


# PESD5V5V1BCSN

## Extremely low clamping bidirectional ESD protection diode

**2 October 2019** **Product data sheet**

## 1. General description

Extremely symmetrical bidirectional ElectroStatic Discharge (ESD) protection diode housed in a leadless ultra small DSN0402B-2 (SOD992B) 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
- Very low diode capacitance $C_d$ = 8.6 pF
- Extremely low clamping to protect sensitive I/Os
- Extremely low-inductance protection path to ground
- ESD protection up to ±25 kV according to IEC 61000-4-2
- Leadless ultra small SMD package

## 3. Applications

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

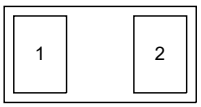
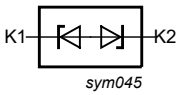
## 4. Quick reference data

**Table 1. Quick reference data**

| Symbol | Parameter | Conditions | | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|---|
| $V_{RWM}$ | reverse standoff voltage | | | -5.5 | - | 5.5 | V |
| $C_d$ | diode capacitance | f = 1 MHz; $V_R$ = 0 V; $T_{amb}$ = 25 °C | | - | 8.6 | 10.3 | pF |

## 5. Pinning information

**Table 2. Pinning information**

| Pin | Symbol | Description | Simplified outline | Graphic symbol |
|---|---|---|---|---|
| 1 | K1 | cathode (diode 1) |   Transparent top view **DSN0402B (SOD992B)** |   |
| 2 | K2 | cathode (diode 2) | | |

# 6. Ordering information

**Table 3. Ordering information**

| Type number | Package | | |
|---|---|---|---|
| | Name | Description | Version |
| PESD5V5V1BCSN | DSN0402B | silicon, leadless tiny package; 2 terminals; 0.28 mm pitch; 0.43 mm x 0.23 mm x 0.12 mm body | SOD992B |

# 7. Marking

**Table 4. Marking codes**

| Type number | Marking code |
|---|---|
| PESD5V5V1BCSN | no marking |

# 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 | | | -5.5 | 5.5 | V |
| $T_j$ | 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 | [1] | -25 | 25 | kV |
| | | IEC 61000-4-2; air discharge | [1] | -25 | 25 | kV |

