# XB1008-QT

## Buffer Amplifier
## 10.0-21.0 GHz

Rev. V1
Mimix Broadband

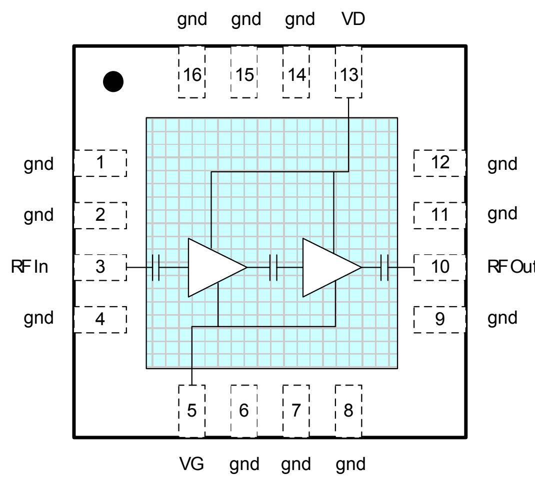
## Features

- Excellent Transmit LO/Output Buffer Stage
- 3x3mm, QFN
- 17.0 dB Small Signal Gain
- +20.0 dBm Psat
- +32 dBm Output IP3
- 4.5 dB Noise Figure
- Variable Gain with Adjustable Bias
- 100% RF, DC and Output Power Testing
- RoHS* Compliant and 260°C Reflow Compatible

## Description

M/A-COM Tech's two stage 10.0-21.0 GHz GaAs MMIC buffer amplifier has a small signal gain of 17.0 dB with a +18.0 dBm P1dB output compression point. The device also provides variable gain regulation with adjustable bias. The device is ideally suited as an LO or RF buffer stage with broadband performance at a very low cost. The device comes in an RoHS compliant 3x3mm QFN surface mount package offering excellent RF and thermal properties. This device is well suited for Microwave and Millimeter-wave Point-to-Point Radio, LMDS, SATCOM and VSAT applications.

## Functional Block Diagram




## Pin Configuration

| Pin No. | Function | Pin No. | Function |
|---|---|---|---|
| 1-2 | Ground | 10 | RF Output |
| 3 | RF Input | 11-12 | Ground |
| 4 | Ground | 13 | Drain Bias |
| 5 | Gate Bias | 14-16 | Ground |
| 6-9 | Ground | | |

## Ordering Information

| Part Number | Package |
|---|---|
| XB1008-QT-0G00 | bulk quantity |
| XB1008-QT-0G0T | tape and reel |
| XB1008-QT-EV1 | evaluation module |

## Absolute Maximum Ratings

| Parameter | Absolute Max. |
|---|---|
| Supply Voltage (Vd) | +4.3 VDC |
| Supply Current (Id1) | 180 mA |
| Gate Bias Voltage (Vg) | 0 V |
| Input Power (Pin) | +20.0 dBm |
| Storage Temperature (Tstg) | -65 °C to +165 °C |
| Operating Temperature (Ta) | -55 °C to +85 °C |
| Channel Temperature (Tch) | 150 °C |
| ESD Min. - Machine Model (MM) | Class A |
| ESD Min. - Human Body Model (HBM) | Class 1A |
| MSL Level | MSL1 |

Channel temperature directly affects a device's MTTF. Channel temperature should be kept as low as possible to maximize lifetime.






- **North America** Tel: 800.366.2266
- **Europe** Tel: +353.21.244.6400
- **India** Tel: +91.80.43537383
- **China** Tel: +86.21.2407.1588

Visit www.macomtech.com for additional data sheets and product information.

## Electrical Specifications: 10-21 GHz (Ambient Temperature T = 25°C)

| Parameter | Units | Min. | Typ. | Max. |
|---|---|---|---|---|
| Input Return Loss (S11) | dB | - | 12.0 | - |
| Output Return Loss (S22) | dB | - | 12.0 | - |
| Small Signal Gain (S21) | dB | - | 17.0 | - |
| Gain Flatness (ΔS21) | dB | - | +/-2.0 | |
| Reverse isolation (S12) | dB | - | 65.0 | - |
| Noise Figure | dB | - | 4.5 | |
| Output Power for 1dB Compression Point (P1dB) | dBm | - | +18.0 | - |
| Saturated Output Power (Psat) | dBm | - | +20.0 | - |
| Output Third Order Intercept | dBm | - | +32.0 | - |
| Drain Bias Voltage (Vd) | VDC | - | +4.0 | +4.0 |
| Gate Bias Voltage (Vg) | VDC | -1.0 | -0.23 | -0.1 |
| Supply Current (Id) (Vd=4.0 V, Vg2=-0.5 V Typical) | mA | - | 100 | 130 |





