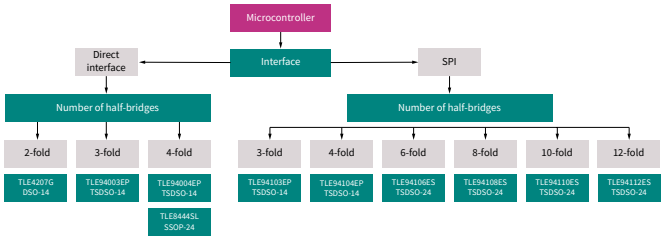
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MOTIX™ multi half-bridge ICs

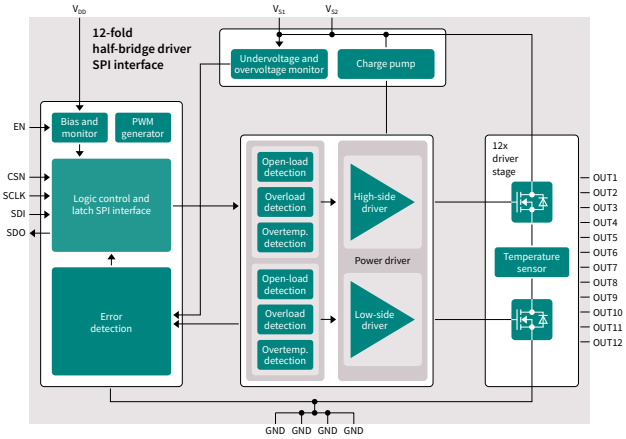
Extensive offering ranging from two-fold half-bridge ICs to twelve-fold half-bridge ICs

The MOTIX™ TLE94xyz products are protected half-bridge drivers designed for 12 V motion control applications such as small DC motors for heating, ventilation, and air conditioning (HVAC), as well as automotive mirror adjustment and fold. The family offers two-, three-, four-, six-, eight-, ten-, and twelve-fold integrated half-bridge drivers. All devices can drive DC motor loads up to 0.9 A per output, or the outputs can be used stand-alone or combined with increasing driving capability up to 3.6 A. They diagnose short circuits, open loads, power supply failures, and overtemperature for each half-bridge to ensure safe operation in HVAC or other systems. The TLE94xyz offers enhanced EMC performance, which, combined with the low quiescent current and a small package, makes the product attractive for a wide range of 12 V automotive and industrial applications. In addition to TLE94xyz, Infineon's multi-half-bridge offerings include a dual-half-bridge driver, TLE4207G.

Infineon's portfolio of MOTIX™ multi half-bridge ICs



Block diagram MOTIX™ TLE94112ES



Features and benefits

Key features and benefits
– Three-, four-, six-, eight-, ten-, and twelve-fold half-bridges with integrated output stages and PWM
– 16-bit SPI or direct inputs for control and diagnosis
– Voltage supply range: 5.5-20 V
– Variable driving schemes for up to 11 motors

Key applications

- 12 V automotive and industrial applications
- Flap motors in HVAC systems
- Mirror adjustment and fold
- Small DC motors (≤ 0.9 A/output)
- Bistable relays
- Bipolar stepper motors in full-step and half-step mode

Product name	Config.	$I_{L(NOM)}$ [A]	$I_{L(lim)}$ [A]	I_q [µA]	$V_{S(OP)}$ [V]	Protection	Diagnostic interface	Highlights	$V_{CE(sat)}$/ $R_{DS(on)}$ [mΩ]	Package
TLE94003EP	3 x half-bridge	3 x 0.30	3 x 0.90	0.6	5.5 to 20	OC, OT, VS, UV/OV	Error flag	TLE94xyz family concept + small package	850/switch	TSDSO-14-
TLE94103EP	3 x half-bridge	3 x 0.30	3 x 0.90	0.6	5.5 to 20	OC, OT, OL, VS, UV/OV	16-bit SPI	TLE94xyz family concept + small package		TSDSO-14-
TLE94004EP	4 x half-bridge	4 x 0.30	4 x 0.90	0.6	5.5 to 20	OC, OT, VS, UV/OV	Error flag	TLE94xyz family concept + small package		TSDSO-14-
TLE94104EP	4 x half-bridge	4 x 0.30	4 x 0.90	0.6	5.5 to 20	OC, OT, OL, VS, UV/OV	16-bit SPI	TLE94xyz family concept + small package		TSDSO-14-
TLE94106ES	6 x half-bridge	6 x 0.30	6 x 0.90	0.6	5.5 to 20	OC, OT, OL, VS, UV/OV	16-bit SPI	TLE94xyz family concept + backwards compatible to TLE84106EL		TSDSO-24
TLE94108ES	8 x half-bridge	8 x 0.30	8 x 0.90	0.6	5.5 to 20	OC, OT, OL, VS, UV/OV	16-bit SPI	TLE94xyz family concept		TDSO-24
TLE94110ES	10 x half-bridge	10 x 0.30	10 x 0.90	0.6	5.5 to 20	OC, OT, OL, VS, UV/OV	16-bit SPI	TLE94xyz family concept + backwards compatible to TLE84110		TDSO-24
TLE94112ES	12 x half-bridge	12 x 0.30	12 x 0.90	0.6	5.5 to 20	OC, OT, OL, VS, UV/OV	16-bit SPI	TLE94xyz family concept + 12 outputs in one package		TDSO-24
TLE4207G	2 x half-bridge	2 x 0.80	2 x 1.50	20	8 to 18	OC, OT, VS, UV/OV	Status flag	Error detection		DSO-14

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DC motor control HAT with MOTIX™ TLE94112ES

Complies with Raspberry Pi HAT specification

The Infineon motor control HAT with MOTIX™ TLE94112ES complies with Raspberry Pi HAT specifications and provides a unique evaluation experience. It is equipped with a 12-fold half-bridge driver TLE94112ES and comes with a ready-to-use software library. The HAT is also equipped with an Infineon TLS4125D0EP V50, a synchronous step-down converter, which can power the Raspberry Pi.

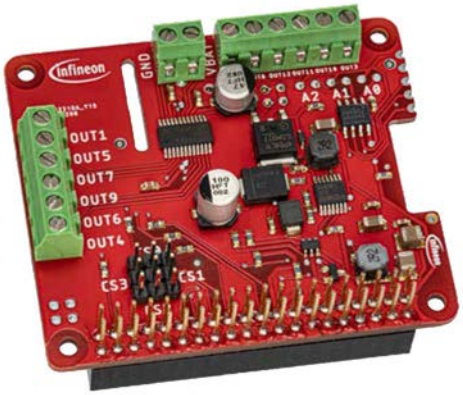
Features and benefits

Key features
– Twelve half-bridge power outputs, 0.9 A each (combinable to up to 3.6 A)
– Wide input voltage range of 5.5 to 20 V
– Powering of Raspberry Pi by TLS4125D0EP V50
– Reverse polarity protection
– Driver is protected against overtemperature, overcurrent, overvoltage, undervoltage, and enables diagnosis of overcurrent, overvoltage, undervoltage
– SPI interface with zero clock diagnosis
– Enhanced EMC performance
– Integrated PWM generator with 3 different frequencies (80 Hz, 100 Hz, 200 Hz)

Benefits
– Compact design for multi-motor applications
– Quick and easy setup for evaluation and demo applications
– Wide range of applications

Target applications

– Automotive motor control: HVAC flap control
– Multi-motor applications
– DC motors and voltage controlled bipolar stepper motors



Ordering code: TLE94112ESRPIHATTOBO1

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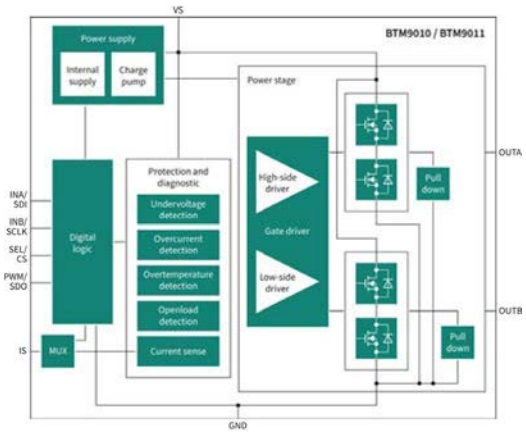
MOTIX™ full-bridge ICs

Smart, reliable, and compact motor control solutions

The MOTIX™ BTM90xx full-bridge IC family is characterized by a high functionality to enable intelligent and tiny motor control solutions. The devices, with a supply voltage range for normal operation of 7 V to 18 V (extended 4.5 V to 40 V), offer extensive protection and diagnostic functions such as overtemperature, undervoltage, overcurrent, cross-current, or short-circuit detection. Currents are measured for both the high-side and low-side switches, and the devices are suitable for applications with a current limit of at least 10 A (BTM901x) or 20 A (BTM902x). PWM operation is possible for frequencies up to 20 kHz. The BTM9011EP and BTM9021EP are SPI variants and support a pin-saving daisy chain function to help reduce overall system costs. BTM9021, in addition, features an integrated watchdog. The BTM90xx's tiny TSDSO-14 (4.9 x 6.0 mm) package reduces the overall PCB board space required and features a large exposed pad that simultaneously improves the device's thermal performance.

Features and benefits

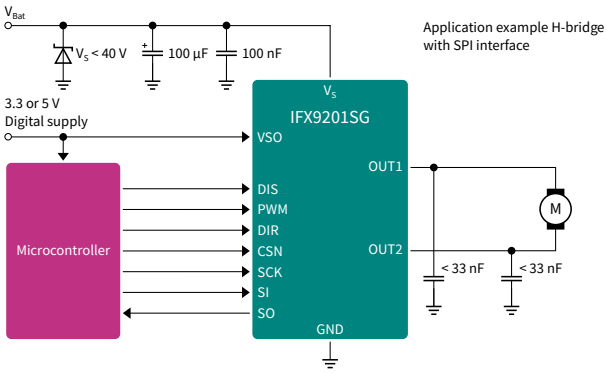
Key features and benefits
– Flexible for applications with full-bridge or two half-bridges
– Precise motor speed adjustment with PWM, and additionally with active FW to reduce power dissipation
– Space savings thanks to a small package
– Cost savings e.g., external capacitors
– Exposed pad package for excellent thermal performance
– Reliable automotive-qualified solution with diverse protection and diagnosis functions



MOTIX™ IFX9201SG full-bridge IC is a general-purpose 6 A H-bridge designed to control small DC motors and inductive loads. The outputs can be pulse-width modulated at frequencies up to 20 kHz, enabling operation above the human sonic range through PWM/DIR control. While the signal at the DIR input defines the direction of the DC motor, the PWM signal controls the duty cycle. The H-bridges switch into chopper current limitation mode for load currents above the current limitation threshold (8 A typically).

Features

Key features
– Up to nominal 36 V supply voltage
– Short circuit, overtemperature protection, and undervoltage shutdown
– Detailed SPI diagnosis or simple error flag
– Simple design with few external components
– Small and robust DSO-12-17 (IFX9201SG) and DSO-36-72 (IFX9202ED) packages

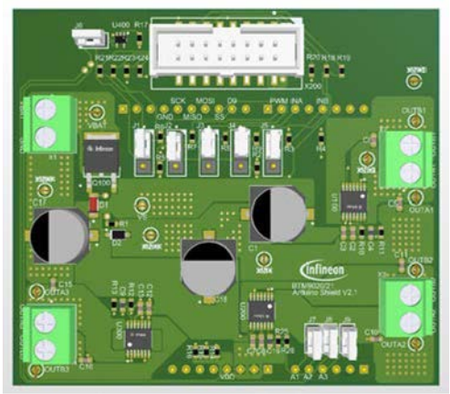


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Shields for Arduino for MOTIX™ BTM90xx full-bridge ICs

KIT_BTM9010/11 and KIT_BTM9020/21 are available for the easy evaluation of the BTM90xx full bridge IC family hardware and software functionality.



The MOTIX™ BTM90xxEP Device Driver, Configuration Wizard and the Arduino Shield Application Software are available on theInfineon Developer Center (IDC) at www.Infineon.com/idc. The latter is a comprehensive solution designed specifically for Arduino Uno and is compatible with the TRAVEO™ Starter Kit and the Shield for Arduino KIT_BTM9020/21.

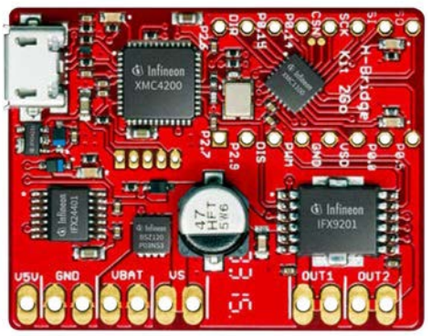
Ordering code: KITBTM901011TOBO1, KITBTM902021TOBO1

H-BRIDGE KIT 2GO with MOTIX™ IFX9201SG

Build your DC motor control with the H-bridge Kit 2GO, a ready-to-use evaluation kit. It is fully populated with all electronic components equipped with the H-bridge MOTIX™ IFX9201 combined with the XMC1100 microcontroller based on Arm® Cortex®-M0 CPU. It is designed for the control of DC motors or other inductive loads up to 6 A or up to 36 V of supply.

Target applications
- DC motor control for industrial applications
- Home and building automation
- Power tools battery management
- Industrial robotic applications
- Electric toys applications

Ordering code: HBRIDGEKIT2GOTOBO1



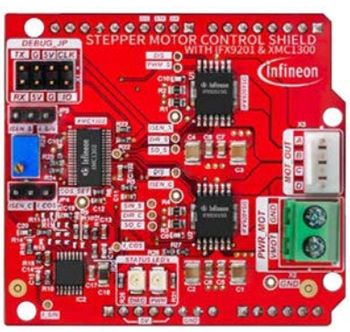
KIT_XMC1300_IFX9201
Stepper motor control shield with MOTIX™ IFX9201SG and XMC1300 for Arduino

The stepper motor control shield is compatible with Arduino and Infineon's XMC1100 boot kit. It can drive the two coils in a stepper motor featuring a dual-half-bridge configuration. A STEP signal can control the implemented integrated MOTIX™ IFX9201 full-bridge IC via the STEP pin. Interfacing with a microcontroller is made easy by the integrated XMC1300 microcontroller that holds the peripherals to allow high-speed current control. Microstepping of the stepper motor can be achieved using the internal comparators, while operational amplifiers are installed to adapt the motor current sense signal to the microcontroller's input levels.

The stepper motor control shield is capable of high-frequency PWM, e.g., 30 kHz. Adjustable slew rates enable optimized EMI by changing the external resistor driver circuit with logic level inputs and diagnosis with current sense, which are further benefits.

Target applications
- Stepper motors up to 5 A phase current
- 24 V nominal input voltage for the power stage
- Average motor current 3 A without additional cooling effort, 5 A possible with proper cooling

Ordering code: KITXMC1300IFX9201TOBO1



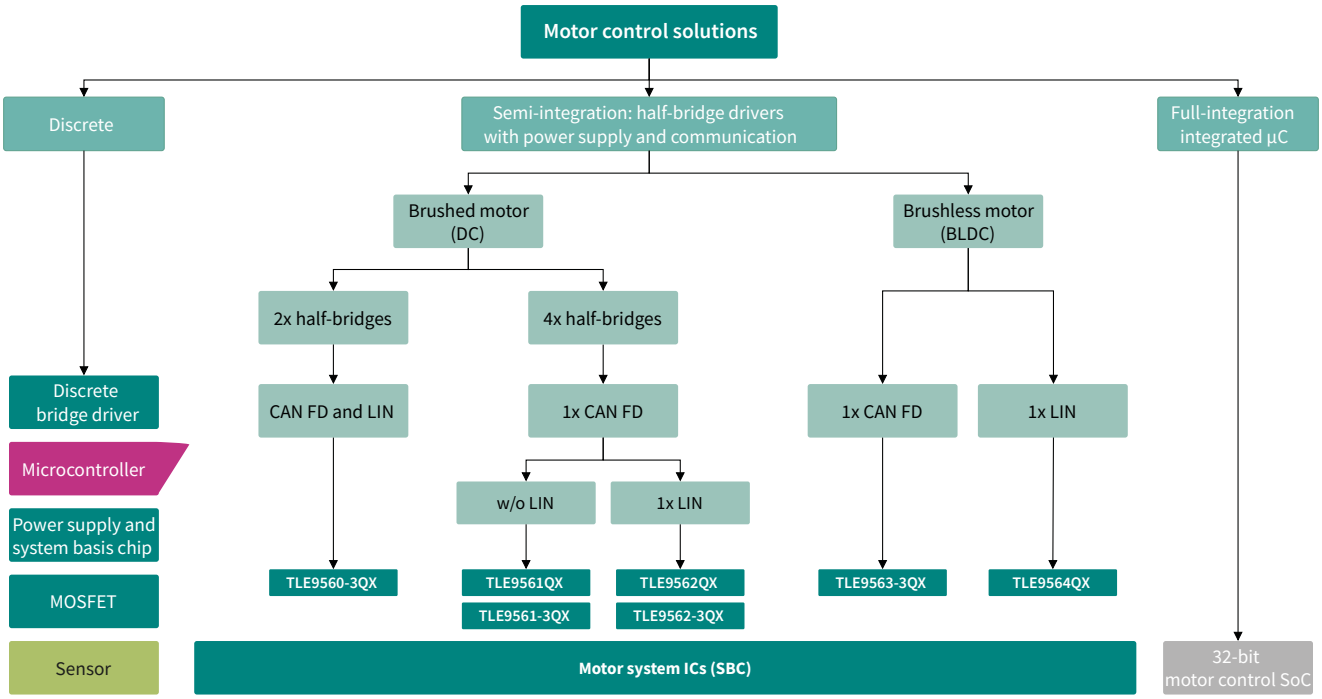
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MOTIX™ motor system ICs (SBC)

Motor system ICs (SBC) for BDC and BLDC motors combine power supply, communication, and multiple half-bridge MOSFET drivers

MOTIX™motor system ICs (SBC) offer integration, high performance, and optimized system cost for DC and BLDC motor control applications. All motor system IC family devices feature a low-dropout voltage regulator with an output current of 250 mA/5 V. The communication interface incorporates a CAN FD transceiver up to 5 Mbit/s according to ISO 11898-2:2016 (including partial networking (PN) option) and/or a LIN transceiver.



Features

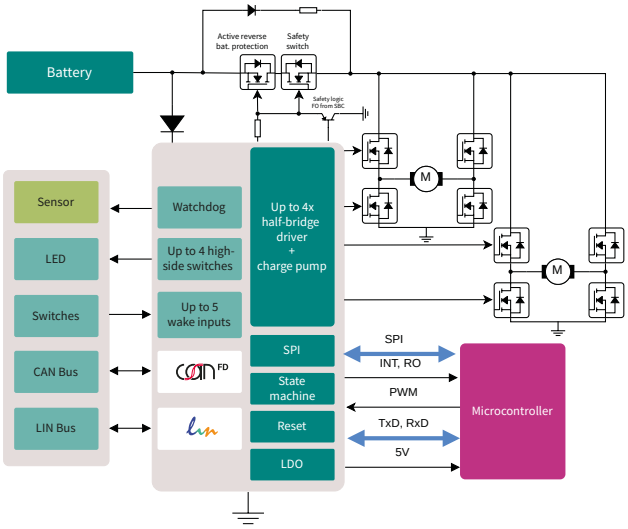
Features
– 5 V linear regulator up to 250 mA
– CAN FD up to 5 Mbps CAN PN and FD tolerant (“-3” variants)
– LIN2.2B/J2602
– MOTIX™ TLE9560/1/2: up to 4 half-bridge gate drivers with adaptive MOSFET control up to 100 mA constant gate charge
– MOTIX™ TLE9563/4: three-phase gate driver with CSA and adaptive MOSFET control up to 150 mA constant gate charge
– Up to 4 high-side switches (with 7 on-resistance) Up to 5 wake inputs
– Up to 6 PWM inputs

Benefits
– PCB savings up to 50% due to unique integration approach
– Lower switching losses and EMC optimization due to adaptive MOSFET control
– Automatic regulation of MOSFET pre-charge currents diminish need for production MOSFET calibration
– VS monitoring in sleep mode activates MOSFET to prevent from ECU damage when motor is in generator mode

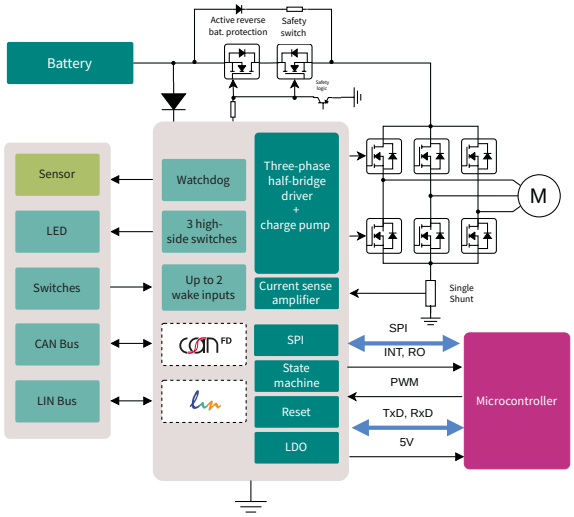
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Application diagram MOTIX™ TLE9560/1/2 for DC motor control



Application diagram MOTIX™ TLE9563/4 for BLDC motor control



Product table

Product variant	V_{CC}1	CAN FD	CAN PN	LIN	HS switches	PWM input	Driver
TLE9560-3QX	5 V up to 250 mA	✓	✓	✓	4	1	2x half-bridges (100 mA const.)
TLE9561QX	5 V up to 250 mA	✓	–	–	4	4	4x half-bridges (100 mA const.)
TLE9561-3QX	5 V up to 250 mA	✓	✓	–	4	4	4x half-bridges (100 mA const.)
TLE9562QX	5 V up to 250 mA	✓	–	✓	4	2	4x half-bridges (100 mA const.)
TLE9562-3QX	5 V up to 250 mA	✓	✓	✓	4	2	4x half-bridges (100 mA const.)
TLE9563-3QX	5 V up to 250 mA	✓	✓	–	3	6	3x half-bridges (150 mA const.)
TLE9564QX	5 V up to 250 mA	–	–	✓	3	6	3x half-bridges (150 mA const.)

Power lift gate · Seat · Electric parking brake · Steering lock · HVAC flap · Transfer case · Sunroof · Fans · Pumps

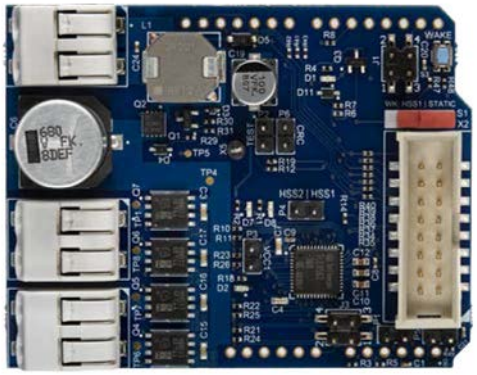
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Your input matters
Share your feedback

DC and BLDC motor control shields and evaluation boards with MOTIX™ TLE9562-3QX and with MOTIX™ TLE9563-3QX

The purpose of these boards is to provide a quick evaluation solution for lab assessments. The evaluation boards offer a unique two-in-one solution: they can be connected via a UIO stick with the computer to evaluate features via config wizard (a graphical user interface), which can be found in the Infineon Developer Center. In addition, the evaluation boards feature an Arduino shield interface for rapid prototyping.



Summary of features BLDC motor control shield with MOTIX™ TLE9563-3QX

- Operating voltage range 5.5-28 V with 5 V compatible logic input
- Integrated reverse polarity protection with on-board EMC filter
- Three integrated half-bridges MOSFET (2-in-1 MOSFET package)
- 5 mΩ low-side current sense
- High-power RGB LED driven by integrated high-side switches
- On-board back-EMF detection circuit and connector for Hall-sensor
- Arduino example codes available

Sales product name: BLDC SHIELD_TLE956X
Ordering code: BLDCSHIELDTLE956XTOBO1

Summary of features DC motor control shield with MOTIX™ TLE9562-3QX

- Operating voltage range 5.5-28 V with 5 V compatible logic input
- Integrated reverse polarity protection with on-board EMC filter
- Four integrated half-bridge MOSFETs (2-in-1 MOSFET package)
- Easy interfacing of CAN and LIN transceiver
- Miniaturization/shrink of the PCB area
- Arduino example codes available

Sales product name: DC SHIELD_TLE956X
Ordering code: DCSHIELDTLE956XTOBO1

Benefits of DC and BLDC motor control shields

- 2-in-1 board with GUI and Arduino interface for evaluation and rapid prototyping
- 50 percent reduced internal operating current consumption
- Simplified and cost-efficient ground network
- Smaller package size for area savings
- Very low quiescent current in sleep mode

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Infineon support for power ICs

Useful links and helpful information

Further information, datasheets, and documents

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Support
Evaluation board
Tools
Simulation



Wide-bandgap semiconductors

Gallium nitride (GaN)

- CoolGaN™ Transistor
- CoolGaN™ Drive
- CoolGaN™ BDS
- CoolGaN™ portfolio
- CoolGaN™ nomenclature

Silicon carbide (SiC)

- CoolSiC™ MOSFETs discrete 650 V G1
- CoolSiC™ MOSFETs discrete 750 V G1
- CoolSiC™ Automotive MOSFETs 750 V G1
- CoolSiC™ MOSFETs discrete 1200 V G1
- CoolSiC™ MOSFETs discrete 1700 V G1
- CoolSiC™ MOSFETs discrete 2000 V G1
- CoolSiC™ MOSFETs discrete 400 V G2
- CoolSiC™ MOSFETs discrete 650 V G2
- CoolSiC™ MOSFETs discrete 750 V G2
- CoolSiC™ Automotive MOSFETs 750 V G2
- CoolSiC™ MOSFETs discrete 1200 V G2
- CoolSiC™ MOSFET discrete 1400 G2
- CoolSiC™ Schottky diodes
- CoolSiC™ Schottky diodes 650 V
- CoolSiC™ Schottky diodes 1200 V
- CoolSiC™ Schottky diodes 2000 V
- CoolSiC™ Schottky diodes product portfolio
- CoolSiC™ nomenclature

Please click here to discover **CoolSiC™ hybrid devices**.

Your input matters
Share your feedback

Wide-bandgap semiconductors

Gallium nitride (GaN) and silicon carbide (SiC)

A key step towards an energy-efficient world is using new materials, such as wide-bandgap semiconductors that allow for greater power efficiency, smaller size, lighter weight and reduced system costs. As the leading and trusted power supplier, Infineon offers the broadest product and technology portfolio of silicon (Si) and wide-bandgap (WBG) solutions with more than 40 years of heritage in silicon and several decades of heritage in wide-bandgap technology development. Infineon's offering in wide-bandgap with CoolGaN™ and CoolSiC™ is complemented by EiceDRIVER™ gate drivers, PSOC™ microcontrollers, and software which provide the flexibility to implement different system partitioning with the right fit isolation rating.

Recent developments include the acquisition of GaN Systems in late 2023, which supports customers with an expanded offering and internal dual sourcing via independent manufacturing flows. In addition, the second generation CoolSiC™ is launched with a rollout through 2024 and 2025, extending the lead in performance and reliability via the adoption of our field-proven .XT™ advanced interconnection technology.

CoolGaN™ – ultimate efficiency and reliability

Compared to silicon (Si) MOSFETs, the breakdown field of Infineon's CoolGaN™ power transistors is ten times higher, and the electron mobility is double. The output and gate charges are ten times lower than with Si, and the reverse recovery charge is almost zero, which is key to high-frequency operations. GaN is well suited for hard-switching and perfect for soft-switching and resonant topologies, enabling new approaches beyond the capabilities of silicon switches. CoolGaN™ power transistors from Infineon are based on the market's most robust and performing concept – the enhancement-mode concept - offering fast turn-on and turn-off speeds. CoolGaN™ products focus on high performance and robustness and add significant value to a wide variety of systems across applications in consumer, industrial, and automotive. Examples of applications that are of great benefit are USB-C adapters, AI server PSUs, telecoms, on-board chargers for EVs, robotics, drones, audio, and many more.

CoolSiC™ - revolution to rely on

Silicon carbide has a significantly higher thermal conductivity compared to silicon. SiC-based MOSFETs are best-suited for applications requiring high power and high temperature operation. SiC allows higher switching frequency than IGBTs with high scalability in breakdown fields up to 3 kV. CoolSiC™ MOSFETs come with a fast internal freewheeling diode, thus making hard commutation without additional diode chips possible. Due to their unipolar character, the MOSFETs have low temperature-dependence switching and low conduction losses, especially under partial load conditions. Based on proven, high-quality volume manufacturing, Infineon's CoolSiC™ solutions combine revolutionary technology with benchmark reliability.

Click here to learn more:

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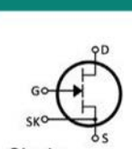
CoolGaN™ innovations from Infineon

Explore the world of CoolGaN™ innovations and enter a new era of efficiency and reliability!

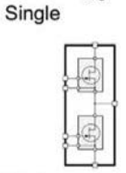
Infineon's CoolGaN™ solutions are what you need to elevate your designs to the next level. The outstanding reliability, industry-leading performance and highest quality of CoolGaN™ add significant value to a broad variety of systems across many applications such as servers, hyperscale data centers, telecom, motor control, industrial solutions, residential solar and ESS, on-board charging, USB-C adapters and chargers, and audio.

CoolGaN™ Transistor

Infineon's CoolGaN™ Transistor are normally-off devices. They range from 60 V up to 700 V.

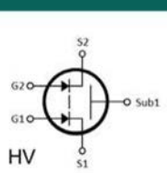


Single

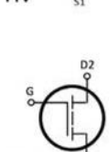

Dual

CoolGaN™ BDS

Family of monotlithic bidirectional switches (BDS) based on Infineon's CoolGaN™ Transistor technology.



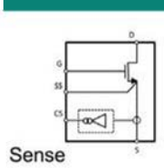
HV

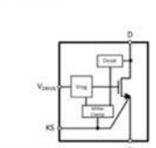


MV

CoolGaN™ Smart Coming soon

Family of CoolGaN™ Transistors with industry-leading integrated features such as lossless current sense and protection functions.

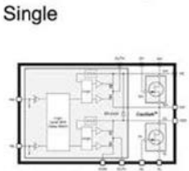

Sense


Protect

CoolGaN™ Drive Coming soon

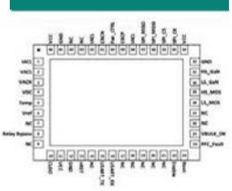
Infineon's CoolGaN™ Drive family integrates CoolGaN™ Transistors with intelligent gate drivers.


Single


Half-bridge

CoolGaN™ Control Coming soon

The CoolGaN™ Control family comprises stand-alone controllers as well as CoolGaN™ Transistors with integrated controllers.



Click here to learn more:

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CoolGaN™ Transistor

Tailor-made for the highest efficiency and power density in switch-mode power supplies

Compared to the next best silicon alternative, CoolGaN™ enables higher power density and the highest efficiency, especially in the partial load range, through novel topologies such as the CCM totem-pole PFC stage. GaN transistor performance features a low reverse recovery charge and excellent dynamic performance in reverse conduction compared to silicon FET solutions. This characteristic enables more efficient operation at established frequencies and much higher frequency operation, improving power density by shrinking the size of passive components. CoolGaN™ enables doubled output power in a given energy storage slot size, simultaneously freeing up space and realizing higher efficiency. Infineon's CoolGaN™ comes with industry-leading reliability. During the quality management process, it is not only the device that is thoroughly tested but also its behavior in the application environment. The performance of CoolGaN™ goes beyond other GaN products in the market.

Features
- Low output charge and gate charge
- No reverse recovery charge

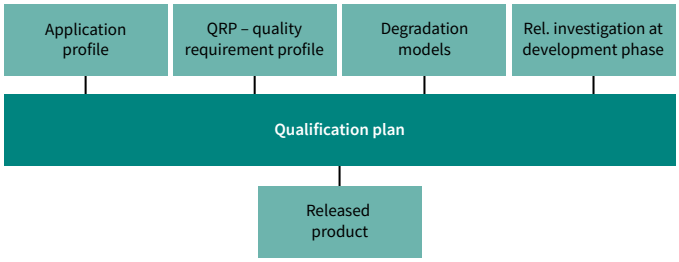
Design benefits
- High power density, small, and light design
- High efficiency in resonant circuits
- New topologies and current modulation
- Fast and (near-) lossless switching

Advantages
- Operational expenses (OPEX) and capital expenditure (CAPEX) reduction
- BOM and overall cost savings

Infineon's high- and low-voltage MOSFETs, gate driver ICs, and digital controllers complement the CoolGaN™ offering to fully exploit the benefits of GaN technology in systems.

The highest quality

The qualification of GaN switches requires a dedicated approach, well above existing silicon standards
- Infineon qualifies GaN devices well beyond industry standards
- Application profiles are an integral part of the qualification process
- Failure models, based on accelerated test conditions, ensure target lifetime and quality are met
- Infineon sets the next level of wide-bandgap quality



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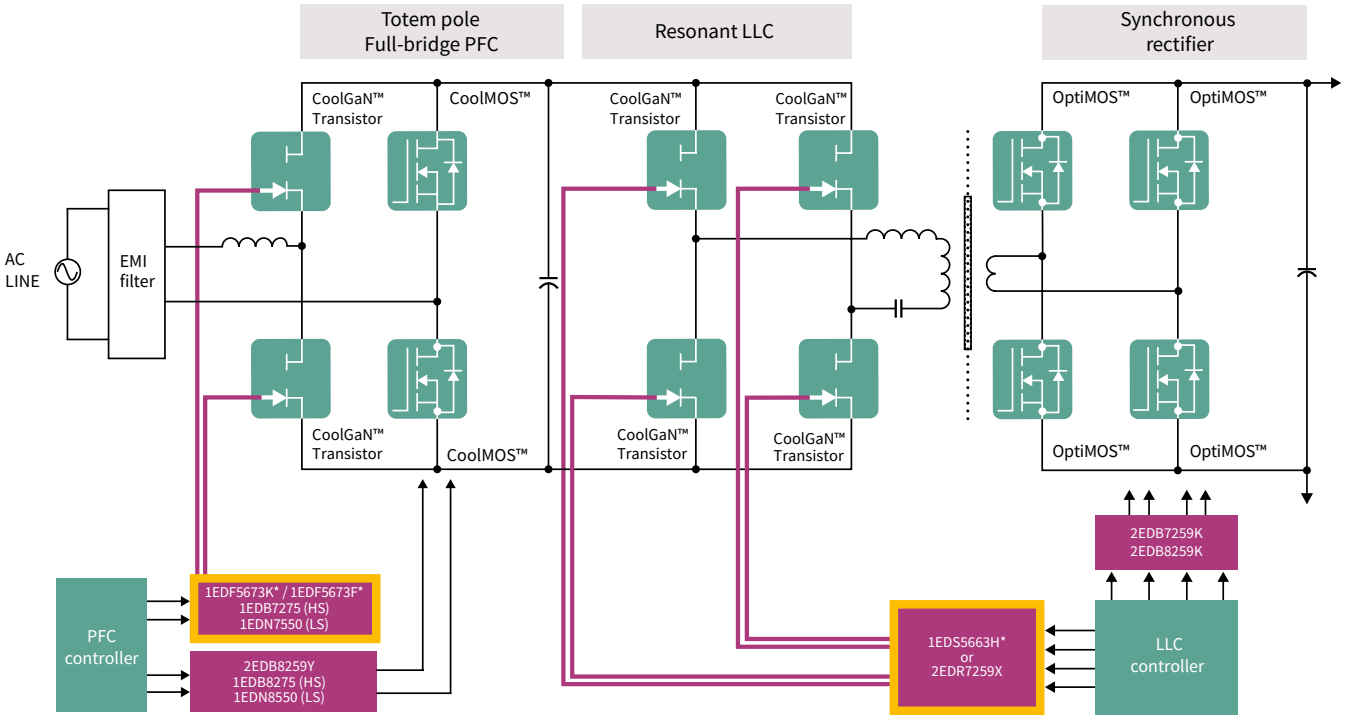
CoolGaN™ Transistor – bringing GaN technology to the next level

Infineon's CoolGaN™ Transistor enables more than 98 percent system efficiency and helps customers make their end products smaller and lighter. Driving enhancement-mode devices requires additional features when choosing the correct gate driver IC. With the EiceDRIVER™ 1EDx56x3x family, Infineon offers dedicated single-channel galvanically isolated gate driver ICs, which are a perfect fit for e-mode GaN HEMTs with non-isolated gate (diode input characteristic) and low threshold voltage, such as CoolGaN™. However, CoolGaN™ technology does not require customized ICs, and in many applications, CoolGaN™ can be driven by standard gate drivers when coupled to an RC interface.

Complete support of all requirements specific to GaN power transistor operation:

- Low driving impedance (on-resistance 0.85 Ω source, 0.35 Ω sink)
- Resistor programmable gate current for steady on-state (typically 10 mA)
- Programmable negative gate voltage to completely avoid spurious turn-on in half-bridges

Block diagram: high-efficiency GaN switched-mode power supply (SMPS)



*Single-channel EiceDRIVER™ ICs dedicated for CoolGaN™ Power Transistor

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High-voltage CoolGaN™ Transistor

The highest efficiency and power density with reduced system costs

The e-mode concept offers fast turn-on and turn-off speeds and a better path toward integration. CoolGaN™ Transistor enables simpler and more cost-effective half-bridge topologies. As e-mode-based products mature, CoolGaN™ Transistor is gaining growing prominence thanks to its potential. Infineon manufactures their GaN devices according to a specific, GaN-tailored qualification process that goes far beyond the standard for silicon power devices. CoolGaN™ Transistor is designed for datacom and server SMPS, telecom rectifiers, mobile chargers, and adapters and can be used as a general switch in many other industrial and consumer applications. It is the most rugged and reliable solution in the market. The CoolGaN™ portfolio is built around high-performing SMD packages to exploit GaN's benefits fully.

CoolGaN™ Transistor for PFC

CoolGaN™ enables the adoption of simpler half-bridge topologies (including eliminating the lossy input bridge rectifier). The result is record efficiency (more than 99 percent) with potential BOM savings.

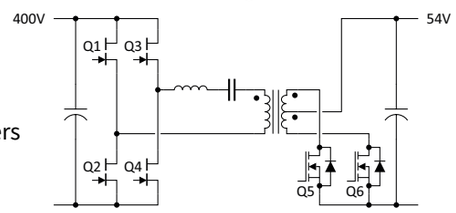
CoolGaN™ Transistor for resonant topologies

- In resonant applications, ten times lower Q_{oss} and Q_g enable high-frequency operations (>1 MHz) at the highest efficiency levels
- Linear output capacitance leads to 8 to 10 times lower deadtime
- Devices can be easily paralleled
- Power density can be pushed even further by optimizing the thermal performance
- CoolGaN™ enables to push the efficiency forward, thus enabling high power density, e.g., in low-power chargers/adapters

Applications

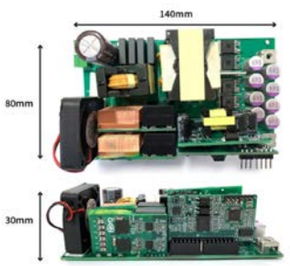
- Telecoms
- Servers
- AI data centers
- USB-C adapters and chargers
- Wireless charging
- SMPS

Full-bridge LLC



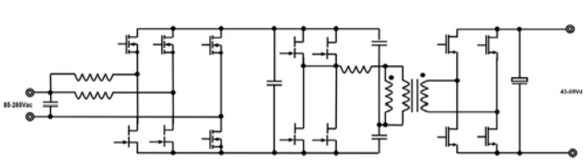
Demonstration board

3 kW full-bridge LLC board
GS-EVB-LLC-3KW-GS



- 50 mΩ CoolGaN™ Transistor in PG-VSON-8

Totem-pole PFC



Reference design 500 kHz high density 3 kW rectifier:
REF_3K3W_HFHD_PSU



- 35 mΩ CoolGaN™ Transistor in PG-HSOF-8

Click here to learn more:

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Medium-voltage CoolGaN™ Transistors

High-performance power solution for efficient and compact designs

Infineon's medium-voltage CoolGaN™ Transistors are highly efficient for power conversion in the voltage range from 60 to 200 V. These cutting-edge devices have fast turn-on/-off speed, minimized switching losses, and a large variety of package options, resulting in increased overall efficiency, reliability, and simple and fast time-to-market. With its high-power density and compact footprint, the medium-voltage CoolGaN™ Transistor family is ideal for a wide range of applications, including motor drives, power tools, audio, energy storage systems, data centers, telecom, and consumer electronics, enabling designers to create smaller, lighter, and more efficient power systems. They are qualified to extensive criteria, exceeding industry standards. GaN technology significantly enhances overall system performance with minimized system costs and increased ease of use.

Features and benefits

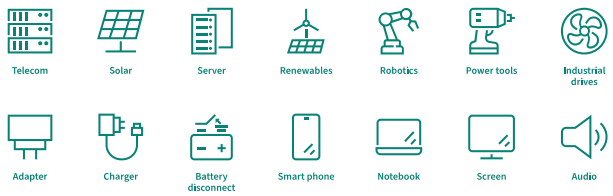
Key features	Benefits
– Enhancement mode transistor – normally off switch	– Best thermal solution in a small footprint
– No reverse-recovery charge	– Available in BSC and DSC easy to assemble PQFN and RQFN package
– Capable of reverse conduction	– Full system enablement with top-side cooling
– Low gate charge, low output charge	– Highest efficiency with low switching losses
– Superior commutation ruggedness	– Improved power density and overall system cost

CoolGaN™ motor drive reference board for battery-powered FOC applications



The REF_MTR_48V30A_GAN is a compact inverter reference design tailored for low-voltage battery applications. At its core, the design features twelve CoolGaN Transistors™ 100 V G3. These transistors are arranged in a half-bridge configuration, with two devices operating in parallel for all phases. This configuration enables efficient power conversion and management in low-voltage battery systems.

Parametrics	Value
Efficiency	99%
Input voltage min/max	48 V/52 V
Output voltage min/max	0 A/34 A
P_{out} max	2 kW
Switching frequency max	100 KHz



Click here to learn more:

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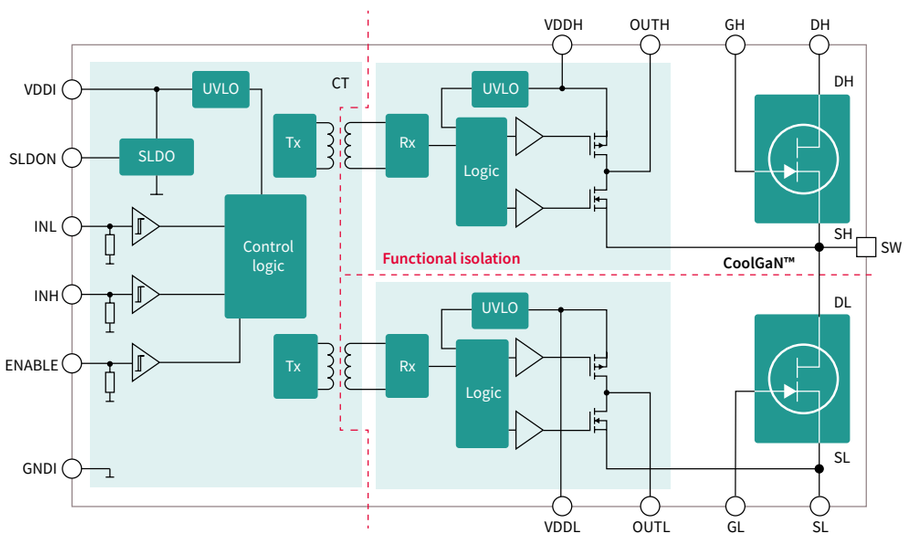
High-voltage CoolGaN™ Drive

Ease of use with integrated drivers for highest efficiency and power density

The CoolGaN™ Drive combines a half-bridge power stage of two CoolGaN™ Transistors and a dedicated gate driver IC. It is thus ideally suited to support the design of compact appliances in the low-to-medium power area. Infineon's CoolGaN™ power switches provide a very robust gate structure. When driven by a continuous gate current of a few mA in the on-state, a minimum on-resistance $R_{DS(on)}$ is always guaranteed.

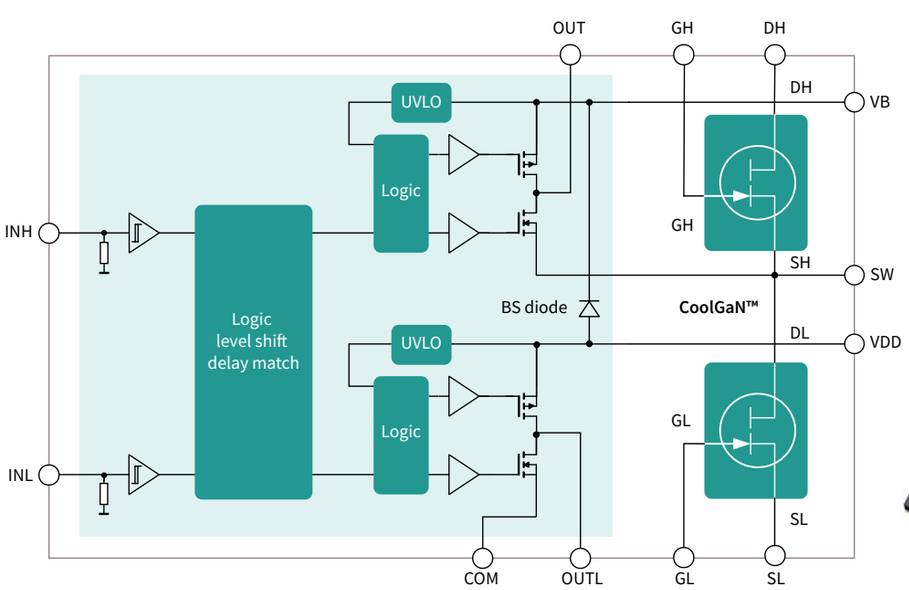
Due to the GaN-specific low threshold voltage and the fast-switching transients, a negative-gate drive voltage is required in specific applications to avoid spurious turn-on effects. The well-known RC interface between the driver and the switch can achieve this. A few external SMD resistors and capacitors allow for easy adaptation to different applications (low/medium power, hard/soft switching).

The CoolGaN™ Drive is available in typical $R_{DS(on)}$ 2x 140/200/270/500 mΩ in a thermally enhanced 8x8 mm QFN-28 package. The built-in driver utilizes an on-chip coreless transformer (CT) technology to achieve level-shifting to the high side. Besides, CT technology guarantees excellent robustness even for extremely fast-switching transients above 150 V/ns.





The CoolGaN™ Drive is also available in typical $R_{DS(on)}$ 2x 500 mΩ in a 6x8 mm TFLGA-27 package. The built-in half-bridge driver integrates a bootstrap diode to configure the high-side gate drive supply easily. With an application-configurable turn-on and turn-off speed, this part can be easily adapted in low-power SMPS and motor driver applications aiming for high-power density design.





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Medium-voltage CoolGaN™ BDS

The CoolGaN™ BDS Medium Voltage products are monolithic bidirectional switch (BDS) devices based on Infineon CoolGaN™ technology. They are normally off, with a single Schottky Gate (SG) and block voltages in both directions.

Features and benefits

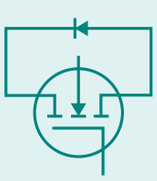
Key features	Benefits vs. back-to-back Si FETs
– E-mode normally-off bidirectional transistor	– 50-75% PCB area savings
– Common-source configuration	– Reduced power losses by more than 50%
– Bidirectional current and voltage blocking capability	– Lower cost
– 40 V device with typical $R_{DS(on)}$ of 6 mΩ, later also in 4 mΩ and 9 mΩ	
– Available in extremely small WLCSP package	

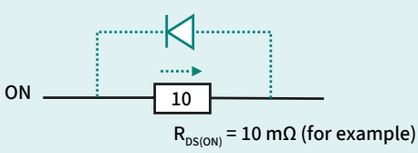
Rethink your device selection to protect your portable electronics

Increase power density, reduce costs, and save power!

Die area

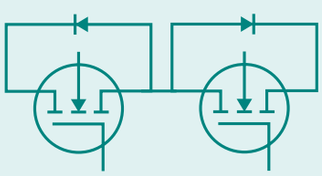
One Si MOSFET switch

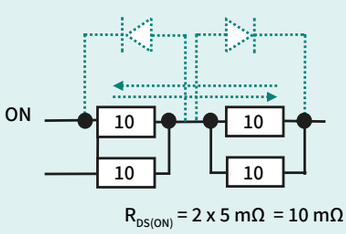




1 x

Two Si MOSFET switches (back-to-back)

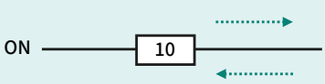




1 x | 2 x | 3 x | 4 x

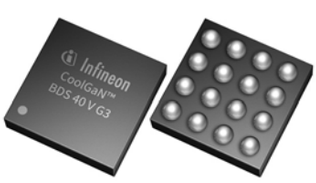
One GaN Bidirectional switch (BDS)





1 x

Game changing



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High-voltage CoolGaN™ BDS for residential solar

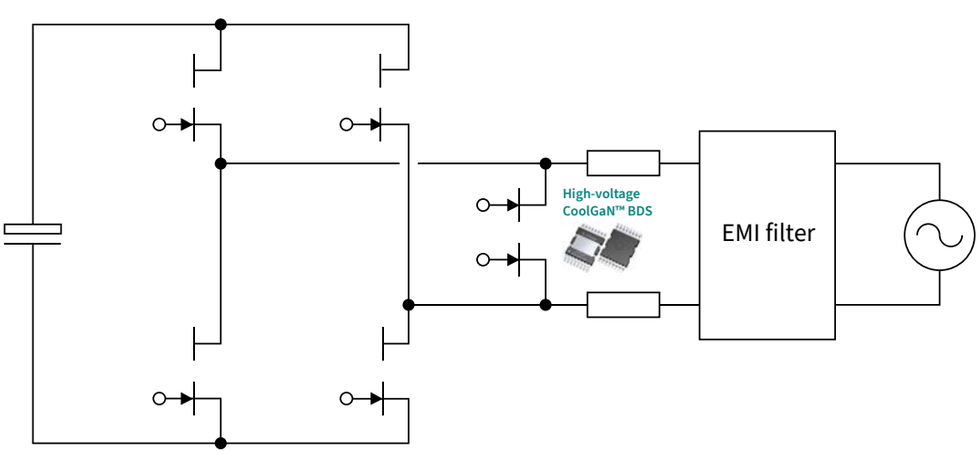
Cost-effective high-performance solution for solar inverters

The high-voltage CoolGaN™ BDS is a game-changing product for solar inverters. In common topologies, such as cycloconverters within microinverters or HERIC within 1-phase inverters, the high-voltage CoolGaN™ BDS enables minimized system size and lower system cost by replacing discrete power switches in bidirectional configuration with a single device. With higher switching frequencies, the high-voltage CoolGaN™ BDS can further boost the performance of solar inverters.

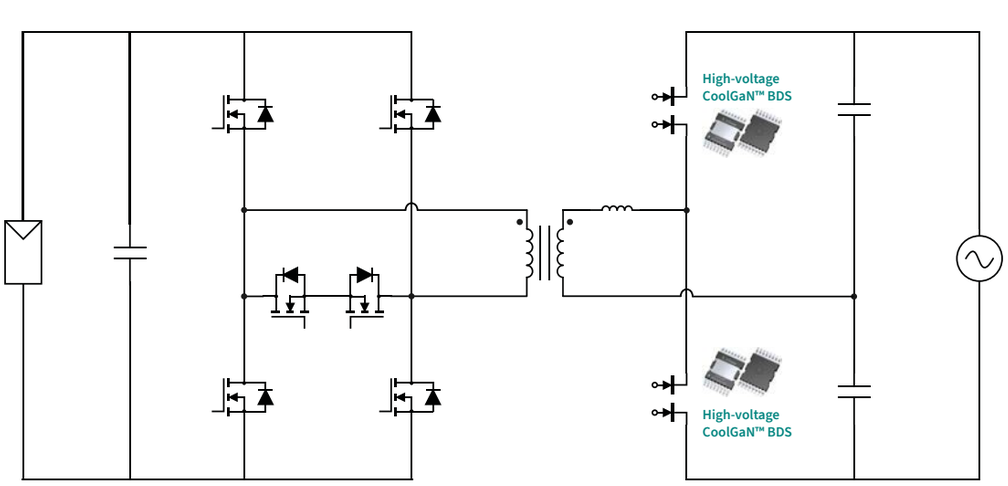
Features and benefits

Key features	Key benefits
– First true “single die” bidirectional switch device	– Minimized system and transistor area
– Cost-effective high-performance solution to replace back-to back discrete	– Higher switching frequencies and improved performance
– Reshaping AC voltage applications	– Lower system cost
– Bidirectional current and voltage blocking capability	– Ease of use
	– Simplified design for accelerated time-to-market

HERIC topology of PV inverter with high-voltage CoolGaN BDS™



Cycloconverter solution for microinverters with high-voltage CoolGaN BDS™



Solar

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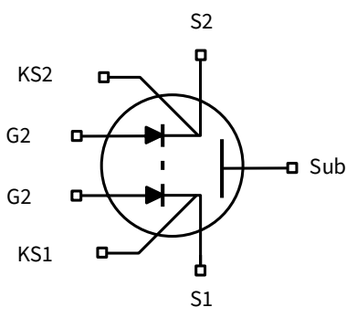
High-voltage CoolGaN™ BDS

Introducing the high-voltage CoolGaN™ Bidirectional Switch (BDS)

The high-voltage CoolGaN™ BDS is a ground-breaking, monolithic GaN switch that can actively block voltage and current in both directions. Its innovative quasi-common drain design features a double gate structure, leveraging Infineon's proven rugged Gate Injection Transistor (GIT) technology. This unique architecture enables the same drift region to block voltages in both directions, resulting in a reduced die size compared to conventional back-to-back arrangements.

Unlocking system efficiency and power density

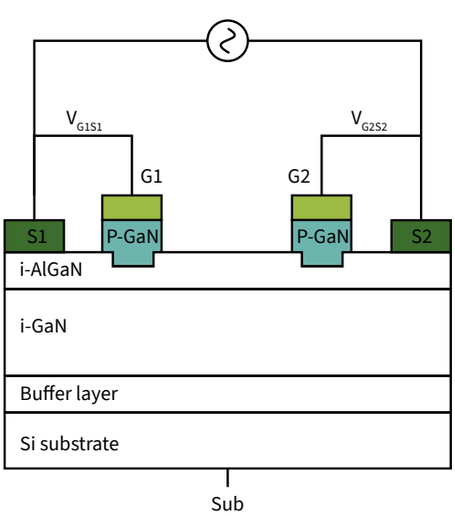
The high-voltage CoolGaN™ BDS offers a significant leap forward in system efficiency and power density compared to traditional back-to-back Unidirectional Switch (UDS) solutions. With its unique monolithic single-die structure, the high-voltage CoolGaN™ BDS empowers designers to achieve compact, efficient, high-performance system designs with unparalleled integration.





Features and benefits

Key features	Key benefits
– Bidirectional current and voltage blocking capability	– Compact design for space-optimized solutions
– Infineon gate injection technology using common-drain configurations	– Cost-effective for high performance solutions
– E-mode normally-off bidirectional transistor	– Higher switching frequency for higher power density
– Stable dynamic $R_{SS(on)}$ across temperature and frequency	– Low conduction loss
– Replacement of back-to-back switches	– Simplified design for accelerated time-to-market



The evolution of power electronics

The high-voltage CoolGaN™ BDS is a game-changing power switch, boasting four active terminals and an additional substrate terminal. Unlike traditional three-terminal UDS, the high-voltage CoolGaN™ BDS offers four modes of operation: two traditional on/off modes and two diode modes. In these diode modes, the switch can be actively controlled to behave like a diode, blocking voltages in both directions. This unprecedented control and flexibility opens up new possibilities for power system design.

