



IMPORTANT NOTICE

10 December 2015

1. Global joint venture starts operations as WeEn Semiconductors

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Thank you for your cooperation and understanding,

WeEn Semiconductors





BYQ42E-200

Dual ultrafast power diode

20 August 2015

Product data sheet

1. General description

Dual ultrafast power diode in a SOT78 (TO-220AB) plastic package.

2. Features and benefits

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

3. Applications

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

4. Quick reference data

Table 1. Quick reference data

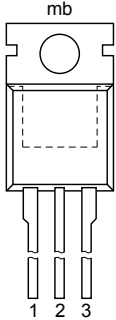
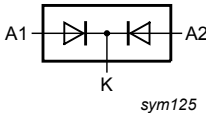
| Symbol | Parameter | Conditions | Min | Typ | Max | Unit |
|-------------------------------|-------------------------------------|--|-----|------|------|------|
| V_{RRM} | repetitive peak reverse voltage | | - | - | 200 | V |
| $I_{F(AV)}$ | average forward current | $\delta = 0.5$; $T_{mb} \leq 114$ °C; SQW; Fig. 1 ; Fig. 2 ; Fig. 3 | - | - | 15 | A |
| $I_{O(AV)}$ | average output current | $\delta = 0.5$; $T_{mb} \leq 114$ °C; SQW; both diodes conducting | - | - | 30 | A |
| I_{FSM} | non-repetitive peak forward current | $t_p = 10$ ms; $T_{j(init)} = 25$ °C; SIN; per diode; Fig. 4 | - | - | 150 | A |
| | | $t_p = 8.3$ ms; $T_{j(init)} = 25$ °C; SIN; per diode; Fig. 4 | - | - | 165 | A |
| V_{ESD} | electrostatic discharge voltage | HBM; all pins; C = 250 pF; R = 1.5 k Ω | - | - | 8 | kV |
| Static characteristics | | | | | | |
| V_F | forward voltage | $I_F = 15$ A; $T_j = 25$ °C; Fig. 6 | - | 0.95 | 1.05 | V |
| | | $I_F = 30$ A; $T_j = 150$ °C; Fig. 6 | - | 1 | 1.2 | V |
| | | $I_F = 15$ A; $T_j = 150$ °C; Fig. 6 | - | 0.78 | 0.85 | V |



| Symbol | Parameter | Conditions | Min | Typ | Max | Unit |
|--------------------------------|-----------------------|---|-----|-----|-----|------|
| Dynamic characteristics | | | | | | |
| t_{rr} | reverse recovery time | $I_F = 1\text{ A}$; $V_R = 30\text{ V}$; $dI_F/dt = 100\text{ A}/\mu\text{s}$; $T_j = 25\text{ }^\circ\text{C}$; ramp recovery; Fig. 7 | - | 18 | 25 | ns |

5. Pinning information

Table 2. Pinning information

| Pin | Symbol | Description | Simplified outline | Graphic symbol |
|-----|--------|------------------------|--|---|
| 1 | A1 | anode 1 |  <p>TO-220AB (SOT78)</p> |  <p>sym125</p> |
| 2 | K | cathode | | |
| 3 | A2 | anode 2 | | |
| mb | K | mounting base; cathode | | |

6. Ordering information

Table 3. Ordering information

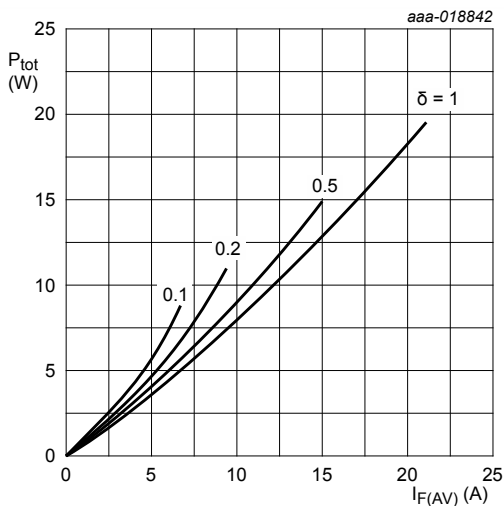
| Type number | Package | | |
|-------------|----------|--|---------|
| | Name | Description | Version |
| BYQ42E-200 | TO-220AB | plastic single-ended package; heatsink mounted; 1 mounting hole; 3-lead TO-220AB | SOT78 |

