

Active Doubler 2.5 - 6.0 / 5.0 - 12.0 GHz

Rev. V4

Features

- Octave Bandwidth Operation
- +16 dBm Output Power
- -35 dBc Fundamental Leakage
- +5 V, 125 mA Bias
- Lead-Free 4 mm 24-lead QFN Package
- 100% RF, DC and Output Power Testing
- RoHS* Compliant and 260°C Reflow Compatible

Description

The XX1002-QH is a 2.5 - 6.0 / 5.0 - 12.0 GHz QFN active doubler that delivers +16 dBm of output power. The device combines an active doubler with an output buffer amplifier that delivers constant power over a range of input powers. The device has excellent rejection of the fundamental and harmonic products and requires a single positive bias supply.

This device uses MACOM's GaAs HBT device technology to ensure high reliability and uniformity. The device comes in a low-cost 4 mm QFN surface mount plastic package offering excellent RF and thermal properties and is RoHS compliant.

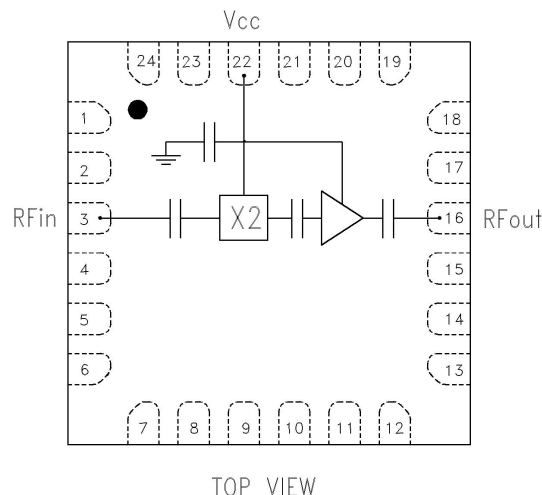
This device is specifically designed for point-to-point radio applications and is well suited for other telecom applications such as SATCOM and VSAT.

Ordering Information¹

Part Number	Package
XX1002-QH-0G0T	tape and reel
XX1002-QH-EV1	evaluation module

1. Reference Application Note M513 for reel size information.

Functional Block Diagram



Pin Configuration²

Pin No.	Function	Pin No.	Function
3	RF In	22	V _{CC}
16	RF Out	25	Paddle ³

2. MACOM recommends connecting unused package pins to ground.
3. The exposed paddle centered on the package bottom must be connected to RF and DC ground.

* Restrictions on Hazardous Substances, European Union Directive 2011/65/EU.

Active Doubler 2.5 - 6.0 / 5.0 - 12.0 GHz

Rev. V4

Electrical Specifications: Input Freq. = 2.5 - 6.0 GHz (unless otherwise noted), $T_A = 25^\circ\text{C}$

Parameter	Units	Min.	Typ.	Max.
Output Frequency Range	GHz	5	-	12
Input Return Loss	dB	-	-15	-
Output Return Loss	dB	-	-7	-
Saturated Output Power	dBm	+13	+16	-
RF Input Power	dBm	-3	-	+3
Fundamental Leakage (Input Freq. = 2.5 - 4.25 GHz)	dBc	-	-35	-23
Third Harmonic Leakage	dBc	-	-30	-
Fourth Harmonic Leakage	dBc	-	-20	-
Bias Voltage	VDC	-	+5.0	+5.5
Supply Current (Quiescent)	mA	-	102	140

Absolute Maximum Ratings^{4,5}

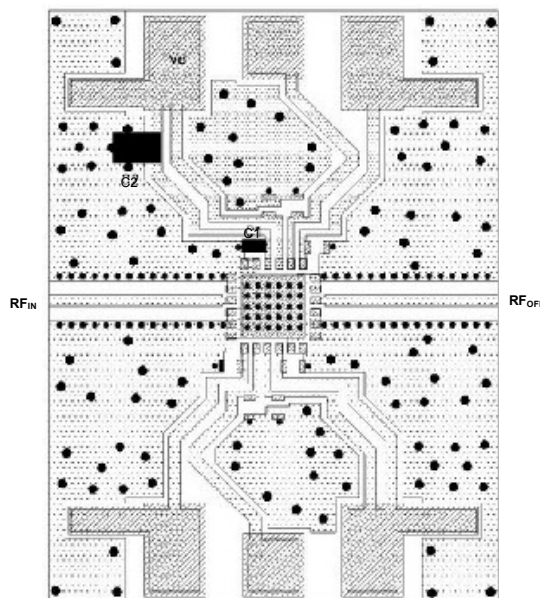
Parameter	Absolute Max.
Supply Voltage	+6 V
Supply Current	200 mA
Input Power	+10 dBm
Storage Temperature	-65°C to +165°C
Operating Temperature	-55°C to +85°C
Junction Temperature ^{6,7}	+150°C

