XX1007-QT

Doubler
13.5-17.0/27.0-34.0 GHz

Features
• Integrated Gain, Doubler and Driver Stages
• Single Positive Supply, +5V
• Integrated Bypassing Capacitor
• +20.0 dBm Output Saturated Power
• 35.0 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
M/A-COM Tech’s 13.5-17.0 / 27.0-34.0 GHz GaAs MMIC doubler integrates a gain stage, passive doubler and driver amplifier onto a single device. The XX1007-QT has a self-biased architecture requiring a single positive supply (+5V) only and integrated on-chip bypassing and DC blocking capacitors eliminating the need for any external components. This device uses M/A-COM Tech’s GaAs PHEMT device model technology, and is based upon electron beam lithography to ensure high repeatability and uniformity. The XX1007-QT has integrated ESD structures for protection and comes in a low cost 3x3mm 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>XX1007-QT-0G00</td>
<td>bulk quantity</td>
</tr>
<tr>
<td>XX1007-QT-0G0T</td>
<td>tape and reel</td>
</tr>
<tr>
<td>XX1007-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>
<th>Pin No.</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>RF In</td>
<td>1,2,4,5,6,7,8,9</td>
<td>NC</td>
</tr>
<tr>
<td>10</td>
<td>RF Out</td>
<td>11,12,14,15,16</td>
<td>NC</td>
</tr>
<tr>
<td>13</td>
<td>Vd</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Absolute Maximum Ratings

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Absolute Max.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Supply Voltage (Vd)</td>
<td>+6.0 VDC</td>
</tr>
<tr>
<td>Supply Current (Id)</td>
<td>300 mA</td>
</tr>
<tr>
<td>Gate Bias Voltage (Vg)</td>
<td>+0.3 VDC</td>
</tr>
<tr>
<td>Input Power (RF Pin)</td>
<td>10 dBm</td>
</tr>
<tr>
<td>Storage Temperature (Tstg)</td>
<td>-65 to +165 ºC</td>
</tr>
<tr>
<td>Operating Temperature (Ta)</td>
<td>-55 to MTTF Table¹</td>
</tr>
<tr>
<td>Channel Temperature (Tch)</td>
<td>MTTF Table¹</td>
</tr>
</tbody>
</table>

(1) Channel temperature directly affects a device's MTTF. It is recommended to keep channel temperature as low as possible to maximize lifetime.
### Electrical Specifications: 13.5-17 GHz (fin) (Ambient Temperature $T = 25^\circ C$)

<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 (fout)</td>
<td>GHz</td>
<td>27.0</td>
<td>-</td>
<td>34.0</td>
</tr>
<tr>
<td>Input Return Loss (S11)</td>
<td>dB</td>
<td>-</td>
<td>-8.0</td>
<td>-</td>
</tr>
<tr>
<td>Output Return Loss (S22)</td>
<td>dB</td>
<td>-</td>
<td>-10.0</td>
<td>-</td>
</tr>
<tr>
<td>Fundamental Suppression</td>
<td>dBc</td>
<td>-28.0</td>
<td>-35.0</td>
<td>-</td>
</tr>
<tr>
<td>RF Input Power (RF Pin)</td>
<td>dBm</td>
<td>-</td>
<td>8.0</td>
<td>-</td>
</tr>
<tr>
<td>Output Power at 8.0 dBm Pin (Pout)</td>
<td>dBm</td>
<td>+16.0</td>
<td>+20.0</td>
<td>-</td>
</tr>
<tr>
<td>Drain Bias Voltage (Vd)</td>
<td>VDC</td>
<td>-</td>
<td>+5.0</td>
<td>+5.5</td>
</tr>
<tr>
<td>Supply Current (Id1,2,3) (Vd=5.0V Typical)</td>
<td>mA</td>
<td>-</td>
<td>200</td>
<td>240</td>
</tr>
</tbody>
</table>
Typical Performance Curves

XX1007-QT: Pout at Fin and 2X Fin, Pin = 10 dBm, Vd = 5V

XX1007-QT: Pout at Fin and 2X Fin, Pin = 5 dBm, Vd = 5V

XX1007-QT: Pout at Fin and 2X Fin, Pin = 0 dBm, Vd = 5V

XX1007-QT: Pout at Fin and 2X Fin, Pin = 3 dBm, Vd = 5V

XX1007-QT: Pout vs Pin, Vd = 5V, Input Frequency = 14.5 GHz

XX1007-QT: Pout vs Pin, Input Frequency = 14.5 GHz
Typical Performance Curves

XX1007-QT: Id vs Pin, Input Frequency = 14.5 GHz

XX1007-QT: Id vs Frequency, Vd = 5V

XX1007-QT: Input Return Loss (S11)

XX1007-QT: Input Return Loss (S22)
Evaluation Board Layout

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.

MTTF Tables (TBD)
These numbers were calculated based on accelerated life test information and thermal model analysis received from the fabricating foundry.

<table>
<thead>
<tr>
<th>Backplate Temperature</th>
<th>Channel Temperature</th>
<th>Rth</th>
<th>MTTF Hours</th>
<th>FITs</th>
</tr>
</thead>
<tbody>
<tr>
<td>75 deg Celsius</td>
<td>192 deg Celsius</td>
<td>126 C/W</td>
<td>3.4 E+06</td>
<td>2.9 E+02</td>
</tr>
</tbody>
</table>

Bias Conditions: Vd=5.0V, Id=200mA
XX1007-QT

Doubler
13.5-17.0/27.0-34.0 GHz

Lead-Free Package Dimensions/Layout

QT (3x3 mm)

Pin 1 Dot
By marking

A2

A

K

b

D2

E2

L

0.0191

0.2999

1.9996

3.9991

RECOMMENDED SOLDER PAD PITCH AND DIMENSIONS

A

A3

A2

b

K

D

E

e

D2

E2

L

MIN

0.80

0.90

1.00

0.20

0.65

1.00

0.20

0.30

3.00 BSC

300 BSC

0.50

1.50

1.65

1.60

1.26

0.36

TOP VIEW

BOTTOM VIEW

Note:

1. ALL DIMENSIONS ARE IN mm.

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