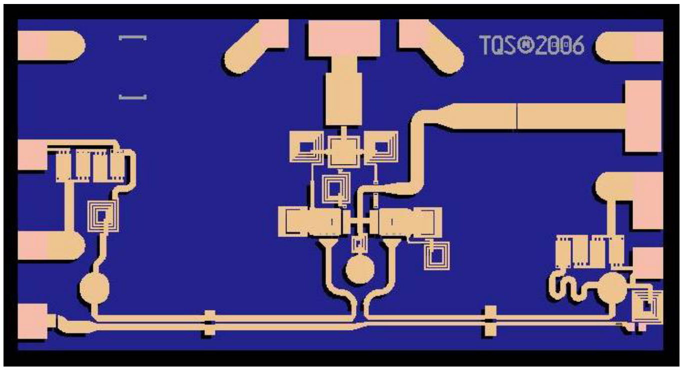
TriQuint SEMICONDUCTOR

TGC4402

17 – 27 GHz Upconverting Mixer

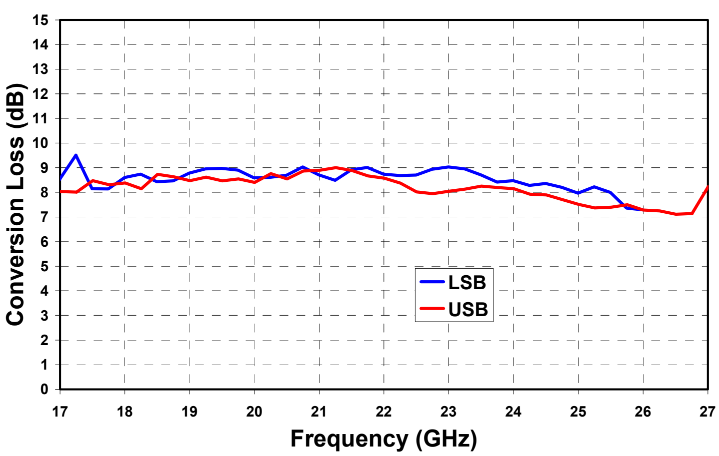


Key Features

- RF Output Frequency Range: 17 - 27 GHz
- IF Input Frequency Range: 0.5 – 3 GHz
- Conversion Loss: 9 dB
- Input TOI: 18 dBm
- LO Input Power: 17 dBm
- Bias: Vg = -0.9 V
- Technology: 3MI 0.25 um pHEMT
- Chip Dimensions: 1.930 x 1.030 x 0.100 mm

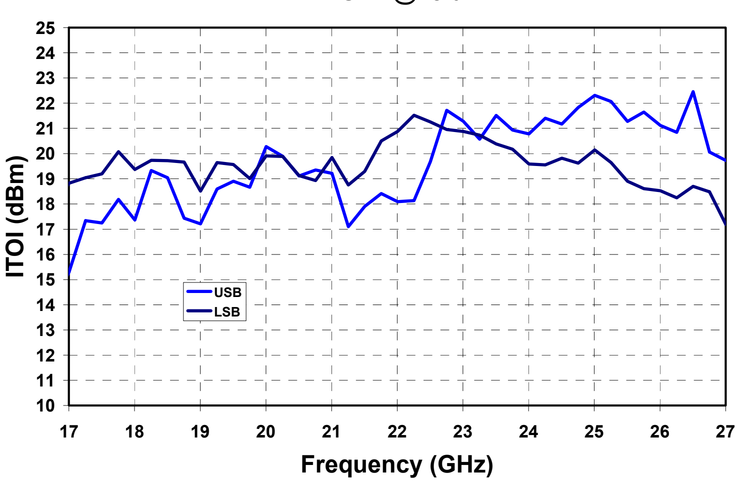
Measured Performance

Conversion Loss vs Frequency: Vg= -0.9V, LO Input @ 17 dBm, IF = 2 GHz @ -5 dBm



ITOI vs Frequency: Vg= -0.9V, LO Input @ 17 dBm,

IF = 2 GHz @ -5 dBm



Primary Applications

- Point-to-Point Radio
- K Band Sat-Com

Product Description

The TriQuint TGC4402 is an upconverting mixer MMIC design using TriQuint’s proven 0.25 um 3MI pHEMT process. The TGC4402 is designed to support a variety of millimeter wave applications including point-to-point digital radio and K band Sat-Com.

The TGC4402 provides -9 dBm nominal conversion loss across 17 – 27 GHz . Typical LO input drive is 17 dBm across the band. The input IF Frequency is 0.5 – 3 GHz.

