

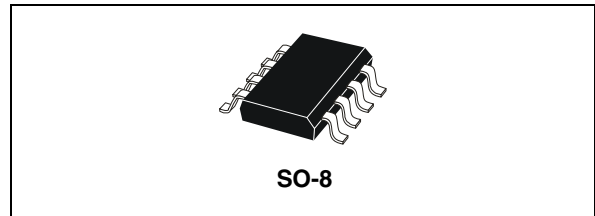
## Tripolar protection for ISDN interfaces

### Features

- Bidirectional triple crowbar protection
- Peak pulse current:  
 $I_{PP} = 30\text{ A}$  , 10/1000  $\mu\text{s}$
- Breakdown voltage:
  - TPI80N: 80 V
  - TPI120N: 120 V
- Available in SO-8 package
- Low dynamic breakover voltage:
  - TPI8011N: 120 V
  - TPI12011N: 170 V

### Benefits

- Low capacitance from lines to ground, allowing high speed transmission without signal attenuation
- Good capacitance balance between lines to ensure longitudinal balance
- Fixed breakdown voltage in both common and differential modes
- The same surge current capability in both common and differential modes
- A particular attention has been given to the internal wire bonding. The “4-point” configuration ensures a reliable protection, eliminating overvoltages introduced by the parasitic inductances of the wiring ( $Ld/dt$ ), especially for very fast transient overvoltages



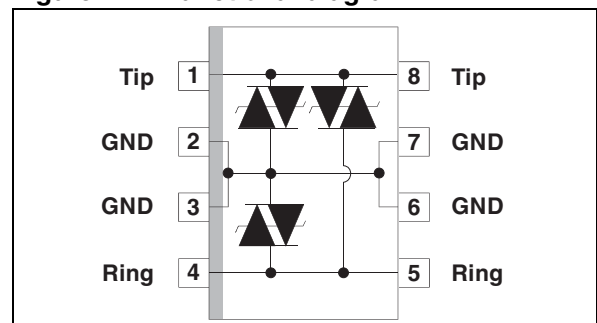
### Complies with following standards

- CCITT K17-K20
  - 10/700  $\mu\text{s}$ , 1.5 kV
  - 5/310  $\mu\text{s}$ , 38 A
- VDE 0433
  - 10/700  $\mu\text{s}$ , 2 kV
  - 5/310  $\mu\text{s}$ , 50 A
- VDE 0878
  - 1.2/50  $\mu\text{s}$ , 1.5 kV
  - 1/20  $\mu\text{s}$ , 40 A
- IEC 61000-4-2 level 4
  - 0.5/700  $\mu\text{s}$ , 1.5 kV
  - 0.2/310  $\mu\text{s}$ , 38 A

### Description

Dedicated devices for **ISDN** interface and high speed data telecom line protection. Equivalent to a triple Trisil™ with low capacitance.

**Figure 1. Functional diagram**



TM: Trisil is a trademark of STMicroelectronics

# 1 Characteristics

**Table 1. Absolute ratings ( $T_{amb} = 25\text{ }^{\circ}\text{C}$ )**

| Symbol             | Parameter                                                         |                                                                    | Value              | Unit               |
|--------------------|-------------------------------------------------------------------|--------------------------------------------------------------------|--------------------|--------------------|
| $I_{PP}$           | Peak pulse current (see note <sup>(1)</sup> )                     | 10/1000 $\mu\text{s}$<br>5/310 $\mu\text{s}$<br>2/10 $\mu\text{s}$ | 30<br>40<br>90     | A                  |
| $I_{TSM}$          | Non repetitive surge peak on-state current ( $F = 50\text{ Hz}$ ) | $t_p = 10\text{ ms}$<br>$t = 1\text{ s}$                           | 8<br>3.5           | A                  |
| $T_{stg}$<br>$T_j$ | Storage temperature range<br>Maximum junction temperature         |                                                                    | - 55 to 150<br>150 | $^{\circ}\text{C}$ |
| $T_L$              | Maximum lead temperature for soldering during 10 s.               |                                                                    | 260                | $^{\circ}\text{C}$ |

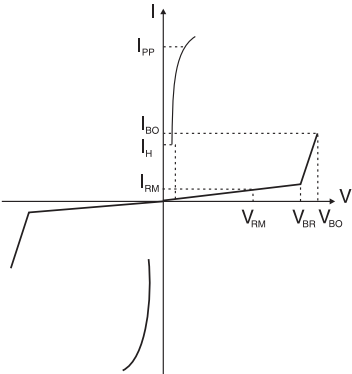
1. See [Figure 3](#).

