Agilent 8474B/C/E
Planar-Doped Barrier Diode Detectors

0.01 to 50 GHz

Data Sheet

Features and description

- Exceptional flatness
- Broadband from 0.01 to 50 GHz
- Extremely temperature stable
- Environmentally rugged

The 8474 series of coaxial detectors are specifically designed for use in microwave instrumentation and systems. These detectors utilize a GaAs diode matched to a 50 ohm transmission line with a miniature thin film circuit.

The diodes are a Planar-Doped Barrier (PDB) structure fabricated by use of Molecular Beam Epitaxy technology. This combination yields a device which has superior characteristics to point-contact and low-barrier Schottky devices. These characteristics are reflected in frequency response specification and in square law response vs. frequency (Figure 7) with PDB detectors showing a maximum square law response variation of 3% from 2 to 18 GHz vs. 9.5% for Schottky detectors.

These detectors are extremely rugged with high resistance to ESD damage and are less sensitive to temperature change than either point-contact or Schottky diodes. These products offer 10 MHz to 50 GHz performance with the 2.4 mm connector (8474E) or narrower frequency coverage with APC-7 Type N or SMAcompatible 3.5 mm and 2.92 mm connectors. There is no need to order matched pairs because the frequency tracking is better than the original matched pair specifications.

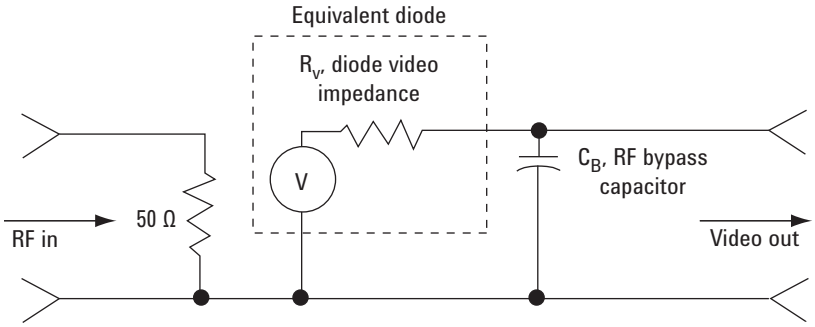


Figure 1. Equivalent circuit for 8474A/B/C/D/E with typical parameters

Typical values:

R_V (diode video impedance) = 1.5 kΩ*

C_B (RF bypass capacitor) = 27 pF nominal

$$\text{TR (10 to 90\% risetime)} = 2.2\,\frac{(R_{LOAD})\,(R_V)}{R_{LOAD} + R_V}\,(C_B + C_{LOAD}) = \frac{0.35}{BW}$$

**@ 25° C and PIN ≤ -20 dBm (see Figure 7)*

Detector performance characteristics

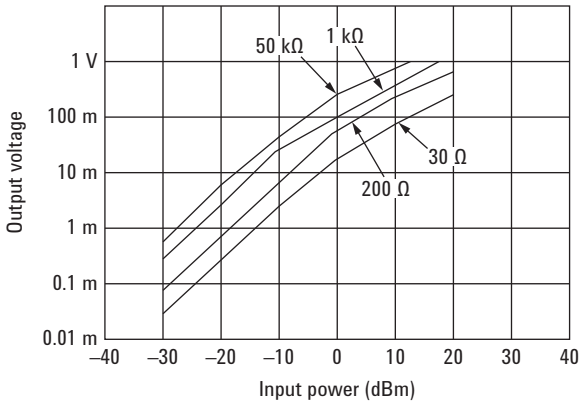


Figure 2. Typical transfer characteristics (Ta = 25 °C)

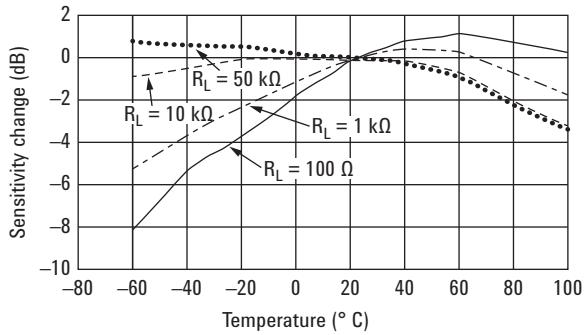


Figure 5. Typical output response with temperature (Pin ≤ –20 dBm)