7. Limiting values

Table 4. Limiting values

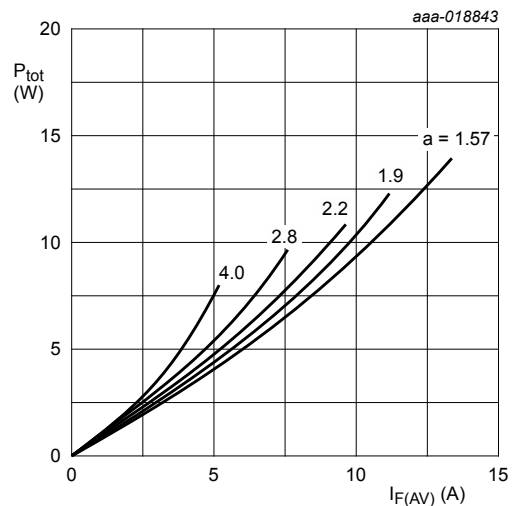
In accordance with the Absolute Maximum Rating System (IEC 60134).

| 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 |
| $I_{F(AV)}$ | average forward current | $\delta = 0.5$; $T_{mb} \leq 114$ °C; SQW; Fig. 1 ; Fig. 2 ; Fig. 3 | - | 15 | A |
| $I_{O(AV)}$ | average output current | $\delta = 0.5$; $T_{mb} \leq 114$ °C; SQW; both diodes conducting | - | 30 | A |
| I_{FSM} | non-repetitive peak forward current | $t_p = 10$ ms; $T_{j(init)} = 25$ °C; SIN; per diode; Fig. 4 | - | 150 | A |
| | | $t_p = 8.3$ ms; $T_{j(init)} = 25$ °C; SIN; per diode; Fig. 4 | - | 165 | A |
| I_{RRM} | repetitive peak reverse current | $\delta = 0.0010$; $t_p = 2$ μ s | - | 0.2 | A |
| I_{RSM} | non-repetitive peak reverse current | $t_p = 100$ μ s | - | 0.2 | A |
| T_{stg} | storage temperature | | -40 | 150 | °C |
| T_j | junction temperature | | - | 150 | °C |
| V_{ESD} | electrostatic discharge voltage | HBM; all pins; C = 250 pF; R = 1.5 k Ω | - | 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; per diode; 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; per diode; maximum values

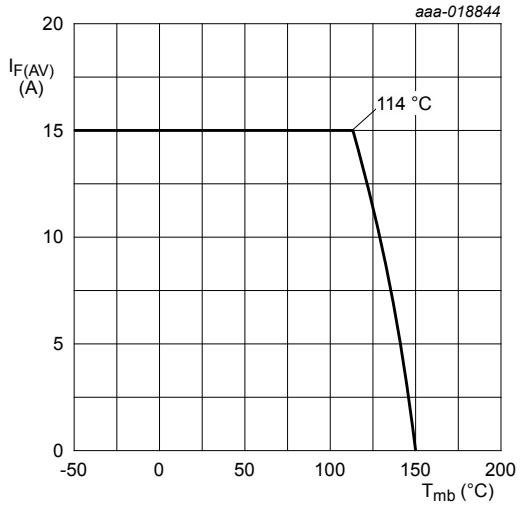


Fig. 3. Average forward current as a function of mounting base temperature; per diode; maximum values

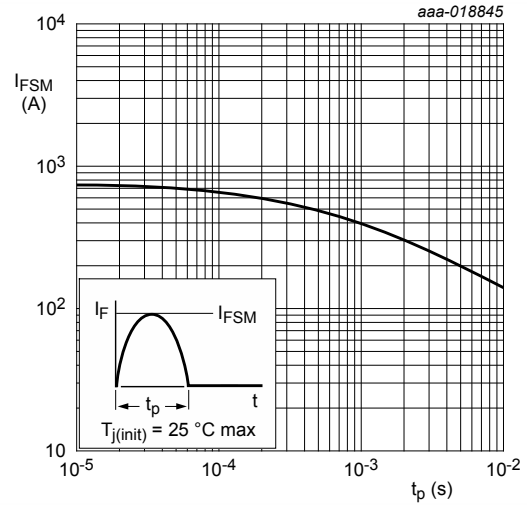


Fig. 4. Non-repetitive peak forward current as a function of pulse width; sinusoidal waveform; per diode; maximum values

8. 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; per diode; Fig. 5 | - | - | 2.4 | K/W |
| | | with heatsink compound; both diodes conducting | - | - | 1.4 | K/W |
| $R_{th(j-a)}$ | thermal resistance from junction to ambient free air | | - | 60 | - | K/W |

