

## 1、Description & Applications

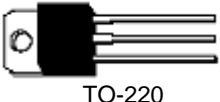
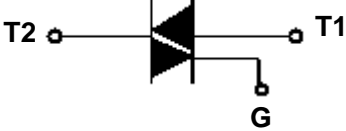
Suitable for general purpose AC power switching. They can be used as an ON/OFF function in applications such as static relays, heating regulation, water heaters, induction motor starting circuits...or for phase control operation in high power motor speed controllers, soft start circuits...

- Motor control
- Heating regulation
- water heaters

## 2、Features

- Blocking voltage to 800V
- On-state RMS current to 25A
- Ultra low gate trigger current
- TO-220 package.

## 3、Pinning information

PIN	Description	Simplified outline	Symbol
1	main terminal 1 ( T1 )	 TO-220	
2	main terminal 2 ( T2 )		
3	gate ( G )		
tab	main terminal		

## 4、Quick reference data

SYMBOL	PARAMETER	MAX	UNIT
$V_{DRM}$ $V_{RRM}$	Repetitive peak off-state voltages	800	V
$I_{T(RMS)}$	RMS on-state current	25	A
$I_{TSM}$	Non-repetitive peak on-state current	220	A

## 5、Limiting value

Limiting values in accordance with the Maximum System(IEC 134).

SYMBOL	PARAMETER	CONDITIONS	MIN	TYP	MAX	UNIT
$V_{DRM}$ $V_{RRM}$	Repetitive peak off-state voltages		-	-	800	V
$I_{T(RMS)}$	RMS on-state current	Full Cycle Sine Wave 50 to 60 Hz (TC = +90 °C)	-	-	25	A
$I_{TSM}$	Peak Non-repetitive Surge Current	One Full Cycle Sine Wave, 60 Hz, $t=16.7ms$	-	-	220	A
$I^2t$	$I^2t$ for fusing	$t_p = 10 ms$	-	-	340	A <sup>2</sup> s
$di/dt$	Critical rate of rise of on-state current	$I_G = 2 \times I_{GT}$ , $t_r = 100 ns$ $F = 120 Hz$ $T_j = 125^\circ C$	-	-	50	A/ $\mu s$
$I_{GM}$	Peak gate current	$t_p = 20\mu s$ , $T_j = 125^\circ C$	-	-	2	A
$V_{DSM}$ $V_{RSM}$	Non repetitive surge peak off-state voltage	$t_p = 10 ms$ $T_j = 25^\circ C$	-	-	700	V
$P_{G(AV)}$	Average gate power	$T_j = 125^\circ C$	-	-	0.5	W
$T_{stg}$	Storage temperature		-40	-	150	°C
$T_j$	Operating junction temperature		-40	-	125	°C

