

Applications

- Phased-Array Radar
- Satellite Communications

Product Features

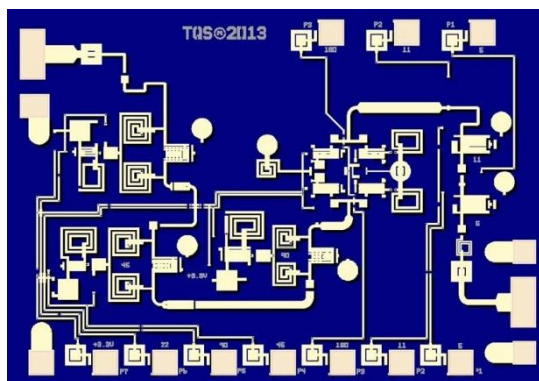
- 6-Bit Digital Phase Shifter
- Frequency Range: 15 to 19 GHz
- 360° Coverage, LSB = 5.625°
- RMS Phase Error: 4°
- RMS Amplitude Error: 1 dB
- Insertion Loss: 7 dB
- Input Return Loss: >10 dB
- Output Return Loss: >9 dB
- Input IP3: >34 dBm
- Input P1dB: >24 dBm
- Positive Control Logic: 0/+3.3 V
- Chip Dimensions: 2.11 x 1.47 x 0.10 mm

General Description

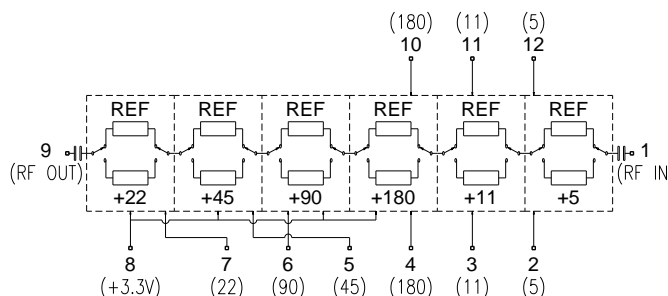
TriQuint's TGP2615 is a 6-bit digital phase shifter fabricated on TriQuint's high-performance 0.15- μ m GaAs pHEMT process. It operates over 15 to 19 GHz, and provides 360° of phase coverage with a LSB of 5.625°. It also achieves a low RMS phase error of 4°, with 7-dB average insertion loss over all states.

The TGP2615 uses positive single-control-line switch logic, eliminating the need for a negative voltage rail or complimentary logic. This, combined with low insertion loss and a high degree of resolution makes the TGP2615 ideally suited for applications in phased-array radar and satellite communications.

The device is lead-free and RoHS compliant.



Functional Block Diagram



Pad Configuration

Pad No.	Symbol
1	RF IN
2	5°
3	11°
4	180°
5	45°
6	90°
7	22°
8	V _{REF}
9	RF OUT
10	180°
11	11°
12	5°

Ordering Information

Part	ECCN	Description
TGP2615	EAR99	6-Bit Digital Phase Shifter (+V _c)

Absolute Maximum Ratings

Parameter	Value
Control and Reference Voltage	6 V
Power Dissipation	0.8 W
Input Power, CW, 50 Ω, 85°C	30 dBm
Channel Temperature	200°C
Mounting Temperature (30 Seconds)	320°C
Storage Temperature	-55 to 150°C

Operation of this device outside the parameter ranges given above may cause permanent damage. These are stress ratings only, and functional operation of the device at these conditions is not implied.

Recommended Operating Conditions

Parameter	Value
Control Voltage (5°, 11°, 22°, 45°, 90°, 180°)	0/+3.3 V
Reference Voltage (V _{REF})	+3.3 V

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

Electrical Specifications

Test conditions unless otherwise noted: 25°C. Control Voltage (REF, 5°, 11°, 22°, 45°, 90°, 180°) = 0/+3.3 V; See Bias Truth Table.

