

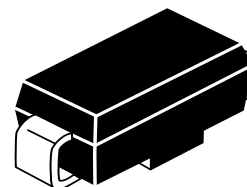
## Transient Suppressor Protection Device (TSPD) Bi-directional, Surface Mount > PxxxxTx Series

### Descriptions

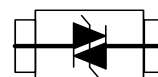
Boarden TSPDs are designed to help protect sensitive telecommunication equipments from over voltage events as lightning strikes, power contact and power induction per as Telcordia GR-1089 and ITU-T K.20(K21). A TSPD appears as a very high impedance device under normal operating conditions, but will change its impedance to short to divert current to ground under over voltage events. TSPDs have a very high power energy absorb capability and very fast response time, which helps this product very suitable to be applied to Central Office Equipments (CO) and Customer Premise Equipments (CPE) in telecommunication field.

### Features

- Excellent capability of absorbing transient surge
- Low Protection Voltage
- Low Leakage Current less than 2 $\mu$ A
- Bi-direction protection devices
- Quick response to surge voltage (ns level)
- Solid-state silicon technology
- RoHS compliant
- Meets MSL 1 Requirements
- IEC61000-4-2 (ESD)  $\pm$ 30kV (air),  $\pm$ 30kV (contact).



SMA  
(JEDEC DO-214AC)

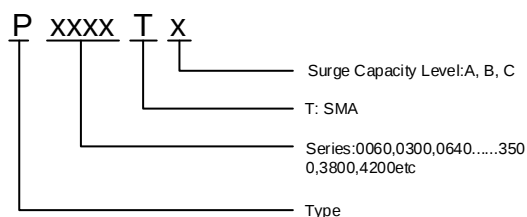


Circuit diagram

### Order Information

| Package | Qty per Box | Tape     |
|---------|-------------|----------|
| SMA     | 5000        | 13" Reel |

### Part Numbering System



### Thermal Characteristics

| Parameter                                        | Symbol                            | Value      | Unit |
|--------------------------------------------------|-----------------------------------|------------|------|
| Operating Junction and Storage Temperature Range | T <sub>J</sub> , T <sub>STG</sub> | -55 to 150 | °C   |
| Typical Thermal Resistance Junction to Lead      | R <sub>uJL</sub>                  | 20         | °C/W |
| Typical Thermal Resistance Junction to Ambient   | R <sub>uJA</sub>                  | 100        | °C/W |

### Surge Ratings

| Series | Peak Pulse Current - I <sub>pp</sub> (A) |              |               |                 | I <sub>TSM</sub><br>50/60Hz | di/dt      |
|--------|------------------------------------------|--------------|---------------|-----------------|-----------------------------|------------|
|        | 2/10 $\mu$ s                             | 8/20 $\mu$ s | 5/310 $\mu$ s | 10/1000 $\mu$ s | A min                       | A/ $\mu$ s |
| A      | 200                                      | 150          | 75            | 45              | 20                          | 500        |
| B      | 250                                      | 250          | 100           | 80              | 25                          | 500        |
| C      | 500                                      | 400          | 200           | 100             | 30                          | 500        |

