8.5 – 10.5 GHz 1 Watt Power Amplifier

Features
- Frequency Range : 8.5 – 10.5GHz
- 29.5 dBm output P1dB
- 16.5 dB Power gain
- 30% PAE
- High IP3
- Input Return Loss > 8.5 dB
- Output Return Loss > 12 dB
- Dual bias operation
- No external matching required
- DC decoupled input and output
- 0.5 µm InGaAs pHEMT Technology
- Open cavity QFN Package

Typical Applications
- RADAR
- Military & space
- LMDS, VSAT

Description
The AMT2144051P is a X-band Power amplifier with 29.5dBm output P1dB. The PA uses two stages of amplification and operates in 8.5 – 10.5 GHz frequency range. The PA features 16.5 dB of gain with input and output return loss 8.5dB and 12 dB respectively. The PA has a high IP3 of 38dBm and 30% PAE. This feature enables it to be used in the applications requiring efficiency along with linearity. The chip operates with dual bias supply voltage. The die is fabricated using a reliable 0.5µm InGaAs pHEMT technology.

The package used is a SMD open cavity QFN Package with base metal made up of copper composite.

Absolute Maximum Ratings (1)

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Absolute Maximum</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Drain bias voltage (Vd)</td>
<td>+10</td>
<td>volts</td>
</tr>
<tr>
<td>Drain current (Id)</td>
<td>0.5</td>
<td>A</td>
</tr>
<tr>
<td>RF input power (RFin at Vd=8V)</td>
<td>26</td>
<td>dBm</td>
</tr>
<tr>
<td>Operating temperature</td>
<td>-50 to +85</td>
<td>°C</td>
</tr>
<tr>
<td>Storage Temperature</td>
<td>-65 to +150</td>
<td>°C</td>
</tr>
</tbody>
</table>

1. Operation beyond these limits may cause permanent damage to the component
Electrical Specifications \( ^{(1)} \) @ \( T_A = 25 \, ^\circ\text{C}, \, V_d = 8\, \text{V}, \, V_g = -1\, \text{V}, \, Z_0 = 50 \, \Omega \)

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Typ.</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Frequency Range</td>
<td>8.5 – 10.5</td>
<td>GHz</td>
</tr>
<tr>
<td>Gain</td>
<td>16.5</td>
<td>dB</td>
</tr>
<tr>
<td>Gain Flatness</td>
<td>+/-0.5</td>
<td>dB</td>
</tr>
<tr>
<td>Output Power (P1 dB)</td>
<td>29.5</td>
<td>dBm</td>
</tr>
<tr>
<td>Input Return Loss</td>
<td>8.5</td>
<td>dB</td>
</tr>
<tr>
<td>Output Return Loss</td>
<td>12</td>
<td>dB</td>
</tr>
<tr>
<td>Saturated output power (Psat)</td>
<td>30.5</td>
<td>dBm</td>
</tr>
<tr>
<td>Output Third Order Intercept (IP3)</td>
<td>38</td>
<td>dBm</td>
</tr>
<tr>
<td>Power Added Efficiency (PAE)</td>
<td>30%</td>
<td>--</td>
</tr>
<tr>
<td>Supply Current (I_{dq})</td>
<td>370</td>
<td>mA</td>
</tr>
<tr>
<td>Supply Current (I_{dsat}^2)</td>
<td>520</td>
<td>mA</td>
</tr>
</tbody>
</table>

Note:

1. Electrical specifications as measured in test fixture.
2. \( I_{dsat} \) is the maximum current under input RF drive condition.
Test fixture data

\[ V_d = 8V, \; V_g = -1V, \; \text{Total Current} = 370mA, \; T_A = 25^\circ C \]
Test fixture data

$V_d = 8V$, $V_g = -1V$, Total Current = 370mA, $T_A = 25^\circ C$
Pin details

**Top View**

**Note:**

1. Pad no. 4 : RF IN
2. Pad no. 8,11 : Vg1, Vg2
3. Pad no. 23,20 : Vd1, Vd2
4. Pad no. 15 : RF OUT
Note:

1. Input and output 50 ohm lines are on 5 mil RT Duroid substrate
2. 0.1 µF and 1µF capacitors may be additionally used as a second level of bypass for reliable operation
3. The RF input & output ports are DC decoupled on-chip.
4. Proper heat sink like Alluminium or copper to be used for better reliability of package

**Die attach:** For Epoxy attachment, use of a two-component conductive epoxy is recommended. An epoxy fillet should be visible around the total die periphery. If Eutectic attachment is preferred, use of fluxless AuSn (80/20) 1-2 mil thick preform solder is recommended. Use of AuGe preform should be strictly avoided.

**Wire bonding:** For DC pad connections use either ball or wedge bonds. For best RF performance, use of 150 - 200µm length of wedge bonds is advised. Single Ball bonds of 250-300µm though acceptable, may cause a deviation in RF performance.
GaAs MMIC devices are susceptible to Electrostatic discharge. Proper precautions should be observed during handling, assembly & testing

All information and Specifications are subject to change without prior notice