# 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 ; $T_{mb}$ ≤ 128 °C; square-wave pulse; Fig. 1; Fig. 2 | | - | - | 8 | A |
| **Static characteristics** | | | | | | | |
| $V_F$ | forward voltage | $I_F$ = 8 A; $T_j$ = 150 °C; Fig. 4 | | - | 0.8 | 0.895 | V |
| **Dynamic characteristics** | | | | | | | |
| $t_{rr}$ | reverse recovery time | $I_F$ = 1 A; $V_R$ = 30 V; $dI_F/dt$ = 100 A/µs; $T_j$ = 25 °C; ramp recovery; Fig. 5; Fig. 7 | | - | 20 | 25 | ns |
| **Electrostatic discharge** | | | | | | | |
| $V_{ESD}$ | electrostatic discharge voltage | HBM; C = 250 pF; R = 1.5 kΩ | | - | - | 8 | kV |

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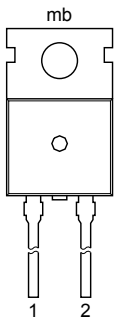
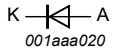
## 5. Pinning information

**Table 2. Pinning information**

| Pin | Symbol | Description | Simplified outline | Graphic symbol |
|---|---|---|---|---|
| 1 | K | cathode |   TO-220AC (SOD59) |   |
| 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 | $\delta = 0.5$ ; $T_{mb} \leq 128$ °C; square-wave pulse; Fig. 1; Fig. 2 | | - | 8 | A |
| $I_{FRM}$ | repetitive peak forward current | $\delta = 0.5$ ; $t_p = 25$ µs; $T_{mb} \leq 128$ °C; square-wave pulse | | - | 16 | A |
| $I_{FSM}$ | non-repetitive peak forward current | $t_p = 8.3$ ms; $T_{j(init)} = 25$ °C; sine-wave pulse | | - | 88 | A |
| | | $t_p = 10$ ms; $T_{j(init)} = 25$ °C; sine-wave pulse | | - | 80 | A |
| $I_{RRM}$ | repetitive peak reverse current | $\delta = 0.001$ ; $t_p = 2$ µs | | - | 0.2 | A |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| Symbol | Parameter | Conditions | | Min | Max | Unit |
|---|---|---|---|---|---|---|
| $I_{RSM}$ | non-repetitive peak reverse current | $t_p$ = 100 µs | | - | 0.2 | A |
| $T_{stg}$ | storage temperature | | | -40 | 150 | °C |
| $T_j$ | junction temperature | | | - | 150 | °C |
| **Electrostatic discharge** | | | | | | |
| $V_{ESD}$ | electrostatic discharge voltage | HBM; C = 250 pF; R = 1.5 kΩ | | - | 8 | kV |

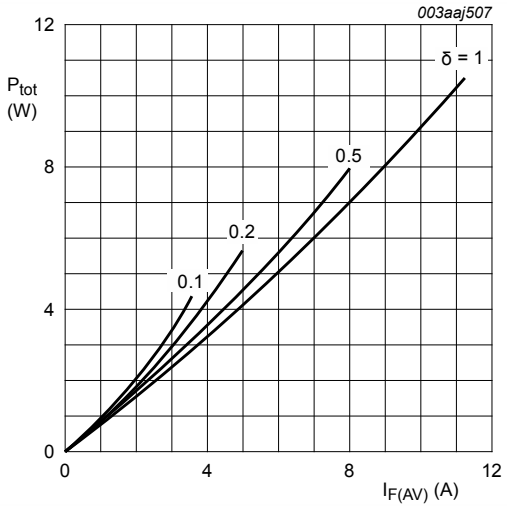


**Fig. 1. Forward power dissipation as a function of average forward current; square waveform; maximum values**

$$I_{F(AV)} = I_{F(RMS)} \times \sqrt{\delta}$$
$$V_O = 0.791\ V;\ R_S = 0.013\ \Omega$$

