



# BYC10X-600P

Hyperfast power diode

9 May 2014

Product data sheet

## 1. General description

Hyperfast power diode in a SOD113A (2-lead TO-220-F) plastic package.

## 2. Features and benefits

- Fast switching
- Isolated plastic package
- Low leakage current
- Low reverse recovery current
- Low thermal resistance
- Reduces switching losses in associated MOSFET or IGBT

## 3. Applications

- Active PFC in air conditioner
- High frequency switched-mode power supplies
- Continuous Current Mode (CCM) Power Factor Correction (PFC)

## 4. Quick reference data

Table 1. Quick reference data

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$V_{RRM}$	repetitive peak reverse voltage		-	-	600	V
$I_{F(AV)}$	average forward current	$\delta = 0.5$ ; $T_h \leq 61^\circ\text{C}$ ; square-wave pulse; <a href="#">Fig. 1</a> ; <a href="#">Fig. 2</a> ; <a href="#">Fig. 3</a>	-	-	10	A
<b>Static characteristics</b>						
$V_F$	forward voltage	$I_F = 10\text{ A}$ ; $T_j = 150^\circ\text{C}$ ; <a href="#">Fig. 6</a>	-	1.3	2	V
<b>Dynamic characteristics</b>						
$t_{rr}$	reverse recovery time	$I_F = 1\text{ A}$ ; $V_R = 30\text{ V}$ ; $dI_F/dt = 200\text{ A}/\mu\text{s}$ ; $T_j = 25^\circ\text{C}$ ; <a href="#">Fig. 7</a>	-	12	18	ns

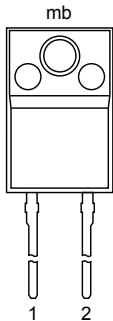



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## 5. Pinning information

Table 2. Pinning information

Pin	Symbol	Description	Simplified outline	Graphic symbol
1	K	cathode	 <p>TO-220F (SOD113A)</p>	
2	A	anode		
mb	n.c.	mounting base; isolated		

## 6. Ordering information

Table 3. Ordering information

Type number	Package		
	Name	Description	Version
BYC10X-600P	TO-220F	plastic single-ended package; isolated heatsink mounted; 1 mounting hole; 2-lead TO-220F "full pack"	SOD113A

## 7. Marking

Table 4. Marking codes

Type number	Marking code
BYC10X-600P	BYC10X-600P

## 8. Limiting values

Table 5. 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	$\delta = 0.5$ ; $T_h \leq 61^\circ\text{C}$ ; square-wave pulse; <a href="#">Fig. 1</a> ; <a href="#">Fig. 2</a> ; <a href="#">Fig. 3</a>	-	10	A
$I_{FRM}$	repetitive peak forward current	$\delta = 0.5$ ; $t_p = 25\ \mu\text{s}$ ; $T_h \leq 61^\circ\text{C}$ ; square-wave pulse	-	20	A

Symbol	Parameter	Conditions		Min	Max	Unit
I <sub>FSM</sub>	non-repetitive peak forward current	t <sub>p</sub> = 10 ms; T <sub>j(init)</sub> = 25 °C; sine-wave pulse; Fig. 4		-	150	A
		t <sub>p</sub> = 8.3 ms; T <sub>j(init)</sub> = 25 °C; sine-wave pulse; Fig. 4		-	165	A
T <sub>stg</sub>	storage temperature			-65	175	°C
T <sub>j</sub>	junction temperature			-	175	°C

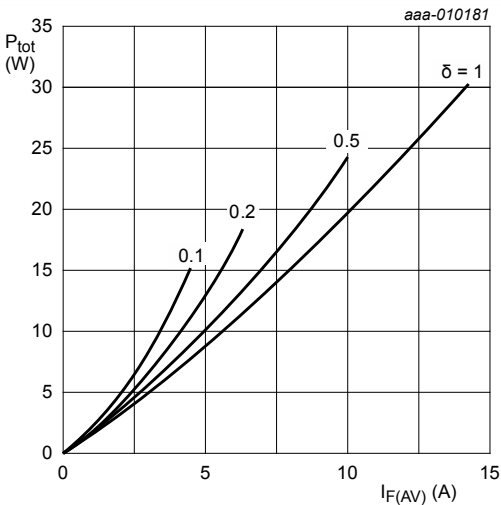


Fig. 1. Forward power dissipation as a function of average forward current; square waveform; maximum values

$$I_{F(AV)} = I_{F(RMS)} \times \sqrt{\delta}$$
$$V_O = 1.572 \text{ V}; R_S = 0.040 \text{ }\Omega$$

