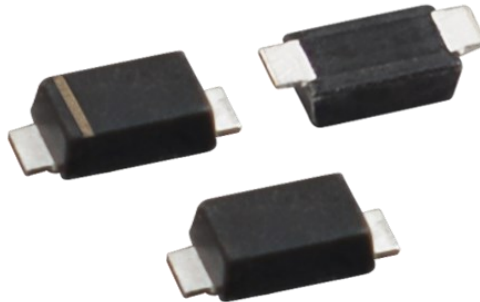


# TVS Diodes

Transient Voltage Suppression Diodes

P4SMF Series



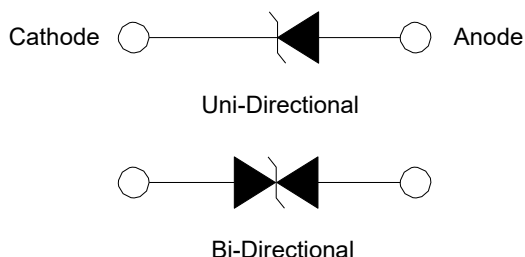
## Description

The P4SMF series is designed specifically to protect sensitive electronic equipment from voltage transients induced by lightning and other transient voltage events. P4SMF package is 50% smaller in footprint when compare to SMA package and delivering one of the low height profiles (1.2 mm) in the industry.

## Applications

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

## Functional Diagram



## Features

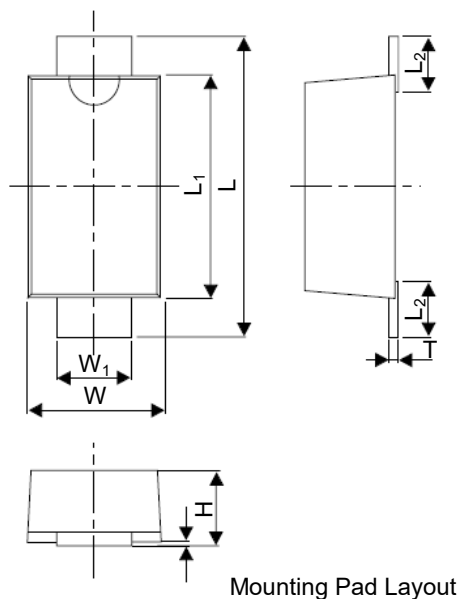
- 400 W peak pulse capability at 10/1000  $\mu$ s waveform, repetition rate (duty cycles):0.01%
- Compatible with industrial standard package SOD-123FL
- Low profile: maximum height of 1.2 mm.
- Low inductance, excellent clamping capability
- For surface mounted applications to optimize board space
- High temperature to reflow soldering guaranteed: 260°C / 30 sec
- 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
- EFT protection of data lines in accordance with IEC 61000 -4-4
- Fast response time: typically less than 1.0 ns from 0 Volts to  $V_{BR}$  min
- Built-in strain relief
- Plastic package is flammability rated V-0 per UL 94
- Meet MSL level1, per J-STD-020
- Matte tin lead-free plated
- Halogen-free and RoHS compliant
- Pb-free E3 means 2<sup>nd</sup> level interconnect is Pb-free and the terminal finish material is tin(Sn) (IPC/ JEDEC J-STD-609A.01)

# TVS Diodes

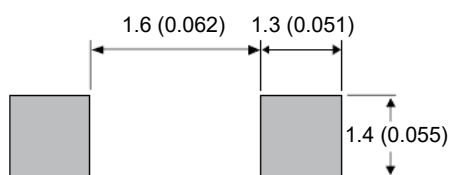
Transient Voltage Suppression Diodes

P4SMF Series

## Package Outline Dimensions (SOD-123FL)



| Symbol         | Millimeters |      | Inches |        |
|----------------|-------------|------|--------|--------|
|                | Min.        | Max. | Min.   | Max.   |
| L <sub>1</sub> | 2.50        | 2.90 | 0.0984 | 0.1140 |
| L              | 3.40        | 3.90 | 0.1339 | 0.1535 |
| W <sub>1</sub> | 0.70        | 1.20 | 0.0275 | 0.0472 |
| W              | 1.50        | 2.00 | 0.0591 | 0.0787 |
| L <sub>2</sub> | 0.35        | 0.90 | 0.0138 | 0.0354 |
| T              | 0.05        | 0.26 | 0.0020 | 0.0102 |
| H              | 0.90        | 1.40 | 0.0354 | 0.0550 |



SOD-123FL

## Maximum Ratings and Characteristics

(T<sub>A</sub> = 25 °C unless otherwise specified.)

| Parameter                                                                           | Symbol                            | Value       | Unit   |
|-------------------------------------------------------------------------------------|-----------------------------------|-------------|--------|
| Peak Pulse Power Dissipation at T <sub>A</sub> =25 °C , 10/1000 μs current waveform | P <sub>PPM</sub>                  | 400         | W      |
| Power Dissipation On Infinite Heat Sink at T <sub>L</sub> =50 °C                    | P <sub>D</sub>                    | 1           | W      |
| Thermal Resistance Junction- to- Ambient                                            | R <sub>θJA</sub>                  | 220         | °C / W |
| Thermal Resistance Junction- to- Lead                                               | R <sub>θJL</sub>                  | 100         | °C / W |
| Operating Junction and Storage Temperature Range                                    | T <sub>J</sub> , T <sub>STG</sub> | -55 to +150 | °C     |

