In the heart of power:

CoolMOS™ 7 - CoolSiC™ - CoolGaN™

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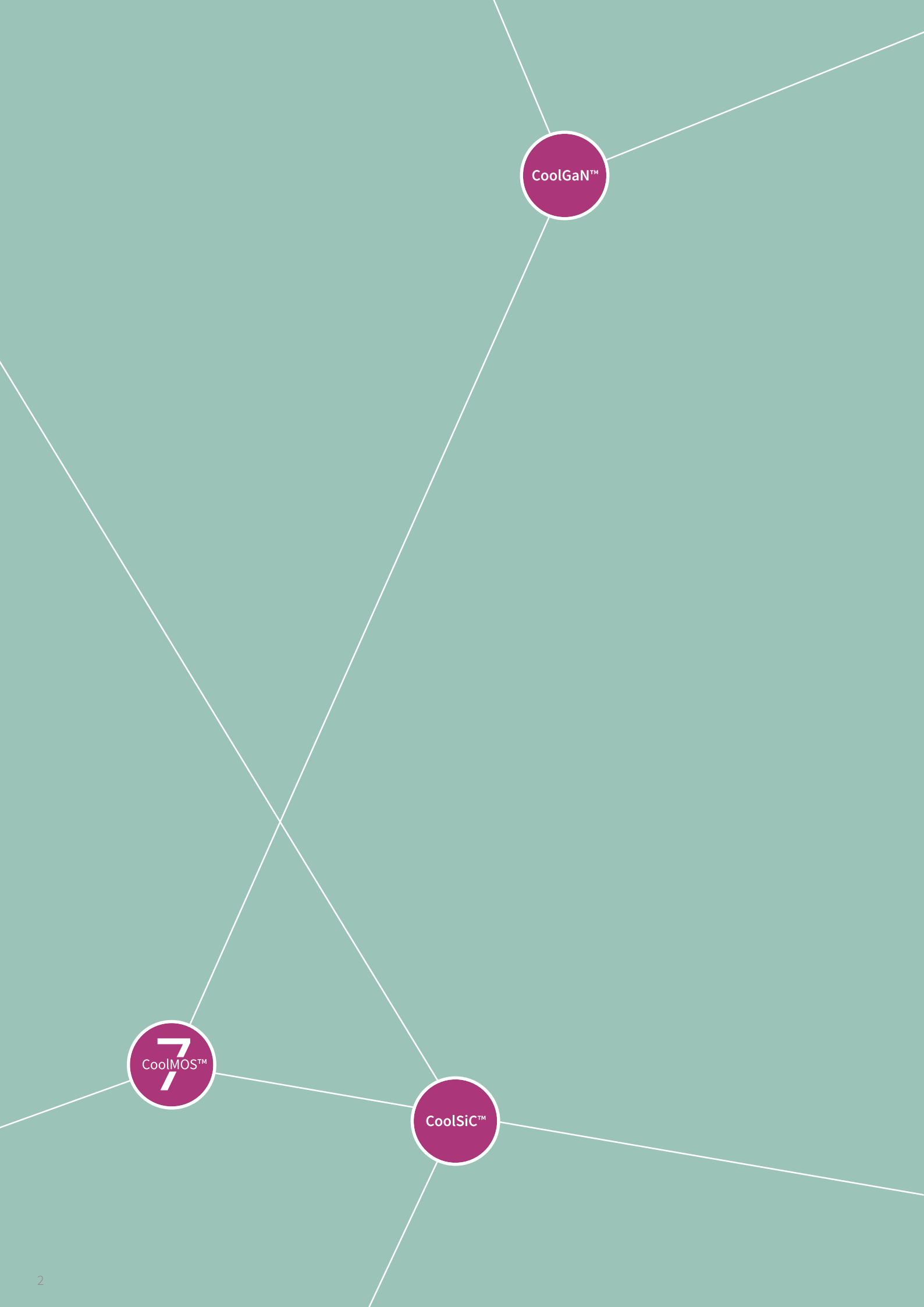
CoolGaN™
CoolMOS™ 7
CoolSiC™

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In the heart of power: CoolMOS™ 7 – CoolSiC™ - CoolGaN™

In a world which is becoming smarter, more connected and progressively more power hungry, the efficient management of power is essential for the green production, delivery and consumption of electrical energy. At heart of this transformation are power semiconductors, the modern enablers of the new home, industrial, automotive and consumer applications. This unveils amazing opportunities that a trusted leader in power semiconductors can help you win, fostering your growth.

Application to product matrix

	CoolMOS™ 7									CoolSiC™	CoolGaN™	Driver ICs
Application	CFD7 – 600 V	C7 – 650 V	C7 – 600 V	G7 – 650 V	G7 – 600 V	P7 – 600 V	P7 – 700 V	P7 – 800 V	P7 – 950 V	CoolSiC™ diode G6	CoolGaN™ 600 V	EiceDRIVER™
Low power applications												
TV						✓	✓				✓	
Charger							✓	✓	✓		✓	
Adapter						✓	✓	✓	✓		✓	
Lighting						✓	✓	✓	✓		✓	
Audio						✓	✓	✓			✓	
Gaming						✓	✓					
PC power						✓						
Smart meter								✓	✓			
Fast growing high power applications												
EV charging	✓	✓		✓		✓						✓
LSEV	✓	✓		✓		✓				✓		✓
Industrial battery charging	✓					✓				✓	✓	✓
High power applications												
Server	✓	✓	✓	✓	✓	✓				✓	✓	✓
Telecom	✓	✓	✓	✓	✓	✓				✓	✓	✓
Industrial SMPS	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Solar		✓		✓		✓				✓	✓	

Portfolio for low power applications (<150 W)

P7 – 600 V 0.18 – 0.6 Ω			P7 – 700 V 0.36 – 2.0 Ω		P7 – 800 V 0.28 – 4.5 Ω		P7 – 950 V 0.45 – 3.7 Ω		CoolGaN™ 0.19 – 0.34 Ω
PFC	Flyback	LLC	PFC	Flyback	PFC	Flyback	PFC	Flyback	Flyback

Portfolio for high power applications (>150 W)

C7 – 600 V C7 – 650 V G7 – 600 V G7 – 650 V CFD7 – 600 V	C7 – 600 V G7 – 600 V CFD7 – 600 V	CFD7 – 600 V	P6 – 600 V P7 – 600 V	P7 – 600 V CFD7 – 600 V	CFD7 – 600 V	CoolSiC™ diode 600 V/650 V	CoolGaN™ 600 V
PFC	LLC	ZVS PS FB	PFC	LLC	ZVS PS	PFC	PFC
$R_{DS(on)}$ 17 – 190 mΩ							
Gate driver ICs							
2EDN 1EDN	2EDN 1EDN	2EDN 1EDN	2EDN 1EDN	2EDN 1EDN	2EDN 1EDN		CoolGaN™ drivers

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TV power supply

Besides outstanding image quality, a new generation of TVs gains attention for their user interface, low power consumption and slim silhouette. This requires the power supply unit (PSU) to either keep a low profile to maintain the TV's slim appearance and a low thermal dissipation image or to have an external adapter to deliver DC power to the TV. The 600 V CoolMOS™ P7 SJ MOSFET - the successor of the 600 V CoolMOS™ P6 - has been developed to cover a broad spectrum of different applications where excellent performance and perfect ease-of-use are required. The rugged body diode enables not only the use in hard switching topologies such as power factor correction, boost, and two transistor forward but also resonant topologies such as LLC where the technologies lead to high efficiency in both hard switching and resonant circuits. For higher $R_{DS(on)}$s there is a new feature of an integrated ESD diode that helps improving the quality in manufacturing. At the same time the low $R_{DS(on)}$ and gate charge Q_G enable high efficiency in the various topologies. The 600 V CoolMOS™ P7 comes with a wide range of $R_{DS(on)}$ values and packages on both industrial and consumer grade to make it suitable for applications such as server, telecom, PC, solar as well as lighting, adapters, and TV. Infineon developed specifically for TV power supplies a family of packages, characterized by short lead, SOT-223 mold stopper and wide creepage distance, which enable our customers cost-effective and reliable manufacturing. The portfolio for TV power supply is complemented by Infineon's digital power XDP™ SMPS products, designed to meet challenging efficiency and standby power requirements for the Internet of Things (IoT) enabled TVs - both embedded PSU and adapter. Customers can reduce the number of TV power supplies by adapting the digital IC parameters to different TV and screen models by flexible and easy parameter setting. With the recently introduced 5th generation of low standby power flyback controllers, ideal to implement low power adapters for TVs and monitors.

600 V CoolMOS™ P7 offers:

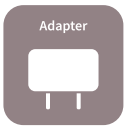
- Competitive price positioning
- Significant efficiency gains up to 1.8% at high but also at low line
- Lower superjunction device temperature enabling reduced thermals on application level

700 V CoolMOS™ P7 offers:

- Best price / performance ratio
- Possibility to switch to higher $R_{DS(on)}$ classes due to temperature dependency of the $R_{DS(on)}$ and the lower switching losses even with higher integrated gate resistor
- Increased efficiency compared to competitor device

Functional block	Product category	Topology	Product family	Benefits
Main stage/PFC combo non-AUX	High voltage MOSFETs	DCM PFC, HB LLC	600 V/700 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
	Control ICs	PFC-LLC non-AUX digital IC for TV embedded PSU	IDP2303	› Low BOM count/system cost due to high integration › Low standby power › High system reliability › Shorter development cycles and higher design and production flexibility
		PFC-LLC non-AUX digital IC for TV adapter	IDP2303A	› Low BOM count/system cost due to high integration › Low standby power › Small form factor designs › High system reliability
PFC	Boost diodes	DCM PFC	650 V Rapid diode	› Low conduction losses
	Control ICs	CCM PFC IC	ICE3PCS0xG	› High PFC and low THD
Main stage	Control ICs	HB LLC IC	ICE1HS01G-1/ICE2HS01G	› High efficiency and low EMI
Auxiliary power supply	Control ICs	QR/FF flyback CoolSET™	700 V/800 V – ICE5QRxx70/80A(Z)(G)	› Low standby power, high efficiency and robustness
Flyback	Control ICs		ICE5QSAG	› Selectable active burst mode entry/exit profile to optimize standby power › Adjustable line input over- and under-voltage protection against abnormal line input › V_{CC} and CS pin short to ground protection against abnormal operation
Synchronous rectification	Low voltage MOSFETs		OptiMOS™	› Low conduction losses, reduced overshoot › Logic level switching

www.infineon.com/tvpower



Adapter and charger power supply

Manufacturers of slimmer and lighter adapters require cost effective MOSFETs in small packages that feature good electromagnetic interference (EMI) and excellent thermal performance enabling high efficiency and low standby power. Infineon offers a wide range of products specifically designed for adapters including high voltage SJ MOSFETs and control ICs for PFC and PWM stages, as well as low voltage MOSFETs for synchronous rectification. Especially versatile is the CoolMOS™ P7 family which combines high efficiency and optimized cost with ease-of-use. Packages – characterized by having a short lead, IPAK Short Lead with ISO-Standoff and wide creepage – enable cost-effective and reliable manufacturing specifically for adapters. High power density at low manufacturing cost can be achieved using Infineon's SOT-223 cost-effective package which enables SMT manufacturing, while maintaining very good thermal performances. For synchronous rectification, Infineon's OptiMOS™ series offer extremely low on-state resistance and low capacitances. New control ICs support topologies such as quasi-resonant flyback and forced frequency resonant flyback (zero voltage switching) operation, ideal to implement high power density adapters and well supporting USB-PD requirements. Regional regulations and a general increased sensitivity toward the containment of electronic waste are pointing toward the adoption of universal adapters. The implementations, methodologies and protocols are not yet harmonized; however Infineon is already closely monitoring and partnering with the decision makers to timely ensure the offer of a competitive semiconductor solution. The capability to efficiently manage different power classes and protocols will be key in this application, and Infineon is supporting adapter makers to respond to this challenge.

