

# 1 Characteristics

Table 1. Absolute maximum ratings ( $T_j = 25$  °C unless otherwise stated)

Symbol	Parameter		Value	Unit	
1	DMC on state surrent (full sine uses)	TO-220AB, D <sup>2</sup> PAK	T <sub>c</sub> = 105 °C	40	
I <sub>T(RMS)</sub>	RMS on-state current (full sine wave)	TO-220AB Ins.	T <sub>c</sub> = 90 °C	12	A
l	Non repetitive surge peak on-state current (full cycle, T <sub>i</sub>	f = 50 Hz	t = 20 ms	120	Α
I <sub>TSM</sub>	initial = 25 °C)	f = 60 Hz	t <sub>p</sub> = 16.7 ms	126	A
l <sup>2</sup> t	I <sup>2</sup> t value for fusing	78	A <sup>2</sup> s		
dl/dt	Critical rate of rise of on-state current $I_G$ = 2 x $I_{GT}$ , tr $\leq$ 100 ns	f = 120 Hz	T <sub>j</sub> = 125 °C	50	A/µs
V <sub>DSM</sub> /V <sub>RSM</sub>	Non repetitive surge peak off-state voltage $t_p = 10 \text{ ms}$		T <sub>j</sub> = 25 °C	V <sub>DRM</sub> / V <sub>RRM</sub> + 100	V
I <sub>GM</sub>	Peak gate current	t <sub>p</sub> = 20 μs	T <sub>j</sub> = 125 °C	4	Α
P <sub>G(AV)</sub>	Average gate power dissipation	1	W		
T <sub>stg</sub>	Storage junction temperature range	-40 to +150	°C		
Tj	Operating junction temperature range	-40 to +125	°C		

Table 2. Electrical characteristics (T<sub>j</sub> = 25 °C, unless otherwise specified) - Snubberless™ and logic level (3 quadrants)

Symbol	Parameter	Quadrant		T1205 BTB12-TW BTA12-TW		T1235 BTB12- CW BTA12-CW	T1250 BTB12- BW BTA12-BW	Unit	
I <sub>GT</sub> <sup>(1)</sup>	$V_D = 12 \text{ V, } R_1 = 30 \Omega$	1 - 11 - 111	Max.	5	10	35	50	mA	
V <sub>GT</sub>	VD 12 V, I'L 00 12	1 - 11 - 111	Max.		1	.3		V	
$V_{GD}$	$V_D = V_{DRM}$ , $R_L = 3.3 \text{ k}\Omega$ , $T_j = 125 \text{ °C}$	1 - 11 - 111	Min.	0.2					
I <sub>H</sub> (2)	I <sub>T</sub> = 100 mA	1 - 11 - 111	Max.	10	15	35	50	mA	
I <sub>1</sub> (2)	I <sub>G</sub> = 1.2 x I <sub>GT</sub>	I - III	Max.	10	25	50	70	mA	
IL	1G - 1.2 x 1G	П	Max.	15	30	60	80	ША	
dV/dt (2)	$V_D$ = 67% $V_{DRM}$ , gate open, $T_j$ = 125 °C		Max.	20	40	500	1000	V/µs	
	$(dV/dt)c = 0.1 V/\mu s, T_j = 125 °C$		Min.	3.5	6.5				
(dl/dt)c (2)	t)c (2) $(dV/dt)c = 10 V/\mu s$ , $T_j = 125 °C$		Min.	1.0	2.9			A/ms	
	Without snubber, $T_j = 125$ °C		Min.			6.5	12		

<sup>1.</sup> Minimum  $I_{GT}$  is guaranteed at 5 % of  $I_{GT}$  max.

