

**Packaged and Bondable Chips**
*Features*

- Low-Noise Performance
- High Cut-off Frequency
- Passivated to Enhance Reliability
- Packaged Diodes and Bondable Chips


*Applications*

- Single and Balanced Mixers and Detectors
- Transceivers X, K and Ka Bands
- 30 and 60 GHz Radios
- Automotive Radar Detectors

*Maximum Ratings*

Incident Power	100 mW @ 25°C Derate Linearly to 0 at 175°C
Forward Current	15 mA @ 25°C
Reverse Voltage	5 V
Operating Temperature	-55°C to +175°C
Storage Temperature	-55°C to +200°C

*Description*

Microsemi's MS8000 series of GaAs Schottky barrier diodes are available in packaged form and bondable chip configurations. These Schottky devices have low series resistance and low junction capacitance. The resulting low noise figure makes these diodes suitable for sensitive mixer and detector applications from below X band to beyond Ka band frequencies.

*Ordering Information*

P00 is the designation for the bondable chip Schottky (e.g. MS8001-P00). Packaged diodes are designated by the package outline number (e.g. MS8001-30)

**IMPORTANT:** For the most current data, consult our website: [www.MICROSEMI.com](http://www.MICROSEMI.com)  
Specifications are subject to change. Consult factory for the latest information.



These devices are ESD sensitive and must be handled using ESD precautions.

<sup>1</sup> The MS8000 Series of products are supplied with a RoHS compliant Gold finish.

**Packaged and Bondable Chips**
*SPICE Model Parameters for MS8004*

$I_S$ (A)	$R_S$ ( $\Omega$ )	N	TT (Sec.)	$C_{JO}$ (pF)	m	$E_G$ (ev)	$V_J$ (V)	$B_V$ (V)	$I_{B_V}$ (A)
$8 \times 10^{-13}$	6	1.05	0	0.06	0.50	1.42	0.85	5.0	$1 \times 10^{-5}$

*Specifications @ 25°C*

Part Number	Typ. $C_J$ @ 0 V ( $\mu$ F) <sup>2</sup>	Max. $R_S$ ( $\Omega$ ) <sup>3</sup>	LO Frequency (GHz)	Typ. Noise Figure (dB) <sup>4</sup>	IF Impedance ( $\Omega$ )	Min. $V_{BR}$ (V) <sup>5</sup>
MS8001 <sup>1</sup>	0.12	6	9.375	5.6	250–500	5
MS8002 <sup>1</sup>	0.10	6	16.000	5.6	250–500	5
MS8003 <sup>1</sup>	0.07	6	24.000	6.5	250–500	5
MS8004 <sup>1</sup>	0.06	6	36.000	6.5	250–500	5

<sup>1</sup>Suffix of the model number indicates the package style. Available in M22, M38 and M39 and in chip form P10, e.g. MS8001-P10.

<sup>2</sup> $C_J$  is specified at 1 MHz.

<sup>3</sup>Series resistance,  $R_S$ , is calculated by subtracting the barrier resistance  $R_D = kT/qI$  from the measured total resistance  $R_T$  at 10 mA:  $R_S = R_T - R_D$ .  
 $k$  = Boltzmann Constant,  $T$  = diode temperature in degrees K,  $q$  = electronic charge,  $I$  = forward current.

<sup>4</sup>The quoted noise figure (NF) is a single side band NF measured at 6 dBm LO power in a single-ended mixer, and 10 dBm in a balanced mixer with a 30 MHz IF amplifier with 1.5 dB NF.

<sup>5</sup>The breakdown voltage,  $V_{BR}$ , is specified at a reverse current of 10  $\mu$ A.

## Device Reliability

The reliability of GaAs Schottky barrier diodes has been established through long-term operation and step-stress testing. A high-temperature refractory metalization structure, Ti- Pt- Au, eliminates potential problems arising from the penetration of metalization into the semiconductor during long-term use in the RF systems. Well established chip fabrication and manufacturing techniques further enhance device reliability by reducing the possibility of surface breakdown or chip damage in mounting.

Long-term operation and step stress tests have indicated that for a junction temperature of 200°C, MTTF will be greater than 1E6 hours.

