

## 1. General description

Ultrafast power diode in a SOD59 (2-lead TO-220AC) plastic package.

## 2. Features and benefits

- Fast switching
- Guaranteed ESD capability
- High thermal cycling performance
- Low on-state loss
- Low thermal resistance
- Rugged: reverse voltage surge capability
- Soft recovery minimizes power-consuming oscillations

## 3. Applications

- Output rectifiers in high-frequency switched-mode power supplies

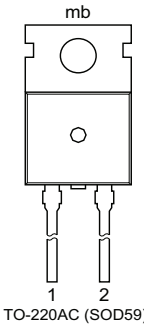
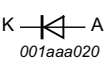
## 4. Quick reference data

Table 1. Quick reference data

| Symbol                         | Parameter                           | Conditions   | Values |     |       | Unit |
|--------------------------------|-------------------------------------|--|--------|-----|-------|------|
| <b>Absolute maximum rating</b> |                                     |  |        |     |       |      |
| $V_{RRM}$                      | repetitive peak reverse voltage     |  | 200    |     |       | V    |
| $I_{F(AV)}$                    | average forward current             | $\delta = 0.5$ ; $T_{mb} \leq 128$ °C; square-wave pulse; <a href="#">Fig. 1</a> ; <a href="#">Fig. 2</a>                            | 8      |     |       | A    |
| $I_{FRM}$                      | repetitive peak forward current     | $\delta = 0.5$ ; $t_p = 25$ $\mu$ s; $T_{mb} \leq 128$ °C; square-wave pulse   | 16     |     |       | A    |
| $I_{FSM}$                      | non-repetitive peak forward current | $t_p = 10$ ms; $T_{j(init)} = 25$ °C; sine-wave pulse  | 80     |     |       | A    |
|                                |                                     | $t_p = 8.3$ ms; $T_{j(init)} = 25$ °C; sine-wave pulse   | 88     |     |       | A    |
| Symbol                         | Parameter                           | Conditions   | Min    | Typ | Max   | Unit |
| <b>Static characteristics</b>  |                                     |  |        |     |       |      |
| $V_F$                          | forward voltage                     | $I_F = 8$ A; $T_j = 150$ °C; <a href="#">Fig. 4</a>  | -      | 0.8 | 0.895 | V    |
| <b>Dynamic characteristics</b> |                                     |  |        |     |       |      |
| $t_{rr}$                       | reverse recovery time               | $I_F = 1$ A; $V_R = 30$ V; $di_F/dt = 100$ A/ $\mu$ s; $T_j = 25$ °C; ramp recovery; <a href="#">Fig. 5</a> ; <a href="#">Fig. 7</a> | -      | 20  | 25    | ns   |
| <b>Electrostatic discharge</b> |                                     |  |        |     |       |      |
| $V_{ESD}$                      | electrostatic discharge voltage     | HBM; C = 250 pF; R = 1.5 k $\Omega$  | -      | -   | 8     | kV   |

## 5. Pinning information

Table 2. Pinning information

| Pin | Symbol | Description            | Simplified outline   | Graphic symbol  |
|-----|--------|------------------------|--|---|
| 1   | K      | cathode                |  |  |
| 2   | A      | anode                  |  |   |
| mb  | mb     | mounting base; cathode |  |   |

## 6. Ordering information

Table 3. Ordering information

| Type number | Package  |  |         |
|-------------|----------|--|---------|
|             | Name     | Description  | Version |
| BYW29E-200  | TO-220AC | plastic single-ended package; heatsink mounted; 1 mounting hole; 2-lead TO-220AC | SOD59   |

## 7. Marking

Table 4. Marking codes

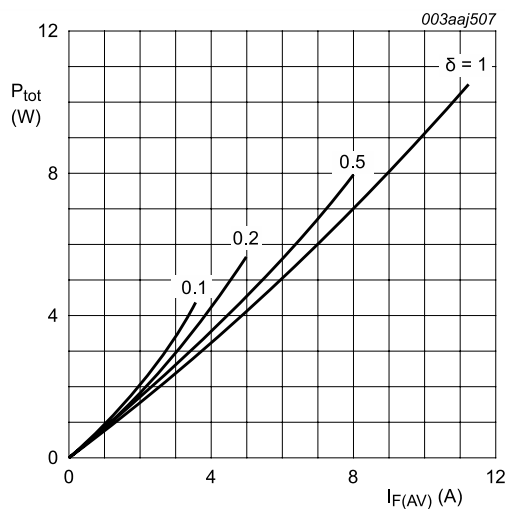
| Type number | Marking codes |
|-------------|---------------|
| BYW29E-200  | BYW29E-200    |

