

1. General description

Hyperfast epitaxial rectifier diode in a SOD113 (2-lead TO-220F) plastic package specifically for use in CCM PFC applications for reduced switching losses.

2. Features and benefits

- Allows use of smaller MOSFETs and heatsinks
- Isolated package
- Low thermal resistance
- Low reverse recovery current
- Reduces switching losses in associated MOSFET
- Superfast switching

3. Applications

- Continuous Current Mode (CCM) Power Factor Correction (PFC)
- Desk top computer power supplies
- Flat panel TV power supplies
- Power supply adapters
- Server power supplies
- Telecom power supplies

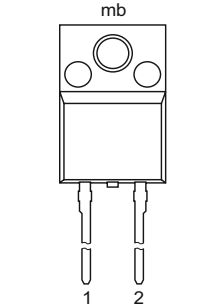
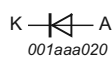
4. Quick reference data

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 | $\delta = 0.5$; square-wave pulse; $T_n \leq 93$ °C; Fig. 1 ; Fig. 2 | 8 | | | A |
| I_{FRM} | repetitive peak forward current | $\delta = 0.5$; $t_p = 25$ μ s; square-wave pulse | 16 | | | A |
| I_{FSM} | non-repetitive peak forward current | $t_p = 10$ ms; $T_{j(init)} = 25$ °C; sine-wave pulse | 110 | | | A |
| | | $t_p = 8.3$ ms; $T_{j(init)} = 25$ °C; sine-wave pulse | 120 | | | A |
| Symbol | Parameter | Conditions | Min | Typ | Max | Unit |
| Static characteristics | | | | | | |
| V_F | forward voltage | $I_F = 8$ A; $T_j = 25$ °C; Fig. 4 | - | 2.35 | 3.2 | V |
| | | $I_F = 8$ A; $T_j = 150$ °C; Fig. 4 | - | 2 | 2.4 | V |
| Dynamic characteristics | | | | | | |
| t_{rr} | reverse recovery time | $I_F = 8$ A; $V_R = 400$ V; $dI_F/dt = 200$ A/ μ s; $T_j = 25$ °C; Fig. 6 | - | 12.5 | - | ns |
| | | $I_F = 8$ A; $V_R = 400$ V; $dI_F/dt = 200$ A/ μ s; $T_j = 125$ °C; Fig. 6 ; Fig. 7 | - | 21 | - | ns |
| Q_r | recovered charge | $I_F = 8$ A; $V_R = 400$ V; $dI_F/dt = 200$ A/ μ s; $T_j = 125$ °C; Fig. 5 ; Fig. 6 | - | 40 | - | nC |

5. Pinning information

Table 2. Pinning information

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

6. Ordering information

Table 3. Ordering information

| Type number | Package | | |
|-------------|---------|---|---------|
| | Name | Description | Version |
| BYC58X-600 | TO-220F | plastic single-ended package; isolated heatsink mounted; 1 mounting hole; 2-lead TO-220 "full pack" | SOD113 |

7. Marking

Table 4. Marking codes

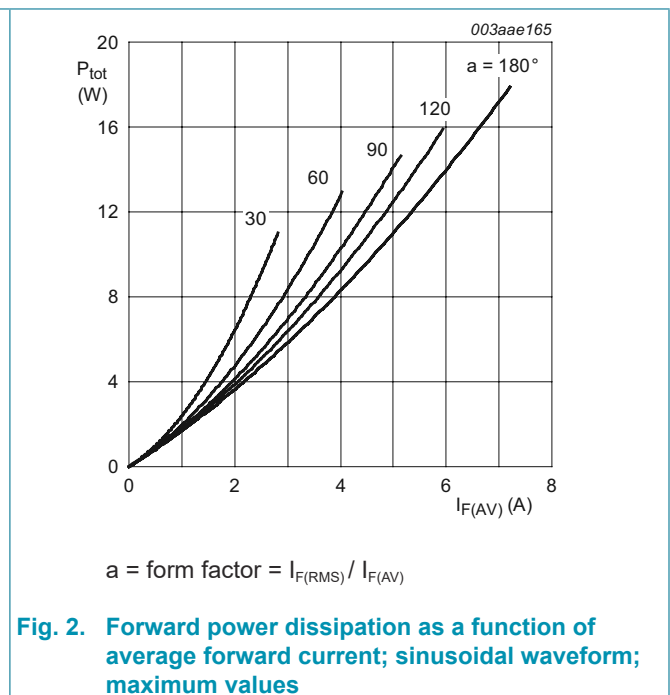
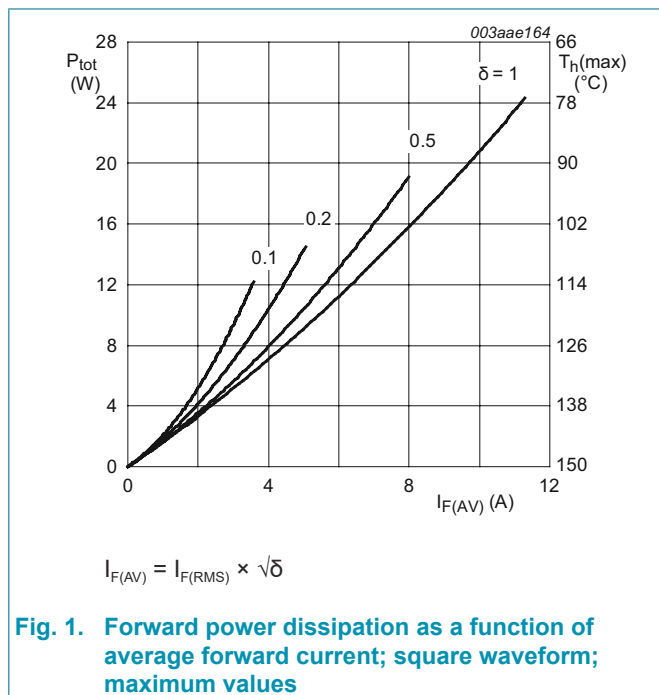
| Type number | Marking codes |
|-------------|---------------|
| BYC58X-600 | BYC58X-600 |

