

1. General description

Ultrafast power diode in a SOD113 (2-lead TO-220F) plastic package.

2. Features and benefits

- Fast switching
- Isolated plastic package
- Low leakage current
- Low forward voltage drop
- Low thermal resistance
- Soft recovery characteristic

3. Applications

- High frequency switched-mode power supplies
- Discontinuous Current Mode (DCM) Power Factor Correction (PFC)

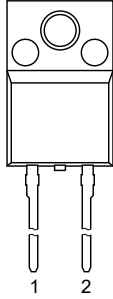
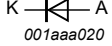
4. Quick reference data

Table 1. Quick reference data

| Symbol | Parameter | Conditions | Min | Typ | Max | Unit |
|--------------------------------|-------------------------------------|--|-----|-----|-----|------|
| V_R | reverse voltage | DC | - | - | 600 | V |
| $I_{F(AV)}$ | average forward current | $\delta = 0.5$; $T_h \leq 71$ °C; square-wave pulse; Fig. 1 ; Fig. 2 ; Fig. 3 | - | - | 10 | A |
| I_{FSM} | non-repetitive peak forward current | $t_p = 10$ ms; $T_{j(init)} = 25$ °C; sine-wave pulse; Fig. 4 | - | - | 80 | A |
| | | $t_p = 8.3$ ms; $T_{j(init)} = 25$ °C; sine-wave pulse | - | - | 88 | A |
| Static characteristics | | | | | | |
| V_F | forward voltage | $I_F = 10$ A; $T_j = 25$ °C; Fig. 6 | - | 1.5 | 2 | V |
| | | $I_F = 10$ A; $T_j = 150$ °C; Fig. 6 | - | - | 1.6 | V |
| Dynamic characteristics | | | | | | |
| t_{rr} | reverse recovery time | $I_F = 1$ A; $V_R = 30$ V; $dI_F/dt = 50$ A/ μ s; $T_j = 25$ °C; Fig. 7 | - | 35 | 50 | ns |

5. Pinning information

Table 2. Pinning information

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

6. Ordering information

Table 3. Ordering information

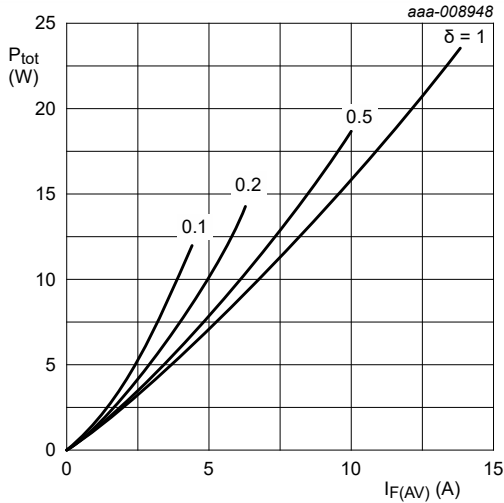
| Type number | Package | | |
|-------------|---------|---|---------|
| | Name | Description | Version |
| BYV10X-600P | TO-220F | plastic single-ended package; isolated heatsink mounted; 1 mounting hole; 2-lead TO-220 "full pack" | SOD113 |

7. Limiting values

Table 4. Limiting values

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

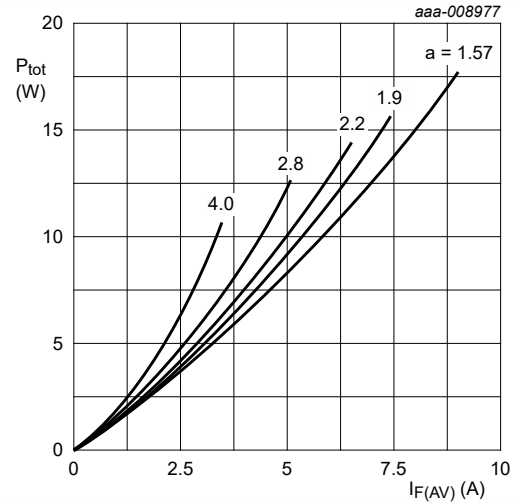
| Symbol | Parameter | Conditions | Min | Max | Unit |
|-------------|-------------------------------------|--|-----|-----|------|
| V_{RRM} | repetitive peak reverse voltage | | - | 600 | V |
| V_{RWM} | crest working reverse voltage | | - | 600 | V |
| V_R | reverse voltage | DC | - | 600 | V |
| $I_{F(AV)}$ | average forward current | $\delta = 0.5$; $T_h \leq 71$ °C; square-wave pulse; Fig. 1 ; Fig. 2 ; Fig. 3 | - | 10 | A |
| I_{FRM} | repetitive peak forward current | $\delta = 0.5$; $t_p = 25$ μ s; $T_h \leq 71$ °C; square-wave pulse | - | 20 | A |
| I_{FSM} | non-repetitive peak forward current | $t_p = 10$ ms; $T_{j(init)} = 25$ °C; sine-wave pulse; Fig. 4 | - | 80 | A |
| | | $t_p = 8.3$ ms; $T_{j(init)} = 25$ °C; sine-wave pulse | - | 88 | A |
| T_{stg} | storage temperature | | -65 | 175 | °C |
| T_j | junction temperature | | - | 175 | °C |



