

TISP7015L1, TISP7038L1

TRIPLE ELEMENT THYRISTOR OVERVOLTAGE PROTECTORS

TISP70xxL1 (VLV) Overvoltage Protectors

Three Terminal Very Low Voltage (VLV) Protection  
Ion-Implanted Breakdown Region

Device	V <sub>DRM</sub> V	V <sub>(BO)</sub> V
'7015L1	8	15
'7038L1	28	38

Protection for Signal, Data and Control Lines

- ISDN
- T1/E1
- Ethernet
- RS232 & RS485

Low Capacitance

- '7015L1 ..... 24 pF typ.
- '7038L1 ..... 17 pF typ.

Rated for International Surge Wave Shapes

Voltage Waveshape	Standard	I <sub>PPSM</sub> A
2/10	GR-1089-CORE	200
1.2/50	IEC 61000-4-5	100
10/700	TIA/EIA-IS-968 ITU-T K.20/45/21	50
10/1000	GR-1089-CORE	30

IEC 61000-4-2 Immunity Ratings

- Contact ..... 6 kV
- Air ..... 8 kV

Description

The TISP70xxL1 series are 3-point overvoltage protectors designed for protecting against metallic (transverse mode) and simultaneous longitudinal (common mode) impulses. Each terminal pair has the same voltage limiting values and surge current capability.

These devices are designed to limit overvoltages between signal, data and control port conductors, connected to terminals T1 and T2, and a protective ground, G. Each terminal pair has a symmetrical voltage-triggered bidirectional thyristor characteristic (Figure 1). Overvoltages are initially clipped by breakdown clamping until the voltage rises to the breakover level, which causes the device to crowbar into a low-voltage on state. This low-voltage on state causes the current resulting from the overvoltage to be safely diverted through the device. The device holding current will normally be higher than the available short circuit d.c. system current, causing the protector to switch off as the diverted current subsides.

How to Order

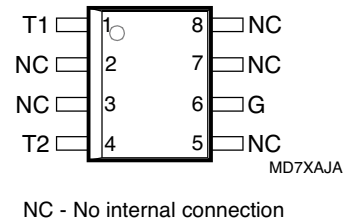
Device	Package	Carrier	Order As
TISP7015L1	D (8-pin, Small-outline)	R (Embossed Tape Reeled)	TISP7015L1DR-S
TISP7038L1	D (8-pin, Small-outline)	R (Embossed Tape Reeled)	TISP7038L1DR-S

... UL Recognized Components

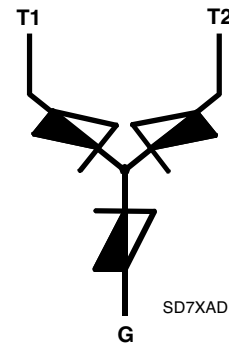
Agency Recognition

Description	
UL	File Number: <a href="#">E215609</a>

D Package (Top View)



Device Symbol



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

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# TISP70xxL1 (VLV) Overvoltage Protectors

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The TISP70xxL1 is guaranteed to withstand the listed international ESD (ElectroStatic Discharge), and lightning impulses in both polarities. Terminals marked NC do not have any internal connections and may be left floating or tied to some circuit point. The TISP7038L1 is a functional replacement for the TPN3021.

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

Rating	Symbol	Value	Unit
Repetitive peak off-state voltage	TISP7015L1 TISP7038L1	$\pm 8$ $\pm 28$	V
Non-repetitive peak on-state pulse current (see Notes 1 and 2)	$I_{PPSM}$	200	A
2/10 (Telcordia GR-1089-CORE, 2/10 voltage wave shape)		100	
1/20 (ITU-T K.22, 1.2/50 voltage wave shape, also VDE0878)		100	
8/20 (IEC 61000-4-5, Figure 12 generator, 1.2/50 voltage wave shape)		75	
10/160 (TIA/EIA-IS-968 (formally FCC Part 68), 10/160 voltage wave shape)		50	
5/310 (ITU-T K.20/21, 10/700 voltage wave shape, also IEC 61000-4-5 and VDE0433)		40	
10/560 (TIA/EIA-IS-968 (formally FCC Part 68), 10/560 voltage wave shape)		30	
Non-repetitive peak on-state current (see Note 1)	$I_{TSM}$	9	A
16.7 ms (60 Hz) full sine wave		8	
20 ms (50 Hz) full sine wave		3	
0.2 s 50 Hz/60 Hz a.c.		1.5	
2.0 s 50 Hz/60 Hz a.c.			
Junction temperature	$T_J$	-40 to +150	$^\circ\text{C}$
Storage temperature range	$T_{stg}$	-65 to +150	$^\circ\text{C}$

