BYV410X-600P

Dual ultrafast power diodes

Rev.01 - 20 June 2018 Product data sheet

1. General description

Ultrafast power diode in a SOT186A 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)

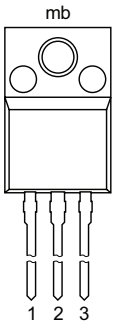
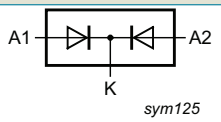
4. Quick reference data

Table 1. Quick reference data

Symbol	Parameter	Conditions	Values				Unit
Absolute maximum rating							
V_{RRM}	repetitive peak reverse voltage		600				V
$I_{O(AV)}$	average output current	δ = 0.5 ; square-wave pulse; $T_h \leq 65$ °C; both diodes conducting; Fig. 1; Fig. 2; Fig. 3	20				A
I_{FRM}	repetitive peak forward current	δ = 0.5 ; t_p = 25 µs; $T_h \leq 97$ °C; square-wave pulse ; per diode	20				A
I_{FSM}	non-repetitive peak forward current	t_p = 10 ms; $T_{j(init)}$ = 25 °C; sine-wave pulse; per diode; Fig. 4	120				A
		t_p = 8.3 ms; $T_{j(init)}$ = 25 °C; sine-wave pulse; per diode	132				A
Symbol	**Parameter**	**Conditions**		**Min**	**Typ**	**Max**	**Unit**
Static characteristics							
V_F	forward voltage	I_F = 10 A; T_j = 25 °C; per diode; Fig. 6		-	1.3	1.7	V
		I_F = 10 A; T_j = 150 °C; per diode; Fig. 6		-	1.0	1.35	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; per diode; Fig. 7		-	30	50	ns

5. Pinning information

Table 2. Pinning information

Pin	Symbol	Description	Simplified outline	Graphic symbol
1	A	anode		
2	K	cathode		
3	A	anode		
mb	n.c.	mounting base; isolated		

6. Ordering information

Table 3. Ordering information

Type number	Package		
	Name	Description	Version
BYV410X-600P	TO-220F	plastic single-ended package; isolated heatsink mounted; 1 mounting hole; 3-lead TO-220 "full pack"	SOT186A

7. Marking

Table 4. Marking codes

Type number	Marking codes
BYV410X-600P	BYV410X-600P

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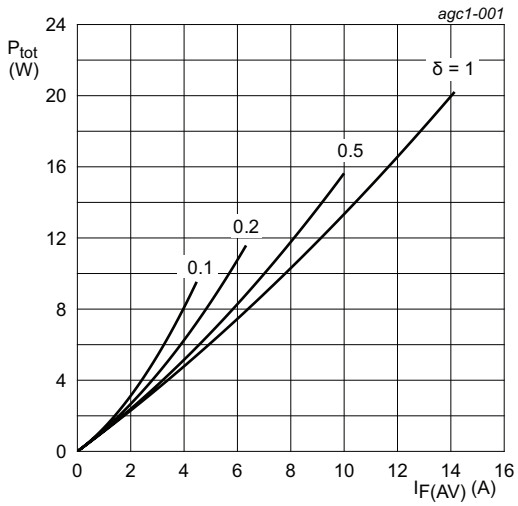
8. Limiting values

Table 5. Limiting values

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

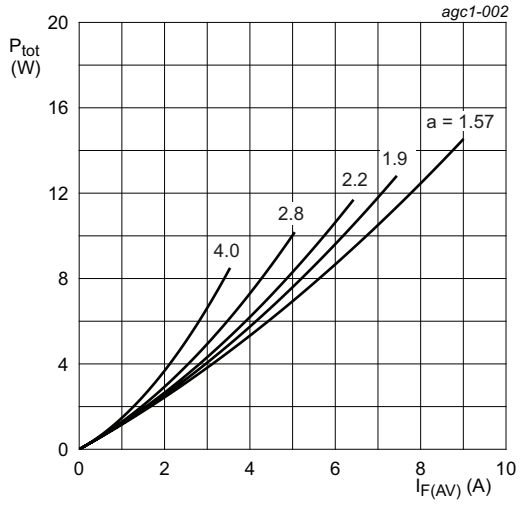
Symbol	Parameter	Conditions	Values	Unit
V_{RRM}	repetitive peak reverse voltage		600	V
V_{RWM}	crest working reverse voltage		600	V
V_R	reverse voltage	DC	600	V
$I_{O(AV)}$	average output current	δ = 0.5 ; square-wave pulse; $T_h \leq 65$ °C; both diodes conducting; Fig. 1; Fig. 2; Fig. 3	20	A
I_{FRM}	repetitive peak forward current	δ = 0.5 ; t_p = 25 µs; $T_h \leq 97$ °C; square-wave pulse ; per diode	20	A
I_{FSM}	non-repetitive peak forward current	t_p = 10 ms; $T_{j(init)}$ = 25 °C; sine-wave pulse; per diode; Fig. 4	120	A
		t_p = 8.3 ms; $T_{j(init)}$ = 25 °C; sine-wave pulse; per diode	132	A
T_{stg}	storage temperature		-55 to 175	°C
T_j	junction temperature		175	°C



