



PESD12VS1UJ

Unidirectional ESD protection for transient voltage suppression

14 April 2023

Product data sheet

1. General description

Unidirectional ElectroStatic Discharge (ESD) protection diode in a very small Surface-Mounted Device (SMD) plastic package designed to protect one signal line from the damage caused by ESD and transient overvoltage.

2. Features and benefits

- Transient Voltage Suppression (TVS) protection of one line
- Max. peak pulse power: $P_{PP} = 600 \text{ W}$
- Low clamping voltage: $V_{CL} = 19 \text{ V}$
- 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); $I_{PP} = 22.5 \text{ A}$

3. Applications

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


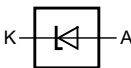
4. Quick reference data

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 | $f = 1 \text{ MHz}; V_R = 0 \text{ V}; T_{amb} = 25 \text{ }^{\circ}\text{C}$ | - | 160 | 180 | pF |

5. Pinning information

Table 2. Pinning information

| Pin | Symbol | Description | Simplified outline | Graphic symbol |
|-----|--------|------------------------|--|--|
| 1 | K | cathode ^[1] |  SC-90 (SOD323F) |  006aaa152 |
| 2 | A | anode | | |

[1] The marking bar indicates the cathode.

6. Ordering information

Table 3. Ordering information

| Type number | Package | | |
|-------------|---------|---|---------|
| | Name | Description | Version |
| PESD12VS1UJ | SC-90 | plastic, surface-mounted package; 2 leads; 1.7 mm x 1.25 mm x 0.7 mm body | SOD323F |

7. Marking

Table 4. Marking codes

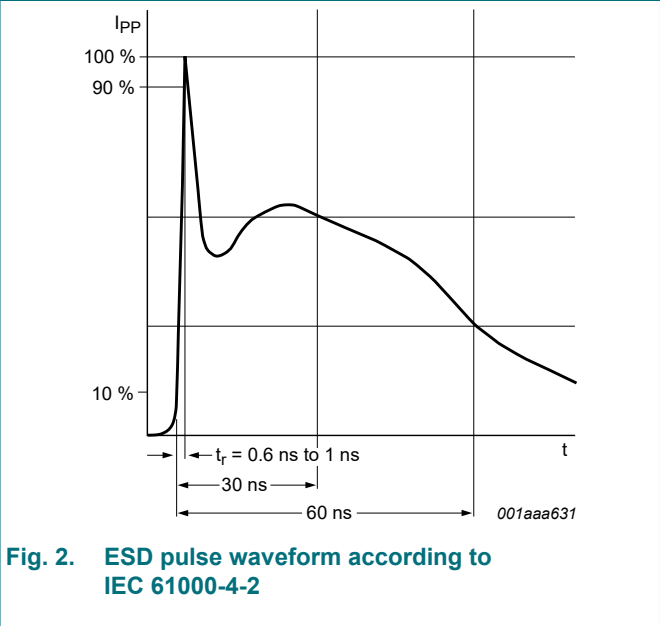
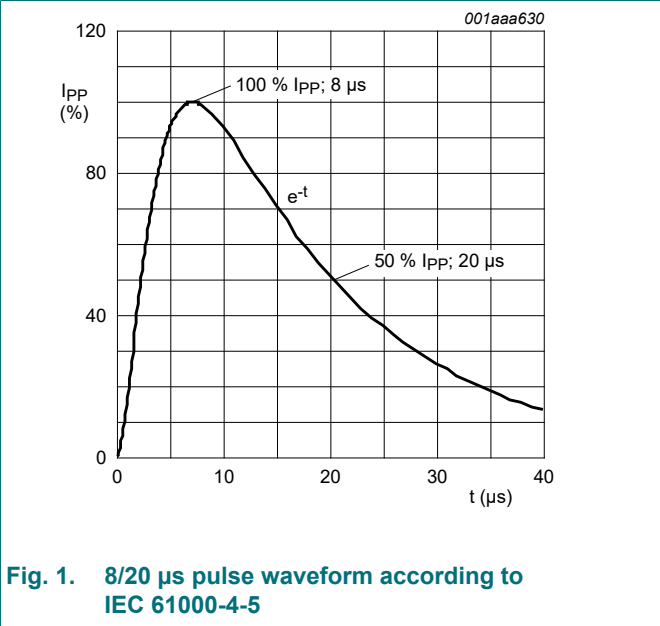
| Type number | Marking code |
|-------------|--------------|
| PESD12VS1UJ | 1R |

