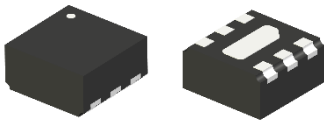


Description

This AEC-Q100 Grade 1 certified SPDT RF switch is engineered for next-generation automotive connectivity, operating from -40 to +125°C. It delivers exceptional performance from 0.3 to 8.5 GHz, featuring ultra-low insertion loss (0.35 dB at 2.5 GHz) and high isolation. With a high +31 dBm power handling and a compact 1.6 x 1.6mm wettable flank package, it ensures reliability in automated manufacturing. Ideal for TCUs, C-V2X, GNSS, UWB, and Wi-Fi 6/6E systems, it provides critical antenna diversity, signal redundancy, and T/R switching for robust, high-speed vehicular communication networks.



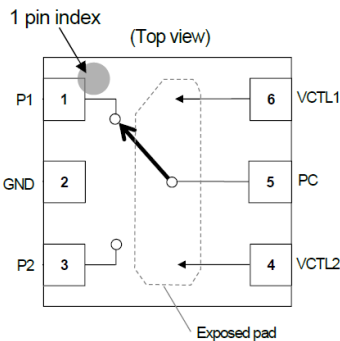
Key Features

- AEC-Q100 Grade 1
- Control Voltage $V_{CTL(H)}$ =3.0 V typ.
- Low Insertion Loss
 - 0.35 dB Typ. @f = 0.3 to 2.5 GHz
 - 0.45 dB Typ. @f = 4.9 to 5.9 GHz
 - 0.60 dB Typ. @f = 8.5 GHz
- High Isolation
 - 28 dB Typ. @f = 0.3 to 2.5 GHz
 - 27 dB Typ. @f = 4.9 to 5.9 GHz
 - 18 dB Typ. @f = 8.5 GHz
- P_{-1dB} = +31dBm Typ. @f = 0.3 GHz, 2.5 GHz, 5.9 GHz
- Wide Operating Temperature -40 to +125°C
- Weight 5. 4mg. Package with Wettable Flank ESON6-GC (Package Size: 1.6 x 1.6 x 0.78 mm Typ.)
- [RoHS Compliant](#) | [HALOGEN-FREE](#) | [MSL Level 1](#)

Typical Applications

- 802.11 a/b/g/n/ac/ax and BT Networks Applications
- Telematics Control Units (TCUs)
- C-V2X (Cellular Vehicle-to-Everything)
- GPS/GNSS Receivers
- SDARS (Satellite Digital Audio Radio Services)
- UWB (ultra-wide band) Applications
- RKE Applications
- Antenna Diversity Switching
- Signal Path Selection/Redundancy
- Band Selection in Multi-Band Antenna Systems
- Transmit/Receive (T/R) Switching for Lower-power Transceivers

Functional Block Diagram



Ordering Information

Part No.	Description
ASWD-S2-0009-Q	AUTOMOTIVE 0.3 ~ 8.5 GHz GaAs SPDT RF Switch on Cut Tape
ASWD-S2-0009-Q-T	AUTOMOTIVE 0.3 ~ 8.5 GHz GaAs SPDT RF Switch on Tape & Reel
ASWD-S2-0009-Q-EVB	AUTOMOTIVE 0.3 ~ 8.5 GHz GaAs SPDT RF Switch EVB

Absolute Maximum Ratings

Parameter	Symbol	Absolute Maximum			Unit
Control Voltage	V _{CTL}	-	-	6.0	V
Max Input Power ⁽¹⁾	P _{IN,MAX}	-	-	+31	dBm
Power Dissipation ⁽²⁾	P _D	-	-	1100	mW
Operating Temperature	T _{OP}	-40	-	125	°C
Storage Temperature	T _{STG}	-55	-	150	°C

General conditions: Ta = +25°C, Z_s = Z_L = 50 ohm

(1): V_{CTL(L)} = 0 V, V_{CTL(H)} = 3.0 V, on state port

(2): 4-layer FR4 PCB with through-hole (101.5 x 114.5 mm), T_J = 150°C.

Recommended Operating Conditions

Parameter	Min.	Typ.	Max.	Unit
V _{CTL,H}	1.8	3.0	5.0	V
V _{CTL,L}	-0.2	-	0.2	V

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

RF Electrical Specifications

Parameters		Frequency	Values			Unit
			Minimum	Typical	Maximum	
Insertion Loss1	LOSS1	0.3-2.5 GHz	-	0.35	0.55	dB
Insertion Loss2	LOSS2	4.9-5.9 GHz	-	0.45	0.70	
Insertion Loss3	LOSS3	8.5 GHz	-	0.60	0.80	
Isolation1	ISL1	0.3-2.5 GHz	25	28	-	dB
Isolation2	ISL2	4.9-5.9 GHz	24	27	-	
Isolation3	ISL3	8.5 GHz	16	18	-	
Return Loss1	RL1	0.3-2.5 GHz	18	28	-	dB
Return Loss2	RL2	4.9-5.9 GHz	10	15	-	
Return Loss3	RL3	8.5 GHz	10	14	-	
Input P _{-1dB} compression point1	P _{-1dB1}	0.3-2.5 GHz	+29	+31	-	dBm
Input P _{-1dB} compression point2	P _{-1dB2}	4.9-5.9 GHz	+28	+31	-	dBm
Input P _{-1dB} compression point3	P _{-1dB3}	8.5 GHz	+11	-	-	dBm
Switching time	T _{SW}	50% CTL to 10%/90% RF	-	100	300	ns

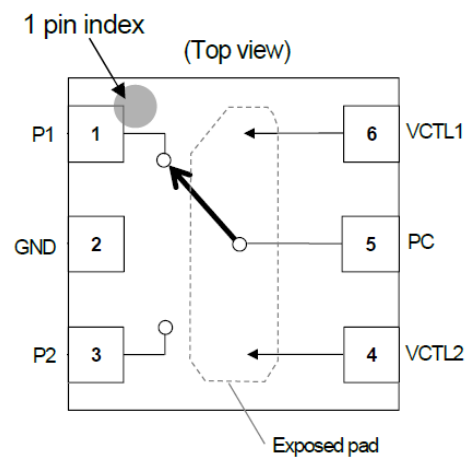
DC Electrical Specifications

Parameter	Symbol	Min.	Typ.	Max.	Unit
Control Voltage (High)	$V_{CTL(H)}$	1.8	3.0	5.0	V
Control Voltage (Low)	$V_{CTL(L)}$	-0.2	-	0.2	V
Control Current	I_{CTL}	-	5	10	uA

