

## Thyristor Surge Suppressors (TSS)

**P0080SB - P5000SB Series - DO-214AA(SMB)**
**@10/700μS, 4KV**

### Description

P0080SB - P5000SB Series are designed to protect broadband equipment such as modems, line card, CPE and DSL from damaging over-voltage transients.

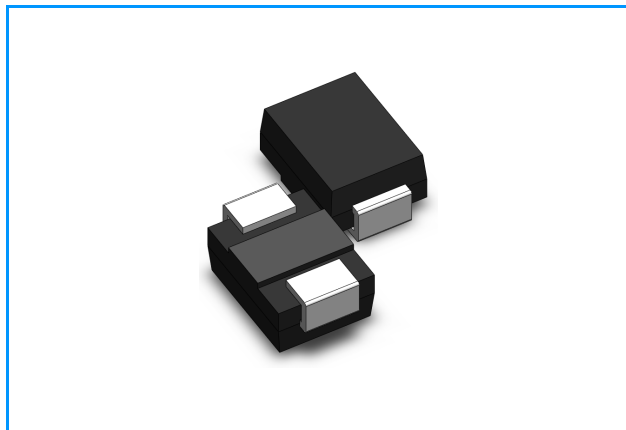
The series provides a surface mount solution that enables equipment to comply with global regulatory standards.

### Features and Benefits

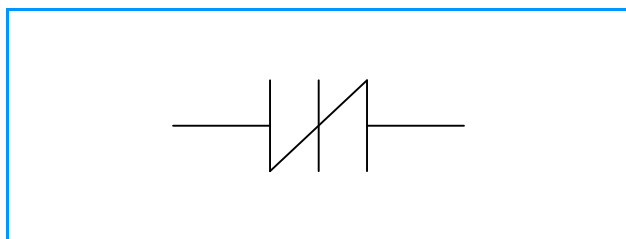
- u Low voltage overshoot
- u Low on-state voltage
- u Does not degrade surge capability after multiple surge events within limit
- u Fails short circuit when surged in excess of ratings
- u Low Capacitance

### 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

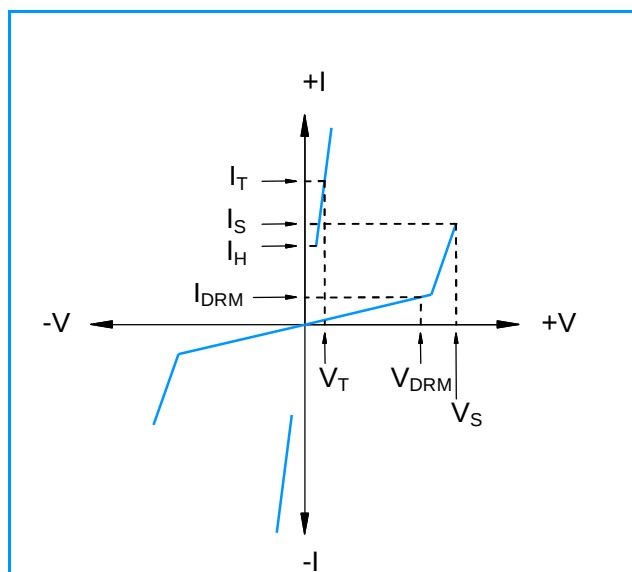


### Schematic Symbol



### 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/μS | $V_T$<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 |
| P0080SB     | P008B   | 6                               | 25                | 4                     | 800    | 2.2   | 50     | 25             | 150    |
| P0300SB     | P03B    | 25                              | 40                | 4                     | 800    | 2.2   | 50     | 15             | 140    |
| P0640SB     | P06B    | 58                              | 77                | 4                     | 800    | 2.2   | 150    | 40             | 60     |
| P0720SB     | P07B    | 65                              | 88                | 4                     | 800    | 2.2   | 150    | 35             | 60     |
| P0900SB     | P09B    | 75                              | 98                | 4                     | 800    | 2.2   | 150    | 25             | 55     |
| P1100SB     | P11B    | 90                              | 130               | 4                     | 800    | 2.2   | 150    | 30             | 50     |
| P1300SB     | P13B    | 120                             | 160               | 4                     | 800    | 2.2   | 150    | 25             | 45     |
| P1500SB     | P15B    | 140                             | 180               | 4                     | 800    | 2.2   | 150    | 25             | 40     |
| P1800SB     | P18B    | 170                             | 220               | 4                     | 800    | 2.2   | 150    | 25             | 35     |
| P2000SB     | P20B    | 180                             | 220               | 4                     | 800    | 2.2   | 150    | 20             | 35     |
| P2300SB     | P23B    | 190                             | 260               | 4                     | 800    | 2.2   | 150    | 25             | 35     |
| P2600SB     | P26B    | 220                             | 300               | 4                     | 800    | 2.2   | 150    | 20             | 35     |
| P3100SB     | P31B    | 275                             | 350               | 4                     | 800    | 2.2   | 150    | 20             | 35     |
| P3500SB     | P35B    | 320                             | 400               | 4                     | 800    | 2.2   | 150    | 20             | 35     |
| P4000SB     | P40B    | 360                             | 460               | 4                     | 800    | 2.2   | 150    | 20             | 35     |
| P4500SB     | P45B    | 400                             | 540               | 4                     | 800    | 2.2   | 150    | 20             | 35     |
| P5000SB     | P50B    | 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.