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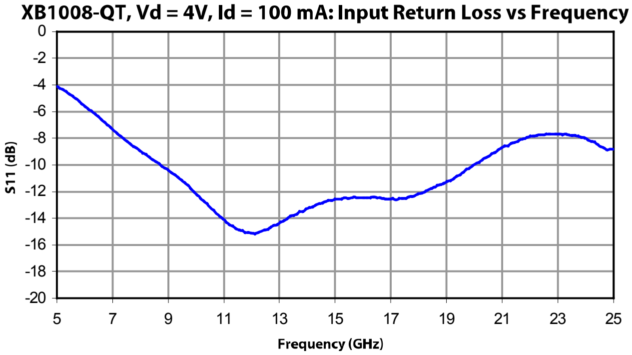
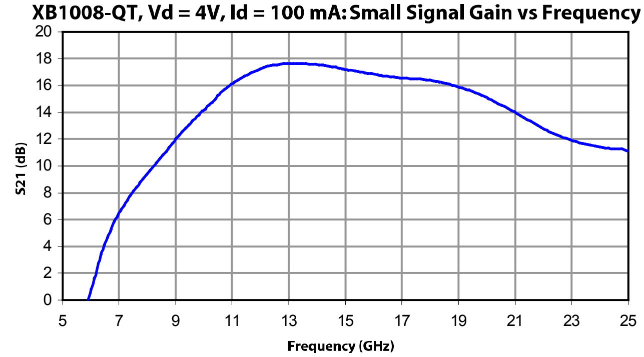
## Typical Performance Curves

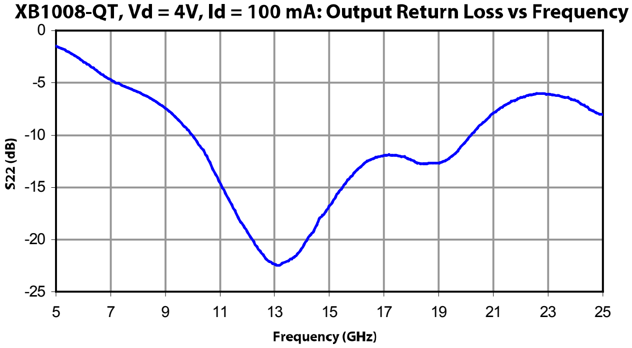
**XB1008-QT, Vd = 4V, Id = 100 mA: Input Return Loss vs Frequency**



