Wolfspeed | A CREE COMPANY

POWER CATALOG

POWER PRODUCTS

Transforming Power with
INDUSTRY-LEADING SILICON CARBIDE EXPERTISE & CAPACITY

2021

NEW

WELCOME TO WOLFSPEED

Wolfspeed is the foremost manufacturer of silicon carbide MOSFETs, Schottky diodes and power modules that put increased efficiency, higher switching frequency and reduced system size and costs in the hands of designers everywhere.

AND WE DIDN'T BECOME THE LEADER IN WIDE BANDGAP SEMICONDUCTORS OVERNIGHT.

Cree, Inc., spent more than 30 years establishing a global brand known for innovation, financial strength and reliable materials sourcing, staffed by the most forward-looking thinkers and doers in any scientific enterprise.

Wolfspeed was born ready, and we're outpacing the competition in every meaningful performance and cost-benefit parameter to provide RF and Power devices to any industry that needs the fastest, smallest, lightest and most efficient semiconductor products available. Which is all of them.

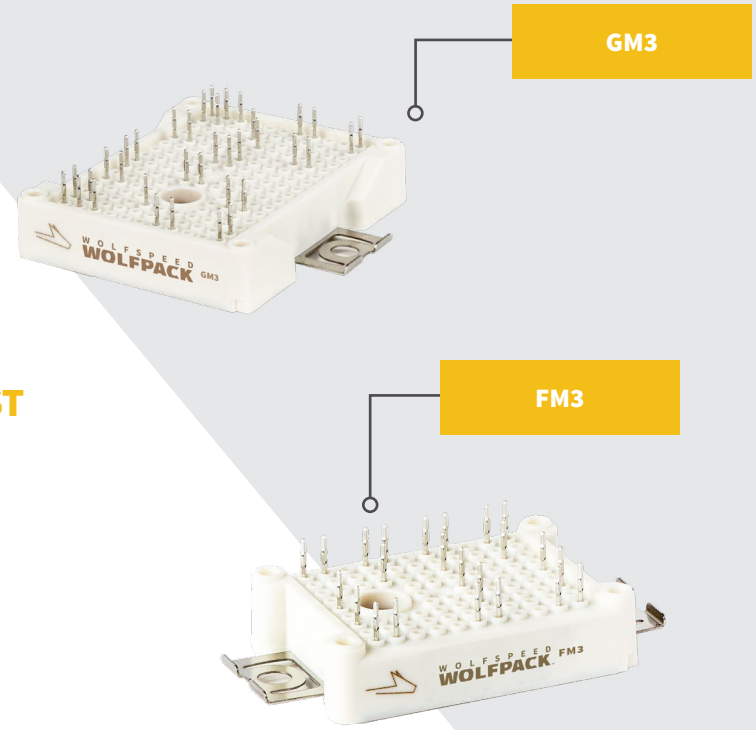
6,000,000,000,000+ HOURS IN THE FIELD. AND COUNTING.

Silicon carbide has powered Wolfspeed's MOSFETs, Schottky diodes and power modules for more than six trillion hours of end-customer usage worldwide.

THE WORLD LEADER IN SILICON CARBIDE.

Meet the Newest Member of Our Family

Wolfspeed WolfPACK™



DELIVERING THE INDUSTRY'S HIGHEST POWER DENSITY IN ITS CLASS FOR UNSURPASSED EFFICIENCY

Wolfspeed's latest power modules enable multiple configurations across power levels for electric vehicle fast charging, industrial power, UPS, induction heating and welding, industrial motor drive, power supply, solar and renewable energy and grid infrastructure applications.

FEATURES

- Leading silicon carbide MOSFET technology in an industry standard form factor
- Highest current rated topologies commercially available in class
- Built in NTC
- Press fit connections

BENEFITS

- Maximum power density in class
- Ease of layout and assembly
- System scalability and reliability
- End to end support - simulation through reference hardware

Part Number	Blocking Voltage	$R_{DS(ON)}$ at 25°C	Configuration	Package
CAB006M12GM3	1200V	6mΩ	Half-Bridge	GM3
CAB008M12GM3	1200V	8mΩ	Half-Bridge	GM3
CAB011M12FM3	1200V	11mΩ	Half-Bridge	FM3
CAB016M12FM3	1200V	16mΩ	Half-Bridge	FM3
CCB021M12FM3	1200V	21mΩ	6-pack	FM3
CCB032M12FM3	1200V	32mΩ	6-pack	FM3

*Refer page 13 for the Evaluation kit

1200V SiC MOSFETs

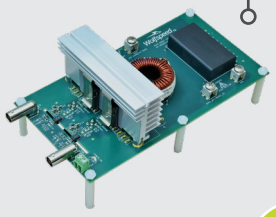
BROADEST PORTFLIO OF **1200V SIC MOSFETS FOR EFFICIENCY**

Wolfspeed's latest generation of SiC MOSFETs set the standard for performance, ruggedness and ease of design-in. Extremely fast switching, ultra-low switching losses, stable conduction losses over temperature assure significant improvement of system efficiency, power density and overall BOM cost versus silicon MOSFET and IGBT incumbants.

Leverage Wolfspeed's extensive SiC device portfolio, manufacturing experience, and systems expertise to accelerate your power supply design.

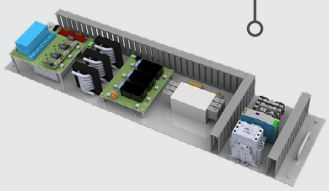
FEATURED DESIGN TOOLS

BUCK-BOOST EVALUATION
BOARD KIT-CRD-3DD12P



22KW HIGH EFFICIENT BI-DIRECTIONAL AFE and DC-DC CONVERTER
CRD-22AD12N & CRD-22DD12N

25kW ACTIVE FRONT END (AFE)
CRD25AD12N-FMC



FEATURES

- Low $R_{DS(ON)}$ over temperature
- Fast, rugged intrinsic body diode
- High Temperature Operation (T_J=175°C)
- Very high speed switching capability
- Wide range of $R_{DS(ON)}$
- Though-hole and surface mount package options with Kelvin source pin

BENEFITS

- Lowest possible switching and conduction losses
- Minimizes system heat-sink requirement
- Enables high power density designs
- Easier to drive (+15V gate drive)
- Lowers overall system BOM cost

