XP1044-QL

3W Power Amplifier Module 4.0-5.9 GHz

Rev. V2

Mimix Broadband

Features

- 34 dBm P1dB
- Pout 26 dBm @ EVM = 2.5% (PAR=9.17 dB)
- 46 dBm OIP3
- 18.5 dB Gain
- 8V Voltage Supply
- Input Internally Matched
- 7x7mm Surface Mount Package
- Ideal for WiMAX Applications @ 5.8 GHz and
- Applications between 4 GHz and 5 GHz
- RoHS* Compliant and 260°C Reflow Compatible

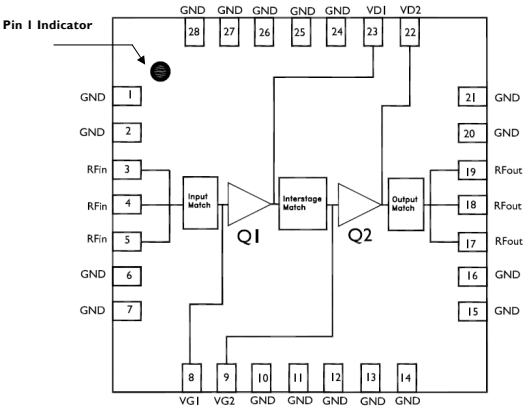
Description

The XP1044 is a highly linear 2-stage power amplifier capable of 18.5 dB of gain, 34 dBm of power at 1 dB compression and is housed in an RoHS compliant 7x7mm package. The XP1044 provides less than 2.5% EVM at 26 dBm output power with 802.16 OFDM signal and peak to average ratio 9.17 dB. The input and output of the device are internally pre-matched facilitating a simplified input and output match. This product operates off an 8V voltage supply and requires negative voltage which is used for current control. The XP1044-QL is specifically designed for WiMAX applications between 4.9 GHz and 5.9 GHz, and the performance can be shifted by adding external matching components to cover applications between 4.0 GHz and 5.0 GHz.

Ordering Information

Part Number	Package
XP1044-QL-0N00	bulk quantity
XP1044-QL-EV1	evaluation module for 4.9 GHz ~ 5.9 GHz
XP1044-QL-EV2	evaluation module for 4.0 GHz ~ 5.0 GHz

Functional Block Diagram



Pin Configuration

Pin No.	Function	Pin No.	Function
3,4,5	RF IN	23	VD1
8	VG!	22	VD2
9	VG2	1,2,6,7,10, 11,12,13, 14,15,16, 20,21,24, 25,26,27, 28	GND
17,18,19	RF OUT		

Absolute Maximum Ratings

Parameter	Absolute Max.
Drain Supply Voltage (Vd)	+9.0 V
Gate Supply Voltage (Vg)	0 V ~ -5 V
RF Input Power (RFin)	+23 dBm
Stage 1 Current (Idd1)	375 mA
Stage 2 Current (Idd2)	750 mA
Power Dissipation (PDC)	9,0 W
Storage Temperature	-55 °C to +150 °C
Junctions Temperature	175 °C
Operating Temperature (Ta)	-40 °C to See Note 2
ESD (HBM)	Class 1A
Moisture Sensitivity level	MSL3
Thermal Resistance (Rth)[1]	15.6 °C

(1) *Thermal resistance of stage 2 only
(2) Calculate maximum operating backside temperature using: Tmax = 167 °C – [Vd*Idd2*Rth]. Thermal resistance of the 1st stage is 2x Rth of the output stage, and therefore Idd1 must not exceed ½ Idd2 for a specific maximum temperature

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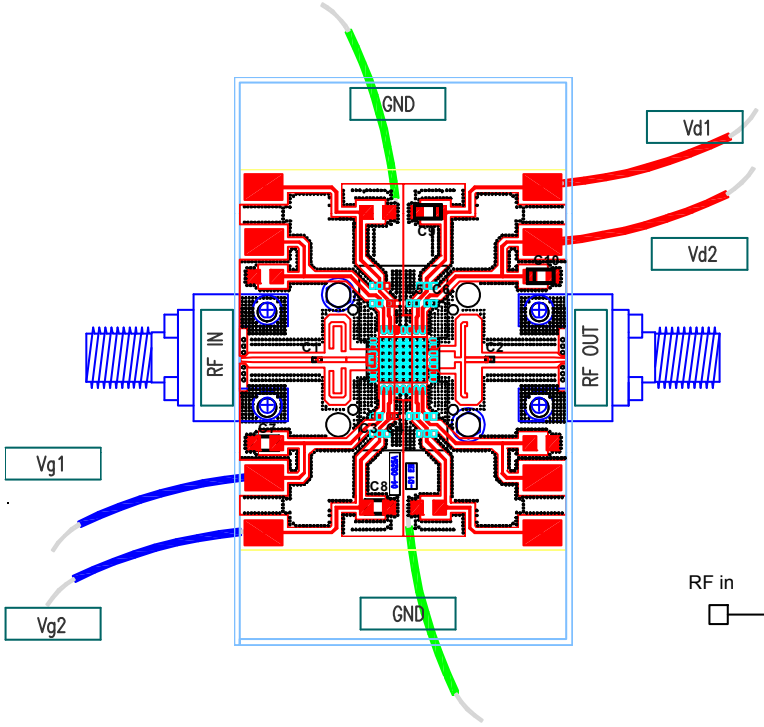
Electrical Specifications: 4.9-5.9 GHz (5.8 GHz Typ.) (Ambient Temperature T = 25°C)[1]

