

ESD5Z SERIES

Surface Mount Uni-Directional TVS For ESD Protection Diode 2.5V-15V

Features

- Small body outline dimensions
- Low body height
- Stand off voltage: 2.5V, 3.3V, 5.0V, 7.0V, 12V, 15V
- Low leakage
- Response time is typically <1ns
- Provide transient protection:
IEC 61000-4-2 (ESD) Level 4
IEC 61000-4-4 (EFT) 40A (5/50ns)
IEC 61000-4-5 (Surge) (8/20 μ s)
- Lead-free parts meet RoHS requirements
- Suffix "-H" indicates Halogen-free part, ex. ESD5Z2.5-H

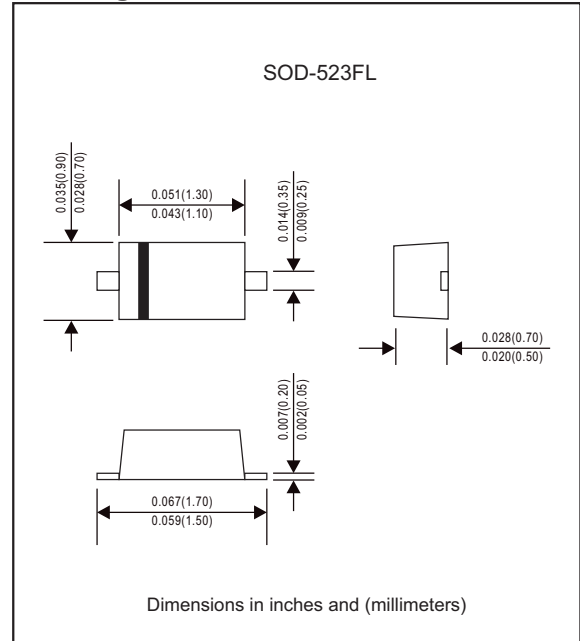
Applications

- Cellular phones
- Portable devices
- Digital cameras
- Power supplies

Mechanical data

- Epoxy: UL94-V0 rated flame retardant
- Case : Molded plastic, SOD-523FL
- Terminals : Solder plated, solderable per MIL-STD-750, Method 2026
- Polarity : Indicated by cathode band
- Mounting Position : Any
- Weight : Approximated 0.002 gram

Package outline



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

Parameter	Conditions	Symbol	Value	Unit
Total power dissipation	Peak pulse power ($t_p = 8/20\mu\text{s}$)	PPP	200	W
Electrostatic discharge	IEC61000-4-2 air discharge IEC61000-4-2 contact discharge	ESD	± 15 ± 8	kV
ESD voltage	Per human body model	ESD	16	kV
Electrostatic discharge	IEC61000-4-4	EFT	40	A
Lead solder temperature-maximum	10 second duration	TL	260	$^\circ\text{C}$
Maximum junction temperature		TJ	+150	$^\circ\text{C}$
Storage temperature range		TSTG	-55 to +150	$^\circ\text{C}$
Operating temperature range		TOP	-40 to +125	$^\circ\text{C}$

Electrical characteristics (at $T_A=25^\circ\text{C}$ unless otherwise noted, $V_{fmax}=0.9\text{V}$ @ $I_f=10\text{mA}$ for all types)

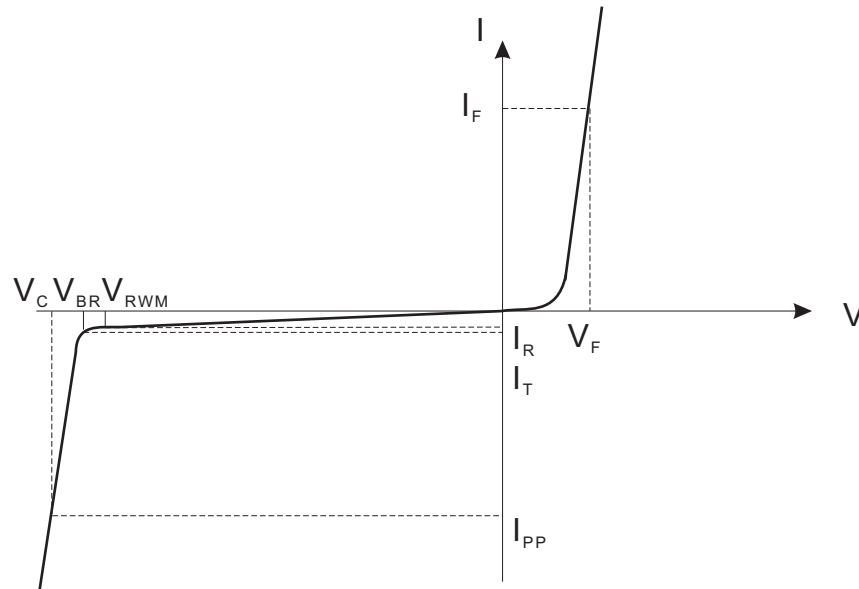
Part No.	V_{RWM} (V) Max.	$I_R(\mu\text{A})$ @ V_{RWM} Max.	$V_{BR}(V)$ @ I_T (Note 2) Min.	I_T (mA)	$V_C(V)$ @ $I_{PP}=5.0\text{A}$ (Note 1) Max.	$I_{PP}(A)$ (Note 1) Max.	$V_C(V)$ @ Max I_{PP} (Note 1) Max.	PPK (W) (Note 1) Max.	$C_J(pF)$ $V_R=0\text{V}$ and $f=1\text{MHz}$ Typ.
ESD5Z2.5	2.5	6.0	4.0	1.0	6.5	11.0	10.9	120	145
ESD5Z3.3	3.3	1.0	5.0	1.0	8.4	11.2	14.1	158	105
ESD5Z5.0	5.0	1.0	6.2	1.0	11.6	9.4	18.6	174	80
ESD5Z7.0	7.0	1.0	7.5	1.0	13.5	8.8	22.7	200	65
ESD5Z12	12	1.0	13.5	1.0	17.0	9.6	25.0	240	55
ESD5Z15	15	1.0	16.5	1.0	22.0	10.0	26.0	260	65

