



PESD3V3V1BCSF

Ultra low clamping bidirectional ESD protection diode

8 April 2021

Product data sheet

1. General description

Ultra low capacitance bidirectional ElectroStatic Discharge (ESD) protection diode in a DSN0603-2 (SOD962) leadless ultra small Surface-Mounted Device (SMD) package. The device is 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
- Ultra small leadless package with a height of 0.3 mm
- IEC 61000-4-5 (surge); $I_{PPM} = 8.3$ A (average measured)
- Very low clamping voltage: $V_{CL} = 8.9$ V max for 7.1 A, 8/20 μ s pulse
- Ultra low leakage current: $I_{RM} < 1$ nA
- ESD protection up to 27 kV

3. Applications

ESD and surge protection for:

- very sensitive interface lines
- generic interface lines

in portable electronics, communication, consumer and computing devices.

4. Quick reference data

Table 1. Quick reference data


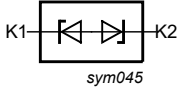
| Symbol | Parameter | Conditions | | Min | Typ | Max | Unit |
|-----------|--------------------------|---|---------|-----|-----|-----|------|
| C_d | diode capacitance | $f = 1$ MHz; $V_R = 0$ V; $T_{amb} = 25$ °C | | - | 8.5 | 10 | pF |
| I_{PPM} | rated peak pulse current | $t_p = 8/20$ μ s | [1] [2] | - | - | 7.1 | A |
| V_{RWM} | reverse standoff voltage | $T_{amb} = 25$ °C | | - | - | 3.3 | V |

[1] According to IEC 61000-4-5.

[2] Average measured $I_{PPM} = 8.3$ A.

5. Pinning information

Table 2. Pinning information

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

6. Ordering information

Table 3. Ordering information

| Type number | Package | | |
|---------------|-----------|---|----------|
| | Name | Description | Version |
| PESD3V3V1BCSF | 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 |
|---------------|--------------|
| PESD3V3V1BCSF | T |

8. Limiting values

Table 5. Limiting values

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

| Symbol | Parameter | Conditions | | Min | Max | Unit |
|----------------------------|---------------------------------|----------------------------------|---------|-----|-----|------|
| I_{PPM} | rated peak pulse current | $t_p = 8/20 \mu s$ | [1] [2] | - | 7.1 | 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] | - | 27 | kV |
| | | IEC 61000-4-2; air discharge | [3] | - | 27 | kV |

[1] According to IEC 61000-4-5.

[2] Average measured $I_{PPM} = 8.3$ A.

