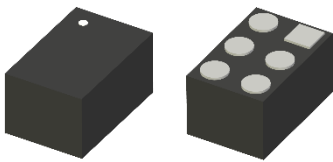


Description

The ASWD-S2-0001 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 $\pm 1\text{kV}$ HBM ESD protection and comes in a compact DFN package measuring 1.1mm x 0.7mm x 0.55mm, providing a space-efficient solution for high-performance RF designs. Additionally, the ASWD-S2-0001 is RoHS compliant and has a Moisture Sensitivity Level (MSL) of 3.



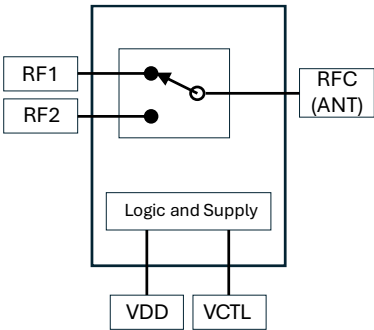
Key Features

- DFN-6L Package: 1.1 mm x 0.7 mm
- Frequency Range: DC to 8.0 GHz
- Low Insertion Loss 0.37 dB Typ. @f = 2.2 to 2.7 GHz
0.57 dB Typ. @f = 4.0 to 8.0 GHz
- High Isolation 25 dB Typ. @f = 2.2 to 2.7 GHz
14 dB Typ. @f = 4.0 to 8.0GHz
- $P_{0.1\text{dB}} = +34.5\text{ dBm}$ Typ. @f = 0.8 to 2.7 GHz
- Low Control Voltage $V_{\text{CTL,H}} = 1.8\text{V}$ Typ.
Voltage Operation $V_{\text{DD}} = 2.8\text{V}$ Typ.
- GPIO Control for SPDT
- $\pm 1\text{kV}$ 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-S2-0001	DC-8GHz SPDT RF & Antenna Switch with Enhanced ESD Protection on Cut Tape
ASWD-S2-0001-T	DC-8GHz SPDT RF & Antenna Switch with Enhanced ESD Protection on Tape & Reel
ASWD-S2-0001-EVB	DC-8GHz SPDT RF & Antenna Switch with Enhanced ESD Protection EVB

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	°C
Storage Temperature	T _{STG}	-55	-	150	°C
Moisture Sensitivity Level	-	MSL3			-
Electrostatic Discharge, HBM ¹	V _{ESD}	-	-	±1000	V
Electrostatic Discharge, CDM ²		-	-	±1000	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
V _{DD}	1.6	2.8	3.1	V
Pin (RFC – RFX), CW, 50 Ω			34.5	dBm
T _j at MTTF>105 hrs.	-	150	-	°C

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	-	0.35	0.50	dB
		1.0-2.2 GHz	-	0.35	0.55	
		2.2-2.7 GHz	-	0.37	0.60	
		2.7-4.0 GHz		0.57	0.75	
		4.0-8.0 GHz		0.57	0.75	
Isolation	ISL	DC-1.0 GHz	30	35	-	dB
		1.0-2.2 GHz	28	33	-	
		2.2-2.7 GHz	20	25	-	
		2.7-4.0 GHz	15	18		
		4.0-8.0 GHz	12	14		
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
2 nd Harmonics	2f ₀	Pin = 26dBm	-	-80	-	dBc
3 rd 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

DC Electrical Specifications

Parameter	Symbol	Minimum	Typical	Maximum	Unit
Supply Voltage	V_{DD}	1.6	2.8	3.1	V
Supply Current	I_{DD}	-	10	50	uA
Control Voltage	V_{CTL_H}	1.2	1.8	2.85	V
	V_{CTL_L}	-	-	0.4	V
Control Current	I_{CTL}	-	2.5	5	uA

Control Logic

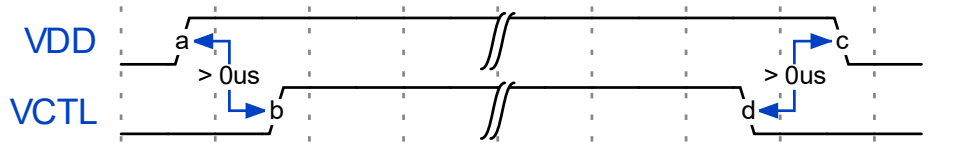
Control Pin	RF1	RF2
0	ON	OFF
1	OFF	ON

Timing Requirements

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

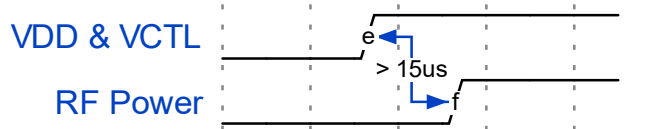
1. VDD and VCTL cannot be powered on and off independently from one another. During power-on sequence, the user must power up VDD first, then power up VCTL. During power-off sequence, the user must power off VCTL first, then power off VDD.

