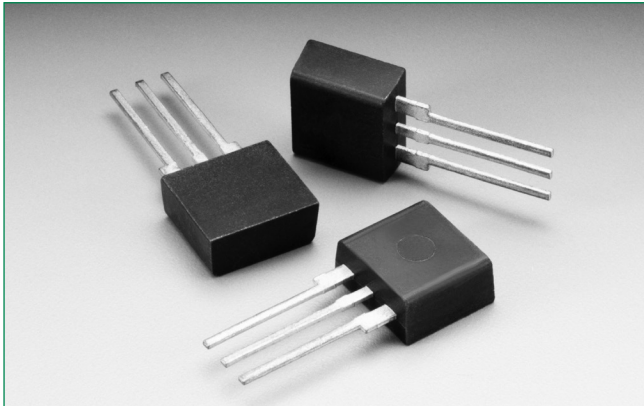


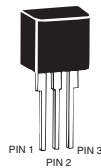
MC Series - Modified TO-220 Two-Chip MicroCapacitance (MC) SIDACtor® Device **HF** **RoHS** **UL** **e3**



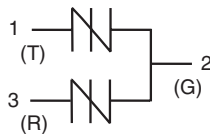
Agency Approvals

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

Pinout Designation



Schematic Symbol



Description

This MC Series (Pxxx2ACMC) offered in a modified TO-220 package are low capacitance SIDACtor components designed to protect various types of Broadband equipment from damaging overvoltage transients.

The series provides a robust single port solution that enables equipment to comply with various global regulatory standards while limiting the impact to broadband signals.

Features and Benefits

- 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
- Robust Modified TO-220 Package
- Custom lead forms available
- 40% lower capacitance
- than our Baseband Protectors, for applications that demand greater signal integrity
- Pb-free E3 means 2nd level interconnect is Pb-free and the terminal finish material is tin(Sn) (IPC/JEDEC J-STD-609A.01)
- Halogen-free and RoHS compliant
- Recognized to UL 497B as an Isolated Loop Circuit Protector

Applicable Global Standards

- TIA-968-A
- TIA-968-B
- ITU K.20/21 Enhanced Level
- ITU K.20/21 Basic Level
- GR 1089 Intra-building
- IEC 61000-4-5 2nd Edition
- YD/T 1082
- YD/T 993
- YD/T 950
- GR 1089 Inter-building

Electrical Characteristics

| Part Number | Marking | V_{DRM} @ $I_{DRM}=5\mu A$ | V_s @ 100V/ μs | V_{DRM} @ $I_{DRM}=5\mu A$ | V_s @ 100V/ μs | I_H | I_s | I_T | V_T @ $I_T=2.2$ Amps | Capacitance |
|--------------|-----------|---------------------------------|--------------------------|---------------------------------|--------------------------|---------------|--------|-------|---------------------------|------------------------------------|
| | | V min | V max | V min | V max | mA min | mA max | A max | V min | |
| | | Pins 1-2, 3-2 | | Pins 1-3 | | Pins 1-2, 3-2 | | | | |
| P0602ACMCLxx | P0602ACMC | 25 | 40 | 50 | 80 | 50 | 800 | 2.2 | 4 | See Capacitance Values Table |
| P1402ACMCLxx | P1402ACMC | 58 | 77 | 116 | 154 | 150 | 800 | 2.2 | 4 | |
| P1602ACMCLxx | P1602ACMC | 65 | 95 | 130 | 190 | 150 | 800 | 2.2 | 4 | |
| P2202ACMCLxx | P2202ACMC | 90 | 130 | 180 | 260 | 150 | 800 | 2.2 | 4 | |
| P2702ACMCLxx | P2702ACMC | 120 | 160 | 240 | 320 | 150 | 800 | 2.2 | 4 | |
| P3002ACMCLxx | P3002ACMC | 140 | 180 | 280 | 360 | 150 | 800 | 2.2 | 4 | |
| P3602ACMCLxx | P3602ACMC | 170 | 220 | 340 | 440 | 150 | 800 | 2.2 | 4 | |
| P4202ACMCLxx | P4202ACMC | 190 | 250 | 380 | 500 | 150 | 800 | 2.2 | 4 | |

Table continues on next page.

Electrical Characteristics (continued)

| Part Number | Marking | V_{DRM} @ $I_{DRM}=5\mu A$ | V_S @ 100V/ μs | V_{DRM} @ $I_{DRM}=5\mu A$ | V_S @ 100V/ μs | I_H | I_S | I_T | V_T @ $I_T=2.2$ Amps | Capacitance |
|--------------|-----------|---------------------------------|--------------------------|---------------------------------|--------------------------|---------------|--------|-------|---------------------------|------------------------------------|
| | | V min | V max | V min | V max | mA min | mA max | A max | V min | |
| | | Pins 1-2, 3-2 | | Pins 1-3 | | Pins 1-2, 3-2 | | | | |
| P4802ACMCLxx | P4802ACMC | 220 | 300 | 440 | 600 | 150 | 800 | 2.2 | 4 | See Capacitance Values Table |
| P6002ACMCLxx | P6002ACMC | 275 | 350 | 550 | 700 | 150 | 800 | 2.2 | 4 | |

Notes:

- Absolute maximum ratings measured at $T_J = 25^\circ C$ (unless otherwise noted).
- Components are bi-directional (unless otherwise noted).
- **XX** Part Number Suffix: **RP** (Reel Pack), **Blank** (Bulk Pack), or **60** (Type 60 lead form, Bulk Pack. Special order item -- contact factory.)

