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Overview of Wolfspeed Reference Designs and Evaluation Boards

Power Applications

Solve problems that Si can't

Reference Designs to show case the advantages of SiC devices (System):

- High Voltage
- High switching frequency
- Body diode operation

Evaluation boards to enable customers to speed up evaluation (Building Block)

- Gate drivers
- Half Bridge boards

Reference Designs

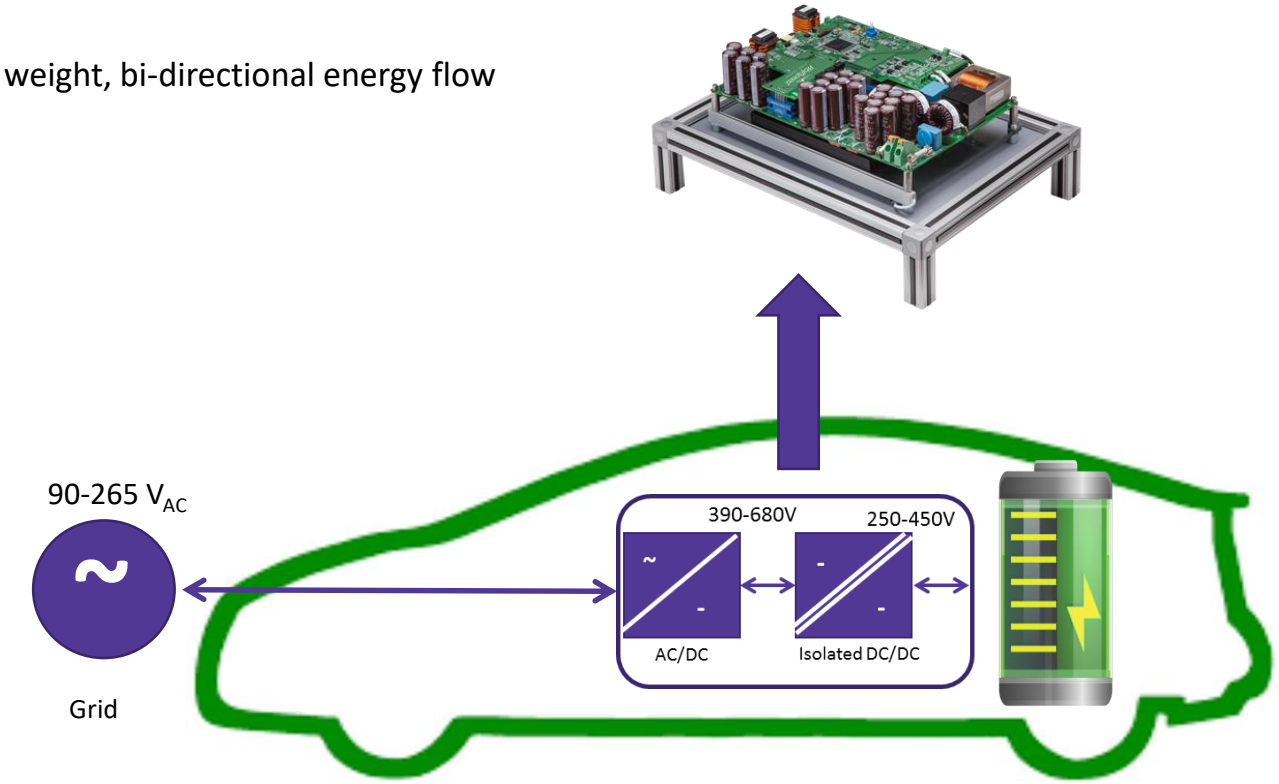
Focus on the Applications Where SiC Has Significant Advantage Than Si

The purpose is to show case the advantages of SiC devices, and help customers to shorten development time

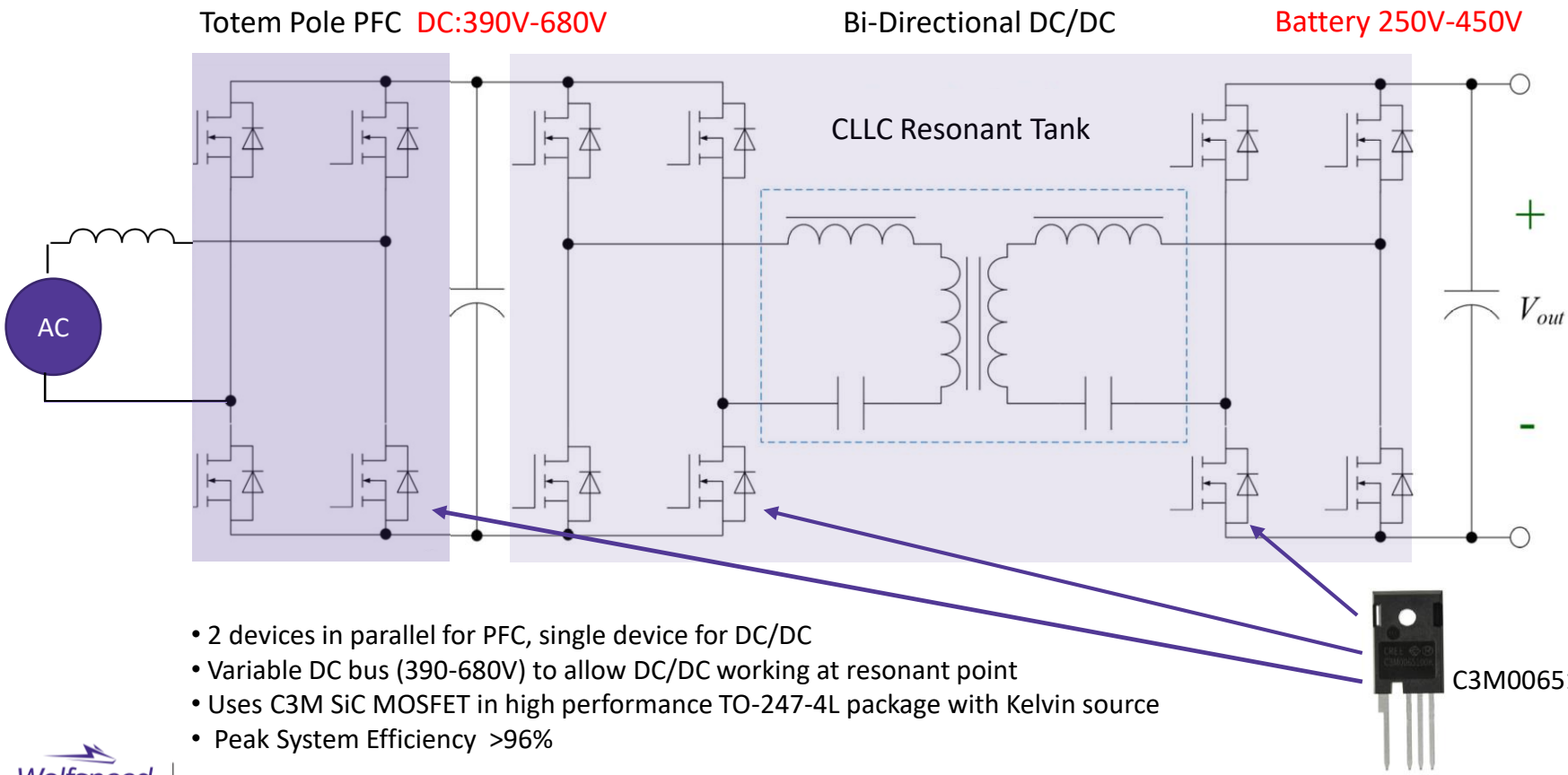
- EV On Board Charger(OBC)
- Solar Power
- High Efficiency Telecom/Server power
- Energy Storage
- Transportation

