# BYC10DX-600

## Hyperfast power diode

**Rev. 1 — 30 June 2011** **Product data sheet**

## 1. Product profile

### 1.1 General description

Hyperfast power diode in a SOD113 (2-lead TO-220F) plastic package.

### 1.2 Features and benefits

- Isolated plastic package
- Low reverse recovery current
- 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

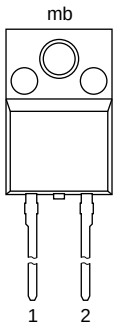
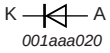
### 1.4 Quick reference data

**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; $\delta = 0.5$ ; $T_h = 41$ °C; see Figure 1; see Figure 2 | - | - | 10 | A |
| **Static characteristics** | | | | | | |
| $V_F$ | forward voltage | $I_F = 10$ A; $T_j = 25$ °C; see Figure 5 | - | 2 | 2.5 | V |
| | | $I_F = 10$ A; $T_j = 150$ °C; see Figure 5 | - | 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; see Figure 6 | - | 18 | - | ns |

## 2. Pinning information

**Table 2. Pinning information**

| Pin | Symbol | Description | Simplified outline | Graphic symbol |
|---|---|---|---|---|
| 1 | K | cathode |   SOD113 (TO-220F) |   001aaa020 |
| 2 | A | anode | | |
| mb | n.c. | mounting base; isolated | | |

## 3. Ordering information

**Table 3. Ordering information**

| Type number | Package | | |
|---|---|---|---|
| | Name | Description | Version |
| BYC10DX-600 | TO-220F | plastic single-ended package; isolated heatsink mounted; 1 mounting hole; 2-lead TO-220 "full pack" | SOD113 |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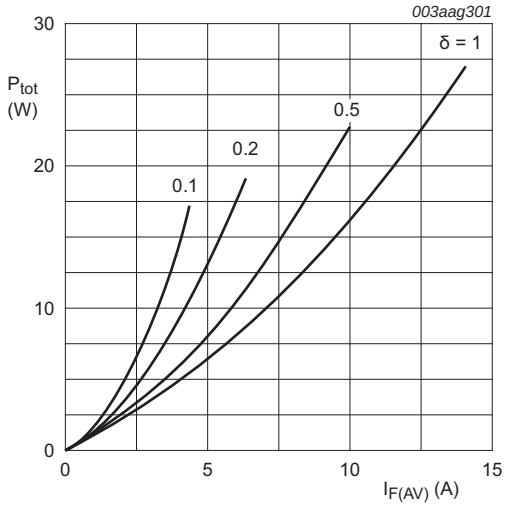
## 4. Limiting values

**Table 4. Limiting values**

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

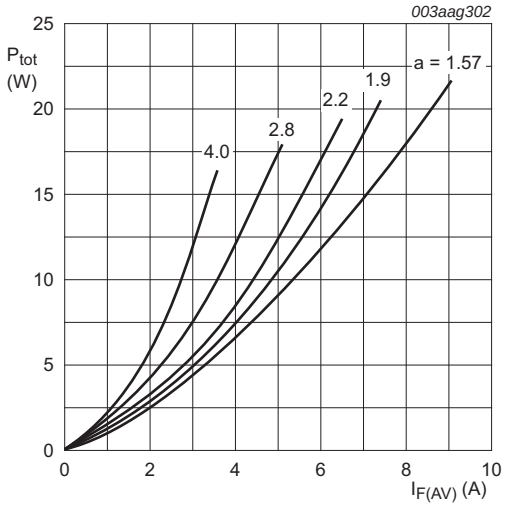
| Symbol | Parameter | Conditions | Min | Max | Unit |
|---|---|---|---|---|---|
| $V_{RRM}$ | repetitive peak reverse voltage | | - | 600 | V |
| $V_{RWM}$ | crest working reverse voltage | | - | 600 | V |
| $V_R$ | reverse voltage | DC | - | 500 | V |
| $I_{F(AV)}$ | average forward current | square-wave pulse; δ = 0.5 ; $T_h$ = 41 °C; see Figure 1; see Figure 2 | - | 10 | A |
| $I_{FRM}$ | repetitive peak forward current | square-wave pulse; δ = 0.5 ; $t_p$ = 25 µs; $T_h$ = 41 °C | - | 20 | A |
| $I_{FSM}$ | non-repetitive peak forward current | $t_p$ = 10 ms; sine-wave pulse; $T_{j(init)}$ = 25 °C; see Figure 3 | - | 65 | A |
| | | $t_p$ = 8.3 ms; sine-wave pulse; $T_{j(init)}$ = 25 °C; see Figure 3 | - | 71 | A |
| $T_{stg}$ | storage temperature | | -40 | 150 | °C |
| $T_j$ | junction temperature | | - | 150 | °C |




