



# BYC5D-500

Hyperfast power diode

Rev.02 - 5 March 2018

Product data sheet

## 1. General description

Hyperfast power diode in a SOD59 (2-lead TO-220AC) plastic package.

## 2. Features and benefits

- Low reverse recovery current and low thermal resistance
- Reduces switching losses in associated MOSFET

## 3. Applications

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

## 4. Quick reference data

Table 1. Quick reference data

Symbol	Parameter	Conditions	Values			Unit
<b>Absolute maximum rating</b>						
$V_{RRM}$	repetitive peak reverse voltage		500			V
$I_{F(AV)}$	average forward current	$\delta = 0.5$ ; square-wave pulse; $T_{mb} \leq 129\text{ }^{\circ}\text{C}$ ; <a href="#">Fig. 1</a> ; <a href="#">Fig. 2</a>	5			A
$I_{FRM}$	repetitive peak forward current	$\delta = 0.5$ ; $t_p = 25\text{ }\mu\text{s}$ ; $T_{mb} \leq 129\text{ }^{\circ}\text{C}$ ; square-wave pulse	10			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; <a href="#">Fig. 3</a>	40			A
		$t_p = 8.3\text{ ms}$ ; $T_{j(\text{init})} = 25\text{ }^{\circ}\text{C}$ ; sine-wave pulse	44			A
Symbol	Parameter	Conditions	Min	Typ	Max	Unit
<b>Static characteristics</b>						
$V_F$	forward voltage	$I_F = 5\text{ A}$ ; $T_j = 25\text{ }^{\circ}\text{C}$ ; <a href="#">Fig. 5</a>	-	1.5	2	V
		$I_F = 5\text{ A}$ ; $T_j = 150\text{ }^{\circ}\text{C}$ ; <a href="#">Fig. 5</a>	-	1.15	1.45	V
<b>Dynamic characteristics</b>						
$t_{rr}$	reverse recovery time	$I_F = 5\text{ A}$ ; $V_R = 400\text{ V}$ ; $dI_F/dt = 500\text{ A}/\mu\text{s}$ ; $T_j = 25\text{ }^{\circ}\text{C}$ ; <a href="#">Fig. 6</a>	-	16	-	ns

## 5. Pinning information

Table 2. Pinning information

Pin	Symbol	Description	Simplified outline	Graphic symbol
1	K	cathode		
2	A	anode		
mb	mb	mounting base; connected to cathode		

## 6. Ordering information

Table 3. Ordering information

Type number	Package		
	Name	Description	Version
BYC5D-500	TO-220AC	plastic single-ended package; heatsink mounted; 1 mounting hole; 2-lead TO-220AC	SOD59

## 7. Marking

Table 4. Marking codes

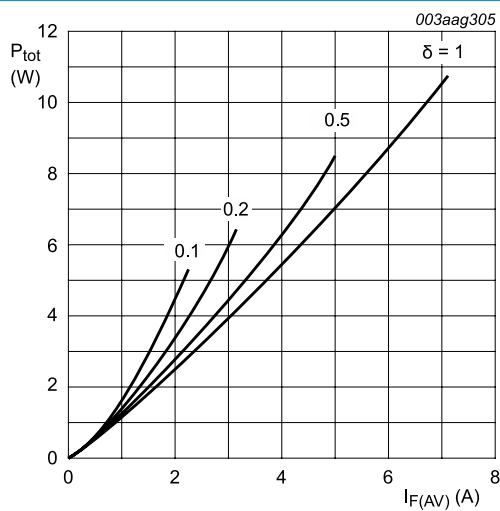
Type number	Marking codes
BYC5D-500	BYC5D-500

