



# BYC5DX-500

## Hyperfast power diode

Rev. 1 — 6 July 2011

Product data sheet

## 1. Product profile

### 1.1 General description

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

### 1.2 Features and benefits

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

### 1.3 Applications

- Continuous Current Mode (CCM) Power Factor Correction (PFC)
- Half-bridge/full-bridge switched-mode power supplies
- Half-bridge lighting ballasts

### 1.4 Quick reference data

Table 1. Quick reference data

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$V_{RRM}$	repetitive peak reverse voltage		-	-	500	V
$I_{F(AV)}$	average forward current	square-wave pulse; $\delta = 0.5$ ; $T_h = 103\text{ }^\circ\text{C}$ ; see <a href="#">Figure 1</a> ; see <a href="#">Figure 2</a>	-	-	5	A
<b>Static characteristics</b>						
$V_F$	forward voltage	$I_F = 5\text{ A}$ ; $T_j = 25\text{ }^\circ\text{C}$ ; see <a href="#">Figure 5</a>	-	1.5	2	V
		$I_F = 5\text{ A}$ ; $T_j = 150\text{ }^\circ\text{C}$ ; see <a href="#">Figure 5</a>	-	1.15	1.45	V
<b>Dynamic characteristics</b>						
$t_{rr}$	reverse recovery time	$I_F = 5\text{ A}$ ; $V_R = 400\text{ V}$ ; $di_F/dt = 500\text{ A}/\mu\text{s}$ ; $T_j = 25\text{ }^\circ\text{C}$ ; see <a href="#">Figure 6</a>	-	16	-	ns



## 2. Pinning information

**Table 2. Pinning information**

Pin	Symbol	Description	Simplified outline	Graphic symbol
1	K	cathode		
2	A	anode		
mb	n.c.	mounting base; isolated		

**SOD113 (TO-220F)**

## 3. Ordering information

**Table 3. Ordering information**

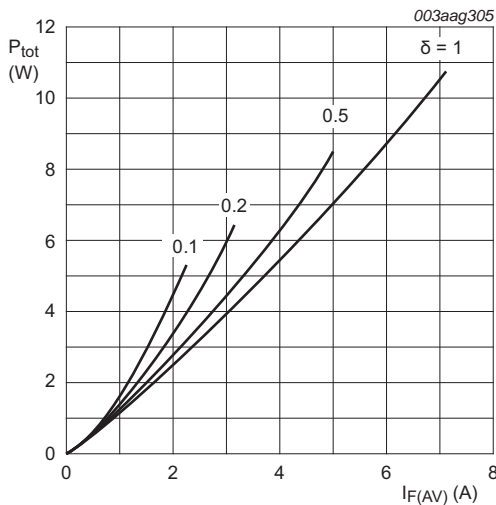
Type number	Package		
	Name	Description	Version
BYC5DX-500	TO-220F	plastic single-ended package; isolated heatsink mounted; 1 mounting hole; 2-lead TO-220 "full pack"	SOD113

### 4. Limiting values

**Table 4. Limiting values**

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

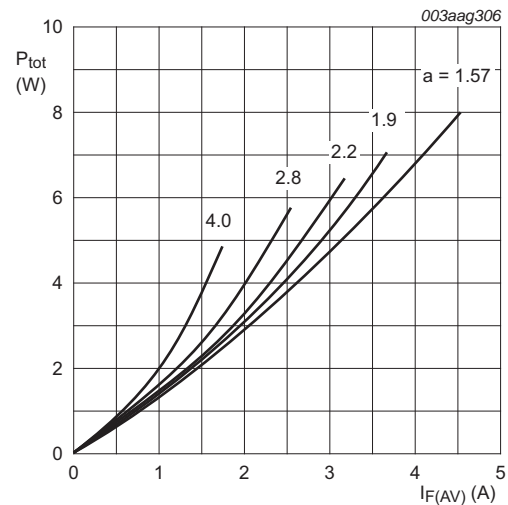
Symbol	Parameter	Conditions	Min	Max	Unit
$V_{RRM}$	repetitive peak reverse voltage		-	500	V
$V_{RWM}$	crest working reverse voltage		-	500	V
$V_R$	reverse voltage	DC	-	500	V
$I_{F(AV)}$	average forward current	square-wave pulse; $\delta = 0.5$ ; $T_h = 103\text{ }^\circ\text{C}$ ; see <a href="#">Figure 1</a> ; see <a href="#">Figure 2</a>	-	5	A
$I_{FRM}$	repetitive peak forward current	square-wave pulse; $\delta = 0.5$ ; $t_p = 25\text{ }\mu\text{s}$ ; $T_h = 103\text{ }^\circ\text{C}$	-	10	A
$I_{FSM}$	non-repetitive peak forward current	$t_p = 10\text{ ms}$ ; sine-wave pulse; $T_{j(\text{init})} = 25\text{ }^\circ\text{C}$ ; see <a href="#">Figure 3</a>	-	40	A
		$t_p = 8.3\text{ ms}$ ; sine-wave pulse; $T_{j(\text{init})} = 25\text{ }^\circ\text{C}$ ; see <a href="#">Figure 3</a>	-	44	A
$T_{stg}$	storage temperature		-40	150	$^\circ\text{C}$
$T_j$	junction temperature		-	150	$^\circ\text{C}$



