

1 Characteristics

Table 1. Absolute maximum ratings

Symbol	Parameters	Value	Unit		
I _{T(RMS)}	RMS on-state current (full sine wave)	D ² PAK / TO-220AB	T _c = 100 °C	25	А
		TO-220AB Ins.	T _c = 75 °C		
I	Non repetitive surge peak on-state current (full cycle,	f = 60 Hz	t _p = 16,7 ms	260	
I _{TSM}	T _j initial = 25 °C)	f = 50 Hz	t _p = 20 ms	250	Α
l ² t	I ² t value for fusing	340	A ² s		
dl/dt	Critical rate of rise of on-state current $I_G = 2 \times I_{GT}$, $t_r \le 100 \text{ ns}$ $f = 120 \text{ Hz}$ $T_j = 125$		T _j = 125 °C	50	A/µs
V _{DSM} , V _{RSM}	Non repetitive surge peak off-state voltage $t_p = 10 \text{ ms}$ $T_j = 25$		T _j = 25 °C	V _{DRM} , V _{RRM} + 100	V
V _{DRM} , V _{RRM}	Repetitive peak off-state voltage	600 or 800	V		
I _{GM}	Peak gate current	t _p = 20 μs	T _j = 125 °C	4	Α
P _{G(AV)}	Average gate power dissipation		T _j = 125 °C	1	W
T _{stg}	Storage junction temperature range	-40 to +150	°C		
T _j	Operating junction temperature range	-40 to +125	°C		
TL	Maximum lead temperature for soldering during 10 s	260	°C		
V _{INS}	Insulation RMS voltage, 1 minute		2.5	kV	

Table 2. Electrical characteristics (T_j = 25 °C, unless otherwise specified) - Snubberless (3 quadrants) T25, BTA24-XXXXW, BTB24-XXXXW

Symbol	Parameters	Quadrant		T25 BTA/BTB		ВТВ	Unit
Зуппоп	Fatallieters		T2535	cw	BW		
I _{GT} ⁽¹⁾	$V_{\rm D}$ = 12 V, R _I = 33 Ω	1 - 11 - 111	Max.	35	35	50	mA
V _{GT}	VD = 12 V, NL = 33 12	1 - 11 - 111	Max.	1.3		V	
V _{GD}	$V_D = V_{DRM}, R_L = 3.3 \text{ k}\Omega, T_j = 125 \text{ °C}$ I - II - III			0.2			V
I _H ⁽²⁾	I _T = 500 mA		Max.	50	50	75	mA
IL	I _G = 1.2 I _{GT}	1 - 111	Max.	70	70	80	mA
'L	16 - 1.2 161	II	Max.	80	80	100	ША
dV/dt ⁽²⁾	V_D = 67 % V_{DRM} gate open, T_j = 125 °C			500	500	1000	V/µs
(dl/dt)c ⁽²⁾	Without snubber	Min.	13	13	22	A/ms	

^{1.} Minimum I_{GT} is guaranteed at 5 % of I_{GT} max.

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^{2.} For both polarities of A2 referenced to A1



Table 3. Electrical characteristics (T_j = 25 °C, unless otherwise specified) - standard (4 quadrants) BTB24-800B, BTB24-600B

Symbol	Parameters	Quadrant		Value	Unit
I _{GT} ⁽¹⁾		1 - 11 - 111	Max.	50	mA
'GT`	$V_D = 12 \text{ V}, R_L = 33 \Omega$	IV	IVIAX.	100	IIIA
V_{GT}		All	Max.	1.3	V
V_{GD}	$V_D = V_{DRM}, R_L = 3.3 \text{ k}\Omega, T_j = 125 \text{ °C}$ All		Min.	0.2	V
IH ⁽²⁾	I _T = 500 mA				mA
ı.	1-111		Max.	70	A
ΙL	$I_G = 1.2 I_{GT}$	II	Max.	160	mA
dV/dt ⁽²⁾	$V_{\rm D}$ = 67 % $V_{\rm DRM}$ gate open, $T_{\rm j}$ = 125 °C				V/µs
(dV/dt)c(2)	$/dt)c^{(2)}$ (dl/dt)c = 13.3 A/ms, T _j = 125 °C				V/µs

