



# BYC5D-500

## Hyperfast power diode

Rev. 1 — 6 July 2011

Product data sheet

## 1. Product profile

### 1.1 General description

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

### 1.2 Features and benefits

- Low reverse recovery current and 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

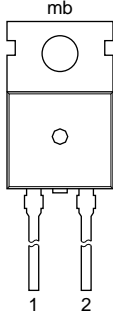

Table 1. Quick reference data

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$V_{RRM}$	repetitive peak reverse voltage		-	-	500	V
$I_{F(AV)}$	average forward current	square-wave pulse; $\delta = 0.5$ ; $T_{mb} \leq 129$ °C; see <a href="#">Figure 1</a> ; see <a href="#">Figure 2</a>	-	-	5	A
<b>Static characteristics</b>						
$V_F$	forward voltage	$I_F = 5$ 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
<b>Dynamic characteristics</b>						
$t_{rr}$	reverse recovery time	$I_F = 5$ A; $V_R = 400$ V; $di_F/dt = 500$ A/ $\mu$ s; $T_j = 25$ °C; see <a href="#">Figure 6</a>	-	16	-	ns



## 2. 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		

**SOD59 (TO-220AC)**

## 3. Ordering information

**Table 3. Ordering information**

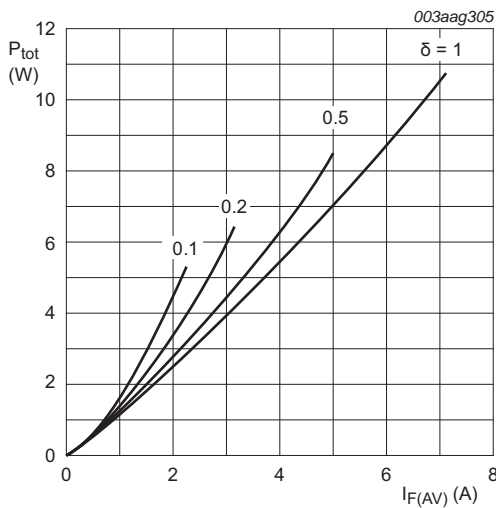
Type number	Package		Version
	Name	Description	
BYC5D-500	TO-220AC	plastic single-ended package; heatsink mounted; 1 mounting hole; 2-lead TO-220AC	SOD59

### 4. Limiting values

**Table 4. Limiting values**

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

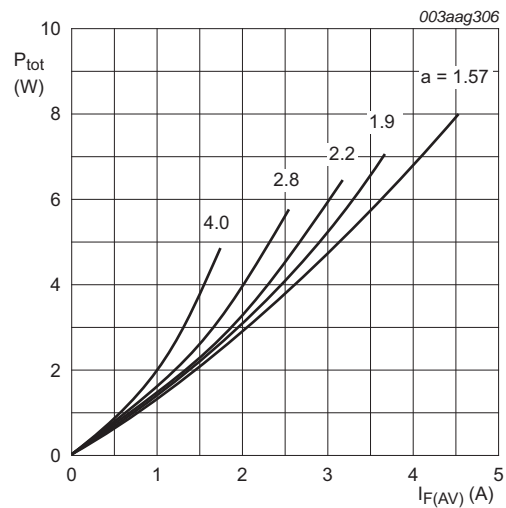
Symbol	Parameter	Conditions	Min	Max	Unit
$V_{RRM}$	repetitive peak reverse voltage		-	500	V
$V_{RWM}$	crest working reverse voltage		-	500	V
$V_R$	reverse voltage	DC	-	500	V
$I_{F(AV)}$	average forward current	square-wave pulse; $\delta = 0.5$ ; $T_{mb} \leq 129\text{ }^\circ\text{C}$ ; see <a href="#">Figure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