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

V_o = 1.104; R_s = 0.0230 Ω

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



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

Vo = 1.104 V; Rs = 0.0230 Ω

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

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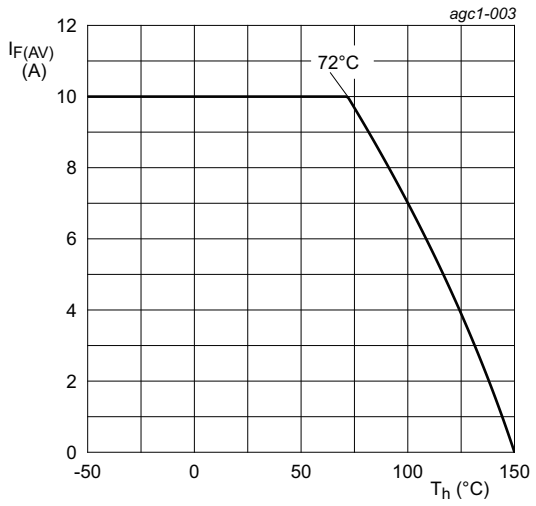

Fig. 3. Forward current as a function of heatsink temperature; maximum values; per diode

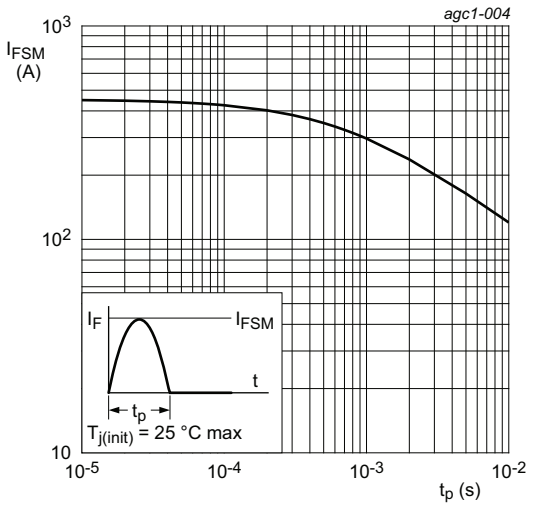

Fig. 4. Non-repetitive peak forward current as a function of pulse width; sinusoidal waveform; maximum values; per diode

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9. Thermal characteristics

Table 6. Thermal characteristics

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
$R_{th(j-h)}$	thermal resistance from junction to heatsink	per diode; Fig. 5		-	-	5	K/W
		both diodes conducting; Fig. 5		-	-	3.5	K/W
$R_{th(j-a)}$	thermal resistance from junction to ambient free air	in free air		-	60	-	K/W

