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Kind regards,

Team Nexperia



# PESD5V0L1USF

Low capacitance unidirectional ESD protection diode

Rev. 1 — 12 July 2012

Product data sheet

## 1. Product profile

### 1.1 General description

Low capacitance unidirectional ElectroStatic Discharge (ESD) protection diode designed to protect one signal line from the damage caused by ESD and other transients. The device is encapsulated in a leadless super small DSN0603-2 (SOD962) Surface-Mounted Device (SMD) package.

### 1.2 Features and benefits

- ESD protection of one line
- Low diode capacitance  $C_d = 12$  pF
- Super small SMD package
- Ultra low leakage current  $I_{RM} < 1$  nA
- ESD protection up to 30 kV
- IEC 61000-4-2; level 4 (ESD)
- IEC 61643-321 (surge);  $I_{PPM} = 1.2$  A

### 1.3 Applications

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

### 1.4 Quick reference data

Table 1. Quick reference data

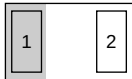
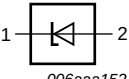
$T_{amb} = 25$  °C unless otherwise specified.

| Symbol    | Parameter                | Conditions               | Min | Typ | Max | Unit |
|-----------|--------------------------|--------------------------|-----|-----|-----|------|
| $V_{RWM}$ | reverse standoff voltage |                          | -   | -   | 5   | V    |
| $C_d$     | diode capacitance        | $f = 1$ MHz; $V_R = 0$ V | 9   | 12  | 15  | pF   |



## 2. Pinning information

Table 2. Pinning

| Pin | Description                 | Simplified outline                                                                                            | Graphic symbol                                                                                   |
|-----|-----------------------------|---------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------|
| 1   | cathode <a href="#">[1]</a> | <br>Transparent<br>top view | <br>006aaa152 |
| 2   | anode                       |                                                                                                               |                                                                                                  |

[1] The marking bar indicates the cathode.

## 3. Ordering information

Table 3. Ordering information

| Type number  | Package   |                                                                       |         |
|--------------|-----------|-----------------------------------------------------------------------|---------|
|              | Name      | Description                                                           | Version |
| PESD5V0L1USF | DSN0603-2 | leadless ultra small package; 2 terminals; body<br>0.6 × 0.3 × 0.3 mm | SOD962  |

## 4. Marking

Table 4. Marking codes

| Type number  | Marking code |
|--------------|--------------|
| PESD5V0L1USF | 2            |

## 5. Limiting values

**Table 5. Limiting values**

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

| Symbol           | Parameter                | Conditions               | Min      | Max  | Unit |
|------------------|--------------------------|--------------------------|----------|------|------|
| P <sub>PPM</sub> | rated peak pulse power   | t <sub>p</sub> = 8/20 μs | [1][2] - | 11   | W    |
| I <sub>PPM</sub> | rated peak pulse current | t <sub>p</sub> = 8/20 μs | [1][2] - | 1.2  | A    |
| T <sub>j</sub>   | junction temperature     |                          | -        | 150  | °C   |
| T <sub>amb</sub> | ambient temperature      |                          | -55      | +150 | °C   |
| T <sub>stg</sub> | storage temperature      |                          | -65      | +150 | °C   |

[1] Device stressed with 8/20 μs exponential decay waveform according to IEC 61000-4-5 and IEC 61643-321.

[2] Measured from pin 1 to pin 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 (contact discharge) | [1][2] - | 30  | kV   |
|                  |                                 | IEC 61000-4-2 (air discharge)     | [1][2] - | 30  | kV   |
|                  |                                 | machine model                     | [2] -    | 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 3B (human body model) | > 8 kV                          |

