

# Thyristor Surge Suppressors (TSS)

**P0080SC - P5000SC Series - DO-214AA(SMB)**

**@10/700 $\mu$ S, 6KV**

## Description

P0080SC - P5000SC Series are designed to protect broadband equipment such as modems, line card, CPE and DSL from damaging over-voltage transients.

The series provides a surface mount solution that enables equipment to comply with global regulatory standards.

## Features and Benefits

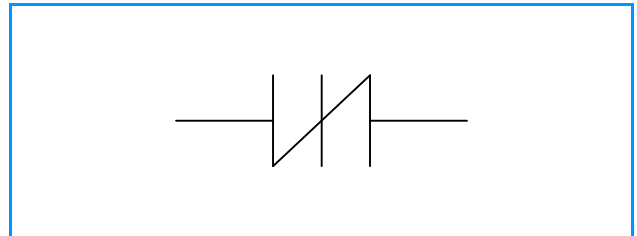
- u Low voltage overshoot
- u Low on-state voltage
- u Does not degrade surge capability after multiple surge events within limit
- u Fails short circuit when surged in excess of ratings
- u Low Capacitance

## Applicable Global Standards

- u TIA-968-A
- u ITU K.20/21 Enhanced level
- u ITU K.20/21 Basic Level
- u GR 1089 Inter building
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- u IEC 6100-4-5
- u YD/T 1082
- u YD/T 993
- u YD/T 950

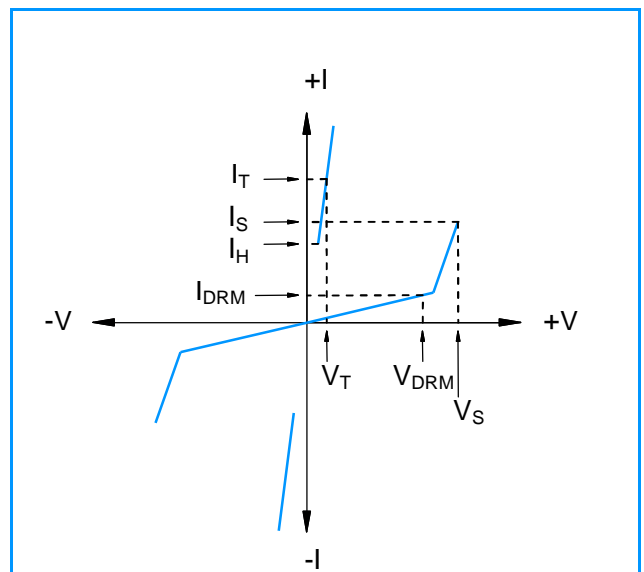


## Schematic Symbol



## Electrical Parameters

| Parameter | Definition  |
|-----------|---|
| $I_S$     | <b>Switching Current</b> - maximum current required to switch to on state                       |
| $I_{DRM}$ | <b>Leakage Current</b> - maximum peak off-state current measured at $V_{DRM}$                   |
| $I_H$     | <b>Holding Current</b> - minimum current required to maintain on state                          |
| $I_T$     | <b>On-state Current</b> - maximum rated continuous on-state current                             |
| $V_S$     | <b>Switching Voltage</b> - maximum voltage prior to switching to on stat                        |
| $V_{DRM}$ | <b>Peak Off-state Voltage</b> - maximum voltage that can be applied while maintaining off state |
| $V_T$     | <b>On-state Voltage</b> - maximum voltage measured at rated on-state current                    |
| $C_0$     | <b>Off-state Capacitance</b> - typical capacitance measured in off state                        |



