

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 industrial 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

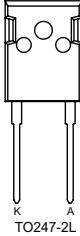
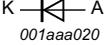
4. Quick reference data

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	$\delta = 0.5$; $T_{mb} \leq 123$ °C; square-wave pulse; Fig. 1 ; Fig. 2 ; Fig. 3	50			A
I_{FRM}	repetitive peak forward current	$\delta = 0.5$; $t_p = 25$ μ s; $T_{mb} \leq 123$ °C; square-wave pulse	100			A
I_{FSM}	non-repetitive peak forward current	$t_p = 10$ ms; $T_{j(initial)} = 25$ °C; sine-wave pulse; Fig. 4	600			A
		$t_p = 8.3$ ms; $T_{j(initial)} = 25$ °C; sine-wave pulse	660			A
Symbol	Parameter	Conditions	Min	Typ	Max	Unit
Static characteristics						
V_F	forward voltage	$I_F = 50$ A; $T_j = 25$ °C; Fig. 6	-	1.35	1.70	V
		$I_F = 50$ A; $T_j = 150$ °C; Fig. 6	-	1.05	1.40	V
Dynamic characteristics						
t_{rr}	reverse recovery time	$I_F = 1$ A; $V_R = 30$ V; $di_F/dt = 100$ A/ μ s; $T_j = 25$ °C; Fig. 7	-	38	-	ns

5. Pinning information

Table 2. Pinning information

Pin	Symbol	Description	Simplified outline	Graphic symbol
1	K	cathode	 <p style="text-align: center;">K A TO247-2L</p>	 <p style="text-align: center;">K — <— A 001aaa020</p>
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
BYV50MW-650PT2	TO247-2L	BYV50MW-650PT2Q	Tube	30	TO247L-2L	10-Nov-2020

7. Marking

Table 4. Marking codes

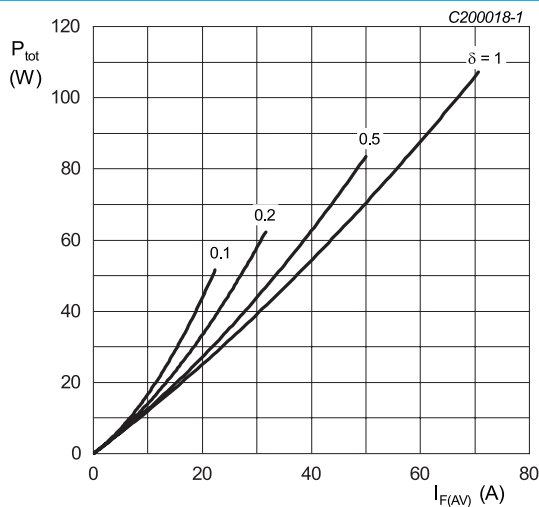
Type number	Marking codes
BYV50MW-650PT2	BYV50MW 650PT2

8. Limiting values

Table 5. Limiting values

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

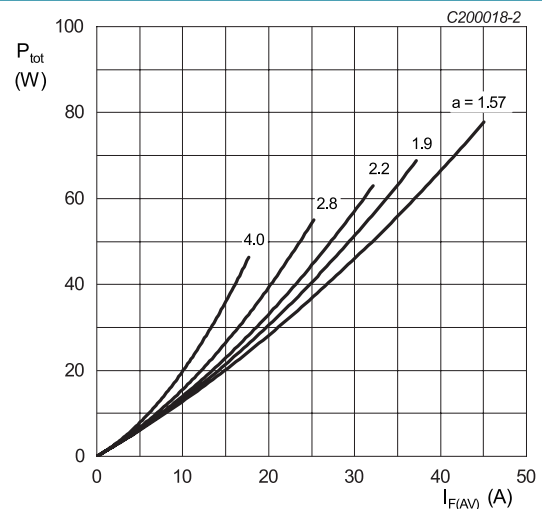
Symbol	Parameter	Conditions	Values	Unit
V_{RRM}	repetitive peak reverse voltage		650	V
V_{RWM}	crest working reverse voltage		650	V
V_R	reverse voltage	DC	650	V
$I_{F(AV)}$	average forward current	$\delta = 0.5$; $T_{mb} \leq 123\text{ }^\circ\text{C}$; square-wave pulse; Fig. 1 ; Fig. 2 ; Fig. 3	50	A
I_{FRM}	repetitive peak forward current	$\delta = 0.5$; $t_p = 25\text{ }\mu\text{s}$; $T_{mb} \leq 123\text{ }^\circ\text{C}$; square-wave pulse	100	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	600	A
		$t_p = 8.3\text{ ms}$; $T_{j(\text{init})} = 25\text{ }^\circ\text{C}$; sine-wave pulse	660	A
I^2t	I^2t for fusing	$t_p = 10\text{ ms}$; sine-wave pulse	1800	A^2s
T_{stg}	storage temperature		-65 to 175	$^\circ\text{C}$
T_j	junction temperature		-65 to 175	$^\circ\text{C}$



