



# 1.6W S/C-Band Power Amplifier 2.5-5.5 GHz

MAAPGM0035

## Preliminary Information

### Features

- ◆ 2.5-5.5 GHz Operation
- ◆ 1.6 Watt Saturated Output Power Level
- ◆ Variable Drain Voltage (4-10V) Operation
- ◆ Self-Aligned MSAG<sup>®</sup> MESFET Process
- ◆ High Performance Ceramic Bolt Down Package

### Primary Applications

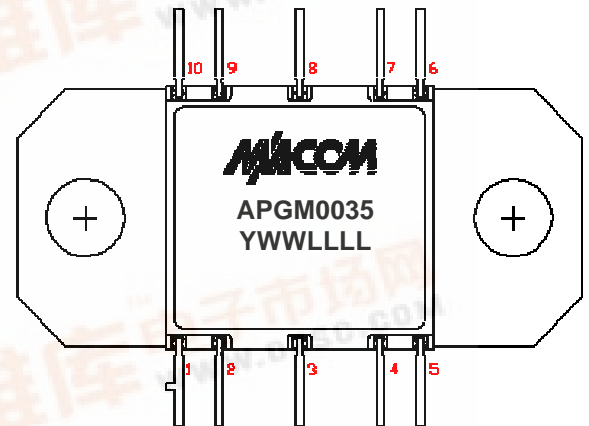
- ◆ WLL
- ◆ MMDS
- ◆ SatCom

### Description

The MAAPGM0035 is a packaged, 2-stage, 1.6 W power amplifier with on-chip bias networks in a bolt down ceramic package, allowing easy assembly. This product is fully matched to 50 ohms on both the input and output. It can be used as a power amplifier stage or as a driver stage in high power applications.

Each device is 100% RF tested to ensure performance compliance. The part is fabricated using M/A-COM's GaAs Multifunction Self-Aligned Gate (MSAG<sup>®</sup>) MESFET Process.

## 2.5-5.5 GHz GaAs MMIC Amplifier



| Pin Number | Description     |
|------------|-----------------|
| 1          | No Connection   |
| 2          | V <sub>GG</sub> |
| 3          | RF IN           |
| 4          | V <sub>GG</sub> |
| 5          | No Connection   |
| 6          | No Connection   |
| 7          | V <sub>DD</sub> |
| 8          | RF OUT          |
| 9          | V <sub>DD</sub> |
| 10         | No Connection   |

## Maximum Operating Conditions <sup>1</sup>

| Parameter                             | Symbol            | Absolute Maximum | Units |
|---------------------------------------|-------------------|------------------|-------|
| Input Power                           | P <sub>IN</sub>   | 25.0             | dBm   |
| Drain Supply Voltage                  | V <sub>DD</sub>   | +12.0            | V     |
| Gate Supply Voltage                   | V <sub>GG</sub>   | -3.0             | V     |
| Quiescent Drain Current (No RF)       | I <sub>BQ</sub>   | 790              | mA    |
| Quiescent DC Power Dissipated (No RF) | P <sub>DISS</sub> | 6.3              | W     |
| Junction Temperature                  | T <sub>J</sub>    | 180              | °C    |
| Storage Temperature                   | T <sub>STG</sub>  | -55 to +150      | °C    |

1. Operation outside of these ranges may reduce product reliability.



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## Recommended Operating Conditions

| Characteristic        | Symbol   | Min  | Typ  | Max    | Unit |
|-----------------------|----------|------|------|--------|------|
| Drain Supply Voltage  | $V_{DD}$ | 4.0  | 8.0  | 10.0   | V    |
| Gate Supply Voltage   | $V_{GG}$ | -2.3 | -2.0 | -1.5   | V    |
| Input Power           | $P_{IN}$ |      | 20.0 | 23.0   | dBm  |
| Junction Temperature  | $T_J$    |      |      | 150    | °C   |
| Thermal Resistance    | $T_{JC}$ |      | 14.9 |        | °C/W |
| MMIC Base Temperature | $T_B$    |      |      | Note 2 | °C   |

