HSCH-55XX
Beam Lead Schottky Diode Pairs for Mixers and Detectors

Data Sheet

Description

These dual beam lead diodes are constructed using a metal-semiconductor Schottky barrier junction. Advanced epitaxial techniques and precise process control insure uniformity and repeatability of this planar passivated microwave semiconductor. A nitride passivation layer provides immunity from contaminants which could otherwise lead to IR drift.

The Avago beam lead process allows for large beam anchor pads for rugged construction (typical 6 gram pull strength) without degrading capacitance.

Applications

The beam lead diode is ideally suited for use in stripline or microstrip or coplanar waveguide circuits. Its small physical size and uniform dimensions give it low parasitics and repeatable RF characteristics through K-band.

These dual beam leads are intended for use in balanced mixers and in even harmonic anti-parallel pair mixers. By using several of these devices in the proper configuration it is easy to assemble bridge quads, star quads, and ring quads for Class I, II, or III type double balanced mixers.

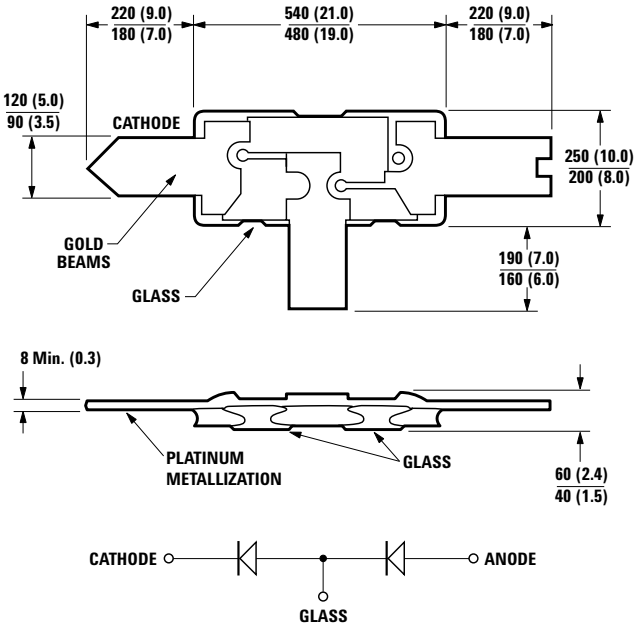
Assembly Techniques

Thermocompression bonding is recommended. Welding or conductive epoxy may also be used. For additional information see Application Note 979, "The Handling and Bonding of Beam Lead Devices Made Easy," or Application Note 993, "Beam Lead Device Bonding to Soft Substrates."

Features

- Monolithic Pair: Closely Matched Electrical Parameters
- Low Capacitance: 0.1 pF Maximum at 0 Volts
- Low Noise Figure: Typical 7.5 dB at 26 GHz
- Rugged Construction: 4 Grams Minimum Lead Pull
- Platinum Tri-Metal System: High Temperature Stability
- Polyimide Scratch Protection
- Silicon Nitride Passivation: Stable, Reliable Performance

Outline 04B



DIMENSIONS IN m (1/1000 inch)

Maximum Ratings (for Each Diode)

Pulse Power Incident at T_A = 25°C..... 1 W
Pulse Width = 1 μs, Du = 0.001

CW Power Dissipation at T_A = 25°C ..... 150 mW
Measured in an infinite heat sink derated linearly to zero at maximum rated temperature

T_{OPR} – Operating Temperature Range .....-65°C to +175 °C

T_{STG} – Storage Temperature Range .....-65°C to +200°C

Minimum Lead Strength.....4 grams pull on any lead

Diode Mounting Temperature..... 350°C for 10 sec. max.

These diodes are ESD sensitive. Handle with care to avoid static discharge through the diode.

