

1. General description

Hyperfast power diode in a SOD113A (2-lead TO-220F) plastic package.

2. Features and benefits

- Low reverse recovery current
- Low thermal resistance
- Low leakage current
- Reduces switching losses in associated MOSFET or IGBT

3. Applications

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

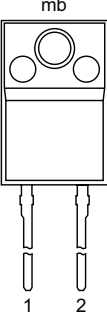
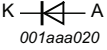
4. Quick reference data

Table 1. Quick reference data

| Symbol | Parameter | Conditions | Values | | | | Unit |
|-------------------------|-------------------------------------|---|--------|-----|------|-----|------|
| Absolute maximum rating | | | | | | | |
| V _{RRM} | repetitive peak reverse voltage | | 600 | | | | V |
| I _{F(AV)} | average forward current | δ = 0.5 ; square-wave pulse; T _h ≤ 97 °C; Fig. 1 ; Fig. 2 ; Fig. 3 | 5 | | | | A |
| I _{FRM} | repetitive peak forward current | δ = 0.5 ; t _p = 25 μs; T _h ≤ 97 °C; square-wave pulse | 10 | | | | A |
| I _{FSM} | non-repetitive peak forward current | t _p = 10 ms; T _{j(init)} = 25 °C; sine-wave pulse; Fig. 4 | 60 | | | | A |
| | | t _p = 8.3 ms; T _{j(init)} = 25 °C; sine-wave pulse | 65 | | | | A |
| Symbol | Parameter | Conditions | | Min | Typ | Max | Unit |
| Static characteristics | | | | | | | |
| V _F | forward voltage | I _F = 5 A; T _j = 150 °C; Fig. 6 | | - | 1.35 | 2.1 | V |
| Dynamic characteristics | | | | | | | |
| t _{rr} | reverse recovery time | I _F = 1 A; V _R = 30 V; dI _F /dt = 200 A/μs; T _j = 25 °C; Fig. 7 | | - | 11 | - | ns |

5. Pinning information

Table 2. Pinning information

| Pin | Symbol | Description | Simplified outline | Graphic symbol |
|-----|--------|-------------------------|---|---|
| 1 | K | cathode |  |  |
| 2 | A | anode | | |
| mb | n.c. | mounting base; isolated | | |

6. Ordering information

Table 3. Ordering information

| Type number | Package | | |
|-------------|---------|--|---------|
| | Name | Description | Version |
| BYC5X-600P | TO-220F | plastic single-ended package; isolated heatsink mounted; 1 mounting hole; 2-lead TO-220F "full pack" | SOD113A |

7. Marking

Table 4. Marking codes

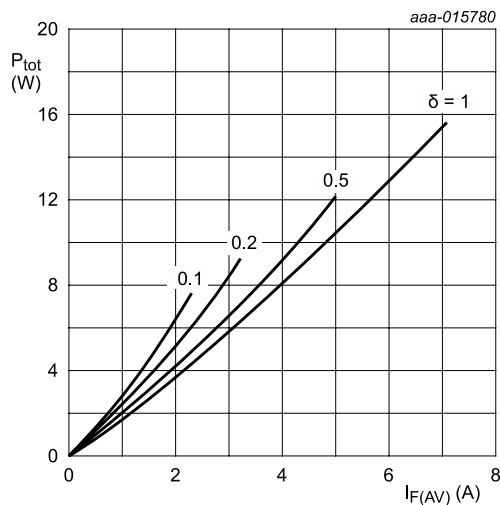
| Type number | Marking codes |
|-------------|---------------|
| BYC5X-600P | BYC5X-600P |

8. Limiting values

Table 5. Limiting values

In accordance with the Absolute Maximum Rating System (IEC 60134).

