



Wolfspeed®

# POWER PRODUCTS

Transforming Power with

**INDUSTRY-LEADING SILICON CARBIDE  
EXPERTISE & CAPACITY**

# WELCOME TO WOLFSPEED

Wolfspeed is the foremost manufacturer of Silicon Carbide Bare Die Schottky Diodes and MOSFETs, Discrete Schottky Diodes and MOSFETs, 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.**

Wolfspeed 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.

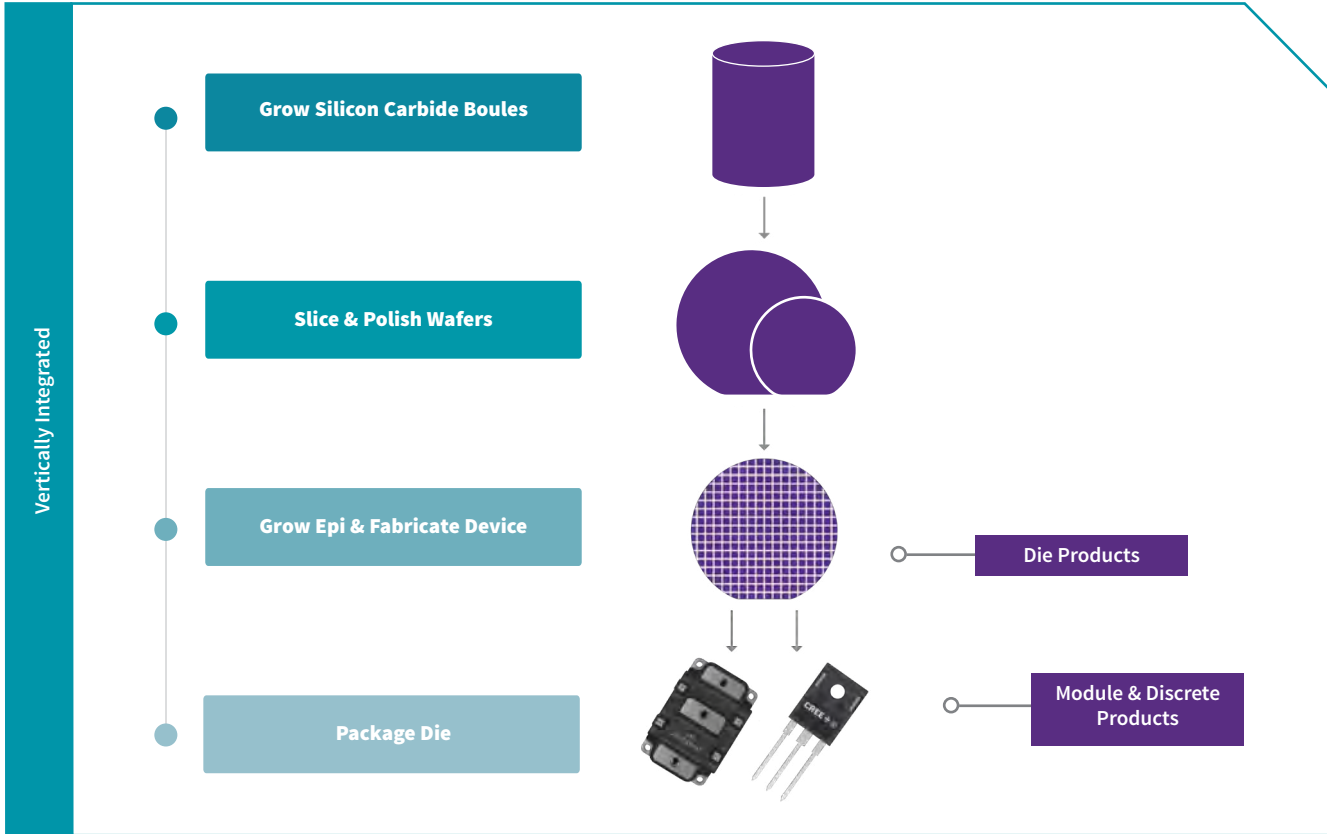
Wolfspeed was born ready, and we're outpacing the competition in every meaningful performance and cost-benefit parameter to provide RF and Power devices to any industry that needs the fastest, smallest, lightest and most efficient semiconductor products available. Which is all of them.

## **7,000,000,000,000+ HOURS IN THE FIELD. AND COUNTING.**

Silicon Carbide has powered Wolfspeed's Bare Die Schottky Diodes and MOSFETs, Discrete Schottky Diodes and MOSFETs, and Power Modules for more than seven trillion hours of end-customer usage worldwide.

**THE WORLD LEADER IN SILICON CARBIDE.**

# WOLFSPEED IS THE ONLY VERTICALLY-INTEGRATED SILICON CARBIDE MANUFACTURER



## WE UNLEASH THE POWER OF POSSIBILITIES THROUGH HARD WORK, COLLABORATION AND A PASSION FOR INNOVATION

As a vertically integrated company, Wolfspeed owns all steps in the Silicon Carbide production process, allowing us to push the technology forward quickly. Our founders pioneered Silicon Carbide and GaN solutions for both High Power and RF applications, and Wolfspeed remains the sole vertically integrated manufacturer for both industry sectors.

Wolfspeed was the first to commercialize the Silicon Carbide MOSFET and has the world's largest install base of Silicon Carbide devices. With a best-in-class failure-in-time (FIT) rate, Wolfspeed is consistently in the single digits at 5-per-billion device hours, illustrating the industry-leading reliability and performance of the company's Silicon Carbide devices.

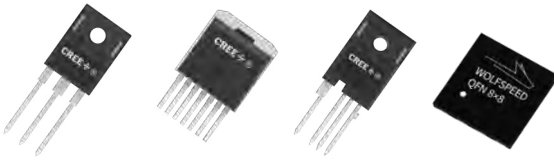
# BECAUSE WE INNOVATE AT EVERY STAGE, WE'RE ABLE TO DO THINGS OTHER COMPANIES CAN'T



Pages 5-6

## POWER BARE DIE PRODUCTS

MOSFET and Schottky diode devices in die form for customers with internal semiconductor packaging capability



Pages 7-15

## DISCRETE POWER DEVICES

Discrete devices for broad applications across automotive, industrial and energy



Pages 16-21

## POWER MODULES

Power modules for high power applications in automotive, industrial, and energy

OUR STRENGTHS

- **WORKING CLOSELY WITH CUSTOMERS**  
TO ENABLE NEW PRODUCTS WITH INCREASING ADOPTION OF SILICON CARBIDE
- **UTILIZE RAPID LEARNING CYCLES**  
TO CREATE DEVICES AND DRIVE SIGNIFICANT IMPROVEMENTS IN QUALITY AND MANUFACTURING
- **QUALITY**  
END-TO-END MANUFACTURING

