

## 1. General description

Ultrafast, dual common cathode, epitaxial rectifier diodes in a TO220 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; $T_{mb} \leq 119\text{ °C}$ ; 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
Symbol	Parameter	Conditions	Min	Typ	Max	Unit
<b>Static characteristics</b>						
$V_F$	forward voltage	$I_F = 5\text{ A}$ ; $T_j = 25\text{ °C}$ ; <a href="#">Fig. 2</a>	-	0.95	1.1	V
		$I_F = 5\text{ A}$ ; $T_j = 150\text{ °C}$ ; <a href="#">Fig. 2</a>	-	0.8	0.895	V
		$I_F = 10\text{ A}$ ; $T_j = 25\text{ °C}$ ; <a href="#">Fig. 2</a>	-	1.1	1.25	V
<b>Dynamic characteristics</b>						
$t_{rr}$	reverse recovery time	ramp recovery; $I_F = 1\text{ A}$ ; $V_R = 30\text{ V}$ ; $di_F/dt = 100\text{ A}/\mu\text{s}$ ; $T_j = 25\text{ °C}$ ; <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	Orderable part number	Packing method	Small packing quantity	Package version	Package issue date
BYQ28E-200	TO220	BYQ28E-200,127	Tube	50	SOT78 (A)	13-Jun-2008
BYQ28E-200E	TO220	BYQ28E-200E,127	Tube	50	TO220E (E)	26-Apr-2019

## 7. Marking

Table 4. Marking codes

Type number	Marking codes	
	Assembly Factory: A	Assembly Factory: E
BYQ28E-200	BYQ28E 200	BYQ28E 200E
BYQ28E-200E	PJAxxxx xx	PJExxxx xx

## 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

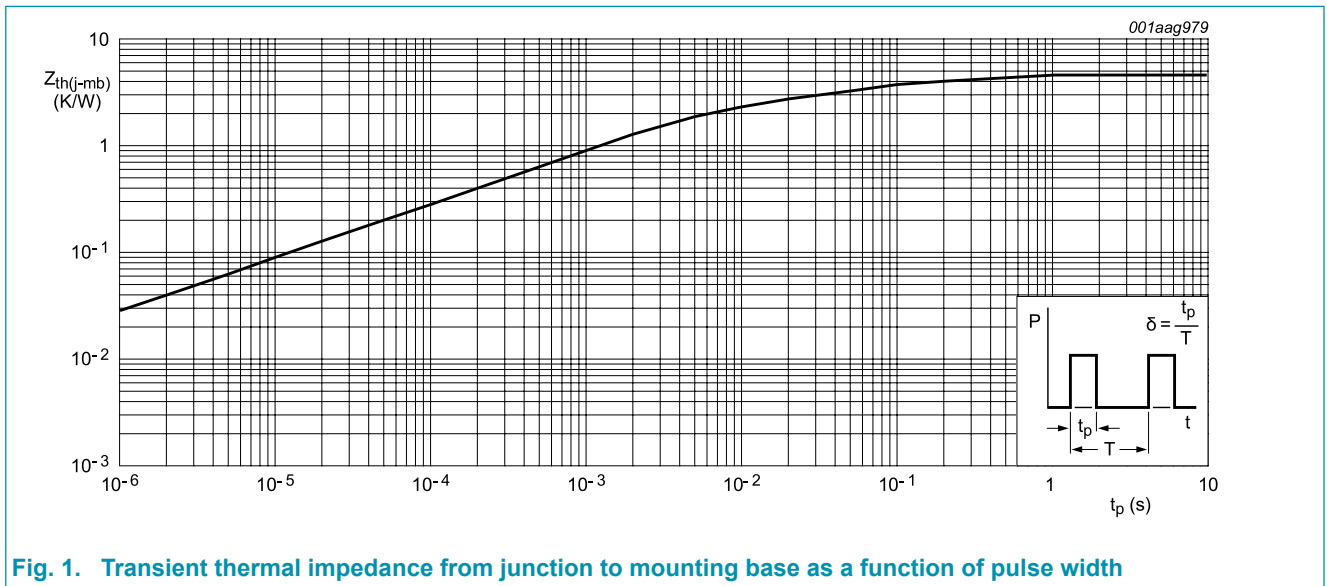
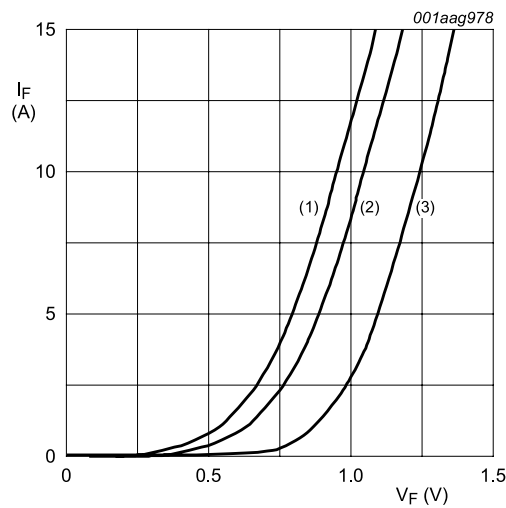


