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

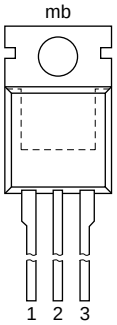
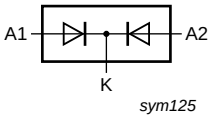
1.4 Quick reference data

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	$\delta = 0.5$; $t_p = 25$ µs; $T_{mb} \leq 119$ °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	0.895	V
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; see Figure 5	-	15	25	ns
Electrostatic discharge						
V_{ESD}	electrostatic discharge voltage	HBM; C = 250 pF; R = 1.5 kΩ; 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

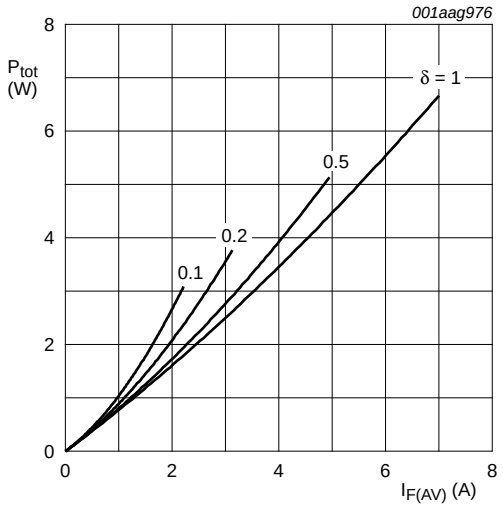
Type number	Package		
	Name	Description	Version
BYQ28E-200E	TO-220AB	plastic single-ended package; heatsink mounted; 1 mounting hole; 3-lead TO-220AB	SOT78

4. Limiting values

Table 4. Limiting values

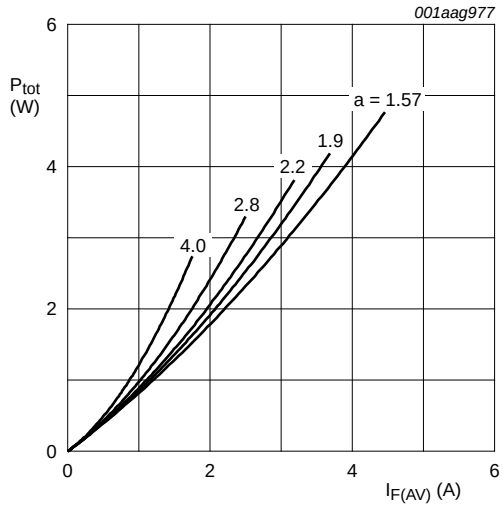
In accordance with the Absolute Maximum Rating System (IEC 60134).

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; δ = 0.5 ; T_{mb} ≤ 119 °C; both diodes conducting; see Figure 1; see Figure 2	-	10	A
I_{FRM}	repetitive peak forward current	δ = 0.5 ; t_p = 25 µs; T_{mb} ≤ 119 °C; per diode; square-wave pulse	-	10	A
I_{FSM}	non-repetitive peak forward current	t_p = 8.3 ms; sine-wave pulse; $T_{j(init)}$ = 25 °C; per diode	-	55	A
		t_p = 10 ms; sine-wave pulse; $T_{j(init)}$ = 25 °C; per diode	-	50	A
I_{RRM}	repetitive peak reverse current	δ = 0.001 ; 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
Electrostatic discharge					
V_{ESD}	electrostatic discharge voltage	HBM; C = 250 pF; R = 1.5 kΩ; 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
$R_{th(j\text{-}mb)}$	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
$R_{th(j\text{-}a)}$	thermal resistance from junction to ambient		-	60	-	K/W

