

### SIDACtor® Protection Thyristor Series - DO-214



#### Agency Approvals

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

#### Pinout Designation

Not Applicable

#### Schematic Symbol



#### Description

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.
- Low capacitance
- Fails short circuit when surged in excess of ratings
- 2nd level interconnect is Pb-free per IPC/JEDEC J-STD-609A.01
- RoHS compliant, lead-free and halogen-free.

#### Applicable Global Standards

- TIA-968-A
- TIA-968-B
- ITU K.20/21/45 Enhanced Level\*
- ITU K.20/21/45 Basic Level
- GR 1089 Inter-building\*
- GR 1089 Intra-building
- IEC 61000-4-5 2nd edition
- YD/T 1082
- YD/T 993
- YD/T 950

\*A/B-rated parts require series resistance

#### Electrical Characteristics

| Part Number | Marking | $V_{DRM}$<br>@ $I_{DRM}=5\mu A$ | $V_S$<br>@ $100V/\mu s$ | $I_H$  | $I_S$  | $I_T$ | $V_T$<br>@ $I_T=2.2$ Amps | Capacitance<br>@ 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                         | 20                             | 35     |
| P0220SALRP  | P22A    | 15                              | 32                      | 50     | 800    | 2.2   | 4                         | 20                             | 40     |
| P0300SALRP  | P03A    | 25                              | 40                      | 50     | 800    | 2.2   | 4                         | 15                             | 40     |
| P0640SALRP  | P06A    | 58                              | 77                      | 150    | 800    | 2.2   | 4                         | 15                             | 40     |
| P0720SALRP  | P07A    | 65                              | 88                      | 150    | 800    | 2.2   | 4                         | 15                             | 40     |
| P0900SALRP  | P09A    | 75                              | 98                      | 150    | 800    | 2.2   | 4                         | 15                             | 40     |
| P1100SALRP  | P11A    | 90                              | 130                     | 150    | 800    | 2.2   | 4                         | 15                             | 40     |
| P1300SALRP  | P13A    | 120                             | 160                     | 150    | 800    | 2.2   | 4                         | 15                             | 40     |
| P1500SALRP  | P15A    | 140                             | 180                     | 150    | 800    | 2.2   | 4                         | 15                             | 40     |
| P1800SALRP  | P18A    | 170                             | 220                     | 150    | 800    | 2.2   | 4                         | 15                             | 35     |
| P2100SALRP  | P21A    | 180                             | 240                     | 150    | 800    | 2.2   | 4                         | 15                             | 35     |
| P2300SALRP  | P23A    | 190                             | 260                     | 150    | 800    | 2.2   | 4                         | 15                             | 35     |
| P2600SALRP  | P26A    | 220                             | 300                     | 150    | 800    | 2.2   | 4                         | 15                             | 35     |
| P3100SALRP  | P31A    | 275                             | 350                     | 150    | 800    | 2.2   | 4                         | 15                             | 35     |
| P3500SALRP  | P35A    | 320                             | 400                     | 150    | 800    | 2.2   | 4                         | 15                             | 35     |
| P0080SBLRP  | P-8B    | 6                               | 25                      | 50     | 800    | 2.2   | 4                         | 20                             | 50     |
| P0220SBLRP  | P22B    | 15                              | 32                      | 50     | 800    | 2.2   | 4                         | 20                             | 50     |
| P0300SBLRP  | P03B    | 25                              | 40                      | 50     | 800    | 2.2   | 4                         | 15                             | 50     |
| P0640SBLRP  | P06B    | 58                              | 77                      | 150    | 800    | 2.2   | 4                         | 20                             | 50     |
| P0720SBLRP  | P07B    | 65                              | 88                      | 150    | 800    | 2.2   | 4                         | 20                             | 50     |

Table continues on next page.

