17.0-34.0 GHz Up-Converter QFN, 4x4mm

February 2010 - Rev 12-Feb-10

Mimix BROADBAND™

XU1010-QH
RoHS

Features

- Integrated Balanced Mixer, LO Buffer and LO Doubler
- +23.0 dBm Input Third Order Intercept (IIP3)
- +2.0 dBm LO Drive Level
- 4x4mm QFN Package
- 100% RF and DC Testing

General Description

Mimix Broadband's 17.0-34.0 GHz GaAs packaged up-converter has an input third order intercept point of +23.0 dBm and 10.0 dB of conversion loss. The device consists of a balanced resistive pHEMT mixer, LO buffer amplifier and LO doubler packaged in an industry standard, fully molded 4x4mm QFN package. IF and *IF mixer inputs are provided and an external 180 degree hybrid is required. The device includes on-chip ESD protection structures and DC by-pass capacitors to ease the implementation and volume assembly of the packaged part. This device is well suited for Millimeter-wave Point-to-Point Radio, LMDS, SATCOM and VSAT applications.

Absolute Maximum Ratings[1]

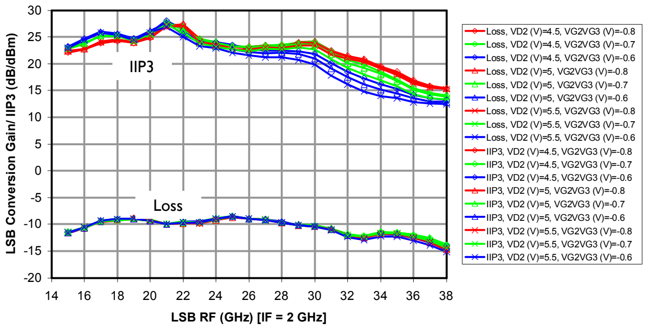
Drain Voltage Supply (Vdd)	+4.3V
Drain Current (Ids)	350 mA
Input Power (Pin) IF	+5 dBm
Input Power (Pin) LO	+10 dBm
Storage Temperature (Tstg)	-65 to +165 ºC
Operating Temperature (Tb)	-55 to +85 ºC
ESD Min. - Machine Model (MM)	Class A
ESD Min. - Human Body Model (HBM)	Class 0
MSL Level	MSL3

Electrical Characteristics (Ambient Temperature T = 25 ºC)

Parameter	Units	Min.	Typ.	Max.
Frequency Range (RF)	GHz	17		34
Frequency Range (LO)	GHz	8		20
Frequency Range (IF)	GHz	DC		3.5
Conversion Loss (CL)	dB		10	
Input Third Order Intercept (IIP3)	dBm		23	
LO Input Drive	dBm		2	
RF Input Return Loss	dB		15	
LO Input Return Loss	dB		15	
IF Input Return Loss	dB		15	
2xLO Leakage at RF	dBm		-20	
1xLO Leakage at RF	dBm		-30	
Drain Bias Voltage (Vd1,2)	VDC		4.0	
Gate Bias Voltage (Vg1)	VDC		~ -0.2	
Gate Bias Voltage (Vg2,3)	VDC		-0.8	
Gate Bias Voltage (Vss)	VDC		-4.0	
Supply Current (Id1)	mA		130	
Supply Current (Id2)	mA		~ 60	
Supply Current (Iss)	mA		45	

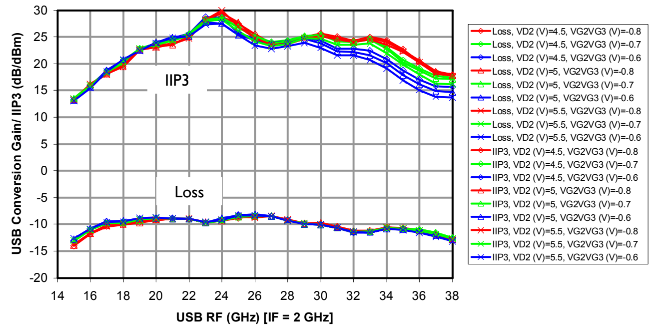
Up-Converter Measurements

XU1010-QH, Glob Top, R10C2: LSB Conversion Loss & IIP3 vs. RF, PLO = 2 dBm, PIFscl = 0 dBm, IF1 - IF2 = 10 MHz, Doubler and Mixer bias swept