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

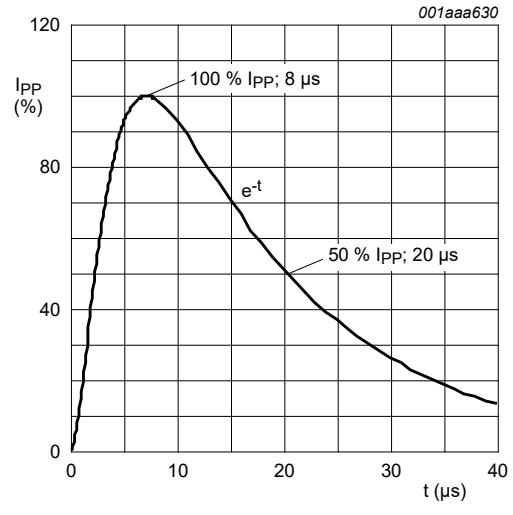



**Fig. 1. 8/20 µs pulse waveform according to IEC 61000-4-5**

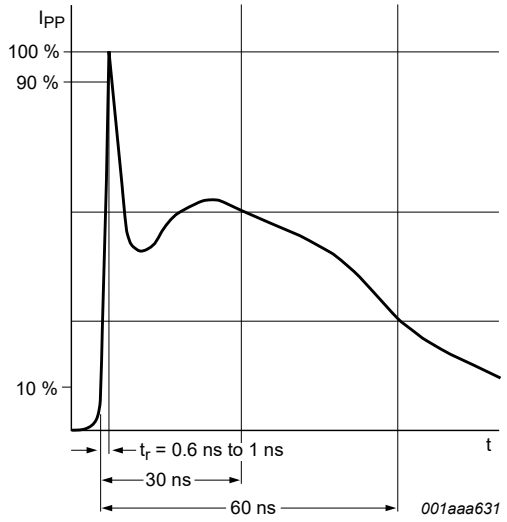



**Fig. 2. ESD pulse waveform according to IEC 61000-4-2**


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# 9. Characteristics

**Table 6. Characteristics**

| Symbol | Parameter | Conditions | | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|---|
| $I_{RM}$ | reverse leakage current | $V_R$ = 5.5 V; $T_{amb}$ = 25 °C | | - | 1 | 100 | nA |
| $C_d$ | diode capacitance | f = 1 MHz; $V_R$ = 0 V; $T_{amb}$ = 25 °C | | - | 8.6 | 10.3 | pF |
| | | f = 1 MHz; $V_R$ = 2.5 V; $T_{amb}$ = 25 °C | | - | 7.7 | - | pF |
| $V_{CL}$ | clamping voltage | $I_{PPM}$ = 8 A; $t_p$ = 8/20 µs; $T_{amb}$ = 25 °C | [1] | - | 8.5 | 10.2 | V |
| | | $I_{PPM}$ = 16 A; $t_p$ = TLP; $T_{amb}$ = 25 °C | [2] | - | 8.8 | - | V |
| $R_{dyn}$ | dynamic resistance | $I_R$ = 10 A; $T_{amb}$ = 25 °C | [2] | - | 0.2 | - | Ω |
| | | $I_R$ = -10 A; $T_{amb}$ = 25 °C | [2] | - | 0.2 | - | Ω |
| $f_{-3dB}$ | -3 dB cut-off frequency | $T_{amb}$ = 25 °C; normalized to attenuation at 1 MHz | | - | 550 | - | MHz |
| $V_{t1}$ | trigger voltage | TLP, 100 ns; $T_{amb}$ = 25 °C | | - | 8.2 | - | V |
| $V_h$ | holding voltage | | | 4.3 | 5.5 | - | V |

[1] In accordance with IEC 61000-4-5 (8/20 µs current waveform).
[2] Non-repetitive current pulse, Transmission Line Pulse (TLP); square pulse; ANSI/ESD STM5.5.1-2008

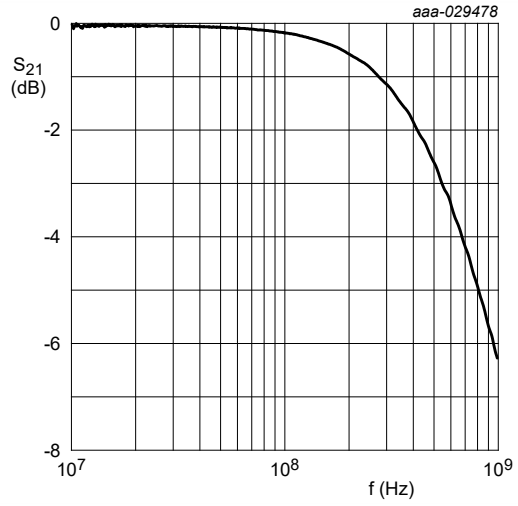
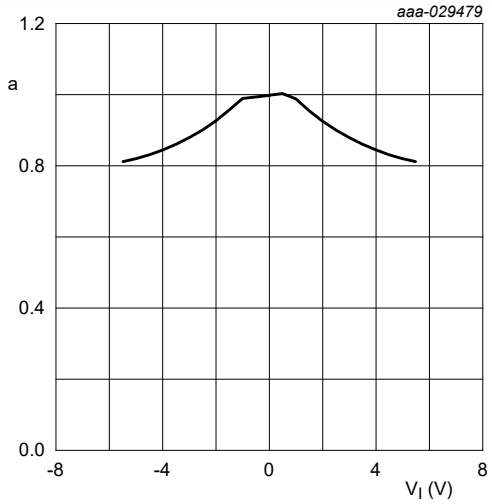



