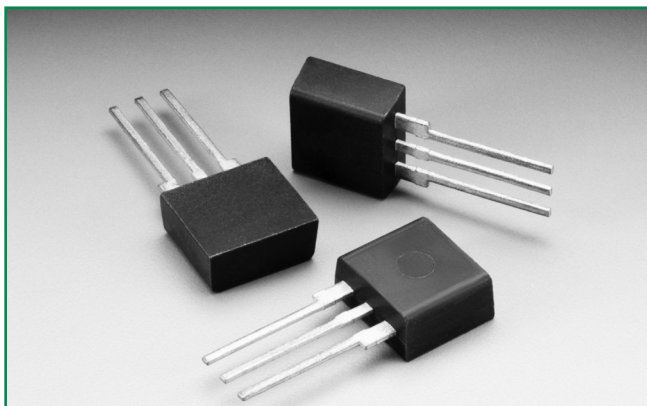


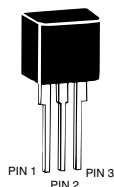
### SIDACtor® Primary Protection Balanced Series - Modified TO-220



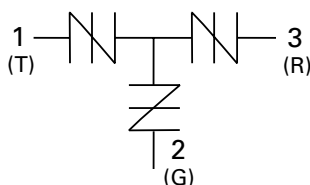
#### Agency Approvals

| Agency                                                                            | Agency File Number |
|-----------------------------------------------------------------------------------|--------------------|
|  | E133083            |

#### Pinout Designation



#### Schematic Symbol



#### Description

The SIDACtor® Primary Protection Balanced Series Modified TO-220 thyristors are components designed for use in primary protection applications.

The series provides a single port overvoltage solution that enables applications to comply with the balance requirements of GR-974 and GTS-8700. Please contact Littelfuse to discuss your particular application and regulatory requirements.

#### Features and Benefits

- High holding current options available
- Balanced overvoltage protection
- Failsafe option available
- Low voltage overshoot
- Low on-state voltage
- Does not degrade surge capability after multiple surge events within limit.
- Fails short circuit when surged in excess of ratings
- Single-port protection
- Modified TO-220 Package
- Lead forms available
- RoHS Compliant
- Pb-free E3 means 2nd level interconnect is Pb-free and the terminal finish material is tin(Sn) IPC/JEDEC J-STD-609A.01

#### Applicable Global Standards

- GR-974
- GTS-8700
- UL 497
- ITU K.28

#### Electrical Characteristics

| Part Number | Marking | $V_{DRM}$<br>@ $I_{DRM}=5\mu A$ | $V_S$<br>@ $100V/\mu s$ | $I_H^*$ | $I_S$  | $I_T$ | $V_T@I_T=2.2\text{ Amps}$ | Capacitance                              |        |                     |        |
|-------------|---------|---------------------------------|-------------------------|---------|--------|-------|---------------------------|------------------------------------------|--------|---------------------|--------|
|             |         | V min                           | V max                   | mA min  | mA max | A max | V max                     | Pin 1-2 / 3-2<br>Tip-Ground, Ring-Ground |        | Pin 1-3<br>Tip-Ring |        |
|             |         | Pins 1-2, 3-2, 1-3              |                         |         |        |       |                           | pF min                                   | pF max | pF min              | pF max |
| P1553ACLxx  | P1553AC | 130                             | 180                     | 150     | 800    | 2.2   | 8                         | 65                                       | 95     | 40                  | 60     |
| P1803ACLxx  | P1803AC | 150                             | 210                     | 150     | 800    | 2.2   | 8                         | 55                                       | 85     | 35                  | 55     |
| P2103ACLxx  | P2103AC | 170                             | 250                     | 150     | 800    | 2.2   | 8                         | 55                                       | 85     | 30                  | 55     |
| P2353ACLxx  | P2353AC | 200                             | 270                     | 150     | 800    | 2.2   | 8                         | 50                                       | 75     | 30                  | 50     |
| P2703ACLxx  | P2703AC | 230                             | 300                     | 150     | 800    | 2.2   | 8                         | 50                                       | 75     | 30                  | 50     |
| P3203ACLxx  | P3203AC | 270                             | 350                     | 150     | 800    | 2.2   | 8                         | 45                                       | 70     | 25                  | 45     |
| P3403ACLxx  | P3403AC | 300                             | 400                     | 150     | 800    | 2.2   | 8                         | 45                                       | 65     | 25                  | 45     |
| P5103ACLxx  | P5103AC | 420                             | 600                     | 150     | 800    | 2.2   | 8                         | 40                                       | 60     | 20                  | 40     |

Notes:

\* Higher holding current available by special order. Contact Littelfuse for additional information.