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

$$V_o = 0.987\ V;\ R_s = 0.065\ \Omega$$

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




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

$$V_o = 0.987\ V;\ R_s = 0.065\ \Omega$$

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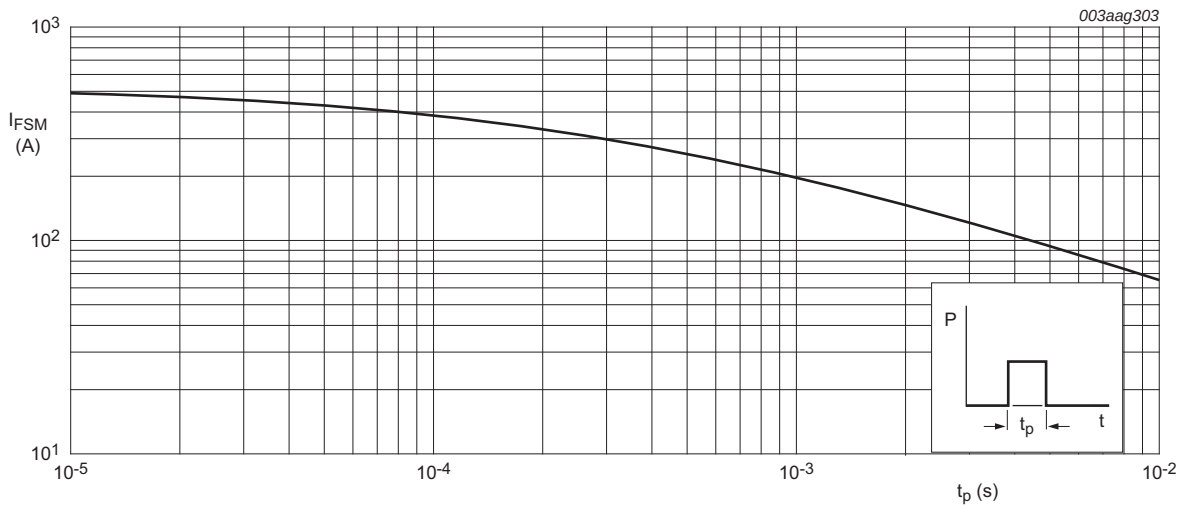


**Fig 3. Non-repetitive peak forward current as a function of pulse width; square waveform; maximum values**


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## 5. Thermal characteristics

**Table 5. Thermal characteristics**

| Symbol | Parameter | Conditions | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| $R_{th(j-h)}$ | thermal resistance from junction to heatsink | without heatsink compound | - | - | 5.9 | K/W |
| | | with heatsink compound ; see Figure 4 | - | - | 4.8 | K/W |
| $R_{th(j-a)}$ | thermal resistance from junction to ambient free air | | - | 60 | - | K/W |

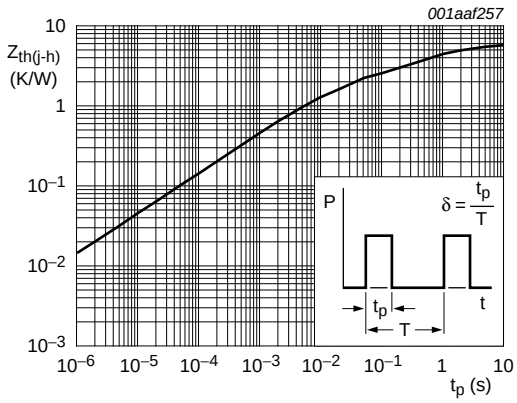


**Fig 4. Transient thermal impedance from junction to heatsink as a function of pulse width**

## 6. Isolation characteristics

**Table 6. Isolation characteristics**

| Symbol | Parameter | Conditions | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| $V_{isol(RMS)}$ | RMS isolation voltage | 50 Hz ≤ f ≤ 60 Hz; RH ≤ 65 %; from all pins to external heatsink; sinusoidal waveform; clean and dust free | - | - | 2500 | V |
| $C_{isol}$ | isolation capacitance | f = 1 MHz ; from cathode to external heatsink | - | 10 | - | pF |


