



# BYV25FB-600

Enhanced ultrafast power diode

Rev. 02 — 7 March 2011

Product data sheet

## 1. Product profile

### 1.1 General description

Enhanced ultrafast power diode in a SOT404 (D2PAK) plastic package

### 1.2 Features and benefits

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

### 1.3 Applications

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

### 1.4 Quick reference data

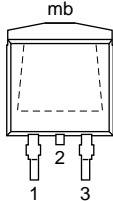

Table 1. Quick reference data

| Symbol                         | Parameter                       | Conditions  | Min | Typ  | Max | Unit |
|--------------------------------|---------------------------------|---|-----|------|-----|------|
| $V_{RRM}$                      | repetitive peak reverse voltage |   | -   | -    | 600 | V    |
| $I_{F(AV)}$                    | average forward current         | square-wave pulse; $\delta = 0.5$ ;<br>$T_{mb} \leq 126$ °C; see <a href="#">Figure 1</a> ;<br>see <a href="#">Figure 2</a> | -   | -    | 5   | A    |
| <b>Static characteristics</b>  |                                 |   |     |      |     |      |
| $V_F$                          | forward voltage                 | $I_F = 5$ A; $T_j = 25$ °C;<br>see <a href="#">Figure 5</a>   | -   | 1.3  | 1.9 | V    |
|                                |                                 | $I_F = 5$ A; $T_j = 150$ °C;<br>see <a href="#">Figure 5</a>  | -   | 1.1  | 1.7 | V    |
| <b>Dynamic characteristics</b> |                                 |   |     |      |     |      |
| $t_{rr}$                       | reverse recovery time           | $I_F = 1$ A; $V_R = 30$ V;<br>$di_F/dt = 100$ A/ $\mu$ s; $T_j = 25$ °C;<br>see <a href="#">Figure 6</a>                    | -   | 17.5 | 35  | ns   |



## 2. Pinning information

**Table 2. Pinning information**

| Pin | Symbol | Description            | Simplified outline  | Graphic symbol  |
|-----|--------|------------------------|---|---|
| 1   | n.c.   | not connected          |  |  |
| 2   | K      | cathode <sup>[1]</sup> |   |   |
| 3   | A      | anode                  |   |   |
| mb  | K      | mounting base; cathode |   |   |

**SOT404 (D2PAK)**

[1] It is not possible to connect to pin 2 of the SOT404 package.

## 3. Ordering information

**Table 3. Ordering information**

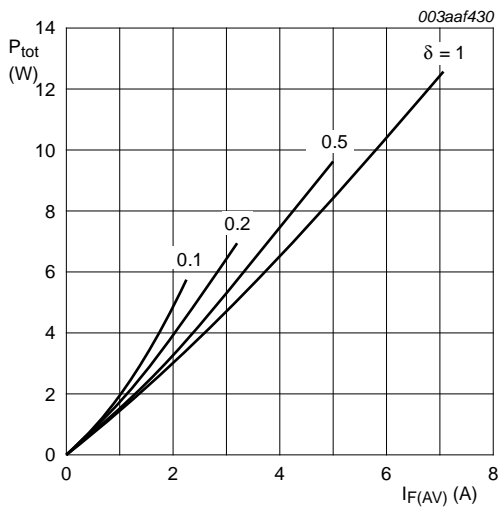
| Type number | Package |  |         |
|-------------|---------|--|---------|
|             | Name    | Description  | Version |
| BYV25FB-600 | D2PAK   | plastic single-ended surface-mounted package (D2PAK); 3 leads (one lead cropped) | SOT404  |

