

1 Characteristics

Table 1. Absolute maximum ratings

Symbol	Parameters			Value	Unit
	DMC on state surrent (full sine verse)	TO-220AB, D ² PAK	T _c = 100 °C	40	
I _{T(RMS)}	RMS on-state current (full sine wave)	TO-220AB Ins.	T _c = 86 °C	16	Α
l	Non repetitive surge peak on-state current (full cycle,	F = 50 Hz	t _p = 20 ms	160	A
I _{TSM}	T _j initial = 25 °C)	F = 60 Hz	t _p = 16.7 ms	168	
I ² t	l^2t value for fusing $t_p = 10 \text{ ms}$				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 Hz	T _j = 125 °C	50	A/µs
V _{DSM} /V _{RSM}	Non repetitive surge peak off-state voltage	t _p = 10 ms	T _j = 25 °C	V _{DRM} /V _{RRM} + 100	V
I _{GM}	Peak gate current	t _p = 20 μs	T _j = 125 °C	4	Α
P _{G(AV)}	Average gate power dissipation	1	W		
T _{stg}	Storage junction temperature range	-40 to +150	°C		
Tj	Operating junction temperature range		-40 to +125	°C	

Table 2. Static electrical characteristics

Symbol	Test conditions	Tj		Value	Unit
V _T ⁽¹⁾	$I_{TM} = 22.5 \text{ A}, t_p = 380 \ \mu\text{s}$	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.	25	mΩ
I _{DRM} /I _{RRM}	$V_{DRM} = V_{RRM}$	25 °C	Max.	5	μA
'DRM' 'RRM	VDRM - VRRM	125 °C	ividX.	2	mA

^{1.} For both polarities of A2 referenced to A1

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

Symbol	Parameters	Quadrant		BT/ BTI	Unit	
				С	В]
I _{GT} ⁽¹⁾		1 - 11 - 111	Max.	25	50	mA
'GT'	$V_D = 12 \text{ V}, R_L = 33 \Omega$	IV	IVIAX.	50	100	mA
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		Max.	25	50	mA
ı.	L = 12L_	I - III - IV	Max.	40	60	m 1
IL	I _G = 1.2 I _{GT}	П	Max.	80	120	mA

DS2114 - Rev 11 page 2/18



Symbol	Parameters	Quadrant		BTA16 BTB16		Unit
				С	В	
dV/dt ⁽²⁾	V _D = 67 % V _{DRM} gate open, T _j = 125 °C			200	400	V/µs
(dV/dt)c ⁽²⁾	(dl/dt)c = 7 A/ms, T _j = 125 °C			5	10	V/µs

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

Table 4. Electrical characteristics (T_j = 25 °C, unless otherwise specified) - Snubberless and logic level (3 quadrants)

Symbol	Parameters Quadrant			T1610 / BTA16- SW / BTB16- SW	T1635 / BTA16-CW / BTB16-CW	T1650 / BTA16-BW / BTB16-BW	Unit
I _{GT} ⁽¹⁾	$V_D = 12 \text{ V, R}_1 = 30 \Omega$		Max.	10	35	50	mA
V _{GT}	VD = 12 V, IVL = 50 32	1 - 11 - 111	Max.		1.3		V
V_{GD}	$V_D = V_{DRM}, R_L = 3.3 \text{ k}\Omega, T_j = 125 \text{ °C}$		Min.		0.2		V
IH ⁽²⁾	I _T = 500 mA		Max.	15	35	50	mA
I ₁	I _G = 1.2 I _{GT}	1 - 111	Max.	25	50	70	mA
"L	IG - 1.2 IG	II	Max.	30	60	80	IIIA
(dV/dt) ⁽²⁾	VD = 67 % V _{DRM} gate open, T _j = 125 °C		Min.	40	500	1000	V/µs
	$(dV/dt)c = 0.1 V/\mu s, T_j = 125 °C$			8.5			
(dl/dt)c ⁽²⁾	(dV/dt)c = 10 V/μs, T _j = 125 °C		Min.	3.0			A/ms
	Without snubber, T _j = 125 °C				8.5	14	

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

Table 5. Thermal resistance

Symbol	Paramete	Value	Unit	
Page 3	Max. junction to case (AC)	TO-220AB / D ² PAK	1.2	
R _{th(j-c)}	TO-220AB insulated		2.1	°C/W
D.,	Junction to ambient (S = 2 cm²)	D²PAK	45	C/VV
R _{th(j-a)}	Junction to ambient	TO-220AB / TO-220AB ins	60	