The TGC4402 requires only 1 off-chip component. Each device is 100% DC and RF tested on-wafer to ensure performance compliance. The device is available in chip form.

The TGC4402 has a protective surface passivation layer providing environmental robustness.

Lead-free and RoHS compliant

Datasheet subject to change without notice.

TriQuint Semiconductor: www. triquint.com (972)994-8465 Fax (972)994-8504 Info-mmw@tqs.com

May 2007 © Rev A

Table I
Absolute Maximum Ratings 1/

Symbol	Parameter	Value	Notes
Vmxr	Gate Supply Voltage Range	-5 - 0 V	
Pin	LO Input Continuous Wave Power	25 dBm	

1/ These ratings represent the maximum operable values for this device. Stresses beyond those listed under “Absolute Maximum Ratings” may cause permanent damage to the device and / or affect device lifetime. These are stress ratings only, and functional operation of the device at these conditions is not implied.

Table II
Recommended Operating Conditions

Symbol	Parameter	Value
Vmxr	Gate Voltage	-0.9 V

Table III
RF Characterization Table

Bias: Vg = -0.9 V, T_A= 25 °C ± 5°C

SYMBOL	PARAMETER	TEST CONDITIONS	NOMINAL	UNITS
F_{OUT}	RF Output Frequency		17 - 26	GHz
F_{IF}	IF Input Frequency		0.5 - 3	GHz
F_{LO}	LO Input Frequency		14 - 28	GHz
P_{LO}	LO Input Power	f = 14 - 28 GHz	17	dBm
	Conversion Loss	f = 17 - 26 GHz	9	dB
ITOI	Input TOI	f = 17 - 26 GHz	18	dBm
	LO – RF Output Isolation	f = 17 - 26 GHz	35	dB

Table IV
Power Dissipation and Thermal Properties

Parameter	Test Conditions	Value	Notes
Maximum Power Dissipation	Tbaseplate = 70 ºC	Pd = 0.45 W Tchannel = 138 ºC Tm = 1.0E+6 Hrs	1/ 2/
Thermal Resistance, θjc	LO input power is 17 dBm	θjc = 76 (ºC/W) Tchannel = 121 ºC Tm = >1E+6 Hrs	
Mounting Temperature	30 seconds	320 ºC Max	
Storage Temperature		-65 to 150 ºC	

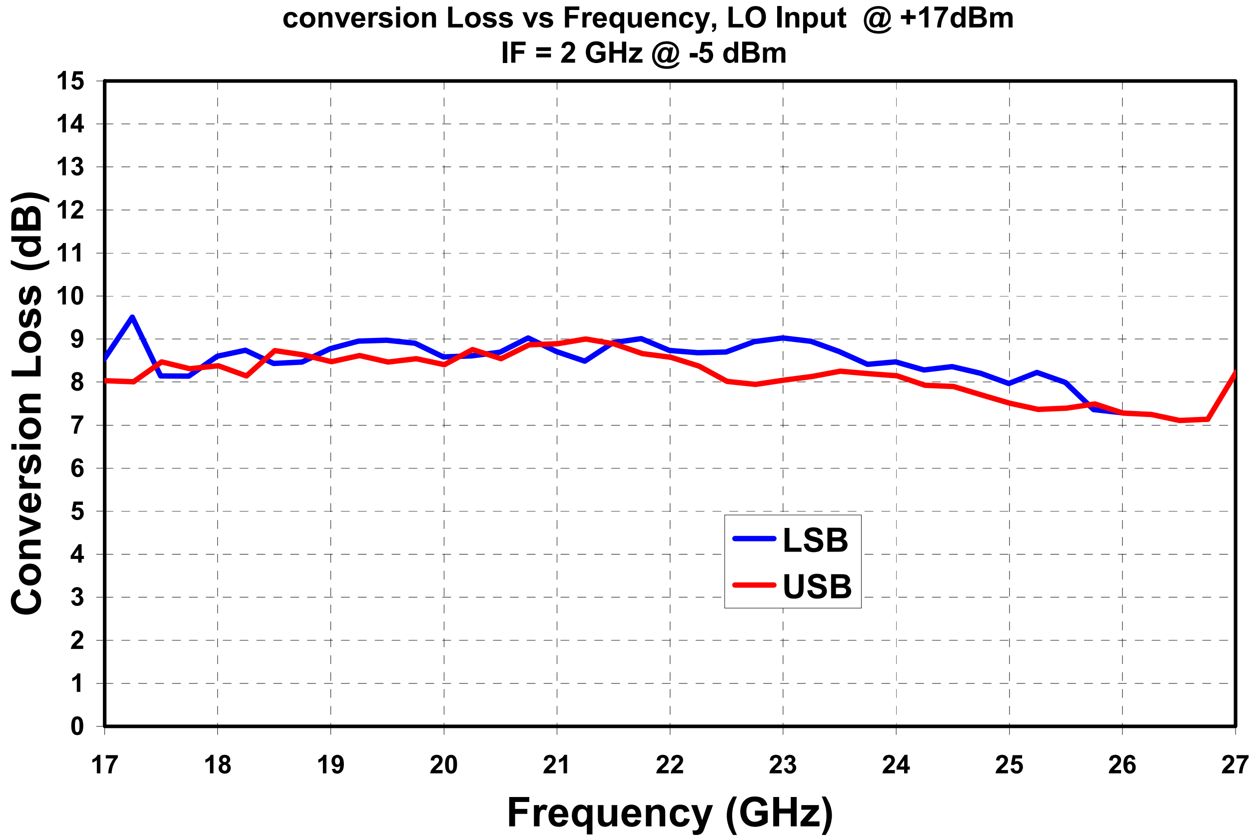
1/ For a median life, Tm, of 1E+6 hours, power dissipation is limited to

