

1、Description & Applications

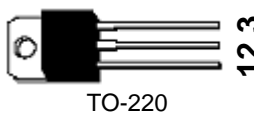
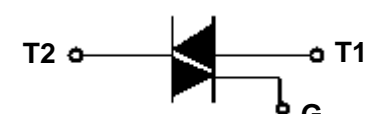
Suitable for general purpose AC power switching. They can be used as an ON/OFF function in applications such as static relays, heating regulation, water heaters, induction motor starting circuits...or for phase control operation in high power motor speed controllers, soft start circuits...

- Motor control
- **Heating regulation**
- water heaters

2、Features

- Blocking voltage to 800V
- On-state RMS current to 20A
- Ultra low gate trigger current
- TO-220 package.

3、Pinning information

PIN	Description	Simplified outline	Symbol
1	main terminal 1 (T1)		
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	20	A
I_{TSM}	Non-repetitive peak on-state current	180	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)	-	-	20	A
I_{TSM}	Peak Non-repetitive Surge Current	One Full Cycle Sine Wave, 60 Hz, t=16.7ms	-	-	180	A
I^2t	I^2t for fusing	tp = 10 ms	-	-	240	A ² s
di/dt	Critical rate of rise of on-state current	$I_G = 2 \times I_{GT}$, tr = 100 ns F = 120 Hz Tj = 125°C	-	-	50	A/μs
I_{GM}	Peak gate current	tp = 20μs, Tj = 125°C	-	-	2	A
V_{DSM} V_{RSM}	Non repetitive surge peak off-state voltage	tp = 10 ms Tj = 25°C	-	-	700	V
$P_{G(AV)}$	Average gate power	Tj = 125°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
Static characteristics						
I_{GT}	Gate trigger current	$V_D = 12\text{ V}$; $R_L = 33\Omega$ T2+ G+ T2+ G- T2- G- T2- G+	- - - -	- - - -	50 50 50	mA mA mA
V_{GT}	Gate Trigger Voltage (Continuous dc)	$V_D = 12\text{ V}$; $R_L = 33\Omega$ T2+ G+ T2+ G- T2- G- T2- G+ "A" SUFFIX ONLY	- - - -	0.9 0.9 1.1	2.0 2.0 2.0	V V V
I_H	Holding current	$I_T = \pm 500\text{ mA}$		25	60	mA
I_L	Latching current	$I_G = 1.2 I_{GT}$ T2 G(++,-,-,++) T2 G(+,-)			60	mA
V_{TM}	On-state voltage	$I_{TM} = 25\text{ A}$ tp = 380 μs	-	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	$\text{m}\Omega$
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
Dynamic Characteristics						
dV/dt	Critical Rate of Rise of Voltage	$V_D = 67\%$ V_{DRM} gate open $T_J = 125^\circ\text{C}$	500	-	-	V/ μs
(dV/dt) _c	Critical Rate of Rise of Commutation Voltage	(dI/dt) _c = 13.3 A/ms $T_J = 125^\circ\text{C}$	10	-	-	V/ μs

