BYV21MB-650P

Ultrafast power diode

Rev.01 - 08 October 2023 Product data sheet

1. General description

Ultrafast power diode in a TO263 plastic package.

2. Features and benefits

- Low leakage current
- Low thermal resistance
- Low reverse recovery current
- Reduces switching losses in associated MOSFET or IGBT

3. Applications

- Active PFC in air conditioner/EV charger/PV
- Continuous Current Mode (CCM) Power Factor Correction (PFC)
- Half-bridge/full-bridge switched-mode power supplies

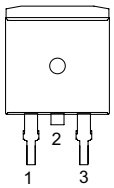
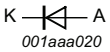
4. Quick reference data

Table 1. Quick reference data

Symbol	Parameter	Conditions	Notes	Values			Unit
Absolute maximum rating							
V_{RRM}	repetitive peak reverse voltage			650			V
$I_{F(AV)}$	average forward current	δ = 0.5 ; square-wave pulse; $T_{mb} \leq 105$ °C; Fig. 1; Fig. 2; Fig. 3		20			A
I_{FRM}	repetitive peak forward current	δ = 0.5 ; t_p = 25 µs; $T_{mb} \leq 105$ °C; square-wave pulse		40			A
I_{FSM}	non-repetitive peak forward current	t_p = 10 ms; $T_{j(init)}$ = 25 °C; sine-wave pulse; Fig. 4		180			A
		t_p = 8.3 ms; $T_{j(init)}$ = 25 °C; sine-wave pulse		198			A
Symbol	**Parameter**	**Conditions**	**Notes**	**Min**	**Typ**	**Max**	**Unit**
Static characteristics							
V_F	forward voltage	I_F = 20 A; T_j = 25 °C; Fig. 6		-	1.90	2.60	V
		I_F = 20 A; T_j = 150 °C; Fig. 6		-	1.50	2.20	V
Dynamic characteristics							
t_{rr}	reverse recovery time	I_F = 1 A; V_R = 30 V; dI_F/dt = 100 A/µs; T_j = 25 °C; Fig. 7		-	26	-	ns

5. Pinning information

Table 2. Pinning information

Pin	Symbol	Description	Simplified outline	Graphic symbol
1	nc	no connected		
2	K	cathode [1]		
3	A	anode		
mb	mb	mounting base; connected to cathode		

[1] It is not possible to connect to pin 2 of the TO-263 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
BYV21MB-650P	TO263	BYV21MB-650PJ	Reel	800	TO263d	17-Mar-2023

7. Marking

Table 4. Marking codes

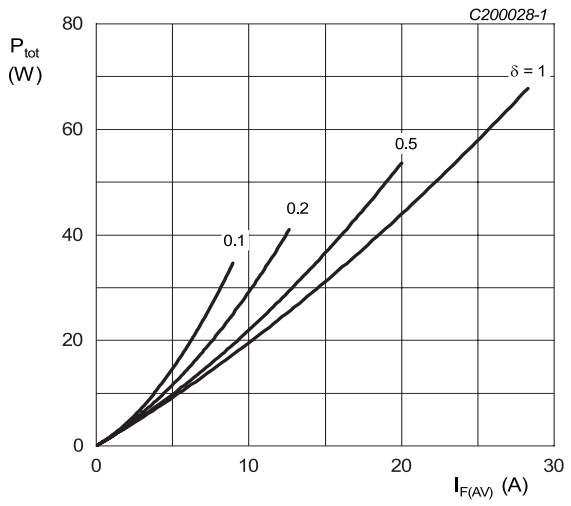
Type number	Marking codes
BYV21MB-650P	BYV21MB 650P

