BYC5DX-500

Hyperfast power diode

Rev.02 - 29 January 2018 Product data sheet

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

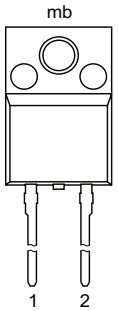
4. Quick reference data

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	δ = 0.5 ; square-wave pulse; $T_h \leq 103$ °C; Fig. 1; Fig. 2	5				A
I_{FRM}	repetitive peak forward current	δ = 0.5 ; t_p = 25 µs; $T_h \leq 103$ °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/µs; 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	 SOD113 (2-lead TO-220F)	 *001aaa020*
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

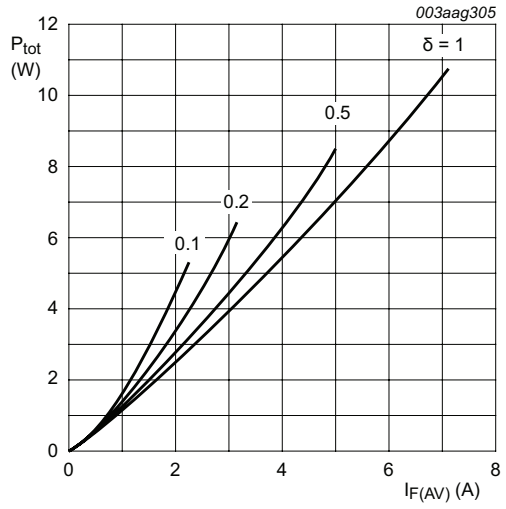
Type number	Marking codes
BYC5DX-500	BYC5DX-500

8. Limiting values

Table 5. Limiting values

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

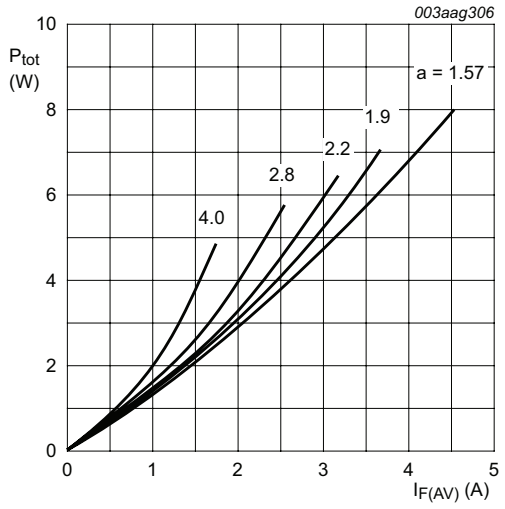
Symbol	Parameter	Conditions	Values	Unit
V_{RRM}	repetitive peak reverse voltage		500	V
V_{RWM}	crest working reverse voltage		500	V
V_R	reverse voltage	DC	500	V
$I_{F(AV)}$	average forward current	δ = 0.5 ; square-wave pulse; $T_h \leq 103$ °C; Fig. 1; Fig. 2	5	A
I_{FRM}	repetitive peak forward current	δ = 0.5 ; t_p = 25 µs; $T_h \leq 103$ °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
T_{stg}	storage temperature		-40 to 150	°C
T_j	junction temperature		150	°C



