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	δ = 0.5 ; T_{mb} ≤ 114 °C; SQW; Fig. 1; Fig. 2; Fig. 3		-	-	15	A
$I_{O(AV)}$	average output current	δ = 0.5 ; T_{mb} ≤ 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 kΩ		-	-	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

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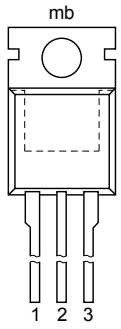
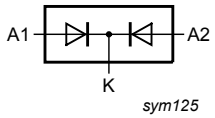
Symbol	Parameter	Conditions		Min	Typ	Max	Unit
Dynamic characteristics							
t_{rr}	reverse recovery time	I_F = 1 A; V_R = 30 V; dI_F/dt = 100 A/µs; T_j = 25 °C; ramp recovery; Fig. 7		-	18	25	ns

5. Pinning information

Table 2. Pinning information

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

6. Ordering information

Table 3. Ordering information

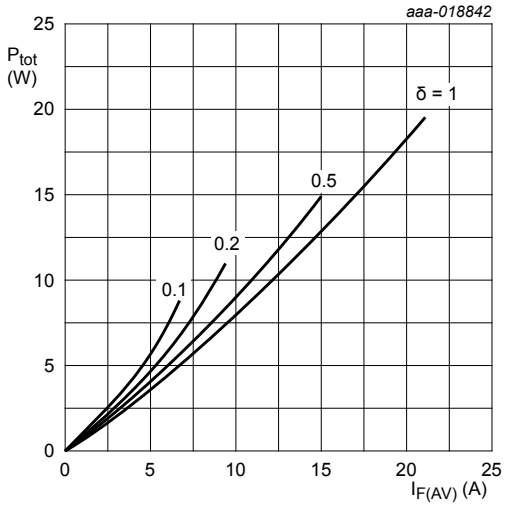
Type number	Package		
	Name	Description	Version
BYQ42E-200	TO-220AB	plastic single-ended package; heatsink mounted; 1 mounting hole; 3-lead TO-220AB	SOT78

7. Limiting values

Table 4. Limiting values

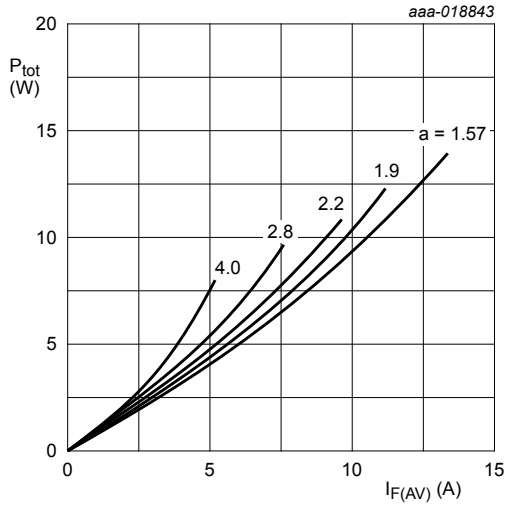
In accordance with the Absolute Maximum Rating System (IEC 60134).

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	δ = 0.5 ; T_{mb} ≤ 114 °C; SQW; Fig. 1; Fig. 2; Fig. 3		-	15	A
$I_{O(AV)}$	average output current	δ = 0.5 ; T_{mb} ≤ 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	δ = 0.0010 ; t_p = 2 µs		-	0.2	A
I_{RSM}	non-repetitive peak reverse current	t_p = 100 µs		-	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 kΩ		-	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 = 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

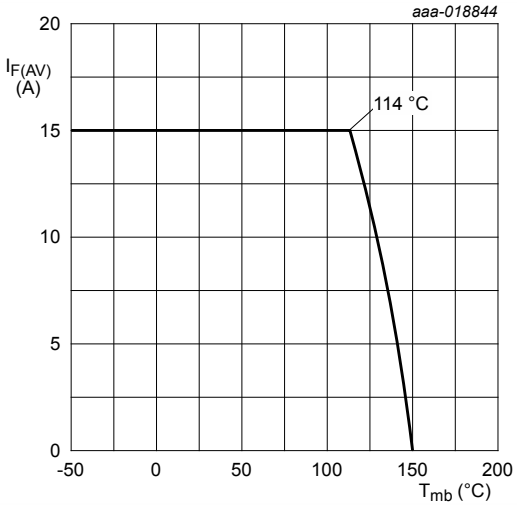


Fig. 3. Average forward current as a function of mounting base temperature; per diode; maximum values

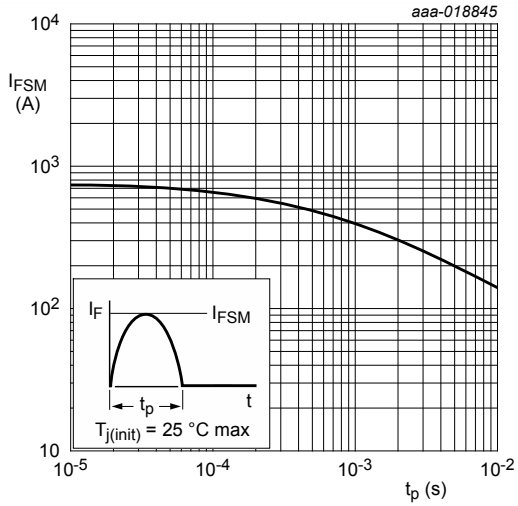


Fig. 4. Non-repetitive peak forward current as a function of pulse width; sinusoidal waveform; per diode; maximum values