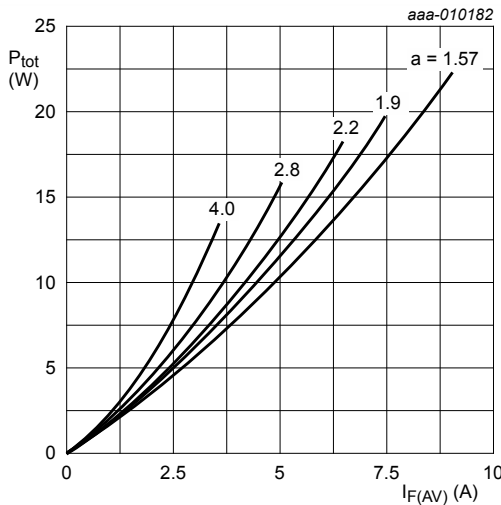


Fig. 2. Forward power dissipation as a function of average forward current; sinusoidal waveform; maximum values

$$a = \text{form factor} = I_{F(RMS)} / I_{F(AV)}$$
$$V_O = 1.572 \text{ V}; R_S = 0.040 \text{ }\Omega$$

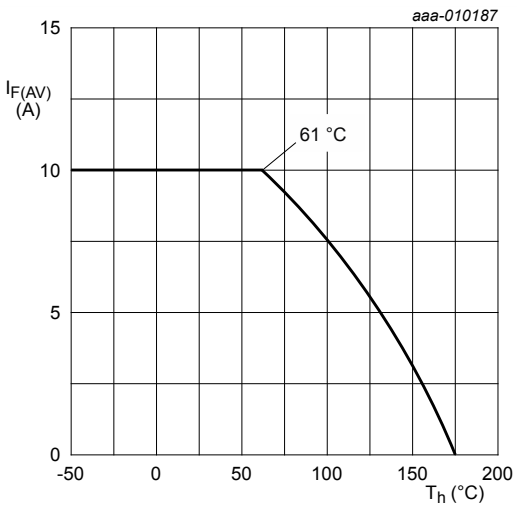


Fig. 3. Forward current as a function of heatsink temperature; maximum values

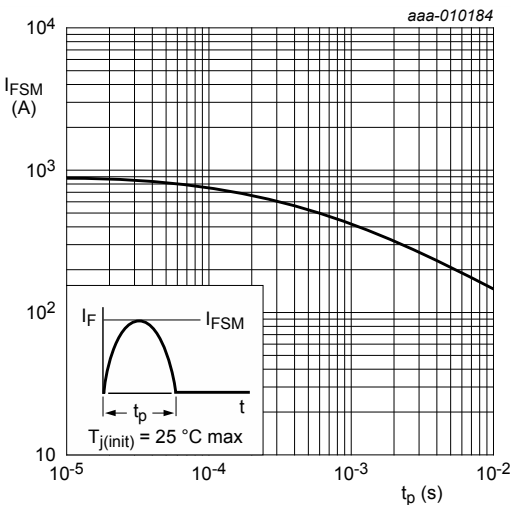


Fig. 4. Non-repetitive peak forward current as a function of pulse width; sinusoidal waveform; maximum values

9. Thermal characteristics

Table 6. Thermal characteristics

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
$R_{th(j-h)}$	thermal resistance from junction to heatsink	with heatsink compound; Fig. 5		-	-	4.8	K/W
$R_{th(j-a)}$	thermal resistance from junction to ambient	in free air		-	55	-	K/W

