

## Features

- Input Power: -15 to +15 dBm
- Dynamic Range: 30 dB
- DC supply: 4.5 V, 70  $\mu$ A
- Lead-Free 3 mm 16-Lead QFN Package
- ESD protected
- RoHS\* Compliant

## Description

MADT-011000 is a single-ended, internally-matched power detector with wide input bandwidth and high dynamic range. The circuit consumes 70  $\mu$ A from a 4.5 V supply, while matched detector and reference diodes provide temperature compensation in differential operation.

The power detector is housed in a 3 mm 16-lead QFN package and is ESD protected for reliability and ease of handling.

MADT-011000 is well suited for power control in microwave radios, test and measurement equipment, and radar applications.

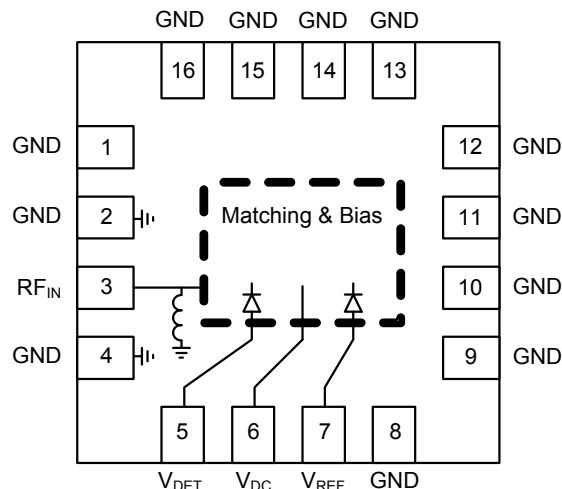
MADT-011000 is also available in bare die format. Refer to datasheet MADT-011000-DIE.

## Ordering Information<sup>1,2</sup>

Part Number	Package
MADT-011000	Bulk
MADT-011000-TR1000	1000 Piece Reel
MADT-011000-SB1	Sample Board

1. Reference Application Note M513 for reel size information.
2. All sample boards include 5 loose parts.

## Functional Schematic



## Pin Configuration<sup>3</sup>

Pin No.	Function
1, 2, 4, 8 - 16	GND <sup>3</sup>
3	RF <sub>IN</sub>
5	V <sub>DET</sub>
6	V <sub>DC</sub>
7	V <sub>REF</sub>
Paddle <sup>4</sup>	

3. MACOM recommends connecting unused package pins to ground.
4. The exposed pad centered on the package bottom must be connected to RF, DC and thermal ground.

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

## Power Detector 5 - 44 GHz

Rev. V1

**Electrical Specifications: Freq. = 5 - 44 GHz,  $T_A = +25^\circ\text{C}$ ,  $V_{DC} = 4.5\text{ V}$ ,  $Z_0 = 50\ \Omega^5$**

Parameter	Test Conditions	Units	Min.	Typ.	Max.
Input Power	—	dBm	-15	—	+15
Dynamic Range	$V_{ref} - V_{det} > 5\text{ mV}$	dB	30	—	—
Vdelta	$V_{delta} = V_{ref} - V_{det}$ Input power = -15 to +15 dBm	mV	5	—	2200
Return Loss	5 - 10 GHz	dB	—	-11	-9
	10 - 12 GHz			-11	-9
	12 - 36 GHz			-15	-9
	36 - 44 GHz			-18	-13
Supply Voltage	—	V	—	4.5	—
Current Consumption	—	$\mu\text{A}$	60	70	80

5. All specifications refer to CW input signal.

### Absolute Maximum Ratings<sup>6,7</sup>

Parameter	Absolute Maximum
Input Power	18 dBm
VDC	6 V
Operating Temperature	$-40^\circ\text{C}$ to $+85^\circ\text{C}$
Storage Temperature	$-65^\circ\text{C}$ to $+150^\circ\text{C}$

6. Exceeding any one or combination of these limits may cause permanent damage to this device.  
7. MACOM does not recommend sustained operation near these survivability limits.