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<sup>2.</sup> For both polarities of A2 referenced to A1



Table 3. Electrical characteristics ( $T_j$  = 25 °C, unless otherwise specified) - Standard Triac (4 quadrants)

Symbol	Parameter	Quadrant		Value		Unit
Зушьог	Farameter	Quaurant		С	В	Ullit
I <sub>GT</sub> <sup>(1)</sup>		1 - 11 - 111	Max.	25	50	mA
'GT \'	$V_D = 12 \text{ V}, R_L = 30 \Omega$	IV	IVIAX.	50	100	IIIA
V <sub>GT</sub>		All	Max.	ix. 1.3		V
$V_{GD}$	$V_D = V_{DRM}, R_L = 33 \text{ k}\Omega, T_j = 125 \text{ °C}$	All	Min.	0.2		V
IH (2)	I <sub>T</sub> = 500 mA	1 - 11 - 111	Max.	25	50	mA
IL	I <sub>G</sub> = 1.2 I <sub>GT</sub>	I - III - IV	May	40	50	mA
'L	IG = 1.2   IG	II	Max.	80	100	
dV/dt (2)	V <sub>D</sub> = 67 % V <sub>DRM</sub> gate open, T <sub>j</sub> = 125 °C		Min.	200	400	V/µs
(dV/dt)c (2)	(dl/dt)c = 5.3 A/ms, T <sub>j</sub> = 125 °C		Min.	5	10	V/µs

<sup>1.</sup> Minimum  $I_{GT}$  is guaranteed at 5 % of  $I_{GT}$  max.

**Table 4. Static electrical characteristics** 

Symbol	Test conditions				Unit
V <sub>TM</sub> <sup>(1)</sup>	I <sub>TM</sub> = 17 A, t <sub>p</sub> = 380 μs	T <sub>j</sub> = 25 °C	Max.	1.55	V
V <sub>TO</sub> <sup>(1)</sup>	threshold on-state voltage	T <sub>j</sub> = 125 °C	Max.	0.85	V
R <sub>D</sub> <sup>(1)</sup>	Dynamic resistance	T <sub>j</sub> = 125 °C	Max.	35	mΩ
I <sub>DRM</sub> I <sub>RRM</sub>	$V_{DRM} = V_{RRM}$	T <sub>j</sub> = 25 °C	Max.	5	μA
		T <sub>j</sub> = 125 °C	Max.	1	mA

<sup>1.</sup> For both polarities of A2 referenced to A1

**Table 5. Thermal resistance** 

Symbol	Parameter				Value	Unit
D.,	Max. junction to case thermal resistance (AC)		D <sup>2</sup> PAK / TO-220AB	Max.	1.4	°C/W
R <sub>th(j-c)</sub> Ma	wax. junction to case thermal re	isistance (AC)	TO-220AB insulated	Max.	2.3	C/VV
Pu a	Junction to ambient	S = 2 cm <sup>2</sup> (1)	D²PAK	Тур.	45	°C/W
R <sub>th(j-a)</sub>	Junction to ambient		TO-220AB / TO-220AB insulated	Тур.	60	C/VV

1. S = Copper surface under tab.

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<sup>2.</sup> For both polarities of A2 referenced to A1



## 1.1 Characteristics (curves)

Figure 1. Maximum power dissipation versus on-state RMS current (full cycle)

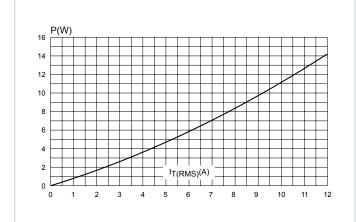


Figure 2. RMS on-state current versus case temperature (full cycle)

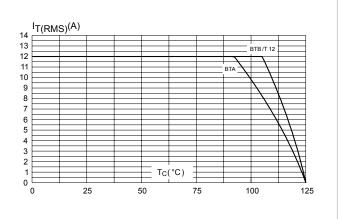


Figure 3. RMS on-state current versus ambient temperature (printed circuit board FR4, copper thickness: 35 µm) (full cycle)

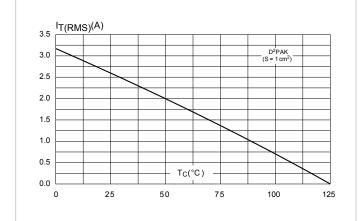
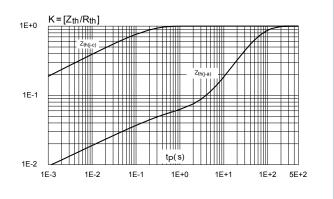


