



# PESD12VS1UL

## Unidirectional ESD protection diode

15 January 2020

Product data sheet

## 1. General description

Unidirectional ElectroStatic Discharge (ESD) protection diode 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.

## 2. Features and benefits

- Ultra small SMD plastic package
- ESD protection of one line
- Max. peak pulse power:  $P_{PPM} = 150 \text{ W}$
- Low clamping voltage:  $V_{CL} = 35 \text{ V}$
- Ultra low leakage current:  $I_{RM} < 1 \text{ nA}$
- ESD protection up to 30 kV
- IEC 61000-4-2; level 4 (ESD)
- IEC 61000-4-5; (surge);  $I_{PPM} = 5 \text{ A}$
- AEC-Q101 qualified

## 3. Applications

- Computers and peripherals
- Audio and video equipment
- Parallel ports
- Communication systems
- High-speed data lines

## 4. Quick reference data

Table 1. Quick reference data

| Symbol    | Parameter                | Conditions                                                                    | Min | Typ | Max | Unit |
|-----------|--------------------------|-------------------------------------------------------------------------------|-----|-----|-----|------|
| $V_{RWM}$ | reverse standoff voltage | $T_{amb} = 25 \text{ }^{\circ}\text{C}$                                       | -   | -   | 12  | V    |
| $C_d$     | diode capacitance        | $f = 1 \text{ MHz}; V_R = 0 \text{ V}; T_{amb} = 25 \text{ }^{\circ}\text{C}$ | -   | 38  | 75  | pF   |

## 5. Pinning information

Table 2. Pinning information

| Pin | Symbol | Description | Simplified outline                                                                                                                             | Graphic symbol                                                                                    |
|-----|--------|-------------|------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------|
| 1   | K      | cathode[1]  |  <p>Transparent top view</p> <p><b>DFN1006-2 (SOD882)</b></p> |  <p>sym035</p> |
| 2   | A      | anode       |                                                                                                                                                |                                                                                                   |

[1] The marking bar indicates the cathode.

## 6. Ordering information

Table 3. Ordering information

| Type number | Package   |                                                                                                 |         |
|-------------|-----------|-------------------------------------------------------------------------------------------------|---------|
|             | Name      | Description                                                                                     | Version |
| PESD12VS1UL | DFN1006-2 | plastic, leadless ultra small package; 2 terminals; 0.65 mm pitch; 1 mm x 0.6 mm x 0.48 mm body | SOD882  |

## 7. Marking

Table 4. Marking codes

| Type number | Marking code |
|-------------|--------------|
| PESD12VS1UL | G3           |

## 8. Limiting values

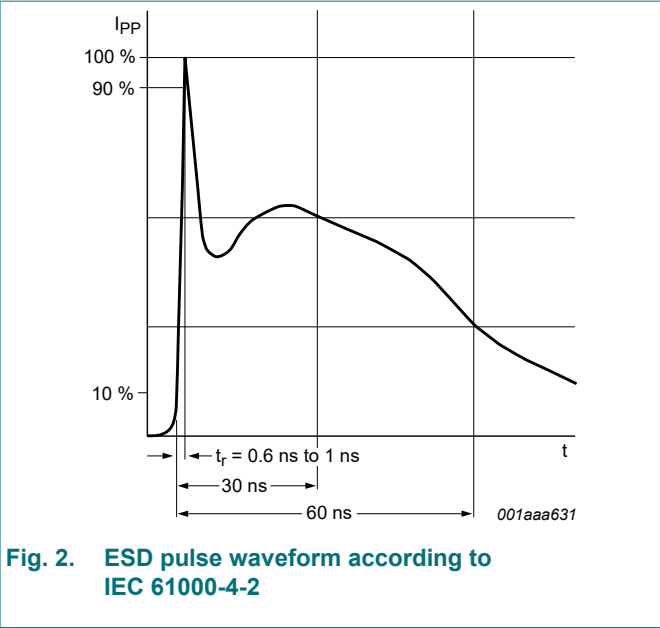
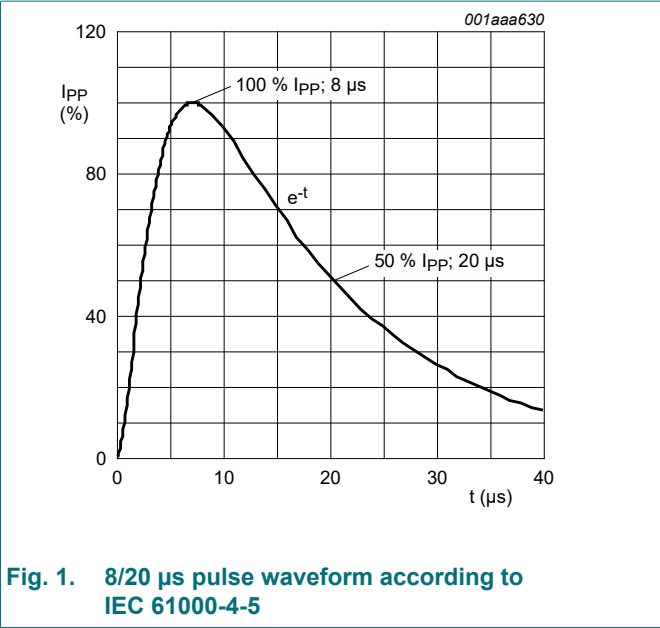
Table 5. Limiting values

