BYC10X-600P

Hyperfast power diode

Rev.02 - 28 October 2021 Product data sheet

1. General description

Hyperfast power diode in a 2-lead TO220F plastic package.

2. Features and benefits

- Fast switching
- 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
- High frequency switched-mode power supplies
- Continuous Current Mode (CCM) Power Factor Correction (PFC)

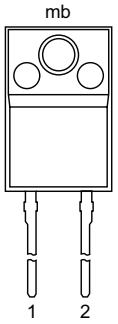
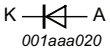
4. Quick reference data

Table 1. Quick reference data

Symbol	Parameter	Conditions	Values				Unit
Absolute maximum rating							
V_{RRM}	repetitive peak reverse voltage		600				V
$I_{F(AV)}$	average forward current	δ = 0.5 ; square-wave pulse; $T_h \leq 61$ °C; Fig. 1; Fig. 2	10				A
I_{FRM}	repetitive peak forward current	δ = 0.5 ; t_p = 25 µs; $T_h \leq 61$ °C; square-wave pulse	20				A
I_{FSM}	non-repetitive peak forward current	t_p = 10 ms; $T_{j(init)}$ = 25 °C; sine-wave pulse; Fig. 4	150				A
		t_p = 8.3 ms; $T_{j(init)}$ = 25 °C; sine-wave pulse	165				A
Symbol	**Parameter**	**Conditions**		**Min**	**Typ**	**Max**	**Unit**
Static characteristics							
V_F	forward voltage	I_F = 10 A; T_j = 25 °C; Fig. 4		-	2.5	3.2	V
		I_F = 10 A; T_j = 150 °C; Fig. 4		-	1.3	2	V
Dynamic characteristics							
t_{rr}	reverse recovery time	I_F = 1 A; V_R = 30 V; dI_F/dt = 200 A/µs; T_j = 25 °C; Fig. 5		-	12	18	ns
		I_F = 10 A; V_R = 400 V; dI_F/dt = 500 A/µs; T_j = 25 °C; Fig. 5		-	19	-	ns

5. 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		

6. Ordering information

Table 3. Ordering information

Type number	Package Name	Orderable part number	Packing method	Small packing quantity	Package version	Package issue date
BYC10X-600P	TO220F	BYC10X-600PQ	Tube	50	SOD113	28-Aug-2015

7. Marking

Table 4. Marking codes

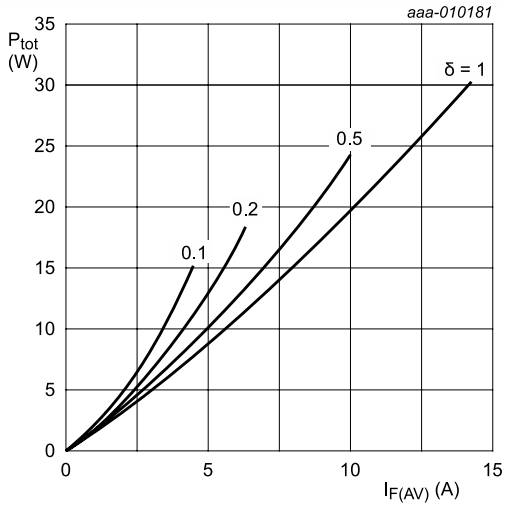
Type number	Marking codes	
	Assembly factory: d	Assembly factory: A
BYC10X-600P	BYC10X 600P PJdxxxx xx	BYC10X 600P PJAxxxx xx

