



## **Applications**

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

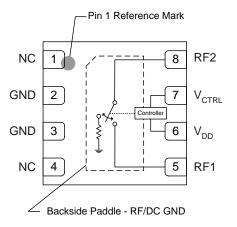


8-pin 2x2 mm DFN Package

### **Product Features**

- General Purpose
- · Low Insertion Loss
- +49 dBm Input IP3
- High Isolation
- Absorptive
- Single Positive Voltage Control
- Small 2x2 mm SMT Package

# **Functional Block Diagram**



# **General Description**

The TQP4M0013 is a GaAs FET single-pole, single throw (SPST) high isolation absorptive switch. The TQP4M0013 may be operated using a DC supply range from 3 to 5 Volts and with control signals operating from 3 to 5 Volts. The TQP4M0013 has 100-4000 MHz broadband performance.

The TQP4M0013 is packaged in a RoHS-compliant, compact 2x2 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 RF application.

# **Pin Configuration**

| Pin No. | Label           |
|---------|-----------------|
| 1, 4    | NC              |
| 2, 3    | GND             |
| 5       | RF1             |
| 6       | V <sub>DD</sub> |
| 7       | Vctrl           |
| 8       | RF2             |

# **Ordering Information**

| Part No.      | Description                  |
|---------------|------------------------------|
| TQP4M0013     | SPST Absorptive Switch       |
| TQP4M0013-PCB | 0.1-4.0 GHz Evaluation Board |

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



# High Isolation Absorptive SPST Switch

# **Absolute Maximum Ratings**

| Parameter                         | Rating                 |  |  |
|-----------------------------------|------------------------|--|--|
| Storage Temperature               | -65 to 165°C           |  |  |
| RF Input Power, CW, 50Ω, T = 25°C | +33 dBm                |  |  |
| Supply Voltage (V <sub>DD</sub> ) | +6 V                   |  |  |
| Control Voltage (VCTRL)           | V <sub>DD</sub> +0.5 V |  |  |

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

# **Recommended Operating Conditions**

| Parameter             | Min | Тур | Max | Units |
|-----------------------|-----|-----|-----|-------|
| $V_{DD}$              | 3.0 |     | 5.0 | 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<sub>DD</sub> = +5 V, V<sub>CTRL</sub> = 0 V (low) or 3.3 V (high), Temp.=+25°C, 50 Ω system

| Parameter                                   | Conditions                             | Min | Тур                  | Max      | Units |
|---|--|-----|----------------------|----------|-------|
| Operational Frequency Range                 |  | 100 |                      | 4000     | MHz   |
| Control Voltogo (V                          | Low                                    | 0   |                      | 0.2      | V     |
| Control Voltage (VCTRL)                     | High                                   | 1.8 |                      | $V_{DD}$ | V     |
| Insertion Loss                              | 1 GHz<br>2 GHz<br>3 GHz                |     | 0.55<br>0.71<br>0.77 | 0.87     | dB    |
| Isolation                                   | 1 GHz<br>2 GHz<br>3 GHz                | 38  | 50<br>43<br>37       |          | dB    |
| RF1/RF2 Return Loss<br>Insertion Loss State | 1 GHz<br>2 GHz<br>3 GHz                |     | 15<br>15<br>17       |          | dB    |
| RF2 Return Loss<br>Isolation Loss State     | 1 GHz<br>2 GHz<br>3 GHz                |     | 16<br>15<br>17       |          | dB    |
| Input P1dB                                  | f=1 GHz                                |     | +35                  |          | dBm   |
| Input IP3                                   | f=1 GHz<br>Pin=+15 dBm/tone, Δf= 1 MHz |     | +49                  |          | dBm   |
| Cuitabina Casad                             | ton,toff (50% CTL to 10/90% RF)        |     | 150                  |          | ns    |
| Switching Speed                             | ton,toff (50% CTL to 2/98% RF)         |     | 150                  |          | ns    |
| Total Supply current (IDD)                  |  |     | 82                   |          | uA    |

# **Control Voltages**

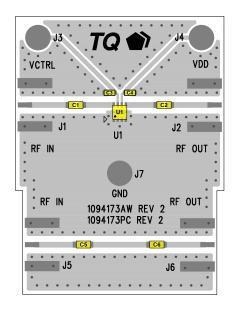
| State | Bias Condition |
|-------|----------------|
| Low   | ≤ 0.2 V        |
| High  | ≥ 1.8 V        |

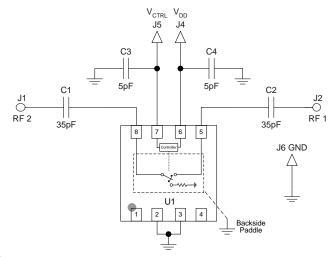
# **Switch Control Truth Table**

| VCTRL | Signal Path State (RF1 to RF2) |
|-------|--------------------------------|
| Low   | Off (isolation)                |
| High  | On (Insertion Loss)            |



