

**Linear Power Amplifier**  
2.4 - 2.5 GHz, 802.11b/g

MAAP-008015  
V1

**Features**

- Ideal for 802.11b/g
- +23 dBm P1dB typical at 3.3 V
- 31 dB Gain typical
- 802.11b compliant to 20 dBm P<sub>OUT</sub>
- 802.11g compliant to 16 dBm P<sub>OUT</sub>
- Micro-Amp Shutdown
- Integrated Detector
- SiGe Process: Lowest Cost Solution
- Operates from 1.5 V to 4.0 V
- Lead-Free 3 mm 12-Lead PQFN Package
- 100% Matte Tin Plating over Copper
- Halogen-Free “Green” Mold Compound
- RoHS\* Compliant 260°C Reflow Compatible

**Description**

The MAAP-008015 is a three stage power amplifier, designed for 2.4 GHz linear applications. This power amplifier is available in a lead free 3 mm 12-lead PQFN plastic package. The MAAP-008015 also features an integrated power detector.

**Ordering Information<sup>1</sup>**

| Part Number        | Package                                   |
|--------------------|---|
| MAAP-008015-TR3000 | 3000 piece reel                           |
| MAAP-008015-001SMB | Sample Test Board<br>(Includes 5 Samples) |

1. Reference Application Note M513 for reel size information.

**Handling Procedures**

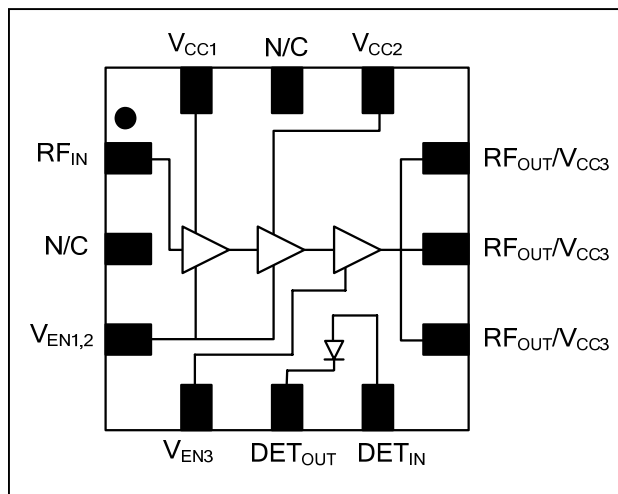
Please observe the following precautions to avoid damage:

**Static Sensitivity**

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

\* Restrictions on Hazardous Substances, European Union Directive 2002/95/EC.

**Functional Schematic**



**Pin Configuration**

| Pin No. | Pin Name                             | Description                 |
|---------|--------------------------------------|-----------------------------|
| 1       | RF <sub>IN</sub>                     | RF Input                    |
| 2       | N/C                                  | No Connect                  |
| 3       | V <sub>EN1,2</sub>                   | Power Enable                |
| 4       | V <sub>EN3</sub>                     | Power Enable                |
| 5       | DET <sub>OUT</sub>                   | Detector Output             |
| 6       | DET <sub>IN</sub>                    | Detector Input              |
| 7       | RF <sub>OUT</sub> / V <sub>CC3</sub> | RF Output, 3rd Stage Supply |
| 8       | RF <sub>OUT</sub> / V <sub>CC3</sub> | RF Output, 3rd Stage Supply |
| 9       | RF <sub>OUT</sub> / V <sub>CC3</sub> | RF Output, 3rd Stage Supply |
| 10      | V <sub>CC2</sub>                     | 2nd Stage Supply            |
| 11      | N/C                                  | No Connect                  |
| 12      | V <sub>CC1</sub>                     | 1st Stage Supply            |
| Pad     | Paddle <sup>2</sup>                  | RF & DC Ground              |

2. The exposed pad centered on the package bottom must be connected to RF and DC ground.

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**Electrical Specifications: F = 2.45 GHz, V<sub>CC</sub> = 3.3 V, V<sub>EN</sub> = 2.5 V, T<sub>A</sub> = 25°C, Z<sub>0</sub> = 50 Ω**

