

## 1. General description

Ultrafast, dual common cathode, epitaxial rectifier diodes in a SOT78 (TO-220AB) 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

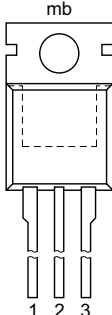
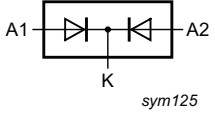
## 4. Quick reference data

Table 1. Quick reference data

Symbol	Parameter	Conditions	Values			Unit
<b>Absolute maximum rating</b>						
$V_{RRM}$	repetitive peak reverse voltage		200			V
$I_{O(AV)}$	average output current	$\delta = 0.5$ ; square-wave pulse; $T_{mb} \leq 119\text{ }^{\circ}\text{C}$ ; both diodes conducting; <a href="#">Fig. 5</a> ; <a href="#">Fig. 6</a>	10			A
$I_{FRM}$	repetitive peak forward current	$\delta = 0.5$ ; $t_p = 25\text{ }\mu\text{s}$ ; $T_{mb} \leq 119\text{ }^{\circ}\text{C}$ ; 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
<b>Static characteristics</b>						
$V_F$	forward voltage	$I_F = 5\text{ A}$ ; $T_j = 25\text{ }^{\circ}\text{C}$ ; <a href="#">Fig. 2</a>	-	0.95	1.1	V
		$I_F = 5\text{ A}$ ; $T_j = 150\text{ }^{\circ}\text{C}$ ; <a href="#">Fig. 2</a>	-	0.8	0.895	V
		$I_F = 10\text{ A}$ ; $T_j = 25\text{ }^{\circ}\text{C}$ ; <a href="#">Fig. 2</a>	-	1.1	1.25	V
<b>Dynamic characteristics</b>						
$t_{rr}$	reverse recovery time	ramp recovery; $I_F = 1\text{ A}$ ; $V_R = 30\text{ V}$ ; $di_F/dt = 100\text{ A}/\mu\text{s}$ ; $T_j = 25\text{ }^{\circ}\text{C}$ ; <a href="#">Fig. 3</a>	-	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	Description	Version
BYQ28E-200	TO-220AB	plastic single-ended package; heatsink mounted; 1 mounting hole; 3-lead TO-220AB	SOT78

## 7. Marking

Table 4. Marking codes

Type number	Marking codes
BYQ28E-200	BYQ28E-200

## 8. Limiting values

**Table 5. Limiting values**

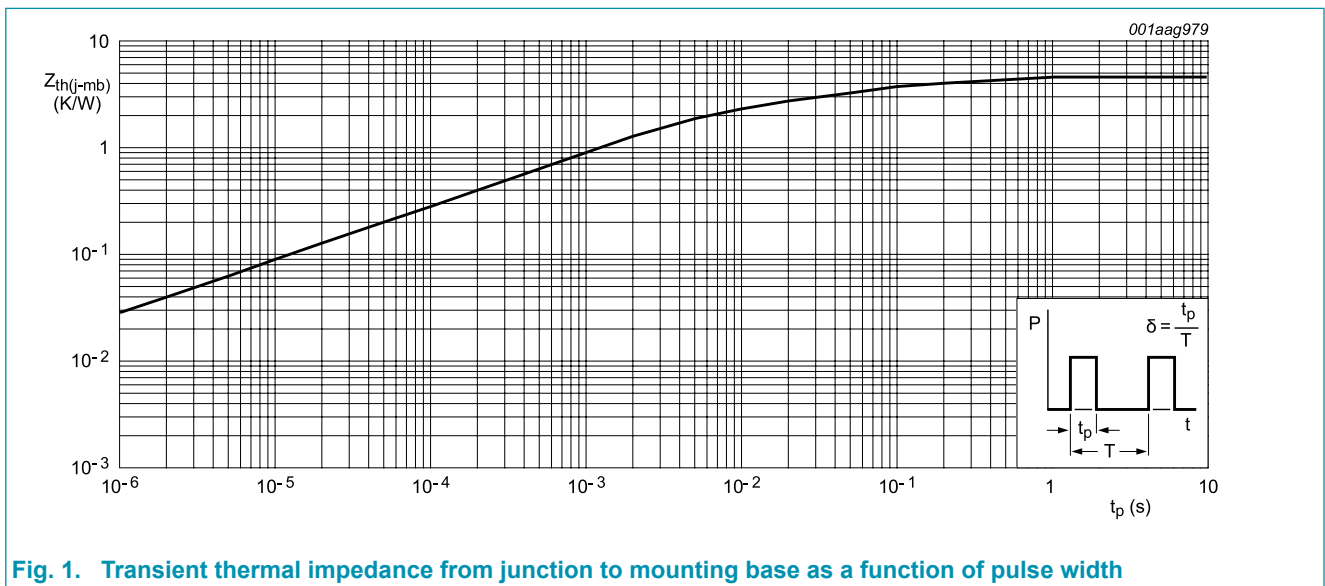
In accordance with the Absolute Maximum Rating System (IEC 60134).

