

## Applications

- Commercial and Military Radar
- Communications
- Electronic Warfare
- Test Instrumentation
- General Purpose

## Product Features

- SPDT, Reflective
- Frequency Range: 0.5 to 12 GHz
- Input Power: up to 20 W
- Insertion Loss: <1 dB
- Isolation: -35 dB Typical
- Switching Speed: <35 ns
- Control Voltages: 0 V/-40 V
- Dimensions: 4.0 x 4.0 x 1.42 mm

## General Description

The TriQuint TGS2352-2-SM is a single-pole, double-throw (SPDT) reflective switch packaged in a 4x4mm ceramic, air-cavity QFN.

Fabricated on TriQuint's 0.25um GaN on SiC production process, the TGS2353-2-SM operates from 0.5-18GHz and can switch up to 10W with low insertion loss and high isolation.

The TGS2353-2-SM performance allows it to be used in a variety of applications across commercial and military markets; low and high power.

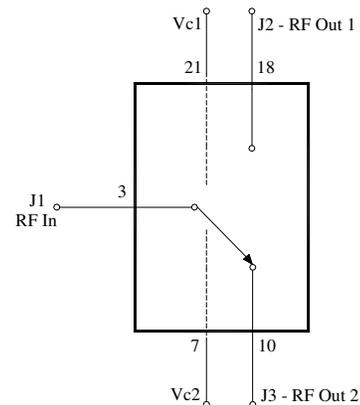
Lead-free and RoHS compliant

Evaluation Boards are available upon request.



QFN 4x4mm 22L

## Functional Block Diagram



## Pin Configuration

Pin No.	Label
1-2, 4-6, 8-9, 11-17, 19-20, 22-23	GND
3	RF IN
7	V <sub>C2</sub>
10	RF OUT 2
18	RF OUT 1
21	V <sub>C1</sub>

## Ordering Information

Part No.	ECCN	Description
TGS2352-2-SM	EAR99	0.5 to 12 GHz High Power SPDT Reflective Switch

### Absolute Maximum Ratings

Parameter	Rating
Control Voltage ( $V_C$ )	-50 V
Control Current ( $I_{DC}$ )	-1.5 to 6 mA
Power Dissipation ( $P_{DISS}$ )	5 W
RF Input Power, CW, 50 $\Omega$ , T = 25 °C	44 dBm
Channel Temperature ( $T_{CH}$ )	275 °C
Mounting Temperature (30 Seconds)	320 °C
Storage Temperature	-40 to 150 °C

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

### Recommended Operating Conditions

Parameter	Min	Typ	Max	Units
$V_{C1}$		-40/0		V
$V_{C2}$		0/-40		V
$I_{C1} / I_{C2}$		-0.25 to 0.1		mA

Electrical performance is measured under conditions noted in the electrical specifications table. Specifications are not guaranteed over all recommended operating conditions.

### Electrical Specifications

Test conditions unless otherwise noted: 25 °C,  $V_{C1} = -40/0$  V,  $V_{C2} = 0/-40$  V, see Function Table on page 7

Parameter	Min	Typ	Max	Units
Operational Frequency Range	0.5		12	GHz
Insertion Loss		<1		dB
Input Return Loss – Common Port		15		dB
Output Return Loss – Switched Port		15		dB
Isolation		-35		dB
Output Return Loss – Isolated Port		3		dB
Input Power		43		dBm
Insertion Loss Temperature Coefficient		-0.004		dB/°C
Switching Speed – On		31		ns
Switching Speed – Off		18		ns