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

- Components are bi-directional.

- Off-state capacitance ( $C_o$ ) is measured at 1 MHz with a 2 V bias.

- xx Part Number Suffix: 'RP' (Reel pack), 'Blank' (Bulk pack), '60' (Type 60 lead form bulk pack), 'FS1' (Failsafe option bulk pack). Refer to Part Numbering section for additional details.

### Surge Ratings

| Series | I <sub>PP</sub>                              |                                        |                                          |                                            |                                            |                                          |                                            |                                              |                                           | I <sub>TSM</sub><br>50/60 Hz | di/dt |
|--------|----------------------------------------------|----------------------------------------|------------------------------------------|--------------------------------------------|--------------------------------------------|------------------------------------------|--------------------------------------------|----------------------------------------------|-------------------------------------------|------------------------------|-------|
|        | 0.2/310 <sup>1</sup><br>0.5/700 <sup>2</sup> | 2/10 <sup>1</sup><br>2/10 <sup>2</sup> | 8/20 <sup>1</sup><br>1.2/50 <sup>2</sup> | 10/160 <sup>1</sup><br>10/160 <sup>2</sup> | 10/560 <sup>1</sup><br>10/560 <sup>2</sup> | 5/320 <sup>1</sup><br>9/720 <sup>2</sup> | 10/360 <sup>1</sup><br>10/360 <sup>2</sup> | 10/1000 <sup>1</sup><br>10/1000 <sup>2</sup> | 5/310 <sup>1</sup><br>10/700 <sup>2</sup> |                              |       |
|        | A min                                        | A min                                  | A min                                    | A min                                      | A min                                      | A min                                    | A min                                      | A min                                        | A min                                     |                              |       |
| C      | 50                                           | 500                                    | 400                                      | 200                                        | 150                                        | 200                                      | 175                                        | 100                                          | 200                                       | 50                           | 500   |

Notes:

1 Current waveform in  $\mu s$

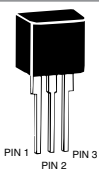
2 Voltage waveform in  $\mu s$

- Peak pulse current rating ( $I_{pp}$ ) is repetitive and guaranteed for the life of the product in thermal equilibrium.

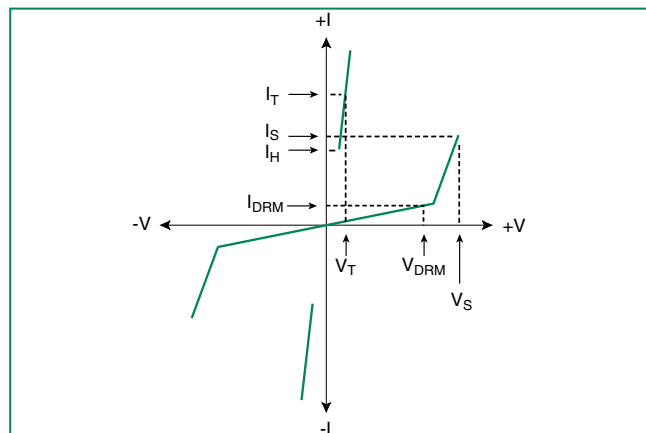
-  $I_{pp}$  ratings applicable over temperature range of -40°C to +85°C

- The component must initially be in thermal equilibrium with -40°C  $\leq T_J \leq$  +150°C

