# RoHS SIDACtor® Series - TO-92

## Description

SIDACtor® Series TO-92 are designed to protect baseband equipment such as modems, line cards, CPE and DSL from damaging overvoltage transients.

The series provides a robust through-hole solution that enables equipment to comply with global regulatory standards.

## Features and Benefits

- Low voltage overshoot
- Low on-state voltage
- Does not degrade with use
- Fails short circuit when surged in excess of ratings
- Low Capacitance

## Applicable Global Standards

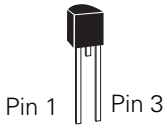
- TIA-968-A
- TIA-968-B
- ITU K.20/21 Enhanced Level*
- ITU K.20/21 Basic Level
- GR 1089 Inter-building*
- GR 1089 Intra-building
- IEC 61000-4-5
- YD/T 1082
- YD/T 993
- YD/T 950

* A/B-rated parts require series resistance

## Agency Approvals

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

## Pinout Designation




## Schematic Symbol

## Electrical Characteristics

| Part Number | Marking | $V_{DRM}$ @$I_{DRM}$=5µA | $V_S$ @100V/µs | $I_H$ | $I_S$ | $I_T$ | $V_T$ @$I_T$=2.2 Amps | Capacitance @1MHz, 2V bias | |
|---|---|---|---|---|---|---|---|---|---|
| | | V min | V max | mA min | mA max | A max | V max | pF min | pF max |
| P0080EALxxx | P0080EA | 6 | 25 | 50 | 800 | 2.2 | 4 | 25 | 150 |
| P0300EALxxx | P0300EA | 25 | 40 | 50 | 800 | 2.2 | 4 | 15 | 140 |
| P0640EALxxx | P0640EA | 58 | 77 | 150 | 800 | 2.2 | 4 | 40 | 60 |
| P0720EALxxx | P0720EA | 65 | 88 | 150 | 800 | 2.2 | 4 | 35 | 60 |
| P0900EALxxx | P0900EA | 75 | 98 | 150 | 800 | 2.2 | 4 | 35 | 55 |
| P1100EALxxx | P1100EA | 90 | 130 | 150 | 800 | 2.2 | 4 | 30 | 50 |
| P1300EALxxx | P1300EA | 120 | 160 | 150 | 800 | 2.2 | 4 | 25 | 45 |
| P1500EALxxx | P1500EA | 140 | 180 | 150 | 800 | 2.2 | 4 | 25 | 40 |
| P1800EALxxx | P1800EA | 170 | 220 | 150 | 800 | 2.2 | 4 | 25 | 35 |
| P2300EALxxx | P2300EA | 190 | 260 | 150 | 800 | 2.2 | 4 | 25 | 35 |
| P2600EALxxx | P2600EA | 220 | 300 | 150 | 800 | 2.2 | 4 | 20 | 35 |
| P3100EALxxx | P3100EA | 275 | 350 | 150 | 800 | 2.2 | 4 | 20 | 35 |
| P3500EALxxx | P3500EA | 320 | 400 | 150 | 800 | 2.2 | 4 | 20 | 35 |

**Table continues on next page.**

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## Electrical Characteristics (continued)

