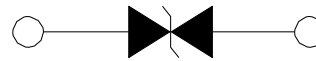




### Description

The SPC10 in SMT-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

### 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

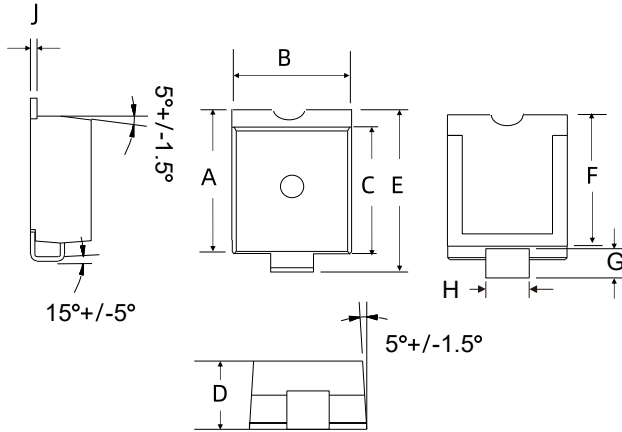
### Applications

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

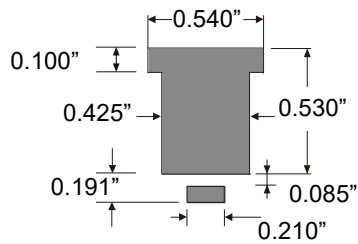
### Electrical Characteristics (T<sub>A</sub>=25 °C unless otherwise noted )

| Part Number | Stand-off Voltage V <sub>R</sub> | Max. Reverse Leakage I <sub>R</sub> @V <sub>R</sub> | Breakdown Voltage V <sub>BR</sub> @I <sub>T</sub> Min Max |     | Test Current I <sub>T</sub> | Max. Clamping Voltage V <sub>CL</sub> @Peak Pulse Current (I <sub>PP</sub> ) |                           |                             | Max. Temp Coefficient of V <sub>BR</sub> | Max. Capacitance 0 Bias 10KHz |
|-------------|----------------------------------|-----------------------------------------------------|-----------------------------------------------------------|-----|-----------------------------|------------------------------------------------------------------------------|---------------------------|-----------------------------|------------------------------------------|-------------------------------|
|             |                                  |                                                     |                                                           |     |                             | V <sub>CL</sub>                                                              | I <sub>PP</sub> (8/20 μS) | I <sub>PP</sub> (10/350 μS) |                                          |                               |
|             |                                  |                                                     |                                                           |     |                             |                                                                              | Min                       | Max                         |                                          |                               |
|             |                                  | (V)                                                 | (μA)                                                      | (V) |                             | (mA)                                                                         | (V)                       | (A)                         | (A)                                      | (%/°C)                        |
| 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 (SMT0-218)



Note: Coplanarity of solder side is controlled within 0.10 mm



Mounting Pad Layout (Inch)

| 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 |

### Maximum Ratings and Characteristics

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

| Parameter                     | Symbol           | Value      | Unit |
|-------------------------------|------------------|------------|------|
| Storage Temperature Range     | T <sub>STG</sub> | -55 to 150 | °C   |
| Operating Junction            | T <sub>J</sub>   | -55 to 125 | °C   |
| Current Rating (8/20 μS wave) | I <sub>PP</sub>  | 10         | kA   |

