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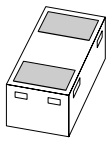


# PESD9X5.0L; PESD9X7.0L

## Unidirectional ESD protection diodes

Rev. 1 — 16 December 2010 Product data sheet

## 1. Product profile

### 1.1 General description

Single unidirectional ElectroStatic Discharge (ESD) protection diodes in a SOD882 leadless ultra small Surface-Mounted Device (SMD) plastic package designed to protect one signal line from the damage caused by ESD and other transients.

### 1.2 Features and benefits

- ESD protection of one line
- Max. peak pulse power: $P_{PP}$ = 150 W
- Low clamping voltage: $V_{CL}$ = 10 V
- Ultra low leakage current: $I_{RM}$ = 3 nA
- AEC-Q101 qualified
- ESD protection up to 30 kV
- IEC 61000-4-2; level 4 (ESD)
- IEC 61000-4-5 (surge); $I_{PP}$ = 10 A
- Ultra small SMD plastic package

### 1.3 Applications

- Computers and peripherals
- Audio and video equipment
- Cellular handsets and accessories
- Portable electronics
- Communication systems

### 1.4 Quick reference data

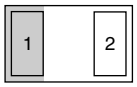
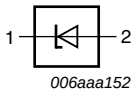
**Table 1. Quick reference data**

*$T_{amb}$ = 25 °C unless otherwise specified.*

| Symbol | Parameter | Conditions | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| $V_{RWM}$ | reverse standoff voltage | | | | | |
| | PESD9X5.0L | | - | - | 5.0 | V |
| | PESD9X7.0L | | - | - | 7.0 | V |
| $C_d$ | diode capacitance | f = 1 MHz; $V_R$ = 0 V | | | | |
| | PESD9X5.0L | | - | 68 | 100 | pF |
| | PESD9X7.0L | | - | 62 | 100 | pF |

## 2. Pinning information

**Table 2. Pinning**

| Pin | Description | | Simplified outline | Graphic symbol |
|---|---|---|---|---|
| 1 | cathode | [1] |   Transparent top view |   006aaa152 |
| 2 | anode | | | |

[1] The marking bar indicates the cathode.

## 3. Ordering information

**Table 3. Ordering information**

| Type number | Package | | |
|---|---|---|---|
| | Name | Description | Version |
| PESD9X5.0L | - | leadless ultra small plastic package; 2 terminals; body 1.0 × 0.6 × 0.5 mm | SOD882 |
| PESD9X7.0L | | | |

## 4. Marking

**Table 4. Marking codes**

| Type number | Marking code |
|---|---|
| PESD9X5.0L | AS |
| PESD9X7.0L | AT |

## 5. Limiting values

**Table 5. Limiting values**

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

| Symbol | Parameter | Conditions | | Min | Max | Unit |
|---|---|---|---|---|---|---|
| $P_{PP}$ | peak pulse power | $t_p$ = 8/20 μs | [1][2] | - | 150 | W |
| $I_{PP}$ | peak pulse current | $t_p$ = 8/20 μs | [1][2] | - | 10 | A |
| $T_j$ | junction temperature | | | - | 150 | °C |
| $T_{amb}$ | ambient temperature | | | −55 | +150 | °C |
| $T_{stg}$ | storage temperature | | | −65 | +150 | °C |

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

[2] Measured from pin 1 to pin 2.

**Table 6. ESD maximum ratings**

*$T_{amb}$ = 25 °C unless otherwise specified.*

| Symbol | Parameter | Conditions | | Min | Max | Unit |
|---|---|---|---|---|---|---|
| $V_{ESD}$ | electrostatic discharge voltage | IEC 61000-4-2 (contact discharge) | [1][2] | - | 30 | kV |
| | | machine model | | - | 400 | V |
| | | MIL-STD-883 (human body model) | | - | 10 | kV |

[1] Device stressed with ten non-repetitive ESD pulses.

[2] Measured from pin 1 to pin 2.

