

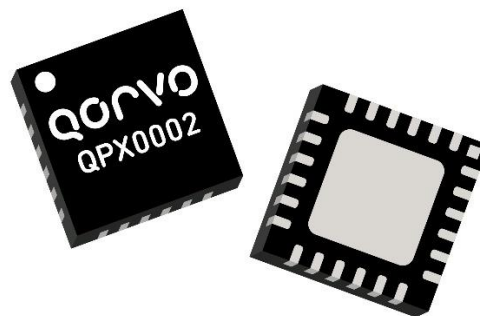


QPX0002

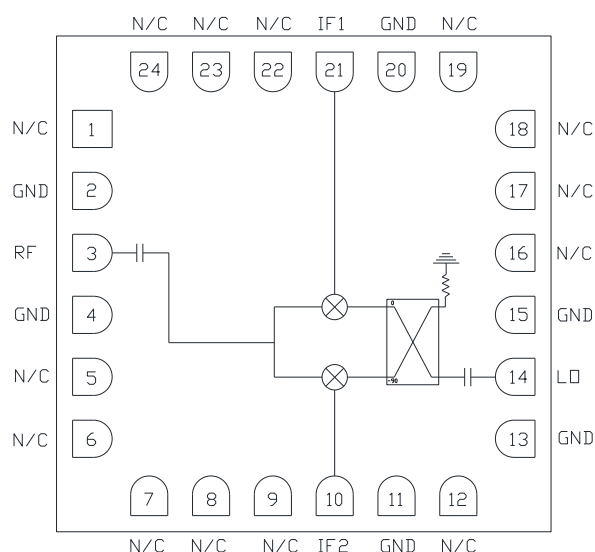
2.5-15 GHz I/Q Mixer

Product Overview

Qorvo's QPX0002 is a compact, wideband I/Q GaAs mixer housed in a 4 x 4 mm air cavity surface mount plastic package. Operating over the 2.5 to 15 GHz bandwidth, the mixer can be configured as an image reject mixer, a single sideband upconverter, or a QPSK modulator/demodulator. The QPX0002 utilizes two double balanced mixer cells and a 90° hybrid internal to the MMIC. An external 90° IF hybrid is required to complete the image rejection or sideband suppression. The QPX0002 is a much smaller alternative to higher cost hybrid I/Q Mixers and single sideband upconverter assemblies.



Functional Block Diagram



Key Features

- I, Q outputs
- RF, LO Frequency Range: 2.5 – 15 GHz
- IF Frequency Range: DC – 1 GHz
- Low conversion loss of 8 dB at 8 GHz
- High image rejection of 22 dB
- High LO/RF isolation > 50 dB at 8 GHz
- Wide operating bandwidth
- Package dimensions: 4 x 4 x 1.2 mm

Performance is typical across frequency. Please reference electrical specification table and data plots for more details.

Applications

- Image reject downconversion
- Single-sideband modulation
- Low noise receiver systems
- Phase detection
- Electronic Warfare (EW)
- QPSK modulation/demodulation

Ordering Information

Part No.	Description
QPX0002SR	100 pcs on 7" reel
QPX0002EVB1	Evaluation Board

Absolute Maximum Ratings

Parameter	Rating
LO, RF, or IF power, CW, 25 °C	+25 dBm
Channel Temperature, T _{ch}	150 °C
Operating Temperature	-40 to 85 °C
Storage Temperature	-55 to 150 °C
Mounting Temperature (30 sec)	260 °C

Exceeding any one or a combination of the Absolute Maximum Rating conditions may cause permanent damage to the device. Extended application of Absolute Maximum Rating conditions to the device may reduce device reliability.

Recommended Operating Conditions

Parameter	Min	Typ.	Max	Units
LO Drive Power	+13	+17	+21	dBm
RF input Power (downconversion)			+17	dBm
IF Input Power (upconversion)			+17	dBm
Temperature Range	-40	+25	+85	°C

