POWER PRODUCTS
Transforming Power with
INDUSTRY-LEADING SILICON CARBIDE EXPERTISE & CAPACITY
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.

Our parent company, 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.
Wolfspeed extends its leadership in silicon carbide by introducing the E-Series line of SiC MOSFETs, the industry’s first automotive qualified, PPAP capable and humidity resistant MOSFET. It features Wolfspeed’s 3rd generation rugged technology, offering the industry’s lowest switching losses and highest figure of merit. The E-Series MOSFET is optimized for use in EV battery chargers and high voltage DC/DC converters and is featured in Wolfspeed’s 6.6kW Bi-Directional On-Board Charger reference design.

**FEATURES**
- Automotive qualified (AEC-Q101) and PPAP capable
- Low R\(_{\text{DS(on)}}\) over temperature
- Fast intrinsic diode with low reverse recovery (Q\(_r\))
- High breakdown voltage across entire operating temperature range

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

**FEATURED DESIGN TOOLS**
- 6.6kW HIGH FREQUENCY DC-DC CONVERTER
- CRD-06600DD065N

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**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**
- 6.6kW High Frequency DC-DC Converter
  - CRD-06600DD065N
- 2.2kW High Efficiency (88% Titanium) Bridgeless Totem-Pole PFC with SiC MOSFET
  - CRD-02AD065N
- Buck-Boost Evaluation Kit for Wolfspeed 650V SiC MOSFET
  - KIT-CRD-3DD065P
- 6.6kW High Power Density Bi-Directional EV On-Board Charger
  - CRD-06600FT065N

**FEATURES**
- Low R\(_{\text{DS(on)}}\) over Temperature
- Low Device Capacitances
- Kelvin Source Pin
- High Temperature Operation (T\(_J\) = 175°C)
- Fast Diode with ultra low reverse recovery

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

**SYSTEM SPECS**

<table>
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<tr>
<th>Part Number</th>
<th>Blocking Voltage</th>
<th>R(_{\text{DS(on)}}) at 25°C</th>
<th>Current Rating at 25°C</th>
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**FEATURES**
- Automotive qualified (AEC-Q101) and PPAP capable
- Low R\(_{\text{DS(on)}}\) over temperature
- Fast intrinsic diode with low reverse recovery (Q\(_r\))
- High breakdown voltage across entire operating temperature range

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

**FEATURED DESIGN TOOLS**
- 6.6kW BI-DIRECTIONAL EV ON-BOARD CHARGER
- CRD-06600FF10N
**900V SILICON CARBIDE MOSFETs**

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 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.

**FEATURES**
- Low R\(_{\text{DS(ON)}}\) over Temperature
- Low-impedance package
- Fast intrinsic diode with low reverse recovery (Q\(_{\text{rr}}\))
- 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

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**1000V SILICON CARBIDE MOSFETs**

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.

**FEATURES**
- Low R\(_{\text{DS(ON)}}\) over Temperature
- High-speed switching with low output capacitance
- Fast intrinsic diode with low reverse recovery (Q\(_{\text{rr}}\))
- 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
- Fast electric vehicle charging systems
- Onboard electric vehicle charging systems

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**FEATURED DESIGN TOOLS**

- **20kW FULL BRIDGE LLC RESONANT CONVERTER**
  - CRD-20DD09P-2
- **BUCK-BOOST EVALUATION BOARD**
  - KIT-CRD-3DD12P

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**SYSTEM SPECS**

**FEATURED DESIGN TOOLS**

- **20kW FULL BRIDGE LLC RESONANT CONVERTER**
  - CRD-20DD09P-2
- **BUCK-BOOST EVALUATION BOARD**
  - KIT-CRD-3DD12P
**1200V SILICON CARBIDE MOSFETs**

**FEATURES**
- Low R\(_{\text{DS(on)}}\) over Temperature
- Low-impedance package with driver source
- Rugged body diode (no need for external diode)
- High Temperature Operation (T\(_J\) = 175°C)

**BENEFITS**
- Improves system efficiency with lower conduction losses
- Enables high switching frequency operation
- Extremely fast switching
- Reduction of heat-sink requirements

**APPLICATIONS**
- Solar inverters and energy storage
- Onboard and fast DC EV-Charging Systems
- Motor control and drives
- Welding and inductive heating
- Auxiliary power supplies
- High-voltage DC/DC converters

**SYSTEM SPECS**

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Based on 3rd generation technology, the wide variety of on-resistances and package options enables designers to select the right part for their applications.

Pairing Wolfspeed’s 1200V SiC diodes with SiC MOSFETs creates a powerful combination of higher efficiency for demanding applications.

**Buck-Boost Evaluation Kit CRD-3DD12P**

**60kW Interleaved Boost Converter CRD-60DD12N**

Wolfspeed’s family of 1200V SiC MOSFETs are optimized for use in high power applications such as UPS, motor control and drives, switched-mode power supplies, solar and energy storage systems, electric vehicle charging, high-voltage DC/DC converters, and more.
**1700V SILICON CARBIDE MOSFETs**

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**

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</table>

**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

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**SiC SCHOTTKY DIODES**

Wolfspeed’s 6th generation SiC Schottky diode family offers the lowest forward voltage drop (VF = 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.