NOTES: 1. Initially the TISP70xxL1 must be in thermal equilibrium at the specified TA. The surge may be repeated after the TISP70xxL1 returns to its initial conditions.

2. These non-repetitive rated currents are peak values of either polarity.

## EMC Immunity Test Ratings, $T_A = 25\text{ }^\circ\text{C}$ (Unless Otherwise Noted)

Rating	Symbol	Value	Unit
Level 3 open-circuit voltage, IEC 61000-4-2, 2001-4, ESD generator, also ITU-T K.20	$V_{O/C}$	6	kV
contact discharge air discharge		8	

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

Parameter	Test Conditions	Min	Typ	Max	Unit
$I_{DRM}$ Repetitive peak off-state current	$V_D = \pm V_{DRM}$			$\pm 4$	$\mu\text{A}$
$V_{(BO)}$ Breakover voltage	$dv/dt = \pm 250\text{ V/ms}$ , $R_{SOURCE} = 300\ \Omega$			$\pm 15$ $\pm 38$	V
$I_{(BO)}$ Breakover current	$dv/dt = \pm 250\text{ V/ms}$ , $R_{SOURCE} = 300\ \Omega$			$\pm 300$	mA
$I_H$ Holding current	$I_T = \pm 5\text{ A}$ , $di/dt = \pm 30\text{ mA/ms}$	$\pm 30$			mA

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# TISP70xxL1 (VLV) Overvoltage Protectors

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

Parameter	Test Conditions	Min	Typ	Max	Unit
$C_{KA}$ Off-state capacitance	$f = 1\text{ MHz}$ , $V_d = 1\text{ V rms}$ , $V_D = 0$ (see Note 3)		24 17		$\mu\text{F}$
	TISP7015L1 TISP7038L1				

NOTE 3: Value for any terminal pair, three-terminal guarded measurement with zero voltage bias on the unmeasured terminal.

## Thermal Characteristics

Parameter	Test Conditions	Min	Typ	Max	Unit
$R_{\theta JA}$ Junction to free air thermal resistance	$P_{tot} = 0.8\text{ W}$ , $T_A = 25\text{ }^\circ\text{C}$ , $5\text{ cm}^2$ , FR4 PCB			170	$^\circ\text{C/W}$

