

## 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)

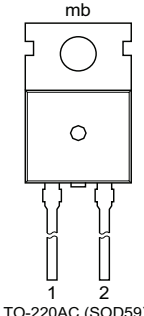
## 4. Quick reference data

Table 1. Quick reference data

| Symbol                  | Parameter                           | Conditions                                                                                                                     | Values |     |     |     | Unit |
|-------------------------|-------------------------------------|--------------------------------------------------------------------------------------------------------------------------------|--------|-----|-----|-----|------|
| Absolute maximum rating |                                     |                                                                                                                                |        |     |     |     |      |
| V <sub>RRM</sub>        | repetitive peak reverse voltage     |                                                                                                                                | 600    |     |     |     | V    |
| I <sub>F(AV)</sub>      | average forward current             | δ = 0.5; T <sub>mb</sub> ≤ 121 °C; square-wave pulse; <a href="#">Fig. 1</a> ; <a href="#">Fig. 2</a> ; <a href="#">Fig. 3</a> | 15     |     |     |     | A    |
| I <sub>FRM</sub>        | repetitive peak forward current     | δ = 0.5; t <sub>p</sub> = 25 μs; T <sub>mb</sub> ≤ 121 °C; square-wave pulse                                                   | 30     |     |     |     | A    |
| I <sub>FSM</sub>        | non-repetitive peak forward current | t <sub>p</sub> = 10 ms; T <sub>J(init)</sub> = 25 °C; sine-wave pulse; <a href="#">Fig. 4</a>                                  | 180    |     |     |     | A    |
|                         |                                     | t <sub>p</sub> = 8.3 ms; T <sub>J(init)</sub> = 25 °C; sine-wave pulse                                                         | 200    |     |     |     | A    |
| Symbol                  | Parameter                           | Conditions                                                                                                                     |        | Min | Typ | Max | Unit |
| Static characteristics  |                                     |                                                                                                                                |        |     |     |     |      |
| V <sub>F</sub>          | forward voltage                     | I <sub>F</sub> = 15 A; T <sub>j</sub> = 150 °C; <a href="#">Fig. 6</a>                                                         |        | -   | 1.4 | 2   | V    |
| Dynamic characteristics |                                     |                                                                                                                                |        |     |     |     |      |
| t <sub>rr</sub>         | reverse recovery time               | I <sub>F</sub> = 1 A; V <sub>R</sub> = 30 V; dI <sub>F</sub> /dt = 200 A/μs; T <sub>j</sub> = 25 °C; <a href="#">Fig. 7</a>    |        | -   | 13  | 18  | ns   |

5. Pinning information

Table 2. Pinning information

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

6. Ordering information

Table 3. Ordering information

| Type number | Package  |                                                                                     |         |
|-------------|----------|-------------------------------------------------------------------------------------|---------|
|             | Name     | Description                                                                         | Version |
| BYC15-600P  | TO-220AC | plastic single-ended package; heatsink mounted;<br>1 mounting hole; 2-lead TO-220AC | SOD59   |

7. Marking

Table 4. Marking codes

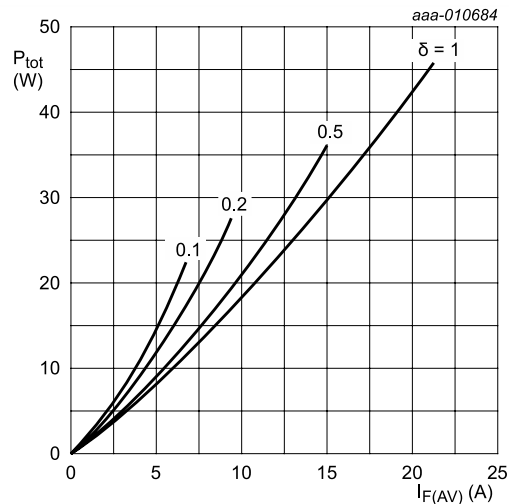
| Type number | Marking codes |
|-------------|---------------|
| BYC15-600P  | BYC15-600P    |

