30.0 kHz-32.0 GHz GaAs MMIC Distributed QFN Packaged Amplifier

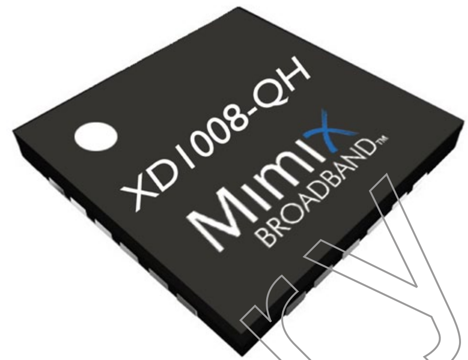
December 2009 - Rev 08-Dec-09

Mimix BROADBAND™

XD1008-QH
XRoHS

Features

- 17 dB Small Signal Gain
- 24 dBm Saturated Power
- 3.0 dB Noise Figure
- Unconditional Stability over Temperature Range
- 4x4mm Fully Molded Standard QFN Package
- 100% RF & DC Testing



General Description

Mimix Broadband's 30 kHz – 32 GHz MMIC distributed amplifier has a gain of 17 dB and provides 24 dBm saturated power with 3.0 dB Noise Figure. The device comes in an RoHS compliant 4x4mm QFN surface mount package offering excellent RF and thermal properties. The device's broad bandwidth operation makes it very versatile for microwave and millimeter applications such as instrumentation, EW and commercial communication systems.

Absolute Maximum Ratings

Supply Voltage (Vd1,2,3)	+10.0V
Gate Bias Voltage (Vg1,2,3)	-9.5V < Vg < 0V
Input Power (Pin)	+17 dBm
Abs. Max. Junction/Channel Temp.	See MTTF Graph[1]
Max. Operating Junction/Channel Temp.	150 ºC
Continuous Power Dissipation (Pdiss) at 85 ºC	1.6W
Thermal Resistance	40 ºC/W
Operating Temperature (Ta)	-55 ºC to +85 ºC
Storage Temperature (Tstg)	-65 ºC to 165 ºC
Mounting Temperature	See solder reflow profile
ESD Min - Machine Model (MM)	Class A
ESD Min - Human Body Model (HBM)	Class 1A
MSL Level	MSL3

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

Bias Settings

Parameter	Units	Min.	Typ.	Max.
Drain Current (Id)	mA	150	-	300
Drain Voltage (Vd)	V	4.0	-	7.0
Gate Bias (Vg1)[1]	V	-5.0	-	0.0
Gate Bias (Vg3)[2]	Ohm	GND	-	Open

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Electrical Characteristics for High Power Applications[1] Vd=7V, Id=200mA, VG3 = OPEN

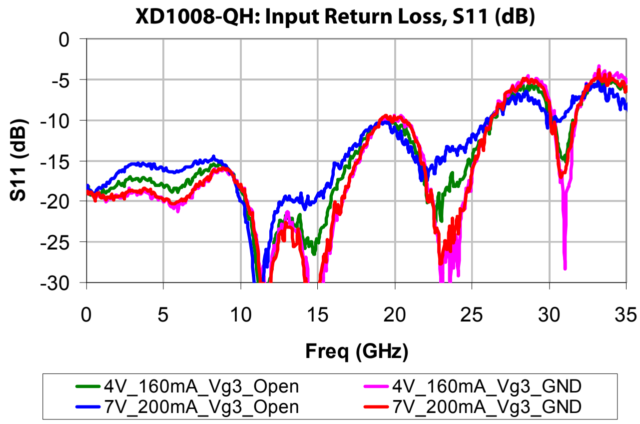
Frequency Range		30.0 kHz to 26.5 GHz			26.5 to 32.0 GHz		
Parameter	**Units**	**Min**	**Typ**	**Max**	**Min**	**Typ**	**Max**
Input Return Loss (S11)	dB		10.0			5.0	
Output Return Loss (S22)	dB		12.0			5.0	
Small Signal Gain (S21)	dB		14.0			14.0	
Reverse Isolation (S12)	dB		30.0			30.0	
Output Power for 1dB Compression (P1dB)	dBm		22.5			20.0	
Saturated Output Power (Psat)	dBm		24.0			22.0	
Output IP3 (dBm) (Pscl=4dBm)	dBm		32.0			28.0	
Noise Figure (NF)	dB		3.0			3.0	

