BTA16, BTB16
T1610, T1635

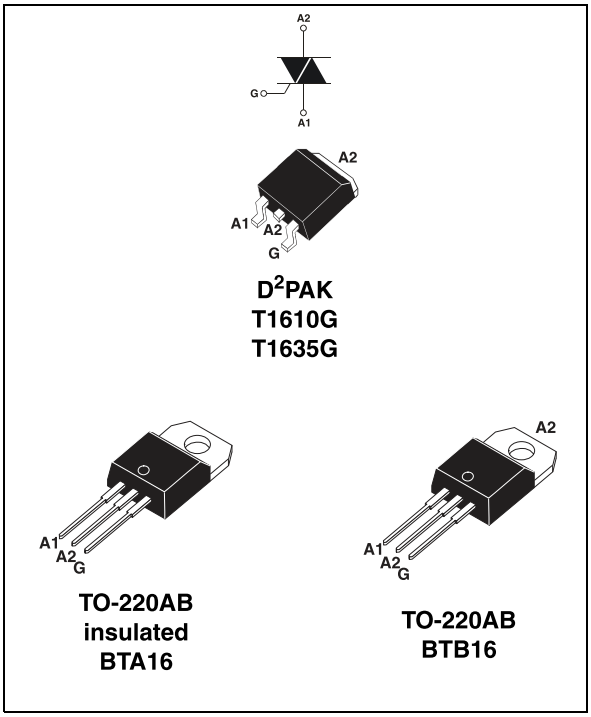
16 A Snubberless™, logic level and standard Triacs

Features

- Medium current Triac
- Low thermal resistance with clip bonding
- Low thermal resistance insulation ceramic for insulated BTA
- High commutation (4Q) or very high commutation (3Q) capability
- BTA series UL1557 certified (File ref: 81734)
- RoHS (2002/95/EC) compliant
- Insulated tab (BTA series, rated at 2500 V_{RMS})

Applications

- Snubberless versions (BTA/BTB...W and T1635) especially recommended for use on inductive loads, because of their high commutation performances
- On/off or phase angle function in applications such as static relays, light dimmers and appliance motor speed controllers



Description

Available either in through-hole or surface-mount packages, the BTA16, BTB16, T1610 and T1635 Triacs series are suitable for general purpose mains power AC switching.

Table 1. Device summary

Symbol	Parameter	BTA16 (1)	BTB16	T1610	T1635
$I_{T(RMS)}$	On-state rms current	16	16	16	16
V_{DRM}/V_{RRM}	Repetitive peak off-state voltage	600/800	600/800	600/800	600/800
I_{GT} (Snubberless)	Triggering gate current	35/50	35/50	-	35
I_{GT} (logic level)	Triggering gate current	10	10	10	-
I_{GT} (standard)	Triggering gate current	25/50	25/50	-	-

1. Insulated

TM: Snubberless is a trademark of STMicroelectronics

1 Characteristics

Table 2. Absolute maximum ratings

Symbol	Parameter			Value	Unit
$I_{T(RMS)}$	On-state rms current (full sine wave)	D^2PAK / TO-220AB	T_c = 100 °C	16	A
		TO-220AB insulated	T_c = 86 °C		
I_{TSM}	Non repetitive surge peak on-state current (full cycle, T_j initial = 25 °C)	F = 50 Hz	t = 20 ms	160	A
		F = 60 Hz	t = 16.7 ms	168	
I^2t	I^2t value for fusing	t_p = 10 ms		144	A^2s
dI/dt	Critical rate of rise of on-state current I_G = 2 x I_{GT} , $t_r \leq$ 100 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	A
$P_{G(AV)}$	Average gate power dissipation		T_j = 125 °C	1	W
T_{stg}	Storage temperature range			-40 to + 150	
T_j	Maximum operating junction temperature			-40 to + 125	

