0.5-26 GHz Wideband Amplifier

Features

- Frequency Range: 0.5 - 26.0GHz
- 11dB Nominal gain
- Mid-band Noise Figure < 3dB
- Input Return Loss > 10 dB
- Output Return Loss > 13 dB
- DC decoupled input and output
- 0.15 µm InGaAs pHEMT Technology
- Chip dimension: 3.0 x 1.2 x 0.1 mm

Typical Applications

- Wideband LNA/Gain block
- Electronic warfare
- Test Instrumentation

Description

The ASL5000 is a broadband pHEMT GaAs MMIC TWA designed to operate over 0.5 to 26 GHz frequency range. The design employs 4 cascode pHEMT cells in a distributed amplifier topology, to ensure larger bandwidth, flat gain and good return losses. The device offers a typical small signal gain of 11 dB over the operating frequency band and has a Noise figure less than 4.5 dB in 1-20GHz band. The Input & output are matched to 50Ω with a VSWR better than 1.7:1. The chip is unconditionally stable over the entire operating frequency range. The ASL5000 is suitable for a variety of wideband electronic warfare systems such as radar warning receivers, jammers and instrumentation. In addition, the chip may also be used as a gain block.

Absolute Maximum Ratings(1)

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Absolute Maximum</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Positive DC voltage</td>
<td>+8</td>
<td>V</td>
</tr>
<tr>
<td>RF input power</td>
<td>+16</td>
<td>dBm</td>
</tr>
<tr>
<td>Supply Current</td>
<td>150</td>
<td>mA</td>
</tr>
<tr>
<td>Storage Temperature</td>
<td>-55 to +150</td>
<td>ºC</td>
</tr>
<tr>
<td>Operating Temperature</td>
<td>-40 to +85</td>
<td>ºC</td>
</tr>
</tbody>
</table>

1. Operation beyond these limits may cause permanent damage to the component.
Electrical Specifications (1) @ $T_A = 25 \, ^{\circ}C$, $Zo = 50 \Omega$; $V_d = 5.0V$, $Vg2 = 2.0V$
$Vg1 = -0.28V$

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Min.</th>
<th>Typ.</th>
<th>Max.</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Frequency Range</td>
<td>0.5</td>
<td>–</td>
<td>26.0</td>
<td>GHz</td>
</tr>
<tr>
<td>Gain</td>
<td>-</td>
<td>11</td>
<td>–</td>
<td>dB</td>
</tr>
<tr>
<td>Gain Flatness</td>
<td>–</td>
<td>± 0.75</td>
<td>–</td>
<td>dB</td>
</tr>
<tr>
<td>Noise Figure (mid-band)</td>
<td>-</td>
<td>2.5</td>
<td>–</td>
<td>dB</td>
</tr>
<tr>
<td>Input Return Loss</td>
<td>-</td>
<td>10</td>
<td>–</td>
<td>dB</td>
</tr>
<tr>
<td>Output Return Loss</td>
<td>-</td>
<td>12</td>
<td>–</td>
<td>dB</td>
</tr>
<tr>
<td>Output Power (P1 dB)</td>
<td>–</td>
<td>5</td>
<td>–</td>
<td>dBm</td>
</tr>
<tr>
<td>Third Order Intercept point</td>
<td>–</td>
<td>14</td>
<td>–</td>
<td>dBm</td>
</tr>
<tr>
<td>Supply Current (2)</td>
<td>–</td>
<td>46</td>
<td>65</td>
<td>mA</td>
</tr>
</tbody>
</table>

Note:

1. Electrical specifications mentioned above are measured in a test fixture.
2. For optimal performance, the gate voltage $Vg1$ should be tuned to achieve a drain current of 46 mA (typ.).
3. The negative gate supply ($Vg1$) can be tuned from 0V to -0.3V.
4. By varying the $Vg1$, the gain & current can be controlled to the user requirements.
Test fixture data

\( V_d = +5.0\, \text{V}, \, V_{g2} = +2.0\, \text{V} \, \& \, V_{g1} = -0.28\, \text{V}, \, \text{Current} = 46\, \text{mA}, \, T_A = 25\, ^\circ\text{C} \)
Test fixture data

\( V_d = +5.0 \text{V}, \ V_g2 = +2.0 \text{V} \ & \ V_g1 = -0.28 \text{V}, \ \text{Current} = 46 \text{mA}, \ T_A = 25 \degree \text{C} \)
Mechanical Characteristics

**Units:** millimeters (inches)

**Note:**
1. All RF and DC bond pads are 100µm x 100µm
2. Pad no. 1 : RF In
3. Pad no. 4 : Vd
4. Pad no. 5 : Vg2
5. Pad no. 8 : RF out
6. Pad no. 11 : Vg1
Recommended Assembly Diagram

Note:
1. Two 1 mil (0.0254mm) bond wires of minimum length should be used for RF input and output.
2. Input and output 50 ohm lines are on 5mil Alumina/RT Duroid substrate.
3. The supply voltages are Vd=5.0V, Vg2=+2.0V & Vg1=-0.28V.
4. 0.1 µF capacitors may be additionally used as a second level of bypass at the power supplies for reliable operation.

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.