**FEATURES**

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

**APPLICATIONS**

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

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**FEATURES**

- Low \( V_F \) with improved thermal stability
- Improved system level efficiency

**APPLICATIONS**

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**FEATURES**

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

**APPLICATIONS**

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

### 600V & 650V DISCRETE

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**E-SERIES DIODE FAMILY**

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 is ideal for on-board and off-board automotive charger applications and solar power inversion.

### FEATURES

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

### BENEFITS

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

### SYSTEM SPECS

- **6.6KW HIGH FREQUENCY DC-DC CONVERTER**
  - CRD-06600D065N

- **60KW INTERLEAVED BOOST CONVERTER**
  - CRD-600D12N

### DESIGN TOOLS

- 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 is ideal for on-board and off-board automotive charger applications and solar power inversion.
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.

**FEATURE 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.

### Part Number Status Blocking

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*Current at Tj = 125°C – metrics imply estimated performance above.
**BM (62MM) MODULE PLATFORM**

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

**PLATFORM BENEFITS:**
- Industry-Standard 62mm Footprint
- Fast Time-to-Market with Existing 62mm Compatible Designs
- Second and Third Generation MOSFET Technology Available
- Low Inductance (10-15 nH) Design
- Industry-Standard (“C”) & THB-80 (HV-H3TRB) High Humidity (“W”) Qualified Variants

**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 Applications - Solar, Wind

**SUPPORTING GATE DRIVER:** CGD1200HB2P-BM2, -BM3
**SUPPORTING EVALUATION KIT:** KIT-CRD-CIL12N-BM

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**XM3 (53MM) MODULE PLATFORM**

**WOLFSPEED’S XM3 HALFW-BRIDGE SiC MODULES ARE DESIGNED FOR POWER DENSITY**

**PLATFORM BENEFITS:**
- High Power Density Footprint
- High Temperature (175 °C) Operation
- Low Inductance (6.7 nH) Design
- Implements Third Generation MOSFET Technology (Frequency and Conduction Optimized Configurations Available)
- 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

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**RMS AMPACITY SHOWN WITH NOTIONAL THERMAL MANAGEMENT SYSTEM CAPABLE OF MAINTAIN MODULE WITHIN SOA.**

**Data Collected from Hard-Switching Inverter Applications**

\[ V_{DS} = 800V, T_C = 90^\circ C, R_{g(ext)} = 0.0 \, \Omega, \, MF = 1 \]
MODULE SUPPORTING TOOLS

COMPANION GATE DRIVERS

- Replaceable, Easy-Access Turn-On and Turn-Off Gate Resistors for Switching Loss Optimization
- On-Board Overcurrent, Shoot-Through Prevention and Reverse Polarity Protection with LEDs for Instant Feedback
- Very Low Isolation Capacitance (<5 pF) and 100 kV/µs Common-Mode Transient Immunity (CMTI)
- Design Documentation Available for Download on Website
- CGD1200HBP-BM2 for Gen2 62mm (BM2) Modules
- CGD1200HBP-BM3 for Gen3 62mm (BM3) Modules
- CGD12HBXMP for XM3 Modules
- All Drivers Listed use Differential Inputs for Increased Noise Immunity, CGD12HB00D is Available Separately to enable Single-Ended Testing

KIT-CRD-CIL12N DYNAMIC EVALUATION KITS

- Evaluate and Optimize the Switching Performance of the Wolfspeed SiC Module Platforms
- Compatible with 350 MHz Current Shunt
- Includes Bulk and High-Frequency Film Capacitors with Low Stray Inductance
- Configurable Connections to Evaluate Both Low- and High-Side Switching
- Documentation Available for Download on Website: Schematic, Bill of Materials, Board Layout and Application Note
- KIT-CRD-CIL12N-BM: Compatible with 62mm (BM) Platform
- KIT-CRD-CIL12N-XM3: Compatible with XM3 Platform

XM3 INVERTER REFERENCE DESIGN KITS

- Demonstrates Best-in-Class System-Level Power Density and Efficiency Obtained by Using Wolfspeed’s New XM3 Power Module Platform
- Includes XM3 Power Modules, CGD12HBXMP Gate Drivers, High Performance Cold Plate, Optimized Laminated Bussing for Reduced Power Loop Inductance, DC-Link Capacitors, Sensors and Control Hardware
- Enables Over 2x the Power Density of Comparable Si Based Designs and >98% Efficiency
- Three Power Levels with the Different XM3 Part Numbers:
  - CRD000DA12E-XM3 uses CAB450M12XM3
  - CRD200DA12E-XM3 uses CAB425M12XM3
  - CRD240DA12E-XM3 uses CAB400M12XM3

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. Wolfspeed 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.

1. ACCESS TO WORLD-LEADING UNPACKAGED MOSFETs AND DIODES RANGING FROM 650V TO 1700V
2. ASSURED SUPPLY FROM THE LARGEST SiC CAPACITY FROM ANY MANUFACTURER

TO LEARN MORE ABOUT WOLFSPEED SiC BARE DIE MOSFETs AND DIODES, GO TO WOLFSPEED.COM/BAREDIE
NOBODY KNOWS SiC POWER DEVICES LIKE WOLFSPEED. 
WE’RE GLAD TO SHARE WHAT WE KNOW, AND WE LOVE TALKING ABOUT THIS STUFF. VISIT WOLFSPEED.COM TO CONNECT WITH THE SiC EXPERTS.