

Power Detector Bare Die 5 - 44 GHz

Rev. V1

Features

Input Power: -15 to +15 dBm
Dynamic Range: 30 dB
DC supply: 4.5 V, 70 µA
Die size: 1.00 × 0.75 × 0.1 mm

Passivated DieESD ProtectedRoHS* Compliant

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 µm 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.

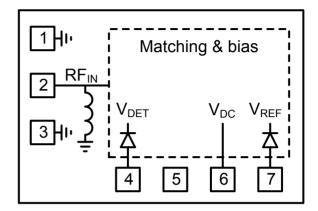
MADT-011000-DIE is also available in a 3 mm QFN package. Refer to datasheet MADT-011000.

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 | | |

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

1

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



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Rev. V1

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

| Parameter | Test Conditions | Units | Min. | Тур. | Max. |
|---------------------|----------------------|-------|------|------|------|
| Input Power | _ | dBm | -15 | _ | +15 |
| Dynamic Range | Vref - Vdet > 5 mV | dB | 30 | _ | _ |
| Vdelta | Vdelta = Vref - Vdet | mV | 5 | _ | 2200 |
| Return Loss | 5 - 10 GHz | | | -11 | -9 |
| | 10 - 12 GHz | | | -12 | -11 |
| | 12 - 36 GHz | dB | _ | -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°C | | |
| Storage Temperature | -65°C to +150°C | | |

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

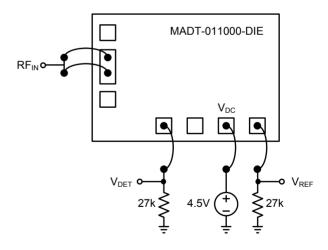
Handling Procedures

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 $k\Omega$ resistors are required for optimum performance.
- 7. Typical Vref = 0.83V
- 8. Attach bare die to PCB or carrier using conductive epoxy

2

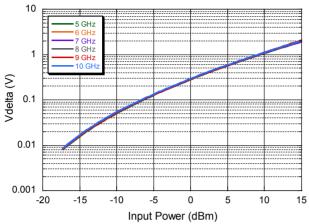


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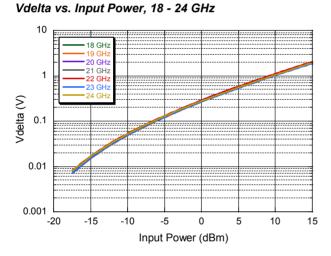
Rev. V1

Typical Performance Curves

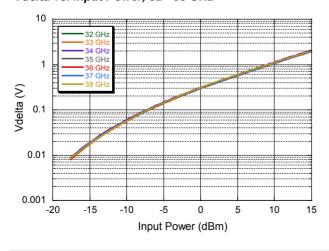
Vdelta vs. Input Power, 5 - 10 GHz



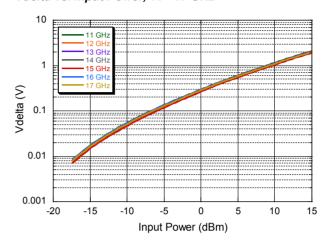
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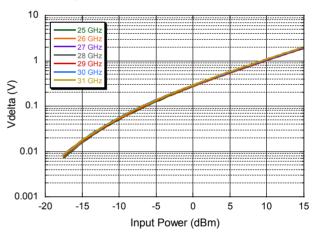
Vdelta vs. Input Power, 32 - 38 GHz



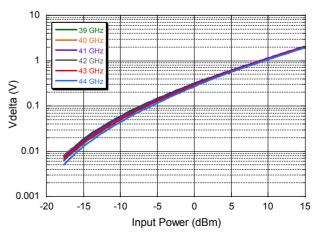
Vdelta vs. Input Power, 11 - 17 GHz



Vdelta vs. Input Power, 25 - 31 GHz



Vdelta vs. Input Power, 39 - 44 GHz



3

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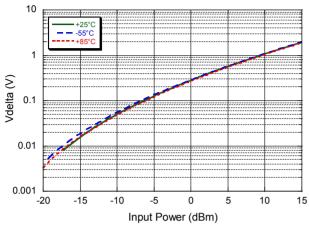


