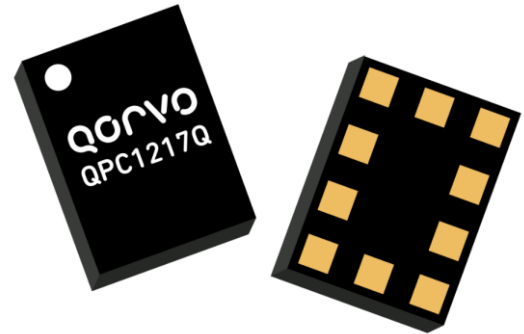


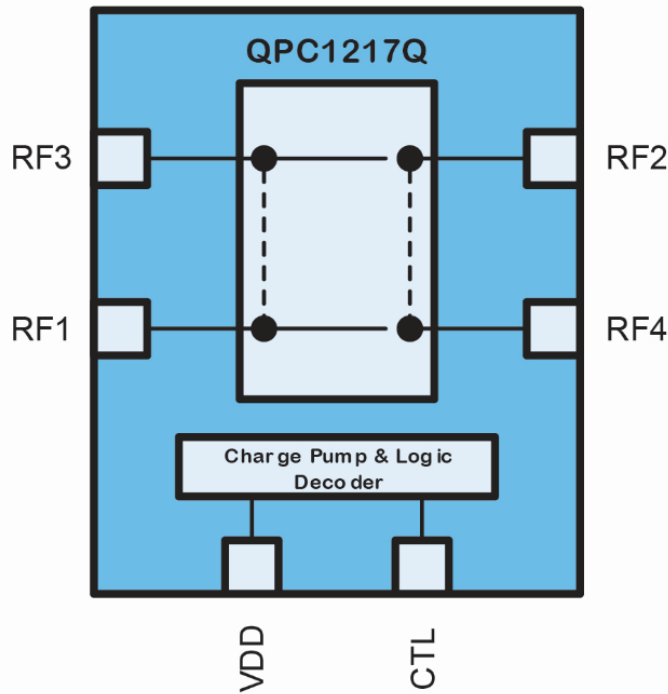
Product Description

The QPC1217Q is a dual-pole double-throw transfer switch designed for general purpose switching applications where RF port transfer (port swapping) control is needed. The low insertion loss along with excellent linearity performance makes the QPC1217Q ideal for multi-mode GSM, EDGE, UMTS, LTE, V2X, and DSRC applications. The RF ports can be directly connected in 50Ω systems and control logic is compatible with 1.3V to 2.7V systems. The supply voltage is intended for connection to 2.8V systems but the device is operable from 2.6V to 5.5V. The compact 1.1mm x 1.5mm size offers designers an easy-to-use switch component for quick integration into multimode, multi-band, multi-technology systems.



10 Pin 1.1 x 1.5 x 0.92 mm Package

Functional Block Diagram



Feature Overview

- Tested in accordance to AEC-Q100 Grade 2
- Low Insertion Loss
- High Port-to-Port Isolation
- GPIO Interface for 1.3V to 2.7V Control Logic
- Broadband Performance Suitable for All Cellular/WiFi/BT/V2X
- Operation up to 6GHz
- Very Low Current Consumption
- Linearity and Harmonic Performance Ideally Suited for LTE, V2X Applications
- DC blocking capacitors are not required in typical applications

Applications

- V2X, DSRC, eCall, WiFi
- General purpose switching up to 6GHz
- Multi-Mode GSM, EDGE, WCDMA, and LTE Applications

Ordering Information

| PART NO. | DESCRIPTION |
|-----------------|----------------------------------|
| QPC1217QSB | 5-pc Sample Bag |
| QPC1217QSR | 100-pc Reel |
| QPC1217QTR13-5K | 5000-pc Reel |
| QPC1217QPCK-01 | Fully Assembled EVB + 5 piece SB |

