

## TwinChip™ Series - DO-15



### Agency Approvals

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

### Pinout Designation

NOT APPLICABLE

### Schematic Symbol



### Description

TwinChip™ Series DO-15 are very low capacitance SIDACTor® thyristors are designed to protect broadband CPE equipment, such as VoIP and xDSL modems from damaging overvoltage transients. The series provides a through-hole solution that enables equipment to comply with global regulatory standards while limiting the impact to broadband signals.

### Features & Benefits

- Differential protection
- Low insertion loss
- Low capacitance
- GDT compatible axial footprint
- Low voltage overshoot
- Does not degrade surge capability after multiple
- surge events within limit.
- Fails short circuit when surged in excess of ratings
- RoHS Compliant
- Pb-free E3 means 2nd level interconnect is Pb-free and the terminal finish material is tin(Sn) (IPC/JEDEC J-STD-609A.01)

### Applicable Global Standards

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

### Electrical Characteristics

| Part Number | Marking | $V_{DRM} @ I_{DRM}=5\mu A$ | $V_S @ 100V/\mu s$ | $I_H$  | $I_S$  | $I_T$ | $V_T @ I_T = 2.2 \text{ Amps}$ | @ 1MHz @ 2V bias |        |
|-------------|---------|----------------------------|--------------------|--------|--------|-------|--------------------------------|------------------|--------|
|             |         | V min                      | V max              | mA min | mA max | A max | V max                          | pF min           | pF max |
| P2602GBLRP  | P262B   | 220                        | 300                | 150    | 800    | 2.2   | 8                              | 15               | 25     |
| P3002GBLRP  | P30B    | 280                        | 360                | 150    | 800    | 2.2   | 8                              | 10               | 20     |
| P3502GBLRP  | P352B   | 320                        | 400                | 150    | 800    | 2.2   | 8                              | 10               | 20     |
| P4502GBLRP* | P452B   | 400                        | 530                | 150    | 800    | 2.2   | 8                              | 25               | 45     |

Notes:

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

### Additional Information



Datasheet



Resources



Samples

## Surge Ratings

| Series | $I_{PP}$                                   |                                              |                                           | $I_{TSM}$  |
|--------|--------------------------------------------|----------------------------------------------|-------------------------------------------|------------|
|        | 10/160 <sup>1</sup><br>10/160 <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> | 50 / 60 Hz |
|        | A min                                      | A min                                        | A typ                                     | A min      |
| B      | 100                                        | 80                                           | 150                                       | 25         |

Notes:

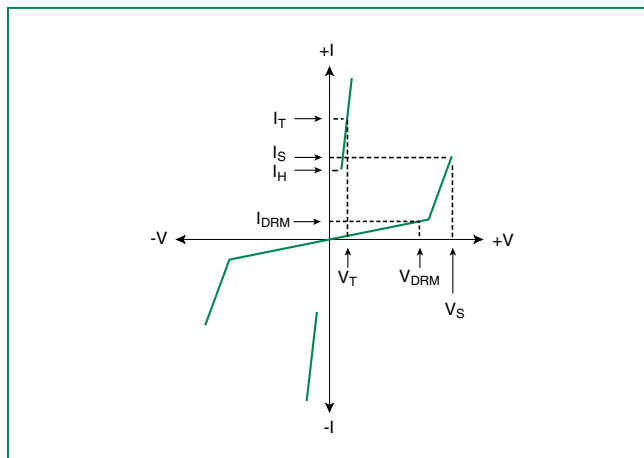
- 1 Current waveform in  $\mu s$   
2 Voltage waveform in  $\mu s$

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

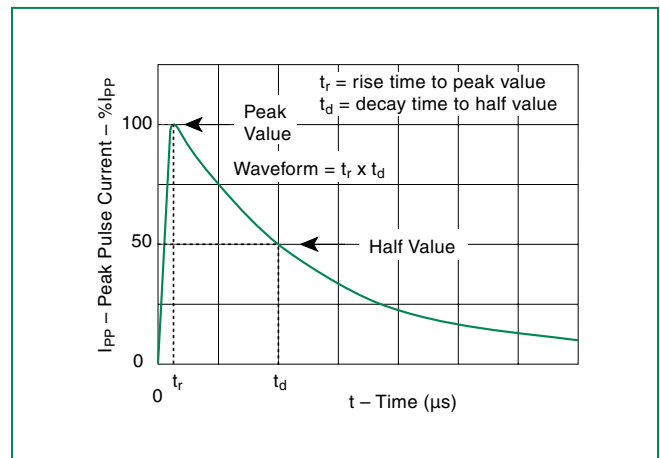
## Thermal Considerations

| Package                                                                                    | Symbol          | Parameter                               | Value       | Unit |
|--------------------------------------------------------------------------------------------|-----------------|-----------------------------------------|-------------|------|
| <br>DO-15 | $T_J$           | 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 | 120         | °C/W |

