



# BYC10D-600

## Hyperfast power diode

Rev. 1 — 28 June 2011

Product data sheet

## 1. Product profile

### 1.1 General description

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

### 1.2 Features and benefits

- Low reverse recovery current and low thermal resistance
- Reduces switching losses in associated MOSFET

### 1.3 Applications

- Continuous Current Mode (CCM) Power Factor Correction (PFC)
- Half-bridge/full-bridge switched-mode power supplies
- Half-bridge lighting ballasts

### 1.4 Quick reference data

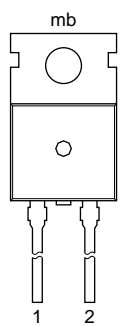
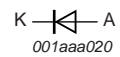
Table 1. Quick reference data

| Symbol                         | Parameter                       | Conditions   | Min | Typ | Max | Unit |
|--------------------------------|---------------------------------|--|-----|-----|-----|------|
| $V_{RRM}$                      | repetitive peak reverse voltage |  | -   | -   | 600 | V    |
| $I_{F(AV)}$                    | average forward current         | square-wave pulse; $\delta = 0.5$ ;<br>$T_{mb} \leq 93$ °C; see <a href="#">Figure 1</a> ;<br>see <a href="#">Figure 2</a> | -   | -   | 10  | A    |
| <b>Static characteristics</b>  |                                 |  |     |     |     |      |
| $V_F$                          | forward voltage                 | $I_F = 10$ A; $T_j = 25$ °C;<br>see <a href="#">Figure 5</a>   | -   | 2   | 2.5 | V    |
|                                |                                 | $I_F = 10$ A; $T_j = 150$ °C;<br>see <a href="#">Figure 5</a>  | -   | 1.4 | 1.8 | V    |
| <b>Dynamic characteristics</b> |                                 |  |     |     |     |      |
| $t_{rr}$                       | reverse recovery time           | $I_F = 10$ A; $V_R = 400$ V;<br>$di_F/dt = 500$ A/ $\mu$ s; $T_j = 25$ °C;<br>see <a href="#">Figure 6</a>                 | -   | 18  | -   | ns   |



## 2. 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 |  |   |

**SOD59 (TO-220AC)**

## 3. Ordering information

Table 3. Ordering information

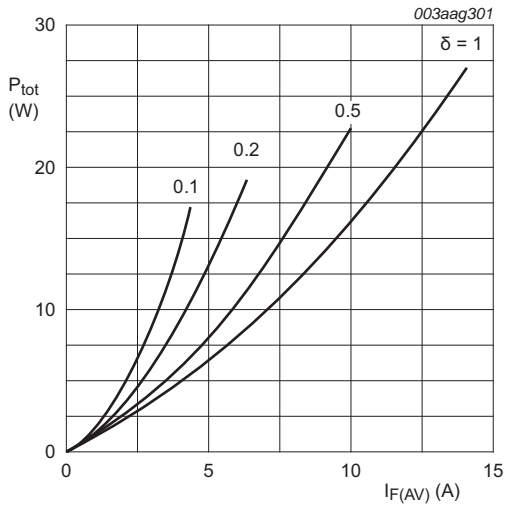
| Type number | Package  |  |         |
|-------------|----------|--|---------|
|             | Name     | Description  | Version |
| BYC10D-600  | TO-220AC | plastic single-ended package; heatsink mounted; 1 mounting hole; 2-lead TO-220AC | SOD59   |

