

## Low Noise CATV Amplifier 50 - 1000 MHz

Rev. V3

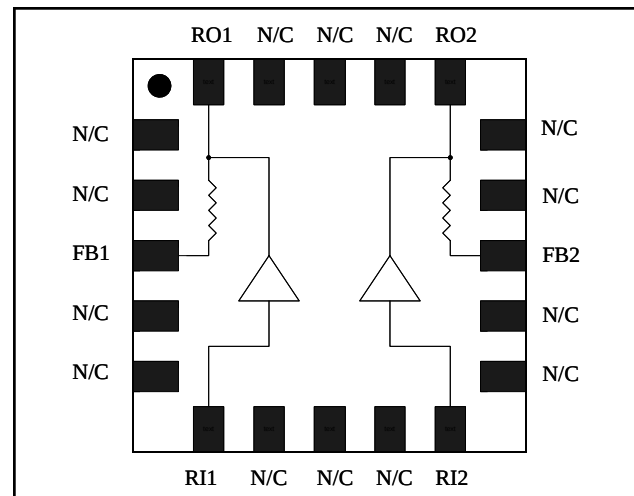
### Features

- Low Distortion
- Low Noise Figure
- Push Pull Design
- Single Positive Supply
- 4 mm 20-Lead PQFN Package

### Description

M/A-COM's MAAMSS0003 is a GaAs PHEMT MMIC amplifier in a 4 mm 20-lead PQFN package. The MMIC design is configured as a pair of cascode PHEMT amplifiers for broadband performance. It is designed for integration in a 75-ohm push-pull, low distortion, amplifier circuit. The device is ideally suited for use in CATV, DBS, and HDTV applications where low noise figure and low distortion are required.

### Functional Schematic



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

| Part Number   | Package                                   |
|---------------|-------------------------------------------|
| MAAMSS0003    | Bulk Packaging                            |
| MAAMSS0003TR  | 1000 piece reel                           |
| MAAMSS0003SMB | Sample Test Board<br>(Includes 5 Samples) |

1. Reference Application Note M513 for reel size information.

### Absolute Maximum Ratings <sup>2,3</sup>

| Parameter             | Absolute Maximum |
|-----------------------|------------------|
| Input Power           | +20 dBm          |
| Operating Voltage     | +10 volts        |
| Operating Temperature | -40°C to +85°C   |
| Storage Temperature   | -65°C to +150°C  |

- Exceeding any one or combination of these limits may cause permanent damage to this device.
- M/A-COM does not recommend sustained operation near these survivability limits.

### Pin Configuration <sup>4</sup>

| PIN No. | PIN Name | Description   |
|---------|----------|---------------|
| 1       | N/C      | No Connection |
| 2       | N/C      | No Connection |
| 3       | FB1      | Feedback 1    |
| 4       | N/C      | No Connection |
| 5       | N/C      | No Connection |
| 6       | RI1      | RF Input 1    |
| 7       | N/C      | No Connection |
| 8       | N/C      | No Connection |
| 9       | N/C      | No Connection |
| 10      | RI2      | RF Input 2    |
| 11      | N/C      | No Connection |
| 12      | N/C      | No Connection |
| 13      | FB2      | Feedback 2    |
| 14      | N/C      | No Connection |
| 15      | N/C      | No Connection |
| 16      | RO2      | RF Output 2   |
| 17      | N/C      | No Connection |
| 18      | N/C      | No Connection |
| 19      | N/C      | No Connection |
| 20      | RO1      | RF Output 1   |

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

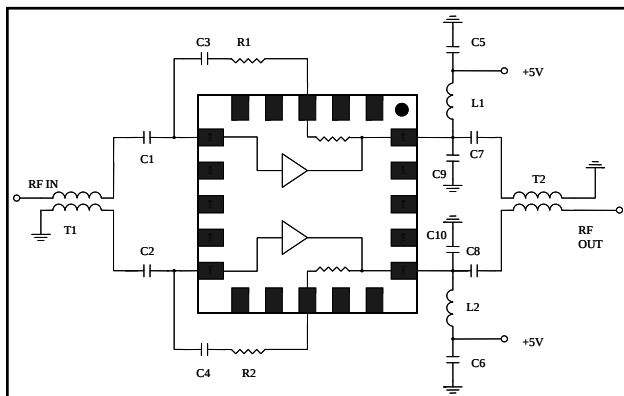
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**Electrical Specifications:**  $T_A = 25^\circ\text{C}$ , Freq: 50 - 1000 MHz,  $V_{DD} = +5$  Volts,  $Z_0 = 75$  ohms  
**Test Circuit with M/A-COM Balun ETN1-1-13TR**

