**Doubler**

**14.625-15.0 / 29.25-30 GHz**

---

**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>
</tr>
<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>

**Functional Block Diagram**

**Pin Configuration**

<table>
<thead>
<tr>
<th>Pin No.</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>1,4,5,6,7,8</td>
<td>No Connection</td>
</tr>
<tr>
<td>2,11</td>
<td>Ground</td>
</tr>
<tr>
<td>3</td>
<td>RF Input</td>
</tr>
<tr>
<td>9,12,14,15,16</td>
<td>No Connection</td>
</tr>
<tr>
<td>10</td>
<td>RF Output</td>
</tr>
<tr>
<td>13</td>
<td>Vd</td>
</tr>
</tbody>
</table>

1. The exposed pad centered on the package bottom must be connected to RF and DC ground.

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>
</tr>
<tr>
<td>RF Input Power Level</td>
<td>dBm</td>
<td>3.0</td>
<td>-</td>
<td>10.0</td>
</tr>
<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>
</tr>
</tbody>
</table>

Absolute Maximum Ratings\(^2,3\)

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Absolute Max.</th>
</tr>
</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>
</tbody>
</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 $MTTF > 1 \times 10^6$ hours.
5. Junction Temperature ($T_J$) = $T_C + \theta_{jc} \times (V \times I - (P_{OUT} - P_{IN}))$
   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} @ 2x\text{Fin} vs. \text{Fin} @ P\text{IN} = 3 \, \text{dBm}**

![Graph 1](image1)

**P\text{OUT} @ 1x\text{Fin} vs. \text{Fin} @ P\text{IN} = 3 \, \text{dBm}**

![Graph 2](image2)

**P\text{OUT} @ 2x\text{Fin} vs. \text{Fin} @ P\text{IN} = 10 \, \text{dBm}**

![Graph 3](image3)

**P\text{OUT} @ 1x\text{Fin} vs. \text{Fin} @ P\text{IN} = 10 \, \text{dBm}**

![Graph 4](image4)
Typical Performance Curves:

### Input Return Loss

-25 dB to 0 dB in frequency range of 5 to 40 GHz.

### Output Return Loss

-25 dB to 0 dB in frequency range of 5 to 40 GHz.

### P_OUT vs. P_IN

Input Power (dBm) vs. Output Power (dBm) for different operating conditions:
- Vdd = 4.5, Fout = 29.25
- Vdd = 4.5, Fout = 30
- Vdd = 5.0, Fout = 29.25
- Vdd = 5.0, Fout = 30

### Ids vs. P_IN

Input Power (dBm) vs. Drain Current (mA) for different operating conditions:
- Vdd = 4.5, Fout = 29.25
- Vdd = 4.5, Fout = 30
- Vdd = 5.0, Fout = 29.25
- Vdd = 5.0, Fout = 30

For further information and support please visit: [https://www.macom.com/support](https://www.macom.com/support)
XX1010-QT

Doubler
14.625-15.0/29.25-30 GHz

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.
**Doubler**

**14.625-15.0/29.25-30 GHz**

---

M/A-COM Technology Solutions Inc. All rights reserved.

Information in this document is provided in connection with M/A-COM Technology Solutions Inc ("MACOM") products. These materials are provided by MACOM as a service to its customers and may be used for informational purposes only. Except as provided in MACOM's Terms and Conditions of Sale for such products or in any separate agreement related to this document, MACOM assumes no liability whatsoever. MACOM assumes no responsibility for errors or omissions in these materials. MACOM may make changes to specifications and product descriptions at any time, without notice. MACOM makes no commitment to update the information and shall have no responsibility whatsoever for conflicts or incompatibilities arising from future changes to its specifications and product descriptions. No license, express or implied, by estoppels or otherwise, to any intellectual property rights is granted by this document.

THESE MATERIALS ARE PROVIDED "AS IS" WITHOUT WARRANTY OF ANY KIND, EITHER EXPRESS OR IMPLIED, RELATING TO SALE AND/OR USE OF MACOM PRODUCTS INCLUDING LIABILITY OR WARRANTIES RELATING TO FITNESS FOR A PARTICULAR PURPOSE, CONSEQUENTIAL OR INCIDENTAL DAMAGES, MERCHANTABILITY, OR INFRINGEMENT OF ANY PATENT, COPYRIGHT OR OTHER INTELLECTUAL PROPERTY RIGHT. MACOM FURTHER DOES NOT WARRANT THE ACCURACY OR COMPLETENESS OF THE INFORMATION, TEXT, GRAPHICS OR OTHER ITEMS CONTAINED WITHIN THESE MATERIALS. MACOM SHALL NOT BE LIABLE FOR ANY SPECIAL, INDIRECT, INCIDENTAL, OR CONSEQUENTIAL DAMAGES, INCLUDING WITHOUT LIMITATION, LOST REVENUES OR LOST PROFITS, WHICH MAY RESULT FROM THE USE OF THESE MATERIALS.

MACOM products are not intended for use in medical, lifesaving or life sustaining applications. MACOM customers using or selling MACOM products for use in such applications do so at their own risk and agree to fully indemnify MACOM for any damages resulting from such improper use or sale.

---

For further information and support please visit:

[https://www.macom.com/support](https://www.macom.com/support)