

1. General description

Hyperfast power diode in a TO220F-2L 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)

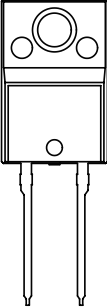
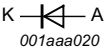
4. Quick reference data

Table 1. Quick reference data

Symbol	Parameter	Conditions	Notes	Values			Unit
Absolute maximum rating							
V_{RRM}	repetitive peak reverse voltage			650			V
$I_{F(AV)}$	average forward current	$\delta = 0.5$; square-wave pulse; Fig. 1 ; Fig. 2		12			A
I_{FRM}	repetitive peak forward current	$\delta = 0.5$; $t_p = 25 \mu s$; square-wave pulse		24			A
I_{FSM}	non-repetitive peak forward current	$t_p = 10 \text{ ms}$; $T_{j(\text{init})} = 25 \text{ }^\circ\text{C}$; sine-wave pulse; Fig. 3		135			A
		$t_p = 8.3 \text{ ms}$; $T_{j(\text{init})} = 25 \text{ }^\circ\text{C}$; sine-wave pulse		148			A
Symbol	Parameter	Conditions	Notes	Min	Typ	Max	Unit
Static characteristics							
V_F	forward voltage	$I_F = 12 \text{ A}$; $T_j = 25 \text{ }^\circ\text{C}$; Fig. 5		-	2.60	3.30	V
		$I_F = 12 \text{ A}$; $T_j = 150 \text{ }^\circ\text{C}$; Fig. 5		-	1.60	2.30	V
Dynamic characteristics							
t_{rr}	reverse recovery time	$I_F = 1 \text{ A}$; $V_R = 30 \text{ V}$; $di_p/dt = 200 \text{ A}/\mu s$; $T_j = 25 \text{ }^\circ\text{C}$; Fig. 6		-	14	-	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
BYC12MX-650P	TO220F-2L	BYC12MX-650PQ	Tube	50	TO220Fd-2L	02-Aug-2022

7. Marking

Table 4. Marking codes

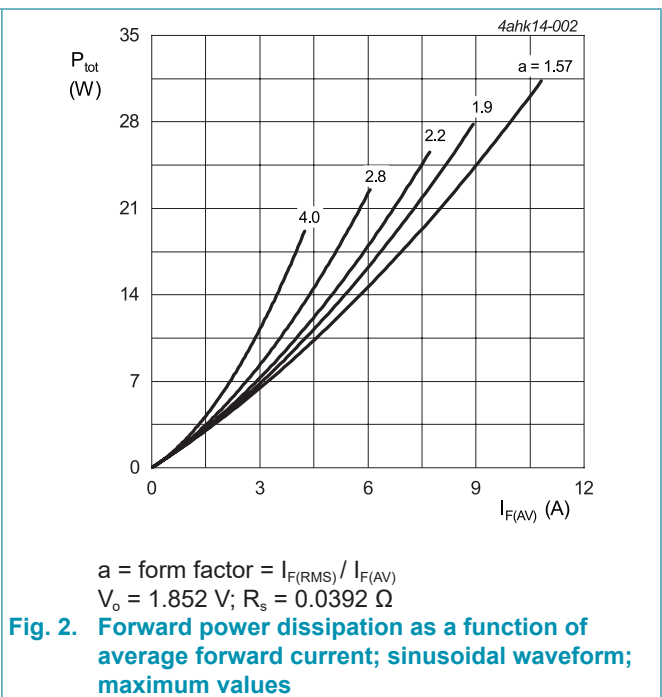
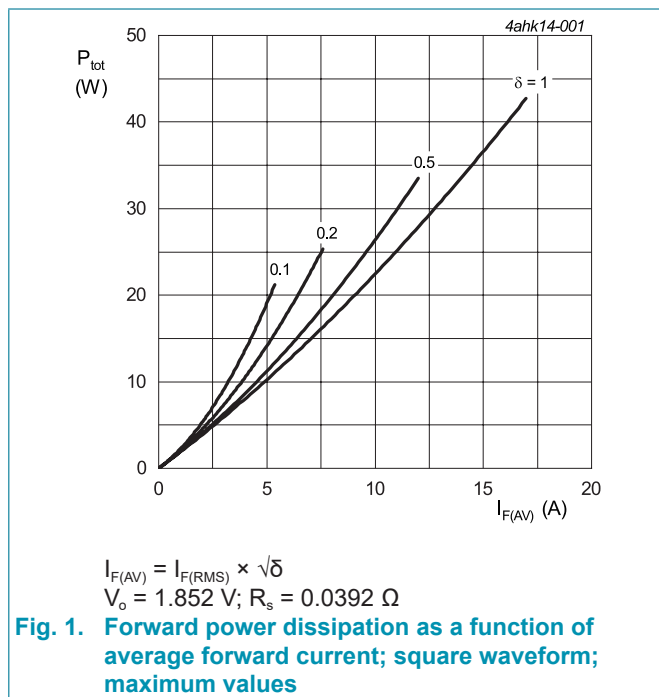
Type number	Marking codes
BYC12MX-650P	BYC12MX 650P