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 |
| $I_{F(AV)}$ | average forward current | $\delta = 0.5$; square-wave pulse; $T_n \leq 93\text{ }^\circ\text{C}$; Fig. 1 ; Fig. 2 ; | 8 | A |
| I_{FRM} | repetitive peak forward current | $\delta = 0.5$; $t_p = 25\text{ }\mu\text{s}$; square-wave pulse | 16 | A |
| I_{FSM} | non-repetitive peak forward current | $t_p = 10\text{ ms}$; $T_{j(\text{init})} = 25\text{ }^\circ\text{C}$; sine-wave pulse | 110 | A |
| | | $t_p = 8.3\text{ ms}$; $T_{j(\text{init})} = 25\text{ }^\circ\text{C}$; sine-wave pulse | 120 | A |
| T_{stg} | storage temperature | | -40 to 150 | $^\circ\text{C}$ |
| T_j | junction temperature | | 150 | $^\circ\text{C}$ |



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 3 | - | 2.5 | 3 | K/W |
| $R_{th(j-a)}$ | thermal resistance from junction to ambient free air | in free air | - | 55 | - | K/W |

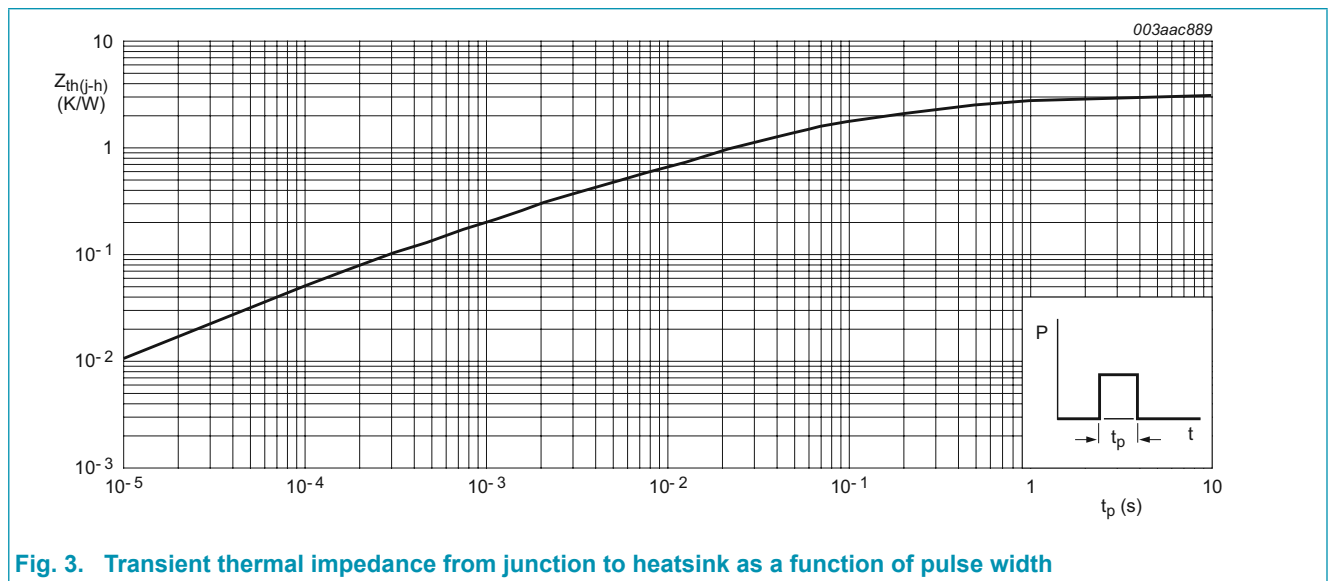


Fig. 3. Transient thermal impedance from junction to heatsink as a function of pulse width

