



# BYC20D-600P

Hyperfast power diode

10 February 2014

Product data sheet

## 1. General description

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

## 2. Features and benefits

- Fast switching
- Low leakage current
- Low reverse recovery current
- Low thermal resistance
- Reduces switching losses in associated MOSFET or IGBT

## 3. Applications

- Active PFC in air conditioner
- High frequency switched-mode power supplies
- Continuous Current Mode (CCM) Power Factor Correction (PFC)

## 4. Quick reference data

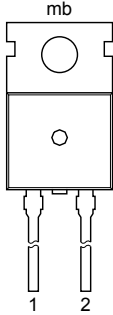
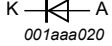
Table 1. Quick reference data

| Symbol                         | Parameter                       | Conditions   | Min | Typ | Max  | Unit |
|--------------------------------|---------------------------------|--|-----|-----|------|------|
| $V_{RRM}$                      | repetitive peak reverse voltage |  | -   | -   | 600  | V    |
| $I_{F(AV)}$                    | average forward current         | $\delta = 0.5$ ; $T_{mb} \leq 120$ °C; square-wave pulse; <a href="#">Fig. 1</a> ; <a href="#">Fig. 2</a> ; <a href="#">Fig. 3</a> | -   | -   | 20   | A    |
| <b>Static characteristics</b>  |                                 |  |     |     |      |      |
| $V_F$                          | forward voltage                 | $I_F = 20$ A; $T_j = 150$ °C; <a href="#">Fig. 6</a>   | -   | 1.2 | 1.97 | V    |
| <b>Dynamic characteristics</b> |                                 |  |     |     |      |      |
| $t_{rr}$                       | reverse recovery time           | $I_F = 1$ A; $V_R = 30$ V; $dI_F/dt = 200$ A/ $\mu$ s; $T_j = 25$ °C; <a href="#">Fig. 7</a>                                       | -   | 16  | 20   | ns   |



## 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; connected to cathode |   |   |

## 6. Ordering information

Table 3. Ordering information

| Type number | Package  |  |         |
|-------------|----------|--|---------|
|             | Name     | Description  | Version |
| BYC20D-600P | 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 code |
|-------------|--------------|
| BYC20D-600P | BYC20D-600P  |

## 8. Limiting values

Table 5. Limiting values

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

| Symbol      | Parameter                       | Conditions   | Min | Max | Unit |
|-------------|---------------------------------|--|-----|-----|------|
| $V_{RRM}$   | repetitive peak reverse voltage |  | -   | 600 | V    |
| $V_{RWM}$   | crest working reverse voltage   |  | -   | 600 | V    |
| $V_R$       | reverse voltage                 | DC   | -   | 600 | V    |
| $I_{F(AV)}$ | average forward current         | $\delta = 0.5$ ; $T_{mb} \leq 120\text{ }^\circ\text{C}$ ; square-wave pulse; <a href="#">Fig. 1</a> ; <a href="#">Fig. 2</a> ; <a href="#">Fig. 3</a> | -   | 20  | A    |
| $I_{FRM}$   | repetitive peak forward current | $\delta = 0.5$ ; $t_p = 25\text{ }\mu\text{s}$ ; $T_{mb} \leq 120\text{ }^\circ\text{C}$ ; square-wave pulse   | -   | 40  | A    |

| Symbol           | Parameter                           | Conditions  | Min | Max | Unit |
|------------------|-------------------------------------|---|-----|-----|------|
| I <sub>FSM</sub> | non-repetitive peak forward current | t <sub>p</sub> = 10 ms; T <sub>j(initial)</sub> = 25 °C; sine-wave pulse; Fig. 4  | -   | 250 | A    |
|                  |                                     | t <sub>p</sub> = 8.3 ms; T <sub>j(initial)</sub> = 25 °C; sine-wave pulse; Fig. 4 | -   | 275 | A    |
| T <sub>stg</sub> | storage temperature                 |   | -65 | 175 | °C   |
| T <sub>j</sub>   | junction temperature                |   | -   | 175 | °C   |

