



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	$\delta = 0.5$; $T_h \leq 51^\circ\text{C}$; square-wave pulse; Fig. 1 ; Fig. 2 ; Fig. 3	-	-	20	A
Static characteristics						
V_F	forward voltage	$I_F = 20\text{ A}$; $T_j = 150^\circ\text{C}$; Fig. 6	-	1.2	1.6	V
Dynamic characteristics						
t_{rr}	reverse recovery time	$I_F = 1\text{ A}$; $V_R = 30\text{ V}$; $dI_F/dt = 50\text{ A}/\mu\text{s}$; $T_j = 25^\circ\text{C}$; Fig. 7	-	-	35	ns

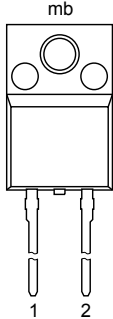
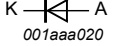


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5. Pinning information

Table 2. Pinning information

Pin	Symbol	Description	Simplified outline	Graphic symbol
1	K	cathode	 <p>TO-220F (SOD113)</p>	
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	$\delta = 0.5$; $T_h \leq 51^\circ\text{C}$; square-wave pulse; Fig. 1 ; Fig. 2 ; Fig. 3	-	20	A
I_{FRM}	repetitive peak forward current	$\delta = 0.5$; $t_p = 25\ \mu\text{s}$; $T_h \leq 51^\circ\text{C}$; square-wave pulse	-	40	A

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

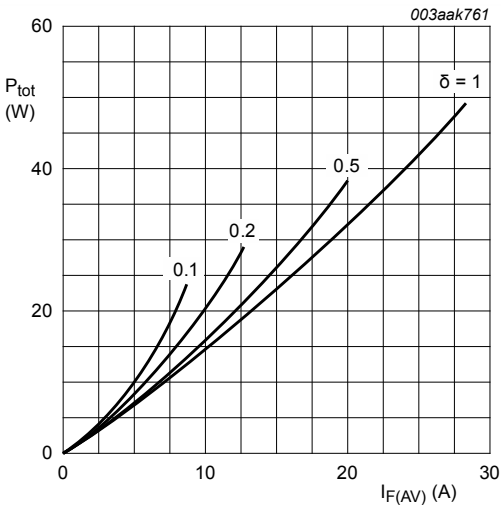


Fig. 1. Forward power dissipation as a function of average forward current; square waveform; maximum values

$$I_{F(AV)} = I_{F(RMS)} \times \sqrt{\delta}$$
$$V_O = 1.311 \text{ V}; R_S = 0.015 \text{ } \Omega$$

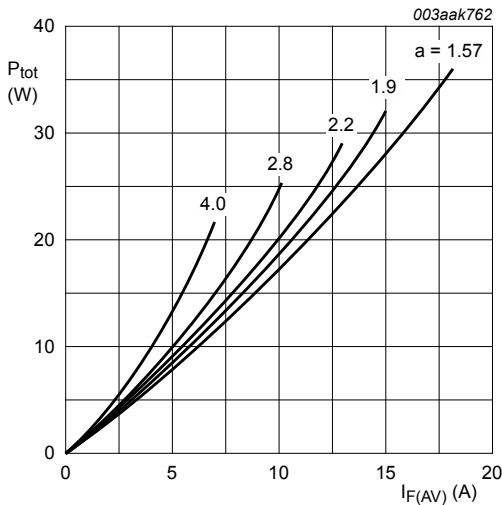


Fig. 2. Forward power dissipation as a function of average forward current; sinusoidal waveform; maximum values

$$a = \text{form factor} = I_{F(RMS)} / I_{F(AV)}$$
$$V_O = 1.311 \text{ V}; R_S = 0.015 \text{ } \Omega$$