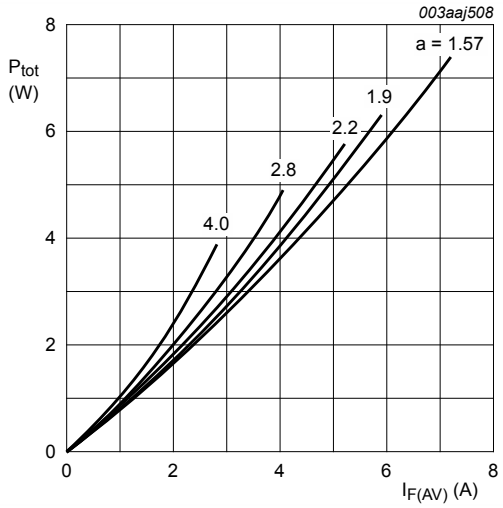


**Fig. 2. Forward power dissipation as a function of average forward current; sinusoidal waveform; maximum values**

$$a = \text{form factor} = I_{F(RMS)} / I_{F(AV)}$$
$$V_O = 0.791\ V;\ R_S = 0.013\ \Omega$$

## 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 | Fig. 3 | | - | - | 2.7 | K/W |
| $R_{th(j-a)}$ | thermal resistance from junction to ambient | in free air | | - | 60 | - | K/W |


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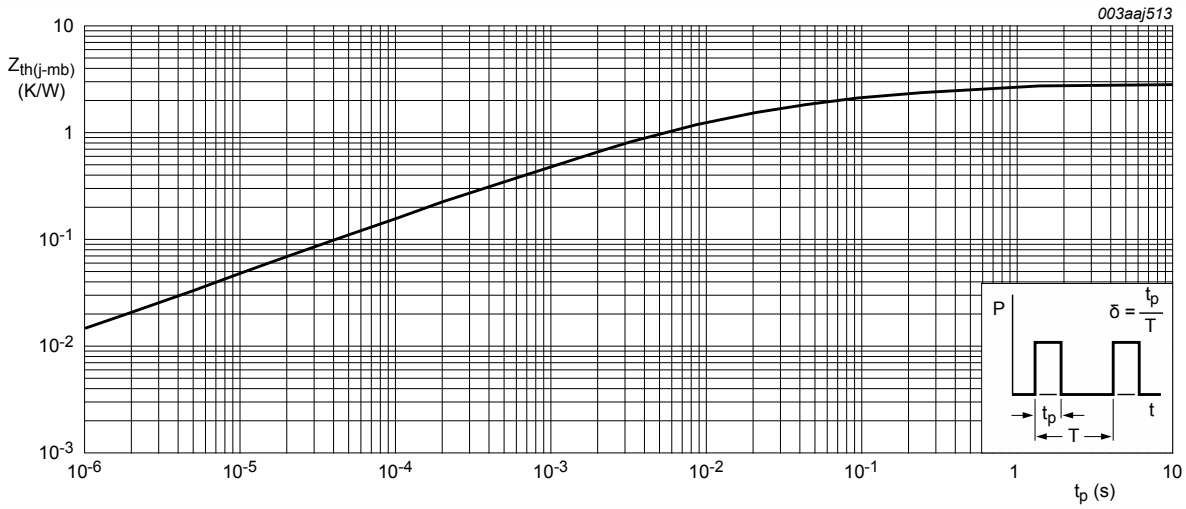


**Fig. 3. Transient thermal impedance from junction to mounting base as a function of pulse width**

## 9. Characteristics

**Table 6. Characteristics**

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


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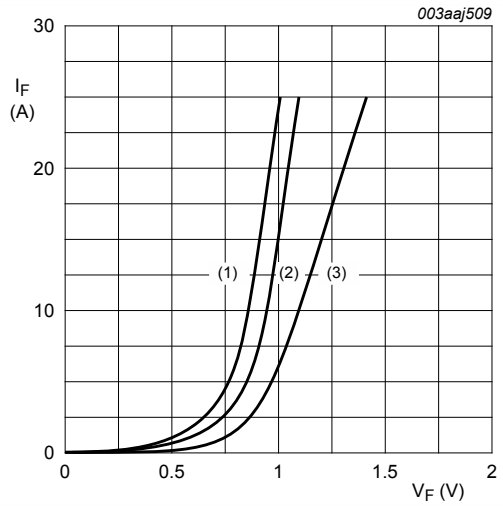


**Fig. 4. Forward current as a function of forward voltage**

(1) $T_j = 150$ °C; typical values;
(2) $T_j = 150$ °C; maximum values;
(3) $T_j = 25$ °C; maximum values;
$V_O = 0.791$ V; $R_S = 0.013$ Ω