10. Isolation characteristics

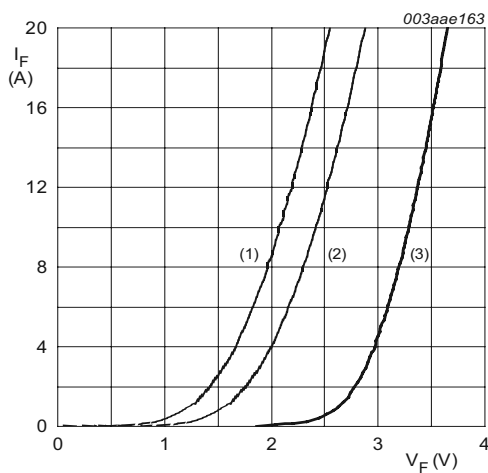
Table 7. Isolation characteristics

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

11. Characteristics

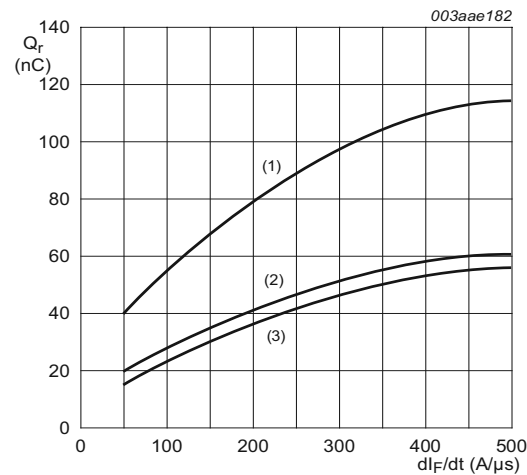
Table 8. Characteristics

| Symbol | Parameter | Conditions | Min | Typ | Max | Unit |
|--------------------------------|-------------------------------|---|-----|------|-----|---------------|
| Static characteristics | | | | | | |
| V_F | forward voltage | $I_F = 8\text{ A}; T_j = 25\text{ }^\circ\text{C}; \text{Fig. 4}$ | - | 2.35 | 3.2 | V |
| | | $I_F = 8\text{ A}; T_j = 150\text{ }^\circ\text{C}; \text{Fig. 4}$ | - | 2 | 2.4 | V |
| I_R | reverse current | $V_R = 600\text{ V}; T_j = 25\text{ }^\circ\text{C}$ | - | - | 150 | μA |
| Dynamic characteristics | | | | | | |
| t_{rr} | reverse recovery time | $I_F = 8\text{ A}; V_R = 400\text{ V}; dI_F/dt = 200\text{ A}/\mu\text{s}; T_j = 25\text{ }^\circ\text{C}; \text{Fig. 6}$ | - | 12.5 | - | ns |
| | | $I_F = 8\text{ A}; V_R = 400\text{ V}; dI_F/dt = 200\text{ A}/\mu\text{s}; T_j = 125\text{ }^\circ\text{C}; \text{Fig. 6}; \text{Fig. 7}$ | - | 21 | - | ns |
| I_{RM} | peak reverse recovery current | $I_F = 8\text{ A}; V_R = 400\text{ V}; dI_F/dt = 200\text{ A}/\mu\text{s}; T_j = 125\text{ }^\circ\text{C}$ | - | 4 | 5.5 | A |
| Q_r | recovered charge | $I_F = 8\text{ A}; V_R = 400\text{ V}; dI_F/dt = 200\text{ A}/\mu\text{s}; T_j = 125\text{ }^\circ\text{C}; \text{Fig. 5}; \text{Fig. 6}$ | - | 40 | - | nC |



(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. 4. Forward current as a function of forward voltage



(1) $I_F = 16\text{ A}$ (2) $I_F = 8\text{ A}$ (3) $I_F = 4\text{ A}$

Fig. 5. Recovered charge as a function of rate of change of forward current; $T_j = 125\text{ }^\circ\text{C}$; typical values