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

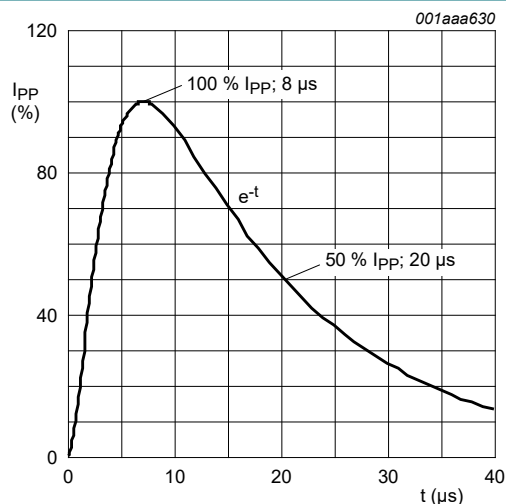


Fig. 1. 8/20 μs pulse waveform according to IEC 61000-4-5

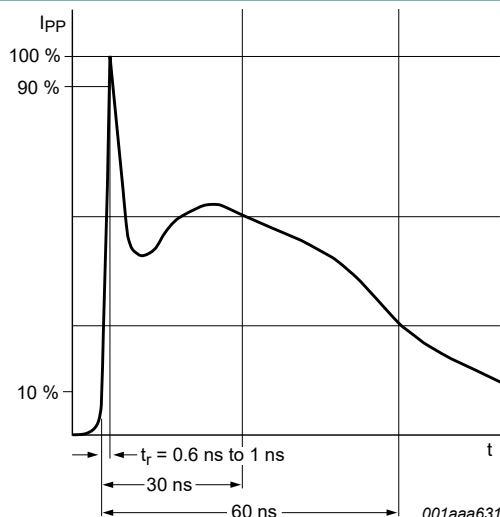


Fig. 2. ESD pulse waveform according to IEC 61000-4-2

9. Characteristics

Table 6. Characteristics

| Symbol | Parameter | Conditions | | Min | Typ | Max | Unit |
|-----------|--------------------------|--|-----|-----|-----|-----|------|
| V_{RWM} | reverse standoff voltage | $T_{amb} = 25^\circ C$ | | - | - | 3.3 | V |
| V_{BR} | breakdown voltage | $I_R = 5$ mA; $T_{amb} = 25^\circ C$ | | 4.5 | 5.5 | 8 | V |
| I_{RM} | reverse leakage current | $V_R = 3.3$ V; $T_{amb} = 25^\circ C$ | | - | 0.1 | 50 | nA |
| C_d | diode capacitance | $f = 1$ MHz; $V_R = 0$ V; $T_{amb} = 25^\circ C$ | | - | 8.5 | 10 | pF |
| V_{CL} | clamping voltage | $I_{PPM} = 7.1$ A; $t_p = 8/20 \mu s$; $T_{amb} = 25^\circ C$ | [1] | - | - | 8.9 | V |
| | | $I_{PP} = 8$ A; $t_p = TLP$; $T_{amb} = 25^\circ C$ | [2] | - | 5.5 | 7.5 | V |
| | | $I_{PP} = 16$ A; $t_p = TLP$; $T_{amb} = 25^\circ C$ | [2] | - | 9 | 11 | V |

Ultra low clamping bidirectional ESD protection diode

| Symbol | Parameter | Conditions | | Min | Typ | Max | Unit |
|------------------|--------------------|---|-----|-----|------|-----|------|
| R _{dyn} | dynamic resistance | I _R = 10 A; T _{amb} = 25 °C | [2] | - | 0.17 | - | Ω |

[1] Device stressed with 8/20 μ s exponential decay waveform according to IEC 61000-4-5.