## 8. Limiting values

**Table 5. Limiting values**

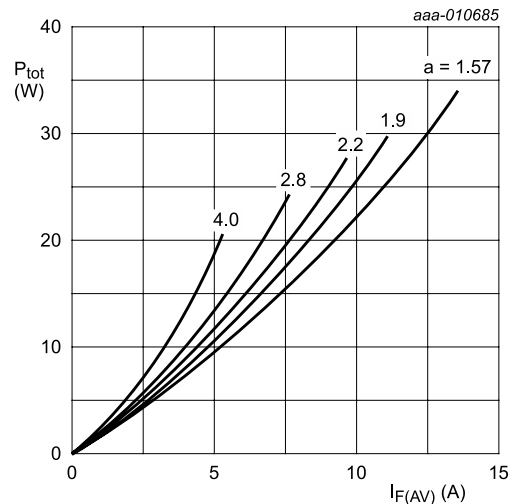
*In accordance with the Absolute Maximum Rating System (IEC 60134).*

| Symbol      | Parameter                           | Conditions                                                                                                                                                  | Values     | Unit               |
|-------------|-------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------|------------|--------------------|
| $V_{RRM}$   | repetitive peak reverse voltage     |                                                                                                                                                             | 600        | V                  |
| $V_{RWM}$   | crest working reverse voltage       |                                                                                                                                                             | 600        | V                  |
| $V_R$       | reverse voltage                     | DC                                                                                                                                                          | 600        | V                  |
| $I_{F(AV)}$ | average forward current             | $\delta = 0.5$ ; $T_{mb} \leq 121\text{ }^{\circ}\text{C}$ ; square-wave pulse;<br><a href="#">Fig. 1</a> ; <a href="#">Fig. 2</a> ; <a href="#">Fig. 3</a> | 15         | A                  |
| $I_{FRM}$   | repetitive peak forward current     | $\delta = 0.5$ ; $t_p = 25\text{ }\mu\text{s}$ ; $T_{mb} \leq 121\text{ }^{\circ}\text{C}$ ;<br>square-wave pulse                                           | 30         | 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;<br><a href="#">Fig. 4</a>                                       | 180        | A                  |
|             |                                     | $t_p = 8.3\text{ ms}$ ; $T_{j(\text{init})} = 25\text{ }^{\circ}\text{C}$ ; sine-wave pulse                                                                 | 200        | A                  |
| $T_{stg}$   | storage temperature                 |                                                                                                                                                             | -65 to 175 | $^{\circ}\text{C}$ |
| $T_j$       | junction temperature                |                                                                                                                                                             | 175        | $^{\circ}\text{C}$ |



$$I_{F(AV)} = I_{F(RMS)} \times \sqrt{\delta}$$
$$V_o = 1.578 \text{ V}; R_s = 0.027 \text{ } \Omega$$

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



$$a = \text{form factor} = I_{F(RMS)} / I_{F(AV)}$$
$$V_o = 1.578 \text{ V}; R_s = 0.027 \text{ } \Omega$$

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

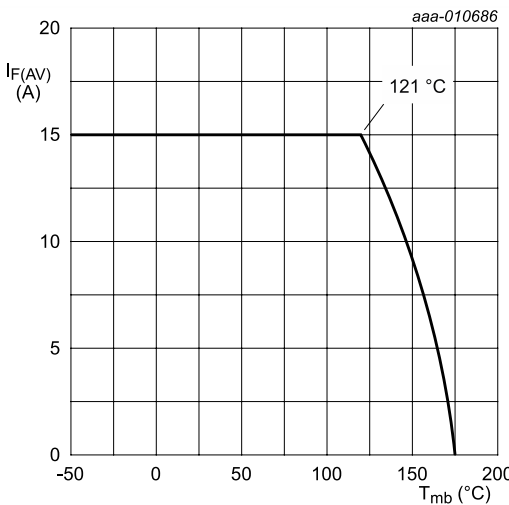


Fig. 3. Forward current as a function of mounting base temperature; maximum values

