TVS Diodes

Transient Voltage Suppression Diodes

SPC10 Series (10KA)

Description

The SPC10 in SMTO-218 package provide the enhanced quality, easy manufacturing than typical through-hole TVS components. They can be connected in series and/or parallel to create various capability and flexible protection solutions.

Functional Diagram

Bi-Directional

Applications

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

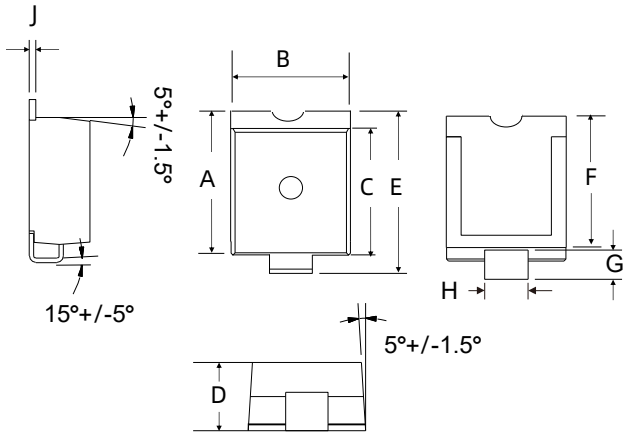
Features

- Bi-directional
- Low clamping and slope resistance
- For automatic pick and place assembly and reflow process to reduce the manufacturing cost and increase the soldering quality compared to axial leads package
- Compact surface mount package design
- Meet MSL level 1, per J-STD-020, LF Maximum peak of 245 °C
- Pb-free E3 means 2nd level interconnect is Pb-free and the terminal finish material is tin (Sn)
- ESD follow IEC 61000-4-2
- Halogen free and RoHS compliant
- Tube or tape and reel pack options available

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

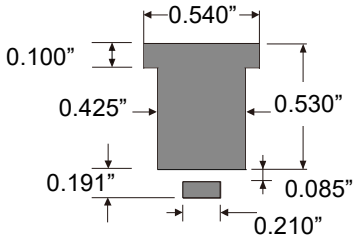
Part Number	Stand-off Voltage V_R	Max. Reverse Leakage I_R@V_R	Breakdown Voltage V_{BR}@I_T Min Max		Test Current I_T	Max. Clamping Voltage V_{CL} @Peak Pulse Current (I_{PP})			Max. Temp Coefficient of V_{BR}	Max. Capacitance 0 Bias 10KHz
						V_{CL}	I_{PP} (8/20 μS)	I_{PP} (10/350 μS)		
			Min	Max			Min	Typical		
	(V)	(μA)	(V)		(mA)	(V)	(A)	(A)	(%/°C)	(nF)
SPC10-058C	58	10	64	70	10	110	10000	1100	0.1	7.5
SPC10-066C	66	10	72	80	10	120	10000	1000	0.1	7.0
SPC10-076C	76	10	85	95	10	140	10000	1000	0.1	6.0
SPC10-086C	86	10	95	105	10	157	10000	1000	0.1	5.5

Package Outline Dimensions (SMTO-218)



Note: Coplanarity of solder side is controlled within 0.10 mm

Symbol	Millimeters		Inches	
	Min.	Max.	Min.	Max.
A	15.78	16.63	0.621	0.655
B	13.43	15.09	0.529	0.594
C	13.83	14.24	0.544	0.561
D	6.94	7.24	0.273	0.285
E	17.82	18.72	0.702	0.737
F	14.40	14.76	0.567	0.581
G	1.88	2.84	0.074	0.112
H	4.89	5.65	0.193	0.222
J	0.72	0.85	0.028	0.033



Mounting Pad Layout (Inch)

Maximum Ratings and Characteristics

(Ratings at 25°C ambient temperature unless otherwise specified.)