**Fig. 3. Insertion loss; typical values**

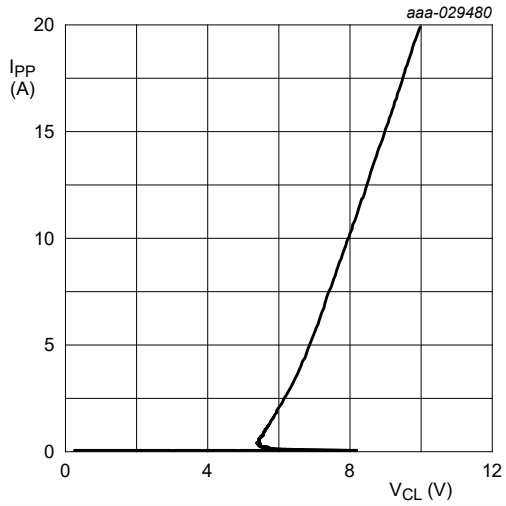



$$a = \frac{C_d}{C_d(V_{RWM} = 0\ V)}$$

**Fig. 4. Relative capacitance as a function of input voltage; typical values**

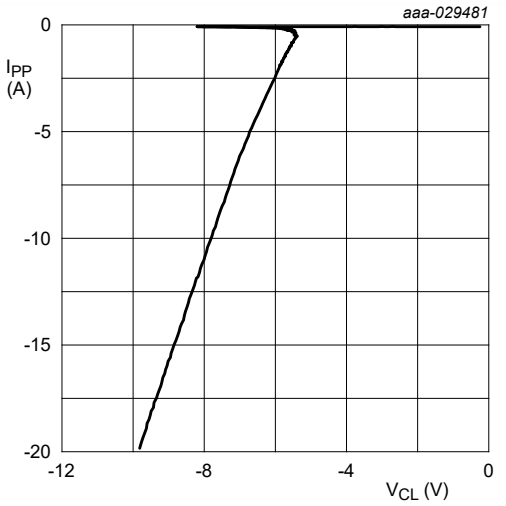

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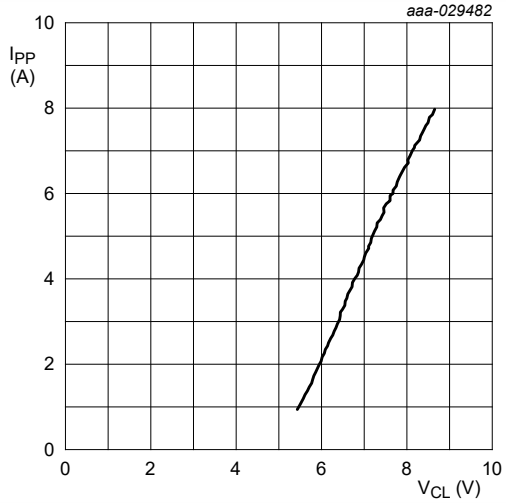

$t_r$ = 1 ns
$t_p$ = 100 ns; Transmission Line Pulse (TLP)

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



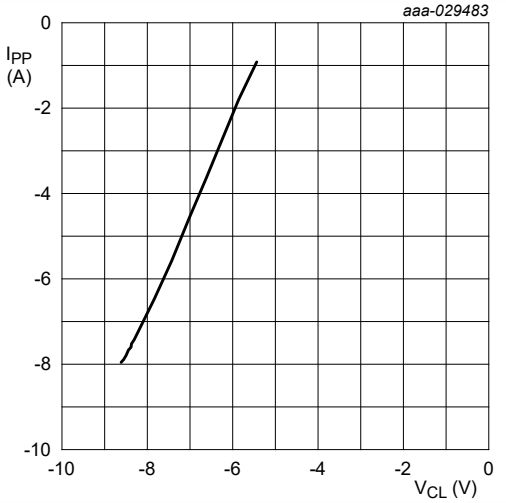

$t_r$ = 1 ns
$t_p$ = 100 ns; Transmission Line Pulse (TLP)

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




IEC 61000-4-5; $t_p$ = 8/20 µs; positive pulse

**Fig. 7. Dynamic resistance with positive clamping; typical values**




IEC 61000-4-5; $t_p$ = 8/20 µs; negative pulse

**Fig. 8. Dynamic resistance with negative clamping; typical values**


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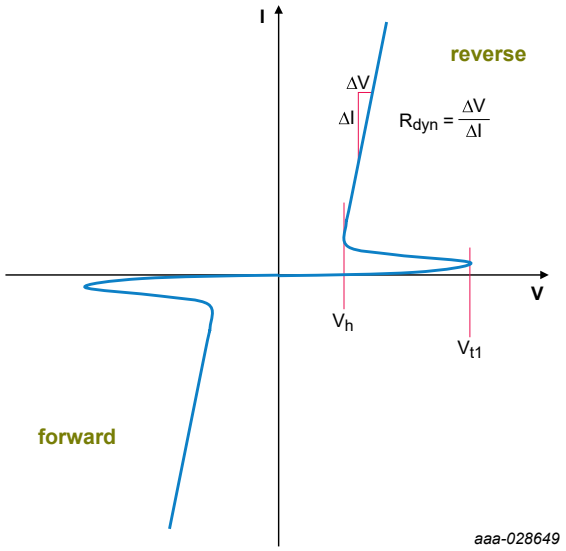



**Fig. 9. Definition of snap-back voltage and trigger voltage in a Transmission Line Pulse (TLP) diagram**

# 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 uses an advanced clamping structure showing a negative dynamic resistance. This snap-back behavior strongly reduces the clamping voltage to the system behind the ESD protection during an ESD event. Do not connect unlimited DC current sources to the data lines to avoid keeping the ESD protection device in snap-back state after exceeding breakdown voltage (due to an ESD pulse for instance).

