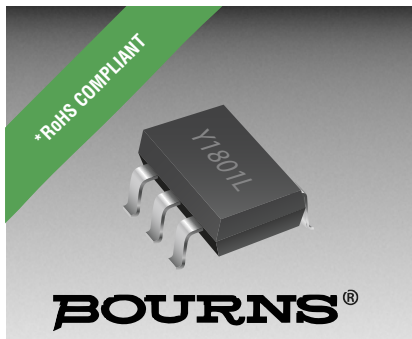




TISP4P015L1N THRU TISP4P035L1N

## LOW CAPACITANCE BIDIRECTIONAL THYRISTOR OVERVOLTAGE PROTECTOR

### TISP4P0xxL1N Overvoltage Protector Series

Designed for ADSL, ADSL2, VDSL, VDSL2 protection

Ion-Implanted Breakdown Region  
- Precise and Stable Voltage

Low Voltage Overshoot Under Surge

Low Off-State Capacitance

| Device Name  | $V_{DRM}$<br>V | $V_{(BO)}$<br>V |
|--------------|----------------|-----------------|
| TISP4P015L1N | 8              | 15              |
| TISP4P020L1N | 12             | 20              |
| TISP4P025L1N | 16             | 25              |
| TISP4P035L1N | 24             | 35              |

Rated for International Surge Wave Shapes

| Wave Shape | Standard      | $I_{PPSM}$<br>A |
|------------|---------------|-----------------|
| 8/20       | IEC 61000-4-5 | 30              |
| 10/1000    | GR-1089-CORE  | 18              |

#### Description

This range of devices is designed to protect xDSL line-driver interfaces from overvoltages up to rated limits. Overvoltages are normally caused by a.c. power-system or lightning-flash disturbances which are induced or conducted onto the telephone line. These symmetrical protectors are two-terminal thyristor-crowbar devices. They can be used to protect between conductors, or a pair of devices can be deployed to protect from line to ground.

When placed between the xDSL line driver IC and the transformer, this protector will clamp and switch into a low-impedance state, safely diverting the energy transferred by the xDSL coupling transformer. The low capacitance design makes this device suitable for designs from ADSL all the way up to 30 MHz VDSL2.

Telecom ports need protection against Common Mode (Longitudinal) and Differential (Metallic) surges, to comply with international standards such as ITU-T K.20, K.21 or K.45, Telcordia GR-1089-CORE and YD/T. Common Mode surges are resisted by the galvanic isolation of the coupling transformer which is commonly rated to 2 kV or greater. Differential surges can be transmitted by the transformer, and can stress the Line Driver Interface IC. As the xDSL interface circuit is designed to operate from 3 kHz to to 30 MHz, nearby high frequency events - such as cable flashover or primary protection activation - can generate damaging conditions for the interface requiring this type of protection.

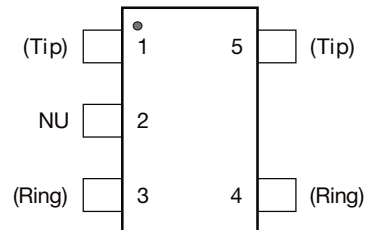
Please contact your Bourns representative if the protection voltage you require is not listed.

#### How to Order

| Device       | Package | Carrier              | Order As        | Reel Quantity |
|--------------|---------|----------------------|-----------------|---------------|
| TISP4P0xxL1N | SOT23-5 | Embossed Tape Reeled | TISP4P0xxL1NR-S | 10,000        |

Insert xx corresponding to device name.

#### SOT23-5 Package (Top View)



Terminal typical application names shown in parenthesis.  
NU - Non-usable; no external electrical connection should be made to this terminal.

MD-SOT23-5-001-a

#### Device Symbol



SD-TISP4-002-a



**WARNING Cancer and Reproductive Harm**  
[www.P65Warnings.ca.gov](http://www.P65Warnings.ca.gov)

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\*RoHS Directive 2002/95/EC Jan. 27, 2003 including annex and RoHS Recast 2011/65/EU June 8, 2011.

