

1. General description

Dual ultrafast power diodes in a TO220 plastic package. These diodes are rugged with a guaranteed electrostatic discharge voltage capability.

2. Features and benefits

- Fast switching
- Low on-state losses
- Guaranteed ESD capability
- Low thermal resistance
- High thermal cycling performance
- Soft recovery minimizes power-consuming oscillations

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
Absolute maximum rating						
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; Fig. 1 ; Fig. 2	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
I_{FSM}	non-repetitive peak forward current	$t_p = 10\text{ ms}$; sine-wave pulse; $T_{j(\text{init})} = 25\text{ }^{\circ}\text{C}$; per diode	50			A
		$t_p = 8.3\text{ ms}$; sine-wave pulse; $T_{j(\text{init})} = 25\text{ }^{\circ}\text{C}$; per diode	55			A
Symbol	Parameter	Conditions	Min	Typ	Max	Unit
Static characteristics						
V_F	forward voltage	$I_F = 5\text{ A}$; $T_j = 150\text{ }^{\circ}\text{C}$; Fig. 4	-	0.8	0.895	V
Dynamic characteristics						
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; Fig. 5	-	15	25	ns
Electrostatic discharge						
V_{ESD}	electrostatic discharge voltage	HBM; $C = 250\text{ pF}$; $R = 1.5\text{ k}\Omega$; all pins	-	-	8	kV

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; 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-200E	TO220	BYQ28E-200E,127	Tube	50	TO220E (E)	26-Apr-2019
					SOT78 (A & d)	13-Jun-2008
BYQ28E-200	TO220	BYQ28E-200,127	Tube	50	SOT78 (A)	13-Jun-2008

7. Marking

Table 4. Marking codes

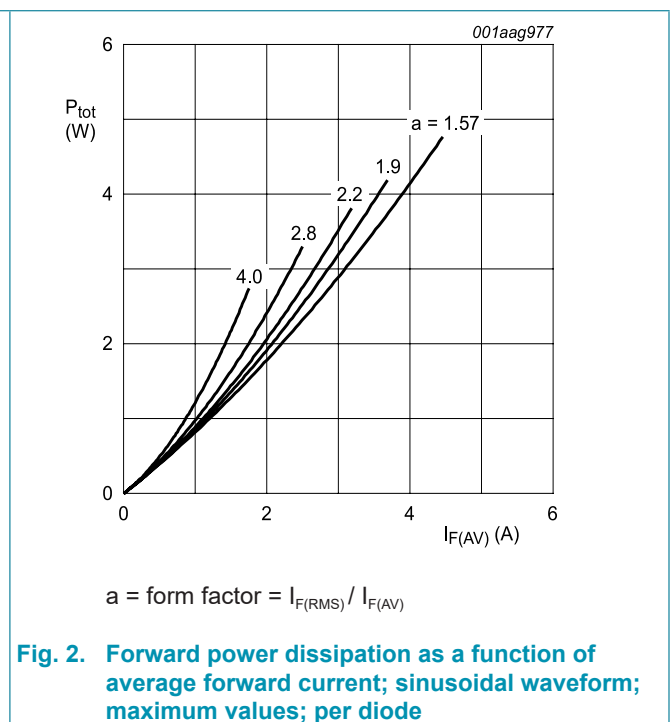
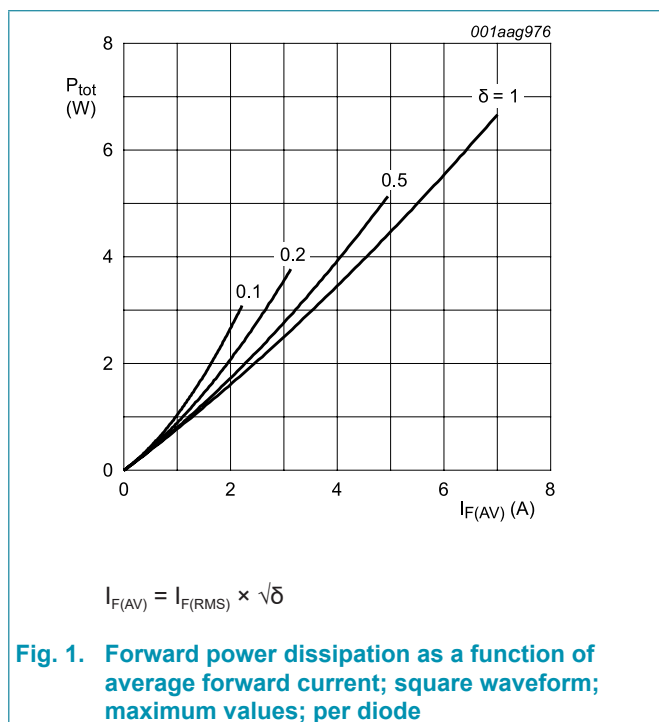
Type number	Marking codes		
	Assembly Factory: E	Assembly Factory: A	Assembly Factory: d
BYQ28E-200E	BYQ28E 200E PJExxxx xx	BYQ28E 200E PJAxxxx xx	BYQ28E 200E PJdxxxx xx
BYQ28E-200	-	BYQ28E 200 PJAxxxx xx	-

