

TRIPLE ELEMENT
THYRISTOR OVERVOLTAGE PROTECTORS



TISP7038 (VLV) Overvoltage Protector

Three Terminal Very Low Voltage (VLV) Protection

Ion-Implanted Breakdown Region
- Precise and Stable Voltage

| DEVICE | V _{DRM} V | V _(BO) V |
|--------|-----------------------|------------------------|
| '7038 | 28 | 38 |

Protection for Signal, Data and Control Lines
- ISDN
- T1/E1
- RS232 & RS485

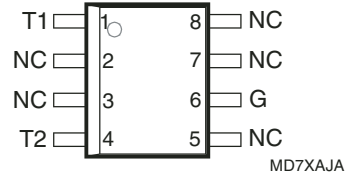
Low Capacitance 30 pF max.

Rated for International Surge Wave Shapes

| Voltage Waveshape | Standard | I _{PPSM} A |
|-------------------|------------------|------------------------|
| 8/20 | IEC 61000-4-5 | 150 |
| 10/700 | ITU-T K.20/45/21 | 40 |
| 10/1000 | GR-1089-CORE | 30 |

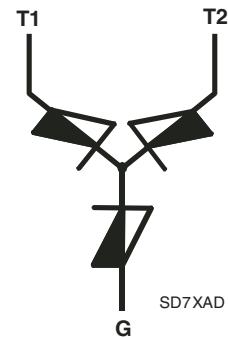
 UL Recognized Components

D Package (Top View)



NC - No internal connection

Device Symbol



Description

The TISP7038 is a 3-point overvoltage protector designed for protecting against metallic (differential mode) and simultaneous longitudinal (common mode) impulses.

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 switches off when the diverted current falls below the holding current value.

Terminals marked NC do not have any internal connections and may be left floating or tied to some circuit point.

How To Order

| Device | Package | Carrier | For Standard Termination Finish Order As | For Lead Free Termination Finish Order As |
|----------|------------------|----------------------|--|---|
| TISP7038 | D, Small-outline | Embossed Tape Reeled | TISP7038DR | TISP7038DR-S |
| | | Tube | TISP7038D | TISP7038D-S |

*RoHS Directive 2002/95/EC Jan 27 2003 including Annex
JULY 2000 - REVISED FEBRUARY 2005
Specifications are subject to change without notice.
Customers should verify actual device performance in their specific applications.

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

| Rating | Symbol | Value | Unit |
|--|------------|-----------------|------------------|
| Repetitive peak off-state voltage | V_{DRM} | ± 28 | V |
| Non-repetitive peak on-state pulse current (see Notes 1 and 2) 8/20 (IEC 61000-4-5, clause 7.2, R = 0, combination wave generator) 5/310 (ITU-T recommendation K.44, 10/700 generator used for K.20/45/21) 10/1000 (Telcordia GR-1089-CORE, 10/1000 voltage wave shape) | I_{PPSM} | 150 40 30 | A |
| Non-repetitive peak on-state current (see Notes 1, 2 and 3) 50/60 Hz, 1 s | I_{TSM} | 4 | A |
| 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 TISP7038 must be in thermal equilibrium at the specified T_A . The surge may be repeated after the TISP7038 returns to its initial conditions.
2. These non-repetitive rated currents are peak values of either polarity.
3. Total return current, I_G , value.

