



CoolSiC™ G2 MOSFETs 400V / 440V incorporating .XT connection technology

September 2025



CoolSiC™ G2 MOSFETs 400 V / 440 V extending the overall portfolio offering from Infineon to set new standard in the power conversion market



Industrial grade							
package options	CoolSiC™ Diode	CoolSiC™ Hybrid		CoolSiC™ MOSFET			
	Discrete	Discrete	Module	Discrete	IPM	Module	HP Module
voltages							
400 V / 440 V							
600 V							
650 V							
750 V							
1200 V							
1700 V							
2000 V							
3300 V							

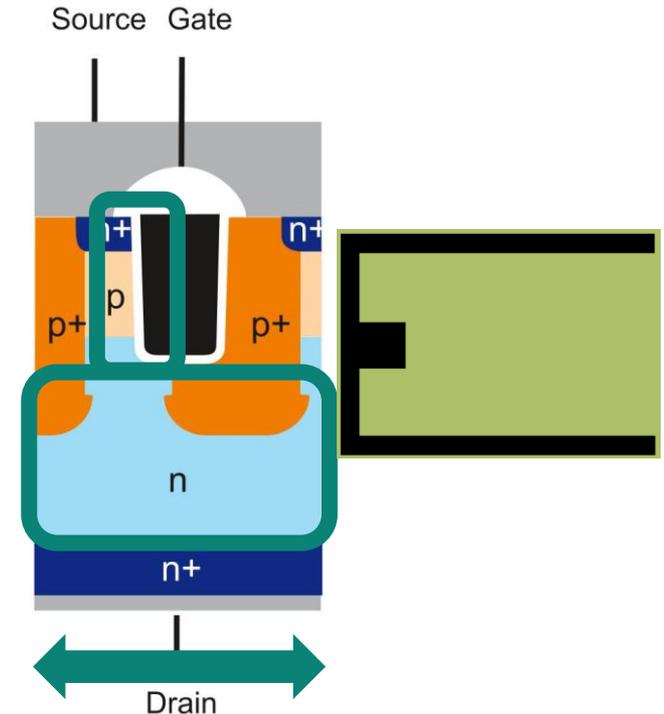
Continuous extension of portfolio

G1 mass production
G2 mass production
G2 in development

CoolSiC™ G2 400 V / 440 V cell is built on continuous technology advancements: an evolutionary next step!



- the 400 V SiC MOSFET cell structure is **based on the design of the higher voltage classes** (as depicted exemplary)
- the significant performance improvements are gained by
 - **reduced cell pitch**
 - **refined channel properties**
 - **enhanced control over drift region** properties
 - **optimization** of chip design to **minimize active area losses**



CoolSiC™ G2 MOSFETs 400 V / 440 V

Industrial grade portfolio overview



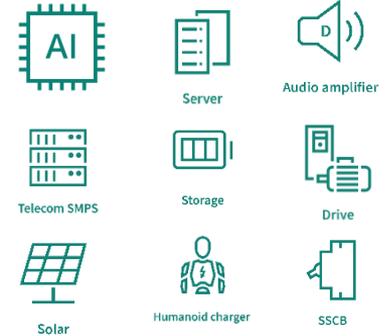
V_{BRDSS}	400 V		440 V	400 V		
$R_{ds(on)}$ typ @ 18V (mΩ)	D2PAK-7p Source-Sense	TOLL Source-Sense	TOLL Source-Sense	TO247-3	TO247-4	TOLT
45	IMBG40R045M2H	IMT40R045M2H	new	IMW40R045M2H	IMZA40R045M2H	IMLT40R045M2H
36	IMBG40R036M2H	IMT40R036M2H		IMW40R036M2H	IMZA40R036M2H	IMLT40R036M2H
25	IMBG40R025M2H	IMT40R025M2H	IMT44R025M2H	IMW40R025M2H	IMZA40R025M2H	IMLT40R025M2H
15	IMBG40R015M2H	IMT40R015M2H	IMT44R015M2H	IMW40R015M2H	IMZA40R015M2H	IMLT40R015M2H
11	IMBG40R011M2H	IMT40R011M2H	IMT44R011M2H	IMW40R011M2H	IMZA40R011M2H	IMLT40R011M2H

Target topologies

- ✓ 3 level flying capacitor CCM TP PFC
- ✓ T type NPC2
- ✓ 3L ANPC inverter
- ✓ B6
- ✓ Solid state switch
- ✓ Class-D audio

Benefits

- ✓ Reduced power losses
- ✓ **Lower price over 650V alternatives**
- ✓ Superior energy efficiency and power system density
- ✓ High slew rate control, C_{oss} linearity and low Q_{fr}
- ✓ 440V TOLL option to comply with IPC-9592B derating guidelines



A unique combination of performance, reliability and ease-of-use

Highest efficiency and power density

Enabling the adoption of **innovative topologies** (e.g. 3L PFC, ANPC)

System cost/performance optimisation

R_{on} x **A reduction** and **FoM improvement** over existing solutions, **flat** $R_{DS,on}$ vs T_j characteristics with minimal increase at 100°C

Fast-switching capability

low Q_{gd} , Q_{oss} , Q_{fr} , E_{oss}

Low EMI

High slew rate control, C_{oss} **linearity** and **low Q_{fr}**

Easy unipolar gate driving

0 V – 18 V / 15 V gate-driving voltage enabled by a high $V_{th,typ} = 4.5$ V, and a low Miller ratio to mitigate $C_{gd} V_{ds}/dt$ induced parasitic turn-on

What makes the 400V SiC MOSFETs so special?