Absolute Maximum Ratings

| PARAMETER | RATING |
|-------------------------------|---|
| Storage Temperature | -65 to +150 °C |
| Ambient Operating Temperature | -40 to +105°C |
| V _{DD} | 6.0 V |
| C _{TL1} | 3.0 V |
| Maximum Junction Temperature | +125°C |
| Maximum Input Power | <20MHz operation requires MPR of 1dB |
| Single Drive | 36.0 dBm, 1:1 VSWR, +85°C, 100% DC 33.5 dBm, 1:1 VSWR, +105°C, 100% DC |
| Dual Drive | 33.5 dBm, 1:1 VSWR, +85°C, 100% DC 30.5 dBm, 1:1 VSWR, +105°C, 100% DC |

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

Recommended Operating Conditions

| PARAMETER | CONDITIONS | MIN. | TYP. | MAX. | UNITS |
|------------------------------------|----------------------------------|------|------|------|-------|
| V _{DD} Supply Voltage | | 2.6 | 2.8 | 5.5 | V |
| V _{DD} Supply Current | | | 57 | 80 | μA |
| C _{TL} Logic Low Voltage | | 0.0 | 0.1 | 0.45 | V |
| C _{TL} Logic High Voltage | | 1.3 | 1.8 | 2.7 | V |
| C _{TL} Logic High Current | | | 0.58 | 5 | μA |
| Turn-On Time | 50% V _{dd} to 10/90% RF | | 2.28 | 20 | μs |
| Switching Speed | 50% Control to 10/90% RF | | 1.42 | 3 | μs |

Electrical specifications are measured at specified test conditions. Specifications are not guaranteed over all recommended operating conditions.

Electrical Specifications

Test conditions unless otherwise stated: all unused RF ports terminated in 50Ω, Input and Output = 50Ω, T = 25°C, V_{DD} = 2.8V, Logic State = RF1-RF4; RF2-RF3 and RF1-RF3; RF2-RF4

| PARAMETER | CONDITIONS | MIN. | TYP. | MAX. | UNITS |
|--------------------------|-------------------------------------|------|--------|------|-------|
| Frequency Range | | 698 | | 960 | MHz |
| Insertion Loss | | | | | |
| RF1 to RF3 | Logic State = RF1-RF3, RF2-RF4 | | 0.32 | 0.45 | dB |
| RF1 to RF4 | Logic State = RF1-RF4, RF2-RF3 | | 0.33 | 0.45 | dB |
| RF2 to RF3 | Logic State = RF1-RF4, RF2-RF3 | | 0.34 | 0.45 | dB |
| RF2 to RF4 | Logic State = RF1-RF3, RF2-RF4 | | 0.33 | 0.45 | dB |
| Isolation | | | | | |
| RF1 to RF2, RF3 to RF4 | Logic State = RF1-RF4, RF2-RF3 | 26 | 33.6 | | dB |
| RF1 to RF2, RF3 to RF4 | Logic State = RF1-RF3, RF2-RF4 | 26 | 30.1 | | dB |
| Harmonics | | | | | |
| 2 nd Harmonic | Frequency = 980MHz; Pin = 26dBm; CW | | -108.1 | | dBm |
| 3 rd Harmonic | | | -85.6 | | dBm |
| IIP2 | | | | | |
| Band 5 & 6 | | | 137.44 | | dBm |
| IIP3 | | | | | |
| Band 5 & 6 | | | 74.5 | | dBm |
| VSWR | | | | | |
| RF1, RF2, RF3, RF4 | 824MHz to 960MHz | | 1.1 | | :1 |