SYSTEM SPECS

Part Number	Blocking Voltage	$R_{DS(ON)}$ at 25°C	Current Rating at 25°C	Package
C3M0016120D	1200 V	16 mΩ	115 A	TO-247-3
C3M0016120K	1200 V	16 mΩ	115 A	TO-247-4
C3M0021120K	1200 V	21 mΩ	100 A	TO-247-4
C3M0021120D	1200 V	21 mΩ	100 A	TO-247-3
C3M0032120K	1200 V	32 mΩ	63 A	TO-247-4
C3M0032120D	1200 V	32 mΩ	63 A	TO-247-3
C3M0032120J1	1200 V	32 mΩ	68 A	TO-263-7
C3M0040120K	1200 V	40 mΩ	66 A	TO-247-4
C3M0075120K	1200 V	75 mΩ	30 A	TO-247-4
C3M0075120J	1200 V	75 mΩ	30 A	TO-263-7
C3M0075120D	1200 V	75 mΩ	30 A	TO-247-3
C3M0160120J	1200 V	160 mΩ	17 A	TO-263-7
C3M0160120D	1200 V	160 mΩ	17 A	TO-247-3
C3M0350120J	1200 V	350 mΩ	7.2 A	TO-263-7
C3M0350120D	1200 V	350 mΩ	7.6 A	TO-247-3

650V SILICON CARBIDE MOSFETs

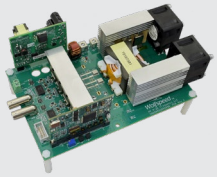
THE INDUSTRY'S **LOWEST ON-STATE RESISTANCE AND SWITCHING LOSSES**

Wolfspeed is proud to offer our of 3rd-Generation 650V MOSFETs, enabling smaller, lighter, and highly-efficient power conversion in an even wider range of power systems.

The 650V MOSFET product family is ideal for applications including high performance industrial power supplies, server/telecom power, electric vehicle charging systems, energy storage systems, uninterruptible power supplies, and battery management systems.

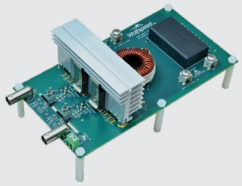
FEATURED DESIGN TOOLS

2.2kW High Efficiency
(80+ Titanium) Bridgeless Totem-Pole PFC
CRD-02AD065N



6.6kW High Frequency DC-DC Converter
CRD-06600DD065N

6.6kW High Power Density Bi-Directional EV On-Board Charger
CRD-06600FF065N



Buck-Boost Evaluation Kit for Wolfspeed 650V SiC MOSFETs
KIT-CRD-3DD065P

FEATURES

- Low $R_{DS(ON)}$ over Temperature
- Low Device Capacitances
- Kelvin Source Pin
- High Temperature Operation (T_J = 175°C)
- Fast Diode with ultra low reverse recovery

BENEFITS

- Improves System Efficiency with lower conduction losses
- Enables high switching frequency operation
- Improves System Level Power Density
- Reduces System Size, Weight, and Cooling Requirements
- Enables new hard switching topologies (Totem-Pole PFC)

APPLICATIONS

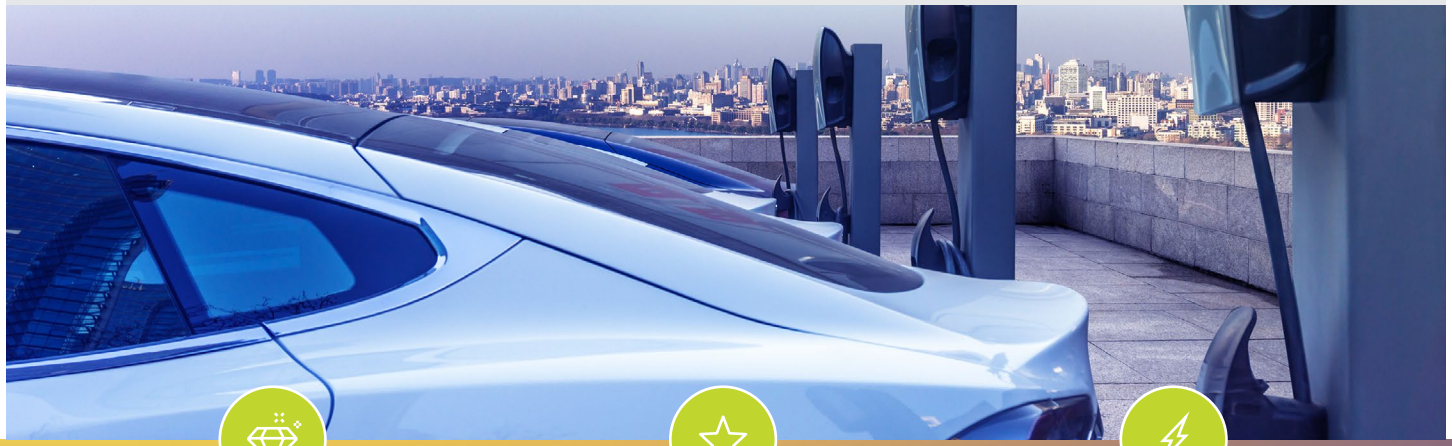
- Industrial Power Supplies
- Server/Telecom
- EV-Charging Systems
- Energy Storage Systems (ESS)
- Uninterruptible Power Supplies (UPS)
- Battery Management Systems (BMS)

Part Number	Blocking Voltage	$R_{DS(ON)}$ at 25°C	Current Rating at 25°C	Package
C3M0015065D	650 V	15 mΩ	81 A	TO-247-3
C3M0015065K	650 V	15 mΩ	91 A	TO-247-4
C3M0025065K	650 V	25 mΩ	97 A	TO-247-4
C3M0025065D	650 V	25 mΩ	97 A	TO-247-3
C3M0045065D	650 V	45 mΩ	49 A	TO-247-3
C3M0045065K	650 V	45 mΩ	49 A	TO-247-4
C3M0060065D	650 V	60 mΩ	29 A	TO-247-3
C3M0060065J	650 V	60 mΩ	36 A	TO-263-7
C3M0060065K	650 V	60 mΩ	37 A	TO-247-4
C3M0120065D	650 V	120 mΩ	22 A	TO-247-3
C3M0120065K	650 V	120 mΩ	22 A	TO-247-4
C3M0120065J	650 V	120 mΩ	21 A	TO-263-7

E-SERIES™ AUTOMOTIVE SiC PRODUCTS

INDUSTRY'S FIRST **AUTOMOTIVE-QUALIFIED SILICON CARBIDE PRODUCTS**

Wolfspeed continues to lead in silicon carbide with our E-Series line of SiC MOSFETs and Schottky diodes. The portfolio is fully automotive qualified and PPAP capable, and adds superior resistance to humidity to our already rugged technology, enabling the lowest switching losses and highest figures of merit in the most demanding applications. These devices are optimized for use in EV battery chargers and high-voltage DC/DC converters, and are featured in Wolfspeed's 6.6kW bi-directional on-board charger reference design.