600 V CoolMOS™ P7

- Most balanced technology of all CoolMOS™ families
- Integrated Zener diode
- Highest efficiency
- Excellent ease-of-use and commutation ruggedness
- Competitive price and
- Outstanding portfolio granularity

700 V/800 V/950 V CoolMOS™ P7

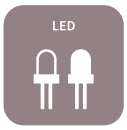
- Price competitiveness compared to similar competitor technologies
- Supports increased switching frequency to reduce magnetics
- Integrated Zener diode
- Best fit for target applications in terms of
  - Thermals and efficiency
  - Ease-of-use level
  - Fulfilling common EMI criteria

600 V CoolGaN™

- Outstanding performance
- Highest power density > 20 W/in^3

Functional block	Product category	Topology	Product family	Benefits
Flyback converter	High voltage MOSFETs	Flyback	600 V/700 V/800 V/950 V CoolMOS™ P7	› Fast switching speed for improved efficiency and thermals › Reduced gate charge for enhanced light load efficiency › Optimized V_{GS} threshold for lower turn-off losses
		Flyback	600 V/650 V/700 V/800 V CoolMOS™ CE	› Easy control of switching behavior due to higher $R_{G,int}$ › Better transition losses versus standard MOSFET
	Low voltage MOSFETs	Flyback/auxiliary synchronous rectification	OptiMOS™ 100 V-150 V	› Low conduction losses and reduced overshoot › Logic level can support low voltage gate drive to achieve high efficiency
	Control ICs	QR flyback IC	ICE2QS03G, ICE5QSAG	› High efficiency and low standby power
		FFR flyback IC	IDP2105	› High power density and digital control
PFC	High voltage MOSFETs	DCM PFC	600 V/700 V/800 V/950 V CoolMOS™ P7	› Fast switching speed for improved efficiency › Reduced gate charge for enhanced light load efficiency › Optimized V_{GS} threshold for lower turn-off losses
		DCM PFC	650 V Rapid 1	› Easy control of switching behavior due to higher $R_{G,int}$ › Better transition losses versus standard MOSFET
	Boost diode	DCM/PFC	650 V Rapid 1	› Low conduction losses
	Control ICs	DCM PFC ICs	TDA4863G, IRS2505LTRPBF	› Simple external circuitry › High power factor and low THD
Main stage	High voltage MOSFETs	HB LLC	600 V CoolMOS™ P7	› Fast switching speed for improved efficiency and thermals › Reduced gate charge for enhanced light load efficiency › Optimized V_{GS} threshold for lower turn-off losses
Synchronous rectification	Low voltage MOSFETs	Synchronous rectification	OptiMOS™ 5 100 V-150 V	› Low conduction losses, reduced overshoot › Logic level switching
	Control ICs	Synchronous rectification	IR1161LTRPBF	› High efficiency › Simple external circuitry

www.infineon.com/adapter



LED lighting

Our focus at Infineon lies on supplying tailored products for LED drivers , LED tubes, LED controls and LED strips. Our portfolio of high-quality, energy-efficient products and solutions comprises LED driver ICs, MOSFETs and microcontrollers suited for LED drivers as well as sensors and ICs for secure communication. In addition to offering products of proven quality, a highly competent global lighting team, in collaboration with channel partners, optimally supports our lighting customers in designing LED lighting products and systems. Lighting applications create high demands on power supply designs in terms of efficiency, thermal management, surge protection, electromagnetic interference and cost. Our CoolMOS™ products offer a significant reduction of conduction, switching and driving losses and enable high power density and efficiency for superior power conversion systems. In particular, the latest state-of-the-art generation of high-voltage power MOSFETs contributes to making LED drivers and LED power supplies more efficient, more compact, lighter and cooler than ever before. Each lighting subapplication has its own requirements and optimization criteria, which are reflected in the available technologies paired with innovative package solutions.

950 V CoolMOS™ P7

- Best-in-class performance by providing ≤10°C lower device temperature and ≤ 0.35% efficiency gains
- Additional efficiency improvements, and space and cost savings enabled when applying it in snubberless flyback designs

CoolMOS™ P7 in SOT-223

- Drop-in replacement for DPAK
- Improved efficiency and thermals compared to previous CoolMOS™ technologies (e.g. conversion C3 DPAK vs. P7 DPAK)
- Similar efficiency and thermals compared to CoolMOS™ P7 in DPAK, but enabling additional commercial benefits by making use of the SOT-223 price advantage

600 V CoolMOS™ P7

- Rugged body diode capable to withstand hard commutation conditions up to 2.5 times higher than nominal ID
- Smooth waveform and a reduced V_{DS}max

LED drivers

Functional block	Product type	IC product family	MOSFET technology	Voltage class
PFC stage	PFC	TDA4863	CoolMOS™ P7	600 V/700 V
	PFC+LLC (constant current /constant voltage)	ICL5101 ICL5102	CoolMOS™ P7	600 V
	PFC + flyback (dual-stage)	XDPL8220 XDPL8221*	CoolMOS™ P7	950 V/800 V/700 V/600 V
	PFC/flyback (single-stage)	XDPL8105	CoolMOS™ P7	950 V/800 V
Buck solutions	Buck (single-stage)	ICL8201	CoolMOS™ P7	600 V
	Secondary buck	ILD6150	Integrated	-
		XMC1300/XMC1400*	OptiMOS™	100 V/150 V/ 200 V/250 V/ 300 V
Synchronous rectification	Synchronous rectification controller	IR116xx	OptiMOS™	100 V/150 V/200 V
Dimming	0 V-10 V dimming interface IC	CDM10 V	-	-
		CDM10 VD	-	-
Hardware based security	OPTIGA™	OPTIGA™ Trust	-	-
MCU	XMC™ microcontroller	XMC1100	-	-
Sensors	Radar sensor ICs	BGT24LTR11	-	-

*coming Q4 2018

Linear/switch mode LED driver ICs

Functional block	Topology	IC product family	MOSFET technology	Voltage class
Linear LED driver IC	Linear	BCR400 series	Integrated (extra transistor for BCR450)	-
Switch mode LED driver IC	Buck	ILD4000 series	Integrated (OptiMOS™ for ILD4001)	30 V/60 V
		ILD6000 series	Integrated	-
		XMC1300/XMC1400**	OptiMOS™	100 V/150 V/200 V/250 V/ 300 V
	Buck/boost	ILD1151	OptiMOS™	60 V/100 V

** including communication

www.infineon.com/lighting

Audio power supplies

For consumer audio solutions Infineon's 700 V and 800 V CoolMOS™ P7 SJ MOSFETs are the ideal switch allowing for lower switching noise, voltage ripple, and a proper switching frequency to not produce additional audio noise. Higher efficiency and less thermals allow for smaller form factors and thus for lower cost and easier integration into speakers and sound systems.

Class D audio amplifiers offer 0 percent distortion and 100 percent efficiency in theory. What decreases the actual number depends on how close the PWM is to an ideal waveform shape and how much power loss is in the device. The zero reverse recovery charge in the body diode and very small, linear input and output capacitances from Infineon CoolGaN™ technology allow switching waveforms to be close to an ideal switch device and thus is perfectly suitable for professional audio solutions.

600 V/700 V/800 V CoolMOS™ P7

- Allows to reduce the number of total components while maintaining performance
- Increased efficiency
- Allows smaller form factors
- Reduced noise
- Offered within a reference solution for audio system power supplies

CoolGaN™ benefits in Class D amplifier

- Efficient: Best FOM of 400 V power devices
- Very low noise: zero reverse recovery charge enables quiet hard switching
- Small and linear C_{oss} narrows dead time window for better THD
- Easy-to-use: compatible with Class D audio control ICs

Functional block	Product category	Product family	Benefits
Main power suppply	High voltage MOSFET	600 V/700 V/800 V CoolMOS™ P7	› Enables increased system level efficiency and compactness
	GaN	CoolGaN™	› Very low noise › Max. efficiency
Auxiliary power supply	Control IC with integrated MOSFET	PWM FF CoolSET™ 5th generation: › ICE5xRxxxxAG › ICE5xRxxxxBZS	› Adjustable line input OVP (only SMD) › Adjustable OLP › Adjustable burst mode entry/exit level › Ability to disable burst mode operation › CCM/DCM › 100kHz and 125kHz
	Control IC	› ICE5ASAG › ICE5GSAG	
Synchronous rectification	Low voltage MOSFET	80 V OptiMOS™ 5 › BSC0xxN08NS5 › BSZxxxN08NS5 › IPP020N08N5 › IPB017N08N5	› Fine-tuned for synchronous rectification applications reaching higher efficiency than the best competitor devices in the market over the whole load range
		60 V OptiMOS™ 5 › BSC070xLS, BSZ070xLS	
		80 V OptiMOS™ › BSZ0602LS	
		100 V OptiMOS™ 5 › BSC080xLS* › BSZ096N10LS5 › BSZ0803LS	

www.infineon.com/audio

PC power supply

The PC power market is diversified into high-end gaming PC and better cost-performance sectors to achieve a better price/performance goal for desktop SMPS. The PC OEMs are implementing the desktop SMPS by removing the AUX power block to save the cost of having a flyback circuit. Infineon's IDP2321 is the first digital PFC + LLC combo IC worldwide to meet the world's leading PC manufacturers' specifications with integrated drivers and a 600 V depletion cell to achieve low standby power and lower cost. The PFC controlling loop is a configurable CrCM/DCM multimode to meet highest light-load efficiency. The IDP2321 has approximately 30 to 40 less part counts than traditional analogue solutions thanks to the state-of-the-art digital control. Furthermore, Infineon's IDP2321 offers flexible IC parameter configuration with friendly GUI, which means R&D engineers can key in the parameters on the PC to fine tune and debug the system performance instead of soldering the passive components. Infineon offers the best total system solutions for non-AUX PC power, together with Infineon's SMD and through-hole MOSFETs.

