

# BYV29X-600

Rectifier diode ultrafast

Rev. 02 — 4 September 2007

Product data sheet

## 1. Product profile

### 1.1 General description

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

### 1.2 Features

- Fast switching
- Soft recovery characteristic
- Low forward voltage drop
- Low thermal resistance
- Isolated package
- High thermal cycling performance

### 1.3 Applications

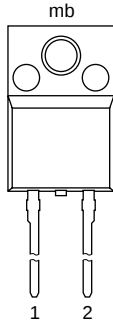
- Output rectifiers in high frequency switched-mode power supplies
- Discontinuous Current Mode (DCM) Power Factor Correction (PFC)

### 1.4 Quick reference data

- $V_{RRM} \leq 600 \text{ V}$
- $V_F \leq 1.11 \text{ V}$
- $I_{F(AV)} \leq 9 \text{ A}$
- $t_{rr} \leq 60 \text{ ns}$

## 2. Pinning information

Table 1. Pinning

| Pin | Description             | Simplified outline                                                                   | Symbol                                                                                             |
|-----|-------------------------|--------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------|
| 1   | cathode (k)             |  | <br>001aaa020 |
| 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 |
| BYV29X-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; $\delta = 1.0$ ; $T_h \leq 100\text{ }^{\circ}\text{C}$                              | -   | 600  | V                  |
| $I_{F(AV)}$ | average forward current             | square waveform; $\delta = 0.5$ ; $T_h \leq 85\text{ }^{\circ}\text{C}$                               | -   | 9    | A                  |
| $I_{FRM}$   | repetitive peak forward current     | $t = 25\text{ }\mu\text{s}$ ; square waveform; $\delta = 0.5$ ; $T_h \leq 85\text{ }^{\circ}\text{C}$ | -   | 18   | 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 <sub>th(j-h)</sub> | thermal resistance from junction to heatsink | with heatsink compound; see <a href="#">Figure 1</a> | -   | -   | 5.5 | K/W  |
|                      |                                              | without heatsink compound                            | -   | -   | 5.9 | K/W  |
| R <sub>th(j-a)</sub> | thermal resistance from junction to ambient  | in free air                                          | -   | 55  | -   | K/W  |

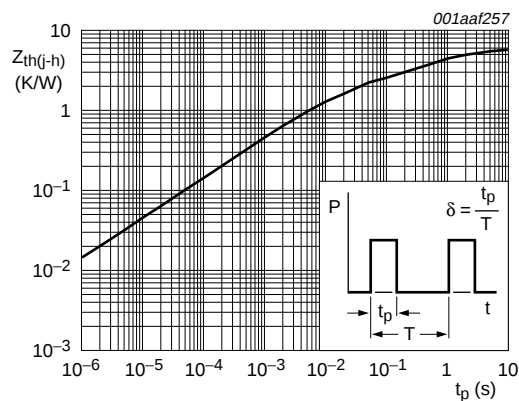


Fig 1. Transient thermal impedance from junction to heatsink as a function of pulse width

6. Isolation characteristics

Table 5. Isolation limiting values and characteristics  
*T<sub>h</sub> = 25 °C unless otherwise specified.*

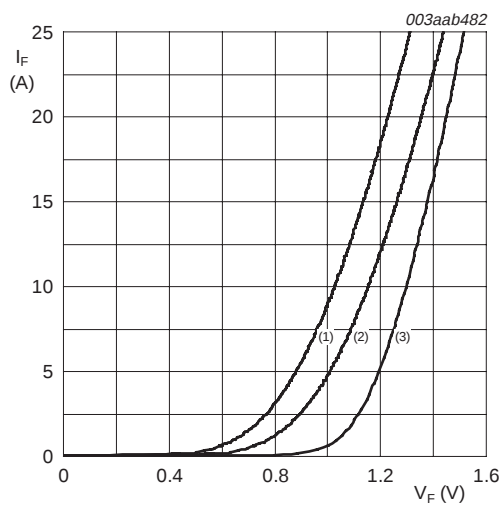
| Symbol                 | Parameter             | Conditions                                                                                                                            | Min | Typ | Max  | Unit |
|------------------------|-----------------------|---------------------------------------------------------------------------------------------------------------------------------------|-----|-----|------|------|
| V <sub>isol(RMS)</sub> | RMS isolation voltage | from all terminals to external heatsink;<br>f = 50 Hz to 60 Hz; sinusoidal waveform;<br>relative humidity ≤ 65 %; clean and dust free | -   | -   | 2500 | V    |
| C <sub>isol</sub>      | isolation capacitance | from cathode to external heatsink; f = 1 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> = 8 A; T <sub>j</sub> = 150 °C; see <a href="#">Figure 2</a>                                                          | -   | 0.97 | 1.11 | V    |
|                         |                               | I <sub>F</sub> = 8 A; see <a href="#">Figure 2</a>                                                                                   | -   | 1.12 | 1.26 | V    |
|                         |                               | I <sub>F</sub> = 20 A; see <a href="#">Figure 2</a>                                                                                  | -   | 1.31 | 1.45 | V    |
| I <sub>R</sub>          | reverse current               | V <sub>R</sub> = 600 V                                                                                                               | -   | 2    | 50   | μA   |
|                         |                               | V <sub>R</sub> = 600 V; T <sub>j</sub> = 100 °C                                                                                      | -   | 0.1  | 0.35 | mA   |
| Dynamic characteristics |                               |                                                                                                                                      |     |      |      |      |
| Q <sub>r</sub>          | recovered charge              | I <sub>F</sub> = 2 A to V <sub>R</sub> ≥ 30 V; dI <sub>F</sub> /dt = 20 A/μs; see <a href="#">Figure 3</a>                           | -   | 40   | 70   | nC   |
| 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 = 100 A/μs; see <a href="#">Figure 3</a>                          | -   | 50   | 60   | ns   |
| I <sub>RM</sub>         | peak reverse recovery current | I <sub>F</sub> = 10 A to V <sub>R</sub> ≥ 30 V; dI <sub>F</sub> /dt = 50 A/μs; T <sub>j</sub> = 100 °C; see <a href="#">Figure 3</a> | -   | 3    | 5.5  | A    |
| V <sub>FR</sub>         | forward recovery voltage      | I <sub>F</sub> = 10 A; dI <sub>F</sub> /dt = 10 A/μs; see <a href="#">Figure 4</a>                                                   | -   | 3.2  | -    | 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

