



# BYV34-500

## Dual ultrafast power diodes

4 June 2014

Product data sheet

### 1. General description

Dual ultrafast power diodes in a SOT78 (TO-220AB) plastic package.

### 2. Features and benefits

- Fast switching
- High thermal cycling performance
- Low forward voltage drop
- Low switching loss
- Low thermal resistance
- Soft recovery characteristic

### 3. Applications

- Discontinuous Current Mode (DCM) Power Factor Correction (PFC)
- Output rectifiers in high-frequency switched-mode power supplies

### 4. Quick reference data

Table 1. Quick reference data

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$V_{RRM}$	repetitive peak reverse voltage		-	-	500	V
$I_{O(AV)}$	average output current	SQW; $\delta = 0.5$ ; $T_{mb} \leq 115$ °C; both diodes conducting; <a href="#">Fig. 1</a> ; <a href="#">Fig. 2</a>	-	-	20	A
<b>Static characteristics</b>						
$V_F$	forward voltage	$I_F = 10$ A; $T_j = 150$ °C; <a href="#">Fig. 4</a>	-	0.87	1.05	V
<b>Dynamic characteristics</b>						
$t_{rr}$	reverse recovery time	$I_F = 1$ A; $V_R = 30$ V; $dI_F/dt = 100$ A/ $\mu$ s; $T_j = 25$ °C; <a href="#">Fig. 7</a> ; <a href="#">Fig. 5</a>	-	50	60	ns

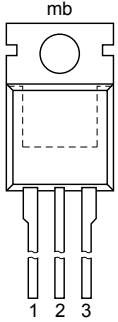
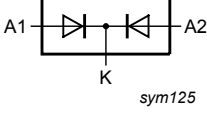


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## 5. Pinning information

Table 2. Pinning information

Pin	Symbol	Description	Simplified outline	Graphic symbol
1	A1	anode 1	 <p><b>TO-220AB (SOT78)</b></p>	 <p><i>sym125</i></p>
2	K	cathode		
3	A2	anode 2		

## 6. Ordering information

Table 3. Ordering information

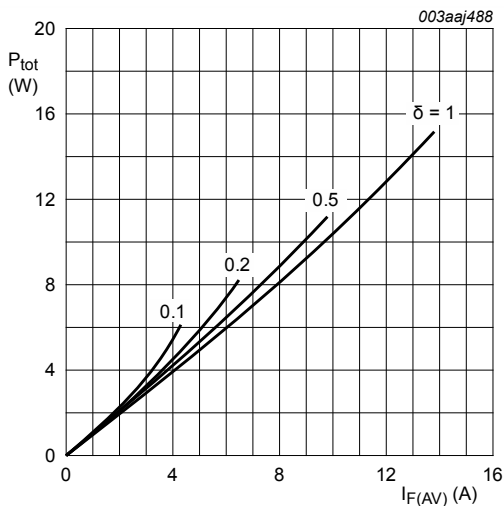
Type number	Package		
	Name	Description	Version
BYV34-500	TO-220AB	plastic single-ended package; heatsink mounted; 1 mounting hole; 3-lead TO-220AB	SOT78