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 μs | [1] [2] | - | 600 | W |
| I _{PPM} | rated peak pulse current | | [1] [2] | - | 22.5 | A |
| P _{tot} | total power dissipation | T _{amb} ≤ 25 °C | [3] | - | 420 | mW |
| | | | [4] | - | 720 | mW |
| T _j | junction temperature | | | - | 150 | °C |
| T _{amb} | ambient temperature | | | -55 | 150 | °C |
| T _{stg} | storage temperature | | | -65 | 150 | °C |
| ESD maximum ratings | | | | | | |
| V _{ESD} | electrostatic discharge voltage | IEC 61000-4-2 (contact discharge); T _{amb} = 25 °C | [5] | - | 30 | kV |
| | | IEC 61000-4-2 (air discharge); T _{amb} = 25 °C | | - | 15 | kV |
| | | machine model; T _{amb} = 25 °C | | - | 400 | V |
| | | MIL-STD-883 (human body model); T _{amb} = 25 °C | | - | 16 | kV |

- [1] Non-repetitive current pulse 8/20μs exponential decay waveform according to IEC 61000-4-5.
- [2] Soldering point of cathode tab
- [3] Device mounted on an FR4 Printed-Circuit Board (PCB), single-sided copper, tin-plated and standard footprint.
- [4] Device mounted on an FR4 PCB, single-sided copper, tin-plated, mounting pad for cathode 1 cm²
- [5] Device stressed with ten non-repetitive ESD pulses.



9. Thermal characteristics

Table 6. Thermal characteristics

| Symbol | Parameter | Conditions | | Min | Typ | Max | Unit |
|----------------|--|-------------|-----|-----|-----|-----|------|
| $R_{th(j-a)}$ | thermal resistance from junction to ambient | in free air | [1] | - | - | 290 | K/W |
| | | | [2] | - | - | 170 | K/W |
| $R_{th(j-sp)}$ | thermal resistance from junction to solder point | | [3] | - | - | 35 | K/W |

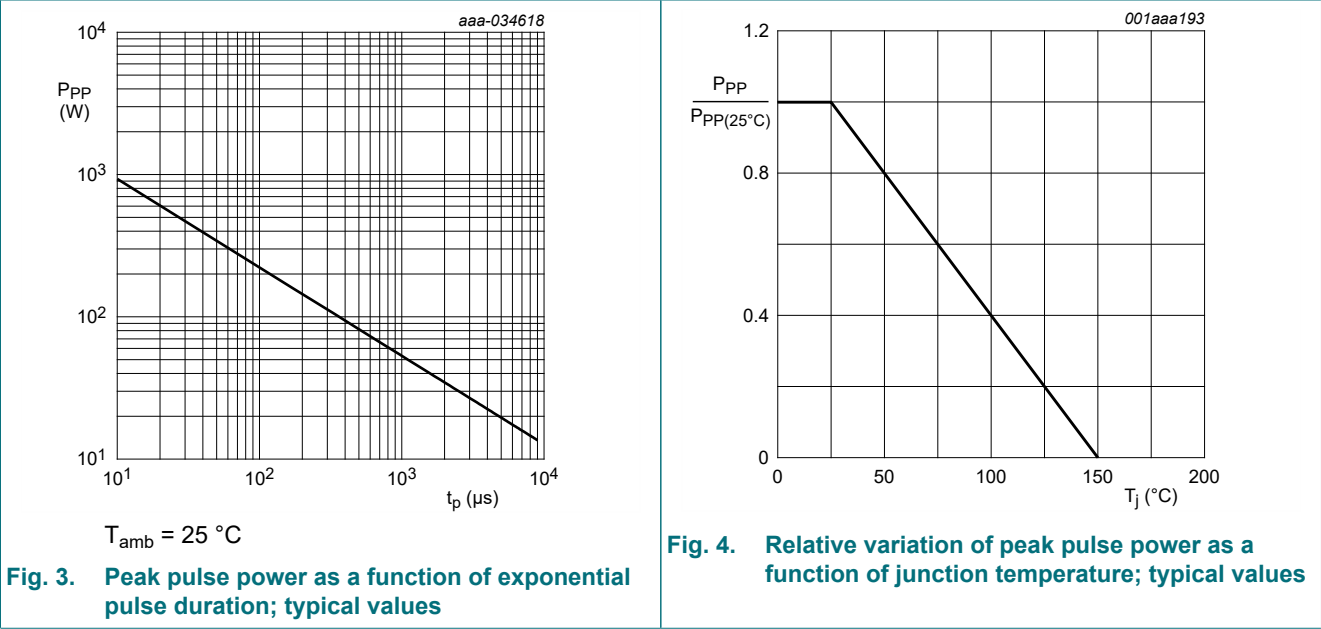
- [1] Device mounted on an FR4 PCB, single-sided copper, tin-plated and standard footprint.
[2] Device mounted on an FR4 PCB, single-sided copper, tin-plated, mounting pad for cathode 1 cm².
[3] Soldering point of cathode tab.

