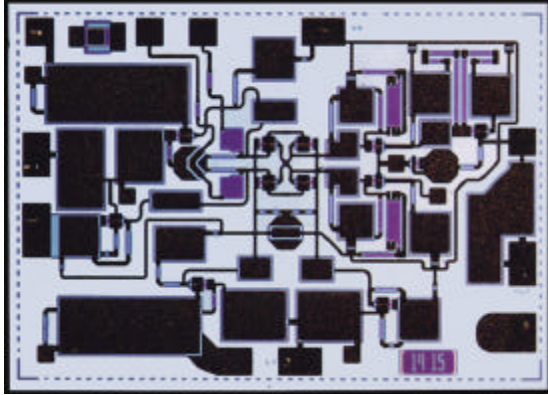


**0.3 - 10 GHz Downconverter**

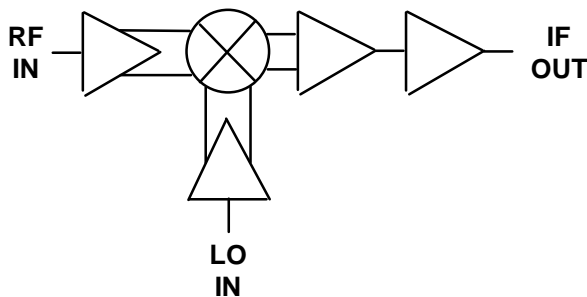
**TGC1411-EPU**



The TriQuint TGC1411-EPU is a double balanced MMIC mixer design using TriQuint's proven 0.25  $\mu$ m Power pHEMT process to support a variety of communication system applications including satellite.

The double balanced design consists of an integrated Gilbert cell mixer core, RF/LO baluns, differential combiner, and output driver amplifier. The TGC1411 may be operated from a single +3 V to +5 V power supply with typical current draw of 26 mA. The nominal LO power requirement is -5 dBm. The TGC1411 may also be operated as an up-converter.

The TGC1411 requires a minimum of off-chip components employing only a 100 pF off-chip bypass capacitor for the power supply line. No additional off-chip RF matching components are required. Each device is 100% DC and RF tested on-wafer to ensure performance compliance. The device is available in chip form.



*Note: Devices designated as EPU are typically early in their characterization process prior to finalizing all electrical and process specifications. Specifications are subject to change without notice.*

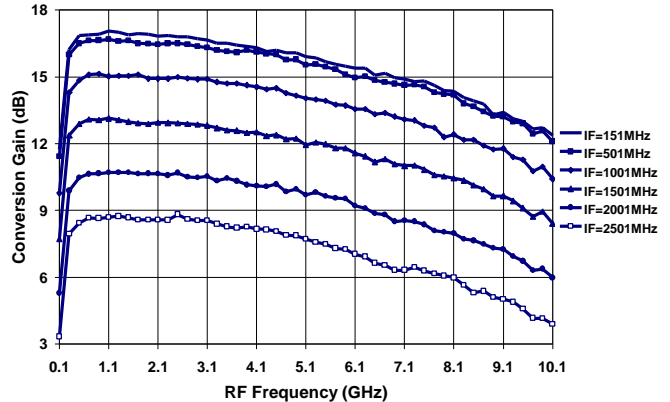
**Key Features and Performance**

- 0.25 $\mu$ m pHEMT Technology
- 0.3-10 GHz RF/LO Frequency Range
- 0.15-2.5 GHz IF Frequency Range
- Nominal Conversion Gain of 12 dB
- Bias 3-5V @ 26 mA
- Chip Dimensions 1.8 mm x 2.6mm