## 4. Limiting values

**Table 4. Limiting values**

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

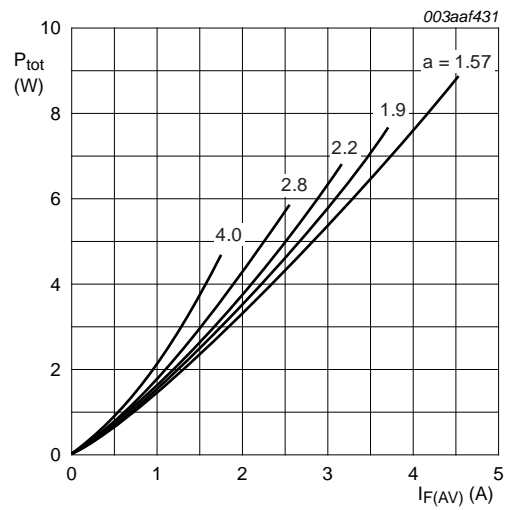
| Symbol      | Parameter                           | Conditions  | Min | Max | Unit             |
|-------------|-------------------------------------|---|-----|-----|------------------|
| $V_{RRM}$   | repetitive peak reverse voltage     |   | -   | 600 | V                |
| $V_{RWM}$   | crest working reverse voltage       |   | -   | 600 | V                |
| $V_R$       | reverse voltage                     | DC  | -   | 600 | V                |
| $I_{F(AV)}$ | average forward current             | square-wave pulse; $\delta = 0.5$ ;<br>$T_{mb} \leq 126\text{ }^\circ\text{C}$ ; see <a href="#">Figure 1</a> ;<br>see <a href="#">Figure 2</a> | -   | 5   | A                |
| $I_{FRM}$   | repetitive peak forward current     | square-wave pulse; $\delta = 0.5$ ; $t_p = 25\text{ }\mu\text{s}$ ;<br>$T_{mb} \leq 126\text{ }^\circ\text{C}$                                  | -   | 10  | A                |
| $I_{FSM}$   | non-repetitive peak forward current | $t_p = 10\text{ ms}$ ; sine-wave pulse;<br>$T_{j(init)} = 25\text{ }^\circ\text{C}$ ; see <a href="#">Figure 3</a>                              | -   | 60  | A                |
|             |                                     | $t_p = 8.3\text{ ms}$ ; sine-wave pulse;<br>$T_{j(init)} = 25\text{ }^\circ\text{C}$ ; see <a href="#">Figure 3</a>                             | -   | 66  | A                |
| $T_{stg}$   | storage temperature                 |   | -40 | 150 | $^\circ\text{C}$ |
| $T_j$       | junction temperature                |   | -   | 150 | $^\circ\text{C}$ |



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

$V_o = 1.50 \text{ V}; R_s = 0.041 \Omega$

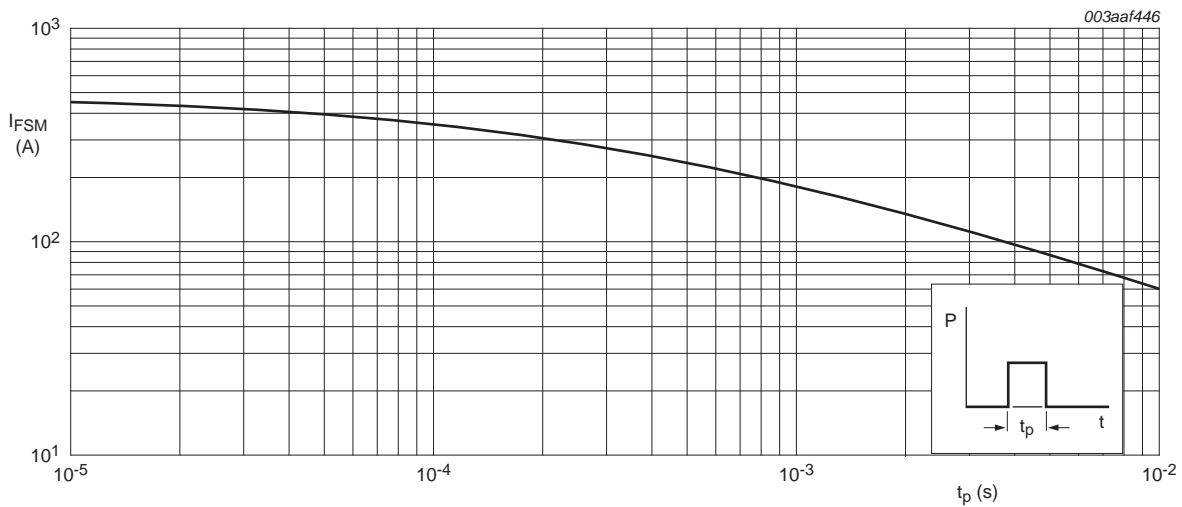
**Fig 1. Forward power dissipation as a function of average forward current; square waveform; maximum values**



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

$V_o = 1.50 \text{ V}; R_s = 0.041 \Omega$

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



**Fig 3. 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 |
|----------------|---|------------------------------|-------|-----|-----|------|
| $R_{th(j-mb)}$ | thermal resistance from junction to mounting base | see <a href="#">Figure 4</a> | -     | -   | 2.5 | K/W  |
| $R_{th(j-a)}$  | thermal resistance from junction to ambient       | in free air                  | [1] - | 50  | -   | K/W  |

[1] Device mounted on an FR4 Printed-Circuit Board (PCB), single-sided copper, tin-plated and standard footprint.