FEATURES

- Automotive qualified (AEC-Q101) and PPAP capable
- Low MOSFET $R_{DS(ON)}$ and Schottky Diode V_F over temperature
- Fast intrinsic diode with low reverse recovery (Qrr)
- Low forward voltage in diodes (V_F)

BENEFITS

- High-voltage, high-temperature, and high-humidity resistance
- Improves system efficiency with lower conduction losses
- Enables high switching frequency operation
- Enables high-reliability operation

APPLICATIONS

- Drivetrain traction inverters
- Onboard EV battery chargers
- PV inverters
- High voltage DC/DC converters

SYSTEM SPECS

Part Number	Blocking Voltage	Current Rating at 25°C	Package
E3D08065G	650 V	8 A	TO-263-2
E3D20065D	650 V	20 A	TO-247-3
E3D30065D	650 V	30 A	TO-247-3
E4D20120A	1200 V	20 A	TO-220-2
E4D20120D	1200 V	20 A	TO-247-3
E4D20120G	1200 V	20 A	TO-263-2
E4D10120A	1200 V	10 A	TO-220-2

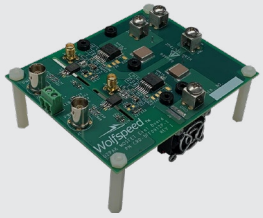
Part Number	Blocking Voltage	$R_{DS(ON)}$ at 25°C	Current Rating at 25°C	Package
E3M0120090D	900 V	120 mΩ	22 A	TO-247-3

900V SILICON CARBIDE MOSFETs

WOLFSPEED SILICON CARBIDE SOLUTIONS FOR **FAST SWITCHING POWER DEVICES**

Wolfspeed's 900V SiC MOSFETs offer low inductance in low inductance discrete packages with wide creepage and clearance distance between drain and source (~8mm). These MOSFETs take advantage of the high-frequency capability of the latest technology chips while providing extra electrical isolation suitable for high pollution environments. The separate Kelvin source pin reduces inductance, which reduces switching loses by as much as 30%. Designers can reduce component-count by moving from silicon-based, three-level topologies to simpler two-level topologies made possible by the improved switching performance.

FEATURED DESIGN TOOLS



Evaluation Board for 900V SiC C3M™ MOSFET in a 7-pin D2PAK (TO-263-7L)
KIT-CRD-8FF90P

FEATURES

- Low $R_{DS(ON)}$ over Temperature
- Low-impedance package
- Fast intrinsic diode with low reverse recovery (Qrr)
- Kelvin source pin

BENEFITS

- Improves system efficiency with lower conduction losses
- Enables high switching frequency operation
- Reduces system size, weight, and cooling requirements
- Enables new hard switching topologies (Totem-Pole PFC)

APPLICATIONS

- Motor Drive
- EV Charging Systems
- Uninterruptible Power Supply (UPS)
- Battery management systems
- Fast EV-Charging Systems
- Welding

Part Number	Blocking Voltage	$R_{DS(ON)}$ at 25°C	Current Rating at 25°C	Package
C3M0030090K	900 V	30 mΩ	63 A	TO-247-4
C3M0065090J	900 V	65 mΩ	35 A	TO-263-7
C3M0065090D	900 V	65 mΩ	36 A	TO-247-3
C3M0120090J	900 V	120 mΩ	22 A	TO-263-7
C3M0120090D	900 V	120 mΩ	23 A	TO-247-3
C3M0280090J	900 V	280 mΩ	11.5 A	TO-263-7
C3M0280090D	900 V	280 mΩ	11.5 A	TO-247-3

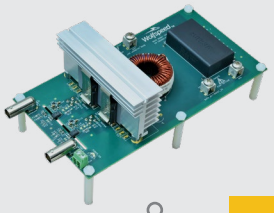
1000V SILICON CARBIDE MOSFETs

WOLFSPEED SILICON CARBIDE SOLUTIONS FOR **FAST SWITCHING POWER DEVICES**

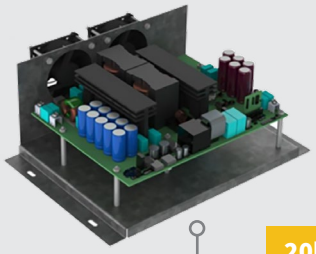
The 1000V SiC MOSFETs address many power design challenges by providing a unique device with low on-resistance, very low output capacitance, and low source inductance for a perfect blend of low switching losses and low conduction losses.

Wolfspeed's 1000V SiC MOSFETs are optimized for fast switching devices such as electric-vehicle charging systems, industrial power supplies, and renewable energy systems.

FEATURED DESIGN TOOLS



BUCK-BOOST EVALUATION BOARD
KIT-CRD-3DD12P



20kW FULL BRIDGE LLC RESONANT CONVERTER
CRD-20DD09P-2

FEATURES

- Low $R_{DS(ON)}$ over Temperature
- High-speed switching with low output capacitance
- Fast intrinsic diode with low reverse recovery (Qrr)
- Kelvin source pin

BENEFITS

- Enables a reduction in overall system cost
- Improves system efficiency while decreasing system-size
- Enables hard switching topologies
- Enables high switching frequency operation

APPLICATIONS

- Industrial Power Supplies
- Renewable energy systems
- EV-Charging Systems
- Fast electric vehicle charging systems
- Onboard electric vehicle charging

SYSTEM SPECS

Part Number	Blocking Voltage	$R_{DS(ON)}$ at 25°C	Current Rating at 25°C	Package
C3M0120100K	1000 V	120 mΩ	22 A	TO-247-4
C3M0120100J	1000 V	120 mΩ	22 A	TO-263-7
C3M0065100K	1000 V	65 mΩ	35 A	TO-247-4
C3M0065100J	1000 V	65 mΩ	35 A	TO-263-7

1700V SILICON CARBIDE MOSFETs

FASTER SWITCHING, ENHANCED RELIABILITY FOR **SUPERIOR POWER CONVERSION**

Wolfspeed's 1700V SiC MOSFETs enable smaller and more efficient power conversion systems. Compared to silicon-based solutions, Wolfspeed silicon carbide technology enables increased system power density, higher switching frequencies, smaller designs, cooler components, reduced size of components like inductors, capacitors, filters & transformers, and overall cost benefits.

FEATURED DESIGN TOOLS

WIDE INPUT VOLTAGE RANGE (300 VDC – 1200 VDC) 15W FLYBACK AUXILIARY POWER SUPPLY BOARD
CRD-15DD17P

FEATURES

- High blocking voltage with low $R_{DS(ON)}$
- High speed switching with low capacitances
- Fast intrinsic diode with low reverse recovery (Qrr)
- Low parasitic inductance
- ~8mm creepage and clearance distance

BENEFITS

- Higher system efficiency
- Increased system switching frequency
- Enables hard-switching topologies
- Separate Kelvin source pin lowers source inductance and provides up to 30% lower switching losses
- Robust isolation with wide creepage and clearance distance between drain and source

APPLICATIONS

- Auxiliary power supplies
- Switch mode power supplies
- Power inverters
- 1500V solar inverters
- High voltage DC-DC converters
- Motor drives
- Pulsed power applications

