DATA SHEET

Zero Bias Silicon Schottky Barrier Detector Diodes

Features

- High sensitivity
- Low video impedance

Description

Skyworks series of packaged, beam-lead and chip zero bias Schottky barrier detector diodes are designed for applications through K band. The choice of barrier metal and process techniques results in a diode with a wide selection of video impedance ranges.

The packaged diodes are suitable for use in waveguide, coaxial and stripline applications. The beam-lead and chip diodes can also be mounted in a variety of packages.

Unmounted beam-lead diodes are especially well suited for use in MIC applications. Mounted beam-lead diodes can be easily used in MIC, stripline and other such circuitry.

A complete line of chips is shown for those MIC applications where the chip and wire approach is more desirable.

Applications

The zero bias Schottky detector diodes are designed for detector applications through 26 GHz and are useful to 40 GHz. They require no bias and operate efficiently even at tangential signal power levels. Since they require no bias, noise is at a minimum. Their low video impedance means a short R-C time constant and hence wide video bandwidth and excellent pulse fidelity. As power monitors, these diodes may also be used to drive metering circuits directly even at low power input levels. These diodes are categorized by TSS (Tangential Signal Sensitivity), voltage output and video impedance for detector applications.

TSS is the parameter that best describes a diode's use as a video detector. It is defined as the amount of signal power, below a one milliwatt reference level, required to produce an output pulse whose amplitude is sufficient to raise the noise fluctuations by an amount equal to the average noise level. TSS is approximately 4 dB above the Minimum Detectable Signal.

Voltage output is another useful parameter, since it can be used in the design of threshold detectors and power monitor circuits. Since voltage output is a function of the diode's video impedance, a different minimum value is specified for each video impedance range.

Figure 1 is a plot of the forward DC characteristics. In Figure 2 voltage output is plotted as a function of power input for diodes of various video impedances. Tangential Signal Sensitivity as a function of video impedance is shown in Figure 3. Figure 4 shows two typical detector circuits. The multi-octave–high-sensitivity circuit would be used in ECM and similar applications. An RF matching structure that will present the maximum power at the diode junction must be incorporated to insure maximum sensitivity. The broadband–low-sensitivity circuit would be used where low input VSWR is required. In this circuit the low VSWR is accomplished by the use of the 50 Ω terminating resistor. Sensitivity, however, is degraded by typically 10 dB from the multi-octave–high-sensitivity circuit. The most common use for this circuit is in the broadband, flat detector used primarily in the laboratory.

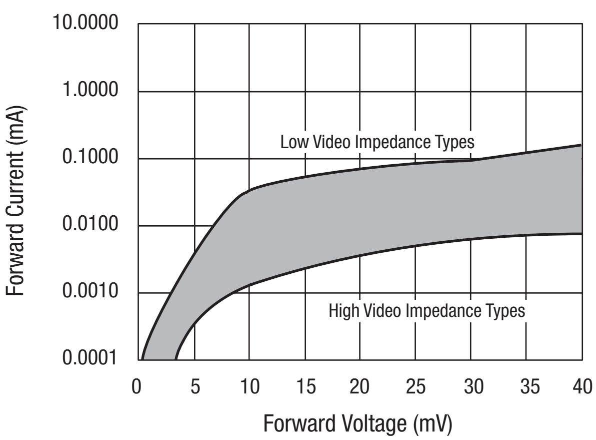
Electrical Specifications at 25 °C

Part Number	Min. EO (mV)	Z_V (Ω)	Min. T_{SS} (dBm)	Outling Drawing
DDC2353-000	8	2000–5000	-52	491-006
DDC2354-000	15	5000–15000	-56	491-006
CDC7630-000	8	2000–5000	-52	571-006
CDC7631-000	15	5000–15000	-56	571-006