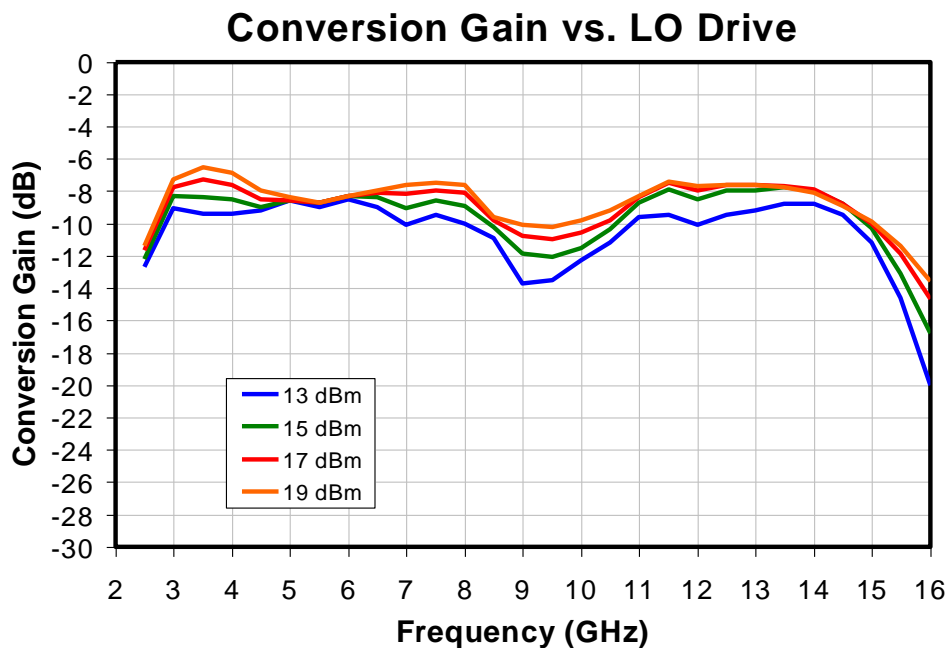
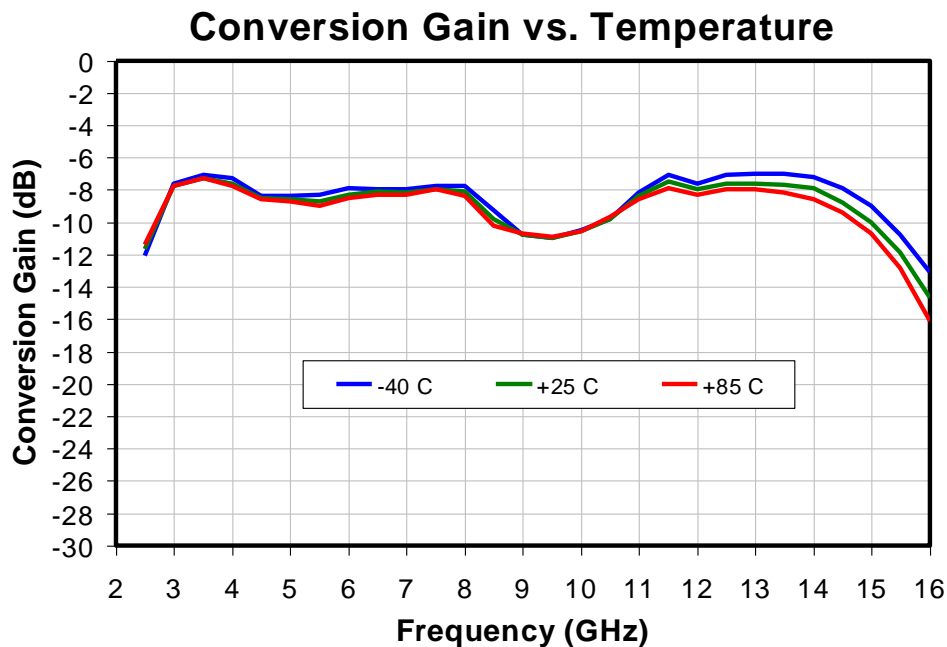
Electrical specifications are measured at specified test conditions. Specifications are not guaranteed over all recommended operating conditions.

Electrical Specifications

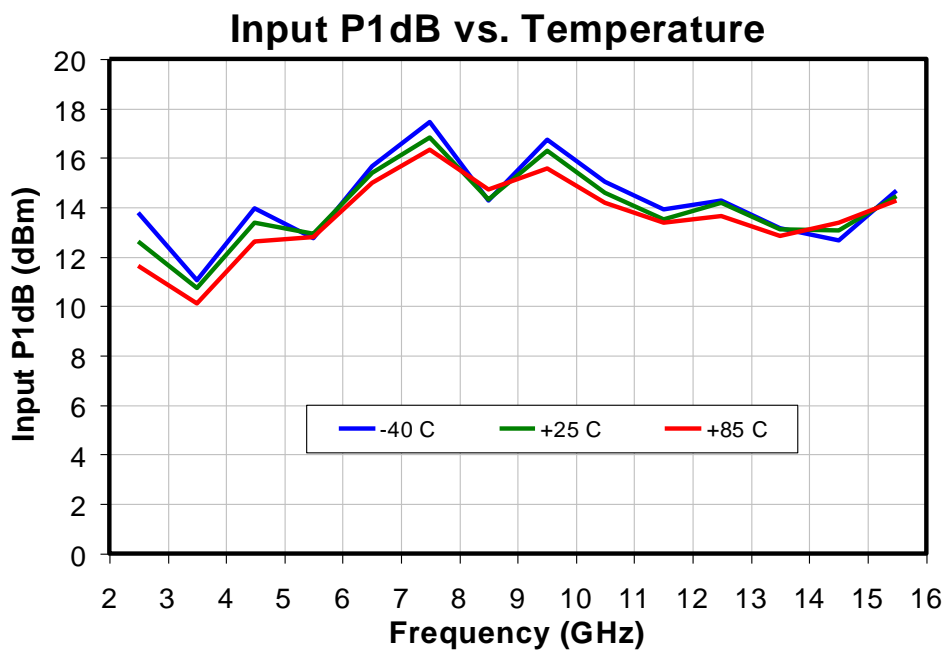
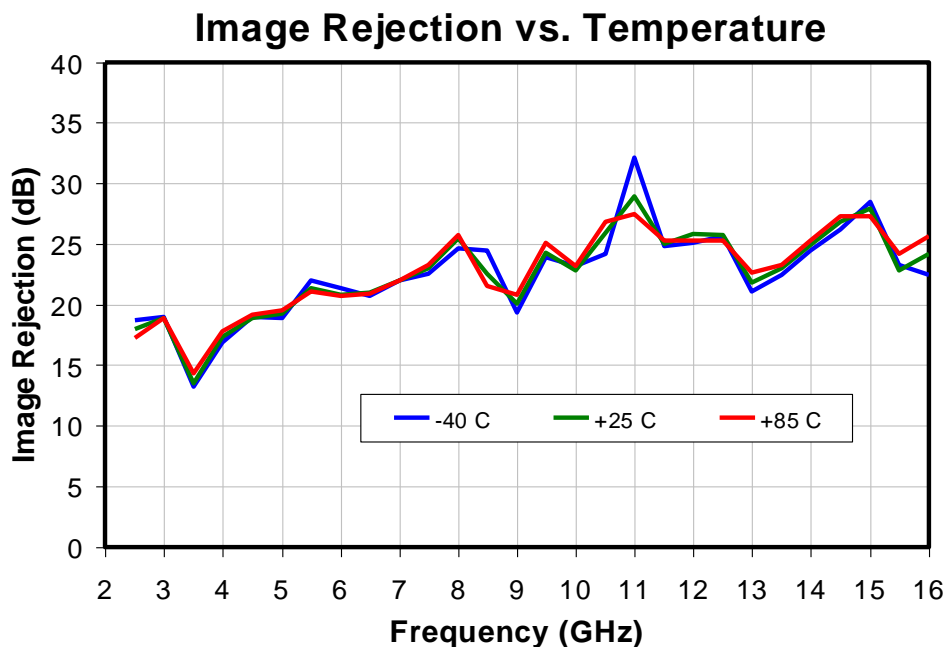
Test conditions unless otherwise noted: 25 °C, IF = 100 MHz USB, LO = +17 dBm