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

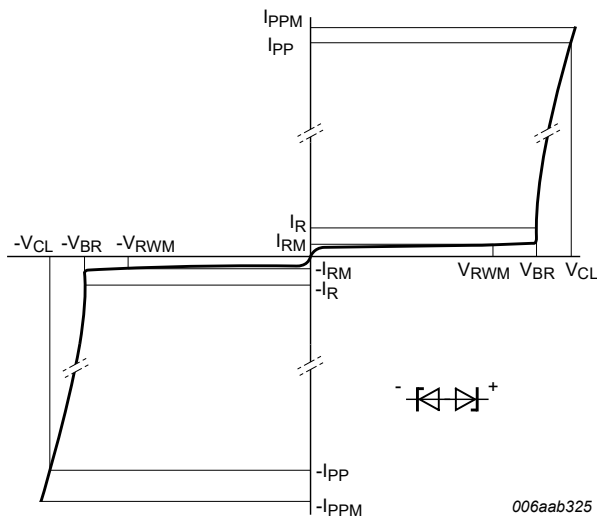


Fig. 3. V-I characteristics for a bidirectional ESD protection diode

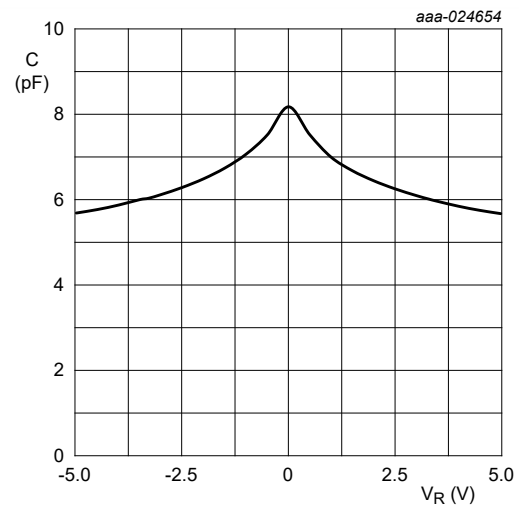
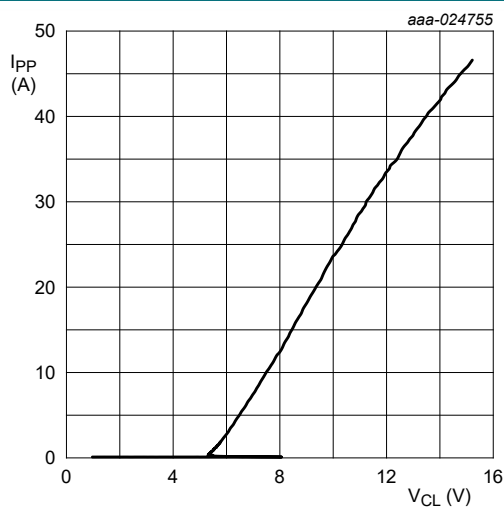
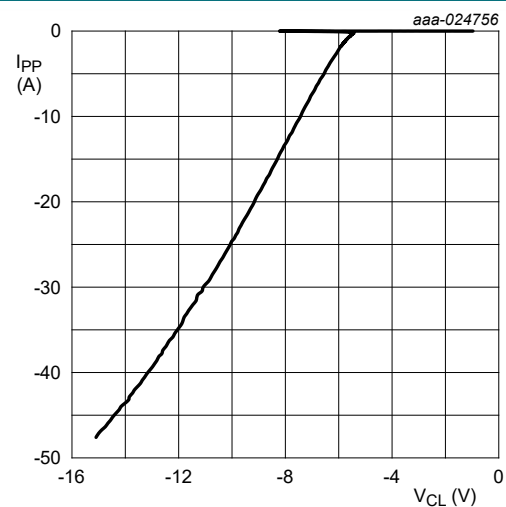


