



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

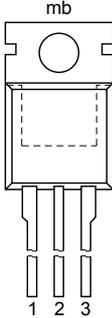
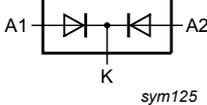
Symbol	Parameter	Conditions	Min	Typ	Max	Unit
V_{RRM}	repetitive peak reverse voltage		-	-	200	V
$I_{F(AV)}$	average forward current	$\delta = 0.5$; $T_{mb} \leq 114$ °C; SQW; Fig. 1 ; Fig. 2 ; Fig. 3	-	-	15	A
$I_{O(AV)}$	average output current	$\delta = 0.5$; $T_{mb} \leq 114$ °C; SQW; both diodes conducting	-	-	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><i>sym125</i></p>
2	K	cathode		
3	A2	anode 2		
mb	K	mounting base; cathode		

6. Ordering information

Table 3. Ordering information

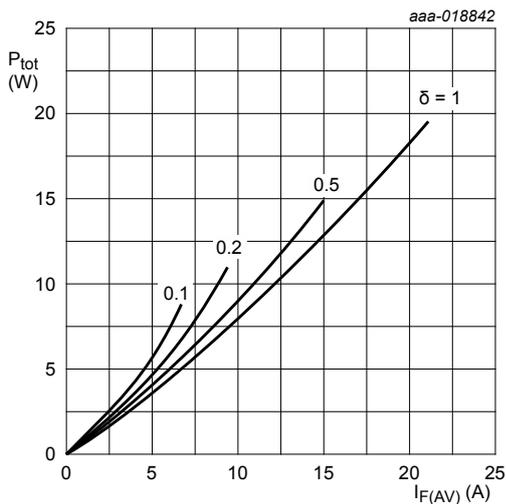
Type number	Package		
	Name	Description	Version
BYQ42E-200	TO-220AB	plastic single-ended package; heatsink mounted; 1 mounting hole; 3-lead TO-220AB	SOT78

7. Limiting values

Table 4. Limiting values

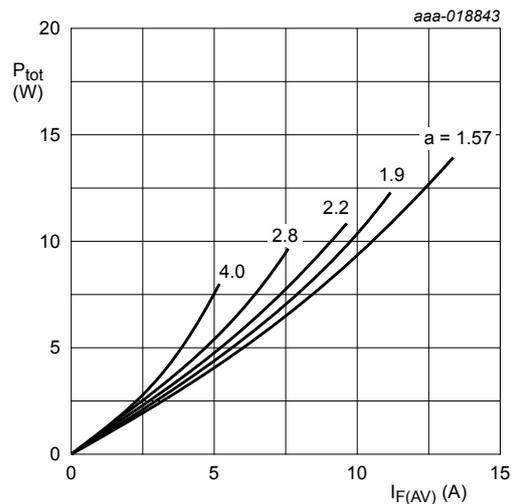
In accordance with the Absolute Maximum Rating System (IEC 60134).

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

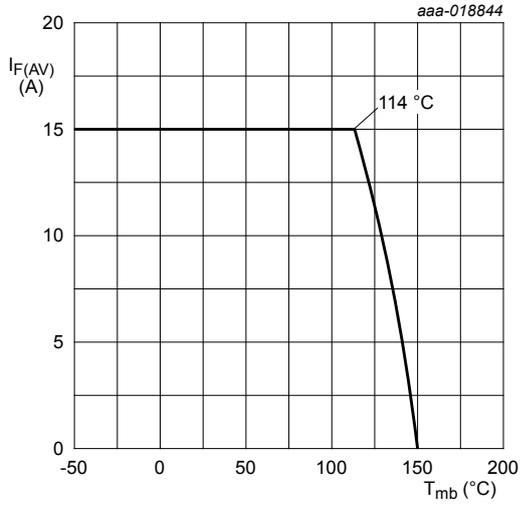


Fig. 3. Average forward current as a function of mounting base temperature; per diode; maximum values