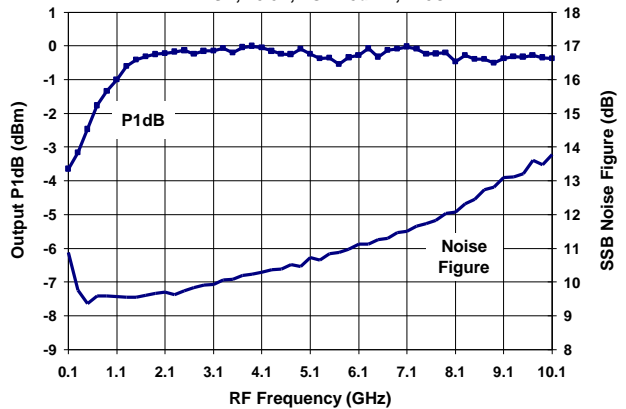
**Primary Applications**

- Satellite Systems
- Point-to-Point Radio

TGC 1411 **Typical Down-Conversion Gain**  
LSB, +5.0V, LO = -5dBm, +25C



TGC 1411 **Typical P1dB and SSB Noise Figure**  
LSB, +5.0V, LO = -5dBm, +25C



## Electrical Characteristics

### RECOMMENDED MAXIMUM RATINGS

Symbol	Parameter	Value	Notes
V <sup>+</sup>	Positive Supply Voltage	8 V	
I <sup>+</sup>	Positive Supply Current	80 mA	3/
P <sub>D</sub>	Power Dissipation	0.64 W	
P <sub>IN</sub>	Input Continuous Wave Power	14 dBm	
T <sub>CH</sub>	Operating Channel Temperature	150 °C	1/, 2/
T <sub>M</sub>	Mounting Temperature (30 seconds)	320 °C	
T <sub>STG</sub>	Storage Temperature	-65 °C to 150 °C	

- 1/ These ratings apply to each individual FET
- 2/ Junction operating temperature will directly affect the device mean time to failure (MTTF). For maximum life it is recommended that junction temperatures be maintained at the lowest possible levels.
- 3/ Total current for the entire MMIC

### DC PROBE TESTS

(T<sub>A</sub> = 25 °C ± 5°C)

Symbol	Parameter	Minimum	Maximum	Value
V <sub>P Test FET</sub>	Pinch-off Voltage	-1.5	-0.5	V
BV <sub>Test FET</sub>	Breakdown Voltage gate-source	-30	-8	V
BV <sub>Test FET</sub>	Breakdown Voltage gate-drain	-30	-8	V

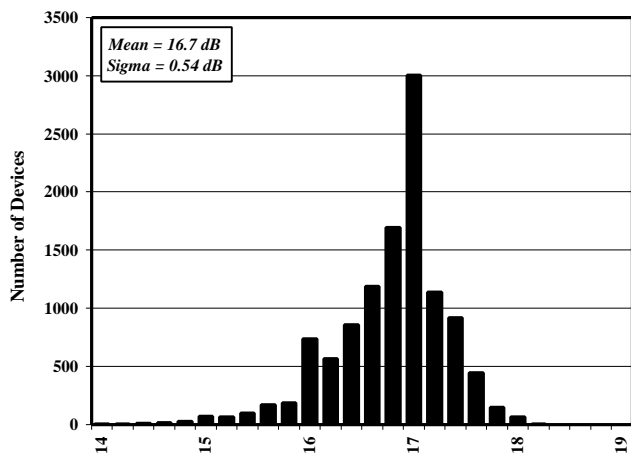
### ON-WAFER RF PROBE CHARACTERISTICS

(T<sub>A</sub> = 25 °C ± 5°C)

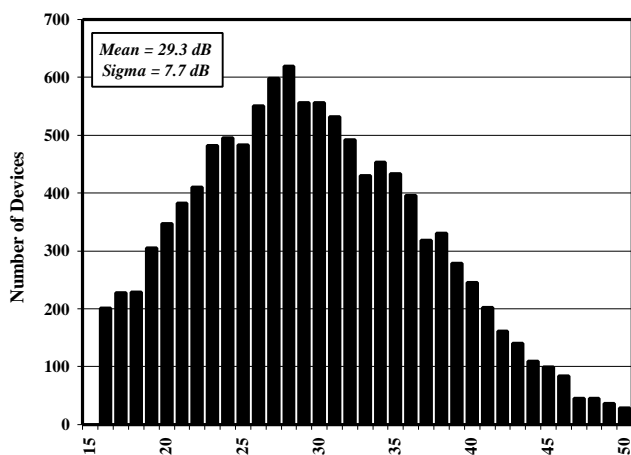
Symbol	Parameter	Test Condition V <sub>d</sub> =5V, LO=-5dBm	Limit			Units
			Min	Nom	Max	
G	Conversion Gain	F <sub>RF</sub> = 1.0 GHz	13	16	20	dB
		F <sub>LO</sub> = 1.6 GHz				dB
ILO	LO Isolation	F <sub>LO</sub> = 1.6 GHz	-	-30	-20	dB
P1dB	Output P1dB	F <sub>RF</sub> = 1.0 GHz	-5	-1	-	dBm
		F <sub>LO</sub> = 1.6 GHz				
IDC	DC Current		-	26	35	mA

Note: Devices designated as EPU are typically early in their characterization process prior to finalizing all electrical and process specifications. Specifications are subject to change without notice.