6.6kW SiC based Bi-Directional On-board Charger in EV

Need high efficiency, small and light weight, bi-directional energy flow



Block Diagram: All SiC MOSFET



- 2 devices in parallel for PFC, single device for DC/DC
- Variable DC bus (390-680V) to allow DC/DC working at resonant point
- Uses C3M SiC MOSFET in high performance TO-247-4L package with Kelvin source
- Peak System Efficiency >96%

6.6 kW Bi-Directional EV On-Board Charger

Features:

- Demonstration of Cree's 1000 V, 65 mΩ (C3M™) SiC MOSFETs in a 6.6 kW Bi-Directional converter targeting high efficiency and high power density On-Board Charging applications
- The demo board consist of a Bi-Directional Totem-Pole PFC (AC/DC) stage and an Isolated Bi-Directional DC/DC stage based on a CLLC topology with a variable DC Link Voltage
- Utilization of the high switching frequency operation allow the demo board to be smaller, lighter and overall more cost effective
- Targeting high-efficiency and high power density, On-Board charging applications

Applications:

- EV Charger
- Energy Storage
- UPS Equipment

Limited Availability:

- Available for Purchase On Request

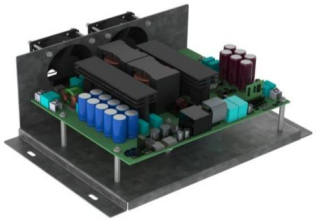
SiC MOSFET
C3M0065100K
TO-247-4 Package

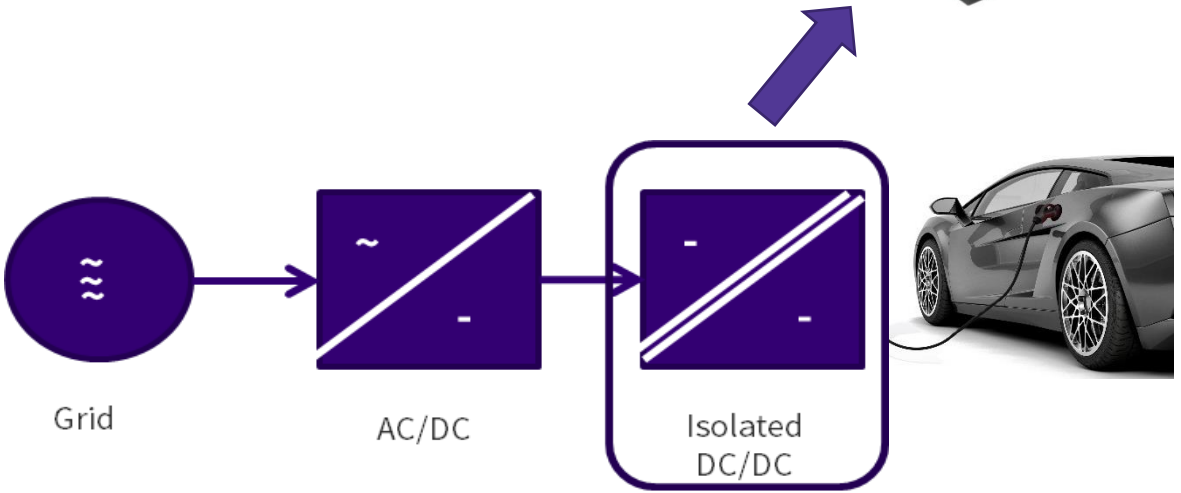
Technical Specifications:

Input Voltage Range	90 VAC - 265 VAC (rms)
Output Voltage	250 VDC - 450 VDC
Output Power	6.6 kW
Switching Frequency	70 kHz (PFC) & 200kHz (DC/DC)
Efficiency	> 96 %
MOSFET Package	TO-247-4
Physical Dimensions	330 mm X 200 mm X 50 mm

High Power LLC Resonant DC/DC for Off-board Charger

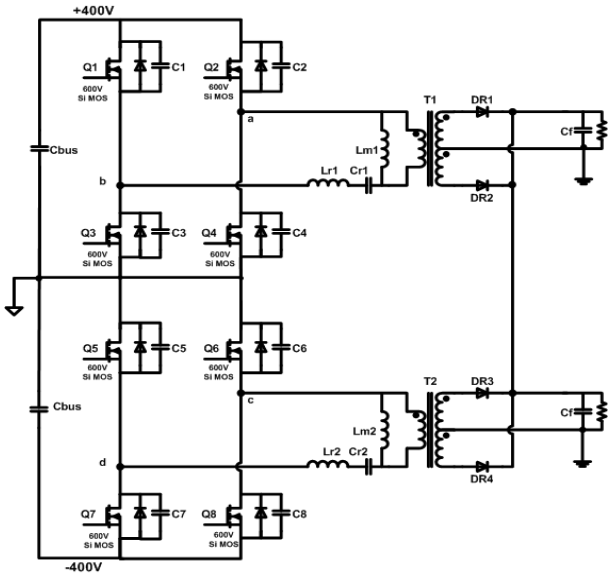
Need high efficiency high power density DC/DC converter