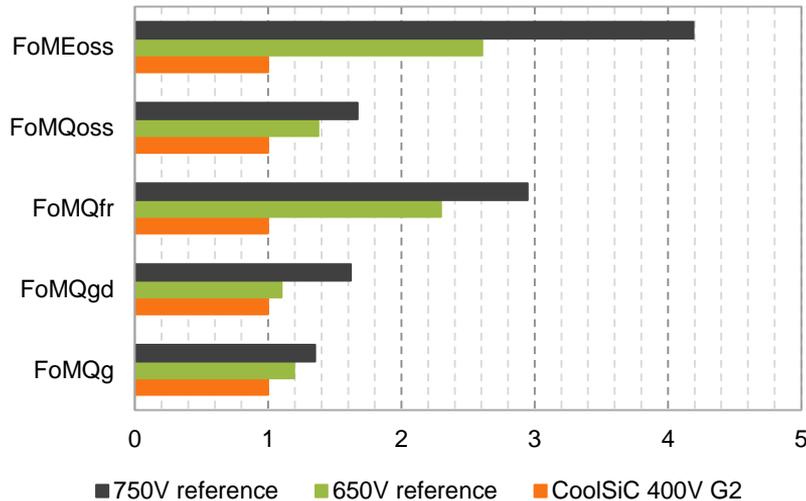
Super low FoMs and $R_{DS(on)}$ behaviour over temperature to achieve ...



... the highest efficiency and power density!
 ... at lowest price!

Switching losses

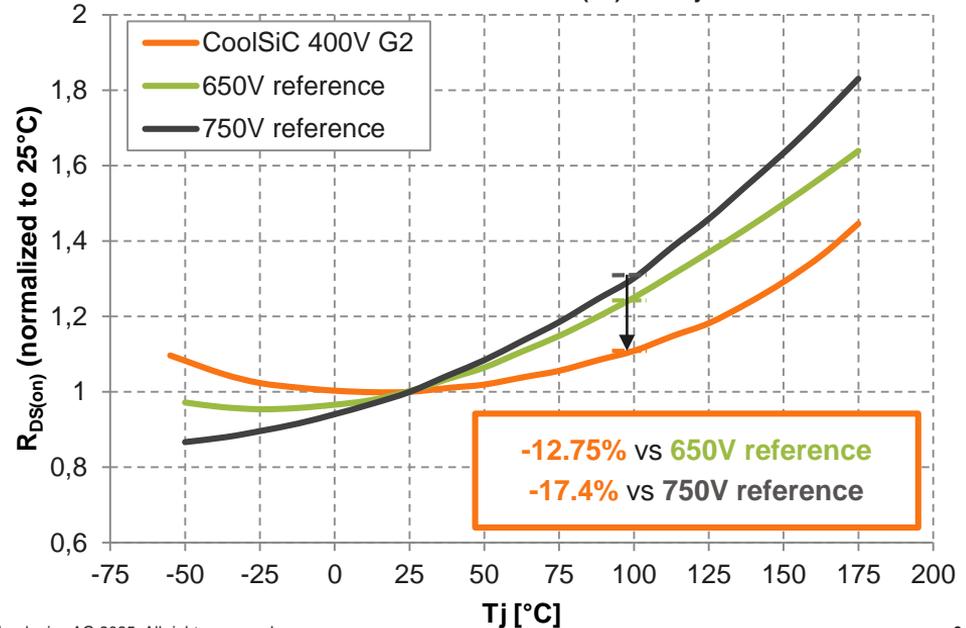
Normalized switching Figures of Merit (FoMs)



FoMs defined at $V_{DS} = 200V$ for 400V SiC and $V_{DS} = 400V$ for 650V SiC and 500V for 750V SiC reference parts.

