



TGS2353-2-SM

0.5 - 18 GHz High Power SPDT Reflective Switch

Product Overview

Qorvo's TGS2353-2-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 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

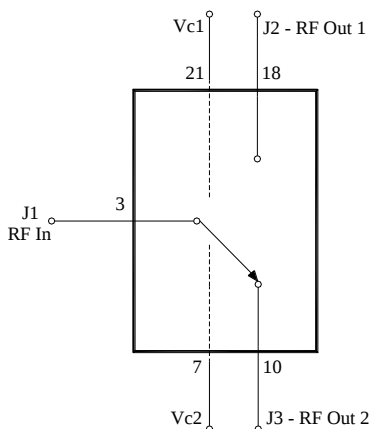


QFN 4x4 mm 22L

Key Features

- SPDT, Reflective
- Frequency Range: 0.5 to 18 GHz
- Input Power: up to 10 W
- Insertion Loss: <1.5 dB
- Isolation: 30 dB Typical
- Switching Speed: <35 ns
- Control Voltages: 0 V/-40 V
- Dimensions: 4.0 x 4.0 x 1.42 mm

Functional Block Diagram



Applications

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

Ordering Information

Part No.	Description
TGS2353-2-SM	0.5-18 GHz High Power SPDT Reflective Switch
1112206	TGS2353-2-SM Evaluation Board



TGS2353-2-SM

0.5 to 18 GHz High Power SPDT Reflective

Absolute Maximum Ratings

Parameter	Rating
Control Voltage (V_C)	-50 V
Control Current (I_C)	-1.5 / 6 mA
Power Dissipation	3.5 W
RF Input Power, CW, 50 Ω , T = 25 °C	41 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		18	GHz
Input power	CW		40		dBm
Insertion Loss	On-State		<1.5		dB
Input Return Loss – Common Port	On-State		15		dB
Output Return Loss – Switch Port	On-State		15		dB
Isolation	Off-State		30		dB
Output Return Loss – Isolated Port	Off-State		2		dB
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