## 8. Limiting values

**Table 5. Limiting values**

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

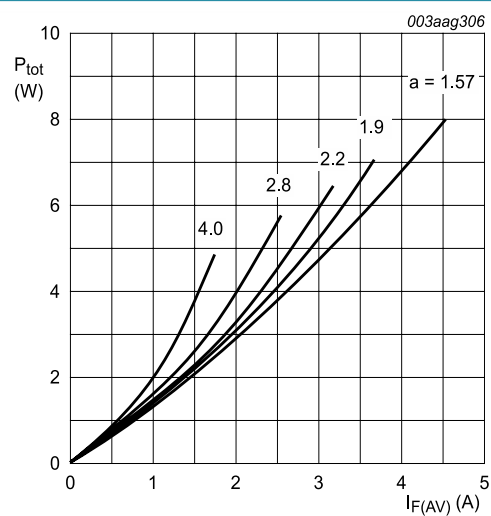
Symbol	Parameter	Conditions	Values	Unit
$V_{RRM}$	repetitive peak reverse voltage		500	V
$V_{RWM}$	crest working reverse voltage		500	V
$V_R$	reverse voltage	DC	500	V
$I_{F(AV)}$	average forward current	$\delta = 0.5$ ; square-wave pulse; $T_{mb} \leq 129\text{ }^\circ\text{C}$ ; <a href="#">Fig. 1</a> ; <a href="#">Fig. 2</a>	5	A
$I_{FRM}$	repetitive peak forward current	$\delta = 0.5$ ; $t_p = 25\text{ }\mu\text{s}$ ; $T_{mb} \leq 129\text{ }^\circ\text{C}$ ; square-wave pulse	10	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; <a href="#">Fig. 3</a>	40	A
		$t_p = 8.3\text{ ms}$ ; $T_{j(\text{init})} = 25\text{ }^\circ\text{C}$ ; sine-wave pulse	44	A
$T_{stg}$	storage temperature		-40 to 150	$^\circ\text{C}$
$T_j$	junction temperature		150	$^\circ\text{C}$



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

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

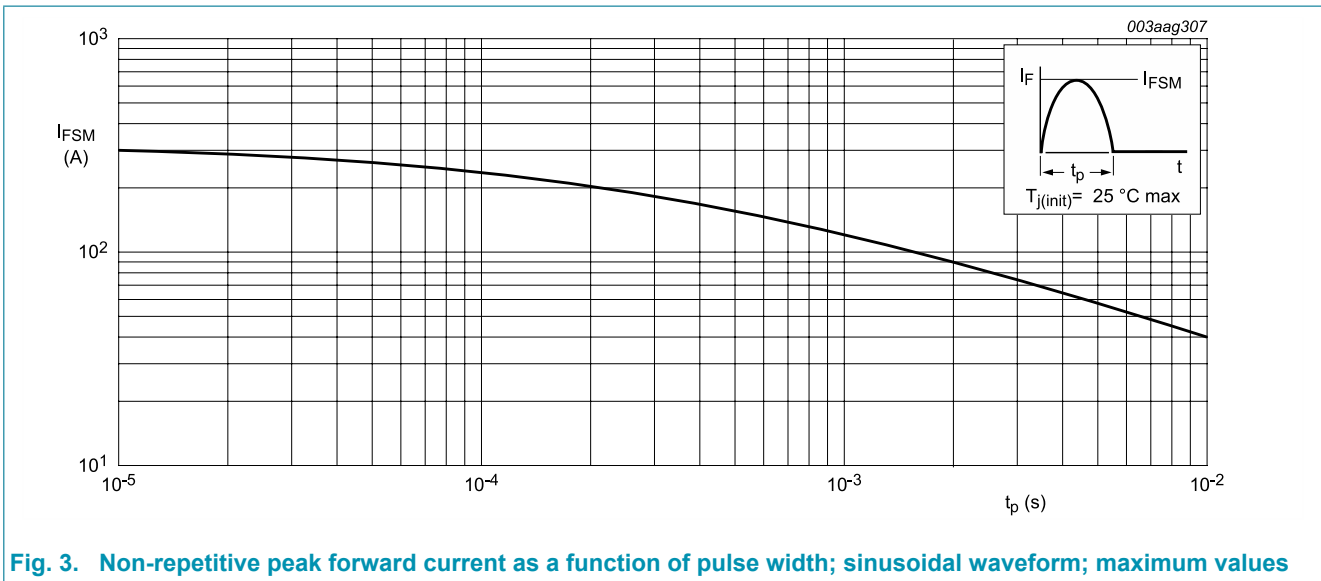
**Fig. 1. Forward power dissipation as a function of average forward current; square waveform; maximum values**



