12 – 16 GHz GaAs MMIC Image Reject I/Q Upconverter

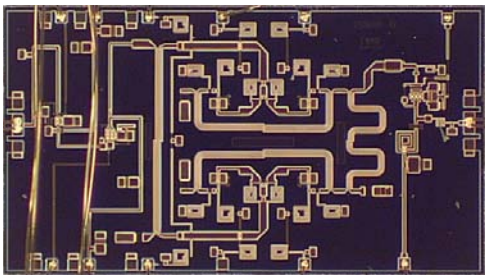
EWU1501ZZ

September 2009 – Rev 2
Preliminary

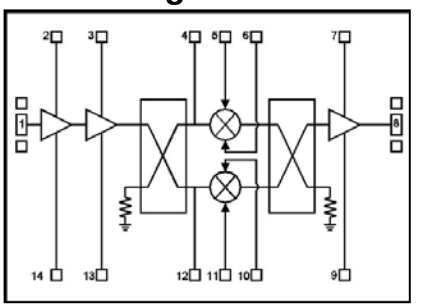
Features

- Integrated I/Q Mixer with LO Driver Amplifier
- RF & LO Frequency: 12 to 16 GHz
- IF Bandwidth: 0 to 3.5 GHz
- Conversion Gain: -2 dB, typical
- LO Drive Level: 0 dBm, typical
- Input IP3: +25 dBm, typical
- LO/RF Rejection: -40 dB, typical
- Image Rejection: -20 dB, typical
- Die size: 4.475 x 2.5 x 0.1 mm
- 100% RF and DC tested
- RoHS Compliant

Device Photo



Block Diagram



Description

The Endwave *EWU1501ZZ* is a highly integrated GaAs pHEMT MMIC upconverter which provides -2 dB of conversion gain, +25 dBm input third order intercept and 35 dB image rejection with only 0 dBm of LO power. The balanced image reject mixer topology is driven by a 2 stage LO buffer amplifier. The I/Q mixer can be used as a single-sideband modulator or as an IF-RF converter with an external balun and is followed by a single stage, self-biased RF amplifier with an optional gate bias point for gain adjustment. The device can be used for a wide range of applications from defense electronics to commercial communication systems. All parts are 100% DC and RF tested and visually inspected to Mil-Std-883 Method 2010.

Electrical Characteristics (Temperature = +25 °C)

Parameter	Min.	Typ.	Max.	Units
Frequency Range, IF	0		3.5	GHz
Frequency Range, RF/LO	12		16	GHz
Conversion Gain (I&Q applied)(1,2)		2		dB
Image Rejection		-20		dB
LO to RF Isolation		40		dB
LO to IF Isolation		20		dB
Input 3rd-Order Intercept with IF=17&18 MHz		+25		dBm
Amplitude Balance			1	dB
Phase Balance			9	°
IF Return Loss		-6		dB
LO Return Loss		-7		dB
RF Return Loss		-10		dB
Drain Bias Voltages (Vd1, 2, 4)		+4.2		V
Drain Bias Currents (Id1+Id2) @ 4.2V		105		mA
Drain Bias Current (Id4) @ 4.2V		68		mA

Note 1: I & Q applied with DC offset voltages to reduce LO leakage, LO = 0 dBm
Note 2: Mixer Gate Bias Vg3 = -1.0 volt