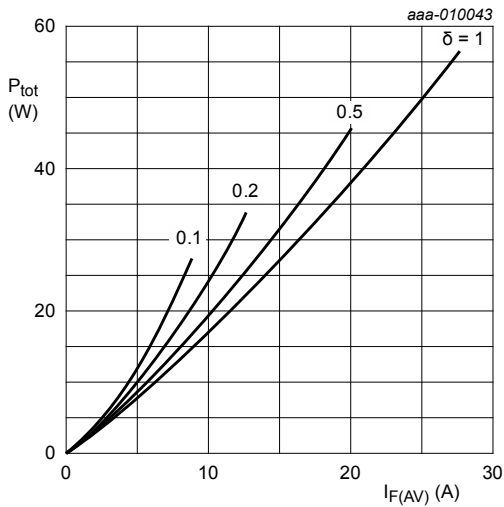


Fig. 1. Forward power dissipation as a function of average forward current; square waveform; maximum values

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

$$V_O = 1.622 \text{ V}; R_S = 0.016 \text{ } \Omega$$

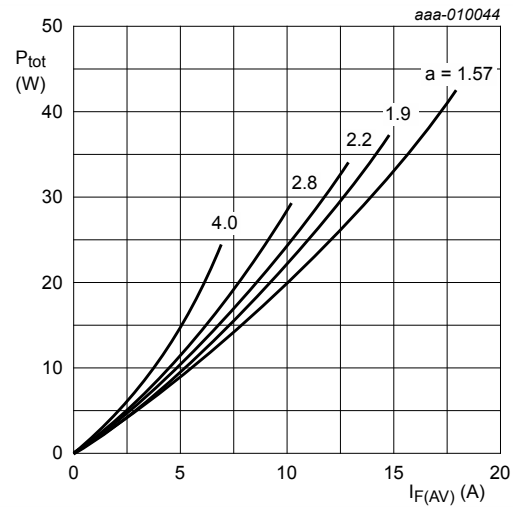


Fig. 2. Forward power dissipation as a function of average forward current; sinusoidal waveform; maximum values

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

$$V_O = 1.622 \text{ V}; R_S = 0.016 \text{ } \Omega$$

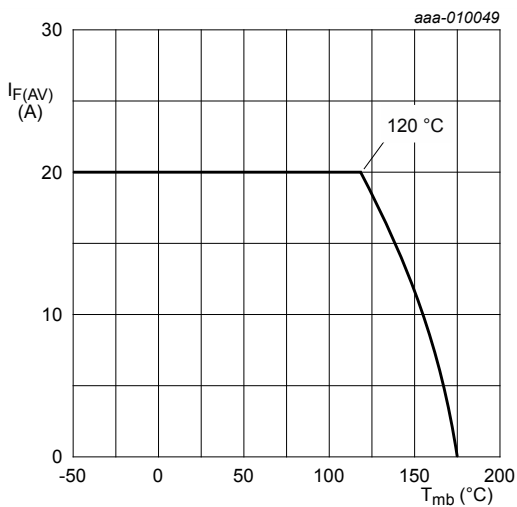


Fig. 3. Forward current as a function of mounting base temperature; maximum values

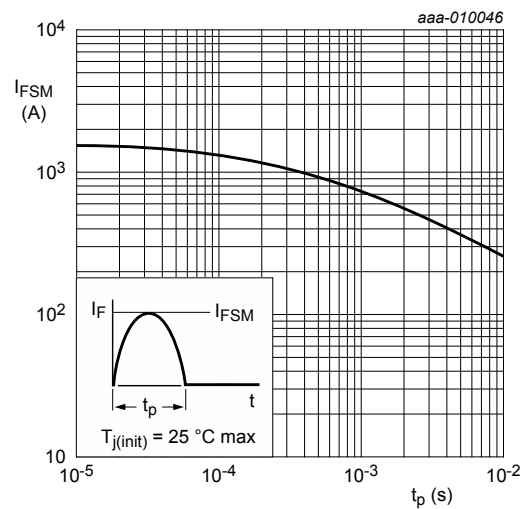


Fig. 4. Non-repetitive peak forward current as a function of pulse width; sinusoidal waveform; maximum values

### 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 | with heatsink compound; <a href="#">Fig. 5</a> | -   | -   | 1.2 | K/W  |
| $R_{th(j-a)}$  | thermal resistance from junction to ambient       | in free air                                    | -   | 60  | -   | K/W  |

