HEWLETT PACKARD

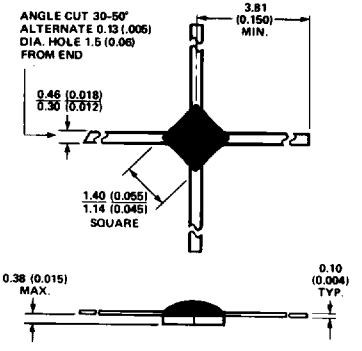
Schottky Barrier Diode Quads for Double Balanced Mixers

Technical Data

5082-2231
5082-2233
5082-2263
5082-2271/72
5082-2277
5082-2279/80
5082-2291/92
5082-2294
5082-2830/31

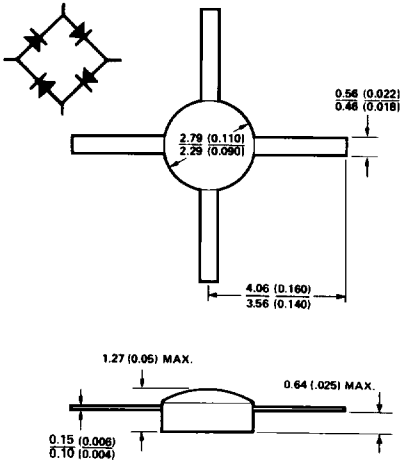
Features

- **Small Size**
  Eases Broad Band Designs
- **Tight Match**
  Improves Mixer Balance
- **Improved Balance over Temperature**
- **Rugged Design**
- **Both Medium and Low Barrier Diodes Available**



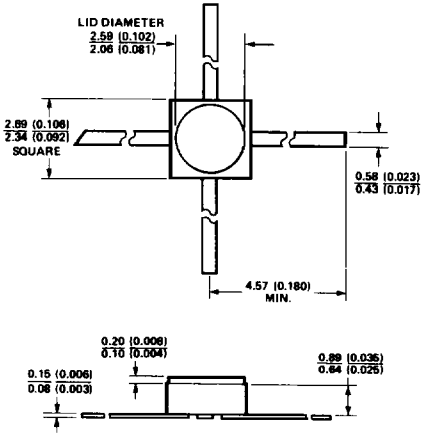
Outline C4

C_P = 0.05 pF diagonal C_P = 0.07 pF adjacent



Outline E4

C_P = 0.07 pF diagonal C_P = 0.09 pF adjacent



Outline H4

C_P = 0.16 pF diagonal C_P = 0.20 pF adjacent

DIMENSIONS IN MILLIMETERS (INCHES)

Description/ Applications

These matched diode quads use 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.

Maximum Ratings

Junction Operating and Storage Temperature Range
- H4 Packaged Diodes ..... -65°C to +150°C
- E4 ..... -65°C to +125°C
- C4 Packaged Diodes ..... -65°C to +150°C

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

Soldering Temperature
- H4 ..... 260°C for 10 sec.
- C4 ..... 235°C for 10 sec.
- E4 ..... 220°C for 10 sec.

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

Selection Guide

Frequency / Package Outline	Barrier	To 2 GHz	2-4 GHz	4-8 GHz	8-12 GHz	12-18 GHz
E4	Medium	5082-2830	5082-2277	5082-2277		
Low Cost	Low	5082-2831				
H4	Medium	5082-2263	5082-2263	5082-2263		
Hermetic	Low	5082-2231	5082-2231	5082-2233		
C4	Medium	5082-2291	5082-2291	5082-2292	5082-2294	5082-2294
Broadband	Low	5082-2271	5082-2271	5082-2272	5082-2279	5082-2280

Electrical Characteristics at $T_A = 25°C$

Typical Parameters

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)	Forward Voltage V_F (V)
2231	H4	Low	0.60	0.10	20	12	0.25
2233			0.40	0.05		16	0.30
2263		Medium	0.40	0.05		16	0.45
2830	E4		0.5 Typ.	0.20		12	0.40
2831		Low	0.5 Typ.	0.20		12	0.25
2277		Medium	0.50	0.10		15	0.35
2271	C4	Low	0.60	0.10		12	0.25
2272			0.40	0.10		15	0.25
2279			0.25	0.05		16	0.30
2280			0.20	0.05		16	0.30
2291		Medium	0.60	0.10		12	0.35
2292			0.40	0.10		15	0.35
2294			0.20	0.05		16	0.45
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 X-Band. The leads provide a good continuity of transmission line impedance to the monolithic diode array. The leads are tin plated copper.

The C4 subminiature package is a ceramic carrier whose gold plated kovar leads are brazed to the substrate for maximum package ruggedness. If the leads are to be formed, they should be restricted so the bend starts at least 0.25 mm (0.01 inch) from the package body. The semiconductor is protected from mechanical abrasion by epoxy. The H4 miniature package is a hermetic metal-ceramic device, which makes it ideal for applications requiring high reliability. The leads are gold plated kovar. Outline H4 is capable of passing many of the environmental tests of MIL-STD-750. The applicable solderability test is reference 2031.1: 260°C, 10 seconds.

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 1. The diagonal capacitance is calculated using the following formula:

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

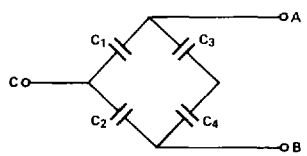


Figure 1.

The equivalent adjacent capacitance is the capacitance between points A and C in Figure 1. This capacitance is calculated using the following formula:

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

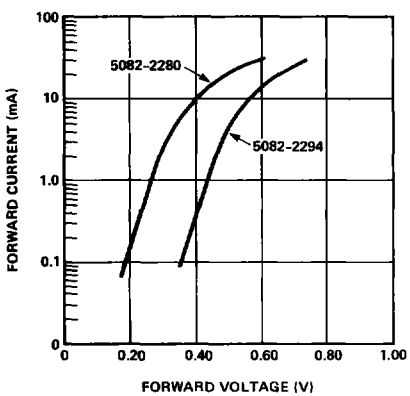


Figure 2. Typical Forward Characteristics at T_A = 25°C.

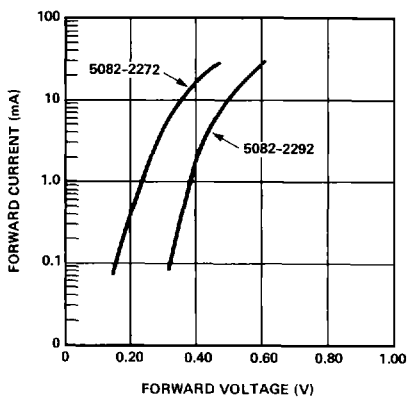


Figure 3. Typical Forward Characteristics at T_A = 25°C.