

## High Dynamic Range IF Amplifier 50 - 1000 MHz

Rev. V2

### Features

- Single +5 V Supply Voltage
- 18 dB Gain
- +22 dBm P1dB
- +40 dBm OIP3
- 2.4 dB Noise Figure
- Lead-Free SOT-89 Package
- Halogen-Free “Green” Mold Compound
- RoHS\* Compliant and 260°C Re-flow Compatible

### Description

The MAAM-009116 is a high dynamic range amplifier in a lead-free SOT-89 surface mount plastic package. It can be operated from a single 5 volt supply.

The MAAM-009116 offers a combination of low noise figure, high gain, and high output IP3 making this an ideal IF amplifier for receiver and transmitter applications.

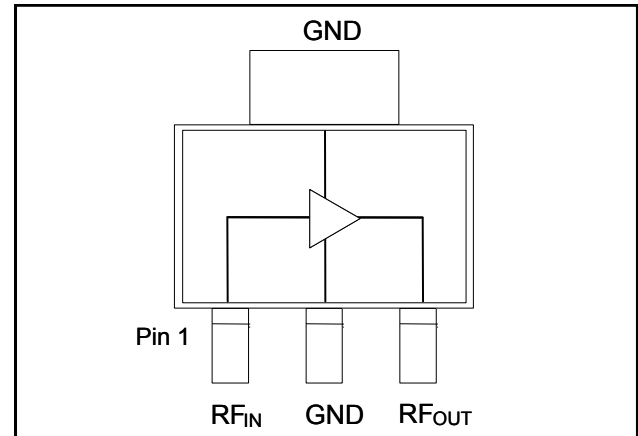
The MAAM-009116 is fabricated using M/A-COM Technology Solutions MESFET process to realize low noise and high dynamic range. The process features full passivation for performance and reliability.

### Ordering Information <sup>1,2</sup>

| Part Number        | Package               |
|--------------------|-----------------------|
| MAAM-009116-000000 | Bulk Packaging        |
| MAAM-009116-TR3000 | 3000 piece reel       |
| MAAM-009116-001SMB | 500 MHz Configuration |

1. Reference Application Note M513 for reel size information.
2. All sample boards include 5 loose parts.

### Functional Block Diagram



### Pin Configuration

| Pin No. | Function | Pin No. | Function       |
|---------|----------|---------|----------------|
| 1       | RF Input | 3       | RF Output/Bias |
| 2       | Ground   | 4       | Ground         |

### Maximum Operating Conditions <sup>3</sup>

| Parameter                         | Maximum Operating Conditions |
|-----------------------------------|------------------------------|
| Junction Temperature <sup>4</sup> | 150°C                        |
| RF Output Power                   | 22 dBm                       |
| Operating Temperature             | -40°C to +85°C               |

3. These operating conditions will ensure MTTF > 1 x 10<sup>6</sup> hours.

4. Junction Temperature ( $T_J$ ) =  $T_C + \Theta_{jc} * ((V * I) - (P_{OUT} - P_{IN}))$   
Typical thermal resistance ( $\Theta_{jc}$ ) = 70° C/W.

a) For  $T_C = 25^\circ\text{C}$ ,

$T_J = 88^\circ\text{C}$  @ 5 V, 180 mA,  $P_{OUT} = 5$  dBm,  $P_{IN} = -13$  dBm

b) For  $T_C = 85^\circ\text{C}$ ,

$T_J = 143^\circ\text{C}$  @ 5 V, 165 mA,  $P_{OUT} = 4.7$  dBm,  $P_{IN} = -13$  dBm

### Absolute Maximum Ratings <sup>5,6</sup>

| Parameter            | Absolute Maximum |
|----------------------|------------------|
| RF Input Power       | 20 dBm           |
| Voltage              | 6 volts          |
| Storage Temperature  | -55°C to +150°C  |
| Junction Temperature | 175°C            |

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

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

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

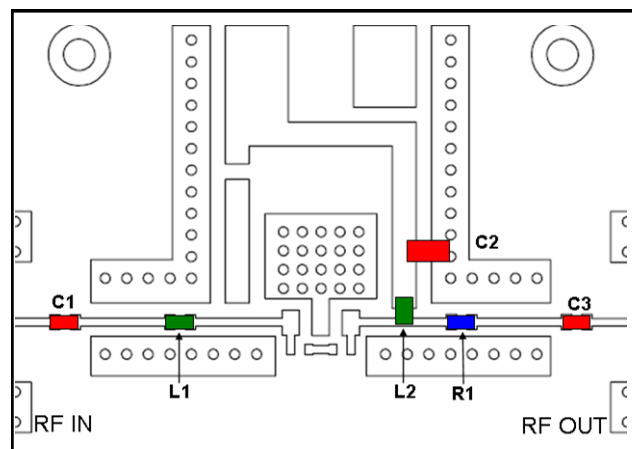
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Electrical Specifications for Single Ended Performance:  $Z_0 = 50 \Omega$ ,  $T_A = 25^\circ\text{C}$ ,  $V_{DD} = +5\text{ V}$

