

Power Detector Bare Die

5 - 44 GHz



MADT-011000-DIE

Rev. V2

Features

- Input Power: -15 to +15 dBm
- Dynamic Range: 30 dB
- DC supply: 4.5 V, 70 μ A
- Die size: 1.00 $\times$ 0.75 $\times$ 0.1 mm
- Passivated Die
- ESD Protected
- RoHS* Compliant

Applications

- Microwave Radios
- Radar Application
- Test & Measurement Equipment

Description

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

The 100 μ m thick GaAs die is fully passivated for reliability and ease of handling.

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

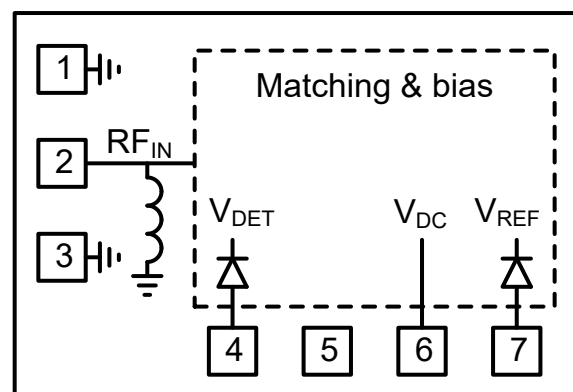
MADT-011000-DIE is also available in a 3 mm QFN package. Refer to datasheet MADT-011000.

Ordering Information¹

Part Number	Package
MADT-011000-DIE	Vacuum release gel pack ¹
MADT-011000-SB2	Sample Board

1. Die quantity varies.

Functional Schematic



Bond-pad Configuration²

Pin #	Function
1	GND/NC
2	RFIN
3	GND/NC
4	VDET
5	NC
6	VDC
7	VREF
8	GND ²

2. The die backside must be connected to RF, DC and thermal ground.

* Restrictions on Hazardous Substances, compliant to current RoHS EU directive.

Electrical Specifications: Freq. = 5 - 44 GHz, $T_A = +25^\circ\text{C}$, $V_{DC} = 4.5\text{ V}$, $Z_0 = 50\ \Omega^3$

Parameter	Test Conditions	Units	Min.	Typ.	Max.
Input Power	—	dBm	-15	—	+15
Dynamic Range	$V_{ref} - V_{det} > 5\text{ mV}$	dB	30	—	—
Vdelta	$V_{delta} = V_{ref} - V_{det}$	mV	5	—	2500
Return Loss	5 - 10 GHz	dB	—	-11	-9
	10 - 12 GHz			-12	-11
	12 - 36 GHz			-11	-9
	36 - 42 GHz			-12	-9
	42 - 44 GHz			-9	-6.5
Supply Voltage	—	V	—	4.5	—
Current Consumption	—	μA	60	70	80

3. All specifications refer to CW input signal.

Absolute Maximum Ratings^{4,5}

Parameter	Absolute Maximum
Input Power	18 dBm
VDC	6 V
Operating Temperature	-55°C to $+85^\circ\text{C}$
Storage Temperature	-65°C to $+150^\circ\text{C}$

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

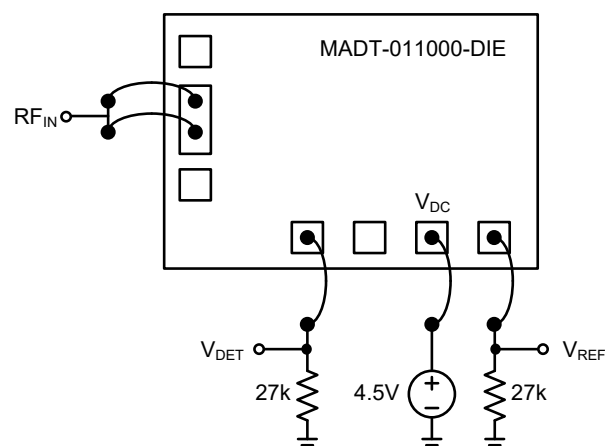
Handling Procedures

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.

