

## 1. General description

Dual ultrafast power diodes in a TO220 plastic package.

## 2. Features and benefits

- Low forward voltage drop
- Low leakage current
- Soft reverse recovery characteristics
- High thermal cycling performance

## 3. Applications

- Home appliance power supply
- Discontinuous Current Mode (DCM) Power Factor Correction (PFC)

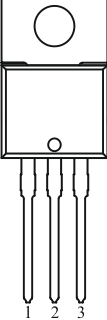
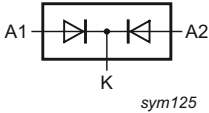
## 4. Quick reference data

Table 1. Quick reference data

Symbol	Parameter	Conditions	Values			Unit
<b>Absolute maximum rating</b>						
$V_R$	repetitive peak reverse voltage	DC	600			V
$I_{O(AV)}$	average forward current	$\delta = 0.5$ ; $T_{mb} \leq 124$ °C; square-wave pulse; both diodes conducting	20			A
$I_{FRM}$	repetitive peak forward current	$\delta = 0.5$ ; $t_p = 25$ $\mu$ s; $T_{mb} \leq 140$ °C; square-wave pulse; per diode	20			A
$I_{FSM}$	non-repetitive peak forward current	$t_p = 10$ ms; $T_{j(imit)} = 25$ °C; sine-wave pulse; per diode; <a href="#">Fig. 4</a>	120			A
		$t_p = 8.3$ ms; $T_{j(imit)} = 25$ °C; sine-wave pulse; per diode	132			A
Symbol	Parameter	Conditions	Min	Typ	Max	Unit
<b>Static characteristics</b>						
$V_F$	forward voltage	$I_F = 10$ A; $T_j = 25$ °C; per diode; <a href="#">Fig. 6</a>	-	1.3	1.7	V
		$I_F = 10$ A; $T_j = 150$ °C; per diode; <a href="#">Fig. 6</a>	-	1.0	1.35	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; per diode; <a href="#">Fig. 7</a>	-	30	50	ns
		$I_F = 1$ A; $V_R = 30$ V; $dI_F/dt = 50$ A/ $\mu$ s; $T_j = 25$ °C; per diode; <a href="#">Fig. 7</a>	-	40	55	ns
		$I_F = 0.5$ A; $I_{rr} = 0.25$ A; $I_R = 1$ A; $T_j = 25$ °C; per diode	-	-	35	ns

## 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; connected to 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
BYV410-600P	TO220	BYV410-600PQ	Tube	50	TO220E	26-April-2019

## 7. Marking

Table 4. Marking codes

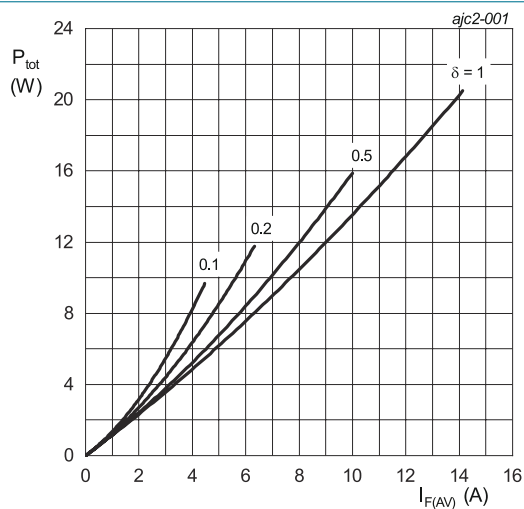
Type number	Marking codes
BYV410-600P	BYV410-600P

### 8. Limiting values

**Table 5. Limiting values**

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

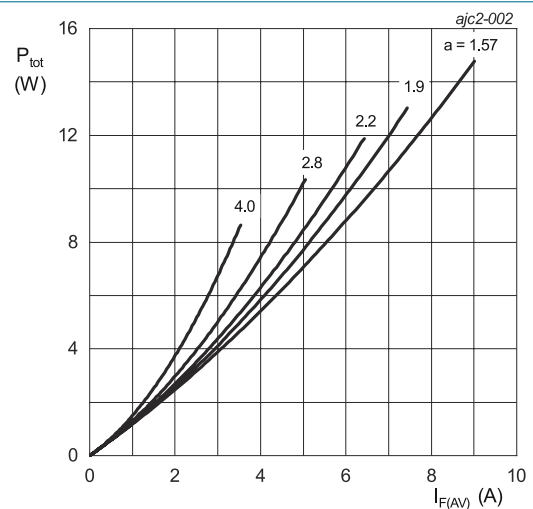
Symbol	Parameter	Conditions	Values	Unit
$V_{RRM}$	repetitive peak reverse voltage		600	V
$V_{RWM}$	crest working reverse voltage		600	V
$V_R$	reverse voltage	DC	600	V
$I_{O(AV)}$	average forward current	$\delta = 0.5$ ; $T_{mb} \leq 124\text{ }^\circ\text{C}$ ; square-wave pulse; both diodes conducting; Fig. 1; Fig. 2; Fig. 3	20	A
$I_{FRM}$	repetitive peak forward current	$\delta = 0.5$ ; $t_p = 25\text{ }\mu\text{s}$ ; $T_{mb} \leq 140\text{ }^\circ\text{C}$ ; square-wave pulse; per diode	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; per diode; Fig. 4	120	A
		$t_p = 8.3\text{ ms}$ ; $T_{j(\text{init})} = 25\text{ }^\circ\text{C}$ ; sine-wave pulse; per diode	132	A
$T_{stg}$	storage temperature		-55 to 175	$^\circ\text{C}$
$T_j$	junction temperature		175	$^\circ\text{C}$



