

Silicon Carbide Semiconductor Products



Low Switching Losses

Low Gate Resistance

High Power Density

High Thermal Conductivity

High Avalanche (UIS) Rating

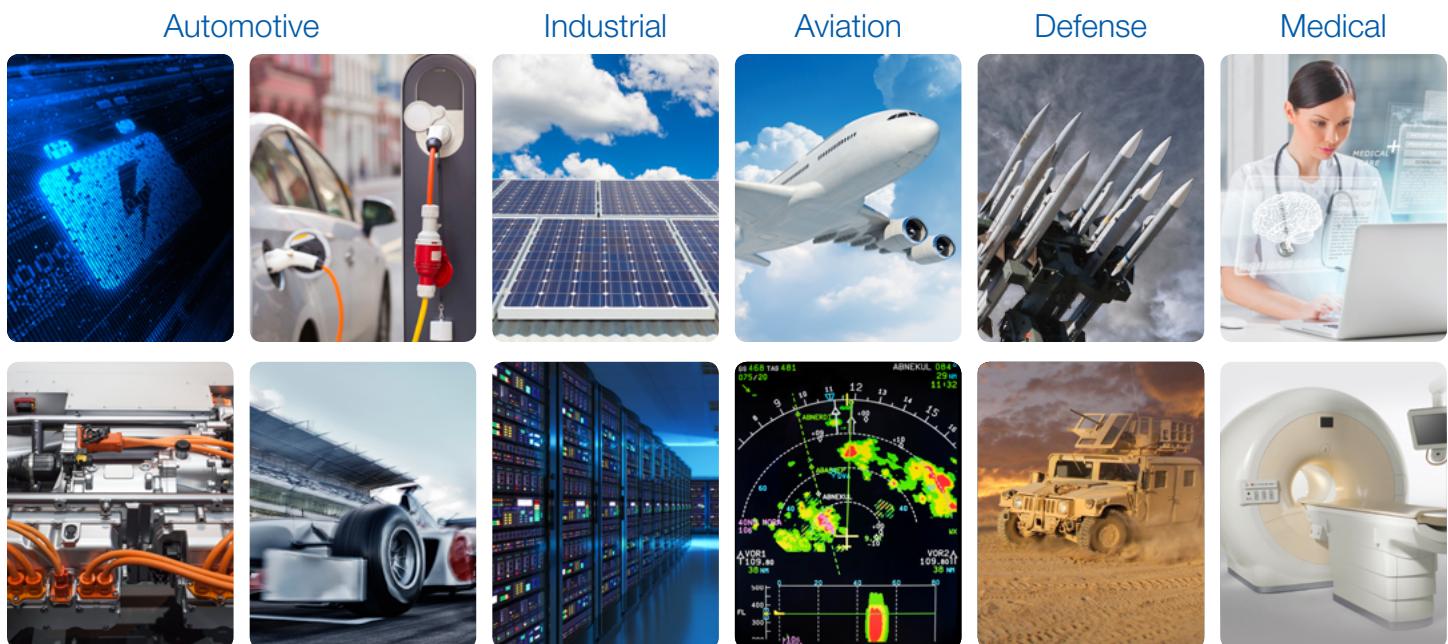
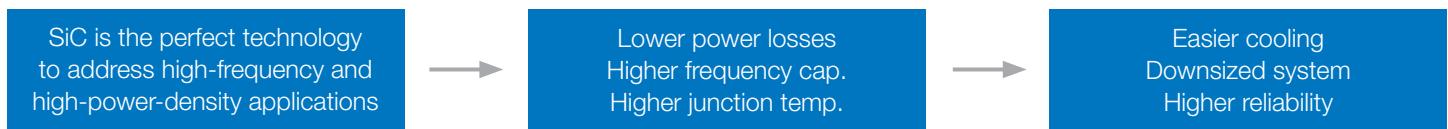
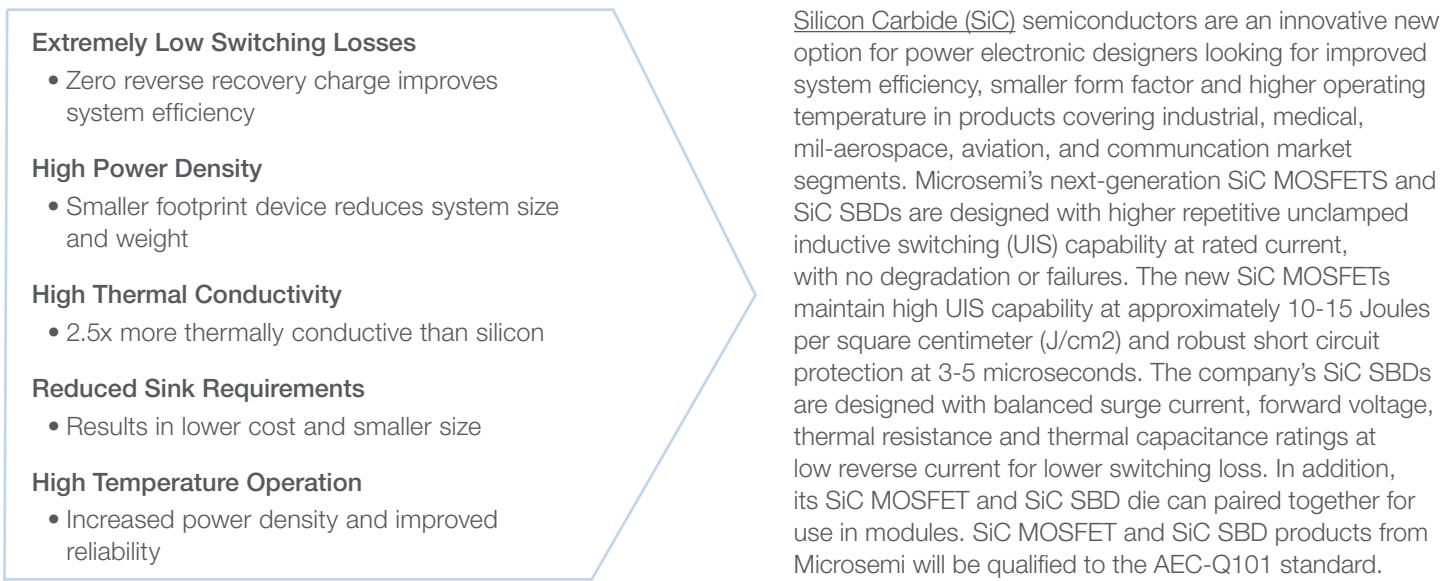
Reduced Heat Sink Requirements