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

| Symbol                     | Parameter                       | Conditions                        |     | Min | Max | Unit |
|----------------------------|---------------------------------|-----------------------------------|-----|-----|-----|------|
| $P_{PPM}$                  | rated peak pulse power          | $t_p = 8/20 \mu s$                | [1] | -   | 150 | W    |
| $I_{PPM}$                  | rated peak pulse current        |                                   | [1] | -   | 5   | A    |
| $T_j$                      | junction temperature            |                                   |     | -   | 150 | °C   |
| $T_{amb}$                  | ambient temperature             |                                   |     | -55 | 150 | °C   |
| $T_{stg}$                  | storage temperature             |                                   |     | -65 | 150 | °C   |
| <b>ESD maximum ratings</b> |                                 |                                   |     |     |     |      |
| $V_{ESD}$                  | electrostatic discharge voltage | IEC 61000-4-2 (contact discharge) | [2] | -   | 30  | kV   |
|                            |                                 | MIL-STD-883 (human body model)    | [2] | -   | 10  | kV   |

[1] Non-repetitive current pulse 8/20  $\mu s$  exponential decay waveform according to IEC61000-4-5.

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



9. Characteristics

Table 6. Characteristics

| Symbol    | Parameter                | Conditions                                                                       |     | Min  | Typ | Max  | Unit     |
|-----------|--------------------------|----------------------------------------------------------------------------------|-----|------|-----|------|----------|
| $V_{RWM}$ | reverse standoff voltage | $T_{amb} = 25\text{ }^{\circ}\text{C}$                                           |     | -    | -   | 12   | V        |
| $V_{BR}$  | breakdown voltage        | $I_R = 5\text{ mA}$ ; $T_{amb} = 25\text{ }^{\circ}\text{C}$                     | [1] | 14.7 | 15  | 15.3 | V        |
| $I_{RM}$  | reverse leakage current  | $V_{RWM} = 12\text{ V}$ ; $T_{amb} = 25\text{ }^{\circ}\text{C}$                 |     | -    | 1   | 50   | nA       |
| $C_d$     | diode capacitance        | $f = 1\text{ MHz}$ ; $V_R = 0\text{ V}$ ; $T_{amb} = 25\text{ }^{\circ}\text{C}$ |     | -    | 38  | 75   | pF       |
| $V_{CL}$  | clamping voltage         | $I_{PP} = 1\text{ A}$ ; $T_{amb} = 25\text{ }^{\circ}\text{C}$                   | [2] | -    | -   | 19   | V        |
|           |                          | $I_{PPM} = 5\text{ A}$ ; $T_{amb} = 25\text{ }^{\circ}\text{C}$                  | [2] | -    | -   | 35   | V        |
| $r_{dif}$ | differential resistance  | $I_R = 1\text{ mA}$ ; $T_{amb} = 25\text{ }^{\circ}\text{C}$                     |     | -    | -   | 200  | $\Omega$ |

[1] Pulse test:  $t_p \leq 300\text{ }\mu\text{s}$ ; duty cycle  $\leq 0.02$ .  
[2] Non-repetitive current pulse 8/20  $\mu$ s exponential decay waveform according to IEC 61000-4-5.

