

1. General description

Ultrafast, dual common cathode, epitaxial rectifier diodes in a TO220 plastic package.

2. Features and benefits

- Fast switching
- Low thermal resistance
- Soft recovery characteristic
- Low forward voltage drop
- Reverse surge capability
- High thermal cycling performance

3. Applications

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

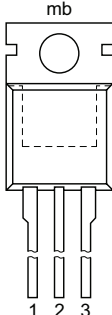
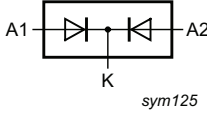
4. Quick reference data

Table 1. Quick reference data

| Symbol | Parameter | Conditions | Values | | | Unit |
|--------------------------------|-------------------------------------|--|--------|------|-------|------|
| Absolute maximum rating | | | | | | |
| V_{RRM} | repetitive peak reverse voltage | | 200 | | | V |
| $I_{O(AV)}$ | average output current | $\delta = 0.5$; square-wave pulse; $T_{mb} \leq 119\text{ °C}$; both diodes conducting; Fig. 5 ; Fig. 6 | 10 | | | A |
| I_{FRM} | repetitive peak forward current | $\delta = 0.5$; $t_p = 25\ \mu\text{s}$; $T_{mb} \leq 119\text{ °C}$; square-wave pulse; per diode | 10 | | | A |
| I_{FSM} | non-repetitive peak forward current | $t_p = 10\text{ ms}$; sine-wave pulse; per diode | 50 | | | A |
| | | $t_p = 8.3\text{ ms}$; sine-wave pulse; per diode | 55 | | | A |
| Symbol | Parameter | Conditions | Min | Typ | Max | Unit |
| Static characteristics | | | | | | |
| V_F | forward voltage | $I_F = 5\text{ A}$; $T_j = 25\text{ °C}$; Fig. 2 | - | 0.95 | 1.1 | V |
| | | $I_F = 5\text{ A}$; $T_j = 150\text{ °C}$; Fig. 2 | - | 0.8 | 0.895 | V |
| | | $I_F = 10\text{ A}$; $T_j = 25\text{ °C}$; Fig. 2 | - | 1.1 | 1.25 | V |
| Dynamic characteristics | | | | | | |
| t_{rr} | reverse recovery time | ramp recovery; $I_F = 1\text{ A}$; $V_R = 30\text{ V}$; $di_F/dt = 100\text{ A}/\mu\text{s}$; $T_j = 25\text{ °C}$; Fig. 3 | - | 15 | 25 | ns |
| | | step recovery; when switched from $I_F = 0.5\text{ A}$ to $I_R = 1\text{ A}$; measured at $I_R = 0.25\text{ A}$ | - | 10 | 20 | ns |

5. 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; connected to cathode | | |

6. Ordering information

Table 3. Ordering information

| Type number | Package Name | Orderable part number | Packing method | Small packing quantity | Package version | Package issue date |
|-------------|--------------|-----------------------|----------------|------------------------|-----------------|--------------------|
| BYQ28E-200 | TO220 | BYQ28E-200,127 | Tube | 50 | SOT78 | 26-Sep-2016 |

7. Marking

Table 4. Marking codes

| Type number | Marking codes |
|-------------|---------------|
| BYQ28E-200 | BYQ28E 200 |

8. Limiting values

Table 5. Limiting values

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

| Symbol | Parameter | Conditions | Values | Unit |
|--------------------------------|-------------------------------------|---|------------|------|
| V_{RRM} | repetitive peak reverse voltage | | 200 | V |
| V_{RWM} | crest working reverse voltage | | 200 | V |
| V_R | reverse voltage | $\delta = 1.0$; square-wave pulse | 200 | V |
| $I_{O(AV)}$ | average output current | $\delta = 0.5$; square-wave pulse; $T_{mb} \leq 119\text{ °C}$; both diodes conducting; Fig. 5 ; Fig. 6 | 10 | A |
| I_{FRM} | repetitive peak forward current | $\delta = 0.5$; $t_p = 25\ \mu\text{s}$; $T_{mb} \leq 119\text{ °C}$; square-wave pulse; per diode | 10 | A |
| I_{FSM} | non-repetitive peak forward current | $t_p = 10\text{ ms}$; sine-wave pulse; per diode | 50 | A |
| | | $t_p = 8.3\text{ ms}$; sine-wave pulse; per diode | 55 | A |
| I_{RM} | peak reverse recovery 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 to 150 | °C |
| T_j | junction temperature | | 150 | °C |
| Electrostatic discharge | | | | |
| V_{ESD} | electrostatic discharge voltage | all pins; human body model; $C = 250\text{ pF}$; $R = 1.5\text{ k}\Omega$ | 8 | kV |

