

# 12.0-16.0 GHz Power Amplifier QFN, 3x3mm



February 2008 - Rev 10-Feb-08

✕ **PI042-QT**  
✕ **RoHS**

## Features

- ✕ 21 dB Small Signal Gain
- ✕ 25 dBm P1dB Compression Point
- ✕ 38 dBm Output IP3 Linearity
- ✕ 3x3mm Standard QFN Package
- ✕ 100% RF Testing



## General Description

The XP1042-QT is a packaged driver amplifier that operates over the 12.0-16.0 GHz frequency band. The device provides 21 dB gain and 38 dBm Output Third Order Intercept Point (OIP3) across the band and is offered in an industry standard, fully molded 3x3mm QFN package. The device includes on-chip ESD protection structures and DC by-pass capacitors to ease the implementation and volume assembly of the packaged part. The device is manufactured in 0.5um GaAs PHEMT device technology with BCB wafer coating to enhance ruggedness and repeatability of performance. The XP1042-QT is well suited for Point-to-Point Radio, LMDS, SATCOM and VSAT applications.

## Absolute Maximum Ratings<sup>1</sup>

Supply Voltage (Vd1,2,3)	+6V
Supply Current (Id1,2,3)	550 mA
Gate Bias Voltage (Vg1,2,3)	-3V
Max Power Dissipation (Pdis)	3.2W
RF Input Power	15 dBm
Operating Temperature (Ta)	-55 to +85 °C
Storage Temperature (Tstg)	-65 to 150 °C
Channel Temperature (Tch)	-40 to MTTF Graph <sup>2</sup>

(1) Operation of this device above any one of these parameters may cause permanent damage.

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

## Electrical Characteristics (Ambient Temperature T = 25 °C)

Parameter	Units	Min.	Typ.	Max.
Frequency Range (f)	GHz	12.0	-	16.0
Small Signal Gain (S21)	dB		21.0	
Input Return Loss (S11)	dB		12.0	
Output Return Loss (S22)	dB		10.0	
Reverse Isolation (S12)	dB		50.0	
NF	dB		6.0	
P1dB	dB		25.0	
OIP3	dBm		38.0	
Drain Bias Voltage (Vd1,2,3)	VDC		5	
Gate Bias Voltage (Vg1,2,3)	VDC	-2	-1	
Supply Current (Id1)	mA		125	
Supply Current (Id2)	mA		125	
Supply Current (Id3)	mA		250	