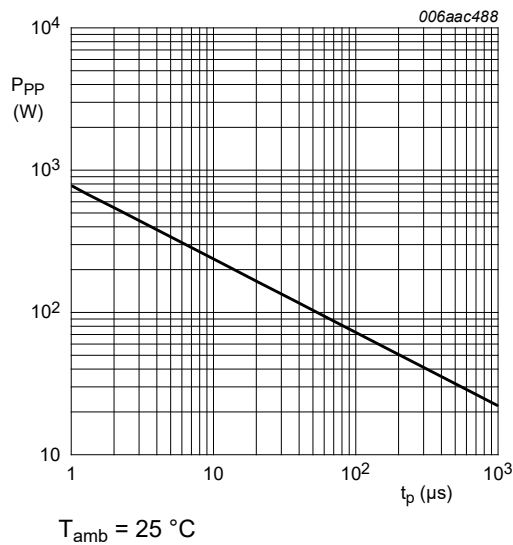


Fig. 3. Peak pulse power as a function of exponential pulse duration; typical values

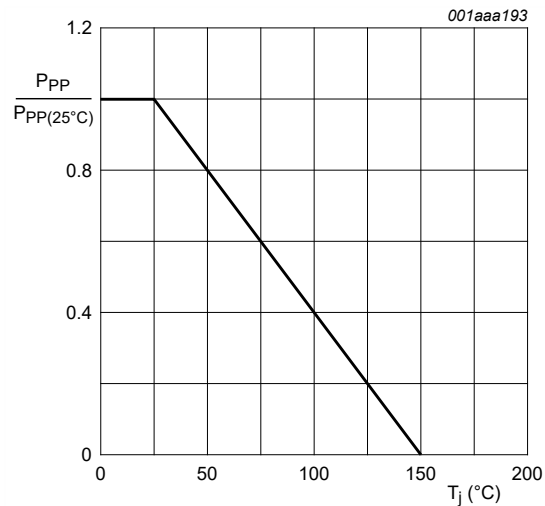


Fig. 4. Relative variation of peak pulse power as a function of junction temperature; typical values