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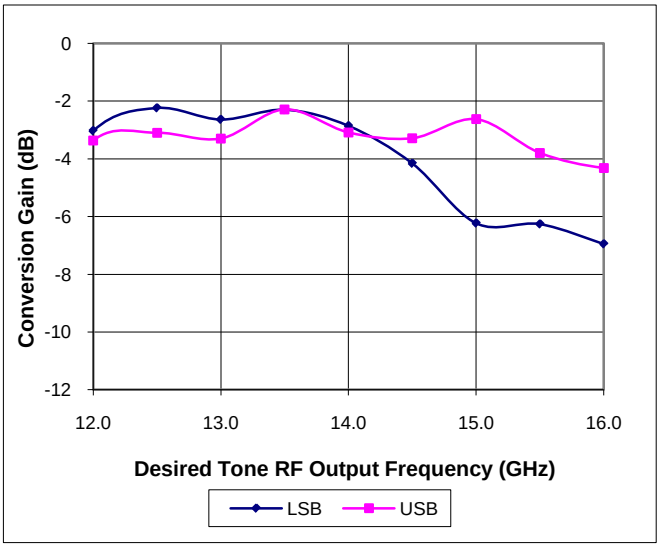
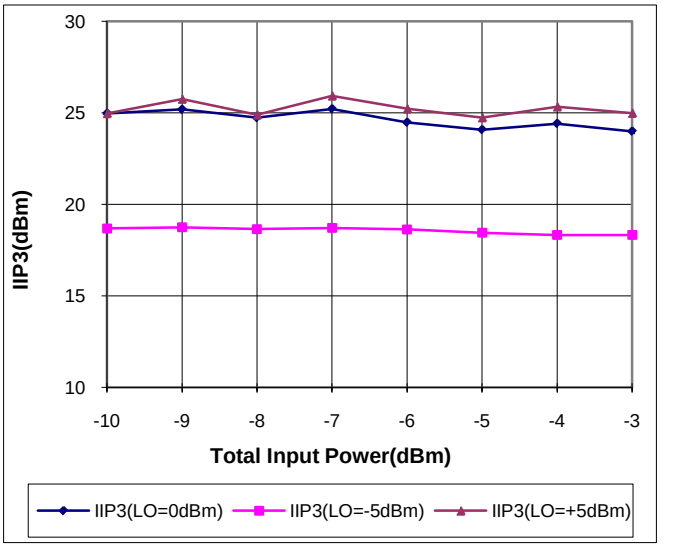
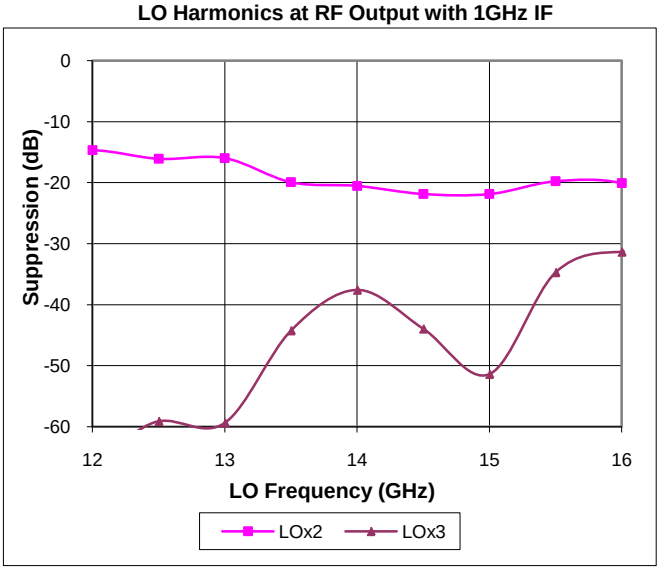
Conversion Gain vs. RF Output Frequency with 1GHz IF Input



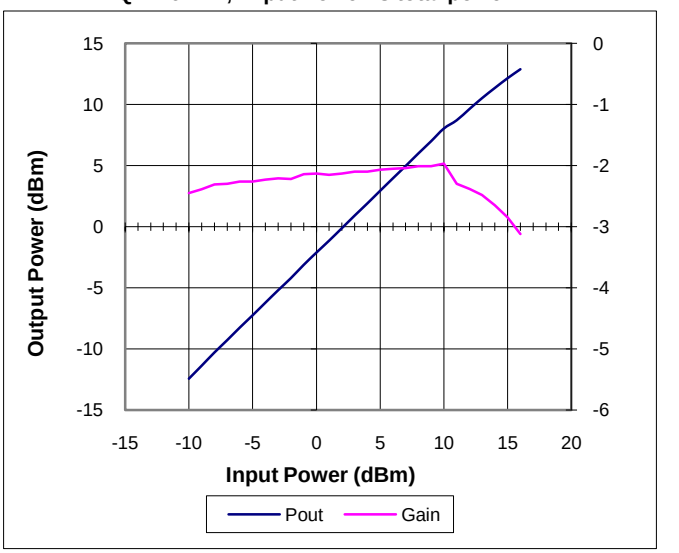
IIP3 vs. Input Power
Input power = Total power both tones IQ @ 17, 18 MHz



