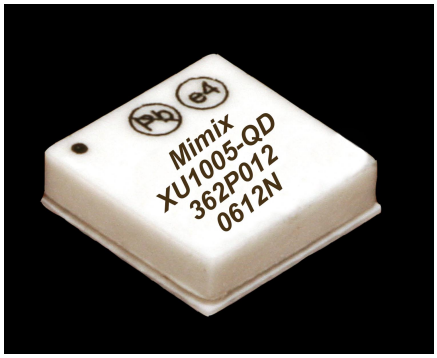
10.0-18.0 GHz GaAs Transmitter QFN, 7x7mm

August 2007 - Rev 19-Aug-07

XU1005-QD
XRoHS

Features

- Integrated Mixer, LO Buffer and Output Amplifier
- 8 dB Conversion Gain
- 15 dB Image Rejection
- +11 dBm P1dB
- +6 dBm LO Drive Level
- -12 dBm LO Leakage Power



General Description

Mimix Broadband's 10.0-18.0 GHz GaAs MMIC transmitter provides +11 dBm output P1dB compression and 15 dB image rejection across the band. This device is an image reject, balanced mixer followed by a two stage output amplifier. The image reject mixer reduces the need for unwanted sideband filtering before the power amplifier. I and Q mixer inputs are provided and an external 90 degree hybrid is required to select the desired sideband. This device comes in a 7x7mm QFN surface mount laminate package which is RoHS compliant. This device is well suited for Millimeter-wave Point-to-Point Radio, LMDS, SATCOM and VSAT applications.

Absolute Maximum Ratings

Supply Voltage (Vd)	+6.0 VDC
Supply Current (Id1,2,3)	250,400 mA
Gate Bias Voltage (Vg)	+0.3 VDC
Input Power (IF Pin)	0.0 dBm
Storage Temperature (Tstg)	-65 to +165 ^{O}C
Operating Temperature (Ta)	-55 to MTTF Table [1]
Channel Temperature (Tch)	MTTF Table [1]

(1) Channel temperature affects a device's MTTF. It is recommended to keep channel temperature as low as possible for maximum life.

Electrical Characteristics (Ambient Temperature T = 25° C)

Parameter	Units	Min.	Typ.	Max.
Frequency Range (RF) Upper Side Band	GHz	10.0	-	18.0
Frequency Range (LO)	GHz	7.0	-	21.0
Frequency Range (IF)	GHz	DC	-	3.0
Output Return Loss RF (S22)	dB	-	18.0	-
Small Signal Conversion Gain IF/RF (S21)	dB	-	10.0	-
LO Input Drive (P_{LO})	dBm	-	+6.0	-
LO Leakage at RF (LO/RF)	dBm	+4.0	-18.0	-
Output P1dB Compression (P1dB)	dBm	-	11.0	-
Output Third Order Intercept (OIP3)	dBm	-	TBD	-
Drain Bias Voltage (Vd1,2)	VDC	-	+5.0	+5.5
Source Bias Voltage (Vs1)	VDC	-	-5.0	-
Gate Bias Voltage (Vg1), Mixer	VDC	-	-0.6	-
Gate Bias Voltage (Vg2)	VDC	-1.2	-0.1	+0.1
Supply Current (Id1) (Vd1=5.0V)	mA	-	140	200
Supply Current (Id2) (Vd2=5.0V, Vg=-0.1V Typical)	mA	-	210	300
Supply Current (Is1) (Vs1=-5.0V)	mA	-	140	200

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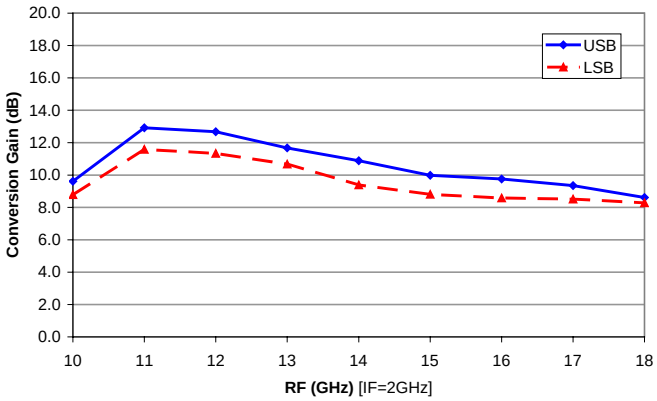
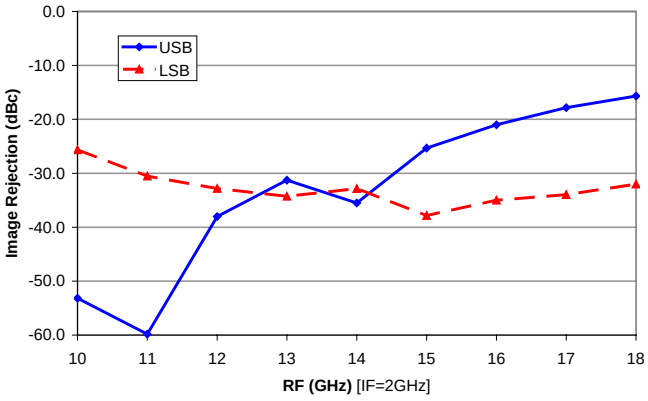
Transmitter Measurements