10. Characteristics

Table 7. Characteristics

| Symbol | Parameter | Conditions | | Min | Typ | Max | Unit |
|-------------------|--------------------------|---|-----|------|------|-------|------|
| V _{RWM} | reverse standoff voltage | T _{amb} = 25 °C | | - | - | 12 | V |
| V _{BR} | breakdown voltage | I _R = 5 mA; T _{amb} = 25 °C | | 13.3 | 14.5 | 15.75 | V |
| I _{RM} | reverse leakage current | V _{RWM} = 5 V; T _{amb} = 25 °C | | - | 1 | 100 | nA |
| C _d | diode capacitance | f = 1 MHz; V _R = 0 V; T _{amb} = 25 °C | | - | 160 | 180 | pF |
| V _{CL} | clamping voltage | I _{PP} = 22.5 A; T _{amb} = 25 °C | [1] | - | - | 27 | V |
| | | I _{PP} = 15 A; T _{amb} = 25 °C | [1] | - | - | 23.5 | V |
| | | I _{PP} = 5 A; T _{amb} = 25 °C | [1] | - | - | 19 | V |
| R _{diff} | differential resistance | I _R = 5 mA; T _{amb} = 25 °C | | - | 5 | 100 | Ω |

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



Unidirectional ESD protection for transient voltage suppression

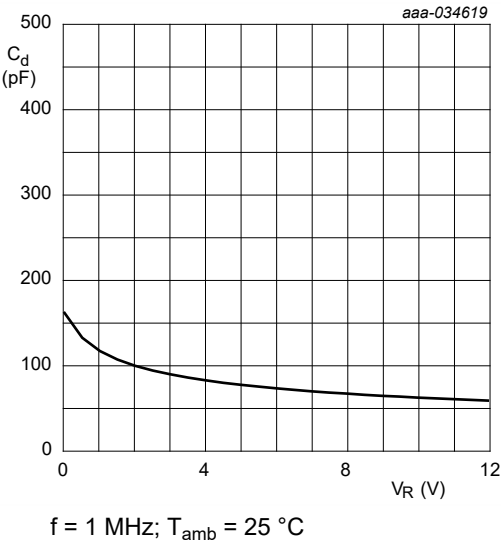


Fig. 5. Diode capacitance as a function of reverse voltage; typical values

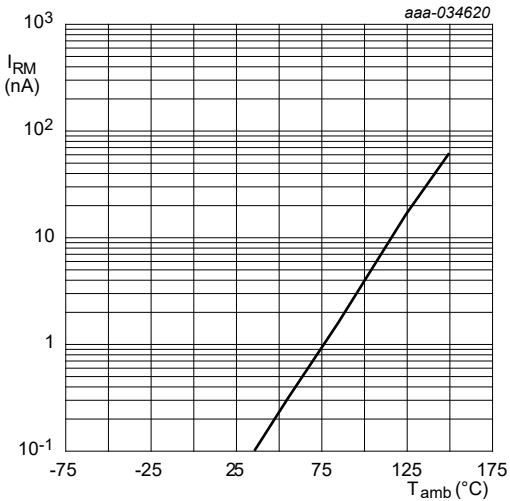


Fig. 6. Reverse leakage current as a function of ambient temperature; typical values

