TGS2352-2-SM

0.5 - 12 GHz High Power SPDT Reflective Switch

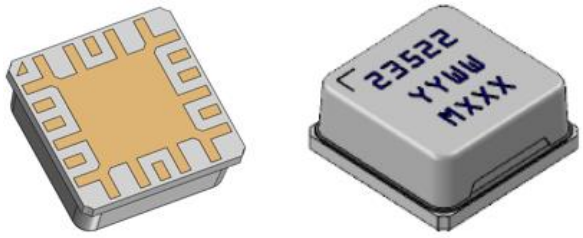
Product Overview

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

Fabricated on Qorvo's QGaN25 0.25um GaN on SiC production process, the TGS2352-2-SM operates from 0.5-12GHz and can swtich up to 20W with low insertion loss and high isolation.

The TGS2352-2-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.



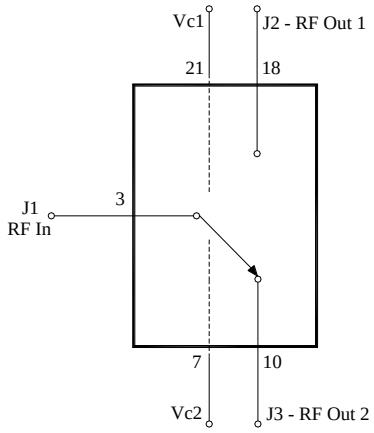
QFN 4x4 mm 22L

Key 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

Performance is typical across frequency. Please reference electrical specification table and data plots for more details.

Functional Block Diagram



Applications

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

Ordering Information

Part No.	Description
TGS2352-2-SM	0.5–12 GHz High Power SPDT Reflective Switch
TGS2352-2-SMEVB	TGS2352-2-SM Evaluation Board

Absolute Maximum Ratings

Parameter	Rating
Control Voltage (V_C)	−50 V
Control Current (I_C)	−1.5 / 6 mA
Power Dissipation	5 W
RF Input Power, CW, 50 Ω, T = 25 °C	44 dBm
Mounting Temperature (30 sec)	260 °C
Storage Temperature	−40 to 150 °C

Exceeding any one or a combination of the Absolute Maximum Rating conditions may cause permanent damage to the device. Extended application of Absolute Maximum Rating conditions to the device may reduce device reliability.

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
Temperature Range	-40	+25	+85	°C

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

Electrical Specifications

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

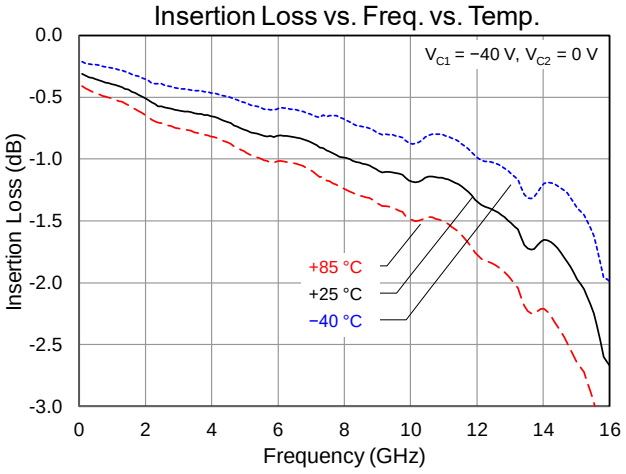
Notes:
1. Test conditions unless otherwise noted: Temp= +25°C. V_{C1} = −40/0 V, V_{C2} = 0/−40 V, see Function Table on page 6