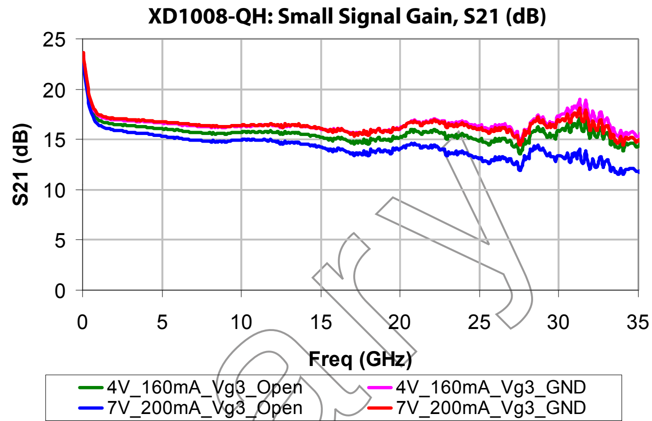
Electrical Characteristics for High Gain Applications[1] Vd=4V, Id=160mA, VG3=GND

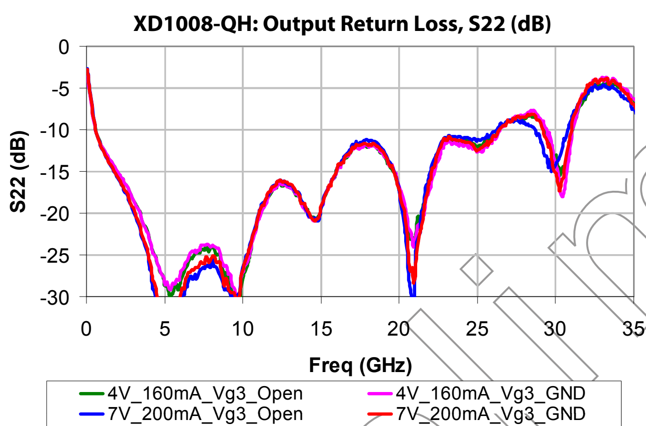
Frequency Range		30 kHz to 26.5 GHz			26.5 to 32.0 GHz		
Parameter	**Units**	**Min**	**Typ**	**Max**	**Min**	**Typ**	**Max**
Input Return Loss (S11)	dB		10.0			5.0	
Output Return Loss (S22)	dB		12.0			5.0	
Small Signal Gain (S21)	dB		17.0			17.0	
Reverse Isolation (S12)	dB		30.0			30.0	
Output Power for 1dB Compression (P1dB)	dBm		17.0			14.0	
Saturated Output Power (Psat)	dBm		20.0			17.0	
Output IP3 (dBm) (Pscl=4dBm)	dBm		29.0			22.0	
Noise Figure (NF)	dB		3.0			3.0	

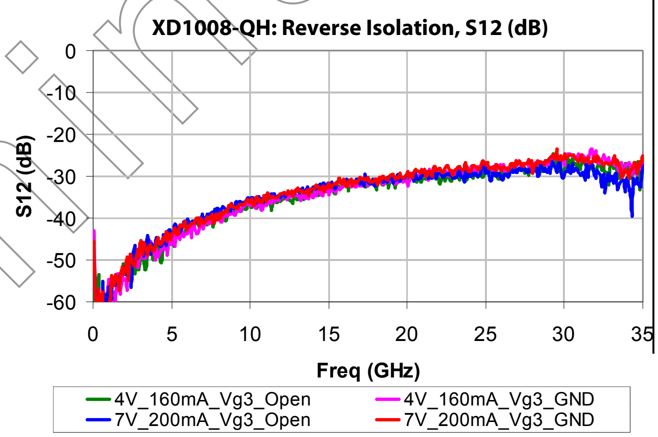
(1) Data measured at ambient temperature of 25 °C.

