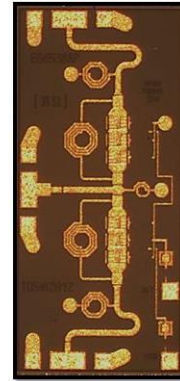


Applications

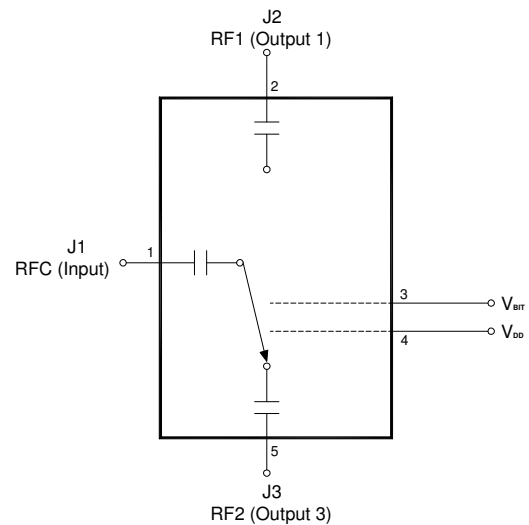
- Ku-Band High Power Switching
- Communication Systems
- Radar

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

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

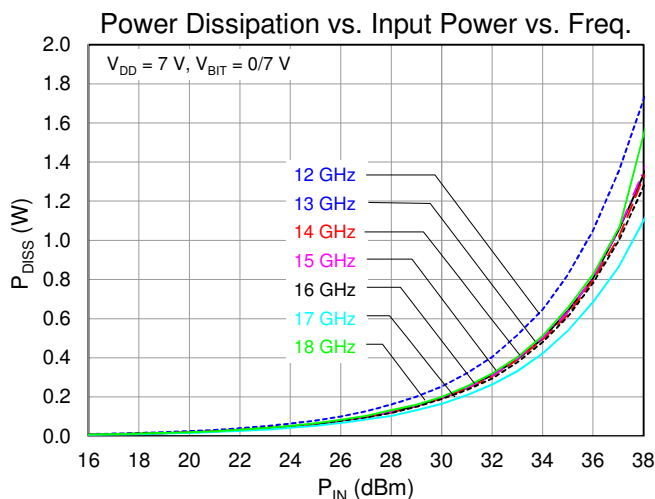
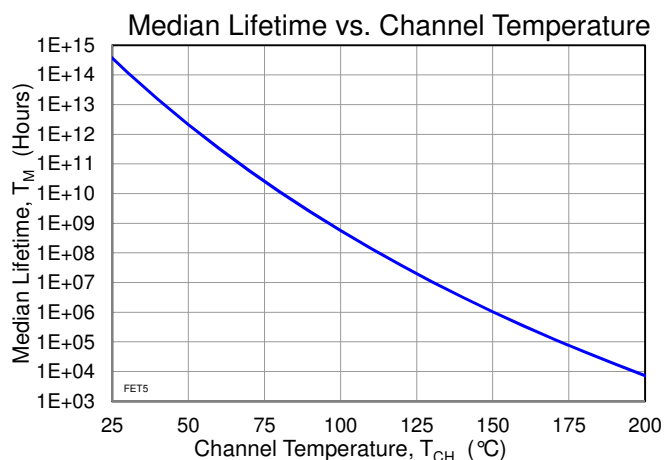
Parameter	Conditions	Value	Units
Thermal Resistance (θ_{JC}) ⁽¹⁾	$T_{BASE} = 85\text{ }^{\circ}\text{C}$, $V_{DD} = 7\text{ V}$, $V_{BIT} = 0/7\text{ V}$, CW, Frequency = 18 GHz, $P_{IN} = 38\text{ dBm}$ (6.31W), Insertion Loss = 1.2 dB, $P_{OUT} = 36.8\text{ dBm}$ (4.786W), $P_{DISS} = 1.523\text{ W}$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

Notes:

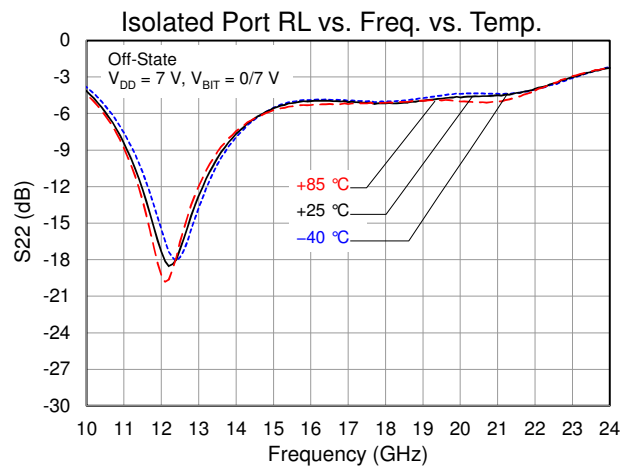
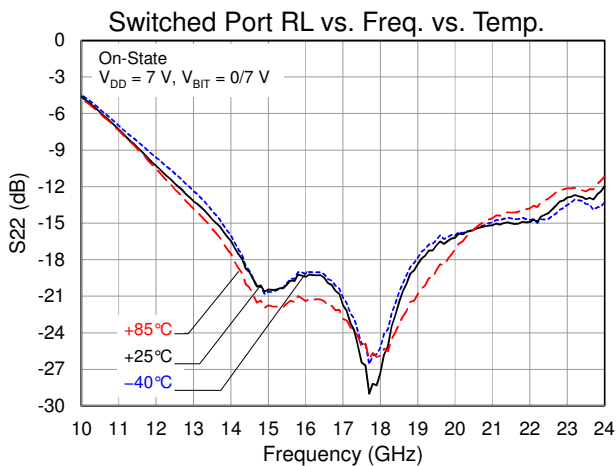
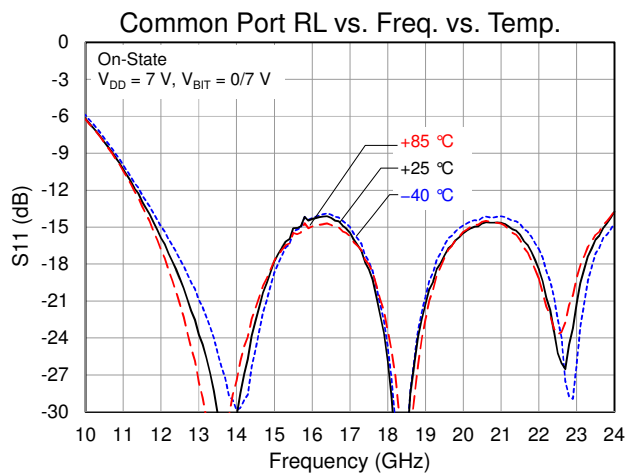
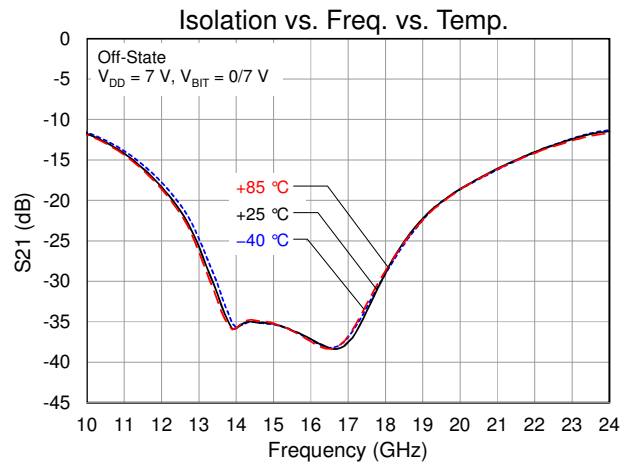
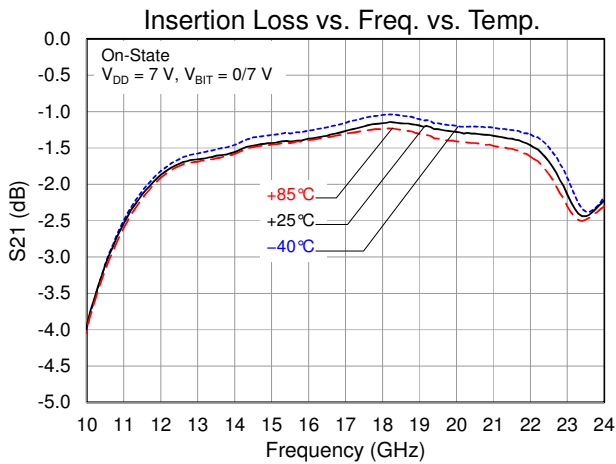
- MMIC soldered to 20 mil thick Cu-Mo carrier plate using 1.5 mil thick AuSn solder. Thermal resistance is determined from the channel to the back of the carrier plate (fixed 85 $^{\circ}\text{C}$ temperature).