USB PD charger · Adapter · Consumer · Smartphone charger

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Share your feedback

CoolGaN™ Drive 600-700 V

Package / $R_{DS(on),max.}$	PQFN 5x6 single switch CS, OCP, OTP	PQFN 6x8 single switch CS, OCP, OTP	TOLL single switch CS, OCP, OTP	TOLT single switch SCP, OCP, OTP	PQFN 6x8 Half-Bridge No driver	LGA 6x8 half-bridge integrated Boostrap diode	PQFN 6x8 half-bridge Bi-di CS, OCP, OTP, Bootstrap diode	QFN 8x8 half-bridge CS, OCP, OTP, Bootstrap diode	Q-DPAK BSC half-bridge Bi-di CS, OCP, OTP, Bootstrap diode
500 mΩ	IGI70N500A2PS*	IGI70N500A2MS*				IGI60L5050B1M*			
270 mΩ	IGI70N270A2PS*	IGI70N270A2MS*				IGI60L2727B1M	IGI65L2727C2MS*		
200 mΩ	IGI70N200A2PS*	IGI70N200A2MS*					IGI65L2020C2MS*	IGI65L2020C2LS*	
140 mΩ	IGI70N140A2PS*	IGI70N140A2MS*			IGI65D1414A3MS*	IGI60L1414B1M*	IGI65L1414C2MS*	IGI65L1414C2LS*	IGI65L1414C2QC*
90/110 mΩ		IGI70N095A2MS*				IGI60L1111B1M*		IGI65L0909C2LS*	IGI65L0909C2QC*
70 mΩ		IGI70N070A2MS*							IGI65L0707C2QC*
55 mΩ		IGI70N055A2MS*	IGI65N055A1T*	IGI65N055A1LT*					IGI65L0505C2QC*
45 mΩ			IGI65N045A1T*	IGI65N045A1LT*					
35 mΩ			IGI65N035A1T*	IGI65N035A1LT*					
25 mΩ			IGI65N025A1T*	IGI65N025A1LT*					

CoolGaN™ Transistor 650-700 V

Package / $R_{DS(on),max.}$	ThinPAK 8x8	DPAK	Thin-PAK/PDFN 5x6	DFN/PDFN 8x8	GaNPX	TOLL	TOLT	DSO
500 mΩ		IGD70R500D2S*						
450 mΩ			GS-065-004-1-L					
315 mΩ			GS-065-004-6-L					
260/270 mΩ		IGD70R270D2S*	IGLR65R270D2					
200-225 mΩ		IGD70R200D2S*	IGLR65R200D2 GS-065-008-1-L		GS66502B			
165 mΩ			GS-065-008-6-L					
140/150 mΩ	IGL65R140D2*	IGD70R140D2S*	IGLR65R140D2 GS-065-011-1-L	IGLD65R140D2 GS-065-011-2-L		IGT65R140D2		
125 mΩ			GS-065-011-6-L	GS-065-011-6-LR				
110 mΩ	IGL65R110D2*			IGLD65R110D			IGLT65R110D2*	
95/100 mΩ			GS-065-014-6-L	GS-065-014-6-LR	GS66504B			
78/80 mΩ	IGL65R080D2*			IGLD65R080D2 GS-065-018-2-L				
62/67 mΩ				GS-065-018-6-LR	GS66506T			
45-55 mΩ				IGLD65R055D2 GS-065-030-2-L	GS66508B GS66508T	IGT65R055D2 IGT65R045D2	IGLT65R055D2 IGLT65R045D2	IGOT65R055D2 IGOT65R045D2
30-37 mΩ				GS-065-030-6-LR		IGT65R035D2 GS-065-030-6-LL	IGLT65R035D2	IGOT65R035D2
25 mΩ					GS66516B GS66516T	IGT65R025D2	IGLT65R025D2	IGOT65R025D2
17 mΩ								

CoolGaN™ Bidirectional Switch 650 V

Package / $R_{DS(on),max.}$	TOLT	DSO
110 mΩ	IGLT65R110B2*	
55 mΩ	IGLT65R55B2*	
35 mΩ		IGOT65R035B3*
25 mΩ		IGOT65R025B3*
15 mΩ		IGOT65R015B3*

EiceDRIVER™ family optimized for high-voltage CoolGaN™ Transistor

Product	Package	Input to output isolation				Propagation delay accuracy	Typ. high level (sourcing) output resistance	Typ. low level (sinking) output resitance
		Isolation class	Rating	Surge testing	Certification			
1EDF5673K	LGA, 13-pin, 5x5 mm	functional	V_{IO} = 1.5 kV_{DC}	n.a.	n.a.	-6 ns/+7 ns	0.85 Ω	0.35 Ω
1EDF5673F	DSO, 16-pin, 150 mil	functional	V_{IO} = 1.5 kV_{DC}	n.a.	n.a.	-6 ns/+7 ns	0.85 Ω	0.35 Ω
1EDS5663H	DSO, 16-pin, 300 mil	reinforced	V_{IOTM} = 8 kV_{pk} V_{ISO} = 5.7 kV_{RMS}	V_{ISOM} >10 kV_{pk}	EN 62368-1 UL1577	-6 ns/+7 ns	0.85 Ω	0.35 Ω

Gate driver ICs for GaN transistors
EiceDRIVER™ 2EDi, 1EDB, and 1EDN-TDI product families

Family	Product	Package	Input to output isolation		Output UVLO	Output peak source/sink current	CMTI (min.)	Propagation delay (typ.)	Active Clamping	Separate Source/Sink Output
			Isolation class	Rating						
2EDi	2EDR7258X	DSO-14 300 mil	Reinforced	V_{ISO} = 5.7 kV_{rms} UL 1577 V_{IOTM} = 8 kV_{pk} VDE 0884-11	4 V	5 A/9 A	150 V/ns	38 ns	Yes	No
	2EDR8259X				8 V					
	2EDB7259Y	DSO-14 150 mil	Single Protection	V_{ISO} = 3.0 kV_{RMS} UL 1577	4 V					
	2EDB8259Y				8 V					
1EDB	1EDB7275F	DSO-8 150 mil	Single Protection	V_{ISO} = 3 kV_{rms} UL 1577	4 V	5 A/9 A	300 V/ns	45 ns	Yes	Yes
	1EDB8275F				8 V					
1EDN-TDI	1EDN7550B	SOT23 6-pin	Non-Isolated	n.a.	4 V	5 A/9 A	n.a.	45 ns	No	Yes
	1EDN8550B				8 V					
1EDN-TDI	1EDN71X6G	VSON-10	Non-Isolated	n.a.	4 V	0.5 A/0.5 A, 1 A/1 A 1.5 A /1.5 A, 2 A/2 A	n.a.	125 ns/ 105 ns/75 ns /55 ns	Yes	Yes
	1EDN71X6U	TSNP-7								

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*Coming soon

CoolGaN™ Transistor 200 V



Package / $R_{DS(on)}$	PQFN 3x5 Dual-side cooled
6.7 mΩ	IGC090S20S1*

CoolGaN™ Transistor 120 V



Package / $R_{DS(on)}$	PQFN 3x5 Dual-side cooled
2.7 mΩ	IGC037S12S1

CoolGaN™ Transistor 100 V



Package / $R_{DS(on)}$	PQFN 3x5 Bottom-side cooled	PQFN 3x5 Dual-side cooled	PQFN 3x3 Bottom-side cooled	PQFN 3x3 Dual-side cooled	ULGA
2.4 mΩ	IGC033S101	IGC033S10S1			
5 mΩ				IGB070S10S1	
7 mΩ					GS61008P GS61008T
9.4 mΩ			IGB110S101	IGB110S10S1	
16 mΩ					GS61004B

CoolGaN™ Transistor 80 V



Package / $R_{DS(on)}$	PQFN 3x5 Dual-side cooled
1.8 mΩ	IGC025S08S1

CoolGaN™ Transistor 60 V



Package / $R_{DS(on)}$	PQFN 3x5 Dual-side cooled
1.3 mΩ	IGC01906S1

CoolGaN™ Bidirectional switch 40 V

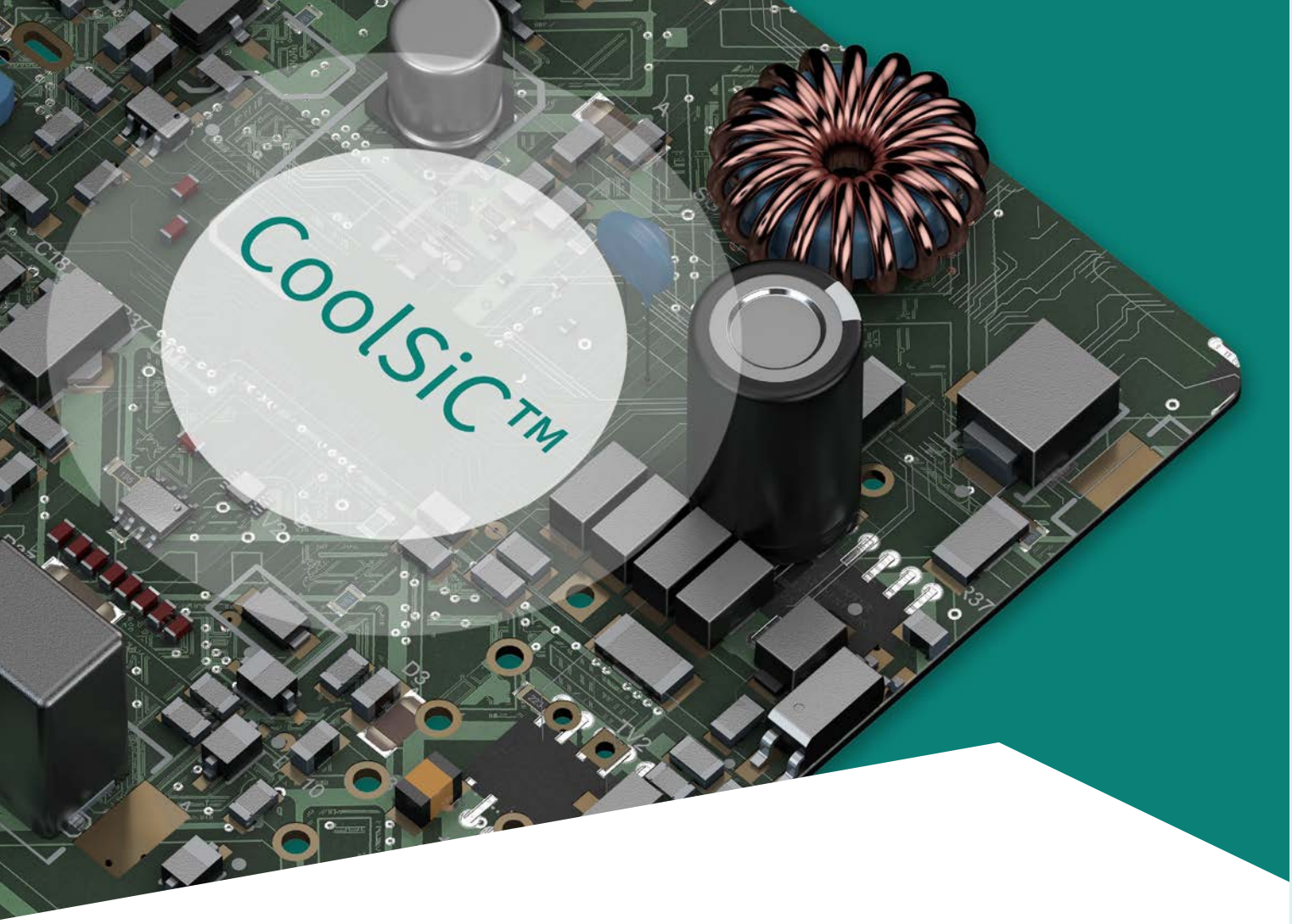


Package / $R_{DS(on)}$	WLCSP 1.2x1.7	WLCSP 1.7x1.7	WLCSP 2.1x2.1
4 mΩ	IGK048B041S*		
6 mΩ		IGK080B041S*	
9 mΩ			IGK120B041S*

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Silicon carbide

Silicon carbide CoolSiC™ solutions are the next essential step towards an energy-smart world.

Silicon carbide (SiC) devices belong to the wide-bandgap semiconductor group, which offers many attractive characteristics for high-voltage power semiconductors compared to commonly used silicon (Si). In particular, the much higher breakdown field strength and thermal conductivity of silicon carbide allow the development of devices that far outperform the corresponding silicon-based ones and enable efficiency levels that are otherwise unattainable. Infineon's portfolio of SiC devices covers 600 to 2000 V Schottky diodes and the revolutionary CoolSiC™ MOSFETs 400 V, 650 V, 750 V, 1200 V, 1700 V, and 2000 V.

EiceDRIVER™ SiC MOSFET gate driver ICs are well-suited to drive SiC MOSFETs, especially Infineon's ultrafast switching CoolSiC™ SiC MOSFETs. These gate drivers incorporate the most important features and parameters for driving SiC, such as tight propagation delay matching, precise input filters, wide output-side supply range, negative gate voltage capability, active Miller clamp, DESAT protection, and extended CMTI capability.

Click here to learn more:

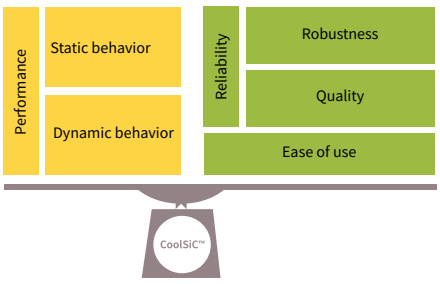
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CoolSiC™ MOSFETs discrete 650 V G1

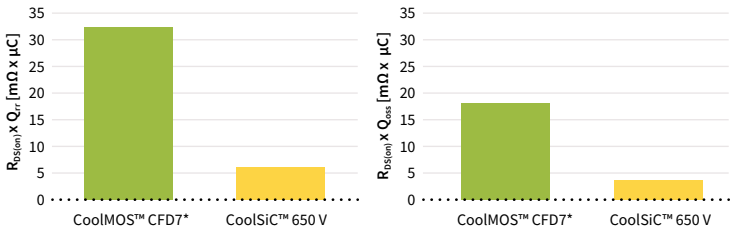
Delivering reliable and cost-effective top performance

Silicon carbide's physical characteristics, from wide-bandgap to electron mobility and thermal conductivity, provide the basis for engineering high-performance semiconductor technologies and products. The CoolSiC™ MOSFETs from Infineon maximize the advantages of silicon carbide, offering a high-performance product that meets power electronics design requirements, like reliability and ease of use. As per performance, the CoolSiC™ MOSFETs show low $R_{DS(on)}$ dependency with temperature and low switching losses. The reliability is built on technological strengths and flawless quality processes. Some aspects of Infineon's SiC technology, like superior gate oxide reliability, excellent thermal behavior, advanced avalanche ruggedness, and short circuit capabilities, contribute to the robustness of the device. Infineon's benchmark quality was further improved for silicon carbide, with an application-focused qualification scope exceeding standards, complemented by SiC-specific screening measures. Additional unique features, like 0 V turn-off V_{GS}, wide V_{GS} range, and silicon MOSFET drivers and driving schemas, make CoolSiC™ MOSFETs 650 V easy to integrate and use.

Leveraging SiC's material properties



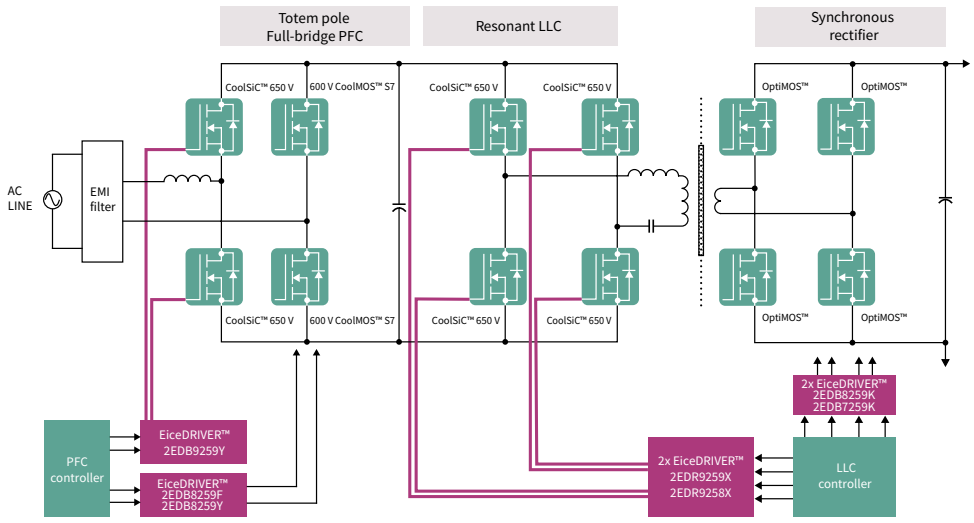
Robustness for continuous hard commutation topologies



* Best CoolMOS™ SJ MOSFET reference in the market

CoolSiC™ MOSFETs can enable streamlined and cost-optimized system designs with fewer components, weight and size, reaching high energy efficiency and power density. For instance, the CoolSiC™ MOSFETs boast a low level of Q_{rr}, roughly 80 percent less than the best CoolMOS™ reference in the market, the CoolMOS™ CFD7. This ensures the robustness of the body diode, making the CoolSiC™ MOSFETs suitable for topologies with continuous hard commutation, like the high-efficiency totem-pole PFC, a topology that enables more than 99 percent efficiency.

High-efficiency CoolSiC™ totem-pole PFC in server SMPS (switched-mode power supply)



CoolSiC™ MOSFET 650 V G1

EV charger · Server · Telecom · Solar · UPS · LSEV · Battery formation · SSCB

$R_{DS(on)}$ max. [mΩ]	$R_{DS(on)}$ typ. [mΩ]	TO-247 4-pin	TO-247	D²PAK-7	TOLL
30/34	22/27	IMZA65R027M1H	IMW65R027M1H	IMBG65R022M1H	IMT65R022M1H
42	30	IMZA65R030M1H	IMW65R030M1H	IMBG65R030M1H	IMT65R030M1H
50	39	IMZA65R039M1H	IMW65R039M1H	IMBG65R039M1H	IMT65R039M1H
64	48	IMZA65R048M1H	IMW65R048M1H	IMBG65R048M1H	IMT65R048M1H
74	57	IMZA65R057M1H	IMW65R057M1H	IMBG65R057M1H	IMT65R057M1H
94	72	IMZA65R072M1H	IMW65R072M1H	IMBG65R072M1H	IMT65R072M1H
111	83	IMZA65R083M1H	IMW65R083M1H	IMBG65R083M1H	IMT65R083M1H
141	107	IMZA65R107M1H	IMW65R107M1H	IMBG65R107M1H	IMT65R107M1H
217	163			IMBG65R163M1H	IMT65R163M1H
346	260			IMBG65R260M1H	IMT65R260M1H

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CoolSiC™ MOSFETs discrete 750 V G1

Delivering enhanced robustness and reliability

Infineon's CoolSiC™ MOSFETs 750 V extends the product family of CoolSiC™ MOSFETs 650 V G1, offering customers granularity in selecting an optimized solution in price and performance for their designs, with typical $R_{DS(on)}$ ranging from 8 to 140 mΩ. It addresses especially solid-state circuit breakers, EV charging, solar inverters, servers, and AI PSU where topologies like totem-pole with CCM and TCM modulation, HERIC, active neutral point clamp (ANPC), Vienna-rectifier, dual active bridge (DAB), phase-shifted full-bridge (PSFB), LLC, and CLLC are used. The 750 V G1 best-in-class robustness to parasitic turn-on enables minimizing switching losses both with unipolar (i.e., $-V_{GS(off)} = 0$ V) and bipolar (i.e., $V_{GS(off)} < 0$ V) gate driving. Moreover, the low Q_g and Q_{oss} make it suitable for ZVS topologies operating at high frequencies. Finally, the higher breakdown voltage enhances cosmic radiation ruggedness and gives more room to increase the DC-link voltage. CoolSiC™ MOSFET 750 V is available in the SMD top-side cooled Q-DPAK package, enabling increased power density by more efficient use of PCB space. The Kelvin-source connection and lower parasitic source inductance help reduce switching losses at high currents. It improves heat dissipation, reduces size and cost, and extends the system lifetime, creating the highest customer value.

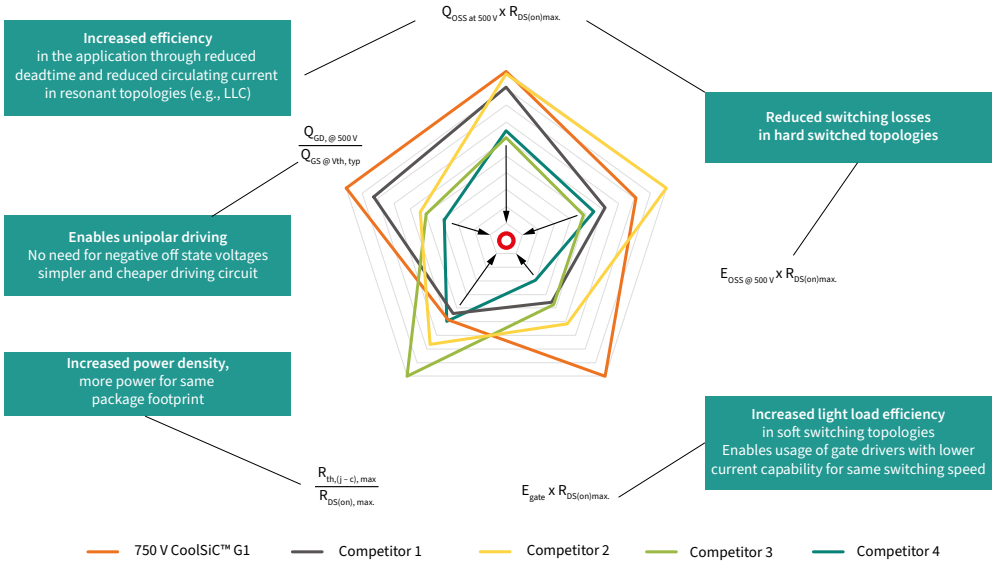
Features and benefits

Key features	Key benefits
– Cosmic ray ruggedness	– High reliability and improved system lifetime
– Intrinsic diode with low reverse recovery charge	– Superior efficiency in hard and soft switching
– Low device capacitance	– Enables higher switching frequency
– Temperature independent switching losses	– Robust against parasitic turn-on
– Infineon die attach technology	– Reduced system complexity
	– Excellent thermal dissipation

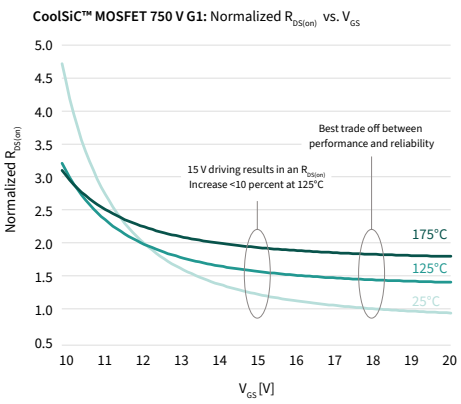
CoolSiC™ 750 V is the most balanced technology, combining ease of use, switching efficiency, and superior thermal performance.

FoMs of competitor parts based on publicly available datasheets and reference products:
SCT011H753AG, NVH4L018N075SC1, SCT4013DR, AOM015V75X2Q





The CoolSiC™ MOSFETs 750 V G1 is fully compatible with negative off state voltages and 15 V on state voltage for a seamless dual sourcing



CoolSiC™ MOSFET 750 V G1

Server Solar EV charger SSCB

$R_{DS(on)}$ typ. [mΩ]	$R_{DS(on)}$ max. [mΩ]	Q-DPAK TSC	TO-247 4-pin
7.8	10.6	IMDQ75R008M1H*	IMZA75R008M1H
16	22	IMDQ75R016M1H	IMZA75R016M1H
20	27	IMDQ75R020M1H	IMZA75R020M1H
27	36	IMDQ75R027M1H	IMZA75R027M1H
40	52	IMDQ75R040M1H	IMZA75R040M1H
60	78	IMDQ75R060M1H	IMZA75R060M1H
90	117	IMDQ75R090M1H	IMZA75R090M1H
140	182	IMDQ75R140M1H	IMZA75R140M1H

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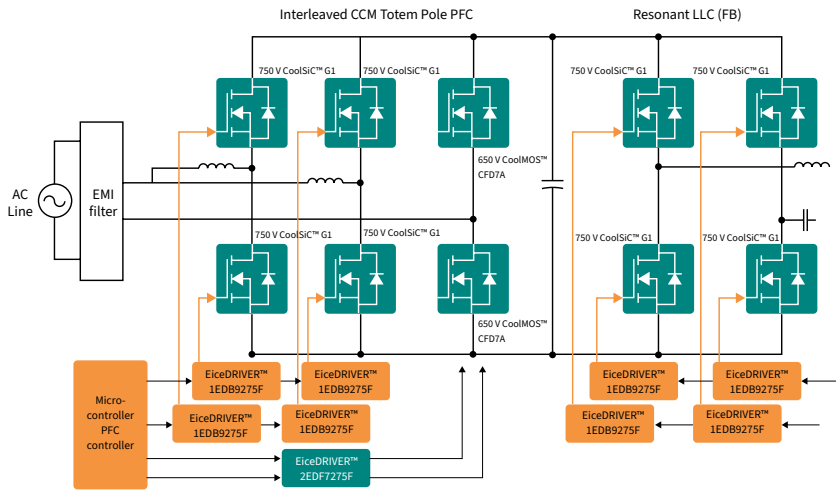
CoolSiC™ Automotive MOSFETs 750 V G1

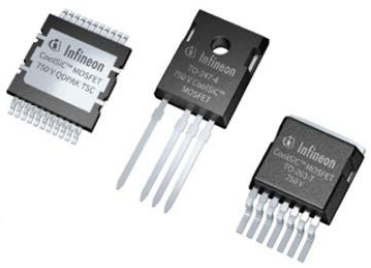
Smaller, lighter, and more efficient solutions

Infineon's CoolSiC™ Automotive MOSFETs 750 V G1 represents a pioneering response to the evolving trends within electric vehicles (EVs) and high-voltage applications, with a keen focus on addressing critical facets of on-board chargers (OBCs) and related systems. Optimized for a wide array of topologies, these MOSFETs empower engineers to revolutionize on-board charger designs, aligning seamlessly with trends such as higher power density, bidirectionality, and increased demand for efficiency. The devices offer a granular portfolio with typical $R_{DS(on)}$ values ranging from 8 to 140 mΩ at 25°C, showcasing their versatility across diverse applications. Leveraging the intrinsic advantages of silicon carbide (SiC) technology, the CoolSiC™ 750 V MOSFETs exhibit lower $R_{DS(on)}$ temperature coefficient, reduced hard switching losses, and increased light-load efficiency. This, combined with their robustness against parasitic turn-on (PTO) and adherence to AEC Q101 automotive standards, underscores their unwavering commitment to reliability and longevity in safety-critical automotive applications. These MOSFETs stand as a testament to pioneering advancements in SiC-based semiconductor technology tailored to the ever-evolving needs of automotive power applications.

Features and benefits

Key features	Key benefits
– Highly robust 750 V technology	– Superior efficiency in hard switching
– Best-in-class $R_{DS(on)}$ x Q_G	– Enables higher switching frequency
– Excellent Ron x Q_{oss} and R_{on} x Q_G	– Higher reliability
– Low C_{rss}/C_{iss} together and high $V_{GS(th)}$	– Can withstand bus voltages beyond 500 V
– 100% avalanche tested	– Robustness against parasitic turn
– Infineon die attach technology	– Unipolar driving
– Cutting-edge top-side-cooled package	– Best-in-class thermal dissipation





Infineon's innovative top-side cooled Q-DPAK package, housing the CoolSiC™ Automotive MOSFETs 750 V G1, enables increased power density by better use of PCB space. The package's Kelvin-source connection and lower parasitic source inductance reduce switching losses at high currents, extending the system's lifetime by shrinking the device and board temperature. It also allows for a flexible PCB layout and efficient heat dissipation, ultimately delivering more power from smaller enclosures. This advantage reduces manufacturing effort and costs, making electric vehicles a more attractive proposition for consumers.

CoolSiC™ Automotive MOSFETs 750 V G1

On-board charger · HV-LV DC-DC converter · eFuses

$R_{DS(on)}$ typ. [mΩ]	$R_{DS(on)}$ max. [mΩ]	Q-DPAK	D^2PAK 7-pin TO-263 7-pin	TO-247-4 pin
7.8	10.6	AIMDQ75R008M1H*		AIMZA75R008M1H
16	22	AIMDQ75R016M1H	AIMBG75R016M1H	AIMZA75R016M1H
20	27	AIMDQ75R020M1H	AIMBG75R020M1H	AIMZA75R020M1H
27	36	AIMDQ75R027M1H	AIMBG75R027M1H	AIMZA75R027M1H
40	52	AIMDQ75R040M1H	AIMBG75R040M1H	AIMZA75R040M1H
60	78	AIMDQ75R060M1H	AIMBG75R060M1H	AIMZA75R060M1H
90	117	AIMDQ75R090M1H	AIMBG75R090M1H	AIMZA75R090M1H
140	182	AIMDQ75R140M1H	AIMBG75R140M1H	AIMZA75R140M1H

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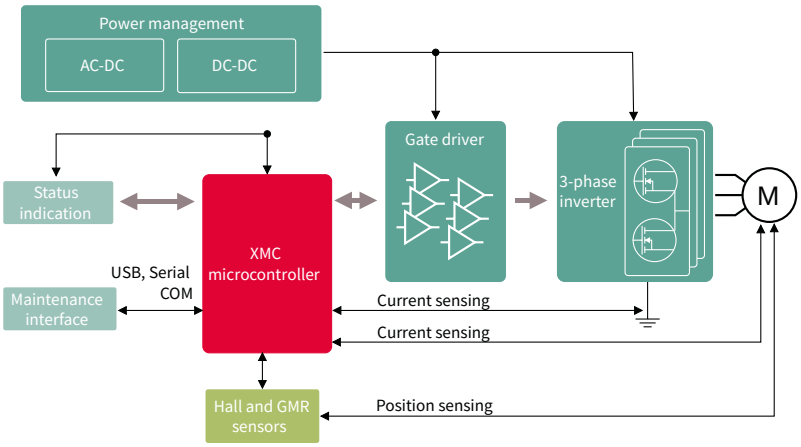
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*Available on request

CoolSiC™ MOSFETs discrete 1200 V G1

Infineon's CoolSiC™ technology enables radically new product designs

Silicon carbide (SiC) opens up new degrees of freedom for designers to harness unseen levels of efficiency and system flexibility. Compared to traditional silicon-based switches like IGBTs and MOSFETs, SiC MOSFETs offer many advantages. These include the low switching losses, low reverse recovery losses of the internal commutation-proof body diode, temperature-independent low switching losses, and threshold-free on-state characteristics. Based on volume experience and compatibility know-how, Infineon presents the revolutionary CoolSiC™ technology, enabling radically new product designs with high performance and reliability. CoolSiC™ MOSFET products target automotive, photovoltaic inverters, battery charging, EV charging, industrial drives, UPS, SMPS, and energy storage.





Features and benefits

Key features	Key benefits
– Very low switching losses	– Best-in-class system performance
– Superior gate-oxide reliability	– Efficiency improvement and reduced cooling effort
– Threshold-free on-state characteristic	– Longer lifetime and higher reliability
– Wide gate-source voltage range	– Enables higher frequency operation, allowing the increase in power density
– Benchmark gate threshold voltage, $V_{GS(th)}$ = 4.5 V	– Reduction in system cost
– Fully controllable dV/dt	– Ease of use
– Commutation robust body diode, ready for synchronous rectification	

Energy storage · UPS · Drives · EV charging · SMPS · Solar

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The TO-247 4-pin package contains an additional connection to the source (Kelvin connection) used as a reference potential for the gate driving voltage, thereby eliminating the effect of voltage drops over the source inductance. The result is even lower switching losses than the TO-247 3-pin version, especially at higher currents and switching frequencies.

The gate-source pin of the TO-263 7-pin package, similar to the TO-247 4-pin, eliminates the effect of voltage drops over the source inductance, further reducing turn-on switching loss. TO-263 7-pin package minimizes the leakage inductance between drain and source, reducing the risk of high turn-off voltage overshoot.

Also, explore our new CoolSiC™ MOSFET 1200 V G2 portfolio in different package variants. The G2 enables a new level of SiC performance while meeting the highest quality standards in all common combinations of power schemes: AC-DC, DC-DC, and DC-AC. PV inverters, energy storage systems, EV charging, power supplies, motor drives, DC-DC converters, and more belong to the many cases where CoolSiC™ MOSFET G2 provides additional performance compared to G1 or Si alternatives.

CoolSiC™ MOSFET discrete 1200 V G1



$R_{DS(on)}$ typ. [mΩ]	TO-247	TO-247-4	D^2PAK 7-pin TO-263 7-pin	Gate driver ICs for CoolSiC™	
7 mΩ	IMW120R007M1H	IMZA120R007M1H		**EiceDRIVER™ Compact:** 1EDI20I12MF 1EDI60I12AF 1ED3124MU12F 1ED3125MU12F 1ED3122MC12H 1ED3124MC12H 1ED3241MC12H	**EiceDRIVER™ Enhanced:** 1ED3322MC12N 1ED3491MC12M 1ED3890MC12M 2ED020I12-F2
14 mΩ	IMW120R014M1H	IMZA120R014M1H			
20 mΩ	IMW120R020M1H	IMZA120R020M1H			
30 mΩ	IMW120R030M1H	IMZ120R030M1H IMZA120R030M1H	IMBG120R030M1H		
40/45 mΩ	IMW120R040M1H	IMZA120R040M1H	IMBG120R045M1H		
60 mΩ	IMW120R060M1H	IMZ120R060M1H	IMBG120R060M1H		
90 mΩ	IMW120R090M1H	IMZ120R090M1H	IMBG120R090M1H		
140 mΩ	IMW120R140M1H	IMZ120R140M1H	IMBG120R140M1H		
220 mΩ	IMW120R220M1H	IMZ120R220M1H	IMBG120R220M1H		
350 mΩ	IMW120R350M1H	IMZ120R350M1H	IMBG120R350M1H		

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CoolSiC™ MOSFETs discrete 1700 V G1

Best efficiency and reduced complexity for high voltage auxiliary power supplies

The CoolSiC™ MOSFET 1700 V G1 is optimized for flyback topologies used in auxiliary power supplies connected to DC-link voltages ranging from 600 V to 1000 V, making it ideal for numerous power applications.

Features and benefits CoolSiC™ MOSFET 1700 V G1 in TO-263-7 package

Key features

- Optimized for flyback topologies
- Extremely low switching loss
- 12 V/0 V gate source voltage compatible with fly-back controllers
- Fully controllable dV/dt for EMI optimization
- SMD package with enhanced creepage and clearance distances, >7 mm

Key benefits

- The CoolSiC™ MOSFET 1700 V G1 enables simple single-ended flyback topology at high efficiency level for use in auxiliary power supplies
- SMD package enables direct integration into PCB, with natural convection cooling without extra heatsink
- Reduced isolation efforts due to extended creepage and clearance distance of package
- Reduced system complexity
- High power density

CoolSiC™ MOSFETS discrete 1700 V G1

AUX power | Drives | Solar | EV charger | Energy storage | UPS

Package / $R_{DS(on)}$	D²PAK 7-pin TO-263-7	TO-247-3 HCC
450 mΩ	IMBF170R450M1	IMWH170R450M1
650 mΩ	IMBF170R650M1	IMWH170R650M1
1000 mΩ	IMBF170R1K0M1	IMWH170R1K0M1



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Your input matters
Share your feedback

CoolSiC™ MOSFETs discrete 2000 V G1 in TO-247 PLUS-4-HCC package

The CoolSiC™ MOSFET 2000 V G1 in TO-247PLUS-4 HCC package has been designed to offer increased power density without compromising the system's reliability even under demanding high voltage and switching frequency conditions. The low power losses of CoolSiC™ technology provide increased reliability thanks to the .XT interconnection technology in a 2000 V optimized package, enabling top efficiency in applications such as string inverters, EV charging and energy storage systems. The CoolSiC™ MOSFET 2000 V product family is accompanied by the matching CoolSiC™ Schottky diodes 2000 V in TO-247PLUS-4-HCC and TO-247-2 (10-80 A).

Features and benefits

Key features	Key benefits
– V_{DSS} = 2000 V for high DC-link systems up to 1500 V_{DC}	– High power density
– Very low switching losses	– Excellent reliability
– Innovative HCC package with 14 mm creepage and 5.5 mm clearance distances	– Highest efficiency
– Benchmark gate threshold voltage, $V_{GS(th)}$ = 4.5 V	– Ease of design
– Robust body diode for hard commutation	
– .XT interconnection technology for best-in-class thermal performance	
– Improved humidity robustness proved through H3HVTRB stress tests	

CoolSiC™ MOSFETS discrete 2000 V G1

Solar · Energy storage · EV charger

Package / $R_{DS(on)}$	TO-247PLUS-4-HCC
12 mΩ	IMYH200R012M1H
24 mΩ	IMYH200R024M1H
50 mΩ	IMYH200R050M1H
75 mΩ	IMYH200R075M1H
100 mΩ	IMYH200R100M1H



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CoolSiC™ MOSFET Generation 2

Empowering the next generation of high-performance systems

The new Infineon CoolSiC™ MOSFET 400 V, 650 V, 750 V, and 1200 V Generation 2 improve MOSFET key performance figures such as stored energies and charges by up to 20 percent compared to the previous generation without compromising quality and reliability levels leading to higher overall energy efficiency and further contributing to decarbonization.

CoolSiC™ MOSFET Generation 2 (G2) technology continues to leverage the performance capabilities of silicon carbide by enabling lower energy loss that turns into higher efficiency during power conversion. This provides strong benefits to customers for various power semiconductor applications such as photovoltaics, energy storage, DC EV charging, motor drives, and industrial power supplies.

Improved chip performance and FOMs

Improved .XT package interconnect

Best-in-class $R_{DS(on)}$ and the most granular portfolio in the market



For more details scan the QR Code:
www.infineon.com/coolsic-g2

CoolSiC™ MOSFETs discrete 400 V G2

Unique opportunity to provide applications with high performance MOSFETs between 200 V_{DS} and 600 V_{DS}

The new CoolSiC™ MOSFET 400 V Generation 2 delivers improved system efficiency and power density thanks to ultralow switching losses and on-state resistance while offering system cost improvements.
The CoolSiC™ MOSFET 400 V family is the perfect performance and BOM-cost fit in 3- and 2-level topologies:

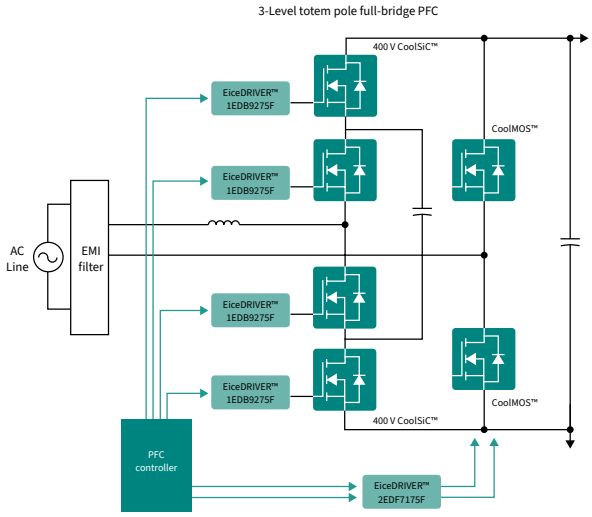
- 3-level topologies operating up to 400 $V_{RMS\ AC}$/560 V_{DC_LINK} bus voltage for example:
  3L totem pole PFC, ANPC, and NPC2 topologies
- 2-level topologies operating up to 288 V_{DC_LINK} battery/bus voltage for example:
  B6, full bridge buck/boost topologies

Features and benefits

Key features	Key benefits
– 400 V_{DS} voltage class	– Optimum device selection for highest efficiency in multi-level topologies
– Using infineon's latest CoolSiC™ Generation 2 technology	– Proprietary technology with highest efficiency, reliability, and best price position
– $R_{DS(on)}$ with low positive temperature co-efficient	– High efficiency operation during high load conditions
– Incorporates .XT connect technology	– Outstanding heat dissipation and highest reliability
– Low turn-off voltage overshoot and excellent dV/dt controllability	– Optimum tuning for highest efficiency and fulfilling EMI requirements

Featured topology:
3-level flying-capacitor totem pole PFC

Used within a hard-switching 3-level totem pole PFC, the new CoolSiC™ MOSFET 400 V family delivers a clear advantage. For example, it represents the perfect choice for the next generation of server power supplies, enabling new power density and efficiency levels beyond the current limits!



CoolSiC™ MOSFETs discrete 400 V G2

eAviation · Server · Telecom SMPS · Solar · Servo drive · Industrial SMPS · Audio · Robotics

$R_{DS(on)}$ typ. [mΩ]	TO-Leadless	D^2PAK-7 TO-263-7
11	IMT40R011M2H	IMBG40R011M2H
15	IMT40R015M2H	IMBG40R015M2H
25	IMT40R025M2H	IMBG40R025M2H
36	IMT40R036M2H	IMBG40R036M2H
45	IMT40R045M2H	IMBG40R045M2H

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CoolSiC™ MOSFETs discrete 650 V Generation 2

Empowering the next generation of high-performance systems

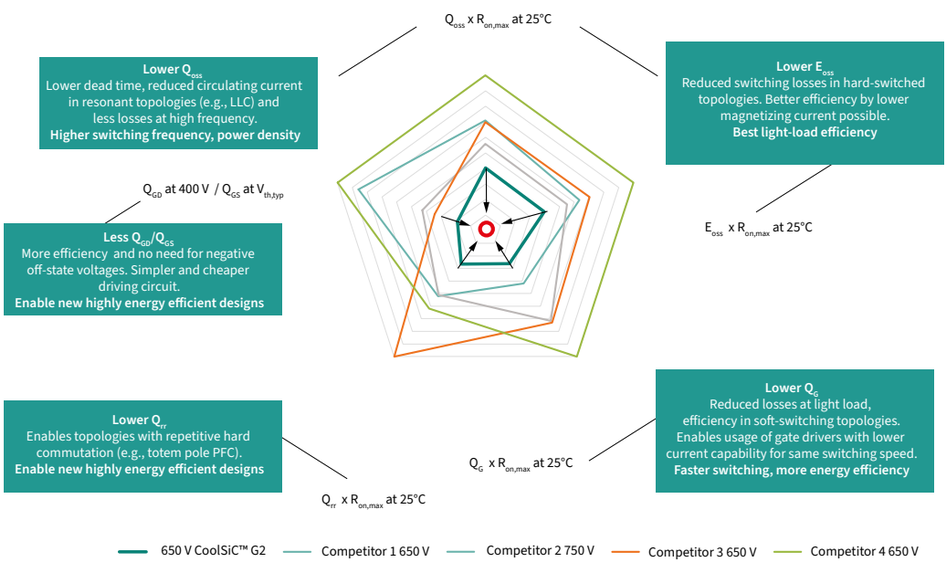
CoolSiC™ MOSFET G2 trench technology represents a significant advancement in harnessing silicon carbide's performance capabilities. It builds upon the reliability of its predecessor, G1, while enabling lower power losses. It features excellent $R_{DS(on)}$ x Q_{fr} and superior $R_{DS(on)}$ x Q_{oss} figures-of-merits (FOMs), resulting in ultrahigh efficiency in hard-switching and soft-switching topologies, respectively. This makes it a compelling power device for various applications, such as photovoltaics, energy storage, servers, telecom, and EV charging.

The best-in-class lowest $R_{DS(on)}$, the 7 mΩ rating, is a feature in the TO-263-7 SMD package. It helps the designer reduce conduction loss and improve overall energy efficiency. Combined with the fast switching capability, which offers more than 30 percent improvement compared to the previous generation, G2 offers the next level of power density.

The G2 technology's unique combination of high threshold voltage ($V_{GS(th),typ}$ of 4.3 V) with low Q_{GD}/Q_{GS} ratio ensures high robustness against parasitic turn-on, which enables unipolar gate driving (i.e., $V_{GS(off)}$ = 0). This helps to increase the power density and low the cost of the systems. Moreover, it has more flexibility on driving voltage, which means customers can turn on the MOSFET with voltages between 15 V and 8 V and turn it off with voltages between -7 V and 0 V. Further advancement of Infineon's unique .XT interconnection technology serves to overcome the common challenge of improving semiconductor chip performance while maintaining its thermal capability. With a different interconnection technology, the thermal capability shows a 25 percent improvement for a given chip size, further boosting the chip figures-of-merit to a new level of SiC performance.

Features and benefits

Key features	Key benefits
– Outstanding switching performance	– Improved efficiency and achieving high power density
– Best-in-class $R_{DS(on)}$ and a large granular portfolio	– Reduce conduction losses and improved efficiency
– Enlarged driving voltage range to 7 V - +23 V static	– Ease of use and compatibility enabling second source
– Best immunity against unwanted turn-on events	– Enable unipolar driving reaching >99% peak efficiency at PFC and reduced system size
– High reliability with record low DPM rates	– Increased system lifetime



CoolSiC™ MOSFET discrete 650 V G2

Telecom · UPS · Server · EV charging · Solar · LSEV · SSCB

$R_{DS(on)}$ max. [mΩ]	$R_{DS(on)}$ typ. [mΩ]	TO-247-3	TO-247-4	D²PAK-7	TOLT TSC	Thin-TOLL 8x8	Q-DPAK	TO Leadless
95	75	IMW65R075M2H*	IMZA65R075M2H*	IMBG65R075M2H*	IMLT65R075M2H*	IMTA65R075M2H*		IMT65R075M2H*
75	60	IMW65R060M2H	IMZA65R060M2H	IMBG65R060M2H	IMLT65R060M2H	IMTA65R060M2H		IMT65R060M2H
62	50	IMW65R050M2H	IMZA65R050M2H	IMBG65R050M2H	IMLT65R050M2H	IMTA65R050M2H		IMT65R050M2H
49	40	IMW65R040M2H	IMZA65R040M2H	IMBG65R040M2H	IMLT65R040M2H	IMTA65R040M2H		IMT65R040M2H
42	33	IMW65R033M2H	IMZA65R033M2H	IMBG65R033M2H	IMLT65R033M2H	IMTA65R033M2H		IMT65R033M2H
33	26	IMW65R026M2H	IMZA65R026M2H	IMBG65R026M2H	IMLT65R026M2H	IMTA65R026M2H		IMT65R026M2H
24	20	IMW65R020M2H	IMZA65R020M2H	IMBG65R020M2H	IMLT65R020M2H	IMTA65R020M2H	IMDQ65R020M2H	IMT65R020M2H
18	14.5	IMW65R015M2H	IMZA65R015M2H	IMBG65R015M2H	IMLT65R015M2H		IMDQ65R015M2H	IMT65R015M2H
13.1	10	IMW65R010M2H	IMZA65R010M2H	IMBG65R010M2H			IMDQ65R010M2H	IMT65R010M2H
8.5	6.7/7	IMW65R007M2H	IMZA65R007M2H	IMBG65R007M2H			IMDQ65R007M2H	

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* Coming soon

CoolSiC™ MOSFETs discrete 750 V Generation 2

Accelerating design of more cost optimized, efficient, compact, and reliable systems

CoolSiC™ 750 V G2 MOSFET power devices are characterized by enhanced switching performance and significantly faster switching speeds. They are a key enabler for higher power density in modern power electronics systems. The new generation of Infineon CoolSiC™ devices further supports the development of smaller, lighter, and more energy-efficient systems by enabling higher-frequency operation and more compact designs.

Best-in-class 4 mΩ CoolSiC™ 750 V G2 MOSFET in Q-DPAK package provides designers with highly efficient and reliable solutions for top-side cooling applications. Such advanced components are specifically engineered to meet the rigorous demands of multiple industrial applications, offering exceptional thermal performance and reduced power losses. These devices enable more compact, energy-efficient, and thermally optimized designs by leveraging their ultralow resistance and superior thermal management capabilities.

Compared to G1, the latest CoolSiC™ 750 V G2 MOSFETs enable more compact, efficient, and cost-optimized designs, making it a valuable choice for industries aiming for reliable and energy-efficient systems. CoolSiC™ 750 V G2 MOSFETs meet the existing and future demands for efficient and reliable power systems. By offering improved performance, CoolSiC™ 750 V G2 MOSFETs allow the building of cutting-edge, energy-efficient solutions without compromising quality or durability. Combined with the award-winning .XT interconnect technology, G2 is further increasing the potential of designs based on CoolSiC™ with higher thermal conductivity, better assembly control, and improved performance.

Features and benefits

Key features	Key benefits
– High switching speed	– Faster switching compared to G1 by approximately 25%
– Reduced parasitic capacitance (C_{oss}, C_{iss} ,C_{rss})	– Minimized switching losses, particularly at high voltages and frequencies
– Reduced gate charge (Q_g)	– Lower gate charge allows for faster switching
– Improved body diode performance	– Reduced reverse recovery losses in bridge configurations
– Extended negative gate driving voltage	– Enhanced voltage tolerance provides engineers with greater design margins
– Enhanced thermal performance	– Improved thermal management and reliability

CoolSiC™ MOSFETs discrete 750 V Generation 2

Server · Telecom · Energy storage · Solar · EV charging · SSCB

$R_{DS(on)}$ typ. [mΩ]	Q-DPAK TSC	D²PAK-7	TO-247-4
60	IMDQ75R060M2H	IMBG75R060M2H*	IMZA75R060M2H*
50	IMDQ75R050M2H*	IMBG75R050M2H*	IMZA75R050M2H*
40	IMDQ75R040M2H*	IMBG75R040M2H*	IMZA75R040M2H*
33	IMDQ75R033M2H*	IMBG75R033M2H*	IMZA75R033M2H*
25	IMDQ75R025M2H	IMBG75R025M2H*	IMZA75R025M2H*
20	IMDQ75R020M2H*	IMBG75R020M2H*	IMZA75R020M2H*
16	IMDQ75R016M2H	IMBG75R016M2H*	IMZA75R016M2H*
11	IMDQ75R011M2H*	IMBG75R011M2H*	IMZA75R011M2H*
7	IMDQ75R007M2H	IMBG75R007M2H*	IMZA75R007M2H*
4	IMDQ75R004M2H		

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* Coming soon

CoolSiC™ Automotive MOSFETs 750 V G2

Revolutionizing the next-generation power conversion systems

The new CoolSiC™ Automotive MOSFETs 750 V G2 technology delivers improved system efficiency and increased power density by enabling lower switching losses while persisting in high reliability and quality level, aligning seamlessly with the evolving trends such as higher power density, higher efficiency and bidirectionality within electric vehicles (EVs) and high-voltage power conversion applications, with a keen focus on addressing critical facets of on-board chargers (OBCs), DC-DC converters, auxiliaries, and static switching applications i.e., HV eFuse and HV-Battery disconnect.

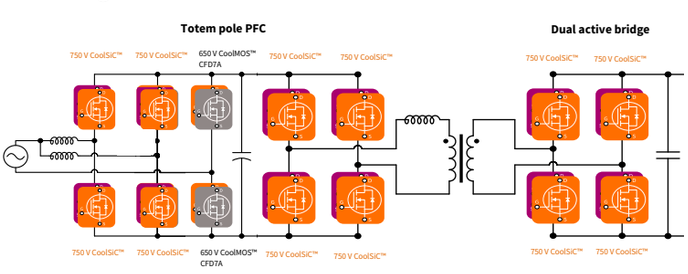
Leveraging technology advancement, CoolSiC™ 750 V G2 exhibits excellent $R_{DS(on)}$ x Q_{oss} and best-in-class $R_{DS(on)}$ x Q_{fr}, contributing to reduced switching loss in both hard-switching and soft-switching topologies and superior efficiency in hard-switching. To ensure the high robustness against parasitic turn-on (PTO), CoolSiC™ 750 V G2 MOSFETs are powered at a high threshold voltage $V_{GS(th),typ}$ of 4.5 V at 25°C in combination with an ultralow Q_{GD}/Q_{GS} ratio, which enables designers to apply the unipolar gate driving to simplify system designs and save costs without concerns. This, combined with increased flexibility on the driving voltage to turn on the MOSFET with voltages between 23 V and 18 V (static) and to turn it off with voltages between -7 V and 0 V (static), meets the various needs in different systems with its best compatibility. Further beyond, CoolSiC™ 750 V G2 MOSFETs can operate at higher junction temperatures (up to 200°C for <100 hours, limited to 7500 temperature cycles), improving thermal management and reliability, and ideal for surge events in the applications.

The CoolSiC™ 750 V G2 technology offers a granular portfolio with typical $R_{DS(on)}$ values ranging from 4 to 60 mΩ at 25°C, making them suitable for diverse applications. Infineon's innovative top-side cooled Q-DPAK package features the best-in-class lowest $R_{DS(on)}$ of 4 mΩ, making it ideal for static-switching applications due to its ultralow on-state resistance. Additionally, the 7 mΩ $R_{DS(on)}$ variants are available in all industry-standard packages, including Q-DPAK, D2PAK-7, and TO-247-4, which help designers reduce conduction losses in switching applications to achieve higher efficiency. The CoolSiC™ 750 V G2 delivers unparalleled performance, superior reliability, firm adherence to AEC Q101 automotive standards, and great ease of use. It enables cost-effective, highly efficient, simplified designs to fulfill the ever-growing system and market needs. It underscores its commitment to reliability and longevity in safety-critical automotive applications.

Features and benefits

Key features	Key benefits
– Unparalleled switching performance with outstanding FoM	– System efficiency and power density improvement
– Best-in-class $R_{DS(on)}$ and portfolio with higher granularity	– Reduced conduction loss and selection of best-fit devices
– Unique combination of low C_{rss} x C_{iss} and high $V_{GS(th)}$	– Robustness against parasitic turn-on for unipolar gate driving
– Enlarged driving voltage range -7 to +23 V static	– Ease-of-use and best compatibility enabling second source
– Higher junction temperature up to 200°C under given condition	– Higher reliability in overload condition and surge events
– Highly robust 750 V technology, 100% avalanche-tested	– Enhanced robustness and reliability for bus voltages beyond 500 V
– Dedicated driver source pin	– Reduced switching loss through improved gate control
– Infineon's .XT die attach technology	– Best-in-class thermal dissipation

Block diagram







CoolSiC™ Automotive MOSFETs 750 V G2

$R_{DS(on)}$,typ at 25°C [mΩ]	Q-DPAK	D²PAK 7-pin TO-263 7-pin	TO-247 4-pin
4	AIMDQ75R004M2H*		
7	AIMDQ75R007M2H*	AIMBG75R007M2H*	AIMZA75R007M2H*
11	AIMDQ75R011M2H*	AIMBG75R011M2H*	AIMZA75R011M2H*
16	AIMDQ75R016M2H	AIMBG75R016M2H*	AIMZA75R016M2H*
20	AIMDQ75R020M2H*	AIMBG75R020M2H*	AIMZA75R020M2H*
25	AIMDQ75R025M2H	AIMBG75R025M2H*	AIMZA75R025M2H*
33	AIMDQ75R033M2H*	AIMBG75R033M2H*	AIMZA75R033M2H*
40	AIMDQ75R040M2H*	AIMBG75R040M2H*	AIMZA75R040M2H*
50	AIMDQ75R050M2H*	AIMBG75R050M2H*	AIMZA75R050M2H*
60	AIMDQ75R060M2H	AIMBG75R060M2H*	AIMZA75R060M2H*

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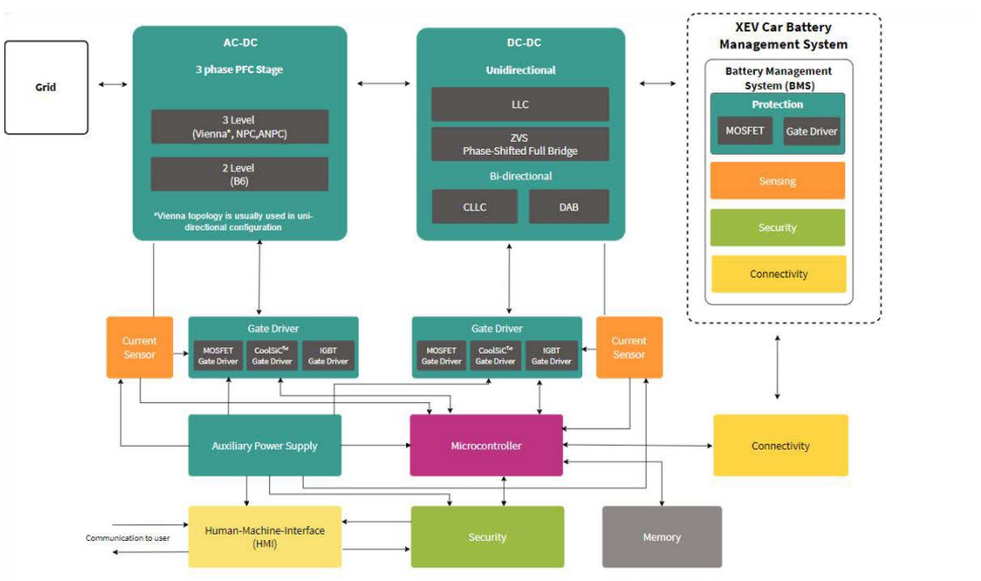
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CoolSiC™ MOSFETs 1200 V G2

Striving for excellence in SiC MOSFETs

The CoolSiC™ MOSFET 1200 V G2 in a TO-263-7, TO-247-4, and Q-DPAK package package builds on the strengths of Generation 1 technology and enables the accelerated system design of more cost-optimized, efficient, compact, and reliable solutions. Generation 2 comes with significant improvements in key figures-of-merit for both, hard-switching operation and soft-switching topologies, suitable for all common combinations of AC-DC, DC-DC, and DC-AC stages.