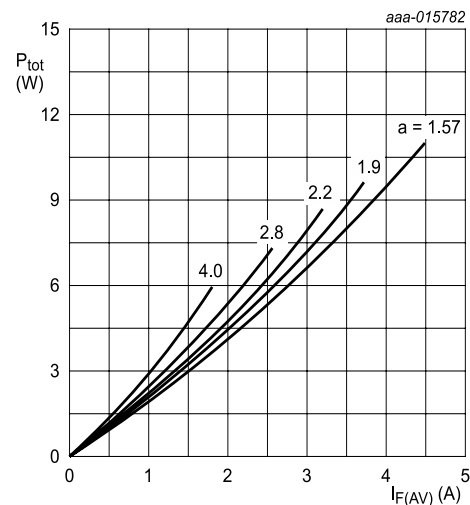
| Symbol | Parameter | Conditions | Values | Unit |
|-------------|-------------------------------------|---|------------|------------------|
| V_{RRM} | repetitive peak reverse voltage | | 600 | V |
| V_{RWM} | crest working reverse voltage | | 600 | V |
| V_R | reverse voltage | DC | 600 | V |
| $I_{F(AV)}$ | average forward current | $\delta = 0.5$; square-wave pulse; $T_h \leq 97^\circ\text{C}$; Fig. 1 ; Fig. 2 ; Fig. 3 | 5 | A |
| I_{FRM} | repetitive peak forward current | $\delta = 0.5$; $t_p = 25\ \mu\text{s}$; $T_h \leq 97^\circ\text{C}$; square-wave pulse | 10 | A |
| I_{FSM} | non-repetitive peak forward current | $t_p = 10\ \text{ms}$; $T_{j(\text{init})} = 25^\circ\text{C}$; sine-wave pulse; Fig. 4 | 60 | A |
| | | $t_p = 8.3\ \text{ms}$; $T_{j(\text{init})} = 25^\circ\text{C}$; sine-wave pulse | 65 | A |
| T_{stg} | storage temperature | | -65 to 175 | $^\circ\text{C}$ |
| T_j | junction temperature | | 175 | $^\circ\text{C}$ |



