



# 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

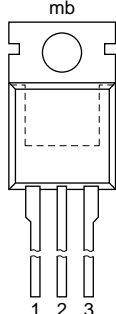
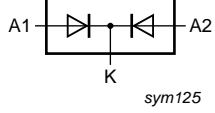
Table 1. Quick reference data

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$V_{RRM}$	repetitive peak reverse voltage		-	-	200	V
$I_{O(AV)}$	average output current	square-wave pulse; $\delta = 0.5$ ; $T_{mb} \leq 119\text{ }^{\circ}\text{C}$ ; both diodes conducting; see <a href="#">Figure 1</a> ; see <a href="#">Figure 2</a>	-	-	10	A
$I_{FRM}$	repetitive peak forward current	$\delta = 0.5$ ; $t_p = 25\text{ }\mu\text{s}$ ; $T_{mb} \leq 119\text{ }^{\circ}\text{C}$ ; per diode; square-wave pulse	-	-	10	A
<b>Static characteristics</b>						
$V_F$	forward voltage	$I_F = 5\text{ A}$ ; $T_j = 150\text{ }^{\circ}\text{C}$ ; see <a href="#">Figure 4</a>	-	0.8	0.89 5	V
<b>Dynamic characteristics</b>						
$t_{rr}$	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; see <a href="#">Figure 5</a>	-	15	25	ns
<b>Electrostatic discharge</b>						
$V_{ESD}$	electrostatic discharge voltage	HBM; $C = 250\text{ pF}$ ; $R = 1.5\text{ k}\Omega$ ; 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

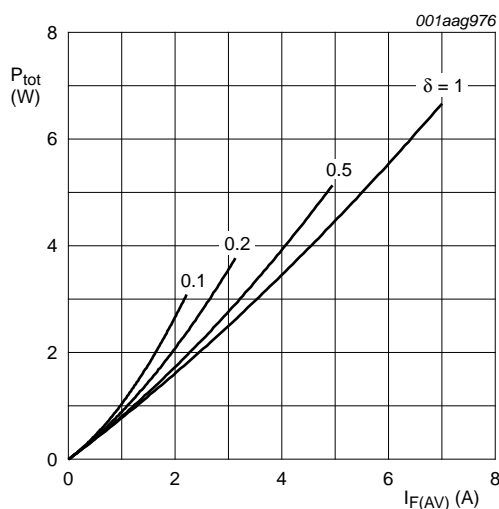
Type number	Package		
	Name	Description	Version
BYQ28E-200E	TO-220AB	plastic single-ended package; heatsink mounted; 1 mounting hole; 3-lead TO-220AB	SOT78

## 4. Limiting values

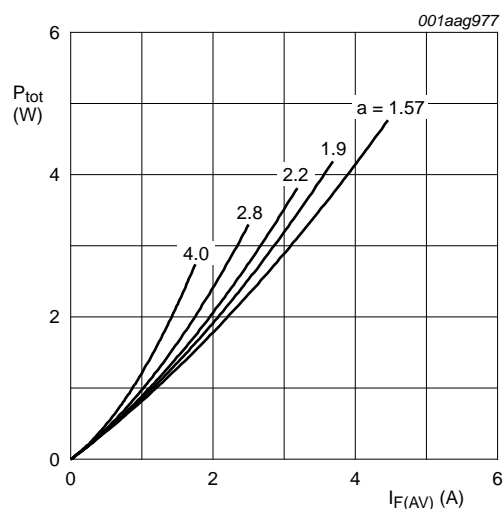
**Table 4. Limiting values**

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; $\delta = 0.5$ ; $T_{mb} \leq 119^\circ\text{C}$ ; both diodes conducting; see <a href="#">Figure 1</a> ; see <a href="#">Figure 2</a>	-	10	A
$I_{FRM}$	repetitive peak forward current	$\delta = 0.5$ ; $t_p = 25\text{ }\mu\text{s}$ ; $T_{mb} \leq 119^\circ\text{C}$ ; per diode; square-wave pulse	-	10	A
$I_{FSM}$	non-repetitive peak forward current	$t_p = 8.3\text{ ms}$ ; sine-wave pulse; $T_{j(\text{init})} = 25^\circ\text{C}$ ; per diode	-	55	A
		$t_p = 10\text{ ms}$ ; sine-wave pulse; $T_{j(\text{init})} = 25^\circ\text{C}$ ; per diode	-	50	A
$I_{RRM}$	repetitive peak reverse current	$\delta = 0.001$ ; $t_p = 2\text{ }\mu\text{s}$	-	0.2	A
$I_{RSM}$	non-repetitive peak reverse current	$t_p = 100\text{ }\mu\text{s}$	-	0.2	A
$T_{stg}$	storage temperature		-40	150	$^\circ\text{C}$
$T_j$	junction temperature		-	150	$^\circ\text{C}$
<b>Electrostatic discharge</b>					
$V_{ESD}$	electrostatic discharge voltage	HBM; $C = 250\text{ pF}$ ; $R = 1.5\text{ k}\Omega$ ; all pins	-	8	kV