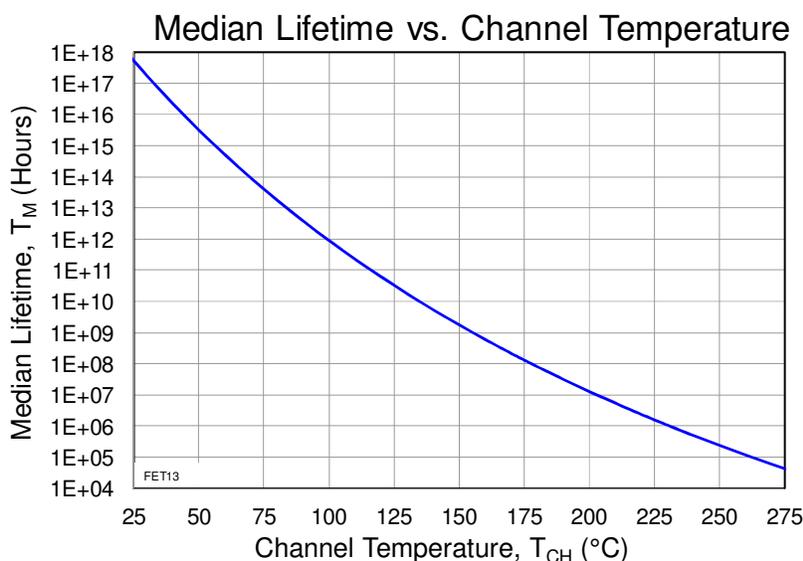
**Thermal and Reliability Information**

Parameter	Condition	Value	Units
Thermal Resistance ( $\theta_{JC}$ ) <sup>(1)</sup>	$T_{BASE} = 85\text{ }^\circ\text{C}$	21	$^\circ\text{C/W}$
Channel Temperature ( $T_{CH}$ )	$T_{BASE} = 85\text{ }^\circ\text{C}, V_{C1} = 0\text{ V}, V_{C2} = -40\text{ V},$	166	$^\circ\text{C}$
