

# BYV32E-200

Dual rugged ultrafast rectifier diode, 20 A, 200 V

Rev. 04 — 27 February 2009

Product data sheet

## 1. Product profile

### 1.1 General description

Ultrafast dual epitaxial rectifier diode in a SOT78 (TO-220AB) plastic package.

### 1.2 Features and benefits

- High reverse voltage surge capability
- High thermal cycling performance
- Low thermal resistance
- Soft recovery characteristic minimizes power consuming oscillations
- Very low on-state loss

### 1.3 Applications

- Output rectifiers in high-frequency switched-mode power supplies

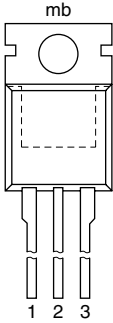
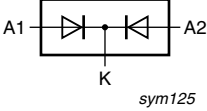
### 1.4 Quick reference data

Table 1. Quick reference

| Symbol                  | Parameter                       | Conditions                                                                                                                                              | Min | Typ  | Max  | Unit |
|-------------------------|---------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------|-----|------|------|------|
| V <sub>RRM</sub>        | repetitive peak reverse voltage |                                                                                                                                                         | -   | -    | 200  | V    |
| I <sub>O(AV)</sub>      | average output current          | square-wave pulse; δ = 0.5; T <sub>mb</sub> ≤ 115 °C; both diodes conducting; see <a href="#">Figure 1</a> ; see <a href="#">Figure 2</a>               | -   | -    | 20   | A    |
| I <sub>RRM</sub>        | repetitive peak reverse current | t <sub>p</sub> = 2 μs; δ = 0.001                                                                                                                        | -   | -    | 0.2  | A    |
| V <sub>ESD</sub>        | electrostatic discharge voltage | HBM; C = 250 pF; R = 1.5 kΩ; all pins                                                                                                                   | -   | -    | 8    | kV   |
| Dynamic characteristics |                                 |                                                                                                                                                         |     |      |      |      |
| t <sub>rr</sub>         | reverse recovery time           | I <sub>F</sub> = 1 A; V <sub>R</sub> = 30 V; dI <sub>F</sub> /dt = 100 A/μs; T <sub>j</sub> = 25 °C; ramp recovery; see <a href="#">Figure 5</a>        | -   | 20   | 25   | ns   |
|                         |                                 | I <sub>R</sub> = 1 A; I <sub>F</sub> = 0.5 A; T <sub>j</sub> = 25 °C; step recovery; measured at reverse current = 0.25 A; see <a href="#">Figure 6</a> | -   | 10   | 20   | ns   |
| Static characteristics  |                                 |                                                                                                                                                         |     |      |      |      |
| V <sub>F</sub>          | forward voltage                 | I <sub>F</sub> = 8 A; T <sub>j</sub> = 150 °C; see <a href="#">Figure 4</a>                                                                             | -   | 0.72 | 0.85 | V    |

2. Pinning information

Table 2. Pinning information

| Pin | Symbol | Description            | Simplified outline                                                                 | Graphic symbol                                                                      |
|-----|--------|------------------------|------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| 1   | A1     | anode 1                |  |  |
| 2   | K      | cathode                |                                                                                    |                                                                                     |
| 3   | A2     | anode 2                |                                                                                    |                                                                                     |
| mb  | K      | mounting base; cathode |                                                                                    |                                                                                     |
|     |        |                        | SOT78<br>(TO-220AB; SC-46)                                                         |                                                                                     |

3. Ordering information

Table 3. Ordering information

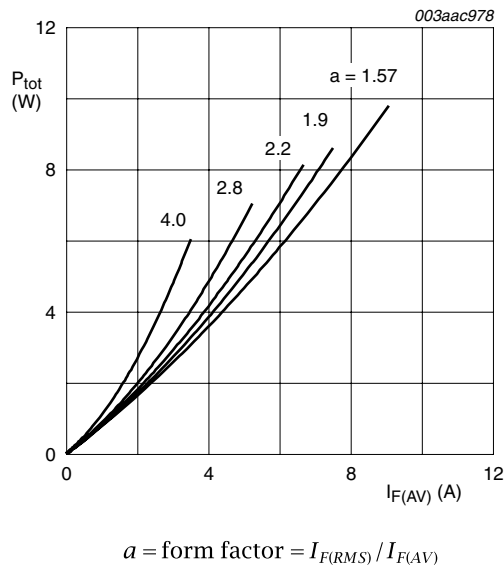
| Type number | Package            |                                                                                     | Version |
|-------------|--------------------|-------------------------------------------------------------------------------------|---------|
|             | Name               | Description                                                                         |         |
| BYV32E-200  | TO-220AB;<br>SC-46 | plastic single-ended package; heatsink mounted; 1 mounting hole; 3-lead<br>TO-220AB | SOT78   |