## Precautions for Handling Schottky Barrier Diodes

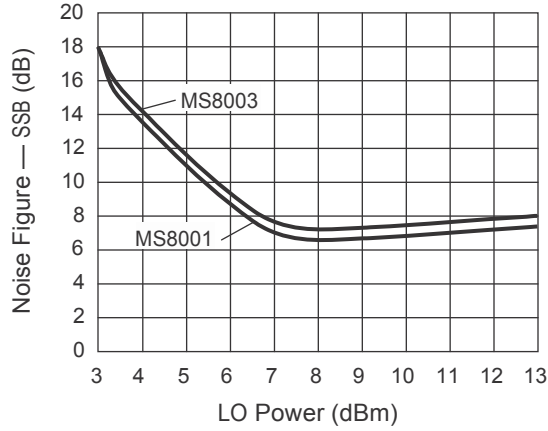
Microwave and millimeter wave Schottky barrier diodes have very small junction areas and are therefore extremely sensitive to accidental electrostatic discharge (ESD) and over voltage burnout. The first or most sensitive indication of excessive electrical stress or burnout is an increase in the reverse leakage current:  $I_R$

of the diode. A large overload will cause the reverse breakdown voltage to decrease to a lower value, and also degrade the forward voltage characteristics of the diode. ESD is responsible for both catastrophic and latent failures of high-frequency Schottky barrier diodes.

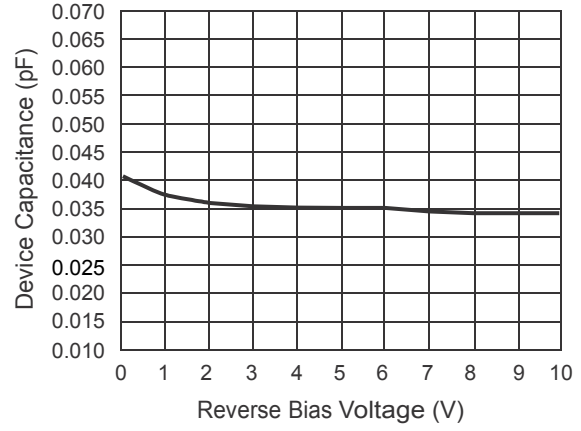
Static electricity, or ESD, is more prevalent in dry climates such as experienced during the winter months, and may be generated on one's person or by the diode packaging material. Therefore, extreme care must be taken when handling these diodes.

Grounded dual wrist straps with continuous monitor, table-top ionizers and ESD bags/enclosures should be used when handling Schottky barrier diodes.

If auxiliary test equipment, such as an oscilloscope or a digital voltmeter, is to be connected and used for a monitoring diode operation, it should be connected electrically before the diode is installed if possible. If not, the ground side of the instrument must be connected first, or the diode may be damaged by the AC current flowing in the ground loop and through the diode.

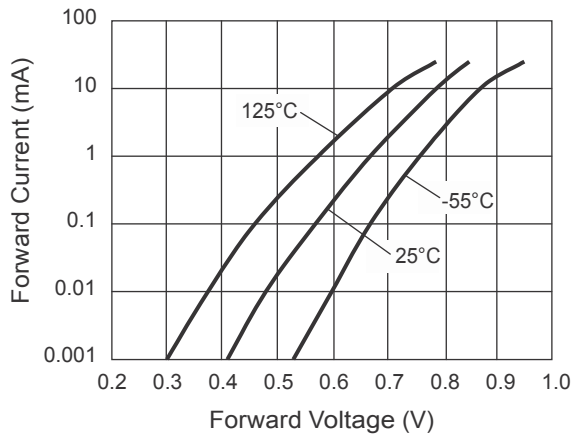
**GaAs Schottky Diodes (Packaged and Bondable Chips)**
*Typical Characteristics*


**Noise Figure (dB) @ 24 GHz**  
**(Balanced Mixer)**



**Junction Capacitance**

The quoted noise figure (NF) is a single side band NF measured at LO power of 6 dBm for a single, and 10 dBm for a balanced mixer with a 30 MHz IF amplifier with a noise figure of 1.5 dB.



**I-V Characteristics for**  
**GaAs Schottky Diode**