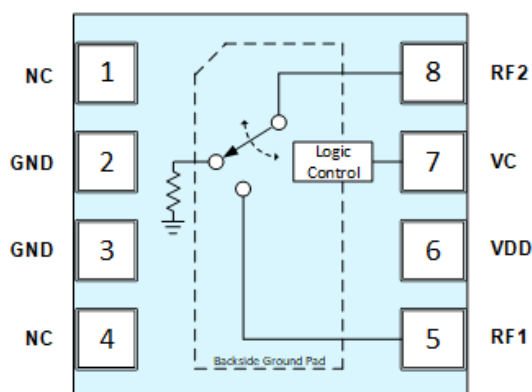


### Product Description

The QPC6014 is a Silicon on Insulator (SOI) single-pole single-throw (SPST) absorptive switch designed for use in cellular, 3G, LTE and other high-performance communications systems. It offers high isolation with excellent linearity and power handling capability. No blocking capacitors are necessary on the RF ports. The design is non-reflective such that the RF2 port is terminated into 50 Ohms in the off state. The QPC6014 is +1.8 V positive logic compatible.

### Functional Block Diagram



8-pin, 2.0 mm x 2.0 mm DFN Package

### Product Features

- 5 MHz to 6000 MHz Operation
- Non-Reflective (RF2)
- No Blocking Capacitors Necessary Unless Voltage is on RF Line
- High Isolation: 53 dB at 2 GHz
- High Input IP3: +58 dBm
- 2 kV ESD
- +1.8 V Logic Compatible

### Applications

- Cellular, 3G, LTE Infrastructure
- High Performance Communications Systems
- Test Equipment

### Ordering Information

| Part No.      | Description                                 |
|---------------|---------------------------------------------|
| QPC6014TR7    | 7" Reel with 2500 pcs                       |
| QPC6014PCK401 | 5 MHz to 6000 MHz PCBA with 5pcs sample bag |

### Absolute Maximum Ratings

| Parameter                                  | Value       | Units |
|--------------------------------------------|-------------|-------|
| Supply Voltage VDD                         | +6          | V     |
| Control Voltage VC                         | +6          | V     |
| RF1 or RF2 Input Power, CW, On-State       | +37         | dBm   |
| RF1 Input Power, CW, Off-State, Reflective | +32         | dBm   |
| RF2 Input Power, CW, Off-State, Absorptive | +29         | dBm   |
| 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. Specified typical performance or functional operation of the device under Absolute Maximum Rating conditions is not implied.

### Recommended Operating Conditions

| Parameter                                 | Min              | Typ  | Max   | Units |
|-------------------------------------------|------------------|------|-------|-------|
| Package Backside Pad Temperature          | -40              |      | +105  | °C    |
| Switching Transistor Junction Temperature |                  |      | +125  | °C    |
| Supply Voltage VDD                        | +2.7             | +3.0 | +5.5  | V     |
| RF1 or RF2 Input Power, CW, On-State      | < 500MHz, +85°C  |      | +30.5 | dBm   |
|                                           | > 500MHz, +85°C  |      | +35.0 | dBm   |
|                                           | < 500MHz, +105°C |      | +27.5 | dBm   |
|                                           | > 500MHz, +105°C |      | +32.0 | dBm   |
| RF2 Input Power, CW, Off-State            | +85°C            |      | +28.5 | dBm   |
|                                           | +105°C           |      | +25.5 | dBm   |

Recommendations are based on measurement at specified conditions. There is no guarantee over all combinations of operating condition. In common switch applications, the maximum input power could be limited by a lower level specified in Off-State or On-State.