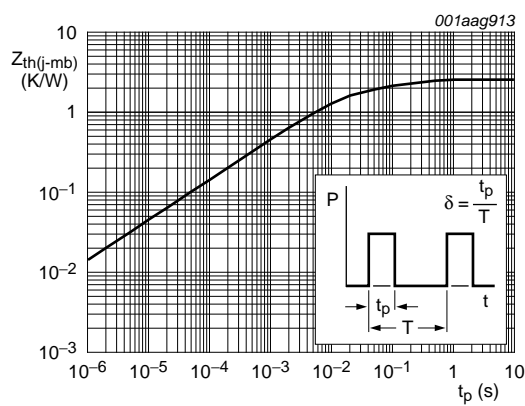
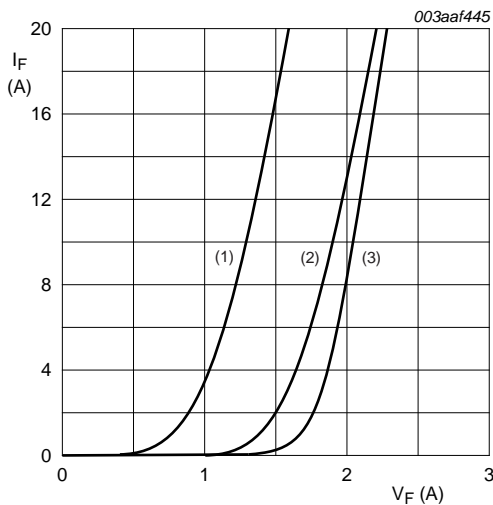


Fig 4. Transient thermal impedance from junction to mounting base as a function of pulse width

## 6. Characteristics

**Table 6. Characteristics**

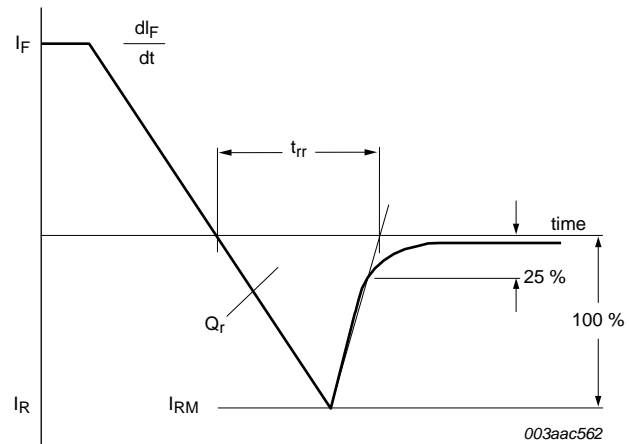
| Symbol                         | Parameter                     | Conditions  | Min | Typ  | Max | Unit          |
|--------------------------------|-------------------------------|---|-----|------|-----|---------------|
| <b>Static characteristics</b>  |                               |   |     |      |     |               |
| $V_F$                          | forward voltage               | $I_F = 5 \text{ A}; T_j = 25 \text{ }^\circ\text{C};$ see <a href="#">Figure 5</a>  | -   | 1.3  | 1.9 | V             |
|                                |                               | $I_F = 5 \text{ A}; T_j = 150 \text{ }^\circ\text{C};$ see <a href="#">Figure 5</a>   | -   | 1.1  | 1.7 | V             |
| $I_R$                          | reverse current               | $V_R = 600 \text{ V}; T_j = 100 \text{ }^\circ\text{C}$   | -   | -    | 1.5 | mA            |
|                                |                               | $V_R = 600 \text{ V}; T_j = 25 \text{ }^\circ\text{C}$  | -   | -    | 50  | $\mu\text{A}$ |
| <b>Dynamic characteristics</b> |                               |   |     |      |     |               |
| $Q_r$                          | recovered charge              | $I_F = 1 \text{ A}; V_R = 30 \text{ V}; dI_F/dt = 100 \text{ A}/\mu\text{s}; T_j = 25 \text{ }^\circ\text{C};$ see <a href="#">Figure 6</a> | -   | 13   | -   | nC            |
| $t_{rr}$                       | reverse recovery time         | $I_F = 1 \text{ A}; V_R = 30 \text{ V}; dI_F/dt = 100 \text{ A}/\mu\text{s}; T_j = 25 \text{ }^\circ\text{C};$ see <a href="#">Figure 6</a> | -   | 17.5 | 35  | ns            |
| $I_{RM}$                       | peak reverse recovery current | $I_F = 1 \text{ A}; V_R = 30 \text{ V}; dI_F/dt = 100 \text{ A}/\mu\text{s}; T_j = 25 \text{ }^\circ\text{C};$ see <a href="#">Figure 6</a> | -   | 1.5  | -   | A             |
| $V_{FRM}$                      | forward recovery voltage      | $I_F = 1 \text{ A}; dI_F/dt = 100 \text{ A}/\mu\text{s}; T_j = 25 \text{ }^\circ\text{C};$ see <a href="#">Figure 7</a>                     | -   | 3.2  | -   | V             |