**Fig 1. Forward power dissipation as a function of average forward current; square waveform; maximum values**

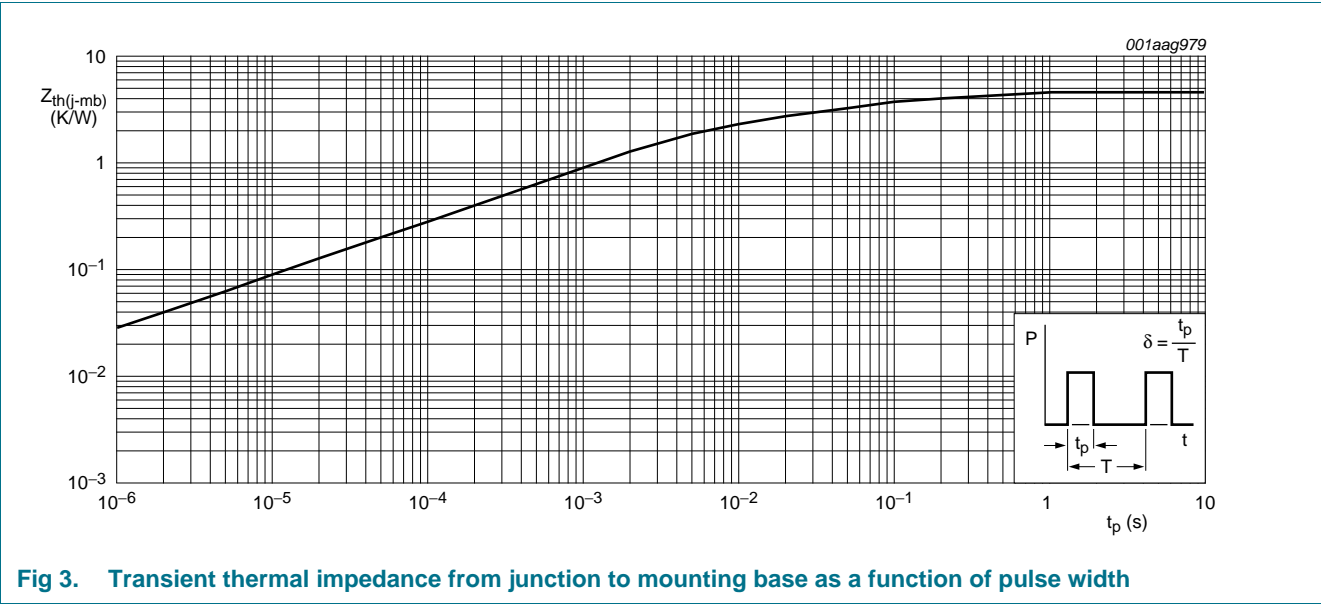


**Fig 2. Forward power dissipation as a function of average forward current; sinusoidal waveform; maximum values**

## 5. Thermal characteristics

**Table 5. Thermal characteristics**

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

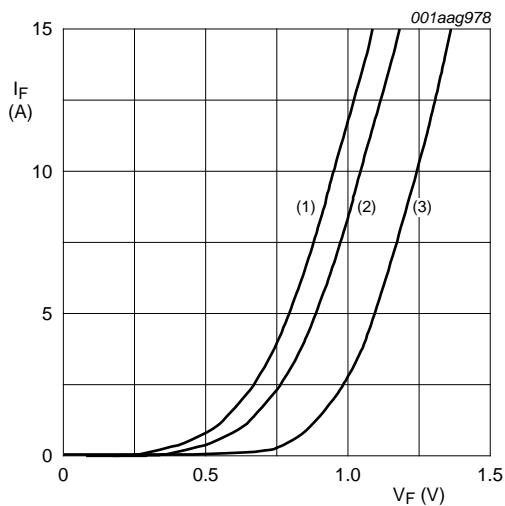


**Fig 3. Transient thermal impedance from junction to mounting base as a function of pulse width**

## 6. Characteristics

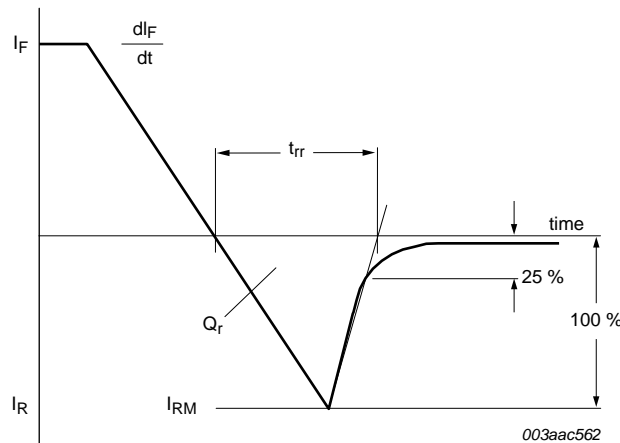
Table 6. Characteristics

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
Static characteristics						
V <sub>F</sub>	forward voltage	I <sub>F</sub> = 5 A; T <sub>j</sub> = 25 °C; see <a href="#">Figure 4</a>	-	0.95	1.1	V
		I <sub>F</sub> = 5 A; T <sub>j</sub> = 150 °C; see <a href="#">Figure 4</a>	-	0.8	0.895	V
		I <sub>F</sub> = 10 A; T <sub>j</sub> = 25 °C; see <a href="#">Figure 4</a>	-	1.1	1.25	V