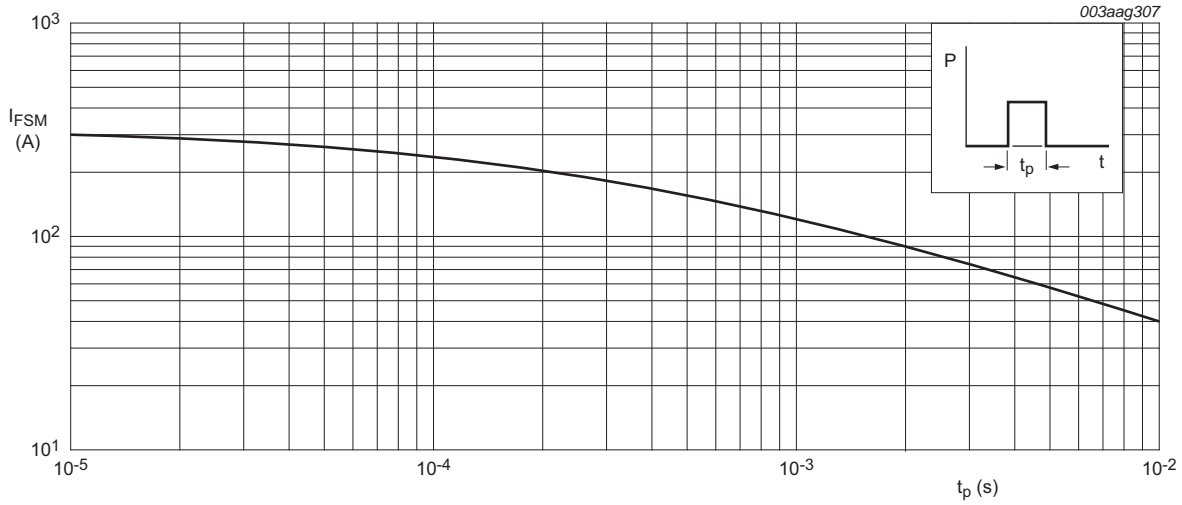


Fig 3. Non-repetitive peak forward current as a function of pulse width; square waveform; maximum values

### 5. Thermal characteristics

Table 5. Thermal characteristics

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

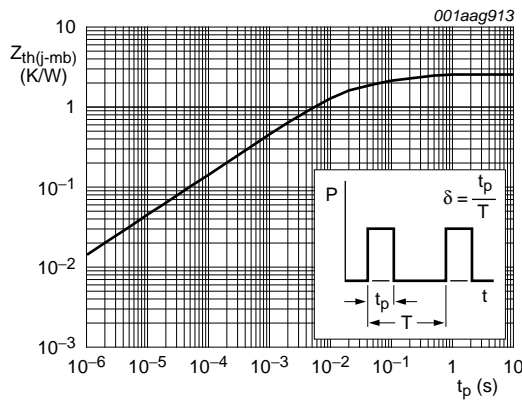
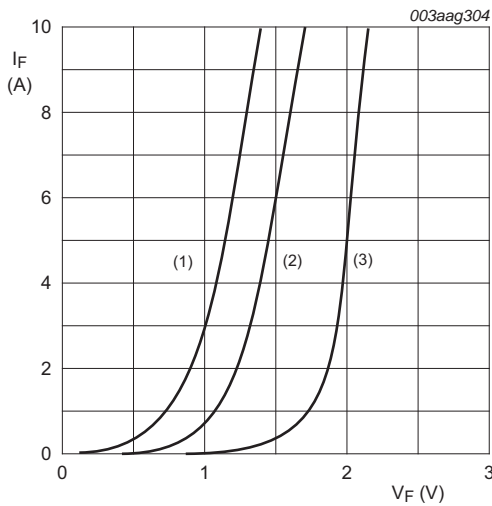


Fig 4. Transient thermal impedance from junction to mounting base as a function of pulse width

