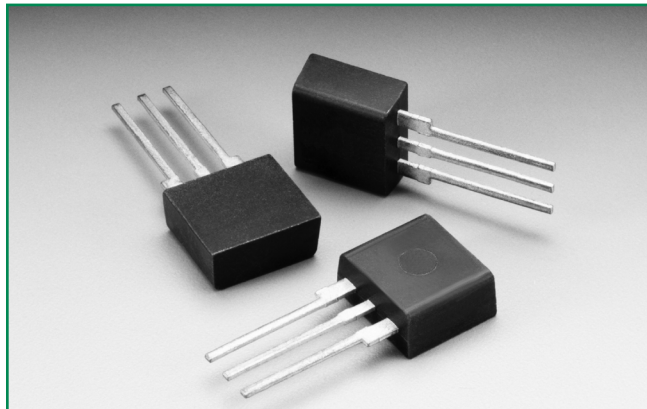


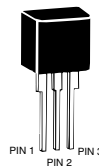
## Balanced MC Series - Modified TO-220



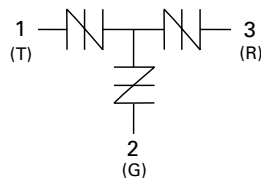
### Agency Approvals

Agency	Agency File Number
	E133083

### Pinout Designation



### Schematic Symbol



### Description

Balanced MC Series Modified TO-220 are low capacitance SIDACtor® components designed to protect broadband equipment from damaging overvoltage transients. The patented “Y” configuration also ensures balanced overvoltage protection that prevents a longitudinal to differential conversion.

The series provides a 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
- Balanced overvoltage protection
- RoHS Compliant, Lead-Free, and Halogen-Free
- 40% lower capacitance
- than our Baseband Protectors, for applications that demand greater signal integrity
- Robust Modified TO-220 Package
- Custom 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)

### Applicable Global Standards

- TIA-968-A
- TIA-968-B
- ITU K.20/21/45 Enhanced Level
- ITU K.20/21/45 Basic
- GR 1089 Intra-building
- IEC 61000-4-5
- YD/T 1082
- YD/T 993
- YD/T 950

### Electrical Characteristics

Part Number	Marking	$V_{DRM}$ @ $I_{DRM} = 5\mu A$	$V_S$ @ 100V/ $\mu s$	$I_H$	$I_S$	$I_T$	$V_T$ @ $I_T = 2.2$ Amps	Capacitance
		V min	V max	mA max	mA max	A max	V min	
		Pins 1-2, 3-2, 1-3		Pins 1-2, 3-2, 1-3				
P1553ACMCLxx	P1553ACMC	130	180	150	800	2.2	8	See Capacitance Values Table
P1803ACMCLxx	P1803ACMC	150	210	150	800	2.2	8	
P2103ACMCLxx	P2103ACMC	170	250	150	800	2.2	8	
P2353ACMCLxx	P2353ACMC	200	270	150	800	2.2	8	
P2703ACMCLxx	P2703ACMC	230	300	150	800	2.2	8	
P3203ACMCLxx	P3203ACMC	270	350	150	800	2.2	8	
P3403ACMCLxx	P3403ACMC	300	400	150	800	2.2	8	
P5103ACMCLxx	P5103ACMC	420	600	150	800	2.2	8	

Notes:

- Absolute maximum ratings measured at  $T_a = 25^\circ C$  (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
P1553ACMCLxx	30	55	20	35
P1803ACMCLxx	30	60	15	30
P2103ACMCLxx	30	45	15	30
P2353ACMCLxx	25	45	15	30
P2703ACMCLxx	25	40	15	30
P3203ACMCLxx	25	40	15	30
P3403ACMCLxx	20	35	15	25
P5103ACMCLxx	20	30	10	20