**Table 2. Thermal resistances**

| Symbol        | Parameter           | Value | Unit                 |
|---------------|---------------------|-------|----------------------|
| $R_{th(j-a)}$ | Junction to ambient | 170   | $^{\circ}\text{C/W}$ |

**Table 3. Electrical characteristics ( $T_{amb} = 25\text{ }^{\circ}\text{C}$ )**

| 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) |
|            | $\mu A$           | 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  $\mu\text{s}$  between Tip or Ring and ground
3. See functional holding current test circuit 2 ([Figure 6](#).)

**Figure 2.**

Table 4. Capacitance characteristics

| CONFIGURATION                                   | C <sub>A</sub> (pF)<br>max. | C <sub>B</sub> (pF)<br>max. | C <sub>A</sub> - C <sub>B</sub> (pF)<br>max. |
|-------------------------------------------------|-----------------------------|-----------------------------|----------------------------------------------|
| V <sub>A</sub> = -1 V<br>V <sub>B</sub> = -56 V | 45                          | 15                          | 30                                           |
| V <sub>A</sub> = -56 V<br>V <sub>B</sub> = -1 V | 15                          | 45                          | 30                                           |

Figure 3. Pulse waveform (10/1000 μs)

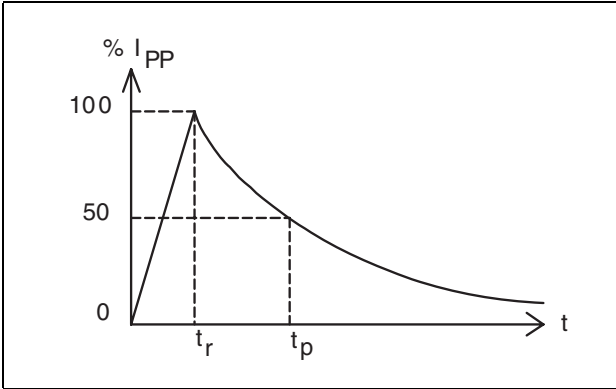
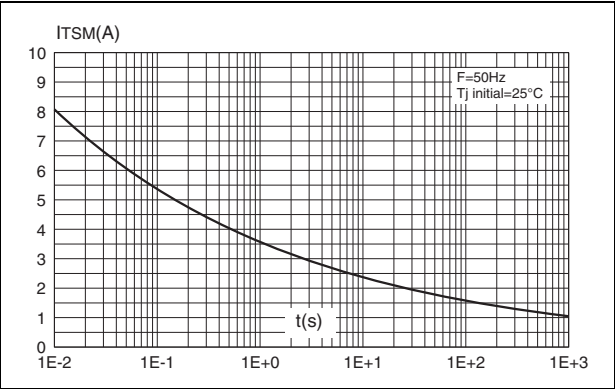
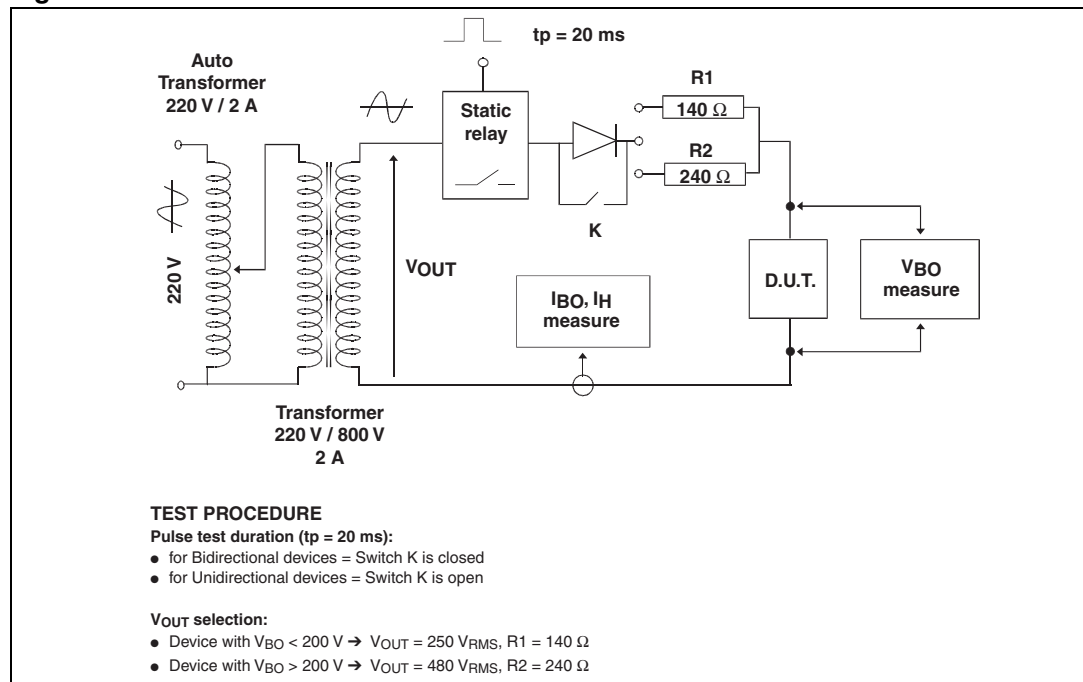