| Part Number | Marking | $V_{DRM}$ @$I_{DRM}$=5µA | $V_S$ @100V/µs | $I_H$ | $I_S$ | $I_T$ | $V_T$ @$I_T$=2.2 Amps | Capacitance @1MHz, 2V bias | |
|---|---|---|---|---|---|---|---|---|---|
| | | V Min | V Max | mA Min | mA Max | A Max | V Max | pF Min | pF Max |
| P0080EBLxxx | P0080EB | 6 | 25 | 50 | 800 | 2.2 | 4 | 25 | 150 |
| P0300EBLxxx | P0300EB | 25 | 40 | 50 | 800 | 2.2 | 4 | 15 | 140 |
| P0640EBLxxx | P0640EB | 58 | 77 | 150 | 800 | 2.2 | 4 | 40 | 60 |
| P0720EBLxxx | P0720EB | 65 | 88 | 150 | 800 | 2.2 | 4 | 35 | 75 |
| P0900EBLxxx | P0900EB | 75 | 98 | 150 | 800 | 2.2 | 4 | 35 | 70 |
| P1100EBLxxx | P1100EB | 90 | 130 | 150 | 800 | 2.2 | 4 | 30 | 70 |
| P1300EBLxxx | P1300EB | 120 | 160 | 150 | 800 | 2.2 | 4 | 25 | 60 |
| P1500EBLxxx | P1500EB | 140 | 180 | 150 | 800 | 2.2 | 4 | 25 | 55 |
| P1800EBLxxx | P1800EB | 170 | 220 | 150 | 800 | 2.2 | 4 | 25 | 50 |
| P2300EBLxxx | P2300EB | 190 | 260 | 150 | 800 | 2.2 | 4 | 25 | 50 |
| P2600EBLxxx | P2600EB | 220 | 300 | 150 | 800 | 2.2 | 4 | 20 | 45 |
| P3100EBLxxx | P3100EB | 275 | 350 | 150 | 800 | 2.2 | 4 | 20 | 45 |
| P3500EBLxxx | P3500EB | 320 | 400 | 150 | 800 | 2.2 | 4 | 20 | 40 |
| P0080ECLxxx | P0080EC | 6 | 25 | 50 | 800 | 2.2 | 4 | 35 | 260 |
| P0300ECLxxx | P0300EC | 25 | 40 | 50 | 800 | 2.2 | 4 | 25 | 250 |
| P0640ECLxxx | P0640EC | 58 | 77 | 150 | 800 | 2.2 | 4 | 55 | 155 |
| P0720ECLxxx | P0720EC | 65 | 88 | 150 | 800 | 2.2 | 4 | 50 | 150 |
| P0900ECLxxx | P0900EC | 75 | 98 | 150 | 800 | 2.2 | 4 | 45 | 140 |
| P1100ECLxxx | P1100EC | 90 | 130 | 150 | 800 | 2.2 | 4 | 45 | 115 |
| P1300ECLxxx | P1300EC | 120 | 160 | 150 | 800 | 2.2 | 4 | 40 | 105 |
| P1500ECLxxx | P1500EC | 140 | 180 | 150 | 800 | 2.2 | 4 | 35 | 95 |
| P1800ECLxxx | P1800EC | 170 | 220 | 150 | 800 | 2.2 | 4 | 35 | 90 |
| P2300ECLxxx | P2300EC | 190 | 260 | 150 | 800 | 2.2 | 4 | 30 | 80 |
| P2600ECLxxx | P2600EC | 220 | 300 | 150 | 800 | 2.2 | 4 | 30 | 80 |
| P3100ECLxxx | P3100EC | 275 | 350 | 150 | 800 | 2.2 | 4 | 30 | 70 |
| P3500ECLxxx | P3500EC | 320 | 400 | 150 | 800 | 2.2 | 4 | 25 | 65 |

Notes:
- Absolute maximum ratings measured at $T_A$= 25°C (unless otherwise noted).
- Devices are bi-directional (unless otherwise noted).
- xxx part number suffix: 'AP' = Ammo Pack, 'RP1' and 'RP2' = Reel Pack, blank = Bulk 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 | A min | A/µs max |
| A | 20 | 150 | 150 | 90 | 50 | 75 | 75 | 45 | 75 | 20 | 500 |
| B | 25 | 250 | 250 | 150 | 100 | 100 | 125 | 80 | 100 | 25 | 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 |
|---|---|---|---|---|
| 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 |