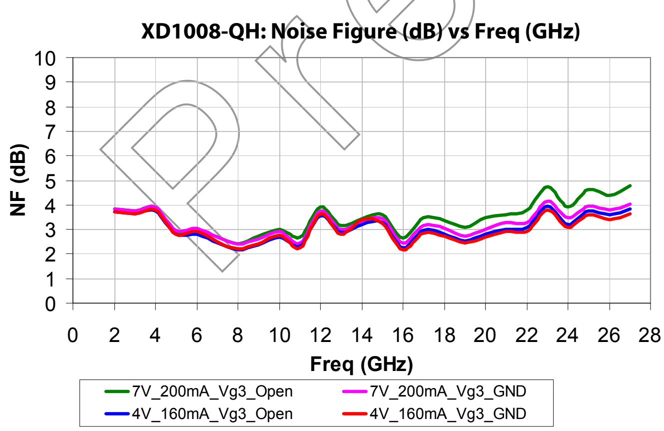
Measured Performance

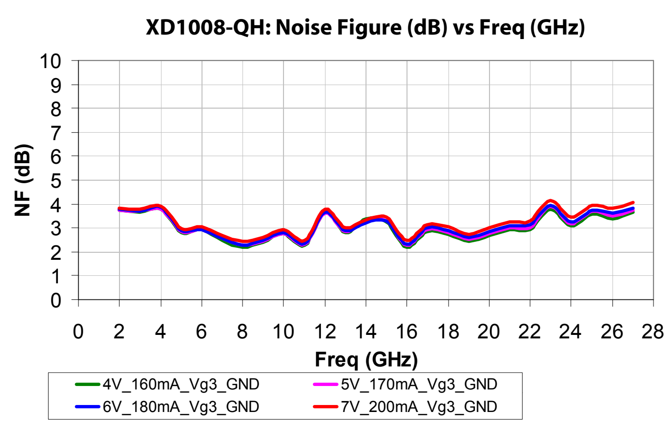






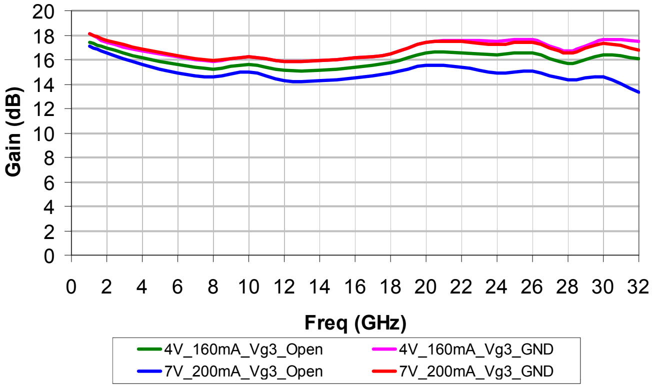




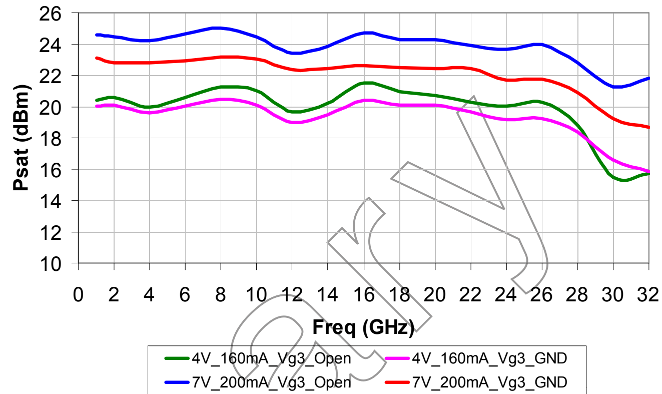


Measured Performance (cont.)