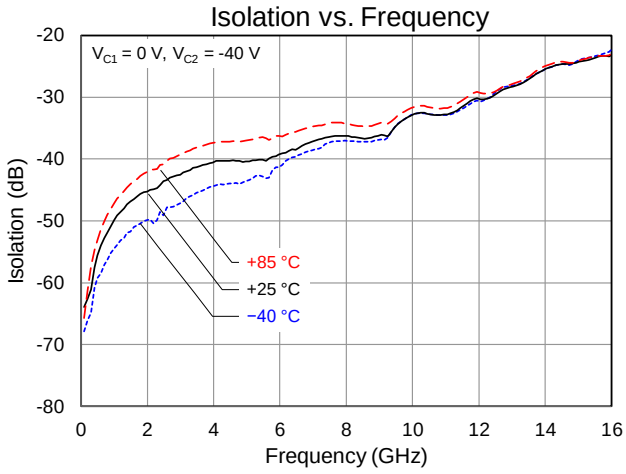
Thermal and Reliability Information

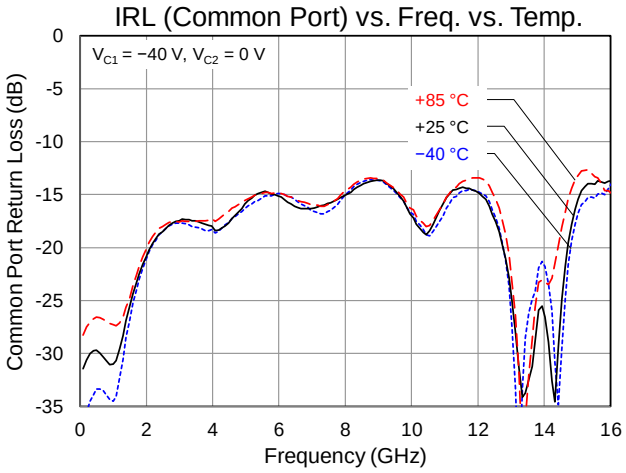
Parameter	Test Conditions	Value	Units
Thermal Resistance (θ_{JC}) (1,2)	T_{BASE} = 85 °C, V_{C1} = 0 V, V_{C2} = -40 V, Freq. = 4 GHz, CW P_{IN} = 43 dBm, P_{OUT} = 41.95 dBm, P_{DISS} = 4.29 W	22.38	ºC/W
Channel Temperature (T_{CH}) (1,2)		181	°C
Thermal Resistance (θ_{JC}) (1)	T_{BASE} = 85 °C, V_{C1} = 0 V, V_{C2} = -40 V, Freq. = 5 GHz, CW P_{IN} = 42.5 dBm, P_{OUT} = 41.2 dBm, P_{DISS} = 4.6 W	22.83	ºC/W
Channel Temperature (T_{CH}) (1,2)		190	°C
Thermal Resistance (θ_{JC}) (1,2)	T_{BASE} = 85 °C, V_{C1} = 0 V, V_{C2} = -40 V, Freq. = 8 GHz, CW P_{IN} = 41 dBm, P_{OUT} = 39.15 dBm, P_{DISS} = 4.36 W	22.48	ºC/W
Channel Temperature (T_{CH}) (1,2)		183	°C
Thermal Resistance (θ_{JC}) (1,2)	T_{BASE} = 85 °C, V_{C1} = 0 V, V_{C2} = -40 V, Freq. = 10 GHz, CW P_{IN} = 40.5 dBm, P_{OUT} = 38.5 dBm, P_{DISS} = 4.14 W	21.98	ºC/W
Channel Temperature (T_{CH}) (1,2)		176	°C
Thermal Resistance (θ_{JC}) (1,2)	T_{BASE} = 85 °C, V_{C1} = 0 V, V_{C2} = -40 V, Freq. = 12 GHz, CW P_{IN} = 40 dBm, P_{OUT} = 37.4 dBm, P_{DISS} = 4.5 W	22.67	ºC/W
Channel Temperature (T_{CH}) (1,2)		187	°C