8. Limiting values

Table 5. Limiting values

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

Symbol	Parameter	Conditions	Notes	Values	Unit
V_{RRM}	repetitive peak reverse voltage			650	V
V_{RWM}	crest working reverse voltage			650	V
V_R	reverse voltage	DC		650	V
$I_{F(AV)}$	average forward current	$\delta = 0.5$; square-wave pulse; Fig. 1 ; Fig. 2		12	A
I_{FRM}	repetitive peak forward current	$\delta = 0.5$; $t_p = 25 \mu s$; square-wave pulse		24	A
I_{FSM}	non-repetitive peak forward current	$t_p = 10 ms$; $T_{j(init)} = 25 \text{ }^\circ C$; sine-wave pulse; Fig. 3		135	A
		$t_p = 8.3 ms$; $T_{j(init)} = 25 \text{ }^\circ C$; sine-wave pulse		148	A
T_{stg}	storage temperature			-65 to 175	$^\circ C$
T_j	junction temperature			-65 to 175	$^\circ C$



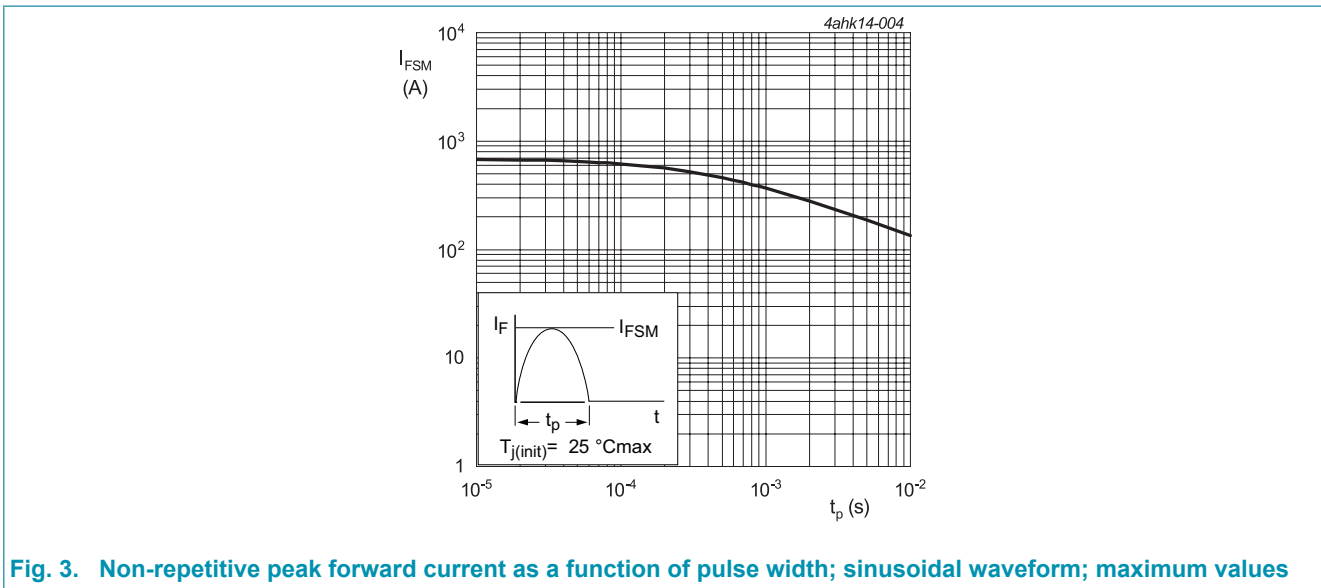


Fig. 3. Non-repetitive peak forward current as a function of pulse width; sinusoidal waveform; maximum values

9. Thermal characteristics

Table 6. Thermal characteristics

Symbol	Parameter	Conditions	Notes	Min	Typ	Max	Unit
$R_{th(j-h)}$	thermal resistance from junction to heatsink	with heatsink compound; Fig 4		-	-	4.8	K/W
$R_{th(j-a)}$	thermal resistance from junction to ambient free air	in free air		-	60	-	K/W

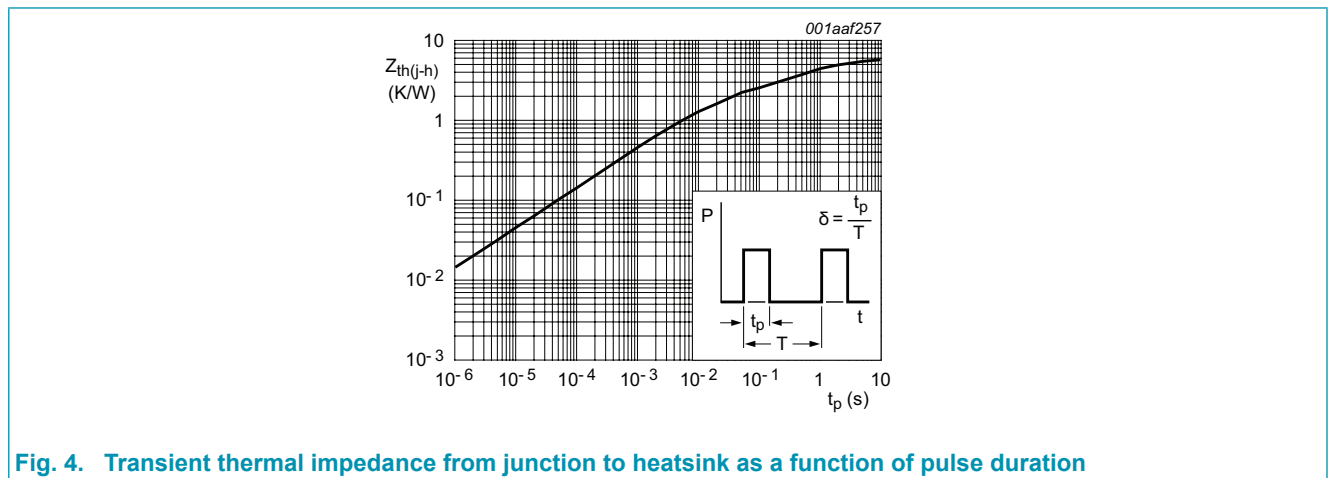


Fig. 4. Transient thermal impedance from junction to heatsink as a function of pulse duration