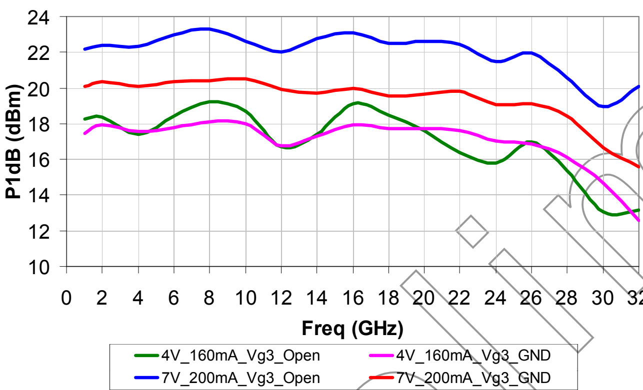
XD1008-QH: Small Signal Gain (dB) vs Freq (GHz)



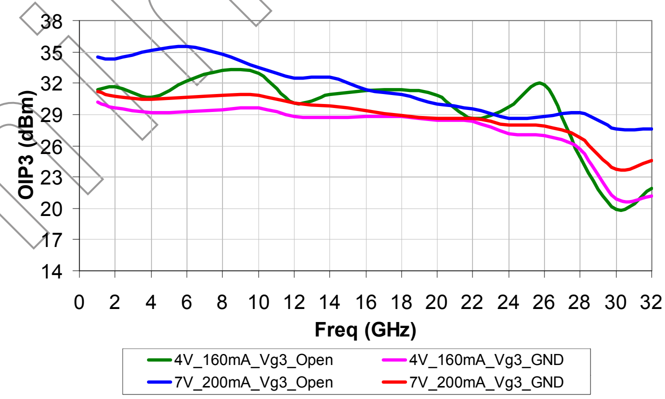
XD1008-QH: Psat (dBm) vs Freq (GHz)



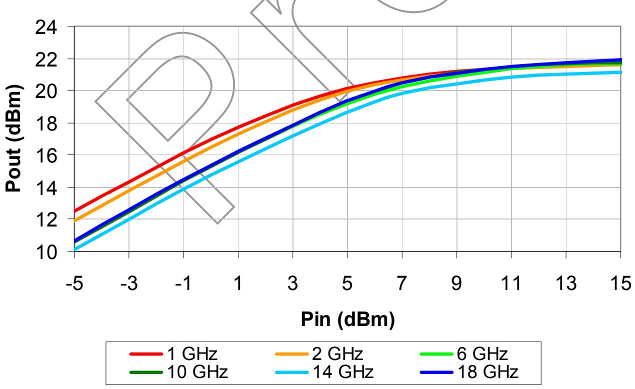
XD1008-QH: P1dB (dBm) vs Freq (GHz)



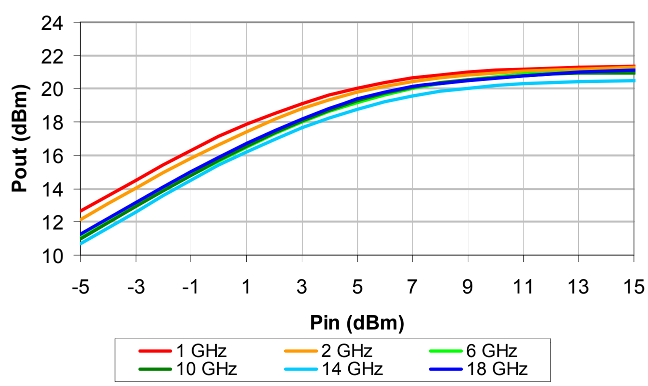
XD1008-QH: OIP3 (dBm) vs Freq (GHz)



