

# BYC8X-600P

## Hyperfast power diode

24 July 2012

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

- Fast switching
- Isolated plastic package
- Low leakage current
- 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

### 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         | SQW; $\delta = 0.5$ ; $T_h \leq 75^\circ\text{C}$ ; <a href="#">Fig. 1</a> ; <a href="#">Fig. 2</a> ; <a href="#">Fig. 3</a> | -   | -   | 8   | A    |
| <b>Static characteristics</b>  |                                 |                                                                                                                              |     |     |     |      |
| $V_F$                          | forward voltage                 | $I_F = 8\text{ A}$ ; $T_j = 125^\circ\text{C}$ ; <a href="#">Fig. 6</a>                                                      | -   | 1.5 | 1.9 | V    |
| <b>Dynamic characteristics</b> |                                 |                                                                                                                              |     |     |     |      |
| $t_{rr}$                       | reverse recovery time           | $I_F = 1\text{ A}$ ; $V_R = 30\text{ V}$ ; $dI_F/dt = 200\text{ A/s}$ ; $T_j = 25^\circ\text{C}$ ; <a href="#">Fig. 7</a>    | -   | 12  | 18  | ns   |

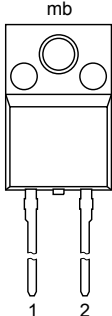
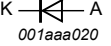


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## 2. Pinning information

Table 2. Pinning information

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

## 3. Ordering information

Table 3. Ordering information

| Type number | Package |                                                                                                     |         |
|-------------|---------|-----------------------------------------------------------------------------------------------------|---------|
|             | Name    | Description                                                                                         | Version |
| BYC8X-600P  | TO-220F | plastic single-ended package; isolated heatsink mounted; 1 mounting hole; 2-lead TO-220 "full pack" | SOD113  |

## 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                                                                                                                           | -   | 600 | V                |
| $I_{F(AV)}$ | average forward current             | SQW; $\delta = 0.5$ ; $T_h \leq 75^\circ\text{C}$ ; <a href="#">Fig. 1</a> ; <a href="#">Fig. 2</a> ; <a href="#">Fig. 3</a> | -   | 8   | A                |
| $I_{FRM}$   | repetitive peak forward current     | SQW; $\delta = 0.5$ ; $t_p = 25\ \mu\text{s}$ ; $T_h \leq 75^\circ\text{C}$                                                  | -   | 16  | A                |
| $I_{FSM}$   | non-repetitive peak forward current | SIN; $t_p = 10\ \text{ms}$ ; $T_{J(\text{init})} = 25^\circ\text{C}$ ; <a href="#">Fig. 4</a>                                | -   | 91  | A                |
|             |                                     | SIN; $t_p = 8.3\ \text{ms}$ ; $T_{J(\text{init})} = 25^\circ\text{C}$ ; <a href="#">Fig. 4</a>                               | -   | 100 | A                |
| $T_{stg}$   | storage temperature                 |                                                                                                                              | -65 | 175 | $^\circ\text{C}$ |
| $T_j$       | junction temperature                |                                                                                                                              | -   | 175 | $^\circ\text{C}$ |

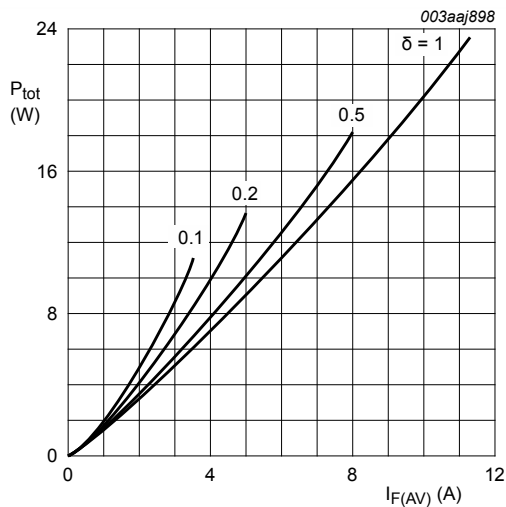


Fig. 1. Forward power dissipation as a function of average forward current; square waveform; maximum values

$$I_{F(AV)} = I_{F(RMS)} \times \sqrt{\delta}$$
$$V_O = 1.581 \text{ V}; R_S = 0.043 \text{ } \Omega$$

