

Planar Back (Tunnel) Diodes

Rev. V2

Features

- Zero Bias Operation
- Low Video Impedance
- Excellent Temperature Stability
- Screening per MIL-PRF-19500 and MIL-PRF-35834 available
- RoHS* Compliant

Description

The MBD series of back (tunnel) diodes are fabricated on germanium substrates using passivated, planar construction and gold metallization for reliable operation up to +110°C. Unlike the standard tunnel diode IP is minimized for detector operation and offered in five nominal values with varying degrees of sensitivity and video impedance. The back detector is generally operated with zero bias and is known for its excellent temperature stability and fast video rise times



Die Electrical Specifications: $T_A = +25^\circ\text{C}$, Peak / Valley Current = 2.5 A

Part Number	Junction Capacitance (C_J)	Peak Current (I_P)		Sensitivity (γ)	Video Resistance (R_V)	Reverse Voltage (V_R)	Forward Voltage (V_F)
	$V_R = V_V$, 100 MHz			$P_{IN} = -20 \text{ dBm}$, $R_L = 10 \text{ k}\Omega$, 10 GHz		$I_R = 500 \mu\text{A}$	$I_F = 3 \text{ mA}$
	(pF)	(μA)		(mV / mW)	(Ω)	(mV)	(mV)
	Max.	Min.	Max.	Typ.	Typ.	Min.	Max.
MBD1057-C18	0.30	100	200	1000	180	420	135
MBD2057-C18	0.30	200	300	750	130	410	130
MBD3057-C18	0.30	300	400	500	80	400	125
MBD4057-C18	0.30	400	500	275	65	400	120
MBD5057-C18	0.30	500	600	250	60	400	110

* Restrictions on Hazardous Substances, European Union Directive 2011/65/EU.

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Package Electrical Specifications: $T_A = +25^\circ\text{C}$, Peak / Valley Current = 2.5 A

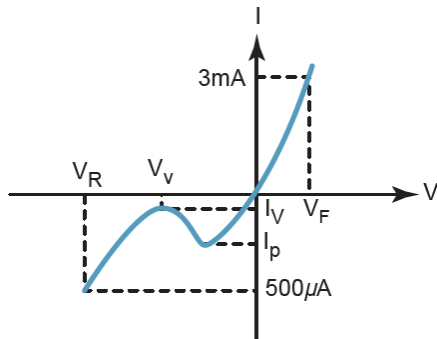
Base Part Number ¹	Package Style	Total Capacitance (C_T)	Peak Current (I_P)		Sensitivity (γ)	Video Resistance (R_V)	Reverse Voltage (V_R)	Forward Voltage (V_F)
		$V_R = V_V$, 100 MHz			$P_{IN} = -20\text{ dBm}$, $R_L = 10\text{ k}\Omega$, 10 GHz		$I_R = 500\text{ }\mu\text{A}$	$I_F = 3\text{ mA}$
		(pF)	(μA)		(mV / mW)	(Ω)	(mV)	(mV)
		Max.	Min.	Max.	Typ.	Typ.	Min.	Max.
MBD1057	E28 / 28X	0.40	100	200	1000	180	420	135
	H20	0.50						
	T54	0.55						
	T80	0.65						
MBD2057	E28 / 28X	0.40	200	300	750	130	410	130
	H20	0.50						
	T54	0.55						
	T80	0.65						
MBD3057	E28 / 28X	0.45	300	400	500	80	400	125
	H20	0.55						
	T54	0.60						
	T80	0.70						
MBD4057	E28 / 28X	0.50	400	500	275	65	400	120
	H20	0.60						
	T54	0.65						
	T80	0.75						
MBD5057	E28 / 28X	0.55	500	600	250	60	400	110
	H20	0.65						
	T54	0.70						
	T80	0.80						