Parameter	Conditions	Min	Typ	Max	Units
Operational Frequency Range		15		19	GHz
Insertion Loss	Average across all phase states		6 - 8		dB
Input Return Loss	Average across all phase states		>10		dB
Output Return Loss	Average across all phase states		>9		dB
RMS Phase Error			4		deg
RMS Amplitude Error			1		dB
Input P1dB			>24		dBm
Input IP3	Tone spacing = 10 MHz Pin/Tone = 15 dBm		>34		dBm
Insertion Loss Temperature Coefficient	Average all phase states, 19 GHz		0.002		dB/°C
Control Current			+/- 20		uA

Bias Truth Table

Logic "0" = 0 V, Logic "1" = V_{REF} = +3.3 V

Phase Shifter	5°	11°	22°	45°	90°	180°	REF
0° (Reference)	0	0	0	0	0	0	1
5°	1	0	0	0	0	0	1
11°	0	1	0	0	0	0	1
22°	0	0	1	0	0	0	1
45°	0	0	0	1	0	0	1
90°	0	0	0	0	1	0	1
180°	0	0	0	0	0	1	1
355°	1	1	1	1	1	1	1

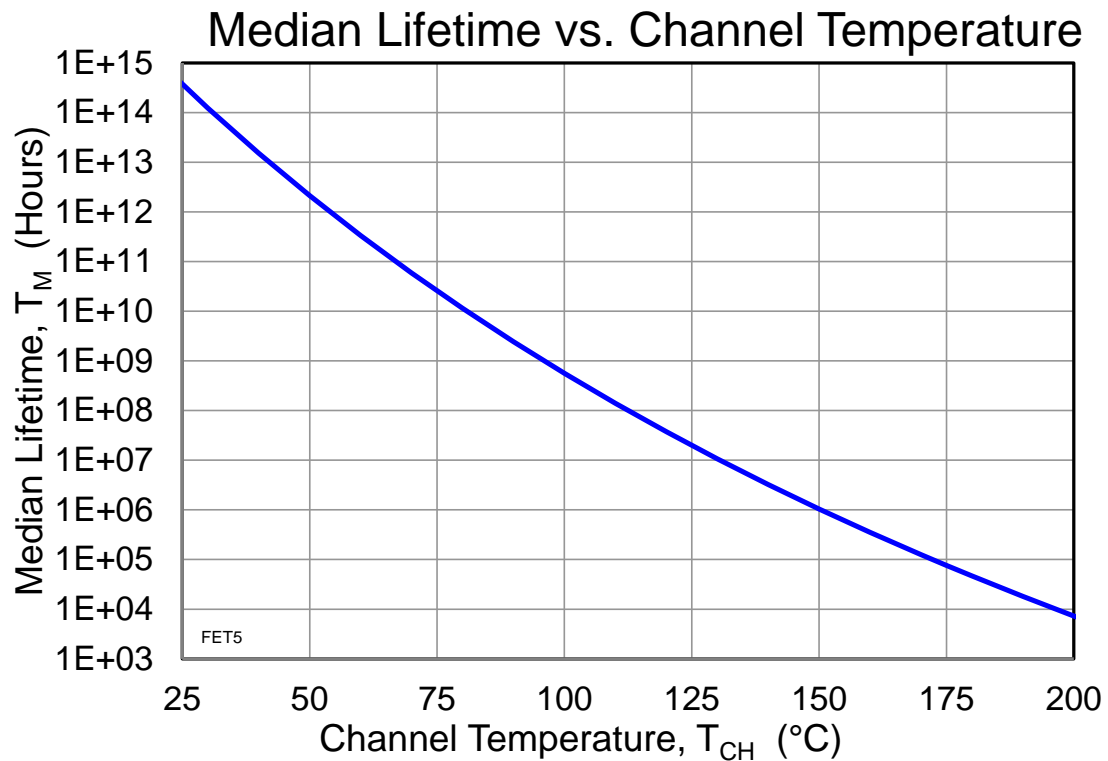
Thermal and Reliability Information

Parameter	Test Conditions	Value	Units
Channel Temperature (T_{CH})	$T_{BASEPLATE} = 85^{\circ}C$	85	$^{\circ}C$
Median Lifetime (T_M)		5.2E+9	Hrs

Notes:

- Under normal (lifetime) operating conditions, self-heating is not a significant contributor to channel temperature.