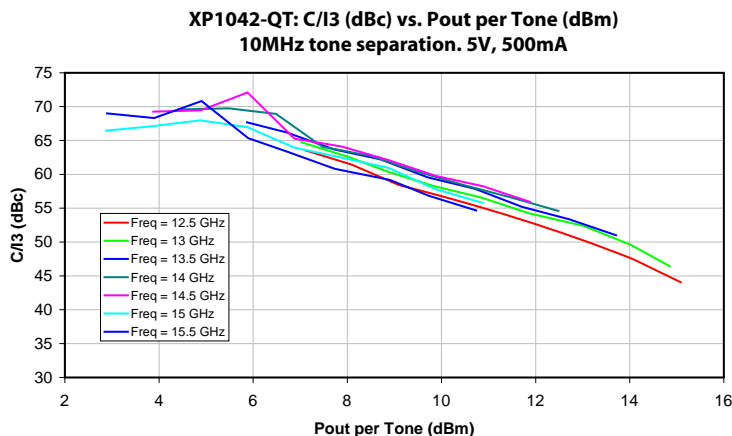
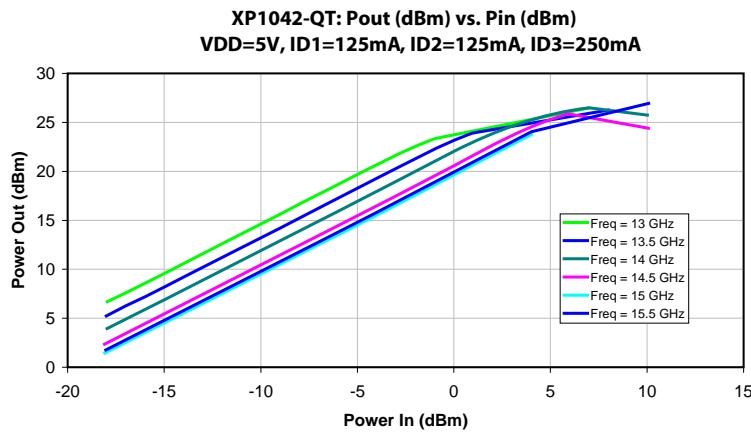
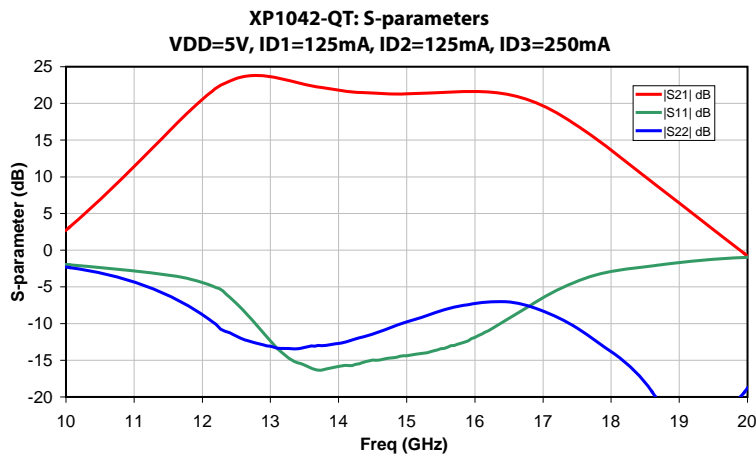
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## Power Amplifier Measurements



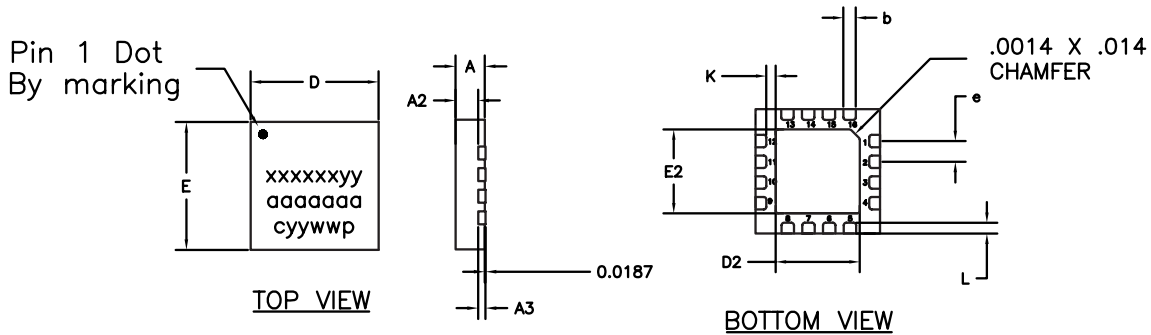
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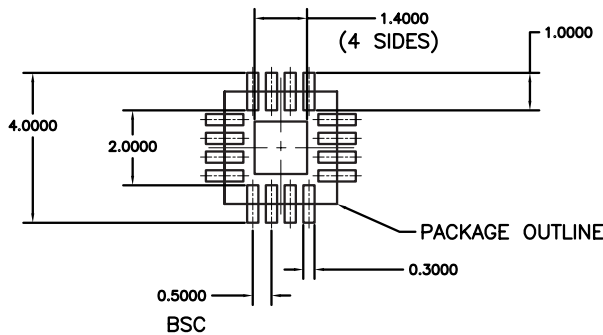
## Package Dimensions / Layout



Note:

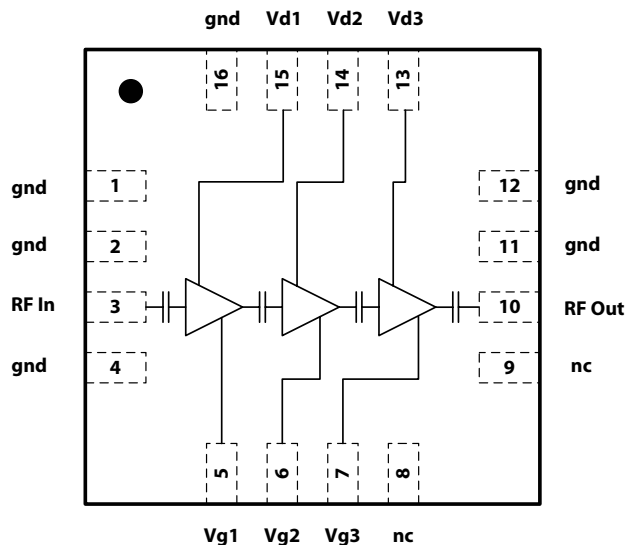
### RECOMMENDED SOLDER PAD PITCH AND DIMENSIONS

1. ALL DIMENSIONS ARE IN mm.



	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	300 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

## Functional Block Diagram



## Pin Designations

Pin Number	Pin Name	Pin Function	Nominal Value
1-2	GND	Ground	
3	RF In	RF Input	
4	GND	Ground	
5	Vg1	Gate 1 Bias	~-1.0V
6	Vg2	Gate 2 Bias	~-0.8V
7	Vg3	Gate 3 Bias	~-1.0V
8-9	NC	Not Connected	
10	RF Out	RF Output	
11-12	GND	Ground	
13	Vd3	Drain 3 Bias	5.0V, 250 mA
14	Vd2	Drain 2 Bias	5.0V, 125 mA
15	Vd1	Drain 1 Bias	5.0V, 125 mA
16	GND	Ground	

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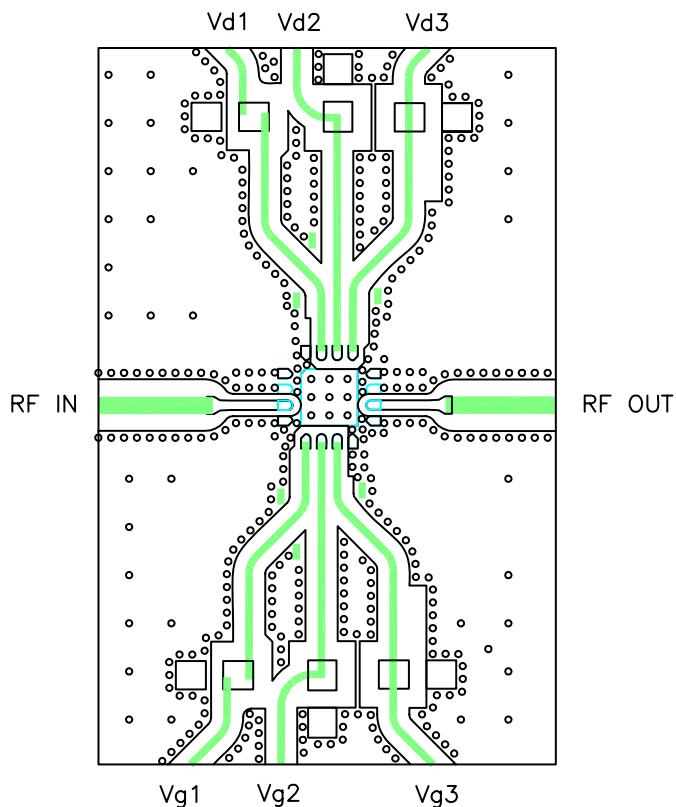
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**App Note [1] Biasing** - As shown in the Pin Designations table, the device is operated by biasing VD1,2,3 at 5.0V with 125, 125, 250 mA respectively. It is recommended to use active bias to keep the currents constant in order to maintain the best performance over temperature. 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 -1.0V. Make sure to sequence the applied voltage to ensure negative gate bias is available before applying the positive drain supply.

