

1. General description

Ultrafast power diode in a SOT186A plastic package.

2. Features and benefit

- 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)

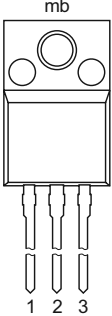
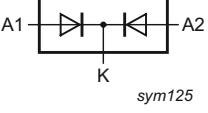
4. Quick reference data

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	$\delta = 0.5$; 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	$\delta = 0.5$; $t_p = 25$ μ s; $T_h \leq 97$ °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/ μ s; $T_j = 25$ °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

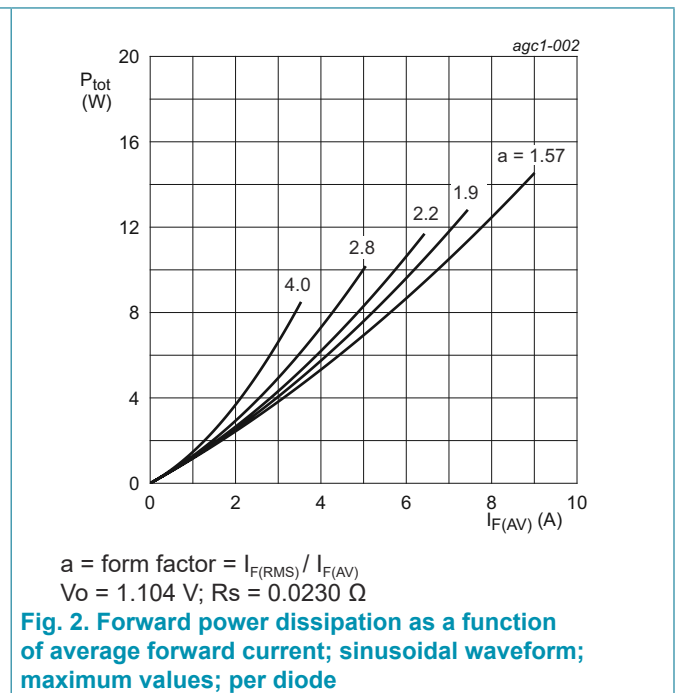
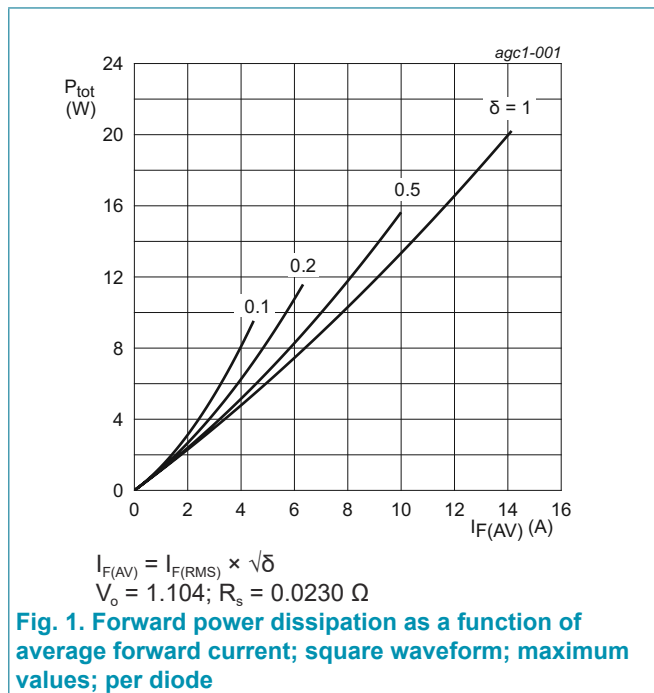
Type number	Marking codes
BYV410X-600P	BYV410X-600P

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	$\delta = 0.5$; square-wave pulse; $T_h \leq 65\text{ }^\circ\text{C}$; both diodes conducting; Fig. 1 ; Fig. 2 ; Fig. 3	20	A
I_{FRM}	repetitive peak forward current	$\delta = 0.5$; $t_p = 25\text{ }\mu\text{s}$; $T_h \leq 97\text{ }^\circ\text{C}$; 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	$^\circ\text{C}$