- Exceeding any one or combination of these limits may cause permanent damage to this device.
- MACOM does not recommend sustained operation near these survivability limits.
- Operating at nominal conditions with $T_J \leq +150^\circ\text{C}$ will ensure $\text{MTTF} > 1 \times 10^6$ hours.
- Junction Temperature (T_J) = $T_C + \Theta_{JC} * (V * I)$
Typical CW thermal resistance (Θ_{JC}) = 77°C/W

Biasing

The device is operated by biasing $V_{CC} = 5\text{ V}$ which will draw typically 102 mA quiescent / 125 mA under RF drive. The device requires by-passing as shown in the recommended layout with $C1 = 1\text{ nF}$ and $C2 = 1\text{ }\mu\text{F}$.

PCB Layout

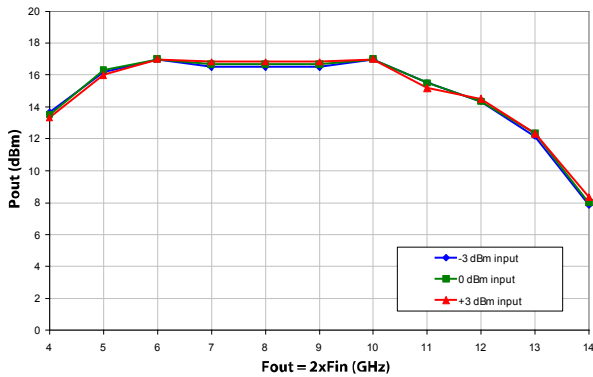


Parts List

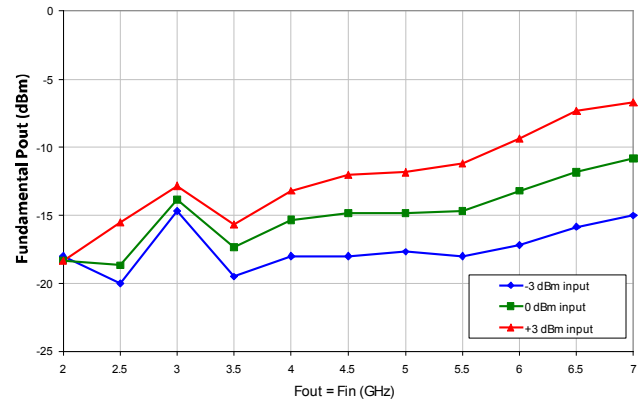
Component	Value	Package
C1	1 nF	0402
C2	1 μF	0805