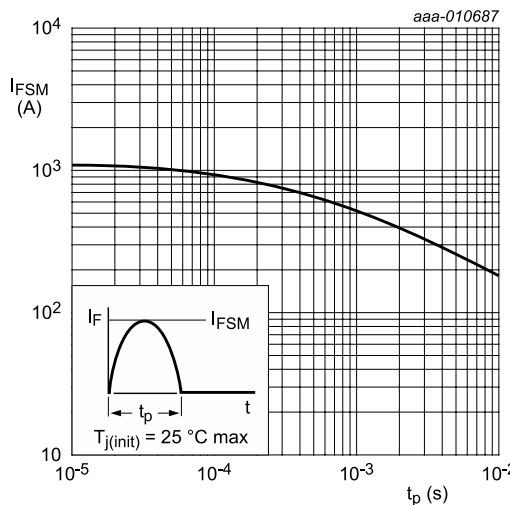


Fig. 4. Non-repetitive peak forward current as a function of pulse width; sinusoidal waveform; maximum values

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> | -   | -   | 1.5 | K/W  |
| $R_{th(j-a)}$  | thermal resistance from junction to ambient       | in free air                                    | -   | 60  | -   | K/W  |

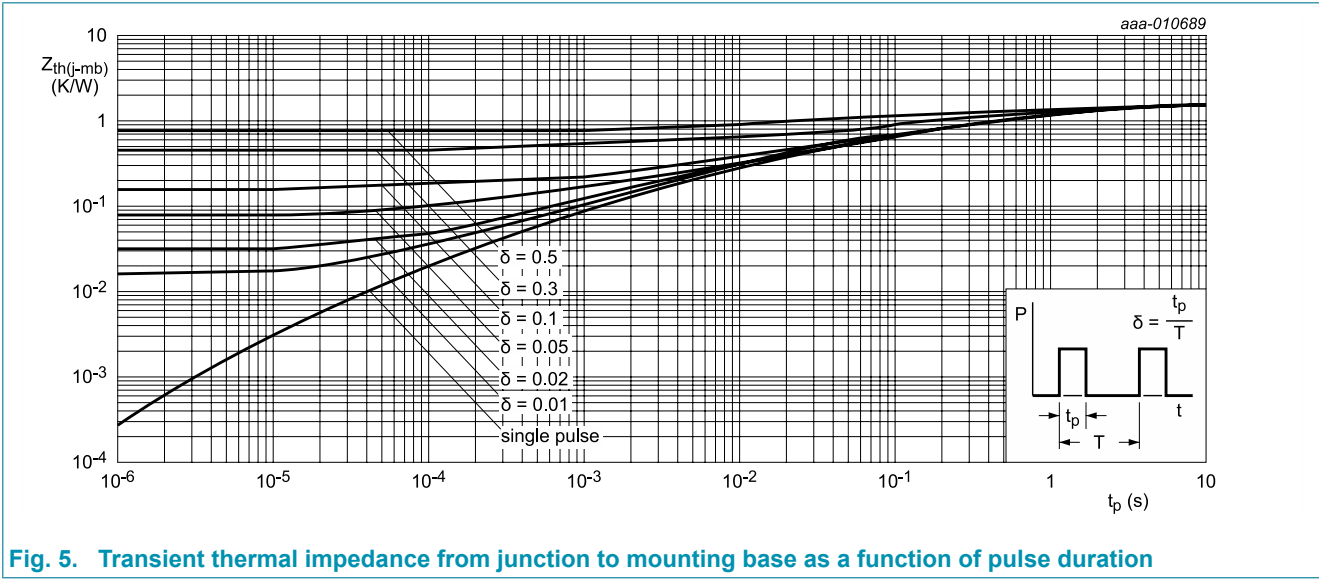
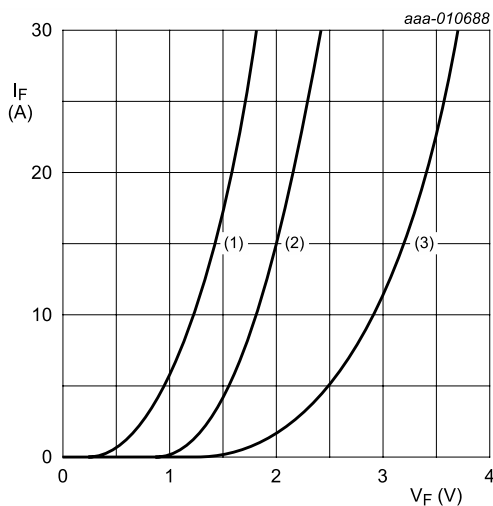