8. Limiting values

Table 5. Limiting values

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

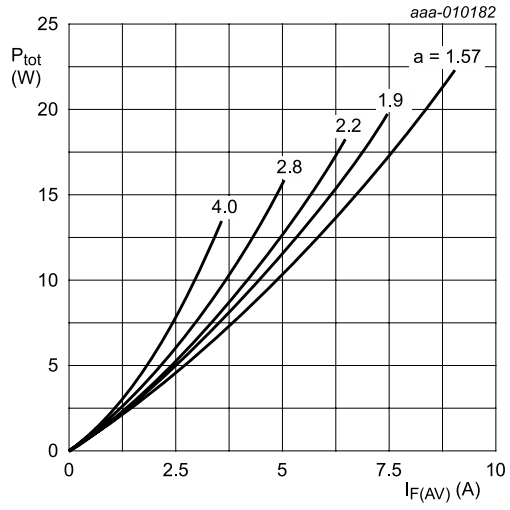
Symbol	Parameter	Conditions	Values	Unit
V_{RRM}	repetitive peak reverse voltage		600	V
V_{RWM}	crest working reverse voltage		600	V
V_R	reverse voltage	DC	600	V
$I_{F(AV)}$	average forward current	δ = 0.5 ; square-wave pulse; $T_h \leq 61$ °C; Fig. 1; Fig. 2; Fig. 3	10	A
I_{FRM}	repetitive peak forward current	δ = 0.5 ; t_p = 25 µs; $T_h \leq 61$ °C; square-wave pulse	20	A
I_{FSM}	non-repetitive peak forward current	t_p = 10 ms; $T_{j(init)}$ = 25 °C; sine-wave pulse; Fig. 4	150	A
		t_p = 8.3 ms; $T_{j(init)}$ = 25 °C; sine-wave pulse	165	A
T_{stg}	storage temperature		-65 to 175	°C
T_j	junction temperature		175	°C



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

V_o = 1.572 V; R_s = 0.040 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 = 1.572 V; R_s = 0.040 Ω

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

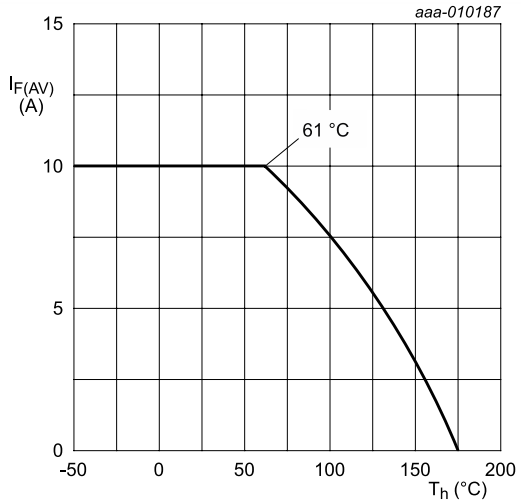


Fig. 3. Forward current as a function of heatsink temperature; maximum values

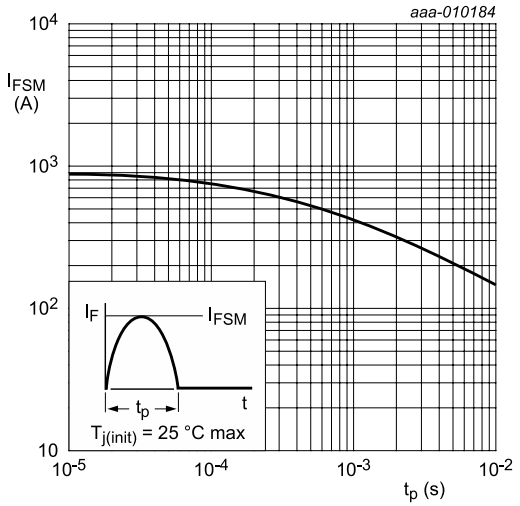


Fig. 4. Non-repetitive peak forward current as a function of pulse width; sinusoidal waveform; maximum values

