

Applications

- WLAN
- Cellular Infrastructure
- Test and Measurement
- Smart Energy
- UHF/VHF
- LMR
- General Purpose Broadband Wireless

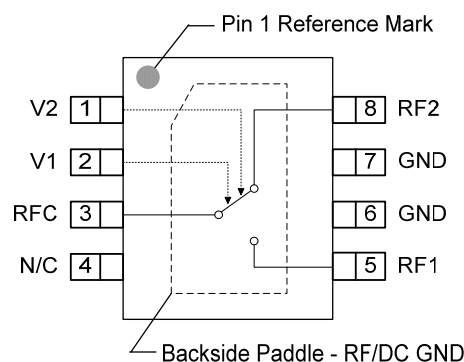


8-pin MSOP Package

Product Features

- General Purpose
- Broadband: 100-5000 MHz
- High Isolation: 54 dB at 2 GHz
- High Input IP3: +57 dBm at 2 GHz
- CMOS Compatible Dual Voltage Control
- Lead Free, RoHS Compliant MSOP 8 Package

Functional Block Diagram



General Description

The TQP4M0009 is GaAs FET single-pole, double throw (SPDT) high isolation reflective switch. The TQP4M0009 may be operated using control signals from 1.8 to 5 Volts. The TQP4M0009 has 100-5000 MHz broadband performance

The TQP4M0009 is packaged in a RoHS-compliant, compact 8-pin MSOP package.

The TQP4M0009 is an ideal choice for wireless infrastructure and test & measurement applications requiring high isolation and high input IP3. It can also be used for any general purpose wireless application where isolation is critical.

Pin Configuration

Pin No.	Symbol
1	V2
2	V1
3	RFC
4	N/C
6, 7	GND
5	RF1
8	RF2
Backside Paddle	RF/DC GND

Ordering Information

Part No.	Description
TQP4M0009	SPDT Reflective Switch
TQP4M0009-PCB	0.1 - 5 GHz Evaluation Board

Standard T/R size = 2500 pieces on a 7" reel

Absolute Maximum Ratings

Parameter	Rating
Storage Temperature	-65 to 150°C
RF Input Power, CW, 50Ω, T = 25°C	+33 dBm
Control Voltage (V1/V2)	+6 V

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

Recommended Operating Conditions

Parameter	Min	Typ	Max	Units
V1/V2 High State	1.8	3.3	5.00	V
Operating Temp. Range	-40		+85	°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: Temp.=+25°C, 50 Ω system

Parameter	Conditions	Min	Typ	Max	Units
Operational Frequency Range		100		5000	MHz
Control Voltage	Low	0		0.25	V
	High	1.8	3.3	5.0	V
Insertion Loss	0.1 – 1.0 GHz		0.5		dB
	1.0 – 2.5 GHz		0.6		
	2.5 – 3.0 GHz		0.7		
	3.0 – 4.5 GHz		0.9		
	4.5 – 5.0 GHz		1.2		
Isolation RFC Port to RF1 or RF2	0.1 – 1.0 GHz		55		dB
	1.0 – 2.5 GHz		50		
	2.5 – 3.0 GHz		45		
	3.0 – 4.5 GHz		38		
	4.5 – 5.0 GHz		35		
Isolation RF1 to RF2	0.1 – 1.0 GHz		50		dB
	1.0 – 2.5 GHz		45		
	2.5 – 3.0 GHz		40		
	3.0 – 4.5 GHz		35		
	4.5 – 5.0 GHz		30		
Return Loss – RFC Port	0.1 – 1.0 GHz		20		dB
	1.0 – 2.5 GHz		15		
	2.5 – 3.0 GHz		13		
	3.0 – 4.5 GHz		13		
	4.5 – 5.0 GHz		13		
Input P1dB	f = 2 GHz		+33		dBm
Input IP3	f = 0.1 – 5.0 GHz , Pout=+10 dBm/tone, Δf=1 MHz		+50		dBm
Rise / Fall Time	10/90% or 90/10% RF		50		ns
On / Off Time	50% VCTL to 90% RF		170		ns
	50% VCTL to 10% RF		100		
Control Voltage Bias Current	V1 or V2 = 5 V			15	uA

