

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

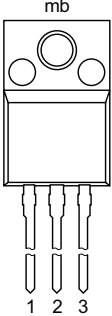
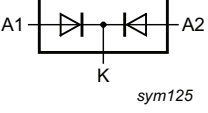
Table 1. Quick reference data

Table 7: 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; $T_h \leq 65\text{ }^{\circ}\text{C}$; 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
Symbol	Parameter	Conditions		Min	Typ	Max	Unit
Static characteristics							
V_F	forward voltage	$I_F = 10\text{ A}$; $T_j = 25\text{ }^{\circ}\text{C}$; per diode; Fig. 6		-	1.3	1.7	V
		$I_F = 10\text{ A}$; $T_j = 150\text{ }^{\circ}\text{C}$; per diode; Fig. 6		-	1.0	1.35	V
Dynamic characteristics							
t_{rr}	reverse recovery time	$I_F = 1\text{ A}$; $V_R = 30\text{ V}$; $di_F/dt = 100\text{ A}/\mu\text{s}$; $T_j = 25\text{ }^{\circ}\text{C}$; per diode; Fig. 7		-	30	50	ns

5. Pinning information

Table 2. Pinning information

Pin	Symbol	Description	Simplified outline	Graphic symbol
1	A	anode		 sym125
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; $T_h \leq 65^\circ\text{C}$; both diodes conducting; Fig. 1 ; Fig. 2 ; Fig. 3	20	A
I_{FRM}	repetitive peak forward current	$\delta = 0.5$; $t_p = 25\ \mu\text{s}$; $T_h \leq 97^\circ\text{C}$; square-wave pulse; per diode	20	A
I_{FSM}	non-repetitive peak forward current	$t_p = 10\ \text{ms}$; $T_{j(\text{init})} = 25^\circ\text{C}$; sine-wave pulse; per diode; Fig. 4	120	A
		$t_p = 8.3\ \text{ms}$; $T_{j(\text{init})} = 25^\circ\text{C}$; sine-wave pulse; per diode	132	A
T_{stg}	storage temperature		-55 to 175	$^\circ\text{C}$
T_j	junction temperature		175	$^\circ\text{C}$

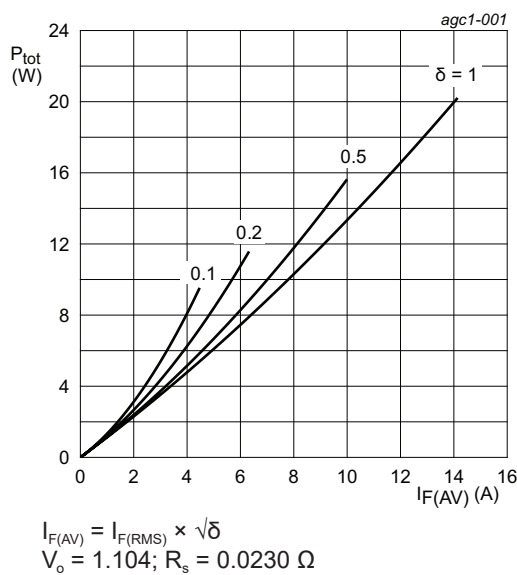


Fig. 1. Forward power dissipation as a function of average forward current; square waveform; maximum values; per diode

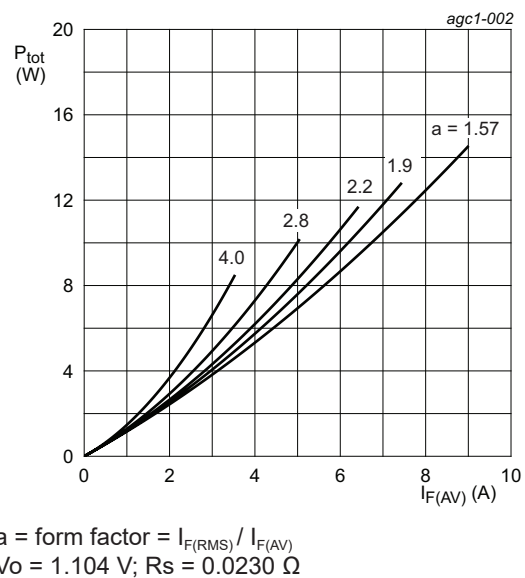


Fig. 2. Forward power dissipation as a function of average forward current; sinusoidal waveform; maximum values; per diode

