

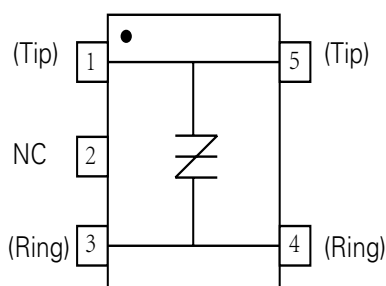
## SDP Series - SOT23-5



### Agency Approvals

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

### Schematic Symbol



### Additional Information



Datasheet



Resources



Samples

### Description

This new SIDACtor series thyristors are targeted for the tertiary or line driver side protection position for VDSL2+, ADSL2 applications and general I/O protection functions. This new low capacitance over voltage protection does not require a bias voltage and is sufficiently robust for the chip-side position behind the coupling transformer.

This SOT23-5 solution, with its flow-through design, minimizes PCB trace layout routing, while its four different stand-off voltage values offer compatibility with a variety of line drivers. Its low capacitance makes it compatible with ADSL2 and VDSL2, and the 30MHz bandplan of VDSL2+.

### Features & Benefits

- Lower overshooting protection than clamping
- SOT23-5 surface mount package
- Low insertion loss
- Low capacitance
- Bidirectional transient voltage protection
- Robust surge rating
- Starts to switch in nanoseconds
- RoHS compliant and Halogen-Free
- 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

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

### Electrical Characteristics

| Part Number     | Marking | $V_{DRM} @ I_{DRM}=5\mu A$ | $V_S @ 250V/\mu s$ | $I_H$  | $I_S$  | $V_T @ I_T=1.0$<br>Amps | $Co @ f=1MHz, 2V$ |        |
|-----------------|---------|----------------------------|--------------------|--------|--------|-------------------------|-------------------|--------|
|                 |         | V min                      | V max              | mA typ | mA max | V max                   | pF typ            | pF max |
| SDP0080T023G5RP | P8G     | 8                          | 15                 | 30     | 500    | 4.0                     | 8.0               | 9.0    |
| SDP0120T023G5RP | P12G    | 12                         | 20                 | 30     | 500    | 4.0                     | 7.8               | 9.0    |
| SDP0180T023G5RP | P18G    | 18                         | 25                 | 30     | 500    | 4.0                     | 7.3               | 8.3    |
| SDP0240T023G5RP | P24G    | 24                         | 35                 | 30     | 500    | 4.0                     | 5.7               | 6.5    |

Notes:

- All measurement are made at an ambient temperature of 25°C.
- Ipp applies to -40°C through +85°C temperature range.
- Ipp is repetitive surge rating and is guaranteed for the life of the product.
- SIDACtor components are bidirectional. All electrical parameters and surge rating apply to forward and reverse polarities.

## Maximum Ratings

| Parameter Name                   | Symbol    | Test Conditions                           |     | Value           |      | Units |
|----------------------------------|-----------|-------------------------------------------|-----|-----------------|------|-------|
| Lightning surge waveforms        | $I_{pp}$  | 8/20 <sup>1</sup><br>1.2/50 <sup>2</sup>  | min | SDP0080T023G5RP | 50   | A     |
|                                  |           |                                           |     | SDP0120T023G5RP | 70   |       |
|                                  |           |                                           |     | SDP0180T023G5RP | 70   |       |
|                                  |           |                                           |     | SDP0240T023G5RP | 70   |       |
|                                  |           | 5/310 <sup>1</sup><br>10/700 <sup>2</sup> | min |                 | 20   |       |
| Operating Free Temperature Range | $T_A$     |                                           |     | min             | max  |       |
| Junction temperature             | $T_J$     |                                           |     | -40             | +85  | °C    |
| Storage temperature              | $T_{STG}$ |                                           |     | -40             | +150 | °C    |

Notes:

1. Voltage waveform in  $\mu s$

2. Current waveform in  $\mu s$

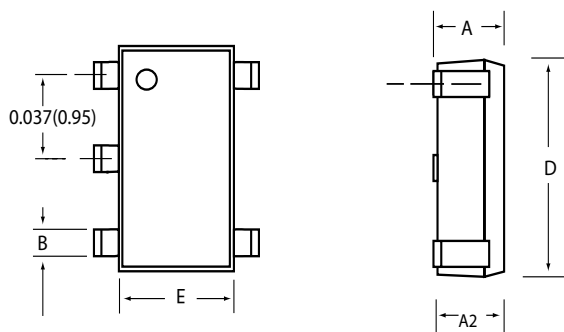
-The device also complies with IEC 61000-4-2 ESD  $\pm 15kV$  (air discharge),  $\pm 8kV$  (contact discharge) and IEC 61000-4-4 EFT 40A(5/50ns) in equipment level ESD test when used behind the xDSL transformer.

