



# BYC10-600

Hyperfast power diode

27 May 2013

Product data sheet

## 1. General description

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

## 2. Features and benefits

- Extremely fast switching
- Low reverse recovery current
- 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	Min	Typ	Max	Unit
$V_{RRM}$	repetitive peak reverse voltage		-	-	600	V
$I_{F(AV)}$	average forward current	$\delta = 0.5$ ; $T_{mb} \leq 78$ °C; square-wave pulse; <a href="#">Fig. 1</a> ; <a href="#">Fig. 2</a>	-	-	10	A
<b>Static characteristics</b>						
$V_F$	forward voltage	$I_F = 10$ A; $T_j = 150$ °C; <a href="#">Fig. 4</a>	-	1.4	1.8	V
<b>Dynamic characteristics</b>						
$t_{rr}$	reverse recovery time	$I_F = 10$ A; $V_R = 400$ V; $di_F/dt = 500$ A/ $\mu$ s; $T_j = 25$ °C; <a href="#">Fig. 6</a>	-	19	-	ns

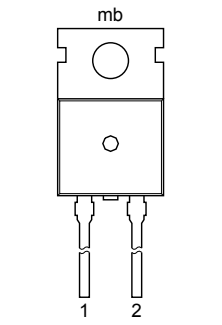
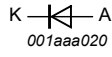


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### 5. Pinning information

Table 2. Pinning information

Pin	Symbol	Description	Simplified outline	Graphic symbol
1	K	cathode	 <p>TO-220AC (SOD59)</p>	 <p>001aaa020</p>
2	A	anode		
mb	mb	mounting base; connected to cathode		

### 6. Ordering information

Table 3. Ordering information

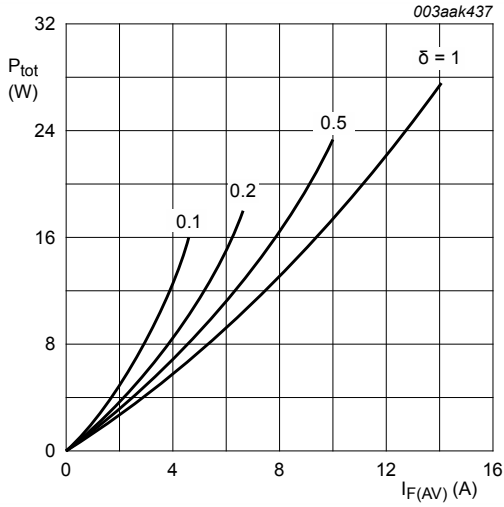
Type number	Package		
	Name	Description	Version
BYC10-600	TO-220AC	plastic single-ended package; heatsink mounted; 1 mounting hole; 2-lead TO-220AC	SOD59

### 7. Limiting values

Table 4. Limiting values

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

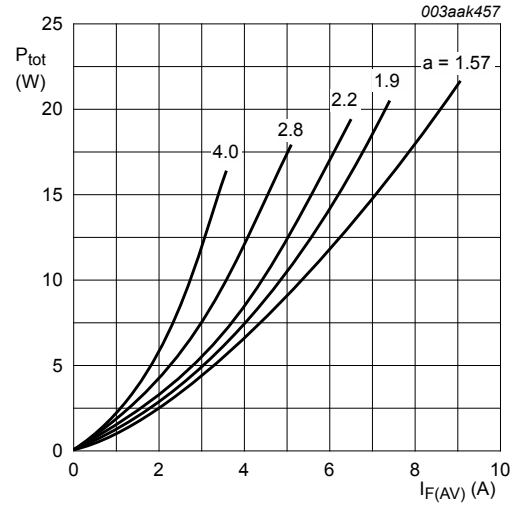
Symbol	Parameter	Conditions	Min	Max	Unit
$V_{RRM}$	repetitive peak reverse voltage		-	600	V
$V_{RWM}$	crest working reverse voltage		-	600	V
$V_R$	reverse voltage	$T_{mb} \leq 114\text{ °C}$	-	500	V
$I_{F(AV)}$	average forward current	$\delta = 0.5$ ; $T_{mb} \leq 78\text{ °C}$ ; square-wave pulse; <a href="#">Fig. 1</a> ; <a href="#">Fig. 2</a>	-	10	A
$I_{FRM}$	repetitive peak forward current	$\delta = 0.5$ ; $T_{mb} \leq 78\text{ °C}$ ; square-wave pulse	-	20	A
$I_{FSM}$	non-repetitive peak forward current	$t_p = 10\text{ ms}$ ; $T_{j(init)} = 25\text{ °C}$ ; sine-wave pulse	-	65	A
		$t_p = 8.3\text{ ms}$ ; $T_{j(init)} = 25\text{ °C}$ ; sine-wave pulse	-	71	A
$T_{stg}$	storage temperature		-40	150	°C
$T_j$	junction temperature		-	150	°C



