

1. General description

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



2. Features and benefits

- Excellent avalanche energy robustness
- Low leakage current
- Low thermal resistance
- Low reverse recovery current
- Reduces switching losses in associated MOSFET or IGBT

3. Applications

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

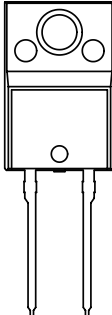
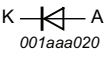
4. Quick reference data

Table 1. Quick reference data

Symbol	Parameter	Conditions	Notes	Values			Unit
Absolute maximum rating							
V _{RRM}	repetitive peak reverse voltage			650			V
I _{F(AV)}	average forward current	δ = 0.5 ; square-wave pulse; Fig. 1 ; Fig. 2		30			A
I _{FRM}	repetitive peak forward current	δ = 0.5 ; t _p = 25 μs; square-wave pulse		60			A
I _{FSM}	non-repetitive peak forward current	t _p = 10 ms; T _{j(init)} = 25 °C; sine-wave pulse; Fig. 3		270			A
		t _p = 8.3 ms; T _{j(init)} = 25 °C; sine-wave pulse		297			A
Symbol	Parameter	Conditions	Notes	Min	Typ	Max	Unit
Static characteristics							
V _F	forward voltage	I _F = 30 A; T _j = 25 °C; Fig. 5		-	2.05	2.75	V
		I _F = 30 A; T _j = 150 °C; Fig. 5		-	1.38	1.80	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. 6		-	20	24	ns

5. Pinning information

Table 2. Pinning information

Pin	Symbol	Description	Simplified outline	Graphic symbol
1	K	cathode		
2	A	anode		
mb	mb	mounting base; connected to cathod		

6. Ordering information

Table 3. Ordering information

Type number	Package name	Orderable part number	Packing method	Small packing quantity	Package version	Package issue date
BYC30MX-650P	TO220F-2L	BYC30MX-650PQ	Tube	50	TO220Fd-2L	02-Aug-2022

7. Marking

Table 4. Marking codes

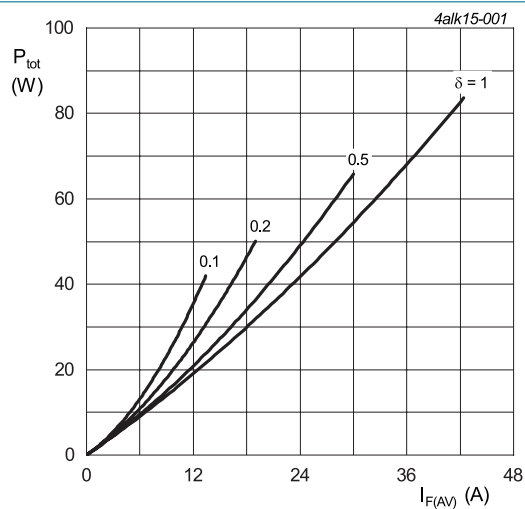
Type number	Marking codes
BYC30MX-650P	BYC30MX 650P