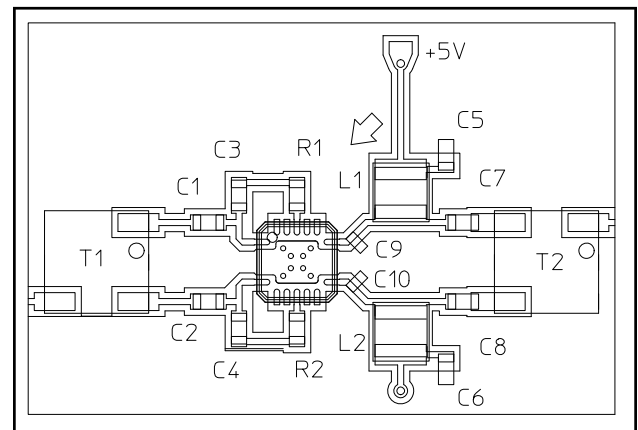
| Parameter                   | Test Conditions                                    | Units | Min. | Typ.  | Max. |
|-----------------------------|----------------------------------------------------|-------|------|-------|------|
| Gain                        | —                                                  | dB    | 11.5 | 12.2  | 13.0 |
| Gain Flatness               | —                                                  | dB    | —    | 0.4   | 1.0  |
| Noise Figure                | —                                                  | dB    | —    | 3.3   | 4.0  |
| Input VSWR                  | —                                                  | ratio | —    | 1.3:1 | —    |
| Output VSWR                 | —                                                  | ratio | —    | 1.5:1 | —    |
| Output IP3                  | Two tones at 397 & 403 MHz, +4 dBm output per tone | dBm   | —    | 32    | —    |
| Composite Triple Beat, CTB  | 135 Channels, +13 dBmV/Channel at the input        | dBc   | —    | -78   | -70  |
| Composite Second Order, CSO | 135 Channels, +13 dBmV/Channel at the input        | dBc   | —    | -78   | -70  |
| Cross modulation            | 135 Channels, +13 dBmV/Channel at the input        | dBc   | —    | -73   | -64  |
| P1dB                        | 400 MHz                                            | dBm   | —    | 24    | —    |
| $I_{DD}$                    | +5 Volts                                           | mA    | 160  | 190   | 225  |

### Test Circuit Schematic<sup>5</sup>



5. The 1:1 baluns, T1 & T2, are M/A-COM part number ETN1-1-13TR.

### Recommended Test Circuit Layout<sup>6</sup>



6. Reference M/A-COM Application Note S2083 for recommended PCB configuration. R1 and R2 are 0 ohms.

### External Circuitry Parts List

| Qty | Description                                              |
|-----|----------------------------------------------------------|
| 8   | Capacitor, 0.01 uF, 0603, SMT, 10% (C1-C8)               |
| 2   | Capacitor, 2 pF, 0402, SMT, $\pm 0.25\text{pF}$ (C9-C10) |
| 2   | Inductor, 390 nH, 1008, SMT, 10% (L1, L2)                |
| 2   | Balun, 1:1, M/A-COM, ETN1-1-13, SMT (T1,T2)              |
| 2   | Resistor, 0 ohms, 0603, SMT (R1, R2)                     |