| Parameter            | Test Conditions  | Units | Min. | Typ. | Max. |
|----------------------|--|-------|------|------|------|
| Gain                 |  | dB    | 29   | 31   | 33   |
| Input Return Loss    |  | dB    | —    | 9    | —    |
| Forward Isolation    |  | dB    | —    | 50   | —    |
| P1dB                 |  | dBm   | —    | 23   | —    |
| Supply Voltage       | V <sub>CC1</sub> , V <sub>CC2</sub> , V <sub>CC3</sub>                 | V     | —    | 3.3  | —    |
| Bias Voltage         | V <sub>EN</sub>  | V     | —    | 2.5  | —    |
| Current              | Idle   | mA    | 30   | 43   | 55   |
|                      | P <sub>OUT</sub> = 16 dBm, Modulated <sup>3</sup>                      | mA    | —    | 65   | —    |
|                      | P <sub>OUT</sub> = 16 dBm, C.W.  | mA    | 60   | 85   | 100  |
| Off Current          | V <sub>EN</sub> = 0 V  | μA    | —    | 3    | 20   |
| Control Current      | V <sub>EN</sub> Current  | mA    | —    | 3    | 5    |
| Harmonics            | 2fo @ -15 dBm Input Power  | dBc   | —    | -26  | —    |
|                      | 3fo @ -15 dBm Input Power  | dBc   | —    | -75  | —    |
| Duty Cycle           |  | %     | —    | 100  | —    |
| Linear Output Power  | DSS source; compliance with 802.11b<br>EVM=2.5%, OFDM, QAM-64, 54 Mbps | dBm   | —    | 20   | —    |
|                      |  | dBm   | —    | 16   | —    |
| Detector Output      | P <sub>OUT</sub> = 16 dBm, C.W.  | V     | 1.35 | 1.5  | 1.75 |
| Detector Sensitivity | Up to P <sub>OUT</sub> = 16 dBm  | mV/dB | —    | 110  | —    |

3. EVM=2.5%, OFDM, QAM-64, 54 Mbps.

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

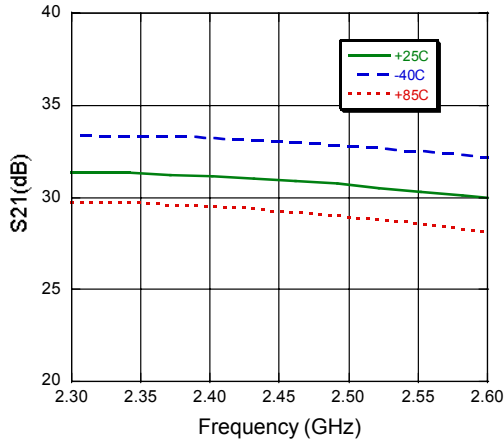
| Parameter                 | Absolute Maximum |
|---------------------------|------------------|
| Input Power               | + 5 dBm          |
| Operating Supply Voltage  | +4.0 Volts       |
| Operating Control Voltage | +3.0 Volts       |
| Operating Temperature     | -20°C to +85°C   |
| Channel Temperature       | +150°C           |
| Storage Temperature       | -40°C to +150°C  |

4. Exceeding any one or combination of these limits may cause permanent damage to this device.

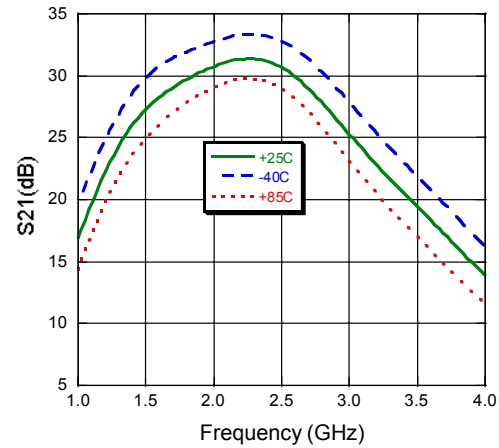
5. M/A-COM does not recommend sustained operation near these survivability limits.

**Typical Performance Curves:  $V_{CC} = 3.3\text{ V}$ ,  $V_{EN} = 2.5\text{ V}$ , over Temperature**

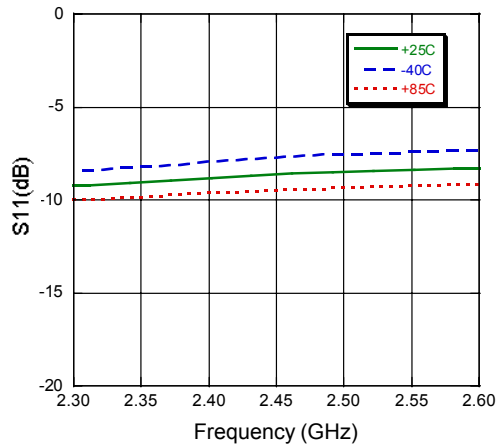
**$S_{21}$  vs. Frequency (2.3 GHz - 2.6 GHz) -Gain**