Typical Performance Curves

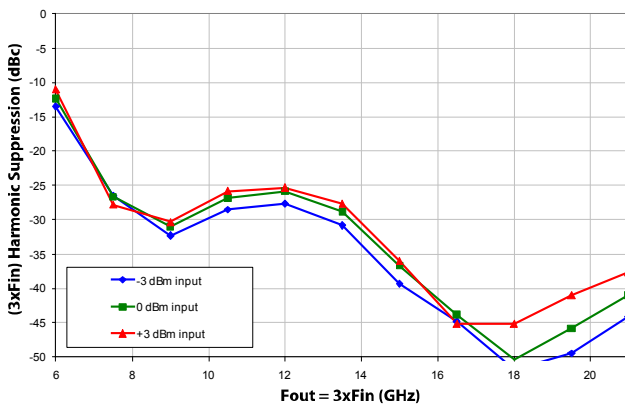
(x2) Output Power



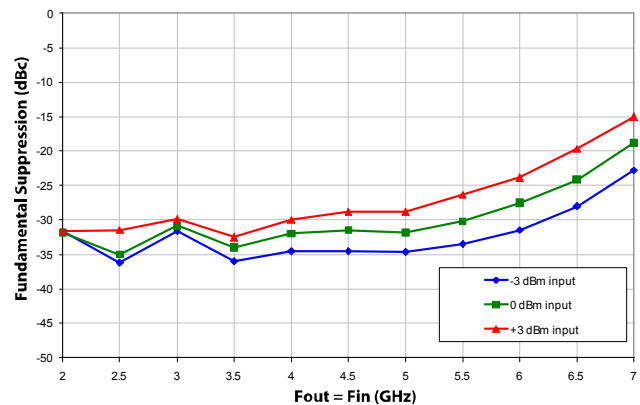
Fundamental Leakage



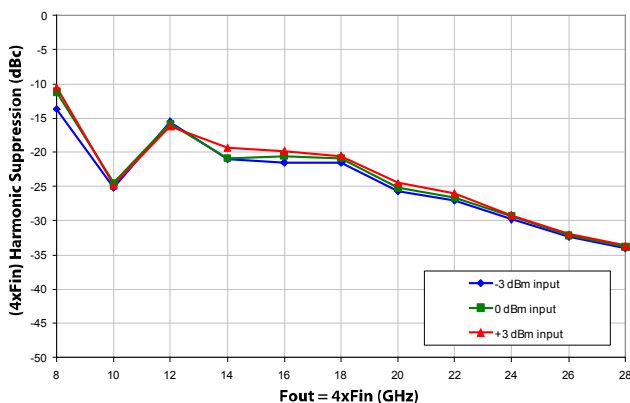
(3xFin) Harmonic Suppression



Fundamental Suppression

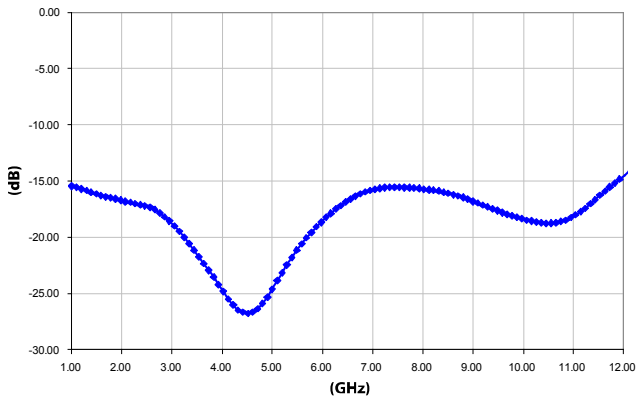


(4xFin) Harmonic Suppression

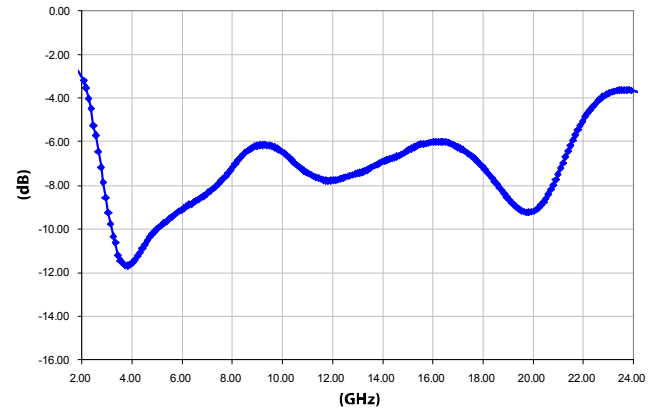


Typical Performance Curves

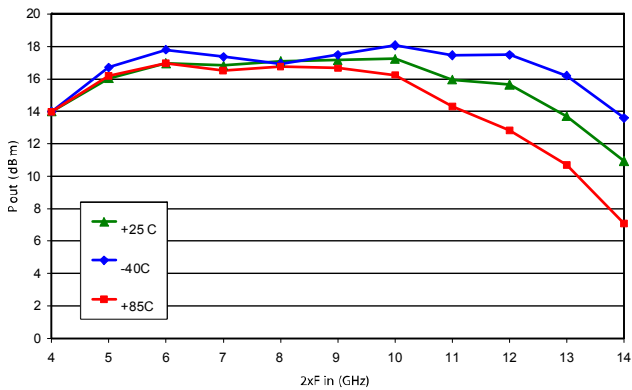
Input Return Loss (S11)



