BYC5DX-500

Hyperfast power diode

Rev. 1 — 6 July 2011 **Product data sheet**

1. Product profile

1.1 General description

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

1.2 Features and benefits

- Isolated plastic package
- Low reverse recovery current
- 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

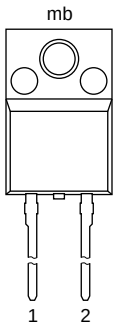
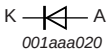
1.4 Quick reference data

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; δ = 0.5; T_h = 103 °C; see Figure 1; see Figure 2	-	-	5	A
Static characteristics						
V_F	forward voltage	I_F = 5 A; T_j = 25 °C; see Figure 5	-	1.5	2	V
		I_F = 5 A; T_j = 150 °C; see Figure 5	-	1.15	1.45	V
Dynamic characteristics						
t_{rr}	reverse recovery time	I_F = 5 A; V_R = 400 V; dI_F/dt = 500 A/µs; T_j = 25 °C; see Figure 6	-	16	-	ns

2. Pinning information

Table 2. Pinning information

Pin	Symbol	Description	Simplified outline	Graphic symbol
1	K	cathode		
2	A	anode		
mb	n.c.	mounting base; isolated		

SOD113 (TO-220F)

3. Ordering information

Table 3. Ordering information

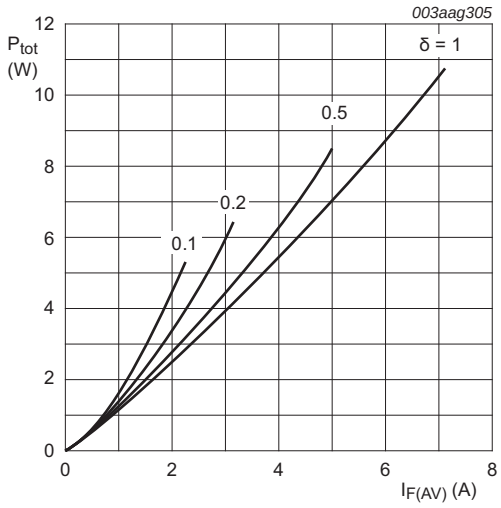
Type number	Package		
	Name	Description	Version
BYC5DX-500	TO-220F	plastic single-ended package; isolated heatsink mounted; 1 mounting hole; 2-lead TO-220 "full pack"	SOD113

4. Limiting values

Table 4. Limiting values

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

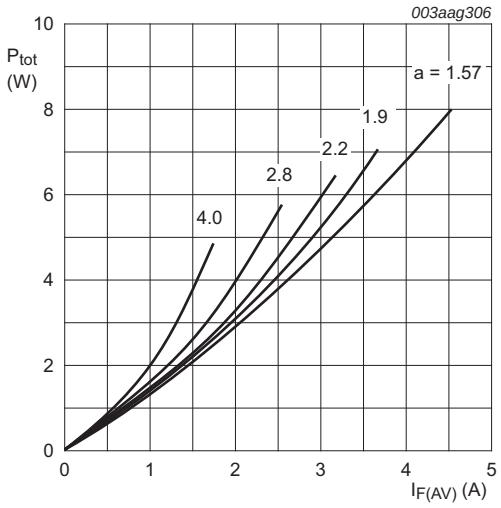
Symbol	Parameter	Conditions	Min	Max	Unit
V_{RRM}	repetitive peak reverse voltage		-	500	V
V_{RWM}	crest working reverse voltage		-	500	V
V_R	reverse voltage	DC	-	500	V
$I_{F(AV)}$	average forward current	square-wave pulse; δ = 0.5; T_h = 103 °C; see Figure 1; see Figure 2	-	5	A
I_{FRM}	repetitive peak forward current	square-wave pulse; δ = 0.5; t_p = 25 µs; T_h = 103 °C	-	10	A
I_{FSM}	non-repetitive peak forward current	t_p = 10 ms; sine-wave pulse; $T_{j(init)}$ = 25 °C; see Figure 3	-	40	A
		t_p = 8.3 ms; sine-wave pulse; $T_{j(init)}$ = 25 °C; see Figure 3	-	44	A
T_{stg}	storage temperature		-40	150	°C
T_j	junction temperature		-	150	°C