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### Electrical Characteristics

| Part Number | Marking | $V_{DRM}$<br>@ $I_{DRM}=5\mu A$ | $V_S$<br>@100V/ $\mu S$ | $V_T$<br>@ $I_T=2.2A$ | $I_S$  | $I_T$ | $I_H$  | $C_0$<br>@1MHz |        |
|-------------|---------|---------------------------------|-------------------------|-----------------------|--------|-------|--------|----------------|--------|
|             |         | V min                           | V max                   | V max                 | mA max | A max | mA min | pF min         | pF max |
| P0080SC     | P008C   | 6                               | 25                      | 4                     | 800    | 2.2   | 50     | 25             | 150    |
| P0300SC     | P03C    | 25                              | 40                      | 4                     | 800    | 2.2   | 50     | 15             | 140    |
| P0640SC     | P06C    | 58                              | 77                      | 4                     | 800    | 2.2   | 150    | 40             | 60     |
| P0720SC     | P07C    | 65                              | 88                      | 4                     | 800    | 2.2   | 150    | 35             | 60     |
| P0900SC     | P09C    | 75                              | 98                      | 4                     | 800    | 2.2   | 150    | 25             | 55     |
| P1100SC     | P11C    | 90                              | 130                     | 4                     | 800    | 2.2   | 150    | 30             | 50     |
| P1300SC     | P13C    | 120                             | 160                     | 4                     | 800    | 2.2   | 150    | 25             | 45     |
| P1500SC     | P15C    | 140                             | 180                     | 4                     | 800    | 2.2   | 150    | 25             | 40     |
| P1800SC     | P18C    | 170                             | 220                     | 4                     | 800    | 2.2   | 150    | 25             | 35     |
| P2000SC     | P20C    | 180                             | 220                     | 4                     | 800    | 2.2   | 150    | 20             | 35     |
| P2300SC     | P23C    | 190                             | 260                     | 4                     | 800    | 2.2   | 150    | 25             | 35     |
| P2600SC     | P26C    | 220                             | 300                     | 4                     | 800    | 2.2   | 150    | 20             | 35     |
| P3100SC     | P31C    | 275                             | 350                     | 4                     | 800    | 2.2   | 150    | 20             | 35     |
| P3500SC     | P35C    | 320                             | 400                     | 4                     | 800    | 2.2   | 150    | 20             | 35     |
| P4000SC     | P40C    | 360                             | 460                     | 4                     | 800    | 2.2   | 150    | 20             | 35     |
| P4500SC     | P45C    | 400                             | 540                     | 4                     | 800    | 2.2   | 150    | 20             | 35     |
| P5000SC     | P50C    | 440                             | 600                     | 4                     | 800    | 2.2   | 150    | 20             | 35     |

**Notes:**

- Absolute maximum ratings measured at  $T_A=25^\circ C$  (unless otherwise noted).
- Devices are bi-directional.

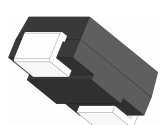
### Surge Ratings

| Series | $2/10\mu S^1$ | $8/20\mu S^1$   | $10/160\mu S^1$ | $10/560\mu S^1$ | $10/1000\mu S^1$ | $5/310\mu S^1$  | $I_{TSM}$<br>50/60 Hz | di/dt             |
|--------|---------------|-----------------|-----------------|-----------------|------------------|-----------------|-----------------------|-------------------|
|        | $2/10\mu S^2$ | $1.2/50\mu S^2$ | $10/160\mu S^2$ | $10/560\mu S^2$ | $10/1000\mu S^2$ | $10/700\mu S^2$ |                       |                   |
|        | A min         | A min           | A min           | A min           | A min            | A min           | A min                 | Amps/ $\mu s$ max |
| C      | 500           | 400             | 200             | 150             | 100              | 150             | 50                    | 500               |

**Notes:**

- Current waveform in  $\mu s$
  - Voltage waveform in  $\mu s$
- Peak pulse current rating ( $I_{PP}$ ) is repetitive and guaranteed for the life of the product.
  - $I_{PP}$  ratings applicable over temperature range of  $-40^\circ C$  to  $+85^\circ C$
  - The device must initially be in thermal equilibrium with  $-40^\circ C < T_J < +150^\circ C$