Control Logic

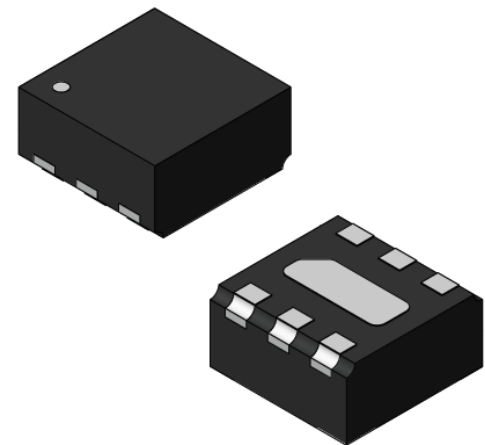
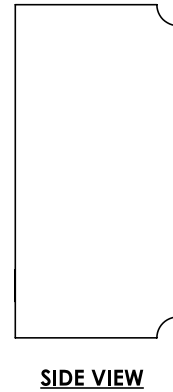
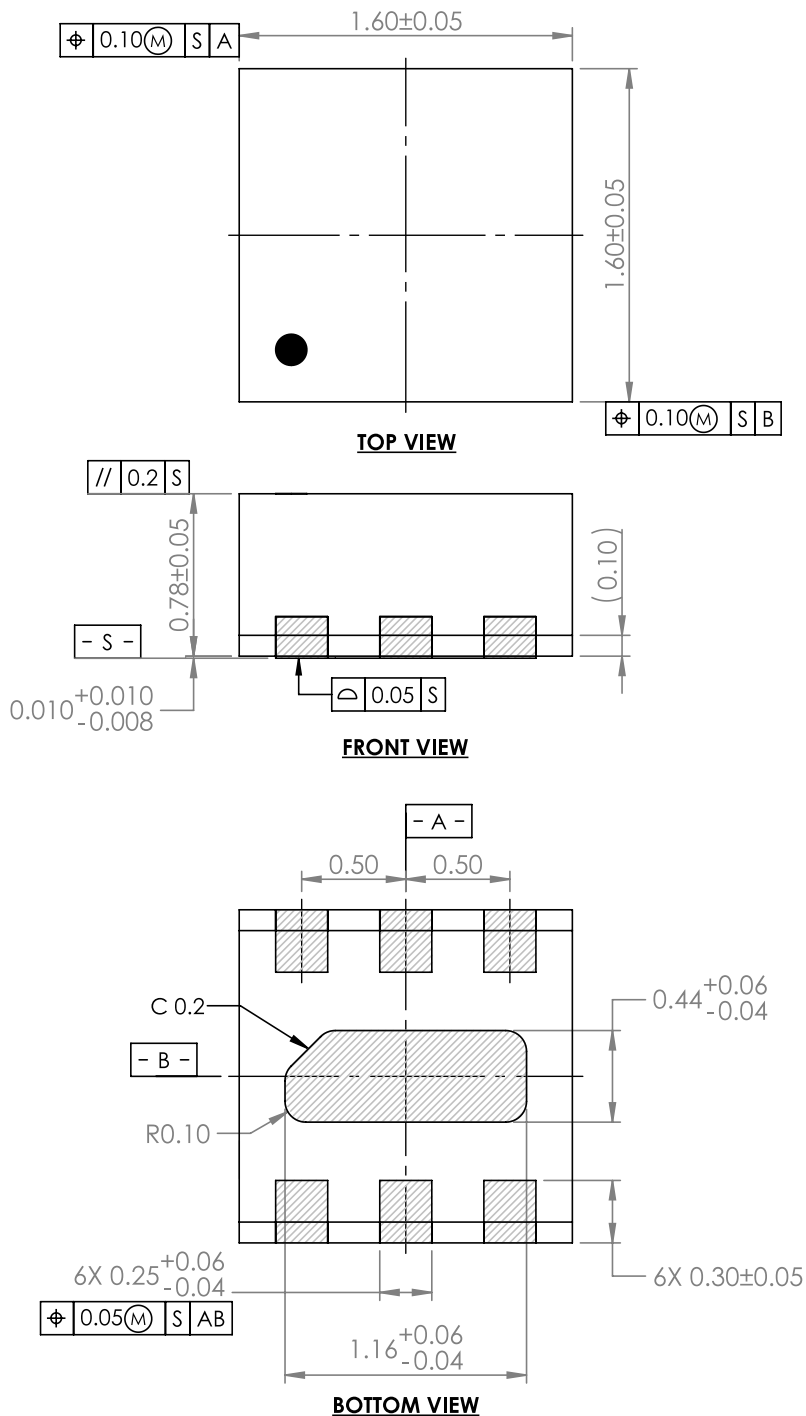
On Path	PC-P1	PC-P2
VCTL1	L	H
VCTL2	H	L