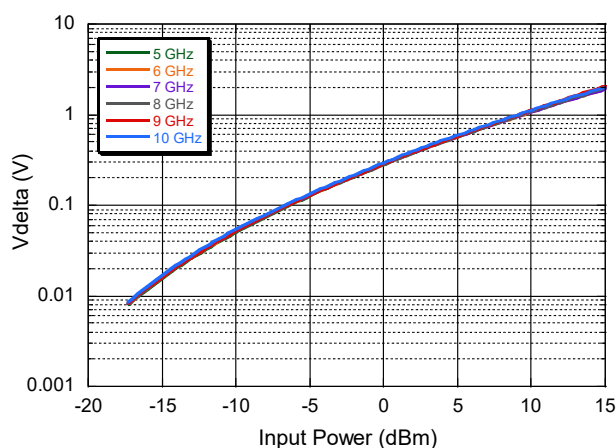
Application Circuit^{6,7,8}



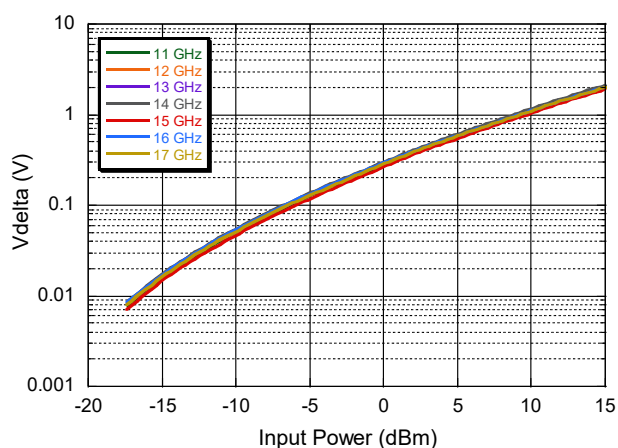
6. External 27 k Ω resistors are required for optimum performance.
7. Typical $V_{ref} = 0.83\text{V}$
8. Attach bare die to PCB or carrier using conductive epoxy

