



# BYW29E-100

## Ultrafast power diode

17 September 2013

Product data sheet

## 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

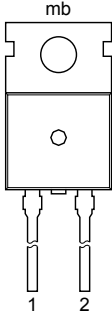
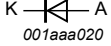
Table 1. Quick reference data

| Symbol                         | Parameter                       | Conditions                                                                                                                                                                  | Min | Typ | Max   | Unit |
|--------------------------------|---------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|-----|-------|------|
| $V_{RRM}$                      | repetitive peak reverse voltage |                                                                                                                                                                             | -   | -   | 100   | V    |
| $I_{F(AV)}$                    | average forward current         | $\delta = 0.5$ ; $T_{mb} \leq 128^\circ\text{C}$ ; square-wave pulse; <a href="#">Fig. 1</a> ; <a href="#">Fig. 2</a>                                                       | -   | -   | 8     | A    |
| <b>Static characteristics</b>  |                                 |                                                                                                                                                                             |     |     |       |      |
| $V_F$                          | forward voltage                 | $I_F = 8\text{ A}$ ; $T_J = 150^\circ\text{C}$ ; <a href="#">Fig. 4</a>                                                                                                     | -   | 0.8 | 0.895 | V    |
| <b>Dynamic characteristics</b> |                                 |                                                                                                                                                                             |     |     |       |      |
| $t_{rr}$                       | reverse recovery time           | $I_F = 1\text{ A}$ ; $V_R = 30\text{ V}$ ; $dI_F/dt = 100\text{ A}/\mu\text{s}$ ; $T_J = 25^\circ\text{C}$ ; 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; $C = 250\text{ pF}$ ; $R = 1.5\text{ k}\Omega$                                                                                                                         | -   | -   | 8     | kV   |



## 5. Pinning information

Table 2. Pinning information

| Pin | Symbol | Description            | Simplified outline                                                                                        | Graphic symbol                                                                      |
|-----|--------|------------------------|-----------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| 1   | K      | cathode                |  <p>TO-220AC (SOD59)</p> |  |
| 2   | A      | anode                  |                                                                                                           |                                                                                     |
| mb  | mb     | mounting base; cathode |                                                                                                           |                                                                                     |

## 6. Ordering information

Table 3. Ordering information

| Type number | Package  |                                                                                  |         |
|-------------|----------|----------------------------------------------------------------------------------|---------|
|             | Name     | Description                                                                      | Version |
| BYW29E-100  | TO-220AC | plastic single-ended package; heatsink mounted; 1 mounting hole; 2-lead TO-220AC | SOD59   |

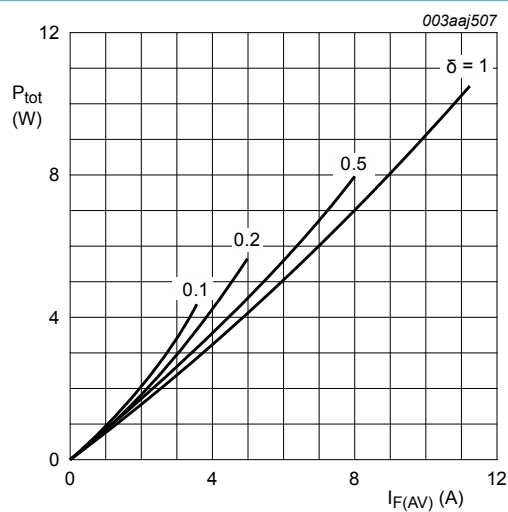
## 7. Limiting values

Table 4. Limiting values

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

| Symbol      | Parameter                           | Conditions                                                                                                                      | Min | Max | Unit |
|-------------|-------------------------------------|---------------------------------------------------------------------------------------------------------------------------------|-----|-----|------|
| $V_{RRM}$   | repetitive peak reverse voltage     |                                                                                                                                 | -   | 100 | V    |
| $V_{RWM}$   | crest working reverse voltage       |                                                                                                                                 | -   | 100 | V    |
| $V_R$       | reverse voltage                     |                                                                                                                                 | -   | 100 | 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 | $t_p = 8.3\text{ ms}$ ; $T_{j(\text{init})} = 25\text{ }^{\circ}\text{C}$ ; sine-wave pulse                                     | -   | 88  | A    |
|             |                                     | $t_p = 10\text{ ms}$ ; $T_{j(\text{init})} = 25\text{ }^{\circ}\text{C}$ ; sine-wave pulse                                      | -   | 80  | A    |
| $I_{RRM}$   | repetitive peak reverse current     | $\delta = 0.001$ ; $t_p = 2\text{ }\mu\text{s}$                                                                                 | -   | 0.2 | A    |