## 4. Limiting values

Table 4. Limiting values

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

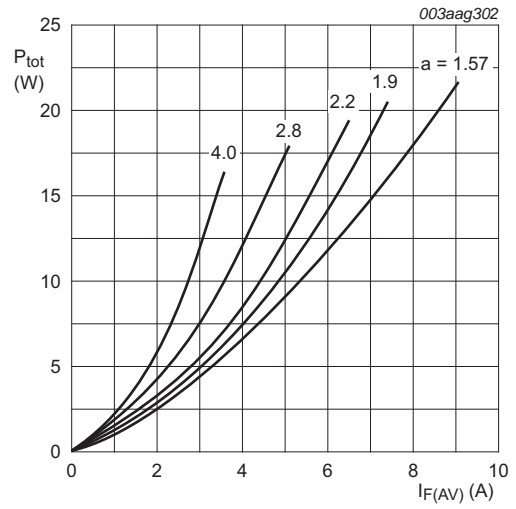
| Symbol      | Parameter                           | Conditions   | Min | Max | Unit |
|-------------|-------------------------------------|--|-----|-----|------|
| $V_{RRM}$   | repetitive peak reverse voltage     |  | -   | 600 | V    |
| $V_{RWM}$   | crest working reverse voltage       |  | -   | 600 | V    |
| $V_R$       | reverse voltage                     | DC   | -   | 500 | V    |
| $I_{F(AV)}$ | average forward current             | square-wave pulse; $\delta = 0.5$ ; $T_{mb} \leq 93\text{ °C}$ ; see <a href="#">Figure 1</a> ; see <a href="#">Figure 2</a> | -   | 10  | A    |
| $I_{FRM}$   | repetitive peak forward current     | square-wave pulse; $\delta = 0.5$ ; $t_p = 25\ \mu\text{s}$ ; $T_{mb} \leq 93\text{ °C}$                                     | -   | 20  | A    |
| $I_{FSM}$   | non-repetitive peak forward current | $t_p = 8.3\text{ ms}$ ; sine-wave pulse; $T_{j(\text{init})} = 25\text{ °C}$ ; see <a href="#">Figure 3</a>                  | -   | 71  | A    |
|             |                                     | $t_p = 10\text{ ms}$ ; sine-wave pulse; $T_{j(\text{init})} = 25\text{ °C}$ ; see <a href="#">Figure 3</a>                   | -   | 65  | A    |
| $T_{stg}$   | storage temperature                 |  | -40 | 150 | °C   |
| $T_j$       | junction temperature                |  | -   | 150 | °C   |



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

$V_o = 0.987 \text{ V}; R_s = 0.065 \Omega$

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



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

$V_o = 0.987 \text{ V}; R_s = 0.065 \Omega$

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

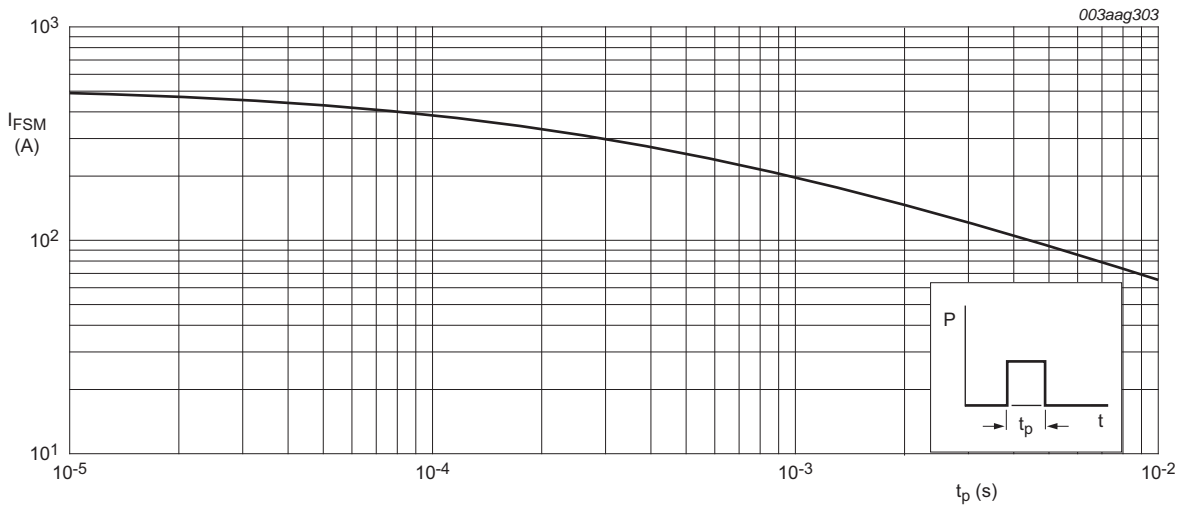
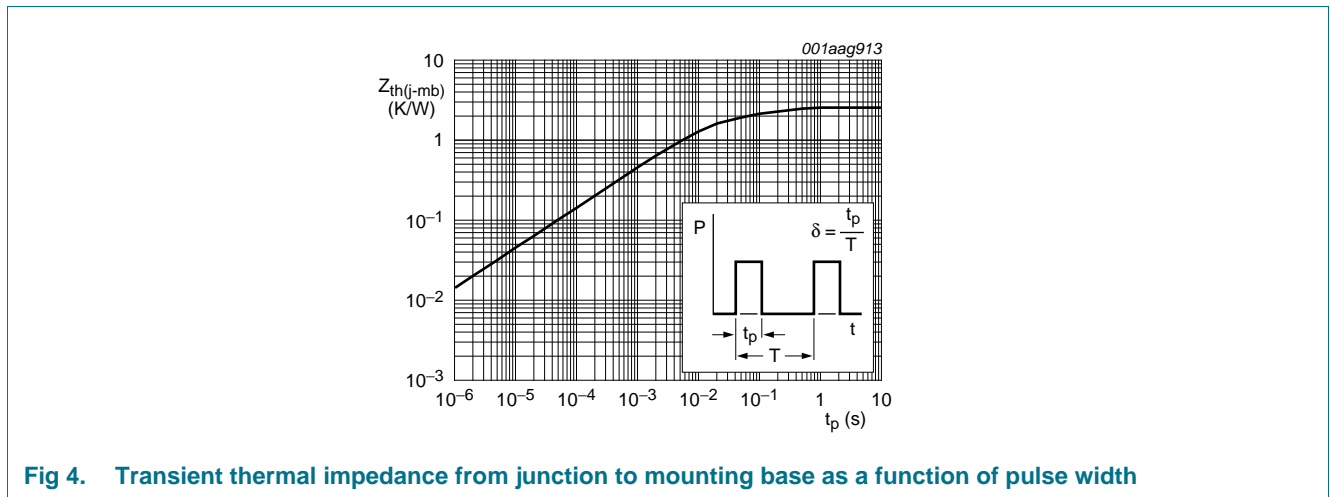