Fig. 1. Transient thermal impedance from junction to mounting base as a function of pulse width

## 10. Characteristics

Table 7. Characteristics

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
<b>Static characteristics</b>						
$V_F$	forward voltage	$I_F = 5 \text{ A}; T_j = 150 \text{ }^\circ\text{C}; \text{ Fig. 2}$	-	0.8	0.895	V
		$I_F = 5 \text{ A}; T_j = 25 \text{ }^\circ\text{C}; \text{ Fig. 2}$	-	0.95	1.1	V
		$I_F = 10 \text{ A}; T_j = 25 \text{ }^\circ\text{C}; \text{ Fig. 2}$	-	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	$I_F = 2 \text{ A}; V_R = 30 \text{ V}; di_F/dt = 20 \text{ A}/\mu\text{s}; T_j = 25 \text{ }^\circ\text{C}; \text{ Fig. 3}$	-	4	9	nC
$t_{rr}$	reverse recovery time	ramp recovery; $I_F = 1 \text{ A}; V_R = 30 \text{ V}; di_F/dt = 100 \text{ A}/\mu\text{s}; T_j = 25 \text{ }^\circ\text{C}; \text{ Fig. 3}$	-	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	$I_F = 5 \text{ A}; V_R = 30 \text{ V}; di_F/dt = 50 \text{ A}/\mu\text{s}; T_j = 25 \text{ }^\circ\text{C}; \text{ Fig. 3}$	-	0.5	0.7	A
$V_{FR}$	forward recovery voltage	$I_F = 1 \text{ A}; di_F/dt = 10 \text{ A}/\mu\text{s}; T_j = 25 \text{ }^\circ\text{C}; \text{ Fig. 4}$	-	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. 2. Forward current as a function of forward voltage