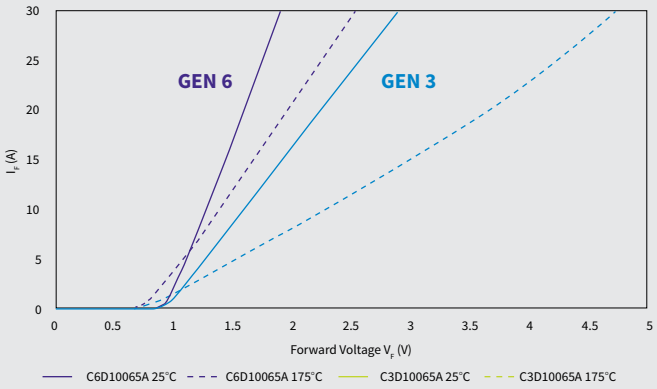
Part Number	Blocking Voltage	$R_{DS(ON)}$ at 25°C	Current Rating at 25°C	Package
C2M1000170D	1700 V	1000 mΩ	5 A	TO-247-3
C2M1000170J	1700 V	1000 mΩ	5.3 A	TO-263-7
C2M0045170D	1700 V	45 mΩ	72 A	TO-247-3
C2M0045170P	1700 V	45 mΩ	72 A	TO-247-4 Plus

SiC SCHOTTKY **DIODES**

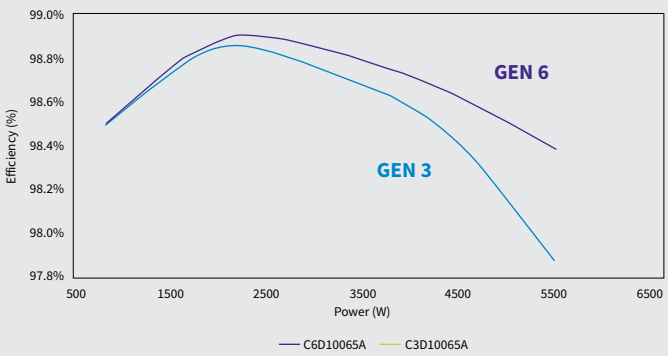
WOLFSPEED'S LATEST GENERATION (C6D) **SCHOTTKY DIODES**

Wolfspeed's 6th generation SiC Schottky diode family offers the lowest forward voltage drop (V_F = 1.27 V @25°C), which significantly reduces conduction losses. This reduction enables extremely high system level efficiency and power density in the most demanding power conversion applications, such as Power Factor Correction (PFC) and High Voltage DC/DC Converters.

LOW FORWARD VOLTAGE (V_F) WITH IMPROVED THERMAL STABILITY



IMPROVED SYSTEM LEVEL EFFICIENCY



FEATURES

- Low V_F = 1.27 V @25°C
- Positive Temperature Co-efficient
- Zero Reverse Recovery
- Robust MPS Technology
- Low Figure of Merit (Q_C x V_F)
- Wide range of T_J (-55°C to 175°C)
- Standard TO-220 package

BENEFITS

- Improved System Level Efficiency
- High Surge Current Capability
- High Frequency Operation
- Direct Drop in Replacement of C3D
- Easy Parallel Operation
- Reduced Heat Sink Requirements

APPLICATIONS

- Server/Telecom
- Uninterruptible Power Supplies (UPS)
- Medical
- Consumer Electronics
- Industrial Power Supplies
- Solar Energy Systems

SYSTEM SPECS

Part Number	V_{RRM}	IF	V_F	Package Options
C6D04065E	650V	4A	1.27V	TO-252-2
C6D04065A	650V	4A	1.27V	TO-220-2
C6D06065E	650V	6A	1.27V	TO-252-2
C6D06065A	650V	6A	1.27V	TO-220-2
C6D08065E	650V	8A	1.27V	TO-252-2
C6D08065A	650V	8A	1.27V	TO-220-2
C6D10065E	650V	10A	1.27V	TO-252-2
C6D10065A	650V	10A	1.27V	TO-220-2
C6D16065D	650V	16A	1.27V	TO-247-3
C6D20065D	650V	20A	1.27V	TO-247-3

SiC SCHOTTKY DIODES

WOLFSPEED HAS THE BROADEST PORTFOLIO OF SiC SCHOTTKY DIODES, WITH MORE THAN SIX TRILLION FIELD HOURS AND NEARLY 20 YEARS OF EXPERIENCE.

Our diodes feature the MPS (Merged PiN Schottky) design, which is more robust and reliable than standard Schottky barrier diodes, and can be easily paralleled for increased design flexibility.

	Part Number	Blocking Voltage (V)	Current Rating	Package
600V & 650V DISCRETE	CSD01060A	600	1	TO-220-2
	CSD01060E	600	1	TO-252-2
	C3D02060A	600	2	TO-220-2
	C3D02060F	600	2	TO-220-F2
	C3D02060E	600	2	TO-252-2
	C3D03060A	600	3	TO-220-2
	C3D03060F	600	3	TO-220-F2
	C3D03060E	600	3	TO-252-2
	C3D04060A	600	4	TO-220-2
	C3D04060F	600	4	TO-220-F2
	C3D04060E	600	4	TO-252-2
	C3D06060A	600	6	TO-220-2
	C3D06060F	600	6	TO-220-F2
	C3D06060G	600	6	TO-263-2
	C3D08060A	600	8	TO-220-2
	C3D08060G	600	8	TO-263-2
	C3D10060A	600	10	TO-220-2
	C3D10060G	600	10	TO-263-2
	C3D16060D	600	16	TO-247-3
	C3D20060D	600	20	TO-247-3
	C3D02065E	650	2	TO-252-2
	C3D03065E	650	3	TO-252-2
	C3D04065A	650	4	TO-220-2
	C3D04065E	650	4	TO-252-2
	C3D06065I	650	6	TO-220 Iso
	C3D06065A	650	6	TO-220-2
	C3D06065E	650	6	TO-252-2
	C3D08065I	650	8	TO-220 Iso
	C3D08065A	650	8	TO-220-2
	C3D08065E	650	8	TO-252-2
	C3D10065I	650	10	TO-220 Iso
	C3D10065A	650	10	TO-220-2
	C3D10065E	650	10	TO-252-2

	Part Number	Blocking Voltage (V)	Current Rating	Package
600V & 650V CONT.	C3D12065A	650	12	TO-220-2
	C3D16065A	650	16	TO-220-2
	C3D16065D	650	16	TO-247-3
	CVFD20065A	650	20	TO-220-2
	C3D20065D	650	20	TO-247-3
	C3D20065D1	650	20	TO-247-3
	C3D30065D	650	30	TO-247-3
	C6D10065A	650	10	TO-220-2
	C6D08065A	650	8	TO-220-2
	C6D06065A	650	6	TO-220-2
	C6D04065A	650	4	TO-220-2
	C6D04065E	650	4	TO-252-2
	C6D06065E	650	6	TO-252-2
	C6D08065E	650	B	TO-252-2
	C6D10065E	650	B	TO-252-2
	C6D16065D	650	16	TO-247-3
	C6D20065D	650	20	TO-247-3

