# 1 Characteristics

**Table 1. Absolute ratings (T$_{amb}$ = 25 °C)**

| Symbol | Parameter | | Value | Unit |
|---|---|---|---|---|
| I$_{PP}$ | Peak pulse current (see note [1]) | 10/1000 µs<br>5/310 µs<br>2/10 µs | 30<br>40<br>90 | A |
| I$_{TSM}$ | Non repetitive surge peak on-state current (F = 50 Hz) | t$_p$ = 10 ms<br>t = 1s | 8<br>3.5 | A |
| T$_{stg}$<br>T$_j$ | Storage temperature range<br>Maximum junction temperature | | - 55 to 150<br>150 | °C |
| T$_L$ | Maximum lead temperature for soldering during 10 s. | | 260 | °C |
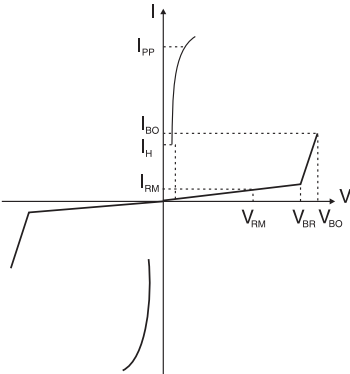
1. See *Figure 3.*

**Table 2. Thermal resistances**

| Symbol | Parameter | Value | Unit |
|---|---|---|---|
| R$_{th(j-a)}$ | Junction to ambient | 170 | °C/W |

**Table 3. Electrical characteristics (T$_{amb}$ = 25 °C)**

| Symbol | Parameter |
|---|---|
| V$_{RM}$ | Stand-off voltage |
| V$_{BR}$ | Breakdown voltage |
| V$_{BO}$ | Breakover voltage |
| I$_{RM}$ | Leakage current |
| I$_{PP}$ | Peak pulse current |
| I$_{BO}$ | Breakover current |
| I$_H$ | Holding current |
| V$_F$ | Forward voltage drop |
| C | Capacitance |



| Order code | I$_{RM}$ @ V$_{RM}$ | | V$_{BR}$ @ I$_R$ | | V$_{BO}$ | V$_{BO}$ dyn. | I$_{BO}$ | I$_H$ |
|---|---|---|---|---|---|---|---|---|
| | max. | | min. | | max.<br>note [1] | typ.<br>note [2] | max.<br>note [1] | min.<br>note[3] |
| | µA | V | V | mA | V | V | mA | mA |
| TPI8011N | 10 | 70 | 80 | 1 | 110 | 120 | 800 | 150 |
| TPI12011N | 10 | 105 | 120 | 1 | 160 | 170 | 800 | 150 |

1. See the reference test circuit 1 (*Figure 5.)*

2. Surge test according to CCITT 1.5 kV, 10/700 µs between Tip or Ring and ground

3. See functional holding current test circuit 2 *(Figure 6.)*

**Figure 2.**

**Table 4.    Capacitance characteristics**

| CONFIGURATION | $C_A$ (pF) max. | $C_B$ (pF) max. | $C_A - C_B$ (pF) max. |
|---|---|---|---|
| $V_A$ = -1 V<br>$V_B$ = -56 V | 45 | 15 | 30 |
| $V_A$ = -56 V<br>$V_B$ = -1 V | 15 | 45 | 30 |



