

## 1. General description

Ultrafast power diode in a 2-lead TO247 plastic package



## 2. Features and benefits

- Fast switching
- 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)

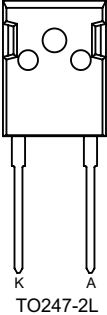
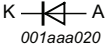
## 4. Quick reference data

Table 1. Quick reference data

Symbol	Parameter	Conditions	Notes	Values			Unit
Absolute maximum rating							
V <sub>RRM</sub>	repetitive peak reverse voltage			650			V
I <sub>F(AV)</sub>	average forward current	δ = 0.5 ; square-wave pulse; T <sub>mb</sub> ≤ 134 °C; <a href="#">Fig. 1</a> ; <a href="#">Fig. 2</a> ; <a href="#">Fig. 3</a>		30			A
I <sub>FRM</sub>	repetitive peak forward current	δ = 0.5 ; t <sub>p</sub> = 25 μs; T <sub>mb</sub> ≤ 134 °C; square-wave pulse		60			A
I <sub>FSM</sub>	non-repetitive peak forward current	t <sub>p</sub> = 10 ms; T <sub>j(init)</sub> = 25 °C; sine-wave pulse; <a href="#">Fig. 4</a>		350			A
		t <sub>p</sub> = 8.3 ms; T <sub>j(init)</sub> = 25 °C; sine-wave pulse		385			A
Symbol	Parameter	Conditions	Notes	Min	Typ	Max	Unit
Static characteristics							
V <sub>F</sub>	forward voltage	I <sub>F</sub> = 30 A; T <sub>j</sub> = 25 °C; <a href="#">Fig. 6</a>	I <sub>F</sub>	-	1.34	1.55	V
		I <sub>F</sub> = 30 A; T <sub>j</sub> = 150 °C; <a href="#">Fig. 6</a>		-	1.06	1.27	V
Dynamic characteristics							
t <sub>rr</sub>	reverse recovery time	I <sub>F</sub> = 1 A; V <sub>R</sub> = 30 V; dI <sub>F</sub> /dt = 200 A/μs; T <sub>j</sub> = 25 °C; <a href="#">Fig. 7</a>		-	27	-	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
BYV30MW-650PT2	TO247-2L	BYV30MW-650PT2Q	Tube	30	TO247L-2L	10-Nov-2020

7. Marking

Table 4. Marking codes

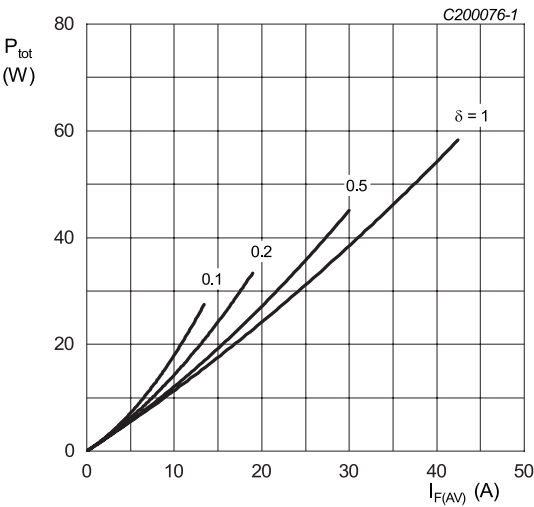
Type number	Marking codes
BYV30MW-650PT2	BYV30MW 650PT2

8. Limiting values

Table 5. Limiting values

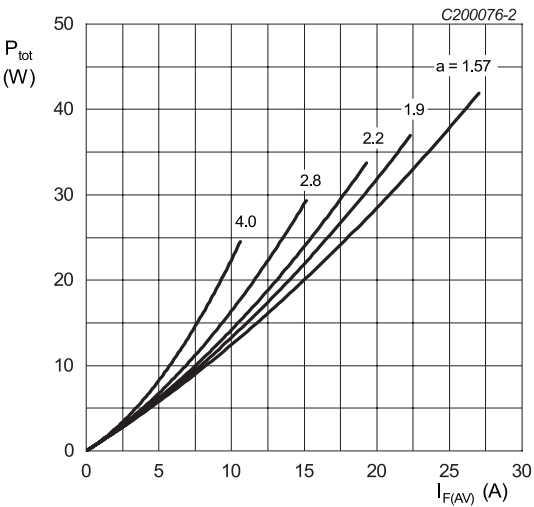
In accordance with the Absolute Maximum Rating System (IEC 60134).