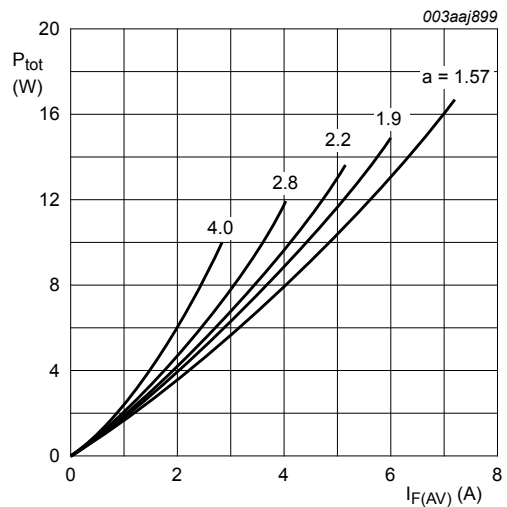


Fig. 2. Forward power dissipation as a function of average forward current; sinusoidal waveform; maximum values

$$a = \text{form factor} = I_{F(RMS)} / I_{F(AV)}$$
$$V_O = 1.581 \text{ V}; R_S = 0.043 \text{ } \Omega$$

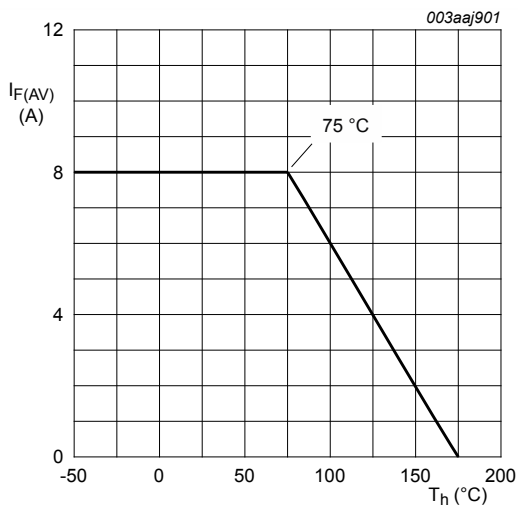


Fig. 3. Average forward current as a function of heatsink temperature; maximum values

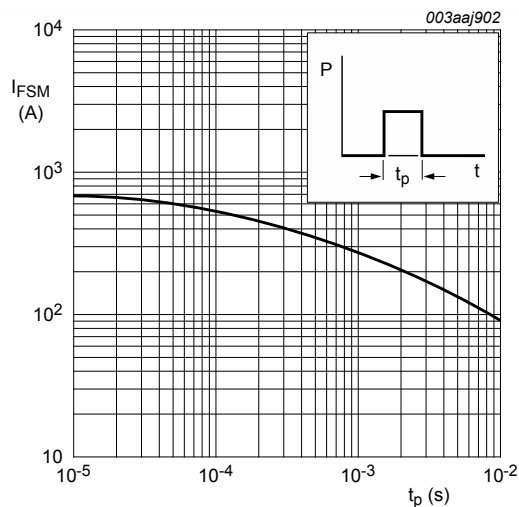


Fig. 4. Non-repetitive peak forward current as a function of pulse width; square waveform; maximum values

## 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       | -   | -   | 7.2 | K/W  |
|               |                                              | with heatsink compound ; Fig. 5 | -   | -   | 5.5 | K/W  |

| Symbol        | Parameter                                            | Conditions |  | Min | Typ | Max | Unit |
|---------------|------------------------------------------------------|------------|--|-----|-----|-----|------|
| $R_{th(j-a)}$ | thermal resistance from junction to ambient free air |            |  | -   | 60  | -   | K/W  |

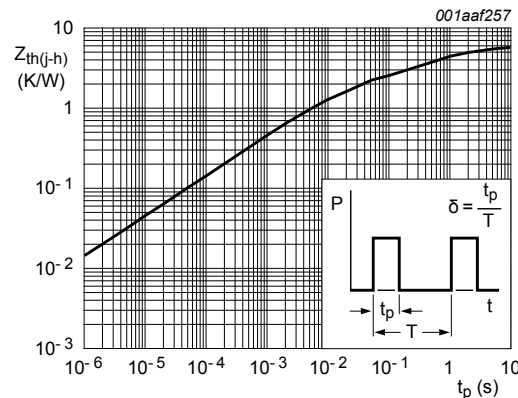


Fig. 5. Transient thermal impedance from junction to heatsink as a function of pulse width

## 6. Isolation characteristics

Table 6. Isolation characteristics

| Symbol          | Parameter             | Conditions                                                                                                              |  | Min | Typ | Max  | Unit |
|-----------------|-----------------------|-------------------------------------------------------------------------------------------------------------------------|--|-----|-----|------|------|
| $V_{isol(RMS)}$ | RMS isolation voltage | 50 Hz $\leq f \leq$ 60 Hz; RH $\leq$ 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   |

