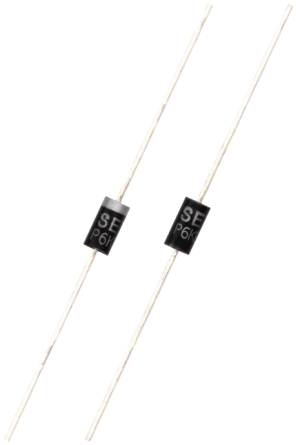
TVS Diodes

Transient Voltage Suppression Diodes

SAC Series



Description

The SAC Series is designed specifically to protect sensitive electronic equipment from voltage transients induced by lightning and other transient voltage events.

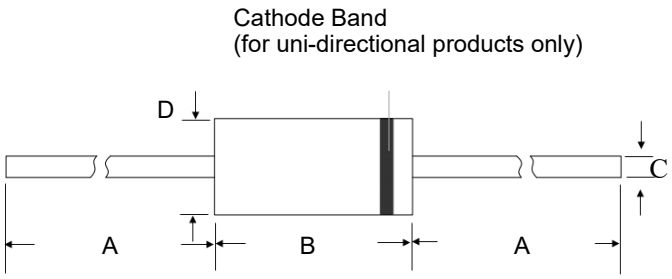
Applications

- Communication Equipment
- Security & Protection
- Industrial Control Equipment
- Power Supply
- Automotive Electronics
- New Energy
- Lightning Protection

Features

- 500 W peak pulse capability at 10/1000 μS waveform, repetition rate (duty cycles):0.01%
- Glass passivated chip junction in DO-15 Package
- Fast response time: typically less than 1.0 PS from 0 Volts to BV min
- Typical failure mode is short from over-specified voltage or current
- Whisker test is conducted based on JEDEC JESD201A per its table 4a and 4c
- IEC-61000-4-2 ESD 30 kV (Air), 30 kV (Contact)
- ESD protection of data lines in accordance with IEC 61000-4-2
- Low incremental surge resistance
- EFT protection of data lines in accordance with IEC 61000 -4-4
- High temperature to reflow soldering guaranteed: 260 °C/30 sec / 0.375”,(9.5 mm) lead length, 5 lbs., (2.3 kg) tension
- Plastic package is flammability rated V-0 per Underwriters Laboratories
- Matte tin lead–free plated
- Ideal for data line applications
- Halogen free and RoHS compliant
- Pb-free E3 means 2nd level interconnect is Pb-free and the terminal finish material is tin(Sn) (IPC/JEDEC J-STD-609A.01)

Package Outline Dimensions (DO-204AC/DO-15)



DO-204AC(DO-15)

Symbol	Millimeters		Inches	
	Min.	Max.	Min.	Max.
A	25.40	-	1.000	-
B	5.80	7.60	0.230	0.300
C	0.71	0.86	0.028	0.034
D	2.60	3.60	0.104	0.140

TVS

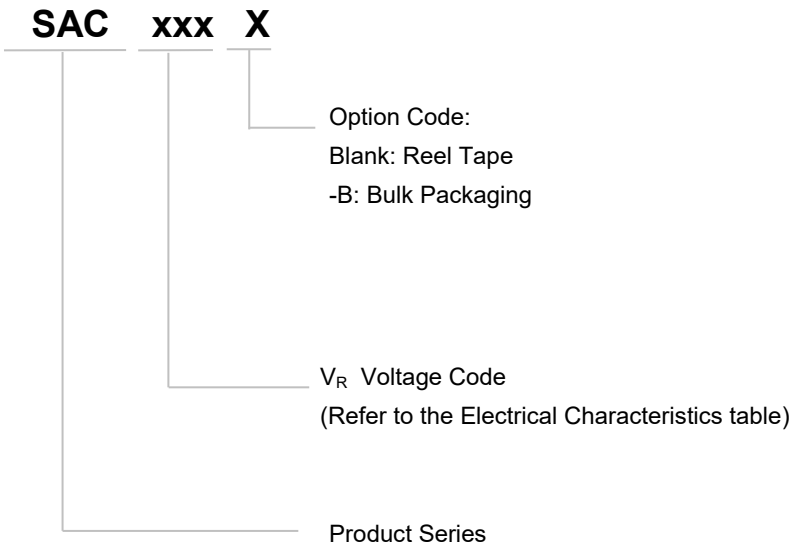
Maximum Ratings and Characteristics

(T_A = 25 °C unless otherwise specified.)