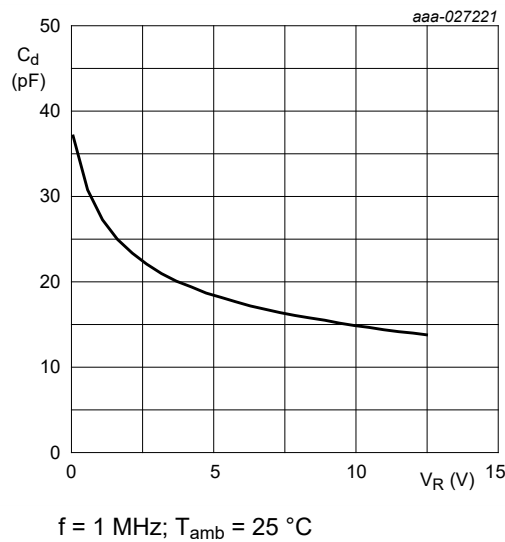


Fig. 5. Diode capacitance as a function of reverse voltage; typical values

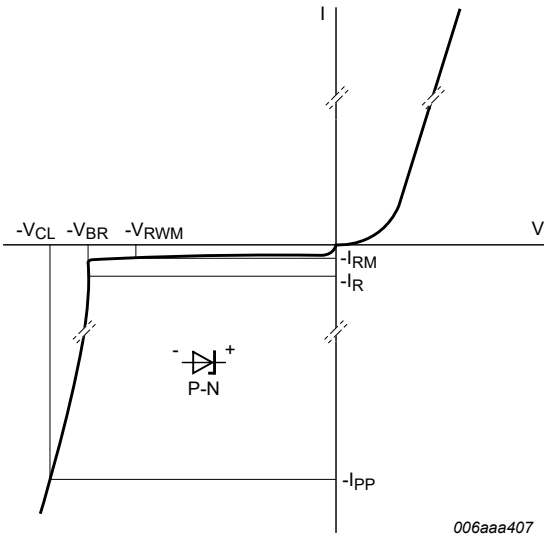
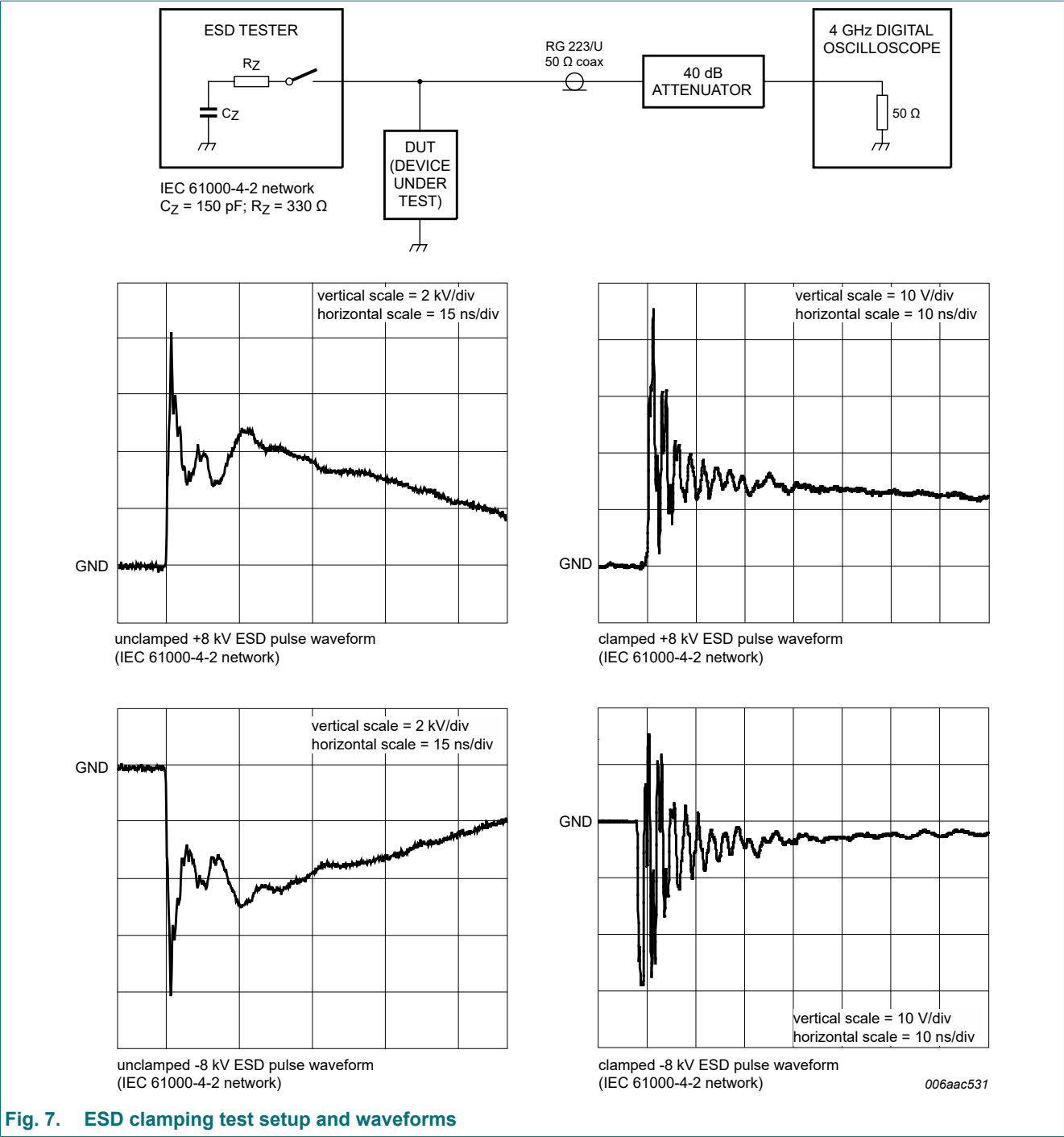
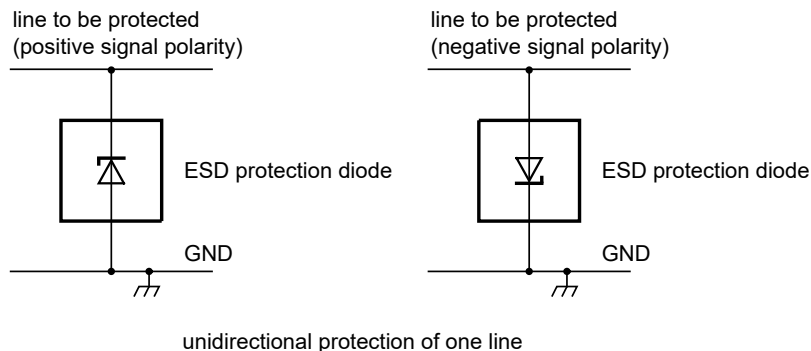