-The component must initially be in thermal equilibrium with  $-40^\circ C \leq T_{amb} \leq +150^\circ C$

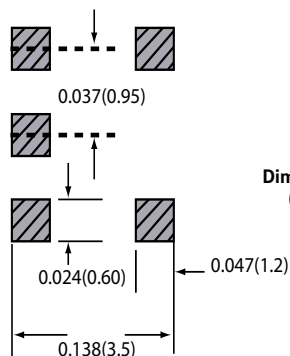
-The lightning surge may be repeated after the device returns to its initial conditions.

## Mechanical dimensions, recommended layout dimensions

The epoxy meets UL 94V-0 ratings.

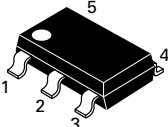


| Dimension | Inches |       | Millimeters |      |
|-----------|--------|-------|-------------|------|
|           | Min    | Max   | Min         | Max  |
| <b>A</b>  | 0.035  | 0.057 | 0.90        | 1.45 |
| <b>A1</b> | 0      | 0.004 | 0           | 0.10 |
| <b>A2</b> | 0.035  | 0.051 | 0.90        | 1.30 |
| <b>B</b>  | 0.014  | 0.020 | 0.35        | 0.50 |
| <b>C</b>  | 0.004  | 0.008 | 0.09        | 0.20 |
| <b>D</b>  | 0.11   | 0.118 | 2.80        | 3.00 |
| <b>E</b>  | 0.059  | 0.069 | 1.50        | 1.75 |
| <b>F</b>  | 0.102  | 0.118 | 2.6         | 3.00 |
| <b>G</b>  | 0.004  | 0.024 | 0.10        | 0.60 |

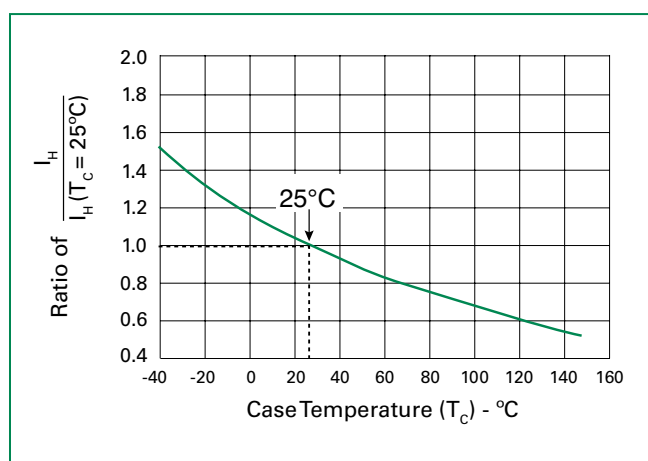


Dimension are in inches  
(and millimeters).

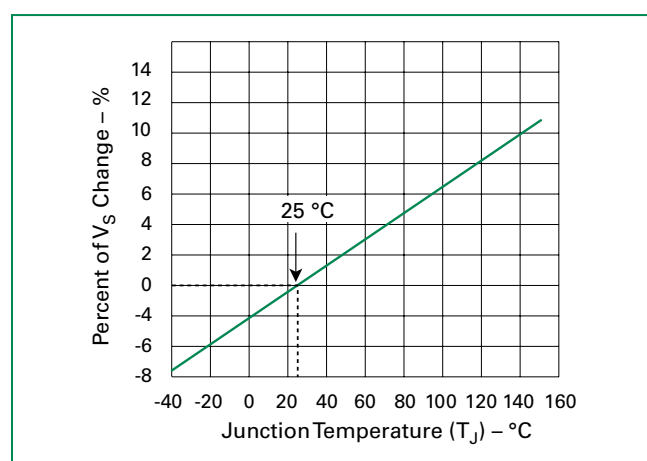
### Thermal Considerations

| Package                                                                           | Symbol          | Parameter                               | Value       | Unit |
|-----------------------------------------------------------------------------------|-----------------|-----------------------------------------|-------------|------|
|  | $T_J$           | Operating Junction Temperature Range    | -40 to +150 | °C   |
|                                                                                   | $T_{STG}$       | Storage Temperature Range               | -40 to +150 | °C   |
|                                                                                   | $R_{\theta JA}$ | Thermal Resistance: Junction to Ambient | 120         | °C/W |

