Agilent HSCH-9161 Zero Bias Beamlead Detector Diode

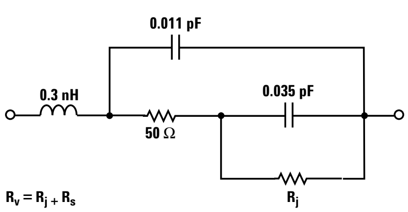
Data Sheet

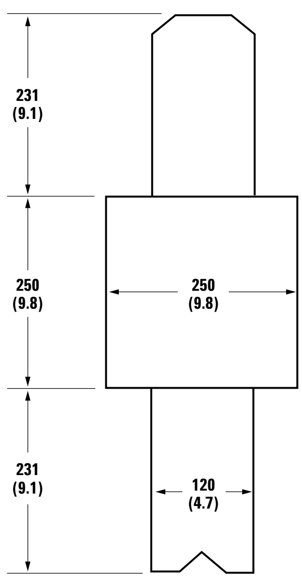
Description

Agilent's HSCH-9161 is a GaAs beamlead detector diode, fabricated using the modified barrier integrated diode (MBID) process[1]. This diode is designed for zero bias detecting applications at frequencies through 110 GHz. It can be mounted in ceramic microstrip (MIC), finline and coplanar waveguide circuits.

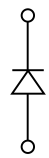
Note 1:
The diode structure and process are covered by U.S. Patent No. 4,839,709 issued to Mark Zurakowski on June 13, 1989, and assigned to Agilent.

Small Signal Linear Model





ALL DIMENSIONS IN MICRONS.



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 992, "Beam Lead Attachment Methods," or Application Note 993, "Beam Lead Device Bonding to Soft Substrates."

Features

- **Low junction capacitance**
- **Lower temperature coefficient than silicon**
- **Durable construction— typical 6 gram beamlead strength**
- **Operation to 110 GHz**

Applications

At room temperature and frequencies under 10 GHz, the silicon zero bias Schottky detectors HSMS-0005 and HSMS-2850 offer comparable performance. However, the HSCH-9161 yields virtually flat detection sensitivity from 10 to 30 GHz with good performance from 30 to 110 GHz. In a wideband matched detector, in which a shunt 50 Ω resistor is used in front of the diode, voltage sensitivity (γ) is calculated to be 1 mV/µW. Where a high-Q reactive impedance matching network is substituted for the shunt 50 Ω resistor, values of γ approaching 25 mV/µW can be expected.

In applications below 10 GHz where DC bias is not available and where temperature sensitivity is a design consideration, the HSCH-9161 offers superior stability when compared to silicon zero bias Schottky diodes.

Bonding and Handling

For more detailed information, see Agilent Application Note 999, "GaAs MMIC Assembly and Handling Guidelines."

Agilent Technologies

HSCH-9161 Absolute Maximum Ratings, $T_A = 25°C$

Symbol	Parameters/Conditions	Units	Min.	Typ.	Max.
T_{op}	Operating Temp. Range	°C	–65		175
T_{stg}	Storage Temp. Range	°C	–65		200
P_B	Burnout Power	dBm		20	

DC Specifications/Physical Properties, $T_A = 25°C$

Symbol	Parameters and Test Conditions	Units	Min.	Typ.	Max.
C_j	Junction Capacitance Test Conditions: f = 1 GHz	pF		.035	
R_V	Video Resistance Test Conditions: Zero Bias	kΩ	2.5		7.5
γ	Voltage Sensitivity Test Conditions: Zero Bias, 10 GHz, shunt 50 Ω input matching resistor	mV/µW	0.5		
—	Beamlead Strength	grams	3		

HSCH-9161 Typical Performance

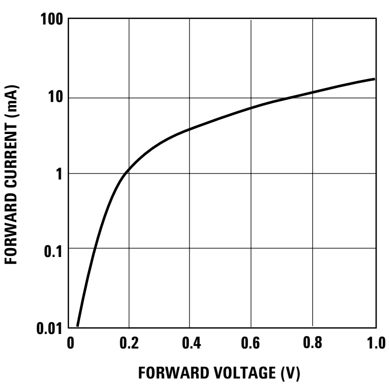


Figure 1. Forward Current vs. Forward Voltage.

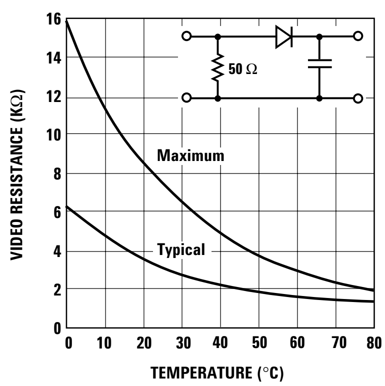


Figure 2. Typical Variation of Video Resistance vs. Temperature.

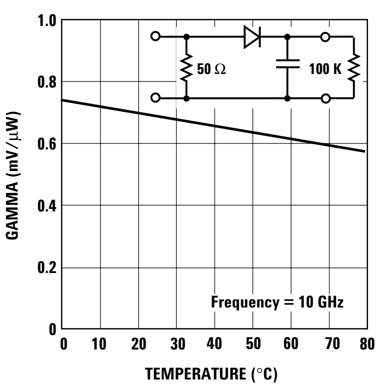
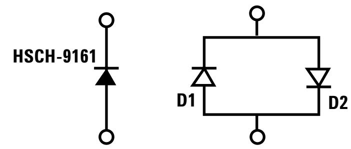


Figure 3. Calculated Variation of Voltage Sensitivity vs. Temperature.

SPICE Parameters

Because of the high leakage of this diode under reverse bias, it must be modelled as an anti-parallel pair.



D1 represents the characteristic of the HSCH-9161 under forward bias and D2 (in the forward direction) gives the V-I curve of the HSCH-9161 under reverse bias.

Parameter	Units	D1	D2
B_V	V	10	10
C_{J0}	pF	0.030	0.030
E_G	eV	1.42	1.42
I_{BV}	A	10E-12	10E-12
I_S	A	12 x 10E-6	84 x 10E-6
N		1.2	40.0
R_S	Ω	50	10
P_B (V_J)	V	0.26	0.26
P_T (XTI)		2	2
M		0.5	0.5

For product information and a complete list of Agilent contacts and distributors, please go to our web site.

www.agilent.com/semiconductors

E-mail: SemiconductorSupport@agilent.com
Data subject to change.

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