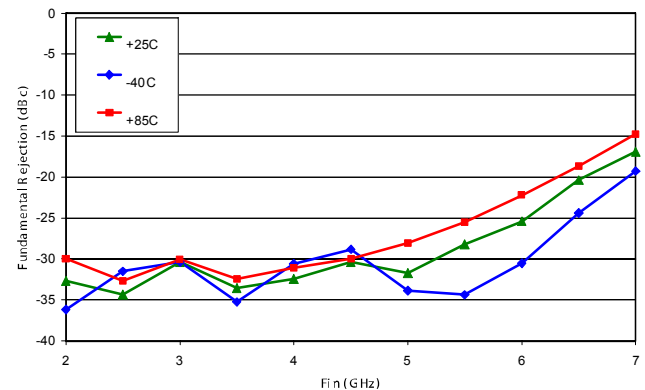
Output Return Loss (S22)



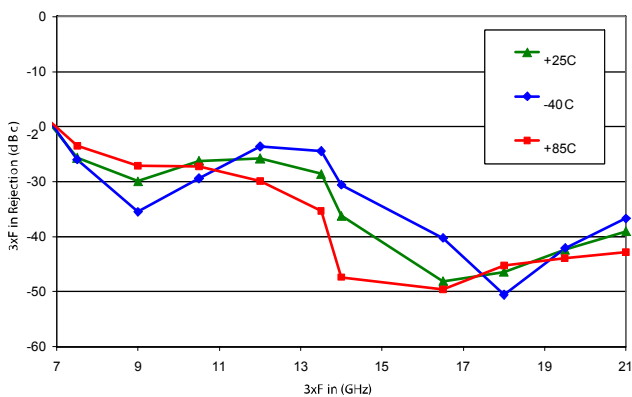
(2xFin) Output Power



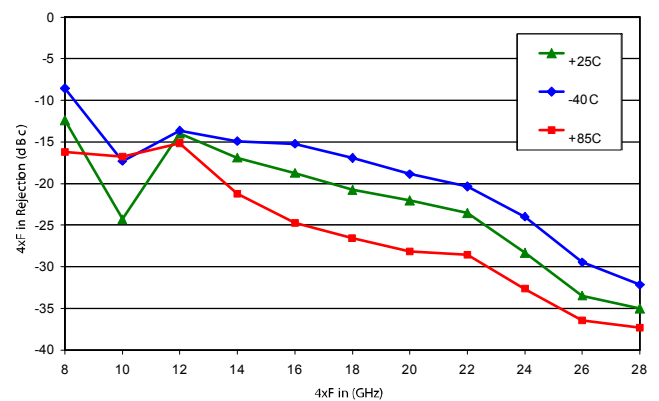
Fundamental Rejection



(3xFin) Rejection

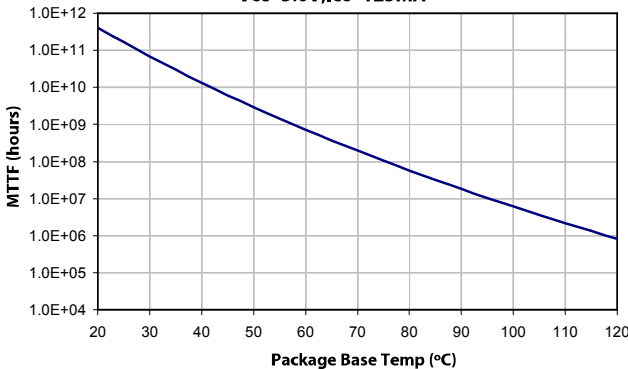


(4xFin) Rejection

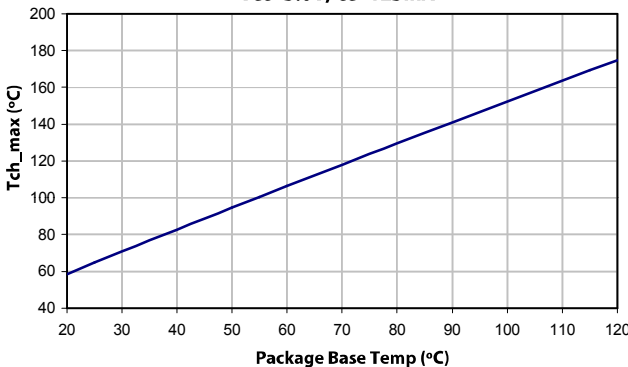


MTTF

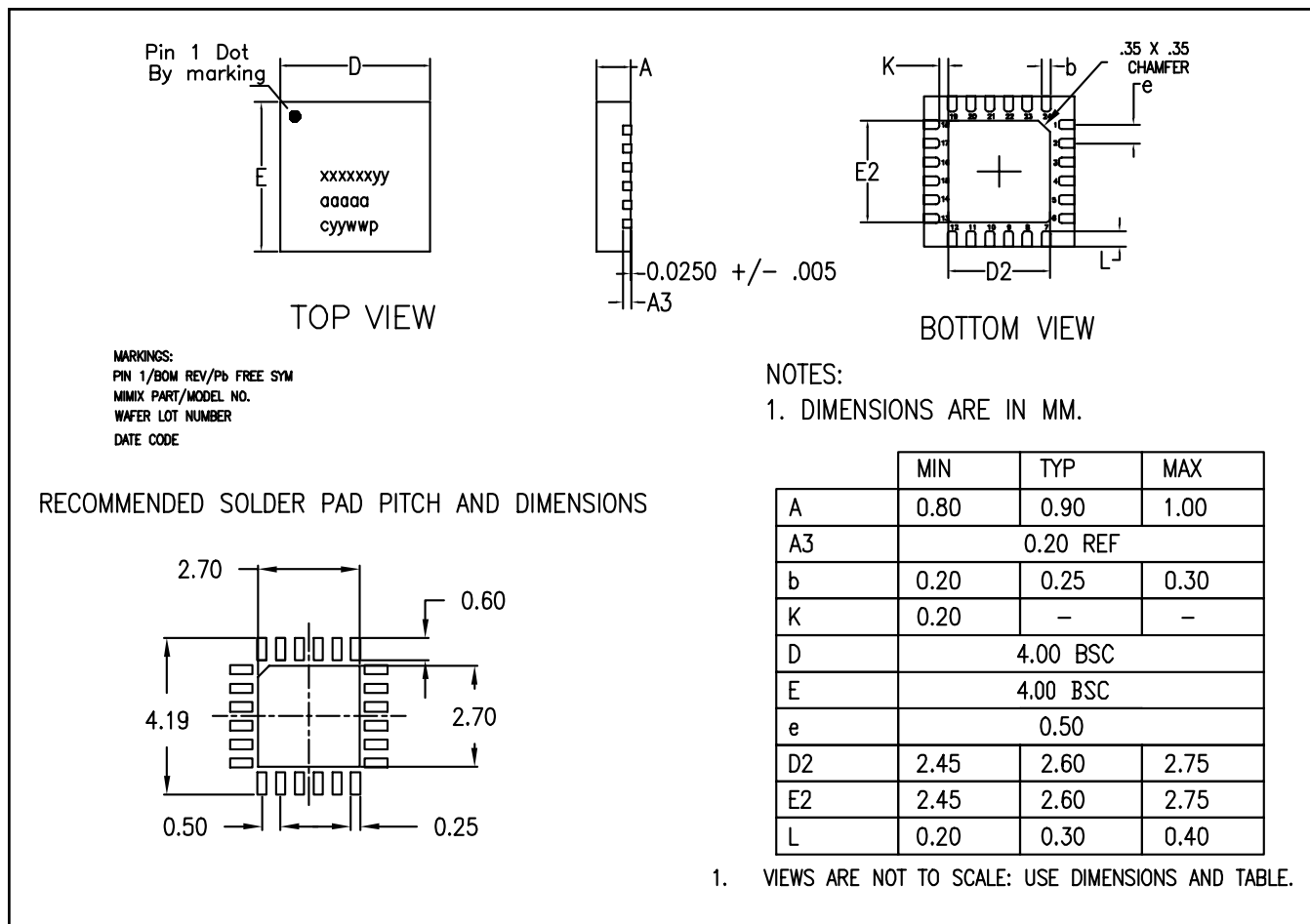
XX1002-QH: MTTF hours vs. Package Base Temperature
Vcc=5.0V, Icc=125mA



XX1002-QH: Tch (max) vs. Package Base Temperature
Vcc=5.0V, Icc=125mA



Lead-Free 4mm 24-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.

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 0 (200 V HBM) devices.

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 estoppel 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.

Mouser Electronics

Authorized Distributor

Click to View Pricing, Inventory, Delivery & Lifecycle Information:

MACOM:

[XX1002-QH-0G0T](#)