Median Lifetime ( $T_M$ )	$P_{IN} = 20\text{ W}, P_{DISS} = 4.15\text{ W}$	$3.21 \times 10^8$	Hours

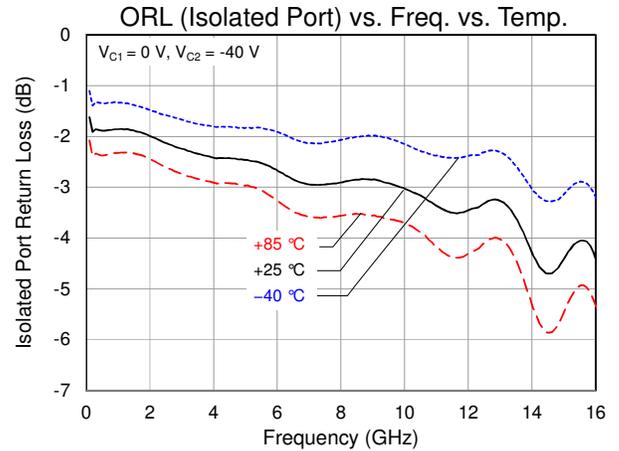
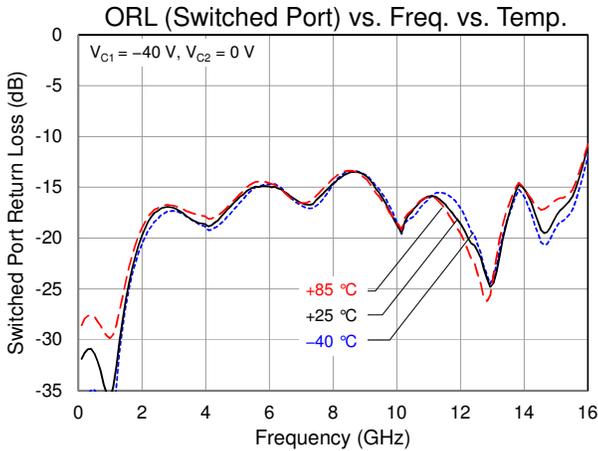
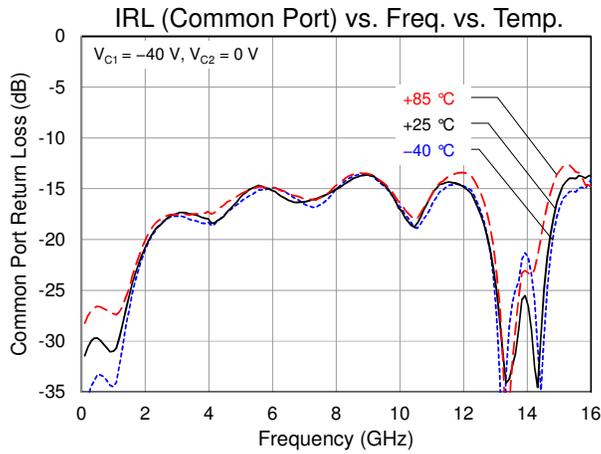
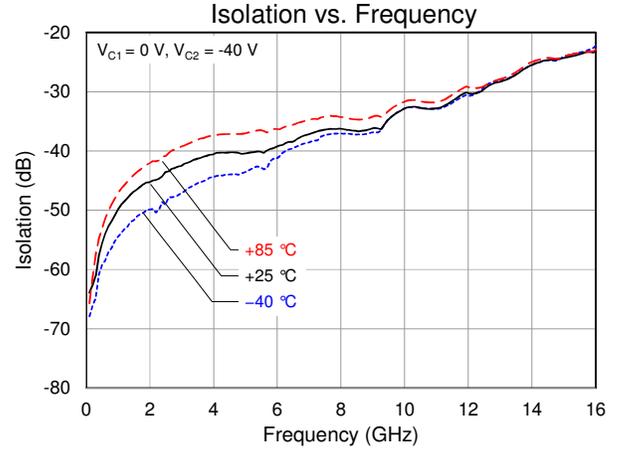
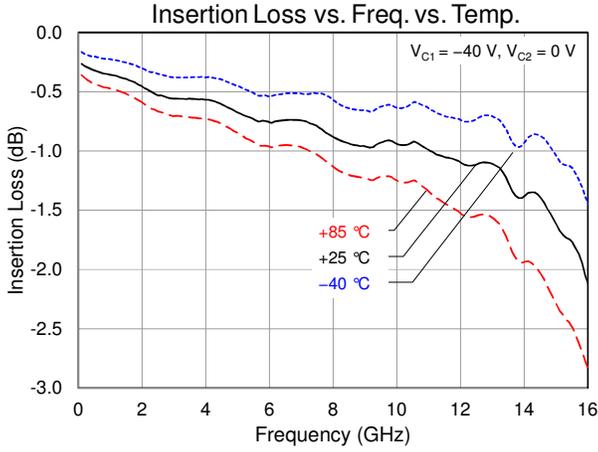
Notes:

- 1. Measured to back of package

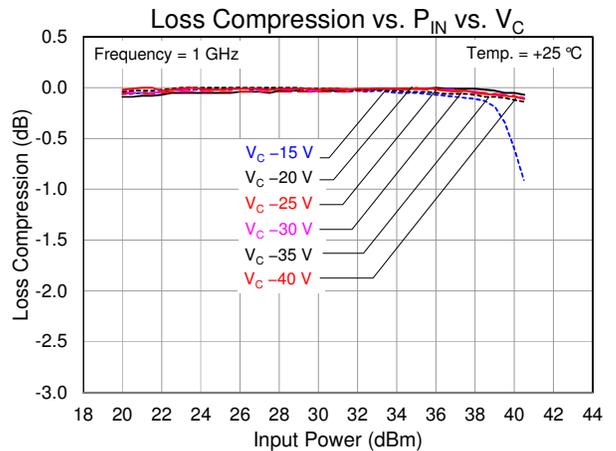
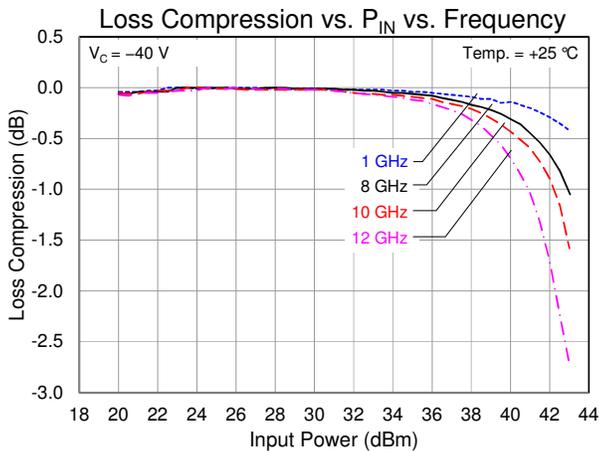
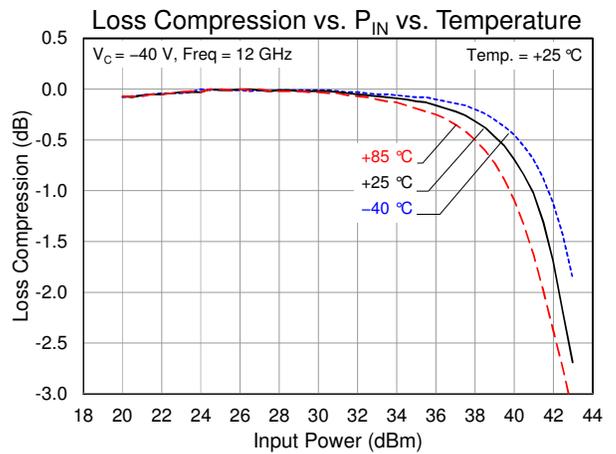
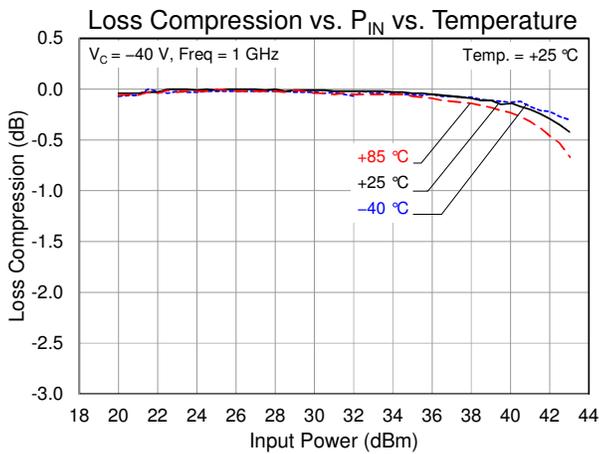
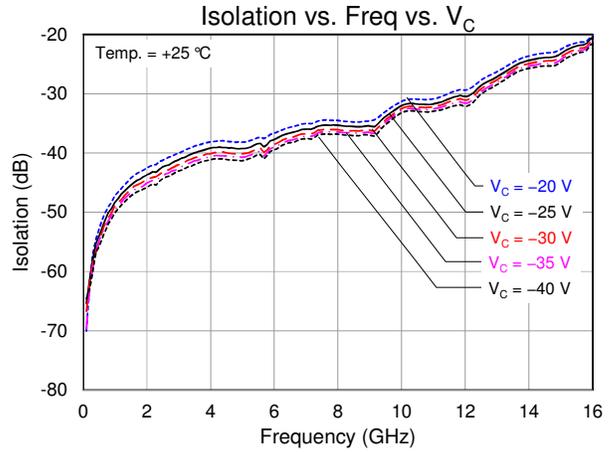
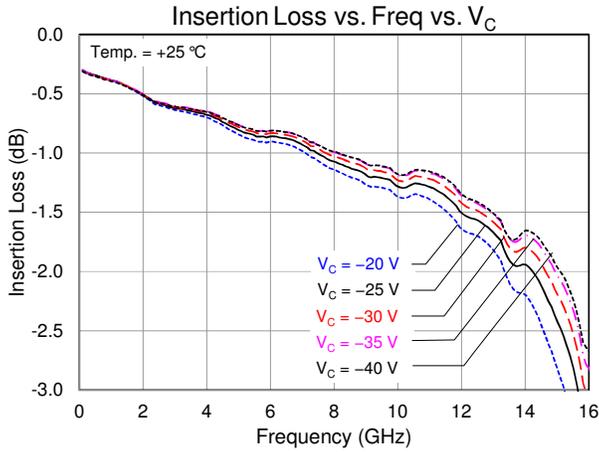
**Median Lifetime**