System diagram: DC EV chargers up to 150 kW



Features and benefits

Key features
– Very low switching losses
– Overload operation up to T_j = 200°C (100 hours)
– Short circuit withstand time 2 µs
– Benchmark gate threshold voltage, $V_{GS(th)}$ = 4.2 V
– Robust against parasitic turn-on, 0 V turn-off gate voltage can be applied
– Robust body diode for hard commutation
– .XT interconnection technology for best-in-class thermal performance

Key benefits
– Better energy efficiency
– Cooling optimization
– Higher power density
– New robustness features
– Highly reliable

CoolSiC™ MOSFET 1200 V G2

Energy storage · SSCB · Server · Artificial intelligence · EV charging · Solar · UPS · Drives

$R_{DS(on)}$ typ. [mΩ]	TO-247-4-HC	TO-247-4	TO-263-7
	1200 V		
7/8	IMZC120R007M2H		IMBG120R008M2H
10/11/12	IMZC120R012M2H	IMZA120R012M2H*	IMBG120R012M2H
17	IMZC120R017M2H	IMZA120R017M2H*	IMBG120R017M2H
22	IMZC120R022M2H	IMZA120R022M2H*	IMBG120R022M2H
26	IMZC120R026M2H	IMZA120R026M2H*	IMBG120R026M2H
34	IMZC120R034M2H	IMZA120R034M2H*	IMBG120R034M2H
40	IMZC120R040M2H	IMZA120R040M2H*	IMBG120R040M2H
53	IMZC120R053M2H	IMZA120R053M2H*	IMBG120R053M2H
78	IMZC120R078M2H	IMZA120R078M2H*	IMBG120R078M2H
116			IMBG120R116M2H
181			IMBG120R181M2H
234			IMBG120R234M2H

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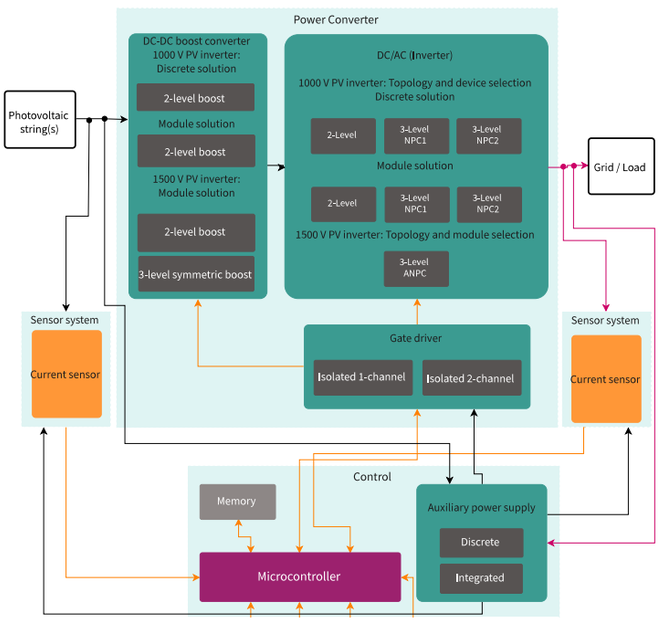
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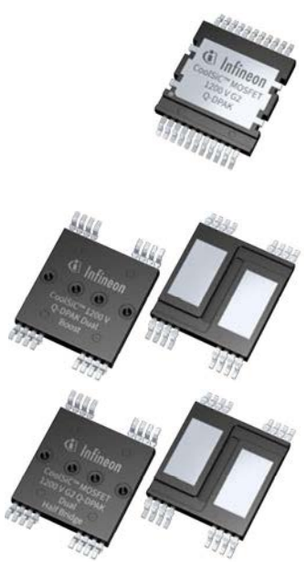
CoolSiC™ MOSFETs 1200 V G2 Q-DPAK

Stay cooled with top-side cooled Q-DPAK package variants

The CoolSiC™ MOSFET discrete 1200 V G2 in a top-side cooled Q-DPAK package has been specifically designed for wide use in industrial applications. The Q-DPAK package solutions provide customers with outstanding thermal performance, easier assembly, and reduced system costs. The top-side cooled Q-DPAK is introducing a new era in cooling, energy efficiency, design flexibility, and performance.

Block diagram





Features and benefits

Key features	Key benefits
– SMD top-side-cooled package	– Automated assembly
– Low stray inductance	– Less complex designs needed
– .XT interconnection technology	– Outstanding thermal performance compared to BSC packages
– Lowest $R_{DS(on)}$	– Higher power density
– Avalanche-robust, short-circuit, and PTO	– Lower TCO cost or BOM cost

CoolSiC™ MOSFETs 1200 V G2 Q-DPAK

EV charging · Solar · UPS · SSCB · Drives · Solar · Artificial Intelligence · CAV

$R_{DS(on)}$ typ. [mΩ]	Q-DPAK single switch	Q-DPAK Dual Half-bridge		Q-DPAK Dual Half-bridge	I_d [A]
	CoolSiC™ G2 1200 V	2x CoolSiC™ G2 1200 V	Boost CoolSiC™ G2 1200 V	Dual CoolSiC™ Diode 1200 V	
4	IMCQ120R004M2H				
5	IMCQ120R005M2H				
7	IMCQ120R007M2H				
10/12	IMCQ120R010M2H	IMSQ120R012M2HH			
17	IMCQ120R017M2H		IMSQ120R017M2HB w/50A*	IDSQ50G120C5D*	50
26	IMCQ120R026M2H	IMSQ120R026M2HH	IMSQ120R026M2HB w/40A*	IDSQ40G120C5D*	40
34	IMCQ120R034M2H				
40	IMCQ120R040M2H	IMSQ120R040M2HH	IMSQ120R040M2HB w/30A*	IDSQ30G120C5D*	30
53	IMCQ120R053M2H	IMSQ120R053M2HH	IMSQ120R053M2HB w/20A*	IDSQ20G120C5D*	20
60				IDSQ10G120C5D*	15
78	IMCQ120R078M2H	IMSQ120R078M2HH*			
118		IMSQ120R118M2HH*			
181		IMSQ120R181M2HH*			
234		IMSQ120R234M2HH*			

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CoolSiC™ MOSFETs discrete 1400 V G2

Extending the design boundaries with a new voltage class

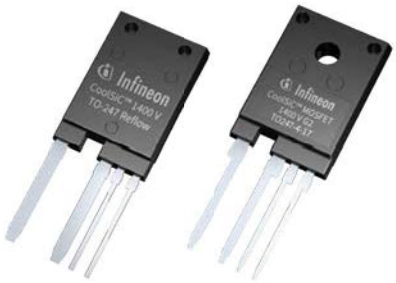
The CoolSiC™ MOSFET 1400 V G2 comes in two different package variants—a TO-247PLUS-4 Reflow and a TO-247-4 standard package. The Reflow package is especially designed for harsh environments. It has a 6.1 mm creepage and 10.8 mm pin creepage. The Reflow/SMD capability (three times reflow solderable) enables lower $R_{th,c-h}$ resulting in up to greater than ten percent higher current output when combined with liquid cooling.

Features and benefits

Key features	Key benefits
– New 1400 V_{DS} voltage class	– DC bus voltages >1000 V

– Latest CoolSiC™ G2 technology
  – Very low switching losses
	– Best-in-class thermal performance
	  – More design flexibility
	  – Additional voltage buffer for faster switching at high currents

– .XT interconnection technology – Reflow package: Package backside suitable for reflow soldering at 260°C	



CoolSiC™ MOSFETs discrete 1400 V G2

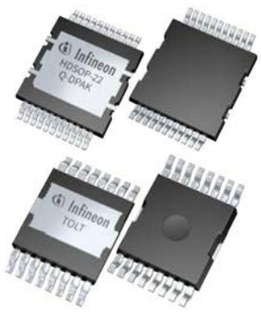
CAV · EV charging · UPS · Solar · Energy storage · Drives

$R_{DS(on)}$ typ. [mΩ]	TO-247-4 Reflow	TO-247-4 HC
	1400 V	
6	IMYR140R006M2H*	
8	IMYR140R008M2H*	
11	IMYR140R011M2H*	IMZC140R011M2H*
19	IMYR140R019M2H*	IMZC140R019M2H*
24	IMYR140R024M2H*	IMZC140R024M2H*
29	IMYR140R029M2H*	IMZC140R029M2H*
38		IMZC140R038M2H*

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CoolSiC™ MOSFET package innovations



Innovative top-side cooled SMD solution for high-power applications

Top-side cooled Quadruple-DPAK (Q-DPAK) and TOLT package

These top-side cooled surface mount device (SMD) packages (available today in 600 V CFD7, G7, S7, CM8, CoolSiC™ MOSFET 650 V and 750 V) address high-power SMPS applications such as PC power, solar, telecom, solid-state circuit breaker as well as automotive applications like HV eDisconnect, HV eFuse and on-board charger. SMD-based SMPS designs support fast switching and help to reduce the parasitic inductance associated with long-leaded packages such as the TO-247 package. In today's SMD-based designs, the output power is restricted by the thermal limit of the PCB material because the heat must be dissipated through the board. Thanks to the top-side cooling concept of TOLT and Q-DPAK, the thermal decoupling of board and semiconductor is possible, enabling higher power density or improved system lifetime.



Optimized for high-power applications

TO-Leadless

Combined with the CoolMOS™ C7 Gold (G7) technology, the TO-Leadless (TOLL) package is Infineon's flagship SMD package for high power/high current SMD solutions. Compared to D²PAK 7-pin, TO-Leadless shows a 30 percent reduction in footprint, yet offers improved thermal performance. This and the 50 percent height reduction result in a significant advantage whenever the highest power density is demanded. The package offers the best efficiency and ease of use and is equipped with a 4-pin Kelvin source connection and low parasitic inductances. The package is MSL1 compliant and reflow solderable.



Optimized for high-power applications

Thin-TOLL 8x8

Infineon's Thin-TOLL 8x8 is a clever cross between a Thin-PAK 8x8 and a TOLL package. While maintaining a small footprint and the pin to pin compatibility with Thin-PAK 8x8 and similar 8x8 packages, the thicker Thin-TOLL leadframe allows tolerating a higher number of TCoB (thermal cycles on board) up to 4 times than other 8x8 packages. The support for .XT enables a T_j of 175°C when a CoolSiC™ die is used. The Thin-TOLL 8x8 is the next evolutionary step towards greater power density for mid- to high-power applications.



Innovative top-side cooled SMD solution for high-power applications

Top-side cooled Quadruple-DPAK (Q-DPAK)
Single switch and dual half-bridge variants

These top-side cooled surface mount device (SMD) packages (available today in 1200 V CoolSiC™ MOSFET G2) have been specifically designed for wide use in industrial applications. The Q-DPAK single switch addresses applications such as EVC, solar, UPS, SSCB, drives, AI data centers, and CAV. The Q-DPAK Dual half-bridge package consists of two identical $R_{DS(on)}$ CoolSiC™ MOSFETs and targets at drives, EVC, solar, and UPS applications. The Q-DPAK package variants provide customers with a reduced system cost by enabling easier assembly with outstanding thermal performance. Compared to bottom-side cooled solutions, top-side cooled devices enable a more optimized PCB layout, minimizing the effects of parasitic components and stray inductances and providing enhanced thermal management capabilities. The Q-DPAK is introduces a new era in cooling, power density, design flexibility, and performance.



Optimized for high-power applications

TO-247PLUS-4 Reflow

The TO-247PLUS-4 Reflow package is available in 1400 V CoolSiC™ MOSFET G2. It is ideal for low $R_{DS(on)}$ in a TO-247 form and can go as low as 6 mΩ for 1400 V. The package offers reflow/SMD capability (three times reflow solderable). It enables lower $R_{th,c\text{-}h}$ improvements of more than 40 percent, resulting in more than 10 percent higher current output when combined with liquid cooling. The TO-247PLUS-4 Reflow package has wider pins (2 mm) for higher current output, enabling up to 180 A at 100°. This high-voltage package has a 10.8 mm pin-to-pin creepage and CTI ≥600 V. The package's short trousers (2.6 mm) lead to better electrical switching performance due to fewer stray inductances. This new package has been designed for harsh environments and perfectly matches applications such as CAV, solar/ESS, EVC, UPS, and drives.

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Share your feedback

CoolSiC™ Schottky diodes

The differences in material properties between silicon carbide and silicon limit the fabrication of practical silicon unipolar diodes (Schottky diodes) to a range of up to 100-150 V, with a relatively high on-state resistance and leakage current. With SiC, Schottky diodes can reach a much higher breakdown voltage. With more than 20 years of field experience in SiC, Infineon is the world's first SiC discrete power supplier. Infineon offers products up to 2000 V in discrete packages and 2000 V in modules.

The long market presence and experience enable Infineon to deliver highly reliable, industry-leading SiC performance. With over ten years of pioneering experience developing and manufacturing SiC diodes, Infineon's latest CoolSiC™ Schottky diode Generation 6 family sets a benchmark in quality, efficiency, and reliability.

Features

- No reverse recovery charge
- Purely capacitive switching
- High operating temperature ($T_{j, max}$ 175°C)

Advantages

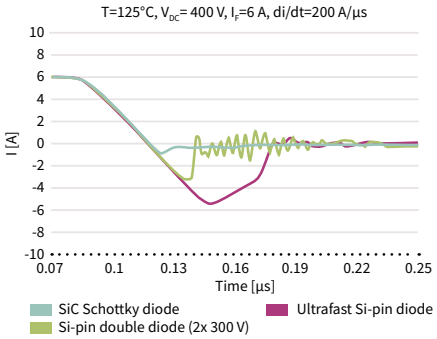
- Low turn-off losses
- Reduction of CoolMOS™ or IGBT turn-on loss
- Switching losses independent from load current, switching speed, and temperature

Benefits

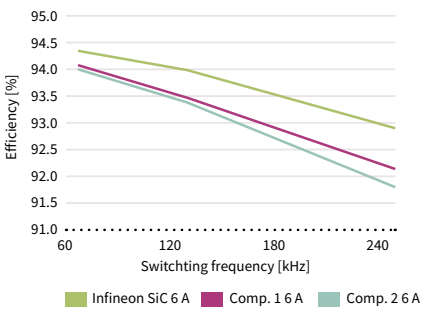
- System efficiency improvement compared to Si diodes
- Reduced cooling requirements
- Enabling higher frequency/increased power density
- Higher system reliability due to lower operating temperature
- Reduced EMI

Applications

- Server
- Telecom
- Solar
- UPS
- EV-charging
- Energy storage
- PC power
- Motor drives
- Lighting
- CAV



Reverse-recovery charge of SiC Schottky diodes versus Si-pin diodes
The majority of carrier characteristics imply no reverse recovery charge and the only contribution to the switching losses comes from the tiny displacement charge of a capacitive nature. In the same voltage range, silicon devices have a bipolar component, resulting in much higher switching losses. The graph shows the comparison between various 600 V devices.



Improved system efficiency (PFC in CCM mode operation, full load, low line)
The fast switching characteristics of the SiC diodes provide clear efficiency improvements at a system level. The performance gap between SiC and high-end silicon devices increases with the operating frequency.

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CoolSiC™ Schottky diodes 650 V

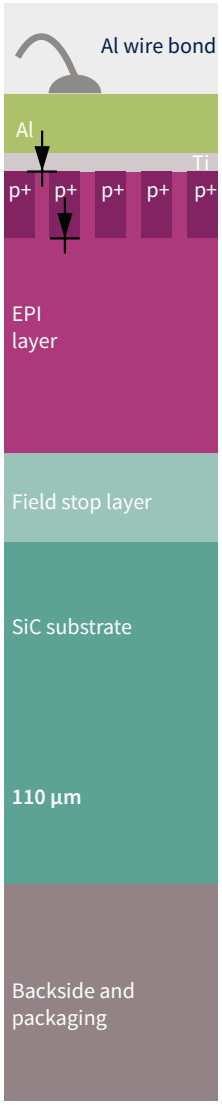
CoolSiC™ Schottky diodes 650 V G6 and G5

The CoolSiC™ Schottky diode 650 V G6 product family builds on the strong characteristics of the previous G5 generation, fully leveraging technology and process innovation to propose the best efficiency and price/performance products to date.

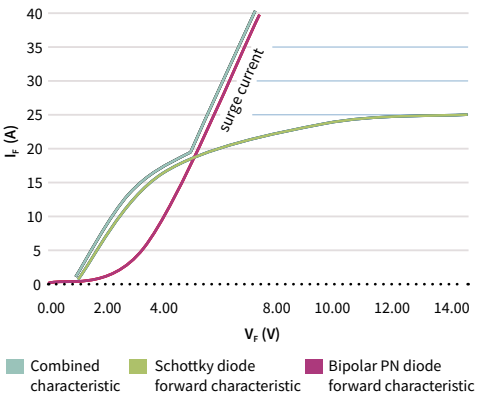
Foundation technology – CoolSiC™ Schottky diodes 650 V G5

The established CoolSiC™ Schottky diodes G5 product family has been optimized after all key aspects, including junction structure, substrate, and die attach. It represents a well-balanced product family that offers state-of-the-art performance and high surge current capability at a competitive cost level.

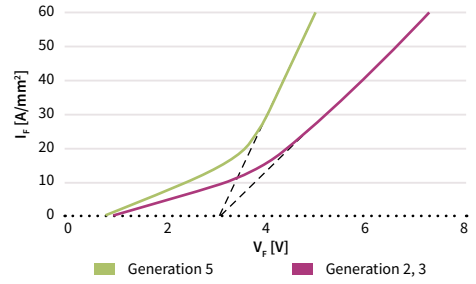
Innovation: Optimized junction, substrate, and die attach
Infineon's SiC Schottky diode Generation 5 is optimized with regard to all key aspects relevant to high-power and high-efficiency SMPS applications.



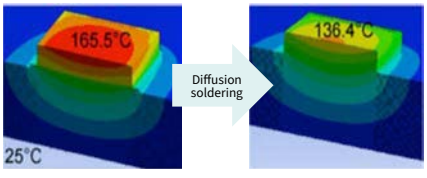
Junction: Merged PN structure
On the junction level, it has an optimized merged PN structure. Compared to competitors, Infineon's SiC diode has an additional P-doped area, which, together with the N-doped EPI layer, forms a PN junction diode. Thus, it combines the Schottky diode and the PN junction diode. Under normal conditions, it works like a standard Schottky diode. It works like a PN junction diode under abnormal conditions, such as lighting and AC line drop-out. At a high current level, the PN junction diode has a significantly lower forward voltage (V_F) than the Schottky diode, which leads to less power dissipation, thus significantly improving the surge current capability.



Substrate: Thin wafer technology
On the substrate level, Infineon introduced the thin wafer technology. At the later stage of our SiC diode production, the thin wafer process reduces the wafer thickness by about two-thirds, which significantly reduces the substrate resistance contribution, thus improving both forward voltage (V_F) and thermal performance.



Die attach: Diffusion soldering
On the backside, package-level diffusion soldering is introduced, which significantly improves the thermal path between the lead frame and the diode, enhancing the thermal performance. With the same chip size and power dissipation, the junction temperature is reduced by 30°C.



R_{thJC}= 2.0 K/W R_{thJC}= 1.5 K/W

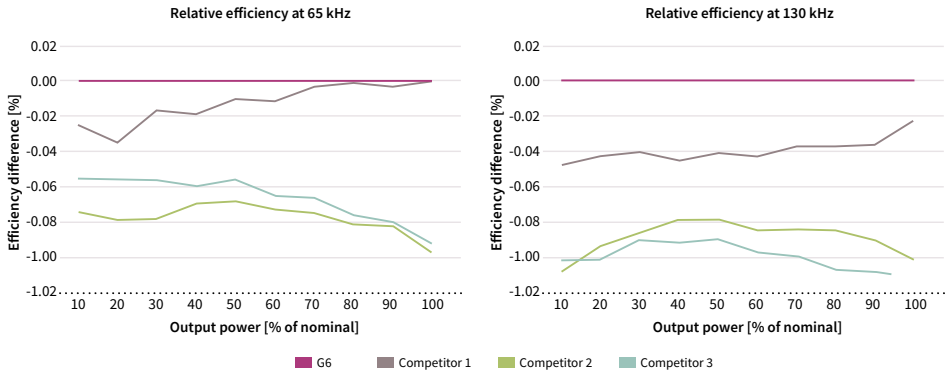
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www.infineon.com/coolsic-diodes
www.infineon.com/coolsic-gen2
www.infineon.com/SiCgd

Latest development - CoolSiC™ Schottky diodes 650 V G6

The CoolSiC™ Schottky diodes G6 product family introduces a novel and proprietary Schottky metal system. This contributes to reducing the forward voltage (VF) to challenging levels, determining a measurable decrease in conduction losses. Infineon's CoolSiC™ Schottky diodes enable optimum efficiency and ruggedness. Lower forward voltage (V_F) means lower conduction loss and lower capacitive charge (Q_c) means lower switching loss. $Q_c \times V_F$ is the figure of merit for efficiency, and comparison indicates that the latest Generation 6 products have the lowest $Q_c \times V_F$ on the market. Infineon's CoolSiC™ Schottky diodes offer far better surge-current robustness than the most efficient products. Thus, this surge-current capability offers excellent device robustness under abnormal conditions.

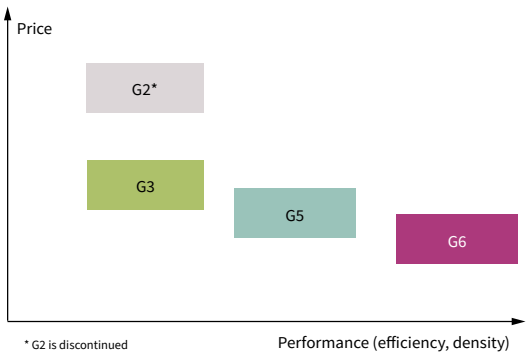
Efficiency comparison



Regarding efficiency, the 8 A G6 device has been tested in CCM PFC. The maximum output power is 3.5 kW. The figure on the left shows the relative efficiency at 65 kHz, while the figure on the right shows the relative efficiency at 130 kHz. This shows that Infineon's CoolSiC™ Schottky diode G6 delivers better efficiency over the full load range, keeping this advantage even at 130 kHz. Therefore, it meets the needs of designers who want to increase the switching frequencies in their designs to attain more power density.

The best price performance

CoolSiC™ Schottky diodes G6 are the outcome of Infineon's continuous technological and process improvements, which enable the design and development of SiC-based products, making them more price-competitive and increasing performance across generations. As a result, G6 is Infineon's best price/performance CoolSiC™ Schottky diode generation, offering the highest efficiency. In addition, Infineon offers the reliability of collaborating with the industry leader. Customers can leverage Infineon's proven quality and supply chain reliability. They can benefit from "one-stop-shop" advantages and maximize system performance, combining CoolSiC™ Schottky diodes with the SJ MOSFETs of the CoolMOS™ 7 family, such as 600 V C7, 650 V C7, 600 V G7, 650 V G7, and 600 V P7.



A comprehensive portfolio

The combined G6 and G5 CoolSiC™ Schottky diode 650 V diode portfolio offers a wide choice of packages and ampere class granularity to allow the best fit to applications. G6 comes in double DPAK, the first top-side cooled surface mount package, which allows thermal decoupling of PCB to chip junction and enables higher power dissipation and improved system lifetime thanks to the reduced board temperature.

Click here to learn more:

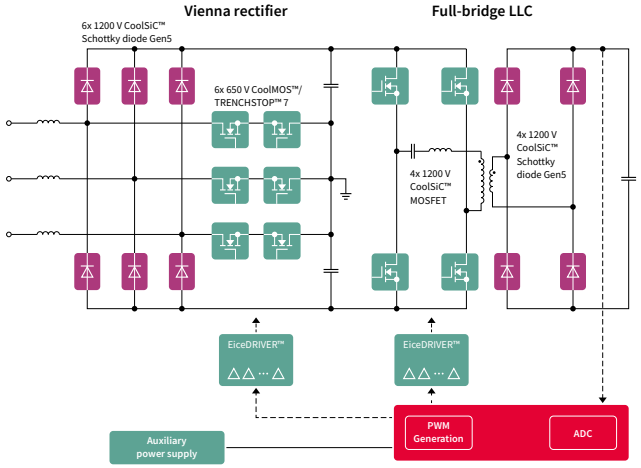
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CoolSiC™ Schottky diodes 1200 V

A new level of system efficiency and reliability

By using hybrid Si power switch/SiC diode sets, industrial application designers will gain flexibility for system optimization compared to purely silicon-based solutions. SiC diodes enable system improvements such as higher output power, greater efficiency, or higher switching frequency. By implementing CoolSiC™ diodes Generation 5, for example, in the Vienna rectifier topology, in combination with Infineon's 650 V TRENCHSTOP™ IGBTs and 650 V CoolMOS™ MOSFETs, designers can achieve outstanding system-level performance and reliability.

One of the most commonly used topologies for EV DC charging

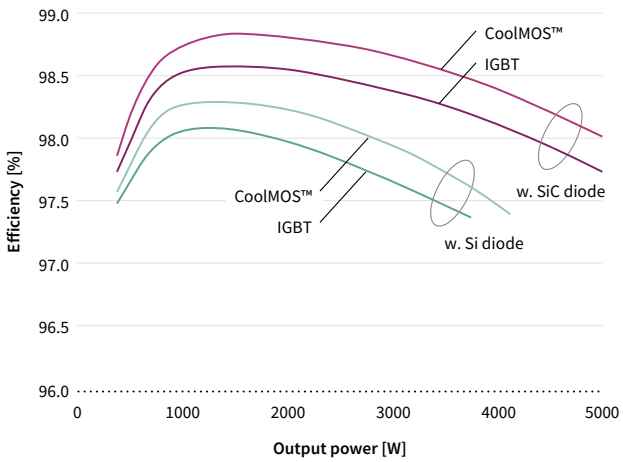




Features and benefits

Key features	Key benefits
– Zero Q_{rr} leading to no reverse recovery losses	– System efficiency improvement over Si-based diodes
– High surge current capability up to fourteen times of the nominal current	– Enabling higher frequency/increased power density solutions
– Tight forward voltage distribution	– High system reliability by extended surge current
– Temperature-independent switching behavior	– Reduced cooling requirements through lower diode losses and lower case temperatures
– Low forward voltage (V_F = 1.4 V) even at high operating temperature	– System size/cost saving due to reduced heatsink requirements and smaller magnetics
– Available in both through-hole and SMD packages	
– Up to 40 A rated diode	

650 V Si IGBT/Si SJ MOSFET and 1200 V SiC diode/ultrafast Si diode in a Vienna rectifier topology, f_{sw} = 48 kHz



650 V SJ MOSFET + 1200 V SiC diode (IPW65R045C7 + IDW15G120C5B)

650 V IGBT + 1200 V SiC diode (IKW50N65EH5 + IDW15G120C5B)

650 V SJ MOSFET + 1200 V Si diode (IPW65R045C7 + Vendor A)

650 V IGBT + 1200 V Si diode (IKW50N65EH5 + Vendor A)

SiC vs. Si diode

– +0.8 percent higher efficiency

– Increased output power is possible

EV charging SMPS Solar Drives

Click here to learn more:

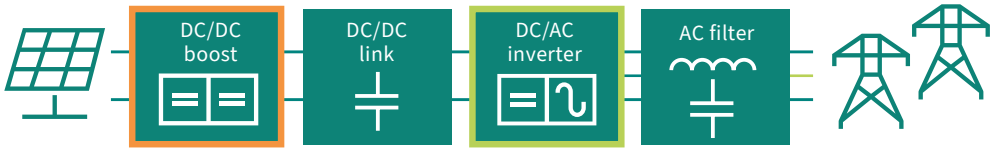
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CoolSiC™ Schottky diode 2000 V G5

CoolSiC™ Schottky diodes for up to 1500 V_{DC} applications

The CoolSiC™ Schottky diode 2000 V family is ideally suited for high DC link systems with up to 1500 V_{DC}. Compared to the 1700 V SiC diode, the devices also provide a sufficiently high overvoltage margin for 1500 V_{DC} systems. Due to the .XT connection technology, the components offer first-class thermal performance. They are also highly resistant to humidity. The CoolSiC™ Schottky Diodes are offered in two package variants – TO-247PLUS-4 HCC and TO-247-2. These diodes are particularly suitable for solar and EV charging applications. A matching gate driver portfolio is also available.

Optimize your 1500 V_{DC} PV system with CoolSiC™ MOSFETs and diodes



Features and benefits

Key features	Key benefits
– High surge current capability	– Enables high DC-link systems up to 1500 V_{DC}
– Temperature-independent switching behavior	– Minimized conduction losses
– Low forward voltage even at high operating temperatures	– No reverse recovery current
– Tight forward voltage distribution	– High power with half the part count
– Specified dv/dt ruggedness	– Topology simplification
– .XT interconnection technology for best-in-class thermal performance	– Increased reliability

CoolSiC™ Schottky diodes 2000 V G5

Solar EV charger

I_F [A]	TO-247PLUS-4 HCC	TO-247 2-pin
10	IDYH10G200C5	IDWD10G200C5
25	IDYH25G200C5	IDWD25G200C5
40	IDYH40G200C5	IDWD40G200C5
50	IDYH50G200C5	IDWD50G200C5
80	IDYH80G200C5	IDWD80G200C5



EV charger Solar

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CoolSiC™ Schottky diodes 650 V G6

Server Telecom Solar UPS Lighting PC power

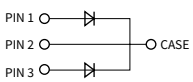
I_F [A]	TO-220 R2L	Double-DPAK (D-DPAK)
4	IDH04G65C6	
6	IDH06G65C6	
8	IDH08G65C6	IDDD08G65C6
10	IDH10G65C6	
12	IDH12G65C6	
16	IDH16G65C6	IDDD16G65C6
20	IDH20G65C6	

CoolSiC™ Schottky diodes 650 V G5

Server Telecom Solar UPS Lighting PC power

IF [A]	TO-220 R2L	TO-247 Dual Die	TO-247	D^2PAK R2L	Thin-PAK 8x8
4	IDH04G65C5				IDL04G65C5
6	IDH06G65C5			IDK06G65C5	IDL06G65C5
8	IDH08G65C5			IDK08G65C5	IDL08G65C5
10	IDH10G65C5		IDW10G65C5	IDK10G65C5	IDL10G65C5
12	IDH12G65C5		IDW12G65C5	IDK12G65C5	IDL12G65C5
16	IDH16G65C5		IDW16G65C5		
20	IDH20G65C5	IDW20G65C5B	IDW20G65C5		
24					
30/32		IDW32G65C5B	IDW30G65C5		
40		IDW40G65C5B	IDW40G65C5		

"B" in product name refers to dual die with the common-cathode configuration.



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CoolSiC™ Schottky diodes 600 V G3

Server Telecom Solar UPS Lighting PC power

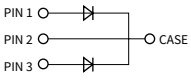
I_F [A]	TO-220 R2L	DPAK R2L
3		IDD03SG60C
4		IDD04SG60C
6	IDH06SG60C	IDD06SG60C
8	IDH08SG60C	IDD08SG60C
10	IDH10SG60C	IDD10SG60C
12	IDH12SG60C	

CoolSiC™ Schottky diodes 1200 V G5

Energy storage EV charging Solar UPS SMPS CAV

I_F [A]	TO-220 R2L	TO-247 Dual Die	TO-247 R2L	DPAK R2L	D²PAK R2L
2	IDH02G120C5			IDM02G120C5	IDK02G120C5
5	IDH05G120C5			IDM05G120C5	IDK05G120C5
8	IDH08G120C5			IDM08G120C5	IDK08G120C5
10	IDH10G120C5	IDW10G120C5B [1)]	IDWD10G120C5	IDM10G120C5	IDK10G120C5
15/16	IDH16G120C5	IDW15G120C5B [1)]	IDWD15G120C5		IDK16G120C5
20	IDH20G120C5	IDW20G120C5B [1)]	IDWD20G120C5		IDK20G120C5
30		IDW30G120C5B [1)]	IDWD30G120C5		
40		IDW40G120C5B [1)]	IDWD40G120C5		
50			IDWD50G120C5*		
60			IDWD60G120C5*		
75			IDWD75G120C5*		
150			IDWD150G120C5*		

1) "B" in product name refers to dual die with the common-cathode configuration.



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Nomenclature

High-voltage CoolGaN™ Transistor and Smart

GS - 065 - 011 - #S - LL - ☐

Company and technology
GS = Infineon GaN

Voltage
065 = 650 V or 700 V

Resistance
004 = 4 A to 5 A
008 = 8 A to 10 A
011 = 11 A to 13 A
014 = 14 A to 17 A
018 = 18 A to 24 A
030 = 30 A to 40 A

Reliability grade
blank = Industrial
A = Automotive
S = Standard

Package
B = Bottom-side cooled GaNpx™ embedded
T = Top-side cooled GaNpx™ embedded
S = Dual Side Cooled GaNpx™ embedded
L = PDFN package
LR = PDFN with reversed Pin1 location as compared to -L
LL = TOLL Package
LT = TOLT Package
D = Die

1st digit = Internal use

2nd digit:
Blank = Transistor
S = Single switch with current sensing without VCC
P = Single switch with current sensing with VCC

High-voltage CoolGaN™ Transistor and Smart

I G LD 65 R 070 D 1 ☐

Company
I = Infineon

Technology
G = GaN

Package
LR = DFN 5x6 –TSON
LD =DFN 8x8 –LSON
T = TOLL
LT = TOLT
O = DSO20-BSC
OT = DSO20-TSC
DQ = QDPAK TSC
QC = QDPAK BSC
SO = DSO-12
LV = VSON 8x8
D = DPAK
L = TSON 8-12 (8x8)
C = bare die

Blocking voltage
Multiplied by 10
65= 650 V
70= 700 V

Reliability grade
blank = Industrial
A = Automotive
S = Standard

Technology indicator
1 = HV G3 inhouse
2 = HV G5 inhouse
x = HV G6 inhouse

Product type
D = Discrete
S = Smart Sense
B = Smart Protect

$R_{DS(on)}$ typ [mΩ]
070 = 70 mΩ

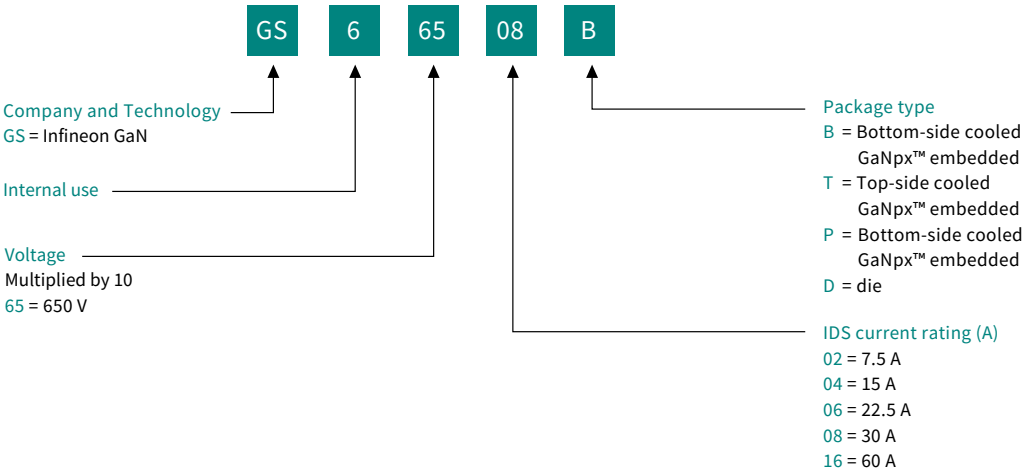
Resistance $R_{DS(on)}$

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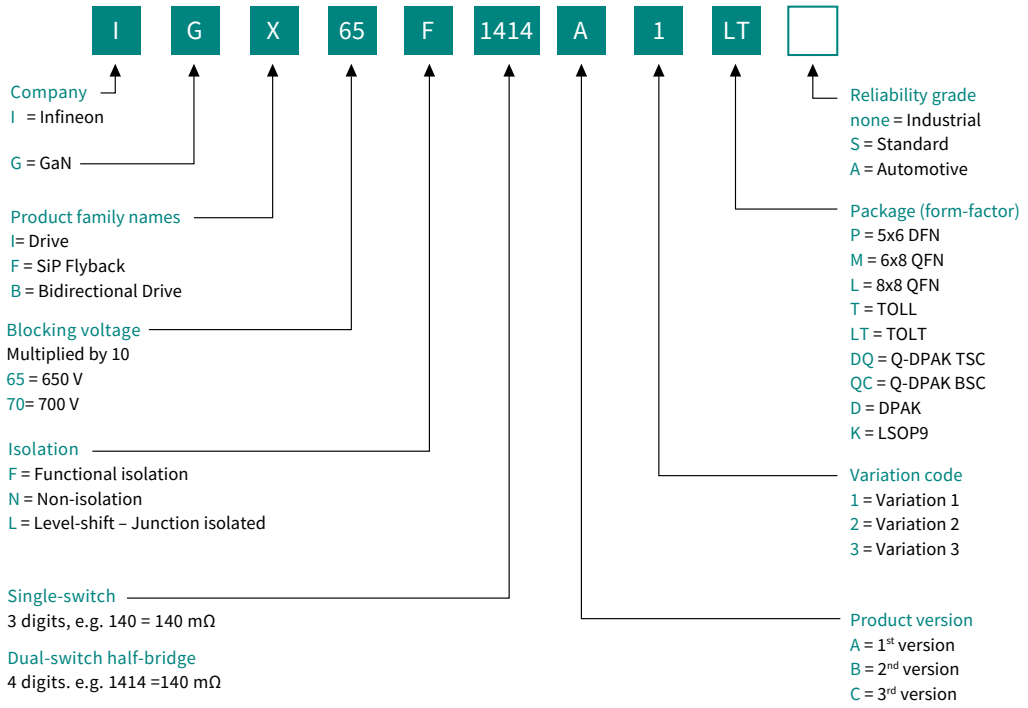
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High-voltage CoolGaN™ Transistor



High-voltage CoolGaN™ Drive and SiP

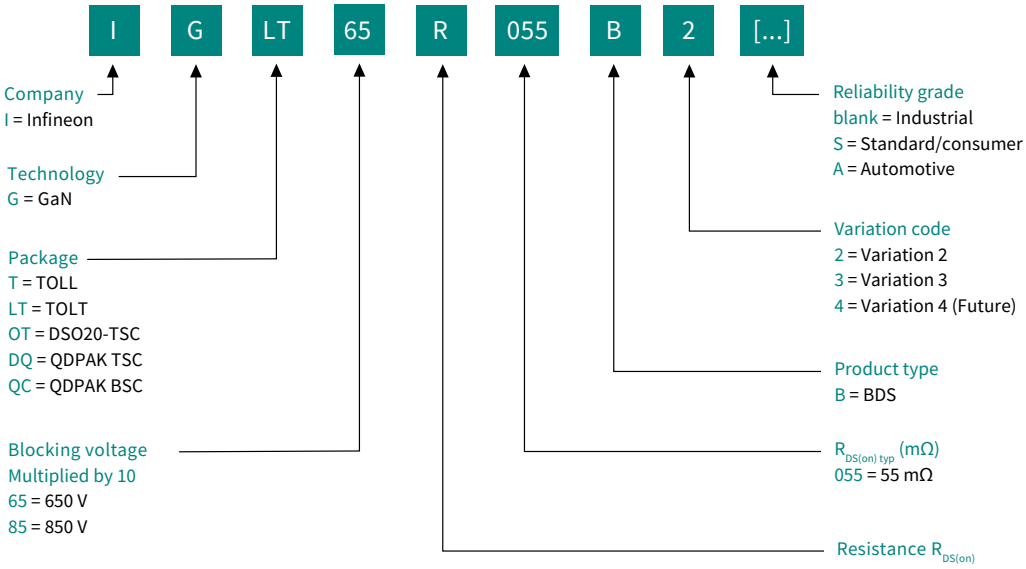


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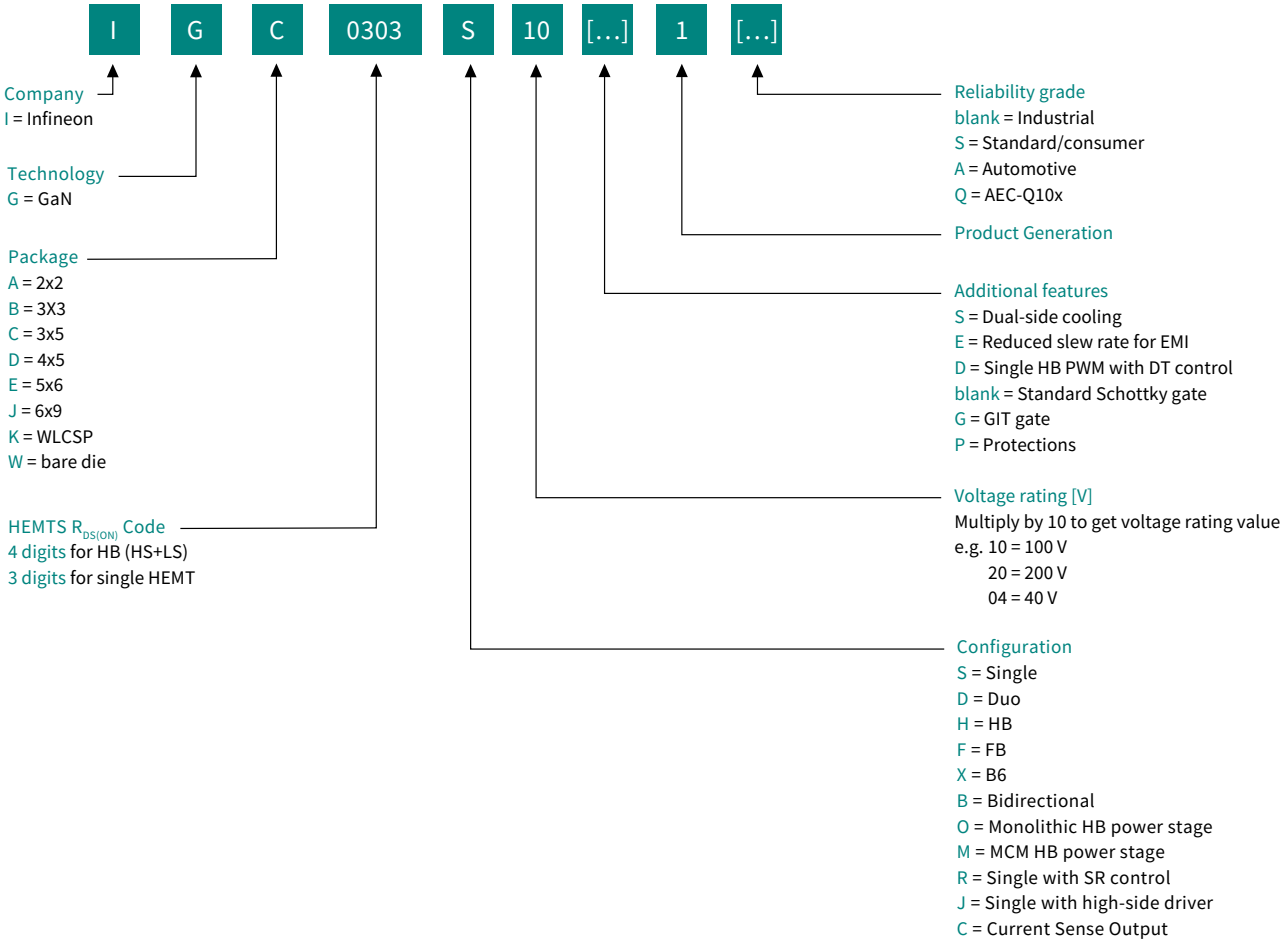
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High-voltage CoolGaN™ BDS



Medium-voltage CoolGaN™ Transistor

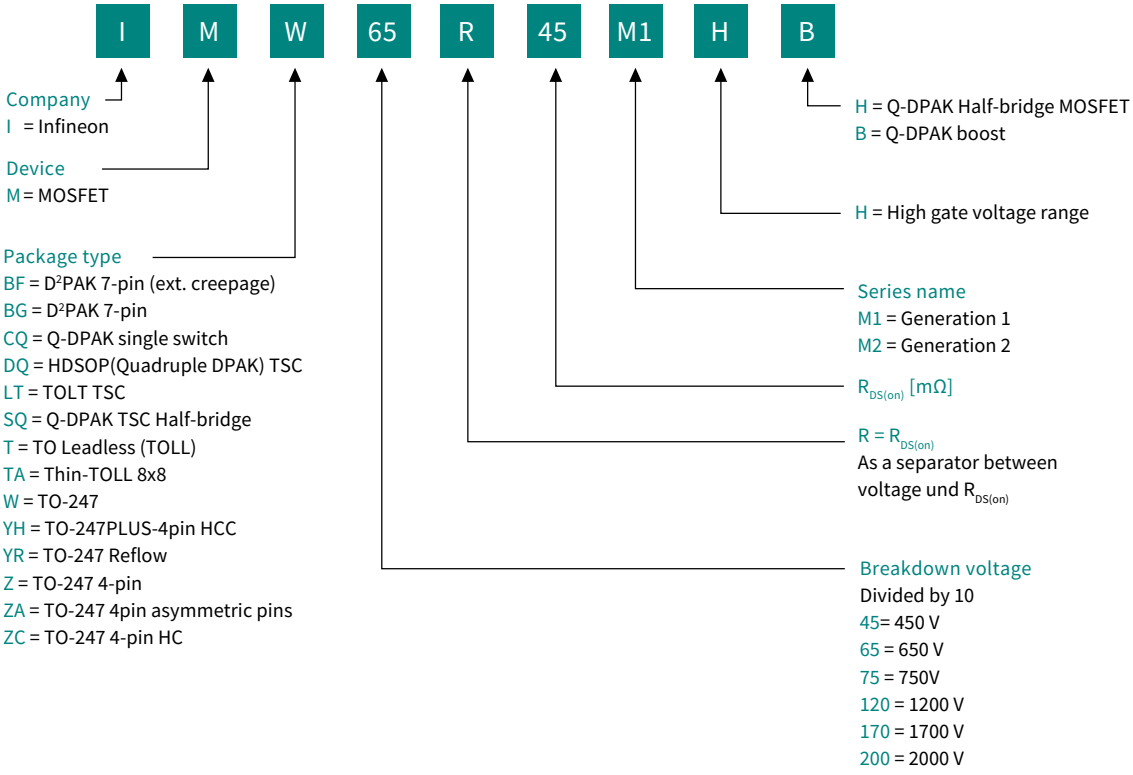


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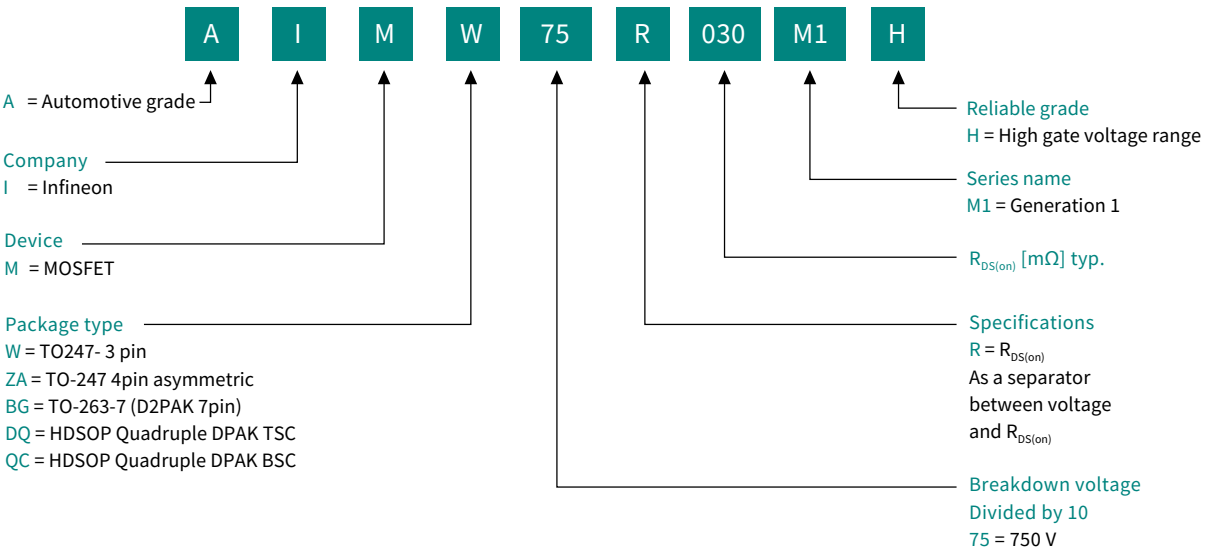
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CoolSiC™ MOSFET nomenclature



CoolSiC™ Automotive MOSFET discrete 750 V nomenclature

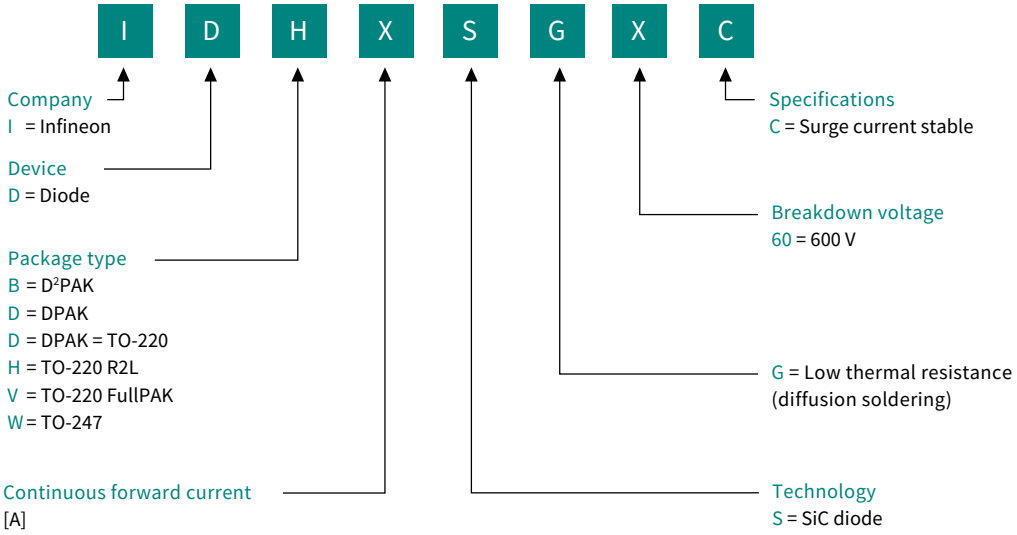


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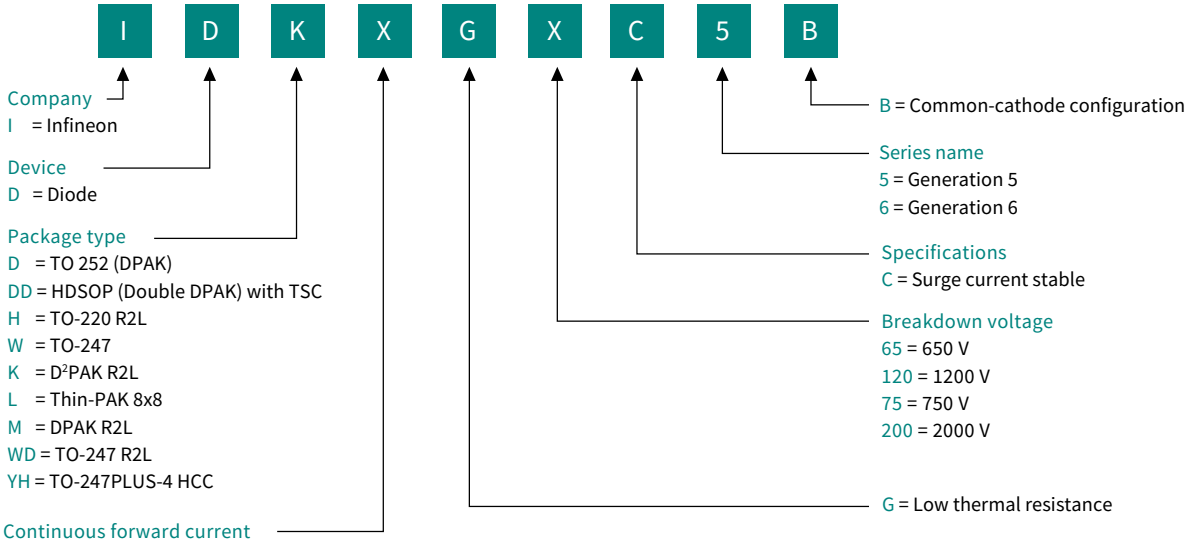
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CoolSiC™ Schottky diodes G2 and G3



CoolSiC™ Schottky diodes G5 and G6



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Infineon support for wide-bandgap semiconductors

Useful links and helpful information

Further information, datasheets, and documents

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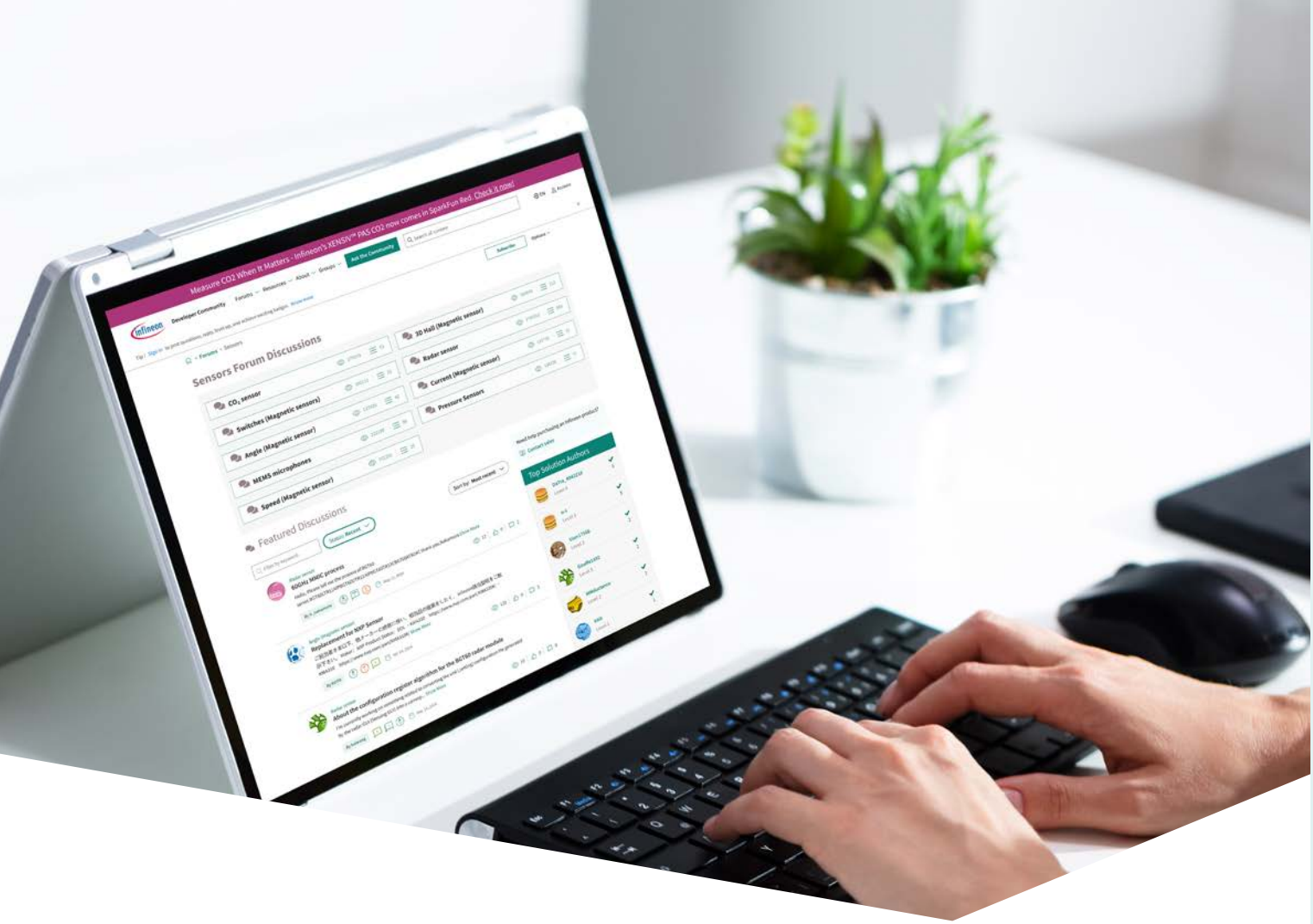
Support
Evaluation board
Tools
Simulation



XENSIV™ sensor technologies for automotive, industrial, consumer, and IoT applications

- Infineon Developer Community
- XENSIV™ sensor applications
  - Sensors in smart industries
  - Sensors in smart homes
  - Sensors in smart buildings
- Current sensors
- Inductive position sensing
- Magnetic sensors
  - 3D magnetic sensors
  - Linear sensors
  - Angle sensors
  - Magnetic speed sensors
- Pressure sensors
  - Absolute pressure sensors (MAP and BAP)
  - Side crash detection (SAB)
  - Tire pressure sensors (TPMS)
  - Pressure sensors for consumer and IoT
- MEMS microphones
  - MEMS microphones for automotive
  - MEMS microphones for consumer
- Radar sensors
  - Radar sensors for automotive
  - Radar sensors for consumer and IoT
- Gas sensors
  - CO_2 sensors
  - H_2 sensors

- **Design support**
- Connected Sensor Kit (CSK)
- Shield2Go
- Sensor2Go kits
- Add ons for Sensor2Go kits and Shield2Go
- Evaluations boards



Ask the Infineon Developer Community

The Infineon Developer Community offers 24/7 self-service and lightning fast responses to customer demands. Any user, anywhere, anytime – any subject. The community is well-organized due to its multi-channel strategy. Unlike unmoderated forums, the developer community is based on high quality content that is professionally moderated and reviewed.