**Table 7. ESD standards compliance**

| Standard | Conditions |
|---|---|
| IEC 61000-4-2; level 4 (ESD) | > 15 kV (air); > 8 kV (contact) |
| MIL-STD-883; class 3 (human body model) | > 4 kV |

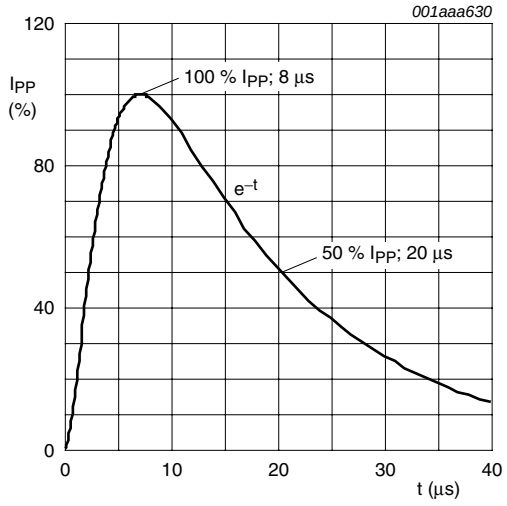



**Fig 1. 8/20 µs pulse waveform according to IEC 61000-4-5**

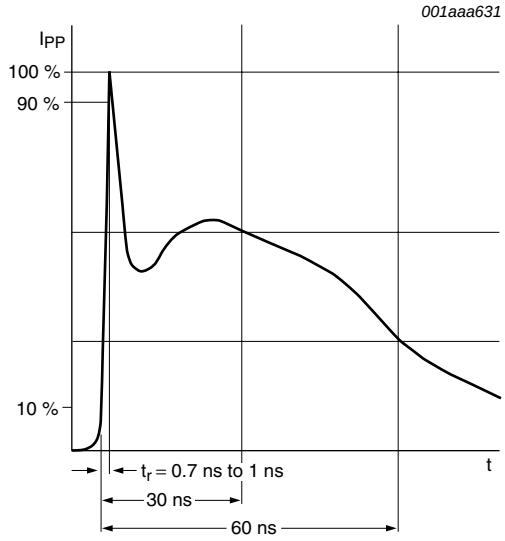



**Fig 2. ESD pulse waveform according to IEC 61000-4-2**

## 6. Characteristics

**Table 8. Characteristics**

*$T_{amb}$ = 25 °C unless otherwise specified.*

| Symbol | Parameter | Conditions | | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|---|
| $V_{RWM}$ | reverse standoff voltage | | | | | | |
| | PESD9X5.0L | | | - | - | 5.0 | V |
| | PESD9X7.0L | | | - | - | 7.0 | V |
| $I_{RM}$ | reverse leakage current | | | | | | |
| | PESD9X5.0L | $V_{RWM}$ = 5.0 V | | - | 3 | 100 | nA |
| | PESD9X7.0L | $V_{RWM}$ = 7.0 V | | - | 35 | 500 | nA |
| $V_{BR}$ | breakdown voltage | $I_R$ = 1 mA | | | | | |
| | PESD9X5.0L | | | 6.2 | - | - | V |
| | PESD9X7.0L | | | 7.5 | - | - | V |
| $C_d$ | diode capacitance | f = 1 MHz; $V_R$ = 0 V | | | | | |
| | PESD9X5.0L | | | - | 68 | 100 | pF |
| | PESD9X7.0L | | | - | 62 | 100 | pF |
| $V_{CL}$ | clamping voltage | | [1][2] | | | | |
| | PESD9X5.0L | $I_{PP}$ = 10 A | | - | - | 18 | V |
| | | $I_{PP}$ = 1 A | | - | - | 10 | V |
| | PESD9X7.0L | $I_{PP}$ = 10 A | | - | - | 18 | V |
| | | $I_{PP}$ = 1 A | | - | - | 11 | V |
| $r_{dyn}$ | dynamic resistance | $I_R$ = 10 A | [2][3] | - | 0.4 | - | Ω |

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

[2] Measured from pin 1 to pin 2.

[3] Non-repetitive current pulse; Transmission Line Pulse (TLP) $t_p$ = 100 ns; square pulse; ANSI/ESD STM5.1-2008.