10. Isolation characteristics

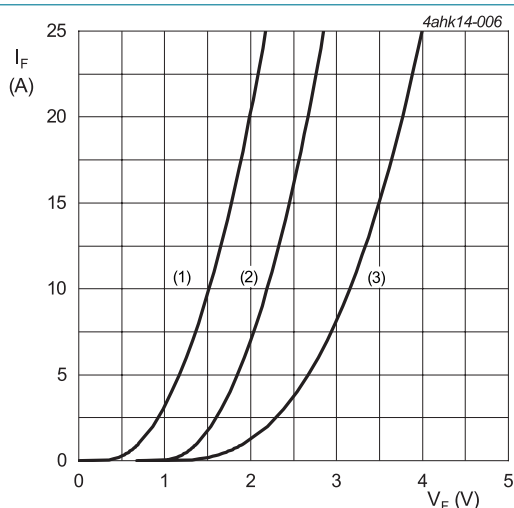
Table 7. Isolation characteristics

Symbol	Parameter	Conditions	Notes	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	Notes	Min	Typ	Max	Unit
Static characteristics							
V_F	forward voltage	$I_F = 12\text{ A}; T_j = 25\text{ °C}; \text{Fig. 5}$		-	2.60	3.30	V
		$I_F = 12\text{ A}; T_j = 150\text{ °C}; \text{Fig. 5}$		-	1.60	2.30	V
I_R	reverse current	$V_R = 650\text{ V}; T_j = 25\text{ °C}$		-	0.5	30	μA
		$V_R = 650\text{ V}; T_j = 150\text{ °C}$		-	-	0.8	mA
Dynamic characteristics							
Q_r	reverse charge	$I_F = 12\text{ A}; V_R = 200\text{ V}; di_F/dt = 200\text{ A}/\mu\text{s}; T_j = 25\text{ °C}; \text{Fig. 6}$		-	37	-	nC
		$I_F = 12\text{ A}; V_R = 200\text{ V}; di_F/dt = 200\text{ A}/\mu\text{s}; T_j = 125\text{ °C}; \text{Fig. 6}$		-	126	-	nC
t_{rr}	reverse recovery time	$I_F = 0.5\text{ A}; I_{rr} = 0.25\text{ A}; I_R = 1\text{ A}; T_j = 25\text{ °C}; \text{Fig. 6}$		-	20	-	ns
		$I_F = 1\text{ A}; V_R = 30\text{ V}; di_F/dt = 200\text{ A}/\mu\text{s}; T_j = 25\text{ °C}; \text{Fig. 6}$		-	14	-	ns
		$I_F = 12\text{ A}; V_R = 200\text{ V}; di_F/dt = 200\text{ A}/\mu\text{s}; T_j = 25\text{ °C}; \text{Fig. 6}$		-	29	-	ns
		$I_F = 12\text{ A}; V_R = 200\text{ V}; di_F/dt = 200\text{ A}/\mu\text{s}; T_j = 125\text{ °C}; \text{Fig. 6}$		-	50	-	ns
I_{RM}	peak reverse recovery current	$I_F = 12\text{ A}; V_R = 200\text{ V}; di_F/dt = 200\text{ A}/\mu\text{s}; T_j = 25\text{ °C}; \text{Fig. 6}$		-	2.5	-	A
		$I_F = 12\text{ A}; V_R = 200\text{ V}; di_F/dt = 200\text{ A}/\mu\text{s}; T_j = 125\text{ °C}; \text{Fig. 6}$		-	5.1	-	A
E_{as}	non-repetitive avalanche energy	$T_{j(\text{init})} = 25\text{ °C}$		-	10.8	-	mJ



$V_o = 1.852\text{ V}; R_s = 0.0392\ \Omega$
 (1) $T_j = 150\text{ °C};$ typical values
 (2) $T_j = 150\text{ °C};$ maximum values
 (3) $T_j = 25\text{ °C};$ maximum values