## 6、Characteristics

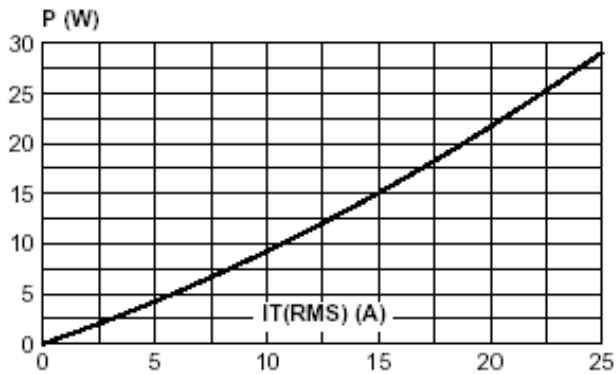
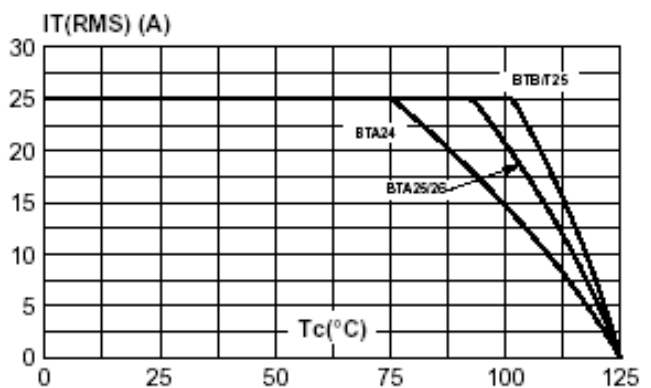
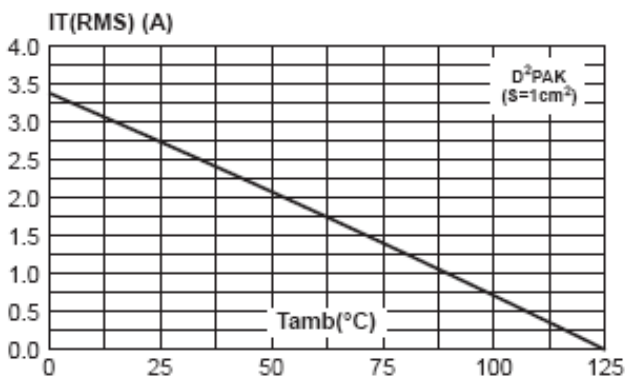
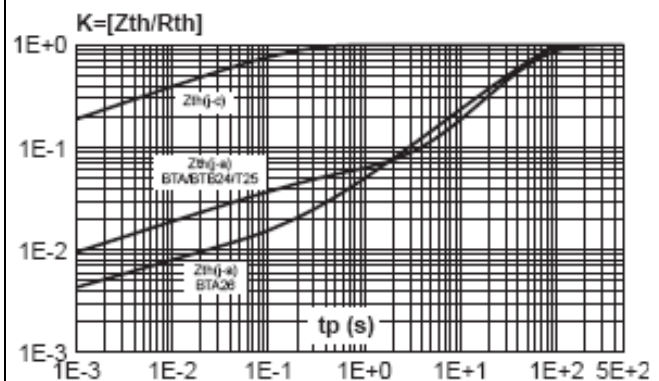
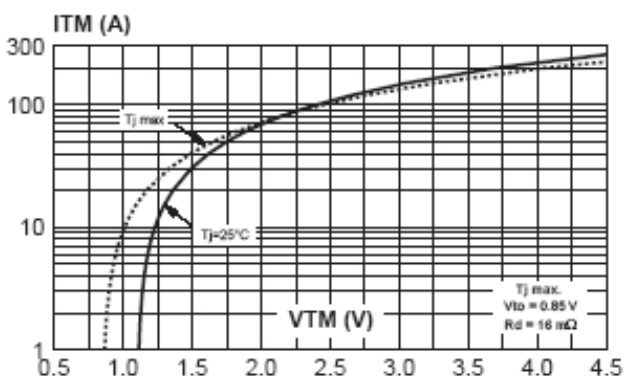
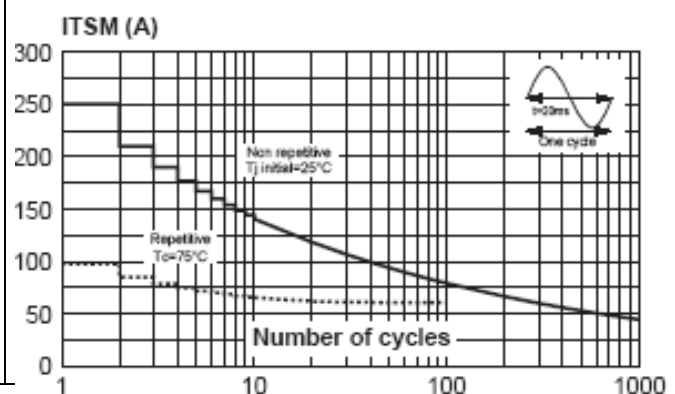
$T_J = 25^\circ\text{C}$  unless otherwise stated

