

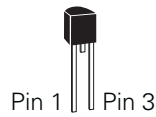
RoHS MC Series - TO-92



Agency Approvals

Agency	Agency File Number
	E133083

Pinout Designation



Schematic Symbol



Description

MC Series TO-92 are low capacitance SIDACtor® devices designed to protect broadband CPE equipment such as VoIP and DSL Modems from damaging overvoltage transients.

The series provides a through-hole solution that enables CPE equipment to comply with 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
- 40% lower capacitance than our Baseband Protectors, for applications that demand greater signal integrity

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
- 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 @ $100V/\mu s$	I_H	I_S	I_T	V_T @ $I_T=2.2$ Amps	Capacitance @ 1MHz, 2V bias	
		V min	V max	mA min	mA max	A max	V max	pF min	pF max
P0080ECMCLxxx	P0080ECMC	6	25	50	800	2.2	4	35	75
P0300ECMCLxxx	P0300ECMC	25	40	50	800	2.2	4	25	45
P0640ECMCLxxx	P0640ECMC	58	77	150	800	2.2	4	55	85
P0720ECMCLxxx	P0720ECMC	65	88	150	800	2.2	4	50	75
P0900ECMCLxxx	P0900ECMC	75	98	150	800	2.2	4	45	70
P1100ECMCLxxx	P1100ECMC	90	130	150	800	2.2	4	45	70
P1300ECMCLxxx	P1300ECMC	120	160	150	800	2.2	4	40	60
P1500ECMCLxxx	P1500ECMC	140	180	150	800	2.2	4	35	55
P1800ECMCLxxx	P1800ECMC	170	220	150	800	2.2	4	35	50
P2300ECMCLxxx	P2300ECMC	190	260	150	800	2.2	4	30	50
P2600ECMCLxxx	P2600ECMC	220	300	150	800	2.2	4	30	45
P3100ECMCLxxx	P3100ECMC	275	350	150	800	2.2	4	30	45
P3500ECMCLxxx	P3500ECMC	320	400	150	800	2.2	4	25	40

Notes:
 - Absolute maximum ratings measured at $T_a = 25^\circ C$ (unless otherwise noted).
 - Devices are bi-directional (unless otherwise noted).
 - **XXX** Part Number Suffix: 'AP' (Ammo Pack), or 'RP1' or 'RP2' (Reel Pack).

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		
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.

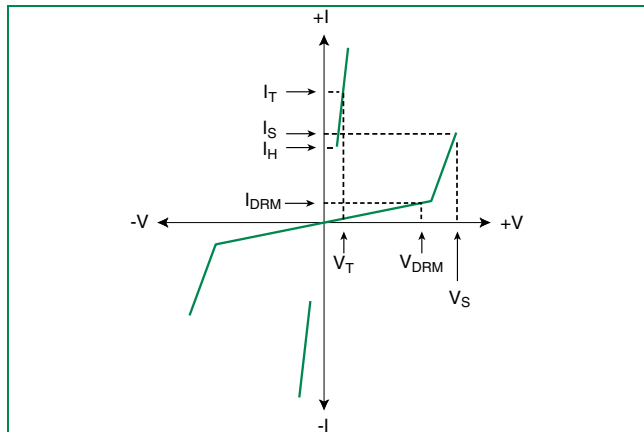
- I_{PP} ratings applicable over temperature range of -40°C to +85°C

- The device must initially be in thermal equilibrium with -40°C $\leq T_J \leq$ +150°C

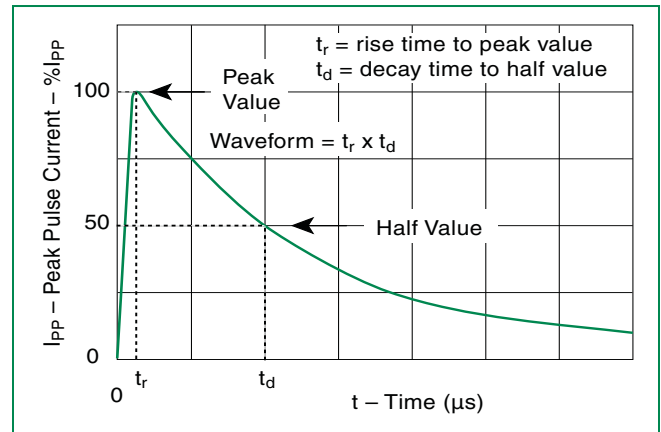
Thermal Considerations

Package	Symbol	Parameter	Value	Unit
 TO-92	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	90	°C/W