Figure 4. Relative variation of thermal impedance versus pulse duration



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Figure 5. On-state characteristics (maximum values)

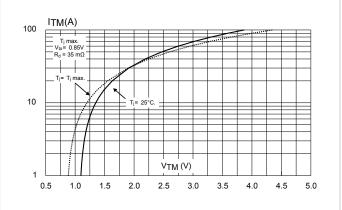


Figure 6. Surge peak on-state current versus number of cycles

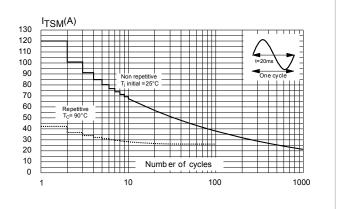


Figure 7. Non repetitive surge peak on-state current for a sinusoidal pulse

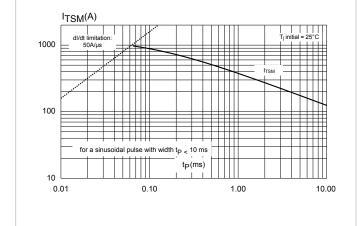
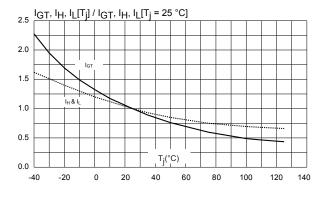


Figure 8. Relative variation of gate trigger current holding current and latching current versus junction temperature (typical values)



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

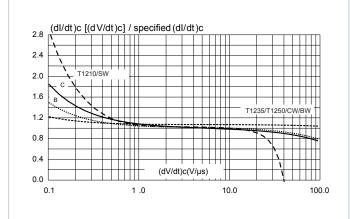


Figure 10. Relative variation of critical rate of decrease of main current versus (dV/dt)c (typical values)(TW)

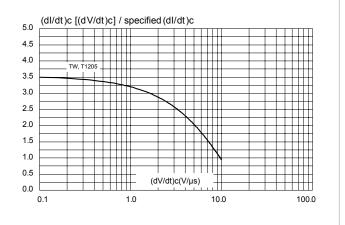


Figure 11. Relative variation of critical rate of decrease of main current versus junction temperature

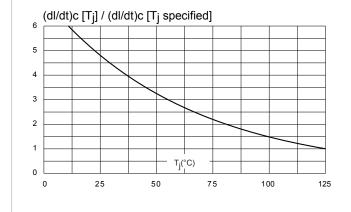
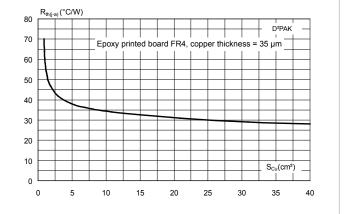


Figure 12. D<sup>2</sup>PAK thermal resistance junction to ambient versus copper surface under tab



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# 2 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 D<sup>2</sup>PAK package information

- ECOPACK2® compliant
- · Lead-free package leads finishing
- Molding compound resin is halogen-free and meets UL standard level V0

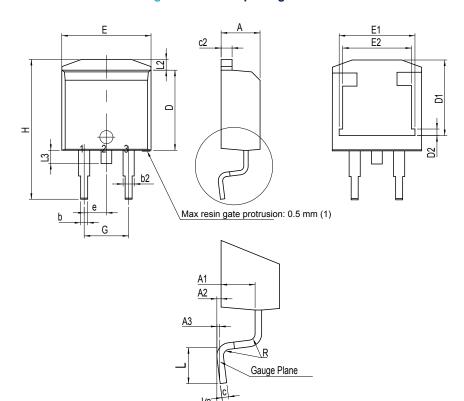


Figure 13. D<sup>2</sup>PAK package outline

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

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Table 6. D<sup>2</sup>PAK package mechanical data

