W-MPA-8690
Previously named TU-W1330307
GaAs PHEMT MMIC Medium Power Amplifier, 86-90 GHz

Overview

W-MPA-8690 is a 4-stage MMIC power amplifier that covers frequencies from 86GHz to 90GHz. This MMIC provides greater than 23dB of stable gain, and a power output of more than 14dBm from a 2.5V supply voltage and 90mA current at the high output powers.

All bond pads and the die backside are gold plated. The MMIC is compatible with precision die attach methods, as well as thermo-compression and thermosonic wire bonding, making it ideal for MCM and hybrid microcircuit applications. All data shown is measured with the chip in a 50 Ohm environment and contacted with RF probes.

Features

- 86 - 90GHz.
- >23dB gain.
- >14dBm Psat.
- Unconditionally stable.

Applications

- Narrow bandwidth millimeter-wave imaging.
- High resolution radar.
- Sensing.
- P2P communications;
- short haul/high capacity/low interference links.
- Medical.
- IOT.
### Specification Overview

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Min.</th>
<th>Typ.</th>
<th>Max.</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Frequency</td>
<td>86</td>
<td>90</td>
<td></td>
<td>GHz</td>
</tr>
<tr>
<td>Gain</td>
<td>20</td>
<td>23</td>
<td></td>
<td>dB</td>
</tr>
<tr>
<td>Input Return Loss</td>
<td>12</td>
<td>15</td>
<td></td>
<td>dB</td>
</tr>
<tr>
<td>Output Return Loss</td>
<td>10</td>
<td></td>
<td></td>
<td>dB</td>
</tr>
<tr>
<td>Output Power</td>
<td>14</td>
<td>15</td>
<td></td>
<td>dBm</td>
</tr>
<tr>
<td>Drain Voltage</td>
<td></td>
<td>2.5</td>
<td></td>
<td>V</td>
</tr>
<tr>
<td>Quiescent Current</td>
<td></td>
<td>80</td>
<td></td>
<td>mA</td>
</tr>
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</table>

### Absolute Maximum Ratings

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gate Voltage</td>
<td>-5V to 0.2V dc</td>
</tr>
<tr>
<td>Drain Voltage</td>
<td>5V</td>
</tr>
<tr>
<td>Drain Current</td>
<td>150mA</td>
</tr>
<tr>
<td>RF Input Power</td>
<td>0dBm</td>
</tr>
<tr>
<td>Storage Temperature</td>
<td>-65°C to +175°C</td>
</tr>
<tr>
<td>Channel Temperature</td>
<td>+175°C</td>
</tr>
<tr>
<td>Operating Temperature</td>
<td>-40°C to +85°C</td>
</tr>
</tbody>
</table>

*Gate voltages should be adjusted to ensure the correct quiescent current is drawn.

All results are stated for temperatures at 25°C.

Assumes 100pF de-coupling capacitors on all bias pads.

ESD (electrostatic discharge) sensitive device. Charged devices and circuit boards can discharge without detection. Although this product features proprietary protection circuitry, damage may occur on devices subjected to ESD. Proper ESD precautions should be taken to avoid performance degradation or loss of functionality.
Performance Data

(Vdd=2.5V, Idq=80mA)

Figure 1
Gain

RF Frequency (GHz)

(Vdd=2.5V, Idq=80mA)

Figure 2
Input Return Loss

RF Frequency (GHz)
GaAs PHEMT MMIC Medium Power Amplifier, 86-90 GHz

product datasheet  

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Figure 3
Output Return Loss

Figure 4
Power Characteristic

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(Vdd=2.5V, Idq=80mA)

Return Loss (dB)

RF Frequency (GHz)

(Vdd=2.5V, Idq=80mA)

Pin (dBm)

Power Characteristic

Pin (dBm)

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Figure 5
Gain Compression

Figure 6
Current Draw

(V_{dd}=2.5V, I_{dq}=80mA)

(V_{dd}=2.5V, I_{dq}=80mA)
1. All dimensions are in um.
2. Typical DC bond pads are 83um x 86um.
3. RF bond pads are 105um x 86um.
5. Backside metal is ground.
6. Die thickness is 70um.
### Pad Descriptions

<table>
<thead>
<tr>
<th>Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>RFIN</td>
<td>Input RF pad. This pad is AC coupled.</td>
</tr>
<tr>
<td>RFOUT</td>
<td>Output RF pad. This pad is AC coupled.</td>
</tr>
<tr>
<td>VDx</td>
<td>Drain bias pad for stage x. VD3 can be biased either from the top side or bottom side (or both).</td>
</tr>
<tr>
<td>VGx</td>
<td>Gate bias pad for stage x. VG3 can be biased either from the top side or bottom side (or both).</td>
</tr>
<tr>
<td>BOTTOM</td>
<td>The die backside must be connected to RF/DC ground.</td>
</tr>
</tbody>
</table>

(Not actual die – these rules are applied to all MMICs unless otherwise stated)

### Die Packing Information

All die are delivered using gel-paks unless otherwise requested.
Die should be mounted on conductive material such as gold-plated metal to provide a good ground and suitable heat sink, if necessary.

1. Attaching the die using Au/Sn preforms is preferable. The Eutectic melt for Au/Sn occurs at approximately 280°C so the die (plus mount and preform) is initially heated up to 180°C and then it is heated for approximately 10 seconds to 280°C using a nitrogen heat gun. The device will survive 10 seconds at this temperature. The static breakdown for GaAs devices is approximately 330°C.

2. Pure, dry nitrogen should be used as the heat source.

3. If the devices cannot be lifted/placed by a vacuum device, then ESD die-lifting tweezers are preferable.

4. Aluminium wire must not be used.
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