

## Low Noise CATV Amplifier 50 - 1005 MHz

Rev. V1

### Features

- Low Distortion
- Low Noise Figure
- Push Pull Design
- Single Positive Supply
- Lead-Free 4 mm 20-Lead PQFN Package
- 100% Matte Tin Plating over Copper
- Halogen-Free "Green" Mold Compound
- RoHS\* Compliant and 260°C Reflow Compatible

### Description

M/A-COM's MAAM-007724 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-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.

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

| Part Number        | Package                                   |
|--------------------|---|
| MAAM-007724-TR1000 | 1000 piece reel                           |
| MAAM-007724-TR3000 | 3000 piece reel                           |
| MAAM-007724-000SMB | Sample Test Board<br>(Includes 5 Samples) |

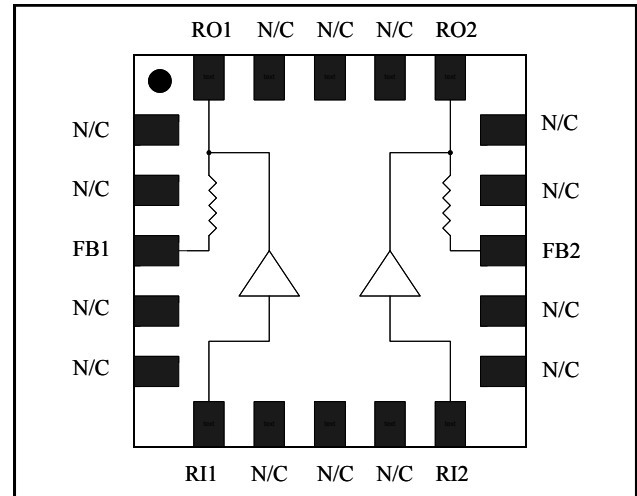
1. Reference Application Note M513 for reel size information.

### 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.

### Functional Schematic



### 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.

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

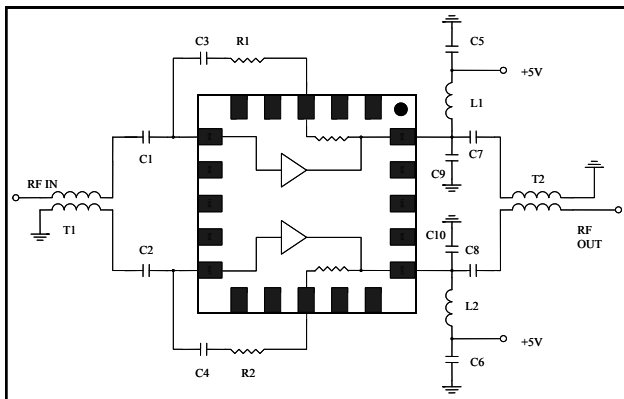
## Low Noise CATV Amplifier 50 - 1005 MHz

Rev. V1

**Electrical Specifications:**  $T_A = 25^\circ\text{C}$ , Freq: 50 - 1005 MHz,  $V_{DD} = +5$  Volts,  $Z_0 = 75$  ohms  
**Test Circuit with M/A-COM Balun ETN1-1-13**

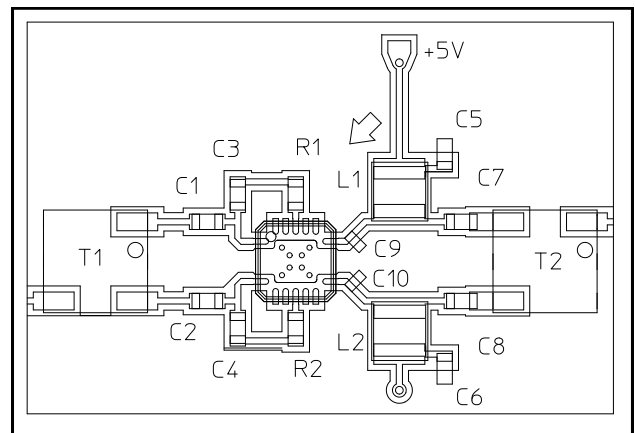
| Parameter                   | Test Conditions                                    | Units | Min. | Typ.  | Max. |
|-----------------------------|--|-------|------|-------|------|
| Gain                        | —  | dB    | 11.5 | 12.2  | 13.0 |
| Gain Flatness               | —  | dB    | —    | 0.4   | 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    | —    | 190   | 225  |

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



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

### 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 $\mu\text{F}$ , 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

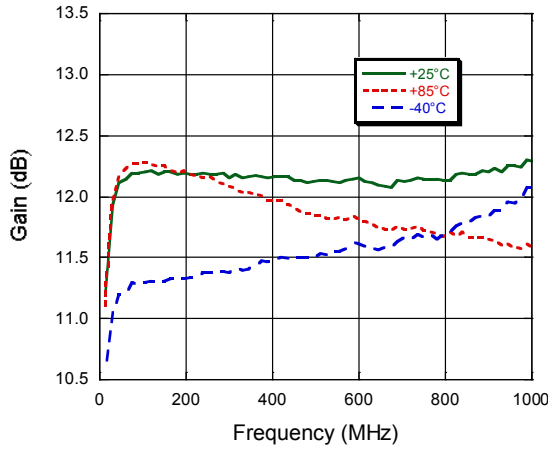
Please observe the following precautions to avoid damage:

### Static Sensitivity

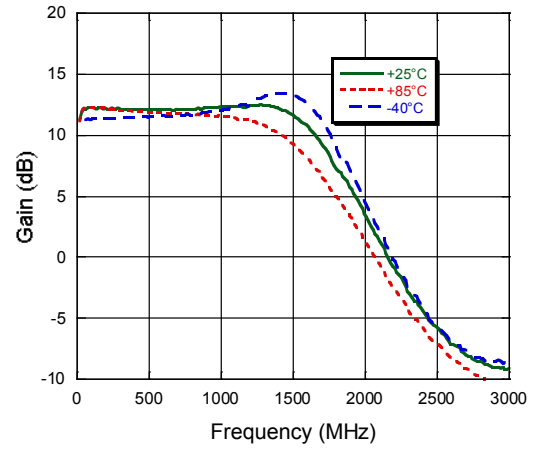
Gallium Arsenide Integrated Circuits are sensitive to electrostatic discharge (ESD) and can be damaged by static electricity. Proper ESD control techniques should be used when handling these devices.

## Typical Performance Curves

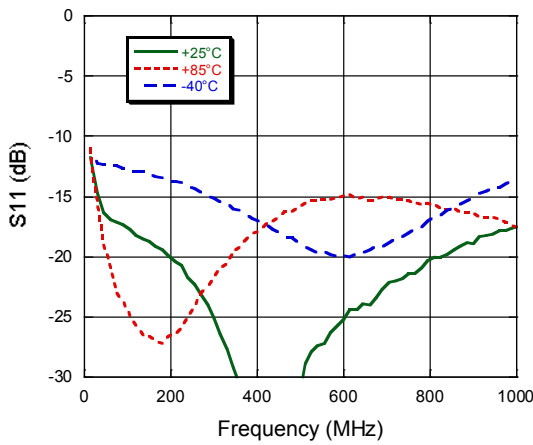
### Gain



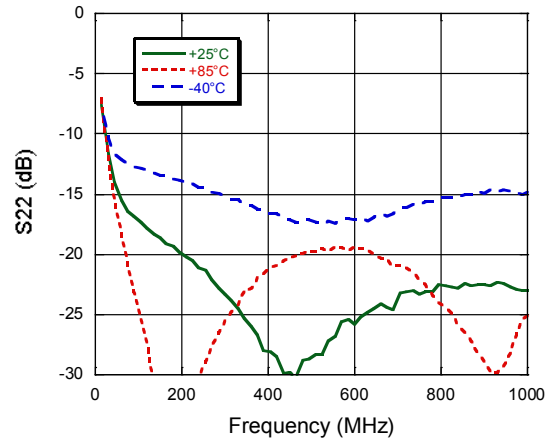
### Gain vs. Frequency to 3 GHz



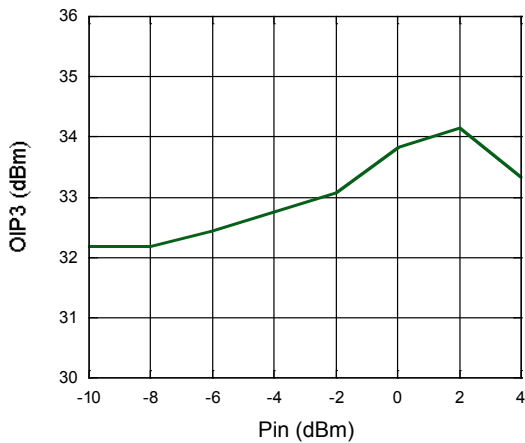
### Input Return Loss



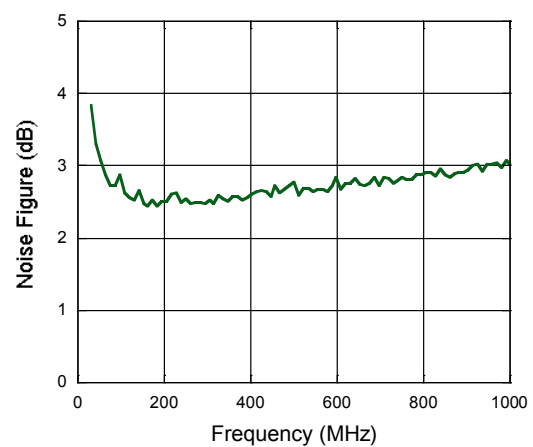
### Output Return Loss



### OIP



### Noise Figure vs. Frequency, 25°C

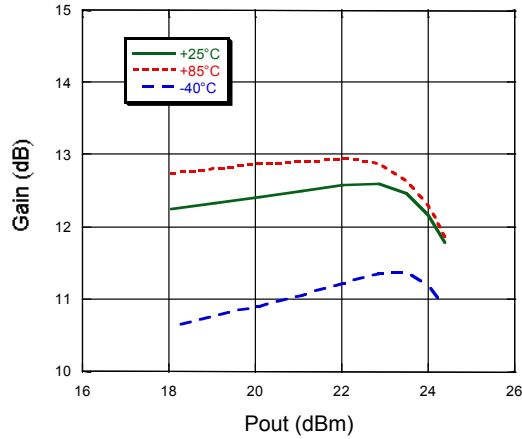


## Low Noise CATV Amplifier 50 - 1005 MHz

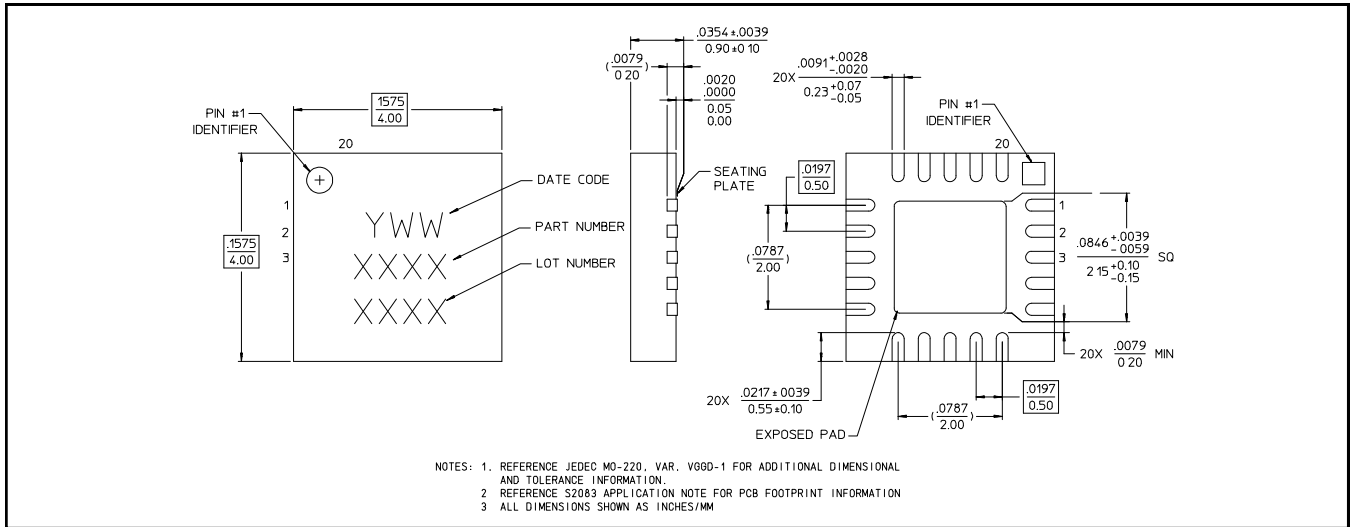
Rev. V1

### Typical Performance Curves (continued)

Gain vs.  $P_{OUT}$  at 400 MHz



### Lead-Free 4 mm 20-lead PQFN<sup>†</sup>



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

M/A-COM Technology Solutions Inc. All rights reserved.

Information in this document is provided in connection with M/A-COM Technology Solutions Inc ("MACOM") products. These materials are provided by MACOM as a service to its customers and may be used for informational purposes only. Except as provided in MACOM's Terms and Conditions of Sale for such products or in any separate agreement related to this document, MACOM assumes no liability whatsoever. MACOM assumes no responsibility for errors or omissions