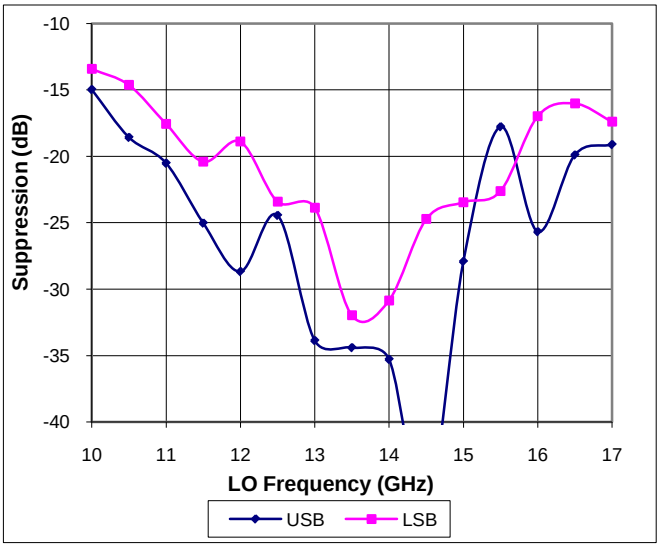
LO Harmonics at RF Output with 1GHz IF



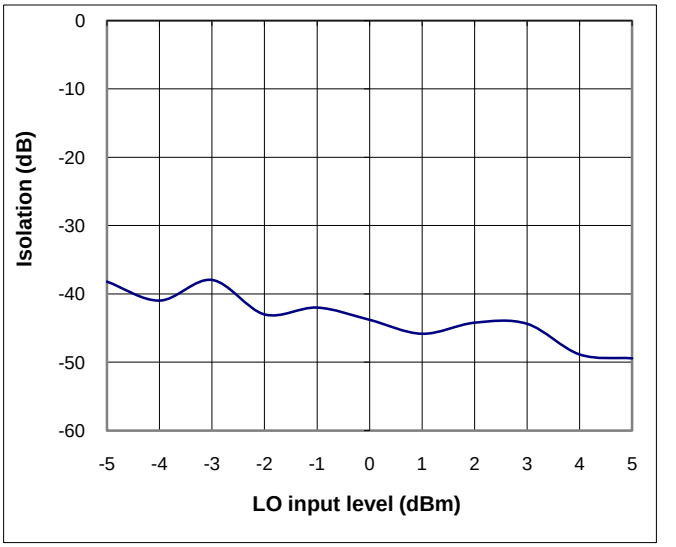
Input vs. Output Power and Gain
IQ = 16MHz; Input Power is total power



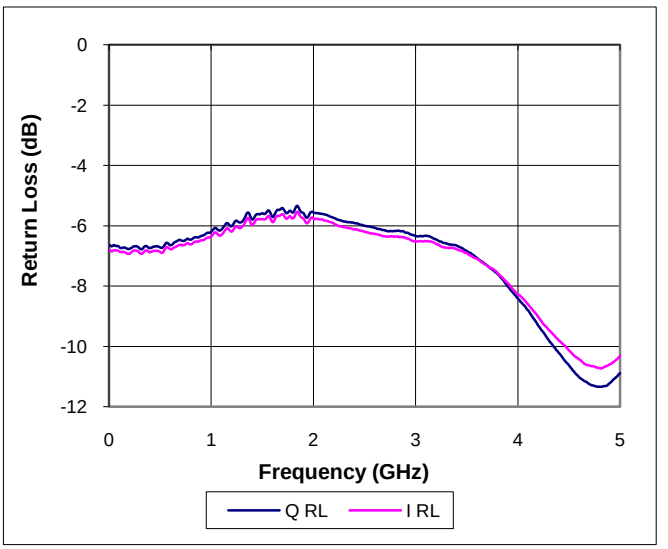
Sideband Suppression vs. LO Frequency with 1GHz IF