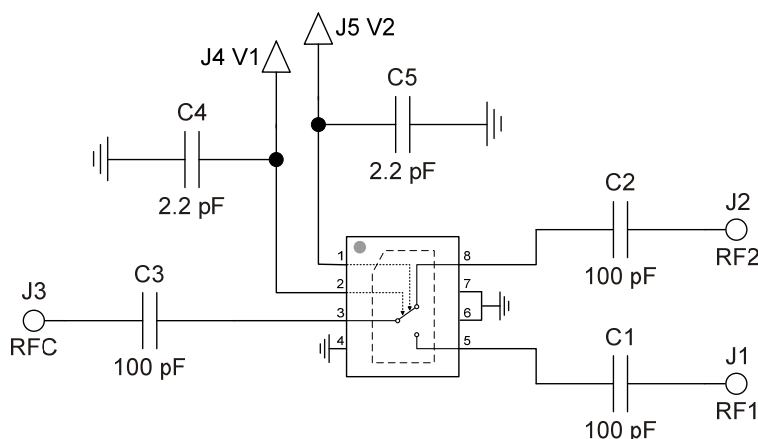
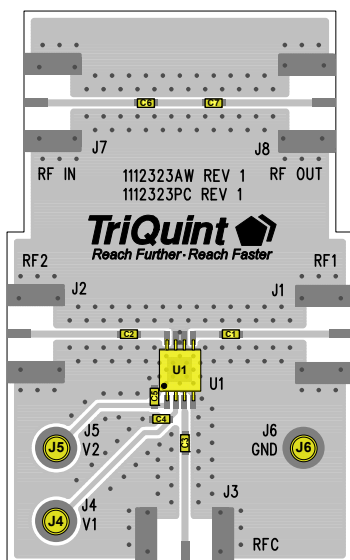
Digital Control Voltages

State	Bias Condition
Low	≤ 0.25 V
High	≥ 1.8 V

Switch Control Truth Table

Control Voltages		Signal Path State	
V1	V2	RFC to RF1	RFC to RF2
Low	High	Off (isolation)	On (Insertion Loss)
High	Low	On (Insertion Loss)	Off (isolation)

TQP4M0009-PCB Evaluation Board



Notes:

- J7 to J8 thru line may be used to calibrate PCB losses to device.

Typical Performance – TQP4M0009-PCB

Test conditions unless otherwise noted: V1 / V2 = +5 V, Temp = 25°C, 50 Ω system

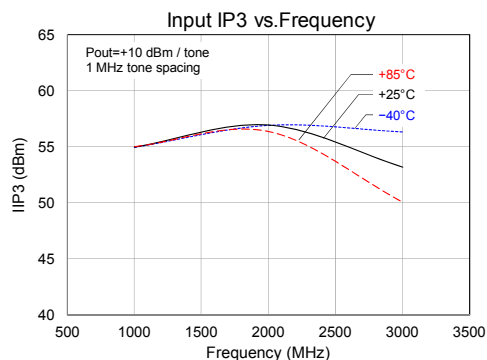
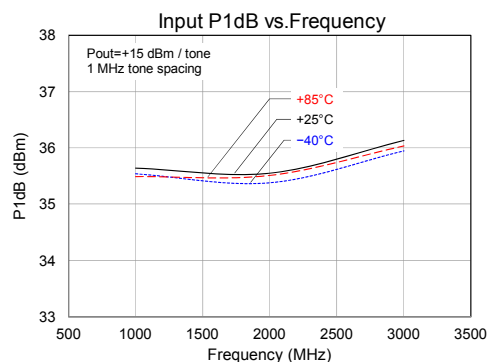
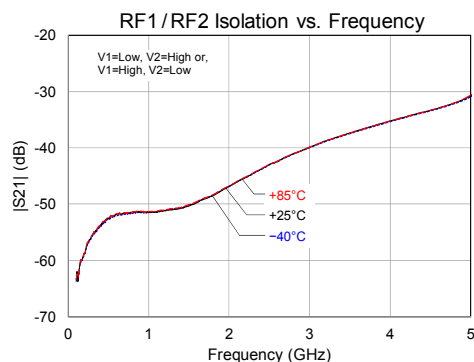
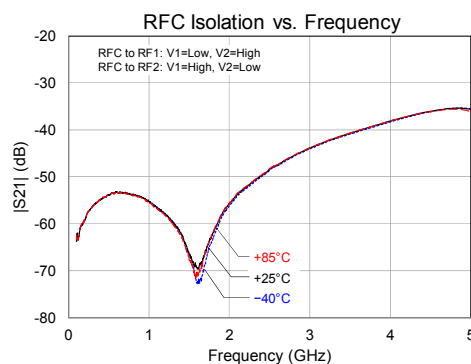
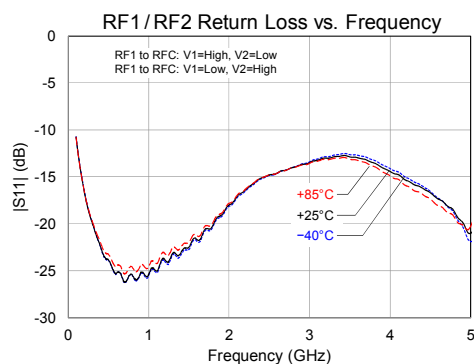
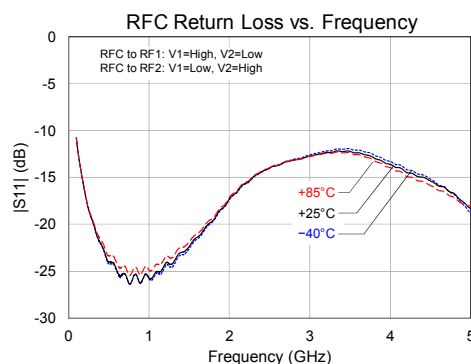
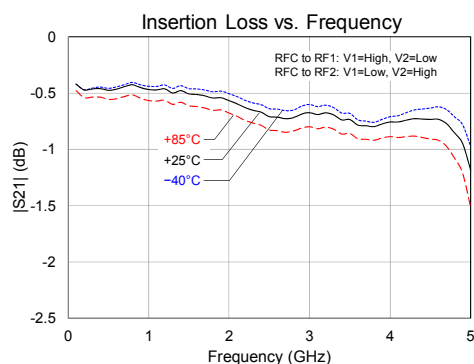
Parameter	Conditions	Typical Value			Units
Frequency		1	2	3	GHz
Insertion Loss ⁽¹⁾	RFC Port to RF1 or RF2	0.4	0.6	0.8	dB
RFC Port Return Loss		20	15	13	dB
Isolation	RFC Port to RF1 or RF2	50	50	45	dB
	RF1 to RF2	50	45	40	dB
Input P1dB		+33	+33	+33	dBm
Input IP3	Pout = +10 dBm/tone, $\Delta f = 1$ MHz	+50	+50	+50	dBm

