

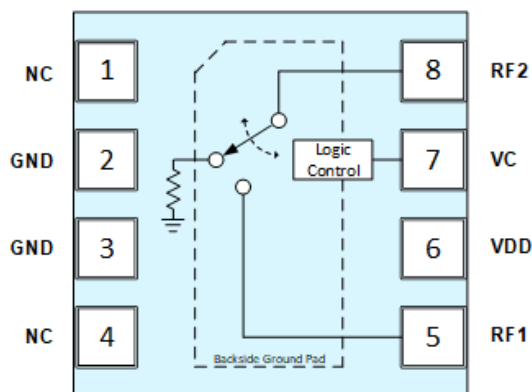
Product Description

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.



8-pin, 2.0 mm x 2.0 mm DFN Package

Functional Block Diagram



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	-55 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 ⁽¹⁾		Min	Typ	Max	Units
Operational Frequency Range			5		6000	MHz
Insertion Loss (RF1 to RF2 On-State)	V _{CTRL} =+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 (RF1 to RF2 Off-State)	V _{CTRL} =0 V	450 MHz		70		dB
		900 MHz	45	64		
		2100 MHz		53		
		2600 MHz	35	51		
		4000 MHz		43		
Return Loss (RFX On-State)	V _{CTRL} =+3.3 V	450 MHz		20		dB
		900 MHz		20		
		2100 MHz		20		
		2600 MHz		20		
		4000 MHz		20		
Return Loss (RF2 Off-State)	V _{CTRL} =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_{DD}=+5 V, Temp.=+25 °C, 50 Ω system

Electrical Specifications (continued)

Parameter	Conditions ⁽¹⁾	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		μ s
Start-up Time	V_{DD} turn on to 90% RF		1.8	25	μ 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:

- Test conditions unless otherwise noted: $V_{DD}=+3.3$ V, Temp. $=+25$ $^{\circ}$ C, 50 Ω 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	μ A
Control Current (I_C on VC Pin)	$V_{CTRL} = +3.3$ V		0.1		μ 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

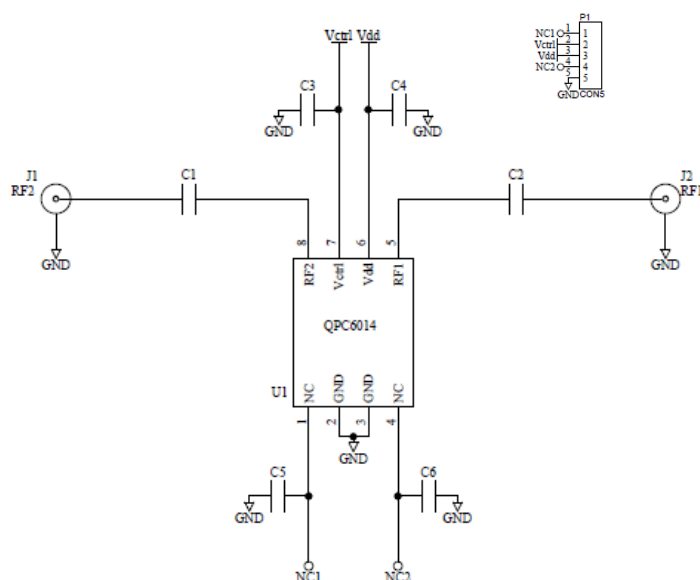
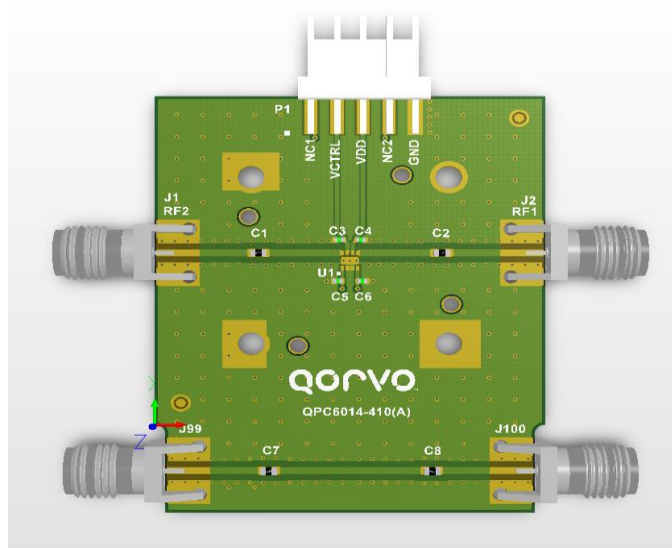
Notes:

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

Truth Table

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

QPC6014 Evaluation Board

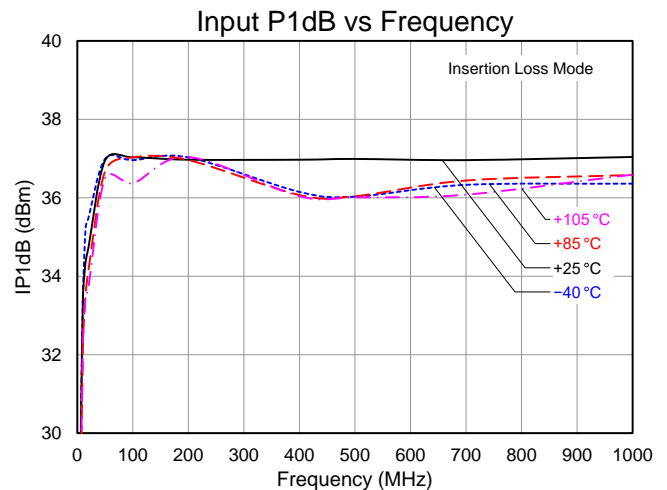
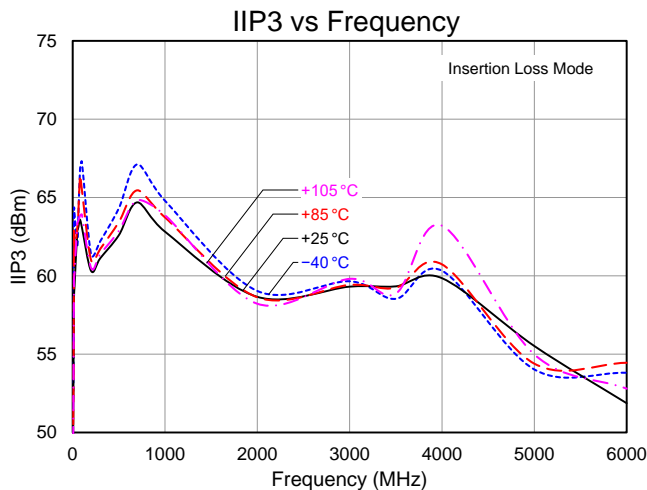
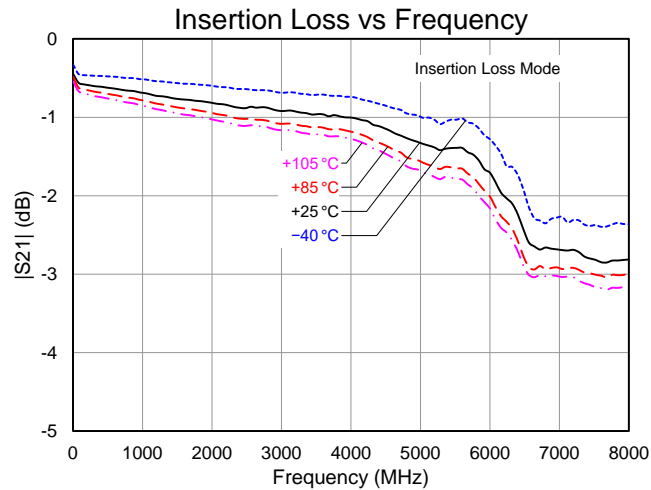
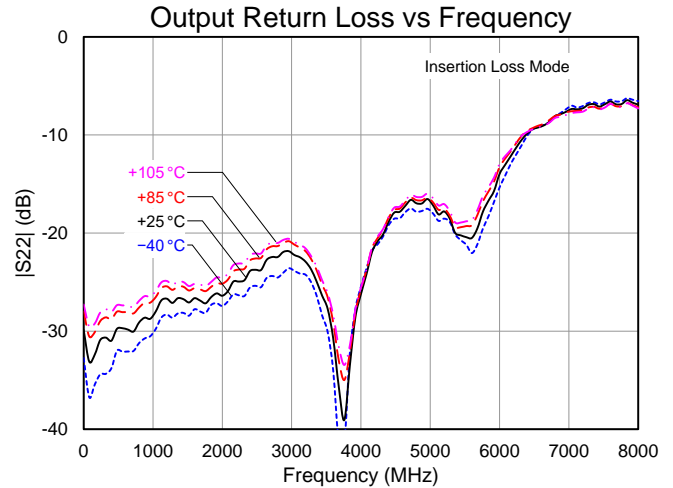
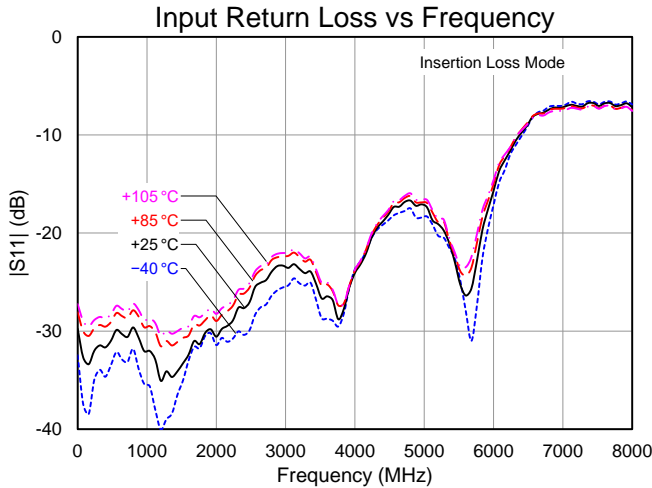