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

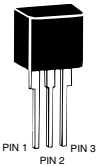
### Surge Ratings

Series	$I_{PP}$									$I_{TSM}$ 50/60 Hz	di/dt
	0.2/310 <sup>1</sup> 0.5/700 <sup>2</sup>	2x/0 <sup>1</sup> 2/10 <sup>2</sup>	8/20 <sup>1</sup> 1.2/50 <sup>2</sup>	10/160 <sup>1</sup> 10/160 <sup>2</sup>	10/560 <sup>1</sup> 10/560 <sup>2</sup>	5/320 <sup>1</sup> 9/720 <sup>2</sup>	10/360 <sup>1</sup> 10/360 <sup>2</sup>	10/1000 <sup>1</sup> 10/1000 <sup>2</sup>	5/310 <sup>1</sup> 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	30	500

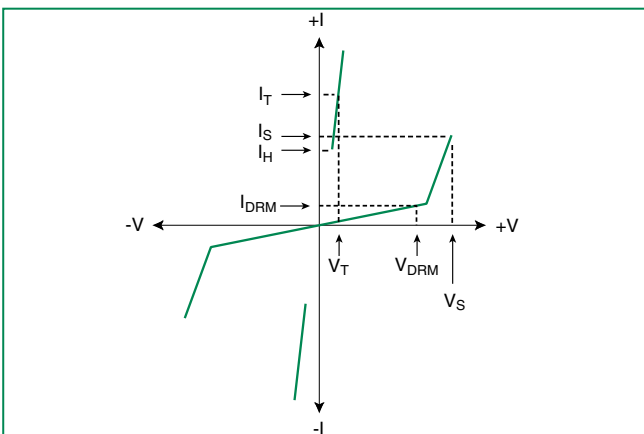
Notes:

- 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 that remains 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  $-40^{\circ}C \leq T_J \leq +150^{\circ}C$

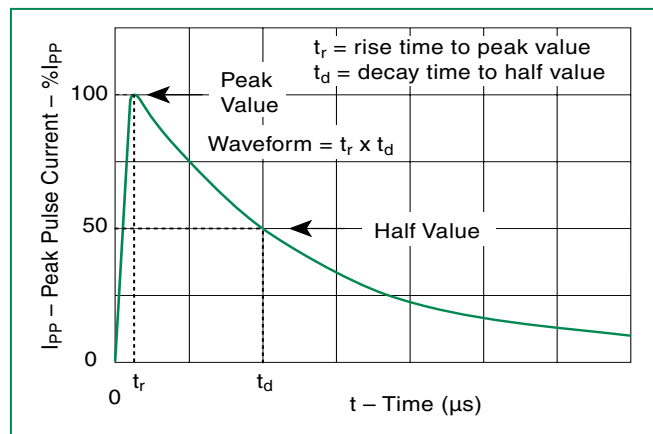
### Thermal Considerations

Package	Symbol	Parameter	Value	Unit
Modified TO-220 	$T_J$	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	$^{\circ}C/W$

