BYV80MW-650PT2

Ultrafast power diode

Rev.02 - 25 January 2024 Product data sheet

1. General description

Ultrafast power diode in a TO247-2L plastic package.

2. Features and benefits

- 650V FRD
- Low thermal resistance
- Low forward voltage drop
- Low leakage current & reverse recovery current
- Enhanced Eas capability suitable for industrical application
- Reduces switching losses in associated MOSFET or IGBT
- Package meets UL94 V-0 which guaranteed by Epoxy Mold Compound

3. Applications

- NPC-I in UPS
- LLC in EV charger
- PFC in air conditioner or welding machine
- Power Factor Correction (PFC)
- 2nd rectification in HB/FB SMPS

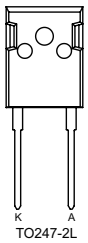
4. Quick reference data

Table 1. Quick reference data

Symbol	Parameter	Conditions	Values				Unit
Absolute maximum rating							
V_{RRM}	repetitive peak reverse voltage		650				V
$I_{F(AV)}$	average forward current	δ = 0.5; $T_{mb} \leq 114$ °C; square-wave pulse; Fig. 1; Fig. 2; Fig. 3	80				A
I_{FRM}	repetitive peak forward current	δ = 0.5; t_p = 25 µs; $T_{mb} \leq 114$ °C; square-wave pulse	160				A
I_{FSM}	non-repetitive peak forward current	t_p = 10 ms; $T_{j(init)}$ = 25 °C; sine-wave pulse; Fig. 4	730				A
		t_p = 8.3 ms; $T_{j(init)}$ = 25 °C; sine-wave pulse	800				A
Symbol	**Parameter**	**Conditions**		**Min**	**Typ**	**Max**	**Unit**
Static characteristics							
V_F	forward voltage	I_F = 80 A; T_j = 25 °C; Fig. 6		-	1.40	1.70	V
		I_F = 80 A; T_j = 150 °C; Fig. 6		-	1.20	1.40	V
Dynamic characteristics							
t_{rr}	reverse recovery time	I_F = 1 A; V_R = 30 V; dI_F/dt = 100 A/µs; T_j = 25 °C; Fig. 7		-	46	-	ns

5. Pinning information

Table 2. Pinning information

Pin	Symbol	Description	Simplified outline	Graphic symbol
1	K	cathode	 TO247-2L	 *001aaa020*
2	A	anode		
mb	mb	mounting base; connected to cathode		

6. Ordering information

Table 3. Ordering information

Type number	Package name	Orderable part number	Packing method	Small packing quantity	Package version	Package issue date
BYV80MW-650PT2	TO247-2L	BYV80MW-650PT2Q	Tube	30	TO247L-2L (L)	10-Nov-2020
					TO247P-2L (P)	31-Mar-2023

7. Marking

Table 4. Marking codes

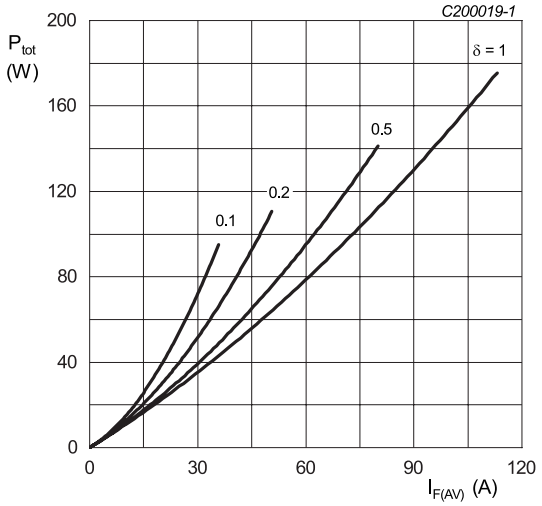
Type number	Marking codes	
	Assembly factory: L	Assembly factory: P
BYV80MW-650PT2	BYV80MW 650PT2 PJLxxxx xx	BYV80MW 650PT2 PJPxxxx xx