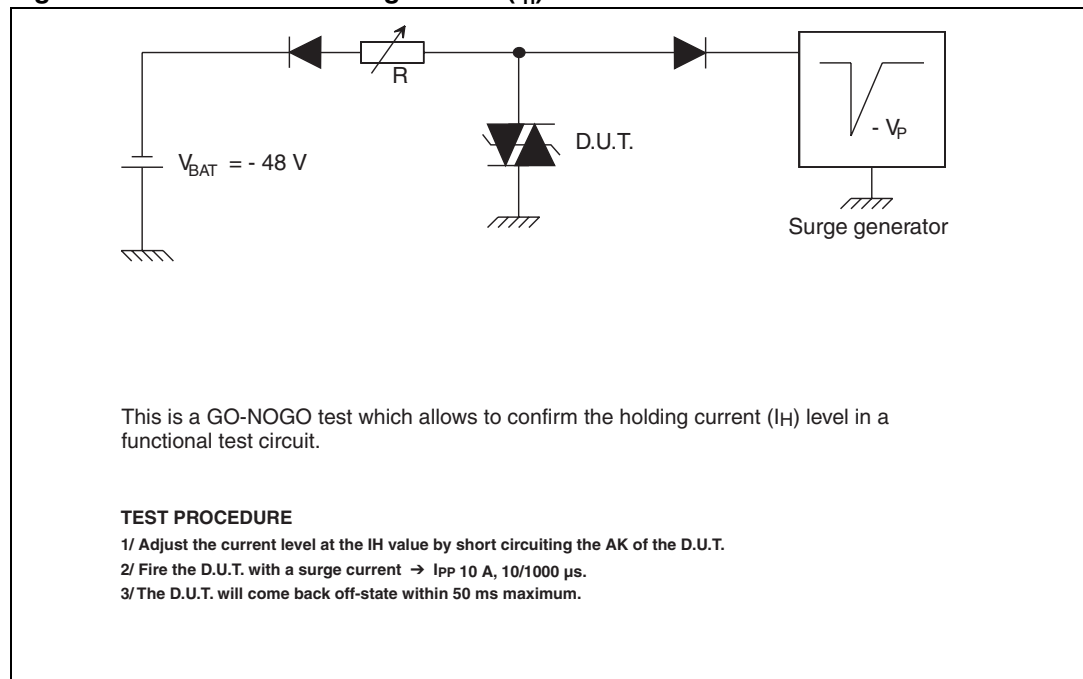
Figure 4. Surge peak current versus overload duration