Parameter	Units	Min.	Typ.	Max.
Power Gain	dB	16.5	18.5	
Linear Power (@ EVM=2.5%, OFDM, 802.16 PAR=9.17 dB)	dBm		26.0	
Input Return Loss (S11)	dB		-10.0	
Output IP3 @ 22 dBm/Tone	dBm	44	46.0	
Noise Figure	dB		5	
Output P1dB	dBm	32.5	34.0	
Stage 1 Supply Current (Idd1)	mA		300	
Stage 2 Supply Current (Idd2)	mA		600	
Stage 1 Gate Voltage (Vg1)	V	-1.2	-0.85	-0.5
Stage 2 Gate Voltage (Vg2)	V	-1.2	-0.85	-0.5
Supply Voltage (Vd1 & Vd2)	V		8.0	

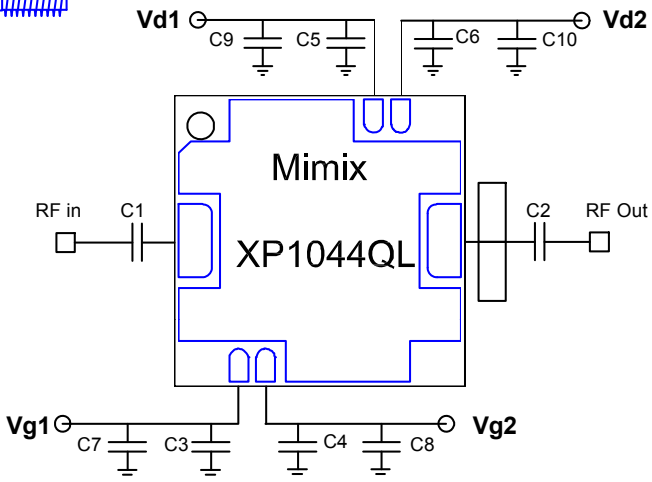
(1) Unless otherwise specified, the following specifications are guaranteed at room temperature in a M/A-COM Tech test fixture.

Evaluation Board Layout (4.9 GHz ~ 5.9 GHz

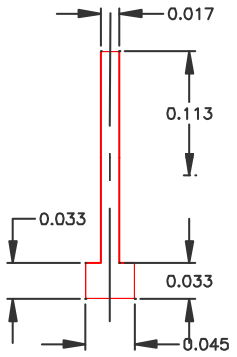


Ref Designator	Description	QTY
C1 , C2	10.0 pF 0402 Capacitor	1
C3, C4, C5, C6	1000 pF 0402 Capacitor	4
C7, C8, C9, C10	1 uF A-Case Capacitor	4

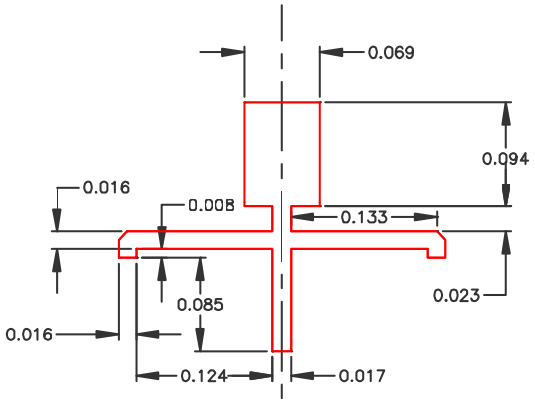
Material: Rogers 4003
Thickness: 8mil



Dimensions are in inches.