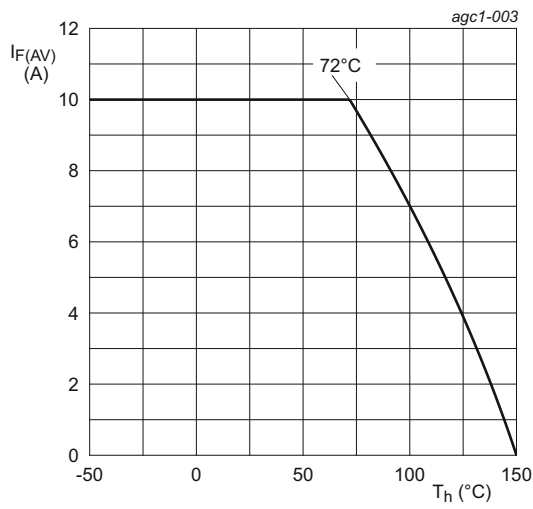


Fig. 3. Forward current as a function of heatsink temperature; maximum values; per diode

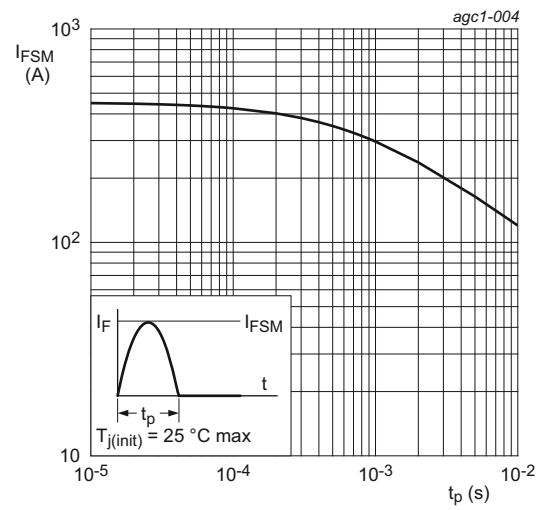


Fig. 4. Non-repetitive peak forward current as a function of pulse width; sinusoidal waveform; maximum values; per diode