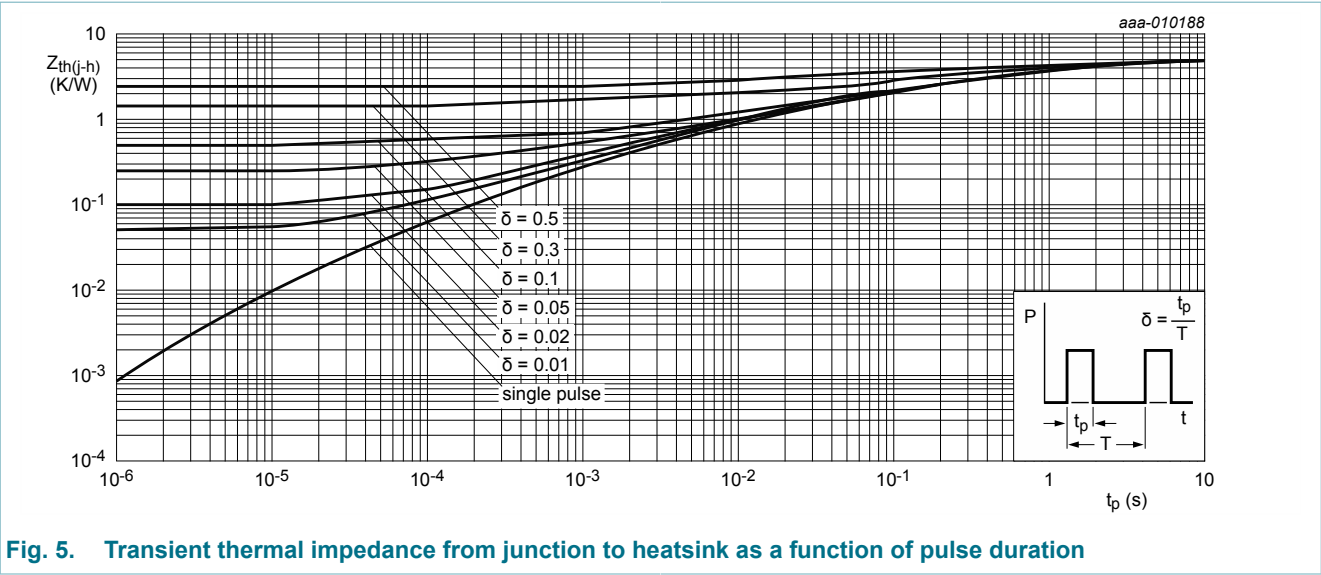


Fig. 5. Transient thermal impedance from junction to heatsink as a function of pulse duration

10. Isolation characteristics

Table 7. Isolation characteristics

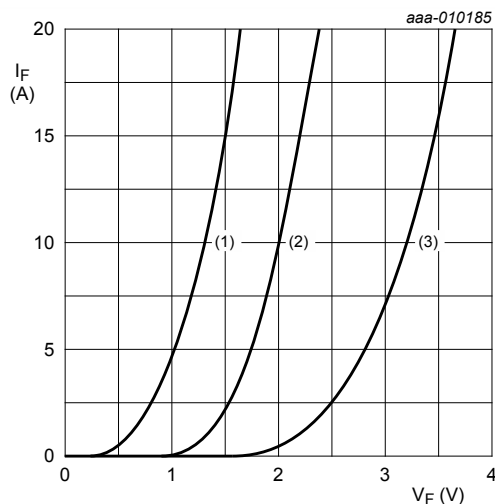
Symbol	Parameter	Conditions		Min	Typ	Max	Unit
$V_{isol(RMS)}$	RMS isolation voltage	50 Hz ≤ f ≤ 60 Hz; RH ≤ 65 %; from all pins to external heatsink; sinusoidal waveform; clean and dust free		-	-	2500	V
$C_{isol}$	isolation capacitance	f = 1 MHz; from cathode to external heatsink		-	10	-	pF