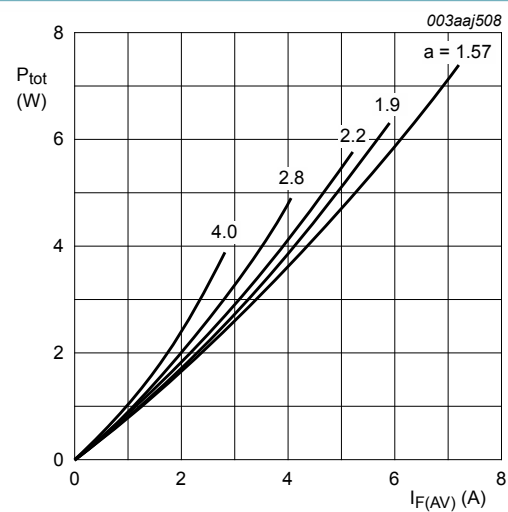
| Symbol                         | Parameter                           | Conditions                  |  | Min | Max | Unit |
|--------------------------------|-------------------------------------|-----------------------------|--|-----|-----|------|
| $I_{RSM}$                      | non-repetitive peak reverse current | $t_p = 100 \mu s$           |  | -   | 0.2 | A    |
| $T_{stg}$                      | storage temperature                 |                             |  | -40 | 150 | °C   |
| $T_j$                          | junction temperature                |                             |  | -   | 150 | °C   |
| <b>Electrostatic discharge</b> |                                     |                             |  |     |     |      |
| $V_{ESD}$                      | electrostatic discharge voltage     | HBM; C = 250 pF; R = 1.5 kΩ |  | -   | 8   | kV   |



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

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

$$V_O = 0.791 \text{ V}; R_S = 0.013 \Omega$$



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

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

$$V_O = 0.791 \text{ V}; R_S = 0.013 \Omega$$

## 8. Thermal characteristics

**Table 5. 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  |

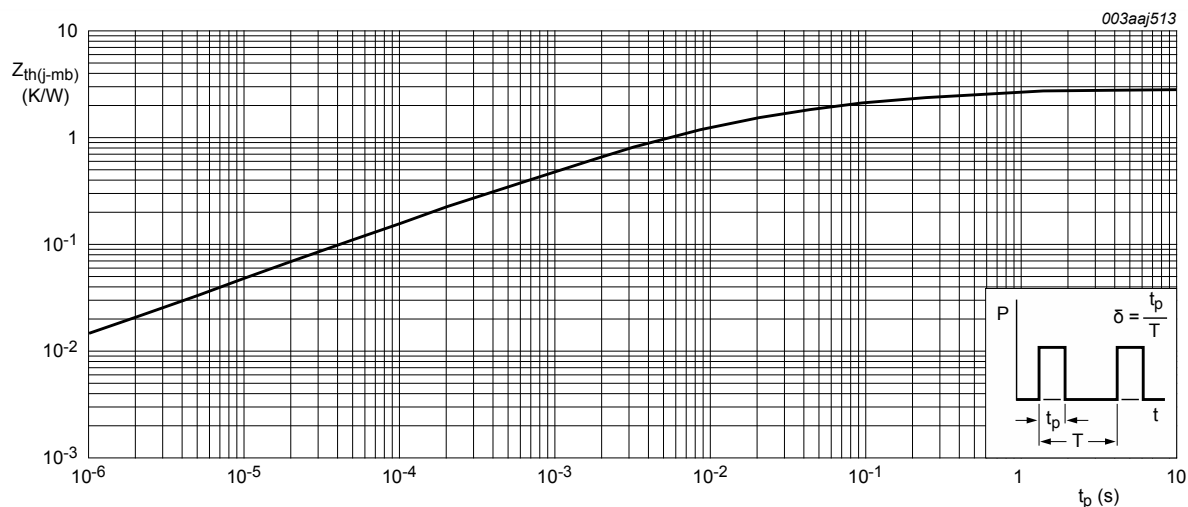
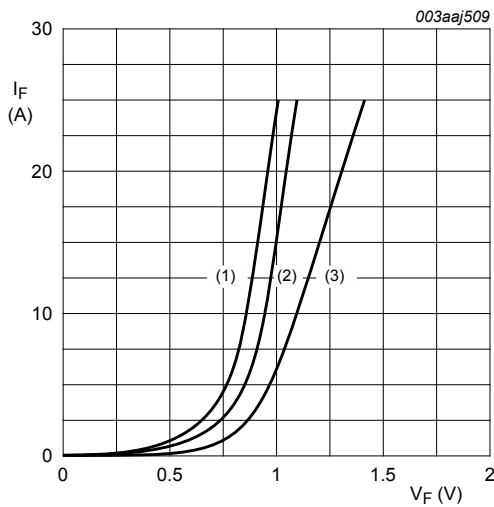