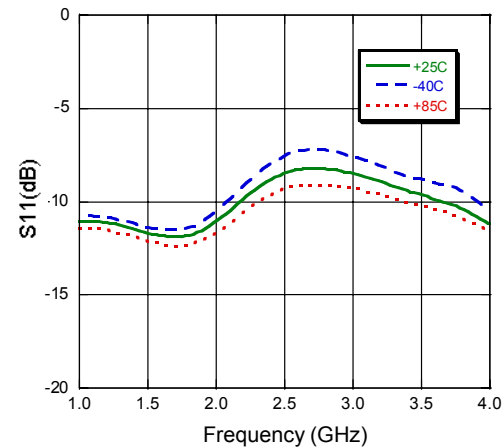
**$S_{21}$  vs. Frequency -Gain**



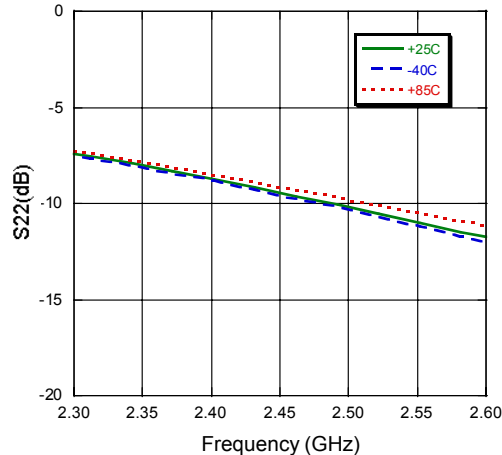
**$S_{11}$  vs. Frequency (2.3 GHz - 2.6 GHz)**



