

1. General description

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

2. Features and benefits

- Isolated plastic package
- Low thermal resistance
- Low reverse recovery current
- 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
Absolute maximum rating						
V_{RRM}	repetitive peak reverse voltage		500			V
$I_{F(AV)}$	average forward current	$\delta = 0.5$; square-wave pulse; $T_h \leq 103$ °C; Fig. 1 ; Fig. 2	5			A
I_{FRM}	repetitive peak forward current	$\delta = 0.5$; $t_p = 25$ μ s; $T_h \leq 103$ °C; square-wave pulse	10			A
I_{FSM}	non-repetitive peak forward current	$t_p = 10$ ms; $T_{j(init)} = 25$ °C; sine-wave pulse; Fig. 3	40			A
		$t_p = 8.3$ ms; $T_{j(init)} = 25$ °C; sine-wave pulse	44			A
Symbol	Parameter	Conditions	Min	Typ	Max	Unit
Static characteristics						
V_F	forward voltage	$I_F = 5$ A; $T_j = 25$ °C; Fig. 5	-	1.5	2	V
		$I_F = 5$ A; $T_j = 150$ °C; Fig. 5	-	1.15	1.45	V
		$I_F = 10$ A; $T_j = 150$ °C; Fig. 5	-	1.4	1.7	V
Dynamic characteristics						
t_{rr}	reverse recovery time	$I_F = 1$ A; $V_R = 30$ V; $dI_F/dt = 50$ A/ μ s; $T_j = 25$ °C; Fig. 6	-	15	30	ns

5. Pinning information

Table 2. Pinning information

Pin	Symbol	Description	Simplified outline	Graphic symbol
1	K	cathode	<p>SOD113 (2-lead TO-220F)</p>	
2	A	anode		
mb	n.c.	mounting base; isolated		

6. 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

7. Marking

Table 4. Marking codes

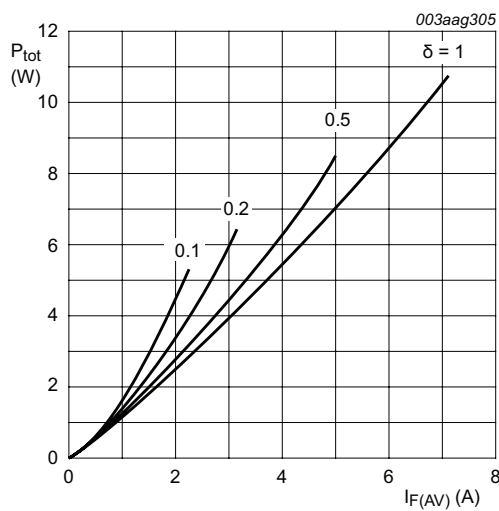
Type number	Marking codes
BYC5DX-500	BYC5DX-500

8. Limiting values

Table 5. Limiting values

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

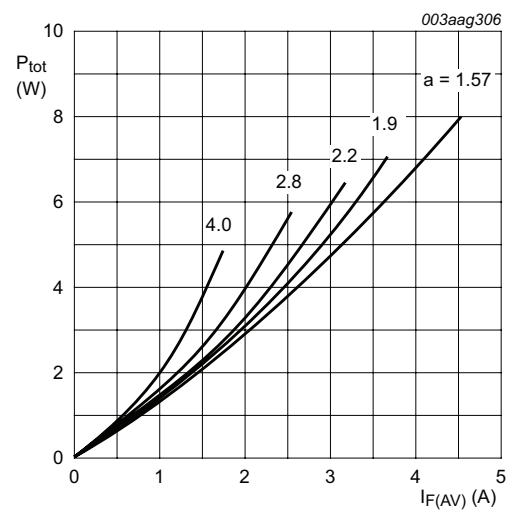
Symbol	Parameter	Conditions	Values	Unit
V_{RRM}	repetitive peak reverse voltage		500	V
V_{RWM}	crest working reverse voltage		500	V
V_R	reverse voltage	DC	500	V
$I_{F(AV)}$	average forward current	$\delta = 0.5$; square-wave pulse; $T_h \leq 103\text{ }^\circ\text{C}$; Fig. 1 ; Fig. 2	5	A
I_{FRM}	repetitive peak forward current	$\delta = 0.5$; $t_p = 25\text{ }\mu\text{s}$; $T_h \leq 103\text{ }^\circ\text{C}$; 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; Fig. 3	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	$^\circ\text{C}$



