

# BYQ28 series E and ED

Rectifier diodes ultrafast, rugged

Rev. 05 — 23 September 2016

Product data sheet

## 1. Product profile

### 1.1 General description

Ultrafast, dual common cathode, epitaxial rectifier diodes in a SOT78 (TO-220AB) and a TO252 (DPAK) plastic package.

### 1.2 Features

- Fast switching
- Soft recovery characteristic
- Reverse surge capability
- Low thermal resistance
- Low forward voltage drop
- High thermal cycling performance

### 1.3 Applications

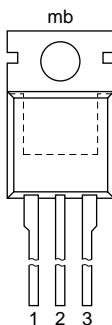
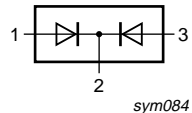
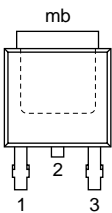
- Output rectifiers in high-frequency switched-mode power supplies

### 1.4 Quick reference data

- $V_{RRM} \leq 200$  V
- $V_F \leq 0.895$  V
- $I_{O(AV)} \leq 10$  A
- $t_{rr} = 10$  ns (typ)

## 2. Pinning information

Table 1. Pinning

Pin	Description	Simplified outline	Symbol
1	anode 1		 <i>sym084</i>
2	cathode <a href="#">[1]</a>		
3	anode 2		
mb	mounting base; cathode	 TO252 (DPAK)	

SOT78 (3-lead TO-220AB)

[1] It is not possible to connect to pin 2 of the TO252 package.

### 3. Ordering information

**Table 2. Ordering information**

Type number	Package		Version
	Name	Description	
BYQ28E-200	TO-220AB	plastic single-ended package; heatsink mounted; 1 mounting hole; 3-lead TO-220AB	SOT78
BYQ28ED-200	DPAK	plastic single-ended surface-mounted package (DPAK); 3-leads (one lead cropped)	TO252

### 4. Limiting values

**Table 3. Limiting values**

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

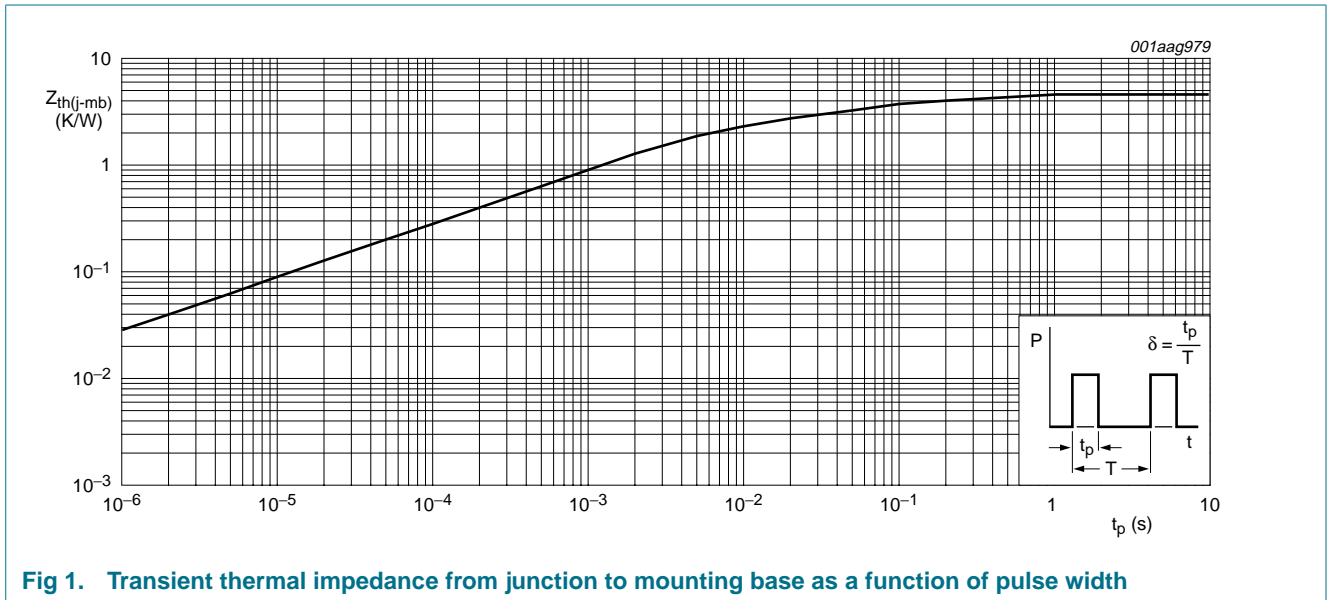
Symbol	Parameter	Conditions	Min	Max	Unit
$V_{RRM}$	repetitive peak reverse voltage		-	200	V
$V_{RWM}$	crest working reverse voltage		-	200	V
$V_R$	reverse voltage	square waveform; $\delta = 1.0$	-	200	V
$I_{O(AV)}$	average output current	square waveform; $\delta = 0.5$ ; $T_{mb} \leq 119\text{ °C}$ ; both diodes conducting	-	10	A
$I_{FRM}$	repetitive peak forward current	$t_p = 25\ \mu\text{s}$ ; square waveform; $\delta = 0.5$ ; $T_{mb} \leq 119\text{ °C}$ ; per diode	-	10	A
$I_{FSM}$	non-repetitive peak forward current	$t = 10\text{ ms}$ ; sinusoidal waveform; per diode	-	50	A
		$t = 8.3\text{ ms}$ ; sinusoidal waveform; per diode	-	55	A
$I_{RM}$	peak reverse recovery current	$t_p = 2\ \mu\text{s}$ ; $\delta = 0.001$	-	0.2	A
$I_{RSM}$	non-repetitive peak reverse current	$t_p = 100\ \mu\text{s}$	-	0.2	A
$T_{stg}$	storage temperature		-40	+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