11. Characteristics

Table 8. Characteristics

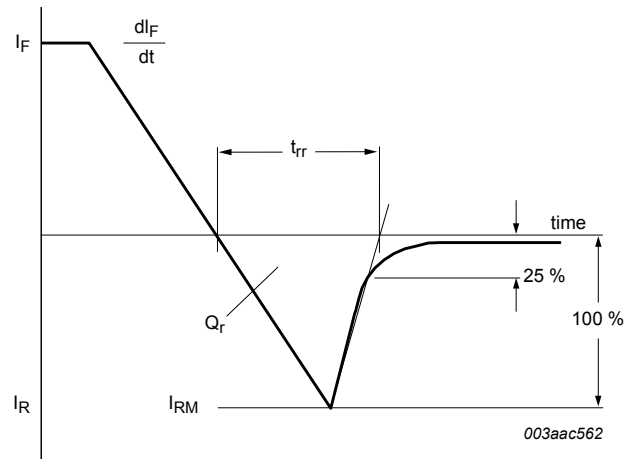
Symbol	Parameter	Conditions		Min	Typ	Max	Unit
Static characteristics							
$V_F$	forward voltage	$I_F = 10\text{ A}$ ; $T_j = 25\text{ °C}$ ; Fig. 6		-	2.5	3.2	V

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
		$I_F = 10\text{ A}$ ; $T_j = 150\text{ }^\circ\text{C}$ ; <a href="#">Fig. 6</a>		-	1.3	2	V
$I_R$	reverse current	$V_R = 600\text{ V}$ ; $T_j = 25\text{ }^\circ\text{C}$		-	-	10	$\mu\text{A}$
		$V_R = 600\text{ V}$ ; $T_j = 150\text{ }^\circ\text{C}$		-	-	0.8	mA
Dynamic characteristics							
$Q_r$	recovered charge	$I_F = 10\text{ A}$ ; $V_R = 200\text{ V}$ ; $dI_F/dt = 200\text{ A}/\mu\text{s}$ ; $T_j = 25\text{ }^\circ\text{C}$ ; <a href="#">Fig. 7</a>		-	26	-	nC
		$I_F = 10\text{ A}$ ; $V_R = 200\text{ V}$ ; $dI_F/dt = 200\text{ A}/\mu\text{s}$ ; $T_j = 125\text{ }^\circ\text{C}$ ; <a href="#">Fig. 7</a>		-	83	-	nC
$t_{rr}$	reverse recovery time	$I_F = 1\text{ A}$ ; $V_R = 30\text{ V}$ ; $dI_F/dt = 200\text{ A}/\mu\text{s}$ ; $T_j = 25\text{ }^\circ\text{C}$ ; <a href="#">Fig. 7</a>		-	12	18	ns
		$I_F = 10\text{ A}$ ; $V_R = 400\text{ V}$ ; $dI_F/dt = 500\text{ A}/\mu\text{s}$ ; $T_j = 25\text{ }^\circ\text{C}$ ; <a href="#">Fig. 7</a>		-	19	-	ns
		$I_F = 10\text{ A}$ ; $V_R = 200\text{ V}$ ; $dI_F/dt = 200\text{ A}/\mu\text{s}$ ; $T_j = 25\text{ }^\circ\text{C}$ ; <a href="#">Fig. 7</a>		-	26	-	ns
		$I_F = 10\text{ A}$ ; $V_R = 200\text{ V}$ ; $dI_F/dt = 200\text{ A}/\mu\text{s}$ ; $T_j = 125\text{ }^\circ\text{C}$ ; <a href="#">Fig. 7</a>		-	34	-	ns
$I_{RM}$	peak reverse recovery current	$I_F = 10\text{ A}$ ; $V_R = 200\text{ V}$ ; $dI_F/dt = 200\text{ A}/\mu\text{s}$ ; $T_j = 25\text{ }^\circ\text{C}$ ; <a href="#">Fig. 7</a>		-	2	-	A
		$I_F = 10\text{ A}$ ; $V_R = 200\text{ V}$ ; $dI_F/dt = 200\text{ A}/\mu\text{s}$ ; $T_j = 125\text{ }^\circ\text{C}$ ; <a href="#">Fig. 7</a>		-	4.8	-	A