Fig. 4. Diode capacitance as a function of reverse voltage; typical values



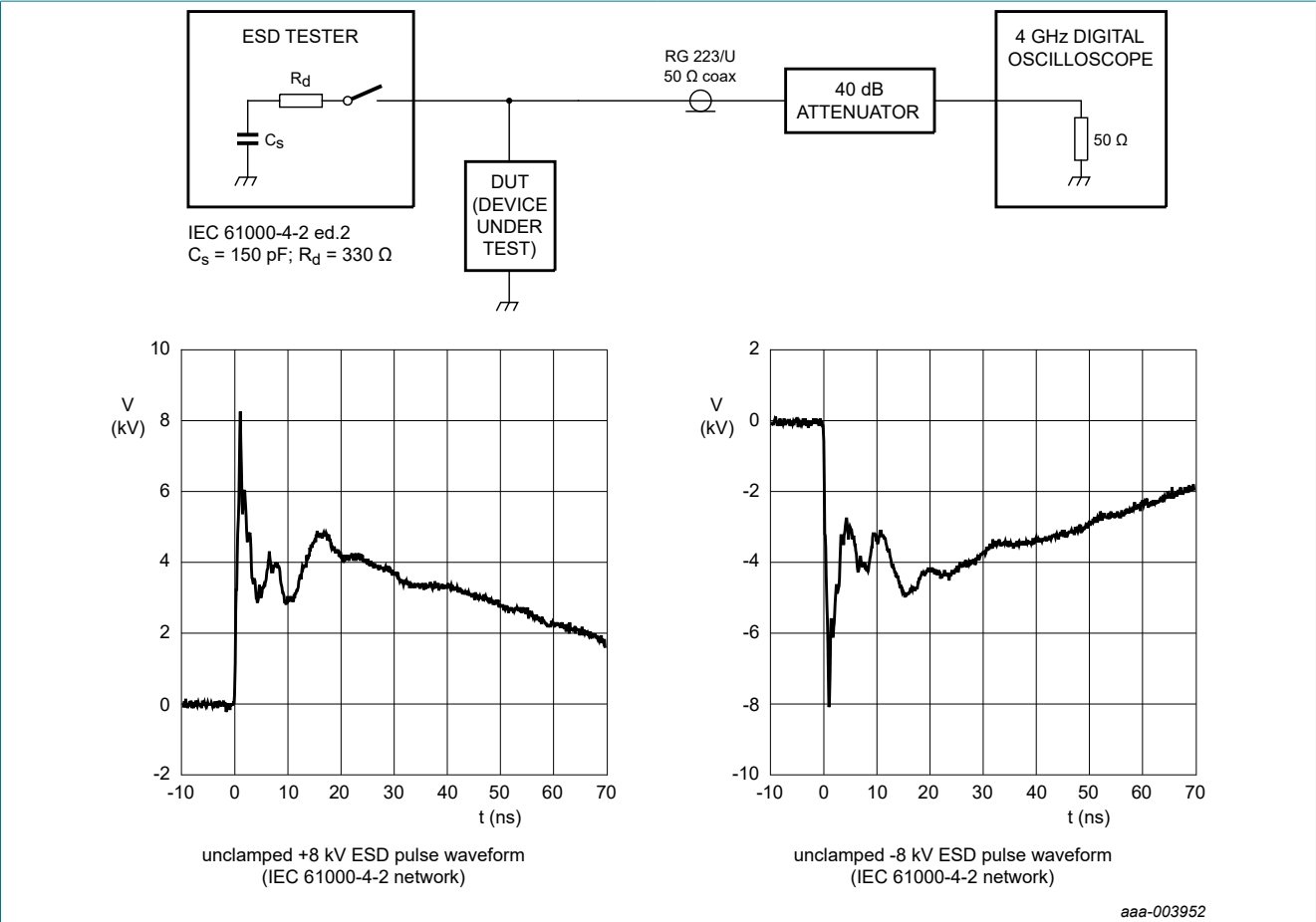
$t_p = 100$ ns; Transmission Line Pulse (TLP)

Fig. 5. Positive clamping voltage (TLP); typical values



$t_p = 100$ ns; Transmission Line Pulse (TLP)

Fig. 6. Negative clamping voltage (TLP); 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. The device is not designed to be used on lines connected to a DC supply.