Parameter	Min	Typ.	Max	Units
RF, LO Operational Frequency Range	2.5	–	15	GHz
IF Frequency Range	DC	–	1	GHz
Conversion Gain (with external 90° IF hybrid)	-11.5	-8	–	dB
Image Rejection (with external 90° IF hybrid)	–	23	–	dB
LO to RF Isolation	–	45	–	dB
LO to IF Isolation	–	25	–	dB
Input Power (P _{1dB})	–	+14	–	dBm
Input IP3	–	+22	–	dBm

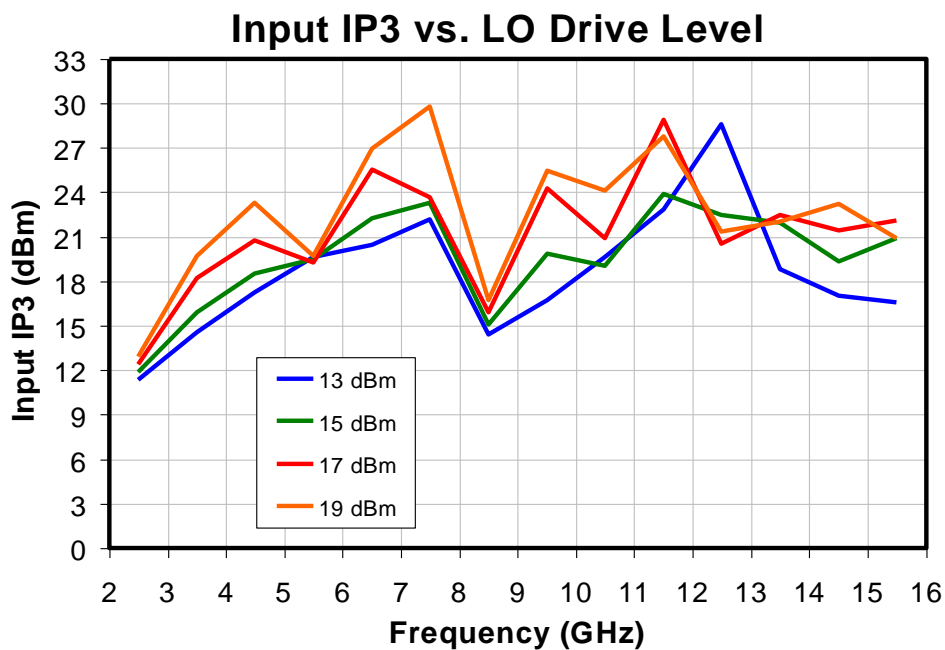
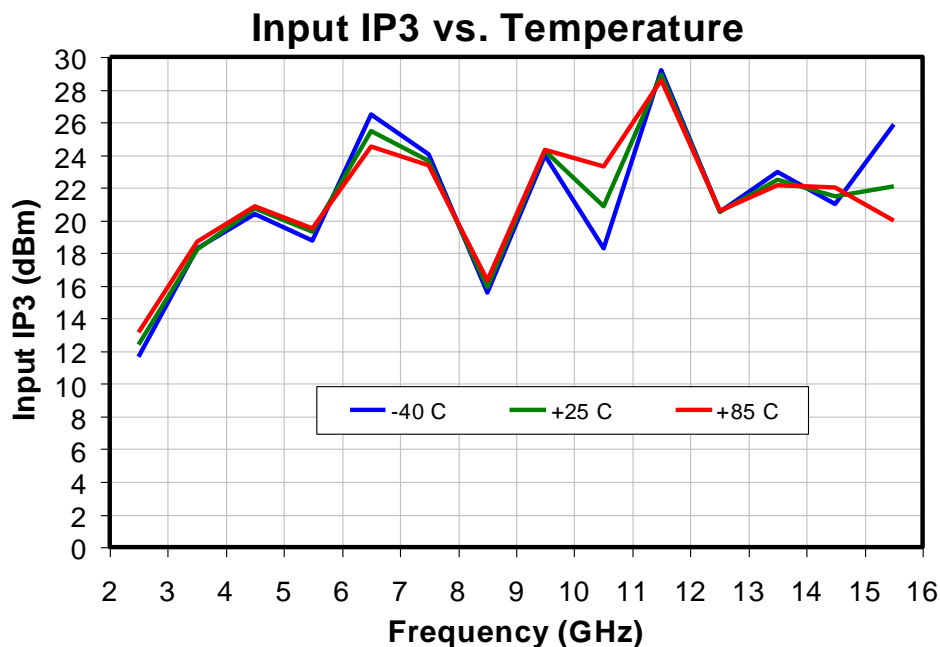
Typical Performance – Data Taken as IRM with External IF Hybrid, IF=100 MHz USB