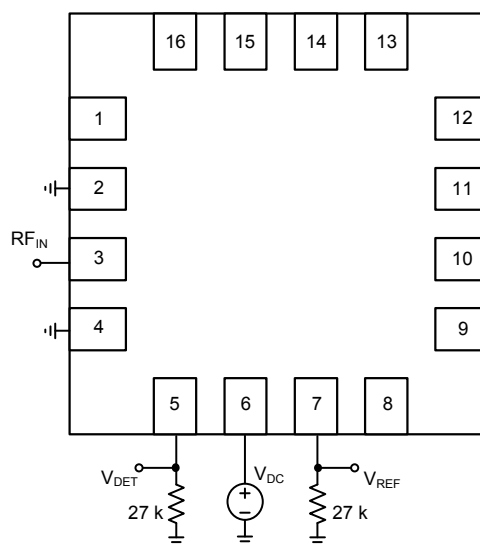
### Handling Procedures

Please observe the following precautions to avoid damage:

### Static Sensitivity

These electronic devices are sensitive to electrostatic discharge (ESD) and can be damaged by static electricity. Proper ESD control techniques should be used when handling these Class 1B devices.

### Application Circuit<sup>8,9</sup>



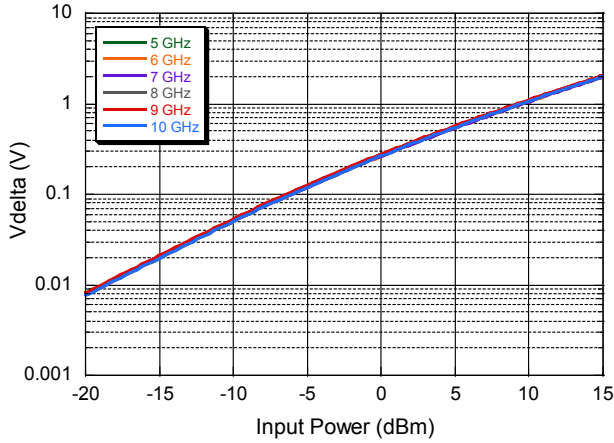
8. External 27 k $\Omega$  resistors are recommended for optimum performance.  
9. Typical  $V_{ref} = 0.74\text{ V}$