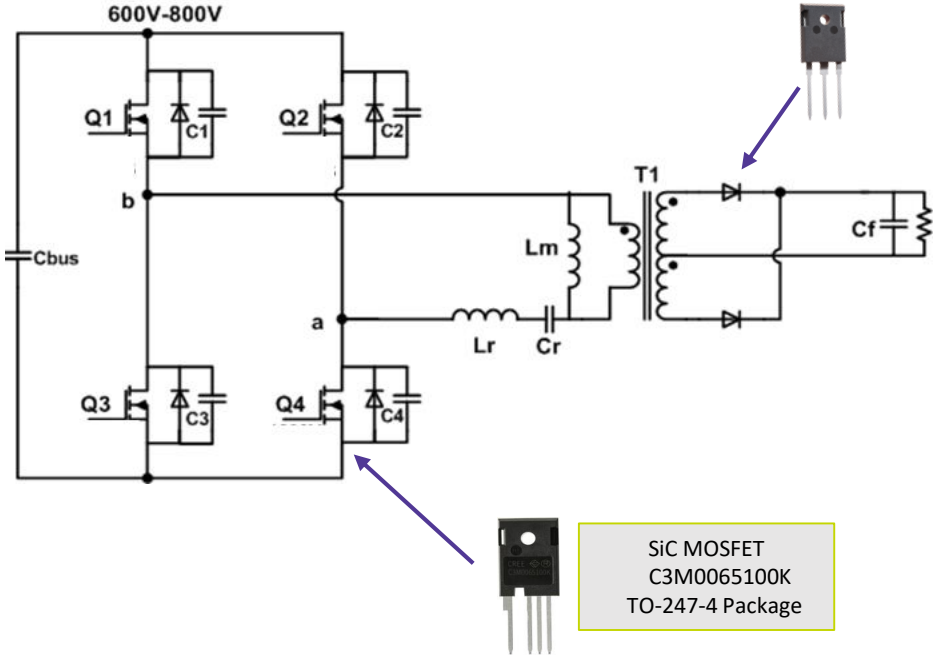


SiC based 2-level high frequency LLC Resonant Converter

Si MOSFET



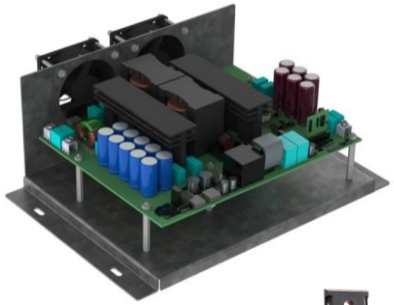
SiC MOSFET



20kW LLC Full Bridge DC/DC Converter

Features:

- Demonstration of Cree's 1000 V, 65 mΩ (C3M™) SiC MOSFETs in a 20kW LLC converter targeting high efficiency and high power density Off-Board Charging applications
- Simple 2-level topology using SiC MOSFET to replace complicated multi-level Si MOSFET topology
- High operating frequency significantly reduce the magnetics size and weight
- Provide higher efficiency and higher power density than Si solution
- Documentation includes bill of materials (BOM), schematic, board layout, presentation and the application note



SiC MOSFET
C3M0065100K
TO-247-4 Package

SiC Schottky Diode
C3D20065D
TO-247-3 Package

Applications:

- EV Charger
- Energy Storage
- Power Supplies

Availability:

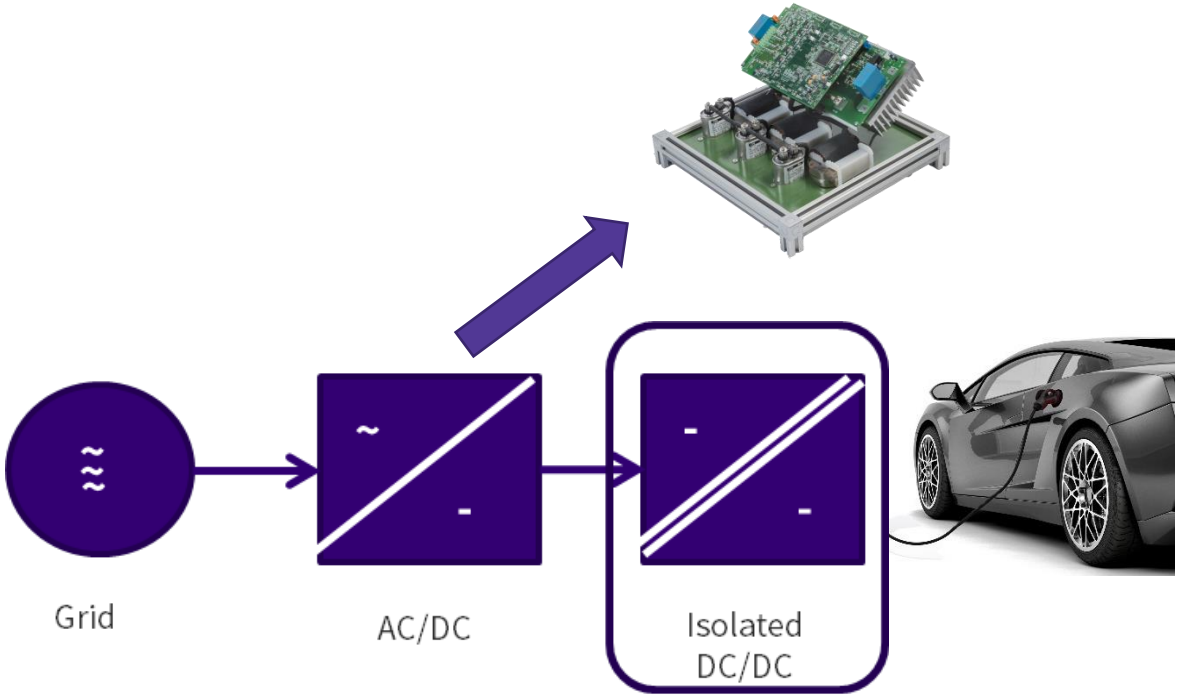
- Available for Purchase On Request

Technical Specifications:

Input Voltage Range	650-750V DC
Output Voltage	300-570V DC
Output Power	20kW
Switching Frequency	110-350 kHz
Efficiency	> 98%
MOSFET Package	TO-247-4L

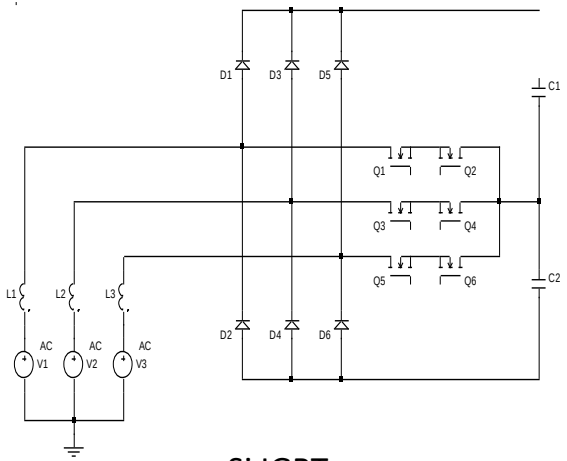
High Power AC/DC Converter for Off-board Charger

