



PESD16VV1BSF

Extremely symmetrical bidirectional ESD protection diode

5 July 2018

Product data sheet

1. General description

Extremely symmetrical bidirectional ElectroStatic Discharge (ESD) protection diode. This device is housed in a DSN0603-2 (SOD962) leadless ultra small Surface-Mounted Device (SMD) package designed to protect one signal line from the damage caused by ESD and other transients.

2. Features and benefits

- Bidirectional ESD protection of one line
- Extremely symmetrical layout
- Very low diode capacitance $C_d = 6.5$ pF maximum values
- Low clamping to protect sensitive I/Os
- Low inductance protection path to ground
- ESD protection up to ± 12 kV according to IEC 61000-4-2
- Ultra small SMD package

3. Applications

- Cellular handsets and accessories
- Portable electronics
- Communication systems
- Computers and peripherals

4. Quick reference data

Table 1. Quick reference data


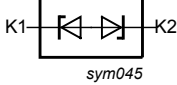
| Symbol | Parameter | Conditions | Min | Typ | Max | Unit |
|-----------|--------------------------|---|---------|-----|-----|------|
| V_{RWM} | reverse standoff voltage | | - | - | 16 | V |
| C_d | diode capacitance | $f = 1$ MHz; $V_R = 0$ V; $T_{amb} = 25$ °C | - | 5.7 | 6.5 | pF |
| I_{PPM} | rated peak pulse current | $t_p = 8/20$ μ s | [1] [2] | - | 1.3 | A |

[1] According to IEC 61000-4-5 and IEC 61643-321.

[2] In positive and negative direction.

5. Pinning information

Table 2. Pinning information

| Pin | Symbol | Description | Simplified outline | Graphic symbol |
|-----|--------|-------------------|--|---|
| 1 | K1 | cathode (diode 1) |  <p>Transparent top view</p> <p>DSN0603-2 (SOD962-2)</p> |  <p>sym045</p> |
| 2 | K2 | cathode (diode 2) | | |

6. Ordering information

Table 3. Ordering information

| Type number | Package | | |
|--------------|-----------|---|----------|
| | Name | Description | Version |
| PESD16VV1BSF | DSN0603-2 | silicon, leadless ultra small package; 2 terminals; 0.4 mm pitch; 0.6 mm x 0.3 mm x 0.3 mm body | SOD962-2 |

7. Marking

Table 4. Marking codes

| Type number | Marking code |
|--------------|--------------|
| PESD16VV1BSF | W |

8. Limiting values

Table 5. Limiting values

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

| Symbol | Parameter | Conditions | | Min | Max | Unit |
|----------------------------|---------------------------------|----------------------------------|---------|-----|-----|------|
| V_{RWM} | reverse standoff voltage | | | - | 16 | V |
| I_{PPM} | rated peak pulse current | $t_p = 8/20 \mu s$ | [1] [2] | - | 1.3 | A |
| T_j | junction temperature | | | - | 150 | °C |
| T_{amb} | ambient temperature | | | -40 | 125 | °C |
| T_{stg} | storage temperature | | | -65 | 150 | °C |
| ESD maximum ratings | | | | | | |
| V_{ESD} | electrostatic discharge voltage | IEC 61000-4-2; contact discharge | [3] | - | 12 | kV |

[1] According to IEC 61000-4-5 and IEC 61643-321.

[2] In positive and negative direction.