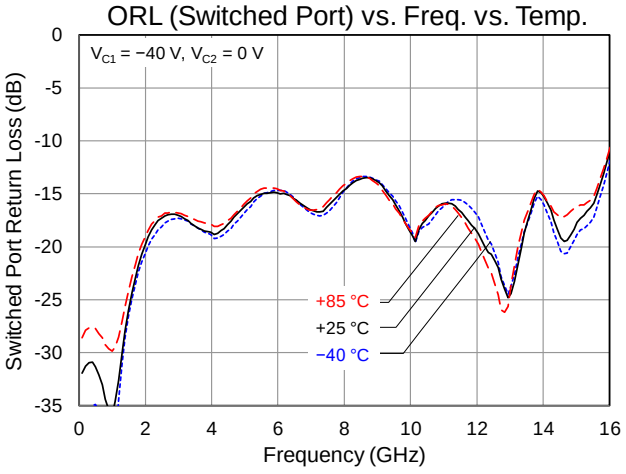
Notes:
1. Measured to the back of the package.
2. Refer to the following document: GaN Device Channel Temperature, Thermal Resistance, and Reliability Estimates

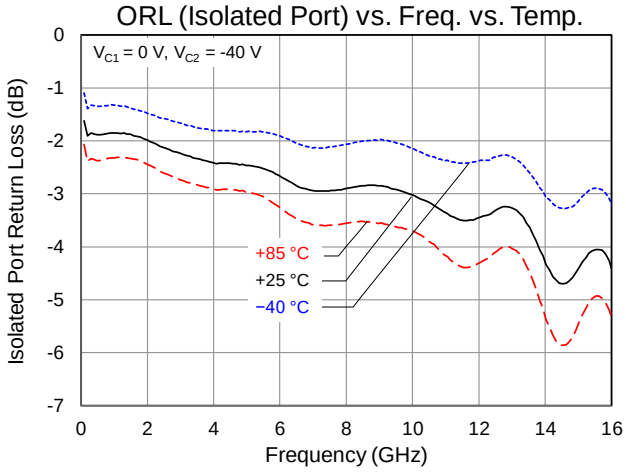
Performance Plots – Small Signal