## 4. Limiting values

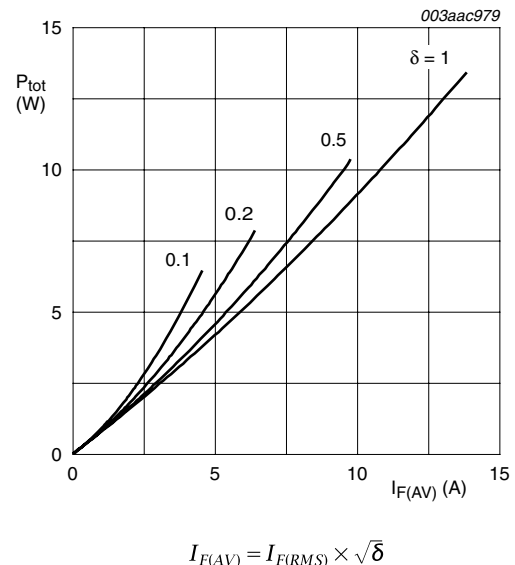
**Table 4. Limiting values**

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

| Symbol      | Parameter                           | Conditions                                                                                                                                                | Min | Max | Unit             |
|-------------|-------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------|-----|-----|------------------|
| $V_{RRM}$   | repetitive peak reverse voltage     |                                                                                                                                                           | -   | 200 | V                |
| $V_{RWM}$   | crest working reverse voltage       |                                                                                                                                                           | -   | 200 | V                |
| $V_R$       | reverse voltage                     | DC                                                                                                                                                        | -   | 200 | V                |
| $I_{O(AV)}$ | average output current              | square-wave pulse; $\delta = 0.5$ ; $T_{mb} \leq 115^\circ\text{C}$ ; both diodes conducting; see <a href="#">Figure 1</a> ; see <a href="#">Figure 2</a> | -   | 20  | A                |
| $I_{FRM}$   | repetitive peak forward current     | $\delta = 0.5$ ; $t_p = 25\ \mu\text{s}$ ; $T_{mb} \leq 115^\circ\text{C}$ ; per diode                                                                    | -   | 20  | A                |
| $I_{FSM}$   | non-repetitive peak forward current | $t_p = 8.3\ \text{ms}$ ; sine-wave pulse; $T_{j(\text{init})} = 25^\circ\text{C}$ ; per diode                                                             | -   | 137 | A                |
|             |                                     | $t_p = 10\ \text{ms}$ ; sine-wave pulse; $T_{j(\text{init})} = 25^\circ\text{C}$ ; per diode                                                              | -   | 125 | A                |
| $I_{RRM}$   | repetitive peak reverse current     | $\delta = 0.001$ ; $t_p = 2\ \mu\text{s}$                                                                                                                 | -   | 0.2 | A                |
| $I_{RSM}$   | non-repetitive peak reverse current | $t_p = 100\ \mu\text{s}$                                                                                                                                  | -   | 0.2 | A                |
| $T_{stg}$   | storage temperature                 |                                                                                                                                                           | -40 | 150 | $^\circ\text{C}$ |
| $T_j$       | junction temperature                |                                                                                                                                                           | -   | 150 | $^\circ\text{C}$ |
| $V_{ESD}$   | electrostatic discharge voltage     | HBM; $C = 250\ \text{pF}$ ; $R = 1.5\ \text{k}\Omega$ ; all pins                                                                                          | -   | 8   | kV               |