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; both diodes conducting | - | - | 3 | K/W |
| | | with heatsink compound; per diode; Fig 1 | - | - | 4.5 | K/W |
| $R_{th(j-a)}$ | thermal resistance from junction to ambient | in free air | - | 60 | - | K/W |

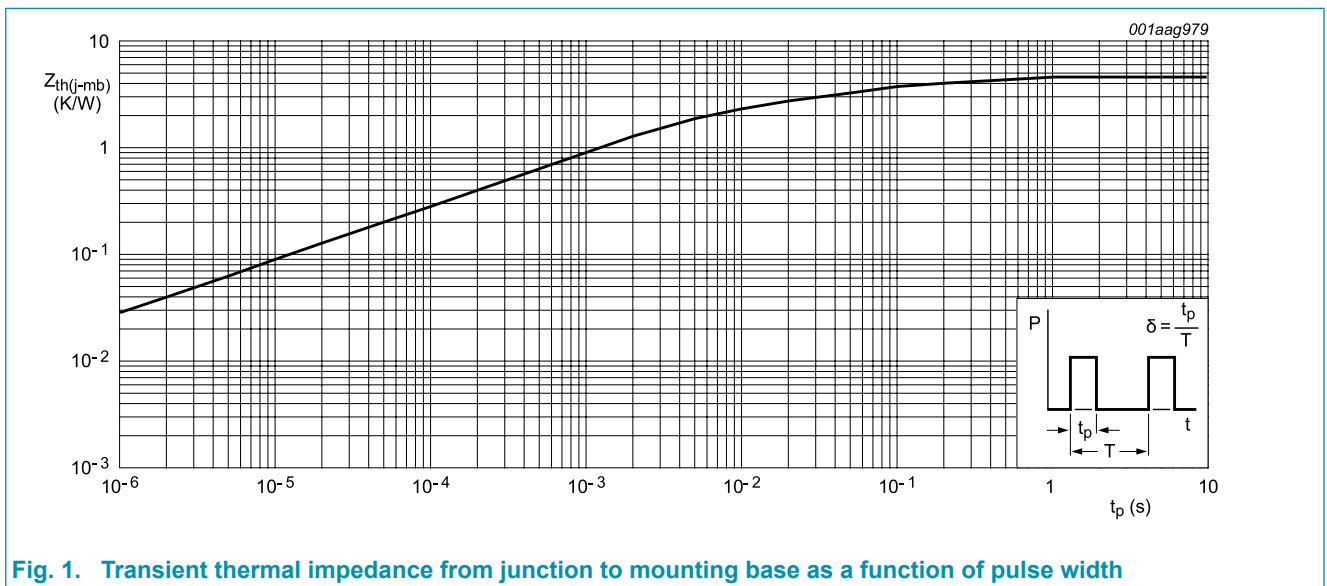
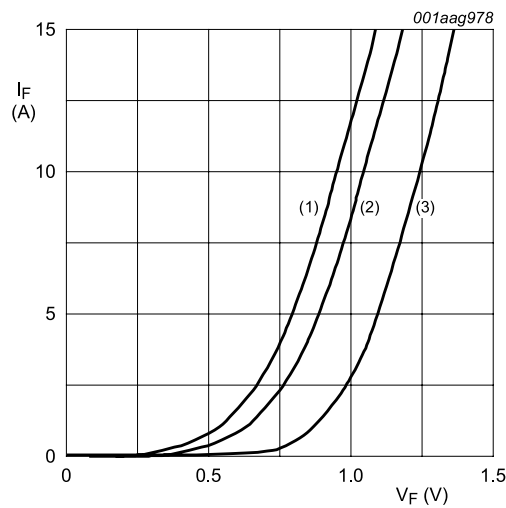