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

$$V_o = 1.119\text{ V}; R_s = 0.0235\text{ }\Omega$$

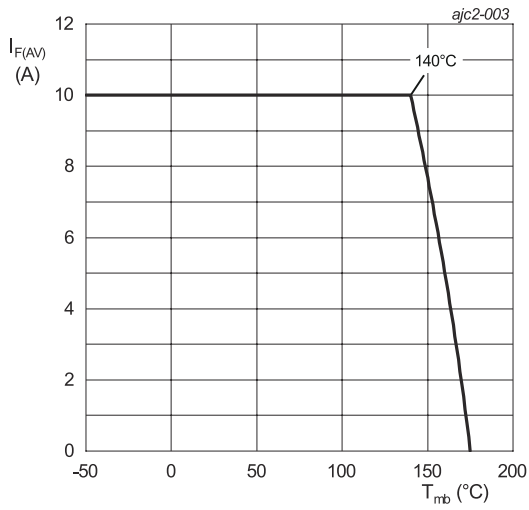
**Fig. 1. Forward power dissipation as a function of average forward current; square waveform; maximum values; per diode**



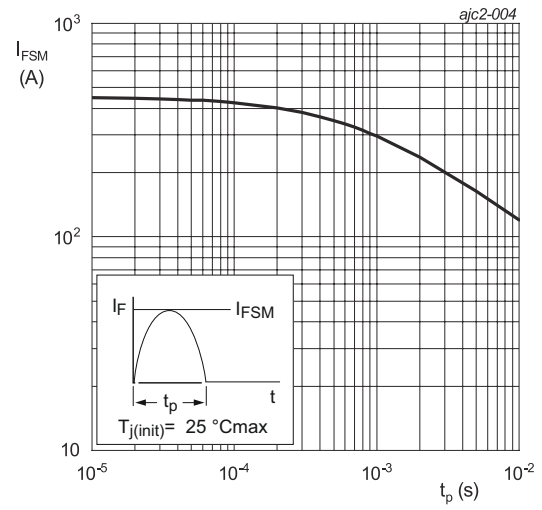
$$a = \text{form factor} = I_{F(RMS)} / I_{F(AV)}$$