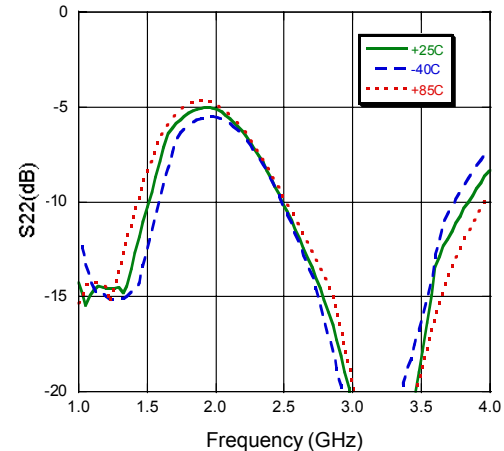
**$S_{11}$  vs. Frequency**



**$S_{22}$  vs. Frequency (2.3 GHz - 2.6 GHz)**

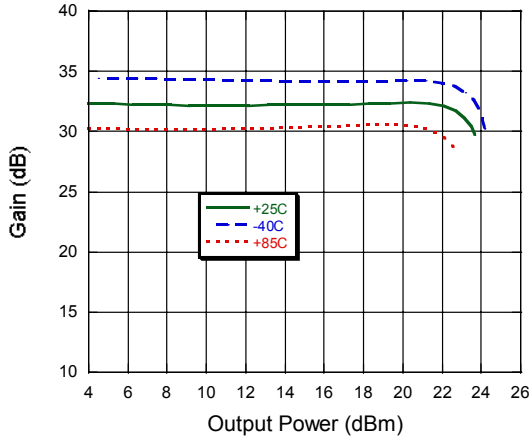


**$S_{22}$  vs. Frequency**

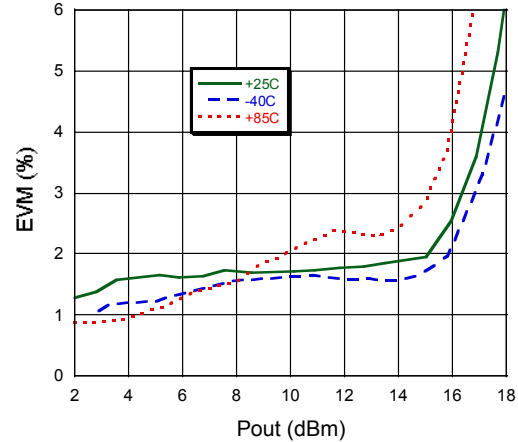


**Typical Performance Curves:  $V_{CC} = 3.3\text{ V}$ ,  $V_{EN} = 2.5\text{ V}$**

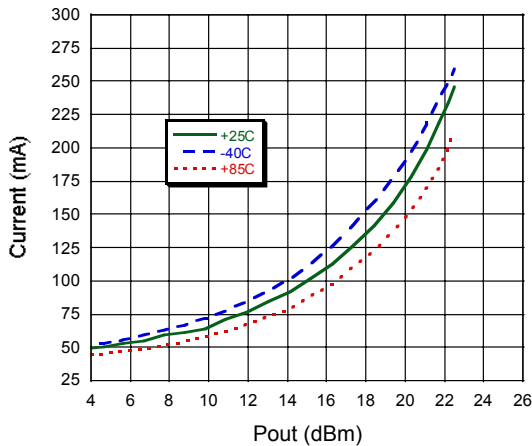
***P*<sub>1dB</sub> at 2.45 GHz**



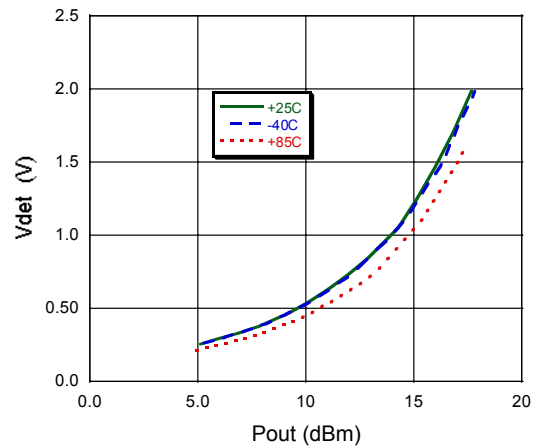
***EVM* vs. *P*<sub>OUT</sub>, OFDM, QAM-64, 54 Mbps**



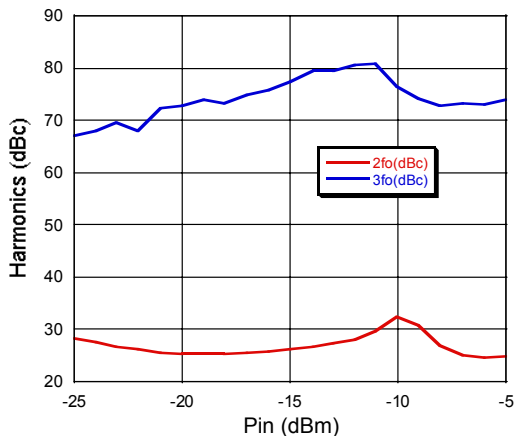
***C.W.* Current vs. *P*<sub>OUT</sub> over Temperature at 2.45 GHz**