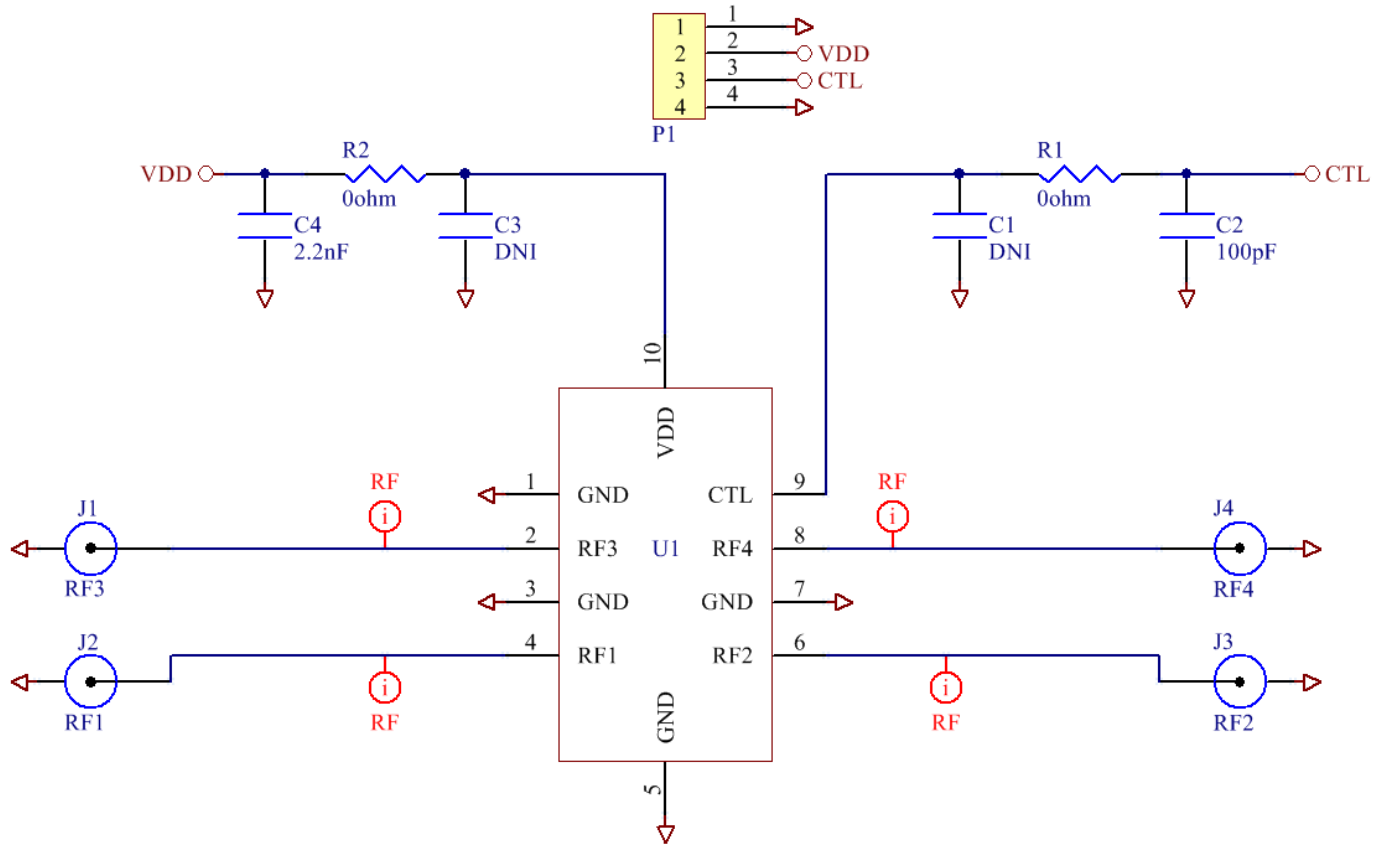
General Purpose DPDT Transfer Switch

| PARAMETER | CONDITIONS | MIN. | TYP. | MAX. | UNITS |
|--------------------------|--|------|--------|------|-------|
| Frequency Range | | 1425 | | 2200 | MHz |
| Insertion Loss | | | | | |
| RF1 to RF3 | Logic State = RF1-RF3, RF2-RF4 | | 0.39 | 0.5 | dB |
| RF1 to RF4 | Logic State = RF1-RF4, RF2-RF3 | | 0.39 | 0.5 | dB |
| RF2 to RF3 | Logic State = RF1-RF4, RF2-RF3 | | 0.42 | 0.5 | dB |
| RF2 to RF4 | Logic State = RF1-RF3, RF2-RF4 | | 0.39 | 0.5 | dB |
| Isolation | | | | | |
| RF1 to RF3, RF2-RF4 | Logic State = RF1-RF4, RF2-RF3 | 22 | 27.8 | | dB |
| RF1 to RF4, RF2-RF3 | Logic State = RF1-RF3, RF2-RF4 | 22 | 24.4 | | dB |
| Harmonics | | | | | |
| 2 nd Harmonic | Frequency = 2010MHz; P _{in} = 26dBm; CW | | -100.2 | | dBm |
| 3 rd Harmonic | | | -101.2 | | dBm |
| IIP2 | | | | | |
| Band 2 (PCS) | | | 129.9 | | dBm |
| IIP3 | | | | | |
| Band 2 (PCS) | | | 73.9 | | dBm |
| VSWR | | | | | |
| RF1, RF2, RF3, RF4 | 1427MHz to 2170MHz | | 1.15 | | :1 |
| Frequency Range | | 2300 | | 2690 | MHz |
| Insertion Loss | | | | | |
| RF1 to RF3 | Logic State = RF1-RF3, RF2-RF4 | | 0.41 | 0.6 | dB |
| RF1 to RF4 | Logic State = RF1-RF4, RF2-RF3 | | 0.41 | 0.6 | dB |
| RF2 to RF3 | Logic State = RF1-RF4, RF2-RF3 | | 0.45 | 0.6 | dB |