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

$$V_o = 1.149\text{ V}; R_s = 0.0052\text{ }\Omega$$

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



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

$$V_o = 1.149\text{ V}; R_s = 0.0052\text{ }\Omega$$

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

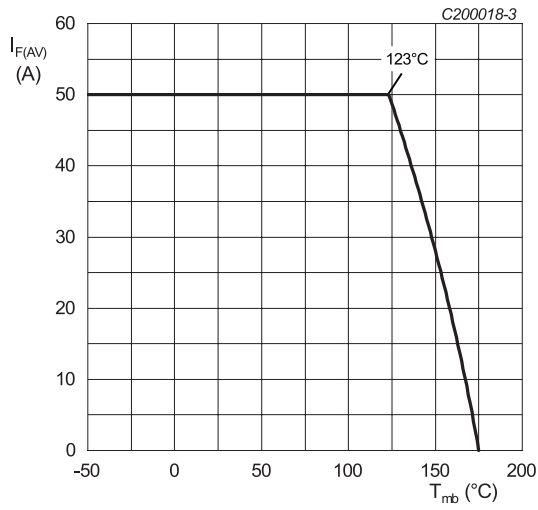


Fig. 3. Average forward current as a function of mounting base temperature; maximum values

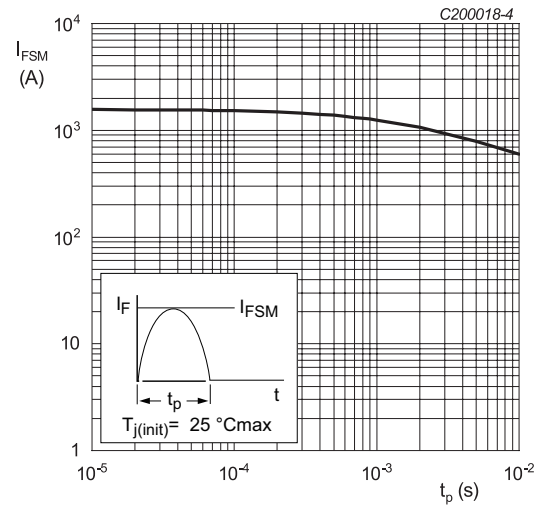


Fig. 4. Non-repetitive peak forward current as a function of pulse width; sinusoidal waveform; maximum values

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	-	-	0.62	K/W
$R_{th(j-a)}$	thermal resistance from junction to ambient free air	in free air	-	40	-	K/W