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.



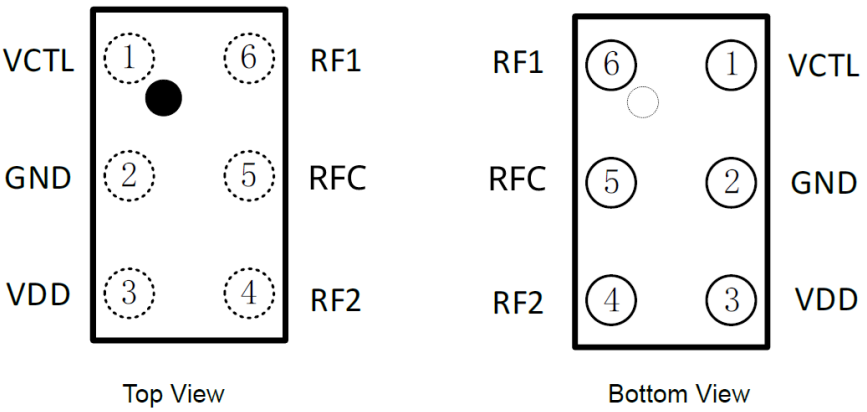
a: VDD ON b: VCTL ON c: VDD OFF d: VCTL OFF

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

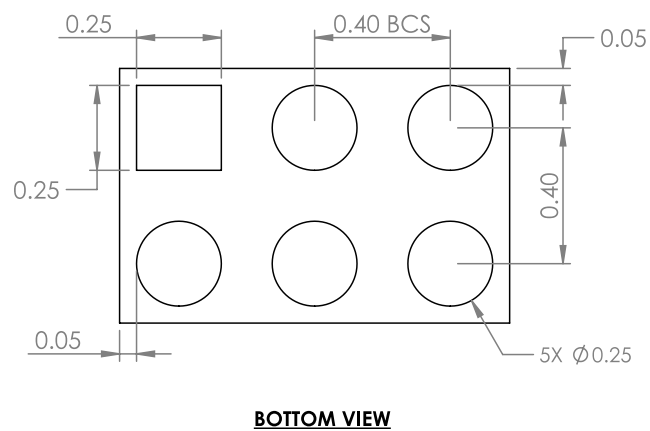
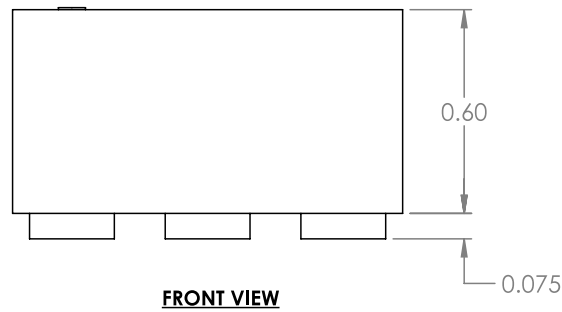
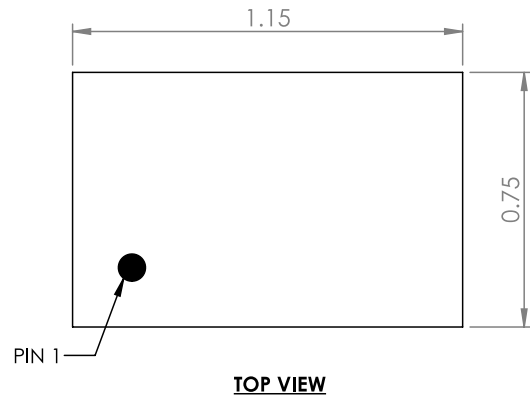


