

## 1. Product profile

### 1.1 General description

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

### 1.2 Features

- Extremely fast switching
- Low reverse recovery current
- Reduces switching loss in associated MOSFET
- Low thermal resistance
- Isolated package

### 1.3 Applications

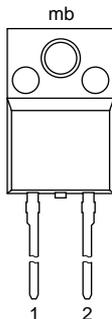
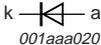
- Half-bridge or full-bridge switched-mode power supplies
- Half-bridge lighting ballasts
- Continuous Current Mode (CCM) Power Factor Correction (PFC)

### 1.4 Quick reference data

- $V_{RRM} \leq 600$  V
- $V_F = 1.54$  V (typ)
- $I_{F(AV)} \leq 20$  A
- $t_{rr} = 19$  ns (typ)

## 2. Pinning information

Table 1. Pinning

Pin	Description	Simplified outline	Symbol
1	cathode (k)		 001aaa020
2	anode (a)		
mb	mounting base; isolated		

SOD113 (2-lead TO-220F)

### 3. Ordering information

**Table 2. Ordering information**

Type number	Package		Version
	Name	Description	
BYC20X-600	TO-220F	plastic single-ended package; isolated heatsink mounted; 1 mounting hole; 2-lead TO-220 'full pack'	SOD113

### 4. Limiting values

**Table 3. Limiting values**

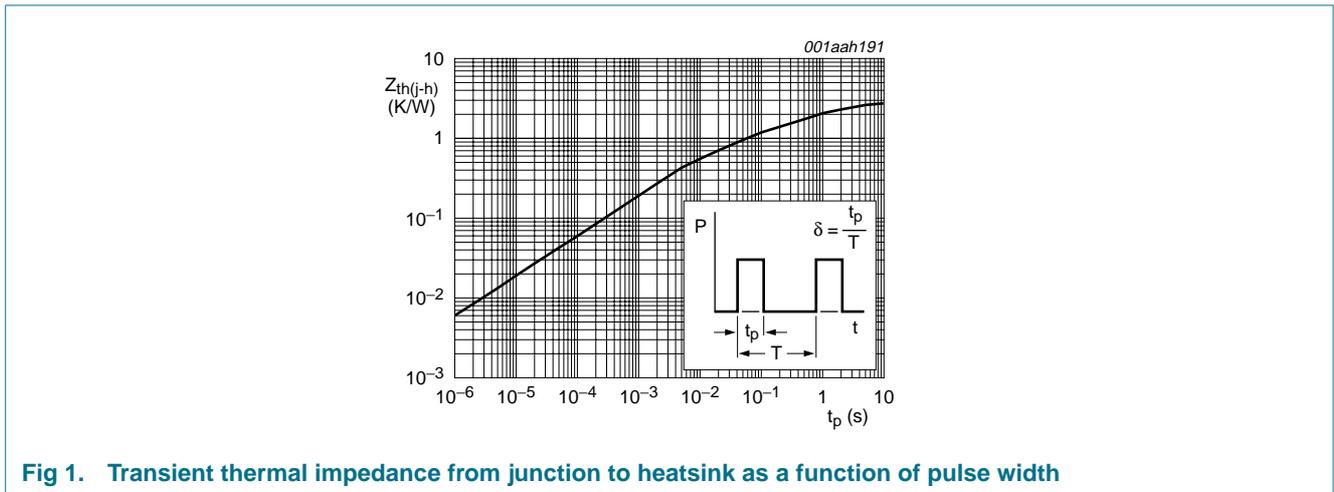
*In accordance with the Absolute Maximum Rating System (IEC 60134).*

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	square waveform; $\delta = 1.0$ ; $T_h \leq 100$ °C	-	500	V
$I_{F(AV)}$	average forward current	square waveform; $\delta = 0.5$ ; $T_h \leq 25$ °C	-	20	A
$I_{FRM}$	repetitive peak forward current	square waveform; $\delta = 0.5$ ; $T_h \leq 25$ °C; $t_p = 25$ $\mu$ s	-	40	A
$I_{FSM}$	non-repetitive peak forward current	$t = 10$ ms; sinusoidal waveform	-	250	A
		$t = 8.3$ ms; sinusoidal waveform	-	274	A
$T_{stg}$	storage temperature		-40	+150	°C
$T_j$	junction temperature		-	150	°C