### Notes

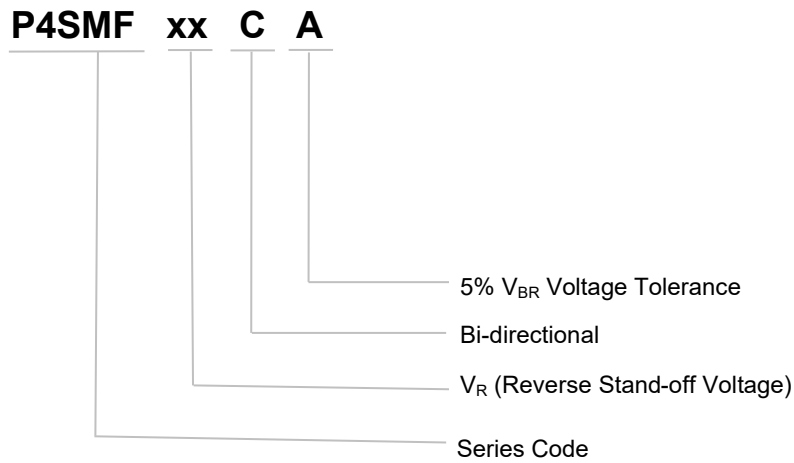
1. Non-repetitive current pulse, per Fig. 4 and derated above T<sub>J</sub>(initial)=25 °C per Fig. 3.