Epoxy and Hermetic Packages

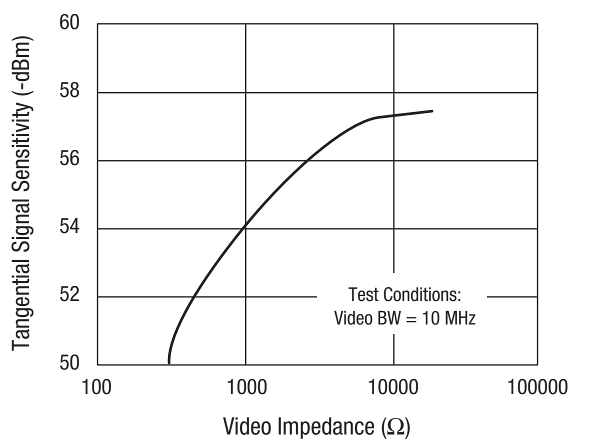
Epoxy Stripline 250	Hermetic Pill 207	Hermetic Pill 203	Hermetic 109	Hermetic 220
DDC2353-250	CDC7630-207	CDC7630-203	SMS7630-109	DDC2353-220
DDC2354-250	CDC7631-207	CDC7631-203	SMS7619-109	DDC2354-220

Typical Performance Data



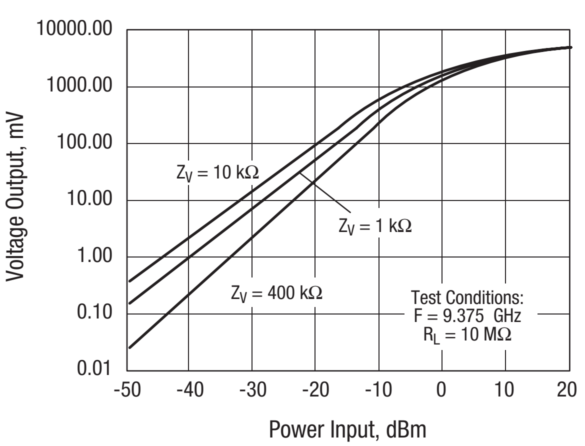
Zero Bias Schottky Detector Diodes

Figure 1. Typical Forward DC Characteristics



Typical Zero Bias X-Band Detector Diodes

Figure 3. Tangential Signal Sensitivity vs. Video Impedance



Typical Zero Bias X-Band Detector Diodes

Figure 2. Voltage Output vs. Power Input As a Function of Video Impedance

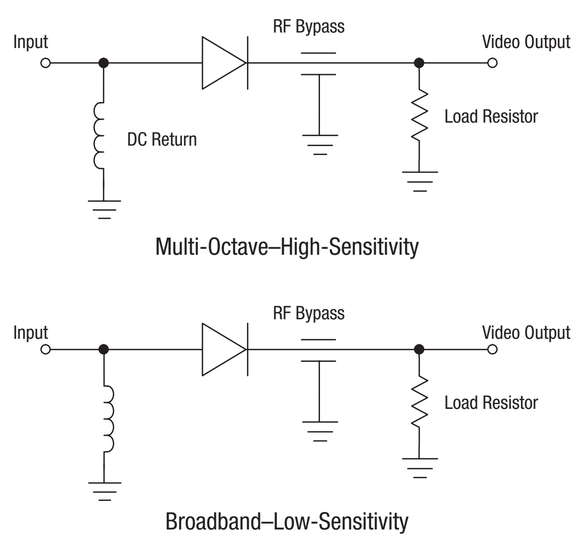
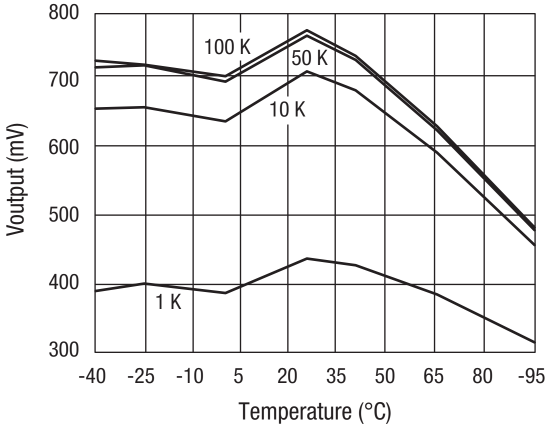
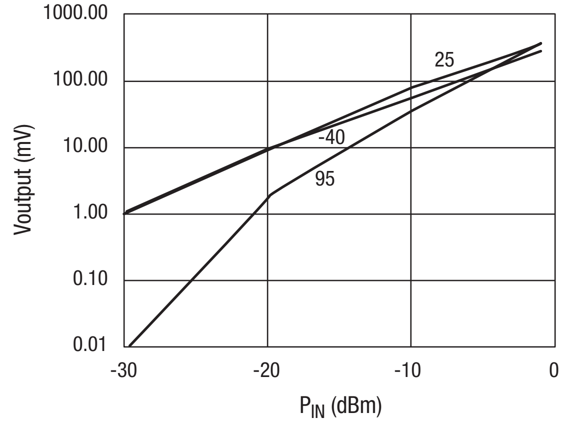