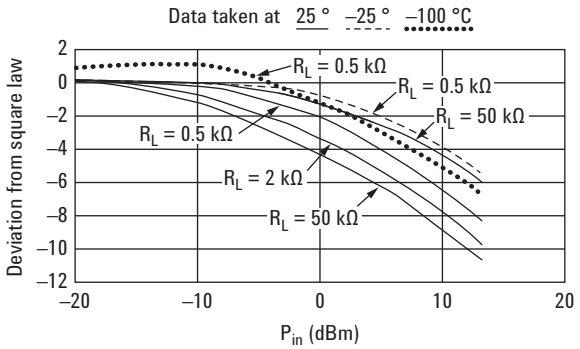


Figure 3. Typical square law deviation

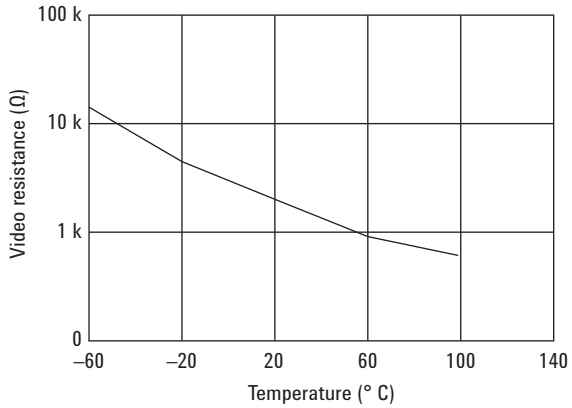


Figure 6. Typical video impedance variation with temperature

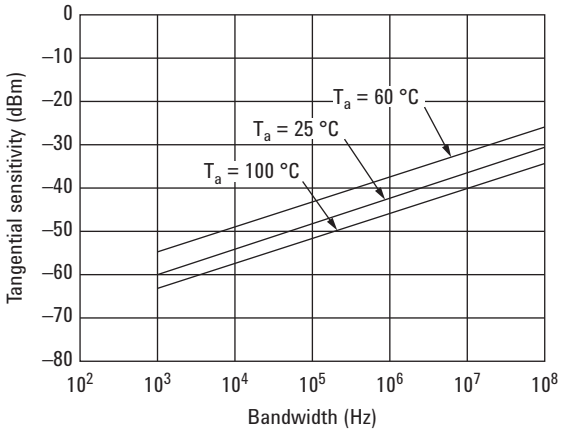


Figure 4. Typical tangential sensitivity

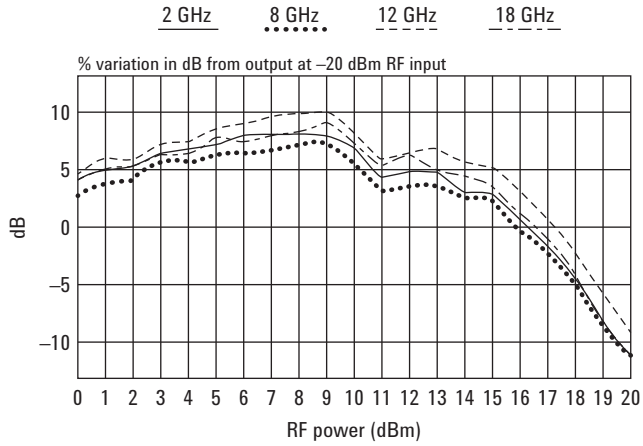


Figure 7. Typical square law deviation due to frequency

Specifications

	8474B	8474C	8474E
Frequency range	0.01 to 18 GHz	0.01 to 33 GHz	0.01 to 50 GHz
Frequency response	±0.35 dB	±0.45 dB from 0.01 to 26.5 GHz	±0.4 dB from 0.01 to 26.5 GHz
		±0.7 dB from 26.5 to 33 GHz	±0.6 dB from 26.5 to 40 GHz ±1.0 dB from 40 to 50 GHz
SWR	< 1.3	< 1.4 .01 to 26.5 GHz < 2.2 26.5 to 33 GHz	< 1.2 .01 to 26.5 GHz < 1.6 26.5 to 40 GHz < 2.8 40 to 50 GHz
Low-level sensitivity	> 0.4 mV/µW	> 0.4 mV/µW	> 0.4 mV/µW > 0.34 mV/µW 40 to 50 GHz
Maximum operating inputs	200 mW	200 mW	200 mW
Typical short-term maximum input	0.75 watt (< 1 min.)	0.75 watt (< 1 min.)	0.75 watt (< 1 min.)
Noise (µV peak-to-peak with CW power applied to produce 100 MV output, 400 kHz BW)	< 50 µV	< 50 µV	< 50 µV
Standard output polarity (default)	negative	negative	negative

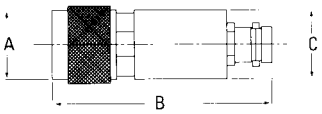
Notes:

Above specifications are at 25 °C and ≤ –20 dBm unless otherwise specified.