# TVS Diodes

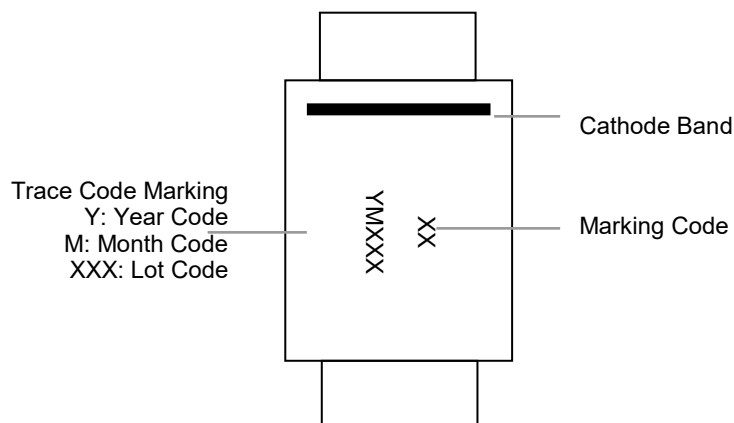
Transient Voltage Suppression Diodes

**P4SMF Series**

## Part Numbering System



## Marking



# TVS Diodes

Transient Voltage Suppression Diodes

P4SMF Series

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

| Part Number |            | Device Marking Code |    | Breakdown Voltage V <sub>BR</sub> @I <sub>T</sub> |       | Test Current I <sub>T</sub> | Reverse Stand-off Voltage V <sub>R</sub> | Max. Reverse Leakage I <sub>R</sub> @V <sub>R</sub> | Max. Peak Pulse Current I <sub>PPM</sub> | Max. Clamping Voltage V <sub>C</sub> @I <sub>PPM</sub> |
|-------------|------------|---------------------|----|---------------------------------------------------|-------|-----------------------------|------------------------------------------|-----------------------------------------------------|------------------------------------------|--------------------------------------------------------|
|             |            |                     |    | Min                                               | Max   |                             |                                          |                                                     |                                          |                                                        |
| Uni         | Bi         | Uni                 | Bi | (V)                                               |       | (mA)                        | (V)                                      | (μA)                                                | (A)                                      | (V)                                                    |
| P4SMF5.0A   | -          | KE                  | -  | 6.40                                              | 7.00  | 10                          | 5.00                                     | 300.00                                              | 43.50                                    | 9.20                                                   |
| P4SMF6.0A   | -          | KG                  | -  | 6.67                                              | 7.37  | 10                          | 6.00                                     | 300.00                                              | 38.80                                    | 10.30                                                  |
| P4SMF6.5A   | -          | KK                  | -  | 7.22                                              | 7.98  | 10                          | 6.50                                     | 200.00                                              | 35.70                                    | 11.20                                                  |
| P4SMF7.0A   | -          | KM                  | -  | 7.78                                              | 8.60  | 10                          | 7.00                                     | 100.00                                              | 33.30                                    | 12.00                                                  |
| P4SMF7.5A   | -          | KP                  | -  | 8.33                                              | 9.21  | 1                           | 7.50                                     | 50.00                                               | 31.00                                    | 12.90                                                  |
| P4SMF8.0A   | -          | KR                  | -  | 8.89                                              | 9.83  | 1                           | 8.00                                     | 20.00                                               | 29.40                                    | 13.60                                                  |
| P4SMF8.5A   | -          | KT                  | -  | 9.44                                              | 10.40 | 1                           | 8.50                                     | 10.00                                               | 27.80                                    | 14.40                                                  |
| P4SMF9.0A   | P4SMF9.0CA | KV                  | AV | 10.00                                             | 11.10 | 1                           | 9.00                                     | 2.00                                                | 26.00                                    | 15.40                                                  |
| P4SMF10A    | P4SMF10CA  | KX                  | AX | 11.10                                             | 12.30 | 1                           | 10.00                                    | 2.00                                                | 23.50                                    | 17.00                                                  |
| P4SMF11A    | P4SMF11CA  | KZ                  | AZ | 12.20                                             | 13.50 | 1                           | 11.00                                    | 2.00                                                | 22.00                                    | 18.20                                                  |
| P4SMF12A    | P4SMF12CA  | LE                  | BE | 13.30                                             | 14.70 | 1                           | 12.00                                    | 2.00                                                | 20.10                                    | 19.90                                                  |
| P4SMF13A    | P4SMF13CA  | LG                  | BG | 14.40                                             | 15.90 | 1                           | 13.00                                    | 1.00                                                | 18.60                                    | 21.50                                                  |
| P4SMF14A    | P4SMF14CA  | LK                  | BK | 15.60                                             | 17.20 | 1                           | 14.00                                    | 1.00                                                | 17.20                                    | 23.20                                                  |
| P4SMF15A    | P4SMF15CA  | LM                  | BM | 16.70                                             | 18.50 | 1                           | 15.00                                    | 1.00                                                | 16.40                                    | 24.40                                                  |
| P4SMF16A    | P4SMF16CA  | LP                  | BP | 17.80                                             | 19.70 | 1                           | 16.00                                    | 1.00                                                | 15.40                                    | 26.00                                                  |
| P4SMF17A    | P4SMF17CA  | LR                  | BR | 18.90                                             | 20.90 | 1                           | 17.00                                    | 1.00                                                | 14.50                                    | 27.60                                                  |
| P4SMF18A    | P4SMF18CA  | LT                  | BT | 20.00                                             | 22.10 | 1                           | 18.00                                    | 1.00                                                | 13.70                                    | 29.20                                                  |
| P4SMF20A    | P4SMF20CA  | LV                  | BV | 22.20                                             | 24.50 | 1                           | 20.00                                    | 1.00                                                | 12.30                                    | 32.40                                                  |
| P4SMF22A    | P4SMF22CA  | LX                  | BX | 24.40                                             | 26.90 | 1                           | 22.00                                    | 1.00                                                | 11.30                                    | 35.50                                                  |
| P4SMF24A    | P4SMF24CA  | LZ                  | BZ | 26.70                                             | 29.50 | 1                           | 24.00                                    | 1.00                                                | 10.30                                    | 38.90                                                  |
| P4SMF26A    | P4SMF26CA  | ME                  | CE | 28.90                                             | 31.90 | 1                           | 26.00                                    | 1.00                                                | 9.50                                     | 42.10                                                  |
| P4SMF28A    | P4SMF28CA  | MG                  | CG | 31.10                                             | 34.40 | 1                           | 28.00                                    | 1.00                                                | 8.80                                     | 45.40                                                  |
| P4SMF30A    | P4SMF30CA  | MK                  | CK | 33.30                                             | 36.80 | 1                           | 30.00                                    | 1.00                                                | 8.30                                     | 48.40                                                  |
| P4SMF33A    | P4SMF33CA  | MM                  | CM | 36.70                                             | 40.60 | 1                           | 33.00                                    | 1.00                                                | 7.50                                     | 53.30                                                  |
| P4SMF36A    | P4SMF36CA  | MP                  | CP | 40.00                                             | 44.20 | 1                           | 36.00                                    | 1.00                                                | 6.90                                     | 58.10                                                  |