Input Match Details

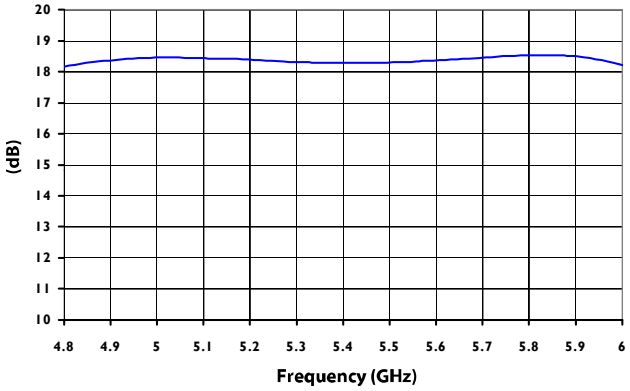


Output Match Details

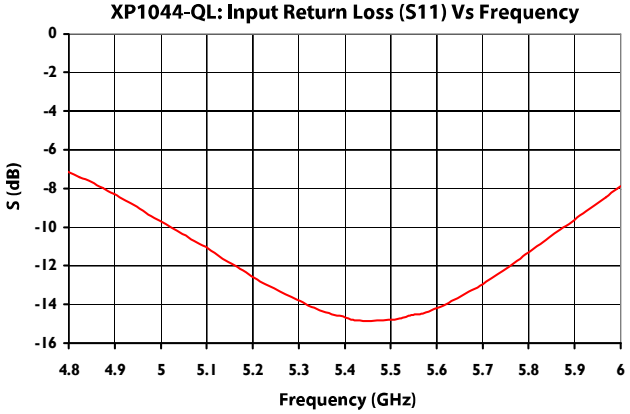
For improved performance at 6 GHz the thick transmission line (W=0.069") on the output can be extended to touch the two open stubs.

Typical Performance Curves (EV1, Idq1 = 300 mA, Idq2 = 600 mA)

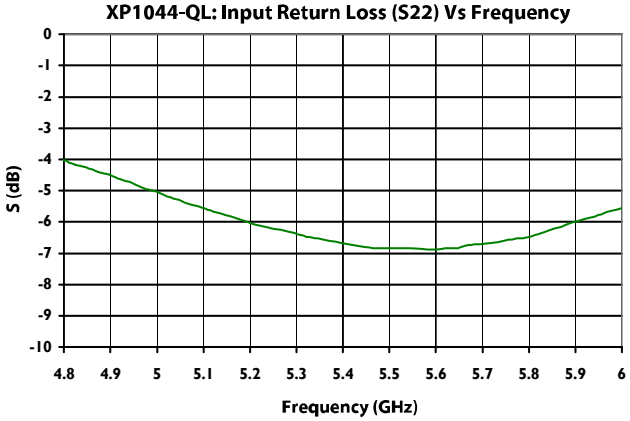
XP1044-QL: Gain Vs Frequency



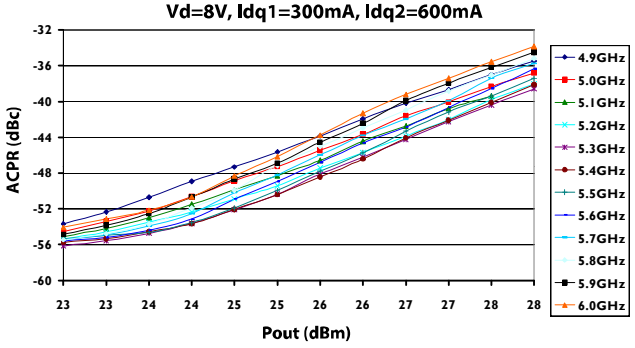
XP1044-QL: Input Return Loss (S11) Vs Frequency



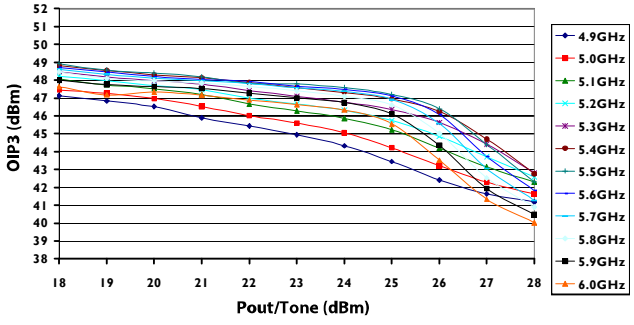
XP1044-QL: Input Return Loss (S22) Vs Frequency