High Temperature Operation

Reduced Circuit Size and System Costs

Overview

Breakthrough Technology Combines High Performance with Low Losses



Higher Switching Frequency

Silicon Carbide (SiC) is the ideal technology for higher switching frequency, higher efficiency, and higher power (>650 V) applications. Target markets and applications include:

- Industrial—motor drives, welding, UPS, SMPS, induction heating
- Transportation/automotive—EV battery charger, onboard chargers, hybrid electric vehicle (HEV)/electric vehicle (EV) powertrain, DC–DC converter, energy recovery
- Smart energy—PV inverter, wind turbine
- Medical—MRI power supply, X-ray power supply
- Commercial aviation—actuation, air conditioning, power distribution
- Defense—motor drives, auxiliary power supplies, integrated vehicle systems

SiC MOSFET and SiC Schottky Barrier Diode product lines from Microsemi increase your system efficiency over silicon MOSFET and IGBT solutions while lowering your total cost of ownership by enabling downsized systems and smaller/lower cost cooling.

Full In-House and Foundry Capabilities

Design

- Silvaco design and process simulator
- TCAD-TMA
- Mask-making and layout
- Solid works and FEA

Process

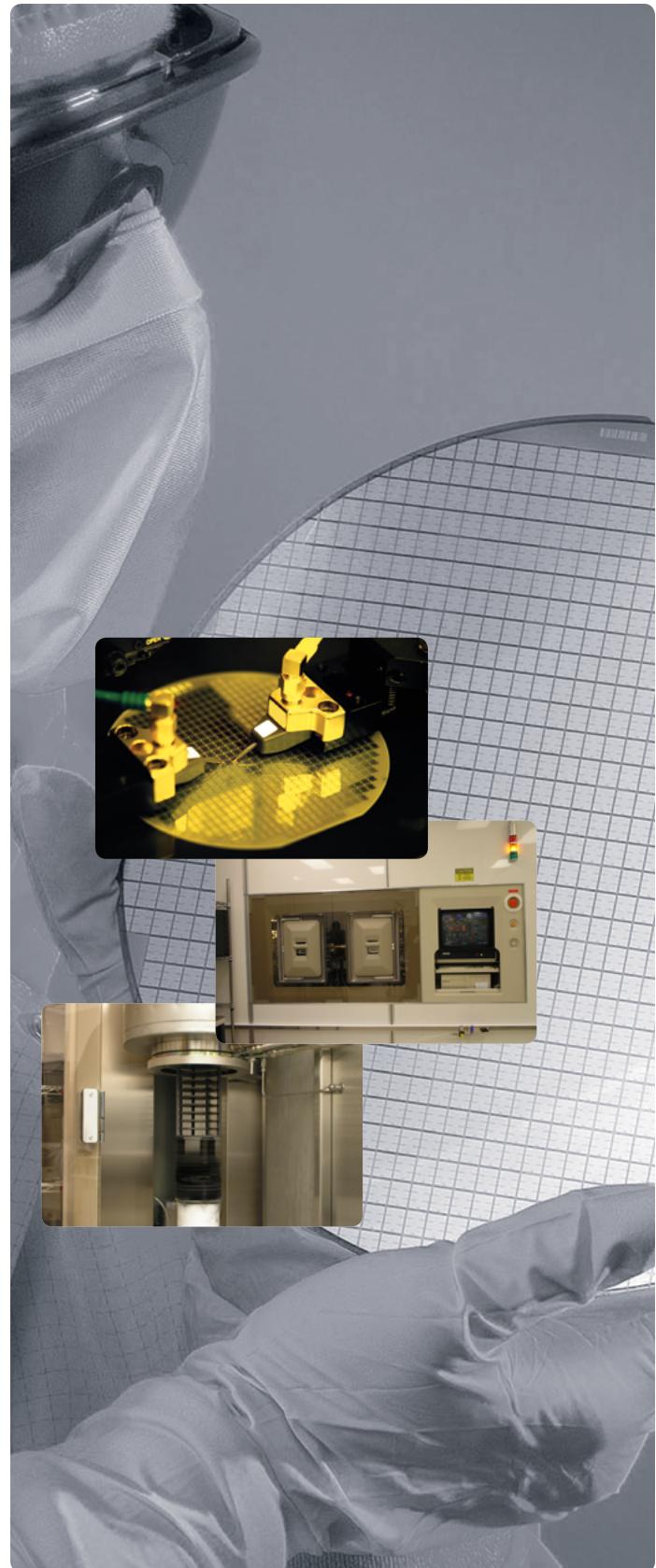
- High-temperature ion implantation
- High-temperature annealing
- SiC MOSFET gate oxide
- ASML steppers
- RIE and plasma etching
- Sputtered and evaporated metal deposition

Analytical and Support

- SEM/EDAX
- Thermal imaging
- Photo Emission Microscope system (Phemos 1000)

