

## Thyristor Surge Suppressors (TSS)

**P0080LB - P5000LB Series - DO-15 @10/700 $\mu$ S, 4KV**

### Description

P0080LB - P5000LB 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

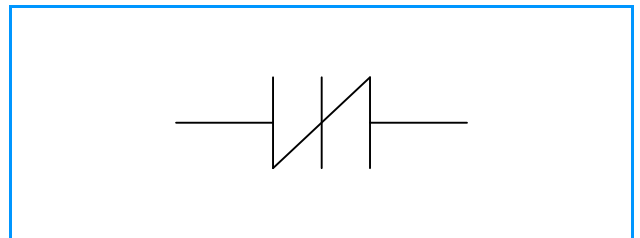
- u Low voltage overshoot
- u Low on-state voltage
- u Does not degrade surge capability after multiple surge events within limit
- u Fails short circuit when surged in excess of ratings
- u Low Capacitance

### Applicable Global Standards

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

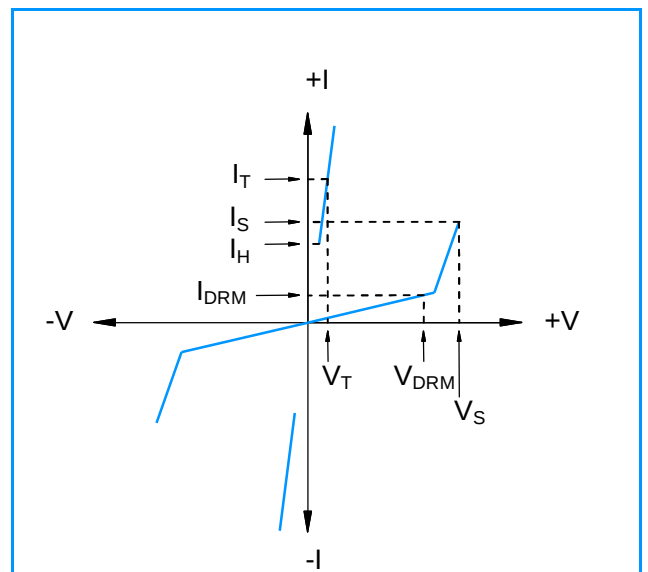


### Schematic Symbol



### 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 |
| P0080LB     | P008LB  | 6                               | 25                | 4                     | 800    | 2.2   | 50     | 25             | 150    |
| P0300LB     | P03LB   | 25                              | 40                | 4                     | 800    | 2.2   | 50     | 15             | 140    |
| P0640LB     | P06LB   | 58                              | 77                | 4                     | 800    | 2.2   | 150    | 40             | 60     |
| P0720LB     | P07LB   | 65                              | 88                | 4                     | 800    | 2.2   | 150    | 35             | 60     |
| P0900LB     | P09LB   | 75                              | 98                | 4                     | 800    | 2.2   | 150    | 25             | 55     |
| P1100LB     | P11LB   | 90                              | 130               | 4                     | 800    | 2.2   | 150    | 30             | 50     |
| P1300LB     | P13LB   | 120                             | 160               | 4                     | 800    | 2.2   | 150    | 25             | 45     |
| P1500LB     | P15LB   | 140                             | 180               | 4                     | 800    | 2.2   | 150    | 25             | 40     |
| P1800LB     | P18LB   | 170                             | 220               | 4                     | 800    | 2.2   | 150    | 25             | 35     |
| P2000LB     | P20LB   | 180                             | 220               | 4                     | 800    | 2.2   | 150    | 20             | 35     |
| P2300LB     | P23LB   | 190                             | 260               | 4                     | 800    | 2.2   | 150    | 25             | 35     |
| P2600LB     | P26LB   | 220                             | 300               | 4                     | 800    | 2.2   | 150    | 20             | 35     |
| P3100LB     | P31LB   | 275                             | 350               | 4                     | 800    | 2.2   | 150    | 20             | 35     |
| P3500LB     | P35LB   | 320                             | 400               | 4                     | 800    | 2.2   | 150    | 20             | 35     |
| P4000LB     | P40LB   | 360                             | 460               | 4                     | 800    | 2.2   | 150    | 20             | 35     |
| P4500LB     | P45LB   | 400                             | 540               | 4                     | 800    | 2.2   | 150    | 20             | 35     |
| P5000LB     | P50LB   | 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.

