

1. General description

Ultrafast power diode in a TO252 (DPAK) plastic package



2. Features and benefits

- Fast switching
- Low leakage current
- Low reverse recovery current
- Low thermal resistance
- Reduces switching losses in associated MOSFET or IGBT
- Package meets UL94 V0 which guaranteed by Epoxy Mold Compound

3. Applications

- Active PFC in air conditioner
- High frequency switched-mode power supplies
- Power Factor Correction (PFC)

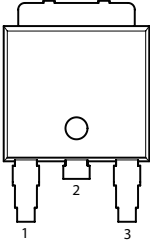
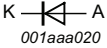
4. Quick reference data

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} ≤ 114 °C; Fig. 1 ; Fig. 2 ; Fig. 3		10			A
I _{FRM}	repetitive peak forward current	δ = 0.5 ; t _p = 25 μs; T _{mb} ≤ 114 °C; square-wave pulse		20			A
I _{FSM}	non-repetitive peak forward current	t _p = 10 ms; T _{j(init)} = 25 °C; sine-wave pulse; Fig. 4		95			A
		t _p = 8.3 ms; T _{j(init)} = 25 °C; sine-wave pulse		104.5			A
Symbol	Parameter	Conditions	Notes	Min	Typ	Max	Unit
Static characteristics							
V _F	forward voltage	I _F = 10 A; T _j = 25 °C; Fig. 6		-	1.43	2.00	V
		I _F = 10 A; T _j = 150 °C; Fig. 6		-	1.20	1.60	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		-	27	-	ns

5. Pinning information

Table 2. Pinning information

Pin	Symbol	Description	Simplified outline	Graphic symbol
1	n.c.	not connected		
2	K	cathode [1]		
3	A	anode		
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
BYV10MED-650P	TO252	BYV10MED-650PJ	Reel	2500	TO252d	07-Sep-2022

7. Marking

Table 4. Marking codes

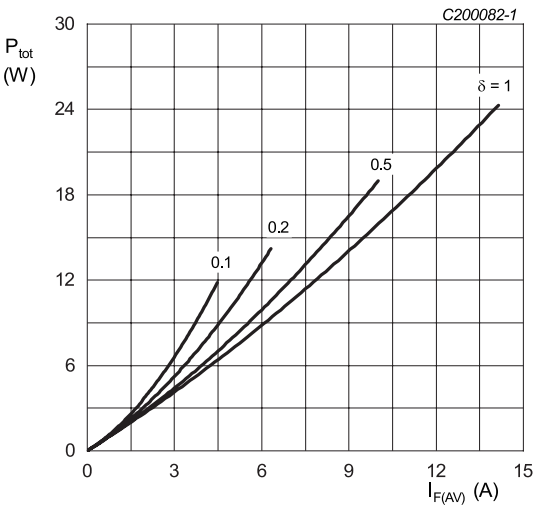
Type number	Marking codes
BYV10MED-650P	BYV10MED 650P

8. Limiting values

Table 5. Limiting values

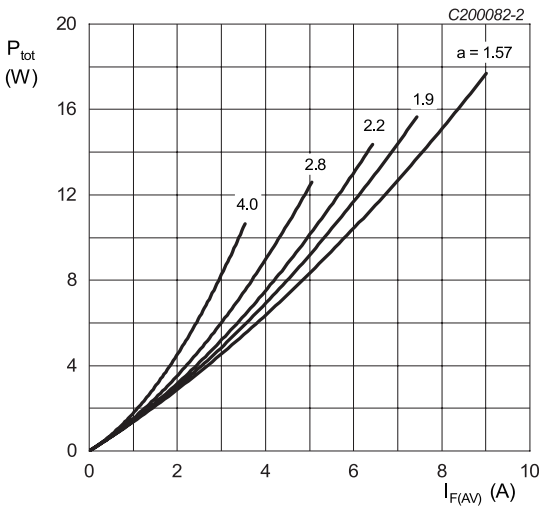
In accordance with the Absolute Maximum Rating System (IEC 60134).