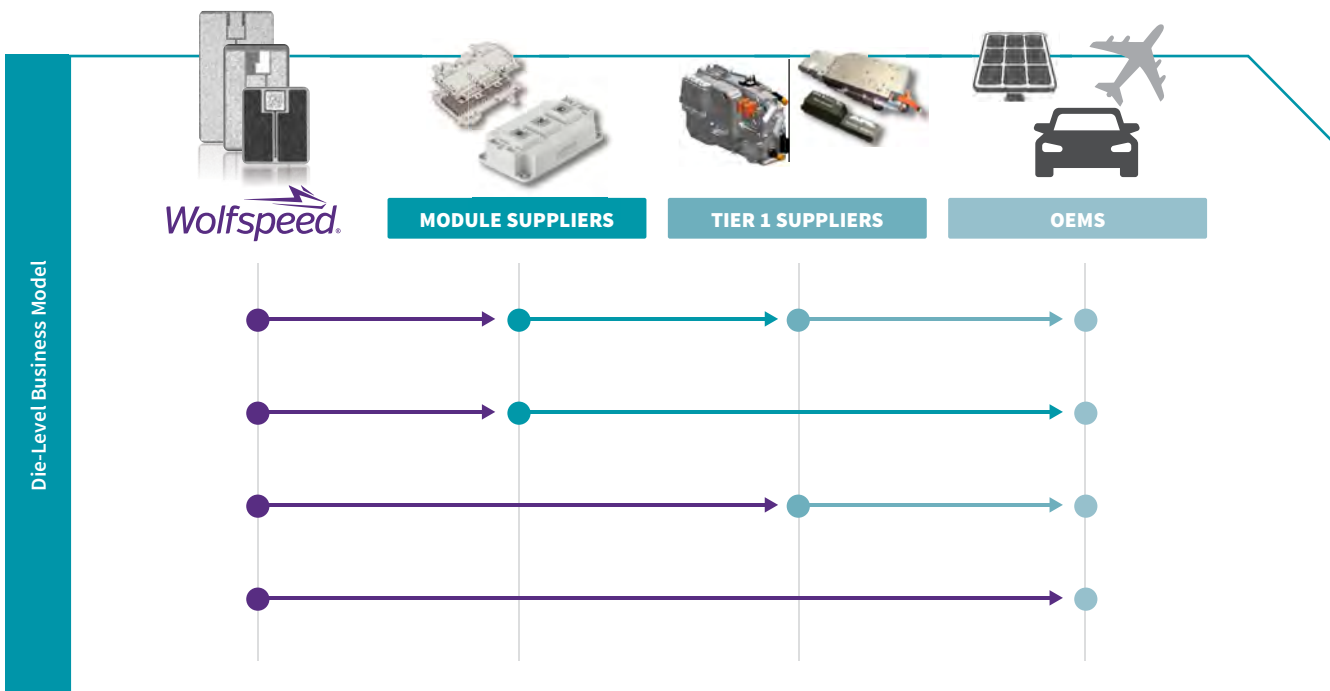


# ABOUT BARE DIE

Wolfspeed has the broadest portfolio of Silicon Carbide (SiC) Bare Die MOSFETs and Schottky diodes on the market

Wolfspeed power bare die technology enables a broad array of technology and system solutions for the market. Wolfspeed power die team is engaged with the best module vendors, tier one suppliers, and OEM providers across the globe. This close interaction allows for the

best outcome in innovation, technology and systems. Customers gain supply chain flexibility and insurance of supply that enable them to develop their systems with multiple solutions across multiple applications.



## Unleashing the Power of Possibilities™

Wolfspeed has the broadest portfolio of Silicon Carbide (SiC) Bare Die MOSFETs and Schottky diodes, with more than seven trillion field hours, lowest FIT rate, and 30+ years of experience in Silicon Carbide. Wolfspeed provides advanced design, extensive qualification, screening and parametric characterization resulting in the most reliable and robust devices on the market.

[Learn more at wolfspeed.com](http://www.wolfspeed.com)

# BARE DIE SILICON CARBIDE MOSFETs

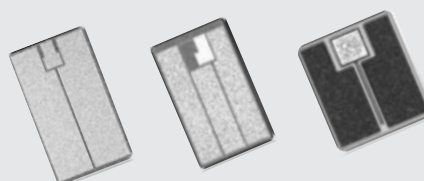
## BROAD PORTFOLIO OF SILICON CARBIDE BARE DIE MOSFETs FOR EFFICIENCY

Wolfspeed continues to lead in Silicon Carbide with our first Automotive 1200V E-Series™ line of Bare Die Silicon Carbide (SiC) MOSFETs. The portfolio is fully automotive qualified, with high blocking voltage with the industry-leading low RDS(ON) over temperature stability, enabling low conduction losses and highest figures of merit in the most demanding applications. These devices are optimized for use in high power applications such as automotive drive trains, motor drives, solid state circuit breakers, resonant topologies, and more.

Based on the latest 3rd generation technology, Wolfspeed's 1200V Bare Die SiC MOSFETs include a range of on-resistance and package options that enable designers to select the right part for their application.

The 1200V MOSFETs are designed for low RDS(ON), are easy to parallel and compatible with standard gate drive design. The efficiency gained by moving from a silicon-based solution to Silicon Carbide can help reduce system size, weight, and cooling requirements.

A range of top side and back side metallization options and die layouts provide flexibility to module designers in choice of assembly process and module layout.



### FEATURES

High blocking voltage with industry leading low RDS(on) over temperature stability

Fast intrinsic diode with low reverse recovery charge (Qrr)

High-speed switching with low output capacitance

Low conduction losses over temperature

Avalanche ruggedness



### BENEFITS

Supply Chain Flexibility

Improves System Efficiency with lower conduction losses

Enables high switching frequency operation

Improves system level power density

Reduces system size, weight, and cooling requirements



### APPLICATIONS

Drivetrain

Fast Charging

Energy Storage

Solar

Motor Drive

UPS

Aerospace

	Part Number	Blocking Voltage (V)	R <sub>DS(ON)</sub> at 25°C	Die Size (mm <sup>2</sup> )	Status
Power Die Industrial Products	CPM3-0650-0015A	650	15	18	Released
	CPM3-0650-0045A	650	45	6	Released
	CPM3-0650-0060A	650	60	5	Released
	CPM3-1200-0013A	1200	13	32	Released
	CPM3-1200-0016A	1200	16	26	Released
	CPM3-1200-0021A	1200	21	20	Released
	CPM3-1200-0032A	1200	32	15	Released
	CPM3-1200-0075A	1200	75	7	Released
	CPM3-1200-0160A	1200	160	4	Coming Soon
	CPM3-1700-R020E	1700	20	32	Released
	HPM3-3300-R050A	3300	50	37	Coming Soon

	Part Number	Blocking Voltage (V)	R <sub>DS(ON)</sub> at 25°C	Die Size (mm <sup>2</sup> )	Status
Power Die Automotive products	EPM3-0750-0010D	750	10	25	Released
	EPM3-1200-0017C	1200	17	25	Released
	EPM3-1200-0017D	1200	17	25	Released
	EPM3-1200-0017D1	1200	17	25	Released

# ABOUT DISCRETES

## Wolfspeed has the broadest portfolio of Silicon Carbide (SiC) MOSFETs and Schottky diodes

Wolfspeed has the broadest portfolio of Silicon Carbide (SiC) MOSFETs and Schottky diodes enabling power applications across automotive, renewable energy, power supply, and industrial.

Wolfspeed’s Silicon Carbide MOSFETs enable higher switching frequencies, lower conduction losses, higher blocking voltages and avalanche capability, and reduce the size of components like inductors, capacitors, filters and transformers. We established

a new benchmark for energy-efficient power switches when we commercialized the industry’s first fully-qualified Silicon Carbide MOSFET in 2011, and we have been perfecting the technology ever since.

Wolfspeed has more than seven trillion field hours, lowest FIT rate, and 30+ years of experience in Silicon Carbide. Designing with both Wolfspeed Silicon Carbide diodes and MOSFETs creates a powerful, cost-effective approach to reaching higher efficiency performance.