## 5. Thermal characteristics

**Table 4. Thermal characteristics**

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$R_{th(j-h)}$	thermal resistance from junction to heatsink	with heatsink compound; see <a href="#">Figure 1</a>	-	-	2.6	K/W
$R_{th(j-a)}$	thermal resistance from junction to ambient	in free air	-	55	-	K/W



**Fig 1. Transient thermal impedance from junction to heatsink as a function of pulse width**

## 6. Isolation characteristics

**Table 5. Isolation limiting values and characteristics**

$T_h = 25^\circ C$  unless otherwise specified.

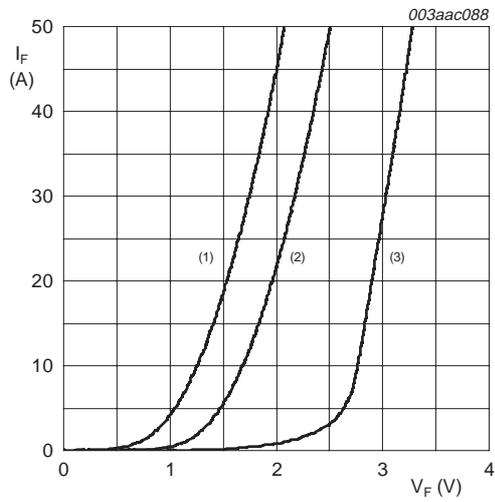
Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$V_{isol(RMS)}$	RMS isolation voltage	from all terminals to external heatsink; $f = 50\text{ Hz to }60\text{ Hz}$ ; sinusoidal waveform; relative humidity $\leq 65\%$ ; clean and dust free	-	-	2500	V
$C_{isol}$	isolation capacitance	from pin 1 (cathode) to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

## 7. Characteristics

**Table 6. Characteristics**

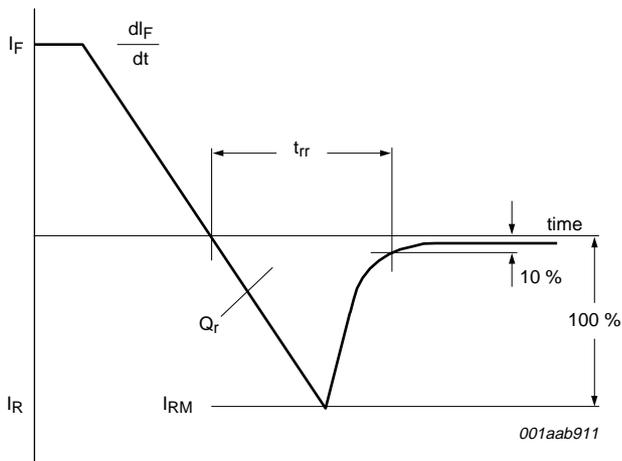
$T_j = 25\text{ °C}$  unless otherwise specified.

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
<b>Static characteristics</b>						
$V_F$	forward voltage	$I_F = 20\text{ A}$ ; $T_j = 150\text{ °C}$ ; see <a href="#">Figure 2</a>	-	1.54	1.97	V
		$I_F = 40\text{ A}$ ; $T_j = 150\text{ °C}$ ; see <a href="#">Figure 2</a>	-	1.95	2.34	V
		$I_F = 20\text{ A}$ ; see <a href="#">Figure 2</a>	-	1.89	2.9	V
$I_R$	reverse current	$V_R = 600\text{ V}$	-	16	200	$\mu\text{A}$
		$V_R = 500\text{ V}$ ; $T_j = 100\text{ °C}$	-	1.6	3.0	mA
<b>Dynamic characteristics</b>						
$t_{rr}$	reverse recovery time	$I_F = 1\text{ A}$ to $V_R = 30\text{ V}$ ; $di_F/dt = 50\text{ A}/\mu\text{s}$ ; see <a href="#">Figure 3</a>	-	35	55	ns
		$I_F = 20\text{ A}$ to $V_R = 400\text{ V}$ ; $di_F/dt = 500\text{ A}/\mu\text{s}$ ; see <a href="#">Figure 3</a>	-			
		$T_j = 25\text{ °C}$	-	19	-	ns
		$T_j = 100\text{ °C}$	-	32	40	ns
$I_{RM}$	peak reverse recovery current	$I_F = 20\text{ A}$ to $V_R = 400\text{ V}$ ; $T_j = 125\text{ °C}$ ; see <a href="#">Figure 3</a>	-			
		$di_F/dt = 50\text{ A}/\mu\text{s}$	-	3.0	7.5	A
		$di_F/dt = 500\text{ A}/\mu\text{s}$	-	9.5	12	A
$V_{FR}$	forward recovery voltage	$I_F = 20\text{ A}$ ; $di_F/dt = 100\text{ A}/\mu\text{s}$ ; see <a href="#">Figure 4</a>	-	8	11	V

