

BYC20X-600P

Hyperfast power diode

4 February 2013 **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 leakage current
- Low reverse recovery current
- Low thermal resistance
- Reduces switching losses in associated MOSFET or IGBT

3. Applications

- Active PFC in air conditioner
- Continuous Current Mode (CCM) Power Factor Correction (PFC)
- Half-bridge/full-bridge switched-mode power supplies

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	$\delta = 0.5$; $T_h \leq 51$ °C; square-wave pulse; Fig. 1; Fig. 2; Fig. 3		-	-	20	A
Static characteristics							
V_F	forward voltage	$I_F = 20$ A; $T_j = 150$ °C; Fig. 6		-	1.2	1.6	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. 7		-	-	35	ns

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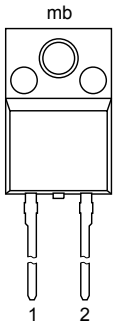
5. Pinning information

Table 2. Pinning information

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

6. Ordering information

Table 3. Ordering information

Type number	Package		
	Name	Description	Version
BYC20X-600P	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 code
BYC20X-600P	BYC20X-600P

8. Limiting values

Table 5. 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	DC		-	600	V
$I_{F(AV)}$	average forward current	$\delta = 0.5$; $T_h \leq 51$ °C; square-wave pulse; Fig. 1; Fig. 2; Fig. 3		-	20	A
I_{FRM}	repetitive peak forward current	$\delta = 0.5$; $t_p = 25$ µs; $T_h \leq 51$ °C; square-wave pulse		-	40	A

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Symbol	Parameter	Conditions		Min	Max	Unit
I_{FSM}	non-repetitive peak forward current	t_p = 10 ms; $T_{j(init)}$ = 25 °C; sine-wave pulse; Fig. 4		-	200	A
		t_p = 8.3 ms; $T_{j(init)}$ = 25 °C; sine-wave pulse; Fig. 4		-	220	A
T_{stg}	storage temperature			-65	175	°C
T_j	junction temperature			-	175	°C

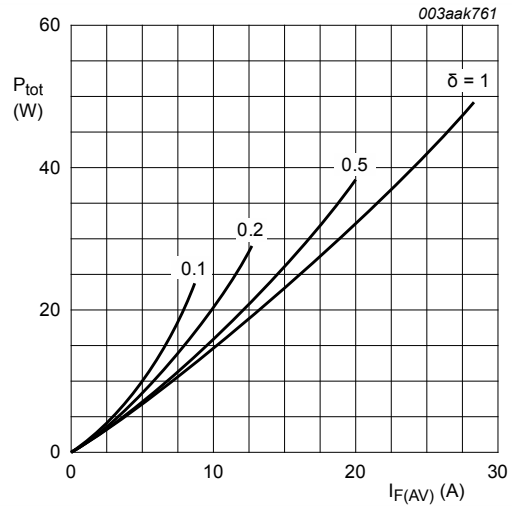

Fig. 1. Forward power dissipation as a function of average forward current; square waveform; maximum values

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

$V_O = 1.311\ V;\ R_S = 0.015\ \Omega$

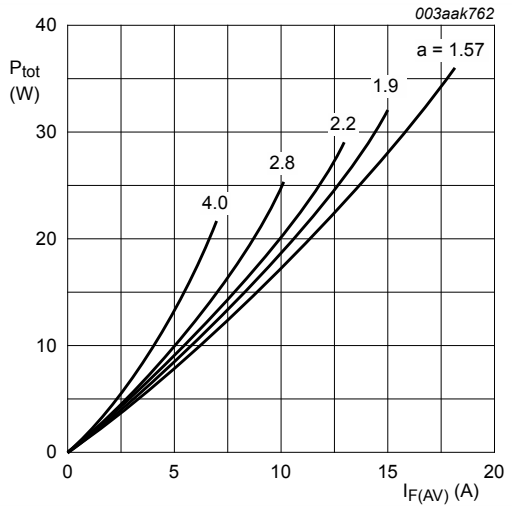

Fig. 2. Forward power dissipation as a function of average forward current; sinusoidal waveform; maximum values