### Thermal Considerations

| Package   | Symbol          | Parameter                               | Value         | Unit         |
|---|-----------------|---|---------------|--------------|
| DO-214AA<br> | $T_J$           | Operating Junction Temperature Range    | - 40 to + 150 | $^\circ C$   |
|   | $T_S$           | Storage Temperature Range               | - 40 to +150  | $^\circ C$   |
|   | $R_{\theta JA}$ | Thermal Resistance: Junction to Ambient | 90            | $^\circ C/W$ |

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## Characteristic Curves

Figure 1 - V-I Characteristics

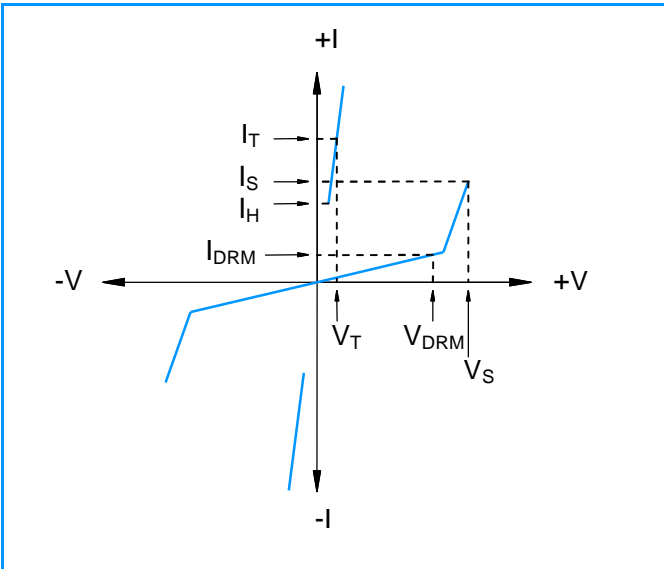


Figure 2 -  $t_r \times t_d$  Pulse Waveform

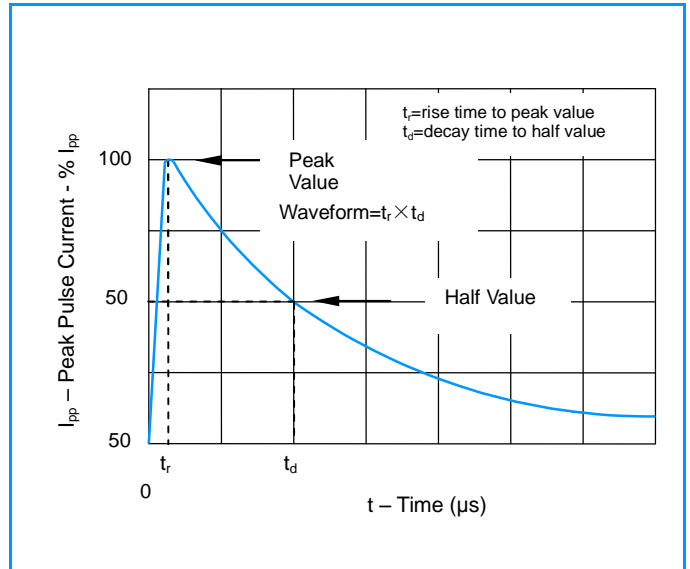


Figure 3 - Normalized  $V_s$  Change Versus Junction Temperature

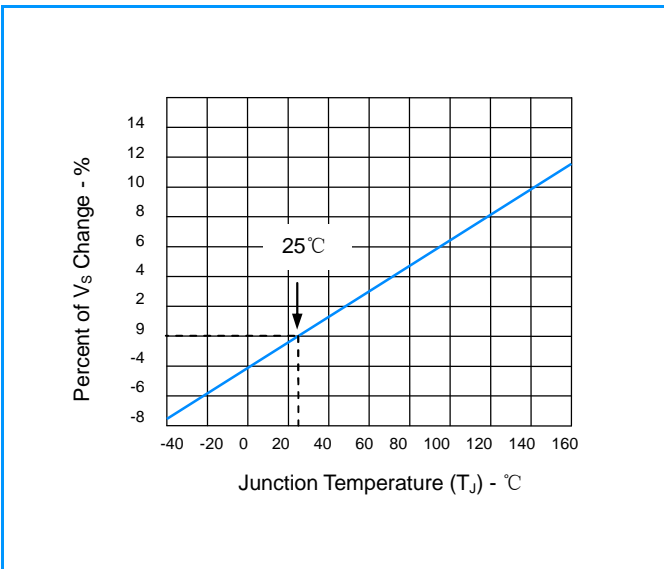
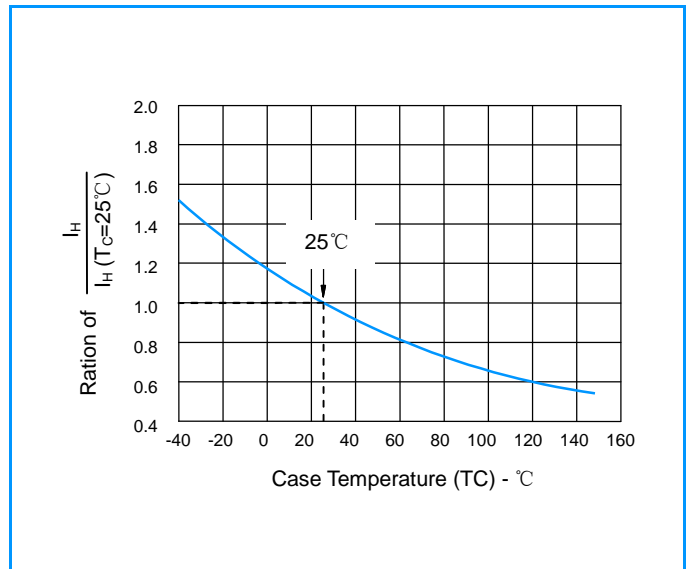


Figure 4 - Normalized DC Holding Current Versus Case Temperature



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## Environmental Specifications

|   |   |
|---|---|
| <b>High Temp Voltage Blocking</b>       | 80% Rated VDRM (VAC Peak ) +125°C or +150°C, Lead Material Copper Alloy High Temp Voltage Blocking 504 or 1008 hrs. MIL-STD-750 (Method 1040) JEDEC, JESD22-A-101 |