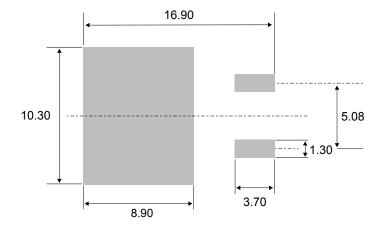
				Dimensions		
Ref.		Millimeters				
	Min.	Тур.	Max.	Min.	Тур.	Max.
Α	4.30		4.60	0.1693		0.1811
A1	2.49		2.69	0.0980		0.1059
A2	0.03		0.23	0.0012		0.0091
A3		0.25			0.0098	
b	0.70		0.93	0.0276		0.0366
b2	1.25		1.7	0.0492		0.0669
С	0.45		0.60	0.0177		0.0236
c2	1.21		1.36	0.0476		0.0535
D	8.95		9.35	0.3524		0.3681
D1	7.50		8.00	0.2953		0.3150
D2	1.30		1.70	0.0512		0.0669
е	2.54			0.1		
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	1.27		1.40	0.0500		0.0551
L3	1.40		1.75	0.0551		0.0689
R		0.40			0.0157	
V2	0°		8°	0°		8°

<sup>1.</sup> Dimensions in inches are given for reference only

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Figure 14. D<sup>2</sup>PAK recommended footprint (dimensions are in mm)





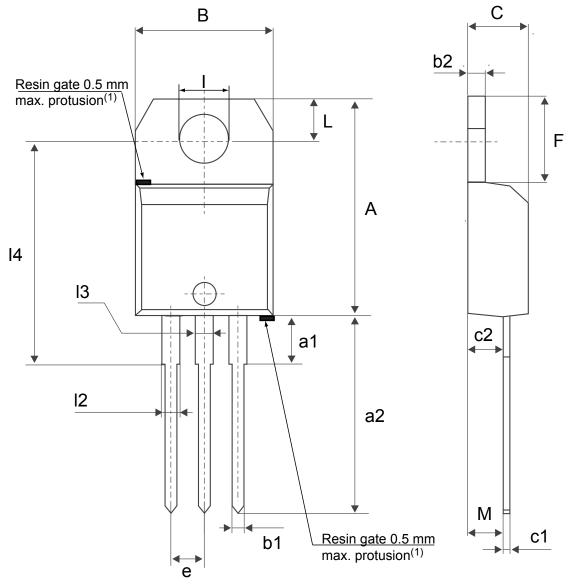
#### 2.2 TO-220AB insulated package information

Epoxy meets UL 94,V0

Cooling method: by conduction (C)
 Recommended torque value: 0.55 N·m

Maximum torque value: 0.70 N·m

Figure 15. TO-220AB insulated and non insulated package outline



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

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Table 7. TO-220AB insulated and non insulated package mechanical data

			Di	mensions		
Ref.		Millimeters			Inches <sup>(1)</sup>	
	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
Į.	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	

<sup>1.</sup> Inch dimensions are for reference only.

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# 3 Ordering information

Figure 16. Ordering information scheme (BTA12 and BTB12 series)

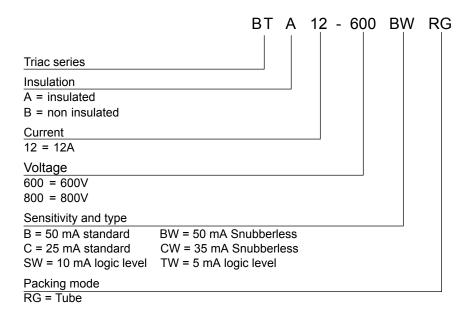
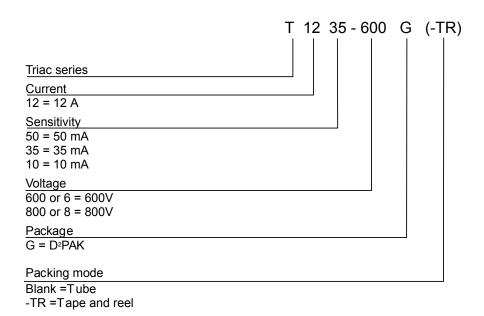


Figure 17. Ordering information scheme (T12 series)



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**Table 8. Product selector** 

