# *SIDACtor*® Protection Thyristors
## Baseband Protection (Voice-DS1)

## SIDACtor® Series - DO-214

HF RoHS



## Description

SIDACtor® Series DO-214AA are designed to protect baseband equipment such as modems, line cards, CPE and DSL from damaging overvoltage transients.

The series provides a surface mount solution that enables equipment to comply with global regulatory standards.

## 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
- Low capacitance

## Agency Approvals

| AGENCY | AGENCY FILE NUMBER |
|---|---|
| UL | E133083 |

## Pinout Designation

Not Applicable

## Schematic Symbol



## 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

## 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 |
| P0080SALRP | P-8A | 6 | 25 | 50 | 800 | 2.2 | 4 | 25 | 150 |
| P0220SALRP | P22A | 15 | 32 | 50 | 800 | 2.2 | 4 | 25 | 150 |
| P0300SALRP | P03A | 25 | 40 | 50 | 800 | 2.2 | 4 | 15 | 140 |
| P0640SALRP | P06A | 58 | 77 | 150 | 800 | 2.2 | 4 | 40 | 60 |
| P0720SALRP | P07A | 65 | 88 | 150 | 800 | 2.2 | 4 | 35 | 60 |
| P0900SALRP | P09A | 75 | 98 | 150 | 800 | 2.2 | 4 | 25 | 55 |
| P1100SALRP | P11A | 90 | 130 | 150 | 800 | 2.2 | 4 | 30 | 50 |
| P1300SALRP | P13A | 120 | 160 | 150 | 800 | 2.2 | 4 | 25 | 45 |
| P1500SALRP | P15A | 140 | 180 | 150 | 800 | 2.2 | 4 | 25 | 40 |
| P1800SALRP | P18A | 170 | 220 | 150 | 800 | 2.2 | 4 | 25 | 35 |
| P2100SALRP | P21A | 180 | 240 | 150 | 800 | 2.2 | 4 | 20 | 35 |
| P2300SALRP | P23A | 190 | 260 | 150 | 800 | 2.2 | 4 | 25 | 35 |
| P2600SALRP | P26A | 220 | 300 | 150 | 800 | 2.2 | 4 | 20 | 35 |
| P3100SALRP | P31A | 275 | 350 | 150 | 800 | 2.2 | 4 | 20 | 35 |
| P3500SALRP | P35A | 320 | 400 | 150 | 800 | 2.2 | 4 | 20 | 35 |
| P0080SBLRP | P-8B | 6 | 25 | 50 | 800 | 2.2 | 4 | 25 | 150 |
| P0220SBLRP | P22B | 15 | 32 | 50 | 800 | 2.2 | 4 | 25 | 150 |
| P0300SBLRP | P03B | 25 | 40 | 50 | 800 | 2.2 | 4 | 15 | 140 |
| P0640SBLRP | P06B | 58 | 77 | 150 | 800 | 2.2 | 4 | 40 | 80 |
| P0720SBLRP | P07B | 65 | 88 | 150 | 800 | 2.2 | 4 | 35 | 75 |

**Table continues on next page.**

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## Electrical Parameters (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 |
| P0900SBLRP | P09B | 75 | 98 | 150 | 800 | 2.2 | 4 | 35 | 70 |
| P1100SBLRP | P11B | 90 | 130 | 150 | 800 | 2.2 | 4 | 30 | 70 |
| P1300SBLRP | P13B | 120 | 160 | 150 | 800 | 2.2 | 4 | 25 | 60 |
| P1500SBLRP | P15B | 140 | 180 | 150 | 800 | 2.2 | 4 | 25 | 55 |
| P1800SBLRP | P18B | 170 | 220 | 150 | 800 | 2.2 | 4 | 25 | 50 |
| P2100SBLRP | P21B | 180 | 240 | 150 | 800 | 2.2 | 4 | 20 | 35 |
| P2300SBLRP | P23B | 190 | 260 | 150 | 800 | 2.2 | 4 | 25 | 50 |
| P2600SBLRP | P26B | 220 | 300 | 150 | 800 | 2.2 | 4 | 20 | 45 |
| P3100SBLRP | P31B | 275 | 350 | 150 | 800 | 2.2 | 4 | 20 | 45 |
| P3500SBLRP | P35B | 320 | 400 | 150 | 800 | 2.2 | 4 | 20 | 40 |
| P0080SCLRP | P-8C | 6 | 25 | 50 | 800 | 2.2 | 4 | 45 | 260 |
| P0220SCLRP | P22C | 15 | 32 | 50 | 800 | 2.2 | 4 | 30 | 240 |
| P0300SCLRP | P03C | 25 | 40 | 50 | 800 | 2.2 | 4 | 25 | 250 |
| P0640SCLRP | P06C | 58 | 77 | 150 | 800 | 2.2 | 4 | 55 | 155 |
| P0720SCLRP | P07C | 65 | 88 | 150 | 800 | 2.2 | 4 | 50 | 150 |
| P0900SCLRP | P09C | 75 | 98 | 150 | 800 | 2.2 | 4 | 45 | 140 |
| P1100SCLRP | P11C | 90 | 130 | 150 | 800 | 2.2 | 4 | 45 | 115 |
| P1300SCLRP | P13C | 120 | 160 | 150 | 800 | 2.2 | 4 | 40 | 105 |
| P1500SCLRP | P15C | 140 | 180 | 150 | 800 | 2.2 | 4 | 35 | 95 |
| P1800SCLRP | P18C | 170 | 220 | 150 | 800 | 2.2 | 4 | 35 | 90 |
| P2100SCLRP | P21C | 180 | 240 | 150 | 800 | 2.2 | 4 | 30 | 90 |
| P2300SCLRP | P23C | 190 | 260 | 150 | 800 | 2.2 | 4 | 30 | 80 |
| P2600SCLRP | P26C | 220 | 300 | 150 | 800 | 2.2 | 4 | 30 | 80 |
| P3100SCLRP | P31C | 275 | 350 | 150 | 800 | 2.2 | 4 | 30 | 70 |
| P3500SCLRP | P35C | 320 | 400 | 150 | 800 | 2.2 | 4 | 25 | 65 |
| P4500SCLRP | P45C | 400 | 530 | 150 | 800 | 2.2 | 4 | 25 | 65 |