Capacitance Values

| Part Number | pF Pin 1-2 / 3-2 Tip-Ground, Ring-Ground | | pF Pin 1-3 Tip-Ring | |
|--------------|--|-----|---------------------------|-----|
| | MIN | MAX | MIN | MAX |
| P0602ACMCLxx | 25 | 45 | 10 | 25 |
| P1402ACMCLxx | 40 | 60 | 20 | 35 |
| P1602ACMCLxx | 35 | 55 | 20 | 35 |
| P2202ACMCLxx | 45 | 70 | 25 | 40 |
| P2702ACMCLxx | 40 | 60 | 20 | 35 |
| P3002ACMCLxx | 35 | 55 | 20 | 35 |
| P3602ACMCLxx | 35 | 50 | 15 | 30 |
| P4202ACMCLxx | 30 | 50 | 15 | 30 |
| P4802ACMCLxx | 30 | 45 | 15 | 30 |
| P6002ACMCLxx | 30 | 45 | 15 | 25 |

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

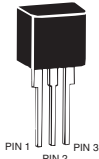
Surge Ratings

| Series | I_{pp} | | | | | | | | | | I_{TSM} 50/60 Hz | di/dt |
|--------|--|--|--|--|--|--|--|--|---|-------|-----------------------|-------|
| | 0.2/310 ¹ 0.5/700 ² | 2/10 ¹ 2/10 ² | 8/20 ¹ 1.2/50 ² | 10/160 ¹ 10/160 ² | 10/560 ¹ 10/560 ² | 5/320 ¹ 9/720 ² | 10/360 ¹ 10/360 ² | 10/1000 ¹ 10/1000 ² | 5/310 ¹ 10/700 ² | | | |
| | A min | 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 | 30 | 500 | |

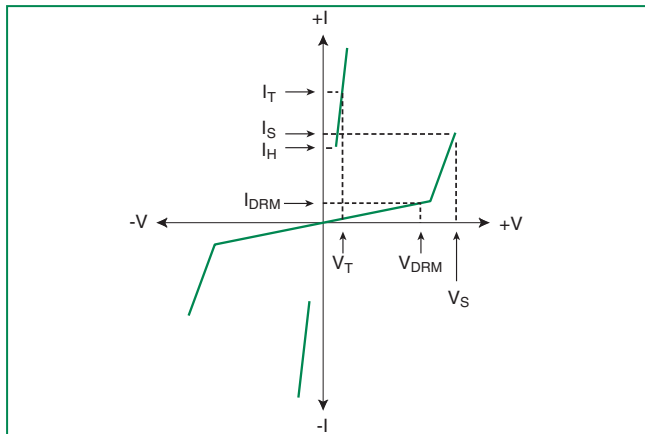
Notes:

- 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 $-40^\circ C$ to $+85^\circ C$
- The component must initially be in thermal equilibrium with $-40^\circ C \leq T_J \leq +150^\circ C$

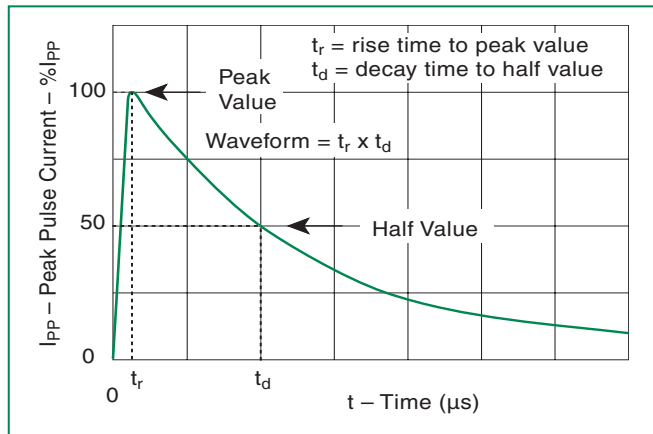
Thermal Considerations

| Package | Symbol | Parameter | Value | Unit |
|--|-----------------|---|-------------|------|
| Modified TO-220  | 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 |