| RF2 to RF4 | Logic State = RF1-RF3, RF2-RF4 | | 0.42 | 0.6 | dB |
| Isolation | | | | | |
| RF1 to RF3, RF2-RF4 | Logic State = RF1-RF4, RF2-RF3 | 20 | 25 | | dB |
| RF1 to RF4, RF2-RF3 | Logic State = RF1-RF3, RF2-RF4 | 20 | 22 | | dB |
| Harmonics | | | | | |
| 2 nd Harmonic | Frequency = 2700MHz; P _{in} = 26dBm; CW | | -100.3 | | dBm |
| 3 rd Harmonic | | | -92.7 | | dBm |
| IIP2 | | | | | |
| Band 7 | | | 129.5 | | dBm |
| IIP3 | | | | | |
| Band 7 | | | 71.7 | | dBm |
| VSWR | | | | | |
| RF1, RF2, RF3, RF4 | 2300MHz to 2690MHz | | 1.17 | | :1 |

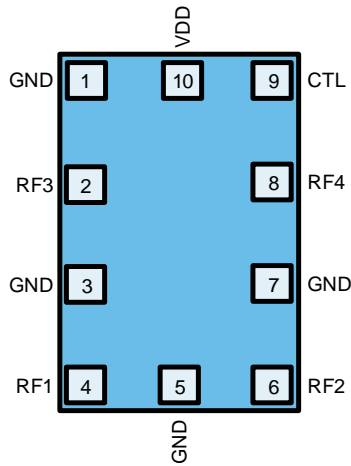
General Purpose DPDT Transfer Switch

| PARAMETER | CONDITIONS | MIN. | TYP. | MAX. | UNITS |
|------------------------|--------------------------------|------|------|------|-------|
| Frequency Range | | 5000 | | 6000 | MHz |
| Insertion Loss | | | | | |
| RF1 to RF3 | Logic State = RF1-RF3, RF2-RF4 | | 0.76 | 0.95 | dB |
| RF1 to RF4 | Logic State = RF1-RF4, RF2-RF3 | | 0.69 | 0.95 | dB |
| RF2 to RF3 | Logic State = RF1-RF4, RF2-RF3 | | 0.86 | 0.95 | dB |
| RF2 to RF4 | Logic State = RF1-RF3, RF2-RF4 | | 0.79 | 0.95 | dB |
| Isolation | | | | | |
| RF1 to RF3, RF2-RF4 | Logic State = RF1-RF4, RF2-RF3 | | 18.5 | | dB |
| RF1 to RF4, RF2-RF3 | Logic State = RF1-RF3, RF2-RF4 | | 16 | | dB |
| VSWR | | | | | |
| RF1, RF2, RF3, RF4 | 5000MHz to 6000MHz | | 1.41 | | :1 |
| | | | | | |

