

1. General description

Ultrafast 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
- Power Factor Correction (PFC)

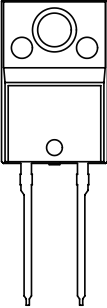
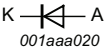
4. Quick reference data

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 ; Fig. 3		20			A
I_{FRM}	repetitive peak forward current	$\delta = 0.5$; $t_p = 25 \mu s$; square-wave pulse		40			A
I_{FSM}	non-repetitive peak forward current	$t_p = 10 ms$; $T_{j(init)} = 25 \text{ }^\circ\text{C}$; sine-wave pulse; Fig. 4		250			A
		$t_p = 8.3 ms$; $T_{j(init)} = 25 \text{ }^\circ\text{C}$; sine-wave pulse		275			A
Symbol	Parameter	Conditions	Notes	Min	Typ	Max	Unit
Static characteristics							
V_F	forward voltage	$I_F = 20 A$; $T_j = 25 \text{ }^\circ\text{C}$; Fig. 6		-	1.65	2.20	V
		$I_F = 20 A$; $T_j = 150 \text{ }^\circ\text{C}$; Fig. 6		-	1.25	1.80	V
Dynamic characteristics							
t_{rr}	reverse recovery time	$I_F = 1 A$; $V_R = 30 V$; $di_F/dt = 200 A/\mu s$; $T_j = 25 \text{ }^\circ\text{C}$; Fig. 7		-	23	-	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
BYV20MX-650P	TO220F-2L	BYV20MX-650PQ	Tube	50	TO220Fd-2L	02-Aug-2022

7. Marking

Table 4. Marking codes

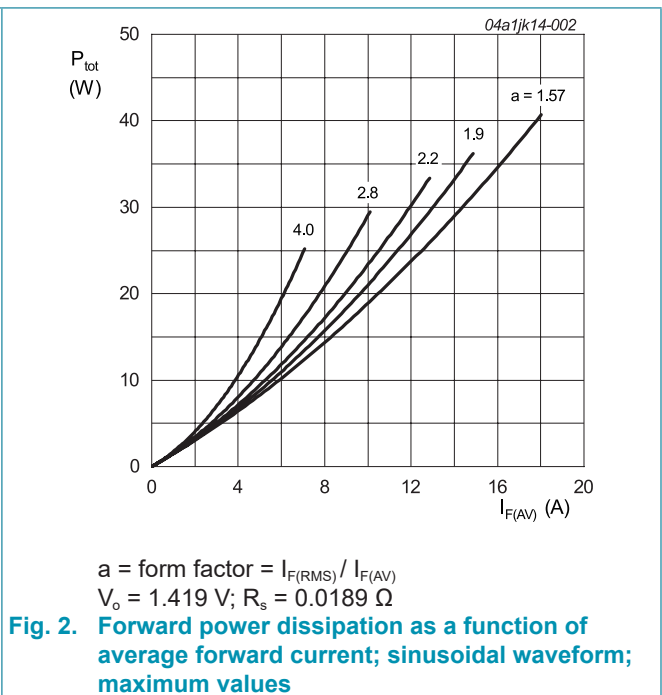
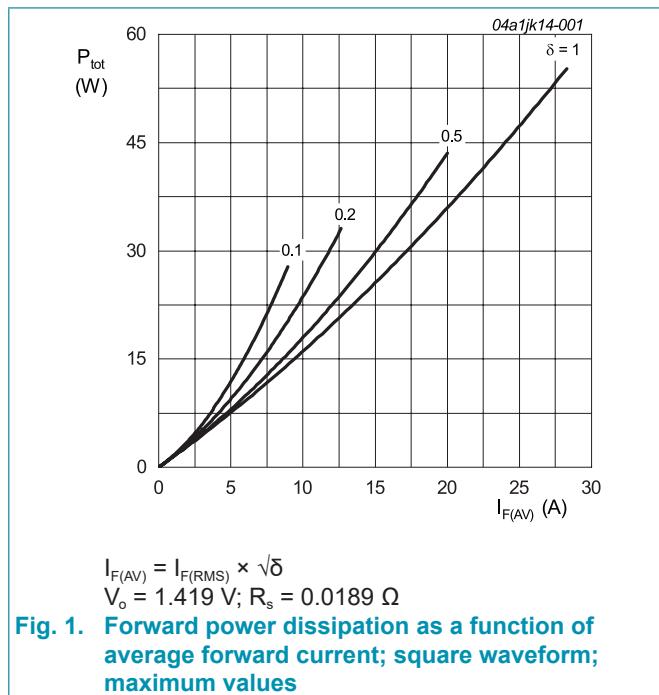
Type number	Marking codes
BYV20MX-650P	BYV20MX 650P

