BYQ28ED-200

Rectifier diodes ultrafast, rugged

Rev.07 - 23 September 2019 Product data sheet

1. General description

Ultrafast, dual common cathode, epitaxial rectifier diodes in a TO252 (DPAK) 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

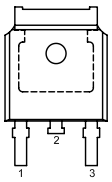
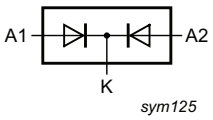
4. Quick reference data

Table 1. Quick reference data

Symbol	Parameter	Conditions	Values				Unit
Absolute maximum rating							
V_{RRM}	repetitive peak reverse voltage		200				V
$I_{O(AV)}$	average output current	δ = 0.5; square-wave pulse; $T_{mb} \leq 119$ °C; both diodes conducting; Fig. 5; Fig. 6	10				A
I_{FRM}	repetitive peak forward current	δ = 0.5; t_p = 25 µs; $T_{mb} \leq 119$ °C; square-wave pulse; per diode	10				A
I_{FSM}	non-repetitive peak forward current	t_p = 10 ms; sine-wave pulse; per diode	50				A
		t_p = 8.3 ms; sine-wave pulse; per diode	55				A
Symbol	**Parameter**	**Conditions**		**Min**	**Typ**	**Max**	**Unit**
Static characteristics							
V_F	forward voltage	I_F = 5 A; T_j = 25 °C; Fig. 2		-	0.95	1.1	V
		I_F = 5 A; T_j = 150 °C; Fig. 2		-	0.8	0.895	V
		I_F = 10 A; T_j = 25 °C; Fig. 2		-	1.1	1.25	V
Dynamic characteristics							
t_{rr}	reverse recovery time	ramp recovery; I_F = 1 A; V_R = 30 V; dI_F/dt = 100 A/µs; T_j = 25 °C; Fig. 3		-	15	25	ns
		step recovery; when switched from I_F = 0.5 A to I_R = 1 A; measured at I_R = 0.25 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 [1]		
3	A2	anode 2		
mb	K	mounting base; connected to cathode		

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

6. Ordering information

Table 3. Ordering information

Type number	Package Name	Orderable part number	Packing method	Small packing quantity	Package version	Package issue date
BYQ28ED-200	TO252	BYQ28ED-200, 118	Reel	2500	TO252N	14-Nov-2016

7. Marking

Table 4. Marking codes

Type number	Marking codes
BYQ28ED-200	Q28E20

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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	δ = 1.0; square-wave pulse;	200	V
$I_{O(AV)}$	average output current	δ = 0.5; square-wave pulse; $T_{mb} \leq 119$ °C; both diodes conducting; Fig. 6; Fig. 7	10	A
I_{FRM}	repetitive peak forward current	δ = 0.5; t_p = 25 µs; $T_{mb} \leq 119$ °C; square-wave pulse; per diode	10	A
I_{FSM}	non-repetitive peak forward current	t_p = 10 ms; sine-wave pulse; per diode; Fig. 3	50	A
		t_p = 8.3 ms; sine-wave pulse; per diode	55	A
I_{RM}	peak reverse recovery current	δ = 0.001; t_p = 2 µs	0.2	A
I_{RSM}	non-repetitive peak reverse current	t_p = 100 µs	0.2	A
T_{stg}	storage temperature		-40 to 150	°C
T_j	junction temperature		150	°C
Electrostatic discharge				
V_{ESD}	electrostatic discharge voltage	all pins; human body model; C = 250 pF; R = 1.5 kΩ	8	kV

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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 1		-	-	4.5	K/W
$R_{th(j-a)}$	thermal resistance from junction to ambient	in free air		-	60	-	K/W