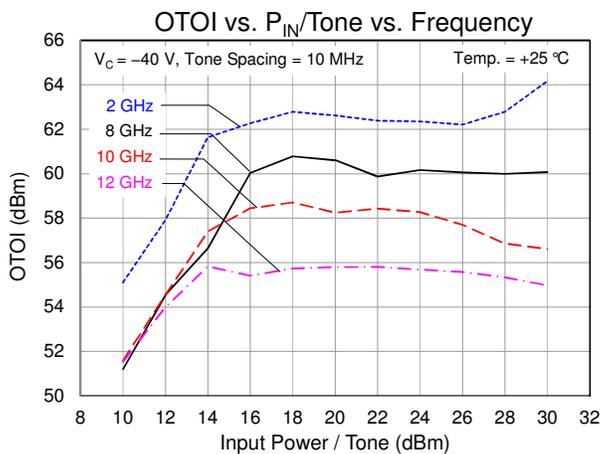
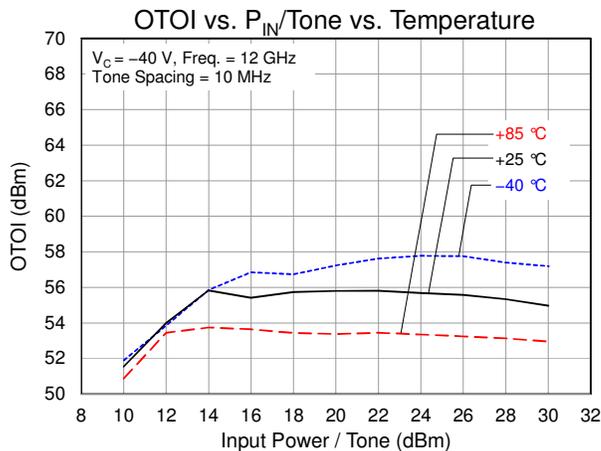
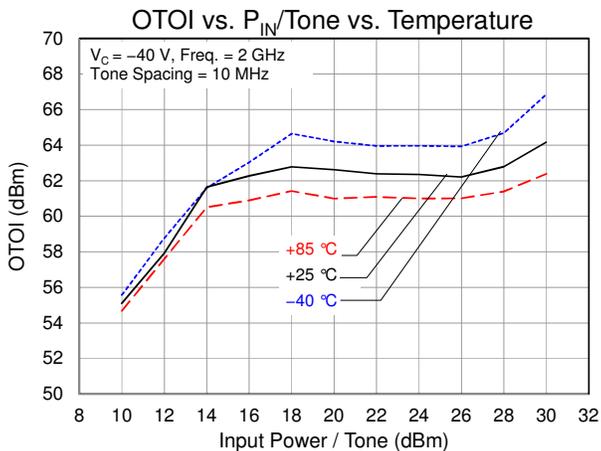
**Typical Performance**