## 6. Characteristics

Table 6. Characteristics

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
<b>Static characteristics</b>						
$V_F$	forward voltage	$I_F = 10\text{ A}; T_j = 150\text{ °C};$ see <a href="#">Figure 5</a>	-	1.4	1.7	V
		$I_F = 5\text{ A}; T_j = 25\text{ °C};$ see <a href="#">Figure 5</a>	-	1.5	2	V
		$I_F = 5\text{ A}; T_j = 150\text{ °C};$ see <a href="#">Figure 5</a>	-	1.15	1.45	V
$I_R$	reverse current	$V_R = 500\text{ V}$	-	9	40	$\mu\text{A}$
		$V_R = 500\text{ V}; T_j = 100\text{ °C}$	-	0.9	3	mA
<b>Dynamic characteristics</b>						
$t_{rr}$	reverse recovery time	$I_F = 1\text{ A}; V_R = 30\text{ V}; dI_F/dt = 50\text{ A}/\mu\text{s}; T_j = 25\text{ °C};$ see <a href="#">Figure 6</a>	-	15	30	ns
		$I_F = 5\text{ A}; V_R = 400\text{ V}; dI_F/dt = 500\text{ A}/\mu\text{s}; T_j = 25\text{ °C};$ see <a href="#">Figure 6</a>	-	16	-	ns
$I_{RM}$	peak reverse recovery current	$I_F = 5\text{ A}; V_R = 400\text{ V}; dI_F/dt = 50\text{ A}/\mu\text{s}; T_j = 125\text{ °C};$ see <a href="#">Figure 6</a>	-	0.9	3	A
		$I_F = 5\text{ A}; V_R = 400\text{ V}; dI_F/dt = 500\text{ A}/\mu\text{s}; T_j = 100\text{ °C};$ see <a href="#">Figure 6</a>	-	9.5	11	A
$V_{FR}$	forward recovery voltage	$I_F = 5\text{ A}; dI_F/dt = 100\text{ A}/\mu\text{s}; T_j = 25\text{ °C};$ 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;  
 $V_o = 1.141\text{ V}; R_s = 0.057\ \Omega$