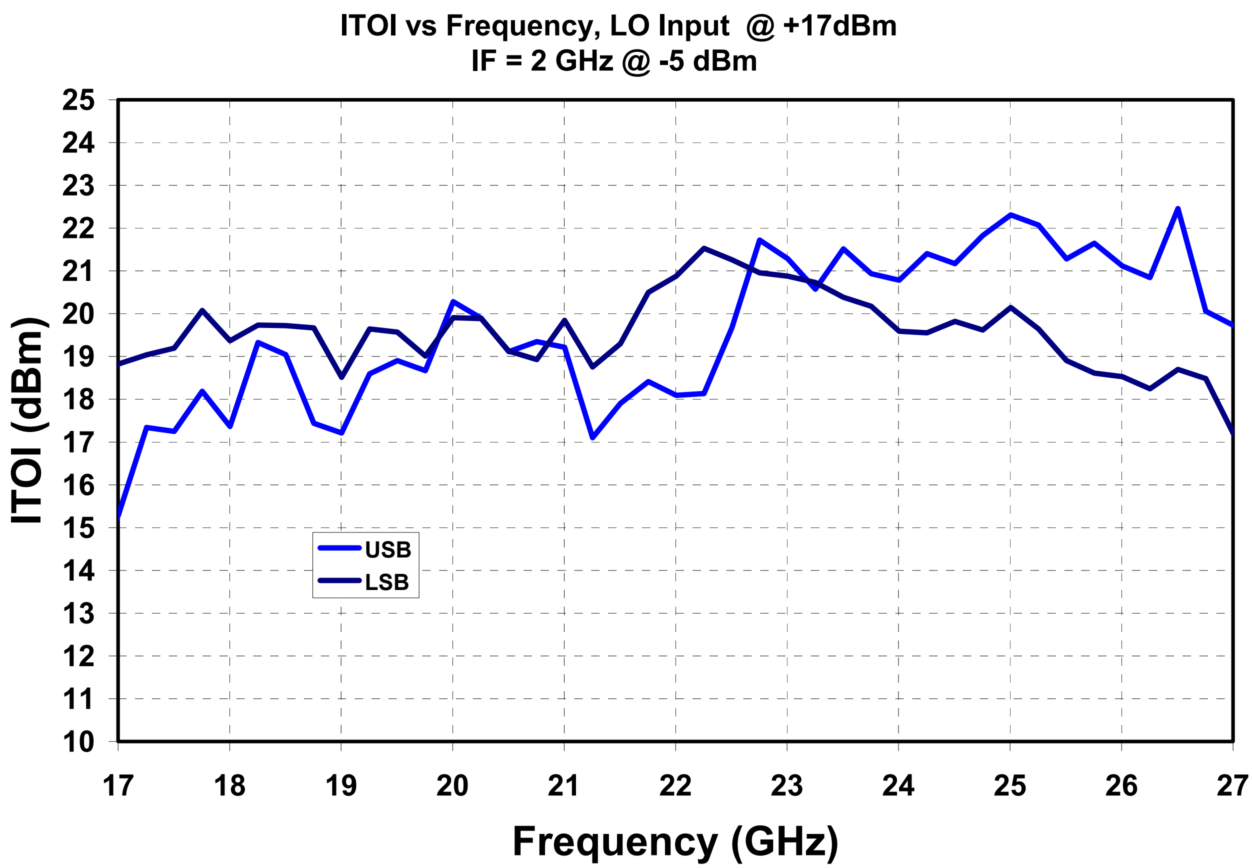
$$Pd(max) = (TBD\ ºC – Tbase\ ºC)/\theta jc.$$

2/ Channel operating temperature will directly affect the device median time to failure (MTTF). For maximum life, it is recommended that channel temperatures be maintained at the lowest possible levels.