## 7. Limiting values

**Table 4. Limiting values**

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

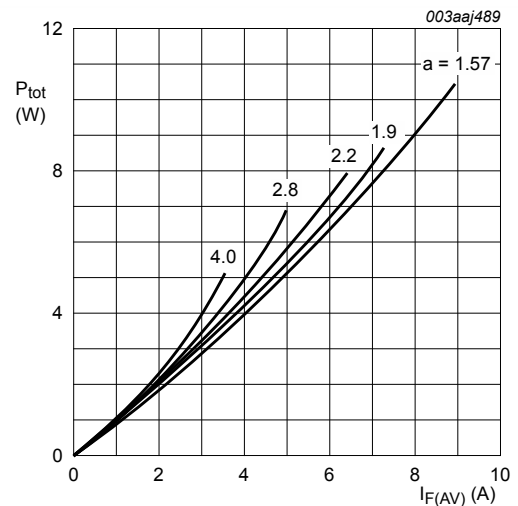
Symbol	Parameter	Conditions	Min	Max	Unit
$V_{RRM}$	repetitive peak reverse voltage		-	500	V
$V_{RWM}$	crest working reverse voltage		-	500	V
$V_R$	reverse voltage	$T_{mb} \leq 138\text{ }^\circ\text{C}$ ; DC	-	500	V
$I_{O(AV)}$	average output current	SQW; $\delta = 0.5$ ; $T_{mb} \leq 115\text{ }^\circ\text{C}$ ; both diodes conducting; <a href="#">Fig. 1</a> ; <a href="#">Fig. 2</a>	-	20	A
$I_{FRM}$	repetitive peak forward current	SQW; $\delta = 0.5$ ; $t_p = 25\text{ }\mu\text{s}$ ; $T_{mb} \leq 115\text{ }^\circ\text{C}$ ; per diode	-	20	A
$I_{FSM}$	non-repetitive peak forward current	SIN; $t_p = 10\text{ ms}$ ; $T_{j(\text{init})} = 25\text{ }^\circ\text{C}$ ; per diode	-	120	A
		SIN; $t_p = 8.3\text{ ms}$ ; $T_{j(\text{init})} = 25\text{ }^\circ\text{C}$ ; per diode	-	132	A
$T_{stg}$	storage temperature		-40	150	$^\circ\text{C}$
$T_j$	junction temperature		-	150	$^\circ\text{C}$



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

$$V_o = 0.94\text{ V}; R_s = 0.01\text{ }\Omega$$

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



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

$$V_o = 0.94\text{ V}; R_s = 0.01\text{ }\Omega$$

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

### 8. Thermal characteristics

Table 5. Thermal characteristics

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$R_{th(j-mb)}$	thermal resistance from junction to mounting base	with heatsink compound; per diode; <a href="#">Fig. 3</a>	-	-	2.4	K/W
		with heatsink compound; both diodes conducting	-	-	1.6	K/W
$R_{th(j-a)}$	thermal resistance from junction to ambient	in free air	-	60	-	K/W

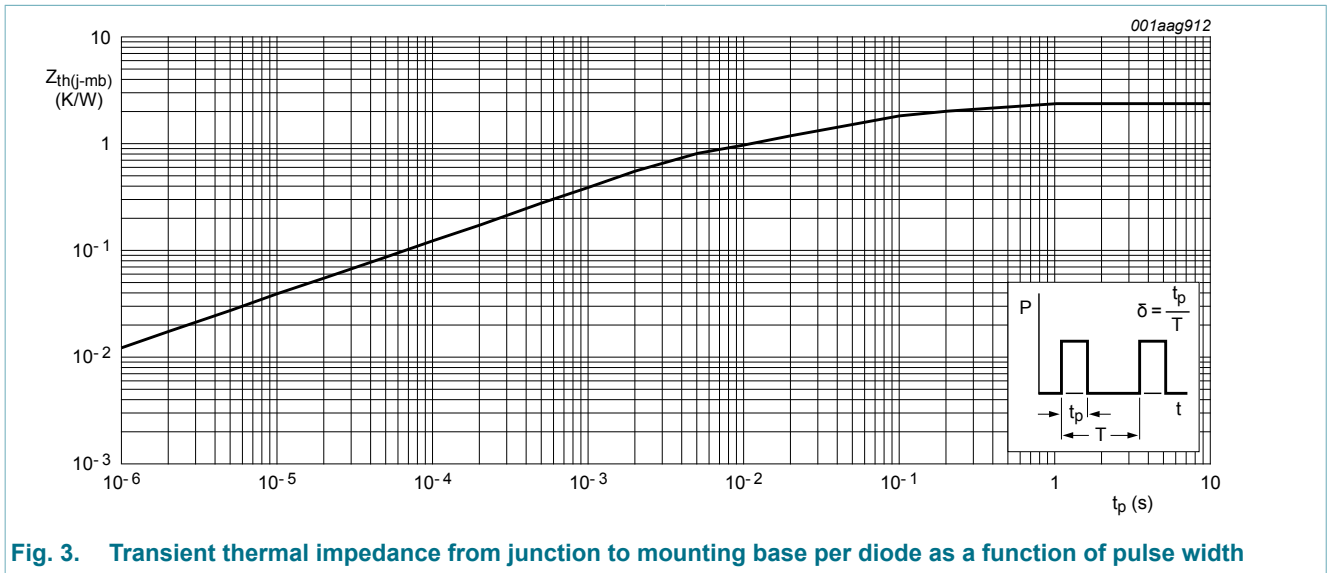
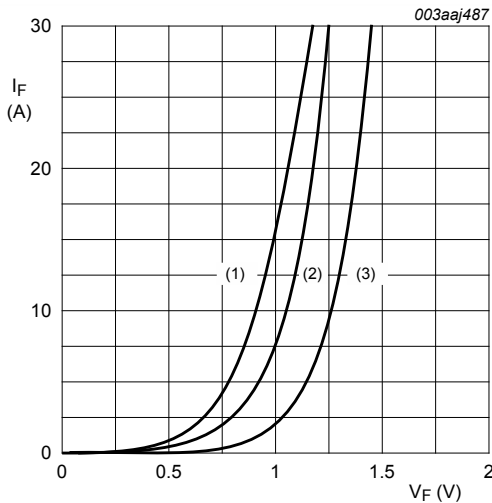


