Agilent HSCH-9301
GaAs Beam Lead Schottky Ring Quad Diode

Data Sheet

Features

- **Gold tri-metal system for improved reliability**
- **Low capacitance**
- **Low series resistance**
- **High cutoff frequency**
- **Polyimide passivation**

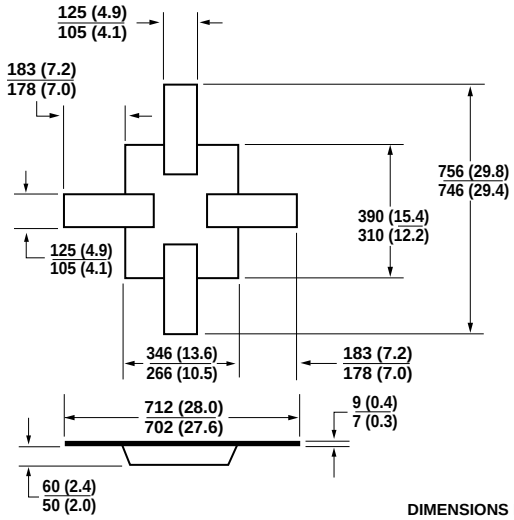
Description

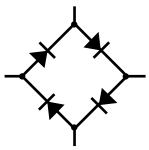
The HSCH-9301 ring quad uses advanced gallium arsenide Schottky barrier diodes. These diodes are fabricated utilizing molecular beam epitaxy (MBE) manufacturing techniques. It features rugged construction and consistent electrical performance. A polyimide coating provides scratch protection and resistance to contamination.

Applications

This Schottky diode is optimized for use in mixer applications at millimeter wave frequencies.

HSCH-9301 (Junction Side Up)





L = 0.1 nH

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

HSCH-9301 Electrical Specifications at T_A = 25°C

Symbol	Parameters and Test Conditions	Units	Min.	Typ.	Max.
C_M	Measured Capacitance V_R = 0 V, f = 1 MHz	pF		0.075	0.100
C_{TA}	Total Adjacent Capacitance V_R = 0 V, f = 1 MHz	pF		0.110	
C_{TD}	Total Diagonal Capacitance V_R = 0 V, f = 1 MHz	pF		0.075	
ΔC_M	Measured Capacitance Difference V_R = 0 V, f = 1 MHz	pF		0.015	0.025
R_S	Series Resistance	W			6
V_F	Forward Voltage, I_F = 1 mA	mV		700	800
ΔV_F	Forward Voltage Difference, I_F = 1 mA	mV			20

Typical Parameters

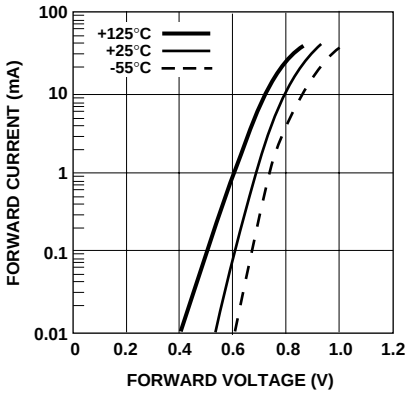

Figure 1. Typical Forward Characteristics for HSCH-9301.

SPICE Parameters

Parameter	Units	HSCH-9301
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. Agilent 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

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

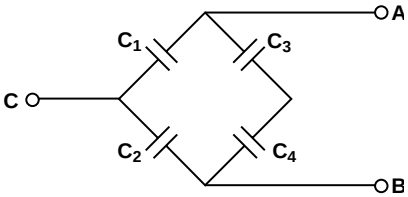

Figure 2.

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

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

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.

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Data subject to change.

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