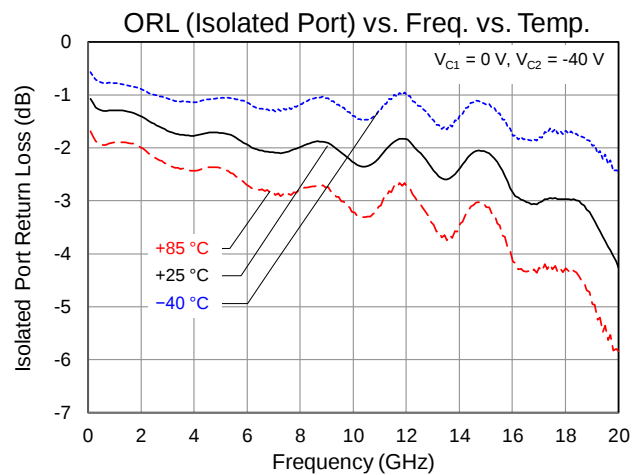
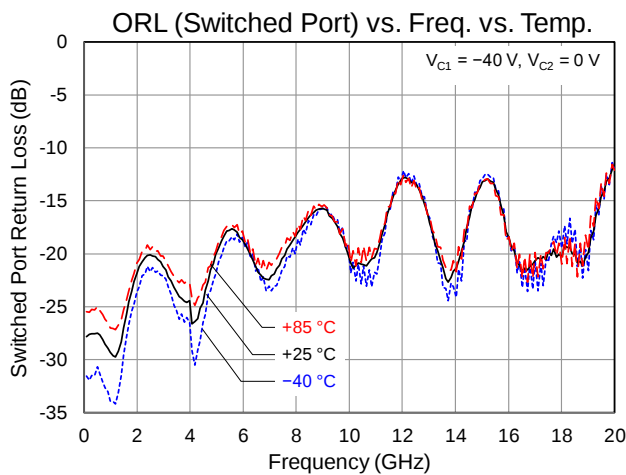
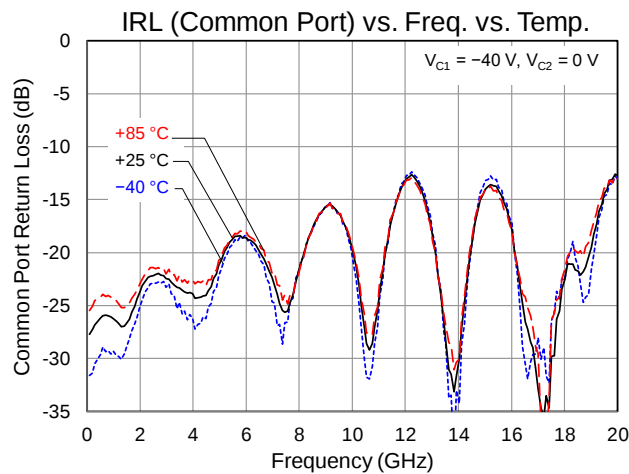
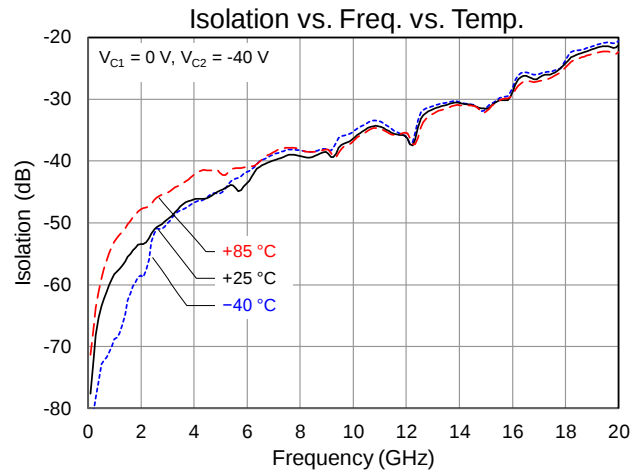
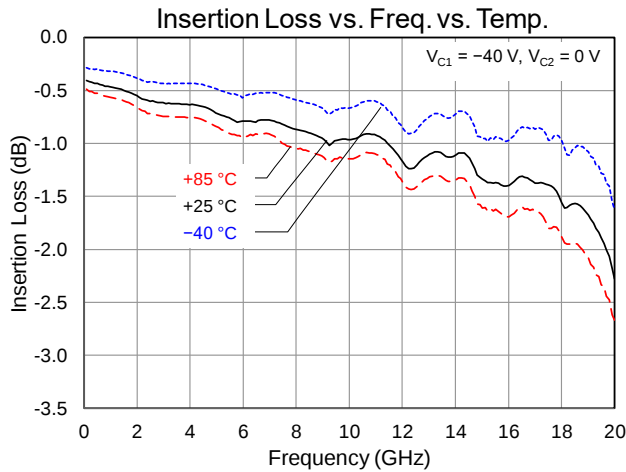
Thermal and Reliability Information

Parameter	Test Conditions	Value	Units
Thermal Resistance (θ_{JC}) ^(1,2)	T_{BASE} = 85 °C, V_{C1} = 0 V, V_{C2} = -40 V, Freq. = 14 GHz, CW	19.78	°C/W
Channel Temperature (T_{CH}) ^(1,2)	P_{IN} = 40 dBm, P_{OUT} = 38 dBm, P_{DISS} = 3.69 W	158	°C
Thermal Resistance (θ_{JC}) ^(1,2)	T_{BASE} = 85 °C, V_{C1} = 0 V, V_{C2} = -40 V, Freq. = 16 GHz, CW	21.23	°C/W
Channel Temperature (T_{CH}) ^(1,2)	P_{IN} = 39.5 dBm, P_{OUT} = 36.7 dBm, P_{DISS} = 4.24 W	175	°C
Thermal Resistance (θ_{JC}) ^(1,2)	T_{BASE} = 85 °C, V_{C1} = 0 V, V_{C2} = -40 V, Freq. = 18 GHz, CW	21.52	°C/W
Channel Temperature (T_{CH}) ^(1,2)	P_{IN} = 39.5 dBm, P_{OUT} = 36.2 dBm, P_{DISS} = 4.74 W	187	°C

