



BYQ28E-200E

Dual ultrafast power diodes

Rev. 4 — 14 July 2011

Product data sheet

1. Product profile

1.1 General description

Dual ultrafast power diodes in a SOT78 (TO-220AB) plastic package. These diodes are rugged with a guaranteed electrostatic discharge voltage capability.

1.2 Features and benefits

- Fast switching
- Guaranteed ESD capability
- High thermal cycling performance
- Low on-state losses
- Low thermal resistance
- Soft recovery minimizes power-consuming oscillations

1.3 Applications

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

1.4 Quick reference data

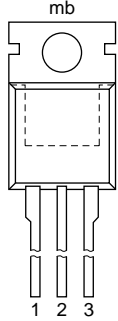
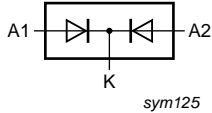
Table 1. Quick reference data

| Symbol | Parameter | Conditions | Min | Typ | Max | Unit |
|--------------------------------|---------------------------------|--|-----|-----|------|------|
| V_{RRM} | repetitive peak reverse voltage | | - | - | 200 | V |
| $I_{O(AV)}$ | average output current | square-wave pulse; $\delta = 0.5$; $T_{mb} \leq 119$ °C; both diodes conducting; see Figure 1 ; see Figure 2 | - | - | 10 | A |
| I_{FRM} | repetitive peak forward current | $\delta = 0.5$; $t_p = 25$ μ s; $T_{mb} \leq 119$ °C; per diode; square-wave pulse | - | - | 10 | A |
| Static characteristics | | | | | | |
| V_F | forward voltage | $I_F = 5$ A; $T_j = 150$ °C; see Figure 4 | - | 0.8 | 0.89 | V |
| Dynamic characteristics | | | | | | |
| t_{rr} | reverse recovery time | $I_F = 1$ A; $V_R = 30$ V; $di_F/dt = 100$ A/ μ s; $T_j = 25$ °C; ramp recovery; see Figure 5 | - | 15 | 25 | ns |
| Electrostatic discharge | | | | | | |
| V_{ESD} | electrostatic discharge voltage | HBM; C = 250 pF; R = 1.5 k Ω ; all pins | - | - | 8 | kV |



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 (TO-220AB)

3. Ordering information

Table 3. Ordering information

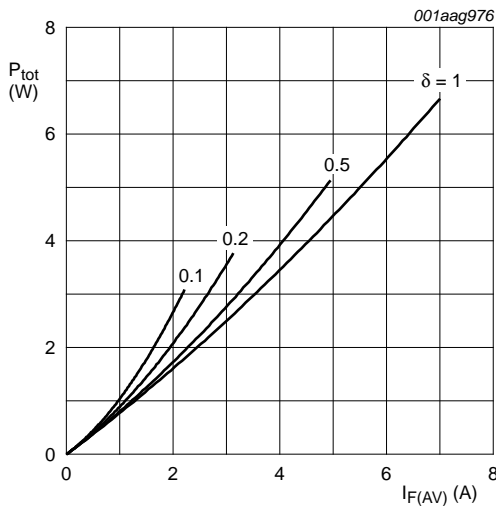
| Type number | Package | | |
|-------------|----------|--|---------|
| | Name | Description | Version |
| BYQ28E-200E | TO-220AB | plastic single-ended package; heatsink mounted; 1 mounting hole; 3-lead TO-220AB | SOT78 |

4. Limiting values

Table 4. Limiting values

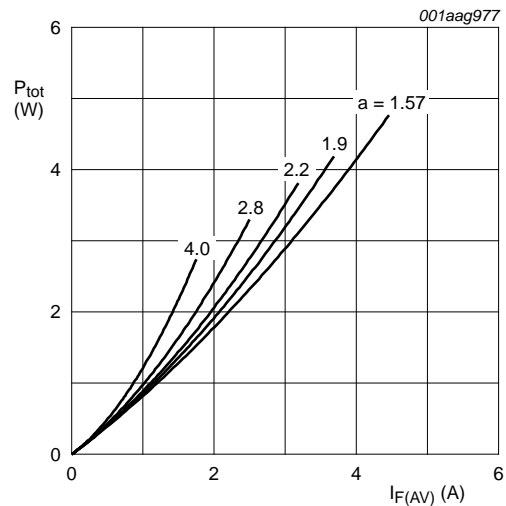
In accordance with the Absolute Maximum Rating System (IEC 60134).

