



PESD5V0S1UJ; PESD12VS1UJ

Unidirectional ESD protection for transient voltage suppression

Rev. 01 — 3 June 2009

Product data sheet

1. Product profile

1.1 General description

Unidirectional ElectroStatic Discharge (ESD) protection diodes 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.

Table 1. Product overview

| Type number | Package | | Configuration |
|-------------|----------|-------|---------------|
| | Nexperia | JEITA | |
| PESD5V0S1UJ | SOD323F | SC-90 | single |
| PESD12VS1UJ | | | |

1.2 Features

- Transient Voltage Suppression (TVS) protection of one line
- ESD protection up to 30 kV
- Max. peak pulse power: $P_{PP} = 890$ W
- IEC 61000-4-2; level 4 (ESD)
- Low clamping voltage: $V_{CL} = 19$ V
- IEC 61000-4-5 (surge); $I_{PP} = 47$ A
- Low leakage current: $I_{RM} = 300$ nA
- AEC-Q101 qualified

1.3 Applications

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

1.4 Quick reference data

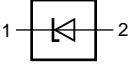

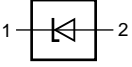
Table 2. Quick reference data

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

| Symbol | Parameter | Conditions | Min | Typ | Max | Unit |
|-----------|--------------------------|--------------------------|-----|-----|-----|------|
| V_{RWM} | reverse standoff voltage | | | | | |
| | PESD5V0S1UJ | | - | - | 5 | V |
| | PESD12VS1UJ | | - | - | 12 | V |
| C_d | diode capacitance | $f = 1$ MHz; $V_R = 0$ V | | | | |
| | PESD5V0S1UJ | | - | 480 | 530 | pF |
| | PESD12VS1UJ | | - | 160 | 180 | pF |

2. Pinning information

Table 3. Pinning

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

[1] The marking bar indicates the cathode.

3. Ordering information

Table 4. Ordering information

| Type number | Package | | |
|-------------|---------|--|---------|
| | Name | Description | Version |
| PESD5V0S1UJ | SC-90 | plastic surface-mounted package; 2 leads | SOD323F |
| PESD12VS1UJ | | | |

4. Marking

Table 5. Marking codes

| Type number | Marking code |
|-------------|--------------|
| PESD5V0S1UJ | 1Q |
| PESD12VS1UJ | 1R |

5. Limiting values

Table 6. Limiting values

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

| Symbol | Parameter | Conditions | Min | Max | Unit |
|----------|--------------------|--------------------|--------|------|------|
| P_{PP} | peak pulse power | $t_p = 8/20 \mu s$ | [1][2] | | |
| | PESD5V0S1UJ | | - | 890 | W |
| | PESD12VS1UJ | | - | 600 | W |
| I_{PP} | peak pulse current | $t_p = 8/20 \mu s$ | [1][2] | | |
| | PESD5V0S1UJ | | - | 47 | A |
| | PESD12VS1UJ | | - | 22.5 | A |

Table 6. Limiting values ...continued*In accordance with the Absolute Maximum Rating System (IEC 60134).*

| Symbol | Parameter | Conditions | Min | Max | Unit |
|------------------|-------------------------|--------------------------|-------|------|------|
| 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 |

[1] Non-repetitive current pulse 8/20 μs 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.