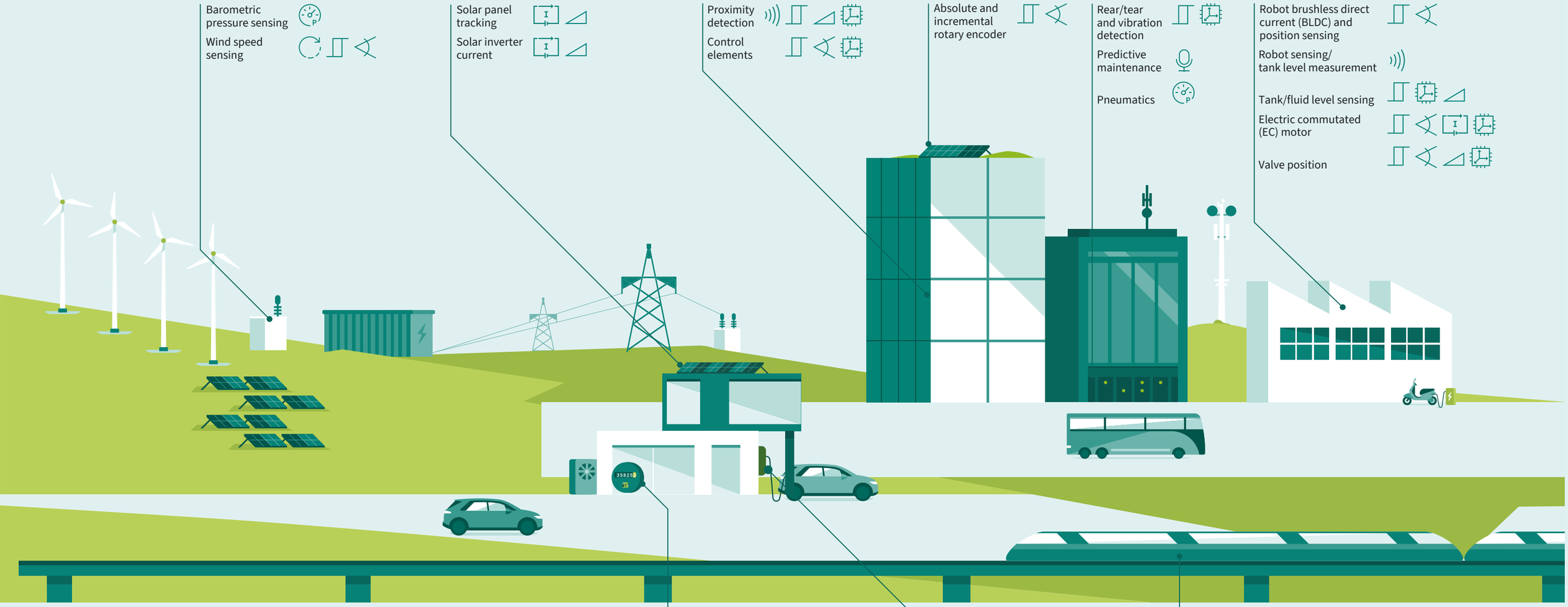
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XENSIV™ sensors in smart industry



Magnetic switches
Pressure sensors
Radar sensors
Linear sensors
3D magnetic sensors
MEMS microphones
Current sensors
Speed sensors
Angle sensors

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XENSIV™ sensors in smart homes

Robots brushless direct current (BLDC) and joints/arms position
Drone camera gimbal
Air flight control
Collision avoidance in multicopters and robotics

Proximity sensing for smart home devices/ voice user interfaces/ recording/ active noise cancellation/ predictive maintenance

Position tracking index counting
People tracking and occupancy detection in IoT/smart home

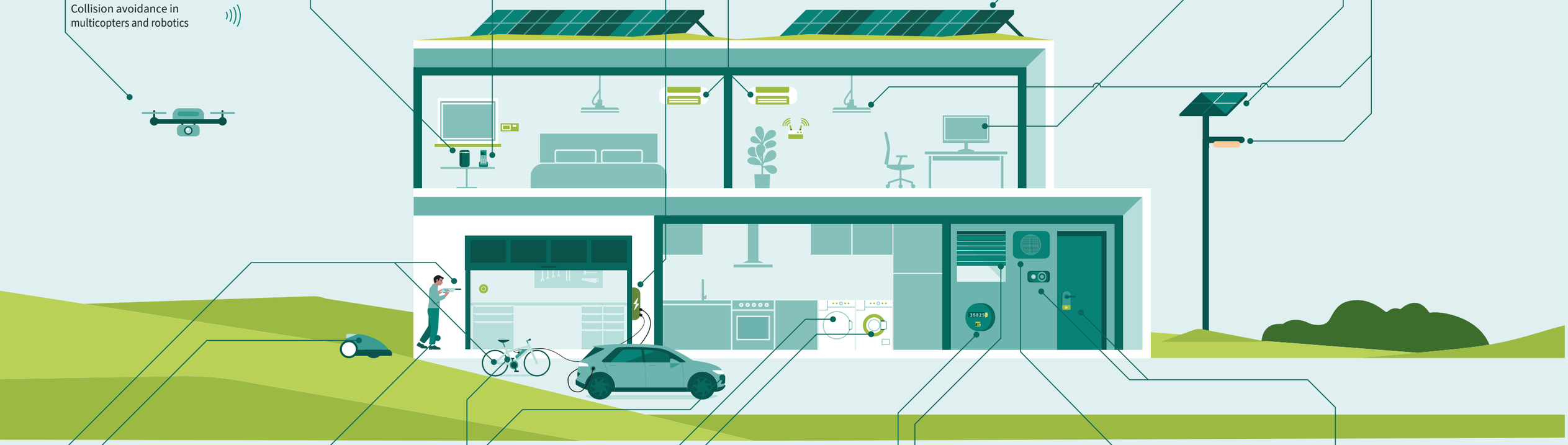
Battery charging and management

Indoor air quality CO_2 measurement/ temperature and air flow management/ predictive maintenance in smart HVAC systems

Solar panel tracking/ solar inverter/ AC and DC current distribution and monitoring

Privacy protection for laptops with presence sensing

Battery management and current monitoring
Indoor and outdoor lighting systems



Collision avoidance
3D collision detection
Electric commutated motor (EC)
Linear movement and direction detection

Sensing of vital functions

Blind spot detection (BSD) in the car
Rear and side detection for bicycles

Open/close detection
Imbalance and state of charge
Water level sensing
Proximity sensor to activate appl.

Flap position/ control elements
Window contacts
Intrusion detection
Gas pressure
Smart fuses
Smart metering

Air flow control for ACs with segmentation
Presence detection and zoning with radar
Voice control with MEMS microphones
Predictive maintenance for HVAC systems

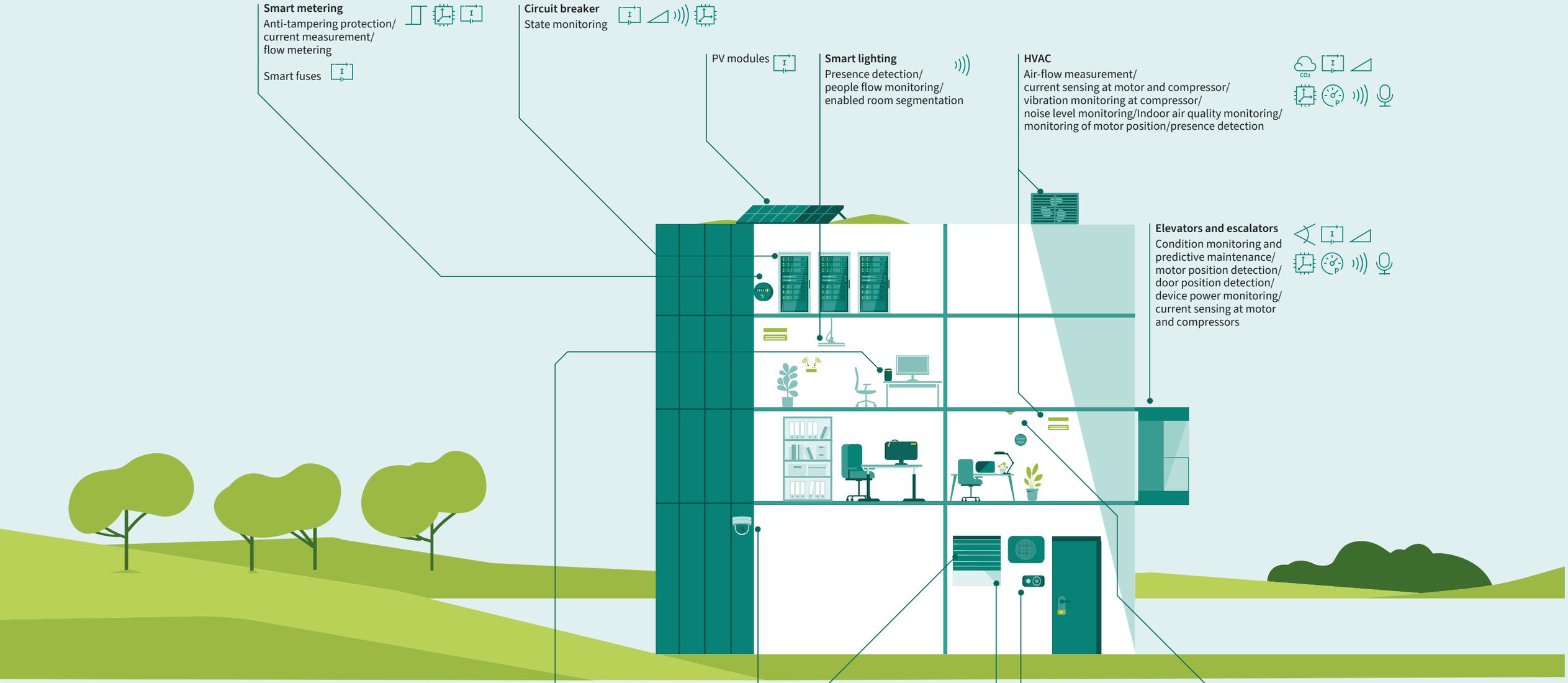
Automatic door opening systems
Smart locks/ door contacts etc.
Intruder alarm/presence detection in surveillance

Magnetic switches
Pressure sensors
Radar sensors
Linear sensors
3D magnetic sensors
MEMS microphones
Current sensors
CO2 sensors
Angle sensors

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XENSIV™ sensors in smart buildings



Smart metering
Anti-tampering protection/
current measurement/
flow metering

Smart fuses

Circuit breaker
State monitoring

PV modules

Smart lighting
Presence detection/
people flow monitoring/
enabled room segmentation

HVAC
Air-flow measurement/
current sensing at motor and compressor/
vibration monitoring at compressor/
noise level monitoring/Indoor air quality monitoring/
monitoring of motor position/presence detection

Elevators and escalators
Condition monitoring and
predictive maintenance/
motor position detection/
door position detection/
device power monitoring/
current sensing at motor
and compressors

Voice control and VUI
Audio/presence

Shutters
Position detection

Surveillance cameras
Presence detection for
switching camera on & off/
perimeter monitoring
outside of the building

Access control
Security systems/
open/close detection

Intrusion detection
Glass break/
presence detection

Room automation
Presence detection/
indoor air quality monitoring/
noise level monitoring

Magnetic switches
Pressure sensors
Radar sensors
Linear sensors
3D magnetic sensors
MEMS microphones
Current sensors
CO2 sensors
Angle sensors

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Current sensors

XENSIV™ high-precision coreless current sensors for automotive and industrial

Used to measure both AC and/or DC currents, Infineon's current sensors provide accurate and stable current measurement up to 160 A with integrated current rail packages (iCR) and magnetic fields up to 41 mT with external current rail packages (eCR), equivalent to 2000 A on external busbars. The products are intended for use in 48 V and high voltage and/or wide-bandgap applications such as traction inverters, industrial drives, photovoltaic inverters, or EV charging systems.

Infineon's XENSIV™ family of high-precision coreless open-loop current sensors is less bulky and costs less than core-based current sensors. Based on Infineon's precise and stable Hall effect current sensor IC technology, the current sensor analog output signal is highly linear over temperature and lifetime. Our newly released TMR sensors offer a high signal-to-noise ratio, low power consumption, and a high bandwidth of 1 MHz. Due to lacking an iron core or a flux concentrator, the sensor signal shows neither hysteresis nor does it suffer from saturation.

The differential current sensor measurement with two Hall cells ensures high accuracy even in a noisy environment like crosstalk from adjacent current lines or magnetic stray fields. System designers can program the sensitivity of the sensor as well as the threshold levels of up to two dedicated overcurrent signals and adapt them to individual requirements without any external components. The contactless current sensor IC also provides advanced diagnostic features for functional safety compliant with ISO 26262.

Product portfolio

On the one hand, we have the current sensors with an integrated current rail. The sensors in the TISON package allow accurate measurement with high frequencies and a small impact on the phase shift of the current signal. On the other hand, our current sensors for external current rails are non-invasive Hall effect current sensors and provide safe and reliable solutions for power electronics since there is no additional power dissipation. Our selection of isolated, non-contact current sensors can be used for current detection and monitoring in SiC and GaN applications, including motor control applications.

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TLx4971 in DSO-16 (300 mm) coreless magnetic current sensor

The TLx4971 current sensor, currently in mass production in the TISON-8 package, is also available in a DSO-16 (300 mm) package. This new package offers 8 mm clearance and creepage, isolation up to 1.7 kVpk (repetitive isolation voltage), and supports currents from 15 Apk to 50 Apk, with a continuous current rating of 45 Arms at 105°C. The DSO-16 version improves accuracy compared to the TISON-8 (1% vs. 2%) while maintaining the same bandwidth and overcurrent detection performance.



Potential applications

The TLI4971/TLE4971 is suitable for AC as well as DC measurement applications:

- Electrical drives
- Current monitoring
- On-board Charger
- Auxiliary drives
- Inverters
- Overcurrent detection (OCD) etc.

Product validation

The “TLE” variant is validated according to AEC-Q100, Grade 0.
The "TLI" variant is UL certified according to UL-1577.
Qualified for automotive applications

Product	Current range [A]	Bandwidth typ. [kHz]	Sensitivity [mV/A]	Accuracy [%]	Output noise density [µA/√Hz]	Certification	Automotive	Industrial	Current rail	Package
TLI4971-A016W2-U-S0001	16	210 typ.	76	<1%	300 typ.	UL		✓	Internal	PG-DSO-16-50
TLI4971-A020W2-U-S0001	20	210 typ.	61	<1%	300 typ.	UL		✓	Internal	PG-DSO-16-50
TLI4971-A030W2-U-S0001	30	210 typ.	40	<1%	300 typ.	UL		✓	Internal	PG-DSO-16-50
TLI4971-A035W2-U-S0001	35	210 typ.	35	<1%	300 typ.	UL		✓	Internal	PG-DSO-16-50
TLI4971-A040W2-U-S0001	40	210 typ.	30	<1%	300 typ.	UL		✓	Internal	PG-DSO-16-50
TLI4971-A050W2-U-S0001	50	210 typ.	23	<1%	300 typ.	UL		✓	Internal	PG-DSO-16-50
TLE4971-A016W2-S0001	16	210 typ.	76	<1%	300 typ.	ASIL B	✓	✓	Internal	PG-DSO-16-50
TLE4971-A020W2-S0001	20	210 typ.	61	<1%	300 typ.	ASIL B	✓	✓	Internal	PG-DSO-16-50
TLE4971-A030W2-S0001	30	210 typ.	40	<1%	300 typ.	ASIL B	✓	✓	Internal	PG-DSO-16-50
TLE4971-A035W2-S0001	35	210 typ.	35	<1%	300 typ.	ASIL B	✓	✓	Internal	PG-DSO-16-50
TLE4971-A040W2-S0001	40	210 typ.	30	<1%	300 typ.	ASIL B	✓	✓	Internal	PG-DSO-16-50
TLE4971-A050W2-S0001	50	210 typ.	23	<1%	300 typ.	ASIL B	✓	✓	Internal	PG-DSO-16-50

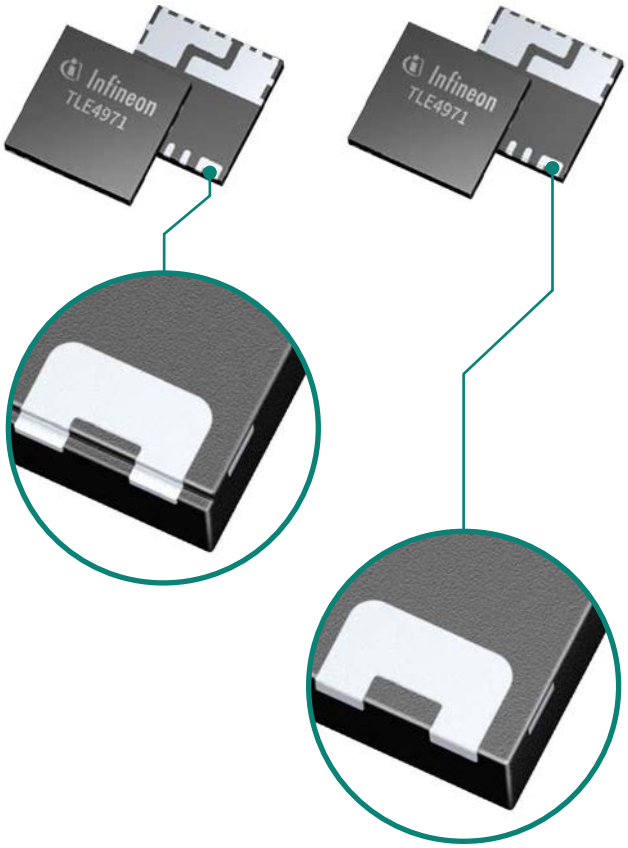
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TLx4971 in PG-TISON-8-5 and PG-TISON-8-6
High-precision coreless current sensor for automotive and industrial applications

The Infineon TLE4971 is a precise current sensor for bidirectional AC and DC measurement up to 120A. A coreless, open-loop design based on Hall effect technology eliminates issues like saturation and hysteresis common in traditional core-based sensors, providing highly linear and accurate readings. Its unique double U-shaped current rail and differential signal sensing provide immunity to stray magnetic fields. The sensor features an analog interface, two fast overcurrent detection outputs for power circuit protection, and galvanic isolation. Delivered fully calibrated in a small 8x8 mm TISON-8 package suitable for SMD assembly, it requires no end-of-line calibration. Furthermore, it is reprogrammable for various parameters, allowing for application-specific optimization in areas like industrial drives, xEV auxiliary drives, PV inverters, DC fast chargers, and on-board chargers (OBCs).

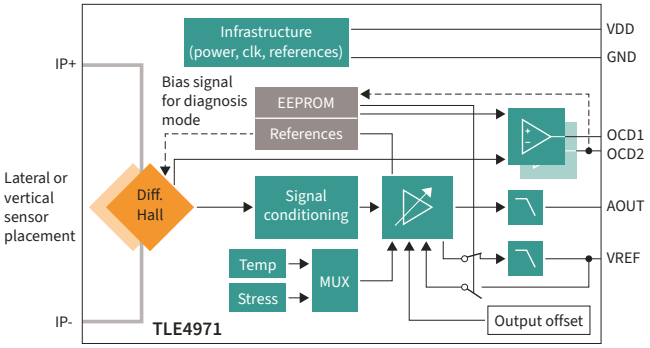
Difference between TISON-8-6 and TISON-8-5



Features and benefits

- Measurement up to 70 A_{RMS} at 690 V_{RMS}
- Typical error at 25°C <2%
- Current rail resistance at 220 µΩ and inductance <1 nH specified type
- Analog output signal (with typ. 210 kHz) bandwidth
- Fast (<0.7 µs) overcurrent detection up to 2 x IFSR
- 4 mm clearance and creepage, 975 Vpk Isolation
- AEC-Q100 Grade 1 qualified (125°C) for the TLE variant
- Ultralow power loss due to minimal resistance of current rail
- Reliable current measurement over lifetime (no re-calibration)
- Functional isolation for high-voltage application
- Easy and compact package allows high-power density design
- Pre-programmed variants for 25, 50, 75, and 120 A
- High accuracy, low noise analog output

Block diagram



Due to its low resistance and inductance, the TLE4971's integrated current rail minimizes power loss and allows for a compact sensing circuit. The analog output (AOUT) offers flexible configuration options, including single-ended, semi-differential, and fully-differential modes, in conjunction with the voltage reference pin (VREF). Two independent overcurrent outputs (OCD1 and OCD2) trigger rapid fault detection when the current surpasses a predefined threshold.

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Your input matters
Share your feedback

TLE4972/TLE4973
High-precision coreless current sensors for automotive and industrial applications

The Infineon TLE4972/3 product family of coreless magnetic current sensors specifically address requirements for current sensing in automotive applications. The well-established and robust Hall technology enables accurate and highly linear current measurements of the magnetic field induced by the current. With its compact design and ISO 26262 compliant ASIL rating with advanced diagnostic mode and easy low voltage programming, the TLE4973 in 5 V with ratiometric output and external current rail package is ideal for high current safety relevant xEV applications like traction inverters used in hybrid and battery-driven vehicles, as well as for battery main switches.

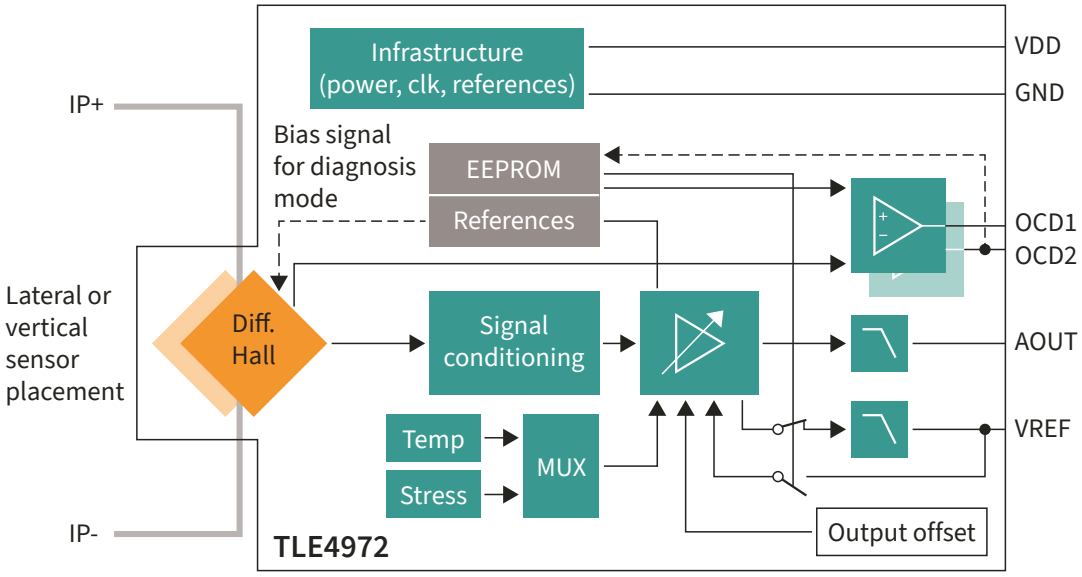
The TLE4973 in TISON package with internal current rail is capable of a low internal resistance and a high heat dissipation capability through its large soldering pads, making it suitable to handle high current up to 70 A continuous at high temperatures and measure up to 160 A peak on PCB in drives and PV inverters.

Features and benefits

- AC and DC Hall-based current sensor
- Differential measurement principle for coreless operation with no saturation or hysteresis effects
- High accuracy with very low error over temperature and lifetime
- Fast reaction time of analog sensor output with 210 kHz bandwidth
- Fast overcurrent detection to protect wide band gap SiC and GaN switching devices
- Up to two dedicated pins for overcurrent detection
- Scalable sensitivity ideal for platform designs
- One wire low voltage programming for up to 8 sensors
- ASIL B as SEooC, ISO 26262-compliant for simplified functional safety assessment



Block diagram



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TLI5570 in SOT23-6 pin package



The XENSIV™ TLI5570-AE35E1-E0001 is a high-precision miniature coreless magnetic sensor for AC and DC measurement. Our revolutionary, robust, highly linear monolithic Tunnel Magnetoresistance (TMR) technology enables accurate current measurement. With a bandwidth of more than 1.1 MHz, this sensor provides a non-amplified high-speed differential analog output signal to be directly connected to replace shunts.

Utilizing Infineon's new and highly linear TMR technology, this coreless sensor can measure currents accurately from 0 to ±1000 A. In particular, the very high signal-to-noise ratio performance of the TMR technology enables precise measurements even in applications with lower currents. Suitable for both AC and DC currents, the sensor's bandwidth of over 1 MHz delivers a non-amplified, high-speed differential analog output signal for direct connection to amplification stages. Our new-generation TMR sensor provides superior temperature and lifetime stability thanks to Infineon's extensive experience in magnetoresistive sensor technologies. Its industrial-grade qualification enables operation in harsh environments up to 125°C.

Potential applications

The TLI5570, a cost-effective shunt-replacement, is suitable for AC as well as DC current measurement applications:

- Power tools
- Home appliances
- Drones and Robotics
- Auxiliary drives
- Inverters
- PV Optimizers

Product	Current range [A]	Bandwidth typ. [kHz]	Sensitivity [mV/A]	Accuracy [%]	Output noise density [µA/√Hz]	Certification	Automotive	Industrial	Current rail	Package
TLI5570-AE35E1-E0001	35	>1100	4.8	5%	5 typ.			✓	External	PG-SOT23-6

Click here to learn more:

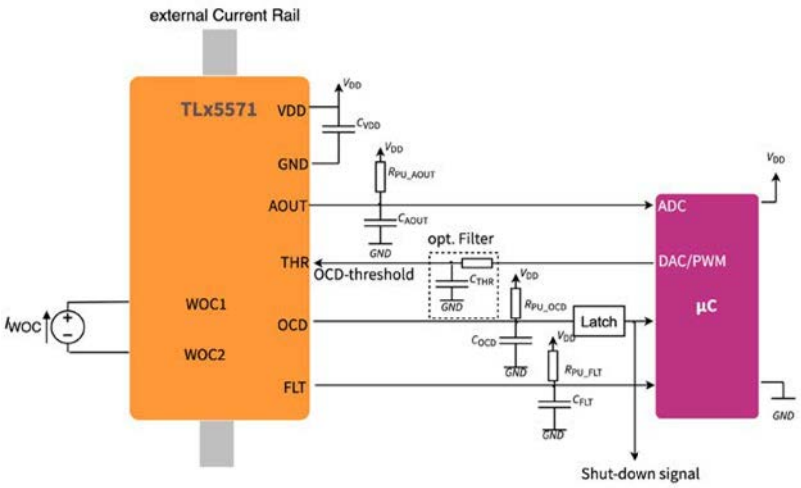
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TLE5571*

Fast overcurrent detection sensor for protection applications

The XENSIV™ TLE5571 is a differential Tunnel Magnetoresistance (TMR) based coreless current sensor with ultrafast single-ended analog output and overcurrent detection (OCD) with a programmable threshold. With a dedicated fault pin to report internal failures and an ASIL C compliant with ISO 26262, the device is particularly suitable for fast protection in automotive and industrial applications such as HV efuse and solid-state circuit breakers (SSBC) that require current sensing with minimal input to output delay.

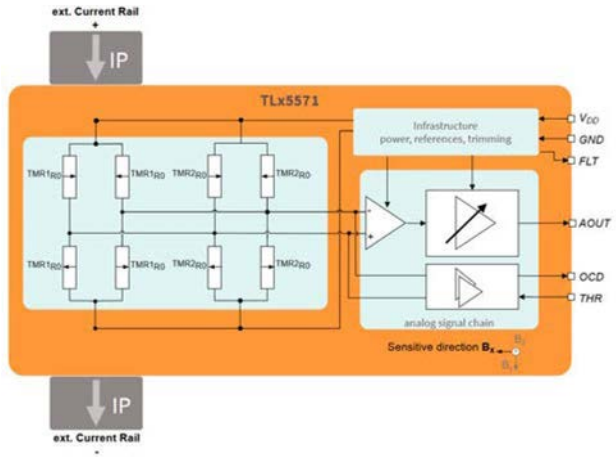
Application diagram





Features and benefits

Key features	Key benefits
– 2.5 MHz bandwidth with 200 ns analog output response time	– Fast protection in HV power distribution units from 100 A on PCB to kA on busbar
– Ultrafast 150 ns OCD with programmable threshold	– Compact solution, reduces footprint and component count on PCB
– Full scale from 5 to 35 mT differential field immune against external stray field	– Flexible sensor placement with possibility for sensing current on high side
– Contactless isolated magnetic sensor with external current rail	– Low resistance and no parasitic inductance effect for highest system efficiency
– ISO 26262 Safety Element out of Context for safety requirements up to ASIL C	– Prevents false OCD trigger due to internal fault and simplify functional safety



The TLE5571 measures a magnetic field via two differential TMR bridges. The signal is fed into a first stage of amplification (OTA) and then through a high-bandwidth and high slew rate differential amplifier, which provides a single-ended output signal on the AOUT pin.

The OCD pin latches whenever the input differential field exceeds the threshold programmed on the THR pin. In case of internal failures, the sensor provides fault information on the FLT pin without affecting the OCD.

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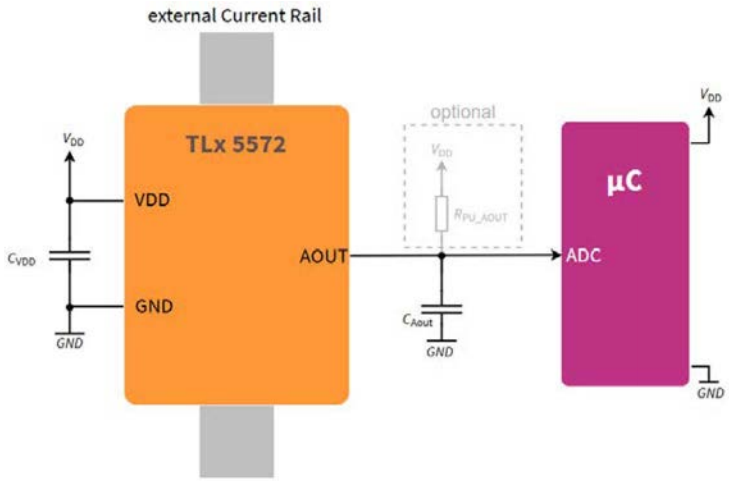
* Coming soon

TLx5572*

Cost competitive current sensor for Shunt and OpAmp replacement

The XENSIV™ TLx5572 is a monocell TMR-based current sensor in a small and cost-competitive SOT23 package, which can replace a shunt and an OpAmp with a single component. The TLx5572 offers intrinsic isolation from the external current rail, with the benefit of reducing insertion resistance and allowing direct in-phase current measurement in automotive and industrial drives. And with its ultrafast response time, it also provides a suitable solution for fast protection.

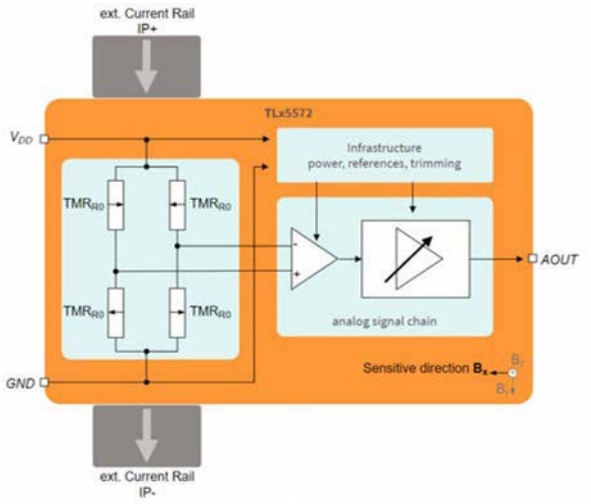
Application diagram





Features and benefits

Key features	Key benefits
– Small 2.4 x2.9mm SOT23 package	– Cost competitive compact solution, reduces footprint and component count
– Isolated current measurement on external current rail	– Enable direct in-phase measurements in motor drives
– Wide full-scale measuring range from 4 mT to 39 mT	– Low resistance and no parasitic inductance effect for highest system efficiency
– High 1 MHz bandwidth with ultrafast 100 ns analog output	– Suitable to measure currents from 30 A on PCB to kA on busbar
– Available in 3.3 V and 5 V supply	– Fast protection for wide bandgap switching devices in automotive and industrial



The TLx5572 measures a magnetic field via a TMR bridge. The signal is fed into a first stage of amplification (OTA) and then through a high-bandwidth and high slew rate differential amplifier, which provides a single-ended output signal on the AOUT pin. The TLx5572 is compatible with 3.3 V and 5 V supplies.



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* Coming soon

Current sensors – overview

Product	Current range [A]	Bandwidth typ. [kHz]	Sensitivity [mV/A]	Accuracy [%]	Output noise density [µA/√Hz]	Classification	Indus-trial	Auto-motive	Supply [V]	Current rail	Package
TLI4971 family											
TLI4971-A025T5-E0001	25	240	48	<2	350	IEC 62368-1	✓	–	3.3	Internal	TISON-8-5
TLI4971-A050T5-E0001	50	240	24	<2	350		✓	–	3.3	Internal	TISON-8-5
TLI4971-A075T5-E0001	75	240	16	<2	350		✓	–	3.3	Internal	TISON-8-5
TLI4971-A120T5-E0001	120	240	10	<2	350		✓	–	3.3	Internal	TISON-8-5
TLI4971-A025T5-U-E0001	25	240	48	<2	350	UL1577/ IEC 62368-1	✓	–	3.3	Internal	TISON-8-5
TLI4971-A050T5-U-E0001	50	240	24	<2	350		✓	–	3.3	Internal	TISON-8-5
TLI4971-A075T5-U-E0001	75	240	16	<2	350		✓	–	3.3	Internal	TISON-8-5
TLI4971-A120T5-U-E0001	120	240	10	<2	350		✓	–	3.3	Internal	TISON-8-5
TLI4971-A016W2-U-S0001*	16	210 typ.	76	<1.5%	300 typ.	UL	✓	–	–	Internal	DSO-16-50
TLI4971-A020W2-U-S0001*	20	210 typ.	61	<1.5%	300 typ.	UL	✓	–	–	Internal	DSO-16-50
TLI4971-A030W2-U-S0001*	30	210 typ.	40	<1.5%	300 typ.	UL	✓	–	–	Internal	DSO-16-50
TLI4971-A035W2-U-S0001*	35	210 typ.	35	<1.5%	300 typ.	UL	✓	–	–	Internal	DSO-16-50
TLI4971-A040W2-U-S0001*	40	210 typ.	30	<1.5%	300 typ.	UL	✓	–	–	Internal	DSO-16-50
TLI4971-A050W2-U-S0001*	50	210 typ.	23	<1.5%	300 typ.	UL	✓	–	–	Internal	DSO-16-50
TLI5570 family											
TLI5570-AE35E1-E0001	35 [mT]	1100	4.8 [mV/V/mT]	5%	5 µVrms		✓	–	–	external	SOT23-6-4
TLE4971 family											
TLE4971-A025N5-E0001	25	210	48	<2	260	AEC-Q100	✓	✓	3.3	Internal	TISON-8-5
TLE4971-A050N5-E0001	50	210	24	<2	260		✓	✓	3.3	Internal	TISON-8-5
TLE4971-A075N5-E0001	75	210	16	<2	260		✓	✓	3.3	Internal	TISON-8-5
TLE4971-A120N5-E0001	120	210	10	<2	260		✓	✓	3.3	Internal	TISON-8-5
TLE4971-A025N5-U-E0001	25	210	48	<2	260	AEC-Q100/UL 1577	✓	✓	3.3	Internal	TISON-8-5
TLE4971-A050N5-U-E0001	50	210	24	<2	260		✓	✓	3.3	Internal	TISON-8-5
TLE4971-A075N5-U-E0001	75	210	16	<2	260		✓	✓	3.3	Internal	TISON-8-5
TLE4971-A120N5-U-E0001	120	210	10	<2	260		✓	✓	3.3	Internal	TISON-8-5
TLE4971-A025T5-E0001	25	210	48	<2	260	AEC-Q100/ ISO 26262-compliant	✓	✓	3.3	Internal	TISON-8-6
TLE4971-A050T5-E0001	50	210	24	<2	260		✓	✓	3.3	Internal	TISON-8-6
TLE4971-A075T5-E0001	75	210	16	<2	260		✓	✓	3.3	Internal	TISON-8-6
TLE4971-A120T5-E0001	120	210	10	<2	260		✓	✓	3.3	Internal	TISON-8-6
TLE4971-A025T5-U-E0001	25	210	48	<2	260	AEC-Q100/ ISO 26262-compliant/ UL 1577	✓	✓	3.3	Internal	TISON-8-6
TLE4971-A050T5-U-E0001	50	210	24	<2	260		✓	✓	3.3	Internal	TISON-8-6
TLE4971-A075T5-U-E0001	75	210	16	<2	260		✓	✓	3.3	Internal	TISON-8-6
TLE4971-A120T5-U-E0001	120	210	10	<2	260		✓	✓	3.3	Internal	TISON-8-6
TLx4971 in DSO16*											
TLE4971-A016W2-S0001*	16	210 typ.	76	<1.5%	300 typ.	ASIL B	✓	✓	–	Internal	DSO-16-50
TLE4971-A020W2-S0001*	20	210 typ.	61	<1.5%	300 typ.	ASIL B	✓	✓	–	Internal	DSO-16-50
TLE4971-A030W2-S0001*	30	210 typ.	40	<1.5%	300 typ.	ASIL B	✓	✓	–	Internal	DSO-16-50
TLE4971-A035W2-S0001*	35	210 typ.	35	<1.5%	300 typ.	ASIL B	✓	✓	–	Internal	DSO-16-50
TLE4971-A040W2-S0001*	40	210 typ.	30	<1.5%	300 typ.	ASIL B	✓	✓	–	Internal	DSO-16-50
TLE4971-A050W2-S0001*	50	210 typ.	23	<1.5%	300 typ.	ASIL B	✓	✓	–	Internal	DSO-16-50
TLE4972 family											
TLE4972-AE35D5	31 [mT]	210	39[1)] [mV/mT]	1	90 [nT/√Hz]	AEC-Q100/ ISO 26262-compliant	✓	✓	3.3	external	TDSO-16
TLE4972-AE35S5	31 [mT]	210	39[1)] [mV/mT]	1	90 [nT/√Hz]		✓	✓	3.3	external	VSON-6

1) Can be reprogrammed by customer
* Coming soon

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Current sensors – overview

Product	Current range [A]	Band-width typ. [kHz]	Sensitivity [mV/A]	Accu-racy [%]	Output noise density [µA/√Hz]	Classification	Indus-trial	Auto-motive	Supply [V]	Current rail	Package
TLE4973 family											
TLE4973-A025T5-S0001	27.5	210	65.5	<2	290	ISO 26262-compliant/ AEC-Q100	✓	✓	5.0	Internal	TISON-8-6
TLE4973-A050T5-S0001	55	210	32.8	<2	290		✓	✓	5.0	Internal	TISON-8-6
TLE4973-A075T5-S0001	82.5	210	21.8	<2	290		✓	✓	5.0	Internal	TISON-8-6
TLE4973-A120T5-S0001	132	210	13.7	<2	290		✓	✓	5.0	Internal	TISON-8-6
TLE4973-R025T5-S0001	27.5	210	65.5	<2	290		✓	✓	5.0	Internal	TISON-8-6
TLE4973-R050T5-S0001	55	210	32.8	<2	290		✓	✓	5.0	Internal	TISON-8-6
TLE4973-R075T5-S0001	82.5	210	21.8	<2	290		✓	✓	5.0	Internal	TISON-8-6
TLE4973-R120T5-S0001	132	210	13.7	<2	290		✓	✓	5.0	Internal	TISON-8-6
TLE4973-R025T5-S0010	27.5	210	65.5	<2	290		✓	✓	5.0	Internal	TISON-8-6
TLE4973-R050T5-S0010	55	210	32.8	<2	290		✓	✓	5.0	Internal	TISON-8-6
TLE4973-R075T5-S0010	82.5	210	21.8	<2	290		✓	✓	5.0	Internal	TISON-8-6
TLE4973-R120T5-S0010	132	210	13.7	<2	290		✓	✓	5.0	Internal	TISON-8-6
TLE4973-R025T5-U-S0010	27.5	210	65.5	<2	290	ISO 26262-compliant/ AEC-Q100/ UL 1577	✓	✓	5.0	Internal	TISON-8-6
TLE4973-R050T5-U-S0010	55	210	32.8	<2	290		✓	✓	5.0	Internal	TISON-8-6
TLE4973-R075T5-U-S0010	82.5	210	21.8	<2	290		✓	✓	5.0	Internal	TISON-8-6
TLE4973-R120T5-U-S0010	132	210	13.7	<2	290		✓	✓	5.0	Internal	TISON-8-6
TLE4973-AE35D5-S0001	34 [mT]	210	53[1] [mV/mT]	1	70 [nT/√Hz]	ISO 26262-compliant/ AEC-Q100	✓	✓	5.0	external	TDSO-16
TLE4973-RE35D5-S0001	34 [mT]	210	53[1] [mV/mT]	1	70 [nT/√Hz]		✓	✓	5.0	external	TDSO-16
TLE4973-RE35D5-S0010	34 [mT]	210	53[1] [mV/mT]	1	70 [nT/√Hz]		✓	✓	5.0	external	TDSO-16
TLE4973-AE35S5-S0001	34 [mT]	210	53[1] [mV/mT]	1	70 [nT/√Hz]		✓	✓	5.0	external	VSON-6
TLE4973-RE35S5-S0001	34 [mT]	210	53[1] [mV/mT]	1	70 [nT/√Hz]		✓	✓	5.0	external	VSON-6
TLE4973-RE35S5-S0010	34 [mT]	210	53[1] [mV/mT]	1	70 [nT/√Hz]		✓	✓	5.0	external	VSON-6
TLE4973-RE35S5-S3510*	17 [mT]	210	105.8 [mV/mT]	1	70 [nT/√Hz]		✓	✓	5.0	external	VSON-6
TLx5572 family*											
TLE5572-AE24E1-R-E0001*	24~39[2] [mT]	2500	56 [mV/mT]	4	8.1 µTrms	AEC-Q100	–	✓	–	external	SOT23-6-4
TLE5572-AE15E1-R-E0001*	15~24[2] [mT]	2500	90 [mV/mT]	4	8.1 µTrms		–	✓	–	external	SOT23-6-4
TLE5572-AE12E1-R-E0001*	12~20[2] [mT]	2500	112.5 [mV/mT]	4	8.1 µTrms		–	✓	–	external	SOT23-6-4
TLE5572-AE08E1-R-E0001*	8~12[2] [mT]	2500	180 [mV/mT]	4	8.1 µTrms		–	✓	–	external	SOT23-6-4
TLE5572-AE06E1-R-E0001*	6~10[2] [mT]	2500	225 [mV/mT]	4	8.1µTrms		–	✓	–	external	SOT23-6-4
TLE5572-AE04E1-R-E0001*	4~6[2] [mT]	2500	360 [mV/mT]	4	8.1 µTrms		–	✓	–	external	SOT23-6-4
TLI5572-AE24E1-R-E0001*	24~39[2] [mT]	2500	56 [mV/mT]	4	8.1 µTrms		✓	–	–	external	SOT23-6-4
TLI5572-AE15E1-R-E0001*	15~24[2] [mT]	2500	90 [mV/mT]	4	8.1 µTrms		✓	–	–	external	SOT23-6-4
TLI5572-AE12E1-R-E0001*	12~20[2] [mT]	2500	112.5 [mV/mT]	4	8.1 µTrms		✓	–	–	external	SOT23-6-4
TLI5572-AE08E1-R-E0001*	8~12[2] [mT]	2500	180 [mV/mT]	4	8.1 µTrms		✓	–	–	external	SOT23-6-4
TLI5572-AE06E1-R-E0001*	6~10[2] [mT]	2500	225 [mV/mT]	4	8.1 µTrms		✓	–	–	external	SOT23-6-4
TLI5572-AE04E1-R-E0001*	4~6[2] [mT]	2500	360 [mV/mT]	4	8.1 µTrms		✓	–	–	external	SOT23-6-4
TLE5571 family*											
TLE5571-AE36O5-I-S0001*	30 [mT]	2500	72 [mV/mT]	4	6.6µTrms	ISO 26262-compliant/AEC-Q100	–	✓	–	external	TDSO-16-10
TLE5571-AE24O5-I-S0001*	20 [mT]	2500	108 [mV/mT]	4	6.6µTrms		–	✓	–	external	TDSO-16-10
TLE5571-AE12O5-I-S0001*	10 [mT]	2500	216 [mV/mT]	4	6.6µTrms		–	✓	–	external	TDSO-16-10
TLE5571-AE06O5-I-S0001*	5 [mT]	2500	432 [mV/mT]	4	6.6µTrms		–	✓	–	external	TDSO-16-10

1) Can be reprogrammed by customer
2) X ~ Y [mT] : X is the full scale input magnetic range with 3.3V supply. Y is the full-scale range with 5V supply
* Coming soon

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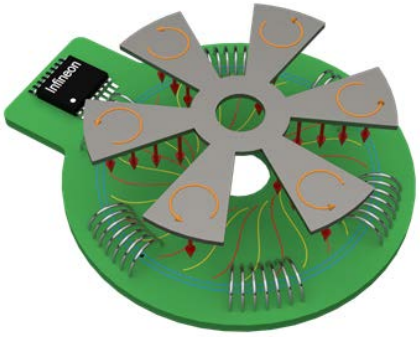
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Inductive position sensing with TLE480x family

High accuracy with stray field robustness

Inductive sensing operates on the electromagnetic coupling principle between a printed circuit board coil and a metal target positioned above it. When the metal target enters the electromagnetic field generated by the sensor coil, a portion of the electromagnetic energy is transferred to the metal target, inducing eddy currents. These eddy currents, in turn, create a reverse electromagnetic field in the sensor coil that alters the effective inductance of the sensor coil. By measuring this change, the position of the target can be accurately determined.



The iTAS products generate an alternating current (AC) through the transmitter coils via TX outputs, creating an alternating magnetic field. This magnetic field induces voltages in the receiving coils. When a metallic rotor is placed above these coils, eddy currents are induced on the rotor surface, which generates a magnetic field that counteracts the flux density below. The amplitude of the voltages in the receiving coils changes according to the rotor's position. TLE480x products then demodulate these output voltages and compute the angle using the tangent inverse function.

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TLE480x – Inductive position sensing: Stray field robust with high accuracy

The increasing trend of car electrification, including both the conversion of internal combustion engine vehicles and the introduction of electric main drives in electric vehicles, is raising the potential for electromagnetic interference (EMI). This can have a detrimental impact on electronic subsystems. The TLE480x family has been developed to address this challenge, explicitly targeting electric power steering systems, including torque angle sensors, steering angle sensors, and pedal and suspension applications.. These devices employ the inductive measurement principle and inherently offer robustness against stray fields, eliminating the need for additional shielding against electromagnetic disturbances.

Furthermore, the TLE480x family meets the increasing demands of passengers for enhanced convenience, boasting an impressive angle error of 0.1 percent full scale (FS) and exceptional accuracy. The monolithic design of these devices enables system cost savings through reduced device count as they have been developed in accordance with ISO 26262 and fully support system design up to Automotive Safety Integrity Level (ASIL) D, ensuring a high level of safety and reliability.



Inductive torque angle sensor (TLE4801/2)

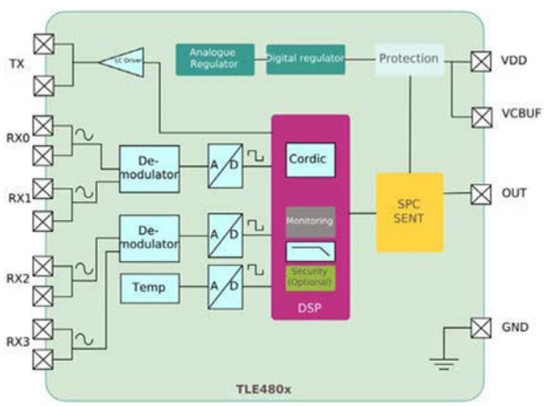


Inductive steering angle sensor (TLE4803)

Features and benefits

Key features	Key benefits
– Stray field robust accordance with ISO 11452-8:2015	– Saves cost of shielding with intrinsic stray field robustness
– ISO 26262:2018 (SEooC) meets ASIL D	– Enables for cost efficient designs with high functional safety rating
– Cyber security (optional) accordance with ISO 21434	– Prevents threats of cyber attacks
– High accuracy angle error (electrical) 0.1% of full scale	– Easy to use high precision sensing

The TLE480x products include a coil system driver, signal conditioning circuits, and a DSP for torque and angle calculation within a single device.
The single-chip is designed according to ISO 26262 Safety Element out of Context (SEooC). It enables safety levels up to ASIL D, which is crucial for meeting future failed operational system safety requirements.

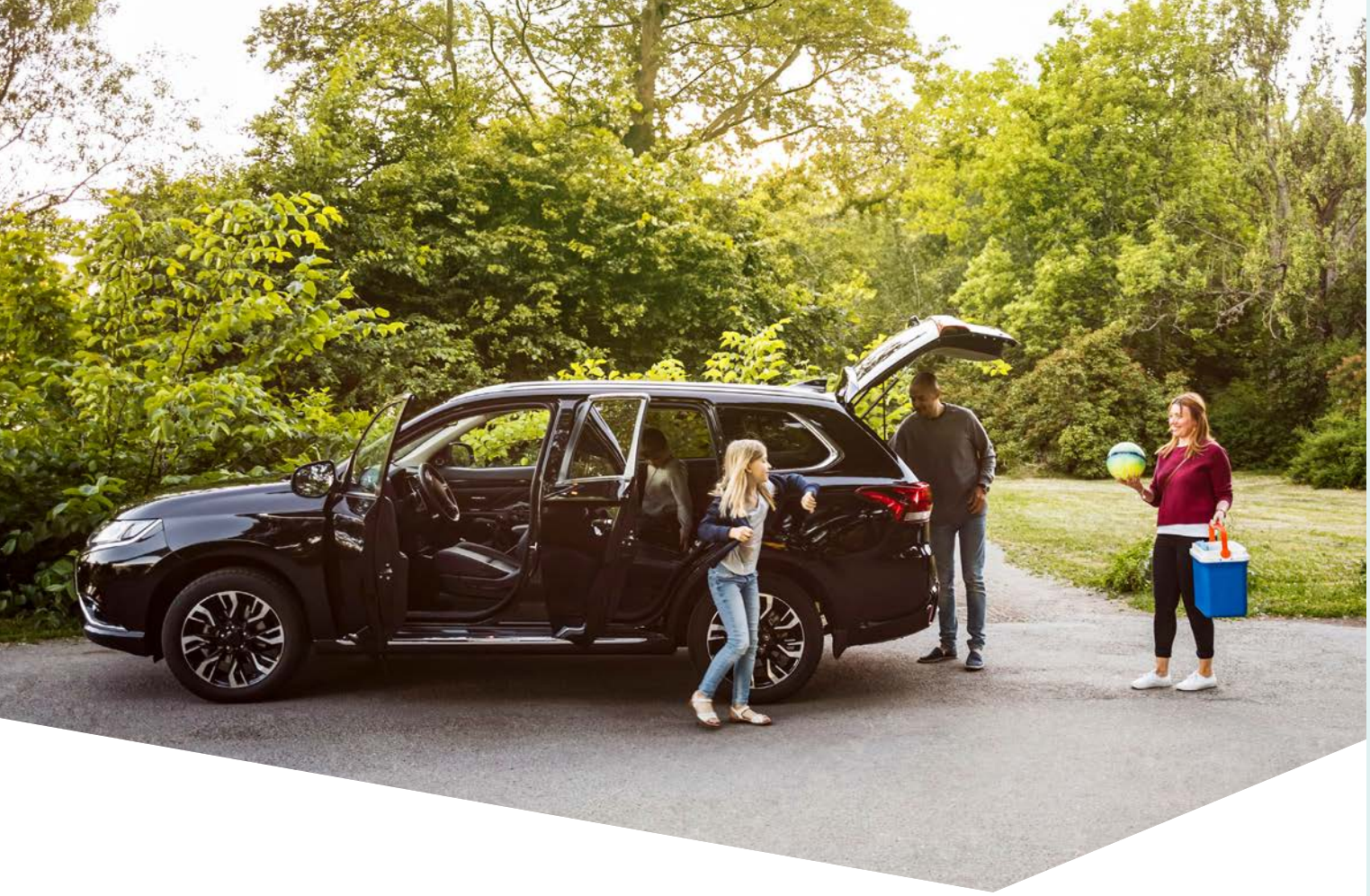


Inductive torque and angle sensors product portfolio

Product	Description	Package	ISO26262 (Functional safety)	ISO11452-8:2015 (Stray field robust)	Ordering code
TLE4801C16-S0000	16-pin SMD package, digital torque, and angle information	TDSO-16	ASIL D	Yes	SP006068554
TLE4801S16-S0000	16-pin SMD package, digital torque, and angle information	TDSO-16	ASIL D	Yes	SP006068552
TLE4802SC16-S0000	16-pin SMD package, digital torque, and angle information	TDSO-16	ASIL D	Yes	SP006068556
TLE4803C16-S0000	16-pin SMD package, digital angle 1, angle 2 information	TDSO-16	ASIL D	Yes	SP006068564
TLE4803S16-S0000	16-pin SMD package, digital angle 1, angle 2 information	TDSO-16	ASIL D	Yes	SP006068562

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Magnetic sensors

Exceptionally precise magnetic sensors comprising industry-leading switches, linear, angle, 3D, and speed sensors

Infineon XENSIV™ sensors are exceptionally precise thanks to an industry-leading magnetic technology portfolio. Our benchmark and innovative magnetic sensor portfolio perfectly fits numerous automotive, industrial, and consumer customer applications. We offer all magnetic sensor technologies in-house production; thus, our customers can choose between Hall sensors, anisotropic magnetoresistance (AMR), giant magnetoresistance (GMR), and tunnel magnetoresistance (TMR) sensors to find their best-fit solution for their application.

