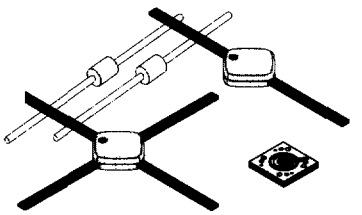
Zero Bias Silicon Schottky Barrier Detector Diodes

Alpha

CDC, DDC Series

Features

- Zero Turn On, No Bias Required
- Low Video Impedance



Description

Alpha's 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.

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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 ohm 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

Part Number	E_O mV	Z_V (Ohms)		TSS dBm	Outline Drawing Number
	Min	Min	Max	Min	
DDC4562–018	8.0	1000	5000	–52	075–001
DDC4562–024	15.0	5000	15000	–56	075–001
DDC4582–018	8.0	1000	5000	–52	130–011
DDC4582–024	15.0	5000	15000	–56	130–011
DDC6980–018	8.0	1000	5000	–52	295–011
DDC6980–024	15.0	5000	15000	–56	295–011
DDC4717–018	8.0	1000	5000	–52	325–001
DDC4717–024	15.0	5000	15000	–56	325–001
DDC2351–018	8.0	1000	5000	–52	491–006
DDC2351–024	15.0	5000	15000	–56	491–006
CDC7622–018	8.0	1000	5000	–52	526–006
CDC7622–024	15.0	5000	15000	–56	526–006

1. Maximum operating temperature is 150°C.
2. Video bandwidth = 10 MHz.
3. P = –30 dBm, R_L > 1 MΩ, frequency = 9.375 GHz.
4. For stripline applications, all diodes in the 075–001 package are available with flattened leads.

5

Typical Performance Data

Zero Bias Schottky Detector Diodes

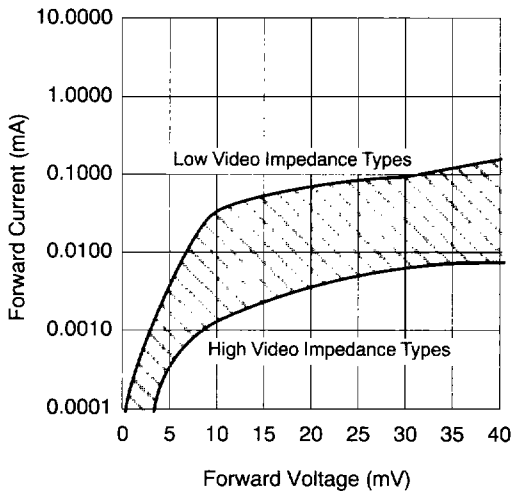
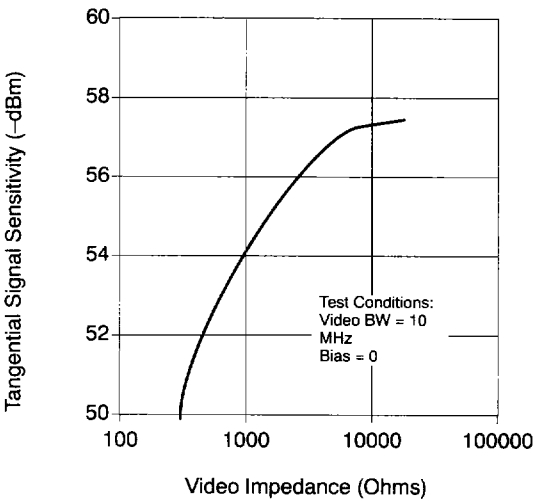


Figure 1. Typical Forward DC Characteristics

Typical Zero Bias X–Band Detector Diodes



Tangential Signal Sensitivity vs. Video Impedance

Typical Zero Bias X–Band Detector Diodes

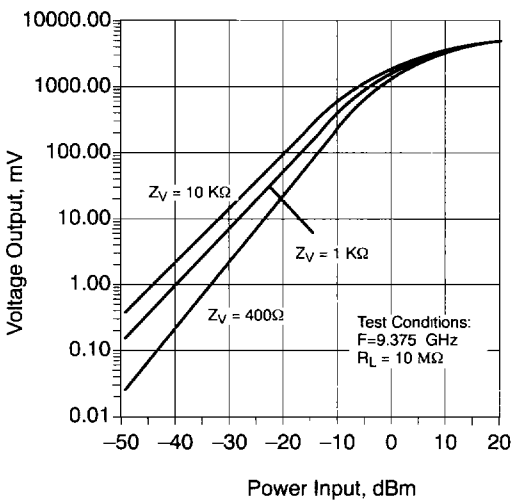
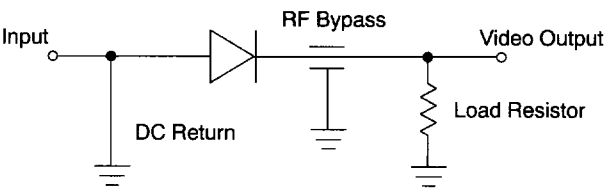


