

Keysight Technologies

423B, 8470B, 8472B, 8473B/C

Low Barrier Schottky Diode Detectors



Keysight 423B



Keysight 8470B



Keysight 8472B



Keysight 8473B



Keysight 8473C

Data Sheet

Introduction

- Excellent broadband flatness
- Low broadband SWR
- High burnout protection
- Environmentally rugged
- Field replaceable diode elements

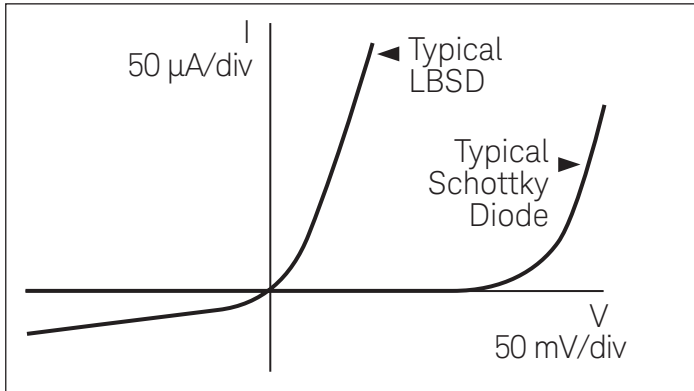


Figure 1. Diode V/I characteristics

Keysight Technologies, Inc. offers a complete family of high performance Low Barrier Schottky Diode Detectors which cover the 10 MHz to 26.5 GHz frequency range. These general purpose components are widely used for CW and pulsed power detection, leveling of sweepers, and frequency response testing of other microwave components. These detectors do not require a dc bias and can be used with common oscilloscopes, thus their simplicity of operation and excellent broadband performance make them useful measurement accessories.

These detectors use a Low-Barrier Schottky Diode (LBSD), specially fabricated with low origin resistance and low junction capacitance. This results in improved broadband flatness and SWR over point-contact diode detectors, thus yielding more accurate measurements. These detectors also offer very good ruggedness and burnout protection. As with all Keysight detectors, these models integrate the diode with the other circuit elements thus minimizing stray reactances and optimizing broadband performance. For economical field repair, replaceable detector modules are available.