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

Symbol	Test conditions	Quadrant		T1610	T1635	BTA16 / BTB16			Unit
						SW	CW	BW	
I_{GT} (1)	V_D = 12 V R_L = 33 Ω	I - II - III	Max.	10	35	10	35	50	mA
V_{GT}		I - II - III	Max.	1.3					V
V_{GD}	V_D = V_{DRM} R_L = 3.3 kΩ T_j = 125 °C	I - II - III	Min.	0.2					V
I_H (2)	I_T = 500 mA		Max.	15	35	15	35	50	mA
I_L	I_G = 1.2 I_{GT}	I - III	Max.	25	50	25	50	70	mA
		II		30	60	30	60	80	
dV/dt (2)	V_D = 67 %V_{DRM} gate open	T_j = 125 °C	Min.	40	500	40	500	1000	V/µs
(dI/dt)c (2)	(dV/dt)c = 0.1 V/µs	T_j = 125 °C	Min.	8.5	-	8.5	-	-	A/ms
	(dV/dt)c = 10 V/µs	T_j = 125 °C		3.0	-	3.0	-	-	
	Without snubber	T_j = 125 °C		-	8.5	-	8.5	14	

1. Minimum IGT is guaranted at 5% of I_{GT} max
2. For both polarities of A2 referenced to A1

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

Symbol	Test conditions	Quadrant		BTA16 / BTB16		Unit
				C	B	
I_{GT} (1)	V_D = 12 V R_L = 33 Ω	I - II - III IV	Max.	25 50	50 100	mA
V_{GT}		ALL	Max.	1.3		V
V_{GD}	$V_D = V_{DRM}$ R_L = 3.3 kΩ T_j = 125 °C	ALL	Min.	0.2		V
I_H (2)	I_T = 500 mA		Max.	25	50	mA
I_L	I_G = 1.2 I_{GT}	I - III - IV	Max.	40	60	mA
		II		80	120	
dV/dt (2)	V_D = 67 %V_{DRM} gate open	T_j = 125 °C	Min.	200	400	V/µs
(dV/dt)c (2)	(dI/dt)c = 7 A/ms	T_j = 125 °C	Min.	5	10	V/µs

1. Minimum IGT is guaranted at 5% of I_{GT} max
2. For both polarities of A2 referenced to A1

Table 5. Static characteristics

Symbol	Test conditions			Value	Unit
V_T (2)	I_{TM} = 22.5 A t_p = 380 µs	T_j = 25 °C	Max.	1.55	V
V_{to} (2)	Threshold voltage	T_j = 125 °C	Max.	0.85	V
R_d (2)	Dynamic resistance	T_j = 125 °C	Max.	25	mΩ
I_{DRM} I_{RRM}	$V_{DRM} = V_{RRM}$	T_j = 25 °C	Max.	5	µA
		T_j = 125 °C		2	mA

Table 6. Thermal resistance

Symbol	Parameter			Value	Unit
$R_{th(j-c)}$	Junction to case (AC)		D^2PAK / TO-220AB	1.2	°C/W
			TO-220AB insulated	2.1	
$R_{th(j-a)}$	Junction to ambient	S(1) = 1 cm^2	D^2PAK	45	°C/W
			TO-220AB / TO-220AB insulated	60	

1. S = Copper surface under tab

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

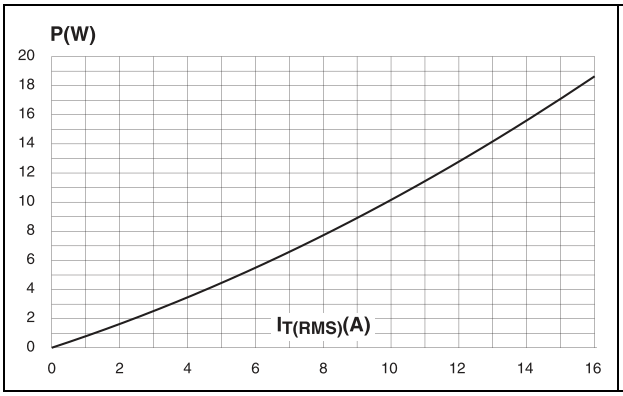


Figure 2. On-state rms current versus case temperature (full cycle)