### Electrical Specifications

| Parameter                                 | Conditions <sup>(1)</sup> |          | Min | Typ  | Max  | Units |
|-------------------------------------------|---------------------------|----------|-----|------|------|-------|
| Operational Frequency Range               |                           |          | 5   |      | 6000 | MHz   |
| Insertion Loss<br>( RF1 to RF2 On-State)  | V <sub>CTRL</sub> =+3.3 V | 450 MHz  |     | 0.63 |      | dB    |
|                                           |                           | 900 MHz  |     | 0.68 | 0.83 |       |
|                                           |                           | 2100 MHz |     | 0.84 |      |       |
|                                           |                           | 2600 MHz |     | 0.89 | 0.98 |       |
|                                           |                           | 4000 MHz |     | 1.05 |      |       |
| Isolation Loss<br>( RF1 to RF2 Off-State) | V <sub>CTRL</sub> =0 V    | 450 MHz  |     | 70   |      | dB    |
|                                           |                           | 900 MHz  | 45  | 64   |      |       |
|                                           |                           | 2100 MHz |     | 53   |      |       |
|                                           |                           | 2600 MHz | 35  | 51   |      |       |
|                                           |                           | 4000 MHz |     | 43   |      |       |
| Return Loss<br>(RFX On-State)             | V <sub>CTRL</sub> =+3.3 V | 450 MHz  |     | 20   |      | dB    |
|                                           |                           | 900 MHz  |     | 20   |      |       |
|                                           |                           | 2100 MHz |     | 20   |      |       |
|                                           |                           | 2600 MHz |     | 20   |      |       |
|                                           |                           | 4000 MHz |     | 20   |      |       |
| Return Loss<br>(RF2 Off-State)            | V <sub>CTRL</sub> =0 V    | 450 MHz  |     | 20   |      | dB    |
|                                           |                           | 900 MHz  |     | 20   |      |       |
|                                           |                           | 2100 MHz |     | 20   |      |       |
|                                           |                           | 2600 MHz |     | 20   |      |       |
|                                           |                           | 4000 MHz |     | 20   |      |       |

Notes:

1. Test conditions unless otherwise noted: V<sub>DD</sub>=+5 V, Temp.=+25 °C, 50 Ω system

### Electrical Specifications (continued)

| Parameter                | Conditions <sup>(1)</sup>                                | Min | Typ | Max  | Units          |
|--------------------------|----------------------------------------------------------|-----|-----|------|----------------|
| Input IP2                |                                                          |     | 110 |      | dBm            |
| Input IP3                | $P_{IN}=+20$ dBm/tone, $\Delta f=1$ MHz, $>15$ MHz       |     | 58  |      | dBm            |
|                          | $P_{IN}=+15$ dBm/tone, $\Delta f=1$ MHz, 5 MHz to 15 MHz |     | 50  |      |                |
| Input P1dB               | 10 MHz to 50 MHz                                         |     | 33  |      | dBm            |
|                          | $>50$ MHz                                                |     | 36  |      |                |
| Settling Time            | 50% Control to On-State harmonic minimized               |     | 1   |      | $\mu$ s        |
| Start-up Time            | $V_{DD}$ turn on to 90% RF                               |     | 1.8 | 25   | $\mu$ s        |
| Switching Time           | 50% Control to 10/90% RF                                 |     | 165 | 500  | ns             |
| Thermal Resistance (Rth) | Switching transistors                                    |     |     | 70.3 | $^{\circ}$ C/W |
|                          | Termination resistor                                     |     |     | 53.2 |                |

Notes:

1. Test conditions unless otherwise noted:  $V_{DD}=+3.3$  V, Temp. $=+25$   $^{\circ}$ C, 50  $\Omega$  system

### Electrical Specifications – DC Power Supply and Control Signal

| Parameter                          | Conditions              | Min  | Typ | Max      | Units   |
|------------------------------------|-------------------------|------|-----|----------|---------|
| Supply Current ( $I_{DD}$ )        | $V_{DD} = +3.3$ V       |      | 75  | 150      | $\mu$ A |
| Control Current ( $I_C$ on VC Pin) | $V_{CTRL} = +3.3$ V     |      | 0.1 |          | $\mu$ A |
| Logic Low Voltage ( $V_{CTRL}$ )   | +1.8 V Logic Compatible | 0    |     | +0.63    | V       |
| Logic High Voltage ( $V_{CTRL}$ )  | +1.8 V Logic Compatible | +1.1 |     | $V_{DD}$ | V       |