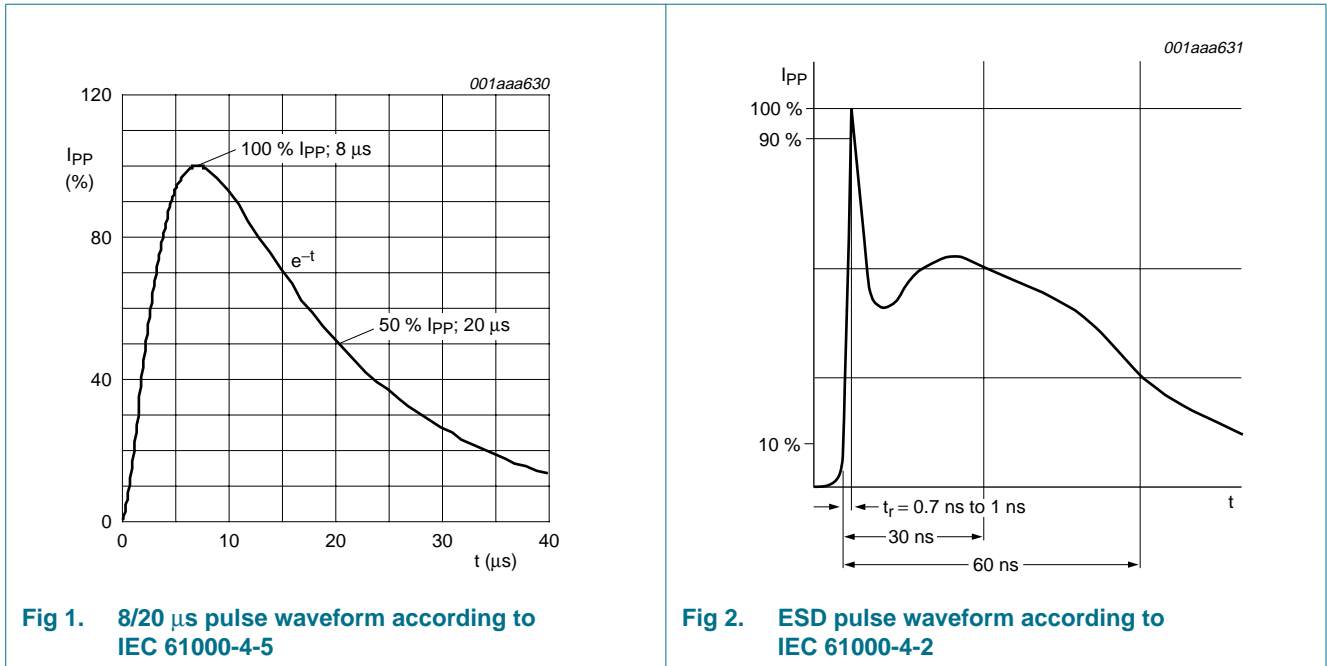
[4] Device mounted on an FR4 PCB, single-sided copper, tin-plated, mounting pad for cathode 1 cm².**Table 7. ESD maximum ratings***T_{amb} = 25 °C unless otherwise specified.*

| Symbol | Parameter | Conditions | Min | Max | Unit |
|------------------|---------------------------------|--------------------------------------|-------|-----|------|
| V _{ESD} | electrostatic discharge voltage | IEC 61000-4-2 (contact discharge) | [1] - | 30 | kV |
| | | machine model | - | 400 | V |
| | | MIL-STD-883 (human body model) | - | 16 | kV |

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

Table 8. 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 |



6. Thermal characteristics

Table 9. 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.