Fig. 1. Transient thermal impedance from junction to mounting base as a function of pulse width

10. Characteristics

Table 7. Characteristics

| Symbol | Parameter | Conditions | Min | Typ | Max | Unit |
|--------------------------------|-------------------------------|--|-----|------|-------|---------------|
| Static characteristics | | | | | | |
| V_F | forward voltage | $I_F = 5 \text{ A}; T_j = 150 \text{ }^\circ\text{C}; \text{ Fig. 2}$ | - | 0.8 | 0.895 | V |
| | | $I_F = 5 \text{ A}; T_j = 25 \text{ }^\circ\text{C}; \text{ Fig. 2}$ | - | 0.95 | 1.1 | V |
| | | $I_F = 10 \text{ A}; T_j = 25 \text{ }^\circ\text{C}; \text{ Fig. 2}$ | - | 1.1 | 1.25 | V |
| I_R | reverse current | $V_R = 200 \text{ V}$ | - | 2 | 10 | μA |
| | | $V_R = 200 \text{ V}; T_j = 100 \text{ }^\circ\text{C}$ | - | 0.1 | 0.2 | mA |
| Dynamic characteristics | | | | | | |
| Q_r | recovered charge | $I_F = 2 \text{ A}; V_R = 30 \text{ V}; dI_F/dt = 20 \text{ A}/\mu\text{s}; T_j = 25 \text{ }^\circ\text{C}; \text{ Fig. 3}$ | - | 4 | 9 | nC |
| t_{rr} | reverse recovery time | ramp recovery; $I_F = 1 \text{ A}; V_R = 30 \text{ V}; dI_F/dt = 100 \text{ A}/\mu\text{s}; T_j = 25 \text{ }^\circ\text{C}; \text{ Fig. 3}$ | - | 15 | 25 | ns |
| | | step recovery; when switched from $I_F = 0.5 \text{ A}$ to $I_R = 1 \text{ A}$; measured at $I_R = 0.25 \text{ A}$ | - | 10 | 20 | ns |
| I_{RM} | peak reverse recovery current | $I_F = 5 \text{ A}; V_R = 30 \text{ V}; dI_F/dt = 50 \text{ A}/\mu\text{s}; T_j = 25 \text{ }^\circ\text{C}; \text{ Fig. 3}$ | - | 0.5 | 0.7 | A |
| V_{FR} | forward recovery voltage | $I_F = 1 \text{ A}; dI_F/dt = 10 \text{ A}/\mu\text{s}; T_j = 25 \text{ }^\circ\text{C}; \text{ Fig. 4}$ | - | 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. 2. Forward current as a function of forward voltage