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

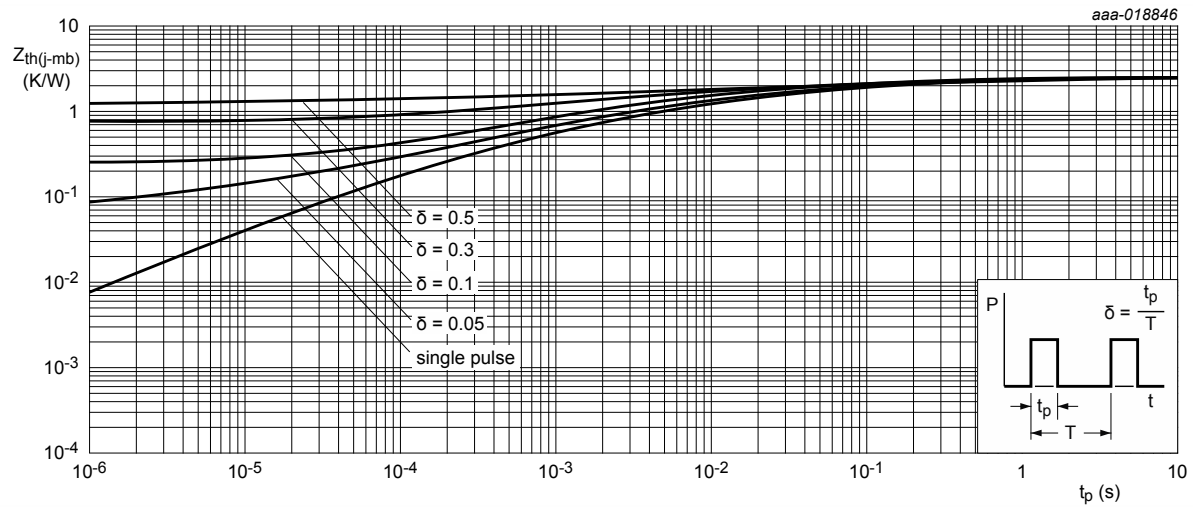
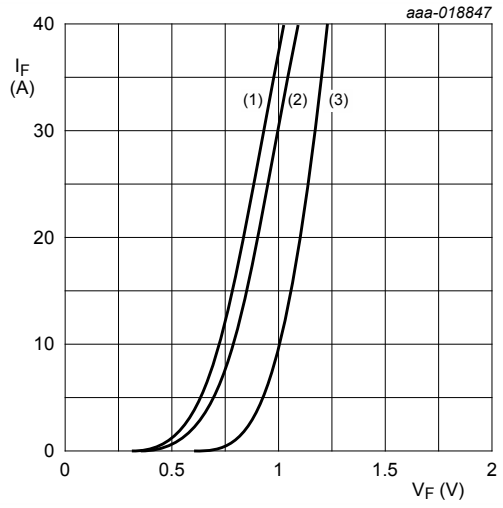


Fig. 5. Transient thermal impedance from junction to mounting base as a function of pulse duration; per diode; maximum values

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



V_o = 0.712 V; R_s = 0.009 Ω

(1) T_j = 150 °C; typical values

(2) T_j = 150 °C; maximum values

(3) T_j = 25 °C; maximum values

Fig. 6. Forward current as a function of forward voltage, per diode

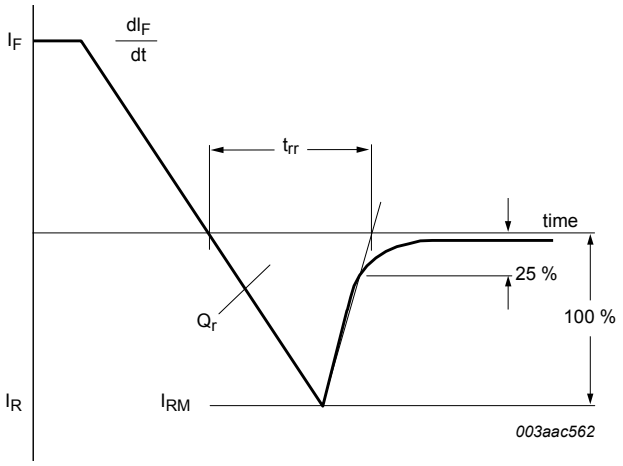
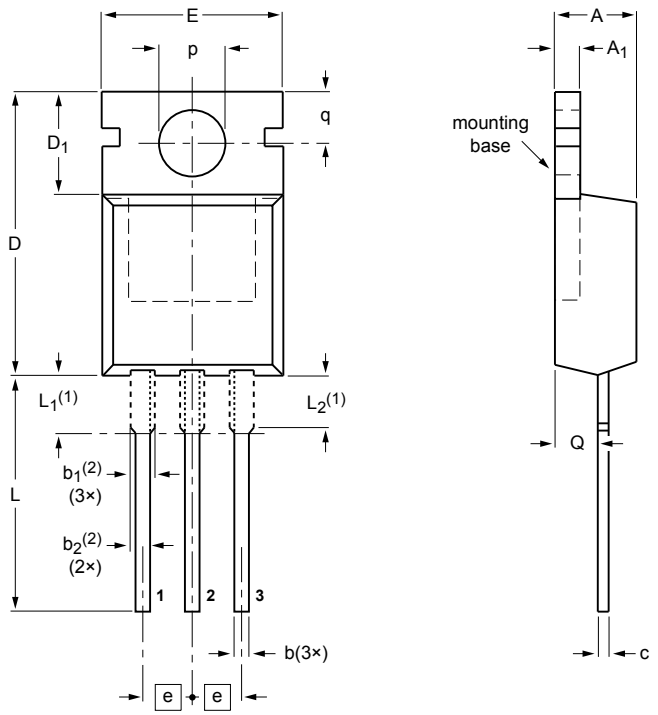


Fig. 7. Reverse recovery definitions; ramp recovery

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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Objective [short] data sheet	Development	This document contains data from the objective specification for product development.
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