



BYV10ED-600P

Ultrafast power diode

24 July 2015

Product data sheet

1. General description

Enhanced ultrafast power diode in a SOT428 (DPAK) plastic package.

2. Features and benefits

- High thermal cycling performance
- Soft recovery characteristic
- Low on-state losses
- Surface-mountable package
- Low thermal resistance
- Enhanced avalanche energy capability

3. Applications

- Dual Mode (DCM and CCM) PFC
- Power Factor Correction (PFC) for Interleaved Topology

4. Quick reference data

Table 1. Quick reference data

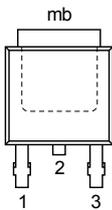
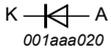
| Symbol | Parameter | Conditions | Min | Typ | Max | Unit |
|--------------------------------|-------------------------------------|--|-----|-----|-----|------|
| V_{RRM} | repetitive peak reverse voltage | | - | - | 600 | V |
| $I_{F(AV)}$ | average forward current | $\delta = 0.5$; $T_{mb} \leq 118$ °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; $T_{mb} \leq 118$ °C; Square-wave pulse | - | - | 20 | A |
| I_{FSM} | non-repetitive peak forward current | $t_p = 10$ ms; $T_{j(init)} = 25$ °C; SIN; Fig. 4 | - | - | 70 | A |
| | | $t_p = 8.3$ ms; $T_{j(init)} = 25$ °C; SIN; Fig. 4 | - | - | 80 | 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 |



| Symbol | Parameter | Conditions | Min | Typ | Max | Unit |
|-------------------------|---------------------------------|--|-----|-----|-----|------|
| | | $I_F = 10\text{ A}$; $V_R = 200\text{ V}$; $di_F/dt = 200\text{ A}/\mu\text{s}$; $T_j = 25\text{ }^\circ\text{C}$; Fig. 7 | - | 50 | - | ns |
| | | $I_F = 10\text{ A}$; $V_R = 200\text{ V}$; $di_F/dt = 200\text{ A}/\mu\text{s}$; $T_j = 125\text{ }^\circ\text{C}$; Fig. 7 | - | 78 | - | ns |
| Avalanche energy | | | | | | |
| E_{AS} | non-repetitive avalanche energy | $I_R = 2.6\text{ A}$; $T_{j(\text{init})} = 25\text{ }^\circ\text{C}$; $L = 15\text{ mH}$ | - | 50 | - | mJ |

5. Pinning information

Table 2. Pinning information

| Pin | Symbol | Description | Simplified outline | Graphic symbol |
|-----|--------|-------------------------------------|--|---|
| 1 | n.c. | not connected |  <p style="text-align: center;">DPAK (SOT428)</p> |  |
| 2 | K | cathode ^[1] | | |
| 3 | A | anode | | |
| mb | K | mounting base; connected to cathode | | |

[1] It is not possible to connect to pin 2 of the SOT428 package.

6. Ordering information

Table 3. Ordering information

| Type number | Package | | |
|--------------|---------|---|---------|
| | Name | Description | Version |
| BYV10ED-600P | DPAK | plastic single-ended surface-mounted package (DPAK); 3 leads (one lead cropped) | SOT428 |

7. Marking

Table 4. Marking codes

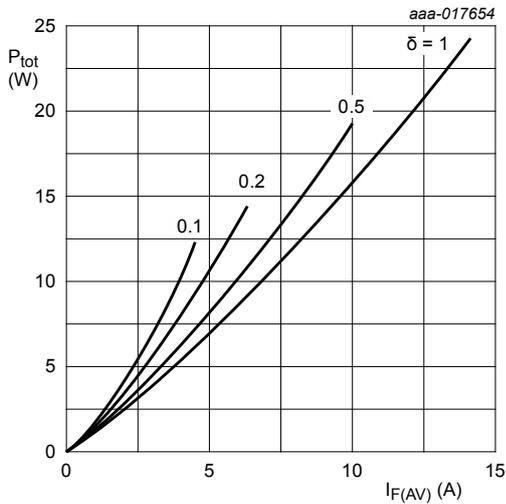
| Type number | Marking code |
|--------------|--------------|
| BYV10ED-600P | BYV10ED-600P |

