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# MAAMSS0044

## Push Pull CATV Amplifier
## 50 - 1000 MHz

Rev. V1

### Features

- Low Distortion
- Low Noise Figure
- Push Pull Design
- Single Positive Supply
- Lead-Free 4 mm 20-Lead PQFN package
- Halogen-Free "Green" Mold Compound
- RoHS* Compliant and 260°C Reflow Compatible

### Description

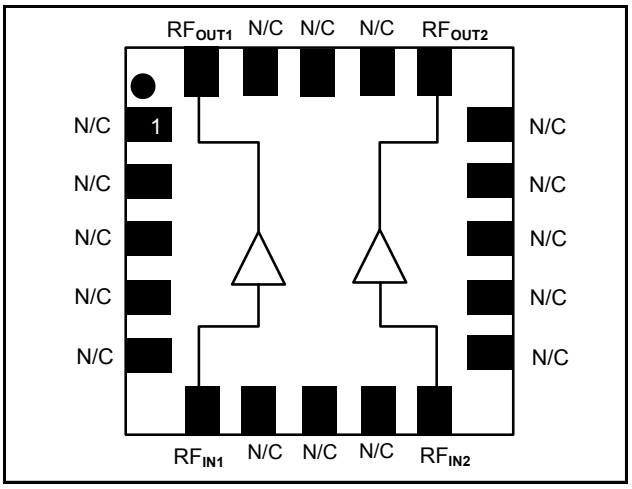
M/A-COM's MAAMSS0044 is a GaAs PHEMT MMIC amplifier in a lead-free 4 mm 20-lead PQFN package. The MMIC design is configured as a pair of cascode PHEMT amplifiers for broadband performance. It is designed for integration in a 75 Ω push-pull, low distortion, amplifier circuit. The device is ideally suited for use in CATV, FTTX, DBS, and HDTV applications where low noise figure and low distortion are required.

### Ordering Information [1,2]

| Part Number | Package |
|---|---|
| MAAMSS0044 | Bulk Packaging |
| MAAMSS0044TR | 1000 Piece Reel |
| MAAMSS0044TR-3000 | 3000 Piece Reel |
| MAAMSS0044SMB | Sample Board<br>50 - 1000 MHZ Tuning |

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

### Functional Schematic




### Pin Configuration [3]

| Pin No. | Pin Name | Description |
|---|---|---|
| 1 | N/C[4] | No Connection |
| 2 | N/C | No Connection |
| 3 | N/C | No Connection |
| 4 | N/C | No Connection |
| 5 | N/C | No Connection |
| 6 | $RF_{IN1}$ | RF Input 1 |
| 7 | N/C | No Connection |
| 8 | N/C | No Connection |
| 9 | N/C | No Connection |
| 10 | $RF_{IN2}$ | RF Input 2 |
| 11 | N/C | No Connection |
| 12 | N/C | No Connection |
| 13 | N/C | No Connection |
| 14 | N/C | No Connection |
| 15 | N/C | No Connection |
| 16 | $RF_{OUT2}$ | RF Output 2 |
| 17 | N/C | No Connection |
| 18 | N/C | No Connection |
| 19 | N/C | No Connection |
| 20 | $RF_{OUT1}$ | RF Output 1 |

3. The exposed pad centered on the package bottom must be connected to RF and DC ground.
4. It is recommended, but not absolutely compulsory, that all No Connections (N/C) within the IC are connected to the ground on the printed circuit board.

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

## Electrical Specifications: $T_A$ = 25°C, Freq: 50 - 1000 MHz, $V_{DD}$ = +5 Volts, $Z_0$ = 75 Ω, Test Circuit with M/A-COM Balun MABACT0069

| Parameter | Test Conditions | Units | Min. | Typ. | Max. |
|---|---|---|---|---|---|
| Gain | — | dB | 11 | 12.5 | 13.5 |
| Gain Flatness | — | dB | — | 0.8 | 1.3 |
| Noise Figure | — | dB | — | 3.7 | 5 |
| Input Return Loss | — | dB | — | 15 | — |
| Output Return Loss | — | dB | — | 15 | — |
| Output IP2 | 400 MHz, +4 dBm output | dBm | — | 75 | — |
| Output IP3 | Two tones at 397 & 403 MHz, +8 dBm output/tone | dBm | — | 42 | — |
| Composite Triple Beat, CTB | 79 Channels, +34 dBmV / Channel at the output<br>77 Channels, +39 dBmV / Channel at the output | dBc<br>dBc | —<br>— | -75<br>-65 | -70<br>— |
| Composite Second Order, CSO | 79 Channels, +34 dBmV / Channel at the output<br>77 Channels, +39 dBmV / Channel at the output | dBc<br>dBc | —<br>— | -85<br>-75 | -80<br>— |
| Cross modulation | 79 Channels, +34 dBmV / Channel at the output<br>77 Channels, +39 dBmV / Channel at the output | dBc<br>dBc | —<br>— | -75<br>-65 | —<br>— |
| P1dB | 400 MHz | dBm | — | 24 | — |
| $I_{DD}$ | +5 Volts | mA | — | 225 | 280 |