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

V_o = 1.141 V; R_s = 0.057 Ω

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



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

V_o = 1.141 V; R_s = 0.057 Ω

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

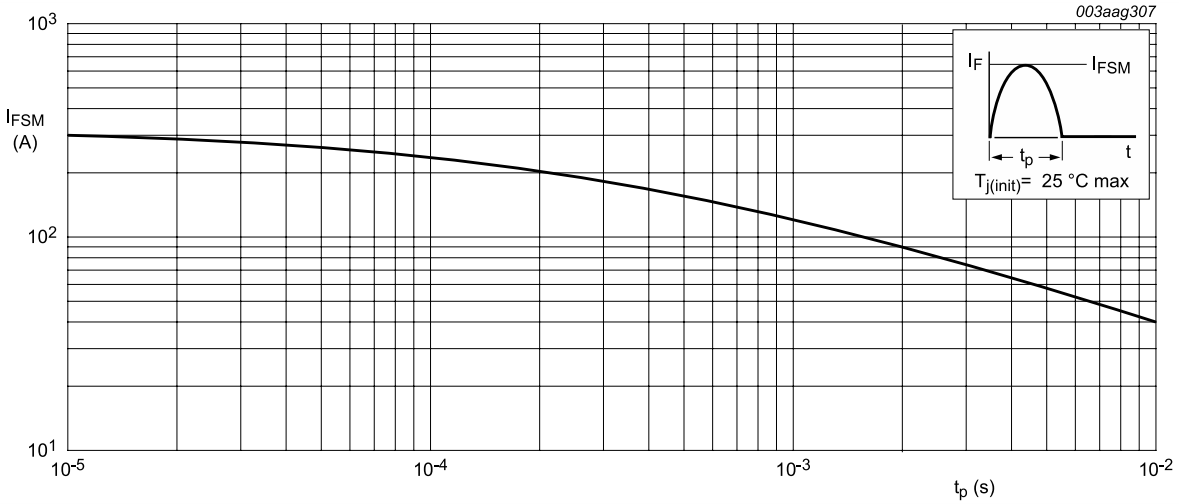


Fig. 3. Non-repetitive peak forward current as a function of pulse width; square waveform; maximum values

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

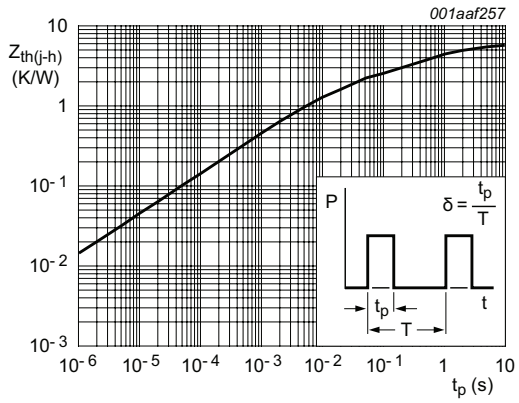


Fig. 4. Transient thermal impedance from junction to heatsink as a function of pulse duration

10. Isolation characteristics

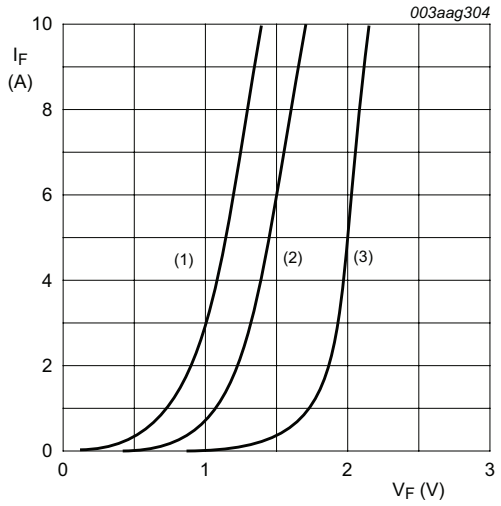
Table 7. Isolation characteristics

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
$V_{isol(RMS)}$	RMS isolation voltage	50 Hz ≤ f ≤ 60 Hz; RH ≤ 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