***V*<sub>DET</sub> vs. *P*<sub>OUT</sub> over Temperature at 2.45 GHz**



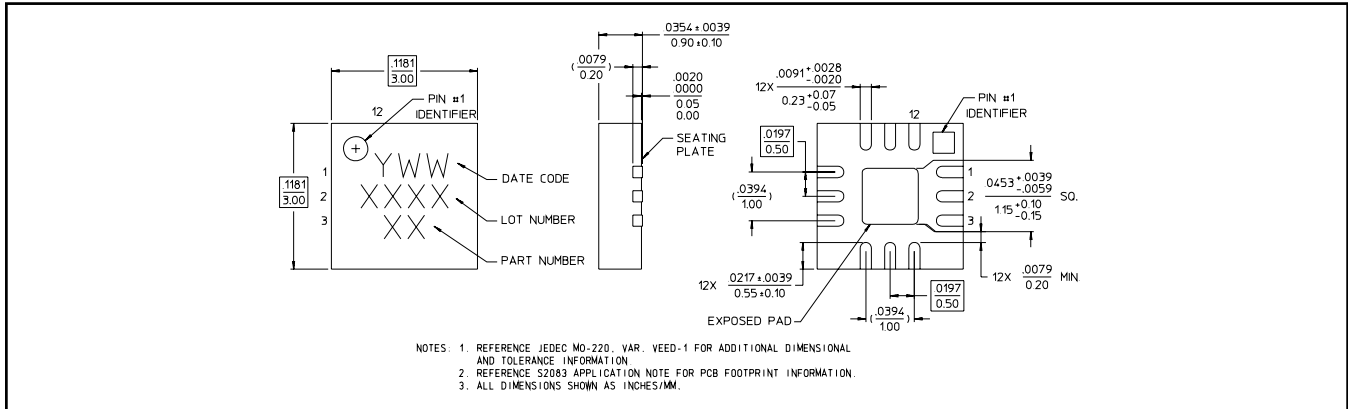
**Harmonics**



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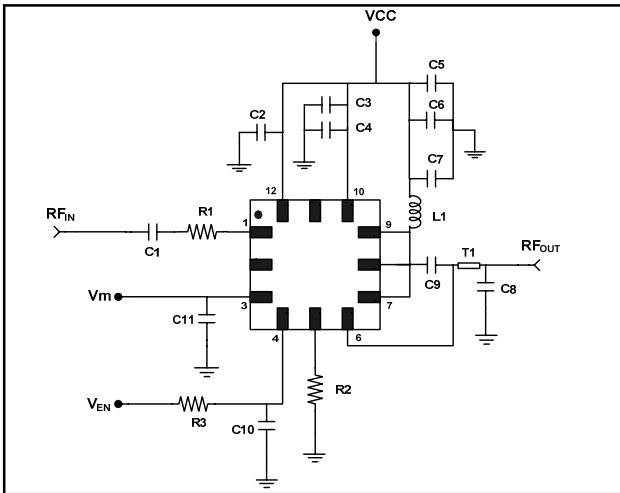
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**Lead-Free 3 mm 12-Lead PQFN†**

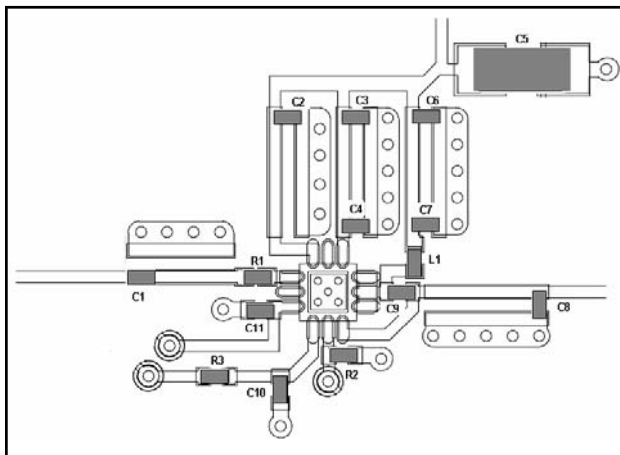


† Reference Application Note M538 for lead-free solder reflow recommendations.  
Meets JEDEC moisture sensitivity level 1 requirements.

**Evaluation Board Schematic**



**Recommended PCB Configuration**



**External Parts List <sup>6</sup>**

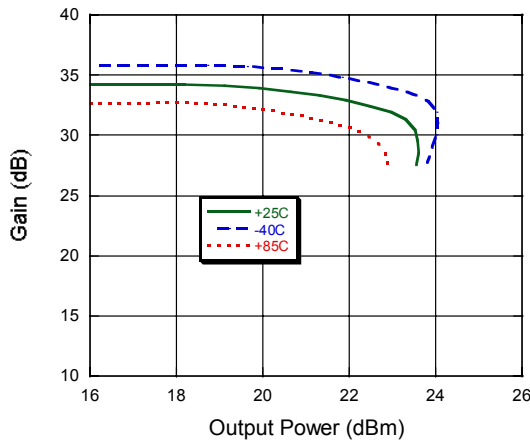
| Component            | Value                             | Footprint | Manufacturer |
|----------------------|-----------------------------------|-----------|--------------|
| C1                   | 1000 $\mu$ F                      | 0402      | Murata       |
| C2, C3, C6, C10, C11 | 0.1 $\mu$ F                       | 0402      | Murata       |
| C4, C7, C9           | 47 pF                             | 0402      | Murata       |
| C5                   | 10 $\mu$ F                        | 1206      | AVX          |
| C8                   | 1.0 pF                            | 0402      | Murata       |
| L1                   | 10 nH                             | 0402      | Coilcraft    |
| R1                   | 10 $\Omega$                       | 0402      | Panasonic    |
| R2                   | 1000 $\Omega$                     | 0402      | Panasonic    |
| R3                   | 619 $\Omega$                      | 0402      | Panasonic    |
| T1                   | 48.8 $\Omega$ , 29.04° @ 2400 MHz |           |              |

6. Equivalent components can be substituted.

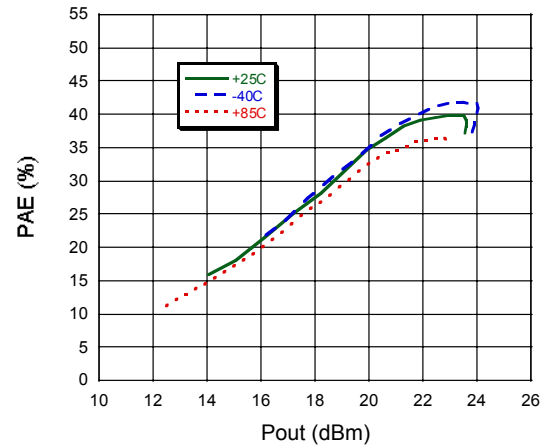
**Applications Section**

**Typical Performance Curves, 900 MHz Configuration**

**P1dB**



**PAE**



**Current**

