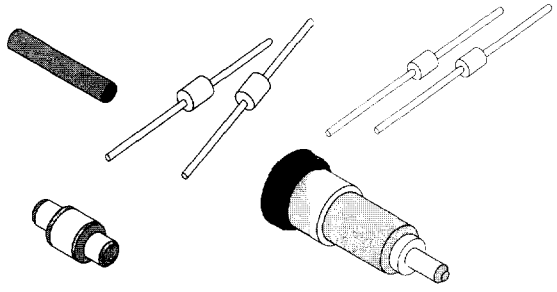
Silicon Point Contact Detector Diodes

Alpha

1N358, 1N1611, 1N83X, DDA4072, DDA5XX, DDA6797 Series

Features

- Broadband Operation
- Bias Not Required



Description

Alpha's point contact detector diodes are designed for applications through mm–band (60.0 GHz). These diodes employ epitaxial silicon optimized for high tangential signal sensitivity. Since they are point contact diodes, they are efficient detectors not requiring the use of bias.

They are available in a variety of packages, which make them suitable for use in waveguide, coaxial and stripline applications.

Maximum Ratings

Operating Temperature:	–55°C to +150°C
Storage Temperature:	–55°C to +150°C
Power Dissipation DC:	100 mW

(derated linearly above 25°C at 0.8 mW/°C)

Applications

These diodes are categorized by TSS (Tangential Signal Sensitivity) for detector applications in eight frequency ranges: L, S, X, Ku, K, and Ka, and mm–bands. TSS is one 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.

Since the point contact diode has a turn–on voltage of essentially zero, it exhibits a typical video impedance of 10K ohms without the use of bias and is an efficient detector under these conditions. The use of a small forward bias will increase sensitivity and greatly reduce parameter variation due to temperature change. Video impedance is a direct function of bias and closely follows the 28/I (mA) relationship. This is important to pulse fidelity, since the video impedance in conjunction with the detector output capacitance and video amplifier input capacitance affects the effective amplifier bandwidth. Bias does, however, increase noise, particularly in the 1/f region. Therefore, it should be kept as low a level as possible (typically 5–50 microamps).

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Matched Pairs

Matched pairs of detector diodes are used when near equal sensitivities are required. This is achieved by matching the voltage outputs at a point in the square law region.

The voltage outputs are matched within 1 dB as follows:

$$\Delta \text{ dB} = 10 \log M1/M2 = \text{dB max}$$

where M1 is the higher Figure of Merit of the two diodes. The video impedances are also matched:

$$\Delta Z_V = 20\% \text{ max}$$

Custom matching may be performed to other tolerances or as a function of frequency, power level and load resistance.

Electrical Specifications

Frequency Band	Type Number			Electrical Characteristics				Test Conditions		Outline Drawing Number
	Polarity			TSS – dBm[1]	FM	Z_V		Frequency MHz	Holder	
	Forward	Reverse	Reversible	min	min	min	max			
UHF			1N830					100		062–001
UHF			1N830A					100		062–001
UHF			DDA5090					100		075–001
UHF			DDA5090A					100		075–001
L–X	1N358[2]	1N358R[2]		40	15	4.5	18.0	1000–12400	P–009	007–001
L–X	1N358A[2]	1N358AR[2]		45	30	4.5	18.0	1000–12400	P–009	007–001
L–X	DDA5638	DDA5638R		45	30	4.5	18.0	1000–12400	P–009	007–001
X			1N833	40	15	4.5	18.0	9375	105–JAN	062–001
X			3315093	40	15	4.5	18.0	9375	105–JAN	075–001
X			DDA5233	40	15	–	10.0	8375	P–017	013–001
X			DDA6797[3]			4.5	18.0	–	–	013–001
			1N833A	45	30	4.5	18.0	9375	105–JAN	062–001
X			DDA5093A	45	30	0.6	0.8	9375	105–JAN	075–001
X	1N1611	1N1611R		51[4]	130[4]	0.6[4]	0.8[4]	9000	P–007	005–802
X			DDA4072	51[4]	130[4]	0.6[4]	0.8[4]	9000	P–007	005–801
X	1N1611A	1N1611AR		53[4]	220[4]	0.6[4]	0.8[4]	9000	P–007	005–802
X			DDA4072A	53[4]	220[4]	0.6_4	0.8[4]	9000	P–007	005–801
X	1N1611B	1N1611BR		53[4]	220[4]	0.6[4]	0.8[4]	9000	P–007	005–802
X			DDA4072B	53[4]	220[4]	0.6[4]	0.8[4]	9000	P–007	005–801
X			DDA5012	53[4]	220[4]	0.6[4]	0.8[4]	9000	105–JAN	062–001
X			DDA55036	53[4]	220[4]	0.6[4]	0.8[4]	9000	105–JAN	075–001
X			DDA5236	53[4]	220[4]	0.6[4]	0.8[4]	9000	P–017	013–001

1. Bandwidth = 10 MHz.
2. Available as JAN or single service types which meet all applicable requirements of MIL–S–19500.
3. This diode has a high self resonant frequency and is specifically designed for broadband, flat detector applications up to 18 GHz.
4. With 50 μA bias.