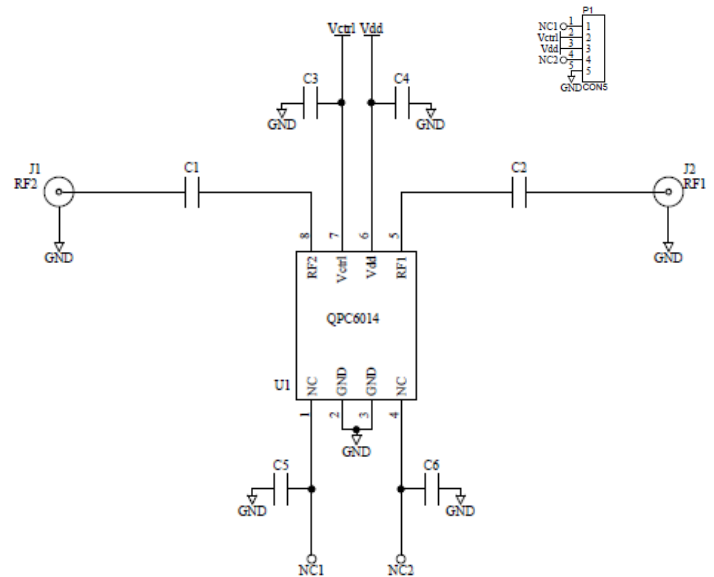
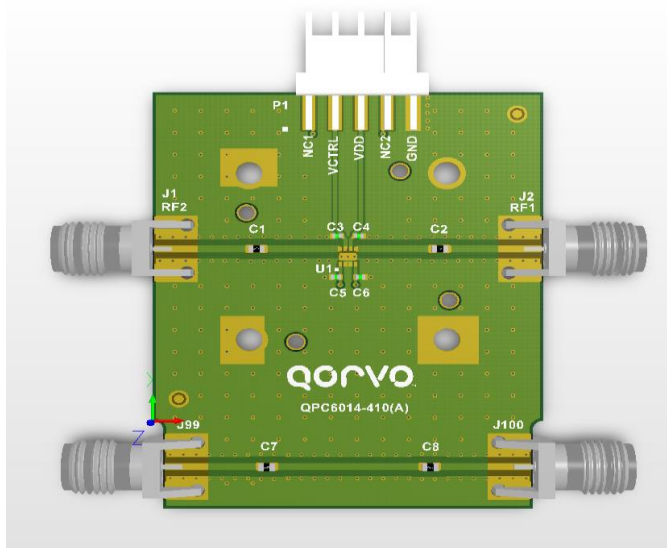
Notes:

1. Test conditions unless otherwise noted:  $V_{DD}=+3.3$  V $_{DC}$ , Temp. $=+25$   $^{\circ}$ C, 50  $\Omega$  system

### Truth Table

| $V_{CTRL}$ Logic | Signal Path and State                |
|------------------|--------------------------------------|
| 0                | RF1 $\nleftrightarrow$ RF2 Off-State |
| 1                | RF1 $\nleftrightarrow$ RF2 On-State  |

