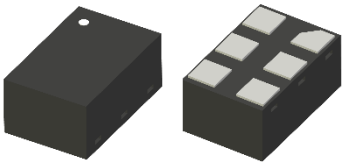
ASWD-S2-0002

DC~ 3.0GHz SPDT RF & Antenna Switch with Enhanced ESD Protection

Description



The ASWD-S2-0002 is a low-loss, high-isolation Silicon-On-Insulator (SOI) SPDT Reflective RF switch, engineered for exceptional performance with ultra-low on-state resistance and ultra-high linearity. These attributes make it ideal for antenna tuning and general-purpose IoT applications. It features ±1.5kV HBM ESD protection and comes in a compact DFN package measuring 1.1mm x 0.7mm x 0.45mm, providing a space-efficient solution for high-performance RF designs. Additionally, the ASWD-S2-0002 is RoHS compliant and has a Moisture Sensitivity Level (MSL) of 3.

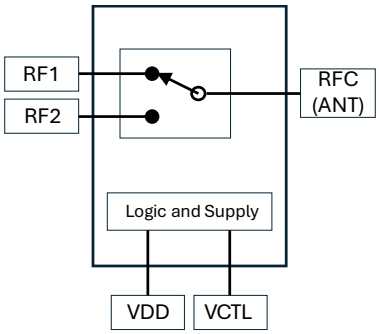
Key Features

- DFN-6L Package: 1.1mm x 0.7mm
- Frequency Range: DC to 3.0GHz
- Low Insertion 0.37dB Typ. @f = 2.2 to 2.7 GHz
- High Isolation 25dB Typ. @f = 2.2 to 2.7 GHz
- $P_{0.1dB}$ = +34.5 dBm Typ. @f = 0.8 to 2.7 GHz
- Low Control Voltage V_{CTL_H} = 1.8V Min.
  Voltage Operation V_{DD} = 2.8V Typ.
- GPIO Control for SPDT
- ±1.5kV HBM ESD Protection
- RoHS Compliant | MSL Level 3

Typical Applications

- Smart Phones, Tablets, PCs
- GSM/WCDMA/LTE band and Mode Switching
- Antenna Selection / Tuning Switch
- RF Combo Modules (Wi-Fi/BT, LTE/GNSS)
- AR/VR, Wi-Fi Speakers
- Access Point, Routers and Gateways

Functional Block Diagram



Ordering Information

Part No.	Description
ASWD-S2-0002	DC~ 3.0GHZ SPDT RF & Antenna Switch with Enhanced ESD Protection on Cut Tape
ASWD-S2-0002-T	DC~ 3.0GHZ SPDT RF & Antenna Switch with Enhanced ESD Protection on Tape & Reel
ASWD-S2-0002-EVB	DC~ 3.0GHZ SPDT RF & Antenna Switch with Enhanced ESD Protection EVB

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Absolute Maximum Ratings

Parameter	Symbol	Min.	Typ.	Max.	Unit
Supply Voltage	V_{DD}	1.6	-	3.6	V
Control Voltage	V_{CTL}			V_{DD}	V
Max Input Power	P_{INMAX}	-	-	+35	dBm
Operating Temperature	T_{OP}	-40	-	85	℃
Storage Temperature	T_{STG}	-55	-	150	℃
Moisture Sensitivity Level	-	MSL3			-
Electrostatic Discharge, HBM[1]	V_{ESD}	-	-	±1500	V
Electrostatic Discharge, CDM[2]		-	-	±2000	V

1. HBM: ESDA/JEDEC JS-001-2017
2. CDM: ESDA/JEDEC JS-002-2018

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

Recommended Operating Conditions

Parameter	Min.	Typ.	Max.	Unit
VDD	1.6	2.8	3.3	V
Pin (RFC – RFX), CW, 50 Ω	-	-	34.5	dBm
T_j at MTTF>105 hrs.	-	150	-	℃

