

# PESD16VX1UL

Ultra low capacitance unidirectional ESD protection diode

Rev. 01 — 16 December 2009

Product data sheet

## 1. Product profile

### 1.1 General description

Ultra low capacitance unidirectional ElectroStatic Discharge (ESD) protection diode in a leadless ultra small SOD882 Surface-Mounted Device (SMD) plastic package designed to protect one signal line from the damage caused by ESD and other transients. The combination of extremely low capacitance, high ESD maximum rating and ultra small package makes the device ideal for high-speed data line protection and antenna protection applications.

### 1.2 Features

- Unidirectional ESD protection of one line
- Ultra low diode capacitance:  $C_d = 0.83 \text{ pF}$
- Low ESD clamping voltage: 40 V at 30 ns and  $\pm 8 \text{ kV}$
- Very low leakage current:  $I_{RM} < 10 \text{ nA}$
- ESD protection up to 8 kV
- IEC 61000-4-2; level 4 (ESD)
- AEC-Q101 qualified

### 1.3 Applications

- 10/100/1000 Mbit/s Ethernet
- FireWire
- High-speed data lines
- Subscriber Identity Module (SIM) card protection
- Cellular handsets and accessories
- Portable electronics
- Communication systems
- Computers and peripherals
- Audio and video equipment
- Antenna protection


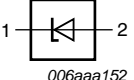
### 1.4 Quick reference data

Table 1. Quick reference data

| Symbol    | Parameter                | Conditions                             | Min | Typ  | Max  | Unit |
|-----------|--------------------------|--|-----|------|------|------|
| $V_{RWM}$ | reverse standoff voltage |  | -   | -    | 16   | V    |
| $C_d$     | diode capacitance        | $f = 1 \text{ MHz}; V_R = 0 \text{ V}$ | -   | 0.83 | 0.98 | pF   |

## 2. Pinning information

**Table 2. Pinning**

| Pin | Description | Simplified outline   | Graphic symbol  |
|-----|-------------|--|---|
| 1   | cathode     |  <p>Transparent top view</p> |  |
| 2   | anode       |  |   |

[1] The marking bar indicates the cathode.

## 3. Ordering information

**Table 3. Ordering information**

| Type number | Package |  |         |
|-------------|---------|--|---------|
|             | Name    | Description  | Version |
| PESD16VX1UL | -       | leadless ultra small plastic package; 2 terminals; body 1.0 × 0.6 × 0.5 mm | SOD882  |

## 4. Marking

**Table 4. Marking codes**

| Type number | Marking code |
|-------------|--------------|
| PESD16VX1UL | Z1           |

## 5. Limiting values

**Table 5. Limiting values**

In accordance with the Absolute Maximum Rating System (IEC 60134).

| Symbol    | Parameter            | Conditions         | Min      | Max  | Unit |
|-----------|----------------------|--------------------|----------|------|------|
| $I_{PP}$  | peak pulse current   | $t_p = 8/20 \mu s$ | [1][2] - | 0.9  | A    |
| $T_j$     | junction temperature |                    | -        | 85   | °C   |
| $T_{amb}$ | ambient temperature  |                    | -40      | +85  | °C   |
| $T_{stg}$ | storage temperature  |                    | -55      | +125 | °C   |

[1] Non-repetitive current pulse 8/20  $\mu s$  exponential decay waveform according to IEC 61000-4-5.

[2] Measured from pin 1 to 2.

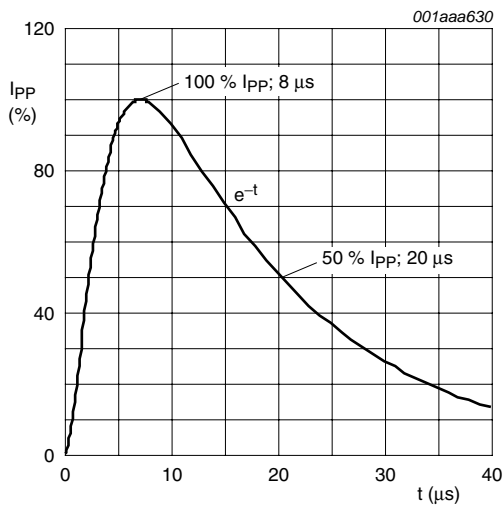
**Table 6. ESD maximum ratings**  
*T<sub>amb</sub> = 25 °C unless otherwise specified.*

| Symbol           | Parameter                       | Conditions                           | Min      | Max | Unit |
|------------------|---------------------------------|--------------------------------------|----------|-----|------|
| V <sub>ESD</sub> | electrostatic discharge voltage | IEC 61000-4-2<br>(contact discharge) | [1][2] - | 8   | kV   |
|                  |                                 | MIL-STD-883 (human body model)       | -        | 10  | kV   |