Fig. 6. V-I characteristics for a unidirectional ESD protection diode



## 10. Application information

The device is designed for the protection of one unidirectional data line from surge pulses and ESD damage. The device is suitable on lines where the signal polarities are either positive or negative with respect to ground. The device provides a surge capability of 150 W for an 8/20  $\mu$ s waveform.



**Fig. 8. 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. Minimize the path length between the device and the protected line.
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. Use ground planes whenever possible. For multilayer PCBs, use ground vias.

## 11. Test information

### 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.

12. Package outline

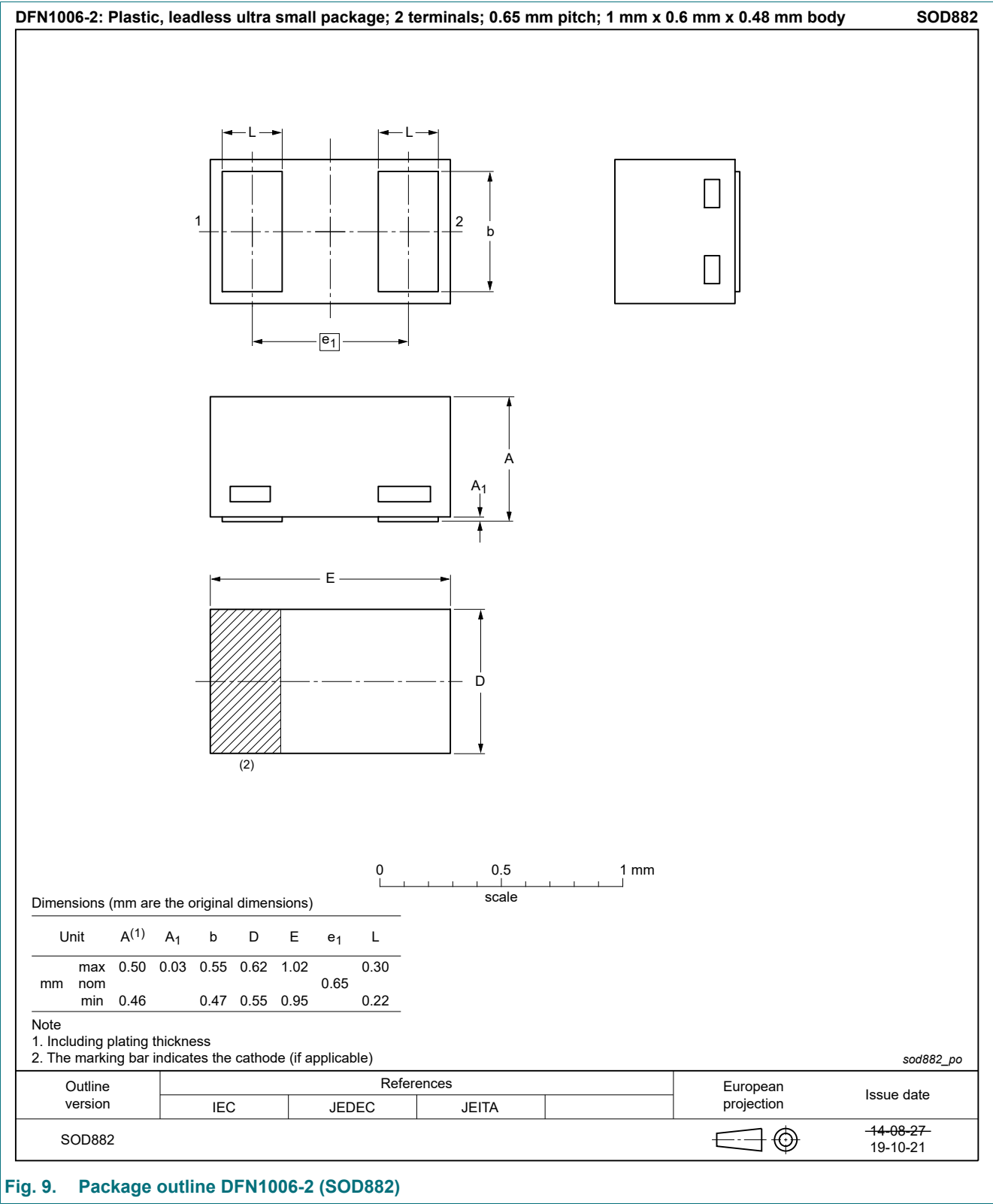
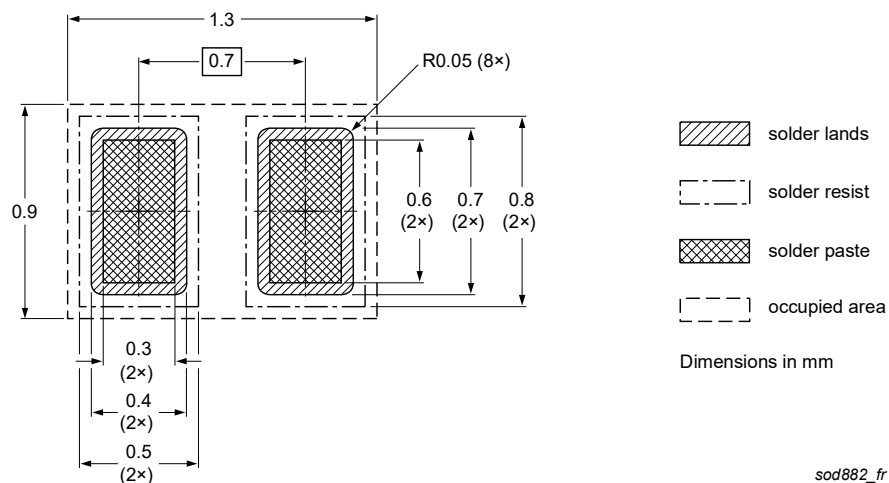