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	DC	200	V
$I_{O(AV)}$	average output current	$\delta = 0.5$; square-wave pulse; $T_{mb} \leq 119\text{ °C}$; both diodes conducting; Fig. 1; Fig. 2	10	A
I_{FRM}	repetitive peak forward current	$\delta = 0.5$; $t_p = 25\ \mu\text{s}$; $T_{mb} \leq 119\text{ °C}$; per diode; square-wave pulse	10	A
I_{FSM}	non-repetitive peak forward current	$t_p = 10\text{ ms}$; sine-wave pulse; $T_{j(\text{init})} = 25\text{ °C}$; per diode	50	A
		$t_p = 8.3\text{ ms}$; sine-wave pulse; $T_{j(\text{init})} = 25\text{ °C}$; per diode	55	A
I_{RRM}	repetitive peak reverse 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
Electrostatic discharge				
V_{ESD}	electrostatic discharge voltage	HBM; C = 250 pF; R = 1.5 kΩ; all pins	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; Fig. 3	-	-	4.5	K/W
$R_{th(j-a)}$	thermal resistance from junction to ambient		-	60	-	K/W

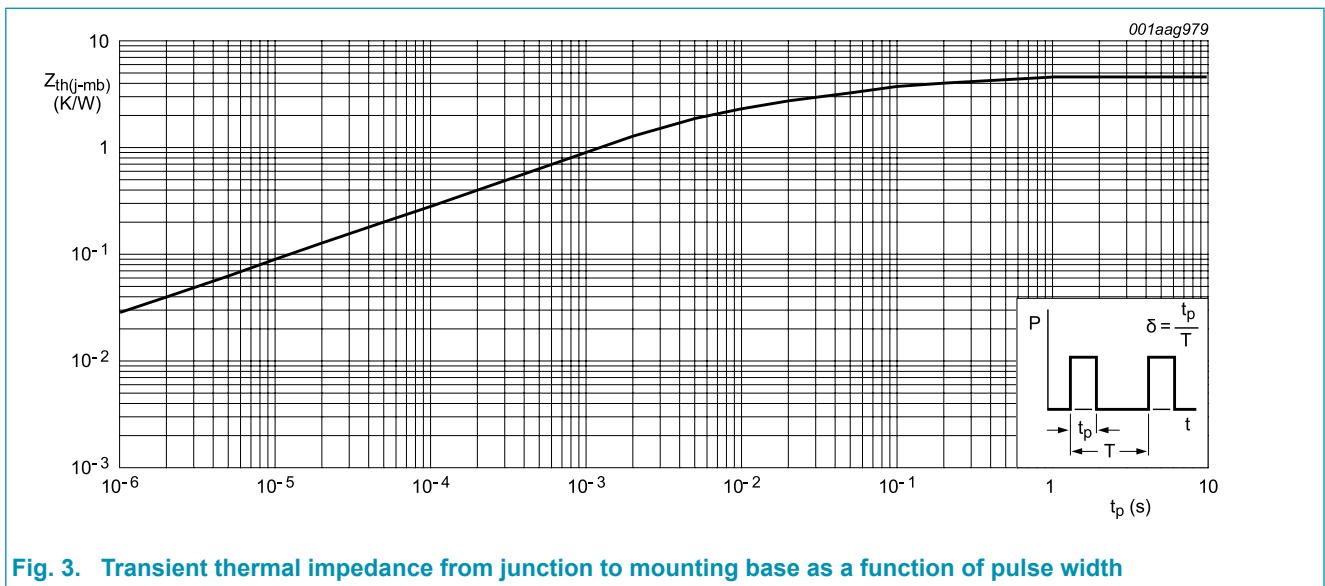


Fig. 3. Transient thermal impedance from junction to mounting base as a function of pulse width

