

Keysight 8474B/C/E

Planar-Doped Barrier Diode Detectors 0.01 to 50 GHz

Data Sheet



Introduction

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 Ω 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 SMA compatible 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.

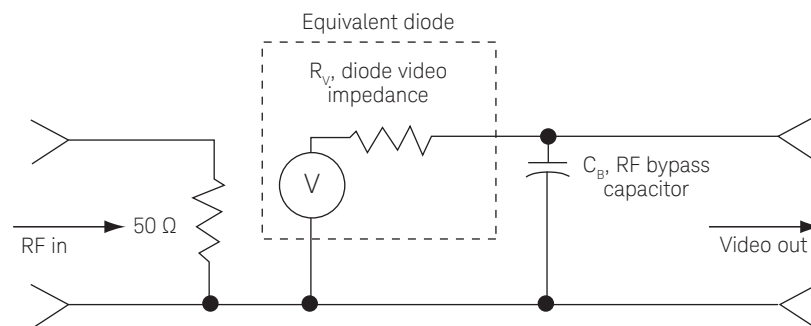


Figure 1. Equivalent circuit for 8474A/B/C/D/E with typical parameters

Typical values:

R_V (diode video impedance) $\sim 1.5 \text{ k}\Omega^*$

C_B (RF bypass capacitor) $\sim 27 \text{ pF}$ nominal

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

*@ 25 $^{\circ}\text{C}$ and $PIN \leq -20 \text{ dBm}$ (see Figure 7)

Detector Performance Characteristics

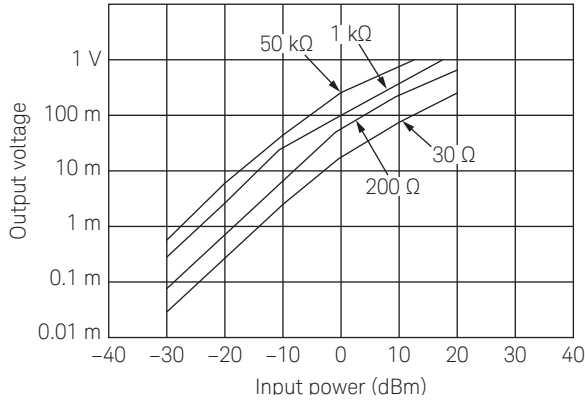


Figure 2. Typical transfer characteristics ($T_a = 25^\circ\text{C}$)

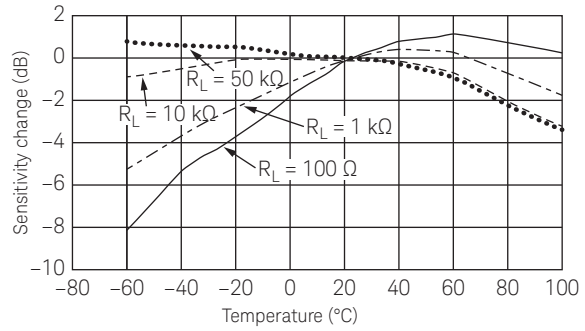


Figure 5. Typical output response with temperature ($P_{in} \leq -20\text{ dBm}$)