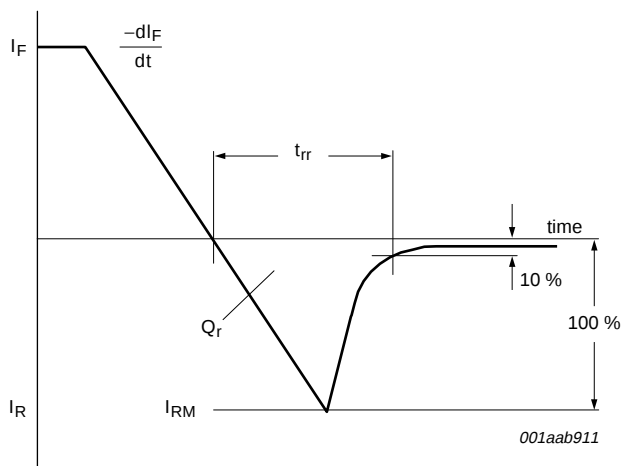


Fig 3. Reverse recovery definitions

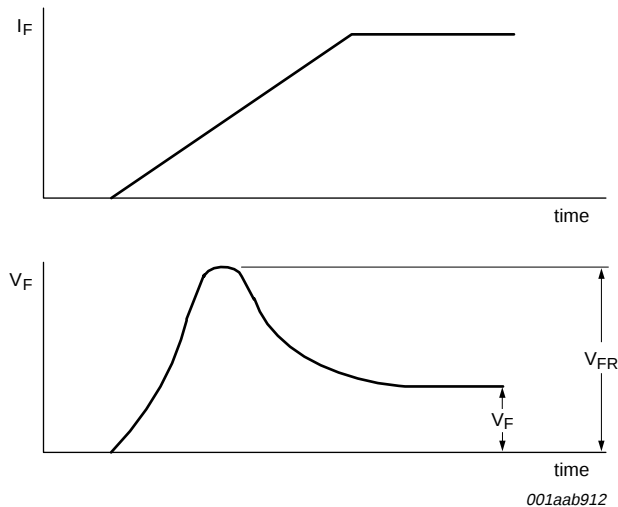
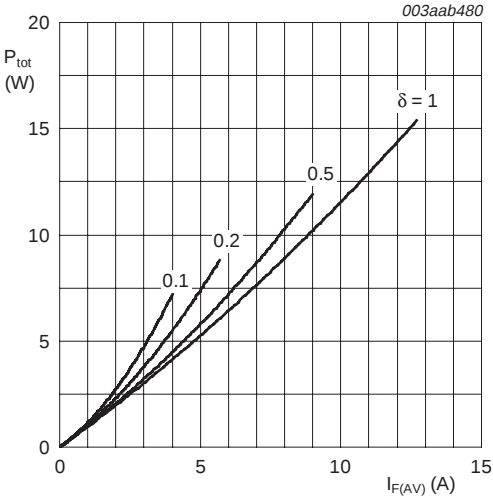
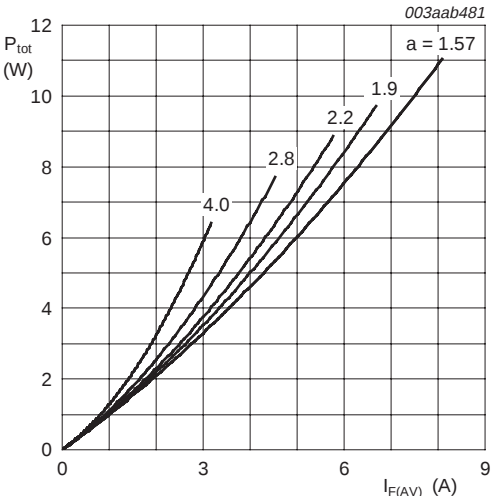


