

- **Detector Diode MMIC**
- **W-Band 75-110 GHz**
- **Lowest 1/f Noise**
- **Zero Bias Detector**

The DD2 is a tunnel diode W-band square law detector fabricated using HRL's advanced InAs/GaAsSb growth and fabrication processes. The zero bias diode produces a DC voltage proportional to input power with high sensitivity. Linearity is excellent up to the -30 dBm input power level. Noise equivalent power is less than 1 pW/Hz<sup>1/2</sup>.

### Electrical Specifications, T<sub>A</sub>= 25°C

Specification	Symbol	Units	Min	Typical	Max
Junction Resistance	R <sub>J</sub>	Ω	900	1400	3000
Curvature Coefficient	γ	mA/mW	15	32	
Mean Sensitivity	β <sub>avg</sub>	V/mW		15	
Center Frequency	F <sub>center</sub>	GHz	85	95	105
Bandwidth	Δv	GHz	25	35	
Reflection Magnitude	Γ	dB			-3

R<sub>J</sub> = dV/dI = slope of DC I(V) curve at zero bias, V=0.

γ = (d<sup>2</sup>I/dV<sup>2</sup>)/(dI/dV) at zero bias, V=0.

Δv and β<sub>avg</sub> are defined in the radiometric sense as:

$$\Delta v = \frac{\left( \int_0^{\infty} \beta(f) df \right)^2}{\int_0^{\infty} \beta^2(f) df}, \beta_{avg} = \frac{\int_0^{\infty} \beta^2(f) df}{\int_0^{\infty} \beta(f) df}, F_{center} = \frac{\int_0^{\infty} f \beta(f) df}{\int_0^{\infty} \beta(f) df}, \Gamma = \frac{\int_0^{\infty} S_{11}(f) \beta(f) df}{\int_0^{\infty} \beta(f) df}$$

Typical operating temperature range: -95 °C to 80 °C

Typical R<sub>J</sub> Temperature Sensitivity: ΔR<sub>J</sub> <10% from -165 to 80 °C

Typical β Temperature Sensitivity: Δβ <10% from -95 to 80 °C

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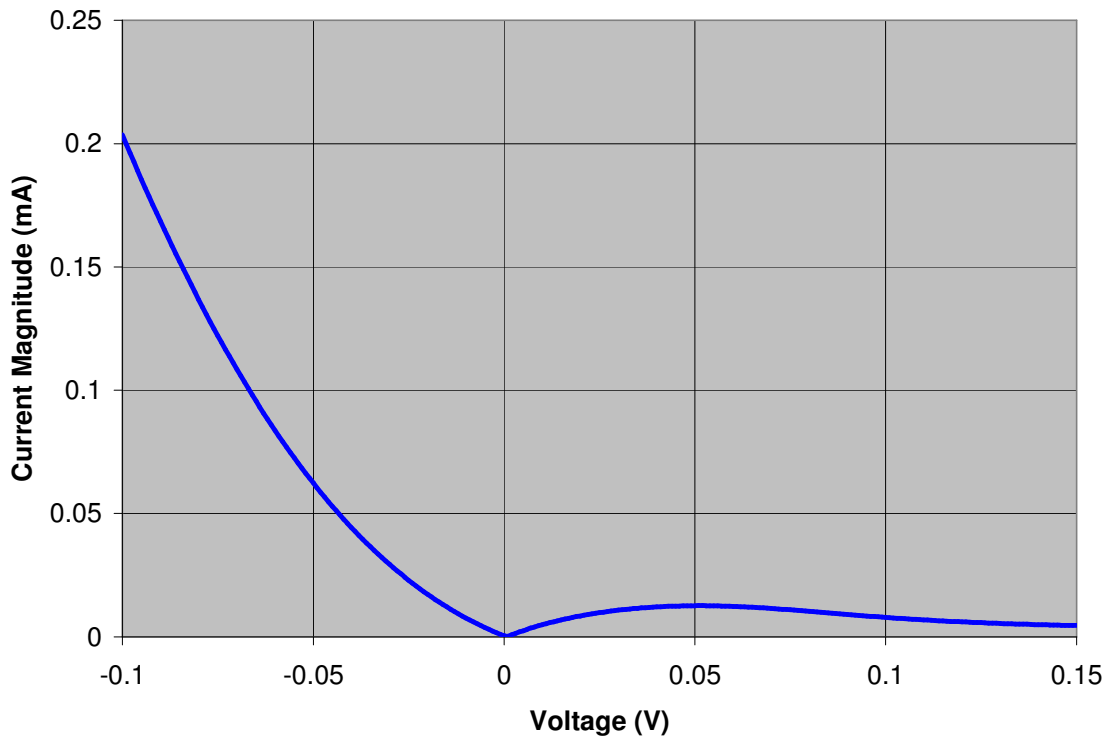
**Table I Maximum Ratings**

<b>Symbol</b>	<b>Parameter</b>	<b>Value</b>	<b>Note</b>
$P_{IN}$	Input Power	-30 dBm	
$ V_{MAX} $	DC Voltage Magnitude	0.2 V	
$T_M$	Mounting Temperature (30 seconds)	290	