I <sub>R</sub>	reverse current	V <sub>R</sub> = 200 V; T <sub>j</sub> = 25 °C	-	2	10	μA
		V <sub>R</sub> = 200 V; T <sub>j</sub> = 100 °C	-	0.1	0.2	mA
Dynamic characteristics						
Q <sub>r</sub>	recovered charge	I <sub>F</sub> = 2 A; V <sub>R</sub> ≥ 30 V; dI <sub>F</sub> /dt = 20 A/μs; T <sub>j</sub> = 25 °C; see <a href="#">Figure 5</a>	-	4	9	nC
t <sub>rr</sub>	reverse recovery time	I <sub>F</sub> = 1 A; V <sub>R</sub> = 30 V; dI <sub>F</sub> /dt = 100 A/μs; ramp recovery; T <sub>j</sub> = 25 °C; see <a href="#">Figure 5</a>	-	15	25	ns
		I <sub>F</sub> = 0.5 A; I <sub>R</sub> = 1 A; step recovery; T <sub>j</sub> = 25 °C; see <a href="#">Figure 6</a>	-	10	20	ns
I <sub>RM</sub>	peak reverse recovery current	I <sub>F</sub> = 2 A; V <sub>R</sub> ≥ 30 V; dI <sub>F</sub> /dt = 20 A/μs; T <sub>j</sub> = 25 °C; see <a href="#">Figure 5</a>	-	0.4	0.7	A
V <sub>FR</sub>	forward recovery voltage	I <sub>F</sub> = 1 A; dI <sub>F</sub> /dt = 10 A/μs; T <sub>j</sub> = 25 °C; see <a href="#">Figure 7</a>	-	1	-	V



