12 – 16 GHz GaAs MMIC I/Q Upconverter

EWU1501ZZ

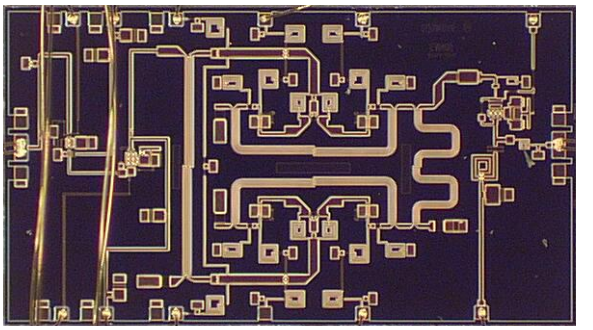
September 2009 – Rev 2

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 Loss: 2 dB typical
- LO Drive Level: 0 dBm typical
- Input IP3: +25 dBm typical
- LO/RF Rejection: -40 dB typical
- Sideband Rejection: -20 dB typical
- Die size: 4.475 x 2.5 x 0.1 mm

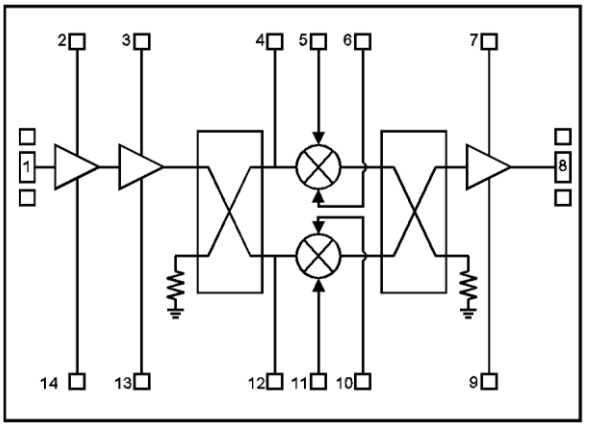
Device Photo



Description

The Endwave *EWU1501ZZ* is a highly integrated 0.15 um GaAs pHEMT MMIC upconverter which provides 2 dB of conversion loss, +25 dBm input third order intercept and 20 dB sideband response with only 0 dBm of LO power. The high degree of LO to RF isolation is achieved through a balanced image reject mixer topology which is driven by a self-biased 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.

Block Diagram

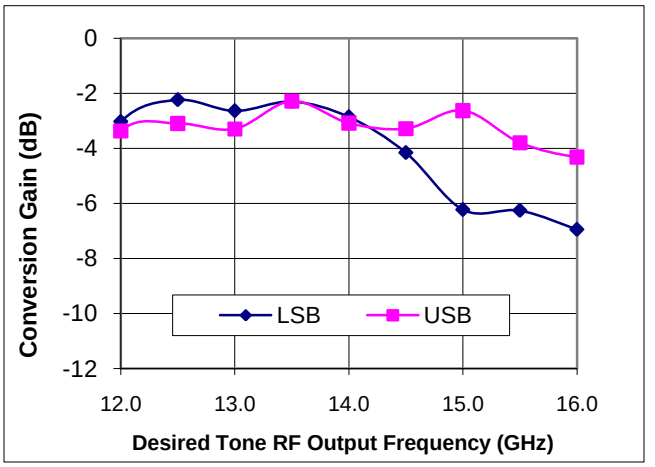


Electrical Characteristics (Temperature = +25 °C)

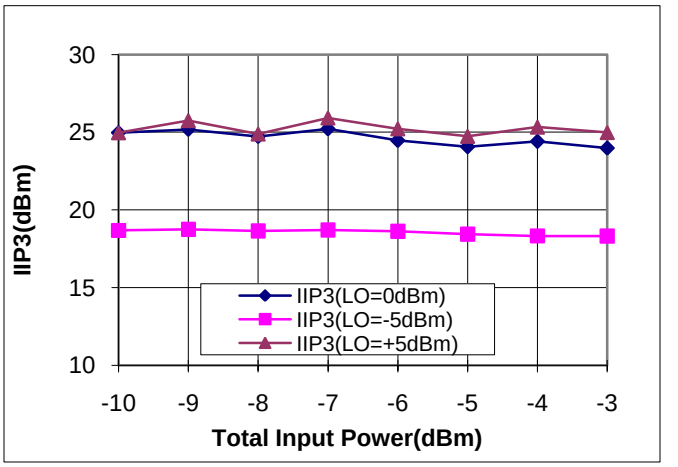
Parameter	Min.	Typ.	Max.	Units
Frequency Range, IF	0		3.5	GHz
Frequency Range, RF/LO	12		16	GHz
Conversion Loss (I&Q applied)(1,2)		2		dB
Sideband Rejection		-20		dB
LO to RF Isolation		-40		dB
Input compression (IP_{-1dB})		+16		dBm
Input 3rd-Order Intercept with IF=17&18 MHz		+25		dBm
Amplitude Balance			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
Gate Bias Voltage (Vg3)		-0.8		V
Drain Bias Currents (Id1+Id2) @ 4.2V		105		mA
Drain Bias Current (Id4) @ 4.2V		68		mA

