

DATA SHEET

# CDC7630/7631 and DDC2353/2354 Series: Zero Bias Silicon Schottky Barrier Detector Diodes in Hermetic Ceramic Packages

## Applications

- Microwave integrated circuits
- Detectors

## Features

- High sensitivity
- Low video impedance
- Packages rated MSL1, 260 °C per JEDEC J-STD-020)

## Description

The Isolink packaged, beam-lead and zero-bias Schottky barrier detector diodes are designed for applications through the K band. The choice of barrier metal and process techniques results in a group of diodes with a wide selection of video impedance ranges. Packaged diodes are suitable for use in waveguide, coaxial, and stripline applications.

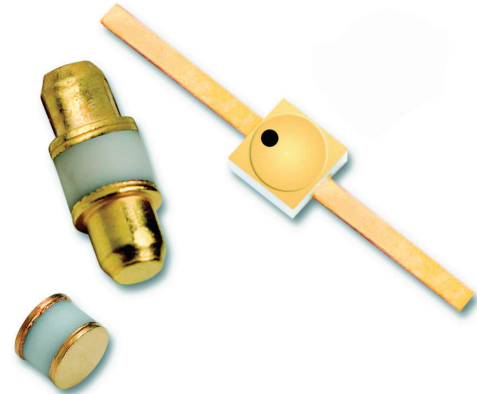
The CDC and DDC series of Schottky diodes are especially well suited for use in Microwave Integrated Circuit (MIC) applications.

## Applications

The CDC and DDC series of zero-bias Schottky diodes are designed for detector applications through 26 GHz. They require no bias and operate efficiently even at tangential signal power levels. Since they require no bias, noise is at a minimum. A low video impedance means a short R-C time constant and, therefore, wide video bandwidth and excellent pulse fidelity.

As power monitors, these diodes may also be used to directly drive metering circuits even at low power input levels. These diodes are categorized by Tangential Signal Sensitivity (TSS), voltage output, and video impedance for detector applications.

TSS is a parameter that best describes the use of a diode 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 with an amplitude sufficient to raise 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.

The absolute maximum ratings for the CDC and DDC series of Schottky diodes are provided in Table 1. Electrical and physical specifications are provided in Table 2. SPICE model parameters for the CDC7630/7631 series are defined in Table 3.

Typical performance characteristics are shown in Figures 1 through 8. Typical video detector circuits are shown in Figure 9. The multi-octave, high-sensitivity circuit would be used in Electronic Countermeasures (ECM) and similar applications. An RF matching structure that presents maximum power at the diode junction must be incorporated to ensure maximum sensitivity.

The broadband low-sensitivity circuit would be used where a low input VSWR is required. In this circuit, 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 a broadband, flat detector used primarily in the laboratory.

Package dimensions are provided in Figures 10 through 12.

**Table 1. CDC7630/7631 and DDC2353/2354 Diode Series Absolute Maximum Ratings<sup>1</sup>**

Parameter	Symbol	Minimum	Maximum	Units
Reverse voltage	V <sub>R</sub>		2	V
Forward current	I <sub>F</sub>		100	mA
RF input power @ T <sub>A</sub> = 25 °C	P <sub>d</sub>		75	mW
Storage temperature	T <sub>STG</sub>	-60	+200	°C
Operating temperature	T <sub>A</sub>	-55	+150	°C
Electrostatic discharge: Human Body Model (HBM), Class 0	ESD		< 250	V

<sup>1</sup> Exposure to maximum rating conditions for extended periods may reduce device reliability. There is no damage to device with only one parameter set at the limit and all other parameters set at or below their nominal value. Exceeding any of the limits listed here may result in permanent damage to the device.

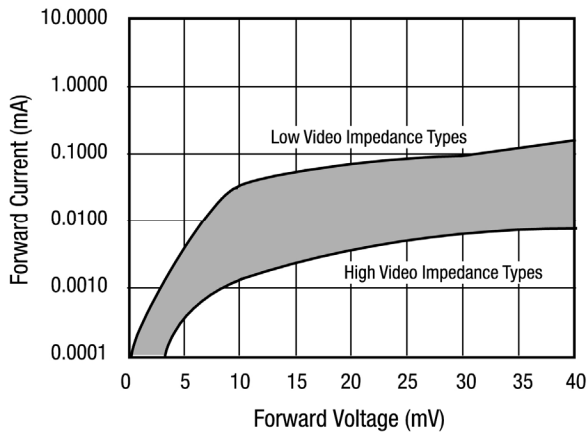
**ESD HANDLING:** *Although this device is designed to be as robust as possible, electrostatic discharge (ESD) can damage this device. This device must be protected at all times from ESD when handling or transporting. Static charges may easily produce potentials of several kilovolts on the human body or equipment, which can discharge without detection. Industry-standard ESD handling precautions should be used at all times.*