**Figure 5. Reference test circuit 1**



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



## 2 Application information

Figure 7. Application circuit - U interface protection

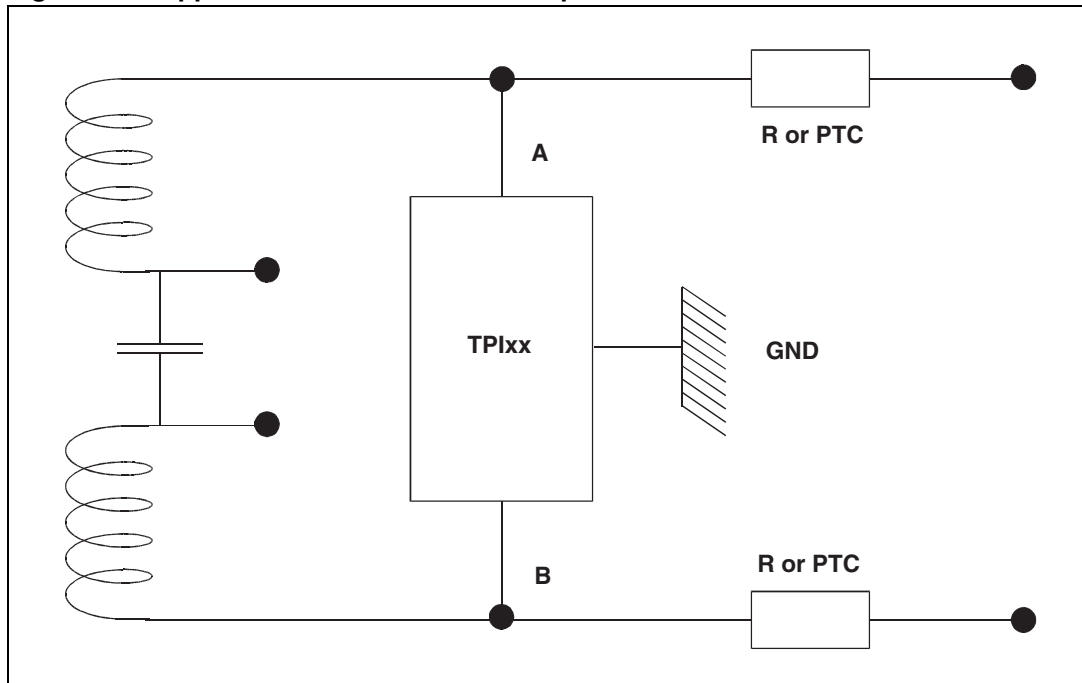
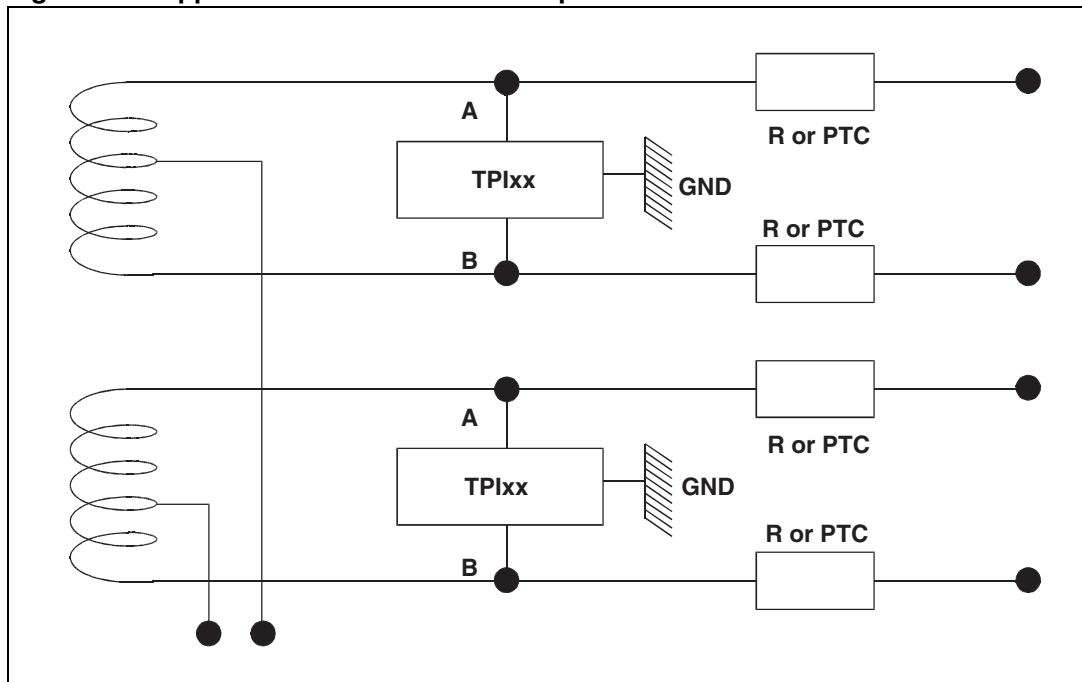
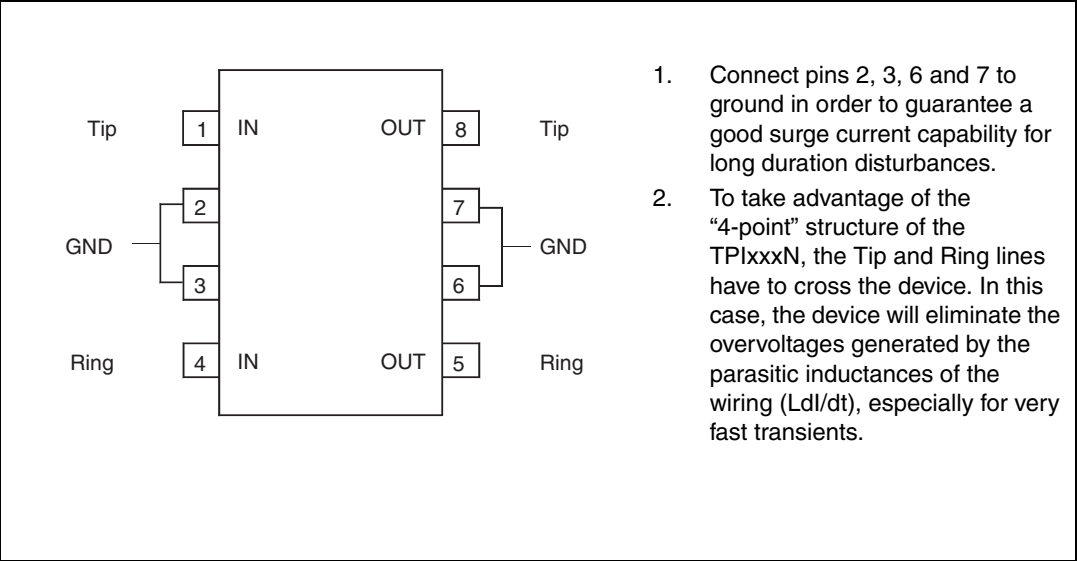