### Electrical Parameters (continued)

| Part Number  | Marking | $V_{DRM}$<br>@ $I_{DRM}=5\mu A$ | $V_S$<br>@ 100V/ $\mu s$ | $I_H$  | $I_S$  | $I_T$ | $V_T$<br>@ $I_T=2.2$ Amps | Capacitance<br>@ 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                         | 20                             | 50     |
| P1100SBLRP   | P11B    | 90                              | 130                      | 150    | 800    | 2.2   | 4                         | 20                             | 50     |
| P1300SBLRP   | P13B    | 120                             | 160                      | 150    | 800    | 2.2   | 4                         | 20                             | 50     |
| P1500SBLRP   | P15B    | 140                             | 180                      | 150    | 800    | 2.2   | 4                         | 20                             | 50     |
| P1800SBLRP   | P18B    | 170                             | 220                      | 150    | 800    | 2.2   | 4                         | 20                             | 50     |
| P2100SBLRP   | P21B    | 180                             | 240                      | 150    | 800    | 2.2   | 4                         | 20                             | 35     |
| P2300SBLRP   | P23B    | 190                             | 260                      | 150    | 800    | 2.2   | 4                         | 20                             | 50     |
| P2600SBLRP   | P26B    | 220                             | 300                      | 150    | 800    | 2.2   | 4                         | 20                             | 35     |
| P3100SBLRP   | P31B    | 275                             | 350                      | 150    | 800    | 2.2   | 4                         | 20                             | 35     |
| P3500SBLRP   | P35B    | 320                             | 400                      | 150    | 800    | 2.2   | 4                         | 20                             | 35     |
| P4500SBLRP   | P45B    | 400                             | 530                      | 150    | 800    | 2.2   | 4                         | 20                             | 50     |
| P0080SCLRP   | P-8C    | 6                               | 25                       | 50     | 800    | 2.2   | 4                         | 25                             | 70     |
| P0220SCLRP   | P22C    | 15                              | 32                       | 50     | 800    | 2.2   | 4                         | 25                             | 70     |
| P0300SCLRP   | P03C    | 25                              | 40                       | 50     | 800    | 2.2   | 4                         | 20                             | 50     |
| P0640SCLRP   | P06C    | 58                              | 77                       | 150    | 800    | 2.2   | 4                         | 45                             | 100    |
| P0720SCLRP   | P07C    | 65                              | 88                       | 150    | 800    | 2.2   | 4                         | 45                             | 100    |
| P0900SCLRP   | P09C    | 75                              | 98                       | 150    | 800    | 2.2   | 4                         | 45                             | 100    |
| P1100SCLRP   | P11C    | 90                              | 130                      | 150    | 800    | 2.2   | 4                         | 45                             | 90     |
| P1300SCLRP   | P13C    | 120                             | 160                      | 150    | 800    | 2.2   | 4                         | 40                             | 85     |
| P1500SCLRP   | P15C    | 140                             | 180                      | 150    | 800    | 2.2   | 4                         | 25                             | 70     |
| P1800SCLRP   | P18C    | 170                             | 220                      | 150    | 800    | 2.2   | 4                         | 25                             | 70     |
| P2100SCLRP   | P21C    | 180                             | 240                      | 150    | 800    | 2.2   | 4                         | 25                             | 70     |
| P2300SCLRP   | P23C    | 190                             | 260                      | 150    | 800    | 2.2   | 4                         | 25                             | 70     |
| P2600SCLRP   | P26C    | 220                             | 300                      | 150    | 800    | 2.2   | 4                         | 30                             | 70     |
| 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     |
| P4500SCLHLP* | P45L    | 400                             | 530                      | 50     | 800    | 2.2   | 4                         | 20                             | 50     |

Notes:

- Absolute maximum ratings measured at  $T_A = 25^\circ C$  (unless otherwise noted).

- Components are bi-directional.

- \* P4500SCLHLP is low  $I_H$  product

### Surge Ratings

| Series | $I_{PP}$                                     |                                        |                                          |                                            |                                            |                                          |                                            |                                              |                                           | $I_{TSM}$<br>50/60 Hz | di/dt |
|--------|----------------------------------------------|----------------------------------------|------------------------------------------|--------------------------------------------|--------------------------------------------|------------------------------------------|--------------------------------------------|----------------------------------------------|-------------------------------------------|-----------------------|-------|
|        | 0.2/310 <sup>1</sup><br>0.5/700 <sup>2</sup> | 2/10 <sup>1</sup><br>2/10 <sup>2</sup> | 8/20 <sup>1</sup><br>1.2/50 <sup>2</sup> | 10/160 <sup>1</sup><br>10/160 <sup>2</sup> | 10/560 <sup>1</sup><br>10/560 <sup>2</sup> | 5/320 <sup>1</sup><br>9/720 <sup>2</sup> | 10/360 <sup>1</sup><br>10/360 <sup>2</sup> | 10/1000 <sup>1</sup><br>10/1000 <sup>2</sup> | 5/310 <sup>1</sup><br>10/700 <sup>2</sup> |                       |       |
|        | A min                                        | A min                                  | A min                                    | A min                                      | A min                                      | A min                                    | A min                                      | A min                                        | A min                                     |                       |       |
| A      | 20                                           | 150                                    | 150                                      | 90                                         | 50                                         | 75                                       | 75                                         | 45                                           | 75                                        | 25                    | 500   |
| B      | 25                                           | 250                                    | 250                                      | 150                                        | 100                                        | 100                                      | 125                                        | 80                                           | 100                                       | 30                    | 500   |
| C      | 50                                           | 500                                    | 400                                      | 200                                        | 150                                        | 200                                      | 175                                        | 100                                          | 200 <sup>3</sup>                          | 35                    | 500   |

Notes:

1 Current waveform in  $\mu s$

2 Voltage waveform in  $\mu s$

3 For surge rating of P4500SCLRP 10/700 $\mu s$  min=150A & typical=180A

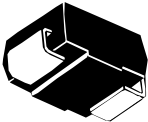
For surge rating of P4500SCLHLP 10/700 $\mu s$  min=150A

- Peak pulse current rating ( $I_{PP}$ ) is repetitive and guaranteed for the life of the product.