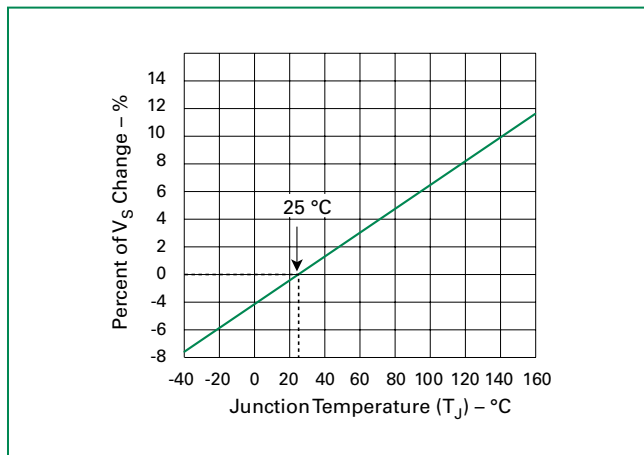
## V-I Characteristics



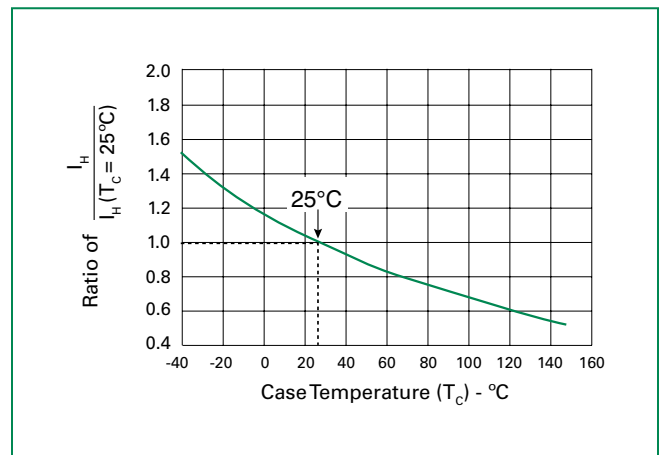
## $t_r \times t_d$ Pulse Waveform



## Normalized $V_S$ Change vs. Junction Temperature

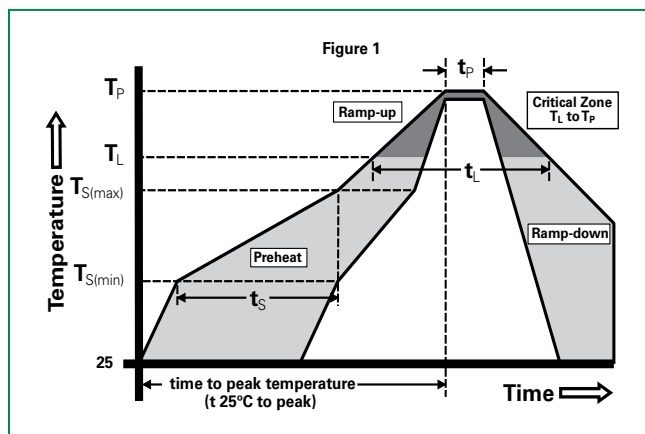


## Normalized DC Holding Current vs. Case Temperature



## Soldering Parameters

|                                                        |                                    |                                 |
|--------------------------------------------------------|------------------------------------|---------------------------------|
| Reflow Condition                                       |                                    | Pb-Free assembly (see Figure 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/second max                  |
| $T_{s(max)}$ to $T_L$ - Ramp-up Rate                   |                                    | 3°C/second max                  |
| Reflow                                                 | - Temperature ( $T_L$ ) (Liquidus) | 217°C                           |
|                                                        | - Temperature ( $t_L$ )            | 60-150 seconds                  |
| Peak Temperature ( $T_p$ )                             |                                    | 260(+0/-5)°C                    |
| Time within 5°C of actual peak Temperature ( $t_p$ )   |                                    | 30 seconds max                  |
| Ramp-down Rate                                         |                                    | 6°C/second max                  |
| Time 25°C to peak Temperature ( $T_p$ )                |                                    | 8 minutes max                   |
| Do not exceed                                          |                                    | 260°C                           |



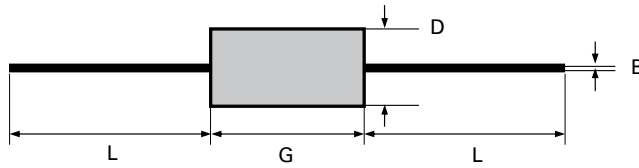
## Physical Specifications

|                        |                                                             |
|------------------------|-------------------------------------------------------------|
| <b>Lead Material</b>   | Copper Alloy                                                |
| <b>Terminal Finish</b> | 100% Matte-Tin Plated                                       |
| <b>Body Material</b>   | UL Recognized epoxy meeting flammability classification V-0 |