### WOLFSPEED DISCRETE POWER | PACKAGE GUIDE

MOSFETs	D	K	K1	J	J1	L	P
	<b>TO-247-3</b> Std. Package	<b>TO-247-4</b> Kelvin Lead	<b>TO-247-4 LP</b> Kelvin Lead Low Profile <i>coming soon</i>	<b>TO-263-7</b> Small Drain Footprint	<b>TO-263-7 XL</b> Larger Drain Footprint	<b>TOLL</b> TO-Lead Less <i>coming soon</i>	<b>TO-247-4 PLUS</b> Kelvin Lead

Schottky Diodes	A	D	D1	E	F	G	H	I	Q
	<b>TO-220-2</b> Std. Package	<b>TO-247-3</b> Dual Die	<b>TO-247-3</b> Single Die	<b>TO-252-2</b> Smaller Footprint	<b>TO-220-2</b> No Back Metal	<b>TO-263-2</b> Better Thermals	<b>TO-247-2</b> More Creepage	<b>TO-220-2</b> Isolated Metal Tab	<b>QFN 8x8</b> Smallest Footprint

### WOLFSPEED DISCRETE POWER | DEVICE NOMENCLATURE GUIDE

	C	3	M	0060	065	D
	-	-	-	----	---	--
MOSFETs	Qualification Grade	Product Series	Device Type	Typ Rdson @ 25C	Voltage Rating	Package
	C = industrial E = automotive	3 = 3 <sup>rd</sup> gen 2 = 2 <sup>nd</sup> gen ...	M = MOSFET	Ex = 0060 = 60mΩ	Ex = 065 = 650V	D = TO-247-3 K1 = TO-247-4-LP K = TO-247-4 J = TO-263-7 J1 = TO-263-7-XL L = TOLL P = TO-247-4-PLUS
	E	4	D	20	120	D
	-	-	-	----	---	--
Schottky Diodes	Qualification Grade	Product Series	Device Type	Current Rating	Voltage Rating	Package
	C = industrial E = automotive	2 = 2 <sup>nd</sup> gen 3 = 3 <sup>rd</sup> gen 4 = 4 <sup>th</sup> gen ...	D = Diode	Ex = 20 = 20A	Ex = 120 = 1200V	A = TO-220-2 D = TO-247-3 D1 = TO-247-3 E = TO-252-2 F = TO-220-2 G = TO-263-2 H = TO-247-2 I = TO-220-2 Q = QFN 8x8

# 650V SILICON CARBIDE MOSFETS

## BROADEST PORTFOLIO OF 650V SILICON CARBIDE MOSFETS FOR EFFICIENCY

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



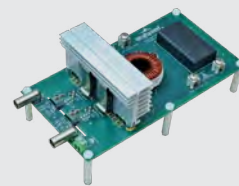
**2.2kW High Efficiency**  
(80+ Titanium) Bridgeless Totem-Pole PFC  
CRD-02AD065N



**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 Silicon Carbide MOSFETs**  
KIT-CRD-3DD065P



### FEATURES

Low  $R_{DS(ON)}$  over Temperature

Low Device Capacitances

Kelvin Source Pin

High Temperature Operation ( $T_J = 175^\circ\text{C}$ )

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 (V)	$R_{DS(ON)}$ at 25°C	Current Rating at 25°C (A)	Package
C3M0015065D	650	15 mΩ	120	TO-247-3
C3M0015065K	650	15 mΩ	120	TO-247-4
C3M0025065D	650	25 mΩ	97	TO-247-3
C3M0025065J1	650	25 mΩ	80	TO-263-7
C3M0025065K	650	25 mΩ	97	TO-247-4
C3M0045065D	650	45 mΩ	49	TO-247-3
C3M0045065J1	650	45 mΩ	47	TO-263-7
C3M0045065K	650	45 mΩ	49	TO-247-4
C3M0060065D	650	60 mΩ	29	TO-247-3
C3M0060065J	650	60 mΩ	36	TO-263-7
C3M0060065K	650	60 mΩ	37	TO-247-4
C3M0120065D	650	120 mΩ	22	TO-247-3
C3M0120065J	650	120 mΩ	21	TO-263-7
C3M0120065K	650	120 mΩ	22	TO-247-4



# 900V SILICON CARBIDE MOSFETs

## WOLFSPEED SILICON CARBIDE SOLUTIONS FOR FAST SWITCHING POWER DEVICES

Wolfspeed's 900V Silicon Carbide 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 losses 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 Silicon Carbide 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 (V)	$R_{DS(ON)}$ at 25°C	Current Rating at 25°C (A)	Package
C3M0030090K	900	30 mΩ	63	TO-247-4
C3M0065090D	900	65 mΩ	36	TO-247-3
C3M0065090J	900	65 mΩ	35	TO-263-7
C3M0120090D	900	120 mΩ	23	TO-247-3
C3M0120090J	900	120 mΩ	22	TO-263-7
E3M0120090J	900	120 mΩ	22	TO-263-7
C3M0280090D	900	280 mΩ	11.5	TO-247-3
C3M0280090J	900	280 mΩ	11.5	TO-263-7

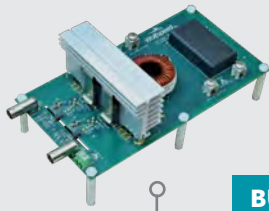
# 1000V SILICON CARBIDE MOSFETs

## WOLFSPEED SILICON CARBIDE SOLUTIONS FOR FAST SWITCHING POWER DEVICES

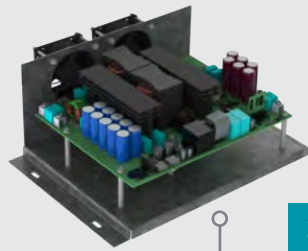
The 1000V Silicon Carbide MOSFETs address many power design challenges by providing a unique device with low on-resistance, very low output capacitance, and low source inductance for a perfect blend of low switching losses and low conduction losses.

Wolfspeed's 1000V Silicon Carbide 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 ( $Q_{rr}$ )

---

- 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

---

- Onboard electric vehicle charging

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

# 1200V SILICON CARBIDE MOSFETs

## BROADEST PORTFOLIO OF 1200V SILICON CARBIDE MOSFETs FOR EFFICIENCY

Wolfspeed's latest generation of Silicon Carbide 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

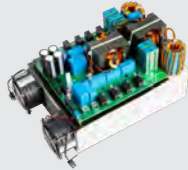
efficiency, power density and overall BOM cost versus silicon MOSFET and IGBT incumbants.