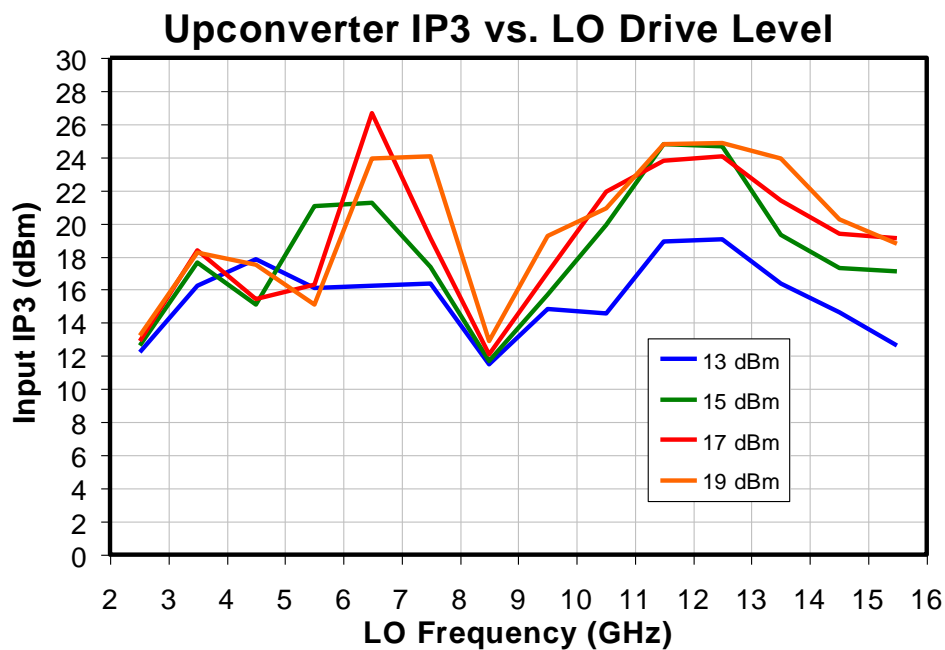
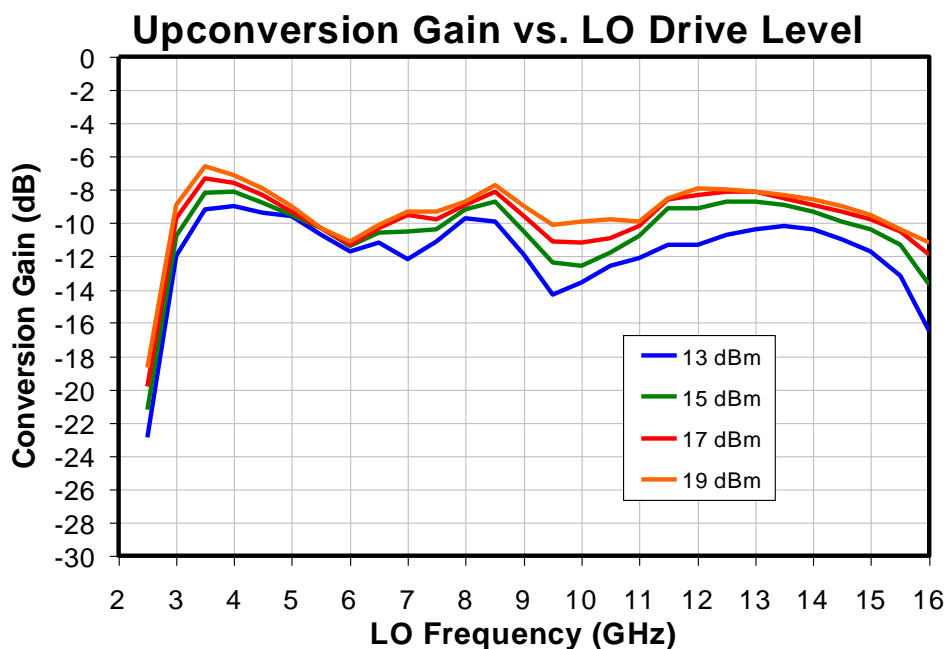
Typical Performance – Data Taken as IRM with External IF Hybrid, IF=100 MHz USB