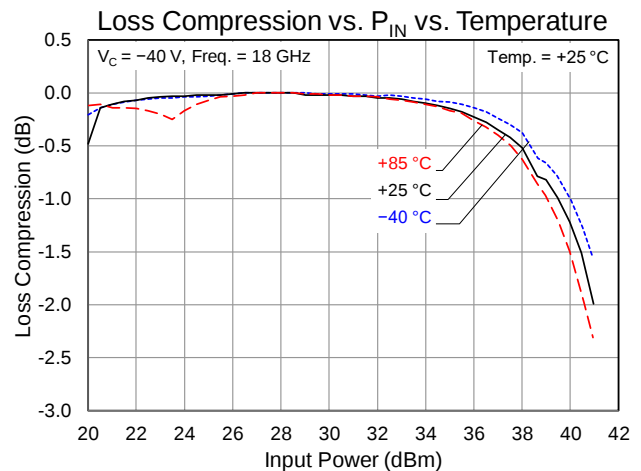
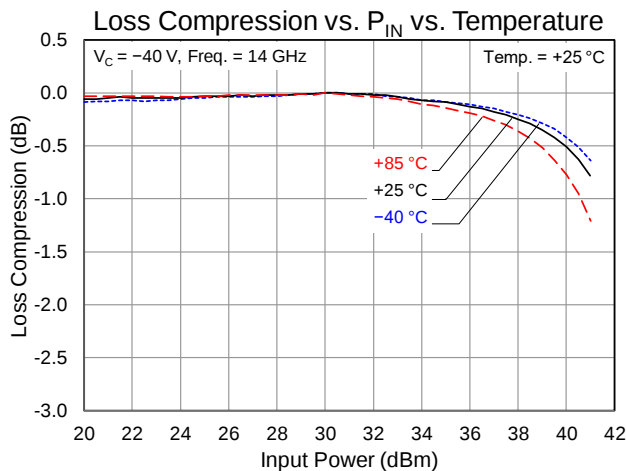
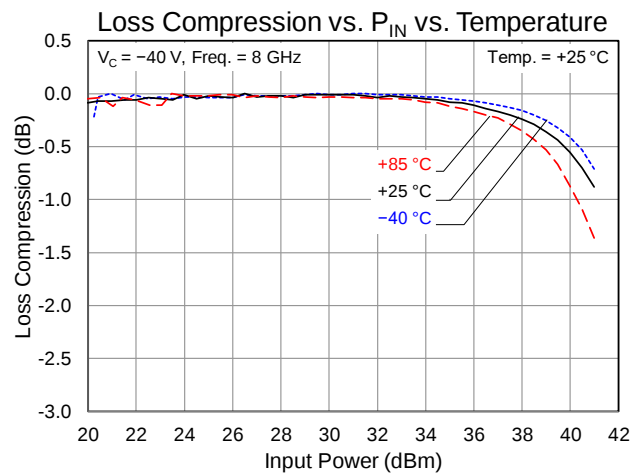
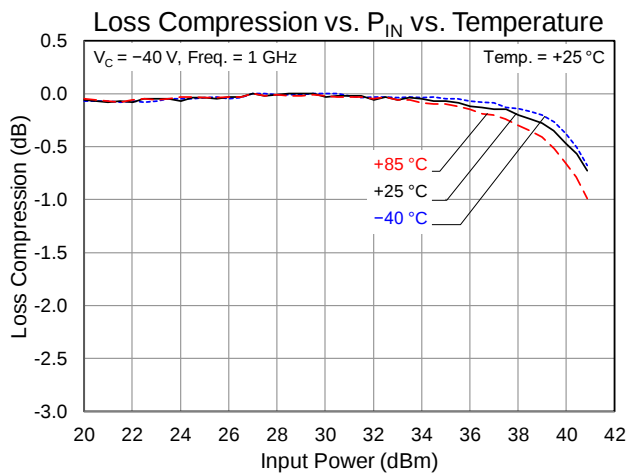
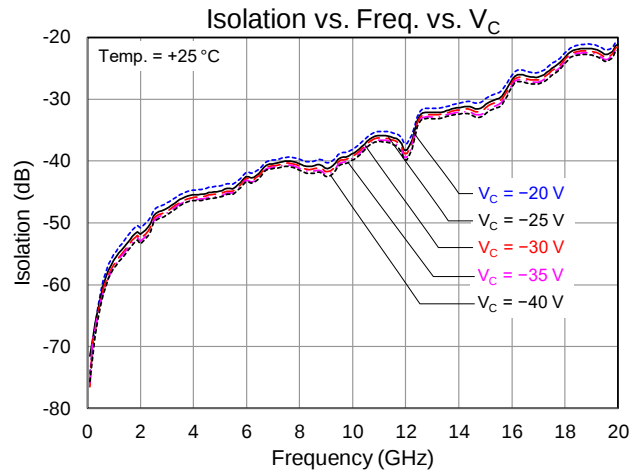
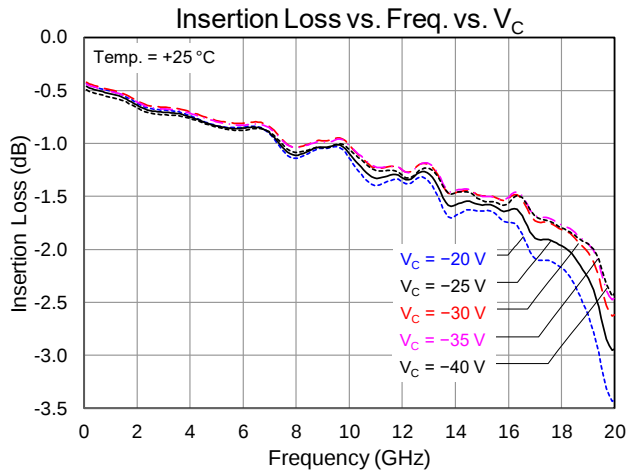
Notes:

1. Measured to the back of the package.
2. Refer to the following document: [GaN Device Channel Temperature, Thermal Resistance, and Reliability Estimates](#)

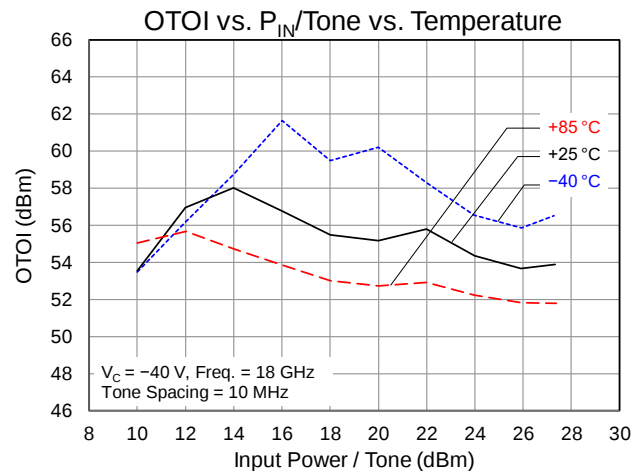
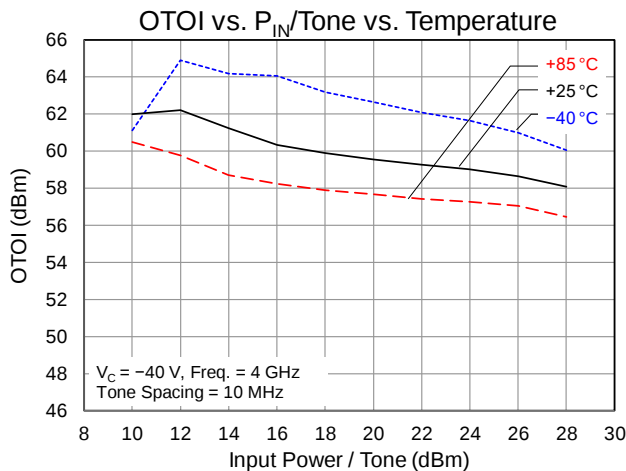
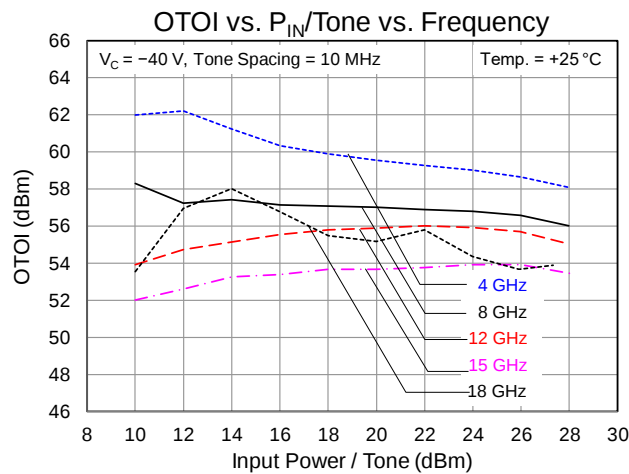
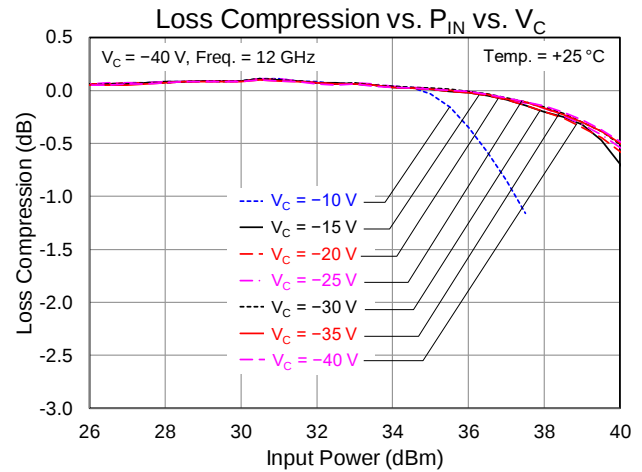
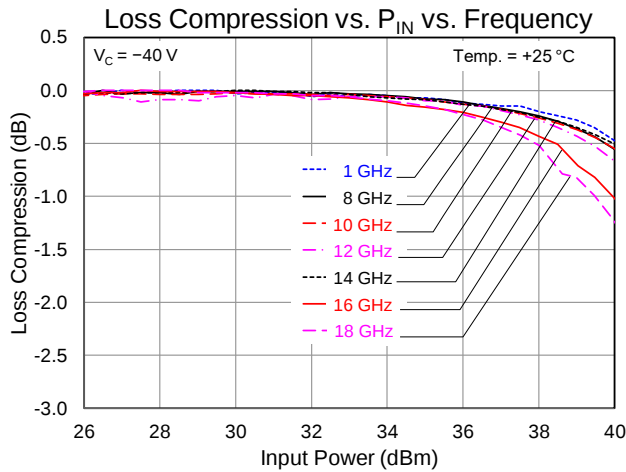
Performance Plots – Small Signal



