

## Thyristor Surge Suppressors (TSS)

P0080LA - P5000LA Series - DO-41 @10/700 $\mu$ S , 2KV

### Description

P0080LA - P5000LA 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

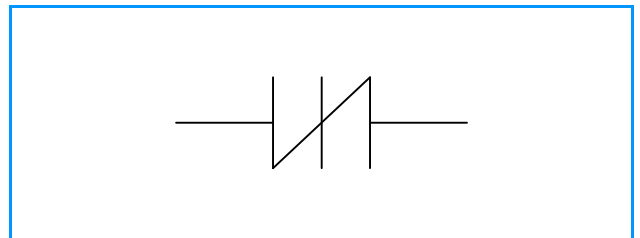
- u Low voltage overshoot
- u Low on-state voltage
- u Does not degrade surge capability after multiple surge events within limit
- u Fails short circuit when surged in excess of ratings
- u Low Capacitance

### 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

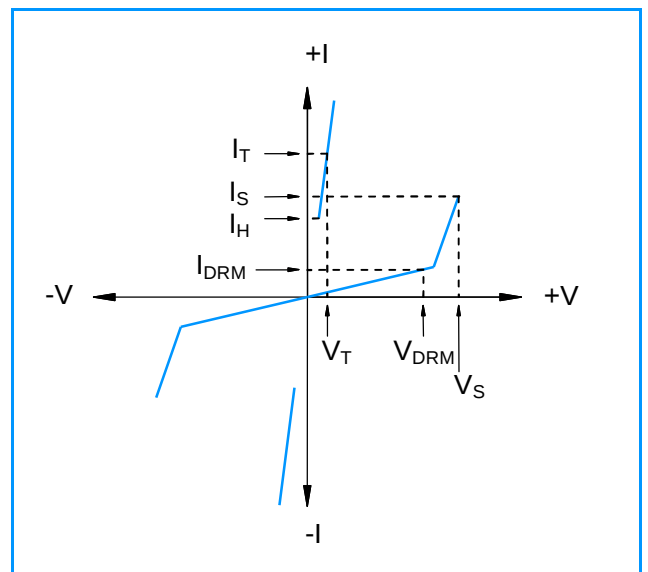


### Schematic Symbol



### 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/ $\mu S$ | $V_T$<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 |
| P0080LA     | P008LA  | 6                               | 25                      | 4                     | 800    | 2.2   | 50     | 25             | 150    |
| P0300LA     | P03LA   | 25                              | 40                      | 4                     | 800    | 2.2   | 50     | 15             | 140    |
| P0640LA     | P06LA   | 58                              | 77                      | 4                     | 800    | 2.2   | 150    | 40             | 60     |
| P0720LA     | P07LA   | 65                              | 88                      | 4                     | 800    | 2.2   | 150    | 35             | 60     |
| P0900LA     | P09LA   | 75                              | 98                      | 4                     | 800    | 2.2   | 150    | 25             | 55     |
| P1100LA     | P11LA   | 90                              | 130                     | 4                     | 800    | 2.2   | 150    | 30             | 50     |
| P1300LA     | P13LA   | 120                             | 160                     | 4                     | 800    | 2.2   | 150    | 25             | 45     |
| P1500LA     | P15LA   | 140                             | 180                     | 4                     | 800    | 2.2   | 150    | 25             | 40     |
| P1800LA     | P18LA   | 170                             | 220                     | 4                     | 800    | 2.2   | 150    | 25             | 35     |
| P2000LA     | P20LA   | 180                             | 220                     | 4                     | 800    | 2.2   | 150    | 20             | 35     |
| P2300LA     | P23LA   | 190                             | 260                     | 4                     | 800    | 2.2   | 150    | 25             | 35     |
| P2600LA     | P26LA   | 220                             | 300                     | 4                     | 800    | 2.2   | 150    | 20             | 35     |
| P3100LA     | P31LA   | 275                             | 350                     | 4                     | 800    | 2.2   | 150    | 20             | 35     |
| P3500LA     | P35LA   | 320                             | 400                     | 4                     | 800    | 2.2   | 150    | 20             | 35     |
| P4000LA     | P40LA   | 360                             | 460                     | 4                     | 800    | 2.2   | 150    | 20             | 35     |
| P4500LA     | P45LA   | 400                             | 540                     | 4                     | 800    | 2.2   | 150    | 20             | 35     |
| P5000LA     | P50LA   | 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.