1200V DISCRETE	C4D02120A	1200	2	TO-220-2
	C4D02120E	1200	2	TO-252-2
	C2D05120A	1200	5	TO-220-2
	C4D05120A	1200	5	TO-220-2
	C4D05120E	1200	5	TO-252-2
	C4D08120A	1200	8	TO-220-2
	C4D08120E	1200	8	TO-252-2
	C4D10120A	1200	10	TO-220-2
	C4D10120D	1200	10	TO-247-3
	C4D10120E	1200	10	TO-252-2
	C4D10120H	1200	10	TO-247-2
	C4D15120A	1200	15	TO-220-2
	C4D15120D	1200	15	TO-247-3
	C4D15120H	1200	15	TO-247-2
	C4D20120A	1200	20	TO-220-2
	C4D20120D	1200	20	TO-247-3
	C4D20120H	1200	20	TO-247-2
	C4D30120D	1200	30	TO-247-3
	C4D40120D	1200	40	TO-247-3

E-SERIES	E4D20120A	1200	20A	TO-220-2
	E4D10120A	1200	10A	TO-220-2
	E4D20120G	1200	20A	TO-263-2
	E4D20120D	1200	20A	TO-247-3

E-SERIES **DIODE FAMILY**

EXPERIENCE THE BENEFITS OF SiC IN YOUR **AUTOMOTIVE OR SOLAR APPLICATION**

Wolfspeed's E-Series diodes are specifically designed to be robust and reliable in the harshest environments. As a result, the E-Series diodes are the industry's first 1200V SiC diodes to be automotive qualified and high-humidity/high-voltage/high-temperature tested. The E-Series family of diodes are ideal for on-board and off-board automotive charger applications and solar power inversion.

FEATURED DESIGN TOOLS

60kW INTERLEAVED BOOST CONVERTER
CRD-60DD12N

FEATURES

- 1200-Volt Schottky Rectifier
- Zero Forward and Reverse Recovery
- High-Frequency Operation
- Temperature-Independent Switching Behavior
- Extremely Fast Switching
- Positive temperature coefficient on V_F

BENEFITS

- Reduces system size, weight, and cooling requirements
- Increased power density
- Improved system efficiency at high switching frequencies
- Parallel mode operation possible

SYSTEM SPECS

Part Number	V_{RRM}	$I_{F,Rated}$	Package
E4D20120A	1200	20A	TO-220-2
E4D10120A	1200	10A	TO-220-2
E4D20120G	1200	20A	TO-263-2
E4D20120D	1200	20A	TO-247-3
EPW4-1200-S020A	1200	20A	Bare die
EPW4-1200-S010A	1200	10A	Bare die

MODULES

WOLFSPEED IS SERIOUS ABOUT POWER MODULES - PROVIDING THE MOST EXTENSIVE LINEUP OF MODULES TO DATE, SERVING INDUSTRIAL, HARSH ENVIRONMENT, AND MOBILITY MARKETS.

Wolfspeed's vertical integration (from SiC material to packaging) enables us to provide leading SiC technology throughout the supply chain. Our power modules are designed to meet each customer's system design requirements with a package that offers best-in-class SiC performance. We offer two distinct product categories to serve different customer value propositions: Industry-Standard Footprints and Optimized Footprints.

INDUSTRY-STANDARD FOOTPRINTS

Well-established footprints / packages that have been internally optimized for SiC and provide a straight-forward drop-in replacement at the package level for customers using these platforms with either Si or SiC devices.

OPTIMIZED FOOTPRINTS

Uniquely developed by Wolfspeed to offer new capability designed specifically for SiC.

FEATURED FOOTPRINTS

Wolfspeed WolfPACK™*

EXPANDED 62MM (BMx)

53MM (XM3)

HIGH PERFORMANCE 62MM (HM3)

*Refer to page 2 for product line up

Part Number	Status	Blocking Voltage (V)	Current* (A)	$R_{DS(ON)}$ (mΩ)	Footprint	Features
CAB530M12BM3	Available	1200	530	2.5	Standard 62mm (BMx)	Industrial-Qualification, C3M MOSFET Only
WAB400M12BM3	Available	1200	400	3.7	Standard 62mm (BMx)	Harsh Environment + High Temperature Qualification, MOSFETs Only (Conduction-Optimized)
WAB300M12BM3	Available	1200	360	4.5	Standard 62mm (BMx)	Harsh Environment + High Temperature Qualification, MOSFETs Only (Switching-Optimized)
CAS300M12BM2	Available	1200	420	5	Standard 62mm (BMx)	Half-Bridge, C2M MOSFETs + Schottky Diodes
CAS120M12BM2	Available	1200	190	13	Standard 62mm (BMx)	Half-Bridge, C2M MOSFETs + Schottky Diodes
CAS110M12BM2	Available	1200	110	12.5	Standard 62mm (BMx)	Half-Bridge, C2M MOSFETs + Schottky Diodes
CAS300M17BM2	Available	1700	325	8	Standard 62mm (BMx)	Half-Bridge, C2M MOSFETs + Schottky Diodes
CCS050M12CM2**	Available	1200	85	25	Standard 45mm	Six-Pack, C2M MOSFETs + Schottky Diodes
CCS020M12CM2**	Available	1200	45	80	Standard 45mm	Six-Pack, C2M MOSFETs + Schottky Diodes
CAB760M12HM3	Available	1200	765	1.33	Optimized 62mm	Half-Bridge, C3M MOSFETs, Switching-Optimized C3M MOSFETs
CAS480M12HM3	Available	1200	480	2.29	Optimized 62mm	Half-Bridge, C3M MOSFETs, Switching-Optimized C3M MOSFETs + Schottky Diodes
CAB400M12XM3	Available	1200	400	3.2	Optimized XM3	Half-Bridge, C3M Switching-Optimized MOSFETs
CAB425M12XM3	Available	1200	425	3.2	Optimized 62mm	Half-Bridge, C3M Switching-Optimized MOSFETs
CAB450M12XM3	Available	1200	450	2.6	Optimized XM3	Half-Bridge, C3M Conduction-Optimized MOSFETs
CAB320M17XM3	CY-2021	1700	320	4	Optimized XM3	Half-Bridge, C3M MOSFETs
CAB350M12BM2		1200	350	4	Standard 62mm (BMx)	Industrial-Qualification, C3M MOSFET Only
CAB175M12BM2		1200	175	6	Standard 62mm (BMx)	Industrial-Qualification, C3M MOSFET Only
HM3 1700 V Gen 3 Configurations	CY-2021	1700			HM3	Half-Bridge Gen3 Technology
BM3 1700 V Gen 3 Configurations	CY-2021	1700			BM3	Half-Bridge Gen3 Technology

***DC Current at T_c = 90 °C' **Not recommended for any new customer designs.**

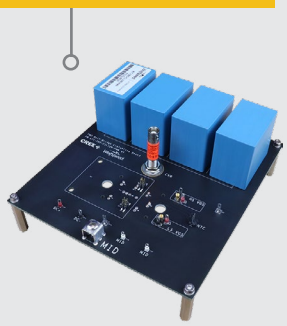
Curious about these parts? Reach out to your local Cree Sales representative for information about sampling and availability.