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

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

$V_O = 1.300 \text{ V}; R_S = 0.050 \Omega$



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

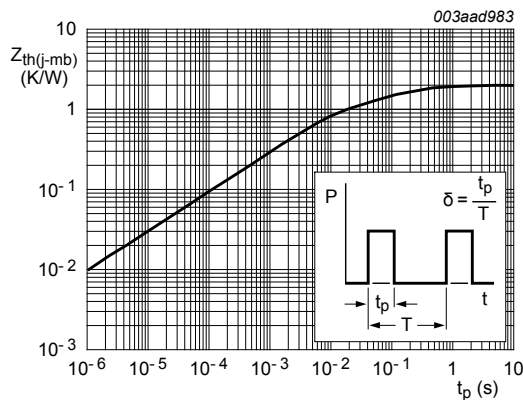
$a = \text{form factor} = I_{F(RMS)} / I_{F(AV)}$

$V_O = 1.300 \text{ V}; R_S = 0.050 \Omega$

## 8. Thermal characteristics

**Table 5. Thermal characteristics**

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$R_{th(j-mb)}$	thermal resistance from junction to mounting base	<a href="#">Fig. 3</a>	-	-	2	K/W
$R_{th(j-a)}$	thermal resistance from junction to ambient free air	in free air	-	60	-	K/W