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

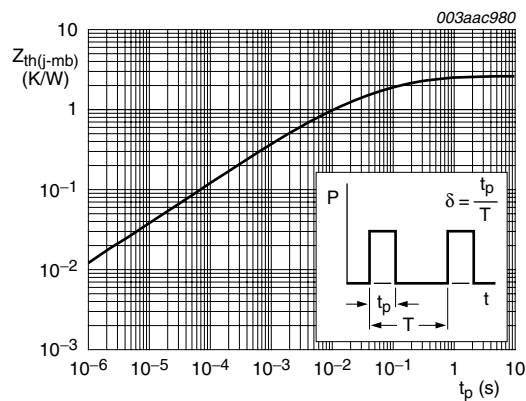


**Fig 2. Forward power dissipation as a function of average forward current; square waveform; maximum values**

## 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 | with heatsink compound; both diodes conducting                  | -   | -   | 1.6 | K/W  |
|                |                                                   | with heatsink compound; per diode; see <a href="#">Figure 3</a> | -   | -   | 2.4 | K/W  |
| $R_{th(j-a)}$  | thermal resistance from junction to ambient       |                                                                 | -   | 60  | -   | K/W  |

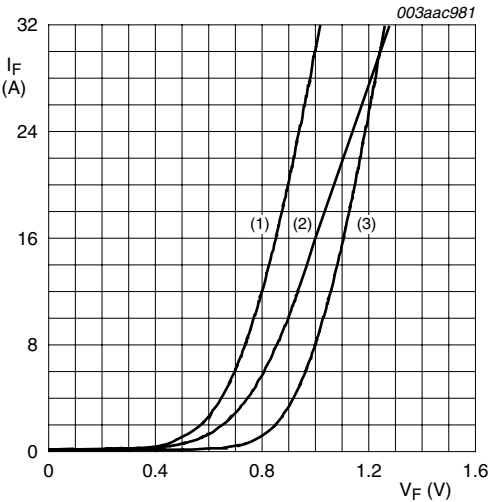


**Fig 3. Transient thermal impedance from junction to mounting base as a function of pulse width**

## 6. Characteristics

**Table 6. Characteristics**

| Symbol                  | Parameter                | Conditions                                                                                                                                              | Min | Typ  | Max  | Unit |
|-------------------------|--------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------|-----|------|------|------|
| Static characteristics  |                          |                                                                                                                                                         |     |      |      |      |
| V <sub>F</sub>          | forward voltage          | I <sub>F</sub> = 20 A; T <sub>j</sub> = 25 °C                                                                                                           | -   | 1    | 1.15 | V    |
|                         |                          | I <sub>F</sub> = 8 A; T <sub>j</sub> = 150 °C; see <a href="#">Figure 4</a>                                                                             | -   | 0.72 | 0.85 | V    |
| I <sub>R</sub>          | reverse current          | V <sub>R</sub> = 200 V; T <sub>j</sub> = 100 °C                                                                                                         | -   | 0.2  | 0.6  | mA   |
|                         |                          | V <sub>R</sub> = 200 V; T <sub>j</sub> = 25 °C                                                                                                          | -   | 6    | 30   | μA   |
| Dynamic characteristics |                          |                                                                                                                                                         |     |      |      |      |
| Q <sub>r</sub>          | recovered charge         | I <sub>F</sub> = 2 A; V <sub>R</sub> = 30 V; dI <sub>F</sub> /dt = 20 A/μs; T <sub>j</sub> = 25 °C                                                      | -   | 8    | 12.5 | nC   |
| t <sub>rr</sub>         | reverse recovery time    | I <sub>F</sub> = 1 A; V <sub>R</sub> = 30 V; dI <sub>F</sub> /dt = 100 A/μs; ramp recovery; T <sub>j</sub> = 25 °C; see <a href="#">Figure 5</a>        | -   | 20   | 25   | ns   |
|                         |                          | I <sub>F</sub> = 0.5 A; I <sub>R</sub> = 1 A; step recovery; measured at reverse current = 0.25 A; T <sub>j</sub> = 25 °C; see <a href="#">Figure 6</a> | -   | 10   | 20   | ns   |
| V <sub>FR</sub>         | forward recovery voltage | I <sub>F</sub> = 1 A; dI <sub>F</sub> /dt = 10 A/μs; T <sub>j</sub> = 25 °C; see <a href="#">Figure 7</a>                                               | -   | -    | 1    | V    |