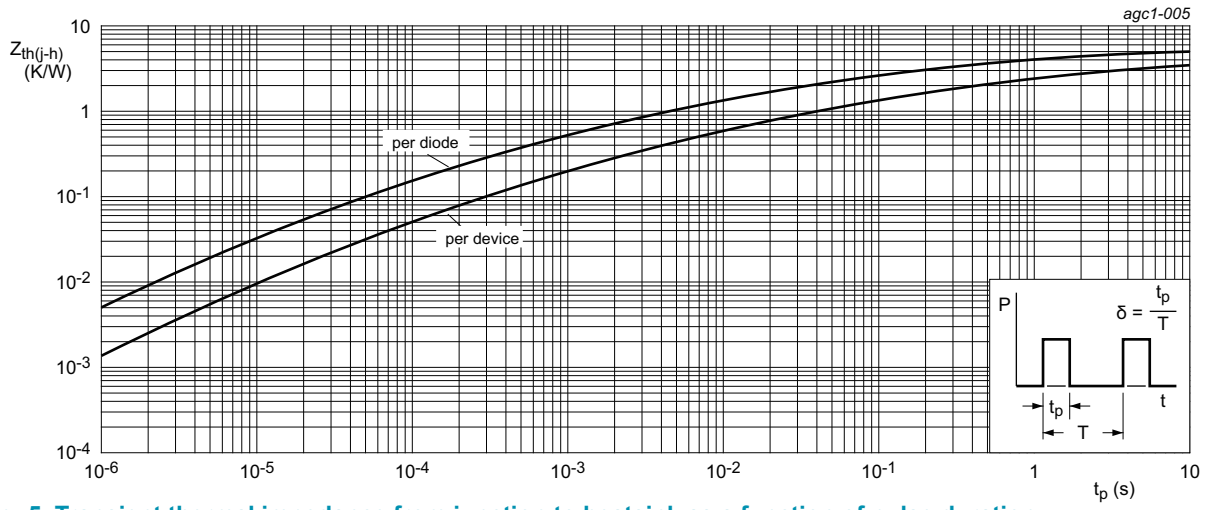

Fig. 5. Transient thermal impedance from junction to heatsink as a function of pulse duration

10. Isolation characteristics

Table 7. Isolation characteristics

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
$V_{isol(RMS)}$	RMS isolation voltage	50 Hz ≤ f ≤ 60 Hz; RH ≤ 65 %; from all pins to external heatsink; sinusoidal waveform; clean and dust free		-	-	2500	V
C_{isol}	isolation capacitance	from cathode to external heatsink		-	10	-	PF

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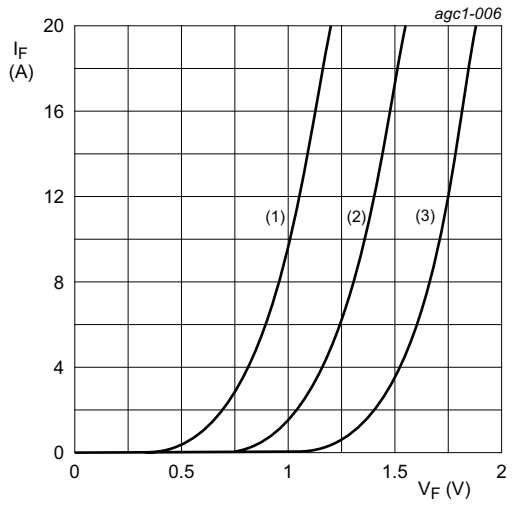
11. Characteristics

Table 8. Characteristics

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
Static characteristics							
V_F	forward current	I_F = 10 A; T_j = 25 °C; per diode; Fig. 6		-	1.3	1.7	V
		I_F = 10 A; T_j = 150 °C; per diode; Fig. 6		-	1.0	1.35	V
		I_F = 16 A; T_j = 25 °C; per diode; Fig. 6		-	1.35	1.75	V
		I_F = 16 A; T_j = 150 °C; per diode; Fig. 6		-	1.1	1.45	V
I_R	reverse current	V_R = 600 V; T_j = 25 °C; per diode		-	1	10	µA
		V_R = 600 V; T_j = 150 °C; per diode		-	0.1	0.5	mA
Dynamic characteristics							
Q_r	reverse charge	I_F = 1 A; V_R = 30 V; dI_F/dt = 100 A/µs; T_j = 25 °C; per diode; Fig. 7		-	22	-	nC
t_{rr}	reverse recovery time	I_F = 1 A; V_R = 30 V; dI_F/dt = 100 A/µs; T_j = 25 °C; per diode; Fig. 7		-	30	50	ns
		I_F = 1 A; V_R = 30 V; dI_F/dt = 50 A/µs; T_j = 25 °C; per diode; Fig. 7		-	40	55	ns
		I_F = 0.5 A; I_{rr} = 0.25 A; I_R = 1 A; T_j = 25 °C; per diode; Fig. 7		-	-	35	ns
I_{RM}	peak reverse recovery current	I_F = 1 A; V_R = 30 V; dI_F/dt = 100 A/µs; T_j = 25 °C; per diode; Fig. 7		-	1.6	-	A
		I_F = 1 A; V_R = 30 V; dI_F/dt = 50 A/µs; T_j = 25 °C; per diode; Fig. 7		-	1.1	-	A
E_{as}	non-repetitive avalanche energy	I_R = 4.8 A; $T_{j(init)}$ = 25 °C; L = 15 mH		130	175	-	mJ



V_o = 1.104 V; R_s = 0.0230 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; per diode