## TVS Diodes

Transient Voltage Suppression Diodes

P4SMF Series

| Part Number |           | Device Marking Code |    | Breakdown Voltage $V_{BR}@I_T$ |        | Test Current $I_T$ | Reverse Stand-off Voltage $V_R$ | Max. Reverse Leakage $I_R@V_R$ | Max. Peak Pulse Current $I_{PPM}$ | Max. Clamping Voltage $V_C@I_{PPM}$ |
|-------------|-----------|---------------------|----|--------------------------------|--------|--------------------|---------------------------------|--------------------------------|-----------------------------------|-------------------------------------|
|             |           |                     |    | Min                            | Max    |                    |                                 |                                |                                   |                                     |
| Uni         | Bi        | Uni                 | Bi | (V)                            |        | (mA)               | (V)                             | ( $\mu$ A)                     | (A)                               | (V)                                 |
| P4SMF40A    | P4SMF40CA | MR                  | CR | 44.40                          | 49.10  | 1                  | 40.00                           | 1.00                           | 6.20                              | 64.50                               |
| P4SMF43A    | P4SMF43CA | MT                  | CT | 47.80                          | 52.80  | 1                  | 43.00                           | 1.00                           | 5.80                              | 69.40                               |
| P4SMF45A    | P4SMF45CA | MV                  | CV | 50.00                          | 55.30  | 1                  | 45.00                           | 1.00                           | 5.50                              | 72.70                               |
| P4SMF48A    | P4SMF48CA | MX                  | CX | 53.30                          | 58.90  | 1                  | 48.00                           | 1.00                           | 5.20                              | 77.40                               |
| P4SMF51A    | P4SMF51CA | MZ                  | CZ | 56.70                          | 62.70  | 1                  | 51.00                           | 1.00                           | 4.90                              | 82.40                               |
| P4SMF54A    | -         | NE                  | -  | 60.00                          | 66.30  | 1                  | 54.00                           | 1.00                           | 4.60                              | 87.10                               |
| P4SMF58A    | -         | NG                  | -  | 64.40                          | 71.20  | 1                  | 58.00                           | 1.00                           | 4.30                              | 93.60                               |
| P4SMF60A    | -         | NK                  | -  | 66.70                          | 73.70  | 1                  | 60.00                           | 1.00                           | 4.10                              | 96.80                               |
| P4SMF64A    | -         | NM                  | -  | 71.10                          | 78.60  | 1                  | 64.00                           | 1.00                           | 3.90                              | 103.00                              |
| P4SMF70A    | -         | NP                  | -  | 77.80                          | 86.00  | 1                  | 70.00                           | 1.00                           | 3.50                              | 113.00                              |
| P4SMF75A    | -         | NR                  | -  | 83.30                          | 92.10  | 1                  | 75.00                           | 1.00                           | 3.30                              | 121.00                              |
| P4SMF78A    | -         | NT                  | -  | 86.70                          | 95.80  | 1                  | 78.00                           | 1.00                           | 3.20                              | 126.00                              |
| P4SMF85A    | -         | NV                  | -  | 94.40                          | 104.00 | 1                  | 85.00                           | 1.00                           | 2.90                              | 137.00                              |

## Notes:

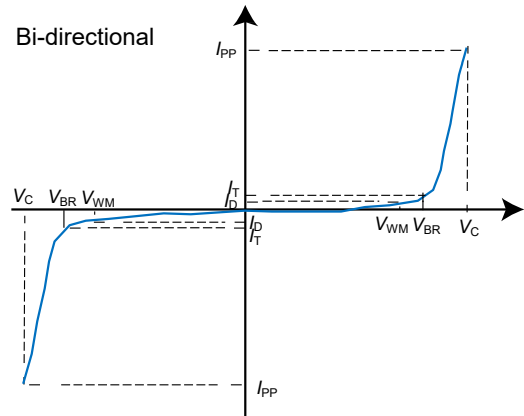
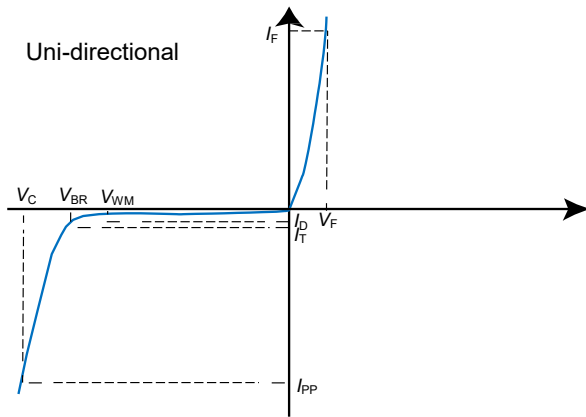
1.  $V_{BR}$  measured after  $I_T$  applied for 300  $\mu$ s,  $I_T$  = square wave pulse or equivalent.
2. Surge current waveform per 10/1000  $\mu$ s exponential wave and derated per Fig.2.
3. All terms and symbols are consistent with ANSI/IEEE C62.35.
4. For bidirectional type having  $V_R$  of 10 volts and less, the  $I_R$  should be doubled.