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

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

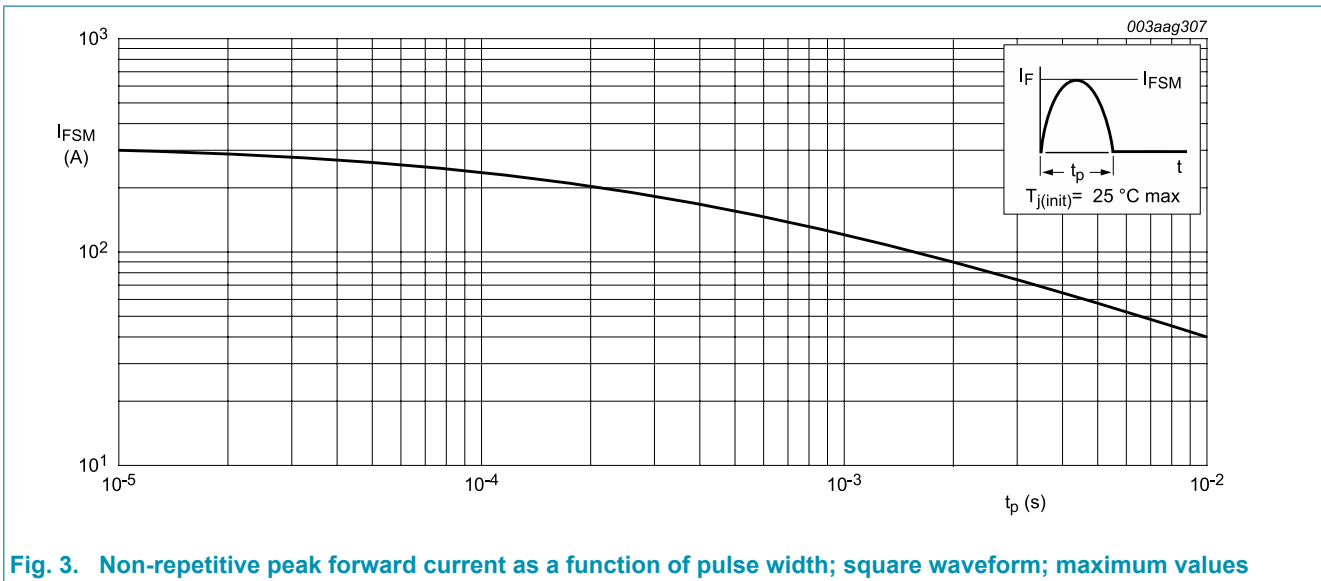
Fig. 1. Forward power dissipation as a function of average forward current; square waveform; maximum values



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

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

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
$R_{th(j-h)}$	thermal resistance from junction to heatsink	with heatsink compound; Fig 4	-	-	5.5	K/W
		without heatsink compound	-	-	7.2	K/W
$R_{th(j-a)}$	thermal resistance from junction to ambient free air	in free air	-	60	-	K/W