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

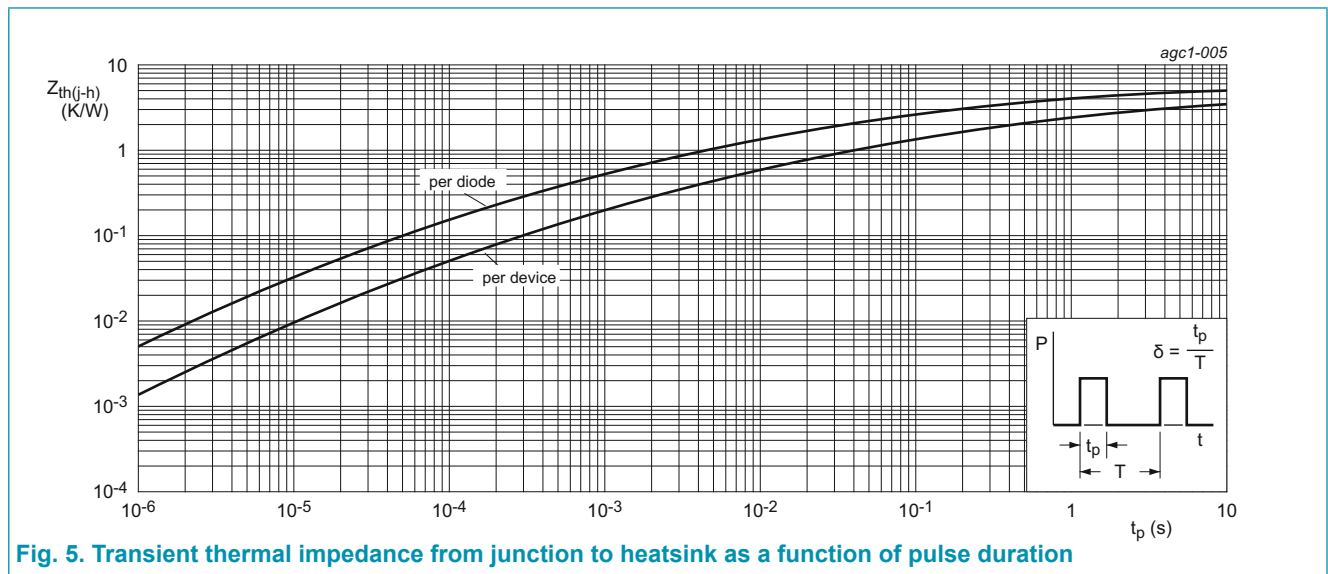


Fig. 5. Transient thermal impedance from junction to heatsink as a function of pulse duration