### QPC6014 Evaluation Board

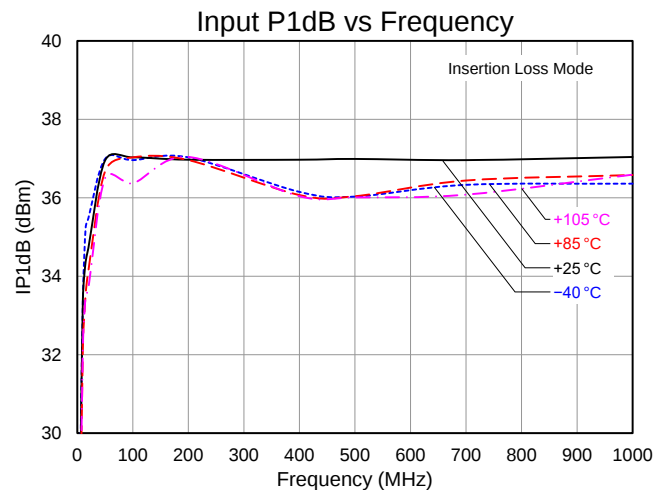
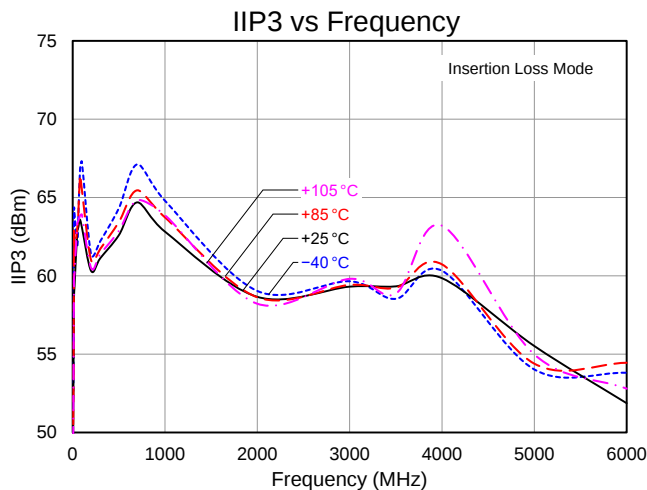
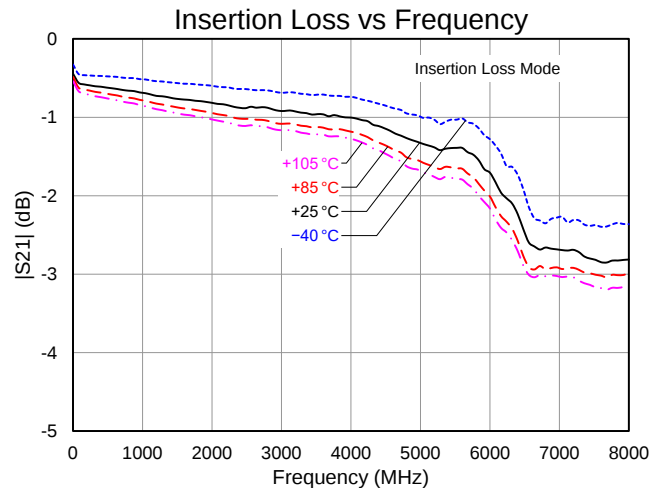
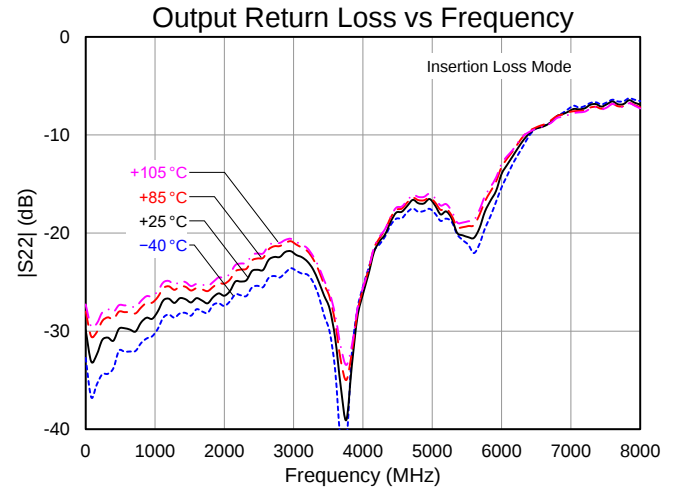
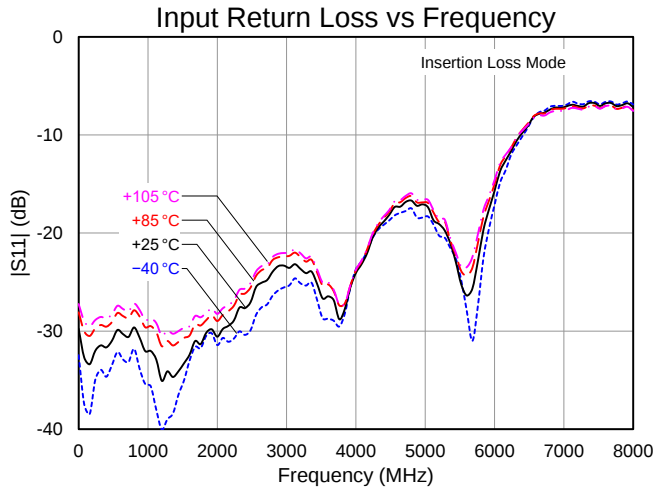


### Bill of Material – QPC6014 Evaluation Board

| Reference Designation | Description                           | Manufacturer         | Part Number        |
|-----------------------|---------------------------------------|----------------------|--------------------|
| -                     | Evaluation Board                      | -                    | QPC6014-410(A)     |
| C3, C4                | CAP, 100pF, 5%, 50V, COG, 0402        | Murata Electronics   | GRM1555C1H101JA01D |
| C1, C2, C7, C8        | RES, 0 OHM, 0603                      | KOA Speer Electronic | RK73Z1JTDD         |
| J1, J2, J99, J100     | CONN, SMA, EL, FLT VIPER, MAT-21-1038 | Amphenol             | 901-10425          |
| P1                    | CONN, HDR, ST, PLRZD, 5-PIN           | ITW Pancon           | MPSS100-5-C        |
| U1                    | QPC6014                               | Qorvo, Inc.          | QPC6014            |