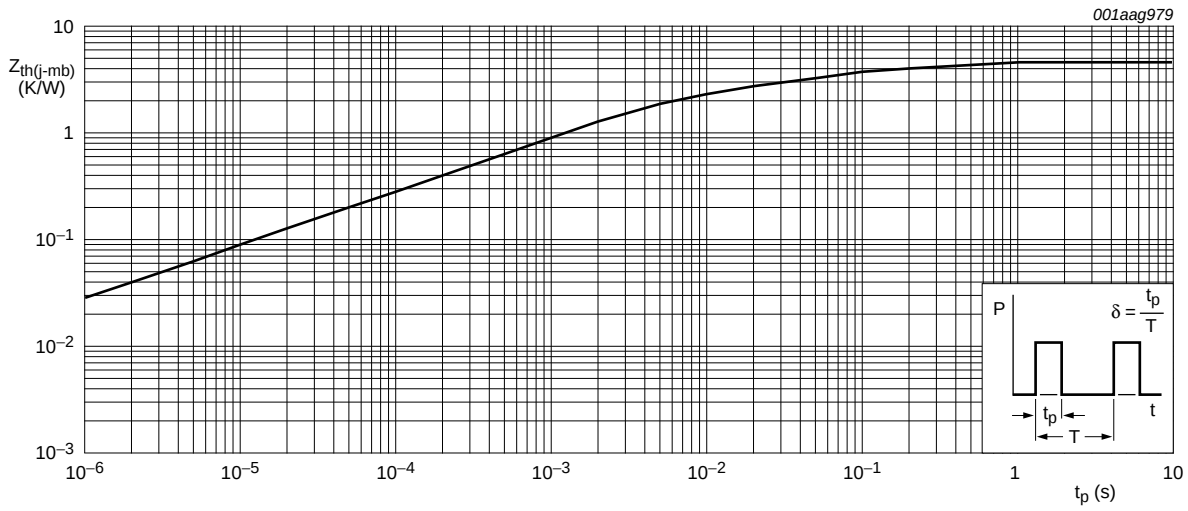
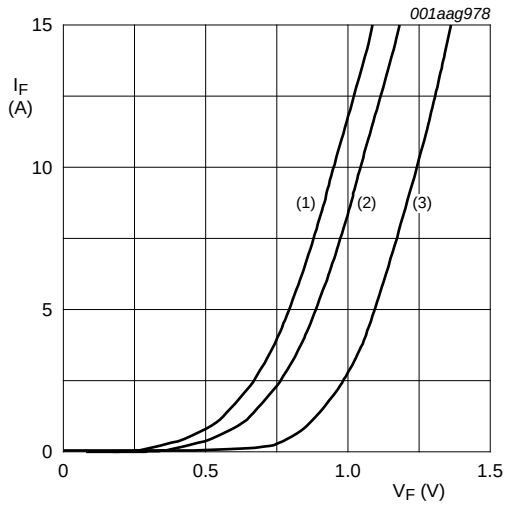


Fig 3. Transient thermal impedance from junction to mounting base as a function of pulse width