Pin Configuration



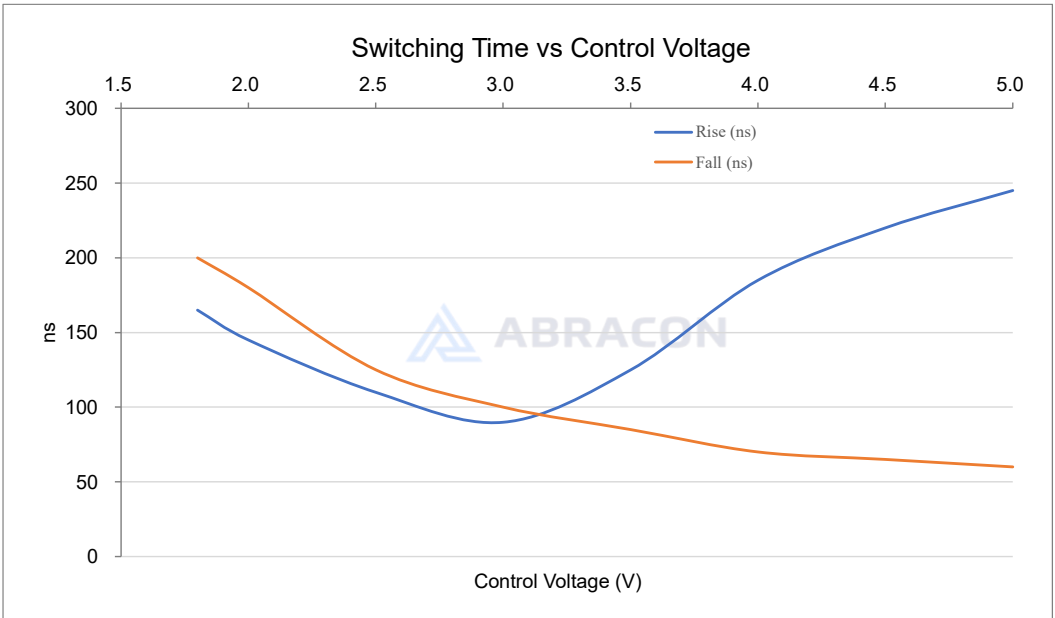
Pin	Name	Description
1	P1	RF input/output
2	GND	Ground terminal
3	P2	RF input/output
4	VCTL2	Control signal input terminal
5	PC	RF input/output
6	VCTL1	Control signal input terminal
Exposed pad	GND	Ground terminal

Product Dimensions



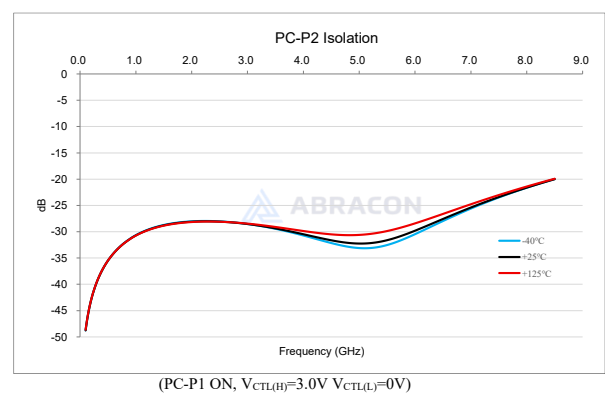
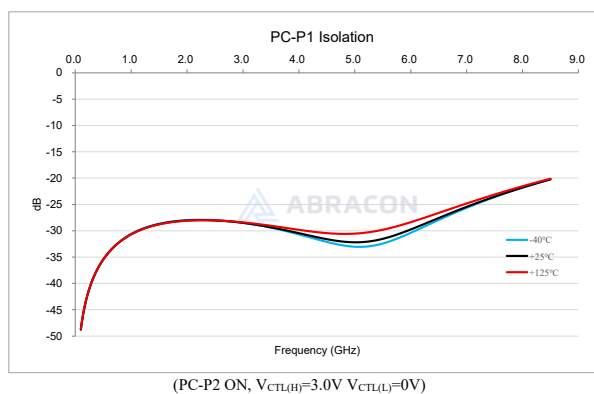
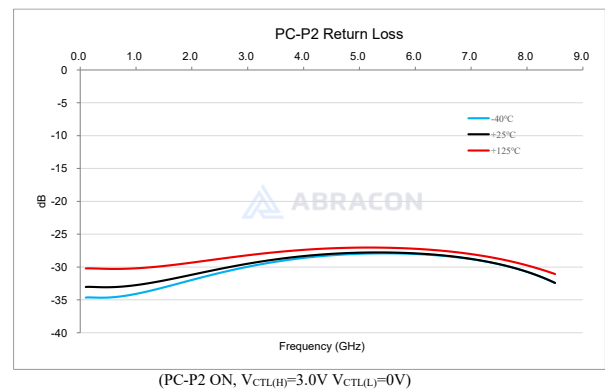
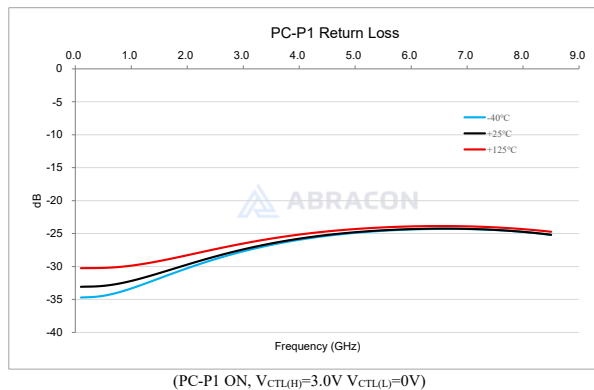
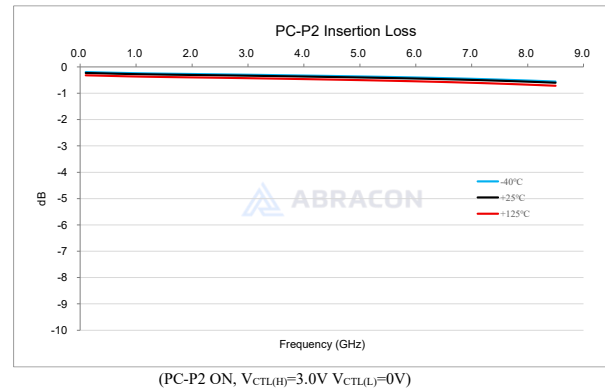
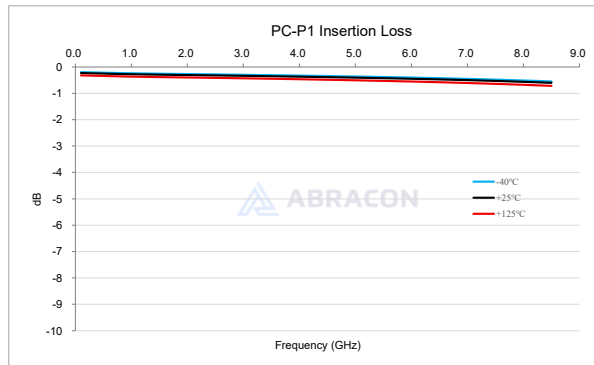
Unit: mm