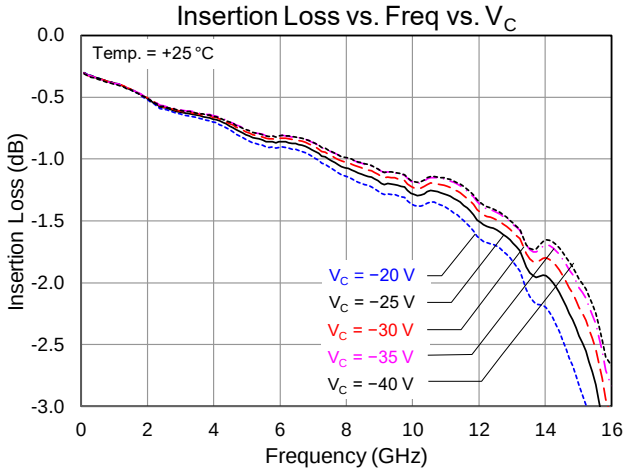


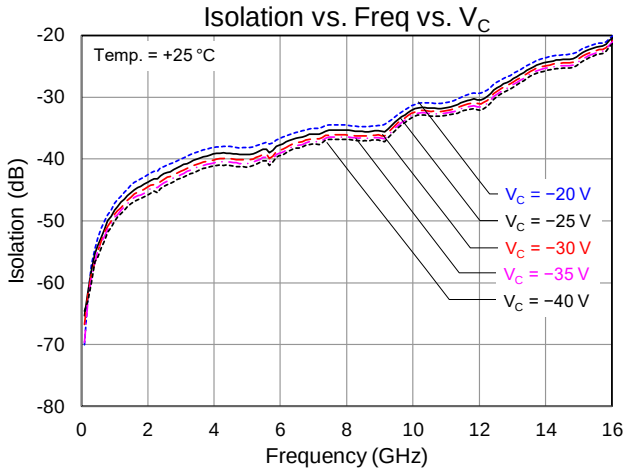


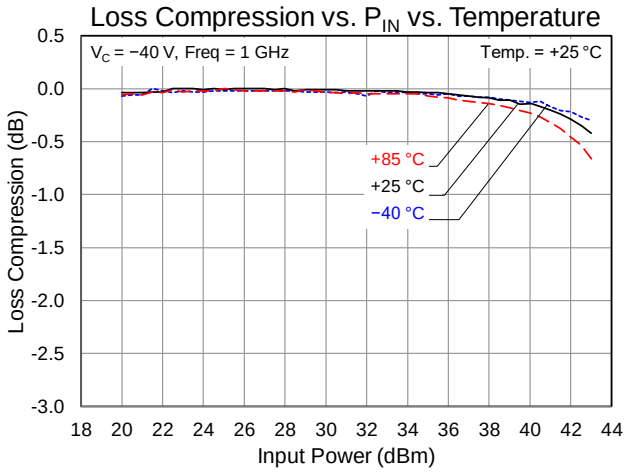


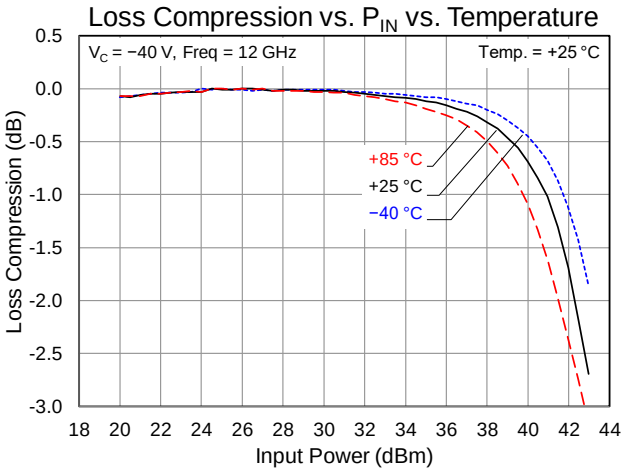


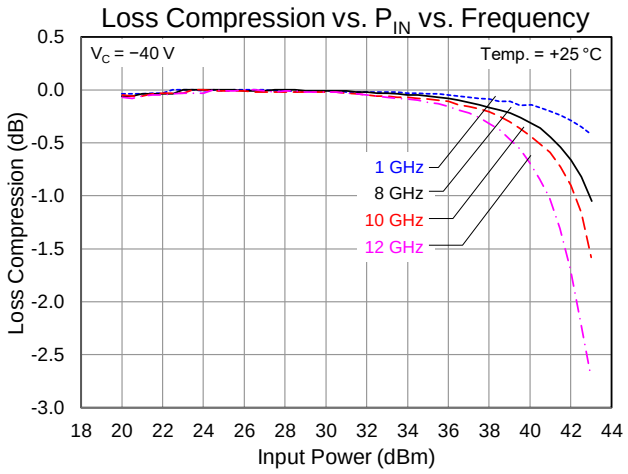
Performance Plots – Small Signal and Compression

