

## 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.

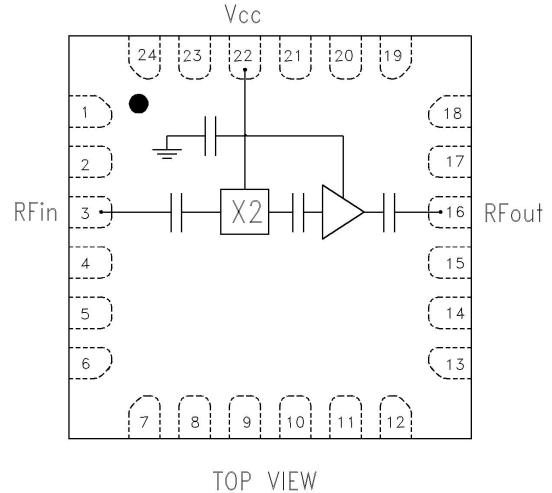
This device is specifically designed for point-to-point radio applications and is well suited for other telecom applications such as SATCOM and VSAT.

## Ordering Information<sup>1</sup>

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 Configuration<sup>2</sup>

Pin No.	Function	Pin No.	Function
3	RF In	22	V <sub>CC</sub>
16	RF Out	25	Paddle <sup>3</sup>

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<sub>A</sub> = 25°C**

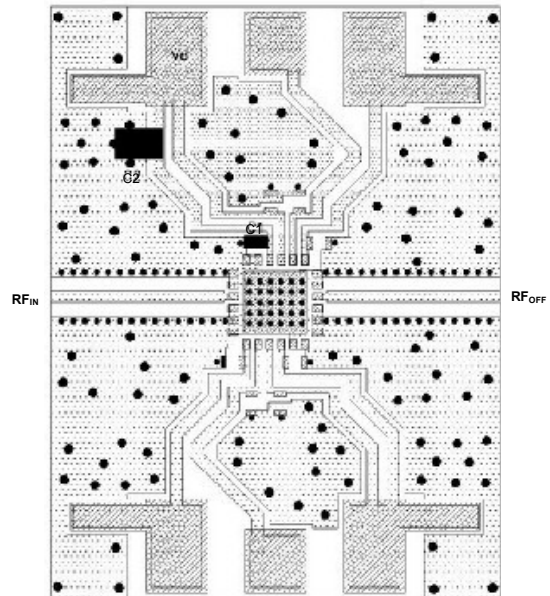
Parameter	Units	Min.	Typ.	Max.
Output Frequency Range	GHz	5	-	12
Input Return Loss	dB	-	-15	-
Output Return Loss	dB	-	-7	-
Saturated Output Power	dBm	+13	+16	-
RF Input Power	dBm	-3	-	+3
Fundamental Leakage (Input Freq. = 2.5 - 4.25 GHz)	dBc	-	-35	-23
Third Harmonic Leakage	dBc	-	-30	-
Fourth Harmonic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

### Absolute Maximum Ratings<sup>4,5</sup>

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 <sup>6,7</sup>	+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<sub>J</sub> ≤ +150°C will ensure MTTF > 1 x 10<sup>6</sup> hours.
- Junction Temperature (T<sub>J</sub>) = T<sub>C</sub> + Θ<sub>JC</sub> \* (V \* I)  
Typical CW thermal resistance (Θ<sub>JC</sub>) = 77°C/W

### PCB Layout



### Biasing

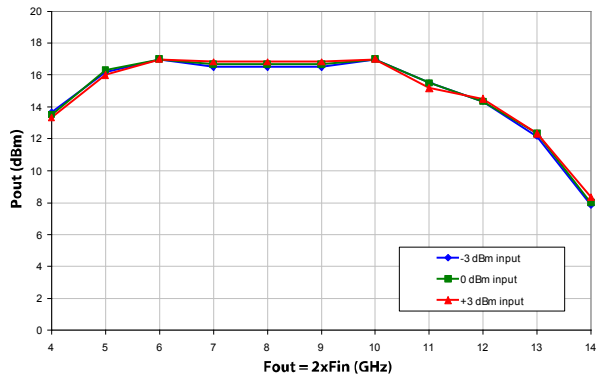
The device is operated by biasing VCC = 5 V which will draw typically 102 mA quiescent / 125 mA under RF drive. The device requires by-passing as shown in the recommended layout with C1 = 1 nF and C2 = 1 μF.