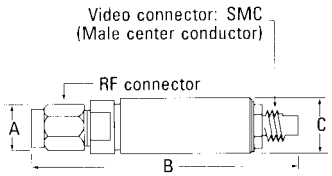
Negative polarity (Option 301) is a default option. Select Option 103 for positive polarity.

Mechanical information

	8474B	8474C	8474E
Dimensions mm (inches)	20.82 (0.82) 59.86 (2.36) 18.68 (0.74)	7.9 (0.31) 41.15 (1.62) 9.7 (0.38)	7.9 (0.31) 37.36 (1.47) 7.6 (0.30)
Input connector	Type N (m)	3.5 mm (m) SMA compatible	2.4 mm (m) 1.85 min compatible
Output connector	BNC (f)	SMC (m)	SMC (m)
Net weight	85.3 grams (3 oz.)	13.9 grams (0.49 oz.)	9.1 grams (0.32 oz.)



8474B



8474C/E

8474B options	002	004	008	012	018
Frequency range (GHz)	0.01 to 2	2 to 4	4 to 8	8 to 12.4	12.4 to 18
Frequency response (dB)	±0.25	±0.25	±0.25	±0.25	±0.35
SWR	< 1.09	< 1.1	< 1.2	< 1.3	< 1.31

8474C options	004	008	012	018	026	033
Frequency range (GHz)	2 to 4	4 to 8	8 to 12.4	12.4 to 18	18 to 26.5	26.5 to 33
Frequency response (dB)	±0.2	±0.2	±0.25	±0.3	±0.3	±0.3
SWR	< 1.1	< 1.16	< 1.2	< 1.3	< 1.41	< 2.2

Environmental	
Operating temperature*	–65 to 100° C
Temperature cycling (non-operating)	MIL-STD 883, method 1010.1: (-65 to 100° C)
Vibration	MIL-STD 883, method 2007: (0.6" D.A. 20 to 80 Hz, 20g, 80 to 200 Hz)
Shock	MIL-STD 883, method 2002.1: (500g, 0.5 msec)
Acceleration	MIL-STD 883, method 2001: (500g)
Altitude	MIL-STD 883, method 1001: (50,000 ft, 15,240 m)
Salt atmosphere	MIL-STD 883, method 1009.1: (48 hr, 5% solution)
Moisture resistance	MIL-STD 883, method 1004.1: (25 to 40° C, 95% RH)
RFI	MIL-STD 461B
ESD	10 hits at 25kV to the body, not the center conductor

* *8474A/B specified for 0 to 75 °C.*

Ordering information

Model	Option number	Option description
8474B	002	0.01 to 2 GHz octave only
	004	2 to 4 GHz octave only
	008	4 to 8 GHz octave only
	1021	Square law load
	103	Positive Polarity
	301	Negative Polarity
8474C	008	4 to 8 GHz octave only
	012	8 to 12.4 GHz octave only
	033	26.5 to 33 GHz octave only
	103	Positive Polarity
	301	Negative Polarity

1. *Option 102 external square law load extends the square law region of the detector with deviation of ± 0.5 dB from the ideal square law response.*

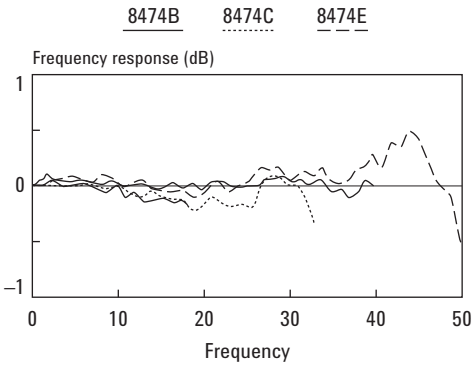


Figure 8. Typical frequency response

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