MAAP-008924

Amplifier, Power, 1.2 W
10 - 13.3 GHz

Features
- OIP3: 44 dBm
- Gain: 20 dB
- P1dB: 31 dB
- Lead-Free 5 mm 20-lead PQFN Package
- Halogen-Free “Green” Mold Compound
- RoHS* Compliant and 260°C Reflow Compatible
- Class 1C ESD Rating

Description
The MAAP-008924 is a 3-stage, high linearity 1.2 W GaAs power amplifier in a 5mm, 20 lead PQFN package, allowing easy assembly. This PA product is fully matched to 50 ohms on both the input and output. It can be used as a power amplifier stage or as a driver stage in high power applications. It is ideally suited for Point-to-Point Radios.

Each device is 100% RF tested to ensure performance compliance. The part is fabricated using M/A-COM Technology Solutions’ high linearity MESFET Process.

Ordering Information

<table>
<thead>
<tr>
<th>Part Number</th>
<th>Package</th>
</tr>
</thead>
<tbody>
<tr>
<td>MAAP-008924-TR0500</td>
<td>500 piece reel</td>
</tr>
<tr>
<td>MAAP-008924-TR1000</td>
<td>1000 piece reel</td>
</tr>
<tr>
<td>MAAP-008924-001SMB</td>
<td>Sample Board</td>
</tr>
</tbody>
</table>

1. Reference Application Note M513 for reel size information.

Functional Schematic

Pin Configuration

<table>
<thead>
<tr>
<th>Pin No.</th>
<th>Function</th>
<th>Pin No.</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>No Connect</td>
<td>11</td>
<td>No Connect</td>
</tr>
<tr>
<td>2</td>
<td>No Connect</td>
<td>12</td>
<td>No Connect</td>
</tr>
<tr>
<td>3</td>
<td>RF IN</td>
<td>13</td>
<td>RF OUT</td>
</tr>
<tr>
<td>4</td>
<td>No Connect</td>
<td>14</td>
<td>No Connect</td>
</tr>
<tr>
<td>5</td>
<td>No Connect</td>
<td>15</td>
<td>No Connect</td>
</tr>
<tr>
<td>6</td>
<td>VG1</td>
<td>16</td>
<td>VG3</td>
</tr>
<tr>
<td>7</td>
<td>No Connect</td>
<td>17</td>
<td>No Connect</td>
</tr>
<tr>
<td>8</td>
<td>VG2</td>
<td>18</td>
<td>VG2</td>
</tr>
<tr>
<td>9</td>
<td>No Connect</td>
<td>19</td>
<td>No Connect</td>
</tr>
<tr>
<td>10</td>
<td>VG3</td>
<td>20</td>
<td>VG1</td>
</tr>
</tbody>
</table>

2. M/A-COM Technology Solutions recommends connecting unused package pins to ground.
3. The exposed pad centered on the package bottom must be connected to RF and DC ground.

Electrical Specifications: Freq. 10 - 13.3 GHz, V_{DD} = 6 V, I_{DQ} = 1000 mA^4, Z_0 = 50 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>Small Signal Gain</td>
<td>10 GHz</td>
<td>dB</td>
<td>—</td>
<td>21</td>
<td>—</td>
</tr>
<tr>
<td></td>
<td>11.7 GHz</td>
<td></td>
<td>20</td>
<td></td>
<td>22</td>
</tr>
<tr>
<td></td>
<td>13.3 GHz</td>
<td></td>
<td></td>
<td></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>10</td>
<td>—</td>
</tr>
<tr>
<td>Noise Figure</td>
<td>—</td>
<td>dB</td>
<td>—</td>
<td>7</td>
<td>—</td>
</tr>
<tr>
<td>P1dB</td>
<td></td>
<td>dBm</td>
<td>—</td>
<td>31</td>
<td>—</td>
</tr>
<tr>
<td>OIP3</td>
<td>10 GHz, @ 15 dBm / tone</td>
<td>dBm</td>
<td>—</td>
<td>42</td>
<td>—</td>
</tr>
<tr>
<td></td>
<td>11.7 GHz, @ 15 dBm / tone</td>
<td></td>
<td>39</td>
<td></td>
<td>44</td>
</tr>
<tr>
<td></td>
<td>13.3 GHz, @ 15 dBm / tone</td>
<td></td>
<td></td>
<td></td>
<td>41</td>
</tr>
<tr>
<td>P_{SAT}</td>
<td>—</td>
<td>dBm</td>
<td>—</td>
<td>32</td>
<td>—</td>
</tr>
<tr>
<td>Current, P_{OUT} = 31 dBm</td>
<td></td>
<td>mA</td>
<td>—</td>
<td>1100</td>
<td>—</td>
</tr>
</tbody>
</table>

