

Silicon Carbide Semiconductor Products



Low Switching Losses

High Power Density

High Thermal Conductivity

Reduced Heat Sink Requirements

High Temperature Operation

Reduced Circuit Size and System Costs

The Power of Silicon Carbide Semiconductors

Breakthrough Technology Combines High Performance & Low Losses

Silicon Carbide (SiC) semiconductors are an innovative new option for power electronic designers looking to improve system efficiency, smaller form factor and higher operating temperature in products covering industrial, medical, mil-aerospace and communication market segments. Microsemi is proud to be at the forefront of this game changing technology with a comprehensive portfolio of SiC solutions and in-house fabrication capabilities.

EXTREMELY LOW SWITCHING LOSSES

- Zero reverse recovery charge improves system efficiency

HIGH POWER DENSITY

- Smaller footprint device reduces system size and weight

HIGH THERMAL CONDUCTIVITY

- 2.5x more thermally conductive than silicon

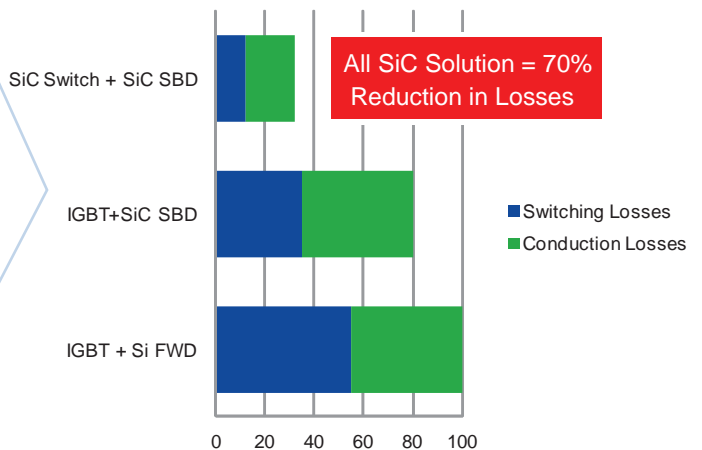
REDUCED SINK REQUIREMENTS

- Results in lower cost and smaller size

HIGH TEMPERATURE OPERATION

- Increased power density and improved reliability

Reduction in Losses
Model Inverter



INDUSTRIAL

DEFENSE

AVIATION

DOWN HOLE

MEDICAL



Overview & Resources

Microsemi Corporation has a full silicon carbide (SiC) wafer fab at its Bend, Oregon site. This facility has a 25-year history of innovation and manufacturing of high-voltage high-frequency power semiconductors and is ISO 9001 and JANS certified.

In addition to producing discrete SiC semiconductors, Microsemi has developed a variety of SiC and mixed semiconductor power modules. These modules, incorporating the latest in available technologies, offer rugged operation as well as high efficiency.

Microsemi has a wide ranging interest in partnering with customers to provide the best SiC solution for a specific application.

FULL IN-HOUSE CAPABILITIES

Design

- Silvaco Design and Process Simulator
- TCAD-TMA
- Mask-Making and Layout
- Solid Works & FEA