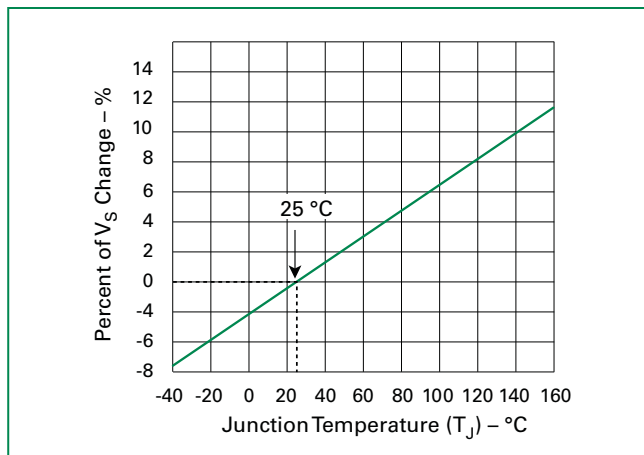
V-I Characteristics



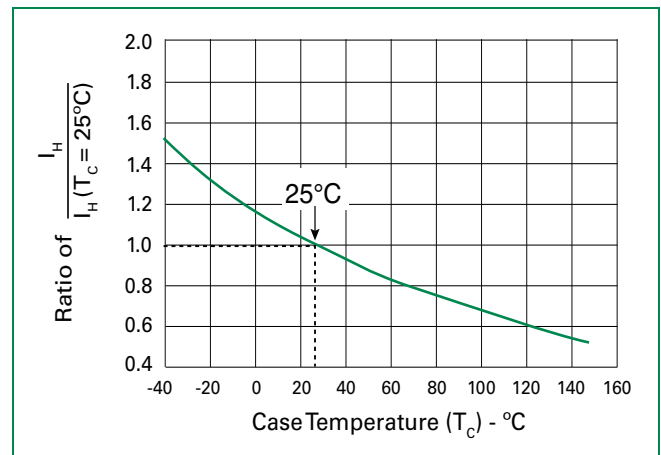
$t_r \times t_d$ Pulse Waveform



Normalized V_S Change vs. Junction Temperature

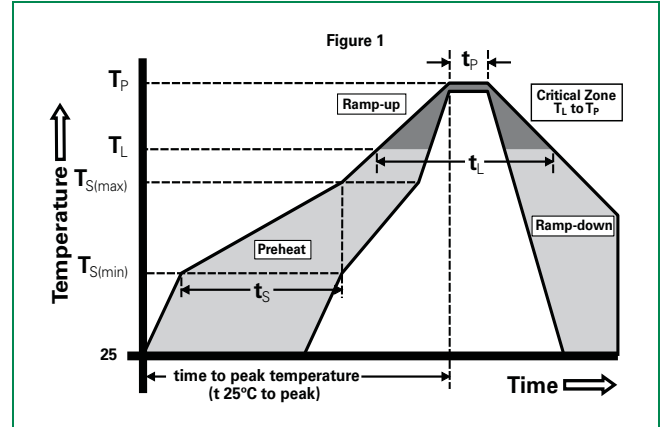


Normalized DC Holding Current vs. Case Temperature



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



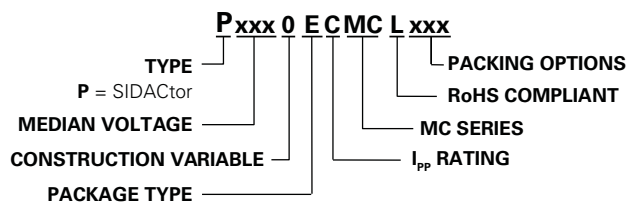
Physical Specifications

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

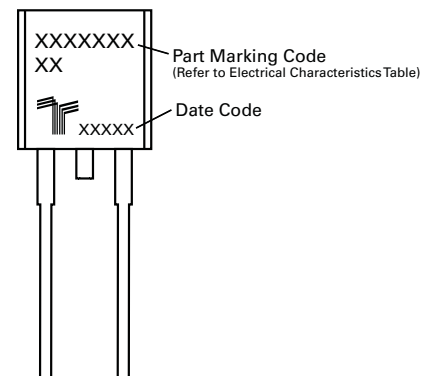
Environmental Specifications

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-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



Package Type	Description	Packing Options Quantity	Added Suffix	Lead Spacing	Industry Standard
E	TO-92 Tape and Reel Pack	2000	RP1	0.1 inch (2.54mm)	EIA-481-D
	RP2		0.2 inch (5.08mm)		
	TO-92 Ammo Pack		AP	(Not applicable)	EIA-468-B
	TO-92 Bulk Pack		N/A	(Not applicable)	N/A

All leads are insulated from case. Case is electrically non-conductive. (Rated at 1600 V_{(AC) RMS} for one minute from leads to case over the operating temperature range.)

The TO-92 is designed to meet mechanical standards as set forth in JEDEC publication number 95.

Figure 1: Dimensions of the device. The figure consists of three parts: a top view of a single device, a perspective view of a folded strip, and a side view of the strip. The top view shows a rectangular device with a width of 0.157 inches (4.0 mm) and a length of 1.27 inches (32.2 mm). It features four circular pads with a diameter of 0.02 inches (0.5 mm) and four circular holes with a diameter of 0.0236 inches (6.0 mm). The distance between the pads is 0.50 inches (12.7 mm), and the distance between the holes is 0.25 inches (6.35 mm). The distance from the left edge to the first hole is 0.236 inches (6.0 mm), and the distance from the last hole to the right edge is 0.125 inches (3.2 mm). The distance from the left edge to the first pad is 0.708 inches (18.0 mm), and the distance from the last pad to the right edge is 0.354 inches (9.0 mm). The perspective view shows a strip of 25 devices per fold, with a 'Direction of Feed' arrow pointing to the right. The side view shows a strip with a thickness of 1.7 inches (43 mm) and a total width of 12.9 inches (327 mm). The distance from the top edge to the bottom edge is 6.9 inches (175 mm), and the distance from the bottom edge to the bottom edge of the strip is 1.7 inches (43 mm).

	Inches		Millimeters	
	Min	Max	Min	Max
A	N/A	14.173	N/A	360.0
B	4.016	N/A	102.0	N/A
C	3.386	N/A	86.0	N/A
D	0.795	N/A	20.2	N/A
W1	1.181	1.968	30.0	50.0
P	0.496	0.504	12.60	12.80
P0	0.498	0.502	12.65	12.75
F(for RP1)	0.090	0.110	2.29	2.80
F(for RP2)	0.182	0.244	4.63	6.19
H	N/A	1.673	N/A	42.50
H1	N/A	1.270	N/A	32.26
W	0.674	0.763	17.12	19.38
W2	0.354	0.370	8.25	9.75
W3	0.236	N/A	6.00	N/A
W4	0.020	N/A	0.50	N/A