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

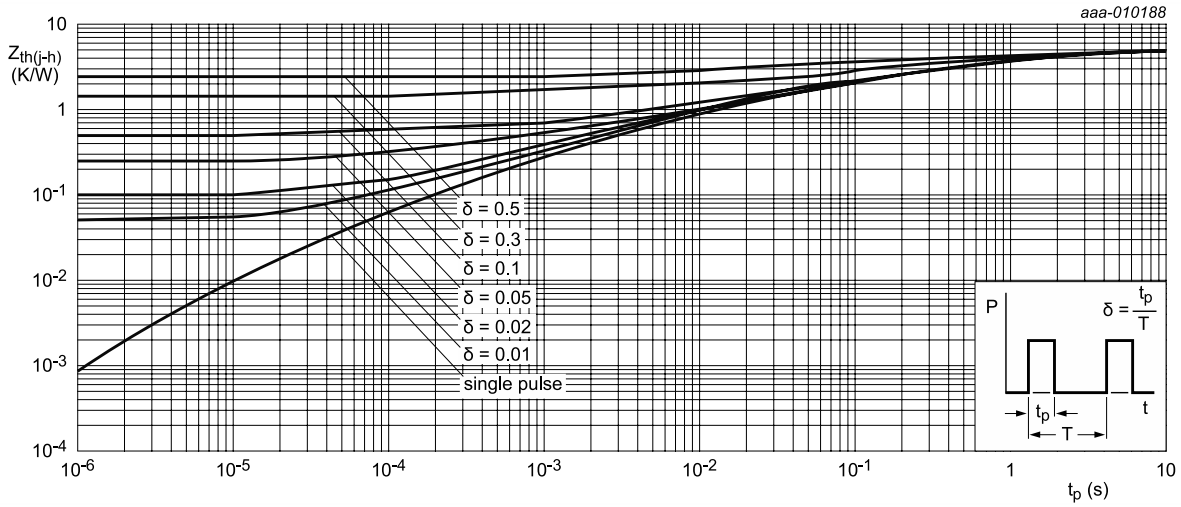


Fig. 5. Transient thermal impedance from junction to heatsink as a function of pulse duration

10. Isolation characteristics

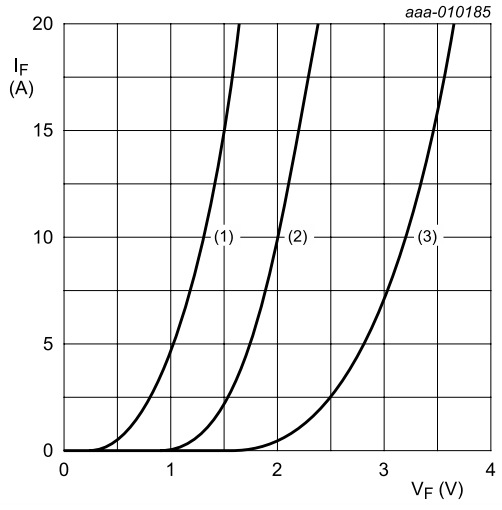
Table 7. Isolation characteristics

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	from cathode to external heatsink; f = 1 MHz		-	10	-	PF

11. Characteristics

Table 8. Characteristics

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
Static characteristics							
V_F	forward voltage	I_F = 10 A; T_j = 25 °C; Fig. 6		-	2.5	3.2	V
		I_F = 10 A; T_j = 150 °C; Fig. 6		-	1.3	2	V
I_R	reverse current	V_R = 600 V; T_j = 25 °C		-	-	10	µA
		V_R = 600 V; T_j = 150 °C		-	-	0.8	mA
Dynamic characteristics							
Q_r	recovered charge	I_F = 10 A; V_R = 200 V; dI_F/dt = 200 A/µs; T_j = 25 °C; Fig. 7		-	26	-	nC
		I_F = 10 A; V_R = 200 V; dI_F/dt = 200 A/µs; T_j = 125 °C; Fig. 7		-	83	-	nC
t_{rr}	reverse recovery time	I_F = 1 A; V_R = 30 V; dI_F/dt = 200 A/µs; T_j = 25 °C; Fig. 7		-	12	18	ns
		I_F = 10 A; V_R = 400 V; dI_F/dt = 500 A/µs; T_j = 25 °C; Fig. 7		-	19	-	ns
		I_F = 10 A; V_R = 200 V; dI_F/dt = 200 A/µs; T_j = 25 °C; Fig. 7		-	26	-	ns
		I_F = 10 A; V_R = 200 V; dI_F/dt = 200 A/µs; T_j = 125 °C; Fig. 7		-	34	-	
I_{RM}	peak reverse recovery current	I_F = 10 A; V_R = 200 V; dI_F/dt = 200 A/µs; T_j = 25 °C; Fig. 7		-	2	-	A
		I_F = 10 A; V_R = 200 V; dI_F/dt = 200 A/µs; T_j = 125 °C; Fig. 7		-	4.8	-	A



(1) T_j = 150 °C; typical values
(2) T_j = 150 °C; maximum values
(3) T_j = 25 °C; maximum values
V_o = 1.572 V; R_s = 0.040 Ω