XD1008-QH: Pout vs Pin at 4V 160mA, VG3 Open

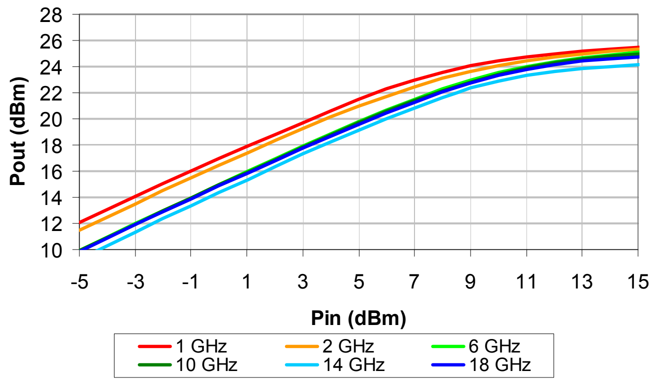


XD1008-QH: Pout vs Pin at 4V 160mA, VG3 GND

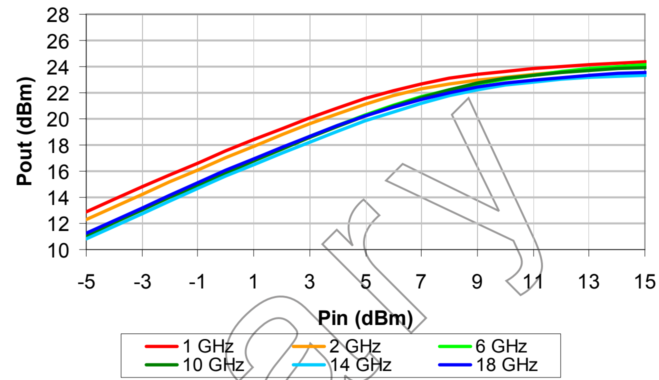


Measured Performance (cont.)

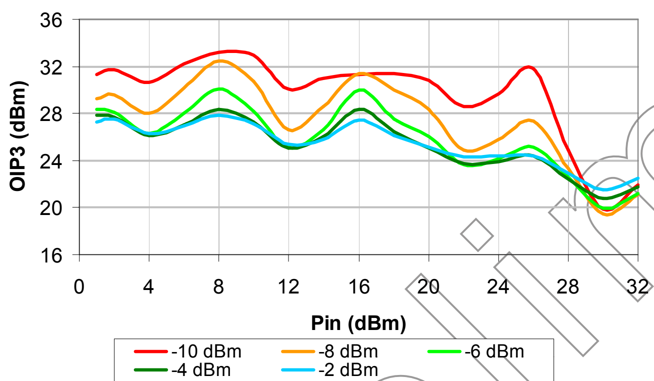
XD1008-QH: Pout vs Pin at 7V 200mA, VG3 Open



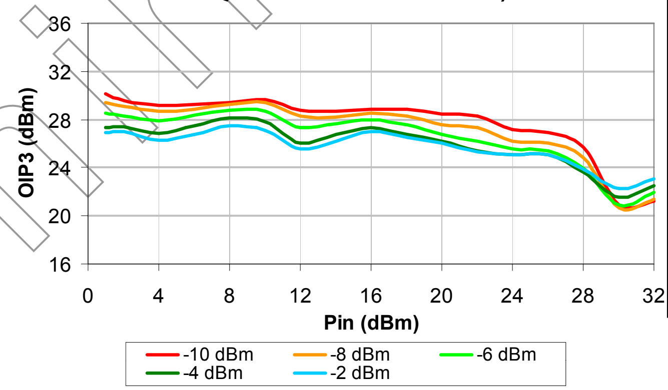
XD1008-QH: Pout vs Pin at 7V 200mA, VG3 GND



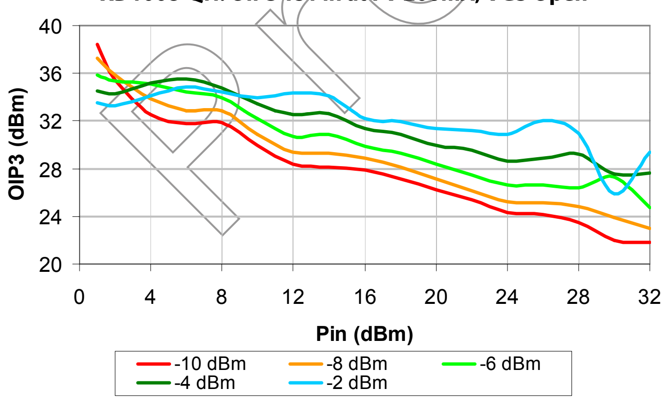
XD1008-QH: OIP3 vs Pin at 4V 160mA, VG3 Open