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

$$V_o = 1.141\text{ V}; R_s = 0.057\text{ }\Omega$$

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



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

$$V_o = 1.141\text{ V}; R_s = 0.057\text{ }\Omega$$

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

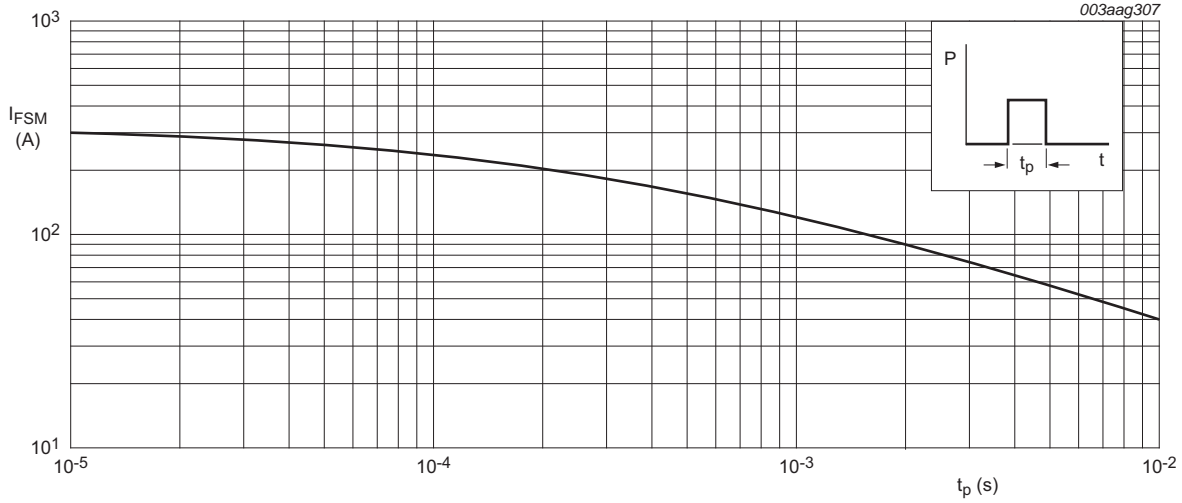


Fig 3. Non-repetitive peak forward current as a function of pulse width; square waveform; maximum values

### 5. Thermal characteristics

Table 5. Thermal characteristics

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$R_{th(j-h)}$	thermal resistance from junction to heatsink	without heatsink compound	-	-	7.2	K/W
		with heatsink compound; see <a href="#">Figure 4</a>	-	-	5.5	K/W
$R_{th(j-a)}$	thermal resistance from junction to ambient free air		-	60	-	K/W

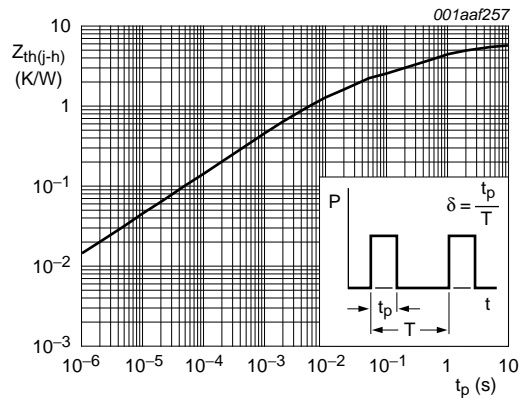


Fig 4. Transient thermal impedance from junction to heatsink as a function of pulse width