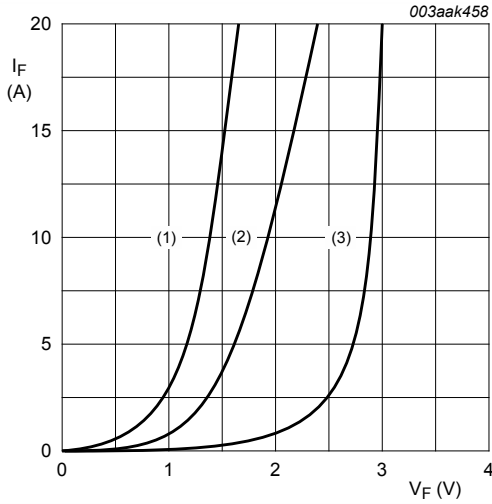


**Fig. 3. Transient thermal impedance from junction to mounting base as a function of pulse width**

## 9. Characteristics

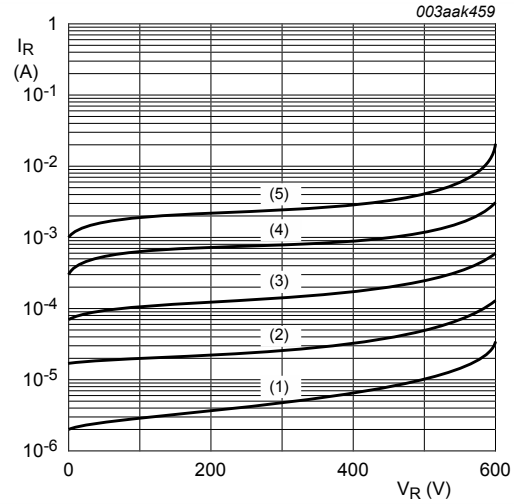
Table 6. Characteristics

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
<b>Static characteristics</b>						
$V_F$	forward voltage	$I_F = 10\text{ A}$ ; $T_j = 25\text{ °C}$ ; <a href="#">Fig. 4</a>	-	2	2.9	V
		$I_F = 10\text{ A}$ ; $T_j = 150\text{ °C}$ ; <a href="#">Fig. 4</a>	-	1.4	1.8	V
		$I_F = 20\text{ A}$ ; $T_j = 150\text{ °C}$ ; <a href="#">Fig. 4</a>	-	1.7	2.3	V
$I_R$	reverse current	$V_R = 600\text{ V}$ ; $T_j = 25\text{ °C}$ ; <a href="#">Fig. 5</a>	-	9	200	$\mu\text{A}$
		$V_R = 500\text{ V}$ ; $T_j = 100\text{ °C}$ ; <a href="#">Fig. 5</a>	-	1.1	3	mA
<b>Dynamic characteristics</b>						
$t_{rr}$	reverse recovery time	$I_F = 1\text{ A}$ ; $V_R = 30\text{ V}$ ; $di_F/dt = 50\text{ A}/\mu\text{s}$ ; $T_j = 25\text{ °C}$ ; <a href="#">Fig. 6</a>	-	35	55	ns
		$I_F = 10\text{ A}$ ; $V_R = 400\text{ V}$ ; $di_F/dt = 500\text{ A}/\mu\text{s}$ ; $T_j = 25\text{ °C}$ ; <a href="#">Fig. 6</a>	-	19	-	ns
		$I_F = 10\text{ A}$ ; $V_R = 400\text{ V}$ ; $di_F/dt = 500\text{ A}/\mu\text{s}$ ; $T_j = 100\text{ °C}$ ; <a href="#">Fig. 6</a>	-	32	40	ns
$I_{RM}$	peak reverse recovery current	$I_F = 10\text{ A}$ ; $V_R = 400\text{ V}$ ; $di_F/dt = 100\text{ A}/\mu\text{s}$ ; $T_j = 125\text{ °C}$ ; <a href="#">Fig. 6</a>	-	3	7.5	A
		$I_F = 10\text{ A}$ ; $V_R = 400\text{ V}$ ; $di_F/dt = 500\text{ A}/\mu\text{s}$ ; $T_j = 125\text{ °C}$ ; <a href="#">Fig. 6</a>	-	9.5	12	A
$V_{FRM}$	forward recovery voltage	$I_F = 10\text{ A}$ ; $di_F/dt = 100\text{ A}/\mu\text{s}$ ; $T_j = 25\text{ °C}$ ; <a href="#">Fig. 7</a>	-	8	11	V



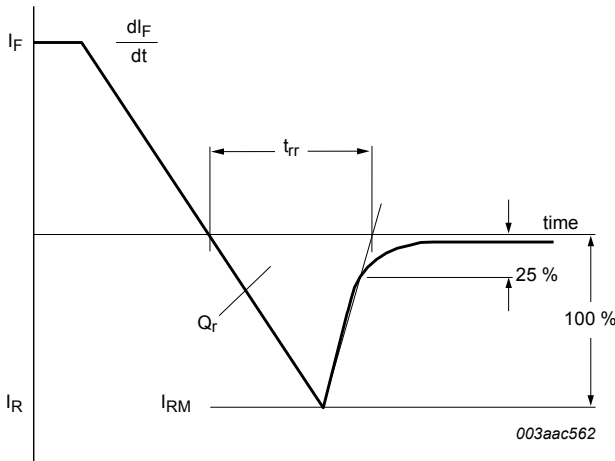
**Fig. 4. Forward current as a function of forward voltage**

- (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;
- $V_O = 1.300\text{ V}$ ;  $R_S = 0.050\ \Omega$