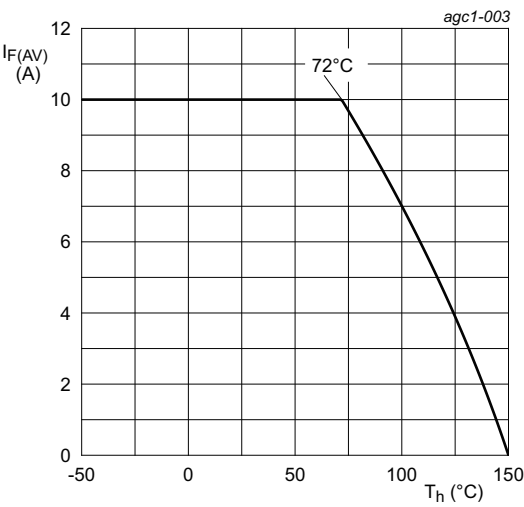


Fig. 3. Forward current as a function of heatsink temperature; maximum values; per diode

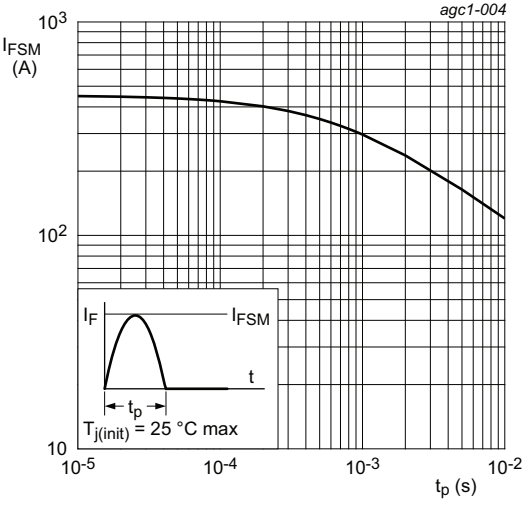


Fig. 4. Non-repetitive peak forward current as a function of pulse width; sinusoidal waveform; maximum values; per diode

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

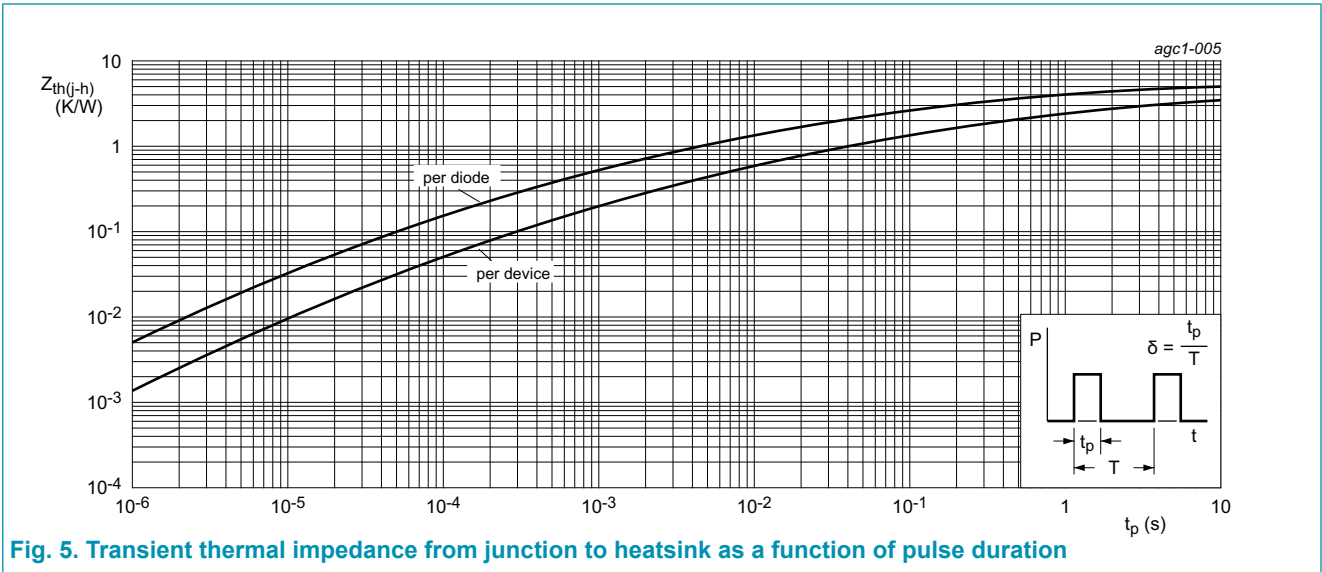


Fig. 5. Transient thermal impedance from junction to heatsink as a function of pulse duration