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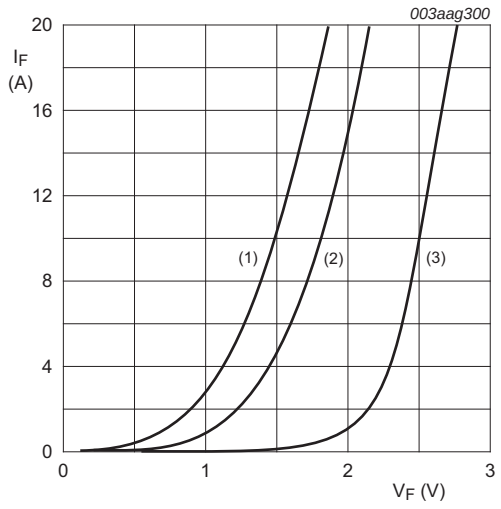
# 7. Characteristics

**Table 7. Characteristics**

| Symbol | Parameter | Conditions | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|
| **Static characteristics** | | | | | | |
| $V_F$ | forward voltage | $I_F$ = 10 A; $T_j$ = 25 °C; see Figure 5 | - | 2 | 2.5 | V |
| | | $I_F$ = 10 A; $T_j$ = 150 °C; see Figure 5 | - | 1.4 | 1.8 | V |
| | | $I_F$ = 20 A; $T_j$ = 150 °C; see Figure 5 | - | 1.7 | 2.2 | V |
| $I_R$ | reverse current | $V_R$ = 500 V; $T_j$ = 100 °C | - | 1.1 | 3 | mA |
| | | $V_R$ = 600 V | - | 9 | 200 | µA |
| **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; see Figure 6 | - | 15 | 30 | ns |
| | | $I_F$ = 10 A; $V_R$ = 400 V; $dI_F/dt$ = 500 A/µs; $T_j$ = 25 °C; see Figure 6 | - | 18 | - | ns |
| $I_{RM}$ | peak reverse recovery current | $I_F$ = 10 A; $V_R$ = 400 V; $dI_F/dt$ = 500 A/µs; $T_j$ = 100 °C; see Figure 6 | - | 9.5 | 12 | A |
| | | $I_F$ = 10 A; $V_R$ = 400 V; $dI_F/dt$ = 50 A/µs; $T_j$ = 125 °C; see Figure 6 | - | 3 | 7.5 | A |
| $V_{FR}$ | forward recovery voltage | $I_F$ = 10 A; $dI_F/dt$ = 100 A/µs; $T_j$ = 25 °C; see Figure 7 | - | 8 | 11 | V |




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

**Fig 5. Forward current as a function of forward voltage**

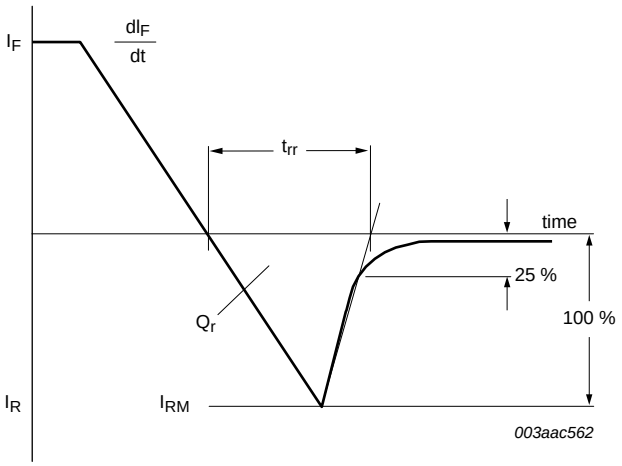



**Fig 6. Reverse recovery definitions; ramp recovery**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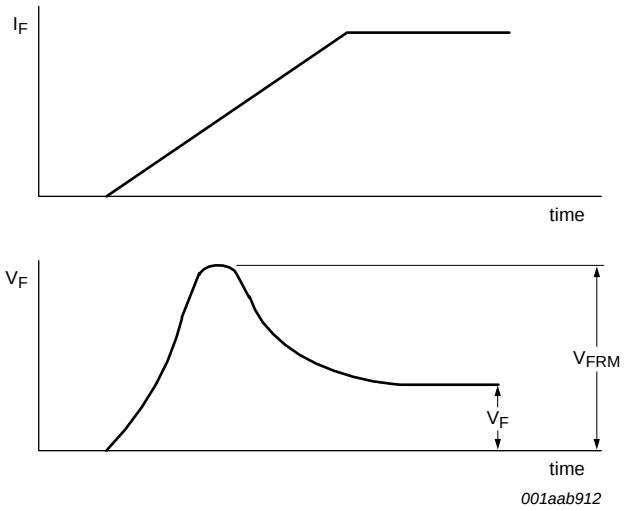