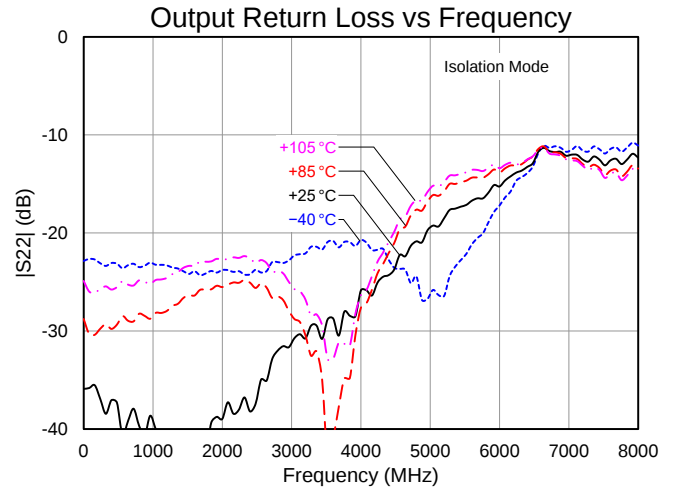
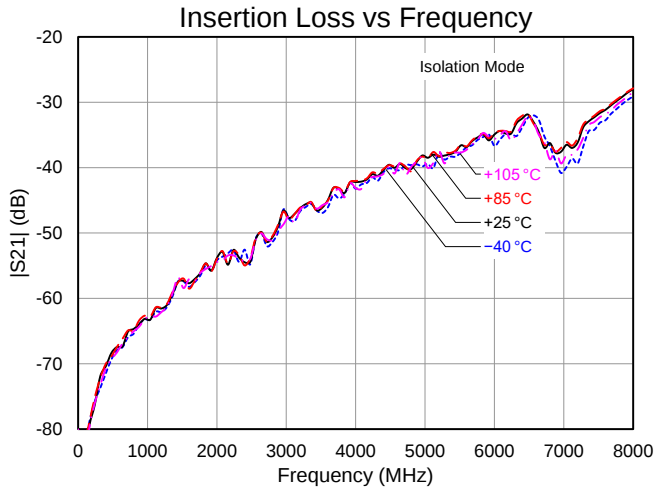
### Performance Plots – On-State

Test conditions unless otherwise noted:  $V_{DD}=+3.3\text{ V}_{DC}$ ,  $V_{CTRL}$ : High,  $50\ \Omega$  system

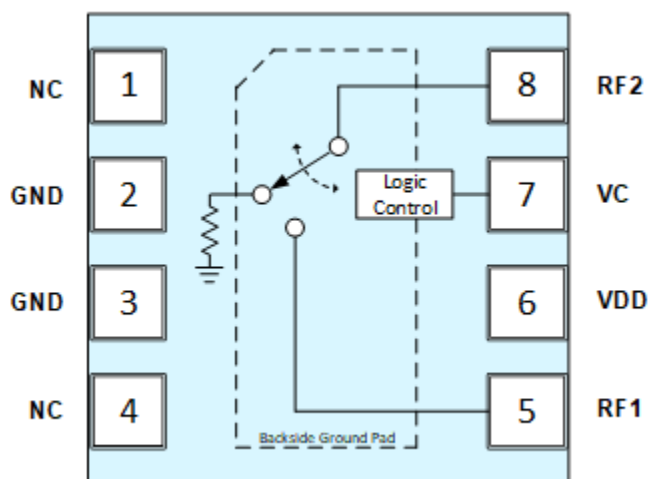


### Performance Plots – Off-State

Test conditions unless otherwise noted:  $V_{DD}=+3.3\text{ V}_{DC}$ ,  $V_{CTRL}$ : Low,  $50\ \Omega$  system