| Parameter              | Test Conditions        | Units | Min. | Typ. | Max. |
|------------------------|------------------------|-------|------|------|------|
| Gain                   | 500 MHz                | dB    | 15   | 18   | —    |
| Noise Figure           | 500 MHz                | dB    | —    | 2.4  | —    |
| Input Return Loss      | 500 MHz                | dB    | —    | 13   | —    |
| Output Return Loss     | 500 MHz                | dB    | —    | 12   | —    |
| Output P1dB            | 500 MHz                | dBm   | —    | 22   | —    |
| Output IP <sub>3</sub> | 500 MHz                | dBm   | 37   | 40   | —    |
| Current                | $V_{DD} = +5\text{ V}$ | mA    | —    | 180  | 200  |

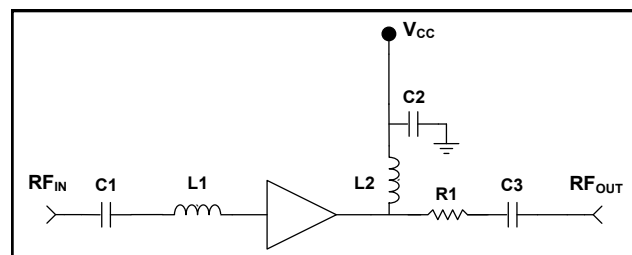
### PCB Layout



### Parts List

| Part  | Value               | Case Style | Manufacturer |
|-------|---------------------|------------|--------------|
| C1,C3 | 1000 pF             | 0402       | Murata       |
| C2    | 0.018 $\mu\text{F}$ | 0805       | Murata       |
| L1    | 22 nH               | 0402       | Coilcraft    |
| L2    | 150 nH              | 0603       | Coilcraft    |
| R1    | 8.2 $\Omega$        | 0402       | Panasonic    |

### Application Schematic

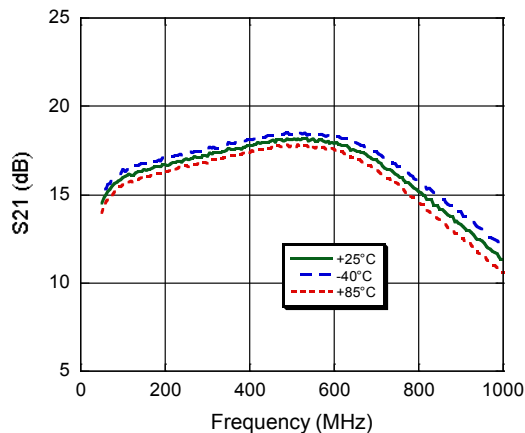


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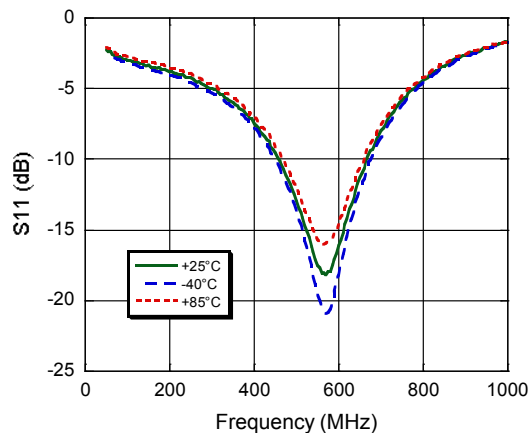
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### Typical Performance Curves