**Table 2. CDC7630/7631 and DDC2353/2354 Diode Series Electrical Specifications<sup>1</sup>**  
**(T<sub>A</sub> = +25 °C, Characteristic Impedance [Z<sub>0</sub>] = 50 Ω, Unless Otherwise Noted)**

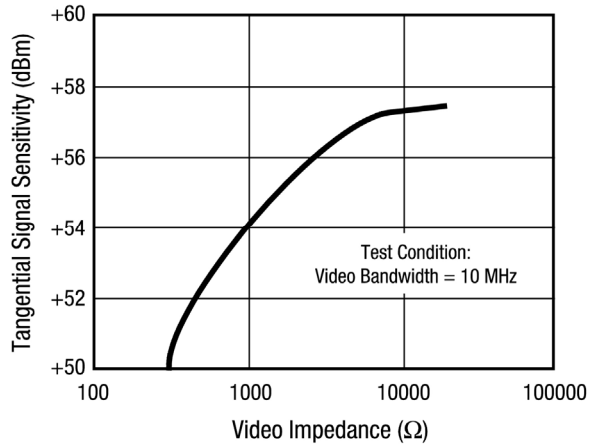
Part Number	Detected Output Voltage, E <sub>O</sub> (mV)	Video Impedance, Z <sub>v</sub> (Ω)		TSS (dBm)
	Minimum	Minimum	Maximum	Maximum
DDC2353-220	8	2,000	6,500	-52
DDC2354-220	15	5,000	15,000	-56
CDC7630-203	8	2,000	6,500	-52
CDC7630-207	8	2,000	6,500	-52
CDC7631-203	15	5,000	15,000	-56
CDC7631-207	15	5,000	15,000	-56

<sup>1</sup> Performance is guaranteed only under the conditions listed in this table.

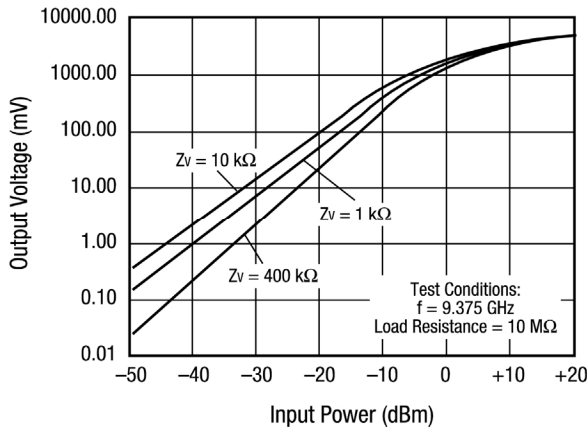
**Typical Performance Characteristics**



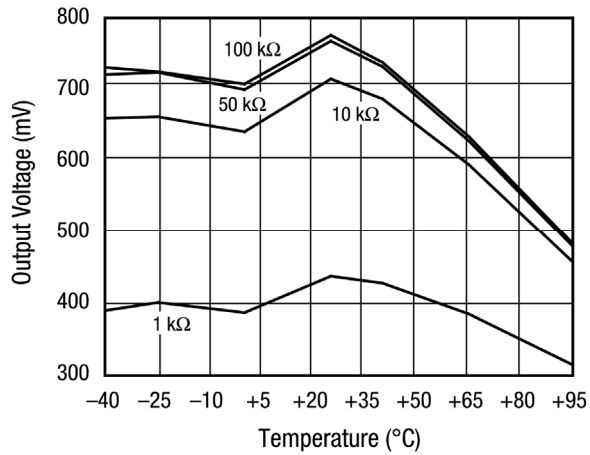
**Figure 1. Zero Bias Schottky Detector Diodes  
Typical Forward DC Characteristics**



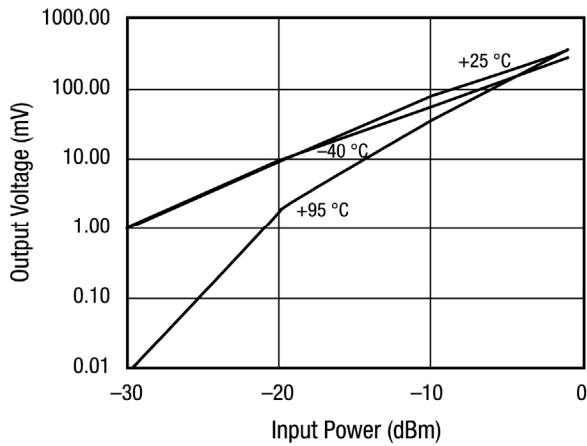
**Figure 2. Typical Zero Bias X-Band Detector Diodes  
TSS vs Video Impedance**