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	$\delta = 0.5$; square-wave pulse; $T_{mb} \leq 114\text{ }^{\circ}\text{C}$; Fig. 1 ; Fig. 2 ; Fig. 3		10	A
I_{FRM}	repetitive peak forward current	$\delta = 0.5$; $t_p = 25\text{ }\mu\text{s}$; $T_{mb} \leq 114\text{ }^{\circ}\text{C}$; square-wave pulse		20	A
I_{FSM}	non-repetitive peak forward current	$t_p = 10\text{ ms}$; $T_{j(\text{init})} = 25\text{ }^{\circ}\text{C}$; sine-wave pulse; Fig. 4		95	A
		$t_p = 8.3\text{ ms}$; $T_{j(\text{init})} = 25\text{ }^{\circ}\text{C}$; sine-wave pulse		104.5	A
T_{stg}	storage temperature			-65 to 175	$^{\circ}\text{C}$
T_j	junction temperature			-65 to 175	$^{\circ}\text{C}$



$I_{F(AV)} = I_{F(RMS)} \times \sqrt{\delta}$
 $V_o = 1.288\text{ V}$; $R_s = 0.0304\text{ }\Omega$

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



$a = \text{form factor} = I_{F(RMS)} / I_{F(AV)}$
 $V_o = 1.288\text{ V}$; $R_s = 0.0304\text{ }\Omega$

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

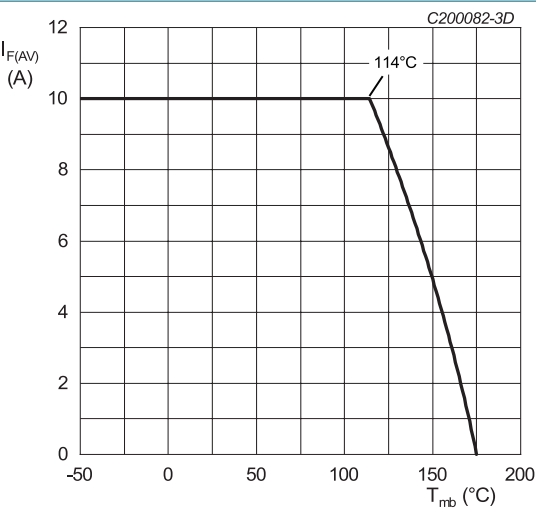


Fig. 3. Forward current as a function of mounting base temperature; maximum values

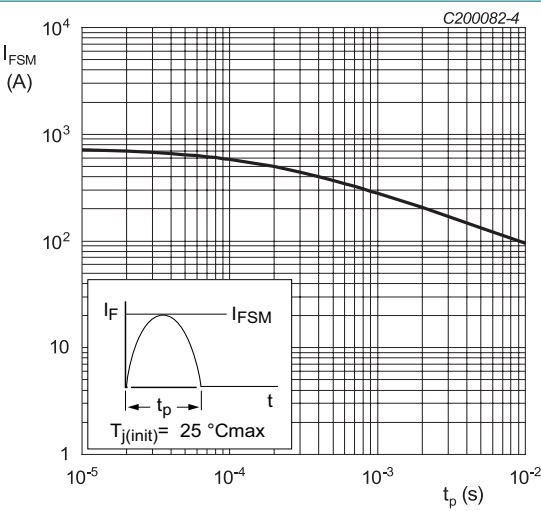


Fig. 4. Non-repetitive peak forward current as a function of pulse width; sinusoidal waveform; maximum values

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		-	-	3.2	K/W
$R_{th(j-a)}$	thermal resistance from junction to ambient free air	in free air	[2]	-	50	-	K/W

[2] Device mounted on an FR4 PCB, single-sided copper, tin plated and standard footprint.