8. Limiting values

Table 5. Limiting values

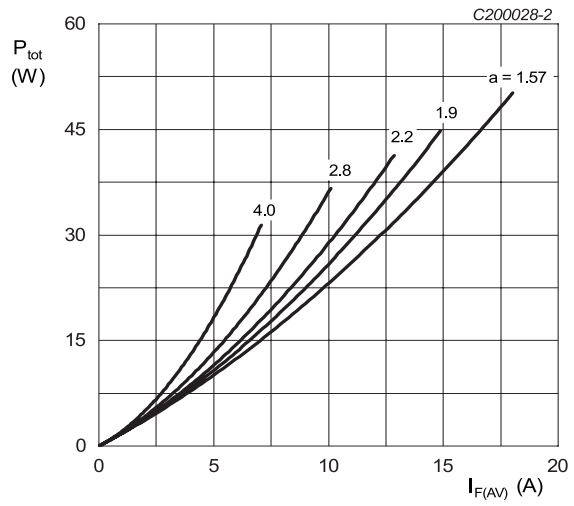
In accordance with the Absolute Maximum Rating System (IEC 60134).

Symbol	Parameter	Conditions	Notes	Values	Unit
V_{RRM}	repetitive peak reverse voltage			650	V
V_{RWM}	crest working reverse voltage			650	V
V_R	reverse voltage	DC		650	V
$I_{F(AV)}$	average forward current	δ = 0.5 ; square-wave pulse; $T_{mb} \leq 105$ °C; Fig. 1; Fig. 2; Fig. 3		20	A
I_{FRM}	repetitive peak forward current	δ = 0.5 ; t_p = 25 µs; $T_{mb} \leq 105$ °C; square-wave pulse		40	A
I_{FSM}	non-repetitive peak forward current	t_p = 10 ms; $T_{j(init)}$ = 25 °C; sine-wave pulse; Fig. 4		180	A
		t_p = 8.3 ms; $T_{j(init)}$ = 25 °C; sine-wave pulse		198	A
T_{stg}	storage temperature			-65 to 175	°C
T_j	junction temperature			-65 to 175	°C



$I_{F(AV)} = I_{F(RMS)} \times \sqrt{\delta}$
V_o = 1.714 V; R_s = 0.0241 Ω

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



a = form factor = $I_{F(RMS)} / I_{F(AV)}$
V_o = 1.714 V; R_s = 0.0241 Ω

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

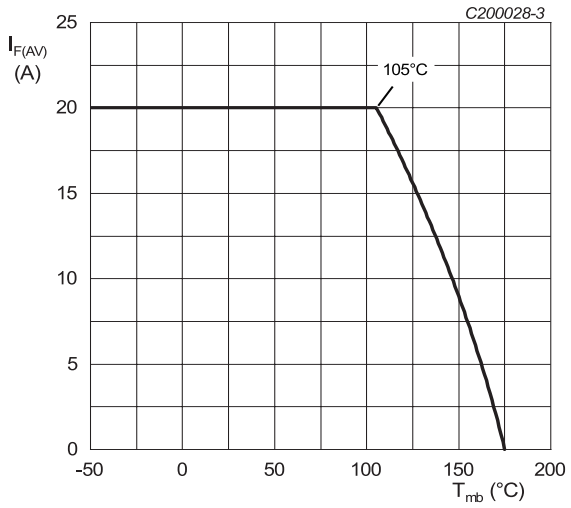


Fig. 3. Forward current as a function of mounting base temperature; maximum values

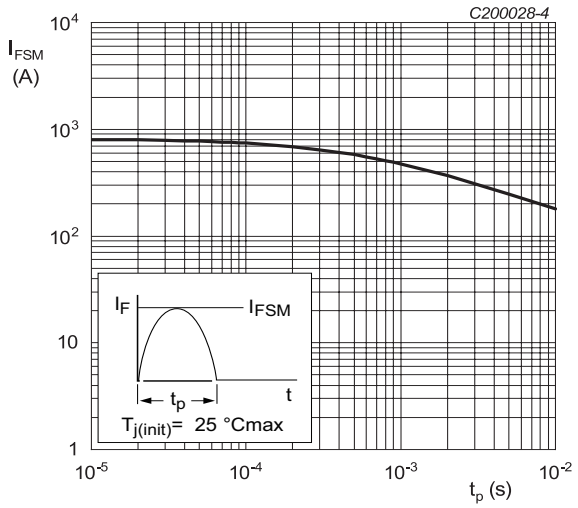


Fig. 4. Non-repetitive peak forward current as a function of pulse width; sinusoidal waveform; maximum values

