# BYC10-600

## Hyperfast power diode

27 May 2013 Product data sheet

## 1. General description

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

## 2. Features and benefits

- Extremely fast switching
- Low reverse recovery current
- Low thermal resistance
- Reduces switching losses in associated MOSFET

## 3. Applications

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

## 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 | δ = 0.5 ; $T_{mb}$ ≤ 78 °C; square-wave pulse; Fig. 1; Fig. 2 | | - | - | 10 | A |
| **Static characteristics** | | | | | | | |
| $V_F$ | forward voltage | $I_F$ = 10 A; $T_j$ = 150 °C; Fig. 4 | | - | 1.4 | 1.8 | V |
| **Dynamic characteristics** | | | | | | | |
| $t_{rr}$ | reverse recovery time | $I_F$ = 10 A; $V_R$ = 400 V; $dI_F/dt$ = 500 A/µs; $T_j$ = 25 °C; Fig. 6 | | - | 19 | - | ns |

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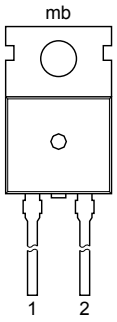
## 5. Pinning information

**Table 2. Pinning information**

| Pin | Symbol | Description | Simplified outline | Graphic symbol |
|---|---|---|---|---|
| 1 | K | cathode |   TO-220AC (SOD59) |   |
| 2 | A | anode | | |
| mb | mb | mounting base; connected to cathode | | |

## 6. Ordering information

**Table 3. Ordering information**

| Type number | Package | | |
|---|---|---|---|
| | Name | Description | Version |
| BYC10-600 | 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 | | | - | 600 | V |
| $V_{RWM}$ | crest working reverse voltage | | | - | 600 | V |
| $V_R$ | reverse voltage | $T_{mb} \leq 114$ °C | | - | 500 | V |
| $I_{F(AV)}$ | average forward current | $\delta = 0.5$ ; $T_{mb} \leq 78$ °C; square-wave pulse; Fig. 1; Fig. 2 | | - | 10 | A |
| $I_{FRM}$ | repetitive peak forward current | $\delta = 0.5$ ; $T_{mb} \leq 78$ °C; square-wave pulse | | - | 20 | A |
| $I_{FSM}$ | non-repetitive peak forward current | $t_p = 10$ ms; $T_{j(init)} = 25$ °C; sine-wave pulse | | - | 65 | A |
| | | $t_p = 8.3$ ms; $T_{j(init)} = 25$ °C; sine-wave pulse | | - | 71 | A |
| $T_{stg}$ | storage temperature | | | -40 | 150 | °C |
| $T_j$ | junction temperature | | | - | 150 | °C |