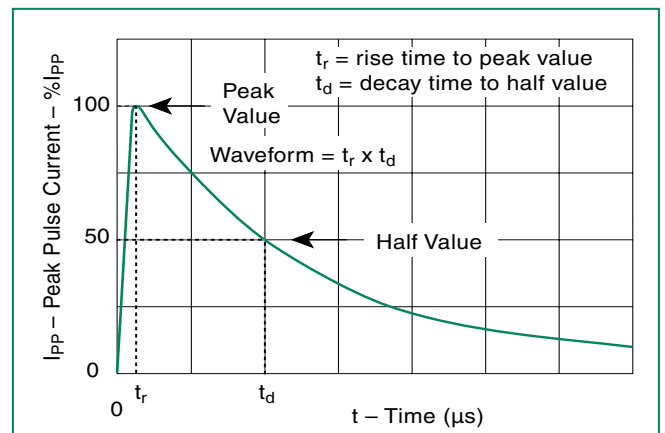
### Thermal Considerations

| Package                                                                                              | Symbol          | Parameter                               | Value       | Unit |
|------------------------------------------------------------------------------------------------------|-----------------|-----------------------------------------|-------------|------|
| Modified TO-220<br> | $T_J$           | Operating Junction Temperature Range    | -40 to +150 | °C   |
|                                                                                                      | $T_S$           | Storage Temperature Range               | -65 to +150 | °C   |
|                                                                                                      | $R_{\theta JA}$ | Thermal Resistance: Junction to Ambient | 50          | °C/W |

