



# BYC5-600P

Hyperfast power diode

24 December 2014

Product data sheet

## 1. General description

Hyperfast power diode in a SOD59 package.

## 2. Features and benefits

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

## 3. Applications

- Half-bridge/full-bridge 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         | $\delta = 0.5$ ; $T_{mb} \leq 133$ °C; square-wave pulse; <a href="#">Fig. 1</a> ; <a href="#">Fig. 2</a> ; <a href="#">Fig. 3</a> | -   | -   | 5   | A    |
| <b>Static characteristics</b>  |                                 |  |     |     |     |      |
| $V_F$                          | forward voltage                 | $I_F = 5$ A; $T_j = 25$ °C; <a href="#">Fig. 6</a>   | -   | 2.5 | 3.3 | V    |
|                                |                                 | $I_F = 5$ A; $T_j = 150$ °C; <a href="#">Fig. 6</a>  | -   | 1.4 | 2.1 | 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>                                       | -   | 11  | -   | ns   |

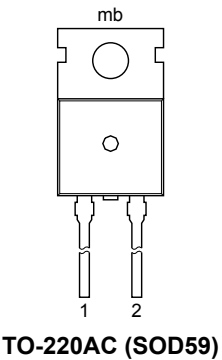
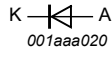


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## 5. Pinning information

Table 2. Pinning information

| Pin | Symbol | Description                         | Simplified outline  | Graphic symbol   |
|-----|--------|-------------------------------------|---|--|
| 1   | K      | cathode                             |  <p>TO-220AC (SOD59)</p> |  <p>K — — A<br/>001aaa020</p> |
| 2   | A      | anode                               |   |  |
| mb  | mb     | mounting base; connected to cathode |   |  |

## 6. Ordering information

Table 3. Ordering information

| Type number | Package  |  |         |
|-------------|----------|--|---------|
|             | Name     | Description  | Version |
| BYC5-600P   | TO-220AC | plastic single-ended package; heatsink mounted; 1 mounting hole; 2-lead TO-220AC | SOD59   |

## 7. Marking

Table 4. Marking codes

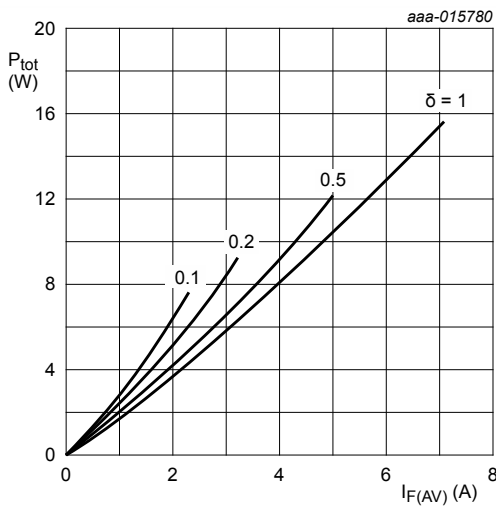
| Type number | Marking code |
|-------------|--------------|
| BYC5-600P   | BYC5-600P    |