## RF-Probe Performance Summary



**Down-Conversion Gain**



**LO-IF Isolation**

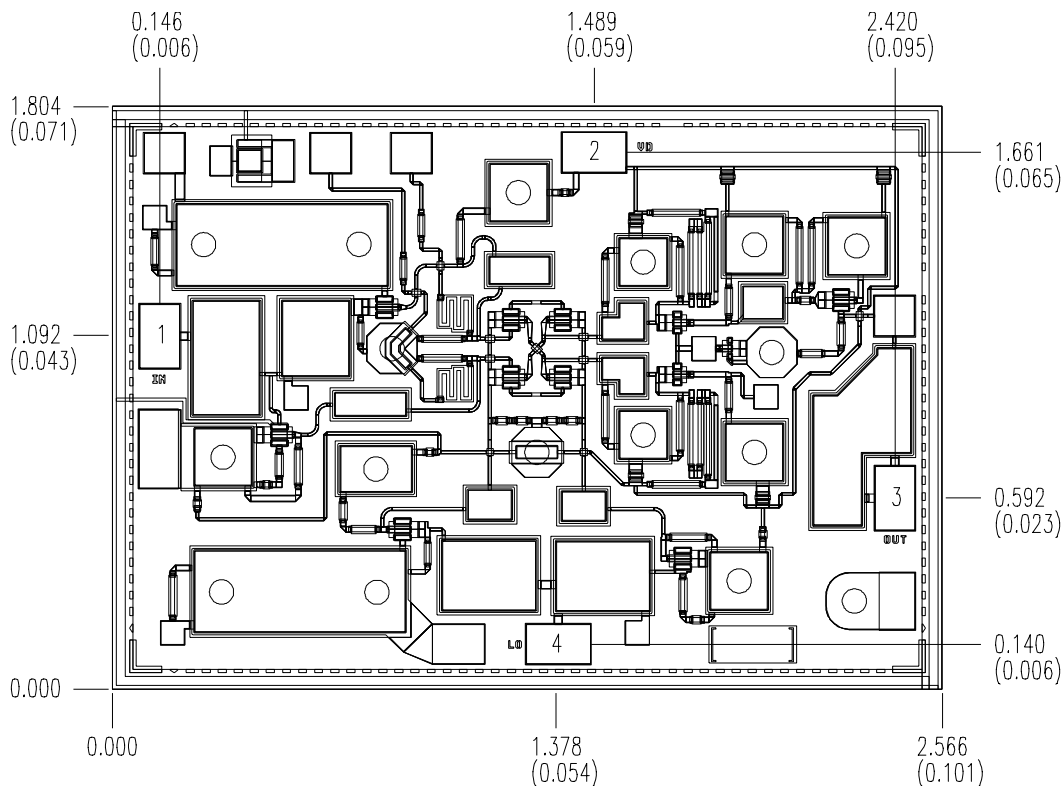
## Typical Performance

Parameter	Units	+5V Supply	+3V Supply
RF Frequency	GHz	0.3 - 10.0	0.3 - 10.0
IF Frequency	GHz	0.15 - 2.5	0.15 - 2.5
LO Frequency	GHz	0.45 - 12.5	0.45 - 12.5
LO Power	dBm	-5	-5
Conversion Gain*	dB	15	13
Output P <sub>1dB</sub> *	dBm	-1	-8
SSB Noise Figure*	dB	11	11
LO Isolation	dB	-30	-30
Input Port Return Loss	dB	-12	-12
Output Port Return Loss	dB	-12	-12
LO Port Return Loss	dB	-12	-12
Supply Current	mA	26	22

\* IF = 501 MHz

Note: Devices designated as EPU are typically early in their characterization process prior to finalizing all electrical and process specifications. Specifications are subject to change without notice.