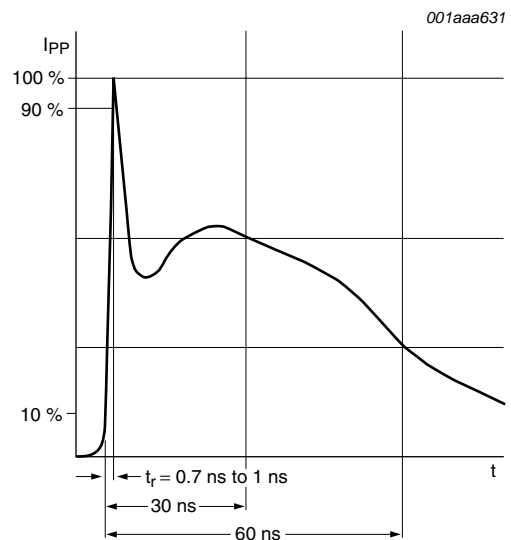
- [1] Device stressed with ten non-repetitive ESD pulses.
- [2] Measured from pin 1 to 2.

**Table 7. ESD standards compliance**

| Standard                                | Conditions       |
|---|------------------|
| IEC 61000-4-2; level 4 (ESD)            | > 8 kV (contact) |
| MIL-STD-883; class 3 (human body model) | > 4 kV           |



**Fig 1. 8/20 μs pulse waveform according to IEC 61000-4-5**



**Fig 2. ESD pulse waveform according to IEC 61000-4-2**

## 6. Characteristics

**Table 8. Characteristics**

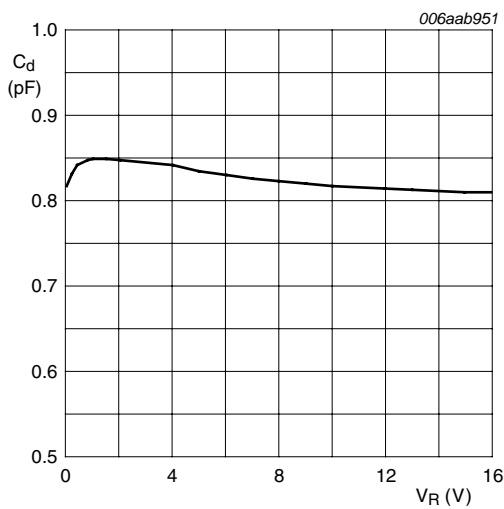
$T_{amb} = 25\text{ }^{\circ}\text{C}$  unless otherwise specified.

| Symbol    | Parameter                | Conditions                           | Min    | Typ  | Max  | Unit     |
|-----------|--------------------------|--------------------------------------|--------|------|------|----------|
| $V_{RWM}$ | reverse standoff voltage |                                      | -      | -    | 16   | V        |
| $I_{RM}$  | reverse leakage current  | $V_{RWM} = 16\text{ V}$              | -      | 10   | 100  | nA       |
| $V_{BR}$  | breakdown voltage        | $I_R = 10\text{ mA}$                 | 17.5   | 22   | 30   | V        |
| $C_d$     | diode capacitance        | $f = 1\text{ MHz}; V_R = 0\text{ V}$ | -      | 0.83 | 0.98 | pF       |
| $V_{CL}$  | clamping voltage         | $I_{PP} = 0.9\text{ A}$              | [1][2] | 34   | -    | V        |
| $r_{dyn}$ | dynamic resistance       | $I_R = 10\text{ A}$                  | [3]    | 2.4  | -    | $\Omega$ |

[1] Non-repetitive current pulse 8/20  $\mu\text{s}$  exponential decay waveform according to IEC 61000-4-5.