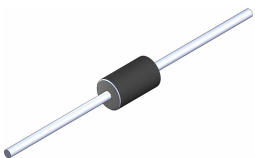
### Surge Ratings

| 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 |
| A      | 150            | 150              | 90               | 50               | 45                | 50               | 20                    | 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-41<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

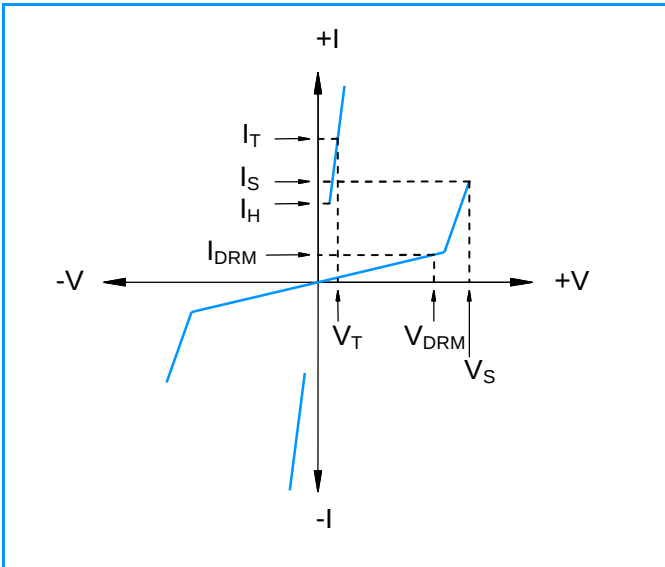


Figure 2 -  $t_r \times t_d$  Pulse Waveform

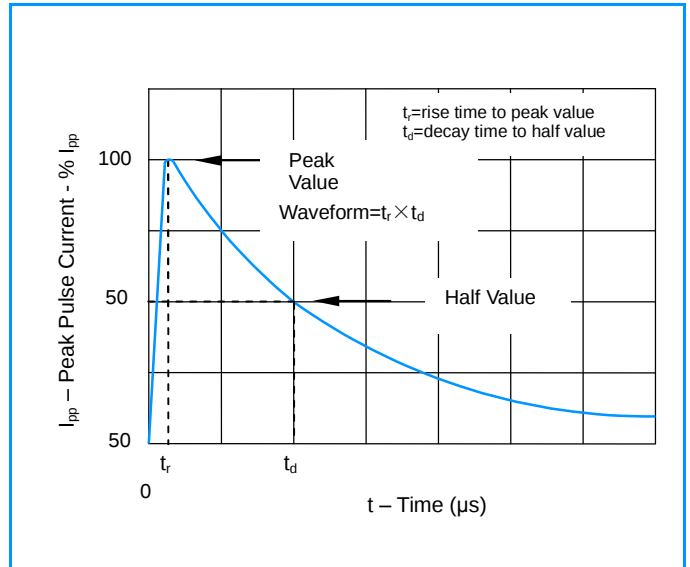


Figure 3 - Normalized  $V_S$  Change Versus Junction Temperature

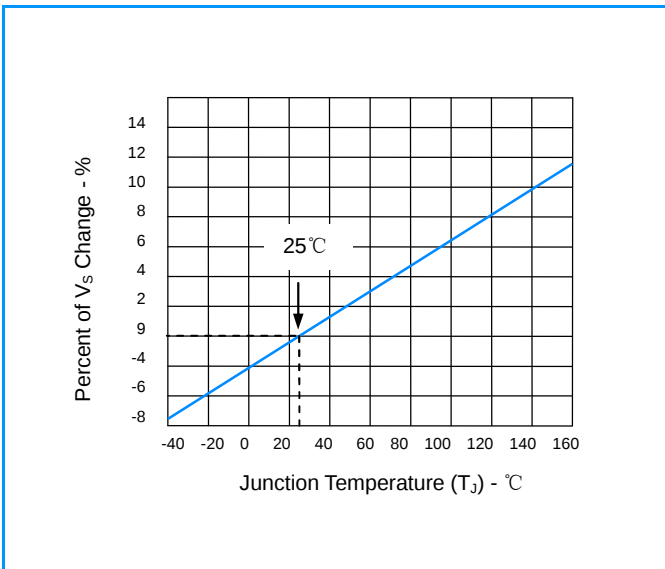
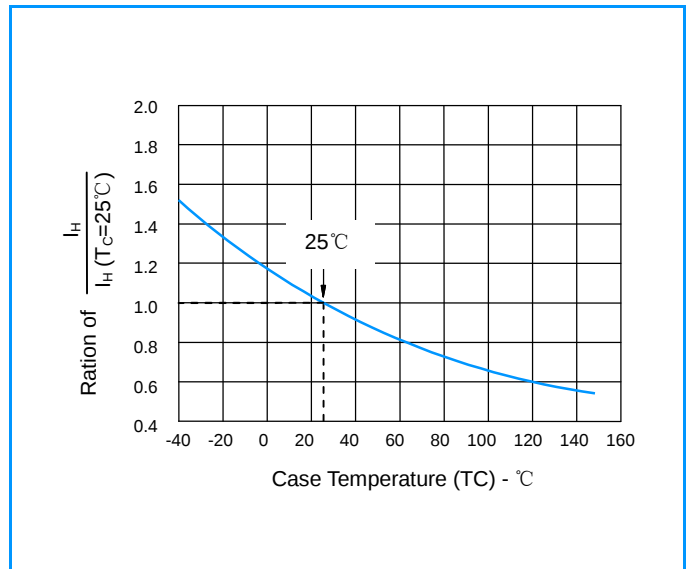