Application Circuit Schematic



Pin Configuration and Description



Top View

| PIN NO. | LABEL | DESCRIPTION |
|---------|-----------------|--|
| 1 | GND | Ground |
| 2 | RF3 | RF Port connecting to either RF1 or RF2. Avoid applying DC voltage |
| 3 | GND | Ground |
| 4 | RF1 | RF Port connecting to either RF3 or RF4. Avoid applying DC voltage |
| 5 | GND | Ground |
| 6 | RF2 | RF Port connecting to either RF3 or RF4. Avoid applying DC voltage |
| 7 | GND | Ground |
| 8 | RF4 | RF Port connecting to either RF1 or RF2. Avoid applying DC voltage |
| 9 | C _{TL} | Logic Control pin |
| 10 | V _{DD} | Power Supply pin |

Control Logic

The Switch is controlled by V_{DD} and C_{TL}.

| LOGIC STATE | V _{DD} | C _{TL} | DESCRIPTION |
|-----------------|--------------------|-----------------|---|
| Off | 0V | Low | Off or Standby – low current state |
| RF1-RF3;RF2-RF4 | “V _{DD} ” | Low | RF1 connected to RF3 and RF2 connected to RF4 |
| RF1-RF4;RF2-RF3 | “V _{DD} ” | High | RF1 connected to RF4 and RF2 connected to RF3 |

NOTE: The switch is in the Off or Standby state only when the V_{DD} supply is low. The RF performance is undefined in the Off State

Power On and Off Sequence

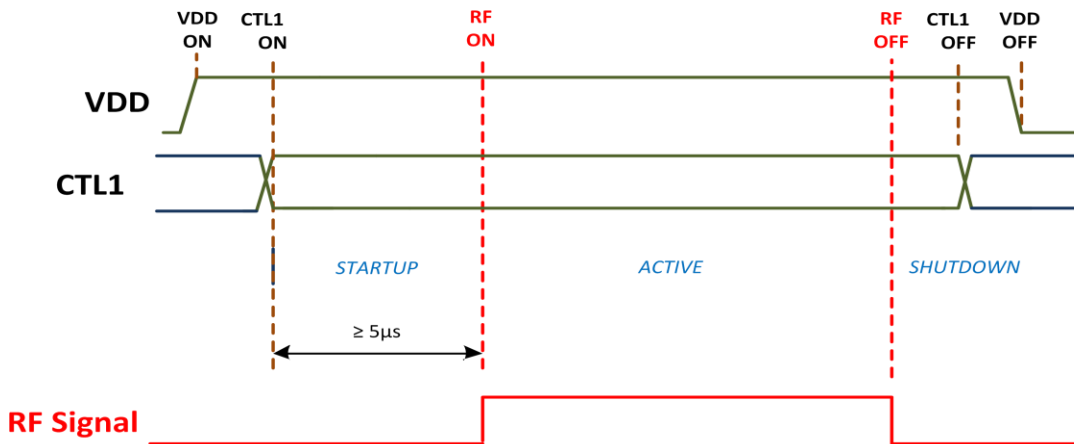
It is very important that the user adheres to the correct power-on/off sequence in order to avoid damaging the part. First apply V_{DD} before applying a high to C_{TL} .