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

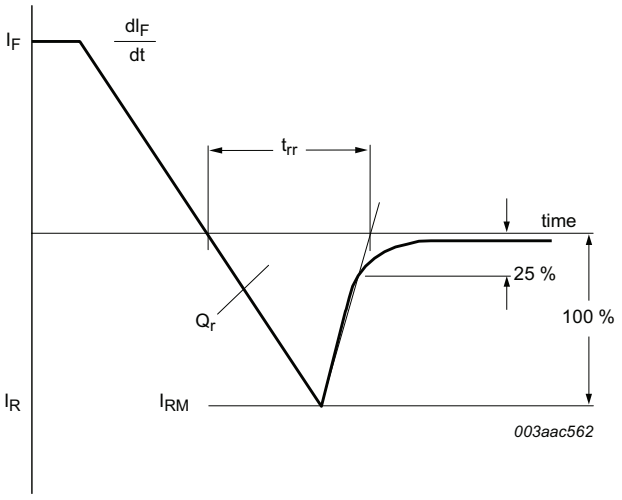
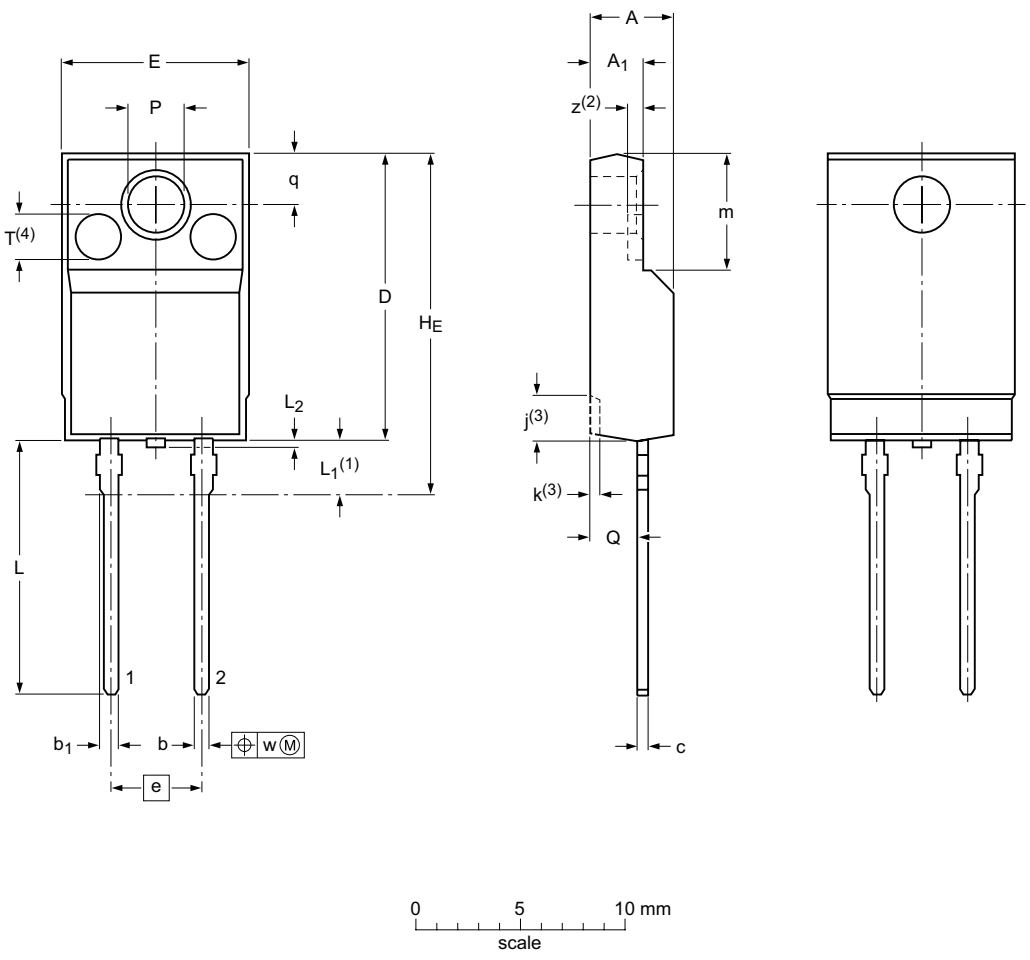


Fig. 7. Reverse recovery definitions; ramp recovery

12. Package outline

Assembly factory: d & A

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 line area (j & k) design for factory A.
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. 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.
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