## Power Detector 5 - 44 GHz

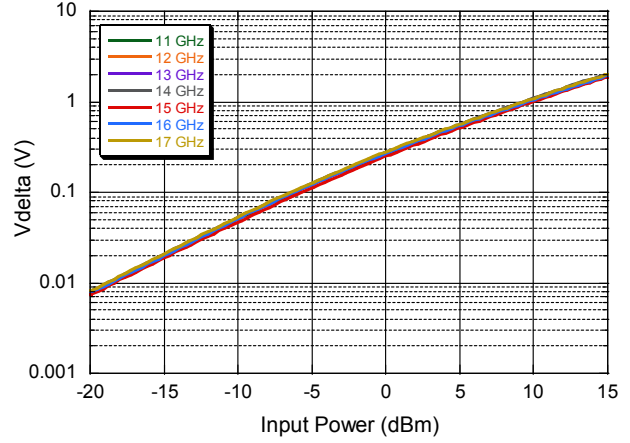
Rev. V1

### Typical Performance Curves: $T_A = 25^\circ\text{C}$

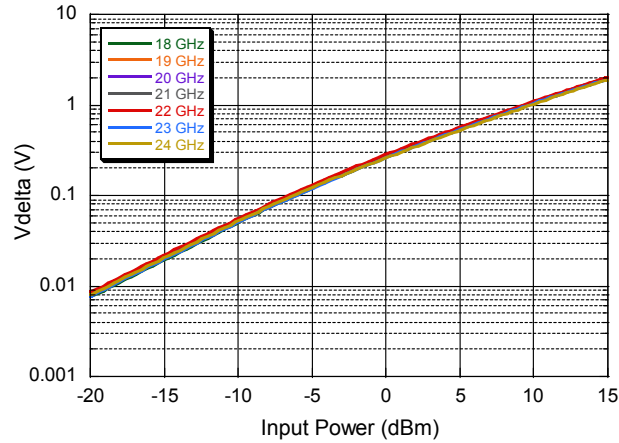
**Vdelta vs. Input Power, 5 - 10 GHz**



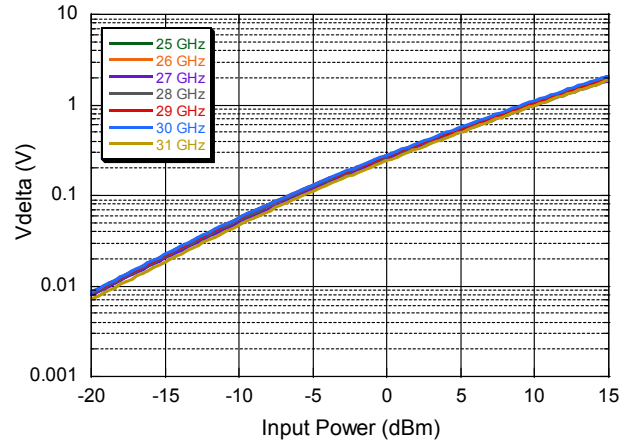
**Vdelta vs. Input Power, 11 - 17 GHz**



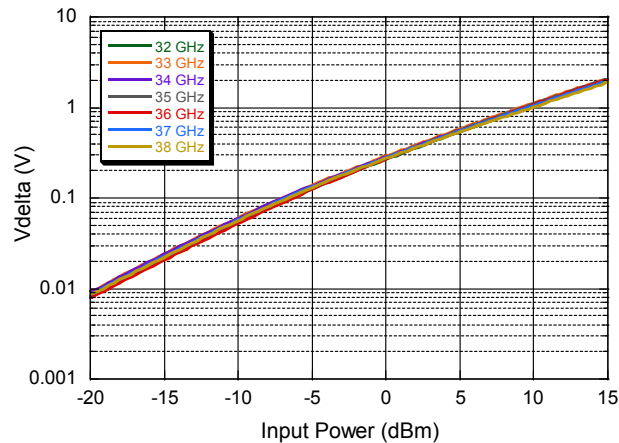
**Vdelta vs. Input Power, 18 - 24 GHz**



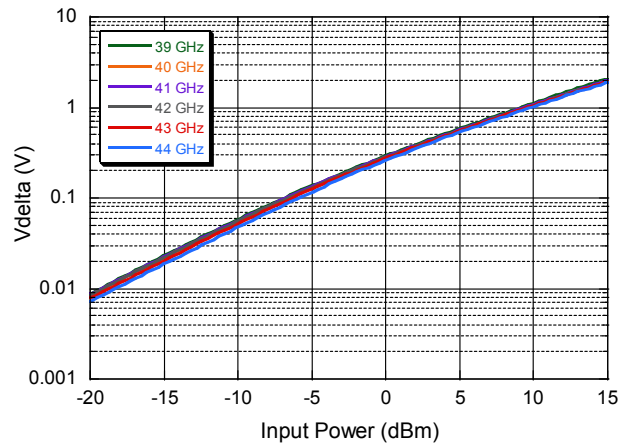