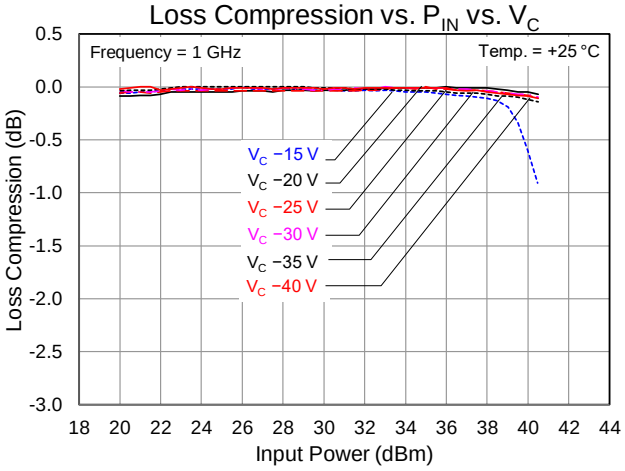




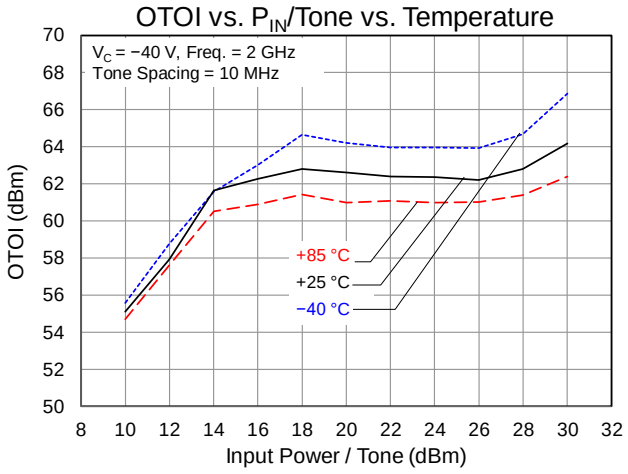


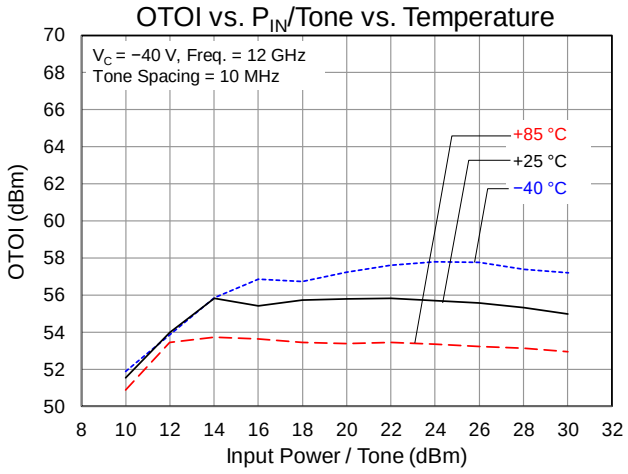


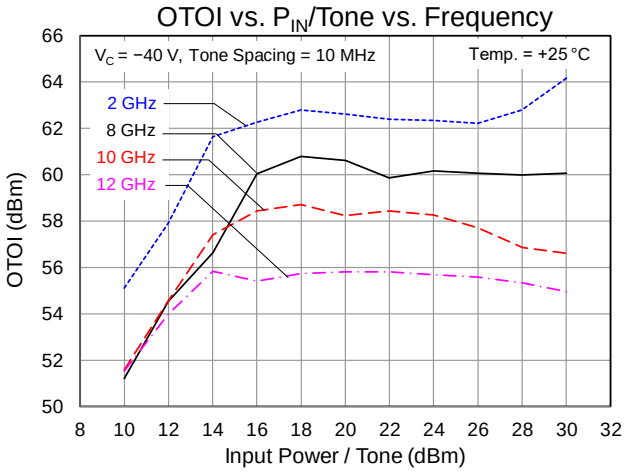




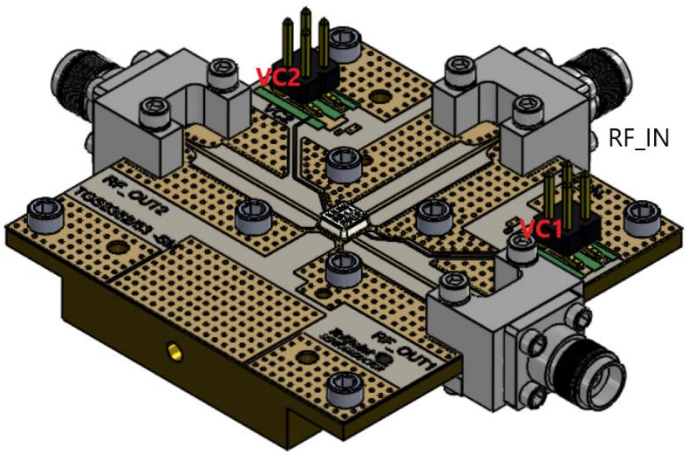
Performance Plots – Linearity

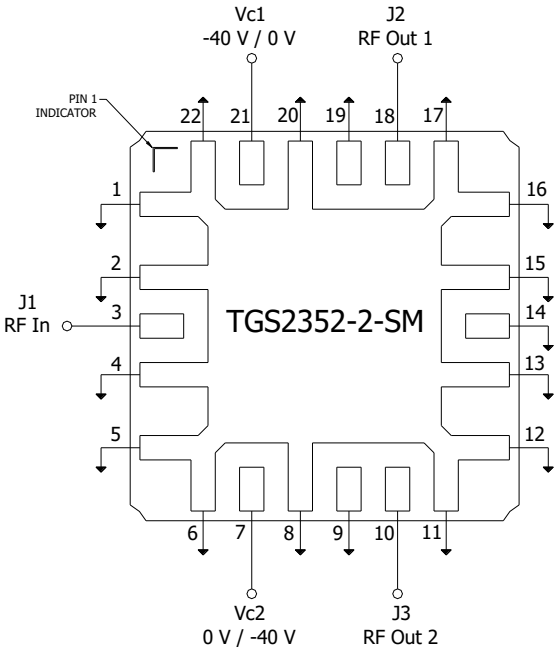






Evaluation Board (EVB) and Application Circuit





Notes:

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

