# High Linearity Distributed Power Amplifier
# 0.05 - 6 GHz

**MAAP-011307-DIE**

**Rev. V3**

## Features

- P1dB Output Power: 29 dBm
- Gain: 12 dB
- Noise Figure: 5 dB
- Output IP3: 41 dBm
- 50 Ω Matched
- RoHS* Compliant

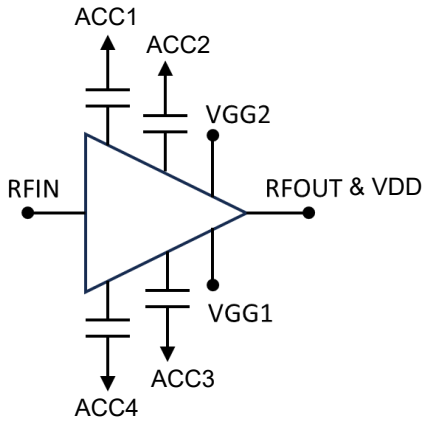
## Applications

- ISM / Multi Market

## Description

The MAAP-011307-DIE is a wideband amplifier that operates from DC to 6 GHz. The device features 12 dB gain, 29 dBm P1dB and excellent OIP3 performance. This power amplifier also features gate bias adjust pins to change current setting for power or temperature.

## Functional Schematic




## Pin Configuration

| Pin # | Function |
|---|---|
| RFIN | RF Input |
| VGG2 | Gate Voltage 2 |
| RFOUT | RF Output and VDD[1] |
| VGG1 | Gate Voltage 1 |
| ACC1 - ACC4 | Bypass Capacitors[2] |

1. Feed drain bias with a bias tee on the RFOUT port.
2. Bypass capacitors should be 1 µF.

## Ordering Information

| Part Number | Package |
|---|---|
| MAAP-011307-DIE | Gel Pack |

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

## Electrical Specifications:
## Freq. = 0.05 - 6.0 GHz, $T_A$ = 25°C, $V_{DD}$ = +12 V, $V_{GG1}$ = -0.8 V, $V_{GG2}$ = +5.2 V, $Z_0$ = 50 Ω

| Parameter | Test Conditions | Units | Min. | Typ. | Max. |
|---|---|---|---|---|---|
| Gain | 1 GHz<br>2 GHz<br>6 GHz | dB | 10.0<br>10.5<br>9.0 | 12.0<br>12.5<br>11.5 | — |
| OIP3 | $P_{IN}$ = -10 dBm / tone, 10 MHz Tone Spacing<br>1 - 6 GHz | dBm | — | 40.0 | — |
| P1dB | — | dBm | — | 29 | — |
| Noise Figure | 0.05 - 0.7 GHz<br>0.7 - 6 GHz | dB | — | 12<br>5 | — |
| Drain Current[3] | — | mA | — | 300 | — |

3. Set quiescent drain current by adjusting the gate potentials. See bias sequencing instructions below.

## Recommended Operating Limits

| Parameter | Maximum |
|---|---|
| RF Input Power CW | 20 dBm |
| $V_{DD}$ | 14 V |
| $V_{GG1}$ | -3 V to -0.5 V |
| $V_{GG2}$ | 3 V to 5.5 V |
| Operating Temperature | -40ºC to +85ºC |
| Junction Temperature[4,5] | +150ºC |

4. Operating at nominal conditions with $T_J \leq 150°C$ will ensure MTTF > 1 x $10^6$ hours.
5. Junction Temperature ($T_J$) = $T_C$ + $\Theta_{JC}$ * ((V * I) - ($P_{OUT}$ - $P_{IN}$))
   Typical thermal resistance ($\Theta_{JC}$) = 14°C/W
   a) For $T_C$ = +25°C,
   $T_J$ = 80.17°C @ 12V, 300 mA, $P_{IN}$ = 0 dBm, $P_{OUT}$ = 13 dBm
   b) For $T_C$ = +85°C,
   $T_J$ = 133.2°C @ 12V, 365 mA, $P_{IN}$ = 18 dBm, $P_{OUT}$ = 30 dBm

## Absolute Maximum Ratings[6,7]

| Parameter | Absolute Maximum |
|---|---|
| RF Input Power CW | 24 dBm |
| $V_{DD}$ | 15 V |
| $V_{GG1}$ | -5 V to -0.4 V |
| $V_{GG2}$ | 1 V to 5.6 V |
| Storage Temperature | -55°C to +150°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.