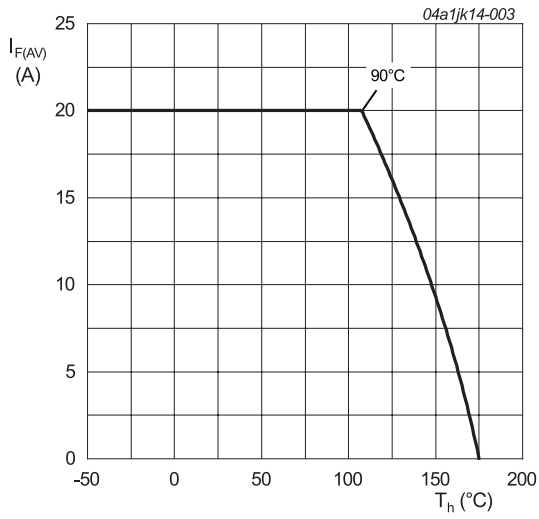
8. Limiting values

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 ; Fig. 3		20	A
I_{FRM}	repetitive peak forward current	$\delta = 0.5$; $t_p = 25 \mu s$; square-wave pulse		40	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. 4		250	A
		$t_p = 8.3 \text{ ms}$; $T_{j(\text{init})} = 25 \text{ }^\circ\text{C}$; sine-wave pulse		275	A
T_{stg}	storage temperature			-65 to 175	$^\circ\text{C}$
T_j	junction temperature			-65 to 175	$^\circ\text{C}$





square waveform; $\delta = 1$

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

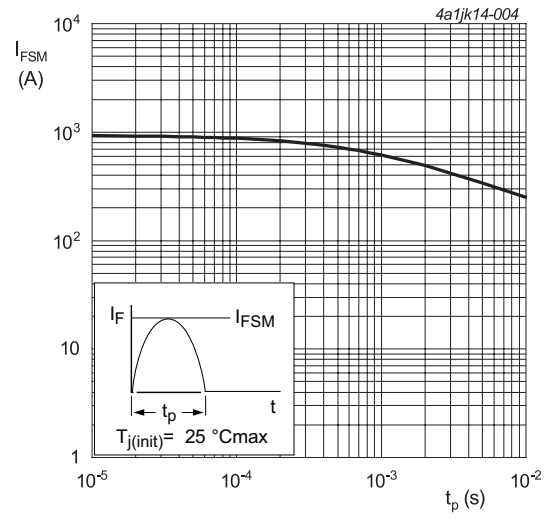


Fig. 4. Non-repetitive peak forward current as a function of pulse width; sinusoidal waveform; maximum values

9. Thermal characteristics

Table 6. Thermal characteristics

Symbol	Parameter	Conditions	Notes	Min	Typ	Max	Unit
$R_{th(j-h)}$	thermal resistance from junction to heatsink	with heatsink compound; Fig. 5		-	-	4	K/W
$R_{th(j-a)}$	thermal resistance from junction to ambient free air	in free air		-	60	-	K/W