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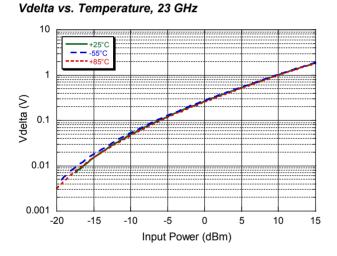
Rev. V1

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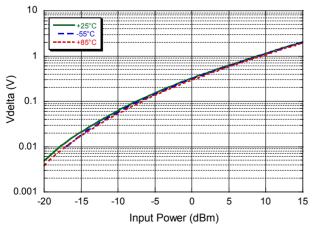
Vdelta vs. Temperature, 5 GHz



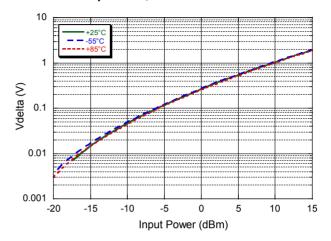
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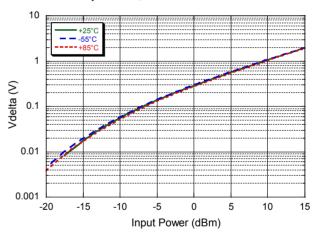
Vdelta vs. Temperature, 38 GHz



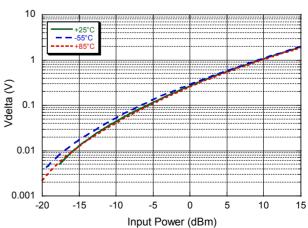
Vdelta vs. Temperature, 15 GHz



Vdelta vs. Temperature, 30 GHz



Vdelta vs. Temperature, 44 GHz



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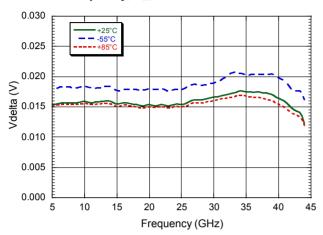


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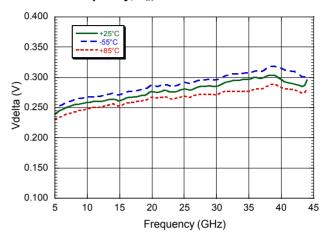
Rev. V1

Typical Performance Curves

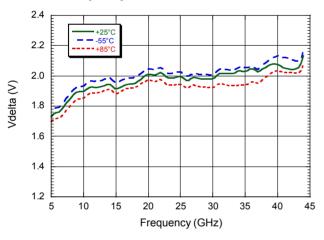
Vdelta vs. Frequency, P_{IN} = -15 dBm



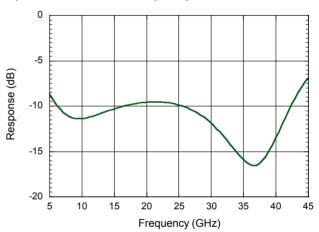
Vdelta vs. Frequency, $P_{IN} = 0$ dBm



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



Input Return Loss vs. Frequency

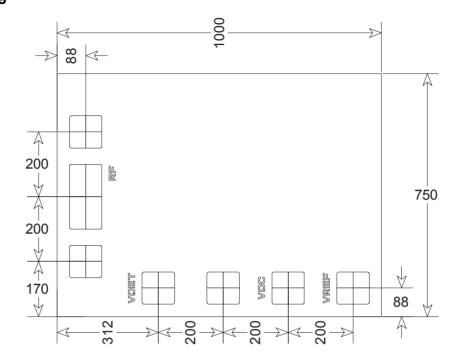




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Rev. V1

Outline Drawing



Notes:

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

Die thickness is 100 \pm 10 μm

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

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



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