Low Noise Amplifier
20 - 38 GHz

Features
- 17.0 dB Small Signal Gain
- 3.0 dB Noise Figure
- Single, Positive Bias Supply
- 3x3mm QFN Package
- 100% RF Tested
- RoHS* Compliant and 260°C Reflow Compatible

Description
The XL1010-QT is a three stage 20.0-38.0 GHz GaAs MMIC low noise amplifier has a small signal gain of 17.0 dB with a noise figure of 3.0 dB. The device comes in a RoHS compliant, 3x3mm QFN package and requires only a single positive bias supply.

The device uses MACOM’s GaAs pHEMT device model technology, and is based upon electron beam lithography to ensure high repeatability and uniformity.

The device is well suited to multiple receiver applications which require broadband performance with simple bias requirements and the ease of volume manufacturing with 3x3mm QFN packaging.

Functional Block Diagram/Board Layout

Pin Configuration

<table>
<thead>
<tr>
<th>Pin No.</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Ground</td>
</tr>
<tr>
<td>2</td>
<td>RF Input</td>
</tr>
<tr>
<td>3</td>
<td>Ground</td>
</tr>
<tr>
<td>4-9</td>
<td>No Connection</td>
</tr>
<tr>
<td>10</td>
<td>Ground</td>
</tr>
<tr>
<td>11</td>
<td>RF Output</td>
</tr>
<tr>
<td>12</td>
<td>Ground</td>
</tr>
<tr>
<td>13</td>
<td>Drain Bias</td>
</tr>
<tr>
<td>14-16</td>
<td>Not Connected</td>
</tr>
<tr>
<td>17²</td>
<td>Paddle</td>
</tr>
</tbody>
</table>

2. The exposed pad centered on the package bottom must be connected to ground.

Ordering Information¹

<table>
<thead>
<tr>
<th>Part Number</th>
<th>Package</th>
</tr>
</thead>
<tbody>
<tr>
<td>XL1010-QT-0G00</td>
<td>bulk quantity</td>
</tr>
<tr>
<td>XL1010-QT-0G0T</td>
<td>tape and reel</td>
</tr>
<tr>
<td>XL1010-QT-EV1</td>
<td>evaluation board</td>
</tr>
</tbody>
</table>

¹. Reference Application Note M513 for reel size information.
Low Noise Amplifier
20 - 38 GHz

Electrical Specifications: 20 - 38 GHz (Ambient Temperature T = 25°C)

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Units</th>
<th>Min.</th>
<th>Typ.</th>
<th>Max.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Input Return Loss</td>
<td>dB</td>
<td>-</td>
<td>12</td>
<td>-</td>
</tr>
<tr>
<td>Output Return Loss</td>
<td>dB</td>
<td>-</td>
<td>15</td>
<td>-</td>
</tr>
<tr>
<td>Small Signal Gain</td>
<td>dB</td>
<td>15 ³</td>
<td>17</td>
<td>-</td>
</tr>
<tr>
<td>Gain Flatness</td>
<td>dB</td>
<td>-</td>
<td>+/-2</td>
<td>-</td>
</tr>
<tr>
<td>Reverse isolation</td>
<td>dB</td>
<td>-</td>
<td>45</td>
<td>-</td>
</tr>
<tr>
<td>Noise Figure</td>
<td>dB</td>
<td>-</td>
<td>3</td>
<td>-</td>
</tr>
<tr>
<td>Average Output Power for 1dB Compression</td>
<td>dBm</td>
<td>-</td>
<td>6</td>
<td>-</td>
</tr>
<tr>
<td>Drain Bias Voltage</td>
<td>VDC</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Supply Current</td>
<td>mA</td>
<td>45</td>
<td>60</td>
<td>-</td>
</tr>
</tbody>
</table>

3. Specified over 24.0 - 36.5 GHz

Absolute Maximum Ratings

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Absolute Max.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Supply Voltage</td>
<td>+7 VDC</td>
</tr>
<tr>
<td>Supply Current</td>
<td>70 mA</td>
</tr>
<tr>
<td>Input Power</td>
<td>+12 dBm</td>
</tr>
<tr>
<td>Storage Temperature</td>
<td>-65°C to +165°C</td>
</tr>
<tr>
<td>Operating Temperature</td>
<td>MTTF Graph ⁴</td>
</tr>
<tr>
<td>Channel Temperature</td>
<td>MTTF Graph ⁴</td>
</tr>
</tbody>
</table>

4. Channel temperature directly affects a device's MTTF. It is recommended to keep channel temperature as low as possible to maximize lifetime.

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 2 devices.
Typical Performance Curves

**Input Return Loss vs. Frequency**

![Input Return Loss vs. Frequency graph](image1)

**Small Signal Gain vs. Frequency**

![Small Signal Gain vs. Frequency graph](image2)

**Reverse Isolation vs. Frequency**

![Reverse Isolation vs. Frequency graph](image3)

**Output Return Loss vs. Frequency**

![Output Return Loss vs. Frequency graph](image4)

**Noise Figure vs. Frequency**

![Noise Figure vs. Frequency graph](image5)

**P1dB vs. Frequency, 5 V @ 52 mA**

![P1dB vs. Frequency graph](image6)
App Note [1] Biasing - The device is operated with a single, positive bias supply. The device performance is insensitive to changes in bias condition; however, gain and power handling can be slightly improved with higher bias conditions without significantly affecting the noise figure performance. Typical biasing conditions within the specified performance ranges are Vd=3 V, 35 mA, Vd=4 V, 45 mA, Vd=5 V, 55 mA.

Recommended Board Layout

(DXF file available from website)
Lead-Free Package Dimensions/Layout

QT (3x3 mm)

Pin 1 Dot
By marking

A2

K

A3

0.0191

0.30 X .30
CHAMFER

3.9991

1.3997

(4 SIDES)

1.9996

0.9998

0.4999

BSC

0.2999

E2

E

D

K

A2

A

b

D2

L

Recommended Solder Pad Pitch and Dimensions

Note:
1. ALL DIMENSIONS ARE IN mm.

MIN  |  TYP  |  MAX
---|---|---
A   | 0.60 | 0.90  | 1.00
A3  | 0.20 REF
A2  | 0.00 | 0.65  | 1.00
b   | 0.20 | 0.25  | 0.30
K   | 0.20 | -     | -
D   | 3.00 BSC
E   | 3.00 BSC
e   | 0.50 |
D2  | 1.50 | 1.65  | 1.80
E2  | 1.50 | 1.65  | 1.80
L   | 0.16 | 0.26  | 0.36

1. VIEWS ARE NOT TO SCALE: USE DIMENSIONS AND TABLE.
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