Figure 4. Typical Video Detector Circuits

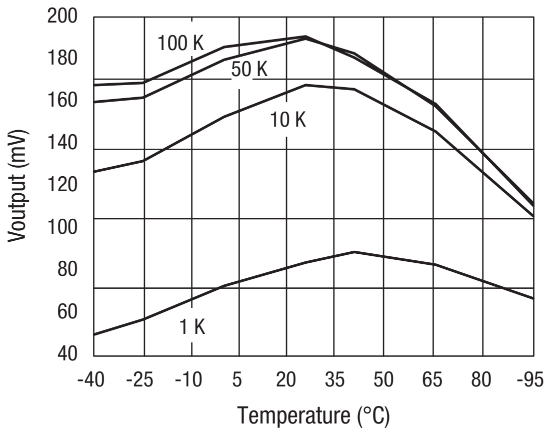
Typical I-V Characteristics



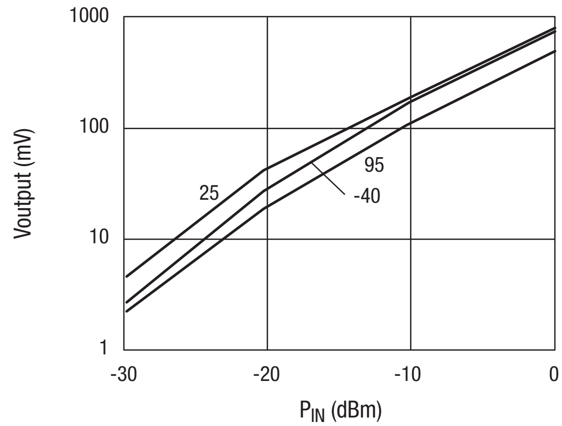
Voltage Output vs Resistance at 0 dBm vs. Temperature °C