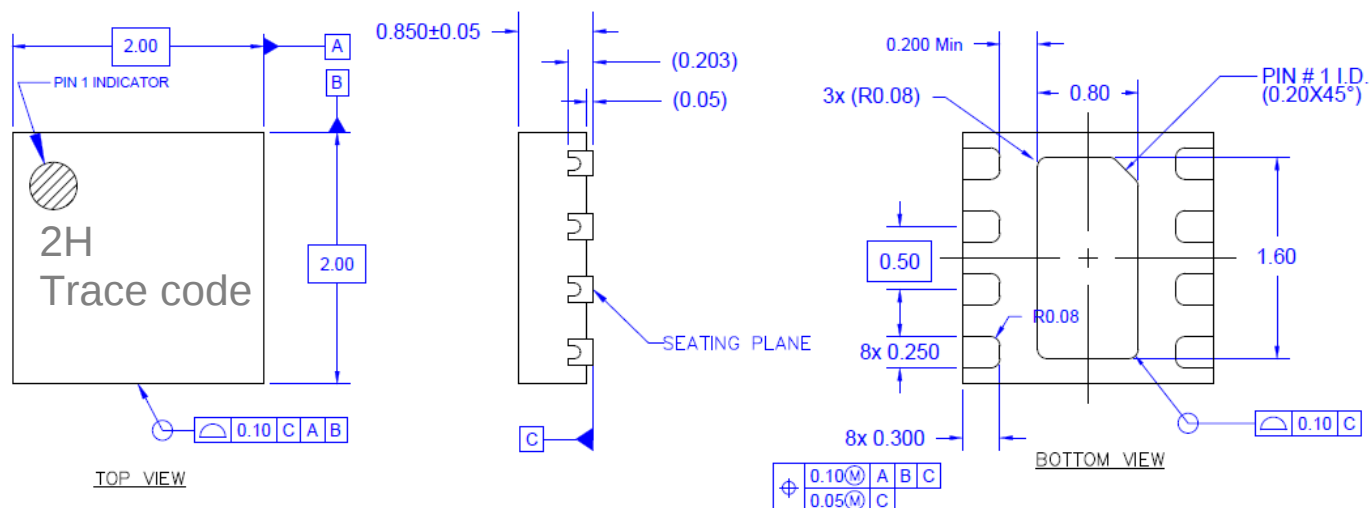


### Pin Configuration and Description



| Pin No. | Label        | Description                                                                          |
|---------|--------------|--------------------------------------------------------------------------------------|
| 1       | NC           | No Connection Internally                                                             |
| 2       | GND          | Ground Pad, Low Inductance Path to Ground Connection Required                        |
| 3       | GND          |                                                                                      |
| 4       | NC           | No Connection Internally                                                             |
| 5       | RF1          | RF Port 1; Reflective in Off-State                                                   |
| 6       | VDD          | DC Voltage Power Supply Input                                                        |
| 7       | VC           | Control Signal Input                                                                 |
| 8       | RF2          | RF Port 2; Absorptive in Off-State                                                   |
| -       | Backside Pad | Ground Pad, Low Electrical and Thermal Resistance Path to Ground Connection Required |

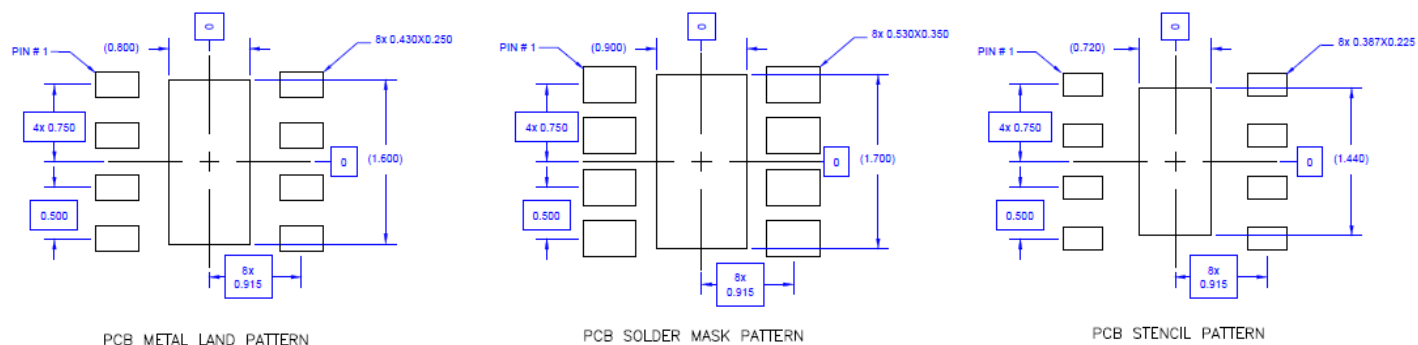
## Package Marking and Dimensions



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.