Timing Requirements

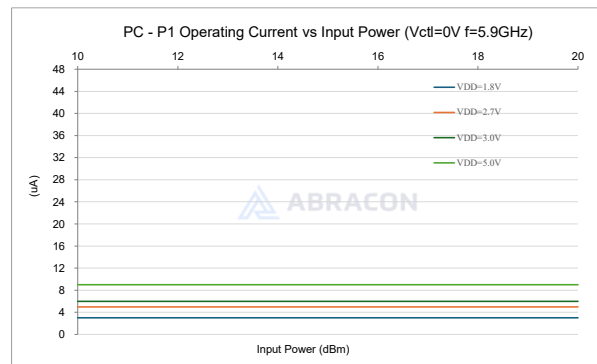
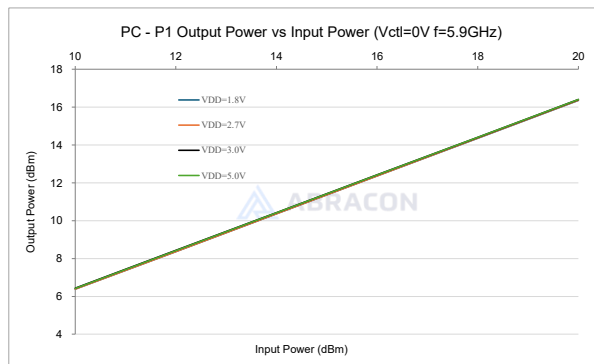
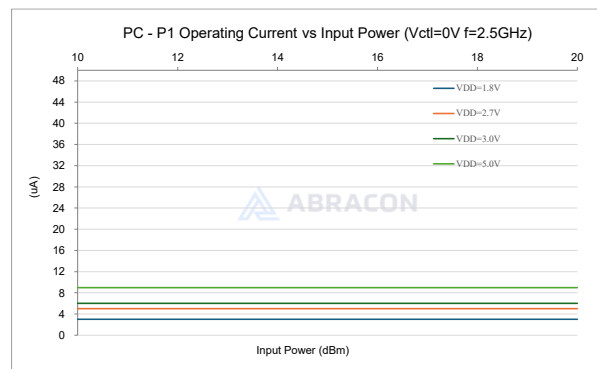
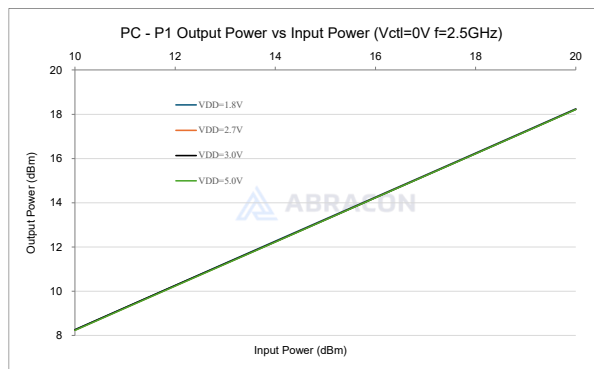
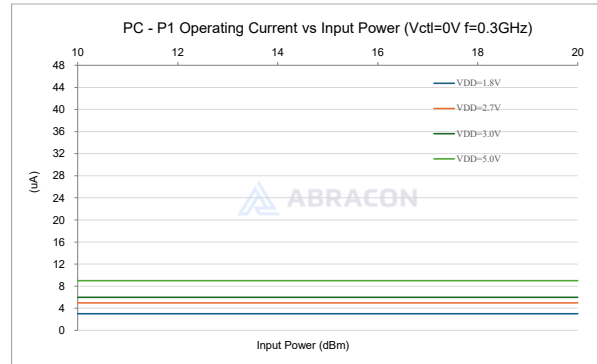
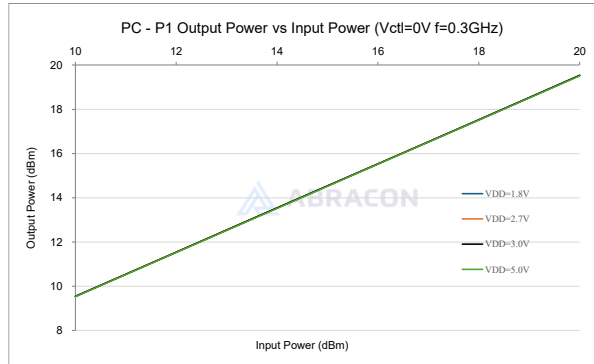


(PC-P1 path, Input: PC Port, Monito : P1 port, $V_{CTL(L)} = 0V$)