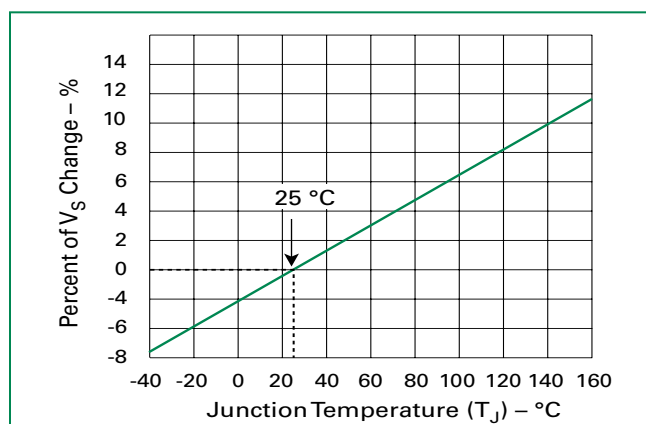
### V-I Characteristics



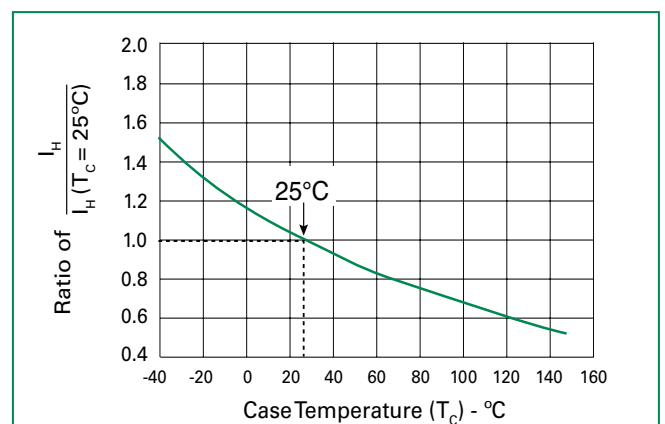
### $t_r \times t_d$ Pulse Waveform



### Normalized $V_S$ Change vs. Junction Temperature

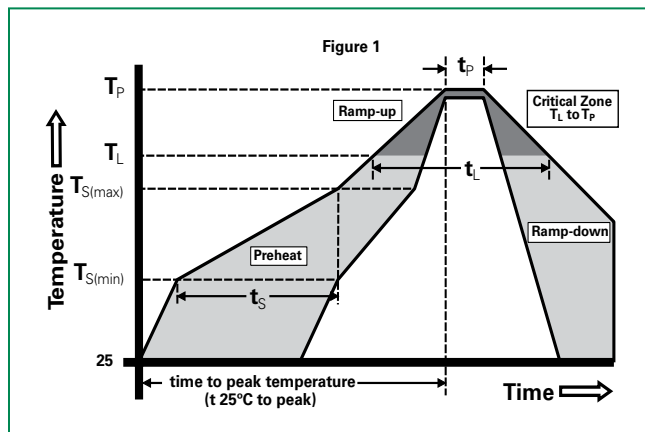


### Normalized DC Holding Current vs. Case Temperature



## Soldering Parameters

|                                                        |                                   |                               |
|--------------------------------------------------------|-----------------------------------|-------------------------------|
| Reflow Condition                                       |                                   | Pb-Free assembly (see Fig. 1) |
| Pre Heat                                               | -Temperature Min ( $T_{s(min)}$ ) | +150°C                        |
|                                                        | -Temperature Max ( $T_{s(max)}$ ) | +200°C                        |
|                                                        | -Time (Min to Max) ( $t_s$ )      | 60-180 secs.                  |
| Average ramp up rate (Liquidus Temp ( $T_L$ ) to peak) |                                   | 3°C/sec. Max.                 |
| $T_{s(max)}$ to $T_L$ - Ramp-up Rate                   |                                   | 3°C/sec. Max.                 |
| Reflow                                                 | -Temperature ( $T_L$ ) (Liquidus) | +217°C                        |
|                                                        | -Temperature ( $t_L$ )            | 60-150 secs.                  |
| Peak Temp ( $T_p$ )                                    |                                   | +260(+0/-5)°C                 |
| Time within 5°C of actual Peak Temp ( $t_p$ )          |                                   | 30 secs. Max.                 |
| Ramp-down Rate                                         |                                   | 6°C/sec. Max.                 |
| Time 25°C to Peak Temp ( $T_p$ )                       |                                   | 8 min. Max.                   |
| Do not exceed                                          |                                   | +260°C                        |



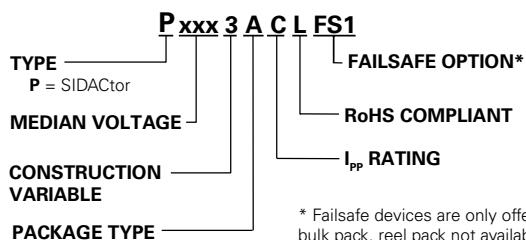
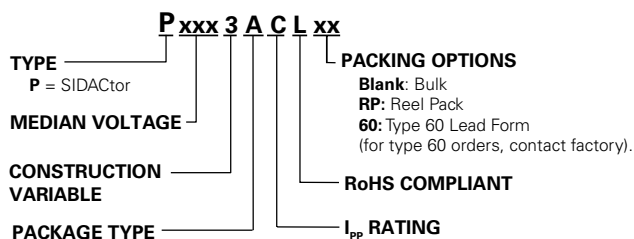
## Physical Specifications

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

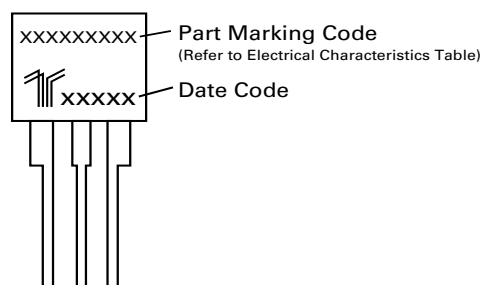
## Environmental Specifications

|                                         |                                                                                                                        |
|-----------------------------------------|------------------------------------------------------------------------------------------------------------------------|
| <b>High Temp Voltage Blocking</b>       | 80% Rated $V_{DRM}$ ( $V_{AC Peak}$ ) +125°C or +150°C, 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-A-104                 |
| <b>Biased Temp &amp; Humidity</b>       | 52 $V_{DC}$ (+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, 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/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 (+260°C Peak). JEDEC-J-STD-020, Level 1                                       |