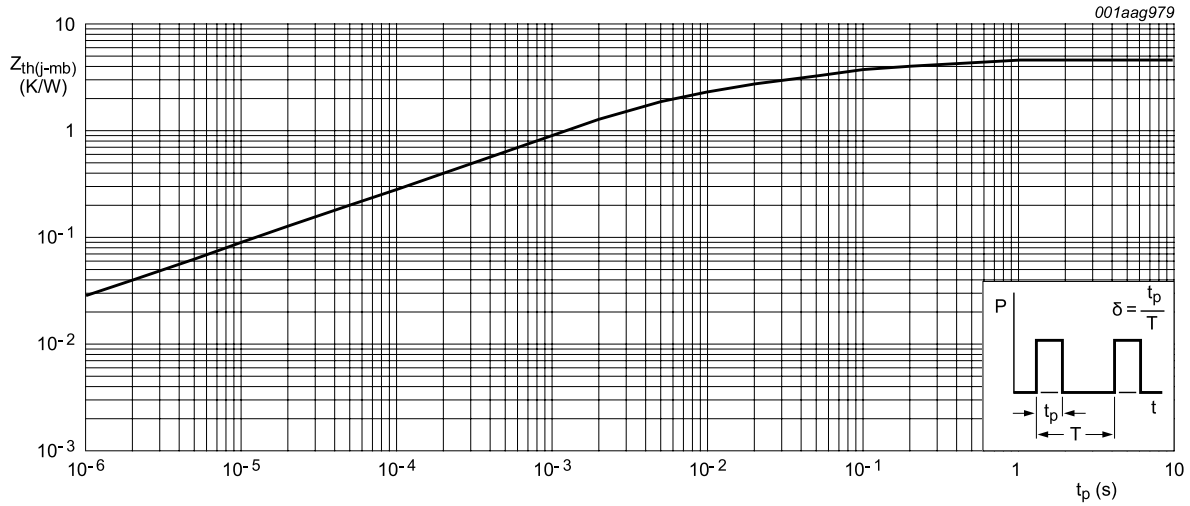


Fig. 1. Transient thermal impedance from junction to mounting base as a function of pulse width

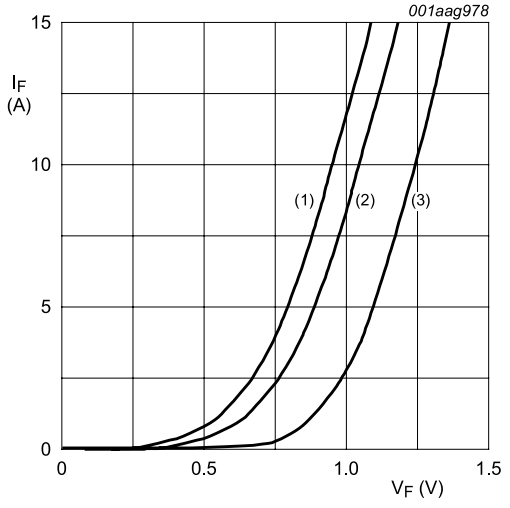
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10. Characteristics

Table 7. Characteristics

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
Static characteristics							
V_F	forward voltage	I_F = 5 A; T_j = 150 °C; Fig. 2		-	0.8	0.895	V
		I_F = 5 A; T_j = 25 °C; Fig. 2		-	0.95	1.1	V
		I_F = 10 A; T_j = 25 °C; Fig. 2		-	1.1	1.25	V
I_R	reverse current	V_R = 200 V; T_j = 25 °C		-	2	10	µA
		V_R = 200 V; T_j = 100 °C		-	0.1	0.2	mA
Dynamic characteristics							
Q_r	recovered charge	I_F = 2 A; V_R = 30 V; dI_F/dt = 20 A/µs; T_j = 25 °C; Fig. 4		-	4	9	nC
t_{rr}	reverse recovery time	ramp recovery; I_F = 1 A; V_R = 30 V; dI_F/dt = 100 A/µs; T_j = 25 °C; Fig. 4		-	15	25	ns
		step recovery; when switched from I_F = 0.5 A to I_R = 1 A; measured at I_R = 0.25 A		-	10	20	ns
I_{RM}	peak reverse recovery current	I_F = 5 A; V_R = 30 V; dI_F/dt = 50 A/µs; T_j = 25 °C; Fig. 4		-	0.5	0.7	A
V_{FR}	forward recovery voltage	I_F = 1 A; dI_F/dt = 10 A/µs; T_j = 25 °C; Fig. 5		-	1	-	V



(1) T_j = 150 °C; typical values
(2) T_j = 150 °C; maximum values
(3) T_j = 25 °C; maximum values

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

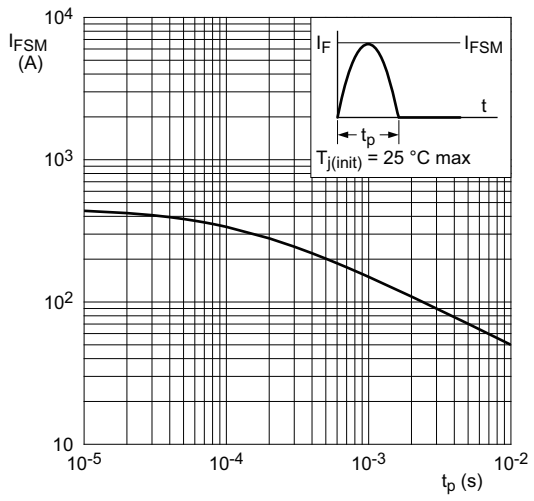


Fig. 3. Non-repetitive peak forward current as a function of pulse width; sinusoidal waveform; maximum values