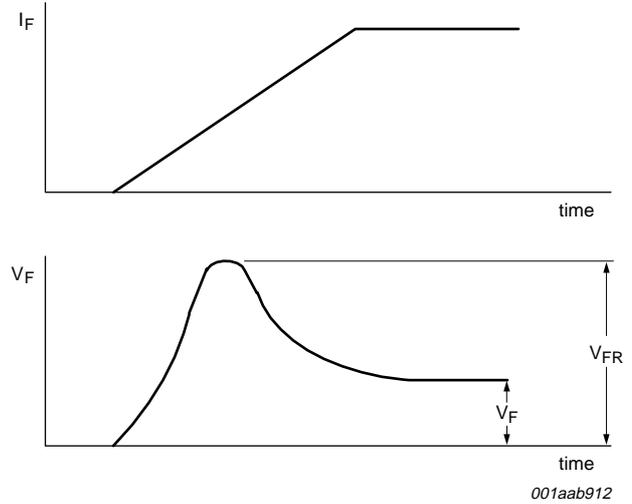


- (1)  $T_j = 150\text{ }^\circ\text{C}$ ; typical values
- (2)  $T_j = 150\text{ }^\circ\text{C}$ ; maximum values
- (3)  $T_j = 25\text{ }^\circ\text{C}$ ; maximum values

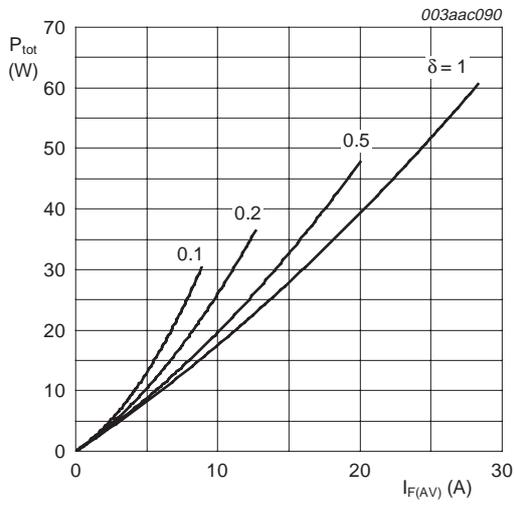
**Fig 2. Forward current as a function of forward voltage**