8. Limiting values

Table 5. Limiting values

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

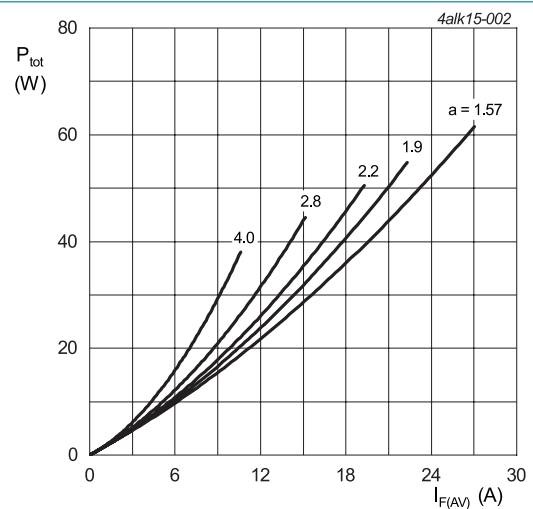
Symbol	Parameter	Conditions	Notes	Values	Unit
V_{RRM}	repetitive peak reverse voltage			650	V
V_{RWM}	crest working reverse voltage			650	V
V_R	reverse voltage	DC		650	V
$I_{F(AV)}$	average forward current	$\delta = 0.5$; square-wave pulse; Fig. 1 ; Fig. 2		30	A
I_{FRM}	repetitive peak forward current	$\delta = 0.5$; $t_p = 25 \mu s$; square-wave pulse		60	A
I_{FSM}	non-repetitive peak forward current	$t_p = 10 ms$; $T_{j(init)} = 25^\circ C$; sine-wave pulse; Fig. 3		270	A
		$t_p = 8.3 ms$; $T_{j(init)} = 25^\circ C$; sine-wave pulse		297	A
T_{stg}	storage temperature			-65 to 175	$^\circ C$
T_j	junction temperature			-65 to 175	$^\circ C$



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

$$V_o = 1.436 \text{ V}; R_s = 0.0127 \Omega$$

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



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

$$V_o = 1.436 \text{ V}; R_s = 0.0127 \Omega$$

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

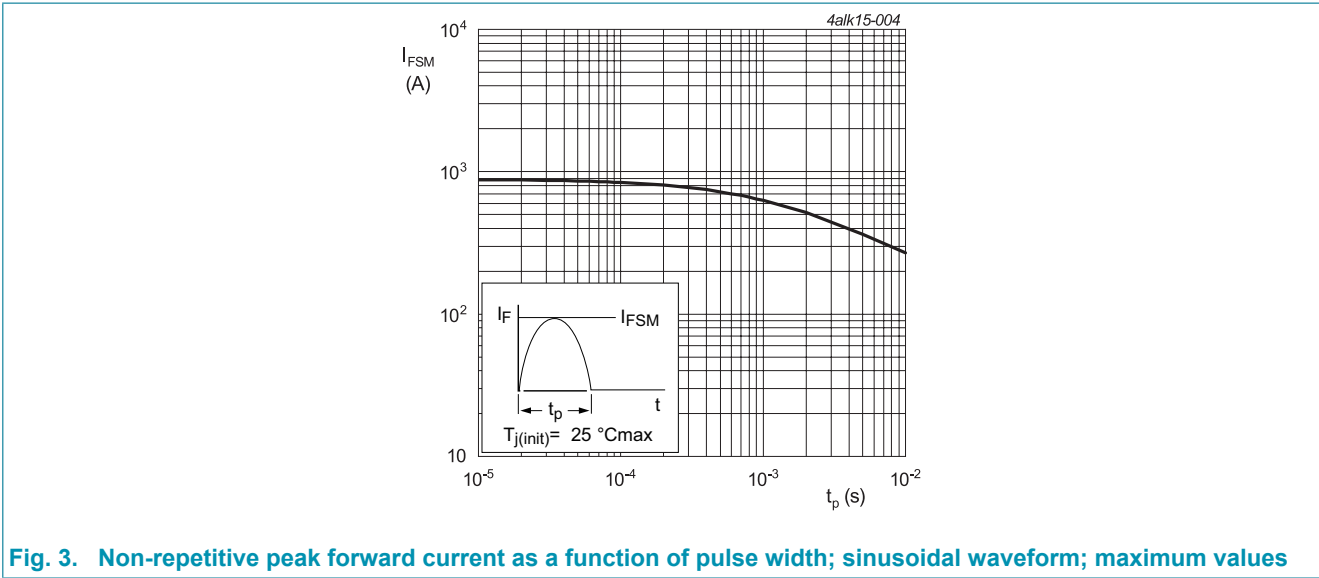


Fig. 3. Non-repetitive peak forward current as a function of pulse width; sinusoidal waveform; maximum values