1. Copper surface under tab.

DS2114 - Rev 11 page 3/18

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

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



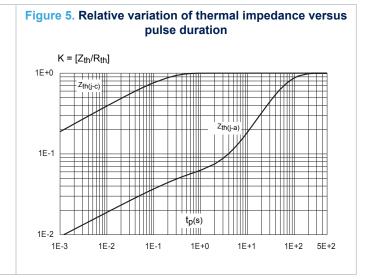
Characteristics (curves) 1.1

Figure 2. Maximum power dissipation versus on-state RMS current (full cycle) P(W) 20 18 16

Figure 3. RMS on-state current versus case temperature (full cycle) I_{T(RMS)}(A) 18 16 -BTB/T16-14 - BŤA 12 10 8 6 4 2 T_C(°C) 0 50 25 75 125 0 100

14 12 10 I_{T(RMS)}(A) 10 12 14

Figure 4. On-state rms current versus ambient temperature (full cycle) I_{T(RMS)}(A) 4.0 3.5 D²PAK (S = 1 cm²) Printed circuit board FR4, copper thickness: 35 um 3.0 2.5 2.0 1.5 1.0 0.5 T_C(°C) 0.0 25 50 75 100 125 0



page 4/18



Figure 6. On-state characteristics (maximum values)

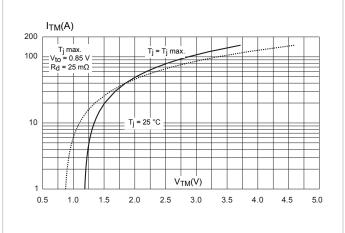


Figure 7. Surge peak on-state current versus number of cycles

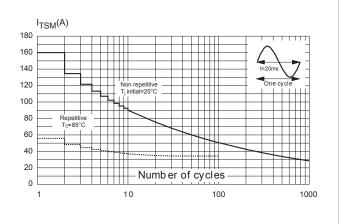


Figure 8. Non-repetitive surge peak on-state current for a sinusoidal

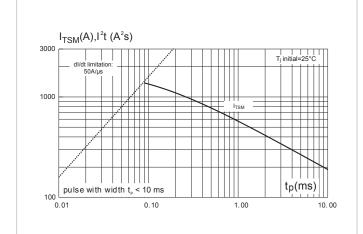


Figure 9. Relative variation of gate trigger current

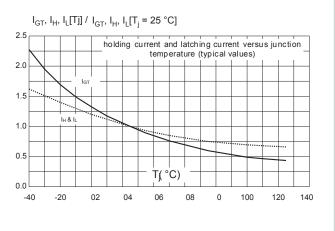


Figure 10. Relative variation of critical rate of decrease of main current versus (dV/dt)c (typical values)

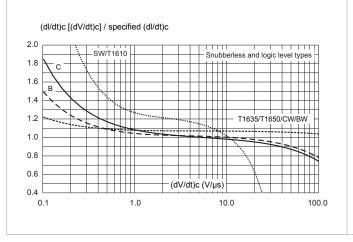
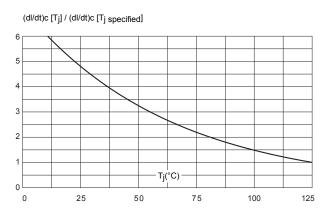
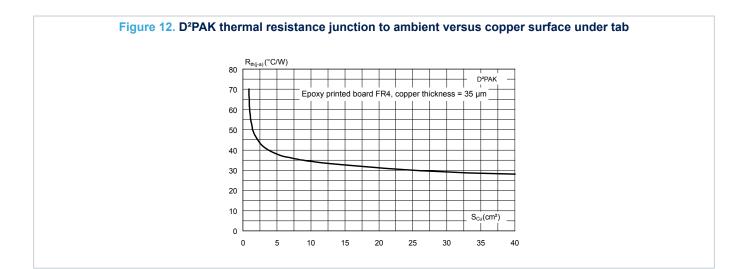


Figure 11. Relative variation of critical rate of decrease of main current versus (junction temperature (typical values)



DS2114 - Rev 11 page 5/18





DS2114 - Rev 11 page 6/18



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.