## 8. Limiting values

**Table 5. Limiting values**

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

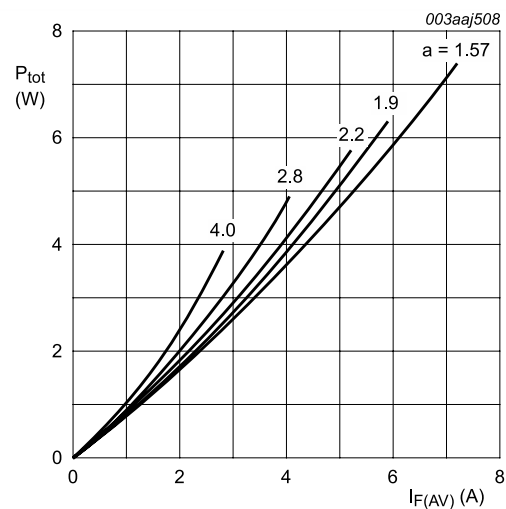
| Symbol                         | Parameter                           | Conditions  | Values     | Unit             |
|--------------------------------|-------------------------------------|---|------------|------------------|
| $V_{RRM}$                      | repetitive peak reverse voltage     |   | 200        | V                |
| $V_{RWM}$                      | crest working reverse voltage       |   | 200        | V                |
| $V_R$                          | reverse voltage                     |   | 200        | V                |
| $I_{F(AV)}$                    | average forward current             | $\delta = 0.5$ ; $T_{mb} \leq 128\text{ }^\circ\text{C}$ ; square-wave pulse; <a href="#">Fig. 1</a> ; <a href="#">Fig. 2</a> | 8          | A                |
| $I_{FRM}$                      | repetitive peak forward current     | $\delta = 0.5$ ; $t_p = 25\text{ }\mu\text{s}$ ; $T_{mb} \leq 128\text{ }^\circ\text{C}$ ; square-wave pulse                  | 16         | A                |
| $I_{FSM}$                      | non-repetitive peak forward current | $t_p = 10\text{ ms}$ ; $T_{j(\text{init})} = 25\text{ }^\circ\text{C}$ ; sine-wave pulse                                      | 80         | A                |
|                                |                                     | $t_p = 8.3\text{ ms}$ ; $T_{j(\text{init})} = 25\text{ }^\circ\text{C}$ ; sine-wave pulse                                     | 88         | A                |
| $I_{RRM}$                      | repetitive peak reverse current     | $\delta = 0.001$ ; $t_p = 2\text{ }\mu\text{s}$   | 0.2        | A                |
| $I_{RSM}$                      | non-repetitive peak reverse current | $t_p = 100\text{ }\mu\text{s}$  | 0.2        | A                |
| $T_{stg}$                      | storage temperature                 |   | -40 to 150 | $^\circ\text{C}$ |
| $T_j$                          | junction temperature                |   | 150        | $^\circ\text{C}$ |
| <b>Electrostatic discharge</b> |                                     |   |            |                  |
| $V_{ESD}$                      | electrostatic discharge voltage     | HBM; C = 250 pF; R = 1.5 k $\Omega$   | 8          | kV               |