7. Thermal characteristics

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

8、Electrical Characteristics Curve

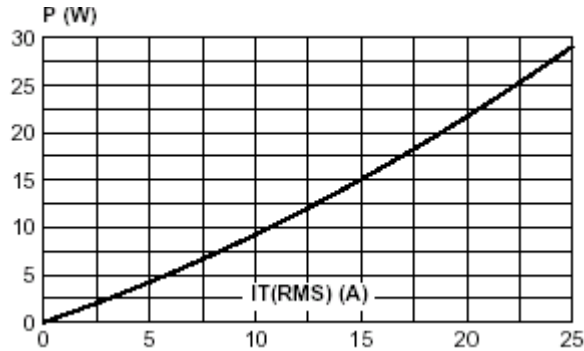
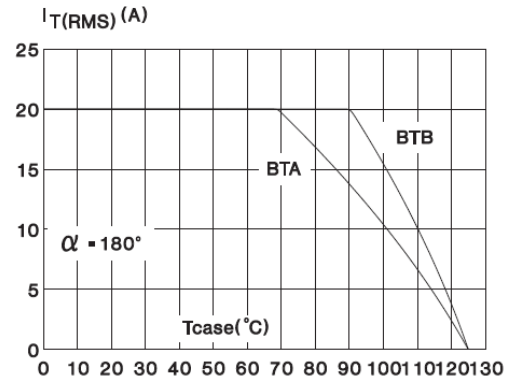
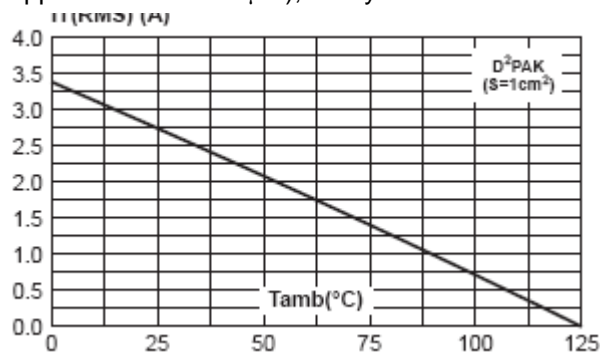
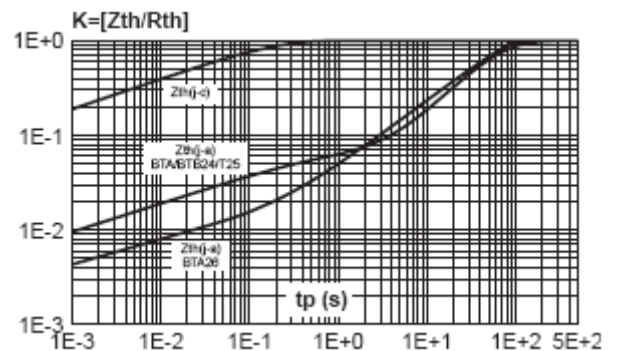
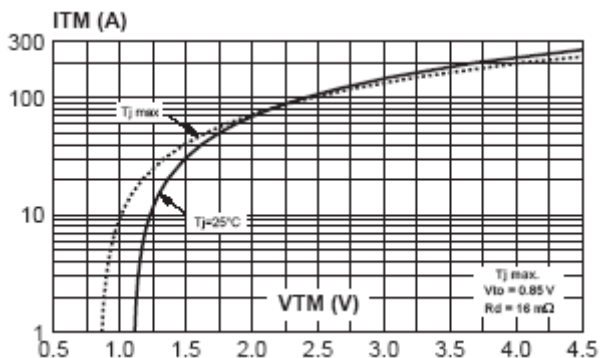
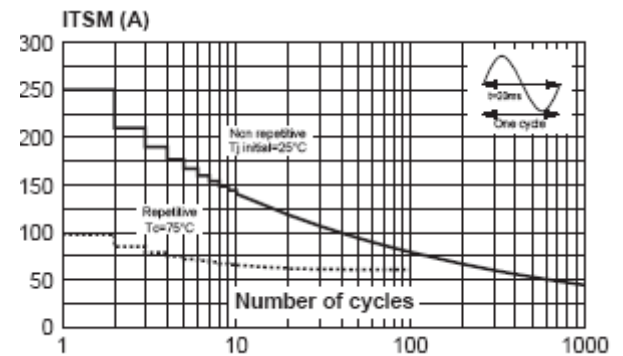
Fig. 1: Maximum power dissipation versus RMS on-state current (full cycle).**Fig. 2-1:** RMS on-state current versus case temperature (full cycle).**Fig. 2-2:** D²PAK RMS on-state current versus ambient temperature (printed circuit board FR4, copper thickness: 35 μ m), full cycle.**Fig. 3:** Relative 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 .

