



# BYC30X-600P

Hyperfast power diode

4 February 2013

Product data sheet

## 1. General description

Hyperfast power diode in a SOD113 (2-lead TO-220F) plastic package.

## 2. Features and benefits

- 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
- Continuous Current Mode (CCM) 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
$V_{RRM}$	repetitive peak reverse voltage		-	-	600	V
$I_{F(AV)}$	average forward current	$\delta = 0.5$ ; $T_n \leq 51$ °C; square-wave pulse; <a href="#">Fig. 1</a> ; <a href="#">Fig. 2</a> ; <a href="#">Fig. 3</a>	-	-	30	A
<b>Static characteristics</b>						
$V_F$	forward voltage	$I_F = 30$ A; $T_j = 150$ °C; <a href="#">Fig. 6</a>	-	1.38	1.8	V
<b>Dynamic characteristics</b>						
$t_{rr}$	reverse recovery time	$I_F = 1$ A; $V_R = 30$ V; $di_F/dt = 50$ A/ $\mu$ s; $T_j = 25$ °C; <a href="#">Fig. 7</a>	-	-	35	ns

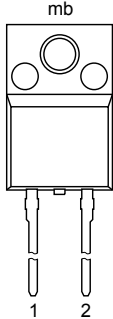
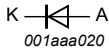


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## 5. Pinning information

Table 2. Pinning information

Pin	Symbol	Description	Simplified outline	Graphic symbol
1	K	cathode	 <p>TO-220F (SOD113)</p>	
2	A	anode		
mb	n.c.	mounting base; isolated		

## 6. Ordering information

Table 3. Ordering information

Type number	Package		
	Name	Description	Version
BYC30X-600P	TO-220F	plastic single-ended package; isolated heatsink mounted; 1 mounting hole; 2-lead TO-220 "full pack"	SOD113

## 7. Marking

Table 4. Marking codes

Type number	Marking code
BYC30X-600P	BYC30X-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	$\delta = 0.5$ ; $T_h \leq 51$ °C; square-wave pulse; <a href="#">Fig. 1</a> ; <a href="#">Fig. 2</a> ; <a href="#">Fig. 3</a>	-	30	A
$I_{FRM}$	repetitive peak forward current	$\delta = 0.5$ ; $t_p = 25$ $\mu$ s; $T_h \leq 51$ °C; square-wave pulse	-	60	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(initial)</sub> = 25 °C; sine-wave pulse; Fig. 4	-	200	A
		t <sub>p</sub> = 8.3 ms; T <sub>j(initial)</sub> = 25 °C; sine-wave pulse; Fig. 4	-	220	A
T <sub>stg</sub>	storage temperature		-65	175	°C
T <sub>j</sub>	junction temperature		-	175	°C

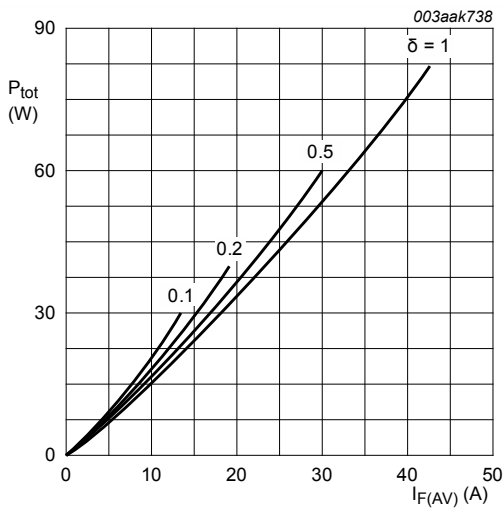


Fig. 1. Forward power dissipation as a function of average forward current; square waveform; maximum values

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

$$V_O = 1.798 \text{ V}; R_S = 0.003 \text{ } \Omega$$

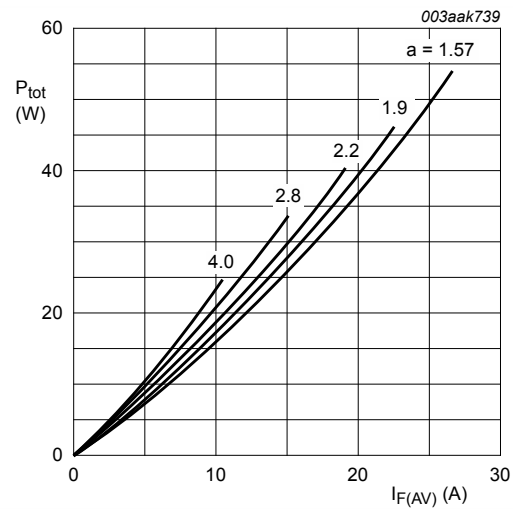


Fig. 2. Forward power dissipation as a function of average forward current; sinusoidal waveform; maximum values

