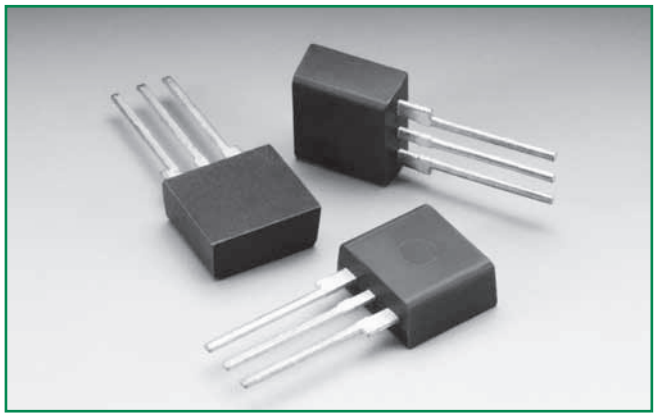
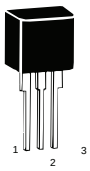
RoHS MC Series - Modified TO-220



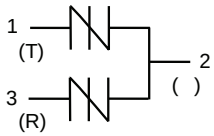
Agency Approvals

Agency	Agency File Number
	E133083

Pinout Designation



Schematic Symbol



Description

MC Series Modified TO-220 are low capacitance SIDACtor® devices 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 with use
- Fails short circuit when surged in excess of ratings
- Robust Modified TO-220 Package
- 40% lower capacitance than our Baseband Protectors, for applications that demand greater signal integrity
- Custom lead forms available

Applicable Global Standards

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

*A-rated parts require series resistance

Electrical Characteristics

Part Number	Marking	V_{DRM} @I_{DRM}=5µA	V_S @100V/µs	V_{DRM} @I_{DRM}=5µA	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				
P0302AAMCLxx	P0302AAMC	6	25	12	50	50	800	2.2	4	See Capacitance Values Table
P0602AAMCLxx	P0602AAMC	25	40	50	80	50	800	2.2	4	
P0602ACMCLxx	P0602ACMC	25	40	50	80	50	800	2.2	4	
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.

Revised: April 15, 2011

Electrical Characteristics (continued)

Part Number	Marking	V_{DRM} @I_{DRM}=5µA	V_S @100V/µs	V_{DRM} @I_{DRM}=5µA	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_A= 25°C (unless otherwise noted).
- Devices 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
P0302AAMCLxx	25	55	15	35
P0602AAMCLxx	15	35	10	20
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_O) is measured at 1 MHz with a 2 V bias.

Surge Ratings

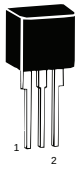
Series	I_{PP}									I_{TSM} 50/60 Hz	di/dt
	0.2x310 [1] 0.5x700 [2]	2x10 [1] 2x10 [2]	8x20 [1] 1.2x50 [2]	10x160 [1] 10x160 [2]	10x560 [1] 10x560 [2]	5x320 [1] 9x720 [2]	10x360 [1] 10x360 [2]	10x1000 [1] 10x1000 [2]	5x310 [1] 10x700 [2]		
	A min	A min	A min	A min	A min	A min	A min	A min	A min	A min	A/µs Max
A	20	150	150	90	50	75	75	45	75	20	500
C	50	500	400	200	150	200	175	100	200	30	500

Notes:

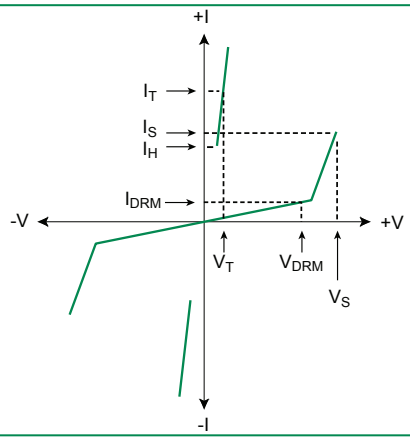
1 Current waveform in µs
2 Voltage waveform in µs

- 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°C to +85°C
- The device must initially be in thermal equilibrium with -40°C ≤ T_J ≤ +150°C

