

# IMPORTANT NOTICE

10 December 2015

## 1. Global joint venture starts operations as WeEn Semiconductors

Dear customer,

As from November 9th, 2015 NXP Semiconductors N.V. and Beijing JianGuang Asset Management Co. Ltd established Bipolar Power joint venture (JV), **WeEn Semiconductors**, which will be used in future Bipolar Power documents together with new contact details.

In this document where the previous NXP references remain, please use the new links as shown below.

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Thank you for your cooperation and understanding,

WeEn Semiconductors

# 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

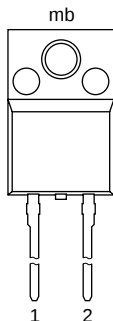
- Half-bridge or full-bridge switched-mode power supplies
- Half-bridge lighting ballasts
- Continuous Current Mode (CCM) Power Factor Correction (PFC)

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

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; 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  |

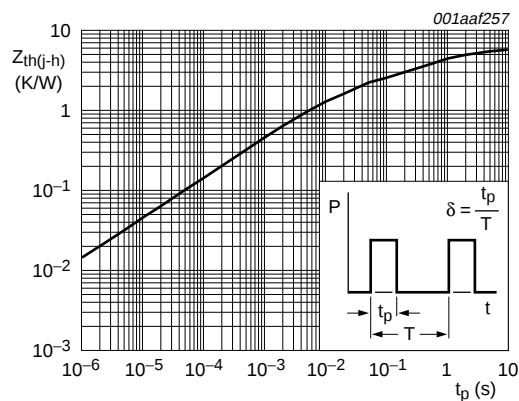


Fig 1. Transient thermal impedance from junction to heatsink as a function of pulse width

6. Isolation characteristics

Table 5. Isolation limiting values and characteristics  
 $T_h = 25\text{ }^{\circ}\text{C}$  unless otherwise specified.

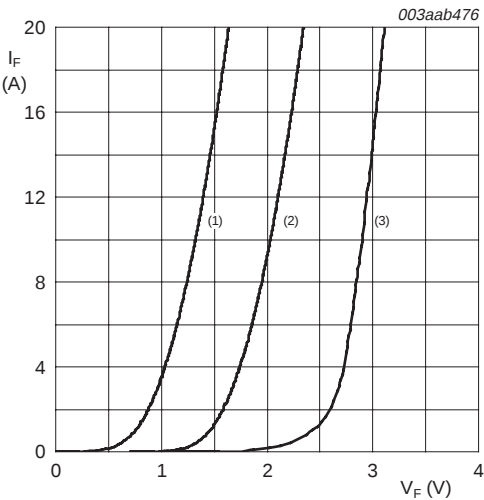
| Symbol          | Parameter             | Conditions                                                                                                                                                   | Min | Typ | Max  | Unit |
|-----------------|-----------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------|-----|-----|------|------|
| $V_{isol(RMS)}$ | 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 |
|-------------------------|-------------------------------|----------------------------------------------------------------------------------------------------------------------------------------|-----|------|------|------|
| Static characteristics  |                               |                                                                                                                                        |     |      |      |      |
| V <sub>F</sub>          | forward voltage               | I <sub>F</sub> = 10 A; T <sub>j</sub> = 150 °C; see <a href="#">Figure 2</a>                                                           | -   | 1.32 | 2.03 | V    |
|                         |                               | I <sub>F</sub> = 20 A; T <sub>j</sub> = 150 °C; see <a href="#">Figure 2</a>                                                           | -   | 1.64 | 2.34 | V    |
|                         |                               | I <sub>F</sub> = 10 A; see <a href="#">Figure 2</a>                                                                                    | -   | 1.89 | 2.9  | V    |
| I <sub>R</sub>          | reverse current               | V <sub>R</sub> = 600 V                                                                                                                 | -   | 9    | 200  | μA   |
|                         |                               | V <sub>R</sub> = 500 V; T <sub>j</sub> = 100 °C                                                                                        | -   | 1.1  | 3.0  | mA   |
| Dynamic characteristics |                               |                                                                                                                                        |     |      |      |      |
| t <sub>rr</sub>         | reverse recovery time         | I <sub>F</sub> = 1 A to V <sub>R</sub> = 30 V; dI <sub>F</sub> /dt = 50 A/μs; see <a href="#">Figure 3</a>                             | -   | 35   | 55   | ns   |
|                         |                               | I <sub>F</sub> = 10 A to V <sub>R</sub> = 400 V; dI <sub>F</sub> /dt = 500 A/μs; see <a href="#">Figure 3</a>                          | -   | 19   | -    | ns   |
|                         |                               | I <sub>F</sub> = 10 A to V <sub>R</sub> = 400 V; dI <sub>F</sub> /dt = 500 A/μs; T <sub>j</sub> = 100 °C; see <a href="#">Figure 3</a> | -   | 32   | 40   | ns   |
| I <sub>RM</sub>         | peak reverse recovery current | I <sub>F</sub> = 10 A to V <sub>R</sub> = 400 V; dI <sub>F</sub> /dt = 50 A/μs; T <sub>j</sub> = 125 °C; see <a href="#">Figure 3</a>  | -   | 3.0  | 7.5  | A    |
|                         |                               | I <sub>F</sub> = 10 A to V <sub>R</sub> = 400 V; dI <sub>F</sub> /dt = 500 A/μs; T <sub>j</sub> = 100 °C; see <a href="#">Figure 3</a> | -   | 9.5  | 12   | A    |
| V <sub>FR</sub>         | forward recovery voltage      | I <sub>F</sub> = 10 A; dI <sub>F</sub> /dt = 100 A/μs; see <a href="#">Figure 4</a>                                                    | -   | 8    | 11   | V    |