Need high efficiency high power density bi-directional 3 phase AC/DC converter

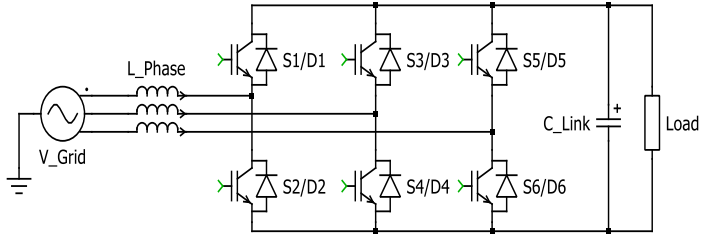


SiC based 2-level 3 Phase Bi-Directional AC/DC Converter

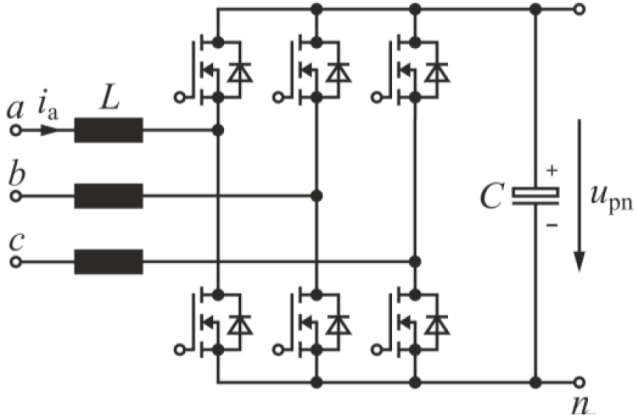
Si MOSFET



Si IGBT



SiC MOSFET



20kW SiC AC/DC Converter

Features:

- Demonstration of Cree's 1000 V, 65 mΩ (C3M™) SiC MOSFETs in a 20kW 3 phase AC/DC converter targeting high efficiency and high power density Off-Board Charging applications
- Simple 2-level topology using SiC MOSFET to replace complicated multi-level Si MOSFET topology or traditional Si IGBT solution
- High operating frequency significantly reduce the magnetics size and weight
- Provide higher efficiency and higher power density than Si solution
- Documentation includes bill of materials (BOM), schematic, board layout, presentation and the application note

SiC MOSFET
C3M0065100K
TO-247-4 Package

Applications:

- EV Charger
- Energy Storage
- Power Supplies

Availability:

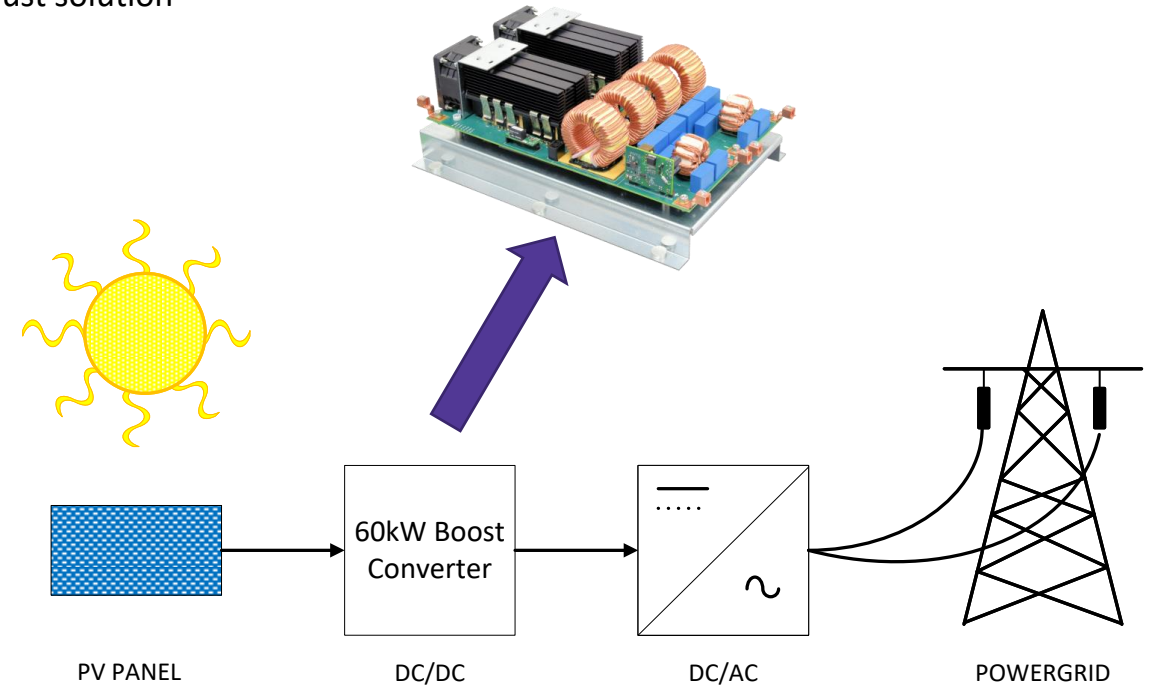
- Hardware not available

Technical Specifications:

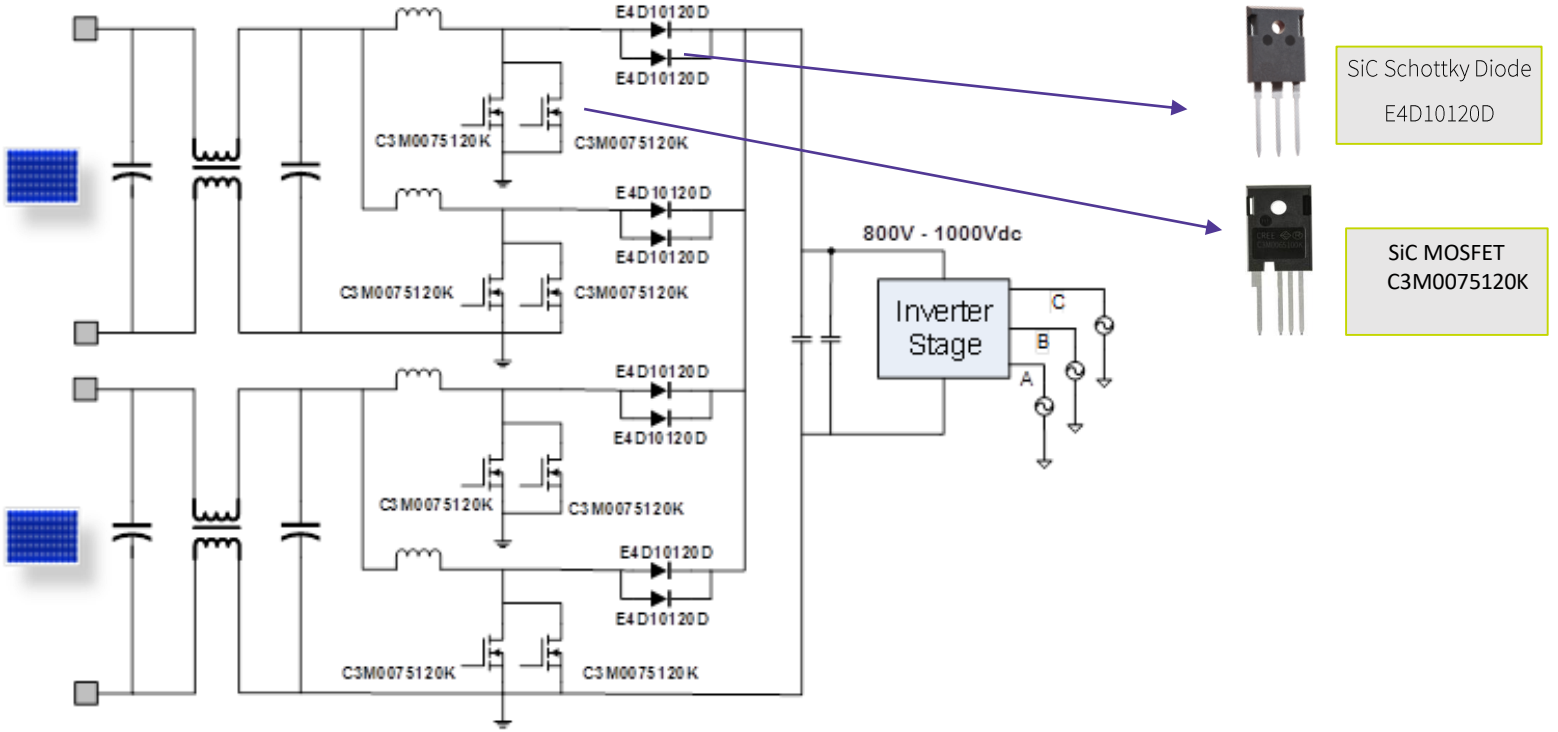
Input Voltage Range	380V-480V AC
Output Voltage	800V DC
Output Power	20kW
Switching Frequency	48kHz
Efficiency	> 98%
MOSFET Package	TO-247-4L

60 kW SiC Boost Converter for PV Application

Need high efficiency and robust solution



60 kW SiC based Multi-Channel Interleaved Boost Converter



60 kW Interleaved Boost Converter

Features:

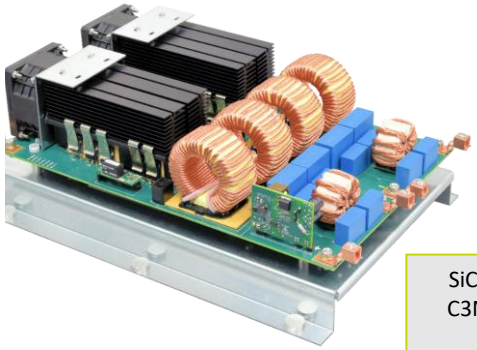
- Performance benefits of Cree's new 1200 V, 75 mΩ MOSFETs and E series SiC Diode in a 60 kW Interleaved Boost Converter
- 60 kW Interleaved Boost Converter demo board is based on four 15 kW Interleaved Boost Stages and each stage is using Cree's CGD15SG00D2 isolated Gate Driver Board specifically designed for C3M™ SiC MOSFETs
- Demonstration of the parallel operation of Cree's C3M™ SiC MOSFETs
- Targeting high voltage and high power density applications
- The demo board can accept 470VDC - 800VDC as an input and provide 850 VDC at the output with a peak efficiency of 99.5 % and a power density of 127W/in^3
- Documentation includes bill of materials (BOM), schematic, board layout presentation and the application note

Applications:

- Solar Power Generation
- UPS Equipment
- Energy Storage

Availability:

- Available for Purchase On Request



SiC MOSFET
C3M0075120K

SiC Schottky Diode
E4D10120D

Technical Specifications:

Input Voltage Range	470 VDC -800 VDC
Output Voltage	850 VDC
Output Power	60 kW
Switching Frequency	78 kHz
Efficiency	> 99.5 %
MOSFET Package	TO-247-4
Physical Dimensions	442 mm X 296 mm X 154 mm

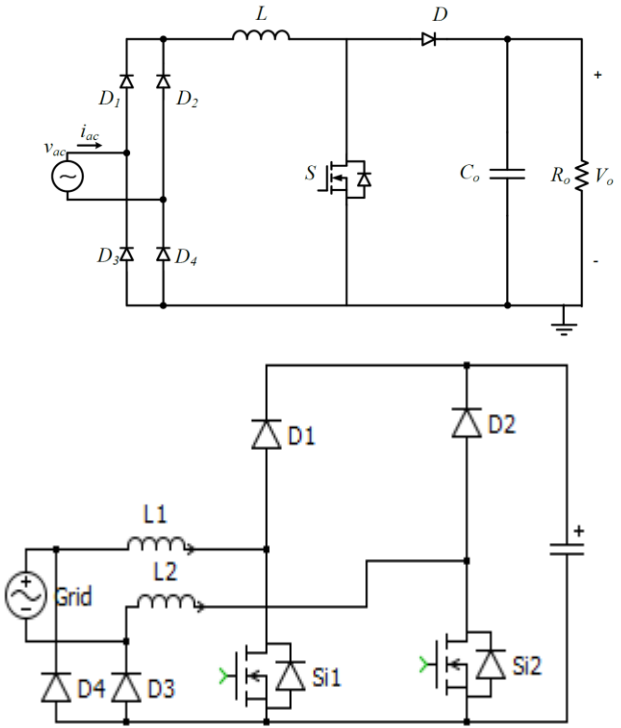
Totem Pole PFC for Very High Efficiency Server Power Supplies