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

### FEATURED DESIGN TOOLS



**22KW HIGH EFFICIENT BI-DIRECTIONAL AFE**  
CRD-22AD12N



**22kW Bi-directional High Efficiency DC/DC Converter**  
CRD-22DD12N



**Buck-Boost Evaluation Kit for Wolfspeed 650V Silicon Carbide MOSFETs**  
KIT-CRD-3DD065P



### FEATURES

- Low  $R_{DS(ON)}$  over temperature
- Fast, rugged intrinsic Silicon Carbide body diode
- High Temperature Operation ( $T_J=175^\circ\text{C}$ )
- Very high speed switching capability
- Wide range of  $R_{DS(ON)}$
- Through-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



### APPLICATIONS

- Solar Inverters
- Battery Charging
- Energy Storage
- Switched-Mode Power Supplies
- UPS
- Motor Drive

Part Number	Blocking Voltage (V)	$R_{DS(ON)}$ at 25°C	Current Rating at 25°C (A)	Package
C3M0016120D	1200	16 mΩ	115	TO-247-3
C3M0016120K	1200	16 mΩ	115	TO-247-4
C3M0021120D	1200	21 mΩ	100	TO-247-3
C3M0021120K	1200	21 mΩ	100	TO-247-4
C3M0032120D	1200	32 mΩ	63	TO-247-3
C3M0032120J1	1200	32 mΩ	68	TO-263-7
C3M0032120K	1200	32 mΩ	63	TO-247-4
C3M0040120K	1200	40 mΩ	66	TO-247-4
C3M0040120J1	1200	40 mΩ	64	TO-263-7
C3M0075120D-A	1200	75 mΩ	30	TO-247-3
C3M0075120K-A	1200	75 mΩ	30	TO-247-4
C3M0075120J	1200	75 mΩ	30	TO-263-7
E3M0075120D	1200	75 mΩ	30	TO-247-3
E3M0075120K	1200	75 mΩ	30	TO-247-4
C3M0160120D	1200	160 mΩ	17	TO-247-3
C3M0160120J	1200	160 mΩ	17	TO-263-7
C3M0350120D	1200	350 mΩ	7.6	TO-247-3
C3M0350120J	1200	350 mΩ	7.2	TO-263-7

# 1700V SILICON CARBIDE MOSFETs

## FASTER SWITCHING, ENHANCED RELIABILITY FOR SUPERIOR POWER CONVERSION

Wolfspeed's 1700V Silicon Carbide 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 ( $Q_{rr}$ )

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

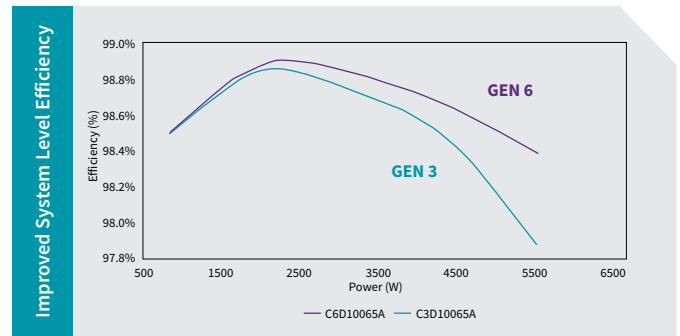
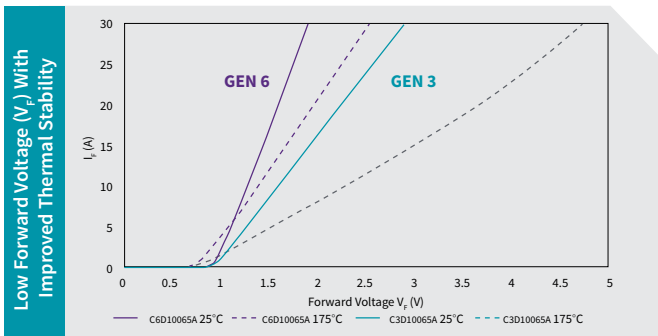
Part Number	Blocking Voltage (V)	$R_{DS(ON)}$ at 25°C	Current Rating at 25°C (A)	Package
C2M0045170D	1700	45 mΩ	72	TO-247-3
C2M0045170P	1700	45 mΩ	72	TO-247-4 Plus
C2M1000170D	1700	1000 mΩ	5	TO-247-3
C2M1000170J	1700	1000 mΩ	5.3	TO-263-7

# SILICON CARBIDE SCHOTTKY DIODES

## Wolfspeed's Latest Generation (C6D) Schottky Diodes

Wolfspeed's Silicon Carbide diode portfolio offers multiple generations to meet diverse application requirements. Wolfspeed's continually expanding 6th generation Silicon Carbide Schottky diode family offers best-in-class forward

voltage drop ( $V_F$  (25 °C) = 1.27 V &  $V_F$  (175 °C) = 1.5 V). This improvement further reduces conduction losses and boosts overall system efficiency – even in the most demanding power conversion applications.



### FEATURES

- Low  $V_F$  (25 °C) = 1.27 V & (175 °C) = 1.5 V
- Positive Temperature Co-efficient
- Zero Reverse Recovery
- Robust MPS Technology
- Low Figure of Merit ( $Q_C \times V_F$ )
- Wide range of  $T_J$  (-55°C to 175°C)



### BENEFITS

- Improved System Level Efficiency
- High Surge Current Capability
- High Frequency Operation
- Cost Effective High Power Density
- Easy Parallel Operation
- Reduced Heat Sink Requirements



### APPLICATIONS

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

Part Number	Blocking Voltage (V)	Current Rating at 25°C (A)	Package
C6D04065A	650	4	TO-220-2
C6D04065E	650	4	TO-252-2
C6D06065A	650	6	TO-220-2
C6D06065E	650	6	TO-252-2
C6D06065G	650	6	TO-263-2
C6D06065Q	650	6	QFN 8x8
C6D08065A	650	8	TO-220-2
C6D08065E	650	8	TO-252-2
C6D08065G	650	8	TO-263-2
C6D08065Q	650	8	QFN 8x8
C6D10065A	650	10	TO-220-2
C6D10065E	650	10	TO-252-2
C6D10065G	650	10	TO-263-2
C6D10065Q	650	10	QFN 8x8
C6D16065D	650	16	TO-247-3
C6D20065D	650	20	TO-247-3



# SILICON CARBIDE SCHOTTKY DIODES

WOLFSPEED'S BROAD PORTFOLIO OF SILICON CARBIDE SCHOTTKY DIODES OFFERS CUSTOMER PROVEN RELIABILITY WITH MORE THAN SEVEN TRILLION FIELD HOURS OF EXPERIENCE.

Wolfspeed Silicon Carbide diodes make efficient systems cost effective through a diverse portfolio of different power ranges and package footprints to fit all applications.

	Part Number	Blocking Voltage (V)	Current Rating (A)	Package
600V DISCRETE	CSD01060A	600	1	TO-220-2
	CSD01060E	600	1	TO-252-2
	C3D02060A	600	2	TO-220-2
	C3D02060E	600	2	TO-252-2
	C3D02060F	600	2	TO-220-F2
	C3D03060A	600	3	TO-220-2
	C3D03060E	600	3	TO-252-2
	C3D03060F	600	3	TO-220-F2
	C3D04060A	600	4	TO-220-2
	C3D04060E	600	4	TO-252-2
	C3D04060F	600	4	TO-220-F2
	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

	Part Number	Blocking Voltage (V)	Current Rating (A)	Package
650V DISCRETE	C3D02065E	650	2	TO-252-2
	C3D03065E	650	3	TO-252-2
	C3D04065A	650	4	TO-220-2
	C3D04065E	650	4	TO-252-2
	C6D04065A	650	4	TO-220-2
	C6D04065E	650	4	TO-252-2
	C3D06065A	650	6	TO-220-2
	C3D06065E	650	6	TO-252-2
	C3D06065I	650	6	TO-220 Iso
	C6D06065A	650	6	TO-220-2
	C6D06065E	650	6	TO-252-2
	C6D06065G	650	6	TO-263-2
	C6D06065Q	650	6	QFN 8x8
	C3D08065A	650	8	TO-220-2
	C3D08065E	650	8	TO-252-2
	C3D08065I	650	8	TO-220 Iso
	C6D08065A	650	8	TO-220-2
	C6D08065E	650	8	TO-252-2
	C6D08065G	650	8	TO-263-2
	C6D08065Q	650	8	QFN 8x8
	C3D10065A	650	10	TO-220-2
	C3D10065E	650	10	TO-252-2