- 1. Minimum I_{GT} is guaranteed at 5 % of I_{GT} max.
- 2. For both polarities of A2 referenced to A1

Table 4. Static electrical characteristics

Symbol	Test conditions	Тј		Value	Unit
V _{TM} ⁽¹⁾	$I_{TM} = 35 \text{ A}, t_p = 380 \mu\text{s}$	25 °C	Max.	1.55	V
V _{TO} ⁽¹⁾	threshold on-state voltage	125 °C	Max.	0.85	V
R _D ⁽¹⁾	Dynamic resistance	125 °C	Max.	16	mΩ
lanu/lanu	$V_T = V_{DRM}, V_T = V_{RRM}$	25 °C	Max.	5	μA
I _{DRM} /I _{RRM}		125 °C	IVIAX.	3	mA

1. For both polarities of A2 referenced to A1

Table 5. Thermal resistance

Symbol	Parameters Parameters Parameters				
Rusgray	Junction to case (AC)		Max.	0.8	
R _{th(j-c)}	Junction to case (AC)	TO-220AB insulated	iviax.	1.7	°C/W
Page 3	Junction to ambient, $S^{(1)} = 2.5 \text{ cm}^2$ D^2PAK		Tun	45	C/VV
R _{th(j-a)}	Junction to ambient	TO-220AB / TO-220AB insulated	Тур.	60	

1. S = Copper surface under tab.

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1.1 Characteristics (curves)

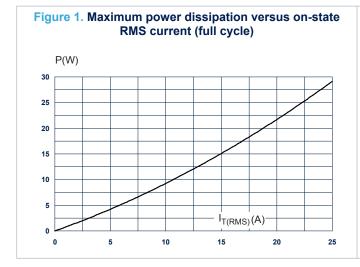


Figure 3. RMS on-state current versus ambient temperature (full cycle) D2PAK $I_{T(RMS)}(A)$ 3.5 3.0 2.5 2.0 1.5 1.0 0.5 T_a (°C) 0.0 0 25 50 75 100 125

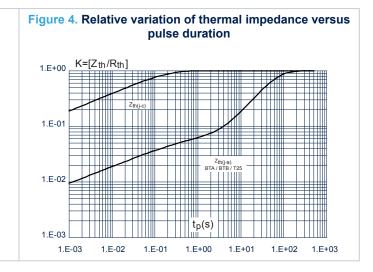


Figure 5. On-state characteristics (maximum values)

I_{TM}(A)

1000

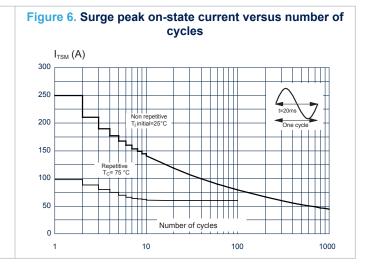
I_{TM}(A)

I_{TM}(A)

1000

I_{TM}(A)

I_{TM}



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Figure 7. Non-repetitive surge peak on-state current for a sinusoidal pulse with width t_P < 10 ms

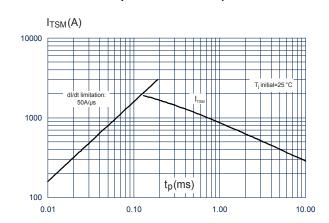


Figure 8. Relative variation of gate trigger current, holding and latching current versus junction temperature

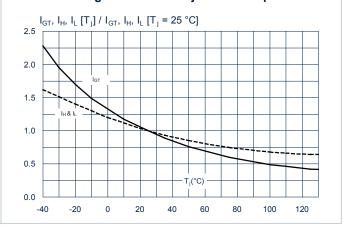


Figure 9. Relative variation of critical rate of decrease of main current versus (dV/dt)c (typical values)

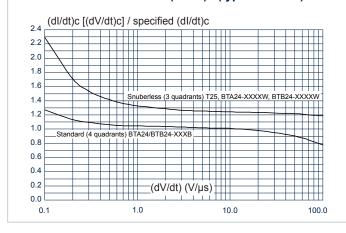


Figure 10. Relative variation of critical rate of decrease of main current versus junction temperature (typical values)