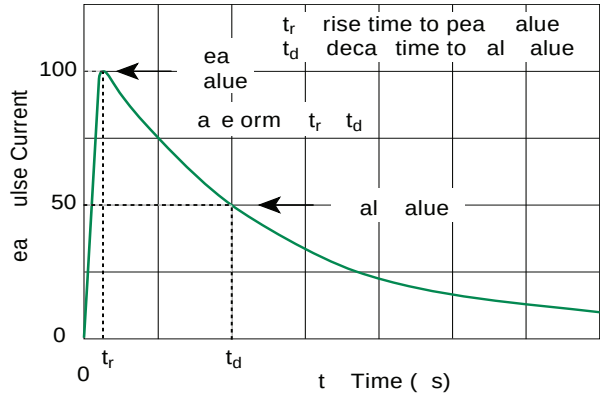
Thermal Considerations

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

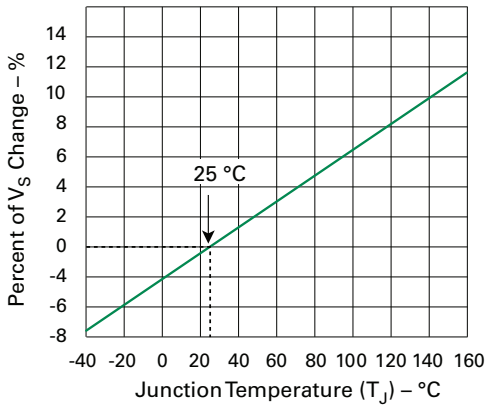
V-I Characteristics



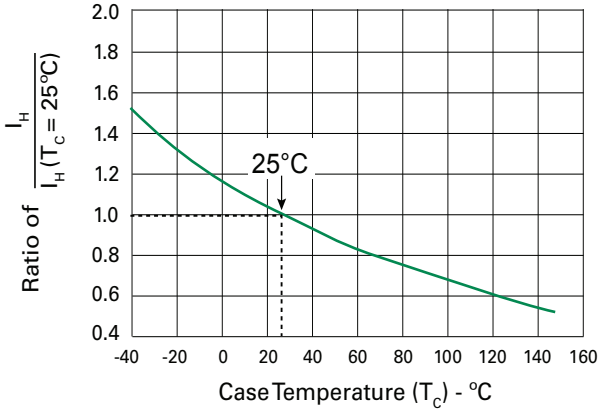
t_r x t_d Pulse Waveform



Normalized V_S Change vs. Junction Temperature



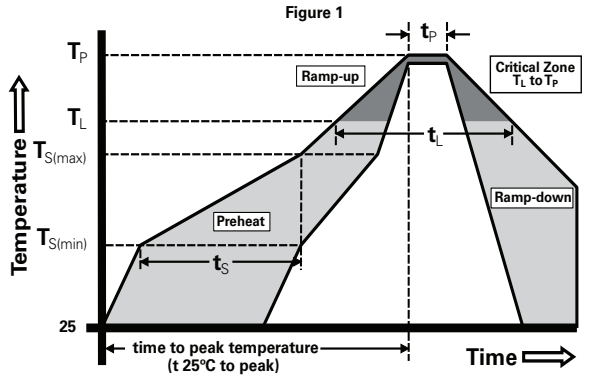
Normalized DC Holding Current vs. Case Temperature



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

Figure 1



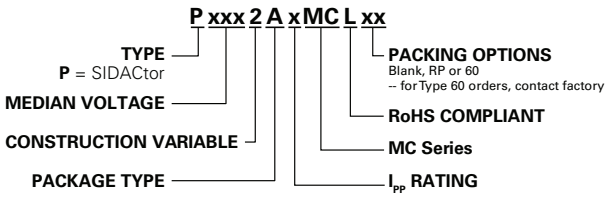
Physical Specifications

Lead Material	Copper Alloy
Terminal Finish	100% Matte-Tin Plated
Body Material	UL recognized epoxy meeting flammability classification 94V-0

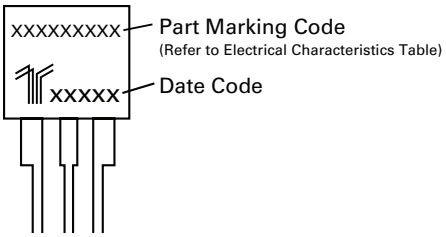
Environmental Specifications

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

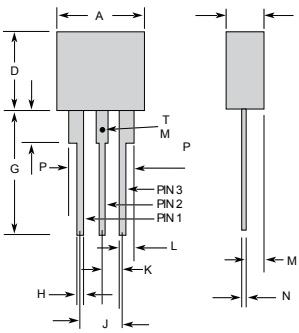
Part Numbering



Part Marking



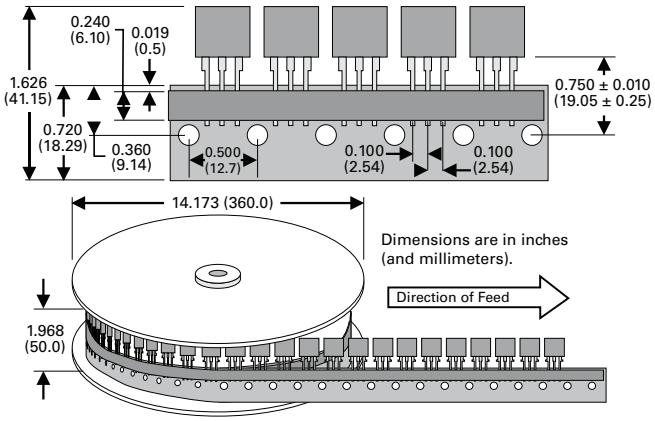
Dimensions - Modified TO-220



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
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

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