

## 1. General description

Dual ultrafast power diodes in a TO3PF plastic package.

## 2. Features and benefits

- Very low on-state loss
- Reduces switching losses in associated MOSFET or IGBT
- Low leakage current
- Isolated plastic package

## 3. Applications

- Active PFC in air conditioner
- S.M.P.S Power Factor Correction (PFC)
- Half-bridge/full-bridge switched-mode power supplies

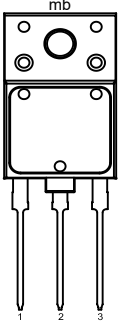
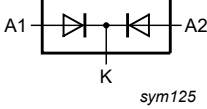
## 4. Quick reference data

Table 1. Quick reference data

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$V_R$	reverse voltage	DC	-	-	600	V
$I_{F(AV)}$	average forward current	$\delta = 0.5$ ; $T_h \leq 101$ °C; square-wave pulse; <a href="#">Fig. 1</a> ; <a href="#">Fig. 2</a> ; <a href="#">Fig. 3</a>	-	-	15	A
$I_{FRM}$	repetitive peak forward current	$\delta = 0.5$ ; $t_p = 25$ $\mu$ s; $T_h \leq 101$ °C; Square-wave pulse	-	-	30	A
$I_{FSM}$	non-repetitive peak forward current	$t_p = 10$ ms; $T_{j(init)} = 25$ °C; sine-wave pulse; per diode; <a href="#">Fig. 4</a>	-	-	150	A
		$t_p = 8.3$ ms; $T_{j(init)} = 25$ °C; sine-wave pulse; per diode	-	-	165	A
<b>Static characteristics</b>						
$V_F$	forward voltage	$I_F = 15$ A; $T_j = 25$ °C; <a href="#">Fig. 6</a>	-	1.17	1.4	V
		$I_F = 15$ A; $T_j = 150$ °C; <a href="#">Fig. 6</a>	-	1	-	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>	-	38	-	ns
		$I_F = 15$ A; $V_R = 200$ V; $di_F/dt = 200$ A/ $\mu$ s; $T_j = 25$ °C; <a href="#">Fig. 7</a>	-	67	-	ns
		$I_F = 15$ A; $V_R = 200$ V; $di_F/dt = 200$ A/ $\mu$ s; $T_j = 125$ °C; <a href="#">Fig. 7</a>	-	106	-	ns

## 5. Pinning information

Table 2. Pinning information

Pin	Symbol	Description	Simplified outline	Graphic symbol
1	A1	anode 1	 <p style="text-align: center;"><b>TO3PF</b></p>	 <p style="text-align: center;"><i>sym125</i></p>
2	K	cathode		
3	A2	anode 2		
mb	mb	mounting base		

## 6. Ordering information

Table 3. Ordering information

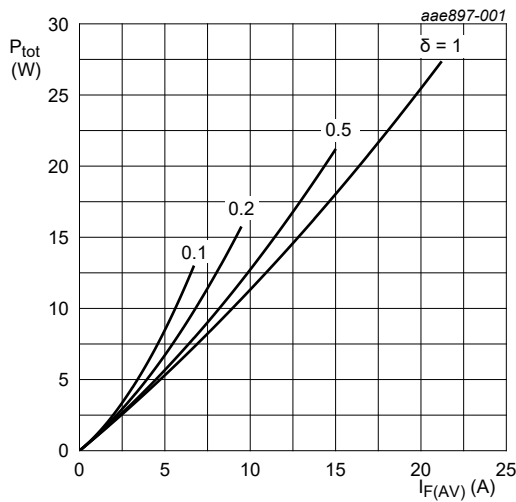
Type number	Package		
	Name	Description	Version
BYV415J-600P	TO3PF	Plastic single-ended package; isolated heatsink mounted; 1 mounting hole; 3-lead TO-3P 'full pack'	TO3PF

