# PESD16VV1BSF

## Extremely symmetrical bidirectional ESD protection diode

3 March 2021 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 µs | [1] [2] | - | - | 1.3 | A |

[1] According to IEC 61000-4-5 and IEC 61643-321.
[2] In positive and negative direction.

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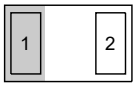
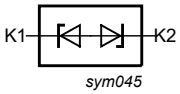
# 5. Pinning information

**Table 2. Pinning information**

| Pin | Symbol | Description | Simplified outline | Graphic symbol |
|---|---|---|---|---|
| 1 | K1 | cathode (diode 1) |  Transparent top view **DSN0603-2 (SOD962-2)** |  |
| 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 µs | [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.

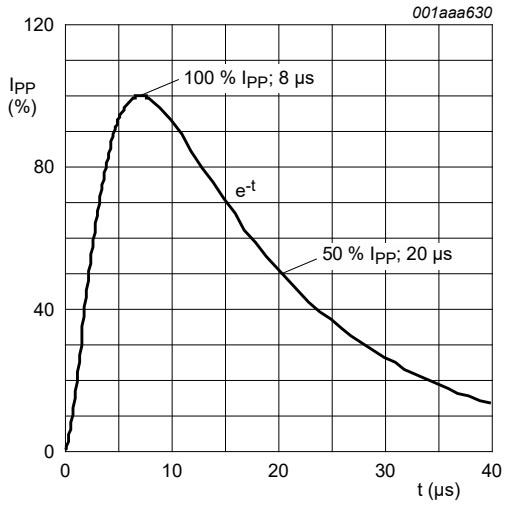



Fig. 1. 8/20 µs pulse waveform according to IEC 61000-4-5