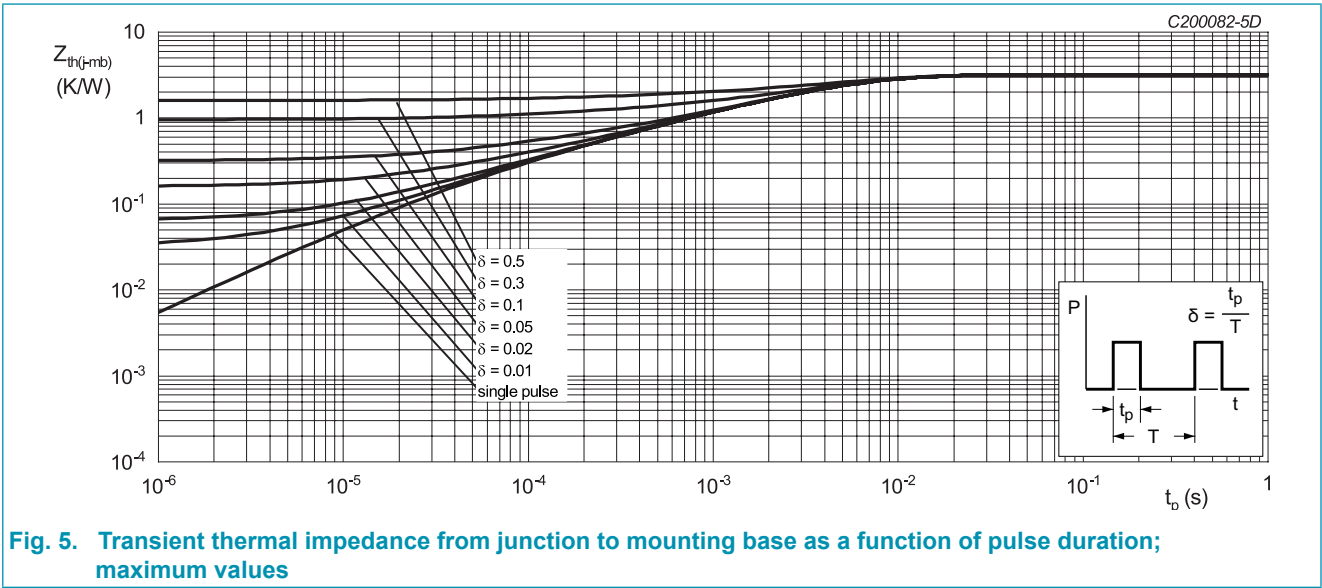
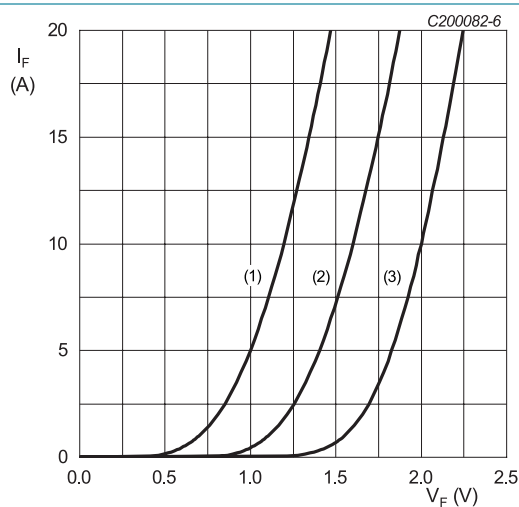


Fig. 5. Transient thermal impedance from junction to mounting base as a function of pulse duration; maximum values