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

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

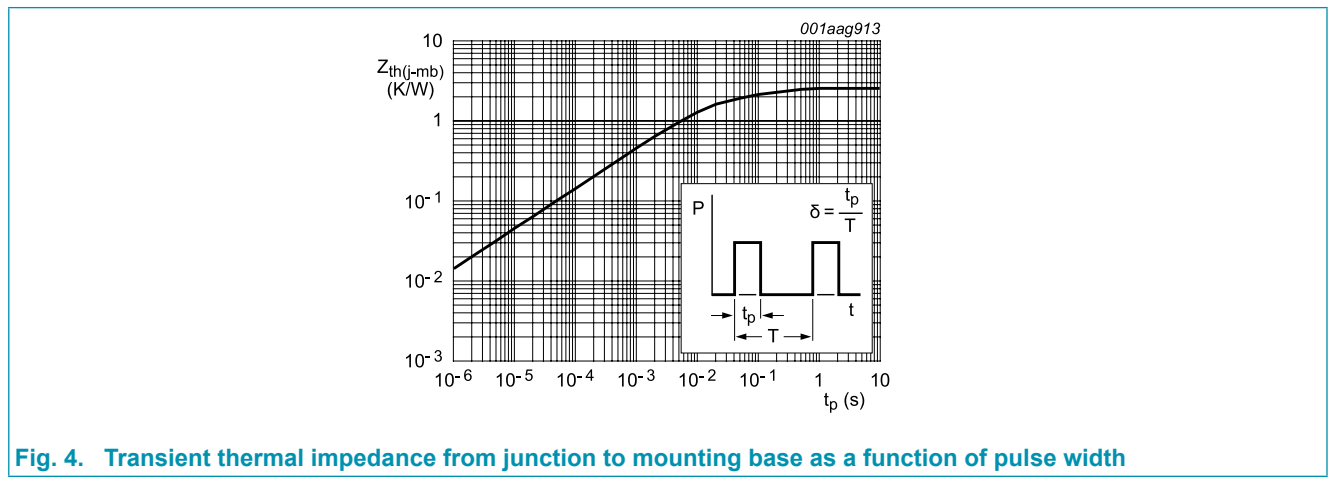
**Fig. 2. Forward power dissipation as a function of average forward current; sinusoidal waveform; maximum values**



## 9. Thermal characteristics

**Table 6. Thermal characteristics**

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$R_{th(j-mb)}$	thermal resistance from junction to mounting base	<a href="#">Fig 4</a>	-	-	2.5	K/W
$R_{th(j-a)}$	thermal resistance from junction to ambient free air	in free air	-	60	-	K/W