8. Limiting values

Table 5. Limiting values

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

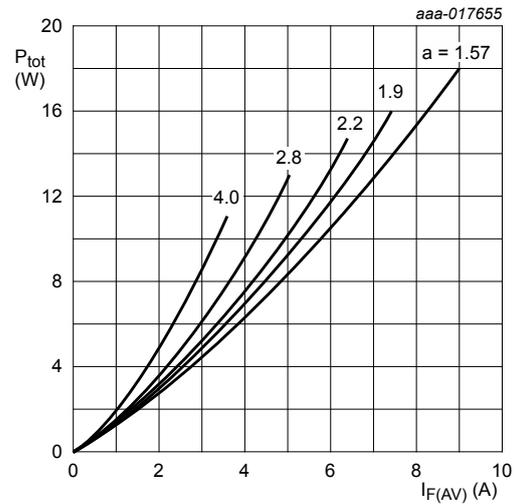
| Symbol | Parameter | Conditions | Min | Max | Unit |
|-------------|-------------------------------------|--|-----|-----|------|
| V_{RRM} | repetitive peak reverse voltage | | - | 600 | V |
| V_{RWM} | crest working reverse voltage | | - | 600 | V |
| V_R | reverse voltage | DC | - | 600 | V |
| $I_{F(AV)}$ | average forward current | $\delta = 0.5$; $T_{mb} \leq 118$ °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; $T_{mb} \leq 118$ °C; Square-wave pulse | - | 20 | A |
| I_{FSM} | non-repetitive peak forward current | $t_p = 10$ ms; $T_{j(init)} = 25$ °C; SIN; Fig. 4 | - | 70 | A |
| | | $t_p = 8.3$ ms; $T_{j(init)} = 25$ °C; SIN; Fig. 4 | - | 80 | A |
| T_{stg} | storage temperature | | -40 | 175 | °C |
| T_j | junction temperature | | - | 175 | °C |



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

$$V_o = 1.241 \text{ V}; R_s = 0.034 \text{ } \Omega$$

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



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

$$V_o = 1.241 \text{ V}; R_s = 0.034 \text{ } \Omega$$

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

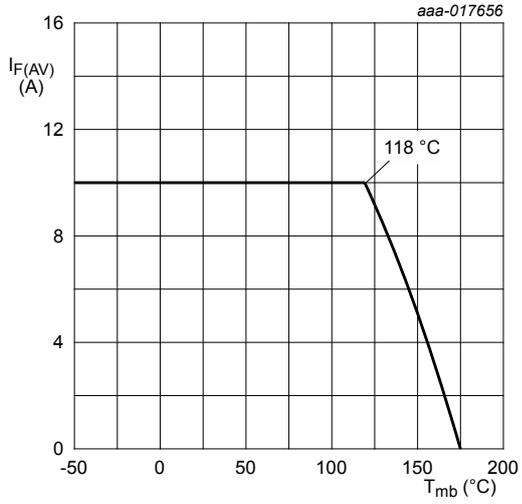


Fig. 3. Forward current as a function of mounting base temperature; maximum values

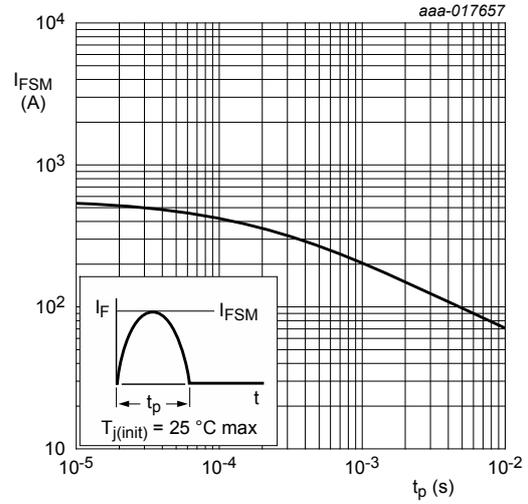


Fig. 4. Non-repetitive peak forward current as a function of pulse width; sinusoidal waveform; maximum values

9. Thermal characteristics

Table 6. Thermal characteristics

| Symbol | Parameter | Conditions | Min | Typ | Max | Unit |
|----------------|--|--|-----|-----|-----|------|
| $R_{th(j-mb)}$ | thermal resistance from junction to mounting base | With heatsink compound; Fig. 5 | - | - | 3 | K/W |
| $R_{th(j-a)}$ | thermal resistance from junction to ambient free air | in free air | - | 50 | - | K/W |