e: VDD and VCTL ON f: RF Power Up

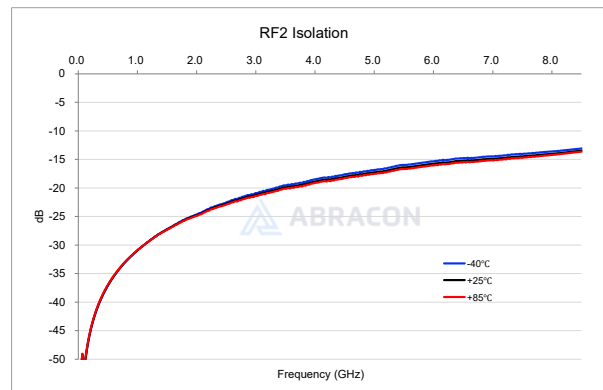
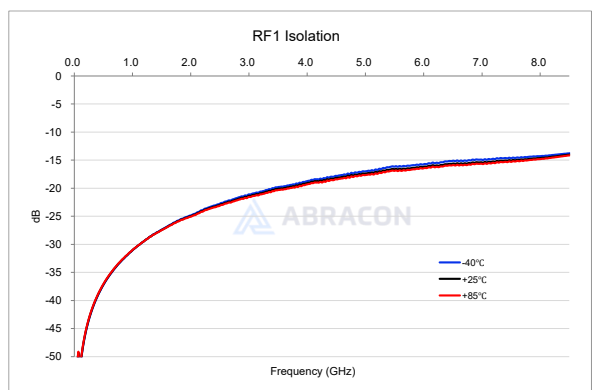
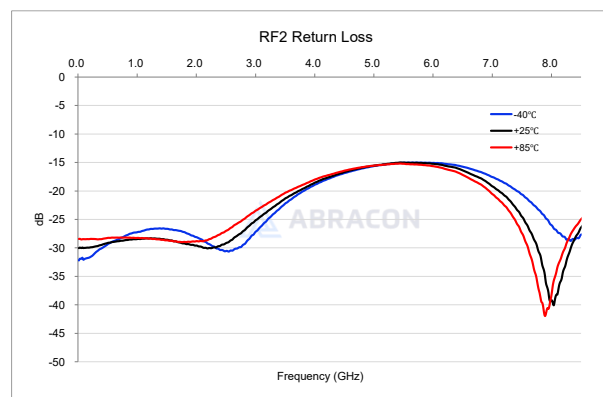
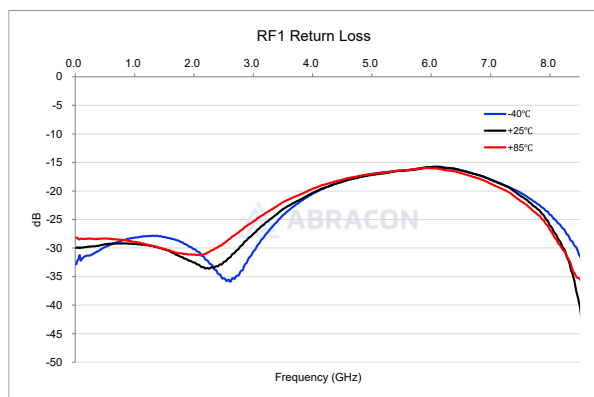
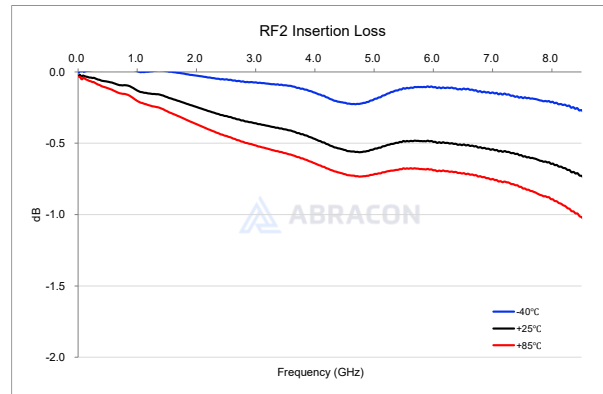
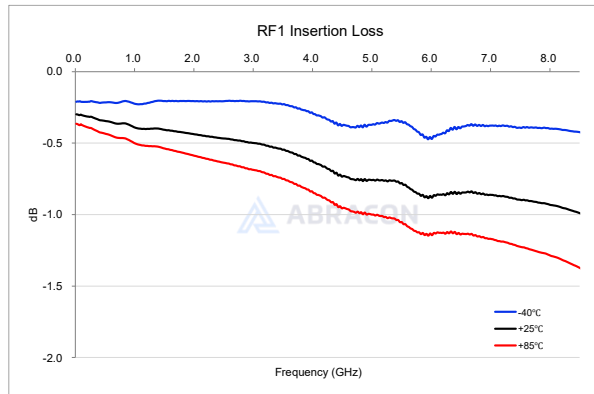
Pin Configuration