8. Limiting values

Table 5. Limiting values

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

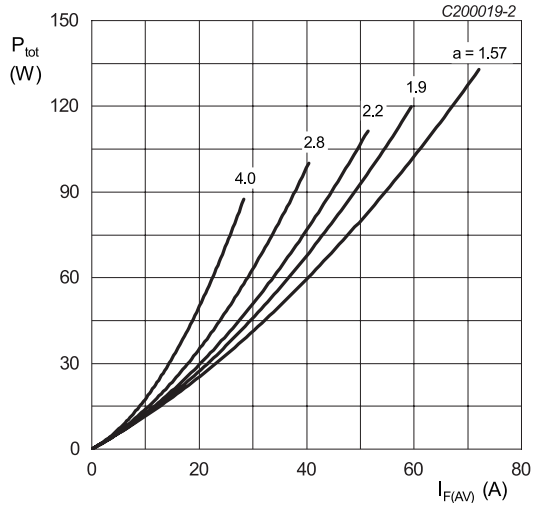
Symbol	Parameter	Conditions	Values	Unit
V_{RRM}	repetitive peak reverse voltage		650	V
V_{RWM}	crest working reverse voltage		650	V
V_R	reverse voltage	DC	650	V
$I_{F(AV)}$	average forward current	δ = 0.5; $T_{mb} \leq 114$ °C; square-wave pulse; Fig. 1; Fig. 2; Fig. 3	80	A
I_{FRM}	repetitive peak forward current	δ = 0.5; t_p = 25 µs; $T_{mb} \leq 114$ °C; square-wave pulse	160	A
I_{FSM}	non-repetitive peak forward current	t_p = 10 ms; $T_{j(init)}$ = 25 °C; sine-wave pulse; Fig. 4	730	A
		t_p = 8.3 ms; $T_{j(init)}$ = 25 °C; sine-wave pulse	800	A
I^2t	I^2t for fusing	t_p = 10 ms; sine-wave pulse	2665	A^2s
T_{stg}	storage temperature		-65 to 175	°C
T_j	junction temperature		-65 to 175	°C



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

V_o = 1.039 V; R_s = 0.0045 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 = 1.039 V; R_s = 0.0045 Ω

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

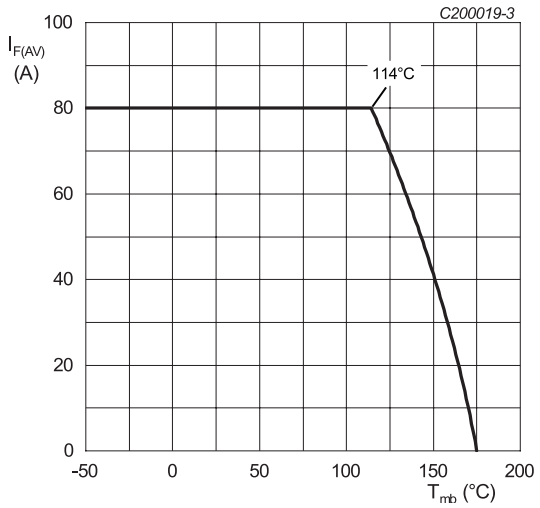


Fig. 3. Average forward current as a function of mounting base temperature; maximum values

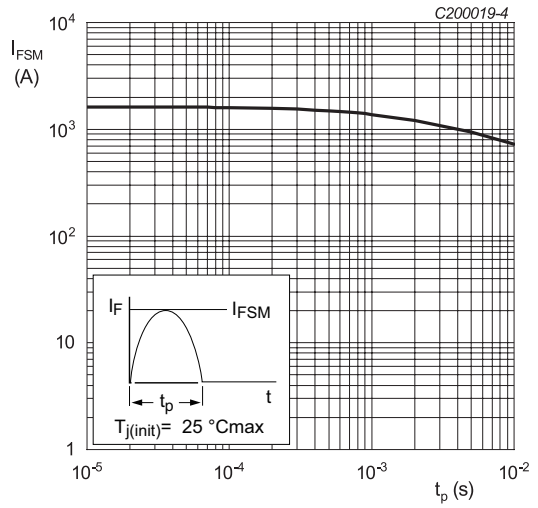


Fig. 4. Non-repetitive peak forward current as a function of pulse width; sinusoidal waveform; maximum values

9. Thermal characteristics

Table 6. Thermal characteristics

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
$R_{th(j-mb)}$	thermal resistance from junction to mounting base	Fig. 5		-	-	0.43	K/W
$R_{th(j-a)}$	thermal resistance from junction to ambient free air	in free air		-	40	-	K/W

