



BTA24, BTB24, BTA25, BTA26 and T25 series

Snubberless™ and Standard

25 A Triacs

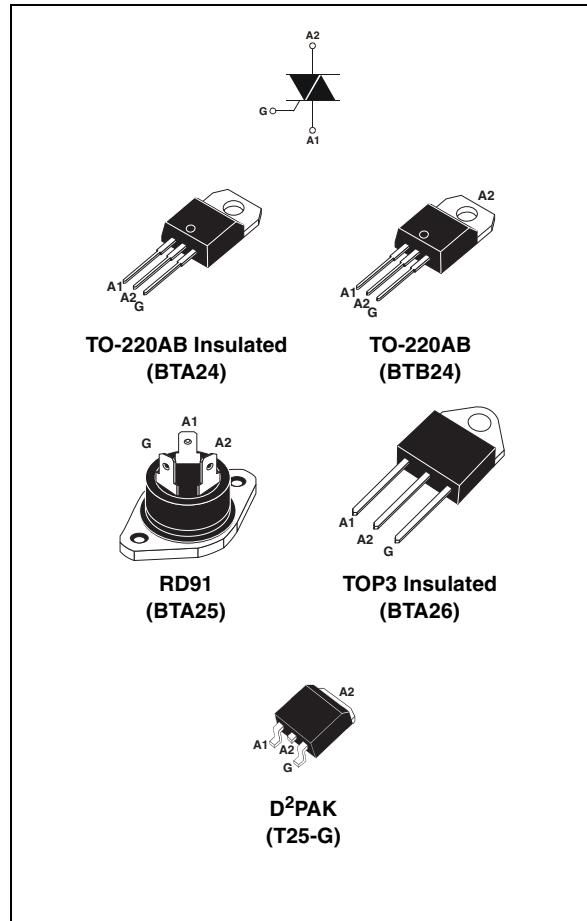
Main features

Symbol	Value	Unit
$I_T(\text{RMS})$	25	A
$V_{\text{DRM}}/V_{\text{RRM}}$	600 and 800	V
$I_{\text{GT}}(Q_1)$	35 to 50	mA

Description

Available either in through-hole or surface-mount packages, the **BTA24**, **BTB24**, **BTA25**, **BTA26** and **T25** triac series is suitable for general purpose AC switching. They can be used as an ON/OFF function in applications such as static relays, heating regulation, induction motor starting circuits... or for phase control operation in light dimmers, motor speed controllers, ...

The snubberless versions (BTA/BTB...W and T25 series) are specially recommended for use on inductive loads, thanks to their high commutation performances. By using an internal ceramic pad, the BTA series provides voltage insulated tab (rated at 2500V_{RMS}) complying with UL standards (File ref.: E81734).



Order codes

Part Number	Marking
BTA24-xxxxxRG	See <i>Table 6 on page 6</i>
BTB24-xxxxxRG	
BTA25-xxxxxRG	
BTA26-xxxxxRG	
T25xx-xxxG	
T25xx-xxxG-TR	

TM: Snubberless is a trademark of STMicroelectronics

1 Characteristics

Table 1. Absolute maximum ratings

Symbol	Parameter	Value	Unit		
$I_{T(RMS)}$	D ² PAK / TO-220AB	25	A		
	RD91 / TOP3 Ins.				
	TO-220AB Ins.				
I_{TSM}	$F = 50 \text{ Hz}$	$t = 20 \text{ ms}$	250		
	$F = 60 \text{ Hz}$	$t = 16.7 \text{ ms}$	260		
I^2t	I^2t Value for fusing	$t_p = 10 \text{ ms}$	$340 \text{ A}^2\text{s}$		
dI/dt	Critical rate of rise of on-state current $I_G = 2 \times I_{GT}, t_r \leq 100 \text{ ns}$	$F = 120 \text{ Hz}$	$T_j = 125^\circ \text{C}$	50	$\text{A}/\mu\text{s}$
V_{DSM}/V_{RSM}	Non repetitive surge peak off-state voltage	$t_p = 10 \text{ ms}$	$T_j = 25^\circ \text{C}$	$V_{DSM}/V_{RSM} + 100$	V
I_{GM}	Peak gate current	$t_p = 20 \mu\text{s}$	$T_j = 125^\circ \text{C}$	4	A
$P_{G(AV)}$	Average gate power dissipation		$T_j = 125^\circ \text{C}$	1	W
T_{stg} T_j	Storage junction temperature range Operating junction temperature range			- 40 to + 150 - 40 to + 125	$^\circ \text{C}$