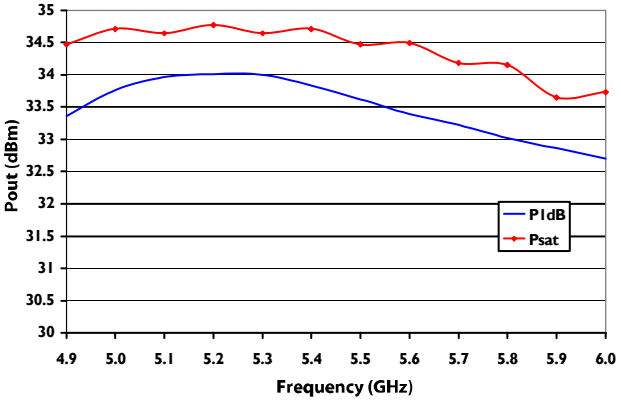
XP1044-QL: WCDMA 3GPP Downlink ACPR vs. Pout
Vd=8V, Idq1=300mA, Idq2=600mA



XP1044-QL: OIP3 vs. Pout
Vd=8V, Idq1=300mA, Idq2=600mA



XP1044-QL: Power vs. Frequency
Vd=8V, Idq1 = 300mA, Idq2 = 600mA



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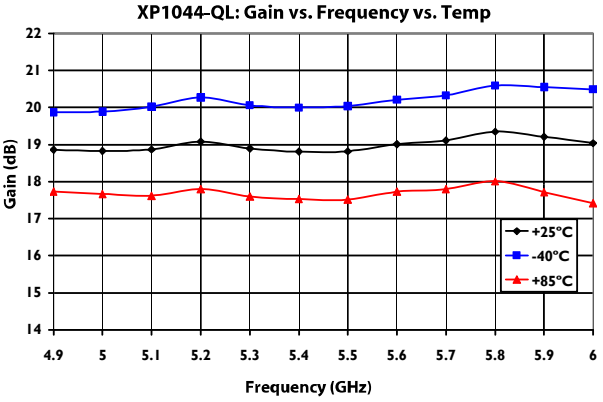
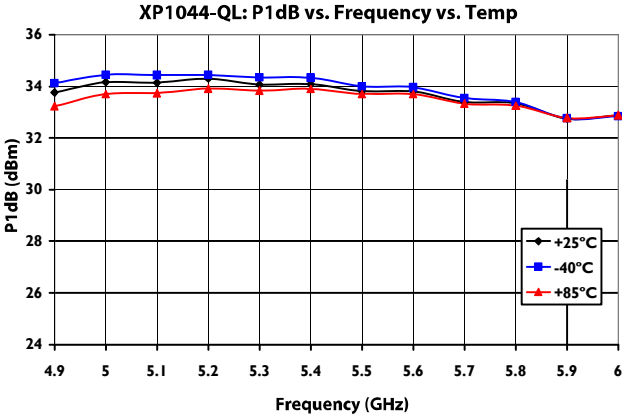
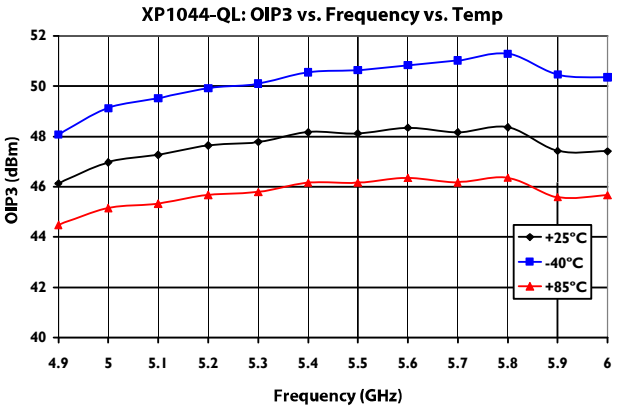
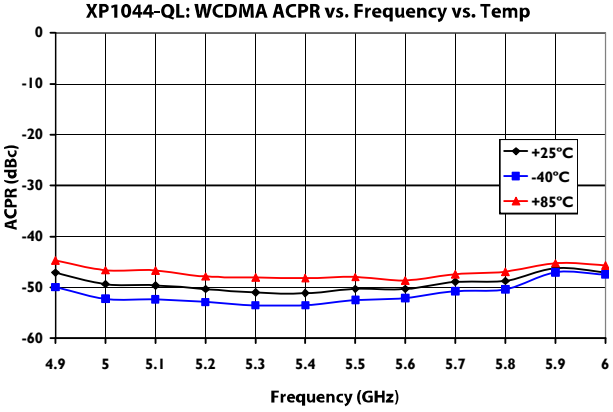
Typical Performance Curves (EV1, Idq1 = 300 mA, Idq2 = 600 mA, Over Temp)