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; <a href="#">Fig. 5</a> ; <a href="#">Fig. 6</a>	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
<b>Electrostatic discharge</b>				
$V_{ESD}$	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

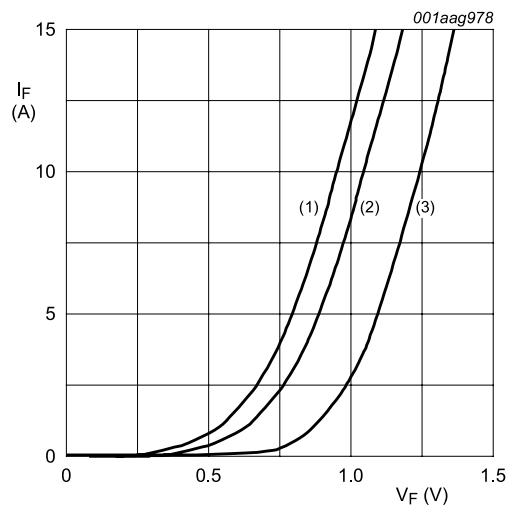
Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$R_{th(j-mb)}$	thermal resistance from junction to mounting base	with heatsink compound; both diodes conducting	-	-	3	K/W
		with heatsink compound; per diode; <a href="#">Fig 1</a>	-	-	4.5	K/W
$R_{th(j-a)}$	thermal resistance from junction to ambient	in free air	-	60	-	K/W



## 10. Characteristics

Table 7. Characteristics

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
<b>Static characteristics</b>						
$V_F$	forward voltage	$I_F = 5\text{ A}; T_j = 150\text{ °C};$ <a href="#">Fig. 2</a>	-	0.8	0.895	V
		$I_F = 5\text{ A}; T_j = 25\text{ °C};$ <a href="#">Fig. 2</a>	-	0.95	1.1	V
		$I_F = 10\text{ A}; T_j = 25\text{ °C};$ <a href="#">Fig. 2</a>	-	1.1	1.25	V
$I_R$	reverse current	$V_R = 200\text{ V}$	-	2	10	$\mu\text{A}$
		$V_R = 200\text{ V}; T_j = 100\text{ °C}$	-	0.1	0.2	mA
<b>Dynamic characteristics</b>						
$Q_r$	recovered charge	$I_F = 2\text{ A}; V_R = 30\text{ V}; dI_F/dt = 20\text{ A}/\mu\text{s}; T_j = 25\text{ °C};$ <a href="#">Fig. 3</a>	-	4	9	nC
$t_{rr}$	reverse recovery time	ramp recovery; $I_F = 1\text{ A}; V_R = 30\text{ V}; dI_F/dt = 100\text{ A}/\mu\text{s}; T_j = 25\text{ °C};$ <a href="#">Fig. 3</a>	-	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	$I_F = 5\text{ A}; V_R = 30\text{ V}; dI_F/dt = 50\text{ A}/\mu\text{s}; T_j = 25\text{ °C};$ <a href="#">Fig. 3</a>	-	0.5	0.7	A
$V_{FR}$	forward recovery voltage	$I_F = 1\text{ A}; dI_F/dt = 10\text{ A}/\mu\text{s}; T_j = 25\text{ °C};$ <a href="#">Fig. 4</a>	-	1	-	V