Table 2. Electrical characteristics ($T_j = 25^\circ \text{C}$, unless otherwise specified), Snubberless™ and Logic Level (3 quadrants) T25-G, BTA/BTB24...W, BTA25...W, BTA26...W

Symbol	Test Conditions	Quadrant		T25	BTA/BTB		Unit
				T2535	CW	BW	
$I_{GT}^{(1)}$	$V_D = 12 \text{ V}$ $R_L = 33 \Omega$	I - II - III	MAX.	35	35	50	mA
V_{GT}		I - II - III	MAX.		1.3		V
V_{GD}	$V_D = V_{DRM}$ $R_L = 3.3 \text{ k}\Omega$ $T_j = 125^\circ \text{C}$	I - II - III	MIN.		0.2		V
$I_H^{(2)}$	$I_T = 500 \text{ mA}$		MAX.	50	50	75	mA
I_L	$I_G = 1.2 I_{GT}$	I - III	MAX.	70	70	80	mA
		II		80	80	100	
$dV/dt^{(2)}$	$V_D = 67 \% V_{DRM}$ gate open	$T_j = 125^\circ \text{C}$	MIN.	500	500	1000	$\text{V}/\mu\text{s}$
$(dI/dt)c^{(2)}$	Without snubber	$T_j = 125^\circ \text{C}$	MIN.	13	13	22	A/ms

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

2. for both polarities of A2 referenced to A1.

Table 3. Electrical characteristics ($T_j = 25^\circ C$, unless otherwise specified), Standard (4 quadrants), BTB24...B, BTA25...B, BTA26...B

Symbol	Test Conditions	Quadrant		Value	Unit
$I_{GT}^{(1)}$	$V_D = 12 V$ $R_L = 33 \Omega$	I - II - III - IV	MAX.	50 100	mA
V_{GT}		ALL	MAX.	1.3	V
V_{GD}	$V_D = V_{DRM}$ $R_L = 3.3 k\Omega$ $T_j = 125^\circ C$	ALL	MIN.	0.2	V
$I_H^{(2)}$	$I_T = 500 mA$		MAX.	80	mA
I_L	$I_G = 1.2 I_{GT}$	I - III - IV	MAX.	70	mA
		II		160	
$dV/dt^{(2)}$	$V_D = 67 \% V_{DRM}$ gate open	$T_j = 125^\circ C$	MIN.	500	V/ μ s
$(dV/dt)c^{(2)}$	$(dl/dt)c = 13.3 A/ms$	$T_j = 125^\circ C$	MIN.	10	V/ μ s

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

2. for both polarities of A2 referenced to A1.

Table 4. Static characteristics

Symbol	Test Conditions			Value	Unit	
$V_T^{(1)}$	$I_{TM} = 35 A$	$t_p = 380 \mu s$	$T_j = 25^\circ C$	MAX.	1.55	V
$V_{t0}^{(1)}$	Threshold voltage		$T_j = 125^\circ C$	MAX.	0.85	V
$R_d^{(1)}$	Dynamic resistance		$T_j = 125^\circ C$	MAX.	16	$m\Omega$
I_{DRM} I_{RRM}	$V_{DRM} = V_{RRM}$	$T_j = 25^\circ C$	MAX.	5	μA	
		$T_j = 125^\circ C$		3	mA	

1. for both polarities of A2 referenced to A1.

