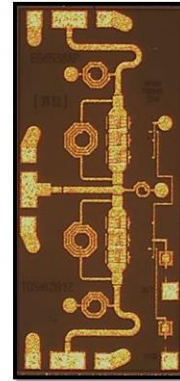


Applications

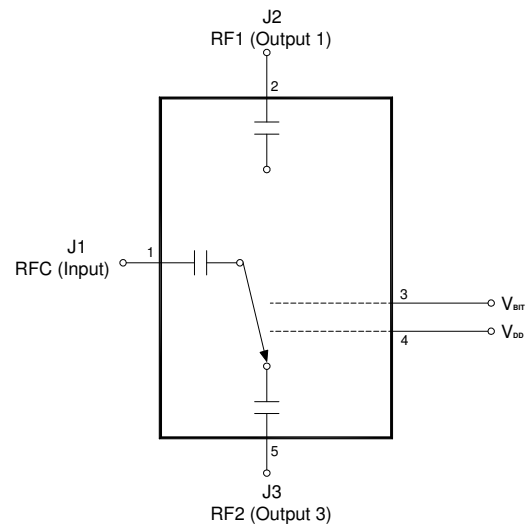
- Ku-Band High Power Switching
- Communication Systems
- Radar

Product Features

- Frequency Range: 13 - 19 GHz
- Insertion Loss: < 1.7 dB
- Power Handling: 5 W (P-0.1dB)
- Isolation: > 20 dB
- Return Loss: > 15 dB
- Control Voltages $V_{DD} = 7V$, $V_{BIT} = 0 V/7 V$
- Reflective Switch
- Chip Dimensions: 1.00 x 2.14 x 0.1 mm



Functional Block Diagram



General Description

The TGS4310 is a single-pole, double-throw (SPDT) reflective switch fabricated on TriQuint's 0.15um GaAs production process. Operating from 13 to 19 GHz, the part handles 37 dBm input power with < 0.1 dB compression and less than 1.7 dB insertion loss.

The TGS4310 is available in a small 1.00 x 2.14 mm die size and requires very little control current allowing for easy system integration without impacting system power budgets.

The TGS4310 is ideally suited for Ku-band high power switching applications across both defense and commercial applications.

Lead-free and RoHS compliant.

Pin Configuration

Pin No.	Label
1	RFC
2	RF1
3	V_{BIT}
4	V_{DD}
5	RF2

Ordering Information

Part No.	ECCN	Description
TGS4310	EAR99	13-19 GHz 5 W SPDT Switch

Absolute Maximum Ratings

Parameter	Rating
Voltages (V_{DD} , V_{BIT})	7.5 V
Currents (I_{DD} , I_{BIT})	-1.7 / +1.7 mA
Power Dissipation, $T_{BASE} = 85\text{ }^{\circ}\text{C}$	1.9 W
RF Input Power (CW)	38 dBm
Channel Temperature, T_{CH}	200 $^{\circ}\text{C}$
Mounting Temperature (30 sec)	320 $^{\circ}\text{C}$
Storage Temperature	-55 to 150 $^{\circ}\text{C}$

Operation of this device outside the parameter ranges given above may cause permanent damage.

Recommended Operating Conditions

Parameter	Min	Typ	Max	Units
Frequency	13		19	GHz
Input Power Handling (CW)		≤ 37.5		dBm
Reference Voltage, V_{DD}		7		V
Control Voltage, V_{BIT}		0/7		V
Currents (I_{DD} , I_{BIT})	See plots p. 5			mA
Operating Temperature	-40		+85	$^{\circ}\text{C}$

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

Electrical Specifications

Test conditions unless otherwise noted: $V_{DD} = 7\text{ V}$, $V_{BIT} = 0/7\text{ V}$, $\text{Temp} = +25\text{ }^{\circ}\text{C}$, $Z_0 = 50\ \Omega$