	Part Number	Blocking Voltage (V)	Current Rating (A)	Package
650V DISCRETE	C3D10065I	650	10	TO-220 Iso
	C6D10065A	650	10	TO-220-2
	C6D10065E	650	10	TO-252-2
	C6D10065G	650	10	TO-263-2
	C6D10065Q	650	10	QFN 8x8
	C3D12065A	650	12	TO-220-2
	C3D16065A	650	16	TO-220-2
	C3D16065D	650	16	TO-247-3
	C6D16065D	650	16	TO-247-3
	C3D20065D	650	20	TO-247-3
	C3D20065D1	650	20	TO-247-3
	C6D20065D	650	20	TO-247-3
	C3D30065D	650	30	TO-247-3

	Part Number	Blocking Voltage (V)	Current Rating (A)	Package
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
	C4D30120H	1200	30	TO-247-2
	C4D40120D	1200	40	TO-247-3
	C4D40120H	1200	40	TO-247-2

	Part Number	Blocking Voltage (V)	Current Rating (A)	Package
E-SERIES	E3D08065G	650	8	TO-263-2
	E3D20065D	650	20	TO-247-3
	E3D30065D	650	30	TO-247-3
	E4D02120E	1200	2	TO-252-2
	E4D10120A	1200	10	TO-220-2
	E4D20120A	1200	20	TO-220-2
	E4D20120D	1200	20	TO-247-3
	E4D20120G	1200	20	TO-263-2

# E-SERIES™ AUTOMOTIVE SILICON CARBIDE PRODUCTS

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

Wolfspeed continues to lead in Silicon Carbide with our E-Series line of Silicon Carbide MOSFETs and Schottky Diodes. The portfolio is fully automotive qualified and PPAP capable, and are specifically designed to be robust and reliable in the harshest environments. As a result, the E-Series family 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 to use in on-board automotive charger and off-board fast charging applications, and high-voltage DC/DC converters.

### FEATURED DESIGN TOOLS



**60kW INTERLEAVED BOOST CONVERTER**  
CRD-60DD12N



**6.6kW HIGH POWER DENSITY BI-DIRECTIONAL EV ON-BOARD CHARGER**  
CRD-06600FF065N



### 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 ( $Q_{rr}$ )

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

Off-Board Fast Charging

On-Board EV Charging

Drivetrain traction inverters

High voltage DC/DC converters

Part Number	Blocking Voltage (V)	Current Rating at 25°C (A)	Package
E3D08065G	650	8	TO-263-2
E3D20065D	650	20	TO-247-3
E3D30065D	650	30	TO-247-3
E4D02120E	1200	2	TO-252-2
E4D10120A	1200	10	TO-220-2
E4D20120A	1200	20	TO-220-2
E4D20120D	1200	20	TO-247-3
E4D20120G	1200	20	TO-263-2

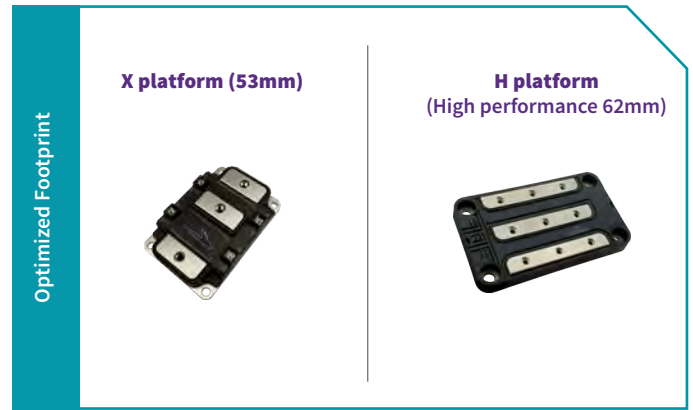
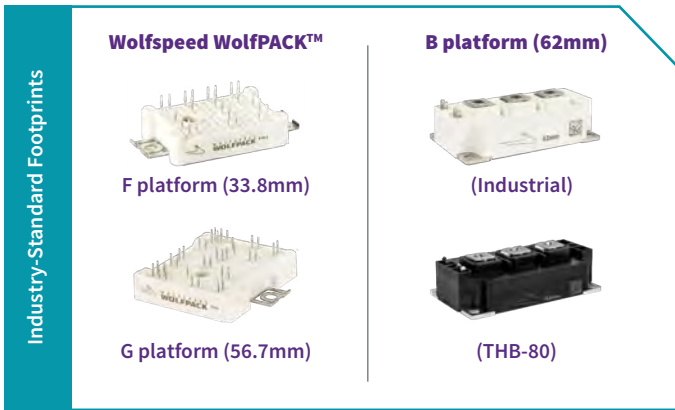
Part Number	Blocking Voltage (V)	$R_{DS(ON)}$ at 25°C	Current Rating at 25°C (A)	Package
E3M0120090J	900	120mΩ	22	TO-263-7
E3M0075120D	1200	75mΩ	32	TO-247-3
E3M0075120K	1200	75mΩ	32	TO-247-4

# 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 Silicon Carbide material to packaging) enables us to provide leading Silicon Carbide 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 Silicon Carbide 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 Silicon Carbide and provide a straight-forward drop-in replacement at the package level for customers using these platforms with either Si or Silicon Carbide devices.

## OPTIMIZED FOOTPRINTS

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

## MODULE GATE DRIVER BOARDS

CGD1200HBP-BM2  
CGD1200HBP-BM3



CGD12HBXMP



	SKU	Package	Designed By	Working Voltage	Gate Driver	Output Channels
COMPANION GATE DRIVERS	CGD1200HB2P-BM2	B Platform	Wolfspeed	1000V	Analog Devices AduM4135	2
	CGD1200HB2P-BM3	B Platform	Wolfspeed	1000V	Analog Devices AduM4135	2
	CGD1700HB2M-UNA	F Platform, G Platform	Wolfspeed	1200V	Texas Instruments UCC21710	2
	EVAL-ADUM4146WHB1Z	F Platform, G Platform	Partner	1200V	Analog Devices AduM4146	2
	Si823H-AxWA-KIT	F Platform, G Platform	Partner	1200V	Silicon Labs Si823Hx	2
	CGD15HB62LP	H Platform	Wolfspeed	1500V	IXDD614YY	2
	CGD1700HB3P-HM3	H Platform	Wolfspeed	1500V	IXDD614YY	2
	CGD12HBXMP	X Platform	Wolfspeed	1000V	Analog Devices AduM4135	2

