Features
- Linear Gain: 27 dB
- Saturated Output Power: +39 dBm Pulsed
- 50 Ω Input / Output Match
- Lead-Free 5 mm 20-lead PQFN Package
- Halogen-Free “Green” Mold Compound
- RoHS* Compliant and 260°C Reflow Compatible

Description
The MAAP-010171 is a 2-stage, 8 W saturated S-band power amplifier in a 5mm 20 lead PQFN package, allowing easy assembly. This 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 pulsed applications.

It is ideally suited for Air Traffic Control, Weather, Military and S-band radar applications.

Each device is 100% RF tested to ensure performance compliance.

Ordering Information

<table>
<thead>
<tr>
<th>Part Number</th>
<th>Package</th>
</tr>
</thead>
<tbody>
<tr>
<td>MAAP-010171-TR0500</td>
<td>500 piece reel</td>
</tr>
<tr>
<td>MAAP-010171-TR1000</td>
<td>1000 piece reel</td>
</tr>
<tr>
<td>MAAP-010171-000SMB</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>Ground</td>
<td>11</td>
<td>Ground</td>
</tr>
<tr>
<td>2</td>
<td>Ground</td>
<td>12</td>
<td>RF&lt;sub&gt;IN&lt;/sub&gt;</td>
</tr>
<tr>
<td>3</td>
<td>RF&lt;sub&gt;IN&lt;/sub&gt;</td>
<td>13</td>
<td>RF&lt;sub&gt;OUT&lt;/sub&gt;</td>
</tr>
<tr>
<td>4</td>
<td>Ground</td>
<td>14</td>
<td>Ground</td>
</tr>
<tr>
<td>5</td>
<td>Ground</td>
<td>15</td>
<td>Ground</td>
</tr>
<tr>
<td>6</td>
<td>V&lt;sub&gt;G&lt;/sub&gt;1b</td>
<td>16</td>
<td>V&lt;sub&gt;G&lt;/sub&gt;1a</td>
</tr>
<tr>
<td>7</td>
<td>V&lt;sub&gt;G&lt;/sub&gt;2b</td>
<td>17</td>
<td>V&lt;sub&gt;G&lt;/sub&gt;2a</td>
</tr>
<tr>
<td>8</td>
<td>V&lt;sub&gt;G&lt;/sub&gt;1b</td>
<td>18</td>
<td>V&lt;sub&gt;D&lt;/sub&gt;1a</td>
</tr>
<tr>
<td>9</td>
<td>V&lt;sub&gt;G&lt;/sub&gt;2b</td>
<td>19</td>
<td>V&lt;sub&gt;G&lt;/sub&gt;2a</td>
</tr>
<tr>
<td>10</td>
<td>V&lt;sub&gt;G&lt;/sub&gt;2b</td>
<td>20</td>
<td>V&lt;sub&gt;G&lt;/sub&gt;1a</td>
</tr>
<tr>
<td></td>
<td></td>
<td>21</td>
<td>Paddle&lt;sup&gt;3&lt;/sup&gt;</td>
</tr>
</tbody>
</table>

2. MACOM recommends connecting unused package pins to ground.
3. The exposed pad centered on the package bottom must be connected to RF, DC and thermal ground.

Amplifier, Power, 8 W
2.5 - 3.5 GHz

Electrical Specifications:
Freq. 2.5 - 3.5 GHz, \( V_{DD} = 9 \) V Pulsed, 100 \( \mu \)s Pulse Width, 10% Duty Cycle, \( Z_0 = 50 \) \( \Omega \)

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Units</th>
<th>Min.</th>
<th>Typ.</th>
<th>Max.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gain</td>
<td>dB</td>
<td>25</td>
<td>27</td>
<td>—</td>
</tr>
<tr>
<td>Input Return Loss</td>
<td>dB</td>
<td>—</td>
<td>10</td>
<td>—</td>
</tr>
<tr>
<td>Output Return Loss</td>
<td>dB</td>
<td>—</td>
<td>10</td>
<td>—</td>
</tr>
<tr>
<td>( P_{SAT} )</td>
<td>dBm</td>
<td>37</td>
<td>39</td>
<td>—</td>
</tr>
<tr>
<td>Small Signal Current (I_{DD})</td>
<td>A</td>
<td>—</td>
<td>1</td>
<td>—</td>
</tr>
<tr>
<td>Efficiency</td>
<td>%</td>
<td>—</td>
<td>38</td>
<td>—</td>
</tr>
</tbody>
</table>

Absolute Maximum Ratings\(^4,5\)