Table 5. Thermal resistance

Symbol	Parameter			Value	Unit
$R_{th(j-c)}$	Junction to case (AC)	D ² PAK / TO-220AB		0.8	$^\circ C/W$
		RD91 (Insulated) / TOP3 Insulated		1.1	
		TO-220AB Insulated		1.7	
$R_{th(j-a)}$	Junction to ambient $(1) S = 1 cm^2$	D ² PAK		45	$^\circ C/W$
		TOP3 Insulated		50	
		TO-220AB / TO-220AB Insulated		60	

1. S = Copper surface under tab.

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

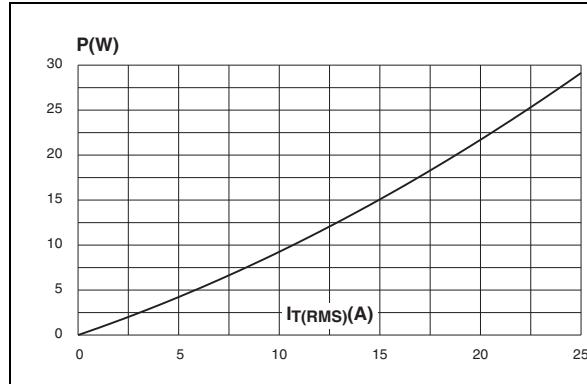


Figure 2. RMS on-state current versus case temperature (full cycle)

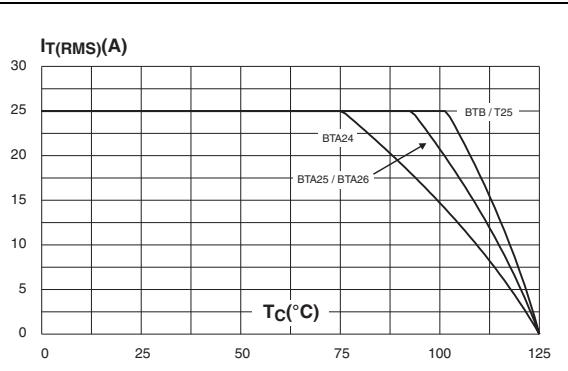


Figure 3. D²PAK RMS on-state current versus ambient temperature (printed circuit board FR4, copper thickness: 35µm) (full cycle)

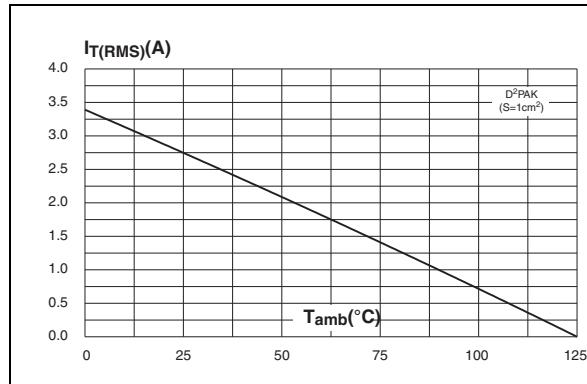


Figure 4. Relative variation of thermal impedance versus pulse duration

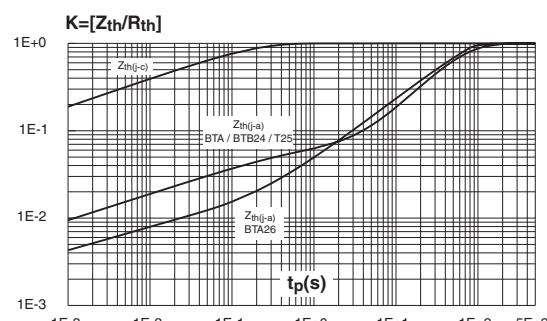


Figure 5. On-state characteristics (maximum values)