Fig. 3. Transient thermal impedance from junction to mounting base as a function of pulse width

## 9. Characteristics

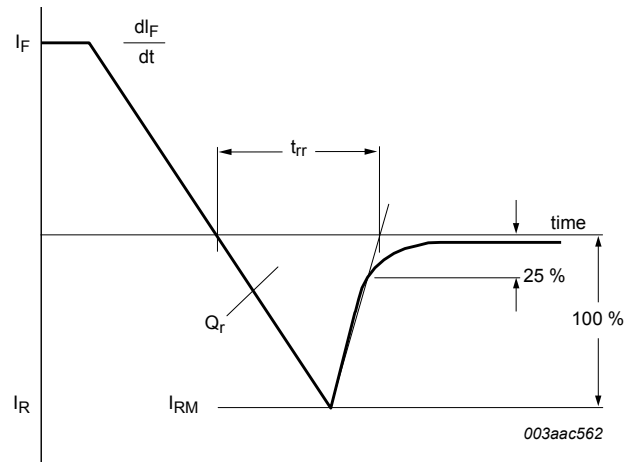
Table 6. Characteristics

| Symbol                  | Parameter                | Conditions                                                                                                                                                          |  | Min | Typ  | Max   | Unit |
|-------------------------|--------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|-----|------|-------|------|
| Static characteristics  |                          |                                                                                                                                                                     |  |     |      |       |      |
| V <sub>F</sub>          | forward voltage          | I <sub>F</sub> = 8 A; T <sub>j</sub> = 25 °C; <a href="#">Fig. 4</a>                                                                                                |  | -   | 0.92 | 1.05  | V    |
|                         |                          | I <sub>F</sub> = 20 A; T <sub>j</sub> = 25 °C; <a href="#">Fig. 4</a>                                                                                               |  | -   | 1.1  | 1.3   | V    |
|                         |                          | I <sub>F</sub> = 8 A; T <sub>j</sub> = 150 °C; <a href="#">Fig. 4</a>                                                                                               |  | -   | 0.8  | 0.895 | V    |
| I <sub>R</sub>          | reverse current          | V <sub>R</sub> = 100 V; T <sub>j</sub> = 25 °C                                                                                                                      |  | -   | 2    | 10    | μA   |
|                         |                          | V <sub>R</sub> = 100 V; T <sub>j</sub> = 100 °C                                                                                                                     |  | -   | 0.2  | 0.6   | mA   |
| Dynamic characteristics |                          |                                                                                                                                                                     |  |     |      |       |      |
| Q <sub>r</sub>          | recovered charge         | I <sub>F</sub> = 2 A; V <sub>R</sub> = 30 V; dI <sub>F</sub> /dt = 20 A/μs; T <sub>j</sub> = 25 °C; <a href="#">Fig. 5</a> ; <a href="#">Fig. 6</a>                 |  | -   | 4    | 11    | nC   |
| t <sub>rr</sub>         | reverse recovery time    | I <sub>F</sub> = 1 A; V <sub>R</sub> = 30 V; dI <sub>F</sub> /dt = 100 A/μs; T <sub>j</sub> = 25 °C; ramp recovery; <a href="#">Fig. 5</a> ; <a href="#">Fig. 7</a> |  | -   | 20   | 25    | ns   |
|                         |                          | I <sub>F</sub> = 0.5 A; I <sub>R</sub> = 1 A; I <sub>R(meas)</sub> = 0.25 A; T <sub>j</sub> = 25 °C; step recovery; <a href="#">Fig. 8</a>                          |  | -   | 15   | 20    | ns   |
| V <sub>FRM</sub>        | forward recovery voltage | I <sub>F</sub> = 1 A; dI <sub>F</sub> /dt = 10 A/μs; T <sub>j</sub> = 25 °C; <a href="#">Fig. 9</a>                                                                 |  | -   | 1    | -     | V    |