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

**Fig 4.** Forward current as a function of forward voltage



**Fig 5.** Reverse recovery definitions; ramp recovery

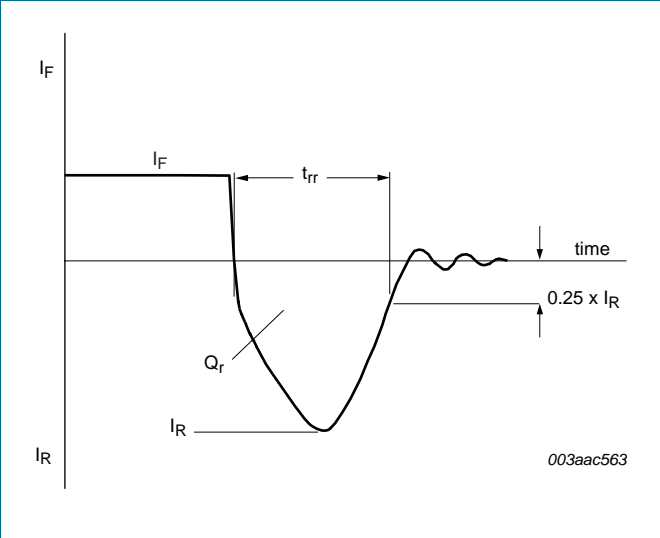


Fig 6. Reverse recovery definitions; step recovery

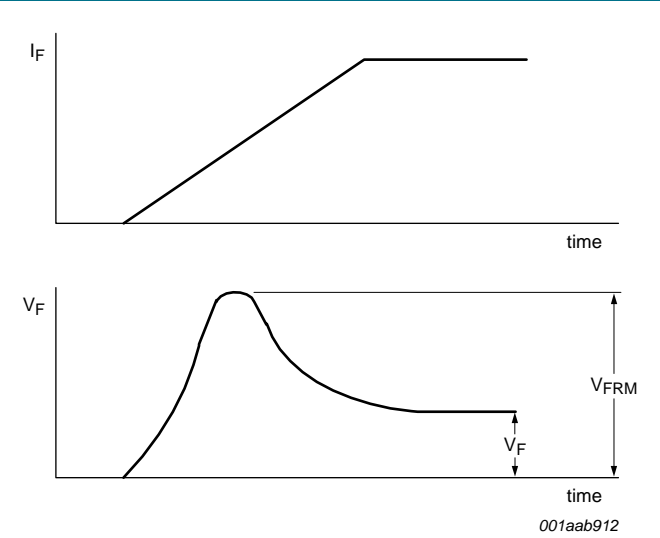


Fig 7. Forward recovery definitions

## 7. Package outline

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

SOT78

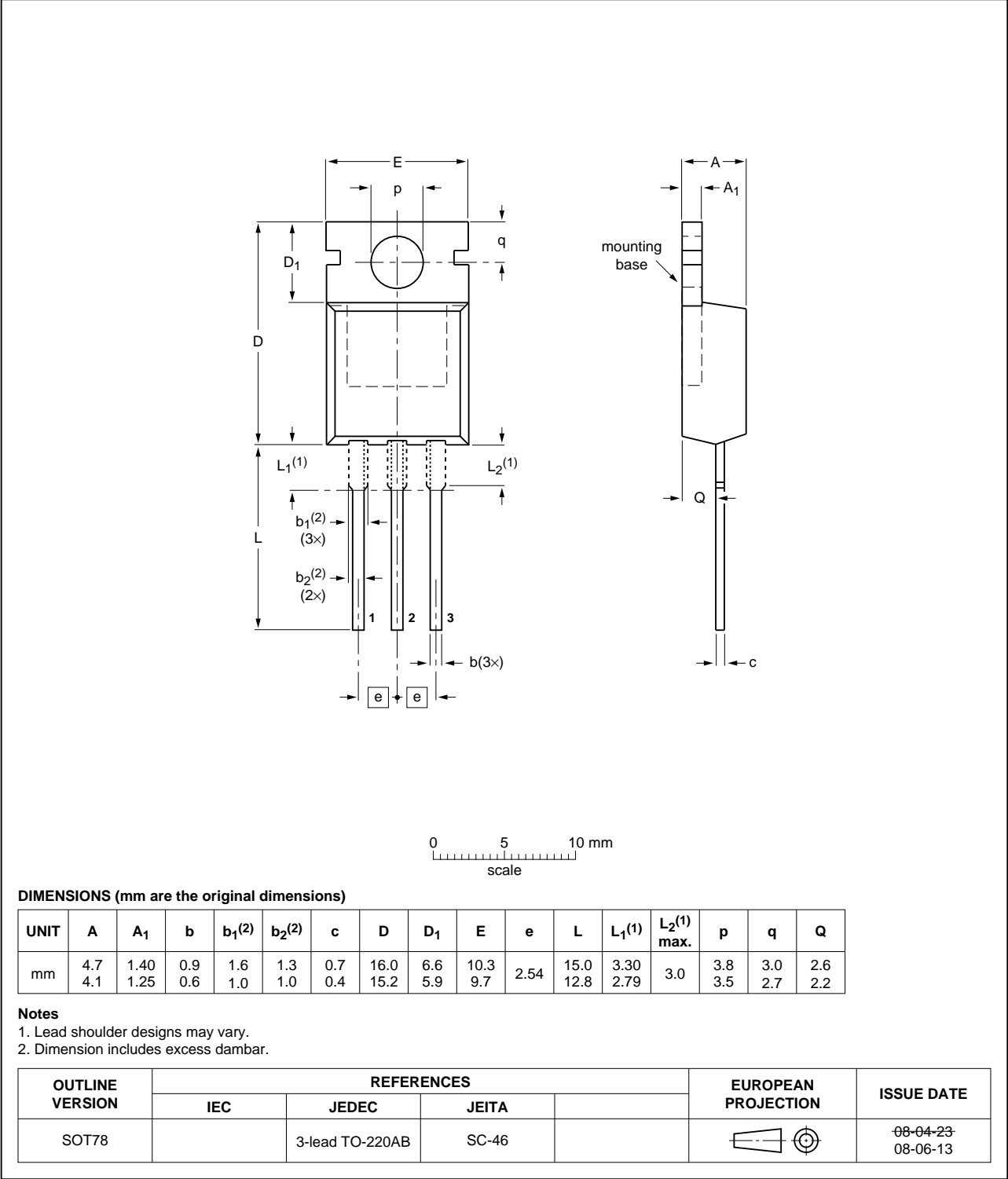


Fig 8. Package outline SOT78 (TO-220AB)

## 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:	<ul style="list-style-type: none"><li>• Type number BYQ28E-200E separated from data sheet BYQ28E_SERIES v.3.</li><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></ul>			
BYQ28E_SERIES v.3	19981001	Product specification	-	BYQ28E_SERIES v.2



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Document status <sup>[1] [2]</sup>	Product status <sup>[3]</sup>	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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