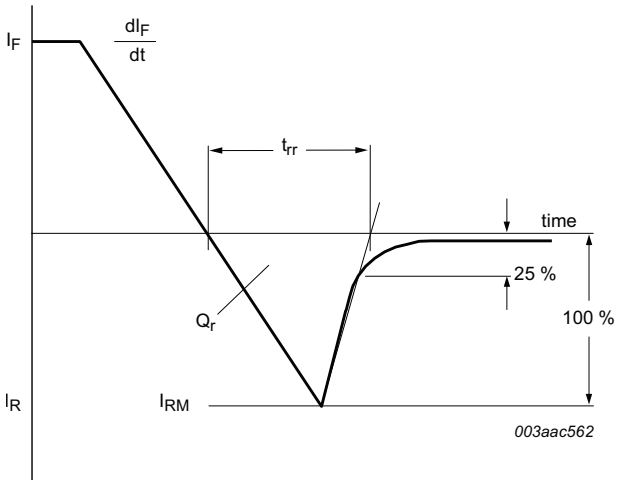


Fig. 7. Reverse recovery definitions; ramp recovery

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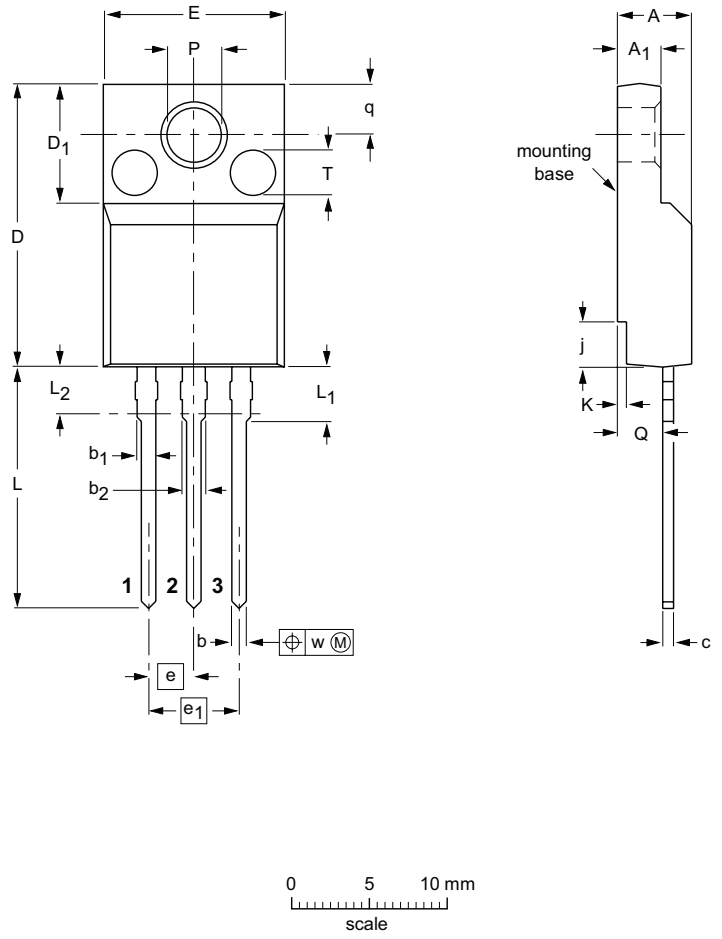
12. Package outline

Plastic single-ended package; isolated heatsink mounted;
1 mounting hole; 3-lead TO-220 'full pack'

SOT186A



DIMENSIONS (mm are the original dimensions)

UNIT	A	A_1	b	b_1	b_2	c	D	D_1	E	e	e_1	j	K	L	L_1	L_2 (1) max.	P	Q	q	T (2)	w
mm	4.6 4.0	2.9 2.5	0.9 0.7	1.1 0.9	1.4 1.0	0.7 0.4	15.8 15.2	6.5 6.3	10.3 9.7	2.54	5.08	2.7 1.7	0.6 0.4	14.4 13.5	3.30 2.79	3	3.2 3.0	2.6 2.3	3.0 2.6	2.5	0.4

Notes

1. Terminal dimensions within this zone are uncontrolled.
2. Both recesses are ☒2.5 × 0.8 max. depth

OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	JEITA			
SOT186A		3-lead TO-220F				~~02-04-09~~ 06-02-14

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Офис по работе с юридическими лицами:

105318, г.Москва, ул.Щербаковская д.3, офис 1107, 1118, ДЦ «Щербаковский»

Телефон: +7 495 668-12-70 (многоканальный)

Факс: +7 495 668-12-70 (доб.304)

E-mail: info@moschip.ru

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