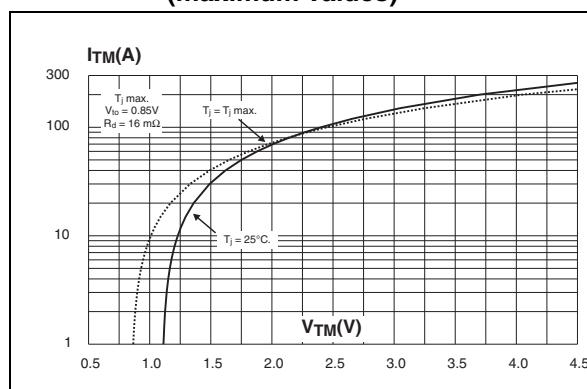


Figure 6. Surge peak on-state current versus number of cycles

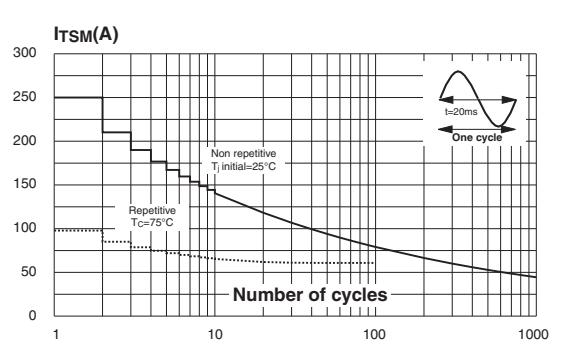


Figure 7. Non-repetitive surge peak on-state current for a sinusoidal pulse with width $t_p < 10$ ms and corresponding value of I^2t

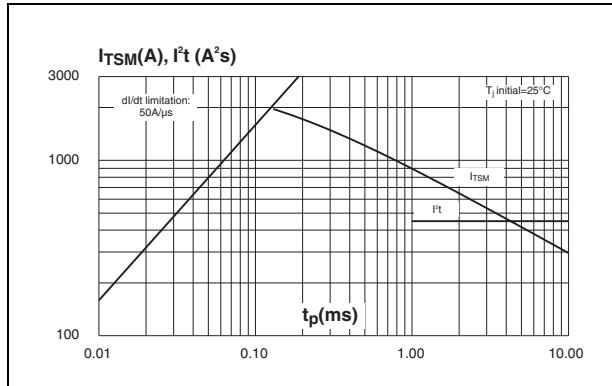


Figure 8. Relative variation of gate trigger current, holding current and latching current versus junction temperature (typical values)

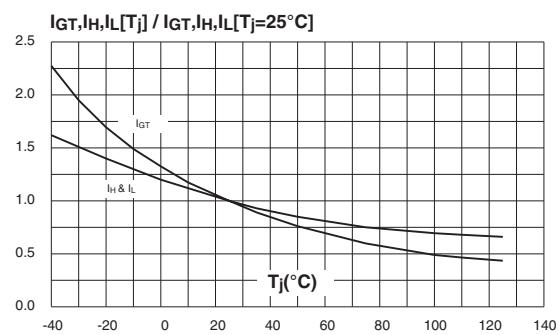


Figure 9. Relative variation of critical rate of decrease of main current versus $(dV/dt)c$ (typical values)

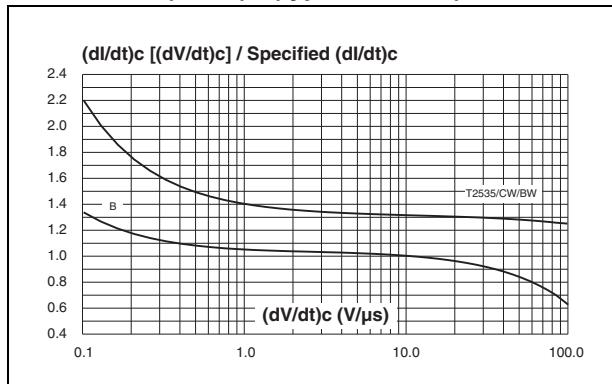


Figure 10. Relative variation of critical rate of decrease of main current versus (dV/dt)