in these materials. MACOM may make changes to specifications and product descriptions at any time, without notice. MACOM makes no commitment to update the information and shall have no responsibility whatsoever for conflicts or incompatibilities arising from future changes to its specifications and product descriptions. No license, express or implied, by estoppel or otherwise, to any intellectual property rights is granted by this document.

THESE MATERIALS ARE PROVIDED "AS IS" WITHOUT WARRANTY OF ANY KIND, EITHER EXPRESS OR IMPLIED, RELATING TO SALE AND/OR USE OF MACOM PRODUCTS INCLUDING LIABILITY OR WARRANTIES RELATING TO FITNESS FOR A PARTICULAR PURPOSE, CONSEQUENTIAL OR INCIDENTAL DAMAGES, MERCHANTABILITY, OR INFRINGEMENT OF ANY PATENT, COPYRIGHT OR OTHER INTELLECTUAL PROPERTY RIGHT. MACOM FURTHER DOES NOT WARRANT THE ACCURACY OR COMPLETENESS OF THE INFORMATION, TEXT, GRAPHICS OR OTHER ITEMS CONTAINED WITHIN THESE MATERIALS. MACOM SHALL NOT BE LIABLE FOR ANY SPECIAL, INDIRECT, INCIDENTAL, OR CONSEQUENTIAL DAMAGES, INCLUDING WITHOUT LIMITATION, LOST REVENUES OR LOST PROFITS, WHICH MAY RESULT FROM THE USE OF THESE MATERIALS.

MACOM products are not intended for use in medical, lifesaving or life sustaining applications. MACOM customers using or selling MACOM products for use in such applications do so at their own risk and agree to fully indemnify MACOM for any damages resulting from such improper use or sale.