Conduction losses

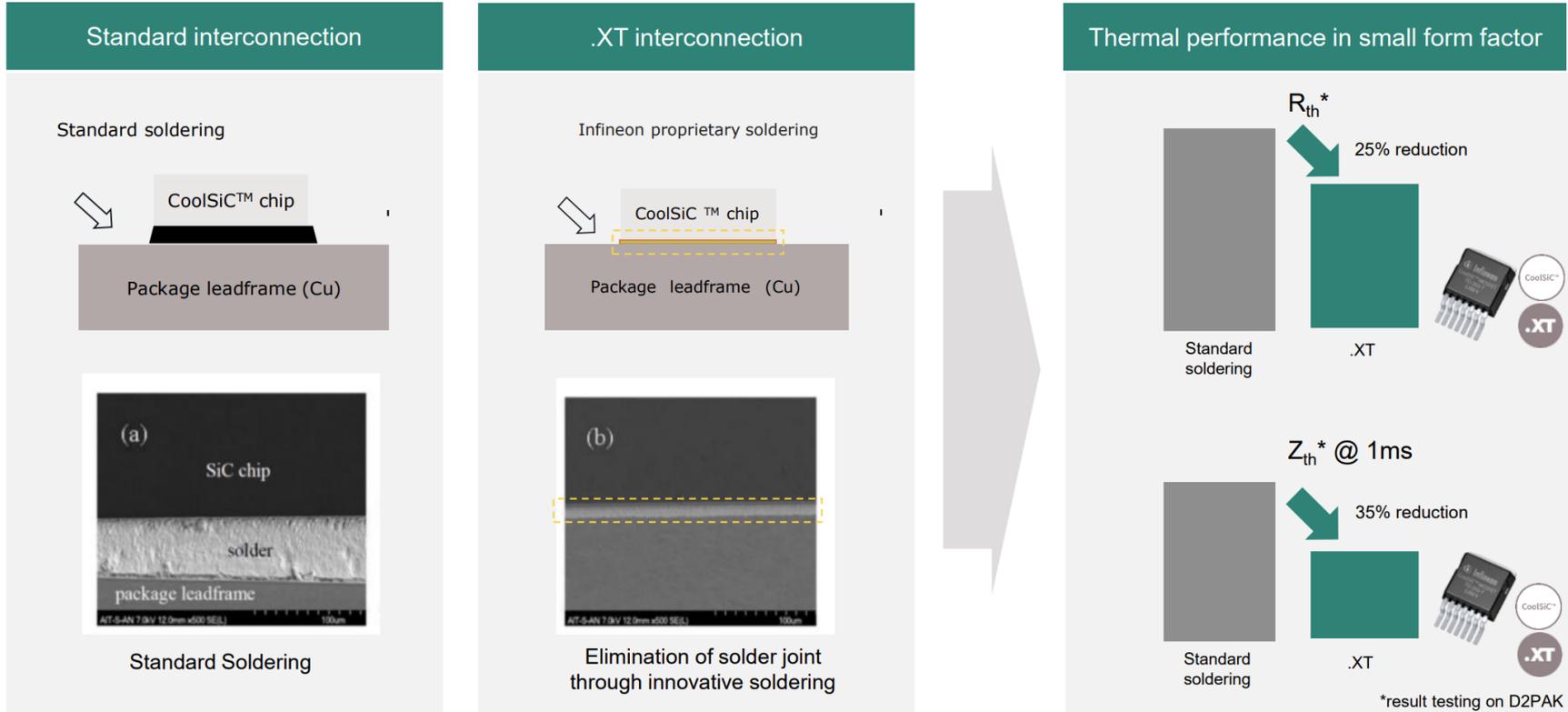
Normalized $R_{DS(on)}$ vs T_j



-12.75% vs 650V reference
 -17.4% vs 750V reference

Product Value Proposition CoolSiC™ MOSFET 400 V / 440 V technology

Significant improvement of thermal capabilities by .XT interconnection



*result testing on D2PAK 650V G1 22 mΩ

CoolSiC™ G2 MOSFETs 400 V / 440 V

Opportunities where they fit perfectly



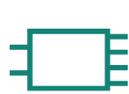
Unique opportunity to provide applications with high performance MOSFETs
with $V_{(BR)DSS}$ between 200 V and 650 V



Server



Telecom



SMPS



LEV



Energy storage



Solar



Forklift



Audio amplifier



eAviation



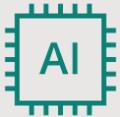
SSCB

CoolSiC™ G2 MOSFETs 400 V / 440 V

Target applications



A unique combination of performance, reliability and ease-of-use



Server



Audio amplifier



Telecom SMPS



Storage



Solar



Humanoid charger



Drive



SSCB

Target topologies

- ✓ 3 level flying capacitor CCM TP PFC
- ✓ T type NPC2
- ✓ 3L ANPC inverter
- ✓ B6
- ✓ Solid state switch

Motivation

- There is a sweet spot between the 200V Si MOSFET and 650V CoolSiC MOSFET to maximize the efficiency and power density with **right sizing** the CoolSiC MOSFET to 400V_{DS} and 440V_{DS}

Product description

- 400 V_{DS} comes in D2PAK, TOLL, TOLT and TO247 variants, while the 440V V_{DS} arrives in TOLL
- It brings **best value** with ultra low switching losses and on-state resistance at lowest CoolSiC price position



