

## Features

- Wide Bandwidth Fixed Attenuation up to 50 GHz
- 2, 3, 4, 6, 10, 15, and 20 dB Values
- Two 0 dB thru lines
- 50  $\Omega$  Impedance
- 27 dBm Power Handling
- Bare Die
- RoHS\* Compliant

## Applications

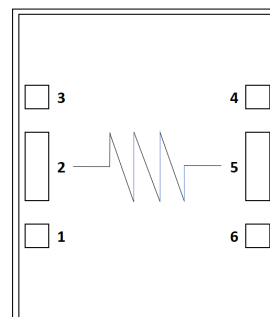
- Telecom Infrastructure
- Fiber Optics
- Sensors
- Test Instruments
- Microwave Radio
- General Purpose

## Description

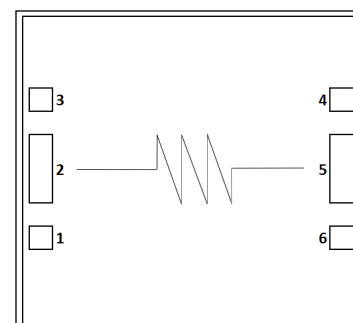
The MAAT-0110xx-DIE are broadband bidirectional, fixed attenuator values including 0, 2, 3, 4, 6, 10, 15, and 20 dB

The MAAT-0110xx-DIE are suited for many applications that require a small attenuator die for chip-and-wire assemblies delivering flat attenuation and excellent return loss.

## Functional Schematic



**MAAT-011022 / 024 / 025 / 026 / 027 / 028 / 029**



**MAAT-011023 / 030**

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

| Part Number     | Description      |
|-----------------|------------------|
| MAAT-011022-DIE | Thru Line        |
| MAAT-011023-DIE | Thru Line        |
| MAAT-011024-DIE | 2 dB Attenuator  |
| MAAT-011025-DIE | 3 dB Attenuator  |
| MAAT-011026-DIE | 4 dB Attenuator  |
| MAAT-011027-DIE | 6 dB Attenuator  |
| MAAT-011028-DIE | 10 dB Attenuator |
| MAAT-011029-DIE | 15 dB Attenuator |
| MAAT-011030-DIE | 20 dB Attenuator |

1. Die supplied in gel pack.

## Pin Configuration<sup>2,3</sup>

| Pin #   | Name              | Function  |
|---------|-------------------|-----------|
| 1,3,4,6 | GND               | Ground    |
| 2       | RF <sub>IN</sub>  | RF Input  |
| 5       | RF <sub>OUT</sub> | RF Output |

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

3. Ground pins may be left open.

<sup>1</sup> \* Restrictions on Hazardous Substances, compliant to current RoHS EU directive.

**Electrical Specifications: (measured with 150  $\mu$ m G-S-G RF probes);  $T_A = 25^\circ\text{C}$ ,  $Z_0 = 50 \Omega$**

| Part Number     | Attenuation<br>0.05 - 24 GHz<br>25 - 50 GHz |              |               | Return Loss<br>In/Out<br>0.05 - 24 GHz<br>25 - 50 GHz | Input P1dB<br>0.05 - 30 GHz | Input IP3<br>0.05 - 30 GHz |
|-----------------|---------------------------------------------|--------------|---------------|-------------------------------------------------------|-----------------------------|----------------------------|
|                 | dB                                          |              |               | dB                                                    | dBm                         | dBm                        |
|                 | Min.                                        | Typ.         | Max.          | Typ.                                                  | Typ.                        | Typ.                       |
| MAAT-011022-DIE | —                                           | 0.1<br>0.2   | 0.15<br>0.25  | 21.0<br>17.5                                          | —                           | —                          |
| MAAT-011023-DIE | —                                           | 0.2<br>0.3   | 0.3<br>0.4    | 21.0<br>17.5                                          | —                           | —                          |
| MAAT-011024-DIE | 1.7<br>1.6                                  | 1.9<br>2.0   | 2.1<br>2.4    | 21.0<br>17.5                                          | 27                          | 40                         |
| MAAT-011025-DIE | 2.8<br>2.75                                 | 3.0<br>3.1   | 3.2<br>3.5    | 21.0<br>17.5                                          | 27                          | 40                         |
| MAAT-011026-DIE | 3.9<br>3.75                                 | 4.1<br>4.2   | 4.3<br>4.65   | 21.0<br>17.5                                          | 27                          | 40                         |
| MAAT-011027-DIE | 6.0<br>6.0                                  | 6.2<br>6.3   | 6.4<br>6.6    | 21.0<br>17.5                                          | 27                          | 40                         |
| MAAT-011028-DIE | 10.0<br>9.85                                | 10.2<br>10.3 | 10.4<br>10.75 | 21.0<br>17.5                                          | 27                          | 40                         |
| MAAT-011029-DIE | 15.0<br>15.1                                | 15.3<br>15.4 | 15.5<br>15.7  | 21.0<br>17.5                                          | 27                          | 40                         |
| MAAT-011030-DIE | 20.1<br>19.9                                | 20.5<br>20.4 | 21.0<br>20.8  | 21.0<br>17.5                                          | 27                          | 40                         |