## Bias Sequencing

**Turn ON:**

1. Apply –2.5 V to Vgg1
2. Apply +5.2 V to Vgg2
3. Apply +12 V to $V_{DD}$
4. Adjust $V_{GG}$1 more positive until $I_{DQ}$ = 300 mA[8]
5. Apply RF.

**Turn OFF**: Is the reverse order of turn ON.

8. VGG1 - VGG2 should be approximately equal to 6V when $I_{DQ}$ = 300 mA.

## Handling Procedures

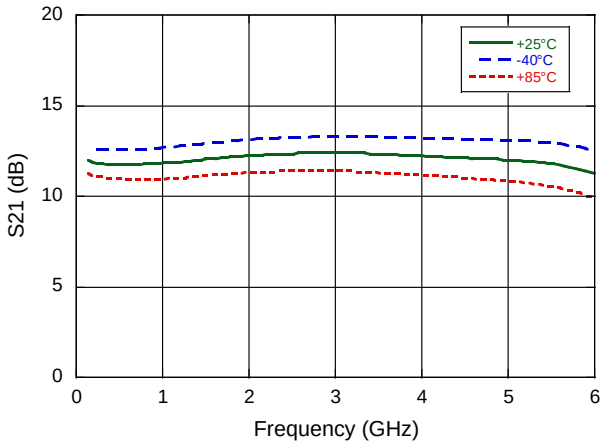
Please observe the following precautions to avoid damage:

## Static Sensitivity

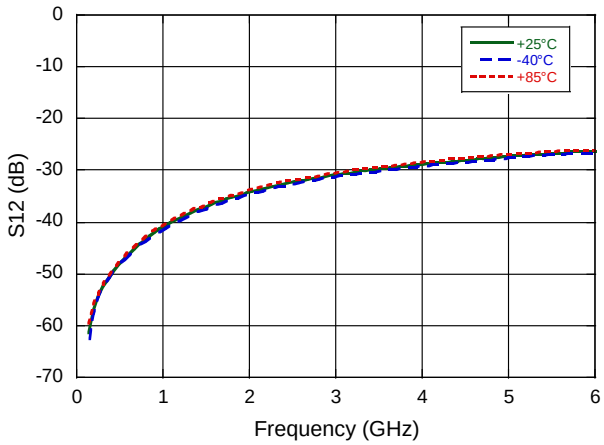
These electronic devices are sensitive to electrostatic discharge (ESD) and can be damaged by static electricity. Proper ESD control techniques should be used when handling these devices.