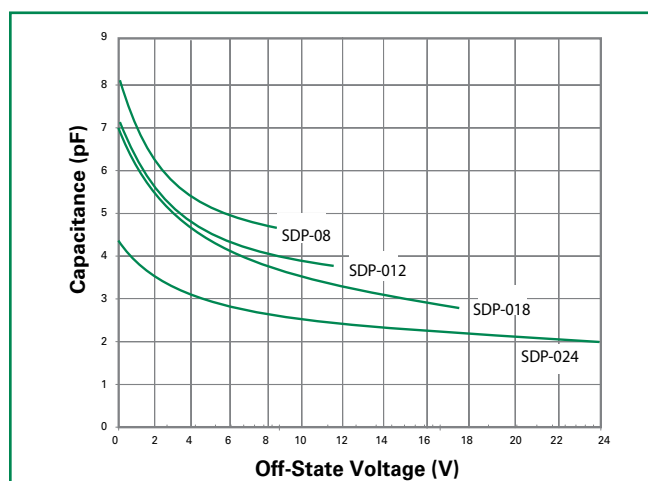
### Holding Current vs. Case Temperature



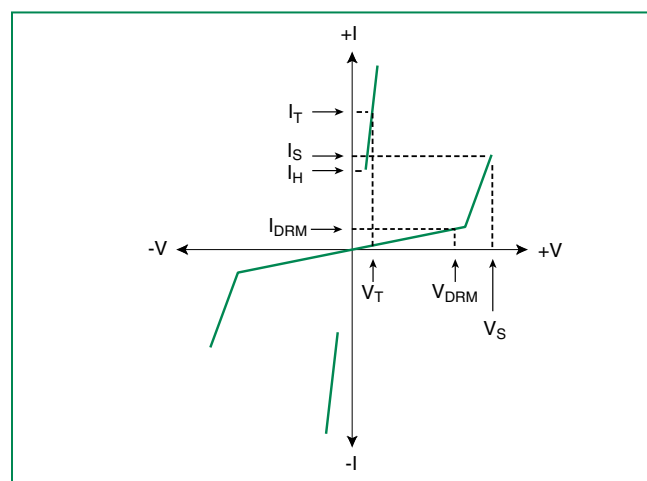
### $V_S$ vs. Junction Temperature



### Capacitance vs. Bias Voltage



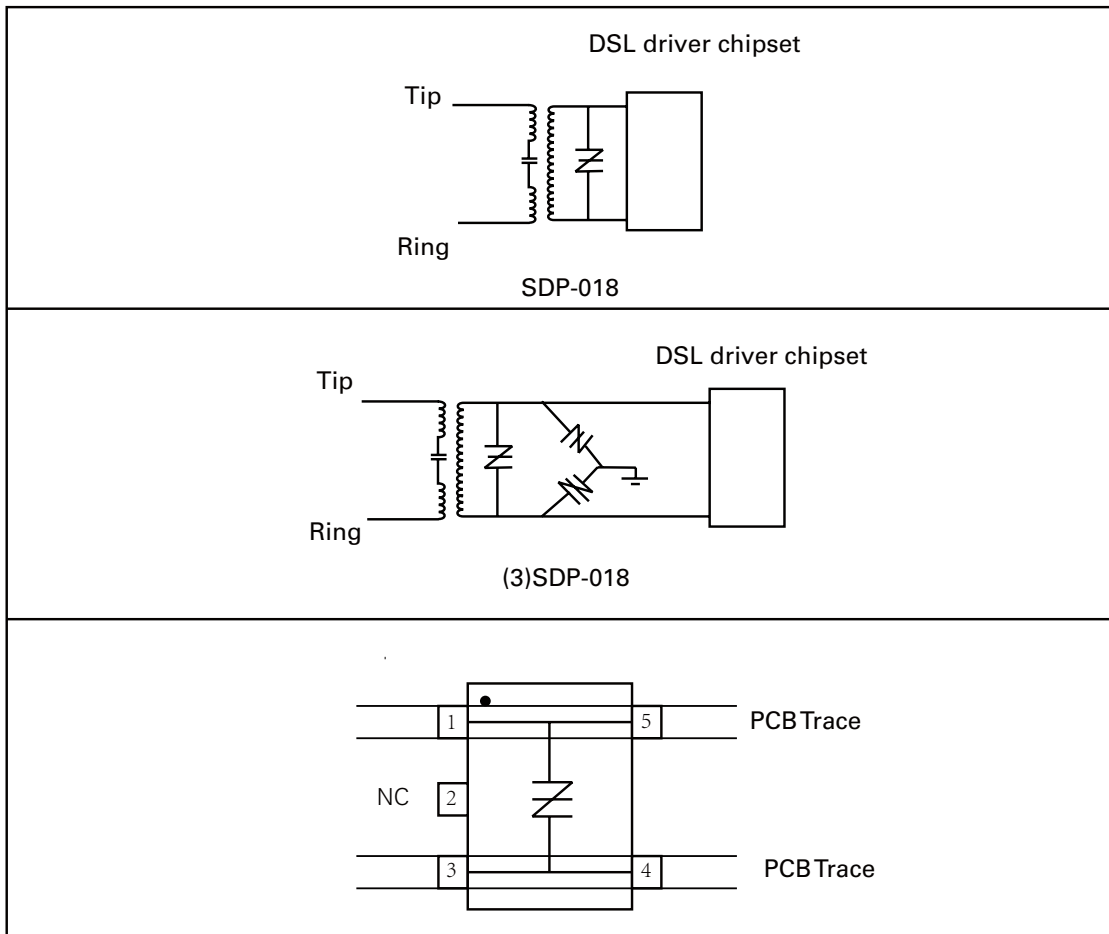
### V-I Characteristics



## SDP-xxx Application example

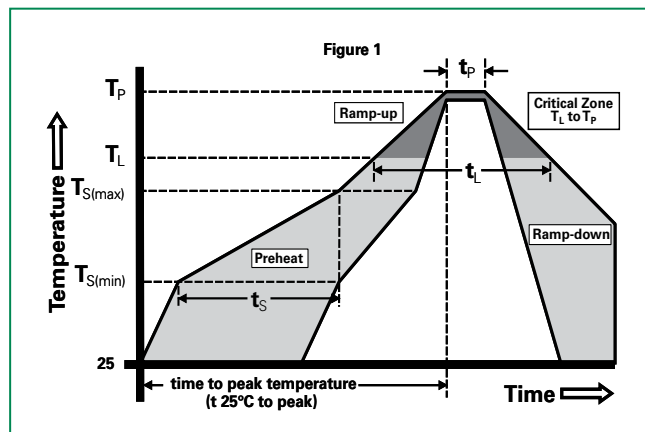
The following schematics show alternate protection solutions for a typical DSL interface that connects to outside wiring. This surface mount SOT23-5 chip-side solution provides a minimum footprint solution appropriate for high density card designs. The SDP-xxx0T023 will protect the interface from lightning induced surges on the chip-side of the coupling transformer. This tertiary protector may be preceded by line-side protection such as the TeleLink over-current protector

and the SDP3500Q38CB overvoltage protector. GDTs may also be used on the line side of the coupling transformer. The flow-through design of the SOT23-5 package is illustrated below. If the inter winding capacitance of the transformer is allowing some common mode events to get coupled across, then the SDP-xxx0T023 can be placed in a three chip mode, as shown below for additional chip-side protection.



### 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

|                          |                        |
|--------------------------|------------------------|
| <b>Terminal Material</b> | 100% Matte-Tin Plated  |
| <b>Solderability</b>     | EIA J-STD-002, TEST A. |