CoolSiC™ G2 MOSFETs

400 V / 440 V

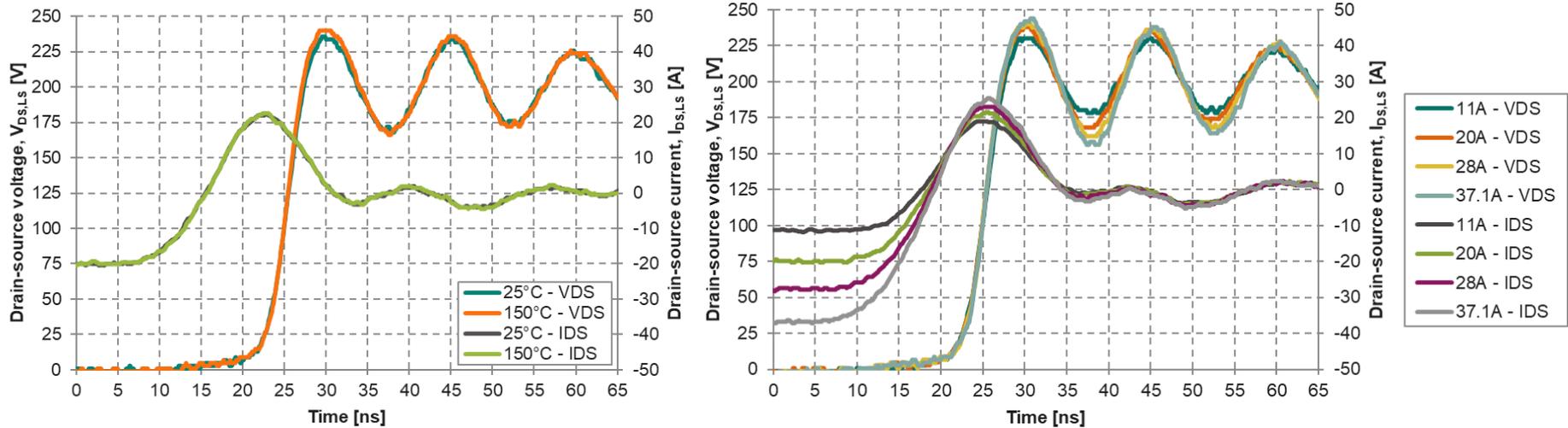
Device performance



Commutation robust body diode optimized for hard and soft switching applications



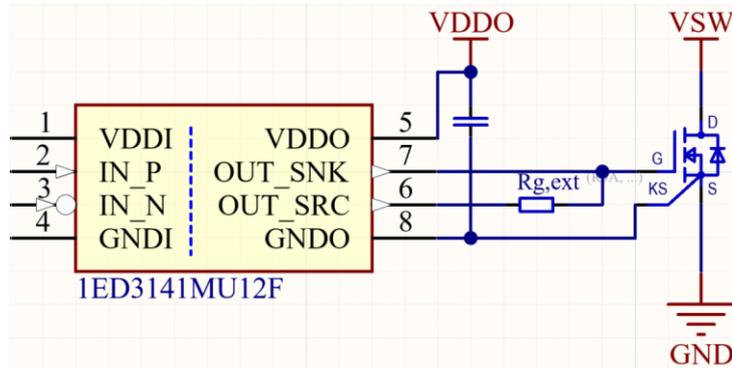
IMT40R011M2H: Double-pulse-test characterization of the body diode



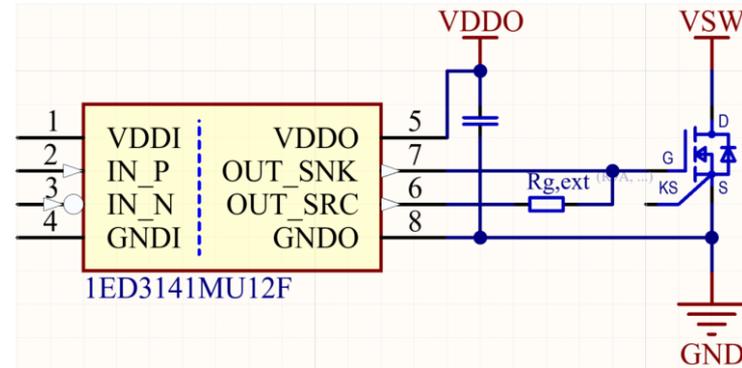
- The **body diode is commutation robust** with very low bipolar charges Q_{bip} even at high di/dt conditions that are seen in SMPS applications. The measurement of Q_{fr} includes Q_{oss} , which doesn't contribute to losses.
- The switching waveforms show **negligible dependence on the operating temperature and load current**. This shows the commutation robustness of the body diode.