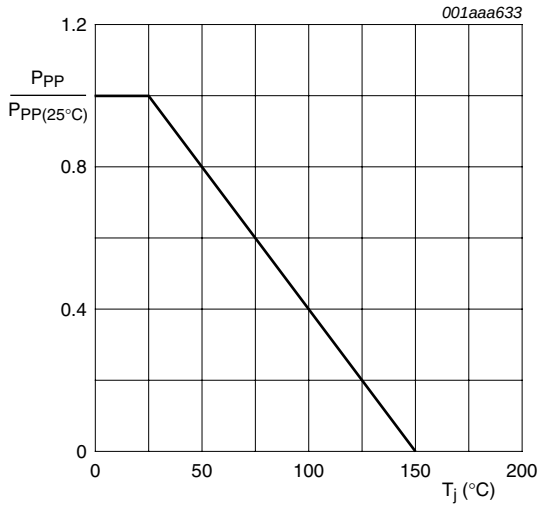
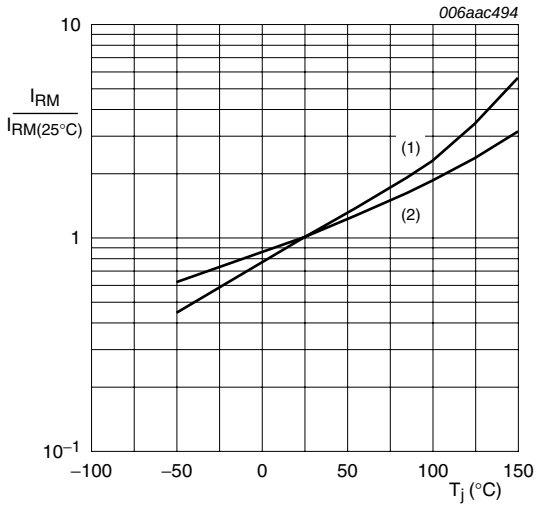