Median Lifetime

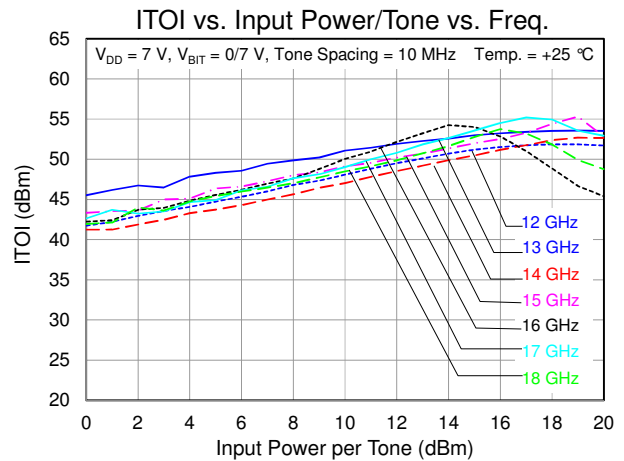
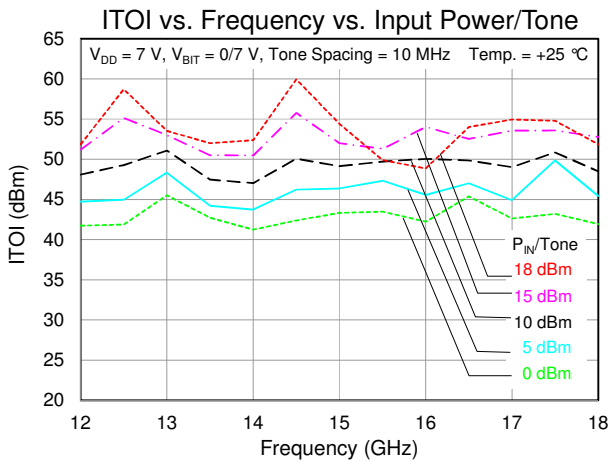
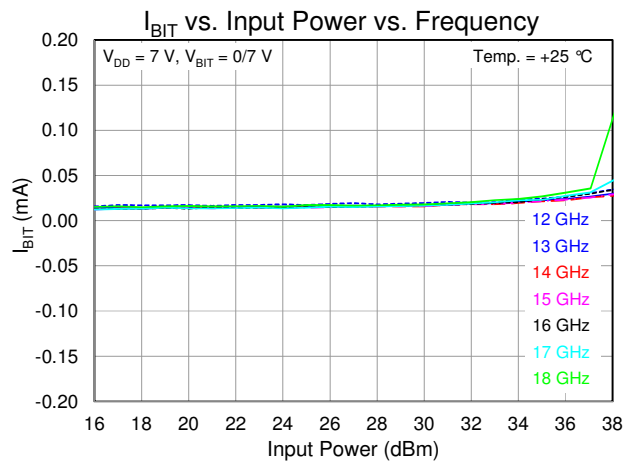
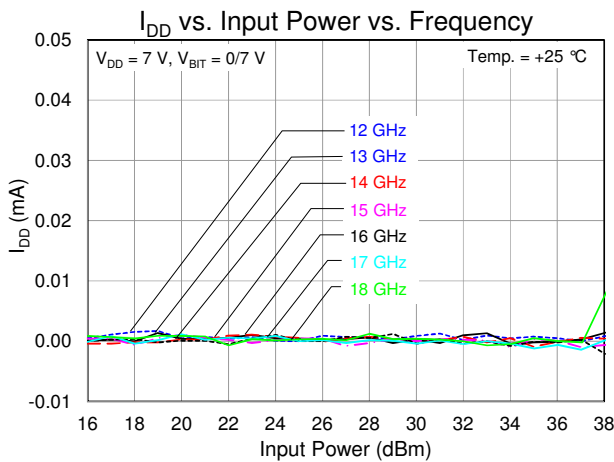
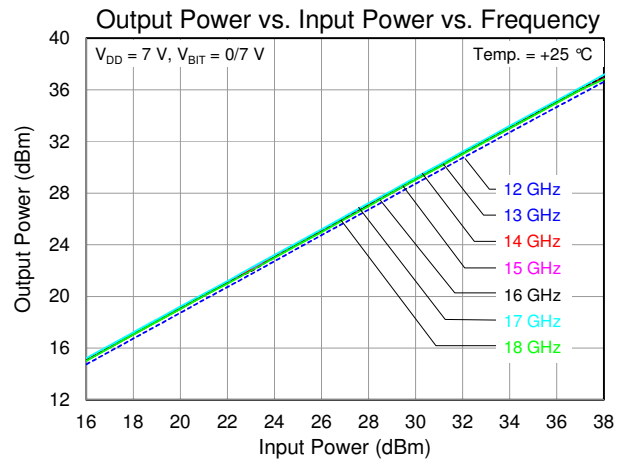
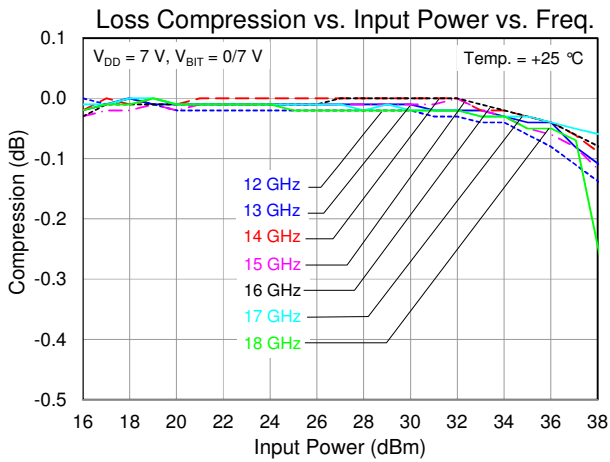
Test Conditions: 7 V; Failure Criteria = 10% reduction in I_{MAX}



