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 ¹

<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 ²,³

<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>V_G1</td>
<td>16</td>
<td>V_D3</td>
</tr>
<tr>
<td>7</td>
<td>No Connect</td>
<td>17</td>
<td>No Connect</td>
</tr>
<tr>
<td>8</td>
<td>V_G2</td>
<td>18</td>
<td>V_D2</td>
</tr>
<tr>
<td>9</td>
<td>No Connect</td>
<td>19</td>
<td>No Connect</td>
</tr>
<tr>
<td>10</td>
<td>V_G3</td>
<td>20</td>
<td>V_D1</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.

**Amplifier, Power, 1.2 W**

**10 - 13.3 GHz**

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**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>—</td>
<td>20</td>
<td>—</td>
</tr>
<tr>
<td></td>
<td>13.3 GHz</td>
<td></td>
<td>20</td>
<td>22</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>10 GHz, @ 15 dBm / tone</td>
<td>dBm</td>
<td>—</td>
<td>31</td>
<td>—</td>
</tr>
<tr>
<td></td>
<td>11.7 GHz, @ 15 dBm / tone</td>
<td></td>
<td>—</td>
<td>42</td>
<td>—</td>
</tr>
<tr>
<td></td>
<td>13.3 GHz, @ 15 dBm / tone</td>
<td></td>
<td>39</td>
<td>44</td>
<td>—</td>
</tr>
<tr>
<td>OIP3</td>
<td>10 GHz, @ 15 dBm / tone</td>
<td>dBm</td>
<td>—</td>
<td>41</td>
<td>—</td>
</tr>
<tr>
<td></td>
<td>11.7 GHz, @ 15 dBm / tone</td>
<td></td>
<td>—</td>
<td>44</td>
<td>—</td>
</tr>
<tr>
<td></td>
<td>13.3 GHz, @ 15 dBm / tone</td>
<td></td>
<td>—</td>
<td>41</td>
<td>—</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>$I_{DD}$</td>
<td>mA</td>
<td>—</td>
<td>1100</td>
<td>—</td>
</tr>
</tbody>
</table>

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

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**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.

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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 $T_J \leq +150°C$ will ensure $MTTF > 1 \times 10^6$ hours.

8. Junction Temperature ($T_J$) = $T_C + \Theta_{jc} * ((V * I) - (P_{OUT} - P_{IN}))$

   Typical thermal resistance ($\Theta_{jc}$) = 9.1°C/W.

a) For $T_C = 25°C$,
   
   $T_J = 74°C \div 6$ V, 1100 mA, $P_{OUT} = 31$ dBm, $P_{IN} = 11$ dBm

b) For $T_C = 85°C$,
   
   $T_J = 134°C \div 6$ V, 1100 mA, $P_{OUT} = 31$ dBm, $P_{IN} = 11$ dBm

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10 - 13.3 GHz

Typical Performance Curves

**Gain**

*S21 (dB)*

[S21 graph with frequency (GHz) from 10.0 to 13.5 and gain values from 10 to 30 dB for different temperatures (+25 C, -40 C, +85 C).]

**Input Return Loss**

*S11 (dB)*

[S11 graph with frequency (GHz) from 10.0 to 13.5 and return loss values from -10 to 0 dB for different temperatures (+25 C, -40 C, +85 C).]

**Output Return Loss**

*S22 (dB)*

[S22 graph with frequency (GHz) from 10.0 to 13.5 and return loss values from 0 to -35 dB for different temperatures (+25 C, -40 C, +85 C).]

**Noise Figure**

[Noise Figure graph with frequency (GHz) from 10.0 to 13.5 and noise figure values from 1 to 9 dB for different temperatures (+25 C, -40 C, +85 C).]

**P1dB**

[P1dB graph with frequency (GHz) from 10.0 to 13.5 and P1dB values from 25 to 35 dBm for different temperatures (+25 C, -40 C, +85 C).]

**Output IP3 @ 10 GHz**

[Output IP3 graph with frequency (GHz) from 10.0 to 13.5 and IP3 values from 28 to 60 dBm for different temperatures (+25 C, -40 C, +85 C).]

For further information and support please visit: [https://www.macom.com/support](https://www.macom.com/support)
**Typical Performance Curves (cont.)**

*Output IP3 @ 11.7 GHz*

![Graph showing Output IP3 @ 11.7 GHz for different temperatures.]

*Output IP3 @ 13.3 GHz*

![Graph showing Output IP3 @ 13.3 GHz for different temperatures.]

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**Lead-Free 5 mm 20-Lead PQFN†**

![Diagram of Lead-Free 5 mm 20-Lead PQFN package.]

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**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.