## 7. Limiting values

**Table 4. Limiting values**

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

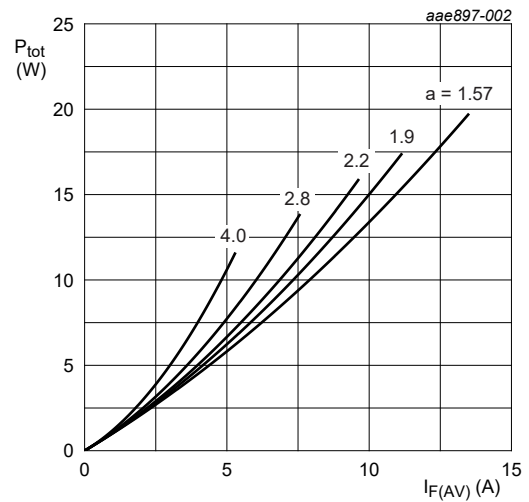
Symbol	Parameter	Conditions	Min	Max	Unit
$V_{RRM}$	repetitive peak reverse voltage		-	600	V
$V_{RWM}$	crest working reverse voltage		-	600	V
$V_R$	reverse voltage	DC	-	600	V
$I_{F(AV)}$	average forward current	$\delta = 0.5$ ; $T_h \leq 101\text{ }^\circ\text{C}$ ; square-wave pulse; Fig. 1; Fig. 2; Fig. 3	-	15	A
$I_{O(AV)}$	average output current	$\delta = 0.5$ ; $T_h \leq 90\text{ }^\circ\text{C}$ ; square-wave pulse; both diodes conducting	-	30	A
$I_{FRM}$	repetitive peak forward current	$\delta = 0.5$ ; $t_p = 25\text{ }\mu\text{s}$ ; $T_h \leq 101\text{ }^\circ\text{C}$ ; Square-wave pulse	-	30	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	-	150	A
		$t_p = 8.3\text{ ms}$ ; $T_{j(\text{init})} = 25\text{ }^\circ\text{C}$ ; sine-wave pulse; per diode	-	165	A
$T_{stg}$	storage temperature		-65	175	$^\circ\text{C}$
$T_j$	junction temperature		-	175	$^\circ\text{C}$



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

$$V_o = 0.990\text{ V}; R_s = 0.0141\text{ }\Omega$$

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



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

$$V_o = 0.990\text{ V}; R_s = 0.0141\text{ }\Omega$$

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

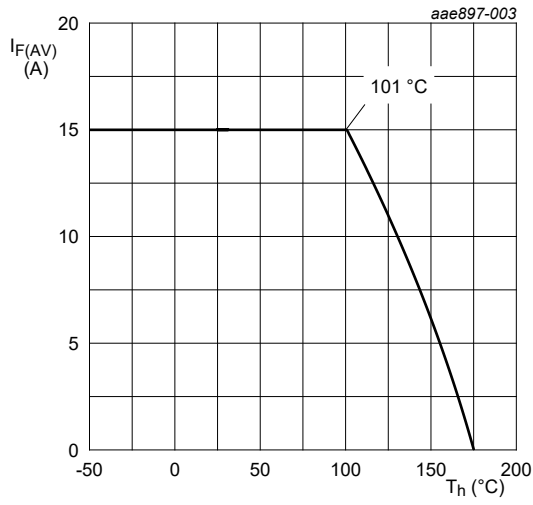


Fig. 3. Average forward current as a function of heatsink temperature; maximum values; per diode

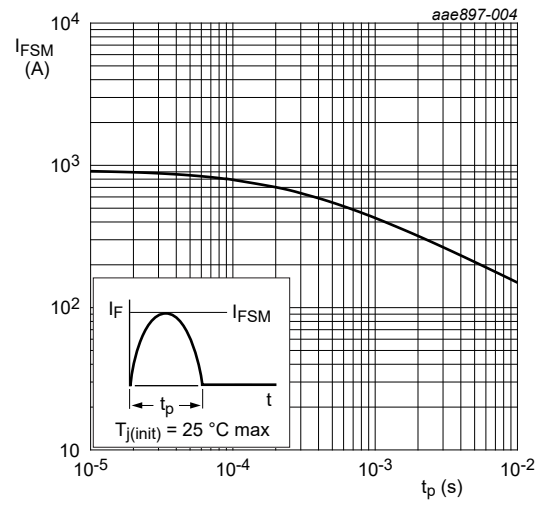


Fig. 4. Non-repetitive peak forward current as a function of pulse width; sinusoidal waveform; maximum values; per diode