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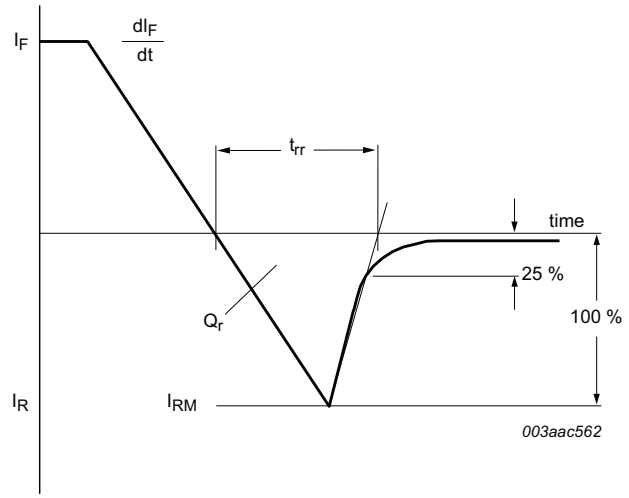


Fig. 4. Reverse recovery definitions; ramp recovery

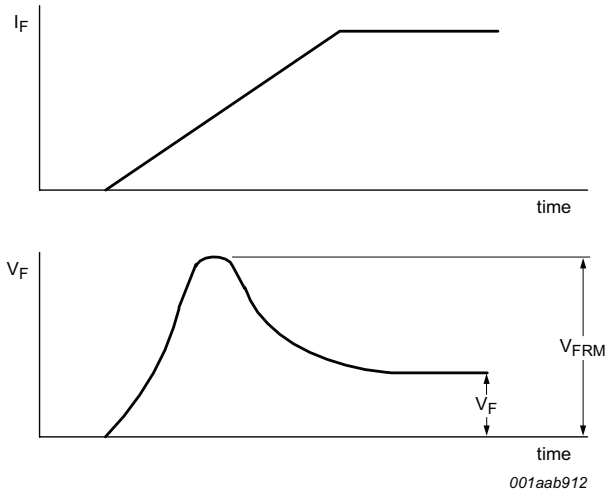
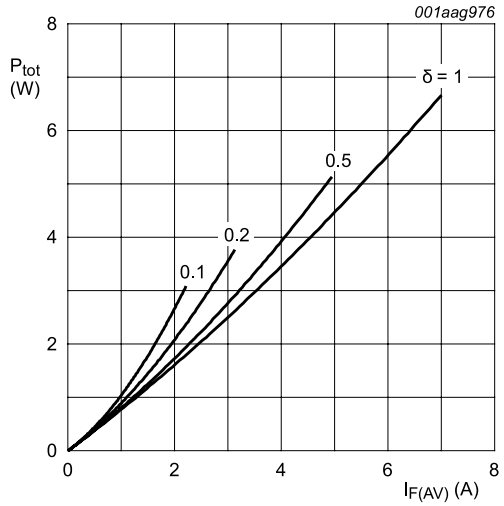
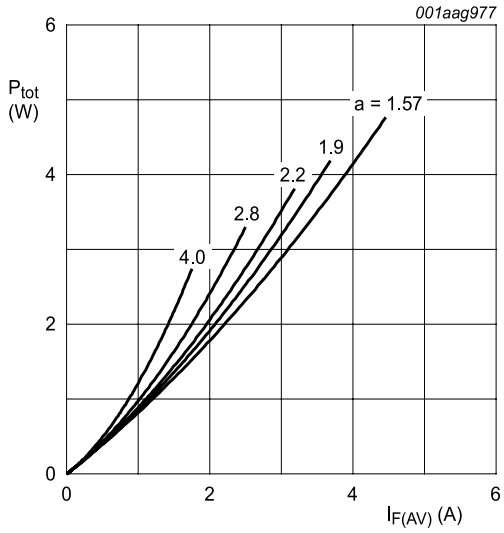