**Vdelta vs. Input Power, 25 - 31 GHz**



**Vdelta vs. Input Power, 32 - 38 GHz**

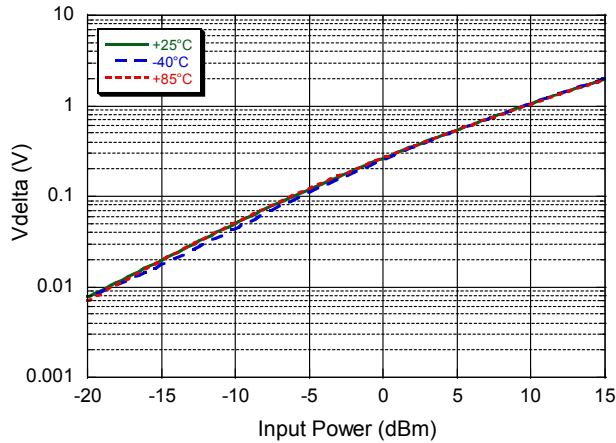


**Vdelta vs. Input Power, 39 - 44 GHz**

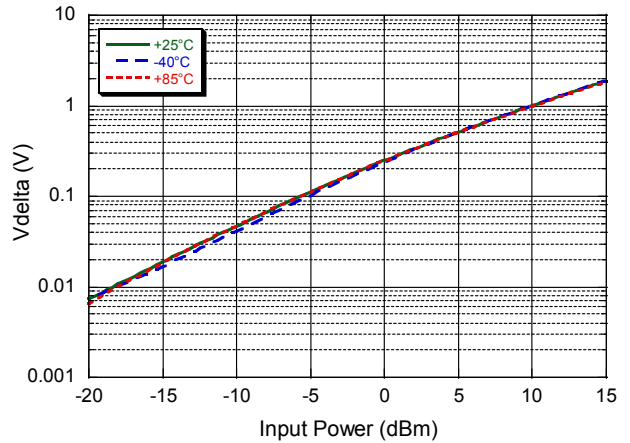


## Typical Performance Curves - Over Temperature

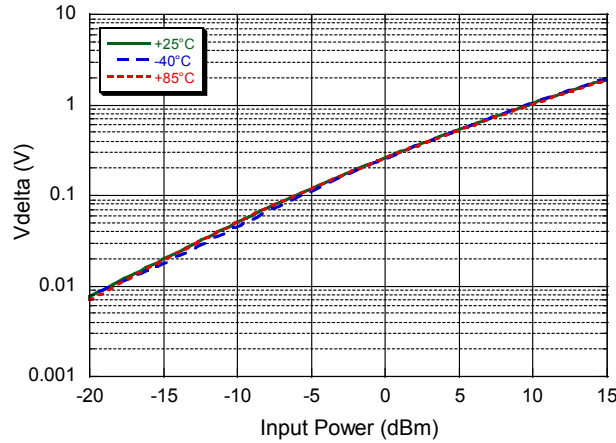
**Vdelta vs. Temperature, 5 GHz**



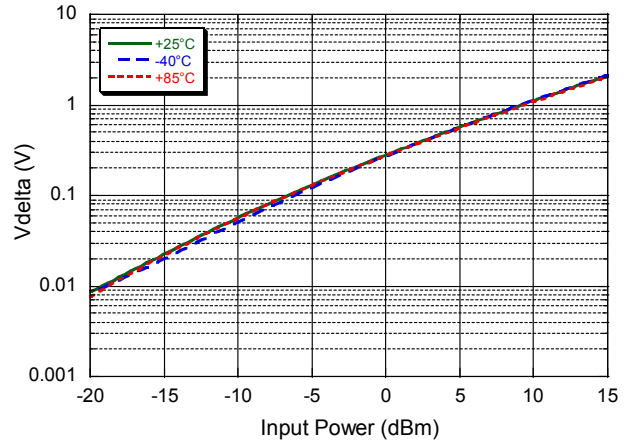
**Vdelta vs. Temperature, 15 GHz**



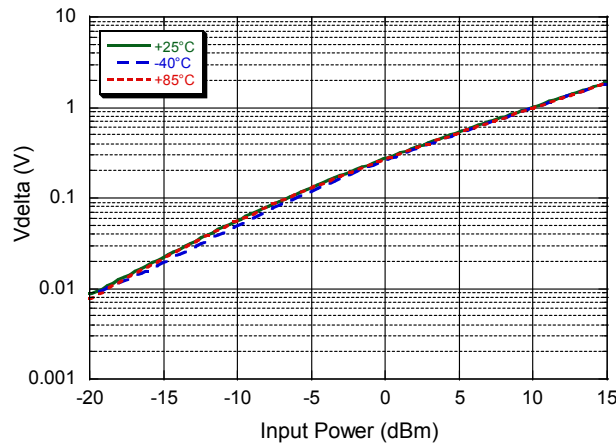