Fig 3. Non-repetitive peak forward current as a function of pulse width; square waveform; maximum values

### 5. Thermal characteristics

Table 5. Thermal characteristics

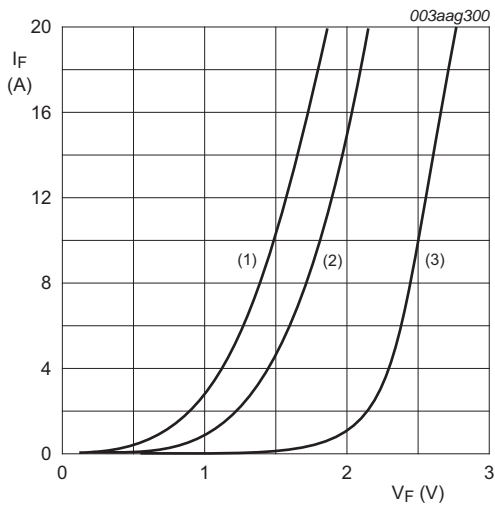
| Symbol         | Parameter  | Conditions                   | Min | Typ | Max | Unit |
|----------------|--|------------------------------|-----|-----|-----|------|
| $R_{th(j-mb)}$ | thermal resistance from junction to mounting base    | see <a href="#">Figure 4</a> | -   | -   | 2.5 | K/W  |
| $R_{th(j-a)}$  | thermal resistance from junction to ambient free air | in free air                  | -   | 60  | -   | K/W  |