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

$$V_O = 1.798 \text{ V}; R_S = 0.003 \text{ } \Omega$$

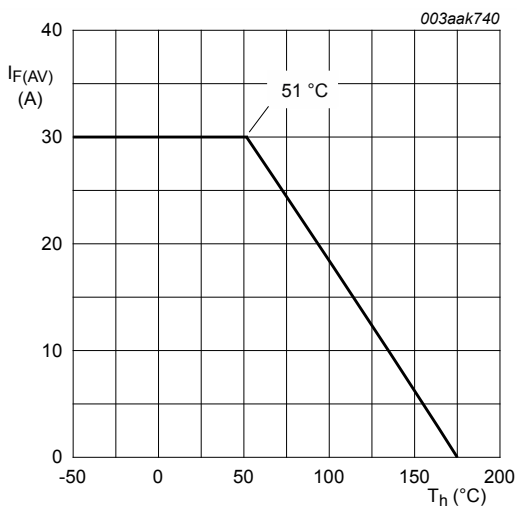


Fig. 3. Forward current as a function of heatsink temperature; maximum values

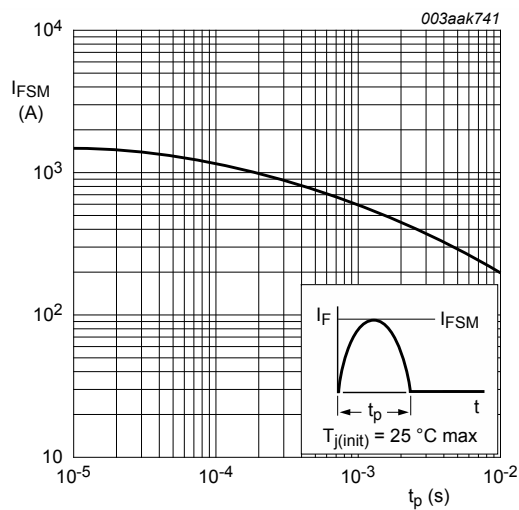


Fig. 4. Non-repetitive peak forward current as a function of pulse width; sinusoidal waveform; maximum values

### 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	-	-	3.5	K/W
$R_{th(j-a)}$	thermal resistance from junction to ambient free air		-	55	-	K/W

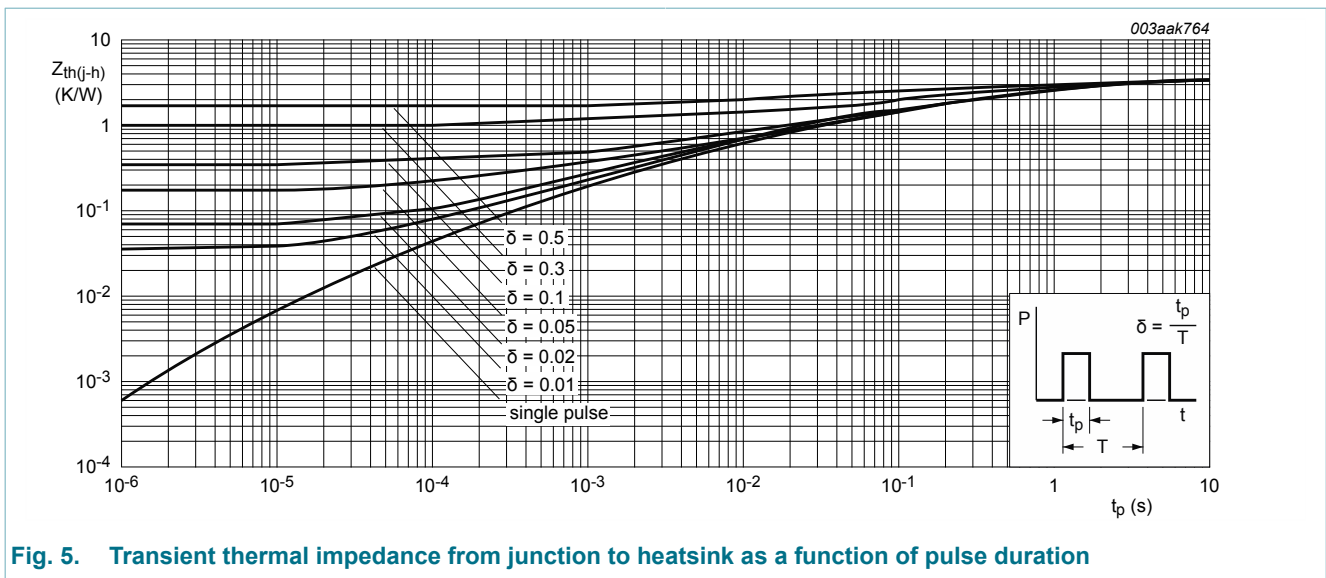


Fig. 5. Transient thermal impedance from junction to heatsink as a function of pulse duration