Recommended 600 V CoolMOS™ P7 package

TO-220 FP Wide Creepage	TO-252 DPAK	SOT-223
Flyback/PFC/LLC	**Flyback/LLC**	**Flyback (LLC)**
› Increased creepage distance › Good thermal behavior › Easy to assemble but not automated	› Standard DPAK › Automated assembly, cost saving and improved yield at customer › Lower price compared to TO220FP	

600 V CoolMOS™ P7

- High efficiency combined with ease-of-use and low design-in effort
- Suitable for both soft and hard switching applications (PFC/LLC)
- Price/performance optimized for cost effective designs

Functional block	Topology	Voltage class	Technology	Benefits
PFC/Main stage	High voltage MOSFETs	CrCM/DCM PFC	600 V CoolMOS™ P7	› Best thermal performance › Rugged body diode › ESD enhancement for production line › Wide $R_{DS(on)}$ portfolio including both THD and SMD packages available
	Boost diodes	DCM PFC	650 V Rapid 1	› Low conduction losses
		CCM PFC	650 V Rapid 2	› Low reverse recovery losses and PFC switch turn-on losses
	Control ICs	CCM PFC IC	ICE3PCS0xG	› High PFC and low THD
Main stage	Control ICs	HB LLC IC	650 V – ICE1HS01G-1/ ICE2HS01G	› High efficiency and low EMI
Synchronous rectification	Mid. voltage diodes	HB LLC + center-tap	OptiMOS™ 40 V	› Optimized cost/performance and low thermal
			OptiMOS™ 60 V	› Layout tolerance and low thermals

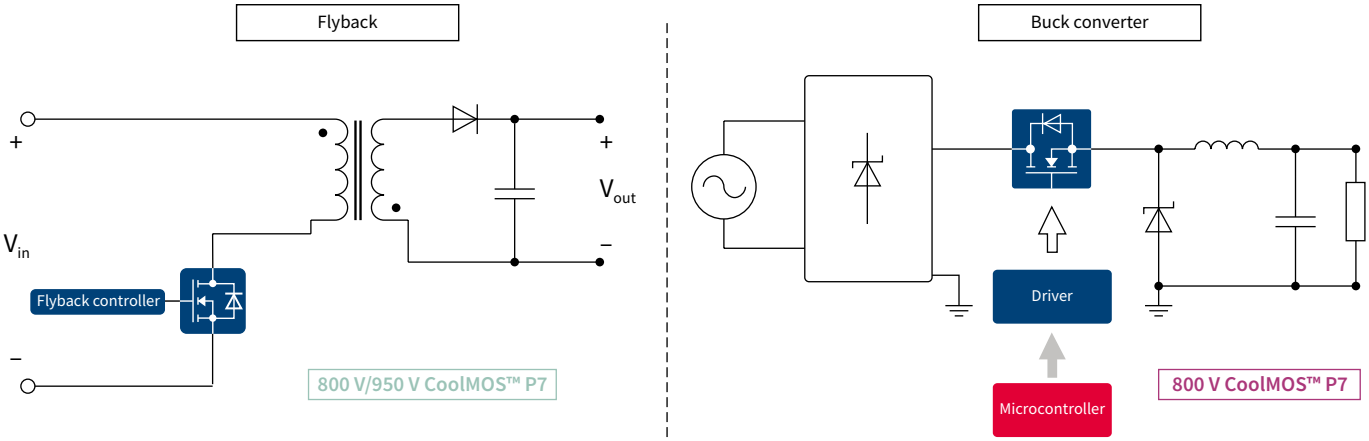
www.infineon.com/pcpower

Smart meter

In today's technologically advanced world the demand for electrical energy is going up, as the traditional mechanical energy-based systems now depend on electrical power. An increasing trend can be seen in active monitoring and in dynamic pricing of electricity. A typical energy meter measures the amount of electrical energy consumed in kilowatt-hours (kWh) and can be mainly categorized into single phase and three phase types of smart meter. Existing and future energy meters should limit the self-consumption to 4 VA (~1.2 W) for single-phase or 8 VA (~2.4 W) for three-phasing energy meters. There is a tendency of moving from the traditional techniques of powering the meter to switch-mode-power-supply-based powering of the modern smart-grid-enabled smart energy meter.

Among the key characteristics of the smart meter SMPS are a wide input voltage (60 V_{AC} to 580 V_{AC}) and a quite low output voltage (12 V, 5 V, 3.3 V), as well as relatively low level of the output power (3-15 W). Among the requirements for the smart meter SMPS are low cost and low component count.

Infineon's latest CoolMOS™ P7 family, specifically 800 V/950 V CoolMOS™ P7, fulfills these requirements and satisfies comparatively high input voltage. Superjunction CoolMOS™ P7 technology brings the benefits of increased efficiency, low switching losses, high quality and reliability, and best-in-class thermal performance, being the right fit for the application.



Functional block	Product category	Product family	Benefits
Flyback	HV MOSFETs	800/950 V CoolMOS™ P7	› Best-in-class performance › Highest efficiency › Outstanding thermal behavior
Buck converter		800 V CoolMOS™ P7	› Best-in-class performance › Highest efficiency › Outstanding thermal behavior

www.infineon.com/950v-p7

Off-board DC EV charging stations

What speaks for off-board DC EV charging?

The demand for enhanced power supplies for charging stations increases with the growing number of electric vehicles (EVs), now in some markets seen viable alternatives to traditional internal combustion engine vehicles. Currently, all eyes are on China where EVs have gained traction in the rapidly expanding middle class, while the United States is expected to follow soon. However, to truly welcome EVs on a large scale, these markets need to provide wide-spread availability of DC charging infrastructure so that drivers can quickly charge their vehicles. DC charging stations are an attractive choice because they offer much faster charging than a standard AC EV charging pile which many EV drivers have at home. Today a DC charging pile with e.g. 120 kW can charge around 80 percent of an EV's battery in just 30 minutes. As charging technologies improve, the charging time will drop even further. Consequently, off-board charging is becoming more and more attractive.

Challenges on the horizon

Reaching the next level in designing DC EV charging power supplies confronts engineers with many new challenges.
For a DC power supply design to be a long term success you must:

- Enhance output power to shorten the charging time
- Improve power density within the set dimensions of the charging station
- Increase efficiency by boosting the load and decreasing power dissipation
- Reduce design cost per watt

Overcoming all of the mentioned issues is possible – with the right partner.

Best-fit performance for target applications

- Ultra fast body diode and best-in-class Q_{rr} level of all CoolMOS™ families
- Highest reliability and robustness
- Highest efficiency within CoolMOS™ fast body diode series
- Enabling highest power density levels thanks to best-in-class $R_{DS(on)}$ in THD and SMD packages

Adequate ease-of-use

- 600 V CoolMOS™ P7 offers
  - Excellent ESD robustness >2 kV (HBM)
  - Smooth switching waveforms
- 600 V CoolMOS™ CFD7 offers
  - Best-in-class body diode robustness
  - Early channel shut down allows increase of R_{Gon}, ext. without negative impact on efficiency

High quality and price/performance

- Best-in-class price/performance ratio
  - Attractive price position for high performance technology
- Granular portfolio - $R_{DS(on)}$ range from 70 down to 18 mΩ in the common TO-247 package
- High Infineon quality

Functional block	Product category	Product family	Product	Additional information
PFC stage (3-phase input Vienna PFC stage)	High voltage MOSFETs	650 V CoolMOS™ C7/G7	IPW65R019C7	650 V, 19 mΩ, TO-247
		600 V CoolMOS™ P7	IPW60R037P7 IPW60R060P7	600 V, 37 mΩ, TO-247 600 V, 60 mΩ, TO-247
HV DC-DC main stage (Soft switching type full-bridge stage)	High voltage MOSFETs	650 V CoolMOS™ CFD2	IPW65R041CFD	650 V, 41 mΩ, TO-247
			IPW65R080CFD	650 V, 80 mΩ, TO-247
		600 V CoolMOS™ CFD7	IPW60R031CFD7	600 V, 31 mΩ, TO-247
			IPW60R040CFD7	600 V, 40 mΩ, TO-247
			IPW60R055CFD7	600 V, 55 mΩ, TO-247
Analog and digital control ICs	Microcontroller	XMC™	XMC1400 family (PFC stage)	ARM® Cortex® M0 based µC
			XMC4000 family (HV DC-DC/PWM stage)	ARM® Cortex® M4F based µC
AUX	AC-DC power conversion	QR/FF flyback CoolSET™	ICE5QR0680AG	800 V, 42 W, 0.8 mΩ, PG-DSO-12
			ICE5AR0680AG	800 V, 42 W, 0.8 mΩ, PG-DSO-12
Driver ICs (PFC and LLC)	Gate driver ICs for MOSFETs	2EDN EiceDRIVER™	2EDN7524F/R	2-channel low-side, non-isolated, 5 A
		1EDN EiceDRIVER™	1EDN7x	1-channel low side, non-isolated, 4 A source, 8 A sink
			1EDN7550x	1-channel low-side, non-isolated, true differential inputs
		2EDFx EiceDRIVER™ *	2EDF7275F/K, 2EDF7235K	2-channel functional isolated (1.5 kV)
		2EDSx EiceDRIVER™ *	2EDS81x5H, 2EDS82x5H	2-channel reinforced (safe) isolated (6 kV)

*coming Q2 2018

www.infineon.com/ev-charging

Low speed electric vehicles

Based on industry leading technology, highest quality and manufacturing expertise, Infineon provides a variety of innovative power semiconductors which enable designers to develop highly reliable and efficient solutions. Through our comprehensive portfolio we can address a broad range of battery powered motor control applications, such as power tools, forklifts, all kinds of light electric vehicles including e-skateboards, e-scooters, pedelecs, low speed cars and many others. Infineon offers an excellent selection of devices for power management and consumption, as well as voltage regulation – such as power MOSFETs (e.g. CoolMOS™ and OptiMOS™), XMC™ microcontrollers, EiceDRIVER™ gate drivers and more.