10. Isolation characteristics

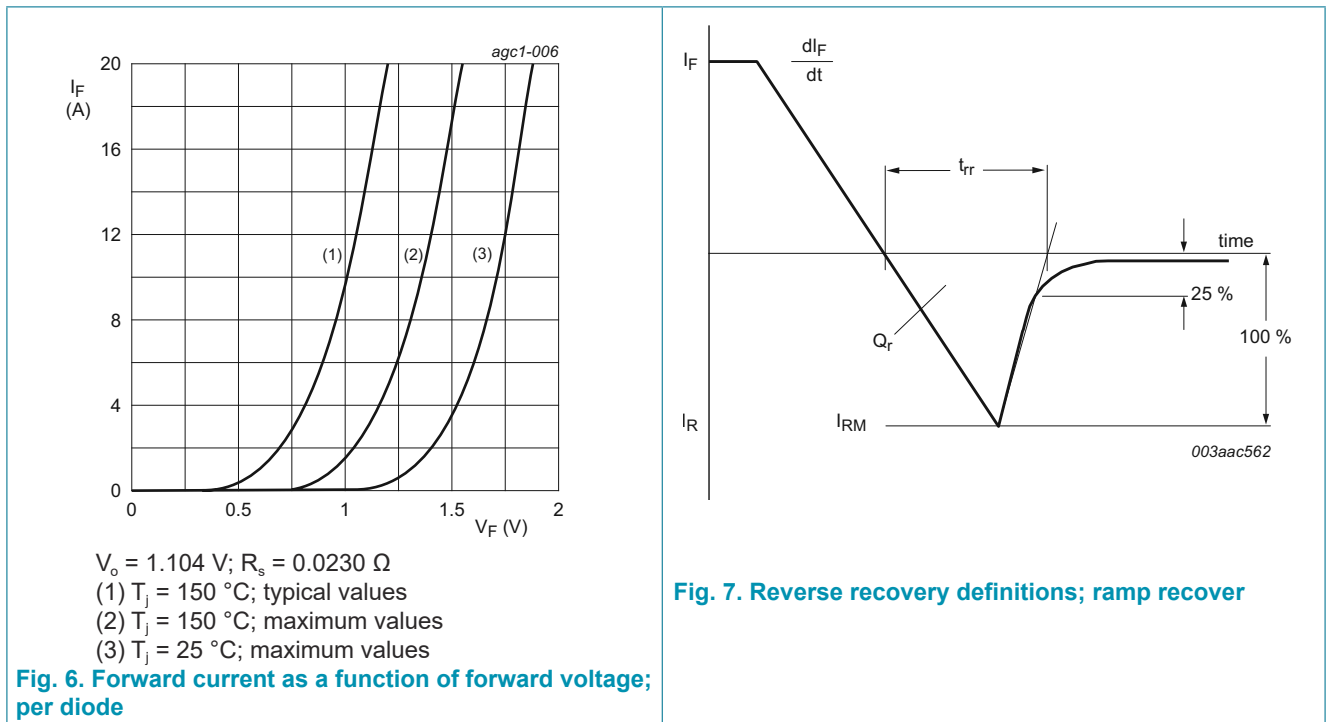
Table 7. Isolation characteristics

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

11. Characteristics

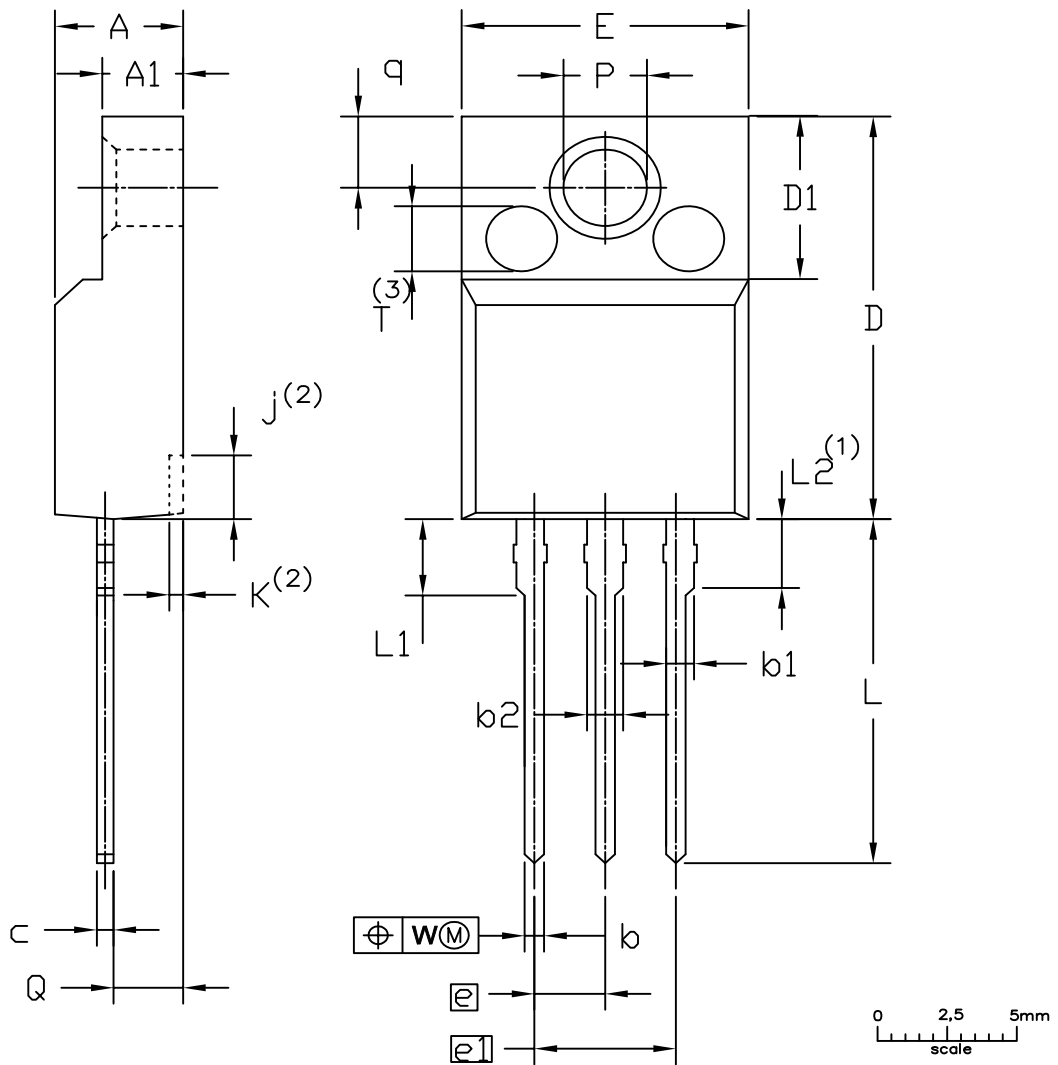
Table 8. Characteristics

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



12. Package outline

Plastic single-ended package; isolated heatsink mounted; 1 mounting hole; 3-lead TO-220 "full pack" SOT186A



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

Notes

1. Terminal dimensions within this zone are uncontrolled
2. Dot lines area designs may vary
3. Eject pin mark is for reference only

OUTLINE VERSION	REFERENCES			EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	JEITA		
SOT186A		3 LEADS TO220F			2013-11-14

Fig. 8. Package outline TO-220F (SOT186A)

13. 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.
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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