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# TISP4P0xxL1N Overvoltage Protector Series

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## Absolute Maximum Ratings, $T_A = 25\text{ }^{\circ}\text{C}$ (Unless Otherwise Noted)

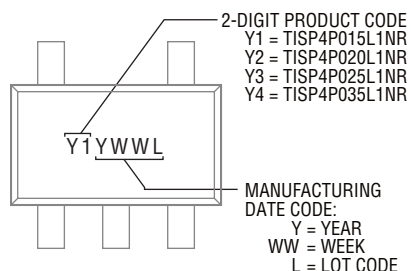
| Rating                                                                                                                                                                                                                                                    | Symbol            | Value                                                                               | Unit               |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------|-------------------------------------------------------------------------------------|--------------------|
| Repetitive peak off-state voltage                                                                                                                                                                                                                         | $V_{\text{DRM}}$  | '4P015L1N $\pm 8$<br>'4P020L1N $\pm 12$<br>'4P025L1N $\pm 16$<br>'4P035L1N $\pm 24$ | V                  |
| Non-repetitive peak impulse current (see Notes 1, 2 and 3)<br>8/20 $\mu\text{s}$ (IEC 61000-4-5, 1.2/50 $\mu\text{s}$ voltage, 8/20 current combination wave generator)<br>10/1000 $\mu\text{s}$ (GR-1089-CORE, 10/1000 $\mu\text{s}$ voltage wave shape) | $I_{\text{PPSM}}$ | $\pm 30$<br>$\pm 18$                                                                | A                  |
| Junction temperature                                                                                                                                                                                                                                      | $T_J$             | -40 to +150                                                                         | $^{\circ}\text{C}$ |
| Storage temperature range                                                                                                                                                                                                                                 | $T_{\text{stg}}$  | -65 to +150                                                                         | $^{\circ}\text{C}$ |

- NOTES: 1. Initially the device must be in thermal equilibrium with  $T_J = 25\text{ }^{\circ}\text{C}$ .  
 2. The surge may be repeated after the device returns to its initial conditions.  
 3. Rated currents only apply if pins 1 & 5 (Tip) are connected together and pins 3 & 4 (Ring) are connected together.

## Electrical Characteristics, $T_A = 25\text{ }^{\circ}\text{C}$ (Unless Otherwise Noted)

| Parameter                                          | Test Conditions                                                                     | Min | Typ                                                                                  | Max                                                                                  | Unit          |
|----------------------------------------------------|-------------------------------------------------------------------------------------|-----|--------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|---------------|
| $I_{\text{DRM}}$ Repetitive peak off-state current | $V_D = V_{\text{DRM}}$                                                              |     |                                                                                      | $\pm 1$                                                                              | $\mu\text{A}$ |
| $V_{(\text{BO})}$ Breakover voltage                | $dv/dt = \pm 250\text{ V/ms}$ , $R_{\text{SOURCE}} = 300\text{ }\Omega$             |     |                                                                                      | '4P015L1N $\pm 15$<br>'4P020L1N $\pm 20$<br>'4P025L1N $\pm 25$<br>'4P035L1N $\pm 35$ | V             |
| $I_H$ Holding current                              | $I_T = \pm 5\text{ A}$ , $di/dt = \pm 30\text{ mA/ms}$                              |     | '4P015L1N $\pm 30$<br>'4P020L1N $\pm 10$<br>'4P025L1N $\pm 30$<br>'4P035L1N $\pm 30$ |                                                                                      | mA            |
| $C_O$ Off-state capacitance                        | $f = 1\text{ MHz}$ , $V_d = 1\text{ V rms}$ , $V_D = 2\text{ V}$                    |     | '4P015L1N 6.5<br>'4P020L1N 6<br>'4P025L1N 5.5<br>'4P035L1N 3.5                       |                                                                                      | pF            |
| $\Delta C$ Delta-capacitance                       | $f = 1\text{ MHz}$ , $V_d = 1\text{ V rms}$ , $V_D = 1\text{ V to } V_{\text{DRM}}$ |     | '4P015L1N 2<br>'4P020L1N 2.5<br>'4P025L1N 3<br>'4P035L1N 2                           |                                                                                      | pF            |