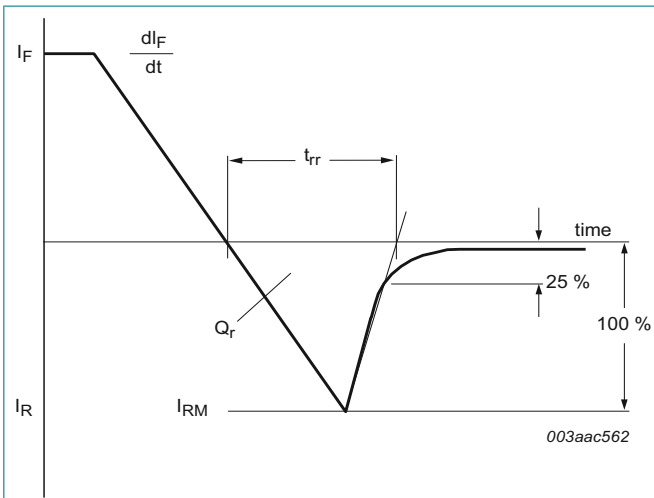
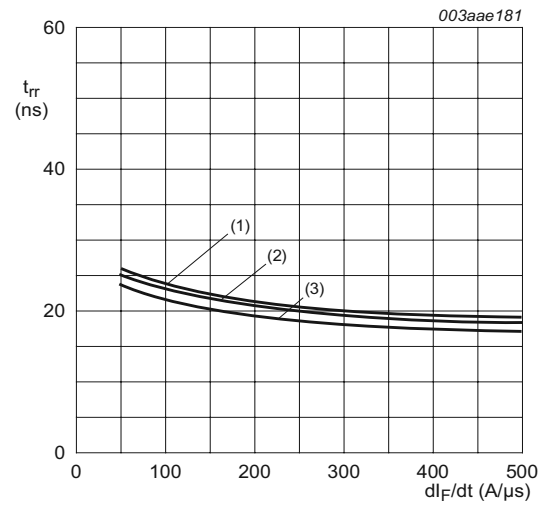


Fig. 6. Reverse recovery definitions; ramp recovery



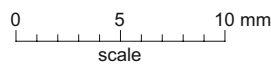
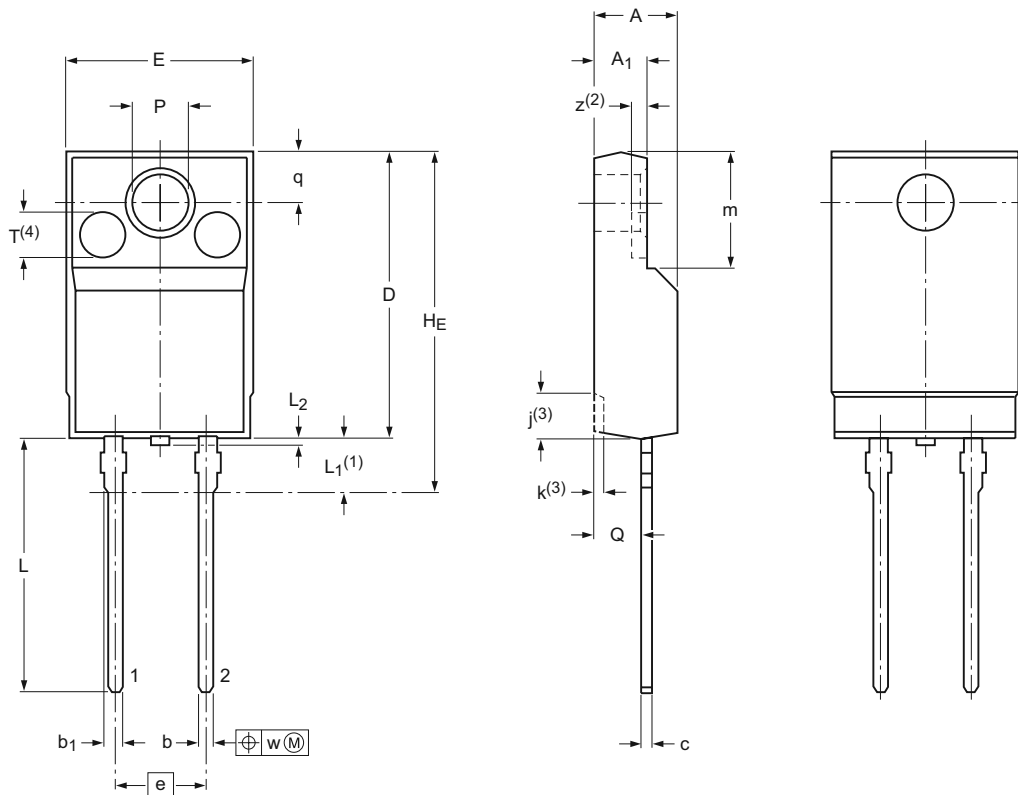
(1) $I_F = 16\text{ A}$ (2) $I_F = 8\text{ A}$ (3) $I_F = 4\text{ A}$

Fig. 7. Recovered charge as a function of rate of change of forward current; $T_j = 125\text{ }^\circ\text{C}$; typical values

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

Data sheet status

| Document status [1][2] | Product status [3] | Definition |
|--------------------------------|--------------------|---|
| Objective [short] data sheet | Development | This document contains data from the objective specification for product development. |
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| 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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