Fig. 3. Transient thermal impedance from junction to mounting base per diode as a function of pulse width

### 9. Characteristics

Table 6. Characteristics

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
<b>Static characteristics</b>						
V <sub>F</sub>	forward voltage	I <sub>F</sub> = 20 A; T <sub>j</sub> = 25 °C; Fig. 4	-	1.1	1.35	V
		I <sub>F</sub> = 10 A; T <sub>j</sub> = 150 °C; Fig. 4	-	0.87	1.05	V
I <sub>R</sub>	reverse current	V <sub>R</sub> = 500 V; T <sub>j</sub> = 25 °C	-	10	50	μA
		V <sub>R</sub> = 500 V; T <sub>j</sub> = 100 °C	-	0.2	0.6	mA
<b>Dynamic characteristics</b>						
Q <sub>r</sub>	recovered charge	I <sub>F</sub> = 2 A; V <sub>R</sub> = 30 V; dI <sub>F</sub> /dt = 20 A/s; T <sub>j</sub> = 25 °C; Fig. 5; Fig. 6	-	50	60	nC
t <sub>rr</sub>	reverse recovery time	I <sub>F</sub> = 1 A; V <sub>R</sub> = 30 V; dI <sub>F</sub> /dt = 100 A/μs; T <sub>j</sub> = 25 °C; Fig. 7; Fig. 5	-	50	60	ns
I <sub>RM</sub>	peak reverse recovery current	I <sub>F</sub> = 10 A; V <sub>R</sub> = 30 V; dI <sub>F</sub> /dt = 50 A/μs; T <sub>j</sub> = 100 °C; Fig. 8; Fig. 5	-	4	5	A
V <sub>FRM</sub>	forward recovery voltage	I <sub>F</sub> = 10 A; dI <sub>F</sub> /dt = 10 A/μs; T <sub>j</sub> = 25 °C; Fig. 9	-	2.5	-	V



V<sub>0</sub> = 0.94 V; R<sub>s</sub> = 0.01 Ω  
 (1) T<sub>j</sub> = 150 °C; typical values  
 (2) T<sub>j</sub> = 150 °C; maximum values  
 (3) T<sub>j</sub> = 25 °C; maximum values

