8.0-12.0 GHz Low Noise Amplifier

Features
- Frequency Range: 8.0-12.0 GHz
- Low Noise Figure < 1.7 dB
- 26 dB nominal gain
- 12 dBm P1dB
- High IP3
- Input Return Loss > 10 dB
- Output Return Loss > 10 dB
- DC decoupled input and output
- 0.15 μm InGaAs pHEMT Technology
- Chip dimension: 3.0 x 3.0 x 0.1 mm

Typical Applications
- RADAR
- Military
- Test Equipment and sensors
- Point-to-Point Radios, Point-to-Multi-Point Radios & VSATS

Description

The Aelius ASL1013 is a three stage ultra low noise amplifier that operates from 8.0-12.0 GHz. The LNA features 26 dB gain and has a typical mid-band noise figure of 1.35 dB. The LNA has nominal input/output return losses of 10 dB. The nominal P1dB is 12 dBm.

Self bias technique has been employed to facilitate single supply operation. Circuit ground is provided through vias to backside metallization. The Aelius 2142051 performs well as a low noise amplifier in receive applications and as a driver or buffer amplifier where high gain, excellent linearity and low power consumption are important.

Absolute Maximum Ratings

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Absolute Maximum</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Drain bias voltage (Vd)</td>
<td>+6 volts</td>
<td></td>
</tr>
<tr>
<td>RF input power</td>
<td>+10 dBm</td>
<td></td>
</tr>
<tr>
<td>Operating temperature</td>
<td>-50 to +85 °C</td>
<td></td>
</tr>
<tr>
<td>Storage Temperature</td>
<td>-65 to +150 °C</td>
<td></td>
</tr>
</tbody>
</table>

1. Operation beyond these limits may cause permanent damage to the component
### Electrical Specifications @ $T_A = 25\, ^\circ C$, $V_{d1} = V_{d2} = 2V$, $V_{d3} = 5V$, $Z_0 = 50\, \Omega$

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Typ</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Frequency Range</td>
<td>8.0-12.0</td>
<td>GHz</td>
</tr>
<tr>
<td>Gain</td>
<td>26</td>
<td>dB</td>
</tr>
<tr>
<td>Gain Flatness</td>
<td>±2</td>
<td>dB</td>
</tr>
<tr>
<td>Noise Figure (mid-band)</td>
<td>1.4</td>
<td>dB</td>
</tr>
<tr>
<td>Input Return Loss</td>
<td>10</td>
<td>dB</td>
</tr>
<tr>
<td>Output Return Loss</td>
<td>10</td>
<td>dB</td>
</tr>
<tr>
<td>Output Power ($P_{1dB}$)</td>
<td>+12</td>
<td>dBm</td>
</tr>
<tr>
<td>Saturated Output Power ($Psat$)</td>
<td>+15</td>
<td>dBm</td>
</tr>
<tr>
<td>Output Third Order Intercept (IP3)</td>
<td>23</td>
<td>dBm</td>
</tr>
<tr>
<td>Supply Current ($I_d$) ($V_{d1} = V_{d2} = 2V$, $V_{d3} = 5V$)</td>
<td>80</td>
<td>mA</td>
</tr>
</tbody>
</table>

**Note:**

1. Electrical performance from test fixture measurements
Test fixture data
\( V_{d1} = V_{d2} = 2V, \ V_{d3} = 5V, \ \text{Total Current} = 80\text{mA}, \ \text{T}_A = 25^\circ C \)

![Gain graph](image1)

Test fixture data
\( V_{d1} = V_{d2} = 2V, \ V_{d3} = 5V, \ \text{Total Current} = 80\text{mA}, \ \text{T}_A = 25^\circ C \)

![Noise figure graph](image2)
Test fixture data
$V_d1 = V_d2 = 2V, \ V_d3 = 5V, \ Total \ Current = 80\text{mA}, \ T_A = 25^\circ C$

Test fixture data
$V_d1 = V_d2 = 2V, \ V_d3 = 5V, \ Total \ Current = 80\text{mA}, \ T_A = 25^\circ C$
Test fixture data

\( V_{d1} = V_{d2} = 2V, V_{d3} = 5V. \) Total Current = 75 ma, Gain Compression and \( P_{1dB} \) measured at 9 GHz, \( T_A = 25^\circ C \)

![Graph showing isolation vs frequency](image)

Test fixture data

\( V_{d1} = V_{d2} = 2V, V_{d3} = 5V, \) Frequency = 9.6 GHz Total Current = 75 ma, \( T_A = 25^\circ C \)

![Graph showing power characteristics](image)

Pout at 1 dB compression @ 9.6 GHz = 12 dBm
Mechanical Characteristics

Units: Millimeters [Inches]
All RF and DC bond pads are 100µm x 100µm

Note:
Pad 1 : RF in
Pad 2 : VG1 (Source grounding)
Pad 3 : VD1 (Drain bias)
Pad 4 : VD2 (Drain Bias)
Pad 5 : VG3 (Source grounding)
Pad 6 : VD3 (Drain Bias)
Pad 7 : RF out
Pad 10 : VG2 (Source grounding)
Recommended Assembly Diagram

Note:
1. Two 1 mil (0.0254mm) bond wires of minimum length should be used for RF input and output.
2. Two 1 mil (0.0254mm) bond wires of minimum length should be used from chip bond pad to 100pF capacitor.
3. Input and output 50 ohm lines are on 5 mil substrate.
4. 0.1 µF capacitors may be additionally used as a second level of bypass for reliable operation.

Die attach: Use AuSn (80/20) 1-2 mil. Preform solder.

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. Ball bonds are also acceptable.

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