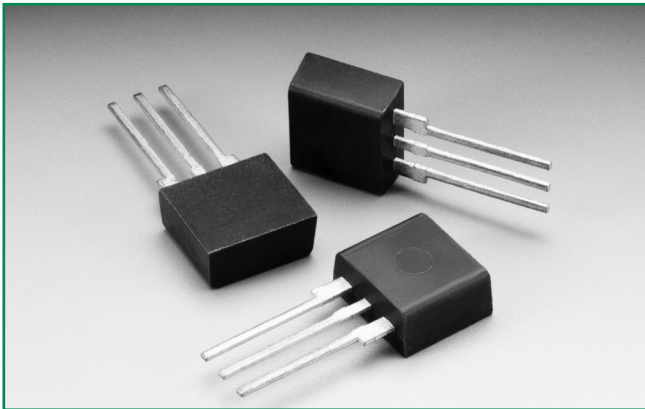


SIDACtor® Primary Protection Series - Modified TO-220



Description

The SIDACtor® Primary Protection 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 GR-974 and a range of other global regulatory standards. Please contact Littelfuse to discuss your particular application and regulatory requirements.

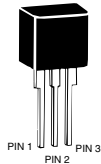
Features and Benefits

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

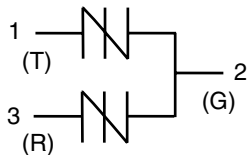
Agency Approvals

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

Pinout Designation



Schematic Symbol



Applicable Global Standards

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

Electrical Characteristics

| Part Number | Marking | V_{DRM} @ $I_{DRM} = 5\mu A$ | | V_S @ $100V/\mu s$ | | V_{DRM} @ $I_{DRM} = 5\mu A$ | V_S @ $100V/\mu s$ | V_T @ $I_T = 2.2 A$ | I_H^* | I_S | I_T | Capacitance @ 1MHz, 2V bias | |
|-------------|---------|--------------------------------|-------|----------------------|-------|--------------------------------|----------------------|-----------------------|---------|------------------------------|--------|-----------------------------|--|
| | | V min | V max | V min | V max | V max | mA min | mA max | A max | pF min | pF max | | |
| | | Pins 1-2, 3-2 | | Pins 1-3 | | Pins 1-2, 3-2 | | | | | | | |
| P0602ACLxx | P0602AC | 25 | 40 | 50 | 80 | 4 | 50 | 800 | 2.2 | See Capacitance Values Table | | | |
| P1402ACLxx | P1402AC | 58 | 77 | 116 | 154 | 4 | 150 | 800 | 2.2 | | | | |
| P1602ACLxx | P1602AC | 65 | 95 | 130 | 190 | 4 | 150 | 800 | 2.2 | | | | |
| P2202ACLxx | P2202AC | 90 | 130 | 180 | 260 | 4 | 150 | 800 | 2.2 | | | | |
| P2702ACLxx | P2702AC | 120 | 160 | 240 | 320 | 4 | 150 | 800 | 2.2 | | | | |
| P3002ACLxx | P3002AC | 140 | 180 | 280 | 360 | 4 | 150 | 800 | 2.2 | | | | |
| P3602ACLxx | P3602AC | 170 | 220 | 340 | 440 | 4 | 150 | 800 | 2.2 | | | | |
| P4202ACLxx | P4202AC | 190 | 250 | 380 | 500 | 4 | 150 | 800 | 2.2 | | | | |
| P4802ACLxx | P4802AC | 220 | 300 | 440 | 600 | 4 | 150 | 800 | 2.2 | | | | |
| P6002ACLxx | P6002AC | 275 | 350 | 550 | 700 | 4 | 150 | 800 | 2.2 | | | | |

Notes:
 * Higher holding current available by special order. Contact Littelfuse for additional information. - **xx** Part Number Suffix: 'RP' (Reel pack), **Blank** (Bulk pack), '60' (Type 60 lead form bulk pack),
 - Absolute maximum ratings measured at $T_a = 25^\circ C$ (unless otherwise noted).
 - Devices are bi-directional (unless otherwise noted).
 'FS1' (Failsafe option bulk pack). Refer to Part Numbering section for additional details.