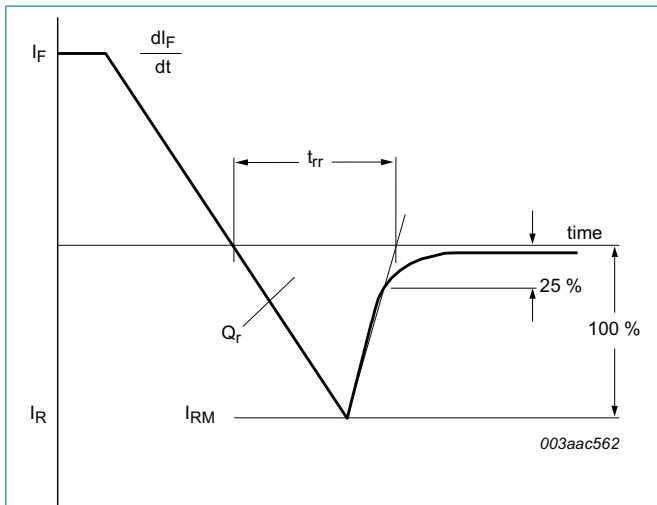


Fig. 3. Reverse recovery definitions; ramp recovery

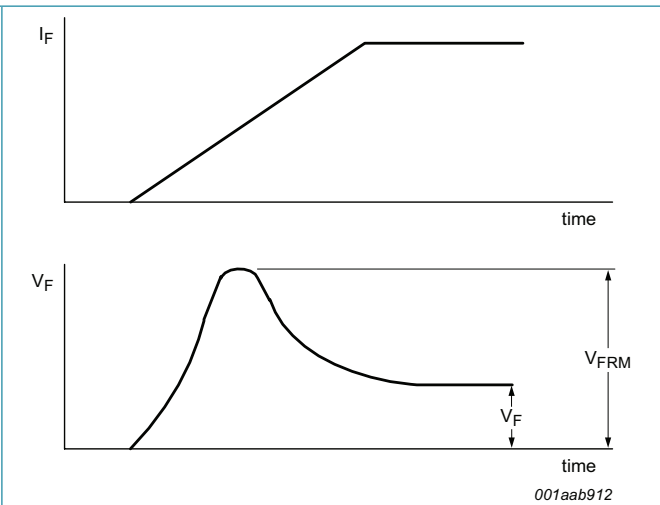


Fig. 4. Forward recovery definitions

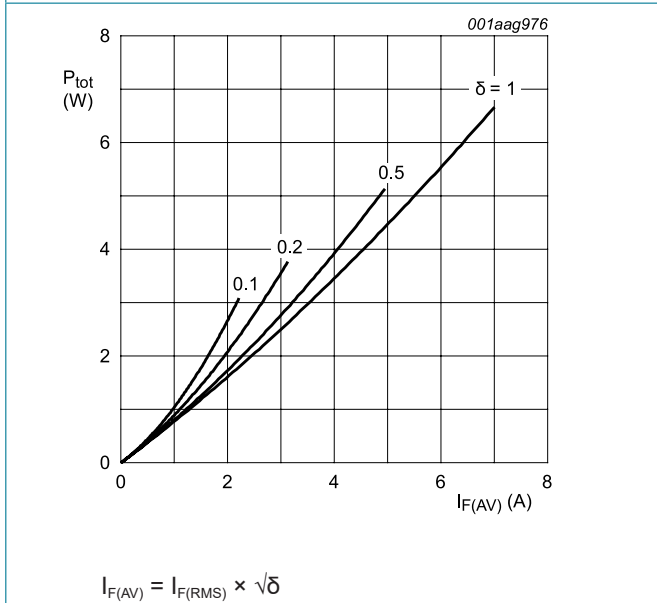


Fig. 5. Forward power dissipation as a function of average forward current; square waveform; maximum values; per diode

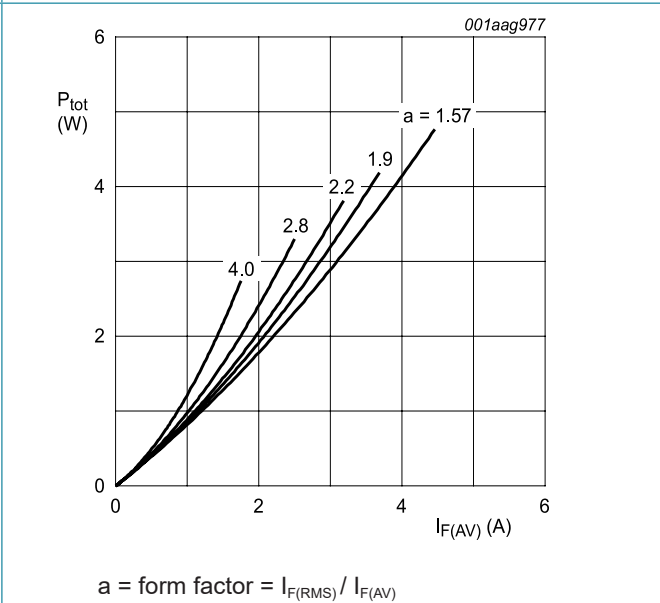


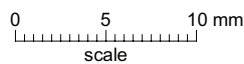
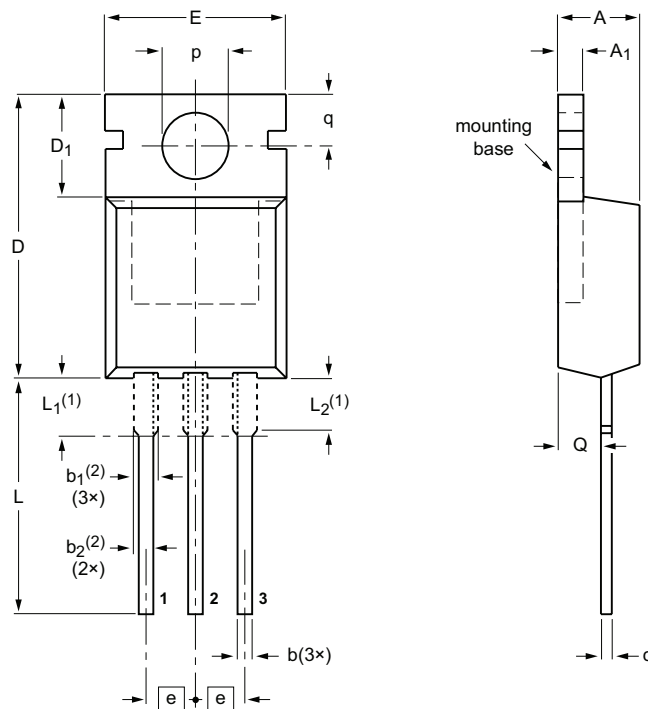
Fig. 6. Forward power dissipation as a function of average forward current; sinusoidal waveform; maximum values; per diode

### 11. Package outline

Assembly Factory: A

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	1.40	0.9	1.6	1.3	0.7	16.0	6.6	10.3	2.54	15.0	3.30	3.0	3.8	3.0	2.6
	4.1	1.25	0.6	1.0	1.0	0.4	15.2	5.9	9.7		12.8	2.79		3.5	2.7	2.2

Notes

- 1. Lead shoulder designs may vary.
- 2. Dimension includes excess dambar.