Note: I & Q applied with DC offset voltages applied to reduce LO leakage, LO = 0 dBm

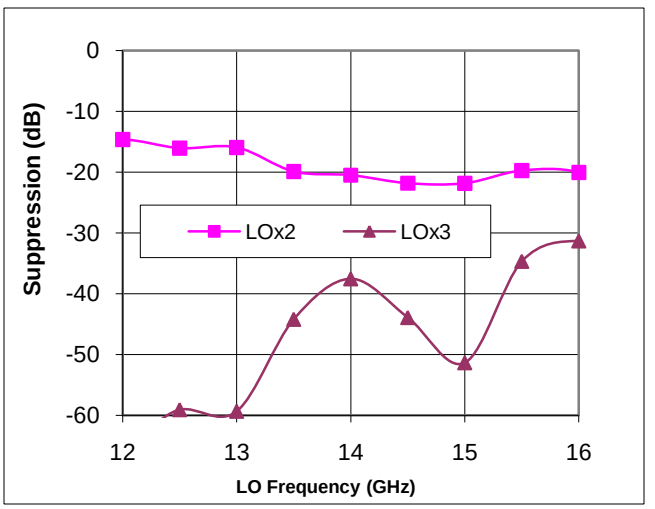
Conversion Gain vs. RF Output Frequency with 1GHz IF Input



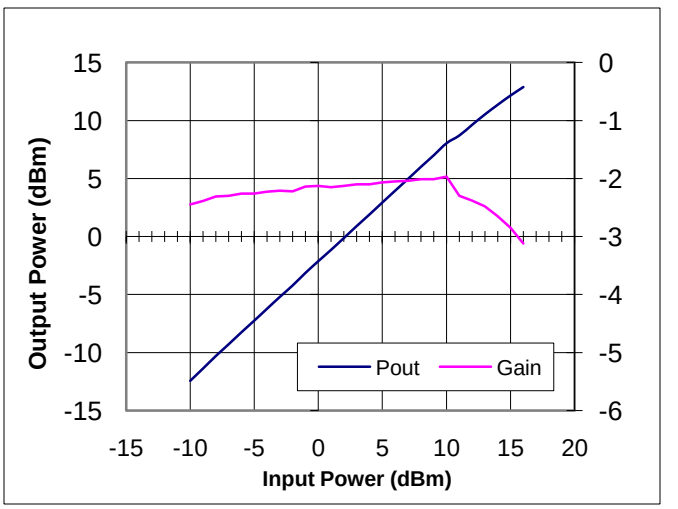
IIP3 vs. Input Power
Input power = Total pwr both tones IQ @ 17, 18 MHz