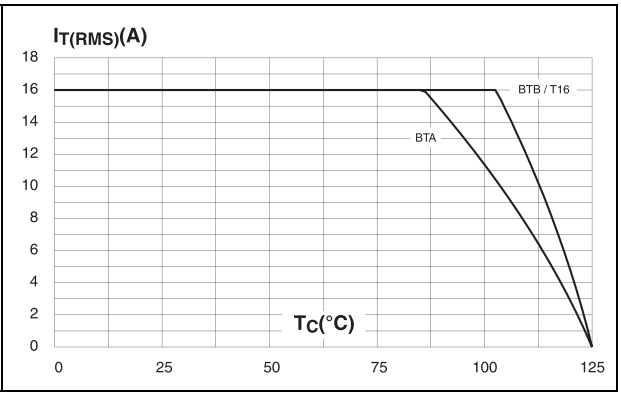


Figure 3. On-state rms current versus ambient temperature (full cycle)

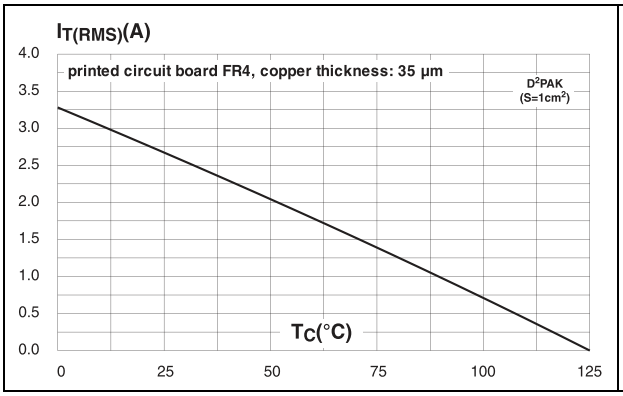


Figure 4. Relative variation of thermal impedance versus pulse duration

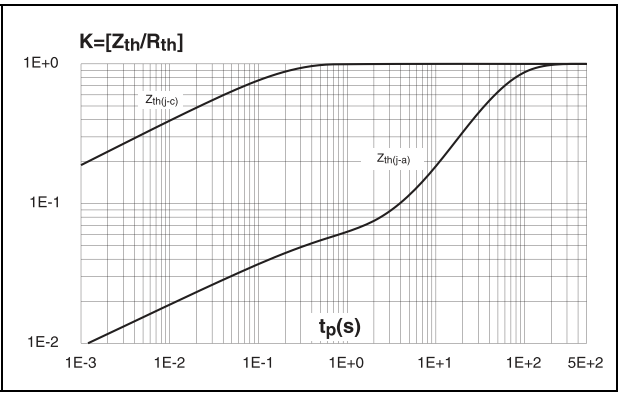


Figure 5. On-state characteristics (maximum values)