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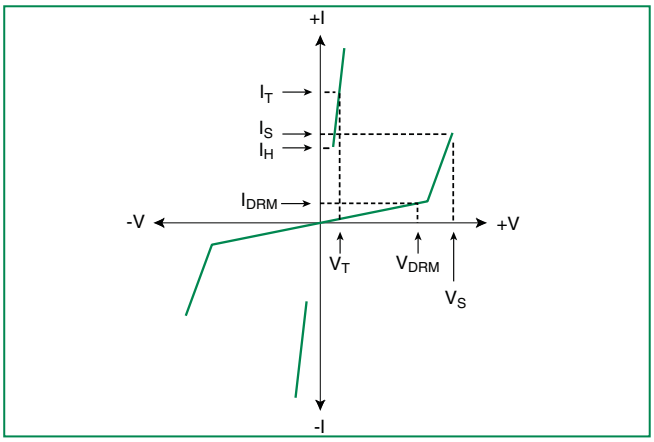
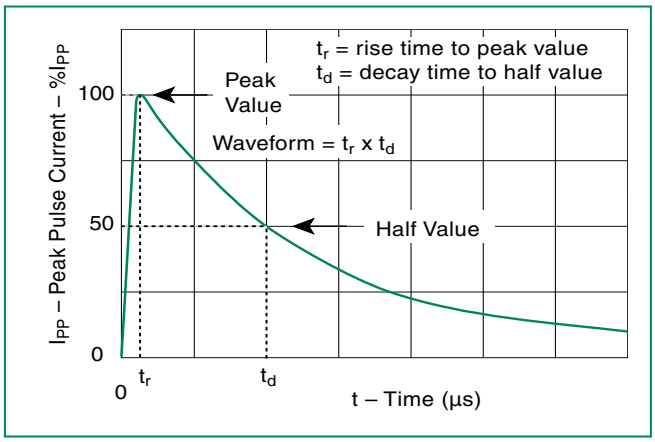
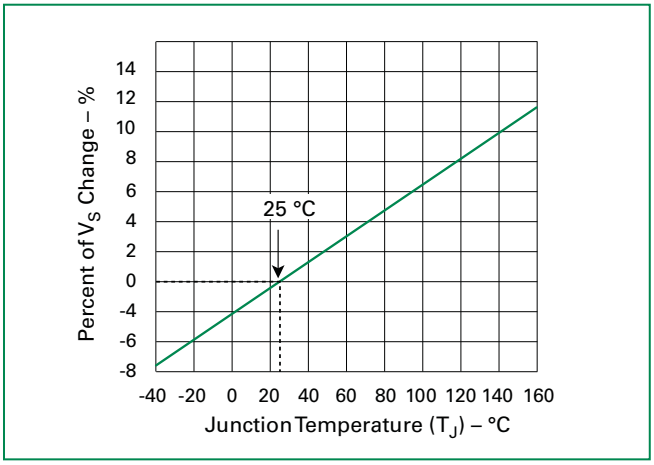
## V-I Characteristics



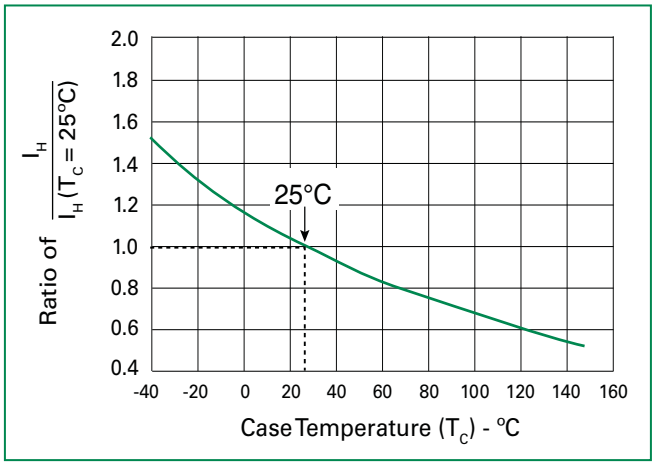

## $t_r$ x $t_d$ Pulse Waveform




## Normalized $V_S$ Change vs. Junction Temperature



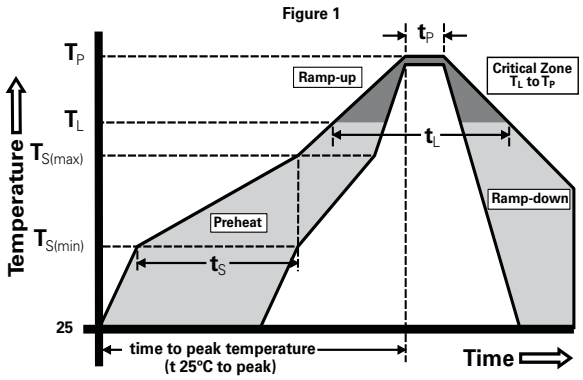

## Normalized DC Holding Current vs. Case Temperature




## 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

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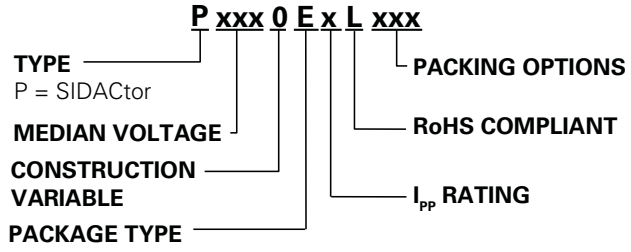
## Physical Specifications