1. To order enter base part number-package style.

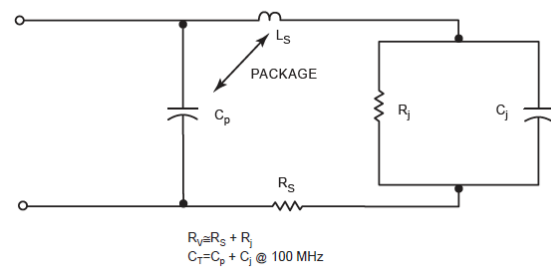
Absolute Maximum Ratings

Parameter	Absolute Maximum
Input Power	14 dBm CW or Pulsed in a tuned detector
Operating Temperature	-65°C to $+110^\circ\text{C}$
Storage Temperature	-65°C to $+125^\circ\text{C}$
Soldering Temperature: Die Packaged	See chip assembly instructions $+230^\circ\text{C}$ for 5 seconds (must be hand soldered)

Back Diode Parameters



Diode Equivalent Circuit



Die Assembly

The germanium planar back (tunnel) diode is sensitive to mechanical pressure and high temperatures.

Die attach: Conductive epoxy only with maximum curing temperature of +125°C

Wire Bond: 0.7 mil gold wire and thermo-compression wedge bond within the following:

Stage Temperature: +155°C maximum for 20 seconds max

Tip Temperature: +160°C maximum

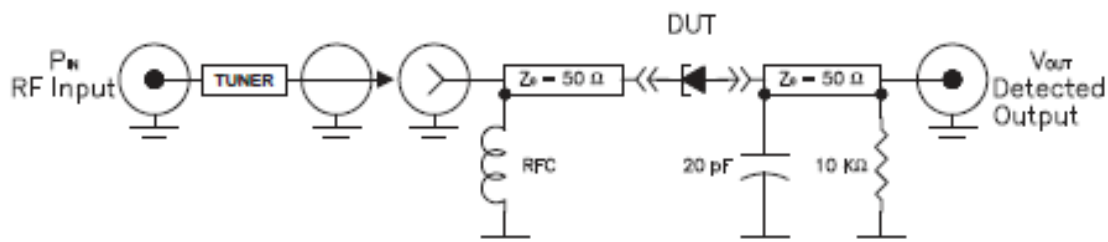
Bonding Pressure: 20 grams maximum

Bonding is performed on the larger diameter offset bonding pad (see figure 1) and not over the junction.