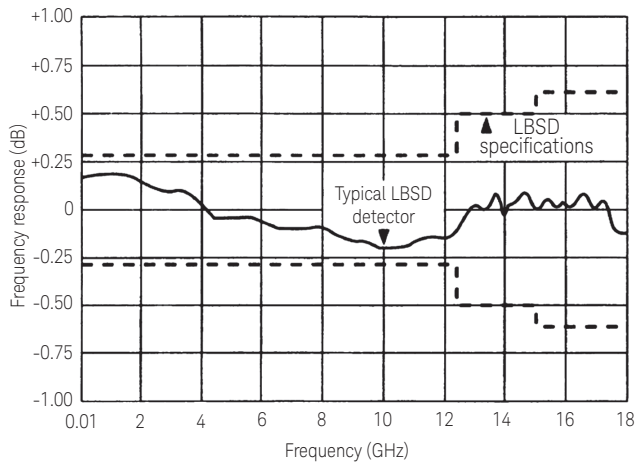


Figure 2. Detector frequency response specifications

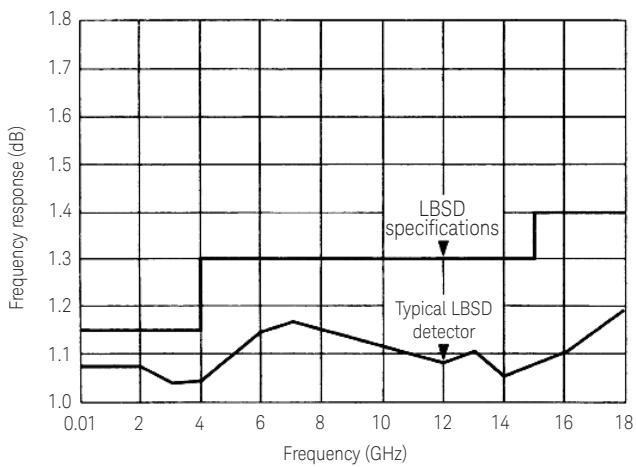


Figure 3. Detector SWR specifications

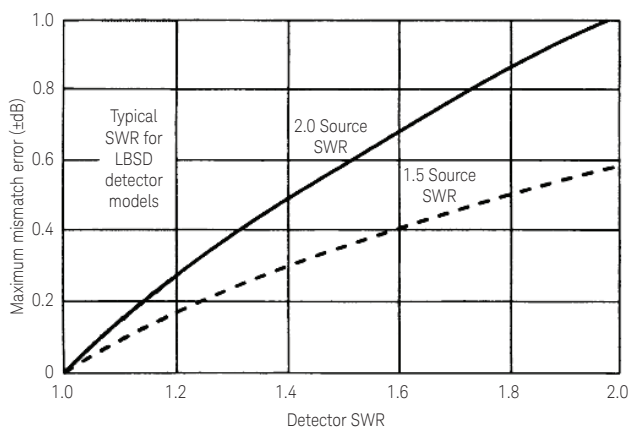


Figure 4. Measurement uncertainty due to detector source mismatch

Field-replaceable detector elements

In the event of diode burnout, field-replaceable detector elements are available for economical customer repair. The critical components are supplied (and tested) as an integrated unit, with the mount playing only a minor role in determining frequency response and SWR. The following table lists field-replaceable detector modules that have been tested to their respective specifications.

Table 1.

| Keysight model | Keysight replacement part number |
|------------------|----------------------------------|
| 423B | 00423-60003 |
| 8470B | 08470-60012 |
| 8472B | 08470-60012 |
| 8473B | 08473-80001 |
| Option 8473B-001 | 08473-80002 |
| Option 8473B-003 | 08473-80003 |
| 8473C | 08473-80004 |
| Option 8473C-001 | 08473-80005 |
| Option 8473C-003 | 08473-80006 |