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

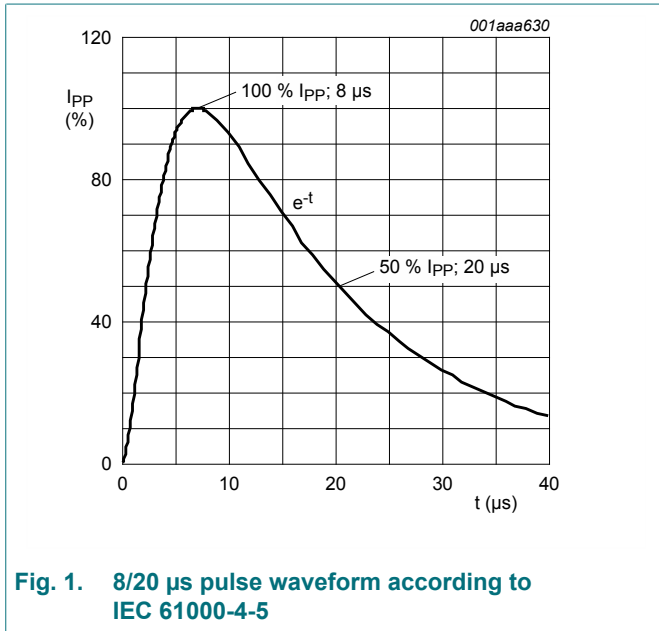


Fig. 1. 8/20 μs pulse waveform according to IEC 61000-4-5

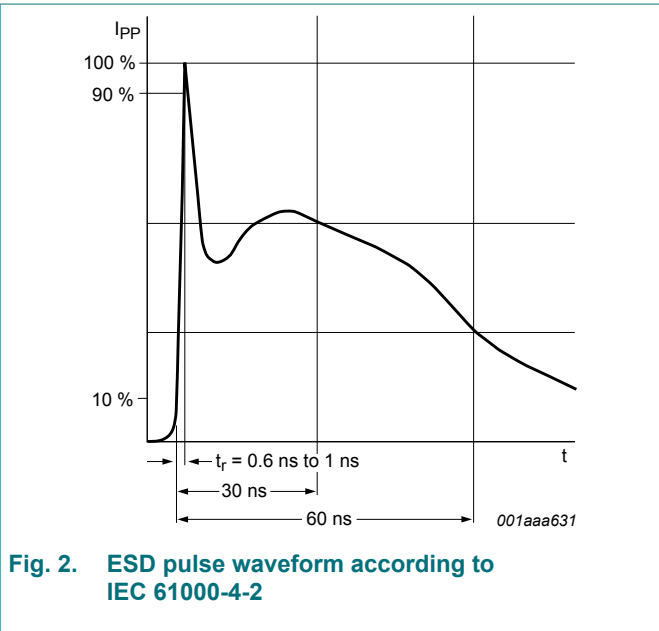


Fig. 2. ESD pulse waveform according to IEC 61000-4-2

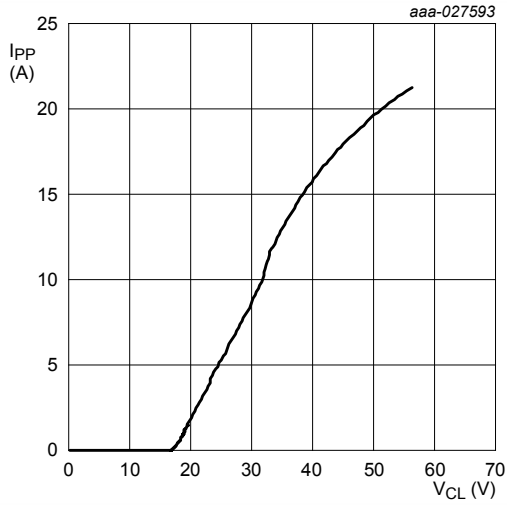
9. Characteristics

Table 6. Characteristics

| Symbol | Parameter | Conditions | Min | Typ | Max | Unit | |
|---|-------------------------|---|------|------|------|------|---|
| V _{BR} | breakdown voltage | I _R = 1 mA; T _{amb} = 25 °C | 16.2 | 18 | - | V | |
| I _{RM} | reverse leakage current | V _{RWM} = 16 V; T _{amb} = 25 °C | - | 1 | 50 | nA | |
| C _d | diode capacitance | f = 1 MHz; V _R = 0 V; T _{amb} = 25 °C | - | 5.7 | 6.5 | pF | |
| V _{CL} | clamping voltage | I _{PP} = 1.3 A; t _p = 8/20 μs; T _{amb} = 25 °C | [1] | - | 22.6 | - | V |
| | | I _{PP} = 8 A; t _p = TLP; T _{amb} = 25 °C | [2] | - | 29 | - | V |
| | | I _{PP} = 16 A; t _p = TLP; T _{amb} = 25 °C | [2] | - | 40.5 | - | V |
| R _{dyn} | dynamic resistance | I _R = 10 A; T _{amb} = 25 °C | [2] | - | 1.1 | - | Ω |
| | | I _R = -10 A; T _j = 25 °C | [2] | - | 1.1 | - | Ω |
| normalized to attenuation at 1 MHz | | | | | | | |
| f _{-3dB} | -3 dB cut-off frequency | T _{amb} = 25 °C | - | 0.97 | - | GHz | |

