MAAMSS0060

Broadband CATV Amplifier
50 - 1000 MHz

Features
- 75 Ω Input / Output Match
- CTB: -75 dBC
- Noise Figure: 1.8 dB
- Gain: 17 dB, 20 dB
- Lead Free SOT-89 Package
- Halogen-Free “Green” Mold Compound
- RoHS* Compliant and 260°C Reflow Compatible

Description
M/A-COM’s MAAMSS0060 CATV amplifier is a GaAs MMIC which exhibits low distortion in a lead free miniature surface mount plastic package. The MAAMSS0060 employs a monolithic single stage design featuring a convenient 75 Ω input/output impedance that minimizes the number of external components required.

The MAAMSS0060 provides low noise and high linearity. It is ideally suited for set top boxes, home gateways, FTTX, Drop Amplifiers, and other broadband internet based applications.

The MAAMSS0060 is fabricated using M/A-COM’s PHEMT process to realize low noise and low distortion. The process features full passivation for robust performance and reliability.

Ordering Information 1,2

<table>
<thead>
<tr>
<th>Part Number</th>
<th>Package</th>
</tr>
</thead>
<tbody>
<tr>
<td>MAAMSS0060</td>
<td>Bulk Packaging</td>
</tr>
<tr>
<td>MAAMSS0060TR</td>
<td>1000 piece reel</td>
</tr>
<tr>
<td>MAAMSS0060TR-3000</td>
<td>3000 piece reel</td>
</tr>
<tr>
<td>MAAM-000060-001SMB2</td>
<td>17 dB Gain Configuration</td>
</tr>
<tr>
<td>MAAM-000060-002SMB2</td>
<td>20 dB Gain Configuration</td>
</tr>
</tbody>
</table>

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

Functional Schematic

![Schematic Diagram]

Pin Configuration

<table>
<thead>
<tr>
<th>Pin No.</th>
<th>Pin Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>RF\text{IN}</td>
<td>RF Input</td>
</tr>
<tr>
<td>2</td>
<td>GND</td>
<td>Ground</td>
</tr>
<tr>
<td>3</td>
<td>RF\text{OUT}</td>
<td>RF Output / Drain Supply</td>
</tr>
</tbody>
</table>

Absolute Maximum Ratings 3,4,5

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Absolute Maximum</th>
</tr>
</thead>
<tbody>
<tr>
<td>RF Input Power</td>
<td>6 dBm</td>
</tr>
<tr>
<td>Voltage</td>
<td>10.0 volts</td>
</tr>
<tr>
<td>Operating Temperature</td>
<td>-40°C to +85°C</td>
</tr>
<tr>
<td>Junction Temperature 6</td>
<td>+150°C</td>
</tr>
<tr>
<td>Storage Temperature</td>
<td>-65°C to +150°C</td>
</tr>
</tbody>
</table>

3. Exceeding any one or combination of these limits may cause permanent damage to this device.
4. M/A-COM does not recommend sustained operation near these survivability limits.
5. These operating conditions will ensure MTTF > 1 x 10³ hours.
6. Junction Temperature \(T_J = T_C + \Theta_{jc} \times (V \times I)\)
   - Typical thermal resistance \((\Theta_{jc}) = 58°C/W\).
   - For \(T_C = 25°C\), \(T_J = 81°C @ 8 V, 120 mA\)
   - For \(T_C = 85°C\), \(T_J = 136 °C @ 8 V, 110 mA\)


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Broadband CATV Amplifier
50 - 1000 MHz

17 dB Gain Configuration
Electrical Specifications:  \( T_A = 25^\circ C, \) Freq: 50 - 1000 MHz, \( V_{DD} = 8 \) Volts, \( Z_0 = 75 \) Ω

<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>15.8</td>
<td>17</td>
<td>17.8</td>
</tr>
<tr>
<td>Gain Flatness</td>
<td></td>
<td>dB</td>
<td>—</td>
<td>0.5</td>
<td>1.0</td>
</tr>
<tr>
<td>Noise Figure</td>
<td></td>
<td>dB</td>
<td>—</td>
<td>1.8</td>
<td>3.5</td>
</tr>
<tr>
<td>Input Return Loss</td>
<td></td>
<td>dB</td>
<td>—</td>
<td>20</td>
<td>—</td>
</tr>
<tr>
<td>Output Return Loss</td>
<td></td>
<td>dB</td>
<td>—</td>
<td>20</td>
<td>—</td>
</tr>
<tr>
<td>Output IP3</td>
<td>6 MHz Spacing, -10 dBm output per tone</td>
<td>dBm</td>
<td>—</td>
<td>37</td>
<td>—</td>
</tr>
<tr>
<td>Composite Triple Beat, CTB</td>
<td>132 channels, +33 dBmV / channel at the output.</td>
<td>dBC</td>
<td>—</td>
<td>-75</td>
<td>—</td>
</tr>
<tr>
<td>Composite Second Order, CSO</td>
<td>132 channels, +33 dBmV / channel at the output.</td>
<td>dBC</td>
<td>—</td>
<td>-60</td>
<td>—</td>
</tr>
<tr>
<td>P1dB</td>
<td></td>
<td>dBm</td>
<td>—</td>
<td>23</td>
<td>—</td>
</tr>
<tr>
<td>( I_{DD} )</td>
<td>8 Volts</td>
<td>mA</td>
<td>—</td>
<td>120</td>
<td>140</td>
</tr>
</tbody>
</table>