- (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 2. Forward current as a function of forward voltage

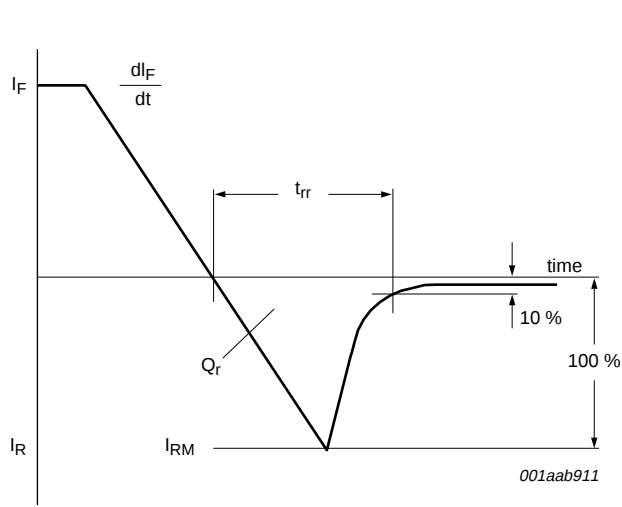


Fig 3. Reverse recovery definitions

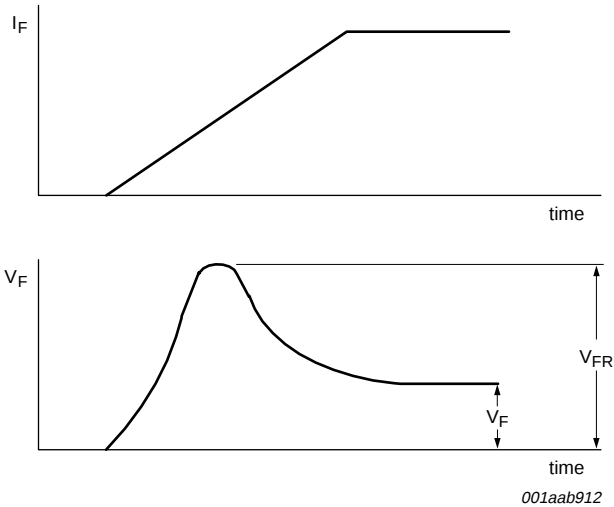
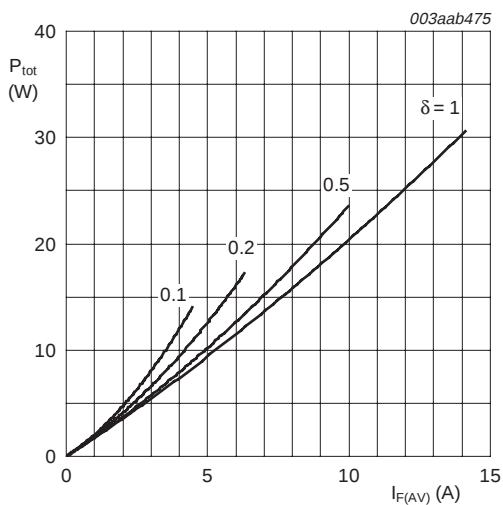
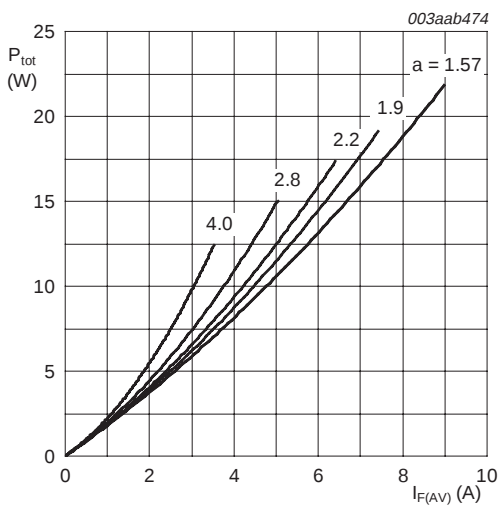