A complete set of components that ensure system-cost competitiveness and high performance solution

	Consumer robotics	Home and professional	Light electric vehicles
MOSFETs	StrongIRFET™ 20 V-300 V		
	OptiMOS™ 25 V-80 V		OptiMOS™ 80 V-300 V
	CoolMOS™ P7 (standard grade)[1]		CoolMOS™ P7 (industrial grade)[1]
Gate driver ICs	EiceDRIVER™/Half-bridge and three-phase gate driver ICs		
	200 V to 600 V gate driver ICs		
IPM	CIPOS™ Nano		
Microcontrollers	XMC1300/XMC1400		
	iMOTION™	XMC4500/XMC4400	
Microcontroller & driver supply	Linear voltage and DC-DC switching regulators		
CAN transceivers	IFX1050, IFX1051		
Magnetic sensors	Hall and xMR sensors		
Authentication	OPTIGA™ Trust B		

Infineon product offering		Consumer robotics	Home and professional	Light electric vehicles
Supply voltage		12 V-48 V	10.8 V-56 V	24 V-144 V
MOSFET OptiMOS™ StrongIRFET™	Voltage	25 V-100 V	20 V -100 V	60 V-300 V
	Package	SuperSO8/PQFN 3x3/DirectFET™ S/M-Can	SuperSO8/PQFN 3x3/DirectFET™ S/M/L-Can TOLL/TO-220/DPAK/D²PAK	TO-220/DPAK/D²PAK/D²PAK 7pin/TOLL/ DirectFET™ L-Can
HV MOSFETs CoolMOS™ P7	Voltage	600 V – 700 V*	600 V – 700 V*	600 V**
Gate driver ICs		6EDL04N02PR/2EDL05N06PF/IRS2005,7,8 IRS2301/IRS2136/IRS21867/IRS2334	1EDN/2EDN/6EDL04N02PR/2EDL05N06PF IRS2005,7,8 /IRS2301/IRS2136/IRS21867/IRS2334	
IPM – CIPOS™ Nano		IRSM836-0x4MA (x=2,4,8) IRSM808-204MH	IRSM005-800MH IRSM005-301MH	
Authentication IC**)		OPTIGA™ Trust B	OPTIGA™ Trust B	OPTIGA™ Trust B
Microcontroller XMC		XMC1100	XMC1300	XMC1300
iMOTION™		IRMCK099M	IRMCK099M	XMC4400/4500
Microcontroller & driver supply		IFX1763/IFX54441/IFX54211/IFX30081/ IFX90121/IFX91041	IFX1763/IFX54441/IFX54211/IFX30081/ IFX90121/IFX91041	IFX1763/IFX54441/IFX54211/IFX30081/ IFX90121/IFX91041
CAN transceivers		IFX1050, IFX1051	IFX1050, IFX1051	IFX1050, IFX1051
Sensors		Hall switches (TLE496X), Angle sensor (TLI5012B), 3D magnetic sensor (TLV493D)	Hall switches (TLE496X), Angle sensor (TLI5012B), 3D magnetic sensor (TLV493D)	Hall switches (TLE496X), Angle sensor (TLE5012B), 3D magnetic sensor (TLV493D)

1) If the necessary package/$R_{DS(on)}$ combination is not available in the new CoolMOS™ P7 series yet, the previous CoolMOS™ CE and P6 series are the preferred series
* standard grade
** industrial grade

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Telecom power supply

The telecommunication industry providing data, voice and video is continuously growing supported by the expansion into new markets and accelerated by the spread of wireless and broadband technologies. The outstanding improvements in telecom SMPS performance achieved in the past 10 years have been primarily brought by the dramatic reduction of the on-resistance achieved in high voltage MOSFETs, using the revolutionary superjunction principle.

This principle was introduced by Infineon at the end of the nineties in the CoolMOS™ series. Equally impressive improvements in reverse-recovery characteristics have been achieved for high voltage CoolSiC™ (Silicon Carbide) diodes. Infineon's high voltage offerings are complemented by the newly introduced high voltage GaN switches named CoolGaN™, enabling highest electrical conversion efficiency at attractive system cost. In order to achieve the new challenging efficiency targets, the synchronous rectification utilizing the unique performance of OptiMOS™ low voltage MOSFETs has become increasingly popular even in the typically high output voltage of telecom rectifiers.

Functional block	Product category	Topology	Product family	Benefits
PFC	High voltage MOSFETs	CCM/interleaved PFC; TTF	600 V/650 V CoolMOS™ C7/G7	› Best FOM $R_{DS(on)}$*Q_G and $R_{DS(on)}$*E_{oss} › Lowest $R_{DS(on)}$ per package › Low dependency of switching losses form $R_{g,ext}$
			600 V CoolMOS™ P7	› Low turn-off losses › Low Q_{oss} › Low Q_G
	High voltage GaN	PFC, totem pole full-bridge	600 V CoolGaN™	› Switching at high frequencies (> Si) › Enables high power desnity
	SiC diodes	CCM/interleaved PFC	650 V CoolSiC™ Schottky diode generation 6	› Low FOM V_F*Q_C
	Control ICs	CCM PFC IC	800 V – ICE3PCS0xG	› High PFC and low THD
DC-DC main stage	High voltage MOSFETs	CCM/interleaved PFC; TTF HB LLC	600 V CoolMOS™ C7/P7/G7	› Fast switching speed for improved efficiency and thermals › 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 which prevents device failure during hard commutation
		LLC	600 V CoolMOS™ C7/G7	› Low turn-off losses › Low Q_{oss} › Low Q_G
		CCM/interleaved PFC; TTF HB LLC	600 V CoolMOS™ CFD7	› Best-in-class Q_{rr} and t_{rr} level › Significant reduced Q_G › Improved efficiency over previous CoolMOS™ fast body diode series
	Control ICs	HB LLC IC	ICE1HS01G-1, ICE2HS01G	› High efficiency and low EMI
Synchronous rectification	Low voltage MOSFETs	Synchronous rectification MOSFET	OptiMOS™ 80 V-100 V	› Industry's lowest FOM ($R_{DS(on)}$*Q_G) leading to high efficiency at good price/performance › Low voltage overshoots enabling easy design-in › Industry's lowest $R_{DS(on)}$ › Highest system efficiency and power density › Outstanding quality and reliability › Reduces the need for a snubber circuit
Auxiliary power supply	Control ICs	5th generation QR/FF flyback CoolSET™	QR 800 V - ICE5QRxx80Ax FF 800 V - ICE5xRxx80AG	› Quasi-resonant switching operation for high efficiency and low EMI signature › Fixed frequency switching operation for ease-of-design – 100 KHz and 125 KHz › Fast and robust start-up with cascode configuration › Robust protection with adjustable line input over-voltage protection, V_{CC} and CS pin short-to-ground protection › Optimized light-load efficiency with selectable burst mode entry/exit profile › Frequency reduction for mid and light load condition to reduce switching losses and increase efficiency › Direct feedback and regulation with integrated error amplifier for non-isolated output › High power delivery of up to 42 W with 800 V heatsink-less SMD package CoolSET™
Housekeeping	Microcontrollers	-	XMC1xxx	› Flexibility, HR PWM, digital communication › ARM® based standard MCU family and wide family
Conversion	Microcontrollers	-	XMC4xxx	› Flexibility, HR PWM, digital communication › ARM® based standard MCU family and wide family
PFC, PWM/resonant converter, synchronous rectification	Gate driver ICs	Single channel non-isolated	1EDN751x EiceDRIVER™	› 8 V UVLO option › (-)10 V input robustness › Output robust against reverse current
		Single channel non-isolated	1EDN7550 EiceDRIVER™	› 8 V UVLO option › (-)10 V input robustness › True differential inputs for >100 V_{AC} ground shift robustness
		Dual channel non-isolated	2EDN7x EiceDRIVER™	› 8 V UVLO option › (-)10 V input robustness › Output robust against reverse current
		Dual channel junction isolated	2EDL811x EiceDRIVER™ (Expected Q2 2018)	› 20 ns typ. propagation delay time › 20 V bootstrap capability on high side › (-)7 V input robustness
		Single channel isolated	1EDi Compact EiceDRIVER™	› 100 ns typ. propagation delay time › Functional isolation 1.2 kV Separate source and sync outputs
		Dual channel isolated	2EDFx EiceDRIVER™	› 35 ns typ. propagation delay time › Functional isolation 1.5 kVCMTI > 150 V/ns
		Dual channel isolated	2EDSx EiceDRIVER™	› 35 ns typ. propagation delay time › Reinforced (safe) isolation 6 kV CMTI > 150 V/ns
Or-ing	Low voltage MOSFETs	Or-ing MOSFET	OptiMOS™ 60 V-200 V	› Industry's lowest FOM ($R_{DS(on)}$*Q_G) leading to high efficiency at good price/performance
Battery protection	Low voltage MOSFETs	MOSFET	OptiMOS™ 60 V-150 V	› Low voltage overshoots enabling easy design-in
Isolated DC-DC	Low voltage MOSFETs	Primary side PWM MOSFET	OptiMOS™ 60 V-200 V	› Industry's lowest $R_{DS(on)}$ › Highest system efficiency and power density › Outstanding quality and reliability › Reduces the need for a snubber circuit
			StrongIRFET™ 60 V-200 V	
			Small Signal 60 V-200 V	
		Synchronous rectification MOSFET	OptiMOS™ 40 V-100 V	
			StrongIRFET™ 40 V-100 V	
		Or-ing MOSFET	OptiMOS™ 25 V-30 V	
			StrongIRFET™ 25 V-30 V	

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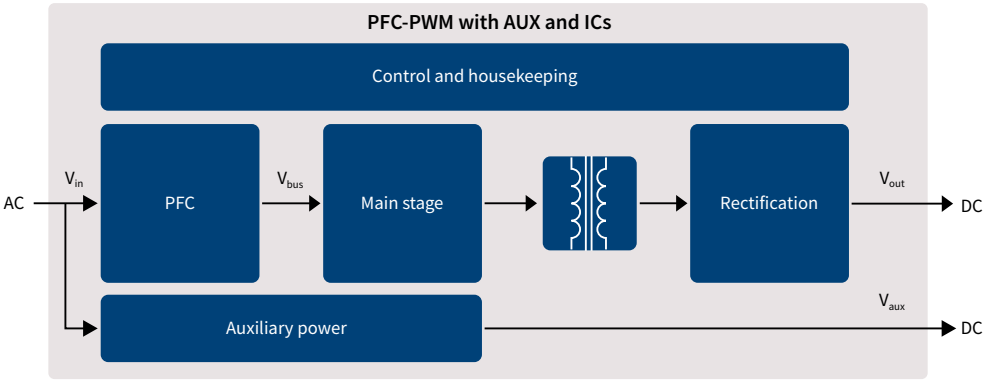
Server power supply

The trend of the enterprise server and datacenter server is to deliver more power per rack and meanwhile the higher rising cost of energy and environmental concerns make SMPS efficiency optimization a key requirement across the entire load range for server and data center design. This challenging task is combined with the requirement for higher power and higher power density with cost effective design. In the PFC stage, and in general hard switching topologies used in server applications, Infineon proposes the 600 V CoolMOS™ C7 family with the lowest FOM $R_{DS(on)}$ *Q_G and $R_{DS(on)}$ *E_{oss}. This provides the lowest switching losses, which are necessary in fast switching needed in high-end server SMPS, thus optimizing the efficiency starting from very light load operation. The very compact SMD packages such as ThinPAK, offer benefits in space and power density, and are used with Infineon's new industry standard non-isolated driver family 2EDN752x.