Parameter	Min	Typ	Max	Units
Operational Frequency Range	13		19	GHz
P-0.1dB (CW)		37		dBm
Insertion Loss (On-State)		< 1.7		dB
Input Return Loss – On-State (Common Port RL)		> 15		dB
Output Return Loss – On-State (Switched Port RL)		> 15		dB
Isolation (Off-State)		> 20		dB
Output Return Loss – Off-State (Isolated Port RL)		5		dB
Insertion Loss Temperature Coefficient		0.002		dB/ $^{\circ}\text{C}$

Thermal and Reliability Information

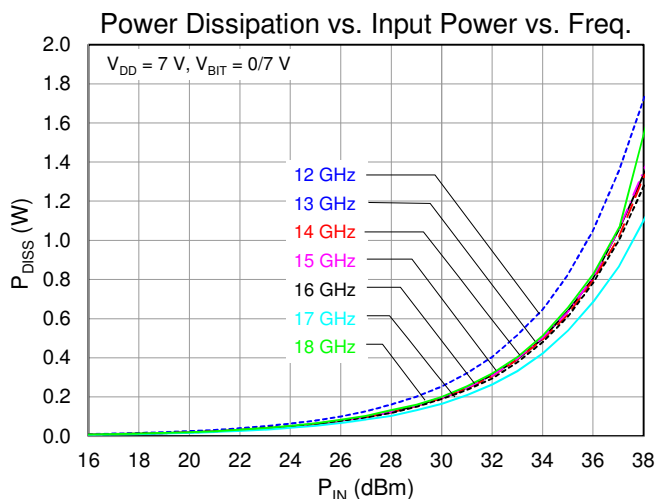
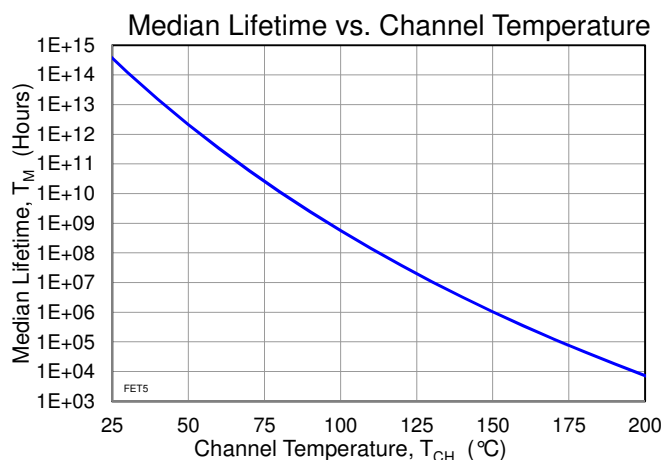
Parameter	Conditions	Value	Units
Thermal Resistance (θ_{JC}) ⁽¹⁾	$T_{BASE} = 85\text{ }^{\circ}\text{C}$, $V_{DD} = 7\text{ V}$, $V_{BIT} = 0/7\text{ V}$, CW, Frequency = 18 GHz, $P_{IN} = 38\text{ dBm}$ (6.31W), Insertion Loss = 1.2 dB, $P_{OUT} = 36.8\text{ dBm}$ (4.786W), $P_{DISS} = 1.523\text{ W}$	40	$^{\circ}\text{C/W}$
Channel Temperature (T_{CH})		146	$^{\circ}\text{C}$
Median Lifetime (T_M)		1.6E+6	Hrs

Notes:

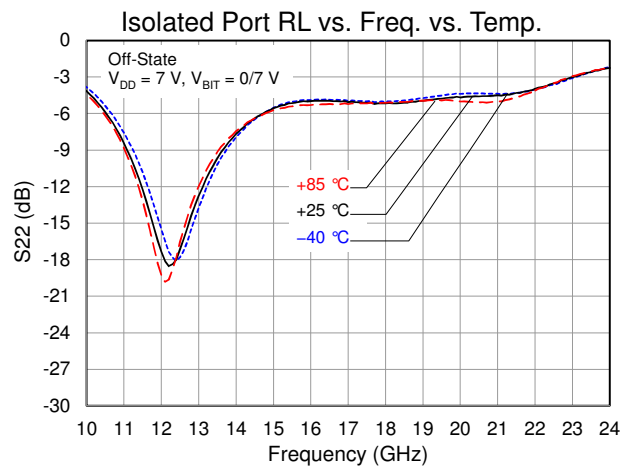
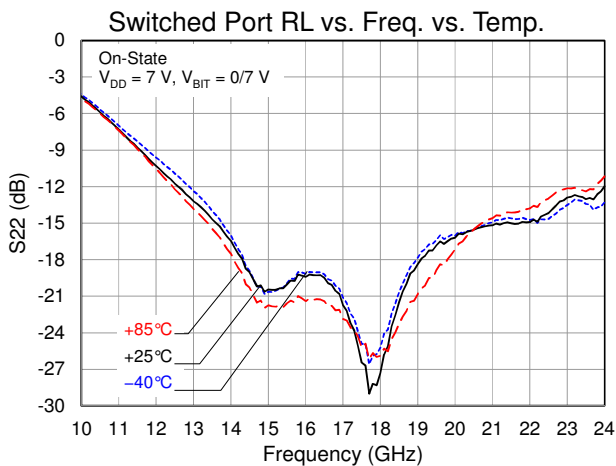
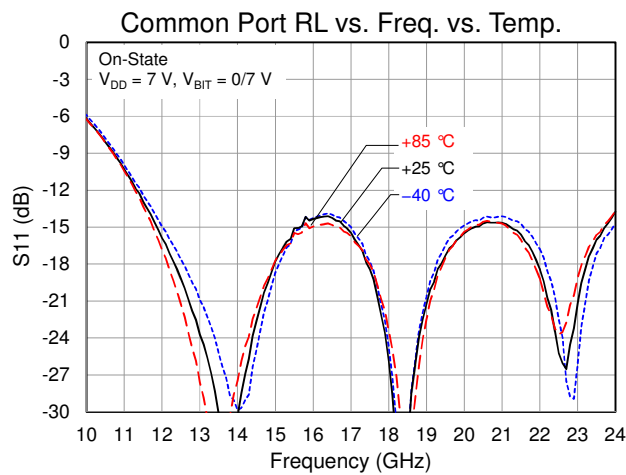
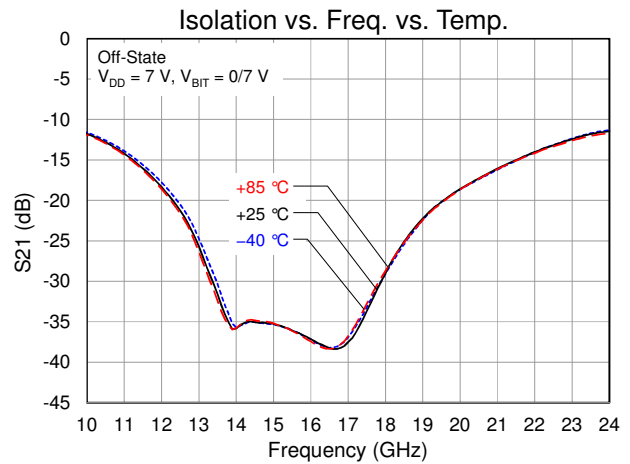
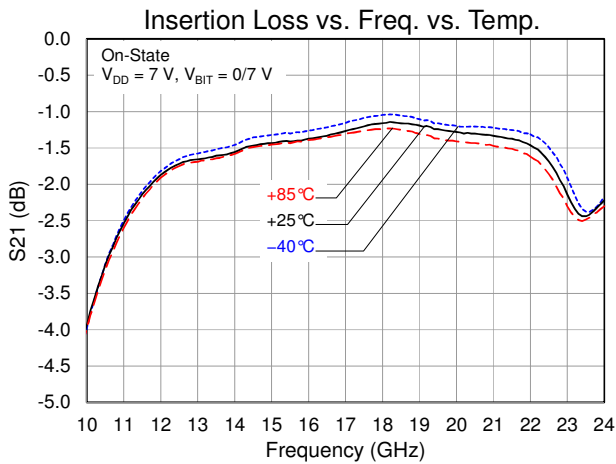
- MMIC soldered to 20 mil thick Cu-Mo carrier plate using 1.5 mil thick AuSn solder. Thermal resistance is determined from the channel to the back of the carrier plate (fixed 85 $^{\circ}\text{C}$ temperature).