**Fig 3. Reverse recovery definitions; ramp recovery**

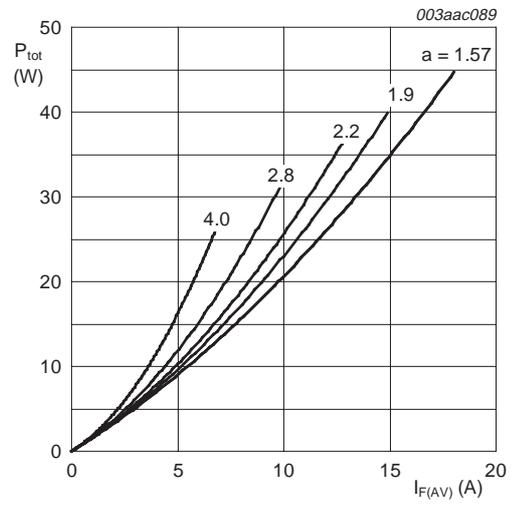


**Fig 4. Forward recovery definitions**



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

**Fig 5. Forward power dissipation as a function of average forward current; square waveform; maximum values**



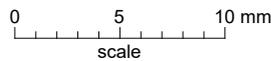
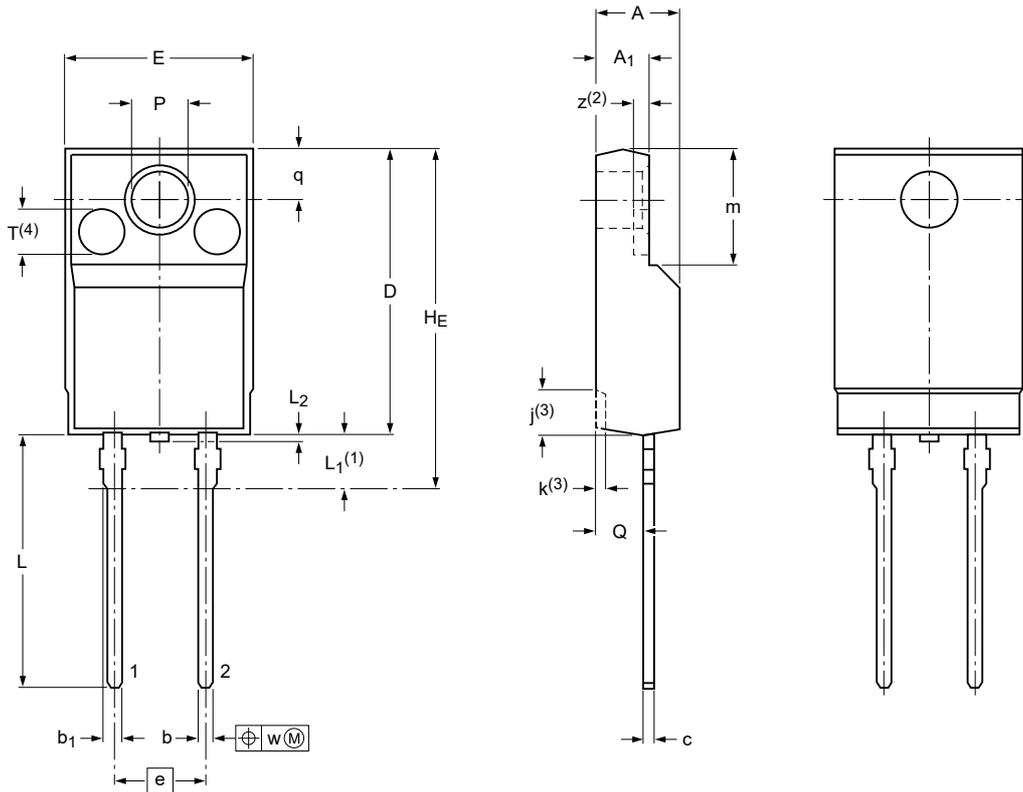
$$a = \text{form factor} = I_{F(RMS)} / I_{F(AV)}$$

**Fig 6. Forward power dissipation as a function of average forward current; sinusoidal waveform; maximum values**

**8. Package outline**

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

SOD113



Dimensions (mm are the original dimensions)

Unit	A	A <sub>1</sub>	b	b <sub>1</sub>	c	D	E	e	HE <sub>max</sub>	j <sup>(3)</sup>	k <sup>(3)</sup>	L	L <sub>1</sub> <sup>(1)</sup>	L <sub>2</sub> <sub>max</sub>	m	P	Q	q	T <sup>(4)</sup>	w	z <sup>(2)</sup>	
mm	max	4.6	2.9	0.9	1.1	0.7	15.8	10.3		2.7	0.6	14.4	3.3		6.5	3.2	2.6					
	nom							5.08	19.0					0.5					2.6	2.55	0.4	0.8
	min	4.0	2.5	0.7	0.9	0.4	15.2	9.7		1.7	0.4	13.5	2.8		6.3	3.0	2.3					

Notes

1. Terminals are uncontrolled within zone L1.
2. z is depth of T.
3. Dot lines area designs may vary.
4. Eject pin mark is for reference only.

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Outline version	References			European projection	Issue date
	IEC	JEDEC	JEITA		
SOD113	2-lead TO-220F				07-06-08 15-08-28

## 9. 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.

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- [2] The term 'short data sheet' is explained in section "Definitions".
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