### **TQP4M0013-PCB Evaluation Board**





#### Notes:

1. Capacitance values shown for C1, C2, C3 and C4 are required to achieve data sheet RF performance specifications.

# Typical Performance - TQP4M0013-PCB

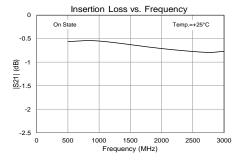
Test conditions unless otherwise noted:  $V_{DD} = +5 \text{ V}$ , Temp=25°C, 50  $\Omega$  system

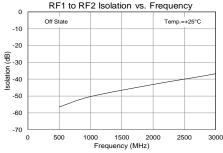
| Parameter                                       | Typical Value Units |      |      | Units |
|---|---------------------|------|------|-------|
| Frequency                                       | 1                   | 2    | 3    | GHz   |
| Insertion Loss (1)                              | 0.55                | 0.71 | 0.77 | dB    |
| RF1/RF2 Port Return Loss (Insertion Loss State) | 15                  | 15   | 17   | dB    |
| RF1 to RF2 Isolation                            | 50                  | 43   | 37   | dB    |
| Input P1dB                                      | +35                 |      |      | dBm   |
| Input IP3 (Pin=+15 dBm/tone, Δf=1 MHz)          | +49                 | +50  |      | dBm   |

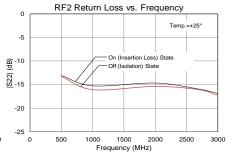
#### Notes:

### Performance Plots - TQP4M0013-PCB

Test conditions unless otherwise noted:  $V_{DD}$  =+5 V,  $V_{CTRL}$  = +3.3 V,  $T_{CTRL}$  = +25°C, 50  $\Omega$  system



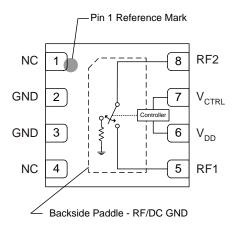




<sup>1.</sup> Insertion loss values reflect de-embedding of eval board RF line losses.



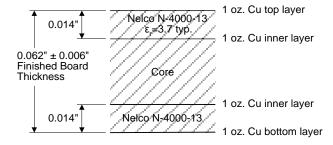
# **Pin Configuration and Description**



| Pin No.            | Symbol    | Description  |
|--------------------|-----------|--|
| 1, 4               | N/C       | No electrical connection. Provide grounded land pads for PCB mounting integrity.                                     |
| 2, 3               | GND       | RF/DC Ground   |
| 5                  | RF1       | RF Port 1. DC block required.  |
| 6                  | $V_{DD}$  | Bias Voltage   |
| 7                  | Vctl      | Control Voltage  |
| 8                  | RF2       | RF Port 2. DC block required. Internal resistive termination in off (isolation) state.                               |
| Backside<br>Paddle | RF/DC GND | RF/DC Ground. Use recommended via pattern and ensure good solder attach for best thermal and electrical performance. |

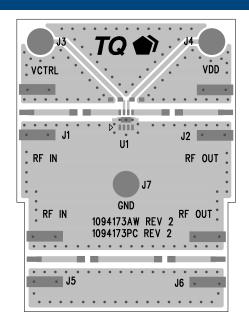
# **Evaluation Board PCB Specifications**

### PCB 1094173 Material and Stack-Up



50 ohm input/output (I/O) line structure Width = 0.028"

Gap = 0.028"

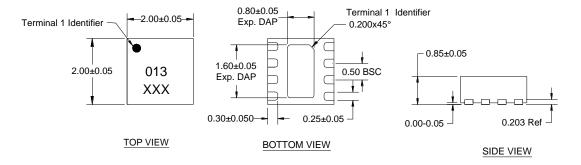




### **Mechanical Information**

### **Package Marking and Dimensions**

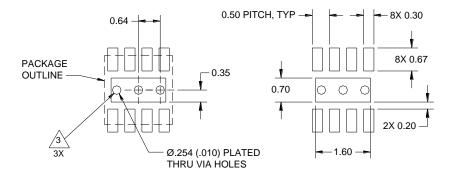
Marking: Product Code – 013
Assembly code - XXX



#### 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 0

Value: Passes >125 V and < 250 V
Test: Human Body Model (HBM)
Standard: JEDEC Standard JESD22-A114

ESD Rating: Class IV

Value: Passes >1000 volts

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

# **Important Notice**

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

 Web:
 www.triquint.com
 Tel:
 +1.503.615.9000

 Email:
 info-sales@triquint.com
 Fax:
 +1.503.615.8902

For technical questions and application information:

Email: sjcapplications.engineering@triquint.com

### **Contact Information**

The information contained herein is believed to be reliable. TriQuint makes no warranties regarding the information contained herein. TriQuint assumes no responsibility or liability whatsoever for any of the information contained herein. The information contained herein is provided "AS IS, WHERE IS" and with all faults, and the entire risk associated with such information is entirely with the user. All information contained herein is subject to change without notice. Customers should obtain and verify the latest relevant information before placing orders for TriQuint 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.

TriQuint 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.