### 5. Thermal characteristics

**Table 4. 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; see <a href="#">Figure 1</a>	-	-	4.5	K/W
		with heatsink compound; both diodes conducting	-	-	3	K/W
$R_{th(j-a)}$	thermal resistance from junction to ambient	in free air; SOT78	-	60	-	K/W
		TO252	[1]	50	-	K/W

[1] Device mounted on an FR4 Printed-Circuit Board (PCB), single-sided copper, tin-plated and standard footprint.



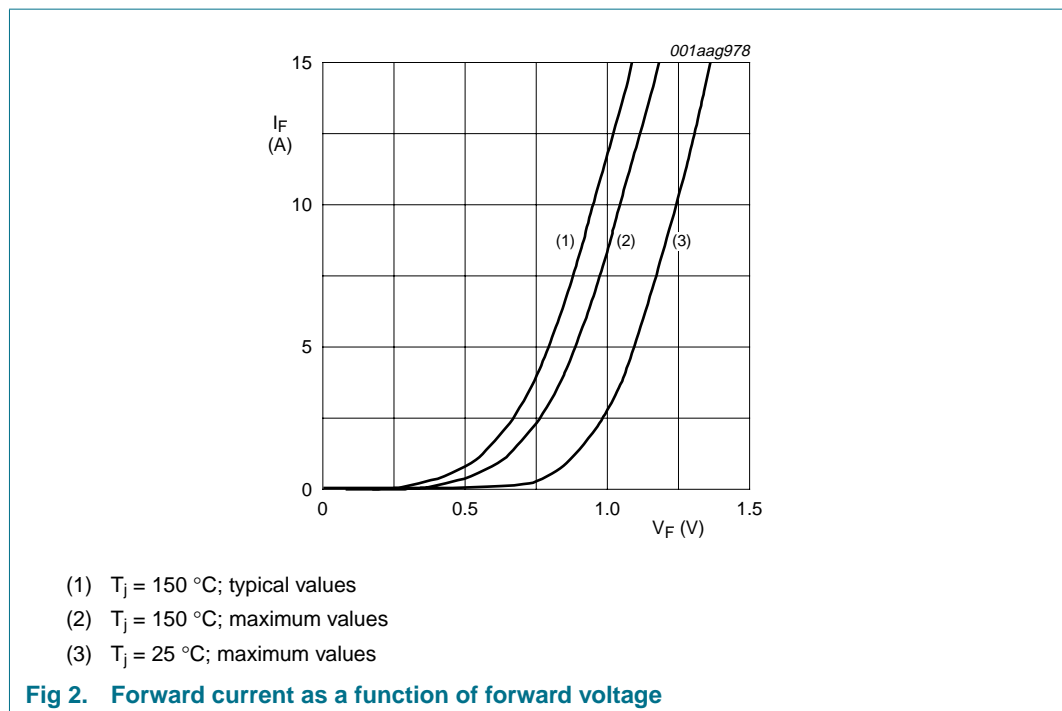
**Fig 1. Transient thermal impedance from junction to mounting base as a function of pulse width**