WOLFSPEED WolfPACK

INDUSTRY'S HIGHEST POWER DENSITY FOR UNSURPASSED EFFICIENCY

Wolfspeed's latest power modules enable multiple configurations across power levels for electric vehicle fast charging, industrial power, UPS, induction heating and welding, industrial motor drive, power supply, solar and renewable energy and grid infrastructure applications.

KIT-CRD-CIL12N-FMA



DYNAMIC CHARACTERIZATION EVALUATION TOOL OPTIMIZED FOR THE WOLFSPEED WolfPACK HALF-BRIDGE MODULE PLATFORM

Wolfspeed's KIT-CRD-CIL12N-FMA is a dynamic characterization tool that can be used to evaluate and optimize switching performance of Wolfspeed's WolfPACK SiC half-bridge power modules. A clamped inductive load (CIL) test circuit with current measurement provides a high speed, low inductance test fixture for double pulse testing. This test fixture in conjuction with a choice of gate driver boards options allows measurement of: Timing (TDelay-On, TDelay-Off, TRise, TFall), Overshoot (VDS-Max, ID-Max), Speed (di/dt, dv/dt) Switching Loss (EON, EOFF, ERR).

EVALUATION TOOL MATRIX

Wolfspeed WolfPACK™	Dynamic Characterization Evaluation Tool	Differential Transceiver Evaluation Tool	Silicon Labs® Gate Driver Board	Analog Devices® Gate Driver Board	Wolfspeed Gate Driver Board (Design Only)
CAB011M-12FM3	KIT-CRD-CIL12N-FMA	CGD12HB00D	Si823H-AxWA-KIT	EVAL-ADUM4146WHB1Z	CGD1700HB2M-UNA
CAB016M-12FM3	KIT-CRD-CIL12N-FMA	CGD12HB00D	Si823H-AxWA-KIT	EVAL-ADUM4146WHB1Z	CGD1700HB2M-UNA
CCB021M-12FM3	KIT-CRD-CIL12N-FMC	CGD12HB00D (3 pcs)	Si823H-AxWA-KIT (3 pcs)	EVAL-ADUM4146WHB1Z (3 pcs)	CGD1700HB2M-UNA (3 pcs)
CCB032M-12FM3	KIT-CRD-CIL12N-FMC	CGD12HB00D (3 pcs)	Si823H-AxWA-KIT (3 pcs)	EVAL-ADUM4146WHB1Z (3 pcs)	CGD1700HB2M-UNA (3 pcs)

BM (62MM) MODULE PLATFORM

WOLFSPEED'S 62MM HALF-BRIDGE SiC MODULES SUPPORT **RAPID SYSTEM DEVELOPMENT**

PLATFORM BENEFITS:

- Second and Third Generation MOSFET Technology Available
- Industry-Standard 62mm Footprint
- Fast Time-to-Market with Existing 62mm Compatible Designs
- Low Inductance (10-11 nH) Design
- Expanded Portfolio Offering Solutions to Meet Demands of Industrial & Harsh Environment Operating Conditions

MODULE SIZE:

106 x 62 x 30 (mm)

TOPOLOGY:

Half-Bridge

TARGETED APPLICATIONS:

Industrial Automation & Testing, Railway & Traction, EV Charging Infrastructure, Power Supplies (UPS), Renewable-Energy Systems & Grid-Tied Inverters

SUPPORTING GATE DRIVER:

CGD1200HB2P-BM2, -BM3

SUPPORTING EVALUATION KIT:

KIT-CRD-CIL12N-BM

	CAS-BM2	CAB-BM3	CAS-BM3	WAB-BM3
Robust, Reliable Wolfspeed SiC Performance?	✓	✓	✓	✓
Latest Gen3 MOSFET Technology?		✓	✓	✓
Materials Optimized for Industrial Operating Conditions?	✓	✓	✓	
Devices Optimized for Humidity Robustness?		✓	✓	✓
Reduced SiC Device Area (Includes only MOSFETs)?		✓		✓
Minimization of Switching Losses?	✓		✓	
Materials Optimized for Sustained High Junction Temperature Operation?				✓
Commercial Part Numbers **Not Yet Commercial, Planned Products Only with Limited Samples*	CAS120M12BM2 CAS300M12BM2 CAS300M17BM2	CAB530M12BM3 CAB350M12BM3* CAB175M12BM3*	CAS530M12BM3* CAS350M12BM3* CAS175M12BM3*	WAB400M12BM3 WAB300M12BM3

XM3 (53MM) MODULE PLATFORM

WOLFSPEED'S XM3 HALF-BRIDGE SiC MODULES ARE **DESIGNED FOR POWER DENSITY**

PLATFORM BENEFITS:

Implements Third Generation MOSFET Technology (Frequency and Conduction Optimized Configurations Available)

High Power Density Footprint

High Temperature (175 °C) Operation

Low Inductance (6.7 nH) Design

Offset Terminal Layout Simplifies Bus Bar Design

Integrated Temperature Sensing

Dedicated Drain-Kelvin Pin

Silicon Nitride Insulator and Copper Baseplate

MODULE SIZE:

80 x 53 x 19 (mm)

TOPOLOGY:

Half-Bridge

TARGETED APPLICATIONS:

Motor and Traction Drives, UPS, EV Chargers, Industrial Automation and Testing, Power Supplies

SUPPORTING GATE DRIVER:

CGD12HBXMP

SUPPORTING EVALUATION KIT:

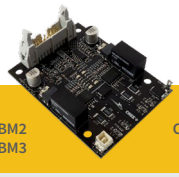
KIT-CRD-CIL12N-XM3

SUPPORTING REFERENCE DESIGNS:

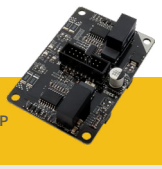
CRD---DA12E-XM3 Inverters

Module Gate Driver Boards

COMPANION GATE DRIVERS



CGD1200HBP-BM2
CGD1200HBP-BM3



CGD12HBXMP

SKU	Package	Designed By	Working Voltage	Gate Driver	Output Channels
CGD1700HB2M-UNA	FM3, GM3	Wolfspeed	1200 V	Texas Instruments UCC21710	2
EVAL-ADUM4146WHB1Z	FM3, GM3	Partner	1200 V	Analog Devices AduM4146	2
Si823H-AxWA-KIT	FM3, GM3	Partner	1200 V	Silicon Labs Si823Hx	2
CGD1700HB3P-HM3	HM High Performance 62 mm	Wolfspeed	1500 V	IXDD614YY	2
CGD15HB62LP	HM High Performance 62 mm	Wolfspeed	1500 V	IXDD614YY	2
CGD1200HB2P-BM3	Standard 62mm (BMx)	Wolfspeed	1000 V	Analog Devices AduM4135	2
CGD1200HB2P-BM2	Standard 62mm (BMx)	Wolfspeed	1000 V	Analog Devices AduM4135	2
CGD12HBXMP	XM3	Wolfspeed	1000 V	Analog Devices AduM4135	2
CGD15FB45P1	45mm	Wolfspeed	1200 V	NA	6

Design Tools

START MODELING FOR YOUR DESIGN WITH SpeedFIT™

WELCOME TO SpeedFit 2.0

Welcome to SpeedFit 2.0, the industry's most comprehensive system-level circuit simulator for silicon carbide power applications.