Parameter	Symbol	Value	Unit
Storage Temperature Range	T_{STG}	-55 to150	°C
Operating Junction	T_J	-55 to125	°C
Current Rating (8/20 μS wave)	I_{PP}	10	kA

Physical Specifications

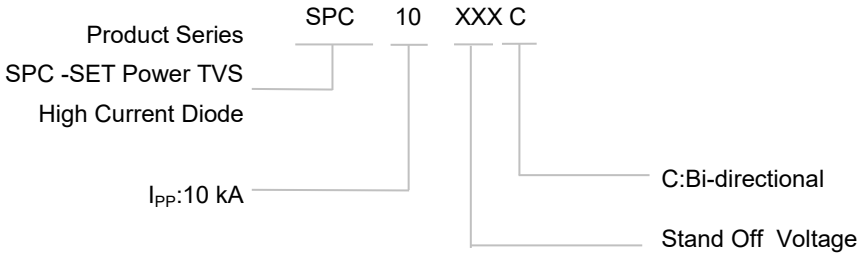
Weight	Contact manufacturer
Case	Epoxy molding compound encapsulated
Terminal	Tin plated lead, solderability per MIL-STD-202 Method 208

Environmental Specifications

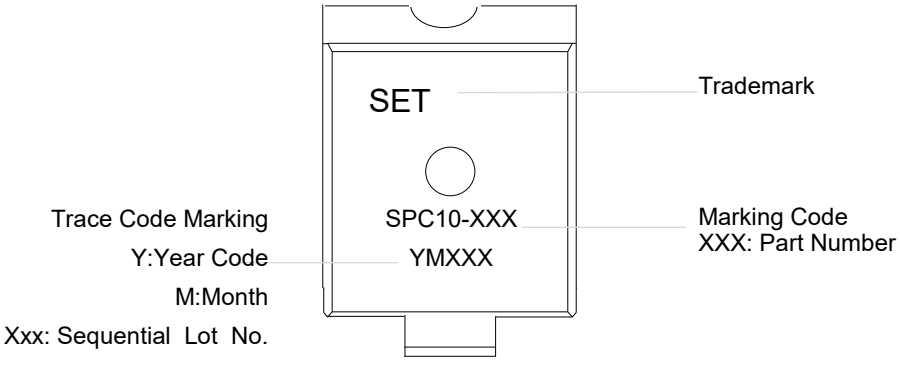
Temperature Cycling	JESD22-A104
HTRB	JESD22-A108
MSL	JESDEC-J-STD-020, Level 1
H3TRB	JESD22-A101
RSH	JESD22-B106

TVS

Part Numbering System



Marking



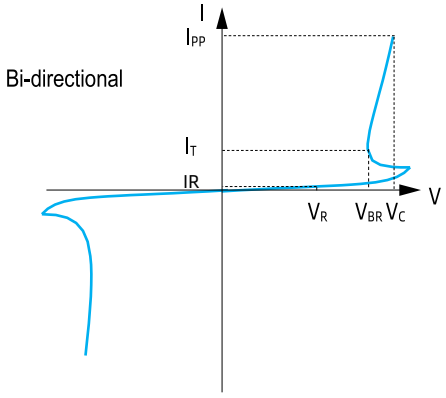
Glossary

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)

TVS

I-V Curve Characteristics



P_{PPM} - Peak Pulse Power Dissipation
V_R - Stand-off Voltage
V_{BR} - Breakdown Voltage
V_C - Clamping Voltage
I_R - Reverse Leakage Current