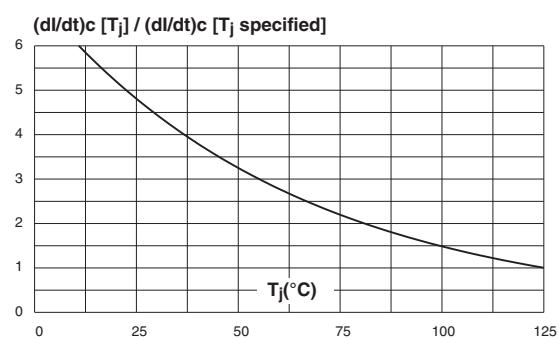
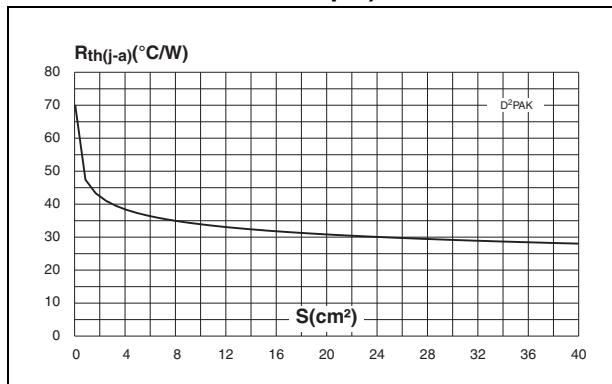


Figure 11. D²PAK Thermal resistance junction to ambient versus copper surface under tab (printed circuit board FR4, copper thickness: 35 μm)