Fig. 9. Package outline DFN1006-2 (SOD882)

## 13. Soldering



**Fig. 10. Reflow soldering footprint for DFN1006-2 (SOD882)**

## 14. Revision history

**Table 7. Revision history**

| Data sheet ID     | Release date                                                                                                                                                                                                                                                                                                                                                                                                                                      | Data sheet status  | Change notice | Supersedes        |
|-------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------|---------------|-------------------|
| PESD12VS1UL v.4   | 20200115                                                                                                                                                                                                                                                                                                                                                                                                                                          | Product data sheet | -             | PESDXS1UL_SER v.3 |
| Modifications:    | <ul style="list-style-type: none"><li>• The format of this data sheet has been redesigned to comply with the identity guidelines of Nexperia.</li><li>• Legal texts have been adapted to the new company name where appropriate.</li><li>• Table Limiting values: updated <math>T_{amb}</math> to -55 °C minimum values</li><li>• Soldering section: updated.</li><li>• Application information: updated.</li><li>• Figure 10: updated.</li></ul> |                    |               |                   |
| PESDXS1UL_SER v.3 | 20111025                                                                                                                                                                                                                                                                                                                                                                                                                                          | Product data sheet | -             | PESDXS1UL_SER v.2 |
| PESDXS1UL_SER v.2 | 20090820                                                                                                                                                                                                                                                                                                                                                                                                                                          | Product data sheet | -             | PESDXS1UL_SER v.1 |
| PESDXS1UL_SER v.1 | 20060331                                                                                                                                                                                                                                                                                                                                                                                                                                          | Product data sheet | -             | -                 |

## 15. Legal information

### Data sheet status

| Document status<br>[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.
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