## 8. Limiting values

**Table 5. Limiting values**

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

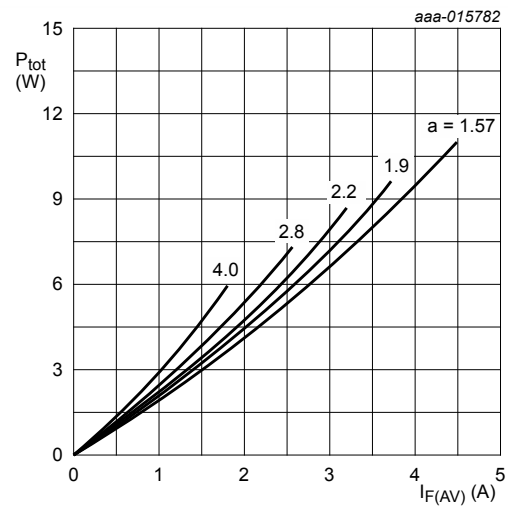
| Symbol      | Parameter                           | Conditions   | Min | Max | Unit             |
|-------------|-------------------------------------|--|-----|-----|------------------|
| $V_{RRM}$   | repetitive peak reverse voltage     |  | -   | 600 | V                |
| $V_{RWM}$   | crest working reverse voltage       |  | -   | 600 | V                |
| $V_R$       | reverse voltage                     | DC   | -   | 600 | V                |
| $I_{F(AV)}$ | average forward current             | $\delta = 0.5$ ; $T_{mb} \leq 133\text{ }^\circ\text{C}$ ; square-wave pulse; Fig. 1; Fig. 2; Fig. 3         | -   | 5   | A                |
| $I_{FRM}$   | repetitive peak forward current     | $\delta = 0.5$ ; $t_p = 25\text{ }\mu\text{s}$ ; $T_{mb} \leq 133\text{ }^\circ\text{C}$ ; square-wave pulse | -   | 10  | 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; Fig. 4             | -   | 60  | A                |
|             |                                     | $t_p = 8.3\text{ ms}$ ; $T_{j(\text{init})} = 25\text{ }^\circ\text{C}$ ; sine-wave pulse; Fig. 4            | -   | 65  | A                |
| $T_{stg}$   | storage temperature                 |  | -65 | 175 | $^\circ\text{C}$ |
| $T_j$       | junction temperature                |  | -   | 175 | $^\circ\text{C}$ |



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

$$V_o = 1.801\text{ V}; R_s = 0.062\text{ }\Omega$$

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



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

$$V_o = 1.801\text{ V}; R_s = 0.062\text{ }\Omega$$

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

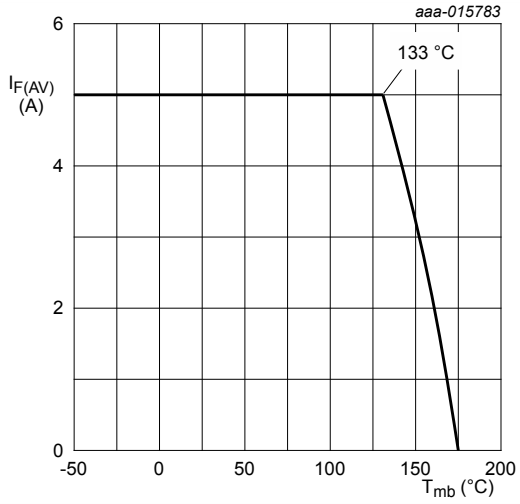


Fig. 3. Forward current as a function of mounting base temperature; maximum values

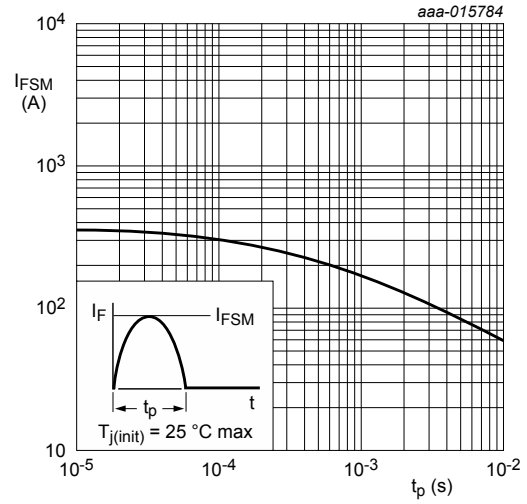


Fig. 4. Non-repetitive peak forward current as a function of pulse width; sinusoidal waveform; maximum values

### 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> | -   | -   | 3.5 | K/W  |
| $R_{th(j-a)}$  | thermal resistance from junction to ambient       | in free air                                    | -   | 60  | -   | K/W  |

