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Agilent 423B, 8470B, 8472B, 8473B/C Low Barrier Schottky Diode Detectors

Data Sheet

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



Agilent 423B



Agilent 8470B



Agilent 8472B



Agilent 8473B



Agilent 8473C

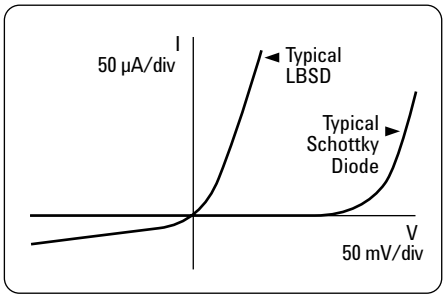


Figure 1. Diode V/I characteristics

Agilent 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 frequencyresponse 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 Agilent 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.

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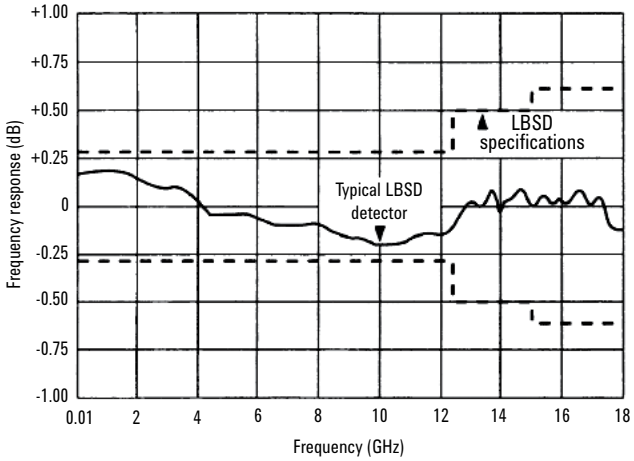


Figure 2. Detector frequency response specifications

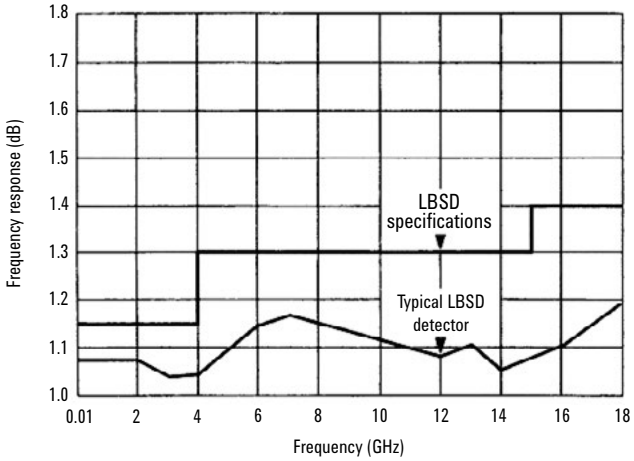


Figure 3. Detector SWR specifications

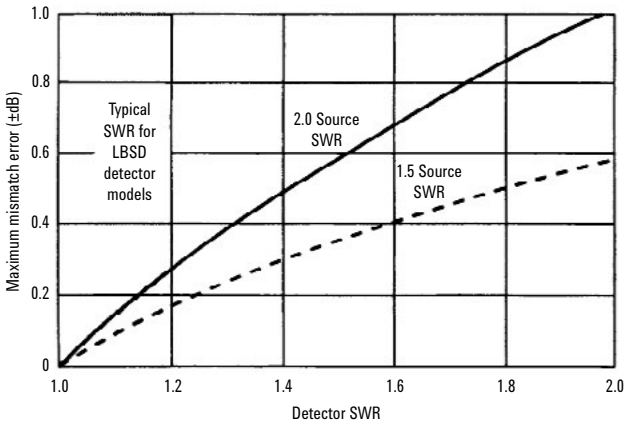


Figure 4. Measurement uncertainty due to detector source mismatch

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.