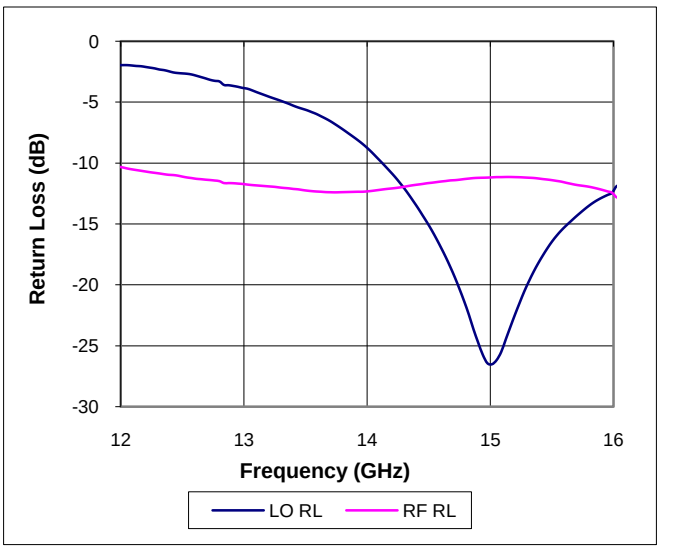
LO - RF Isolation at 15GHz
I and Q Offsets optimized for LO cancellation



I & Q Return Loss vs. Frequency



LO & RF Return Loss vs. Frequency



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Mixers – I/Q Upconverter – Bare Die

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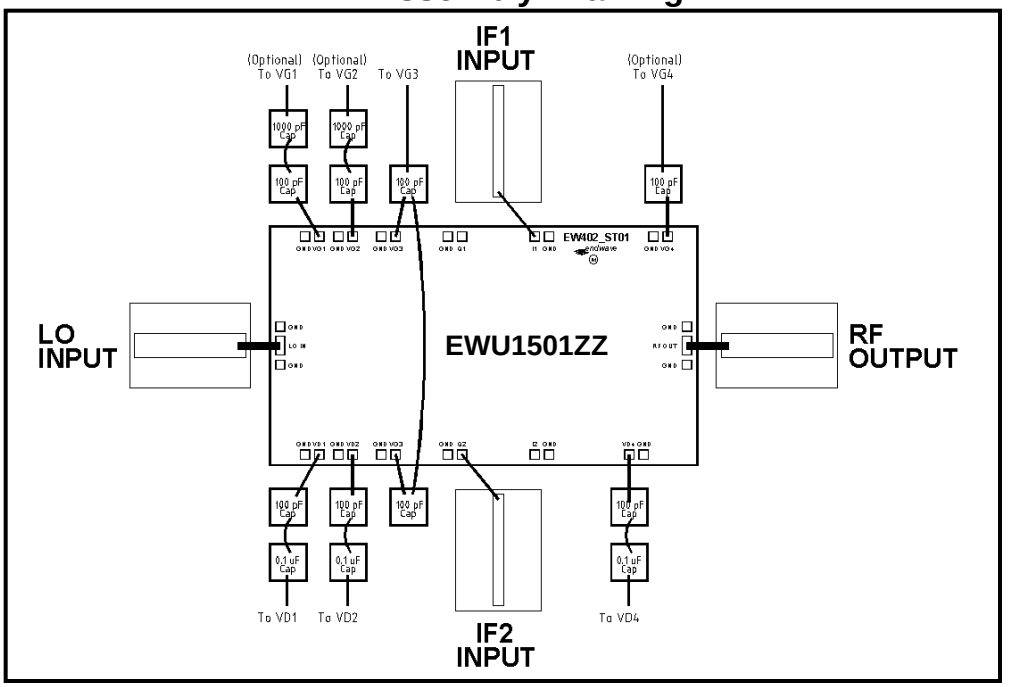
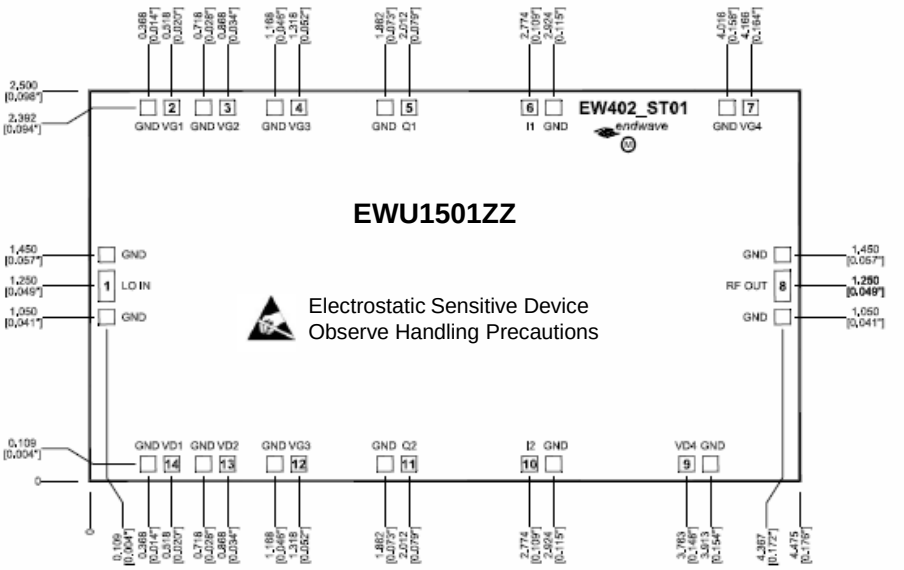
Assembly Drawing



