Features
- Integrated Gain, Doubler and Driver Stages
- +4.5 V Single Positive Bias
- Integrated Bypassing Capacitor
- +20 dBm Output Saturated Power
- 30 dBc Fundamental Suppression
- On-Chip ESD Protection
- 100% RF, DC and Output Power Testing
- Lead-Free 3 mm 16-Lead QFN Package
- RoHS* Compliant and 260°C Reflow Compatible

Description
The XX1010-QT is a 14.625-15.0 / 29.25-30.0 GHz GaAs MMIC doubler that integrates a gain stage, passive doubler and driver amplifier onto a single device. This device has a self-biased architecture requiring a single positive supply (+4.5V) only and integrated on-chip bypassing and DC blocking capacitors eliminating the need for any external components.

This device uses InGaAs pHEMT device technology, and is based upon electron beam lithography to ensure high repeatability and uniformity.

The XX1010-QT has integrated ESD structures for protection and comes in a low cost 3 mm QFN package.

The device is well suited for millimeter wave Point-to-Point Radio, LMDS, SATCOM and VSAT applications.

Ordering Information

<table>
<thead>
<tr>
<th>Part Number</th>
<th>Package</th>
</tr>
</thead>
<tbody>
<tr>
<td>XX1010-QT-0G00</td>
<td>Bulk Quantity</td>
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<tr>
<td>XX1010-QT-0G0T</td>
<td>1000 Piece Reel</td>
</tr>
<tr>
<td>XX1010-QT-EV1</td>
<td>Evaluation Board</td>
</tr>
</tbody>
</table>

Doubler
14.625-15.0/29.25-30 GHz

Electrical Specifications: Input Freq: 14.625-15.0 GHz, $T_A = 25^\circ C$, $V_D = +4.5$ Volts

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Units</th>
<th>Min.</th>
<th>Typ.</th>
<th>Max.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Output Frequency Range</td>
<td>GHz</td>
<td>29.25</td>
<td>-</td>
<td>30.0</td>
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<tr>
<td>RF Input Power Level</td>
<td>dBm</td>
<td>3.0</td>
<td>-</td>
<td>10.0</td>
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<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>14</td>
<td>-</td>
</tr>
<tr>
<td>Fundamental Suppression</td>
<td>dBC</td>
<td>-</td>
<td>35</td>
<td>-</td>
</tr>
<tr>
<td>Output Power</td>
<td>dBm</td>
<td>+18.0</td>
<td>+20.0</td>
<td>+22.0</td>
</tr>
<tr>
<td>Supply Current</td>
<td>mA</td>
<td>-</td>
<td>200</td>
<td>280</td>
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Absolute Maximum Ratings$^{2,3}$

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Absolute Max.</th>
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</thead>
<tbody>
<tr>
<td>Supply Voltage</td>
<td>+5.25 VDC</td>
</tr>
<tr>
<td>Supply Current</td>
<td>350 mA</td>
</tr>
<tr>
<td>Input Power</td>
<td>12 dBm</td>
</tr>
<tr>
<td>Storage Temperature</td>
<td>-65 to +150 ºC</td>
</tr>
<tr>
<td>Operating Temperature</td>
<td>-40 to +85 ºC</td>
</tr>
<tr>
<td>Junction Temperature$^4,5$</td>
<td>+160 ºC</td>
</tr>
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</table>

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 1A devices.

2. Exceeding any one or combination of these limits may cause permanent damage to this device.
3. M/A-COM Technology Solutions does not recommend sustained operation near these survivability limits.
4. Operating at nominal conditions with $T_J \leq 160^\circ C$ will ensure MTTF > 1 x 10$^6$ hours.
5. Junction Temperature ($T_J$) = $T_C + \Theta_{jc} * (V * I) - (P_{OUT} - P_{IN})$
   Typical thermal resistance ($\Theta_{jc}$) = 65°C/W.
   a) For $T_C = 25^\circ C$, $T_J = 101^\circ C @ 4.5$ V, 280 mA, $P_{IN} = 3$ dBm, $P_{OUT} = 20$ dBm
   b) For $T_C = 85^\circ C$, $T_J = 156^\circ C @ 4.5$ V, 264 mA, $P_{IN} = 3$ dBm, $P_{OUT} = 20$ dBm
**Typical Performance Curves:**

- **$P_{\text{OUT}}$ @ 2xFin vs. Fin @ $P_{\text{IN}} = 3$ dBm**
  
  ![Graph 1](image1.png)

- **$P_{\text{OUT}}$ @ 1xFin vs. Fin @ $P_{\text{IN}} = 3$ dBm**
  
  ![Graph 2](image2.png)

- **$P_{\text{OUT}}$ @ 2xFin vs. Fin @ $P_{\text{IN}} = 10$ dBm**
  
  ![Graph 3](image3.png)

- **$P_{\text{OUT}}$ @ 1xFin vs. Fin @ $P_{\text{IN}} = 10$ dBm**
  
  ![Graph 4](image4.png)
Typical Performance Curves:

**Input Return Loss**

![Input Return Loss Graph](image)

**Output Return Loss**

![Output Return Loss Graph](image)

**P<sub>OUT</sub> vs. P<sub>IN</sub>**

![P<sub>OUT</sub> vs. P<sub>IN</sub> Graph](image)

**Ids vs. P<sub>IN</sub>**

![Ids vs. P<sub>IN</sub> Graph](image)
**Evaluation Board Layout**

**PCB Land Pattern**

**Lead-Free 3mm 16-Lead PQFN**

- Reference Application Note S2083 for lead-free solder reflow recommendations.
- Meets JEDEC moisture sensitivity level 1 requirements.
- Plating is 100% matte tin over copper.