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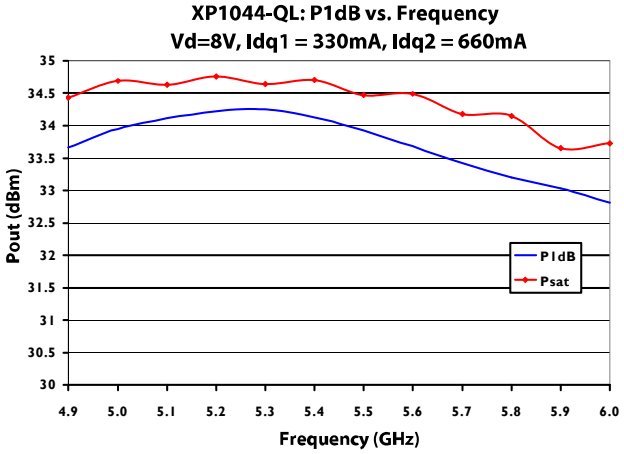
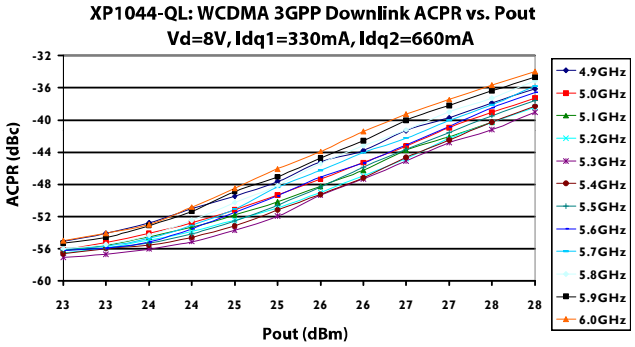
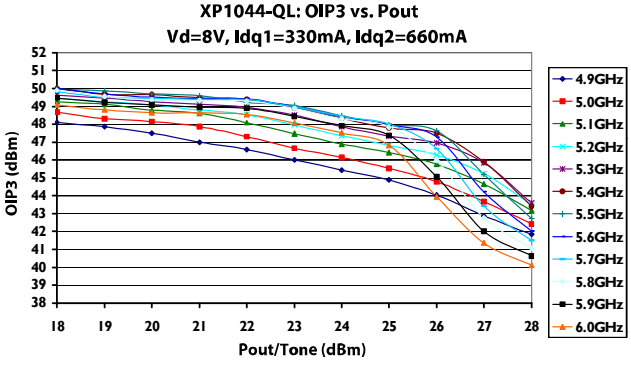
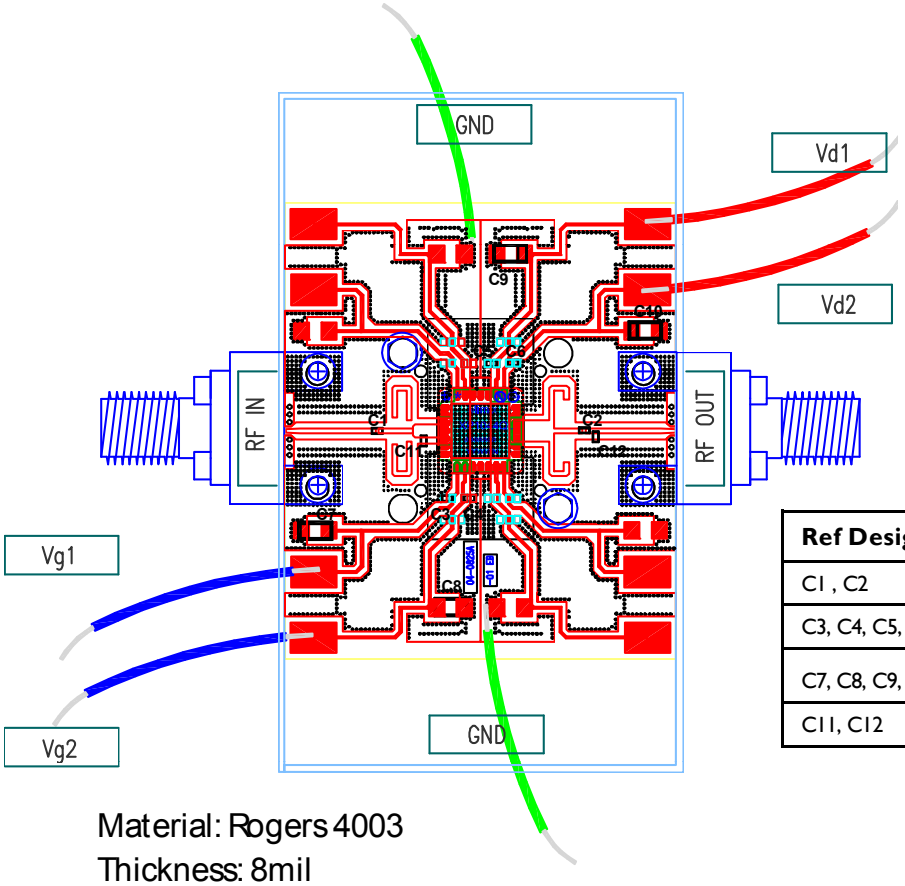
Typical Performance Curves (EV1, Idq1 = 330 mA, Idq2 = 660 mA)