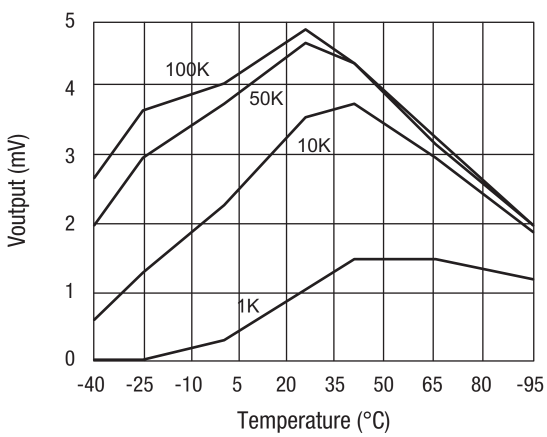
Transfer at -40, 25, 90 °C
R_L = 1 kΩ



Voltage Output vs. Resistance at -10 dBm vs. Temperature °C

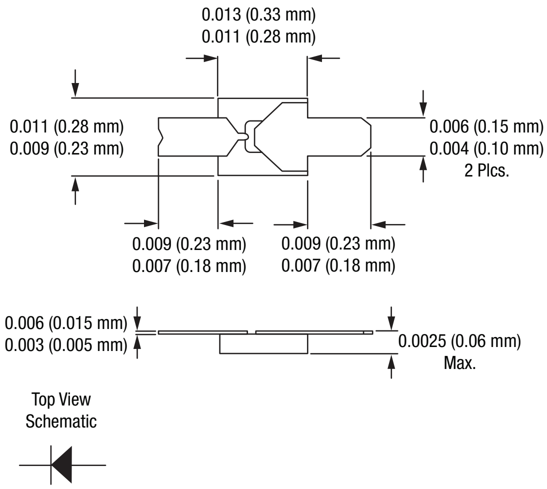


Transfer at -40, 25, 90 °C
R_L = 100 kΩ

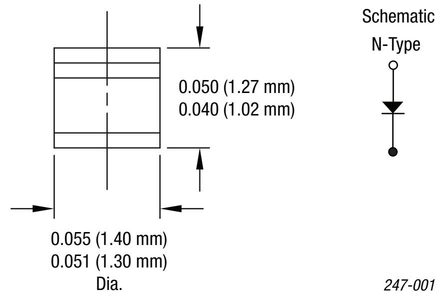


Voltage Output vs. Resistance at -30 dBm vs. Temperature °C

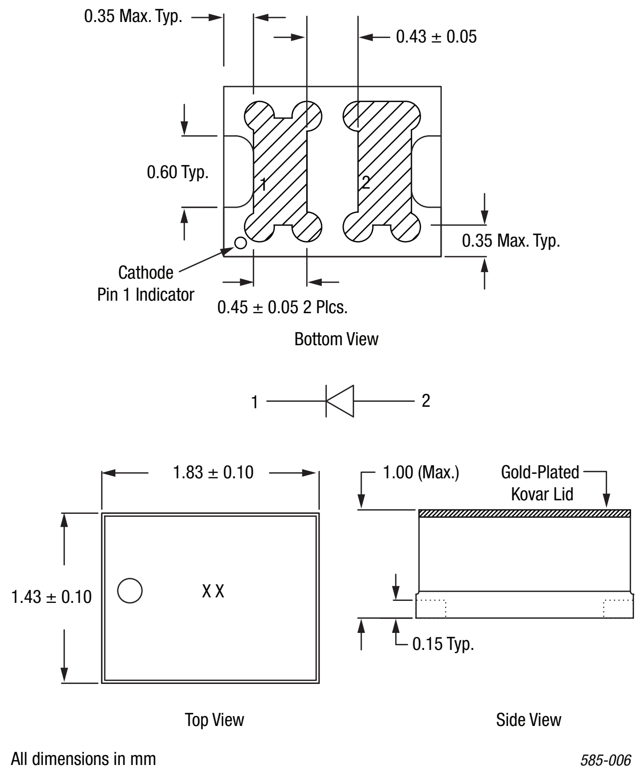
491–006



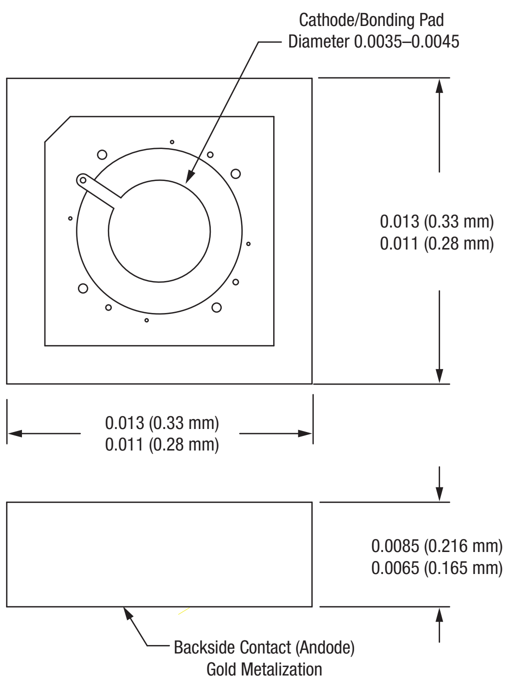
-203



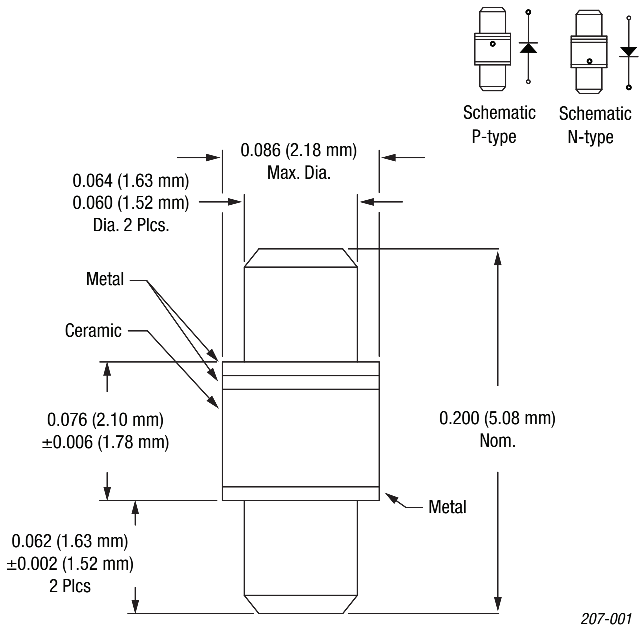
-109



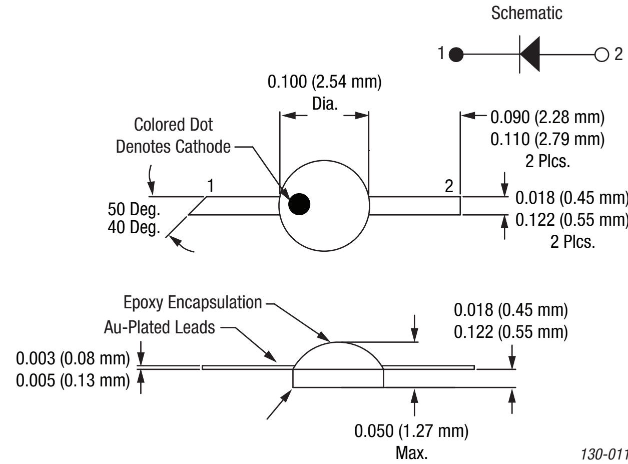
571–006



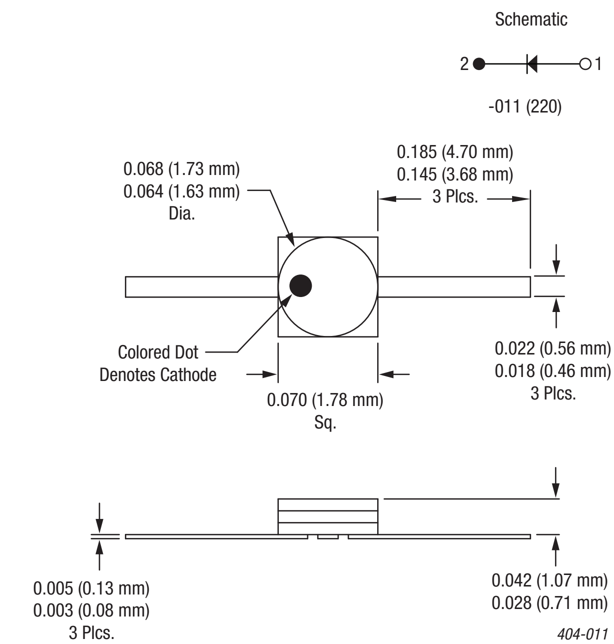
-207


Schematic
P-type
Schematic
N-type
0.086 (2.18 mm)
Max. Dia.
0.064 (1.63 mm)
0.060 (1.52 mm)
Dia. 2 Plcs.
Metal
