

## 1. Product profile

### 1.1 General description

Hyperfast, epitaxial rectifier diode in a SOD113 (2-lead 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

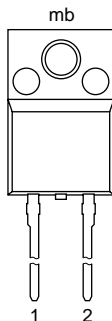

- Half-bridge or full-bridge switched-mode power supplies
- Half-bridge lighting ballasts
- Continuous Current Mode (CCM) Power Factor Correction (PFC)

### 1.4 Quick reference data

- $V_{RRM} \leq 600 \text{ V}$
- $V_F = 1.54 \text{ V (typ)}$
- $I_{F(AV)} \leq 20 \text{ A}$
- $t_{rr} = 19 \text{ ns (typ)}$

## 2. Pinning information

Table 1. Pinning

| Pin | Description             | Simplified outline   | 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 |
| BYC20X-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; $\delta = 0.5$ ; $T_h \leq 25\text{ }^{\circ}\text{C}$                                    | -   | 20   | A                  |
| $I_{FRM}$   | repetitive peak forward current     | square waveform; $\delta = 0.5$ ; $T_h \leq 25\text{ }^{\circ}\text{C}$ ;<br>$t_p = 25\text{ }\mu\text{s}$ | -   | 40   | A                  |
| $I_{FSM}$   | non-repetitive peak forward current | $t = 10\text{ ms}$ ; sinusoidal waveform   | -   | 250  | A                  |
|             |                                     | $t = 8.3\text{ ms}$ ; sinusoidal waveform  | -   | 274  | 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;<br>see <a href="#">Figure 1</a> | -   | -   | 2.6 | K/W  |
| $R_{th(j-a)}$ | thermal resistance from junction to ambient  | in free air   | -   | 55  | -   | K/W  |

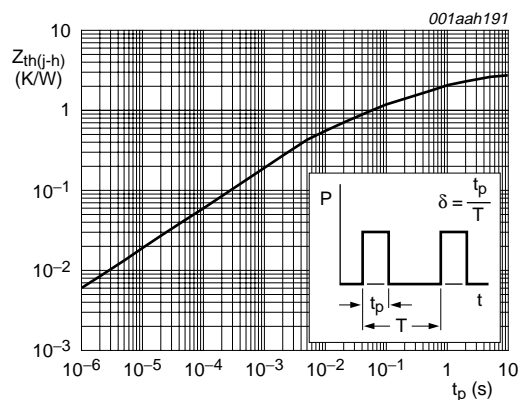


Fig 1. Transient thermal impedance from junction to heatsink as a function of pulse width