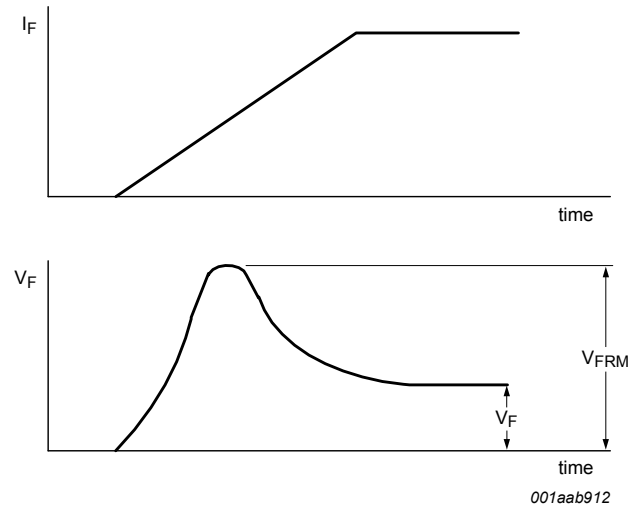


**Fig. 5. Reverse leakage current as a function of reverse voltage; typical values**

- (1)  $T_j = 25\text{ }^\circ\text{C}$ ; typical values;
- (2)  $T_j = 50\text{ }^\circ\text{C}$ ; typical values;
- (3)  $T_j = 75\text{ }^\circ\text{C}$ ; typical values;
- (4)  $T_j = 100\text{ }^\circ\text{C}$ ; typical values;
- (5)  $T_j = 125\text{ }^\circ\text{C}$ ; typical value



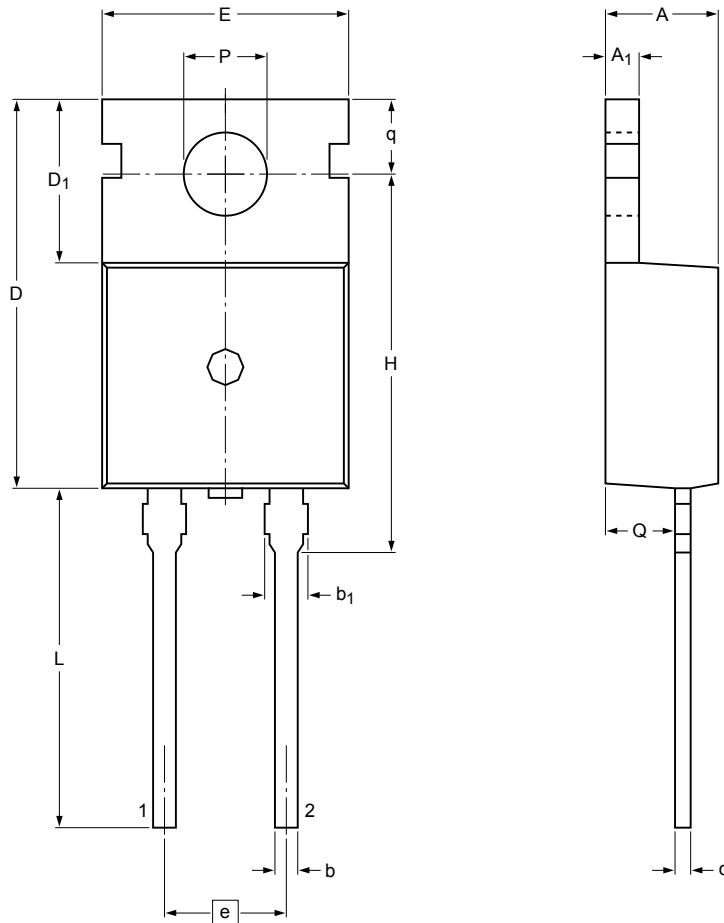
**Fig. 6. Reverse recovery definitions; ramp recovery**



**Fig. 7. Forward recovery definitions**

10. 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	15.70	12.5	3.65	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				09-08-25 12-11-27

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

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Objective [short] data sheet	Development	This document contains data from the objective specification for product development.
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