$$I_{F(AV)} = I_{F(RMS)} \times \sqrt{\delta}$$

$$V_o = 0.791\text{ V}; R_s = 0.013\text{ }\Omega$$

**Fig. 1. Forward power dissipation as a function of average forward current; square waveform; maximum values**



$$a = \text{form factor} = I_{F(RMS)} / I_{F(AV)}$$

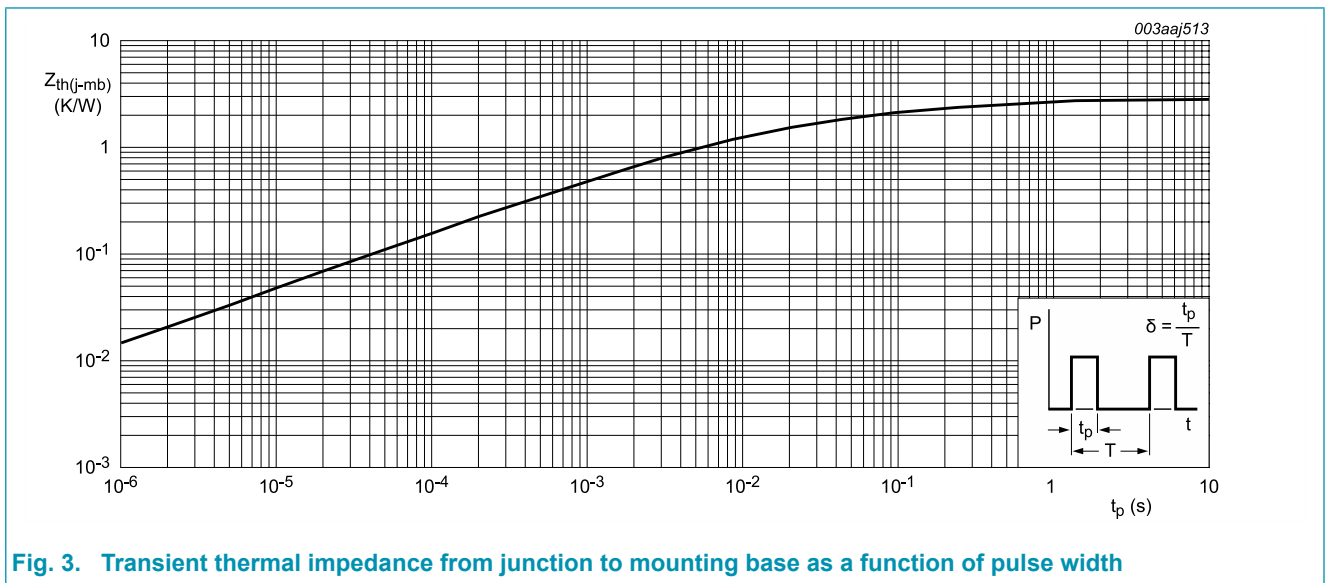
$$V_o = 0.791\text{ V}; R_s = 0.013\text{ }\Omega$$

**Fig. 2. Forward power dissipation as a function of average forward current; sinusoidal waveform; maximum values**

### 9. Thermal characteristics

Table 6. Thermal characteristics