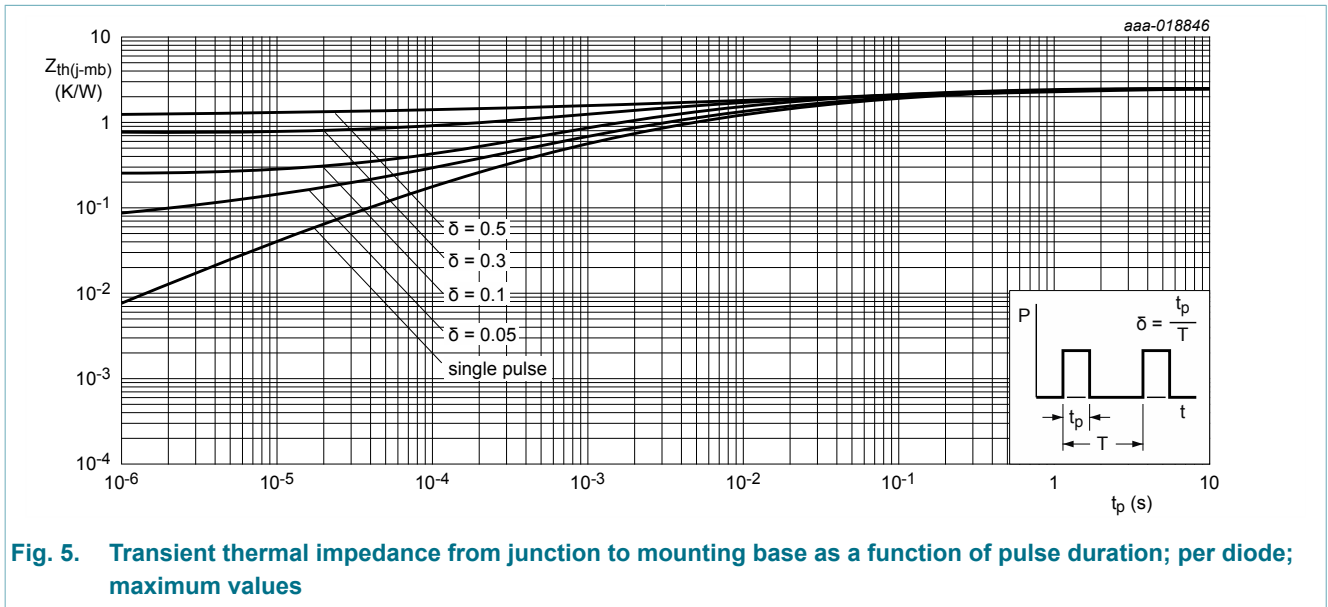
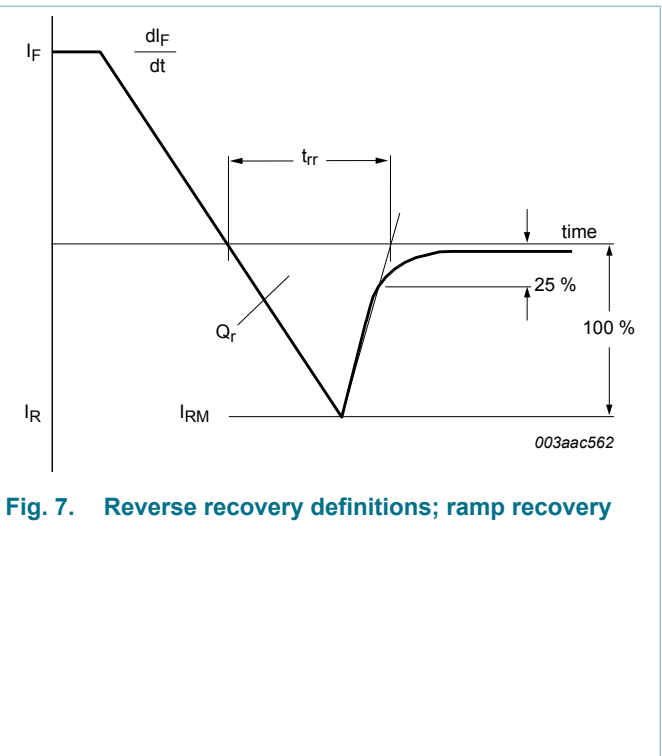
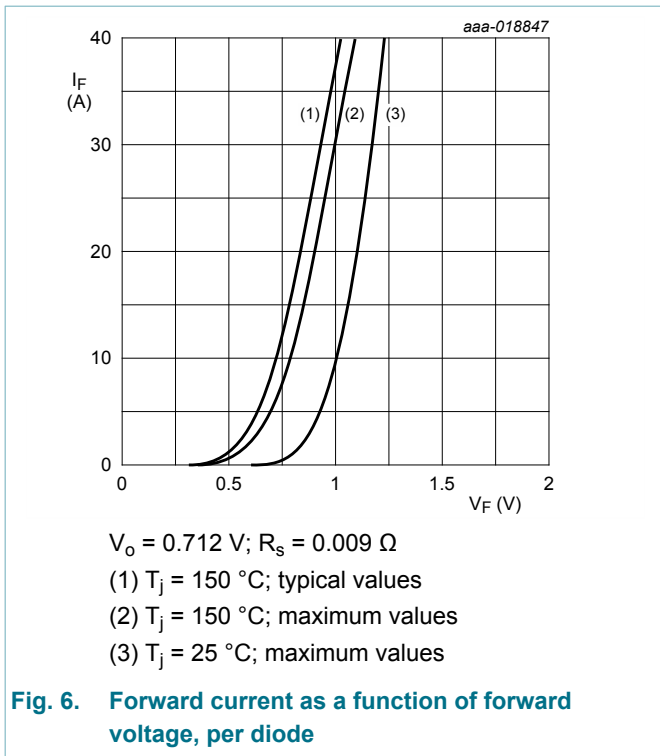