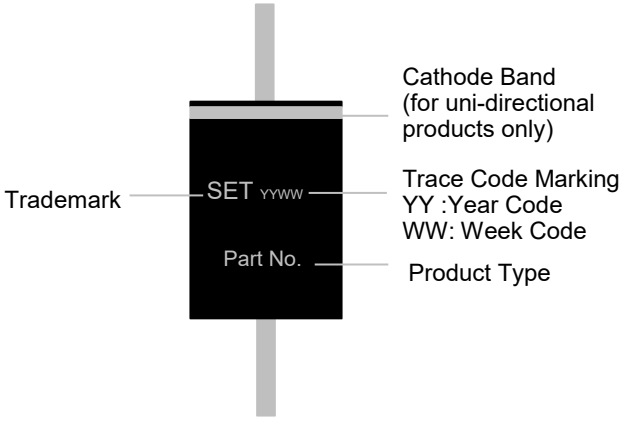
Parameter	Symbol	Value	Unit
Peak Pulse Power Dissipation by 10/1000 μS Test Waveform (Fig.1)(Note 1)	P_{PPM}	500	W
Steady State Power Dissipation on Infinite Heat Sink at TL=75 °C	P_D	3.0	W
Operating Junction and Storage Temperature Range	T_J, T_{STG}	-65 to 175	°C
Typical Thermal Resistance Junction to Lead	$R_{\theta JL}$	20	°C/W
Typical Thermal Resistance Junction to Ambient	$R_{\theta JA}$	75	°C/W

Note
1. Non-repetitive current pulse, per Fig. 3 and derated above T_J (initial)=25 °C per Fig. 2.

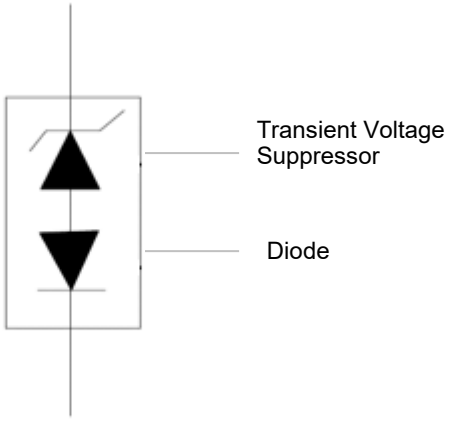
Part Numbering System



Marking



Functional Diagram



Glossary

Item	Description
V_C	**Clamping Voltage** Voltage across TVS in a region of low differential resistance that serves to limit the voltage across the device terminals.
V_R	**Reverse Stand-off Voltage** Maximum voltage that can be applied to the TVS without operation. NOTE : It is also shown as V_{WM} (maximum working voltage (maximum d.c. voltage)) and known as rated stand-off voltage (V_{so}).
I_R	**Reverse Leakage Current** Current measured at V_R.
V_{BR}	**Breakdown Voltage** Voltage across TVS at a specified current I_T in the breakdown region.
I_{PPM}	**Rated Random Recurring Peak Impulse Current** Maximum-rated value of random recurring peak impulse current that may be applied to a device.
$P_{M(AV)}$	**Rated Average Power Dissipation** Maximum-rated value of power dissipation resulting from all sources, including transients and standby current, averaged over a short period of time.
P_{PPM}	**Rated Random Recurring Peak Impulse Power Dissipation** Maximum-rated value of the product of rated random recurring peak impulse current (I_{PPM}) multiplies by specified maximum clamping voltage (V_C).
C_J	**Capacitance** Capacitance across the TVS measured at a specified frequency and voltage.
V_{FS}	**Peak Forward Surge Voltage** Peak voltage across an TVS for a specified forward surge current (I_{FS}) and time duration. NOTE : Also shown as V_F.
I_{FS}	**Forward Surge Current** Pulsed current through TVS in the forward conducting region. NOTE : Also shown as I_F.
$\alpha_{V(BR)}$	**Temperature Coefficient of Breakdown Voltage** The change of breakdown voltage divided by the change of temperature.
I_{PP}	**Peak pulse Current** Peak pulse current value applied across the TVS to determine the clamping voltage V_C for a specified wave shape.
I_T	**Pulsed D.C. Test Current** Test current for measurement of the breakdown voltage V_{BR}. This is defined by the manufacturer and usually given in milliamperes with a pulse duration of less than 40 ms. NOTE : Also shown as I_{BR}.