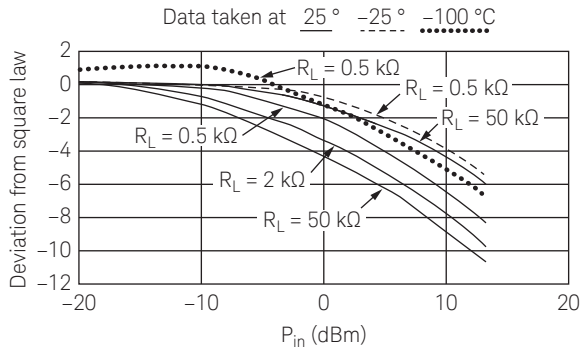


Figure 3. Typical square law deviation

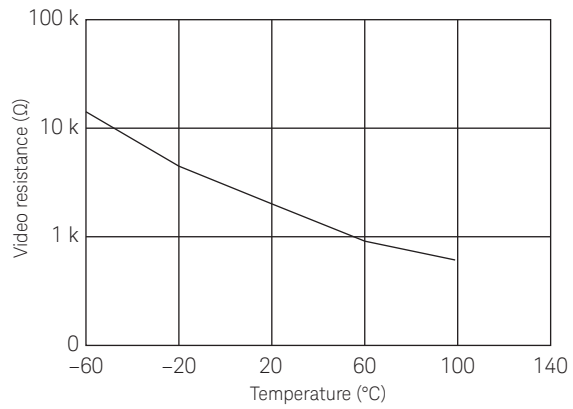


Figure 6. Typical video impedance variation with temperature

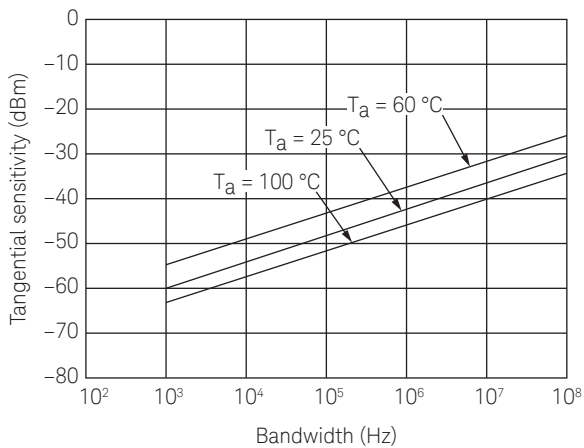


Figure 4. Typical tangential sensitivity

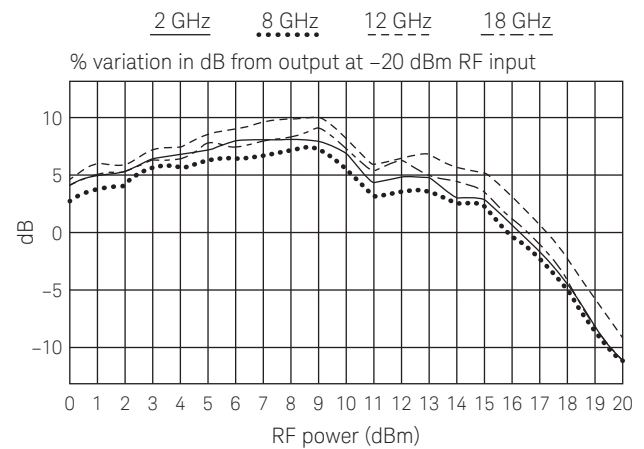


Figure 7. Typical square law deviation due to frequency

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 ± 0.7 dB from 26.5 to 33 GHz | ± 0.4 dB from 0.01 to 26.5 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 |

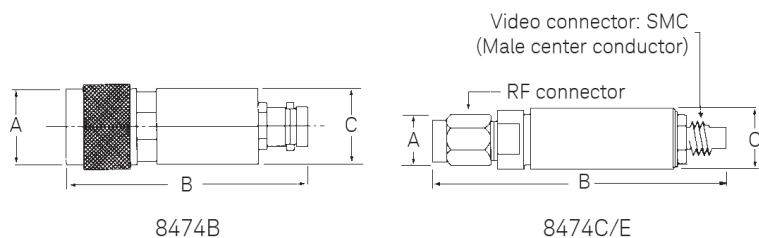
Notes:

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 options | 001 | 002 | 004 | 008 |
|-------------------------|------------|------------|------------|------------|
| Frequency range (GHz) | 0.01 to 18 | 0.01 to 2 | 2 to 4 | 4 to 8 |
| Frequency response (dB) | ± 0.35 | ± 0.25 | ± 0.25 | ± 0.25 |
| SWR | < 1.31 | < 1.09 | < 1.1 | < 1.2 |
| 8474C options | 001 | 008 | 012 | 033 |
| Frequency range (GHz) | 0.01 to 33 | 4 to 8 | 8 to 12.4 | 26.5 to 33 |
| Frequency response (dB) | ± 0.3 | ± 0.2 | ± 0.25 | ± 0.3 |
| SWR | < 2.2 | < 1.16 | < 1.2 | < 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, 20 g, 80 to 200 Hz) |
| Shock | MIL-STD 883, method 2002.1: (500 g, 0.5 msec) |
| Acceleration | MIL-STD 883, method 2001: (500 g) |
| 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 400 °C, 95% RH) |
| RFI | MIL-STD 461B |
| ESD | 10 hits at 25 kV 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 |
| | 102 ¹ | 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.

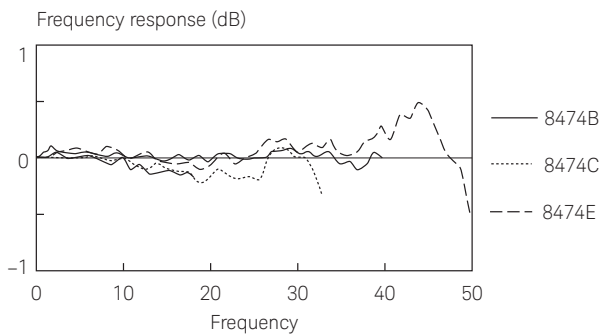
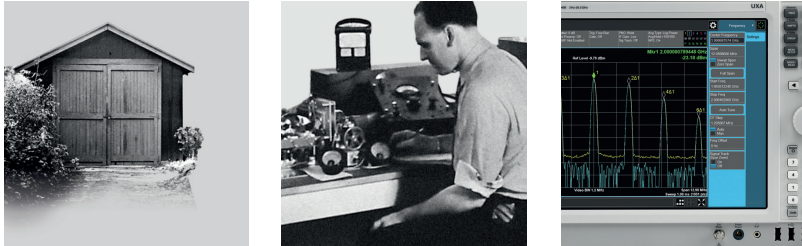


Figure 8. Typical frequency response

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