Typical Performance Curves

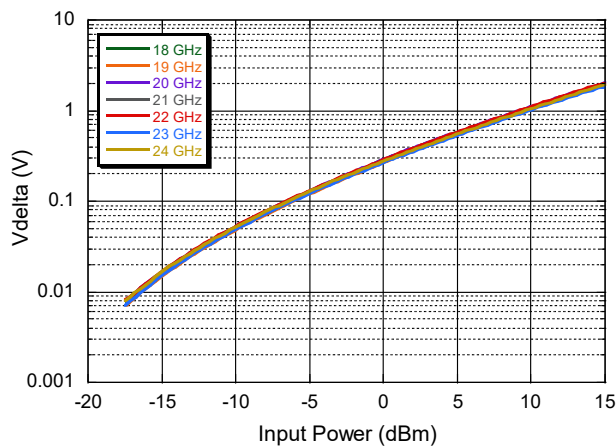
Vdelta vs. Input Power, 5 - 10 GHz



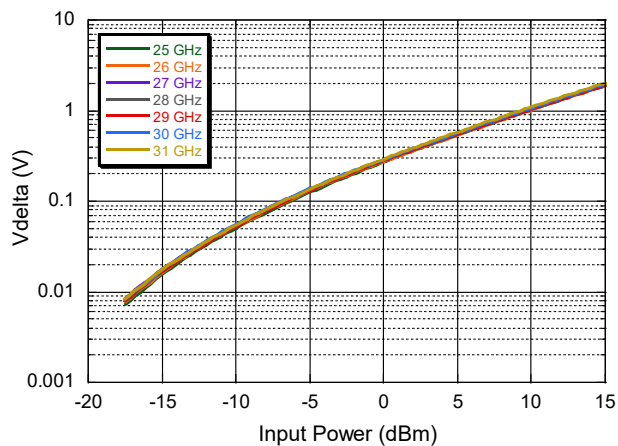
Vdelta vs. Input Power, 11 - 17 GHz



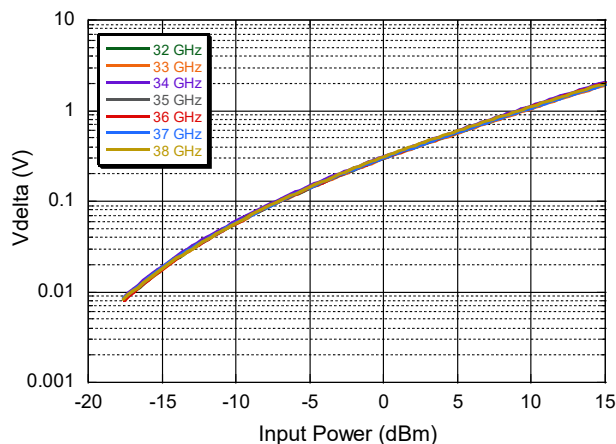
Vdelta vs. Input Power, 18 - 24 GHz



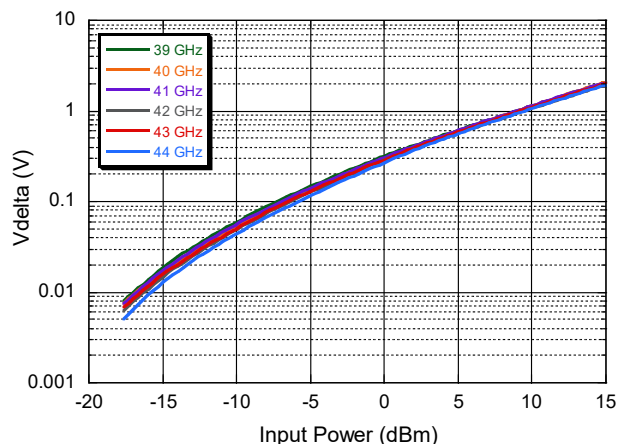
Vdelta vs. Input Power, 25 - 31 GHz



Vdelta vs. Input Power, 32 - 38 GHz

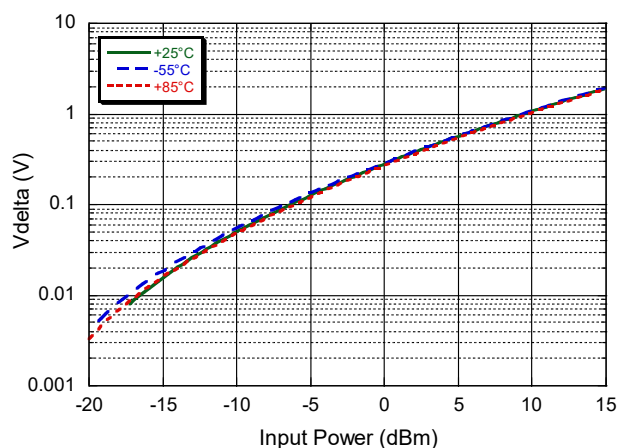


Vdelta vs. Input Power, 39 - 44 GHz

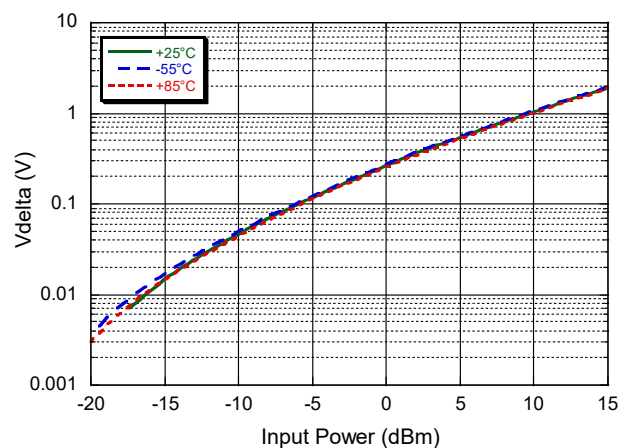


Typical Performance Curves