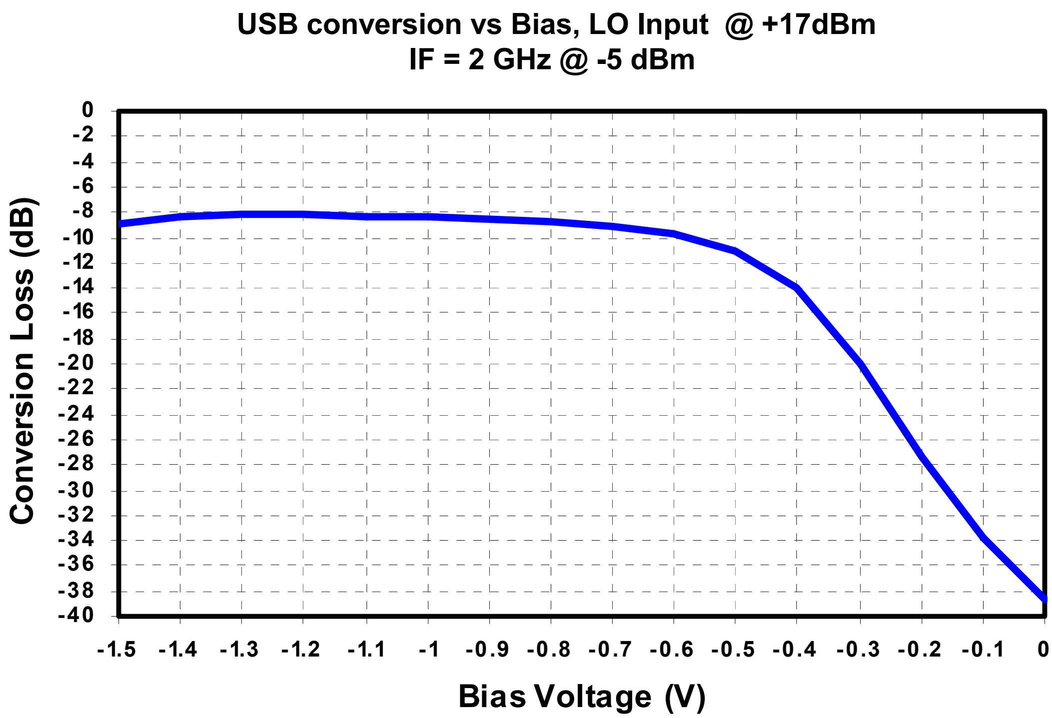
TriQuint Semiconductor: www. triquint.com (972)994-8465 Fax (972)994-8504 Info-mmw@tqs.com