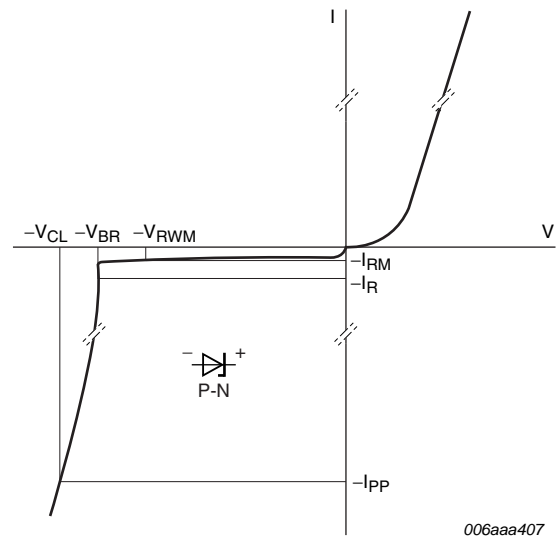
[2] Measured from pin 1 to 2.

[3] Non-repetitive current pulse, Transmission Line Pulse (TLP)  $t_p = 100\text{ ns}$ ; square pulse; ANS/IESD STM5.1-2008.

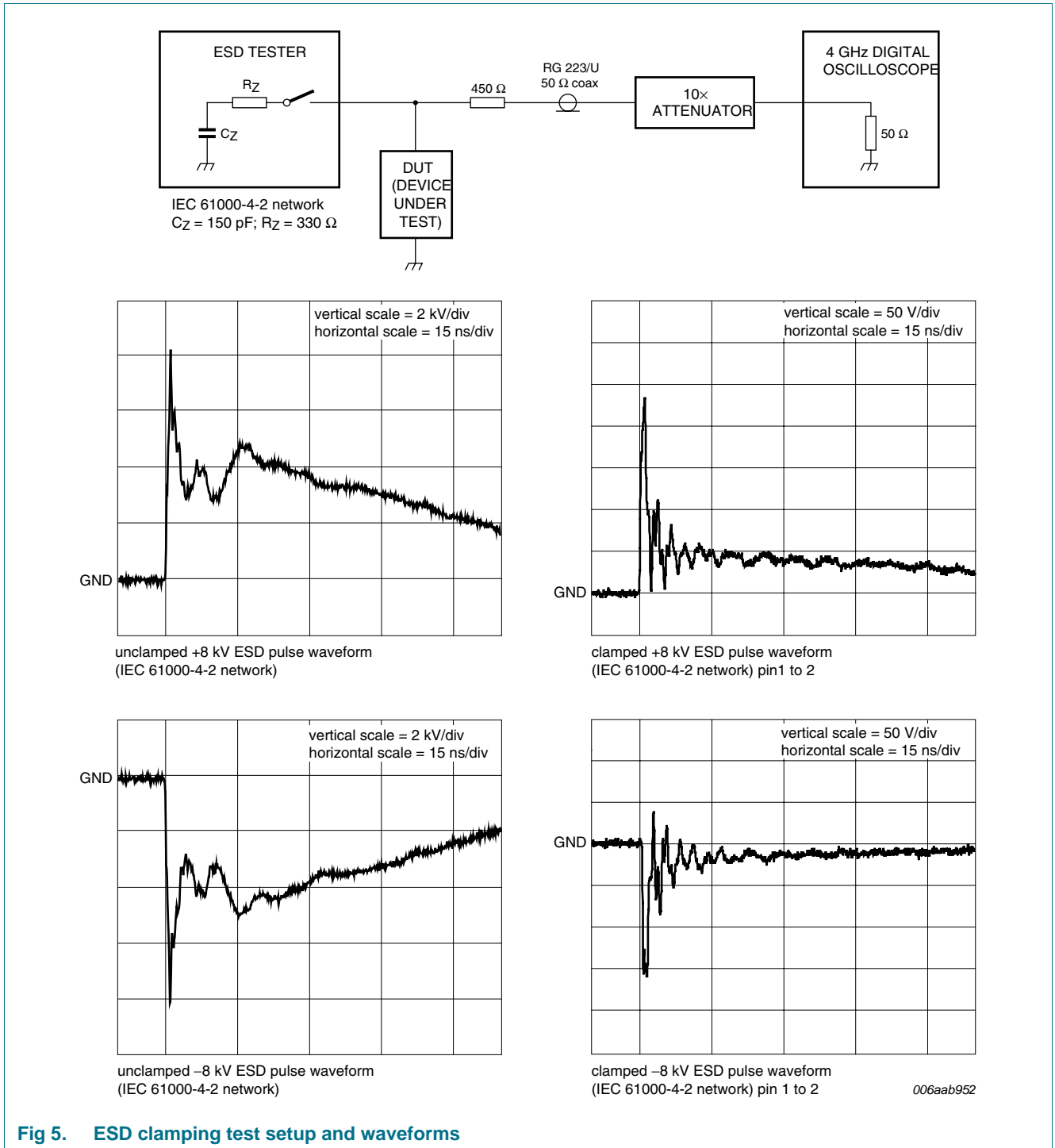


$f = 1\text{ MHz}; T_{amb} = 25\text{ }^{\circ}\text{C}$

**Fig 3. Diode capacitance as a function of reverse voltage; typical values**



**Fig 4. V-I characteristics for a unidirectional ESD protection diode**



## 7. Application information

PESD16VX1UL is designed for the protection of one unidirectional data or signal line from the damage caused by ESD and surge pulses. The device may be used on lines where the signal polarities are either positive or negative with respect to ground.

Figure 6 shows a typical application for the bidirectional protection of one line using two PESD16VX1UL diodes in a back-to-back configuration, e.g. Near Field Communication (NFC) antenna protection.