- (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

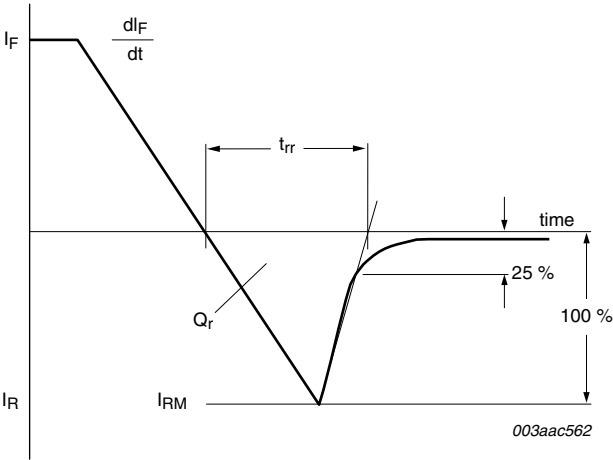


Fig 5. Reverse recovery definitions; ramp recovery

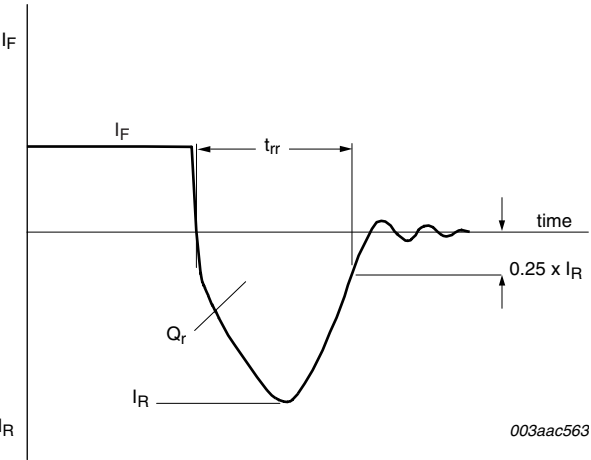


Fig 6. Reverse recovery definitions; step recovery

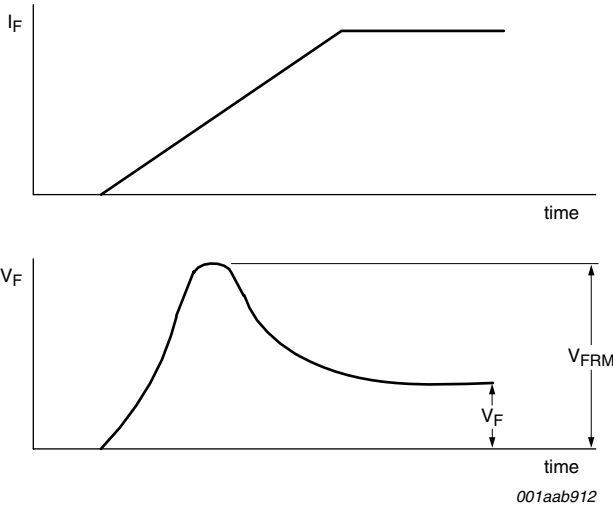


Fig 7. Forward recovery definitions

7. Package outline

Plastic single-ended package; heatsink mounted; 1 mounting hole; 3-lead TO-220AB SOT78