TVS

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

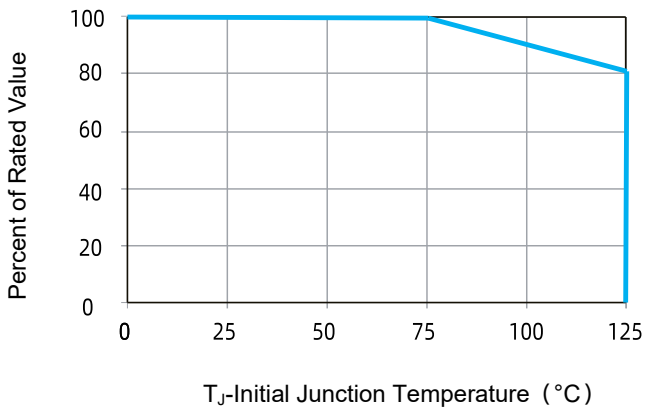


FIGURE 1 Peak Power Derating

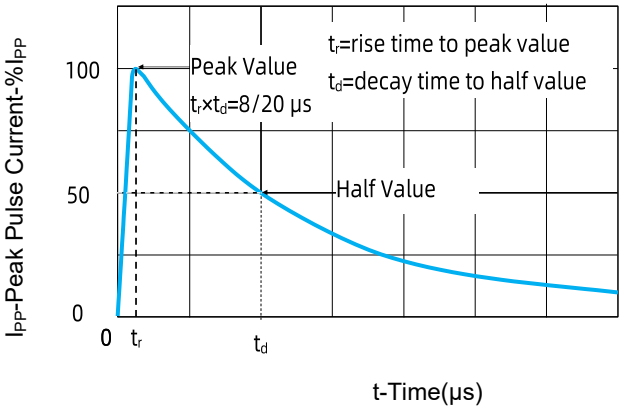
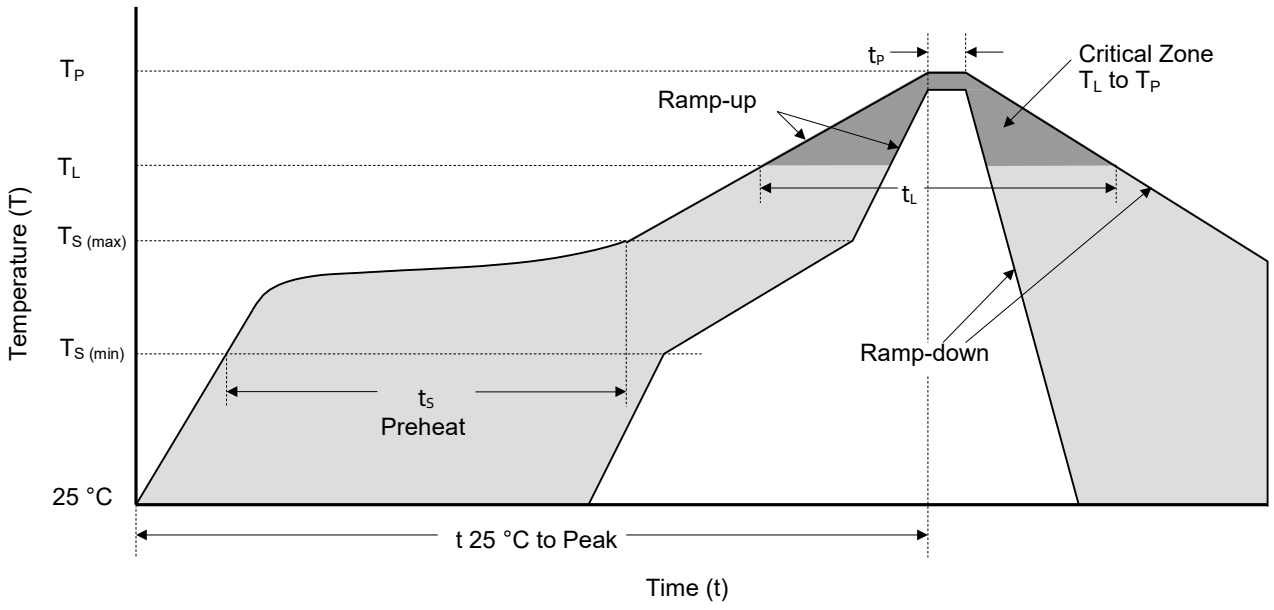