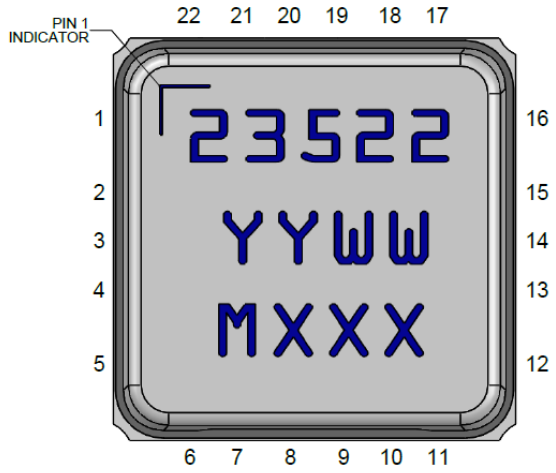
Bias Up Down

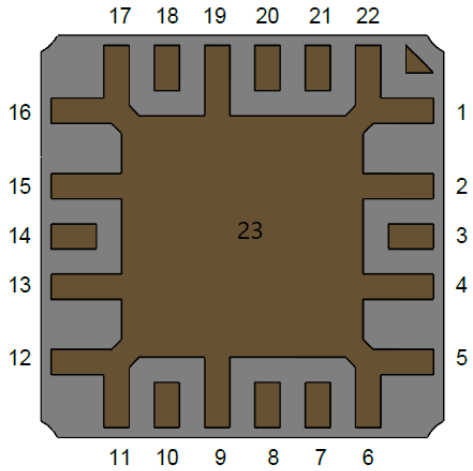
1. Turn off RF supply
2. Turn V_{C2} or V_{C1} to 0 V
3. Turn V_{C1} or V_{C2} to 0 V

Function Table

RF Path	State	V_{C1}	V_{C2}
RF In to RF Out1 (50 Ω load to RF Out2)	On-State (Insertion Loss)	0 V	−40 V
	Off-State (Isolation)	−40 V	0 V
RF In to RF Out2 (50 Ω load to RF Out1)	On-State (Insertion Loss)	−40 V	0 V
	Off-State (Isolation)	0 V	−40 V