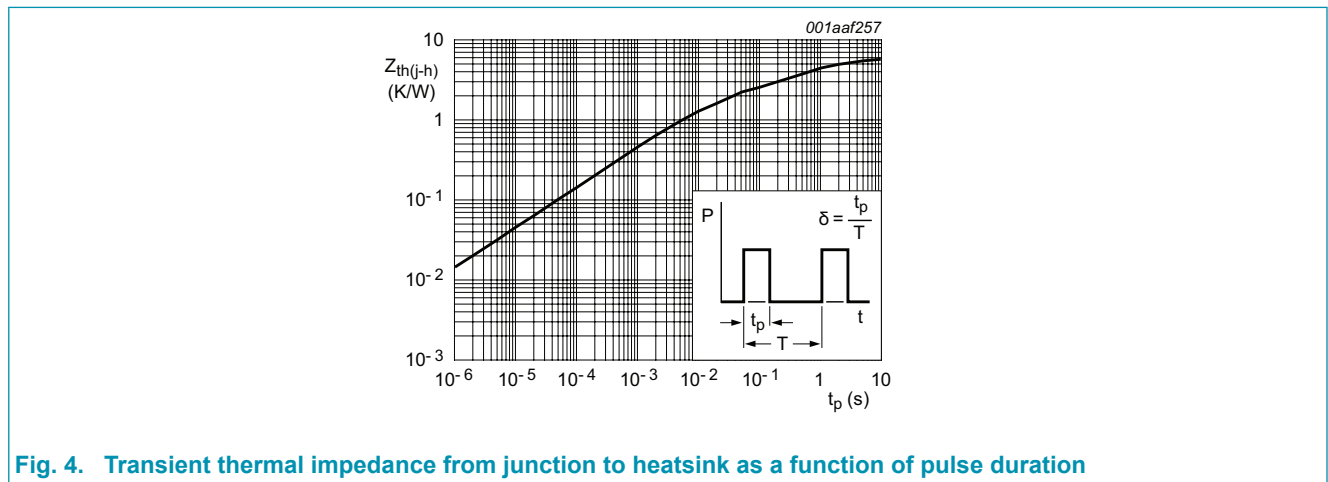


Fig. 4. Transient thermal impedance from junction to heatsink as a function of pulse duration

10. Isolation characteristics

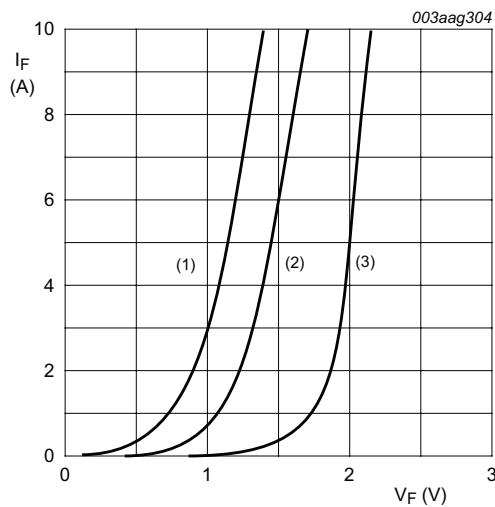
Table 7. Isolation characteristics

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$V_{isol(RMS)}$	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_{isol}	isolation capacitance	f = 1 MHz; from cathode to external heatsink	-	10	-	pF

11. Characteristics

Table 8. Characteristics

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
Static characteristics						
V _F	forward voltage	I _F = 5 A; T _J = 25 °C; Fig. 5	-	1.5	2	V
		I _F = 5 A; T _J = 150 °C; Fig. 5	-	1.15	1.45	V
		I _F = 10 A; T _J = 150 °C; Fig. 5	-	1.4	1.7	V
I _R	reverse current	V _R = 500 V; T _J = 25 °C	-	9	40	μA
		V _R = 500 V; T _J = 100 °C	-	0.9	3	mA
Dynamic characteristics						
t _{rr}	reverse recovery time	I _F = 1 A; V _R = 30 V; dI _F /dt = 50 A/μs; T _J = 25 °C; Fig. 6	-	15	30	ns
		I _F = 5 A; V _R = 400 V; dI _F /dt = 500 A/μs; T _J = 25 °C; Fig. 6	-	16	-	ns
I _{RM}	peak reverse recovery current	I _F = 5 A; V _R = 400 V; dI _F /dt = 500 A/μs; T _J = 100 °C; Fig. 6	-	9.5	11	A
		I _F = 5 A; V _R = 400 V; dI _F /dt = 50 A/μs; T _J = 125 °C; Fig. 6	-	0.9	3	A
V _{FR}	forward recovery voltage	I _F = 5 A; dI _F /dt = 100 A/μs; T _J = 25 °C; Fig. 7	-	9	11	V