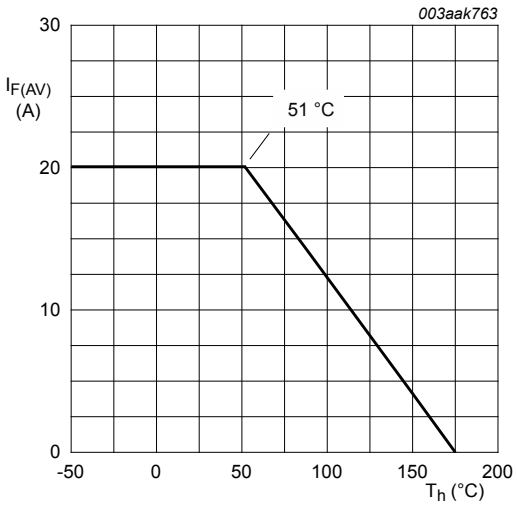


Fig. 3. Forward current as a function of heatsink temperature; maximum values

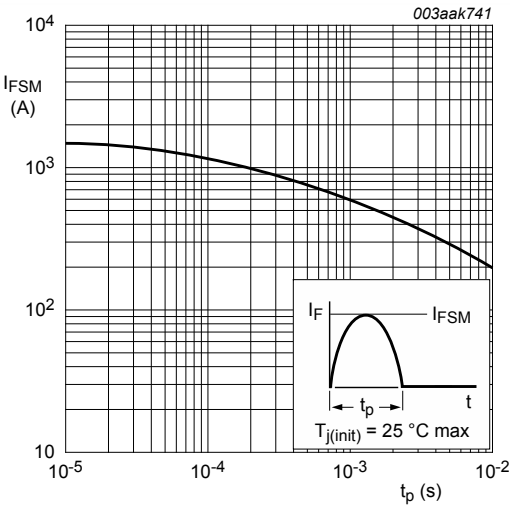


Fig. 4. Non-repetitive peak forward current as a function of pulse width; sinusoidal waveform; maximum values

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

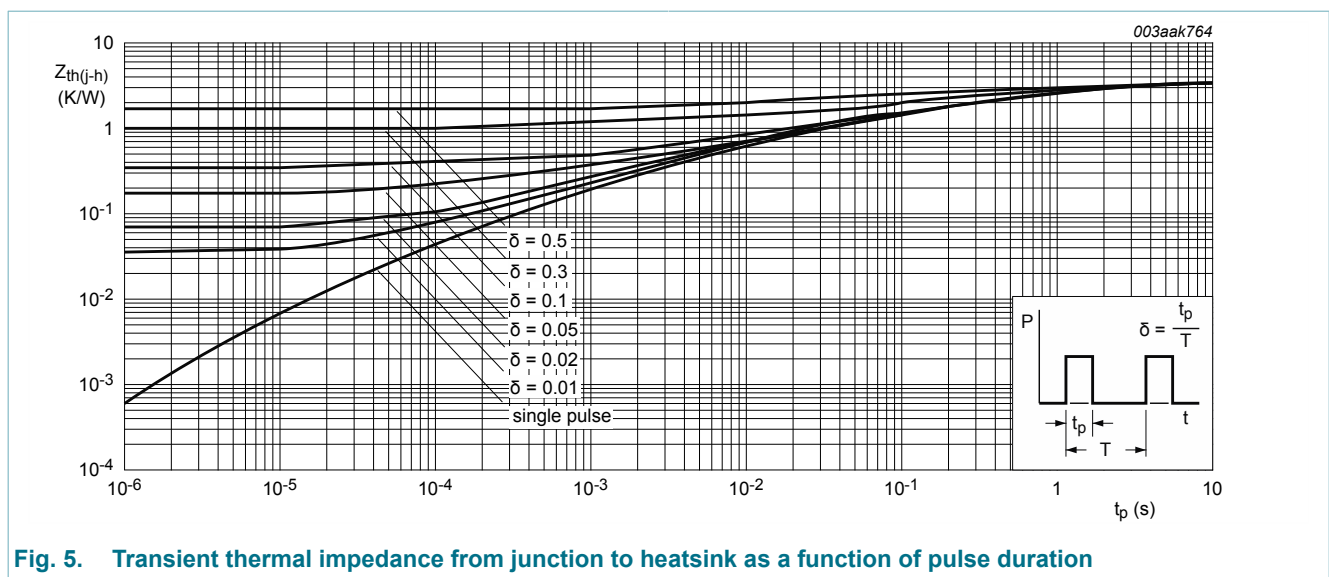


Fig. 5. Transient thermal impedance from junction to heatsink as a function of pulse duration

10. Isolation characteristics

Table 7. Isolation characteristics

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$V_{isol(RMS)}$	RMS isolation voltage	50 Hz $\leq f \leq$ 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	$I_F = 20$ A; $T_j = 25$ °C; Fig. 6	-	1.8	2.5	V

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

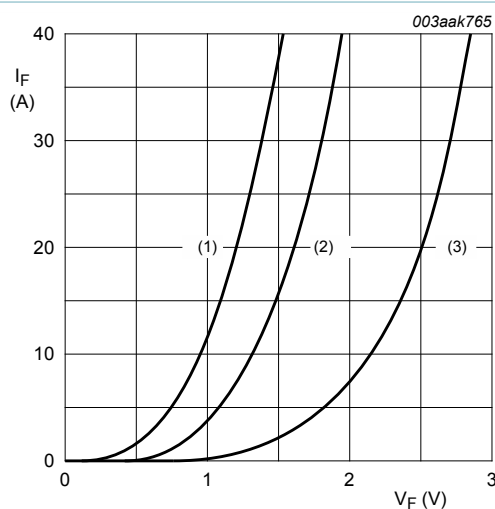


Fig. 6. Forward current as a function of forward voltage

- (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;
- $V_O = 1.311\text{ V}$; $R_S = 0.015\text{ }\Omega$