Median Lifetime

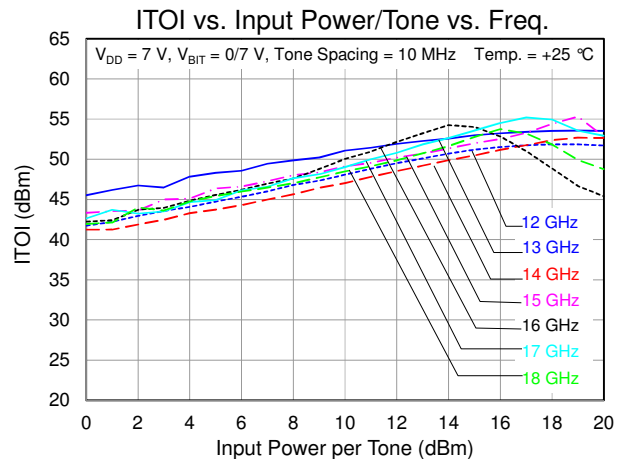
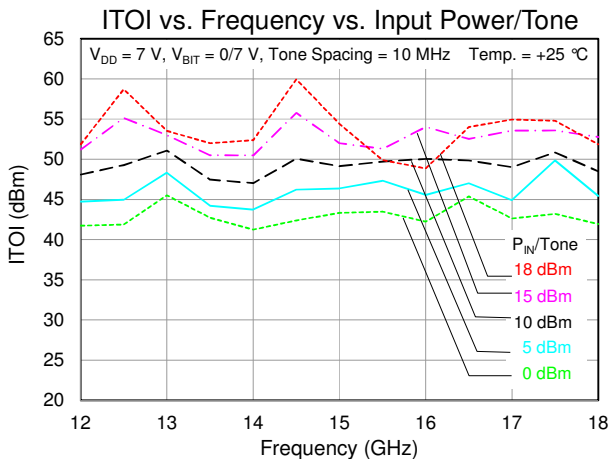
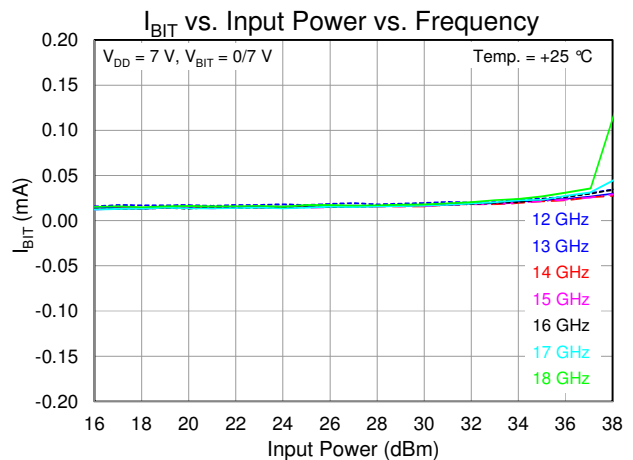
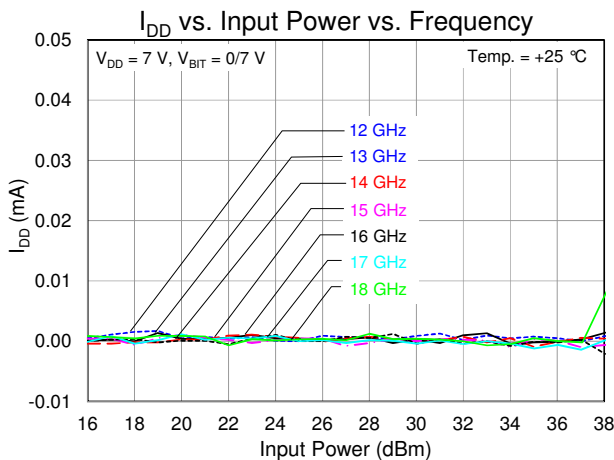