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

$$V_o = 1.268 \text{ V}; R_s = 0.031 \text{ } \Omega$$

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



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

$$V_o = 1.268 \text{ V}; R_s = 0.031 \text{ } \Omega$$

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

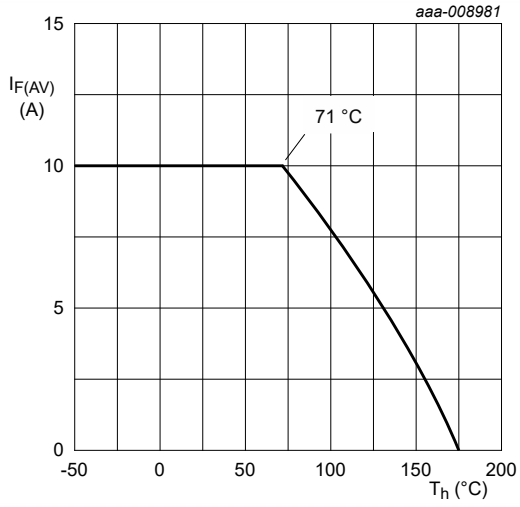


Fig. 3. Forward current as a function of heatsink temperature; maximum values

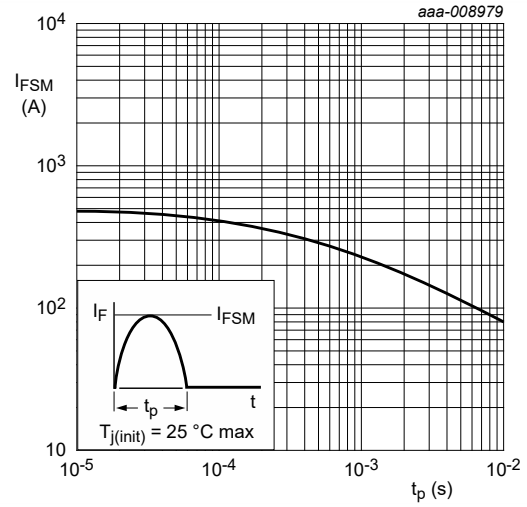


Fig. 4. Non-repetitive peak forward current as a function of pulse width; sinusoidal waveform; maximum values

8. 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 |
| $R_{th(j-a)}$ | thermal resistance from junction to ambient free air | in free air | - | 55 | - | K/W |