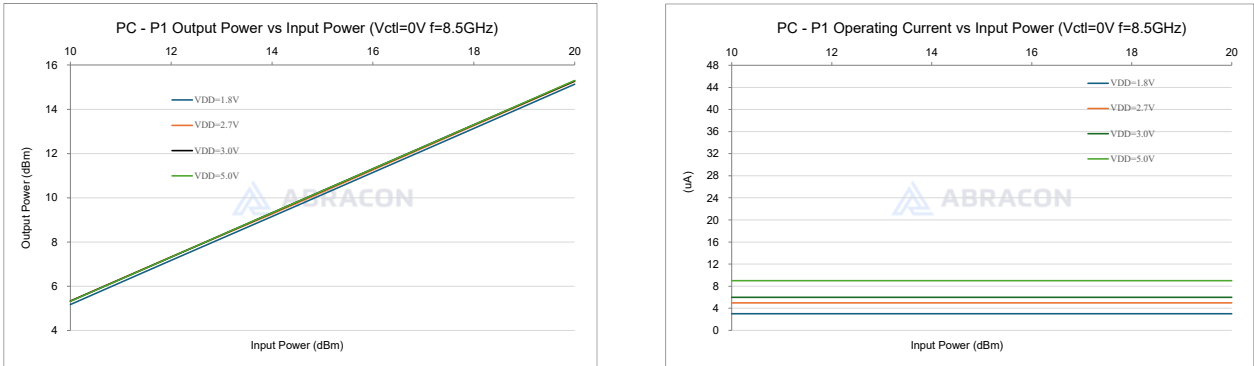
Performance Plots



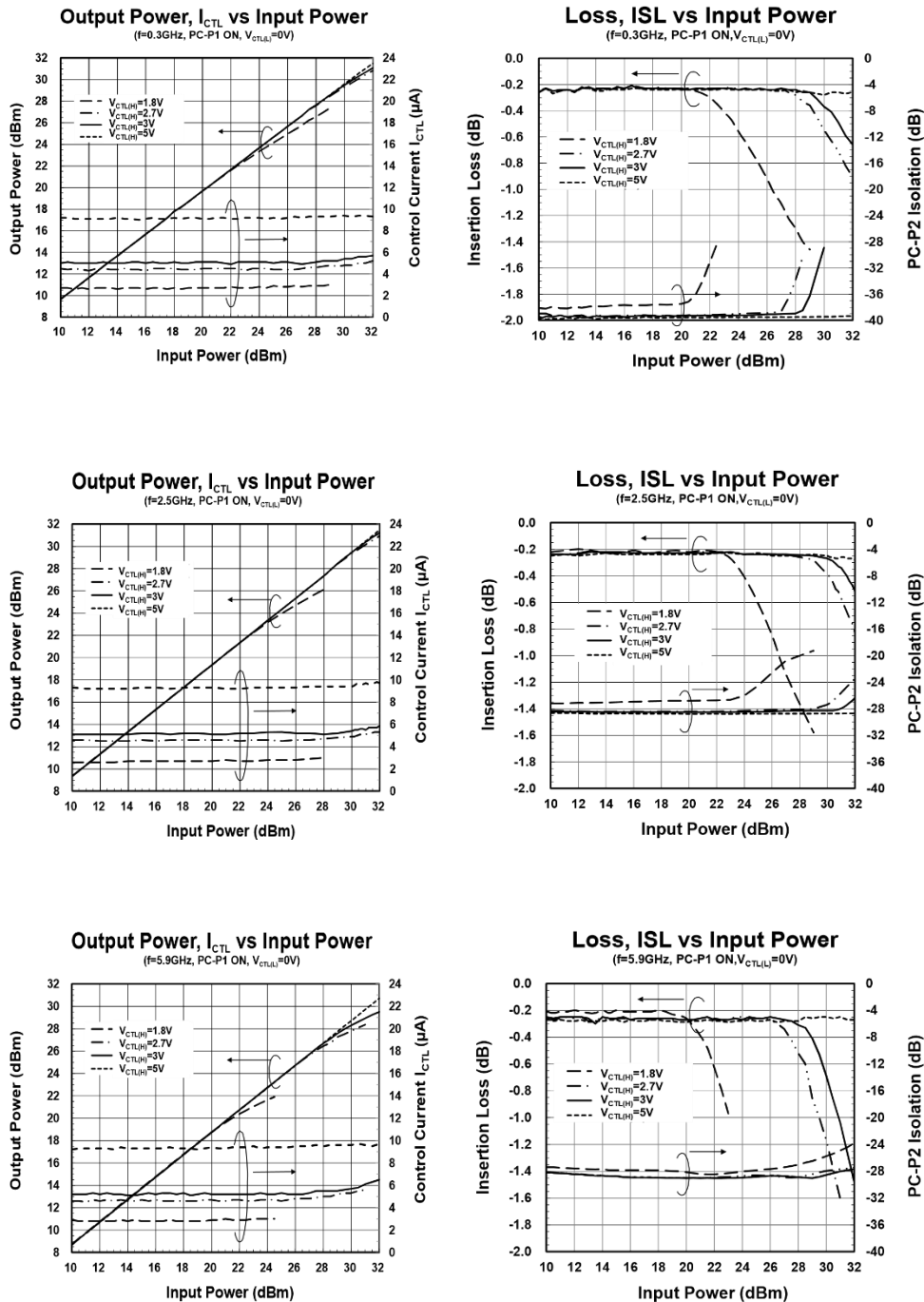
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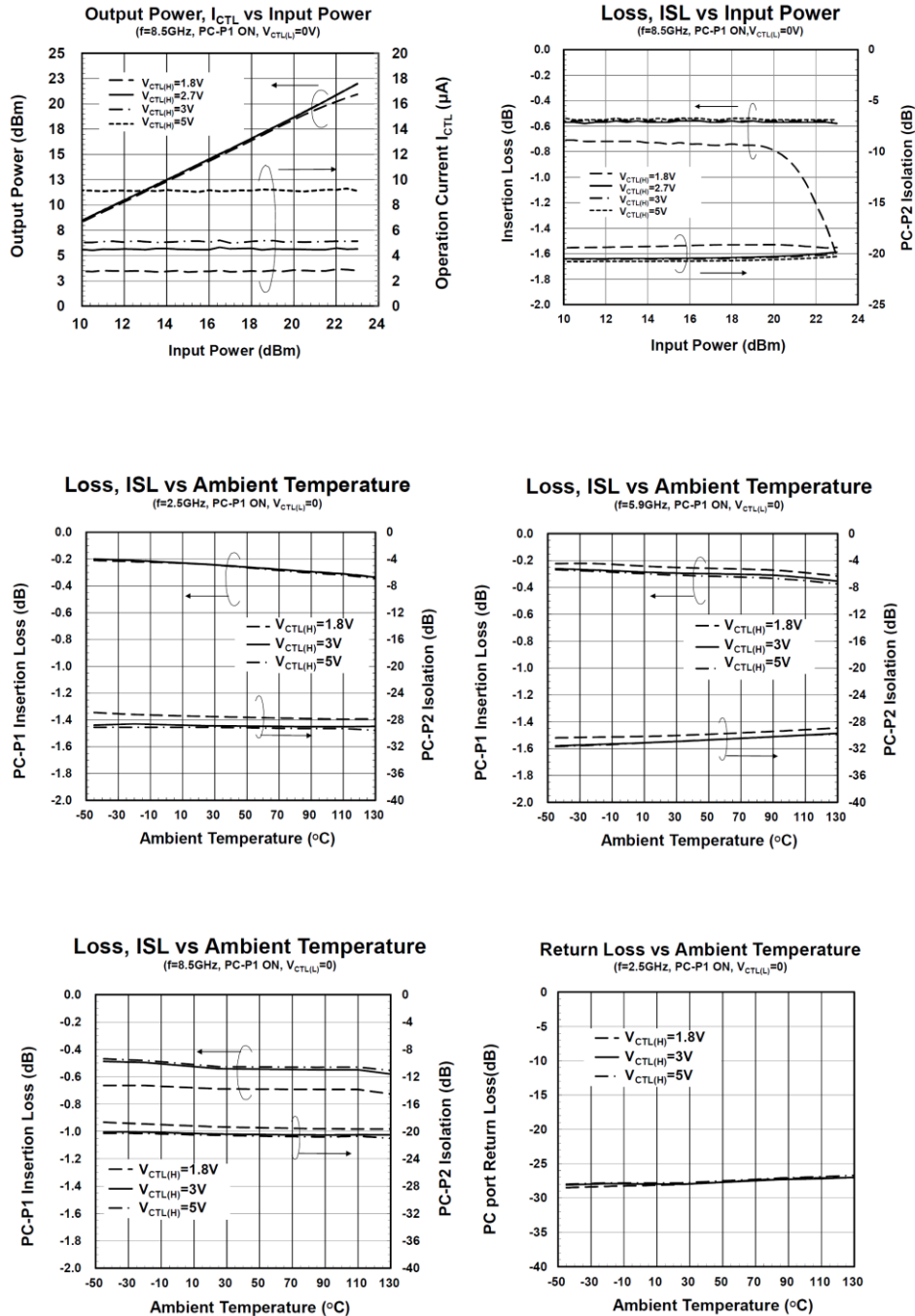
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