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

$$V_o = 1.141\,V;\ R_s = 0.057\,\Omega$$

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



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

$$V_o = 1.141\,V;\ R_s = 0.057\,\Omega$$

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

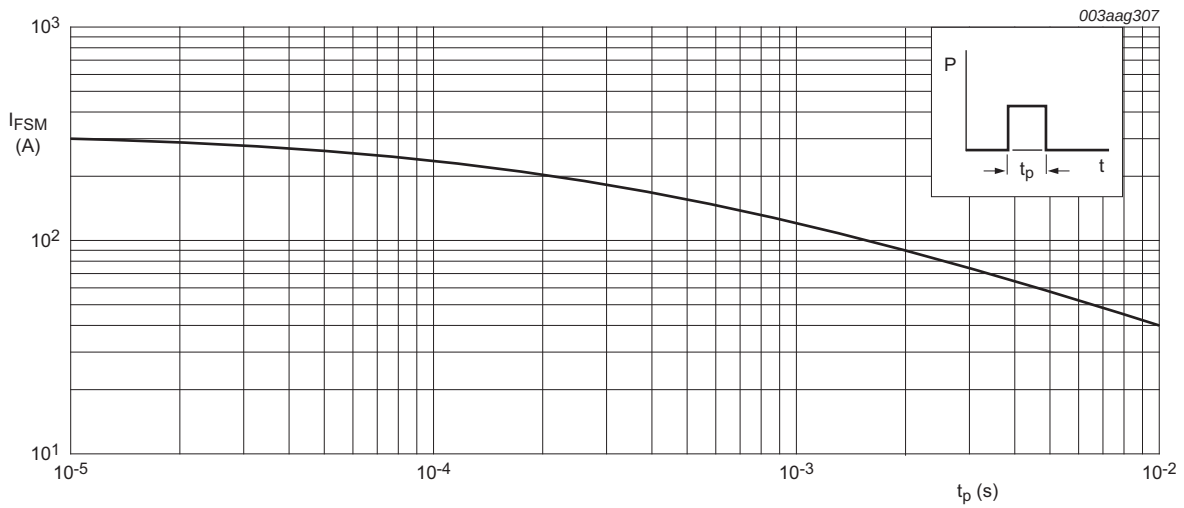


Fig 3. Non-repetitive peak forward current as a function of pulse width; square waveform; maximum values

5. Thermal characteristics

Table 5. Thermal characteristics

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$R_{th(j-h)}$	thermal resistance from junction to heatsink	without heatsink compound	-	-	7.2	K/W
		with heatsink compound; see Figure 4	-	-	5.5	K/W
$R_{th(j-a)}$	thermal resistance from junction to ambient free air		-	60	-	K/W

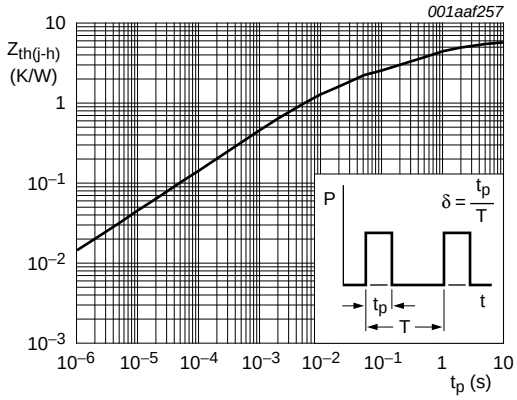


Fig 4. Transient thermal impedance from junction to heatsink as a function of pulse width