### Parts List

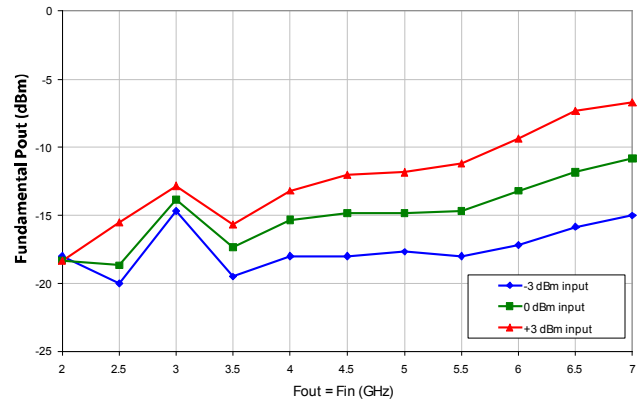
Component	Value	Package
C1	1 nF	0402
C2	1 μF	0805

## Typical Performance Curves

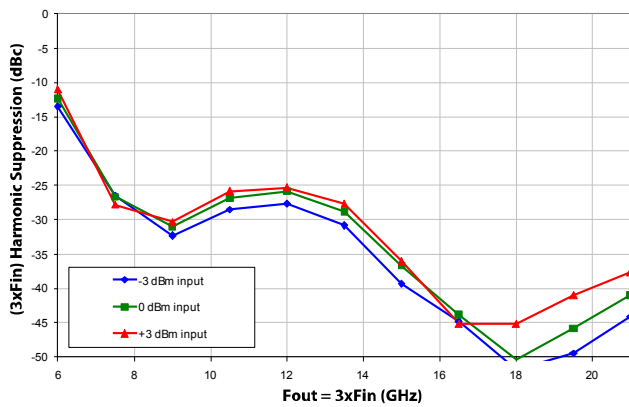
**(x2) Output Power**



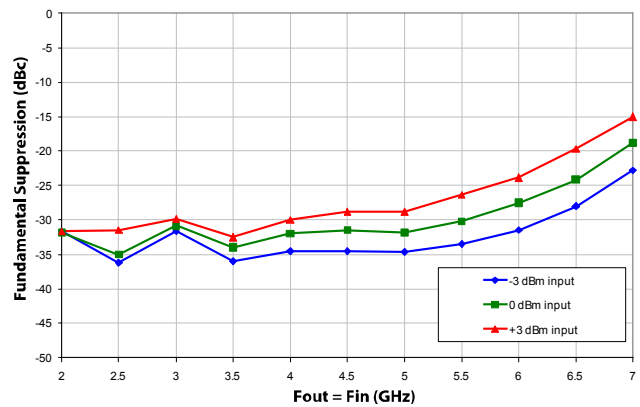
**Fundamental Leakage**



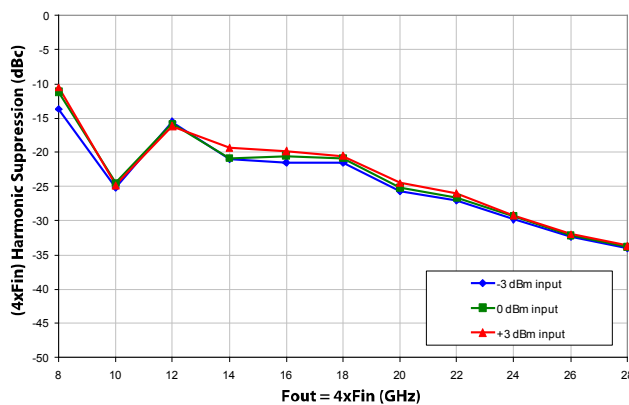
**(3xFin) Harmonic Suppression**



**Fundamental Suppression**

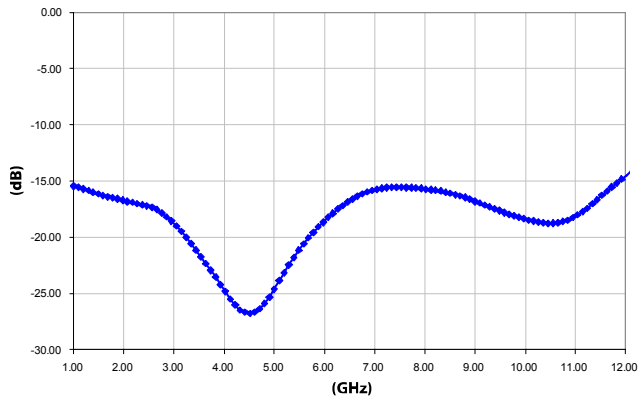


**(4xFin) Harmonic Suppression**

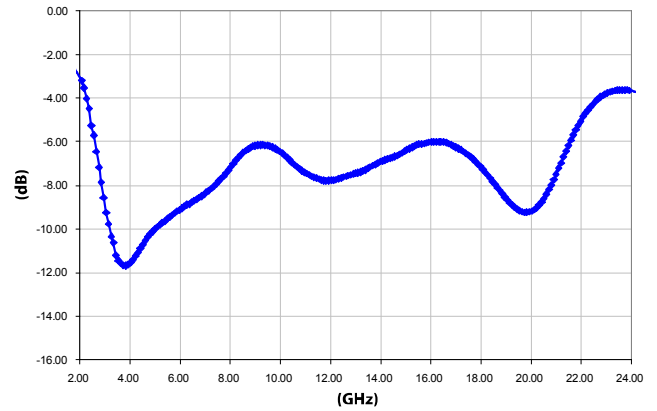


## Typical Performance Curves

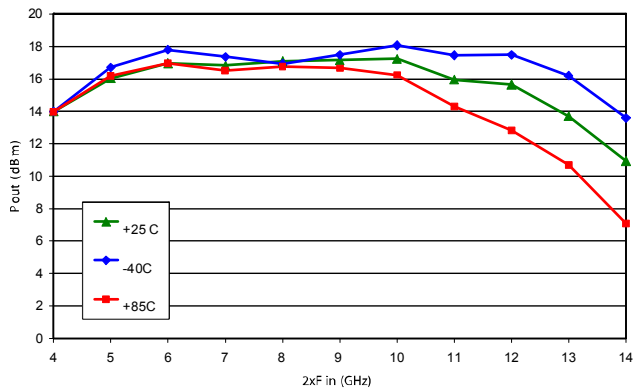