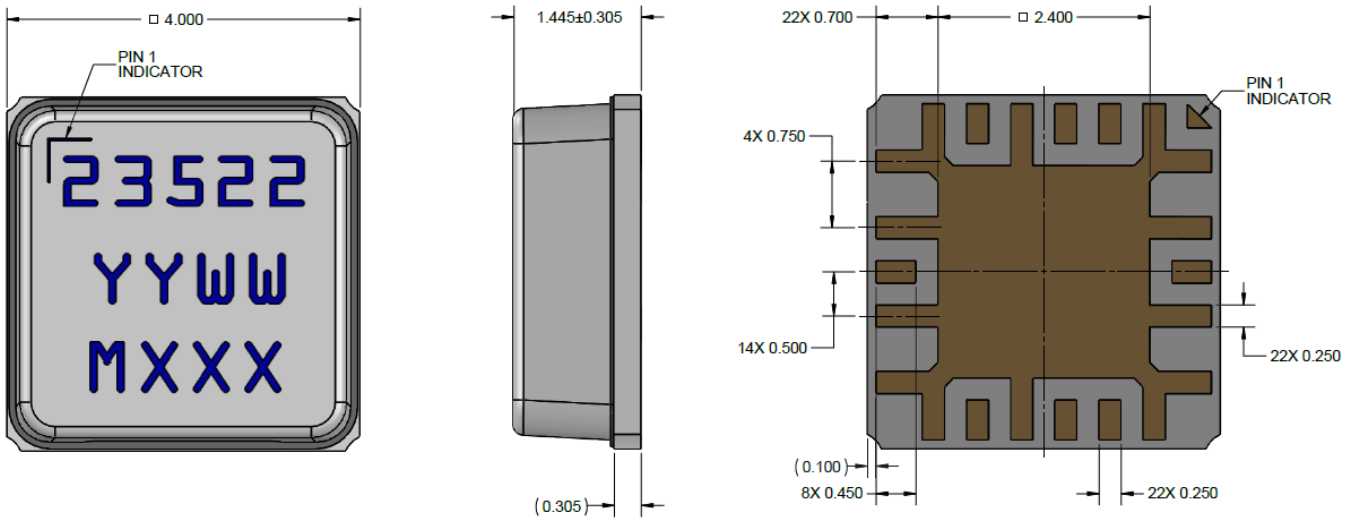
Pin Configuration and Description





Pin No.	Label	Description
1, 2, 4-6, 8, 9, 11-17, 19, 20, 22	GND	Connected to ground paddle (23); must be grounded to PCB to improve isolation.
3	RF IN	RF Input, matched to 50 Ω; DC coupled
7	V_{C2}	Control voltage #2; External components are not required
10	RF OUT2	RF switched port 2; matched to 50 Ω; DC coupled
18	RF OUT1	RF switched port 1; matched to 50 Ω; DC coupled
21	V_{C1}	Control voltage #1; External components are not required
23	GND	Backside paddle. Multiple vias should be employed to minimize inductance and thermal resistance.

Package Marking and Dimensions



Package lead finish:
Ni / Au plating with minimum gold thickness of 0.5 µm
Materials:
Base: Ceramic, Lid: Plastic, Part is epoxy sealed
Part Marking:
23522 = Part Number, YY = Part Assembly Year, WW = Part Assembly Week, MXXX = Batch ID