### Maximum Operating Conditions

| Parameter             | Maximum        |
|-----------------------|----------------|
| Input Power           | 29 dBm         |
| Operating Temperature | -40°C to +85°C |

### Absolute Maximum Ratings<sup>4,5</sup>

| Parameter           | Absolute Maximum |
|---------------------|------------------|
| Input Power         | 30 dBm           |
| Storage Temperature | -65°C to +150°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

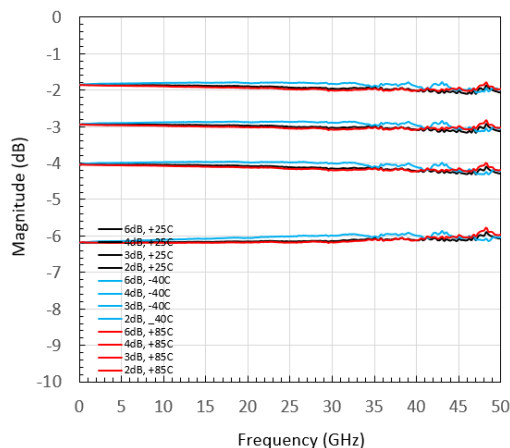
Please observe the following precautions to avoid damage:

### Static Sensitivity (ESD Rating)

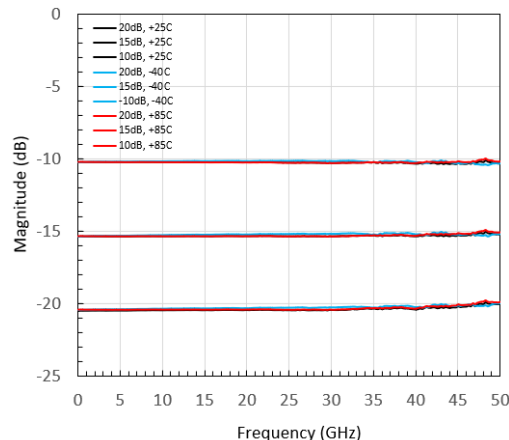
These electronic devices are sensitive to electrostatic discharge (ESD) and can be damaged by static electricity. Proper ESD control techniques should be used when handling these devices. This device has a Class 1B HBM ESD rating

## Typical Performance Curves

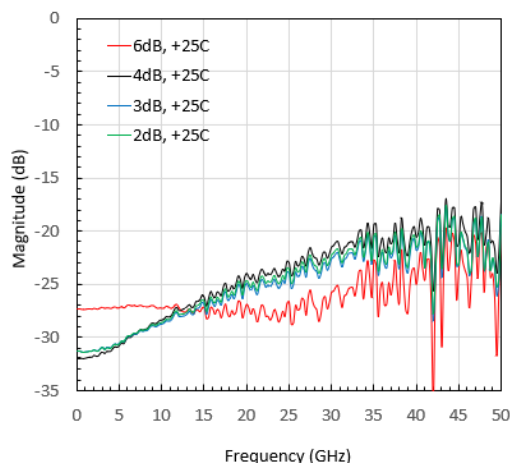
**Attenuation 6 dB, 4 dB, 3 dB, and 2 dB over temp**