2 Ordering information scheme

Figure 12. BTA and BTB series

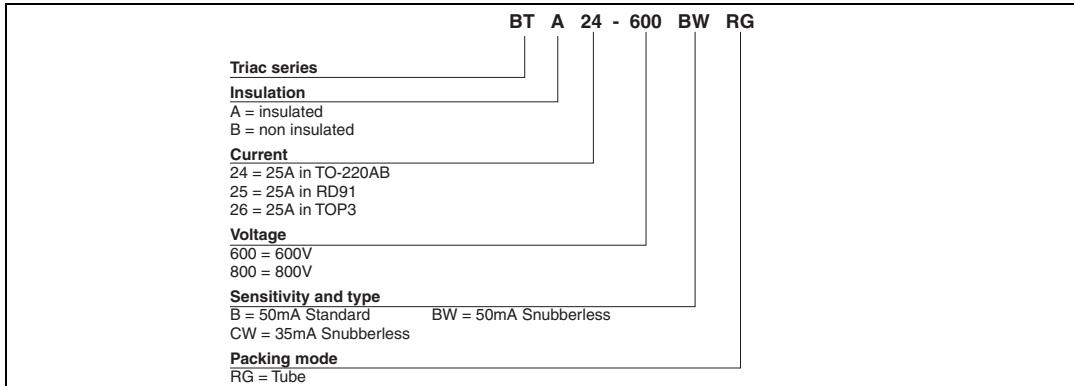


Figure 13. T25 series

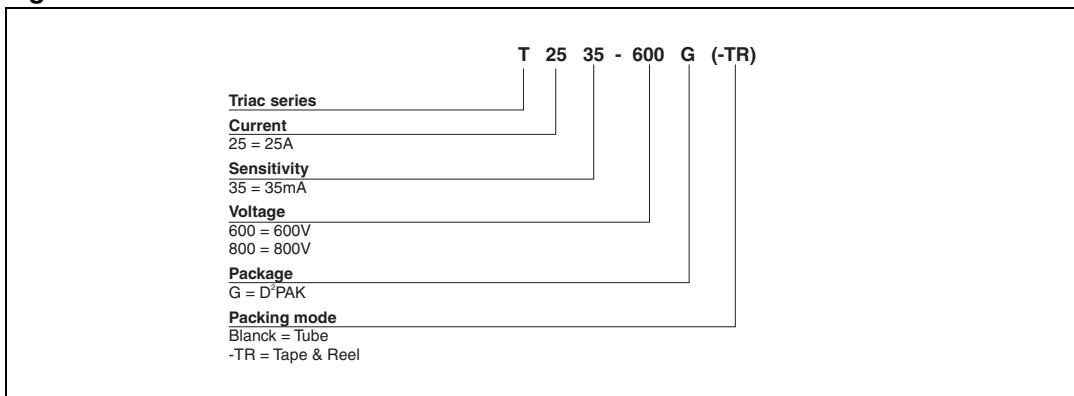


Table 6. Product Selector

Part Numbers	Voltage (xxx)		Sensitivity	Type	Package
	600 V	800 V			
BTA24-xxxBRG	X	X	50 mA	Standard	TO-220AB
BTA/BTB ⁽¹⁾ 24-xxxBWRG	X	X	50 mA	Snubberless	TO-220AB
BTA/BTB ⁽¹⁾ 24-xxxCWRG	X	X	35 mA	Snubberless	TO-220AB
BTA25-xxxBRG	X	X	50 mA	Standard	RD91
BTA25-xxxBWRG	X	X	50 mA	Snubberless	RD91
BTA25-xxxCWRG	X	X	35 mA	Snubberless	RD91
BTA26-xxxBRG	X	X	50 mA	Standard	TOP3 Ins.
BTA26-xxxBWRG	X	X	50 mA	Snubberless	TOP3 Ins.
BTA26-xxxCWRG	X	X	35 mA	Snubberless	TOP3 Ins.
T2535-xxxG	X	X	35 mA	Snubberless	D ² PAK

1. **BTB:** non insulated TO-220AB package

3 Package information

Table 7. D²PAK Package dimensions

REF.	DIMENSIONS					
	Millimeters			Inches		
	Min.	Typ.	Max.	Min.	Typ.	Max.
A	4.30		4.60	0.169		0.181
A1	2.49		2.69	0.098		0.106
A2	0.03		0.23	0.001		0.009
B	0.70		0.93	0.027		0.037
B2	1.25	1.40		0.048	0.055	
C	0.45		0.60	0.017		0.024
C2	1.21		1.36	0.047		0.054
D	8.95		9.35	0.352		0.368
E	10.00		10.28	0.393		0.405
G	4.88		5.28	0.192		0.208
L	15.00		15.85	0.590		0.624
L2	1.27		1.40	0.050		0.055
L3	1.40		1.75	0.055		0.069
R		0.40			0.016	
V2	0°		8°	0°		8°

Figure 14. D²PAK Foot Print Dimensions (in millimeters)

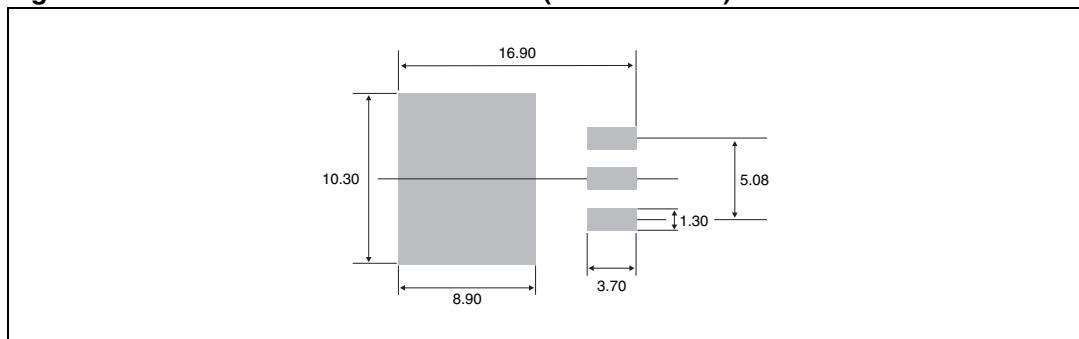
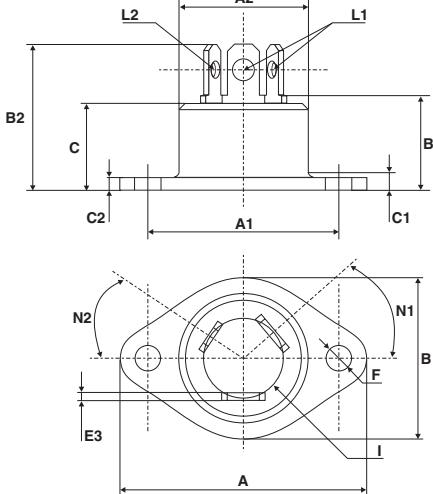