**Figure 3.    Pulse waveform (10/1000 μs)**



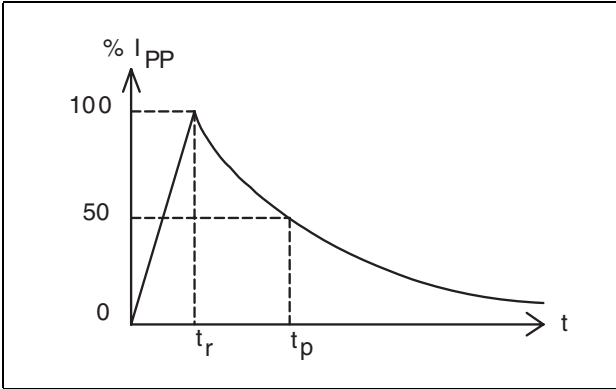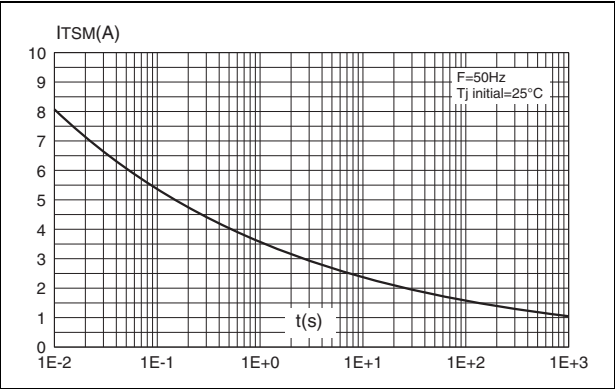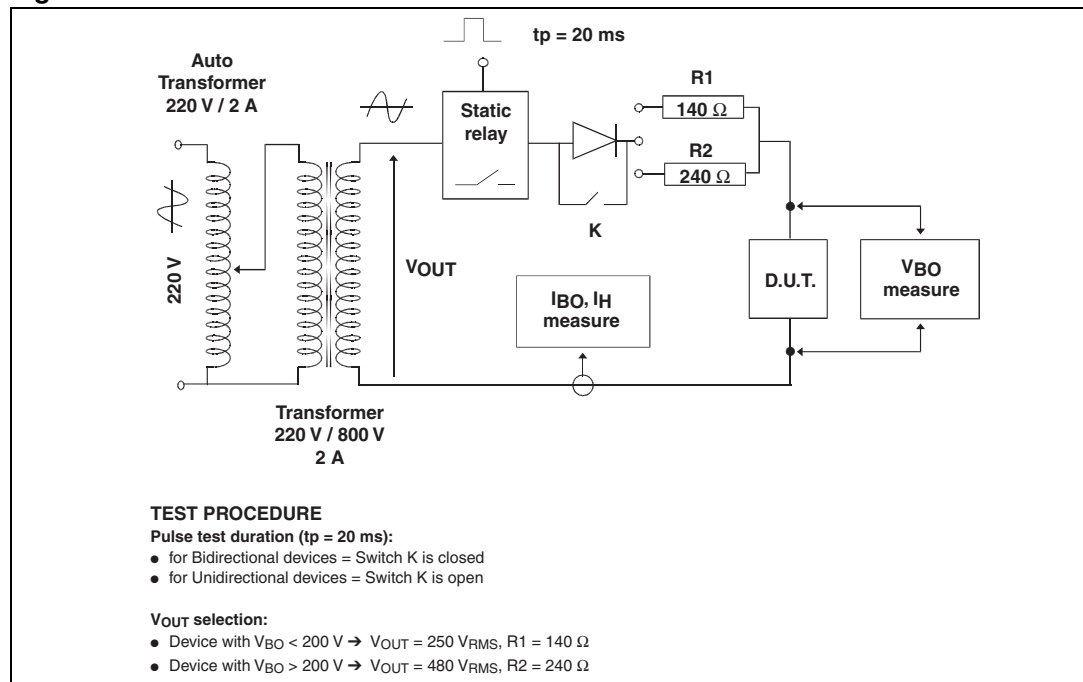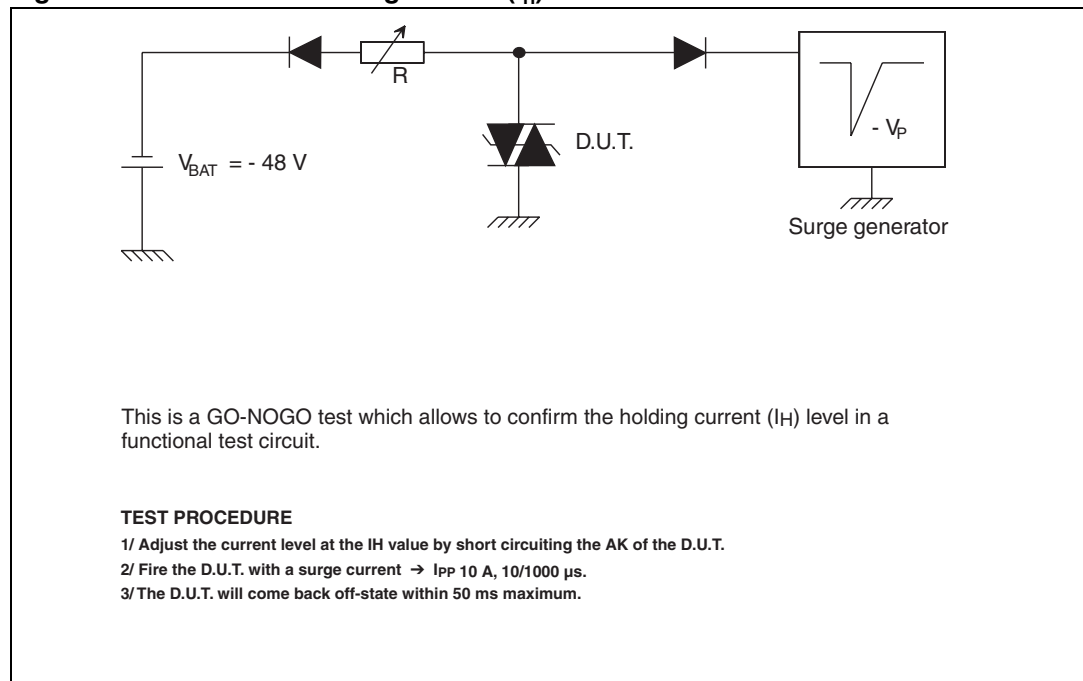**Figure 4.    Surge peak current versus overload duration**