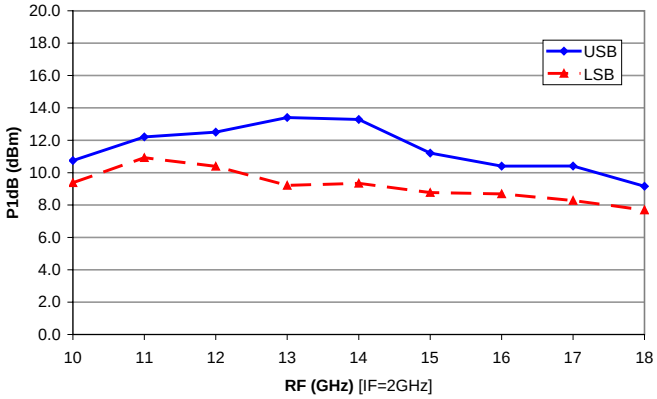
XU1005-QD, Conversion Gain (dB)



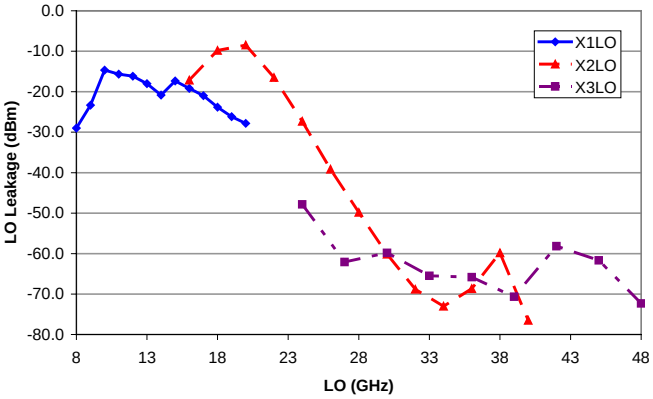
XU1005-QD, Image Rejection (dBc)



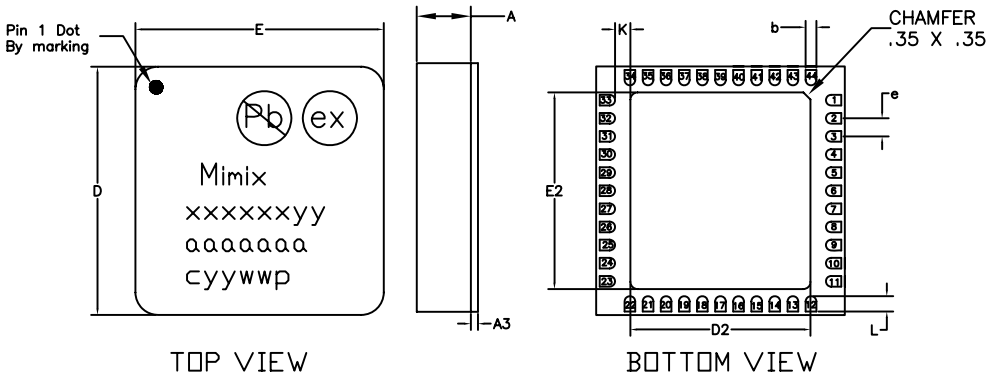
XU1005-QD, P1dB Compression (dBm)

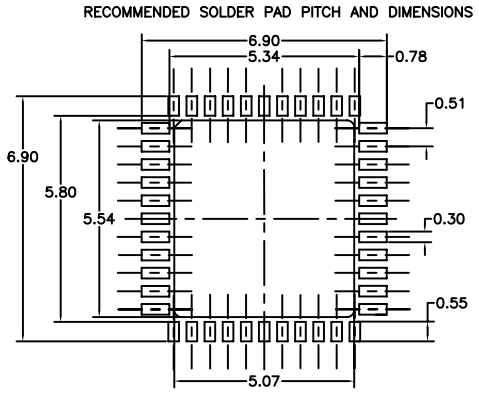


XU1005-QD, LO Leakage at RF (dBm), LO = +4 dBm



Physical Dimensions





Note:

1. ALL DIMENSIONS ARE IN mm.

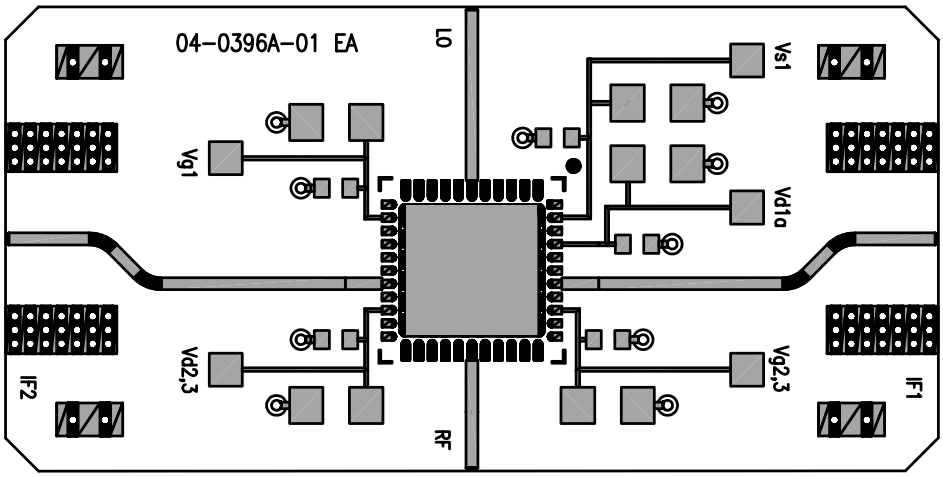
	MIN	TYP	MAX
A	1.47	1.52	1.57
A3		0.20 REF	
b	0.25	0.30	0.35
K	0.43	–	–
D		7.00 BSC	
E		7.00 BSC	
e		0.50	
D2	5.02	5.07	5.12
E2	5.49	5.54	5.59
L	0.38	0.43	0.48

(Note: Engineering designator is 14TX0614)

Pin Table

Pin Number	Pin Name	Pin Function	Nominal Value	Units
1-5	NC	Not Connected		
6	LO	LO Input		
7-12	NC	Not Connected		
13	VG1	Mixer Gate Bias	-0.6	Volts
14-17	NC	Not Connected		
18	IF2	IF2 Input		
19	NC	Not Connected		
20	VD2	Drain Bias	+5.0, 210	Volts, mA
21-27	NC	Not Connected		
28	RF Out	RF Output		
29-35	NC	Not Connected		
36	VG2	RF Amp Gate Bias	-0.1	Volts
37	NC	Not Connected		
38	IF1	IF1 Input		
39-40	NC	Not Connected		
41	VD1	Drain Bias	+5.0, 140	Volts, mA
42	NC	Not Connected		
43	VS1	VS1 Bias	-5.0	Volts
44	NC	Not Connected		

Application Layout



Application Layout Pin Designations

Pin Name	Pin Function	Nominal Value	Unit
GND	Ground		
LO IN	LO Input	7 to 21	GHz
GND	Ground		
VG1	Mixer gate Voltage	-0.6	Volt
IF2 IN	IF2 Input	DC to 3	GHz
VD2	RF Amp Drain Voltage	5	Volt
GND	Ground		
RF Out	RF output	10 to 18	GHz
GND	Ground		
VG2	RF Amp Gate Voltage	-0.1	Volt
IF1 IN	IF1 Input	DC to 3	GHz
VD1	LO Amp Drain Voltage	5	Volt
VS1	LO Amp Bias Voltage	-5	Volt
NC	Not Connected		

App Note [1] Biasing - This device is operated by separately biasing Vd(1,2)=5.0V, Vss=-5.0V, Id1=140mA, Id2=210mA and Is1=140mA. Additionally, a mixer is also required with Vg1=-0.6V. Adjusting Vg1 above or below this value can adversely affect conversion gain, LO/RF isolation and intercept point performance. Gain control can be adjusted by varying Vg2 from 0.0 to -1.2 V with 0.0V providing minimum attenuation and -1.2 V providing maximum attenuation. It is also recommended to use active biasing to keep the currents constant as the RF power and temperature vary; this gives the most reproducible results. 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. 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.

MTTF Tables (TBD)

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

Backplate Temperature	Channel Temperature	Rth	MTTF Hours	FITs
55 deg Celsius	deg Celsius	C/W	E+	E+
75 deg Celsius	deg Celsius	C/W	E+	E+
95 deg Celsius	deg Celsius	C/W	E+	E+

Bias Conditions: Vd1=Vd2=5.0V, Vss=-5.0V, Id1=140mA, Id2=210mA, Id3=140mA, Is1=140mA

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. The package is a low-cost plastic package. 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

Part Number for Ordering	Description
XU1005-QD-0N00	Ni/Au plated RoHS compliant QFN 7x7 44L surface mount package in bulk quantity
XU1005-QD-0N0T	Ni/Au plated RoHS compliant QFN 7x7 44L surface mount package in tape and reel
XU1005-QD-EV1	XU1005-QD Evaluation Module

We also offer this part with alternative plating options. Please contact your regional sales manager for more information regarding different plating types.