6. Isolation characteristics

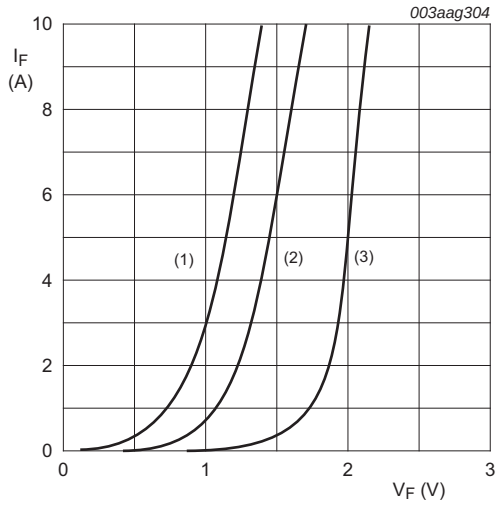
Table 6. Isolation characteristics

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

7. Characteristics

Table 7. Characteristics

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
Static characteristics						
V_F	forward voltage	I_F = 5 A; T_j = 25 °C; see Figure 5	-	1.5	2	V
		I_F = 5 A; T_j = 150 °C; see Figure 5	-	1.15	1.45	V
		I_F = 10 A; T_j = 150 °C; see Figure 5	-	1.4	1.7	V
I_R	reverse current	V_R = 500 V; T_j = 100 °C	-	0.9	3	mA
		V_R = 500 V	-	9	40	µA
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; see Figure 6	-	15	30	ns
		I_F = 5 A; V_R = 400 V; dI_F/dt = 500 A/µs; T_j = 25 °C; see Figure 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; see Figure 6	-	9.5	11	A
		I_F = 5 A; V_R = 400 V; dI_F/dt = 50 A/µs; T_j = 125 °C; see Figure 6	-	0.9	3	A
V_{FR}	forward recovery voltage	I_F = 5 A; dI_F/dt = 100 A/µs; T_j = 25 °C; see Figure 7	-	9	11	V



(1) $T_j = 150$ °C; typical values;
(2) $T_j = 150$ °C; maxium values;
(3) $T_j = 25$ °C; maxium values;
$V_o = 1.141$ V; $R_s = 0.057\ \Omega$