Figure 2. Voltage Output vs. Power Input as a Function of Video Impedance

Multi Octave – High Sensitivity



Broadband – Low Sensitivity

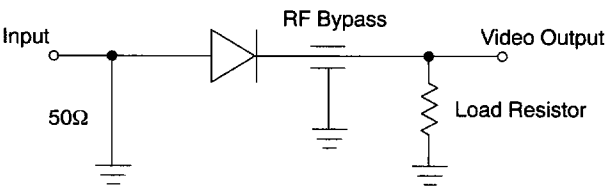


Figure 4. Typical Video Detector Circuits

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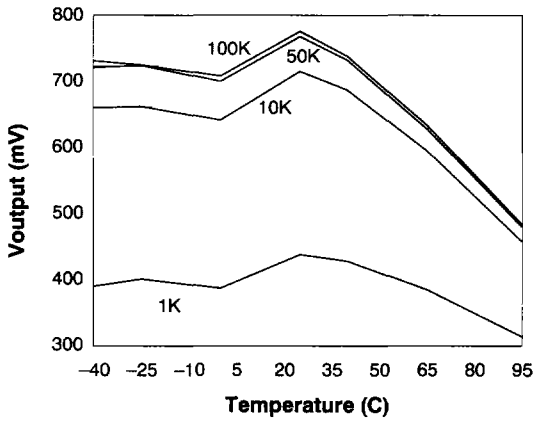
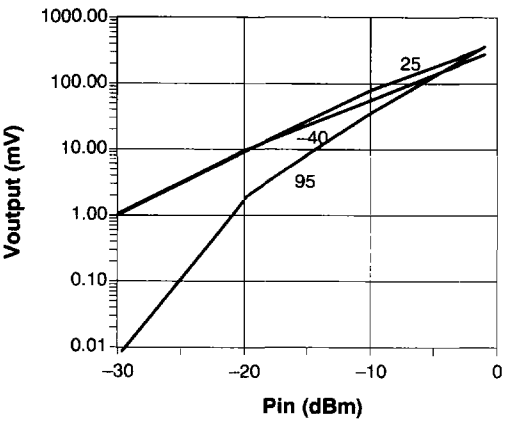
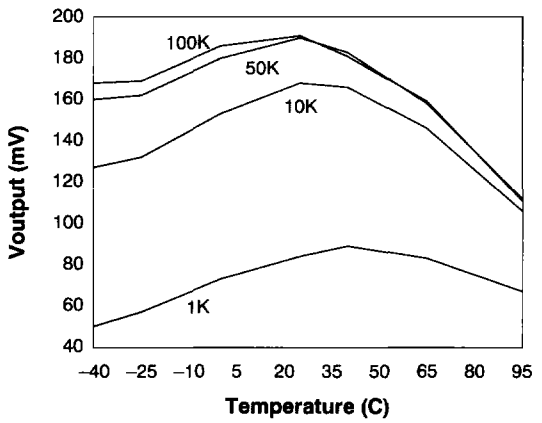
Performance Characteristics



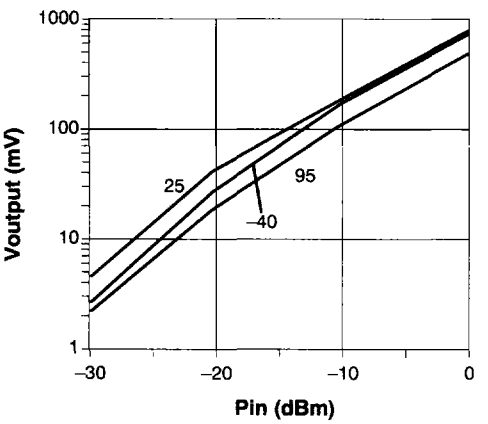
Voltage Output vs Resistance at 0 dBm vs Temperature °C



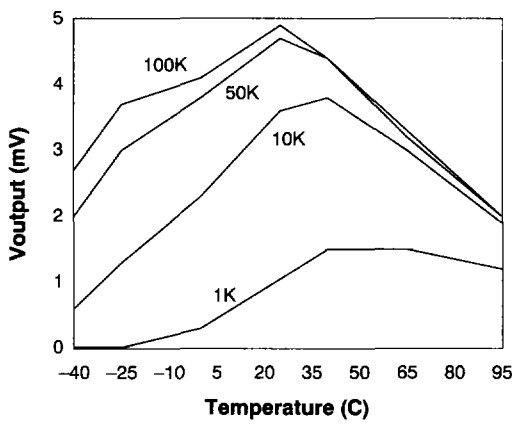
Transfer at –40, 25, 90 °C RL = 1 Kohm



Voltage Output vs Resistance at –10 dBm vs Temperature °C



Transfer at –40, 25, 90 °C RL = 100 Kohm



Voltage Output vs Resistance at –30 dBm vs Temperature °C