**Fig 7. Forward recovery definitions**


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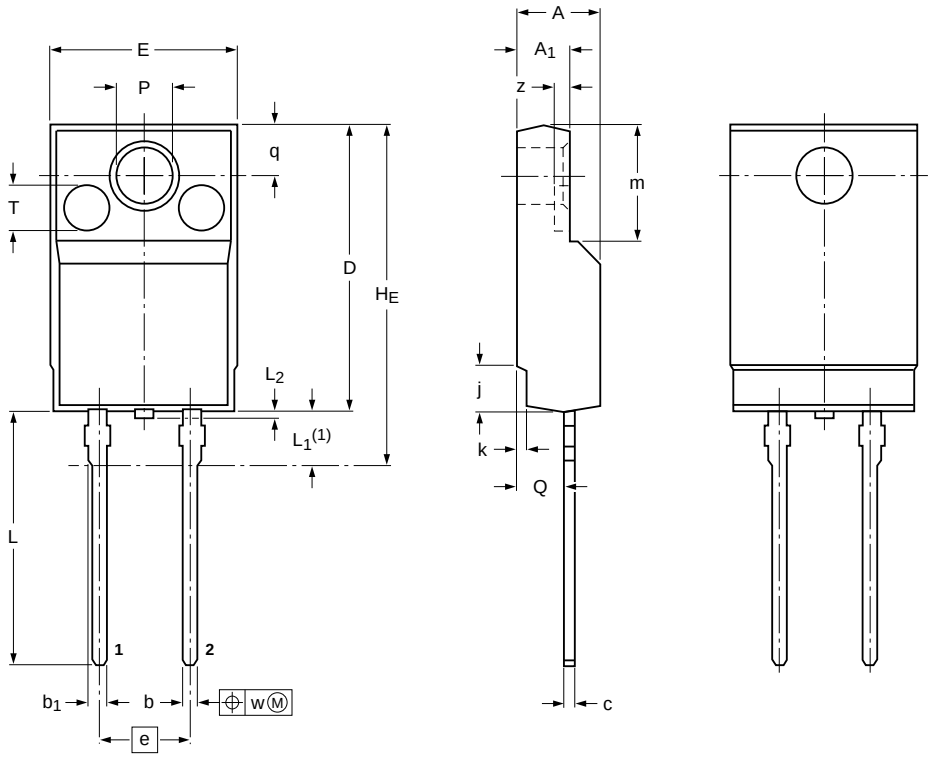
## 8. Package outline

**Plastic single-ended package; isolated heatsink mounted;**
**1 mounting hole; 2-lead TO-220 'full pack'** **SOD113**




| z(2) |
|---|
| 0.8 |

**DIMENSIONS (mm are the original dimensions)**

| UNIT | A | $A_1$ | b | $b_1$ | c | D | E | e | $H_E$ max | j | k | L | $L_1$(1) | $L_2$ max | m | P | Q | q | T | w |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| mm | 4.6<br>4.0 | 2.9<br>2.5 | 0.9<br>0.7 | 1.1<br>0.9 | 0.7<br>0.4 | 15.8<br>15.2 | 10.3<br>9.7 | 5.08 | 19.0 | 2.7<br>1.7 | 0.6<br>0.4 | 14.4<br>13.5 | 3.3<br>2.8 | 0.5 | 6.5<br>6.3 | 3.2<br>3.0 | 2.6<br>2.3 | 2.6 | 2.55 | 0.4 |

**Notes**
1. Terminals are uncontrolled within zone $L_1$.
2. z is depth of T.

| OUTLINE VERSION | REFERENCES | | | | EUROPEAN PROJECTION | ISSUE DATE |
|---|---|---|---|---|---|---|
| | IEC | JEDEC | JEITA | | | |
| SOD113 | | 2-lead TO-220F | | | | ~~02-04-09~~<br>07-06-18 |

**Fig 8. Package outline SOD113 (TO-220F)**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# 9. Revision history

**Table 8. Revision history**

| Document ID | Release date | Data sheet status | Change notice | Supersedes |
|---|---|---|---|---|
| BYC10DX-600 v.1 | 20110630 | Product data sheet | - | - |


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