Flexible use of Kelvin/Power Source-pins in low-inductance packages with unipolar gate driving

Using KelvinSource



Using PowerSource

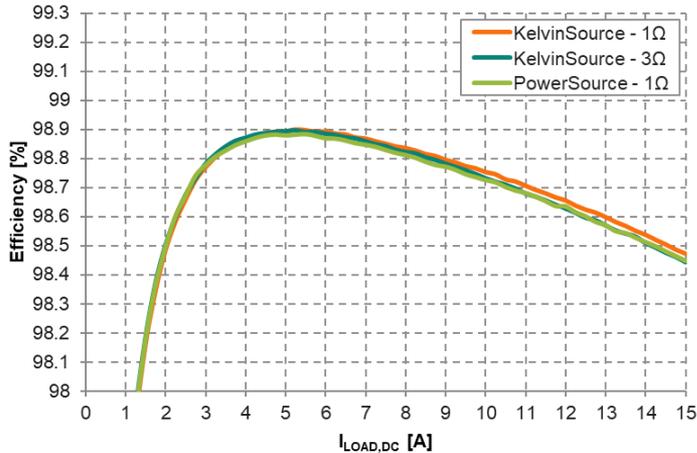
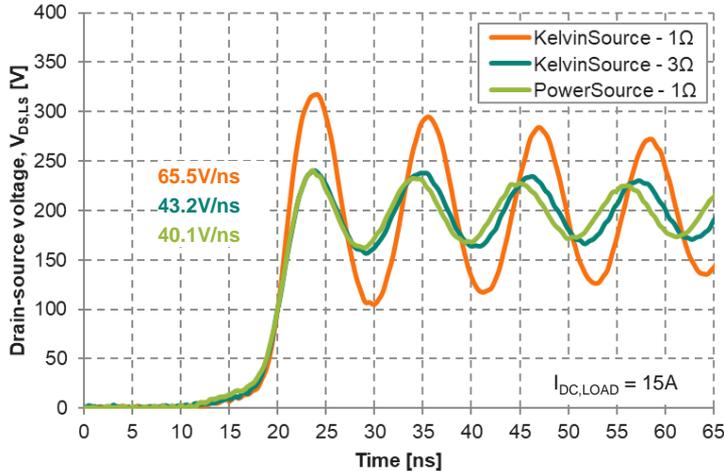


- **KelvinSource** gate drive offers the fastest switching performance for the lowest switching losses.
- **Low source-inductance offered by the TOLL package** ensures minimal impact in switching losses even when using **PowerSource**.
- Flexibility to use **KelvinSource** or **PowerSource** to **optimize switching performance and EMI signature** for all layout designs.
- **Easy unipolar gate driving (0 V – 18 V)** is enabled by a high $V_{th,typ}=4.5$ V, and a **low Miller ratio** to avoid $C_{gd}V_{ds}/dt$ induced parasitic turn-on.
- **Fast-switching capability** (low Q_{gd} , Q_{oss} , Q_{fr}) enables higher f_{sw} with reduced dead-time, higher power density and higher efficiency.

Excellent controllability of switching speed to optimize switching performance (efficiency) and EMI signature



IMT40R011M2H: Effect of using KelvinSource vs PowerSource and varying $R_{g,ext}$



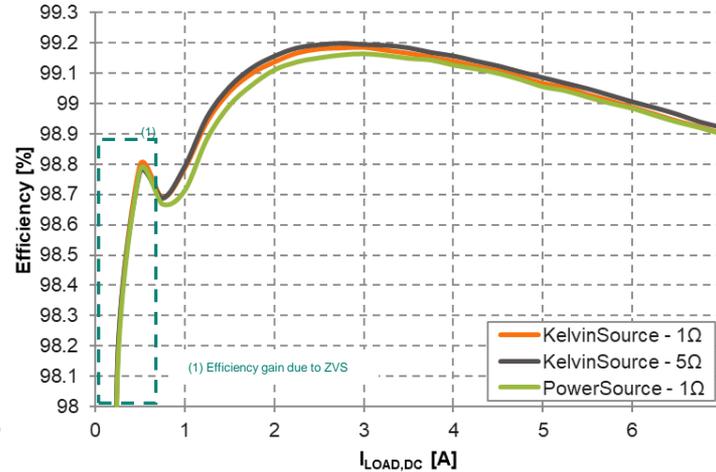
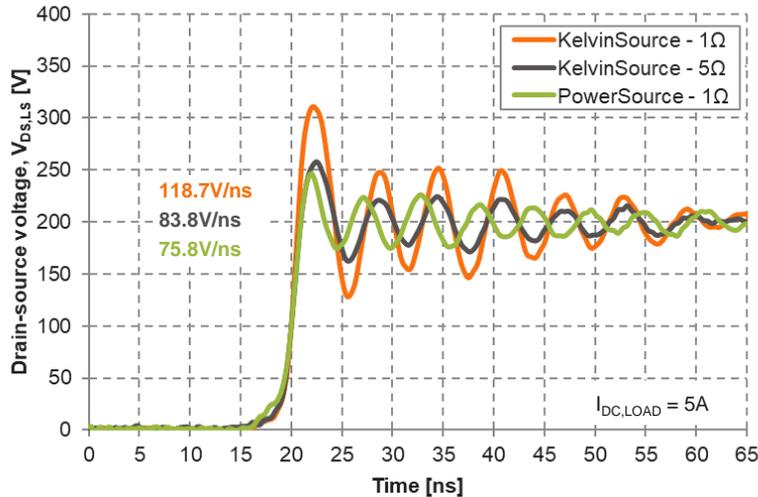
Test conditions:

Half-bridge in buck-mode
“L”-layout with $L_{loop} = \sim 8nH$
 $V_{DC,IN} = 200V$
 $V_{LOAD} = 100V$
 $f_{sw} = 65kHz$
 $V_{gs,drv} = 18V/0V$
 $R_{g,ext} = \text{variable}$

- **Low source-inductance offered by the TOLL package** ensures minimal impact in switching losses even when using **PowerSource**.
- High C_{oss} **linearity** and a **robust body diode with low Q_{fr}** help mitigate V_{DS} overshoots and ringing, enabling **80% derating** even at high switching speeds with low $R_{g,ext}$ when using the best-in-class $R_{ds,on}$ part.
- The excellent switching FoMs (Q_{gd} , Q_{oss} , Q_{fr}) translate to high switching speeds resulting in **minimized switching and dead-time losses**.
- This translates to system level improvement in **efficiency and power density with good EMI performance**.

Excellent controllability of switching speed to optimize switching performance (efficiency) and EMI signature

IMT40R045M2H: Effect of using KelvinSource vs PowerSource and varying $R_{g,ext}$



Test conditions:
Half-bridge in buck-mode
“L”-layout with $L_{loop} = \sim 8nH$
 $V_{DC,IN} = 200V$
 $V_{LOAD} = 100V$
 $f_{sw} = 65kHz$
 $V_{gs,drv} = 18V/0V$
 $R_{g,ext} = \text{variable}$

- **Low source-inductance offered by the TOLL package** ensures minimal impact in switching losses even when using **PowerSource**.
- The excellent switching FoMs (Q_{gd} , Q_{oss} , Q_{fr}) translate to high switching speeds resulting in **minimized switching and dead-time losses**.
- Despite the **high switching speeds >100V/ns**, the switching performance is robust with low $V_{DS,pk}$ enabling **80% derating**.
- This translates to system level improvement in **efficiency and power density with good EMI performance**.



CoolSiC™ 400V G2

Focus Application: AI Server PSUs

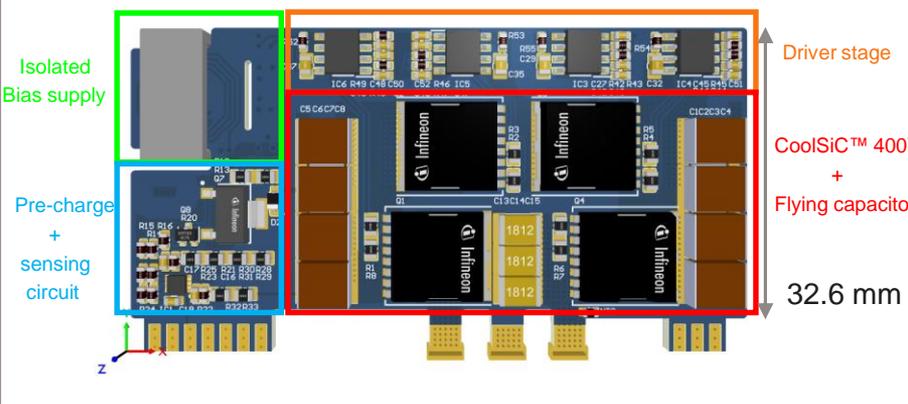
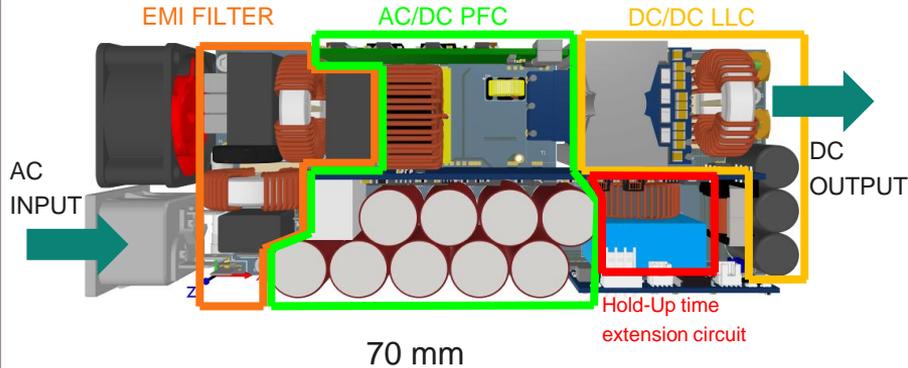


