

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



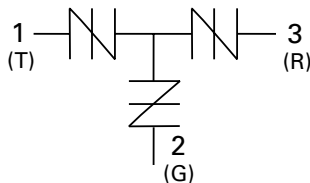
**Agency Approvals**

| 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/ $\mu s$ | $I_H^*$ | $I_s$ | $I_T$ | $V_T @ I_T=2.2$ 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 | $I_{PP}$                                     |  |  |  |  |  |  |  |   | $I_{TSM}$<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  $-40^{\circ}C$  to  $+85^{\circ}C$
- The component must initially be in thermal equilibrium with  $-40^{\circ}C \leq T_J \leq +150^{\circ}C$

### Thermal Considerations

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

### V-I Characteristics



### $t_r \times t_d$ Pulse Waveform



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

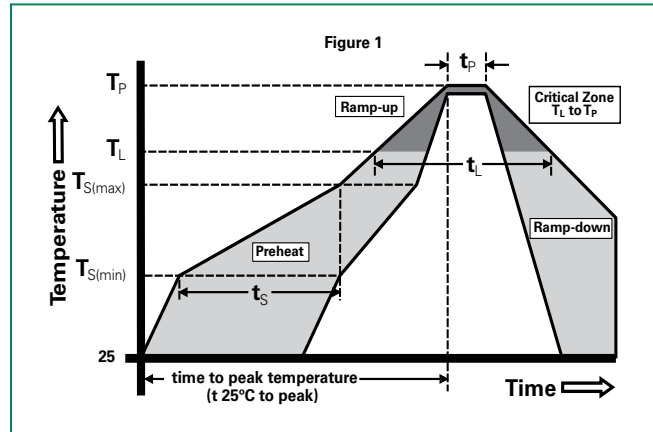


### Normalized DC Holding Current vs. Case Temperature



**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 |

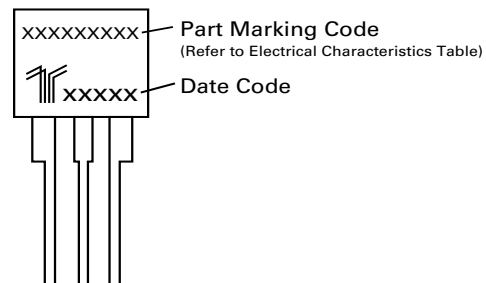
**Environmental Specifications**

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



The modified TO-220 package is designed to meet mechanical standards as set forth in JEDEC publication number 95.

|          | Inches |       | Millimeters |       |
|----------|--------|-------|-------------|-------|
|          | Min    | Max   | Min         | Max   |
| <b>A</b> | 0.400  | 0.410 | 10.16       | 10.42 |
| <b>D</b> | 0.360  | 0.375 | 9.14        | 9.53  |
| <b>F</b> | 0.110  | 0.130 | 2.80        | 3.30  |
| <b>G</b> | 0.540  | 0.575 | 13.71       | 14.61 |
| <b>H</b> | 0.025  | 0.035 | 0.63        | 0.89  |
| <b>J</b> | 0.195  | 0.205 | 4.95        | 5.21  |
| <b>K</b> | 0.095  | 0.105 | 2.41        | 2.67  |
| <b>L</b> | 0.060  | 0.075 | 1.52        | 1.90  |
| <b>M</b> | 0.070  | 0.085 | 1.78        | 2.16  |
| <b>N</b> | 0.018  | 0.024 | 0.46        | 0.61  |
| <b>O</b> | 0.178  | 0.188 | 4.52        | 4.78  |
| <b>P</b> | 0.290  | 0.310 | 7.37        | 7.87  |

### 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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