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

$$V_o = 1.801\ \text{V}; R_s = 0.062\ \Omega$$

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



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

$$V_o = 1.801\ \text{V}; R_s = 0.062\ \Omega$$

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

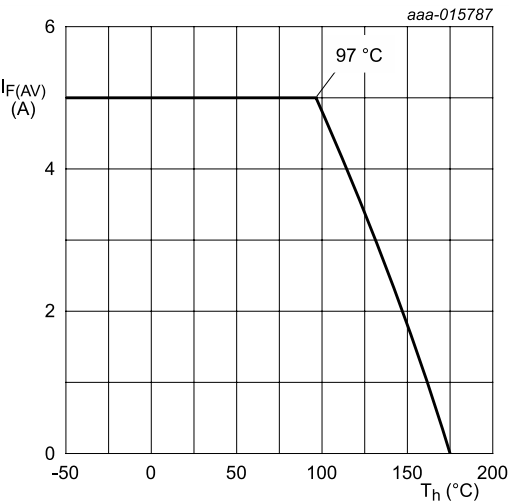


Fig. 3. Forward current as a function of heatsink temperature; maximum values

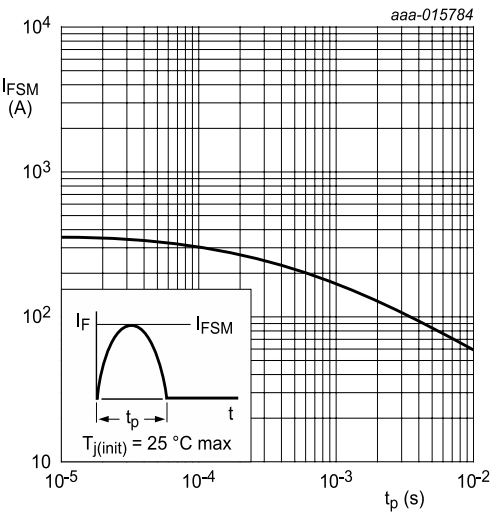
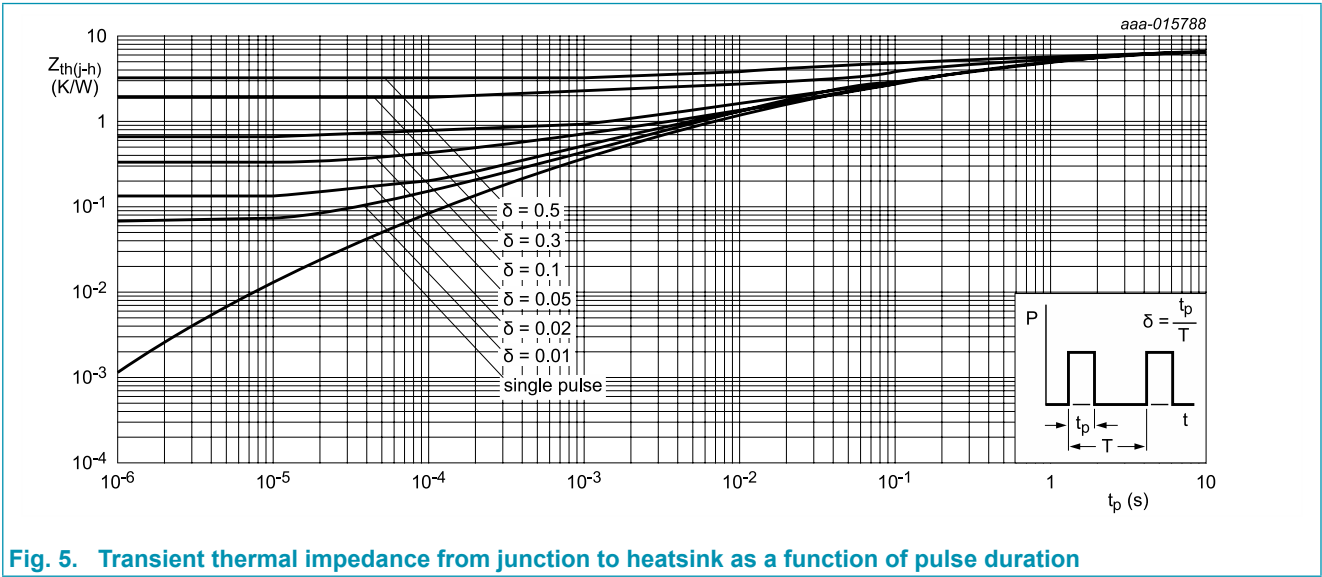


Fig. 4. Non-repetitive peak forward current as a function of pulse width; sinusoidal waveform; maximum values

9. Thermal characteristics

Table 6. Thermal characteristics

| Symbol | Parameter | Conditions | Min | Typ | Max | Unit |
|---------------|--|-------------------------------|-----|-----|-----|------|
| $R_{th(j-h)}$ | thermal resistance from junction to heatsink | with heatsink compound; Fig.5 | - | - | 6.5 | K/W |
| $R_{th(j-a)}$ | thermal resistance from junction to ambient | in free air | - | 55 | - | K/W |



10. Isolation characteristics

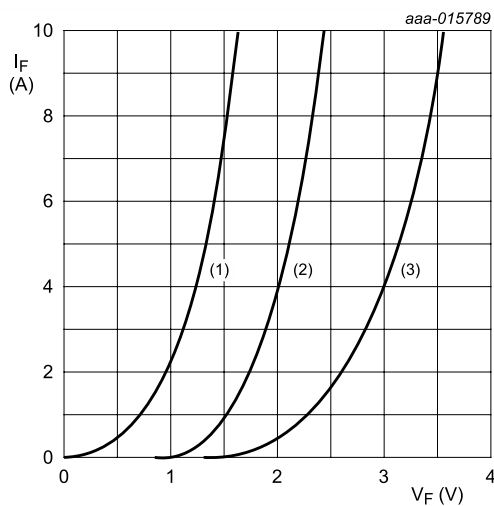
Table 7. Isolation characteristics

| Symbol | Parameter | Conditions | Min | Typ | Max | Unit |
|-----------------|-----------------------|--|-----|-----|------|------|
| $V_{isol(RMS)}$ | RMS isolation voltage | from all pins to external heatsink; sinusoidal waveform; clean and dust free; 50 Hz ≤ f ≤ 60 Hz; RH ≤ 65 % | - | - | 2500 | V |
| C_{isol} | isolation capacitance | from cathode to external heatsink; f = 1 MHz | - | 10 | - | pF |