Power On –

1. Apply voltage supply – V_{DD}
2. Apply Logic signal – C_{TL}
3. Wait $5\mu s$ or greater after C_{TL} is stable and then apply the RF signal

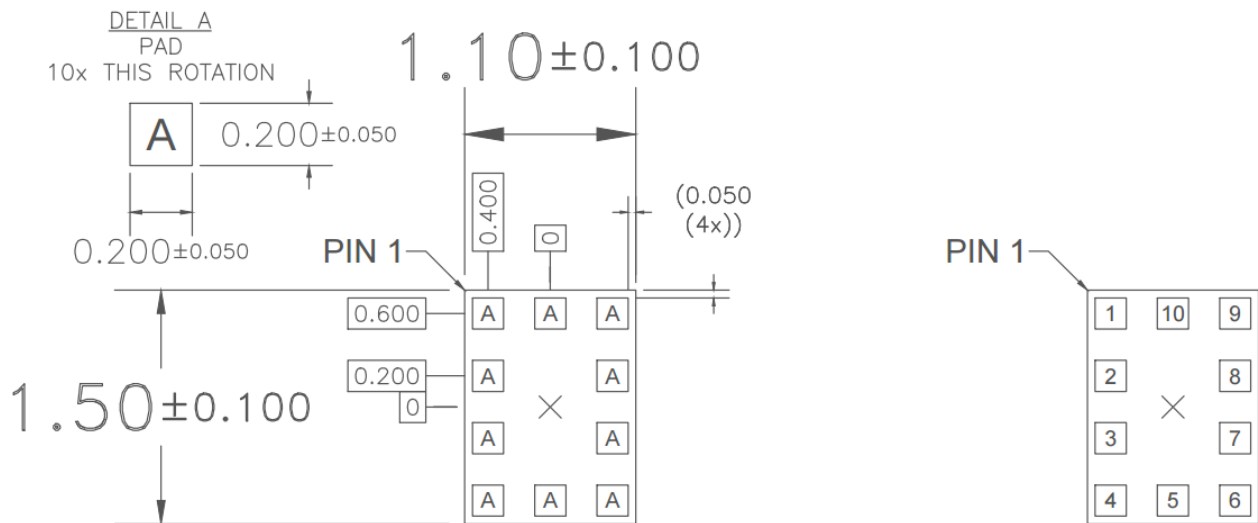
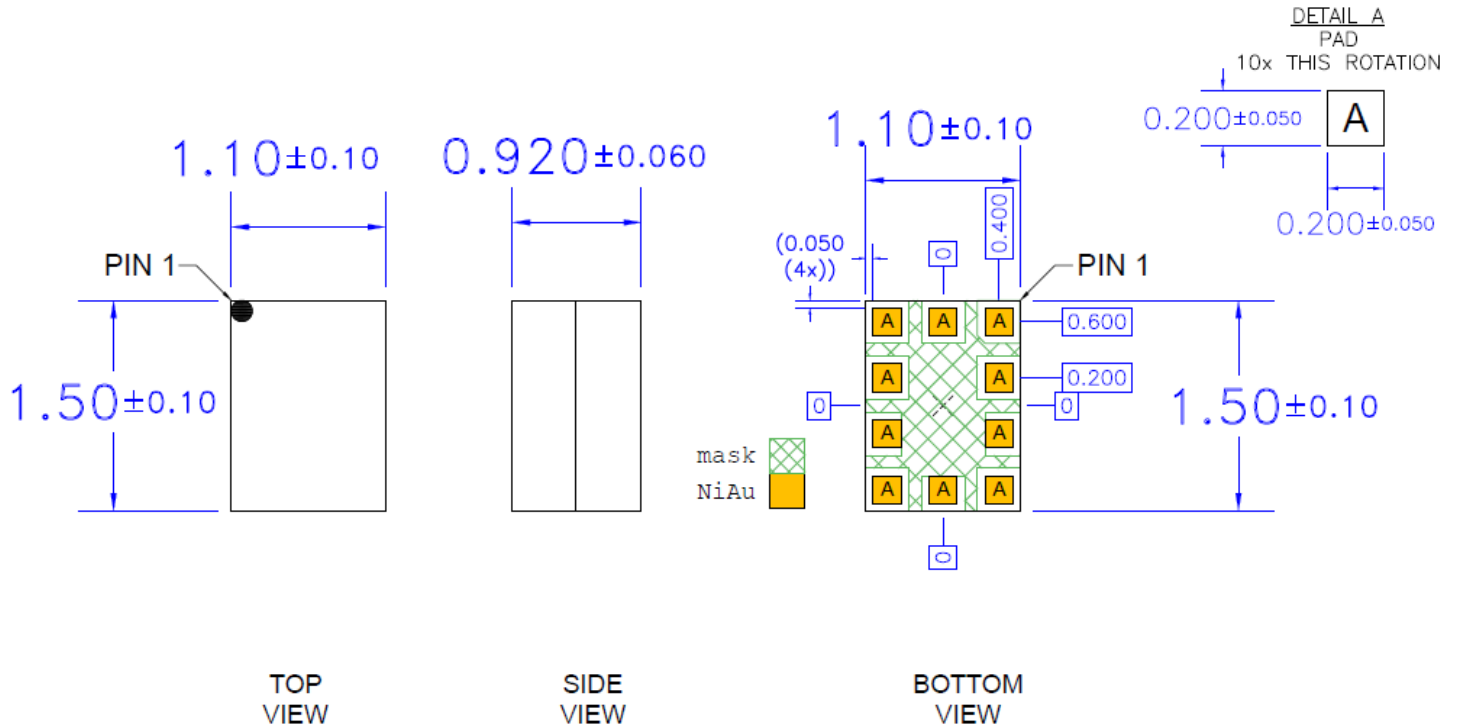
Power Off –