### Handling Procedures

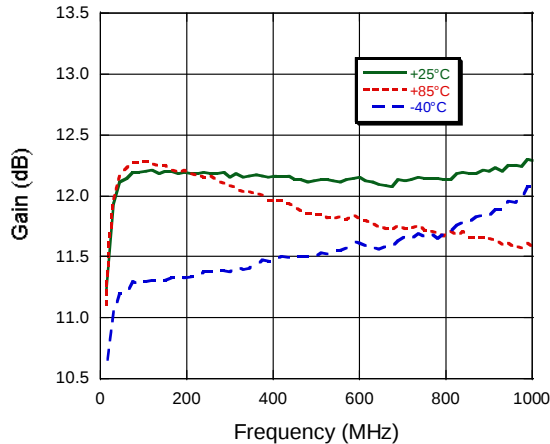
Please observe the following precautions to avoid damage:

### Static Sensitivity

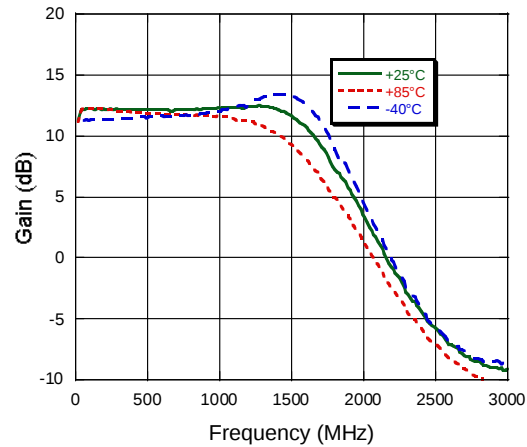
Gallium Arsenide Integrated Circuits are sensitive to electrostatic discharge (ESD) and can be damaged by static electricity. Proper ESD control techniques should be used when handling these devices.

