Features
- Linear Gain: 20 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-011027 is a 2-stage, 8 W saturated C-band power amplifier in a 5 mm 20 lead PQFN package, allowing for 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 Point-to-Point Radios and C-band radar applications.

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

Functional Schematic

Pin Configuration

<table>
<thead>
<tr>
<th>Pin #</th>
<th>Function</th>
<th>Pin #</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>1,2,4,5,11, 12,14,15</td>
<td>Ground</td>
<td>13</td>
<td>RFOUT</td>
</tr>
<tr>
<td>3</td>
<td>RFIN</td>
<td>16,17</td>
<td>VD2a</td>
</tr>
<tr>
<td>6</td>
<td>VG1b</td>
<td>18</td>
<td>VD1a</td>
</tr>
<tr>
<td>7</td>
<td>VG2b</td>
<td>19</td>
<td>VG2a</td>
</tr>
<tr>
<td>8</td>
<td>VG1b</td>
<td>20</td>
<td>VG1a</td>
</tr>
<tr>
<td>9,10</td>
<td>VD2b</td>
<td>21</td>
<td>Paddle³</td>
</tr>
<tr>
<td>13</td>
<td>RFOUT</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

1. Reference Application Note M513 for reel size information.
2. MACOM recommends connecting unused package pins to ground.
3. The exposed pad centered on the package bottom must be connected to RF and DC ground.

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* Restrictions on Hazardous Substances, compliant to current RoHS EU directive.
Amplifier, Power, 8 W
5.2 - 5.9 GHz

Electrical Specifications:
Freq. 5.2 - 5.9 GHz, $V_{DD} = 9 \text{ V Pulsed}$, 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>17</td>
<td>20</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>Pulse Period</td>
<td>$\mu$s</td>
<td>—</td>
<td>100</td>
<td>—</td>
</tr>
<tr>
<td>Pulse Duty Cycle</td>
<td>%</td>
<td>—</td>
<td>10</td>
<td>—</td>
</tr>
<tr>
<td>Efficiency</td>
<td>%</td>
<td>—</td>
<td>37</td>
<td>—</td>
</tr>
<tr>
<td>Small Signal Current</td>
<td>A</td>
<td>—</td>
<td>1</td>
<td>—</td>
</tr>
</tbody>
</table>

Maximum Operating Ratings$^{4,5,6}$

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Absolute Maximum</th>
</tr>
</thead>
<tbody>
<tr>
<td>Input Power</td>
<td>28 dBm</td>
</tr>
<tr>
<td>Supply Voltage</td>
<td>11 V</td>
</tr>
<tr>
<td>Operating Temperature</td>
<td>-40°C to +85°C</td>
</tr>
<tr>
<td>Junction Temperature$^7$</td>
<td>+150 °C</td>
</tr>
<tr>
<td>Storage Temperature</td>
<td>-55°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 class 1A devices.

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 $\text{MTTF} > 1 \times 10^6$ hours.
7. Junction Temperature ($T_J$) = $T_C + \Theta_{JC} * (V * I)$
   Typical CW thermal resistance ($\Theta_{JC}$) = 7.7°C/W

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DC-0004492
MAAP-011027
Amplifier, Power, 8 W
5.2 - 5.9 GHz

Schematic

Recommended PCB Layout

Parts List

<table>
<thead>
<tr>
<th>Component</th>
<th>Value</th>
<th>Package</th>
</tr>
</thead>
<tbody>
<tr>
<td>C2, C3, C5, C7, C9, C11, C13, C16</td>
<td>100 pF</td>
<td>0402</td>
</tr>
<tr>
<td>C1, C4, C6, C8, C10, C12, C14, C15</td>
<td>1000 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-011027

To operate the MAAP-011027, follow these steps.
Ramp down or shut down in reverse order.

1. Apply \( V_G \) between -1 V and -0.5 V to set IDQ to 1 A
2. Apply RF Power ON
3. Apply \( V_{DD} \) Pulsed
Amplifier, Power, 8 W
5.2 - 5.9 GHz

Typical Performance Curves over Temperature

**Gain**

- **Output Power**
  - Frequency (GHz): 5.0 to 6.0
  - Output Power (dBm): 37 to 41

- **Input Return Loss**
  - Frequency (GHz): 5.0 to 6.0
  - S11 (dB): -30 to 0

- **Output Return Loss**
  - Frequency (GHz): 5.0 to 6.0
  - S22 (dB): -20 to 0

- **Reverse Isolation**
  - Frequency (GHz): 5.0 to 6.0
  - S12 (dB): -40 to -30

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DC-0004492
Typical Performance Curves over Voltage

Gain

![Gain Graph](image)

Reverse Isolation

![Reverse Isolation Graph](image)

Input Return Loss

![Input Return Loss Graph](image)

Output Return Loss

![Output Return Loss Graph](image)

Output Power

![Output Power Graph](image)

Power Added Efficiency

![Power Added Efficiency Graph](image)
Typical Performance Curves

**Power Gain vs. Input Power**

![Power Gain vs. Input Power Curve](image1)

**Power Added Efficiency vs. Output Power**

![Power Added Efficiency vs. Output Power Curve](image2)

**Power Gain vs. Input Power @ 5.6 GHz**

![Power Gain vs. Input Power @ 5.6 GHz Curve](image3)

**Power Added Efficiency vs. Input Power @ 5.6 GHz**

![Power Added Efficiency vs. Input Power @ 5.6 GHz Curve](image4)

**Power Gain vs. Input Power @ 5.6 GHz**

![Power Gain vs. Input Power @ 5.6 GHz Curve](image5)

**Power Added Efficiency vs. Input Power @ 5.6 GHz**

![Power Added Efficiency vs. Input Power @ 5.6 GHz Curve](image6)
**Amplifier, Power, 8 W**

5.2 - 5.9 GHz

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**Typical Performance Curves**

*Small Signal wideband performance*

8. Average dissipated power: \( P_{\text{Diss}} = P_{\text{dc}} + P_{\text{in}} - P_{\text{out}} \) (all powers are average in Watts)

9. Average power is integrated over pulse period, for short pulses (not exceeding pulse width of 100 µs), average power can be approximated as \( P_{\text{average}} = P_{\text{peak}} \cdot D \), where D is duty cycle.

10. For pulses wider than 100 µs self heating during pulse reduces allowable average dissipated power.

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**Drain Current vs. Input Power @ \( T=+25^\circ\text{C}, F=5.6 \text{ GHz} \)**

**Drain Current vs. Input Power @ \( T=+25^\circ\text{C}, V_D = 9 \text{ V} \)**

**Drain Current vs. Input Power @ \( F=5.6 \text{ GHz}, V_D = 9 \text{ V} \)**

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**Amplifier, Power, 8 W**

5.2 - 5.9 GHz

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**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 3 requirements.

Plating is 100% matte tin over copper.
<table>
<thead>
<tr>
<th>Amplifier, Power, 8 W</th>
<th>5.2 - 5.9 GHz</th>
</tr>
</thead>
</table>

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