4. Set V_{GO} to −1.5 V prior to applying V_{DD}, once V_{DD} is applied adjust V_{GO} to achieve specific I_{DQ}.

Maximum Operating Ratings 5,6

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Absolute Maximum</th>
</tr>
</thead>
<tbody>
<tr>
<td>Input Power</td>
<td>+12 dBm</td>
</tr>
<tr>
<td>Drain Supply Voltage</td>
<td>+7 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>-55°C to +150°C</td>
</tr>
</tbody>
</table>

5. Exceeding any one or combination of these limits may cause permanent damage to this device.
6. M/A-COM Technology Solutions does not recommend sustained operation near these survivability limits.
7. Operating at nominal conditions with T_J ≤ +150°C will ensure MTTF > 1 x 10^6 hours.
8. Junction Temperature (T_J) = T_C + θ_{jc} * ((V * I) - (P_{OUT} - P_IN))
   Typical thermal resistance (θ_{jc}) = 9.1°C/W.
   a) For T_C = 25°C,
      T_J = 74°C @ 6 V, 1100 mA, P_{OUT} = 31 dBm, P_IN = 11 dBm
   b) For T_C = 85°C,
      T_J = 134°C @ 6 V, 1100 mA, P_{OUT} = 31 dBm, P_IN = 11 dBm

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 class 1C devices.
Typical Performance Curves

**Gain**

![Gain Graph]

- **S21 (dB)**
- Temperature: +25°C, -40°C, +85°C
- Frequency (GHz): 10.0 to 13.5

**Input Return Loss**

![Input Return Loss Graph]

- **S11 (dB)**
- Temperature: +25°C, -40°C, +85°C
- Frequency (GHz): 10.0 to 13.5

**Output Return Loss**

![Output Return Loss Graph]

- **S22 (dB)**
- Temperature: +25°C, -40°C, +85°C
- Frequency (GHz): 10.0 to 13.5

**Noise Figure**

![Noise Figure Graph]

- **Noise Figure (dB)**
- Temperature: +25°C, -40°C, +85°C
- Frequency (GHz): 10.0 to 13.5

**P1dB**

![P1dB Graph]

- **P1dB (dBm)**
- Temperature: +25°C, -40°C, +85°C
- Frequency (GHz): 10.0 to 13.5

**Output IP3 @ 10 GHz**

![Output IP3 Graph]

- **OP3 (dBm)**
- Temperature: +25°C, -40°C, +85°C
- Output Power (dBm): 8 to 28
Amplifier, Power, 1.2 W
10 - 13.3 GHz

Typical Performance Curves (cont.)

Output IP3 @ 11.7 GHz

Output IP3 @ 13.3 GHz

Lead-Free 5 mm 20-Lead PQFN†

NOTES:
1. Reference JEDEC M0-220, VAR VHHC for additional dimensions and tolerance information.
2. Reference S2083 application note for PCB footprint information.
3. All dimensions shown as inches/mm.

† Reference Application Note S2083 for lead-free solder reflow recommendations.
Meets JEDEC moisture sensitivity level 1 requirements.
Plating is 100% matte tin over copper.
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