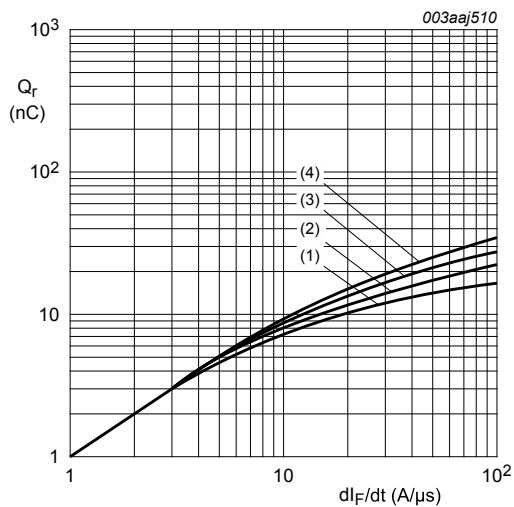


**Fig. 4. Forward current as a function of forward voltage**

- (1)  $T_j = 150\text{ °C}$ ; typical values;
  - (2)  $T_j = 150\text{ °C}$ ; maximum values;
  - (3)  $T_j = 25\text{ °C}$ ; maximum values;
- $V_O = 0.791\text{ V}$ ;  $R_S = 0.013\text{ }\Omega$