Unless otherwise specified dimensions are in mm.
Tolerances: XXX = ± 0.127

Assembly Notes

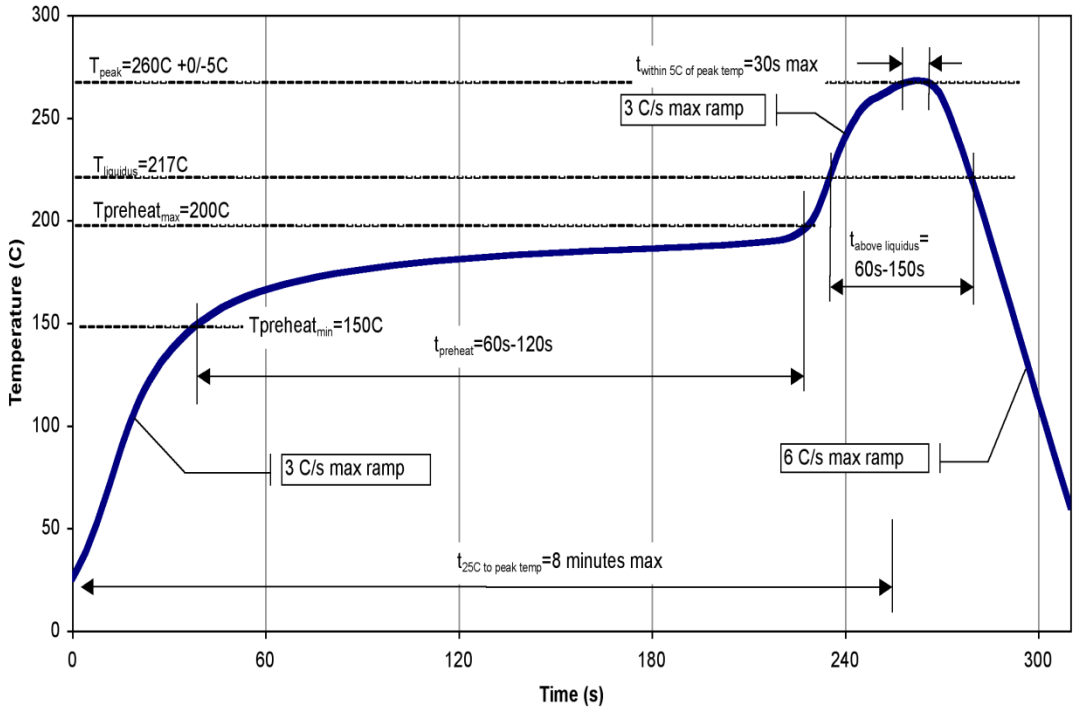
Compatible with lead-free soldering processes with 260°C peak reflow temperature.

This package is air-cavity and non-hermetic, and therefore cannot be subjected to aqueous washing. The use of no-clean solder to avoid washing after soldering is highly recommended.

Contact plating: Ni-Au

Solder rework not recommended

Recommended Soldering Profile



Handling Precautions

Parameter	Rating	Standard
ESD – Human Body Model (HBM)	Class 1A	ESDA / JEDEC JESD22-A114
ESD – Charge Device Model (CDM)	Class 3	EIA/JESD22-C101
MSL – Moisture Sensitivity Level	Level 1	IPC/JEDEC J-STD-020

Caution!
ESD-Sensitive Device

RoHS Compliance

This part is compliant with 2011/65/EU RoHS directive (Restrictions on the Use of Certain Hazardous Substances in Electrical and Electronic Equipment) as amended by Directive 2015/863/EU.

This product also has the following attributes:

- Lead Free
- Halogen Free (Chlorine, Bromine)
- Antimony Free
- TBBP-A ($C_{15}H_{12}Br_4O_2$) Free
- PFOS Free
- SVHC Free

Contact Information

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

Web: www.qorvo.com

Tel: 1-844-890-8163

Email: customer.support@qorvo.com

Important Notice

The information contained herein is believed to be reliable; however, Qorvo makes no warranties regarding the information contained herein and assumes no responsibility or liability whatsoever for the use of the information contained herein. All information contained herein is subject to change without notice. Customers should obtain and verify the latest relevant information before placing orders for Qorvo 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. **THIS INFORMATION DOES NOT CONSTITUTE A WARRANTY WITH RESPECT TO THE PRODUCTS DESCRIBED HEREIN, AND QORVO HEREBY DISCLAIMS ANY AND ALL WARRANTIES WITH RESPECT TO SUCH PRODUCTS WHETHER EXPRESS OR IMPLIED BY LAW, COURSE OF DEALING, COURSE OF PERFORMANCE, USAGE OF TRADE OR OTHERWISE, INCLUDING THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE.**

Without limiting the generality of the foregoing, Qorvo 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.