Generally, magnetic sensors measure the strength and/or direction of an applied magnetic field generated by, e.g., ferromagnetic materials and magnets, inductive coils like in motors, etc. The information on the measured field is processed within the sensor and converted into strength, position, speed, angular, and/or direction information. The processed sensor information is transmitted to the application via specific analog or digital interfaces. A wide range of sensors is equipped with additional safety and diagnostic features, options with outstanding stray field robust performance, and ISO 26262-compliant developed.

Our portfolio includes a broad range of ISO 26262-compliant products meeting safety requirements as safety element out of context (SEooC) up to the highest safety level of ASIL D, as well as stray field robust sensors exceeding ISO 11452-1:20015, which are well perceived within the market and used in a wide range of automotive and industrial safety applications.

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Magnetic switches

Broadest energy saving portfolio of high precision magnetic switches for automotive, industrial, and consumer applications
TLE/TLI/TLV4961, TLE/TLI/TLV4964, TLE/TLI/TLV4968
Energy-efficient magnetic switch family for up to 32 V

The TLE/TLI/TLV496x-xM/L family of magnetic switches saves energy and enables designers to create precise and compact systems. With an operational current consumption of just 1.6 mA, TLE/TLI/TLV496x-xM/L products can cut energy consumption by up to 50 percent compared with similar competitor products. The family paves the way for precise system switching points thanks to its small magnetic hysteresis. The integrated temperature profile compensates for magnetic drifts and enables stable performance over temperature and lifetime.

TLE/TLI/TLV496x-xM products come in the smallest SOT23 package, reducing height by 10 percent compared with predecessor products on the market. The sensors also feature an integrated functionality test for better system control.



Features
- Current consumption of just 1.6 mA
- 3 to 32 V supply voltage range (overvoltage up to 42 V)
- 7 kV ESD protection (HBM)
- Overtemperature and overcurrent protection
- Temperature compensation
- Smallest SOT23 package on the market
- Dedicated products for industrial applications (TLI496x) and consumer (TLV496x)
- AEC-Q100 qualified

Applications
- Window lifter
- Power closing
- Gear stick
- Seat belt
- BLDC commutation (e.g., wiper, seat belt pretensioner, pump, seating)
- Service robots
- Power tools
- White goods

Product	Type	Operating point B_{OP} [mT]	Release point B_{RP} [mT]	Hysteresis ΔB_{HY} [mT]	Automotive	Industrial	Consumer	Package
TLE4961-1M/L	Latch	2.0	-2.0	4.0	✓	✓	✓	SOT23/SSO-3-2
TLE4961-2M	Latch	5.0	-5.0	10	✓	✓	✓	SOT23
TLE4961-3M/L	Latch	7.5	-7.5	15	✓	✓	✓	SOT23/SSO-3-2
TLE4961-4M	Latch	10.0	-10.0	20	✓	✓	✓	SOT23
TLE4961-5M	Latch	15.0	-15.0	30	✓	✓	✓	SOT23
TLE4964-1M	Switch	18.0	12.5	5.5	✓	✓	✓	SOT23
TLE4964-2M	Switch	28.0	22.5	5.5	✓	✓	✓	SOT23
TLE4964-3M	Switch	12.5	9.5	3.0	✓	✓	✓	SOT23
TLE4964-4M	Switch	10.0	8.5	1.5	✓	✓	✓	SOT23
TLE4964-6M	Switch	3.5	2.5	1.0	✓	✓	✓	SOT23
TLE4964-5M	Switch	7.5	5.0	2.5	✓	✓	✓	SOT23
TLE4968-1M/L	Bipolar	1.0	-1.0	2.0	✓	✓	✓	SOT23/SSO-3-2
TLI4961-1M	Latch	2.0	-2.0	4.0	–	✓	✓	SOT23/SSO-3-2
TLV4961-1M	Latch	2.0	-2.0	4.0	–	–	✓	SOT23
TLV4961-3M	Latch	7.5	-7.0	15.0	–	–	✓	SOT23
TLV4964-1M	Switch	18.0	12.5	5.5	–	–	✓	SOT23
TLV4964-2M	Switch	28.0	22.5	5.5	–	–	✓	SOT23

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TLE/TLI4963, TLE/TLI4965
5 V high-precision automotive/industrial Hall-effect sensor

TLE/TLI496x-xM are integrated Hall-effect sensors specially designed for highly accurate applications. The sensors provide an easy-to-use and cost-effective solution for position sensing applications, requiring high-temperature stability of the magnetic threshold.

Target applications for TLE/TLI496x-xM are all low-power applications requesting a precision magnetic latch or switch with a broad operating temperature range.

By offering an excellent magnetic behavior, Infineon's switches are ideally suited for:
- Index counting application with a pole wheel
- Rotor position detection (BLDC motors)
- Open/close detection

Features
- 3.0 to 5.5 V operating supply voltage
- Low current consumption 1.4 mA
- ESD protection 4 kV HBM
- Active error compensation (chopped)
- High stability of magnetic thresholds
- Low jitter (typ. 0.35 µs)
- Operating temperature range:
  - from -40 to +170°C (TLE496x-xM)
  - from -40 to +125°C (TLI496x-xM)
- Small SMD package SOT23
- TLE: AEC-Q100 qualified
- TLI: JEDEC qualified



Product	Type	Operating point B_{OP} [mT]	Release point B_{RP} [mT]	Hysteresis ΔB_{HY} [mT]	Automotive	Industrial	Consumer	Package
TLE4963-1M	Latch	2.0	-2.0	4.0	✓	✓	✓	SOT23
TLE4963-2M	Latch	5.0	-5.0	10.0	✓	✓	✓	SOT23
TLE4965-5M	Unipolar switch	7.5	5.0	2.5	✓	✓	✓	SOT23
TLI4963-1M	Latch	2.0	-2.0	4.0	–	✓	✓	SOT23
TLI4963-2M	Latch	5.0	-5.0	10.0	–	✓	✓	SOT23
TLI4965-5M	Unipolar switch	7.5	5.0	2.5	–	✓	✓	SOT23

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TLV496x-xTA/TLV496x-xTB
Precise Hall-effect sensor for consumer applications in leaded package

The TLV496x-xTA/B Hall-effect sensor family comprises a line of magnetic switches for contactless position sensing. The sensors are specially designed to provide an easy-to-use and cost-effective solution for position sensing applications.



Features
- 3.0 to 26 V operating supply voltage
- Low current consumption 1.6 mA
- ESD protection 4 kV HBM
- Operating temperature range from -40°C to 125°C
- Leaded package TO92S

Applications
- BLDC motor commutation for consumer devices (e.g., e-bikes, fans, aircons)
- Position detection (e.g., flaps and control buttons)

Product	Type	Operating point B_{OP} [mT]	Release point B_{RP} [mT]	Hysteresis ΔB_{HY} [mT]	Consumer	Package
TLV4961-1TA	Latch	2.0	-2.0	4.0	✓	TO92S-3-1
TLV4961-1TB	Latch	2.0	-2.0	4.0	✓	TO92S-3-2
TLV4961-3TA	Latch	7.5	-7.5	15.0	✓	TO92S-3-1
TLV4961-3TB	Latch	7.5	-7.5	15.0	✓	TO92S-3-2
TLV4964-4TA	Unipolar switch	10.0	8.5	1.5	✓	TO92S-3-1
TLV4964-4TB	Unipolar switch	10.0	8.5	1.5	✓	TO92S-3-2
TLV4964-5TA	Unipolar switch	7.5	5.0	2.5	✓	TO92S-3-1
TLV4964-5TB	Unipolar switch	7.5	5.0	2.5	✓	TO92S-3-2
TLV4968-1TA	Bipolar switch	1.0	-1.0	2.0	✓	TO92S-3-1
TLV4968-1TB	Bipolar switch	1.0	-1.0	2.0	✓	TO92S-3-2

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TLx4966 xG family
Two-in-one double Hall-effect sensor

Our XENSIV™ TLx4966 xG family features two integrated, calibrated sensor elements for detecting direction and counting indexes in one device. This two-in-one feature eliminates the need for a second sensor, cutting engineering and production costs. Using just one sensor ensures perfect alignment of the sensor elements, raising system quality and reliability.

Features

- Two Hall probes in one package
- Excellent matching between the two Hall probes
- Hall plate distance of 1.45 mm
- Outstanding quality
- Information on direction and speed
- TSOP6 package
- AEC-Q100 qualified

Applications

- Window lifter
- Sunroof
- Automatic tailgate
- Automated doors
- Sun blinds

AEC Qualified

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TLE4966V-1G
Vertical dual-Hall switch

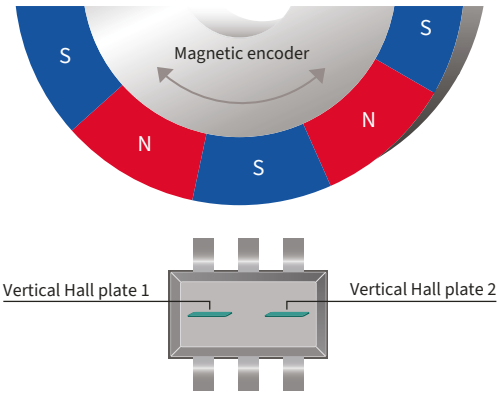
The Infineon vertical double Hall-effect switch TLE4966V-1G further develops the TLX4966-xG family. The vertical orientation of the Hall plates, resulting in in-plane field sensitivity, is completely new, enabling entirely new application layouts.

This device, which is designed using new technology, offers high voltage capabilities with very small current consumption. It can be operated from unregulated power supplies, which offers our customers unique freedom of design for their systems. This product is AEC-Q100 certified and enables our customers to build systems for the highest automotive quality requirements.

Features

- Saves space
- Easy mounting of sensor and PCB board
- Allows increased mounting flexibility
- Enables new, compact system designs





Product	Type	Output	Operating point B_{OP} [mT]	Release point B_{RP} [mT]	Hysteresis ΔB_{HY} [mT]	Automotive	Industrial	Consumer	Package
TLE4966G	Double Hall, speed and direction output	Speed and direction	7.5	-7.5	15	✓	✓	✓	TSOP6/ SSO-4-1
TLE4966L	Double Hall, speed and direction output	Speed and direction	7.5	-7.5	15	✓	✓	✓	TSOP6/ SSO-4-1
TLE4966-2G	Double Hall, two independent outputs	2 x speed	7.5	-7.5	15	✓	✓	✓	TSOP6
TLE4966-3G	Double Hall, speed and direction output	Speed and direction	2.5	-2.5	5.0	✓	✓	✓	TSOP6
TLE4966V-1G	Vertical double Hall, speed and direction output	Speed and direction	2.5	-2.5	5.0	✓	✓	✓	TSOP6
TLI4966G	Double Hall, speed and direction output	Speed and direction	7.5	-7.5	15	–	✓	✓	TSOP6

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TLE49x6/TLI49x6/TLV49x6 family
High-precision magnetic switches

The TLE49x6, TLI49x6, and the TLV49x6 families comprise high-precision, unipolar Hall-effect switches and latch for different magnetic sensitivities.

TLE/TLI/TLV49x6 products have succeeded in many automotive, industrial, and consumer applications. The family includes two-wire sensors with a current interface.

Features

- Broad, successful family concept
- Best-in-class quality
- Chopped Hall system for high sensitivity
- High jitter performance
- SMD and leaded packages
- Open collector or current interface
- Temperature compensation
- Up to 18 V supply
- Dedicated products for industrial (TLI49x6) and consumer applications (TLV49x6)
- AEC-Q100 qualified (TLE products)

Applications

- Power closing
- Gear stick
- Seat belt
- HVAC flap
- BLDC commutation
- Two-wheeler application

Product	Type	Operating point B_{OP} [mT]	Release point B_{RP} [mT]	Hysteresis ΔB_{HY} [mT]	Automotive	Industrial	Consumer	Package
TLE4906K	Unipolar switch	10.0	8.5	1.5	✓	✓	✓	SC59/SSO-3-2
TLE4906L	Unipolar switch	10.0	8.5	1.5	✓	✓	✓	SC59/SSO-3-2
TLE4906-2K	Unipolar switch	18.0	12.5	5.5	✓	✓	✓	SC59
TLE4906-3K	Unipolar switch	28.0	22.5	5.5	✓	✓	✓	SC59
TLE4946K	Latch	14.0	-14	28	✓	✓	✓	SC59
TLE4946-1L	Latch	15.0	-15	30	✓	✓	✓	SSO-3-2
TLE4946-2K	Latch	2.0	-2.0	4.0	✓	✓	✓	SC59/SSO-3-2
TLE4946-2L	Latch	2.0	-2.0	4.0	✓	✓	✓	SC59/SSO-3-2
TLE4976-1K	Unipolar switch/ Current interface	9.25	7.25	2.0	✓	✓	✓	SC59
TLE4976-2K	Unipolar switch/ Current interface	4.5	2.7	1.8	✓	✓	✓	SC59
TLV4976-2K	Unipolar switch/ Current interface	4.5	2.7	1.8	–	–	✓	SC59

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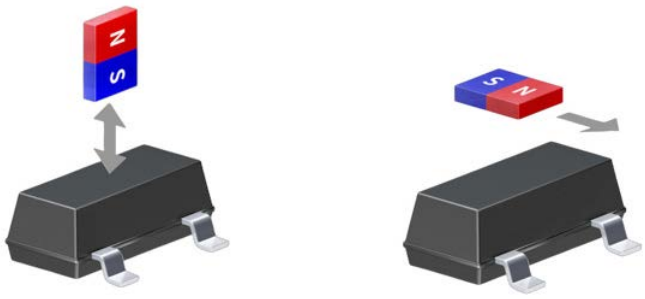
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ASIL B compliant magnetic switches

ISO 26262-compliant switches with extended mounting flexibility enabling safety on application level up to ASIL B

The TLE496xx family of magnetic Hall switches is a range of high-precision magnetic sensors designed for use in demanding automotive applications with extended safety requirements. The different sensor variants, sensitive in planar and orthogonal directions, achieve extended mounting flexibility on PCBs, making them a perfect solution for a wide range of applications.



Large portfolio of Hall switches allows a maximum of mounting flexibility

The increasing electrification of vehicles, including safety-relevant areas such as steering and braking, has led to a growing concern about safety and redundancy in the automotive sector. The smallest errors in one magnetic sensor can lead to the failure of an entire system. The TLE496xx family sensors have been developed per ISO 26262 standard to address this issue, avert harm under all possible circumstances, and meet the ASIL B metric on chip level as a safety element that is out of context. Therefore, sensors are equipped with a fully ASIL B-compliant internal diagnosis and a periodically sent life-tick, which can be evaluated externally at the application level to detect faults. The evaluation of the sensor signals is particularly smart and cost-effective since both the magnetic switching signal and the safety diagnostic signals are transmitted via a single output, enabling drop-in replacements for conventional magnetic switches.

The TLE496xx family is designed for various automotive applications, including window lifters, gear sticks, steer-by-wire and motor commutation. Some derivatives can be operated in two-wire mode, requiring only a minimum of two wires between the controller unit and sensor, especially for remote peripheral devices inside automotive solutions.

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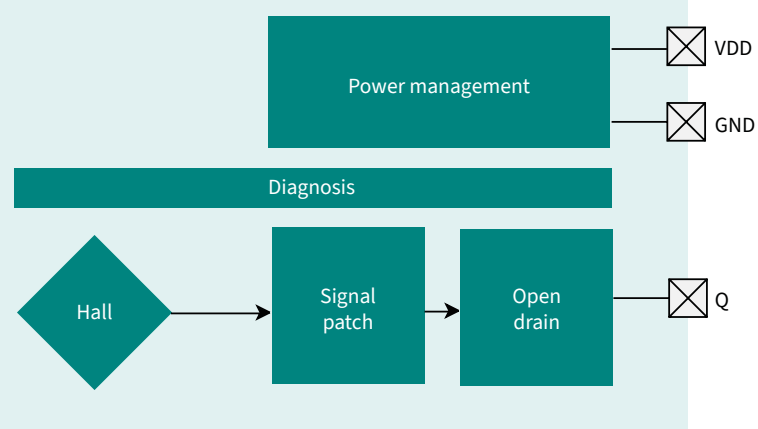
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TLE4960x – ASIL B compliant magnetic switches with open drain interface

Upgrade your safety and flexibility in cars

Infineon has launched the pilot ASIL B magnetic switch family, which measures the magnetic field orthogonal to the PCB direction in the Z direction. This sensor family is developed according to ISO 26262 and provides built-in diagnosis functions to support functional safety applications with requirements up to ASIL B. It is also AEC-100 compliant and Grade 0 qualified.

The very small SOT23 package reduces overall system cost and ensures design flexibility. By using TLE4960x, safety and flexibility can be redefined in multiple car applications, such as window lifts, sunroofs, power closure actuators, seat positioning, and seat belt pre-tensioners.



Features and benefits

Key features	Key benefits
– Meets safety standard up to ASIL B	– Increased reliability means less fails at the end-customer within warranty time
– Smallest automotive-qualified SMD package on the market	– Reduces system cost, increases flexibility, and enables small designs
– Broad portfolio of specialized sensors for all kind of applications	– Ensures easy replacement and enables supplier flexibility
– Online simulation tool to ensure short design cycles	– Allows first time right designs and ensures fast time to market
– Lowest best-in-class effective noise	– Enables a very accurate time critical switching

Product portfolio

Product	Description	Package	ISO26262	Orientation	Ordering code
TLE49601-1M-S2	Latch with Bop/Brp (2/-2 mT)	SOT23-3	ASIL B	Z	SP005924303
TLE49601-3M-S2	Latch with Bop/Brp (7.5/-7.5 mT)	SOT23-3	ASIL B	Z	SP005924485
TLE49601-5M-S2	Latch with Bop/Brp (15/-15 mT)	SOT23-3	ASIL B	Z	SP005924491
TLE49604-1M-S2	Unipolar switch with Bop/Brp (18/12.5 mT)	SOT23-3	ASIL B	Z	SP005924627
TLE49604-2M-S2	Unipolar switch with Bop/Brp (28.0/22.5 mT)	SOT23-3	ASIL B	Z	SP005924552
TLE49604-4M-S2	Unipolar switch with Bop/Brp (10/8.5 mT)	SOT23-3	ASIL B	Z	SP005924634
TLE49604-6M-S2	Unipolar switch with Bop/Brp (3.5/2.5 mT)	SOT23-3	ASIL B	Z	SP005924642
TLE49604-7M-S2	Unipolar switch with Bop/Brp (9.5/7 mTG)	SOT23-3	ASIL B	Z	SP005924558
TLE49608-1M-S2	Bipolar switch with Bop/Brp 1/-1 mT	SOT23-3	ASIL B	Z	SP005924532

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3D magnetic sensors

Infineon's 3D magnetic sensors (TLx493D-xxxx) combine high-accuracy magnetic field measurements with an extremely compact footprint and exceptionally low power consumption (typ. 7 nA). Our sensors open up a lot of exciting new use cases, including innovative human-machine interfaces in the form of industrial joysticks, ergonomic pushbuttons on domestic appliances and highly precise position control in robotics.

XENSIV™ TLE493D-P3I8 /-P3B6 /-W3B6 is our latest magnetic 3D sensor, enabled by new and improved accuracy. With respect to pricing and package size, it is the best product for high-performance applications.

The TLE493D-P3I8 /-P3B6 /-W3B6 has an extremely low current consumption and a wake-up function in a small package. Also, the sensor provides configuration options to fit customer requirements best (e.g., data communication, definition of measurements, etc.). The ISO 26262 compliance includes the safety manual and supports functional safety applications. The configurability of the sensor is used in application platforms to adapt to end customer wishes. TLE493D-P3I8 /-P3B6 /-W3B6 is available in 4 different address variants. It is possible to connect up to 4 sensors to one I^2C bus.

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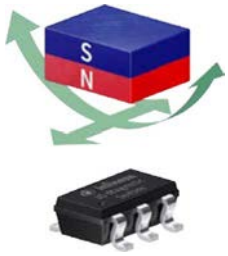
3D magnetic sensors

For consumer and industrial markets

The TLV(I)493D-AxB6 sensor realizes accurate three-dimensional sensing with extremely low power consumption in a small package. Capable of detecting the magnetic field in the x, y, and z-directions, the sensor is ideally suited for the measurement of linear, rotational, or three-dimensional movements. Thanks to its small package and low power consumption, the TLV(I)493D-AxB6can be used in new applications, replacing potentiometer and optical solutions. Featuring contactless position sensing and high-temperature stability of the magnetic measurement, the sensor allows systems to get smaller, more accurate, and more robust.



Rotation movement



3D movement



Linear movement



Features

- 3D magnetic sensing
- Integrated temperature sensing
- Low current consumption
  - 7 nA in power-down mode
- 2.8 to 3.5 V operating supply voltage
- Digital communication via a 2-wire standard I^2C interface
- Bx, By, and Bz linear field measurement up to ±160 mT
- JESD47 qualified
- 12-bit data resolution for each measurement direction
- Various resolution options from 32 to 130 µT/LSB_{12}
- Operating temperature range from -40 to +125°C

Product	Temperature range	Qualification	Linear magnetic range	Resolution	I_{DD}	Update rate XYZ measurement	Package	Ordering code
TLI493D-A2B6	-40 … 105°C	JESD47	±100 mT ±160 mT	7.7 or 15.4 LSB_{12}/mT	7 nA – 3.4 mA	up to 8.4 kHz	TSOP6	SP001689844
TLV493D-A1B6	-40 … 125°C	JESD47	±130 mT (typ)	10.2 LSB_{12}/mT	7 nA – 3.7 mA	up to 3.3 kHz	TSOP6	SP001286056

New features

- Advanced operation modes to provide high flexibility
- Short mode range setting, focusing on the half of the magnetic range, ensuring higher accuracy
- Higher update frequency allows for an application field that requires faster update speed
- Angular mode (for x and y measurement only)

Applications

- Anti-tampering protection in smart meters
- Joysticks
- CCTV-control, game consoles
- Control elements e.g., white goods multifunction knobs
- Ergonomic push- and control buttons on domestic appliances and power tools
- Position control in robotics
- Smart lock position detection

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3D magnetic sensors

For automotive applications

Infineon's TLE493D-xxxx enables automotive control element applications within the passenger compartment or under the hood with a temperature range of -40°C up to 150°C, with linear magnetic range requirements up to ±160 mT.



Features

- 3D magnetic sensing
- Integrated temperature sensing
- 2.8 to 5.5 V operating supply voltage
- Low current consumption
  - 7 nA in power-down mode
  - Up to 10 power modes
- Digital output via I^2C or SPI interface
- Bx, By, and Bz linear field measurement ±160 mT
- AEC-Q100 qualified
- Up to 14-bit data resolution for each measurement direction
- Various resolution options from 8.5 µT/LSB_{14} to 130 µT/LSB_{1}2
- Operating temperature range from -40°C up to 150°C
- ISO 26262 compliant for ASIL B

Applications

- Control elements for infotainment/navigation systems, air-conditions, multifunctional steering wheels, seat controls
- Top column modules e.g., direction indicator, wiper control
- Gear stick position sensing
- Multi-function knobs
- Pedal/valve position sensing

Product	Supply voltage [V]	Inter-face	Qualification	Magnetic range (Se-lectable) [mT]	Sensitivity drift [%]	Matching drift X to Y [%]	Matching drift X/Y to Z [%]	Wake-up	Package	Ordering code
TLE493D-A2B6	2.8-3.5	I^2C	AEC-Q100	±160 ±100	±5	±3.5	±10	No	TSOP6	SP001689848
TLE493D-W286 A0 **TLE493D-W286 A1** **TLE493D-W286 A2** **TLE493D-W286 A3**	2.8-3.5	I^2C	AEC-Q100 ISO 26262-ready	±160 ±100	±5	±3.5	±10	Yes	TSOP6	SP001655334 SP001655340 SP001655344 SP001655348
TLE493D-W3B6 B0 **TLE493D-W3B6 B1** **TLE493D-W3B6 B2** **TLE493D-W3B6 B3**	2.8-3.5	I^2C	AEC-Q100 ISO 26262-compli-ant ASIL-B	±160 ±100 ±50	±5	±1	±10	Yes	TSOP6	SP005952965 SP005952969 SP005952973 SP005952977
TLE493D-P3B6 A0 **TLE493D-P3B6 A1** **TLE493D-P3B6 A2** **TLE493D-P3B6 A3**	2.8-3.5	I^2C	AEC-Q100 ISO 26262-ready ASIL-B	±160 ±100 ±50	±5	±1.7	±6.75	Yes	TSOP6	SP005427119 SP005427121 SP005427123 SP005427125
TLE493D-P3I8	2.8-3.5	I^2C	AEC-Q100 ISO 26262-ready ASIL-B	±160 ±100 ±50	±5	±1.7	±6.75	Yes	VSON-8	SP005633649

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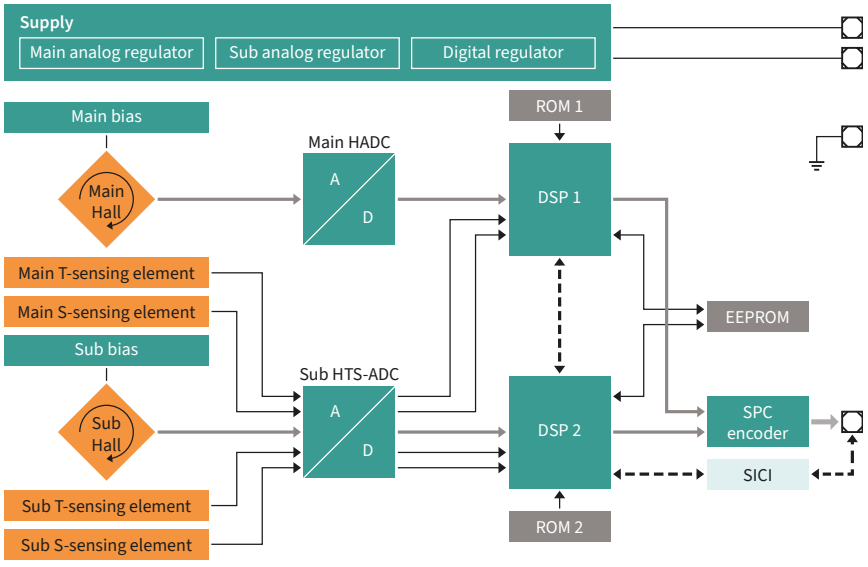
Linear sensors

Programmable dual channel linear Hall sensor with fast SPC interface for high precision applications

Infineon's TLE4999C8 is a programmable dual-channel linear Hall sensor designed to meet the requirements of safety-critical automotive and industrial applications. It is developed in full compliance with ISO 26262 using two sensor elements included within one monolithic silicon design. The sensor cells are designed to complement the state-of-the-art safety requirements at the system level and enable ASIL D system developments. Their signals follow two independent analog paths. Each signal path has a digital signal processing unit to ensure maximum independence (redundancy, respectively). The sensor offers a multi-point calibration with up to 9 selectable set points for enhanced linearization of the output signal. The chip provides five different calibration characteristics for an easy and flexible adaptation to the non-linearity of magnetic circuit design.

TLE4999C features a digital Short-PWM Code (SPC) interface with a bus capability for up to 4 sensor ICs on a single data output. The communication interface with minimum 0.5 µs unit time guarantees a fast transmission of a complete two-channel data signal in less than 500 µs. The additionally implemented frame holder circuit enables the synchronicity of multiple sensors (e.g., in combination with angle sensors) via an SPC bus. The chip offers a 12-, 14- and 16-bit output signal resolution, ensuring the highest flexibility and superior noise performance.

An integrated digital temperature and stress compensation achieves the highest accuracy over a wide temperature range and lifetime. The chip is available in a thin 8-pin SMD single-sensor package.





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Features

- Fully ISO 26262-compliant, supports ASIL D systems
- <2% sensitivity drift, <100 µT offset drift overtemperature and lifetime
- Integrated digital temperature- and stress-compensation
- Fast digital SPC interface (unit time 0.5–3.0 µs)
- Multi-point calibration with up to nine linearization set points

Key benefits

- High diagnostic coverage, ISO 26262-compliancy and dual sensor cell integration enable development of fail operational systems
- Multi-point calibration for better fit into various magnetic circuit designs
- Easy system integration due to programmability of several sensor parameters

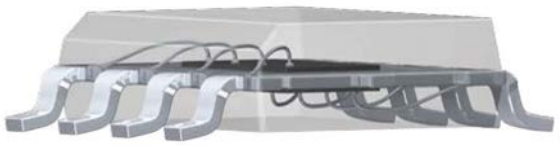
Applications

Automotive safety critical applications

- Electric power steering
- Linear movement position sensing
- Pedal position
- Electric throttle control
- Seat rail adjustment
- Headlight adjustment

Industrial applications

- Small home appliances
- Joystick applications



ISO 26262-ready/compliant dual channel linear sensors

Sales name	Interface	Magnetic linear range [mT]	Sensitivity	Sensitivity drift [%]	Gain	Magnetic offset drift [µT] [1]	Classification	Ordering code	Package
TLE4997A8D	Analog ratiometric	50, 100, 200	±60 mV/mT default for 100 mT range, with gain 1.5	±3	±4	<±400	ISO 26262-ready	SP000902760	TDSO-8
TLE4998P8D	Digital interface PWM	50, 100, 200	±48 LSB_{12}/mT default for 100 mT range, with gain 1.5	±2	±4	<±400	ISO 26262-ready	SP000902776	TDSO-8
TLE4998S8D	Digital interface SENT	50, 100, 200	±48 LSB_{12}/mT default for 100 mT range, with gain 1.5	±2	±4	<±400	ISO 26262-ready	SP000902784	TDSO-8
TLE4998C8D	Digital interface SPC	50, 100, 200	±48 LSB_{12}/mT default for 100 mT range, with gain 1.5	±2	±4	<±400	ISO 26262-ready	SP000902768	TDSO-8
TLE4999I3	Digital interface PSI5	12.5, 25	±147.5 LSB_{13}/mT default for 25 mT range, with gain 1.5	±2	±7.59	<±100/ <±200 [2]	ISO 26262-compliant	SP001689862	SSO-3
TLE4999C8 (TLE4999C8-S0001)	Digital interface SPC	25, 50	±36.875 LSB_{12}/mT default for in 50 mT range, with gain 1.0	±2	±7.59	<±100/ <±2002 [2]	ISO 26262-compliant ASIL D (ASIL C)	SP002662500 (SP005727371)	TDSO-8
TLE4999C4 (TLE4999C4-S0001)	Digital interface SPC	25, 50	±36.875 LSB_{12}/mT default for in 50 mT range, with gain 1.0	±2	±7.59	<±100/ <±200 [2]	ISO 26262-compliant ASIL D (ASIL C)	SP003420076 (SP005727375)	SSO-4

1) Maximum drift overtemperature and lifetime
2) Main channel/sub channel

PRO SIL ISO 26262 compliant

PRO SIL ISO 26262 ready

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TLE499x family:
Programmable analog/digital single channel linear Hall sensor family

Infineon's family of TLE499x linear Hall ICs is tailored to the needs of highly accurate angular and linear position detection and current measurement applications. Each product measures the vertical component of a magnetic field and outputs a signal that is directly proportional to the magnetic field. These programmable linear Hall sensors come with different interface options: TLE4997 features ratiometric analog output, while TLE4998P comes with pulse width modulation (PWM), TLE4998S with single edge nibble transmission (SENT), and TLE4998C with short PWM codes (SPC).

These high-precision 12-bit resolution linear Hall sensors feature EEPROM memory for flexible programming across a wide range of parameters.

These sensors deliver outstanding temperature stability compared with similar compensation methods thanks to digital signal processing based on a 20-bit DSP architecture and digital temperature compensation. TLE4998 also includes stress compensation to withstand stress effects from the package, such as moisture, thus ensuring best-inclass accuracy over the device's lifetime.

Features

- Best-in-class accuracy with low drift of output signal temperature range lifetime (including stress compensation in TLE4998)
- Programmable transfer function (gain, offset), clamping, bandwidth, and temperature characteristics
- AEC-Q100 qualified
- Available in various packages including SSO-3-9 with two integrated capacitors to improve ESD and ESC behavior
- TLE4997, TLE4998 ISO 26262-ready

Applications

- Detecting linear and angular position
- Detecting pedal and throttle position
- Steering torque measurement
- Headlight leveling
- High-current sensing
- Seat position and occupant detection
- Suspension control
- Detecting gear stick/lever positions
- Detecting liquid levels in fuel tanks
- Current sensing e.g., for battery management

Product	Programm.	Number of pins	Sensitivity (programmable range)	Magnetic offset	Supply voltage (extended range)	Automotive	Classification	Interface	Package
TLE4997	EEPROM	3/Single die SMD 8	±12.5 to ±300 mV/mT	<±400 µT	5 V ±10% (7 V)	✓	–	Analog	SSO-3-10 TDSO-8
TLE4998P	EEPROM	3/4/Single die SMD 8	±0.2 to ±6%/mT	<±400 µT	5 V ±10% (16 V)	✓	ISO 26262-ready	PWM	SSO-3 SSO-4 SSO-3 (2 capacitors) TDSO- 8
TLE4998S	EEPROM	3/4/Single die SMD 8	±8.2 to ±245 LSB_{12}/mT	<±400 µT	5 V ±10% (16 V)	✓	ISO 26262-ready	SENT	SSO-3 SSO-4 SSO-3 (2 capacitors) TDSO-8
TLE4998C	EEPROM	3/4/Single die SMD 8	±8.2 to ±245 LSB_{12}/mT	<±400 µT	5 V ±10% (16 V)	✓	ISO 26262-ready	SPC	SSO-3 SSO-4 SSO-3 (2 capacitors) TDSO-8

1) 147.44 LSB_{13} converts to 294.88 LSB_{12}

PRO SIL

ISO 26262 ready

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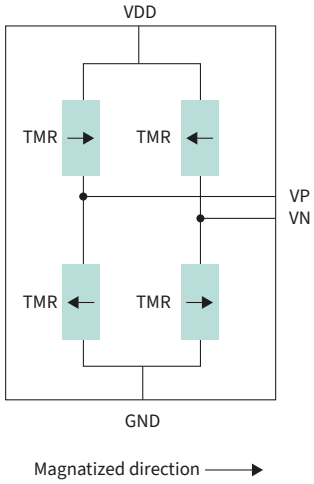
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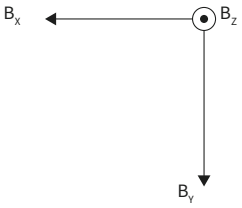
Linear TMR sensor

For consumer and industrial markets

The TLI55910 is a high-sensitivity and low-power linear position sensor that leverages tunnel magnetoresistance (TMR) technology to deliver precise linear measurements. This non-amplified analog sensor can measure magnetic fields within a range of ±35 mT and boasts a large ratiometric output sensitivity of 5 mV/V/mT. Additionally, the sensor has a low noise level of 5 µVRMS, which helps to minimize errors and ensure reliable measurements. The sensor's low power consumption of 0.25 mA at 1.8 Vdd makes it suitable for battery-powered devices or applications where power consumption is a concern. The TLI55910 sensor complies with JEDEC JESD47 and is available in a compact SOT23-6 package.

The TLI55910 is a versatile solution for various position-sensing applications, including industrial automation, consumer electronics, game controllers, home appliances and medical devices. The sensor is suitable for applications where low power consumption, high accuracy and reliability are beneficial. It can be used for linear, angle and rotary position sensing, displacement measurement, and motor control. It can enhance precision in machinery and robotic systems, improve user experiences in consumer electronics such as game controllers, provide precise feedback for efficient motor operation and ensure accurate and reliable measurements, even in harsh environments.







Features and benefits

Key features	Key benefits
– High signal-to-noise ratio	– Enables precise measurements
– Low power consumption (0.25 mA at 1.8 Vdd)	– Ideal for battery-powered devices
– Magnetic measurement range of ±35 mT	– Allows small and cost-effective magnet design
– Strong cross-field immunity	– Robustness against magnetic influences
– Very low temperature drift characteristic	– Stable measurements and operation even in harsh environments

Product	Interface	Magnetic linear range [mT]	Sensitivity [mV/V/mT]	Non-linearity [%]	Offset [mV/VDD]	Classification	Ordering code	Package
TLI55910*	Analog	±35	5	±1.8	10	JEDEC JESD47	SP006118939	PG-SOT23-6

Consumer · Game controller · Home appliance · Automation

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*Coming soon

Angle sensors

Compact designs in small outline packages – at highest functional safety

Highest variety – low end to high end, standardized and specialized in various technologies: GMR, AMR, TMR, and Hall
Angle sensors detect the orientation of an applied magnetic field by measuring sine and cosine angle components with monolithically integrated magnetoresistive elements. Infineon offers a large variety of high-precision angle sensors in all common technologies such as anistrophic magnetoresistance (AMR), giant magnetoresistance (GMR), tunnel magnetoresistance (TMR), and Hall.

General features of Infineon portfolio
- Wide product range, allowing for tailored solutions
- Analog and digital interface options
- Single and dual-chip variants available
- Products specifically designed for safety-relevant applications

Automotive applications
- Electric Power Steering
- Braking
- BLDC Motor Control
- Rotational Position Measurement (e.g., windscreen wiper, valves, flaps, pedals, etc.)

Industrial/consumer applications
- BLDC motor control
- Robotics
- Servo Drives
- Industrial Automation
- High End Drones

GMR, AMR, and TMR based angle sensors

Product	Technology	Die configuration	Sin/cos output	Angle output	Second interface	Accuracy	Classification	Package
TLE5009	GMR	Single die	Analog sin/cos	–	–	0.9°	ISO 26262-ready	DSO-8
TLE5009A16D	GMR	Dual die	Analog sin/cos	–	–	0.9°	ISO 26262-ready	TDSO-16
TLI5012B	GMR	Single die	SSC (SPI)	SSC (SPI)	PWM/IIF/SPC/HSM	1.9°	JESD47	DSO-8
TLE5012BD	GMR	Single & dual die	SSC (SPI)	SSC (SPI)	PWM/IIF/SPC/HSM	1.0°	ISO 26262-ready	DSO-8/ TDSO-16
TLE5014C16(D)	GMR	Single & dual die	–	SPC	–	1.0°	ISO 26262-compliant	TDSO-16
TLE5014P16(D)	GMR	Single & dual die	–	PWM	–	1.0°	ISO 26262-compliant	TDSO-16
TLE5014S16(D)	GMR	Single & dual die	–	SENT	–	1.0°	ISO 26262-compliant	TDSO-16
TLE5014SP16(D)	GMR	Single & dual die	–	SPI	–	1.0°	QM ISO 26262-compliant	TDSO-16
TLE5109A16D	AMR	Single	Analog sin/cos	–	–	0.5°	ISO 26262-ready	TDSO-16
TLE5309D	AMR + GMR	Dual die	Analog sin/cos	–	–	AMR 0.5°, GMR 0.9°	ISO 26262-ready	TDSO-16
TLE5501	TMR	Single die	Analog sin/cos	–	–	1.0°	QM ISO 26262-compliant	DSO-8
TLE5502(D)	TMR	Single & dual die	Analog sin/cos	–	–	0.8°	ISO 26262-compliant	QFN-16

SPI = Serial peripheral interface
IIF = Incremental interface
PWM = Pulse width modulation
HSM = Hall switch mode
SENT = Single edge nibble transmission
SPC = Short PWM code
SSC = Synchronous serial communication

PRO SIL ISO 26262 compliant

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TMR based angle sensors

Tunneling magnetoresistance (TMR) technology offers high sensing sensitivity with a high output voltage, reducing the need for an internal amplifier. Thus, the sensor can be connected directly to the microcontroller without any further amplification.

In addition, TMR technology shows a very low temperature drift, reducing external calibration and compensation efforts. The TMR technology is also well known for its low current consumption.

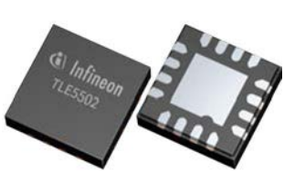


TLE5501

Infineon's TMR sensor TLE5501 is available in two versions.

TLE5501 – product versions with different pin out:
- TLE5501 E0001: pin-compatible to TLE5009 automotive qualified acc. AEC-Q100
- TLE5001 E0002: decoupled bridges for redundant external angle calculation and highest diagnostic coverage, realizing ISO 26262-compliant development ASIL D

Features
- Large output signals of up to 0.37 V/V for direct microcontroller connection
- Discrete bridge with differential sine and cosine output
- Very low supply current: ~2 mA
- Magnetic field range (20–100 mT)
- Typ. angle error ~ 1.0° (overtemperature and lifetime)
- DSO-8 package
- AEC-Q100, grade 0: T_A = -40 … +150°C (ambient temperature)
- For TLE5501 E0002:
  - Reaching ASIL D with just one single sensor chip
  - ISO 26262-compliant development ASIL D



TLE5502D

Infineon's latest and improved TMR sensor generation

TLE5502 – product versions with different pin out:
- TLE5502D S0002: de-coupled P/N-bridges for redundant external angle calculation and highest diagnostic coverage
- TLE5502D S0003: SIN/COS bridge design

Features
- Up to 4x ASIL-D (ISO 26262) sensors in one package enabling fail operational designs
- Improved accuracy (0.8° over lifetime and temperature)
- Compact QFN-16 package (3x3 mm)

Applications
- Steering angle sensor
- BLDC motor commutation (e.g., wipers, pumps and actuators)
- Angular position sensing for e.g., robotics or gimbal
- Electric motors
- Industrial automation
- Safety applications

PRO SIL

ISO 26262 compliant

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GMR based angle sensors

TLE5014(D)
Digital GMR sensor with an easy-to-use plug-and-play concept for highest functional safety applications

All XENSIV™ TLE5014 angle sensors are available as single- and dual-die products. They are easy to use and come pre-configured and pre-calibrated as plug-and-play sensors. Customers can choose between SENT, PWM, SPC, and SPI interfaces. On top of those protocol options, the sensors can be adapted to any application setup via their programmable E²PROM interfaces. TLE5014 magnetic angle sensors meet ISO 26262 ASIL C for the single die and ISO 26262 ASIL D for the dual die versions.

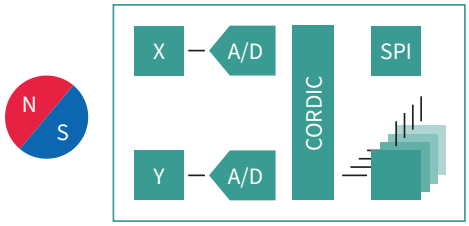
All products are ready for applications with the highest functional safety requirements. The sensors show an extremely small angle error of less than 1° across the entire temperature profile and lifetime. This is particularly helpful in applications requiring very accurate position sensing, such as steering angle sensing or motor commutation. Further application areas range from rotor position measurement to electric power steering (EPS), pedal position, and any other kind of position measurement.

Features

- Easy-to-use, plug-and-play sensors, pre-configured and pre-calibrated
- Offering high flexibility:
  - Available as single- and dual-die products
  - 12-bit digital interface with protocol options PWM, SENT, SPC, and SPI
  - E² PROM and look-up table for customer configuration and calibration
- High angle accuracy: max. 1.0° overtemperature and lifetime
- High voltage capability up to 26 V
- Development fully compliant with ISO 26262
  - Developed according to ASIL D level
  - Dual die sensors reaching ASIL D, single die sensors ASIL C metrics
- Safety manual and safety analysis summary report available on request







Applications

- Steering angle sensing (SAS)
- Motor commutation
- Rotor position measurement
- Pedal position
- Safety applications
- Any other kind of high-accuracy position measurement

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ISO 26262 compliant

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GMR based angle sensors

TLE5012B(D), TLI5012B
GMR sensor with integrated angle calculation and multiple interfaces

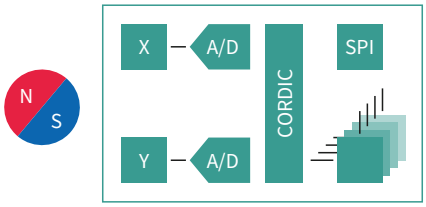


Features

- Integrated angle calculation with CORDIC algorithm
- 15-bit representation of calculated angle value
- High update rate up to 43 µs (23 kHz)
- Range of selectable interfaces
- SPI compatible Synchronous Serial Communication (SSC)
- Bidirectional communication up to 8 Mbit/s
- Pulse width modulation (PWM)
- Hall switch mode (HSM) for motor commutation
- Incremental Interface (IIF)
- Temperature compensation and auto-calibration algorithm
- Diagnostic function for sensor elements and circuitry with PRO-SIL™ support
- Dual die SMD package (redundancy)
- ISO 26262-ready
- Available as single- and dual-die
- Industrial version TLI5012B in line with JEDEC JESD47

Applications

- Steering angle
- Brushless DC motor commutation, i.e., electric power steering (EPS)
- Rotary switches
- General angular sensing
- Incremental or absolute magnetic encoders
- Gimbals, drones, robots



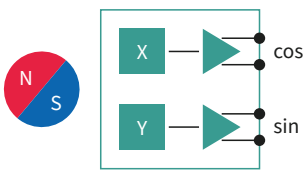
AMR based angle sensors

TLE5109A16(D)
Analog AMR sensor with temperature compensation



Features

- Features a differential or single-ended analog interface for sine and cosine values
- Internal temperature drift compensation for gain and offset
- ISO 26262-ready



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Combined AMR and GMR based angle sensors

TLE5309D
Dual angle sensor combining AMR and GMR technology

The TLE5309D is a diverse redundant angle sensor with analog outputs. It combines a giant magnetoresistance (GMR) sensor for a full 360° angle range with an anisotropic magnetoresistance (AMR) sensor for high precision in a flipped configuration in one package. Magnetoresistive (MR) elements measure a rotating magnetic field's sine and cosine angle components. The sensors provide analog sine and cosine output voltages that describe the magnetic angle from 0 to 180° (AMR sensor) and 0 to 360° (GMR sensor), respectively.

The differential MR bridge signals are independent of the magnetic field strength, and the analog output is designed for differential or single-ended applications.

The output voltages are designed to use the dynamic range of an A/D-converter using the same supply as the sensor as a voltage reference. Both sensor ICs are supplied independently by separate supply and ground pins.

Summary of features

- Separate supply pins for AMR and GMR sensors
- Diverse redundant design with one GMR sensor (top die) and one AMR sensor (bottom die) in one package
- Low current consumption and very fast start up
- 360° contactless angle measurement
- Immune to air gap variations due to MR-based sensing principle
- Operating ambient temperature:
  -40 … +125°C/-40 … +150°C (TLE5309DHT)

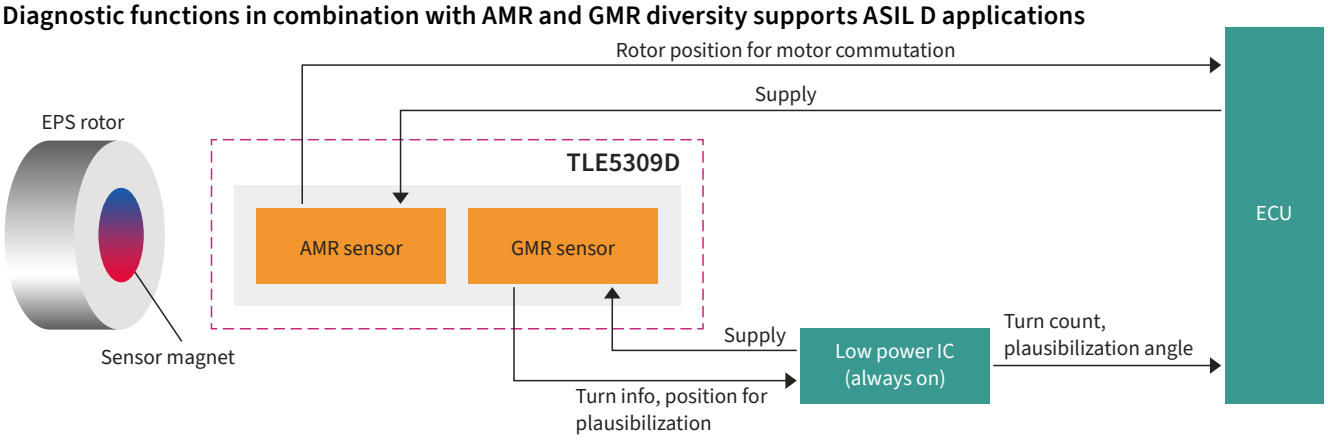


Potential applications

The TLE5309D angle sensor is designed for angular position sensing in safety-critical automotive applications.
Its high accuracy, 360° measurement range, and short propagation delay make it suitable for systems with high speeds and high accuracy demands, such as brushless DC (BLDC) motors for actuators and electric power steering systems (EPS). At the same time, its fast start-up time and low overall power consumption enable the device to be employed for low-power turn counting. Extremely low power consumption can be achieved with power cycling, where the advantage of fast power-on time reduces the average power consumption.

- BLDC motors for electric power steering (EPS)
- Low-power turn counter

Diagnostic functions in combination with AMR and GMR diversity supports ASIL D applications



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Stray field robust angle sensors

Outstanding stray field robustness, high accuracy, and flexibility

The TLE49SRx family of angle sensors is a range of high-performance, stray field-robust sensors designed for use in demanding automotive applications. With their advanced measurement capabilities and compliance with key safety and electromagnetic compatibility standards, these sensors offer a reliable and versatile solution for a wide range of applications.

The increasing electrification of vehicles, including integrating electric main drives, has led to a growing concern about electromagnetic interference (EMI) caused by stray fields. These stray fields can potentially disrupt the functioning of electronic subsystems. The TLE49SRx family of angle sensors has been developed to address this issue. It features spatially separated Hall cells that enable robust magnetic field measurement, even in the presence of inhomogeneous stray fields, exceeding the requirements of EMC standards ISO 11452-1:2015.



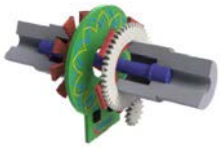
Chassis height leveling
e.g., TLE49SRI3



Chassis pedal
e.g.TLE49SRS3



Steering angle sensor (SAS)
e.g., 2 x TLE49SRC8(D)



Steering torque angle sensor(TAS)
e.g., (TLE4801-iTAS)+ TLE49SRC8(D)

The TLE49SRx family is designed for various automotive applications, including chassis height, pedal position, and steering angle sensors. Several derivatives of the TLE49SR sensor are available, offering a range of package options, including a package with long leads and integrated capacitors for easy use in remote sensor applications and surface-mounted packages, as well as various communication interfaces.

These sensors have been developed in accordance with the ISO 26262 standard, meeting the ASIL C (D) metric on chip level as a safety element out of context.

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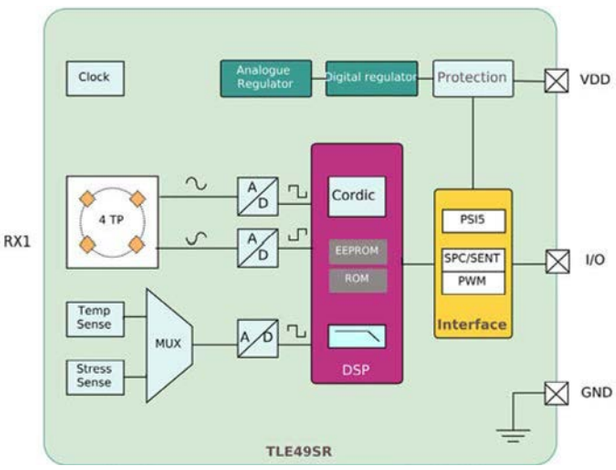
TLE49SR – Stray field robust angle sensors

Outstanding stray field robustness, high accuracy, and flexibility

The XENSIV™ TLE49SR magnetic angle sensor family is designed to meet the demands of high-performance applications. It offers excellent stray field robustness up to 8 mT in homogeneous stray fields and is compliant with EMC standards ISO 11452-1:2015.

The TLE49SR sensors are available in various configurations to suit different application needs. For on-PCB usage, the 8-pin surface-mounted device (SMD) package is available with PWM (TLE49SRP8), SENT (TLE49SRS8), or SPC (TLE49SRC8) communication interfaces. A dual-channel version is also available to support redundancy requirements. For remote sensor applications, derivatives are available in a 3-pin package with long leads, offering PWM (TLE49SRP3), SENT (TLE49SRS3), or SPC (TLE49SRC3) options.

All members of the XENSIV™ TLE49SR magnetic sensor family are developed in compliance with ISO26262 and support the ASIL C metric on the device level, enabling the development of fail-safe systems.



The TLE49SR integrated circuit (IC) features a comprehensive set of on-chip components, including spatially separated Hall-, temperature-, stress sensors, a signal conditioning circuit, analog-to-digital converters, and a digital signal processor. The IC also includes a clock, voltage regulators and internal protection circuitry to ensure safe and reliable operations.
The TLE49SR family offers a range of digital output interfaces, providing flexibility and compatibility with various systems. These interfaces include PSI5, SENT, SPC, and PWM, allowing for seamless integration into a variety of applications.

