

# BYC10X-600

Rectifier diode, hyperfast

Rev. 02 — 16 January 2008

Product data sheet

## 1. Product profile

### 1.1 General description

Hyperfast, epitaxial rectifier diode in a SOD113 (TO-220F) plastic package.

### 1.2 Features

- Extremely fast switching
- Low reverse recovery current
- Reduces switching loss in associated MOSFET
- Low thermal resistance
- Isolated package

### 1.3 Applications

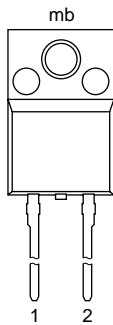
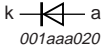
- Half-bridge or full-bridge switched-mode power supplies
- Half-bridge lighting ballasts
- Continuous Current Mode (CCM) Power Factor Correction (PFC)

### 1.4 Quick reference data

- $V_{RRM} \leq 600$  V
- $V_F = 1.32$  V (typ)
- $I_{F(AV)} \leq 10$  A
- $t_{rr} = 19$  ns (typ)

## 2. Pinning information

Table 1. Pinning

| Pin | Description             | Simplified outline   | Graphic symbol  |
|-----|-------------------------|--|---|
| 1   | cathode (k)             |  |  |
| 2   | anode (a)               |  |   |
| mb  | mounting base; isolated |  |   |

SOD113 (2-lead TO-220F)

### 3. Ordering information

**Table 2. Ordering information**

| Type number | Package |   | Version |
|-------------|---------|---|---------|
|             | Name    | Description   |         |
| BYC10X-600  | TO-220F | plastic single-ended package; isolated heatsink mounted; 1 mounting hole; 2-lead TO-220 'full pack' | SOD113  |

### 4. Limiting values

**Table 3. 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                     | square waveform; $\delta = 1.0$ ; $T_h \leq 100$ °C | -   | 500  | V    |
| $I_{F(AV)}$ | average forward current             | square waveform; $\delta = 0.5$ ; $T_h \leq 37$ °C  | -   | 10   | A    |
| $I_{FRM}$   | repetitive peak forward current     | square waveform; $\delta = 0.5$ ; $T_h \leq 37$ °C  | -   | 20   | A    |
| $I_{FSM}$   | non-repetitive peak forward current | $t = 10$ ms; sinusoidal waveform                    | -   | 91   | A    |
|             |                                     | $t = 8.3$ ms; sinusoidal waveform                   | -   | 100  | A    |
| $T_{stg}$   | storage temperature                 |   | -40 | +150 | °C   |
| $T_j$       | junction temperature                |   | -   | 150  | °C   |

## 5. Thermal characteristics

Table 4. Thermal characteristics

| Symbol        | Parameter                                    | Conditions  | Min | Typ | Max | Unit |
|---------------|--|---|-----|-----|-----|------|
| $R_{th(j-h)}$ | thermal resistance from junction to heatsink | with heatsink compound;<br>see <a href="#">Figure 1</a> | -   | -   | 4.8 | K/W  |
|               |  | without heatsink compound                               | -   | -   | 5.9 | K/W  |
| $R_{th(j-a)}$ | thermal resistance from junction to ambient  | in free air   | -   | 60  | -   | K/W  |

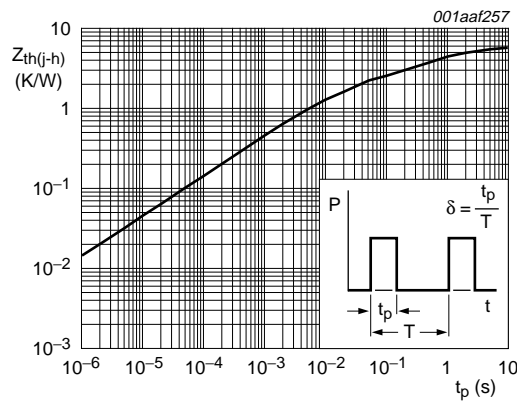


Fig 1. Transient thermal impedance from junction to heatsink as a function of pulse width

## 6. Isolation characteristics

Table 5. Isolation limiting values and characteristics

$T_h = 25^\circ\text{C}$  unless otherwise specified.