SYMBOL	PARAMETER	CONDITIONS	MIN	TYP	MAX	UNIT
<b>Static characteristics</b>						
$I_{GT}$	Gate trigger current	$V_D = 12\text{ V}; R_L = 33\Omega$				
		T2+ G+	-	-	25	mA
		T2+ G-	-	-	25	mA
		T2- G-	-	-	25	mA
		T2- G+	-	-	50	mA
$V_{GT}$	Gate Trigger Voltage (Continuous dc)	$V_D = 12\text{ V}; R_L = 33\Omega$				
		T2+ G+	-	0.9	2.0	V
		T2+ G-	-	0.9	2.0	V
		T2- G-	-	1.1	2.0	V
		T2- G+ "A" SUFFIX ONLY	-	-	2.0-	V
$I_H$	Holding current	$I_T = \pm 500\text{ mA}$		25	80	mA
$I_L$	Latching current	$I_G = 1.2 I_{GT}$ T2 G(++,-,-,++) T2 G(+/-)			30 70	mA
$V_{TM}$	On-state voltage	$I_{TM} = 35\text{ A } t_p = 380\text{ }\mu\text{s}$	-	1.3	2.0	V
$V_{to}$	Threshold voltage	$T_J = 125^\circ\text{C}$	-	-	0.85	V
$R_d$	Dynamic resistance	$T_J = 125^\circ\text{C}$	-	-	16	m $\Omega$
$V_{GD}$	Gate Non-Trigger Voltage	$V_D = V_{DRM} R_L = 3.3\text{ k } T_J = 125^\circ\text{C}$	0.2	-	-	mA
<b>Dynamic Characteristics</b>						
dV/dt	Critical Rate of Rise of Voltage	$V_D = 67\% V_{DRM}$ gate open $T_J = 125^\circ\text{C}$	500	-	-	V/ $\mu\text{s}$
(dV/dt) <sub>c</sub>	Critical Rate of Rise of Commutation Voltage	(dI/dt) <sub>c</sub> = 13.3 A/ms $T_J = 125^\circ\text{C}$	10	-	-	V/ $\mu\text{s}$

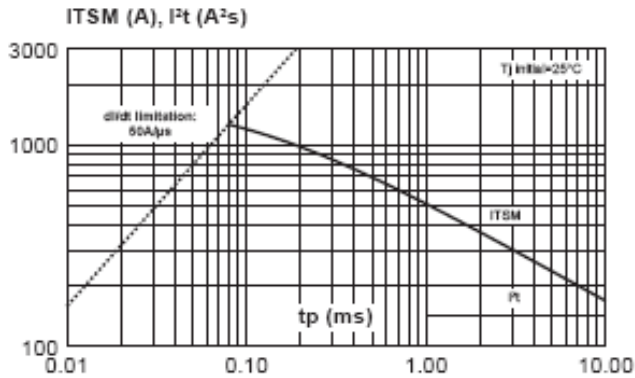
## 7、Thermal characteristics

SYMBOL	PARAMETER	CONDITIONS	MIN	TYP	MAX	UNIT
$R_{JC}$	Thermal resistance junction to case		-	-	1.1	C/W
$R_{JA}$	Thermal Resistance, Junction to Ambient		-	-	50	C/W

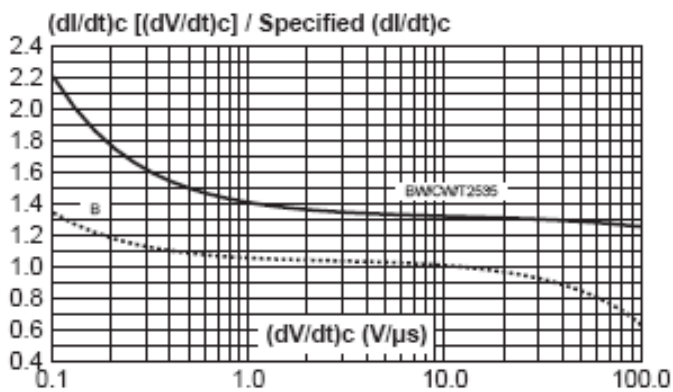
## 8、Electrical Characteristics Curve

**Fig. 1:** Maximum power dissipation versus RMS on-state current (full cycle).**Fig. 2-1:** RMS on-state current versus case temperature (full cycle).**Fig. 2-2:** D<sup>2</sup>PAK RMS on-state current versus ambient temperature (printed circuit board FR4, copper thickness: 35  $\mu$ m), full cycle.**Fig. 3:** Relative variation of thermal impedance versus pulse duration.**Fig. 4:** On-state characteristics (maximum values).**Fig. 5:** Surge peak on-state current versus number of cycles.