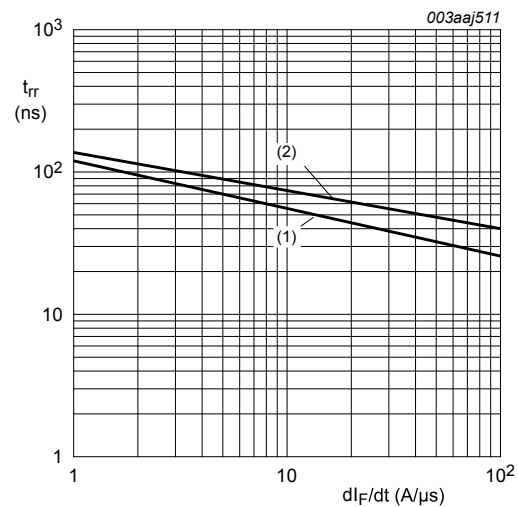


**Fig. 5. Reverse recovery definitions; ramp recovery**



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

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



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

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

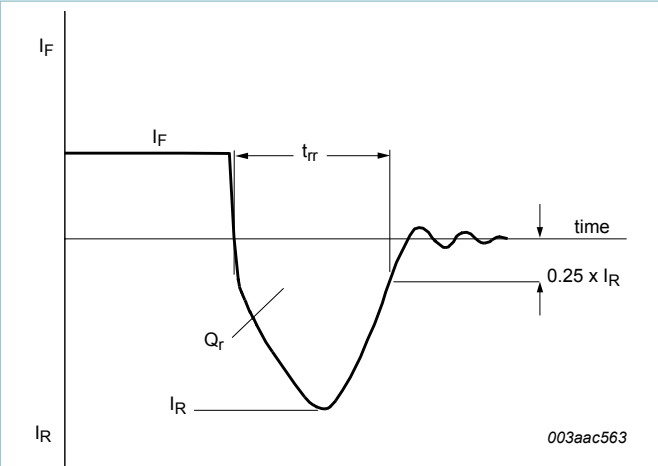


Fig. 8. Reverse recovery definitions; step recovery

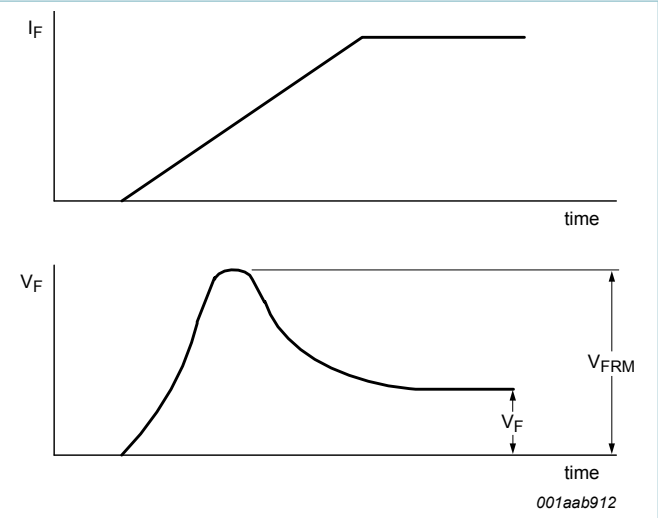


Fig. 9. Forward recovery definitions

10. Package outline

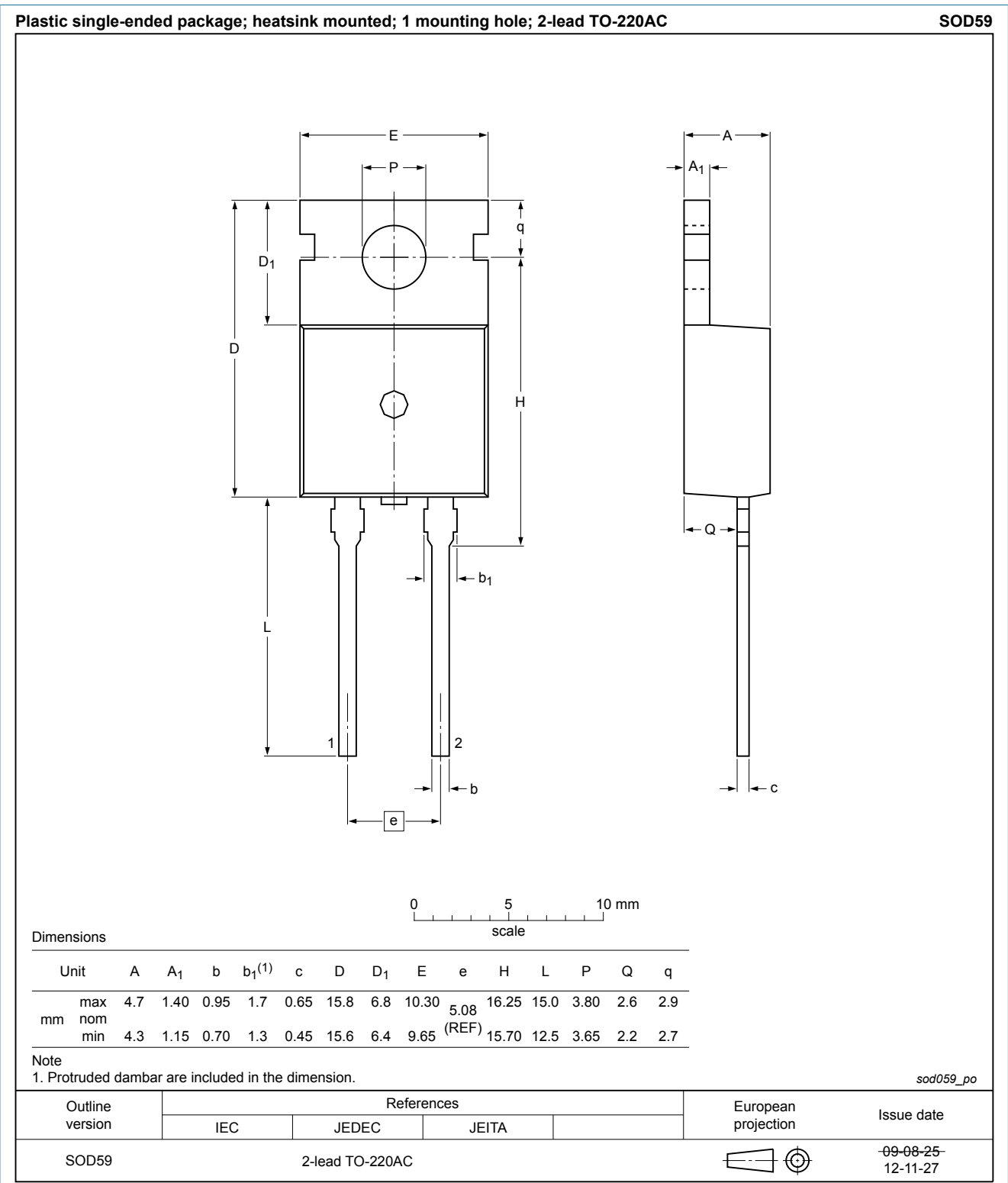


Fig. 10. Package outline TO-220AC (SOD59)

## 11. Legal information

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|--------------------------------|--------------------|---------------------------------------------------------------------------------------|
| Objective [short] data sheet   | Development        | This document contains data from the objective specification for product development. |
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