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; $T_{mb} \leq 134\text{ }^{\circ}\text{C}$ ; <a href="#">Fig. 1</a> ; <a href="#">Fig. 2</a> ; <a href="#">Fig. 3</a>		30	A
$I_{FRM}$	repetitive peak forward current	$\delta = 0.5$ ; $t_p = 25\text{ }\mu\text{s}$ ; $T_{mb} \leq 134\text{ }^{\circ}\text{C}$ ; square-wave pulse		60	A
$I_{FSM}$	non-repetitive peak forward current	$t_p = 10\text{ ms}$ ; $T_{j(init)} = 25\text{ }^{\circ}\text{C}$ ; sine-wave pulse; <a href="#">Fig. 4</a>		350	A
		$t_p = 8.3\text{ ms}$ ; $T_{j(init)} = 25\text{ }^{\circ}\text{C}$ ; sine-wave pulse		385	A
$T_{stg}$	storage temperature			-65 to 175	$^{\circ}\text{C}$
$T_j$	junction temperature			-65 to 175	$^{\circ}\text{C}$



$I_{F(AV)} = I_{F(RMS)} \times \sqrt{\delta}$   
 $V_o = 1.061\text{ V}$ ;  $R_s = 0.0074\text{ }\Omega$

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



$a = \text{form factor} = I_{F(RMS)} / I_{F(AV)}$   
 $V_o = 1.061\text{ V}$ ;  $R_s = 0.0074\text{ }\Omega$

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

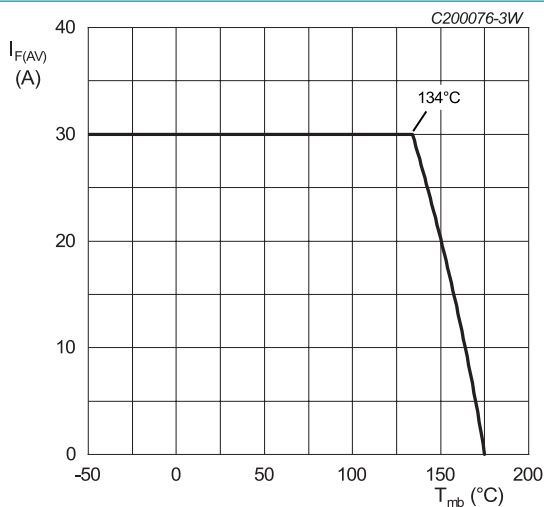


Fig. 3. Forward current as a function of mounting base temperature; maximum values

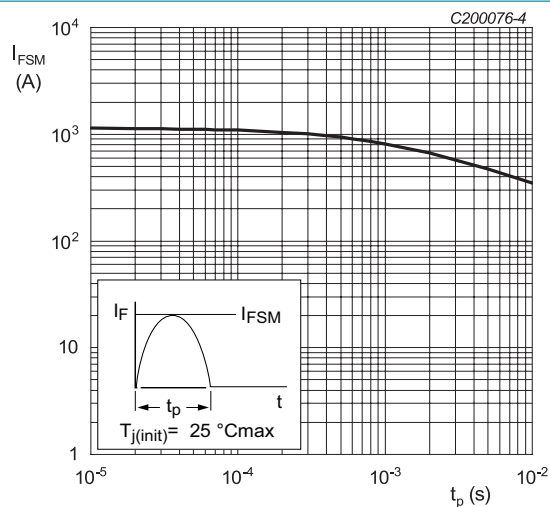


Fig. 4. Non-repetitive peak forward current as a function of pulse width; sinusoidal waveform; maximum values

9. Thermal characteristics

Table 6. Thermal characteristics

Symbol	Parameter	Conditions	Notes	Min	Typ	Max	Unit
$R_{th(j-mb)}$	thermal resistance from junction to mounting base	<a href="#">Fig. 5</a>		-	-	0.91	K/W
$R_{th(j-a)}$	thermal resistance from junction to ambient free air	in free air		-	40	-	K/W