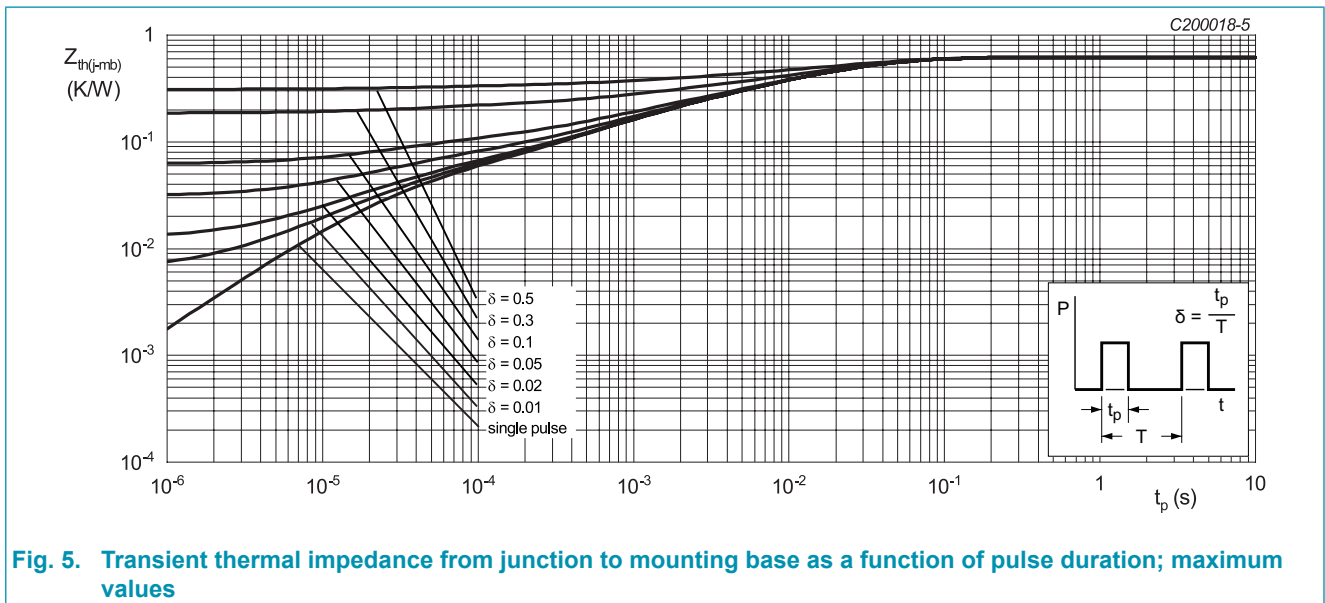
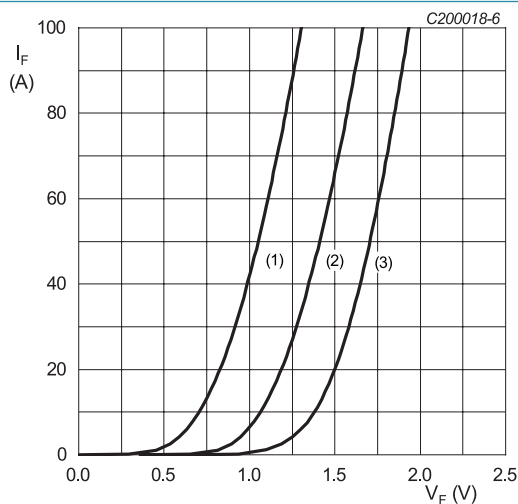


Fig. 5. Transient thermal impedance from junction to mounting base as a function of pulse duration; maximum values

10. Characteristics

Table 7. Characteristics

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
Static characteristics						
V _F	forward voltage	I _F = 50 A; T _J = 25 °C; Fig. 6	-	1.35	1.70	V
		I _F = 50 A; T _J = 150 °C; Fig. 6	-	1.05	1.40	V
I _R	reverse current	V _R = 650 V; T _J = 25 °C	-	3	30	μA
		V _R = 650 V; T _J = 150 °C	-	-	2	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	-	52	-	ns
		I _F = 1 A; V _R = 30 V; dI _F /dt = 100 A/μs; T _J = 25 °C; Fig. 7	-	38	-	ns
		I _F = 50 A; V _R = 200 V; dI _F /dt = 500 A/μs; T _J = 25 °C; Fig. 7	-	65	-	ns
		I _F = 50 A; V _R = 200 V; dI _F /dt = 500 A/μs; T _J = 125 °C; Fig. 7	-	120	-	ns
I _{RM}	peak reverse recovery current	I _F = 50 A; V _R = 200 V; dI _F /dt = 500 A/μs; T _J = 25 °C; Fig. 7	-	16.5	-	A
		I _F = 50 A; V _R = 200 V; dI _F /dt = 500 A/μs; T _J = 125 °C; Fig. 7	-	32	-	A
Q _r	recovered charge	I _F = 50 A; V _R = 200 V; dI _F /dt = 500 A/μs; T _J = 25 °C; Fig. 7	-	530	-	nC
		I _F = 50 A; V _R = 200 V; dI _F /dt = 500 A/μs; T _J = 125 °C; Fig. 7	-	1900	-	nC
E _{as}	non-repetitive avalanche energy	T _J = 25 °C	46	-	-	mJ



(1) T_J = 150 °C; typical values
 (2) T_J = 150 °C; maximum values
 (3) T_J = 25 °C; maximum values
 V₀ = 1.149 V; R_s = 0.0052 Ω