# TVS Diodes

Transient Voltage Suppression Diodes

P4SMF Series

## I-V Curve Characteristics



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

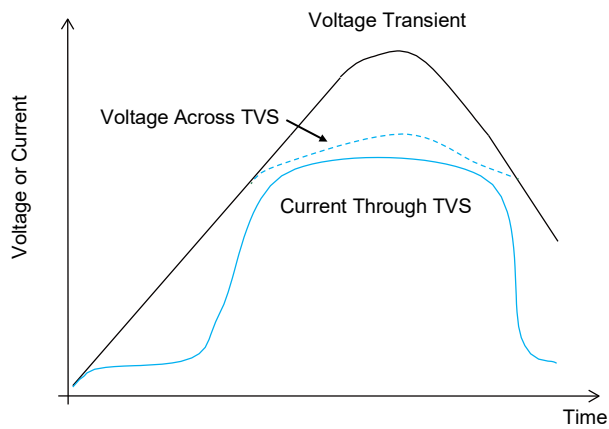


FIGURE 1 TVS Transients Clamping Waveform

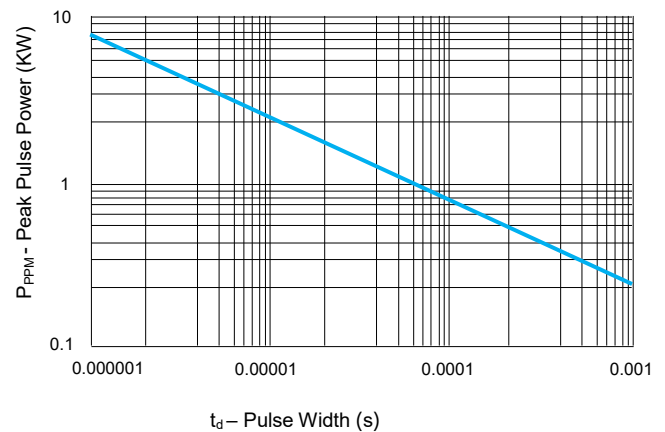


FIGURE 2 Peak Pulse Power Rating Curve

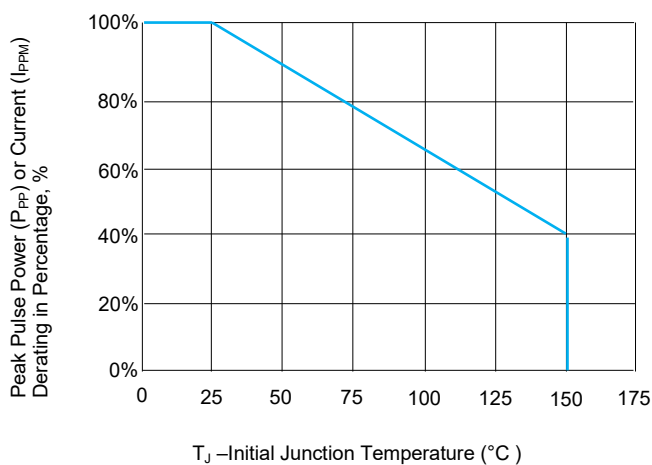


FIGURE 3 Peak Pulse Power Derating Curve

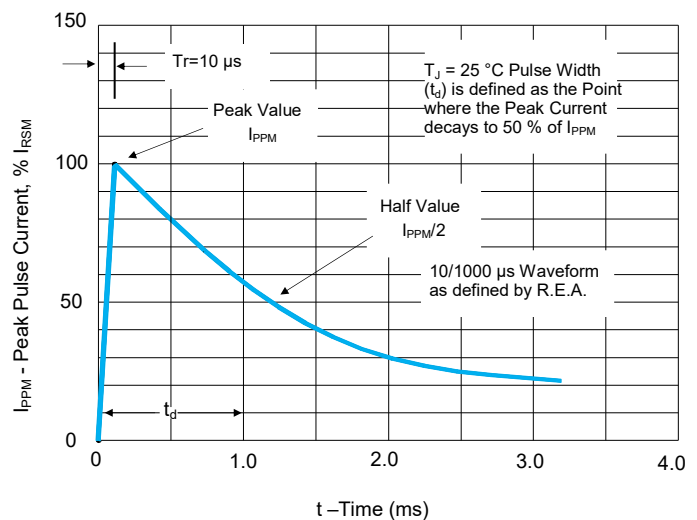


FIGURE 4 Pulse Waveform - 10/1000  $\mu\text{s}$

# TVS Diodes

Transient Voltage Suppression Diodes

P4SMF Series

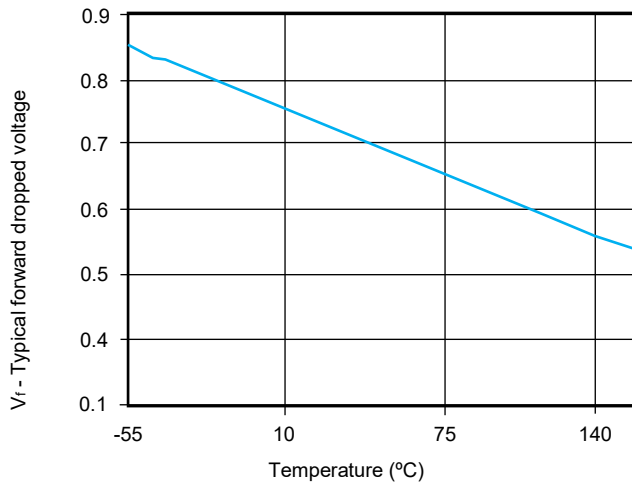


FIGURE 5 Forward Voltage

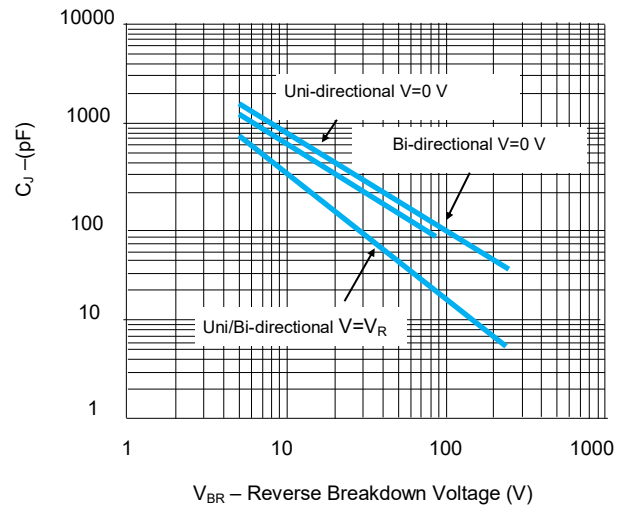


FIGURE 6 Typical Junction Capacitance

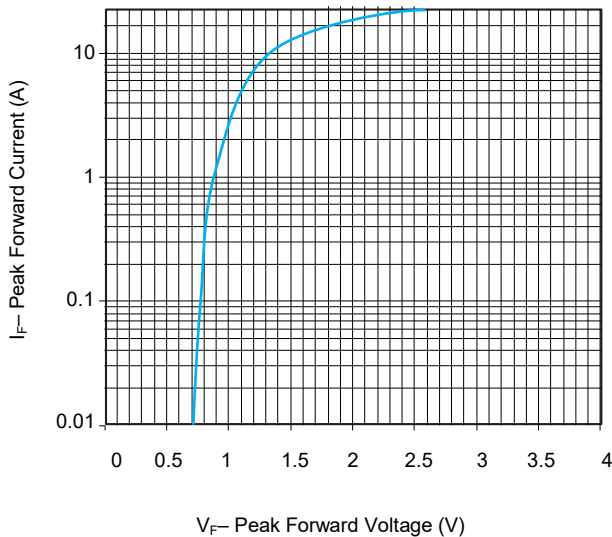


FIGURE 7 Peak Forward Drop vs Peak Forward Current (Typical Values)

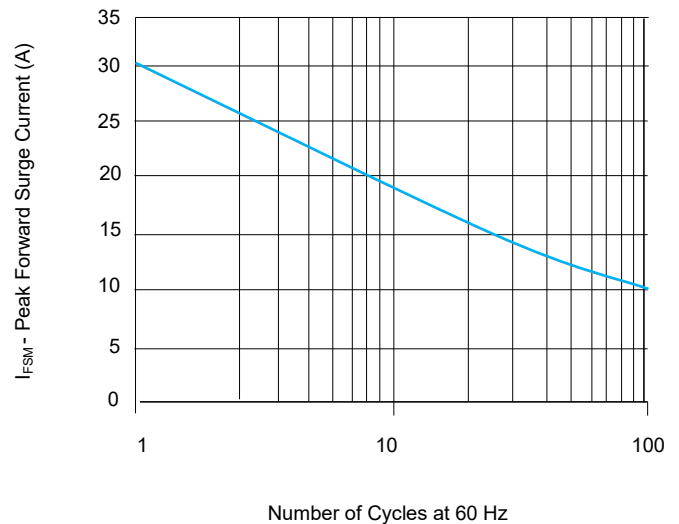