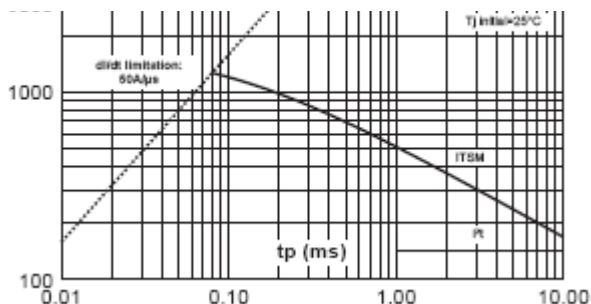


Fig. 7: Relative variation of gate trigger current, holding current and latching current versus junction temperature (typical values).

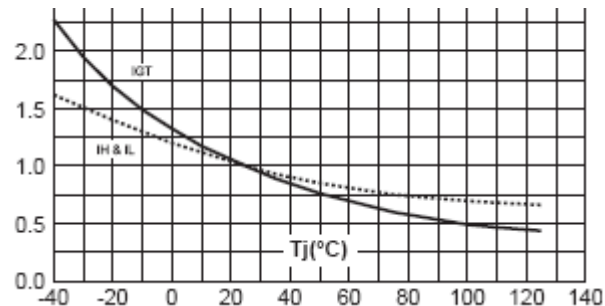


Fig. 8: Relative variation of critical rate of decrease of main current versus $(dV/dt)_c$ (typical values).

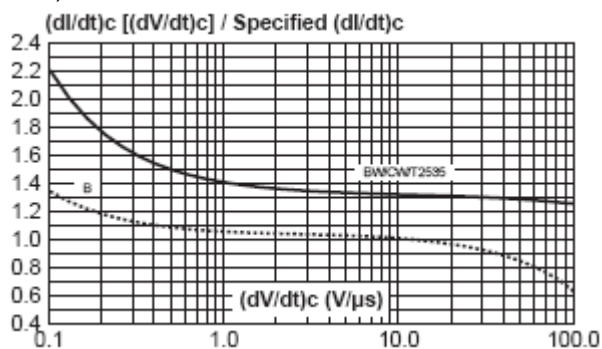


Fig. 9: Relative variation of critical rate of decrease of main current versus junction temperature.