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

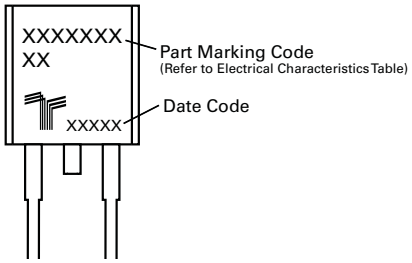
## Environmental Specifications

| | |
|---|---|
| **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




## Packing Options

| 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 | | EIA-468-B |
| | TO-92 Bulk Pack | | N/A | | N/A |

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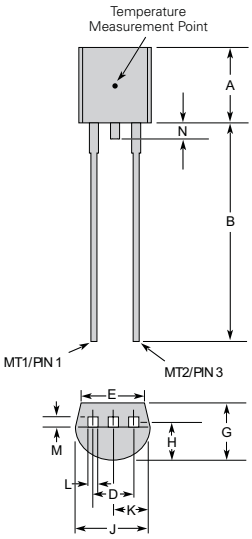
## Dimensions — TO-92



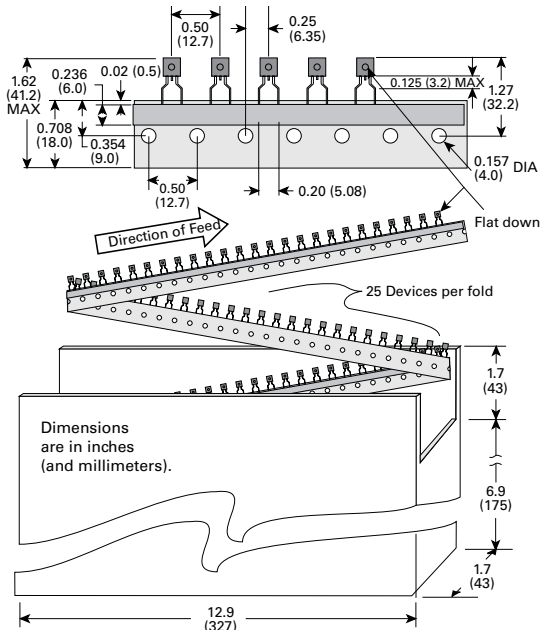

| | Inches | | Millimeters | |
|---|---|---|---|---|
| | Min | Max | Min | Max |
| A | 0.176 | 0.196 | 4.47 | 4.98 |
| B | 0.500 | | 12.70 | |
| D | 0.095 | 0.105 | 2.41 | 2.67 |
| E | 0.150 | | 3.81 | |
| G | 0.135 | 0.145 | 3.43 | 3.68 |
| H | 0.088 | 0.096 | 2.23 | 2.44 |
| J | 0.176 | 0.186 | 4.47 | 4.73 |
| K | 0.088 | 0.096 | 2.23 | 2.44 |
| L | 0.013 | 0.019 | 0.33 | 0.48 |
| M | 0.013 | 0.017 | 0.33 | 0.43 |
| N | | 0.60 | | 1.52 |

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

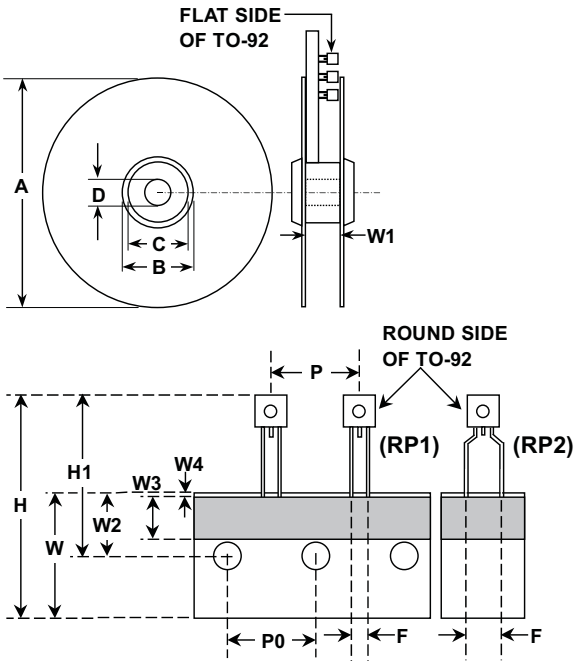
All leads are insulated from case. Case is electrically non-conductive. (Rated at 1600 $V_{(AC)\ RMS}$ for one minute from leads to case over the operating temperature range.)

Mold flash shall not exceed 0.13 mm per side.

## Ammo Pack Specification — TO-92




## Tape and Reel Specification — TO-92




| Dimensions | 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 |

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Стандарт Электрон Связь

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