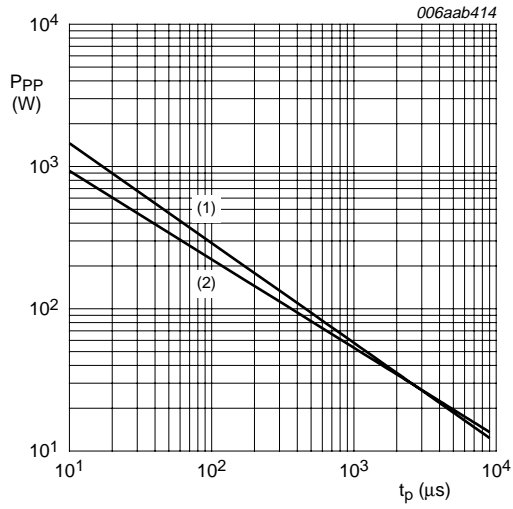
7. Characteristics

Table 10. Characteristics

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

| Symbol | Parameter | Conditions | Min | Typ | Max | Unit |
|-----------------------|--------------------------|---|------|------|-------|---------------|
| V_{RWM} | reverse standoff voltage | | | | | |
| | PESD5V0S1UJ | | - | - | 5 | V |
| | PESD12VS1UJ | | - | - | 12 | V |
| I_{RM} | reverse leakage current | | | | | |
| | PESD5V0S1UJ | $V_{RWM} = 5\text{ V}$ | - | 0.3 | 4 | μA |
| | PESD12VS1UJ | $V_{RWM} = 12\text{ V}$ | - | < 1 | 100 | nA |
| V_{BR} | breakdown voltage | $I_R = 5\text{ mA}$ | | | | |
| | PESD5V0S1UJ | | 6.2 | 6.8 | 7.3 | V |
| | PESD12VS1UJ | | 13.3 | 14.5 | 15.75 | V |
| C_d | diode capacitance | $f = 1\text{ MHz};$ $V_R = 0\text{ V}$ | | | | |
| | PESD5V0S1UJ | | - | 480 | 530 | pF |
| | PESD12VS1UJ | | - | 160 | 180 | pF |
| V_{CL} | clamping voltage | | [1] | | | |
| | PESD5V0S1UJ | $I_{PP} = 47\text{ A}$ | - | - | 19 | V |
| | | $I_{PP} = 25\text{ A}$ | - | - | 13.5 | V |
| | | $I_{PP} = 5\text{ A}$ | - | - | 9.8 | V |
| | PESD12VS1UJ | $I_{PP} = 22.5\text{ A}$ | - | - | 27 | V |
| | | $I_{PP} = 15\text{ A}$ | - | - | 23.5 | V |
| $I_{PP} = 5\text{ A}$ | | - | - | 19 | V | |
| r_{dif} | differential resistance | $I_R = 5\text{ mA}$ | | | | |
| | PESD5V0S1UJ | | - | 2 | 100 | Ω |
| | PESD12VS1UJ | | - | 5 | 100 | Ω |

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



$T_{amb} = 25\text{ }^{\circ}\text{C}$
 (1) PESD5V0S1UJ
 (2) PESD12VS1UJ

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

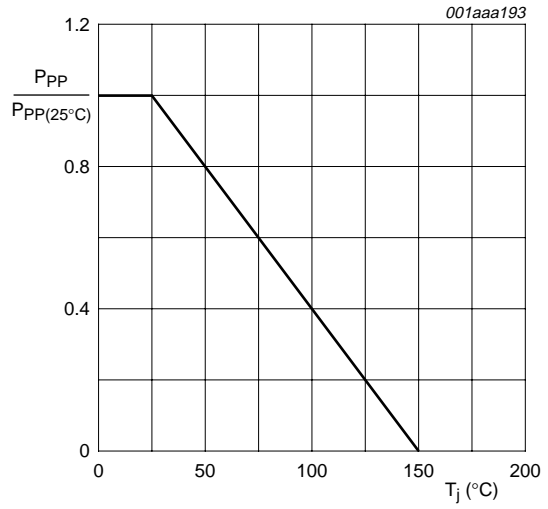
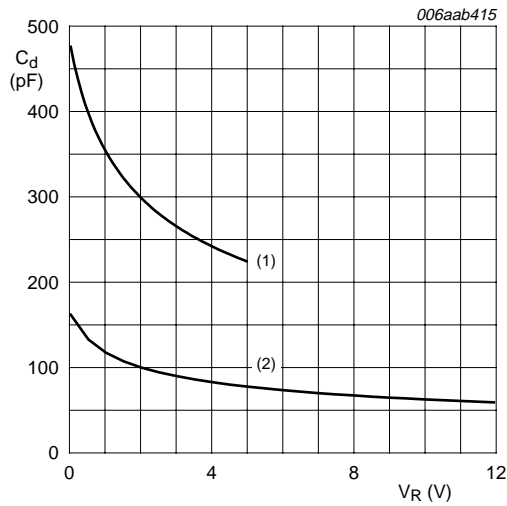
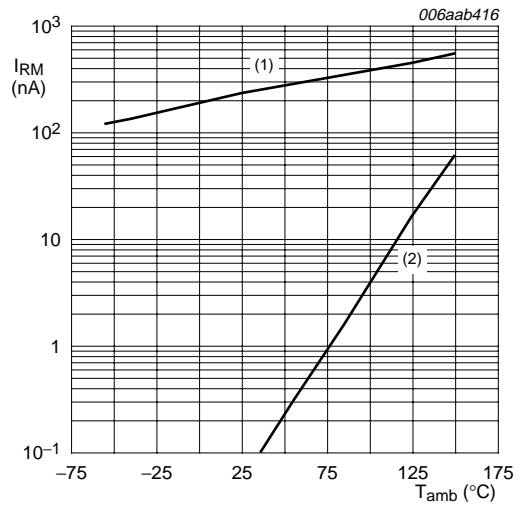