## 7. Characteristics

Table 7. Characteristics

| 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> = 25 °C; <a href="#">Fig. 6</a>                                                         |  | -   | -   | 3.4 | V    |
|                         |                  | I <sub>F</sub> = 8 A; T <sub>j</sub> = 125 °C; <a href="#">Fig. 6</a>                                                        |  | -   | 1.5 | 1.9 | V    |
| I <sub>R</sub>          | reverse current  | V <sub>R</sub> = 600 V; T <sub>j</sub> = 25 °C                                                                               |  | -   | -   | 20  | μA   |
|                         |                  | V <sub>R</sub> = 600 V; T <sub>j</sub> = 125 °C                                                                              |  | -   | -   | 200 | μA   |
| Dynamic characteristics |                  |                                                                                                                              |  |     |     |     |      |
| Q <sub>r</sub>          | recovered charge | I <sub>F</sub> = 8 A; V <sub>R</sub> = 200 V; dI <sub>F</sub> /dt = 200 A/s; T <sub>j</sub> = 25 °C; <a href="#">Fig. 7</a>  |  | -   | 17  | -   | nC   |
|                         |                  | I <sub>F</sub> = 8 A; V <sub>R</sub> = 200 V; dI <sub>F</sub> /dt = 200 A/s; T <sub>j</sub> = 125 °C; <a href="#">Fig. 7</a> |  | -   | 90  | -   | nC   |

| Symbol   | Parameter                     | Conditions                                                                                                                               | Min | Typ | Max | Unit |
|----------|-------------------------------|------------------------------------------------------------------------------------------------------------------------------------------|-----|-----|-----|------|
| $t_{rr}$ | reverse recovery time         | $I_F = 1\text{ A}$ ; $V_R = 30\text{ V}$ ; $dI_F/dt = 200\text{ A/s}$ ;<br>$T_j = 25\text{ }^{\circ}\text{C}$ ; <a href="#">Fig. 7</a>   | -   | 12  | 18  | ns   |
| $I_{RM}$ | peak reverse recovery current | $I_F = 8\text{ A}$ ; $V_R = 200\text{ V}$ ; $dI_F/dt = 200\text{ A/s}$ ;<br>$T_j = 25\text{ }^{\circ}\text{C}$ ; <a href="#">Fig. 7</a>  | -   | -   | 2.2 | A    |
|          |                               | $I_F = 8\text{ A}$ ; $V_R = 200\text{ V}$ ; $dI_F/dt = 200\text{ A/s}$ ;<br>$T_j = 125\text{ }^{\circ}\text{C}$ ; <a href="#">Fig. 7</a> | -   | -   | 6   | A    |

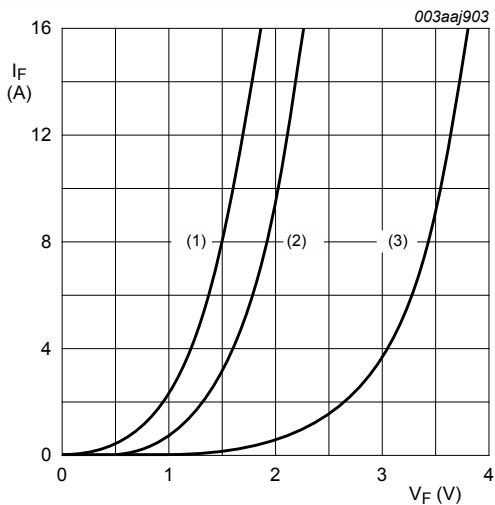


Fig. 6. Forward current as a function of forward voltage

- (1)  $T_j = 125\text{ }^{\circ}\text{C}$ ; typical values;
  - (2)  $T_j = 125\text{ }^{\circ}\text{C}$ ; maximum values;
  - (3)  $T_j = 25\text{ }^{\circ}\text{C}$ ; maximum values;
- $V_O = 1.581\text{ V}$ ;  $R_S = 0.043\text{ }\Omega$