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

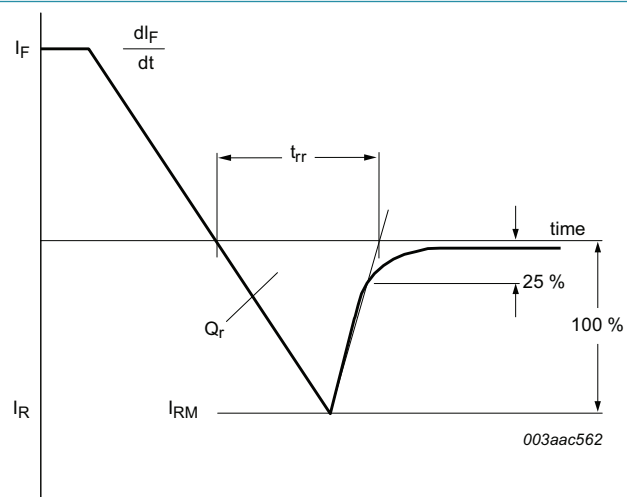
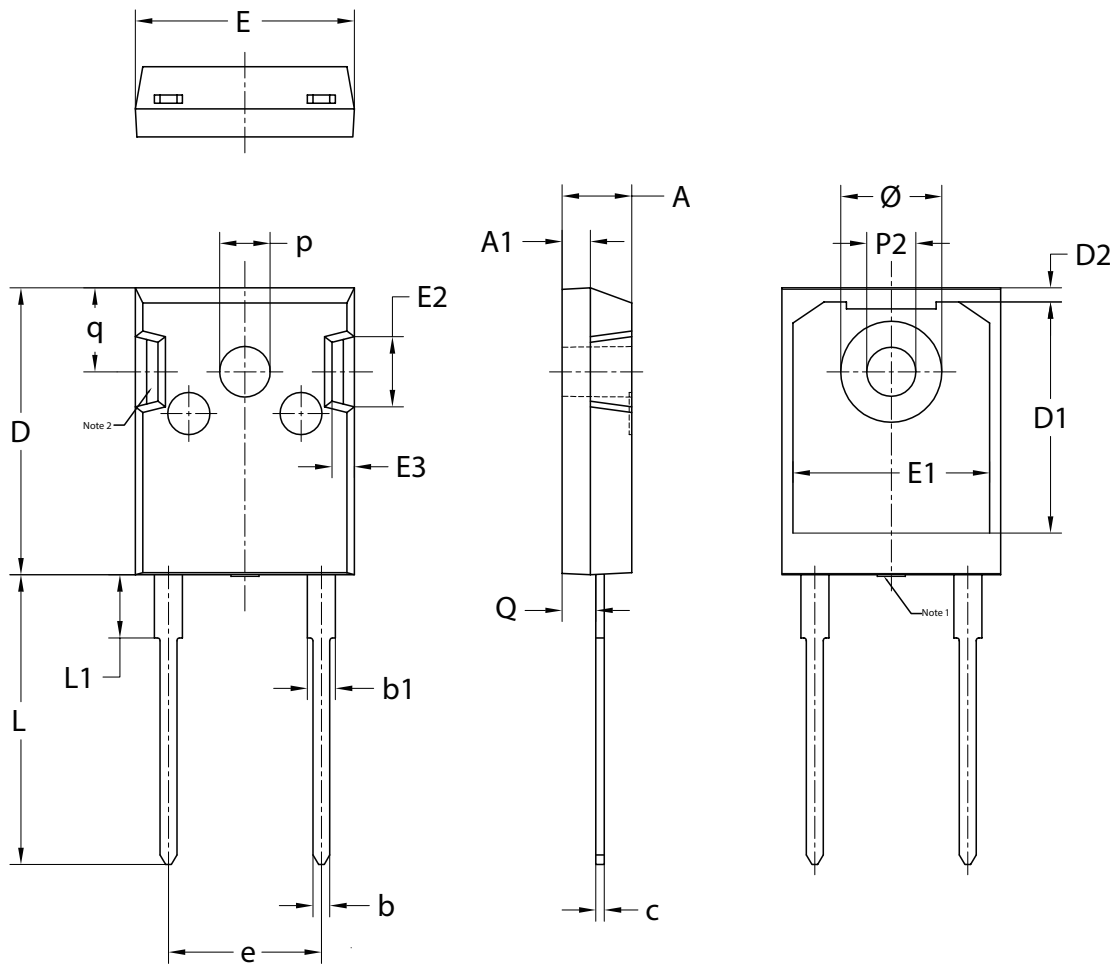


Fig. 7. Reverse recovery definitions; ramp recovery

11. Package outline

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

TO247-2L



UNIT	A	A ₁	b	b ₁	c	D	D ₁	D ₂	E	E ₁	E ₂	E ₃	e	L	L ₁	P ₂	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

Data sheet status

Document status [1][2]	Product status [3]	Definition
Objective [short] data sheet	Development	This document contains data from the objective specification for product development.
Preliminary [short] data sheet	Qualification	This document contains data from the preliminary specification.
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- [2] The term 'short data sheet' is explained in section "Definitions".
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