## Environmental Specifications

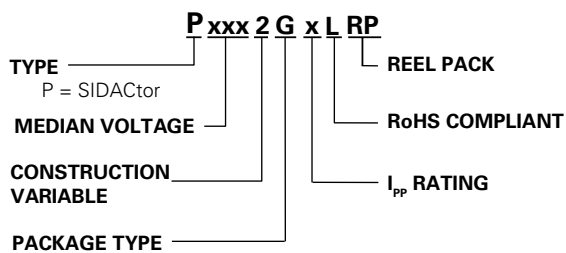
|                                         |                                                                                                                       |
|-----------------------------------------|-----------------------------------------------------------------------------------------------------------------------|
| <b>High Temp Voltage Blocking</b>       | 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 |
| <b>Temp Cycling</b>                     | -65°C to +150°C, 15 min. dwell, 10 up to 100 cycles. MIL-STD-750 (Method 1051) EIA/ JEDEC, JESD22-A-104               |
| <b>Biased Temp &amp; Humidity</b>       | 52 $V_{DC}$ (+85°C) 85%RH, 504 up to 1008 hrs. EIA/JEDEC, JESD22-A-101                                                |
| <b>High Temp Storage</b>                | +150°C 1008 hrs. MIL-STD-750 (Method 1031) JEDEC, JESD22-A-101                                                        |
| <b>Low Temp Storage</b>                 | -65°C, 1008 hrs.                                                                                                      |
| <b>Thermal Shock</b>                    | 0°C to +100°C, 5 min. dwell, 10 sec. transfer, 10 cycles. MIL-STD-750 (Method 1056) JEDEC, JESD22-A-106               |
| <b>Autoclave (Pressure Cooker Test)</b> | +121°C, 100%RH, 2atm, 24 up to 168 hrs. EIA/JEDEC, JESD22-A-102                                                       |
| <b>Resistance to Solder Heat</b>        | +260°C, 30 secs. MIL-STD-750 (Method 2031)                                                                            |
| <b>Moisture Sensitivity Level</b>       | 85%RH, +85°C, 168 hrs., 3 reflow cycles (+260°C peak). JEDEC-J-STD-020, Level 1                                       |

## Dimensions — DO-15

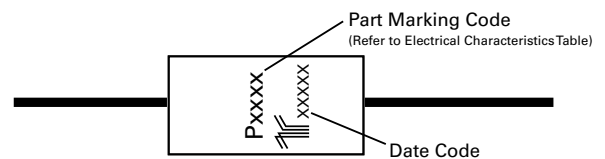


| Dimension | Inches |       | Millimeters |       |
|-----------|--------|-------|-------------|-------|
|           | min    | max   | min         | max   |
| <b>B</b>  | 0.028  | 0.034 | 0.711       | 0.864 |
| <b>D</b>  | 0.12   | 0.14  | 3.048       | 3.556 |
| <b>G</b>  | 0.235  | 0.27  | 5.969       | 6.858 |
| <b>L</b>  | 1      |       | 25.4        |       |

## Part Numbering



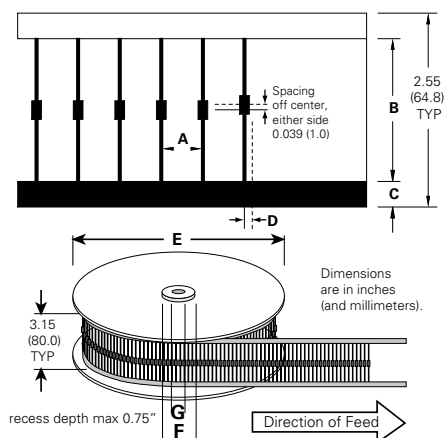
## Part Marking



## Packing Options

| Package Type | Description             | Quantity | Added Suffix | Industry Standard |
|--------------|-------------------------|----------|--------------|-------------------|
| G            | DO-15 Axial Tape & Reel | 5000     | RP           | EIA-RS-296-D      |

## Tape and Reel Specification — DO-15



| Symbols  | Description                      | inch           | mm            |
|----------|----------------------------------|----------------|---------------|
| <b>A</b> | Component Spacing (lead to lead) | 0.200 ± 0.020" | 5.08 ± 0.508  |
| <b>B</b> | Inner Tape Pitch                 | 2.062 ± 0.059" | 52.37 ± 1.498 |
| <b>C</b> | Tape Width                       | 0.250"         | 6.35          |
| <b>D</b> | Max. Off Alignment               | 0.048"         | 1.219         |
| <b>E</b> | Reel Dimension                   | 13"            | 330.2         |
| <b>F</b> | Max. Hub Recess                  | 3"             | 76.19         |
| <b>G</b> | Max. Abor Hole                   | 0.68"          | 17.27         |

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