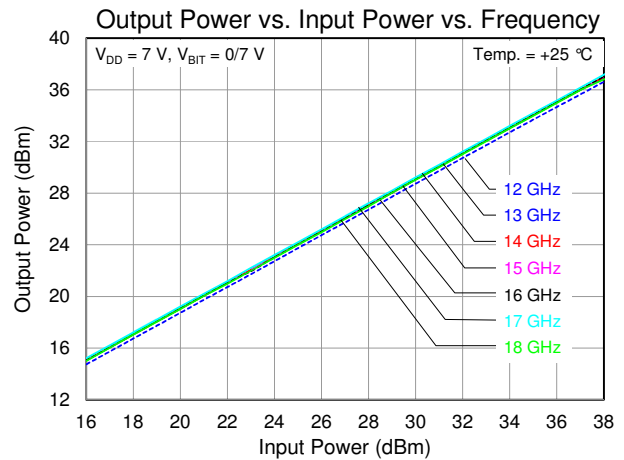
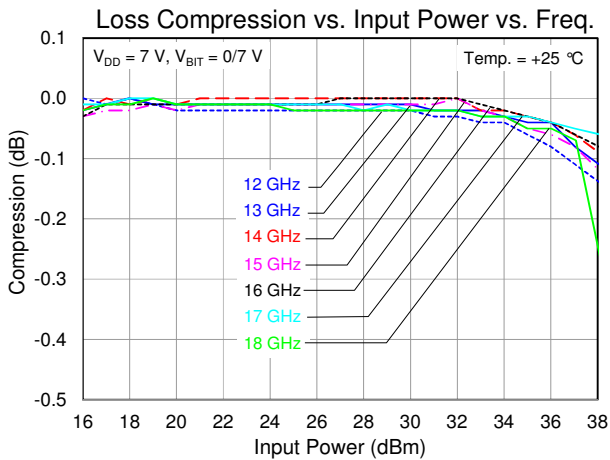
Test Conditions: 7 V; Failure Criteria = 10% reduction in I_{MAX}