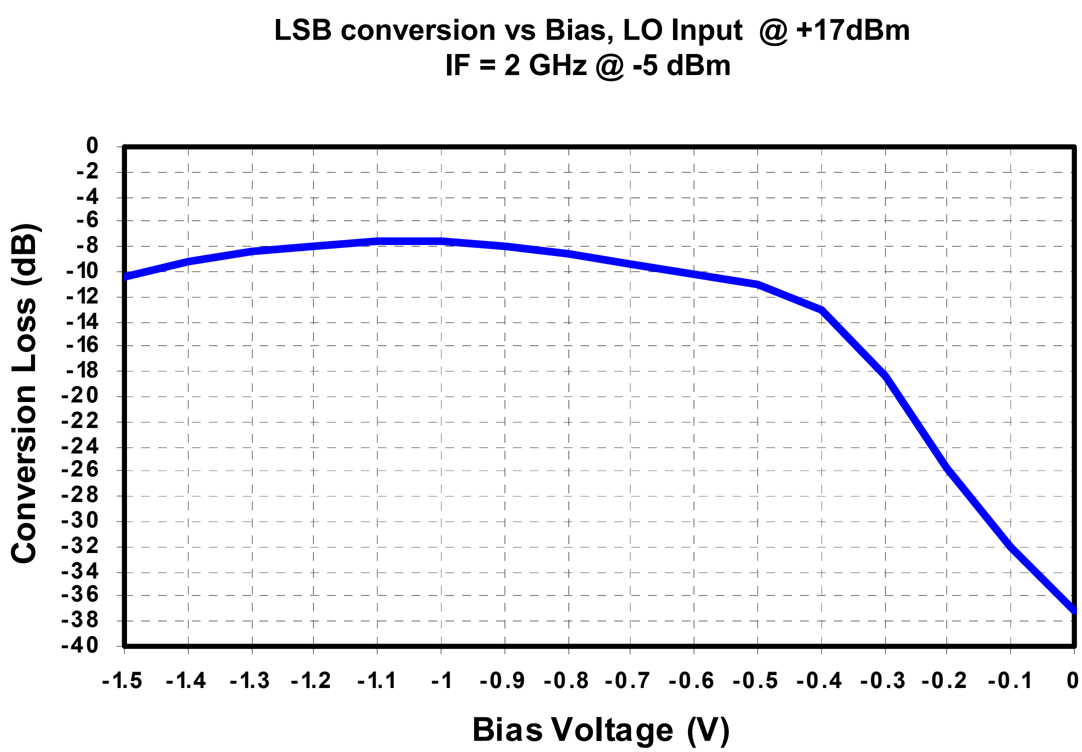
Measured Data





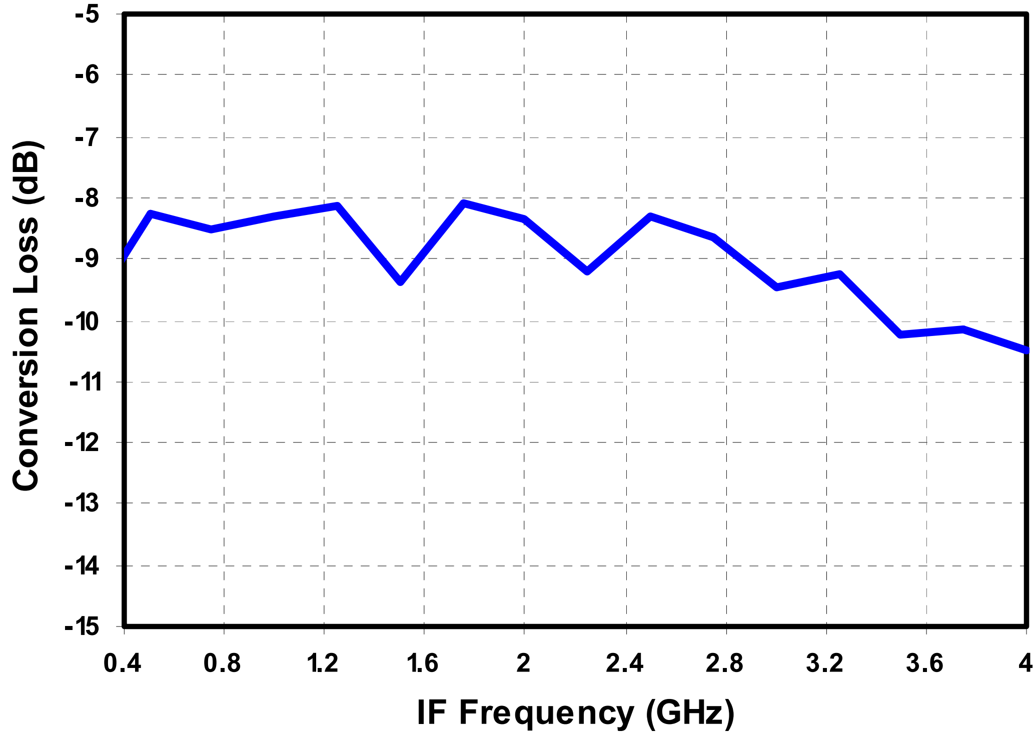
Measured Data



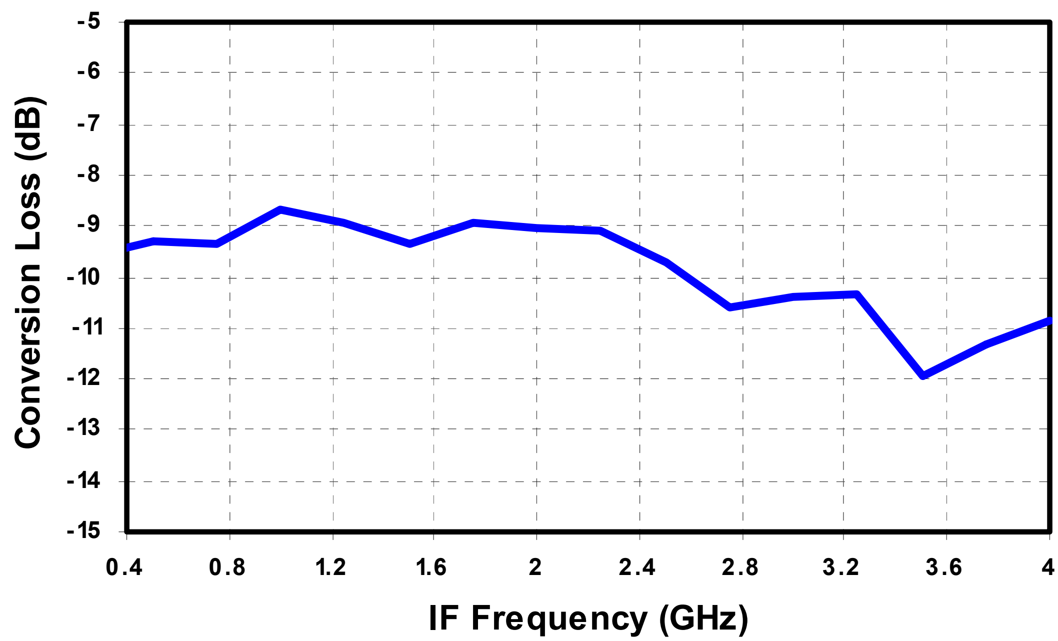