## 6. Characteristics

**Table 5. Characteristics**

$T_j = 25\text{ }^\circ\text{C}$  unless otherwise specified.

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



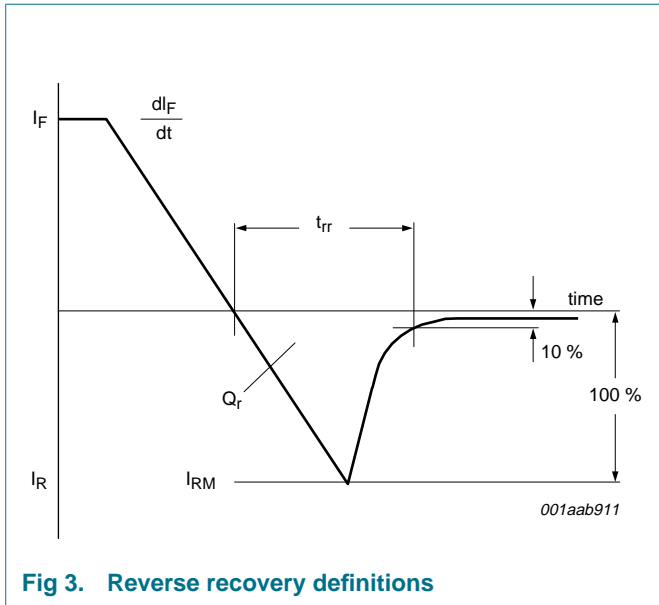


Fig 3. Reverse recovery definitions

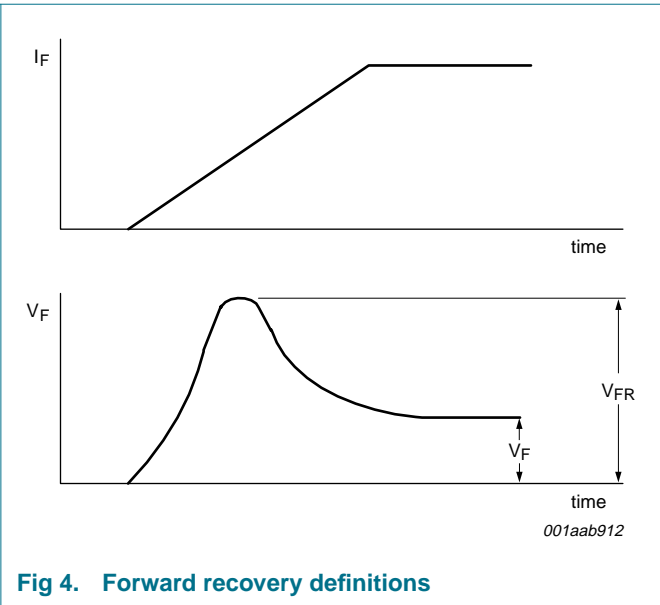


Fig 4. Forward recovery definitions

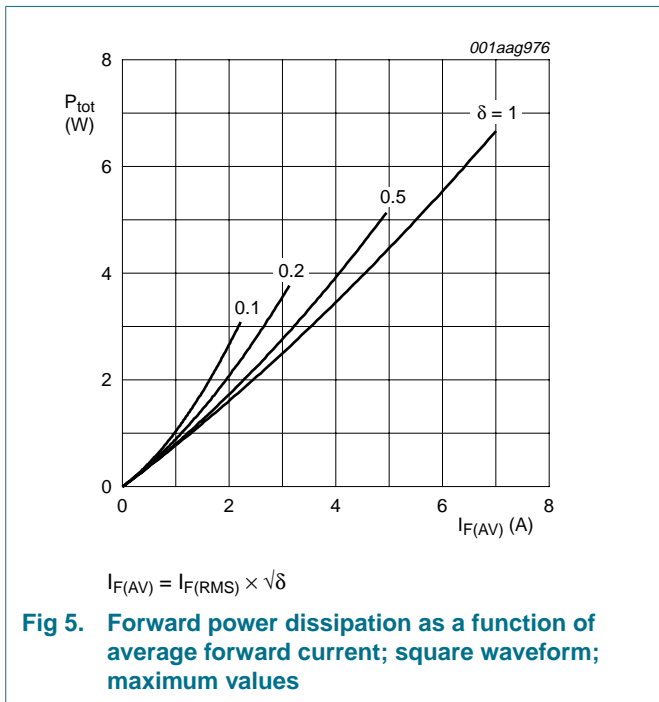


Fig 5. Forward power dissipation as a function of average forward current; square waveform; maximum values

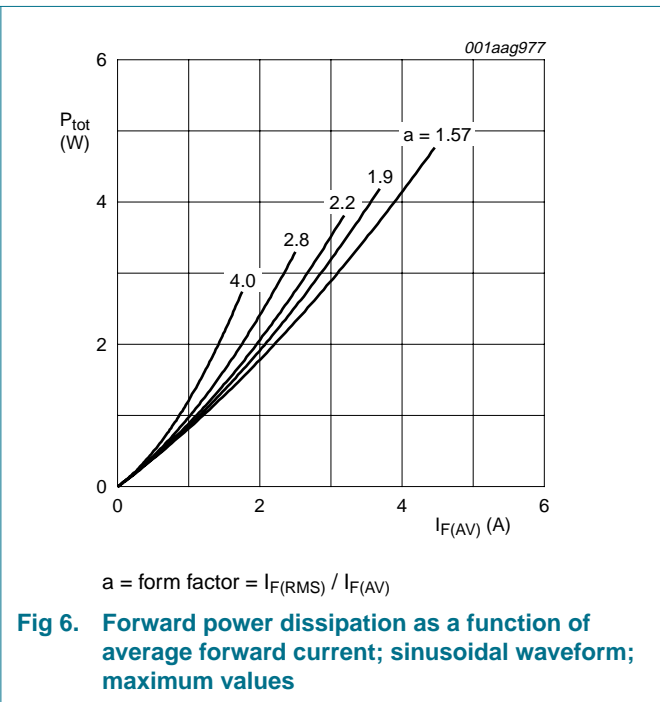


Fig 6. Forward power dissipation as a function of average forward current; sinusoidal waveform; maximum values