Bill of Material – QPC6014 Evaluation Board

Reference Designation	Description	Manufacturer	Part Number
-	Evaluation Board	-	QPC6014-410(A)
C3, C4	CAP, 100pF, 5%, 50V, C0G, 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

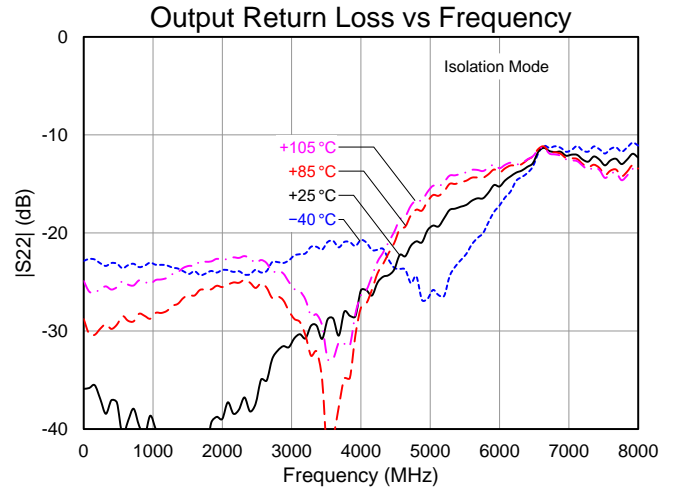
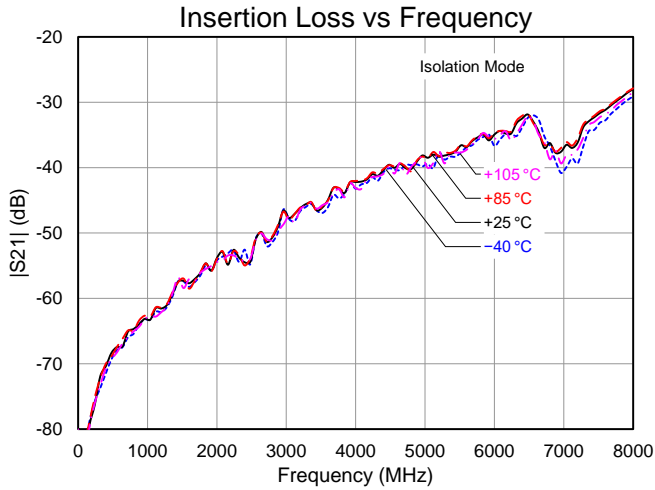
Performance Plots – On-State

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

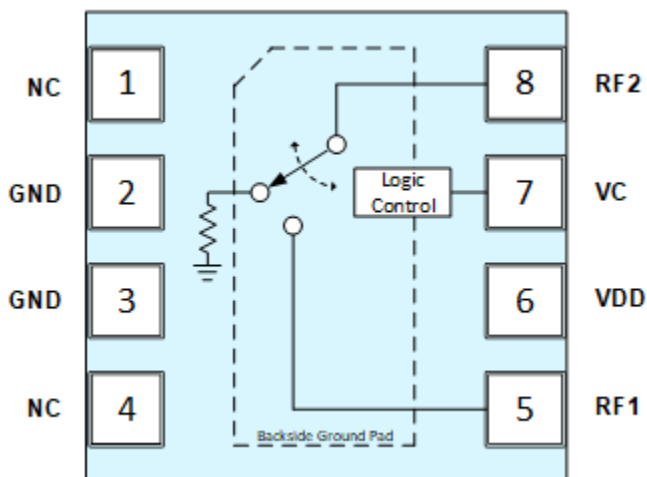


Performance Plots – Off-State

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

[illegible]