**Vdelta vs. Temperature, 23 GHz**



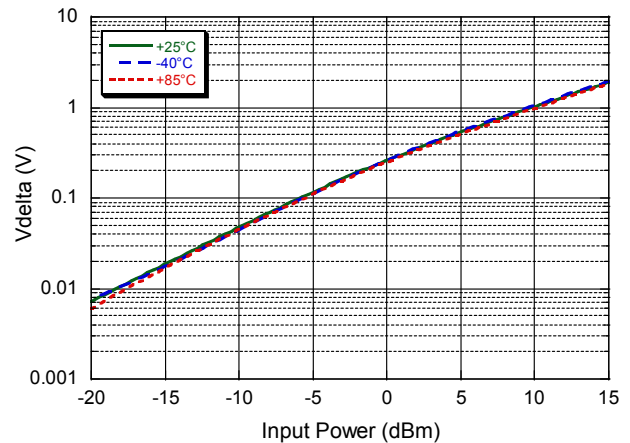
**Vdelta vs. Temperature, 30 GHz**



**Vdelta vs. Temperature, 38 GHz**

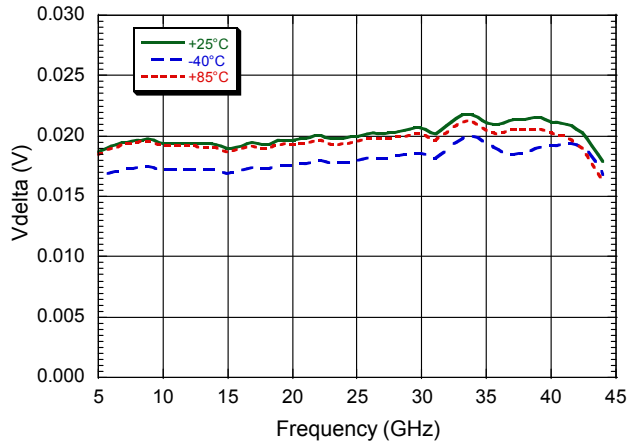


**Vdelta vs. Temperature, 44 GHz**

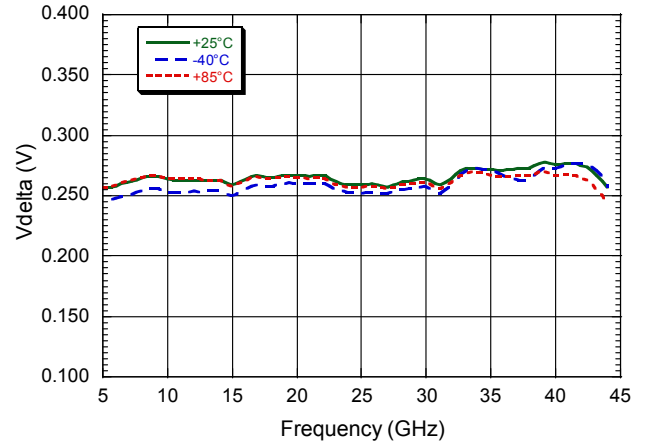


## Typical Performance Curves

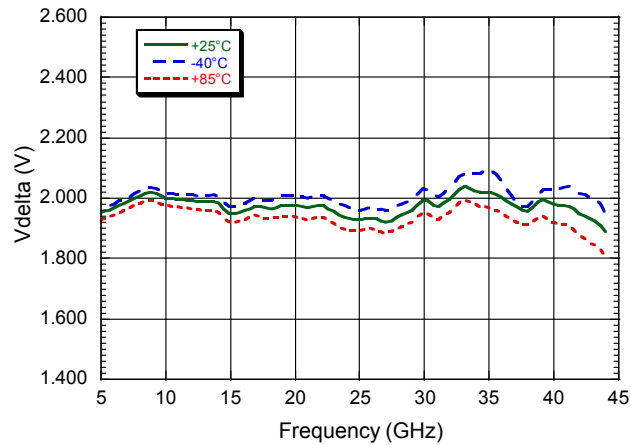
**Vdelta vs. Frequency,  $P_{IN} = -15$  dBm**