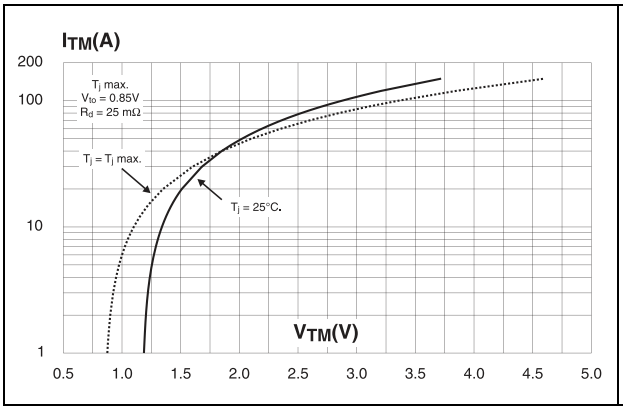


Figure 6. Surge peak on-state current versus number of cycles

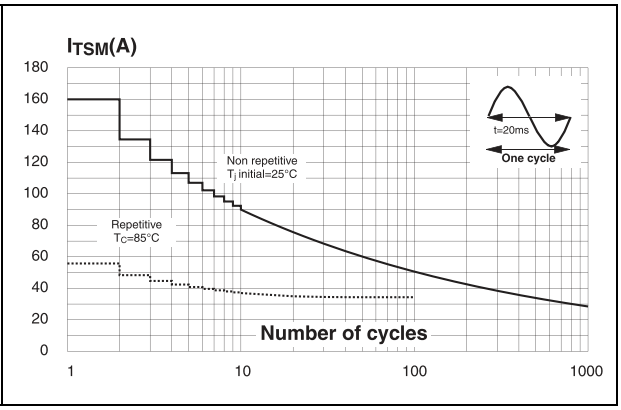


Figure 7. Non-repetitive surge peak on-state current for a sinusoidal

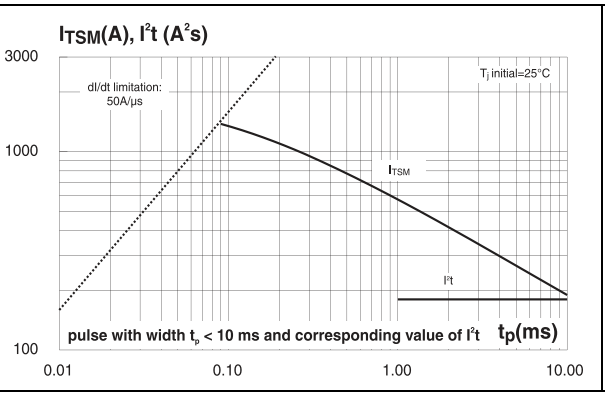


Figure 8. Relative variation of gate trigger current

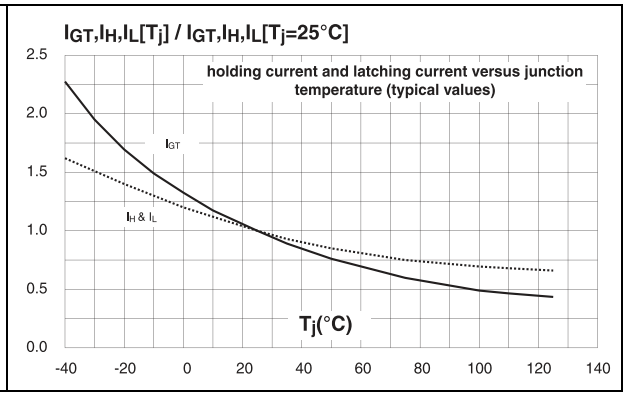


Figure 9. Relative variation of critical rate of decrease of main current versus (dV/dt)c (typical values)

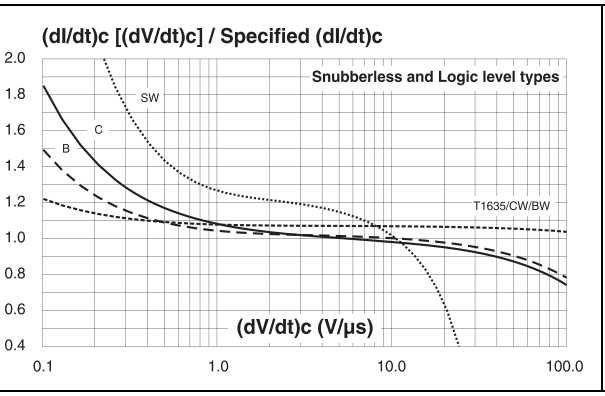


Figure 10. Relative variation of critical rate of decrease of main current versus (dV/dt)c (typical values)

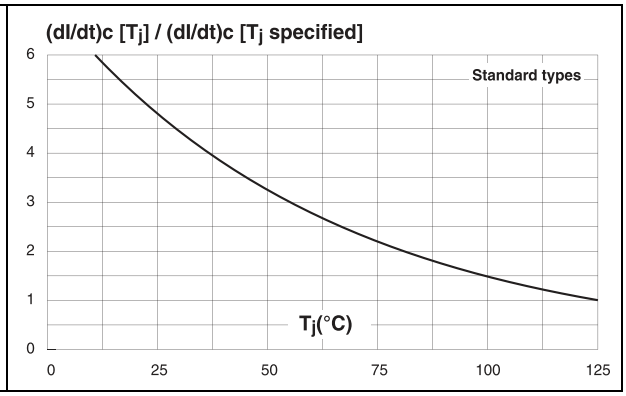
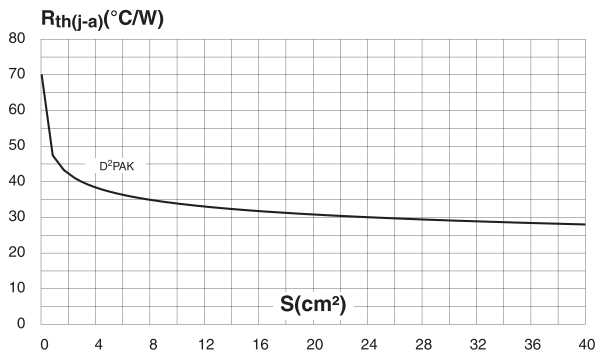