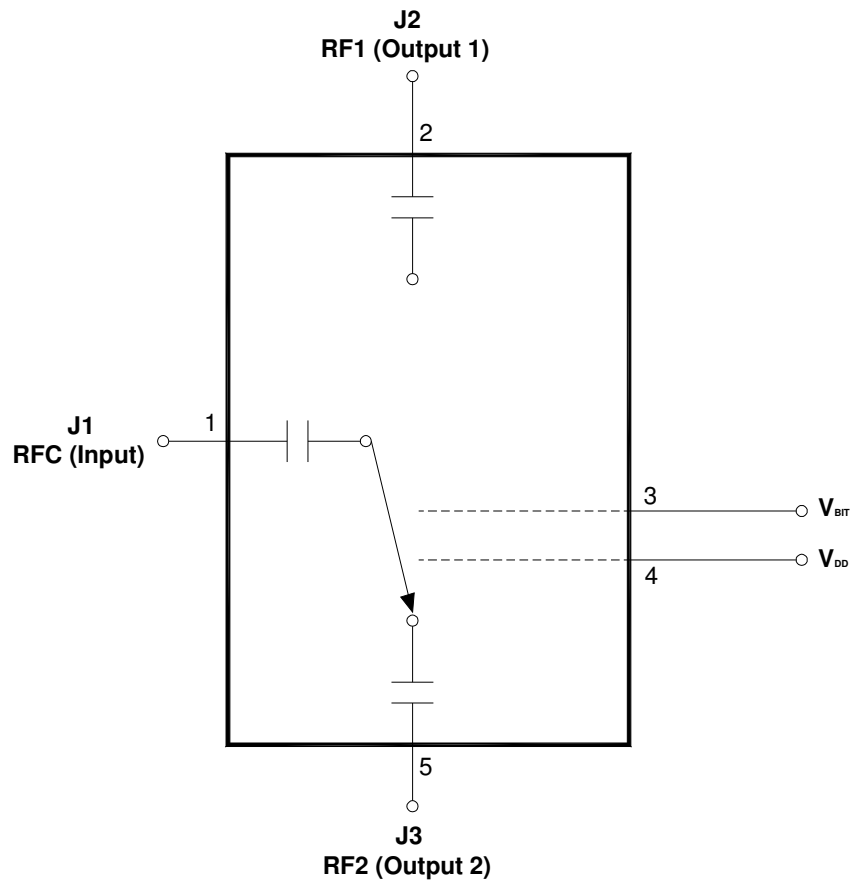
Typical Performance: Small Signal



Typical Performance: Large Signal



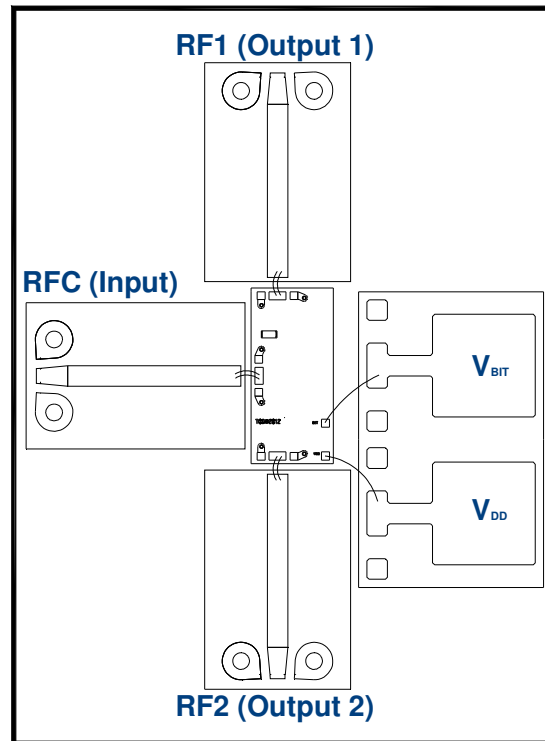
Application Circuit



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.