10. Characteristics

Table 7. Characteristics

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

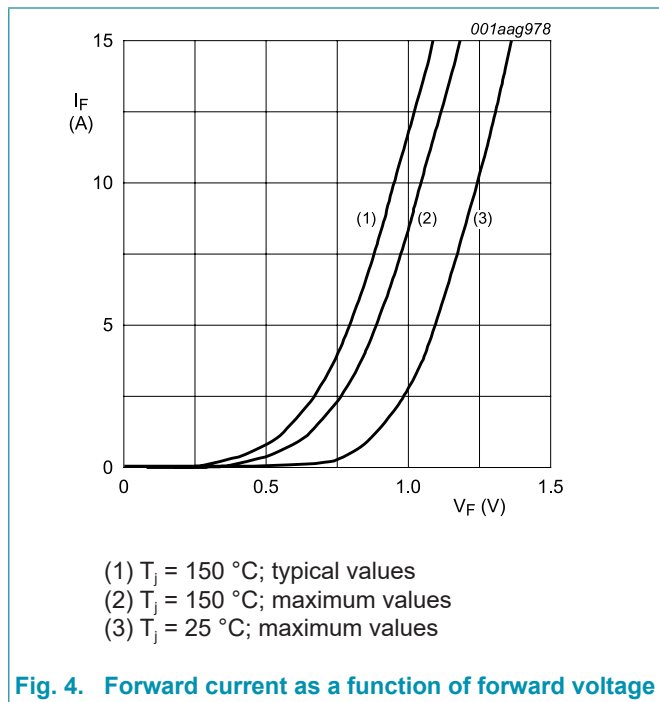


Fig. 4. Forward current as a function of forward voltage

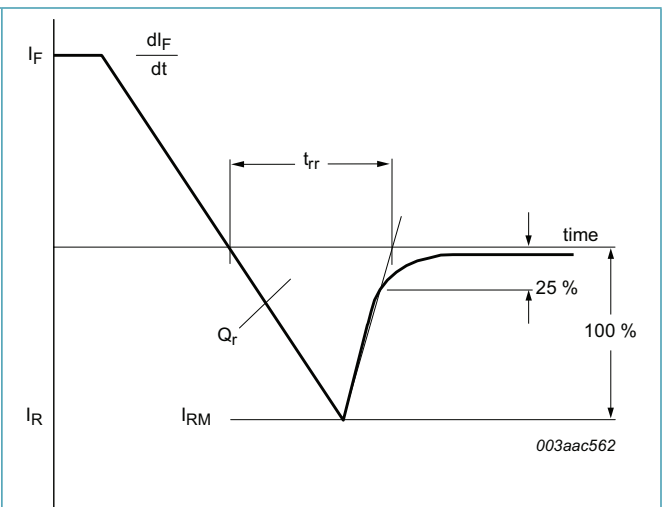