| 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; $\delta = 0.5$; $T_{mb} \leq 119\text{ }^\circ\text{C}$; both diodes conducting; see Figure 1 ; see Figure 2 | - | 10 | A |
| I_{FRM} | repetitive peak forward current | $\delta = 0.5$; $t_p = 25\text{ }\mu\text{s}$; $T_{mb} \leq 119\text{ }^\circ\text{C}$; per diode; square-wave pulse | - | 10 | A |
| I_{FSM} | non-repetitive peak forward current | $t_p = 8.3\text{ ms}$; sine-wave pulse; $T_{j(\text{init})} = 25\text{ }^\circ\text{C}$; per diode | - | 55 | A |
| | | $t_p = 10\text{ ms}$; sine-wave pulse; $T_{j(\text{init})} = 25\text{ }^\circ\text{C}$; per diode | - | 50 | A |
| I_{RRM} | repetitive peak reverse current | $\delta = 0.001$; $t_p = 2\text{ }\mu\text{s}$ | - | 0.2 | A |
| I_{RSM} | non-repetitive peak reverse current | $t_p = 100\text{ }\mu\text{s}$ | - | 0.2 | A |
| T_{stg} | storage temperature | | -40 | 150 | $^\circ\text{C}$ |
| T_j | junction temperature | | - | 150 | $^\circ\text{C}$ |
| Electrostatic discharge | | | | | |
| V_{ESD} | electrostatic discharge voltage | HBM; C = 250 pF; R = 1.5 k Ω ; all pins | - | 8 | kV |



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

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



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

Fig 2. Forward power dissipation as a function of average forward current; sinusoidal 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 | - | - | 3 | K/W |
| | | with heatsink compound; per diode; see Figure 3 | - | - | 4.5 | K/W |
| $R_{th(j-a)}$ | thermal resistance from junction to ambient | | - | 60 | - | K/W |

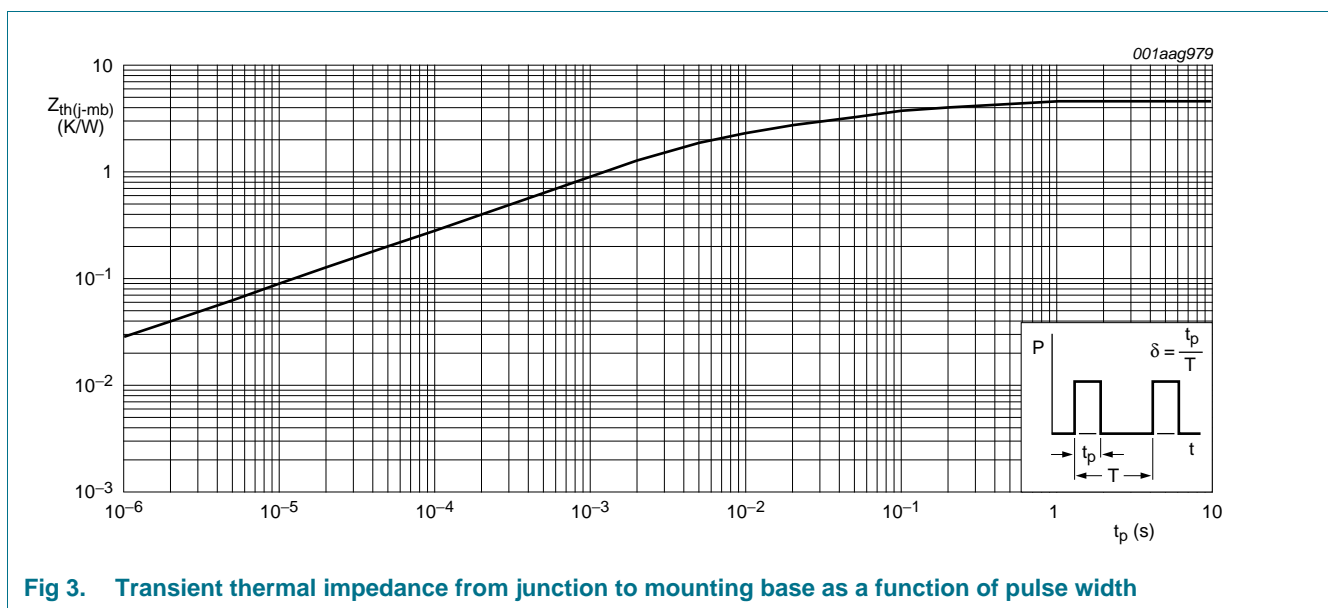
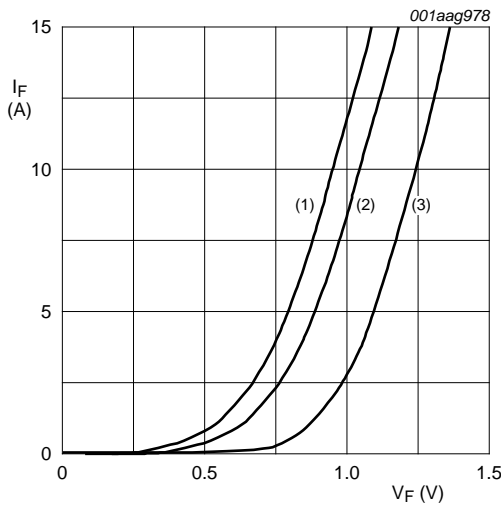