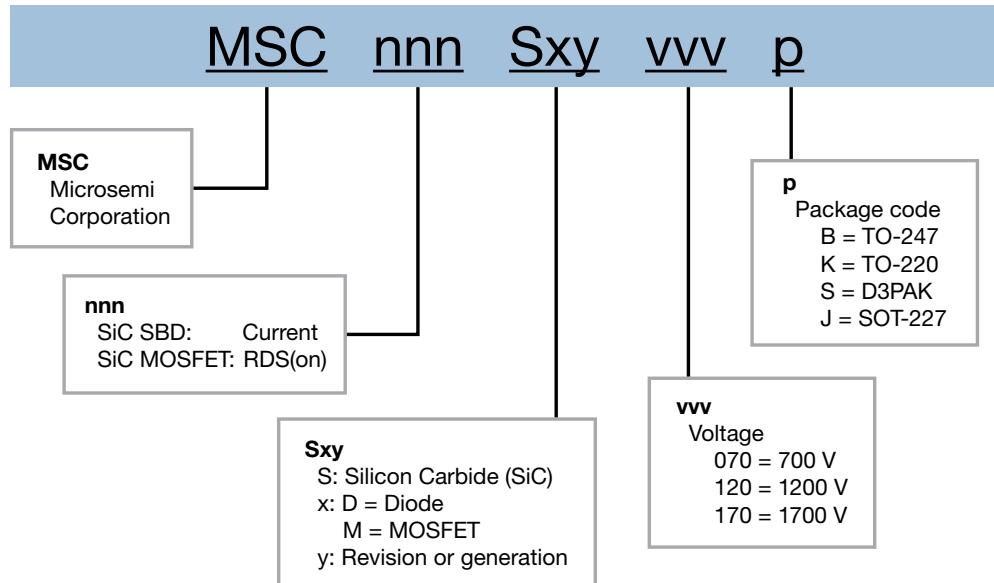
Reliability Testing and Screening

- AEC-Q101
- HTRB and HTGB
- Sonoscan and X-ray

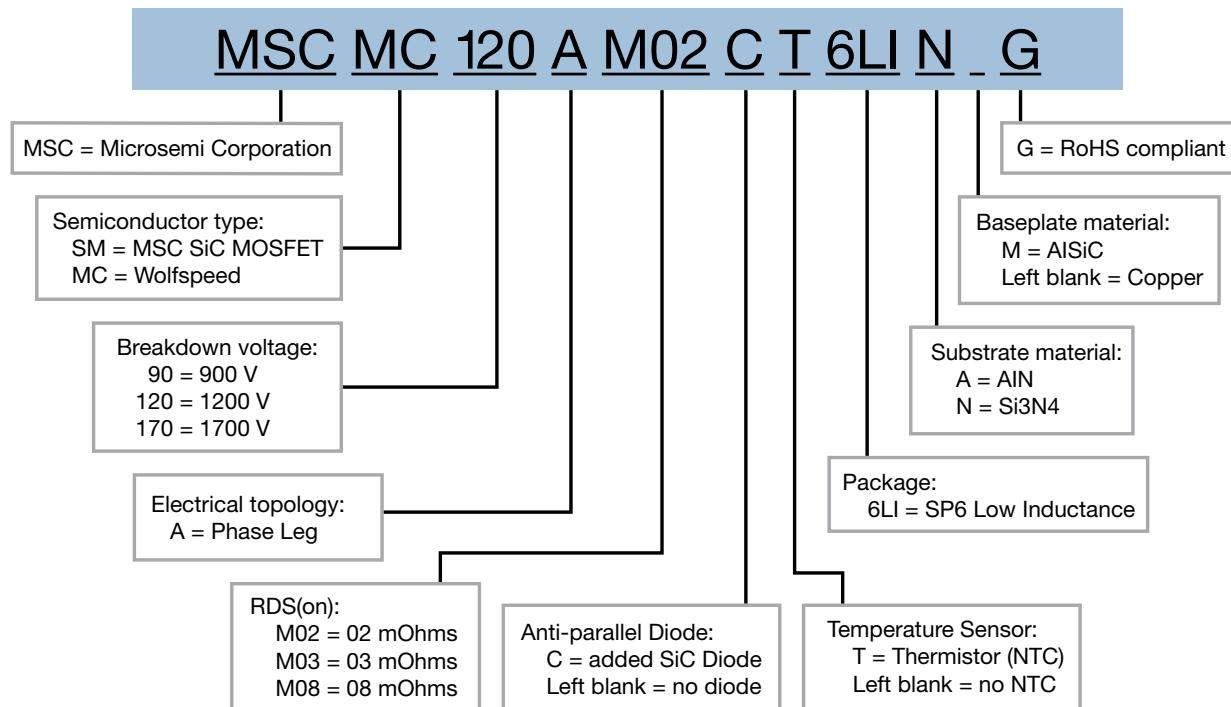


SiC Discretes and Modules Nomenclature

SiC Discretes



SP6LI SiC Power Modules



Discrete Products

SiC Schottky Barrier Diodes

Part Number	Voltage (V)	I _F (A)	Package
MSC010SDA070B	700	10	TO-247
MSC010SDA070K		10	TO-220
MSC030SDA070B		30	TO-247
MSC030SDA070K		30	TO-220
MSC050SDA070B		50	TO-247
MSC010SDA120B	1200	10	TO-247
MSC010SDA120K		10	TO-220
MSC015SDA120B		15	TO-247
MSC030SDA120B		30	TO-247
MSC030SDA120K		30	TO-220
MSC030SDA120S		30	D3PAK
MSC050SDA120B		50	TO-247
MSC050SDA120S		50	D3PAK
MSC010SDA170B	1700	10	TO-247
MSC030SDA170B		30	TO-247
MSC050SDA170B		50	TO-247