| <b>Temp Cycling</b>                     | -65°C to +150°C, 15 min. dwell, 10 up to 100 cycles. MIL-STD-750 (Method 1051) EIA/JEDEC, JESD22-A104   |
| <b>Biased Temp &amp; Humidity</b>       | 52 VDC (+85°C) 85%RH, 504 up to 1008 hrs. EIA/JEDEC, JESD22-A-101   |
| <b>High Temp Storage</b>                | +150°C 1008 hrs. MIL-STD-750 (Method 1031) JEDEC, JESD22-A-101  |
| <b>Low Temp Storage</b>                 | -65°C, 1008 hrs.  |
| <b>Thermal Shock</b>                    | 0°C to +100°C, 5 min. dwell, 10 sec. transfer, Thermal Shock 10 cycles. MIL-STD-750 (Method 1056) JEDEC, JESD22-A-106   |
| <b>Autoclave (Pressure Cooker Test)</b> | +121°C, 100%RH, 2atm, 24 up to 168 hrs. EIA/Cooker Test) JEDEC, JESD22-A-102  |
| <b>Resistance to Solder Heat</b>        | +260°C, 30 secs. MIL-STD-750 (Method 2031   |
| <b>Moisture Sensitivity Level</b>       | 85%RH, +85°C, 168 hrs., 3 reflow cycles Level (+260°C Peak). JEDEC-J-STD-020, Level 1   |

## Physical Specifications

|                        |   |
|------------------------|---|
| <b>Lead Material</b>   | Copper Alloy  |
| <b>Terminal Finish</b> | 100% Matte-Tin Plated   |
| <b>Body Material</b>   | UL recognized epoxy meeting flammability classification 94V-0 |