## 6. Isolation characteristics

Table 5. Isolation limiting values and characteristics

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

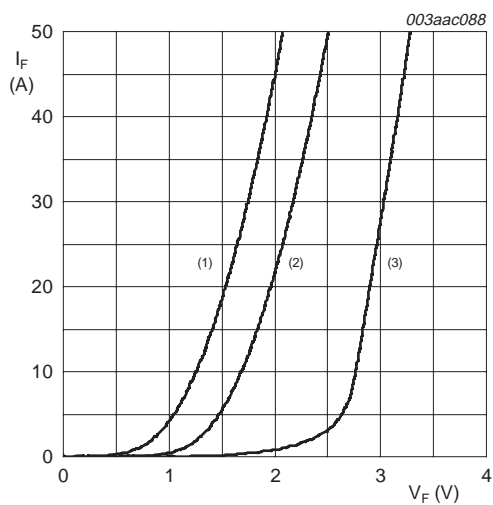
| Symbol          | Parameter             | Conditions   | Min | Typ | Max  | Unit |
|-----------------|-----------------------|--|-----|-----|------|------|
| $V_{isol(RMS)}$ | RMS isolation voltage | from all terminals to external heatsink;<br>$f = 50\text{ Hz to }60\text{ Hz}$ ; sinusoidal waveform;<br>relative humidity $\leq 65\%$ ; clean and dust free | -   | -   | 2500 | V    |
| $C_{isol}$      | isolation capacitance | from pin 1 (cathode) to external heatsink;<br>$f = 1\text{ MHz}$   | -   | 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> = 20 A; T <sub>j</sub> = 150 °C; see <a href="#">Figure 2</a>                                  | -   | 1.54 | 1.97 | V    |
|                         |                               | I <sub>F</sub> = 40 A; T <sub>j</sub> = 150 °C; see <a href="#">Figure 2</a>                                  | -   | 1.95 | 2.34 | V    |
|                         |                               | I <sub>F</sub> = 20 A; see <a href="#">Figure 2</a>   | -   | 1.89 | 2.9  | V    |
| I <sub>R</sub>          | reverse current               | V <sub>R</sub> = 600 V  | -   | 16   | 200  | μA   |
|                         |                               | V <sub>R</sub> = 500 V; T <sub>j</sub> = 100 °C   | -   | 1.6  | 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> = 20 A to V <sub>R</sub> = 400 V; dI <sub>F</sub> /dt = 500 A/μs; see <a href="#">Figure 3</a> |     |      |      |      |
|                         |                               | T <sub>j</sub> = 25 °C  | -   | 19   | -    | ns   |
|                         |                               | T <sub>j</sub> = 100 °C   | -   | 32   | 40   | ns   |
| I <sub>RM</sub>         | peak reverse recovery current | I <sub>F</sub> = 20 A to V <sub>R</sub> = 400 V; T <sub>j</sub> = 125 °C; see <a href="#">Figure 3</a>        |     |      |      |      |
|                         |                               | dI <sub>F</sub> /dt = 50 A/μs   | -   | 3.0  | 7.5  | A    |
|                         |                               | dI <sub>F</sub> /dt = 500 A/μs  | -   | 9.5  | 12   | A    |
| V <sub>FR</sub>         | forward recovery voltage      | I <sub>F</sub> = 20 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