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

Product Dimensions*Unit: mm*

Performance Plots

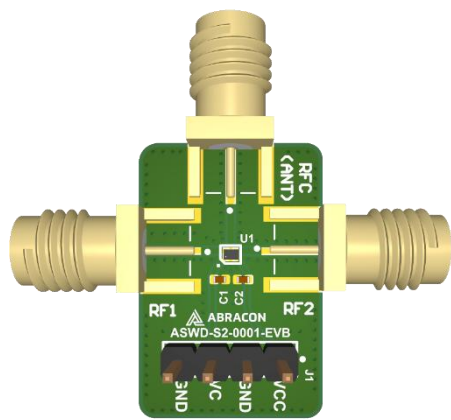


ASWD-S2-0001

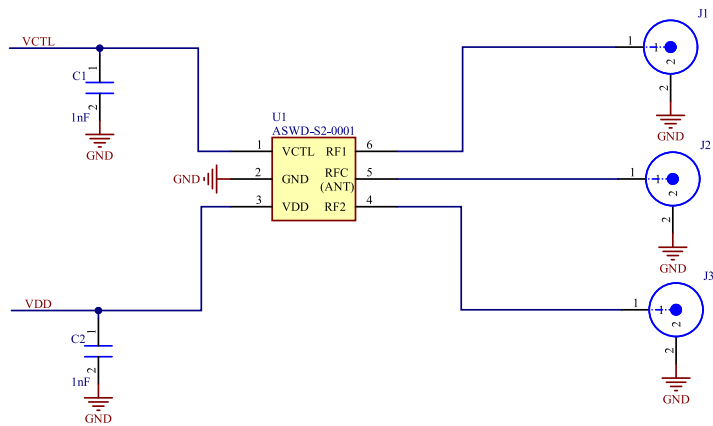
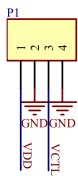
DC-8GHz SPDT RF & Antenna Switch with Enhanced ESD Protection



Evaluation Board ASWD-S2-0001-EVB



EVB



Schematic

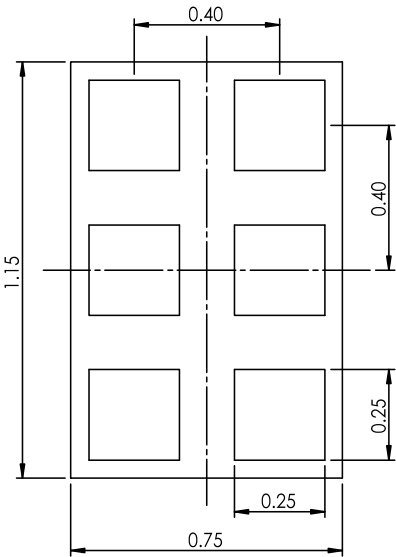
Bill of Material

Component	Description	Manufacturer	Manufacturer Part	QTY
U1	DC-8GHz SPDT RF & Antenna Switch with Enhanced ESD Protection	Abrakon	ASWD-S2-0001	1
C1, C2	Capacitor (0402)	Murata	GRM022R60J102KE19	2

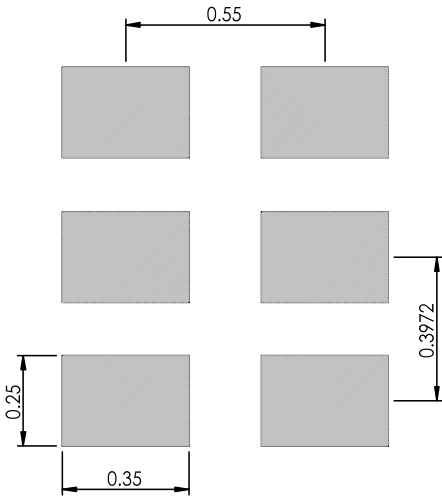
NOTES:

1. Input and output are 50-ohm lines.

IC Footprint & PCB Land Pattern



Footprint



Land Pattern

Unit: mm

Reflow Profile [JEDEC J-STD-020]

Solder paste: Sn/3.0Ag/0.5Cu

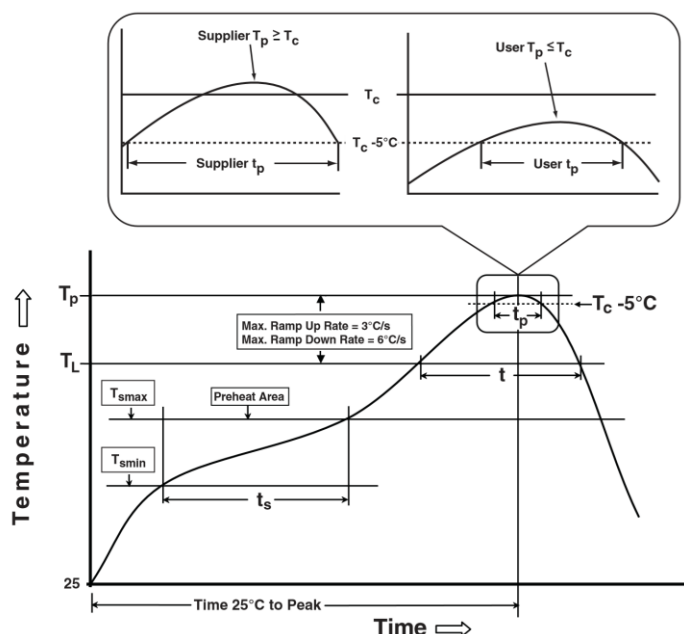


Table 1

SnPb Eutectic Process

Classification Temperatures (T_c)