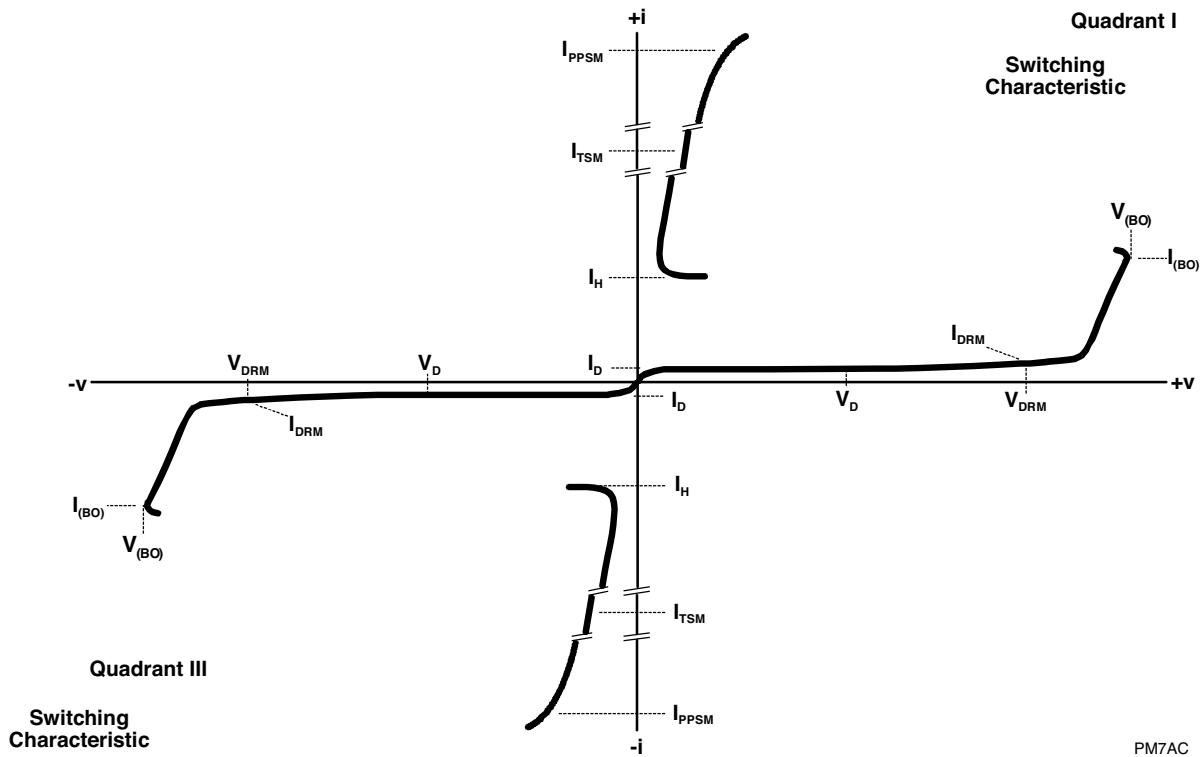
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## Parameter Measurement Information



PM7AC

Figure 1. Voltage-Current Characteristic for any Terminal Pair

## Typical Characteristics

**OFF-STATE CURRENT  
vs  
JUNCTION TEMPERATURE**

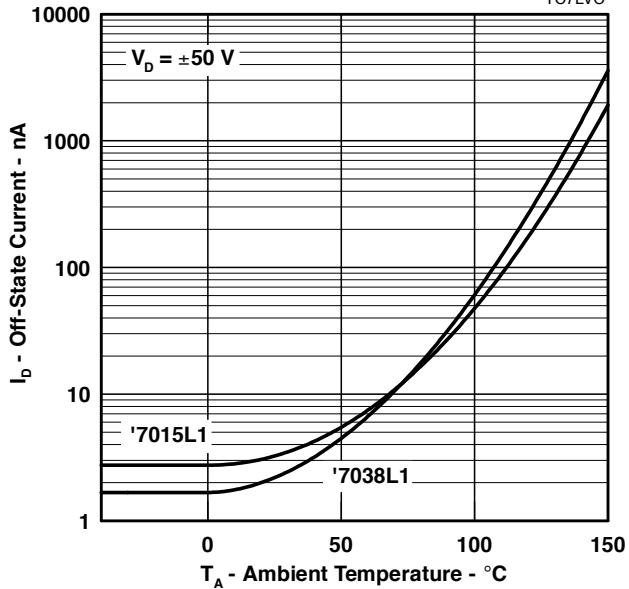


Figure 2.