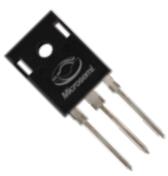
SiC MOSFETs

Part Number	Voltage (V)	RDS(on)	Package
MSC090SMA070B	700	90 mΩ	TO-247
MSC090SMA070S			D3PAK
MSC060SMA070B		60 mΩ	TO-247
MSC060SMA070S			D3PAK
MSC035SMA070B		35 mΩ	TO-247
MSC035SMA070S			D3PAK
MSC015SMA070B	1200	15 mΩ	TO-247
MSC015SMA070S			D3PAK
MSC280SMA120B		280 mΩ	TO-247
MSC280SMA120S			D3PAK
MSC140SMA120B		140 mΩ	TO-247
MSC140SMA120S			D3PAK
MSC080SMA120B		80 mΩ	TO-247
MSC080SMA120S			D3PAK
MSC080SMA120J	1700	SOT-227	
MSC040SMA120B		40 mΩ	TO-247
MSC040SMA120S			D3PAK
MSC040SMA120J		40 mΩ	SOT-227
MSC025SMA120B		25 mΩ	TO-247
MSC025SMA120S			D3PAK
MSC025SMA120J			SOT-227
MSC750SMA170B	1700	750 mΩ	TO-247
MSC750SMA170S			D3PAK
MSC045SMA170B		45 mΩ	TO-247
MSC045SMA170S			D3PAK

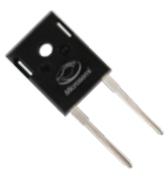


SiC MOSFET Features and Benefits

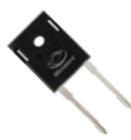
Characteristics	SiC vs. Si	Results	Benefits
Breakdown field (MV/cm)	10x higher	Lower on-resistance	Higher efficiency
Electron sat. velocity (cm/s)	2x higher	Faster switching	Size reduction
Bandgap energy (eV)	3x higher	Higher junction temperature	Improved cooling
Thermal conductivity (W/m.K)	3x higher	Higher power density	Higher current capabilities



TO-247-3L



TO-247



TO-220



D3PAK
(TO-268)



SOT-227

Power Modules

Power Module Advantages

- High-speed switching
- Low switching losses
- Low input capacitance
- High power density
- Low profile packages
- Minimum parasitic inductance
- Lower system cost
- Standard & custom modules
- Choice of Si/SiC devices

Standard Modules

Part Number	Type	Electrical Topology	Voltage (V)	Current	Package
APT2X20DC60J	SiC Diode module	Dual diode	600	20	SOT227
APT2X30DC60J				30	SOT227
APT2X50DC60J				50	SOT227
APT2X60DC60J				60	SOT227
APT2X20DC120J			1200	20	SOT227
APT2X40DC120J				40	SOT227
APT2X50DC120J				50	SOT227
APT2X60DC120J				60	SOT227
APT40DC60HJ		Full bridge	600	40	SOT227
APTD40H601G				40	SP1
APT10DC120HJ			1200	10	SOT227
APT20DC120HJ				20	SOT227
APTD20H1201G				20	SP1
APT40DC120HJ				40	SOT227
APTD40H1201G				40	SP1
APT50MC120JCU2	SiC MOSFET module	Phase leg	1200	50	SOT227
APT100MC120JCU2				100	SOT227
APTMC120HM17CT3AG				110	SP3F
APTMC120AM55CT1AG				40	SP1
APTMC120AM25CT3AG				80	SP3F
APTMC120AM20CT1AG				100	SP1
APTMC120AM16CD3AG		Three level inverter	1700	100	D3
APTMC120AM12CT3AG				150	SP3F
APTMC120AM08CD3AG				185	D3
APTMC120AM09CT3AG				200	SP3F
APTMC170AM60CT1AG				40	SP1
APTMC170AM30CT1AG				80	SP1
APTMC60TL11CT3AG	Very Low Inductance SiC MOSFET module	Three phase bridge Triple phase leg	600	20	SP3F
APTMC60TL55CT3AG				40	SP3F
APTMC60TLM14CAG				160	SP6
APTMC120HR11CT3AG				20	SP3F
APTMC120HRM40CT3AG				50	SP3F
APTMC120TAM34CT3AG				55	SP3F
APTMC120TAM33CTPAG			1200	60	SP6P
APTMC120TAM17CTPAG				100	SP6P
APTMC120TAM12CTPAG				150	SP6P
MSCMC120AM07CT6LIAG		Phase leg	1200	210	SP6LI
MSCMC120AM04CT6LIAG				307	SP6LI
MSCMC120AM03CT6LIAG				475	SP6LI
MSCMC120AM02CT6LIAG				586	SP6LI
MSCMC170AM08CT6LIAG			1700	207	SP6LI