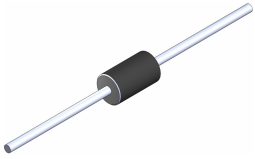
### Surge Ratings

| 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/μs max |
| 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-15<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

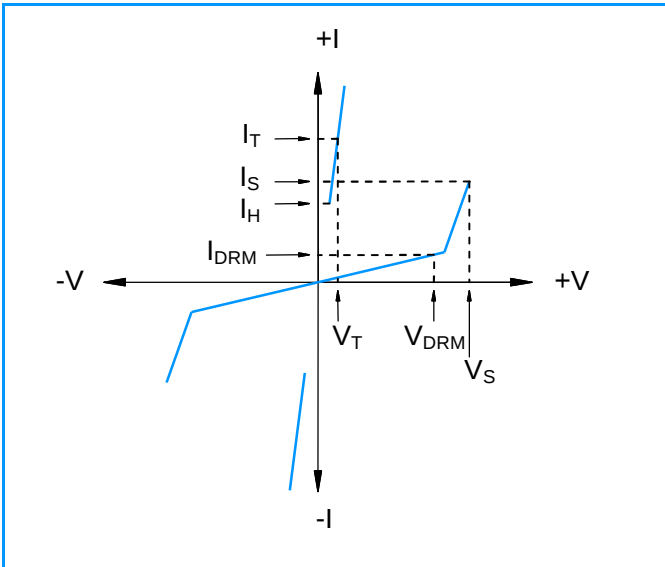


Figure 2 -  $t_r \times t_d$  Pulse Waveform

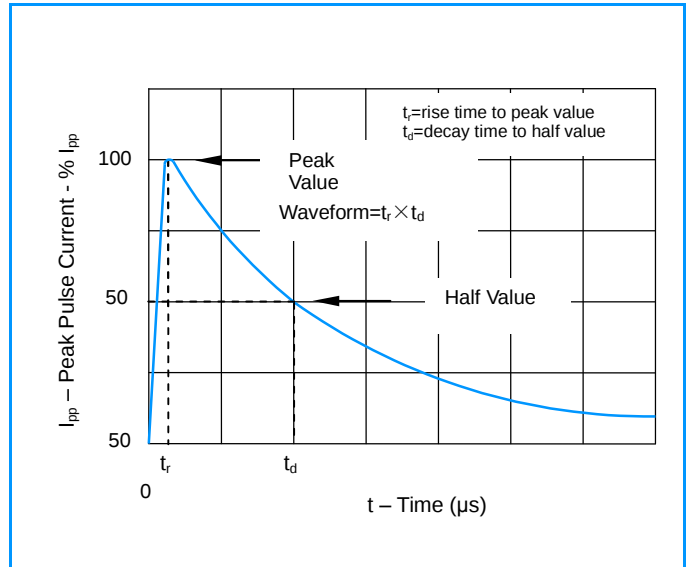


Figure 3 - Normalized  $V_S$  Change Versus Junction Temperature

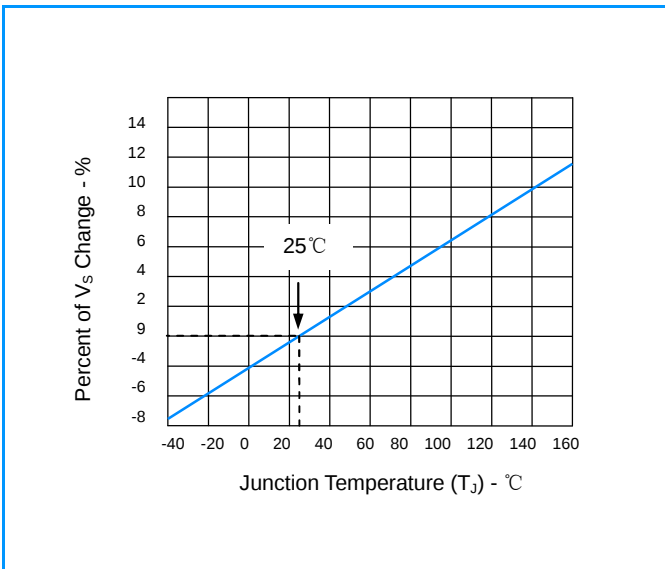
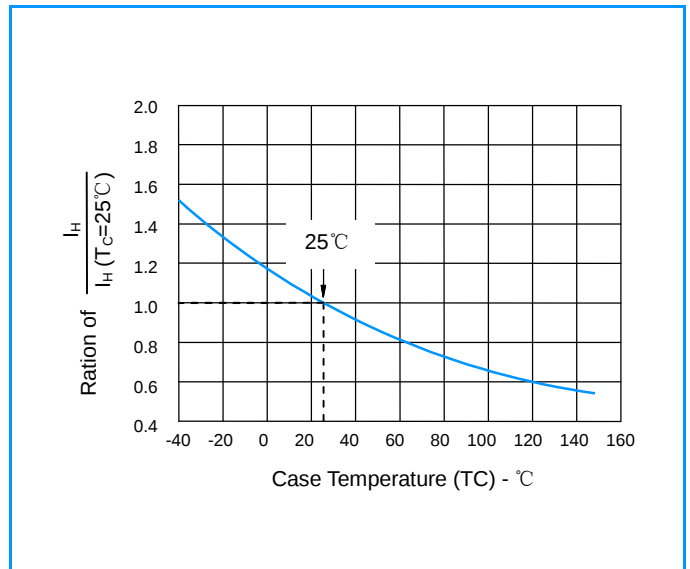