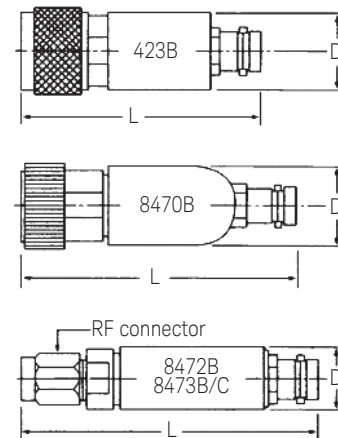


Figure 5. Drawing dimensions given in specification table

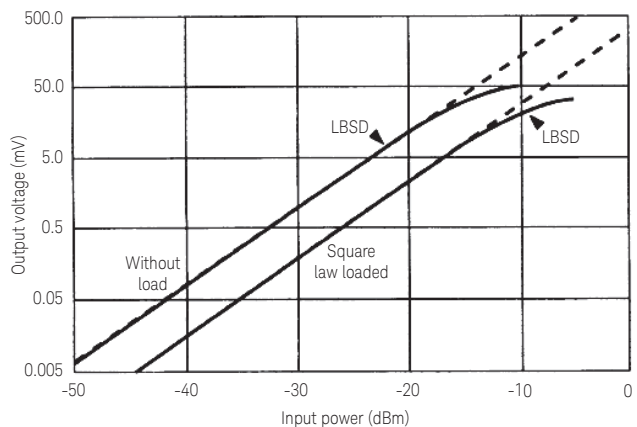


Figure 6. Typical detector square-law response

Specifications

| Specifications ¹ | Keysight 423B | Keysight 8473B | Keysight 8473C | Keysight 8470B | Keysight 8472B |
|--|--|--|---|---|--|
| Frequency range ² | 0.01 to 12.4 GHz | 0.01 to 18 GHz | 0.01 to 26.5 GHz | 0.01 to 18 GHz | 0.00 to 18 GHz |
| Frequency response | ±0.2 dB | ±0.2 dB | ±0.2 dB | ±0.2 dB | ±0.2 dB |
| Octave band flatness (over any octave 0.01 to 8 GHz) | | | | | |
| Broadband flatness | 0.01 dB to 12.4 GHz: ±0.3 dB | 0.01 to 12.4 GHz: ±0.3 dB 0.01 to 18 GHz: ±0.6 dB | 0.01 to 12.4 GHz: ±0.3 dB 0.01 to 20 GHz: ±6 dB 20 to 26.5 GHz: ±1.5 dB from a 3.3 dB linear slope | 0.01 to 12.4 GHz: ±0.3 dB 0.01 to 15 GHz: ±0.5 dB 0.01 to 18 GHz: ±0.6 dB | 0.01 to 12.4 GHz: ±0.3 dB 0.01 to 15 GHz: ±0.5 dB |
| SWR ³ , maximum (50 Ω characteristic impedance) | 0.01 to 4 GHz: 1.15 4 to 12.4 GHz: 1.30 | 0.01 to 4 GHz: 1.2 4 to 18 GHz: 1.5 | 0.01 to 4 GHz: 1.2 4 to 18 GHz: 1.5 18 to 26.5 GHz: 2.2 | 0.01 to 4 GHz: 1.15 4 to 15 GHz: 1.30 15 to 18 GHz: 1.70 | 0.01 to 4.5 GHz: 1.20 4.5 to 7 GHz: 1.35 |
| Maximum operating input (Peak or average) | 200 mW | 200 mW | 200 mW | 200 mW | 200 mW |
| Short-term maximum Input (less than 1 min.) | 1 watt (typical) | 1 watt (typical) | 1 watt (typical) | 1 watt (typical) | 1 watt (typical) |
| Low level sensitivity ⁴ | > 0.5 mV/μW | > 0.5 mV/μW | 0.01 to 18 GHz: > 0.5 mV/μW 18 to 26.5 GHz: > 0.18 mV/μW | > 0.5 mV/μW | > 0.5 mV/μW |
| High level sensitivity | < 3.5 mV produces 100 mV output (for 8473C, up to 18 GHz only) | | | | |
| Noise (μV peak-to-peak with CW power applied to produce 100 mV output) | < 50 μV | < 50 μV | < 50 μV | < 50 μV | < 50 μV |
| Environmental qualifications | | | | | |
| Operating temperature | 0 to 55°C | -20 to +85°C | -20 to +85°C | -20 to +85°C | -20 to +85°C |
| Vibration | 20 G's, 80 - 2000 Hz | 20 G's, 80 - 2000 Hz | 20 G's, 80 - 2000 Hz | 20 G's, 80 - 2000 Hz | 20 G's, 80 - 2000 Hz |
| Shock | 100 G's, 11 ms | 100 G's, 11 ms | 100 G's, 11 ms | 100 G's, 11 ms | 100 G's, 11 ms |
| Output polarity | Negative | Negative | Negative | Negative | Negative |
| Input connector | Type N Male | 3.5 mm Male (SMA Compatible) | 3.5 mm Male (SMA Compatible) | APC-7 (Option 701) Type N Male (Option 012) | SMA Male |
| Output connector | BNC Female | BNC Female | BNC Female | BNC Female | BNC Female (Option 101) OSSM (Option 100) |
| Video impedance | 1 kΩ to 2 kΩ 1.3 kΩ (typical) | 1 kΩ to 2 kΩ 1.3 kΩ (typical) | 1 kΩ to 2 kΩ 1.3 kΩ (typical) | 1 kΩ to 2 kΩ 1.3 kΩ (typical) | 1 kΩ to 2 kΩ 1.3 kΩ (typical) |
| RF bypass capacitor | 20 pF to 60 pF 30 pF (typical) | 20 pF to 60 pF 30 pF (typical) | 20 pF to 60 pF 30 pF (typical) | 20 pF to 60 pF 30 pF (typical) | 20 pF to 60 pF 30 pF (typical) |
| Dimensions in mm (inches) | | | | | |
| Length | 63 (2.47) | 48 (1.89) | 43 (1.89) | 64 (2.50) | 64 (2.50) |
| Diameter | 20 (0.38) | 10 (0.39) | 10 (0.39) | 19 (0.75) | 14 (0.56) |
| Weight in grams (oz) | | | | | |
| Net | 114 (4) | 14 (0.5) | 14 (0.5) | 114 (4) | 57 (2) |
| Shipping | 454 (16) | 454 (16) | 454 (16) | 454 (16) | 454 (16) |
| Options | | | | | |
| xxxx-001 | | | | | |
| Matched response | Tracking: | Tracking: | Tracking: | Tracking: | Tracking: |
| Provides a pair of detectors with matched frequency response | 0.01 to 12.4 GHz: ±0.2 dB | 0.01 to 12.4 GHz: ±0.2 dB 12.4 to 18 GHz: ±0.3 dB | 0.01 to 12.4 GHz: ±0.2 dB 12.4 to 18 GHz: ±0.3 dB 18 to 26.5 GHz: ±0.5 dB | 0.01 to 12.4 GHz: ±0.2 dB 12.4 to 18 GHz: ±0.3 dB | 0.01 to 12.4 GHz: ±0.2 dB 12.4 to 18 GHz: ±0.3 dB |
| xxxx-002 | Optimum square-law load | Optimum square-law load | Optimum square-law load | Optimum square-law load | Optimum square-law load |
| Optimum square-law load | | | | | |
| xxxx-003 | Positive polarity Output | Positive polarity Output | Positive polarity Output | Positive polarity Output | Positive polarity Output |
| Positive polarity out | | | | | |