Process

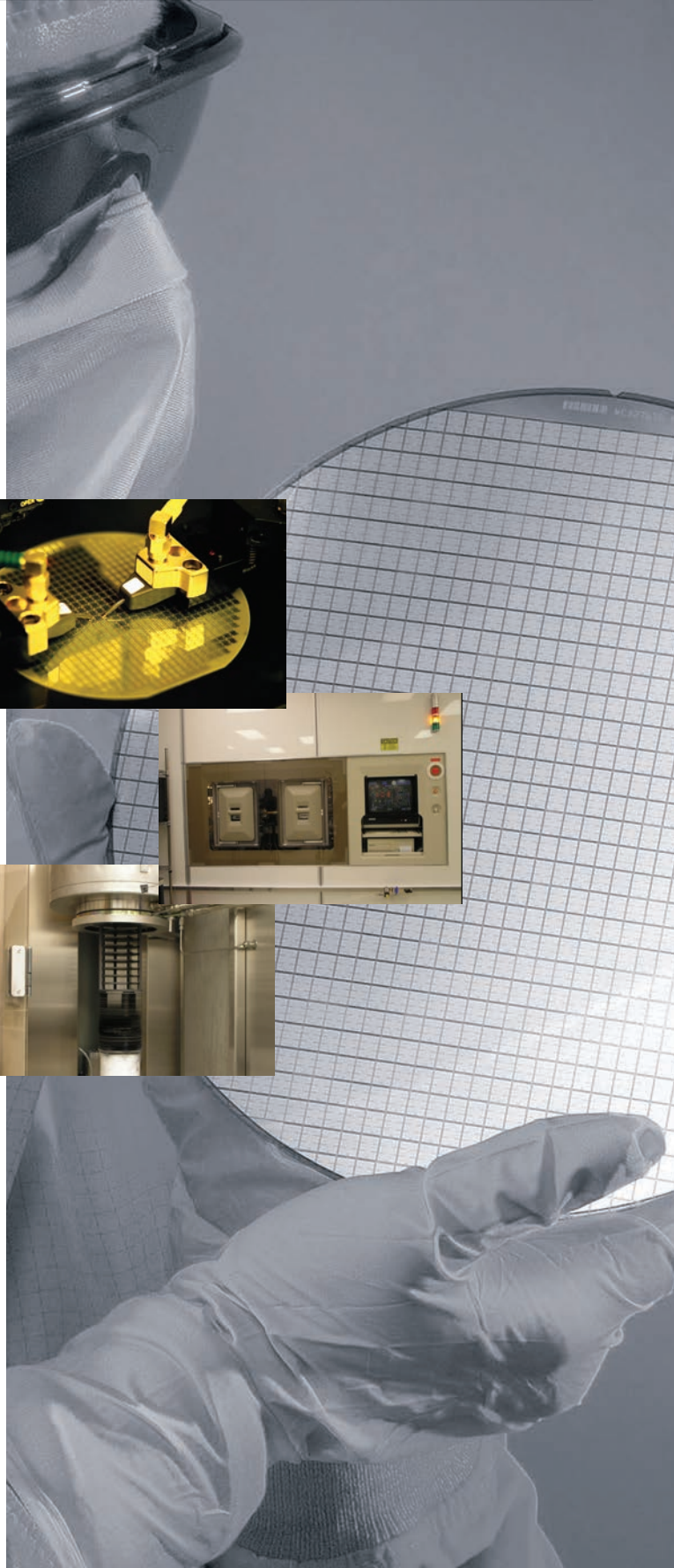
- High-Temperature Ion Implantation
- High-Temperature Annealing
- SiC MOSFET Gate Oxide
- ASML Steppers
- RIE and Plasma Etching
- Sputtered and Evaporated Metal Deposition

Analytical and Support

- Atomic Force Microscope
- n-Spec Defect Detection
- SEM/EDAX
- Thermal Imaging

Reliability Testing & Screening

- HTRB, HTGB, TC, PC, HTOL and 85/85
- Wafer Level HTRB/HTGB
- Sonoscan and X-ray



Power Modules

SiC Power Module Advantages

- High speed switching
- Low switching losses
- Low input capacitance
- Low drive requirements
- Low profile
- Minimum parasitic inductance
- Lower system cost
- Increased reliability



STANDARD MODULES

Electrical Topology	Mix Si-SiC 600V & 1200V	Full SiC 600V & 1200V
Boost & Buck Chopper	15A - 107A	50A - 100A
Dual Boost & Buck Chopper	29A - 40A	-
Dual Diode	-	20A - 90A
Full Bridge Diode	-	6A - 40A
Full Bridge + PFC	38A	-
Full Bridge + Secondary Fast Rectifier Bridge	38A	-
Full Bridge + Series and Parallel Diodes	11A - 38A	-
Phase Leg	-	40A - 200A
Phase Leg + PFC	27A - 38A	-
Phase Leg + Series and Parallel Diodes	21A - 110A	-
Single Switch + Series and Parallel Diodes	86A - 110A	-
3-Level NPT Inverter	-	20A - 160A
3-Level T-Type Inverter	40A - 80A	20A - 50A
Triple Phase Leg	50A - 87A	-

Optional Materials: • AlN substrate • Si3N4 Substrate
 • AISiC base plate material • Temperature sensor
 • Press fit terminals (for SP3 package)

Si IGBT
 Si MOSFET
 SiC Diode

SiC Diode
 SiC MOSFET

CUSTOMIZATION

Microsemi offers a complete engineering solution with mix and match capabilities in terms of package, interconnection, configuration, performance and cost.