Need very high efficiency for PFC

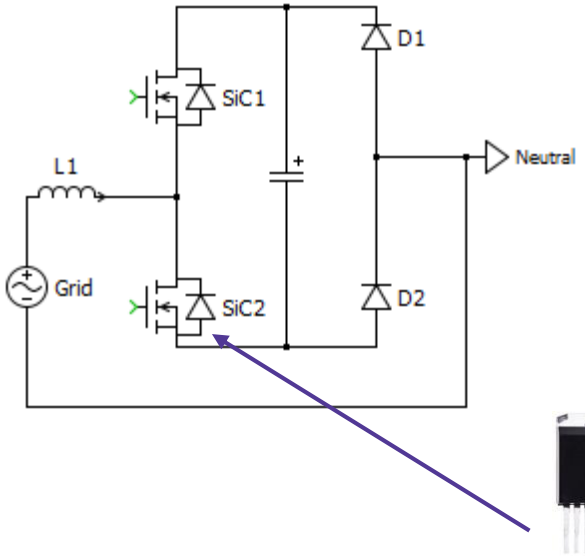
80 Plus Test Type		Efficiency at 115 V Internal Non-Redundant				Efficiency at 230V Internal Redundant			
Fraction of rated load		10%	20%	50%	100%	10%	20%	50%	100%
80 Plus Platinum	PFC		95.8%	95.4%	93.7%		95.7%	97.4%	95.8%
	DC/DC		94%	96.5%	95%		94%	96.5%	95%
80 Plus Titanium	PFC	95.5%	95.8%	96.4%	93.8%	95.8%	98%	98.5%	94.8%
	DC/DC	94%	96%	97.5%	96%	94%	96%	97.5%	96%

Totem Pole PFC for Very High Efficiency Power Supplies

Si MOSFET



SiC MOSFET



SiC MOSFET
C3M0065090J
TO-263-7 Package

2.2 KW, High Efficiency (80+ Titanium) Bridgeless Totem-Pole PFC

Features:

- Demonstration of highly efficient and low cost solution of bridgeless totem-pole PFC topology by using Cree's 3rd Generation (C3M™) 900 V, 65 mΩ SiC MOSFETs in a TO-263-7 Package
- Comfortably achieve 80+ Titanium standard by having 98.5 % efficiency while THD < 5% under all load conditions
- Innovative resistor based current sensing solution
- Distortion less inductor current at zero crossing during all load conditions
- Reduced Bill of Material (BOM) by the use of general purpose diodes in place of low frequency switches
- Documentation includes bill of materials (BOM), schematic, board layout, presentation and the application note

Applications:

- Power Supplies
- UPS Equipment
- EV Charger
- Industrial Drives

Availability:

- Available for Purchase On Request

Cree's C3M™
SiC MOSFET
C3M0065090J
TO-263-7 Package

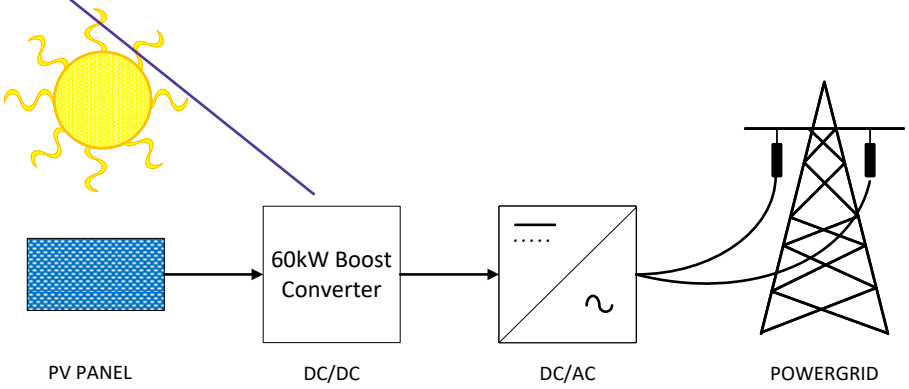
Technical Specifications:

Input Voltage Range	180 VAC – 264 VAC (rms)
Output Voltage	400 VDC
Output Power	2200 W
Switching Frequency	100 kHz
Efficiency	> 98.5 %
MOSFET Package	TO-263-7

High Input Voltage Auxiliary Power Supply (Vin>800V)

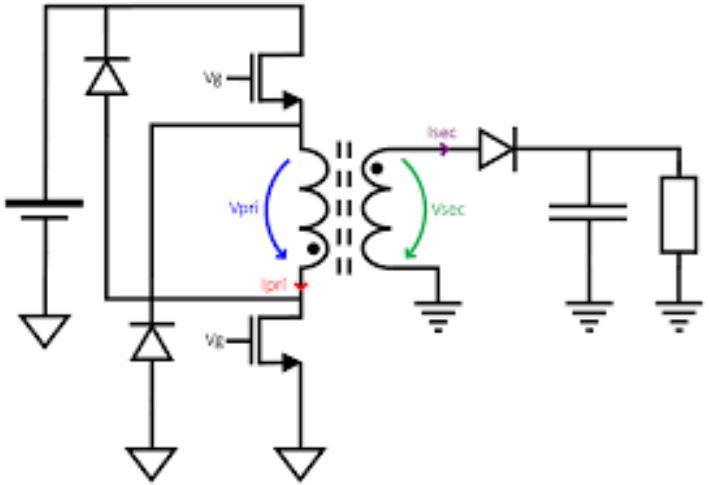
MV Drives or UPS

Need high input voltage auxiliary power supplies

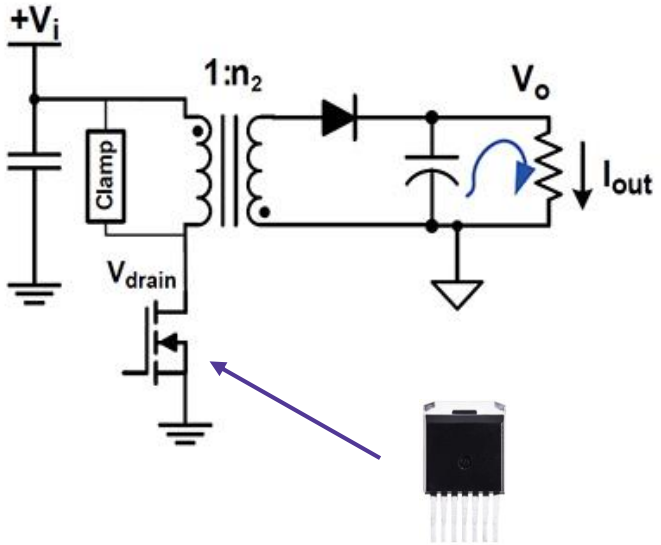


High Input Voltage Auxiliary Power Supply (Vin>800V)

Si MOSFET or IGBT



SiC MOSFET



SiC MOSFET
C3M1000170J
TO-263-7 Package

CRD-15DD17P

Wide Input Voltage Range (300 VDC – 1200 VDC) 15 W Flyback Auxiliary Power Supply Board

SiC MOSFET
C3M1000170J
TO-263-7 Package

Features:

- Demonstration of the efficient operation of Cree's 1700 V, 1Ω SiC MOSFET with an availability of high blocking voltage and high creepage distance (~ 7mm)
- Cree's 15 W flyback auxiliary power supply board can accept a wide range of AC or DC input voltage (480 VAC – 530 VAC) or (300 VDC – 1200 VDC) and provide 12 VDC at the output with an exceptional efficiency of 85 %
- Simple control approach has been utilized to reduce the overall complexity and cost of the system
- Targeting AUX power supplies for high voltage applications
- Documentation includes bill of materials (BOM), schematic, board layout, presentation and the application note

Applications:

- Solar
- Traction
- Energy Storage
- Industrial

Availability:

- Availability = Yes

Technical Specifications:

Input Voltage Range (DC)	300 VDC - 1200 VDC
Input Voltage Range (AC)	480 VAC - 530 VAC
Output Voltage	12 VDC
Output Power	15 W
Switching Frequency	85 kHz
Efficiency	> 85 %
MOSFET Package	TO-263-7
Physical Dimensions	64 mm X 45 mm X 25 mm

Evaluation Boards

Evaluation Boards

Evaluation boards to enable customers to speed up evaluation (Building Block)

- Gate drivers
- Half Bridge boards

CGD15SG00D2

Gate Driver for 3RD Generation (C3M™) SiC MOSFETs

Features:

- Supports 900V, 1000V and 1200V (C3M™) SiC MOSFETs
- Gate driver output voltage = +15 V (max) / -3.3 V (min)
- Integrated isolated power supply
- High Creepage (9mm) clearance
- Resistor network allows the gate driver to be compatible with Cree's (C2M™) SiC MOSFETs including the 1700 V SiC MOSFET

Technical Specifications: vailable for download

Isolation Level	5000 V
Interface Type	3 Pins (Gate, Source & Kelvin)
Output Peak Current	9 A
dv/dt	50 KV/µs
Compatible Packages	TO-263-7, TO-247-4, TO-247-3
Physical Dimensions	47.6 mm X 17.8 mm

Availability:

- Yes

for

Cree's C3M™ SiC MOSFET 900V, 1000V, 1200V TO-247-4 Package

Cree's C3M™ SiC MOSFET 900V TO-247-3 Package

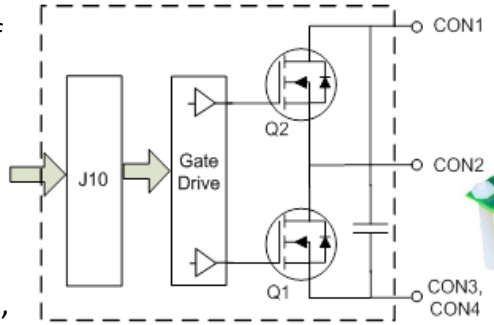
Cree's C2M™ SiC MOSFET 1700V TO-247-4 P Package

KIT8020-CRD-5FF0917P-2

Evaluation Board for Cree's (C3M™) SiC MOSFET in a TO-247-4 Package

Features:

- Evaluate and optimize the steady state and the switching performance of Cree's 3rd generation (C3M™) SiC MOSFETs in a TO-247-4 package
- Analysis of **half bridge** evaluation board in various topologies i.e. Buck converter, Boost converter etc..
- Two dedicated gate drivers available for each (C3M™) SiC MOSFET
- Package includes 1200V 75mΩ (C3M™) SiC MOSFETs (X 2) and the evaluation hardware
- Documentation includes bill of materials (BOM), schematic, board layout, presentation and the application note



Applications:

- Evaluate SiC MOSFET in TO-247-4 Package
- LLC/resonant Half Bridge converter
- DC/DC Converter (Buck, Boost etc..)
- Totem-Pole PFC stage
- Inverter stage

Availability:

- Yes

Cree's C3M™ SiC MOSFET C3M0075120K TO-247-4 Package

Technical Specifications:

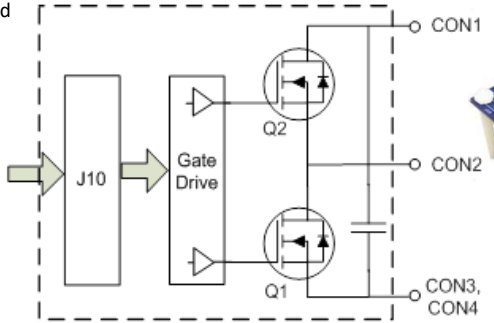
Dedicated Gate Drivers	2
Max Gate Driver Voltage	+19V / -8V
Safe Operating Gate Driver Voltage	+15V / -4V
Isolation Level	5000 V
MOSFET Package	TO-247-4
MOSFETs Included	C3M0075120K
Physical Dimensions	133mm X 88mm X 101mm

CRD-5FF0912P

High-Frequency Evaluation Board for SiC MOSFETs in 7L D2PAK Package

Features:

- Evaluate and optimize the steady state and switching performance of Cree's 3rd generation (C3M™) SiC MOSFETs in a TO-263-7 (D2PAK) package
- Analysis of half bridge evaluation board in various topologies i.e. Buck converter, Boost converter etc..
- Two dedicated gate drivers available for each (C3M) SiC MOSFET Includes (2) 900V 120mΩ (C3M™) SiC MOSFETs in a TO-263-7 Package with the testing hardware
- Evaluate high switching frequency operation of SiC MOSFETs (up to 3 MHz)
- Documentation includes bill of materials (BOM), schematic, board layout, and the user's manual



Applications:

- Evaluate SiC MOSFET in TO-263-7 Package
- LLC/resonant Half Bridge converter
- DC/DC Converter (Buck, Boost etc..)
- Totem-Pole PFC stage
- Inverter stage

Availability:

- Yes

Cree's C3M™ SiC MOSFET C3M0120090J TO-263-7 Package

Technical Specifications:

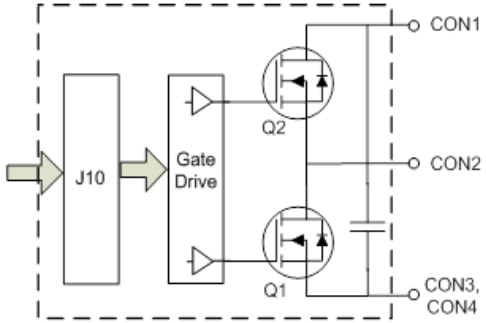
Dedicated Gate Drivers	2
Max Gate Driver Voltage	+19V / -8V
Safe Operating Gate Driver Voltage	+15V / -4V
Isolation Level	5200 V
MOSFET Package	TO-263-7
MOSFETs Included	C3M0120090J
Physical Dimensions	127mm X 98mm X 58mm

KIT8020-CRD-8FF1217P-1

Evaluation Kit for SiC MOSFETs and SiC Diodes in a TO-247-3 Package

Features:

- Evaluate and optimize the steady state and the switching performance of Cree's (C2M™) SiC MOSFETs and SiC Schottky Diodes (SBD) in a TO-247-3 package
- Analyze several topologies including: Basic Phase-leg Configuration, Bi-Directional DC/DC Converter and syn./non-syn. Buck and Boost Converters.
- Two dedicated gate drivers available for each (C2M™) SiC MOSFET
- Package includes 1200V 80mΩ (C2M™) SiC MOSFETs (X 2), 20A SiC Schottky Diode (X2), evaluation board and the mechanical peripherals
- Documentation includes bill of materials (BOM), schematic, board layout, user's guide and the brief summary note



Applications:

- Evaluate SiC MOSFET in TO-247-3 Package
- Phase-leg bridge topology with anti-parallel SiC Diode
- Bi-Directional DC/DC Converter
- Synchronous Buck/Boost Converter
- Non-Synchronous Buck/Boost Converter

Availability:

- Yes

Cree's C2M™ SiC MOSFET C2M0080120D TO-247-3 Package

Technical Specifications:

Dedicated Gate Drivers	2
Max Gate Driver Voltage	+25V / -10V
Safe Operating Gate Driver Voltage	+20V / -5V
Isolation Level	6000 V
MOSFET Package	TO-247-3
MOSFETs Included	C2M0080120D

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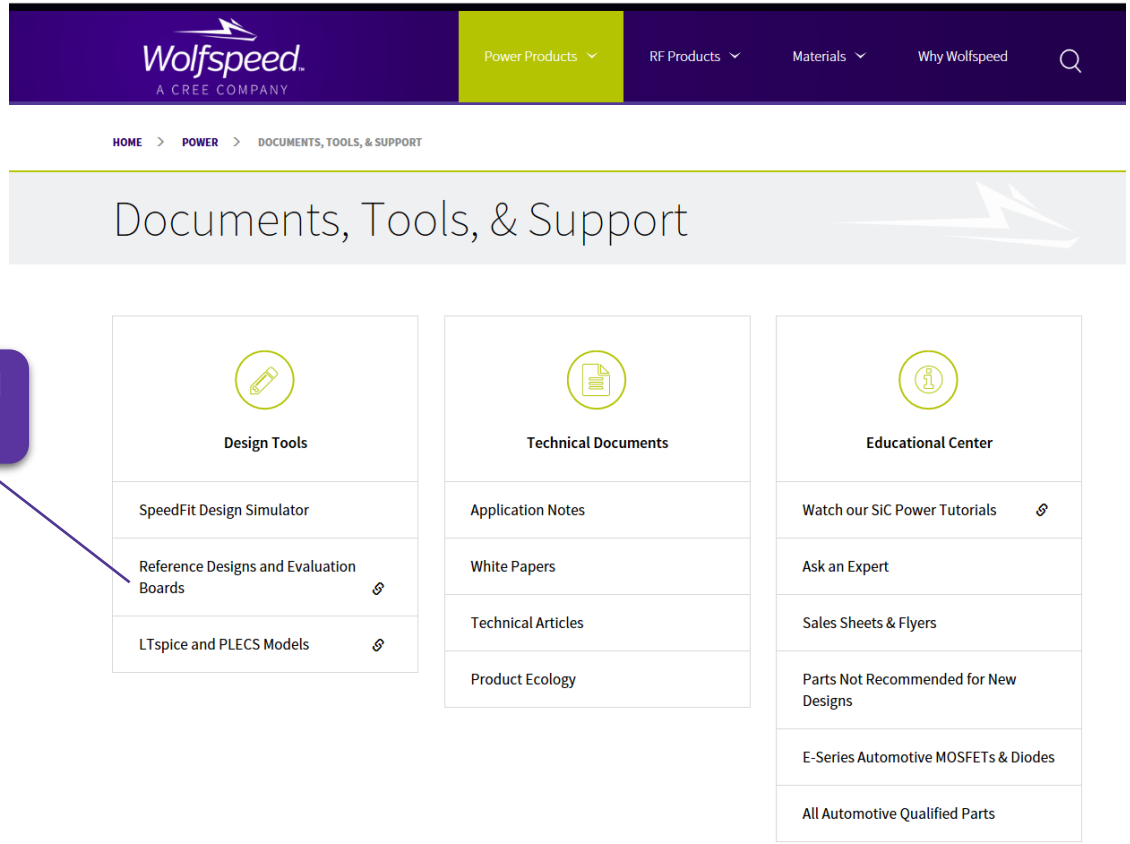
Digital Design Package in wolfspeed.com



Reference Designs and Evaluation Boards

Download

Use the form to the right to request your desired reference design.

You'll also want to see our gate driver boards.

CRD-60DD12N: 60 KW INTERLEAVED BOOST CONVERTER

- Demonstration of new 1200 V, 75 mΩ C3M™ SiC MOSFET and it's parallel operation in a 60 kW Interleaved Boost Converter
- 60 kW Interleaved Boost Converter demo board is based on four 15 kW Interleaved Boost Stages and each stage is using Cree's C3M™ CGD15SG00D2 isolated Gate Driver Board.
- Cree's 60 kW Interleaved Boost Converter demo board can accept 470VDC - 800VDC as an input and provide 850 VDC at the output with a peak efficiency of 99.5% and a power density of 127W/in^3
- Targeting high voltage and high power density applications such as Solar Power Generation
- Documentation includes a bill of materials (BOM), schematic, board layout and the application note
- Download application note
- Download presentation

CRD-06600FF10N: 6.6 KW BI-DIRECTIONAL EV ON-BOARD CHARGER

- Demonstration of 1000 V, 65 mΩ C3M™ SiC MOSFET in a 6.6 kW Bi-Directional EV On-Board Charger
- 6.6 kW Bi-Directional EV On-Board Charger demo board consist of a Bi-Directional Totem-Pole PFC (AC/DC) stage and an Isolated Bi-Directional DC/DC stage based on CLLC topology with a variable DC Link Voltage
- Cree's 6.6 kW Bi-Directional EV On-Board Charger demo board can accept 90VAC-265VAC as an input and provide 250VDC-450VDC at the output with > 96% of efficiency in both charging and inversion modes
- Main target applications of this demo board include: EV Charging industry and the Energy Storage industry

Select a Design *
CRD-15DD17P: Wide Input Voltage Range 15

Email *
jianwen.shao@wolfspeed.com

Phone

Country

Address

State

Zip

I acknowledge that I may, and am willing to, receive future communications from Cree, Inc. regarding this inquiry. *
Yes *

Submit

Cree, Inc. Privacy Policy

How to Order

Reference Designs: Request through Power Sales or Power Services

Evaluation Boards: in Stock

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Thank You