Fig. 4. Forward current as a function of forward voltage; per diode

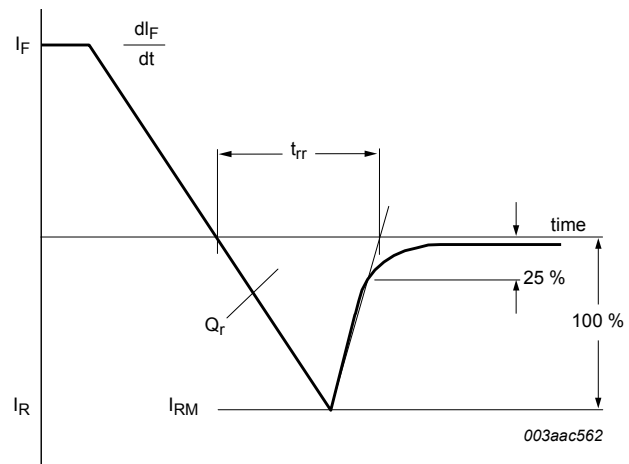
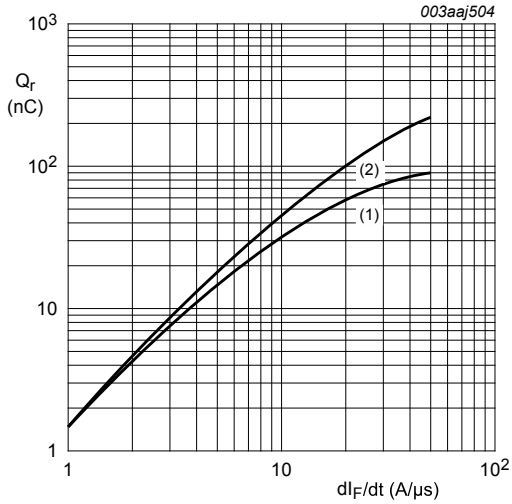
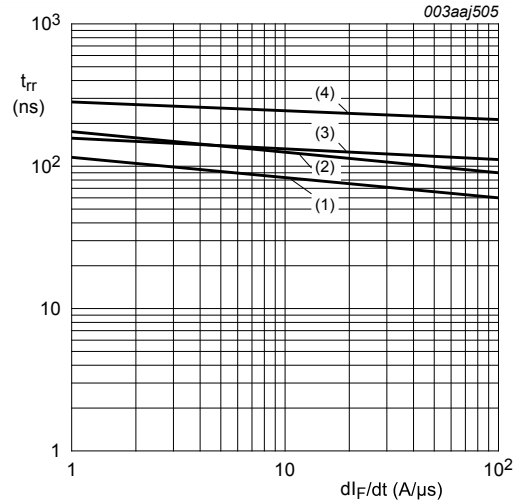


Fig. 5. Reverse recovery definitions; ramp recovery



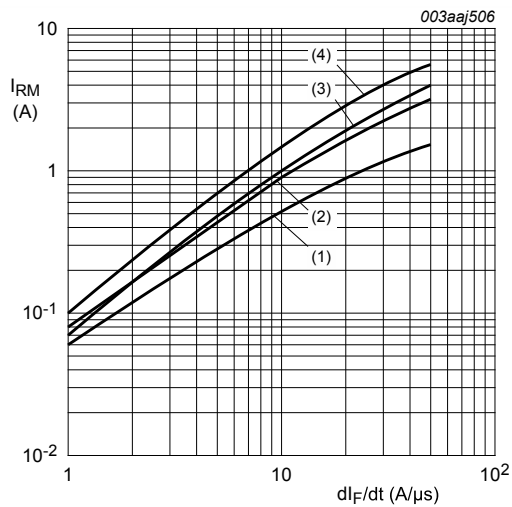
- (1)  $I_F = 2 \text{ A}; T_j = 25 \text{ }^\circ\text{C}$
- (2)  $I_F = 20 \text{ A}; T_j = 25 \text{ }^\circ\text{C}$