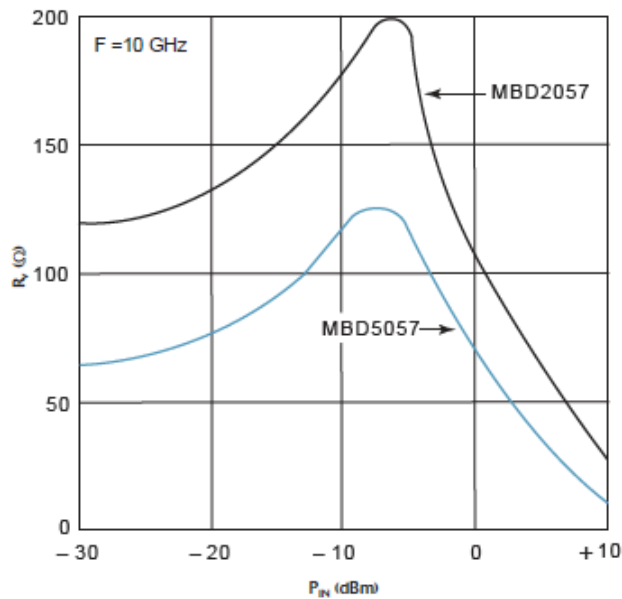
Figure 1

10 GHz RF Detector Test Circuit

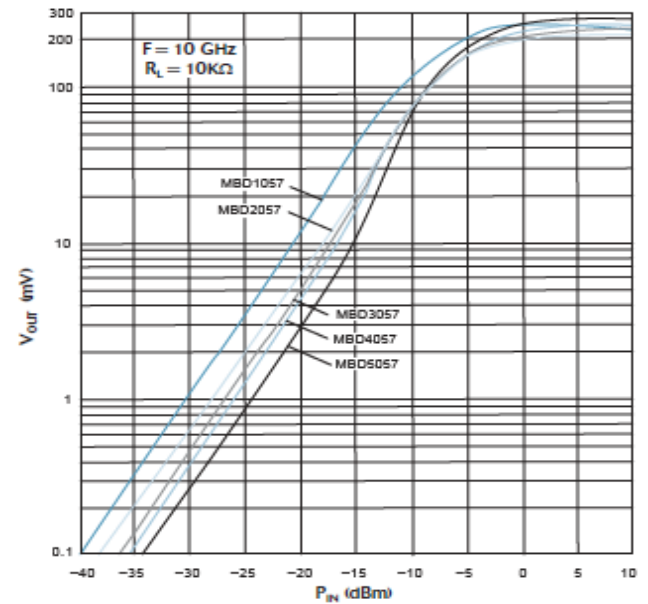


Typical Performance Curves

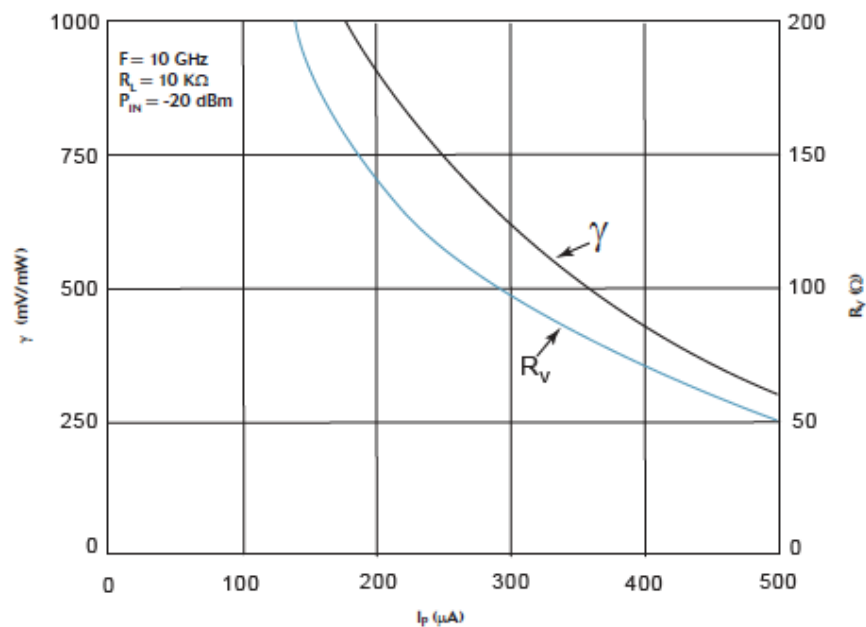
Video Resistance vs. Input Power



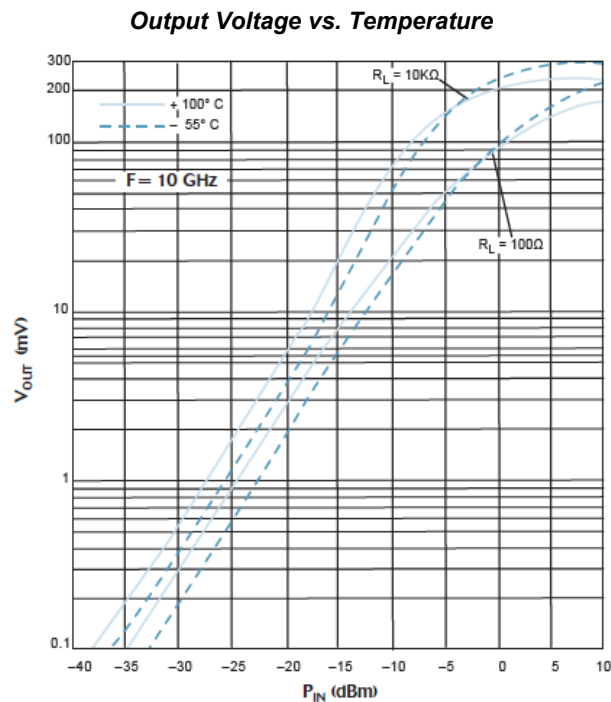
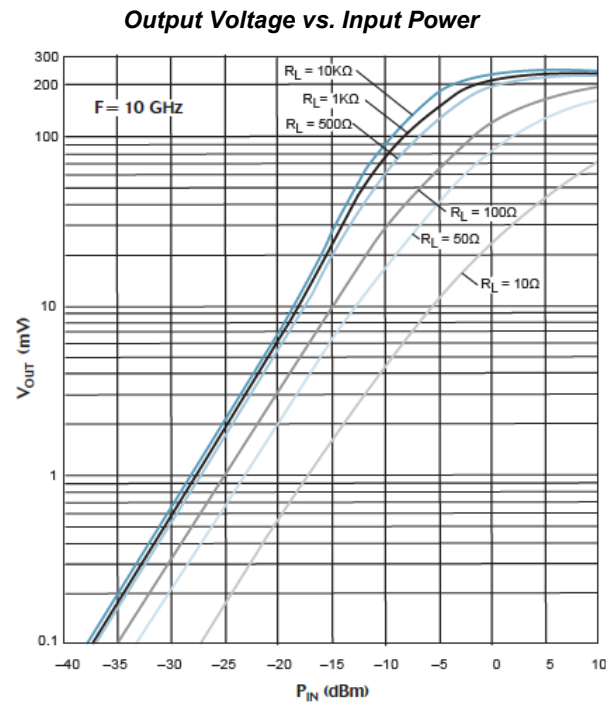
Output Power vs. Input Power