Surge Ratings

| Series | I_{PP} | | | | | | | | | | I_{TSM} 50/60 Hz | di/dt |
|--------|----------------------|-------------------|---------------------|---------------------|---------------------|--------------------|---------------------|----------------------|---------------------|---------------------|-----------------------|----------|
| | 0.2x310 ¹ | 2x10 ¹ | 8x20 ¹ | 10x160 ¹ | 10x560 ¹ | 5x320 ¹ | 10x360 ¹ | 10x1000 ¹ | 5x310 ¹ | 10x700 ² | | |
| | 0.5x700 ² | 2x10 ² | 1.2x50 ² | 10x160 ² | 10x560 ² | 9x720 ² | 10x360 ² | 10x1000 ² | 10x700 ² | 10x700 ² | | |
| | A min | A min | A min | A min | A min | A min | A min | A min | A min | A min | A min | A/μs min |
| C | 50 | 500 | 400 | 200 | 150 | 200 | 175 | 100 | 200 | 50 | 500 | |

Notes:

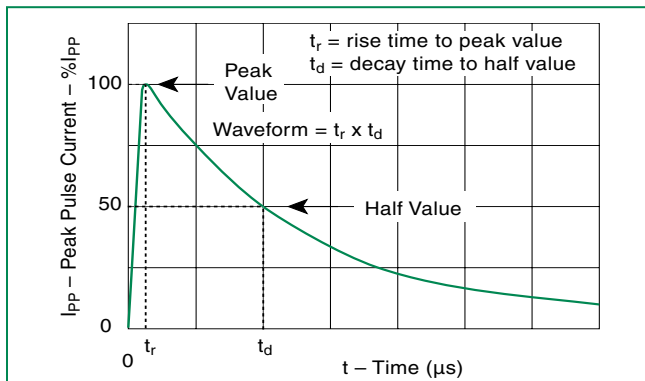
- 1 Current waveform in μs
- 2 Voltage waveform in μs
- Peak pulse current rating (I_{PP}) is repetitive and guaranteed for the life of the product.
- I_{PP} ratings applicable over temperature range of -40°C to +85°C
- The device must initially be in thermal equilibrium with -40°C ≤ T_J ≤ +150°C

Capacitance Values

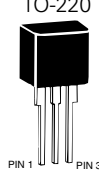
| Part Number | Pin 1-2 / 3-2 Tip-Ground, Ring-Ground | | Pin 1-3 Tip-Ring | |
|-------------|------------------------------------------|--------|---------------------|--------|
| | pF min | pF max | pF min | pF max |
| P0602ACLxx | 35 | 65 | 20 | 40 |
| P1402ACLxx | 105 | 155 | 60 | 90 |
| P1602ACLxx | 95 | 145 | 50 | 85 |
| P2202ACLxx | 75 | 115 | 40 | 65 |
| P2702ACLxx | 70 | 105 | 40 | 60 |
| P3002ACLxx | 65 | 95 | 35 | 55 |
| P3602ACLxx | 65 | 90 | 35 | 50 |
| P4202ACLxx | 60 | 85 | 35 | 50 |
| P4802ACLxx | 60 | 85 | 30 | 50 |
| P6002ACLxx | 55 | 80 | 30 | 45 |

Note: Off-state capacitance (C_O) is measured at 1 MHz with a 2 V bias.

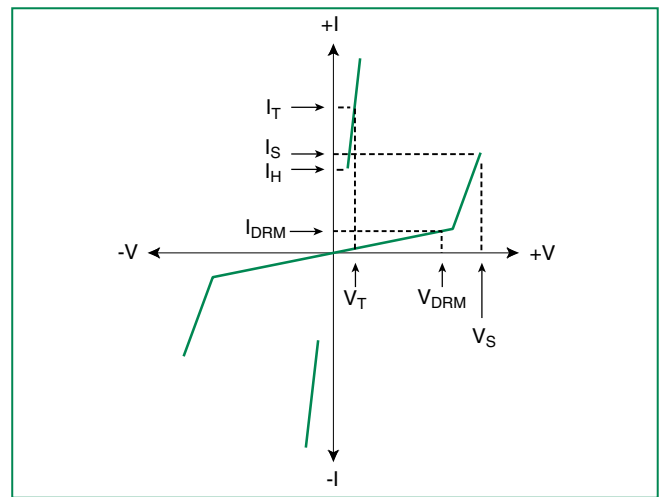
$t_r \times t_d$ Pulse Waveform



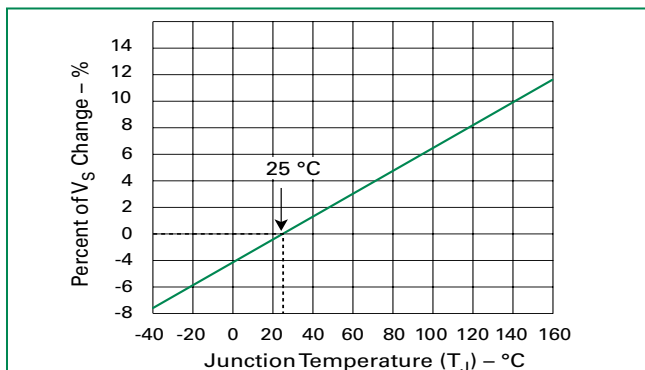
Thermal Considerations

| Package | Symbol | Parameter | Value | Unit |
|------------------------------------------------------------------------------------------------------|-----------------|-----------------------------------------|-------------|------|
| Modified TO-220  | 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 | 60 | °C/W |