Fig 4. Relative variation of peak pulse power as a function of junction temperature; typical values



$f = 1\text{ MHz}; T_{amb} = 25\text{ }^{\circ}\text{C}$
 (1) PESD5V0S1UJ
 (2) PESD12VS1UJ

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



(1) PESD5V0S1UJ
 (2) PESD12VS1UJ

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

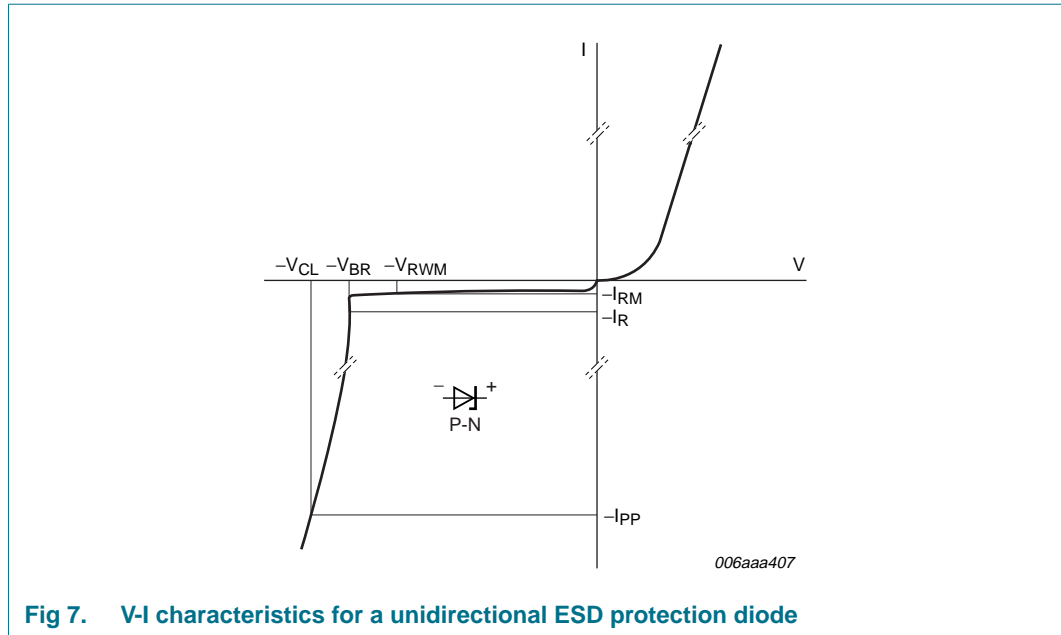


Fig 7. V-I characteristics for a unidirectional ESD protection diode