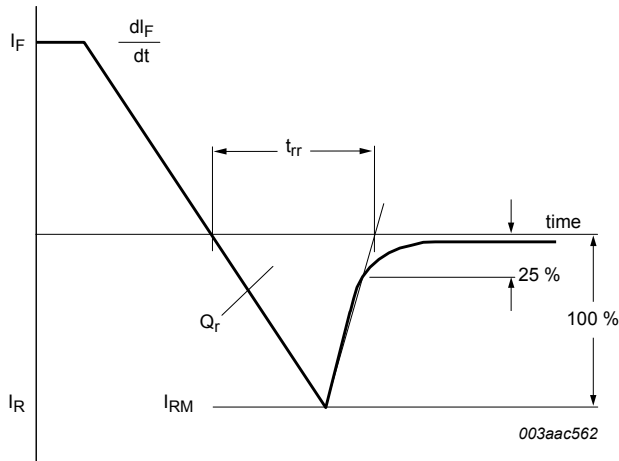


Fig. 7. Reverse recovery definitions; ramp recovery

8. Package outline

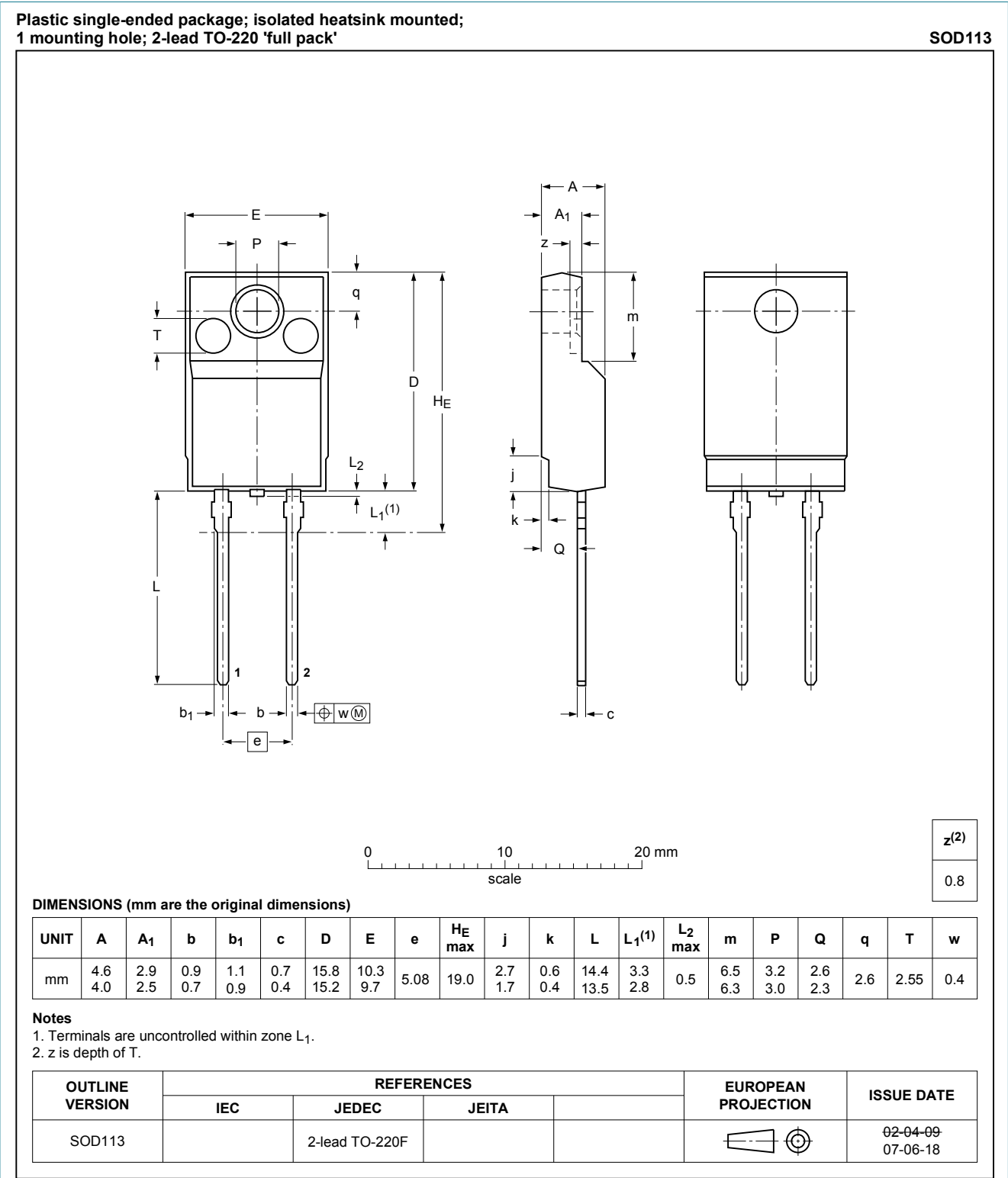


Fig. 8. TO-220F (SOD113)

## 9. Legal information

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