V_o = 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

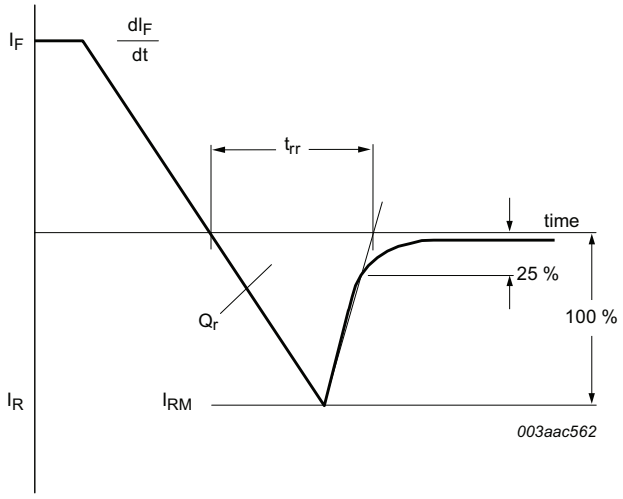


Fig. 6. Reverse recovery definitions; ramp recovery

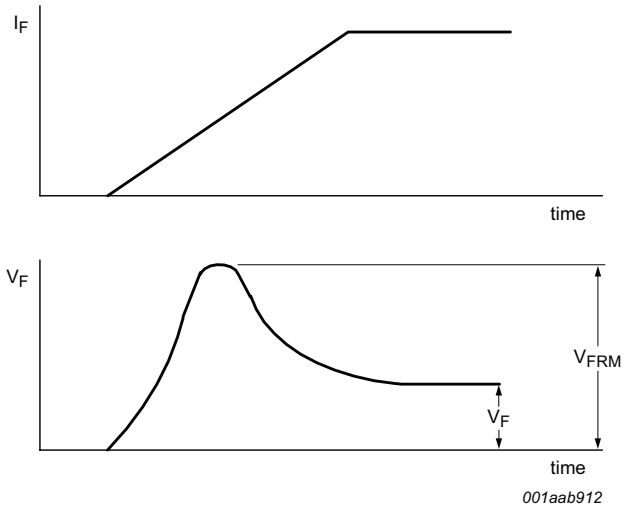
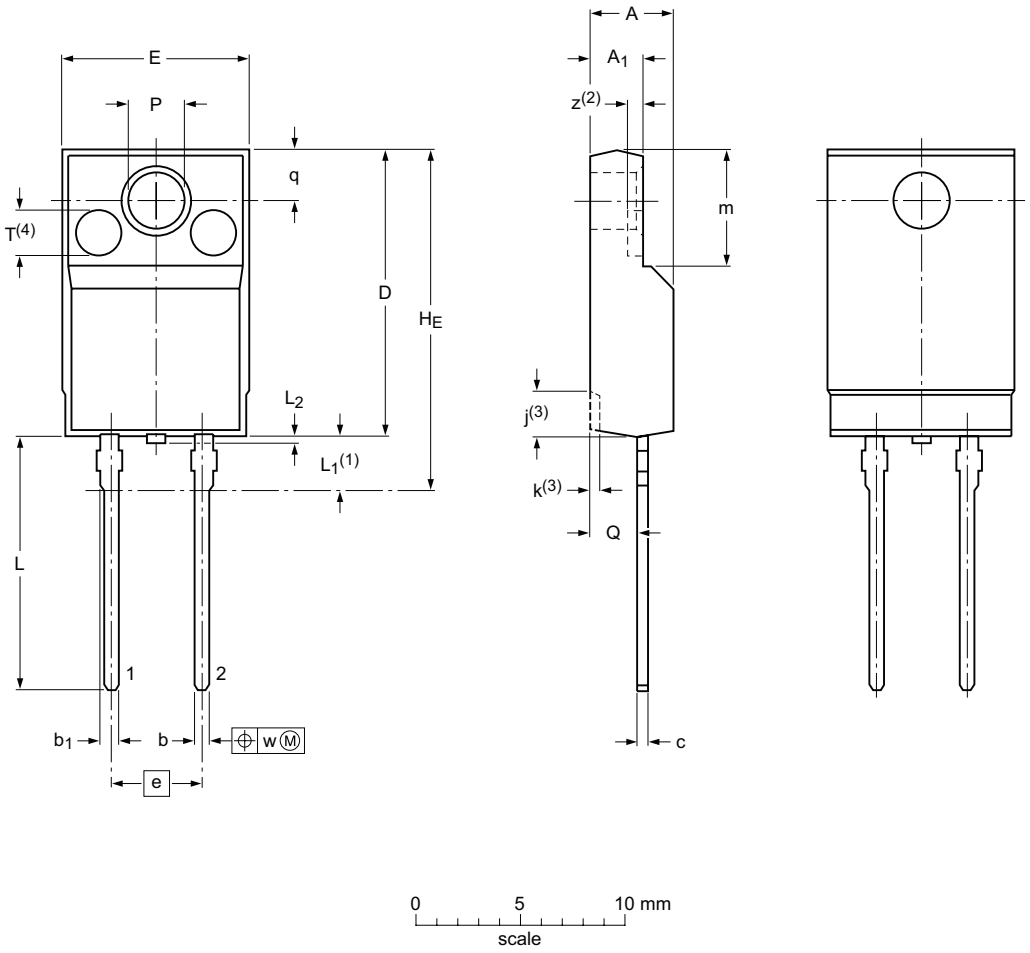


Fig. 7. Forward recovery definitions

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	$z^{(2)}$
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.

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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Date of release: 29 January 2018