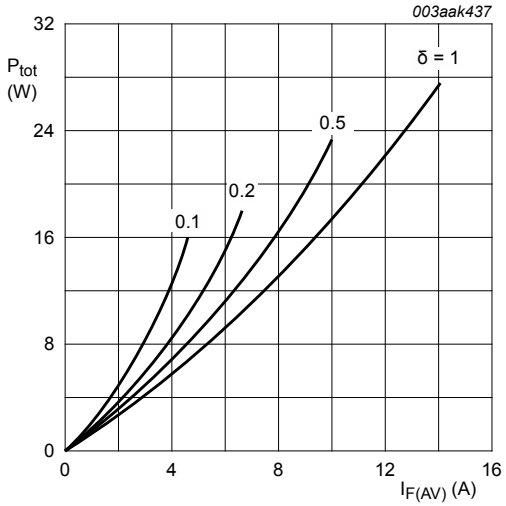



**Fig. 1. Forward power dissipation as a function of average forward current; square waveform; maximum values**

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

$V_O = 1.300\ V;\ R_S = 0.050\ \Omega$

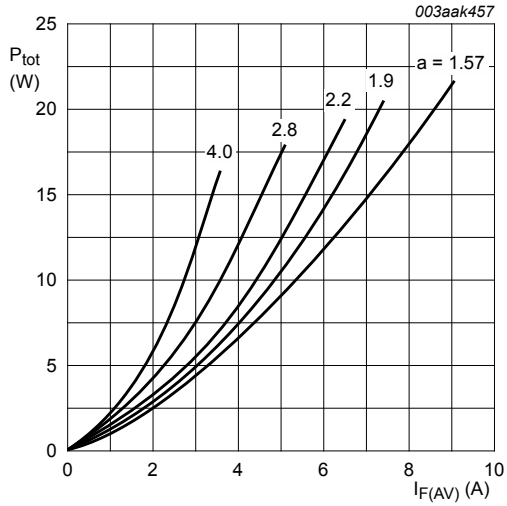



**Fig. 2. Forward power dissipation as a function of average forward current; sinusoidal waveform; maximum values**

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

$V_O = 1.300\ V;\ R_S = 0.050\ \Omega$

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

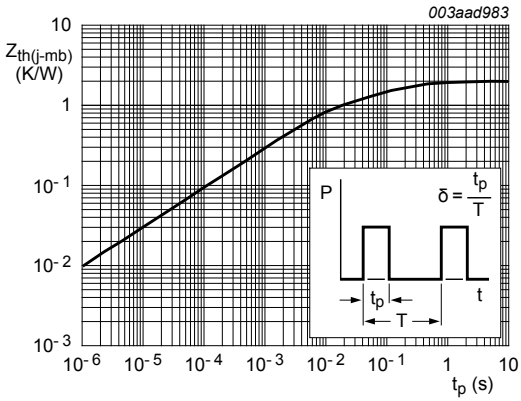



**Fig. 3. Transient thermal impedance from junction to mounting base as a function of pulse width**

# 9. Characteristics

**Table 6. Characteristics**

| Symbol | Parameter | Conditions | | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|---|
| **Static characteristics** | | | | | | | |
| $V_F$ | forward voltage | $I_F$ = 10 A; $T_j$ = 25 °C; Fig. 4 | | - | 2 | 2.9 | V |
| | | $I_F$ = 10 A; $T_j$ = 150 °C; Fig. 4 | | - | 1.4 | 1.8 | V |
| | | $I_F$ = 20 A; $T_j$ = 150 °C; Fig. 4 | | - | 1.7 | 2.3 | V |
| $I_R$ | reverse current | $V_R$ = 600 V; $T_j$ = 25 °C; Fig. 5 | | - | 9 | 200 | µA |
| | | $V_R$ = 500 V; $T_j$ = 100 °C; Fig. 5 | | - | 1.1 | 3 | mA |
| **Dynamic characteristics** | | | | | | | |
| $t_{rr}$ | reverse recovery time | $I_F$ = 1 A; $V_R$ = 30 V; $dI_F/dt$ = 50 A/µs; $T_j$ = 25 °C; Fig. 6 | | - | 35 | 55 | ns |
| | | $I_F$ = 10 A; $V_R$ = 400 V; $dI_F/dt$ = 500 A/µs; $T_j$ = 25 °C; Fig. 6 | | - | 19 | - | ns |
| | | $I_F$ = 10 A; $V_R$ = 400 V; $dI_F/dt$ = 500 A/µs; $T_j$ = 100 °C; Fig. 6 | | - | 32 | 40 | ns |
| $I_{RM}$ | peak reverse recovery current | $I_F$ = 10 A; $V_R$ = 400 V; $dI_F/dt$ = 100 A/µs; $T_j$ = 125 °C; Fig. 6 | | - | 3 | 7.5 | A |
| | | $I_F$ = 10 A; $V_R$ = 400 V; $dI_F/dt$ = 500 A/µs; $T_j$ = 125 °C; Fig. 6 | | - | 9.5 | 12 | A |
| $V_{FRM}$ | forward recovery voltage | $I_F$ = 10 A; $dI_F/dt$ = 100 A/µs; $T_j$ = 25 °C; Fig. 7 | | - | 8 | 11 | V |

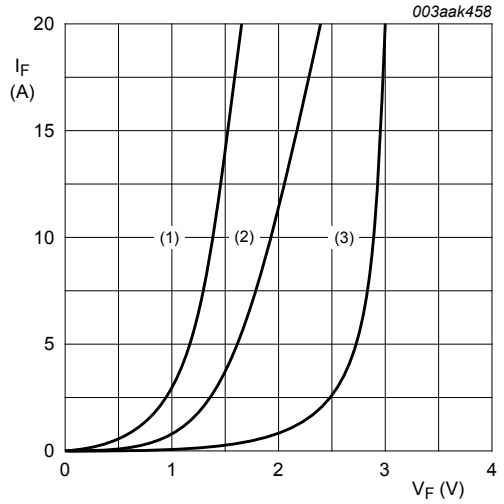



**Fig. 4. Forward current as a function of forward voltage**

(1) $T_j = 150$ °C; typical values;
(2) $T_j = 150$ °C; maximum values;
(3) $T_j = 25$ °C; maximum values;
$V_O = 1.300$ V; $R_s = 0.050$ Ω

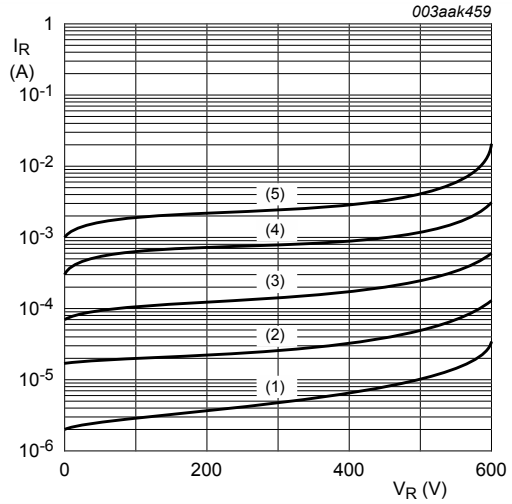



**Fig. 5. Reverse leakage current as a function of reverse voltage; typical values**

(1) $T_j = 25$ °C; typical values;
(2) $T_j = 50$ °C; typical values;
(3) $T_j = 75$ °C; typical values;
(4) $T_j = 100$ °C; typical values;
(5) $T_j = 125$ °C; typical value