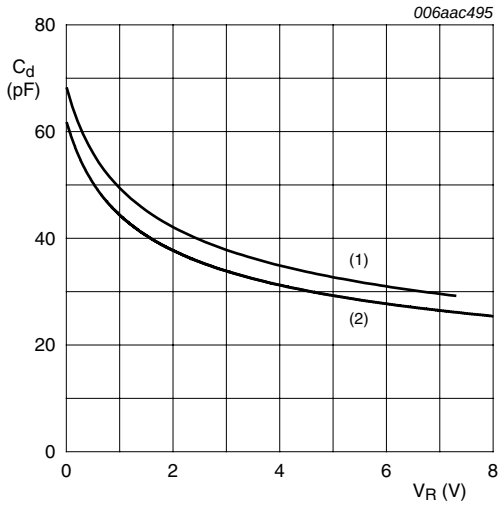

**Fig 3. Relative variation of peak pulse power as a function of junction temperature; typical values**




(1) PESD9X5.0L; $V_{RWM}$ = 5.0 V

(2) PESD9X7.0L; $V_{RWM}$ = 7.0 V

**Fig 4. Relative variation of reverse leakage current as a function of junction temperature; typical values**




f = 1 MHz; $T_{amb}$ = 25 °C

(1) PESD9X5.0L

(2) PESD9X7.0L

**Fig 5. Diode capacitance as a function of reverse voltage; typical values**

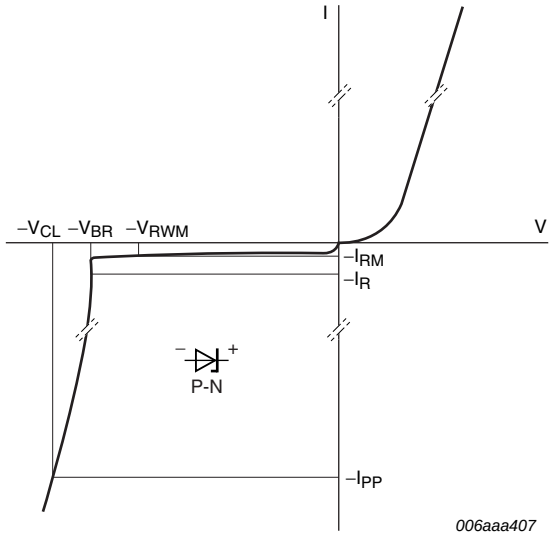



**Fig 6. V-I characteristics for a unidirectional ESD protection diode**

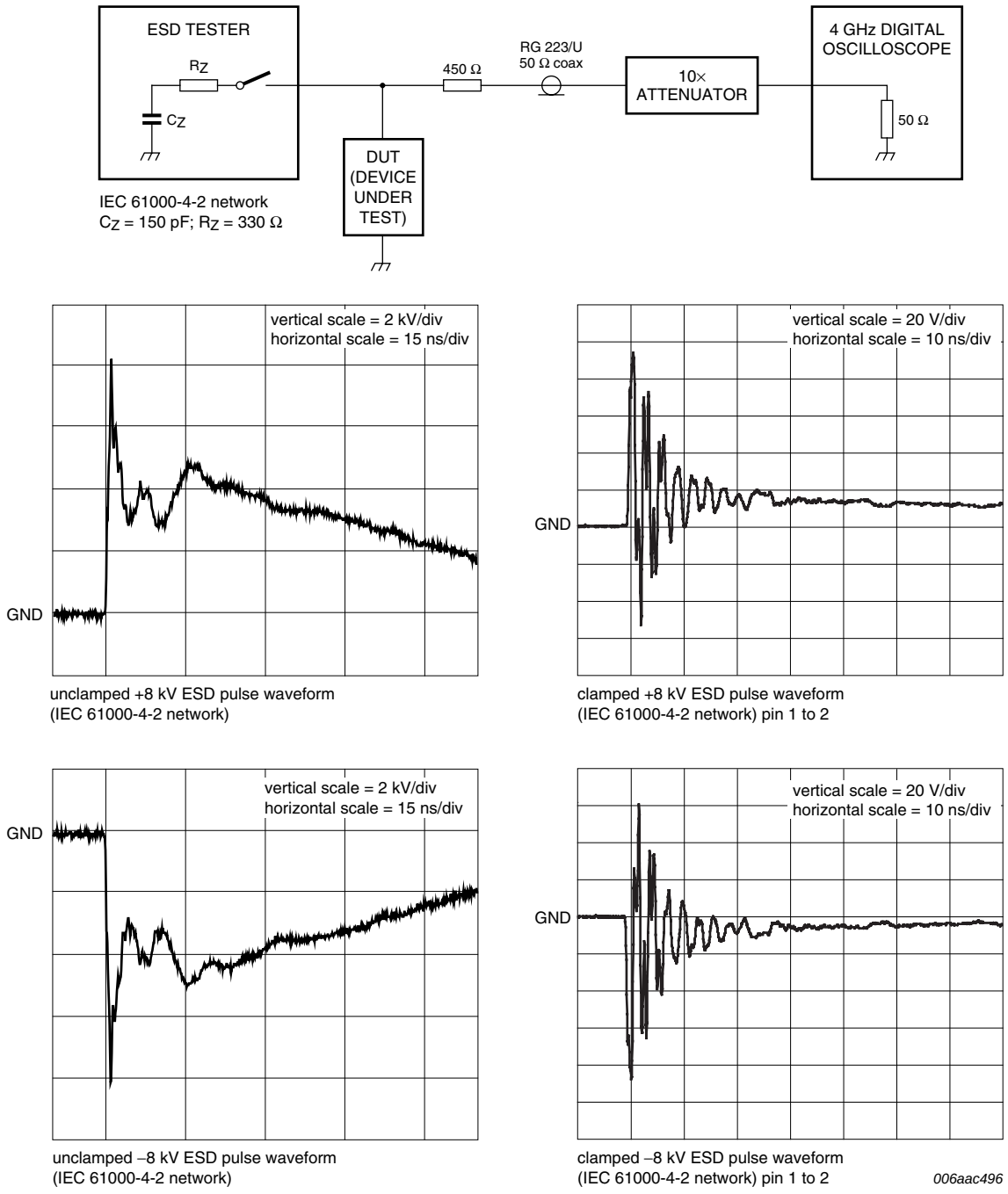