2. Maximum MMIC Base Temperature =  $150^{\circ}\text{C} - T_{JC} * V_{DD} * I_{DQ}$

Electrical Characteristics:  $T_B = 40^{\circ}\text{C}^3$ ,  $Z_0 = 50\ \Omega$ ,  $V_{DD} = 8\text{V}$ ,  $V_{GG} = -1.8\text{V}$ ,  $P_{in} = 20\text{ dBm}$ ,  $R_G = 121\ \Omega$

| Parameter   | Symbol    | Typical | Units |
|---|-----------|---------|-------|
| Bandwidth   | f         | 2.5-5.5 | GHz   |
| Output Power  | $P_{OUT}$ | 32      | dBm   |
| Power Added Efficiency  | PAE       | 32      | %     |
| 1-dB Compression Point  | $P_{1dB}$ | 32      | dBm   |
| Small Signal Gain   | G         | 17      | dB    |
| Input VSWR  | VSWR      | 1.5:1   |       |
| Output VSWR   | VSWR      | 3:1     |       |
| Gate Supply Current   | $I_{GG}$  | < 6     | mA    |
| Drain Supply Current  | $I_{DD}$  | < 850   | mA    |
| Noise Figure  | NF        | 7       | dB    |
| 2 <sup>nd</sup> Harmonic  | 2f        | -10     | dBc   |
| 3 <sup>rd</sup> Harmonic  | 3f        | -20     | dBc   |
| Output Third Order Intercept  | OTOI      | 42      | dBm   |
| 3 <sup>rd</sup> Order Intermodulation Distortion, Single Carrier Level = 22 dBm | IM3       | -16     | dBm   |
| 5 <sup>th</sup> Order Intermodulation Distortion, Single Carrier Level = 22 dBm | IM5       | -47     | dBm   |

3.  $T_B$  = MMIC Base Temperature



## Operating Instructions

This device is static sensitive. Please handle with care. To operate the device, follow these steps.

1. Apply  $V_{GG} = -2.0\text{ V}$ ,  $V_{DD} = 0\text{ V}$ .
2. Ramp  $V_{DD}$  to desired voltage, typically 8 V.
3. Adjust  $V_{GG}$  to set  $I_{DQ}$ , (approximately @  $-1.8\text{V}$ ).
4. Set RF input.
5. Power down sequence in reverse. Turn  $V_{GG}$  off last.

Specifications subject to change without notice.

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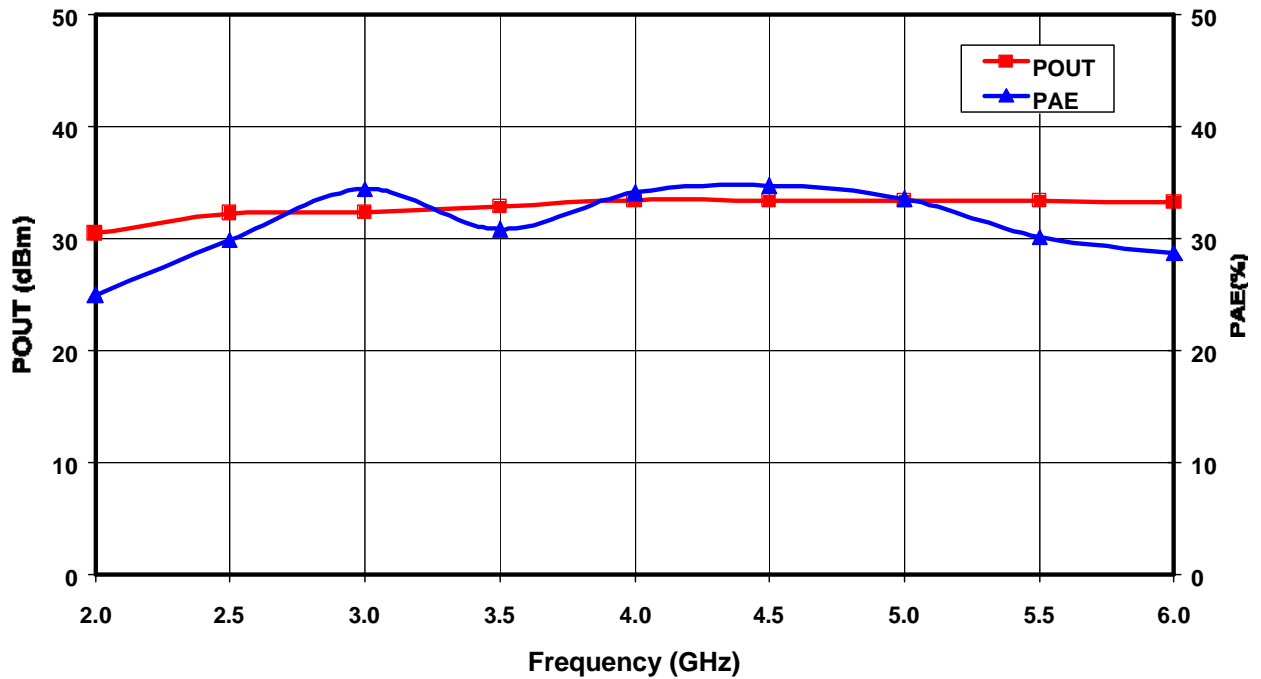