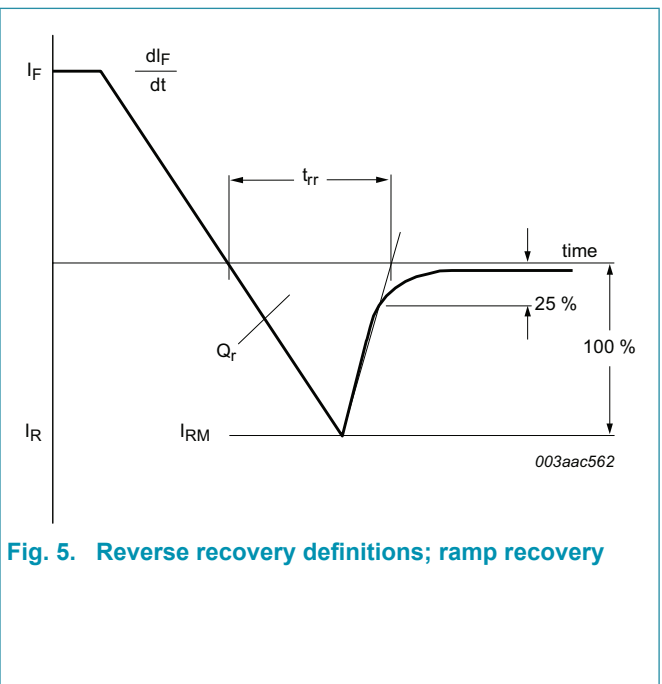
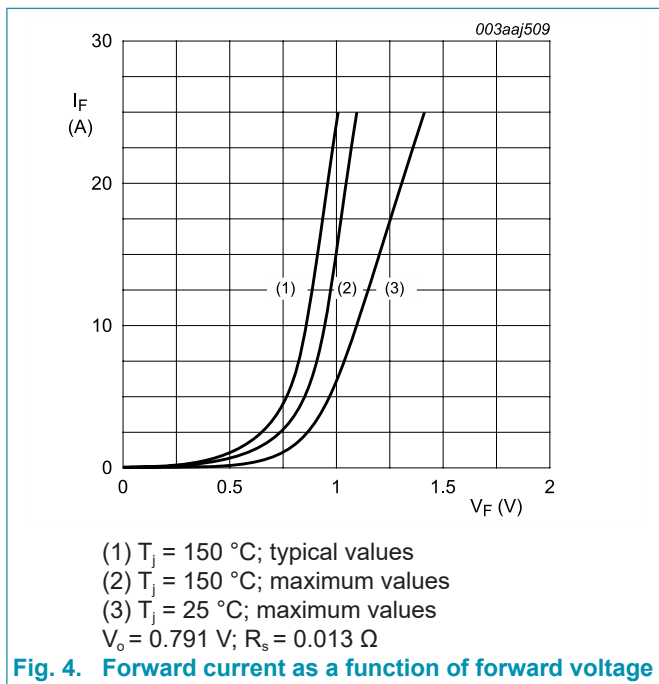
| Symbol         | Parameter   | Conditions             | Min | Typ | Max | Unit |
|----------------|---|------------------------|-----|-----|-----|------|
| $R_{th(j-mb)}$ | thermal resistance from junction to mounting base | <a href="#">Fig. 3</a> | -   | -   | 2.7 | K/W  |
| $R_{th(j-a)}$  | thermal resistance from junction to ambient       | in free air            | -   | 60  | -   | K/W  |