**Fig. 6. Forward current as a function of forward voltage**

- (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;
- $V_O = 1.572\text{ V}$ ;  $R_S = 0.040\text{ }\Omega$

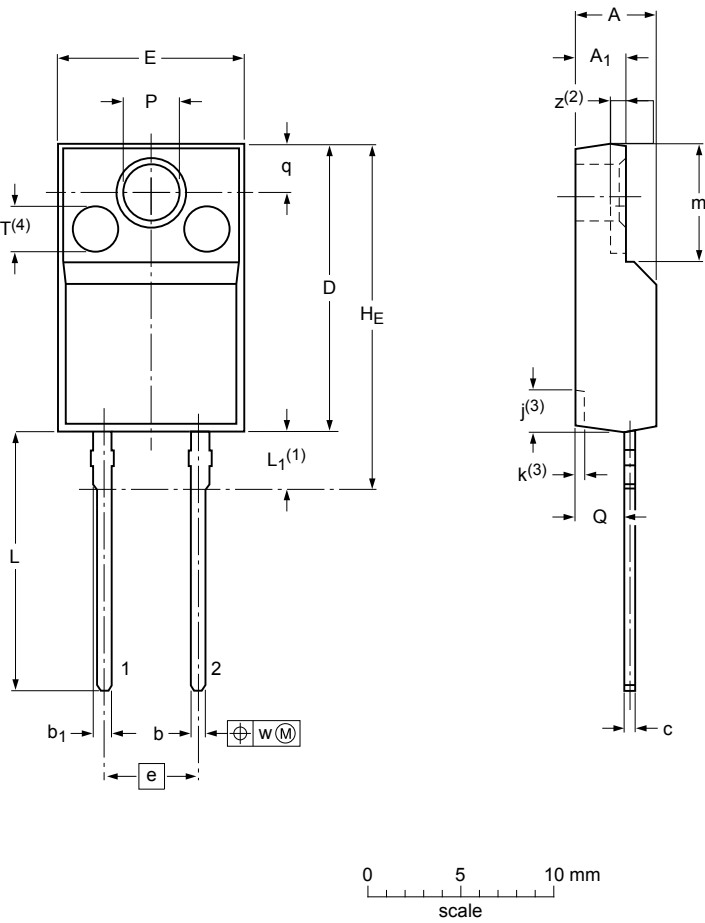


**Fig. 7. Reverse recovery definitions; ramp recovery**

12. Package outline

Plastic single-ended package; isolated heasink mounted;  
1 mounting hole; 2-lead TO-220F 'full pack'

SOD113A



Dimensions (mm are the original dimensions)

Unit	A	A <sub>1</sub>	b	b <sub>1</sub>	c	D	E	e	H <sub>E</sub> max	j <sup>(3)</sup>	k <sup>(3)</sup>	L	L <sub>1</sub> <sup>(1)</sup>	m	P	Q	q	T <sup>(4)</sup>	W	z <sup>(2)</sup>
mm	max	4.6	3.1	0.9	1.1	0.7	15.8	10.3		2.7	0.8	14.4	3.3	6.5	3.2	2.8				
	nom							5.08	19.0								2.6	2.55	0.4	0.8
	min	4.0	2.5	0.7	0.9	0.4	15.2	9.7		1.7	0.4	13.5	2.8	6.3	3.0	2.3				

- Note
- 1. Terminals are uncontrolled within zone L1.
  - 2. z is depth of T.
  - 3. Dot lines area designs may vary.
  - 4. Eject pin mark is for reference only.

sod113a\_po

Outline version	References				European projection	Issue date
	IEC	JEDEC	JEITA			
SOD113A	2 LEADS TO220F					14-01-14 14-04-10

Fig. 8. Package outline TO-220F (SOD113A)

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Objective [short] data sheet	Development	This document contains data from the objective specification for product development.
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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 .....	2
9	Thermal characteristics .....	4
10	Isolation characteristics .....	4
11	Characteristics .....	4
12	Package outline .....	6
13	Legal information .....	7
13.1	Data sheet status .....	7
13.2	Definitions .....	7
13.3	Disclaimers .....	7
13.4	Trademarks .....	8

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