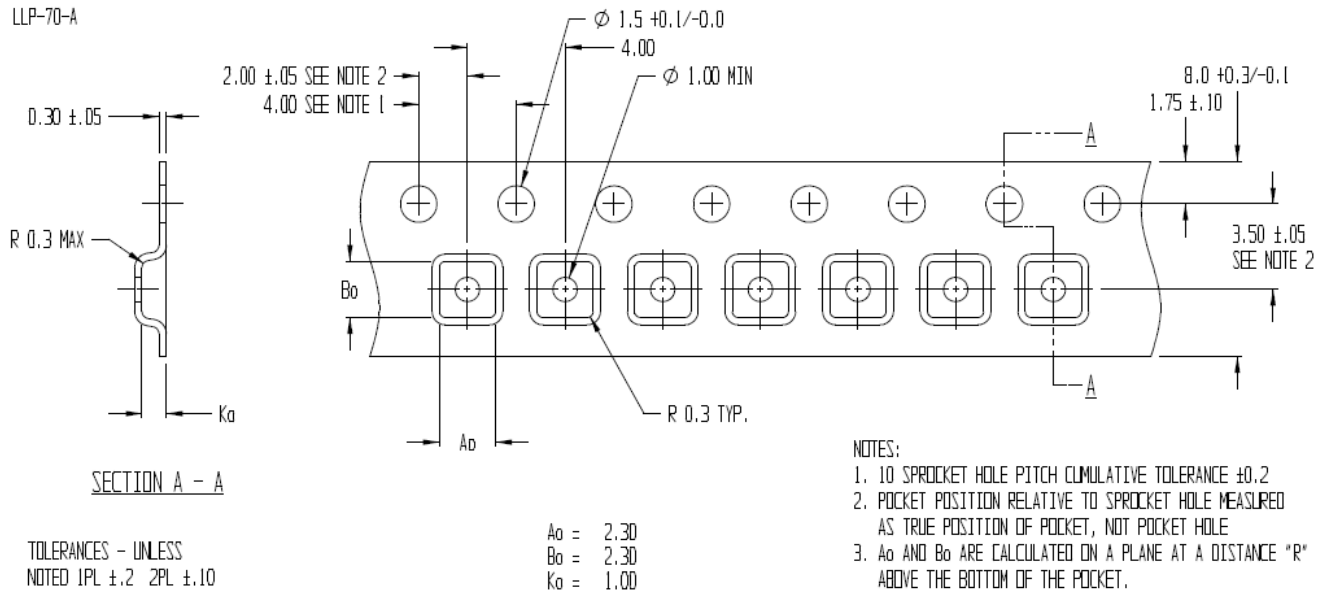
## PCB Mounting Pattern



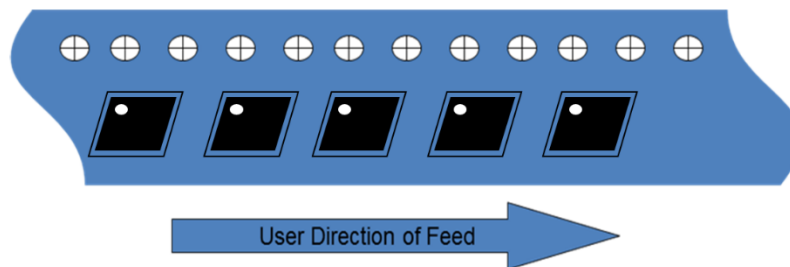
Notes:

1. All dimensions are in millimeters. Angles are in degrees.
2. Use 1 oz. copper minimum for top and bottom layer metal.
3. Vias are required under the backside paddle of this device for proper RF/DC grounding and thermal dissipation.
4. Do not remove or minimize the structure of the vias in the PCB. Thermal and RF grounding is critical.
5. We recommend a 0.35mm (#80/.0135") diameter bit for drilling via holes and a final plated thru diameter of 0.25 mm (0.01").
6. Ensure good package backside paddle solder attach for reliable operation and best electrical performance.

