**Push Pull CATV Amplifier**

50 - 1000 MHz

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### 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.

### Pin Configuration

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

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[https://www.macom.com/support](https://www.macom.com/support)
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50 - 1000 MHz

Electrical Specifications: \( T_A = 25^\circ C, \text{ Freq: 50 - 1000 MHz, } V_{DD} = +5 \text{ Volts, } Z_0 = 75 \Omega, \text{ Test Circuit with M/A-COM Balun MABACT0069} \)

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

Absolute Maximum Ratings 5,6,7

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Absolute Maximum</th>
</tr>
</thead>
<tbody>
<tr>
<td>Input Power</td>
<td>+20 dBm</td>
</tr>
<tr>
<td>Operating Voltage</td>
<td>+10 volts</td>
</tr>
<tr>
<td>Operating Temperature</td>
<td>-40°C to +85°C</td>
</tr>
<tr>
<td>Junction Temperature</td>
<td>150°C</td>
</tr>
<tr>
<td>Storage Temperature</td>
<td>-65°C to +150°C</td>
</tr>
</tbody>
</table>

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.

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 10⁶ hours.
8. Junction Temperature (\( T_J \)) = \( T_C + \Theta_{JC} \times (V - I) - (P_{OUT} - P_{IN}) \)
   Typical thermal resistance (\( \Theta_{JC} \)) = 39°C/W.
   a) For \( T_C = 25°C \),
      \( T_J = 69 \text{ °C @ 5 V, 225 mA} \)
   b) For \( T_C = 85°C \),
      \( T_J = 129 \text{ °C @ 5 V, 225 mA} \)
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PCB Land Pattern

Application Schematic

Parts List

<table>
<thead>
<tr>
<th>Component</th>
<th>Value</th>
<th>Package</th>
</tr>
</thead>
<tbody>
<tr>
<td>C1 - C4</td>
<td>0.01 µF</td>
<td>0402</td>
</tr>
<tr>
<td>C5</td>
<td>0.8 pF</td>
<td>0402</td>
</tr>
<tr>
<td>C6</td>
<td>1 pF</td>
<td>0402</td>
</tr>
<tr>
<td>C7 - C10</td>
<td>0.01 µF</td>
<td>0402</td>
</tr>
<tr>
<td>L1</td>
<td>5.6 nH</td>
<td>0402</td>
</tr>
<tr>
<td>L2</td>
<td>6.8 nH</td>
<td>0402</td>
</tr>
<tr>
<td>L3, L4</td>
<td>470 nH</td>
<td>1008</td>
</tr>
<tr>
<td>R1, R2</td>
<td>300 Ω</td>
<td>0402</td>
</tr>
</tbody>
</table>

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

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**

- [Graph of Gain vs. Frequency with curves for different temperatures: +25°C, -40°C, +85°C.]

**Gain vs. Frequency to 3 GHz**

- [Graph of Gain vs. Frequency to 3 GHz with curves for different temperatures: +25°C, -40°C, +85°C.]

**Input Return Loss vs. Frequency**

- [Graph of Input Return Loss vs. Frequency with curves for different temperatures: +25°C, -40°C, +85°C.]

**Output Return Loss vs. Frequency**

- [Graph of Output Return Loss vs. Frequency with curves for different temperatures: +25°C, -40°C, +85°C.]

**Noise Figure vs. Frequency**

- [Graph of Noise Figure vs. Frequency with curves for different temperatures: +25°C.]

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Typical Performance Curves

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

![Graph: Composite Triple Beat, 79 Channels +34 dBm/channel Output]

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

![Graph: Composite Triple Beat, 77 Channels +39 dBm/channel Output]

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

![Graph: Composite Second Order Low and High, 79 Channels +34 dBm/channel Output]

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

![Graph: Composite Second Order Low and High, 77 Channels +39 dBm/channel Output]
MAAMSS0044

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