Notes:

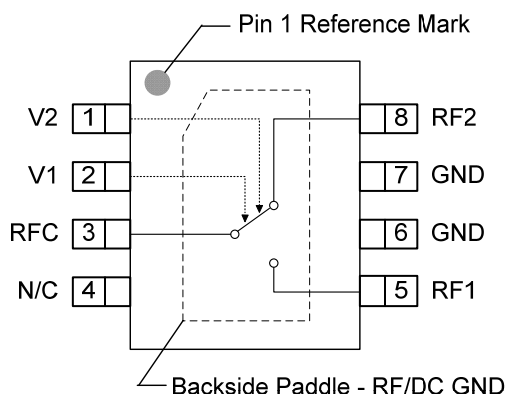
- Insertion Loss values reflect de-embedding of eval board RF line losses.

Performance Plots – TQP4M0009-PCB

Test conditions unless otherwise noted: $V_1/V_2 = +5\text{ V}$



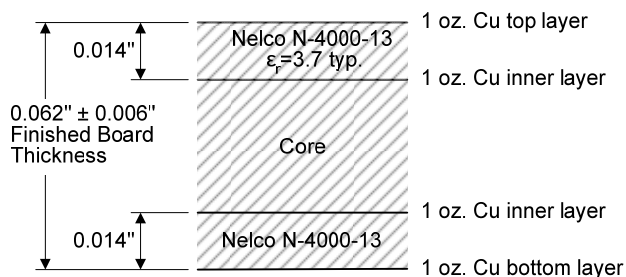
Pin Configuration and Description



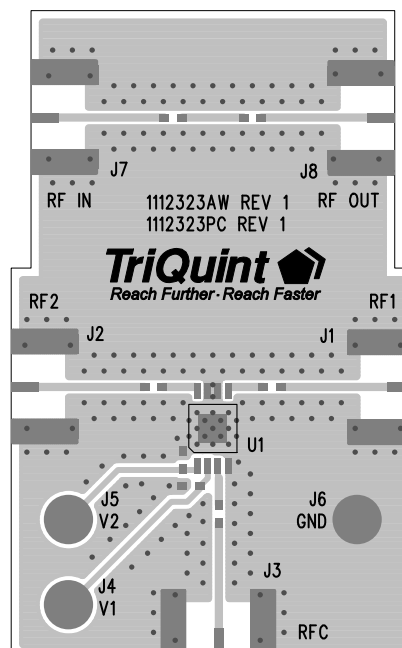
Pin No.	Symbol	Description
1	V2	Switch state control voltage
2	V1	Switch state control voltage
3	RFC	Antenna port
4	N/C	No electrical connection. Provide grounded land pads for PCB mounting integrity.
6, 7	GND	Ground
5	RF1	RF Input/Output port 1
8	RF2	RF Input/Output port 2
Backside Paddle	RF/DC GND	RF/DC Ground. Use recommended via pattern and ensure good solder attach for best thermal and electrical performance.