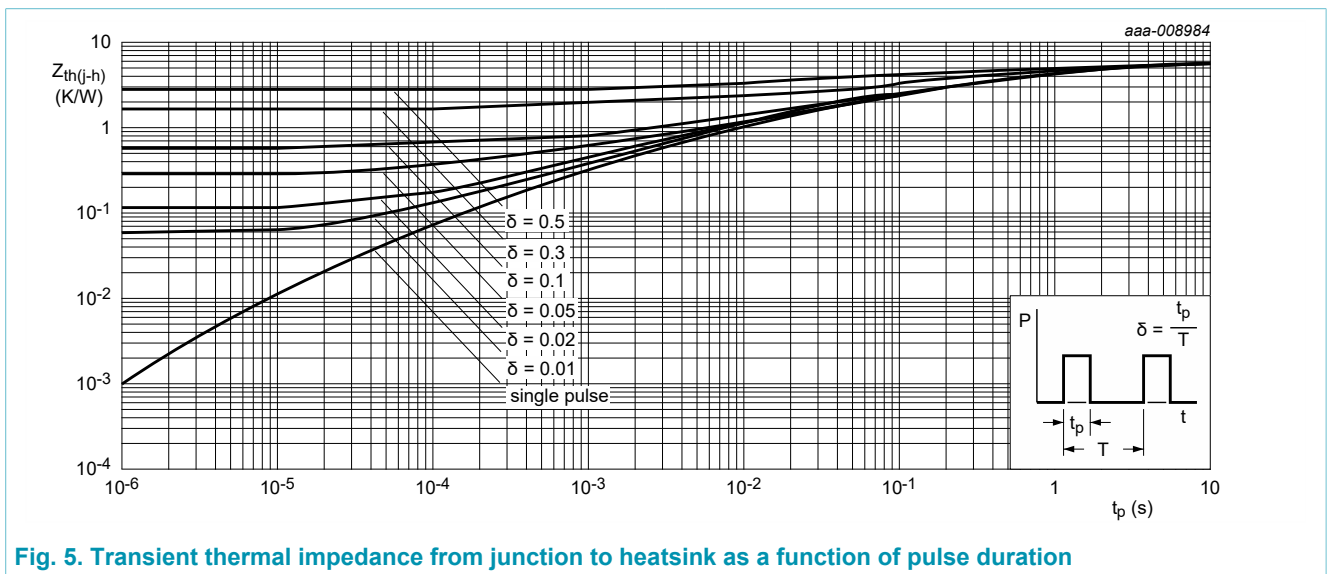


Fig. 5. Transient thermal impedance from junction to heatsink as a function of pulse duration

9. Isolation characteristics

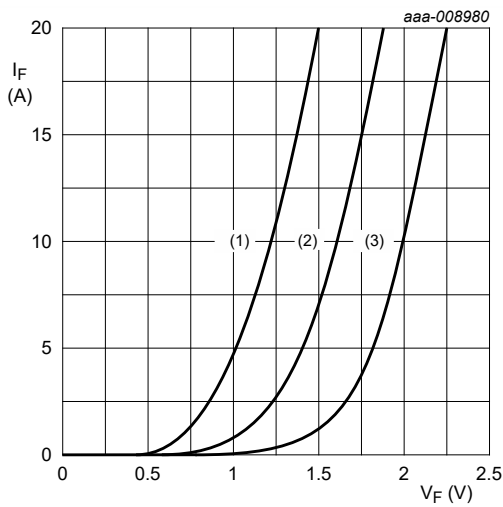
Table 6. Isolation characteristics

| 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 | from cathode to external heatsink | - | 10 | - | pF |

10. Characteristics

Table 7. Characteristics

| Symbol | Parameter | Conditions | Min | Typ | Max | Unit |
|--------------------------------|-----------------------|--|-----|-----|-----|---------------|
| Static characteristics | | | | | | |
| V_F | forward voltage | $I_F = 10\text{ A}; T_j = 25\text{ }^\circ\text{C}; \text{Fig. 6}$ | - | 1.5 | 2 | V |
| | | $I_F = 10\text{ A}; T_j = 150\text{ }^\circ\text{C}; \text{Fig. 6}$ | - | - | 1.6 | V |
| I_R | reverse current | $V_R = 600\text{ V}; T_j = 25\text{ }^\circ\text{C}$ | - | - | 10 | μA |
| | | $V_R = 500\text{ V}; T_j = 150\text{ }^\circ\text{C}$ | - | - | 250 | μA |
| Dynamic characteristics | | | | | | |
| t_{rr} | reverse recovery time | $I_F = 1\text{ A}; V_R = 30\text{ V}; dI_F/dt = 50\text{ A}/\mu\text{s}; T_j = 25\text{ }^\circ\text{C}; \text{Fig. 7}$ | - | 35 | 50 | ns |
| | | $I_F = 1\text{ A}; V_R = 30\text{ V}; dI_F/dt = 100\text{ A}/\mu\text{s}; T_j = 25\text{ }^\circ\text{C}; \text{Fig. 7}$ | - | 20 | - | ns |
| | | $I_F = 10\text{ A}; V_R = 200\text{ V}; dI_F/dt = 200\text{ A}/\mu\text{s}; T_j = 25\text{ }^\circ\text{C}; \text{Fig. 7}$ | - | 40 | - | ns |



$V_o = 1.268\text{ V}; R_s = 0.031\ \Omega$
 (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. 6. Forward current as a function of forward voltage