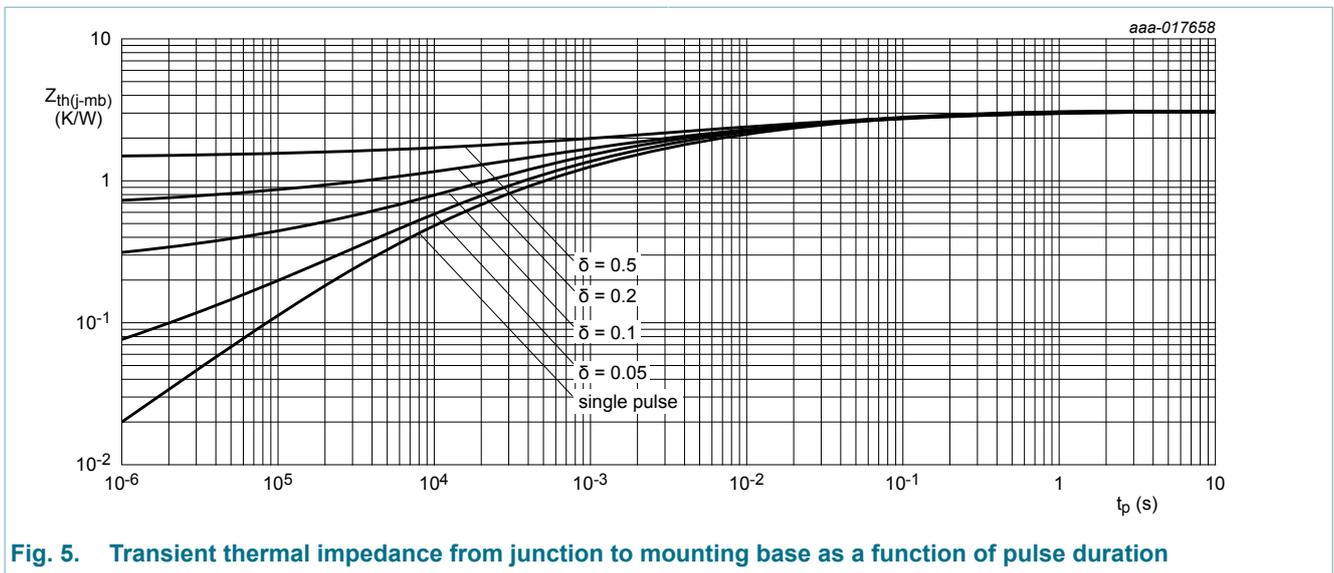
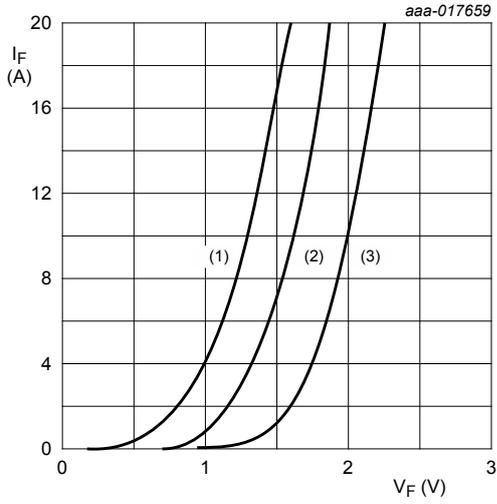


Fig. 5. Transient thermal impedance from junction to mounting base as a function of pulse duration