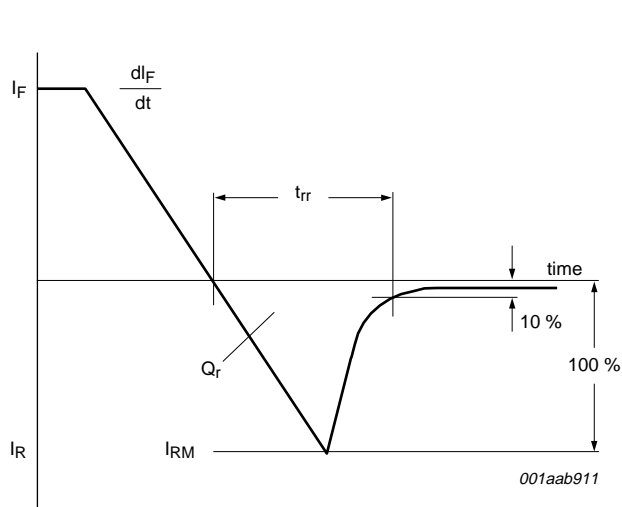


Fig 3. Reverse recovery definitions; ramp recovery

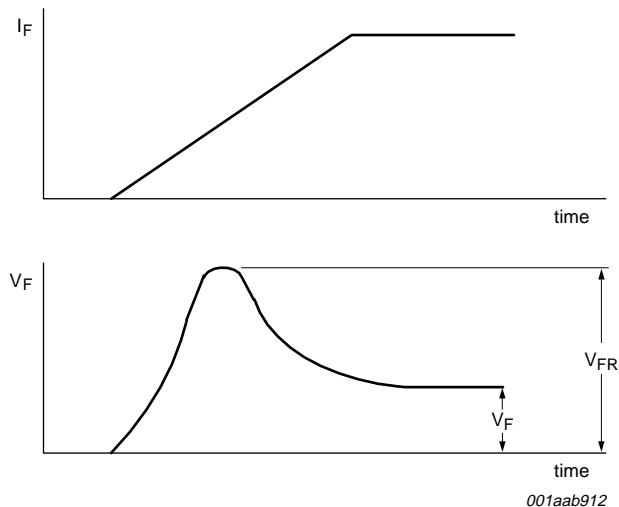
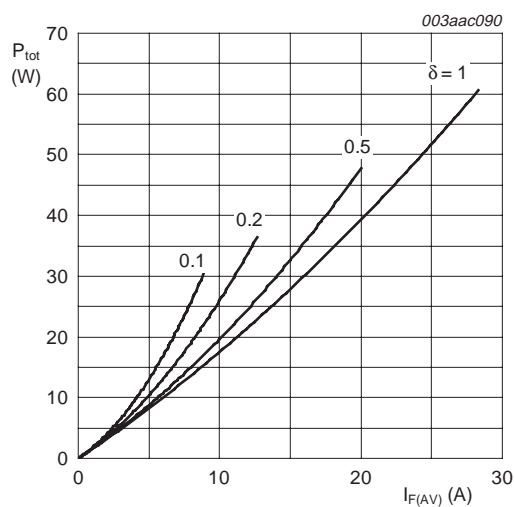
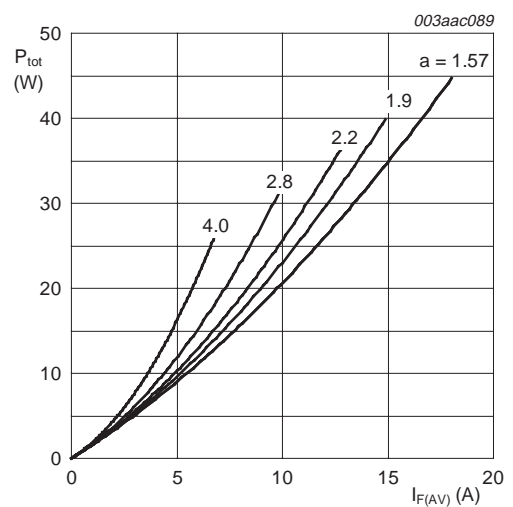


Fig 4. Forward recovery definitions



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

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



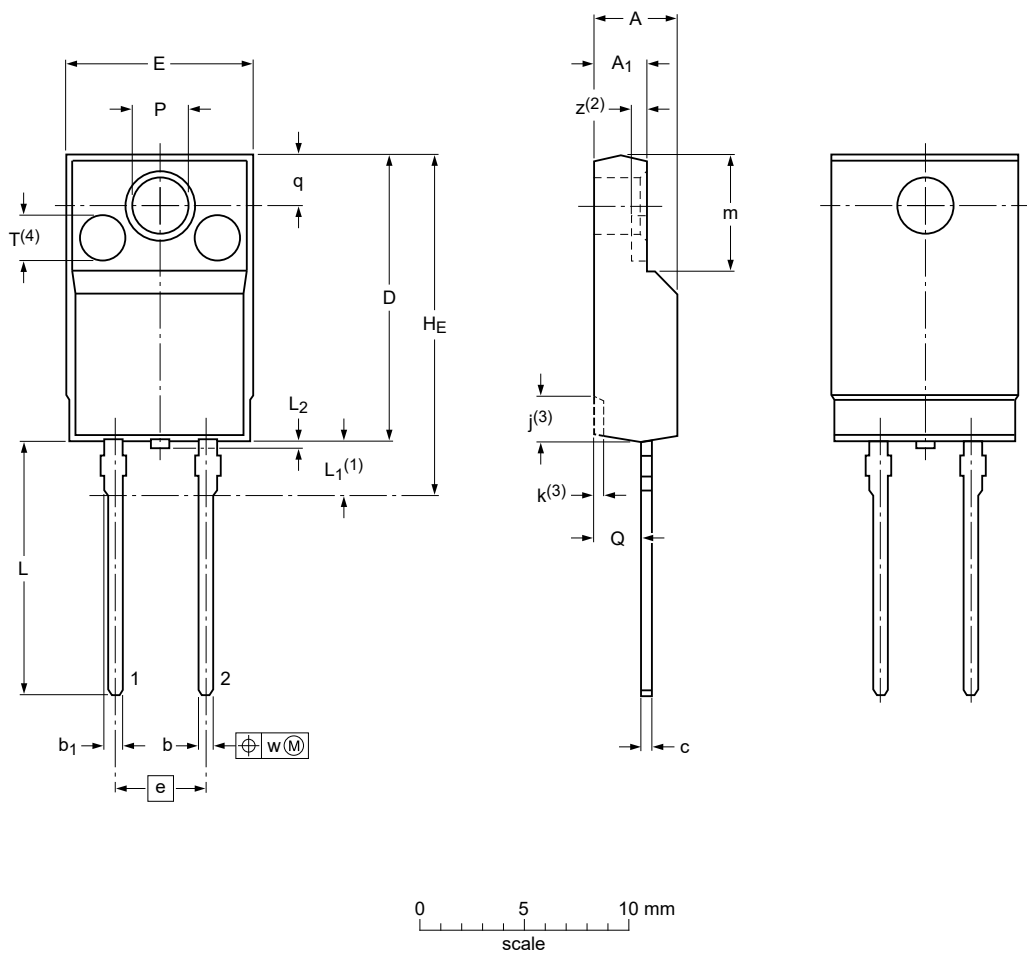
$a = \text{form factor} = I_{F(RMS)} / I_{F(AV)}$