$$V_o = 1.119\text{ V}; R_s = 0.0235\text{ }\Omega$$

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



**Fig. 3. Current derating as a function of mounting base temperature; per diode**

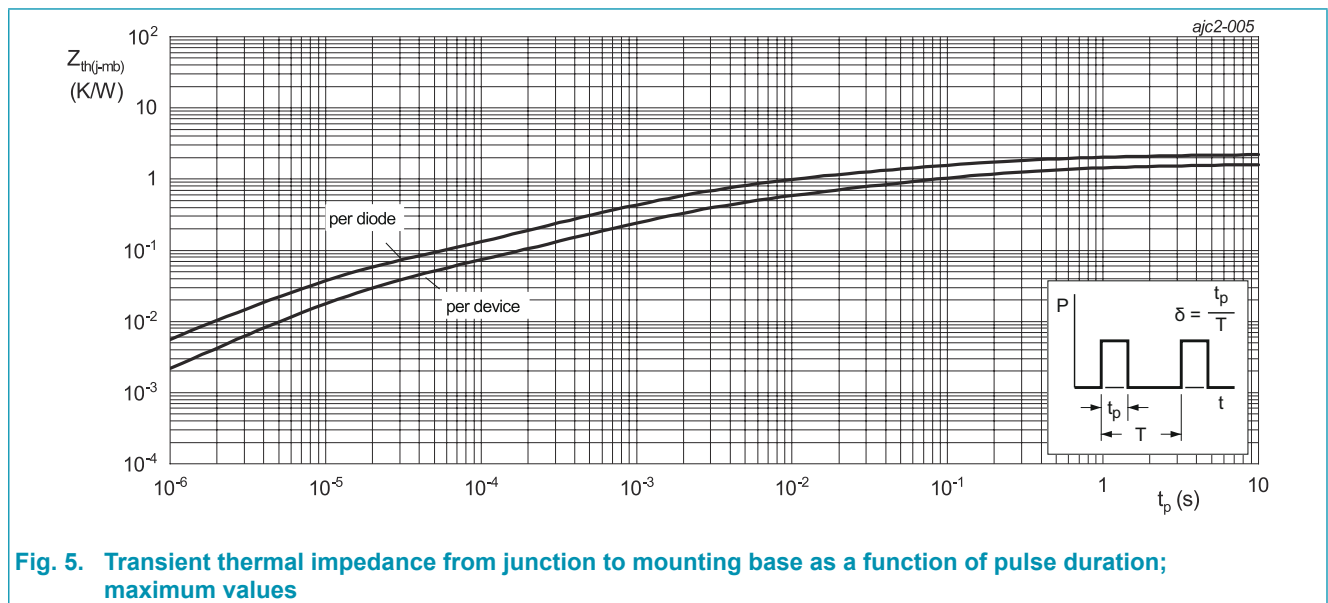


**Fig. 4. Non-repetitive peak forward current as a function of pulse width; sinusoidal waveform; maximum values; per diode**

## 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; per diode; <a href="#">Fig. 5</a>	-	-	2.2	K/W
		with heatsink compound; both diodes conducting; <a href="#">Fig. 5</a>	-	-	1.6	K/W
$R_{th(j-a)}$	thermal resistance from junction to ambient free air	in free air	-	55	-	K/W

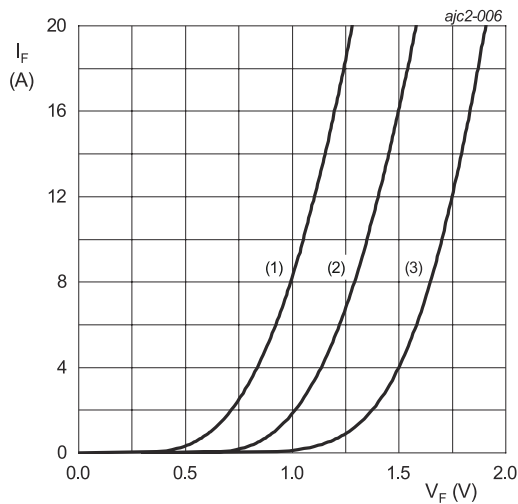


**Fig. 5. Transient thermal impedance from junction to mounting base as a function of pulse duration; maximum values**

### 10. Characteristics

Table 7. Characteristics

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
<b>Static characteristics</b>						
V <sub>F</sub>	forward voltage	I <sub>F</sub> = 10 A; T <sub>J</sub> = 25 °C; Fig. 6	-	1.3	1.7	V
		I <sub>F</sub> = 10 A; T <sub>J</sub> = 150 °C; Fig. 6	-	1.0	1.35	V
I <sub>R</sub>	reverse current	V <sub>R</sub> = 600 V; T <sub>J</sub> = 25 °C	-	1	10	µA
		V <sub>R</sub> = 600 V; T <sub>J</sub> = 150 °C	-	0.1	0.5	mA
<b>Dynamic characteristics</b>						
Q <sub>r</sub>	recovered charge	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; per diode; Fig. 7	-	22	-	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; per diode; Fig. 7	-	30	50	ns
		I <sub>F</sub> = 1 A; V <sub>R</sub> = 30 V; dI <sub>F</sub> /dt = 50 A/µs; T <sub>J</sub> = 25 °C; per diode; Fig. 7	-	40	55	ns
		I <sub>F</sub> = 0.5 A; I <sub>rr</sub> = 0.25 A; I <sub>R</sub> = 1 A; T <sub>J</sub> = 25 °C; per diode	-	-	35	ns
I <sub>RM</sub>	peak reverse recovery current	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; per diode; Fig. 7	-	1.6	-	A
		I <sub>F</sub> = 1 A; V <sub>R</sub> = 30 V; dI <sub>F</sub> /dt = 50 A/µs; T <sub>J</sub> = 25 °C; per diode; Fig. 7	-	1.1	-	A
E <sub>as</sub>	non-repetitive avalanche energy	I <sub>R</sub> = 4.8 A; T <sub>J(init)</sub> = 25 °C; L = 15 mH	130	175	-	mJ



(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  
 V<sub>0</sub> = 1.119 V; R<sub>s</sub> = 0.0235 Ω