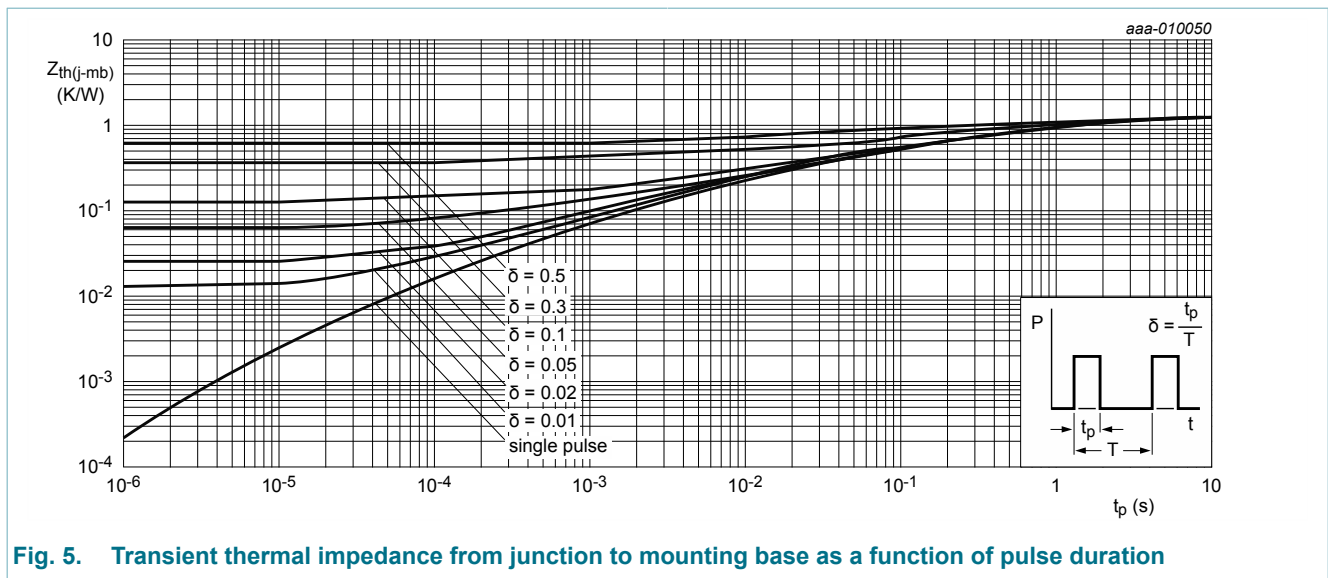


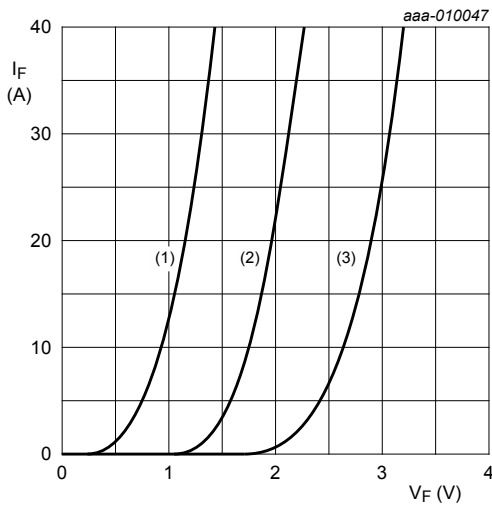
Fig. 5. Transient thermal impedance from junction to mounting base as a function of pulse duration