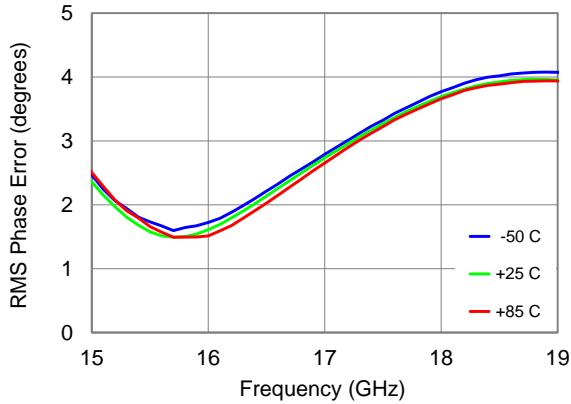
Median Lifetime



Typical Performance

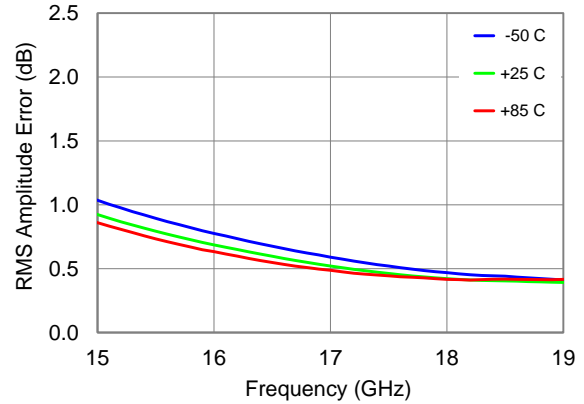
RMS Phase Error vs Frequency

All Phase States, $V_{REF} = 3.3\text{ V}$



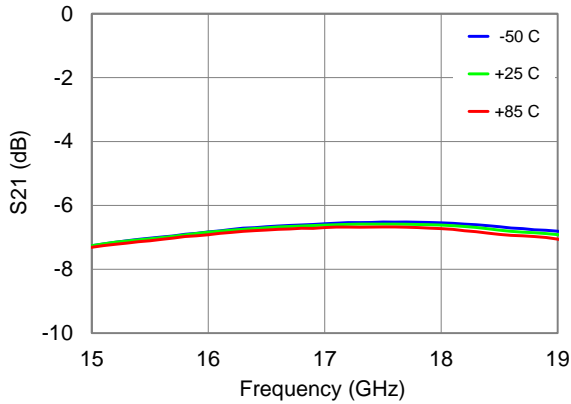
RMS Amplitude Error vs Frequency

All Phase States, $V_{REF} = 3.3\text{ V}$



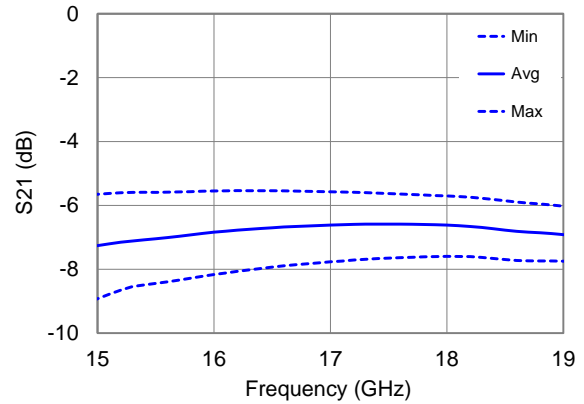
Average Insertion Loss vs Temperature

All Phase States, $V_{REF} = 3.3\text{ V}$



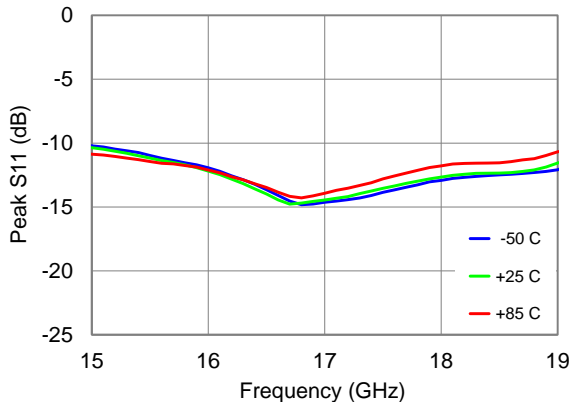
Peak Insertion Loss vs Frequency

All Phase States, 25 °C, $V_{REF} = 3.3\text{ V}$



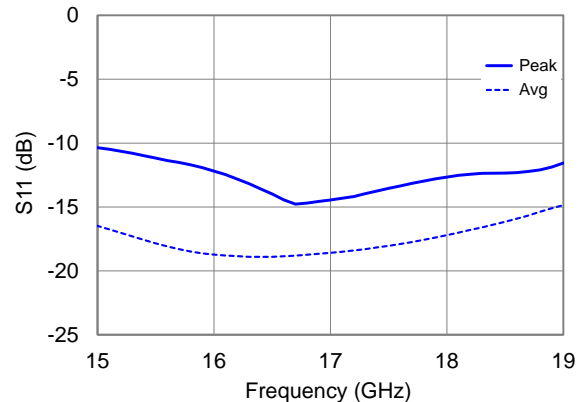
Input Return Loss vs Temperature

All Phase States, $V_{REF} = 3.3\text{ V}$



Input Return Loss vs Frequency

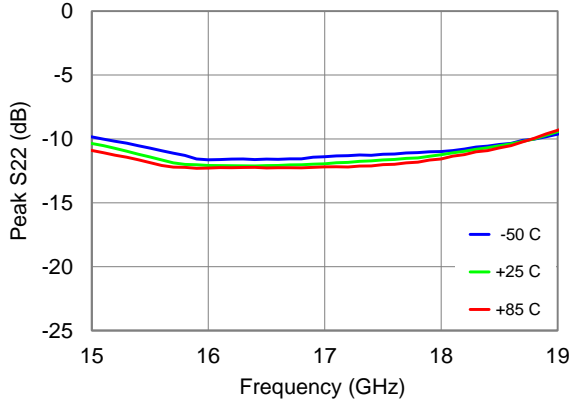
All Phase States, 25 °C, $V_{REF} = 3.3\text{ V}$