Fig. 6. Forward current as a function of forward voltage, per diode

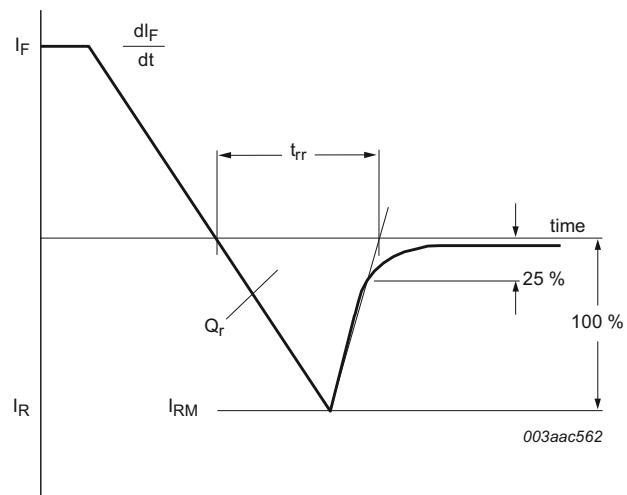
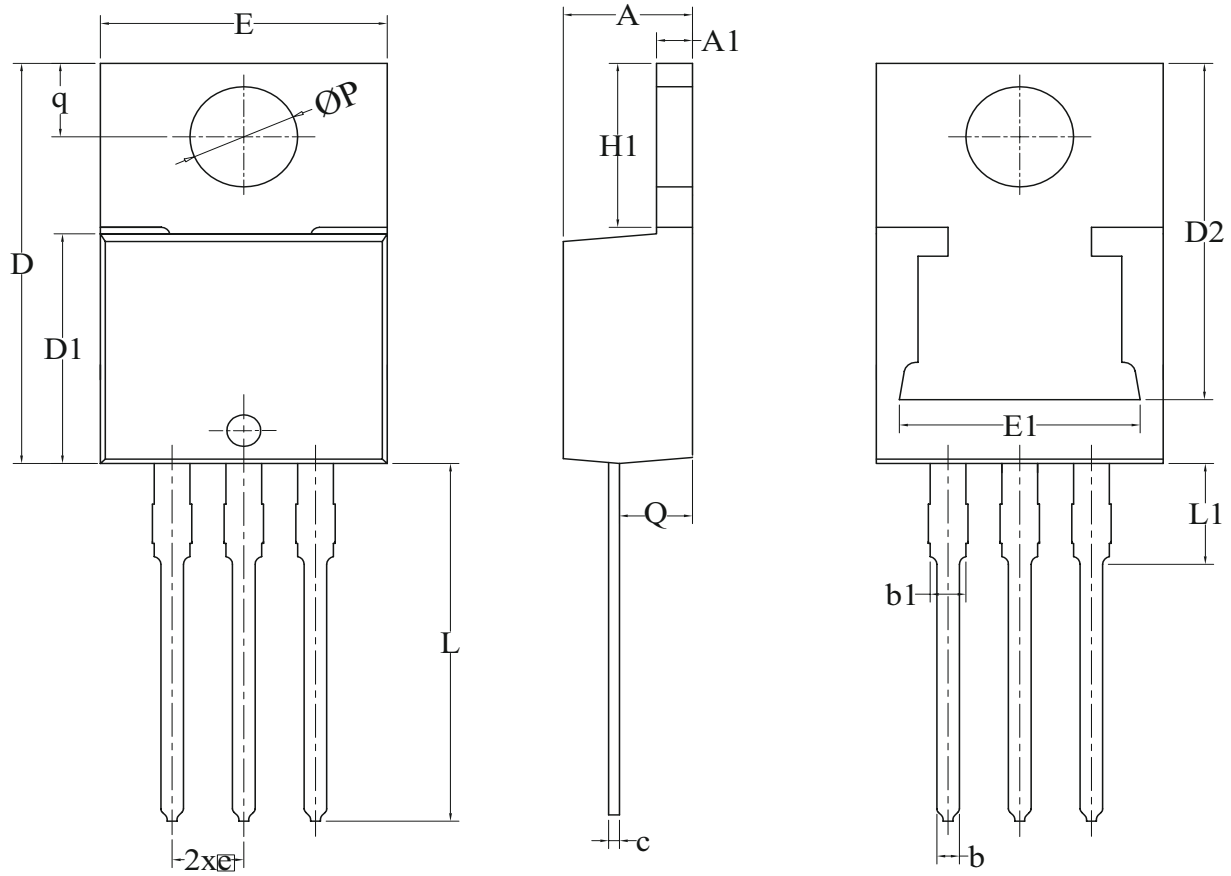


Fig. 7. Reverse recovery definitions; ramp recovery

**11. Package outline**

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	6.40	14.00	3.80	3.95	2.80	3.00

## 12. 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.
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Date of release: 20 November 2019

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