Boot would be	Voltage (xxx)		0	<b>T</b>	Barbara
Part number	600	800	Sensitivity	Type	Package
BTB12-600C	Х		25 mA	Standard	TO-220AB
BTB12-600B	X		50 mA	Standard	TO-220AB
BTB12-600TW	X		5 mA	Snubberless <sup>TM</sup>	TO-220AB
BTB12-600SW	Х		10 mA	Snubberless <sup>TM</sup>	TO-220AB
BTB12-xxxCW	Х	Х	35 mA	Snubberless <sup>TM</sup>	TO-220AB
BTB12-600BW	X		50 mA	Snubberless <sup>TM</sup>	TO-220AB
BTA12-600C	Х		25 mA	Standard	TO-220AB Ins.
BTA12-xxxB	X	Х	50 mA	Standard	TO-220AB Ins.
BTA12-600TW	X		5 mA	Snubberless <sup>TM</sup>	TO-220AB Ins.
BTA12-xxxSW	X	Х	10 mA	Snubberless <sup>TM</sup>	TO-220AB Ins.
BTA12-xxxCW	X	Х	35 mA	Snubberless <sup>TM</sup>	TO-220AB Ins.
BTA12-xxxBW	Х	Х	50 mA	Snubberless <sup>TM</sup>	TO-220AB Ins.
T1205-600G	X		5 mA	Snubberless <sup>TM</sup>	D²PAK
T1210-6G	Х		10 mA	Snubberless <sup>TM</sup>	D²PAK
T1210-800G		Х	10 mA	Snubberless <sup>TM</sup>	D²PAK
T1235-xxxG	Х	Х	35 mA	Snubberless <sup>TM</sup>	D²PAK
T1250-600G	Х		50 mA	Snubberless <sup>TM</sup>	D²PAK

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**Table 9. Ordering information** 

Order code	Marking	Package	Weight	Base qty.	Delivery mode	
BTA12-600BRG	BTA12-600B					
BTA12-600BWRG	BTA12-600BW					
BTA12-600CRG	BTA12-600C					
BTA12-600CWRG	BTA12-600CW					
BTA12-600SWRG	BTA12-600SW	TO-220AB Ins.				
BTA12-600TWRG	BTA12-600TW	TO-220AB IIIS.				
BTA12-800BRG	BTA12-800B					
BTA12-800BWRG	BTA12-800BW					
BTA12-800CWRG	BTA12-800CW	1.9		1.9 g 50	50	Tube
BTA12-800SWRG	BTA12-800SW		TO-220AB			
BTB12-600BRG	BTB12-600B					
BTB12-600BWRG	BTB12-600BW					
BTB12-600CRG	BTB12-600C					
BTB12-600CWRG	BTB12-600CW	TO-220AB				
BTB12-600SWRG	BTB12-600SW					
BTB12-600TWRG	BTB12-600TW					
BTB12-800CWRG	BTB12-800CW					
T1205-600G-TR	T1205-600G					
T1210-6G-TR	T1210-6G					
T1210-800G-TR	T1210-800G			1000	Tana and real 12"	
T1235-600G-TR	T1235-600G	D0D44	4.00 =	1000	Tape and reel 13"	
T1235-800G-TR	T1235-800G	D²PAK	1.38 g			
T1250-600G-TR	T1250-600G					
T1210-6G	T1210-6G			50	Tube	
T1235-600G	T1235-600G			50	rube	



Table 10. Document revision history

Date	Revision	Changes
Sep-2002	6A	Last update.
15-Mar-2005	7	I. I2PAK package added.     TO-220AB delivery mode changed from bulk to tube.
27-May-2005	8	T1210 added.
28-Sep-2007	9	Reformatted to current standards. T1250 added.
02-Feb-2017	10	Removed I <sup>2</sup> PAK package.  Updated Figure 7: "Non-repetitive surge peak on-state current" and Table 9: "Product selector" and Table 10: "Ordering information".
9-Aug-2018	11	Updated D²PAK package information and Figure 10. Updated Section Product status / summary.
07-Feb-2019	12	Updated links syntax.



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