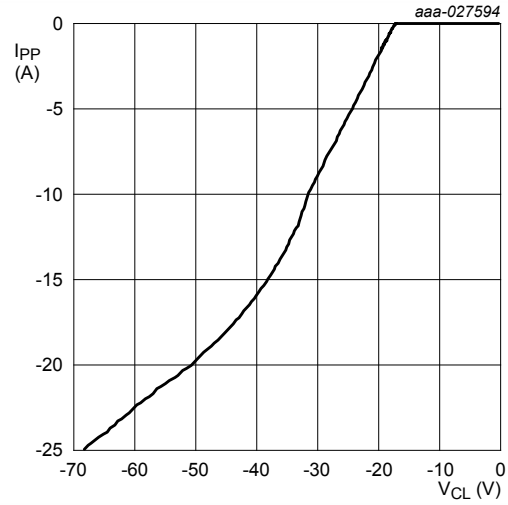
[1] According to IEC 61000-4-5 and IEC 61643-321.

[2] Non-repetitive current pulse, Transmission Line Pulse (TLP) t_p = 100 ns; square pulse; ANSI / ESD STM5.5.1-2008.



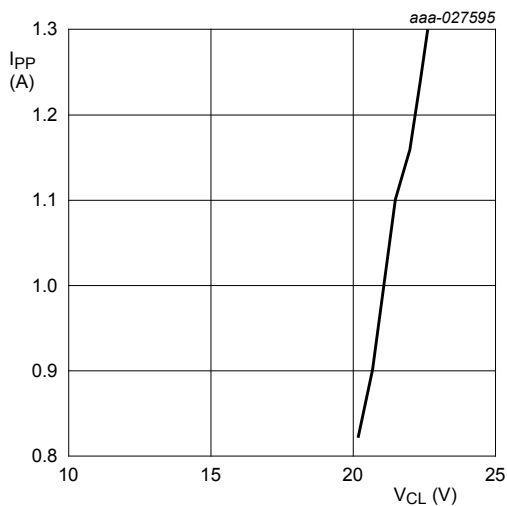
$t_p = 100 \text{ ns}$; Transmission Line Pulse (TLP)

Fig. 3. Dynamic resistance with positive clamping; typical values



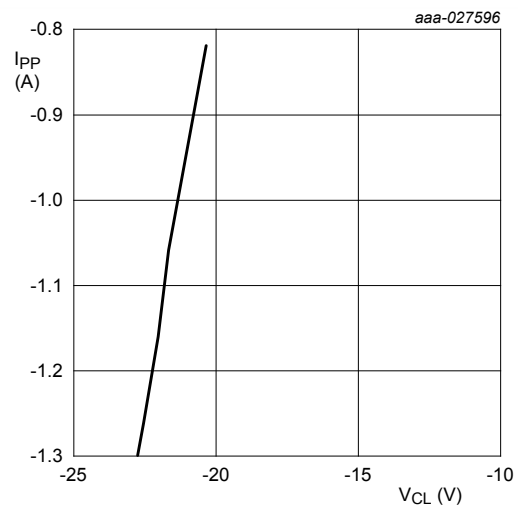
$t_p = 100 \text{ ns}$; Transmission Line Pulse (TLP)

Fig. 4. Dynamic resistance with negative clamping; typical values



IEC 61000-4-5; $t_p = 8/20 \text{ }\mu\text{s}$; positive pulse

Fig. 5. Dynamic resistance with positive clamping; typical values



IEC 61000-4-5; $t_p = 8/20 \text{ }\mu\text{s}$; negative pulse

Fig. 6. Dynamic resistance with negative clamping; typical values

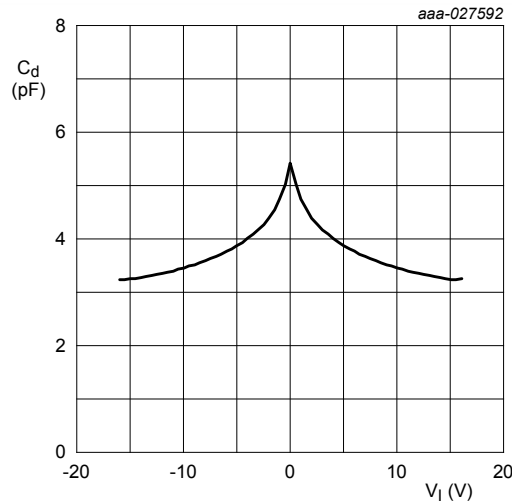


Fig. 7. Diode capacitance as a function of input voltage; typical values

10. Application information

The device is designed for the protection of one bidirectional data line from surge pulses and ESD damage. The device is suitable on lines where the signal polarities are both positive and negative with respect to ground.