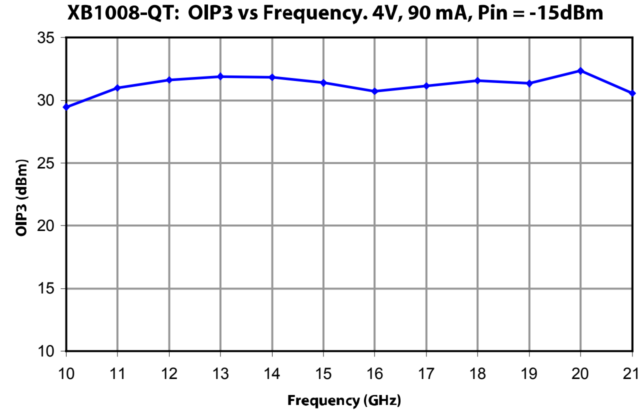

**XB1008-QT, Vd = 4V, Id = 100 mA: Small Signal Gain vs Frequency**



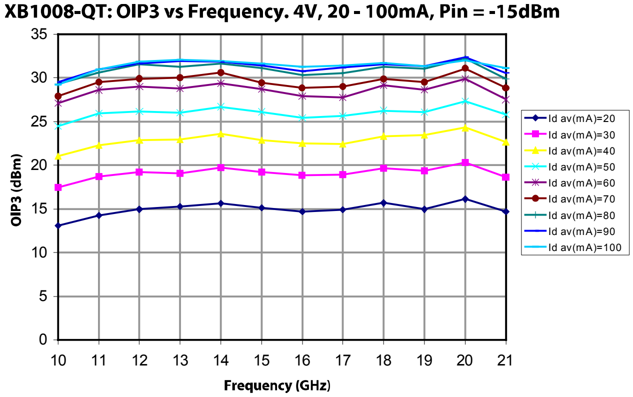

**XB1008-QT, Vd = 4V, Id = 100 mA: Output Return Loss vs Frequency**



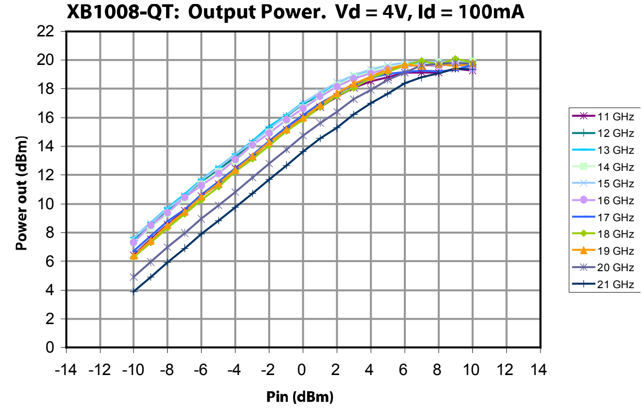

**XB1008-QT: OIP3 vs Frequency. 4V, 90 mA, Pin = -15dBm**



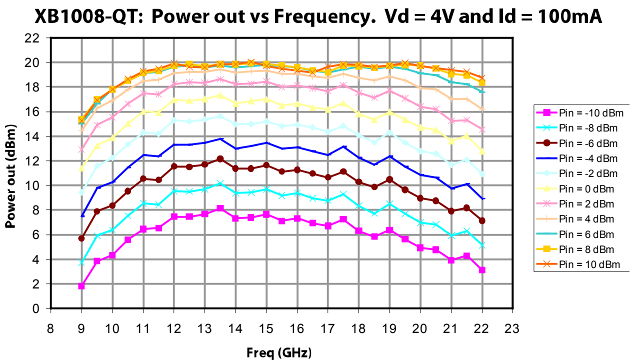

**XB1008-QT: OIP3 vs Frequency. 4V, 20 - 100mA, Pin = -15dBm**




**XB1008-QT: Output Power. Vd = 4V, Id = 100mA**

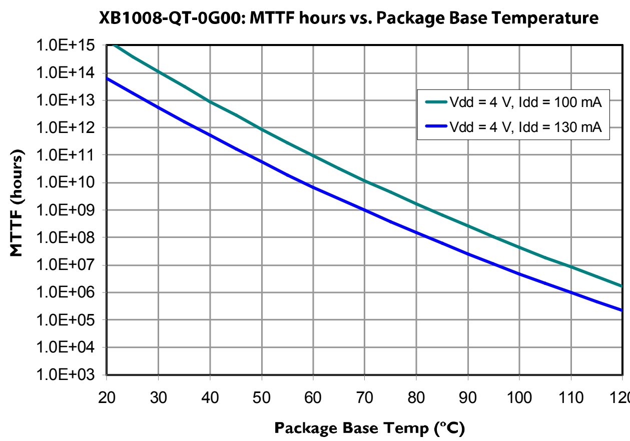


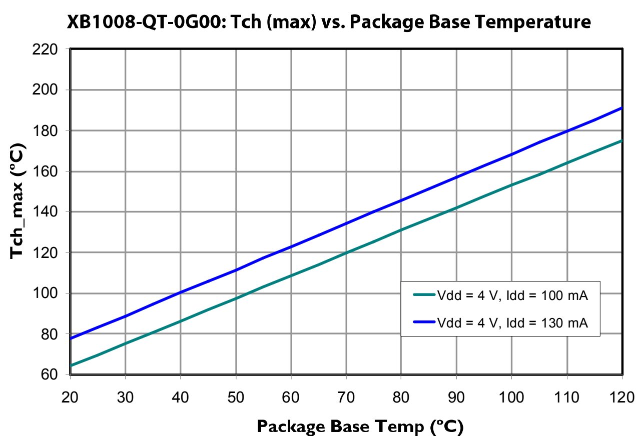
## Typical Performance Curves (cont.)



## MTTF

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



**App Note [1] Biasing -** The device provides variable gain with adjustable bias regulation. For optimum linearity performance, it is recommended to bias this device at Vd=4V with Id=90 mA. It is also recommended to use active biasing to control the drain currents because this gives the most reproducible results over temperature or RF level variations. Depending on the supply voltage available and the power dissipation constraints, the bias circuit may be a single transistor or a low power operational amplifier, with a low value resistor in series with the drain supply used to sense the current. The gate of the pHEMT is controlled to maintain correct drain current and thus drain voltage. The typical gate voltage needed to do this is -0.5V. Typically the gate is protected with Silicon diodes to limit the applied voltage. Also, make sure to sequence the applied voltage to ensure negative gate bias is available before applying the positive drain supply.