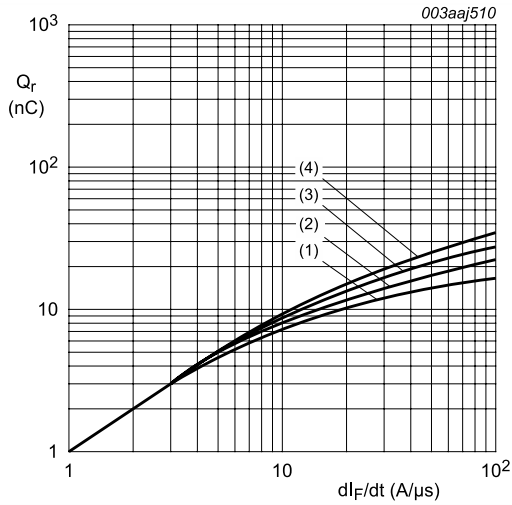


### 10. Characteristics

Table 7. Characteristics

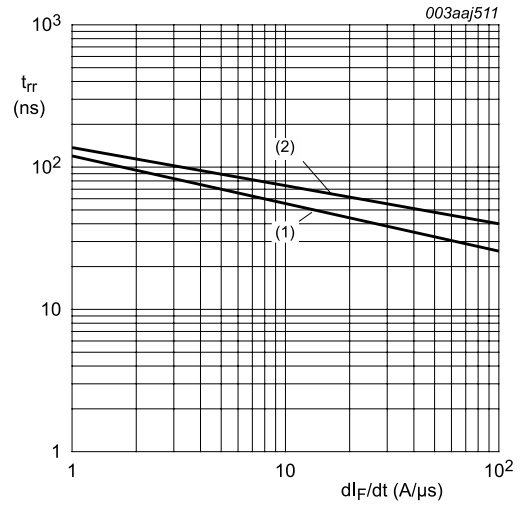
| Symbol                         | Parameter                | Conditions   | Min | Typ  | Max   | Unit          |
|--------------------------------|--------------------------|--|-----|------|-------|---------------|
| <b>Static characteristics</b>  |                          |  |     |      |       |               |
| $V_F$                          | forward voltage          | $I_F = 8 \text{ A}; T_j = 25 \text{ }^\circ\text{C}; \text{ Fig. 4}$   | -   | 0.92 | 1.05  | V             |
|                                |                          | $I_F = 20 \text{ A}; T_j = 25 \text{ }^\circ\text{C}; \text{ Fig. 4}$  | -   | 1.1  | 1.3   | V             |
|                                |                          | $I_F = 8 \text{ A}; T_j = 150 \text{ }^\circ\text{C}; \text{ Fig. 4}$  | -   | 0.8  | 0.895 | V             |
| $I_R$                          | reverse current          | $V_R = 200 \text{ V}; T_j = 25 \text{ }^\circ\text{C}$   | -   | 2    | 10    | $\mu\text{A}$ |
|                                |                          | $V_R = 200 \text{ V}; T_j = 100 \text{ }^\circ\text{C}$  | -   | 0.2  | 0.6   | mA            |
| <b>Dynamic characteristics</b> |                          |  |     |      |       |               |
| $Q_r$                          | recovered charge         | $I_F = 2 \text{ A}; V_R = 30 \text{ V}; dI_F/dt = 20 \text{ A}/\mu\text{s}; T_j = 25 \text{ }^\circ\text{C}; \text{ Fig. 5}; \text{ Fig. 6}$                         | -   | 4    | 11    | nC            |
| $t_{rr}$                       | reverse recovery time    | $I_F = 1 \text{ A}; V_R = 30 \text{ V}; dI_F/dt = 100 \text{ A}/\mu\text{s}; T_j = 25 \text{ }^\circ\text{C}; \text{ ramp recovery}; \text{ Fig. 5}; \text{ Fig. 7}$ | -   | 20   | 25    | ns            |
|                                |                          | $I_F = 0.5 \text{ A}; I_R = 1 \text{ A}; I_{R(\text{meas})} = 0.25 \text{ A}; T_j = 25 \text{ }^\circ\text{C}; \text{ step recovery}; \text{ Fig. 8}$                | -   | 15   | 20    | ns            |
| $V_{FRM}$                      | forward recovery voltage | $I_F = 1 \text{ A}; dI_F/dt = 10 \text{ A}/\mu\text{s}; T_j = 25 \text{ }^\circ\text{C}; \text{ Fig. 9}$   | -   | 1    | -     | V             |





- (1)  $I_F = 1 \text{ A}; T_j = 25 \text{ }^\circ\text{C}$
- (2)  $I_F = 2 \text{ A}; T_j = 25 \text{ }^\circ\text{C}$
- (3)  $I_F = 5 \text{ A}; T_j = 25 \text{ }^\circ\text{C}$
- (4)  $I_F = 10 \text{ A}; T_j = 25 \text{ }^\circ\text{C}$

Fig. 6. Recovered charge as a function of rate of change of forward current; maximum values



- (1)  $I_F = 1 \text{ A}; T_j = 25 \text{ }^\circ\text{C}$
- (2)  $I_F = 10 \text{ A}; T_j = 25 \text{ }^\circ\text{C}$

Fig. 7. Reverse recovery time as a function of rate of change of forward current; maximum values