—(GB-T 18802.321 / IEC 61643-321 / JESD210A)

Electrical Characteristics (T_A=25 °C unless otherwise noted)Table 1

Part Number	Breakdown Voltage V_{BR}@I_T	Reverse Stand-off Voltage V_R	Max. Reverse Leakage I_R@V_R	Max. Peak Pulse Current I_{PPM}	Max. Clamping Voltage at V_C@I_{PPM}=5.0 A	Max. Junction Capacitance @0 Volts	Working Inverse Blocking Voltage V_{WIB}	Inverse Blocking Leakage Current at IIB @ V_{WIB}	Peak Inverse Blocking Voltage V_{PIB}
	Min								
Uni	(V)	(V)	(μA)	(A)	(V	(pF)	(V)	(mA)	(V)
SAC5.0	7.60	5.0	300	44.0	10.0	50	75	1.0	100
SAC6.0	7.90	6.0	300	41.0	11.2	50	75	1.0	100
SAC7.0	8.33	7.0	300	38.0	12.6	50	75	1.0	100
SAC8.0	8.89	8.0	100	36.0	13.4	50	75	1.0	100
SAC8.5	9.44	8.5	50	34.0	14.0	50	75	1.0	100
SAC10	11.10	10.0	5	29.0	16.3	50	75	1.0	100
SAC12	13.30	12.0	1	25.0	19.0	50	75	1.0	100
SAC15	16.70	15.0	1	20.0	23.6	50	75	1.0	100
SAC18	20.00	18.0	1	15.0	28.8	50	75	1.0	100
SAC22	24.40	22.0	1	14.0	35.4	50	75	1.0	100
SAC26	28.90	26.0	1	11.1	42.3	50	75	1.0	100
SAC30	33.30	30.0	1	10.0	48.6	50	75	1.0	100
SAC36	40.00	36.0	1	8.6	60.0	50	75	1.0	100
SAC45	50.00	45.0	1	6.8	77.0	50	150	1.0	200
SAC50	55.50	50.0	1	5.8	88.0	50	150	1.0	200

TVS

Performance Curve for Reference (T_A=25 °C unless otherwise noted)