Accelerate the design process with simulation results you can trust. SpeedFit 2.0 quickly calculates losses and estimates junction temperature for power devices based on lab data for common topologies ranging from simple buck and boost converters to a fully bi-directional totem pole PFC with resonant DC/DC converter.

USING SpeedFIT 2.0, YOU CAN QUICKLY DETERMINE:

- The right product for an application
- Comparative performance for different devices
- How the performance with varies Rg
- How many devices need to be paralleled

KICKSTART YOUR DESIGN

Choose your Application →

- Converter Type *(AC-DC, DC-DC, DC-AC)*
- No. of AC phases *(1, 3)*

Input Design Specifications →

- Input voltage
- Output voltage
- Rated output power S_o
- AC frequency F_{ac}
- Switching frequency F_{sw}
- Deadtime
- Select Circuit Type
  Buck-boost converter
  LLC resonant converter
  Phase shift full bridge converter etc.

Input Design Specifications →

- Select the device from recommended products list
- Number of devices to be paralleled

Input Thermal Management Specs →

- Cooling System
- *Thermal interface resistance $R_{th,ch}$*
- *Heatsink temperature T_h*
- *Thermal resistance $R_{th,ha}$*
- *Heatsink time constant t_{ha}*
- *Additional heat source on heatsink P_{add}*
- *Ambient temperature T_{amb}*

Simulate

- Comparative performance for different devices
- Choose the right product for your application

EXPLORE SPEEDFIT 2.0 AT **WOLFSPEED.COM/SPEEDFIT**

EVALUATION KITS

Wolfspeed understands that system designers want to perform characterization in their own labs when working with a new product. To help reduce design resource investment and enable fast characterization of our products, Wolfspeed offers a wide array of Evaluation Kits to help you better understand the capability of our silicon carbide discrete and module packages.

Wolfspeed partners with component manufacturers to provide our customers with access to the widest selection of and the latest system components. Our Partner Evaluation Kits are developed and supported by our partners in collaboration with Wolfspeed.

Name*	Topology	Package	SKU
Evaluation Board for 650V SiC C3M™ MOSFET in a 7-pin D2PAK (TO-263-7L)	Dynamic Characterization	TO-263-7	KIT-CRD-8FF65P
Evaluation Board for 900V SiC C3M™ MOSFET in a 7-pin D2PAK (TO-263-7L)	Dynamic Characterization	TO-263-7	KIT-CRD-8FF90P
Dynamic Characterization Evaluation Tool Optimized for the Wolfspeed WolfPACK™ Half Bridge Module Platform	Dynamic Characterization	FM3	KIT-CRD-CIL12N-FMA
Dynamic Characterization Evaluation Tool Optimized for the Wolfspeed WolfPACK™ Six-Pack Platform	Dynamic Characterization	FM3	KIT-CRD-CIL12N-FMC
Evaluation Tool for the XM3 Module Platform	AC to DC, Dynamic Characterization	XM3	KIT-CRD-CIL12N-XM3
Dynamic Characterization Evaluation Tool Optimized for the 62mm (BM) Module Platform	Dynamic Characterization	BM2, BM3 (62mm)	KIT-CRD-CIL12N-BM
Dynamic Characterization Evaluation Tool Optimized for the HM High Performance 62mm (HM) Module Platform	Dynamic Characterization	HM High Performance 62 mm	KIT-CRD-CIL12N-HM
Buck-Boost Evaluation Kit for Wolfspeed 650 V SiC MOSFETs	DC to DC, Dynamic Characterization	TO-247-3, TO-247-4	KIT-CRD-3DD065P
Buck Boost Evaluation Board	DC to DC, Dynamic Characterization	TO-247-3, TO-247-4	KIT-CRD-3DD12P

*All of these Evaluation kits are designed by Wolfspeed

TO LEARN MORE, VISIT US AT **WOLFSPEED.COM/POWER**

SYSTEM SOLUTIONS

REFERENCE DESIGNS

Wolfspeed offers time-saving Reference Designs for some of the most in-demand silicon carbide devices in power systems – Inverters, power converters, chargers and many more. These Reference Designs come complete with application notes, user guides and design files to allow designers to create rugged and reliable systems with best-in-class power density, performance and efficiency.

Wolfspeed partners with experts in system integration to offer a wider selection of applications and power topologies built with the latest components. Our Partner reference Designs are developed and supported by our partners in collaboration with Wolfspeed. Hardware Design Files, System and Mechanical Design Files, Firmware are available with these reference designs.

600 kW XM3 High Performance Dual Three-Phase Inverter

Topology:
AC to DC

Package:
XM3

CRD600DA12E-XM3

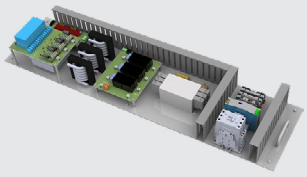
Optimized for Wolfspeed's All-SiC, Low Inductance, Conduction Optimized XM3 Power Module

Complete Stackup, including: Modules, Cooling, Bussing, Gate Drivers, Voltage / Current Sensors, and Controller

Specifications:

- DC Bus voltage: 800 V nominal, 900 V maximum
- Switching frequency: 80 kHz maximum
- DC Link capacitance: 600 µF
- Double-sided liquid cold plate
- CAN interface
- Single Bridge Operation
- 360 Arms output current
- Parallel Bridge Operation
- 720 Arms output current

25kW SiC Active Front End (AFE)



Topology:
AC to DC

Package:
FM3

CRD25AD12N-FMC

This reference design demonstrates the application of Wolfspeeds WolfPACK™ power modules to create a bidirectional high power density Active Front End (AFE) that can be applied to electric vehicle (EV) fast charging, industrial motor drives, power supplies and renewable energy applications.

Specifications:

- Three Phase input voltage between 400 and 480 VAC
- Output Voltage of 800V DC/ 900V Max
- Output Power: 25 kW with 480 VAC input and 20 kW with 400 VAC input
- Switching frequency of 100Khz
- Controller board design and firmware example
- Auxiliary Circuitry Included for Safe Operation: Pre Charge Soft Start, Contactors, Fuses and EMI/EMC Filter
- Complete Stack up Including: Modules, Heatsink, Magnetics, Power PCBs, Gate Drivers, Voltage / Current Sensors, and Controller

22kW Bi-directional High Efficiency Active Front End (AFE) Converter

Topology:
AC to DC

Package:
TO-247-4

CRD-22AD12N

This reference design demonstrates the application of Wolfspeed's 1200V C3M™ SiC MOSFETs to create a 22kW three phase bidirectional active front end (AFE) converter for electric vehicle (EV) on-board charger (OBC), off-board fast charging, and other industrial applications such as energy storage systems and three phase PFC power supplies.