Features and benefits

Key features	Key benefits
– Stray field Immunity, exceeding ISO 11452-1:2015	– High system reliability eliminates the need for external shielding
– Excellent angle performance with very low jitter and fast response time	– Look-up table for correction of systematic angle errors, angle error <0.5°
– Very low jitter delay ±1 µs and very fast response time 9.8 µs ~ 26 ms	– Enables for highly responsive and fast systems
– EEPROM for customized configuration and customer specific ID	– Easy design with high product flexibility
– PSI5 protocol V1.3 and V2.3, PWM, SENT, and SPC Interface	– Synchronization pulse for PSI5- , frame holder mechanism for SPC-sensors
– ISO 26262-compliant, ASIL C(D), and ASIL D rating	– Dual die version for redundant, ASIL D compliant systems

Product portfolio

Product	Description	Package	ISO26262 (Functional safety)	ISO 11452-8:2015 (Stray field robust)	Ordering code
TLE49SRI3	Leaded 3-pin package, with 2 internal capacitors, PSI5 Interface	SSO-3	ASIL C	Yes	SP005398935
TLE49SRC3	Leaded 3-pin package, with 3 internal capacitors, SPC Interface	SSO-3	ASIL C	Yes	SP005398941
TLE49SRS3	Leaded 3-pin package, with 3 internal capacitors, SENT Interface	SSO-3	ASIL C	Yes	SP005398939
TLE49SRP3	Leaded 3-pin package, with 3 internal capacitors, PWM Interface	SSO-3	ASIL C	Yes	SP005398937
TLE49SRC8	8-pin SMD package, SPC Interface	TDSO-8	ASIL C	Yes	SP005398933
TLE49SRS8	8-pin SMD package, SENT Interface	TDSO-8	ASIL C	Yes	SP005398931
TLE49SRP8	8-pin SMD package, PWM Interface	TDSO-8	ASIL C	Yes	SP005398929
TLE49SRC8D	8-pin SMD package, dual die, SPC Interface	TDSO-8	ASIL D	Yes	SP005859106
TLE49SRS8D	8-pin SMD package, dual die, SENT Interface	TDSO-8	ASIL D	Yes	SP005948428

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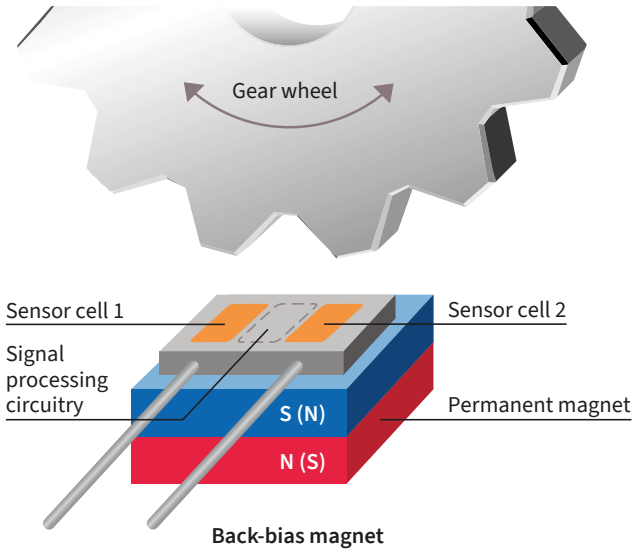


Magnetic speed sensors

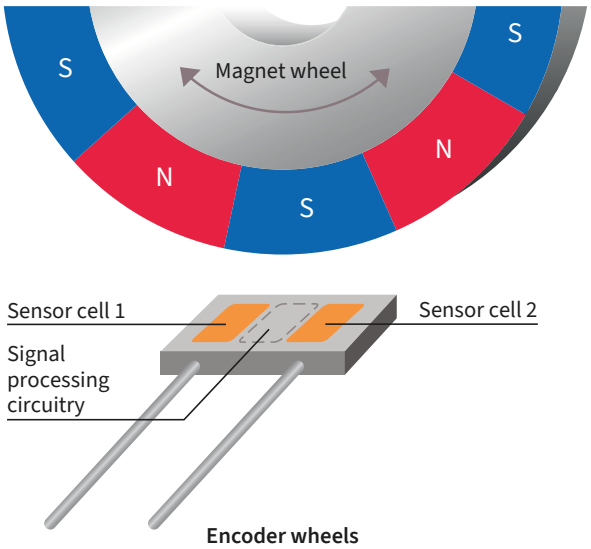
Easy to use, robust, and cost-effective sensors for speed measurement

Infineon's Hall-, GMR- and TMR-based magnetic speed sensors are designed to measure speed in safety and powertrain applications such as speedometers, ABS, camshafts/crankshafts, and automatic transmissions. They are also used in similar applications in the industrial sector. The sensors use a ferromagnetic gear tooth or encoder structure to measure linear or rotational speed and position. Hall sensor measuring rotational speed with a gear tooth and a magnetic encoder wheel. The majority of sensors also feature additional benefits, such as integrated capacitors for high EMC robustness and the highest levels of ESD protection.

Typical application of a magnetic differential sensor



Back-bias magnet



Encoder wheels

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TLE4922
Highly robust, easy-to-use mono-Hall speed sensor with twist-independent mounting

This sensor is specially designed to provide an easy-to-use, robust and cost-effective solution for vehicle or industrial speed sensing applications. The TLE4922 can, therefore, be back-biased using a simple, low-cost bulk magnet while providing a good air gap performance and switching accuracy. Its hidden adaptive hysteresis and calibration algorithm enable good accuracy over air gap jumps and immunity to vibration and run-out events.

Features
- Large operating air gap capability
- Flexible mounting (also known as twist-independent mounting)
- Hidden adaptive hysteresis
- Low current consumption
- Reverse magnetic polarity capability
- Advanced protection technology
  - Reverse voltage protection at VS-pin
  - Short-circuit protection
  - Overtemperature protection
- Wide operating temperature ranges of -40°C ≤ T_j ≤ ±150°C
- High ESD robustness up to ±4 kV HBM
- Three-wire PWM voltage interface



Applications
- Industrial applications
- Two-wheeler and automotive vehicle speed

TLE4927C E6547
Differential Hall effect crankshaft sensor with hidden adaptive hysteresis

Infineon's TLE4927C detects the motion and position of ferromagnetic and permanent magnet structures by measuring the differential flux density of the magnetic field. A self-calibration mode ensures optimum accuracy in running mode in just a few transitions after start-up. The sensor combines a fast power-up time with high accuracy and sensitivity for large operating air gaps. Qualified for automotive temperature ranges and meets the requirements of harsh environmental conditions prevalent in automotive applications.
The TLE4927C comes with the SSO package with two integrated capacitors.

Features
- Differential Hall speed sensor to measure speed and position of tooth/pole wheels
- Easy to use single chip solution in SSO-3-92
- Symmetrical switching point in the middle of the tooth/magnetic pole
- South and north pole pre-induction possible
- Digital output signal (voltage interface)
- Fast start-up time
- Reverse voltage protection at V_S-pin
- Short-circuit and overtemperature protection of output
- Automotive operating temperature range



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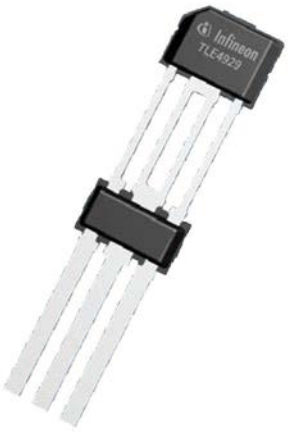
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TLE4929
Fully programmable crankshaft sensor with direction detection

The TLE4929 is an active differential Hall sensor ideally suited for crankshaft applications and similar industrial applications, such as a speedometer or any speed sensor with excellent accuracy and low jitter capabilities. It as well addresses new requirements for crankshaft speed sensing from hybrid powertrains. An advanced vibration detection algorithm ensures valid sensor data for any hybrid powertrain traction. This improves efficiency of the engine start and helps to avoid misfiring or ECU error messages caused by wrongly calibrated sensor data. Also, the compatible 3-pin-package allows a one-to-one-replacement of the former generation of crankshaft sensors without direction detection, TLE4924/25/26/27/28, widely backward compatible functionality through flexible EEPROM configuration of parameters, meaning the former TLE492x-family can be mimicked.

Features

- Differential Hall speed sensor to measure speed and position of tooth/pole wheels
- Ease of use single chip solution in SSO-3-52
- Switching point in the middle of the tooth enables backward compatibility
- Robustness over magnetic stray-field due to the differential sensing principle
- Precise miss fire detection through excellent jitter performance
- Dedicated hybrid engine algorithm keeps combustion engine calibrated during an electric drive cycle
- Digital output signal with programmable output-protocol including diagnosis interface
- Direction detection and stop-start-algorithm
- High accuracy and low jitter
- High sensitivity enables large air gap
- End-of-line programmable to adapt engine parameters
- Can be used as a differential camshaft sensor
- Pre-programmed version TLE4929C-XAN available, TLE4929C-X2A for wheels with 32 teeth
- Automotive operating temperature range



Product	Sensor technology	Classification	Direction detection	Automotive	Industrial	Protocol	RoHS
TLE4922	Mono-Hall	AEC-Q100	–	✓	✓	Single pulse	✓
TLE4927	Differential Hall	AEC-Q100	–	✓	✓	Single pulse	✓
TLE4929	Differential Hall	AEC-Q100	✓	✓	✓	PWM, Single pulse	✓

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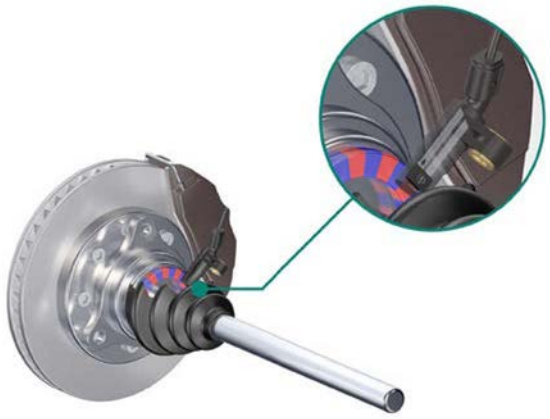
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Safety first – wheel speed sensors

Nowadays, wheel speed sensors have to support an ever-growing list of applications. Years ago, ABS systems simply needed to know if a wheel was blocked, and then ESC used the accurate speed of all four wheels for its corrections. Since then, an increasing number of car modules have considered the wheel speed for their intelligent functions. The electrical parking brake, for example, needs to know about every inch a car moves when it is supposed to be stationary. iTPMS uses sophisticated algorithms to determine if a wheel lacks air pressure. Even the central locking locks the doors after a couple of meters, and the radio turns up the volume at an increasing speed. All of the above rely on accurate information from the wheel speed sensor.

Applications

- Wheel speed sensing in automotive applications
- Antilock braking systems (ABS)
- Electronic stability programs (ESP)
- Automatic transmissions
- iTPMS TLE5045IC and TLE5046SIC
- Support of automated driving and parking, TLE55493IC(D)



TLE4941PLUSC/TLE4942-1C/TLE4943C
My car, how fast and far does it drive?

The TLE4941PLUSC is a widely used wheel speed sensor. TLE4942-1C and TLE4943C are complementing this sensor with additional direction information using PWM or AK protocol, respectively.

As a single-chip sensor, it magnetically measures the car's wheel speed with its differential Hall technology. The ideal all-purpose sensor is equally suitable for pole and steel wheel applications. Because of their differential principle, these sensors are immune to any kind of undesired magnetic stray fields, ferromagnetic particles or other disturbances.

Features

- Family of Hall sensors available with and without direction detection
- Excellent stray field robustness

Applications

- Pole wheel applications
- Steel/tooth wheel applications by using back bias magnet



Product	Sensor technology	Pole wheel	Steel wheel	Classification	Direction detection	Protocol	iTPMS
TLE4941plusC	Hall differential	✓	✓	ISO 26262-compliant	–	Standard	–
TLE4942-1C	Hall differential	✓	✓	ISO 26262-compliant	✓	PWM	–
TLE4943C	Hall differential	✓	✓	–	✓	AK	–

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ISO 26262 compliant

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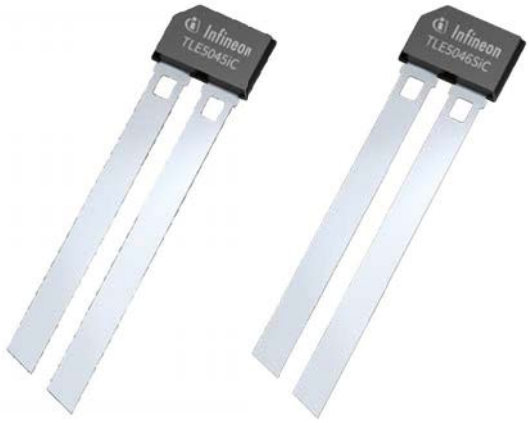
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TLE5045IC/TLE5046SIC
GMR wheel speed sensors

The TLE5045IC/TLE5046SIC is our state-of-the-art wheel speed sensor family based on GMR technology. The family consists of a designed-to-cost speed-only TLE5045IC and a high-end TLE5046SIC that provides not only direction detection but also true “zero-speed” capability and the possibility of self-diagnostics.

TLE5045IC and TLE5046SIC are developed according to ISO 26262 to fulfill ASIL B and support ASIL D systems. The TLE5046SIC with direction detection is available with PWM or AK protocol.



Features

- One family of speed sensors for all wheel speed sensing applications in same package
- Best-in-class in sensitivity, jitter, and duty cycle independent from magnetic target wheel
- “Zero speed” capability
- ISO 26262-compliant ASIL B development, supporting ASIL D systems
- Multiple protocol variants with and without self-diagnosis functionality
- Integrated circuitry for improved EMC and ESD robustness even without external capacitor

Applications

- Pole wheel applications
- Autonomous driving (e.g., park assist)

Product	Sensor technol-ogy	Pole wheel	Steel wheel	Classification	Direction detection	Protocol	iTPMS
TLE5045IC-R050	iGMR differential	✓	–	ISO 26262-compliant	–	Standard	✓
TLE5046SIC-PWM2-R050	iGMR differential	✓	–	ISO 26262-compliant	✓	PWM	✓
TLE5046SIC-AK-LR	iGMR differential	✓	–	ISO 26262-compliant	✓	AK	✓

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TLE55493IC - High end TMR wheel speed sensor

TLE555493IC is our next-generation wheel speed sensor family based on TMR technology. Linearized TMR brings together the benefits of GMR and Hall worlds: very good sensitivity, excellent jitter performance, a very big linear range, and excellent linearity for high-resolution algorithms. It perfectly addresses the customer requirements for autonomous parking and low-speed driving. Electric vehicles with fast torque can be perfectly served with valid direction detection with the first pulse. The complete TLE55493 family is compliant according to ISO 26262 ASIL D process.



TLE55493IC will be offered in two different packages:
PG-SSO-2-51 and PG-SSO-2-53

Product	Sensor technology	Pole wheel	Steel wheel	Classification	Direction detection	Protocol	Resolution
TLE55493IC-LR	iTMR differential	X		ISO 26262-compliant	X	AK	Standard
TLE55493IC-PW2-50	iTMR differential	X		ISO 26262-compliant	X	PWM	Standard
TLE55493IC-LR-4H	iTMR differential	X		ISO 26262-compliant	X	AK-4H	High
TLE55493IC-LR-6M	iTMR differential	X		ISO 26262-compliant	X	AK-6M	High
TLE55493IC-LR-8H	iTMR differential	X		ISO 26262-compliant	X	AK-8H	High
TLE55493IC-1-LR	iTMR differential	X		ISO 26262-compliant	X	AK	Standard
TLE55493IC-1-PW2-50	iTMR differential	X		ISO 26262-compliant	X	PWM	Standard
TLE55493IC-1-LR-4H	iTMR differential	X		ISO 26262-compliant	X	AK-4H	High

Features and benefits

Key features	Key benefits
– Immediate valid direction with first pulse	– Blind spot detection at automated parking
– Improved spatial resolution	– High protocol variants enable accurate, faster, and smoother control of the car movement
– Improved duty cycle	– Smoother control of car movement at low speed movement

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TLE55493ICD – High-end TMR dual die wheel speed sensor

TLE555493ICD is our next-generation wheel speed sensor family based on TMR technology. Linearized TMR brings together the benefits of GMR and Hall worlds: very good sensitivity, excellent jitter performance, very big linear range and excellent linearity for high-resolution algorithms. It perfectly addresses the customer requirements for autonomous parking and low-speed driving. Electric vehicles with fast torque can be perfectly served with valid direction detection with the first pulse. The complete TLE55493 family is developed as ASIL C (D) according to ISO 26262. The dual die sensor has two fully galvanic insulated sensors in one slim package that perfectly serve L3+ cars in case redundancy is required.



TLE55493ICD will be offered with two galvanic isolated dies in one package:
PG-SSO-4-52

Product	Sensor technology	Pole wheel	Steel wheel	Classification	Direction detection	Protocol	Resolution
TLE55493ICD-LR	iTMR differential	X		ISO 26262-compliant	X	AK	Standard
TLE55493ICD-PW2-50	iTMR differential	X		ISO 26262-compliant	X	PWM	Standard
TLE55493ICD-LR-4H	iTMR differential	X		ISO 26262-compliant	X	AK-4H	High
TLE55493ICD-LR-6M	iTMR differential	X		ISO 26262-compliant	X	AK-6M	High
TLE55493ICD-LR-8H	iTMR differential	X		ISO 26262-compliant	X	AK-8H	High

Features and benefits

Key features	Key benefits
– Immediate valid direction with first pulse	– Blind spot detection at automated parking
– Improved spatial resolution	– High protocol variants enable accurate, faster, and smoother control of the car movement
– Improved duty cycle	– Smoother control of car movement at low speed movement
– Redundancy for L3+ cars	– Same TMR chip will be re-used in galvanic isolated dual die package

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TLE4953C
Two-wire transmission speed sensor

The differential Hall sensor TLE4953C can detect direction and was developed specifically to meet the needs of high-end transmission applications. Its jitter performance and high sensitivity enable designers to create high-accuracy systems with excellent vibration suppression. Adaptive hysteresis and the dynamic self-calibration algorithm ensure outstanding measurement results with fine and coarse target wheels. As with other Infineon speed sensors, the south and north poles can be pre-inducted. TLE4953 features a current interface and comes in a two-wire package with an integrated 1.8 nF over molded capacitor for improved EMC.

Features
- Detection of rotation direction
- Highly accurate speed measurements from 0 to 12 kHz over large operating air gaps
- Excellent vibration suppression
- Broad operating temperature range
- AEC-Q100 qualified

Applications
- Automatic transmission systems
- Industrial speed sensing using current interface



TLE4955C
Leading the way in vibration robustness

TLE4955 family of differential Hall sensors specially designed to meet the latest requirements in transmission vibration suppression. It provides best-in-class vibration suppression for applications that require a two-wire current interface. The TLE4955 family provides a similar algorithm plus dynamic self-calibration, jitter and sensitivity levels as our proven TLE4953, thus ensuring accurate speed measurements in the harshest fine and coarse target wheels. Designers can choose different interface protocol versions.

Features
- Detection of rotation direction
- Best-in-class vibration suppression
- Highly accurate speed measurements from zero to 12 kHz over large operating air gaps
- Broad operating temperature range
- Four different interface protocols
- AEC-Q100 qualified

Applications
- Automatic transmission systems
- Industrial speed sensing using current interface



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TLE4959C, TLE4959C-FX
State-of-the-art three-wire transmission speed sensor with direction detection

With our TLE4959, you can now address your three-wire applications with the latest state-of-the-art technology of IFX transmission sensors. Differential Hall sensor TLE4959 is your choice when you need a three-wire sensor with direction detection and active vibration suppression. In addition to its outstanding air gap and best-in-class Hall jitter performance, its high immunity against stray fields makes it the ideal match not only for traditional transmissions but also, particularly, for hybrid applications.

While TLE4959C is provided with the standard protocol, the FX version gives access to different protocols (e.g., speed only) as it is to be programmed at the customer's premises.

Features
- Active vibration suppression
- Highly accurate speed measurements from 0 Hz to 10 kHz over large operating air gaps (up to 20 k for -FX)
- Common three-wire voltage interface
- Broad operating temperature range
- AEC-Q100 qualified
- FX version customer programmable (protocol, hysteresis level)



Applications
- Automatic (hybrid) transmission systems

TLE4959-5U, TLE4959-5U-FX
State-of-the-art four-wire transmission speed sensor with direction detection

XENSIV™ TLE4959-5U and TLE4959-5U-FX are four-wire voltage interface differential Hall speed sensors for transmission speed applications with vibration suppression and direction detection output. The FX version is flexible regarding protocol; it offers customer-programmable EEPROM.

State-of-the-art 4-wire transmission speed sensor

with direction detection. The TLE4959-5U (FX) is an integrated differential Hall speed sensor ideally suited for transmission applications. Its basic function is to provide information on rotational speed and direction of rotation to the transmission control unit.
Sophisticated vibration suppression with excellent air gap performance. TLE4959-5U (FX) includes a sophisticated algorithm that actively suppresses vibration while keeping excellent air gap performance.

Features
- Voltage interface
- Active vibration suppression
- Direction detection output
- Dynamic self-calibration
- 0 Hz capability
- FX: flexible - protocol is customer programmable



Target applications
- Automatic transmission applications
- Transmission applications with speed with direction detection

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TLE4986
Mono-Hall based camshaft speed and position sensor

The TLE4986C is an active Hall sensor ideally suited for camshaft applications and similar industrial applications such as speedometers. Its basic function is to map a tooth or a notch into a unique electrical output state. It has an electrical trimming option for post-fabrication trimming to achieve true power on (TPO) capability even in the case of production spreads such as different magnetic configurations or misalignment. A self-calibration algorithm has also been implemented to achieve optimum accuracy during normal running operations. The EEPROM is adaptable to various performance-affecting parameters. It comes in a three-pin SSO-3-52 package for the supply voltage and an open drain output.

Features

- Hall switching sensor to measure speed or phase of pole/tooth wheels
- Digital output signal (voltage interface)
- Monocell chopped Hall system
- TPO true power on functionality
- TIM twist independent mounting
- Dynamic self-calibrating algorithm
- IST individual switching threshold
- End-of-line programmable switching points
- EEPROM for various algorithm options
- TC of back-bias magnet pre-programmed
- High resistance to mechanical stress
- Enhanced immunity against ESD and EMC
- Improved µ-cut capability
- Enhanced operating temperature range
- Module package SSO-3-52



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TLE4988C
Mono-Hall based camshaft speed and position sensor with reduced dependence on rare-earth backbias magnets

The Infineon XENSIV™ TLE4988C products feature advanced camshaft sensing performance and improved application adaption. One major benefit of advanced sensor performance for module manufacturers is the reduced dependence on rare-earth backbias magnets. The TLE4988C has proven the right performance with a ferrite backbias magnet for all relevant parameters such as phase jitter, phase accuracy or speed effect across key temperature, air gap, and rpm ranges. With automatic in-car TPO calibration, the most accurate start-up sensing in a real application environment is ensured by addressing tolerances of ferromagnetic wheels and magnetic encoders and mounting tolerances of the sensor. Infineon's TLE4988C products are optimized with three different backbias magnet materials: Fe, SmCo, and NdFeB. All products come inside the well-established camshaft sensor package SSO-3-52, allowing low design switch effort in terms of package and performance compatibility with predecessor products.

Features

- Digital output signal (voltage interface)
- True power on functionality (TPO)
- Auto TPO – automatic in car calibration
- Improved switching level/phase accuracy
- TC range including ferrite
- High speed digital interface for diagnosis/test
- Twist independent mounting (TIM)
- EEPROM for algorithm options and ID
- Increased ESD and EMC immunity, improved µCut feature
- Digital magnet temperature compensation
- Mechanical stress compensation
- Module package SSO-3-52



Product	Sensor technology	Magnet TC	Automotive	Industrial	Protocol	RoHS
TLE4986	Mono-Hall	SmCo	✓	✓	Single pulse	✓
TLE4988	Mono-Hall	SmCo, NdFeB, Fe	✓	✓	Single pulse	✓

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TLE5555IC(B)
State-of-the-art TMR transmission speed sensor for pole/toothed wheel in top/side read configuration with/without back-bias magnet

The TLE5555IC is a differential magnetic speed sensor based on tunnel magnetoresistive (TMR) sensing technology. This technology enables best-in-class jitter and air gap performance and allows sensing flexibility in top and side read configuration. Its basic function is to provide information about the rotational speed and the direction of the rotation to the transmission control unit. Therefore, the sensor family includes a sophisticated algorithm that actively suppresses vibration. The output has been designed as a two-wire current interface based on a PWM (pulse width modulation) principle. The TLE5555IC operates without external components and is fully EMC-compliant thanks to its capacitor integrated on silicon level.

Features

- High magnetic field sensitivity enables ultralow jitter over high operating air gap range
- Two wire PWM current interface
- Direction detection
- Vibration suppression (active via protocol suppression; passive via adaptive hysteresis)
- Differential sensing principle enables magnetic stray field robustness
- Equipped with sintered ferrite back-bias magnets and algorithm-optimized for toothed wheel applications
- Package options for top and side read mounting make bending of sensor leads obsolete
- EMC robust without the need of capacitors on sensor leads
- Comprehensive digital diagnostic interface, enabling readout of internal signals and electronic chip ID
- Customer configurable EEPROM in FX version

Potential applications

- Ideal for the use in harsh environments, particularly automotive transmissions
- Suitable for all kinds of transmission systems including dedicated hybrid transmission (DHT) and electric vehicle (EV) concepts

The "ICB-top" family members are designed for toothed wheel applications and have a ferrite back-bias magnet attached. They come in a RoHS-compliant two-pin package and are qualified for automotive usage. It is recommended that the ICB-top be used within an over molded module. For magnetic encoder (ME) applications, other sensors –called ME family – are available.

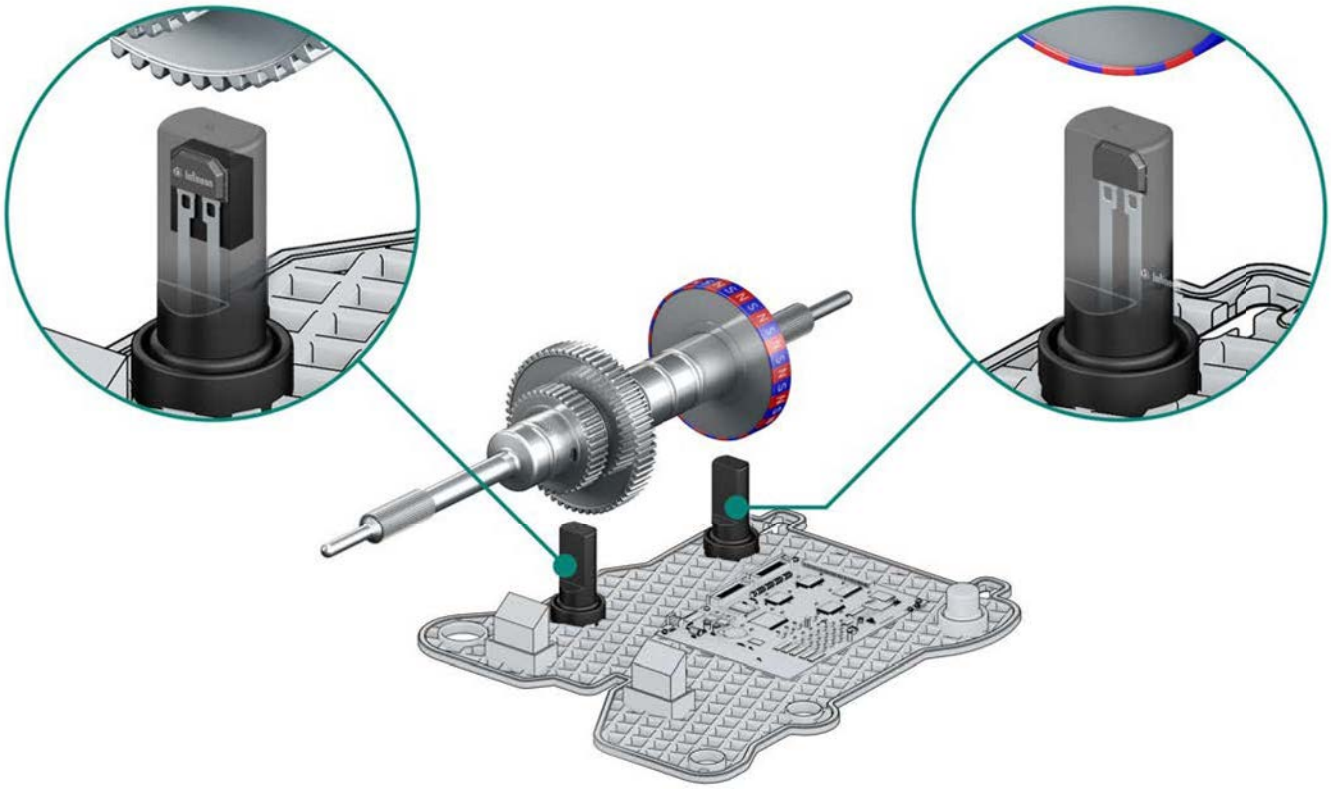
The FX version, which provides a programmable EEPROM, offers high flexibility. This sensor offers many protocol options that have been established in transmission applications over the last decades. Additionally, it offers the option to configure the sensor algorithm (e.g., magnetic threshold, vibration robustness) to optimize the sensor performance for the target wheel fully.



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Available variants

Product	Description	Classification	Ordering code	Package
TLE5555IC ME E0	For polewheel (top + side-read), E0 protocol	ISO 26262-compliant	SP003883456	SSO-2-51
TLE5555IC ME E1	For polewheel (top + side-read), E1 protocol		SP005832719	SSO-2-51
TLE5555IC ME E4B	For polewheel (top + side-read), E4B protocol		SP005829763	SSO-2-51
TLE5555ICB E0-TOP	For steelwheel (top-read), E0 protocol, incl. backbias magnet		SP003883500	SSOA22-2-51
TLE5555ICB E1-TOP	For steelwheel (top-read), E1 protocol, incl. backbias magnet		SP005401486	SSOA22-2-51
TLE5555ICB E4B-TOP	For steelwheel (top-read), E4B protocol, incl. backbias magnet		SP005832705	SSOA22-2-51

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Pressure sensors

For automotive, industrial, and consumer applications – ensure the perfect fit for all performance and integrity needs

Infineon XENSIV™ pressure sensors measure the pressure of air and gases across various industries and applications. As pressure transducer sensors, they convert physical pressure into an electric signal. Infineon XENSIV™ pressure sensors combine sensing functions (via a pressure sensor element) and conversion into an electrical signal (via an absolute pressure transducer and signal processing) in one integrated silicon device.

The sensor element and its integrated circuits (ICs) are the heart of pressure sensor technology. Infineon's small pressure sensor IC chips support various applications with best-in-class performance. Infineon is one of the world's largest semiconductor pressure sensor and transducer manufacturers, thanks to a varied portfolio of absolute air pressure sensor ICs. Our comprehensive family of XENSIV™ sensors includes a wide selection of pressure-sensitive sensors tailored specifically to the automotive, consumer, and industrial sectors. XENSIV™ sensors are compact, designed to save energy, and offer a rapid time-to-market – a perfect fit for any performance and integrity needs.

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Infineon XENSIV™ BAP sensors are calibrated for specific automotive applications, especially for BMS thermal runaway detection, pneumatic seats, and electronic engine control. The BMS sensors are ISO 26262-compliant and support the highest ASIL requirements on the system level.



Powertrain systems have to fulfill the constantly increasing stringent media requirements. Environmental legislation aims to deliver cleaner air by ensuring a steady global decrease in CO2 emissions. Thanks to their accurate measurement capability, Infineon MAP and turbo MAP products with analog or digital interfaces enable engines to meet these requirements.



Typical safety-related automotive pressure sensing applications, such as side impact and pedestrian protection, call for the highest quality and accuracy standards with full ISO 26262 compliance. Every year, thousands of pedestrians are severely injured in traffic due to slow or failing sensing elements.
Our Infineon XENSIV™ safety pressure sensor family includes integrated pressure sensors that tick all these boxes with PSI5 peripheral sensor interfaces for safety-critical use cases. Our sensors support new safety systems, increasing the protection of pedestrians and car occupants in the event of a collision.



Infineon's tire pressure sensors perform all of the functions necessary to implement a state-of-the-art module for a tire pressure monitoring system (TPMS). As part of our XENSIV™ pressure sensors portfolio, our SP49 TPMS sensor ICs are easy to integrate and feature a microcontroller, sensors, wireless communication, and convenient peripherals. They only need a few passive components and a battery to complete a full automotive TPMS sensor assembly.



Our family of digital barometric pressure sensors also gives designers the best choice when it comes to mobile and wearable devices. Highlights include small form factors to facilitate system integration, highest precision and relative accuracy over a wide temperature range, fast read-out speeds via the serial I^2C/SPI interface, and low power consumption to ensure longer battery lifetimes.

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Absolute pressure sensors (MAP and BAP)

Highest accuracy and precision on the smallest footprint and energy bill

Infineon's pressure sensors offer the highest quality and accuracy for safety-relevant automotive, industrial, or consumer lifestyle applications. Typical safety-related automotive pressure sensing applications such as side-impact and pedestrian protection call for the highest quality and accuracy standards with full ISO 26262 compliance. Our XENSIV™ family includes integrated pressure sensors that tick all these boxes with PSI5 peripheral sensor interfaces for a safety-critical use case.

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KP21x/KP22x – Analog manifold air pressure sensor family (MAP + turbo MAP)

Features

- Manifold air pressure measurement – MAP and turbo MAP
- Excellent accuracy of up to 1.0 kPa over a large temperature range
- Ratiometric analog voltage output proportional to the applied pressure
- Output signal fully compensated over pressure and temperature
- Pressure range from 10 to 400 kPa
- Temperature range from -40 to +140°C
- Output clamping (optional)
- Complete product family available with multiple transfer function
- Reverse polarity protection
- Green SMD package



KP23x – Analog barometric air pressure (BAP) sensor family

Features

- Absolute air pressure measurement
- Excellent accuracy of 1.0 kPa over a large temperature range
- Ratiometric analog voltage output proportional to the applied pressure
- Output signal fully compensated across pressure and temperature range
- Pressure range from 15 to 165 kPa
- Temperature range from -40 to +125°C
- Serial service interface
- Open bond detection (OBD) for supply and GND
- Reverse polarity protection
- Green SMD package

KP276 – Media robust MAP sensor with digital interface

Features

- Media robustness for current automotive requirements
- Digital single edge nibble transmission (SENT) interface (282 clock ticks)
- Excellent accuracy of ±0.77% FSS
- Temperature range -40 to +170°C (170°C for 20 min. max., 150°C operating)
- Integrated NTC temperature sensor functionality with fast start up time (typ. 10 ms)
- Green SMD package

Integrated pressure sensor ICs for manifold and barometric air pressure

Product	Max. accuracy [kPa]	Max. operating temperature [°C]	Automotive	Industrial	Classification	Pressure range [kPa]
KP21x	1.0	140	✓	✓	–	10 … 150
KP22x	2.5	140	✓	✓	–	10 … 400
KP23x	1.0	125	✓	✓	–	15 … 115
KP236N6165	1.0	125	✓	✓	–	60 … 165
KP276	3.0	150 (170 time limited)	✓	✓	–	10 … 400

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KP46x – Digital barometric air pressure family in new DFN-8 package

Features

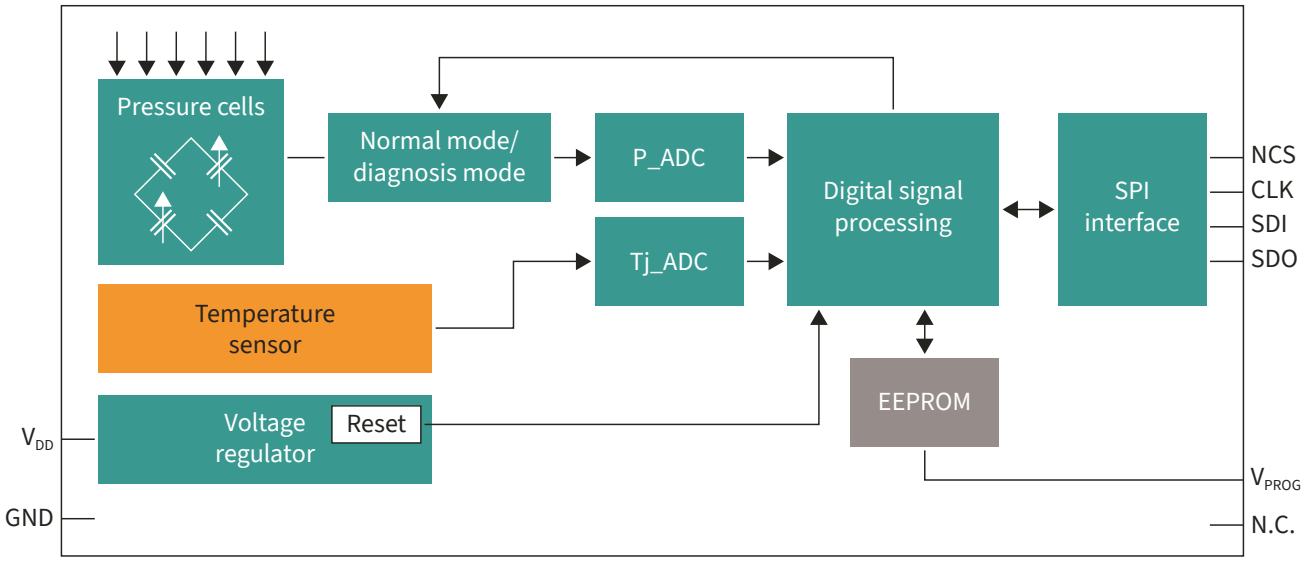
- High accuracy pressure sensing
- Pressure range according to different application needs:
  - ECU/MAF (40–115 kPa)
  - Pneumatic seats (60–165 kPa)
  - BMS thermal runaway (45–200 kPa)
- ISO 26262 compliance for KP467 (ASIL B)
- Operating ambient temperature range -40 … +125°C, KP467 up to 105°C
- Best-in-class low power consumption with dedicated power-down mode for energy saving
- 10-, 12- or 14-bit resolution pressure and temperature values via SPI interface and backwards compatibility to legacy devices KP25x and KP264
- KP467 with autonomous low-power monitoring (LPM) feature for pressure event detection and host wake-up
- Integrated signal path diagnosis features
- Green, small 4.5×5.1 mm 8-pin DFN package for all KP46x



Applications

- KP464/KP464E for ECU and mass airflow sensing to control fuel supply and injection, for air management and ignition
- KP465 for higher pressure levels e.g., within compressed air in fuel-cell applications
- KP466 for pneumatic seat comfort application
- KP466P for pneumatic seat comfort application and thermal runaway detection in battery management system for xEVs
- KP467 for thermal runaway detection in battery management system for xEVs

Block diagram KP46x



Product	Operating pressure range [kPa]	P-accuracy -40°C [kPa]	P-accuracy 0 … +85°C [kPa]	P-accuracy +125°C [kPa]	T-accuracy +25 … +85 [°C]	Supply current I_{VDD} [mA]	Supply current power down I_{VDD_PD} [µA]	Classification
KP464	40 … 115	±1.5	±1.0	±1.5	±3	3.5 (without SPI comm.)	10	AEC-Q103
KP464E	40 … 115	±1.5	±1.0	±1.5	±3	3.5 (without SPI comm.)	10	AEC-Q103
KP465	60 … 320	±5.0	±3.0	±5.0	±3	3.5 (without SPI comm.)	10	AEC-Q103
KP466	60 … 165	±4.0	±1.0	±2.0	±3	5 (without SPI comm.)	10	AEC-Q103
KP466P	60 … 165	±1.5	±1.0	±1.5	±3	5 (without SPI comm.)	10	AEC-Q103
KP467	45 … 200	±3.0 kPa (lifetime) ±1.5 kPa (0h) ±4% of LPM threshold (±2 kPa max.)			±3	– 3.5 mA (on mode without SPI comm.) – typ. 50 µA (in LPM)	10	AEC-Q103 ISO 26262-compliant

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KP497 – Advanced digital barometric air pressure and acceleration sensor

Features

- Pressure range for thermal runaway detection: 20–250 kPa
- Integrated acceleration sensor for battery shock monitoring
- ISO 26262-compliant (ASIL A)
- 2kB flash memory available for storage of customer specific data, e.g., battery passport relevant data
- High accuracy pressure sensing
- Operating ambient temperature range -40 … +105°C
- Ultralow power consumption with dedicated power-down mode for energy saving
- Autonomous low-power monitoring (LPM) feature for event detection and host wake-up



Applications

- KP497 calibrated for thermal-runaway-detection in battery management systems for xEVs by sensing critical air pressure
- Determination of the economic value of the battery over the course of its life cycle in relation to mechanical influences and shocks; with that essential part of the information for battery passport for xEVs and for reprocessing and reuse of batteries

Product	Operating pressure range [kPa]	P-accuracy [kPa]	T-accuracy [°C]	Typ. supply current power down at 25°C I_{VDD_PD} [µA]	Classification
KP497 [1)]	20 … 250	±2	±3	0.24	AEC-Q100 ISO 26262-compliant

1) Coming Q2/2025

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Pressure sensors for side crash detection (SAB)

PSI5 PRO-SIL™-ready pressure sensors for side impact detection and pedestrian protection

Passive safety vehicle systems have improved significantly over the last few years, especially in terms of front impact, side impact, and pedestrian impact detection. Legal regulations and consumer tests have been the main drivers (e.g., FMVSS 214, UN ECE R135, NCAP) for increased penetration. Infineon Technologies' next-generation PSI5 safety pressure sensor family enables very fast reaction times and will help you to fulfill existing and future tests.

The pressure sensor is assembled in a module within the car's side doors in the side airbag application. When the door is compressed due to a side impact, the KPx0x provides a signal pulse proportional to the pressure change inside the door. In the pedestrian protection application, the pressure sensing system based on KP201/KP305/KP405 is mounted within the car's front bumper. In case of an impact, a pedestrian protection device is triggered. The KP201/KP305/KP405 extended pressure range allows common pedestrian protection systems to support front impact detection scenarios and also supports side crash systems.

Features and benefits

Key features	Key benefits
– PSI5 peripheral interfaces	– Fully compliant to PSI5 and AK-LV29/38 and extended pressure range addendum
– Easy customization with end of line programming via PSI5 interface in the final customer module	– ISO 26262-compliant development to be used in ASIL B(D) systems
– Low design-in effort due to drop-in compatibility to previous safety pressure sensor family	– Patented built-in diagnosis for pressure cells and circuitry
– Best-in-class cost performance	– SMD package: DFN-8-1

Product summary

Type	Application	Classification	Package
KP200	Side crash detection	ISO 26262-compliant	DSOF-8-16
KP201	Side crash detection Pedestrian impact detection Front crash detection	ISO 26262-compliant	DSOF-8-16
KP204	Side crash detection	ISO 26262-compliant	DSOF-8-164
KP300	Side crash detection	ISO 26262-compliant	DSOF-8-164
KP305	Side crash detection Pedestrian impact detection Front crash detection	ISO 26262-compliant	DSOF-8-164
KP400	Side crash detection	ISO 26262-compliant	DFN-8-1
KP405	Side crash detection Pedestrian impact detection Front crash detection	ISO 26262-compliant	DFN-8-1

PRO SIL

ISO 26262 compliant

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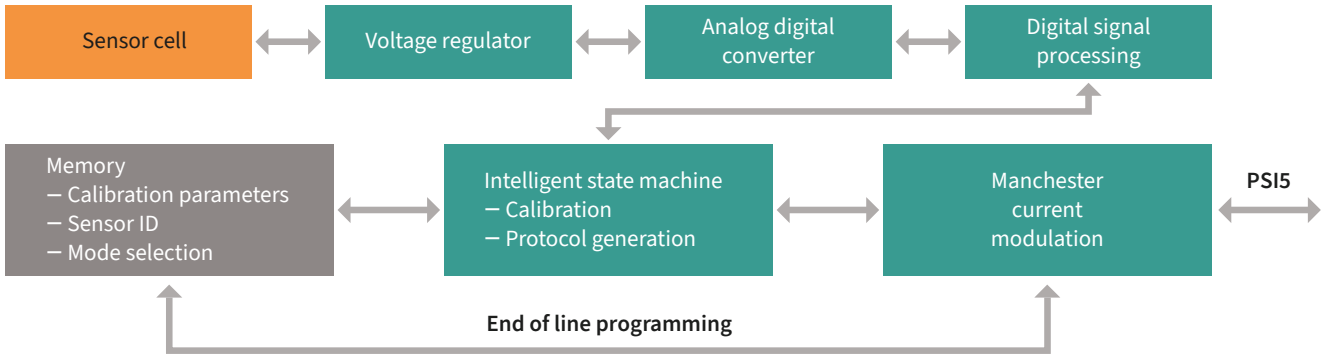
XENSIV™ pressure sensors KP300 and KP305

ISO 26262-compliant pressure sensor for side crash, pedestrian impact, and front crash detection

Infineon's KP30x is a monolithically integrated pressure sensor featuring a programmable PSI5 interface and compliance with AK-LV29/38. An intelligent state machine provides a pressure signal output enabling simple threshold detection algorithms. The amplitude of the signal pulse is independent of the ambient pressure but dependent on the relative pressure change. Several output formats are selectable to provide more design flexibility to the system. The KP30x family forms the next generation of safety pressure sensors and is application-compatible with Infineon's previous generation. ISO 26262-compliant development and corresponding functional safety documentation support the use of the KP30x in ASIL B(D) systems.



Block diagram



Features and benefits

Key features	Key benefits
– Fully compliant to PSI5 and AK-LV29/38 and extended pressure range addendum	– Easy customization with end of line programming via PSI5 interface in the final customer module
– ISO 26262 compliant development to be used in ASIL B(D) systems	– Low design-in effort due to drop-in compatibility to previous safety pressure sensor family
– Patented built-in diagnosis for pressure cells and circuitry	– Best-in-class cost performance
– SMD package: DSOF-8-164	

Product summary

Type	Application	Classification	Package
KP300	Integrated pressure sensors	Side crash detection	DSOF-8-164
KP305	Integrated pressure sensors	Side crash detection Pedestrian impact and front crash detection	DSOF-8-164

PRO SIL

Pedestrian protection

Side airbag

ISO 26262 compliant

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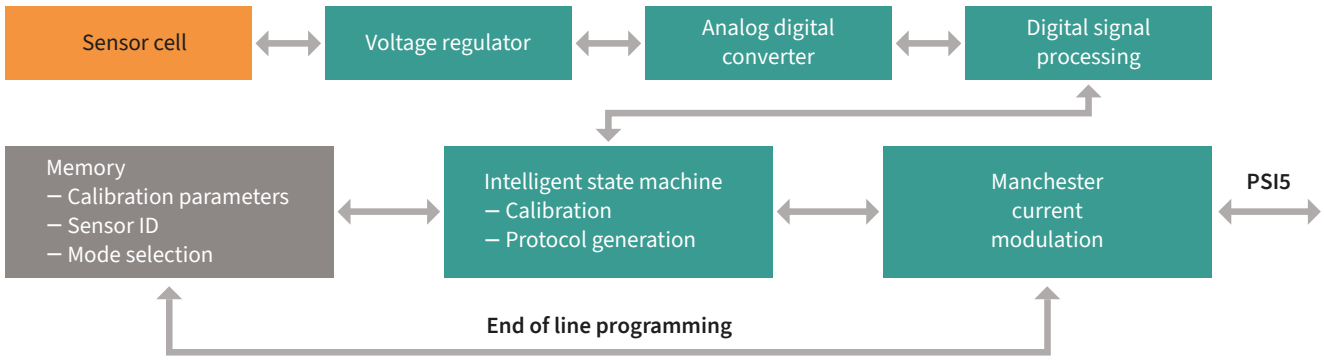
XENSIV™ pressure sensors KP400 and KP405

ISO 26262-compliant pressure sensor for side crash, pedestrian impact, and front crash detection in small DFN package

Infineon's KP40x is a monolithically integrated pressure sensor featuring a programmable PSI5 interface and compliance with AK-LV29/38. An intelligent state machine provides a pressure signal output, enabling simple threshold detection algorithms. The amplitude of the signal pulse is independent of the ambient pressure but dependent on the relative pressure change. Several output formats are selectable to provide more design flexibility to the system. The KP40x family forms the next generation of safety pressure sensors and is fully compatible with Infineon's previous generation. ISO 26262-compliant development and corresponding functional safety documentation support the use of the KP40x in ASIL B(D) systems. Based on the proven chip technology, the KP40x offers best-in-class cost performance and is delivered fully calibrated.



Block diagram



Features and benefits

Key features	Key benefits
– Small holes for intrusion protection	– Fully compliant to PSI5 and AK-LV29/38 and extended pressure range addendum
– Safe operation even with two blocked holes	– ISO 26262-compliant development to be used in ASIL B(D) systems
– Easy customization with end of line programming via PSI5 interface in the final customer module	– Patented built-in diagnosis for pressure cells and circuitry
– Low design-in effort due to drop-in compatibility to previous safety pressure sensor family	– SMD package: DFN-8-1
– Best-in-class cost performance	

Product summary

Type	Application	Classification	Package
KP400	Integrated pressure sensors	Side crash detection	DFN-8-1
KP405	Integrated pressure sensors	Side crash detection Pedestrian impact and front crash detection	DFN-8-1

PRO SIL

Pedestrian protection
Side airbag
RoHS
ISO 26262 compliant

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Tire pressure sensors (TPMS)

SP49 – Tire pressure monitoring sensors

The Infineon SP49 product family provides highly integrated devices that perform all functions for a tire pressure monitoring system (TPMS) wheel module suited for high-volume applications. The devices measure pressure in the range from 100 kPa up to 920 kPa and acceleration between -600 g and 600 g, as well as temperature and supply voltage. Furthermore, they feature efficient power management and an integrated microcontroller. An integrated LF receiver and RF transmitter allows wireless communication.

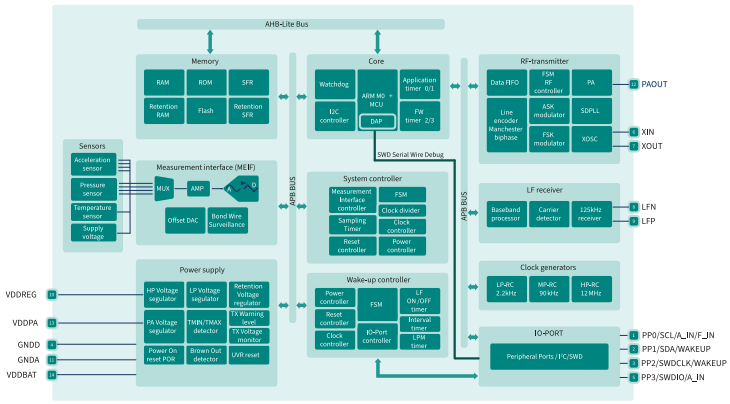
For wired data transfer, the hardware master/slave I2C interface can be used. Further wired interfaces, such as UART, SPI, or PWM, can be realized in software. Infineon's technical leadership in MEMS technology and patented Glass-Silicon-Glass MEMS pressure sensors with best-in-class media compatibility ensure industry-leading performance in TPMS.

Features

Patented Glass-Silicon-Glass MEMS pressure sensor with Best-in-class media compatibility

- Industry-standard power efficient 32-bit Arm® Cortex® [1)]
- 19 kB of flash memory for the application code and/or user data storage; also usable for a bootloader
- 1 kB RAM plus 192 bytes of retention RAM
- Best-in-class lifetime charge consumption

1) Arm® and Cortex® are trademarks of ARM limited, UK

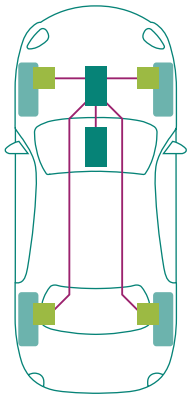


Customer benefits

Optimized for battery-powered applications, the system controller's flexible wake-up and power management, ultralow power down current, and wide range of supply voltages ensure a long battery lifetime (for typical TPMS applications, 10 years with a CR2032 battery).
With the possibility of generating a wake-up from the integrated Interval timer, SP49 products are perfectly suited for standalone remote pressure sensing solutions demanding low charge consumption. For such applications, the LF receiver with wake-up capability and best-in-class sensitivity provides the possibility of on-demand measurements.
SP49 has a tailored ASIC, which is optimized for the following new intelligent tire features.

- On-tire auto-position-sensing (APS)
- Tire filling assist
- Tire burst detection
- Load detection





SP49 fully supports all necessary requirements for a tire pressure monitoring system (TPMS)

Product table

Product variant	Product name	Pressure range [kPa]	Flash size for code [kB]	Package	Ordering code
SP490-01-11	SP49	920	19	DSOSP-14-84	SP005878909
SP490-01-12	SP49i	920	19	DSOSP-14-84	SP005825051
SP49T-05-12	SP49iTruck	1600	19	DSOSP-14-84	SP005957469

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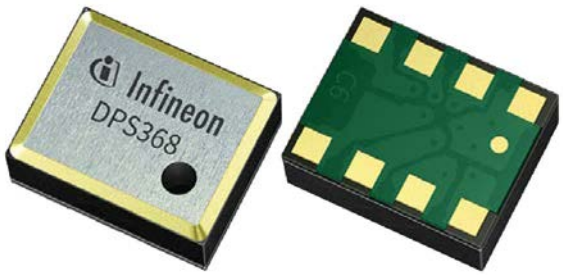
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Pressure sensors for consumer and IoT

DPS368 – Digital barometric pressure sensor for mobile and wearable devices

Infineon's digital barometric pressure sensor DPS368 is the best choice for mobile and wearable devices due to its small form factor, high precision, and low power consumption. Pressure sensing is based on capacitive technology, which guarantees ultrahigh precision (±2 cm) and excellent relative accuracy (±0.06 hPa) over a wide temperature range. The sensor's internal signal processor converts the output from the pressure and temperature sensor elements to 24-bit results. Each pressure sensor has been calibrated individually and contains calibration coefficients. The application uses the coefficients to convert the measurement results to true pressure and temperature values. The sensor has a FIFO that can store the last 32 measurements. Since the host processor can remain in sleep mode for longer between readouts, a FIFO can reduce the system's power consumption. Sensor measurements and calibration coefficients are available via the serial I²C/SPI interface.

DPS368 offers the best-in-class resolution (±2 cm), a very fast readout speed, and low current consumption. The sensor can be used in harsh environments, as it is robust against water (IPx8 - 50 m underwater for 1 hour), dust and humidity. The small package size saves up to 80 percent of the space and makes the DPS368 ideal for mobile applications and wearable devices.