## Absolute Maximum Ratings [5,6,7]

| Parameter | Absolute Maximum |
|---|---|
| Input Power | +20 dBm |
| Operating Voltage | +10 volts |
| Operating Temperature | -40°C to +85°C |
| Junction Temperature[8] | 150°C |
| Storage Temperature | -65°C to +150°C |

5. Exceeding any one or combination of these limits may cause permanent damage to this device.
6. M/A-COM does not recommend sustained operation near these survivability limits.
7. These operating conditions will ensure MTTF > 1 x $10^6$ hours.
8. Junction Temperature ($T_J$) = $T_C$ + Θjc * ((V * I) - ($P_{OUT}$ - $P_{IN}$))
   Typical thermal resistance (Θjc) = 39° C/W.
   a) For $T_C$ = 25°C,
   $T_J$ = 69 °C @ 5 V, 225 mA
   b) For $T_C$ = 85°C,
   $T_J$ = 129 °C @ 5 V, 225 mA

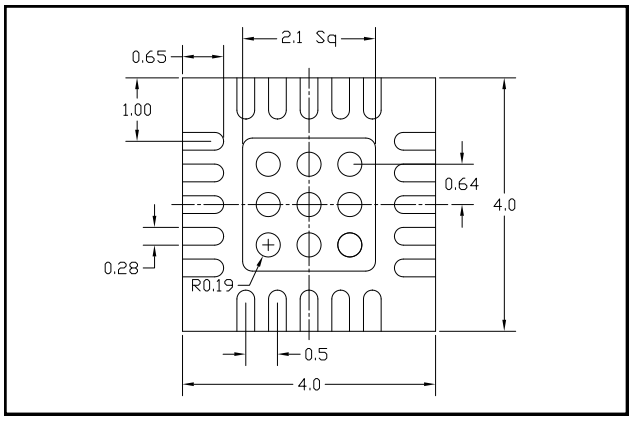
## Handling Procedures

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.

## PCB Land Pattern

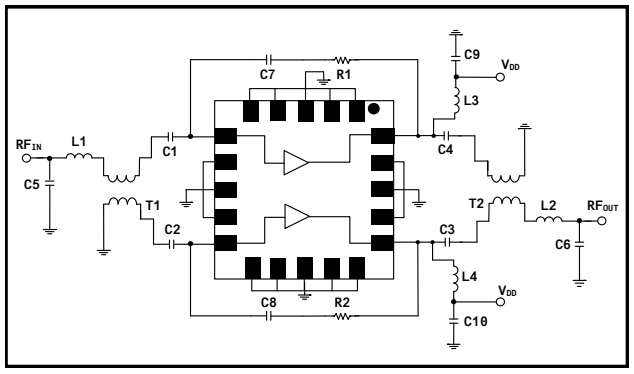



## Parts List[9]

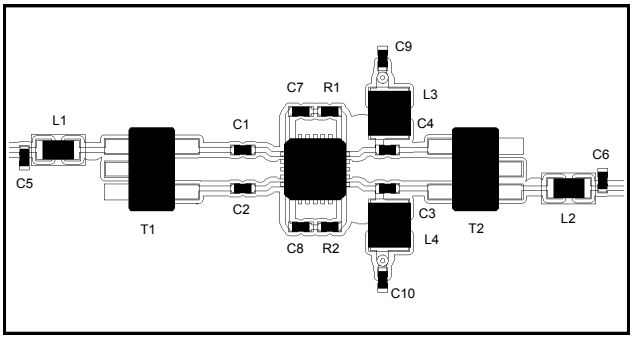
| Component | Value | Package |
|---|---|---|
| C1 - C4 | 0.01 µF | 0402 |
| C5 | 0.8 pF | 0402 |
| C6 | 1 pF | 0402 |
| C7 - C10 | 0.01 µF | 0402 |
| L1 | 5.6 nH | 0402 |
| L2 | 6.8 nH | 0402 |
| L3, L4 | 470 nH | 1008 |
| R1, R2 | 300 Ω | 0402 |