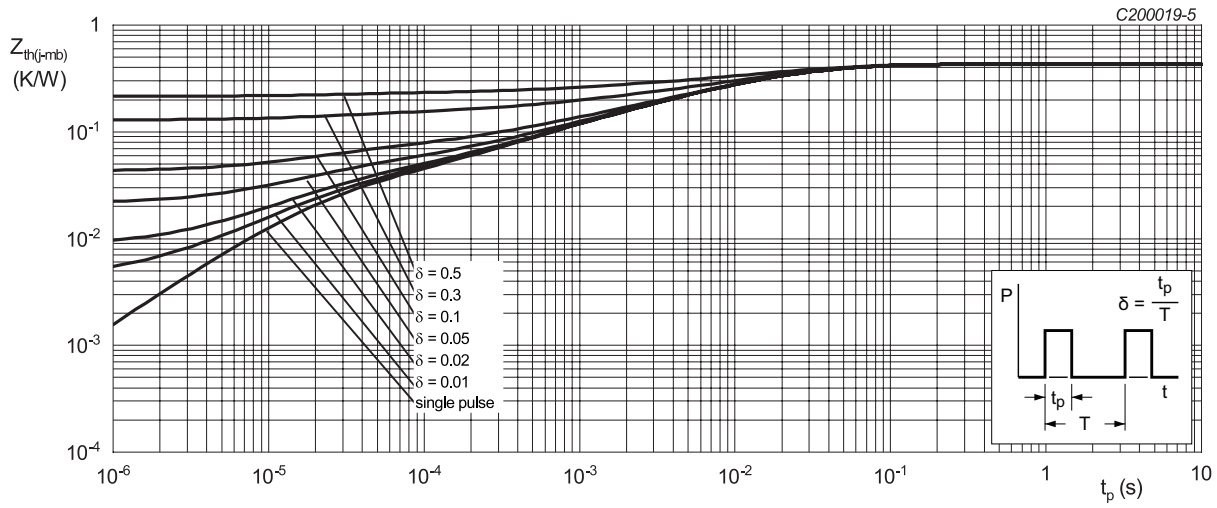
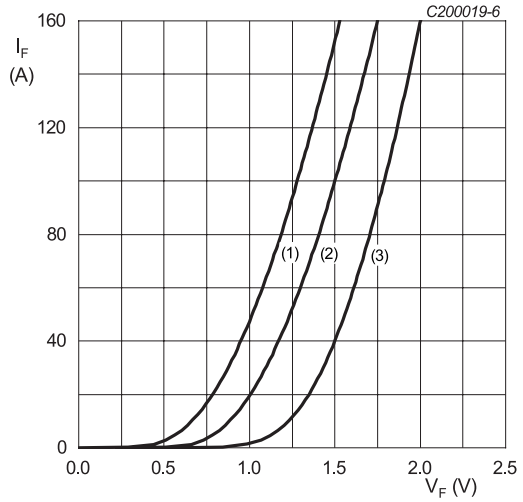


Fig. 5. Transient thermal impedance from junction to mounting base as a function of pulse duration; maximum values

10. Characteristics

Table 7. Characteristics

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
Static characteristics							
V_F	forward voltage	I_F = 80 A; T_j = 25 °C; Fig. 6		-	1.40	1.70	V
		I_F = 80 A; T_j = 150 °C; Fig. 6		-	1.20	1.40	V
I_R	reverse current	V_R = 650 V; T_j = 25 °C		-	0.5	30	µA
		V_R = 650 V; T_j = 150 °C		-	-	5	mA
Dynamic characteristics							
t_{rr}	reverse recovery time	I_F = 0.5 A; I_R = 1 A; I_{rr} = 0.25 A; T_j = 25 °C		-	90	-	ns
		I_F = 1 A; V_R = 30 V; dI_F/dt = 100 A/µs; T_j = 25 °C; Fig. 7		-	46	-	ns
		I_F = 50 A; V_R = 400 V; dI_F/dt = 500 A/µs; T_j = 25 °C; Fig. 7		-	85	-	ns
		I_F = 50 A; V_R = 400 V; dI_F/dt = 500 A/µs; T_j = 125 °C; Fig. 7		-	150	-	ns
I_{RM}	peak reverse recovery current	I_F = 50 A; V_R = 400 V; dI_F/dt = 500 A/µs; T_j = 25 °C; Fig. 7		-	16.5	-	A
		I_F = 50 A; V_R = 400 V; dI_F/dt = 500 A/µs; T_j = 125 °C; Fig. 7		-	30.5	-	A
Q_r	recovered charge	I_F = 50 A; V_R = 400 V; dI_F/dt = 500 A/µs; T_j = 25 °C; Fig. 7		-	700	-	nC
		I_F = 50 A; V_R = 400 V; dI_F/dt = 500 A/µs; T_j = 125 °C; Fig. 7		-	2250	-	nC
Eas	non-repetitive analanche energy	T_j = 25 °C		68	-	-	mJ