Complementary to 600 V CoolMOS™ C7 in high efficiency PFC are the CoolSiC™ Schottky diodes generation 6 and generation 5. The 600 V CoolMOS™ P7 family offers a good compromise between price and performance. This is valuable in both PFC and HV DC-DC stages where the low Q_G and turn-off losses are important benefits, especially in the case of high switching frequency operation and high light load efficiency requirements. In applications with a low output voltage and high output current, further efficiency improvements have been made possible by the continuous reduction of on-resistance by Infineon's low voltage OptiMOS™ MOSFET series used in the synchronous rectification stage. Infineon's low voltage families are complemented by StrongIRFET™ which is optimized for lower switching frequencies and highest system robustness.

The new GaN based MOSFETs enable system with efficiency close to the theoretical limit and very high density. This is a step forward to fulfill the increasing demand for more energy efficiency that large hyperscale data canter are bringing in the industry.

Block diagram



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Functional block	Product category	Topology	Product family	Benefits
PFC	High voltage MOSFETs	CCM/interleaved PFC; TTF	600 V/650 V CoolMOS™ C7 600 V/650 V CoolMOS™ G7	› Best FOM $R_{DS(on)}$*Q_G and $R_{DS(on)}$*E_{oss} › Lowest $R_{DS(on)}$ per package › Low dependency of switching losses form $R_{g,ext}$
	SiC diodes	CCM/interleaved PFC	650 V CoolSiC™ Schottky diode G6 and G5	› Low FOM V_F*Q_G
	Control ICs	CCM PFC IC	ICE3PCS0xG	› Ease-of-use
	IGBTs	CCM/interleaved PFC	650 V TRENCHSTOP™ H5	› High PFC and low THD
			650 V TRENCHSTOP™ F5	› High efficiency in low inductance designs
Main stage	High voltage MOSFETs	ITTF	600 V CoolMOS™ C7/P7	› Fast switching speed for improved efficiency and thermals › 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 which prevents device failure during hard commutation
		LLC	600 V CoolMOS™ C7/P7	› Low turn-off losses › Low Q_{oss} › Low Q_G
		ZVS, phase shift full-bridge	650 V CoolMOS™ CFD7	› Fast and rugged body diode › Highest reliability for 650 V V_{DS} › Low Q_G and soft commutation behavior
	IGBTs	ZVS PS FB; LLC	650 V TRENCHSTOP™ H5	› Improved ruggedness and ease-of-use
		ZVS PS FB; LLC, TTF	650 V TRENCHSTOP™ F5	› Improved ruggedness and high efficiency in low inductance designs
	GaN HEMTs	Totem Pole PFC	650 V CoolGaN™	› Outstanding performance › Highest power density
	Control ICs	HB LLC IC	ICE1HS01G-1	› High efficiency and low EMI
			ICE2HS01G	
Sychronous rectification	Low voltage MOSFETs	HB LLC and centertap	40 V OptiMOS™	› High efficiency over whole load range, layout tolerance
			40 V StrongIRFET™	› High robustness and ruggedness
		ITTF	60 V OptiMOS™	› High efficiency, low thermals, low V_{DS} overshoot
			60 V StrongIRFET™	› High robustness and ruggedness
		ZVS PS FB and center-tap	80 V OptiMOS™	› High efficiency over whole load range, low V_{DS} overshoot and oscillations
			80 V StrongIRFET™	› High robustness and ruggedness
Auxiliary power supply	Control ICs	QR/FF flyback CoolSET™	800 V – ICE2QRxx80(Z)(G) ICE3xRxx80J(Z)(G) 700 V ICE5QRxx70A(Z)(G) 800 V ICE5QRxx80A(Z)(G)	› Low standby power, high efficiency and robustness › An integrated 700 V/800 V superjunction power MOSFET with avalanche capability › Burst mode entry/exit to optimize standby power at different low load conditions
Housekeeping	Microcontrollers	-	XMC1xxx	› Flexibility, HR PWM, digital communication › ARM® based standard MCU family and wide family
Conversion	Microcontrollers	-	XMC4xxx	› Flexibility, HR PWM and digital communication
PFC, PWM/resonant converter, synchronous rectification	Gate driver ICs	-	1EDix EiceDRIVER™	› 100 ns typ. propagation delay time › Functional isolation › Separate source
		-	2EDNx EiceDRIVER™	› 8 V UVLO option › -10 V input robusteness › Output robust against reverse current

www.infineon.com/server

Industrial SMPS

Industrial SMPS are virtually everywhere, powering a wide range of devices from industrial automation robots to medical equipment and vending machines. With the spreading of Internet of things and the adoption of Industry 4.0, the demand for industrial SMPS is on the rise.

The industrial SMPS market is quite fragmented with large players coexisting with smaller specialist ones. Also, the product offering is very differentiated, with companies offering large catalogues and managing many orders of small quantities. This is due to the final applications diversified nature, which often makes it difficult for the manufacturer to know the final usage of their products. The requirement to fit many different usages, often in harsh environments, with many different mission profiles, together with the intrinsic availability needs of industrial and medical devices, makes product reliability one of the main concerns for industrial SMPS makers.

The other trend is towards more power density, with focus on how heat is managed at system level. Infineon's CoolMOS™ product family of superjunction MOSFETs can certainly meet these needs. The new CoolMOS™ 7 family and the new CoolSiC™ silicon carbide diode G6 boast superior quality, unparalleled energy efficiency and optimal price performance. The product range is very large, able to meet all industrial SMPS power classes and fit well into the most used topologies.

Future looking SMPS, requiring max efficiency, max power density, while preserving reliability, may make use of the CoolGaN™ HV HEMTs.

Power Class	Topology PFC	Topology main stage	Product family	Benefits
<75 W	–	Flyback (quasi- resonant)	700 V CoolMOS™ P7 800 V CoolMOS™ P7	› Robustness › Price performance › Energy efficiency › Outstanding portfolio granularity › Ease-of-use › Best EMI behavior
75 W - 300 W	DCM PFC standard	Flyback (quasi- resonant)	700 V CoolMOS™ P7 800 V CoolMOS™ P7	
		LLC	600 V CoolMOS™ P7	
300 W – 500 W	CCM PFC standard	Double forward	650/ 600 V CoolMOS™ C7 650/ 600 V CoolMOS™ CFD7 600 V CoolMOS™ P7 650 V CoolSiC™ diode	› Robustness › Ruggedness › Fast body diode with CFD7 › Lowest $R_{DS(on)}$ per package with C7 › Best efficiency with C7 › Best Qc x Vf FOM with CoolSiC™ 650 V diode › Largest hi-power portfolio
>500 W	CCM PFC standard interleaved dual boost	Half-bridge Full-bridge	650/ 600 V CoolMOS™ C7 and G7 650/ 600 V CoolMOS™ CFD7 600 V CoolMOS™ P7 650 V CoolSiC™ diode	

The new 950V CoolMOS™ is suitable for special cases depending on customer requests.

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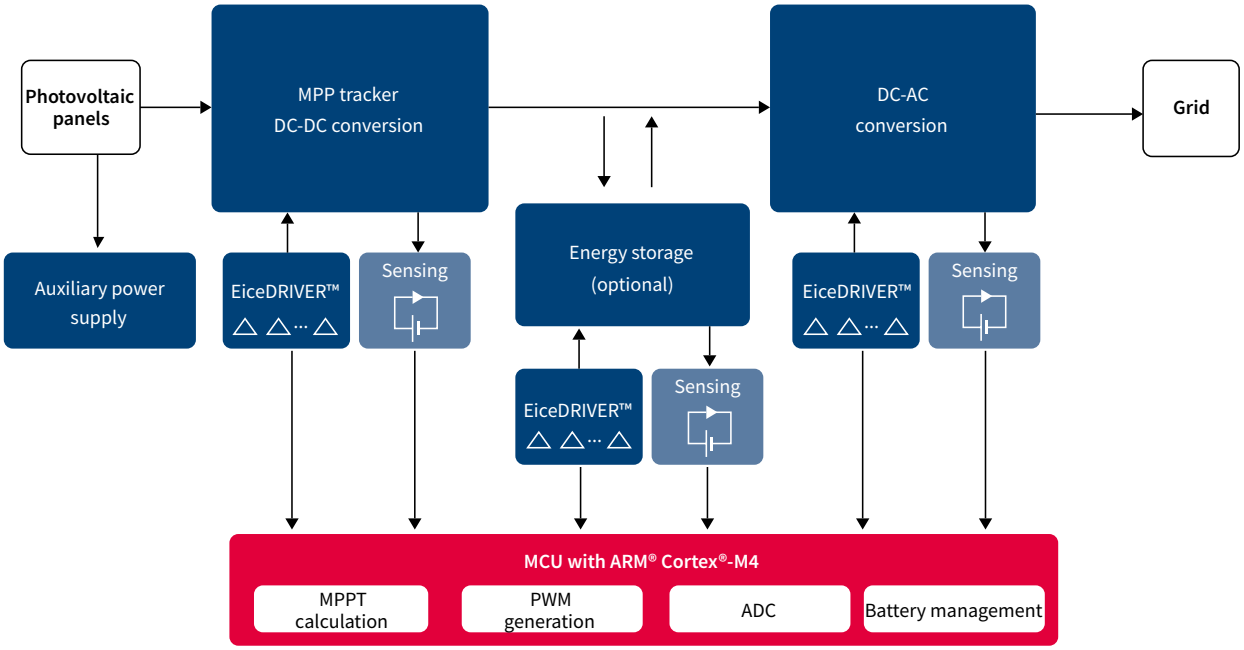
Solar

Infineon provides a comprehensive portfolio to deliver the best efficiency and reliability for solar applications. Infineon's leading edge technology like CoolMOS™ SJ MOSFET, HighSpeed 3 and TRENCHSTOP™ 5, CoolSiC™ Schottky diodes, CoolSiC™ MOSFET, coreless transformer driver etc., combined with rich experience and the highest quality, ensured our number 1 position in solar applications. The newest add ARM® Cortex®-M4 based MCU enables easy and high efficiency design.