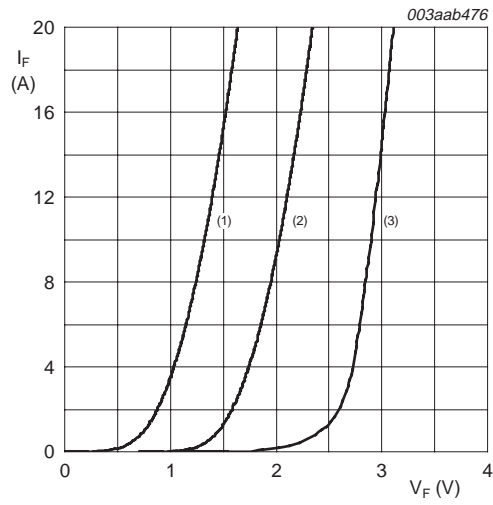
| Symbol          | Parameter             | Conditions   | Min | Typ | Max  | Unit |
|-----------------|-----------------------|--|-----|-----|------|------|
| $V_{isol(RMS)}$ | RMS isolation voltage | from all terminals to external heatsink;<br>$f = 50 \text{ Hz to } 60 \text{ Hz}$ ; sinusoidal waveform;<br>relative humidity $\leq 65 \%$ ; clean and dust free | -   | -   | 2500 | V    |
| $C_{isol}$      | isolation capacitance | from cathode to external heatsink; $f = 1 \text{ MHz}$   | -   | 10  | -    | pF   |

## 7. Characteristics

**Table 6. Characteristics**

$T_j = 25\text{ °C}$  unless otherwise specified.

| Symbol                         | Parameter                     | Conditions  | Min | Typ  | Max  | Unit          |
|--------------------------------|-------------------------------|---|-----|------|------|---------------|
| <b>Static characteristics</b>  |                               |   |     |      |      |               |
| $V_F$                          | forward voltage               | $I_F = 10\text{ A}$ ; $T_j = 150\text{ °C}$ ; see <a href="#">Figure 2</a>  | -   | 1.32 | 2.03 | V             |
|                                |                               | $I_F = 20\text{ A}$ ; $T_j = 150\text{ °C}$ ; see <a href="#">Figure 2</a>  | -   | 1.64 | 2.34 | V             |
|                                |                               | $I_F = 10\text{ A}$ ; see <a href="#">Figure 2</a>  | -   | 1.89 | 2.9  | 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  | 3.0  | mA            |
| <b>Dynamic characteristics</b> |                               |   |     |      |      |               |
| $t_{rr}$                       | reverse recovery time         | $I_F = 1\text{ A}$ to $V_R = 30\text{ V}$ ; $di_F/dt = 50\text{ A}/\mu\text{s}$ ; see <a href="#">Figure 3</a>                            | -   | 35   | 55   | ns            |
|                                |                               | $I_F = 10\text{ A}$ to $V_R = 400\text{ V}$ ; $di_F/dt = 500\text{ A}/\mu\text{s}$ ; see <a href="#">Figure 3</a>                         | -   | 19   | -    | ns            |
|                                |                               | $I_F = 10\text{ A}$ to $V_R = 400\text{ V}$ ; $di_F/dt = 500\text{ A}/\mu\text{s}$ ; $T_j = 100\text{ °C}$ ; see <a href="#">Figure 3</a> | -   | 32   | 40   | ns            |
| $I_{RM}$                       | peak reverse recovery current | $I_F = 10\text{ A}$ to $V_R = 400\text{ V}$ ; $di_F/dt = 50\text{ A}/\mu\text{s}$ ; $T_j = 125\text{ °C}$ ; see <a href="#">Figure 3</a>  | -   | 3.0  | 7.5  | A             |
|                                |                               | $I_F = 10\text{ A}$ to $V_R = 400\text{ V}$ ; $di_F/dt = 500\text{ A}/\mu\text{s}$ ; $T_j = 100\text{ °C}$ ; see <a href="#">Figure 3</a> | -   | 9.5  | 12   | A             |
| $V_{FR}$                       | forward recovery voltage      | $I_F = 10\text{ A}$ ; $di_F/dt = 100\text{ A}/\mu\text{s}$ ; see <a href="#">Figure 4</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