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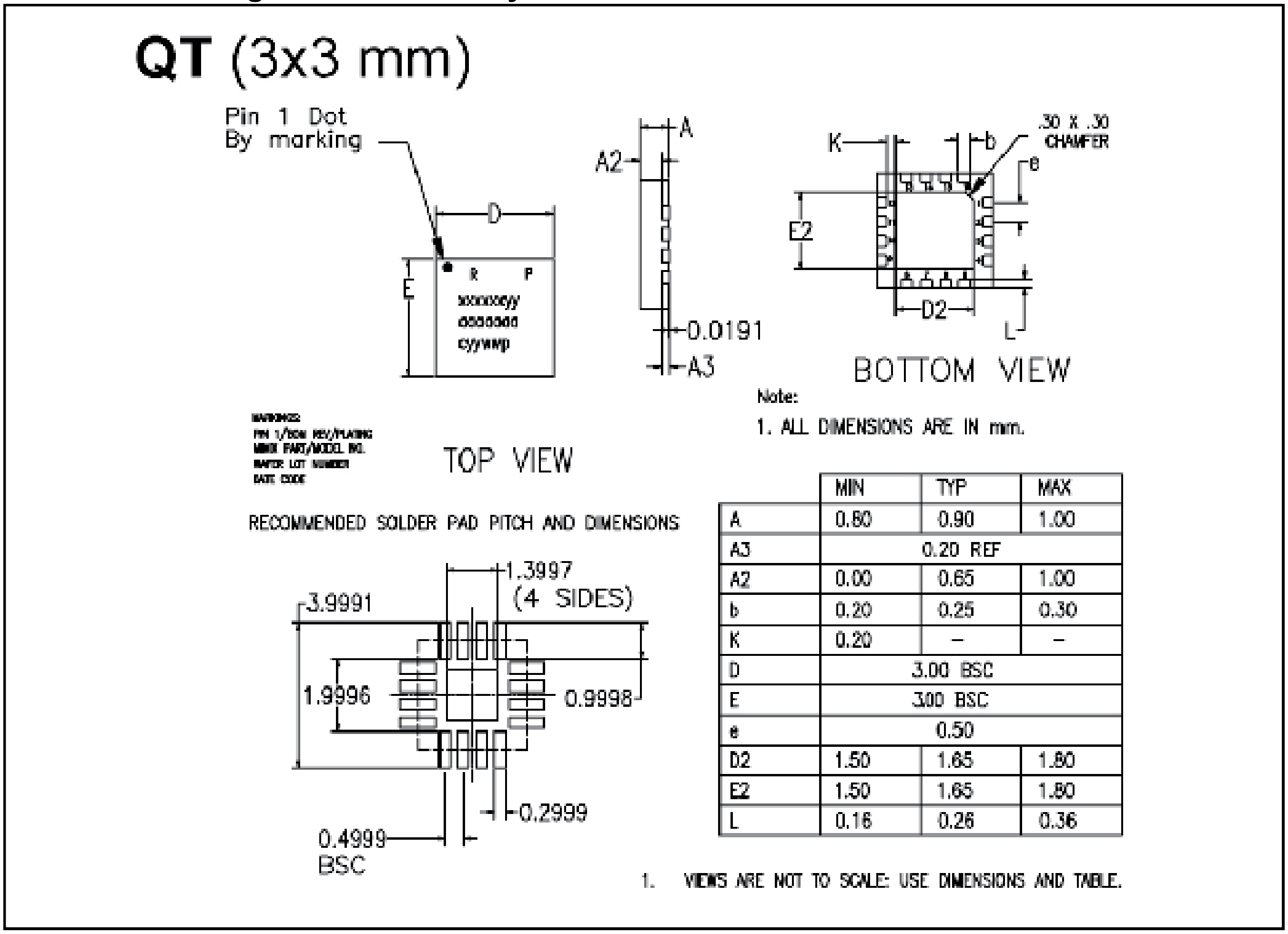
## *Lead-Free* Package Dimensions/Layout




| | MIN | TYP | MAX |
|---|---|---|---|
| A | 0.80 | 0.90 | 1.00 |
| A3 | 0.20 REF | | |
| A2 | 0.00 | 0.65 | 1.00 |
| b | 0.20 | 0.25 | 0.30 |
| K | 0.20 | – | – |
| D | 3.00 BSC | | |
| E | 3.00 BSC | | |
| e | 0.50 | | |
| D2 | 1.50 | 1.65 | 1.80 |
| E2 | 1.50 | 1.65 | 1.80 |
| L | 0.16 | 0.26 | 0.36 |

## 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.