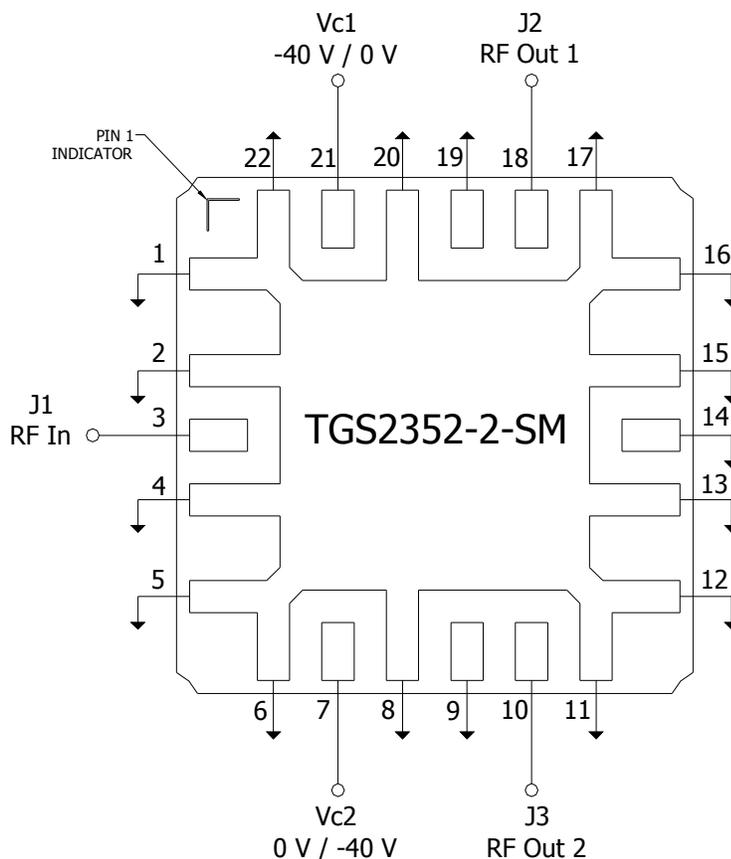
**Typical Performance**



**Typical Performance**



## Application Circuit



The switch can be configured as a Single-Pole, Single-Throw (SPST) by terminating one unused RF Out port with a 50  $\Omega$  load.

### Bias-up Procedure

1.  $V_{C1}$  or  $V_{C2}$  set to 0 V (see Function Table for RF Path)
2.  $V_{C2}$  or  $V_{C1}$  set to -40 V (see Function Table for RF Path)
3. Apply RF signal to RF Input