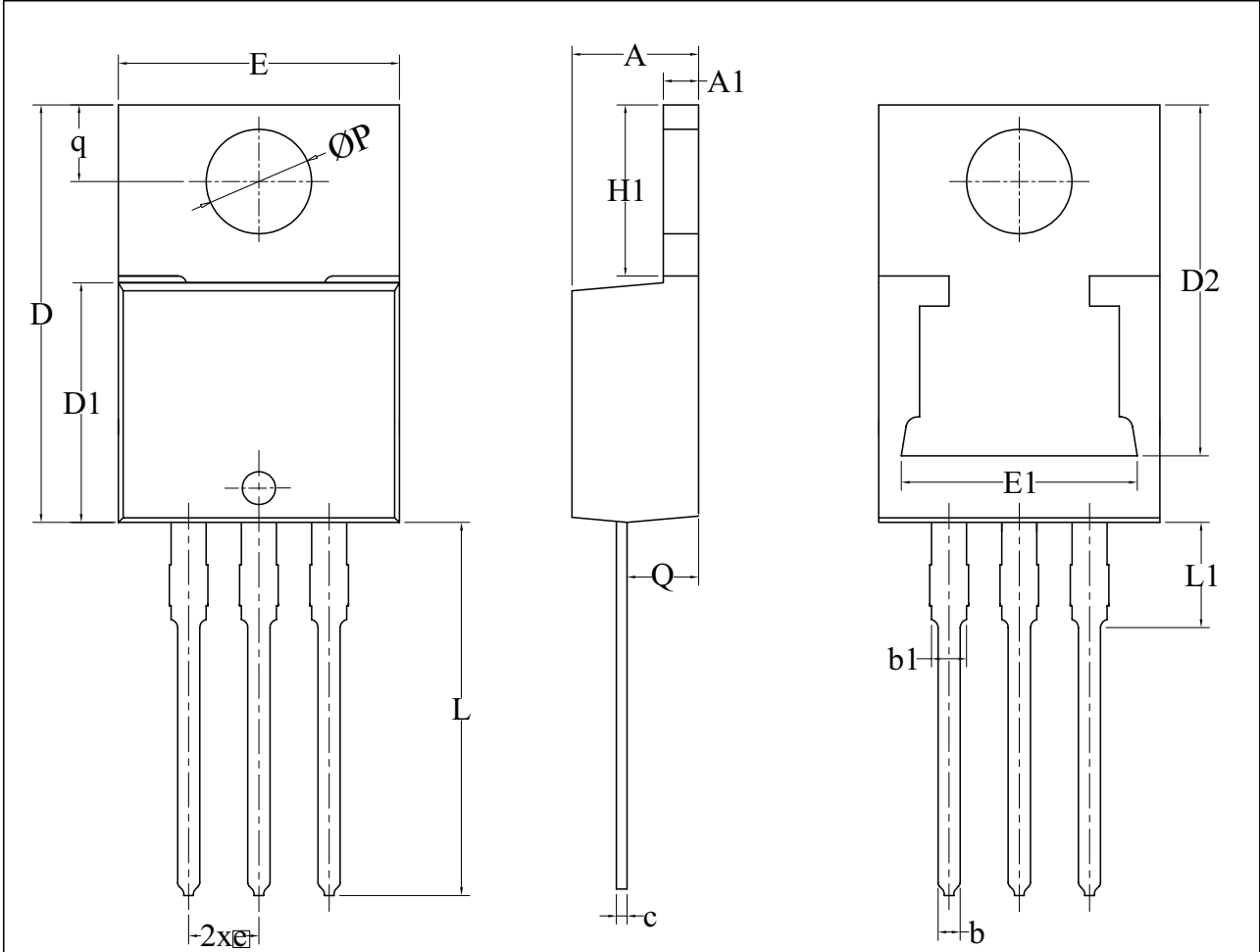
OUTLINE VERSION	REFERENCES			EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	JEITA		
SOT78		3-lead TO-220AB	SC-46		08-04-23 08-06-13

### 11. Package outline

Assembly Factory: E

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

TO220



Unit	A	A1	b	b1	c	D	D1	D2	E	E1	e	H1	L	L1	P	Q	q
min	4.35	1.14	0.69	1.20	0.36	14.95	8.50	12.20	10.00	8.25	2.54 (BSC)	6.00	13.00	3.40	3.70	2.40	2.60
max	4.75	1.40	1.01	1.45	0.61	15.55	9.02	12.88	10.40	8.89		6.40	14.00	3.80	3.95	2.80	3.00



## 12. Revision history

Table 8. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
BYQ28E-200 v.7	20240123	Product data sheet	-	BYQ28E-200 v.6
Modifications: Merged with BYQ28E-200E				
BYQ28E-200 v.6	20230404	Product data sheet	-	BYQ28E-200 v.5
Modifications: Update ordering information.				
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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