**NORMALIZED BREAKOVER VOLTAGE  
vs  
JUNCTION TEMPERATURE**

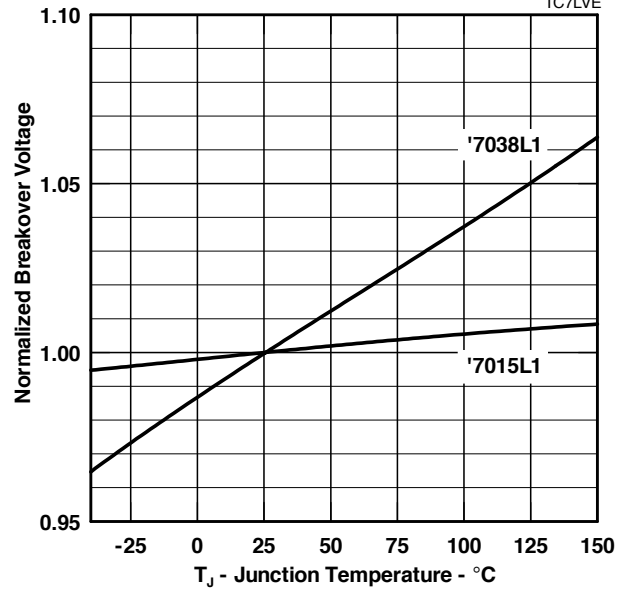


Figure 3.

**ON-STATE CURRENT  
vs  
ON-STATE VOLTAGE**

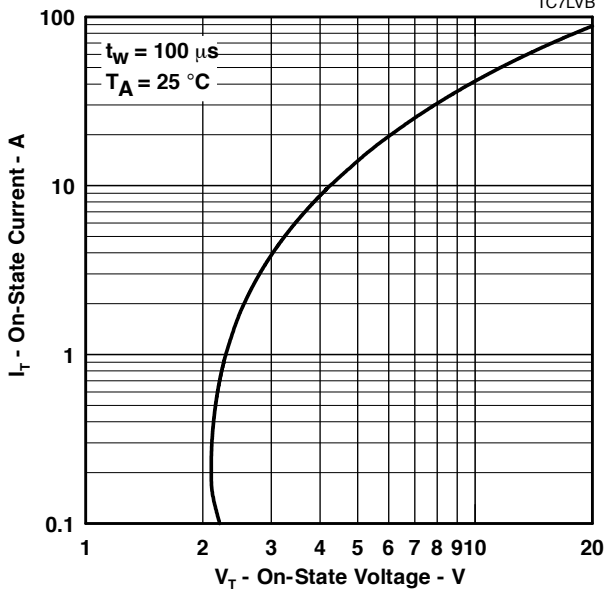


Figure 4.

**NORMALIZED HOLDING CURRENT  
vs  
JUNCTION TEMPERATURE**

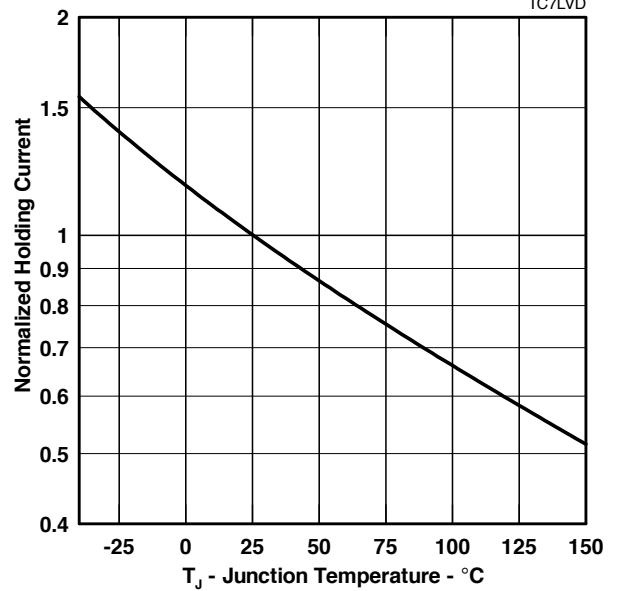


Figure 5.