Ceramic
0.076 (2.10 mm)
±0.006 (1.78 mm)
0.200 (5.08 mm)
Nom.
Metal
0.062 (1.63 mm)
±0.002 (1.52 mm)
2 Plcs
207-001

-250


Schematic
1
2
0.100 (2.54 mm)
Dia.
Colored Dot
Denotes Cathode
0.090 (2.28 mm)
0.110 (2.79 mm)
2 Plcs.
1
2
50 Deg.
40 Deg.
0.018 (0.45 mm)
0.122 (0.55 mm)
2 Plcs.
Epoxy Encapsulation
Au-Plated Leads
0.018 (0.45 mm)
0.122 (0.55 mm)
0.003 (0.08 mm)
0.005 (0.13 mm)
0.050 (1.27 mm)
Max.
130-011

-220


Schematic
2
1
-011 (220)
0.068 (1.73 mm)
0.064 (1.63 mm)
Dia.
0.185 (4.70 mm)
0.145 (3.68 mm)
3 Plcs.
Colored Dot
Denotes Cathode
0.070 (1.78 mm)
Sq.
0.022 (0.56 mm)
0.018 (0.46 mm)
3 Plcs.
0.005 (0.13 mm)
0.003 (0.08 mm)
3 Plcs.
0.042 (1.07 mm)
0.028 (0.71 mm)
404-011