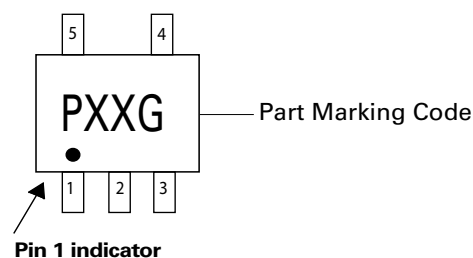
### Environmental Specifications

|                                |                                                                                                              |
|--------------------------------|--------------------------------------------------------------------------------------------------------------|
| <b>Temp Cycling</b>            | Mil-STD-883, Method 1010.8 Condition C, -65°C to +150°C<br>168 Hrs, 85°C /60% RH+3IR-Reflow, 260°C +5V, -0°C |
| <b>Bias Humidity</b>           | JESD 22-A101 85°C, 85%CRH. 50V<br>168 Hrs, 85°C /60% RH+3IR-Reflow, 260°C +5V, -0°C                          |
| <b>Pressure Cooker</b>         | JEDEC 22-A102 No Bias, 121°C, 100%RH 96Hrs/192Hrs.<br>168 Hrs, 85°C /60% RH+3IR-Reflow, 260°C +5V, -0°C      |
| <b>High Temp Storage</b>       | JESD 22-A103 Con B. 150°C, no bias 1000Hrs                                                                   |
| <b>HTRB</b>                    | JESD 22-108<br>168 Hrs, 85°C /60% RH+3IR-Reflow, 260°C +5V, -0°C                                             |
| <b>Thermal Shock</b>           | Mil-STD-883, Method 1011.9 Condition A, 0°C to 100°C<br>168 Hrs, 85°C /60% RH+3IR-Reflow, 260°C +5V, -0°C    |
| <b>C-SAM</b>                   | As per flow, JSTD-020 pre&post preconditioning test.                                                         |
| <b>Wet Humidity (Tin only)</b> | NEMI standard: 60°C/93%RH                                                                                    |

### Part Numbering

|                          |                       |                  |
|--------------------------|-----------------------|------------------|
| Type                     | SDP xxx 0 T023 G 5 RP | Packing Option   |
| SIDACtor DSL Protector   |                       | RP: Reel Pack    |
| Nominal Working voltage: |                       | Number of pins   |
| 008=8V                   |                       |                  |
| 012=12V                  |                       |                  |
| 018=18V                  |                       |                  |
| 024=24V                  |                       |                  |
| Construction variable:   |                       | Surge Ipp rating |
| 0=single chip            |                       |                  |
| Package                  |                       |                  |
| T023=SOT23-5             |                       |                  |

### Part Marking

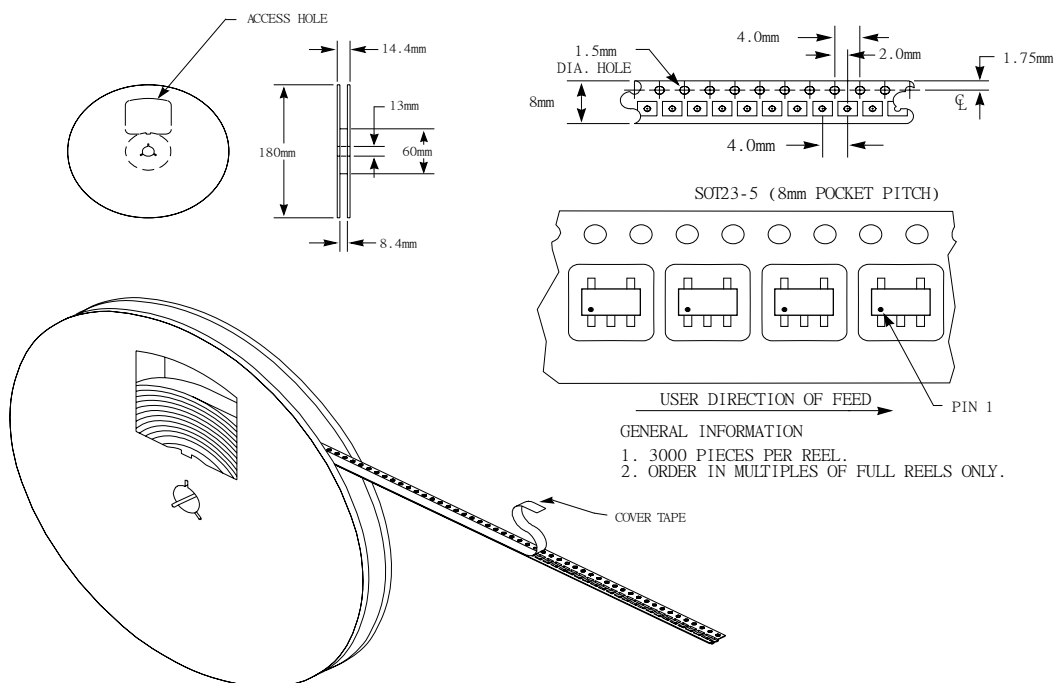


## Packing Options

| Package Type | Description                 | Quantity | Added Suffix | Min. Order Qty. | Industry Standard |
|--------------|-----------------------------|----------|--------------|-----------------|-------------------|
| T023         | SOT23-5<br>Tape & Reel Pack | 3000     | RP           | 3000            | EIA-481-A         |

## Tape and Reel Specification — SOT23-5

### 8mm TAPE AND REEL



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