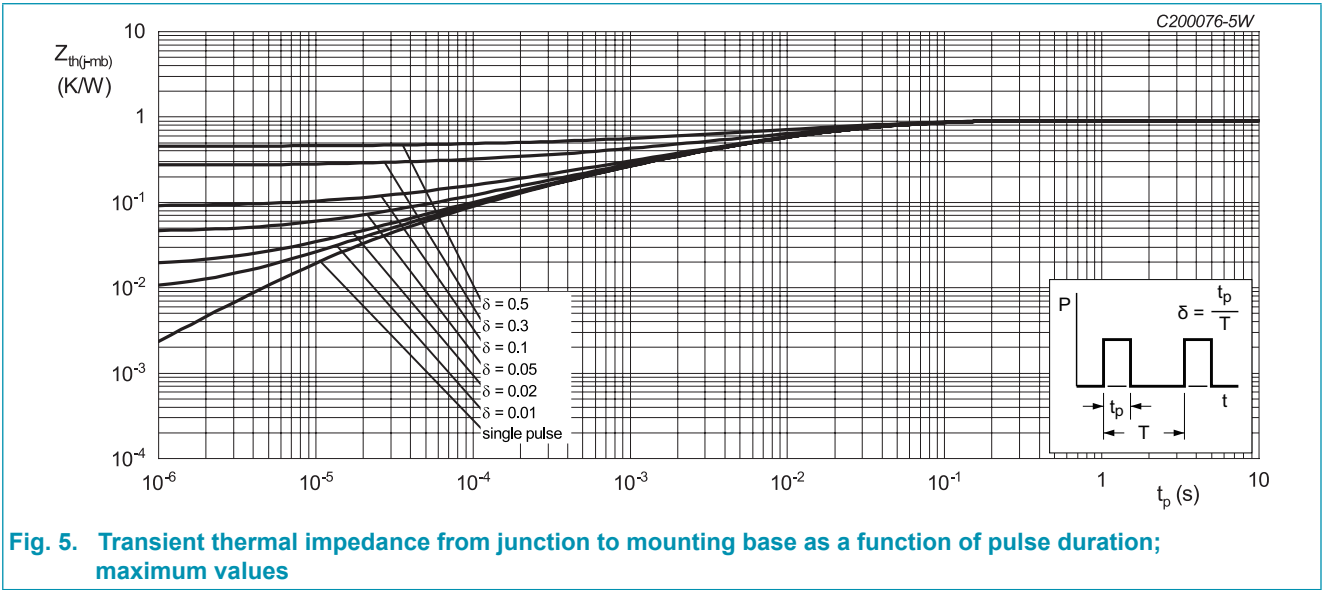
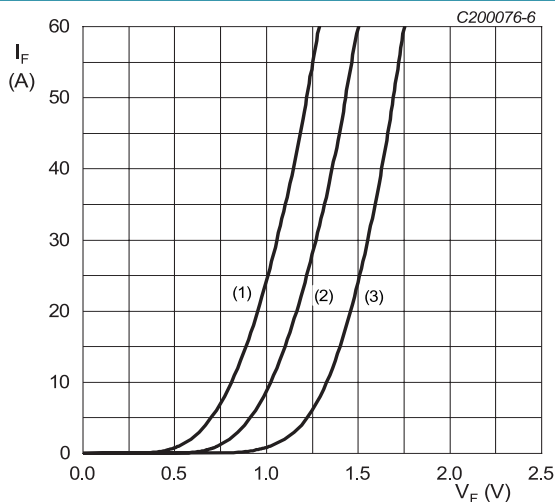


Fig. 5. Transient thermal impedance from junction to mounting base as a function of pulse duration; maximum values