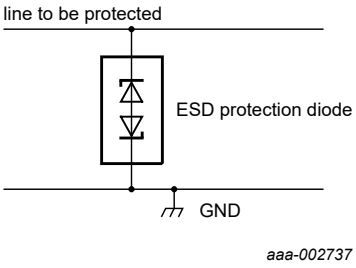



**Fig. 10. Application diagram**

### Circuit board layout and protection device placement

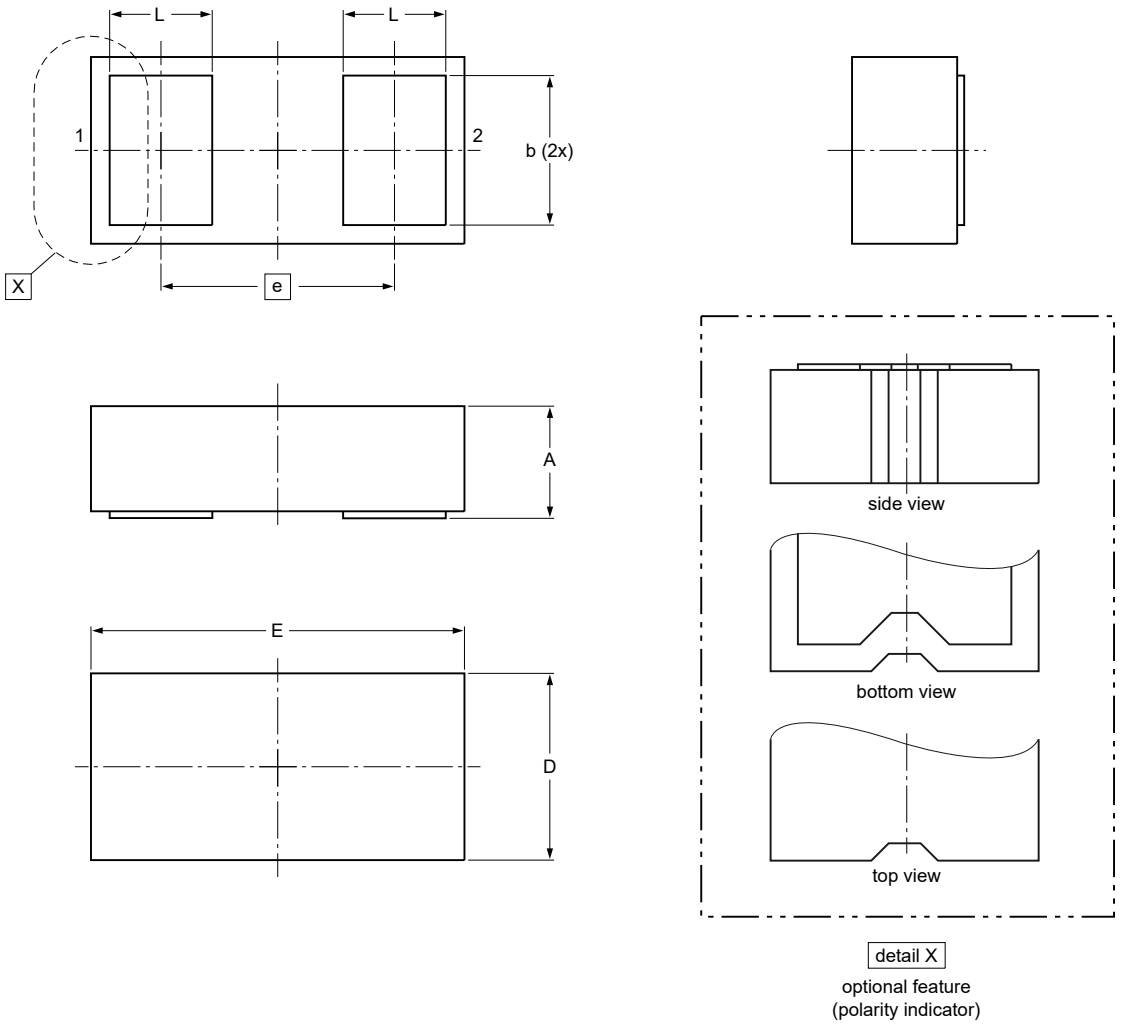
Circuit board layout is critical for the suppression of ESD, Electrical Fast Transient (EFT) and surge transients. The following guidelines are recommended:

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.