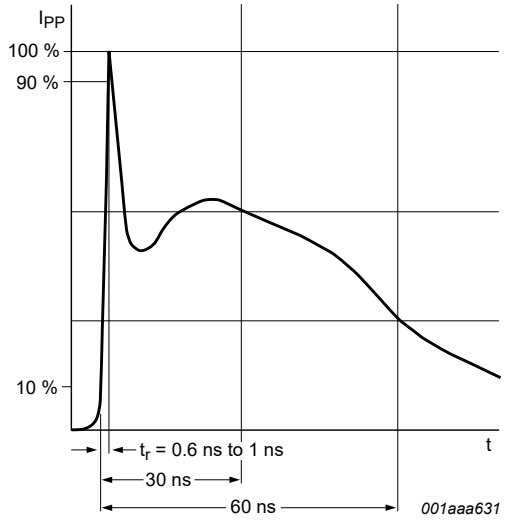


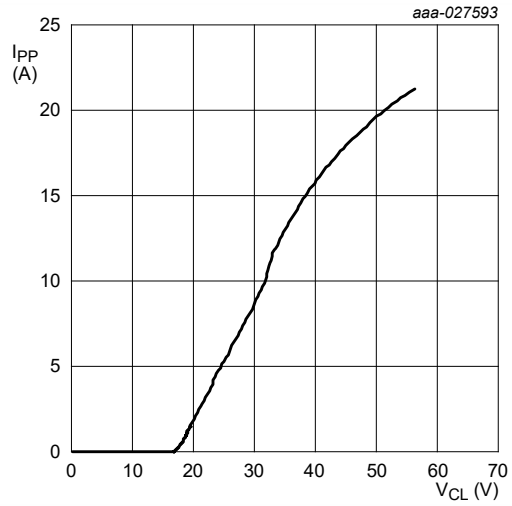

Fig. 2. ESD pulse waveform according to IEC 61000-4-2

# 9. Characteristics

**Table 6. Characteristics**

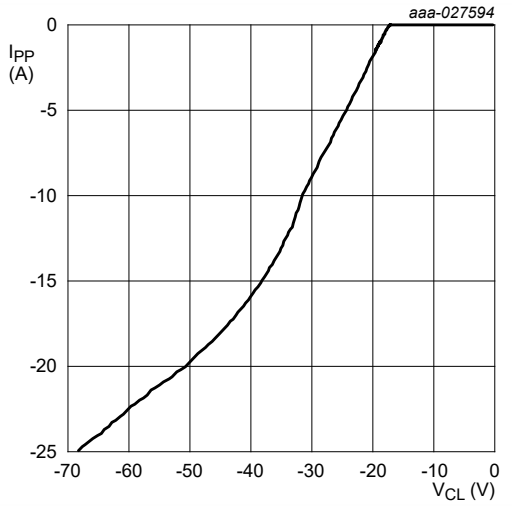
| Symbol | Parameter | Conditions | | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|---|
| $V_{BR}$ | breakdown voltage | $I_R$ = 1 mA; $T_{amb}$ = 25 °C | | 16.2 | 18 | - | V |
| $I_{RM}$ | reverse leakage current | $V_{RWM}$ = 16 V; $T_{amb}$ = 25 °C | | - | 1 | 50 | nA |
| $C_d$ | diode capacitance | 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.



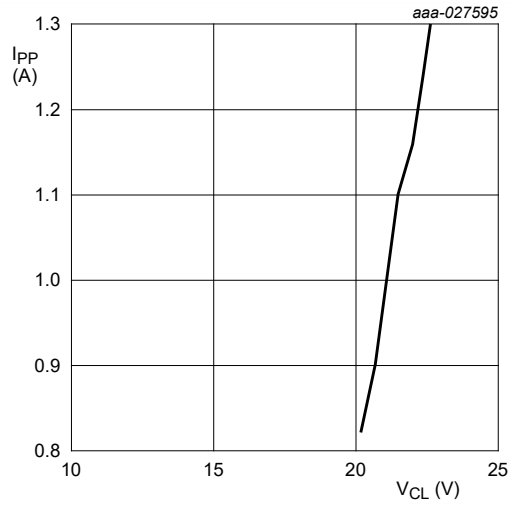

$t_p$ = 100 ns; Transmission Line Pulse (TLP)

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



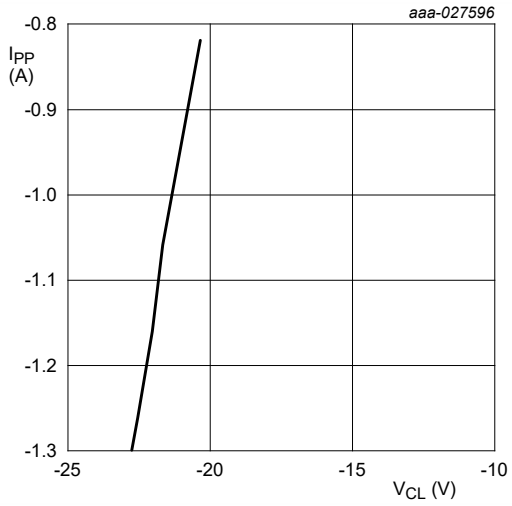

$t_p$ = 100 ns; Transmission Line Pulse (TLP)