## Tape and Reel Information – Carrier and Cover Tape Dimensions

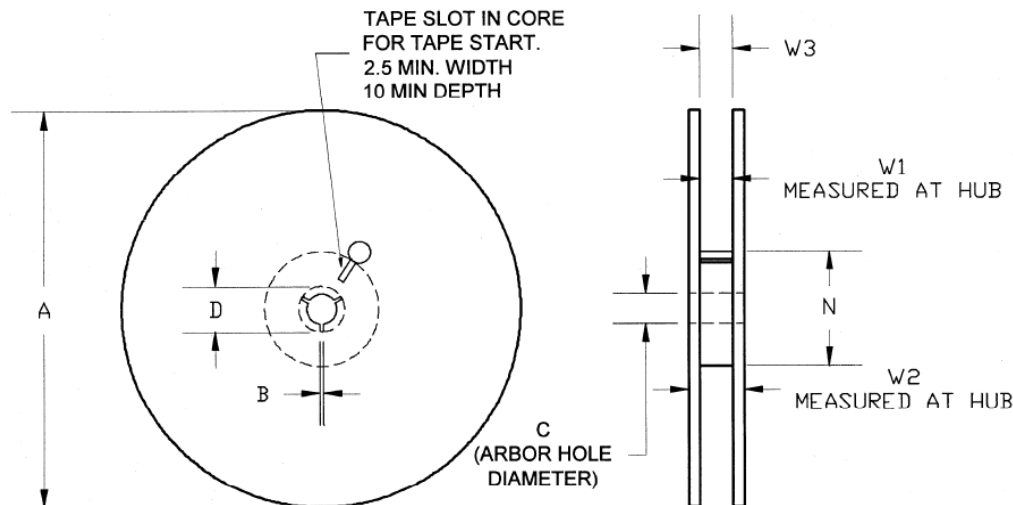


| Feature             | Measure                                  | Symbol | Size (in) | Size (mm) |
|---------------------|------------------------------------------|--------|-----------|-----------|
| Cavity              | Length                                   | A0     | 0.091     | 2.30      |
|                     | Width                                    | B0     | 0.091     | 2.30      |
|                     | Depth                                    | K0     | 0.039     | 1.00      |
|                     | Pitch                                    | P1     | 0.157     | 4.00      |
| Centerline Distance | Cavity to Perforation - Length Direction | P2     | 0.079     | 2.00      |
|                     | Cavity to Perforation - Width Direction  | F      | 0.138     | 3.50      |
| Cover Tape          | Width                                    | C      | 0.213     | 5.40      |
| Carrier Tape        | Width                                    | W      | 0.315     | 8.00      |



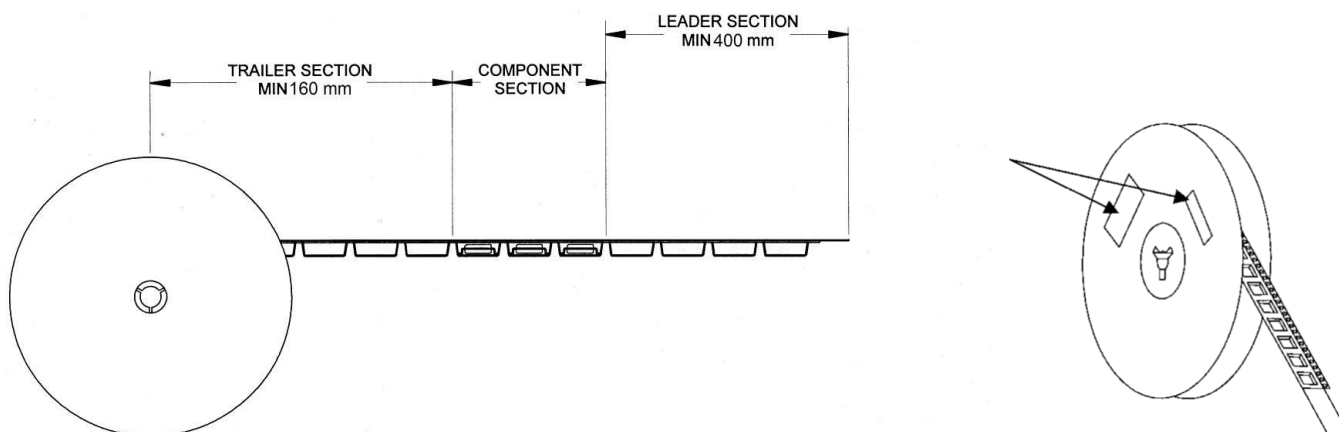
### Tape and Reel Information – Reel Dimensions

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



| Feature | Measure              | Symbol | Size (in) | Size (mm) |
|---------|----------------------|--------|-----------|-----------|
| Flange  | Diameter             | A      | 6.969     | 177.0     |
|         | Thickness            | W2     | 0.559     | 14.2      |
|         | Space Between Flange | W1     | 0.346     | 8.8       |
| Hub     | Outer Diameter       | N      | 2.283     | 58.0      |
|         | Arbor Hole Diameter  | C      | 0.512     | 13.0      |
|         | Key Slit Width       | B      | 0.079     | 2.0       |
|         | Key Slit Diameter    | D      | 0.787     | 20.0      |

### Tape and Reel Information – Tape Length and Label Placement



#### Notes:

1. Empty part cavities at the trailing and leading ends are sealed with cover tape. See EIA 481-1-A.
2. Labels are placed on the flange opposite the sprockets in the carrier tape.

### Handling Precautions

| Parameter                        | Rating   | Standard                    |
|----------------------------------|----------|-----------------------------|
| ESD – Human Body Model (HBM)     | Class 1A | ESDA / JEDEC JS-001-2012    |
| ESD – Charged Device Model (HBM) | Class C3 | JEDEC JESD22-C101F          |
| MSL – Moisture Sensitivity Level | Level 2  | JEDEC IPC/JEDEC J-STD-02020 |



Caution!  
ESD-Sensitive Device

### Solderability

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

Solder profiles available upon request.

Plating: NiPdAu

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



### Contact Information

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

Tel: 1-844-890-8163

Web: [www.qorvo.com](http://www.qorvo.com)

Email: [customer.support@qorvo.com](mailto:customer.support@qorvo.com)

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