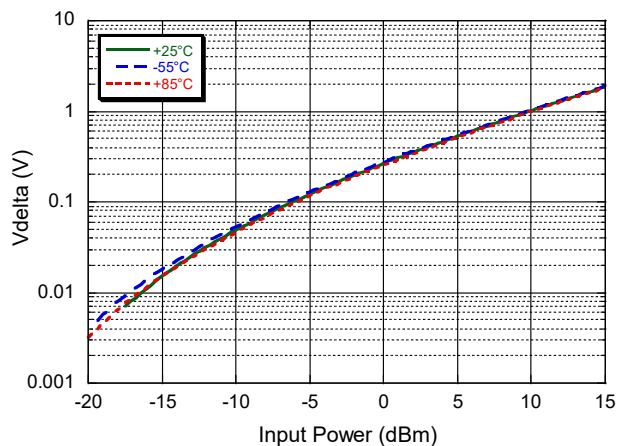
Vdelta vs. Temperature, 5 GHz



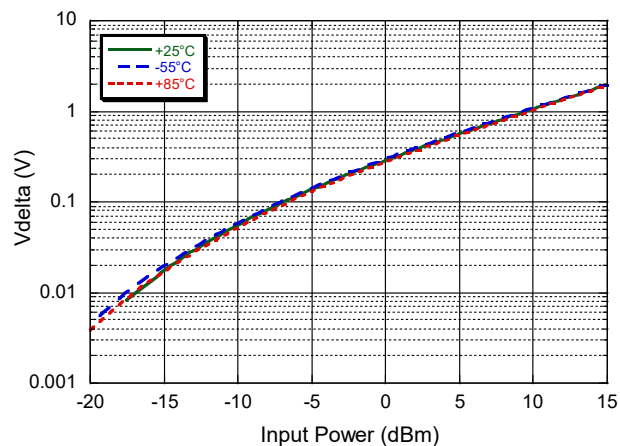
Vdelta vs. Temperature, 15 GHz



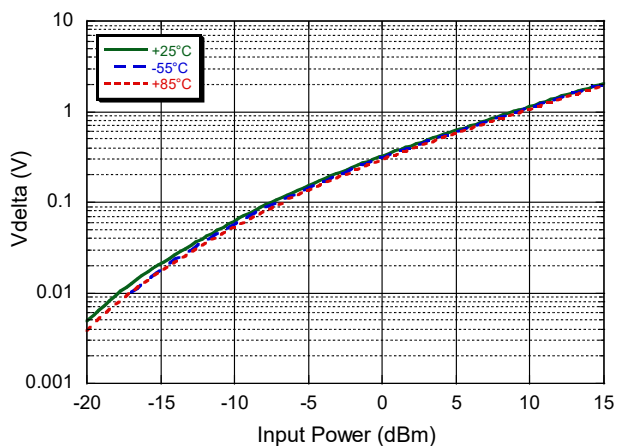
Vdelta vs. Temperature, 23 GHz



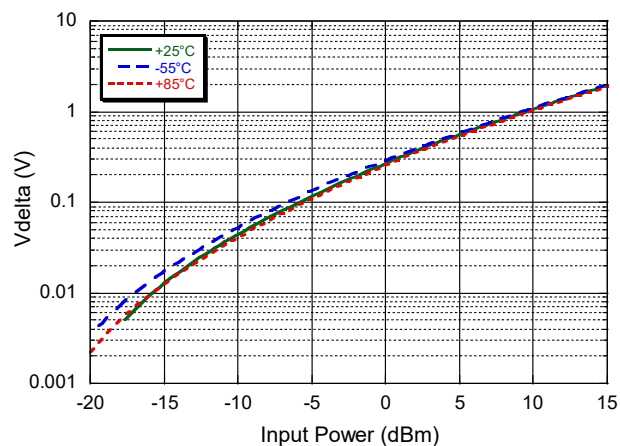
Vdelta vs. Temperature, 30 GHz



Vdelta vs. Temperature, 38 GHz

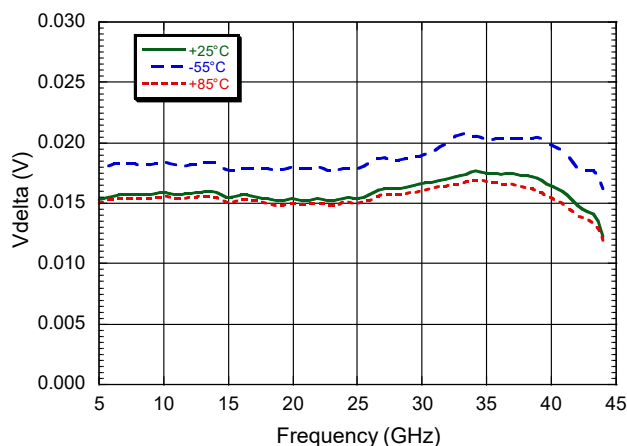


Vdelta vs. Temperature, 44 GHz

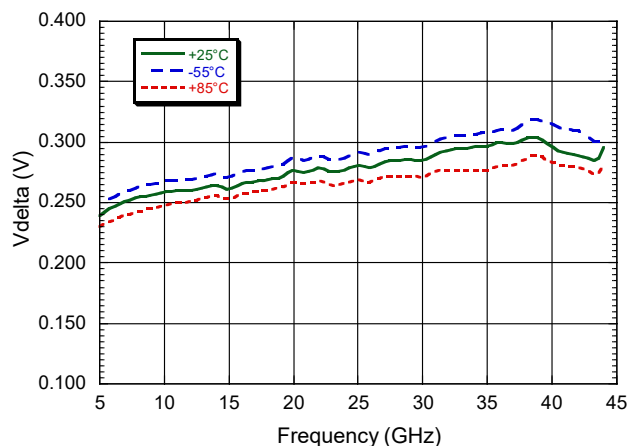


Typical Performance Curves

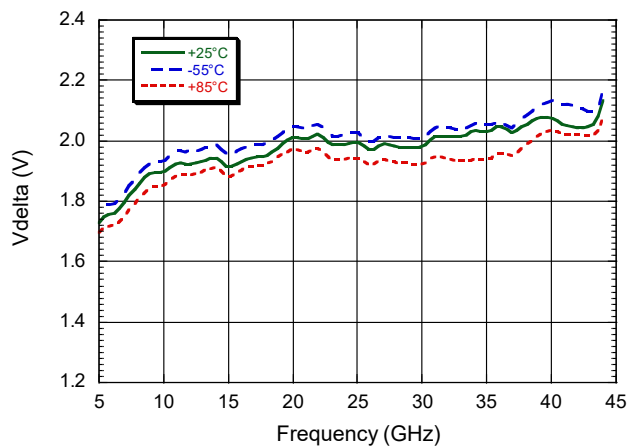
Vdelta vs. Frequency, $P_{IN} = -15$ dBm