Measured Data

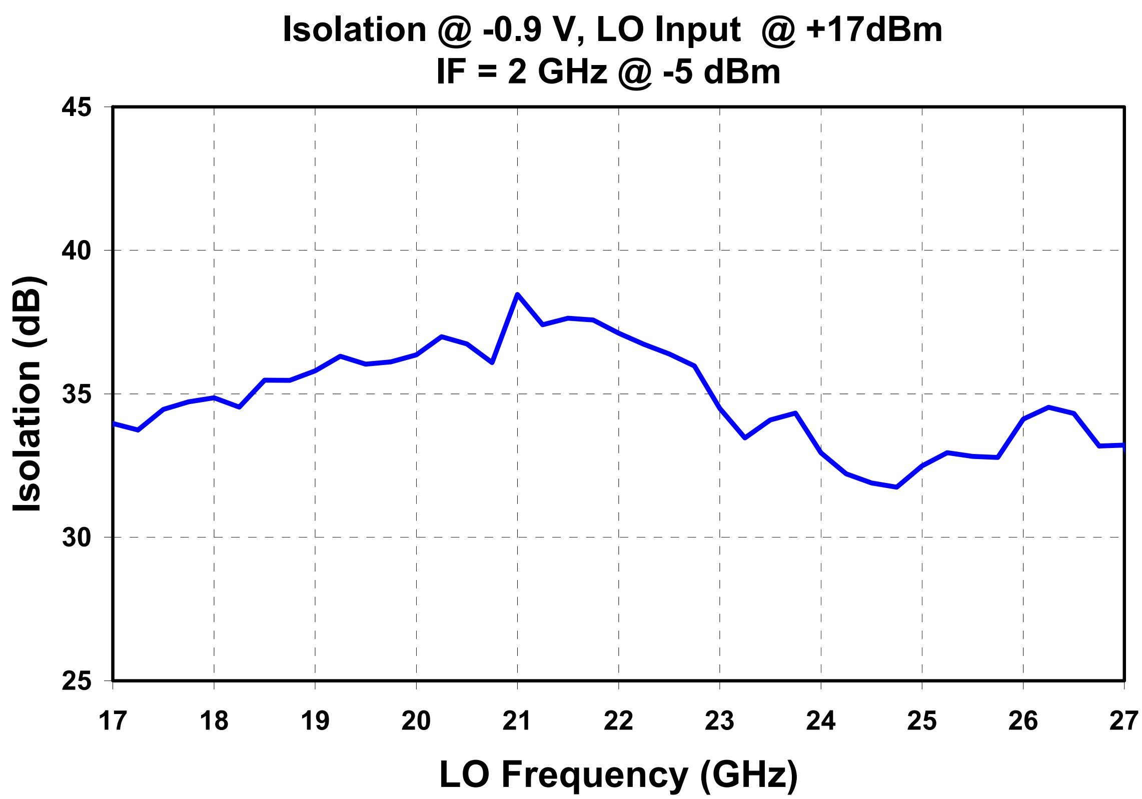
USB conversion vs IF frequency, LO Input @ +17dBm
LO frequency @ 20 GHz