Table 8. RD91 Package dimensions

REF.	DIMENSIONS			
	Millimeters		Inches	
	Min.	Max.	Min.	Max.
A		40.00		1.575
A1	29.90	30.30	1.177	1.193
A2		22.00		0.867
B		27.00		1.063
B1	13.50	16.50	0.531	0.650
B2		24.00		0.945
C		14.00		0.551
C1		3.50		0.138
C2	1.95	3.00	0.077	0.118
E3	0.70	0.90	0.027	0.035
F	4.00	4.50	0.157	0.177
I	11.20	13.60	0.441	0.535
L1	3.10	3.50	0.122	0.138
L2	1.70	1.90	0.067	0.075
N1	33°	43°	33°	43°
N2	28°	38°	28°	38°



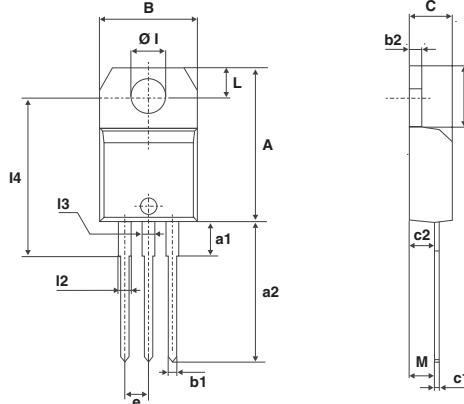
The technical drawings show two views of the RD91 package. The top view illustrates the overall rectangular footprint with internal features like lead frames and bond wires. Dimensions labeled include L1, L2, A1, A2, B1, B2, C, C1, C2, E3, F, I, and various angles N1 and N2. The bottom view provides a cross-sectional look at the package's profile, showing its thickness and internal structure. Dimensions labeled here include A, B, and N2.

Table 9. TOP3 Insulated package dimensions

REF.	DIMENSIONS					
	Millimeters			Inches		
	Min.	Typ.	Max.	Min.	Typ.	Max.
A	4.4		4.6	0.173		0.181
B	1.45		1.55	0.057		0.061
C	14.35		15.60	0.565		0.614
D	0.5		0.7	0.020		0.028
E	2.7		2.9	0.106		0.114
F	15.8		16.5	0.622		0.650
G	20.4		21.1	0.815		0.831
H	15.1		15.5	0.594		0.610
J	5.4		5.65	0.213		0.222
K	3.4		3.65	0.134		0.144
ØL	4.08		4.17	0.161		0.164
P	1.20		1.40	0.047		0.055
R		4.60			0.181	

Table 10. TO-220AB (Insulated and non-insulated) Package dimensions

REF.	DIMENSIONS					
	Millimeters			Inches		
	Min.	Typ.	Max.	Min.	Typ.	Max.
A	15.20		15.90	0.598		0.625
a1		3.75			0.147	
a2	13.00		14.00	0.511		0.551
B	10.00		10.40	0.393		0.409
b1	0.61		0.88	0.024		0.034
b2	1.23		1.32	0.048		0.051
C	4.40		4.60	0.173		0.181
c1	0.49		0.70	0.019		0.027
c2	2.40		2.72	0.094		0.107
e	2.40		2.70	0.094		0.106
F	6.20		6.60	0.244		0.259
Øl	3.75		3.85	0.147		0.151
I4	15.80	16.40	16.80	0.622	0.646	0.661
L	2.65		2.95	0.104		0.116
I2	1.14		1.70	0.044		0.066
I3	1.14		1.70	0.044		0.066
M		2.60			0.102	



The technical drawing illustrates the physical dimensions of the TO-220AB package. The top view shows the overall height (I4), lead spacing (L), lead thickness (a1), lead height (a2), lead width (b1), lead pitch (I2), lead thickness (I3), and lead height (I4). The side view shows the lead height (a1), lead thickness (b1), lead pitch (I2), lead thickness (I3), lead height (I4), lead thickness (M), and lead height (c).