Fig. 5. Transient thermal impedance from junction to mounting base as a function of pulse duration; per diode; maximum values

9. Characteristics

Table 6. Characteristics

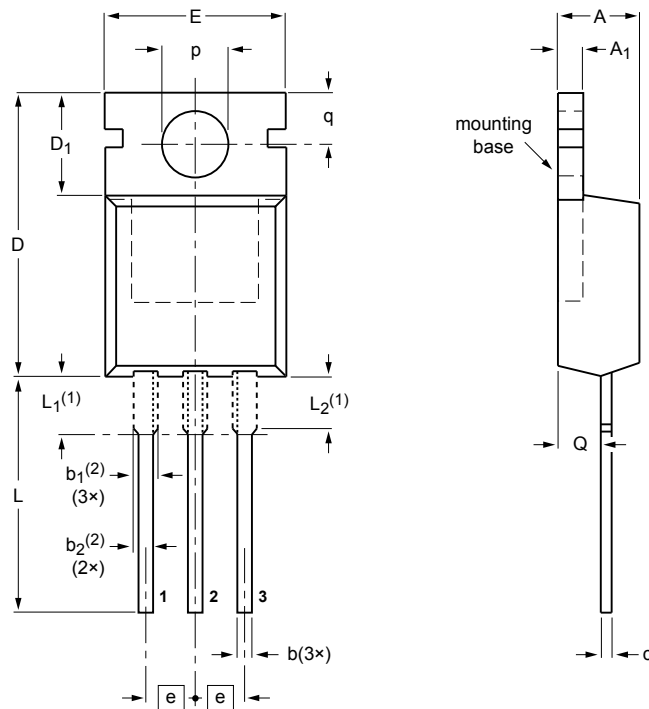
| Symbol | Parameter | Conditions | Min | Typ | Max | Unit |
|--------------------------------|-------------------------------|--|-----|------|------|------|
| Static characteristics | | | | | | |
| V _F | forward voltage | I _F = 15 A; T _j = 25 °C; Fig. 6 | - | 0.95 | 1.05 | V |
| | | I _F = 30 A; T _j = 150 °C; Fig. 6 | - | 1 | 1.2 | V |
| | | I _F = 15 A; T _j = 150 °C; Fig. 6 | - | 0.78 | 0.85 | V |
| I _R | reverse current | V _R = 200 V; T _j = 25 °C | - | 3 | 20 | μA |
| | | V _R = 200 V; T _j = 150 °C | - | 0.3 | 1 | mA |
| Dynamic characteristics | | | | | | |
| Q _r | recovered charge | I _F = 2 A; V _R = 30 V; dI _F /dt = 20 A/s; T _j = 25 °C; Fig. 7 | - | 6 | 15 | nC |
| | | I _F = 1 A; V _R = 30 V; dI _F /dt = 100 A/μs; T _j = 25 °C; Fig. 7 | - | 10 | - | nC |
| t _{rr} | reverse recovery time | I _F = 1 A; V _R = 30 V; dI _F /dt = 100 A/μs; T _j = 25 °C; ramp recovery; Fig. 7 | - | 18 | 25 | ns |
| I _{RM} | peak reverse recovery current | I _F = 1 A; V _R = 30 V; dI _F /dt = 100 A/μs; T _j = 25 °C; Fig. 7 | - | 1 | - | A |



10. 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 |

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

11. Legal information

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| Document status [1][2] | Product status [3] | Definition |
|--------------------------------|--------------------|---|
| Objective [short] data sheet | Development | This document contains data from the objective specification for product development. |
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