Typical Performance

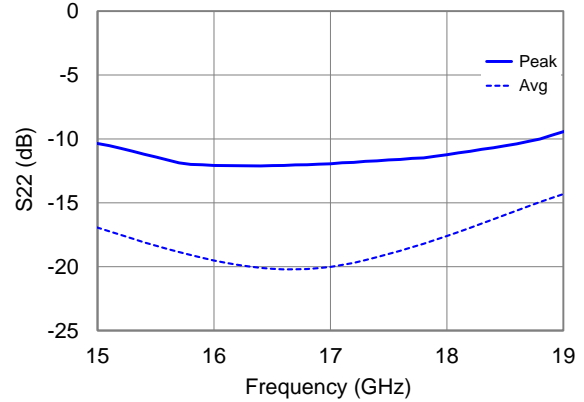
Output Return Loss vs Temperature

All Phase States, $V_{REF} = 3.3\text{ V}$



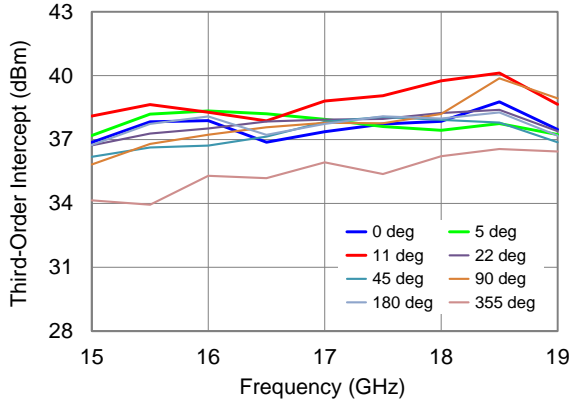
Output Return Loss vs Frequency

All Phase States, 25 °C, $V_{REF} = 3.3\text{ V}$



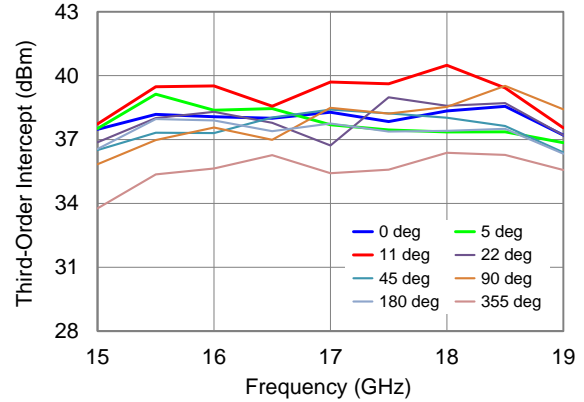
Input TOI vs Frequency

Major Phase States, 25 °C, $V_{REF} = 3.3\text{ V}$



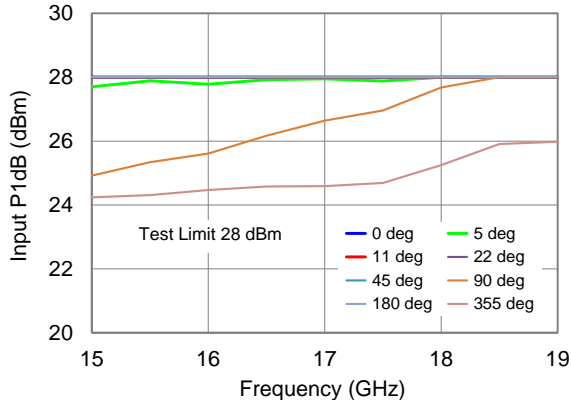
Input TOI vs Frequency

Major Phase States, 85 °C, $V_{REF} = 3.3\text{ V}$



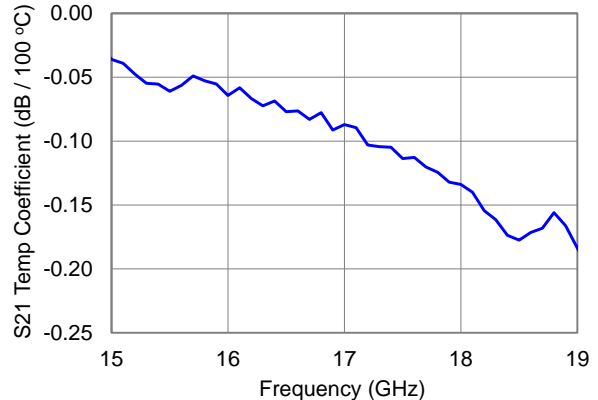
Input P1dB vs Frequency

Major Phase States, 25 °C, $V_{REF} = 3.3\text{ V}$

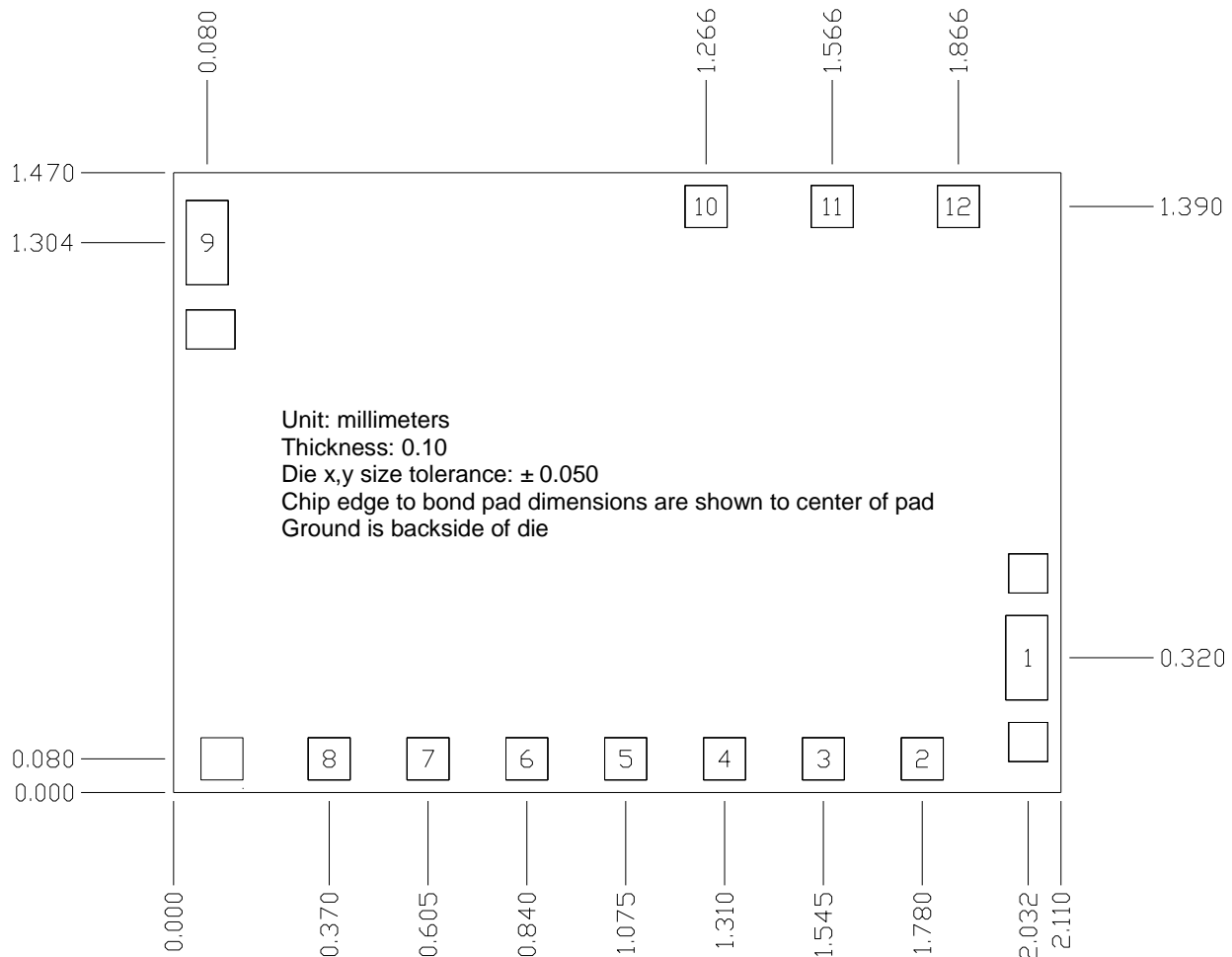


Loss Temperature Coefficient vs Frequency

All Phase States, -50 to +85 °C, $V_{REF} = 3.3\text{ V}$

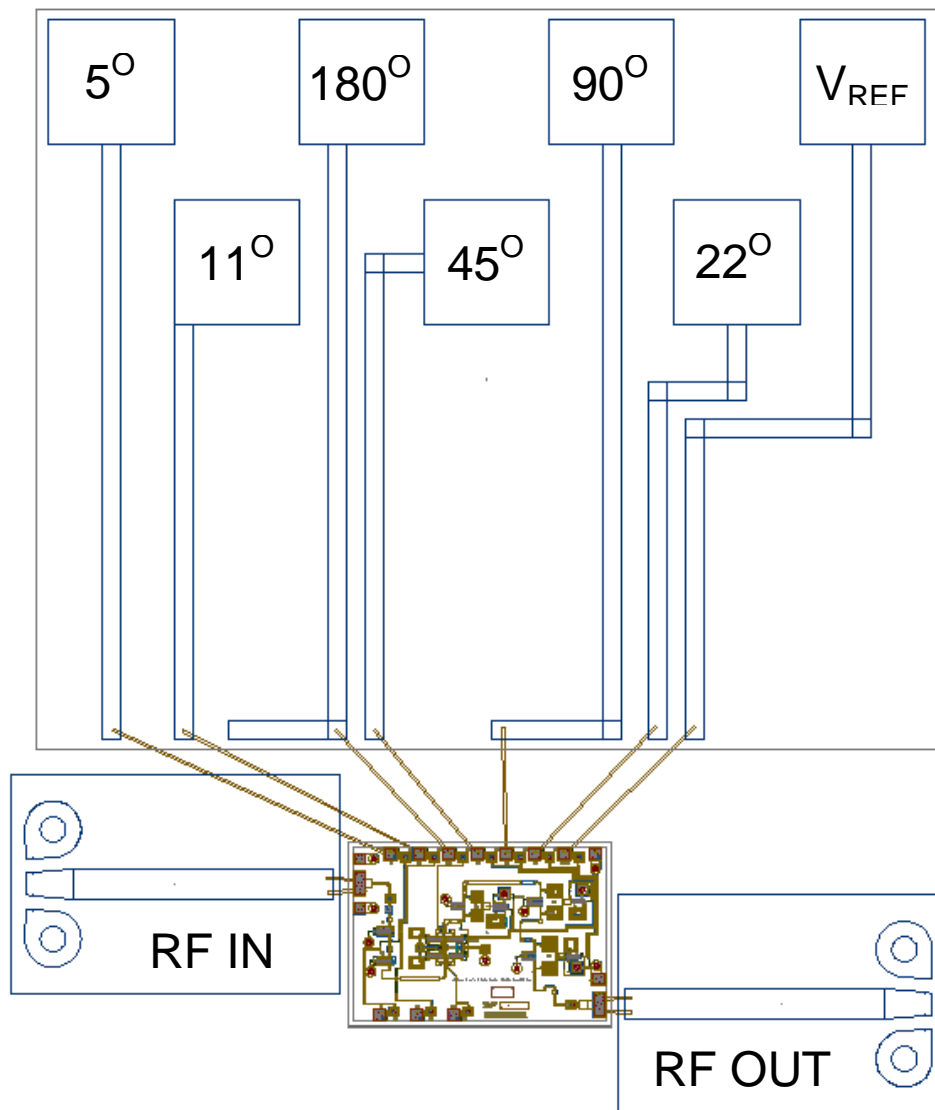


Mechanical Information and Bond Pad Description



Bond Pad	Symbol	Description	Pad Size
1	RF IN	RF Input; 50 Ω ; DC-Blocked	0.100 x 0.200
2	5°	5° Bit Control	0.100 x 0.100
3	11°	11° Bit Control	0.100 x 0.100
4	180°	180° Bit Control	0.100 x 0.100
5	45°	45° Bit Control	0.100 x 0.100