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

RF Electrical Specifications

Parameters		Condition	Values			Unit
			Minimum	Typical	Maximum	
Insertion Loss	IL	DC-1.0 GHz	-	0.30	0.50	dB
		1.0-2.2 GHz	-	0.35	0.55	
		2.2-2.7 GHz	-	0.37	0.60	
Isolation	ISL	DC-1.0 GHz	30	35	-	dB
		1.0-2.2 GHz	28	33	-	
		2.2-2.7 GHz	20	25	-	
Return Loss	RL	DC-2.7 GHz	-	13.9	20.8	dB
Input $P_{0.1dB}$	$P_{0.1dB}$	0.8-2.7 GHz	-	34.5	-	dBm
2nd Harmonics	$2f_0$	Pin = 26dBm	-	-65	-55	dBc
3rd Harmonics	$3f_0$	Pin = 26dBm	-	-75	-	dBc
Turn-on switching time (50% of final VC to 10%/90& of final RF power)	t_{SW}	-	-	1.0	-	us

Notes:
1. Production screening tests are done at 1000MHz and 2000MHz.
2. This is just a linearity figure of merit. Refer to 'Recommended Operating Conditions' table for Pin levels

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DC Electrical Specifications

Parameter	Symbol	Minimum	Typical	Maximum	Unit
Supply Voltage	V_{DD}	1.6	2.8	3.3	V
Supply Current	I_{DD}	-	35	60	uA
Control Voltage	V_{CTL_H}	1.2	1.8	2.85	V
	V_{CTL_L}	-	-	0.4	V
Control Current	I_{CTL}	-	0.5	1.0	uA

Control Logic

Control Pin	RF1	RF2
0	ON	OFF
1	OFF	ON

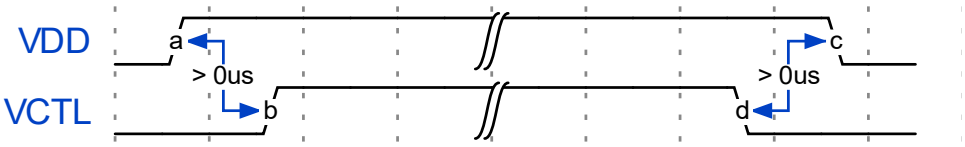
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Timing Requirements

It is important that the user adheres to the correct timing sequences in order to avoid leakage power consumption.

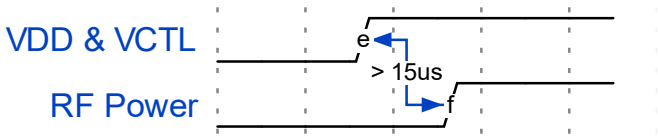
1. VDD and VCTL cannot be powered on and off independently from one another. During power-on sequence, the user must power up VDD first, then power up VCTL. During power-off sequence, the user must power off VCTL first, then power off VDD.

In the state of VDD=OFF (0 V) and VCTL=ON (1.8V), it may cause leakage power consumption as ESD protection circuit inside the switch.



a: VDD ON **b**: VCTL ON **c**: VDD OFF **d**: VCTL OFF

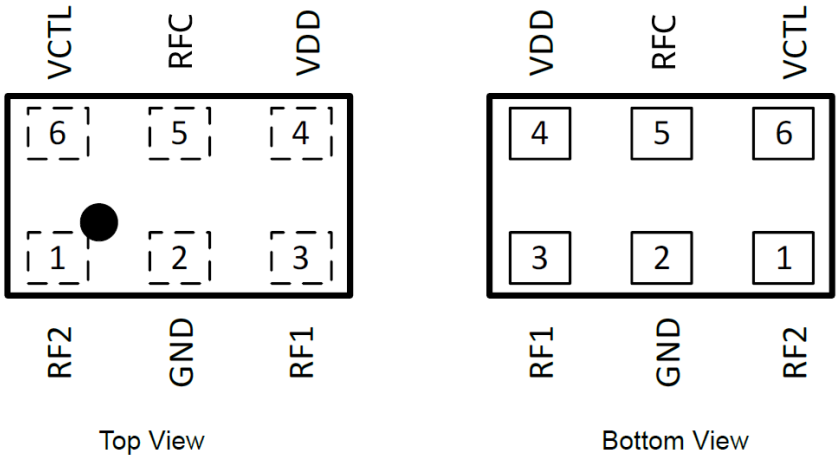
2. VDD and VCTL must be on for a minimum of 15 us before applying RF power



e: VDD and VCTL ON **f**: RF Power Up

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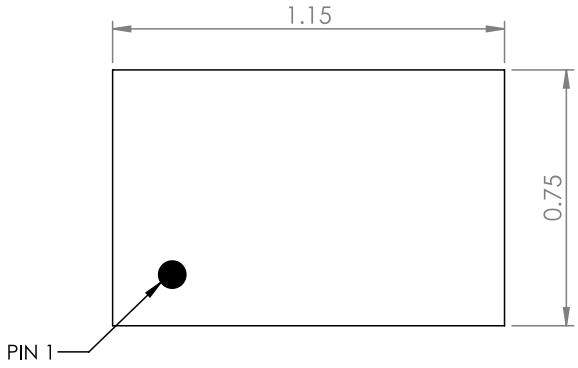
Pin Configuration