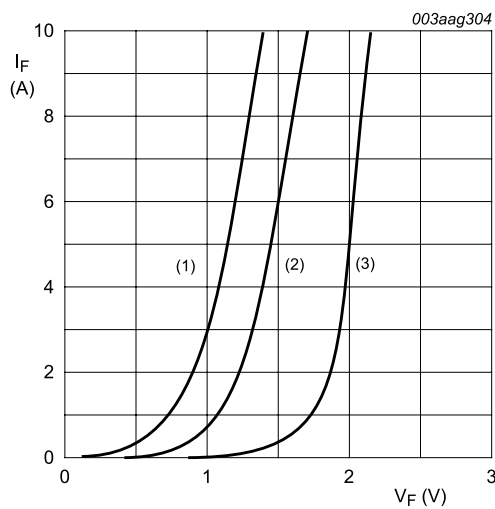


**Fig. 4. Transient thermal impedance from junction to mounting base as a function of pulse width**

### 10. Characteristics

Table 7. Characteristics

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
<b>Static characteristics</b>						
$V_F$	forward voltage	$I_F = 10\text{ A}; T_j = 150\text{ }^\circ\text{C}; \text{ Fig. 5}$	-	1.4	1.7	V
		$I_F = 5\text{ A}; T_j = 25\text{ }^\circ\text{C}; \text{ Fig. 5}$	-	1.5	2	V
		$I_F = 5\text{ A}; T_j = 150\text{ }^\circ\text{C}; \text{ Fig. 5}$	-	1.15	1.45	V
$I_R$	reverse current	$V_R = 500\text{ V}$	-	9	40	$\mu\text{A}$
		$V_R = 500\text{ V}; T_j = 100\text{ }^\circ\text{C}$	-	0.9	3	mA
<b>Dynamic characteristics</b>						
$t_{rr}$	reverse recovery time	$I_F = 1\text{ A}; V_R = 30\text{ V}; dI_F/dt = 50\text{ A}/\mu\text{s}; T_j = 25\text{ }^\circ\text{C}; \text{ Fig. 6}$	-	15	30	ns
		$I_F = 5\text{ A}; V_R = 400\text{ V}; dI_F/dt = 500\text{ A}/\mu\text{s}; T_j = 25\text{ }^\circ\text{C}; \text{ Fig. 6}$	-	16	-	ns
$I_{RM}$	peak reverse recovery current	$I_F = 5\text{ A}; V_R = 400\text{ V}; dI_F/dt = 50\text{ A}/\mu\text{s}; T_j = 125\text{ }^\circ\text{C}; \text{ Fig. 6}$	-	0.9	3	A
		$I_F = 5\text{ A}; V_R = 400\text{ V}; dI_F/dt = 500\text{ A}/\mu\text{s}; T_j = 100\text{ }^\circ\text{C}; \text{ Fig. 6}$	-	9.5	11	A
$V_{FR}$	forward recovery voltage	$I_F = 5\text{ A}; dI_F/dt = 100\text{ A}/\mu\text{s}; T_j = 25\text{ }^\circ\text{C}; \text{ Fig. 7}$	-	9	11	V



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

Fig. 5. Forward current as a function of forward voltage

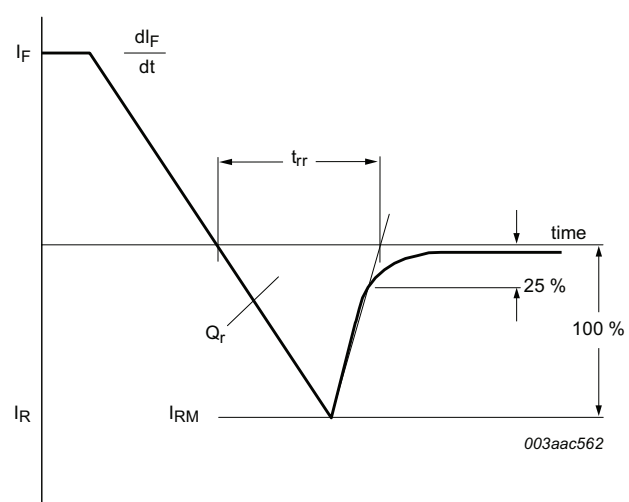
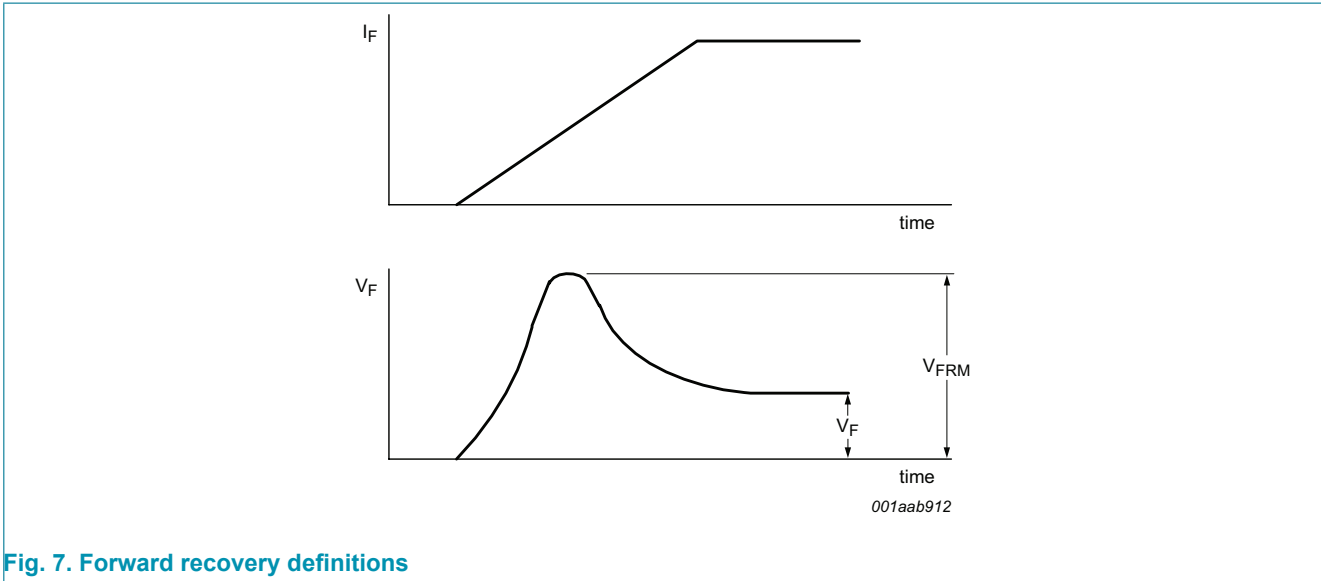