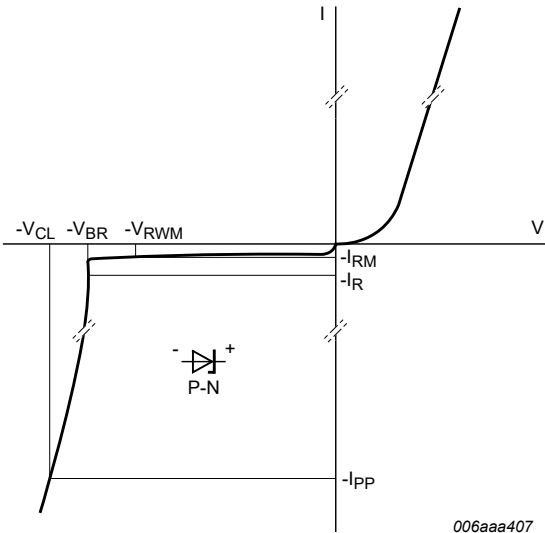
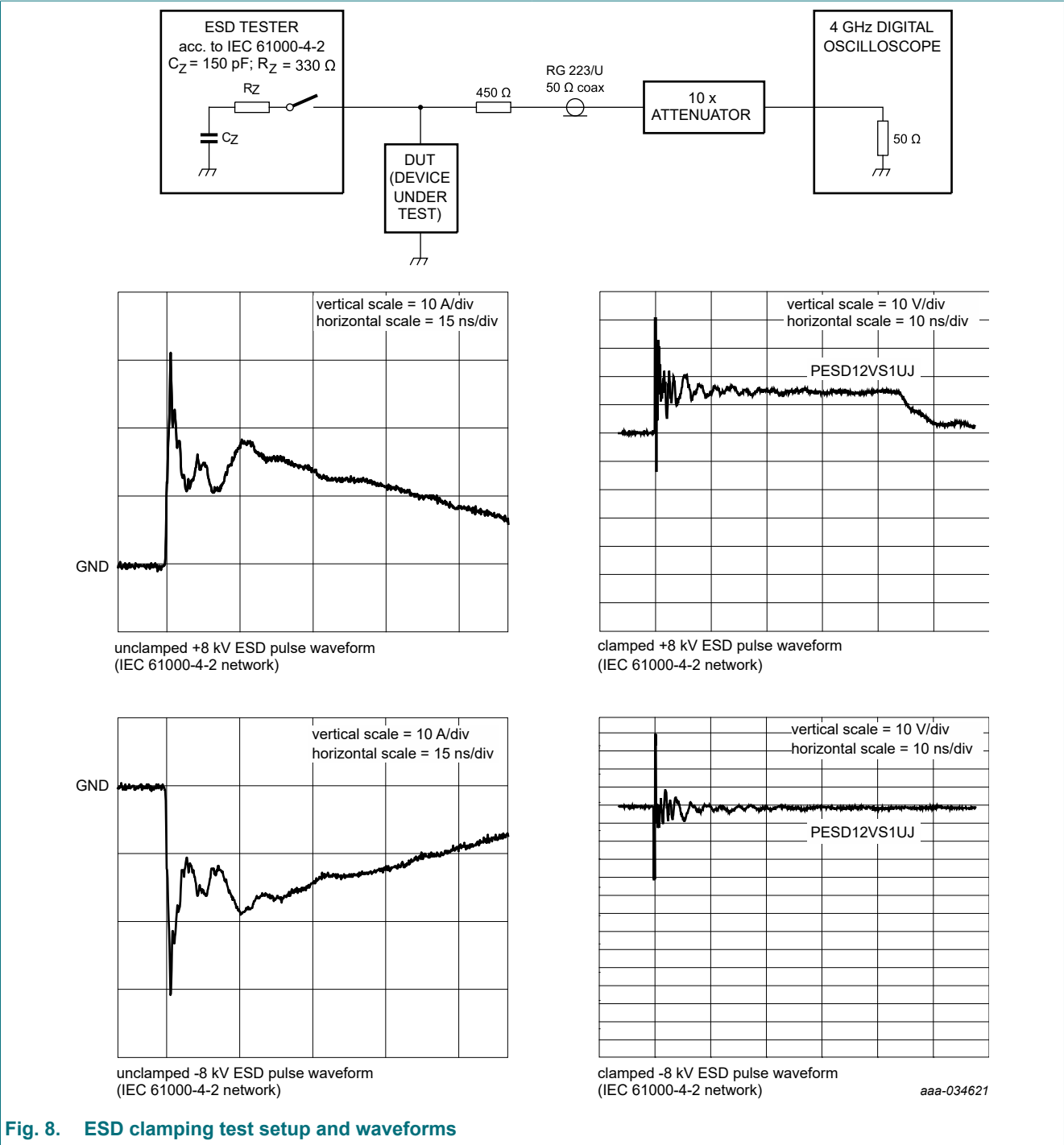


Fig. 7. V-I characteristics for a unidirectional ESD protection diode



11. Application information

The device is designed for protection of one unidirectional data or signal 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.