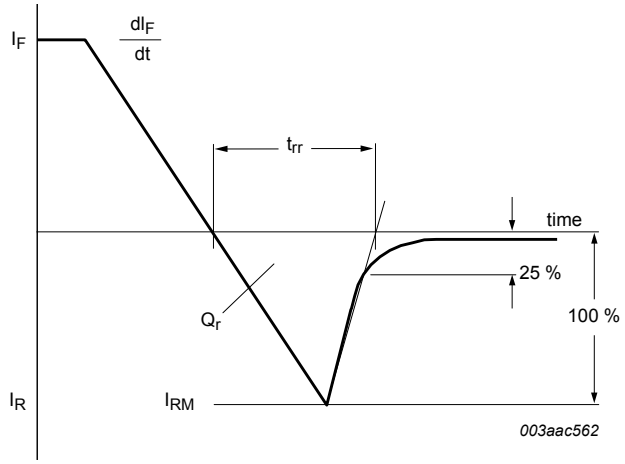


**Fig. 5. Reverse recovery definitions; ramp recovery**

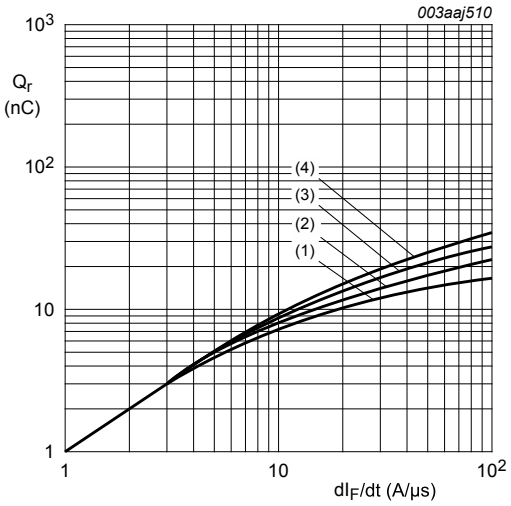


**Fig. 6. Recovered charge as a function of rate of change of forward current; maximum values**

(1) $I_F = 1$ A; $T_j = 25$ °C
(2) $I_F = 2$ A; $T_j = 25$ °C
(3) $I_F = 5$ A; $T_j = 25$ °C
(4) $I_F = 10$ A; $T_j = 25$ °C

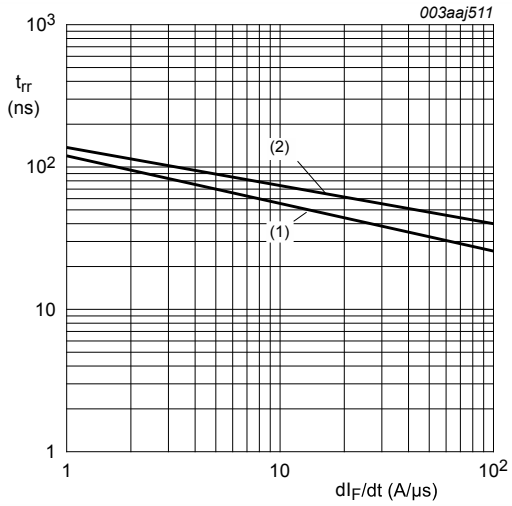


**Fig. 7. Reverse recovery time as a function of rate of change of forward current; maximum values**

(1) $I_F = 1$ A; $T_j = 25$ °C
(2) $I_F = 10$ A; $T_j = 25$ °C


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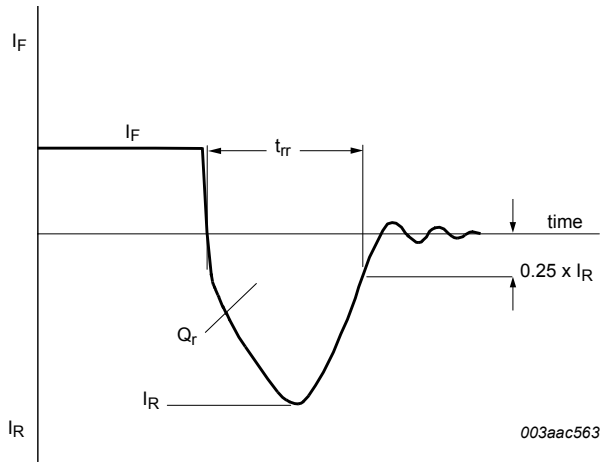