9. Thermal characteristics

Table 6. Thermal characteristics

Symbol	Parameter	Conditions	Notes	Min	Typ	Max	Unit
$R_{th(j-mb)}$	thermal resistance from junction to mounting base	Fig. 5		-	-	1.3	K/W
$R_{th(j-a)}$	thermal resistance from junction to ambient free air	in free air		-	60	-	K/W

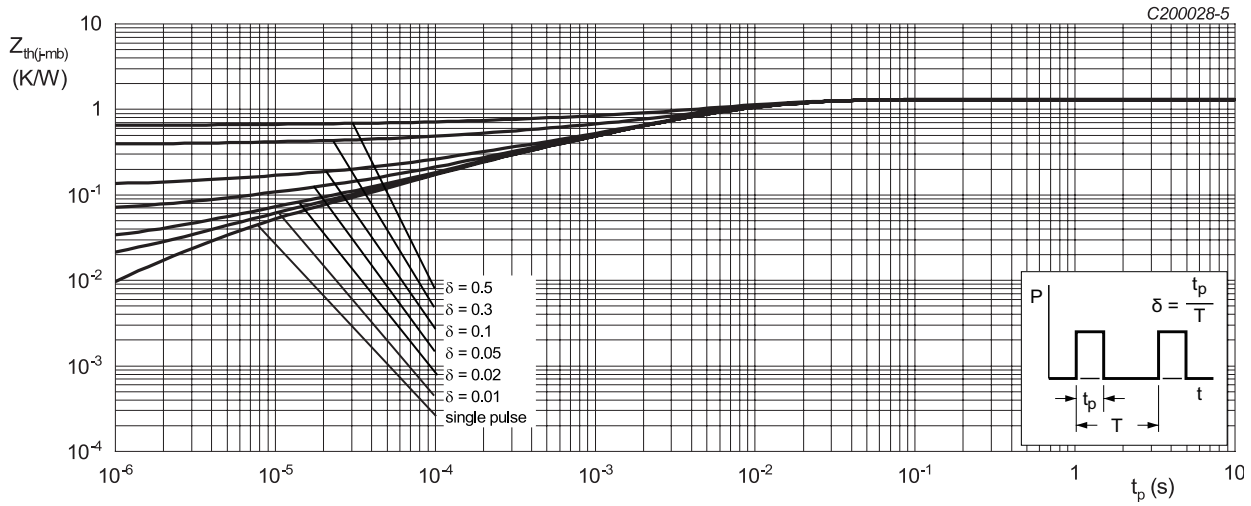
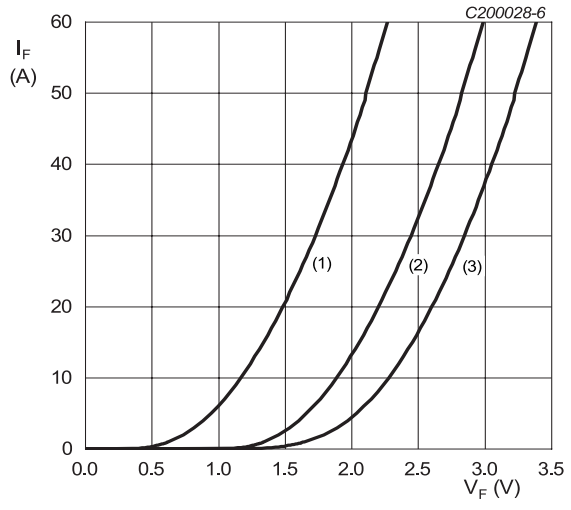