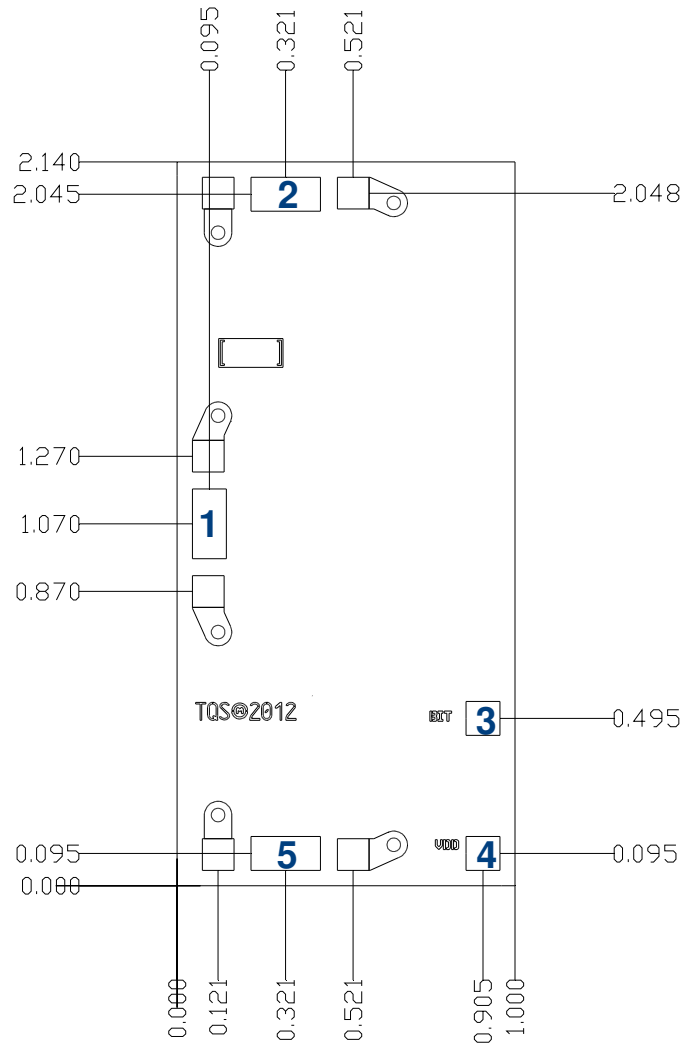
Organic adhesive attachment assembly notes:

- 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

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