In order to meet environmental requirements, ST offers these devices in ECOPACK® packages. These packages have a lead-free second level interconnect. The category of second level interconnect is marked on the package and on the inner box label, in compliance with JEDEC Standard JESD97. The maximum ratings related to soldering conditions are also marked on the inner box label. ECOPACK is an ST trademark. ECOPACK specifications are available at: www.st.com.

4 Ordering information

Ordering type	Marking	Package	Weight	Base qty	Delivery mode
BTA/BTB24-xxxxyzRG	BTA/BTB24xxxxyz	TO-220AB	2.3 g	50	Tube
BTA25-xxxxyzRG	BTA25-xxxxyz	RD91	20 g	25	Bulk
BTA26-xxxxyzRG	BTA26-xxxxyz	TOP3 Ins.	4.5 g	30	Tube
T2535-xxxG	T2535xxxG	D ² PAK	1.5 g	50	Tube
T2535-xxxG-TR	T2535xxxG			1000	Tape and reel

Note: xxx = voltage, yy = sensitivity, z = type

5 Revision History

Date	Revision	Description of 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. T_c in figure 3 changed to T_{amb}
31-Jul-2006	9	Typing error corrected on page 1 (BTB124 instead of BTB24)

Please Read Carefully:

Information in this document is provided solely in connection with ST products. STMicroelectronics NV and its subsidiaries ("ST") reserve the right to make changes, corrections, modifications or improvements, to this document, and the products and services described herein at any time, without notice.

All ST products are sold pursuant to ST's terms and conditions of sale.

Purchasers are solely responsible for the choice, selection and use of the ST products and services described herein, and ST assumes no liability whatsoever relating to the choice, selection or use of the ST products and services described herein.

No license, express or implied, by estoppel or otherwise, to any intellectual property rights is granted under this document. If any part of this document refers to any third party products or services it shall not be deemed a license grant by ST for the use of such third party products or services, or any intellectual property contained therein or considered as a warranty covering the use in any manner whatsoever of such third party products or services or any intellectual property contained therein.

UNLESS OTHERWISE SET FORTH IN ST'S TERMS AND CONDITIONS OF SALE ST DISCLAIMS ANY EXPRESS OR IMPLIED WARRANTY WITH RESPECT TO THE USE AND/OR SALE OF ST PRODUCTS INCLUDING WITHOUT LIMITATION IMPLIED WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE (AND THEIR EQUIVALENTS UNDER THE LAWS OF ANY JURISDICTION), OR INFRINGEMENT OF ANY PATENT, COPYRIGHT OR OTHER INTELLECTUAL PROPERTY RIGHT.

UNLESS EXPRESSLY APPROVED IN WRITING BY AN AUTHORIZED ST REPRESENTATIVE, ST PRODUCTS ARE NOT RECOMMENDED, AUTHORIZED OR WARRANTED FOR USE IN MILITARY, AIR CRAFT, SPACE, LIFE SAVING, OR LIFE SUSTAINING APPLICATIONS, NOR IN PRODUCTS OR SYSTEMS WHERE FAILURE OR MALFUNCTION MAY RESULT IN PERSONAL INJURY, DEATH, OR SEVERE PROPERTY OR ENVIRONMENTAL DAMAGE. ST PRODUCTS WHICH ARE NOT SPECIFIED AS "AUTOMOTIVE GRADE" MAY ONLY BE USED IN AUTOMOTIVE APPLICATIONS AT USER'S OWN RISK.

Resale of ST products with provisions different from the statements and/or technical features set forth in this document shall immediately void any warranty granted by ST for the ST product or service described herein and shall not create or extend in any manner whatsoever, any liability of ST.

ST and the ST logo are trademarks or registered trademarks of ST in various countries.

Information in this document supersedes and replaces all information previously supplied.

The ST logo is a registered trademark of STMicroelectronics. All other names are the property of their respective owners.

© 2006 STMicroelectronics - All rights reserved

STMicroelectronics group of companies

Australia - Belgium - Brazil - Canada - China - Czech Republic - Finland - France - Germany - Hong Kong - India - Israel - Italy - Japan - Malaysia - Malta - Morocco - Singapore - Spain - Sweden - Switzerland - United Kingdom - United States of America

www.st.com