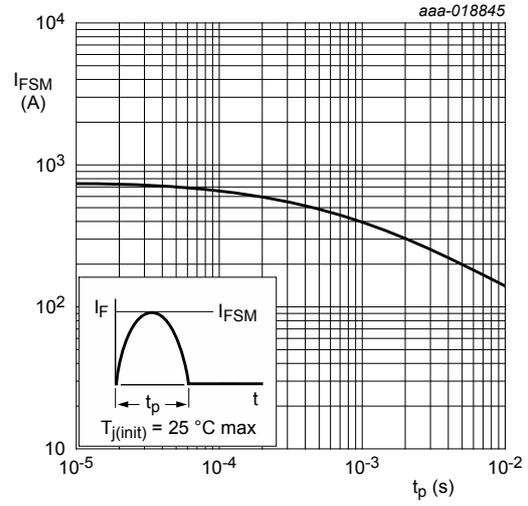


Fig. 4. Non-repetitive peak forward current as a function of pulse width; sinusoidal waveform; per diode; maximum values

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

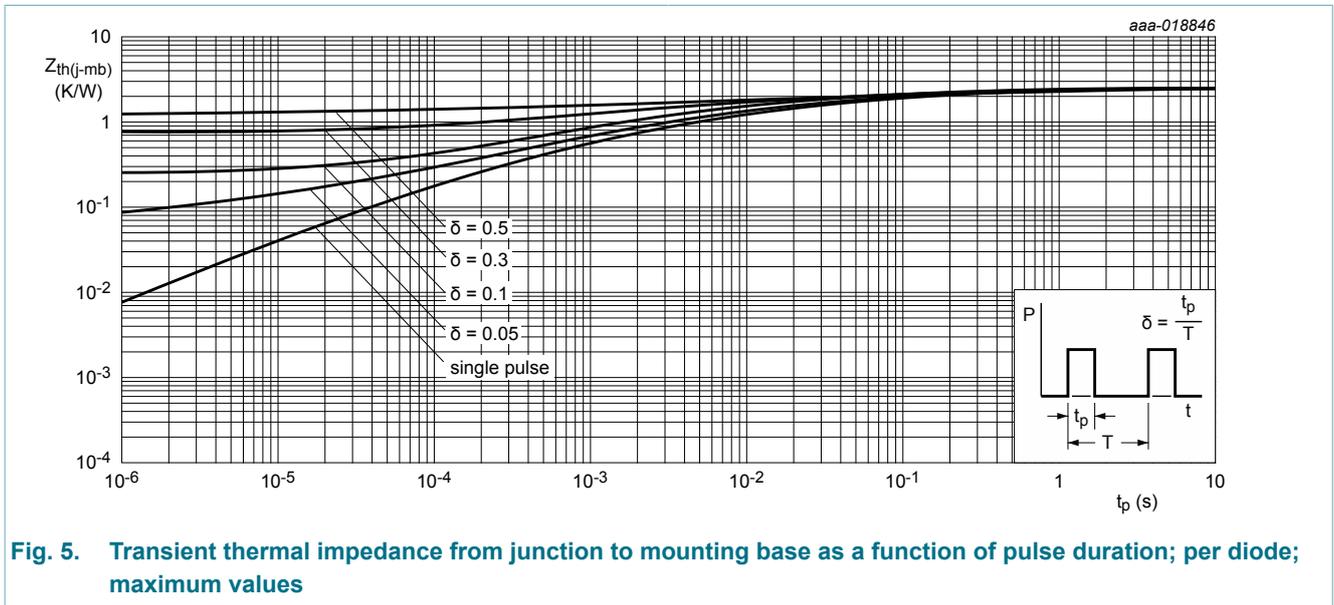
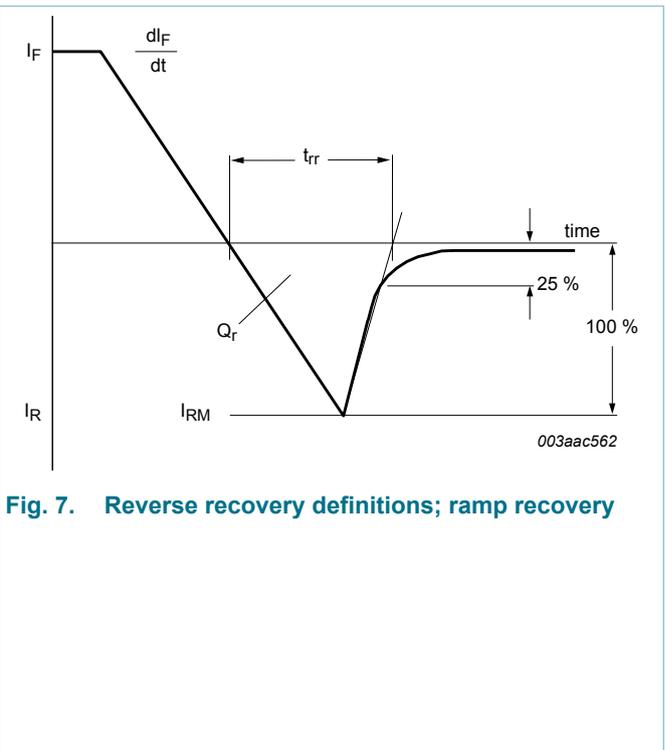
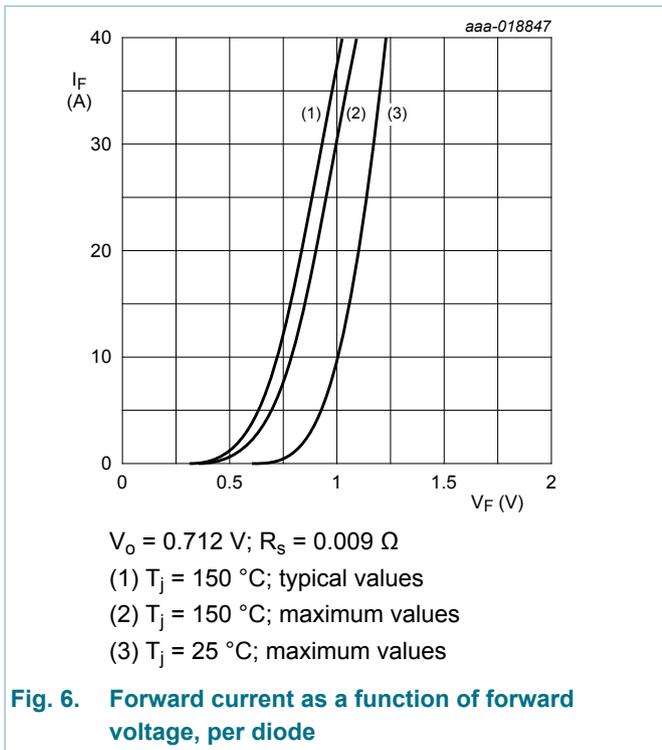


