

# ESD9L5.0

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# ESD9L5.0

## Surface Mount Uni-Directional TVS For ESD Protection Diode with Ultra Low Capacitance- 5.0V

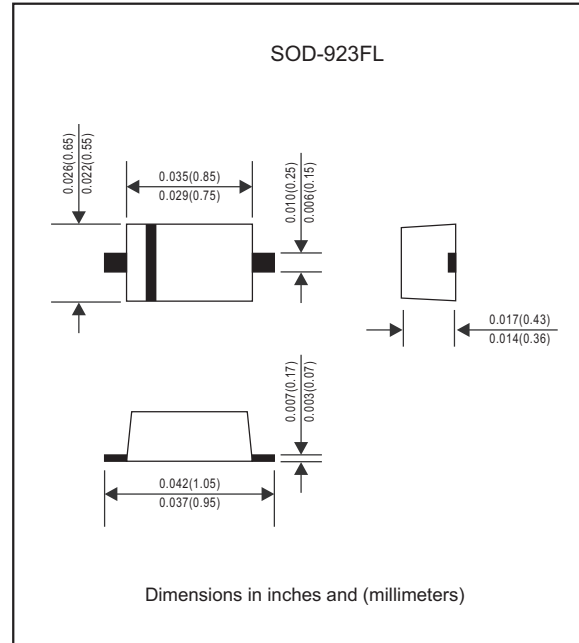
### Features

- Ultra low capacitance 0.5 pF (typ.)
- Low clamping voltage
- Stand-off voltage: 5 V
- Low leakage
- Response time is typically <1.0 ns
- Provide transient protection:  
IEC 61000-4-2 (ESD) level 4  
IEC 61000-4-4 (EFT) 80A (5/50ns)  
IEC 61000-4-5 (Surge) (8/20us)
- This is a Pb-Free device
- Suffix "-H" indicates halogen-free part, ex.ESD9L5.0-H

### Mechanical data

- Epoxy : UL94-V0 rated flame retardant
- Case : Molded plastic, SOD-923FL
- Terminals :Plated terminals, solderable per MIL-STD-750, Method 2026
- Polarity : Indicated by cathode band
- Mounting Position : Any
- Weight : Approximated 0.00044 gram

### Package outline



### Maximum ratings (at T<sub>A</sub>=25°C unless otherwise noted)

PARAMETER	CONDITIONS	Symbol	Value	UNIT
Electrostatic discharge	IEC61000-4-2 air discharge IEC61000-4-2 contact discharge	E <sub>SD</sub>	±15 ±10	kV
Total power dissipation	on FR-5 board (note 1)@T <sub>A</sub> =25°C	P <sub>D</sub>	150	mW
Lead solder temperature-maximum	10 second duration	T <sub>L</sub>	260	°C
Typical thermal resistance	junction to ambient junction to case	R <sub>θJA</sub> R <sub>θJC</sub>	833 460	°C/W °C/W
Operating junction temperature range		T <sub>J</sub>	-55 to +125	°C
Storage temperature range		T <sub>STG</sub>	-55 to +150	°C

Stresses exceeding maximum ratings may damage the device. maximum ratings are stress ratings only. functional operation above the recommended operating conditions is not implied. extended exposure to stresses above the recommended operating conditions may affect device reliability.

1. FR-5=1.0 x 0.75 x 0.62 in.

### Electrical characteristics (at T<sub>A</sub>=25°C unless otherwise noted, V<sub>F</sub> 1.0V Max. @ I<sub>F</sub>=10mA)

Part No.	V <sub>RWM</sub> (V) Max.	I <sub>R</sub> (uA) @V <sub>RWM</sub> Max.	V <sub>BR</sub> (V)@I <sub>T</sub> (Note 2)		I <sub>T</sub> (mA)	V <sub>C</sub> (V)(Note 3) @ I <sub>PP</sub> =1.0A Max.	P <sub>PK</sub> (W) (Note 3) Max.	C <sub>J</sub> (pF) V <sub>R</sub> =0V and f=1MHz	
			Min.	Max.				Typ.	Max.
ESD9L5.0	5.0	1.0	5.4	8.5	1.0	9.8	50	0.5	0.9