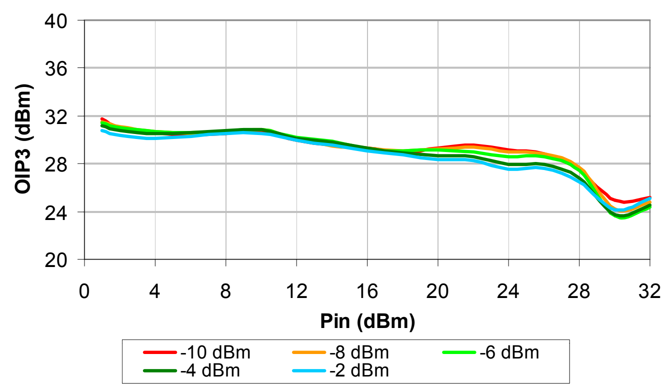
XD1008-QH: OIP3 vs Pin at 4V 160mA, VG GND



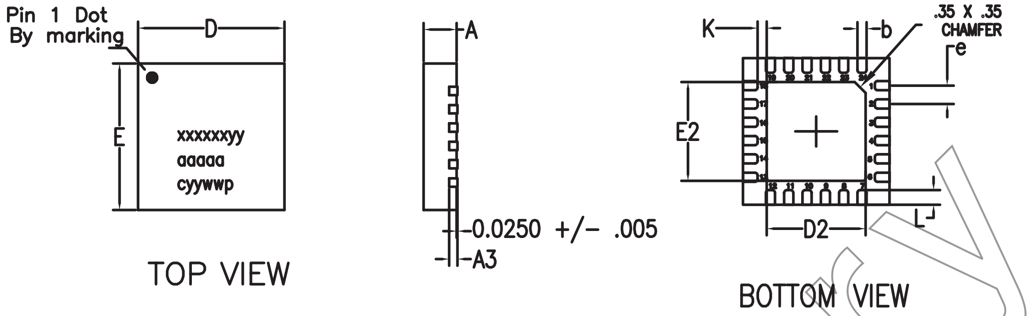
XD1008-QH: OIP3 vs Pin at 7V 200mA, VG3 Open



XD1008-QH: OIP3 vs Pin at 7V 200mA, VG3 GND



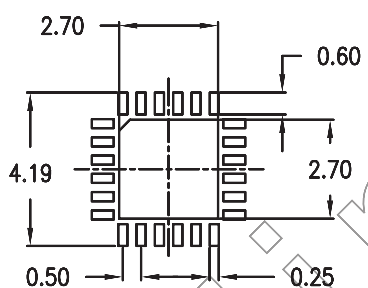
Physical Dimensions/Layout



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

NOTES:
1. DIMENSIONS ARE IN MM.

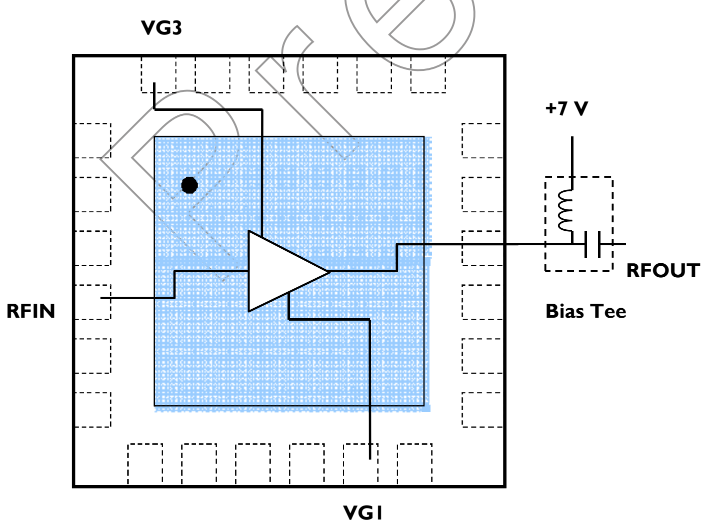
RECOMMENDED SOLDER PAD PITCH AND DIMENSIONS