## Typical Part Marking



## Environmental Specifications

Moisture Sensitivity Level..... 1  
 ESD Classification (HBM)..... 3B

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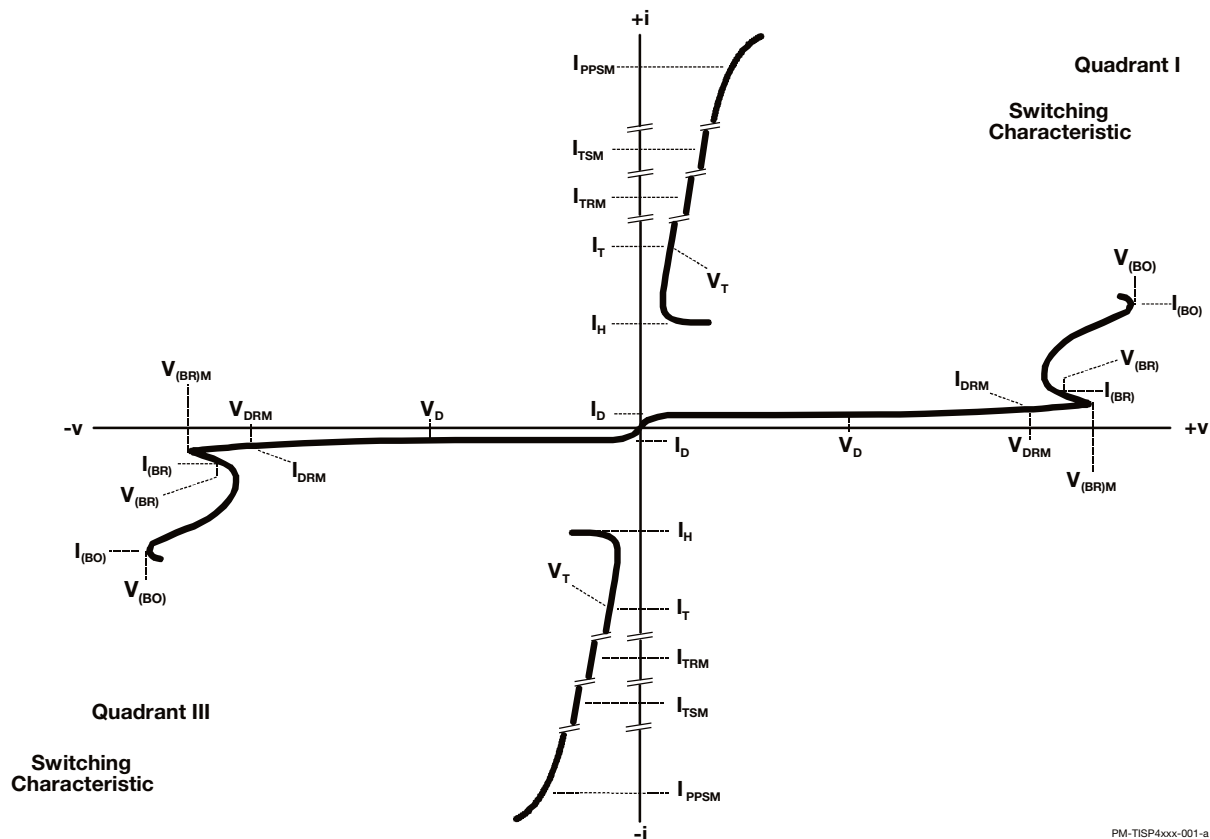
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# TISP4P0xxL1N Overvoltage Protector Series

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## Parameter Measurement Information