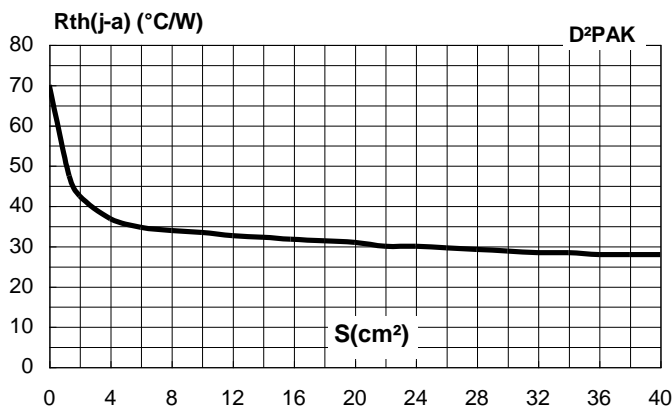
**Fig. 6:** Non-repetitive surge peak on-state current for a sinusoidal pulse with width  $t_p < 10\text{ms}$ , and corresponding value of  $I^2t$ .



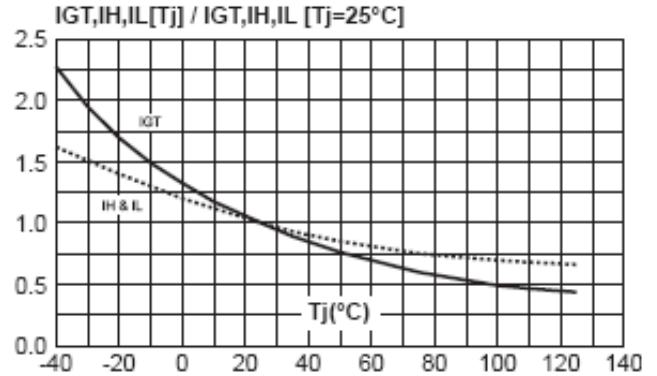
**Fig. 8:** Relative variation of critical rate of decrease of main current versus  $(dV/dt)_c$  (typical values).



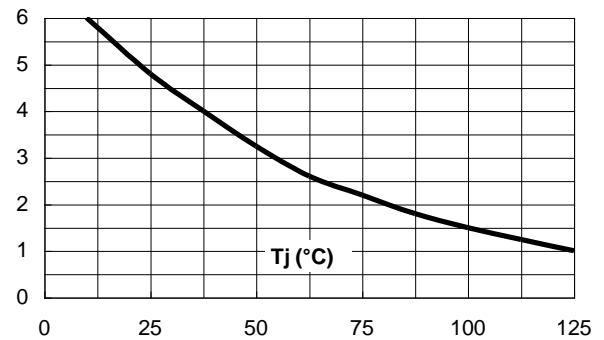
**Fig. 10:** D<sup>2</sup>PAK Thermal resistance junction to ambient versus copper surface under tab (printed circuit board FR4, copper thickness:  $35\mu\text{m}$ ).