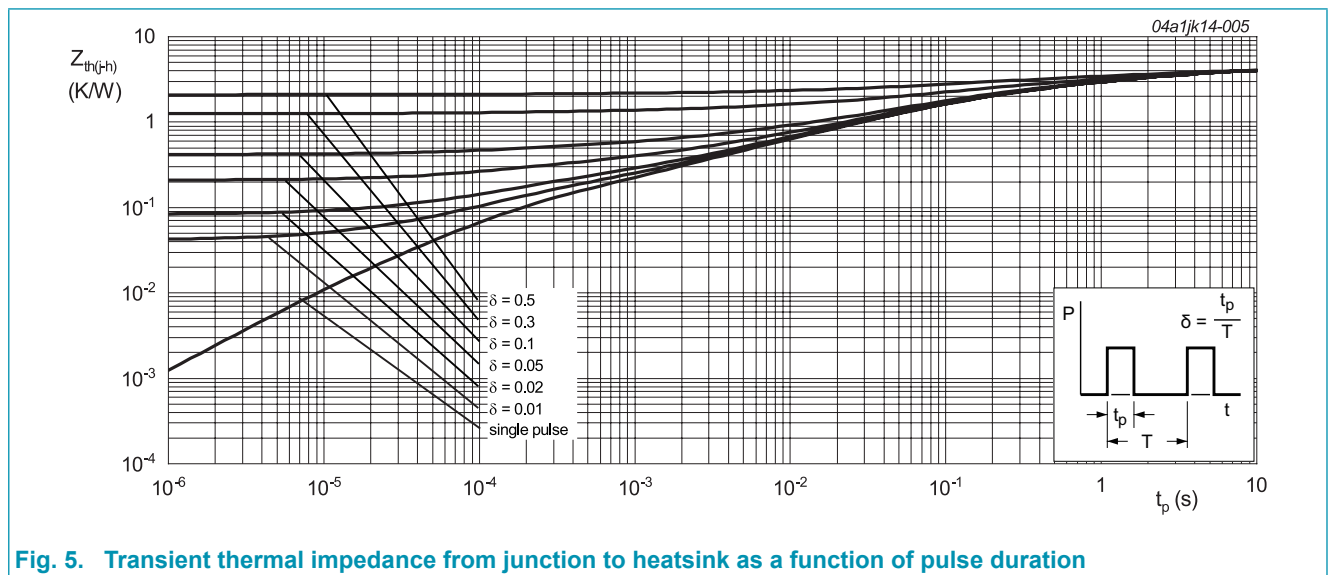


Fig. 5. Transient thermal impedance from junction to heatsink as a function of pulse duration