**Figure 5.    Reference test circuit 1**



**TEST PROCEDURE**

**Pulse test duration (tp = 20 ms):**
● for Bidirectional devices = Switch K is closed
● for Unidirectional devices = Switch K is open

**V$_{OUT}$ selection:**
● Device with V$_{BO}$ < 200 V ➔ V$_{OUT}$ = 250 V$_{RMS}$, R1 = 140 Ω
● Device with V$_{BO}$ > 200 V ➔ V$_{OUT}$ = 480 V$_{RMS}$, R2 = 240 Ω

**Figure 6.    Functional holding current (I$_H$) test circuit 2**



This is a GO-NOGO test which allows to confirm the holding current (I$_H$) level in a functional test circuit.

**TEST PROCEDURE**

**1/ Adjust the current level at the IH value by short circuiting the AK of the D.U.T.**
**2/ Fire the D.U.T. with a surge current ➔ I$_{PP}$ 10 A, 10/1000 µs.**
**3/ The D.U.T. will come back off-state within 50 ms maximum.**

# 2    Application information

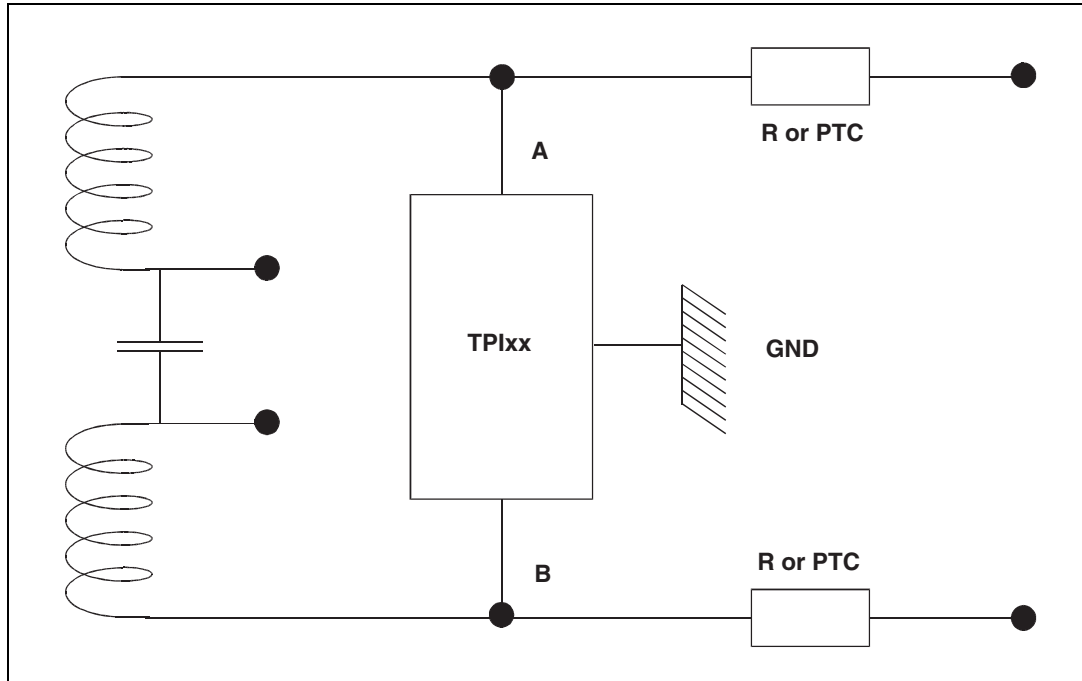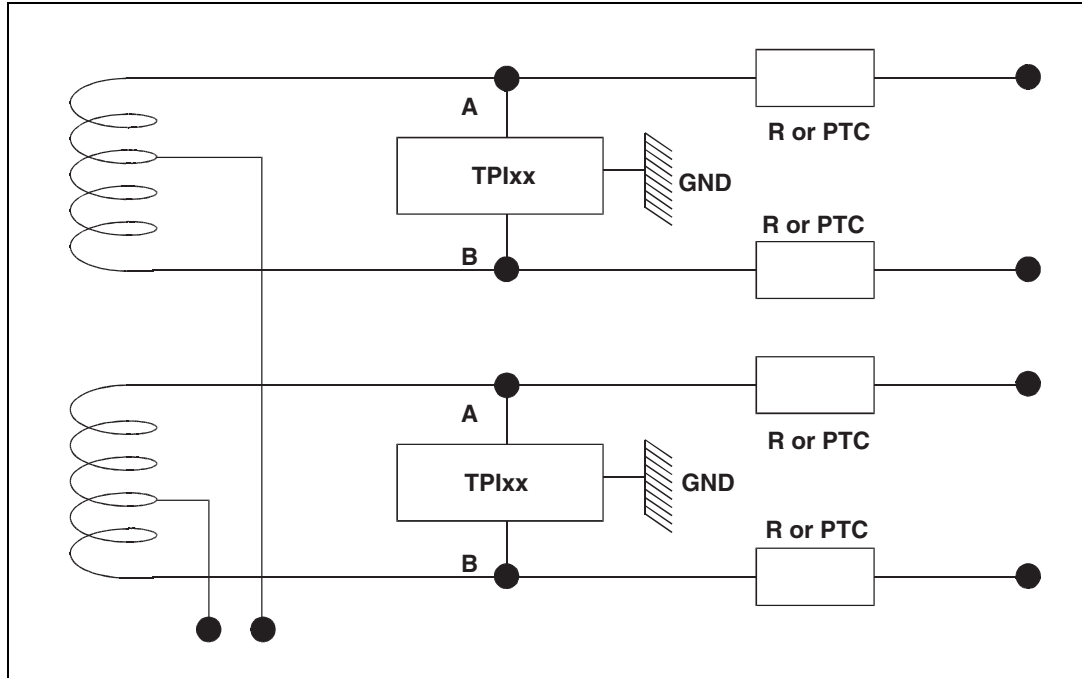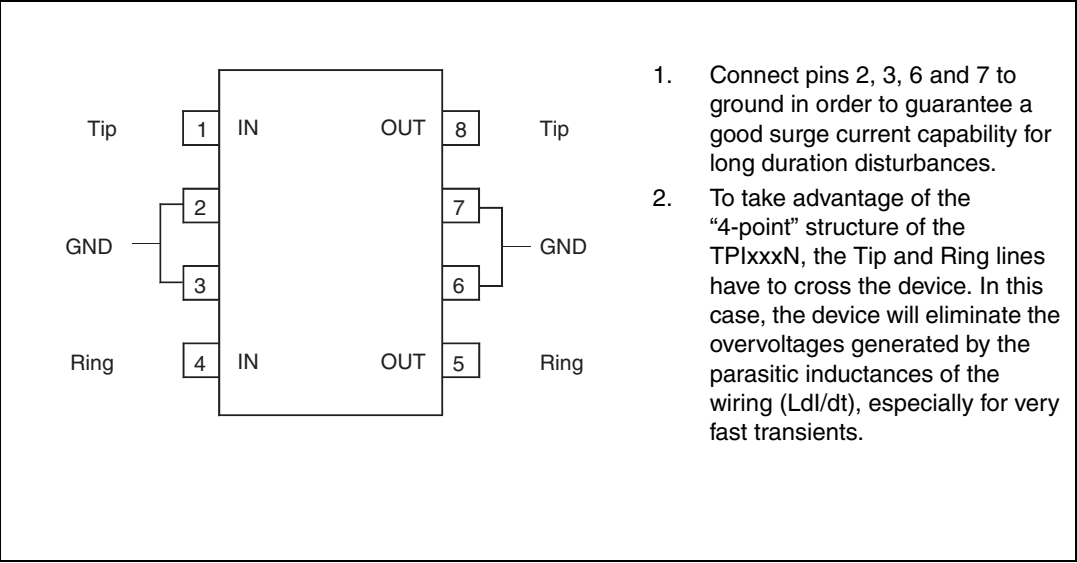**Figure 7.    Application circuit - U interface protection**