Evaluation Board Layout: EV2 (4.0 GHz ~ 5.0 GHz)



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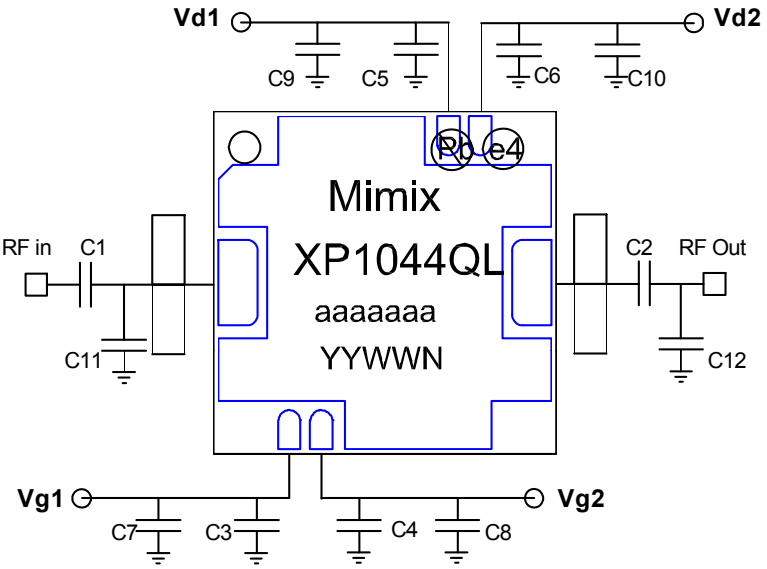
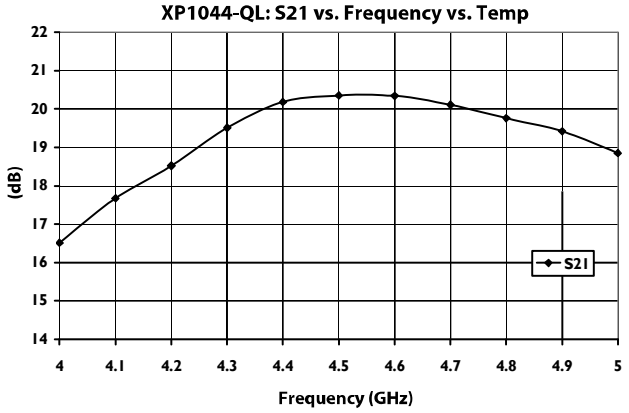
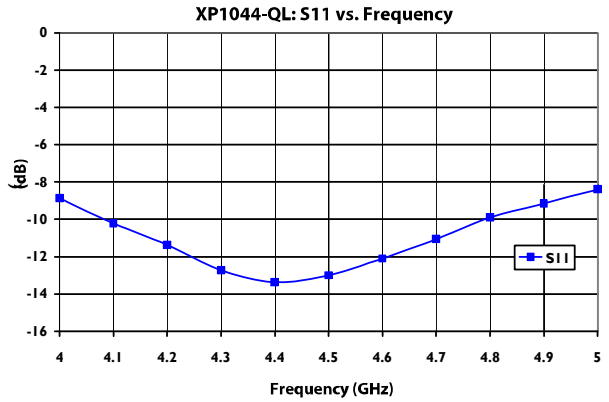
C1 , C2	10.0 pF 0402 Capacitor	1
C3, C4, C5, C6	1000 pF 0402 Capacitor	4
C7, C8, C9, C10	1 uF A-Case Capacitor	4
C11, C12	0.5 pF 0402 Capacitor	2

