5G Millimeter-wave Front-end Solutions

5G millimeter-wave demands extreme requirements for front-end components. Technically, the highest efficiency and linearity are needed for transmit, and in receive mode the lowest noise figure is required. Low-cost and high-volume manufacturing capability are mandatory for commercial application.

In order to address these challenging demands, Altum RF delivers solutions based on an optical GaAs process from a high-volume, pure-play foundry.

Altum RF enables cost-effective solutions with high RF performance and small form factor.

Products Features:
- 24-30 GHz, 37-42 GHz
- GaAs technology for up to 1 W $P_{\text{sat}}$
- Excellent linearity vs. efficiency trade-off
- Ultra-low noise figure
- Small footprint
- ESD protection

Benefits:
- Robust supply from one of the world's leading GaAs foundries
- Cost-effective optical GaAs technology
- Compatible with plastic overmold
- Enhanced moisture protection
- Integration

Building Blocks and Integration (28 and 39 GHz)
### Low Noise Amplifiers (24 - 30 GHz and 37 - 42 GHz)

<table>
<thead>
<tr>
<th>Name</th>
<th>Frequency</th>
<th>Gain</th>
<th>NF</th>
<th>$P_{1dB}$</th>
<th>Bias</th>
<th>Package</th>
</tr>
</thead>
<tbody>
<tr>
<td>ARF1200Q2</td>
<td>20.0 - 31.5 GHz</td>
<td>20 dB</td>
<td>3.5 dB</td>
<td>2 dBm</td>
<td>3.3V, 15mA</td>
<td>2.5x2.5 mm PQFN</td>
</tr>
<tr>
<td>ARF1201Q2</td>
<td>17.0 - 31.5 GHz</td>
<td>21 dB</td>
<td>2.6 dB</td>
<td>8 dBm</td>
<td>3.3V, 40mA</td>
<td>2.5x2.5 mm PQFN</td>
</tr>
<tr>
<td>ARF1202Q2</td>
<td>37.0 - 40.0 GHz</td>
<td>17 dB</td>
<td>3.9 dB</td>
<td>8.5 dBm</td>
<td>3.3V, 15mA</td>
<td>2.5x2.5 mm PQFN</td>
</tr>
<tr>
<td>ARF1203Q2</td>
<td>37.0 - 40.0 GHz</td>
<td>20.5 dB</td>
<td>4 dB</td>
<td>13 dBm</td>
<td>3.3V, 40mA</td>
<td>2.5x2.5 mm PQFN</td>
</tr>
</tbody>
</table>

**Measured GAIN - ARF1200Q2**

![Measured GAIN - ARF1200Q2](image1)

**Measured GAIN - ARF1203Q2**

![Measured GAIN - ARF1203Q2](image2)

**Pinning ARF1200Q2**

![Pinning ARF1200Q2](image3)

**Pinning ARF1203Q2**

![Pinning ARF1203Q2](image4)
## Power Amplifiers (24-30 GHz and 37-43 GHz)

<table>
<thead>
<tr>
<th>Name</th>
<th>Frequency</th>
<th>Gain</th>
<th>P_{1dB}</th>
<th>P_{sat}</th>
<th>Bias</th>
<th>Package</th>
</tr>
</thead>
<tbody>
<tr>
<td>ARF1010Q4</td>
<td>24-30 GHz</td>
<td>28 dB</td>
<td>27 dBm</td>
<td>29.5 dBm</td>
<td>4V, 600mA</td>
<td>4x4 QFN</td>
</tr>
<tr>
<td>ARF1012Q4</td>
<td>37-40 GHz</td>
<td>25 dB</td>
<td>27.5 dBm</td>
<td>28.5 dBm</td>
<td>4V, 550mA</td>
<td>4x4 QFN</td>
</tr>
</tbody>
</table>

### Measured GAIN - ARF1010Q4

![Graph showing measured GAIN for ARF1010Q4 at different temperatures.](image)

### Integrated Front-end

<table>
<thead>
<tr>
<th>Name</th>
<th>Frequency</th>
<th>T_x Gain</th>
<th>T_x P_{1dB}</th>
<th>T_x P_{sat}</th>
<th>R_x NF</th>
<th>R_x Gain</th>
<th>Package</th>
</tr>
</thead>
<tbody>
<tr>
<td>ARF1500Q4</td>
<td>24-30 GHz</td>
<td>27 dB</td>
<td>25 dBm</td>
<td>28.5 dBm</td>
<td>3.5 dB</td>
<td>25 dB</td>
<td>4x4 QFN</td>
</tr>
<tr>
<td>ARF1501Q4</td>
<td>37-40 GHz</td>
<td>22 dB</td>
<td>25 dBm</td>
<td>26 dBm</td>
<td>3.9 dB</td>
<td>19 dB</td>
<td>4x4 QFN</td>
</tr>
</tbody>
</table>

### Tx Output PA ARF1500Q4

![Graph showing output power (Pout), PAE, Gain, and Idd for ARF1500Q4.](image)

### Pinning ARF1010Q4

![Diagram showing pinning configuration for ARF1010Q4.](image)

### Pinning ARF1500Q4

![Diagram showing pinning configuration for ARF1500Q4.](image)
About Altum RF

Inspired by leading experts in the RF/microwave industry, Altum RF transforms how partnerships work to develop high-performance products with a focus on superior technical support and customer service. Our engineers use decades of modeling expertise and system applications knowledge to define the right products for the most challenging requirements.

With the help of our exceptional global partners, we can significantly shorten the product development cycles by managing the entire supply chain from design to packaging, testing and qualification. For development of GaAs or GaN components, discover Altum RF as your next RF semiconductor partner.

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