Diodes ar available in other configurations, consult factory with your specific requirements.
Diodes can be supplied with TX type screening procedures will be supplied on request.
For stripline applications, all diodes in the 062–001 and 075–001 packages are available with flattened leads.

Typical Performance Data

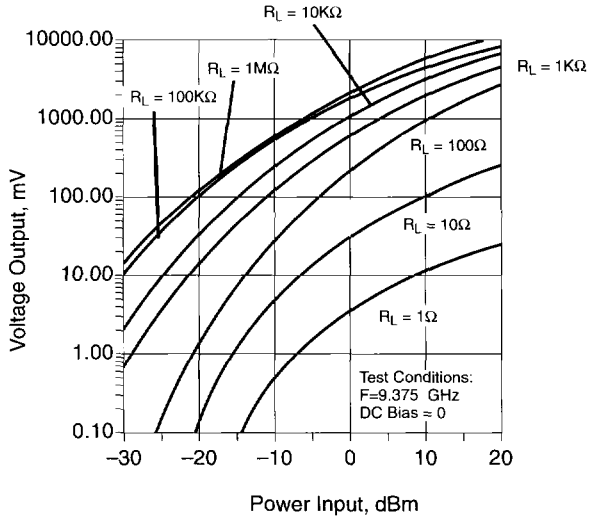


Figure 1a. Voltage Output vs. Power Input as a Function of Load Resistance

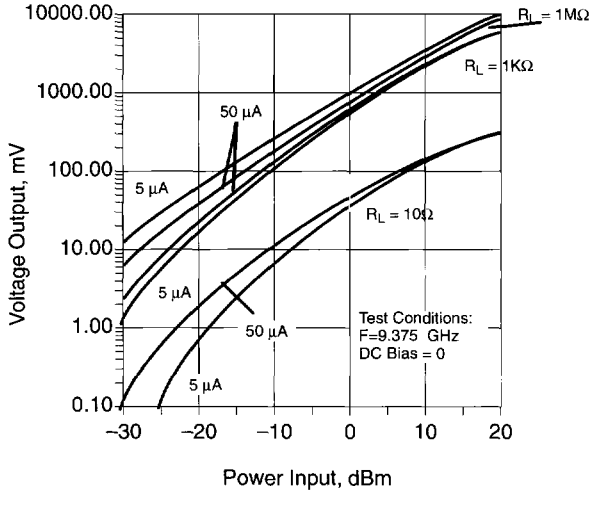
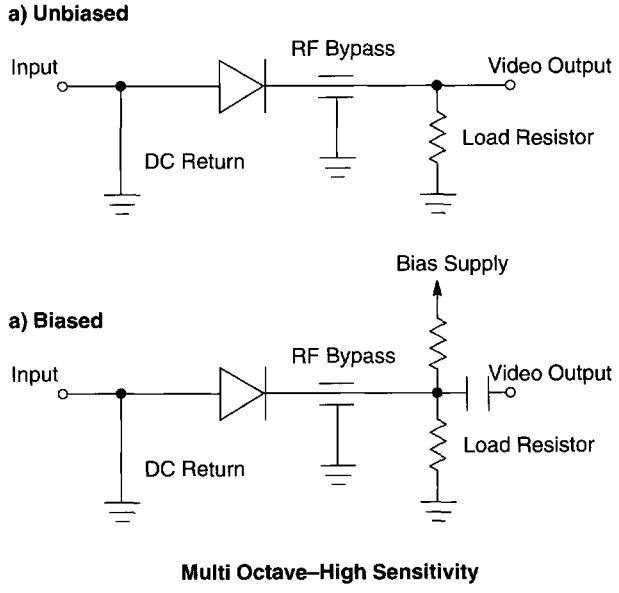
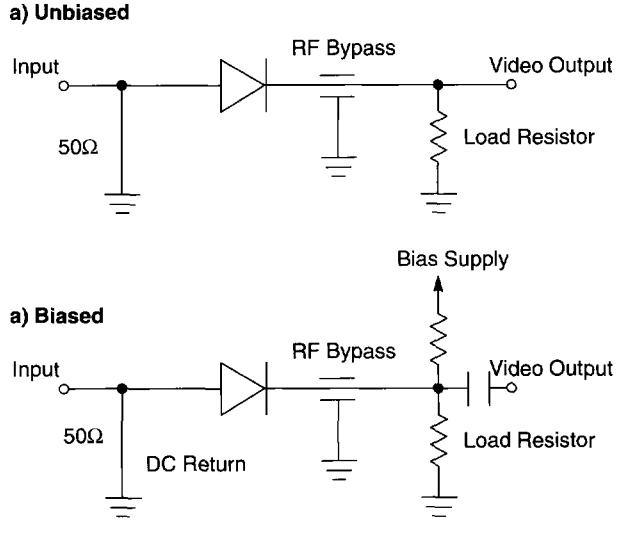


Figure 1b. Voltage Output vs. Power Input as a Function of Load Resistance and Bias



Multi Octave–High Sensitivity



Broadband–Low Sensitivity

Figure 2. Typical Video Detector Circuits

Frequency Table

Band	Frequencies (GHz)
UHF	Up to 1
L	1 – 2
S	2 – 4
C	4 – 8
X	8.2 – 12.4
Ku	12.4 – 18
K	18.0 – 26.5
Ka	26.5 – 40
mm	40 – 100

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