Typical applications

- Drones: altitude detection and height stability
- Health and fitness: accurate elevation gain and step counting (e.g., for smartwatches)
- Outdoor Navigation: GPS start-up time/accuracy improvement; dead reckoning (e.g., in tunnels)
- Indoor navigation: floor detection e.g., in shopping malls and parking garages
- Smart home: micro weather forecasting; room temperature control; intruder detection
- Airflow control: Smart filter replacement alarm (e.g., in home appliances); predictive maintenance
- Health care: fall detection; respiratory devices; smart inhalers

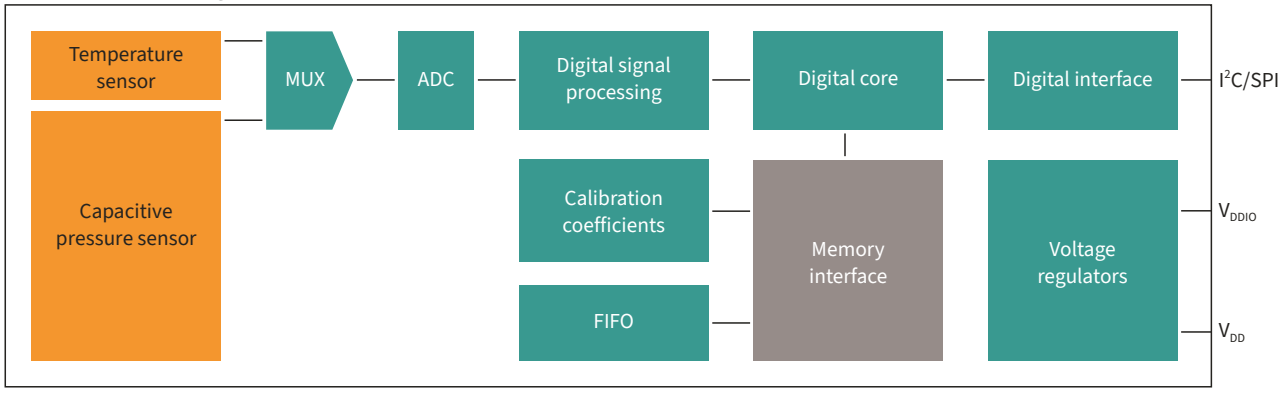
Key product features

Package size	2.0 x 2.5 x 1.1 mm
Operating pressure range	300 … 1200 hPa
Operating temperature range	-40 … 85°C
Pressure level precision	± 0.002 hPa (or ±0.02 m)
Relative accuracy	± 0.06 hPa (or ±0.5 m)
Absolute accuracy	± 1 hPa (or ±8 m)
Temperature accuracy	0.5°C
Pressure temperature sensitivity	0.5 Pa/K
Measurement time	3.6 ms (low precision); 27.6 ms (standard mode)
Average current consumption at 1 Hz sampling rate	1.7 µA pressure measurement, 1.5 µA temp. measurement, standby 0.5 µA
Supply voltage	V_{DDIO}: 1.2–3.6 V; V_{DD}: 1.7–3.6 V
Operating modes	Command (manual), background (automatic), standby
Interface	I²C and SPI, both with optional interrupt

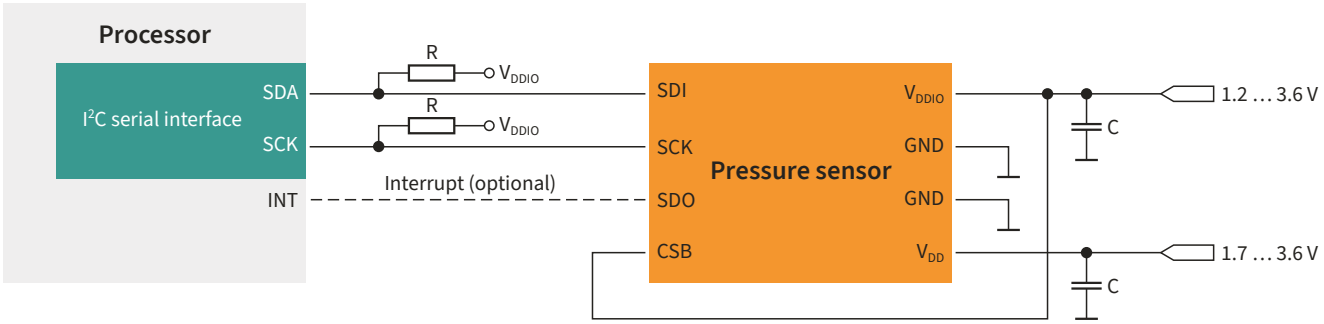
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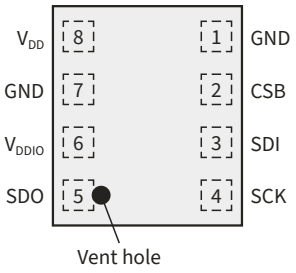
Functional block diagram



Application circuit example (in I²C configuration)



Pin configuration (top view)



Pin	Name	Function
1	GND	Ground
2	CSB	Chip select
3	SDI	Serial data in/out
4	SCK	Serial clock
5	SDO	Serial data out
6	VDDIO	Digital interface supply
7	GND	Ground
8	VDD	Analog supply

Infineon inside pressure sensor partners

Building upon its best-in-class technology, Infineon offers a full range of barometric pressure sensors as chipsets. Infineon's network of global partners offers customers a comprehensive portfolio of Infineon inside pressure sensors that will propel performance to the next level even for the most demanding applications.

Infineon Partner Program

Learn more about our partner program and purchase our partner solutions here.

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MEMS microphones for consumer, industrial, and automotive applications

Infineon XENSIV™ MEMS microphones redefine a growing number of use cases

XENSIV™ MEMS microphones are setting new performance benchmarks across a growing number of industries. These innovative silicon microphones are designed to provide the benefits of the lowest possible self-noise (high SNR) and minimal distortion for an ever-expanding range of applications.

Dedicated digital and analog MEMS mics
Our digital and analog MEMS microphones for consumer applications deliver a studio-quality audio experience in compact form factors such as smartphones or earbuds. Our automotive-qualified solutions, on the other hand, enable the best audio performance in harsh automotive environments improving the in-cabin user experience and passenger comfort. Additionally, they enhance autonomous driving features and contribute to road safety.

MEMS for consumer and industrial applications
Infineon's XENSIV™ MEMS microphones are designed to capture unprecedented precision and quality audio signals. The microphones comprise Infineon's MEMS microphone chips and ASICs, the world's best-selling microphone components. Due to advanced technical characteristics, high-quality standards, and robustness at the chip level, XENSIV™ MEMS microphones add 'hearing' to many consumer applications (earbuds, headphones, wearables, smart speakers, laptops, tables, etc.) and industrial and medical applications (predictive and preventive maintenance, security, patient monitoring systems, etc.).

MEMS microphones for automotive applications
We also offer high-performance MEMS microphones qualified to the AEC-Q103-003 automotive quality standard. They are suited for all applications inside and outside the car where the best audio performance in harsh automotive environments is required. The extended availability of these silicon devices matches the typical long lifecycle of a vehicle.

Typical applications include speech (hands-free/e-call/ICC), voice commands with microphone arrays and beamforming, active and road noise cancellation, and detecting event sounds, sirens, contact, and road conditions.

The extended availability of these silicon devices matches the typical long lifecycle of a vehicle, revolutionizing the use of ATV microphones for a wide range of applications.

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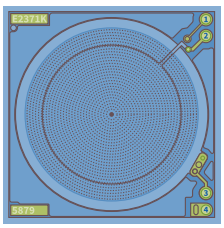
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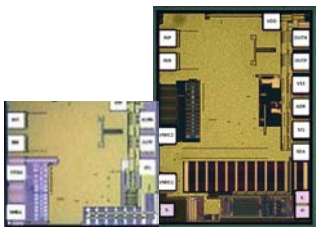
MEMS microphones technology

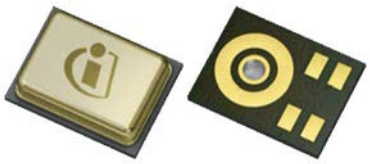
Infineon's XENSIV™ MEMS microphones are designed for capturing audio signals with unprecedented precision and quality. The microphones are comprised of Infineon's MEMS microphone chips and ASICs which are not without reason the world's best-selling microphone components.

Infineon microphone system

MEMS	ASIC	Package







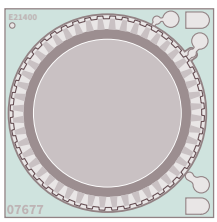
Infineon owns all building blocks of MEMS microphones allowing to develop MEMS, ASIC, and package combinations which achieve the best possible performance and are optimized to each application.

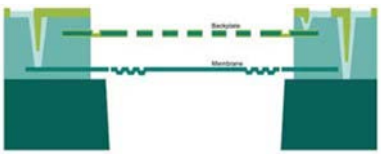
Infineon XENSIV™ MEMS microphones shape the industry on the technology level

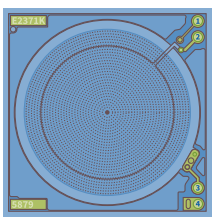
MEMS microphones use an electrically charged backplate and a membrane to form a capacitive sound transducer. The flexible membrane moves proportional to the amplitude and frequency of incoming sound waves. The resulting change in voltage is measured, processed and output by an integrated analog or digital ASIC. Infineon distinguishes two main MEMS technologies:

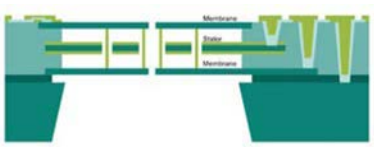
Single backplate technology (SBP)
Single backplate technology (SBP) represents an industry standard for mid-end microphones with its simplicity and robustness. The SBP technology offers the best performance-to-cost ratio, especially for small package sizes and SNR values up to 69 dB SNR.

Sealed Dual Membrane (SDM)
Sealed dual membrane (SDM) is Infineon's revolutionary MEMS microphone technology that utilizes two membranes and a charged stator to create a sealed low-pressure cavity and a differential output signal. The architecture enables ultrahigh SNR (up to 75 dBSNR) and very low distortions and delivers high ingress protection (IP57) at a microphone level. Select SDM technology for best-in-class acoustic performance in medium and larger packages.









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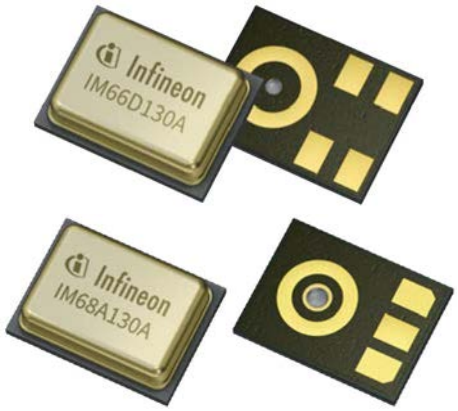
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Your input matters
Share your feedback

MEMS microphones for automotive applications

Qualified according to automotive standard, AEC-Q103-003

As part of our comprehensive XENSIV™ microphone family, we also offer automotive microphones, especially tested and qualified to the stringent needs of automotive use cases. These microphones close the gap in the automotive industry, providing the best possible fit for automotive applications.



Special features and benefits of automotive qualified microphones

- Full automotive qualification according to AEC-Q103-003
- Increased operating temperature range up to +105°C [1)]
- Environmental robust up to IP57 [1)]
- Narrow sensitivity matching for enhanced performance of beam-forming arrays
- Flat frequency and stable phase response down to 7 Hz for optimal performance in acoustic noise cancellation (ANC) applications [1)]
- Very high AOP for high wind-noise robustness ensures stable performance in extremely loud environments of exterior use cases [1)]
- Best-in-class audio performance (SNR, AOP, THD) for optimum speech quality and capture of distortion-free audio signals in loud environments such as inside a car

1) Depending on selected product. See parameter table below for details.

Customer benefits of automotive qualified microphones

Cost saving	– Reduced re-qualification cost for Tier 1 due to minimized risk of qualification failure – Longer available parts enable platform concepts at Tier1/OEM
Quality	– Quality assured for the whole vehicle life by running qualification tests at three different temperatures over the full operating temperature range (-40°C … +105°C) – Compliance with AEC-Q103 and automotive style documentation (PPAP, Qual report, ...) simplifies OEM discussions (no waivers needed)
Performance	– Characterization data over full temperature range provides full transparency of acoustic behavior and avoids late discrepancies – Best-in-class audio performance leads to increased speech intelligibility and improved satisfaction of the end user
Flexibility	– Extended temperature range allow flexible use in different operational areas (internal and external) and various applications – High acoustic-overload-point (AOP) allows flexible placement inside/outside the vehicle
Service and knowledge	– Good reputation of Infineon-Automotive simplifies product selection procedures with OEMs – Premium services with our worldwide support teams shorten the learning curve and design-in cycles – Fast FAR handling, including high traceability, facilitates efficient incident management

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Parameter table: Digital microphones

Key parameters	IM67D130A IM67D120A Optimized for speech	IM66D130A IM66D120A Optimized for ANC and speech	IM64D130A IM64D121A Optimized for mid performance use cases	IM63D135A Optimized for external application
Signal-to-noise ratio (SNR)	67 dB(A)	66 dB(A)	64 dB(A)	63 dB(A)
Sensitivity	-36/-26 dB FS	-36/-26 dB FS	-36/-26 dB FS	-41 dB FS
Acoustic overload point AOP (THD = 10%)	130/120 dB SPL	130/120 dB SPL	130 dB SPL	135 dB SPL
Frequency range	28 Hz … 20 kHz	7 Hz … >20 kHz	7 Hz … >20 kHz	7 Hz … >20 kHz
Package	4.0 x 3.0 mm2	3.50 x 2.65 mm2	3.50 x 2.65 mm2	3.50 x 2.65 mm2
Operating temp.	-40°C … +105°C	-40°C … +105°C	-40°C … +85°C	-40°C … +105°C
AEC-Q103-003 qualification	Yes	Yes	Yes	Yes
Environmental robustness	–	IP57	IP57	IP57
Status	Mass production	Mass production	Mass production	Mass production

Parameter table: Analog microphones

Key parameters	Optimized for ANC	Optimized for mid performance use cases
Signal-to-noise ratio (SNR)	68 dB(A)	64 dB(A)
Sensitivity	-38 dB V	-38 dB V
Acoustic overload point AOP (THD = 10%)	130 dB SPL	130 dB SPL
Frequency range	10 Hz … 18 kHz	10 Hz … 18 kHz
Package	3.35 x 2.50 mm2	3.35 x 2.50 mm2
Operating temp.	-40°C … +105°C	-40°C … +85°C
AEC-Q103-003 qualification	Yes	Yes
Environmental robustness	IP57	IP57
Status	Mass production	Mass production

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Typical applications for automotive MEMS microphones in-cabin and outside of the vehicle



Speech: Hands free/e-call/ICC
Enabling distortion-free audio capturing for all speech-related applications thanks to the high SNR and low distortions.
Recommended products:
IM66D1x0A, IM68A130A, IM64D1xxA, IM64A130A

Interior



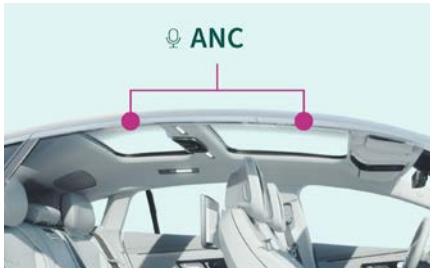
Speech: Microphone arrays/beamforming
Improved beam forming and noise suppression capabilities of microphone arrays, due to the narrow sensitivity and phase matching.
Recommended products:
IM67D1x0A, IM66D1x0A

Interior



Speech recognition/voice commands
Best speech intelligibility for speech recognition due to high SNR and low distortions.
Recommended products:
IM67D1x0A, IM66D1x0A, IM68A130A

Interior



Active and road noise cancellation (ANC/RNC)
Enabling a quite environment for comfortable travels with best ANC performance, thanks to the flat and stable frequency and phase response at lowest frequencies.
Recommended products:
IM66D1x0A, IM68A130A

Interior



Event sound detection/siren detection
Contributing to road safety, by detecting sounds like sirens from emergency vehicles or even dangerous road conditions even thanks the large dynamic range and high acoustic overload point.
Recommended products:
IM63D135A, IM66D130A, IM68A130A

Exterior



Voice recognition/external interaction
Allowing external interaction via voice commands and good speech intelligibility due to high SNR and low distortions (THD)
Recommended products:
IM66D130A, IM63D135A

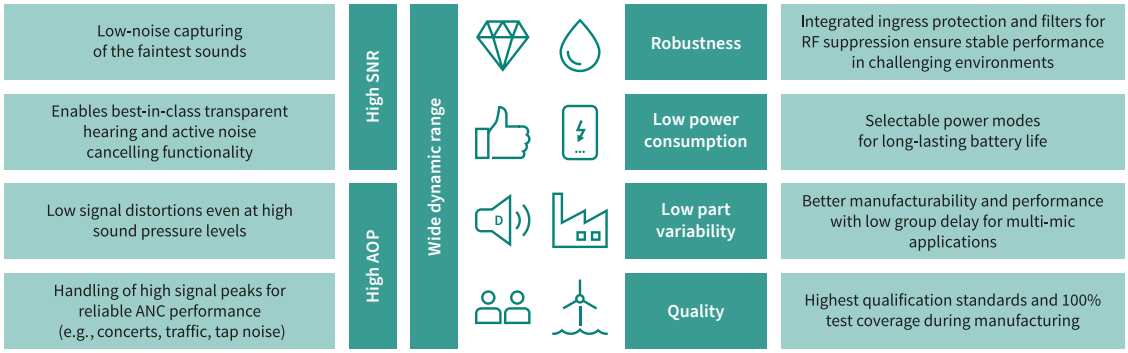
Exterior

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MEMS microphones for consumer applications

XENSIV™ MEMS microphones feature ultralow self-noise (high SNR), extremely low distortions (THD) even at high sound pressure levels (SPL), very tight part-to-part phase and sensitivity matching, a flat frequency response with a low LFRO (low frequency roll-off), and an ultralow group delay. Combined with selectable power modes and their very small package size, Infineon XENSIV™ MEMS microphones, combined with selectable power modes and their tiny package size, perfectly match consumer electronics with excellent audio-capturing functionalities and selected industrial applications such as predictive maintenance and security.



XENSIV™ MEMS microphones product portfolio

	Infineon model	Main features	Interface	Package size	SNR	AOP (1/10%THD)	Current	Sensi-tivity	LFRO [Hz]
Digital	IM69D130	High SNR and high AOP	PDM	4 x 3 x 1.2 mm	69 dB(A)	128/130 dBSPL	980 µA at 3.072 MHz	-36 dBFS	28 Hz
	IM69D120	High SNR and sensitivity	PDM	4 x 3 x 1.2 mm	69 dB(A)	118/120 dBSPL	980 µA at 3.072 MHz	-26 dBFS	28 Hz
	IM69D127	High performance in small size	PDM	3.60 x 2.50 x 1 mm	69 dB(A)	123/127 dBSPL	980 µA at 3.072 MHz	-34 dBFS	40 Hz
	IM69D128S	Ultralow current consumption	PDM	3.5 x 2.65 x 1 mm	69 dB(A)	125/128 dBSPL	520 µA at3.072 MHz	-37 dBFS	30 Hz
	IM70D122	High SNR and sensitivity	PDM	3.5 x 2.65 x 1 mm	70 dB(A)	120/122 dBSPL	980 µA at 3.072 MHz	-26 dBFS	30 Hz
	IM72D128	Ultrahigh SNR	PDM	4 x 3 x 1.2 mm	72 dB(A)	126/128 dBSPL	980 µA at 3.072 MHz	-36 dBFS	20 Hz
	IM73D122	Ultrahigh SNR and sensitivity	PDM	4 x 3 x 1.2 mm	73 dB(A)	120/122 dBSPL	980 µA at 3.072 MHz	-26 dBFS	20 Hz
	IM72D128V NEW	Ultralow current consumption	PDM	4 x 3 x 1.2 mm	71.5 dB(A)	125/128 dBSPL	430 µA at 3.072 MHz	-36 dBFS	11Hz
	IM68D121J NEW	High SNR, high sensitivity & low IDD	PDM	3.5 x 2.65 x 0.98 mm	68 dB(A)	118/121 dBSPL	580 µA at 3.072 MHz	-26 dBFS	20 Hz
	IM68D128B NEW	High SNR & low IDD	PDM	3.5 x 2.65 x 0.98 mm	67.5 dB(A)	122/128 dBSPL	580 µA at 3.072 MHz	-37 dBFS	20 Hz
	IM66D132H NEW	High 1%/10% THD & low IDD	PDM	3.5 x 2.65 x 0.98 mm	66 dB(A)	128/132 dBSPL	580 µA at 3.072 MHz	-37 dBFS	20 Hz
	IM69D129F NEW	Ultralow power	PDM	3.50 x 2.65 x 0.98 mm	69 dB(A)	127/129 dBSPL	450 µA at 3.072 MHz	-36 dBFS	11 Hz
	IM66D130M NEW	Small package & low IDD	PDM	3 x 2 x 0.98 mm	66 dB(A)	124/130 dBSPL	550 µA at 3.072 MHz	-37 dBFS	35 Hz
Analog	IM68A130	Small package and low LFRO	Single Ended	3.35 x 2.5 x 0.98 mm	68 dB(A)	118/130 dBSPL	110 µA at 2.75 V	-38 dBV	10 Hz
	IM70A135	High SNR and high AOP	Differential	3.5 x 2.65 x 1 mm	70 dB(A)	132/135 dBSPL	170 µA at 2.75 V	-38 dBV	37 Hz
	IM73A135	Ultra-high SNR and high AOP	Differential	4 x 3 x 1.2 mm	73 dB(A)	132/135 dBSPL	170 µA at 2.75 V	-38 dBV	20 Hz

All XENSIV™ consumer microphones have bottom port. All SDM (Sealed Dual Membrane) XENSIV™ microphone deliver IP57 ingress protection on the component level for better manufacturability and robustness against water and dust.

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XENSIV™ MEMS microphone boards

The Infineon Audiohub Nano

The Infineon Audiohub Nano enables better evaluation of Infineon XENSIV™ microphones. The kit includes an Infineon Audiohub Nano and four microphones on flex board. Up to two additional Infineon XENSIV™ MEMS microphones can be connected to the mono or stereo output evaluation board. The evaluation board provides a USB audio interface to stream audio data from the microphone to any audio recording and editing software. The board has two different interfaces: analog and digital.

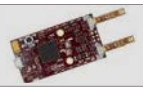
Summary of Features

- Audio interface for analog XENSIV™ MEMS microphones
- Audio streaming over USB interface
- 48 kHz sampling rate
- 24-bit audio data (stereo)
- Dynamic range 120 dB
- LED indication for the configured gain level in normal mode and low power mode
- Volume unit meter display with onboard LEDs
- Powered through Micro-USB

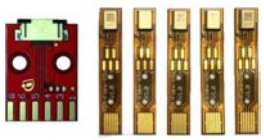
Summary of Features

- Audio streaming over USB interface
- 48 kHz sampling rate
- 24-bit audio data (stereo)
- Mode switch for toggling between normal mode and low power mode with four pre-defined gain configurations
- LEDs indication for the configured gain level in normal mode and low power mode
- Volume unit meter display with on board LEDs
- Powered through Micro-USB

XENSIV™ MEMS microphone boards

Product	Description	SP	OPN	Board
EVAL AHNB DIGITALV01	Digital XENSIV™ MEMS microphones evaluation board	SP005955184	EVALAHNBDIGITALV01TOBO1	
EVAL AHNB ANALOGV01	Analog XENSIV™ MEMS microphones evaluation board	SP005568087	EVALAHNBANALOGV01TOBO1	

XENSIV™ MEMS microphones flex boards

Product	Description	SP	OPN	Flexkit
EVAL_IM69D130_FLEXKIT	– Quick and easy connection to evaluation system – Small size: 25 mm x 4.5 mm – Pre-soldered MEMS microphone – Configurable select pin configuration for digital microphones	SP002153022	EVALIM69D130FLEXKITTOBO1	
EVAL_IM69D120_FLEXKIT		SP002153026	EVALIM69D120FLEXKITTOBO1	
KIT_IM69D127V11_FLEX		SP005403891	KITIM69D127V11FLEXTOBO1	
KIT_IM73A135V01_FLEX		SP005415695	KITIM73A135V01FLEXTOBO1	
KIT_IM72D128V01_FLEX		SP005429924	KITIM72D128V01FLEXTOBO1	
KIT_IM70A135V10_FLEX		SP005728204	KITIM70A135V01FLEXTOBO1	
KIT_IM68A130V01_FLEX		SP005728206	KITIM68A130V01FLEXTOBO1	
KIT_IM69D128SV01_FLEX		SP005744505	KITIM69D128SV01FLEXTOBO1	
KIT_IM70D122V01_FLEX		SP005826638	KITIM70D122V01FLEXTOBO1	
KIT_IM72D128VV01_FLEX		SP006038668	KITIM72D128VV01FLEXTOBO1	
KIT_IM66D130MV01_FLEX		SP006038060	KITIM66D130MV01_FLEXTOBO1	
KIT_IM66D132HV01_FLEX		SP006038061	KITIM66D132HV01_FLEX TOBO1	
KIT_IM68A130V01_FLEX		SP005728206	KITIM68A130V01_FLEX TOBO1	
KIT_IM68D128BV01_FLEX		SP006114517	KITIM68D128BV01_FLEX TOBO1	
KIT_IM68D121JV01_FLEX		SP006155584	KITIM68D121JV01FLEXTOBO1	
KIT_IM69D129FV01_FLEX		SP006038667	KITIM69D129FV01FLEXTOBO1	

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Features, applications, and use cases for MEMS microphones for consumer

Features

- Ultralow self-noise/ultrahigh SNR
- Selectable power modes for longer battery life
- Sealed dual membrane (SDM) technology with ingress protection at microphone level
- Extremely low distortions (THD) even at high sound pressure levels
- High dynamic range and very high acoustic overload points (AOP)
- Very tight part-to-part phase and sensitivity matching
- Flat frequency response with a low LFRO (low frequency roll-off)
- Ultralow group delay for multi-mic applications
- Very small package sizes for various applications



Typical use cases

- Studio quality audio capturing for communication devices
- Low-latency wide-band audio signal capturing for active noise cancellation (ANC) and transparent hearing functionality
- Small form factor and current consumption for battery and size-constrained devices
- Multi-microphone (array) based beamforming and source separation for audio zoom features and multiuser audio capturing
- High range, far field voice pickup for multi room applications
- Capturing of audio signals in loud environments, such as outdoor
- Audio pattern detection for predictive and preventive maintenance and security

Applications

- TWS earbuds
- ANC headphones
- Smart speakers
- Conference speakers
- Laptops/tablets
- Wearables
- AR/VR devices
- Cameras
- Video doorbells
- Smart home
- Smart infrastructure
- Home appliances
- Industrial applications
- Medical applications

Visit the Infineon Developer Community to get the support on your design with our audio experts. Furthermore, you can delve into Knowledge Based Articles, learn about MEMS mics specifications, foundational differences between ECM and MEMS technologies, get electrical implementation hints, and so much more!

Learn more about our partner program and purchase our partner solutions here.

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Radar sensors for consumer, industrial, and automotive applications

Giving technology the ability to “see”

Radar offers a host of advantages over passive infrared (PIR) technology in motion detection applications. These include greater accuracy and more precise measurement of detected objects, paving the way for new speed detection and motion sensing capabilities. These advanced capabilities enable all sorts of “things,” such as robots, cars, smart home devices and even lights, to “see” their surroundings and respond dynamically.

As a leading provider of radar chip technology, we offer a comprehensive range of mmWave radar sensors within our XENSIV™ family, which operates at 24 GHz and 60 GHz frequencies. These sensors cater to diverse industrial, consumer, and automotive applications. In addition, our RASIC™ family of radar front-end MMICs supports 77/79 GHz frequencies and is designed for automotive radar applications, offering a complete solution for a wide range of use cases, from basic warning functions such as lane change assist (LCA) and blind spot detection (BSD) to advanced active safety systems like automatic emergency braking (AEB) and dynamic driving features like adaptive cruise control (ACC).

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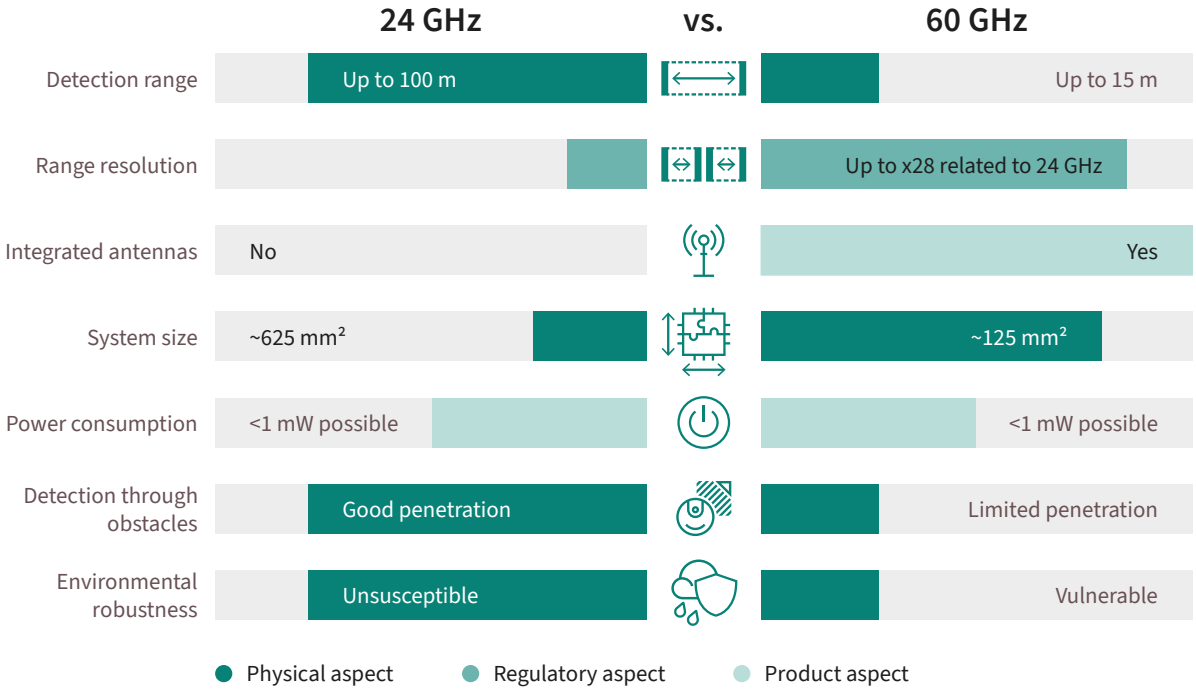
As the market leader in radar chips, we offer a wide portfolio of mmWave radar sensors as part of our XENSIV™ sensor family – including Doppler radar as well as FMCW radar systems. This portfolio includes the smallest 24 GHz MMIC in the market as well as the most integrated and largest 24 GHz radar transceiver family currently available. These radar chips are designed to support different industrial, smart home, and consumer applications. In addition, we also offer radar sensors in the 60 GHz range, which are used in consumer products such as the Google Pixel 4 smartphone.

Motion detection with radar offers significant advantages over PIR and other motion-sensing technologies

Our 24- and 60-GHz radar sensors cover a wide range of applications. Many of them are based on motion detection triggering systems, such as lighting solutions, automatic doors, camera and security systems, or smart home devices. In contrast to other motion detection technologies like PIR, radar technology offers significant advantages. These include smaller system sizes, greater accuracy, and more precise measurements of detected objects. In addition, radar can also determine the direction of a moving object, the speed of an object, distance, and, depending on the antenna configuration, even the position of a moving object.

When to use 24 GHz or 60 GHz radar technology

In the 24 GHz range, the bandwidth for FMCW radar operations covers 250 MHz within the regulated ISM band. In the 60 GHz regime, an unlicensed ultrawideband of up to 7 GHz can be used for short-range applications. Consequently, 60 GHz FMCW radar systems can offer a better resolution, allowing additional use cases such as human tracking and segmentation. Due to micromotion detection, radar technology makes gesture control, material classification, and monitoring of various vital functions (respiration, heartbeat, or blood pressure) possible.



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Your input matters
Share your feedback

Radar implementation can bring several benefits to different applications:

Smart TV



Safe energy and OLED lifetime by turning off

HVAC



Track people to move the airflow away from them

Security



Security camera and doorbells

Lighting



Indoor and outdoor. Resistant to harsh weather

Monitors and laptops



Small, hidden, sensitive

Home appliances



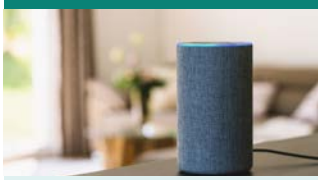
Activate displays and control it with gestures

Door opening



Direction of travel to remove false opening

Smart speaker



Eliminate keyword based activation

Smart Home



Robust, discreet, small

Gaming and VR



Enhance gaming experience

Smart toilet



Presence sensing and water level detection

Service robots



Robust, small footprint, accurate

Robotics



Safety, accuracy and efficiency

Sleep monitoring systems



Breathing and heart rate measurement

Summary of key benefits

- Direction, proximity, and speed detection
- Segmentation and tracking functionalities
- Target positioning
- Detection through non-conductive materials
  - Product design flexibility
  - Anonymous sensing
- Maintains operation through harsh environmental conditions such as rain, snow, fog, dust, etc.
- Sensitive enough to capture breathing and heart-beat
  - Radar can feel presence and vital functions
- Radar performance parameters can be adjusted
  - Adaptable to different application requirements

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XENSIV™ 24 GHz radar for automotive

XENSIV™ BGT24ATR22 24 GHz pulsed Doppler radar transceiver

The BGT24ATR22 is a monolithic microwave integrated circuit (MMIC) for 24 GHz radar applications. It provides building blocks for analog signal generation and reception, operating in the frequency range from 24 GHz up to 24.25 GHz.

Key features

- 24 GHz radar transceiver
- Two Tx channels
- Two Rx channels
- Low-phase noise VCO
- Automatic frequency control
- Automatic DC offset compensation
- State machine with ultralow power modes
- 12-bit ADC
- Digital radar data processing unit
- Temperature range: -40°C to +105°C
- VQFN-32 RoHS compliant, leadless package



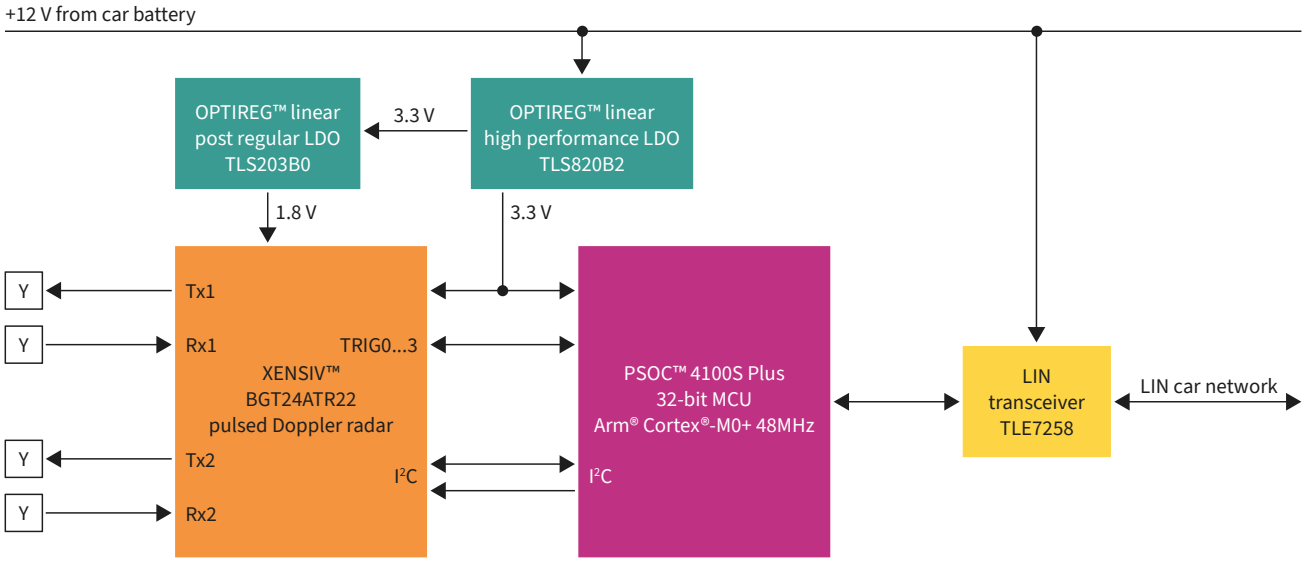
Applications

- Automotive short-range radar
- Hands-free trunk and door opening
- Motion detection
- Touchless switches

Benefits

- Compact PCB design due to high level of integration
- Ultralow power consumption modes for 24/7 use cases
- Low system costs due entry-level only microcontrollers
- Autonomous motion sensing
- Globally approved 24 GHz radar with excellent characteristics for robust and reliable performance in harsh environmental conditions

Smart trunk opener system diagram



24 GHz – Product overview

Product	OPN	Qualification	Frequency min Frequency max	NF	Packages
BGT24ATR22	BGT24ATR22E6433XUMA1	AEC-Q100	24–24.25	NFSSB: 13 dB at 1 kHz	VQFN-32-9

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Your input matters
Share your feedback

XENSIV™ 60 GHz radar for automotive

XENSIV™ BGT60ATR24C 60 GHz radar sensor for automotive enables highly reliable in-cabin monitoring systems

XENSIV™ BGT60ATR24C, an automotive 60 GHz radar sensor, enables ultrawide bandwidth FMCW operation in a small package. Sensor configuration and data acquisition are enabled with a digital interface, and the integrated state machine enables independent data acquisition with power mode optimization for lowest power consumption.

Summary of features

- 60 GHz radar sensor for FMCW operation
- 4 GHz bandwidth
- 2Tx/4Rx channels
- Digital interface for chip configuration and radar data acquisition
- Optimized power modes for low-power operation
- Integrated state machine for independent operation
- AEC-Q100/101 qualified

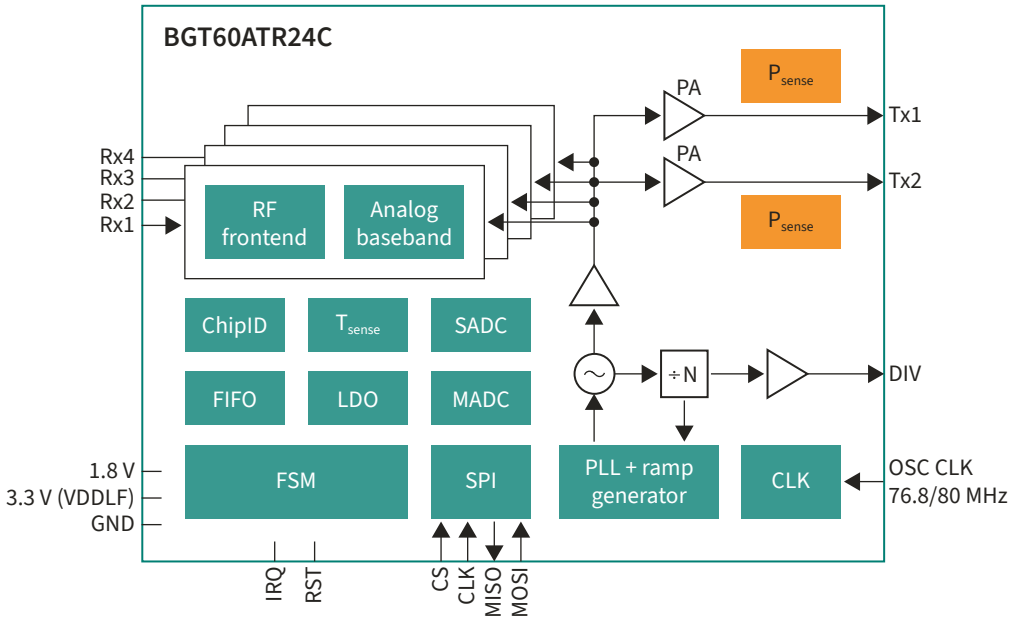


Benefits

- Low power consumption
- Accurate and robust performance
- Excellent thermal management
- Size and space optimized solution

Potential applications

- Radar frontend for gesture sensing
- High resolution FMCW radars
- Short range sensing operations
- Hidden sensing applications behind radome



60 GHz – Product overview

Product	Frequency [GHz]	Ordering code	Packages
BGT60ATR24C	58–62	SP005350514	VFWLB-76-1
SHIELD_60ATR24ES_01	58–62	SP005448216	-

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RASIC™ 77/79 GHz radar for automotive

RASIC™ front-end radar tranceivers ICs

Infineon has been delivering automotive 77 GHz radar products for over a decade. Infineon's RASIC™ family of radar transceiver MMICs addresses the needs of 77/79 GHz radar for all safety-critical applications, from automatic emergency braking (AEB) to high-resolution radars in automated driving. It supports precise distance measurement and simultaneous transmitter operation for MIMO.

RXS81xxx and CTRX8191F are highly integrated devices that perform all functions of a radar front-end in a single device—from FMCW signal conditioning to generation of digital receive data output. On-chip temperature and output power sensors and multiple monitoring circuits allow calibration and monitoring. Controlling the MMIC is done via SPI. CTRX8191F additionally offers cascading functionality, thus enabling up to 24T24R radar systems.

Infineon offers a complete suite of 77/79 GHz radar chipsets consisting of

- Radar 77 GHz transceiver MMIC (RASIC™) with RXS81xxx and CTRX8191F
- Radar MCU family featuring radar signal processing
- units (AURIX™ TC3xx and TC4xx)
- Radar system power supply with numerous safety functions (TLF3068x)

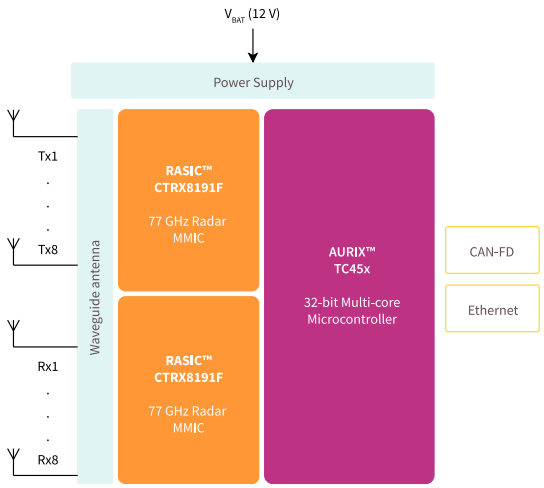
Customer benefits:

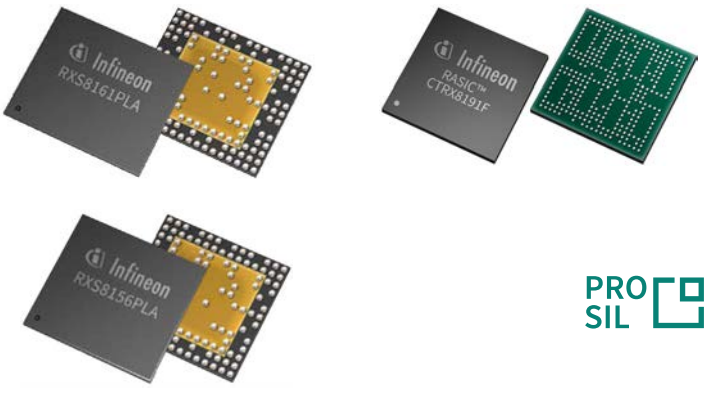
- One 77/79 GHz radar platform supporting all types of automotive radar applications
- Scalability by cascading multiple MMICs and MCUs enabling most advanced sensors
- Flexibility through numerous configuration parameters
- ASIL C support reducing customer R&D efforts

77 GHz – Product overview

Product	Config.	Key benefits	Features
RXS816xPL	3Tx4Rx	RXS8161PLx: Standalone transceiver MMIC	– Transmit channels (2Tx - 4Tx, up to 4 GHz BW within 76–81 GHz) – Receive channels: 4Rx – Integrated PLL (Phase Locked Loop) – Sequencer enabling the execution of a user-defined ramp configuration – Integrated Analog-to-Digital Converter (ADC) – Integrated calibration functionality – Build-in monitoring functionality – Compliant to IS0 26262; capable for up to ASIL C
RXS8156PLA	2Tx4Rx	RXS8156PLA: Cost-optimized transceiver MMIC	
CTRX8191F	4Tx4Rx	Transceiver MMIC with cascading	
CTRX8191FS	4Tx4Rx	Standalone transceiver MMIC	

Please be aware that 77/79 GHz radar products are not available via Infineon's distribution partners.





PRO SIL

ISO 26262 compliant

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XENSIV™ 60 GHz radar for consumer and IoT

Infineon's innovative XENSIV™ 60 GHz radar chip enables things to see and revolutionizes the human-machine interface.

XENSIV™ Radars product portfolio

Product	SP	OPN	Description	Packages
BGT60TR13C	SP002262606	BGT60TR13CE6327XUMA1	XENSIV™ 60 GHz FMCW radar sensor for advanced sensing	VF2BGA-40
BGT60UTR11AIP	SP005407929	BGT60UTR11AIPXUMA1	XENSIV™ 60 GHz highly integrated FMCW radar sensor	VF2BGA-28-1
BGT60LTR11AIP	SP005537624	BGT60LTR11SAIPXUMA1	XENSIV™ 60 GHz completely autonomous pulsed-Doppler radar sensor, operating in the frequency band from 61 GHz to 61.5 GHz.	UF2BGA-421
BGT60LTR11SAIP	SP005832449	BGT60LTR11SAIPXUMA1	Japanese version of XENSIV™ BGT60LTR11AIP, operating in the frequency band from 60.5 GHz to 61 GHz (Japanese ISM band)	
BGT60LTR11BAIP	SP005547020	BGT60LTR11BAIPXUMA1	Down-specified version of XENSIV™ BGT60LTR11AIP with reduced detection range (autonomous mode) and operating temperature from -10 to +70°C	

XENSIV™ Radars boards

Product	SP	OPN	Description
DEMO BGT60TR13C	SP005728718	DEMOBGT60TR13CTOBO1	Demonstration kit, consisting of a Radar Baseboard MCU7 and a XENSIV™ BGT60TR13C sensor shield.
DEMO BGT60UTR11AIP	SP005745304	DEMOBGT60UTR11AIPTOBO1	Demonstration kit, consisting of a Radar Baseboard MCU7 Plus and a XENSIV™ BGT60UTR11AIP sensor shield.
DEMO BGT60LTR11AIP	SP005422969	DEMOBGT60LTR11AIPTOBO1	Demonstration kit, consisting of a Radar Baseboard MCU7 and a XENSIV™ BGT60LTR11AIP sensor shield.
SHIELD_AUTONOM_BGT60	SP005630363	SHIELDAUTONOMBGT60TOBO1	Shield for fully autonomous operation of XENSIV™ BGT60LTR11AIP; directly fits on Arduino MKR board
S2GO RADAR BGT60LTR11	SP005594890	S2GORADARBGT60LTR11TOBO1	Shield2Go version of XENSIV™ BGT60LTR11AIP, that can be used in both autonomous/SPI modes.
REF_BGT60LTR11AIP_M0	SP005894766	REFBGT60LTR11AIPM0TOBO1	Reference design with XENSIV™ BGT60LTR11AIP (SPI mode) and XMC™ Cortex®-M0 Microcontroller for data processing.
REF_BGT60LTR11AIP_AUT	SP005636053	REFBGT60LTR11AIPAUTTOBO1	Reference design with XENSIV™ BGT60LTR11AIP (autonomous mode), FCC, CE certified.
KIT_CSK_BGT60TR13C	SP005635357	KITCSKBGT60TR13CTOBO1	Connected Sensor Kit (CSK), consisting of a Rapid IoT Connect Developer Kit Feather board and a XENSIV™ BGT60TR13C Wing board.
KIT_CSK_BGT60UTR11AIP	SP006089336	KITCSKBGT60UTR11AIPTOBO1	Connected Sensor Kit (CSK), consisting of a Rapid IoT Connect Developer Kit Feather board and a XENSIV™ BGT60UTR11AIP Wing board.

BGT60LTR11AIP – XENSIV™ 60 GHz first completely autonomous radar sensor for motion sensing

The BGT60LTR11AIP is a fully integrated microwave motion sensor that includes antennas in package (AIP) and built-in detectors for motion and direction of motion. A state machine enables the device to operate without any external microcontroller. This autonomous mode detects a human target up to 7 m with a low power consumption of less than 2 mW. The BGT60LTR11AIP enables radar technology for everyone since it does not require know-how in RF, antenna design, or radar signal processing. These features make the small-sized radar solution a compelling, smart, and cost-effective replacement for conventional PIR sensors in low-power or battery-powered applications. Also, with its small form factor, Infineon's highly integrated radar sensor solutions bring innovative, intuitive sensing capabilities to many applications.

Radar has been demonstrated to be a powerful sensor for short-range motion detection. Through reliable presence and absence detection, smart devices with radar sensors become more energy-efficient, smart, and sustainable. Users can also benefit from vacancy detection in applications such as televisions. This function not only saves energy but also displays lifetime. BGT60LTR11AIP has a high sensitivity and can detect if a person is present and if the device needs to be ready – similar to a screensaver that deactivates the PC monitor after a certain time without mouse or keyboard input and reactivates it as soon as new input is noticed.

Through this reliable presence and absence detection, Infineon's 60 GHz radar powers the design of truly smart, energy-saving devices. Find out more on our website.

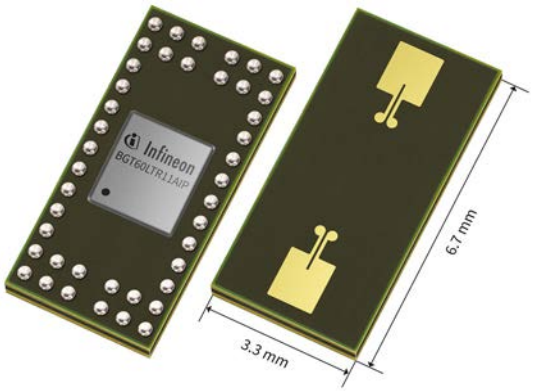
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Key features

- 3.3 x 6.7 x 0.56 mm package size
- 1Tx 1Rx Antennas in Package (AIP) with 80° field of view
- Built-in motion detector
- Built-in direction of motion detector
- Multiple modes of operation including a completely autonomous mode
- Adjustable performance parameters: detection sensitivity, hold time, and frequency of operation
- FR4 material for PCB design is sufficient



Target application

- Smart building and smart home
- Home appliances
- Smart home security
- Room air conditioners
- Automated door openers
- Smart entrance counter solution
- Displays such as TVs, monitors, laptops, or tablets
- Lighting systems and lighting control

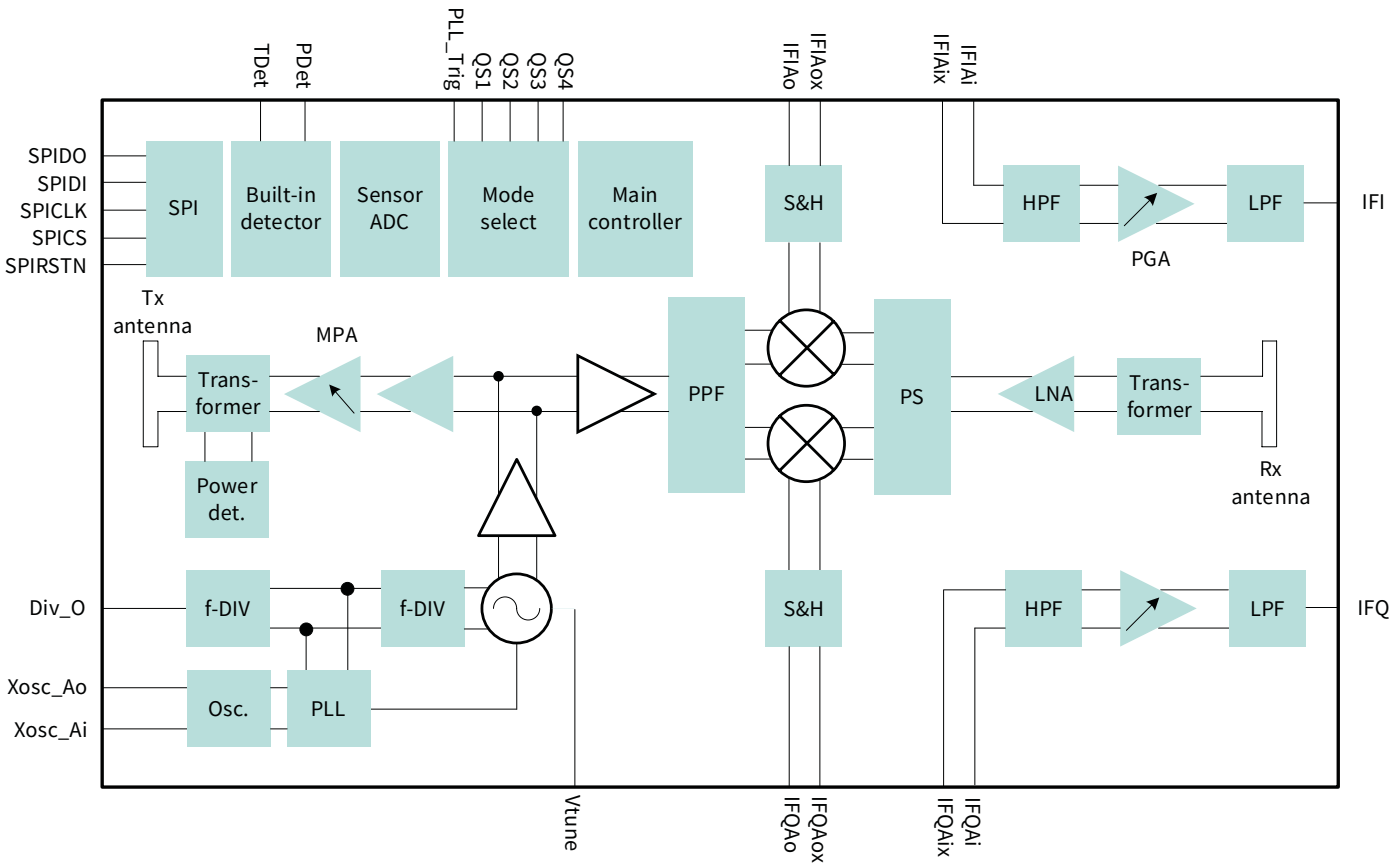
Key benefits

- Autonomous mode
  - Up to 7 m detection range
  - Less than 2 mW power consumption
  - Requires minimal external circuitry including crystal, LDO, and some resistors capacitors

Adding a M0 MCU extends flexibility

- Up to 14 m detection range (SPI mode)
- Less than 2 mW power consumption possible

Block diagram of the BGT60LTR11AIP



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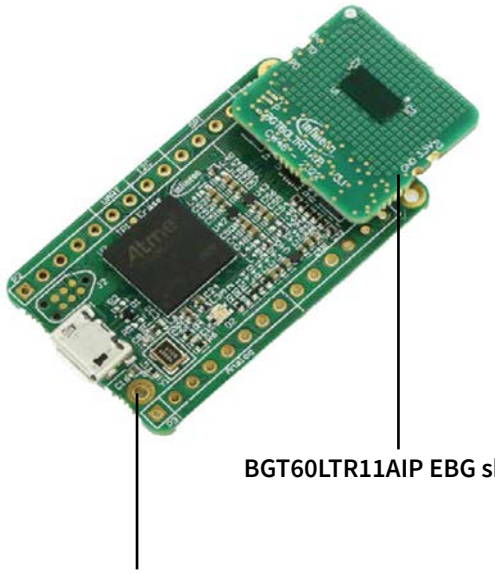
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DEMO BGT60LTR11AIP
XENSIV™ 60 GHz demo board for motion sensing

This demo features Infineon's first completely autonomous radar sensor, the BGT60LTR11AIP. The 60 GHz radar MMIC is a fully integrated microwave motion sensor that includes antennas in package (AIP) as well as integrated detectors for motion and direction of motion. A state machine enables the device to operate without any external microcontroller. This autonomous mode detects a human target up to 7 m with a low-power consumption of less than 2 mW. These features make the small-sized radar solution a compelling, smart, and cost-effective replacement for conventional PIR sensors in low-power or battery-powered applications.

For evaluation of the BGT60LTR11AIP MMIC, this demo includes the BGT60LTR11AIP shield as well as the Infineon Radar Baseboard MCU7.

The BGT60LTR11AIP shield can be attached to an Arduino MKR board or the included Infineon Radar Baseboard MCU7. For first evaluation of the radar sensor, we offer the DEMO BGT60LTR11AIP and the Radar Development Kit (RDK), which can be downloaded via the Infineon Developer Center (IDC).



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BGT60TR13C – XENSIV™ 60 GHz radar sensor for advanced sensing

Enablement of horizontal and vertical angular measurement

The BGT60TR13C MMIC is a 60 GHz radar sensor with integrated antennas and comes with one transmitting and three receiving antennas. Thanks to the antennas in package (AIP) concept, the antenna design complexity at the user end can be eliminated and the PCB-designed with standard FR4 materials.

BGT60TR13C offers innovative and intuitive sensing capabilities

With its small form factor and low power consumption, BGT60TR13C MMIC brings innovative, intuitive sensing capabilities to many applications.