FIGURE 8 Maximum Non-Repetitive Forward Surge Current Uni-Directional only

## Environmental Specifications

|                     |                          |
|---------------------|--------------------------|
| High Temp. Storage  | JESD22-A103              |
| HTRB                | JESD22-A108              |
| Temperature Cycling | JESD22-A104              |
| MSL                 | JEDEC-J-STD-020, Level 1 |
| H3TRB               | JESD22-A101              |
| RSH                 | JESD22-A111              |

## Physical Specifications

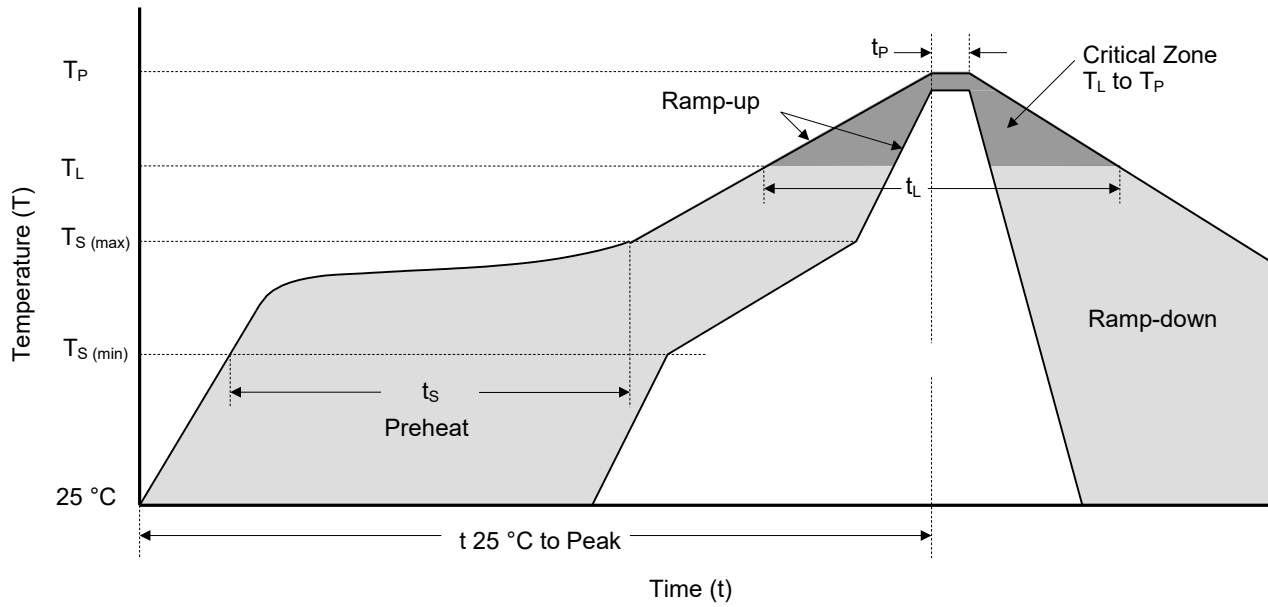
|          |                                                    |
|----------|----------------------------------------------------|
| Case     | SOD-123FL plastic over glass passivated junction   |
| Polarity | Color band denotes cathode except bipolar          |
| Terminal | Matte tin-plated leads, solderable per JESD22-B102 |