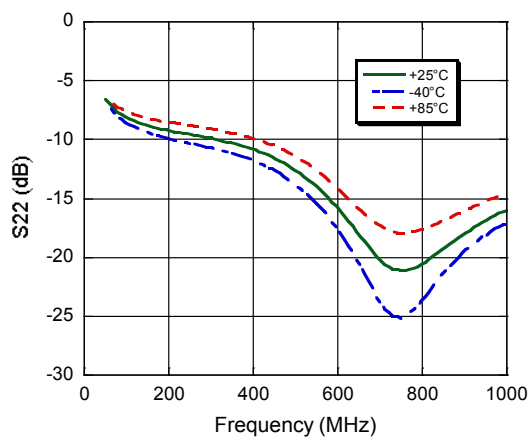
**Gain**



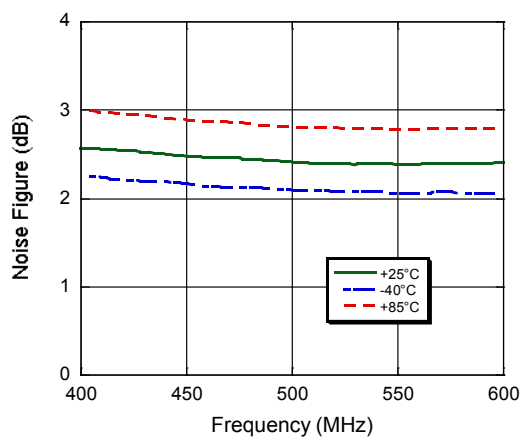
**Input Return Loss**



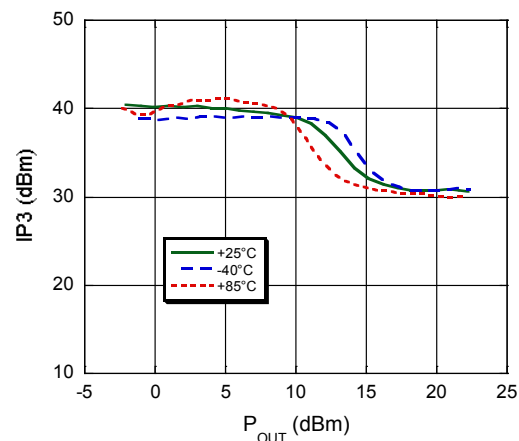
**Output Return Loss**



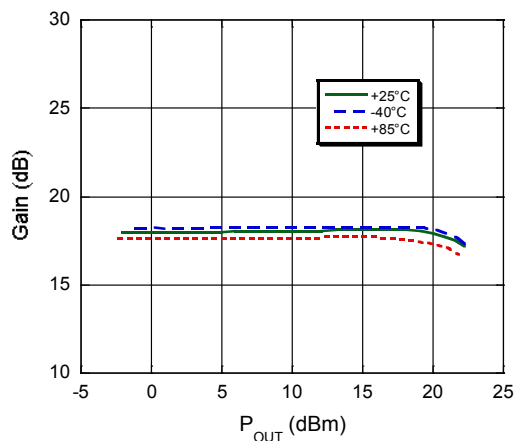
**Noise Figure**



**IP3**



**Gain**

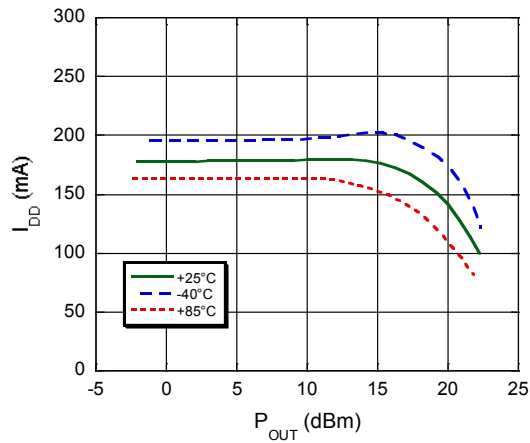


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### Typical Performance Curves

#### Current



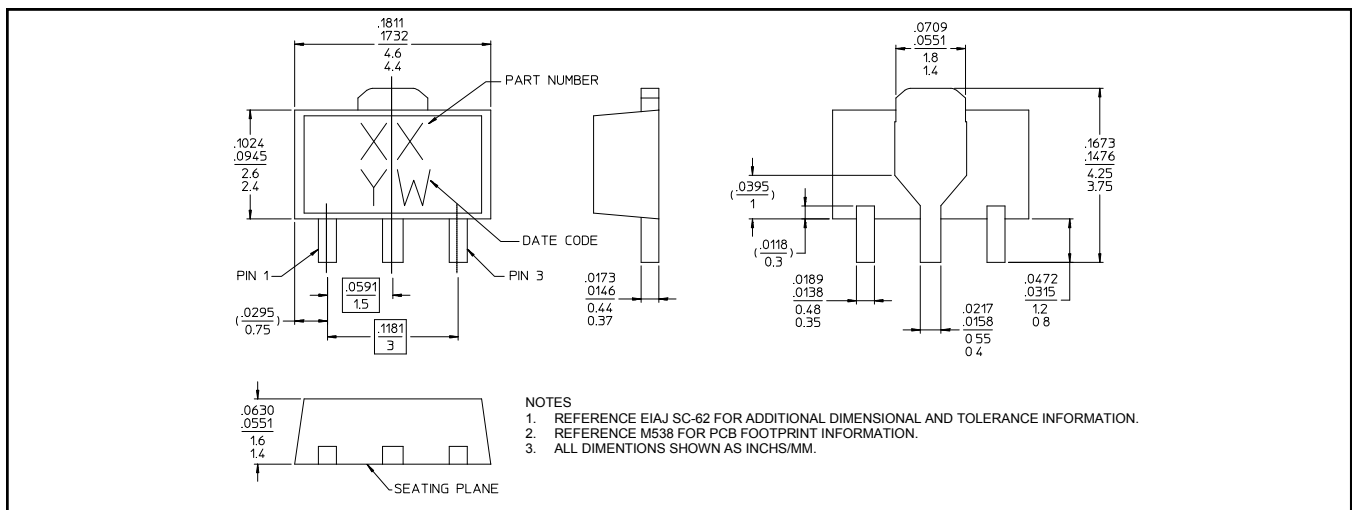
### Handling Procedures

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.

### Lead Free SOT-89 Plastic Package<sup>†</sup>



<sup>†</sup> Reference Application Note M538 for lead-free solder reflow recommendations.  
Meets JEDEC moisture sensitivity level 1 requirements.  
Plating is 100% matte tin over copper.

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