Fig. 5. Transient thermal impedance from junction to mounting base as a function of pulse duration

10. Characteristics

Table 7. Characteristics

Symbol	Parameter	Conditions	Notes	Min	Typ	Max	Unit
Static characteristics							
V_F	forward voltage	I_F = 20 A; T_j = 25 °C; Fig. 6		-	1.90	2.60	V
		I_F = 20 A; T_j = 150 °C; Fig. 6		-	1.50	2.20	V
I_R	reverse current	V_R = 650 V; T_j = 25 °C		-	0.5	30	µA
		V_R = 650 V; T_j = 150 °C		-	-	0.8	mA
Dynamic characteristics							
Q_r	reverse charge	I_F = 20 A; V_R = 200 V; dI_F/dt = 200 A/µs; T_j = 25 °C; Fig. 7		-	85	-	nC
		I_F = 20 A; V_R = 200 V; dI_F/dt = 200 A/µs; T_j = 125 °C; Fig. 7		-	350	-	nC
t_{rr}	reverse recovery time	I_F = 1 A; V_R = 30 V; dI_F/dt = 100 A/µs; T_j = 25 °C; Fig. 7		-	26	-	ns
		I_F = 20 A; V_R = 200 V; dI_F/dt = 200 A/µs; T_j = 25 °C; Fig. 7		-	50	-	ns
		I_F = 20 A; V_R = 200 V; dI_F/dt = 200 A/µs; T_j = 125 °C; Fig. 7		-	90	-	ns
I_{RM}	peak reverse recovery currentnon-repetitive avalanche energy	I_F = 20 A; V_R = 200 V; dI_F/dt = 200 A/µs; T_j = 25 °C; Fig. 7		-	3.6	-	A
		I_F = 20 A; V_R = 200 V; dI_F/dt = 200 A/µs; T_j = 125 °C; Fig. 7		-	7.5	-	A
E_{as}	non-repetitive avalanche energy	T_j = 25 °C		16.8	-	-	mJ



V_o = 1.714 V; R_s = 0.0241 Ω
(1) T_j = 150 °C; typical values
(2) T_j = 150 °C; maximum values
(3) T_j = 25 °C; maximum values