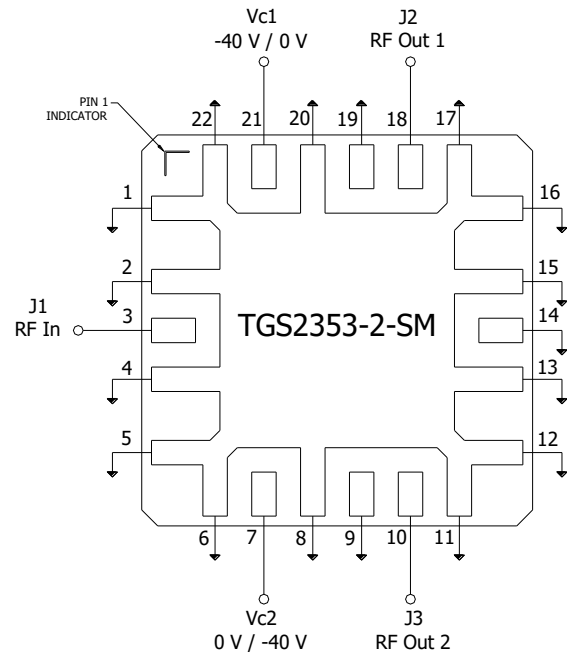
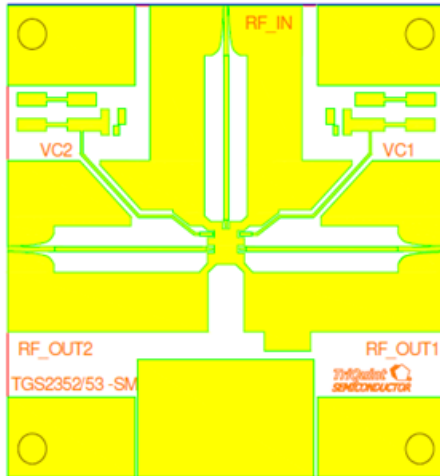
Performance Plots – Small Signal and Compression



Performance Plots – Compression and 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