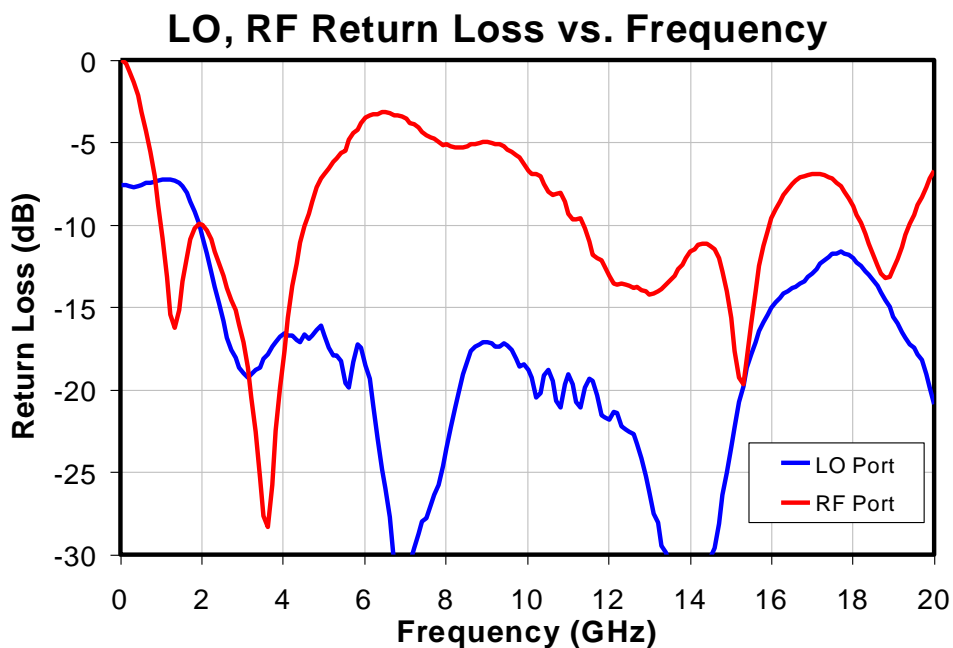
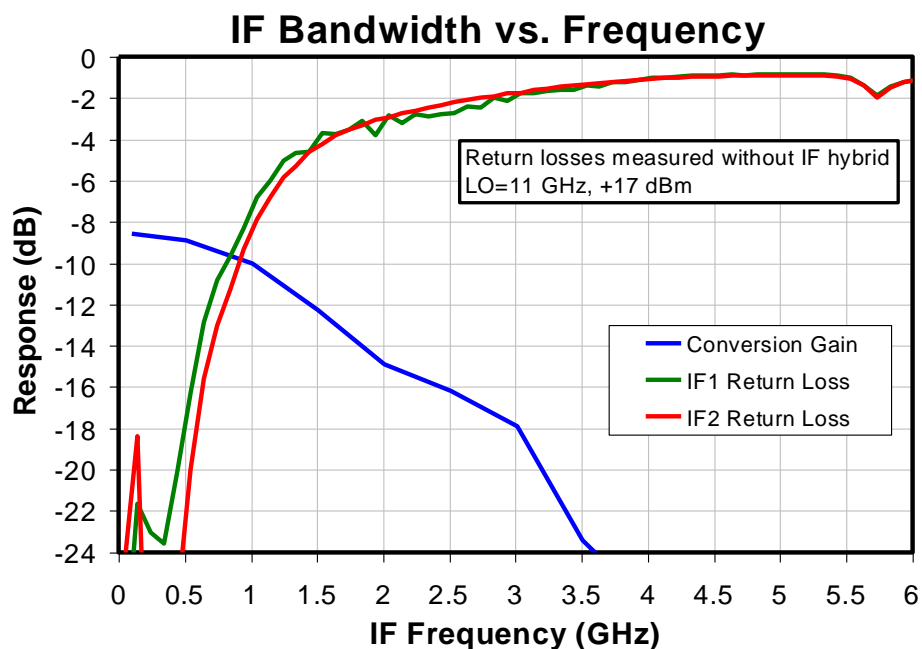
Typical Performance – Data Taken as IRM with External IF Hybrid, IF=100 MHz USB