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

Fig. 2. Forward current as a function of forward voltage

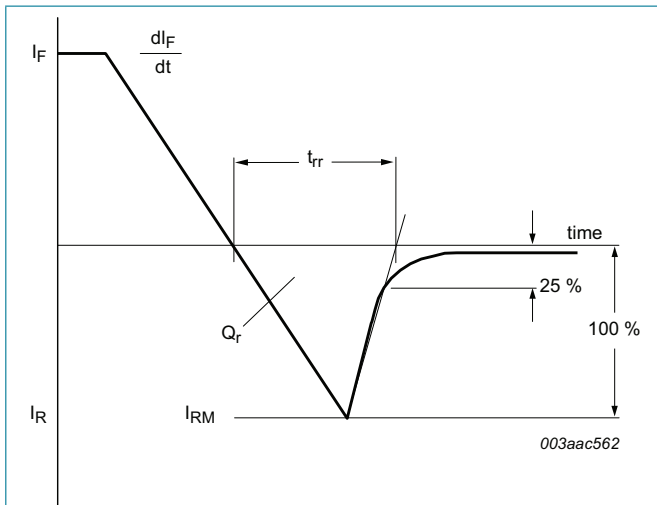


Fig. 3. Reverse recovery definitions; ramp recovery

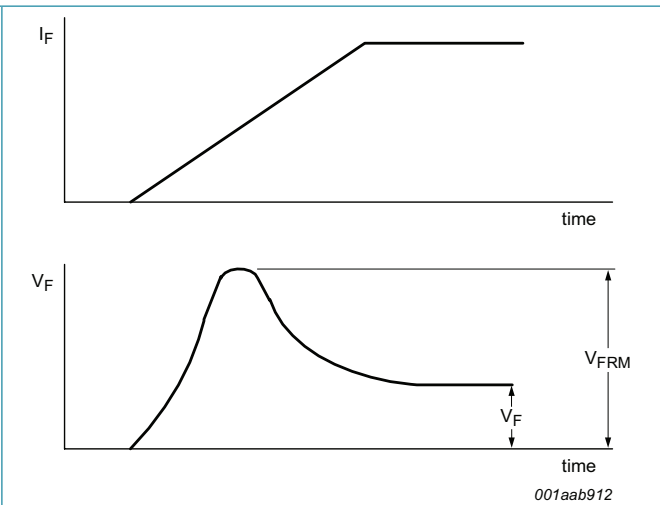
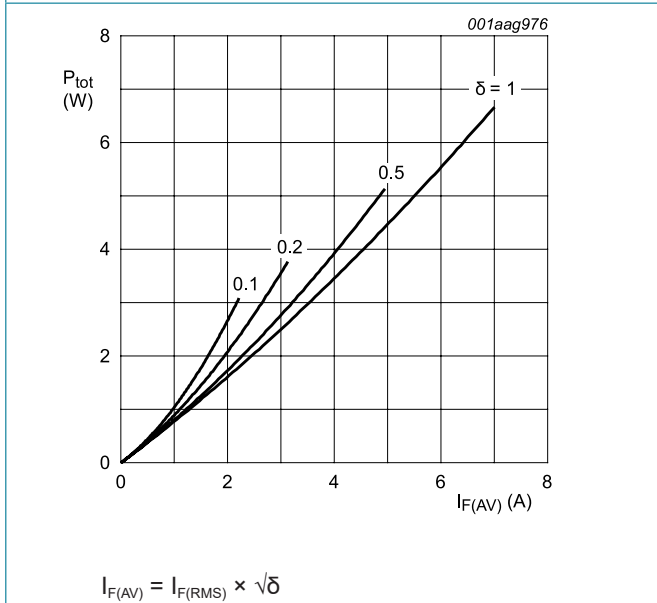
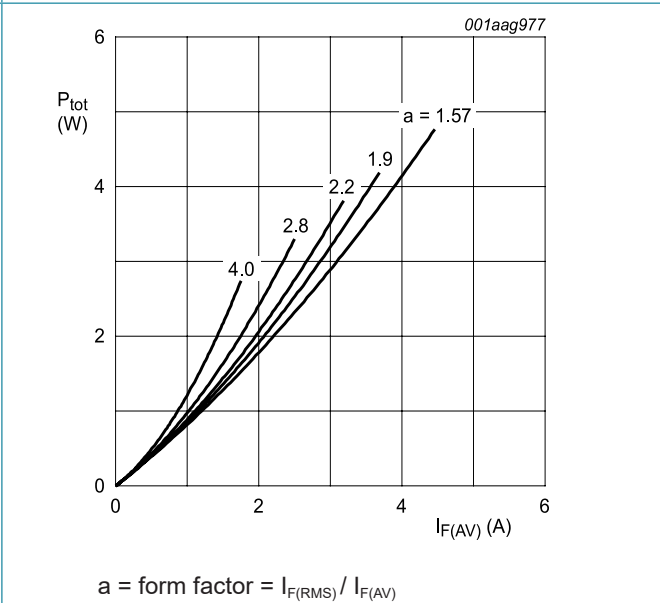