**App Note [2] Board Layout** - As shown in the board layout, it is recommended to provide 100pF decoupling caps as close to the bias pins as possible, with additional 10µF decoupling caps.

## Recommended Layout



Recommended Caps:

(6x) 100pF, 0402

(6x) 10nF, 0805

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## Handling and Assembly Information

**CAUTION!** - Mimix Broadband MMIC Products contain gallium arsenide (GaAs) which can be hazardous to the human body and the environment. For safety, observe the following procedures:

- Do not ingest.
- Do not alter the form of this product into a gas, powder, or liquid through burning, crushing, or chemical processing as these by-products are dangerous to the human body if inhaled, ingested, or swallowed.
- Observe government laws and company regulations when discarding this product. This product must be discarded in accordance with methods specified by applicable hazardous waste procedures.

**Life Support Policy** - Mimix Broadband's products are not authorized for use as critical components in life support devices or systems without the express written approval of the President and General Counsel of Mimix Broadband. As used herein: (1) Life support devices or systems are devices or systems which, (a) are intended for surgical implant into the body, or (b) support or sustain life, and whose failure to perform when properly used in accordance with instructions for use provided in the labeling, can be reasonably expected to result in a significant injury to the user. (2) A critical component is any component of a life support device or system whose failure to perform can be reasonably expected to cause the failure of the life support device or system, or to affect its safety or effectiveness.

**Package Attachment** - This packaged product from Mimix Broadband is provided as a rugged surface mount package compatible with high volume solder installation. Vacuum tools or other suitable pick and place equipment may be used to pick and place this part. Care should be taken to ensure that there are no voids or gaps in the solder connection so that good RF, DC and ground connections are maintained. Voids or gaps can eventually lead not only to RF performance degradation, but reduced reliability and life of the product due to thermal stress.

### Typical Reflow Profiles

Reflow Profile	SnPb	Pb Free
Ramp Up Rate	3-4 °C/sec	3-4 °C/sec
Activation Time and Temperature	60-120 sec @ 140-160 °C	60-180 sec @ 170-200 °C
Time Above Melting Point	60-150 sec	60-150 sec
Max Peak Temperature	240 °C	265 °C
Time Within 5 °C of Peak	10-20 sec	10-20 sec
Ramp Down Rate	4-6 °C/sec	4-6 °C/sec

### Factory Automation and Identification

Mimix Designator	Package Type	Number of leads offered	W Tape Width	P <sub>1</sub> Component Pitch	P <sub>0</sub> Hole Pitch	Reel Diameter	Units per Reel
-QT	QFN (3x3mm)	16	12mm	8mm	4mm	329mm (13in)	2000

Component Orientation: Parts are to be oriented with the PIN 1 closest to the tape's round sprocket holes on the tape's trailing edge.

Note: Tape and Reel packaging is ordered with a -000T suffix. Package is available in 500 unit reels through designated sales channels. Minimum order quantities should be discussed with your local sales representative.

**Mimix Lead-Free RoHS Compliant Program** - Mimix has an active program in place to meet customer and governmental requirements for eliminating lead (Pb) and other environmentally hazardous materials from our products. All Mimix RoHS compliant components are form, fit and functional replacements for their non-RoHS equivalents. Lead plating of our RoHS compliant parts is 100% matte tin (Sn) over copper alloy and is backwards compatible with current standard SnPb low-temperature reflow processes as well as higher temperature (260°C reflow) "Pb Free" processes.

## Ordering Information

### Part Number for Ordering

XP1042-QT-0G00  
XP1042-QT-0G0T  
XP1042-QT-EV1

### Description

Matte Tin plated RoHS compliant 3x3 16L QFN surface mount package in bulk quantity  
Matte Tin plated RoHS compliant 3x3 16L QFN surface mount package in tape and reel  
XP1042-QT evaluation board



**Caution: ESD Sensitive**  
Appropriate precautions in handling, packaging and testing devices must be observed.

Proper ESD procedures should be followed when handling this device.

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