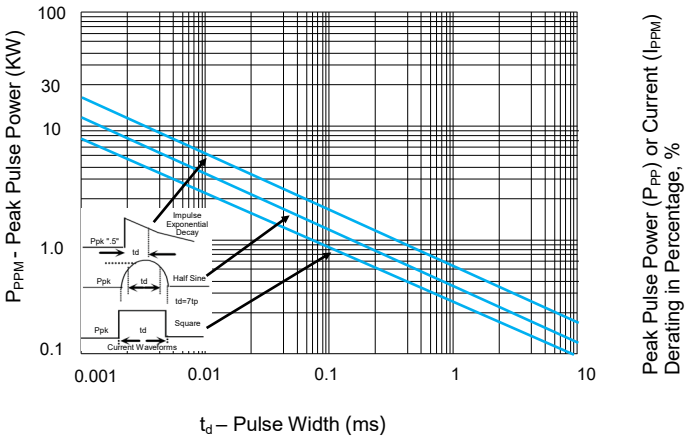


FIGURE 1 Peak Pulse Power Rating Curve

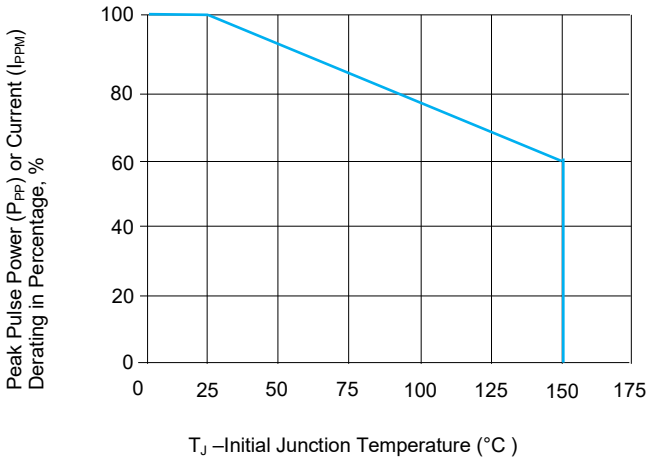


FIGURE 2 Peak Pulse Power Derating Curve

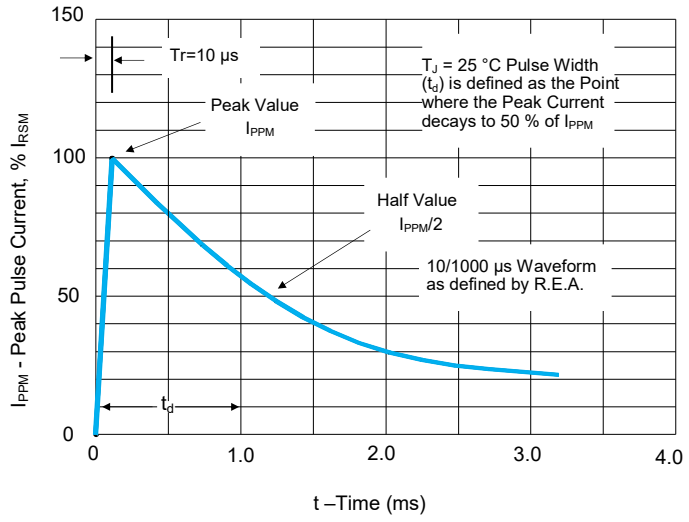
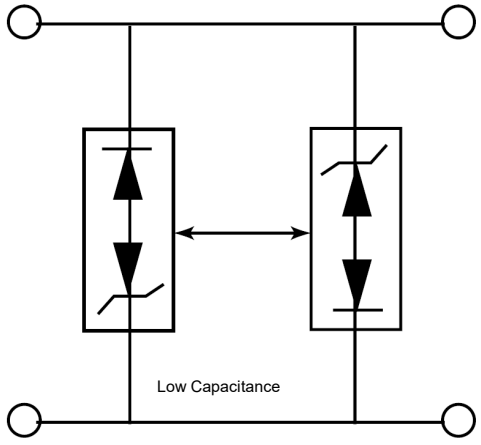


FIGURE 3 Pulse Waveform



Application Note: Device must be used with two units in parallel, opposite in polarity as shown on circuit for AC signal line protection.

FIGURE 4 AC Line Protection Application

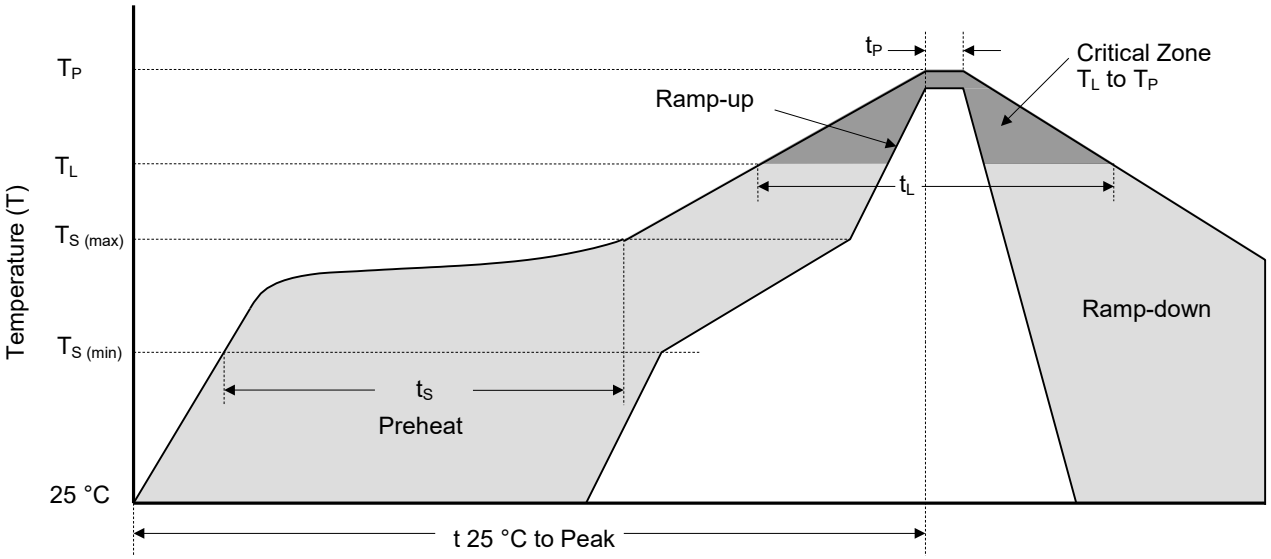
Environmental Specifications

High Temp. Storage	JESD22-A103
HTRB	JESD22-A108
Temperature Cycling	JESD22-A104
H3TRB	JESD22-A101
RSH	JESD22-B106