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

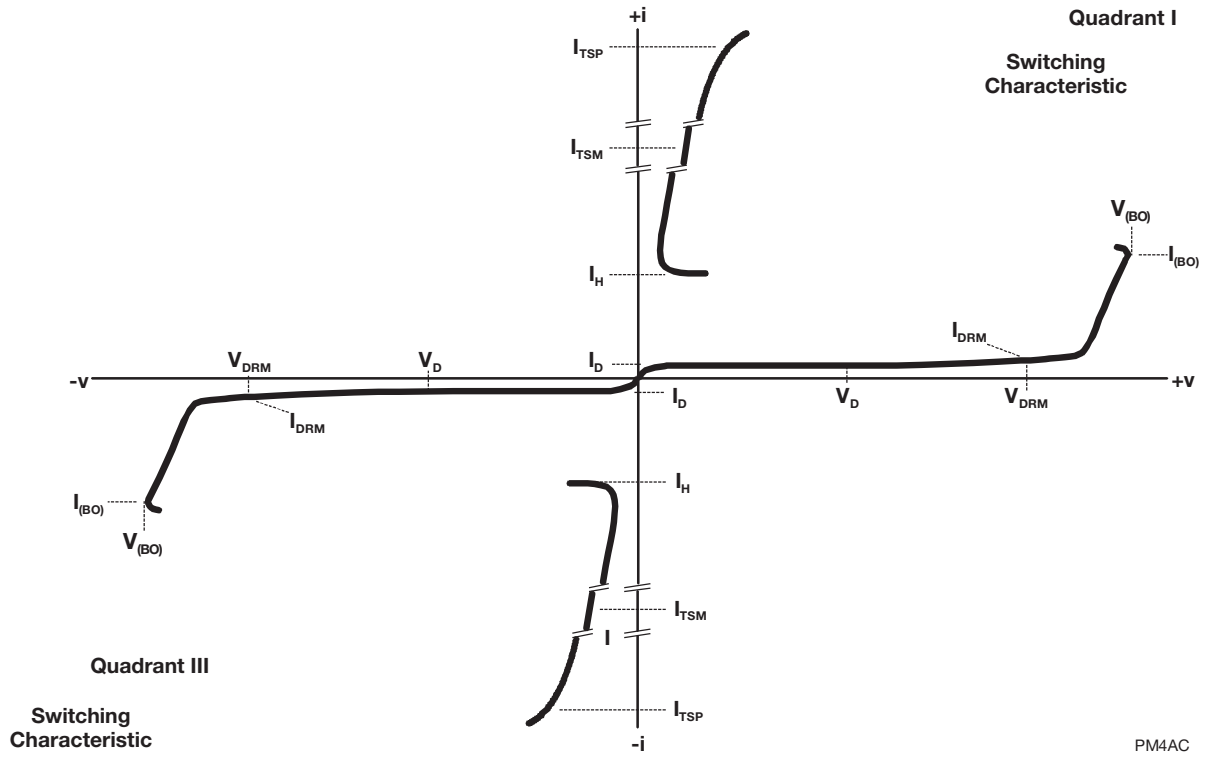
| Parameter | Test Conditions | Min | Typ | Max | Unit |
|---|--|----------|-----|-----------|---------------|
| I_{DRM} Repetitive peak off-state current | $V_D = \pm V_{DRM}$ | | | ± 4 | μA |
| $V_{(BO)}$ Breakover voltage | $dv/dt = \pm 250\text{ V/ms}$, $R_{SOURCE} = 300\ \Omega$ | | | ± 38 | V |
| $I_{(BO)}$ Breakover current | $dv/dt = \pm 250\text{ V/ms}$, $R_{SOURCE} = 300\ \Omega$ | | | ± 100 | mA |
| V_T On-state voltage | $I_T = \pm 5\text{ A}$, $t_W = 100\ \mu\text{s}$ | | | ± 4 | V |
| I_H Holding current | $I_T = \pm 5\text{ A}$, $di/dt = +/- 30\text{ mA/ms}$ | ± 30 | | | mA |
| I_D Off-state current | $V_D = \pm 0.85V_{DRM}$, $T_A = 85\text{ }^\circ\text{C}$ | | | ± 10 | μA |
| C_{KA} Off-state capacitance | $f = 1\text{ MHz}$, $V_d = 30\text{ mV rms}$, $V_D = 0$ (see Note 4) | | 32 | 40 | pF |

NOTE 4: Three-terminal guarded measurement, unmeasured terminal voltage bias is zero.

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 cm^2 , FR4 PCB | | | 160 | $^\circ\text{C/W}$ |

Parameter Measurement Information



PM4AC

Figure 1. Voltage-Current Characteristic for any Terminal Pair

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MECHANICAL DATA

Device Symbolization Code

Devices will be coded as below.

| Device | Symbolization Code |
|----------|--------------------|
| TISP7038 | 7038 |