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Absolute Maximum</th>
</tr>
</thead>
<tbody>
<tr>
<td>Input Power</td>
<td>22 dBm</td>
</tr>
<tr>
<td>Supply Voltage</td>
<td>11 V</td>
</tr>
<tr>
<td>Gate Current</td>
<td>25 mA</td>
</tr>
<tr>
<td>Duty Cycle</td>
<td>50 %</td>
</tr>
<tr>
<td>Operating Temperature</td>
<td>(-40^\circ C ) to (+85^\circ C)</td>
</tr>
<tr>
<td>Junction Temperature(^6,7)</td>
<td>(+150^\circ C)</td>
</tr>
<tr>
<td>Storage Temperature</td>
<td>(-55^\circ C ) to (+150^\circ C)</td>
</tr>
</tbody>
</table>

4. Exceeding any one or combination of these limits may cause permanent damage to this device.
5. MACOM does not recommend sustained operation near these survivability limits.
6. Operating at nominal conditions with \( T_J \leq 150^\circ C \) will ensure \( MTTF > 1 \times 10^6 \) hours.
7. Junction Temperature \((T_J) = T_C + \Theta_{JC} * (V * I)\).  
   Typical thermal resistance \((\Theta_{JC}) = 5.75^\circ C/W\)

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 1A devices.
Schematic

Recommended PCB Layout

Parts List

<table>
<thead>
<tr>
<th>Component</th>
<th>Value</th>
<th>Package</th>
</tr>
</thead>
<tbody>
<tr>
<td>C1, C4, C5, C8, C10, C12, C14, C15</td>
<td>1000 pF</td>
<td>0402</td>
</tr>
<tr>
<td>C2, C3, C6, C7, C9, C11, C13, C16</td>
<td>100 pF</td>
<td>0402</td>
</tr>
<tr>
<td>C17, C18, C21, C22</td>
<td>1 µF</td>
<td>0805</td>
</tr>
<tr>
<td>C19, C20, C23, C24</td>
<td>10 nF</td>
<td>0805</td>
</tr>
</tbody>
</table>

Operating the MAAP-010171

To operate, follow these steps.

1. Apply $V_G$ between -1 V and -0.5 V to set IDQ to 1 A
2. Apply $V_{DD}$ Pulsed
3. Apply RF Power ON
4. The RF ports (pins 3 & 13) are not DC blocked.
   Do not apply DC voltage directly onto these pins.
5. Ramp down or shut down in reverse order.
Typical Performance Curves

### S-Parameters

**Small Signal Gain**

Output Power, Pin = 19 dBm @ +25°C

Output Power, Pin = 19 dBm @ -40°C

Output Power, Pin = 19 dBm @ +85°C

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

**Output Power @ 2.5 GHz**

- **V_{DD} = 8 V**
- **V_{DD} = 9 V**
- **V_{DD} = 10 V**

**Output Power @ 3.1 GHz**

- **V_{DD} = 8 V**
- **V_{DD} = 9 V**
- **V_{DD} = 10 V**

**Output Power @ 3.5 GHz**

- **V_{DD} = 8 V**
- **V_{DD} = 9 V**
- **V_{DD} = 10 V**

**Output Power, V_{DD} = 8 V**

- **2.3 GHz**
- **2.5 GHz**
- **2.7 GHz**
- **2.9 GHz**
- **3.1 GHz**
- **3.3 GHz**
- **3.5 GHz**
- **3.7 GHz**

**Output Power, V_{DD} = 9 V**

- **2.3 GHz**
- **2.5 GHz**
- **2.7 GHz**
- **2.9 GHz**
- **3.1 GHz**
- **3.3 GHz**
- **3.5 GHz**
- **3.7 GHz**

**Output Power, V_{DD} = 10 V**

- **2.3 GHz**
- **2.5 GHz**
- **2.7 GHz**
- **2.9 GHz**
- **3.1 GHz**
- **3.3 GHz**
- **3.5 GHz**
- **3.7 GHz**

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Typical Performance Curves

**PAE**

![Graph showing PAE vs Frequency for different Vdd values]

**1st Stage Gate Current @ 2.9 GHz**

![Graph showing 1st Stage Gate Current vs Input Power for different Vdd values]

**2nd Stage Gate Current @ 2.9 GHz**

![Graph showing 2nd Stage Gate Current vs Input Power for different Vdd values]

**Drain Current @ 2.9 GHz**

![Graph showing Drain Current vs Input Power for different Vdd values]

**Small Signal Drain Current @ 2.9 GHz**

![Graph showing Small Signal Drain Current vs Vdd for different temperatures]
**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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