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

$V_O = 1.311\ V;\ R_S = 0.015\ \Omega$

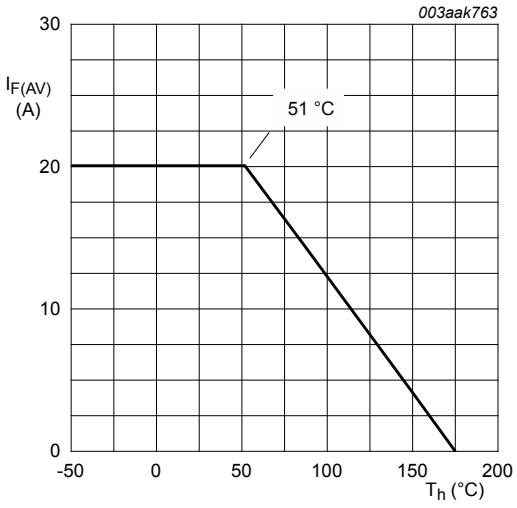

Fig. 3. Forward current as a function of heatsink temperature; maximum values

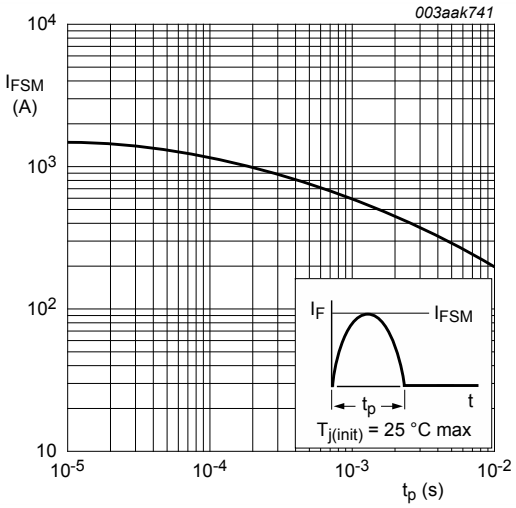

Fig. 4. Non-repetitive peak forward current as a function of pulse width; sinusoidal waveform; maximum values

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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. 5		-	-	3.5	K/W
$R_{th(j-a)}$	thermal resistance from junction to ambient free air			-	55	-	K/W

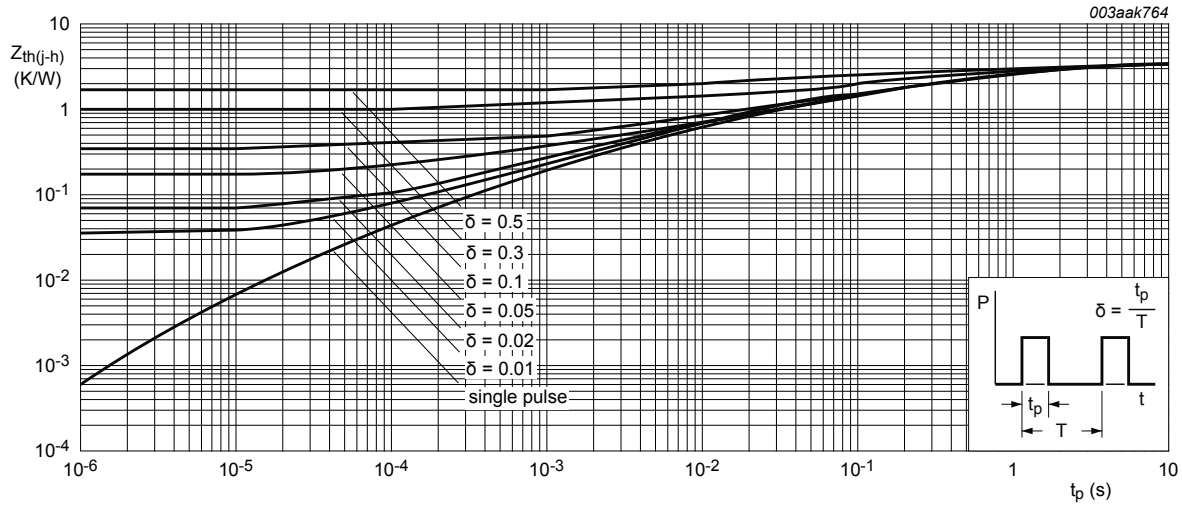

Fig. 5. Transient thermal impedance from junction to heatsink as a function of pulse duration

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 = 20 A; T_j = 25 °C; Fig. 6		-	1.8	2.5	V

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Symbol	Parameter	Conditions		Min	Typ	Max	Unit
		I_F = 20 A; T_j = 150 °C; Fig. 6		-	1.2	1.6	V
I_R	reverse current	V_R = 600 V; T_j = 25 °C		-	-	10	µA
		V_R = 600 V; T_j = 150 °C		-	-	600	µA
Dynamic characteristics							
Q_r	recovered charge	I_F = 20 A; V_R = 200 V; dI_F/dt = 200 A/µs; T_j = 25 °C; Fig. 7		-	50	-	nC
		I_F = 20 A; V_R = 200 V; dI_F/dt = 200 A/µs; T_j = 125 °C; Fig. 7		-	220	-	nC
t_{rr}	reverse recovery time	I_F = 1 A; V_R = 30 V; dI_F/dt = 50 A/µs; T_j = 25 °C; Fig. 7		-	-	35	ns
		I_F = 20 A; V_R = 200 V; dI_F/dt = 200 A/µs; T_j = 25 °C; Fig. 7		-	32	-	ns
		I_F = 20 A; V_R = 200 V; dI_F/dt = 200 A/µs; T_j = 125 °C; Fig. 7		-	55	-	ns
I_{RM}	peak reverse recovery current	I_F = 20 A; V_R = 200 V; dI_F/dt = 200 A/µs; T_j = 25 °C; Fig. 7		-	2.9	-	A
		I_F = 20 A; V_R = 200 V; dI_F/dt = 200 A/µs; T_j = 125 °C; Fig. 7		-	8	-	A