(1) T_j = 150 °C; typical values
(2) T_j = 150 °C; maximum values
(3) T_j = 25 °C; maximum values
V_o = 1.039 V; R_s = 0.0045 Ω

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

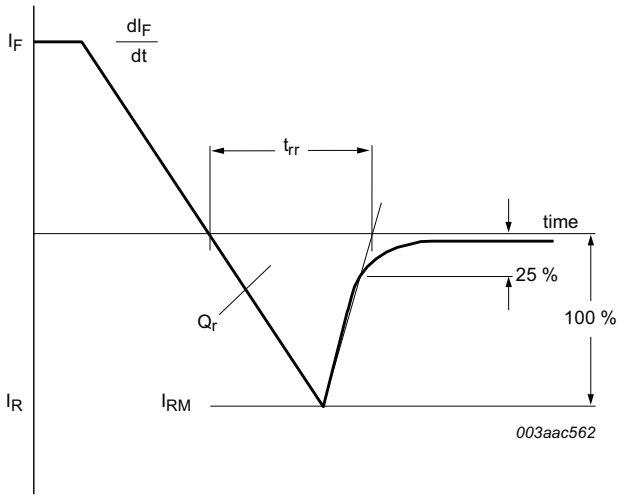
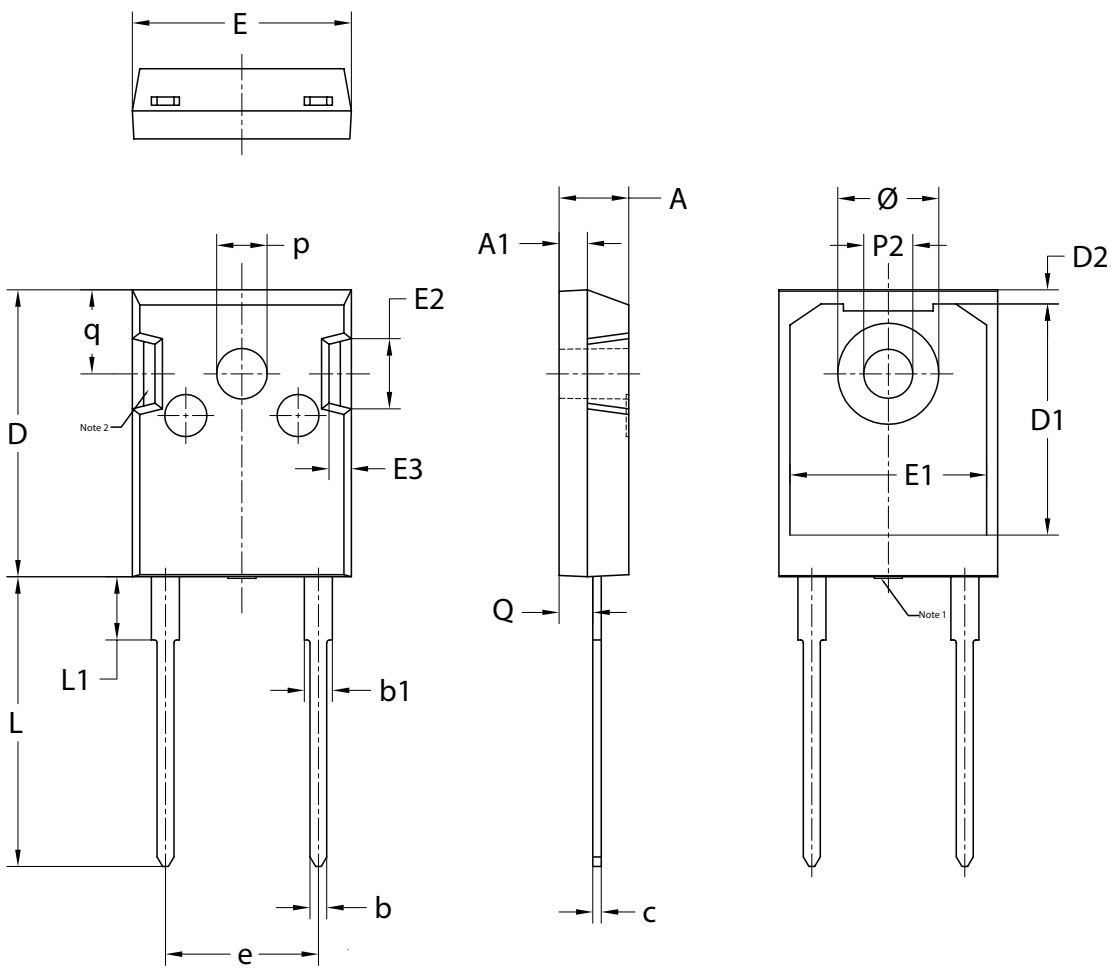