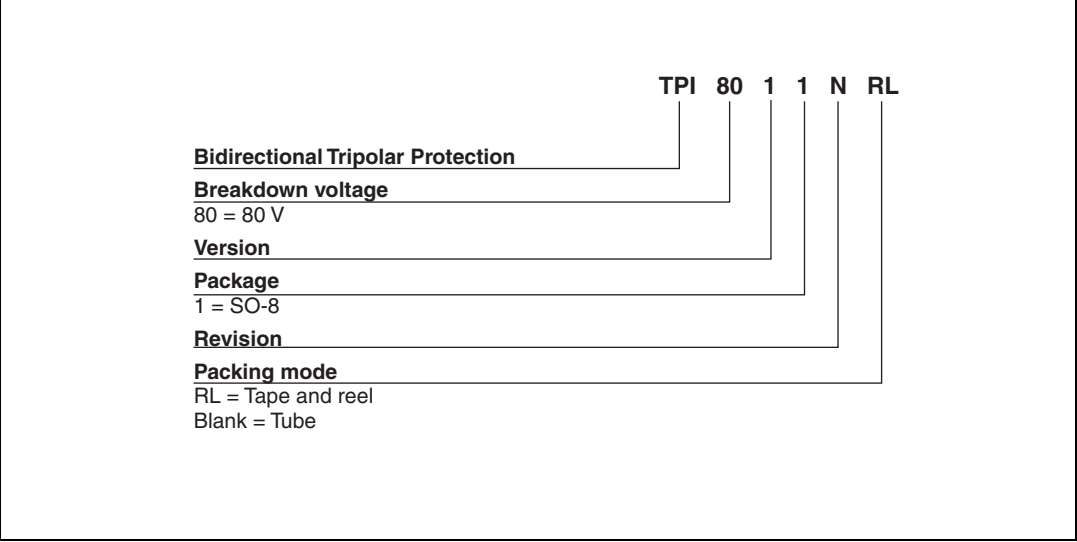**Figure 8.    Application circuit - S interface protection**



This component uses an internal structure resulting in symetrical characteristics with a good balanced behaviour. Its topology ensures the same breakdown voltage level for positive and negative surges in differential and common mode.

**Figure 9.    Connections**



1.   Connect pins 2, 3, 6 and 7 to ground in order to guarantee a good surge current capability for long duration disturbances.

2.   To take advantage of the "4-point" structure of the TPIxxxN, the Tip and Ring lines have to cross the device. In this case, the device will eliminate the overvoltages generated by the parasitic inductances of the wiring (LdI/dt), especially for very fast transients.