Fig. 5. Transient thermal impedance from junction to mounting base as a function of pulse duration

## 10. Characteristics

Table 7. Characteristics

| Symbol                  | Parameter                     | Conditions                                                                                                                     |  | Min | Typ | Max | Unit |
|-------------------------|-------------------------------|--------------------------------------------------------------------------------------------------------------------------------|--|-----|-----|-----|------|
| Static characteristics  |                               |                                                                                                                                |  |     |     |     |      |
| V <sub>F</sub>          | forward voltage               | I <sub>F</sub> = 15 A; T <sub>j</sub> = 25 °C; <a href="#">Fig. 6</a>                                                          |  | -   | 2.7 | 3.2 | V    |
|                         |                               | I <sub>F</sub> = 15 A; T <sub>j</sub> = 150 °C; <a href="#">Fig. 6</a>                                                         |  | -   | 1.4 | 2   | V    |
| I <sub>R</sub>          | reverse current               | V <sub>R</sub> = 600 V; T <sub>j</sub> = 25 °C                                                                                 |  | -   | -   | 10  | μA   |
|                         |                               | V <sub>R</sub> = 600 V; T <sub>j</sub> = 150 °C                                                                                |  | -   | -   | 1   | mA   |
| Dynamic characteristics |                               |                                                                                                                                |  |     |     |     |      |
| Q <sub>r</sub>          | recovered charge              | I <sub>F</sub> = 15 A; V <sub>R</sub> = 200 V; dI <sub>F</sub> /dt = 200 A/μs; T <sub>j</sub> = 25 °C; <a href="#">Fig. 7</a>  |  | -   | 30  | -   | nC   |
|                         |                               | I <sub>F</sub> = 15 A; V <sub>R</sub> = 200 V; dI <sub>F</sub> /dt = 200 A/μs; T <sub>j</sub> = 125 °C; <a href="#">Fig. 7</a> |  | -   | 115 | -   | 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 = 200 A/μs; T <sub>j</sub> = 25 °C; <a href="#">Fig. 7</a>    |  | -   | 13  | 18  | ns   |
|                         |                               | I <sub>F</sub> = 15 A; V <sub>R</sub> = 400 V; dI <sub>F</sub> /dt = 500 A/μs; T <sub>j</sub> = 25 °C; <a href="#">Fig. 7</a>  |  | -   | 22  | -   | ns   |
|                         |                               | I <sub>F</sub> = 15 A; V <sub>R</sub> = 200 V; dI <sub>F</sub> /dt = 200 A/μs; T <sub>j</sub> = 25 °C; <a href="#">Fig. 7</a>  |  | -   | 28  | -   | ns   |
|                         |                               | I <sub>F</sub> = 15 A; V <sub>R</sub> = 200 V; dI <sub>F</sub> /dt = 200 A/μs; T <sub>j</sub> = 125 °C; <a href="#">Fig. 7</a> |  | -   | 39  | -   | ns   |
| I <sub>RM</sub>         | peak reverse recovery current | I <sub>F</sub> = 15 A; V <sub>R</sub> = 200 V; dI <sub>F</sub> /dt = 200 A/μs; T <sub>j</sub> = 25 °C; <a href="#">Fig. 7</a>  |  | -   | 2.1 | -   | A    |
|                         |                               | I <sub>F</sub> = 15 A; V <sub>R</sub> = 200 V; dI <sub>F</sub> /dt = 200 A/μs; T <sub>j</sub> = 125 °C; <a href="#">Fig. 7</a> |  | -   | 5.8 | -   | A    |