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.

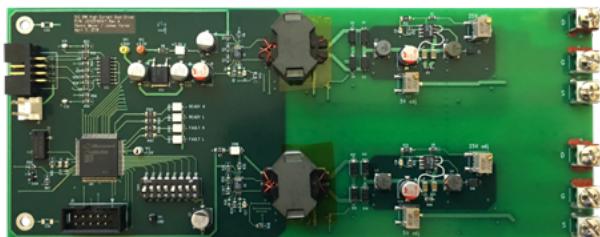
- Design expertise
- High power density
- Low profile packages
- Extended temperature capabilities
- Pin locating flexibility
- Mix of silicon

Gate Driver Solutions

Microsemi and our partner ecosystem provide open-source, user friendly SiC MOSFET driver solutions that enable faster time to market for customers using our SiC MOSFETs and power modules. Customers can use isolated dual-gate driver referenced designs with our SiC MOSFETS in a number of SiC topologies.

SiC MOSFET Driver Reference Designs With Isolation

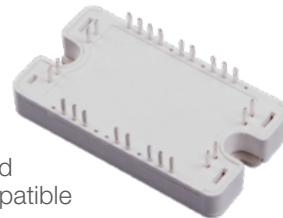
Part Number	Gate Drive Voltage (V)	Freq. (max)	Per Side Drive Power
MSCSICMDD/REF	-5/+20	400 kHz	8 W
MSCSICSP3/REF2	-5/+20	400 kHz	16 W



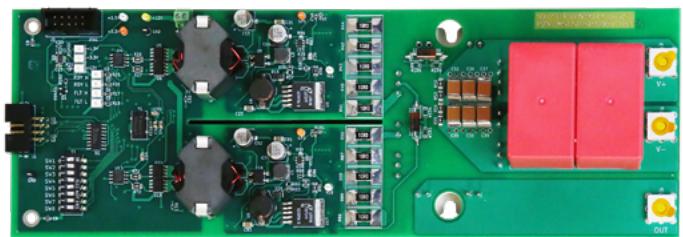
The MSCSICMDD/REF1 is a switch-configurable high/low-side driver with half bridges or independent drive

- 400kHz maximum switching frequency
- 8 W of gate drive power per side
- 30 A peak output current
- -5 V/+20 V gate drive voltage
- +/- 100 kV/uS capability
- Galvanic isolation of more than 2000 V on both gate drivers

www.microsemi.com/product-directory/reference-designs/MSCSICMDD-REF1



SP3F standard package compatible



The MSCSICSP3/REF2 is a half bridge driver compatible with SP3F standard package modules

- 400kHz maximum switching frequency
- 16 W of gate drive power per side
- 30 A peak output current
- -5 V/+20 V gate drive voltage
- +/- 100 kV/uS capability
- Galvanic isolation of more than 2000 V on both gate drivers

www.microsemi.com/product-directory/reference-designs/MSCSICSP3-REF2

**Microsemi is continually adding new products to its
industry-leading portfolio.**

For the most recent updates to our product line and for detailed information and specifications, please call, email, or visit our website.

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