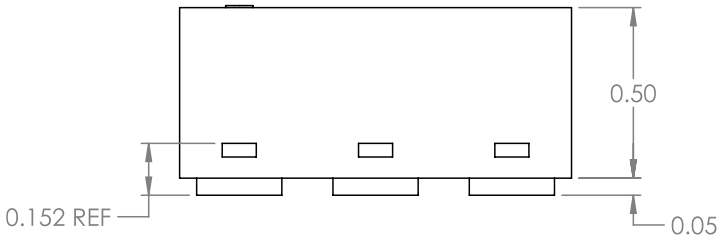
Pin	Name	Description
1	RF2	RF2 Port
2	GND	Ground
3	RF1	RF1 Port
4	VDD	DC Control Voltage
5	RFC	RF Common Port (Antenna Port)
6	VCTL	Switch Control

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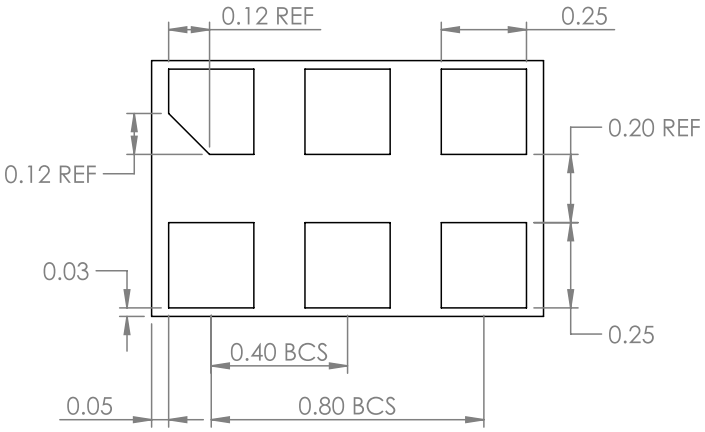
Product Dimensions