Fig 5. Forward current as a function of forward voltage

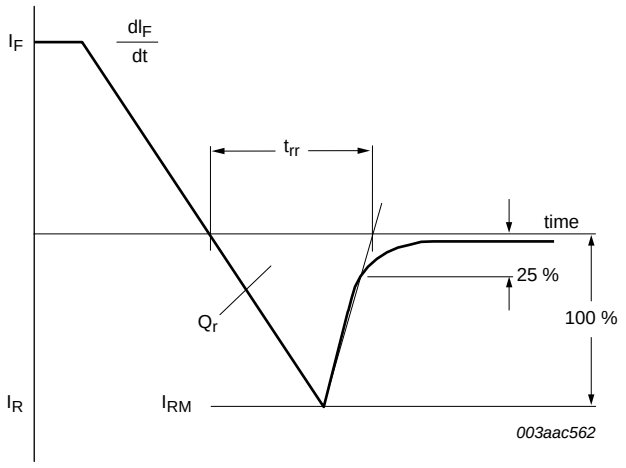


Fig 6. Reverse recovery definitions; ramp recovery

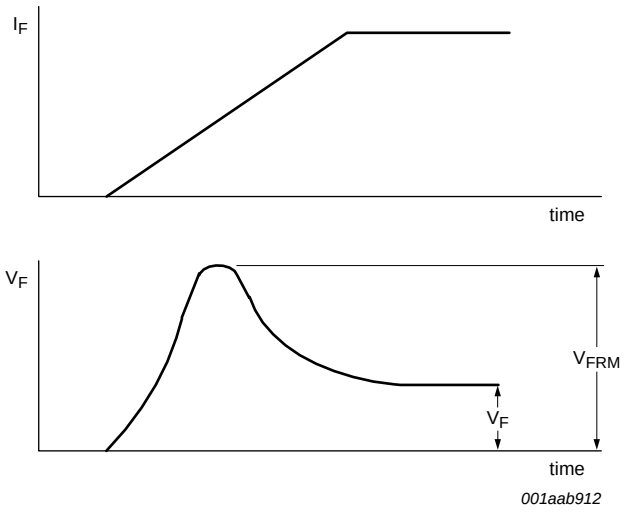
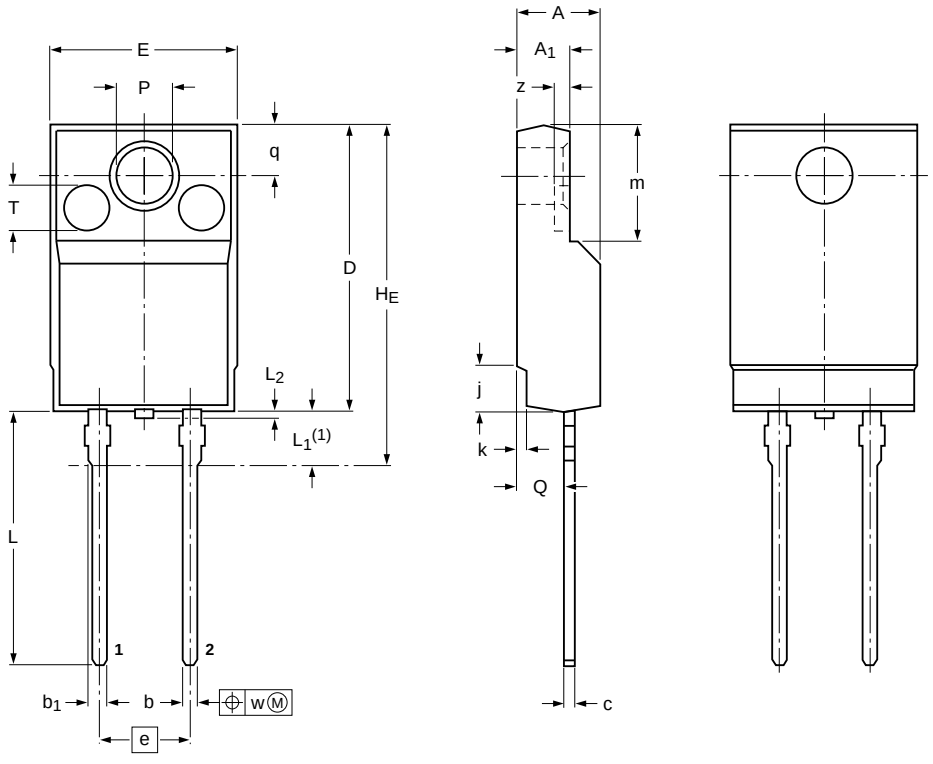


Fig 7. Forward recovery definitions

8. Package outline

Plastic single-ended package; isolated heatsink mounted;
1 mounting hole; 2-lead TO-220 'full pack' **SOD113**



z(2)
0.8

DIMENSIONS (mm are the original dimensions)

UNIT	A	A_1	b	b_1	c	D	E	e	H_E max	j	k	L	L_1(1)	L_2 max	m	P	Q	q	T	w
mm	4.6 4.0	2.9 2.5	0.9 0.7	1.1 0.9	0.7 0.4	15.8 15.2	10.3 9.7	5.08	19.0	2.7 1.7	0.6 0.4	14.4 13.5	3.3 2.8	0.5	6.5 6.3	3.2 3.0	2.6 2.3	2.6	2.55	0.4

Notes
1. Terminals are uncontrolled within zone L_1.
2. z is depth of T.

OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	JEITA			
SOD113		2-lead TO-220F				~~02-04-09~~ 07-06-18

Fig 8. Package outline SOD113 (TO-220F)

9. Revision history

Table 8. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
BYC5DX-500 v.1	20110706	Product data sheet	-	-

10. Legal information

10.1 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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12. Contents

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Date of release: 6 July 2011
Document identifier: BYC5DX-500