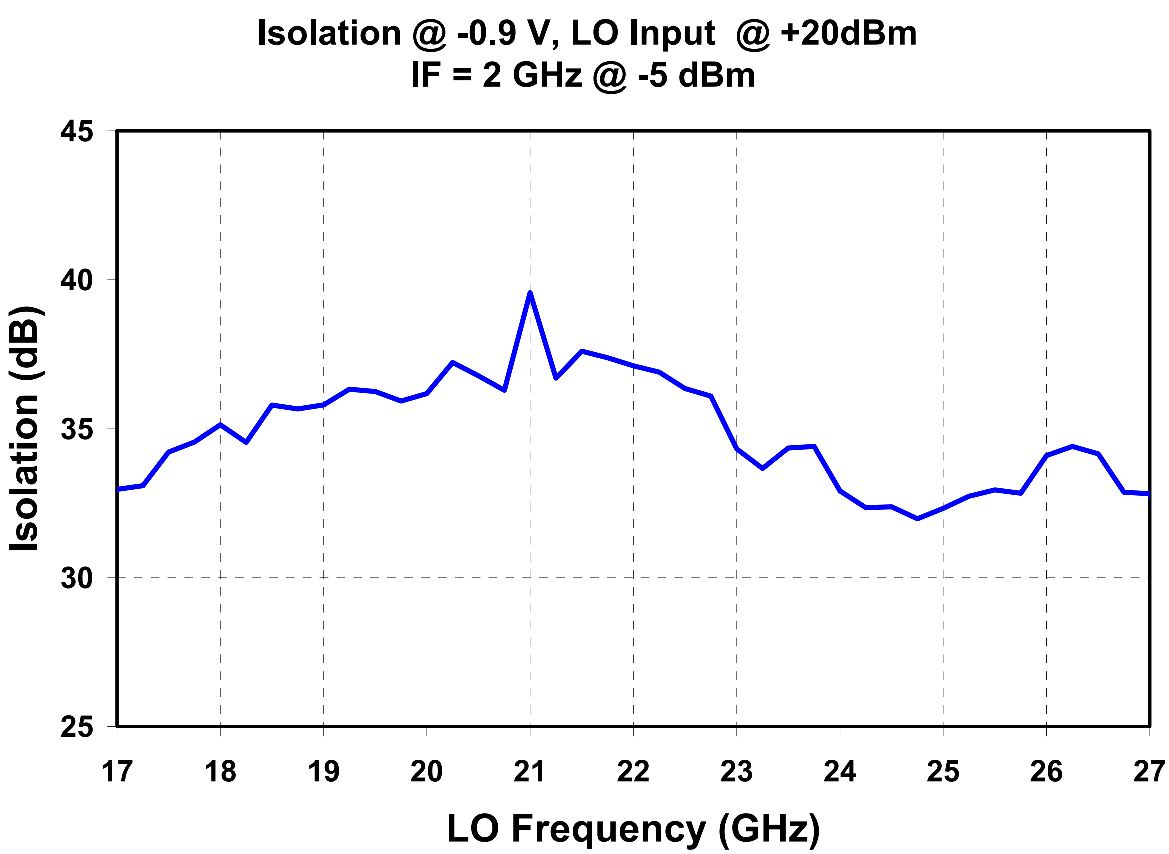


LSB conversion vs IF frequency, LO Input @ +17dBm
LO frequency @ 20 GHz



Measured Data





TriQuint Semiconductor: www. triquint.com (972)994-8465 Fax (972)994-8504 Info-mmw@tqs.com