**Fig. 8. Reverse recovery definitions; step recovery**

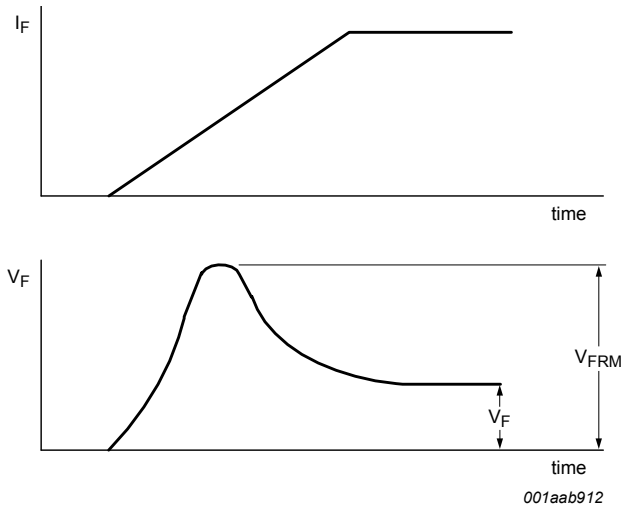


**Fig. 9. Forward recovery definitions**


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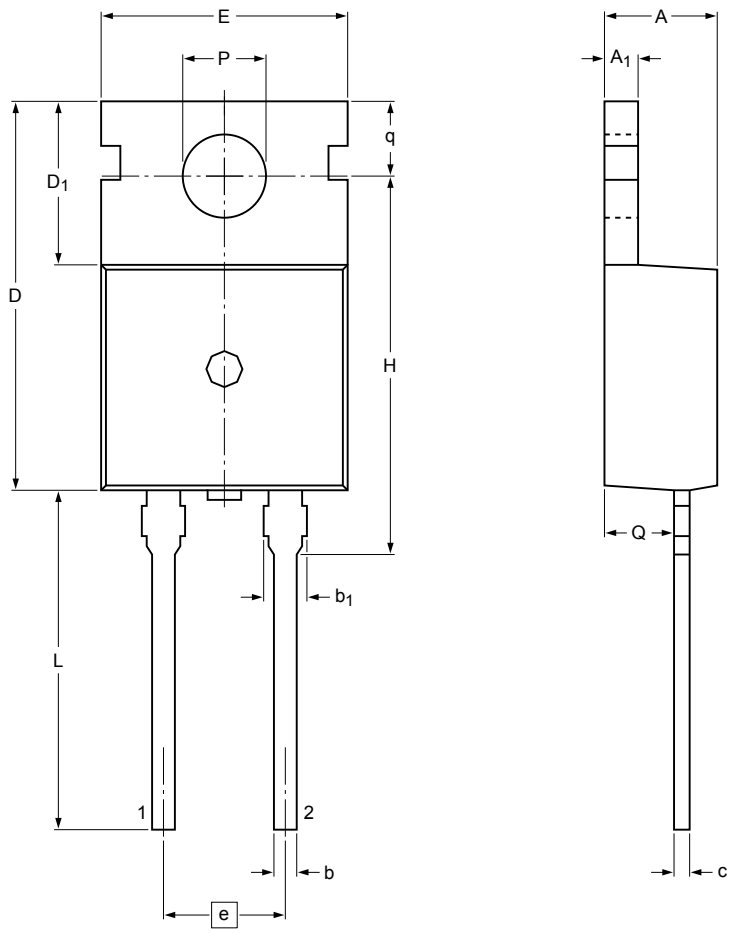
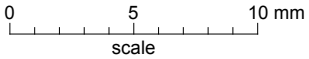
## 10. Package outline

**Plastic single-ended package; heatsink mounted; 1 mounting hole; 2-lead TO-220AC** **SOD59**




Dimensions

| Unit | | A | $A_1$ | b | $b_1$(1) | c | D | $D_1$ | E | e | H | L | P | Q | q |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| mm | max | 4.7 | 1.40 | 0.95 | 1.7 | 0.65 | 15.8 | 6.8 | 10.30 | 5.08 (REF) | 16.25 | 15.0 | 3.80 | 2.6 | 2.9 |
| | nom | | | | | | | | | | | | | | |
| | 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 | | | | ~~09-08-25~~ 12-11-27 |

**Fig. 10. Package outline TO-220AC (SOD59)**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## 12. Contents

**1 General description ..... 1**
**2 Features and benefits ..... 1**
**3 Applications ..... 1**
**4 Quick reference data ..... 1**
**5 Pinning information ..... 2**
**6 Ordering information ..... 2**
**7 Limiting values ..... 2**
**8 Thermal characteristics ..... 3**
**9 Characteristics ..... 4**
**10 Package outline ..... 7**
**11 Legal information ..... 8**
11.1 Data sheet status ..... 8
11.2 Definitions ..... 8
11.3 Disclaimers ..... 8
11.4 Trademarks ..... 9

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