### 10. Characteristics

Table 7. Characteristics

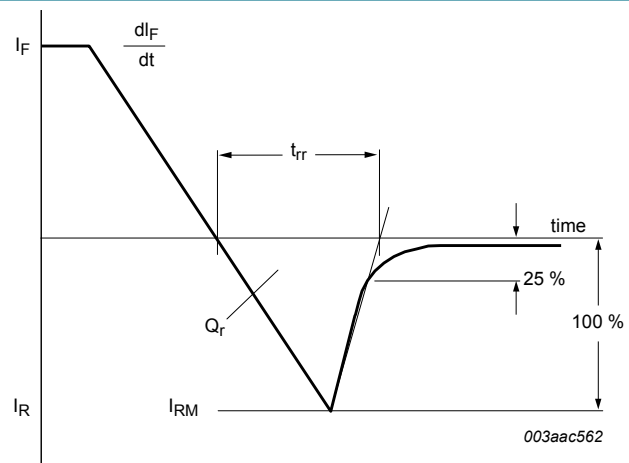
| Symbol                         | Parameter        | Conditions   | Min | Typ | Max  | Unit          |
|--------------------------------|------------------|--|-----|-----|------|---------------|
| <b>Static characteristics</b>  |                  |  |     |     |      |               |
| $V_F$                          | forward voltage  | $I_F = 20\text{ A}; T_j = 25\text{ °C};$ <a href="#">Fig. 6</a>  | -   | 2   | 2.9  | V             |
|                                |                  | $I_F = 20\text{ A}; T_j = 150\text{ °C};$ <a href="#">Fig. 6</a>   | -   | 1.2 | 1.97 | V             |
| $I_R$                          | reverse current  | $V_R = 600\text{ V}; T_j = 25\text{ °C}$   | -   | -   | 10   | $\mu\text{A}$ |
|                                |                  | $V_R = 600\text{ V}; T_j = 150\text{ °C}$  | -   | -   | 1    | mA            |
| <b>Dynamic characteristics</b> |                  |  |     |     |      |               |
| $Q_r$                          | recovered charge | $I_F = 20\text{ A}; V_R = 200\text{ V}; dI_F/dt = 200\text{ A}/\mu\text{s}; T_j = 25\text{ °C};$ <a href="#">Fig. 7</a>  | -   | 47  | -    | nC            |
|                                |                  | $I_F = 20\text{ A}; V_R = 200\text{ V}; dI_F/dt = 200\text{ A}/\mu\text{s}; T_j = 125\text{ °C};$ <a href="#">Fig. 7</a> | -   | 193 | -    | nC            |

| Symbol   | Parameter                     | Conditions  | Min | Typ | Max | Unit |
|----------|-------------------------------|---|-----|-----|-----|------|
| $t_{rr}$ | reverse recovery time         | $I_F = 1 \text{ A}; V_R = 30 \text{ V}; dI_F/dt = 200 \text{ A}/\mu\text{s}; T_j = 25 \text{ }^\circ\text{C}; \text{Fig. 7}$    | -   | 16  | 20  | ns   |
|          |                               | $I_F = 20 \text{ A}; V_R = 400 \text{ V}; dI_F/dt = 500 \text{ A}/\mu\text{s}; T_j = 25 \text{ }^\circ\text{C}; \text{Fig. 7}$  | -   | 26  | -   | ns   |
|          |                               | $I_F = 20 \text{ A}; V_R = 200 \text{ V}; dI_F/dt = 200 \text{ A}/\mu\text{s}; T_j = 25 \text{ }^\circ\text{C}; \text{Fig. 7}$  | -   | 33  | -   | ns   |
|          |                               | $I_F = 20 \text{ A}; V_R = 200 \text{ V}; dI_F/dt = 200 \text{ A}/\mu\text{s}; T_j = 125 \text{ }^\circ\text{C}; \text{Fig. 7}$ | -   | 51  | -   | ns   |
| $I_{RM}$ | peak reverse recovery current | $I_F = 20 \text{ A}; V_R = 200 \text{ V}; dI_F/dt = 200 \text{ A}/\mu\text{s}; T_j = 25 \text{ }^\circ\text{C}; \text{Fig. 7}$  | -   | 2.8 | -   | A    |
|          |                               | $I_F = 20 \text{ A}; V_R = 200 \text{ V}; dI_F/dt = 200 \text{ A}/\mu\text{s}; T_j = 125 \text{ }^\circ\text{C}; \text{Fig. 7}$ | -   | 7.6 | -   | A    |



**Fig. 6. Forward current as a function of forward voltage**

- (1)  $T_j = 150 \text{ }^\circ\text{C}$ ; typical values;
  - (2)  $T_j = 150 \text{ }^\circ\text{C}$ ; maximum values;
  - (3)  $T_j = 25 \text{ }^\circ\text{C}$ ; maximum values;
- $V_O = 1.622 \text{ V}; R_S = 0.016 \text{ } \Omega$