1. Remove the RF signal
2. Remove the logic signal – C_{TL}
3. Remove the voltage supply – V_{DD}



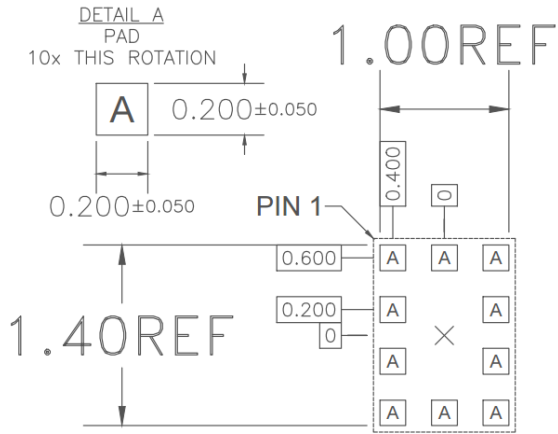
Mechanical Information

Package Drawing

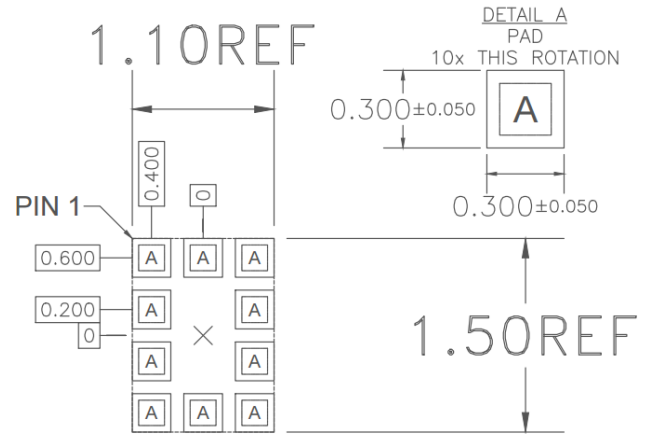


Top View xRay

PCB Design Requirements



Recommended Land Pattern



Recommended Land Pattern Mask

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.

Handling Precautions

| PARAMETER | RATING | STANDARD |
|----------------------------------|---------|------------------------|
| ESD – Human Body Model (HBM) | Class 2 | ESDA/JEDEC JS-001-2012 |
| MSL – Moisture Sensitivity Level | Level 3 | IPC/JEDEC J-STD-020 |



Caution!

ESD sensitive device

Solderability

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

Package lead plating: Electrolytic plated Au over Ni

RoHS Compliance

This part is compliant with the 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
- SVHC Free
- PFOS Free