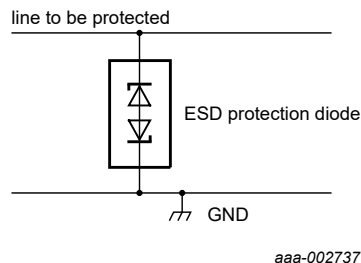


Fig. 10. Application diagram

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

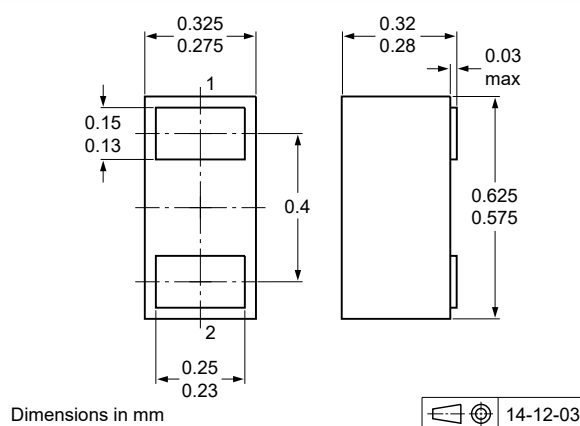
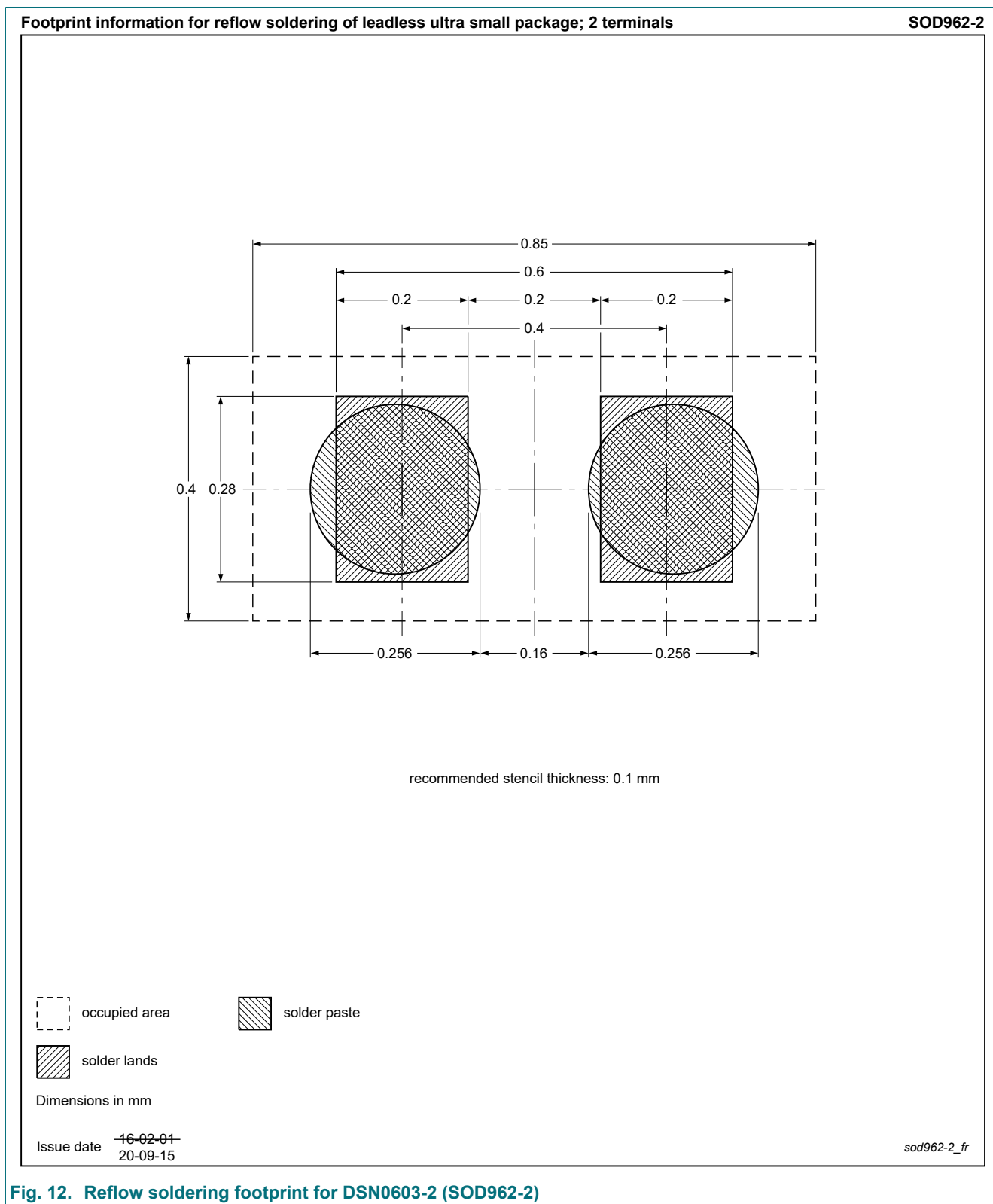


Fig. 11. Package outline DSN0603-2 (SOD962-2)

12. Soldering



13. Revision history

Table 7. Revision history

| Data sheet ID | Release date | Data sheet status | Change notice | Supersedes |
|-------------------|---|--------------------|---------------|-------------------|
| PESD3V3V1BCSF v.3 | 20210408 | Product data sheet | - | PESD3V3V1BCSF v.2 |
| Modifications: | • Figure "Reflow soldering footprint" updated | | | |
| PESD3V3V1BCSF v.2 | 20170721 | Product data sheet | - | PESD3V3V1BCSF v.1 |
| PESD3V3V1BCSF v.1 | 20160929 | 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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Date of release: 8 April 2021

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