Solution Brief

Combining CoolSiC™, CoolMOS™ and EiceDRIVER™

For energy-smart SMPS designs in industrial applications

Telecom, datacenter and industrial SMPS are driven by the trends of improved energy efficiency, high power density and ever growing output power. Wide-bandgap materials, such as the CoolSiC™ MOSFET 650 V and the CoolGaN™ 600 V e-mode HEMT are enablers to move towards high performance topologies such as CCM totem-pole PFC. A topology that ensures 99% efficiency in the PFC stage, leading to 98% overall system efficiency, while hard commutation is present in every switching cycle. While CoolGaN™ excels in delivering the best efficiency at the highest operating frequency, the CoolSiC™ MOSFET provides the right balance of high efficiency, reliability and ease of use.

Cost-competitiveness in CCM totem-pole PFC

The CoolSiC™ MOSFET 650 V comes along with roughly 80% lower Q_{rr} and Q_{oss} compared to the best silicon alternatives. This ensures outstanding hard-commutation robustness. Due to the low temperature dependency of on-state resistance ($R_{DS(on)}$), the 99% efficiency level can be reached by using a SiC MOSFET with a typical $R_{DS(on)}$ of 72 mΩ, resulting in system cost reduction. The second half-bridge in the CCM totem-pole PFC runs at low frequencies for half-cycle management. In this case the perfect choice is the 600 V CoolMOS™ S7, a SJ MOSFET, designed for low-frequency switching, offering the lowest $R_{DS(on)}$ at the best price.

Highest reliability at improved performance in LLC

A full SMPS design requires a DC-DC stage. LLCs are commonly used soft-switching topologies in which non-continuous hard commutation can occur under certain conditions. Fast-body diode CoolMOS™ series are offering a cost/performance solution but due to the outstanding Q_{rr} and Q_{oss} level of the CoolSiC™ MOSFET designs can be even more reliable and at the same time further improve the efficiency level.

EiceDRIVER™ optimized for CoolSiC™ MOSFET 650 V

1-channel and 2-channel galvanically isolated EiceDRIVER™ gate-driver ICs are the best choices for optimal CoolSiC™ MOSFET 650 V operation. For use in CCM totem-pole PFC functional isolation provides the required robustness against switching noise. In secondary-side controlled LLC stages reinforced isolation is indispensable. 13V UVLO_off threshold guarantees safe CoolSiC™ operation at current levels required by the applications. The industry-leading low output-stage impedance minimizes CoolSiC™ switching losses. The excellent + 6/- 4 ns propagation delay accuracy minimizes dead-time losses.

600 V CoolMOS™ S7 is best driven with the EiceDRIVER™ 2EDF7275F.

www.infineon.com/coolsic-mosfet-discretes
www.infineon.com/coolmos
www.infineon.com/eicedriver

System features

CoolSiC™ 650 V

- Optimized switching behavior at higher currents
- Excellent thermal behavior
- Increased avalanche capability
- 80% lower Q_{rr} and Q_{oss} over SJ MOSFET offerings

600 V CoolMOS™ S7

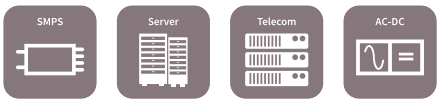
- Best-in-class $R_{DS(on)}$ in SMD packages
- Optimized for conduction performance in low-frequency-switching topologies

EiceDRIVER™

- 13 V UVLO_off threshold for safe-operation area
- 0.35 / 0.85 Ω output stage impedance
- + 6/ - 4 ns propagation delay precision