Physical Specifications

Weight	0.015 oz., 0.4 g
Case	JEDEC DO-204AC (DO-15) molded plastic body over passivated junction.
Polarity	Color band denotes the cathode except Bipolar.
Terminal	Matte Tin axial leads, solderable per JESD22-B102.

Soldering Parameters



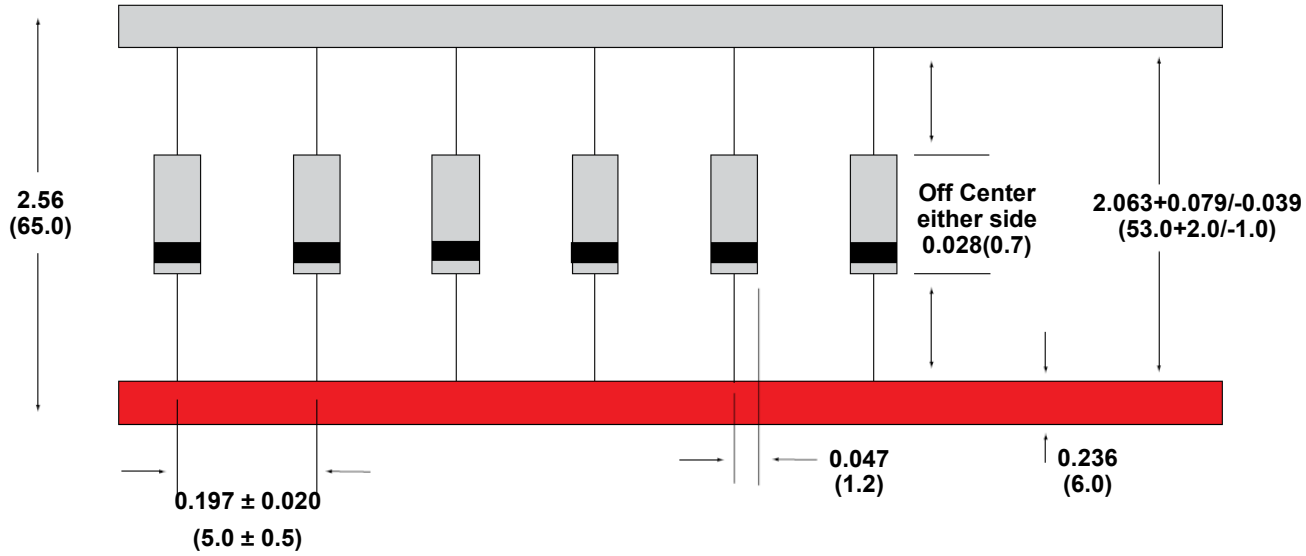
Reflowing Condition

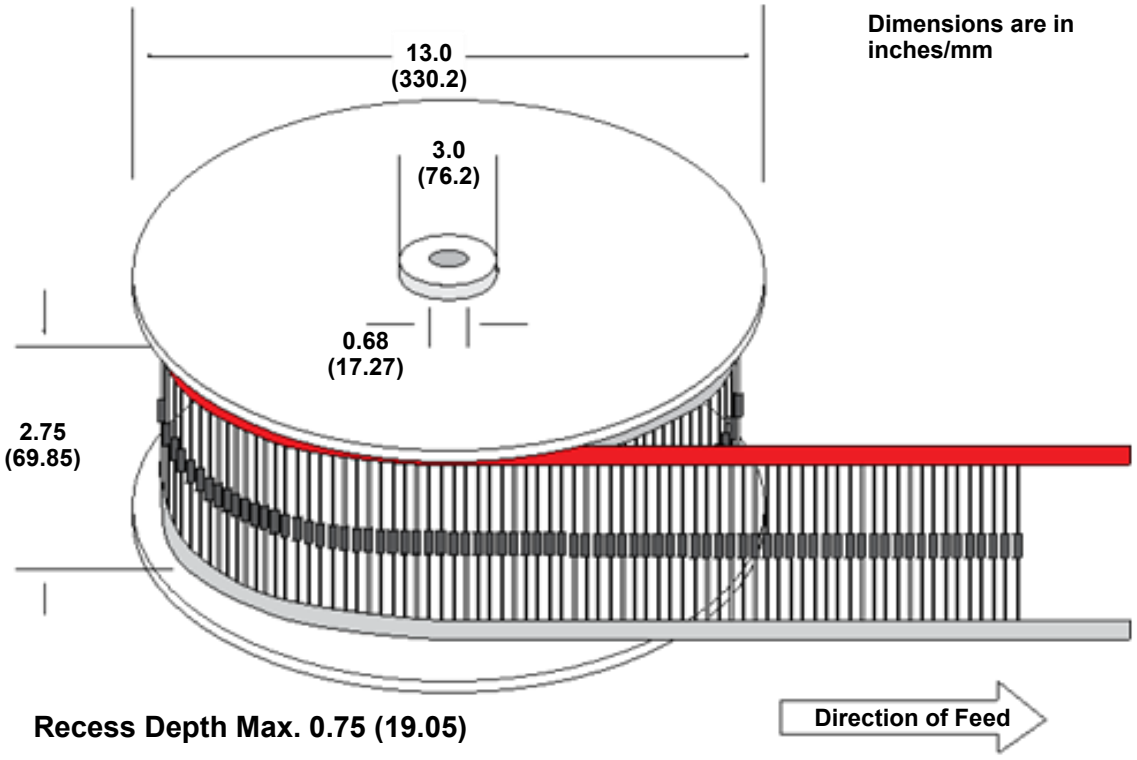
Reflow Soldering Parameters		Lead-Free Assembly
Pre-heat	Temperature Min ($T_{S\ (min)}$)	150 °C
	Temperature Max ($T_{S\ (max)}$)	200 °C
	Time (min to max) (t_s)	60 ~ 120 seconds
Average Ramp Up Rate (Liquidus Temp (TL) to Peak		3 °C / second max.
T_S (max) to T_L Ramp-up Rate		3 °C / second max.
Reflow	Temperature (T_L) (Liquidus)	217 °C
	Time (min to max) (t_L)	60 ~ 150 seconds
Peak Temperature (T_P)		$260^{+0/-5}$ °C
Time of within 5 °C of Actual Peak Temperature (t_P)		20 ~ 40 seconds
Ramp-down Rate		6 °C / second max.
Time from 25 °C to Peak Temperature		8 Minutes max.
Do Not Exceed		260 °C

Flow/Wave Soldering (Solder Dipping)

Peak Temperature	260 °C+0 /- 5 °C
Dipping Time	10 seconds
Soldering Number	1 time

Packaging Information





Part Number	Package	QTY's (Reel)	Packaging Option	Packaging Specification
SACxxxXX	DO-204AC	4000 PCS	Tape & Reel	EIA STD RS-296
SACxxxXX-TB	DO-204AC	3000 PCS	TB	/
SACxxxXX-B	DO-204AC	1000 PCS	BULK	SETsafe | SETfuse Spec

ATTENTION

Usage

1.TVS must be operated in the specified ambient temp.

2.Do not clean the TVS with strong polar solvent such as ketone, esters, benzene and halogenated hydrocarbon, to avoid damaging the encapsulating layer.

3.Please do not apply severe vibration, shock or pressure to TVS, to avoid element cracking.

Replacement

1.If TVS is visually damaged, please replace it.

2.TVS is a non-repairable product. For safety sake, please use equivalent TVS for replacement.

Storage

1.Storage Temp. Range: (-55 to 150) °C.

2.Do not store the TVS at the high temp., high humidity or corrosive gas environment, to avoid influencing the solder- ability of the lead wires. The product shall be used up within 1 year after receiving the goods.

Environmental Conditions

1.TVS should not be exposed to the open air, nor direct sunshine.

2.TVS should avoid rain, water vapor or other condition of high temp. and high humidity.

3.TVS should avoid sand dust, salt mist, or other harmful gases.

Max. Typical Capacitance of TVS

The typical capacitance of TVS is listed in the specifications. Designers may refer to it when designing TVS in High frequency circuit.

Installation Mechanical Stress

1.Do not knock TVS when installing, to avoid mechanical damage.

2.Please do not apply severe vibration, shock or pressure to TVS, to avoid surface resin or element cracking.