- (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  
 $V_o = 1.578 \text{ V}$ ;  $R_s = 0.027 \text{ } \Omega$

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

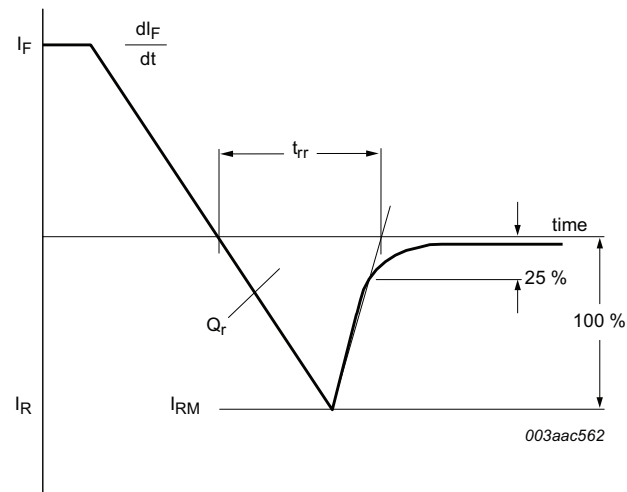
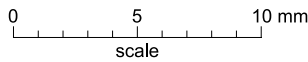
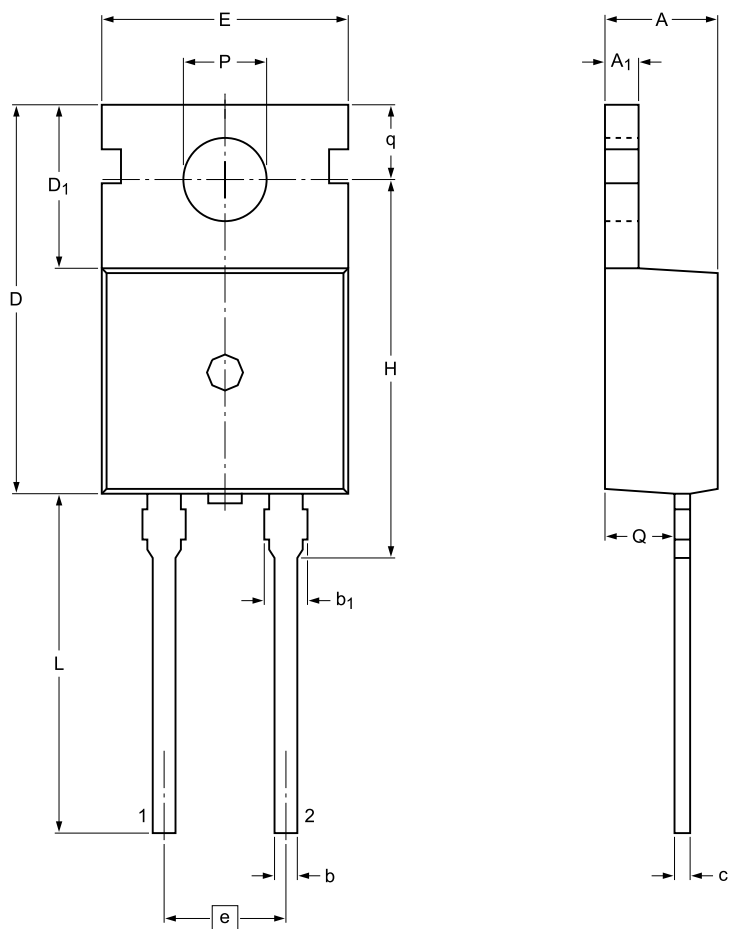


Fig. 7. Reverse recovery definitions; ramp recovery

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. |
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- [1] Please consult the most recently issued document before initiating or completing a design.
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Date of release: 31 May 2018