TOP VIEW



FRONT VIEW

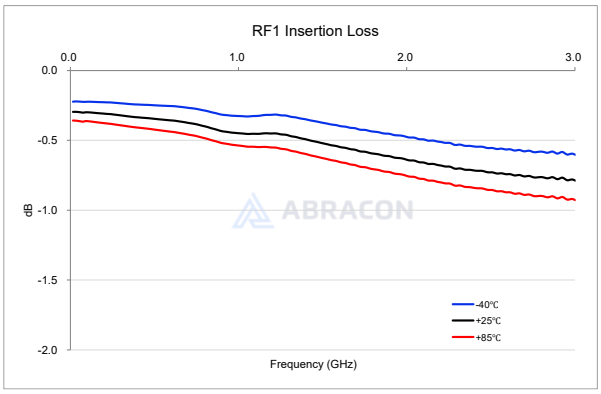


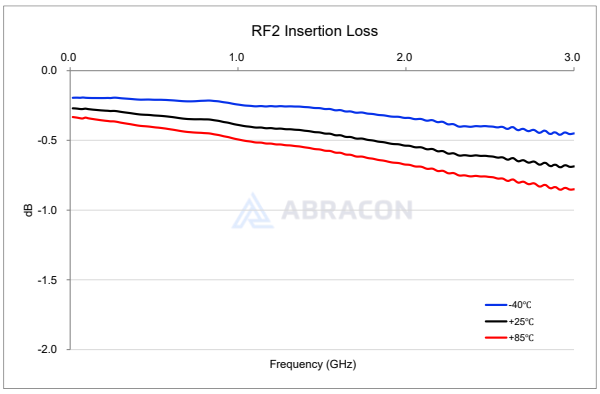
BOTTOM VIEW

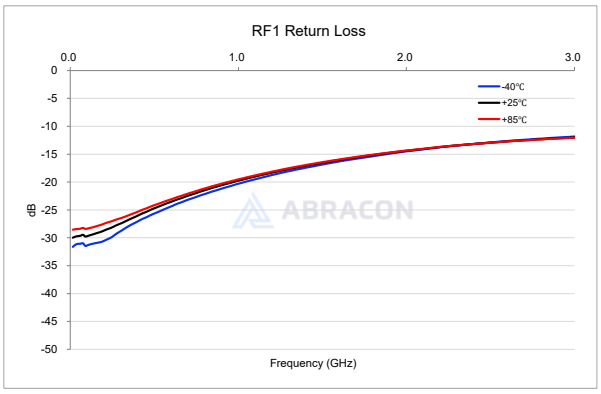
Unit: mm

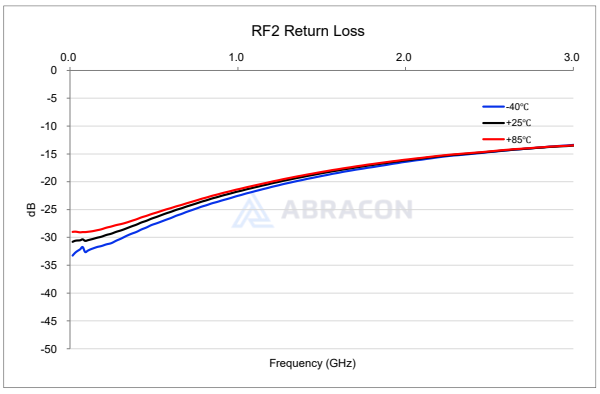
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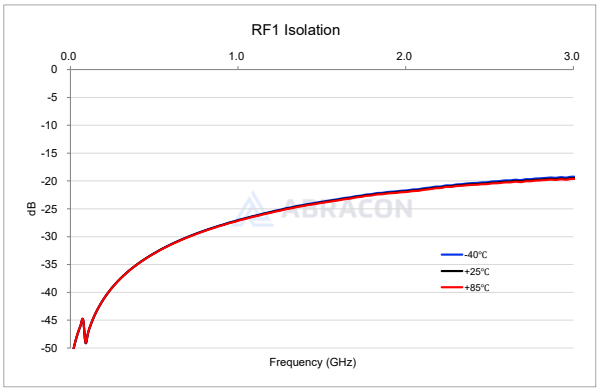
Performance Plots

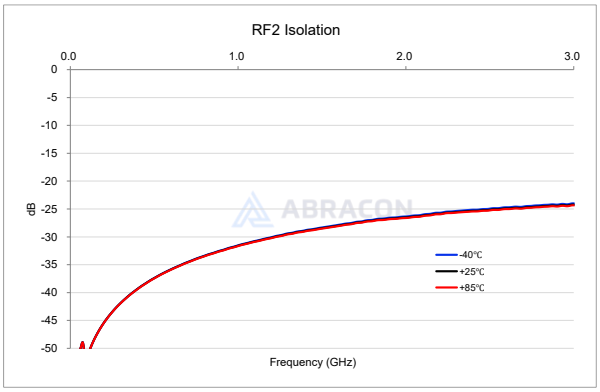






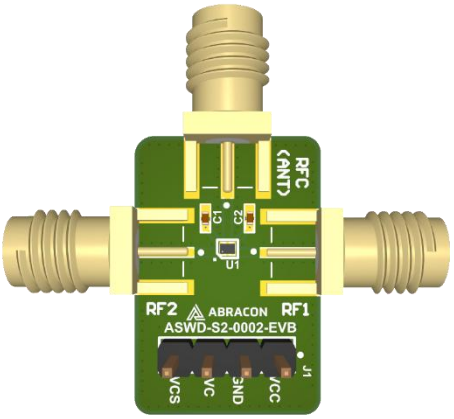




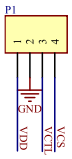


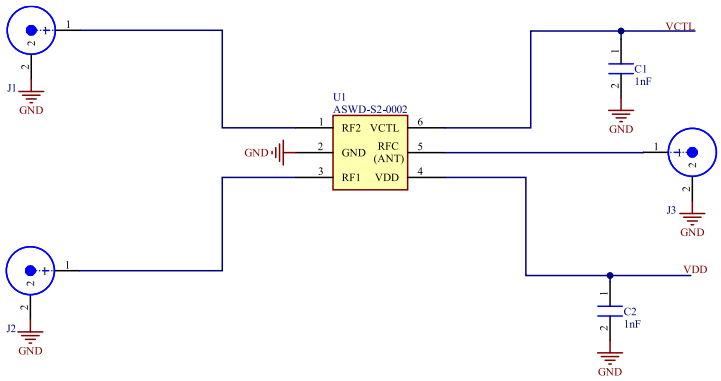
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Evaluation Board ASWD-S2-0002-EVB