6	90°	90° Bit Control	0.100 x 0.100
7	22°	22° Bit Control	0.100 x 0.100
8	V _{REF}	Reference voltage for logic "1"	0.100 x 0.100
9	RF OUT	RF Output; 50 Ω ; DC-Blocked	0.100 x 0.200
10	180°	180° Bit Alternate Control	0.100 x 0.100
11	11°	11° Bit Alternate Control	0.100 x 0.100
12	5°	5° Bit Alternate Control	0.100 x 0.100

Assembly Drawing



- The spacing between MMIC and TFN (at RF In or RF Out) is < 5 mils typical.
- RF connections: Bond two 1 mil diameter, < 20 mils length, gold bond wires at RF In and RF Out for optimum RF performance.
- For fixtured testing, device was rotated 180 degrees from orientation in the page-1 chip photograph.

Assembly Notes

Component placement and adhesive attachment assembly notes:

- Vacuum pencils and/or vacuum collets are the preferred method of pick up.
- Contact with air bridges must be avoided during placement.
- The force impact is critical during auto placement.
- Solder or Organic Adhesive attachment may be used for this part.
- Devices must be stored in a dry nitrogen atmosphere.

Solder attachment reflow process assembly notes:

- Use AuSn (80/20) solder and limit exposure to temperatures above 300°C to 3 to 4 minutes, maximum.
- 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.

Organic adhesive attachment assembly notes:

- The organics such as epoxy or polyimide can be used.
- Epoxies cure at temperatures of 100 to 200°C.
- Curing should be done in a convection oven; proper exhaust is a safety concern.

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.
- Devices with small pad sizes should be bonded with 0.0007-inch wire.

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

Solderability

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

ECCN

US Department of Commerce: EAR99

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@triquint.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.



Стандарт Электрон Связь

Мы молодая и активно развивающаяся компания в области поставок электронных компонентов. Мы поставляем электронные компоненты отечественного и импортного производства напрямую от производителей и с крупнейших складов мира.

Благодаря сотрудничеству с мировыми поставщиками мы осуществляем комплексные и плановые поставки широчайшего спектра электронных компонентов.

Собственная эффективная логистика и склад в обеспечивает надежную поставку продукции в точно указанные сроки по всей России.

Мы осуществляем техническую поддержку нашим клиентам и предпродажную проверку качества продукции. На все поставляемые продукты мы предоставляем гарантию .

Осуществляем поставки продукции под контролем ВП МО РФ на предприятия военно-промышленного комплекса России , а также работаем в рамках 275 ФЗ с открытием отдельных счетов в уполномоченном банке. Система менеджмента качества компании соответствует требованиям ГОСТ ISO 9001.

Минимальные сроки поставки, гибкие цены, неограниченный ассортимент и индивидуальный подход к клиентам являются основой для выстраивания долгосрочного и эффективного сотрудничества с предприятиями радиоэлектронной промышленности, предприятиями ВПК и научно-исследовательскими институтами России.

С нами вы становитесь еще успешнее!

Наши контакты:

Телефон: +7 812 627 14 35

Электронная почта: sales@st-electron.ru

Адрес: 198099, Санкт-Петербург,
Промышленная ул, дом № 19, литера Н,
помещение 100-Н Офис 331