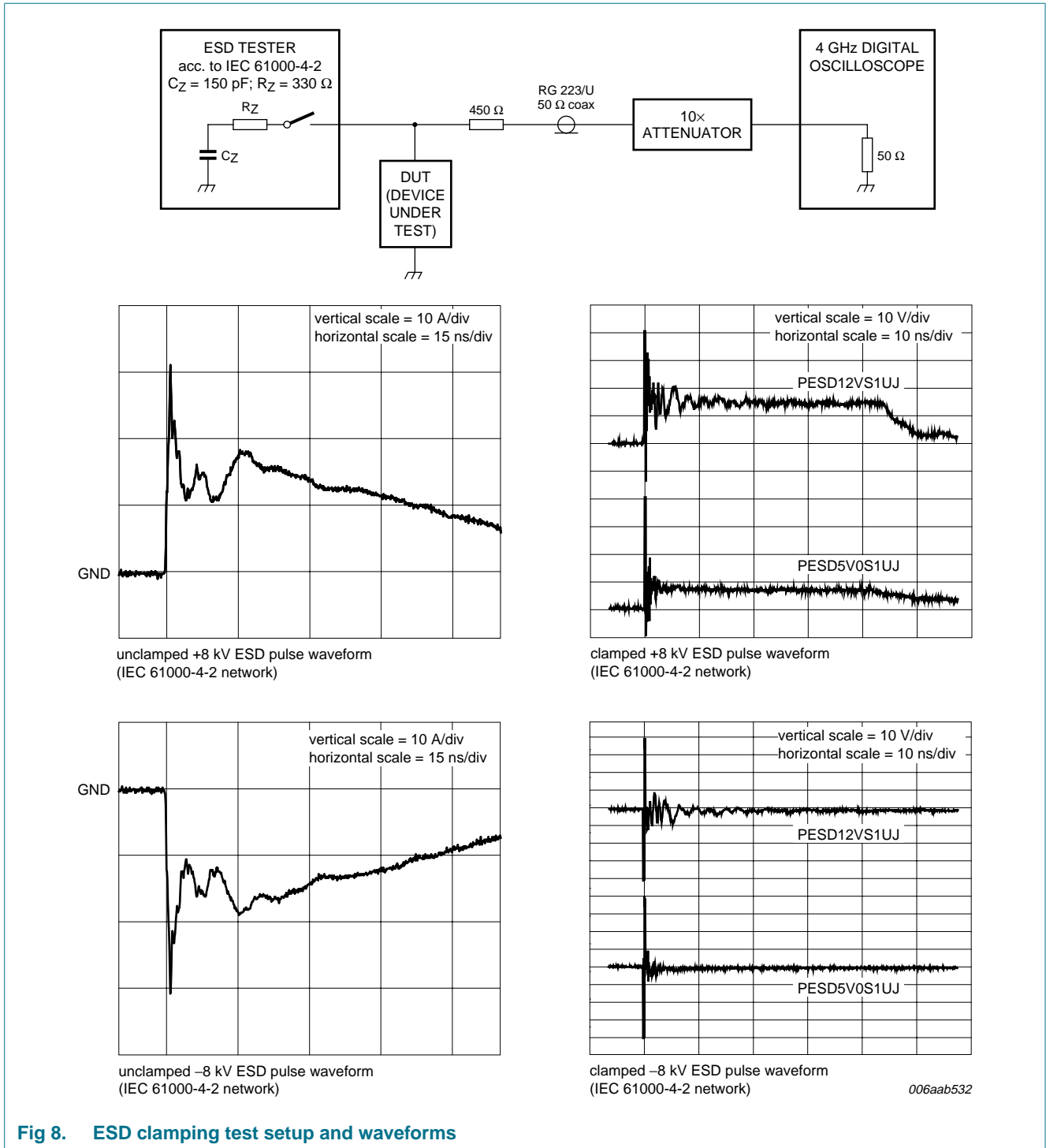


Fig 8. ESD clamping test setup and waveforms

8. Application information

PESD5V0S1UJ and PESD12VS1UJ are designed for the protection of one unidirectional data or signal line from the damage caused by ESD and transient overvoltage. The devices may be used on lines where the signal polarities are either positive or negative with respect to ground.