System benefits

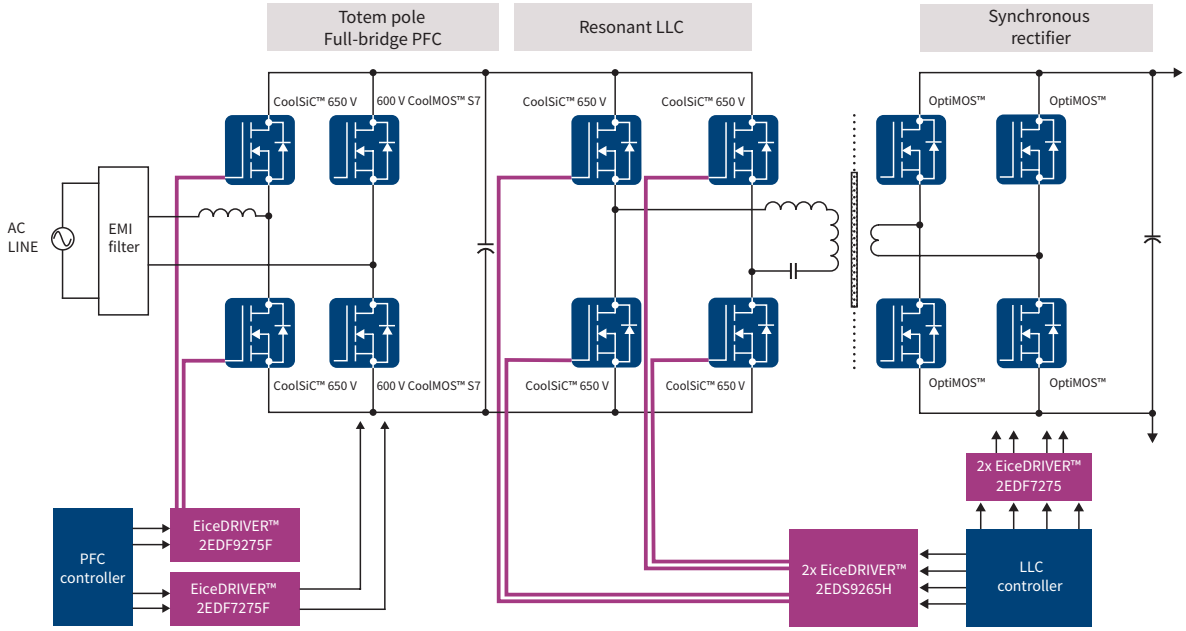
- High performance, high reliability and ease of use
- Allows high system efficiency
- Reduces system cost and complexity
- Enables smaller system size
- Works in topologies with continuous hard commutation
- Fit for high temperature and harsh operations
- Enables bidirectional topologies



Every switch needs a driver

Combining the latest CoolSiC™ 650 V, the 600 V CoolMOS™ S7 and the 1EDN and 2EDN EiceDRIVER™ families enables engineers to easily design systems which are more efficient, compact, reliable and cost effective. The block diagram gives an idea of such a system:

High efficiency CoolSiC™ totem pole PFC in server switched mode power supply (SMPS)



Portfolio selection

CoolSiC™ MOSFETs 650 V			EiceDRIVER™ for CoolSiC™ MOSFET 650 V	
Package	TO-247-4	TO-247-3	1-channel EiceDRIVER™	2-channel EiceDRIVER™
$R_{DS(on)}$ typ.				
27 mΩ	IMZA65R027M1H	IMW65R027M1H	1EDB9275F*	2EDF9275F* 2EDS9265H*
48 mΩ	IMZA65R048M1H	IMW65R048M1H		
72 mΩ	IMZA65R072M1H	IMW65R072M1H		
107 mΩ	IMZA65R107M1H	IMW65R107M1H		

CoolMOS™ S7				EiceDRIVER™ for CoolMOS™ S7
Package		TO-220	TOLL	2-channel EiceDRIVER™
$R_{DS(on)}$ max.				
10 mΩ	IPDQ60R010S7			
22 mΩ		IPP60R022S7	IPT60R022S7	2EDF7275F
40 mΩ			IPT60R040S7	
65 mΩ			IPT60R065S7	

* Coming soon

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