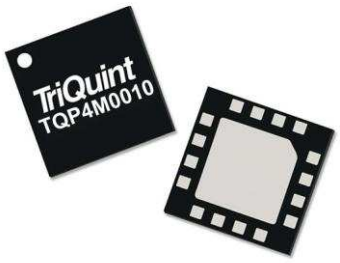
TQP4M0010

High Isolation Absorptive SPDT Switch

Applications

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

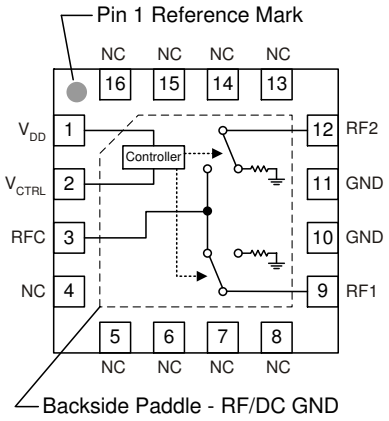


16-pin 4x4mm QFN Package

Product Features

- General Purpose
- Low Insertion Loss
- +56 dBm Input IP3
- High Isolation
- Absorptive
- Single Positive Voltage Control
- Standard SMT Package

Functional Block Diagram



General Description

The TQP4M0010 is a GaAs FET single-pole, double throw (SPDT) high isolation absorptive switch that provides 100-4500 MHz broadband performance. The TQP4M0010 may be operated using a DC supply ranging from 3 to 5 Volts and with control signals operating from 1.8 to 5 Volts.

The TQP4M0010 is packaged in a RoHS-compliant, compact 4x4 mm surface-mount leadless package.

This SPDT switch is targeted for use in wireless infrastructure, test and measurement, or can be used for any general purpose wireless application.

Pin Configuration

Pin No.	Symbol
1	V_{DD}
2	V_{CTRL}
3	RFC
4−8, 13−16	NC
10, 11	GND
9	RF1
12	RF2
Backside Paddle	RF/DC GND

Ordering Information

Part No.	Description
TQP4M0010	SPDT Absorptive Switch
TQP4M0010-PCB	0.1-4.5 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	+36 dBm
Supply Voltage (V_{DD})	+6 V
Control Voltage (V_{CTRL})	V_{DD}+0.5 V

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

Recommended Operating Conditions

Parameter	Min	Typ	Max	Units
V_{DD}	2.75	5.0	5.25	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: V_{DD} = +5 V, V_{CTRL} = +3 V, Temp.=+25°C, 50 Ω system

Parameter	Conditions	Min	Typ	Max	Units
Operational Frequency Range		100		4500	MHz
Control Voltage	Low	0		0.4	V
	High	1.8		V_{DD}+0.5 V	V
Insertion Loss	0.1 – 1.0 GHz 1.0 – 2.5 GHz 2.5 – 3.0 GHz 3.0 – 4.5 GHz		0.5 0.6 0.7 0.8	0.8 0.9 1.0	dB
Isolation – RFC to RF1/RF2	0.1 – 1.0 GHz 1.0 – 2.5 GHz 2.5 – 3.0 GHz 3.0 – 4.5 GHz	50 45 45	55 48 47 44		dB
Isolation – RF1 to RF2	0.1 – 1.0 GHz 1.0 – 2.5 GHz 2.5 – 3.0 GHz 3.0 – 4.5 GHz		50 44 43 40		dB
Return Loss – RFC Port	0.1 – 1.0 GHz 1.0 – 4.5 GHz	16	20 13		dB
Input P1dB	*f* = 2 GHz		+33		dBm
Input IP3	*f* = 2 GHz, Note 1		+56		dBm
Switching Speed	t_{ON},t_{OFF} (50% CTL to 10/90% RF)		190		ns
	t_{ON},t_{OFF} (50% CTL to 2/98% RF)		240		ns
Total Supply current (I_{DD})			70	150	uA

Notes:
1. IIP3 measured with two tones at an output power of +15 dBm / tone separated by 1 MHz.

Digital Control Voltages

State	Bias Condition
Low	≤ 0.4 V
High	≥ 1.8 V

Switch Control Truth Table

	Signal Path State	
V_{CTRL}	RFC to RF1	RFC to RF2
Low	Off (Isolation)	On (Insertion Loss)
High	On (Insertion Loss)	Off (Isolation)

Typical Performance

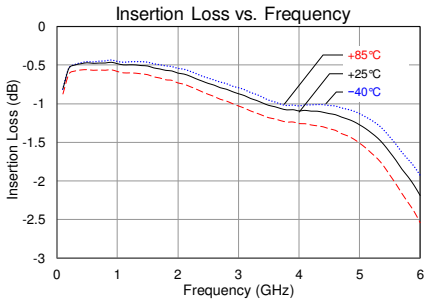
Test conditions unless otherwise noted: V_{DD} = +5 V, V_{CTRL} = +3 V, Temp=25°C, 50 Ω system