Video Impedance & Sensitivity vs. Peak Current

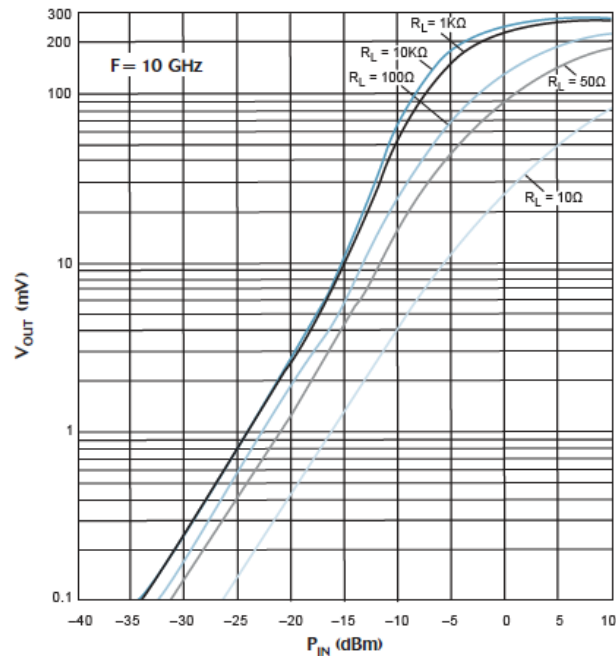


Typical Performance Curves: MDB2057

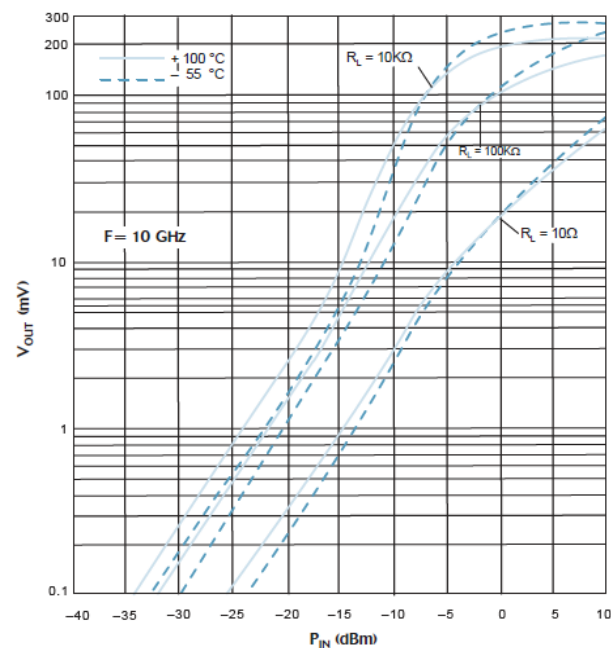


Typical Performance Curves: MDB5057

Output Voltage vs. Input Power