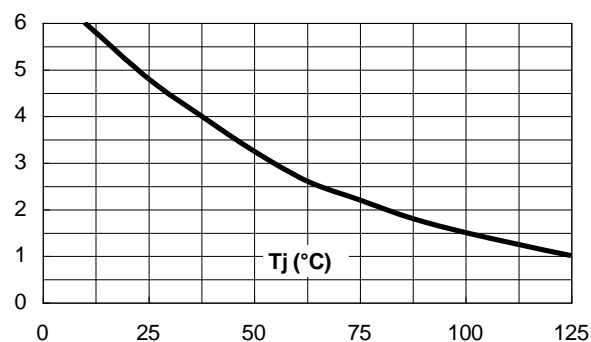
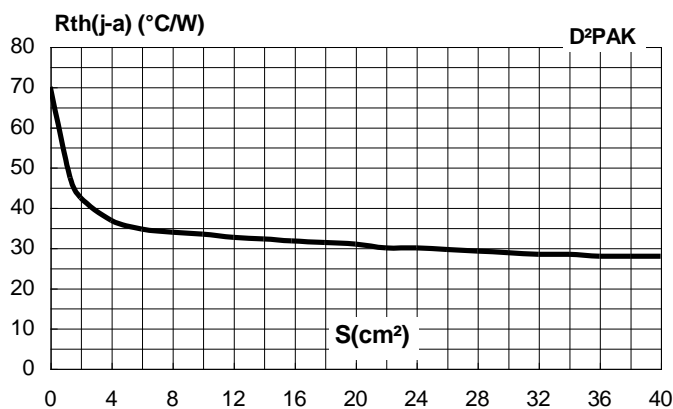
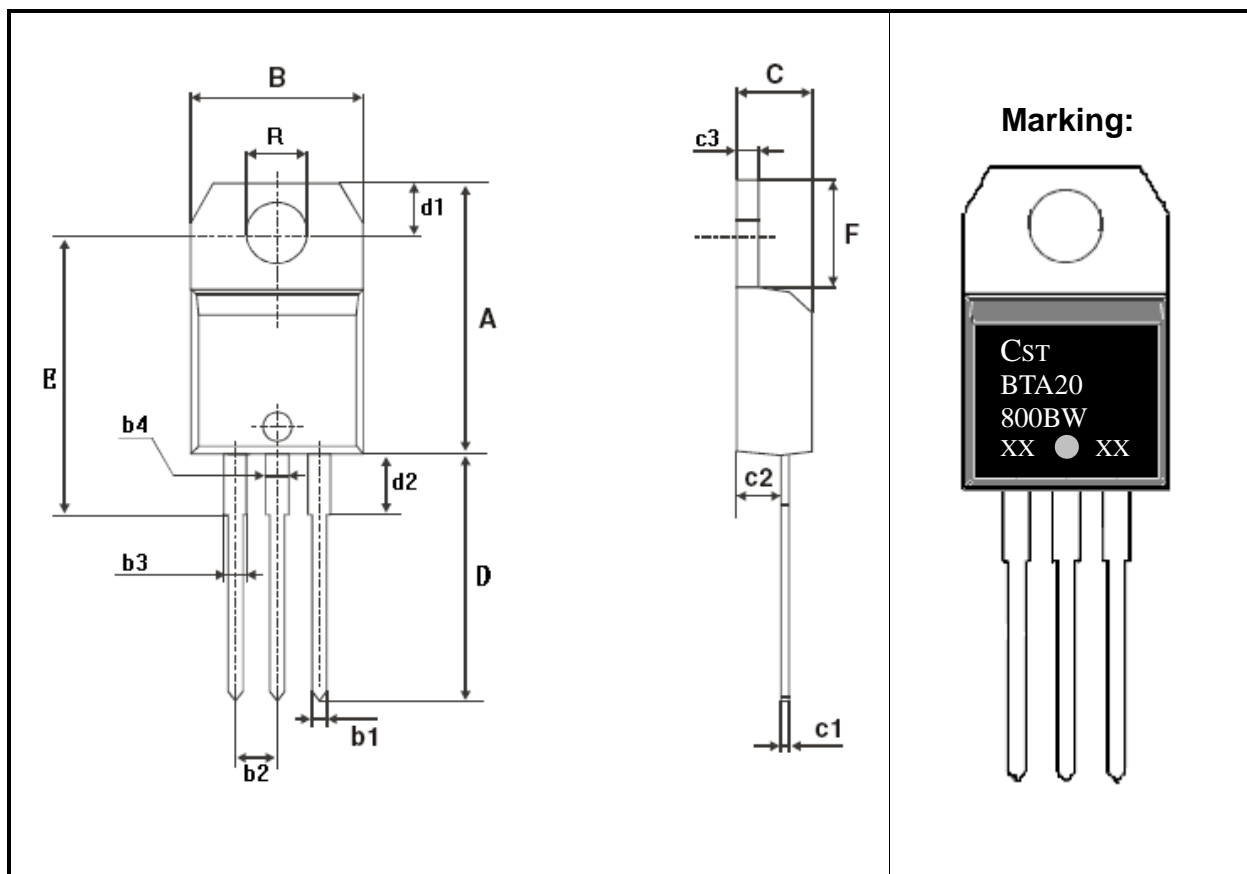


Fig. 10: D²PAK Thermal resistance junction to ambient versus copper surface under tab (printed circuit board FR4, copper thickness: 35 μm).



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