# WOLFSPEED MODULES

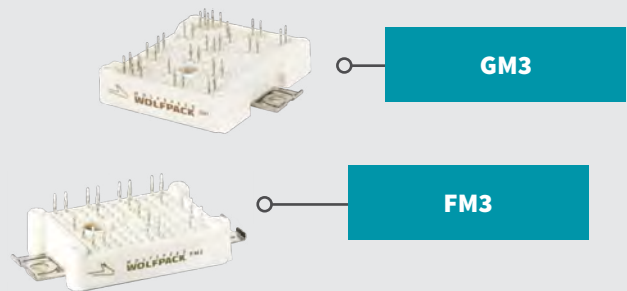
	Part Number	Blocking Voltage (V)	Nominal Current (A)	$R_{DS(ON)}$ (m $\Omega$ ) at 25°C	Description
G PLATFORM std. 56.7mm	CAB006A12GM3	1200	200	6	Half-Bridge, AlN Substrate
	CAB006M12GM3	1200	200	6	Half-Bridge, Al <sub>2</sub> O <sub>3</sub> Substrate
	CAB008A12GM3	1200	194	8	Half-Bridge, AlN Substrate
	CAB008M12GM3	1200	146	8	Half-Bridge, Al <sub>2</sub> O <sub>3</sub> Substrate
F PLATFORM std. 33.8mm	CAB011M12FM3	1200	105	11	Half-Bridge, Al <sub>2</sub> O <sub>3</sub> Substrate
	CAB016M12FM3	1200	78	16	Half-Bridge, Al <sub>2</sub> O <sub>3</sub> Substrate
	CCB021M12FM3	1200	51	21	Six-Pack, Al <sub>2</sub> O <sub>3</sub> Substrate
	CCB032M12FM3	1200	40	32	Six-Pack, Al <sub>2</sub> O <sub>3</sub> Substrate
B PLATFORM standard 62mm	CAB530M12BM3	1200	530	2.7	Half-Bridge, C3M MOSFETs
	CAS530M12BM3*	1200	530	2.7	Half-Bridge, C2M MOSFETs + Schottky Diodes
	WAS530M12BM3*	1200	530	2.7	Half-Bridge, THB-80 Qualified, C3M MOSFETs + Schottky Diodes
	WAB400M12BM3	1200	400	3.7	Half-Bridge, THB-80 Qualified, C3M Conduction-Optimized MOSFETs
	CAS350M12BM3*	1200	350	4	Half-Bridge, C3M MOSFETs + Schottky Diodes
	WAS350M12BM3*	1200	350	4	Half-Bridge, THB-80 Qualified, C3M MOSFETs + Schottky Diodes
	WAB300M12BM3	1200	300	4.5	Half-Bridge, THB-80 Qualified, C3M Switching-Optimized MOSFETs
	CAS300M12BM2	1200	300	5	Half-Bridge, C2M MOSFETs + Schottky Diodes
	CAS175M12BM3*	1200	175	8	Half-Bridge, C3M MOSFETs + Schottky Diodes
	WAS175M12BM3*	1200	175	8	Half-Bridge, THB-80 Qualified, C3M MOSFETs + Schottky Diodes
	CAS110M12BM2	1200	110	12.5	Half-Bridge, C2M MOSFETs + Schottky Diodes
	CAS120M12BM2	1200	120	13	Half-Bridge, C2M MOSFETs + Schottky Diodes
	CAS310M17BM3*	1700	310	5	Half-Bridge, C3M MOSFETs + Schottky Diodes
	WAS310M17BM3*	1700	310	5	Half-Bridge, THB-80 Qualified, C3M MOSFETs + Schottky Diodes
	CAS300M17BM2	1700	300	8	Half-Bridge, C2M MOSFETs + Schottky Diodes
	X PLATFORM optimized 53mm	CAB450M12XM3	1200	450	2.6
EAB450M12XM3*		1200	450	2.6	Automotive grade, Half-Bridge, C3M Conduction-Optimized MOSFETs
CAB425M12XM3		1200	425	3.2	Half-Bridge, C3M Switching-Optimized MOSFETs
CAB400M12XM3		1200	400	4	Half-Bridge, C3M Switching-Optimized MOSFETs
CAB320M17XM3*		1700	320	4	Half-Bridge, C3M MOSFETs
H PLATFORM optimized 62mm	CAR600M12HN6*	1200	600	N/A	Half-Bridge Rectifier, Gen 6 Schottky Diodes
	CAB760M12HM3	1200	765	1.33	Half-Bridge, C3M Switching-Optimized MOSFETs
	CAS480M12HM3	1200	480	2.29	Half-Bridge, C3M Switching-Optimized MOSFETs + Schottky Diodes
	CAB650M17HM3*	1700	650	1.67	Half-Bridge, C3M MOSFETs
	CAS380M17HM3*	1700	380	3.3	Half-Bridge, C3M MOSFETs + Schottky Diodes
	CAB500M17HM3*	1700	500	2.5	Half-Bridge, C3M MOSFETs
	CAR600M17HN6*	1700	600	N/A	Half-Bridge Rectifier, Gen 6 Schottky Diodes

\*Coming Soon

# Wolfspeed WolfPACK™ F & G MODULE PLATFORMS

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

Wolfspeed WolfPACK™ Silicon Carbide Power Modules enable multiple configurations across power levels in multiple applications. The new GM3 Aluminum Nitride Substrate dramatically reduces thermal resistance, lowers junction temperature for given loss, enhances power cycling lifetime for given losses, and enables higher utilization of Silicon Carbide performance.



**Module Size:**

F platform | 62.8 mm x 33.8 mm  
G platform | 62.8 mm x 56.7 mm

**Topology:**

F platform | six-pack / half-bridge  
G platform | half-bridge



## 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

High performance Aluminum Nitride (AlN) substrate



## BENEFITS

Maximum power density in class

Ease of layout and assembly

System scalability and reliability

End to end support - simulation through reference hardware

Simpler cooling systems and smaller systems



## APPLICATIONS

EV Fast Charging

UPS

Induction Heating and Welding

Industrial Motor Drives

Industrial Power Supply

Solar

Wind Energy

Renewable Energy Storage

	Part Number	Blocking Voltage (V)	Nominal Current (A)	R <sub>DS(ON)</sub> (mΩ) at 25°C	Description
<b>G PLATFORM</b> standard 56.7mm	CAB006A12GM3	1200	200	6	Half-Bridge, AlN Substrate
	CAB006M12GM3	1200	200	6	Half-Bridge, Al <sub>2</sub> O <sub>3</sub> Substrate
	CAB008A12GM3	1200	194	8	Half-Bridge, AlN Substrate
	CAB008M12GM3	1200	146	8	Half-Bridge, Al <sub>2</sub> O <sub>3</sub> Substrate
<b>F PLATFORM</b> standard 33.8mm	CAB011M12FM3	1200	105	11	Half-Bridge, Al <sub>2</sub> O <sub>3</sub> Substrate
	CAB016M12FM3	1200	78	16	Half-Bridge, Al <sub>2</sub> O <sub>3</sub> Substrate
	CCB021M12FM3	1200	51	21	Six-Pack, Al <sub>2</sub> O <sub>3</sub> Substrate
	CCB032M12FM3	1200	40	32	Six-Pack, Al <sub>2</sub> O <sub>3</sub> Substrate



# B MODULE PLATFORM

## WOLFSPEED'S 62MM HALF-BRIDGE SILICON CARBIDE POWER MODULES SUPPORT **RAPID SYSTEM DEVELOPMENT**

Wolfspeed's 62mm power module platform provides the system benefits of Silicon Carbide while maintaining the robust, industry-standard 62 mm module package. The internal design of Wolfspeed's 62mm BM package enables high speed Silicon Carbide switching benefits, due to the low-inductance layout. Choose from silicon nitride ceramic for sustained maximum junction temperature operation, or aluminum nitride ceramic for reduced thermal resistance with robust CTE matching. Wolfspeed power modules are backed by industry leading Silicon Carbide technology and a broad portfolio of current and voltage ratings available to fit diverse industrial application requirements.