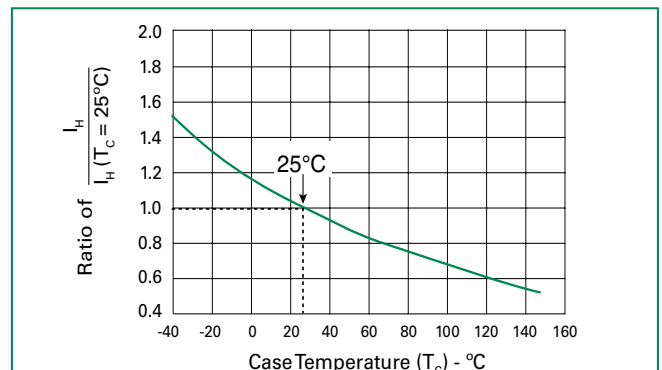
V-I Characteristics



Normalized V_S Change vs. Junction Temperature

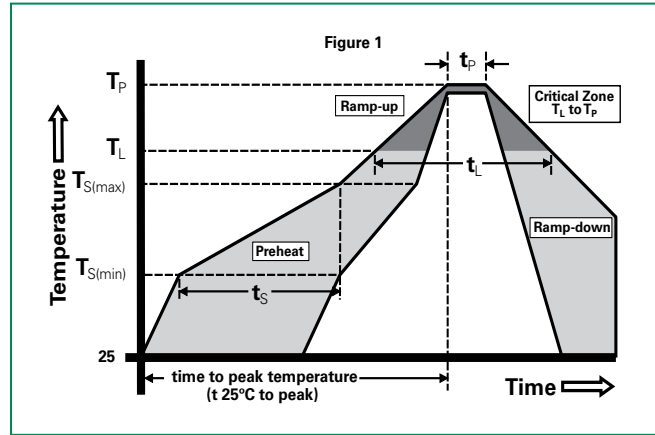


Normalized DC Holding Current vs. Case Temperature



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 |



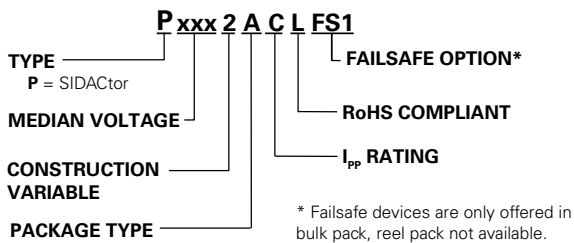
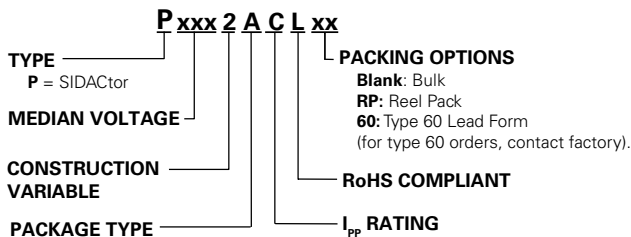
Physical Specifications

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

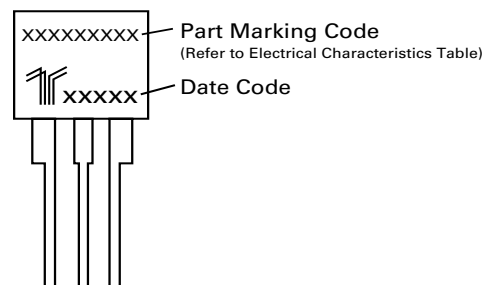
Environmental Specifications

| | |
|-----------------------------------------|-----------------------------------------------------------------------------------------------------------------------|
| High Temp Voltage Blocking | 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 |
| 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 V_{DC} (+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, 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/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 (+260°C Peak). JEDEC-J-STD-020, Level 1 |

Part Numbering



Part Marking



Additional Information



Datasheet



Resources



Samples