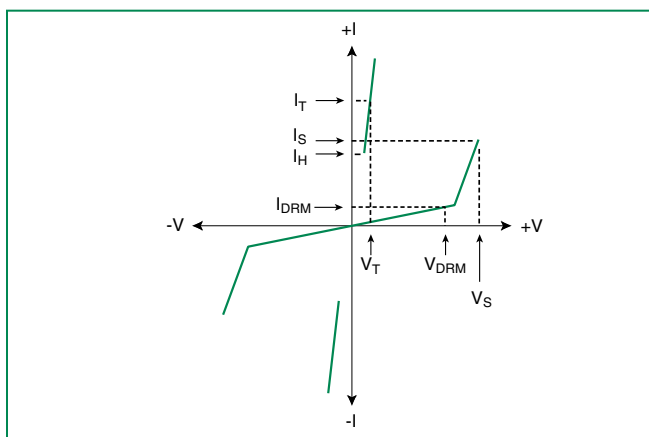
-  $I_{PP}$  ratings applicable over temperature range of  $-40^\circ C$  to  $+85^\circ C$

- The component must initially be in thermal equilibrium with  $-40^\circ C \leq T_J \leq +150^\circ C$

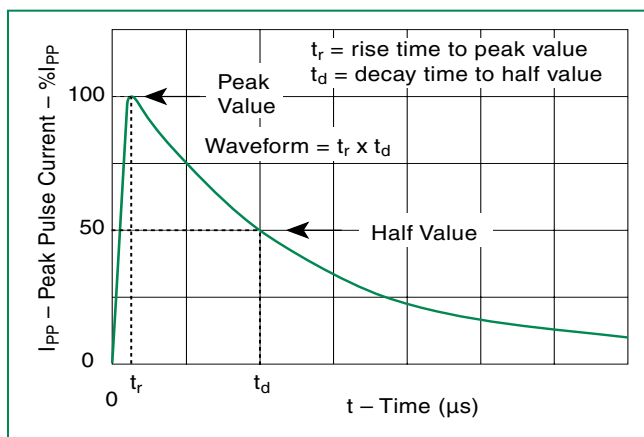
## Thermal Considerations

| Package                                                                                    | Symbol          | Parameter                               | Value       | Unit |
|--------------------------------------------------------------------------------------------|-----------------|-----------------------------------------|-------------|------|
|  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 |