# TVS Diodes

Transient Voltage Suppression Diodes

P4SMF Series

## Soldering Parameters



Reflowing Condition

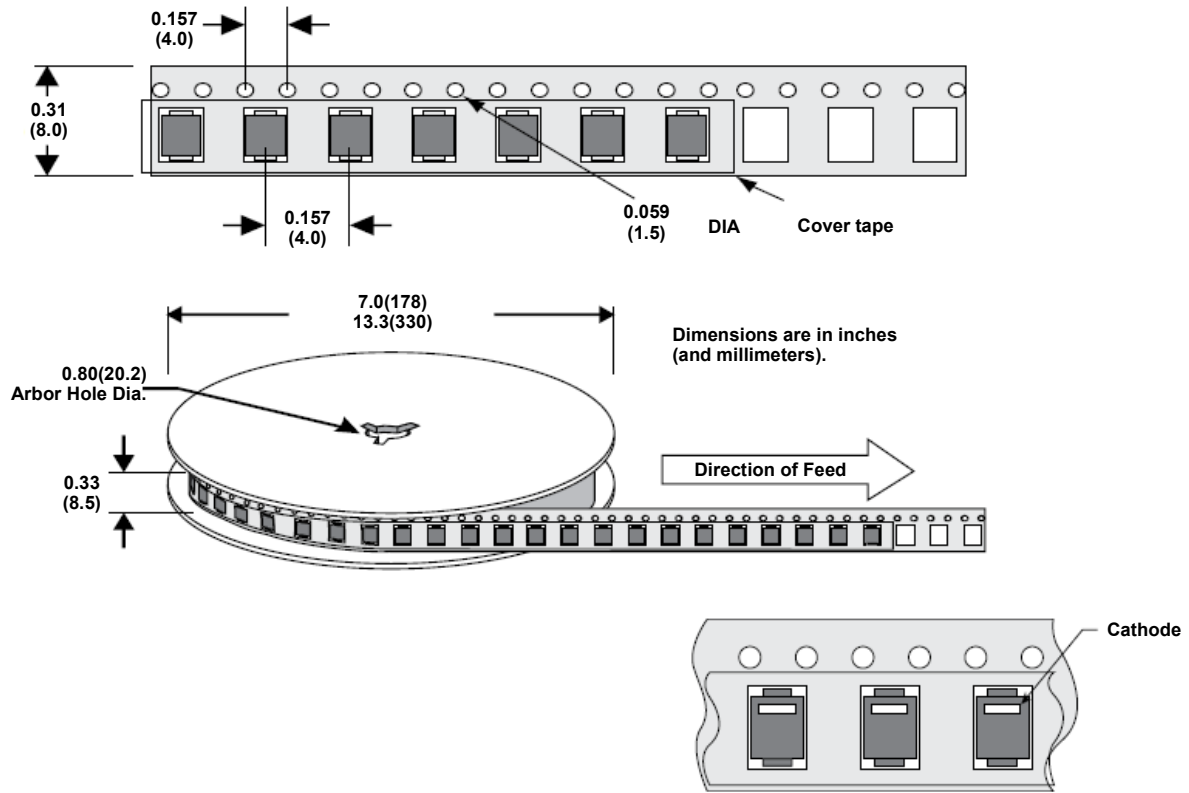
| Reflow Soldering Parameters                              |                                  | Lead-Free Assembly      |
|----------------------------------------------------------|----------------------------------|-------------------------|
| Pre-heat                                                 | 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                  |

# TVS Diodes

Transient Voltage Suppression Diodes

P4SMF Series

## Packaging Information



| Part Number | Package   | QTY' s (Reel) | Packaging Option                | Packaging Specification |
|-------------|-----------|---------------|---------------------------------|-------------------------|
| P4SMFXXX    | SOD-123FL | 3000 PCS      | Tape & Reel – 8 mm tape/7" reel | EIA RS-481              |

## TVS Diodes

Transient Voltage Suppression Diodes

P4SMF Series

## 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)



# 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.

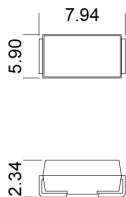
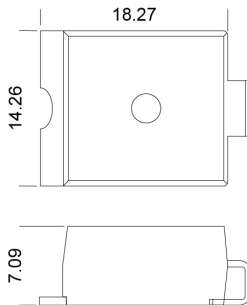
## Installation Mechanical Stress

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.