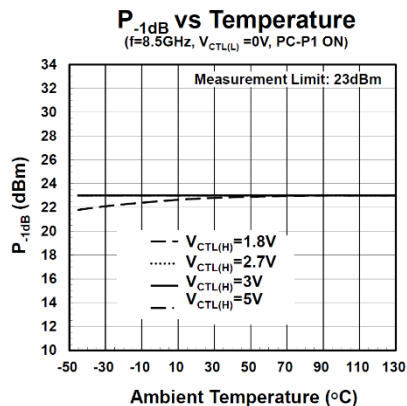
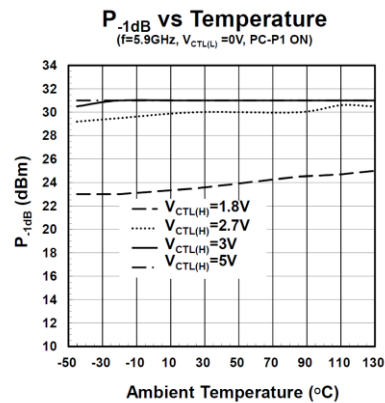
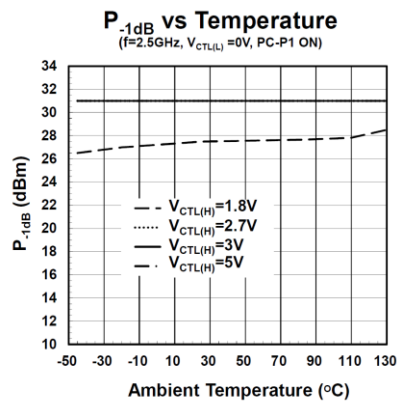
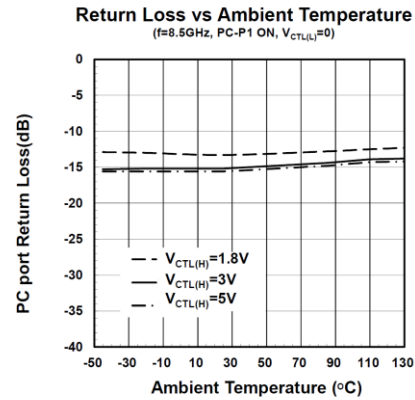
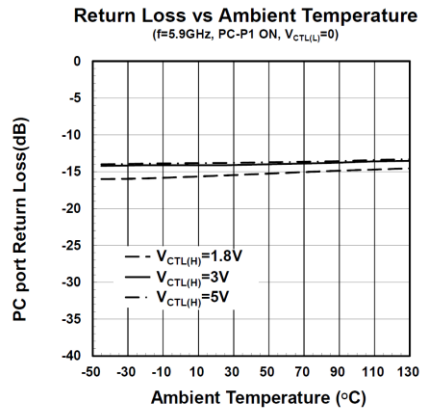
Performance Plots