## Soldering Parameters

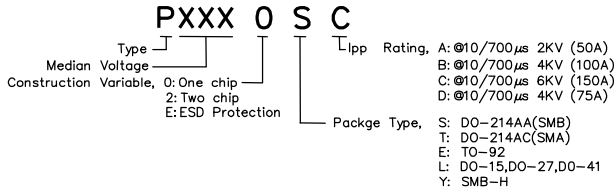


|   |                                    |                    |
|---|------------------------------------|--------------------|
| <b>Reflow Condition</b>   |                                    | Lead-free assembly |
| <b>Pre Heat</b>   | -Temperature Min ( $T_{S(min)}$ )  | +150°C             |
|   | -Temperature Max ( $T_{S(max)}$ )  | +200°C             |
|   | -Time (min to max) ( $t_s$ )       | 60 -180 Seconds    |
| <b>Average ramp up rate ( Liquidus Temp <math>T_L</math> to peak)</b> |                                    | 3°C/Second Max     |
| <b><math>T_{S(max)}</math> to <math>T_L</math> - Ramp-up Rate</b>     |                                    | 3°C/Second Max     |
| <b>Reflow</b>   | - Temperature ( $T_L$ ) (Liquidus) | +217°C             |
|   | - Time (min to max) ( $t_s$ )      | 60 -150 Seconds    |
| <b>Peak Temperature (<math>T_P</math>)</b>                            |                                    | 260 +0/-5°C        |
| <b>Time within 5°C of actual peak Temperature (<math>t_p</math>)</b>  |                                    | 30 Seconds Max     |
| <b>Ramp-down Rate</b>   |                                    | 6°C/Second Max     |
| <b>Time 25°C to peak Temperature (<math>T_P</math>)</b>               |                                    | 8 minutes Max      |
| <b>Do not exceed</b>  |                                    | +260°C             |

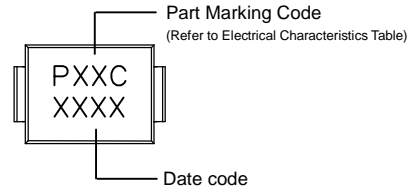
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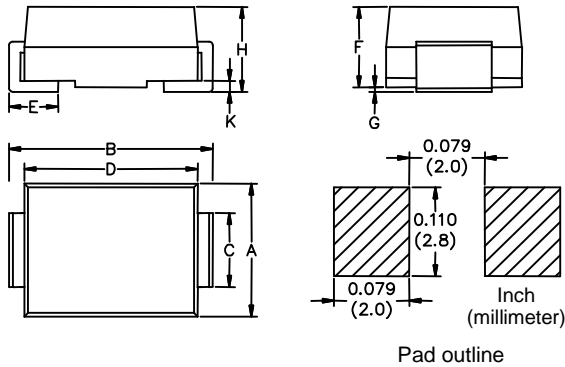
## Part Numbering



## Part Marking



## Dimensions DO-214AA



| Dimensions | Inches |       | Millimeters |      |
|------------|--------|-------|-------------|------|
|            | Min    | Max   | Min         | Max  |
| A          | 0.130  | 0.156 | 3.30        | 3.95 |
| B          | 0.201  | 0.220 | 5.10        | 5.60 |
| C          | 0.077  | 0.087 | 1.95        | 2.20 |
| D          | 0.159  | 0.181 | 4.05        | 4.60 |
| E          | 0.030  | 0.063 | 0.76        | 1.60 |
| F          | 0.076  | 0.096 | 1.90        | 2.45 |
| G          | 0.002  | 0.008 | 0.05        | 0.20 |
| H          | 0.077  | 0.104 | 1.95        | 2.65 |
| K          | 0.006  | 0.016 | 0.15        | 0.41 |

## Packaging

| Part Number | Component Package | Quantity | Packaging Option          | Packaging Specification |
|-------------|-------------------|----------|---------------------------|-------------------------|
| Pxxx0SC     | DO-214AA          | 2500     | Tape & Reel -12mm/13"tape | EIA -481 - D            |

## Tape and Reel Specifications