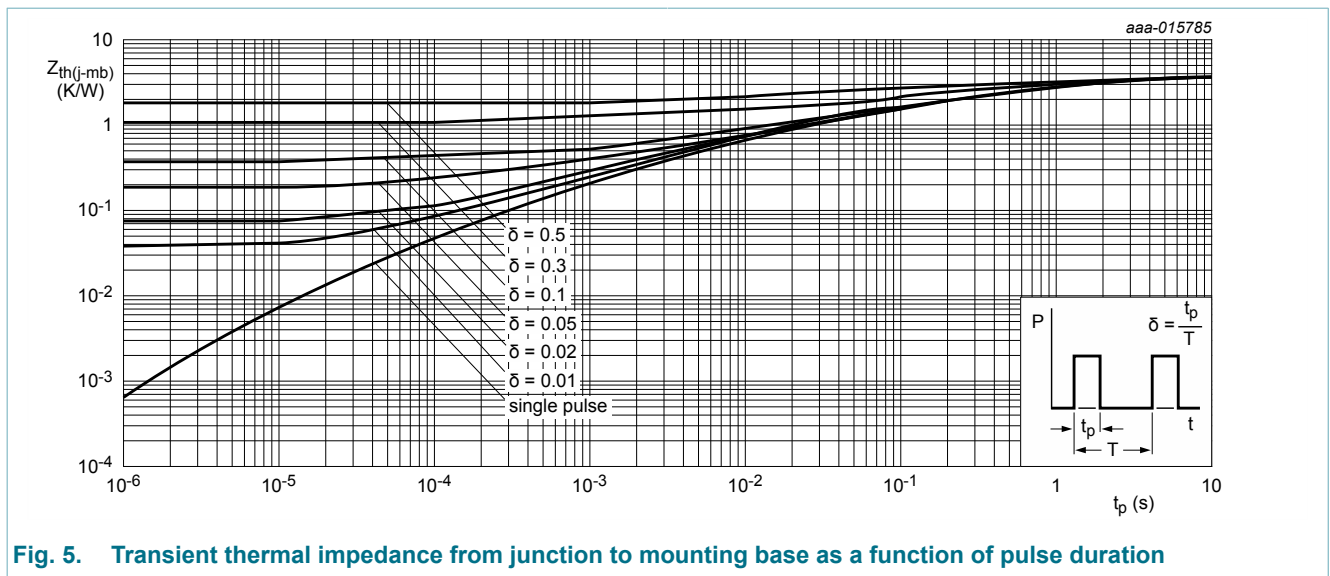
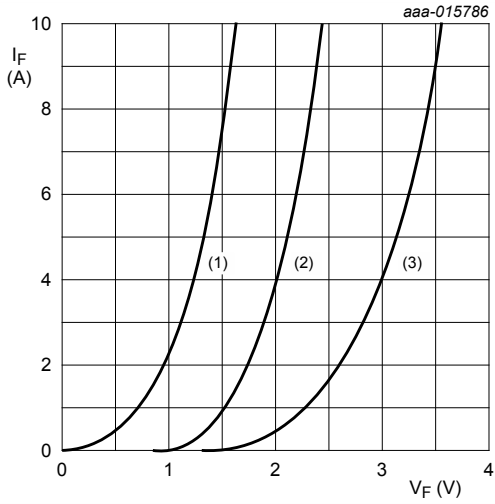


Fig. 5. Transient thermal impedance from junction to mounting base as a function of pulse duration