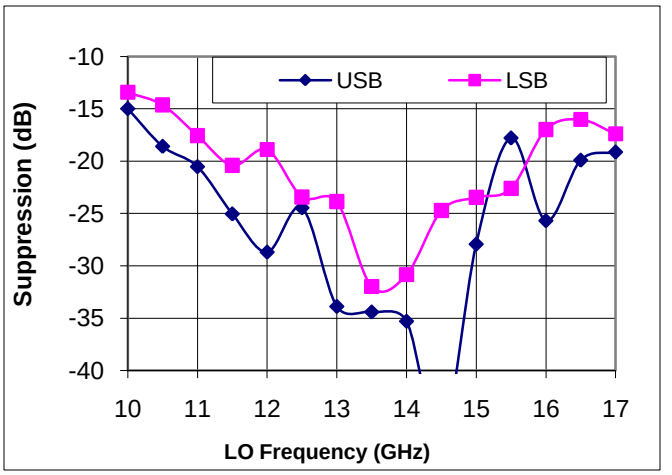
LO Harmonics at RF Output with 1GHz IF



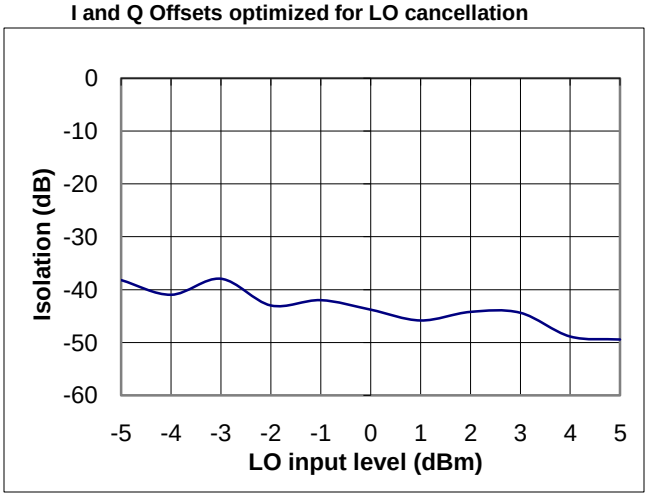
Input vs. Output Power and Gain
IQ = 16MHz; Input Power is Total pwr



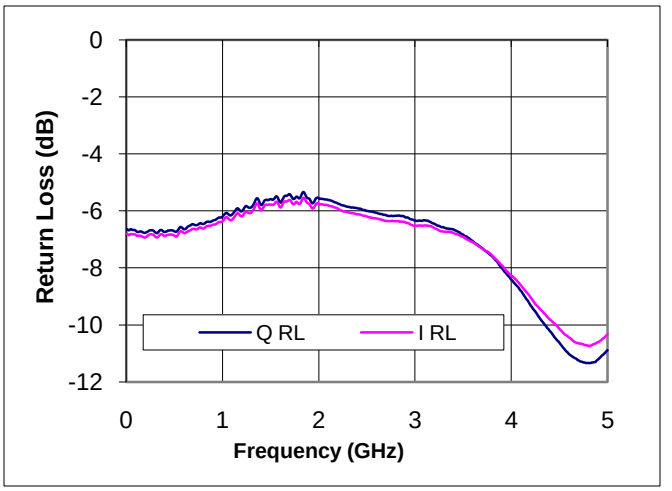
Sideband Suppression vs. LO Frequency with 1GHz IF



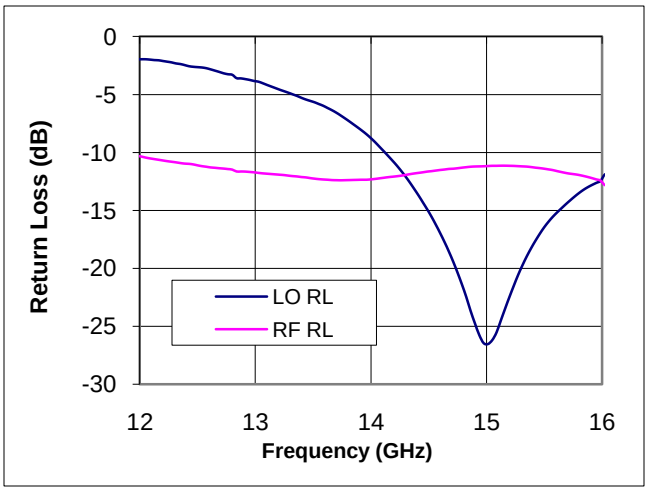
LO - RF Isolation at 15GHz
I and Q Offsets optimized for LO cancellation