Fig 2. Forward current as a function of forward voltage

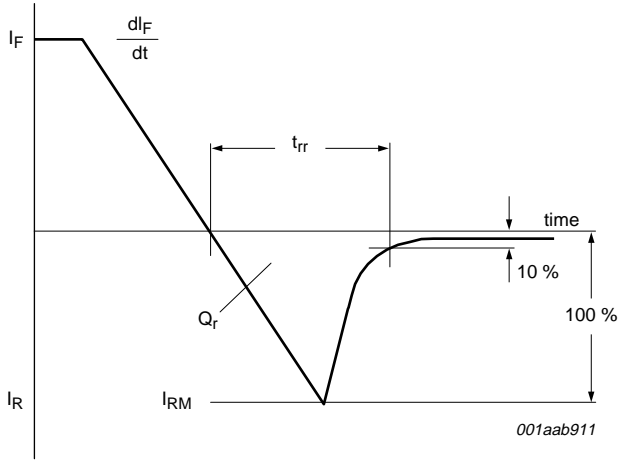


Fig 3. Reverse recovery definitions

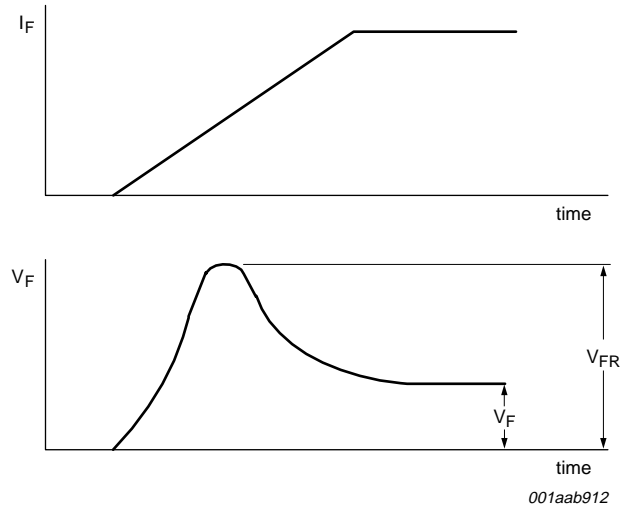
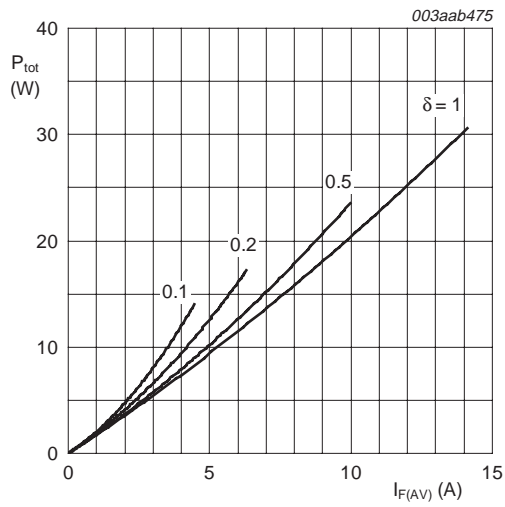
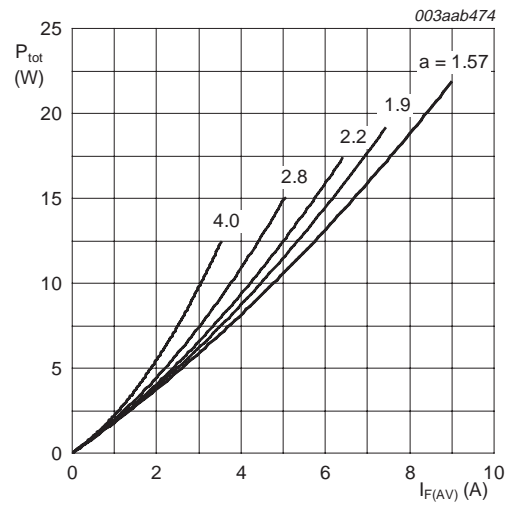