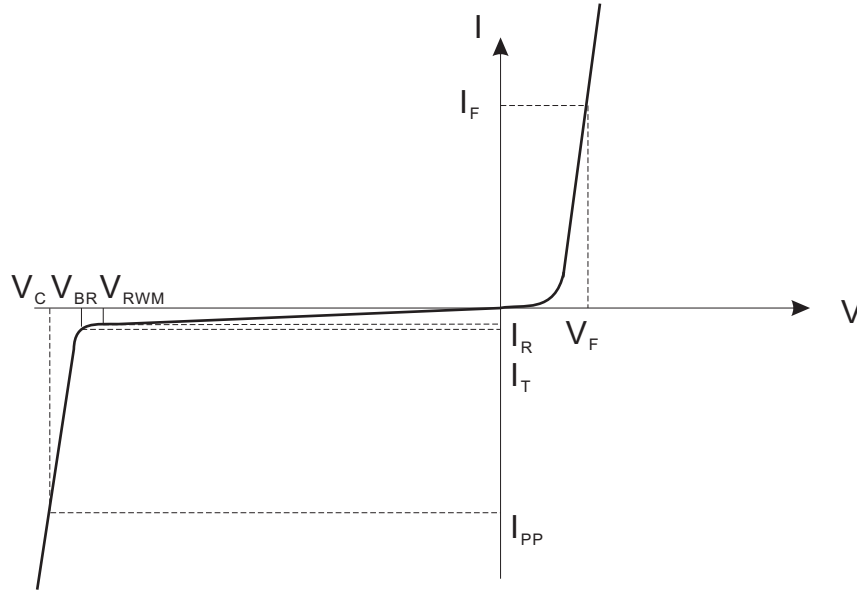
2. V<sub>BR</sub> is measured with a pulse test current I<sub>T</sub> at an ambient temperature of 25°C.

3. Surge current waveform per Figure 5.

4. For test procedure see figures 3 and 4 and application note AND8307/D.

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Typical characteristics (at  $T_A=25^\circ\text{C}$  unless otherwise noted)



Uni-Directional TVS

- $V_C$  : Clamping voltage @  $I_{PP}$
- $I_{PP}$  : Maximum reverse peak pulse current
- $V_{RWM}$  : Maximum working peak reverse voltage
- $I_R$  : Maximum reverse leakage current @  $V_{RWM}$
- $V_{BR}$  : Breakdown voltage @  $I_T$
- $I_T$  : Test current
- $I_F$  : Forward current
- $V_F$  : Forward voltage @  $I_F$
- $C_J$  : Capacitance @  $V_R = 0\text{V}$  and  $f = 1\text{MHz}$

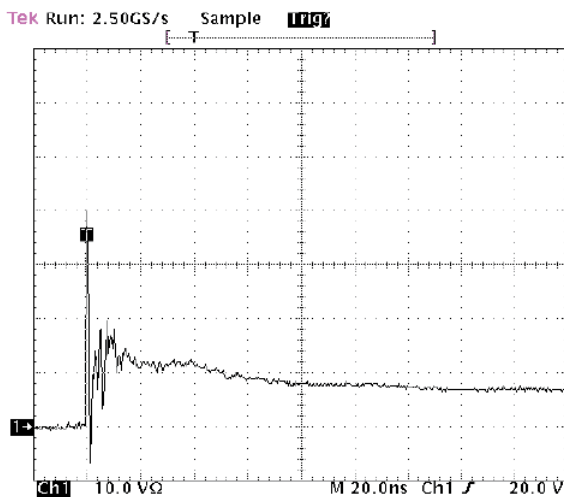


Figure 1. ESD clamping voltage screenshot  
Positive 8 kV contact per IEC 61000-4-2