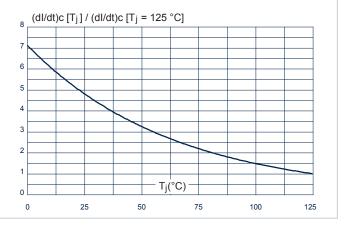
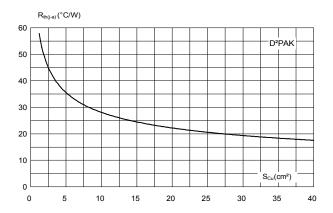


Figure 11. D²PAK thermal resistance junction to ambient versus copper surface under tab



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Package information

In order to meet environmental requirements, ST offers these devices in different grades of ECOPACK packages, depending on their level of environmental compliance. ECOPACK specifications, grade definitions and product status are available at: www.st.com. ECOPACK is an ST trademark.

2.1 TO-220AB package information

- Molding compound resin is halogen free and meets UL94 flammability standard, level V0
- Lead-free plating package leads
- Recommended torque: 0.4 to 0.6 N·m

В b2 Resin gate 0.5 mm max. protusion⁽¹⁾ L F Α 14 13 c2 а1 12 a2 с1 Resin gate 0.5 mm b1 max. protusion⁽¹⁾

Figure 12. TO-220AB package outline

(1)Resin gate position accepted in one of the two positions or in the symmetrical opposites.

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Table 6. TO-220AB package mechanical data

			Di	mensions		
Ref.		Millimeters Inche				
	Min.	Тур.	Max.	Min.	Тур.	Max.
Α	15.20		15.90	0.5984		0.6260
a1		3.75			0.1476	
a2	13.00		14.00	0.5118		0.5512
В	10.00		10.40	0.3937		0.4094
b1	0.61		0.88	0.0240		0.0346
b2	1.23		1.32	0.0484		0.0520
С	4.40		4.60	0.1732		0.1811
c1	0.49		0.70	0.0193		0.0276
c2	2.40		2.72	0.0945		0.1071
е	2.40		2.70	0.0945		0.1063
F	6.20		6.60	0.2441		0.2598
1	3.73		3.88	0.1469		0.1528
L	2.65		2.95	0.1043		0.1161
12	1.14		1.70	0.0449		0.0669
13	1.14		1.70	0.0449		0.0669
14	15.80	16.40	16.80	0.6220	0.6457	0.6614
М		2.6			0.1024	

^{1.} Inch dimensions are for reference only.

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2.2 D²PAK package information

- ECOPACK2 compliant
- Lead-free package leads finishing
- Molding compound resin is halogen-free and meets UL94 flammability standard level V0

Max resin gate protrusion: 0.5 mm (1)

A1

A2

A3

Gauge Plane

Figure 13. D²PAK package outline

(1) Resin gate is accepted in each of position shown on the drawing, or their symmetrical.

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Table 7. D²PAK package mechanical data

				Dimensions			
Ref.	Millimeters				Inches ⁽¹⁾		
	Min.	Тур.	Max.	Min.	Тур.	Max.	
Α	4.30		4.60	0.1693		0.1811	
A1	2.49		2.69	0.0980		0.1059	
A2	0.03		0.23	0.0012		0.0091	
A3		0.25			0.0098		
b	0.70		0.93	0.0276		0.0366	
b2	1.25		1.7	0.0492		0.0669	
С	0.45		0.60	0.0177		0.0236	
c2	1.21		1.36	0.0476		0.0535	
D	8.95		9.35	0.3524		0.3681	
D1	7.50		8.00	0.2953		0.3150	
D2	1.30		1.70	0.0512		0.0669	
е	2.54			0.10000			
Е	10.00		10.28	0.3937		0.4047	
E1	8.30		8.70	0.3268		0.3425	
E2	6.85		7.25	0.2697		0.2854	
G	4.88		5.28	0.1921		0.2079	
Н	15		15.85	0.5906		0.6240	
L	1.78		2.28	0.0701		0.0898	
L2	1.19		1.40	0.0468		0.0551	
L3	1.40		1.75	0.0551		0.0689	
R		0.40			0.0157		
V2 ⁽²⁾	0°		8°	0°		8°	