10. Isolation characteristics

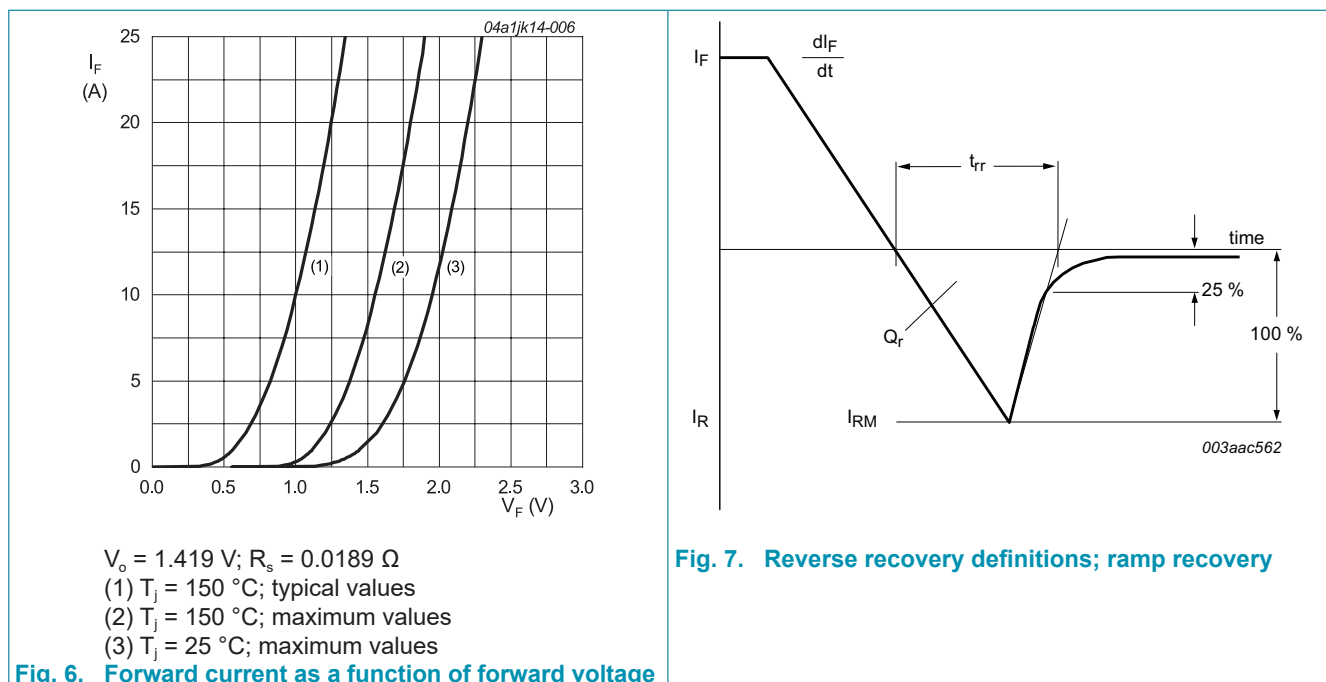
Table 7. Isolation characteristics

Symbol	Parameter	Conditions	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