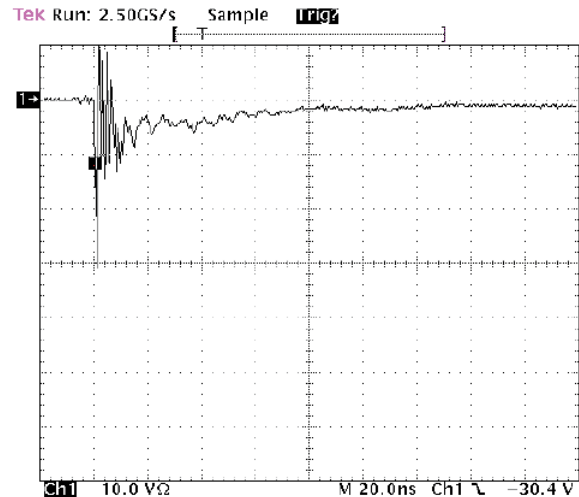


Figure 2. ESD clamping voltage screenshot  
Negative 8 kV contact per IEC 61000-4-2

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IEC 61000-4-2 Spec.

Level	Test Voltage (kV)	First Peak Current (A)	Current at 30 ns (A)	Current at 60 ns (A)
1	2	7.5	4	2
2	4	15	8	4
3	6	22.5	12	6
4	8	30	16	8