Agilent Model	Agilent 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

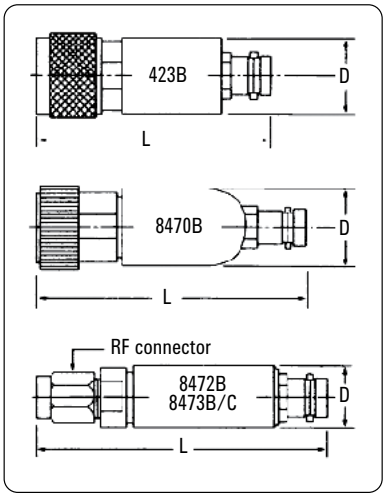


Figure 5. Drawing dimensions given in specification table

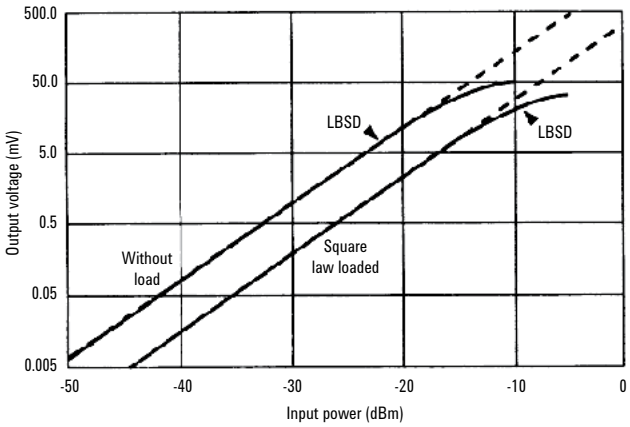


Figure 6. Typical detector square-law response

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Specifications

Specifications[1]	Agilent 423B	Agilent 8473B	Agilent 8473C	Agilent 8470B	Agilent 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 Octave band flatness (over any octave 0 01 to 8 GHz)	±0.2 dB	±0.2 dB	±0.2 dB	±0.2 dB	±0.2 dB
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 (50Ω characteristic impedance)	0.01 to 4 GHz: 1.15 4 to 12.4 G Hz: 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)
Sensitivity[4]	> 0.5 mV/µW	> 0.5 mV/µW	0.01 to 18 GHz: > 0.5 mV/µW 18 to 26.5 GHz: > 0.1 8 mV/µW	> 0.5 mV/µW	> 0.5 mV/µW
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 Vibration Shock	 0 to 55 °C 20 G's, 80 - 2000 Hz 100 G's, 11 ms	 -20 °C to +85 °C 20 G's, 80 - 2000 Hz 100 G's, 11 ms	 -20 °C to +85 °C 20 G's, 80 - 2000 Hz 100 G's, 11 ms	 -20 °C to +85 °C 20 G's, 80 - 2000 Hz 100 G's, 11 ms	 -20 °C to +85 °C 20 G's, 80 - 2000 Hz 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 Diameter	 63 (2.47) 20 (038)	 48 (1.89) 10 (0.39)	 43 (1.89) 10 (0.39)	 64 (2.50) 19 (0.75)	 64 (2.50) 14 (0.56)
Weight in grams (oz) Net Shipping	 114 (4) 454 (16)	 14 (0.5) 454 (16)	 14 (0.5) 454 (16)	 114 (4) 454 (16)	 57 (2) 454 (16)
Options					
xxxx-001 Matched response Provides a pair of detectors with matched frequency response	 Tracking: 0.01 to 12.4 GHz: ±0.2 dB	 Tracking: 0.01 to 12.4 GHz: ±0.2 dB 12.4 to 18 GHz: ±0.3 dB	 Tracking: 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	 Tracking: 0.01 to 12.4 GHz: ±0.2 dB 12.4to 18 GHz: ±0.3 dB	 Tracking: 0.01 to 12.4 GHz: ±0.2 dB 12.4to 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 out	Positive polarity Output	Positive polarity Output	Positive polarity Output	Positive polarity Output	Positive polarity Output

1. *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.*
2. *RF may leak through video connector especially below 1 GHz; if objectionable, this may be eliminated with low-pass filter.*
3. *SWR measured at 2 dBm.*
4. *Sensitivity decreases with increasing temperature typically 0.5 dB from 20 °C to +25 °C, 0.5 dB from +25 °C to +40v C. 1 dB from +40 °C to +55 °C, 1.25 dB from +55 °C to +75 °C, 1 dB from +75 °C to +85 °C.*

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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.

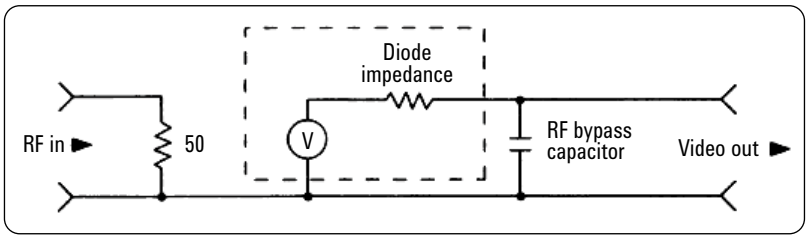


Figure 7. Detector equivalent circuit

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 847xB/C–001	Matched pair of detectors
423B–002 847xB/C–002	External square-law load

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Published in USA, October 18, 2013
5952-8299

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