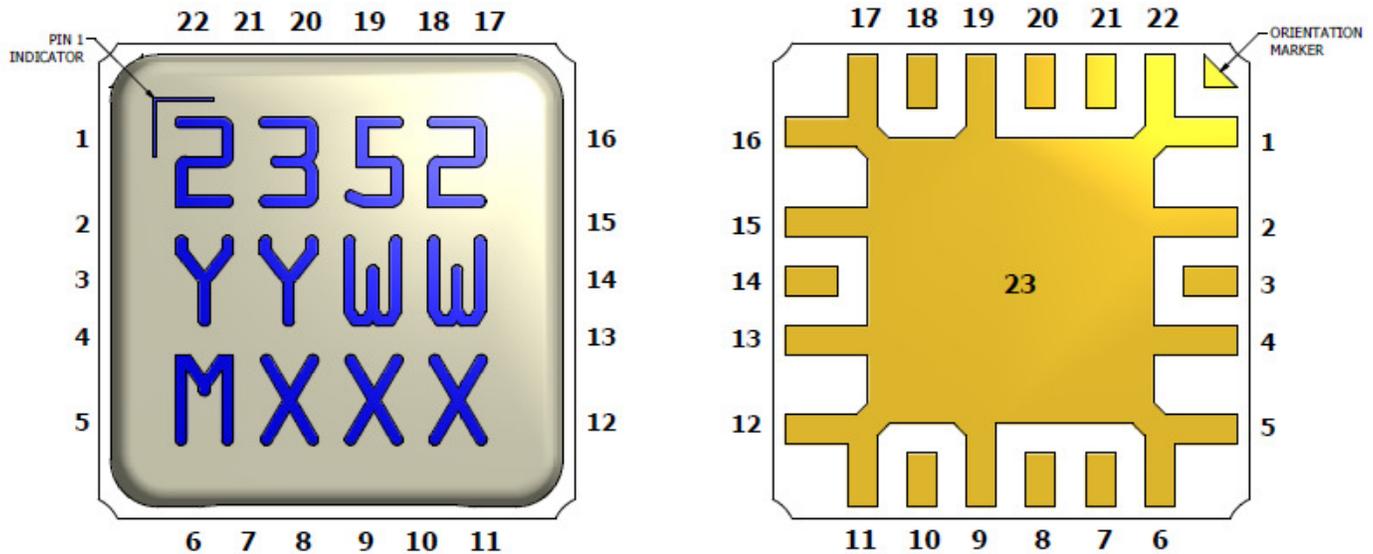
### Bias-down Procedure

1. Turn off RF supply
2. Turn  $V_{C2}$  or  $V_{C1}$  to 0 V
3. Turn  $V_{C1}$  or  $V_{C2}$  to 0 V

### Function Table

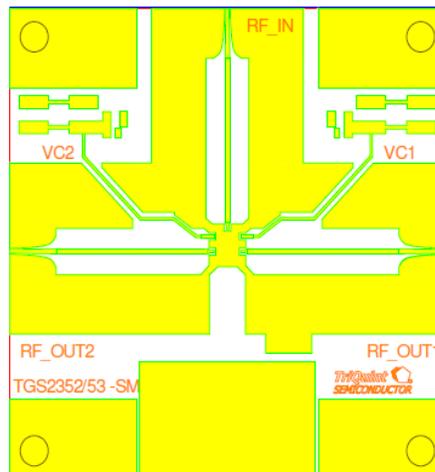
RF Path	State	$V_{C1}$	$V_{C2}$
RF In to RF Out1 (50 $\Omega$ load to RF Out2)	Insertion Loss	0 V	-40 V
	Isolation	-40 V	0 V
RF In to RF Out2 (50 $\Omega$ load to RF Out1)	Insertion Loss	-40 V	0 V
	Isolation	0 V	-40 V

## Pin Description

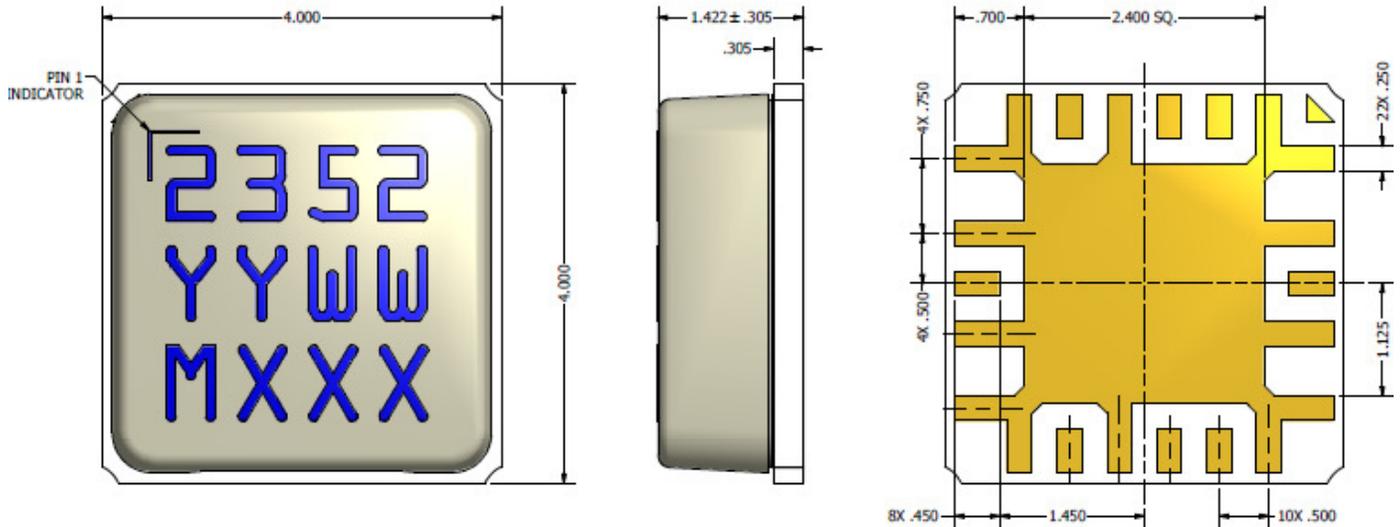


Pin No.	Label	Description
1-2, 4-6, 8-9, 11-17, 19-20, 22	GND	Connected to GND paddle (pin 23); must be grounded on PCB to improve isolation
3	RF IN	RF Input; matched to 50 ohms; DC coupled
7	V <sub>C2</sub>	Control voltage #2; External components are not required
10	RF OUT 2	Output #2, matched to 50 Ω, DC coupled
18	RF OUT 1	Output #1, matched to 50 Ω, DC coupled
21	V <sub>C1</sub>	Control voltage #1; External components are not required
23	GND	Backside Paddle. Multiple vias should be employed to minimize inductance and thermal resistance.