Figure 8. Application circuit - S interface protection



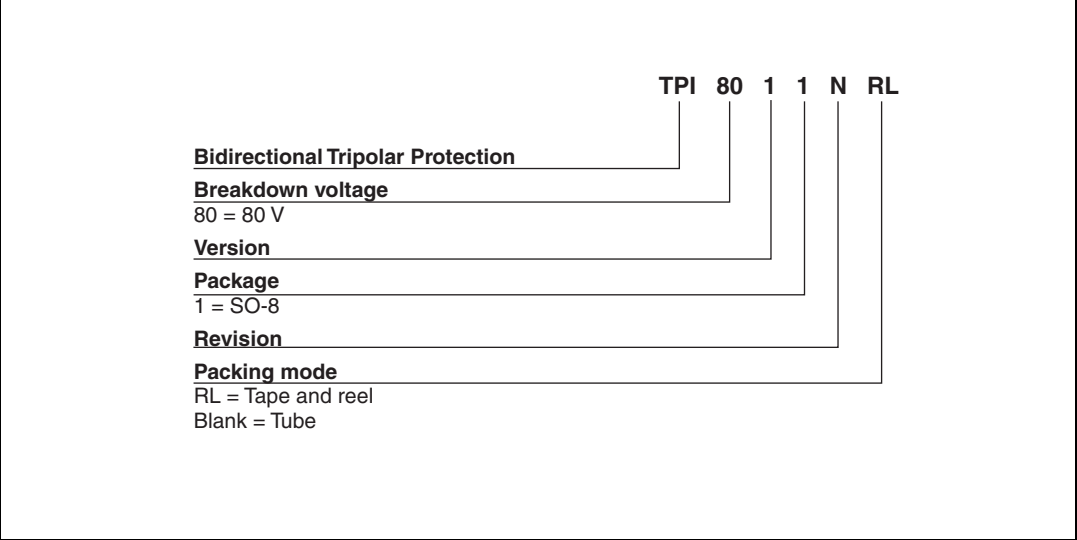
This component uses an internal structure resulting in symmetrical characteristics with a good balanced behaviour. Its topology ensures the same breakdown voltage level for positive and negative surges in differential and common mode.

Figure 9. Connections



3 Ordering information scheme

Figure 10. Ordering information scheme



# 4 Package information

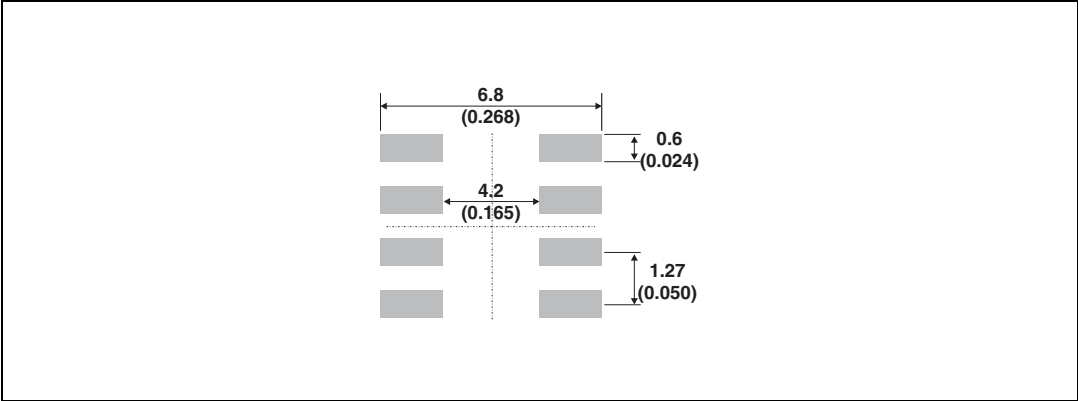
- Epoxy meets UL94, V0

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](http://www.st.com).

**Table 5. SO-8 dimensions**

| Ref. | Dimensions  |      |      |        |       |       |
|------|-------------|------|------|--------|-------|-------|
|      | 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   | SO-8    | 0.08 g | 100      | Tube          |
| TPI8011NRL <sup>(1)</sup>  | TP80N   |         |        | 2500     | Tape and reel |
| TPI12011N                  | TP120N  |         |        | 100      | Tube          |
| TPI12011NRL <sup>(1)</sup> | TP120N  |         |        | 2500     | Tape and reel |

1. Preferred device

## 6 Revision history

**Table 7. Document revision history**

| Date        | Revision | Changes                                                                         |
|-------------|----------|---------------------------------------------------------------------------------|
| August-2001 | 3A       | Last update.                                                                    |
| 02-Aug-2004 | 4        | V <sub>BO</sub> dyn. (page 2) and capacitances (page 3) values update.          |
| 07-Nov-2007 | 5        | Reformatted to current standards. Updated <a href="#">Package information</a> . |



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