10. Characteristics

Table 7. Characteristics

Symbol	Parameter	Conditions	Notes	Min	Typ	Max	Unit
Static characteristics							
V _F	forward voltage	I _F = 10 A; T _J = 25 °C; Fig. 6		-	1.43	2.00	V
		I _F = 10 A; T _J = 150 °C; Fig. 6		-	1.20	1.60	V
I _R	reverse current	V _R = 600 V; T _J = 25 °C		-	0.13	8	μA
		V _R = 600 V; T _J = 150 °C		-	-	0.4	mA
		V _R = 650 V; T _J = 25 °C		-	0.27	30	μA
		V _R = 650 V; T _J = 150 °C		-	-	0.5	mA
Dynamic characteristics							
Q _r	reverse charge	I _F = 10 A; V _R = 200 V; dI _F /dt = 200 A/μs; T _J = 25 °C; Fig. 7		-	141	-	nC
		I _F = 10 A; V _R = 200 V; dI _F /dt = 200 A/μs; T _J = 125 °C; Fig. 7		-	357	-	nC
t _{rr}	reverse recovery time	I _F = 0.5 A; I _R = 1 A; I _{rr} = 0.25 A; T _J = 25 °C		-	30	-	ns
		I _F = 1 A; V _R = 30 V; dI _F /dt = 100 A/μs; T _J = 25 °C; Fig. 7		-	27	-	ns
		I _F = 10 A; V _R = 200 V; dI _F /dt = 200 A/μs; T _J = 25 °C; Fig. 7		-	53	-	ns
		I _F = 10 A; V _R = 200 V; dI _F /dt = 200 A/μs; T _J = 125 °C; Fig. 7		-	84	-	ns
I _{RM}	peak reverse recovery current	I _F = 10 A; V _R = 200 V; dI _F /dt = 200 A/μs; T _J = 25 °C; Fig. 7		-	5.3	-	A
		I _F = 10 A; V _R = 200 V; dI _F /dt = 200 A/μs; T _J = 125 °C; Fig. 7		-	8.5	-	A
E _{as}	non-repetitive analanche energy	T _{J(init)} = 25 °C		20	-	-	mJ



$V_o = 1.288\text{ V}$; $R_s = 0.0304\ \Omega$
 (1) $T_j = 150\text{ °C}$; typical values
 (2) $T_j = 150\text{ °C}$; maximum values
 (3) $T_j = 25\text{ °C}$; maximum values

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

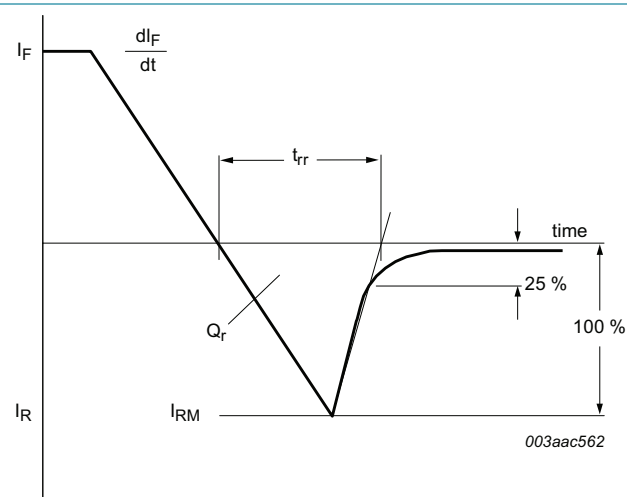


Fig. 7. Reverse recovery definitions; ramp recovery

11. Package outline

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

TO252

The technical drawing illustrates the package outline from three perspectives: top, side, and bottom. The top view shows a rectangular body with a central circular feature and three leads extending from the bottom. Dimensions labeled include E (total width), D (body height), L (lead length), J (lead thickness), b (lead width), b1 (lead width at base), b2 (lead width at top), e (lead pitch), and e1 (lead spacing). The side view shows the profile of the package with dimensions A (total height), c (lead height), A2 (body height), A1 (lead height), and J (lead thickness). A note indicates the gauge plane is 0.508mm from the bottom. The bottom view shows the underside of the package with dimensions E1 (total width), D1 (body height), and D2 (lead height).

Note:

1. All dimensions do not include mold flash & gate remain and metal protrusion.

Unit	A	A1	A2	b	b1	b2	c	D	D1	D2	E	E1	e	e1	L	L1
mm	2.16	0.00	0.90	0.70	0.86	1.06	0.46	5.97	5.05	0.98	6.45	5.20	2.30	4.60	2.60	1.25
min																
nom																
max	2.41	0.10	1.10	0.90	1.11	1.32	0.58	6.22	5.35	1.18	6.75	5.40			2.90	1.65

12. Legal information

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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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