6. Characteristics

Table 6. Characteristics

| Symbol                         | Parameter                     | Conditions   | Min | Typ | Max | Unit          |
|--------------------------------|-------------------------------|--|-----|-----|-----|---------------|
| <b>Static characteristics</b>  |                               |  |     |     |     |               |
| $V_F$                          | forward voltage               | $I_F = 20\text{ A}; T_j = 150\text{ °C};$ see <a href="#">Figure 5</a>   | -   | 1.7 | 2.2 | V             |
|                                |                               | $I_F = 10\text{ A}; T_j = 25\text{ °C};$ see <a href="#">Figure 5</a>  | -   | 2   | 2.5 | V             |
|                                |                               | $I_F = 10\text{ A}; T_j = 150\text{ °C};$ see <a href="#">Figure 5</a>   | -   | 1.4 | 1.8 | V             |
| $I_R$                          | reverse current               | $V_R = 600\text{ V}$   | -   | 9   | 200 | $\mu\text{A}$ |
|                                |                               | $V_R = 500\text{ V}; T_j = 100\text{ °C}$  | -   | 1.1 | 3   | mA            |
| <b>Dynamic characteristics</b> |                               |  |     |     |     |               |
| $t_{rr}$                       | reverse recovery time         | $I_F = 1\text{ A}; V_R = 30\text{ V}; dI_F/dt = 50\text{ A}/\mu\text{s}; T_j = 25\text{ °C};$ see <a href="#">Figure 6</a>     | -   | 15  | 30  | ns            |
|                                |                               | $I_F = 10\text{ A}; V_R = 400\text{ V}; dI_F/dt = 500\text{ A}/\mu\text{s}; T_j = 25\text{ °C};$ see <a href="#">Figure 6</a>  | -   | 18  | -   | ns            |
| $I_{RM}$                       | peak reverse recovery current | $I_F = 10\text{ A}; V_R = 400\text{ V}; dI_F/dt = 50\text{ A}/\mu\text{s}; T_j = 125\text{ °C};$ see <a href="#">Figure 6</a>  | -   | 3   | 7.5 | A             |
|                                |                               | $I_F = 10\text{ A}; V_R = 400\text{ V}; dI_F/dt = 500\text{ A}/\mu\text{s}; T_j = 100\text{ °C};$ see <a href="#">Figure 6</a> | -   | 9.5 | 12  | A             |
| $V_{FR}$                       | forward recovery voltage      | $I_F = 10\text{ A}; dI_F/dt = 100\text{ A}/\mu\text{s}; T_j = 25\text{ °C};$ see <a href="#">Figure 7</a>                      | -   | 8   | 11  | V             |



(1)  $T_j = 150\text{ °C};$  typical values;  
 (2)  $T_j = 150\text{ °C};$  maximum values;  
 (3)  $T_j = 25\text{ °C};$  maximum values;  
 $V_o = 0.987\text{ V}; R_s = 0.065\ \Omega$