Notes 1: Surge current waveform per Fig.1

2: V_{BR} is measured with a pulse test current I_T at an ambient temperature of 25°C

ESD5Z SERIES

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 $f = 1\text{MHz}$

Rating and characteristic curves (ESD5Z SERIES)

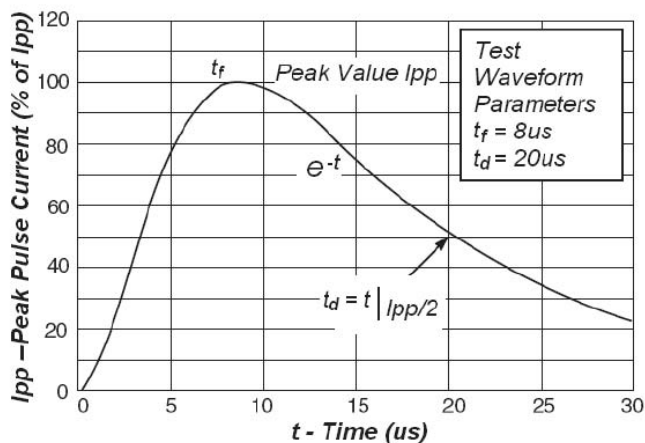


Fig1. Pulse Waveform

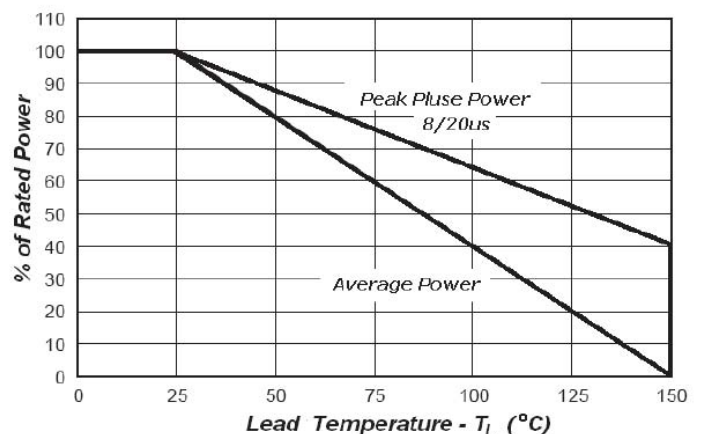
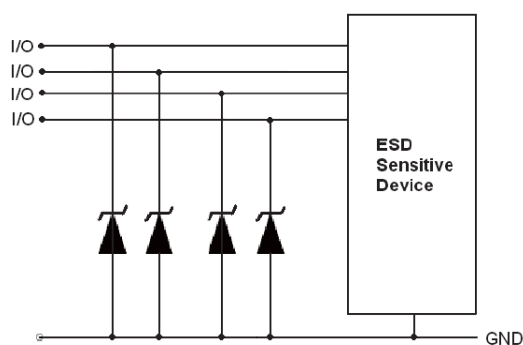


Fig2. Power Derating

ESD5Z SERIES

Application Note

Electrostatic discharge (ESD) is a major cause of failure in electronic system. Transient Voltage Suppressors (TVS) are an ideal choice for ESD protection. They are capable of clamping the incoming transient to a low enough level such that damage to the protected semiconductor is prevented. Surface mount TVS offers the best choice for minimal lead inductance. They serve as parallel protection elements, connected between the signal lines to ground. As the transient rise above the operating voltage of the device, the TVS becomes a low impedance path diverting the transient current to ground. The ESD5Z Series is the ideal board level protection of ESD sensitive semiconductor components. The tiny SOD-523FL package allows design flexibility in the design of high density boards where the space is at a premium. This enables to shorten the routing and contributes to hardening against ESD.