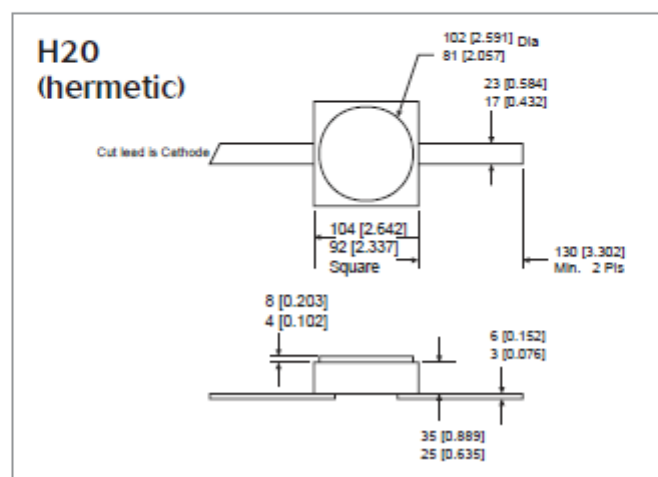
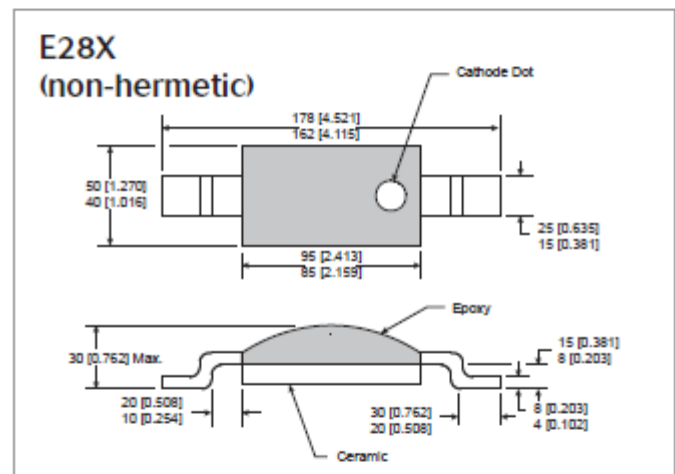
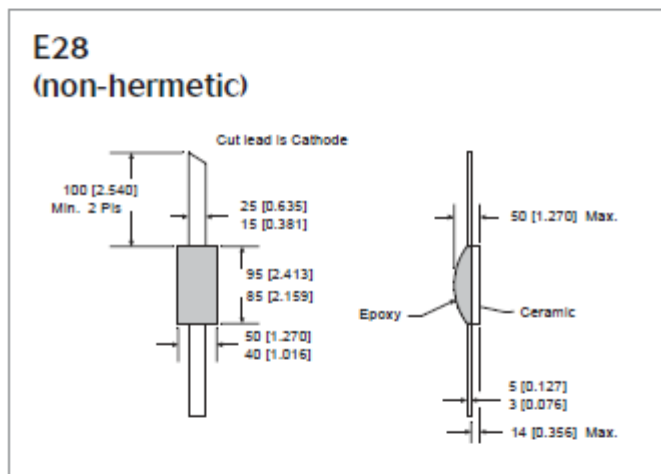
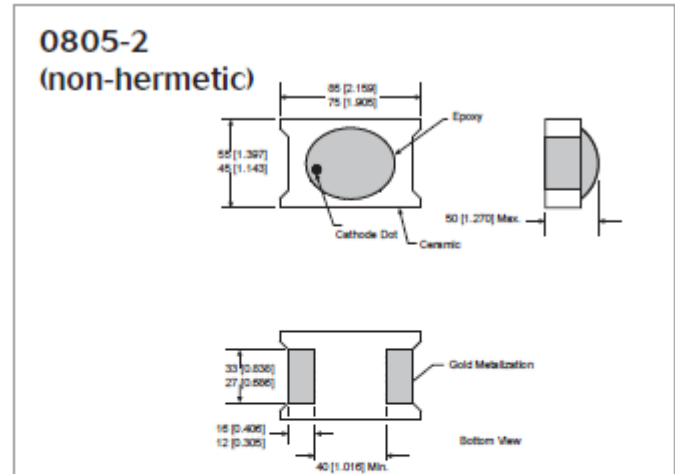
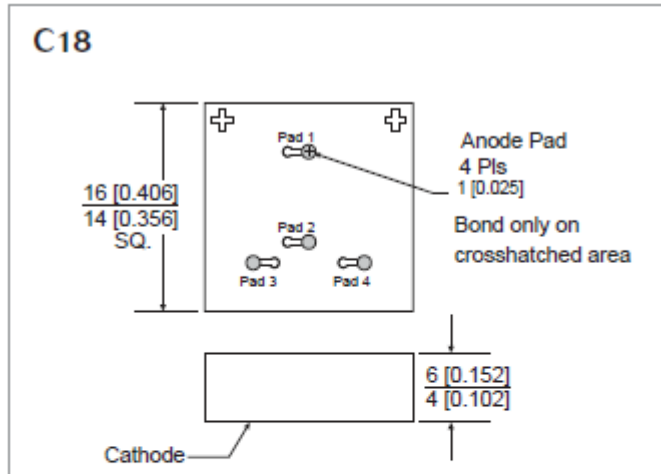
Output Voltage vs. Temperature