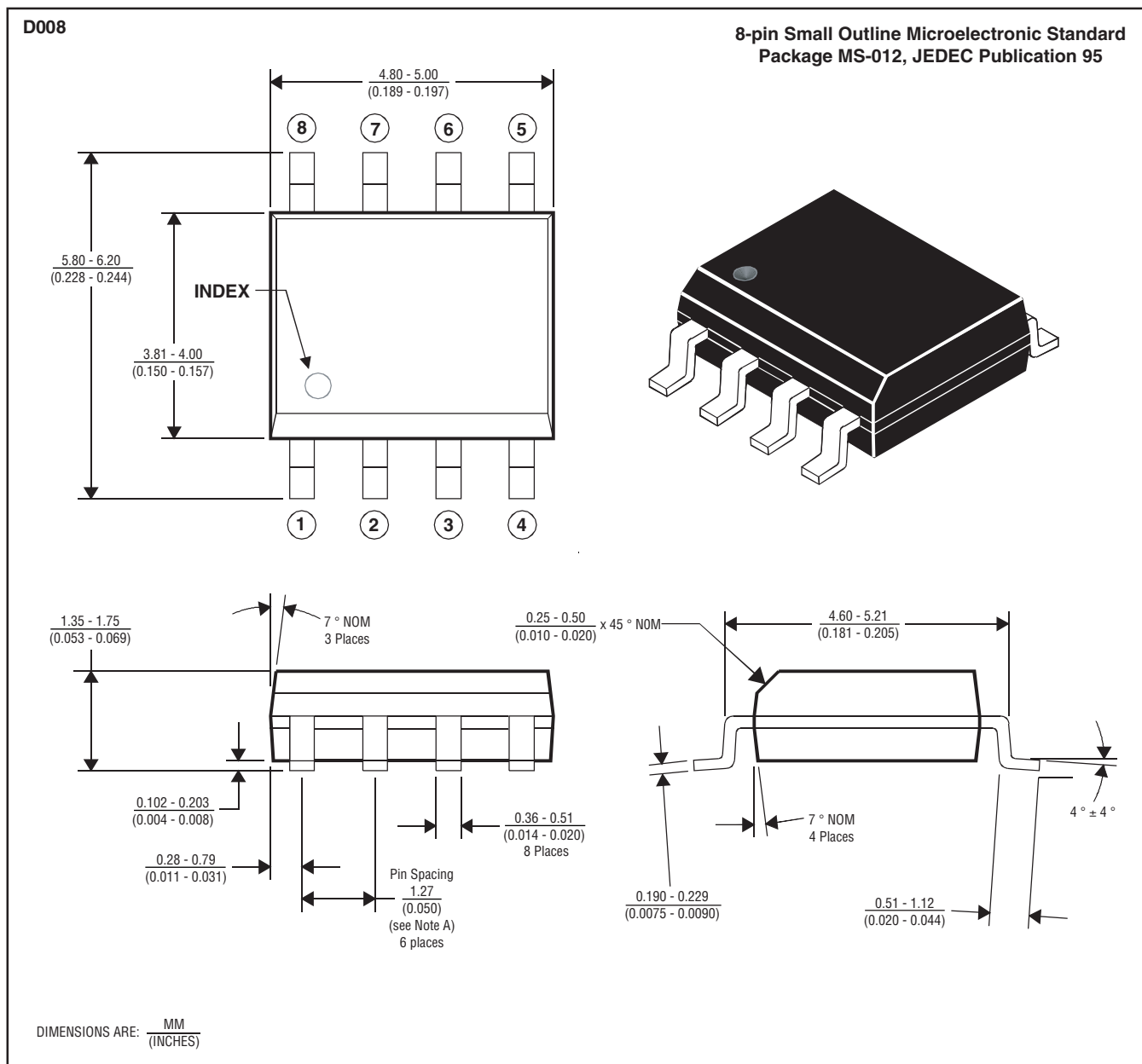
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MECHANICAL DATA

D008 Plastic Small-outline Package

This small-outline package consists of a circuit mounted on a lead frame and encapsulated within a plastic compound. The compound will withstand soldering temperature with no deformation, and circuit performance characteristics will remain stable when operated in high humidity conditions. Leads require no additional cleaning or processing when used in soldered assembly.



- NOTES: A. Leads are within 0.25 (0.010) radius of true position at maximum material condition.
 B. Body dimensions do not include mold flash or protrusion.
 C. Mold flash or protrusion shall not exceed 0.15 (0.006).
 D. Lead tips to be planar within ± 0.051 (0.002).