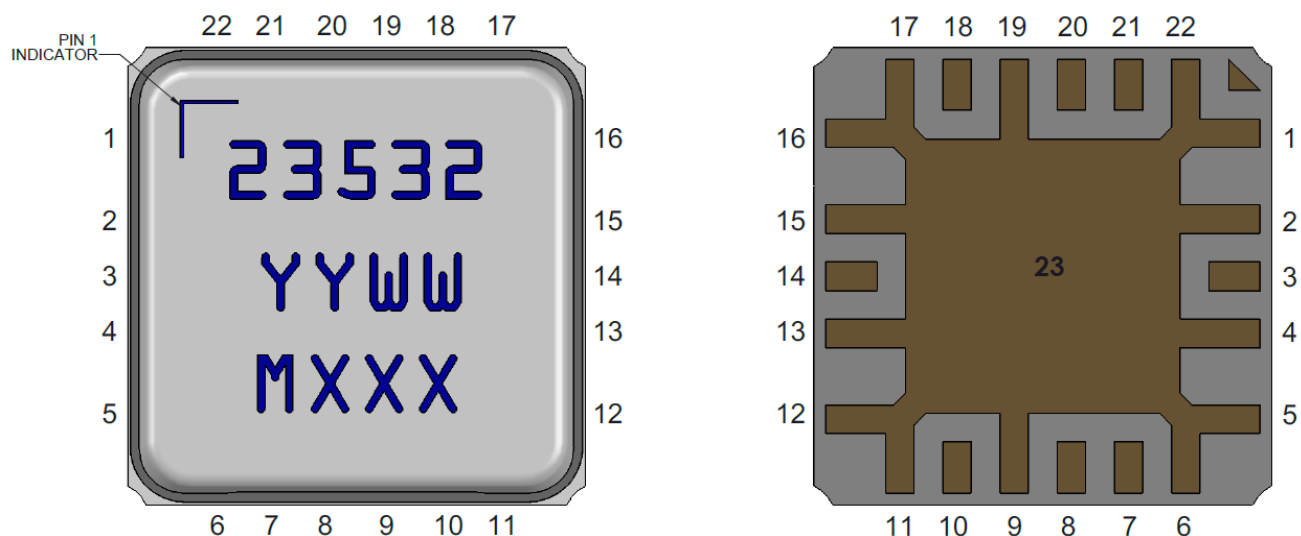
Bias Up Down

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

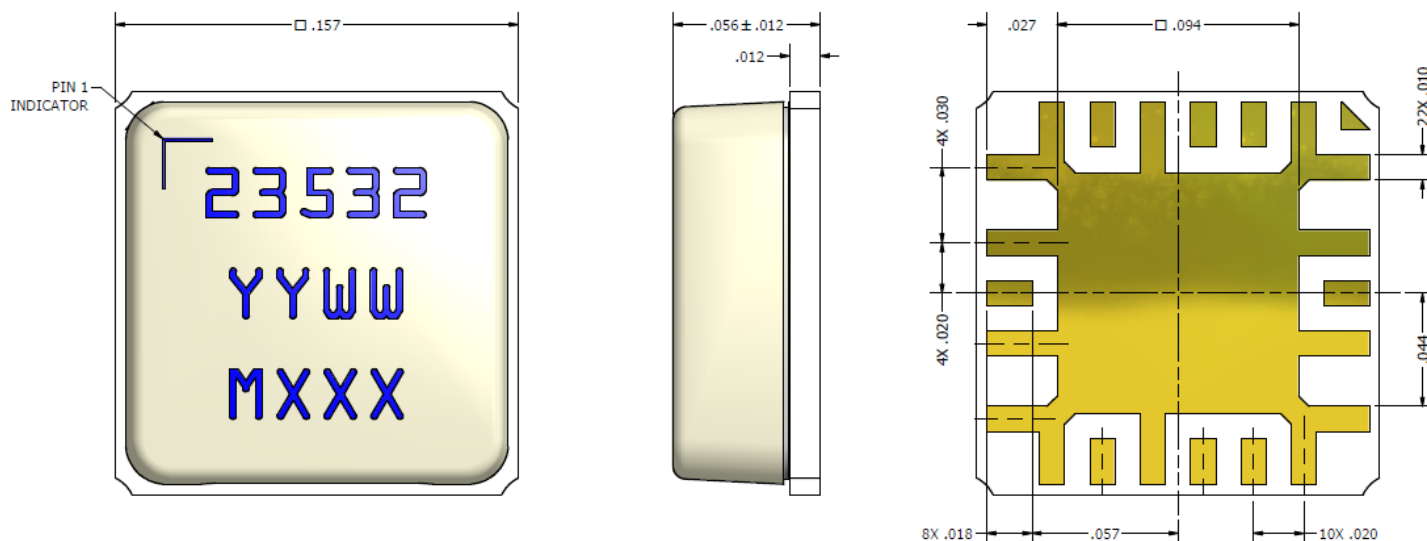
RF Path	State	V_{C1}	V_{C2}
RF In to RF Out1 (50 Ω load to RF Out2)	On-State (Insertion Loss)	0 V	-40 V
	Off-State (Isolation)	-40 V	0 V
RF In to RF Out2 (50 Ω load to RF Out1)	On-State (Insertion Loss)	-40 V	0 V
	Off-State (Isolation)	0 V	-40 V