Fig. 7. Reverse recovery definitions; ramp recovery

11. Package outline

Assembly factory: L

Plastic single-ended through-hole package; heatsink mounted;1 mounting hole; 2 leads TO-247 TO247-2L

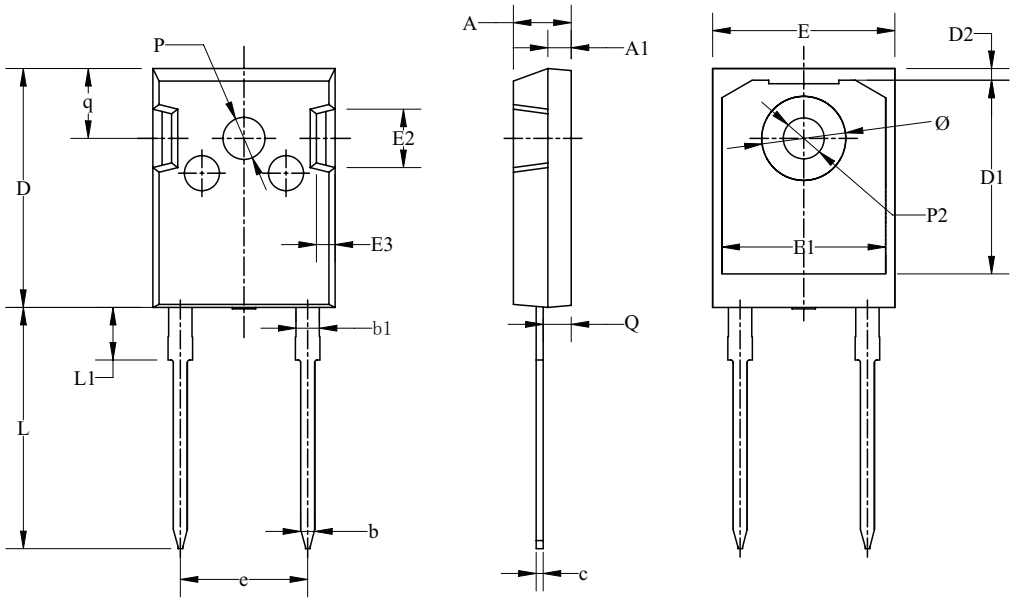


UNIT	A	A_1	b	b_1	c	D	D_1 [2]	D_2	E	E_1	E_2	E_3	e	L	L_1	P_2	p	Q	q	Ø
mm	5.20 4.70	2.10 1.90	1.40 1.00	2.20 1.80	0.70 0.50	20.60 20.30	16.20 16.87	1.20 0.80	15.75 15.45	14.22 13.82	5.20 4.80	1.80 1.40	10.90 BSC	20.72 20.22	4.75 4.25	3.60 3.40	3.70 3.50	2.60 2.20	6.18 5.78	7.30 7.10

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

Assembly factory: P

Plastic single-ended through-hole pack age; headsink mounted; 1 mounting hole; 2 leads TO-247 TO247-2L



Dim	All Dimensions in Millimeters		
	Min	Typ	Max
A	4.70	4.95	5.20
A1	1.90	2.00	2.10
b	1.00	1.20	1.40
b1	1.80	2.00	2.20
c	0.50	0.60	0.70
D	20.30	20.45	20.60
D1	16.20	16.58	16.87
D2	0.80	1.00	1.20
E	15.45	15.60	15.75
E1	13.82	14.02	14.22
E2	4.80	5.00	5.20
E3	1.40	1.60	1.80
e	10.90 BSC		
L	20.40	20.65	20.90
L1	4.25	4.50	4.75
P2	3.40	3.50	3.60
P	3.50	3.60	3.70
Q	2.20	2.40	2.60
q	5.78	5.98	6.18
Ø	7.10	7.19	7.30

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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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13. Contents

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Date of release: 25 January 2024