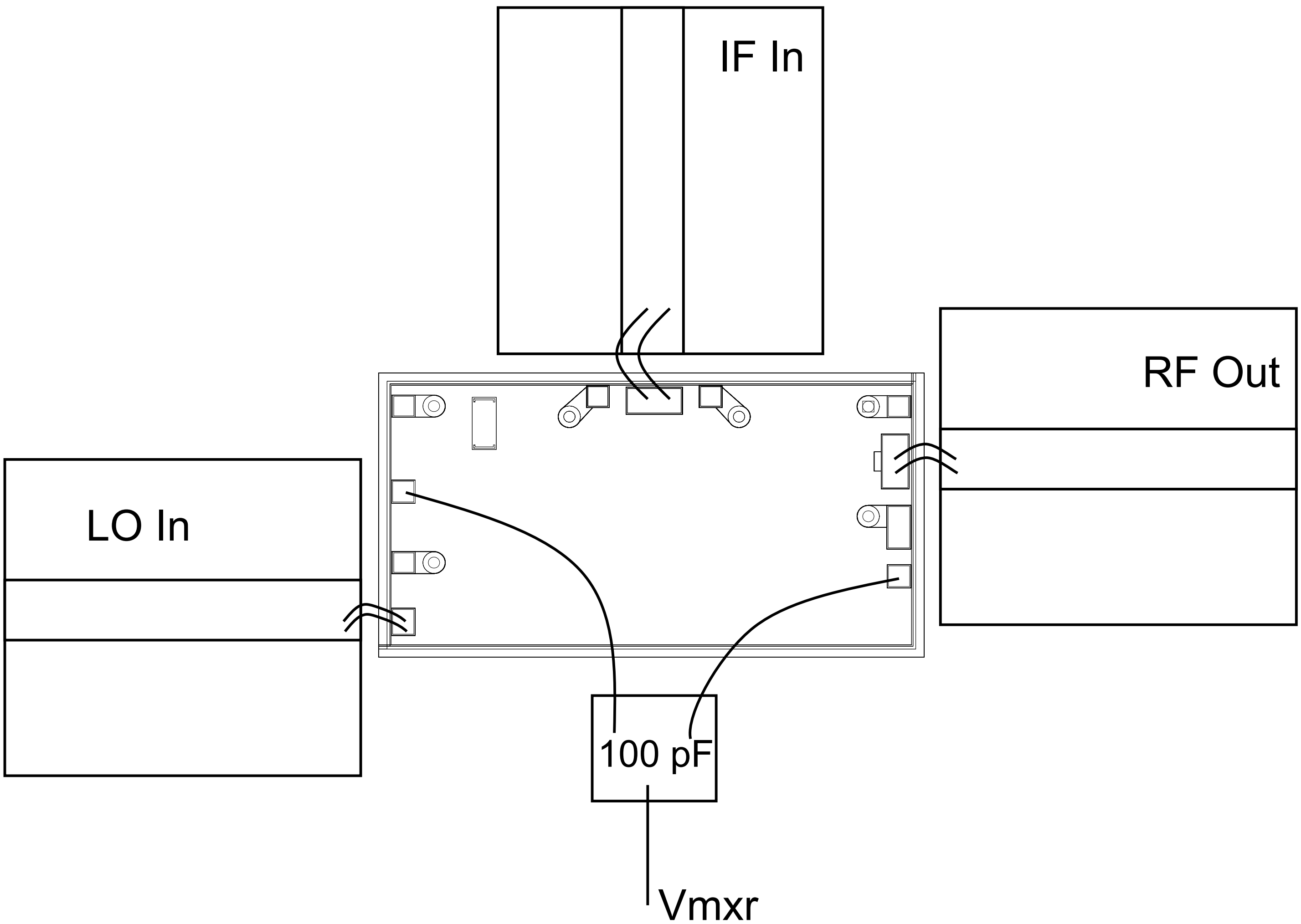
Mechanical Drawing

Unit in mm
Thickness: 0.100
Chip edge to bond pad dimension are shown to center of bond pad
Chip size tolerance: +/- 0.05
Ground is backside of die

Bond Pad #1	LO In	0.085 x 0.100
Bond Pad #2	Vmxr	0.085 x 0.085
Bond Pad #3	IF In	0.200 x 0.100
Bond Pad #4	RF Out	0.100 x 0.200
Bond Pad #5	Vmxr	0.085 x 0.085

GaAs MMIC devices are susceptible to damage from Electrostatic Discharge. Proper precautions should be observed during handling, assembly and test.

Recommended Assembly Diagram



GaAs MMIC devices are susceptible to damage from Electrostatic Discharge. Proper precautions should be observed during handling, assembly and test.

TriQuint Semiconductor: www. triquint.com (972)994-8465 Fax (972)994-8504 Info-mmw@tqs.com

Assembly Notes

Component placement and adhesive attachment assembly notes:

1. Vacuum pencils and/or vacuum collets are the preferred method of pick up.
2. Air bridges must be avoided during placement.
3. The force impact is critical during auto placement.
4. Organic attachment (i.e. epoxy) can be used in low-power applications.
5. Curing should be done in a convection oven; proper exhaust is a safety concern.

Reflow process assembly notes:

1. Use AuSn (80/20) solder and limit exposure to temperatures above 300°C to 3-4 minutes, maximum.
2. An alloy station or conveyor furnace with reducing atmosphere should be used.
3. Do not use any kind of flux.
4. Coefficient of thermal expansion matching is critical for long-term reliability.
5. Devices must be stored in a dry nitrogen atmosphere.

Interconnect process assembly notes:

1. Thermosonic ball bonding is the preferred interconnect technique.
2. Force, time, and ultrasonics are critical parameters.
3. Aluminum wire should not be used.
4. Devices with small pad sizes should be bonded with 0.0007-inch wire.

Ordering Information

Part	Package Style
TGC4402	GaAs MMIC Die

GaAs MMIC devices are susceptible to damage from Electrostatic Discharge. Proper precautions should be observed during handling, assembly and test.