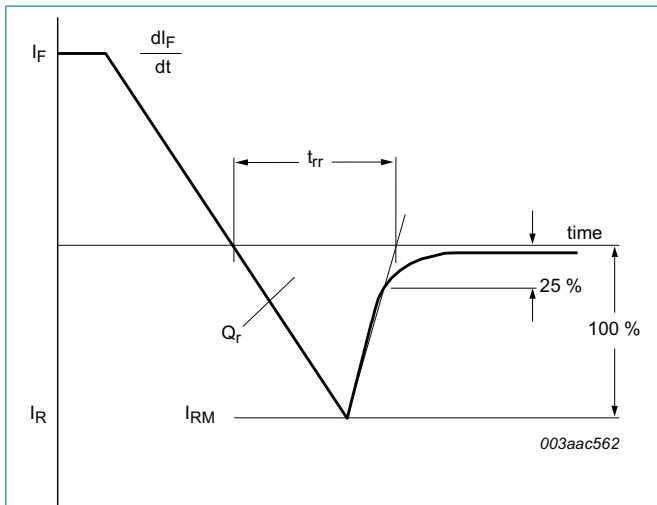


Fig. 3. Reverse recovery definitions; ramp recovery

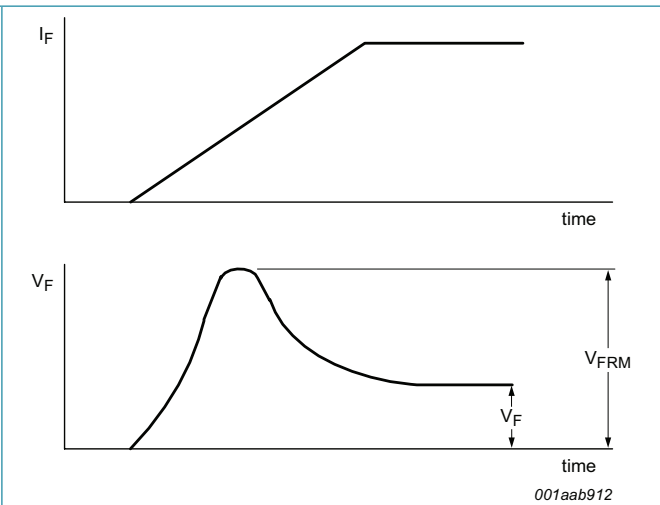


Fig. 4. Forward recovery definitions

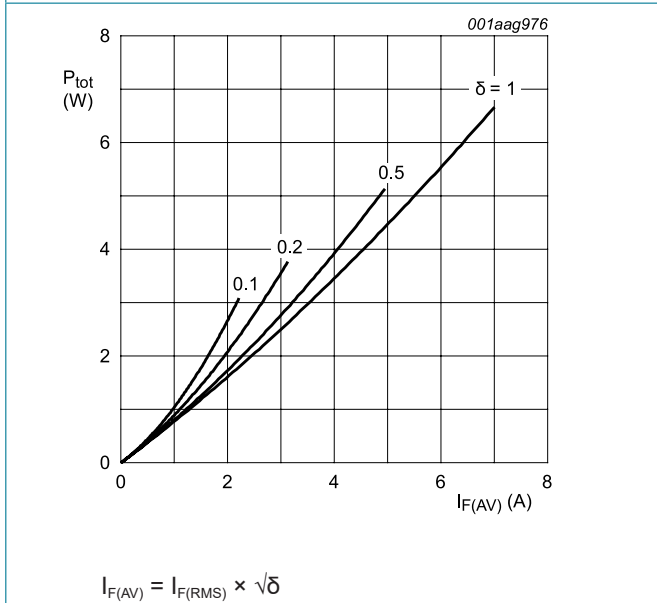


Fig. 5. Forward power dissipation as a function of average forward current; square waveform; maximum values; per diode

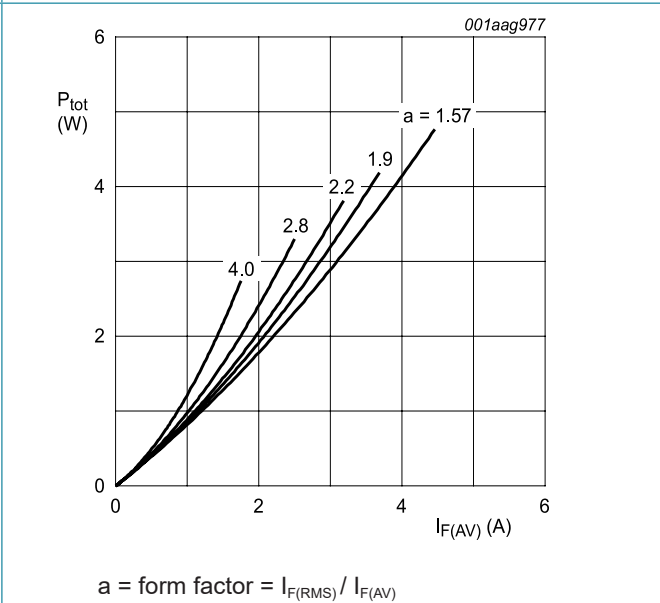
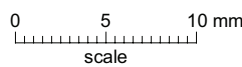
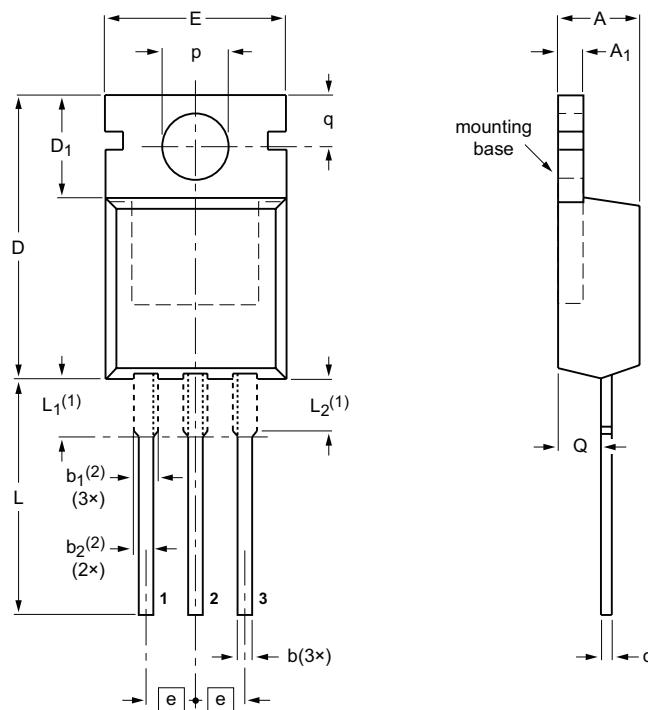