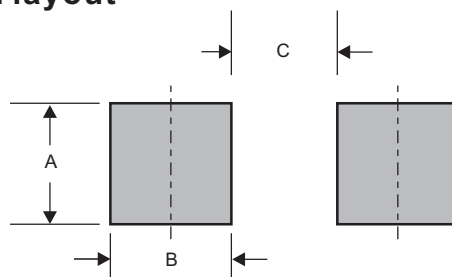
Pinning information

Pin	Simplified outline	Symbol
Pin1 cathode Pin2 anode		

Marking

Type number	Marking code
ESD5Z2.5	ZD,02
ESD5Z3.3	ZE,03
ESD5Z5.0	ZF,05
ESD5Z7.0	ZH,07
ESD5Z12	ZM,12
ESD5Z15	ZN,15

Suggested solder pad layout

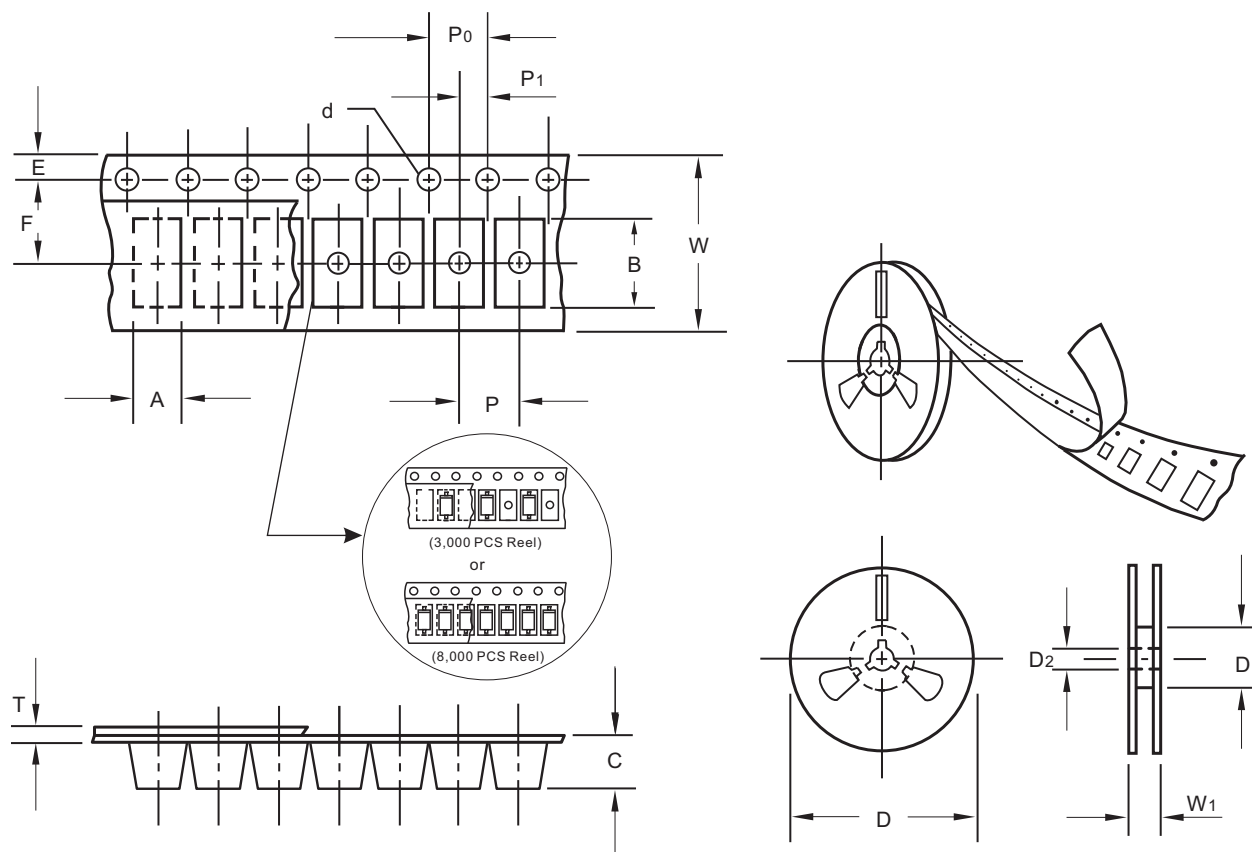


Dimensions in inches and (millimeters)

PACKAGE	A	B	C
SOD-523FL	0.032 (0.80)	0.024 (0.60)	0.044 (1.10)