Notes:
- Absolute maximum ratings measured at $T_A$= 25°C (unless otherwise noted).
- Devices are bi-directional.

## 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 | Amps/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 [3] | 30 | 500 |

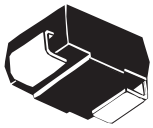
Notes:

1 Current waveform in µs
2 Voltage waveform in µs
3 For surge rating of P4500SCLRP 10x700µs min=150A & typical=180A

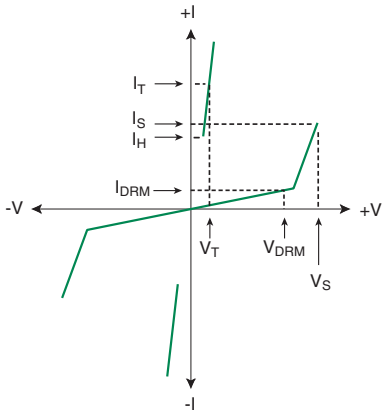
- Peak pulse current rating ($I_{PP}$) is repetitive and guaranteed for the life of the product.
- $I_{PP}$ ratings applicable over temperature range of -40°C to +85°C
- The device must initially be in thermal equilibrium with -40°C ≤ $T_J$ ≤ +150°C

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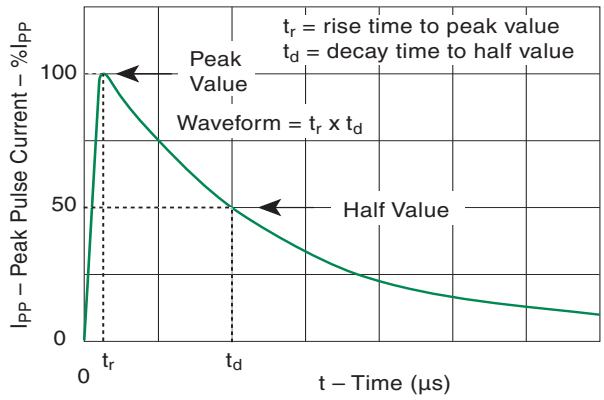
## Thermal Considerations

| Package | Symbol | Parameter | Value | Unit |
|---|---|---|---|---|
| DO-214AA  | $T_J$ | 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 |