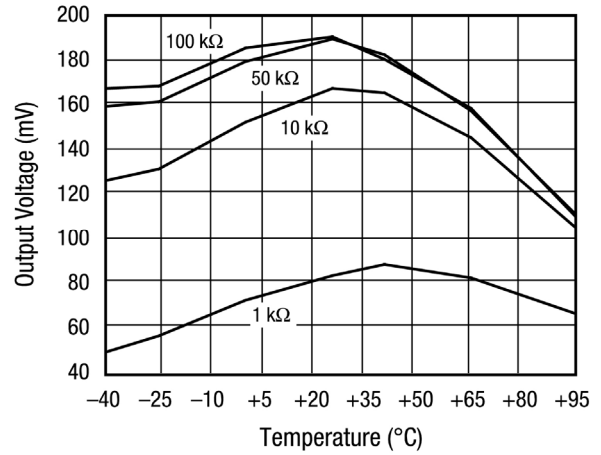
**Figure 3. Typical Zero Bias X-Band Detector Diodes  
Output Voltage vs Input Power as a Function of Video Impedance**



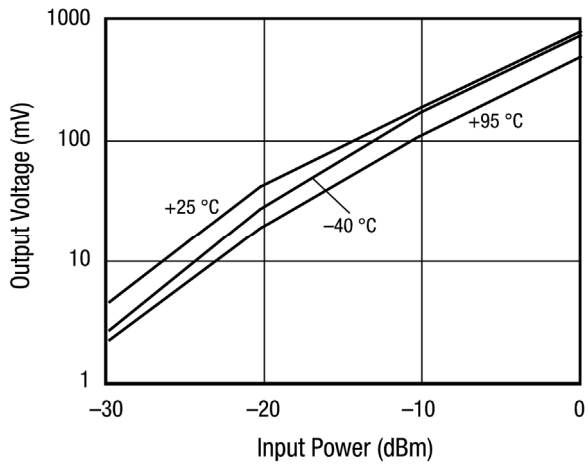
**Figure 4. Output Voltage vs Temperature  
Over Load Resistance @ 0 dBm**



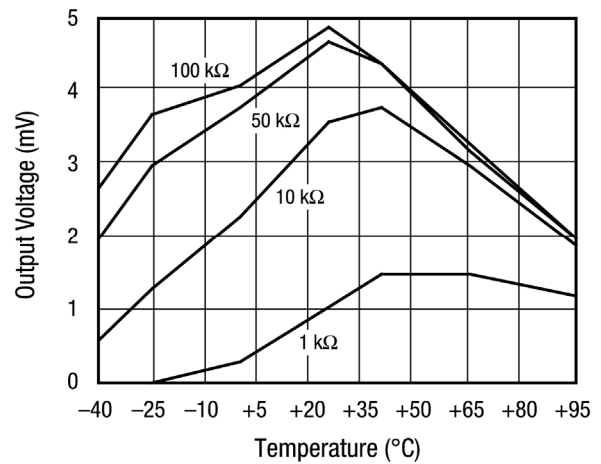
**Figure 5. Output Voltage vs Input Power Over Temperature (Load Resistance = 1 kΩ)**



**Figure 6. Output Voltage vs Temperature Over Load Resistance @ -10 dBm**



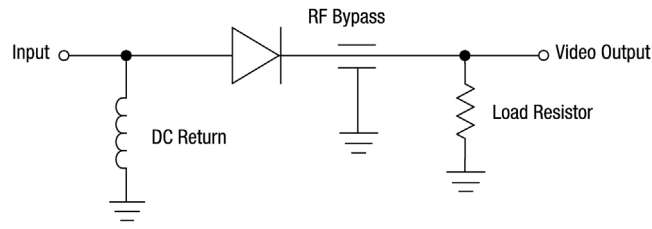
**Figure 7. Output Voltage vs Input Power Over Temperature (Load Resistance = 100 kΩ)**



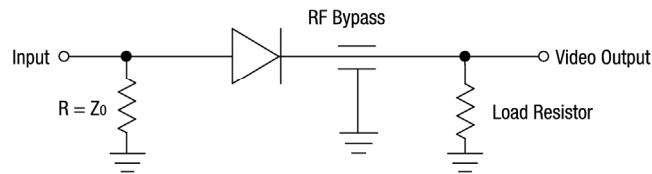
**Figure 8. Output Voltage vs Temperature Over Load Resistance @ -30 dBm**