Fig 4. Forward recovery definitions



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

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

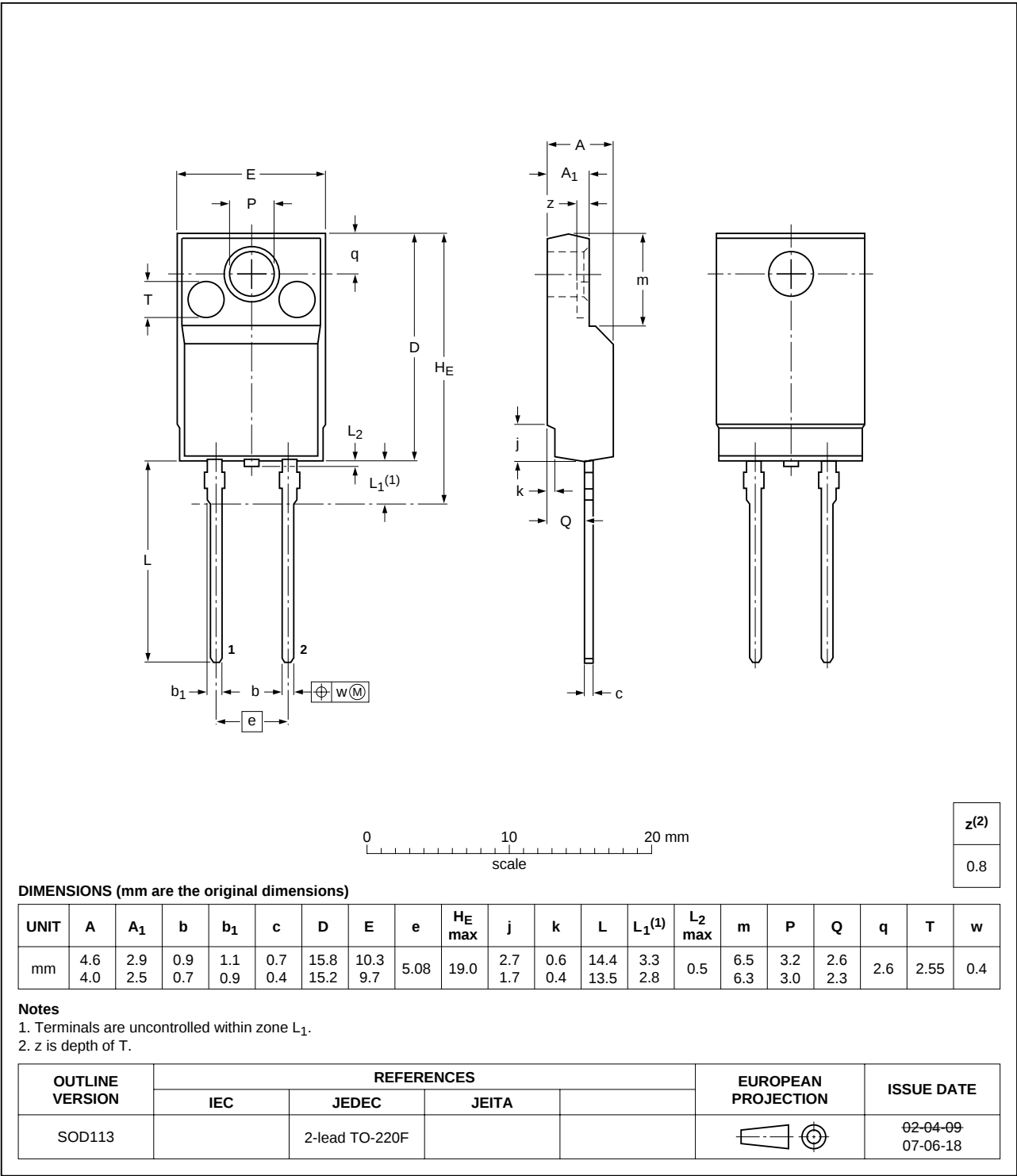


Fig 7. Package outline SOD113 (2-lead TO-220F)

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 | -             | -            |

## 10. Legal information

### 10.1 Data sheet status

| 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.                                     |

[1] Please consult the most recently issued document before initiating or completing a design.

[2] The term 'short data sheet' is explained in section "Definitions".

[3] The product status of device(s) described in this document may have changed since this document was published and may differ in case of multiple devices. The latest product status information is available on the Internet at URL <http://www.nxp.com>.

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