### **ESD Sensitivity**

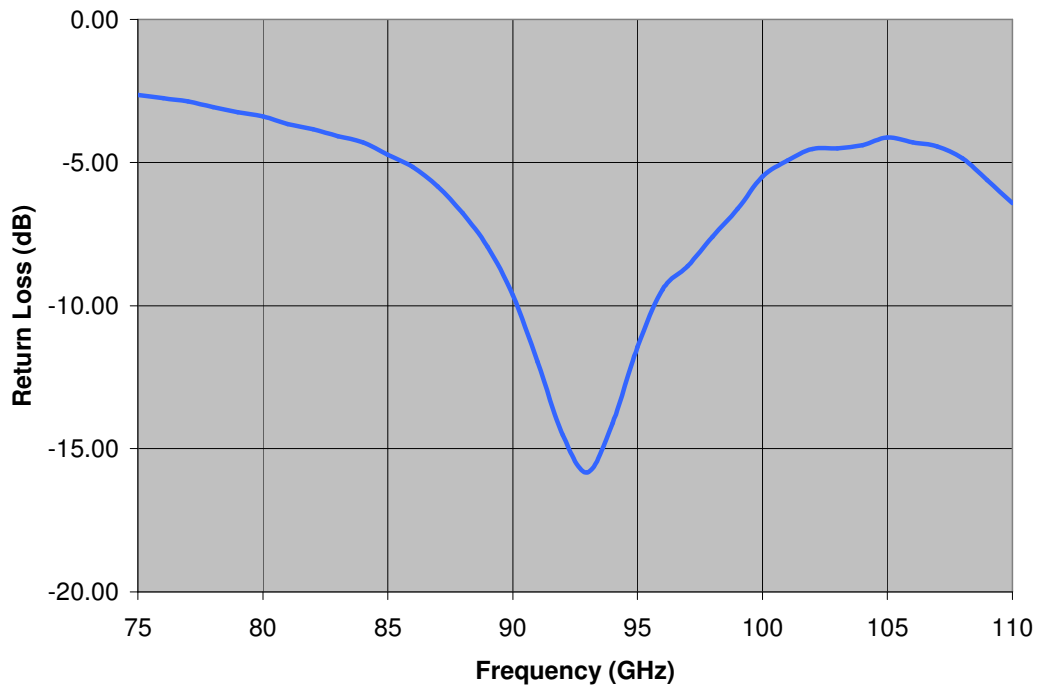
Diodes are ESD sensitive. ESD preventive measures must be employed in all aspects of storage, handling, and assembly. Common causes of ESD include attaching and detaching high capacitance cables, electronic equipment that may produce power spikes, and DC voltage offsets in post-detection amplifiers.

### **Typical DC Current Voltage Performance**



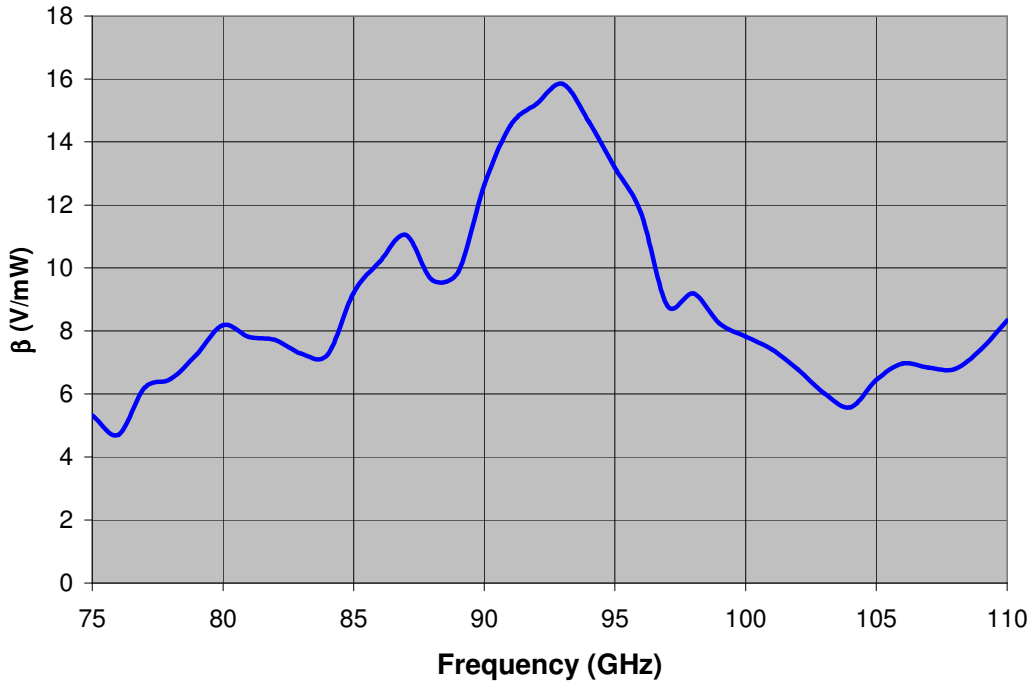
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### Typical Return Loss Performance

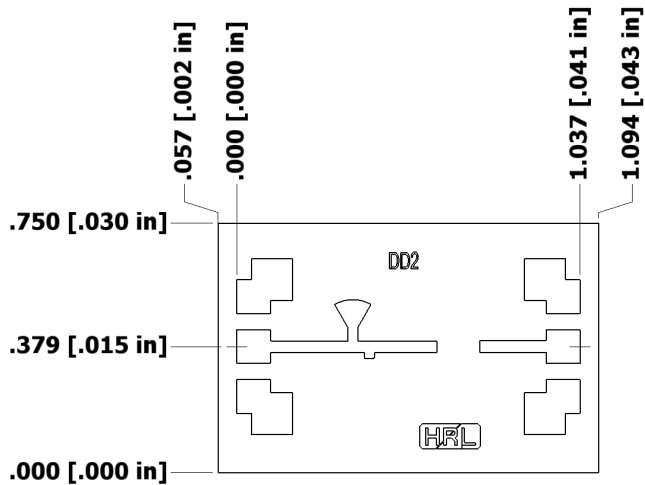


### Typical Sensitivity Performance

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**Outline Drawing**



Bond pads are nominally 0.1mm square  
 Bond pad locations shown from die edge to pad center  
 Die thickness is nominally 50 um

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