**Electrical Characteristics (TA=25°C unless otherwise noted)**

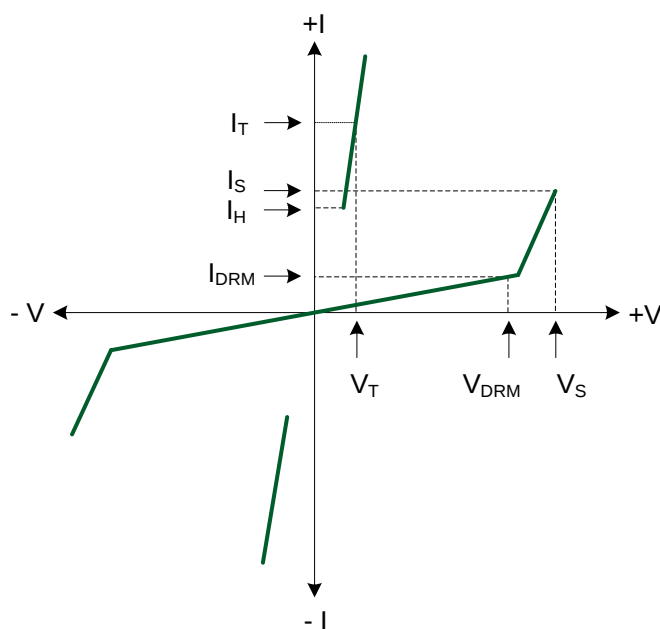
| Type Number | V <sub>DRM</sub><br>@I <sub>DRM</sub> =5μA | V <sub>S</sub><br>@100kV/s | I <sub>S</sub> | V <sub>T</sub><br>@I <sub>T</sub> =2.2A | I <sub>T</sub> | I <sub>H</sub> | C <sub>j</sub> |
|-------------|--------------------------------------------|----------------------------|----------------|-----------------------------------------|----------------|----------------|----------------|
|             | Max. (V)                                   | Max. (V)                   | Max. (mA)      | Max. (V)                                | Max. (A)       | Min. (mA)      | Typ. (pF)      |
| P0080TA     | 6                                          | 25                         | 800            | 4                                       | 2.2            | 20             | 60             |
| P0300TA     | 25                                         | 40                         | 800            | 4                                       | 2.2            | 25             | 60             |
| P0640TA     | 58                                         | 77                         | 800            | 4                                       | 2.2            | 120            | 60             |
| P0720TA     | 65                                         | 88                         | 800            | 4                                       | 2.2            | 120            | 60             |
| P0900TA     | 75                                         | 98                         | 800            | 4                                       | 2.2            | 120            | 50             |
| P1100TA     | 90                                         | 130                        | 800            | 4                                       | 2.2            | 120            | 50             |
| P1300TA     | 120                                        | 160                        | 800            | 4                                       | 2.2            | 120            | 50             |
| P1500TA     | 140                                        | 180                        | 800            | 4                                       | 2.2            | 120            | 45             |
| P1800TA     | 170                                        | 220                        | 800            | 4                                       | 2.2            | 120            | 45             |
| P2000TA     | 180                                        | 220                        | 800            | 4                                       | 2.2            | 120            | 45             |
| P2300TA     | 190                                        | 260                        | 800            | 4                                       | 2.2            | 120            | 45             |
| P2600TA     | 220                                        | 300                        | 800            | 4                                       | 2.2            | 120            | 43             |
| P3100TA     | 275                                        | 350                        | 800            | 4                                       | 2.2            | 120            | 40             |
| P3500TA     | 320                                        | 400                        | 800            | 4                                       | 2.2            | 120            | 35             |
| P3800TA     | 360                                        | 460                        | 800            | 4                                       | 2.2            | 120            | 30             |
| P4200TA     | 400                                        | 540                        | 800            | 4                                       | 2.2            | 120            | 30             |
| P0080TB     | 6                                          | 20                         | 800            | 4                                       | 2.2            | 25             | 70             |
| P0300TB     | 25                                         | 40                         | 800            | 4                                       | 2.2            | 35             | 80             |
| P0640TB     | 58                                         | 77                         | 800            | 4                                       | 2.2            | 120            | 65             |
| P0720TB     | 65                                         | 88                         | 800            | 4                                       | 2.2            | 120            | 65             |
| P0900TB     | 75                                         | 98                         | 800            | 4                                       | 2.2            | 120            | 65             |
| P1100TB     | 90                                         | 130                        | 800            | 4                                       | 2.2            | 120            | 65             |
| P1300TB     | 120                                        | 160                        | 800            | 4                                       | 2.2            | 120            | 65             |
| P1500TB     | 140                                        | 180                        | 800            | 4                                       | 2.2            | 120            | 65             |
| P1800TB     | 170                                        | 220                        | 800            | 4                                       | 2.2            | 120            | 60             |
| P2000TB     | 180                                        | 220                        | 800            | 4                                       | 2.2            | 120            | 60             |
| P2300TB     | 190                                        | 260                        | 800            | 4                                       | 2.2            | 120            | 60             |
| P2600TB     | 220                                        | 300                        | 800            | 4                                       | 2.2            | 120            | 55             |
| P3100TB     | 275                                        | 350                        | 800            | 4                                       | 2.2            | 120            | 50             |
| P3500TB     | 320                                        | 400                        | 800            | 4                                       | 2.2            | 120            | 50             |
| P3800TB     | 360                                        | 460                        | 800            | 4                                       | 2.2            | 120            | 50             |