Fig 3. Transient thermal impedance from junction to mounting base as a function of pulse width

6. Characteristics

Table 6. Characteristics

| Symbol | Parameter | Conditions | Min | Typ | Max | Unit |
|--------------------------------|-------------------------------|---|-----|------|-------|---------------|
| Static characteristics | | | | | | |
| V_F | forward voltage | $I_F = 5\text{ A}; T_j = 25\text{ °C}$; see Figure 4 | - | 0.95 | 1.1 | V |
| | | $I_F = 5\text{ A}; T_j = 150\text{ °C}$; see Figure 4 | - | 0.8 | 0.895 | V |
| | | $I_F = 10\text{ A}; T_j = 25\text{ °C}$; see Figure 4 | - | 1.1 | 1.25 | V |
| I_R | reverse current | $V_R = 200\text{ V}; T_j = 25\text{ °C}$ | - | 2 | 10 | μA |
| | | $V_R = 200\text{ V}; T_j = 100\text{ °C}$ | - | 0.1 | 0.2 | mA |
| Dynamic characteristics | | | | | | |
| Q_r | recovered charge | $I_F = 2\text{ A}; V_R \geq 30\text{ V}; dI_F/dt = 20\text{ A}/\mu\text{s}$; $T_j = 25\text{ °C}$; see Figure 5 | - | 4 | 9 | nC |
| t_{rr} | reverse recovery time | $I_F = 1\text{ A}; V_R = 30\text{ V}; dI_F/dt = 100\text{ A}/\mu\text{s}$; ramp recovery; $T_j = 25\text{ °C}$; see Figure 5 | - | 15 | 25 | ns |
| | | $I_F = 0.5\text{ A}; I_R = 1\text{ A}$; step recovery; $T_j = 25\text{ °C}$; see Figure 6 | - | 10 | 20 | ns |
| I_{RM} | peak reverse recovery current | $I_F = 2\text{ A}; V_R \geq 30\text{ V}; dI_F/dt = 20\text{ A}/\mu\text{s}$; $T_j = 25\text{ °C}$; see Figure 5 | - | 0.4 | 0.7 | A |
| V_{FR} | forward recovery voltage | $I_F = 1\text{ A}; dI_F/dt = 10\text{ A}/\mu\text{s}; T_j = 25\text{ °C}$; see Figure 7 | - | 1 | - | V |



- (1) $T_j = 150\text{ °C}$; typical values
- (2) $T_j = 150\text{ °C}$; maximum values
- (3) $T_j = 25\text{ °C}$; maximum values