DS2114 - Rev 11 page 7/18



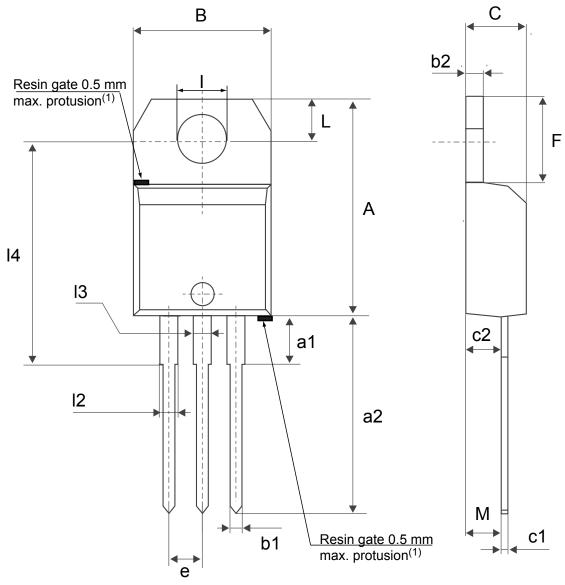
2.1 TO-220AB Insulated and non Insulated package information

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 13. TO-220AB Insulated and non Insulated package outline



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

DS2114 - Rev 11 page 8/18



Table 6. TO-220ABInsulated and non Insulated package mechanical data

			Di	mensions		
Ref.		Millimeters			Inches	
	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
I	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	

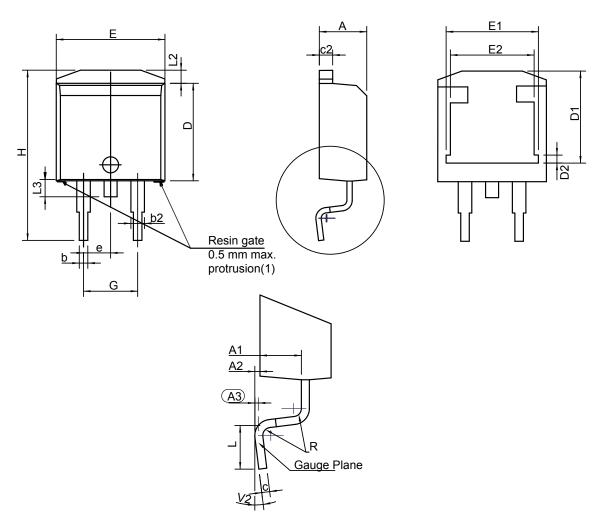
^{1.} Inch dimensions are for reference only.

DS2114 - Rev 11 page 9/18



2.2 D²PAK package information

Figure 14. D²PAK package outline



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

DS2114 - Rev 11 page 10/18



Table 7. D²PAK package mechanical data

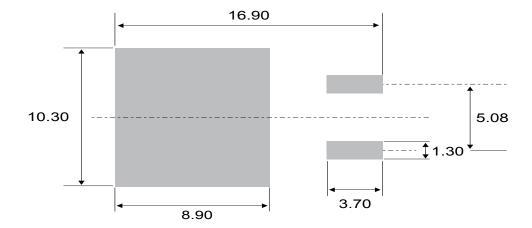
				Dimensions		
Ref.		Millimeters		Inches		
	Min.	Тур.	Max.	Min.	Тур.	Max.
Α	4.30		4.60	0.1693		0.1811
A1	2.49		2.69	0.0980		0.1059
A2	0.03		0.23	0.0012		0.0091
А3		0.25			0.0098	
b	0.70		0.93	0.0276		0.0366
b2	1.25		1.7	0.0492		0.0669
С	0.45		0.60	0.0177		0.0236
c2	1.21		1.36	0.0476		0.0535
D	8.95		9.35	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		
E	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°

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

DS2114 - Rev 11 page 11/18



Figure 15. D²PAK recommended footprint (dimensions are in mm)