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




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

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




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

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

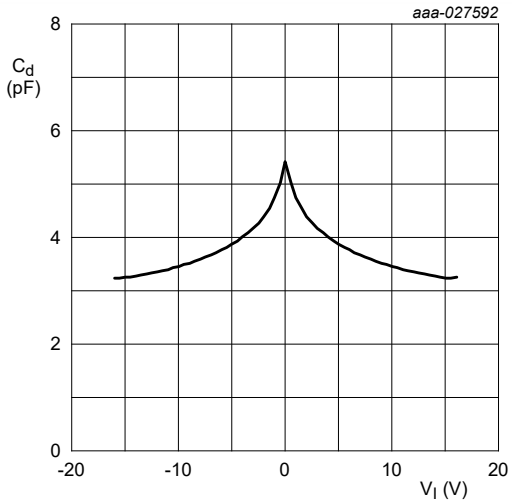



**Fig. 7. Diode capacitance as a function of input voltage; typical values**

# 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.

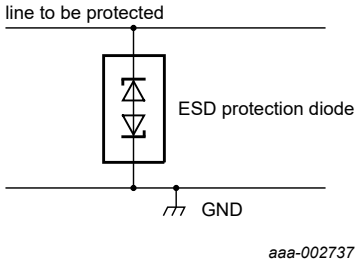



**Fig. 8. Application diagram**

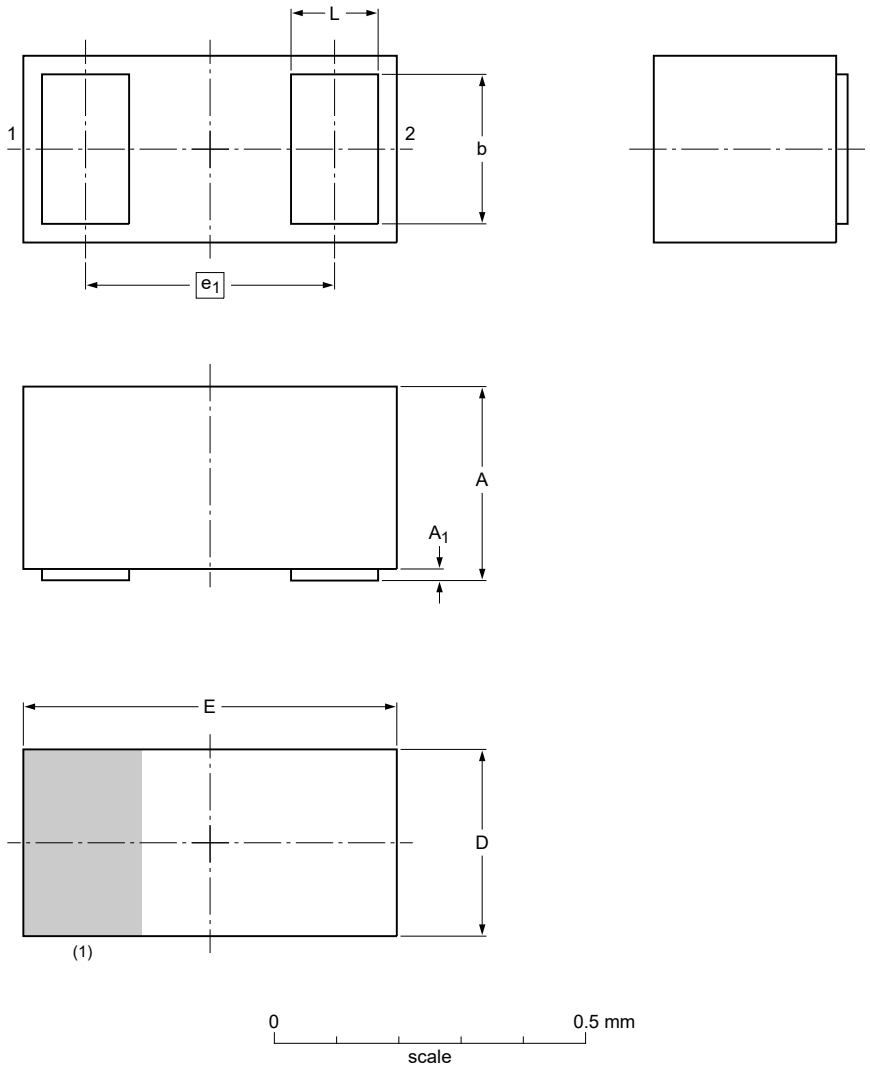
**Circuit board layout and protection device placement**

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

**Leadless ultra small package; 2 terminals; body 0.6 x 0.3 x 0.3 mm** **SOD962-2**




Dimensions (mm are the original dimensions)

| Unit | | A | $A_1$ | b | D | E | $e_1$ | L |
|---|---|---|---|---|---|---|---|---|
| mm | max | 0.32 | 0.03 | 0.25 | 0.325 | 0.625 | | 0.15 |
| | nom | | | | | | 0.4 | |
| | min | 0.28 | | 0.23 | 0.275 | 0.575 | | 0.13 |

Note
1. The marking bar indicates the cathode.

*sod962-2_po*

| Outline version | References | | | | European projection | Issue date |
|---|---|---|---|---|---|---|
| | IEC | JEDEC | JEITA | | | |
| SOD962-2 | | | | | | ~~13-07-12~~ 13-07-17 |