9. The 1:1 Baluns, T1 &T2 are M/A-COM part number MABACT0069

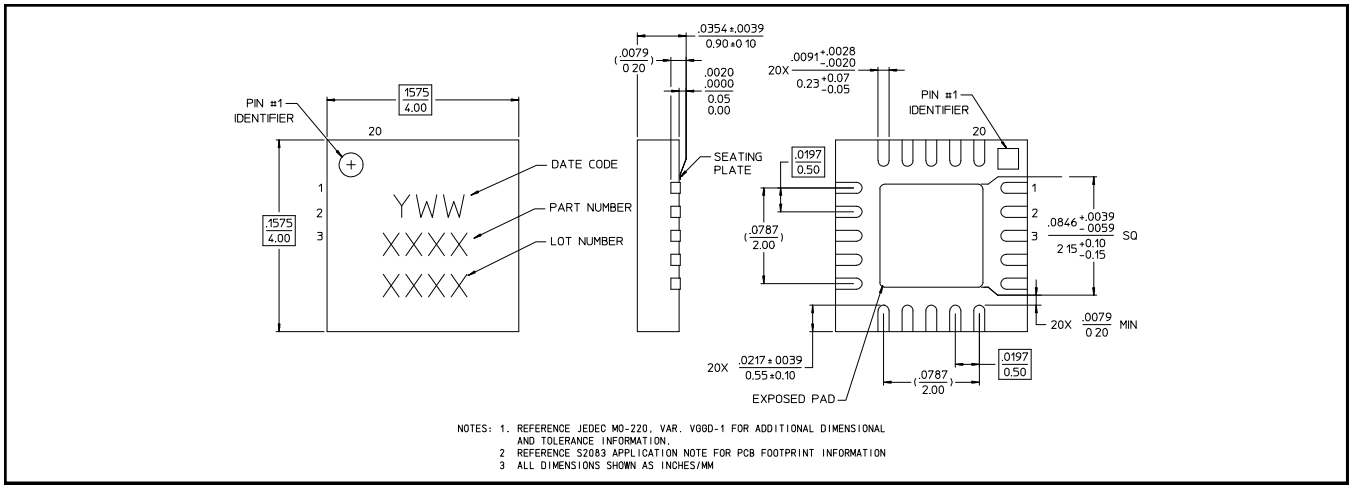
## Application Schematic




## Sample Board



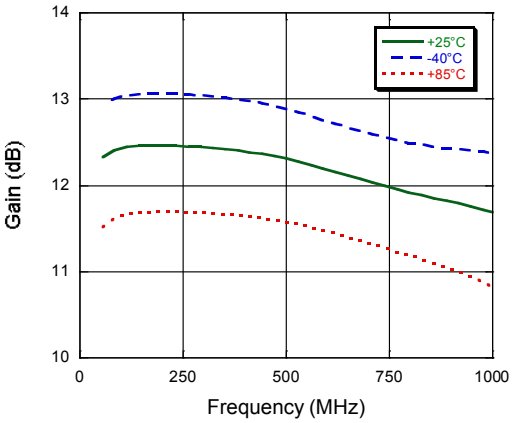

## *Lead Free* 4 mm 20-lead PQFN†



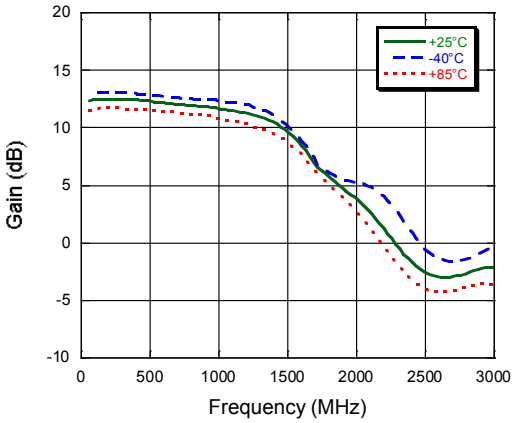

† Reference Application Note M538 for lead-free solder reflow recommendations.
Meets JEDEC moisture sensitivity level 1 requirements.
Plating is 100% matte tin over copper.