7. Package outline

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

SOT78

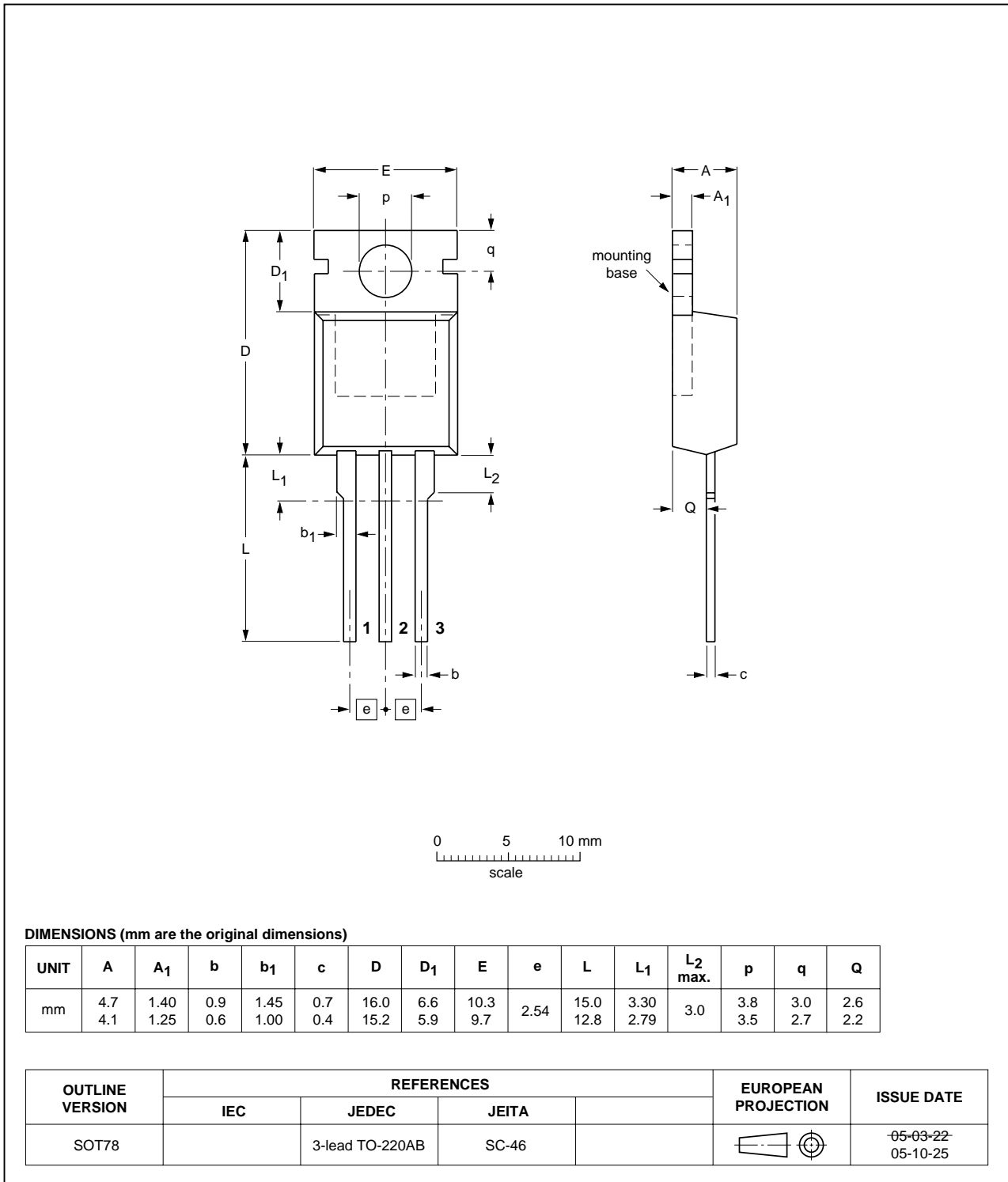
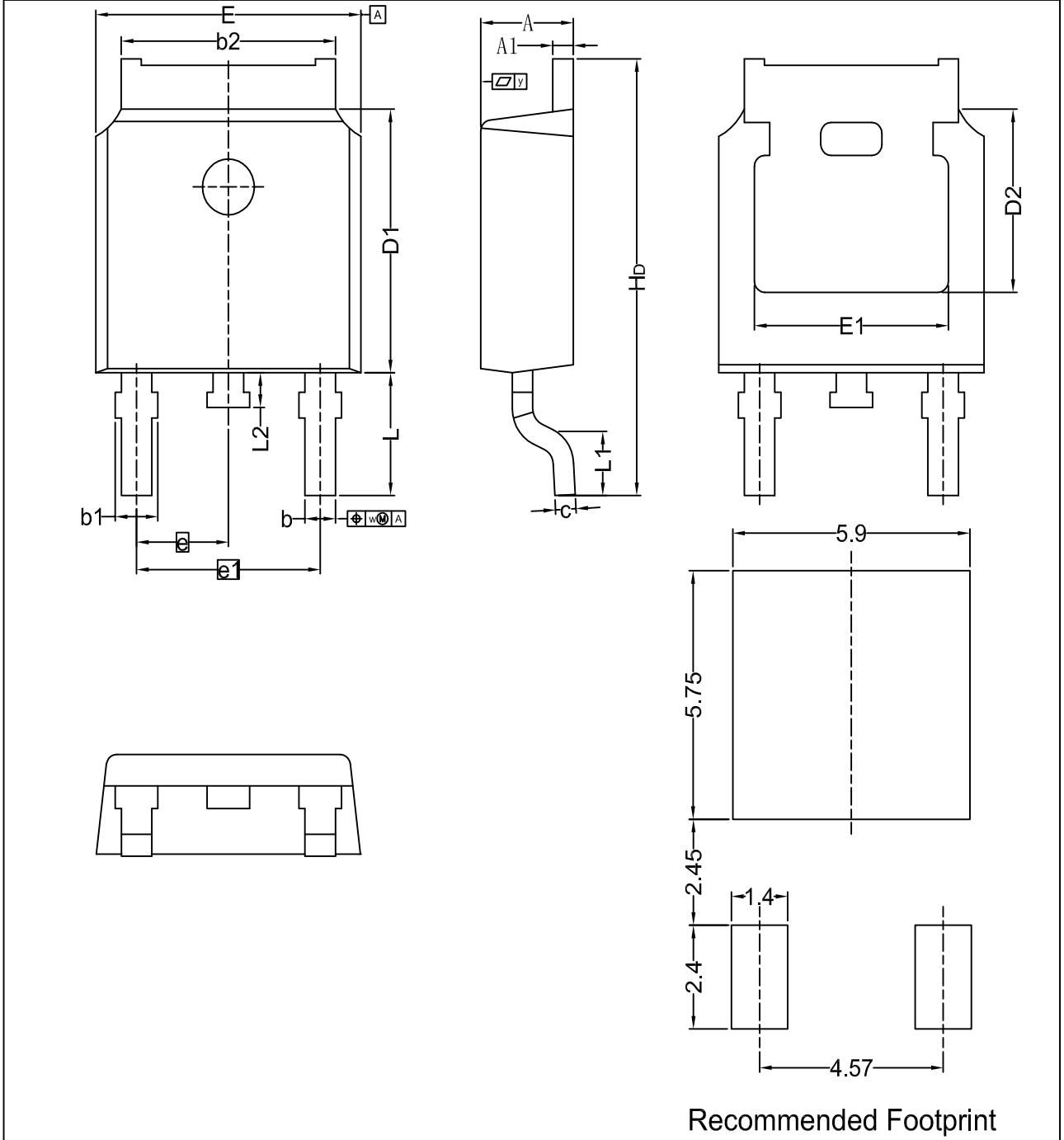