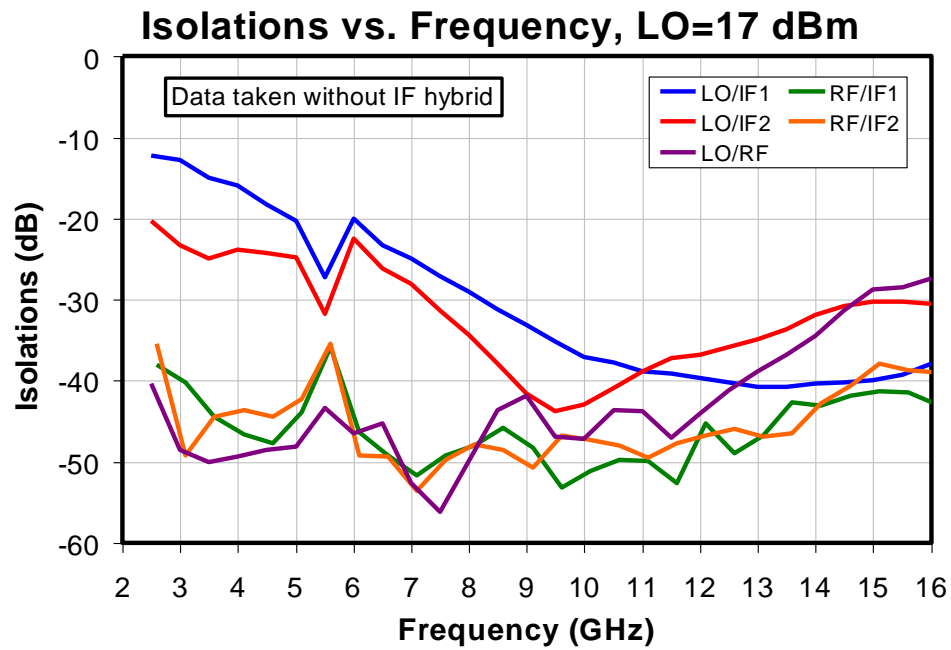
Typical Performance – Data Taken as Upconverter with External IF Hybrid, IF=950 MHz USB



Typical Performance



Typical Performance



Thermal and Reliability Information

Parameter	Test Conditions	Value	Units
Thermal Resistance (θ_{JC}) ⁽¹⁾	T _{BASE} = 85 °C, CW, LO P _{IN} = 17 dBm (0.05 W), P _{DISS} = 0.05 W	279	°C/W
Channel Temperature (T _{CH}) ⁽¹⁾		98.95	°C
Median Lifetime (T _M)		7.0E6	Hrs

Notes:

1. Measured to the back of the package.

Spur Performance

nLO					
mRF	0	1	2	3	4
0	x	-9	20	16	29
1	40	0	60	29	57
2	64	68	45	64	65
3				59	
4					

nLO					
mRF	0	1	2	3	4
0	x	-3	22	11	24
1	44	0		28	60
2			52	66	
3				62	
4					

RF = 8.1 GHz, -10 dBm

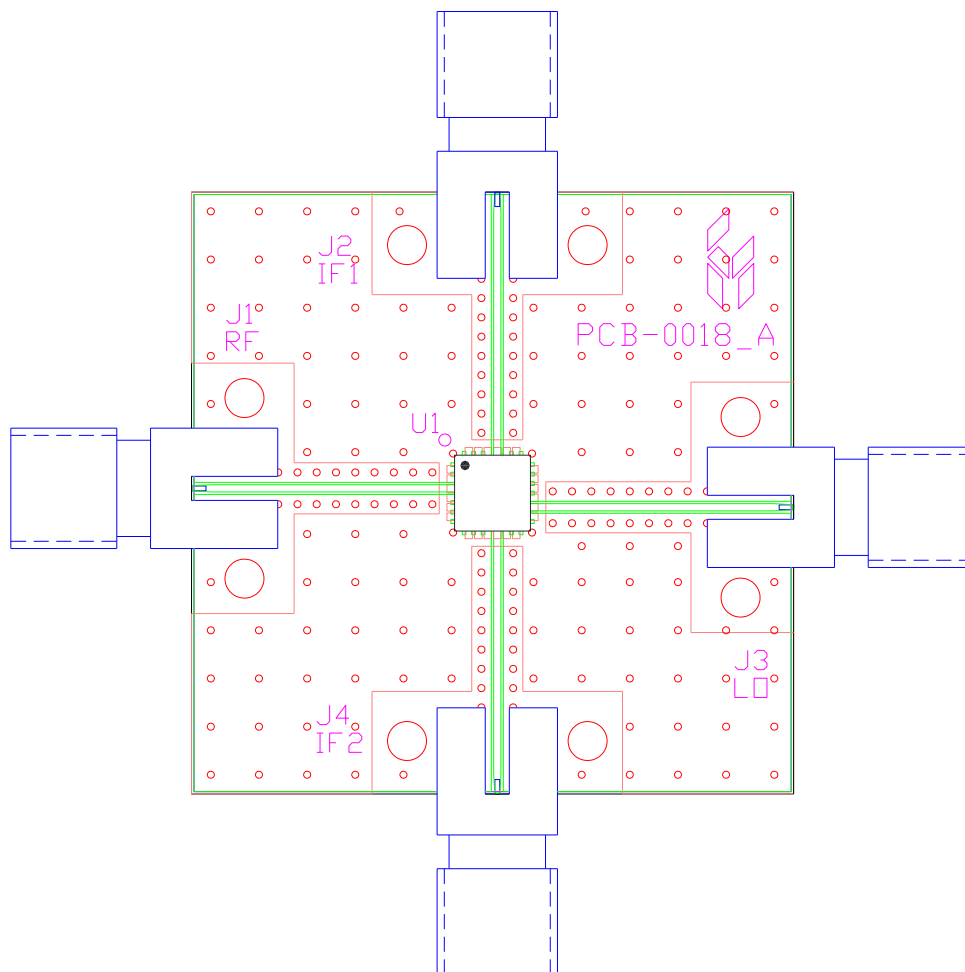
LO = 8 GHz, +17 dBm

All values in dBc below IF output power level (1RF – 1LO)

Data taken as downconverter with no IF hybrid

IF1 response in top table, IF2 response in bottom table.