**Table 4. SPICE Model Parameters**

Parameter	Units	Part Number	
		CDC7630	CDC7631
Is	A	5E-06	3.8E-06
Rs	$\Omega$	20	51
N	–	1.05	1.05
TT	sec	1E-11	1E-11
CJO	pF	0.14	0.08
M	–	0.4	0.4
Eg	eV	0.69	0.69
XTI	–	2	2
Fc	–	0.5	0.5
Bv	V	2	2
Ibv	A	1E-04	1E-04
VJ	V	0.34	0.34

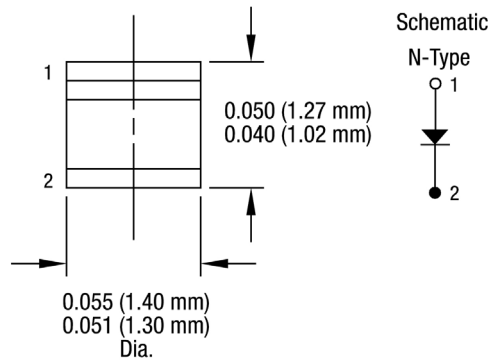


Multi-Octave: High-Sensitivity



Broadband: Low-Sensitivity

Figure 9. Typical Video Detector Circuits



Dimensions are in inches (millimeters shown in parentheses)

S1569

Figure 10. -203 Package Dimensions

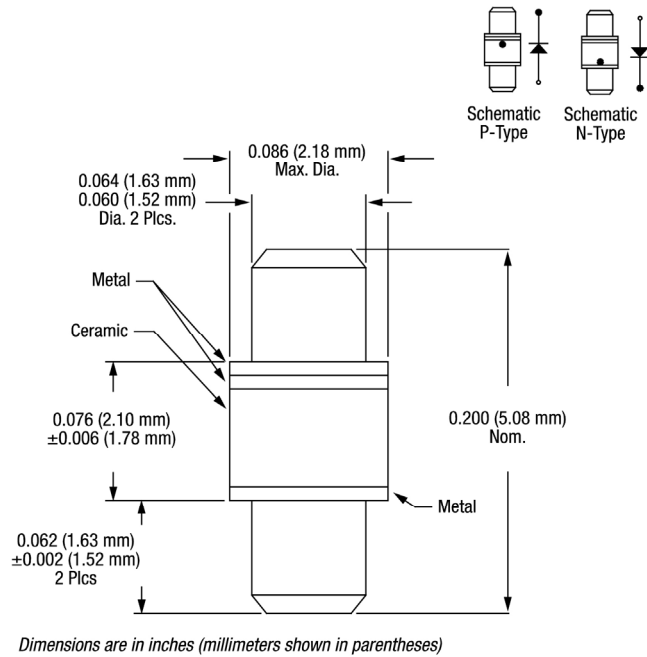


Figure 11. -207 Package Dimensions

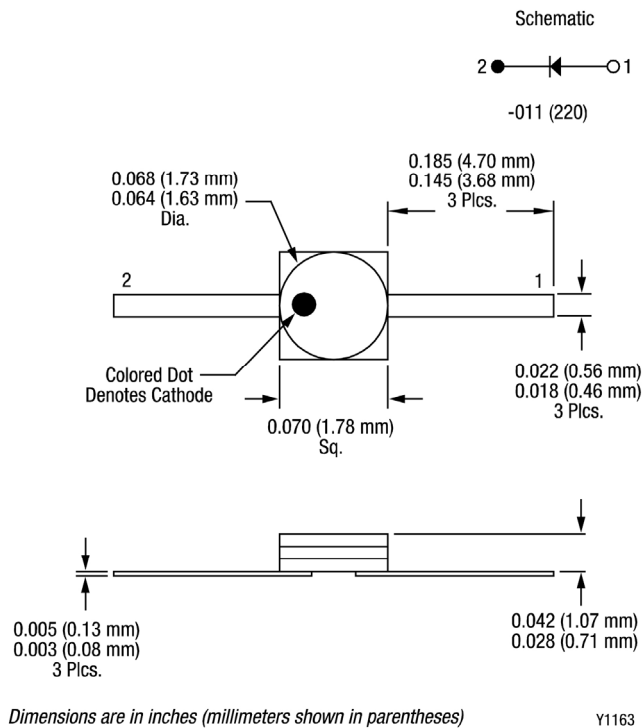


Figure 12. -220 Package Dimensions

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