Agilent Technologies
Innovating the HP Way

Schottky Barrier Chips for Hybrid Integrated Circuits

Technical Data

HSMS-0005/06
HSMS-8002/12

Features

- **Thermocompression/ Thermosonically Bondable**
- **Gold Metallization**
- **Silicon Nitride Passivation**
- **Uniform Electrical Characteristics**
- **Batch Matched Versions Available**
- **Planar Construction**
- **Available in Many Electrical Selections**
- **Ideal for Hybrid Integrated Circuits**

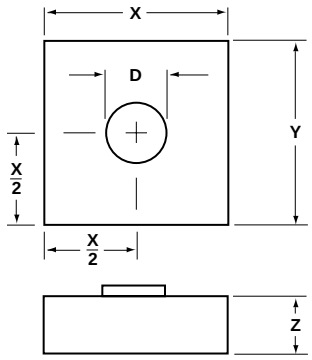
Description/Applications

These Schottky chips are designed for hybrid applications at DC through K-band frequencies. The passivated planar construction of these Schottky chips provides a wide temperature range capability combined with broad bandwidth performance.

A variety of chips are provided which are optimized for various analog and digital applications. Typical applications of Schottky chips are mixing, detecting, switching, gating, sampling, and wave shaping.

This series of Schottky diode chips are specifically designed for analog and digital hybrid applications requiring thermosonic or thermocompression bonding techniques. The large bonding pad allows easy bonding. The top metallization is a layer of gold deposited on adhesive metal layers for a tarnish-free surface that allows either thermosonic or thermocompression bonding techniques. The bottom metallization is also gold, suitable for epoxy or eutectic die attach methods.

Chip Dimensions



DIMENSIONS	PART NO. HSMS-	
	-0006/-8002	-0005
D	75 (3)	55 (2)
X	250 (10)	250 (10)
Y	275 (11)	250 (10)
Z	150 (8)	150 (6)
Top Contact	Anode	Cathode

NOTES:
1. Dimensions in mIcrons (1/1000 inch).
2. Dimension tolerance is ±30μ.
3. All contact metallization is gold.

Absolute Maximum Ratings, T_A = 25°C

Symbol	Parameter	Units	HSMS-8002	HSMS-0005
P_T	Total device dissipation, measured in an infinite heatsink. Derate linearly to zero at maximum rated temperature	mW	75	75
P_{IV}	Peak Inverse Voltage	V	4.0	2.0
TJ	Junction Temperature (maximum)	°C	150	200
T_{STG}	Storage Temp. Range	°C	–65 to 150	–65 to 200
T_{OP}	Operating Temperature	°C	–65 to 150	–65 to 200

Note: Operation in excess of any one of these conditions may result in permanent damage to the device.

DC Electrical Specifications at T_A = 25°C

Schottky Barrier Chips for Microwave and RF Mixers

Part Number HSMS-	Batch Matched[1] HSMS-	Nearest Equivalent Packaged Part: HSMS-	Minimum Breakdown Voltage V_{BR} (V)	Maximum Forward Voltage V_F (mV)	Maximum Forward Voltage V_F (mV)	Maximum Capacitance C_T (pF)	Maximum Dynamic Resistance R_D (Ω)[2]
8002	8012	8101	4	250	350	0.16	14
Test Conditions	ΔV_F = 15 mV I_F = 1 mA		I_R = 10 µA	I_F = 1 mA		V_R = 0 V f = 1.0 MHz	I_F = 5 mA

Notes:
1. Standard batch match size, 100 units.
2. To obtain R_S, subtract 26/5 = 5.2 Ω.

RF Electrical Parameters at T_A = 25°C

Part Number HSMS-	Typical Conversion Loss L_C (dB)	Typical IF Impedance Z_{IF} (Ω)	Typical SWR	Typical Tangential Sensitivity T_{SS} (dBm)
8002	5.5	150	1.2:1	-46
Test Conditions	f = 16 GHz DC load resistance = 0 Ω, LO power = 1 mW			f = 10 GHz BW = 2 MHz I_{BIAS} = 20 µA

DC Electrical Specifications at T_A = 25°C

Schottky Barrier Chips for Microwave and RF Detectors

Part Number HSMS-	Nearest Equivalent Packaged Part No. HSMS-	Maximum Forward Voltage V_F (mV)	Minimum Breakdown Voltage V_{BR} (V)	Typical Capacitance C_T (pF)
0005	2850	250	—	0.20
0006	2860	350	4.0	0.17
Test Conditions		I_F = 1 mA	I_R = 10 μA	V_R = 0.5 V, f = 1 MHz

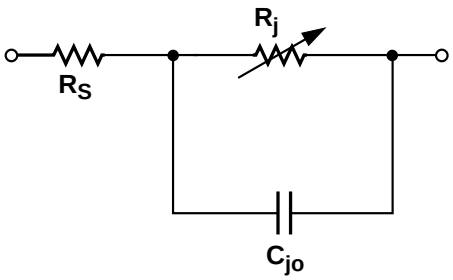
Typical RF Electrical Parameters at T_A = 25°C

Part Number HSMS-	DC Bias	Voltage Sensitivity γ (mV/μW)			Video Resistance R_V (KΩ)
		915 MHz	2.45 GHz	5.8 GHz	
0005	zero	40	30	22	8.0
0006	5 μA	40	32	25	5.5
Test Conditions		P_{in} = -40 dBm	R_L = 100 KΩ		

SPICE Parameters

Parameter	Units	HSMS-8002	HSMS-0005	HSMS-0006
B_V	V	7.0	3.8	6.0
C_{J0}	pF	0.16	0.16	0.17
E_G	eV	0.69	0.69	0.69
I_{BV}	A	10E-5	10E-5	10E-5
I_S	A	4.6 x 10E-8	3 x 10E-6	3 x 10E-8
N		1.08	1.15	1.10
R_S	Ω	5.0	20	7.0
P_B	V	0.65	0.65	0.65
P_T		2	2	2
M		0.5	0.5	0.5

Equivalent Circuit Model



$$R_j \approx \frac{.026}{I_s + I_b}$$

I_b = bias current in A

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Assembly and Handling Procedures for Schottky Chips

1. Storage

Devices should be stored in a dry nitrogen purged desiccator or equivalent.

2. Cleaning

If required, surface contamination may be removed with electronic grade solvents such as freon (T.F. or T.M.C.), acetone, deionized water, and methanol used singularly or in combinations. Typical cleaning times per solvent are one to three minutes. DI water and methanol should be used (in that order) in the final cleansing. Final drying can be accomplished by placing the cleaned dice on clean filter paper and drying with an infrared lamp for 5–10 minutes. Acids such as hydrofluoric (HF), nitric (HNO_3) and hydrochloric (HCl) must not be used.

The effects of cleaning methods/solutions should be verified on small samples prior to submitting the entire lot.

Following cleaning, dice should either be used in assembly (typically within a few hours) or stored in clean containers in an inert atmosphere or a vacuum chamber.

3. Die Attach

a. Eutectic

Eutectic die attach can be accomplished by "scrubbing" the die with a preform on the header. (Note—times and temperature utilized vary depending on the type of preform.) For example, 310°C is suitable for a Au/Sn preform.

b. Epoxy

For epoxy die-attach, conducive silver-filler epoxies are recommended. This method can be used for all Agilent Schottky chips.

4. Wire Bonding

Thermocompression wire bonding is recommended. Suggested wire is pure gold, 0.7 to 1.5 mil diameter.

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Data subject to change.

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