Fig 7. Package outline SOT78 (TO-220AB)

Plastic single-ended surface-mounted package (DPAK); 3 leads (one lead cropped)

TO252



Recommended Footprint

Unit	A	A1	b	b1	b2	c	D1	D2	E	E1	e	e1	H <sub>D</sub>	L	L1	L2	w	y
min	2.22	0.46	0.71	0.72	5.00	0.20	5.98	4.00	6.47	4.45	2.285	4.57	9.60	2.90	0.50	0.50	0.20	
nom														(Ref.)				
max	2.38	0.93	0.89	1.10	5.46	0.56	6.22	---	6.73	---			10.40	---	0.90		0.20	0.20

Fig. 8. Package outline DPAK (TO252N)

## 8. Revision history

**Table 6. Revision history**

Document ID	Release date	Data sheet status	Change notice	Supersedes
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; <math>I_{FRM}</math> conditions amended; <math>V_{ESD}</math> row added.</li> <li>Characteristics: <math>Q_{rr}</math> changed to <math>Q_r</math> 'recovered charge'; <math>t_{rr1}</math> and <math>t_{rr2}</math> changed to <math>t_{rr}</math> 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	-	-



## 9. 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".
- [3] The product status of device(s) described in this document may have changed since this document was published and may differ in case of multiple devices. The latest product status information is available on the Internet at URL <http://www.ween-semi.com>.

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