# 3      Ordering information scheme

**Figure 10.   Ordering information scheme**
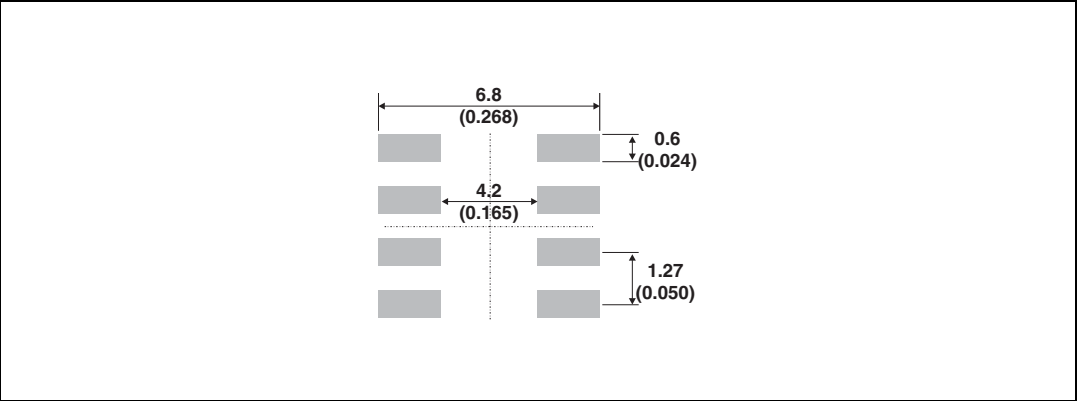
# 4 Package information

- Epoxy meets UL94, V0

In order to meet environmental requirements, ST offers these devices in ECOPACK® packages. These packages have a lead-free second level interconnect. The category of second level interconnect is marked on the package and on the inner box label, in compliance with JEDEC Standard JESD97. The maximum ratings related to soldering conditions are also marked on the inner box label. ECOPACK is an ST trademark. ECOPACK specifications are available at: www.st.com.

**Table 5.       SO-8 dimensions**



| Ref. | Millimeters | | | Inches | | |
|------|------|------|------|------|------|------|
| | Min. | Typ. | Max. | Min. | Typ. | Max. |
| A | | | 1.75 | | | 0.069 |
| A1 | 0.1 | | 0.25 | 0.004 | | 0.010 |
| A2 | 1.25 | | | 0.049 | | |
| b | 0.28 | | 0.48 | 0.011 | | 0.019 |
| C | 0.17 | | 0.23 | 0.007 | | 0.009 |
| D | 4.80 | 4.90 | 5.00 | 0.189 | 0.193 | 0.197 |
| E | 5.80 | 6.00 | 6.20 | 0.228 | 0.236 | 0.244 |
| E1 | 3.80 | 3.90 | 4.00 | 0.150 | 0.154 | 0.157 |
| e | | 1.27 | | | 0.050 | |
| h | 0.25 | | 0.50 | 0.010 | | 0.020 |
| L | 0.40 | | 1.27 | 0.016 | | 0.050 |
| L1 | | 1.04 | | | 0.041 | |
| k | 0° | | 8° | 0° | | 8° |
| ppp | | | 0.10 | | | 0.004 |

**Figure 11.   SO-8 footprint, dimensions in mm (inches)**

# 5 Ordering Information

**Table 6.    Ordering information**

| Order code | Marking | Package | Weight | Base qty | Delivery mode |
|---|---|---|---|---|---|
| TPI8011N | TP80N | | | 100 | Tube |
| TPI8011NRL [(1)] | TP80N | SO-8 | 0.08 g | 2500 | Tape and reel |
| TPI12011N | TP120N | | | 100 | Tube |
| TPI12011NRL [(1)] | TP120N | | | 2500 | Tape and reel |

1.   Prefered device

# 6 Revision history

**Table 7.    Document revision history**

| Date | Revision | Changes |
|---|---|---|
| August-2001 | 3A | Last update. |
| 02-Aug-2004 | 4 | $V_{BO}$ dyn. (page 2) and capacitances (page 3) values update. |
| 07-Nov-2007 | 5 | Reformatted to current standards. Updated *Package information*. |

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