### 8. Thermal characteristics

Table 5. Thermal characteristics

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
R <sub>th(j-h)</sub>	thermal resistance from junction to heatsink	with heatsink compound; per diode; <a href="#">Fig. 5</a>	-	2.9	3.5	K/W
		with heatsink compound; both diodes conducting	-	1.6	2	K/W
R <sub>th(j-a)</sub>	thermal resistance from junction to ambient free air	in free air	-	35	-	K/W

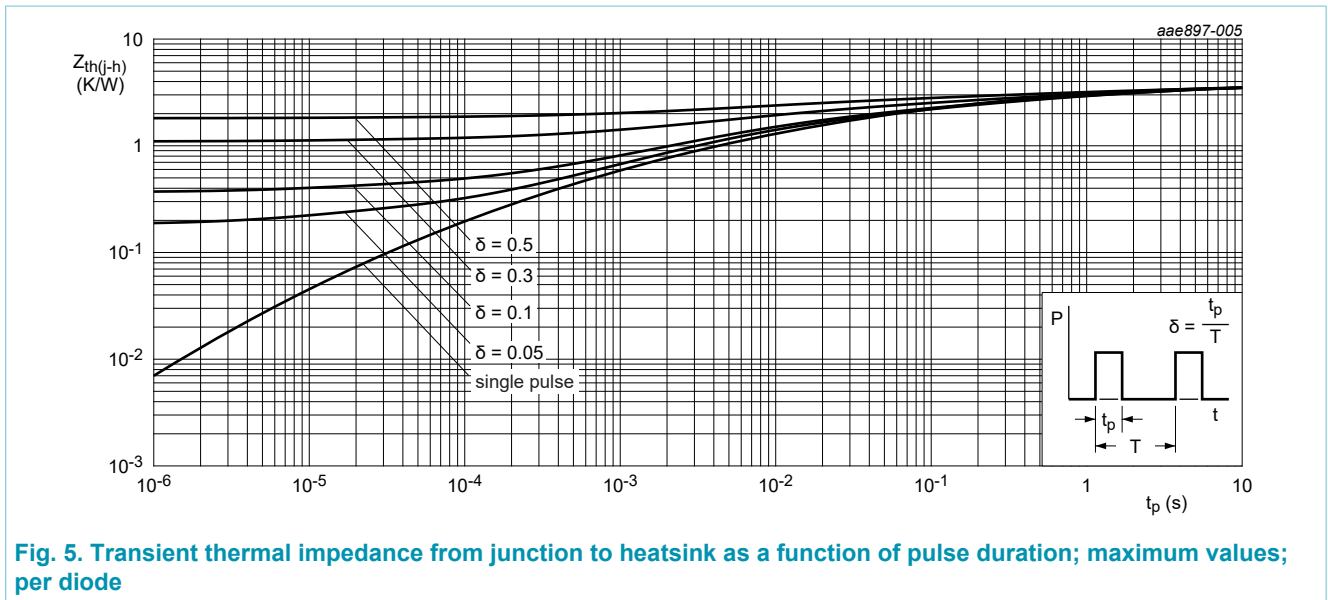
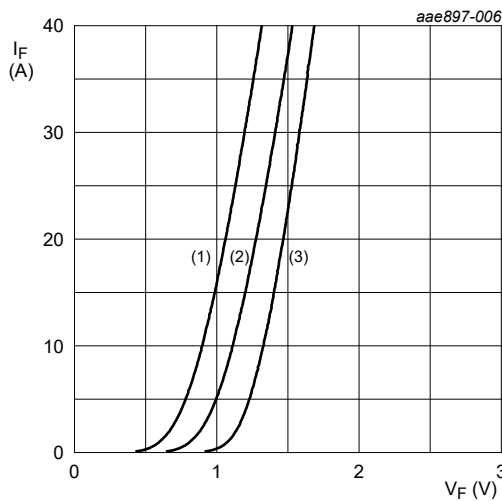


Fig. 5. Transient thermal impedance from junction to heatsink as a function of pulse duration; maximum values; per diode