**Electrical Characteristics (TA=25°C unless otherwise noted)**

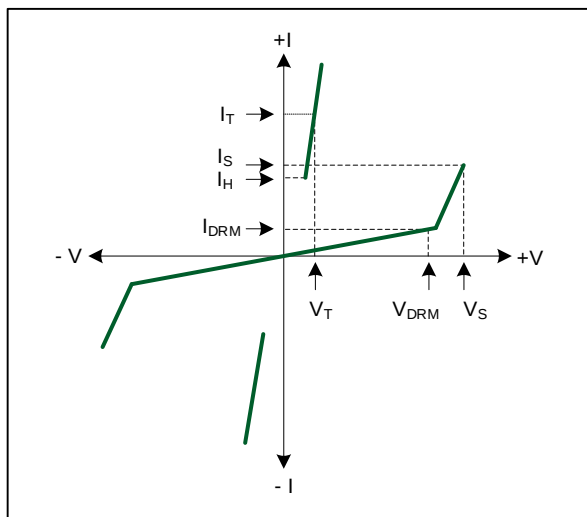
| Type Number | $V_{DRM}$<br>@ $I_{DRM}=5\mu A$ | $V_S$<br>@100kV/s | $I_S$     | $V_T$<br>@ $I_T=2.2A$ | $I_T$    | $I_H$     | $C_j$     |
|-------------|---------------------------------|-------------------|-----------|-----------------------|----------|-----------|-----------|
|             | Max. (V)                        | Max. (V)          | Max. (mA) | Max. (V)              | Max. (A) | Min. (mA) | Typ. (pF) |
| P4200TB     | 400                             | 540               | 800       | 4                     | 2.2      | 120       | 45        |
| P0080TC     | 6                               | 20                | 800       | 4                     | 2.2      | 25        | 80        |
| P0300TC     | 25                              | 40                | 800       | 4                     | 2.2      | 45        | 80        |
| P0640TC     | 58                              | 77                | 800       | 4                     | 2.2      | 120       | 65        |
| P0720TC     | 65                              | 88                | 800       | 4                     | 2.2      | 120       | 65        |
| P0900TC     | 75                              | 98                | 800       | 4                     | 2.2      | 120       | 65        |
| P1100TC     | 90                              | 130               | 800       | 4                     | 2.2      | 120       | 65        |
| P1300TC     | 120                             | 160               | 800       | 4                     | 2.2      | 120       | 65        |
| P1500TC     | 140                             | 180               | 800       | 4                     | 2.2      | 120       | 65        |
| P1800TC     | 170                             | 220               | 800       | 4                     | 2.2      | 120       | 60        |
| P2000TC     | 180                             | 220               | 800       | 4                     | 2.2      | 120       | 60        |
| P2300TC     | 190                             | 260               | 800       | 4                     | 2.2      | 120       | 60        |
| P2600TC     | 220                             | 300               | 800       | 4                     | 2.2      | 120       | 55        |
| P3100TC     | 275                             | 350               | 800       | 4                     | 2.2      | 120       | 50        |
| P3500TC     | 320                             | 400               | 800       | 4                     | 2.2      | 120       | 50        |
| P3800TC     | 360                             | 460               | 800       | 4                     | 2.2      | 120       | 50        |
| P4200TC     | 400                             | 540               | 800       | 4                     | 2.2      | 120       | 45        |