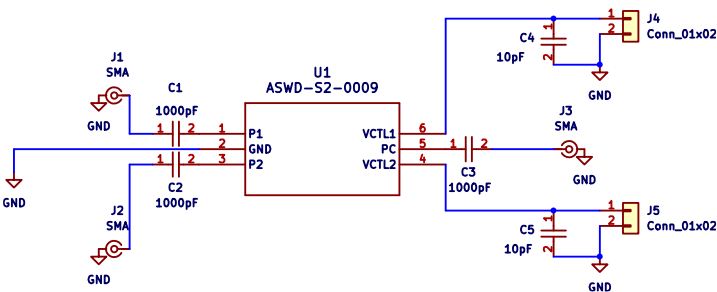
Performance Plots



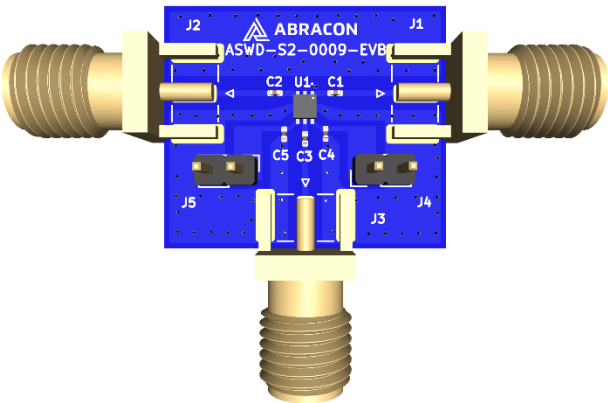
Performance Plots



Schematic



Evaluation Board ASWD-S2-0009-Q -EVB



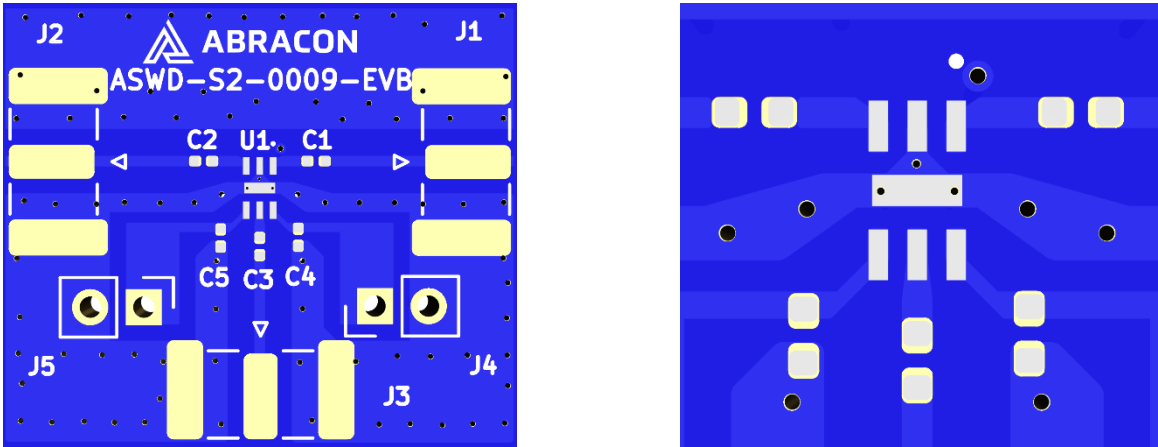
Bill of Material

Component	Description	Manufacturer	Manufacturer Part	QTY
U1	SPDT RF Switch	Abracon	ASWD-S2-0009-Q	1
C1 to C3	1000pF Capacitor (0201 / 0603 Metric)	Murata MFG	GRM0335C1E102GA01D	3
C4 to C5	10pF Capacitor (0201 / 0603 Metric)	Murata MFG	GRM0335C1E100GA01D	2

NOTES:

1. Input and output are 50-ohm lines.

Layout Guide

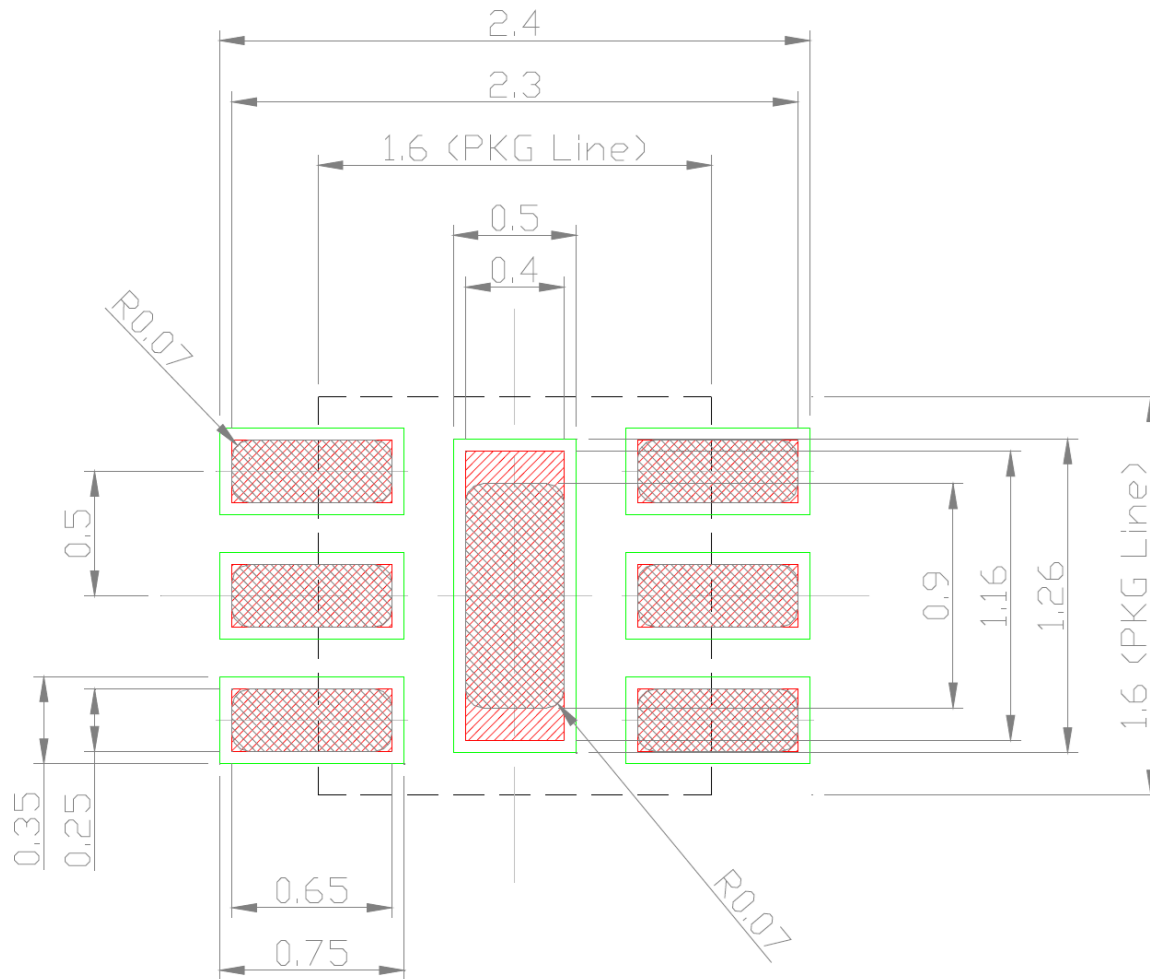


PCB: FR-4, t=0.2mm
Capacitor Size: 0201 (0603 Metric) (0.6 x 0.3 mm)
Strip Line Width: 0.4 mm
PCB Size: 19.7 x 16.9 mm
Through Hole Diameter: 0.2 mm

Losses of PCB and connectors	
Freq (GHz)	Loss (dB)
0.3	0.14
2.4	0.38
2.5	0.39
4.9	0.59
5.9	0.73
8.5	0.91

- PRECAUTIONS
- [1] The DC blocking capacitors (C1, C2, C3) should be placed at RF terminals. Please choose appropriate capacitance value at the application frequency.
- [2] For avoiding the degradation of RF performance, the bypass capacitors (C4, C5) should be placed as close as possible to VCTL terminals.
- [3] For good RF performance, GND terminal must be connected to PCB ground plane of substrate, and through -holes should be placed near the IC.