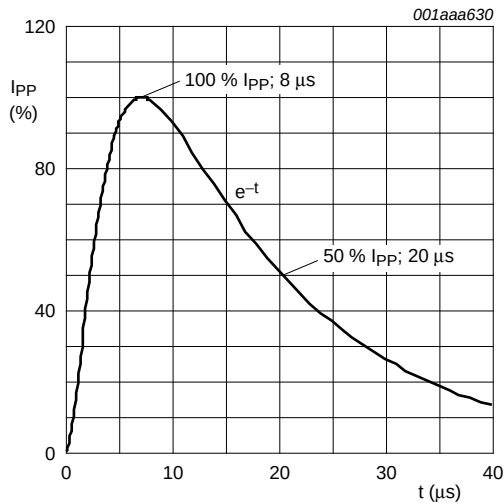


Fig 1. 8/20  $\mu$ s pulse waveform according to IEC 61000-4-5 and IEC 61643-321

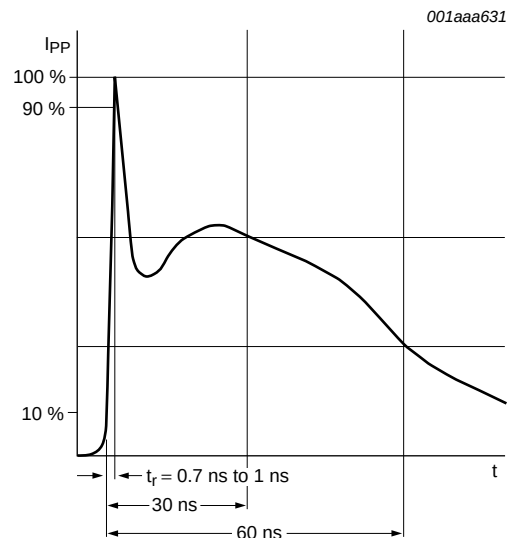


Fig 2. ESD pulse waveform according to IEC 61000-4-2

## 6. Characteristics

**Table 8. Characteristics**

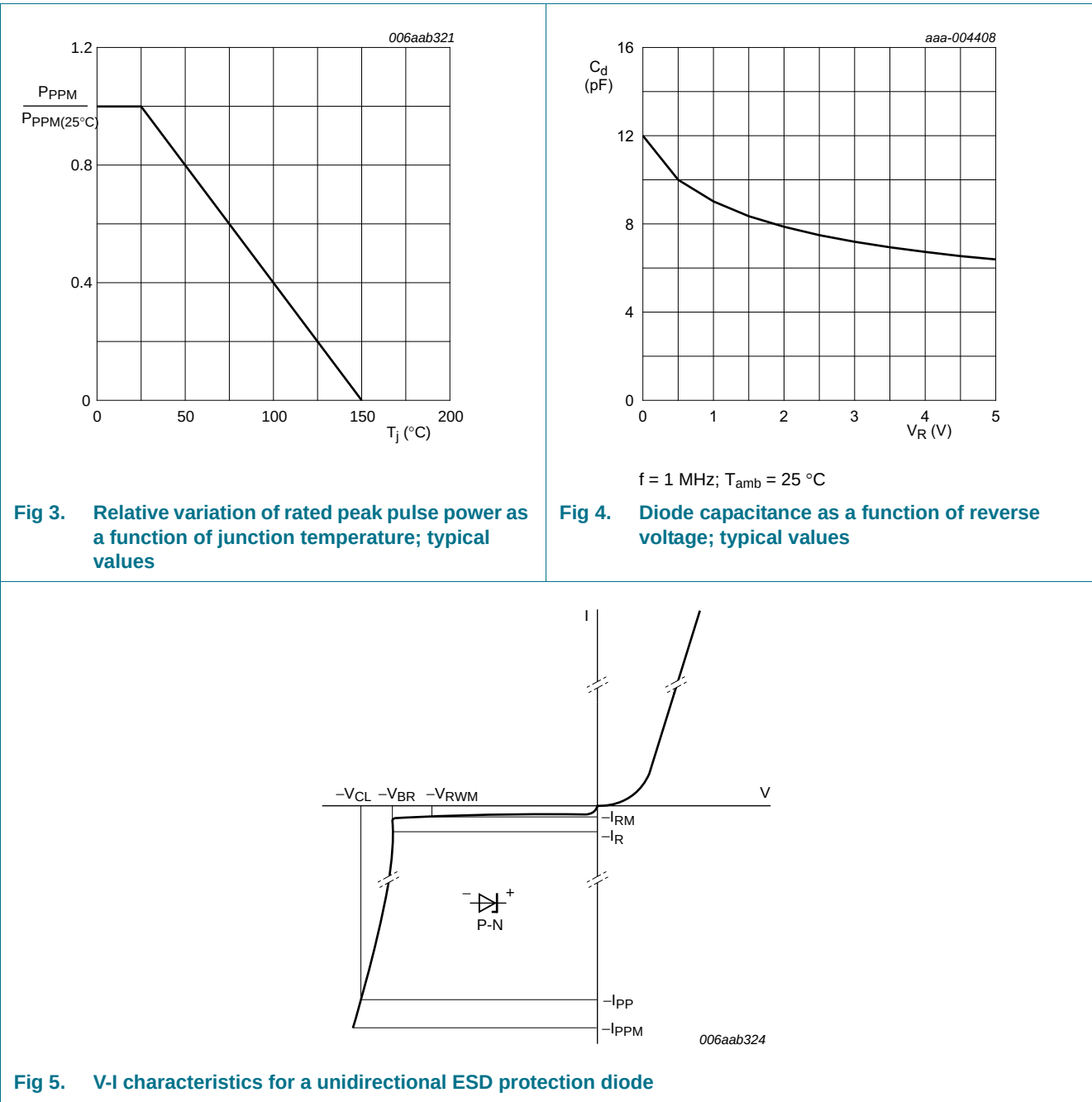
$T_{amb} = 25\text{ }^{\circ}\text{C}$  unless otherwise specified.