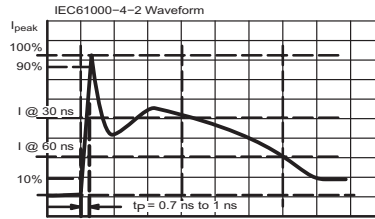


Figure 3. IEC61000-4-2 Spec

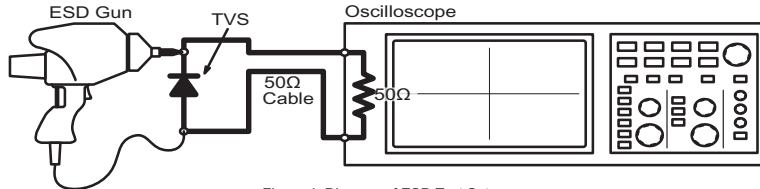


Figure 4. Diagram of ESD Test Setup

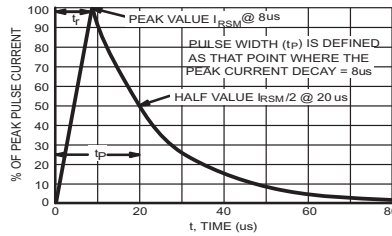


Figure 5. 8 X 20us Pulse Waveform

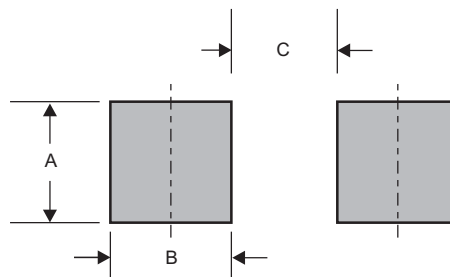
## Pinning information

Pin	Simplified outline	Symbol
Pin1 cathode Pin2 anode		

## Marking

Type number	Marking code
ESD9L5.0	D

## Suggested solder pad layout

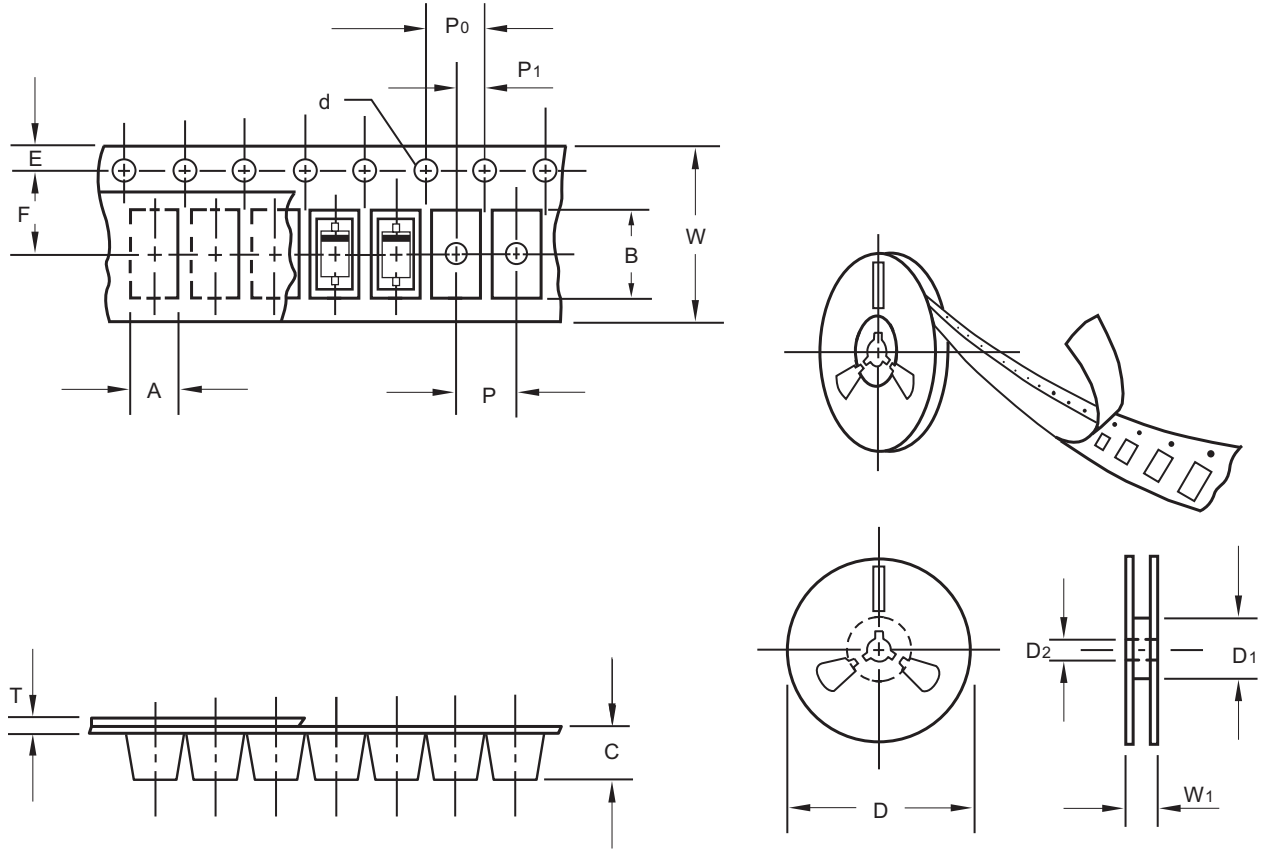


Dimensions in inches and (millimeters)

PACKAGE	A	B	C
SOD-923FL	0.016 (0.40)	0.012 (0.30)	0.024 (0.60)

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## Packing information



unit:mm

Item	Symbol	Tolerance	SOD-923FL
Carrier width	A	0.05	0.70
Carrier length	B	0.05	1.12
Carrier depth	C	0.05	0.48
Sprocket hole	d	0.1	1.50
13" Reel outside diameter	D	2.0	-
13" Reel inner diameter	D1	min	-
7" Reel outside diameter	D	2.0	178.00
7" Reel inner diameter	D1	min	62.00
Feed hole diameter	D2	0.5	13.00
Sprocket hole position	E	0.1	1.75
Punch hole position	F	0.1	3.50
Punch hole pitch	P	0.1	2.00
Sprocket hole pitch	P0	0.1	4.00
Embossment center	P1	0.1	2.00
Overall tape thickness	T	0.1	0.23
Tape width	W	0.3	8.00
Reel width	W1	1.0	11.40

Note: Devices are packed in accordance with EIA standard RS-481-A and specifications listed above.