Fig. 5. Transient thermal impedance from junction to mounting base as a function of pulse duration; per diode; maximum values

9. Characteristics

Table 6. Characteristics

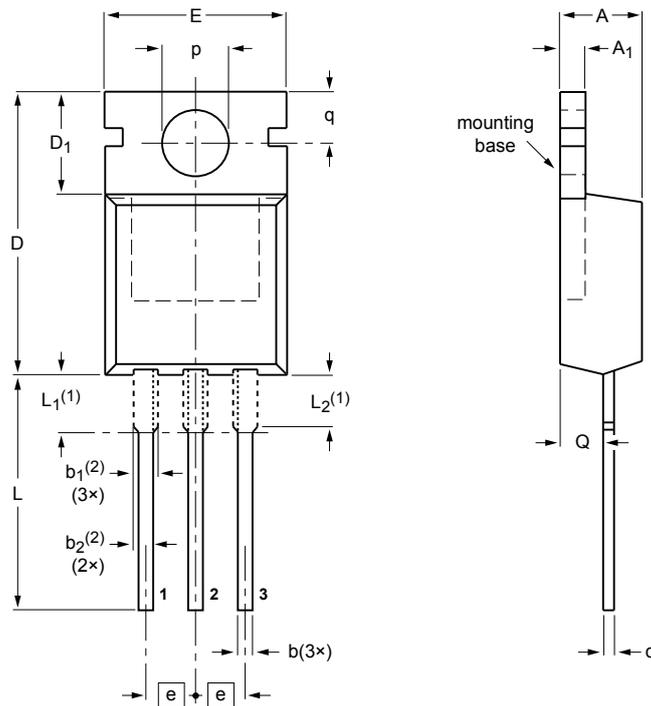
Symbol	Parameter	Conditions	Min	Typ	Max	Unit
Static characteristics						
V _F	forward voltage	I _F = 15 A; T _j = 25 °C; Fig. 6	-	0.95	1.05	V
		I _F = 30 A; T _j = 150 °C; Fig. 6	-	1	1.2	V
		I _F = 15 A; T _j = 150 °C; Fig. 6	-	0.78	0.85	V
I _R	reverse current	V _R = 200 V; T _j = 25 °C	-	3	20	μA
		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

- Lead shoulder designs may vary.
- 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.
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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- [2] The term 'short data sheet' is explained in section "Definitions".
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