| Symbol    | Parameter                | Conditions                           | Min      | Typ | Max  | Unit     |
|-----------|--------------------------|--------------------------------------|----------|-----|------|----------|
| $V_{RWM}$ | reverse standoff voltage |                                      | -        | -   | 5    | V        |
| $I_{RM}$  | reverse leakage current  | $V_{RWM} = 5\text{ V}$               | -        | 1   | 100  | nA       |
| $V_{BR}$  | breakdown voltage        | $I_R = 1\text{ mA}$                  | 6        | 7   | 8    | V        |
| $C_d$     | diode capacitance        | $f = 1\text{ MHz}; V_R = 0\text{ V}$ | 9        | 12  | 15   | pF       |
| $V_{CL}$  | clamping voltage         | $I_{PP} = 1\text{ A}$                | [1][2] - | -   | 10.5 | V        |
| $r_{dyn}$ | dynamic resistance       | $I_R = 10\text{ A}$                  | [3] -    | 1.2 | -    | $\Omega$ |

[1] Device stressed with 8/20  $\mu$ s exponential decay waveform according to IEC 61000-4-5 and IEC 61643-321.

[2] Measured from pin 1 to pin 2.

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



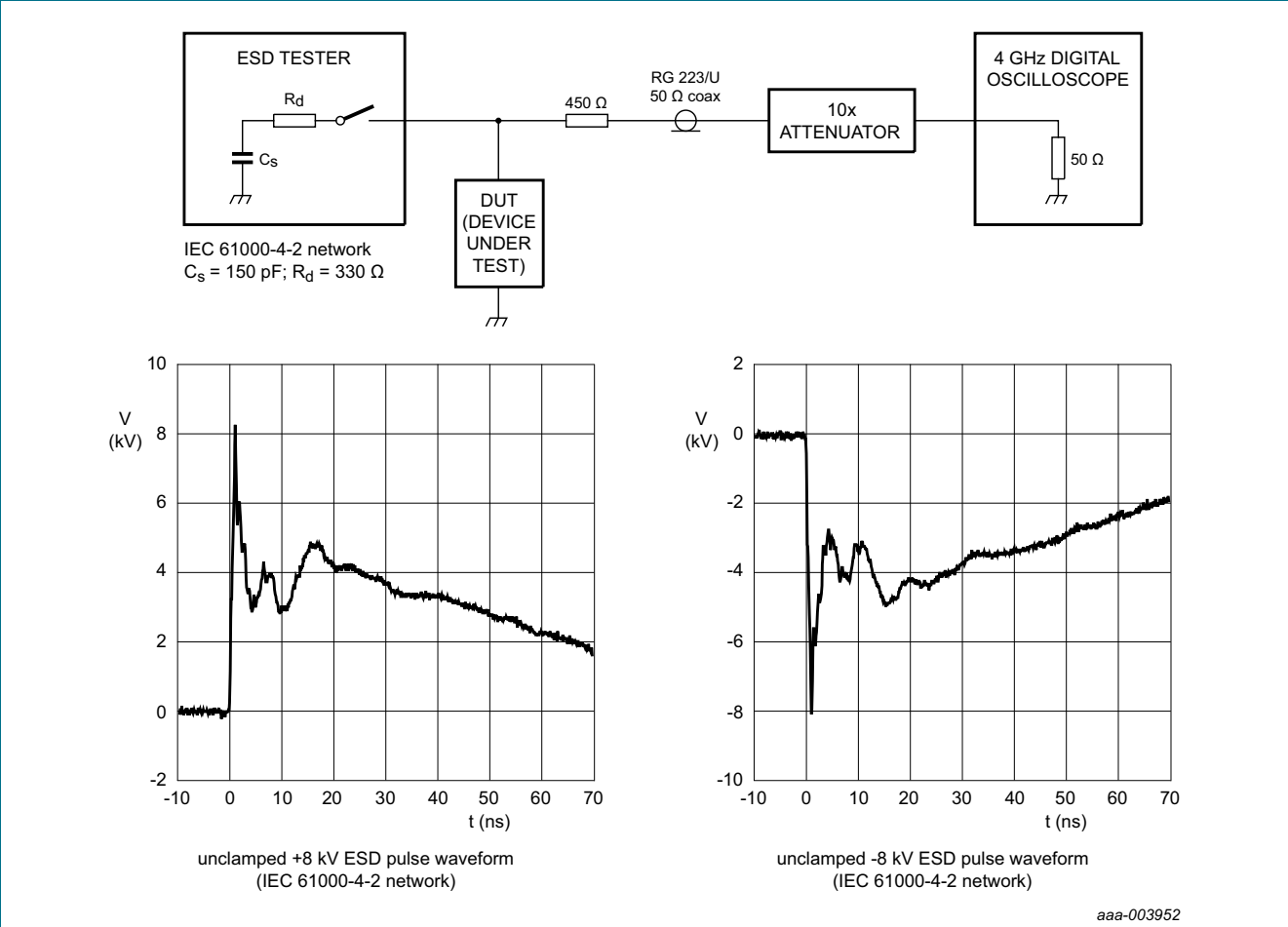


Fig 6. ESD clamping test setup

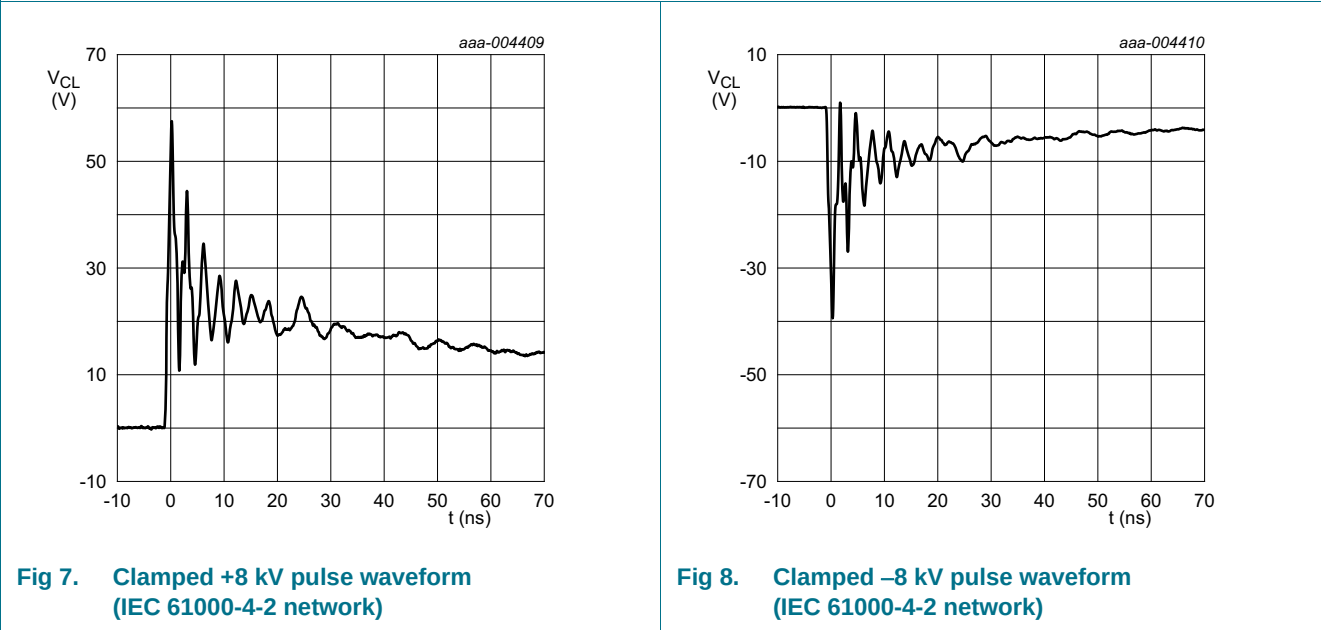
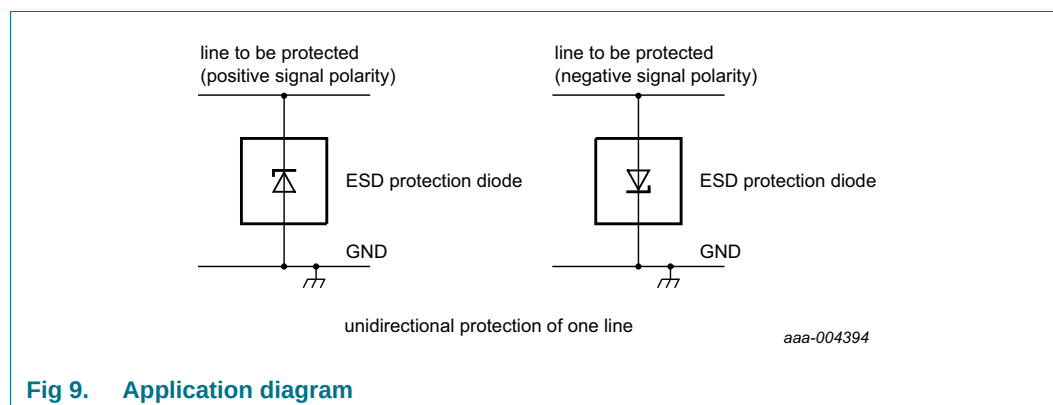