Fig. 6. Reverse recovery definitions; ramp recovery

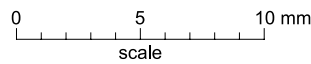
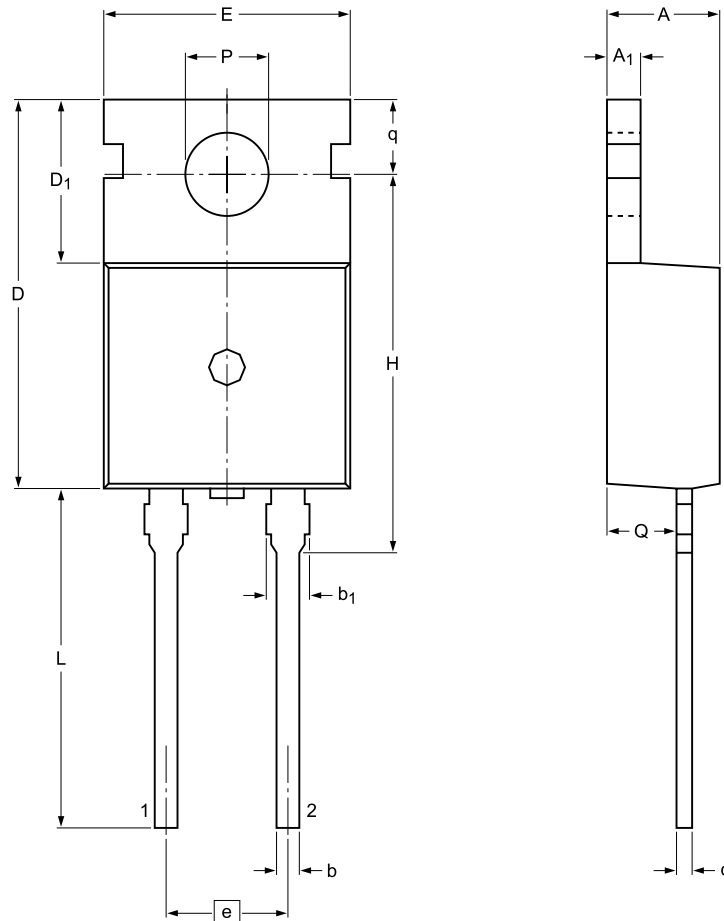


**Fig. 7. Forward recovery definitions**

### 11. Package outline

Plastic single-ended package; heatsink mounted; 1 mounting hole; 2-lead TO-220AC

SOD59



Dimensions

Unit	A	A <sub>1</sub>	b	b <sub>1</sub> <sup>(1)</sup>	c	D	D <sub>1</sub>	E	e	H	L	P	Q	q
mm	max	4.7	1.40	0.95	1.7	0.65	15.8	6.8	10.30	16.25	15.0	3.80	2.6	2.9
	nom								5.08					
	min	4.3	1.15	0.70	1.3	0.45	15.6	6.4	9.65	(REF)	15.70	12.5	3.65	2.2

Note

1. Protruded dambar are included in the dimension.

sod059\_po

Outline version	References				European projection	Issue date
	IEC	JEDEC	JEITA			
SOD59	2-lead TO-220AC					<del>09-08-25</del> 12-11-27



## 12. Revision history

**Table 8. Revision history**

Document ID	Release date	Data sheet status	Change notice	Supersedes
BYC5D-500 v.2	20180305	Product data sheet	-	BYC5D-500 v.1
Modifications:	Change from NXP version to WeEn version			
BYC5D-500 v.1	20110706	Product data sheet	-	-

## 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.

- [1] Please consult the most recently issued document before initiating or completing a design.
- [2] The term 'short data sheet' is explained in section "Definitions".
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