## 6. Isolation characteristics

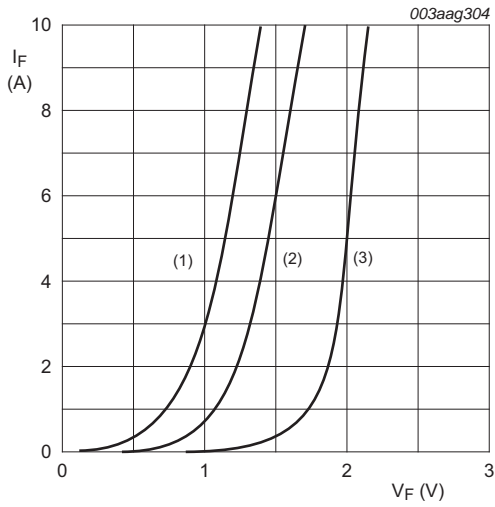
Table 6. Isolation characteristics

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

## 7. Characteristics

Table 7. Characteristics

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
<b>Static characteristics</b>						
$V_F$	forward voltage	$I_F = 5$ A; $T_j = 25$ °C; see <a href="#">Figure 5</a>	-	1.5	2	V
		$I_F = 5$ A; $T_j = 150$ °C; see <a href="#">Figure 5</a>	-	1.15	1.45	V
		$I_F = 10$ A; $T_j = 150$ °C; see <a href="#">Figure 5</a>	-	1.4	1.7	V
$I_R$	reverse current	$V_R = 500$ V; $T_j = 100$ °C	-	0.9	3	mA
		$V_R = 500$ V	-	9	40	$\mu$ A
<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; see <a href="#">Figure 6</a>	-	15	30	ns
		$I_F = 5$ A; $V_R = 400$ V; $di_F/dt = 500$ A/ $\mu$ s; $T_j = 25$ °C; see <a href="#">Figure 6</a>	-	16	-	ns
$I_{RM}$	peak reverse recovery current	$I_F = 5$ A; $V_R = 400$ V; $di_F/dt = 500$ A/ $\mu$ s; $T_j = 100$ °C; see <a href="#">Figure 6</a>	-	9.5	11	A
		$I_F = 5$ A; $V_R = 400$ V; $di_F/dt = 50$ A/ $\mu$ s; $T_j = 125$ °C; see <a href="#">Figure 6</a>	-	0.9	3	A
$V_{FR}$	forward recovery voltage	$I_F = 5$ A; $di_F/dt = 100$ A/ $\mu$ s; $T_j = 25$ °C; see <a href="#">Figure 7</a>	-	9	11	V



(1)  $T_j = 150\text{ °C}$ ; typical values;  
 (2)  $T_j = 150\text{ °C}$ ; maximum values;  
 (3)  $T_j = 25\text{ °C}$ ; maximum values;  
 $V_o = 1.141\text{ V}$ ;  $R_s = 0.057\text{ }\Omega$