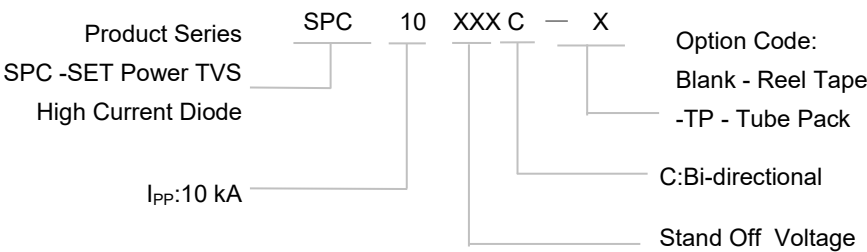
### Physical Specifications

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

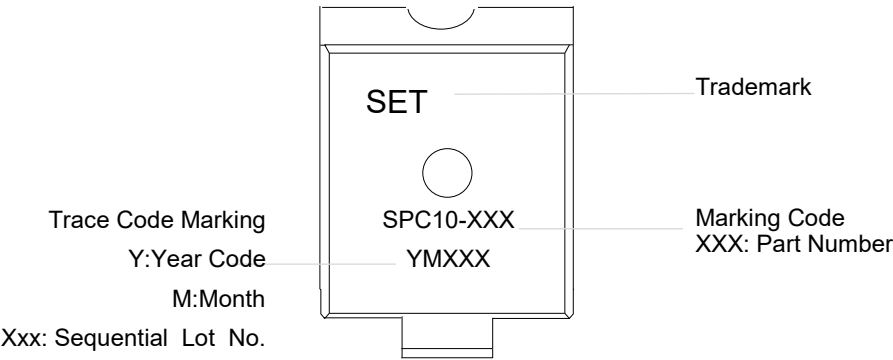
Environmental Specifications

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

Part Numbering System



Marking

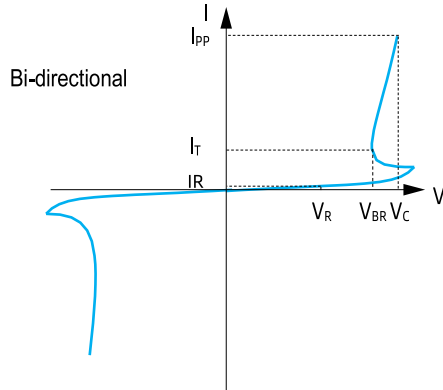


### Glossary

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

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

### 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

### Performance Curve for Reference ( $T_A=25^\circ\text{C}$ unless otherwise noted)

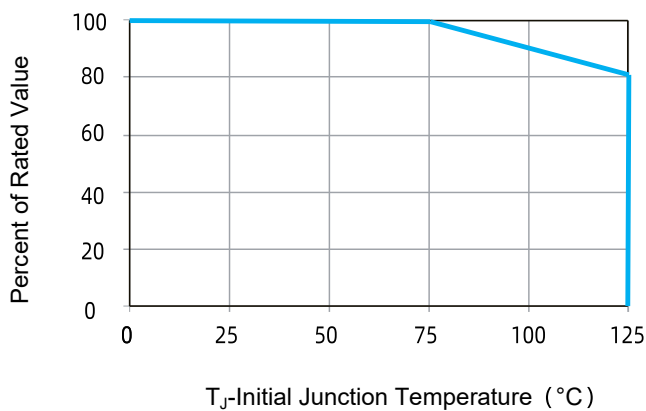


FIGURE 1 Peak Power Derating

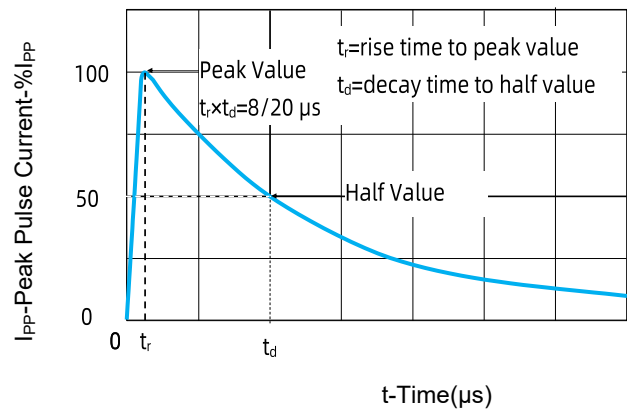
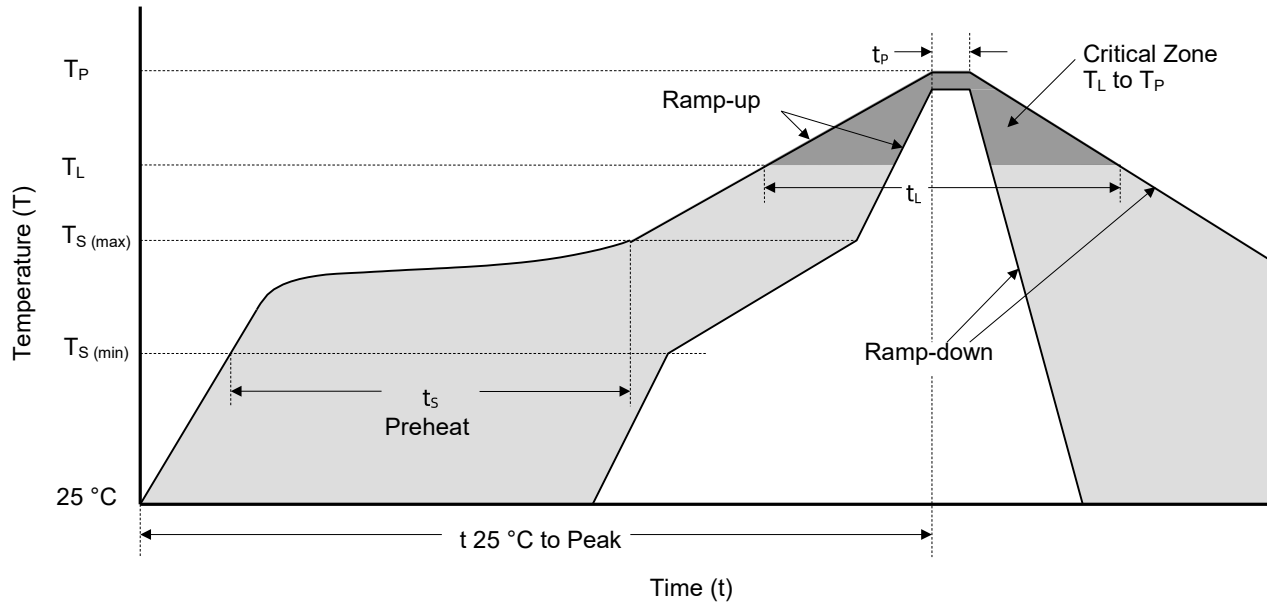