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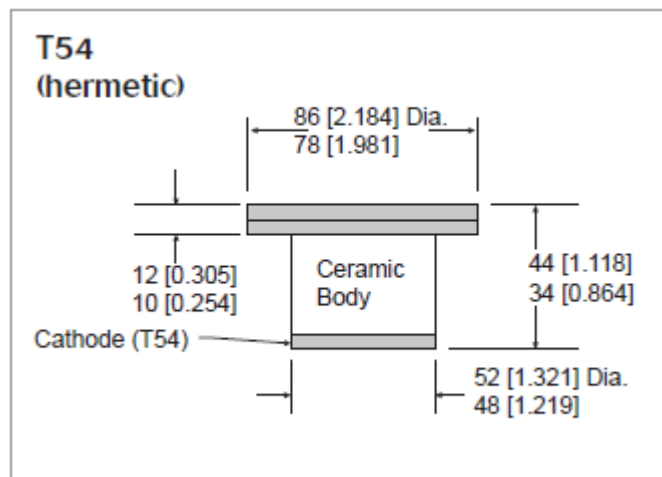
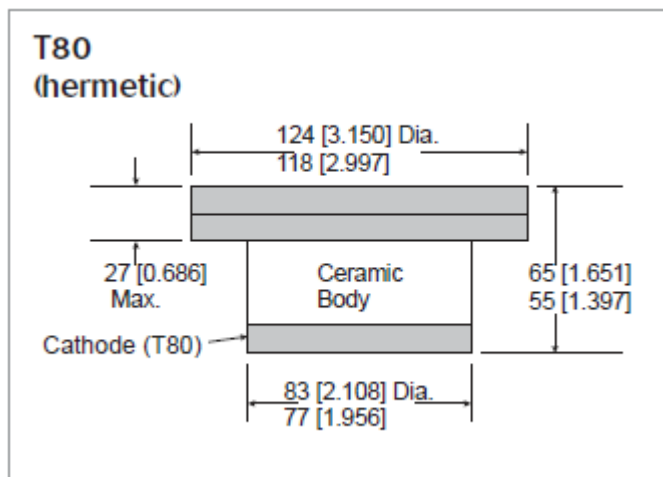
Outline Drawings



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Outline Drawings (continued)



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