I & Q Return Loss vs. Frequency



LO & RF Return Loss vs. Frequency



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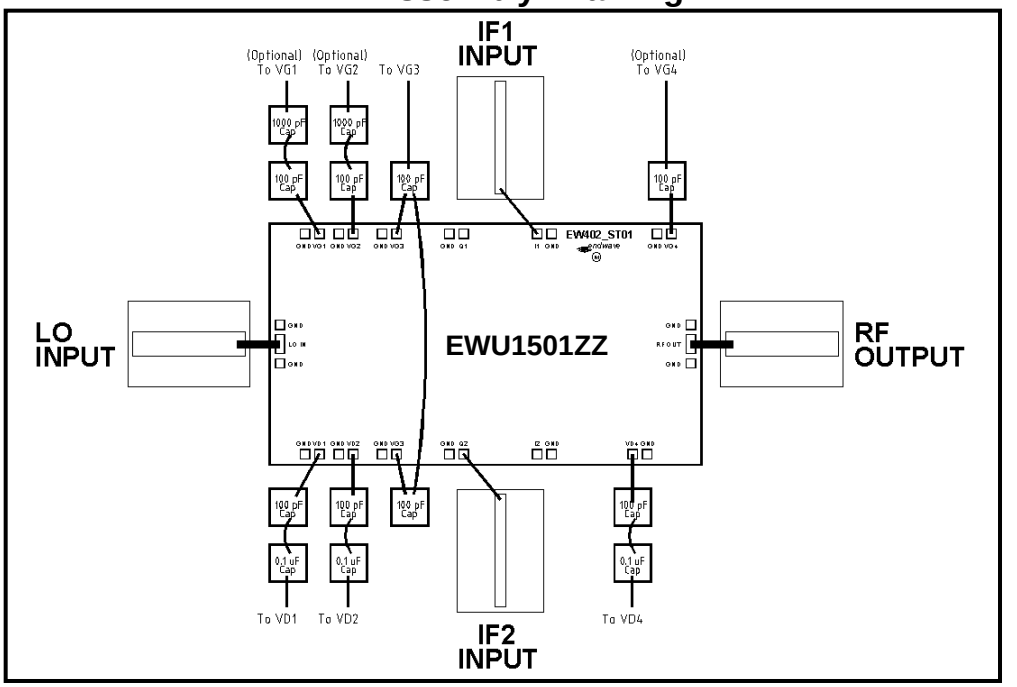
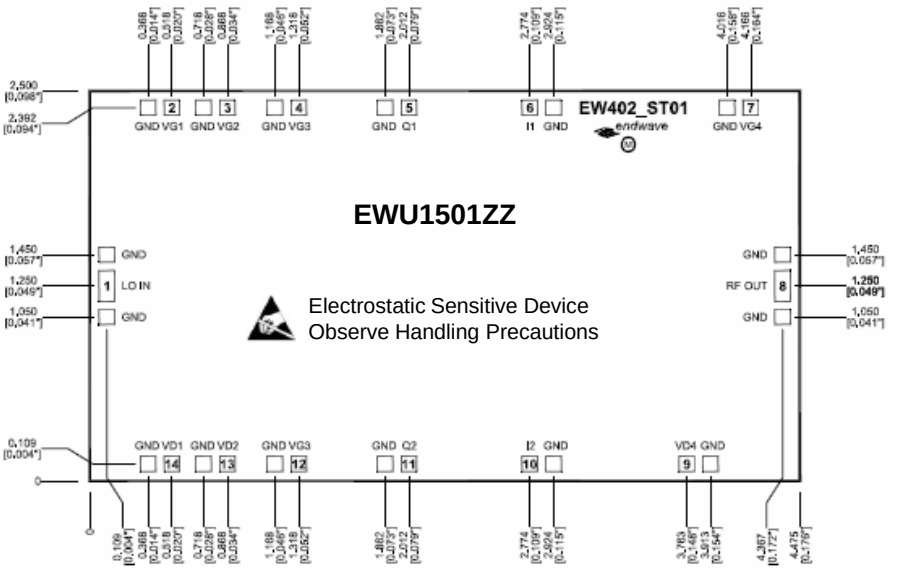
Assembly Drawing



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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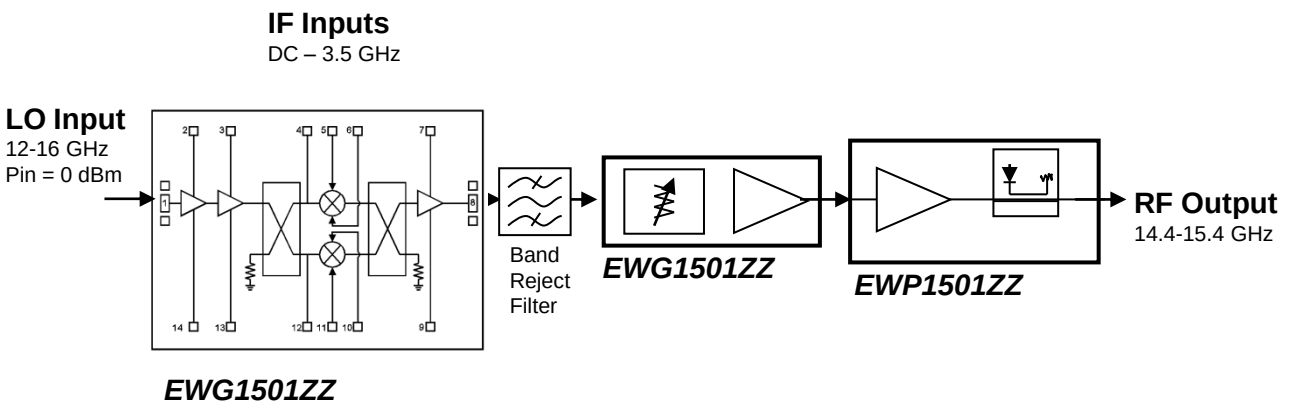
Absolute Maximum Ratings

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
EWU1501ZZ	RoHs Compliant bare die in waffle or gel packs