**Fig 7. PESD9X5.0L: ESD clamping test setup and waveforms**

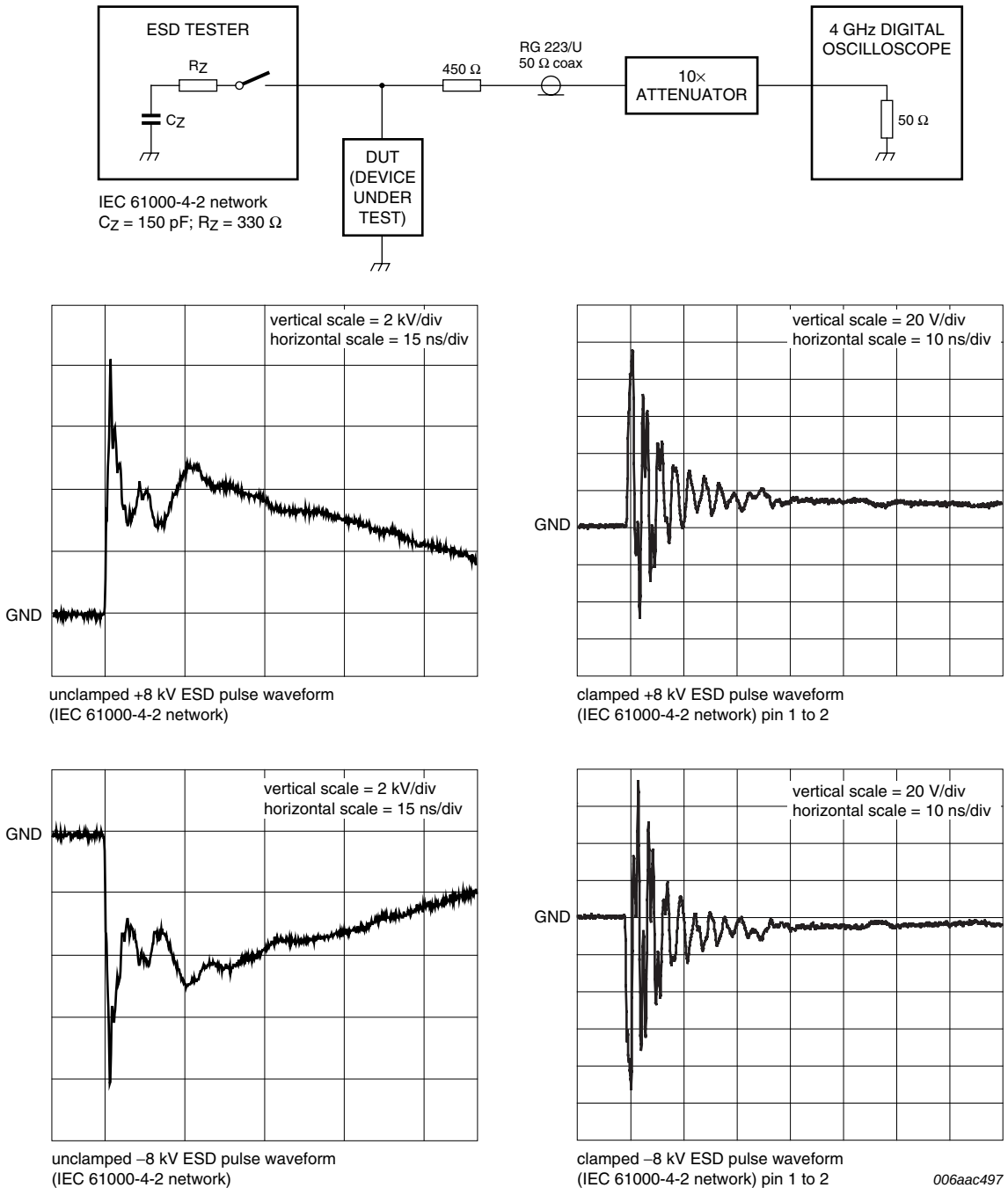



**Fig 8. PESD9X7.0L: ESD clamping test setup and waveforms**

# 7. Application information

The PESD9X5.0L and the PESD9X7.0L are designed for the protection of one unidirectional data or signal line from the damage caused by ESD and surge pulses. Both devices may be used on lines where the signal polarities are either positive or negative with respect to ground. The devices provide a surge capability of 150 W per line for an 8/20 μs waveform.