Key features

- Integrated finite-state-machine (FSM)
- Very fast chirp speed: 400 MHz/µs
- High signal-to-noise ratio (SNR)
- Ultrawide bandwidth >5 GHz
- FMCW operation
- Integrated L-shaped antennas and small package size (6.5 x 5.0 x 0.9 mm³)
- <5 mW (duty cycling according to released FCC waiver)

Key benefits

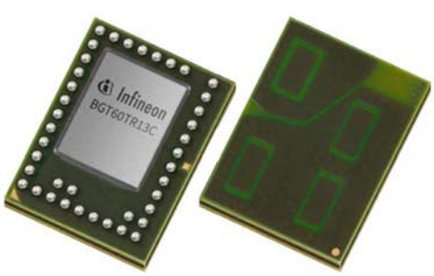
- Allows semi-autonomous operation
- Highly configurable modulation and power modes
- MCU only needs to configure sensor and fetch data
- High velocity resolution
- People can be detected up to 15 m
- High sensitivity allows submillimeter level motion detection
- Allows simultaneous measurement of target range and velocity
- High accuracy of range measurements
- Reduced interference with other sensors
- L-shape enables horizontal and vertical angular measurements
- Thanks to small package size, PCB area can be saved and design-in process simplified
- Reduces average power consumption
- Optimized power modes for low power consumption

Based on the developed algorithm, the MMIC can serve established and new applications and use cases without intruding on privacy. Thanks to its feature set, the MMIC can measure velocity, angle, horizontal, and vertical.

BGT60TR13C demonstrates to be a powerful sensor for:

- Presence detection/segmentation/tracking: BGT60TR13C enables human presence detection, tracking, and segmentation while providing extremely high accuracy in detecting micro and macro motions
- Gesture sensing: BGT60TR13C ensures detection of submillimeter motions
- Vital sensing: BGT60TR13C is able to track vital signs in consumer electronics, healthcare as well as industrial applications

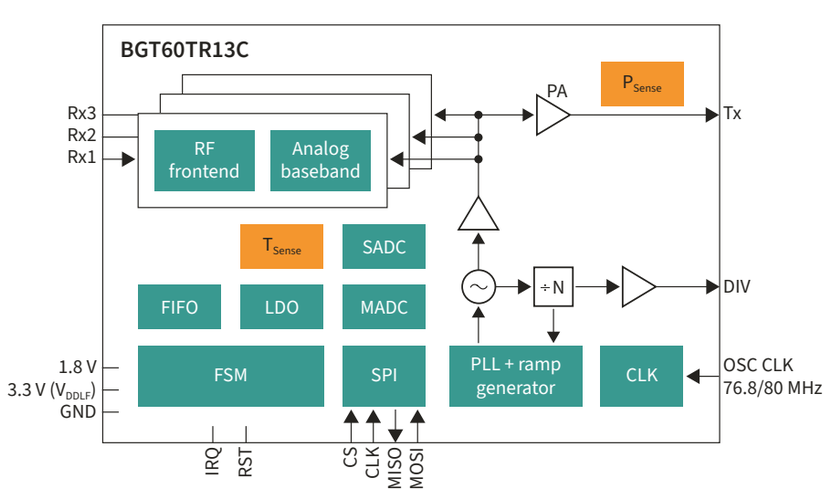
For first evaluation of the radar sensor, we offer the DEMO BGT60TR13C and the Radar Development Kit (RDK), which can be downloaded via the Infineon Developer Center (IDC).



Target application

- Smart TVs
- Smart speaker
- Smart home
- Smart building
- Elderly monitoring
- Vital sensing
- Home appliances

Block diagram of the BGT60TR13C



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DEMO BGT60TR13C
XENSIV™ 60 GHz demo board for advanced sensing

BGT60TR13C offers innovative and intuitive sensing capabilities

This demo board features Infineon's XENSIV™ 60 GHz radar sensor BGT60TR13C, consisting of a Radar Baseboard MCU7 and a BGT60TR13C shield.

The radar baseboard is a 40.64 x 25.4 mm^2 printed circuit board (PCB). Its main purpose is to provide a generic sensor interface for BGT60TR13C MMIC. The central microcontroller unit (MCU) can process radar data or forward the sensor data to a USB interface or an Arduino MKR interface.

Several benefits come along with the BGT60TR13C demo board:

- Flexible platform selection
- Variable connector options, and option to solder onto other PCBs
- Highly flexible configuration on FMCW modulation
- Power consumption can be optimized according to use case

The BGT60TR13C shield presents a minimized form factor of 17 x 12.7 mm2 and comes with an integrated BGT60TR13C Antenna-in-Package (AIP) radar chip of 6.5 x 5.0 x 0.85 mm3. Moreover, the shield contains a digital interface for configuring and transferring the acquired radar data to a microcontroller board. The shield is optimized for fast prototyping designs, system integrations, and initial product feature evaluations. In addition, it offers developers the flexibility to choose their platform depending on their preferred use cases.



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BGT60UTR11AIP – Highly integrated 60 GHz radar sensor for consumer electronics and IoT applications

The BGT60UTR11AIP is optimized for low power consumption and system cost optimization. Its compact size of only 16 mm^2 makes it suitable for integration into the smallest devices. The MMIC is manufactured using Infineon's B11 SiGe BiCMOS technology, ensuring excellent RF performance.

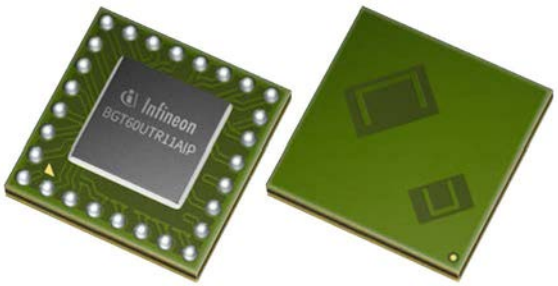
Its 5.6 GHz ultrawide bandwidth allows FMCW operations with extremely high resolution. The detection of sub-mm movements ensures not only extremely sensitive presence and motion detection up to a range of 15 m but also enables mm precise range measurements, 1D gestures, and the measurement of vital signs such as breathing rate and heart rate.

The sensor features a 50 MHz digital SPI interface for configuration and data transfer, while an integrated state machine enables real-time data acquisition without requiring constant interaction with the processor. With three different power modes, users can optimize between performance and power consumption. The BGT60UTR11AIP's sub-mA average current consumption makes it suitable for battery-powered devices.

For first evaluation of the radar sensor, we offer the DEMO BGT60UTR11AIP and the Radar Development Kit (RDK), which can be downloaded via the Infineon Developer Center (IDC).

Features

- 60 GHz radar operating with 6 GHz bandwidth and ramp speed of up to 400 MHz/µs
- Antenna in package (AIP) with ±60° field of view (FoV)
- Integrated finite state machine (FSM) for low power consumption and real-time operation
- 4 MSps ADC sampling rate
- Single 50 MHz SPI for chip configuration and data transfer
- Broadcast mode to trigger and configure multiple devices



Benefits

- High sensitivity to detect sub-mm movements for human presence detection and vital sensing applications
- High bandwidth for precise distance measurements with mm accuracy
- Small size for integration into space-constrained environments
- Low power consumption for battery-driven applications

Applications

- Smart building devices such as door locks, smart doorbells, and air conditioners
- Smart home devices such as smart speakers and thermostats
- Smart appliances such as refrigerators and kitchen machines
- Healthcare devices such as baby monitors and sleep tracker
- Service robots such as vacuum cleaners and lawn mowers
- Security devices such as motion detectors and IP cameras
- Wearables such as headphones and smartwatches
- TVs and notebooks

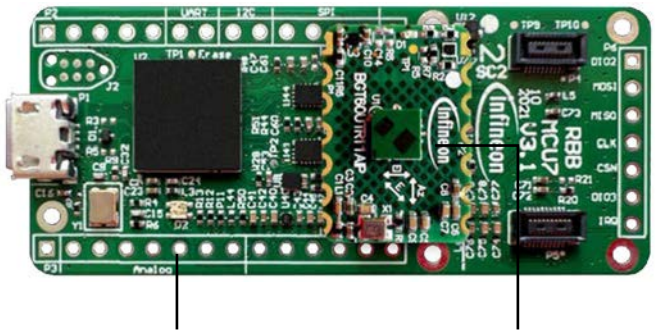
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DEMO BGT60UTR11AIP
XENSIV™ BGT60UTR11AIP 60 GHz radar sensor FMCW demo board

This demo board features Infineon's 60 GHz XENSIV™ radar sensor BGT60UTR11AIP. It consists of a Radar Baseboard MCU7 Plus and a BGT60UTR11AIP sensor shield. The board can be used for product feature evaluations, fast prototyping, and radar algorithm development with the BGT60UTR11AIP.
The BGT60UTR11AIP MMIC has integrated antennas with one transmit and one receive antenna. With its compact size of only 16 mm² and extremely high FMCW performance (5.6 GHz bandwidth), this radar sensor is suitable for a wide range of applications.

The DEMO BGT60UTR11AIP board is supported by our Radar Development Kit (RDK), which can be downloaded from the Infineon Developer Center (IDC).



It contains the Radar Fusion GUI for an instant display of the radar signals as well as predefined applications such as presence detection or distance measurement. For further development of application-specific radar algorithms, C, C++, Python and MATLAB interfaces are provided.

Features of BGT60UTR11AIP shield
- 19 mm x 12.7 mm small form factor
- Digital SPI interface for configuration and data transfer to an MCU
- Standard FR4 laminate
- Castellated holes on the PCB edges for additional signal access
- MCU-controllable LED on board indicating radar sensor status

Features of Radar Baseboard MCU7 Plus
- 59 mm x 25.4 mm size
- Can perform radar data processing Arm® Cortex®-M7 processor or forward the sensor data to an USB interface or an Arduino MKR interface
- Hi-Speed USB 2.0 interface
- Operates with Radar Development Kit and Radar Fusion GUI

Benefits
- Flexible platform selection
- Variable connector options, and option to solder onto other PCBs
- Highly flexible configuration on the FMCW modulation
- Advanced functionalities by SPI configuration or further signal processing
- Power consumption can be optimized according to the radar use case

Applications
- Smart building devices such as door locks, smart doorbells, and air conditioners
- Smart home devices such as smart speakers and thermostats
- Smart appliances such as refrigerators and kitchen machines
- Healthcare devices such as baby monitors and sleep tracker
- Service robots such as vacuum cleaners and lawn mowers
- Security devices such as motion detectors and IP cameras
- Wearables such as headphones and smartwatches
- TVs and notebooks

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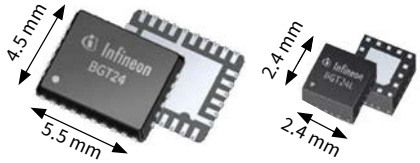
XENSIV™ 24 GHz radar for consumer and IoT

Infineon's range of 24 GHz industrial radar chips provides five configurations of the transmit and receiver channels, ensuring that there is a chip to support your specific application. From basic applications such as motion detection in security systems, which only requires one transmit and one receive channel, to more complex applications like 3D positioning, which requires two or more receive channels, our range of radar chips supports all of your requirements.

Features

- 24 GHz ISM band operation for motion, speed, direction movement and distance measurements
- Five 24 GHz chips available
- Highly integrated MMICs

Infineon MMIC



Benefits

- Long-range distance detection of moving objects up to 50 m
- Wide range speed detection up to ±100 km/h
- Low BOM costs

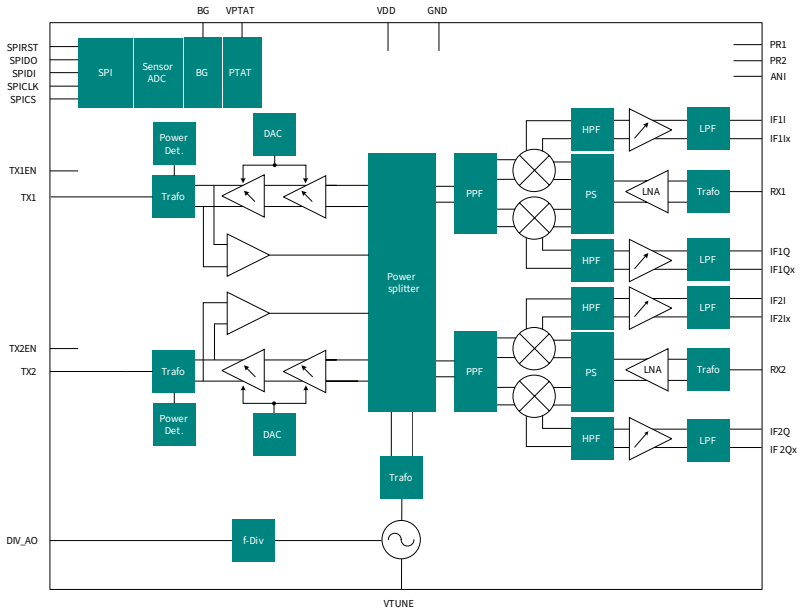
Product	Configuration	Features
BGT24LTR11	1Tx + 1Rx	– Measures, not just motion, but also speed, direction, and distance – Small form factor – Resistance to moisture, dirt, and temperature – Increased area coverage – Discrete design – Low power MMICs for energy saving – Privacy protection – Adaptable to different application requirements – Highly integrated chips eliminating costly external components
BGT24LTR22	2Tx + 2Rx	

BGT24LTR22 – XENSIV™ 24 GHz radar sensor

The BGT24LTR22 key features

- 24 GHz transceiver MMIC
- Fully integrated low phase noise VCO
- Integrated analog base band stage with programmable gain and filter settings
- Bidirectional pin for synchronization
- Built-in temperature compensation circuit for VCO stabilization, no PLL needed
- Low power consumption
- Fully ESD protected device
- Single ended RF and IF terminals
- Single supply voltage 1.5 V

Block diagram of the BGT24LTR22



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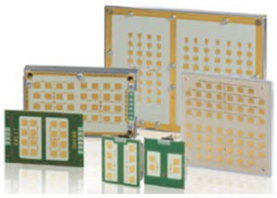
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Radar partner modules

Partnering with the leading radar solution providers enables Infineon to connect with our customers looking for turnkey solutions and design support for a complete range of applications.

Utilizing our strong network of partners, the radar portfolio is extended to include a range of easy-to-integrate modules, each containing Infineon's Radar MMICs.

Features	Partner modules using Infineon chips	Benefits
– Complete module, including radar MMIC, antenna options, MCU signal processing options, and SW options (Doppler, FSK and FMCW versions available)	 Module (RF module; RF module + MCU including SW)	– Ease of design – Turnkey solution, no need for test and certification

By integrating Infineon's Radar MMICs chip into the partners' easy-to-use and simple-to-integrate modules, the complexity and time-to-market for a range of applications such as smart home automation, camera and security systems, air conditioners, UAVs, robotics, and smart lighting are reduced.

XENSIV™ radar sensor partners

Learn more about our partner program and purchase our partner solutions here.

Infineon Partner Program

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Gas sensors

High-accuracy CO_2 and H_2 gas sensors for automotive, industrial, and consumer applications

XENSIV™ gas sensors: Precision and reliability for superior gas sensing

Infineon's XENSIV™ sensor portfolio offers high-precision sensors that deliver accurate and reliable measurements, ideal for automotive, industrial, and consumer applications. XENSIV™ gas sensors excel in detecting and measuring gases like CO2 and H2 by utilizing advanced technologies.

XENSIV™ CO_2 sensors

Infineon's CO_2 sensors use Photoacoustic Spectroscopy (PAS) for precise carbon dioxide detection. PAS absorbs specific light wavelengths, causing CO_2 molecules to vibrate and producing detectable sound waves. This method ensures high accuracy and is less affected by environmental factors like humidity and temperature. Accurate CO_2 monitoring is vital for maintaining indoor air quality in spaces such as offices, schools, and homes. CO_2 sensors also enhance energy efficiency in HVAC systems through Demand Controlled Ventilation (DCV), regulating ventilation based on CO_2 levels.

XENSIV™ H_2 sensors

Infineon's H_2 sensors utilize the thermal conductivity (TC) principle to detect hydrogen gas. By measuring heat conduction changes, these sensors provide precise hydrogen concentration readings. Monitoring hydrogen is crucial due to its flammable nature. Infineon's H_2 sensors ensure safety in automotive applications like fuel-cell electric vehicles (FCEVs) and hydrogen-based internal combustion engines (ICEs). They also detect potential thermal runaways in battery electric vehicles (BEVs) and are vital in industrial settings for monitoring hydrogen electrolyzers, storage, dispensers, fuel stations, and energy storage systems.

Infineon's XENSIV™ gas sensors combine energy efficiency, compact design, and high sensitivity, making them perfect for integration into modern smart systems.

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PAS CO2 gas sensors

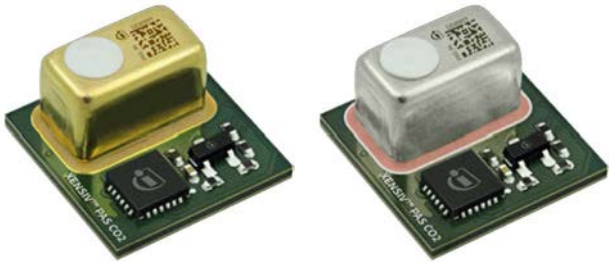
High performance in a small size – disruptive CO_2 gas sensors based on photoacoustic spectroscopy (PAS)

CO_2 measurement contributes to improvements in health, comfort, productivity, and energy efficiency. Even at moderate levels, CO_2 can have a negative impact on health and productivity, causing drowsiness and headaches. Fortunately, smart indoor air quality sensors can "smell" rising levels of CO_2 and either alert the user or trigger a system response. Awareness of indoor air quality is further increasing as a result of the COVID-19 pandemic, making accurate, affordable monitoring solutions like the XENSIV™ PAS CO2 more important than ever. Given the correlation between CO2 and aerosol concentration, CO2 sensors can mitigate the transmission of airborne illnesses such as COVID-19, cold, or influenza. Furthermore, CO2 sensors can facilitate demand-controlled ventilation, improving energy efficiency and significant savings on energy bills.

Accurate, real-time CO_2 measurement thanks to superior MEMS technology

Widespread adoption of real CO_2 sensors has so far been hampered by size, performance, and cost constraints. Infineon's PAS CO2 sensors leverage photoacoustic spectroscopy (PAS) technology to provide an exceptionally small, highly accurate, and cost-effective sensing solution. Infineon's leading position in MEMS technology is the foundation for this unique and accurate CO_2 detection approach.

PASCO2V01 (12 V) **PASCO2V15 (5 V)**



Reliable CO2 measurements enable smart indoor air quality monitoring, facilitating improvements in health, productivity and overall well-being. These features make the PAS CO2 sensors ideal for heating, ventilation, and air conditioning applications as well as for integration into consumer IoT devices such as air purifiers, thermostats, baby monitoring devices, wake-up alarms, and smart speakers.

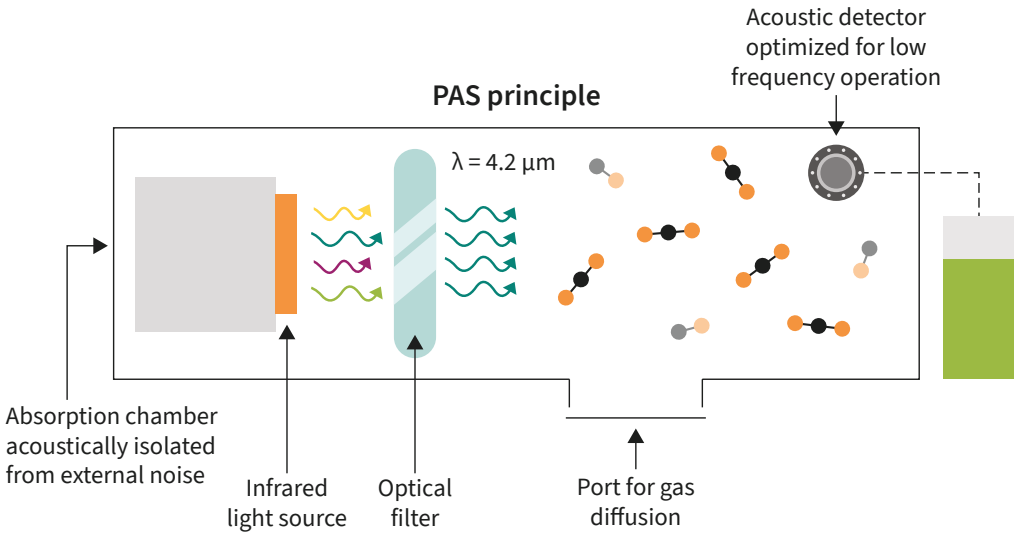
Disruptive gas sensor technology from Infineon

PAS CO2 integrates on the PCB a photoacoustic transducer, including an acoustic detector, infrared source, and optical filter; a microcontroller for signal processing; and a MOSFET chip to drive the infrared source. The exceptional sensitivity of the acoustic detector coupled with the integrated PCB design reduces space requirements by more than 75 percent compared to modern state-of-the-art NDIR CO_2 sensors.

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The PAS (photoacoustic spectroscopy) principle:
The sensor is characterized by a disruptive measurement principle called PAS (photoacoustic spectroscopy). It works as follows: pulses of infrared light pass through an optical filter tuned to the CO_2 absorption wavelength. The CO_2 molecules absorb the filtered light, causing them to shake and generate a pressure wave with each pulse. This is called the photoacoustic effect. The sound is then detected by an acoustic detector optimized for low-frequency operation and converted to a CO_2 concentration reading by the microcontroller.



Features

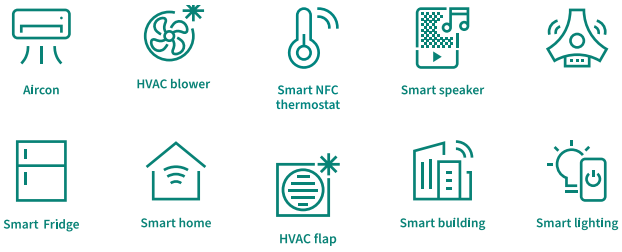
- Exceptionally small form factor (14 x 13.8 x 7.5 mm^3)
- SMD package delivered in tape and reel
- Advanced compensation and self-calibration algorithms
- Various configuration options (e.g., sampling rate, baseline calibration) and interfaces (UART, I^2C, PWM)
- Dust-proof design in compliance with ISO 20653:2013-02

Benefits

- Space savings in customers' end products
- High-quality data and compliance with smart building standards
- Cost-effective high-volume assembly and easy system integration
- Customer flexibility thanks to configuration options
- Increased energy efficiency and enhanced real estate value

Applications

- HVAC (heating, ventilation, and air conditioning) systems
- Smart home appliances such as air purifiers, air conditioners and thermostats
- Consumer devices for air quality monitoring such as personal assistants and CO_2 traffic lights
- Smart indoor lighting
- Smart horticulture
- Smart fridge



Product overview

Product	Accuracy	Interfaces	Operating range [ppm]	Supply voltage [V]
PASCO2V01	± (30 ppm +3%) of reading between 400 ppm and 5000 ppm	I^2C, UART and PWM	0–32000	3.3–12
PASCO2V15	± (50 ppm +5%) of reading between 400 ppm and 3000 ppm	I^2C, UART and PWM	0–32000	3.3–5

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Thermal conductivity H2 gas sensors

XENSIV™ TCI gas sensors with I²C, ultralow power, and 15-years lifetime

Infineon's XENSIV™ TCI gas sensors provide reliable detection of hydrogen (H_2) gas in demanding automotive and industrial applications such as FCEVs, H2 combustion engines, H2 refueling stations, battery electric vehicles (BEVs), energy storage systems (ESS), H2 electrolyzers, and stationary fuel cells. Thanks to the thermal conductivity (TC) principle, the TCI-R sensor can also detect leakage of A2L refrigerants in HVAC systems and other industrial applications. For automotive HVAC systems, TCI-B is a suitable for detecting CO2 refrigerant (R744) and CO2 in high concentrations for other applications, such as medical applications. Infineon's TCIx gas sensors operate on the principle of TC and utilize a full differential MEMS sensor concept. The TC is measured by heating parts of the MEMS structures and measuring the heat transfer through the gas. TC sensing provides the highest robustness and stability for rough automotive applications. Unlike metal oxide-based (MOX) and catalytic combustion (CC) sensors, no chemical reaction occurs in TC gas sensors as they are based on a physical measuring principle. This makes TC gas sensors immune to the risk of poisoning and the tendency to offset high drift shown by chemical sensors.

Key features

- FuSa QM/ASIL B capable
- AEC-Q100 up to 105°C
- Fast response time <100 ms
- Ultralow current consumption
- Robust and proven packages
- Lifetime of 15 years with low drift
- Autonomous operating mode for system level power saving



Benefits

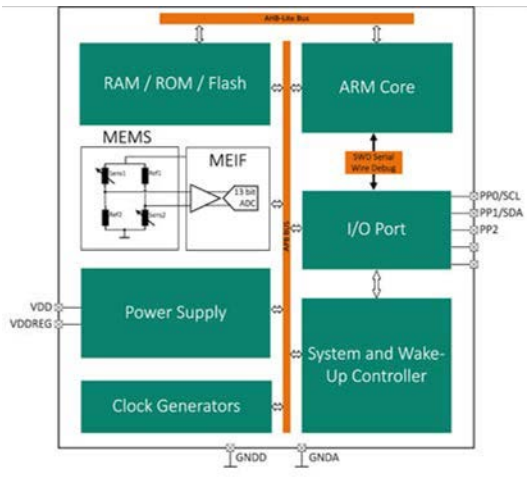
- Automotive grade sensor reliability
- ISO 26262 compliance capabilities up to ASIL B
- No maintenance or replacement costs
- Robustness and stability compared to catalytic- or metal oxide-sensors
- Low power mode state can be enabled by the customer

Potential applications

- Automotive battery management system (BMS)
- Fuel-cell electric vehicle (FCEV) drivetrain system
- Hydrogen economy (production, storage, and transportation) ESS leakage detection
- HVAC refrigerant leakage detection
- Medical applications

Product overview

Product	Accuracy	Interfaces	Supply voltage [V]
TCI	AEC-Q100 up to 105°C UL 2075, 60335-2-40/89	TCIXTMA1	Hydrogen (H2), CO_2
TCI-B	AEC-Q100 up to 105°C UL 2075, 60335-2-40/89 ISO 26262, ASIL B	Will be available soon	Hydrogen (H2), CO_2 (R744)
TCI-R	AEC-Q100 up to 105°C UL 2075, 60335-2-40/89	Will be available soon	R32, R455A, R454 A-B-C, R1234yf) and CO_2 (R744)



Click here to learn more:

www.infineon.com/magnetic-sensors
www.infineon.com/inductive-position-sensing
www.infineon.com/co2
www.infineon.com/current-sensors
www.infineon.com/mems
www.infineon.com/radar



Intuitive sensing

Giving things human-like senses for a better contextual awareness

Imagine a world where technology is unobtrusive and seamlessly integrated into our lives, where intentional/deliberate communication between people and devices is no longer necessary. In this world, there is no need to push buttons or issue commands to activate devices because technology can interpret implicit intentions and context. This enhances the user experience and makes it more natural – it almost seems the devices around us intuitively understand what we want them to do. At Infineon, this future is already becoming a reality. We develop sensor solutions that enable simple and effortless user interactions with all kinds of smart devices. Our technology is developed to make life easier, safer, greener, and more efficient, bridging the gap between the real and digital worlds. Our intuitive sensing solutions are at the very core of this mission. Reflecting our belief that the essential value of sensor technology lies in making our lives more convenient through seamless, natural interactions between people and sensing devices, we aim to leave you free to focus on what matters in life.

Choose your type of sense

Thanks to industry-leading technologies, Infineon XENSIV™ sensors are exceptionally precise. They are the perfect fit for various customer applications in automotive, industrial, and consumer markets.

Pressure sensors

Our digital barometric pressure sensors give designers the best choice regarding small form factors, the highest precision and accuracy over a wide temperature range, fast readout speeds and low power consumption.

Radar sensors

Radar supports existing applications while providing features that enable completely new use cases. It measures velocity, range and angle, both horizontal and vertical, for precise position mapping and 3D tracking.

MEMS microphones

MEMS microphones overcome existing audio chain limitations and are designed for applications where low self-noise (high SNR), wide dynamic range, low distortions, and a high acoustic overload point are required.

PAS CO2 gas sensors

Leveraging photoacoustic spectroscopy (PAS), Infineon has developed an exceptionally small CO_2 sensor that overcomes existing size, cost, and performance challenges.

Today, sensors already enable interactions between people and devices

This interaction often depends on interpreting and merging information from different sources. Machines cannot yet read our minds and do not always have the information necessary to evaluate a given situation correctly. We sometimes have to tell devices what we want them to do explicitly, which can be inconvenient and time-consuming. Inspired by human nature, Infineon intuitive sensing solutions are designed to simplify device interaction.

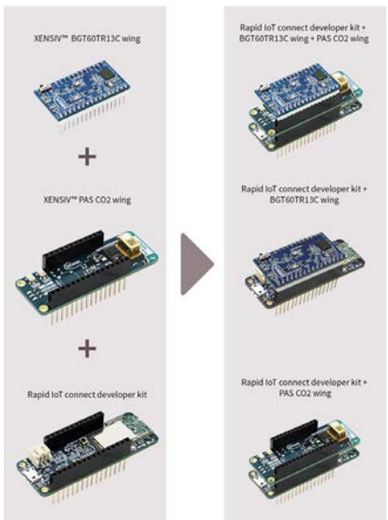
Reflecting a holistic approach, we combine different sensors with state-of-the-art software to create a comprehensive picture of the world around us. By fusing several smart sensors into one coherent, intelligent system, our intuitive sensing solutions simplify complex technical processes and enable people to interact with devices effortlessly. These smart devices intuitively sense the world around them, determining what is expected and needed from them.

Click here to learn more:
www.infineon.com/intuitivesensing

XENSIV™ connected sensor kit

Rapid IoT prototyping experience enabled by XENSIV™ sensors

The XENSIV™ connected sensor kit enables rapid development of a custom solution built on Infineon products. The CSK supports customers in testing sensor-driven IoT products and use cases as well as in prototyping. It offers a real-time sensor evaluation with custom configurations and cloud-based sensor data visualization with sensor fusion. The development kit supports use cases based on XENSIV™ sensors e.g., BGT60TR13C, BGT60UTR11AIP 60 GHz radar sensors, PASCO2V01 gas sensor, and DPS368 pressure sensor(sense), PSOC™ 62 microcontroller embedded processing (compute), connectivity via Infineon AIROC™ CYW43012 dual-band 2.4 GHz and 5 GHz Wi-Fi 4 (802.11n) and Bluetooth® 5.4 combo radio module (connect), and hardware security with OPTIGA™ Trust M (secure). Code examples and sensor libraries are available in the ModusToolbox™ to help customers create use case-specific application codes for new product offerings.

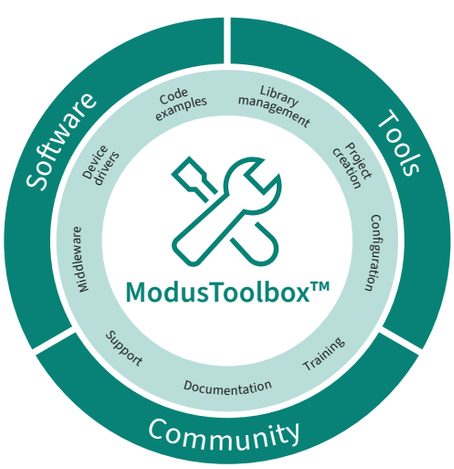


Key features

- Small form factor: 22.5 x 63 x 30 mm³ – Adafruit Feather compatible
- Wi-Fi and Bluetooth® 5.0-compliant combo radio module
- Power optimized design, deployable with battery
- Interchangeable sensor wing boards stacked individually or combined
- Seamless integration into ModusToolbox™
- FCC and CE certified

Key benefits

- Ideal for prototyping battery-powered IoT devices due to optimized power consumption. Suited for customer field trials.
- Rapid development and deployment via code examples in ModusToolbox™ for presence detection, entrance counter, air quality measurements. Enabler for multi-sensor data fusion.
- Secure cloud device onboarding and management with OPTIGA™ Trust M.
- Secure kit provisioning (unique user ID)



The Infineon Rapid IoT Connect platform deployed on the XENSIV™ CSK provides hardware, firmware, and cloud artifacts to enable rapid onboarding to the Internet of Things. Bidirectional XENSIV™ sensor-to-cloud data communication is securely enabled. The XENSIV™ CSK is a pre-implemented Infineon prototyping sensor system that allows provision, monitoring, and managing Infineon hardware remotely. The CSK kit setup takes 10 minutes and 12 months of free user access to a dedicated cloud demo platform for sensor data collection, interpretation, and sensor data download.

Product	Description	OPN No.
KIT_CSK_PASCO2	Rapid prototyping platform for use cases based on Infineon's XENSIV™ PASCO2V01 sensor	KITCSKPASCO2TOBO1
KIT_CSK_BGT60TR13C	Rapid prototyping platform for use cases based on Infineon's XENSIV™ BGT60TR13C 60 GHz radar sensor	KITCSKBGT60TR13CTOBO1
KIT_CSK_BGT60UTR11AIP	Rapid prototyping platform for use cases based on Infineon's XENSIV™ BGT60UTRAIP 60 GHz radar sensor	KITCSKBGT60UTR11AIPTOBO1

Click here to learn more:

www.infineon.com/magnetic-sensors
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www.infineon.com/inductive-position-sensing
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www.infineon.com/co2
www.infineon.com/radar

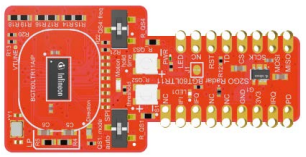
Shield2Go

Infineon's Shield2Go boards offer a unique customer and evaluation experience

The boards are equipped with one Infineon IC and come with a ready-to-use Arduino library. Customers can now develop their own system solutions by combining Sensor2Go boards together with Infineon MyIoT adapters.

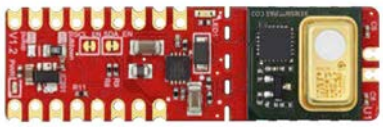
MyIoT adapters are gateways to external hardware solutions like Arduino and Raspberry PI, which are popular IoT hardware platforms. All this enables the fastest evaluation and development of the IoT system.

Sensors



Product name: BGT60LTR11AIP Radar Shield2Go
Sales name: S2GO RADAR BGT60LTR11
Ordering code: SP005594890

Product information



Product name: PASCO2V01 Shield2Go
Sales name: SHIELD_PASCO2_SENSOR
Ordering code: SP005569590

Product information



Product name: IM69D130 Microphone Shield2Go
Sales name: S2GO MEMSMIC IM69D
Ordering code: SP002851544

Product information

Click here to learn more:

www.infineon.com/magnetic-sensors
www.infineon.com/current-sensors
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www.infineon.com/mems
www.infineon.com/co2
www.infineon.com/radar

Shield2Go

Sensors



Product name: DPS368 pressure sensor Shield2Go
Sales name: KIT_DPS368_2GO
Ordering code: SP005729572

Product information



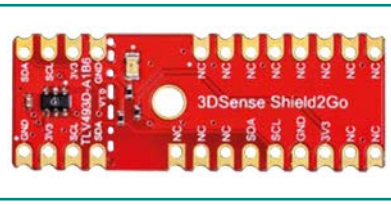
Product name: TLE493DW2B6 3D Sense Shield2Go
Sales name: S2GO_3D_TLE493DW2B6-A0
Ordering code: SP004308594

Product information



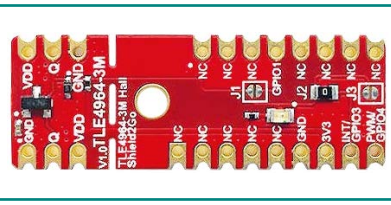
Product name: TLI493D-W2BW 3D Sense Shield2Go in small WFWLB-5-2 package (1.13 mm x 0.93 mm x 0.59 mm)
Sales name: S2GO_3D_TLI493DW2BW-A0
Ordering code: SP005410385

Product information



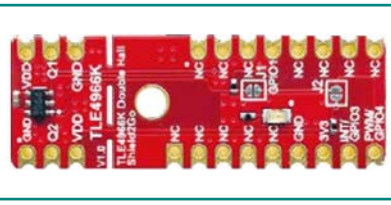
Product name: TLV493D 3D Sense Shield2Go
Sales name: S2GO_3D-SENSE_TLV493D
Ordering code: SP001823678

Product information



Product name: TLE4964-3M Hall Sense Shield2Go
Sales name: S2GO_HALL_TLE4964-3M
Ordering code: SP004308590

Product information



Product name: TLE4966K Double Hall Sense Shield2Go
Sales name: S2GO_2_HALL_TLE4966K
Ordering code: SP004308598

Product information

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www.infineon.com/magnetic-sensors
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Shield2Go

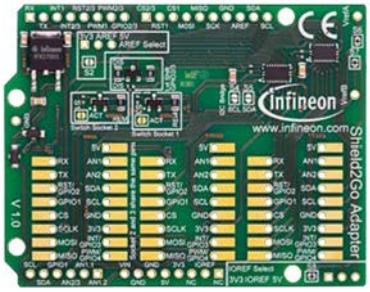
Microcontroller



Product name: XMC1400 2Go kit
Sales name: KIT_XMC14_2GO
Ordering code: SP006065576

Product information

MyIoT Adapter



Product name: MyIoT Adapter
Sales name: MY IOT ADAPTER
Ordering code: SP002434972

Infineon's Shield2Go boards offer a unique customer and evaluation experience – the boards are equipped with one Infineon IC and come with a ready-to-use Arduino library. Customers can now develop their own system solutions by combining Shield2Go boards together with Infineon MyIoT adapters.
MyIoT adapters are gateways to external hardware solutions like Arduino and Raspberry PI, which are popular IoT hardware platforms. All this enables the fastest evaluation and development of IoT system.

Product information

XENSIV™ Sensor Shield



Product name: XENSIV™ Sensor Shield
Sales name: SHIELD_XENSIV_A
Ordering code: SP006018677

Infineon's XENSIV™ Sensor Shield provides seamless hardware compatibility between sensors, microcontrollers, and connectivity products. When paired with an MCU / Wi-Fi baseboard via the Arduino UNO interface, the board enables developers to quickly evaluate and develop with environmental sensors like:

- 60 GHz radars
- PAS CO2 sensor
- PDM microphones
- Pressure sensors
- Six-axis IMU
- Three-axis magnetometer
- Temperature and humidity

The shield also features a TFT display (80x160), and OPTIGA™ Trust-M secure element, and a QWIIC connector for additional peripheral expandability.

Product information

Click here to learn more:

www.infineon.com/magnetic-sensors
www.infineon.com/current-sensors
www.infineon.com/inductive-position-sensing
www.infineon.com/mems
www.infineon.com/co2
www.infineon.com/radar

Sensor2Go kits

Ready to use, budget-priced plug- and play boards

Already equipped with a sensor combined with an Arm® Cortex®-M0 CPU. The Sensor2Go kits provide a complete set of on-board devices, including an on-board debugger. Build your own application and gadget with the Sensor2Go kits.

Automotive pressure Sensor2Go kit

Product name:	Ordering code:
KP215F1701-PS2GO-KIT	SP002676652
KP229E3518-PS2GO-KIT	SP002676656
KP236-PS2GO-KIT	SP002676664
KP254-PS2GO-KIT	SP002676664
KP276-PS2GO-KIT	SP005910372

Product information

3D magnetic Sensor2Go kit

Product name:	Ordering code:
TLE493D-A2B6 MS2GO	SP001707582
TLE493D-W2B6 MS2GO	SP001707578
TLV493D-A1B6 MS2GO	SP001707574

Product information

Angle Sensor2Go kit

Product name:	Ordering code:
TLE5012B_E1000_MS2GO	SP002133956
TLI5012B_E1000_MS2GO	SP002133960
TLE5012B_E5000_MS2GO	SP002133964
TLE5012B_E9000_MS2GO	SP002133968

Product information

TLI4971 current Sensor2Go kit

Product name:	Ordering code:
TLI4971_MS2GO	SP005345474

Product information

TLE4973 current Sensor2Go kit

Product name:	Ordering code:
TLE4973_MS2GO	SP006039680

Product information

Speed Sensor2Go kit

Product name:	Ordering code:
TLE4922 MS2GO	SP003029974

Product information

TLE4966 Hall switches Sensor2Go kit

Product name:	Ordering code:
TLE4966_MS2GO	SP005406992

Product information

PAS CO2 Sensor2Go kit

Product name:	Ordering code:
EVAL_PASCO2_SENSOR2GO	SP005582413
EVAL_CO2_5V_SENSOR2GO	SP006037148

Product information

Click here to learn more:

www.infineon.com/magnetic-sensors
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www.infineon.com/mems
www.infineon.com/co2
www.infineon.com/radar

Add ons for Sensor2Go kits and Shield2Go

	**Joystick for all 3D magnetic Sensor2Go kits and Shield2Go** **Product name:** JOYSTICK FOR 3D 2 GO KIT **Ordering code:** SP001491834	Product information
	**Rotate knob for all 3D magnetic Sensor2Go kits, Angle Sensor2Go kits and 3D magnetic sensor Shield2Go** **Product name:** ROTATE KNOB 3D 2 GO KIT **Ordering code:** SP001504602	Product information
	**Linear slider for all 3D magnetic Sensor2Go kits and Shield2Go** **Product name:** LINEAR-SLIDER 2GO **Ordering code:** SP002043034	Product information
	**Out of shaft adapter for all 3D magnetic Sensor2Go kits and Shield2Go** **Product name:** OUT OF SHAFT FOR 3D 2 GO **Ordering code:** SP003475178	Product information
	**Linear control trigger for all 3D magnetic Sensor2Go kits and Shield2Go** **Product name:** POWER_DRILL2GO **Ordering code:** SP005350194	Product information
	**Human machine interface (HMI) direction indicator for all 3D magnetic Sensor2Go kits and Shield2Go** **Product name:** DIR_INDICATOR2GO **Ordering code:** SP005350196	Product information
	**HMI mini control with 4 directions and 360° rotation for all 3D magnetic Sensor2Go kits and Shield2Go** **Product name:** MINI_CONTROL2GO **Ordering code:** SP005350192	Product information

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www.infineon.com/co2
www.infineon.com/current-sensors
www.infineon.com/mems
www.infineon.com/radar

Add ons for Sensor2Go kits and Shield2Go



OpenClose adapter for Hall switch Shield2Go
Product name: OPENCLOSE2GOHS
Ordering code: SP005544849

Product information



Play2Go for 3D magnetic sensor
Product name: 3D PLAY2GO KIT
Ordering code: SP005731811

Product information



Contactless switch array for all 3D magnetic Sensor2Go kits and Shield2Go
Product name: Contactless switch array
Ordering code:
Simply use our 3D printing files, link to, and start your 3D print.

Product information



Spindle2Go for all 3D magnetic sensor Shield2Go
Product name: SPINDLE2GO
Ordering code: SP005989689

Product information



Drill Trigger V2 for all 3D magnetic Sensor2Go kits
Product name: DRILL TRIGGER V2
Ordering code: SP006066136

Product information

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www.infineon.com/inductive-position-sensing
www.infineon.com/mems
www.infineon.com/co2
www.infineon.com/radar

Evaluation boards – for simple and easy evaluation

MEMS microphones flex evaluation kits

Product name:	Ordering code:
EVAL_IM69D130_FLEXKIT	SP002153022
EVAL_IM69D120_FLEXKIT	SP002153026
EVAL_IM69D127_FLEXKIT	SP005403891
EVAL_IM73D135_FLEXKIT	SP005415695
EVAL_IM72D128_FLEXKIT	SP005429924
EVAL_IM70A135_FLEXKIT	SP005728204
EVAL_IM67D120_FLEXKIT	SP005560671
EVAL_IM67D130_FLEXKIT	SP005537489
KIT_IM68A130A_FLEX	SP005834257

Product information

Current sensors evaluation boards

Product name:	Ordering code:
TLE4973 EVAL 120A	SP006015313
TLE4973 EVAL INLAY	SP005853842
TLE4973 EVAL STD PCB	SP005853840
TLE4973 EVAL VER BAR	SP005853847
TLE4973 EVAL LAT BAR	SP005853844
TLE4972 EVAL LAT BAR	SP005632140
TLE4972 EVAL STD PCB	SP005632136
TLE4972 EVAL INLAY	SP005632138
TLI4971 EVAL 120A	SP005876845
TLE4971 EVAL 120A	SP005343588

Product information

MEMS microphones for ATV plug and play boards

Product name:	Ordering code:
EVAL AHNB DIGITALV01	SP005955184
EVAL AHNB ANALOGV01	SP005568087

Product information

TMR linear sensors evaluation boards

Product name:	Ordering code:
TLI5590 SATELLITE	SP005857647
TLI5590 EVAL KIT	SP005857645

Product information

PAS CO2 sensor evaluation boards

Product name:	Ordering code:
EVAL_CO2_5V_MINIBOARD	SP006037150
EVAL_PASCO2_MINIBOARD	SP005577475

Product information



Position sensors evaluation boards
Product name: GAME CONTROLLER
Ordering code: SP006056290

Product information

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www.infineon.com/magnetic-sensors
www.infineon.com/current-sensors
www.infineon.com/inductive-position-sensing
www.infineon.com/mems
www.infineon.com/co2
www.infineon.com/radar

Choose the best fit magnetic sensor solution from the broadest portfolio

Our sensor simulation tools allow you to compare products in application conditions. The tools are easy-to-use and will guide you in identifying the most suitable Infineon XENSIV™ sensor combined with the best-fit magnet.



Current sensor

XENSIV™ – Current sensor simulation tool
Define and optimize the current sensing structure for your system. The tool supports design of lateral and vertical insertions for PCB (two to ten layer stack) or bus-bar based applications. The simulation will provide insertion resistance, field transfer factor, sensitivity range, measurement range, and power dissipation as well as cross-talk in case of a three-phase system.

Direct link to the Current Sensor Simulation Tool:
https://currentsensorsim.infineon.com/



3D magnetic sensor

XENSIV™ – 3D magnetic sensors simulation tool
3D magnetic field sensor for smaller, more accurate, and robust designs. The sensor family, with low current consumption and cost-optimized design, specifically addresses the needs of new magnetic sensor applications in consumer, industrial, and automotive. They are ideally suited for the measurement of three dimensional movement within a magnetic field, linear slide movement as well as 360° angle rotation.

Direct link to the 3D Magnetic Sensors Simulation Tool:
https://www.infineon.com/3dsim



Magnetic switches

XENSIV™ – Magnetic switches simulation tool
Discover Infineon's broad energy saving portfolio of Hall switches in smallest package. Simulate your Hall switch applications and see the results in an accurate simulation of the magnetic field and the switching behavior of the Hall switch in the application.

Direct link to the Hall Switches Simulation Tool:
https://www.infineon.com/hallsim



Angle sensor

XENSIV™ – Magnetic angle sensor simulation tool
Highest variety - low end to high end, standardized and specialized in all four magnetic technologies: Hall, GMR, AMR, and TMR. This tool calculates the valid distance from the magnet surface to the sensor and the assembly error, given certain parameters: magnetic properties, sensor specification, and assembly tolerances.

Direct link to the Angle Sensors Simulation Tool:
https://www.infineon.com/anglesim



Speed sensors

XENSIV™ Speed sensor solution tool
Infineon's innovative speed sensor solution tool will provide a sensor recommendation for your tooth wheel and back bias magnet geometry. The sensors are ranked according their expected maximum air gap capability. Customer constraints like enhanced strayfield immunity, the necessity for a direction channel, or the sensor interface are considered in the selection process.

Direct link to the Speed Sensor Solution Tool:
https://speedsensortool.infineon.com



Position sensors

XENSIV™ – Position sensors simulation tool
Infineon's innovative design tool covers some typical applications which can be addressed with 3D, angle or linear magnetic sensors:
- Angle measurement (rotational movement of the magnet)
- Linear position measurement (linear movement of the magnet)
- Joystick (3D movement of the magnet)
- Additionally: stray field consideration

The tool provides pre-defined or user-customized magnets. The tool automatically calculates the magnetic field components at the sensor location. Calculation is based on the sensor arrangement defined by the user. Mechanical mounting tolerances of the sensor and the magnet are considered.

Direct link to the Position sensors Simulation Tool:
https://osts.infineon.com/magsimx

Click here to learn more:

www.infineon.com/magnetic-sensors
www.infineon.com/current-sensors
www.infineon.com/inductive-position-sensing
www.infineon.com/mems
www.infineon.com/co2
www.infineon.com/radar

Your input matters
Share your feedback

ISO 26262 – Functional Safety (FuSa)

Dependable electronics based on Functional Safety

Automotive Functional Safety – we ease the process of integrating safety features with our safety guidelines and services.

Infineon provides dependable electronics to support today's safety-relevant systems and future fail-operational systems as essential components that allow customers to fulfill their safety requirements on the application level. Highly integrated systems equipped with safe electronic semiconductors are essential for key application areas like connectivity, electromobility, and higher levels of automated driving. The ISO 26262 standards set requirements and guidance for integrating products into automotive safety applications.

- Discover Infineon's products with ISO 26262 classification

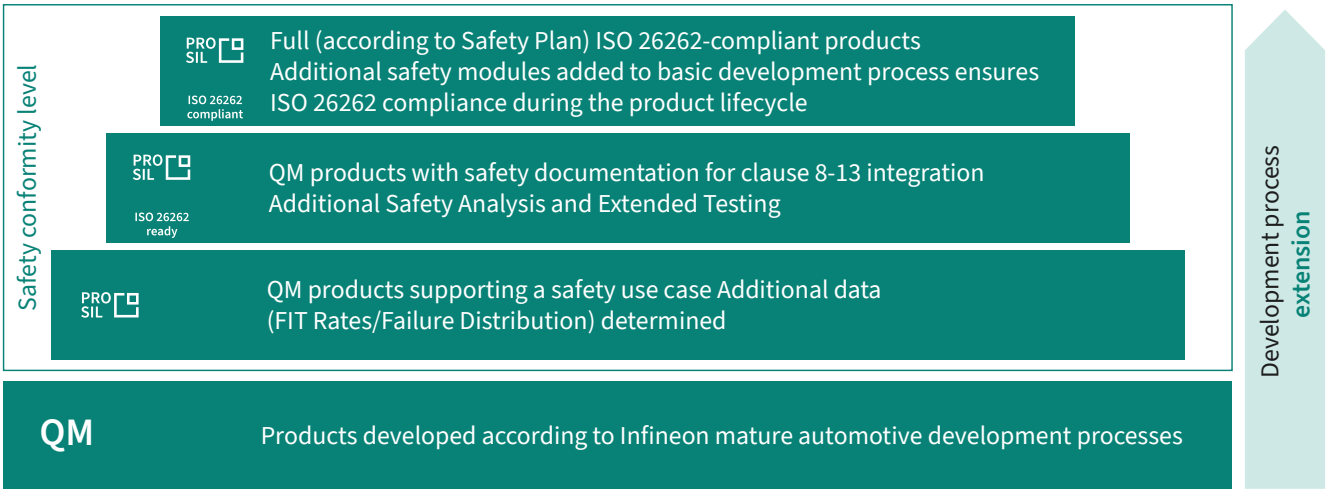
With our holistic approach towards functional safety, Infineon is responding to the increased complexity and strict requirements that make functional safety projects costly and time-consuming. We provide the necessary products, including documentation and supporting information, to ease the integration and reduce the effort at the system integrator level.

Benefit from:

- Innovative solutions for automotive safety-related applications
- Improved time-to-market through comprehensive safety documentation of ISO 26262-compliant products
- Reduced integrator's efforts with ISO 26262-compliant and -ready products
- Broad portfolio of ISO 26262-compliant products already available
- Newly developed automotive parts will primarily be part of an ISO 26262-compliant development flow

Safety conformity levels:

- PRO-SIL™ ISO 26262-compliant devices meet all relevant requirements for semiconductors as defined in the ISO 26262 series of standards for automotive functional safety.
- The PRO-SIL™ ISO 26262-ready marking designates QM devices that can be integrated into a safety-related application by customer usage of the ISO 26262:2018 clause 8-13 class II hardware evaluation.
- The Infineon automotive Ensured Compliance process framework has been certified by SGS-TÜV Saar for process compliance with ISO 26262:2018 as of April 2022. This certification underpins our focus on automotive functional safety.



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Dependability is the key driver for the megatrend towards autonomous driving

The future car is fully connected and always online. It is all-electric and autonomous. At Infineon, we believe that it takes both technology and trust to realize it.

The increased need for safe electronic systems in vehicles, that drivers and passengers can rely on, are the foundation of trust and shape the future towards higher levels of automated driving.

Winning the trust of tomorrow's passengers starts with dependable electronics that enable highly available, dependable, robust, safe, and secure systems that operate in all conditions.

Infineon is your trusted partner, offering all relevant ingredients for your dependable systems – automotive quality, Functional Safety, cybersecurity, innovative products, system understanding, and operational excellence.

Dependable electronics based on quality
As vehicles become more reliant on electronic components, the demand for safe and reliable systems is growing. Especially the rising levels of automated driving depend on the trust that drivers and passengers have towards the quality and reliability of each component. The complexity and
requirements in the automotive industry will continue to grow in terms of quality and dependability to keep vehicles running safely and smoothly over 15 years of lifetime.

Infineon's passion for high quality and dependable products create a portfolio with superior performance and unmatched durability through our zero-defect mentality. We go beyond the standards to fit the real application requirements.

Upgrade your automotive systems and applications with our high-quality semiconductor components for your design.

Dependable electronics based on quality
Automotive quality beyond the standards with a zero defect mindset.
Vehicle complexity and functionalities will continue to grow, driving the need for dependable electronics, with quality being one of its key ingredients. Our passion for quality creates a product portfolio that meets high-quality requirements and leads to highly reliable and robust products.

How Infineon differentiates as a quality leader:
1. Our goal is to go beyond standards to better fit real application requirements: from intensive screening methods to detect production defects, to advanced AEC Q100/101 tests where required, to sub 1 dpm validation to achieve low dpm rates.
2. Our track record of achievements, such as multiple quality awards from our customers Toyota (Honor Quality Award in 2020) and Continental (Supplier of the year in 2019) prove that we consistently achieve outstanding quality targets in the automotive industry.
3. Infineon offers the highest customer service, which includes a regional network of failure analysis labs and strong localized competencies, technical trainings, and regional quality analysis lab capabilities with state of the art failure analysis.
4. Meeting customer needs through best-in-class product requirements, design, manufacturing, and testing: We integrate quality criteria in the development processes (e.g., RDDF), design rules (e.g., ADeGo), materials, large manufacturing processes and process controls, proprietary testing, and screening methods.

Infineon's Zero Defect mentality is built upon:
- We produce 24/7/365 at sub dpm level: translated into a year's timeline: we deliver zero defect for all but the last three seconds of a year
- We deliver sub ppm quality levels
- 90 percent of our products are already Zero Defect

We go beyond the standards to better fit the real application requirements.

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Infineon support for sensors

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Infineon customized solutions

Your specific needs, realized

A customized solution (commonly known in the industry as an ASIC—Application Specific IC or CSP—Customer Specific Product) is designed, planned, developed, and used for a specific purpose. Its mission is to be optimized, efficient, and have all the required functionalities and features for a specific application for a single customer.

Infineon as your one-stop-shop from design to delivery



Infineon, as a market leader in customized solutions, believes innovation comes through collaboration and exploring new paths. Working closely with our customers, understanding their needs, and combining them with our cutting-edge solutions, we know there is always a benefit for every customer and application. Whether the challenge is related to IP, BOM constraints, or simply requires higher integration – an ASIC can be the solution. Furthermore, customers benefit from Infineon's trusted quality, supply guarantee, and experience, which are combined with more advantages such as IP protection and a well-established partner network.

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A process streamlined through efficiency, expertise, and experience

The journey starts with you and a focus on feasibility - we match your needs early on with our 40 years of expertise in building world-class, industry-leading semiconductors and ensure successful implementation of your requirements.

From technology advantage to supply stability

Whether it is digital, analog, mixed-signal devices, an embedded processor or integrated sensors, we have the experience and product know-how. Being one of the largest semiconductor companies, we also have a vast array of IPs. We can integrate almost anything into your chip from the vast variety of our sensors, discrete devices, drivers, and many more, including support for higher voltage levels. Our in-house fabrication facilities and design centers around the globe are known for the highest quality standards. We also have well-established partnerships with all major silicon foundries and assembly test fabs to complement our in-house technologies. At every step along the way, we take pride in the highest quality Infineon is known for.

If you are interested and would like to find out further information, visit **www.infineon.com/asic**



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