11. Characteristics

Table 8. Characteristics

| Symbol | Parameter | Conditions | | Min | Typ | Max | Unit |
|-------------------------|-------------------------------|---|--|-----|------|-----|------|
| Static characteristics | | | | | | | |
| V _F | forward voltage | I _F = 5 A; T _j = 25 °C; Fig. 6 | | - | 2.5 | 3.3 | V |
| | | I _F = 5 A; T _j = 150 °C; Fig. 6 | | - | 1.35 | 2.1 | V |
| I _R | reverse current | V _R = 600 V; T _j = 25 °C | | - | - | 10 | μA |
| | | V _R = 600 V; T _j = 150 °C | | - | - | 0.6 | mA |
| Dynamic characteristics | | | | | | | |
| Q _r | recovered charge | I _F = 5 A; V _R = 200 V; dI _F /dt = 200 A/μs; T _j = 25 °C; Fig. 7 | | - | 19 | - | nC |
| | | I _F = 5 A; V _R = 200 V; dI _F /dt = 200 A/μs; T _j = 125 °C; Fig. 7 | | - | 45 | - | nC |
| t _{rr} | reverse recovery time | I _F = 1 A; V _R = 30 V; dI _F /dt = 200 A/μs; T _j = 25 °C; Fig. 7 | | - | 11 | - | ns |
| | | I _F = 5 A; V _R = 200 V; dI _F /dt = 200 A/μs; T _j = 25 °C; Fig. 7 | | - | 23 | - | ns |
| | | I _F = 5 A; V _R = 200 V; dI _F /dt = 200 A/μs; T _j = 125 °C; Fig. 7 | | - | 28 | - | ns |
| | | I _F = 5 A; V _R = 400 V; dI _F /dt = 500 A/μs; T _j = 25 °C; Fig. 7 | | - | 13 | 25 | ns |
| I _{RM} | peak reverse recovery current | I _F = 5 A; V _R = 200 V; dI _F /dt = 200 A/μs; T _j = 25 °C; Fig. 7 | | - | 1.7 | - | A |
| | | I _F = 5 A; V _R = 200 V; dI _F /dt = 200 A/μs; T _j = 125 °C; Fig. 7 | | - | 3.2 | - | A |



$V_o = 1.833\text{ V}$; $R_s = 0.055\text{ }\Omega$
 (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. 6. Forward current as a function of forward voltage