Figure 1. Output Power and Power Added Efficiency vs. Frequency  
at  $V_{DD} = 8V$  and  $P_{in} = 20$  dBm.

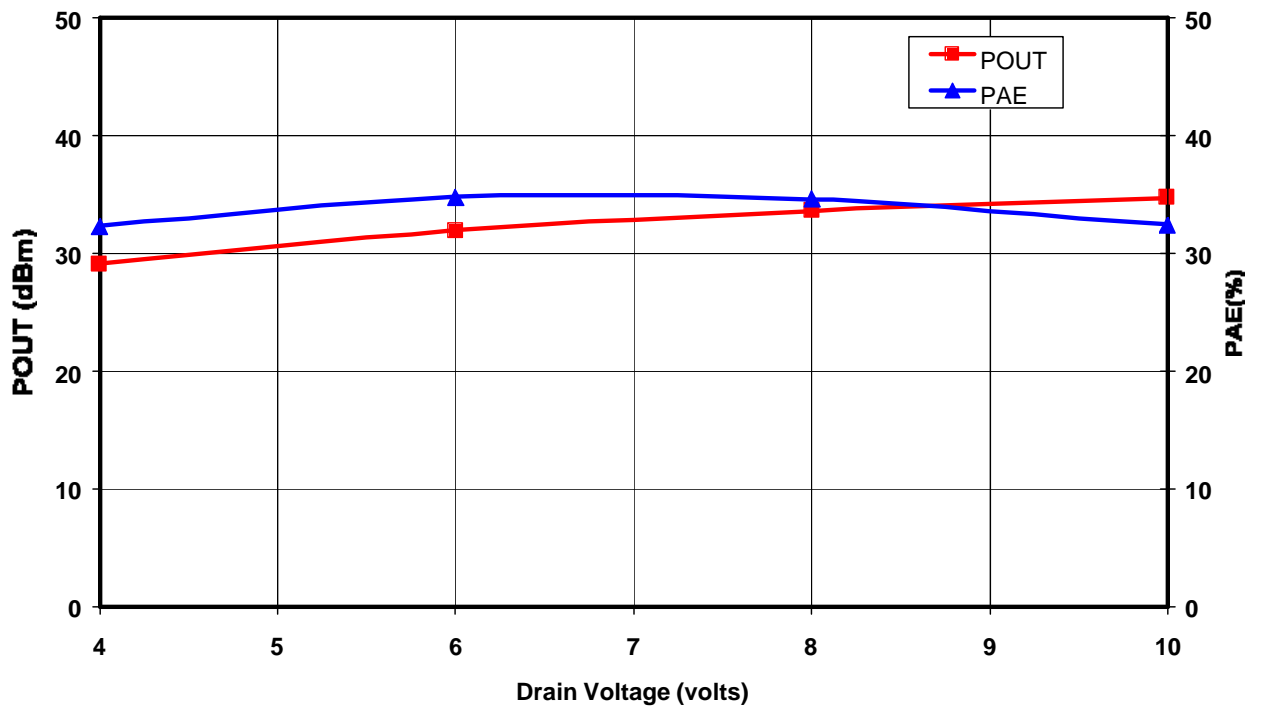


Figure 2. Saturated Output Power and Power Added Efficiency vs. Drain Voltage at  $f_0 = 4$  GHz.