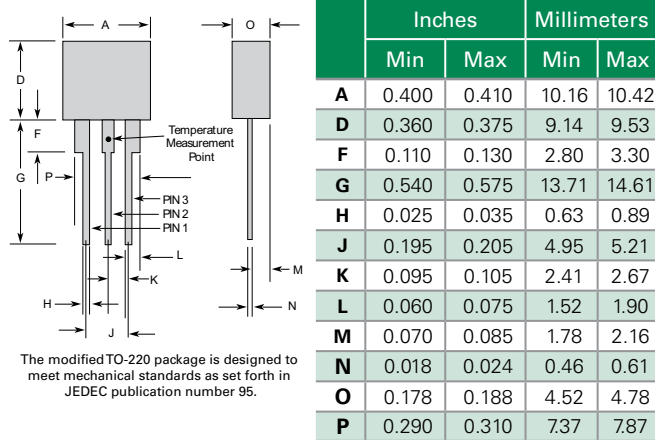
## Part Numbering



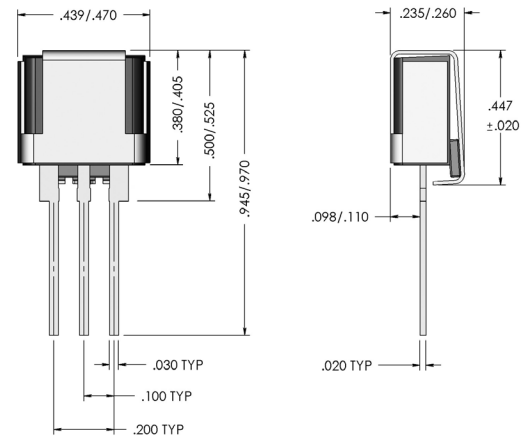
## Part Marking



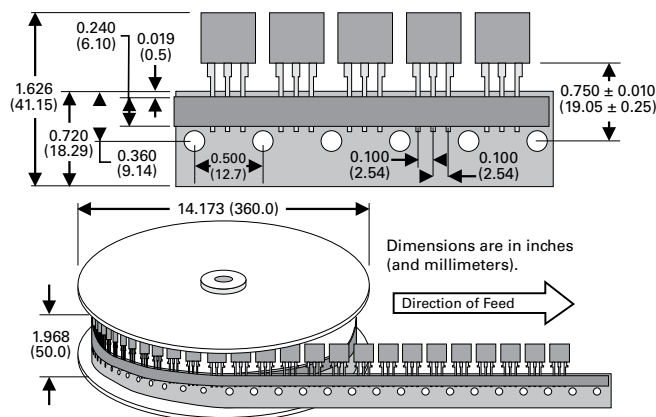
### Dimensions - Modified TO-220



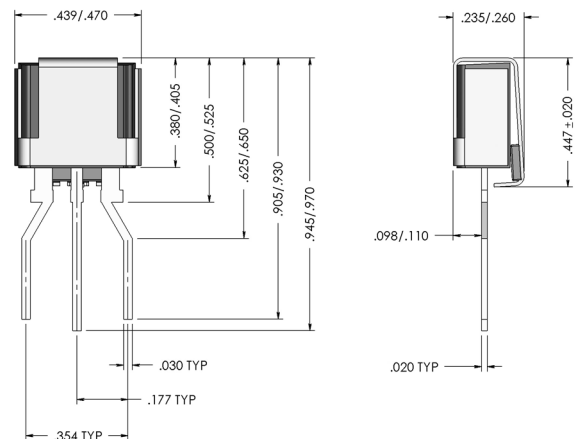
### Dimensions - Modified TO-220 with Failsafe



### Tape and Reel Specification - Modified TO-220



### Dimensions - Modified TO-220 Type 60 with Failsafe



### Packing Options

| Package Type | Description                                 | Quantity | Added Suffix                                            | Industry Standard |
|--------------|---------------------------------------------|----------|---------------------------------------------------------|-------------------|
| A            | Modified TO-220 Tape and Reel Pack          | 700      | RP                                                      | EIA-468-B         |
|              | Modified TO-220 Bulk Pack                   | 500      | (no added suffix)                                       | N/A               |
|              | Modified TO-220 Type 60 Lead Form Bulk Pack | 500      | 60<br>(special order item, contact factory for details) | N/A               |

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