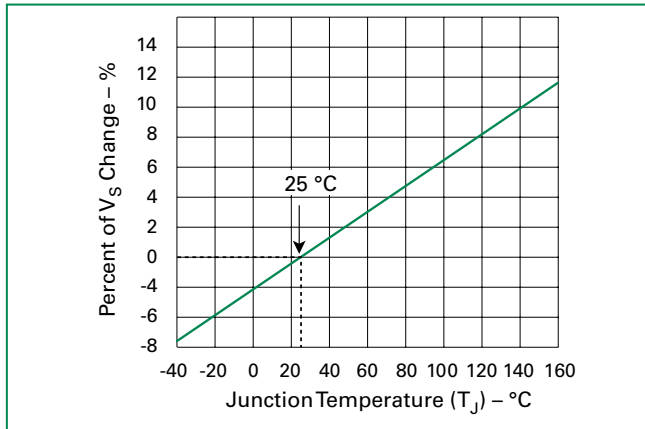
### V-I Characteristics



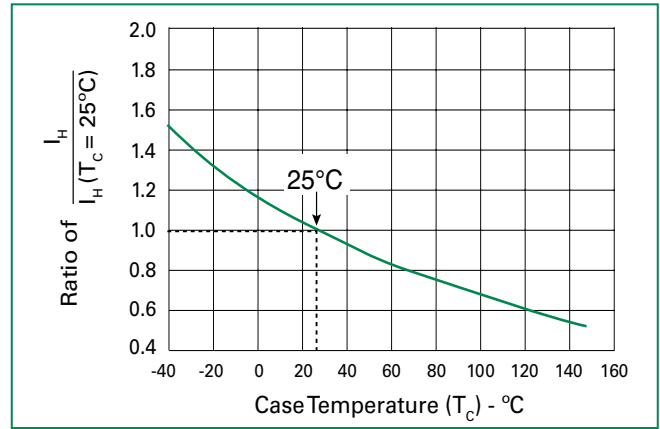
### $t_r \times t_d$ Pulse Waveform



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

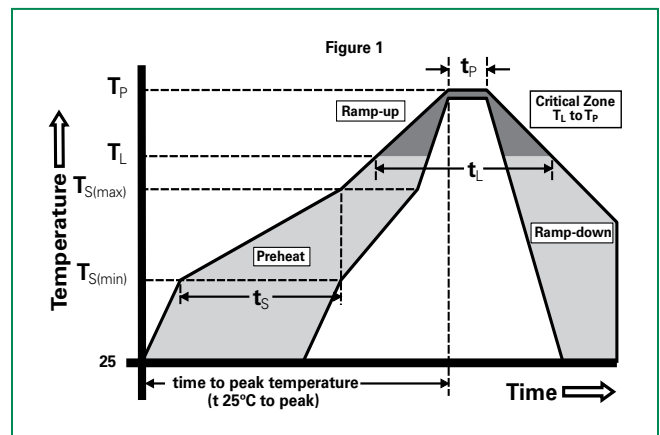


**Normalized DC Holding Current vs. Case Temperature**



**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	



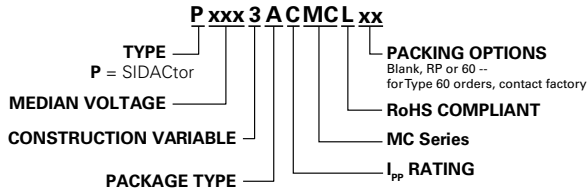
**Physical Specifications**

<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

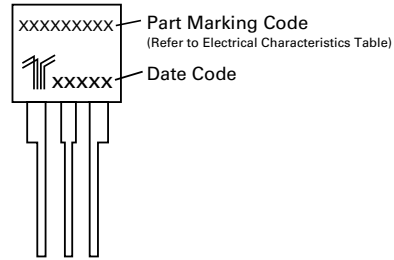
**Environmental Specifications**

<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-A104
<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

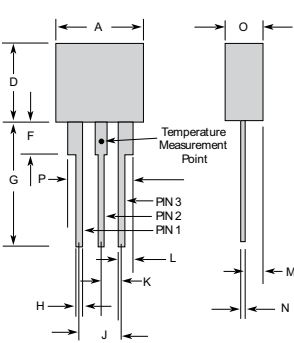
**Part Numbering**



**Part Marking**



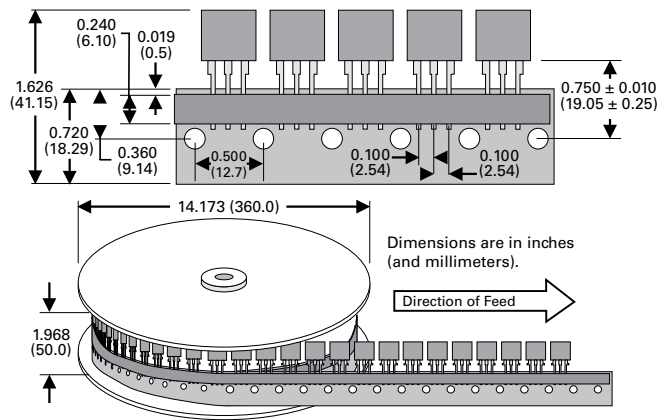
**Dimensions - Modified TO-220**



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

**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

**Additional Information**



**Datasheet**



**Resources**



**Samples**

**Disclaimer Notice - Information furnished is believed to be accurate and reliable. However, users should independently evaluate the suitability of and test each product selected for their own applications. Littelfuse products are not designed for, and may not be used in, all applications. Read complete Disclaimer Notice at [www.littelfuse.com/disclaimer-electronics](http://www.littelfuse.com/disclaimer-electronics).**