	Optimizer 250 W-750 W	Single/Dual microinverter 250 W-600 W; 900 W	String inverter 1 kW-30 kW	Central inverter 500 kW-5000 kW
MOSFET	OptiMOS™ SuperSO8/DirectFET™ | 75 V-150 V	OptiMOS™ SuperSO8 | 60 V-200 V	OptiMOS™ 150 V-300 V	
		CoolMOS™ D²PAK/ThinPAK | 600 V-800 V	CoolMOS™ TO-247 | 600 V/650 V | 19 mΩ-99 mΩ	
			CoolSiC™ MOSFET TO-247-3/TO-247-4 | 1200 V	
SiC diode		CoolSiC™ Schottky diodes DPAK/TO-220 | 600 V/1200 V D²PAK | 650 V	CoolSiC™ Schottky diodes TO-220/TO-247 | 650 V/1200 V	
IGBT			TRENCHSTOP™/HighSpeed 3 TO-247 single/TO-247 DuoPack | 600 V/650 V/1200 V	
Power module and stack			EASYPACK™ 1B/2B Press FIT	Primepack; EconoDual3
Gate driver ICs		2EDN EiceDRIVER™	EiceDRIVER™ 1ED Compact EiceDRIVER™ Enhanced 1ED020I12-F2/2ED020I12-F2	EiceDRIVER™ 1ED Compact EiceDRIVER™ Enhanced 1ED020I12-F2/2ED020I12-F2
Schottky diode			BAT165 Schottky diode	
Auxiliary power supply			CoolSET™ 800 V	
Microcontroller	XMC1xxx ARM® Cortex®-M0	XMC1xxx ARM® Cortex®-M0	XMC1xxx ARM® Cortex®-M0	XMC1xxx ARM® Cortex®-M0
	XMC45xx ARM® Cortex®-M4	XMC45xx ARM® Cortex®-M4	XMC45xx ARM® Cortex®-M4	XMC45xx ARM® Cortex®-M4

Infineon leading products for complete solar system



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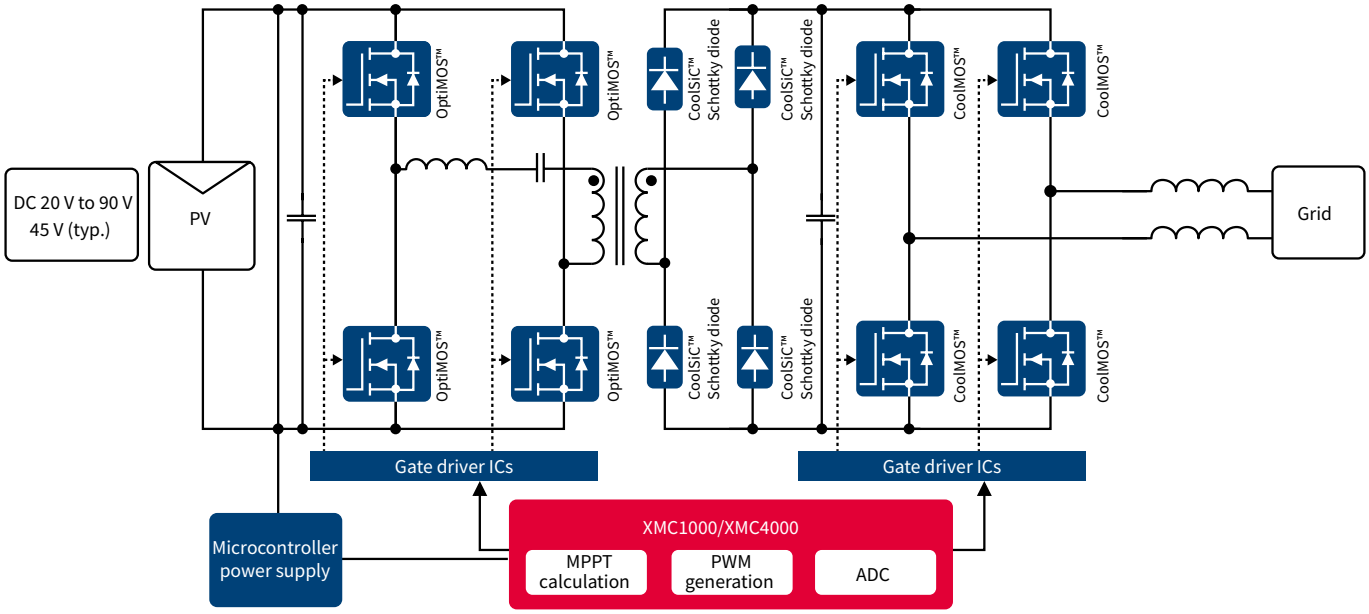
Microinverter



CoolMOS™ MOSFETs for microinverter

Topology	Package	Voltage class	CoolMOS™
Current source	D²PAK	800 V	SPB17N80C3
Current/voltage source	D²PAK	650 V	IPB65R190C6
			IPB65R190C7
			IPB65R125C7
			IPB65R095C7
			IPB65R065C7
			IPB65R045C7
	ThinPAK 8x8	600 V	IPL60R185P7
			IPL60R125P7
			IPL60R105P7
			IPL60R085P7
			IPL60R065P7
			IPL60R185C7
			IPL60R125C7
			IPL60R104C7
			IPL60R065C7
		650 V	IPL65R195C7
			IPL65R130C7
			IPL65R099C7
			IPL65R070C7

CoolSiC™ Schottky diodes for microinverter

Topology	Package	Voltage class	Part number
Rectifier	TO-252 (DPAK)	1200 V	IDM02G120C5
			IDM05G120C5
			IDM08G120C5
		600 V	IDD05SG60C
	D²PAK	650 V	IDK04G65C5

Microcontrollers for microinverter

Topology	Package	Voltage class	Technology
Microcontroller	All	All	XMC1000
Microcontroller supply	Linear voltage regulator	Up to 20 V	IFX1763, IFX54441, IFX54211
Microcontroller	All	All	XMC4000

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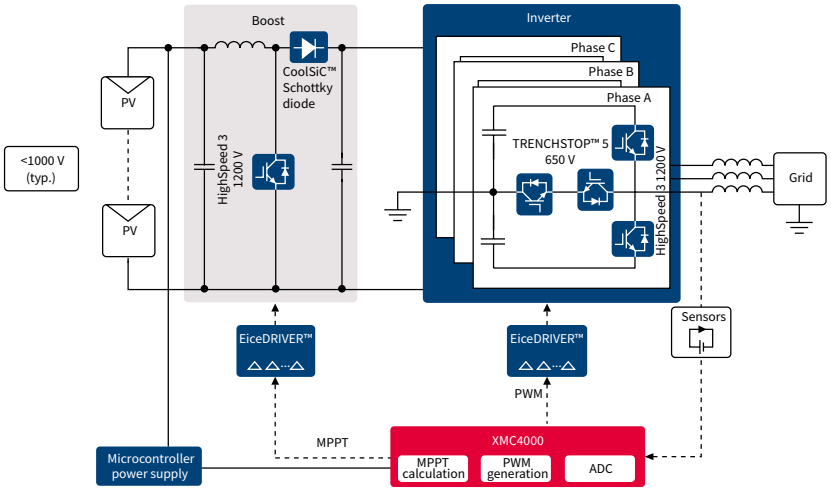
String inverter (three-phase)



Discrete power devices for string inverter

Inverter type	Function	Product series	Part number	Voltage class
Single-phase	Boost	CoolMOS™ C7	IPW60R040C7	600 V
		CoolSiC™ diode	IDW20G65C5	650 V
	DC-DC	CoolMOS™ P7	IPW60R037P7	600 V
		CoolSiC™ diode	IDW20G65C5	650 V
		Rapid diode	IDW15E65D2	650 V
	Inverter	HighSpeed 3	IKW40N60H3	600 V
		TRENCHSTOP™ 5 H5	IKW40N65H5	650 V
		CoolMOS™ P7	IPW60R037P7	600 V
Three-phase	Boost	HighSpeed 3	IKW40N120H3	1200 V
		CoolSiC™ diode	IDW20G120C5B IDW30G120C5B IDW40G120C5B	1200 V
		TRENCHSTOP™ 5 S5	IKW40N65ES5	650 V
		TRENCHSTOP™ 5 L5	IKW30N65EL5	650 V
	Inverter	HighSpeed 3	IKW40N120H3	1200 V
		CoolSiC™ MOSFET	IMW120R045M1 IMZ120R045M1	1200 V

Gate driver ICs for string inverter

Power device	Driving method	Voltage class	Part number
IGBT/SiC MOSFET	Single channel	1200 V	EiceDRIVER™ 1ED Compact EiceDRIVER™ Enhanced 1ED020I12-F2/ 2ED020I12-F2
IGBT/SiC MOSFET	Half-bridge & high- and low-side	1200 V	EiceDRIVER™ Enhanced 2ED020I12-F2/FI

CoolSET™ for string inverter

Voltage class	Part number
800 V	ICE3AR2280JZ
650 V	ICE3BR1765JZ

Microcontrollers for string inverter

Topology	Package	Voltage class	Technology
Microcontroller	All	All	XMC1000
Microcontroller supply	Linear voltage regulator	Up to 20 V	IFX1763, IFX54441, IFX54211
Microcontroller	All	All	XMC4000

For Infineon's extensive module portfolio for string and central inverters, visit:
www.infineon.com/solar
www.infineon.com/igbtmodules1200v

CoolMOS™ SJ MOSFET low power package innovations

Addressing today's consumer needs

Cost-effective drop-in replacement for DPAK

SOT-223

The SOT-223 package without 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 designs with low power dissipation.