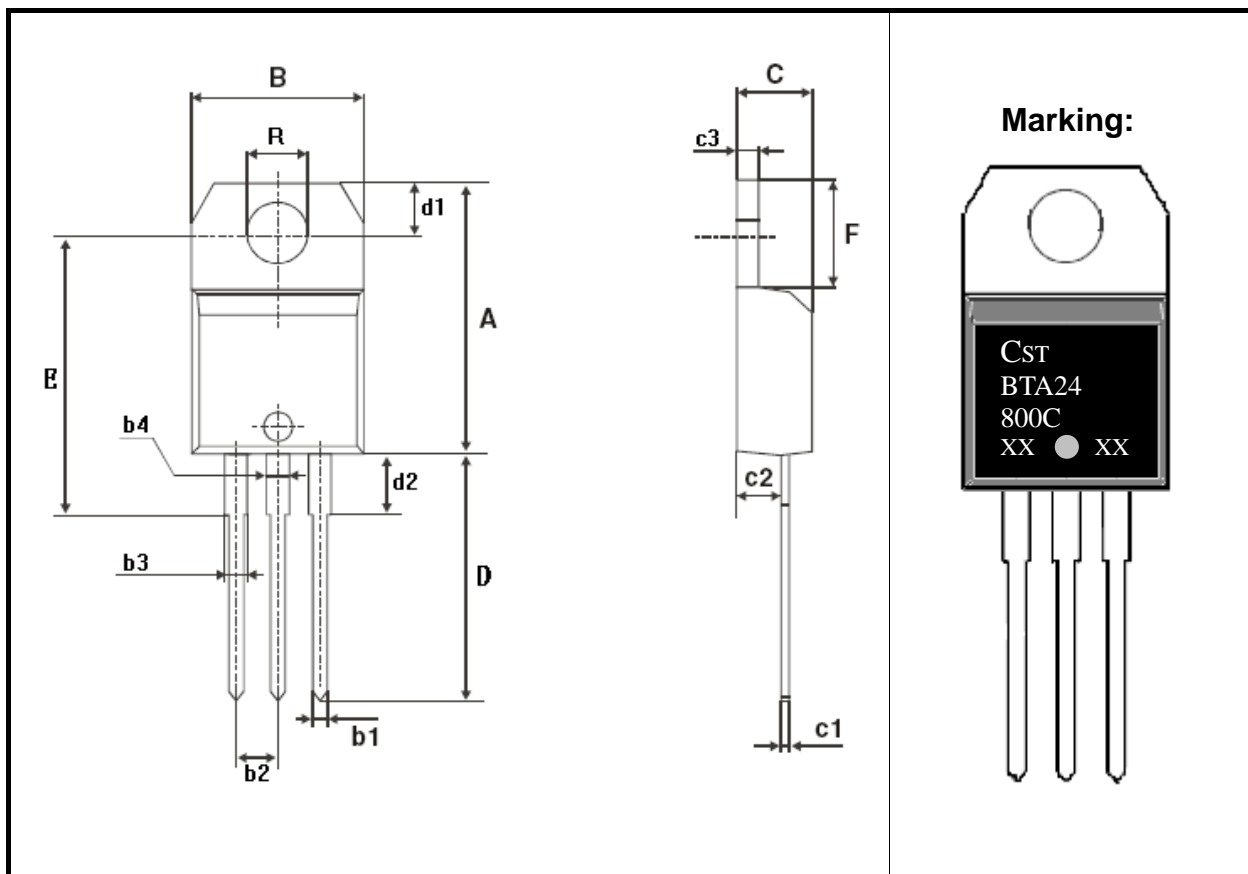
**Fig. 7:** Relative variation of gate trigger current, holding current and latching current versus junction temperature (typical values).



**Fig. 9:** Relative variation of critical rate of decrease of main current versus junction temperature.



## 9、Package outline (TO-220I)



DIM	Inches			Millimeters		
	Min	Type	Max	Min	Type	Max
A	0.591	-	0.646	15.00	-	16.40
B	0.386	-	0.409	9.80	-	10.40
C	0.160	-	0.190	4.07	-	4.82
D	0.500	-	0.562	12.70	-	14.27
E	-	0.640	-	-	16.25	-
F	0.248	-	0.271	6.29	-	6.89
R	0.140	-	0.156	3.56	-	3.96
b1	0.030	-	0.037	0.75	-	0.95
b2	0.095	-	0.105	2.42	-	2.66
b3	0.046	-	0.054	1.17	-	1.37
b4	0.046	-	0.054	1.17	-	1.37
c1	0.017	-	0.023	0.42	-	0.58
c2	0.091	-	0.115	2.32	-	2.92
c3	0.045	-	0.055	1.15	-	1.39
d1	0.100	-	0.120	2.54	-	3.04
d2	0.125	-	0.155	3.18	-	3.93