Fig. 5. Forward current as a function of forward voltage

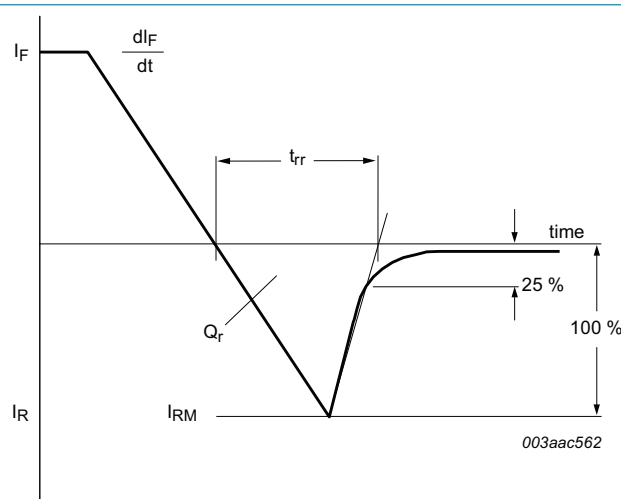
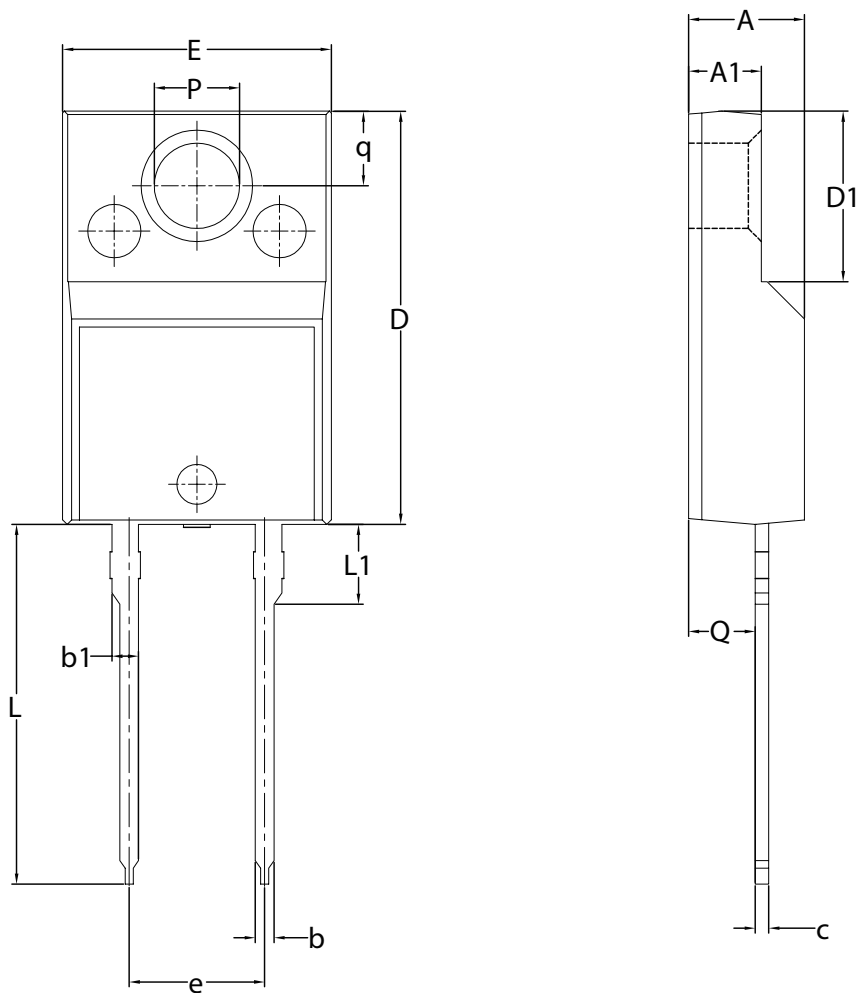


Fig. 6. Reverse recovery definitions; ramp recovery

12. Package outline

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

TO220F-2L



Unit	A	A1	b	b1	c	D	D1	E	e	L	L1	P	Q	q
MM	min	4.00	2.50	0.70	0.90	0.40	15.20	6.30	9.80	13.50	2.80	3.00	2.30	2.60
	max	4.60	3.10	0.90	1.10	0.70	15.80	6.50	10.30	14.40	3.30	3.40	2.80	3.00

Note:

- All dimensions don't include mold flash and metal protrusion.

13. Legal information

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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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- [2] The term 'short data sheet' is explained in section "Definitions".
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