Electrical Specifications for DC Tested Diodes at T_A = 25°C

Part Number HSCH-[1]	Barrier	Minimum Breakdown Voltage V_{BR} (V)	Maximum Dynamic Resistance R_D (Ω)	Max. ΔR_D (Ω)	Maximum Total Capacitance C_T (pF)	Max. ΔC_T (pF)	Maximum Forward Voltage V_F (mV)	Max. ΔV_F (mV)	Max. I_R (nA)
5512	Medium	4	16	3	0.15	0.03	500	10	100
5531	Low		20	3	0.10	0.02	375		400
Test Conditions		I_R = 10 μA	I_F = 5 mA		V_R = 0 V, f = 1 MHz		I_F = 1 mA		V_R = 1

Note:
1. Standard Hi-Rel program available on HSCH-5531. Others are available upon request.

Typical Detector Characteristics at T_A = 25°C

Medium Barrier and Low Barrier (DC Bias)

Parameter	Symbol	Typical Value	Units	Test Conditions
Tangential Sensitivity	TSS	-55	dBm	20 μA Bias, Zero Bias, P_{in} = -40 dBm,
Voltage Sensitivity	γ	9.0	mV/μW	R_L = 100 KΩ, Video Bandwidth = 2 MHz
Video Resistance	R_V	1350	Ω	f = 10 GHz

Low Barrier (Zero Bias)

Parameter	Symbol	Typical Value	Units	Test Conditions
Tangential Sensitivity	TSS	-46	dBm	Zero Bias, Zero Bias, P_{in} = -30 dBm,
Voltage Sensitivity	γ	17	mV/μW	R_L = 10 MΩ, Video Bandwidth = 2 MHz
Video Resistance	R_V	1.4	MΩ	f = 10 GHz

SPICE Parameters

Parameter	Units	HSCH-5512	HSCH-5531
B_V	V	5	5
C_{J0}	pF	0.13	0.09
E_G	eV	0.69	0.69
I_{BV}	A	10E-5	10E-5
I_S	A	3 x 10E-10	4 x 10E-8
N		1.08	1.08
R_S	Ω	9	13
P_B	V	0.65	0.5
P_T		2	2
M	0.5	0.5	

Typical Parameters

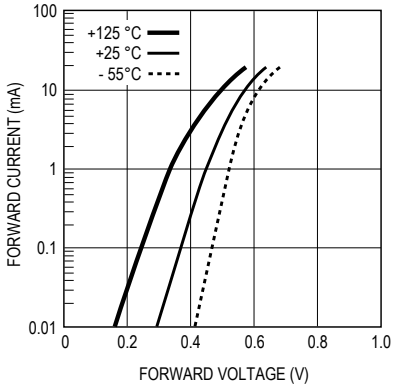


Figure 1. Typical forward characteristics for medium barrier beam lead diodes. HSCH-5512.

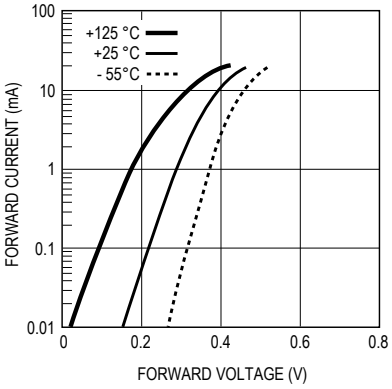


Figure 2. Typical forward characteristics for low barrier beam lead diodes. HSCH-5531.

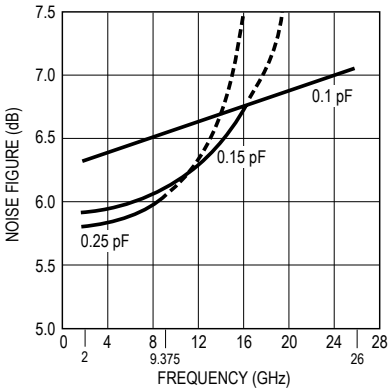


Figure 3. Typical noise figure vs. frequency.