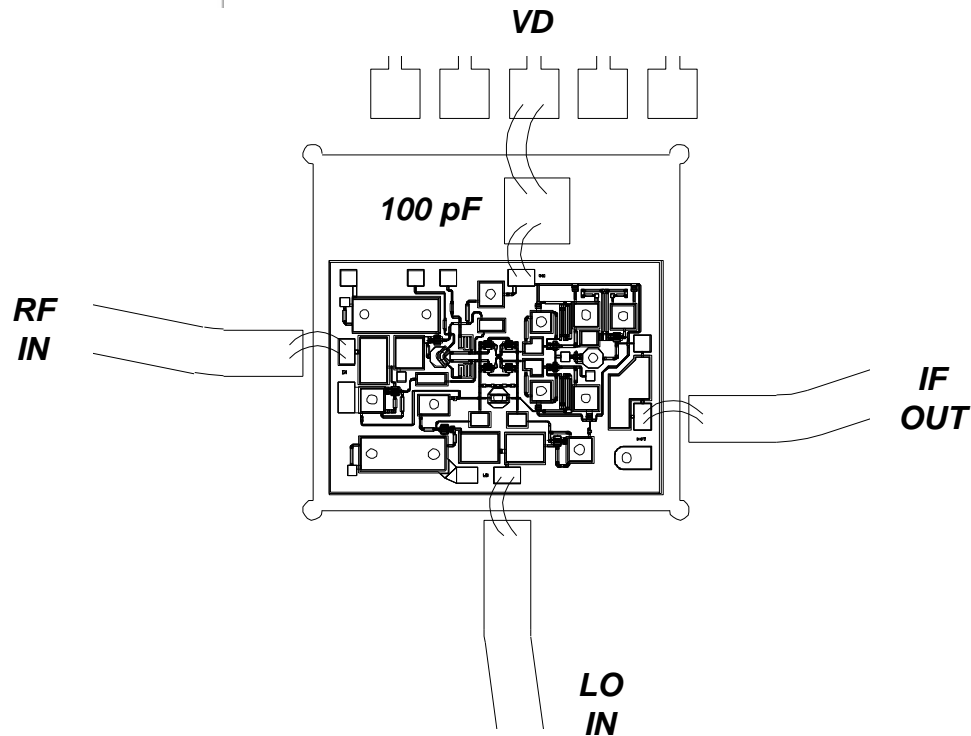
**Mechanical Characteristics**



Units: millimeters (inches)  
 Thickness: 0.1524 (0.006) (reference only)  
 Chip edge to bond pad dimensions are shown to center of bond pad.  
 Chip size tolerance: +/- 0.0508 (0.002)

Bond Pad #1 (RF Input)	0.125 x 0.200	(0.0049 x 0.0079)
Bond Pad #2 (VD)	0.125 x 0.200	(0.0049 x 0.0079)
Bond Pad #3 (RF Output)	0.125 x 0.200	(0.0049 x 0.0079)
Bond Pad #4 (LO Input)	0.125 x 0.200	(0.0049 x 0.0079)

*Note: Devices designated as EPU are typically early in their characterization process prior to finalizing all electrical and process specifications. Specifications are subject to change without notice.*



Chip Assembly and Bonding Diagram

Reflow process assembly notes:

- AuSn (80/20) solder with limited exposure to temperatures at or above 300<sub>μ</sub>C
- alloy station or conveyor furnace with reducing atmosphere
- no fluxes should be utilized
- coefficient of thermal expansion matching is critical for long-term reliability
- storage in dry nitrogen atmosphere

Component placement and adhesive attachment assembly notes:

- vacuum pencils and/or vacuum collets preferred method of pick up
- avoidance of air bridges during placement
- force impact critical during auto placement
- organic attachment can be used in low-power applications
- curing should be done in a convection oven; proper exhaust is a safety concern
- microwave or radiant curing should not be used because of differential heating
- coefficient of thermal expansion matching is critical

Interconnect process assembly notes:

- thermosonic ball bonding is the preferred interconnect technique
- force, time, and ultrasonics are critical parameters
- aluminum wire should not be used
- discrete FET devices with small pad sizes should be bonded with 0.0007-inch wire
- maximum stage temperature: 200<sub>μ</sub>C

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