The PESD5V0S1UJ provides a surge capability of 890 W and the PESD12VS1UJ provides a surge capability of 600 W per line for an 8/20 μs waveform.

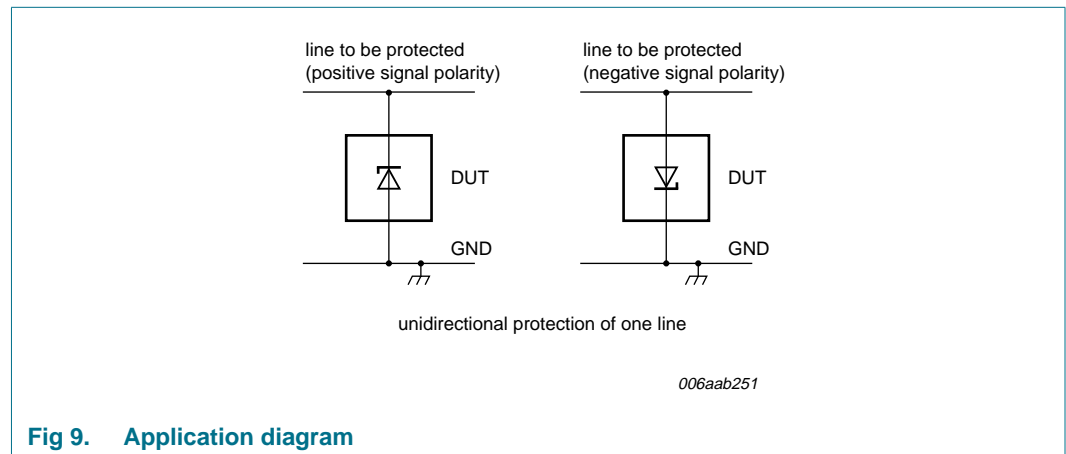


Fig 9. Application diagram

Circuit board layout and protection device placement

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

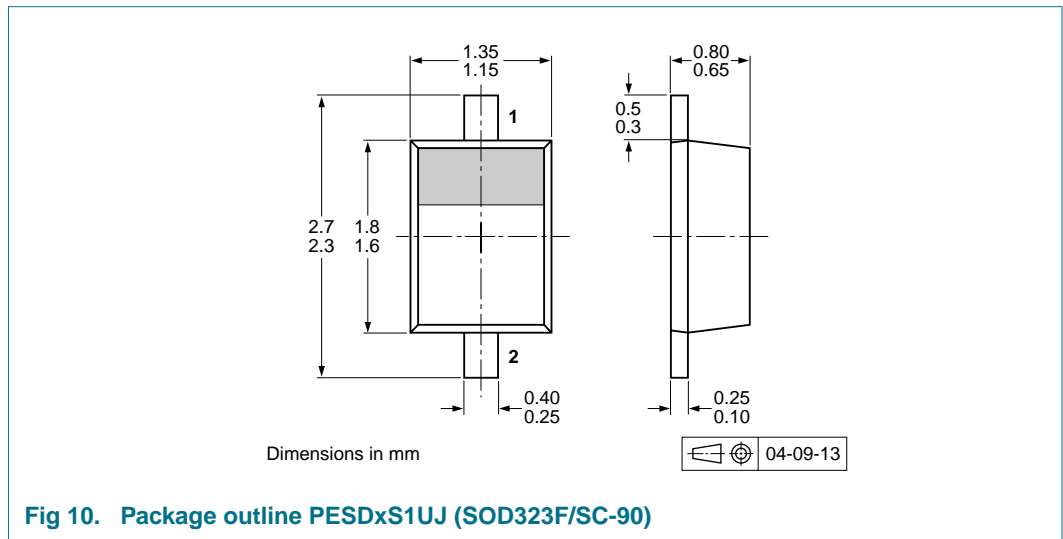
1. Place the device as close to the input terminal or connector as possible.
2. The path length between the device and the protected line should be minimized.
3. Keep parallel signal paths to a minimum.
4. Avoid running protected conductors in parallel with unprotected conductors.
5. Minimize all Printed-Circuit 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.