Typical Parameters, continued

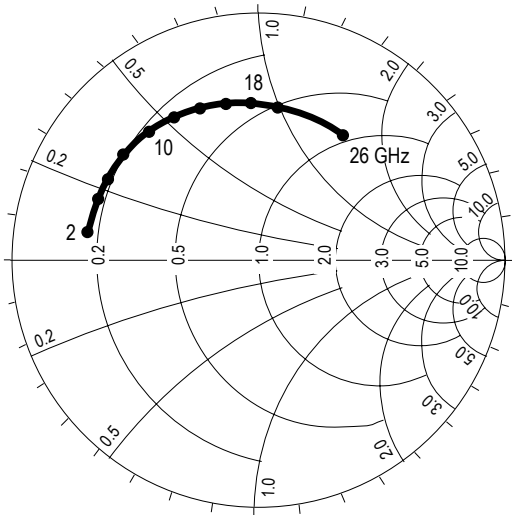


Figure 4. Typical Admittance Characteristics with 1 mA

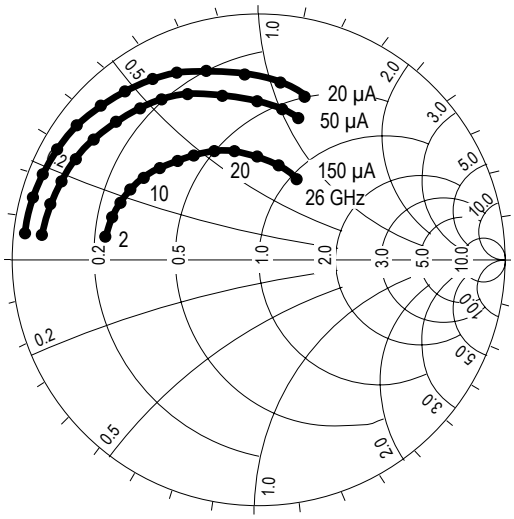


Figure 5. Typical Admittance Characteristics with

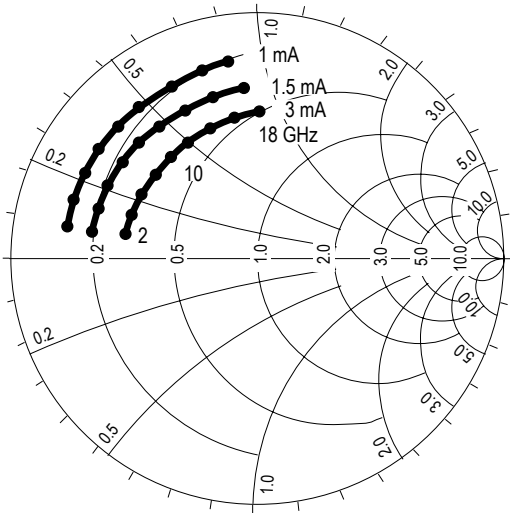


Figure 6. Typical Admittance Characteristics with Self Bias. HSCH-5512.

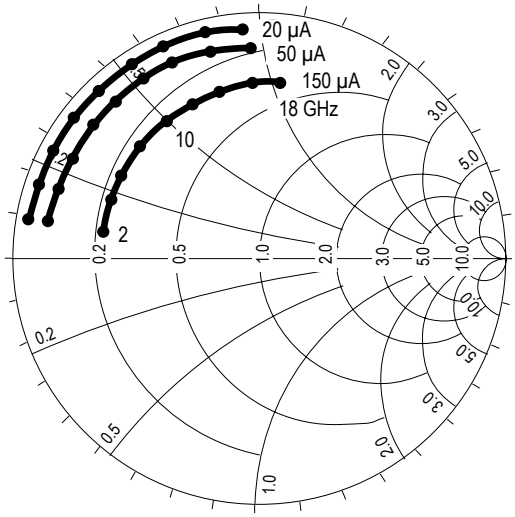
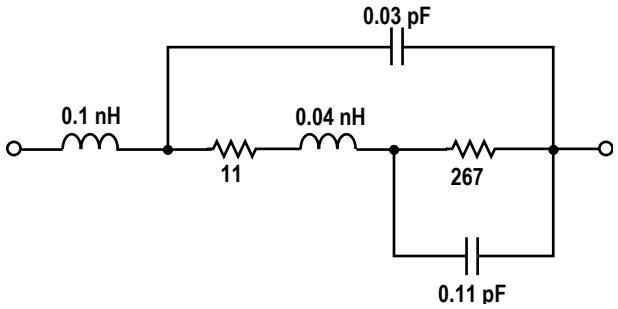