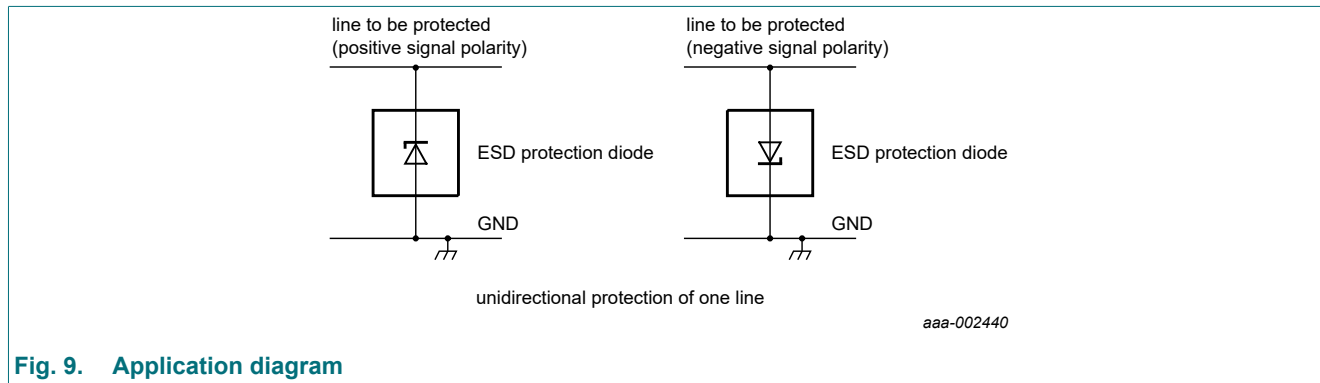


Fig. 9. Application diagram

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. 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.