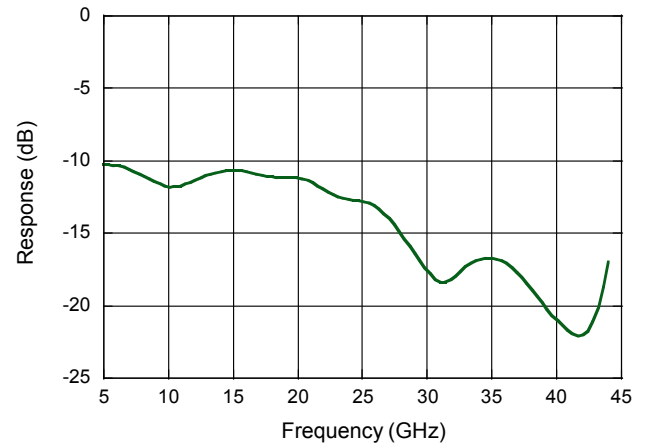
**Vdelta vs. Frequency,  $P_{IN} = 0$  dBm**



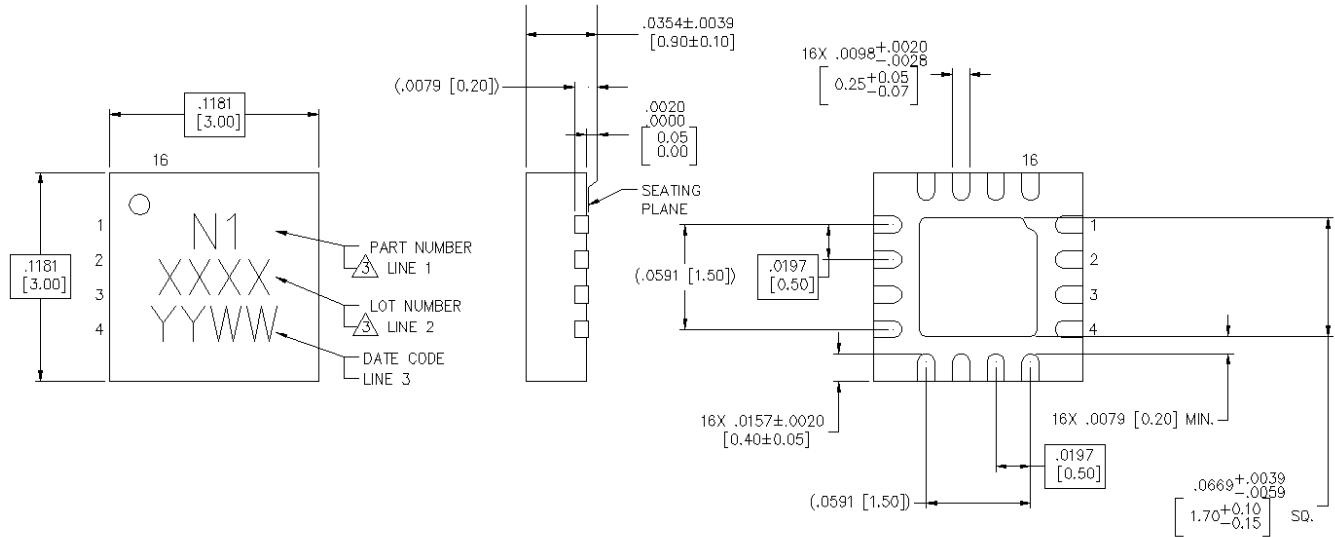
**Vdelta vs. Frequency,  $P_{IN} = +15$  dBm**



**Input Return Loss vs. Frequency**



## Lead-Free 3 mm 16-Lead PQFN<sup>†</sup>



<sup>†</sup> Reference Application Note S2083 for lead-free solder reflow recommendations.  
Meets JEDEC moisture sensitivity level 1 requirements.  
Plating is NiPdAuAg

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