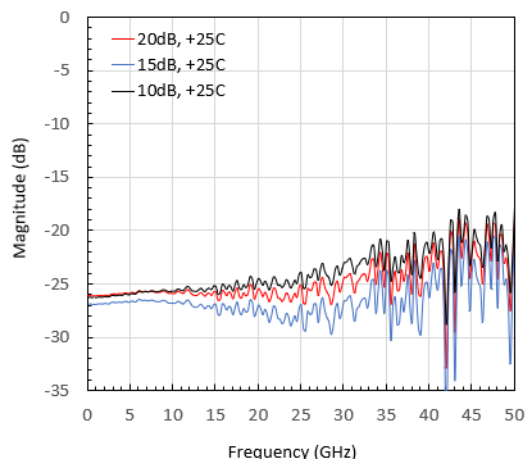
**Attenuation 20 dB, 15 dB, and 10 dB over temp**



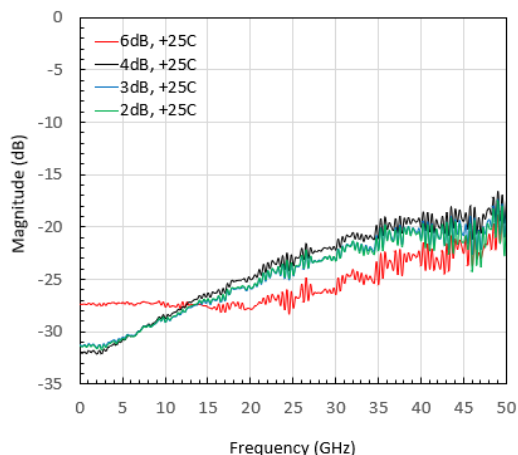
**Input RL 6 dB, 4 dB, 3 dB, and 2 dB Attenuation**



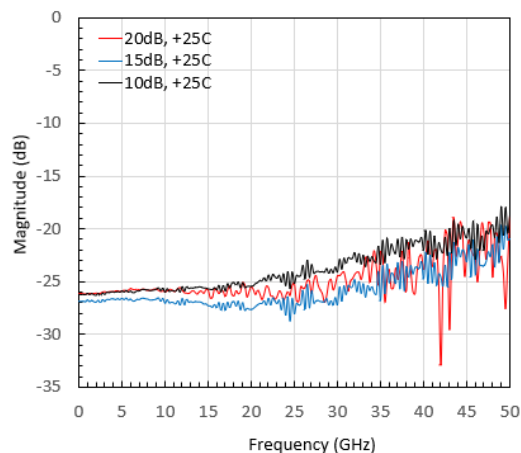
**Input RL 20 dB, 15 dB, and 10 dB Attenuation**



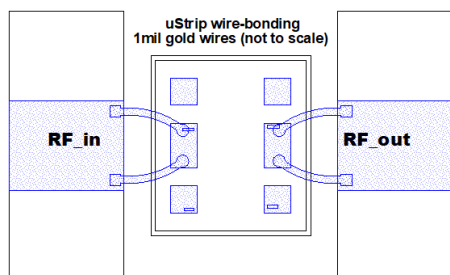
**Output RL 6 dB, 4 dB, 3 dB, and 2 dB Attenuation**



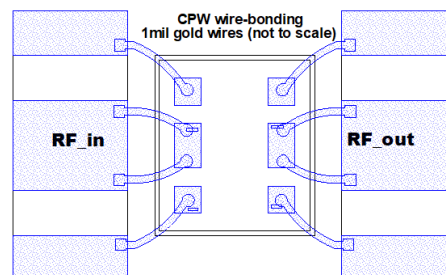
**Output RL 20 dB, 15 dB, and 10 dB Attenuation**