**I-V Curve Characteristics**

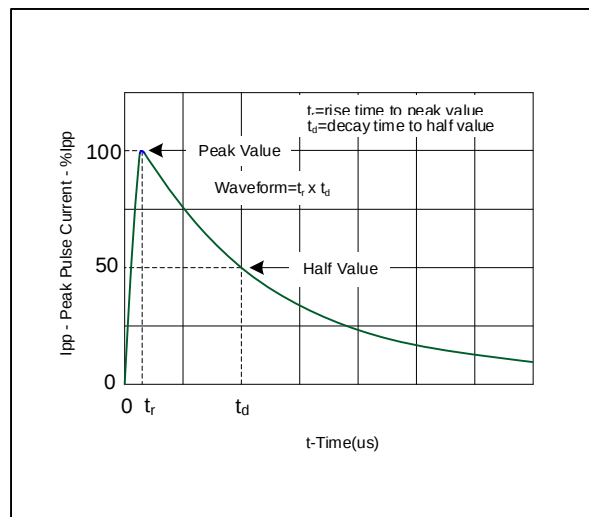
| Parameter | Definition                          |
|-----------|-------------------------------------|
| $C_j$     | Off-state Capacitance               |
| $I_S$     | Switching Current                   |
| $I_{DRM}$ | Leakage Current                     |
| $I_H$     | Holding Current                     |
| $I_{PP}$  | Peak Pulse Current                  |
| $I_T$     | On-state Current                    |
| $I_{TSM}$ | Non-repetitive Peak Impulse Current |
| $V_S$     | Repetitive Peak Off-state Current   |
| $V_{DRM}$ | Repetitive Peak Off-state Voltage   |
| $V_T$     | On-state Voltage                    |



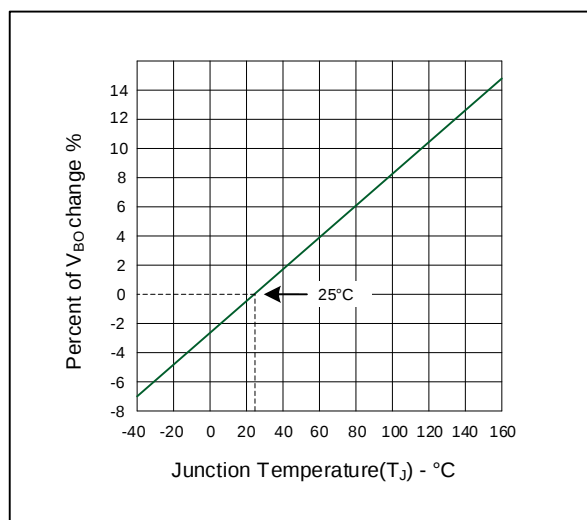
## Typical Electrical Characters Applications