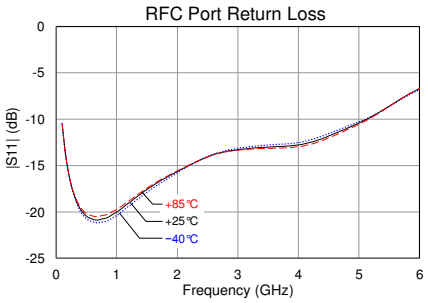
Parameter	Typical Value			Units
Frequency	1	2	3	GHz
Insertion Loss (1)	0.5	0.6	0.7	dB
RFC Port Return Loss	20	16	13	dB
RFC to RF1/RF2 Isolation	55	50	47	dB
RF1 to RF2 Isolation	50	45	43	dB
Input P1dB	+36	+33	+30	dBm
Input IP3 (2)	+53	+56	+56	dBm

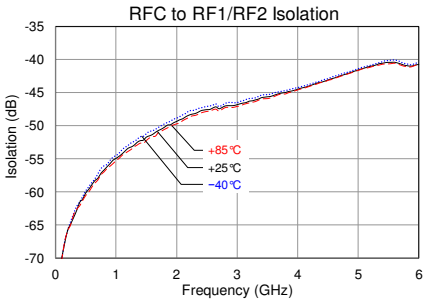
Notes:
1. The Insertion Loss values reflect de-embedding of eval board RF I/O line losses that would not be present in target applications.
2. IIP3 measured with two tones at an input power of +15 dBm / tone separated by 1 MHz.

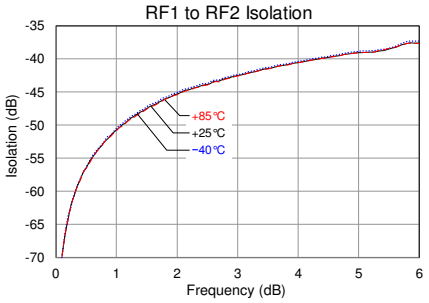
Performance Plots

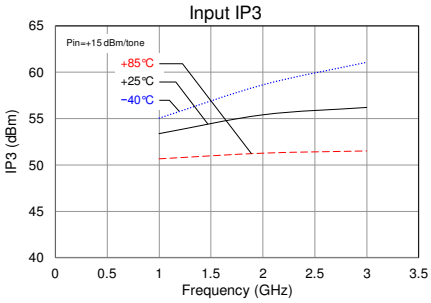
Test conditions unless otherwise noted: V_{DD} =+5 V, V_{CTRL} = +3 V, Temp=+25°C, 50 Ω system