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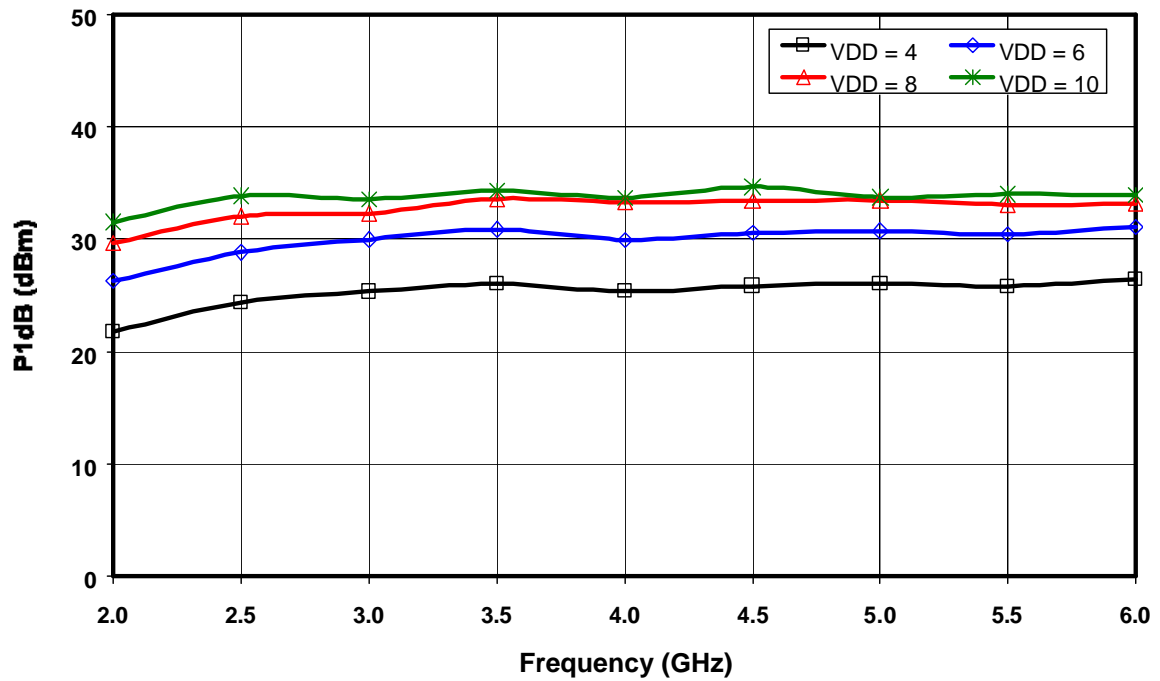