Outline Drawing



Bond Pad #1 - LO In	Bond Pad #8 - RFout
Bond Pad #2 - VG1	Bond Pad #9 - VD4
Bond Pad #3 - VG2	Bond Pad #10 - IF I2
Bond Pad #4 - VG3	Bond Pad #11 - IF Q2
Bond Pad #5 - IF Q1	Bond Pad #12 - RFout
Bond Pad #6 - IF I1	Bond Pad #13 - VG2
Bond Pad #7 - VG4	Bond Pad #14 - VG1

Dimensions in mm [inches]. Die thickness is 0.004".
Bond Pad and backside metallization gold.

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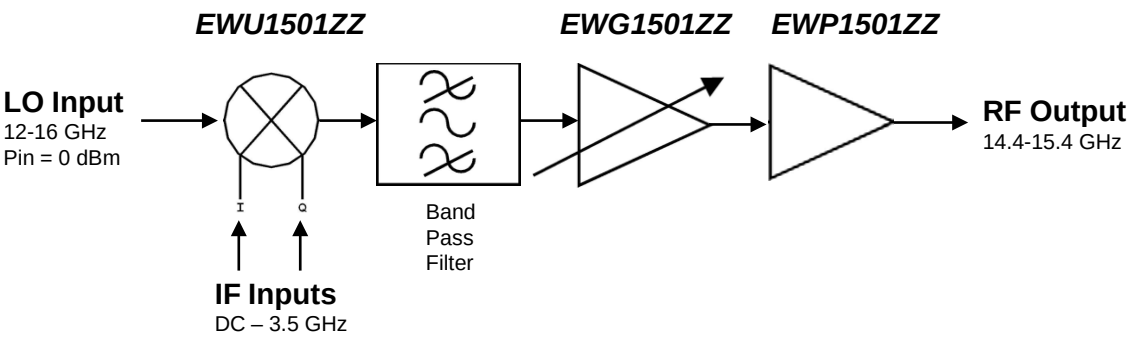
Absolute Maximum Ratings

IF Input Power	+20 dBm
LO Input Power	+20 dBm
Supply Voltage (Vd1, 2, 4)	+5.5 V
Supply Gate Voltage	-2.5V to 0V
Supply Current (Id1, 2)	250 mA
Supply Current (Id4)	135 mA
Storage Temperature	-65 to +150 C
Operating Temperature	-40 to +85 C
Channel Temperature	175 C

Typical Application



Support Documentation

Support documentation including Assembly Notes, Application Notes and Qualification Procedures can be found on our website at www.endwave.com.

Ordering Information

Part Number	Description
EWU1501YZZ	RoHS compliant bare die in waffle or gel packs
EWU1501ZZ-EV	*EWU1501ZZ* in a connectorized test fixture
EWU1501ZYH	RoHS compliant, 6 x 6mm, 40 lead, QFN “H” Package
EWU1501YH-EV	*EWU1501YH* on an Evaluation Board