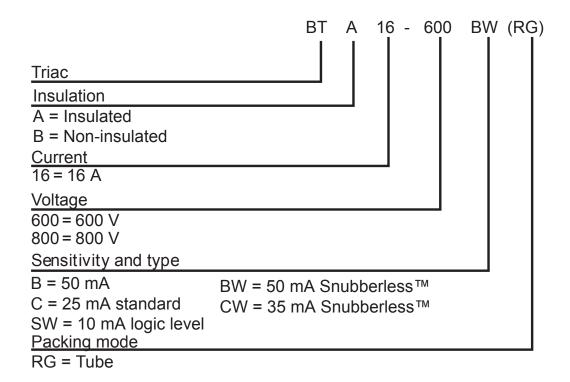


DS2114 - Rev 11 page 12/18



3 Ordering information

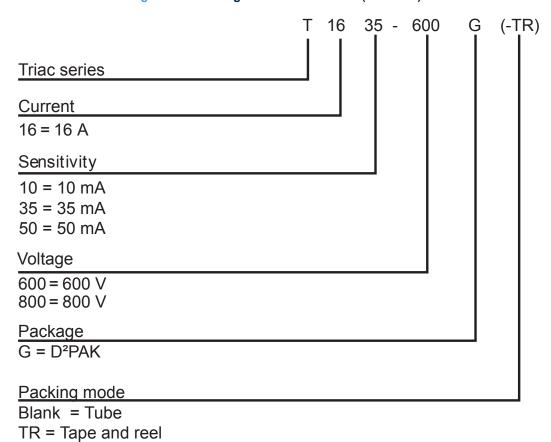
Figure 16. Ordering information scheme (BTA16 and BTB16 series)



DS2114 - Rev 11 page 13/18



Figure 17. Ordering information scheme (T8 series)



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page 14/18



3.1 Product selector

Table 8. Product selector

Part N	umber	- Sensitivity	Type	Backago
600	800	Sensitivity	Type	Package
BTB16-600C		35 mA	Standard	TO-220AB
BTB16-600B	BTB16-800B	50 mA	Standard	TO-220AB
BTB16-600SW	BTB16-800SW	10 mA	Snubberless™	TO-220AB
BTB16-600CW	BTB16-800CW	35 mA	Snubberless™	TO-220AB
BTB16-600BW	BTB16-800BW	50 mA	Snubberless™	TO-220AB
BTA16-600C		35 mA	Standard	TO-220AB Ins.
BTA16-600B	BTA16-800B	50 mA	Standard	TO-220AB Ins.
BTA16-600SW	BTA16-800SW	10 mA	Snubberless™	TO-220AB Ins.
BTA16-600CW	BTA16-800CW	35 mA	Snubberless™	TO-220AB Ins.
BTA16-600BW	BTA16-800BW	50 mA	Snubberless™	TO-220AB Ins.
T1610-600G	T1610-800G	10 mA	Snubberless™	D ² PAK
T1635-600G	T1635-800G	35 mA	Snubberless™	D ² PAK
T1650-600G		50 mA	Snubberless™	D ² PAK



3.2 Ordering information

Table 9. Ordering information

Order code	Marking	Package	Weight	Base qty.	Delivery mode
BTA16-600BRG	BTA16-600B				
BTA16-600BWRG	BTA16-600BW				
BTA16-600CRG	BTA16-600C				
BTA16-600CWRG	BTA16-600CW				
BTA16-600SWRG	BTA16-600SW	TO-220AB Ins.			Tube
BTA16-800BRG	BTA16-800B				
BTA16-800BWRG	BTA16-800BW				
BTA16-800CWRG	BTA16-800CW				
BTA16-800SWRG	BTA16-800SW		2.30	50	
BTB16-600BRG	BTB16-600B		2.30		
BTB16-600BWRG	BTB16-600BW				
BTB16-600CRG	BTB16-600C				
BTB16-600CWRG	BTB16-600CW				
BTB16-600SWRG	BTB16-600SW	TO-220AB			Tube
BTB16-800BRG	BTB16-800B				
BTB16-800BWRG	BTB16-800BW				
BTB16-800CWRG	BTB16-800CW				
BTB16-800SWRG	BTB16-800SW	_			
T1610-600G-TR	T1610-600G				
T1610-800G-TR	T1610-800G				
T1635-600G-TR	T1635-600G	D²PAK	1.50	1000	Tape and reel
T1635-800G-TR	T1635-800G	D-PAK	1.50		
T1650-600G-TR	T1650-600G				
T1635-600G	T1635-600G			50	Tube

DS2114 - Rev 11 page 16/18



Revision history

Table 10. Document revision history

Date	Revision	Changes
Oct-2002	6A	Last update.
13-Feb-2006	7	TO-220AB delivery mode changed from bulk to tube. ECOPACK statement added.
03-Jul-2009	8	Added part number T1610.
04-Dec-2009	9	Updated value for V_{DSM} / V_{RSM} in Table 2. Updated temperature in Table 2 from 15 $^{\circ}C$ to 86 $^{\circ}C.$
11-Mar-2010	10	Updated value for V_{DSM} / V_{RSM} in Table 2. Updated temperature in Table 2 from 15 $^{\circ}C$ to 86 $^{\circ}C.$
30-May-2018	11	Updated Section • Product status / summary. Added T1650 package information.

DS2114 - Rev 11 page 17/18



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DS2114 - Rev 11 page 18/18