Figure 4 - Normalized DC Holding Current Versus Case Temperature



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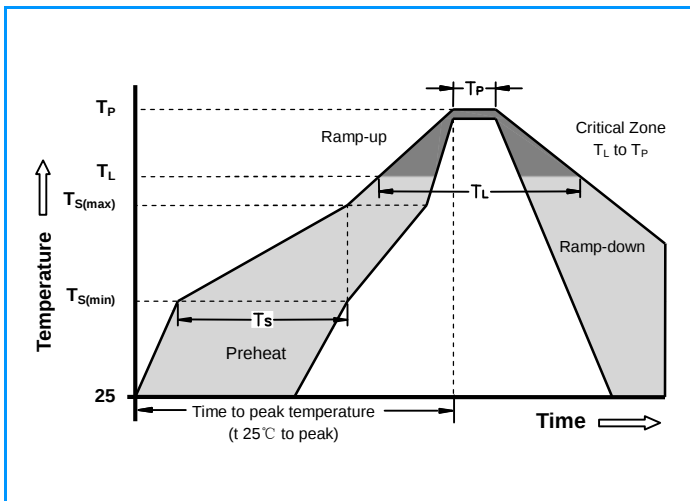
### Environmental Specifications

|                                  |                                                                                                                                                                   |
|----------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 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

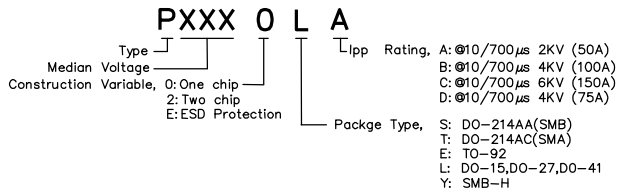


|                                                      |                                    |                    |
|------------------------------------------------------|------------------------------------|--------------------|
| Reflow Condition                                     |                                    | 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             |

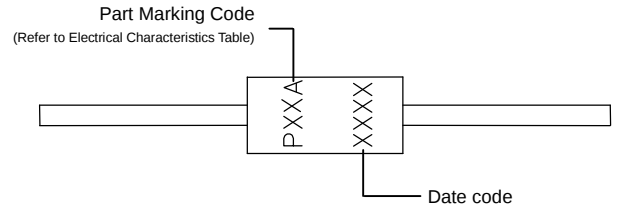
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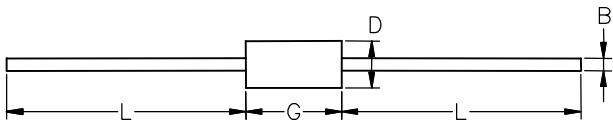
### Part Numbering



### Part Marking



### Dimensions DO-41



| Dimensions | Inches |       | Millimeters |      |
|------------|--------|-------|-------------|------|
|            | Min    | Max   | Min         | Max  |
| <b>B</b>   | 0.028  | 0.035 | 0.70        | 0.90 |
| <b>D</b>   | 0.102  | 0.140 | 2.60        | 3.60 |
| <b>G</b>   | 0.193  | 0.220 | 4.90        | 5.60 |
| <b>L</b>   | 1.000  |       | 25.40       |      |

### Packaging

| Part Number    | Description             | Quantity | Industry Standard |
|----------------|-------------------------|----------|-------------------|
| <b>Pxxx0LA</b> | DO-41 Axial Tape & Reel | 5000     | EIA-RS-296-D      |
|                | DO-41 Bulk Pack         | 500      | N/A               |

### Tape and Reel Specifications DO-41