EVB





Schematic

Bill of Material

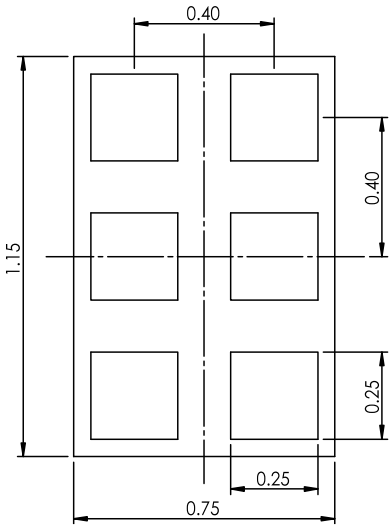
Component	Description	Manufacturer	Manufacturer Part	QTY
U1	DC~ 3.0GHZ SPDT RF & Antenna Switch with Enhanced ESD Protection	Abracon	ASWD-S2-0002	1
C1, C2	Capacitor (0402)	Murata	GRM022R60J102KE19	2

NOTES:

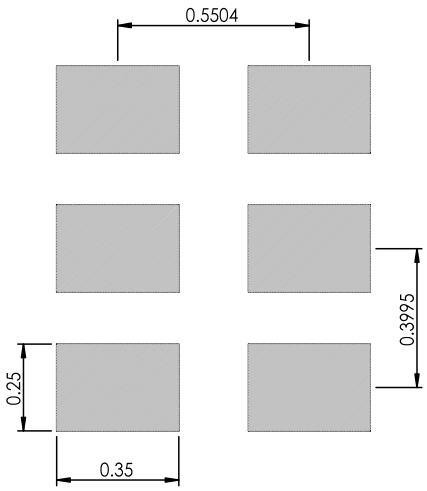
1. Input and output are 50-ohm lines.

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IC Footprint & PCB Land Pattern



Footprint



Land Pattern

Unit: mm

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Reflow Profile [JEDEC J-STD-020]

Solder paste: Sn/3.0Ag/0.5Cu

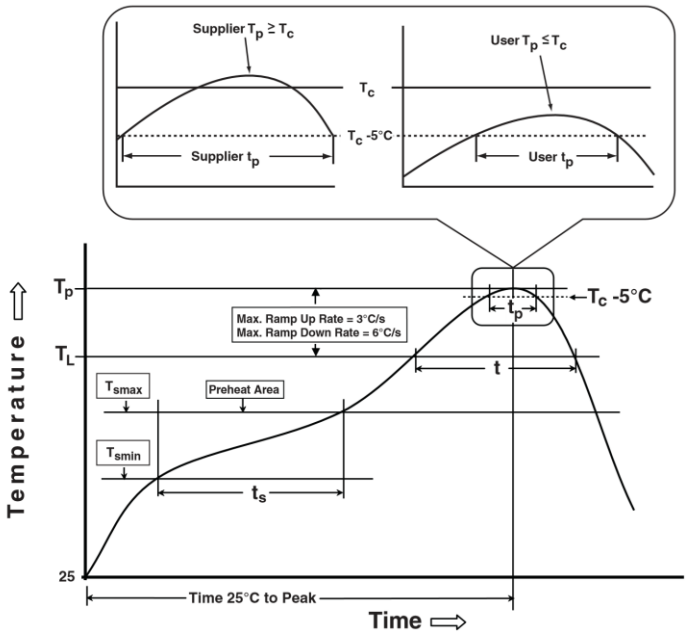


Table 1

SnPb Eutectic Process Classification Temperatures (T_c)		
Package Thickness	**Volume mm³ <350**	**Volume mm³ ≧350**
<2.5mm	235℃	220℃
≧2.5mm	220℃	220℃

Table 2

Pb-Free Process Classification Temperatures (T_c)			
Package Thickness	**Volume mm³ <350**	**Volume mm³ 350-2000**	**Volume mm³ >2000**
<1.6mm	260℃	260℃	260℃
1.6mm - 2.5mm	260℃	250℃	245℃
>2.5mm	250℃	245℃	245℃