MDXXAAE

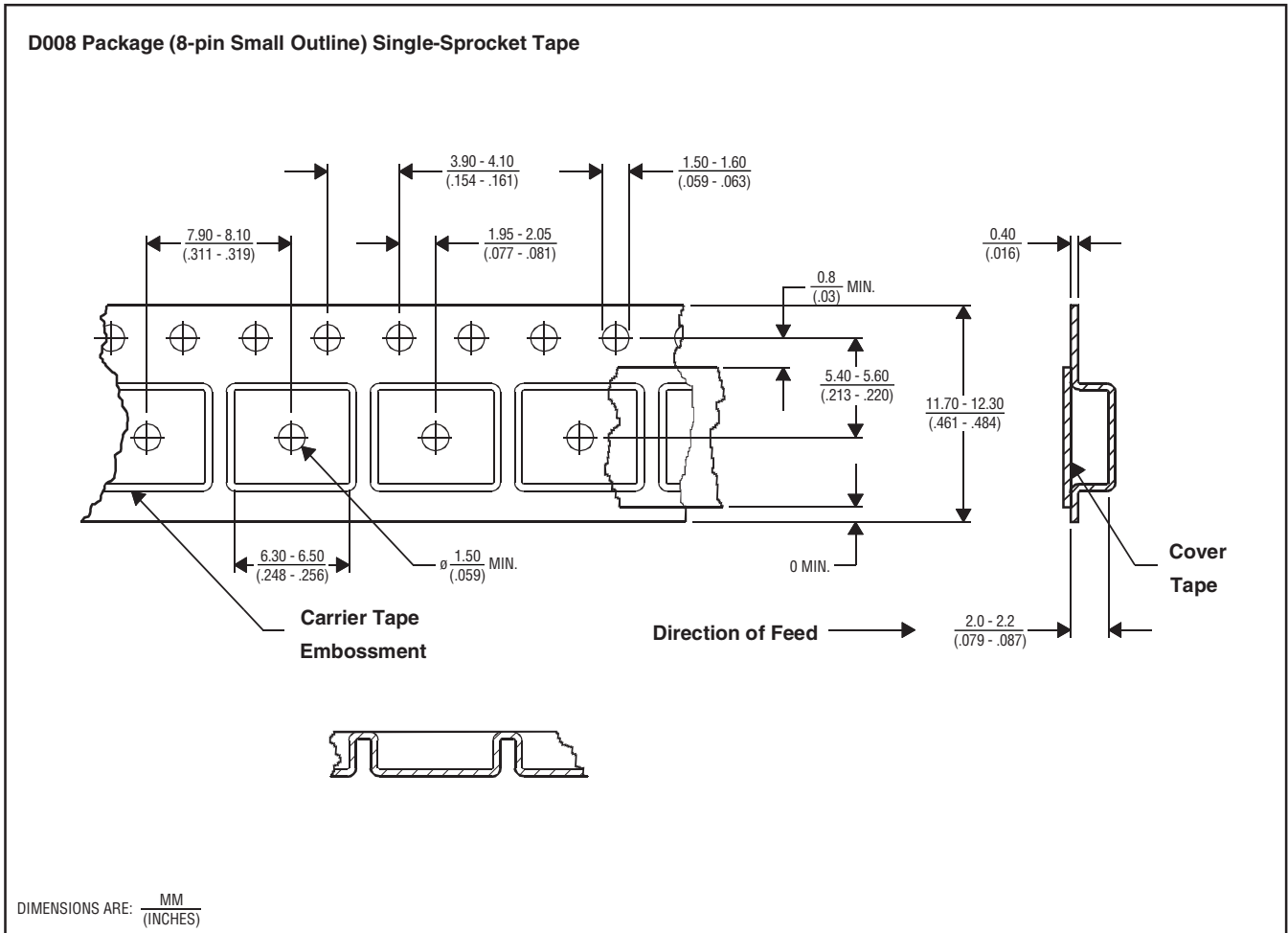
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MECHANICAL DATA

D008 Tape Dimensions



NOTES: A. Taped devices are supplied on a reel of the following dimensions:-

MDXXATC

Reel diameter: $\frac{330 \pm 0.0 / -4.0}{(12.99 \pm 0.0 / -0.157)}$

Reel hub diameter: $\frac{100 \pm 2.0}{(3.937 \pm .079)}$

Reel axial hole: $\frac{13.0 \pm 0.2}{(.512 \pm .008)}$

B. 2500 devices are on a reel.