Fig 4. Forward recovery definitions



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

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

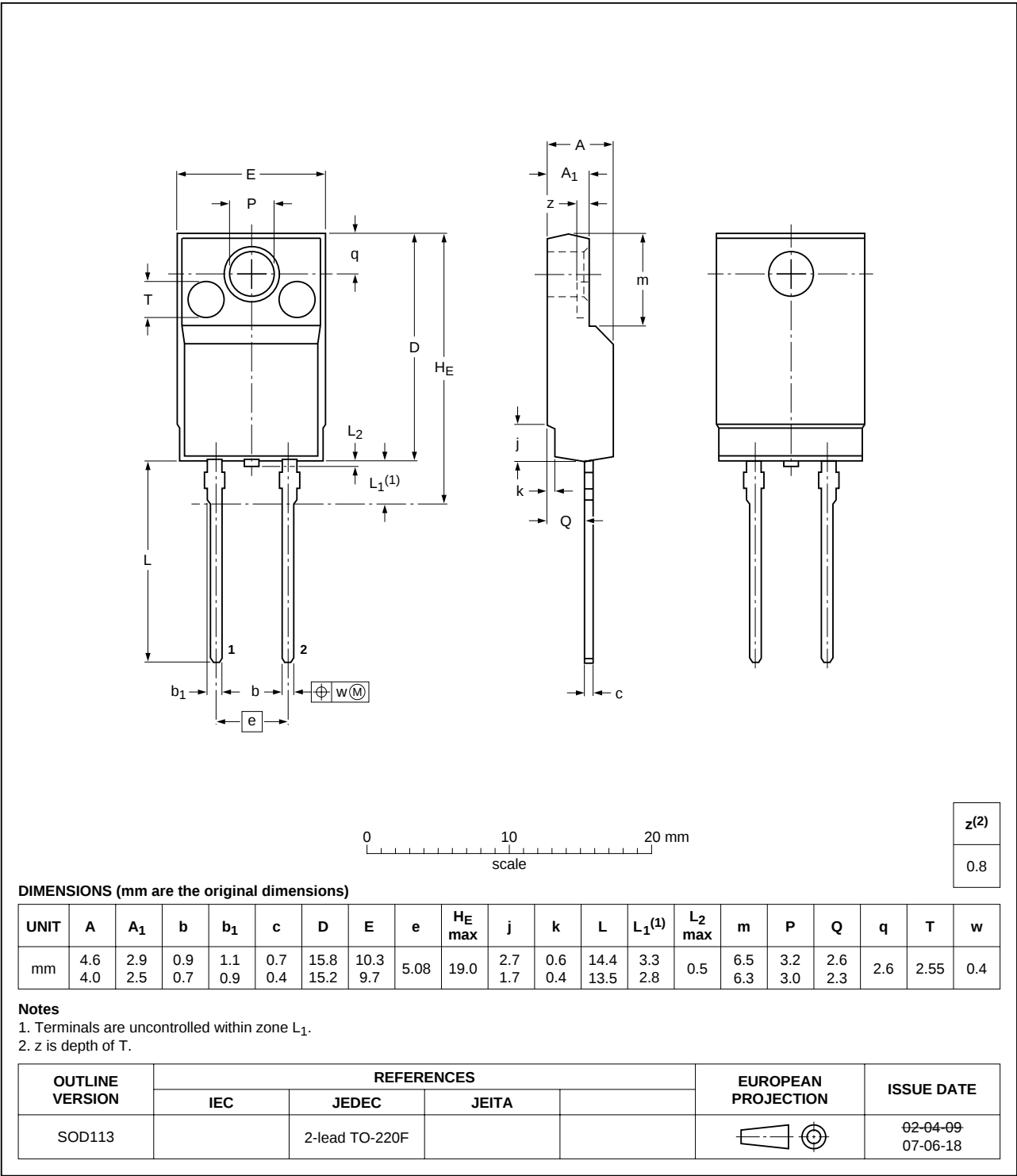


Fig 7. Package outline SOD113 (2-lead TO-220F)

## 9. Revision history

**Table 7.** Revision history

| Document ID    | Release date                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Data sheet status     | Change notice | Supersedes   |
|----------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------|---------------|--------------|
| BYV29X-600_2   | 20070904                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Product data sheet    | -             | BYV29X-600_1 |
| Modifications: | <ul style="list-style-type: none"><li>• The format of this data sheet has been redesigned to comply with the new identity guidelines of NXP Semiconductors.</li><li>• Legal texts have been adapted to the new company name where appropriate.</li><li>• <a href="#">Table 3 "Limiting values" on page 2</a> updated.</li><li>• <a href="#">Table 4 "Thermal characteristics" on page 3</a> updated.</li><li>• <a href="#">Table 5 "Isolation limiting values and characteristics" on page 3</a> updated.</li><li>• <a href="#">Table 6 "Characteristics" on page 4</a> updated.</li><li>• <a href="#">Figure 1, 2, 3, 4, 5, 6 and 7</a> updated.</li></ul> |                       |               |              |
| BYV29X-600_1   | 20000201                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Product specification | -             | -            |

## 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".

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