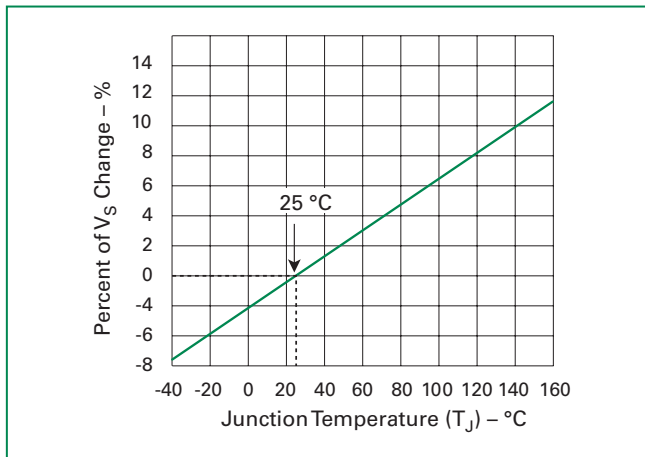
V-I Characteristics



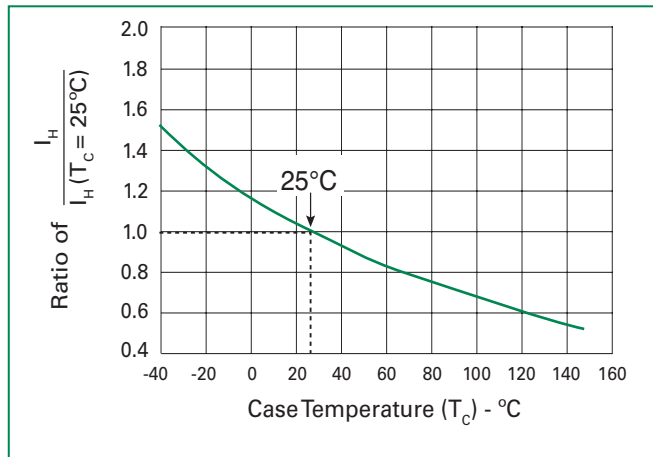
$t_r \times t_d$ Pulse Waveform



Normalized V_S Change vs. Junction Temperature

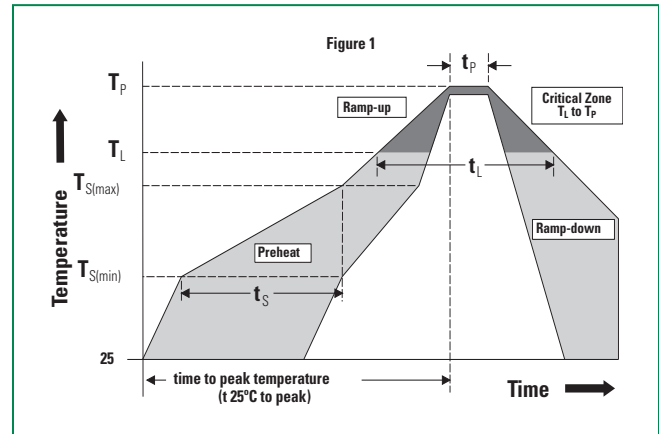


Normalized DC Holding Current vs. Case Temperature



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 |



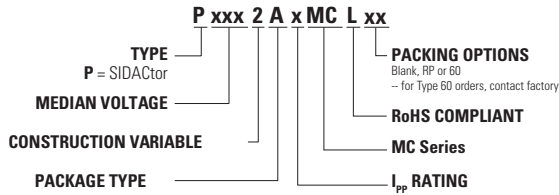
Physical Specifications

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

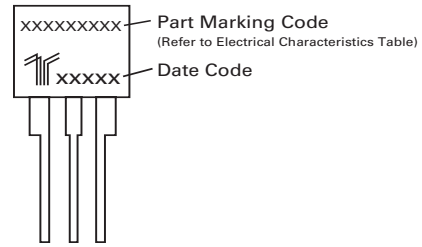
Environmental Specifications

| | |
|---|---|
| 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-A-104 |
| 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 |

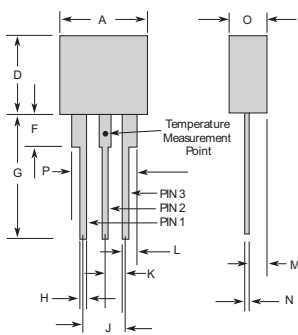
Part Numbering



Part Marking



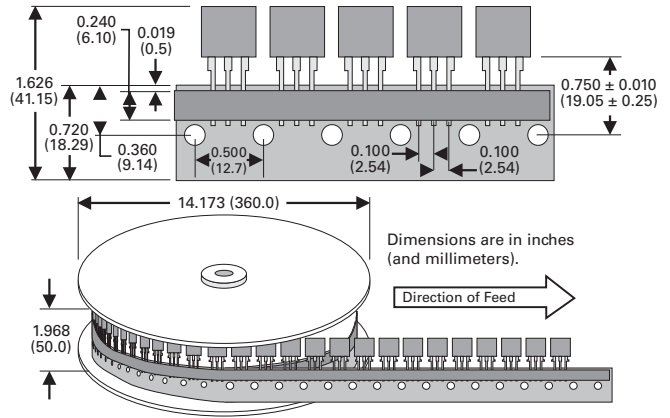
Dimensions - Modified TO-220



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

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

Tape and Reel Specification — Modified TO-220



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 | N/A | N/A |
| | Modified TO-220, Type 60 Lead Form Bulk Pack | 500 | 60 (special order item, contact factory for details) | N/A |

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