Package Thickness	Volume mm^3 <350	Volume mm^3 ≥ 350
<2.5mm	235°C	220°C
$\geq 2.5\text{mm}$	220°C	220°C

Table 2

Pb-Free Process

Classification Temperatures (T_c)

Package Thickness	Volume mm^3 <350	Volume mm^3 350-2000	Volume mm^3 >2000
<1.6mm	260°C	260°C	260°C
1.6mm - 2.5mm	260°C	250°C	245°C
>2.5mm	250°C	245°C	245°C

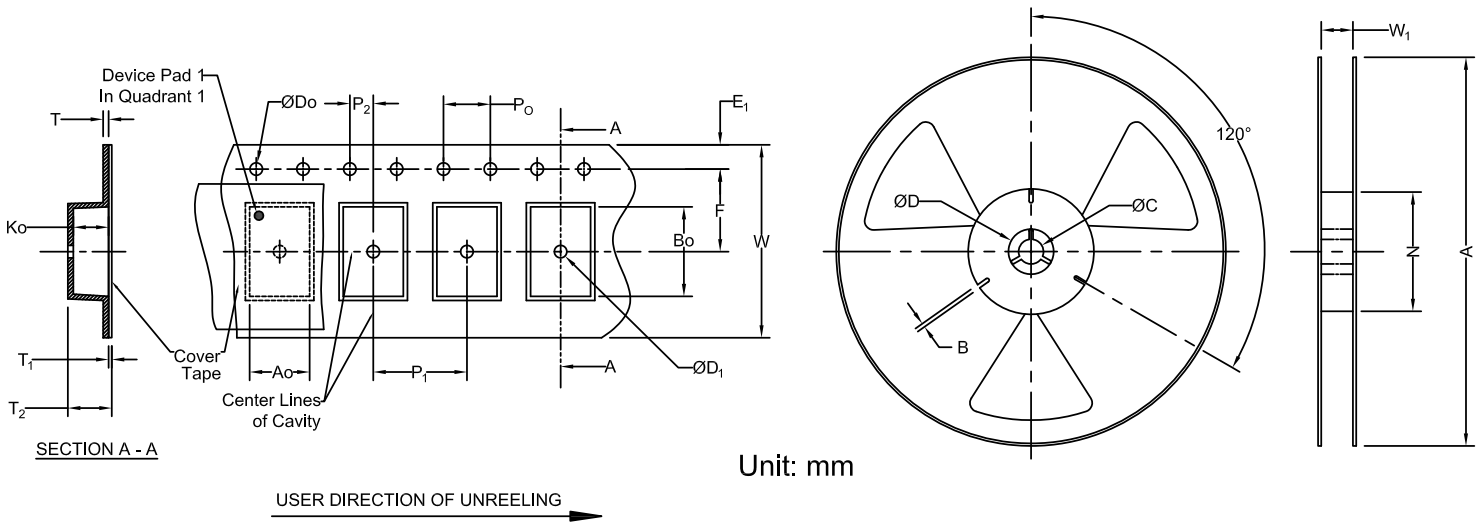
Profile Feature	Sn-Pb Eutectic Assembly	Pb-Free Assembly
Preheat / soak		
Temperature minimum (T_{smin})	100°C	150°C
Temperature maximum (T_{smx})	150°C	200°C
Time (T_{smin} to T_{smx}) (t_s)	60 – 120 sec.	60 – 120 sec.
Average ramp-up rate (T_{smin} to T_p)	3°C/sec. max	3°C/sec. max
Liquidous temperature (T_L)	183°C	217°C
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°C of the specified classification temperature (T_c)	20 sec.	10 sec.
Ramp-down rate (T_p to T_{smx})	3°C/sec. max	3°C/sec. max
Time 25°C 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

Tape & Reel Dimension



Carrier Tape Specifications (mm)										
E1	D0	P0	P2	F	P1	W	A0	B0	K0	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	W1	N	B	C	D
177.8	8.4 ± 1.5	53.6 ± 2.0	1.5	13.2 ± 0.3	20.2