Fig 4. Forward current as a function of forward voltage

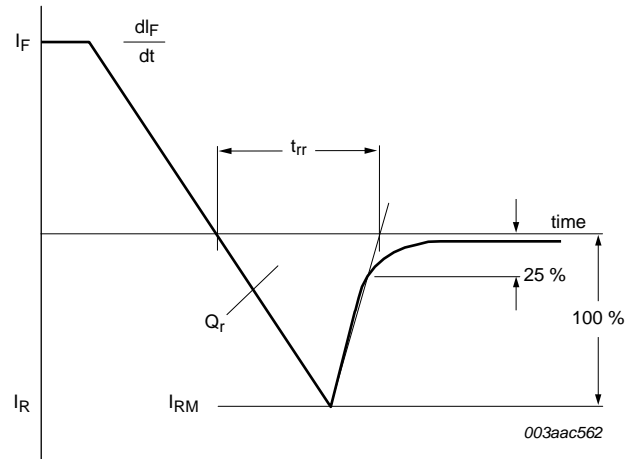


Fig 5. Reverse recovery definitions; ramp recovery

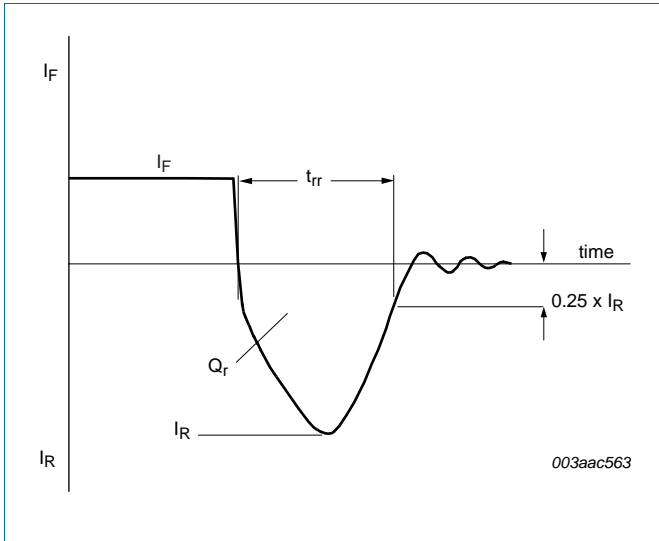


Fig 6. Reverse recovery definitions; step recovery

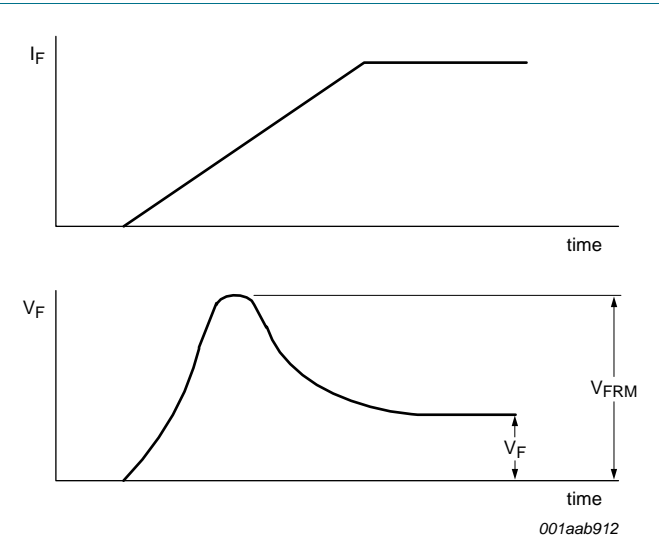


Fig 7. Forward recovery definitions

7. Package outline

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

SOT78

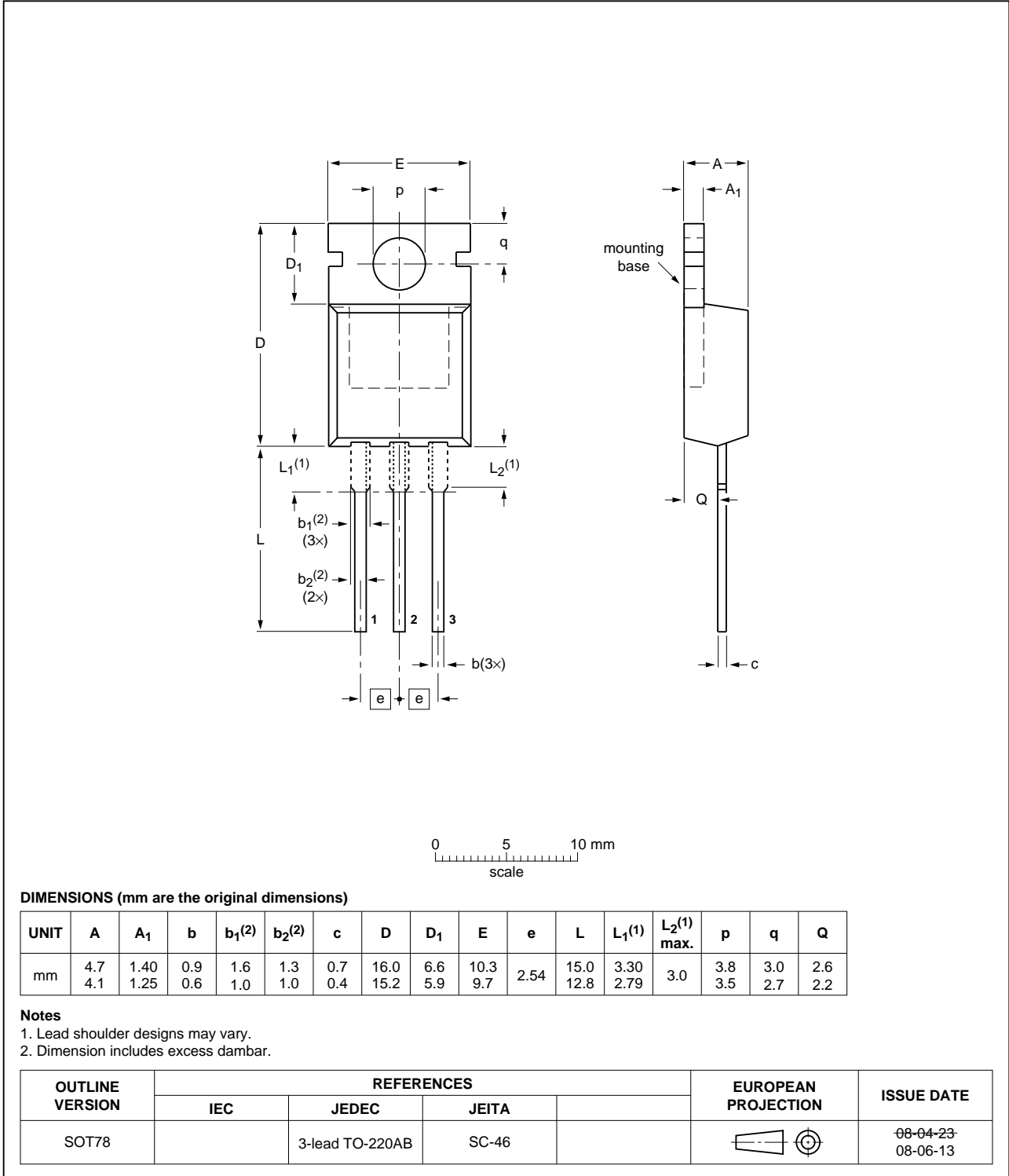


Fig 8. Package outline SOT78 (TO-220AB)

8. Revision history

Table 7. Revision history

| Document ID | Release date | Data sheet status | Change notice | Supersedes |
|-------------------|---|-----------------------|---------------|-------------------|
| BYQ28E-200E v.4 | 20110714 | Product data sheet | - | BYQ28E_SERIES v.3 |
| Modifications: | <ul style="list-style-type: none">• Type number BYQ28E-200E separated from data sheet BYQ28E_SERIES v.3.• The format of this data sheet has been redesigned to comply with the new identity guidelines of NXP Semiconductors.• Legal texts have been adapted to the new company name where appropriate. | | | |
| BYQ28E_SERIES v.3 | 19981001 | Product specification | - | BYQ28E_SERIES v.2 |

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