9. Test information

9.1 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.

10. Package outline



11. Packing information

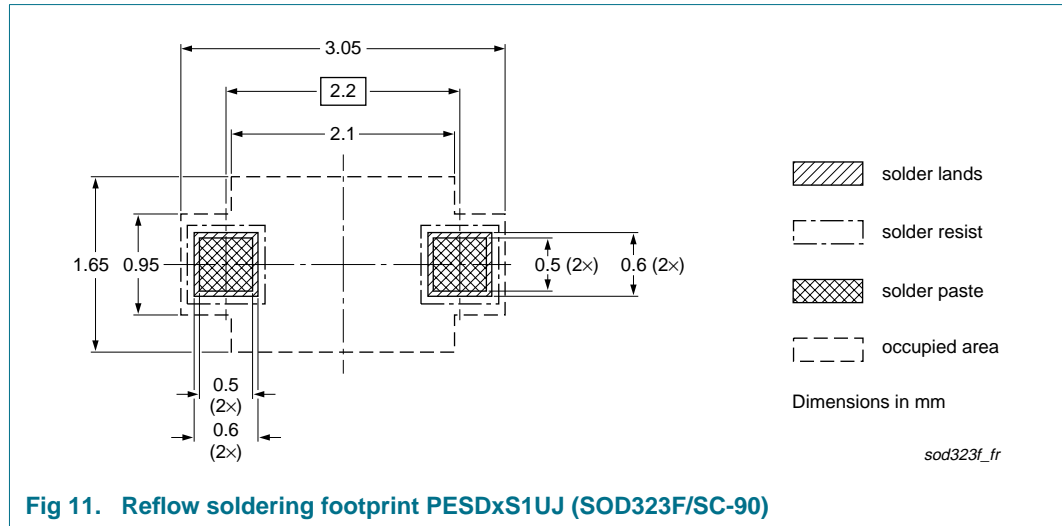
Table 11. Packing methods

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

| Type number | Package | Description | Packing quantity | |
|-------------|---------|--------------------------------|------------------|-------|
| | | | 3000 | 10000 |
| PESD5V0S1UJ | SOD323F | 4 mm pitch, 8 mm tape and reel | -115 | -135 |
| PESD12VS1UJ | | | | |

[1] For further information and the availability of packing methods, see [Section 15](#).

12. Soldering



13. Revision history

Table 12. Revision history

| Document ID | Release date | Data sheet status | Change notice | Supersedes |
|---------------------------|--------------|--------------------|---------------|------------|
| PESD5V0S1UJ_PESD12VS1UJ_1 | 20090603 | Product data sheet | - | - |

14. Legal information

14.1 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. |
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16. Contents

| | | |
|-----------|--|-----------|
| 1 | Product profile | 1 |
| 1.1 | General description | 1 |
| 1.2 | Features | 1 |
| 1.3 | Applications | 1 |
| 1.4 | Quick reference data | 1 |
| 2 | Pinning information | 2 |
| 3 | Ordering information | 2 |
| 4 | Marking | 2 |
| 5 | Limiting values | 2 |
| 6 | Thermal characteristics | 4 |
| 7 | Characteristics | 5 |
| 8 | Application information | 9 |
| 9 | Test information | 10 |
| 9.1 | Quality information | 10 |
| 10 | Package outline | 10 |
| 11 | Packing information | 10 |
| 12 | Soldering | 11 |
| 13 | Revision history | 12 |
| 14 | Legal information | 13 |
| 14.1 | Data sheet status | 13 |
| 14.2 | Definitions | 13 |
| 14.3 | Disclaimers | 13 |
| 14.4 | Trademarks | 13 |
| 15 | Contact information | 13 |
| 16 | Contents | 14 |