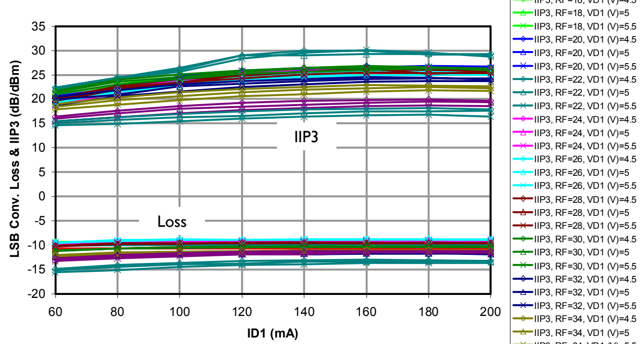
VD1 = 5 V, ID1 = 140 mA, VD2 = 5 V, VG2VG3 = - 0.8 V, VSS = - 5 V

XU1010-QH, Glob Top, R10C2: USB Conversion Loss & IIP3 vs. RF, PLO = 2 dBm, PIFscl = 0 dBm, IF1 - IF2 = 10 MHz, Doubler and Mixer bias swept



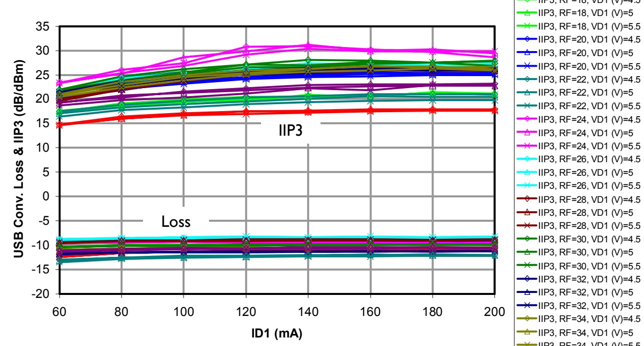
VD1 = 5 V, ID1 = 140 mA, VD2 = 5 V, VG2VG3 = - 0.8 V, VSS = - 5 V

XU1010-QH: LSB IIP3 & Loss vs. ID1 (LO buffer), PLO = 4 dBm, PIFscl = 0 dBm, IF1 - IF2 = 10 MHz



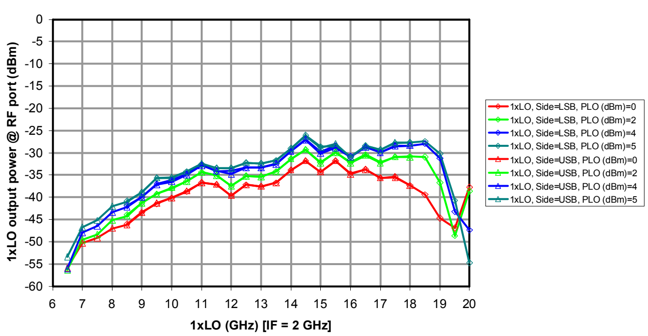
VD1 = 4.5, 5 & 5.5 V, ID1 swept, VD2 = 5 V, VG2VG3 = - 0.8 V, VSS = - 5 V

XU1010-QH: USB IIP3 & Loss vs. ID1 (LO buffer), PLO = 4 dBm, PIFscl = 0 dBm, IF1 - IF2 = 10 MHz



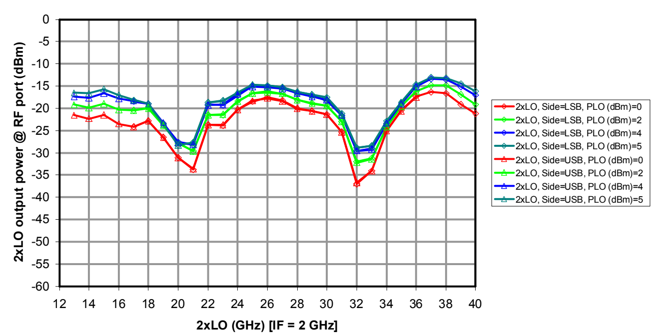
VD1 = 4.5, 5 & 5.5 V, ID1 swept, VD2 = 5 V, VG2VG3 = - 0.8 V, VSS = - 5 V