Fig 4. Forward recovery definitions



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

**Fig 5. Forward power dissipation as a function of average forward current; square waveform; maximum values**



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

**Fig 6. Forward power dissipation as a function of average forward current; sinusoidal waveform; maximum values**

8. Package outline

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

SOD113

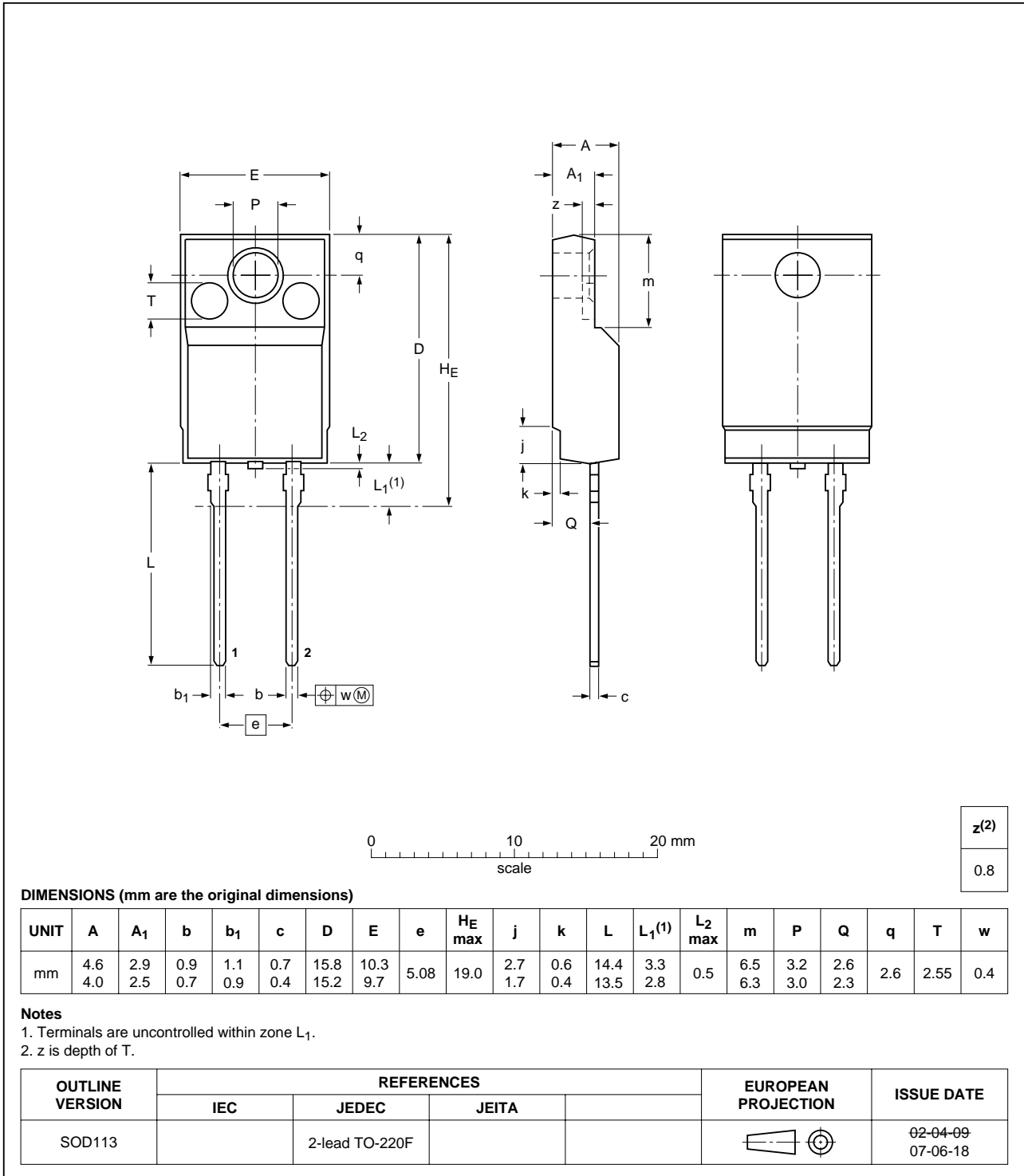


Fig 7. Package outline SOD113 (2-lead TO-220F)

## 9. Revision history

Table 7. Revision history

| Document ID    | Release date   | Data sheet status  | Change notice | Supersedes   |
|----------------|--|--------------------|---------------|--------------|
| BYC10X-600_2   | 20080116   | Product data sheet | -             | BYC10X-600_1 |
| Modifications: | • <a href="#">Table 3 "Limiting values"</a> , $I_{F(AV)}$ and $I_{FRM}$ conditions for $T_h$ changed to 37 °C. |                    |               |              |
| BYC10X-600_1   | 20070831   | Product data sheet | -             | -            |



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| Document status <sup>[1][2]</sup> | Product status <sup>[3]</sup> | 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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