10. Isolation characteristics

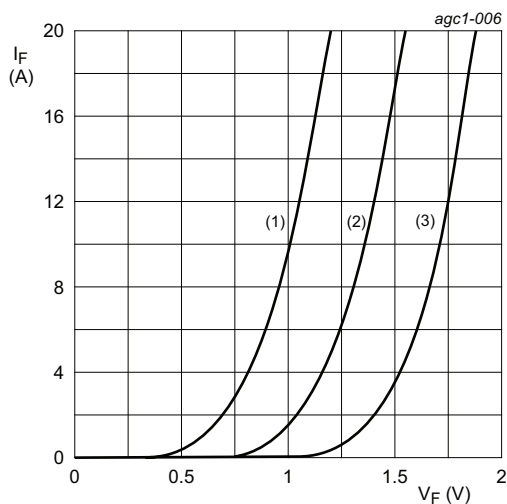
Table 7. Isolation characteristics

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 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



$V_o = 1.104\text{ V}$; $R_s = 0.0230\ \Omega$
 (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; per diode

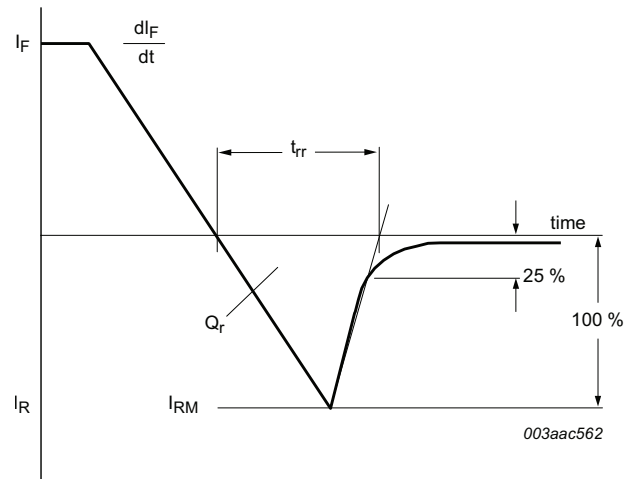
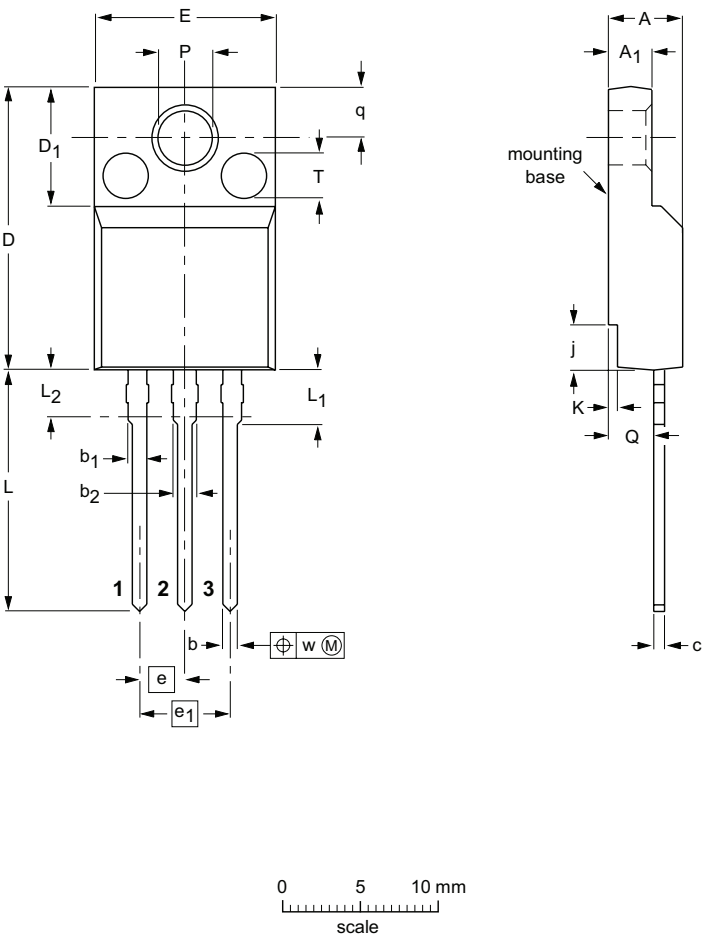


Fig. 7. Reverse recovery definitions; ramp recovery

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
- Terminal dimensions within this zone are uncontrolled.
 - Both recesses are $\square 2.5 \times 0.8$ max. depth

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

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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14. Contents

1. General description.....	1
2. Features and benefits	1
3. Applications	1
4. Quick reference data.....	1
5. Pinning information.....	2
6. Ordering information.....	2
7. Marking.....	2
8. Limiting values	3
9. Thermal characteristics	5
10. Isolation characteristics	5
11. Characteristics.....	6
12. Package outline	7
13. Legal information	8
14. Contents	10

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Date of release: 20 June 2018



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