ESD5Z SERIES

Packing information



unit:mm

Item	Symbol	Tolerance	SOD-523FL
Carrier width	A	0.1	0.90
Carrier length	B	0.1	1.94
Carrier depth	C	0.1	0.76
Sprocket hole	d	0.1	1.50
7" Reel outside diameter	D	2.0	178.00
7" Reel inner diameter	D1	min	50.00
Feed hole diameter	D2	0.2	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	9.50

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

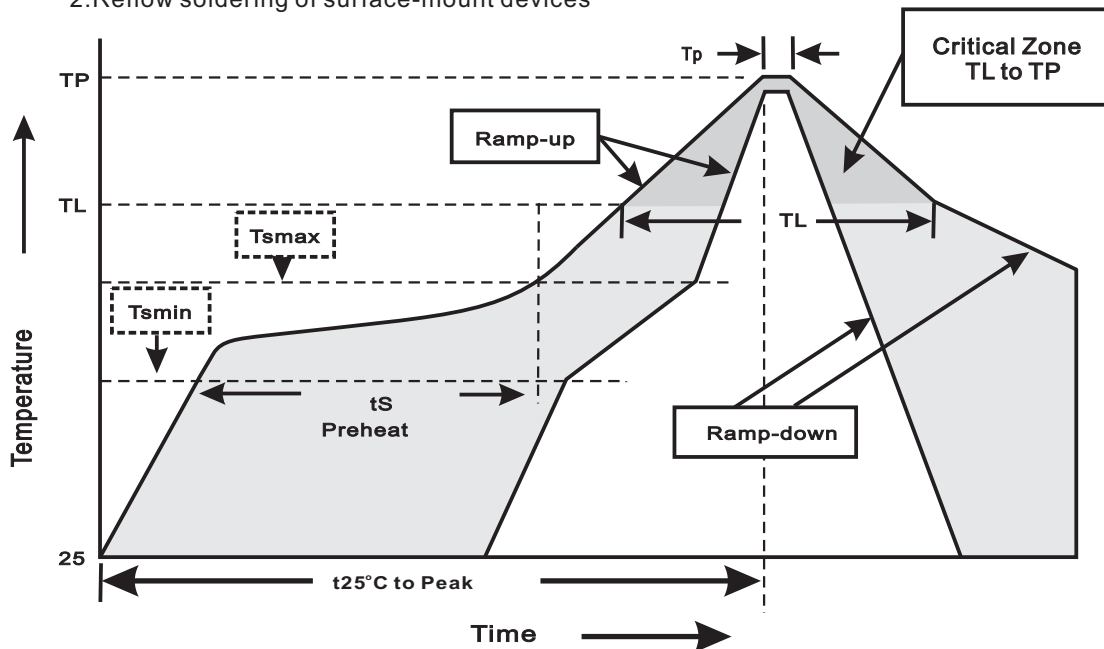
ESD5Z SERIES

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-523FL	7"	3,000	2.0	30,000	183*123*183	178	382*257*387	240,000	8
		8,000	2.0	80,000	183*123*183	178	382*257*387	640,000	10

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 _L to T _P)	<3°C/sec
Preheat -Temperature Min(T _{smmin}) -Temperature Max(T _{smmax}) -Time(min to max)(t _s)	150°C 200°C 60~120sec
T _{smmax} to T _L -Ramp-upRate	<3°C/sec
Time maintained above: -Temperature(T _L) -Time(t _L)	217°C 60~260sec
Peak Temperature(T _P)	255°C-0/+5°C
Time within 5°C of actual Peak Temperature(t _P)	10~30sec
Ramp-down Rate	<6°C/sec
Time 25°C to Peak Temperature	<6minutes

ESD5Z SERIES

High reliability test capabilities

Item Test	Conditions	Reference
1. Solder Resistance	at $260\pm 5^{\circ}\text{C}$ for $10\pm 2\text{sec.}$	MIL-STD-750D METHOD-2031
2. Solderability	at $245\pm 5^{\circ}\text{C}$ for 5 sec.	MIL-STD-202F METHOD-208
3. High Temperature Reverse Bias	$V_{\text{BR}}=V_{\text{BR MIN}}*80\%$ at $T_{\text{J}}=150^{\circ}\text{C}$ for 168 hrs.	MIL-STD-750D METHOD-1038
4. Pressure Cooker	$15P_{\text{SIG}}$ at $T_{\text{A}}=121^{\circ}\text{C}$ for 4 hrs.	JESD22-A102
5. Temperature Cycling	-55°C to $+125^{\circ}\text{C}$ dwelled for 30 min. and transferred for 5min. total 10 cycles.	MIL-STD-750D METHOD-1051
6. Humidity	at $T_{\text{A}}=85^{\circ}\text{C}$, 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