HEWLETT® PACKARD

Schottky Barrier Diode Quads for Double Balanced Mixers

Technical Data

5082-2830

Features

- **Small Size**
  Eases Broad Band Designs
- **Tight Match**
  Improves Mixer Balance
- **Improved Balance over Temperature**
- **Rugged Design**

Description/Applications

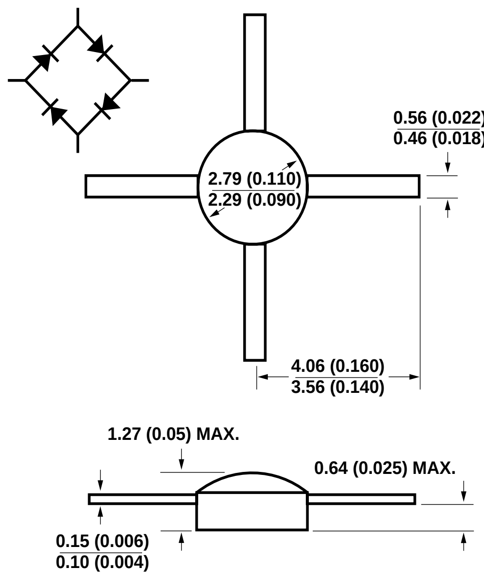
This matched diode quad uses a monolithic array of Schottky diodes interconnected in ring configuration. The relative proximity of the diode junction on the wafer assures uniform electrical characteristics and temperature tracking.

These diodes are designed for use in double balanced mixers, phase detectors, AM modulators, and pulse modulators requiring wideband operation and small size. the low barrier diodes allow for optimum mixer noise figure at lower than conventional local oscillator levels. the wider dynamic range of the medium barrier diodes allows for better distortion performance.

Note: For new designs, the HSMS-820X series of surface mount microwave diodes are recommended.

Outline E4

C_P = 0.07 pF diagonal C_P = 0.09 pF adjacent



DIMENSIONS IN MILLIMETERS AND (INCHES).

Maximum Ratings

Operating and Storage Temperature Range
E4 .... -65°C to +125°C

DC Power Dissipation .... 75 mW per Juction
Derated linearly to zero at maximum rated temperatures (measured in infinite heat sink at T_{CASE} = 25°C).

Soldering Temperature
E4 .... 220°C for 10 sec

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

Electrical Specifications at $T_A = 25°C$

Part Number 5082-	Package	Barrier	Maximum Capacitance C_M (pF)	Maximum Measured Capacitance Difference ΔC_M (pF)	Maximum V_F Difference ΔV_F (mV)	Maximum Dynamic Resistance R_D (Ω)	Typical Parameters: Forward Voltage V_F (V)
2830	E4	Medium	0.5 Typ.	0.20	20	12	0.40
Test Conditions			$V_R = 0$ f = 1 MHz		$I_F = 5$ mA between Adjacent Leads		$I_F = 1$ mA Measured between Adjacent Leads

Package Characteristics

The HP outline E4 package is designed for MIC, Microstrip, and Stripline use from dc through C-Band. The leads provide a good continuity of transmission line impedance to the monolithic diode array. The leads are tin plated copper.

Dynamic and Series Resistance

Schottky diode resistance may be expressed as series resistance, R_S, or as dynamic ressitance, 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.

SPICE Parameters

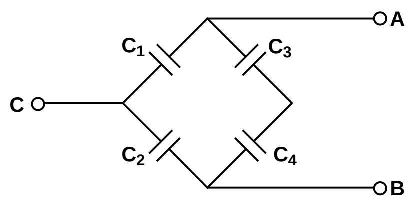
Parameter	Units	5082-2830
B_V	V	10
C_{J0}	pF	4
E_G	eV	0.69
I_{BV}	A	10E-5
I_S	A	2 x 10E-10
N		1.08
R_S	Ω	6
P_B	V	0.65
P_T		2
M		0.5

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 “CM”, 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 below. The diagonal capacitance is calculated using the following formula

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



The equivalent adjacent capacitance is the capacitance between points A and C in figure below. This capacitance is calculated using the following formula

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