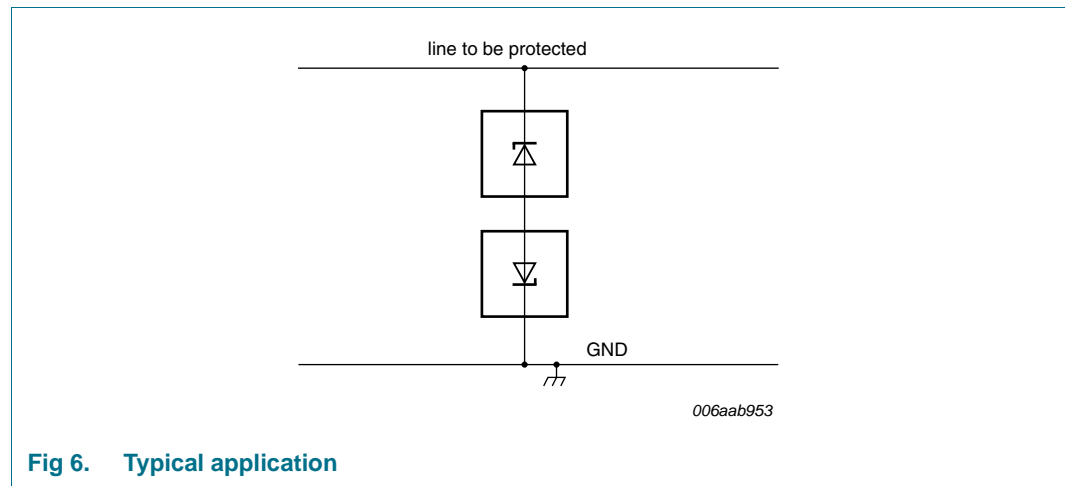


Fig 6. Typical application

### Circuit board layout and protection device placement

Circuit board layout is critical for the suppression of ESD, Electrical Fast Transient (EFT) and surge transients. The following guidelines are recommended:

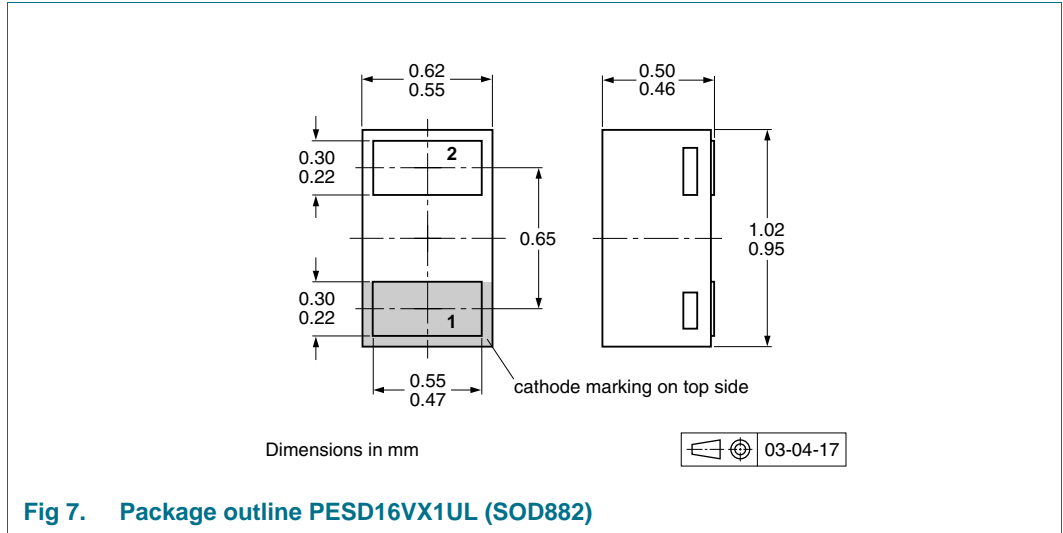
1. Place the device as close to the input terminal or connector as possible.
2. The path length between the device and the protected line should be minimized.
3. Keep parallel signal paths to a minimum.
4. Avoid running protected conductors in parallel with unprotected conductors.
5. Minimize all Printed-Circuit Board (PCB) conductive loops including power and ground loops.
6. Minimize the length of the transient return path to ground.
7. Avoid using shared transient return paths to a common ground point.
8. Ground planes should be used whenever possible. For multilayer PCBs, use ground vias.