FIGURE 2 Pulse Waveform

Soldering Parameters



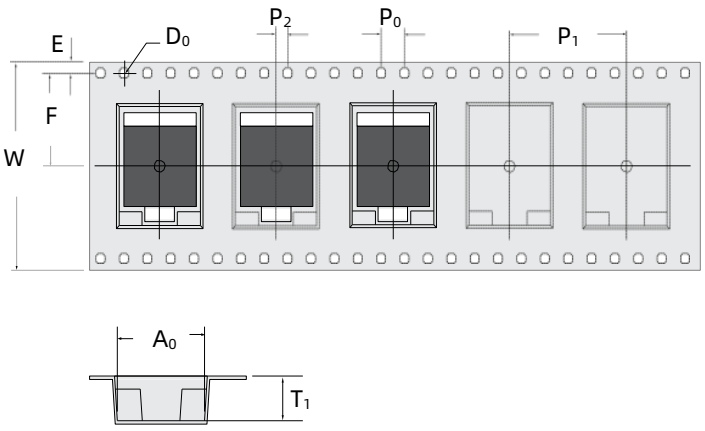
Reflowing Condition

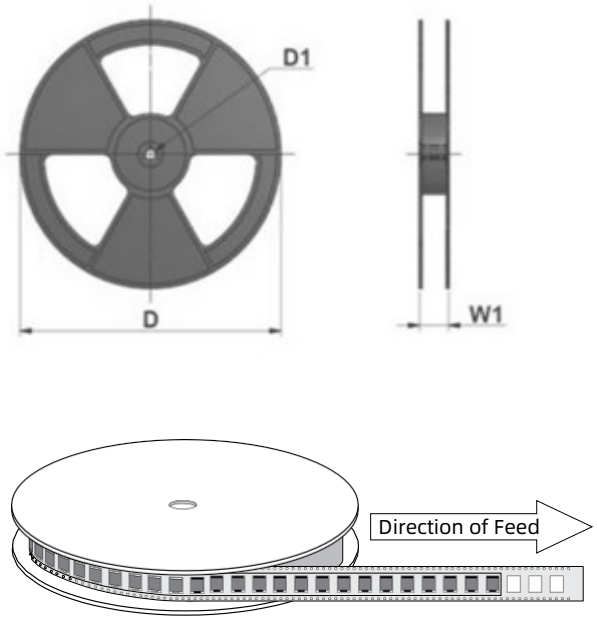
Reflow Soldering Parameters		Lead-Free Assembly
Pre-heat	Temperature Min ($T_{S\ (min)}$)	150 °C
	Temperature Max ($T_{S\ (max)}$)	200 °C
	Time (min to max) (t_S)	60 ~ 120 seconds
Average Ramp Up Rate (Liquidus Temp (TL) to Peak		3 °C / second max.
T_S (max) to T_L Ramp-up Rate		3 °C / second max.
Reflow	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

Wave Soldering (Solder Dipping)

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

Packaging Information

Tape	Symbol	Millimeters	Inches
	W	32 ± 0.3	1.260 ± 0.012
	E	1.75 ± 0.1	0.069 ± 0.004
	F	14.2 ± 0.1	0.559 ± 0.004
	D_0	1.5 + 0.1 / 0.0	0.059 + 0.004 / -0.0
	P_0	4.0 ± 0.1	0.102 ± 0.004
	P_1	20.0 ± 0.1	0.787 ± 0.004
	P_2	2.0 ± 0.1	0.079 ± 0.004
	A_0	14.5 ± 0.1	0.571 ± 0.004
	B_0	18.5 ± 0.1	0.728 ± 0.004
	T	0.40	0.016
	T_1	7.8	0.029

	Symbol	Millimeters	Inches
	D	Φ13.0	Φ330.0
	D_1	Φ0.520±0.008	Φ13.2±0.2
	W_1	1.417±0.079	36.0±2.0

Part Number	Weight	Packaging Option	QTY's
SPC10-XXXXC	4.33 g	Tape & Reel – 32 mm/13" tape	400 PCS

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.