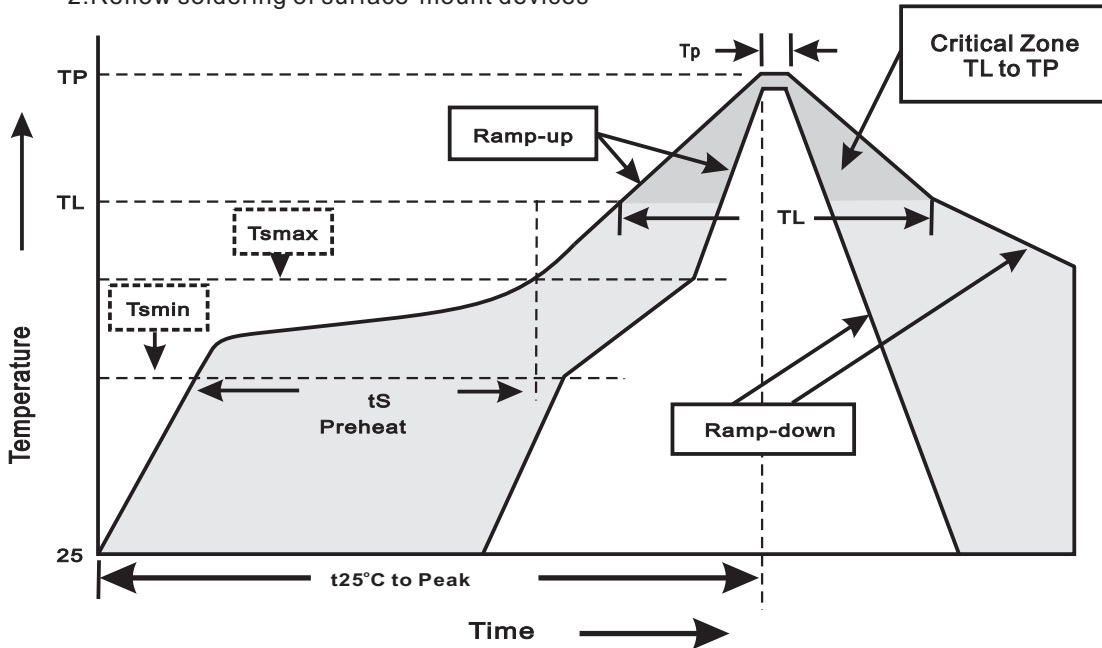
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## Reel packing

PACKAGE	REEL SIZE	REEL (pcs)	COMPONENT SPACING (m/m)	BOX (pcs)	INNER BOX (m/m)	REEL DIA, (m/m)	CARTON SIZE (m/m)	CARTON (pcs)	APPROX. GROSS WEIGHT (kg)
SOD-923FL	7"	8,000	2.0	80,000	183*123*183	178	382*257*387	640,000	9.50

## Suggested thermal profiles for soldering processes

- 1.Storage environment: Temperature=5°C~40°C Humidity=55%±25%
- 2.Reflow soldering of surface-mount devices



### 3.Reflow soldering

Profile Feature	Soldering Condition
Average ramp-up rate(T <sub>L</sub> to T <sub>P</sub> )	<3°C/sec
Preheat -Temperature Min(T <sub>min</sub> ) -Temperature Max(T <sub>max</sub> ) -Time(min to max)(t <sub>s</sub> )	150°C 200°C 60~120sec
T <sub>max</sub> to T <sub>L</sub> -Ramp-upRate	<3°C/sec
Time maintained above: -Temperature(T <sub>L</sub> ) -Time(t <sub>L</sub> )	217°C 60~260sec
Peak Temperature(T <sub>P</sub> )	255°C-0/+5°C
Time within 5°C of actual Peak Temperature(t <sub>p</sub> )	10~30sec
Ramp-down Rate	<6°C/sec
Time 25°C to Peak Temperature	<6minutes

**ESD9L5.0****High reliability test capabilities**

Item Test	Conditions	Reference
1. Solder Resistance	at 260±5°C for 10±2sec. immerse body into solder 1/16"±1/32"	MIL-STD-750D METHOD-2031
2. Solderability	at 245±5°C for 5 sec.	MIL-STD-202F METHOD-208
3. High Temperature Reverse Bias	$V_{BR} = V_{BR \text{ Min}} * 80\%$ at $T_J = 125^\circ\text{C}$ for 168 hrs.	MIL-STD-750D METHOD-1038
4. Pressure Cooker	15P <sub>sig</sub> at $T_A = 121^\circ\text{C}$ for 4 hrs.	JESD22-A102
5. Temperature Cycling	-55°C to +125°C dwelled for 30 min. and transferred for 5min. total 10 cycles.	MIL-STD-750D METHOD-1051
6. Humidity	at $T_A = 85^\circ\text{C}$ , RH=85% for 1000hrs.	MIL-STD-750D METHOD-1021
7. High Temperature Storage Life	at 175°C for 1000 hrs.	MIL-STD-750D METHOD-1031