## 8. Test information

### 8.1 Quality information

This product has been qualified in accordance with the Automotive Electronics Council (AEC) standard *Q101 - Stress test qualification for discrete semiconductors*, and is suitable for use in automotive applications.

## 9. Package outline



## 10. Packing information

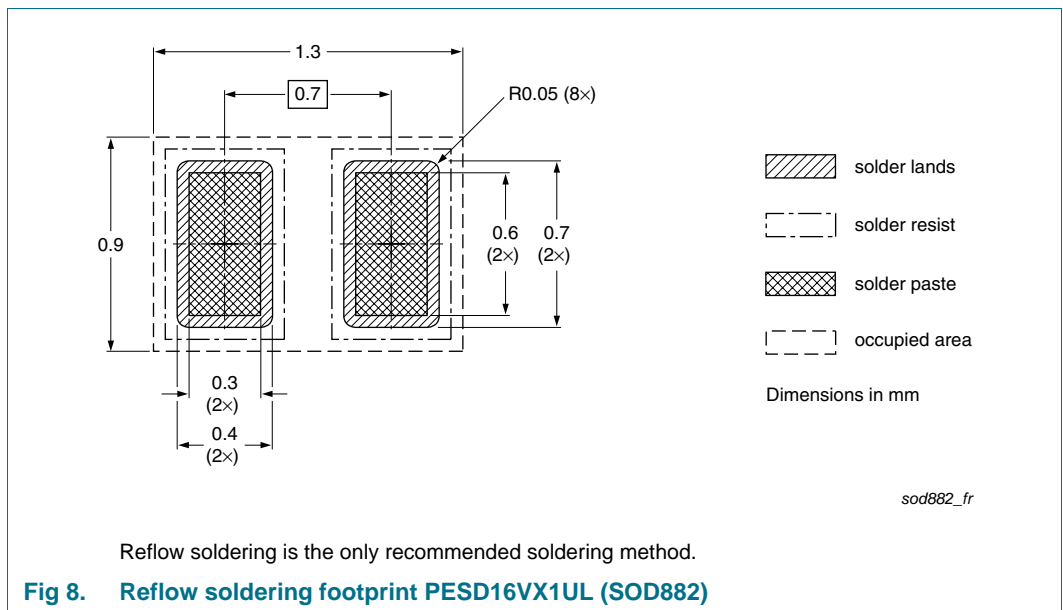
**Table 9. Packing methods**

The indicated -xxx are the last three digits of the 12NC ordering code.<sup>[1]</sup>

| Type number | Package | Description                    | Packing quantity |
|-------------|---------|--------------------------------|------------------|
| PESD16VX1UL | SOD882  | 2 mm pitch, 8 mm tape and reel | 10000            |
|             |         |                                | -315             |

[1] For further information and the availability of packing methods, see [Section 14](#).

## 11. Soldering



## 12. Revision history

Table 10. Revision history

| Document ID   | Release date | Data sheet status  | Change notice | Supersedes |
|---------------|--------------|--------------------|---------------|------------|
| PESD16VX1UL_1 | 20091216     | Product data sheet | -             | -          |



## 13. Legal information

### 13.1 Data sheet status

| Document status <sup>[1][2]</sup> | Product status <sup>[3]</sup> | Definition  |
|-----------------------------------|-------------------------------|---|
| Objective [short] data sheet      | Development                   | This document contains data from the objective specification for product development. |
| Preliminary [short] data sheet    | Qualification                 | This document contains data from the preliminary specification.                       |
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[1] Please consult the most recently issued document before initiating or completing a design.

[2] The term 'short data sheet' is explained in section "Definitions".

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Date of release: 16 December 2009

Document identifier: PESD16VX1UL\_1