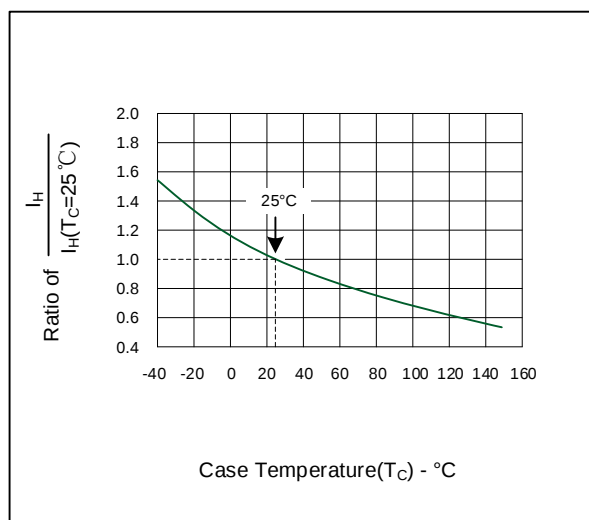
**V - I Characteristics**



**Tr x td Pulse Waveform**



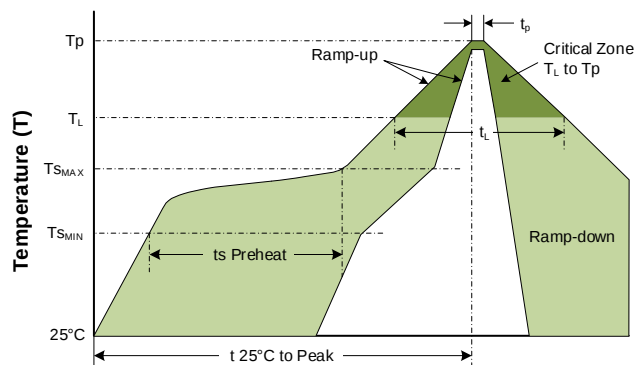
**Normalized  $V_S$  Change versus Junction Temperature**



**Normalized DC Holding current versus Case Temperature**

## Soldering Parameters

| Profile Feature                                                                                                         | Lead-Free Assembly                 |
|-------------------------------------------------------------------------------------------------------------------------|------------------------------------|
| Average Ramp-up Rate ( $T_{S_{MAX}}$ to $T_p$ )<br>Average Ramp-down Rate ( $T_p$ to $T_L$ )                            | 3°C/second max.<br>6°C/second max. |
| <b>Preheat</b><br>• Temperature Min ( $T_{S_{MIN}}$ )<br>• Temperature Max ( $T_{S_{MAX}}$ )<br>• Time ( $t_s$ Preheat) | 150°C<br>200°C<br>60-180 seconds   |
| <b>Time maintained above:</b><br>• Temperature ( $T_L$ )<br>• Time ( $t_L$ )                                            | 217°C<br>60-150 seconds            |
| <b>Peak/Classification Temperature</b><br>• Temperature ( $T_p$ )                                                       | 260 <sup>+0/-5</sup> °C            |
| <b>Time within 5°C of actual Peak</b><br>Time ( $t_p$ )                                                                 | 20-40 seconds                      |
| <b>Time 25°C to peak Temperature</b>                                                                                    | 8 minutes max                      |
| <b>Do not exceed</b>                                                                                                    | 280 °C                             |

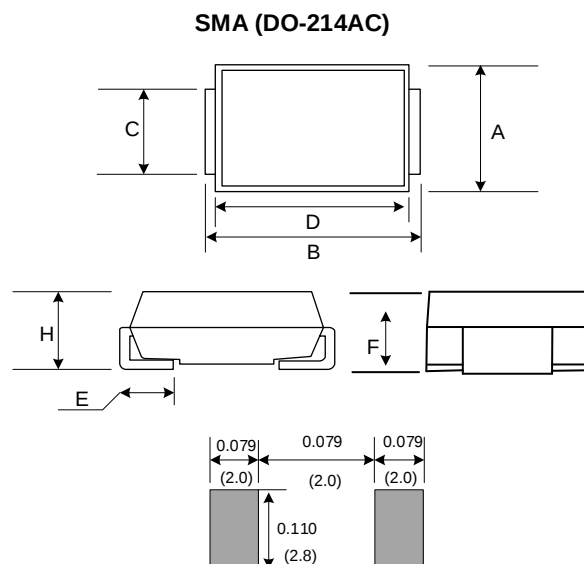


## Flow/Wave Soldering (Solder Dipping)

|                           |            |
|---------------------------|------------|
| <b>Peak Temperature :</b> | 265 °C     |
| <b>Dipping Time :</b>     | 10 seconds |
| <b>Soldering :</b>        | 1 time     |

## Product Dimensions

| Dimension | Inches |       | Millimeters |       |
|-----------|--------|-------|-------------|-------|
|           | MIN    | MAX   | MIN         | MAX   |
| A         | 0.098  | 0.114 | 2.50        | 2.90  |
| B         | 0.188  | 0.208 | 4.80        | 5.28  |
| C         | 0.055  | 0.062 | 1.40        | 1.60  |
| D         | 0.157  | 0.181 | 4.00        | 4.60  |
| E         | 0.030  | 0.060 | 0.76        | 1.52  |
| F         | 0.078  | 0.096 | 2.00        | 2.44  |
| H         | 0.080  | 0.104 | 2.051       | 2.643 |



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