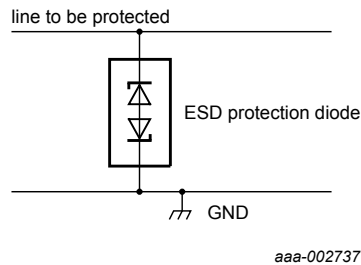


Fig. 8. Application diagram

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. Package outline

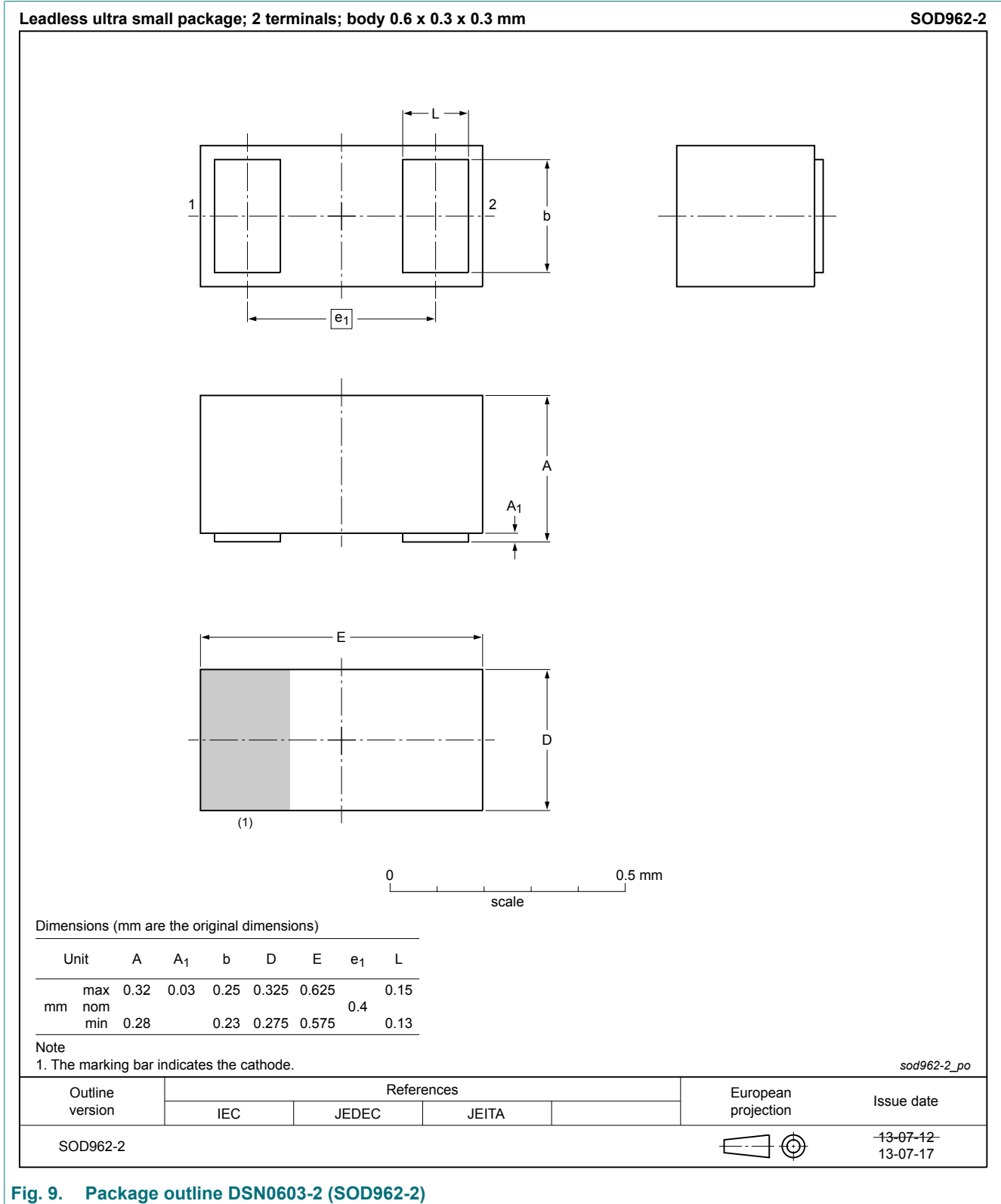
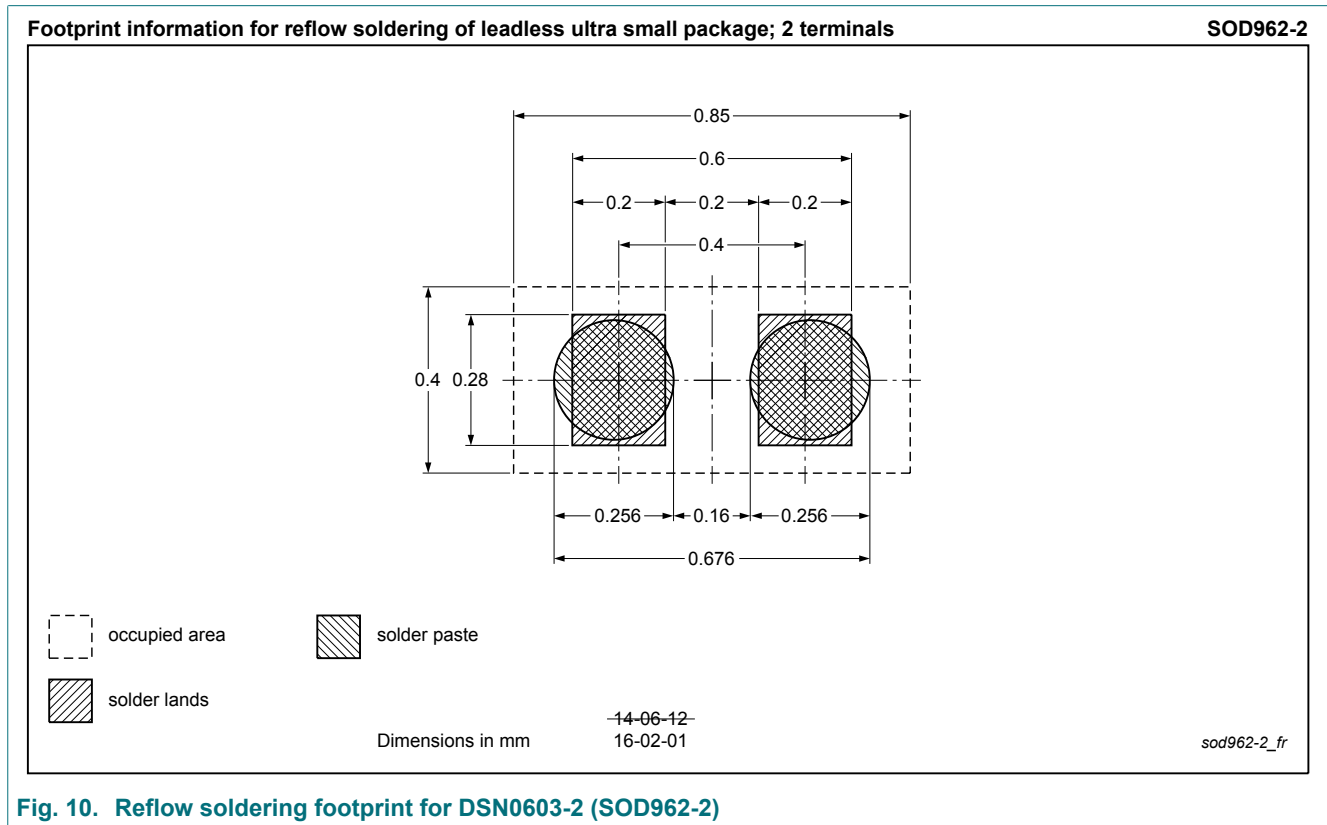


Fig. 9. Package outline DSN0603-2 (SOD962-2)

12. Soldering



13. Revision history

Table 7. Revision history

| Data sheet ID | Release date | Data sheet status | Change notice | Supersedes |
|------------------|---|--------------------|---------------|------------------|
| PESD16VV1BSF v.3 | 20180705 | Product data sheet | - | PESD16VV1BSF v.2 |
| Modifications: | <ul style="list-style-type: none">Characteristics: corrected V_{RWM} as a condition of I_{RM} | | | |
| PESD16VV1BSF v.2 | 20180420 | Product data sheet | - | PESD16VV1BSF v.1 |
| PESD16VV1BSF v.1 | 20180404 | Product data sheet | - | - |

14. 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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