

## 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  $\pm 7$  ns propagation delay accuracy minimizes dead-time losses.

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

[www.infineon.com/coolbic-mosfet-discretes](http://www.infineon.com/coolbic-mosfet-discretes)

[www.infineon.com/coolmos](http://www.infineon.com/coolmos)

[www.infineon.com/eicedriver](http://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
- >  $\pm 7$  ns propagation delay precision

### System benefits

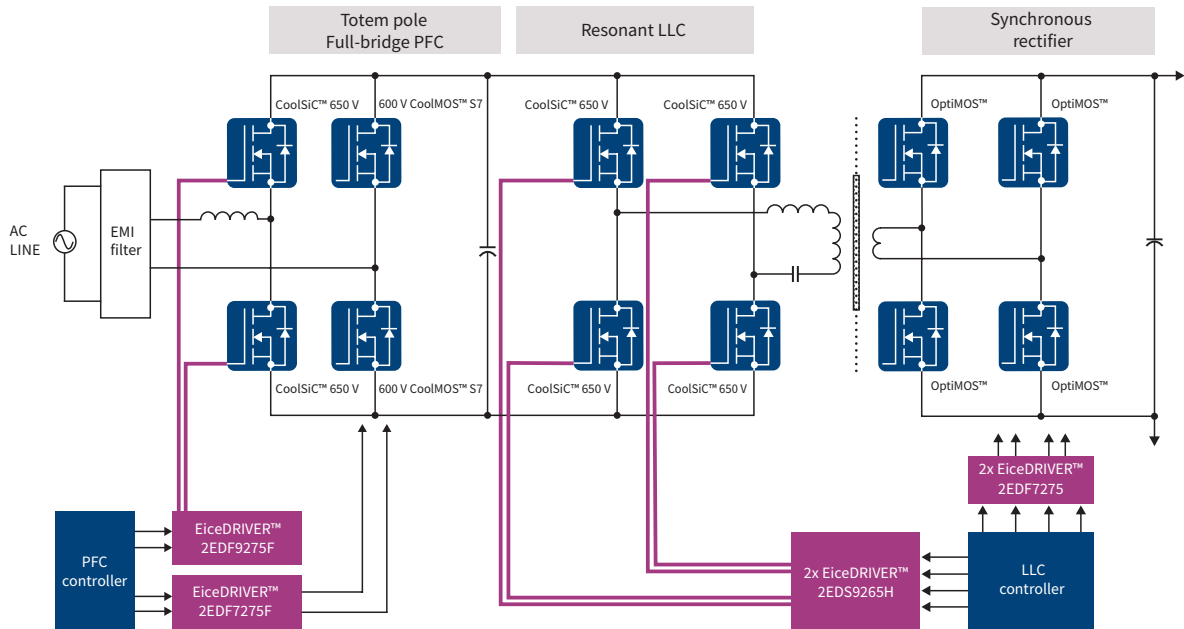
- > High performance, high reliability and ease of use
- > Allows high system efficiency
- > Reduces system cost and complexity
- > Enables smaller system size
- > Works in topologies with continuous hard commutation
- > Fit for high temperature and harsh operations
- > Enables bidirectional topologies



# 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		CoolMOS™ S7			EiceDRIVER™ for CoolMOS™ S7		
Package	TO-247-4	TO-247-3	1-channel EiceDRIVER™	2-channel EiceDRIVER™	Package	TO-220	TOLL	2-channel EiceDRIVER™	
$R_{DS(on)}$ typ.					$R_{DS(on)}$ max.				
27 mΩ	IMZA65R027M1H	IMW65R027M1H	1EDB9275F*	2EDF9275F* 2EDS9265H*	10 mΩ	IPDQ60R010S7			
48 mΩ	IMZA65R048M1H	IMW65R048M1H			22 mΩ		IPP60R022S7	IPT60R022S7	2EDF7275F
72 mΩ	IMZA65R072M1H	IMW65R072M1H			40 mΩ			IPT60R040S7	
107 mΩ	IMZA65R107M1H	IMW65R107M1H			65 mΩ			IPT60R065S7	

\* Coming soon

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