Fig 5. Forward current as a function of forward voltage

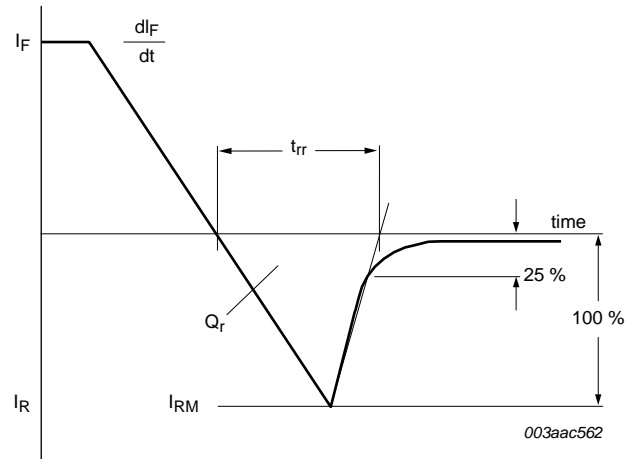


Fig 6. Reverse recovery definitions; ramp recovery

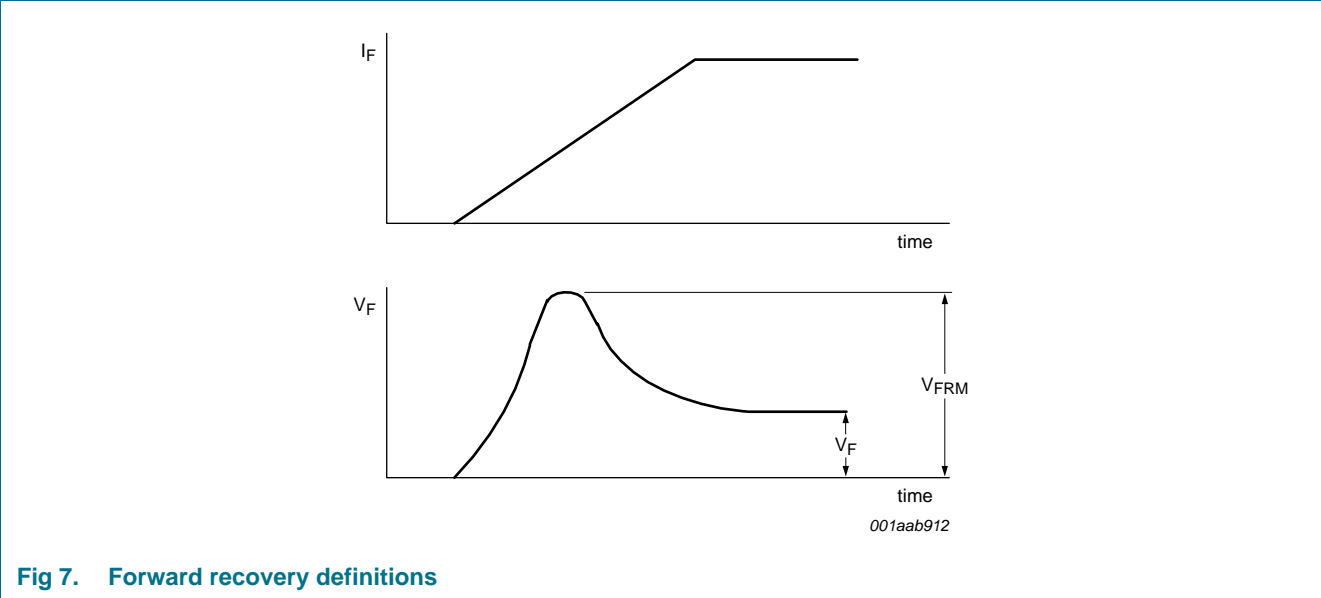
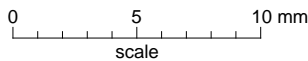
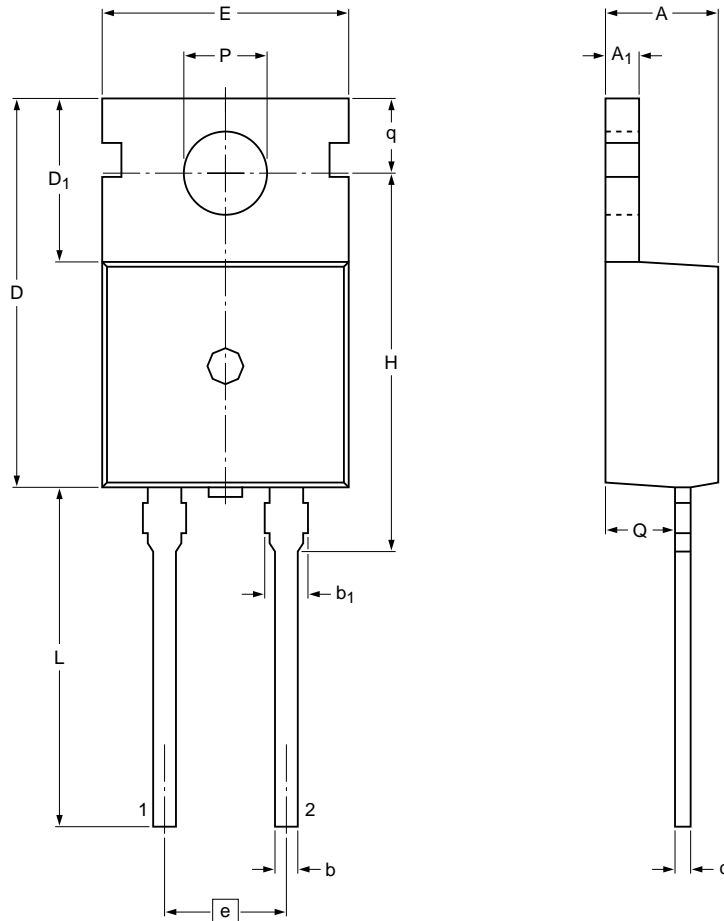


Fig 7. Forward recovery definitions

7. 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 | 3.7 | 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 | 3.5 | 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 |       |       |                     | -09-08-17-<br>09-08-25 |

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

## 8. Revision history

Table 7. Revision history

| Document ID    | Release date | Data sheet status  | Change notice | Supersedes |
|----------------|--------------|--------------------|---------------|------------|
| BYC10D-600 v.1 | 20110628     | Product data sheet | -             | -          |



## 9. Legal information

### 9.1 Data sheet status

| Document status <a href="#">[1]</a> <a href="#">[2]</a> | Product status <a href="#">[3]</a> | Definition  |
|---|------------------------------------|---|
| Objective [short] data sheet                            | Development                        | This document contains data from the objective specification for product development. |
| Preliminary [short] data sheet                          | Qualification                      | This document contains data from the preliminary specification.                       |
| Product [short] data sheet                              | Production                         | This document contains the product specification.                                     |

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