Fig. 4. Forward recovery definitions



$$I_{F(AV)} = I_{F(RMS)} \times \sqrt{\delta}$$

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



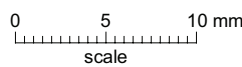
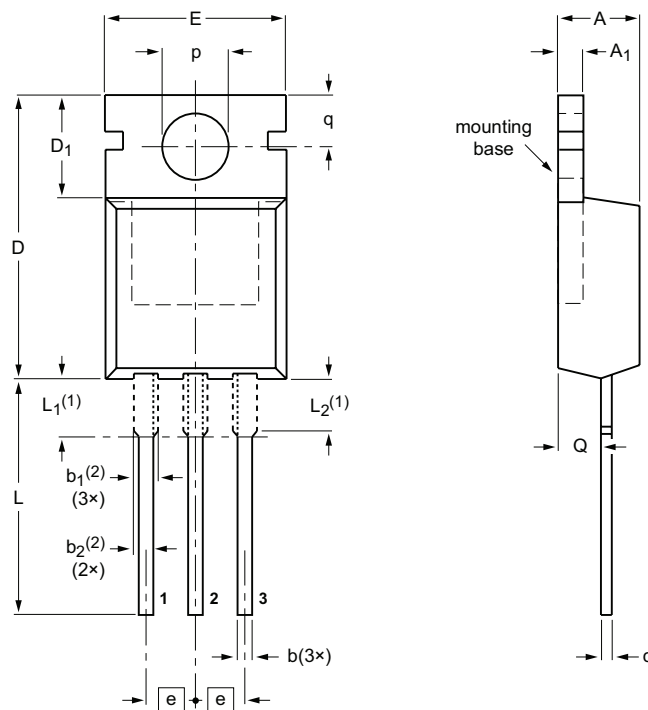
$$a = \text{form factor} = I_{F(RMS)} / I_{F(AV)}$$

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 <sub>1</sub>	b	b <sub>1</sub> (2)	b <sub>2</sub> (2)	c	D	D <sub>1</sub>	E	e	L	L <sub>1</sub> (1)	L <sub>2</sub> (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.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"> <li>• The format of this data sheet has been redesigned to comply with the new identity guidelines of NXP Semiconductors.</li> <li>• Legal texts have been adapted to the new company name where appropriate.</li> <li>• Limiting values table: some parameter descriptions amended to conform to latest standards; IFRM conditions amended; VESD row added.</li> <li>• Characteristics: Qrr changed to Qr 'recovered charge'; trr1 and trr2 changed to trr with 'ramp recovery' and 'step recovery' added to conditions.</li> </ul>				
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".
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For more information, please visit: <http://www.ween-semi.com>

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