## 9. Characteristics

Table 6. Characteristics

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
<b>Static characteristics</b>						
$V_F$	forward voltage	$I_F = 15 \text{ A}; T_j = 25 \text{ }^\circ\text{C}; \text{ Fig. 6}$	-	1.17	1.4	V
		$I_F = 15 \text{ A}; T_j = 150 \text{ }^\circ\text{C}; \text{ Fig. 6}$	-	1	-	V
$I_R$	reverse current	$V_R = 600 \text{ V}; T_j = 25 \text{ }^\circ\text{C}$	-	-	10	$\mu\text{A}$
		$V_R = 600 \text{ V}; T_j = 150 \text{ }^\circ\text{C}$	-	-	500	$\mu\text{A}$
<b>Dynamic characteristics</b>						
$t_{rr}$	reverse recovery time	$I_F = 1 \text{ A}; V_R = 30 \text{ V}; dI_F/dt = 100 \text{ A}/\mu\text{s}; T_j = 25 \text{ }^\circ\text{C}; \text{ Fig. 7}$	-	38	-	ns
		$I_F = 15 \text{ A}; V_R = 200 \text{ V}; dI_F/dt = 200 \text{ A}/\mu\text{s}; T_j = 25 \text{ }^\circ\text{C}; \text{ Fig. 7}$	-	67	-	ns
		$I_F = 15 \text{ A}; V_R = 200 \text{ V}; dI_F/dt = 200 \text{ A}/\mu\text{s}; T_j = 125 \text{ }^\circ\text{C}; \text{ Fig. 7}$	-	106	-	ns
$I_{RM}$	peak reverse recovery current	$I_F = 15 \text{ A}; V_R = 200 \text{ V}; dI_F/dt = 200 \text{ A}/\mu\text{s}; T_j = 25 \text{ }^\circ\text{C}; \text{ Fig. 7}$	-	9.8	-	A
		$I_F = 15 \text{ A}; V_R = 200 \text{ V}; dI_F/dt = 200 \text{ A}/\mu\text{s}; T_j = 125 \text{ }^\circ\text{C}; \text{ Fig. 7}$	-	16	-	A
$Q_r$	recovered charge	$I_F = 15 \text{ A}; V_R = 200 \text{ V}; dI_F/dt = 200 \text{ A}/\mu\text{s}; T_j = 25 \text{ }^\circ\text{C}; \text{ Fig. 7}$	-	329	-	nC
		$I_F = 15 \text{ A}; V_R = 200 \text{ V}; dI_F/dt = 200 \text{ A}/\mu\text{s}; T_j = 125 \text{ }^\circ\text{C}; \text{ Fig. 7}$	-	876	-	nC



$V_o = 0.990 \text{ V}; R_s = 0.0141 \text{ } \Omega$   
 (1)  $T_j = 150 \text{ }^\circ\text{C};$  typical values  
 (2)  $T_j = 150 \text{ }^\circ\text{C};$  maximum values  
 (3)  $T_j = 25 \text{ }^\circ\text{C};$  maximum values