XU1010-QH, Glob Top, R10C2: 1xLO output power @ RF port, PLOswp, PIFscl = 0 dBm, IF1 - IF2 = 10 MHz



VD1 = 5 V, ID1 = 140 mA, VD2 = 5 V, VG2VG3 = - 0.8 V, VSS = - 5 V

XU1010-QH, Glob Top, R10C2: 2xLO output power @ RF port, PLOswp, PIFscl = 0 dBm, IF1 - IF2 = 10 MHz

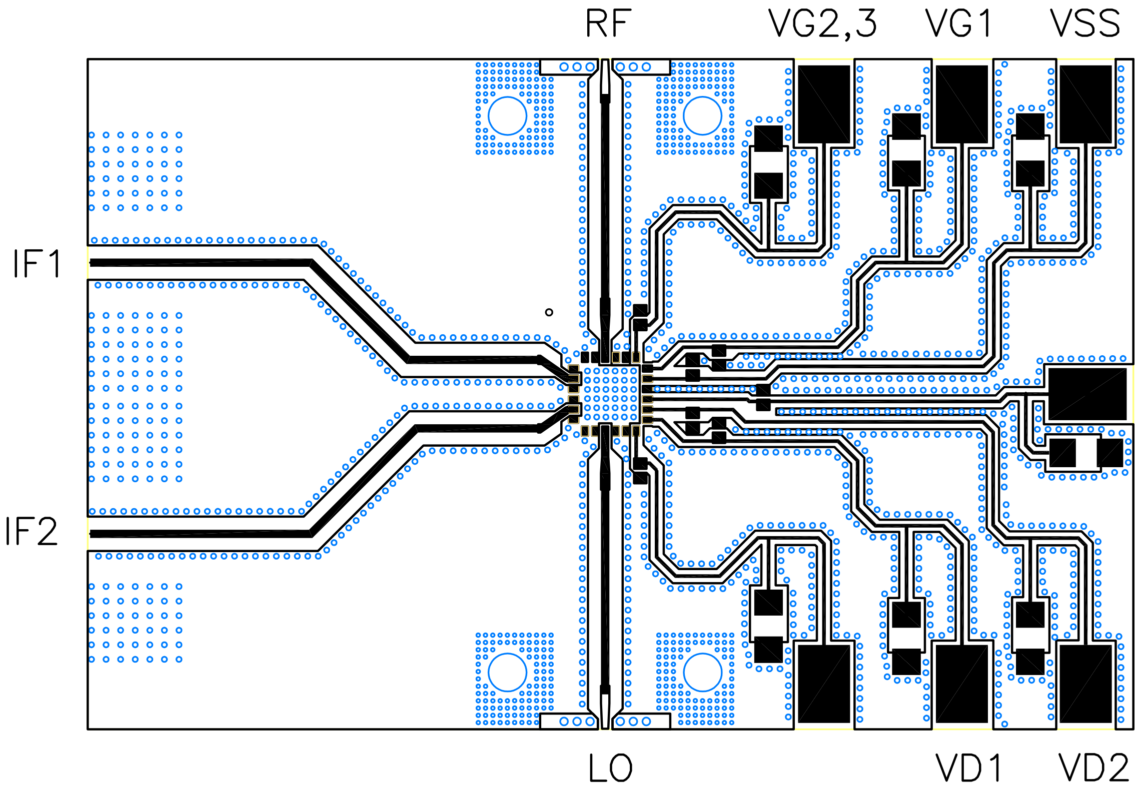


VD1 = 5 V, ID1 = 140 mA, VD2 = 5 V, VG2VG3 = - 0.8 V, VSS = - 5 V

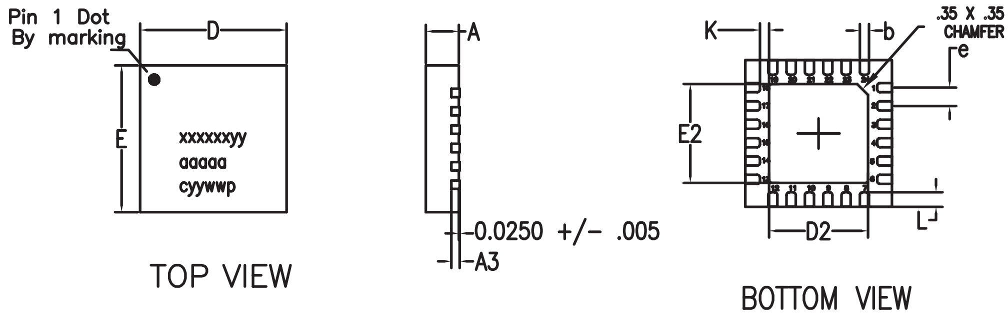
App Note [1] Biasing - As shown in the Pin Designations table, the device is operated by biasing VD1 and VD2 at 4.0V with 130mA and approximately 60mA respectively. VG2,3 and VSS require fixed voltage biasing with VSS biased at -4.0V and 45mA. It is recommended to use active bias on VG1 to keep the current in VD1 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 -0.2V. 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 Board Layout



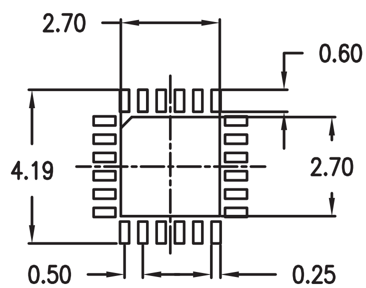
Package Dimensions / Layout



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