## 10. Characteristics

Table 7. Characteristics

Symbol	Parameter	Conditions	Notes	Min	Typ	Max	Unit
Static characteristics							
V <sub>F</sub>	forward voltage	I <sub>F</sub> = 30 A; T <sub>j</sub> = 25 °C; <a href="#">Fig. 6</a>		-	1.34	1.55	V
		I <sub>F</sub> = 30 A; T <sub>j</sub> = 150 °C; <a href="#">Fig. 6</a>		-	1.06	1.27	V
I <sub>R</sub>	reverse current	V <sub>R</sub> = 650 V; T <sub>j</sub> = 25 °C		-	0.67	30	μA
		V <sub>R</sub> = 650 V; T <sub>j</sub> = 150 °C		-	-	1	mA
Dynamic characteristics							
Q <sub>r</sub>	reverse charge	I <sub>F</sub> = 30 A; V <sub>R</sub> = 400 V; dI <sub>F</sub> /dt = 100 A/μs; T <sub>j</sub> = 25 °C; <a href="#">Fig. 7</a>		-	159.3	-	nC
		I <sub>F</sub> = 30 A; V <sub>R</sub> = 400 V; dI <sub>F</sub> /dt = 100 A/μs; T <sub>j</sub> = 125 °C; <a href="#">Fig. 7</a>		-	599.3	-	nC
t <sub>rr</sub>	reverse recovery time	I <sub>F</sub> = 1 A; V <sub>R</sub> = 30 V; dI <sub>F</sub> /dt = 200 A/μs; T <sub>j</sub> = 25 °C; <a href="#">Fig. 7</a>		-	27	-	ns
		I <sub>F</sub> = 30 A; V <sub>R</sub> = 400 V; dI <sub>F</sub> /dt = 100 A/μs; T <sub>j</sub> = 25 °C; <a href="#">Fig. 7</a>		-	78	-	ns
		I <sub>F</sub> = 30 A; V <sub>R</sub> = 400 V; dI <sub>F</sub> /dt = 100 A/μs; T <sub>j</sub> = 125 °C; <a href="#">Fig. 7</a>		-	133	-	ns
I <sub>RM</sub>	peak reverse recovery current	I <sub>F</sub> = 30 A; V <sub>R</sub> = 400 V; dI <sub>F</sub> /dt = 100 A/μs; T <sub>j</sub> = 25 °C; <a href="#">Fig. 7</a>		-	4.1	-	A
		I <sub>F</sub> = 30 A; V <sub>R</sub> = 400 V; dI <sub>F</sub> /dt = 100 A/μs; T <sub>j</sub> = 125 °C; <a href="#">Fig. 7</a>		-	9.1	-	A
E <sub>as</sub>	non-repetitive avalanche energy	T <sub>j(init)</sub> = 25 °C		30	-	-	mJ



$V_o = 1.061\text{ V}$ ;  $R_s = 0.0074\text{ }\Omega$

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

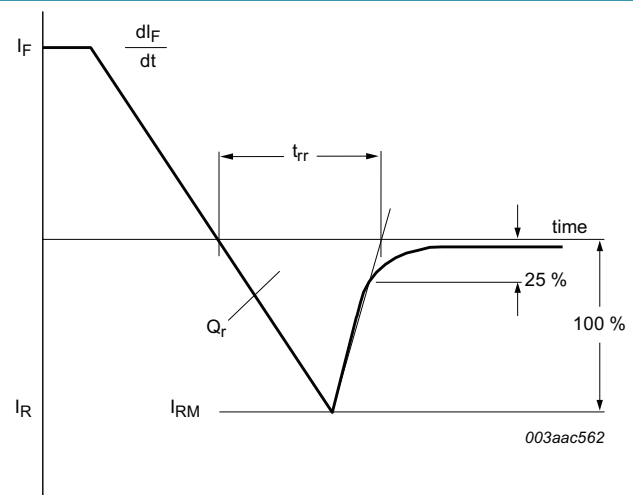


Fig. 7. Reverse recovery definitions; ramp recovery

11. Package outline

Plastic single-ended through-hole package; heatsink mounted;1 mounting hole; 2 leads TO-247

TO247-2L

The technical drawing illustrates the package outline of the BYV30MW-650PT2 ultrafast power diode. It includes three views: a top view, a side view, and a front view. The top view shows the overall dimensions E (width) and D (height), with mounting holes of diameter Ø. The side view shows the lead length L, lead diameter b, and lead spacing e. The front view shows the lead diameter b1, lead spacing b, and lead length L1. The package is a plastic single-ended through-hole package, heatsink mounted, with 1 mounting hole and 2 leads TO-247.

UNIT	A	A <sub>1</sub>	b	b <sub>1</sub>	c	D	D <sub>1</sub>	D <sub>2</sub>	E	E <sub>1</sub>	E <sub>2</sub>	E <sub>3</sub>	e	L	L <sub>1</sub>	P <sub>2</sub>	p	Q	q	Ø
mm	5.20	2.10	1.40	2.20	0.70	20.60	16.20	1.20	15.75	14.22	5.20	1.80	10.90	20.72	4.75	3.60	3.70	2.60	6.18	7.30
	4.70	1.90	1.00	1.80	0.50	20.30	16.87	0.80	15.45	13.82	4.80	1.40	BSC	20.22	4.25	3.40	3.50	2.20	5.78	7.10

Note:

1. Mold resin protrusion max 0.127mm.
2. Metal exposed with Sn plating.

## 12. 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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