9. Thermal characteristics

Table 6. Thermal characteristics

Symbol	Parameter	Conditions	Notes	Min	Typ	Max	Unit
$R_{th(j-mb)}$	thermal resistance from junction to mounting base	Fig. 4		-	-	3.5	K/W
$R_{th(j-a)}$	thermal resistance from junction to ambient free air	in free air		-	60	-	K/W

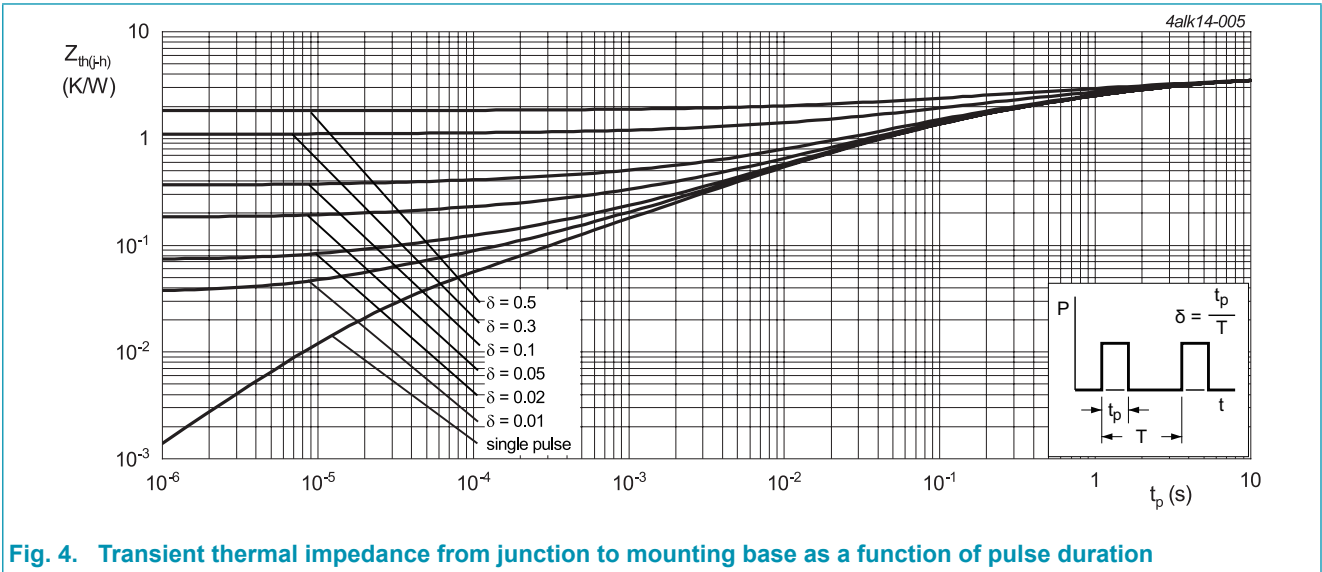


Fig. 4. Transient thermal impedance from junction to mounting base as a function of pulse duration