**MODULE SIZE:**  
106 x 62 x 30 (mm)

**TOPOLOGY:**  
Half-Bridge

**SUPPORTING GATE DRIVER:**  
CGD1200HB2P-BM2 for all BM2 modules  
CGD1200HB2P-BM3 for all BM3 modules

**SUPPORTING EVALUATION KIT:**  
KIT-CRD-CIL12N-BM



### FEATURES

Copper Baseplate, Silicon Nitride and Aluminum Nitride Ceramics

Low Inductance Design (10 – 11nH)



### BENEFITS

Improved Thermal Conductivity

Faster time to Market

Reduced Cooling & System Costs

Low Power Losses & Maximum Voltage Utilization



### APPLICATIONS

Railway Technology

Fast Charging

On-Board Charging

Industrial Automation & Testing

Renewable Energy

	Part Number	Blocking Voltage (V)	Nominal Current (A)	R <sub>DS(ON)</sub> (mΩ) at 25°C	Description
<b>B PLATFORM</b> standard 62mm	CAB530M12BM3	1200	530	2.7	Half-Bridge, C3M MOSFETs
	CAS530M12BM3*	1200	530	2.7	Half-Bridge, C3M MOSFETs + Schottky Diodes
	WAS530M12BM3*	1200	530	2.7	Half-Bridge, THB-80 Qualified, C3M MOSFETs + Schottky Diodes
	WAB400M12BM3	1200	400	3.7	Half-Bridge, THB-80 Qualified, C3M Conduction-Optimized MOSFETs
	CAS350M12BM3*	1200	350	4	Half-Bridge, C3M MOSFETs + Schottky Diodes
	WAS350M12BM3*	1200	350	4	Half-Bridge, THB-80 Qualified, C3M MOSFETs + Schottky Diodes
	WAB300M12BM3	1200	300	4.5	Half-Bridge, THB-80 Qualified, C3M Switching-Optimized MOSFETs
	CAS300M12BM2	1200	300	5	Half-Bridge, C2M MOSFETs + Schottky Diodes
	CAS175M12BM3*	1200	175	8	Half-Bridge, C3M MOSFETs + Schottky Diodes
	WAS175M12BM3*	1200	175	8	Half-Bridge, THB-80 Qualified, C3M MOSFETs + Schottky Diodes
	CAS110M12BM2	1200	110	12.5	Half-Bridge, C2M MOSFETs + Schottky Diodes
	CAS120M12BM2	1200	120	13	Half-Bridge, C2M MOSFETs + Schottky Diodes
	CAS310M17BM3*	1700	310	5	Half-Bridge, C3M MOSFETs + Schottky Diodes
	WAS310M17BM3*	1700	310	5	Half-Bridge, THB-80 Qualified, C3M MOSFETs + Schottky Diodes
	CAS300M17BM2	1700	300	8	Half-Bridge, C2M MOSFETs + Schottky Diodes

\*Coming Soon

# X MODULE PLATFORM

ENABLER TO **MAXIMIZE POWER DENSITY WHILE MINIMIZING LOOP** INDUCTANCE AND SIMPLIFY POWER BUSSING

Wolfspeed has developed the XM3 power module platform to maximize the benefits of Silicon Carbide while keeping the module and system design robust, simple, and cost effective. With half the weight and volume of a standard 62 mm module, the XM3 power module maximizes power density while minimizing loop inductance and enabling simple power bussing. The XM3's Silicon Carbide optimized packaging enables 175°C continuous junction operation with a high reliability silicon nitride (Si3N4) power substrate to ensure mechanical robustness under extreme conditions.

**SUPPORTING GATE DRIVER:**

CGD12HBXMP

**SUPPORTING EVALUATION KIT:**

KIT-CRD-CIL12N-XM3

**SUPPORTING REFERENCE DESIGNS:**

CRD\*\*\*DA12E-XM3

\*\*\*=200, 250, 300, 600

**MODULE SIZE:**

80 x 53 x 19 (mm)

**TOPOLOGY:**

Half-Bridge



## FEATURES

50% smaller/lighter than standard 62mm footprint

Conduction Loss / Switching Loss optimized versions

Allow for simple and low-inductance busbar interconnection

High reliability power substrate to address demanding markets



## BENEFITS

Lightweight, Compact Form Factor with 62mm Compatible Baseplate Enables System Retrofit

Increased System Efficiency, due to Low Switching & Conduction Losses of Silicon Carbide

High Reliability, Robust Material Selection



## APPLICATIONS

Servo & Industrial Drives

UPS

EV Fast Charging

EV On-Board Charging

Industrial Automation & Testing

Power Supplies

	Part Number	Blocking Voltage (V)	Nominal Current (A)	$R_{DS(ON)}$ (mΩ) at 25°C	Description
<b>X PLATFORM</b> standard 52mm	CAB450M12XM3	1200	450	2.6	Half-Bridge, C3M Conduction-Optimized MOSFETs
	EAB450M12XM3*	1200	450	2.6	Automotive grade, Half-Bridge, C3M Conduction-Optimized MOSFETs
	CAB425M12XM3	1200	425	3.2	Half-Bridge, C3M Switching-Optimized MOSFETs
	CAB400M12XM3	1200	400	4	Half-Bridge, C3M Switching-Optimized MOSFETs
	CAB320M17XM3*	1700	320	4	Half-Bridge, C3M MOSFETs

\*Coming Soon

# H MODULE PLATFORM

THE BEST-IN-CLASS 62MM SILICON CARBIDE MODULES AT WOLFSPEED'S **HIGHEST POWER DENSITY, LOWEST INDUCTANCE IN A LIGHTWEIGHT & COMPACT PACKAGE DESIGN**

Wolfspeed has developed the HM power module platform to provide the benefits of Silicon Carbide in power density sensitive applications while maintaining the baseplate compatibility of a 62mm module. The HM platform's Silicon Carbide optimized packaging enables

175°C continuous junction operation with a high-reliability Silicon Nitride ( $\text{Si}_3\text{N}_4$ ) power substrate to ensure mechanical robustness under extreme conditions and a lightweight AlSiC baseplate.

**SUPPORTING GATE DRIVER:**

CGD1700HB3P-HM3

**SUPPORTING EVALUATION KIT:**

KIT-CRD-CIL12N-HM  
coming soon

**MODULE SIZE:**

110 mm x 65 mm x 12.2 mm

**TOPOLOGY:**

Half-Bridge



## FEATURES

Low Inductance, Low Profile 62mm Footprint

High Junction Temperature (175 °C) Operation

Light Weight AlSiC Baseplate

High Reliability Silicon Nitride Insulator



## BENEFITS

Lightweight, Compact Form Factor with 62mm Compatible Baseplate Enables System Retrofit

Increased System Efficiency, due to Low Switching & Conduction Losses of Silicon Carbide

High Reliability Material Selection



## APPLICATIONS

Railway Technology

Solar

EV Fast Charging

On-Board Charging

Industrial Automation & Testing

Medical power

	Part Number	Blocking Voltage (V)	Nominal Current (A)	$R_{DS(ON)}$ (mΩ) at 25°C	Description
<b>H PLATFORM</b> optimized 62mm	CAR600M12HN6*	1200	600	N/A	Half-Bridge Rectifier, Gen 6 Schottky Diodes
	CAB760M12HM3	1200	765	1.33	Half-Bridge, C3M Switching-Optimized MOSFETs
	CAS480M12HM3	1200	480	2.29	Half-Bridge, C3M Switching-Optimized MOSFETs + Schottky Diodes
	CAB650M17HM3*	1700	650	1.67	Half-Bridge, C3M MOSFETs
	CAS380M17HM3*	1700	380	3.3	Half-Bridge, C3M MOSFETs + Schottky Diodes
	CAB500M17HM3*	1700	500	2.5	Half-Bridge, C3M MOSFETs
	CAR600M17HN6*	1700	600	N/A	Half-Bridge Rectifier, Gen 6 Schottky Diodes