Fig. 5. Reverse recovery definitions; ramp recovery

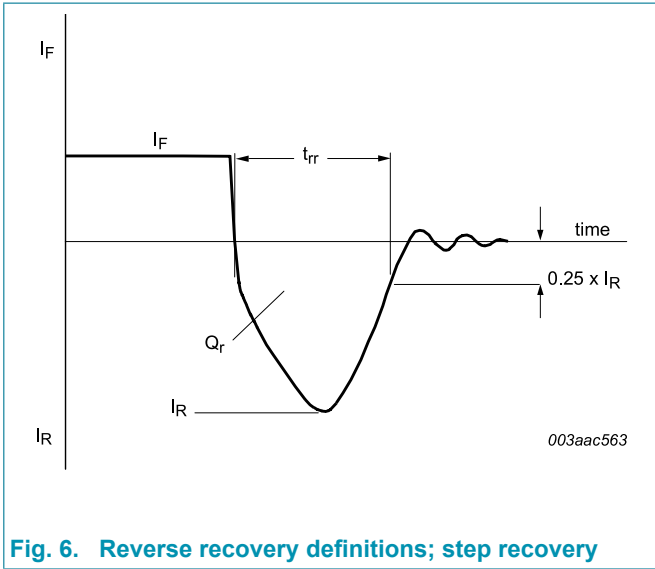


Fig. 6. Reverse recovery definitions; step recovery

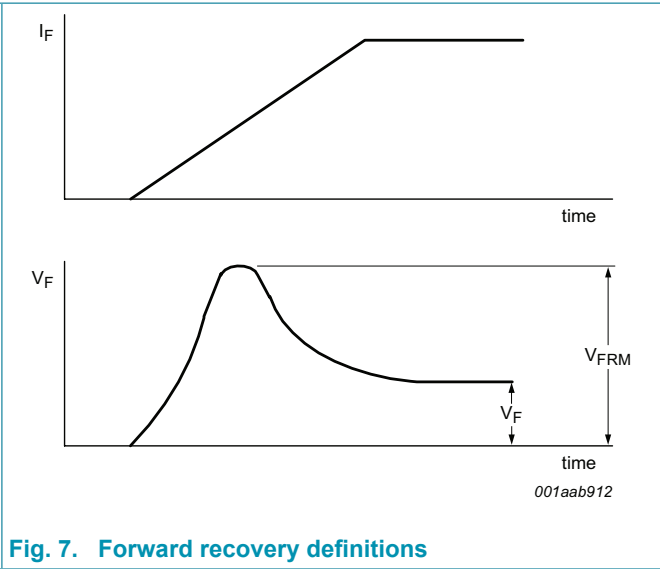
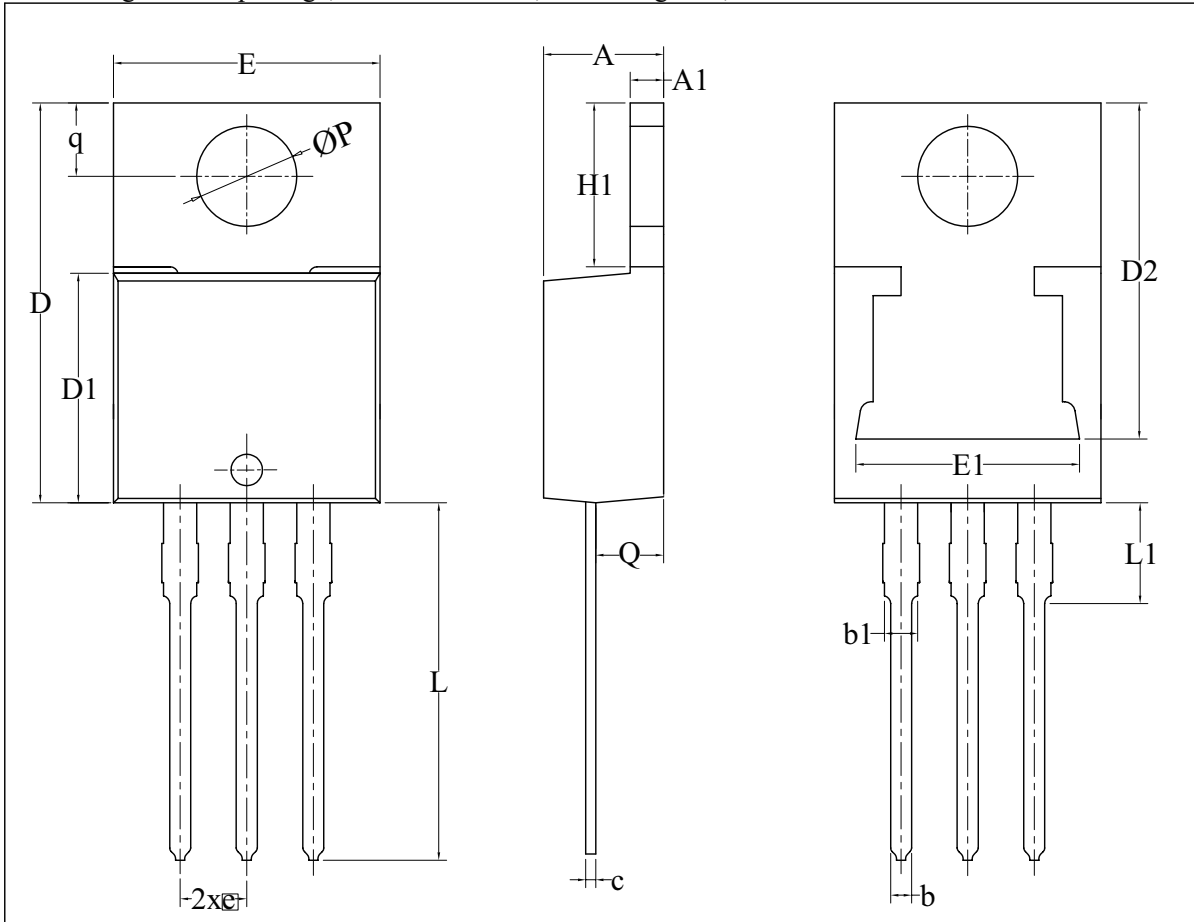