## Recommended Mounting & Wire-Bonding



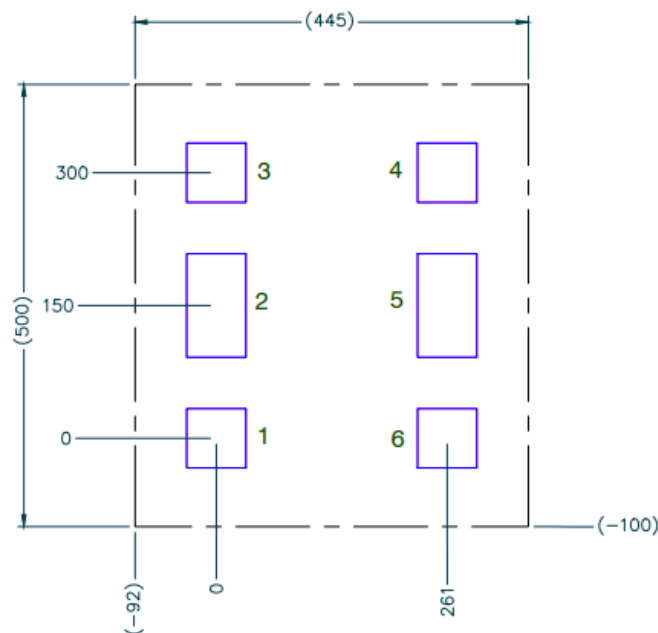
(a) Recommended Microstrip wire bonding



(b) Recommended CPW wire bonding

- The DIE should be directly attached to the RF/DC ground plane; either with solder (AuSn) or a thin application of conductive epoxy. Avoid overflows.
- 50  $\Omega$  microstrip, or 50  $\Omega$  CPW transmission lines should be brought up as close as possible to the die in order to minimize the connecting wire bonds inductances.
- A typical spacing between die and microstrip substrate should be kept between 75 - 125  $\mu\text{m}$  for best RF behavior. All bonds should be kept as short as possible. Use minimum ultrasonic energy for reliable wire bonds.
- Two bond wires are recommended for the RF ports as shown above. Do not exceed a substrate height of 10 mils for any connecting RF transmission line used.

**DIE Outlines**

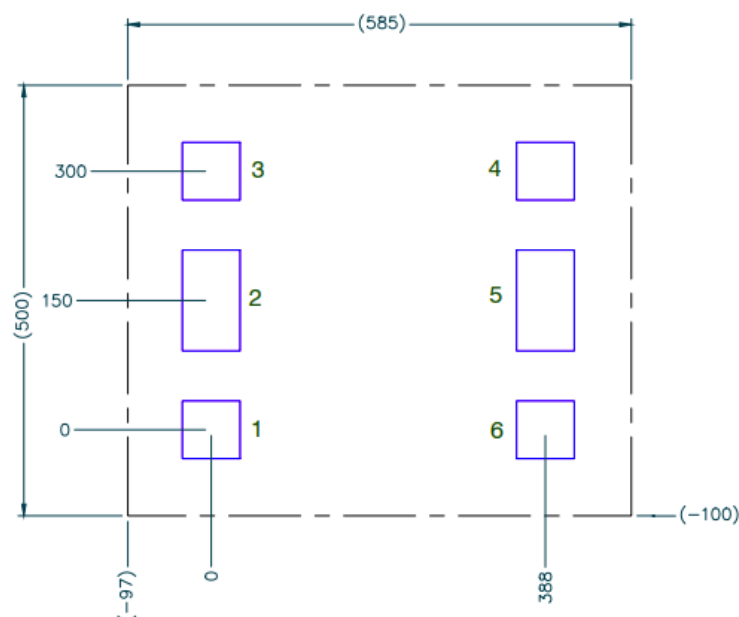


| BOND PAD SIZE $\mu\text{m}$ |                    |                    |           |
|-----------------------------|--------------------|--------------------|-----------|
| PAD                         | X( $\mu\text{m}$ ) | Y( $\mu\text{m}$ ) | PIN LABEL |
| 1,3,4,6                     | 67                 | 67                 | GND       |
| 2                           | 67                 | 117                | RFIN      |
| 5                           | 67                 | 117                | RFOUT     |

NOTES:

1. UNLESS OTHERWISE SPECIFIED, ALL DIMENSIONS SHOWN ARE  $\mu\text{m}$  WITH A TOLERANCE OF  $\pm 5\mu\text{m}$ .
2. DIE THICKNESS IS  $100 \pm 10\mu\text{m}$
3. DIE SIZE REFLECTS CUT DIMENSIONS. DIE SIZE REDUCED BY  $25\mu\text{m}$  EACH DIMENSION.

**MAAT-011022 / 024 / 025 / 026 / 027 / 028 / 029**



| BOND PAD SIZE $\mu\text{m}$ |                    |                    |           |
|-----------------------------|--------------------|--------------------|-----------|
| PAD                         | X( $\mu\text{m}$ ) | Y( $\mu\text{m}$ ) | PIN LABEL |
| 1,3,4,6                     | 67                 | 67                 | GND       |
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**MAAT-011023 / 030**

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