### 10. Isolation characteristics

Table 7. Isolation characteristics

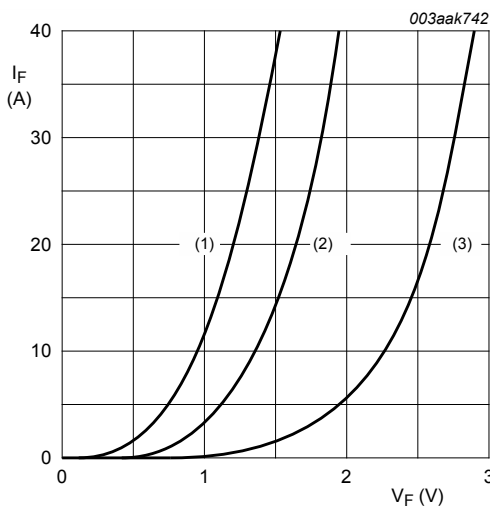
Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$V_{isol(RMS)}$	RMS isolation voltage	50 Hz ≤ f ≤ 60 Hz; RH ≤ 65 %; from all pins to external heatsink; sinusoidal waveform; clean and dust free	-	-	2500	V
$C_{isol}$	isolation capacitance	f = 1 MHz ; from cathode to external heatsink	-	10	-	pF

### 11. Characteristics

Table 8. Characteristics

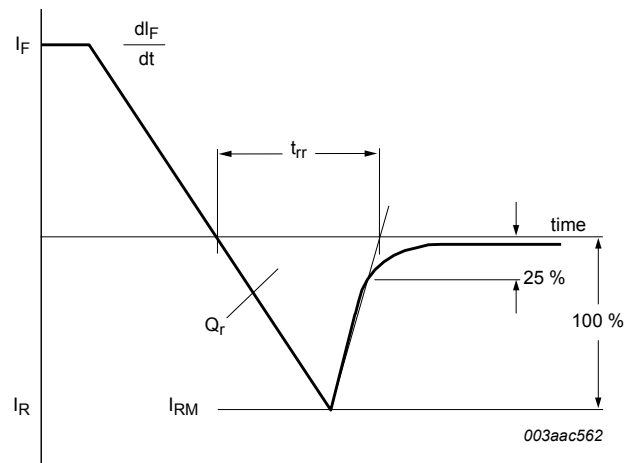
Symbol	Parameter	Conditions	Min	Typ	Max	Unit
<b>Static characteristics</b>						
$V_F$	forward voltage	$I_F = 30\text{ A}$ ; $T_j = 25\text{ °C}$ ; Fig. 6	-	2	2.75	V

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
		$I_F = 30\text{ A}; T_j = 150\text{ }^\circ\text{C};$ <a href="#">Fig. 6</a>	-	1.38	1.8	V
$I_R$	reverse current	$V_R = 600\text{ V}; T_j = 25\text{ }^\circ\text{C}$	-	-	10	$\mu\text{A}$
		$V_R = 600\text{ V}; T_j = 150\text{ }^\circ\text{C}$	-	-	600	$\mu\text{A}$
<b>Dynamic characteristics</b>						
$Q_r$	recovered charge	$I_F = 30\text{ A}; V_R = 200\text{ V}; dI_F/dt = 200\text{ A}/\mu\text{s}; T_j = 25\text{ }^\circ\text{C};$ <a href="#">Fig. 7</a>	-	50	-	nC
		$I_F = 30\text{ A}; V_R = 200\text{ V}; dI_F/dt = 200\text{ A}/\mu\text{s}; T_j = 125\text{ }^\circ\text{C};$ <a href="#">Fig. 7</a>	-	280	-	nC
$t_{rr}$	reverse recovery time	$I_F = 1\text{ A}; V_R = 30\text{ V}; dI_F/dt = 50\text{ A}/\mu\text{s}; T_j = 25\text{ }^\circ\text{C};$ <a href="#">Fig. 7</a>	-	-	35	ns
		$I_F = 30\text{ A}; V_R = 200\text{ V}; dI_F/dt = 200\text{ A}/\mu\text{s}; T_j = 25\text{ }^\circ\text{C};$ <a href="#">Fig. 7</a>	-	-	35	ns
		$I_F = 30\text{ A}; V_R = 200\text{ V}; dI_F/dt = 200\text{ A}/\mu\text{s}; T_j = 125\text{ }^\circ\text{C};$ <a href="#">Fig. 7</a>	-	70	-	ns
$I_{RM}$	peak reverse recovery current	$I_F = 30\text{ A}; V_R = 200\text{ V}; dI_F/dt = 200\text{ A}/\mu\text{s}; T_j = 25\text{ }^\circ\text{C};$ <a href="#">Fig. 7</a>	-	3.5	-	A
		$I_F = 30\text{ A}; V_R = 200\text{ V}; dI_F/dt = 200\text{ A}/\mu\text{s}; T_j = 125\text{ }^\circ\text{C};$ <a href="#">Fig. 7</a>	-	7.6	-	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;
- $V_O = 1.798\text{ V}; R_S = 0.003\ \Omega$