## Typical Performance Curves

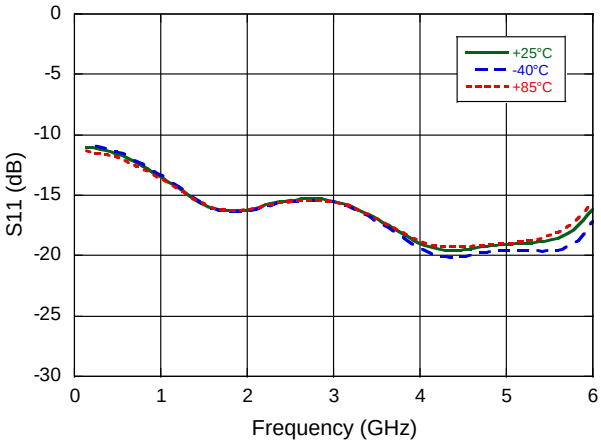
***Gain***



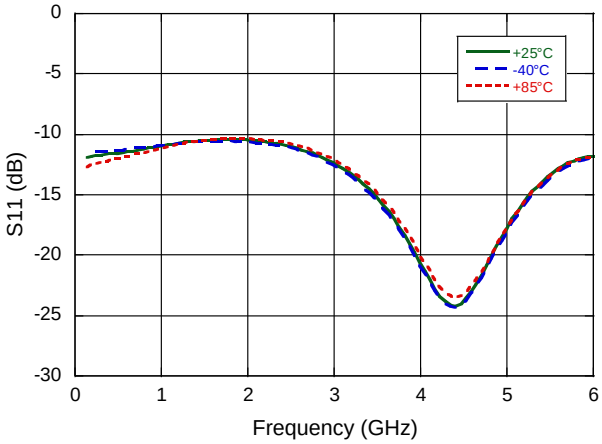

***Reverse Isolation***



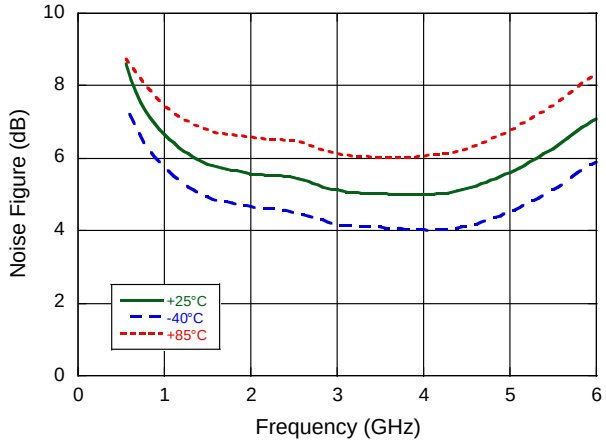

***Input Return Loss***




***Output Return Loss***

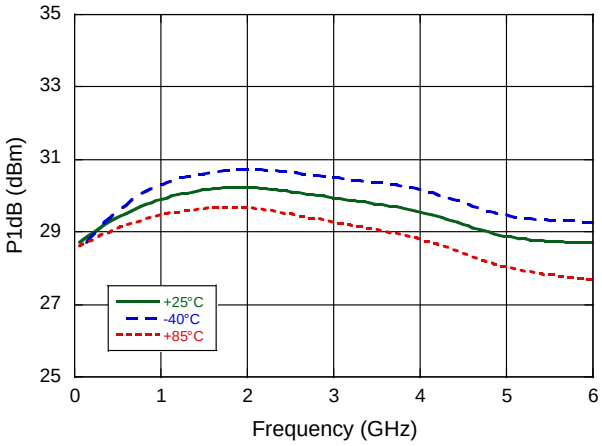



***Noise Figure***

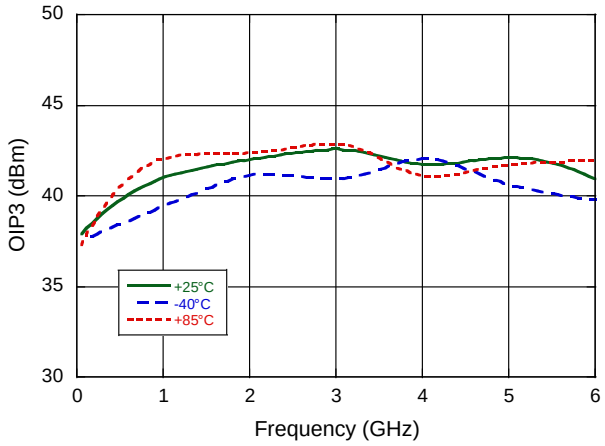


## Typical Performance Curves

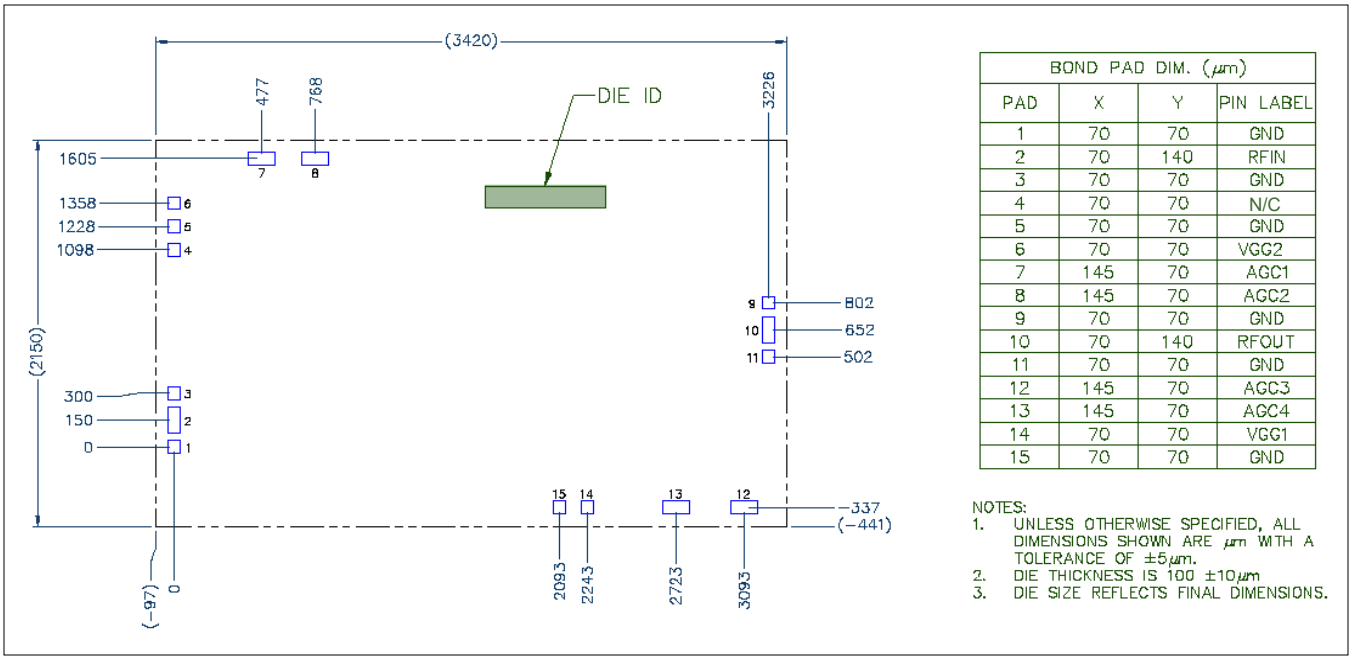
***P1dB***




***OIP3***




## Outline




| BOND PAD DIM. (μm) | | | |
|---|---|---|---|
| PAD | X | Y | PIN LABEL |
| 1 | 70 | 70 | GND |
| 2 | 70 | 140 | RFIN |
| 3 | 70 | 70 | GND |
| 4 | 70 | 70 | N/C |
| 5 | 70 | 70 | GND |
| 6 | 70 | 70 | VGG2 |
| 7 | 145 | 70 | AGC1 |
| 8 | 145 | 70 | AGC2 |
| 9 | 70 | 70 | GND |
| 10 | 70 | 140 | RFOUT |
| 11 | 70 | 70 | GND |
| 12 | 145 | 70 | AGC3 |
| 13 | 145 | 70 | AGC4 |
| 14 | 70 | 70 | VGG1 |
| 15 | 70 | 70 | GND |

NOTES:
1. UNLESS OTHERWISE SPECIFIED, ALL DIMENSIONS SHOWN ARE μm WITH A TOLERANCE OF ±5μm.
2. DIE THICKNESS IS 100 ±10μm
3. DIE SIZE REFLECTS FINAL DIMENSIONS.