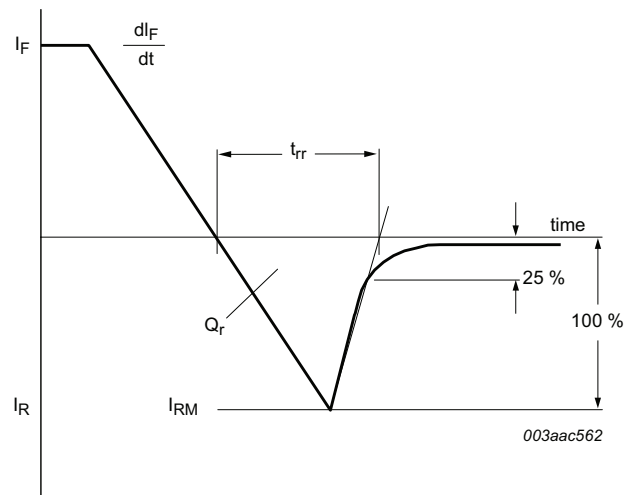
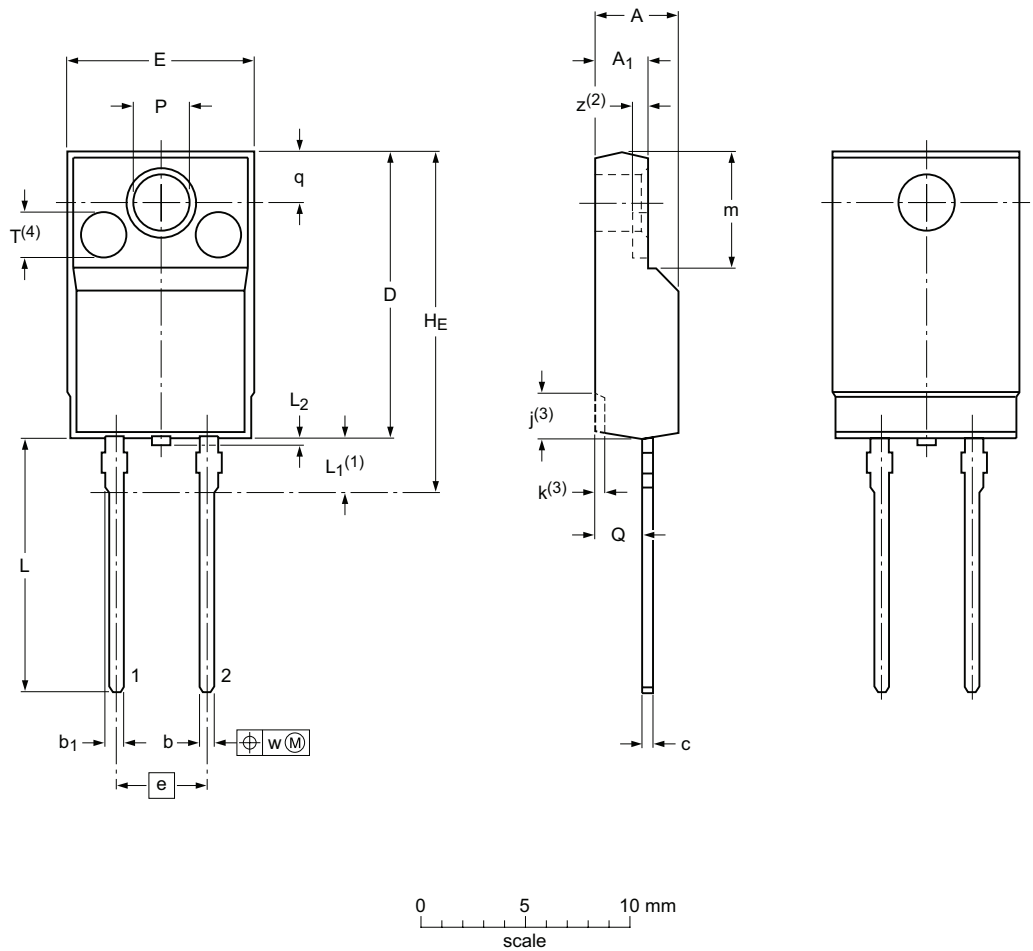


Fig. 7. Reverse recovery definitions; ramp recovery

12. 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 ₁ | b | b ₁ | c | D | E | e | H _E max | j ⁽³⁾ | k ⁽³⁾ | L | L ₁ ⁽¹⁾ | L ₂ max | m | P | Q | q | T ⁽⁴⁾ | w | z ⁽²⁾ |
|------|-----|----------------|-----|----------------|-----|------|------|------|-----------------------|------------------|------------------|------|-------------------------------|-----------------------|-----|-----|-----|-----|------------------|-----|------------------|
| max | 4.6 | 2.9 | 0.9 | 1.1 | 0.7 | 15.8 | 10.3 | | | 2.7 | 0.6 | 14.4 | 3.3 | | 6.5 | 3.2 | 2.6 | | | | |
| nom | | | | | | | | 5.08 | 19.0 | | | | | 0.5 | | | | 2.6 | 2.55 | 0.4 | 0.8 |
| 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 |

13. Legal information

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| Document status [1][2] | Product status [3] | 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. |
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- [2] The term 'short data sheet' is explained in section "Definitions".
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