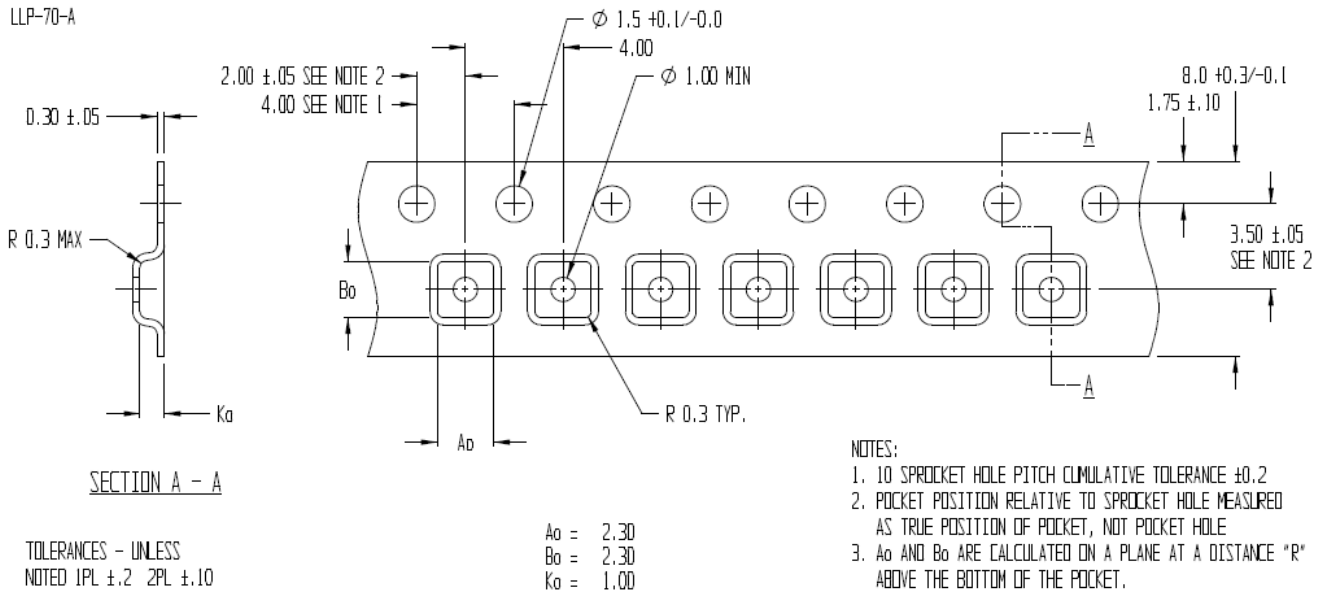
1. All dimensions are in millimeters. Angles are in degrees.
2. Dimension and tolerance formats conform to ASME Y14.4M-1994.
3. The terminal #1 identifier and terminal numbering conform to JESD 95-1 SPP-012.

The figure consists of three technical drawings of a PCB, each with dimensions in millimeters (mm) and inches (in).

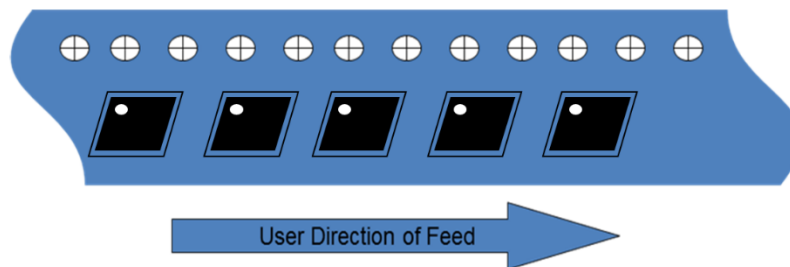
- PCB METAL LAND PATTERN:** Shows a central square pad with a crosshair. Dimensions include:
 - Pin # 1 location: (0.800) mm from the top edge.
 - Land dimensions: 4x 0.750 mm (width) and 0.500 mm (height).
 - Pad dimensions: 8x 0.430x0.250 mm.
 - Overall dimensions: 1.600 mm (width) and 0.915 mm (height).
- PCB SOLDER MASK PATTERN:** Shows a central square pad with a crosshair. Dimensions include:
 - Pin # 1 location: (0.900) mm from the top edge.
 - Land dimensions: 4x 0.750 mm (width) and 0.500 mm (height).
 - Pad dimensions: 8x 0.530x0.350 mm.
 - Overall dimensions: 1.700 mm (width) and 0.915 mm (height).
- PCB STENCIL PATTERN:** Shows a central square pad with a crosshair. Dimensions include:
 - Pin # 1 location: (0.720) mm from the top edge.
 - Land dimensions: 4x 0.750 mm (width) and 0.500 mm (height).
 - Pad dimensions: 8x 0.367x0.225 mm.
 - Overall dimensions: 1.440 mm (width) and 0.915 mm (height).