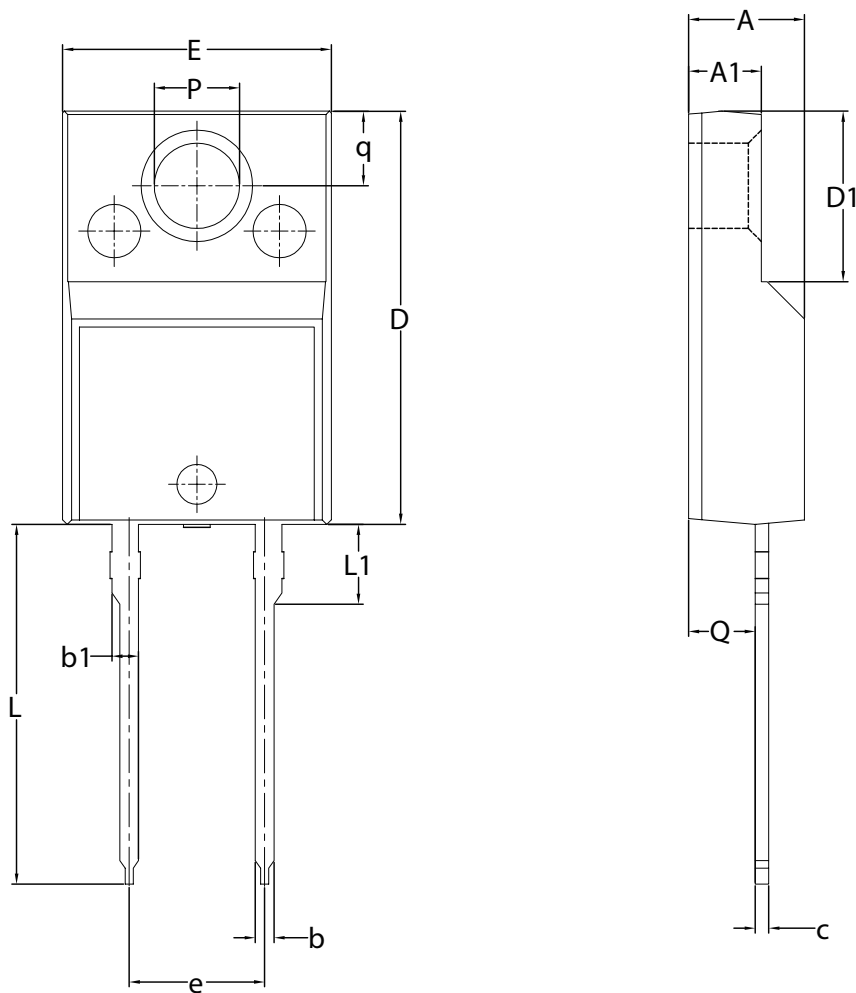
Symbol	Parameter	Conditions	Notes	Min	Typ	Max	Unit
Static characteristics							
V_F	forward voltage	$I_F = 20 \text{ A}; T_j = 25 \text{ }^\circ\text{C}; \text{Fig. 6}$		-	1.65	2.20	V
		$I_F = 20 \text{ A}; T_j = 150 \text{ }^\circ\text{C}; \text{Fig. 6}$		-	1.25	1.80	V
I_R	reverse current	$V_R = 650 \text{ V}; T_j = 25 \text{ }^\circ\text{C}$		-	0.2	30	μA
		$V_R = 650 \text{ V}; T_j = 150 \text{ }^\circ\text{C}$		-	0.05	-	mA
Dynamic characteristics							
Q_r	reverse charge	$I_F = 20 \text{ A}; V_R = 200 \text{ V}; \text{d}I_F/\text{d}t = 200 \text{ A}/\mu\text{s}; T_j = 25 \text{ }^\circ\text{C}; \text{Fig. 7}$		-	125	-	nC
		$I_F = 20 \text{ A}; V_R = 200 \text{ V}; \text{d}I_F/\text{d}t = 200 \text{ A}/\mu\text{s}; T_j = 125 \text{ }^\circ\text{C}; \text{Fig. 7}$		-	500	-	nC
t_{rr}	reverse recovery time	$I_F = 0.5 \text{ A}; I_{rr} = 0.25 \text{ A}; I_R = 1 \text{ A}; T_j = 25 \text{ }^\circ\text{C}; \text{Fig. 7}$		-	36	-	ns
		$I_F = 1 \text{ A}; V_R = 30 \text{ V}; \text{d}I_F/\text{d}t = 200 \text{ A}/\mu\text{s}; T_j = 25 \text{ }^\circ\text{C}; \text{Fig. 7}$		-	23	-	ns
		$I_F = 20 \text{ A}; V_R = 200 \text{ V}; \text{d}I_F/\text{d}t = 200 \text{ A}/\mu\text{s}; T_j = 25 \text{ }^\circ\text{C}; \text{Fig. 7}$		-	65	-	ns
		$I_F = 20 \text{ A}; V_R = 200 \text{ V}; \text{d}I_F/\text{d}t = 200 \text{ A}/\mu\text{s}; T_j = 125 \text{ }^\circ\text{C}; \text{Fig. 7}$		-	100	-	ns
I_{RM}	peak reverse recovery current	$I_F = 20 \text{ A}; V_R = 200 \text{ V}; \text{d}I_F/\text{d}t = 200 \text{ A}/\mu\text{s}; T_j = 25 \text{ }^\circ\text{C}; \text{Fig. 7}$		-	4.5	-	A
		$I_F = 20 \text{ A}; V_R = 200 \text{ V}; \text{d}I_F/\text{d}t = 200 \text{ A}/\mu\text{s}; T_j = 125 \text{ }^\circ\text{C}; \text{Fig. 7}$		-	9.5	-	A
E_{as}	non-repetitive avalanche energy	$T_{j(\text{init})} = 25 \text{ }^\circ\text{C}$		25	-	-	mJ



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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