10. Isolation characteristics

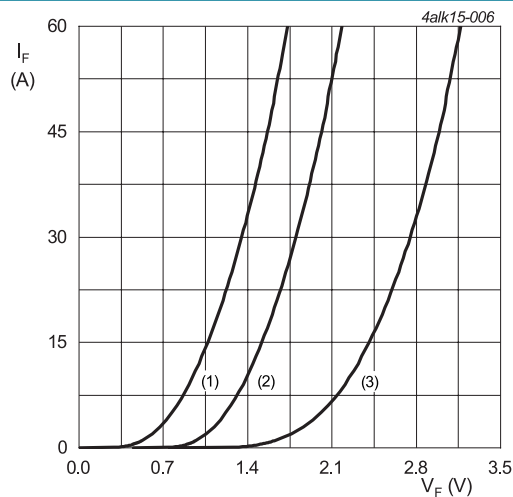
Table 7. Isolation characteristics

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	Notes	Min	Typ	Max	Unit
Static characteristics							
V _F	forward voltage	I _F = 30 A; T _J = 25 °C; Fig. 5		-	2.05	2.75	V
		I _F = 30 A; T _J = 150 °C; Fig. 5		-	1.38	1.80	V
I _R	reverse current	V _R = 650 V; T _J = 25 °C		-	0.6	30	μA
		V _R = 650 V; T _J = 150 °C		-	0.25	1	mA
Dynamic characteristics							
Q _r	reverse charge	I _F = 30 A; V _R = 200 V; dI _F /dt = 200 A/μs; T _J = 25 °C; Fig. 6		-	68	-	nC
		I _F = 30 A; V _R = 200 V; dI _F /dt = 200 A/μs; T _J = 125 °C; Fig. 6		-	330	-	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. 6		-	20	24	ns
		I _F = 30 A; V _R = 200 V; dI _F /dt = 200 A/μs; T _J = 25 °C; Fig. 6		-	38	-	ns
		I _F = 30 A; V _R = 200 V; dI _F /dt = 200 A/μs; T _J = 125 °C; Fig. 6		-	73	-	ns
I _{RM}	peak reverse recovery currentnon-repetitive avalanche energy	I _F = 30 A; V _R = 200 V; dI _F /dt = 200 A/μs; T _J = 25 °C; Fig. 6		-	3.7	-	A
		I _F = 30 A; V _R = 200 V; dI _F /dt = 200 A/μs; T _J = 125 °C; Fig. 6		-	9.1	-	A
E _{as}	non-repetitive avalanche energy	I _R = 2 A; L = 15 mH; T _J (init) = 25 °C		30	-	-	mJ



$V_o = 1.436\text{ V}$; $R_s = 0.0127\text{ }\Omega$

(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

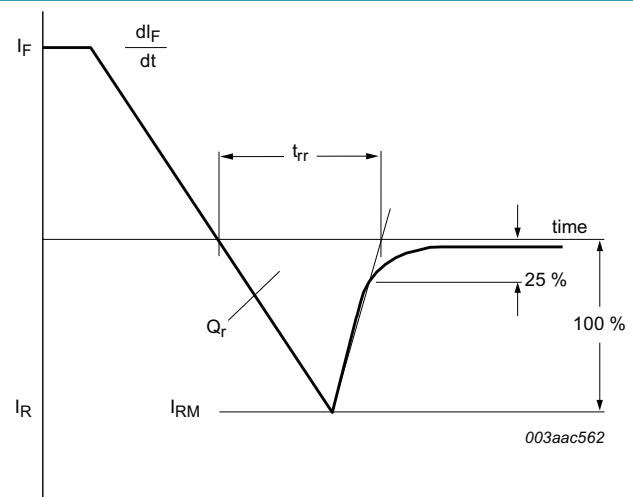


Fig. 6. Reverse recovery definitions; ramp recovery

12. Package outline

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

TO220F-2L

The technical drawing illustrates the package outline of the BYC30MX-650P diode. It includes three views: a top view, a side view, and a lead view. The top view shows a rectangular body with a central mounting hole and two side leads. Dimensions labeled include E (total width), P (hole diameter), q (hole offset), D (body height), L (lead length), L1 (lead thickness), b1 (lead width), b (lead thickness), and e (lead pitch). The side view shows the body's profile with dimensions A (total width), A1 (hole diameter), D1 (body height), and Q (lead length). The lead view shows the lead's profile with dimensions c (lead thickness) and Q (lead length).

Unit	A	A1	b	b1	c	D	D1	E	e	L	L1	P	Q	q
min	4.00	2.50	0.70	0.90	0.40	15.20	6.30	9.80	5.08 (BSC)	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:
1. 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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Product [short] data sheet	Production	This document contains the product specification.

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Date of release: 16 September 2022

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