Fig. 7. Forward recovery definitions

11. Package outline

Assembly Factory: E

Plastic single-ended package; heatsink mounted; 1 mounting hole; 3 leads TO-220AB TO220

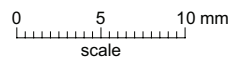
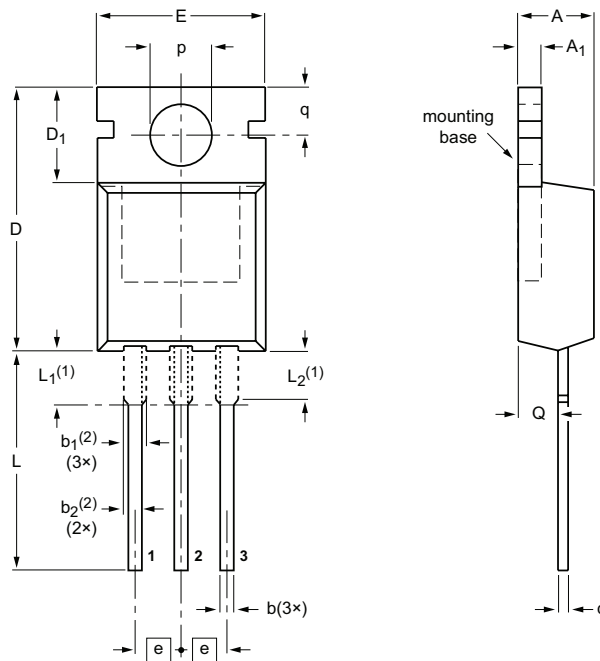


Unit	A	A1	b	b1	c	D	D1	D2	E	E1	e	H1	L	L1	P	Q	q
MM	min	4.35	1.14	0.69	1.20	0.36	14.95	8.50	12.20	10.00	8.25	6.00	13.00	3.40	3.70	2.40	2.60
	max	4.75	1.40	1.01	1.45	0.61	15.55	9.02	12.88	10.40	8.89	2.54 (BSC)	6.40	14.00	3.80	3.95	2.80

Assembly Factory: A & d

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

12. Revision history

Table 8. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
BYQ28E-200E v.7	20240125	Product data sheet	-	BYQ28E-200E v.6
Modifications:	Merged with BYQ28E-200			
BYQ28E-200E v.6	20201208	Product data sheet	-	BYQ28E-200E v.5
Modifications:	Update POD			
BYQ28E-200E v.5	20180605	Product data sheet	-	BYQ28E-200E v.4
Modifications:	Change from NXP version to WeEn version			
BYQ28E-200E v.4	20110714	Product data sheet	-	BYQ28E_SERIES v.3
Modifications:	<ul style="list-style-type: none"> • 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

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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