Figure 4 - Normalized DC Holding Current Versus Case Temperature



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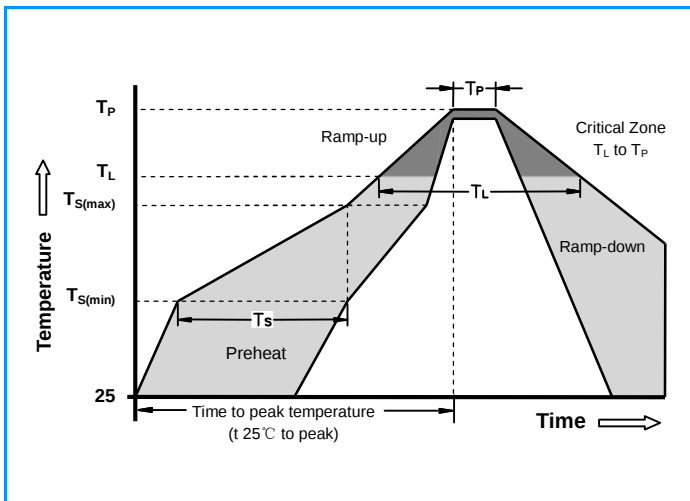
### Environmental Specifications

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

### Physical Specifications

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

### Soldering Parameters

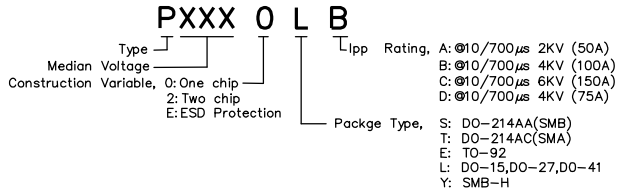


| Reflow Condition                                     |                                    | Lead-free assembly |
|------------------------------------------------------|------------------------------------|--------------------|
| Pre Heat                                             | -Temperature Min ( $T_{S(min)}$ )  | +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             |

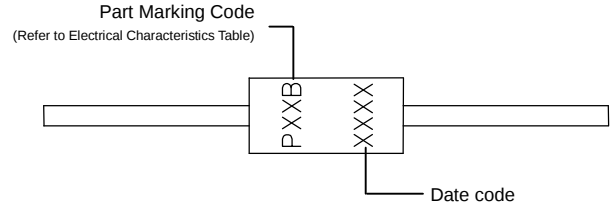
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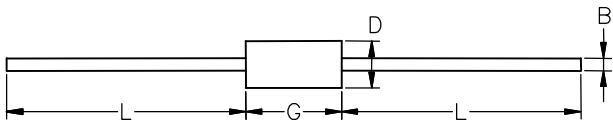
### Part Numbering



### Part Marking



### Dimensions DO-15



| Dimensions | Inches |       | Millimeters |       |
|------------|--------|-------|-------------|-------|
|            | Min    | Max   | Min         | Max   |
| <b>B</b>   | 0.028  | 0.034 | 0.711       | 0.864 |
| <b>D</b>   | 0.120  | 0.140 | 3.048       | 3.556 |
| <b>G</b>   | 0.235  | 0.270 | 5.969       | 6.858 |
| <b>L</b>   | 1.000  |       | 25.40       |       |

### Packaging

| Part Number    | Description             | Quantity | Industry Standard |
|----------------|-------------------------|----------|-------------------|
| <b>Pxxx0LB</b> | DO-15 Axial Tape & Reel | 4000     | EIA-RS-296-D      |
|                | DO-15 Bulk Pack         | 500      | N/A               |

### Tape and Reel Specifications DO-15