	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

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

Functional Block Diagram/Pin Designations



Pin Number	Pin Name	Pin Function	Nominal Value
4	RFin	RF	
11	Vg1	Gate Bias/ Drain Control	-2.5 V
16	RFout	RF/Vd Bias	4-7 V via Bias Tee
24	Vg3	Power or Gain Increase	OPEN/GND
3, 5, 15, 17	GND	GND	GND

All other pins are N/C and should be connected to GND

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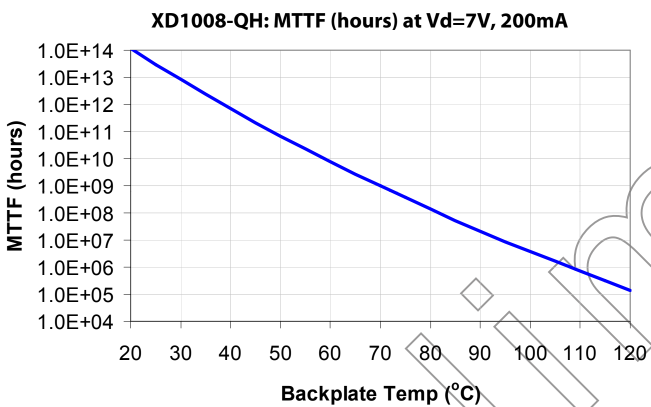
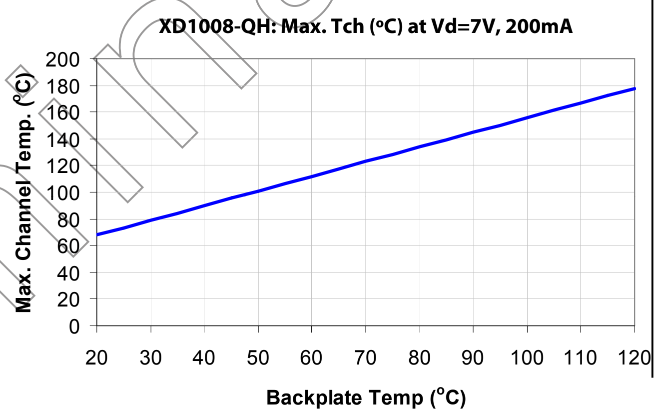
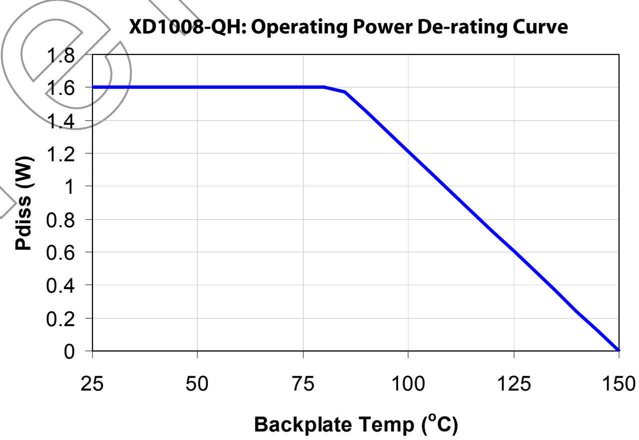
App Note [1] Biasing - As shown in functional schematic, the device is operated by typically biasing the drain with 4.0 to 7.0 V and 160 to 200 mA through a bias tee at RFout. The drain current is controlled by the gate bias at VG1 which is typically at -2.5 V for normal operation. It is recommended 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 -2.5V. Make sure to sequence the applied voltage to ensure negative gate bias is available before applying the positive drain supply.

App Note [2] Bias Arrangement - Each DC pin (Vd and Vg) needs to have DC bypass capacitance (100pF/10nF/1uF) as close to the package as possible.