## Typical Performance Curves

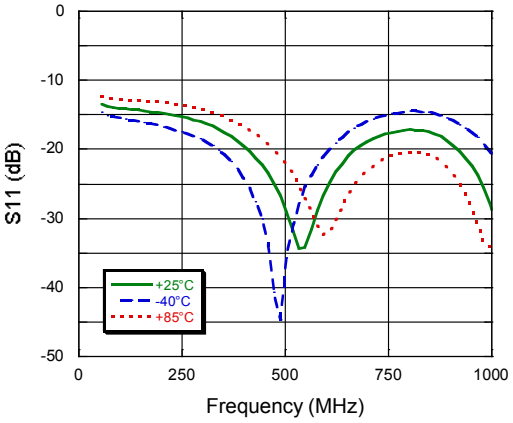
### *Gain vs. Frequency*



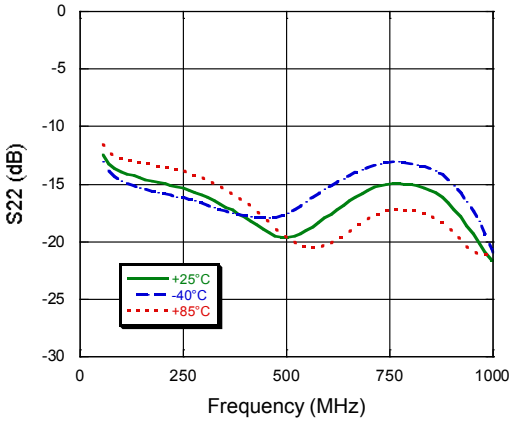

### *Gain vs. Frequency to 3 GHz*



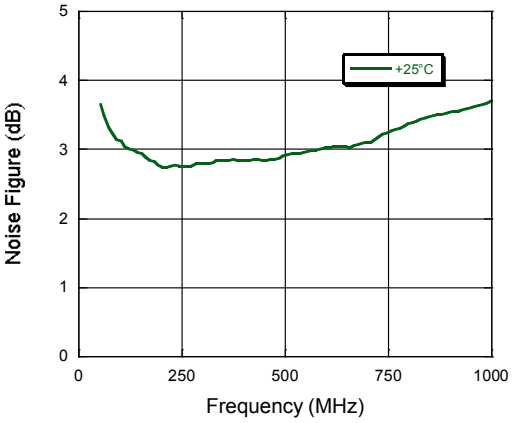

### *Input Return Loss vs. Frequency*




### *Output Return Loss vs. Frequency*

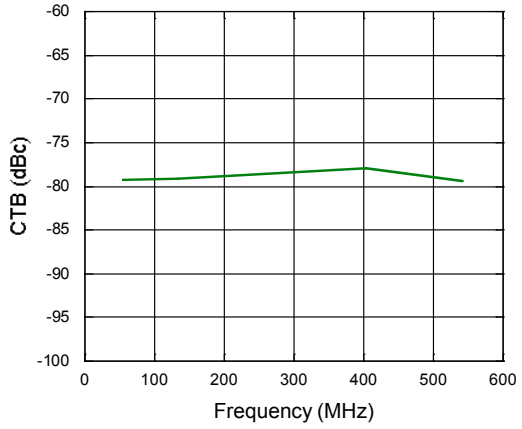



### *Noise Figure vs. Frequency*

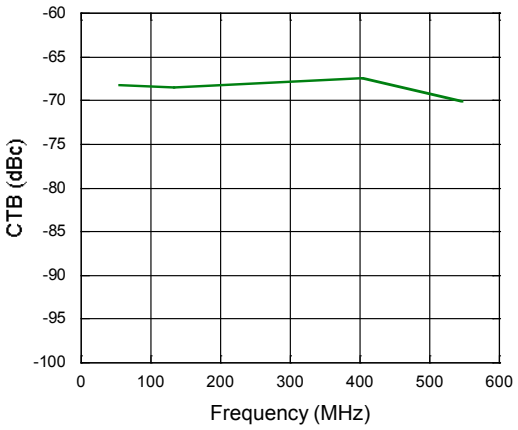


## Typical Performance Curves

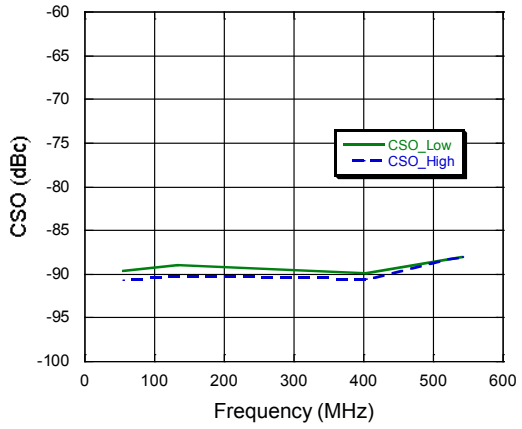
***Composite Triple Beat,***
***79 Channels +34 dBm/channel Output***




***Composite Triple Beat,***
***77 Channels +39 dBm/channel Output***




***Composite Second Order Low and High,***
***79 Channels +34 dBm/channel Output***




***Composite Second Order Low and High,***
***77 Channels +39 dBm/channel Output***