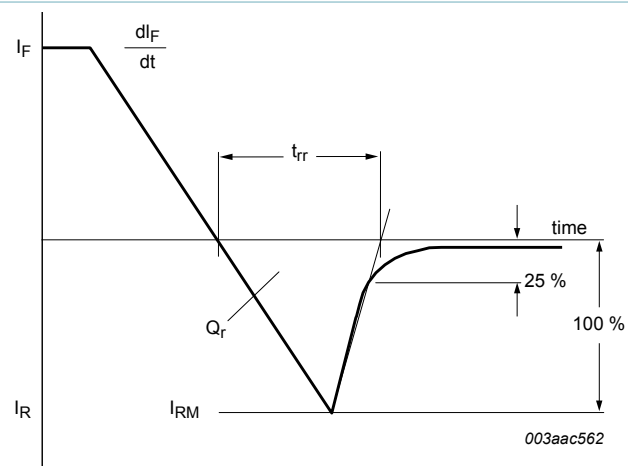


Fig. 7. Reverse recovery definitions; ramp recovery

12. Package outline

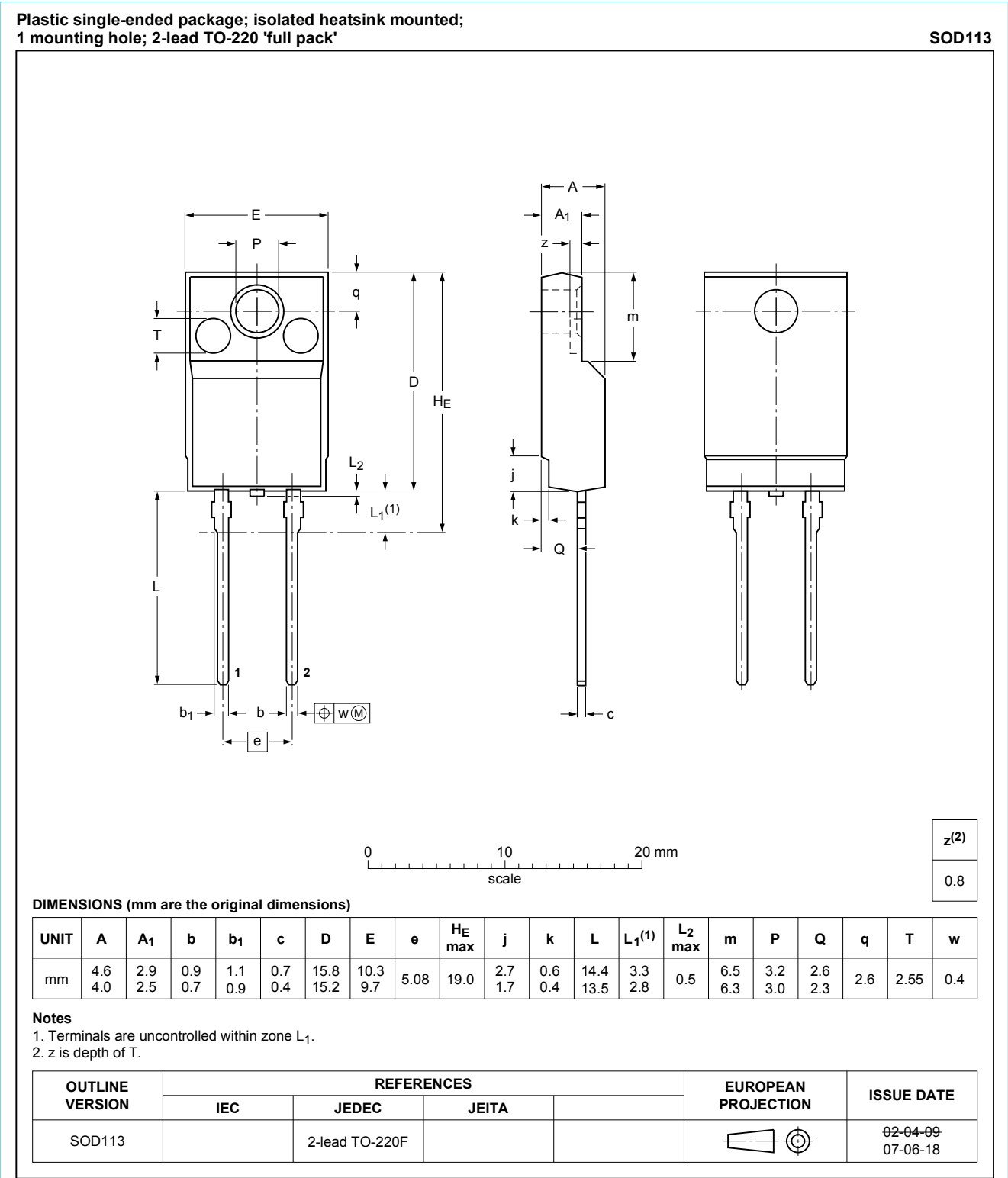


Fig. 8. Package outline TO-220F (SOD113)

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Document status [1][2]	Product status [3]	Definition
Objective [short] data sheet	Development	This document contains data from the objective specification for product development.
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