MTTF







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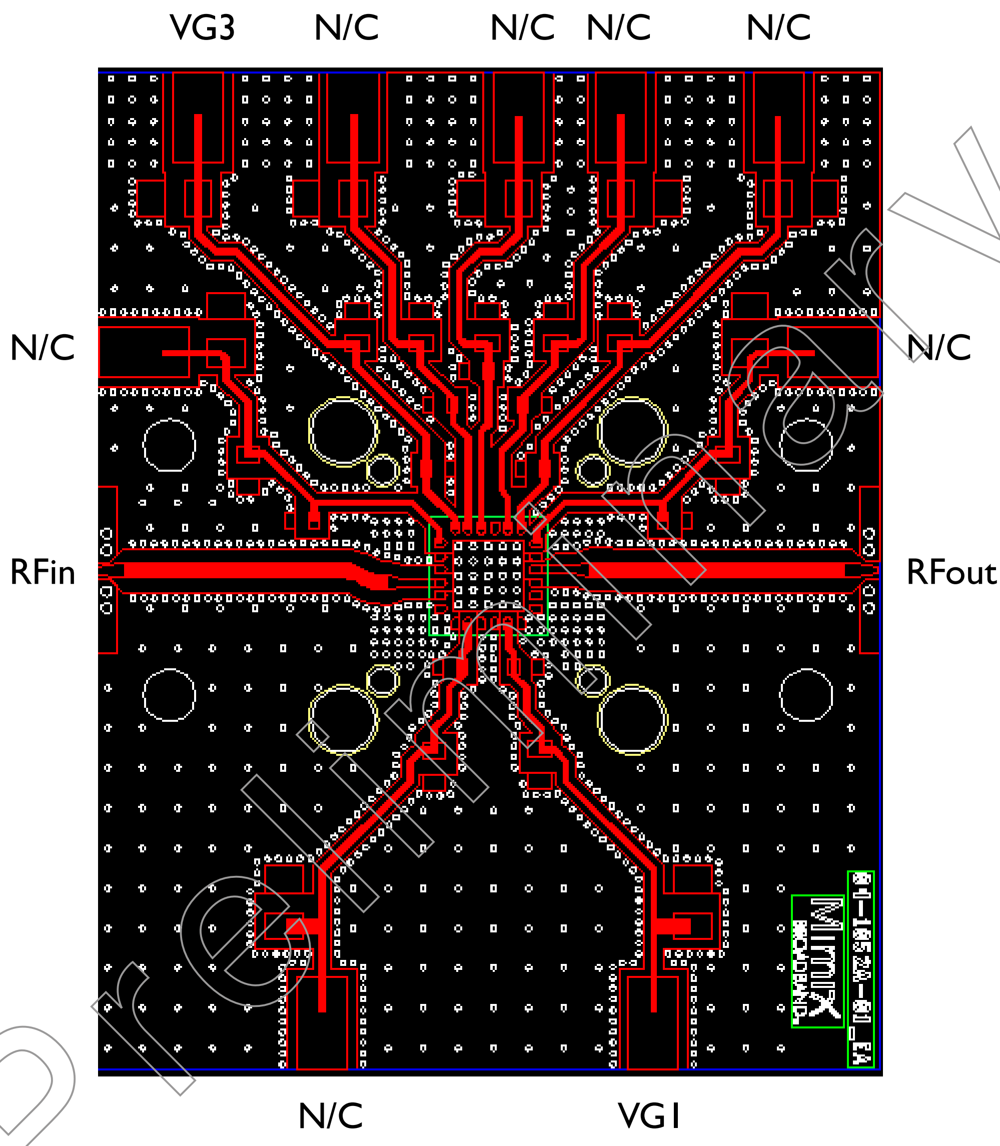
Evaluation Board



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.

Electrostatic Sensitive Device - Observe all necessary precautions when handling.

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 ºC/sec	3-4 ºC/sec
Activation Time and Temperature	60-120 sec @ 140-160 ºC	60-180 sec @ 170-200 ºC
Time Above Melting Point	60-150 sec	60-150 sec
Max Peak Temperature	240 ºC	265 ºC
Time Within 5 ºC of Peak	10-20 sec	10-20 sec
Ramp Down Rate	4-6 ºC/sec	4-6 ºC/sec

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	Description
XD1008-QH-0G00	Matte Tin plated RoHS compliant 4x4 24L QFN surface mount package in bulk quantity
XD1008-QH-0G0T	Matte Tin plated RoHS compliant 4x4 24L QFN surface mount package in tape and reel
XD1008-QH-EV1	XD1008-QH 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.