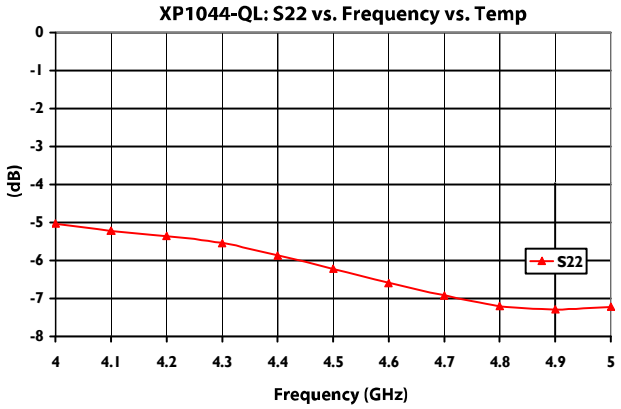
Material: Rogers 4003
Thickness: 8mil

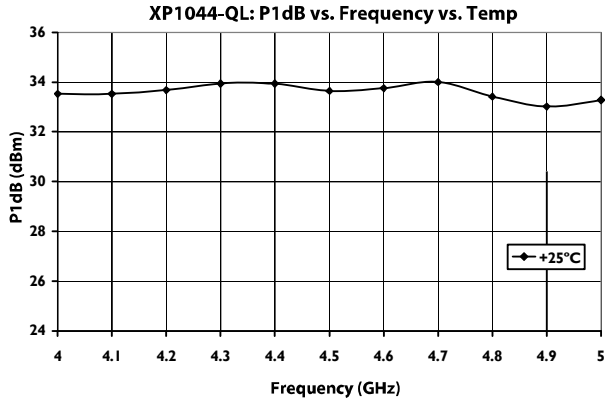


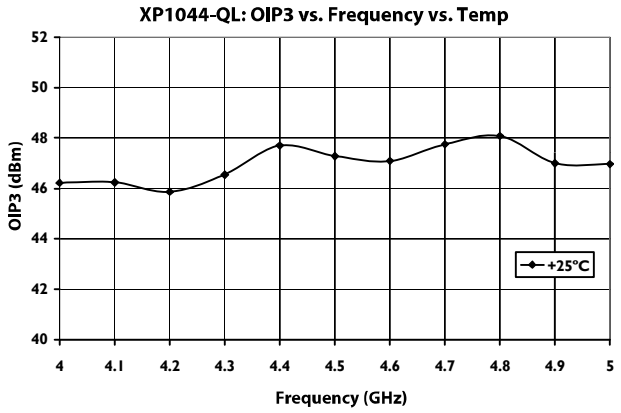
Typical Performance Curves (EV2, Idq1 = 300 mA, Idq2 = 600 mA)

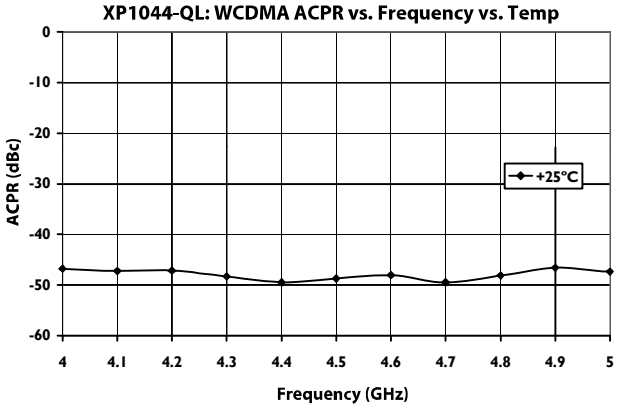












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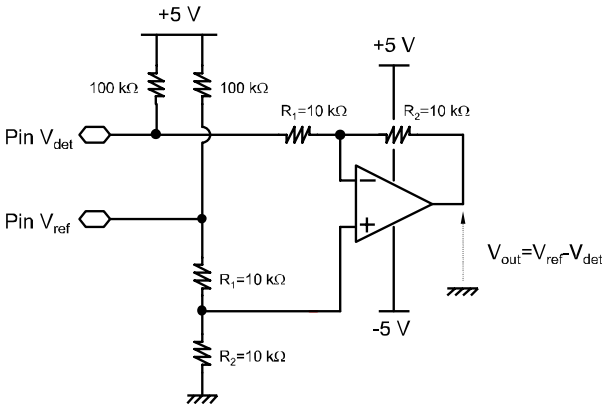
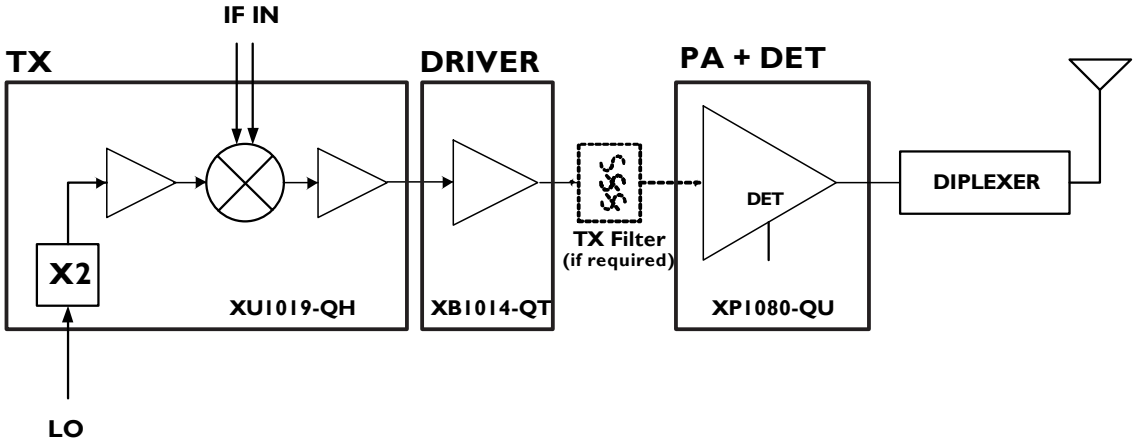
App Note [1] Biasing - The XP1044-QL requires power supply sequencing. Negative voltage supply (VG) needs to be turned on first and then positive voltage can be applied to the drain (VD). When turning off the device, the positive supply (VD) should be turned off first and then negative voltage (VG) can be removed.