Fig 7. Clamped +8 kV pulse waveform (IEC 61000-4-2 network)

Fig 8. Clamped -8 kV pulse waveform (IEC 61000-4-2 network)

## 7. Application information

The device is designed for the 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**

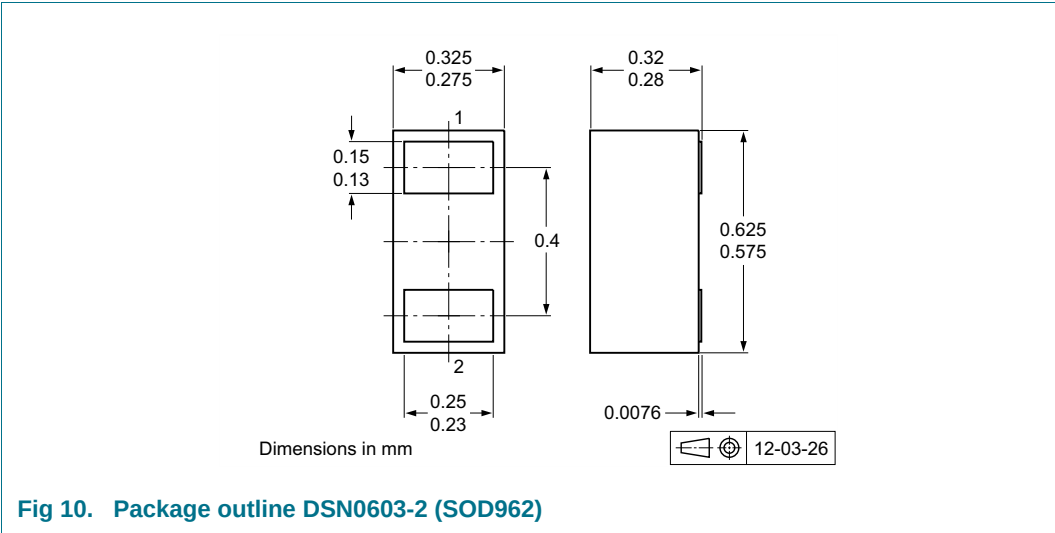
### Circuit board layout and protection device placement

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.