Figure 7. Typical Admittance Characteristics with External Bias.

Models for Each Beam Lead Schottky Diode

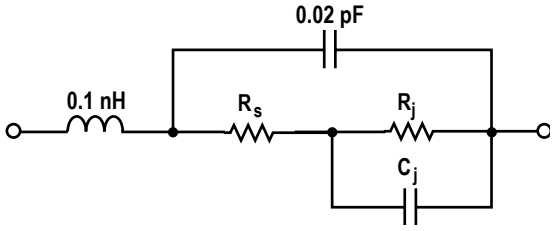
HSCH -5531

1 mA Self Bias



HSCH-5512

Self Bias

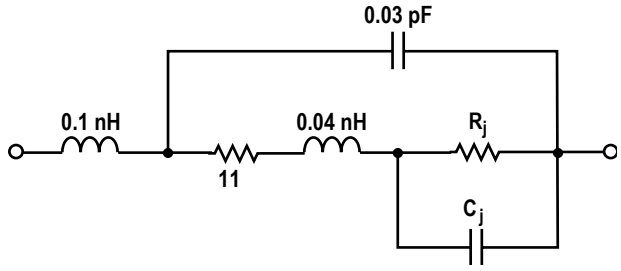


	1.0 mA Self Bias			1.5 mA Self Bias			3.0 mA Self Bias		
Part Number	**R_1 (Ω)**	**R_2 (Ω)**	**C (pF)**	**R_1 (Ω)**	**R_2 (Ω)**	**C (pF)**	**R_1 (Ω)**	**R_2 (Ω)**	**C (pF)**
HSCH-5512	5.0	393	0.11	5.2	232	0.11	5.0	150	0.12

Models for Each Beam Lead Schottky Diode, continued

HSCH -5531

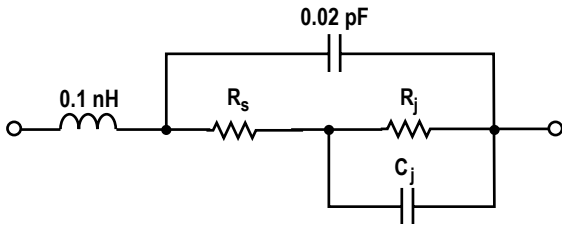
External Bias



	20 μA DC Bias		50 μA DC Bias		150 μA DC Bias	
Part Numbers	**R_j (Ω)**	**C_j (pF)**	**R_j (Ω)**	**C_j (pF)**	**R_j (Ω)**	**C_j (pF)**
HSCH-5531	1400	0.09	560	0.09	187	0.10

HSCH-5512

External Bias



	20 μA DC Bias			50 μA DC Bias			150 μA DC Bias		
Part Numbers	**R_S (Ω)**	**R_j (Ω)**	**C_j (pF)**	**R_S (Ω)**	**R_j (Ω)**	**C_j (pF)**	**R_S (Ω)**	**R_j (Ω)**	**C_j (pF)**
HSCH-5512	2.8	1240	0.11	4.7	550	0.12	2.7	180	0.13

For product information and a complete list of distributors, please go to our web site: **www.avagotech.com**

AV01-0595EN - October 19, 2006