Solution for higher assembly yield in charger applications

IPAK Short Lead with ISO Standoff

With a well-defined mold feature at the bottom of the package body, the package allows to fully insert the MOSFET into the PCB, while preserving a well-defined isolation distance of 0.3 mm between PCB and package body. This way, the residues between these two can be effectively removed after cleaning, improving yield and reducing cost. It also helps to increase the effective creepage distance between the legs. The optimized leg width and length makes this package more suitable for chargers.

Solution for height reduction in adapters and chargers

TO-220 FullPAK Narrow Lead

Infineon's TO-220 FullPAK Narrow Lead addresses customer needs with regards to height reduction requirements in adapter and charger applications. By offering an optimized standoff width and height and improved creepage distance, the package can be fully inserted into the PCB without any production concerns and, therefore, is especially suitable for slim and semi-slim adapter solutions.

Improved creepage distance for open frame power supplies

TO-220 FullPAK Wide Creepage

This package solution has an increased creepage distance between the pins to 4.25 mm compared to 2.54 mm of a TO-220 FullPAK package. It targets open frame power supplies such as TV sets and PC power, where dust can enter the case through air vents. Dust particles can reduce the effective creepage between pins over time, which may lead to high voltage arcing. The package meets the requirements of open frame power supplies without any additional measures. Thus, it reduces system cost by offering an alternative to frequently used approaches to increase creepage distance.

www.infineon.com/sot-223
www.infineon.com/to220-fp-narrowlead
www.infineon.com/ipak-sl-isostandoff
www.infineon.com/to220-fp-widecreepage

CoolMOS™ SJ MOSFET high power package innovations

Space saving and high performance packages

Innovative top-side cooled SMD solution for high power applications

Top side cooled DDPAK

This is the first top-side cooled surface mount device (SMD) package addressing high power SMPS applications such as PC power, solar, server and telecom. SMD based SMPS designs support fast switching and help to reduce the parasitic inductance associated with long leaded packages such as the common TO-220 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 DDPAK, the thermal decoupling of board and semiconductor is possible, enabling higher power density or improved system lifetime.

For highest efficiency and controllability in high power SMPS markets

TO-247 4pin with asymmetric leads

The TO-247 4pin package with asymmetric leads is an optimized version of the standard TO-247 4pin and enables highest efficiency and controllability in the high power SMPS market. The fourth pin acts as a Kelvin source. The main current of the switch is placed outside of the gate loop and the feedback is eliminated. This leads to less switching losses, especially at high currents. Secondly, the EMI will be reduced due to cleaner waveforms. In addition, the asymmetric leads further improve the ease-of-use in the design-in process. Compared to the standard TO-247 4pin the distance between the critical pins has been increased to enable simplified wave soldering and reduced board yield loss.

Enabling significant space savings

ThinPAK 8x8

With very small footprint of only 64 mm² (vs. 150 mm² for the D²PAK) and a very low profile with only 1 mm height (vs. 4.4 mm for the D²PAK) the ThinPAK 8x8 leadless SMD package for high voltage MOSFETs is a first choice to decrease system size in power-density driven designs. Low parasitic inductance and a separate 4pin Kelvin source connection offer best efficiency and ease-of-use. The package is RoHS compliant with Halogen free mold compound.

Optimized for high power applications

TO-Leadless

Combined with the latest 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 7pin, 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 highest power density is demanded. Equipped with 4pin Kelvin source connection and low parasitic inductances the package offers best efficiency and ease of use. The package is MSL1 compliant and reflow solderable.

www.infineon.com/thinpak8x8
www.infineon.com/toll

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600 V CoolMOS™ P7 ACTIVE & PREFERRED
Industrial grade

$R_{DS(on)}$ [mΩ]	TO -220	TO-220 FullPAK	TO-247	TO-247 4pin asymmetric leads	TO-252 (DPAK)	TO-220 FullPAK Wide Creepage	ThinPAK 8x8	D²PAK
37			IPW60R037P7	IPZA60R037P7				
60	IPP60R060P7	IPA60R060P7	IPW60R060P7	IPZA60R060P7				IPB60R060P7
65							IPL60R065P7	
80	IPP60R080P7	IPA60R080P7	IPW60R080P7	IPZA60R080P7			IPL60R085P7	IPB60R080P7
99	IPP60R099P7	IPA60R099P7	IPW60R099P7	IPZA60R099P7				IPB60R099P7
105							IPL60R105P7	
120	IPP60R120P7	IPA60R120P7	IPW60R120P7	IPZA60R120P7				IPB60R120P7
125							IPL60R125P7	
180	IPP60R180P7	IPA60R180P7	IPW60R180P7	IPZA60R180P7	IPD60R180P7			IPB60R180P7
185							IPL60R185P7	
280	IPP60R280P7	IPA60R280P7			IPD60R280P7			IPB60R280P7
285							IPL60R285P7	
360	IPP60R360P7	IPA60R360P7			IPD60R360P7			IPB60R360P7
365							IPL60R365P7	
600	IPP60R600P7	IPA60R600P7			IPD60R600P7			

600 V CoolMOS™ P7 ACTIVE & PREFERRED
Standard grade

$R_{DS(on)}$ [mΩ]	TO -220	TO-220 FullPAK	TO-247	TO-247 4pin	TO-252 (DPAK)	TO-220 FullPAK Wide Creepage	ThinPAK 8x8	SOT-223
180		IPA60R180P7S			IPD60R180P7S	IPAW60R180P7S		
280		IPA60R280P7S			IPD60R280P7S	IPAW60R280P7S		
360		IPA60R360P7S			IPD60R360P7S	IPAW60R360P7S		IPN60R360P7S
600		IPA60R600P7S			IPD60R600P7S	IPAW60R600P7S		IPN60R600P7S

700 V CoolMOS™ P7 ACTIVE & PREFERRED

$R_{DS(on)}$ [mΩ]	TO -220	TO – 262 (I^2PAK)	TO-251 (IPAK Short Lead)	TO-220 FullPAK	TO-247	TO-252 (DPAK)	TO-220 FullPAK narrow lead	TO-251 (IPAK Short Lead w/ ISO Standoff)	SOT-223
360			IPS70R360P7S	IPA70R360P7S		IPD70R360P7S	IPAN70R360P7S	IPSA70R360P7S	IPN70R360P7S
450				IPA70R450P7S			IPAN70R450P7S	IPSA70R450P7S	IPN70R450P7S
600			IPS70R600P7S	IPA70R600P7S		IPD70R600P7S	IPAN70R600P7S	IPSA70R600P7S	IPN70R600P7S
750				IPA70R750P7S			IPAN70R750P7S	IPSA70R750P7S	IPN70R750P7S
900			IPS70R900P7S	IPA70R900P7S		IPD70R900P7S	IPAN70R900P7S	IPSA70R900P7S	IPN70R900P7S
1200								IPSA70R1K2P7S	IPN70R1K2P7S
1400			IPS70R1K4P7S			IPD70R1K4P7S		IPSA70R1K4P7S	IPN70R1K4P7S
2000								IPSA70R2K0P7S	IPN70R2K0P7S

800 V CoolMOS™ P7 ACTIVE & PREFERRED

$R_{DS(on)}$ [mΩ]	TO -220	TO-220 FullPAK	TO-247	TO-252 (DPAK)	TO-251 (IPAK)	TO-251 (IPAK Short Lead)	SOT-223	TO-220 FullPAK narrow lead
280	IPP80R280P7	IPA80R280P7	IPW80R280P7	IPD80R280P7				IPAN80R280P7
360	IPP80R360P7	IPA80R360P7	IPW80R360P7	IPD80R360P7				IPAN80R360P7
450	IPP80R450P7	IPA80R450P7		IPD80R450P7				IPAN80R450P7
600	IPP80R600P7	IPA80R600P7		IPD80R600P7	IPU80R600P7	IPS80R600P7	IPN80R600P7	
750	IPP80R750P7	IPA80R750P7		IPD80R750P7	IPU80R750P7	IPS80R750P7	IPN80R750P7	
900/950	IPP80R900P7	IPA80R900P7		IPD80R900P7	IPU80R900P7	IPS80R900P7	IPN80R950P7	
1200	IPP80R1K2P7	IPA80R1K2P7		IPD80R1K2P7	IPU80R1K2P7	IPS80R1K2P7	IPN80R1K2P7	
1400	IPP80R1K4P7	IPA80R1K4P7		IPD80R1K4P7	IPU80R1K4P7	IPS80R1K4P7	IPN80R1K4P7	
2000				IPD80R2K0P7	IPU80R2K0P7	IPS80R2K0P7	IPN80R2K0P7	
2400				IPD80R2K4P7	IPU80R2K4P7	IPS80R2K4P7	IPN80R2K4P7	
3300				IPD80R3K3P7	IPU80R3K3P7		IPN80R3K3P7	
4500				IPD80R4K5P7	IPU80R4K5P7		IPN80R4K5P7	

www.infineon.com/600v-p7 www.infineon.com/700v-p7 www.infineon.com/800v-p7

950 V CoolMOS™ P7*

$R_{DS(on)}$ [mΩ]	TO -220	TO-220 FullPAK	SOT-223	TO-251 IPAK Long lead	TO-252 (DPAK)	TO-220 FullPAK Wide Creepage	ThinPAK 8x8	D²PAK
450		IPA95R450P7			IPD95R450P7			
750		IPA95R750P7		IPU95R750P7	IPD95R750P7			
1200		IPA95R1K2P7	IPN95R1K2P7	IPU95R1K2P7	IPD95R1K2P7			
2000			IPN95R2K0P7	IPU95R2K0P7	IPD95R2K0P7			
3700			IPN95R3K7P7	IPU95R3K7P7				

*coming soon

600 V CoolMOS™ C7 ACTIVE & PREFERRED

$R_{DS(on)}$ [mΩ]	TO-220	TO-263 (D²PAK)	TO-220 FullPAK	TO-247	TO-247 4pin	TO-252 (DPAK)	ThinPAK 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	IPB60R120C7	IPA60R120C7	IPW60R120C7			
125							IPL60R125C7
180	IPP60R180C7	IPB60R180C7	IPA60R180C7	IPW60R180C7		IPD60R180C7	
185							IPL60R185C7