Profile Feature	Sn-Pb Eutectic Assembly	Pb-Free Assembly
Preheat / soak		
Temperature minimum (T_{smin})	100℃	150℃
Temperature maximum (T_{smax})	150℃	200℃
Time (T_{smin} to T_{smax}) (t_s)	60 – 120 sec.	60 – 120 sec.
Average ramp-up rate (T_{smax} to T_p)	3℃/sec. max	3℃/sec. max
Liquidous temperature (T_L)	183℃	217℃
Time at Liquidous (T_L)	60 – 90 sec.	60 – 90 sec.
Peak package body temperature (T_p)*	**See Table 1**	**See Table 2**
Time (T_p)** within 5℃ of the specified classification temperature (T_c)	20 sec.	10 sec.
Ramp-down rate (T_p to T_{smax})	3℃/sec. max	3℃/sec. max
Time 25℃ to peak temperature	6 min. max	8 min. max
Reflow cycles	2 max	2 max

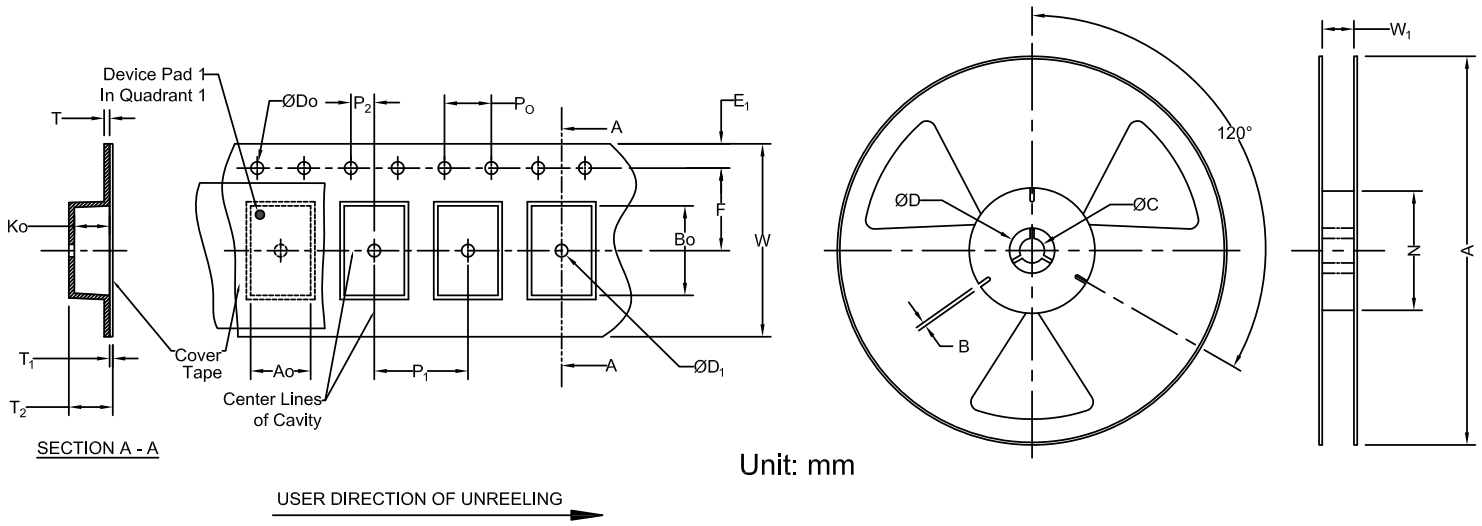
*Tolerance for peak profile temperature (T_p) is defined as a supplier minimum and a user maximum.
**Tolerance for time at peak profile temperature (t_p) is defined as a supplier minimum and a user maximum.

Packaging

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Packaging

Tape & Reel Dimension



Unit: mm

Carrier Tape Specifications (mm)										
E1	D0	P0	P2	F	P1	W	A0	B0	K_0	Reel Qty
1.75 ± 0.1	1.55 ± 0.05	4.0 ± 0.1	2.0 ± 0.05	3.5 ± 0.05	2.0 ± 0.05	8.0 + 0.2/-0.1	0.83 ± 0.05	1.25 ± 0.05	0.55 ± 0.05	5,000

Reel Specifications (mm)					
A	W_1	N	B	C	D
177.8	8.4 ± 1.5	53.6 ± 2.0	1.5	13.2 ± 0.3	20.2

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