Fig. 5. Forward recovery definitions



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

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



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

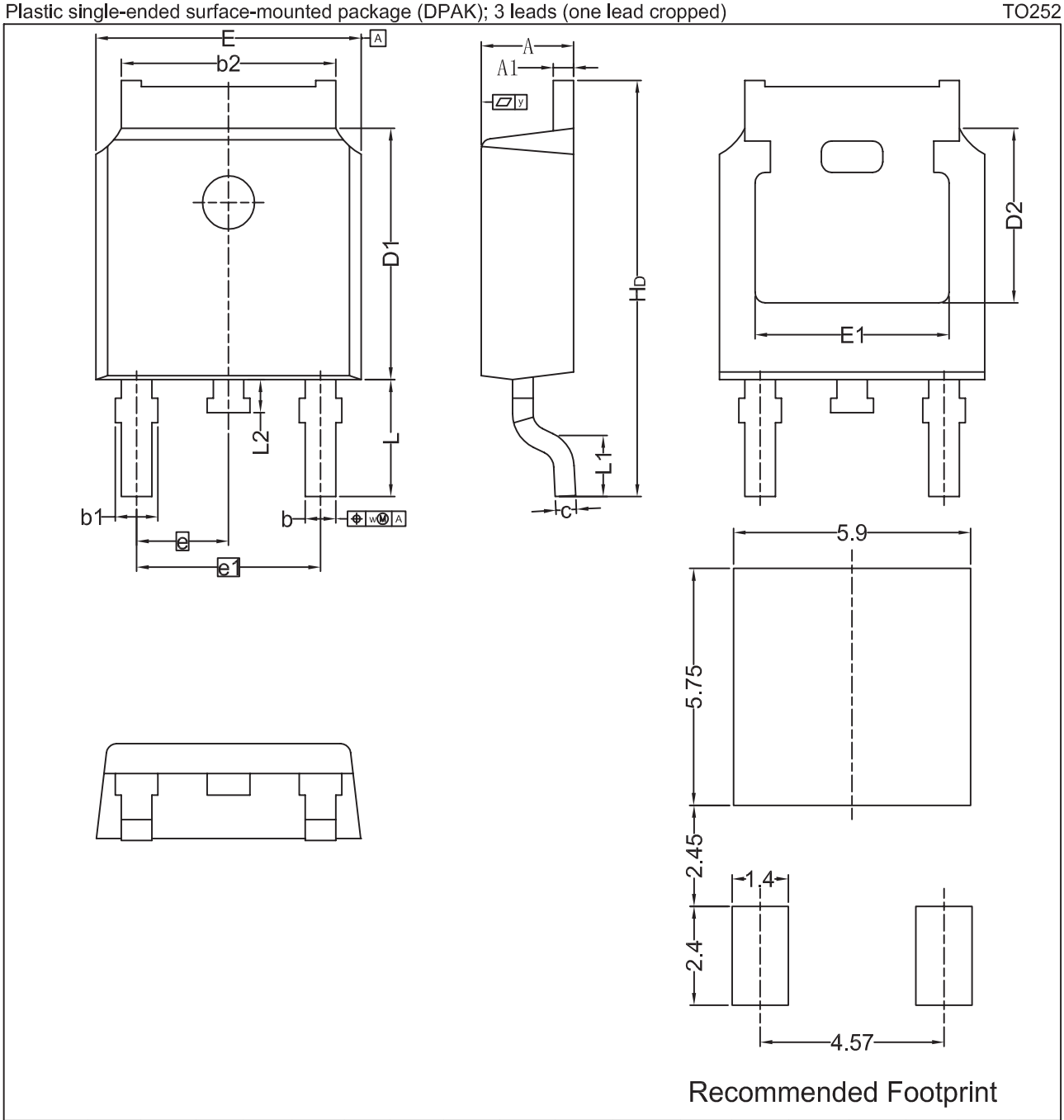
Fig. 7. Forward power dissipation as a function of average forward current; sinusoidal waveform; maximum values; per diode

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11. Package outline

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_D	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 (Ref.)	0.50	0.50	0.20	
mm nom																		
max	2.38	0.93	0.89	1.10	5.46	0.56	6.22	---	6.73	---			10.40		---	0.90		0.20

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12. Revision history

Table 8. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
BYQ28ED-200 v.7	20190923	Product data sheet	-	BYQ28ED-200 v.6
Modifications:	• Update Marking code. • Update ordering information.			
BYQ28ED-200 v.6	20181218	Product data sheet	-	BYQ28ED-200 v.5
Modifications:	Add IFSM figure.			
BYQ28ED-200 v.5	20180224	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:	• 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. • Limiting values table: some parameter descriptions amended to conform to latest standards; IFRM conditions amended; VESD row added. • Characteristics: Qrr changed to Qr 'recovered charge'; trr1 and trr2 changed to trr with 'ramp recovery' and 'step recovery' added to conditions.			
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	-	-

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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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