NOTES:
1. DIMENSIONS ARE IN MM.

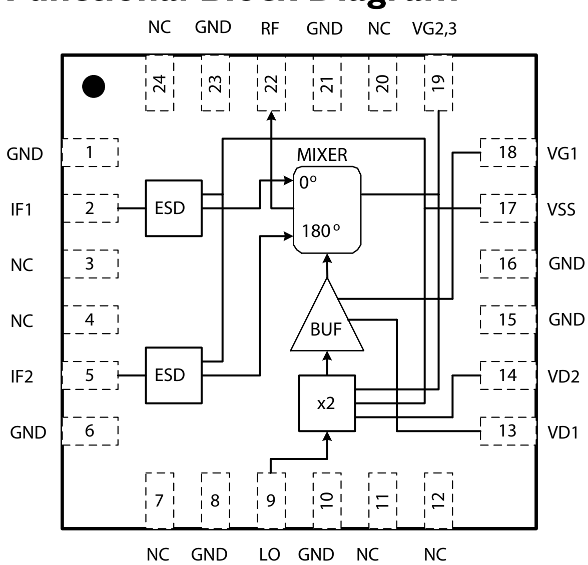
RECOMMENDED SOLDER PAD PITCH AND DIMENSIONS



	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
1	GND		
2	IF1	IF1 Output	
3-4	NC	Not Connected	
5	IF2	IF2 Output	
6-8	GND		
7	NC	Not Connected	
8	GND		
9	LO	LO Input	
10	GND		
11-12	NC	Not Connected	
13	VD1	LO Buffer Drain	4.0V, 130 mA
14	VD2	LO Doubler Drain	4.0V, 60 mA
15-16	GND		
17	VSS	Doubler/ESD Bias	4.0V, 45 mA
18	VG1	LO Buffer Gate	-0.2V
19	VG2,3	LO Doubler/Mixer Gate	-0.8V
20	NC	Not Connected	
21	GND		
22	RF	RF Input	
23	GND		
24	NC	Not Connected	

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.

Part Number for Ordering	Description
XU1010-QH-0G00	Matte Tin plated RoHS compliant 4x4 24L QFN surface mount package in bulk quantity
XU1010-QH-0G0T	Matte Tin plated RoHS compliant 4x4 24L QFN surface mount package in tape and reel
XU1010-QH-EV1	XU1010-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.