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

## 12. Soldering

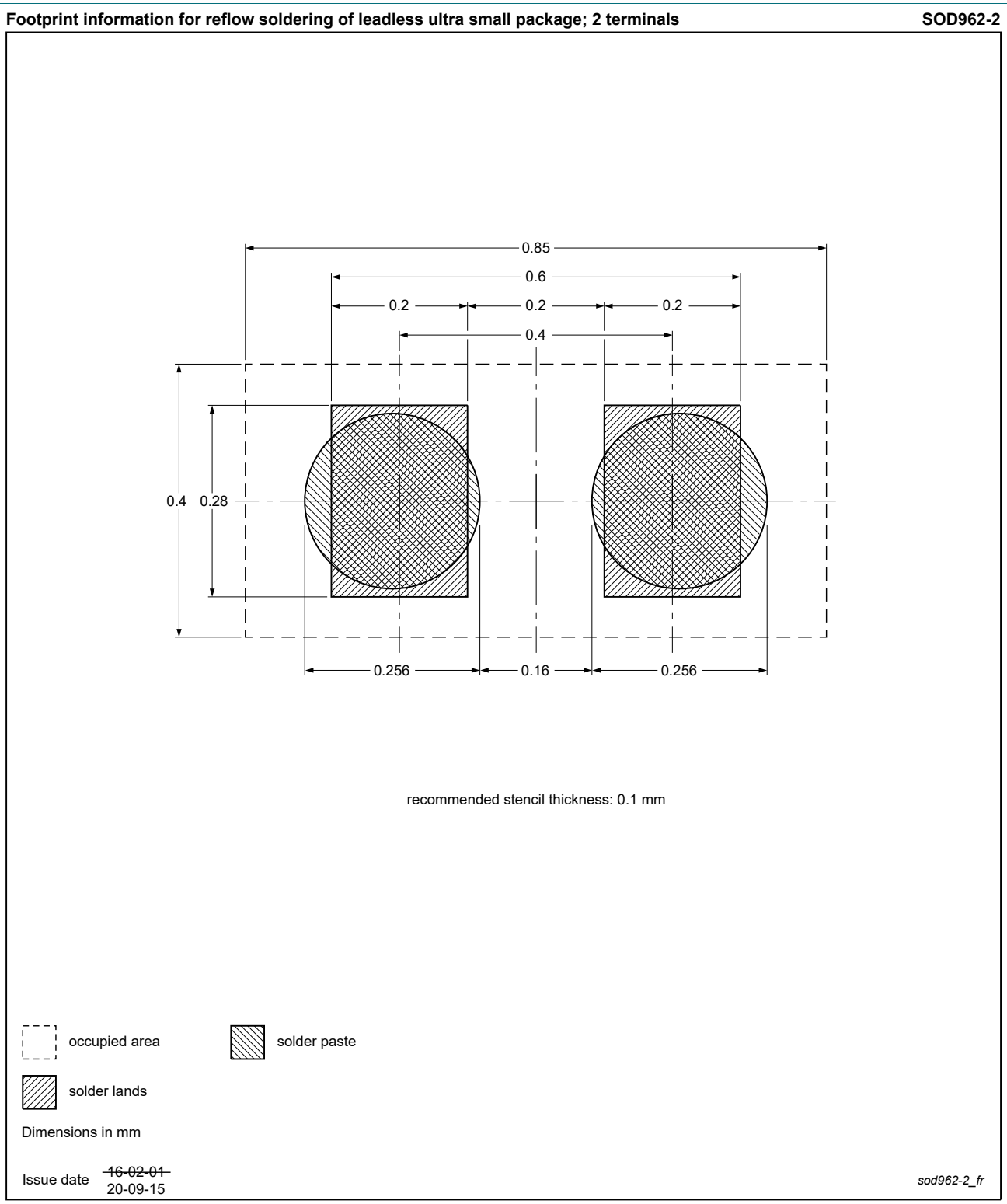



**Fig. 10. Reflow soldering footprint for DSN0603-2 (SOD962-2)**

# 13. Revision history

**Table 7. Revision history**

| Data sheet ID | Release date | Data sheet status | Change notice | Supersedes |
|---|---|---|---|---|
| PESD16VV1BSF v.4 | 20210303 | Product data sheet | - | PESD16VV1BSF v.3 |
| Modifications: | • Figure "Reflow soldering footprint" updated | | | |
| PESD16VV1BSF v.3 | 20180705 | Product data sheet | - | PESD16VV1BSF v.2 |
| PESD16VV1BSF v.2 | 20180420 | Product data sheet | - | PESD16VV1BSF v.1 |
| PESD16VV1BSF v.1 | 20180404 | Product data sheet | - | - |

# 14. Legal information

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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. |
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| 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.
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**Date of release: 3 March 2021**