20 dB Gain Configuration
Typical Performance:  \( T_A = 25^\circ C, \) Freq: 50 - 1000 MHz, \( V_{DD} = 8 \) Volts, \( Z_0 = 75 \) Ω

<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>—</td>
<td>20</td>
<td>—</td>
</tr>
<tr>
<td>Gain Flatness</td>
<td></td>
<td>dB</td>
<td>—</td>
<td>1</td>
<td>—</td>
</tr>
<tr>
<td>Noise Figure</td>
<td></td>
<td>dB</td>
<td>—</td>
<td>1.6</td>
<td>—</td>
</tr>
<tr>
<td>Input Return Loss</td>
<td></td>
<td>dB</td>
<td>—</td>
<td>12</td>
<td>—</td>
</tr>
<tr>
<td>Output Return Loss</td>
<td></td>
<td>dB</td>
<td>—</td>
<td>12</td>
<td>—</td>
</tr>
<tr>
<td>Output IP3</td>
<td>6 MHz Spacing, -10 dBm output per tone</td>
<td>dBm</td>
<td>—</td>
<td>35</td>
<td>—</td>
</tr>
<tr>
<td>Composite Triple Beat, CTB</td>
<td>132 channels, +33 dBmV / channel at the output.</td>
<td>dBC</td>
<td>—</td>
<td>-66</td>
<td>—</td>
</tr>
<tr>
<td>Composite Second Order, CSO</td>
<td>132 channels, +33 dBmV / channel at the output.</td>
<td>dBC</td>
<td>—</td>
<td>-55</td>
<td>—</td>
</tr>
<tr>
<td>P1dB</td>
<td></td>
<td>dBm</td>
<td>—</td>
<td>21</td>
<td>—</td>
</tr>
<tr>
<td>( I_{DD} )</td>
<td>8 Volts</td>
<td>mA</td>
<td>—</td>
<td>120</td>
<td>—</td>
</tr>
</tbody>
</table>
17 & 20 dB Gain Configuration Schematic Including Off-Chip Components

17 dB Gain Configuration
Off-Chip Component Values

<table>
<thead>
<tr>
<th>Component</th>
<th>Value</th>
<th>Package</th>
</tr>
</thead>
<tbody>
<tr>
<td>C1, C3, C4</td>
<td>0.01 µF</td>
<td>0402</td>
</tr>
<tr>
<td>C2</td>
<td>470 pF</td>
<td>0402</td>
</tr>
<tr>
<td>C5</td>
<td>0.7 pF</td>
<td>0402</td>
</tr>
<tr>
<td>L1</td>
<td>1 µH</td>
<td>1210</td>
</tr>
<tr>
<td>L2</td>
<td>4.7 nH</td>
<td>0402</td>
</tr>
<tr>
<td>L3</td>
<td>8.2 nH</td>
<td>0402</td>
</tr>
<tr>
<td>R1</td>
<td>560 Ω</td>
<td>0402</td>
</tr>
<tr>
<td>R2</td>
<td>91 Ω</td>
<td>0402</td>
</tr>
</tbody>
</table>

7. L1 supplied from EPCOS, part number B82422A1102K100

20 dB Gain Configuration
Off-Chip Component Values

<table>
<thead>
<tr>
<th>Component</th>
<th>Value</th>
<th>Package</th>
</tr>
</thead>
<tbody>
<tr>
<td>C1, C2, C3, C4</td>
<td>0.01 µF</td>
<td>0402</td>
</tr>
<tr>
<td>C5</td>
<td>0.75 pF</td>
<td>0402</td>
</tr>
<tr>
<td>L1</td>
<td>1.5 µH</td>
<td>1210</td>
</tr>
<tr>
<td>L2</td>
<td>10 nH</td>
<td>0402</td>
</tr>
<tr>
<td>L3</td>
<td>12 nH</td>
<td>0402</td>
</tr>
<tr>
<td>R1</td>
<td>750 Ω</td>
<td>0402</td>
</tr>
<tr>
<td>R2</td>
<td>360 Ω</td>
<td>0402</td>
</tr>
</tbody>
</table>

8. L1 supplied from EPCOS, part number B82422A1152K100
Typical Performance Curves: 17dB Gain Configuration

Gain to 1 GHz over Temperature

Gain to 3 GHz over Temperature

Input Return Loss over Temperature

Output Return Loss over Temperature

Noise Figure
Typical Performance Curves: 20 dB Gain Configuration

**Gain to 1 GHz**

- **Gain to 3 GHz**

- **Input Return Loss**

- **Output Return Loss**

**Noise Figure**
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.
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