Fig 5. Forward current as a function of forward voltage

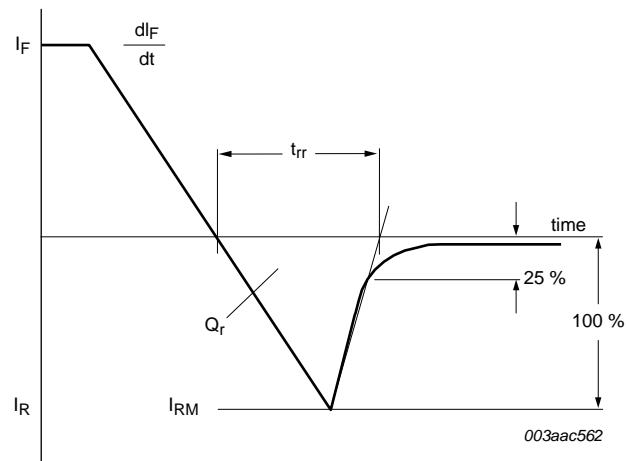


Fig 6. Reverse recovery definitions; ramp recovery

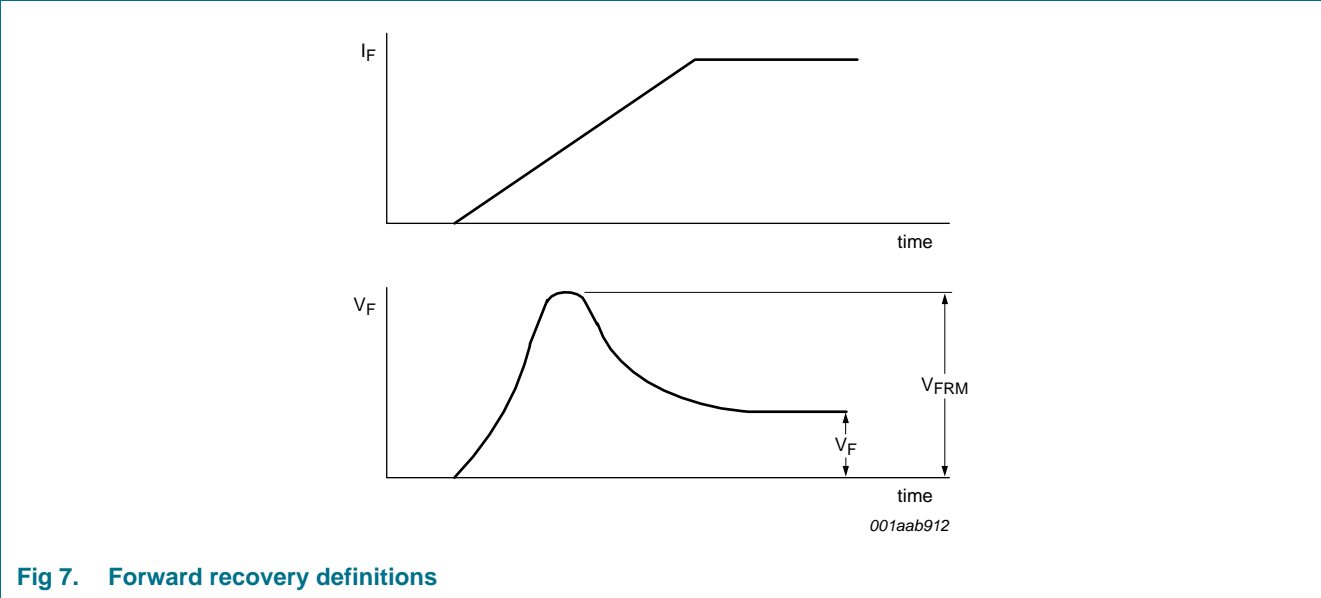
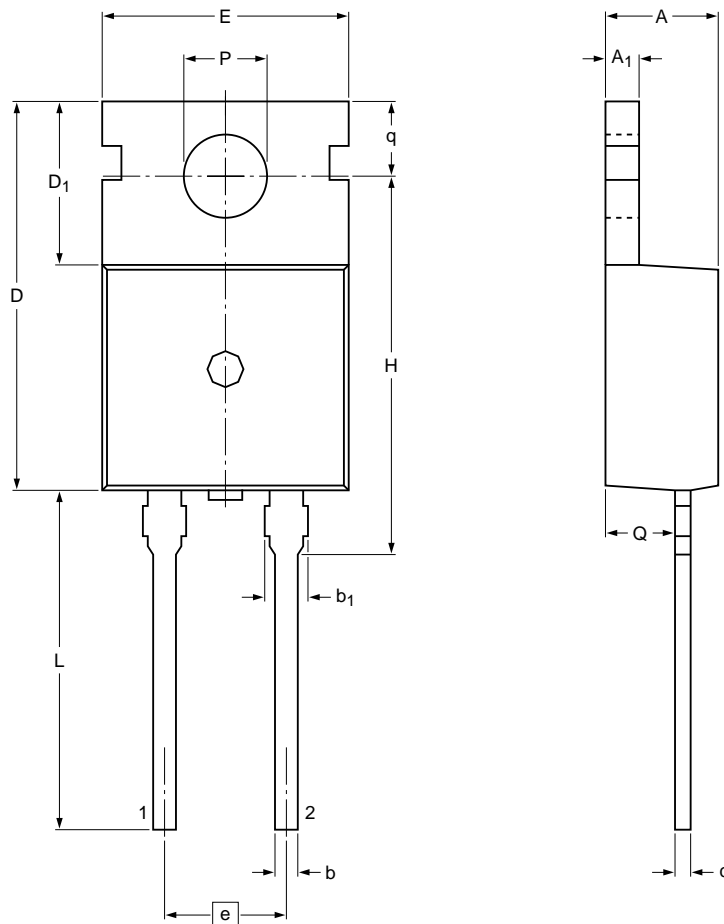


Fig 7. Forward recovery definitions

7. 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> (1)	c	D	D <sub>1</sub>	E	e	H	L	P	Q	q
max	4.7	1.40	0.95	1.7	0.65	15.8	6.8	10.30	5.08	16.25	15.0	3.7	2.6	2.9
nom									(REF)					
min	4.3	1.15	0.70	1.3	0.45	15.6	6.4	9.65		15.70	12.5	3.5	2.2	2.7

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				-09-08-17- 09-08-25

Fig 8. Package outline SOD59 (TO-220AC)

## 8. Revision history

Table 7. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
BYC5D-500 v.1	20110706	Product data sheet	-	-



## 9. Legal information

### 9.1 Data sheet status

Document status <sup>[1]</sup> <sup>[2]</sup>	Product status <sup>[3]</sup>	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.

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