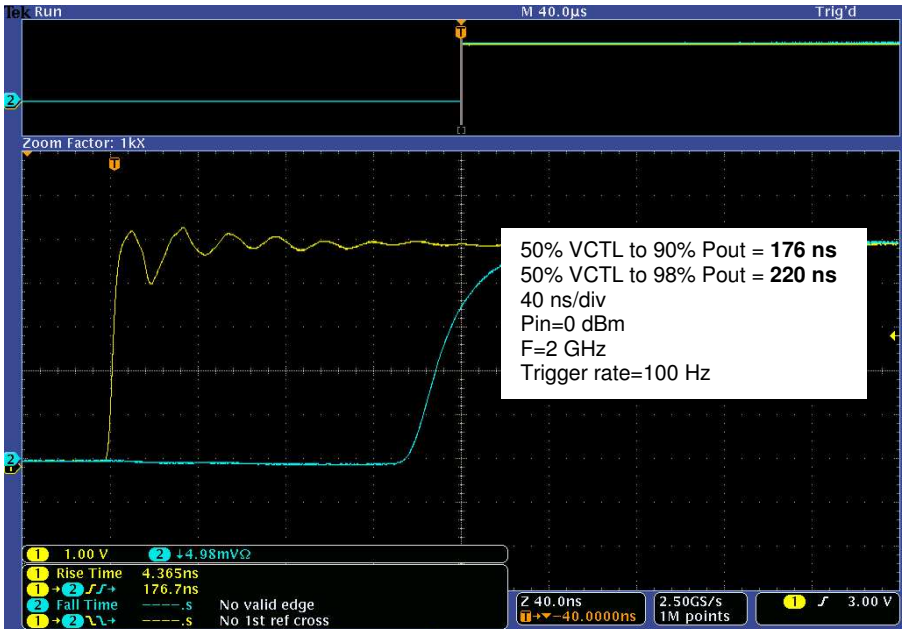




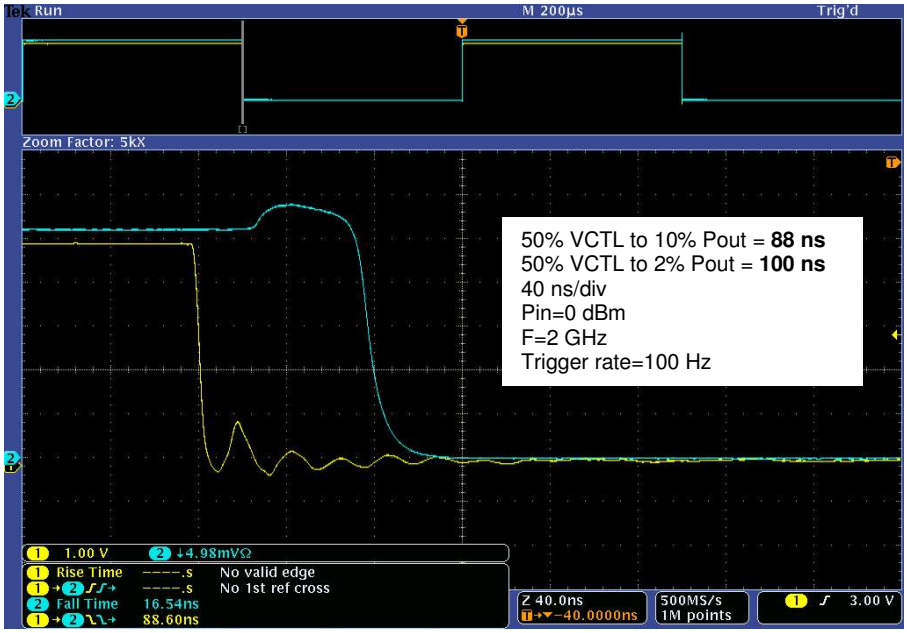


Switching Speed

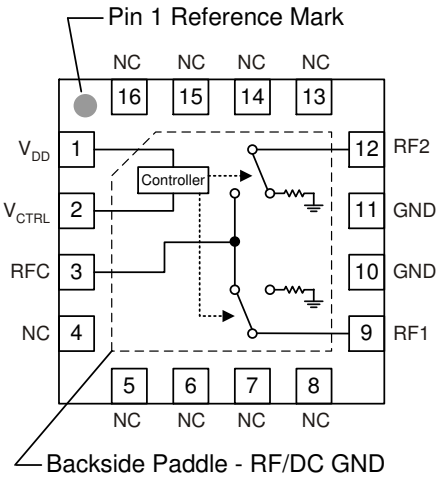
On Switching Speed at 25°C



Off Switching Speed at 25°C



Pin Configuration and Description

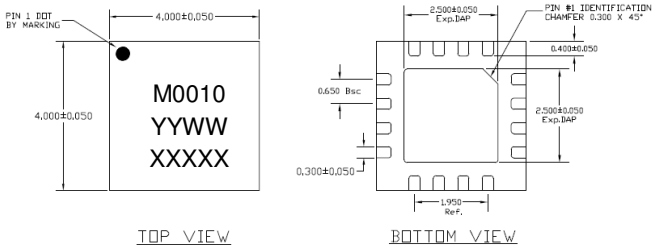


Pin No.	Symbol	Description
1	V_{DD}	DC voltage supply
2	V_{CTRL}	Digital control voltage
3	RFC	Antenna input
4−8, 13−16	NC	No electrical connection. Provide land pads for PCB mounting integrity.
10, 11	GND	RF/DC Ground
9	RF1	RF output 1
12	RF2	RF output 2
Backside Paddle	RF/DC GND	RF/DC Ground. Use recommended via pattern and ensure good solder attach for best thermal and electrical performance.

Mechanical Information

Package Marking and Dimensions

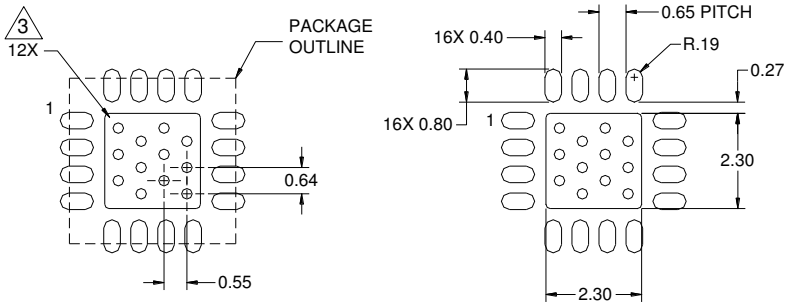
Marking: Part number – M0010
Year, week - YYWW
Assembly code - XXXXX



Notes:

1. All dimensions are in millimeters. Angles are in degrees.
2. Except where noted, this part outline conforms to JEDEC standard MO-220, Issue E (Variation VGGC) for thermally enhanced plastic very thin fine pitch quad flat no lead package (QFN).
3. Dimension and tolerance formats conform to ASME Y14.4M-1994.
4. The terminal #1 identifier and terminal numbering conform to JESD 95-1 SPP-012

PCB Mounting Pattern



COMPONENT SIDE

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 0 (RF Ports)
Value: <250 V
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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