FIGURE 2 Pulse Waveform

### Soldering Parameters



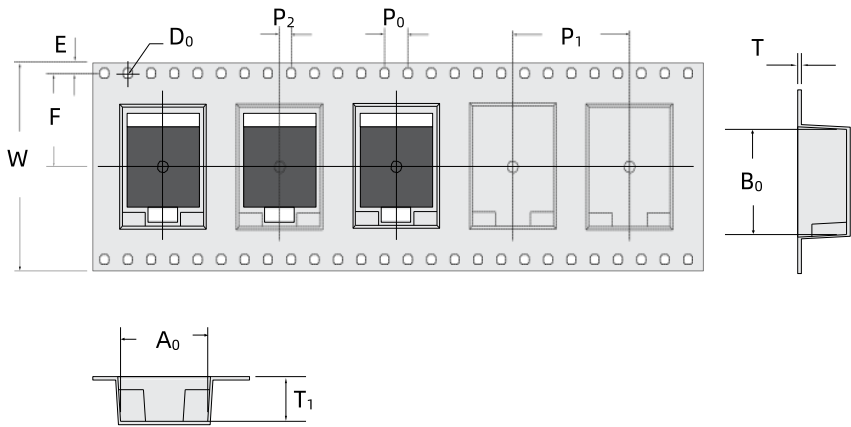
Reflowing Condition

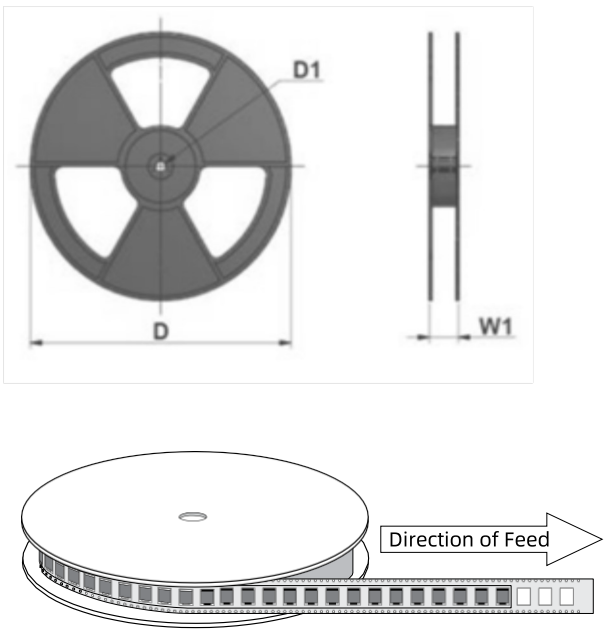
| Reflow Soldering Parameters                              |                                  | Lead-Free Assembly      |
|----------------------------------------------------------|----------------------------------|-------------------------|
| Pre-heat                                                 | 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 ( $T_L$ ) 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 <sup>+0/-5</sup> °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              | $32 \pm 0.3$      | $1.260 \pm 0.012$       |
|                                                                                   | E              | $1.75 \pm 0.1$    | $0.069 \pm 0.004$       |
|                                                                                   | F              | $14.2 \pm 0.1$    | $0.559 \pm 0.004$       |
|                                                                                   | D <sub>0</sub> | $1.5 + 0.1 / 0.0$ | $0.059 + 0.004 / - 0.0$ |
|                                                                                   | P <sub>0</sub> | $4.0 \pm 0.1$     | $0.102 \pm 0.004$       |
|                                                                                   | P <sub>1</sub> | $20.0 \pm 0.1$    | $0.787 \pm 0.004$       |
|                                                                                   | P <sub>2</sub> | $2.0 \pm 0.1$     | $0.079 \pm 0.004$       |
|                                                                                   | A <sub>0</sub> | $14.5 \pm 0.1$    | $0.571 \pm 0.004$       |
|                                                                                   | B <sub>0</sub> | $18.5 \pm 0.1$    | $0.728 \pm 0.004$       |
|                                                                                   | T              | 0.40              | 0.016                   |
|                                                                                   | T <sub>1</sub> | 7.8               | 0.029                   |

|                                                                                     | Symbol         | Millimeters            | Inches              |
|-------------------------------------------------------------------------------------|----------------|------------------------|---------------------|
|  | D              | $\Phi 13.0$            | $\Phi 330.0$        |
|                                                                                     | D <sub>1</sub> | $\Phi 0.520 \pm 0.008$ | $\Phi 13.2 \pm 0.2$ |
|                                                                                     | W <sub>1</sub> | $1.417 \pm 0.079$      | $36.0 \pm 2.0$      |

| Part Number    | Weight | Packaging Option             | QTY' s       |
|----------------|--------|------------------------------|--------------|
| SPC10-XXXXC    | 4.33 g | Tape & Reel – 32 mm/13" tape | 400 PCS      |
| SPC10-XXXXC-TP | 4.33 g | Tube Pack                    | 25 PCS /Tube |



# 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.