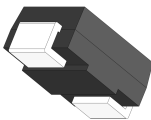
### Surge Ratings

| 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           |                       |       |
| B      | 250           | 250             | 150             | 100             | 80               | 100             | 30                    | 500   |

Notes:

- Current waveform in μs
  - Voltage waveform in μs
- 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

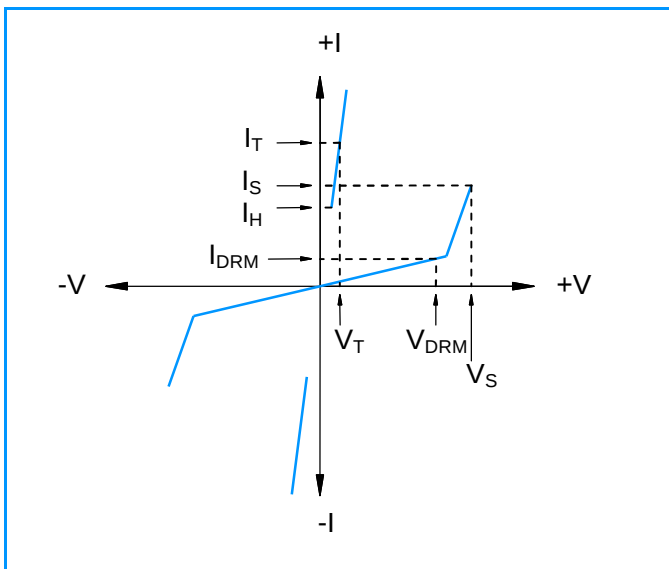


Figure 2 -  $t_r \times t_d$  Pulse Waveform

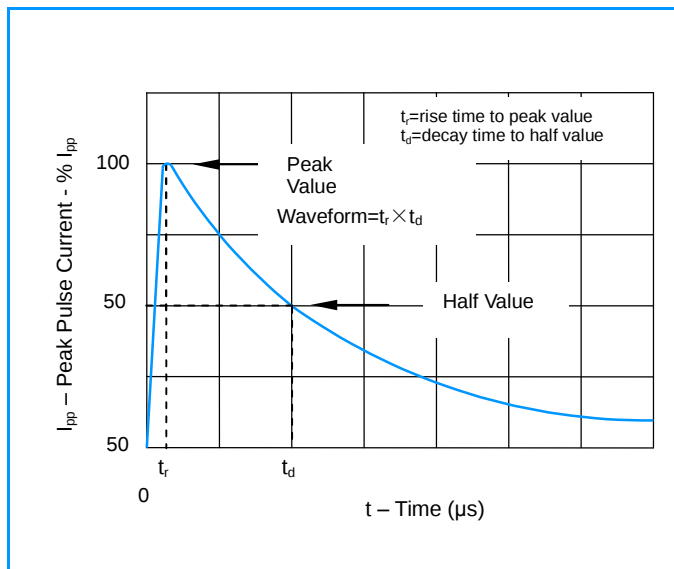


Figure 3 - Normalized  $V_S$  Change Versus Junction Temperature

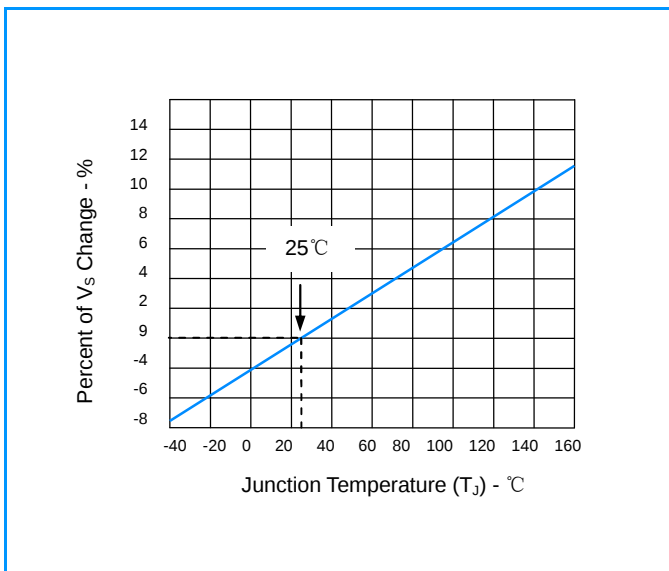
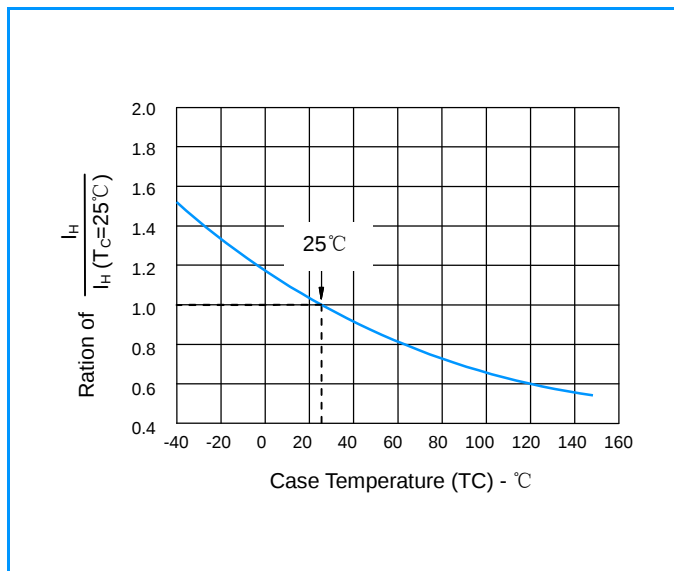