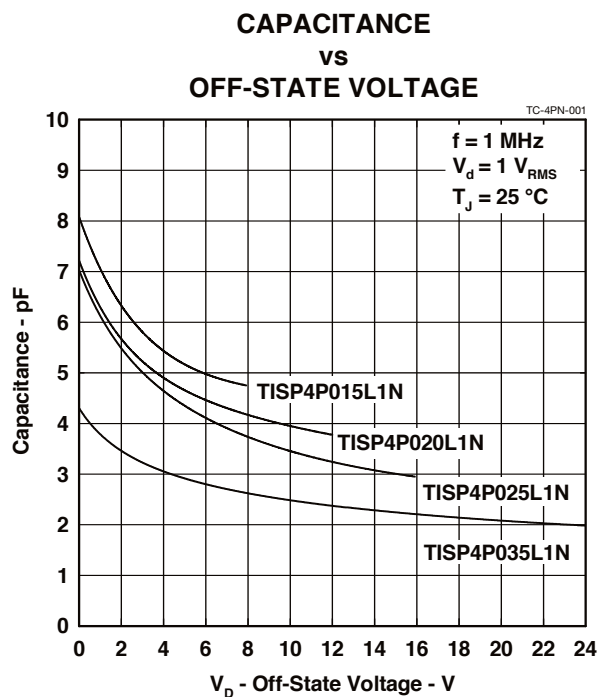
**Figure 1. Voltage-Current Characteristic for Tip and Ring Terminals**  
All Measurements are Referenced to the Ring Terminal

PM-TISP4xxx-001-a

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## Typical Characteristics



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## VDSL Application Examples

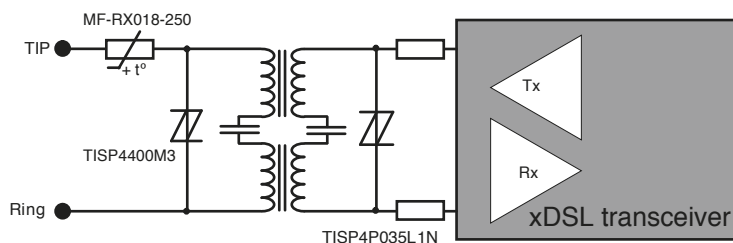


Figure 3.

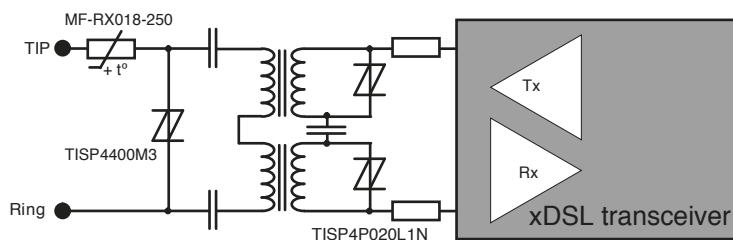


Figure 4.

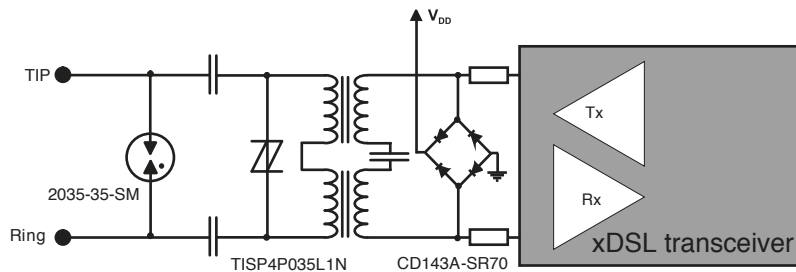
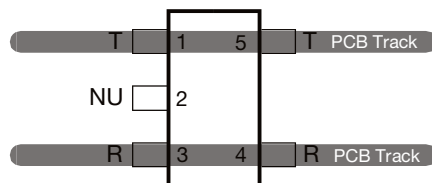


Figure 5.

## Recommended PCB Layout



MD-SOT223-5-xxx

Figure 6.

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