6. Characteristics

Table 6. Characteristics

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



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

Fig 4. Forward current as a function of forward voltage

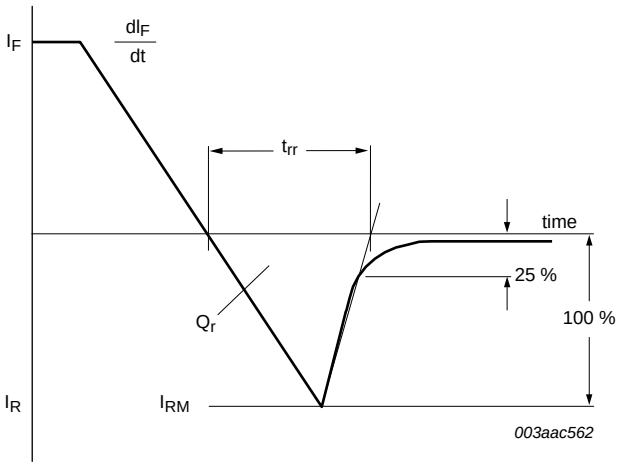


Fig 5. Reverse recovery definitions; ramp recovery

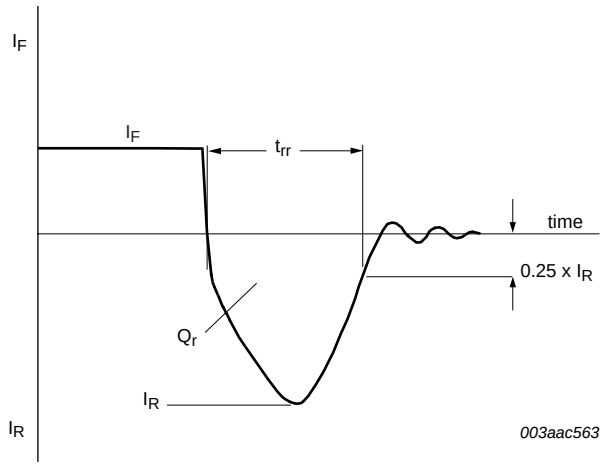


Fig 6. Reverse recovery definitions; step recovery

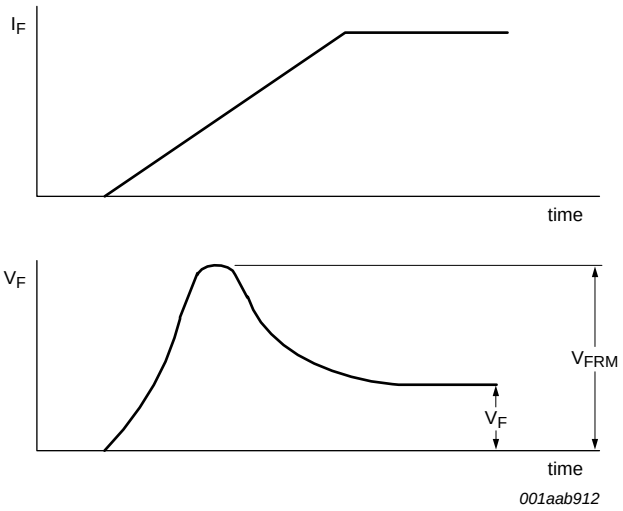
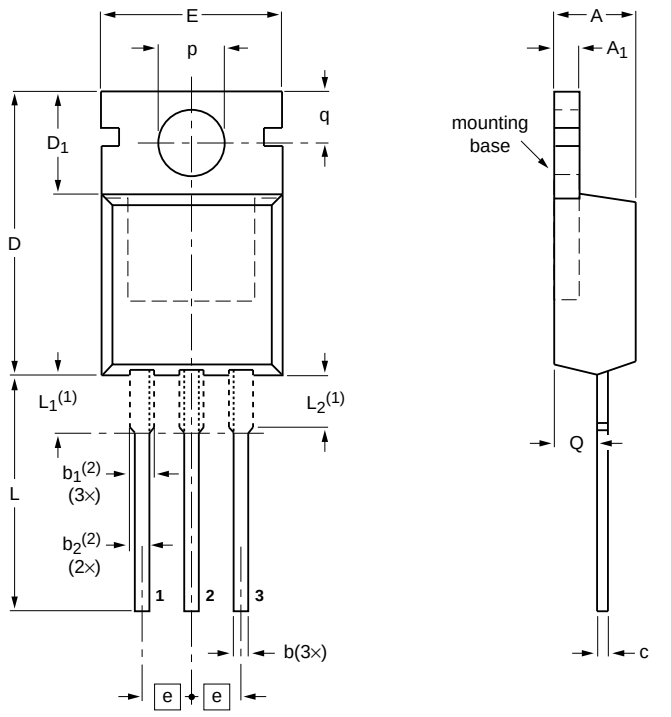


Fig 7. Forward recovery definitions

7. Package outline

Plastic single-ended package; heatsink mounted; 1 mounting hole; 3-lead TO-220AB **SOT78**



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 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:	• 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

9. Legal information

9.1 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".

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