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# 11. Package outline

**DSN0402B-2, leadless tiny package; 2 terminals** **SOD992B**




Dimensions (mm are the original dimensions)

| Unit | | A | E | D | L | b | e |
|---|---|---|---|---|---|---|---|
| mm | max | 0.14 | 0.46 | 0.26 | 0.15 | 0.22 | |
| | nom | 0.12 | 0.43 | 0.23 | 0.13 | 0.20 | 0.28 |
| | min | 0.10 | 0.40 | 0.20 | 0.11 | 0.18 | |

*sod992b_po*

| Outline version | References | | | | European projection | Issue date |
|---|---|---|---|---|---|---|
| | IEC | JEDEC | JEITA | | | |
| SOD992B | | --- | | | | ~~18-08-21~~ 18-08-22 |

**Fig. 11. Package outline DSN0402B (SOD992B)**


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# 12. Soldering

**Footprint information for reflow soldering of DSN0402B-2, leadless tiny package; 2 terminals** **SOD992B**

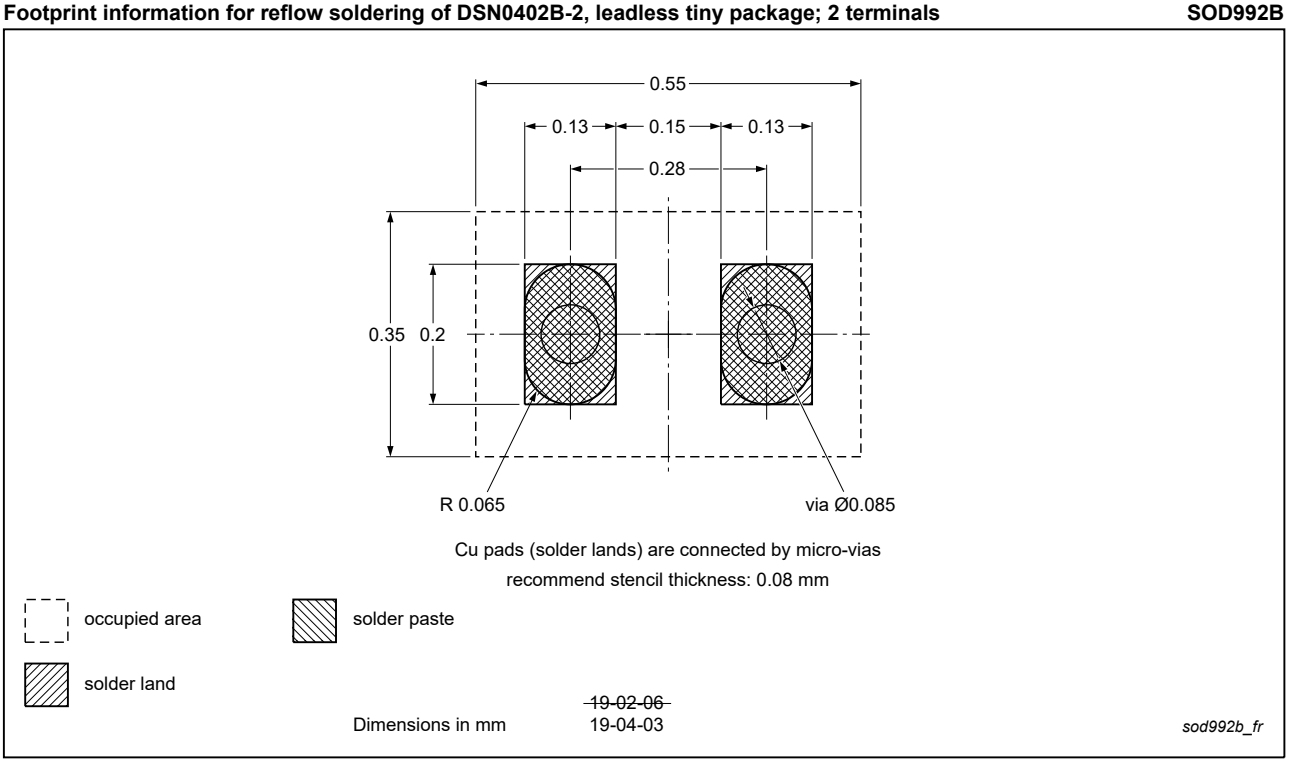



**Fig. 12. Reflow soldering footprint for DSN0402B (SOD992B)**


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# 13. Revision history

**Table 7. Revision history**

| Data sheet ID | Release date | Data sheet status | Change notice | Supersedes |
|---|---|---|---|---|
| PESD5V5V1BCSN v.3 | 20191002 | Product data sheet | - | PESD5V5V1BCSN v.2 |
| Modifications: | • Changed document status to " Product data sheet" | | | |
| PESD5V5V1BCSN v.2 | 20190722 | Preliminary data sheet | - | PESD5V5V1BCSN v.1 |
| PESD5V5V1BCSN v.1 | 20190213 | Preliminary data sheet | - | - |


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| 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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