Out of the existing standard power modules product line, Microsemi can offer simple, modified or fully customized parts to meet 100% of our customers' needs.

- Design expertise
- High power density
- Low profile packages
- Extended temperature capabilities
- Pin locating flexibility
- Mix of Silicon

Discrete Products



RELEASED PRODUCTS

600 Volt

- 150°C Rated Schottky Barrier Diodes: 10A, 20A and 30A
- 175°C Rated Schottky Barrier Diodes: 10A, 20A and 30A

1200 Volt

- 150°C Rated Schottky Barrier Diodes: 10A, 20A and 30A
- 175°C Rated Schottky Barrier Diodes: 10A, 20A and 30A

FUTURE PRODUCTS

2013

- 1700V-175°C Rated Schottky Barrier Diodes: 10A and 20A
- 1200V-175°C Rated Schottky Barrier Diode: 50A

2014

- 1200V-175°C Rated MOSFET
 - 80 milliohm Rdson
 - 160 milliohm Rdson
- 1700V-175°C Rated MOSFET

Extreme Environments



Hermetic SiC Devices

600V rated SiC Schottky Barrier Diode (SBD)
5A, 10A and 50A

1200V rated SiC Schottky Barrier Diode (SBD)
5A, 10A and 50A

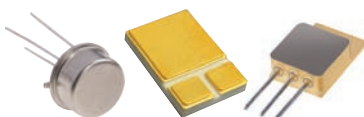
Package Type: TO-254, TO-258, TO-257, TO-39, TO-3, U3, U4 and U1

Configuration: Standard Rectifier, Common Cathode (CC), Common Anode (CA), Doubler (D)

Temperature: 175°C

Future Products:

Voidless Glass SiC SBD



P/N	Current (A)	Voltage (V)	Description	Package Type
MSICSN05120CA	5	1200	SiC Dual Schottky Rectifier	TO-257
MSICSN05120CC	5	1200	SiC Dual Schottky Rectifier	TO-257
MSICSN05120D	5	1200	SiC Dual Schottky Rectifier	TO-257
MSICSS05120CC	5	1200	SiC Dual Schottky Rectifier	U3
MSICSN05120	5	1200	SiC Schottky Rectifier	TO-257
MSICSS05120	5	1200	SiC Schottky Rectifier	U4
MSICST05120	5	1200	SiC Schottky Rectifier	TO-39
MSICSX05120	5	1200	SiC Schottky Rectifier	TO-257 (Tabless)
MSICSN10060CA	10	600	SiC Dual Schottky Rectifier	TO-257
MSICSN10060CC	10	600	SiC Dual Schottky Rectifier	TO-257
MSICSN10060D	10	600	SiC Dual Schottky Rectifier	TO-257
MSICSS10060CC	10	600	SiC Dual Schottky Rectifier	U3
MSICSN10060	10	600	SiC Schottky Rectifier	TO-257
MSICSS10060	10	600	SiC Schottky Rectifier	U4
MSICST10060	10	600	SiC Schottky Rectifier	TO-39
MSICSN10120CA	10	1200	SiC Dual Schottky Rectifier	TO-257
MSICSN10120CC	10	1200	SiC Dual Schottky Rectifier	TO-257
MSICSN10120D	10	1200	SiC Dual Schottky Rectifier	TO-257
MSICSS10120CC	10	1200	SiC Dual Schottky Rectifier	U3
MSICSN10120	10	1200	SiC Schottky Rectifier	TO-257
MSICSS10120	10	1200	SiC Schottky Rectifier	U4
MSICST10120	10	1200	SiC Schottky Rectifier	TO-39
MSICSE50120CA	50	1200	SiC Dual Schottky Rectifier	TO-258
MSICSE50120CC	50	1200	SiC Dual Schottky Rectifier	TO-258
MSICSE50120D	50	1200	SiC Dual Schottky Rectifier	TO-258
MSICSF50120	50	1200	SiC Schottky Rectifier	TO-254
MSICSS50120	50	1200	SiC Schottky Rectifier	U1
MSICST50120	50	1200	SiC Schottky Rectifier	TO-3

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MS8-008-13