Fig. 6. Forward power dissipation as a function of average forward current; sinusoidal waveform; maximum values; per diode

11. Package outline

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

SOT78



DIMENSIONS (mm are the original dimensions)

| UNIT | A | A ₁ | b | b ₁ (²) | b ₂ (²) | c | D | D ₁ | E | e | L | L ₁ (¹) | L ₂ (¹) max. | p | q | Q |
|------|------------|----------------|------------|---------------------------------|---------------------------------|------------|--------------|----------------|-------------|------|--------------|---------------------------------|---|------------|------------|------------|
| mm | 4.7 4.1 | 1.40 1.25 | 0.9 0.6 | 1.6 1.0 | 1.3 1.0 | 0.7 0.4 | 16.0 15.2 | 6.6 5.9 | 10.3 9.7 | 2.54 | 15.0 12.8 | 3.30 2.79 | 3.0 | 3.8 3.5 | 3.0 2.7 | 2.6 2.2 |

Notes

- 1. Lead shoulder designs may vary.
- 2. Dimension includes excess dambar.

| OUTLINE VERSION | REFERENCES | | | EUROPEAN PROJECTION | ISSUE DATE |
|-----------------|------------|-----------------|-------|---------------------|----------------------|
| | IEC | JEDEC | JEITA | | |
| SOT78 | | 3-lead TO-220AB | SC-46 | | 08-04-23 08-06-13 |

12. Revision history

Table 8. Revision history

| Document ID | Release date | Data sheet status | Change notice | Supersedes |
|--|--------------|-----------------------|---------------|--------------------------------------|
| BYQ28E-200 v.6 | 20230404 | Product data sheet | - | BYQ28E-200 v.5 |
| Modifications: Update ordering information. | | | | |
| BYQ28E-200 v.5 | 20180307 | Product data sheet | - | BYQ28_SER_E_ED_4 |
| Modifications: Change from NXP version to WeEn version | | | | |
| BYQ28_SER_E_ED_4 | 20071205 | Product data sheet | - | BYQ28E_SERIES_3 |
| Modifications: <ul style="list-style-type: none"> • 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. • Limiting values table: some parameter descriptions amended to conform to latest standards; IFRM conditions amended; VESD row added. • Characteristics: Qrr changed to Qr 'recovered charge'; trr1 and trr2 changed to trr with 'ramp recovery' and 'step recovery' added to conditions. | | | | |
| BYQ28E_SERIES_3 | 19981001 | Product specification | - | BYQ28E_SERIES_2 |
| BYQ28E_SERIES_2 | 19980701 | Product specification | - | BYQ28E_SERIES_1; BYQ28EB_SERIES_1 |
| BYQ28E_SERIES_1; BYQ28EB_SERIES_1 | 19960801 | Product specification | - | - |

13. 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. |
| 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".
- [3] The product status of device(s) described in this document may have changed since this document was published and may differ in case of multiple devices. The latest product status information is available on the Internet at URL <http://www.ween-semi.com>.

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