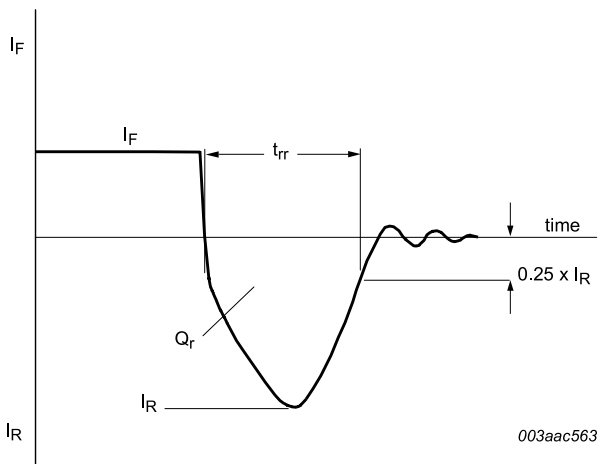


Fig. 8. Reverse recovery definitions; step recovery

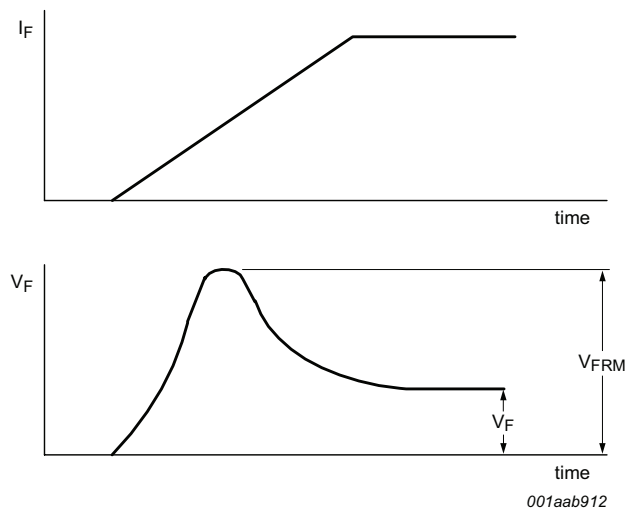
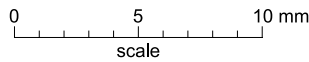
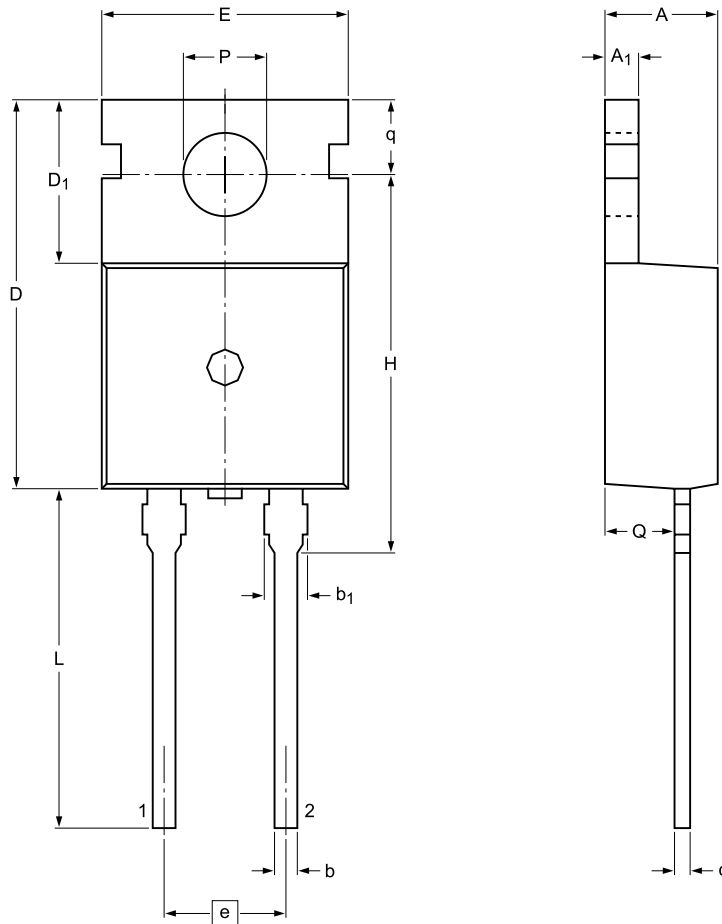


Fig. 9. Forward recovery definitions

### 11. Package outline

Plastic single-ended package; heatsink mounted; 1 mounting hole; 2-lead TO-220AC

SOD59



Dimensions

| Unit | A   | A <sub>1</sub> | b    | b <sub>1</sub> (1) | c    | D    | D <sub>1</sub> | E     | e     | H     | L    | P    | Q   | q   |
|------|-----|----------------|------|--------------------|------|------|----------------|-------|-------|-------|------|------|-----|-----|
| max  | 4.7 | 1.40           | 0.95 | 1.7                | 0.65 | 15.8 | 6.8            | 10.30 | 5.08  | 16.25 | 15.0 | 3.80 | 2.6 | 2.9 |
| nom  |     |                |      |                    |      |      |                |       | (REF) |       |      |      |     |     |
| min  | 4.3 | 1.15           | 0.70 | 1.3                | 0.45 | 15.6 | 6.4            | 9.65  |       | 15.70 | 12.5 | 3.65 | 2.2 | 2.7 |

Note

1. Protruded dambar are included in the dimension.

sod059\_po

| Outline version | References      |       |       | European projection | Issue date                      |
|-----------------|-----------------|-------|-------|---------------------|---------------------------------|
|                 | IEC             | JEDEC | JEITA |                     |                                 |
| SOD59           | 2-lead TO-220AC |       |       |                     | <del>09-08-25</del><br>12-11-27 |

## 12. 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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