Figure 3. 1dB Compression Point vs. Drain Voltage

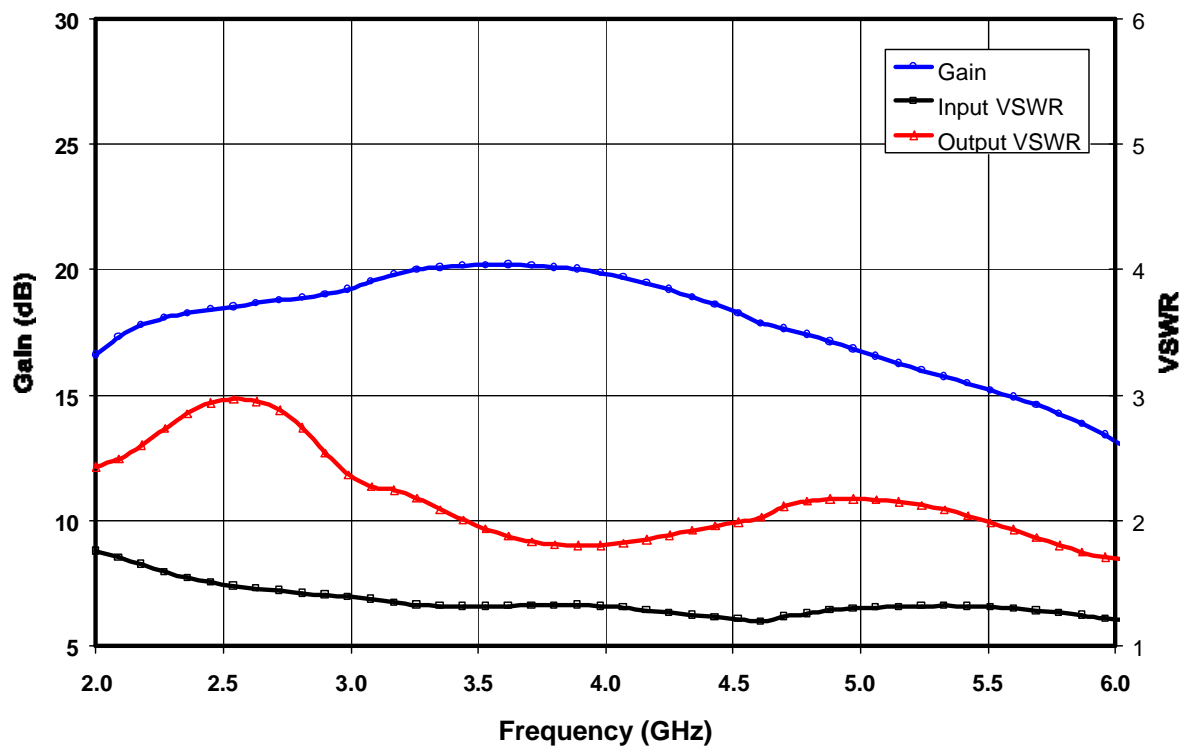


Figure 4. Small Signal Gain and VSWR vs. Frequency at VDD = 8V.

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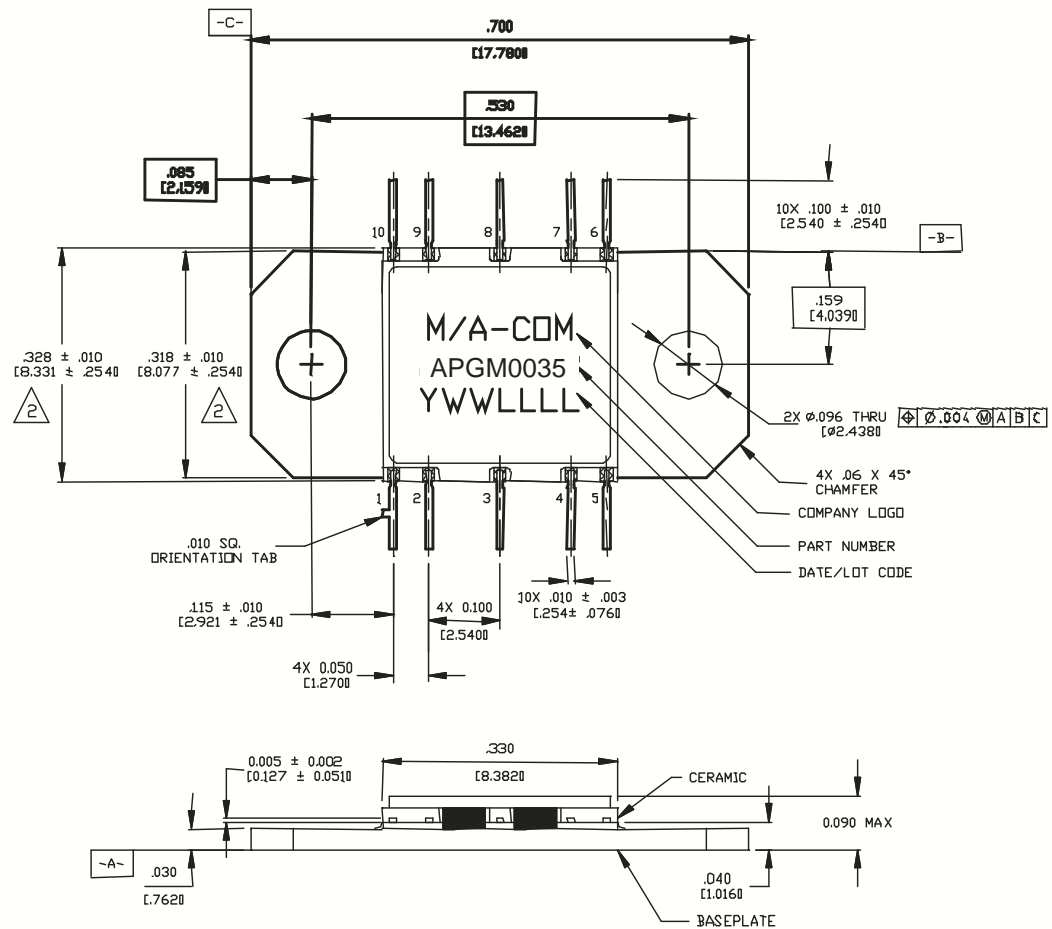


Figure 5. CR-15 Package Dimensions

The CR-15 is a high frequency, low thermal resistance package. The package consists of a cofired ceramic construction with a copper-tungsten base and iron-nickel-cobalt leads. The finish consists of electrolytic gold over nickel plate.