Fig. 6. Forward current as a function of forward voltage

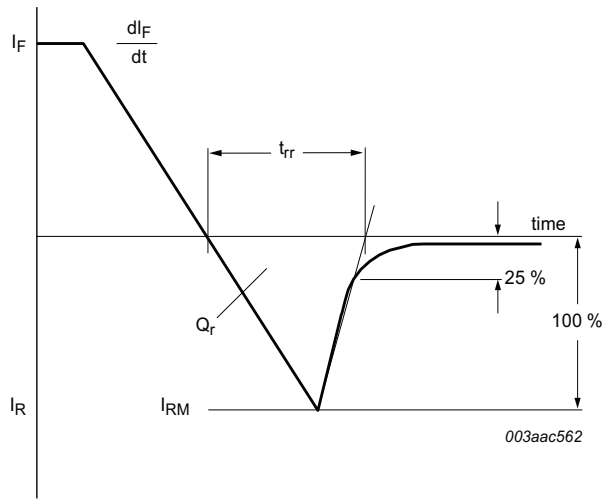
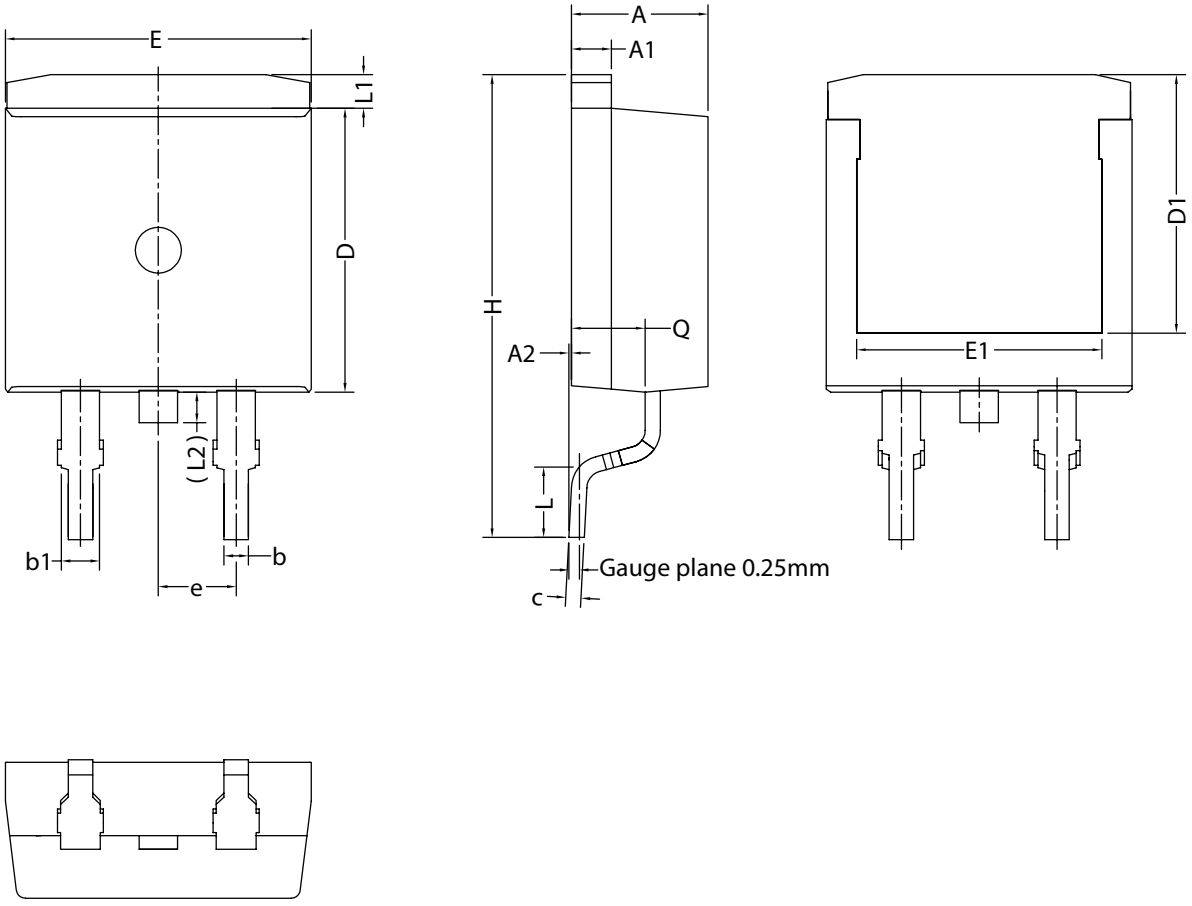


Fig. 7. Reverse recovery definitions; ramp recovery

11. Package outline

Plastic single-ended surface-mounted package (D2PAK); TO263



Note:
All dimensions do not include mold flash or protrusion.

Unit		A	A1	A2	b	b1	c	D	D1	e	E	E1	H	L	L1	L2	Q
MM	min	4.30	1.27	0.00	0.75	1.20	0.45	9.00	7.65	2.54 (BSC)	9.85	7.80	14.84	1.90	0.90	--	2.20
	max	4.60	1.37	0.25	0.90	1.36	0.60	9.45	8.05		10.10	8.20	15.64	2.60	1.35	1.50	2.40

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Document status [1][2]	Product status [3]	Definition
Objective [short] data sheet	Development	This document contains data from the objective specification for product development.
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