Reference Board

3.3kW PSU with 3-Level Flying Capacitor CCM Totem Pole PFC



REF_3K3W_3LFC_PSU



Technical details	
Target applications	Server/Datacenter, Telecom
Input voltage range	180V – 265V
Output voltage range	51 – 49V
Output current nominal	@51V=65A, @50V=66A @48V=69A
Output power max	3300W
Peak efficiency (PFC ¹⁾ / PSU ²⁾	99.15% / 97.52% @ 230V 99.26% / 97.64% @ 265V 98.94% / 97.25% @ 180V
Topology	3-level flying capacitor CCM bridgeless totem pole PFC + half-bridge high-freq LLC
Additional technical parameter	1U height, >100W/in ³

Highlights and key information	
Infineon components	IMT40R025M2H, IPT60R022S7, IGT60R042D1, 1EDB9275F, 1EDB8275F, 2EDN7533B, 1EDN8511B, 1EDN8550B, ICE2QR2280G, BAT46WJ, BAT165, BSS128N, IPN60R3K4CE, TLS4120D0EPV33, TLS820D0ELV33, 4DIR1400H, XMC4200
Infineon hero part	IMT40R025M2H – CoolSiC™ G2 400V
Timeline for availability (Quarter [year])	Hardware: Q4 CY24 Documentation: Q4 CY24 Available for market (ISaR): Available now!

Features & Benefits

- › High-efficiency PSU (97.52%²⁾ peak) @ >100W/in³ in 1U form factor
- › **Benchmark to REF_3K3W_HFHD_PSU**: efficiency, EMI, PFC choke reduction.
- › **Startup, FC-precharging and voltage balancing, isolated gate drive**
- › Full digital control (PFC and DCDC) supporting **dynamic tests, hold-up time extension** using baby-boost (line-cycle drop-out).
- › Full Infineon semiconductor solution: CoolMOS™, CoolSiC™, CoolGaN™
- › Improved ease of measurements

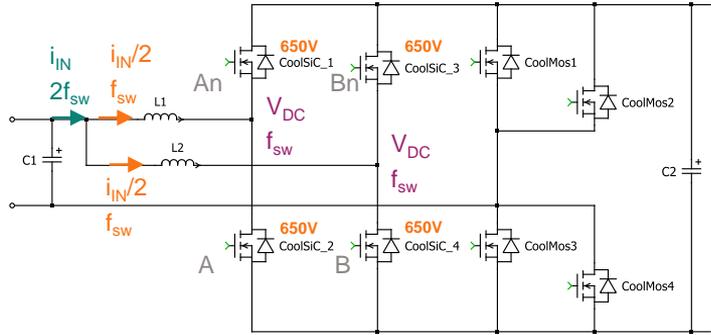
1) PFC efficiency including all aux- supply power (except fan) and EMI filter losses.
2) Full-PSU efficiency including fan power consumption.

Key target application: AI Servers/Datacenter and Telecom Rectifiers



Covering OCP ORV3 HPRx, MCRPS compliant PSUs between 3.3kW – 12kW: a case study of 3.3kW **CCM** PFCs

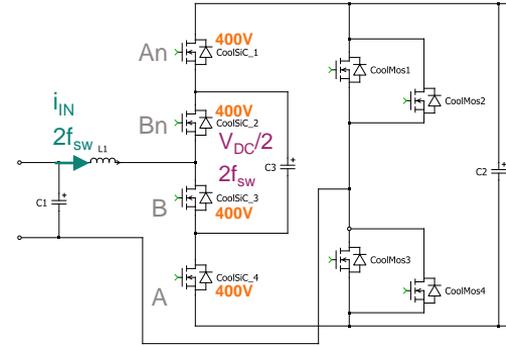
REF_3K3W_HFHD_PSU (2 x 2L PFC)



– 2 x 2L interleaved:

- 4 x **CoolSiC™ 650V** – parallel ($57\text{m}\Omega / R_{\text{dson}} \uparrow$)
 - 2 x PWM – 180deg – f_{sw}
- **2 x PFC chokes**
 - $i_{\text{AC}}/2 - V_{\text{DC}} - f_{\text{sw}} \rightarrow L$
 - Total volume similar than single choke
- Thermal management
 - **Heat spreading**
 - Inductors and Switches share input current
- 2 x f_{sw} effective input current + Δi reduction
 - **DM EMI reduction** in respect to single choke PFC

REF_3K3W_3LFC_PSU (1 x 3LFC PFC)



– 1 x 3L-FC:

- 4 x **CoolSiC™ 400V** – series ($25\text{m}\Omega - 35\text{m}\Omega / R_{\text{dson}} \downarrow$)
 - 2 x PWM – 180deg – f_{sw}
- **1 x PFC choke**
 - $i_{\text{AC}} - V_{\text{DC}}/2 - 2 \cdot f_{\text{sw}} \rightarrow L/4$
 - **Magnetic volume / cost reduction ~60%**
 - **Use of low ESR choke**
- **Increased efficiency** (>0.3% expected @ 230V)
 - Use of better FOM switches
 - Heat spreading in HF leg MOSFETs
- 2 x f_{sw} effective input current + Δi reduction
 - **Same DM EMI as interleaved PFC**



Efficiency measurements: 3L FC PSU vs 2L HFHD PSU

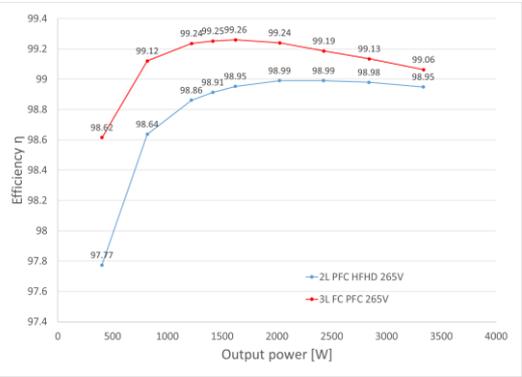
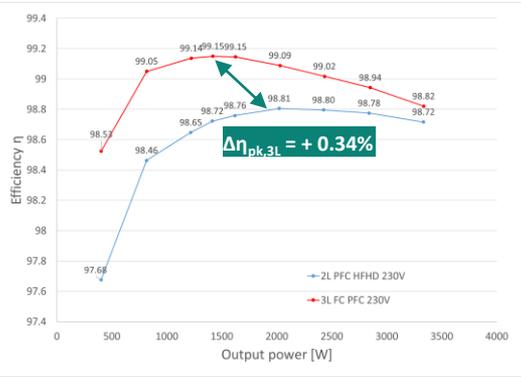
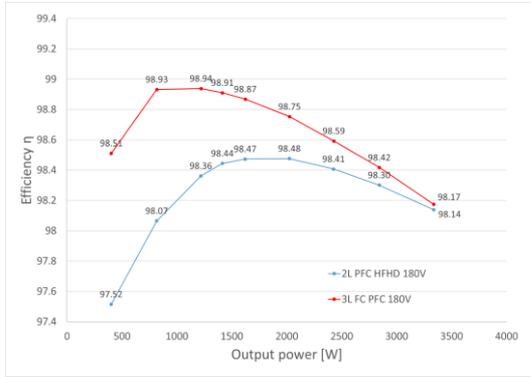
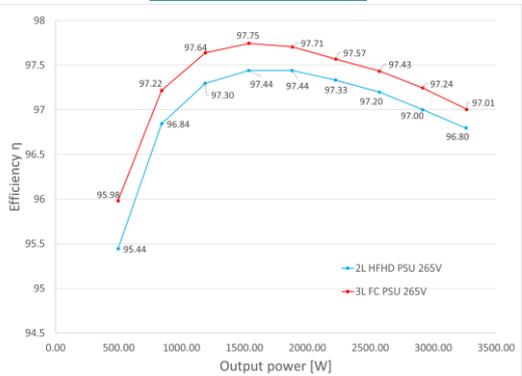
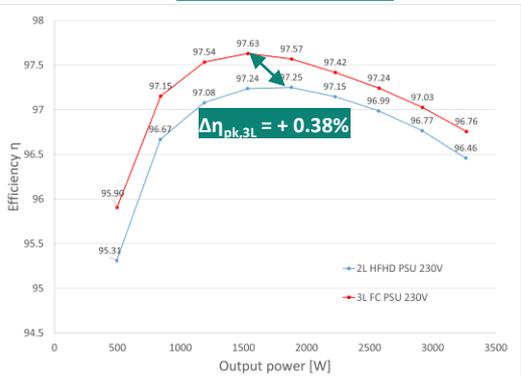
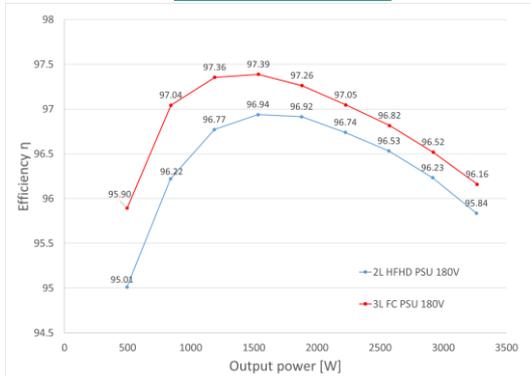
Full PSU

PFC

$V_{ac} = 180\text{ V}$

$V_{ac} = 230\text{ V}$

$V_{ac} = 265\text{ V}$



Note: Ext. Fan supplied & Int. Mounted

