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 Qg and Qfiss compared to the best silicon alternatives. This ensures outstanding hard-commutation robustness. Due to the low temperature dependency of on-state resistance (Ron(Si)), the 99% efficiency level can be reached by using a SiC MOSFET with a typical Ron(Si) 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 Ron(Si) 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 Qg and Qfiss 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 ±7 ns propagation delay accuracy minimizes dead-time losses.

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

System features

- CoolSiC™ 650 V
  - Optimized switching behavior at higher currents
  - Excellent thermal behavior
  - Increased avalanche capability
  - 80% lower Qg and Qfiss over SJ MOSFET offerings

- 600 V CoolMOS™ S7
  - Best-in-class Ron(Si) 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
  - ±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
- Fits for high temperature and harsh operations
- Enables bidirectional topologies

www.infineon.com/coolisc-mosfet-discretes
www.infineon.com/coolmos
www.infineon.com/eicedriver
Every switch needs a driver

Combining the latest CoolSiC™ 650 V, the 600 V CoolMOS™ S7 and the EiceDRIVER™ 1EDB and 2EDI 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)

- **PFC controller**: EiceDRIVER™ 2EDF9275F
- **AC LINE**: EMI filter
- **CoolSiC™ MOSFETs 650 V**: IMZA65R022M1H, IPP60R022S7
- **RDS(on) typ.**
  - 27 mΩ: TO-247-4 IMZA65R027M1H
  - 48 mΩ: TO-247-3 IMW65R027M1H
  - 72 mΩ: IMZA65R048M1H
  - 107 mΩ: IMZA65R072M1H
- **OptiMOS™ MOSFETs 650 V**: IMW65R048M1H, IPT60R040S7
- **RDS(on) max.**
  - 22 mΩ: TO-220 IPP60R022S7
  - 40 mΩ: TOLL IPP60R040S7
  - 65 mΩ: IPT60R065S7

Please note

This document is for informational purposes only and any information given herein shall in no event be regarded as a warranty, guarantee or description of any functionality, conditions and/or quality of our products or any suitability for a particular purpose. With regard to the technical specifications of our products, we kindly ask you to refer to the relevant product data sheets provided by us. Our customers and their technical departments are required to evaluate the suitability of our products for the intended application.

We reserve the right to change this document and/or the information given herein at any time.

Additional information

For further information on technologies, our products, the application of our products, delivery terms and conditions and/or prices, please contact your nearest Infineon Technologies office (www.infineon.com).

Warnings

Due to technical requirements, our products may contain dangerous substances. For information on the types in question, please contact your nearest Infineon Technologies office.

Except as otherwise explicitly approved by us in a written document signed by authorized representatives of Infineon Technologies, our products may not be used in any life-endangering applications, including but not limited to medical, nuclear, military, life-critical or any other applications where a failure of the product or any consequences of the use thereof can result in personal injury.