8. Package outline

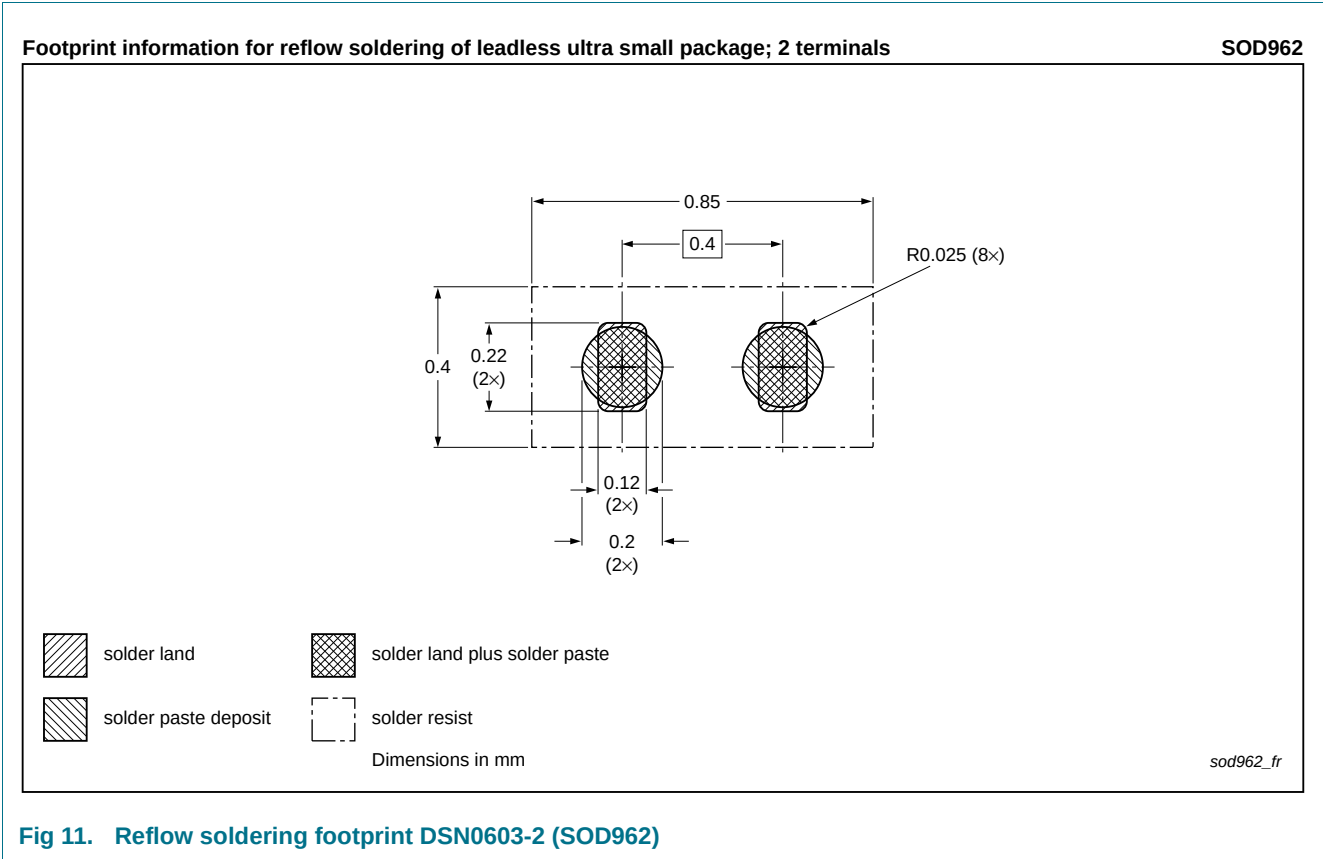


9. Packing information

| Table 9. Packing methods                                                                    |                    |                                |                  |
|---------------------------------------------------------------------------------------------|--------------------|--------------------------------|------------------|
| The indicated -xxx are the last three digits of the 12NC ordering code. <a href="#">[1]</a> |                    |                                |                  |
| Type number                                                                                 | Package            | Description                    | Packing quantity |
| PESD5V0L1USF                                                                                | DSN0603-2 (SOD962) | 2 mm pitch, 8 mm tape and reel | 9000             |
|                                                                                             |                    |                                | -315             |

[1] For further information and the availability of packing methods, see [Section 13](#).

10. Soldering



## 11. Revision history

Table 10. Revision history

| Document ID      | Release date | Data sheet status  | Change notice | Supersedes |
|------------------|--------------|--------------------|---------------|------------|
| PESD5V0L1USF v.1 | 20120712     | Product data sheet | -             | -          |

## 12. Legal information

### 12.1 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.                       |
| 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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