$V_o = 1.50 \text{ V}; R_s = 0.041 \text{ } \Omega$

- (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 5. Forward current as a function of forward voltage**



**Fig 6. Reverse recovery definitions; ramp recovery**

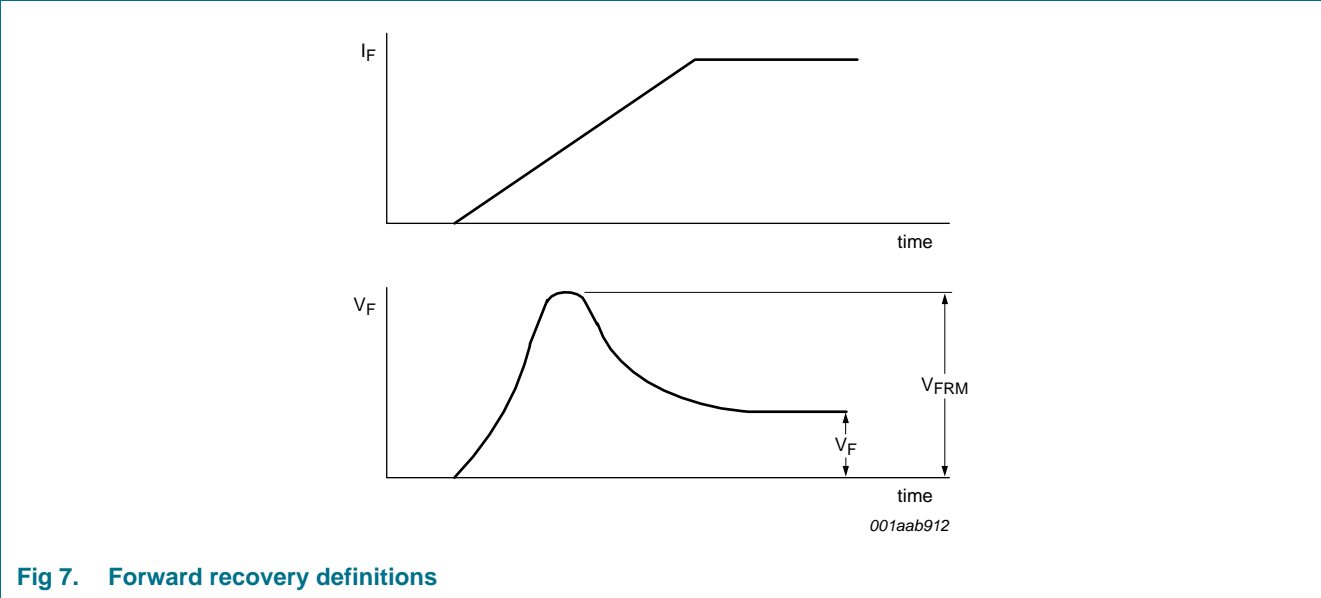
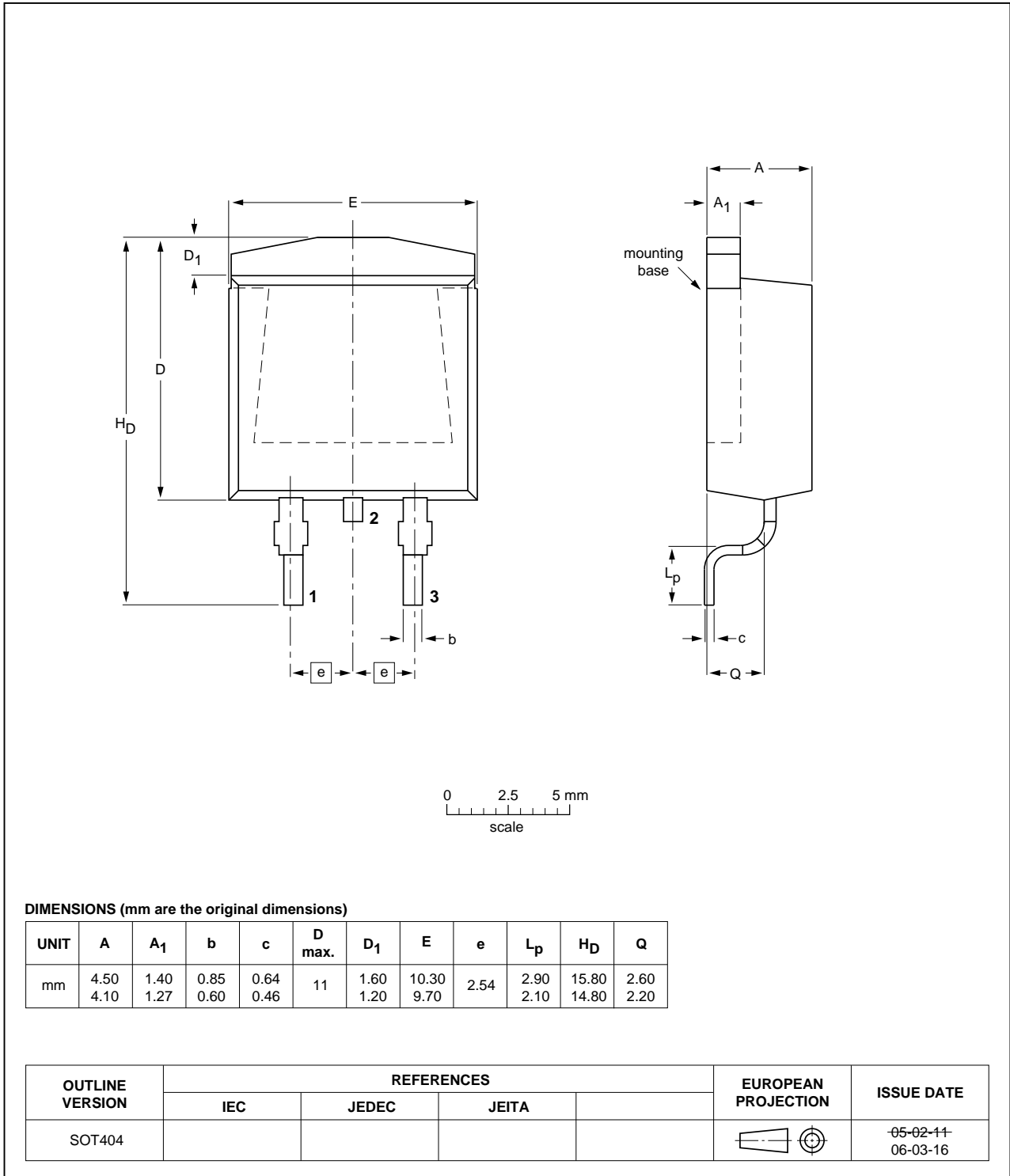


Fig 7. Forward recovery definitions

**7. Package outline**

Plastic single-ended surface-mounted package (D2PAK); 3 leads (one lead cropped)

**SOT404**



**Fig 8. Package outline SOT404 (D2PAK)**





## 9. Revision history

Table 7. Revision history

| Document ID     | Release date                  | Data sheet status  | Change notice | Supersedes      |
|-----------------|-------------------------------|--------------------|---------------|-----------------|
| BYV25FB-600 v.2 | 20110307                      | Product data sheet | -             | BYV25FB-600 v.1 |
| Modifications:  | • Various changes to content. |                    |               |                 |
| BYV25FB-600 v.1 | 20100930                      | Product data sheet | -             | -               |

## 10. Legal information

### 10.1 Data sheet status

| Document status <a href="#">[1]</a> <a href="#">[2]</a> | Product status <a href="#">[3]</a> | 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.                       |
| Product [short] data sheet                              | Production                         | This document contains the product specification.                                     |

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