## 10. Characteristics

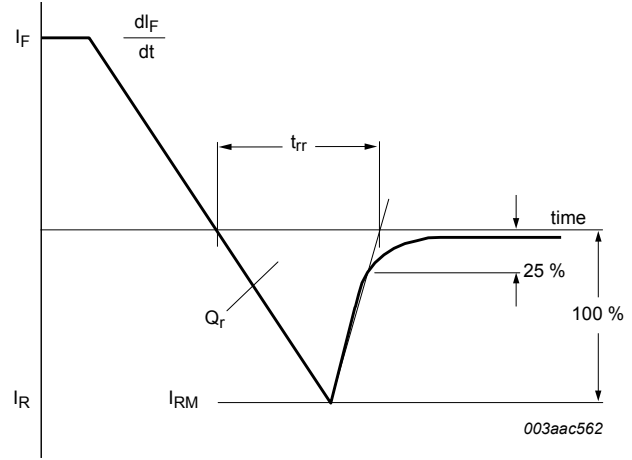
Table 7. Characteristics

| Symbol                         | Parameter                     | Conditions  | Min | Typ | Max | Unit |
|--------------------------------|-------------------------------|---|-----|-----|-----|------|
| <b>Static characteristics</b>  |                               |   |     |     |     |      |
| V <sub>F</sub>                 | forward voltage               | I <sub>F</sub> = 5 A; T <sub>j</sub> = 25 °C; <a href="#">Fig. 6</a>  | -   | 2.5 | 3.3 | V    |
|                                |                               | I <sub>F</sub> = 5 A; T <sub>j</sub> = 150 °C; <a href="#">Fig. 6</a>   | -   | 1.4 | 2.1 | 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   | -   | -   | 0.6 | mA   |
| <b>Dynamic characteristics</b> |                               |   |     |     |     |      |
| Q <sub>r</sub>                 | recovered charge              | I <sub>F</sub> = 5 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>  | -   | 19  | -   | nC   |
|                                |                               | I <sub>F</sub> = 5 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> | -   | 45  | -   | 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>   | -   | 11  | -   | ns   |
|                                |                               | I <sub>F</sub> = 5 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>  | -   | 23  | -   | ns   |
|                                |                               | I <sub>F</sub> = 5 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> | -   | 28  | -   | ns   |
|                                |                               | I <sub>F</sub> = 5 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>  | -   | 13  | 25  | ns   |
| I <sub>RM</sub>                | peak reverse recovery current | I <sub>F</sub> = 5 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>  | -   | 1.7 | -   | A    |
|                                |                               | I <sub>F</sub> = 5 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> | -   | 3.2 | -   | A    |



$V_o = 1.801 \text{ V}; R_s = 0.062 \Omega$   
 (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

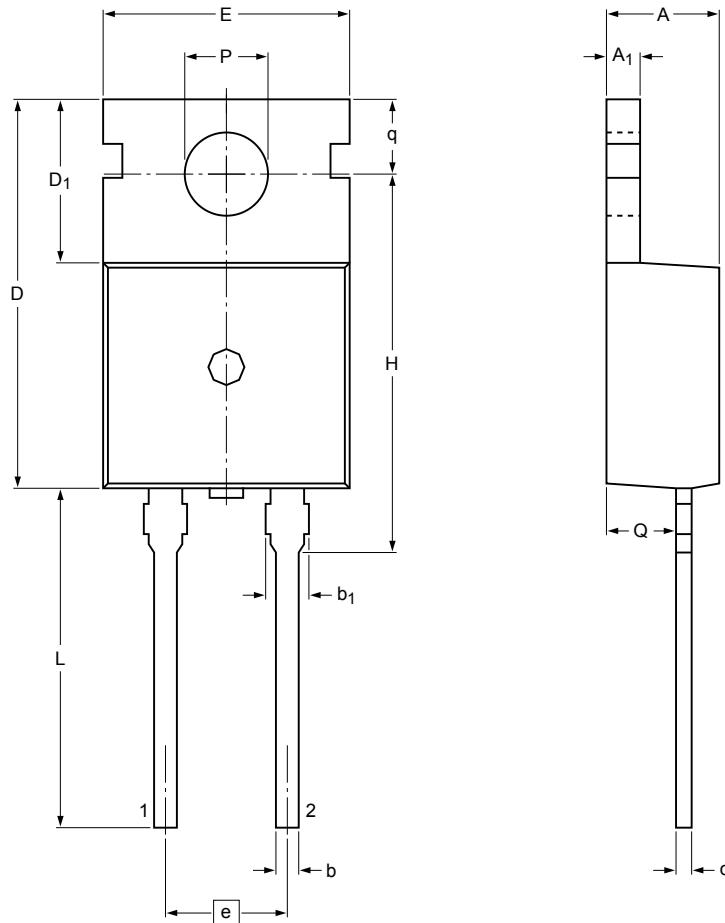
**Fig. 6. Forward current as a function of forward voltage**



**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> <sup>(1)</sup> | 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 |       |       |                     | 09-08-25<br>12-11-27 |

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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