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 $0.5 \mu\text{m}$

Materials:

Base: Ceramic, Lid: Plastic, Part is epoxy sealed

Part Marking:

23532 = Part Number, YY = Part Assembly Year, WW = Part Assembly Week, MXXX = Batch ID

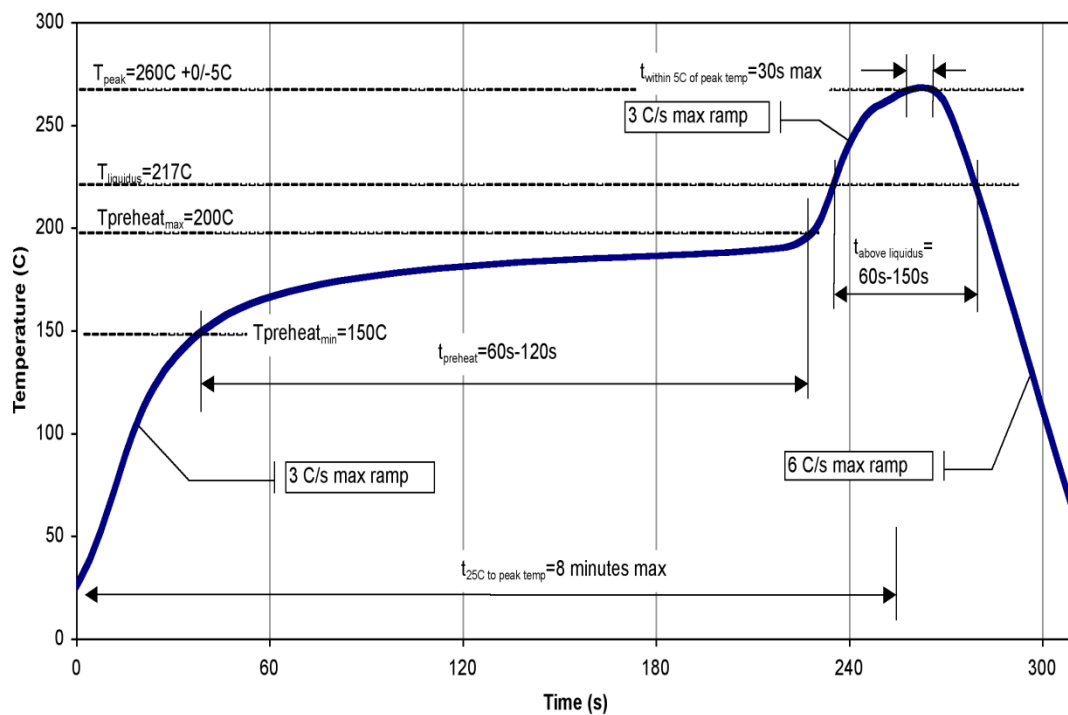
Unless otherwise specified dimensions are in mm.

Tolerances: XXX = ± 0.127

Solderability

1. Compatible with the latest version of J-STD-020, Lead-free solder, 260° C.
2. The use of no-clean solder to avoid washing after soldering is recommended.
3. Contact plating: Ni-Au with minimum gold thickness of 0.5μm.

Recommended Soldering Profile





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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 (C₁₅H₁₂Br₄O₂) Free
- PFOS Free
- SVHC Free



Contact Information

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For technical questions and application information: Email: appsupport@qorvo.com

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