^{1.} Dimensions in inches are given for reference only

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^{2.} Degrees



Figure 14. D²PAK recommended footprint (dimensions are in mm)

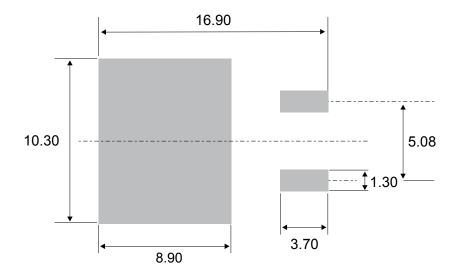
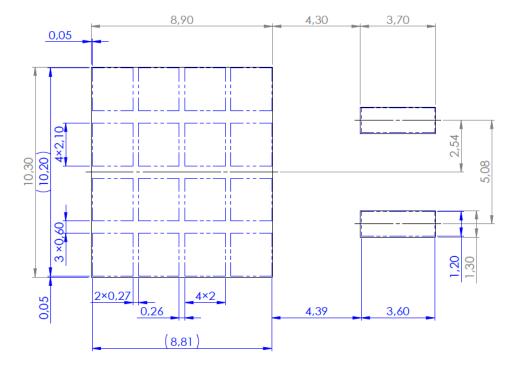


Figure 15. D²PAK stencil definitions (dimensions are in mm)



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3 Ordering information

Figure 16. Ordering information scheme (BTA24 and BTB24 series)

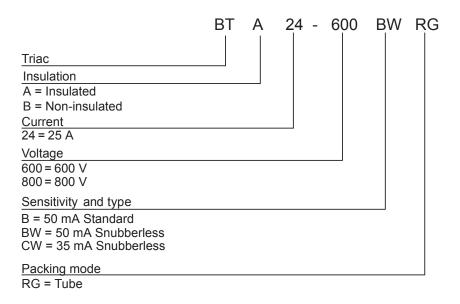
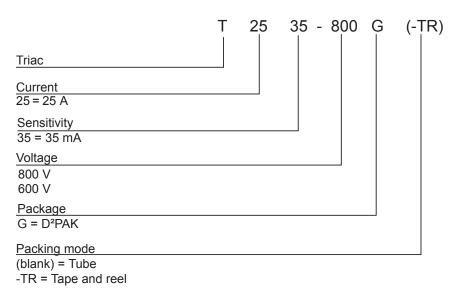


Figure 17. Ordering information scheme (T25 series)



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Table 8. Ordering information

Order code	Order code Marking Package		Weig ht	Base qty.	Delivery mode
BTA24-600BWRG	BTA24 600BW				
BTA24-600CWRG	BTA24 600CW	TO 200AD insulated			
BTA24-800BWRG	BTA24 800BW	TO-220AB insulated			
BTA24-800CWRG	BTA24 800CW				
BTB24-600BRG	BTB24 600B		22.5		Tuba
BTB24-600BWRG	BTB24 600BW	TO-220AB	2.3 g	50	Tube
BTB24-600CWRG	BTB24 600CW				
BTB24-800BRG	BTB24 800B				
BTB24-800BWRG	BTB24 800BW				
BTB24-800CWRG	BTB24 800CW				
T2535-600G	T2535 600G			50	Tube
T2535-600G-TR	T2535 600G	D²PAK	150	2500	Tape and reel
T2535-800G	T2535 800G		1.5 g	50	Tube
T2535-800G-TR	T2535 800G			2500	Tape and reel

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Revision history

Table 9. Document revision history

Date	Revision	Changes
Oct-2002	6A	Previous update.
13-Feb-2006	7	TO-220AB delivery mode changed from bulk to tube. ECOPACK statement added.
31-May-2006	8	Reformatted to current standard. Tc in figure 3 changed to Tamb
31-Jul-2006	9	Typing error corrected on page 1 (BTB124 instead of BTB24)
05-Jul-2007	10	Added BTB26-600BRG. Restructured cover page and section 2: Ordering information scheme on page 6 to simplify product selection. Thermal resistance values updated in Table 6 and Figure 2. Graphic for I2t updated in Figure 7.
28-Jul-2021	11	Removed RD91, TOP3 insulated and TOP3 package information. Put in separate specification. Minor text changes.
29-Sep-2021	12	Updated Table 2.



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