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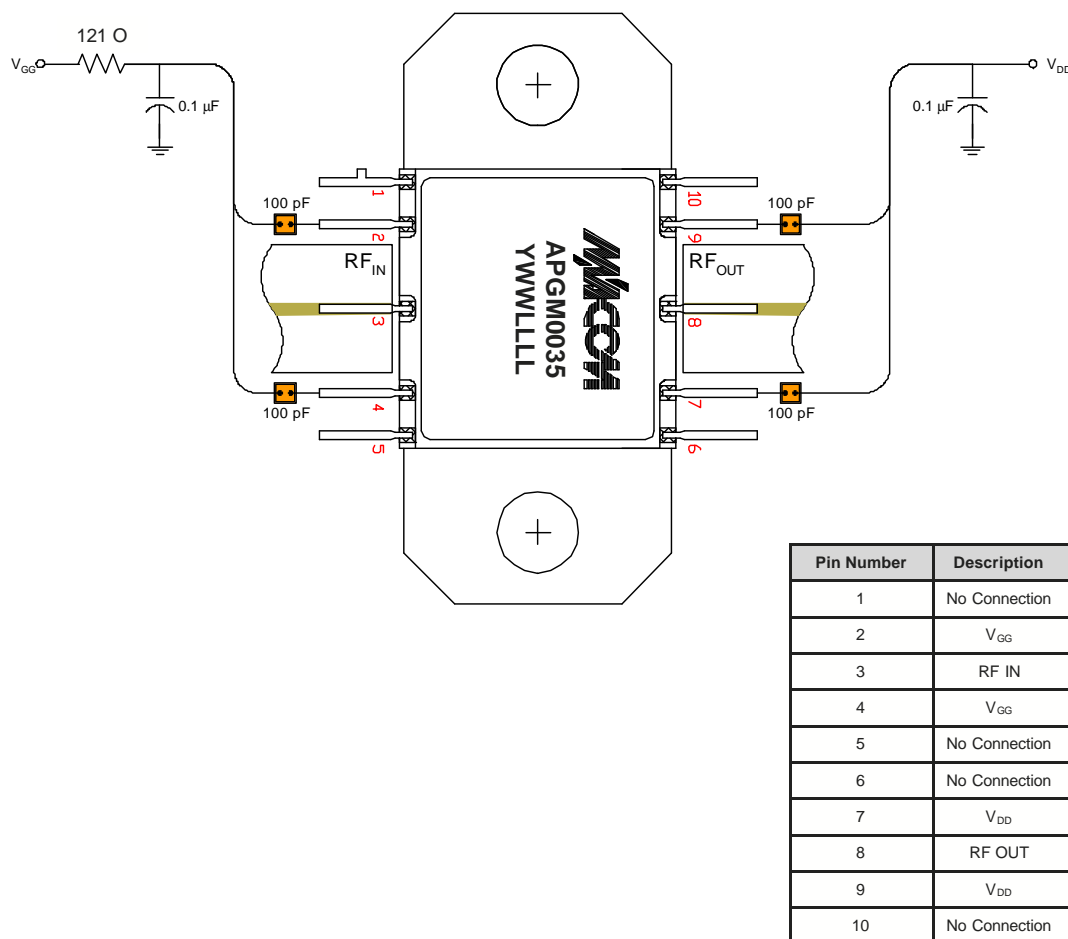
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Figure 6. Recommended Bias Configuration

**Assembly Instructions:**

This flange mount style package provides a robust interface between a highly integrated GaAs MMIC device and a circuit board which may be assembled using conventional surface mount techniques. A thin shim made of a thermally and electrically conductive, ductile material should be used prior to installation of the CR-15 to improve the thermal and electrical performance of the package to housing interface. Refer to **M/A-COM Application Note #M567\*** for more information.

For applications where surface mount components are to be installed after the CR-15 installation, this package will not be damaged when subjected to typical convection or IR oven reflow profiles. Refer to **M/A-COM Application Note #M538\*** for maximum allowable reflow time and temperature. Alternatively, the package leads may be individually soldered. Whether an iron or hot gas soldering equipment is used, care should be taken to insure that the temperature is well controlled and electric static discharge (ESD) safe.

**Biasing Note:** Must apply negative bias to  $V_{GG}$  before applying positive bias to  $V_{DD}$  to prevent damage to amplifier.

\* Application Notes can be found by going to the Site Search Page on M/A-COM's web page (<http://www.macom.com/search/search.jsp>) and searching for the required Application Note.

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