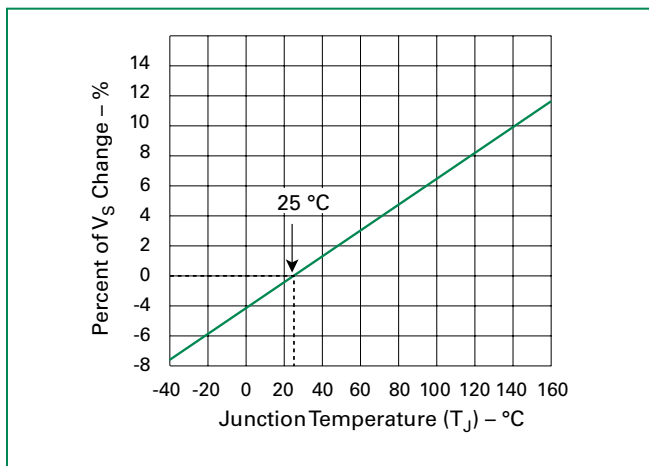
## V-I Characteristics



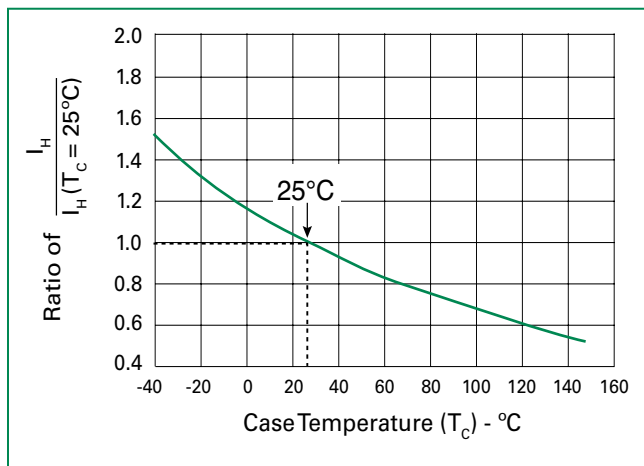
## $t_r \times t_d$ Pulse Waveform



## Normalized $V_S$ Change vs. Junction Temperature



## Normalized DC Holding Current vs. Case Temperature



## Additional Information



Datasheet



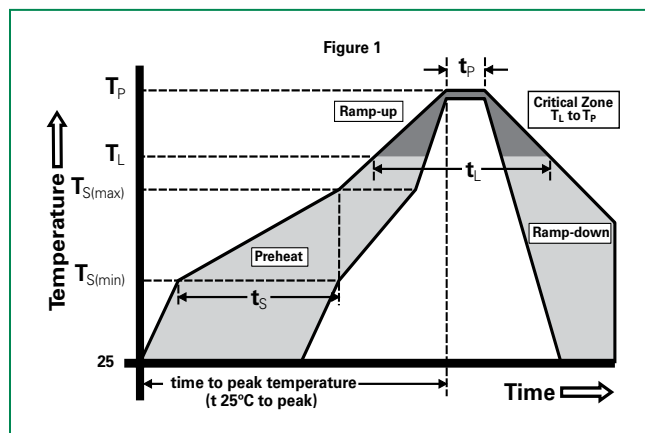
Resources



Samples

### 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                        |



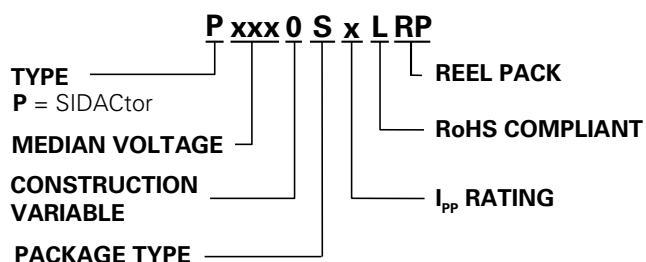
### Physical Specifications

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

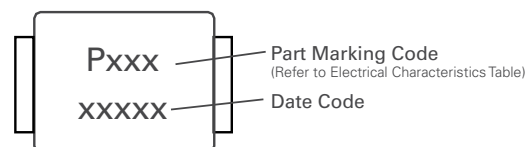
### Environmental Specifications

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

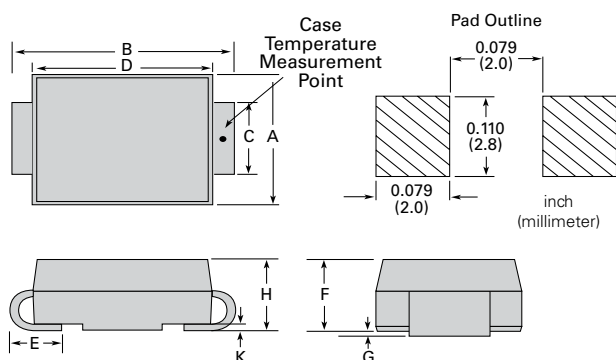
### Part Numbering



### Part Marking



## Dimensions — DO-214AA

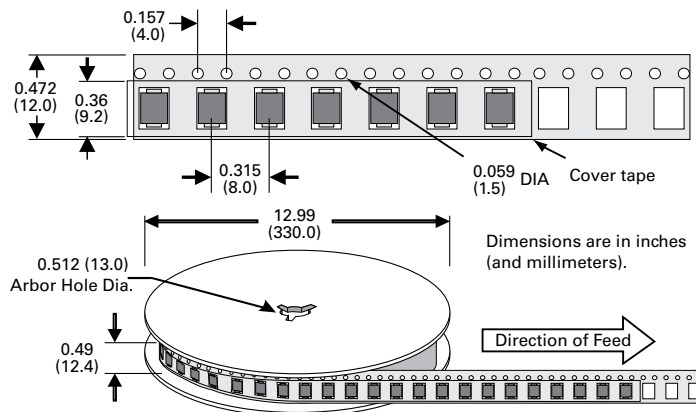


| Dimensions      | Inches |       | Millimeters |      |
|-----------------|--------|-------|-------------|------|
|                 | Min    | Max   | Min         | Max  |
| A               | 0.130  | 0.156 | 3.30        | 3.95 |
| B               | 0.201  | 0.220 | 5.10        | 5.60 |
| C               | 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 |
| H- P4500SCLHLRP | 0.077  | 0.096 | 1.95        | 2.43 |
| K               | 0.006  | 0.016 | 0.15        | 0.41 |

## Packing Options

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

## Tape and Reel Specification — DO-214AA



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