Footprint Land Pattern



Unit: mm

Package: 1.6 mm x 1.6 mm
Pin pitch: 0.5 mm

 : Land
 :Mask (Open area) *Metal mask thickness : 100 μ m
 :Resist(Open area)

Reflow Profile [JEDEC J-STD-020]

Solder paste: Sn/3.0Ag/0.5Cu

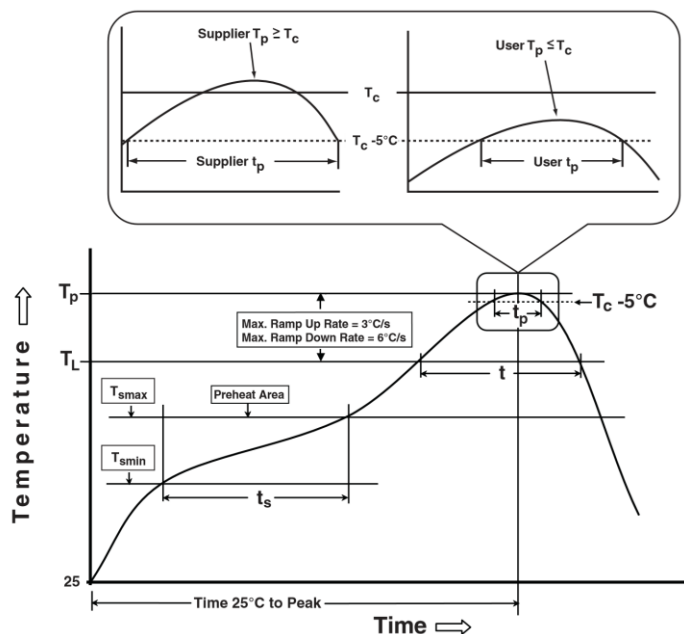


Table 1

SnPb Eutectic Process
Classification Temperatures (T_c)

Package Thickness	Volume mm ³ <350	Volume mm ³ ≥350
<2.5mm	235°C	220°C
≥2.5mm	220°C	220°C

Table 2

Pb-Free Process
Classification Temperatures (T_c)

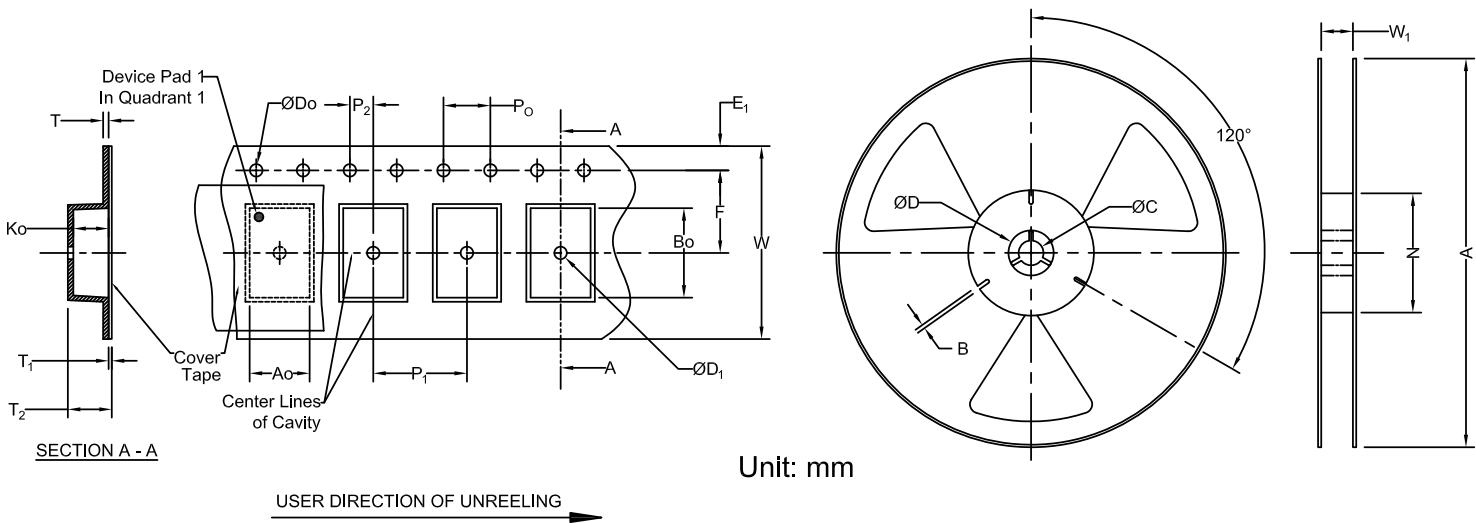
Package Thickness	Volume mm ³ <350	Volume mm ³ 350-2000	Volume mm ³ >2000
<1.6mm	260°C	260°C	260°C
1.6mm - 2.5mm	260°C	250°C	245°C
>2.5mm	250°C	245°C	245°C

Profile Feature	Sn-Pb Eutectic Assembly	Pb-Free Assembly
Preheat / soak		
Temperature minimum (T_{smin})	100°C	150°C
Temperature maximum (T_{smax})	150°C	200°C
Time (T_{smin} to T_{smax}) (t_s)	60 – 120 sec.	60 – 120 sec.
Average ramp-up rate (T_{smax} 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_{smax})	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	D1	P0	P1	P2	F	W	A0	B0	K0	Reel Qty
1.75 ± 0.1	1.5 + 0.1/-0	0.5 + 0.1/-0	4.0 ± 0.1	4.0 ± 0.1	2.0 ± 0.05	3.5 ± 0.05	8.0 + 0.3/-0.1	1.8 ± 0.05	1.8 ± 0.05	0.93 ± 0.05	3,000

Reel Specifications (mm)					
A	W1	N	C	D	B
180 +0/-1.5	9 +0.3/-0	60 +1/-0	13 ± 0.2	21 ± 0.8	2 ± 0.5