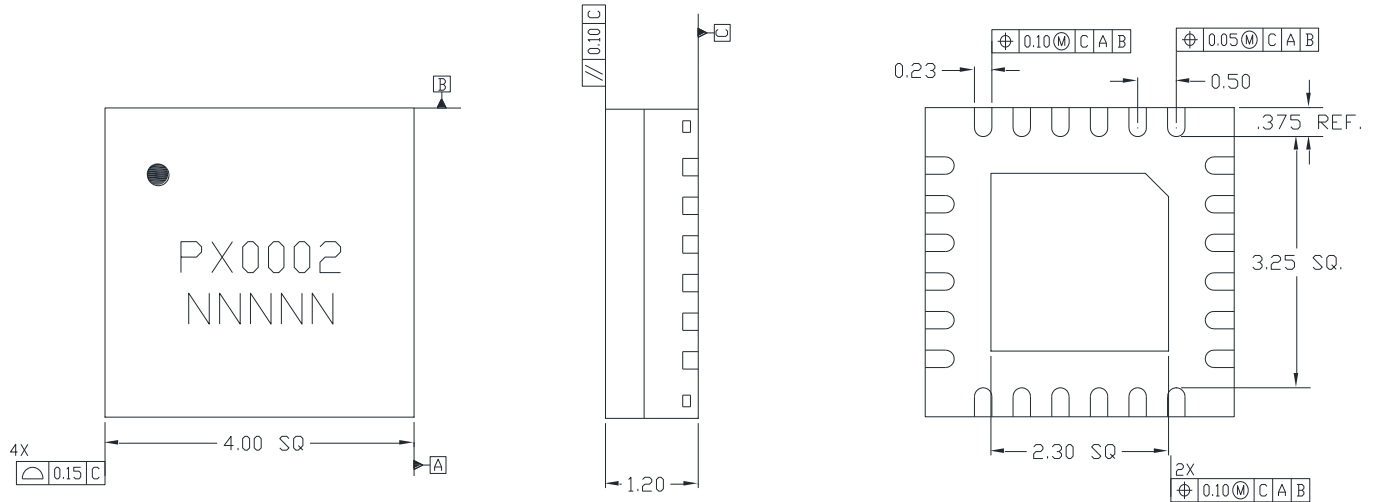
Evaluation Board (EVB) Assembly Layout



Bill of Materials for QPX0002EV1

Reference Des.	Value	Description	Manuf.	Part Number
J1, J2, J3, J4		End Launch Connector		
U1		QPX0002 I/Q Mixer	Qorvo	
PCB		PCB-0018 Evaluation PCB		

Mechanical Information



NOTES:

1. ALL DIMENSIONS AND TOLERANCES ARE WITHIN THOSE INDICATED IN JEDEC MO-220 WITH EXCEPTION OF TOTAL THICKNESS. ALL DIMENSION SHOWN AS mm. CONTROLLING DIMENSION ARE IN mm.
2. LEAD FINISH: ELECTROLESS NICKEL ELECTROLESS PALLADIUM IMMERSION GOLD (ENEPIG) PLATING.
3. MARKING: ALL MARKING SHALL BE PERMANENT AND LEGIBLE
LINE 1: PART NUMBER AS INDICATED
LINE 2: REPRESENTED A 5 DIGITS NNNNN UNIQUE ALPHANUMERIC LOT NUMBER OR LAST 4 DIGITS OF THE CUSTOM MMIC PD NUMBER.
4. INDICATED DIMENSION/TOLERANCE APPLIES TO LEADS AND EXPOSED PAD.
5. REFERENCE ASSEMBLY DRAWING DRAW-AD-0047 FOR ASSEMBLY INFORMATION.
6. ALTERNATE PIN #1 IDENTIFIER WITH CORNER CHAMFER ON GROUND PADDLE IS ACCEPTABLE.