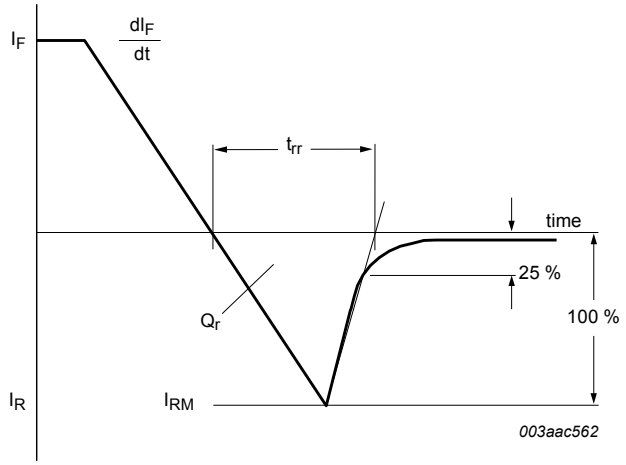



**Fig. 6. Reverse recovery definitions; ramp recovery**

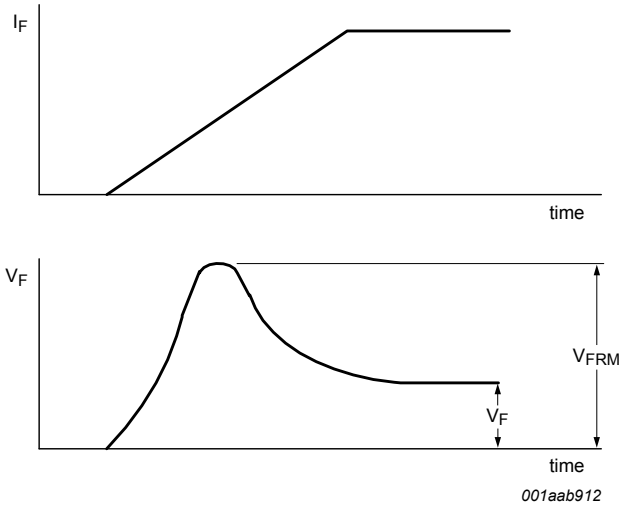
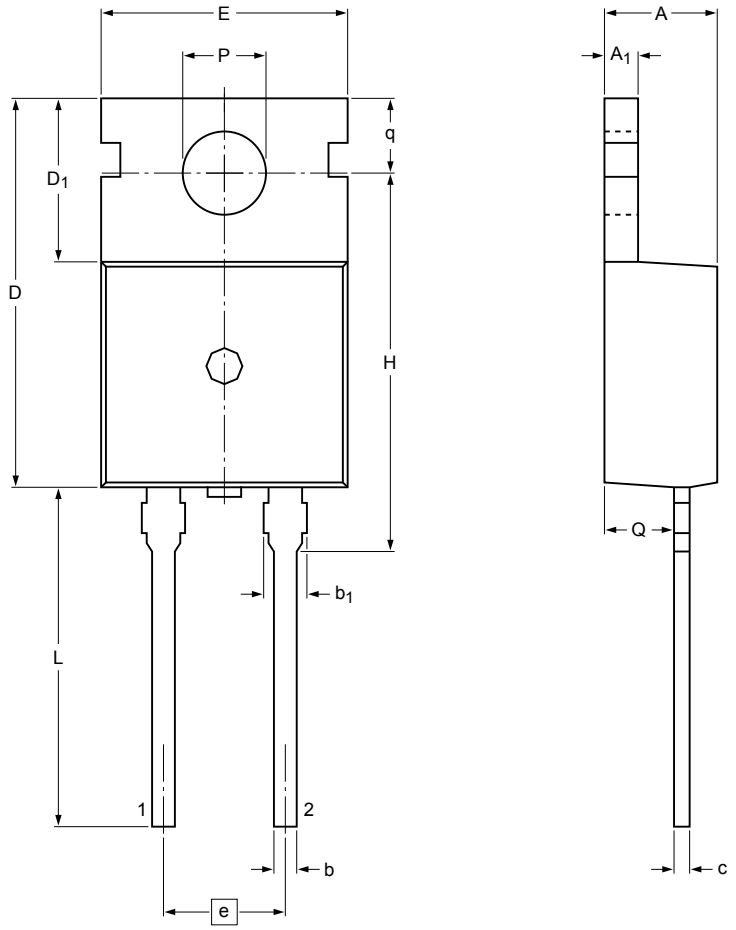



**Fig. 7. Forward recovery definitions**

## 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. 8. Package outline TO-220AC (SOD59)**

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|---|---|---|
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