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

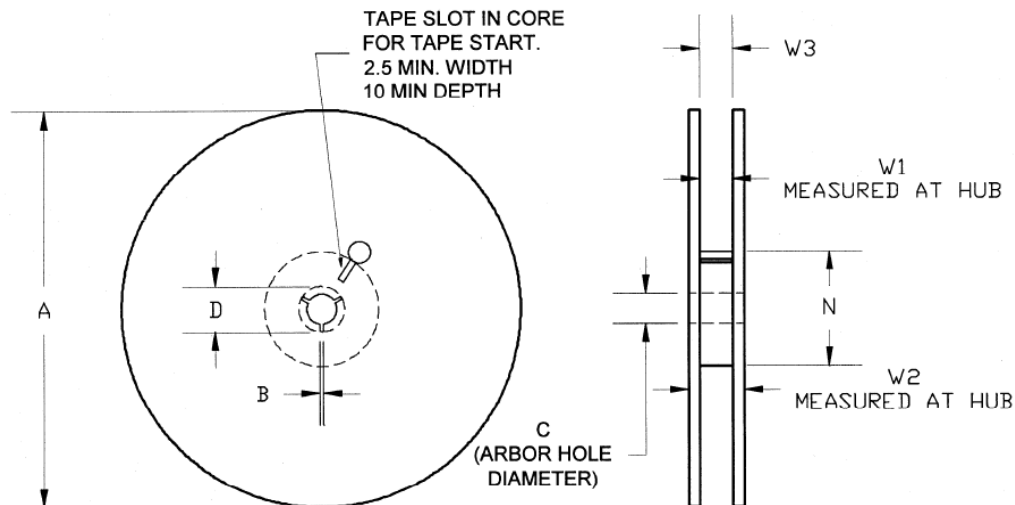


Feature	Measure	Symbol	Size (in)	Size (mm)
Cavity	Length	A0	0.091	2.30
	Width	B0	0.091	2.30
	Depth	K0	0.039	1.00
	Pitch	P1	0.157	4.00
Centerline Distance	Cavity to Perforation - Length Direction	P2	0.079	2.00
	Cavity to Perforation - Width Direction	F	0.138	3.50
Cover Tape	Width (Reference Only)	C	0.213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



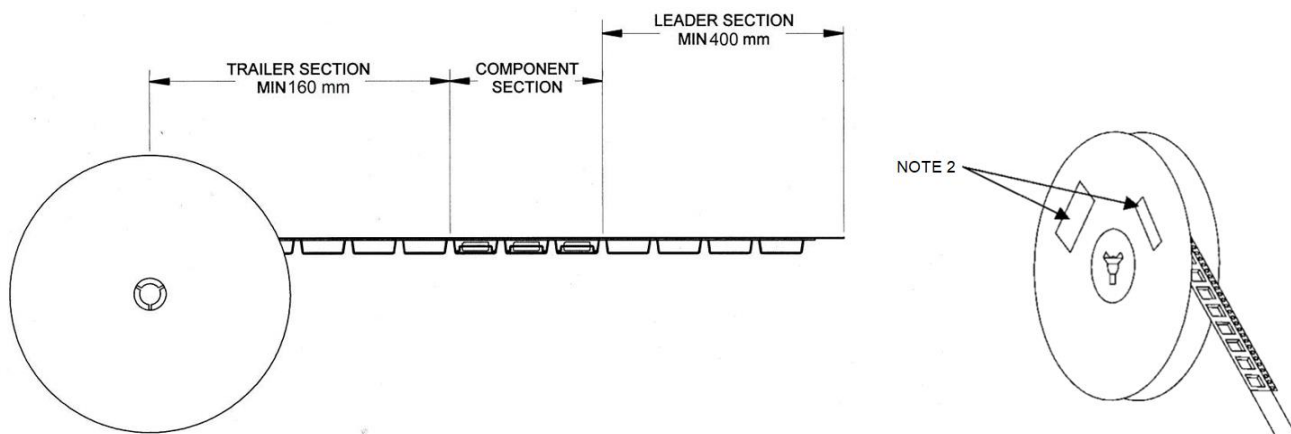
Tape and Reel Information – Reel Dimensions

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 (CDM)	Class C3	JEDEC JESD22-C101F
MSL – Moisture Sensitivity Level	Level 1	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 (C₁₅H₁₂Br₄O₂) Free
- PFOS Free
- SVHC Free



Contact Information

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