## PC Board Layout



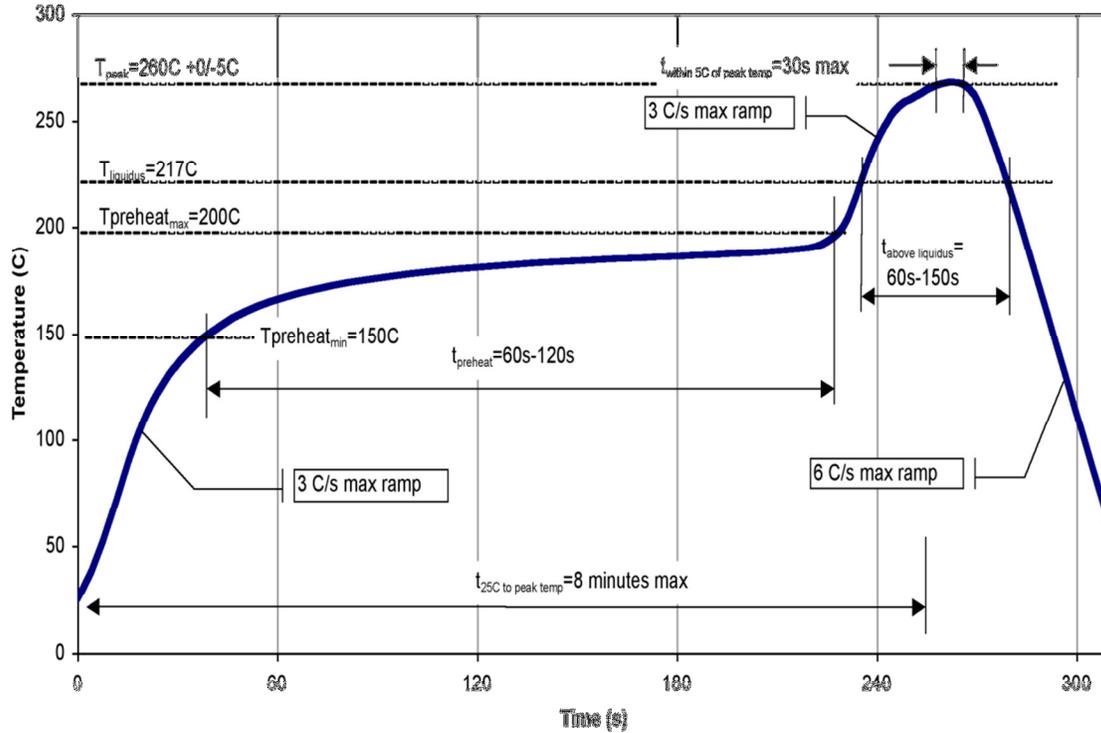
**Mechanical Information – Package Information and Dimensions**



**Notes:**

1. Material:  
 Package Base: Aluminum Nitride (AlN)  
 Package Lid: Liquid Crystal Polymer (LCP)
2. Finish:  
 Electroless Gold (Au): 2.54 to 8.89  $\mu\text{m}$   
 over  
 Electroless Nickel (Ni): 1.52 to 5.71  $\mu\text{m}$
3. Part marking:  
 2352: Part number  
 YY: Part Assembly year  
 WW: Part Assembly week  
 MXXX: Batch ID
4. Units: millimeters

**Recommended Soldering Temperature Profile**



## Product Compliance Information

### ESD Sensitivity Ratings



Caution! ESD-Sensitive Device

ESD Rating: Class 1A  
Value: Passes  $\geq 250$  V min.  
Test: Human Body Model (HBM)  
Standard: JEDEC Standard JESD22-A114

### MSL Rating

Level 1 at +260 °C convection reflow  
The part is rated Moisture Sensitivity Level TBD at 260 °C per  
JEDEC standar IPC/JEDEC J-STD-020.

### ECCN

US Department of Commerce EAR99

### Solderability

Compatible with the latest version of J-STD-020, Lead-free solder, 260 °C.

### 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 (C<sub>15</sub>H<sub>12</sub>Br<sub>4</sub>O<sub>2</sub>) Free
- PFOS Free
- SVHC Free

## Contact Information

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

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## JONHON

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