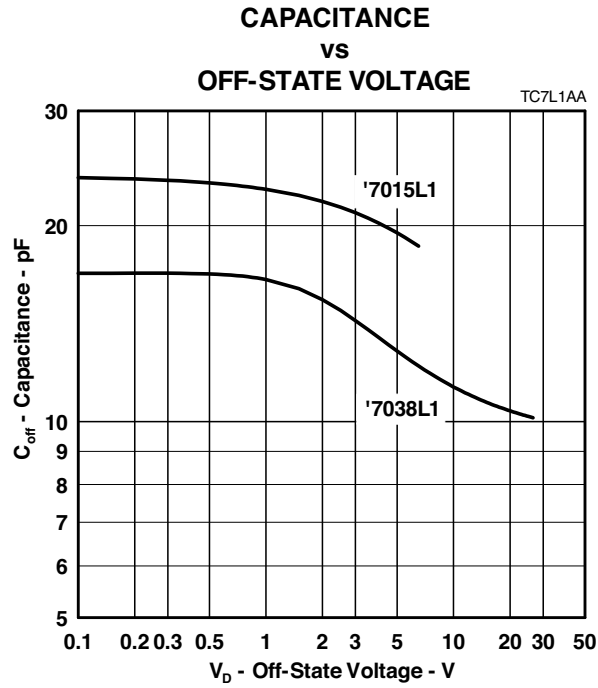
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Typical Characteristics



## Rating and Thermal Information

### NON-REPETITIVE PEAK ON-STATE CURRENT VS CURRENT DURATION

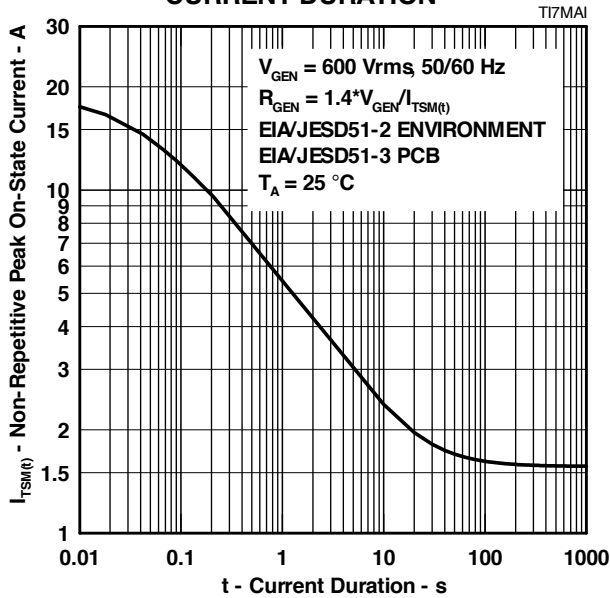


Figure 7.

### $V_{DRM}$ DERATING FACTOR VS MINIMUM AMBIENT TEMPERATURE

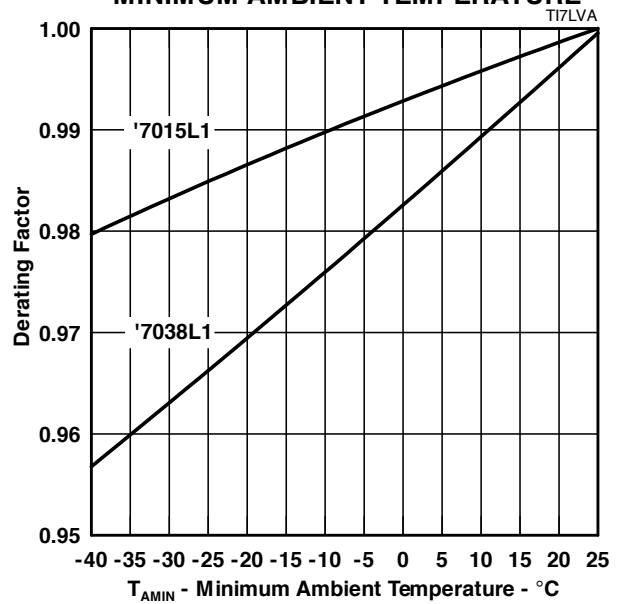


Figure 8.

## MECHANICAL DATA

### Device Symbolization Code

Devices will be coded as below.

Device	Symbolization Code
TISP7015L1DR-S	7015L1
TISP7038L1DR-S	7038L1



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