12. Package outline

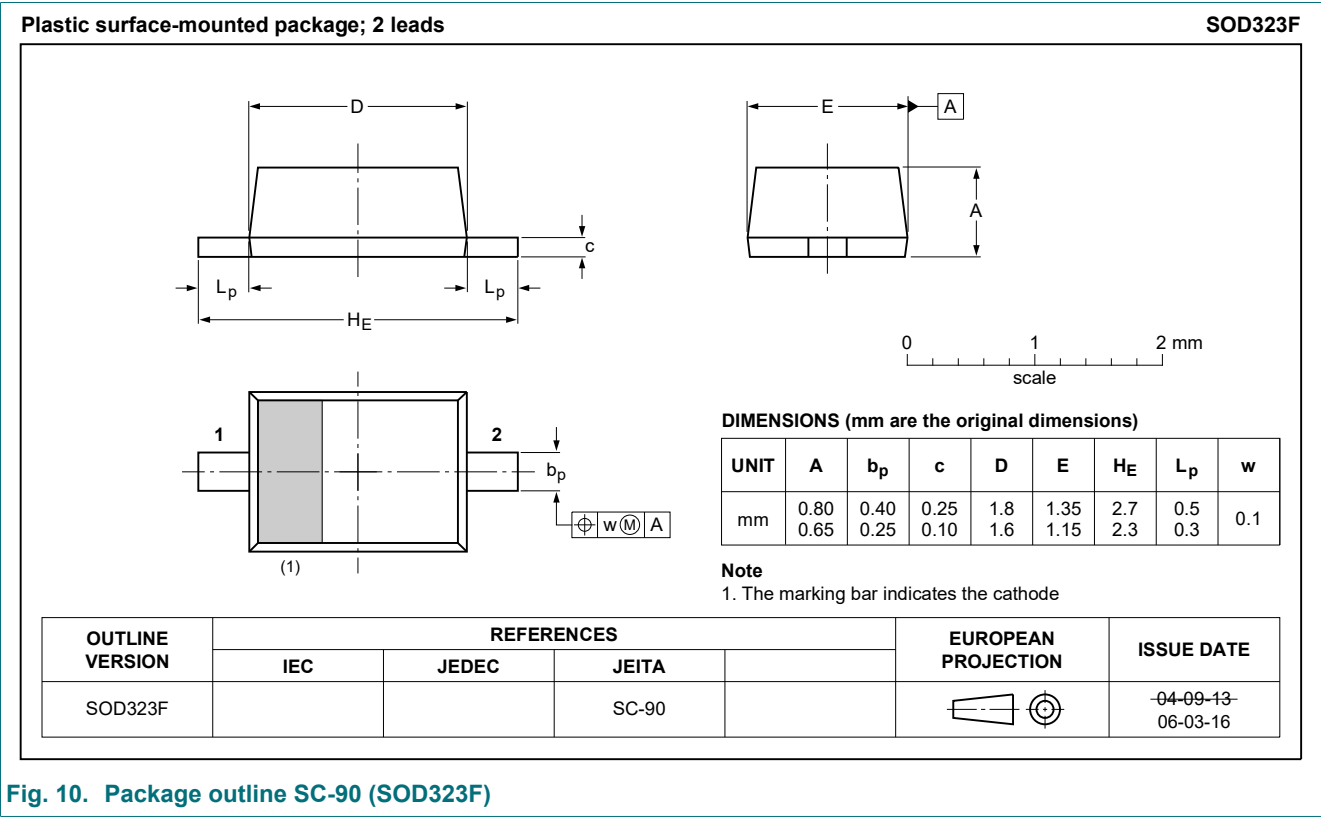
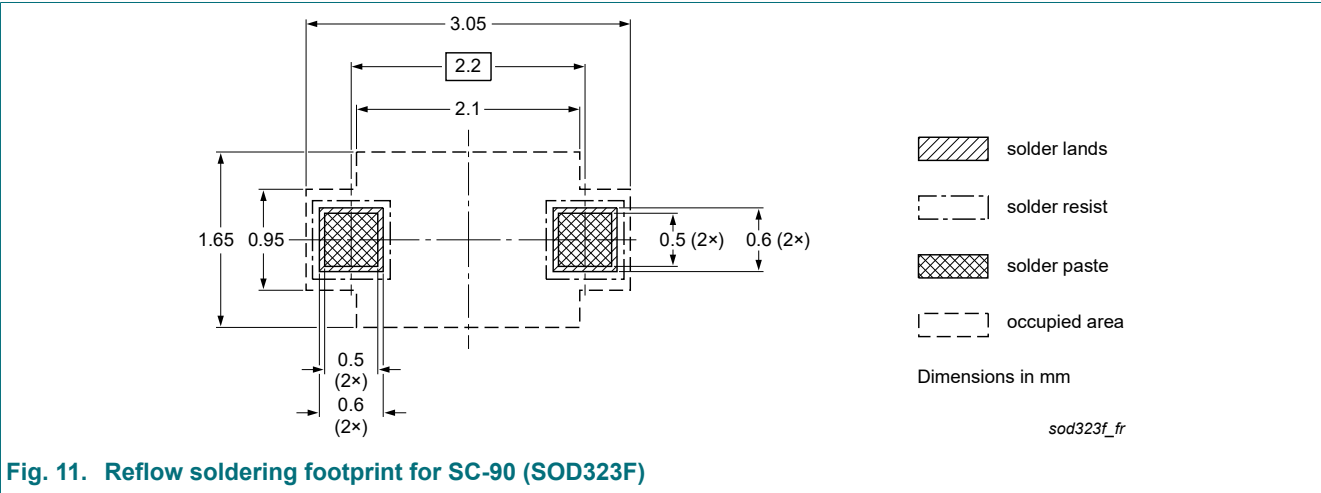


Fig. 10. Package outline SC-90 (SOD323F)

13. Soldering



14. Revision history

Table 8. Revision history

| Data sheet ID | Release date | Data sheet status | Change notice | Supersedes |
|-------------------------------|--|--------------------|---------------|-------------------------------|
| PESD12VS1UJ v.2 | 20230414 | Product data sheet | - | PESD5V0S1UJ_ PESD12VS1UJ_1 |
| Modifications: | <ul style="list-style-type: none">The format of this data sheet has been redesigned to comply with the identity guidelines of NexperiaFamily data sheet reduced to single type data sheetProduct changed to non-automotive qualification. Please refer to nexperia.com for automotive (-Q) product alternative(s). | | | |
| PESD5V0S1UJ_ PESD12VS1UJ_1 | 20090603 | Product data sheet | - | - |

15. Legal information

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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