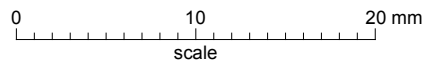
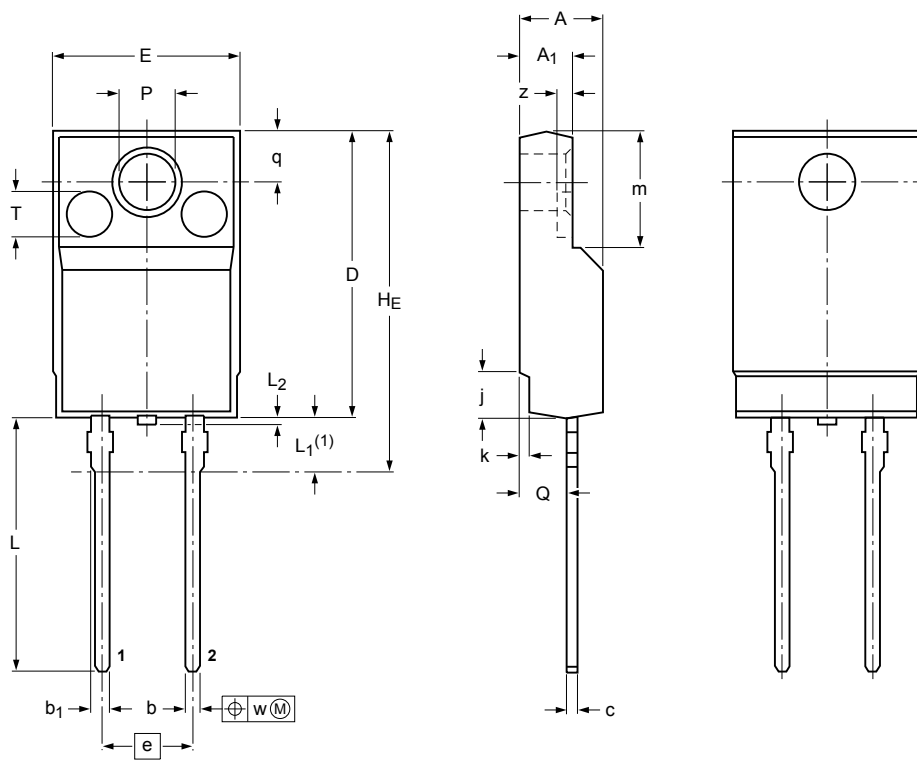


**Fig. 7. Reverse recovery definitions; ramp recovery**

## 12. Package outline

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

SOD113



z <sup>(2)</sup>
0.8

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	k	L	L <sub>1</sub> (1)	L <sub>2</sub> max	m	P	Q	q	T	w
mm	4.6 4.0	2.9 2.5	0.9 0.7	1.1 0.9	0.7 0.4	15.8 15.2	10.3 9.7	5.08	19.0	2.7 1.7	0.6 0.4	14.4 13.5	3.3 2.8	0.5	6.5 6.3	3.2 3.0	2.6 2.3	2.6	2.55	0.4

**Notes**

- 1. Terminals are uncontrolled within zone L<sub>1</sub>.
- 2. z is depth of T.

OUTLINE VERSION	REFERENCES			EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	JEITA		
SOD113		2-lead TO-220F			02-04-09 07-06-18

Fig. 8. Package outline TO-220F (SOD113)

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