10. Characteristics

Table 7. Characteristics

| Symbol | Parameter | Conditions | Min | Typ | Max | Unit |
|--------------------------------|---------------------------------|--|-----|-----|-----|---------------|
| Static characteristics | | | | | | |
| V_F | forward voltage | $I_F = 10\text{ A}$; $T_j = 25\text{ °C}$; Fig. 6 | - | 1.5 | 2 | V |
| | | $I_F = 10\text{ A}$; $T_j = 150\text{ °C}$; Fig. 6 | - | - | 1.6 | V |
| I_R | reverse current | $V_R = 600\text{ V}$; $T_j = 25\text{ °C}$ | - | - | 10 | μA |
| | | $V_R = 600\text{ V}$; $T_j = 150\text{ °C}$ | - | - | 500 | μA |
| Dynamic characteristics | | | | | | |
| Q_r | recovered charge | $I_F = 10\text{ A}$; $V_R = 200\text{ V}$; $di_F/dt = 200\text{ A}/\mu\text{s}$; $T_j = 25\text{ °C}$; Fig. 7 | - | 123 | - | nC |
| | | $I_F = 10\text{ A}$; $V_R = 200\text{ V}$; $di_F/dt = 200\text{ A}/\mu\text{s}$; $T_j = 125\text{ °C}$; Fig. 7 | - | 305 | - | nC |
| t_{rr} | reverse recovery time | $I_F = 1\text{ A}$; $V_R = 30\text{ V}$; $di_F/dt = 50\text{ A}/\mu\text{s}$; $T_j = 25\text{ °C}$; Fig. 7 | - | 35 | 50 | ns |
| | | $I_F = 10\text{ A}$; $V_R = 200\text{ V}$; $di_F/dt = 200\text{ A}/\mu\text{s}$; $T_j = 25\text{ °C}$; Fig. 7 | - | 50 | - | ns |
| | | $I_F = 10\text{ A}$; $V_R = 200\text{ V}$; $di_F/dt = 200\text{ A}/\mu\text{s}$; $T_j = 125\text{ °C}$; Fig. 7 | - | 78 | - | ns |
| I_{RM} | peak reverse recovery current | $I_F = 10\text{ A}$; $V_R = 200\text{ V}$; $di_F/dt = 200\text{ A}/\mu\text{s}$; $T_j = 25\text{ °C}$; Fig. 7 | - | 4.9 | - | A |
| | | $I_F = 10\text{ A}$; $V_R = 200\text{ V}$; $di_F/dt = 200\text{ A}/\mu\text{s}$; $T_j = 125\text{ °C}$; Fig. 7 | - | 7.8 | - | A |
| Avalanche energy | | | | | | |
| E_{AS} | non-repetitive avalanche energy | $I_R = 2.6\text{ A}$; $T_{j(\text{init})} = 25\text{ °C}$; $L = 15\text{ mH}$ | - | 50 | - | mJ |