**Fig. 7. Reverse recovery definitions; ramp recovery**

### 11. Package outline

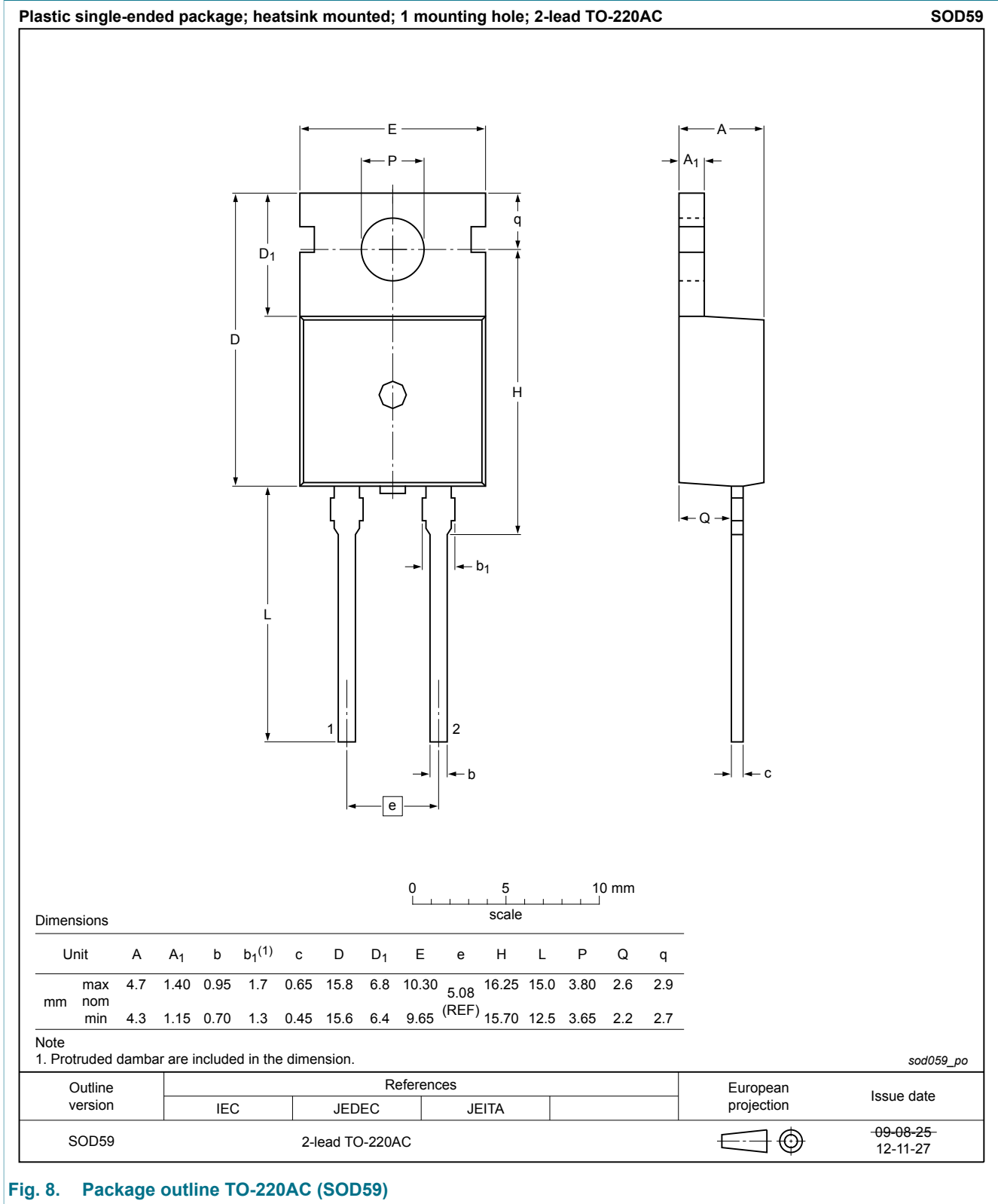


Fig. 8. Package outline TO-220AC (SOD59)

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