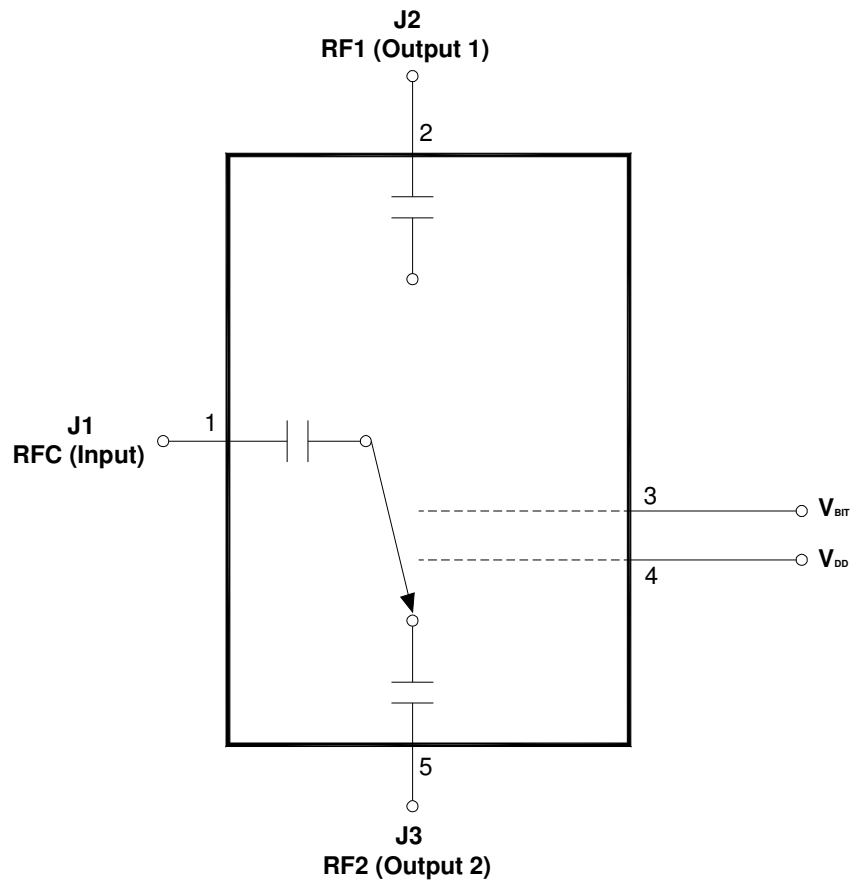
Typical Performance: Small Signal



Typical Performance: Large Signal



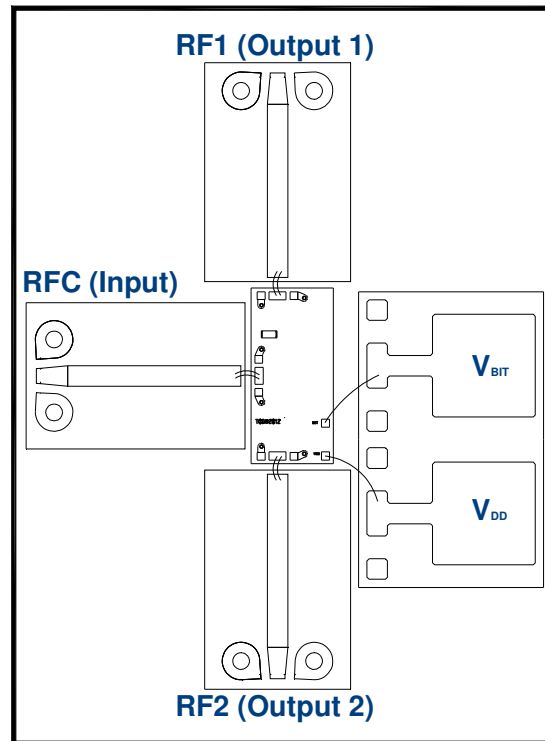
Application Circuit



This switch can be configured as a Single Pole, Single Throw (SPST) by terminating one unused RF (pad 2 or pad 5) switched port with a 50 Ohm load.

Function Table

RF Path	State	V _{DD} (V)	V _{BIT} (V)
RFC (Input) to RF1 (Output1)	On-State (Insertion Loss)	7	0
	Off-State (Isolation)	7	7
RFC (Input) to RF2 (Output 2)	On-State (Insertion Loss)	7	7
	Off-State (Isolation)	7	0

Assembly Drawing**Assembly Notes**

Component placement and adhesive attachment assembly notes:

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

Reflow process assembly notes:

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

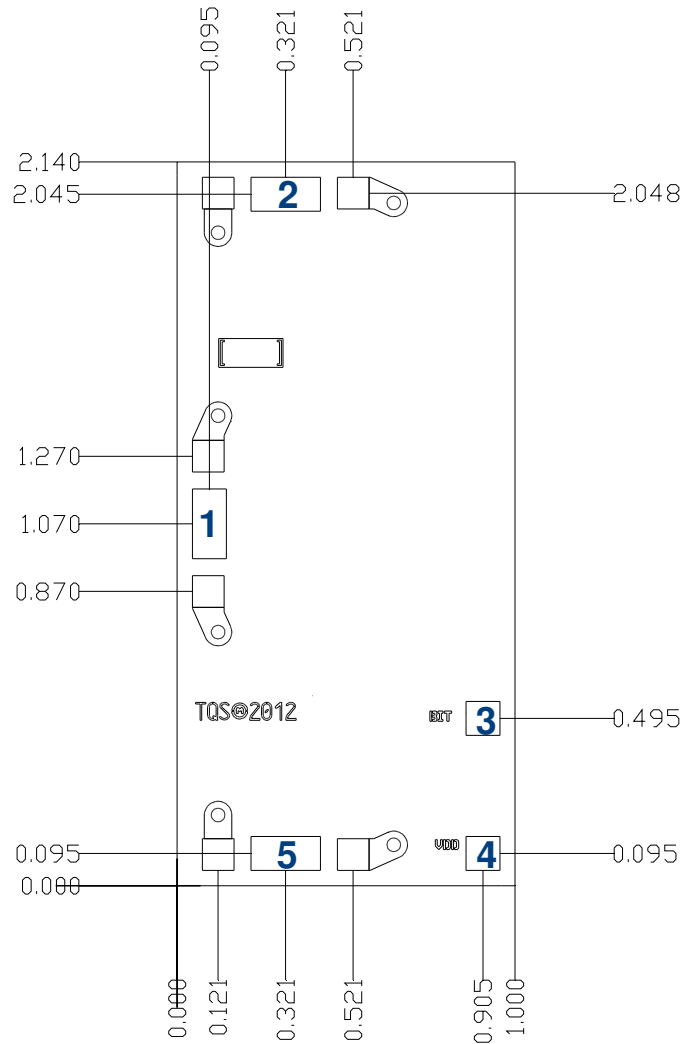
Organic adhesive attachment assembly notes:

- Organic adhesives such as epoxy or polyimide can be used.
- Epoxies cure at temperatures of 100 °C to 200 °C.

Interconnect process assembly notes:

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

Mechanical Drawing and Bond Pad Description



Unit: millimeters
 Thickness: 0.10
 Die x, y size tolerance: +/- 0.050
 Chip edge to bond pad dimensions are shown to center of pad
 Ground is backside of die

Pin No.	Label	Description	Pad Size
1	RFC	Common RF Port (Input); DC blocked	0.100 x 0.206
2	RF1	RF switched port 1 (Output 1); DC blocked	0.206 x 0.100
3	V _{BIT}	Control Voltage	0.100 x 0.100
4	V _{DD}	Reference Voltage	0.100 x 0.100
5	RF2	RF switched port 2 (Output 2); DC blocked	0.206 x 0.100

Product Compliance Information

ESD Sensitivity Ratings



Caution! ESD-Sensitive Device

ESD Rating: TBD
Value: TBD
Test: Human Body Model (HBM)
Standard: JEDEC Standard JESD22-A114

ECCN

US Department of Commerce: EAR99

Solderability

Use only AuSn (80/20) solder and limit exposure to temperatures above 300 °C to 1-3 minutes, maximum.

RoHS-Compliance

This part is compliant with EU 2002/95/EC RoHS directive (Restrictions on the Use of Certain Hazardous Substances in Electrical and Electronic Equipment).

This product also has the following attributes:

- Lead Free
- Halogen Free (Chlorine, Bromine)
- Antimony Free
- TBBP-A (C15H12Br4O2) Free
- PFOS Free
- SVHC Free

Contact Information

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

Web: www.triquint.com
Email: info-sales@tqs.com

Tel: +1.972.994.8465
Fax: +1.972.994.8504

For technical questions and application information: Email: info-products@triquint.com

Important Notice

The information contained herein is believed to be reliable. TriQuint makes no warranties regarding the information contained herein. TriQuint assumes no responsibility or liability whatsoever for any of the information contained herein. TriQuint assumes no responsibility or liability whatsoever for the use of the information contained herein. The information contained herein is provided "AS IS, WHERE IS" and with all faults, and the entire risk associated with such information is entirely with the user. All information contained herein is subject to change without notice. Customers should obtain and verify the latest relevant information before placing orders for TriQuint products. The information contained herein or any use of such information does not grant, explicitly or implicitly, to any party any patent rights, licenses, or any other intellectual property rights, whether with regard to such information itself or anything described by such information.

TriQuint products are not warranted or authorized for use as critical components in medical, life-saving, or life-sustaining applications, or other applications where a failure would reasonably be expected to cause severe personal injury or death.