**Fig. 6. Recovered charge as a function of rate of change of forward current; per diode; maximum values**



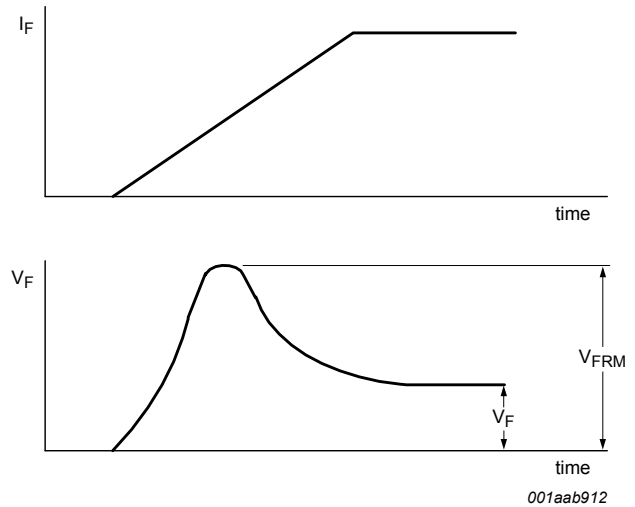
- (1)  $I_F = 1 \text{ A}; T_j = 25 \text{ }^\circ\text{C}$
- (2)  $I_F = 1 \text{ A}; T_j = 100 \text{ }^\circ\text{C}$
- (3)  $I_F = 20 \text{ A}; T_j = 25 \text{ }^\circ\text{C}$
- (4)  $I_F = 20 \text{ A}; T_j = 100 \text{ }^\circ\text{C}$

**Fig. 7. Reverse recovery time as a function of rate of change of forward current; per diode; maximum values**



- (1)  $I_F = 1 \text{ A}; T_j = 25 \text{ }^\circ\text{C}$
- (2)  $I_F = 1 \text{ A}; T_j = 100 \text{ }^\circ\text{C}$
- (3)  $I_F = 20 \text{ A}; T_j = 25 \text{ }^\circ\text{C}$
- (4)  $I_F = 20 \text{ A}; T_j = 100 \text{ }^\circ\text{C}$

**Fig. 8. Peak reverse recovery current as a function of rate of change of forward current; per diode; maximum values**

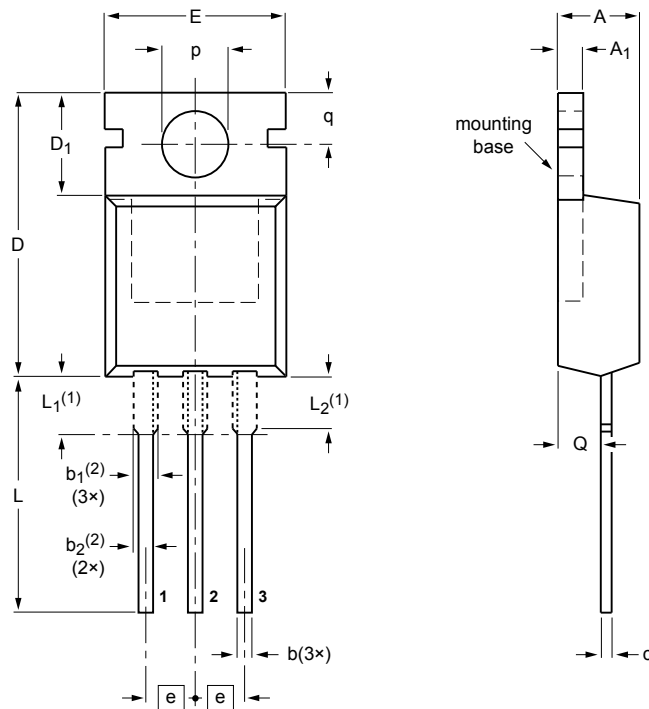


**Fig. 9. Forward recovery definitions**

### 10. Package outline

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 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

Fig. 10. Package outline TO-220AB (SOT78)

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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.

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- [2] The term 'short data sheet' is explained in section "Definitions".
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