## Typical Performance Curves

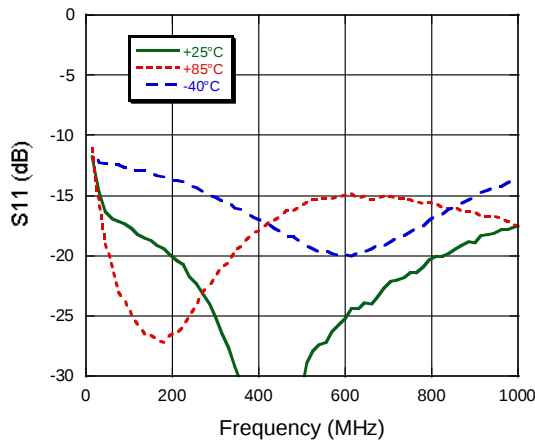
### Gain



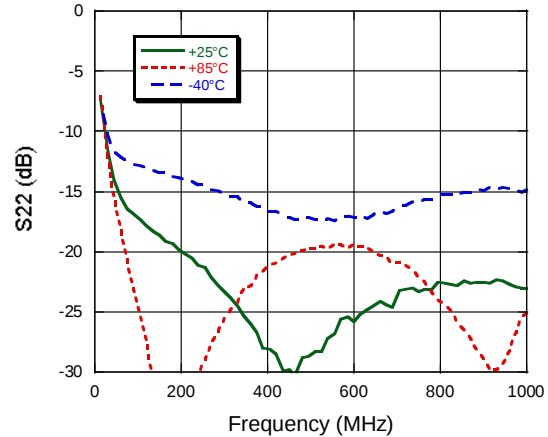
### Gain vs. Frequency to 3 GHz



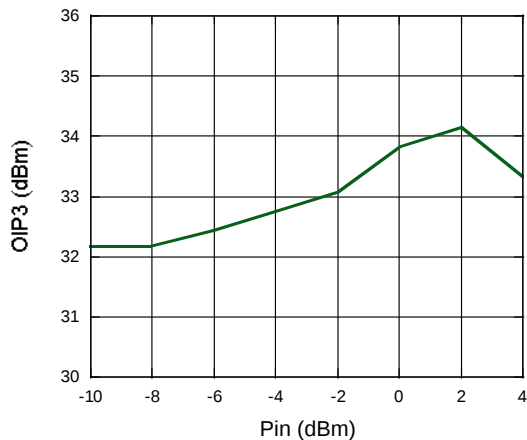
### Input Return Loss



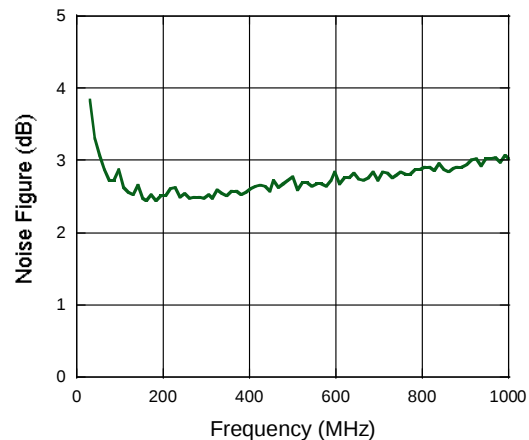
### Output Return Loss



### OIP3 vs. $P_{IN}$ at 400 MHz, 25°C



### Noise Figure vs. Frequency, 25°C

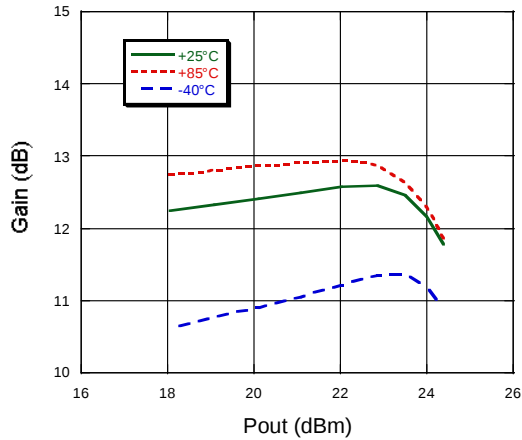


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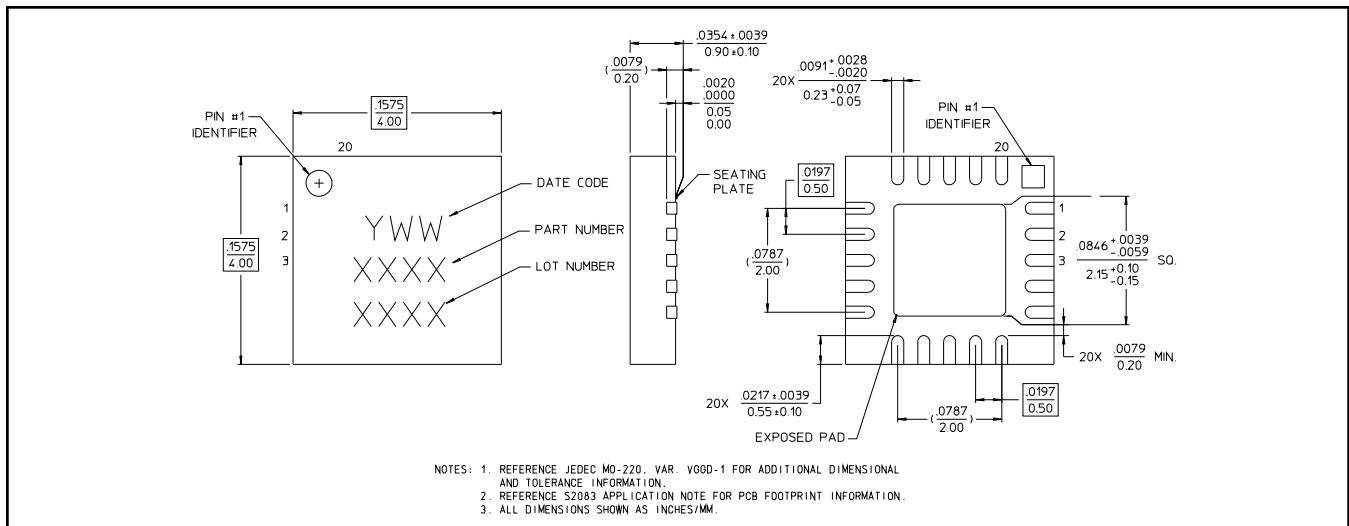
Rev. V3

### Typical Performance Curves (continued)

Gain vs  $P_{OUT}$  at 400 MHz



### 4 mm FQFP-N 20 Lead



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