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

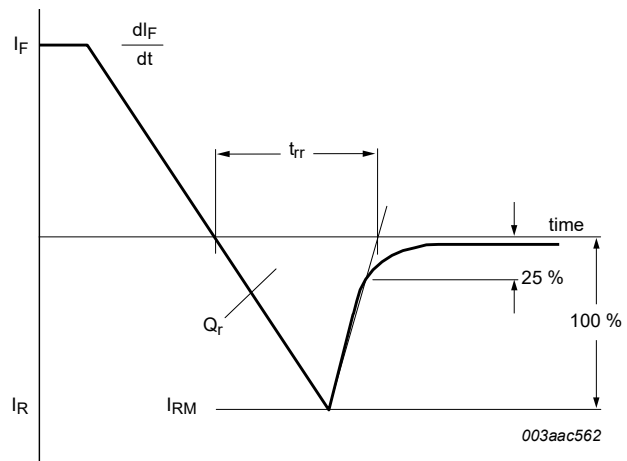
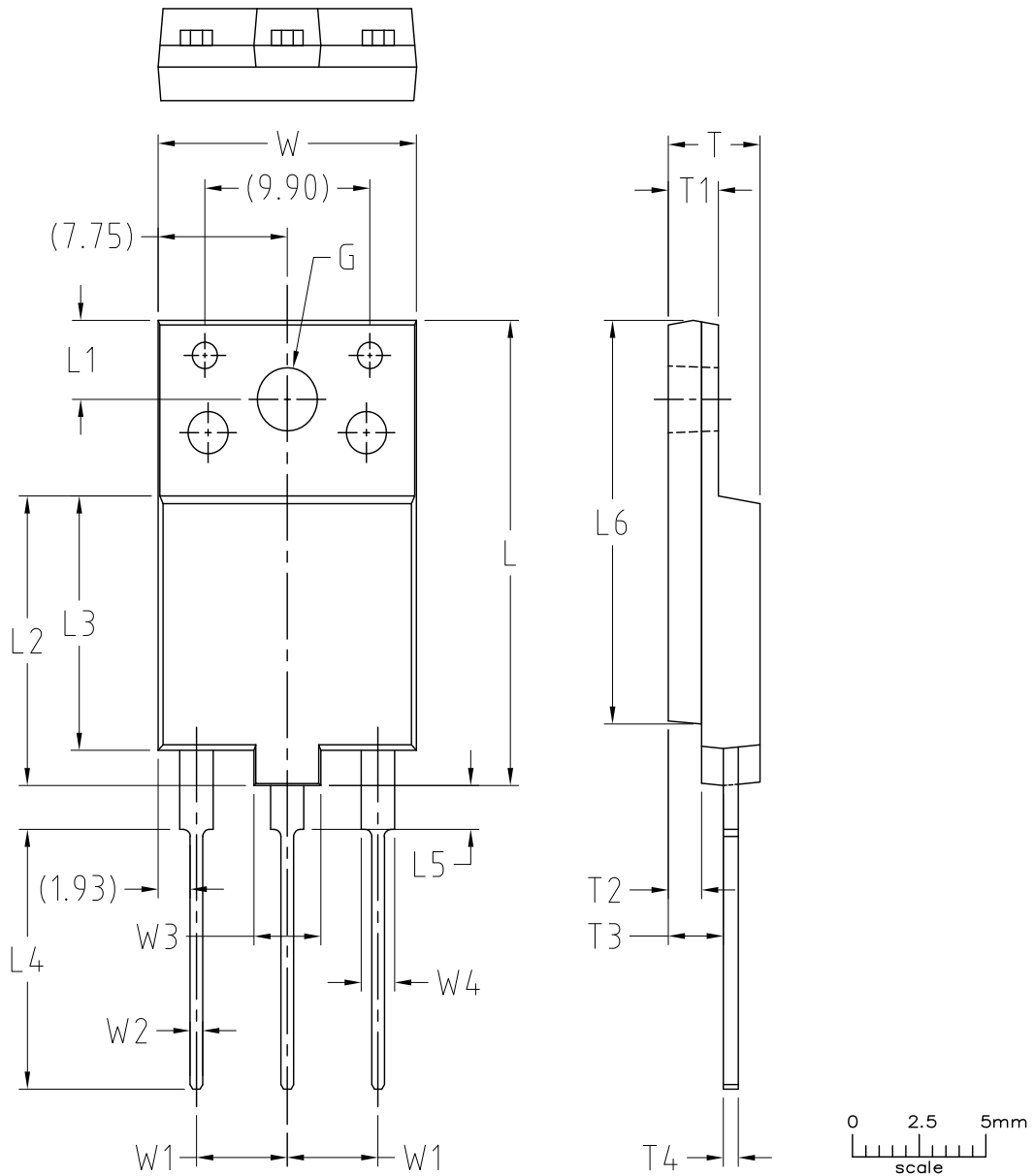


Fig. 7.

10. Package outline

Plastic single-ended package; isolated heatsink mounted; 1 mounting hole; 3-lead TO-3P 'full pack' TO3PF



Remark : (X) the dimension X in brackets is for reference

UNIT	W	W1	W2	W3	W4	L	L1	L2	L3	L4	L5	L6	T	T1	T2	T3	T4	G(φ)
mm	15.7	5.75	0.95	4.20	2.20	26.7	4.6	16.7	14.7	15.0	2.7	23.2	5.7	3.2	2.2	3.5	1.1	3.8
	15.3	5.15	0.65	3.80	1.80	26.3	4.4	16.3	14.3	14.6	2.3	22.8	5.3	2.8	1.8	3.1	0.8	3.4

OUTLINE VERSION	REFERENCES			EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	EIAJ		
		TO-3PF			

Fig. 8. Package outline TO3PF

## 11. Legal information

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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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