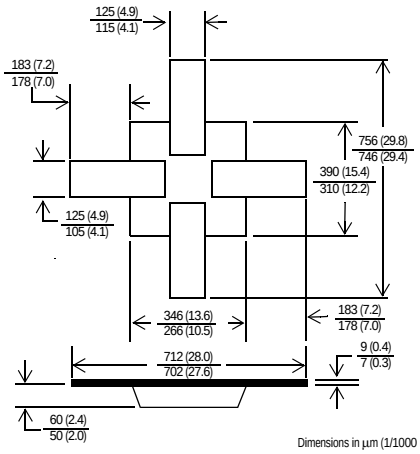
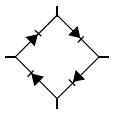
Agilent HSCH-9301/HSCH-9351 GaAs Beam Lead Schottky Barrier Ring and Bridge Diodes

Data Sheet

HSCH-9301 (Junction Side up)



Dimensions in µm (1/1000 inch)



Features

- Gold Tri-Metal System For Improved Reliability
- Low Capacitance
- Low Series Resistance
- High Cutoff Frequency
- Polyimide Passivation

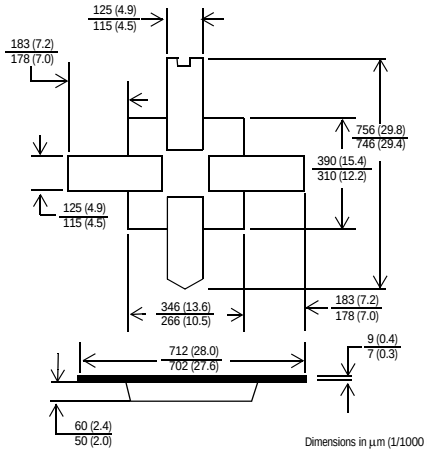
Description

The HSCH-9301 ring quad and the HSCH-9351 bridge quad are advanced gallium arsenide Schottky barrier diodes. These devices are fabricated utilizingmolecular beam epitaxy (MBE) manufacturing techniques and feature rugged construction and consistent electrical performance. A polyimide coating provides scratch protection and resistance to contamination.

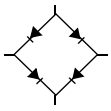
Applications

This line of Schottky diodes is optimized for use in mixer applications at millimeter wave frequencies. Some suggested mixer types are double balanced for the ring quad and biased double balanced for the bridge quad. The bridge quad can also be used in sampling circuits.

HSCH-9351 (Junction Side up)



Dimensions in µm (1/1000 inch)



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Maximum Ratings

Power Dissipation at T_{LEAD} = 25°C..... 75 mW per junction

Measured in an infinite heat sink derated linearly
to zero at maximum rated temperature

Operating Temperature.....-65°C to +150°C

Storage Temperature.....-65°C to +150°C

Mounting Temperature .....235°C for 10 seconds

Minimum Lead Strength.....6 grams

Electrical Specifications @ T_A = 25°C

Symbol	Parameters and Test Conditions	Part Number						Units
		HSCH-9301			HSCH-9351			
		Min.	Typ.	Max.	Min.	Typ.	Max.	
C_M	Measured Capacitance V_R = 0 V, f = 1 MHz		0.075	0.100		0.075	0.100	pF
C_{TA}	Total Adjacent Capacitance V_R = 0 V, f = 1 MHz		0.110			0.110		pF
C_{TD}	Total Diagonal Capacitance V_R = 0 V, f = 1 MHz		0.075			0.075		pF
ΔC_M	Measured Capacitance Difference V_R = 0 V, f = 1 MHz		0.015	0.025		0.015	0.025	pF
R_S	Series Resistance			6			6	W
V_F	Forward Voltage I_F = 1 mA		700	800		700	800	mV
ΔV_F	Forward Voltage Difference I_F = 1 mA			20			20	mV
V_{BR}	Reverse Breakdown Voltage $V_R = V_{BR}$ measure $I_R \leq$ 10 µA (per junction)				4.5			V

Typical Parameters

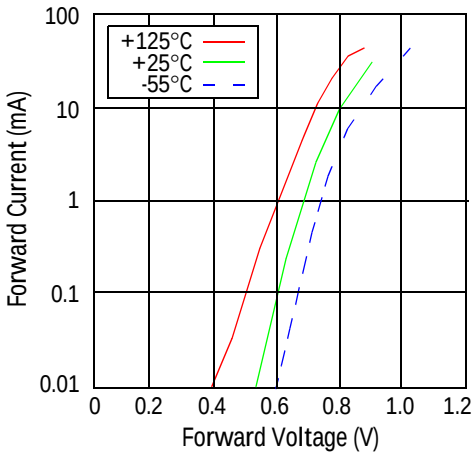

Figure 1.
Typical Forward Characteristics for
HSCH-9301, HSCH-9351

SPICE Parameters

Parameter	Units	HSCH-9XXX
B_V	V	5
C_{J0}	pF	0.04
E_G	eV	1.43
I_{BV}	A	10E-5
I_S	A	1.6 x 10E-13
N		1.20
R_S	Ω	5
P_B	V	0.7
P_T		2
M		0.5

Dynamic and Series Resistance

Schottky diode resistance may be expressed as series resistance, R_S, or as dynamic resistance, R_D. These two terms are related by the equation

$$R_D = R_S + R_j$$

where R_j is the resistance of the junction. Junction resistance of a diode with DC bias is quite accurately calculated by

$$R_j = 26/I_B$$

where I_B is the bias current in milliamperes. The series resistance is independent of current.

The dynamic resistance is more easily measured. If series resistance is specified it is usually obtained by subtracting the calculated junction resistance from the measured dynamic resistance.

Quad Capacitance

Capacitance of Schottky diode quads is measured using an HP4271 LCR meter. This instrument effectively isolates individual diode branches from the others, allowing accurate capacitance measurement of each branch or each diode. The conditions are: 20 mV R.M.S.voltage at 1 MHz. HP defines this measurement as "C_M," and it is equivalent to the capacitance of the diode by itself. The equivalent diagonal and adjacent capacitances can then be calculated by the formulas given below.

In a quad, the diagonal capacitance is the capacitance between points A and B as shown in Figure 2. The diagonal capacitance is calculated using the following formula

$$C_{DIAGONAL} = \frac{C_1 \times C_2}{C_1 \times C_2} + \frac{C_3 \times C_4}{C_3 \times C_4}$$

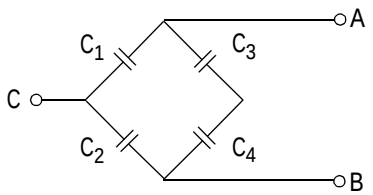

Figure 2.

The equivalent capacitance is the capacitance between points A and C in Figure 2. This capacitance is calculated using the following formula

$$C_{ADJACENT} = C_1 + \frac{1}{\frac{1}{C_2} + \frac{1}{C_3} + \frac{1}{C_4}}$$

Assembly Techniques

Diodes are ESD sensitive. ESD preventive measures must be employed in all aspects of storage, handling, and assembly.

Diode ESD precautions, handling considerations, and bonding methods are critical factors in successful diode performance and reliability.

Agilent application note #55, "Beam Lead Diode Bonding and Handling Procedures" provides basic information on these subjects.

Notes:

This data sheet contains a variety of typical and guaranteed performance data. The information supplied should not be interpreted as a complete list of circuit specifications. In this data sheet the term *typical* refers to the 50th percentile performance. For additional information contact your local Agilent Technologies' sales representative.