The gate voltage is adjusted in order to set the drain current to the desired level. The gate voltage required to achieve a certain current can vary over temperature and from one device to another due to pinch-off voltage variation. Constant drain current can be achieved by implementing an active bias circuit which allows for temperature compensation and eliminates the effect of pinch off voltage variation.

The input stage transistor periphery is half of the output stage transistor periphery and therefore the gate voltages needed to set the first stage current to 300mA and the second stage current to 600mA are the same. The gate voltages can be connected together and a single active bias circuit can be implemented adding a total of 6 components at a cost of approximately $0.15.



Typical Application



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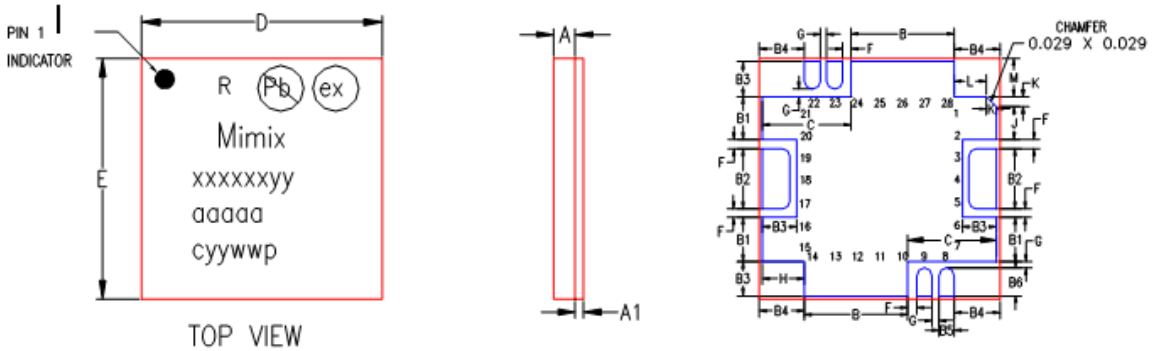
Lead-Free Package Dimensions/Layout



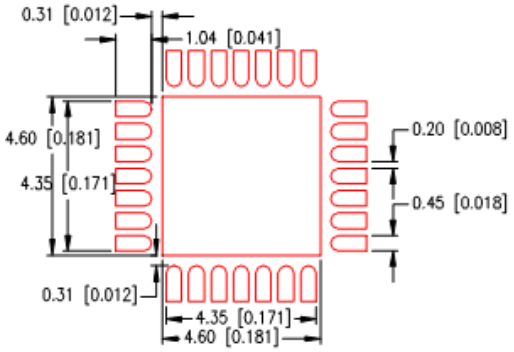
MARKINGS:
PIN 1/BOM REV/Pb FREE SYM
MIMIX CO. NAME
MIMIX PART/MODEL NO.
WAFER LOT NUMBER
DATE CODE/PLATING

NOTE:
1. ALL DIMENSIONS ARE IN MM AND INCHES.

	MIN	TYP	MAX
A	0.61	0.66	0.71
A1	–	0.20	–
B	2.95	3.0	3.05
B1	1.21	1.26	1.31
B2	1.70	1.75	1.80
B3	0.94	0.99	1.04
B4	1.27	1.32	1.37
B5	0.41	0.46	0.51
B6	0.75	0.80	0.85
C	2.47	2.52	2.57
D		7.00 BSC	
E		7.00 BSC	
F	0.20	0.25	0.30
G	0.14	0.19	0.24
H	1.17	1.22	1.27
J	0.92	0.97	1.02
K	0.24	0.29	0.34
L	0.88	0.93	0.97
M	1.05	1.10	1.15

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

RECOMMENDED SOLDER PAD PITCH AND DIMENSIONS
DIMENSIONS ARE IN MM [INCHES]



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.

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