650 V CoolMOS™ C7 ACTIVE & PREFERRED

$R_{DS(on)}$ [mΩ]	TO-220	TO-263 (D²PAK)	TO-220 FullPAK	TO-247	TO-247 4pin	TO-252 (DPAK)	ThinPAK 8x8
19				IPW65R019C7	IPZ65R019C7		
45	IPP65R045C7	IPB65R045C7	IPA65R045C7	IPW65R045C7	IPZ65R045C7		
65	IPP65R065C7	IPB65R065C7	IPA65R065C7	IPW65R065C7	IPZ65R065C7		
70							IPL65R070C7
95	IPP65R095C7	IPB65R095C7	IPA65R095C7	IPW65R095C7	IPZ65R095C7		
99							IPL65R099C7
125	IPP65R125C7	IPB65R125C7	IPA65R125C7	IPW65R125C7			
130							IPL65R130C7
190	IPP65R190C7	IPB65R190C7	IPA65R190C7	IPW65R190C7		IPD65R190C7	
195							IPL65R195C7
225	IPP65R225C7	IPB65R225C7	IPA65R225C7			IPD65R225C7	
230							IPL65R230C7

600 V CoolMOS™ G7 ACTIVE & PREFERRED

$R_{DS(on)}$ [mΩ]	TO -220	TO-Leadless (TOLL)	TO-220 FullPAK	TO-247	TO-252 (Quadruple DPAK)	TO-247 4 pin	TO-252 (Double DPAK)	ThinPAK 8x8
28		IPT60R028G7			IPDQ60R028G7*			
50		IPT60R050G7			IPDQ60R050G7*		IPDD60R050G7*	
80		IPT60R080G7			IPDQ60R080G7*		IPDD60R080G7*	
102		IPT60R102G7			IPDQ60R102G7*		IPDD60R102G7*	
125		IPT60R125G7					IPDD60R125G7*	
150		IPT60R150G7					IPDD60R150G7*	
190							IPDD60R190G7*	

650 V CoolMOS™ G7 ACTIVE & PREFERRED

$R_{DS(on)}$ [mΩ]	TO -220	TO-Leadless (TOLL)	TO-263 (D²PAK)	TO-220 FullPAK	TO-247	TO -252 (DPAK)
33		IPT65R033G7				
105		IPT65R105G7				
195		IPT65R195G7				

*coming soon

www.infineon.com/950v-p7 www.infineon.com/c7 www.infineon.com/g7

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)	ThinPAK 8x8
41					IPW65R041CFD		
80					IPW65R080CFD		
110	IPP65R110CFD		IPB65R110CFD	IPA65R110CFD	IPW65R110CFD		
150	IPP65R150CFD	IPI65R150CFD	IPB65R150CFD	IPA65R150CFD	IPW65R150CFD		
165							IPL65R165CFD
190	IPP65R190CFD	IPI65R190CFD	IPB65R190CFD	IPA65R190CFD	IPW65R190CFD		
210							IPL65R210CFD
310	IPP65R310CFD	IPI65R310CFD	IPB65R310CFD	IPA65R310CFD			
340							IPL65R340CFD
420	IPP65R420CFD			IPA65R420CFD	IPW65R420CFD	IPD65R420CFD	
460							IPL65R460CFD
660				IPA65R660CFD		IPD65R660CFD	
950						IPD65R950CFD	
1400						IPD65R1K4CFD	

600 V CoolMOS™ CFD7 ACTIVE & PREFERRED

$R_{DS(on)}$ [mΩ]	TO-220	TO-263 (D^2PAK)	TO-220 FullPAK	TO-247	TO-247 4pin	TO-252 (DPAK)	ThinPAK 8x8
31				IPW60R31CFD7			
40				IPW60R40CFD7			
55				IPW60R55CFD7			
70	IPP60R70CFD7			IPW60R70CFD7			
75							IPL60R75CFD7
90	IPP60R90CFD7			IPW60R90CFD7			
125	IPP60R125CFD7		IPA60R125CFD7	IPW60R125CFD7			
170	IPP60R170CFD7		IPA60R170CFD7	IPW60R170CFD7		IPD60R170CFD7	
185							IPL60R185CFD7
280	IPP60R280CFD7		IPA60R280CFD7			IPD60R280CFD7	

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www.infineon.com/cfd2

CoolSiC™ Schottky diodes 650 V G6 ACTIVE & PREFERRED

I_F [A]	TO-220 R2L	TO-247 Dual Die	TO-247	Double DPAK (DDPAK)	ThinPAK 8x8
4	IDH04G65C6			IDDD04G65C6	
6	IDH06G65C6			IDDD06G65C6	
8	IDH08G65C6			IDDD08G65C6	
10	IDH10G65C6			IDDD10G65C6	
12	IDH12G65C6			IDDD12G65C6	
16	IDH16G65C6			IDDD16G65C6	
20	IDH20G65C6			IDDD20G65C6	

CoolSiC™ Schottky diodes 650 V G5 ACTIVE

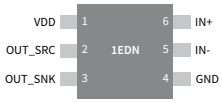
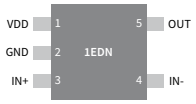
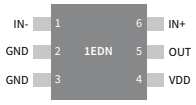
I_F [A]	TO-220 R2L	TO-247 Dual Die	TO-247	D^2PAK R2L	ThinPAK 8x8
2	IDH02G65C5			IDK02G65C5	IDL02G65C5
3	IDH03G65C5			IDK03G65C5	
4	IDH04G65C5			IDK04G65C5	IDL04G65C5
5	IDH05G65C5			IDK05G65C5	
6	IDH06G65C5			IDK06G65C5	IDL06G65C5
8	IDH08G65C5			IDK08G65C5	IDL08G65C5
9	IDH09G65C5			IDK09G65C5	
10	IDH10G65C5		IDW10G65C5	IDK10G65C5	IDL10G65C5
12	IDH12G65C5		IDW12G65C5	IDK12G65C5	IDL12G65C5
16	IDH16G65C5		IDW16G65C5		
20	IDH20G65C5	IDW20G65C5B	IDW20G65C5		
24		IDW24G65C5B			
30/32		IDW32G65C5B	IDW30G65C5		
40		IDW40G65C5B	IDW40G65C5		

CoolSiC™ Schottky diodes 650 V G3 ACTIVE

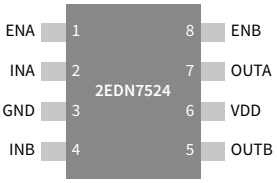
I_F [A]	TO-220 R2L	TO-247 Dual Die	TO-247	DPAK R2L	D^2PAK	ThinPAK 8x8
3	IDH03SG60C			IDD03SG60C		
4	IDH04SG60C			IDD04SG60C		
5	IDH05SG60C			IDD05SG60C		
6	IDH06SG60C			IDD06SG60C		
8	IDH08SG60C			IDD08SG60C		
9	IDH09SG60C			IDD09SG60C		
10	IDH10SG60C			IDD10SG60C		
12	IDH12SG60C			IDD12SG60C		

www.infineon.com/coolsic

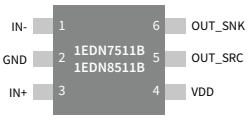
1EDN EiceDRIVER™ portfolio

Package		UVLO	Product name	Orderable part number	Pinout
	SOT-23 6pin	4 V	1EDN7511B	1EDN7511BXUSA1	
		8 V	1EDN8511B	1EDN8511BXUSA1	
	SOT-23 5pin	4 V	1EDN7512B	1EDN7512BXTSA1	
	WSON 6pin	4 V	1EDN7512G	1EDN7512GXTMA1	

2EDN EiceDRIVER™ portfolio

Package		UVLO	Inputs	Product name	Orderable part number	Industry standard pinout configuration
	DSO 8pin	4 V	Direct	2EDN7524F	2EDN7524FXTMA1	
			Inverted	2EDN7523F	2EDN7523FXTMA1	
			Direct	2EDN7424F	2EDN7424FXTMA1	
		8 V	Direct	2EDN8524F	2EDN8524FXTMA1	
			Inverted	2EDN8523F	2EDN8523FXTMA1	
	TSSOP 8pin	4 V	Direct	2EDN7524R	2EDN7524RXUMA1	
			Inverted	2EDN7523R	2EDN7523RXUMA1	
			Direct	2EDN7424R	2EDN7424RXUMA1	
		8 V	Direct	2EDN8524R	2EDN8524RXUMA1	
			Inverted	2EDN8523R	2EDN8523RXUMA1	
	WSON 8pin	4 V	Direct	2EDN7524G	2EDN7524GXTMA1	
			Inverted	2EDN7523G	2EDN7523GXTMA1	

1EDN7550 and 1EDN8550 EiceDRIVER™ with truly differential inputs (TDI) portfolio

Package		UVLO	Ground shift robustness		Product name	Industry standard pinout configuration
			dynamic	static		
	6pin SOT-23	4 V	± 150 V	± 70 V	1EDN7550B	
		8 V	± 150 V	± 70 V	1EDN8550B	

2EDS8xx5H and 2EDF72x5x EiceDRIVER™ (2EDi) portfolio

Package	UVLO	Isolation (input to output)	Output Current (source sink)	Product name	Orderable part number
16-pin DSO 150-mil	4 V	1.5 kV_{peak}	4 A / 8 A	2EDF7275F	2EDF7275FXUMA1
16-pin DSO 300-mil	8 V	V_{IOTM} = 6 kV_{peak} (VDE 0884-11)	4 A / 8 A	2EDS8255H	2EDS8255HXUMA1
		V_{IOTM} = 6 kV_{peak} (VDE 0884-10)		2EDS8265H	2EDS8265HXUMA1
		V_{IOTM} = 6 kV_{peak} (VDE 0884-11)	1 A / 2 A	2EDS8155H	2EDS8155HXUMA1
		VI_{OTM} = 6 kV_{peak} (VDE 0884-10)		2EDS8165H	2EDS8165HXUMA1
13-pin LGA (5x5 mm)	4 V	1.5 kV_{peak}	4 A / 8 A	2EDF7275K	2EDF7275KXUMA1
			4 A / 8 A	2EDF7235K	2EDF7235KXUMA1

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400 V CoolGaN™

$R_{DS(on)}$ [mΩ]	DSO-20-85	DSO-20-87	HSOF-8-3 (TOLL)	DFN 8 x 8
70		IGOT40R070D1 E8220	IGT40R070D1 E8220	

600 V CoolGaN™ **

$R_{DS(on)}$ [mΩ]	DSO-20-85	DSO-20-87	HSOF-8-3 (TOLL)	DFN 8 x 8
70	IGO60R070D1	IGOT60R070D1	IGT60R070D1	IGLD60R070D1
190			IGT60R070D1S*	IGLD60R190D1

All parts are industrial grade qualified
*Standard grade
** Full production Q4/2018

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