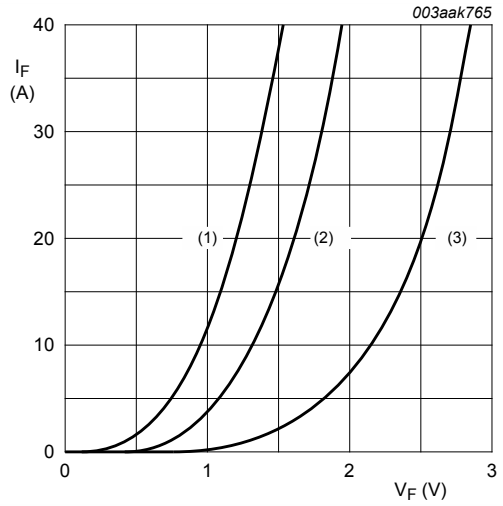

Fig. 6. Forward current as a function of forward voltage

(1) T_j = 150 °C; typical values;
(2) T_j = 150 °C; maximum values;
(3) T_j = 25 °C; maximum values;
V_O = 1.311 V; R_S = 0.015 Ω

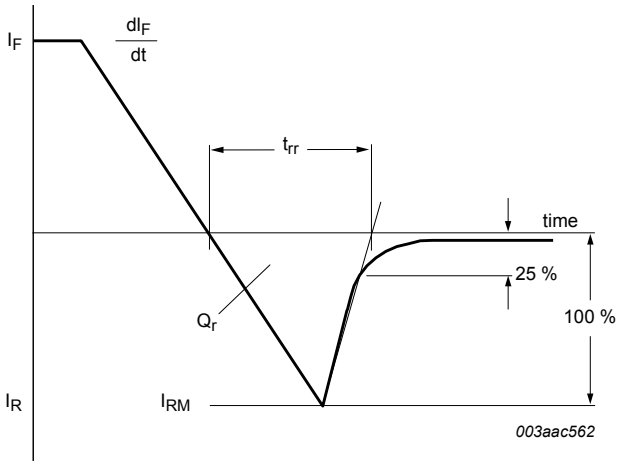

Fig. 7. Reverse recovery definitions; ramp recovery

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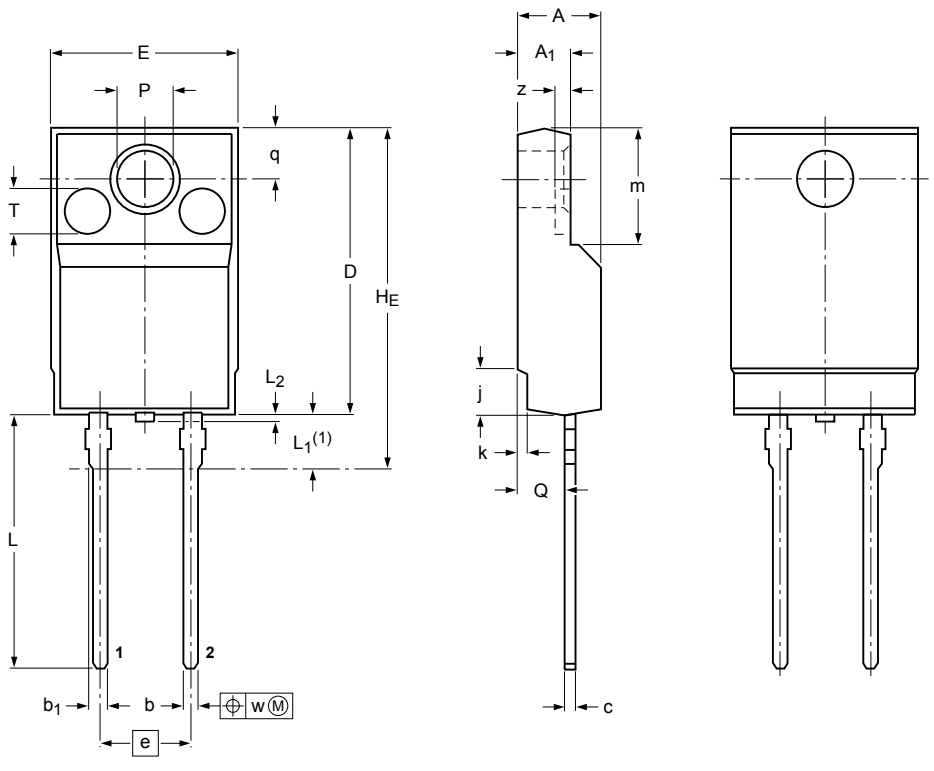
12. Package outline

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 TO-220F (SOD113)

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14. Contents

1 General description 1
2 Features and benefits 1
3 Applications 1
4 Quick reference data 1
5 Pinning information 2
6 Ordering information 2
7 Marking 2
8 Limiting values 2
9 Thermal characteristics 4
10 Isolation characteristics 4
11 Characteristics 4
12 Package outline 6
13 Legal information 7
13.1 Data sheet status 7
13.2 Definitions 7
13.3 Disclaimers 7
13.4 Trademarks 8

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