$V_o = 1.241 \text{ V}; R_s = 0.034 \text{ } \Omega$

- (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

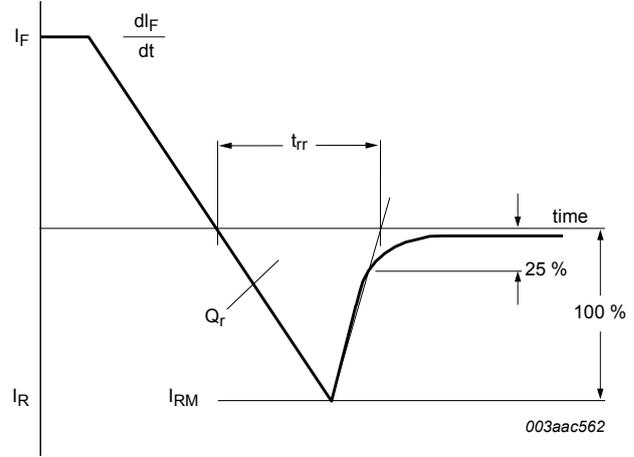
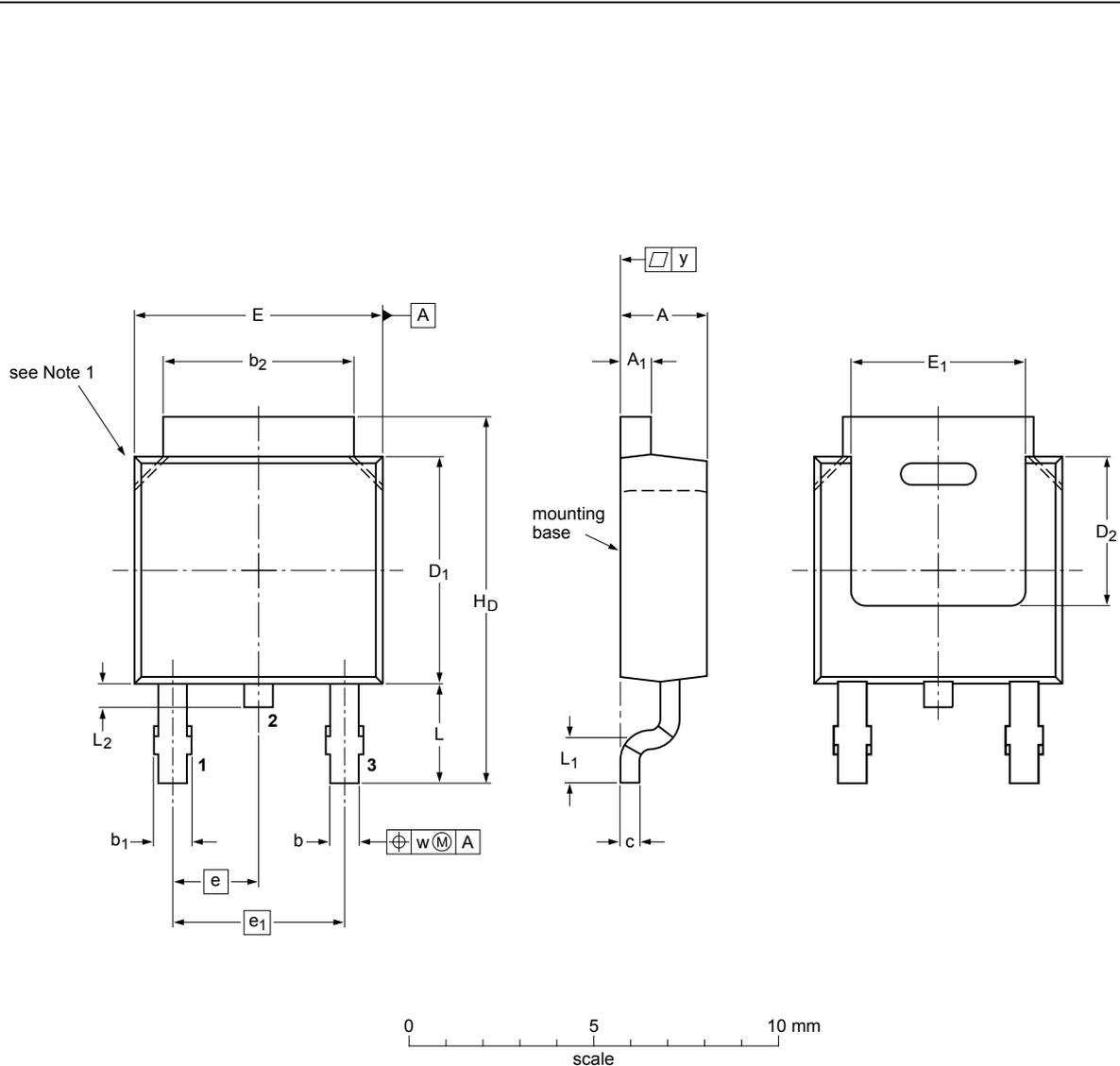


Fig. 7. Reverse recovery definitions; ramp recovery

11. Package outline

Plastic single-ended surface-mounted package (DPAK); 3 leads (one lead cropped) SOT428



Dimensions (mm are the original dimensions)

| Unit | A | A ₁ | b | b ₁ | b ₂ | c | D ₁ | D ₂ | E | E ₁ | e | e ₁ | H _D | L | L ₁ | L ₂ | w | y |
|------|------|----------------|------|----------------|----------------|------|----------------|----------------|------|----------------|-------|----------------|----------------|------|----------------|----------------|-----|-----|
| max | 2.38 | 0.93 | 0.89 | 1.1 | 5.46 | 0.56 | 6.22 | | 6.73 | | | | 10.4 | 2.95 | | 0.9 | | 0.2 |
| nom | | | | | | | | | | | 2.285 | 4.57 | | | | | 0.2 | |
| min | 2.22 | 0.46 | 0.71 | 0.9 | 5.00 | 0.20 | 5.98 | 4.0 | 6.47 | 4.45 | | | 9.6 | 2.55 | 0.5 | 0.5 | | |

Note

1. Plastic body may have 45° chamfer.

sot428_po

| Outline version | References | | | European projection | Issue date |
|-----------------|------------|--------|-------|---------------------|----------------------|
| | IEC | JEDEC | JEITA | | |
| SOT428 | | TO-252 | SC-63 | | 06-03-16 14-06-10 |

Fig. 8. Package outline DPAK (SOT428)

12. Legal information

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