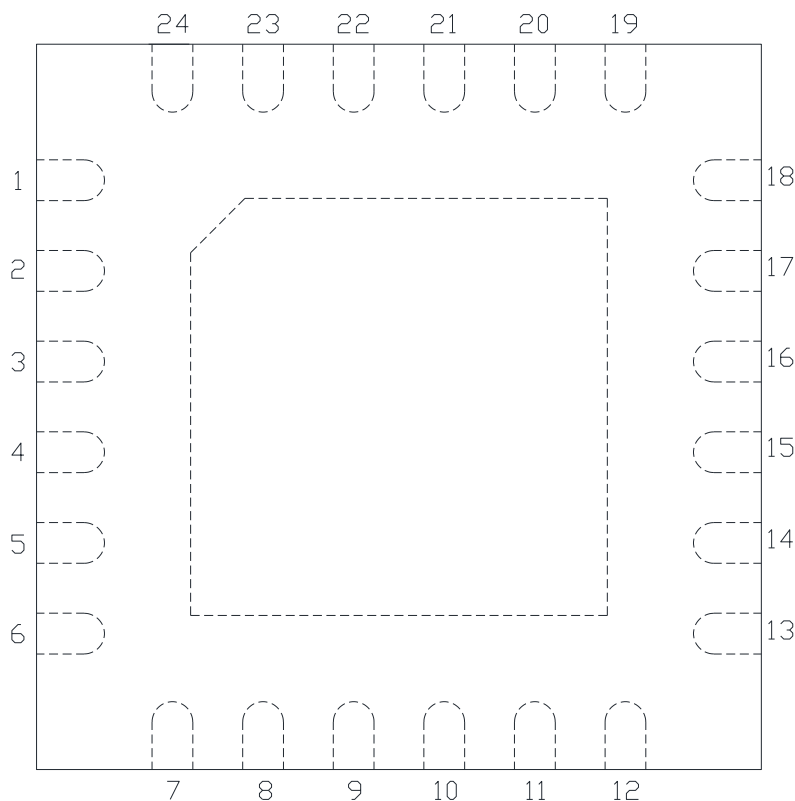
Recommended PCB Land Pattern

Qorvo recommends that the user develop the land pattern that will provide the best design for proper solder reflow and device attach for their specific application. Please review Qorvo Application Note AN 105 for a recommended land pattern approach.

Recommended Solder Reflow Profile

Qorvo recommends screen printing with belt furnace reflow to ensure proper solder reflow and device attach. Please review Qorvo Application Note AN 102 for a recommended solder reflow profile.

Pin Diagram



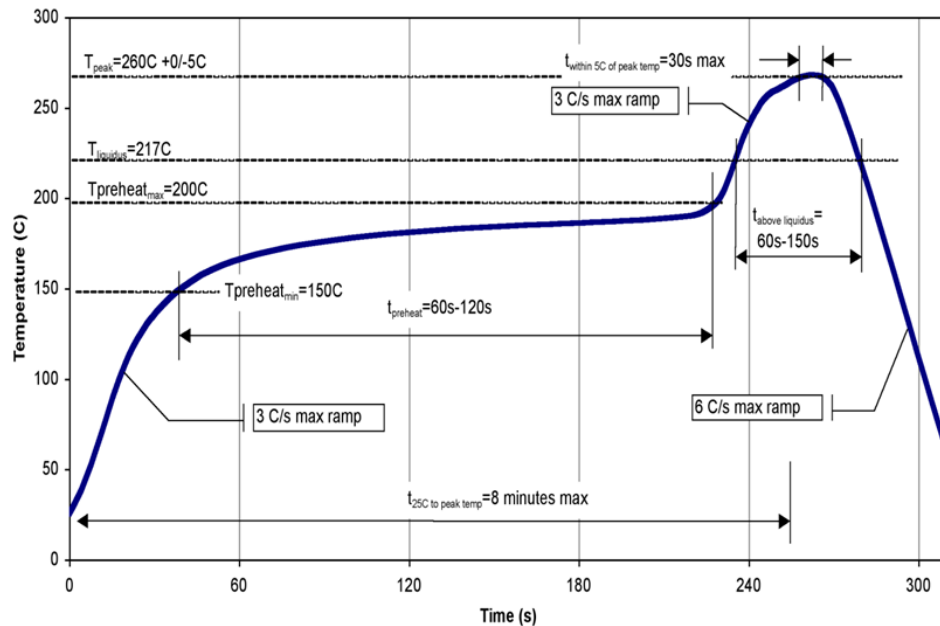
Pin Description

Pad No.	Symbol	Description
1, 5-9, 12, 16-19, 22-24	N/C	No connection required. These pins may be connected to RF/DC ground.
10, 21	IF2, IF1	These pins are DC coupled. For applications not requiring operation to DC, these ports should be DC blocked externally using a series capacitor whose value has been chosen to pass the necessary IF frequency range. For operation to DC, these pins must not source or sink more than 16 mA of current or part non-function or part failure may result.
3	RF	This pin is AC coupled and matched to 50 Ohms.
14	LO	This pin is AC coupled and matched to 50 Ohms.
2, 4, 11, 13, 15, 20, and die paddle	Ground	Connect to RF / DC ground

Assembly Notes

1. Compatible with lead-free soldering processes with 260°C peak reflow temperature.
2. Contact plating: ENEPIG
3. Solder rework not recommended.
4. See Application Note AN102 for further information regarding soldering.

Recommended Soldering Temperature Profile



Handling Precautions

Parameter	Rating	Standard
ESD – Human Body Model (HBM)	Class 1A	ESDA / JEDEC JS-001-2012
MSL – Moisture Sensitivity Level	Level 3	JEDEC standard IPC/JEDEC J-STD-020



Caution!
ESD-Sensitive Device

RoHS Compliance

This part is compliant with 2011/65/EU RoHS directive (Restrictions on the Use of Certain Hazardous Substances in Electrical and Electronic Equipment) as amended by Directive 2015/863/EU.

This product also has the following attributes:

- Lead Free
- Antimony Free
- TBBP-A (C₁₅H₁₂Br₄O₂) Free
- PFOS Free
- SVHC Free

Contact Information

For the latest specifications, additional product information, worldwide sales and distribution locations:

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