# P4SMF Series

# P4SMF Series

## Transient Voltage Suppressor ( Surface Mount ) Features Overview

| Package Type                                                                  | Series                                                                            |           |           |      |          |                                                                                     |      |         |         |
|-------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-----------|-----------|------|----------|-------------------------------------------------------------------------------------|------|---------|---------|
| DO-221AC                                                                      | ○                                                                                 | ○         | ○         | ○    | ○        | ○                                                                                   | ○    | ○       | ○       |
| DO-214AA                                                                      | ○                                                                                 | ○         | ○         | ○    | ○        | ○                                                                                   | ○    | ○       | ○       |
| DO-214AB                                                                      | SMCJ                                                                              | 1.5SMC    | 3.0SMCJ   | SMDJ | 5.0SMDJ  | ○                                                                                   | ○    | ○       | ○       |
| DO-214AC                                                                      | ○                                                                                 | ○         | ○         | ○    | ○        | ○                                                                                   | ○    | ○       | ○       |
| SOD-123FL                                                                     | ○                                                                                 | ○         | ○         | ○    | ○        | ○                                                                                   | ○    | ○       | ○       |
| SMT0-218                                                                      | ○                                                                                 | ○         | ○         | ○    | ○        | SPC1                                                                                | SPC3 | SPC6    | SPC10   |
| Product Outline<br>(mm)                                                       |  |           |           |      |          |  |      |         |         |
| $V_R / V_{WM}$ (V)<br>Reverse Stand-off Voltage                               | 5.0 ~ 440                                                                         | 5.8 ~ 512 | 5.0 ~ 440 |      | 12 ~ 170 | 380 / 430                                                                           | 66   | 58 ~ 76 | 58 ~ 86 |
| $P_{PPM}$ (W)<br>(10/1000 $\mu$ s)<br>Rated Peak ImPulse<br>Power Dissipation | 1500                                                                              |           | 3000      |      | 5000     | ○                                                                                   |      |         |         |
| $I_{PPM}$ (kA)(8/20 $\mu$ s)<br>Rated Peak ImPulse Current                    | ○                                                                                 |           |           |      |          | 1                                                                                   | 3    | 6       | 10      |
| Operating Temperature<br>(°C)                                                 | -55 to +150                                                                       |           |           |      |          | -55 to +125                                                                         |      |         |         |

## Transient Voltage Suppressor ( Axial Lead ) Features Overview

| Package Type                                                                   | Series                   |                          |                          |                          |                          |                          |                          |                          |                          |                          |                          |                          |                          |                          |                          |                          |
|--------------------------------------------------------------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
|                                                                                | DO-201                   | DO-41                    | DO-15                    | P600                     | Radial lead              |                          |                          |                          |                          |                          |                          |                          |                          |                          |                          |                          |
|                                                                                | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | 1.5KE                    | LCE                      | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
|                                                                                | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
|                                                                                | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
|                                                                                |                          |                          |                          |                          |                          |                          |                          |                          |                          |                          |                          |                          |                          |                          |                          |                          |
| Product Outline (mm)                                                           |                          |                          |                          |                          |                          |                          |                          |                          |                          |                          |                          |                          |                          |                          |                          |                          |
|                                                                                |                          |                          |                          |                          |                          |                          |                          |                          |                          |                          |                          |                          |                          |                          |                          |                          |
| $V_R / V_{WM} (V)$<br>Reverse Stand-off Voltage                                | 5.8 ~ 468                | 5.0 ~ 50                 | 5.8 ~ 512                | 5.8 ~ 512                | 6.5 ~ 90                 | 5.0 ~ 250                | 17 ~ 280                 | 20 ~ 300                 | 28 ~ 360                 | 76                       | 15 ~ 430                 | 30 ~ 430                 | 15 ~ 530                 | 58 ~ 380                 | 16 ~ 76                  |                          |
| $P_{PPM} (W)$<br>(10/1000 $\mu s$ )<br>Rated Peak ImPulse<br>Power Dissipation | 400                      | 500                      | 600                      | 1500                     | 5000                     | 15000                    | 20000                    | 30000                    |                          |                          |                          |                          |                          |                          |                          |                          |
| $I_{PPM} (kA)$ (8/20 $\mu s$ )<br>Rated Peak ImPulse Current                   |                          |                          |                          |                          |                          |                          |                          |                          |                          | 1                        | 3                        | 6                        | 10                       | 15                       | 20                       |                          |
| Operating Temperature (°C)                                                     | -55 to +150              |                          |                          |                          |                          |                          |                          |                          |                          | -55 to +125              |                          |                          |                          |                          |                          |                          |