V₀ = 1.141 V; R_s = 0.057 Ω
 (1) T_J = 150 °C; typical values
 (2) T_J = 150 °C; maximum values
 (3) T_J = 25 °C; maximum values

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

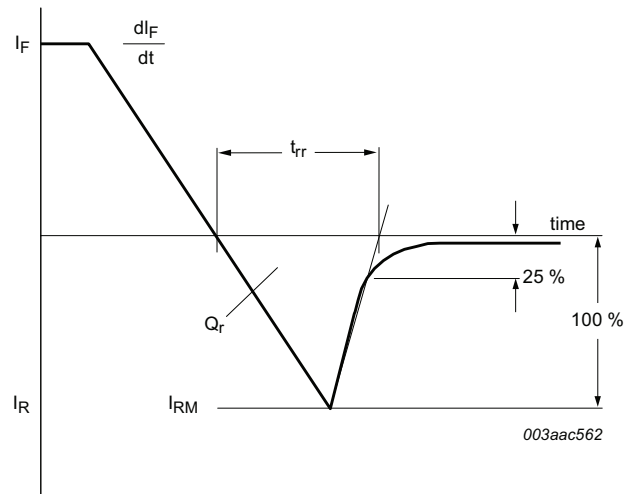


Fig. 6. Reverse recovery definitions; ramp recovery

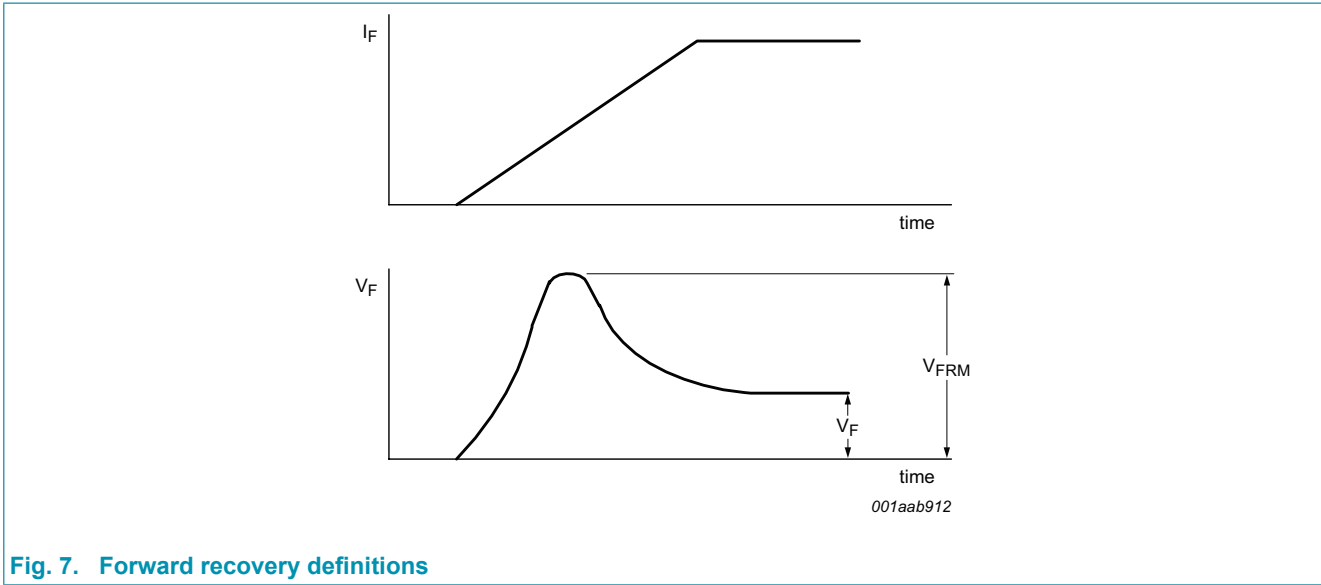
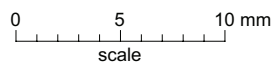
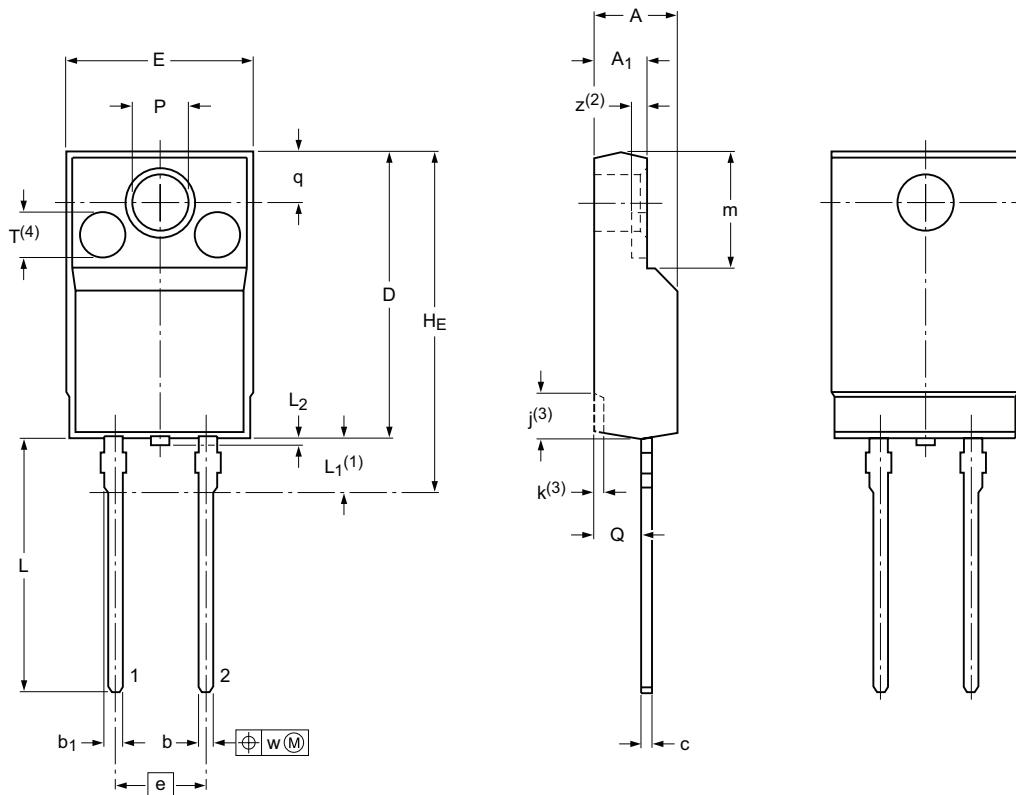


Fig. 7. Forward recovery definitions

12. 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 ₁	b	b ₁	c	D	E	e	H _E max	j ⁽³⁾	k ⁽³⁾	L	L ₁ ⁽¹⁾	L ₂ max	m	P	Q	q	T ⁽⁴⁾	w	z ⁽²⁾	
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.

sod113_po

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

13. Revision history

Table 9. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
BYC5DX-500 v.2	20180129	Product data sheet	-	BYC5DX-500 v.1
Modifications:	Change from NXP version to WeEn version			
BYC5DX-500 v.1	20110706	Product data sheet	-	-

14. 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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