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



| Dimensions (mm are the original dimensions)   |     |                |     |                |     |       |      |      |                       |                  |                  |     |                               |   |     |                    |     |     |                  |      |                  |     |  |  |
|---|-----|----------------|-----|----------------|-----|-------|------|------|-----------------------|------------------|------------------|-----|-------------------------------|---|-----|--------------------|-----|-----|------------------|------|------------------|-----|--|--|
| Unit  | A   | A <sub>1</sub> | b   | b <sub>1</sub> | c   | D     | E    | e    | H <sub>E</sub><br>max | j <sup>(3)</sup> | k <sup>(3)</sup> | L   | L <sub>1</sub> <sup>(1)</sup> | L <sub>2</sub><br>max   | m   | P                  | Q   | q   | T <sup>(4)</sup> | w    | z <sup>(2)</sup> |     |  |  |
| mm  | max | 4.6            | 2.9 | 0.9            | 1.1 | 0.7   | 15.8 | 10.3 | 5.08                  | 19.0             | 2.7              | 0.6 | 14.4                          | 3.3   | 0.5 | 6.5                | 3.2 | 2.6 | 2.6              | 2.55 | 0.4              | 0.8 |  |  |
|   | nom |                |     |                |     |       |      |      |                       |                  |                  |     |                               |   |     |                    |     |     |                  |      |                  |     |  |  |
|   | min | 4.0            | 2.5 | 0.7            | 0.9 | 0.4   | 15.2 | 9.7  |                       |                  | 1.7              | 0.4 | 13.5                          | 2.8   |     | 6.3                | 3.0 | 2.3 |                  |      |                  |     |  |  |
| Notes   |     |                |     |                |     |       |      |      |                       |                  |                  |     |                               |   |     |                    |     |     |                  |      |                  |     |  |  |
| 1. Terminals are uncontrolled within zone L1. |     |                |     |                |     |       |      |      |                       |                  |                  |     |                               |   |     |                    |     |     |                  |      |                  |     |  |  |
| 2. z is depth of T.                           |     |                |     |                |     |       |      |      |                       |                  |                  |     |                               |   |     |                    |     |     |                  |      |                  |     |  |  |
| 3. Dot lines area designs may vary.           |     |                |     |                |     |       |      |      |                       |                  |                  |     |                               |   |     |                    |     |     |                  |      |                  |     |  |  |
| 4. Eject pin mark is for reference only.      |     |                |     |                |     |       |      |      |                       |                  |                  |     |                               |   |     |                    |     |     |                  |      |                  |     |  |  |
| sod113_po                                     |     |                |     |                |     |       |      |      |                       |                  |                  |     |                               |   |     |                    |     |     |                  |      |                  |     |  |  |
| Outline version                               |     | References     |     |                |     |       |      |      |                       |                  |                  |     |                               | European projection   |     | Issue date         |     |     |                  |      |                  |     |  |  |
|   |     | IEC            |     | JEDEC          |     | JEITA |      |      |                       |                  |                  |     |                               |   |     |                    |     |     |                  |      |                  |     |  |  |
| SOD113  |     | 2-lead TO-220F |     |                |     |       |      |      |                       |                  |                  |     |                               |  |     | -07-06-08-15-08-28 |     |     |                  |      |                  |     |  |  |

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|--------------------------------|--------------------|---|
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| Product [short] data sheet     | Production         | This document contains the product specification.                                     |

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