Fig 5. Forward current as a function of forward voltage

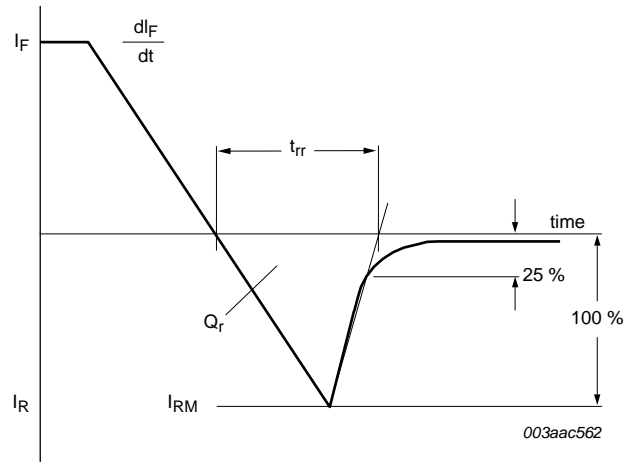


Fig 6. Reverse recovery definitions; ramp recovery

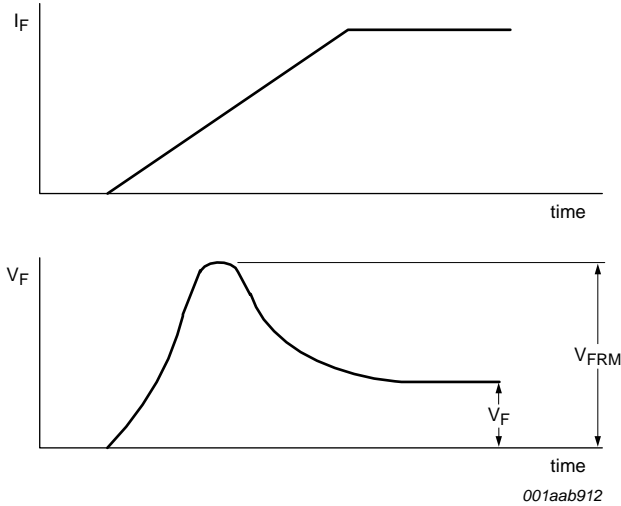


Fig 7. Forward recovery definitions

## 8. Package outline

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

SOD113

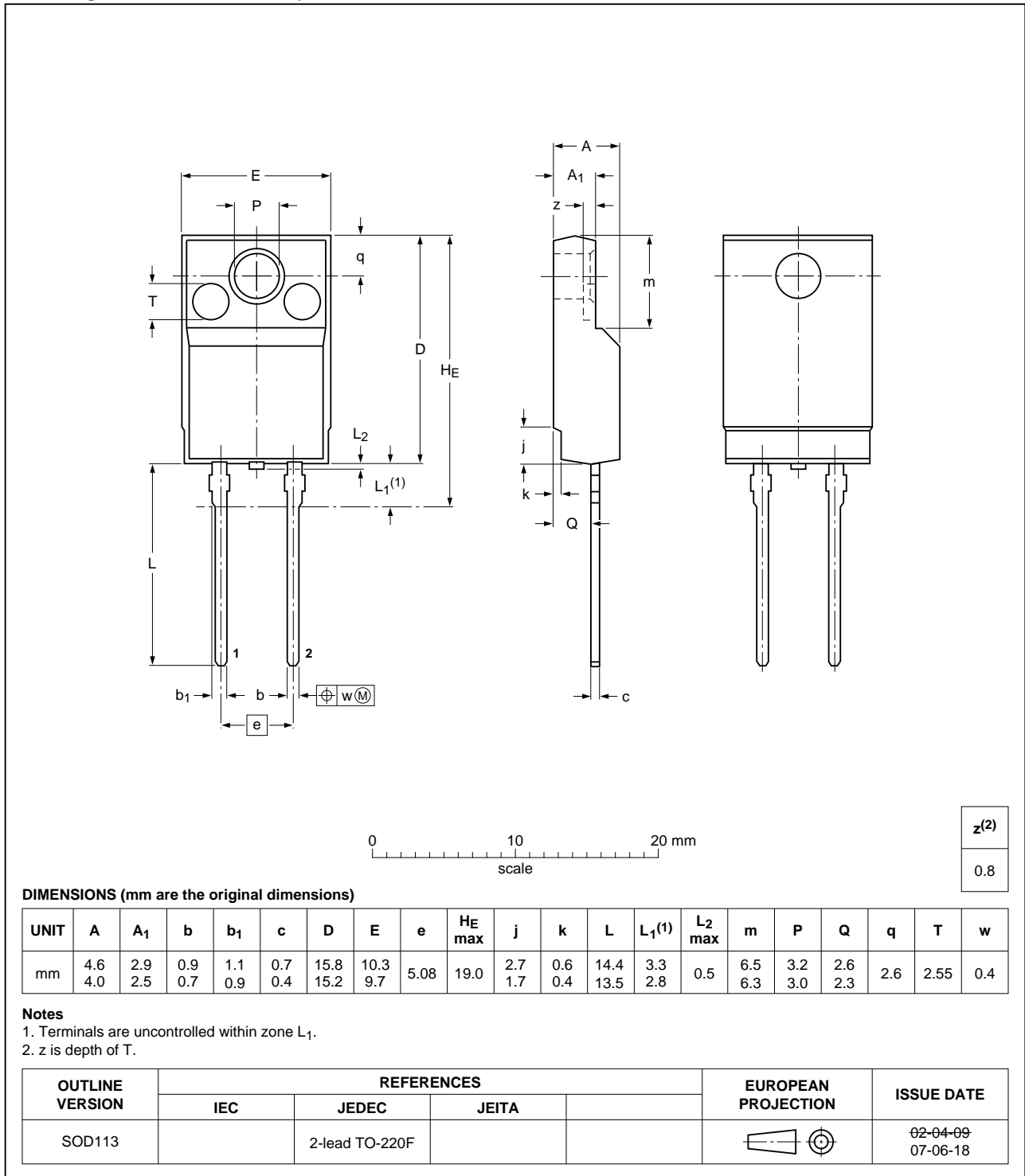


Fig 8. Package outline SOD113 (TO-220F)

## 9. Revision history

Table 8. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
BYC5DX-500 v.1	20110706	Product data sheet	-	-



## 10. Legal information

### 10.1 Data sheet status

Document status <a href="#">[1]</a> <a href="#">[2]</a>	Product status <a href="#">[3]</a>	Definition
Objective [short] data sheet	Development	This document contains data from the objective specification for product development.
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