Evaluation Board PCB Specifications

PCB 1112323 Material and Stack-Up



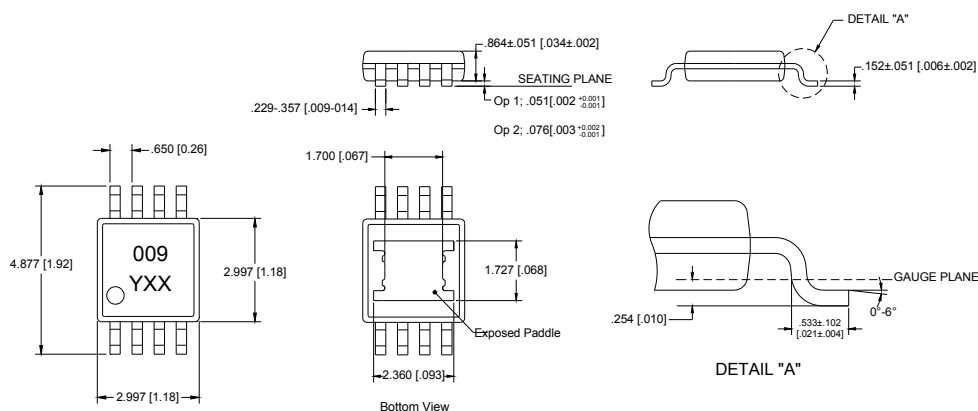
50 ohm line dimensions: Width = .021"
Spacing = .006



Mechanical Information

Package Marking and Dimensions

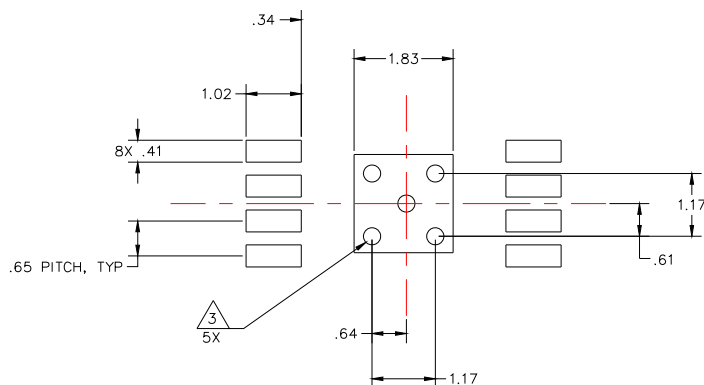
Marking: Product Code – 009
Assembly code - YXX



Notes:

1. All dimensions are in millimeters. Angles are in degrees.
2. Dimension and tolerance formats conform to ASME Y14.4M-1994.
3. The terminal #1 identifier and terminal numbering conform to JESD 95-1 SPP-012.

PCB Mounting Pattern



Notes:

1. All dimensions are in millimeters. Angles are in degrees.
2. Use 1 oz. copper minimum for top and bottom layer metal.
3. We recommend a 0.35mm (#80/.0135") diameter bit for drilling via holes and a final plated thru diameter of 0.25 mm (0.10").
4. Ensure good package backside paddle solder attach for reliable operation and best electrical performance.

Product Compliance Information

ESD Sensitivity Ratings



Caution! ESD-Sensitive Device

ESD Rating: Class 1B (RF Ports)
Value: 500 volts to < 1,000 volts
ESD Rating: Class 1A (DC Lines)
Value: ≥ 250 volts to < 500 volts
Test: Human Body Model (HBM)
Standard: JEDEC Standard JESD22-A114

ESD Rating: Class IV
Value: >1000 V
Test: Charged Device Model (CDM)
Standard: JEDEC Standard JESD22-C101

MSL Rating

MSL Rating: Level 1
Test: 260°C convection reflow
Standard: JEDEC Standard IPC/JEDEC J-STD-020

Solderability

Compatible with both lead-free (260°C max. reflow temperature) and tin/lead (245°C max. reflow temperature) soldering processes.

Package contact plating: NiPdAu

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 ($C_{15}H_{12}Br_4O_2$) Free
- PFOS Free
- SVHC Free

Important Notice

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

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