Specifications:

- Switching Frequency: 45kHz
- Tooled heatsink to simulate cooling plate
- CAN interface

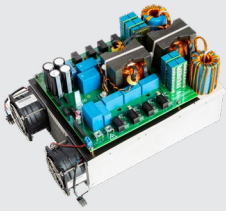
PFC Mode

- Max current: 32A
- Three Phase Input Voltage: 305Vrms → 450Vrms line-line 50/60Hz
- Output DC Voltage: 650V → 900V, Max power 22kW
- Single Phase Input Voltage: 180Vrms → 264Vrms 50/60Hz
- Output DC Voltage: 380V → 900V, Max power 6.6kW

Inverter Mode

- DC Input Voltage: 350V → 760V DC
- Max current: 20A
- AC Output Voltage: 230Vrms 50Hz single phase
- Max power: 6.6kW

22kW Bi-directional High Efficiency DC/DC Converter



Topology:
DC to DC

Package:
TO-247-4

CRD-22DD12N

The design accomplishes peak efficiencies of 98.5% in both charging and discharging mode power densities of 8kW/L. This reference design is offered as a comprehensive design package which can be used as a starting point for new SiC designs.

Specifications:

- Full bridge CLLC resonant converter operating at 135-250kHz
- Tooled heatsink to simulate cooling plate
- CAN interface

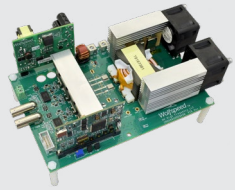
Charging Mode

- Input Voltage : 380V-900V DC
- Output Voltage : 480V-800V DC Nominal. System capable of 200V-800V DC
- At Vin=650V-900V DC , Output Power : 22kW , Output current : 36A
- At Vin=380V-900V DC , Output Power : 6.6kW , Output current : 26.4A

Discharging Mode

- Input Voltage : 300V-800V DC
- Output Voltage : 360V-750V DC Nominal
- Output Power : 6.6kW , Output current : 19A

6.6 kW High Frequency DC-DC Converter



Topology:
DC to DC

Package:
TO-247-3

CRD-06600DD065N

Specifications:

- Input Voltage: 380VDC → 420VDC
- Output Voltage 400VDC
- Max current: 16.5A
- Output Power: 6.6kW
- Switching Frequency: 500kHz – 1 MHz
- Closed loop control for regulated output
- Optional external PWM inputs for open loop testing

2.2 kW High Efficiency (80+ Titanium) Bridgeless Totem-Pole PFC with SiC MOSFET

Topology:
AC to DC

Package:
TO-247-3, TO-247-4, TO-263-7

CRD-02AD065N

Highly efficient and low cost solution of 2.2 kW bridgeless totem-pole PFC topology based on Cree's latest (C3M™) 650 V 60 mΩ SiC MOSFETs. Comfortably achieve Titanium standard by having > 98.5% efficiency while THD < 4% under all load conditions.

Specifications:

- Parameters Values Note
- Input voltage range, 47-63Hz 180-264V (rms)
- Output voltage 385V nominal +/- 5%
- Output power
- 2,200 W At 230V AC
- 1,500 W (limited by thermal) At 180V AC
- Input power factor >.98
- Input THD at full load <5% (of fundamental)
- Switching frequency 64KHz
- Efficiency at 50% load >98.5%
- Max ambient operating temperature 50 °C
- Cooling Forced air, 15x40mm Fan
- Topology Totem pole Diode as LF switch
- Power devices package TO-247-3, TO-247-4, TO-263-7

6.6 kW High Power Density Bi-Directional EV On-Board Charger

Topology:
AC to DC, DC to AC

Package:
TO-247-3

CRD-06600FF065N

This reference design is offered as a comprehensive design package which can be used as a starting point for new SiC designs.

The design accomplishes: Peak efficiencies of 96.5% and power densities of 53W/in^3 or 3KW/L.

Specifications:

- Universal single phase input voltage between 90V and 265V
- Output Voltage of 250V-450V DC
- 18A Output Current in charging mode
- Front End AC/DC PFC using CCM Totem-Pole Bi-Directional Topology operating at 67Khz
- Bi-Directional DC/DC CLLC resonant converter operating at 148-300KHz
- Constant Current, Constant Voltage or Constant Power Mode
- Unique integrated heatsink design removes heat from MOSFET's, transformer and inductors
- CAN Interface

300kW, 250kW & 200kW XM3 Three-Phase Inverter

Topology:
AC to DC, DC to DC, DC to AC

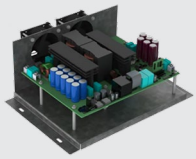
Package:
XM3

CRD200DA12E-XM3
CRD250DA12E-XM3
CRD300DA12E-XM3

Specifications:

- 800VDC bus nominal (900V max)
- 360/240/300ARMS output
- 80kHz maximum switching frequency
- 300uF DC Link Capacitance
- Liquid cooled cold plate
- CAN Interface

20 kW full bridge LLC resonant converter using 1kV SiC MOSFET



Topology:
DC to DC
Package:
TO-247-4

CRD-20DD09P-2

Specifications:

- Input Voltage: 650 – 750 VDC
- Output Voltage:300 – 550 VDC
- Switching Frequency:150-400 kHz
- Continuous Output Power: 20kW
- Pk. Efficiency:>98.4%
- Power Density: 60W Cu/in

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

Topology:
AC to DC, DC to DC
Package:
TO-263-7

CRD-15DD17P

Specifications:

- 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
- High-frequency operation of Cree'ss 1700 V, 1Ω SiC MOSFET has been demonstrated as well that helps in reducing form factor of the board significantly

6.6 kW Bi-Directional EV On-Board Charger

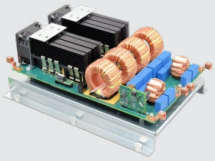
Topology:
AC to DC, DC to AC
Package:
TO-247-4

CRD-06600FF10N

Specifications:

- 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

60 kW Interleaved Boost Converter



Topology:
DC to DC
Package:
TO-247-4

CRD-60DD12N

Specifications:

- 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/in3

DELIVERING BEST-IN-CLASS TECHNOLOGY

As a vertically integrated company, Wolfspeed owns all steps in the silicon carbide production process, allowing us to push the technology forward quickly.

Wolfpseed invented the silicon carbide MOSFET, and has the world's largest install base of SiC devices. With a best-in-class failure-in-time (FIT) rate, Wolfspeed's is consistently in the single digits at 5-per-billion device hours, illustrating the industry-leading reliability and performance of the company's SiC devices.

ACCESS TO WORLD-LEADING UNPACKAGED MOSFETs AND DIODES RANGING FROM 650V TO 1700V

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