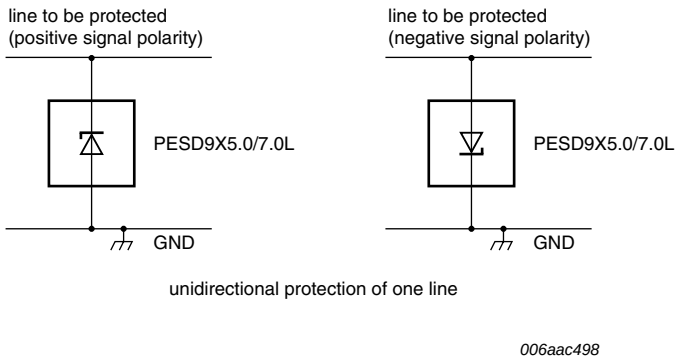



**Fig 9. Application diagram**

### 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

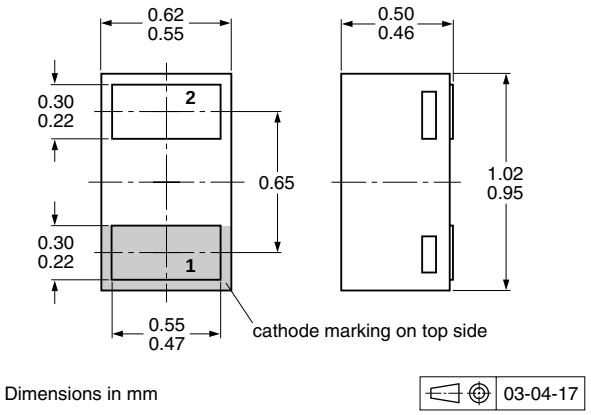



**Fig 10. Package outline SOD882**

## 10. Packing information

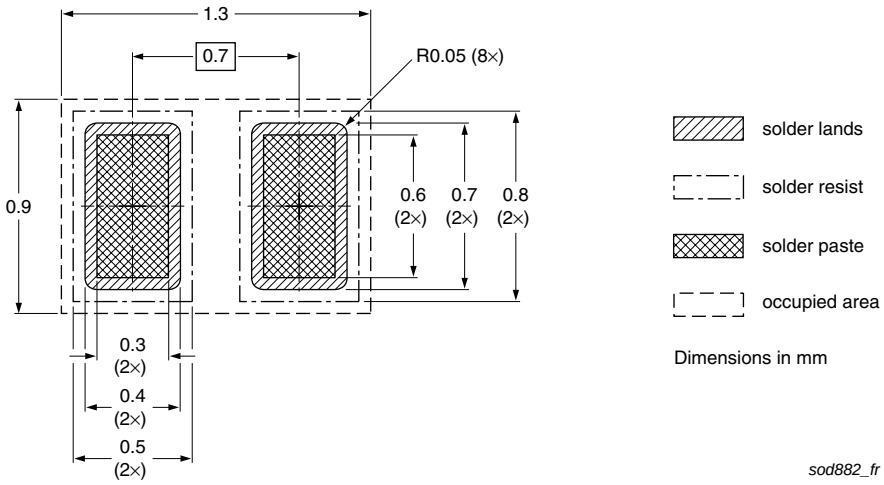
**Table 9. Packing methods**

*The indicated -xxx are the last three digits of the 12NC ordering code.*[1]

| Type number | Package | Description | Packing quantity |
|---|---|---|---|
| | | | 10000 |
| PESD9X5.0L | SOD882 | 2 mm pitch, 8 mm tape and reel | -315 |
| PESD9X7.0L | | | |

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

## 11. Soldering




Reflow soldering is the only recommended soldering method.

**Fig 11. Reflow soldering footprint SOD882**

## 12. Revision history

**Table 10. Revision history**

| Document ID | Release date | Data sheet status | Change notice | Supersedes |
|---|---|---|---|---|
| PESD9XXL_SER v.1 | 20101216 | Product data sheet | - | - |

# 13. Legal information

## 13.1 Data sheet status

| Document status[1][2] | Product status[3] | 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. |
| Product [short] data sheet | Production | This document contains the product specification. |

[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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