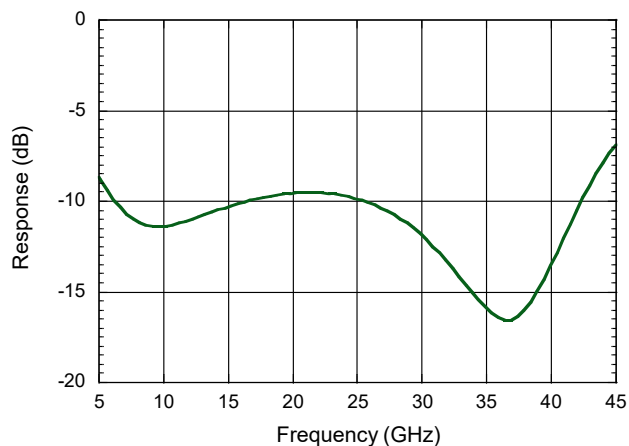
Vdelta vs. Frequency, $P_{IN} = 0$ dBm



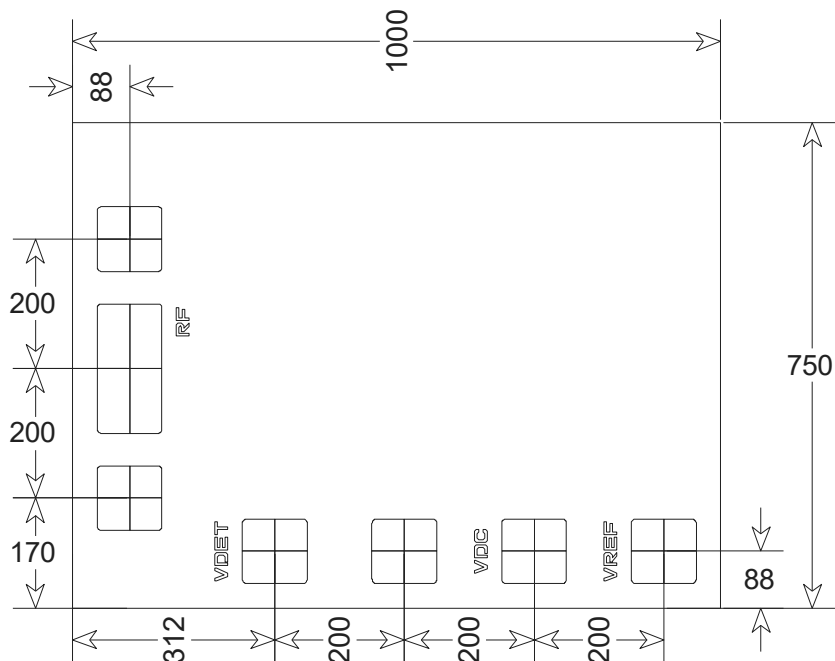
Vdelta vs. Frequency, $P_{IN} = +15$ dBm



Input Return Loss vs. Frequency



Outline Drawing



Notes:

All units are in microns, unless otherwise noted, with a tolerance of $\pm 5 \mu\text{m}$.

Die thickness is $100 \pm 10 \mu\text{m}$

RF bond-pad is $100 \times 200 \mu\text{m}$.

All other bond-pads are $100 \times 100 \mu\text{m}$.

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