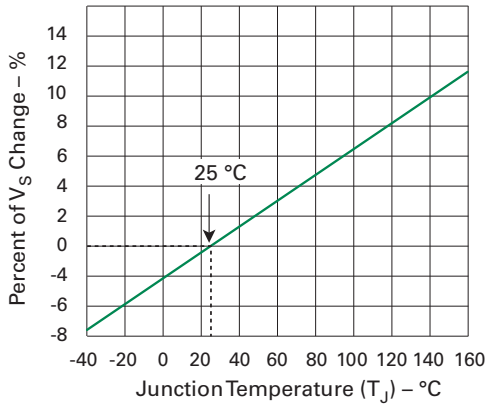
## V-I Characteristics



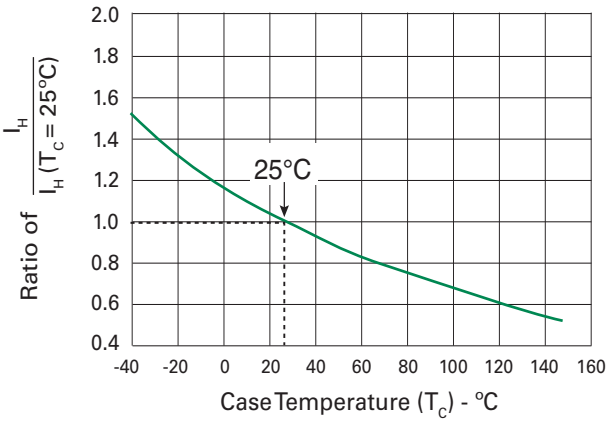

## $t_r$ x $t_d$ Pulse Waveform




## Normalized $V_S$ Change vs. Junction Temperature




## Normalized DC Holding Current vs. Case Temperature

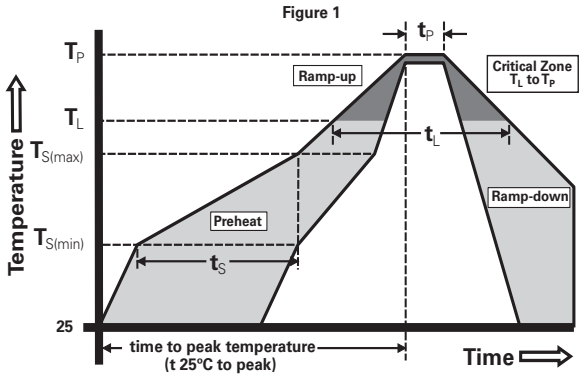



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## Soldering Parameters

| | | |
|---|---|---|
| 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



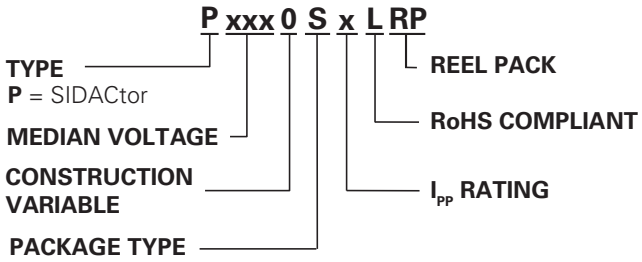

## Physical Specifications

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

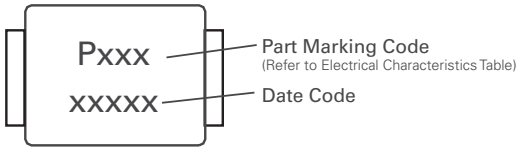
## Environmental Specifications

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

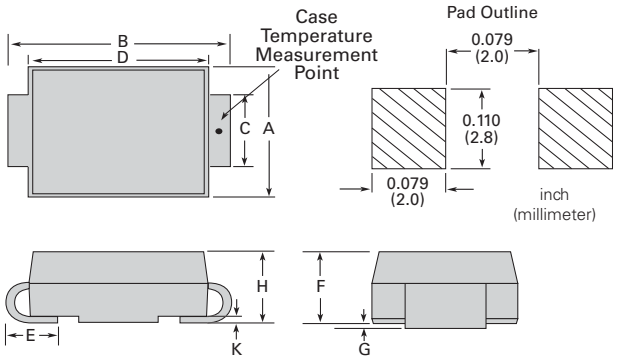



## Part Marking




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## Dimensions — DO-214AA

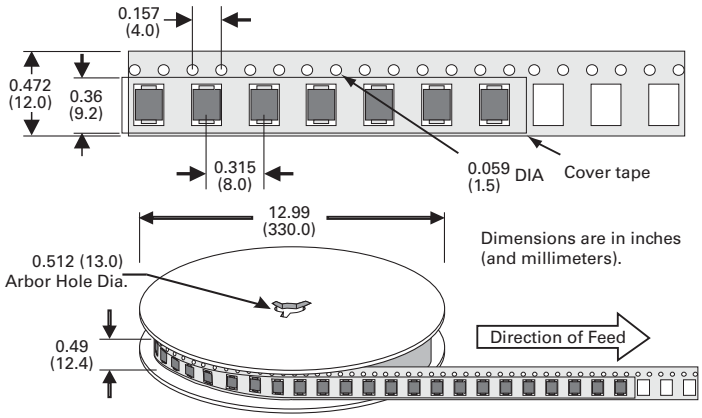



| Dimensions | Inches | | Millimeters | |
|---|---|---|---|---|
| | Min | Max | Min | Max |
| A | 0.130 | 0.156 | 3.30 | 3.95 |
| B | 0.201 | 0.220 | 5.10 | 5.60 |
| C | 0.077 | 0.087 | 1.95 | 2.20 |
| D | 0.159 | 0.181 | 4.05 | 4.60 |
| E | 0.030 | 0.063 | 0.75 | 1.60 |
| F | 0.075 | 0.096 | 1.90 | 2.45 |
| G | 0.002 | 0.008 | 0.05 | 0.20 |
| H | 0.077 | 0.104 | 1.95 | 2.65 |
| K | 0.006 | 0.016 | 0.15 | 0.41 |

## Packing Options

| Package Type | Description | Quantity | Added Suffix | Industry Standard |
|---|---|---|---|---|
| S | DO-214AA Tape & Reel Pack | 2500 | RP | EIA-481-D |

## Tape and Reel Specification — DO-214AA




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