Figure 4 - Normalized DC Holding Current Versus Case Temperature



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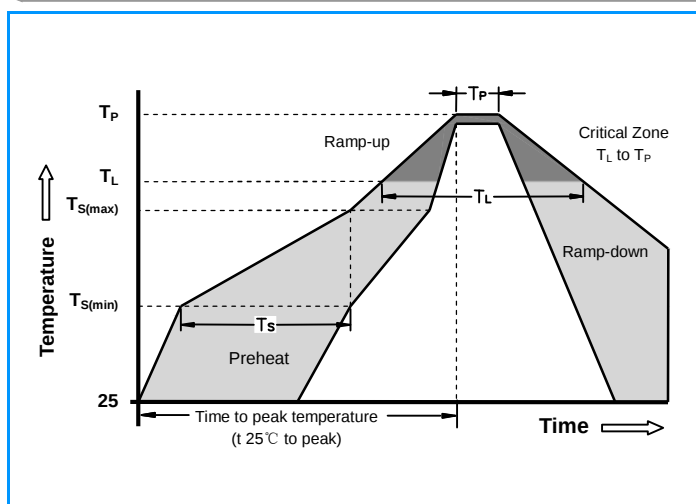
### Environmental Specifications

|                                         |                                                                                                                                                                  |
|-----------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <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



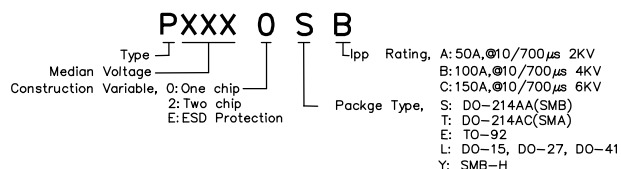
| Reflow Condition                                     |                                    | Lead-free assembly |
|------------------------------------------------------|------------------------------------|--------------------|
| Pre Heat                                             | -Temperature Min ( $T_{s(min)}$ )  | +150°C             |
|                                                      | -Temperature Max ( $T_{s(max)}$ )  | +200°C             |
|                                                      | -Time (min to max) ( $t_s$ )       | 60 -180 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) ( $t_s$ )      | 60 -150 Seconds    |
| Peak Temperature ( $T_P$ )                           |                                    | 260 +0/-5°C        |
| Time within 5°C of actual peak Temperature ( $t_p$ ) |                                    | 30 Seconds Max     |
| Ramp-down Rate                                       |                                    | 6°C/Second Max     |
| Time 25°C to peak Temperature ( $T_P$ )              |                                    | 8 minutes Max      |
| Do not exceed                                        |                                    | +260°C             |

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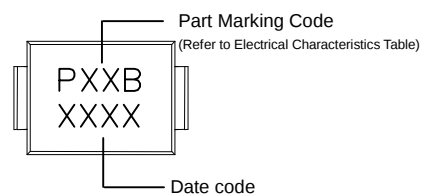
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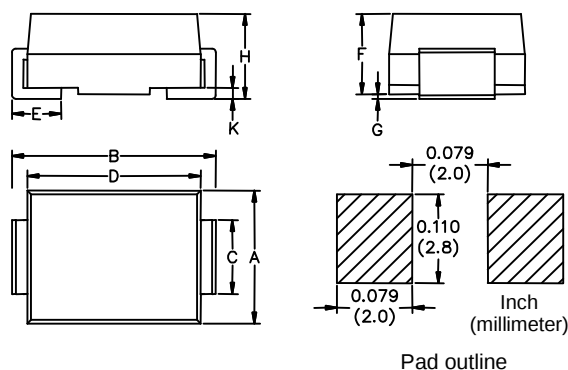
### Part Numbering



### 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 |
|-------------|-------------------|----------|---------------------------|-------------------------|
| Pxxx0SB     | DO-214AA          | 2500     | Tape & Reel -12mm/13"tape | EIA -481 - D            |

### Tape and Reel Specifications