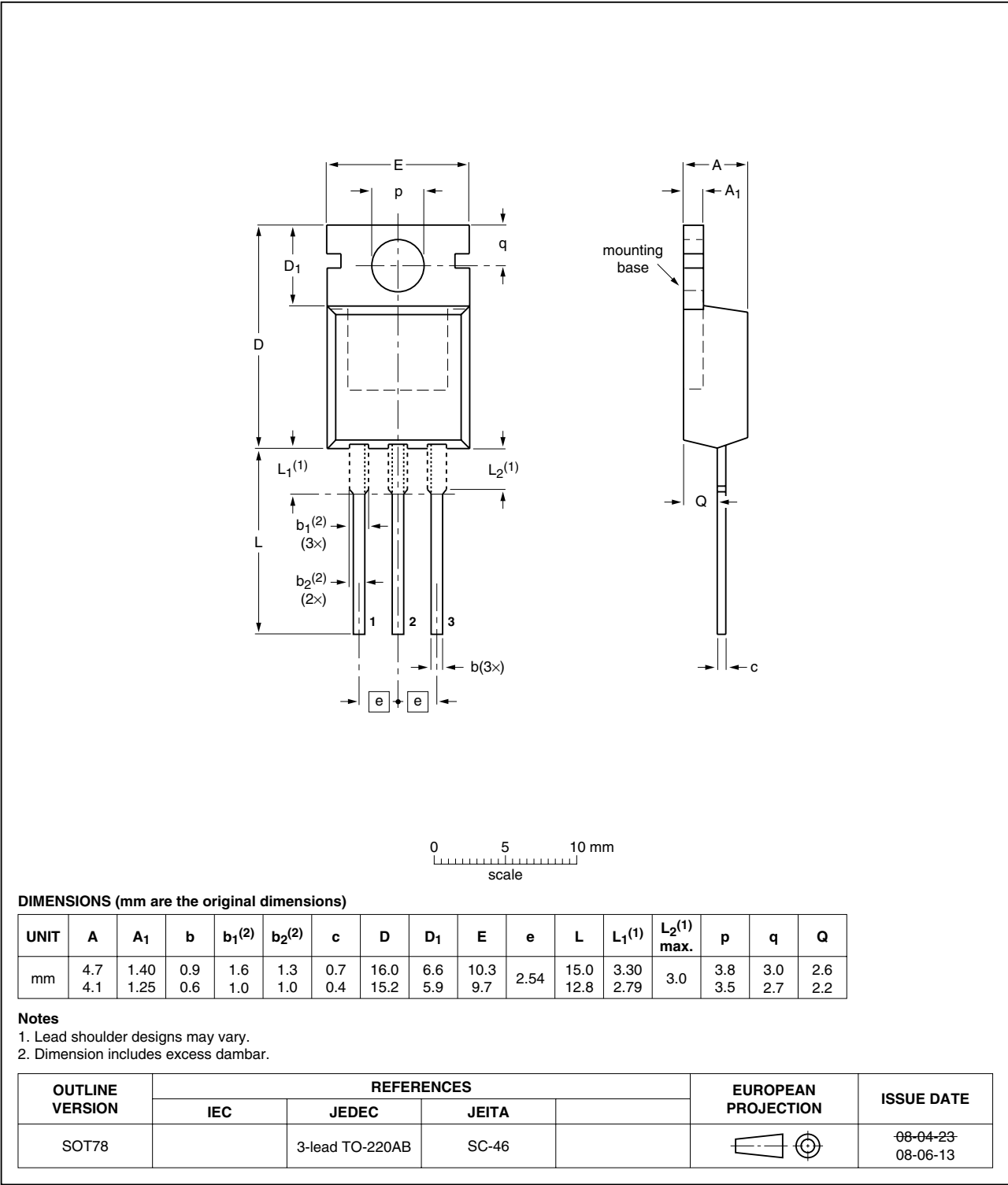


Fig 8. Package outline SOT78 (TO-220AB)

## 8. Revision history

Table 7. Revision history

| Document ID      | Release date                                                                                                                                                                                                                                                                                                                                                           | Data sheet status     | Change notice | Supersedes       |
|------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------|---------------|------------------|
| BYV32E-200_4     | 20090227                                                                                                                                                                                                                                                                                                                                                               | Product data sheet    | -             | BYV32E_SERIES_3  |
| Modifications:   | <ul style="list-style-type: none"><li>• The format of this data sheet has been redesigned to comply with the new identity guidelines of NXP Semiconductors.</li><li>• Legal texts have been adapted to the new company name where appropriate.</li><li>• Package outline updated.</li><li>• Type number BYV32E-200 separated from data sheet BYV32E_SERIES_3</li></ul> |                       |               |                  |
| BYV32E_SERIES_3  | 20010301                                                                                                                                                                                                                                                                                                                                                               | Product specification | -             | BYV32E_SERIES_2  |
| BYV32E_SERIES_2  | 19980701                                                                                                                                                                                                                                                                                                                                                               | Product specification | -             | BYV32EB_SERIES_1 |
| BYV32EB_SERIES_1 | 19960801                                                                                                                                                                                                                                                                                                                                                               | Product specification | -             | -                |

## 9. Legal information

### 9.1 Data sheet status

| Document status <sup>[1][2]</sup> | Product status <sup>[3]</sup> | 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.                                     |

[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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