\*Coming Soon

# DESIGN TOOLS

## START MODELING FOR YOUR DESIGN WITH SpeedFIT™

### WELCOME TO SpeedFit 2.0

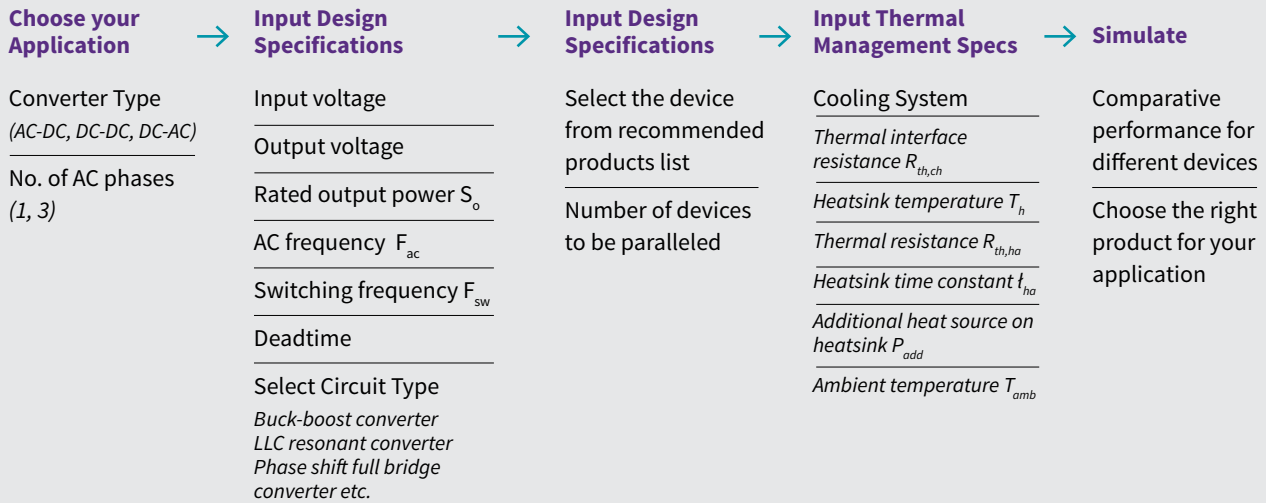
Welcome to SpeedFit 2.0, the industry's most comprehensive system-level circuit simulator for Silicon Carbide power applications.

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



EXPLORE SPEEDFIT 2.0 AT [WOLFSPEED.COM/SPEEDFIT](https://www.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
Buck-Boost Evaluation Kit for Wolfspeed 650 V Silicon Carbide 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
Evaluation Board For Paralleling 1200V C3M Silicon Carbide MOSFETs in a 7-pin, (TO-263 Package)	DC to DC, Dynamic Characterization	TO-263-7	KIT-CRD-HB12N-J1
Evaluation Board for 650V Silicon Carbide C3M MOSFET in a 7-pin D2PAK (TO-263-7L)	Dynamic Characterization	TO-263-7	KIT-CRD-8FF65P
Evaluation Board for 900V Silicon Carbide 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 62mm (BM) Module Platform	Dynamic Characterization	B platform	KIT-CRD-CIL12N-BM
Dynamic Characterization Evaluation Tool Optimized for the Wolfspeed WolfPACK Half Bridge Module Platform	Dynamic Characterization	F platform	KIT-CRD-CIL12N-FMA
Dynamic Characterization Evaluation Tool Optimized for the Wolfspeed WolfPACK, Six-Pack Platform	Dynamic Characterization	F platform	KIT-CRD-CIL12N-FMC
Dynamic Characterization Evaluation Tool Optimized for the Wolfspeed WolfPACK GM3 Half Bridge Module Platform	Dynamic Characterization	G platform	KIT-CRD-CIL12N-GMA
Dynamic Characterization Evaluation Tool Optimized for the HM High Performance 62mm (HM) Module Platform	Dynamic Characterization	H platform	KIT-CRD-CIL12N-HM / KIT-CRD-CIL17N-HM (coming soon)
Evaluation Tool for the XM3 Module Platform	AC to DC, Dynamic Characterization	X platform	KIT-CRD-CIL12N-XM3

\*All of these Evaluation kits are designed by Wolfspeed

TO LEARN MORE, VISIT US AT [WOLFSPEED.COM/POWER](https://www.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, and Firmware are available with these reference designs.

## 600 kW High Performance Dual Three-Phase Inverter



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

**Package:**  
X Platform

**CRD600DA12E-XM3**

- Specifications:**
- DC Bus voltage: 800V nominal, 900V maximum
  - Switching frequency: 80 kHz maximum
  - DC Link capacitance: 600  $\mu$ F
  - Double-sided liquid cold plate
  - CAN interface
  - Single Bridge Operation- 360 A<sub>rms</sub> output current
  - Parallel Bridge Operation -720 A<sub>rms</sub> output current

Optimized for Wolfspeed's all Silicon Carbide, Low Inductance, Conduction Optimized XM3 Power Module. Complete Stackup, including: Modules, Cooling, Bussing, Gate Drivers, Voltage / Current Sensors, and Controller.

## 25kW Silicon Carbide Active Front End (AFE)



**Topology:**  
AC to DC

**Package:**  
F Platform

**CRD25AD12N-FMC**

- 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

This reference design demonstrates the application of Wolfspeed's 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.

## 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™ Silicon Carbide 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

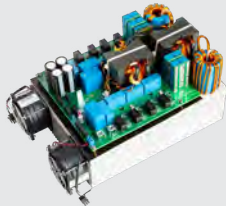
#### PFC Mode

- 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 Silicon Carbide 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 (80Plus Titanium™) Bridgeless Totem-Pole PFC with Silicon Carbide MOSFET



CRD-02AD065N

Highly efficient and low cost solution of 2.2 kW bridgeless totem-pole PFC topology based on Wolfspeed's latest (C3M™) 650V 60 mΩ Silicon Carbide 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 Silicon Carbide designs.

The design accomplishes: Peak efficiencies of 96.5% and power densities of 53W/in<sup>3</sup> 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 MOSFETs, transformer and inductors
- CAN Interface

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



### Topology:

AC to DC, DC to AC

### Package:

X Platform

CRD200DA12E-XM3

CRD250DA12E-XM3

CRD300DA12E-XM3

### Specifications:

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

## 20 kW Full Bridge LLC Resonant Converter Using 1kV Silicon Carbide 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 Wolfspeed's 1700V, 1 $\Omega$  Silicon Carbide MOSFET with an availability of high blocking voltage and high creepage distance (~7mm)
- Wolfspeed'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 Wolfspeed's 1700V, 1 $\Omega$  Silicon Carbide MOSFET 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 1000V, 65 m $\Omega$  C3M Silicon Carbide 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
- Wolfspeed'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 1200V, 75 m $\Omega$  C3M Silicon Carbide MOSFET and its 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 Wolfspeed's C3M™ CGD15SG00D2 isolated Gate Driver Board
- Wolfspeed'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<sup>3</sup>