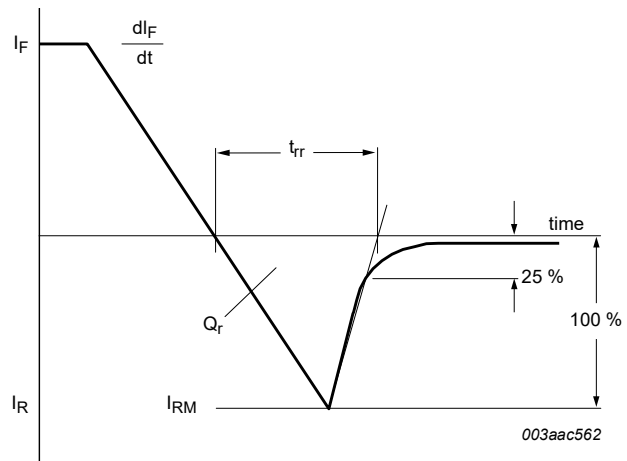
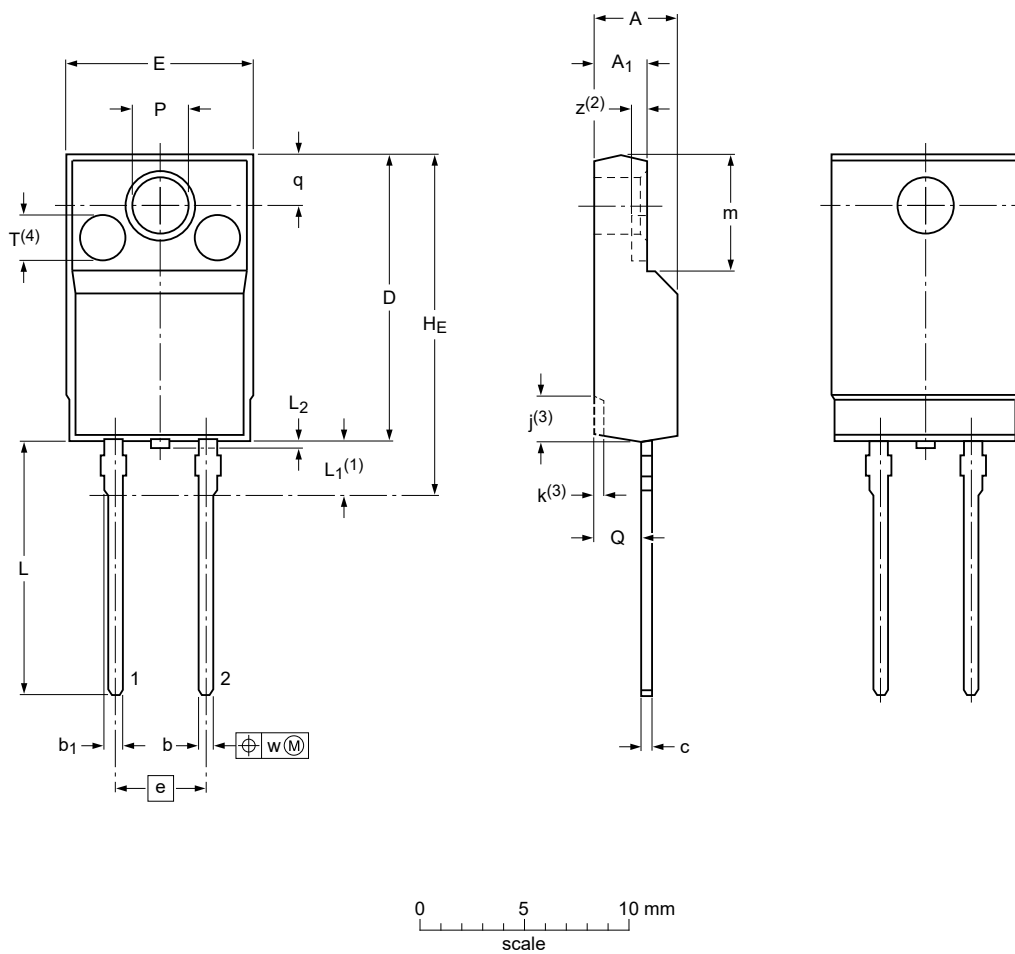


Fig. 7. Reverse recovery definitions; ramp recovery

11. 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 | HE _{max} | j ⁽³⁾ | k ⁽³⁾ | L | L ₁ ⁽¹⁾ | L ₂ _{max} | m | P | Q | q | T ⁽⁴⁾ | w | z ⁽²⁾ | |
|------|-----|----------------|-----|----------------|-----|-----|------|------|-------------------|------------------|------------------|------|-------------------------------|-------------------------------|-----|-----|-----|-----|------------------|-----|------------------|--|
| mm | 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 |

Fig. 8. Package outline TO-220F (SOD113)

12. 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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