**Input Return Loss (S11)**



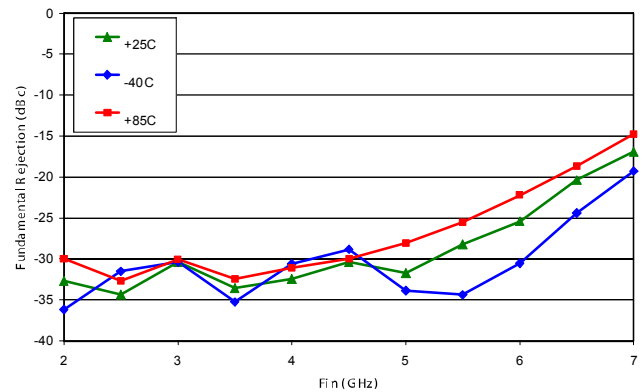
**Output Return Loss (S22)**



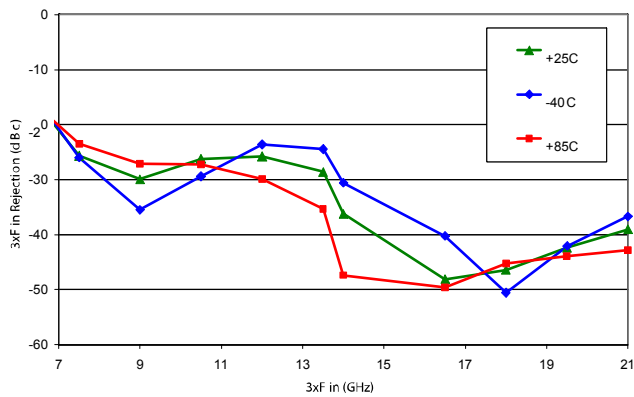
**(2xFin) Output Power**



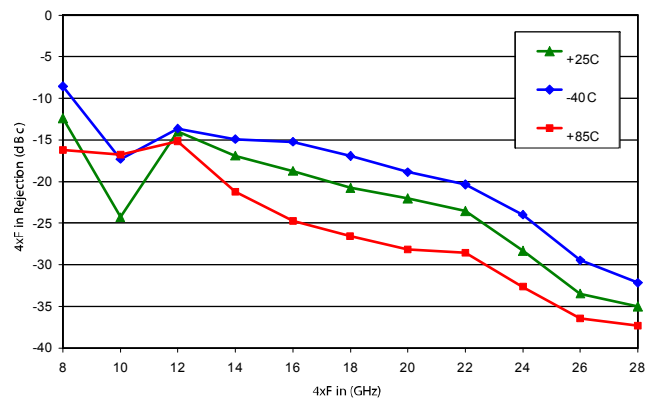
**Fundamental Rejection**



**(3xFin) Rejection**

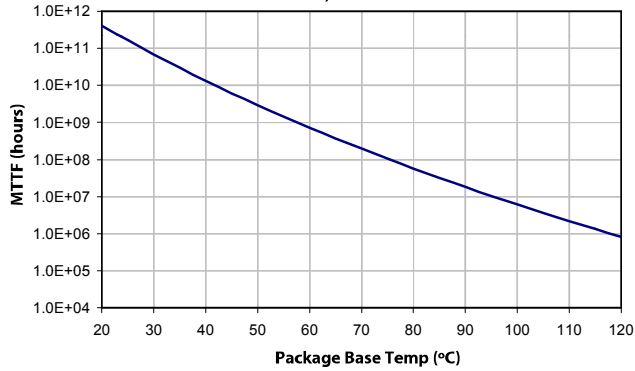


**(4xFin) Rejection**

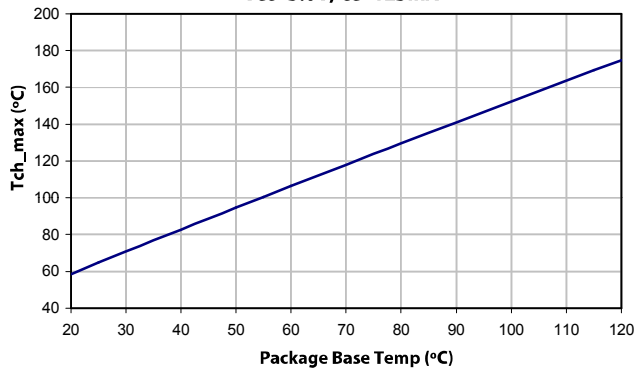


## MTTF

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<sup>†</sup>**

**TOP VIEW**

Pin 1 Dot  
By marking

xxxxxyy  
aaaaa  
cyywpp

**BOTTOM VIEW**

.35 x .35  
CHAMFER

0.0250 +/- .005

**MARKINGS:**  
PIN 1/BOM REV/Pb FREE SYM  
MIMIX PART/MODEL NO.  
WAFER LOT NUMBER  
DATE CODE

**NOTES:**  
1. DIMENSIONS ARE IN MM.

	MIN	TYP	MAX
A	0.80	0.90	1.00
A3	0.20 REF		
b	0.20	0.25	0.30
K	0.20	-	-
D	4.00 BSC		
E	4.00 BSC		
e	0.50		
D2	2.45	2.60	2.75
E2	2.45	2.60	2.75
L	0.20	0.30	0.40

**RECOMMENDED SOLDER PAD PITCH AND DIMENSIONS**

2.70, 0.60, 4.19, 2.70, 0.50, 0.25

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

<sup>†</sup> 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.

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