- Above specifications are at 25° C and ≤ -20 dBm unless otherwise specified. Specifications describe the instrument's warranted performance. Supplemental characteristics (in italics) are intended to provide information useful in applying the instrument by giving typical, but not warranted, performance parameters.
- RF may leak through video connector especially below 1 GHz; if objectionable, this may be eliminated with low-pass filter.
- SWR measured at 2 dBm.
- Sensitivity decreases with increasing temperature typically 0.5 dB from 20 to +25°C, 0.5 dB from +25°C to +40°C, 1 dB from +40 to +55°C, 1.25 dB from +55 to +75°C, 1 dB from +75 to +85°C.

Applications

These detectors can be used in a wide variety of applications ranging from lab and production measurements to systems components. Because of their flatness and match, these detectors can be used for accurately measuring transmission and reflection characteristics in CW or swept-frequency measurements. For these applications in which both flat-frequency response and square-law characteristics are important, Option 423B, 847xB/C–001 provides a matched pair of detectors that track each other within a few tenths of a dB, and Option 423B, 847xB/C–002 (external square-law load) extends the square-law region up to at least 0.1 mW (10 dBm). Other common applications include use with a coupler or power splitter to externally level a source, and to display pulsed-RF and AM-modulated signals.

For OEM and systems applications, the broadband flatness and ruggedness of these detectors make them particularly well suited for use in closed-loop leveling circuits in microwave instrumentation.

Square-law response

For many reflection and transmission measurements it is desirable to use the detector in its square-law region where its output voltage is proportional to the input RF power. As shown in Figure 6, the LBSD typically operate within 0.5 dB of square-law from the tangential signal sensitivity (TSS) level up to –18 dBm.

By specifying Option 423B, 847xB/C–002, a specially selected loading resistor is provided which extends this square-law region to approximately 8 dB with an associated decrease in sensitivity as shown in Figure 6.

Pulse response

The LBSD detectors have extremely good pulse detection characteristics when working into low-capacitance, low-resistance loads. When loaded externally with 50 Ω the LBSD detector can typically display 8 to 12 ns rise times. Figure 7 illustrates the equivalent circuit for the detector, as well as typical values for the diode impedance and the RF bypass capacitor.

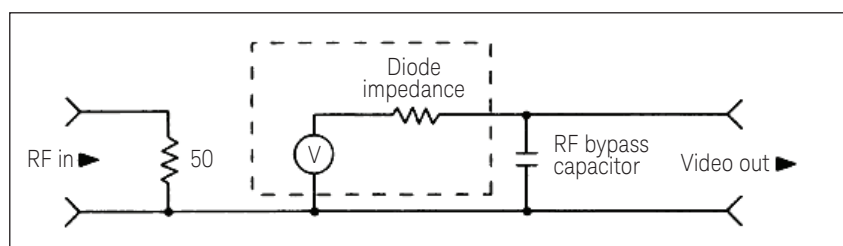


Figure 7. Detector equivalent circuit

Ordering information

To add options to a product, use the following ordering scheme:

Model: 847xB/C (x= 0, 2 or 3)

Example options: 8472B–001, 8473C–001

423B–001 Matched pair of detectors

847xB/C–001

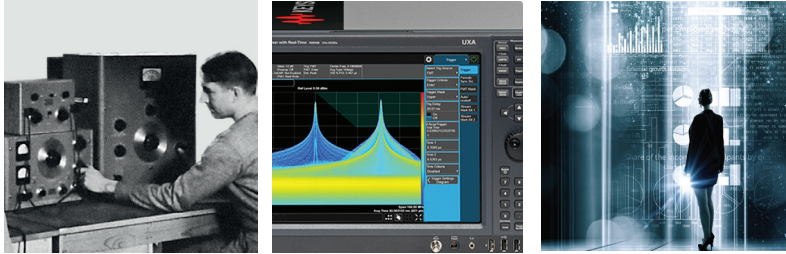
423B–002 External square-law load

847xB/C–002

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