Figure 11. D²PAK thermal resistance junction to ambient versus copper surface under tab (printed circuit board FR4, copper thickness: 35 µm)



2 Ordering information

Figure 12. Ordering information scheme (BTA16 and BTB16 series)

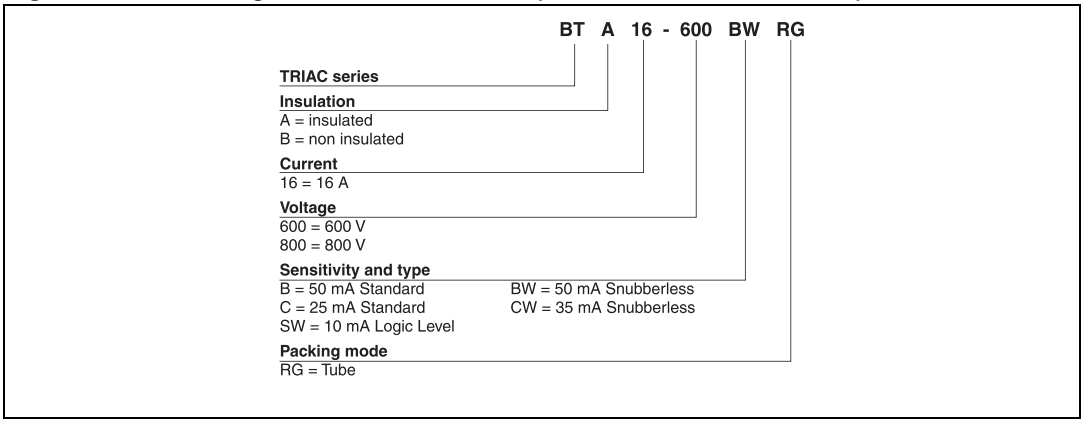


Figure 13. Ordering information scheme (T16 series)

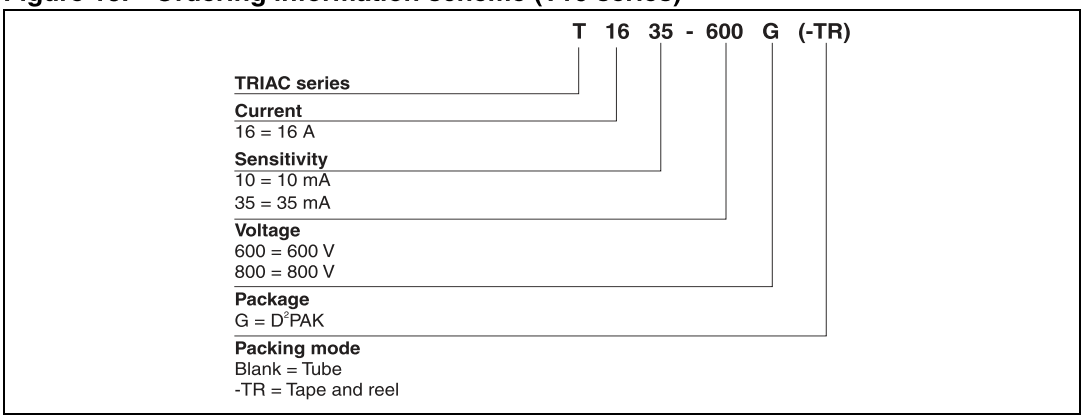


Table 7. Product selector

Device[1]	Voltage (xxx)		Sensitivity	Type	Package
	600 V	800 V			
BTA/BTB16-xxxB	X	X	50 mA	Standard	TO-220AB
BTA/BTB16-xxxBW	X	X	50 mA	Snubberless	TO-220AB
BTA/BTB16-xxxC	X		25 mA	Standard	TO-220AB
BTA/BTB16-xxxCW	X	X	35 mA	Snubberless	TO-220AB
BTA/BTB16-xxxSW	X	X	10 mA	Logic level	TO-220AB
T1610-xxxG	X	X	10 mA	Logic level	D^2PAK
T1635-xxxG	X	X	35 mA	Snubberless	D^2PAK

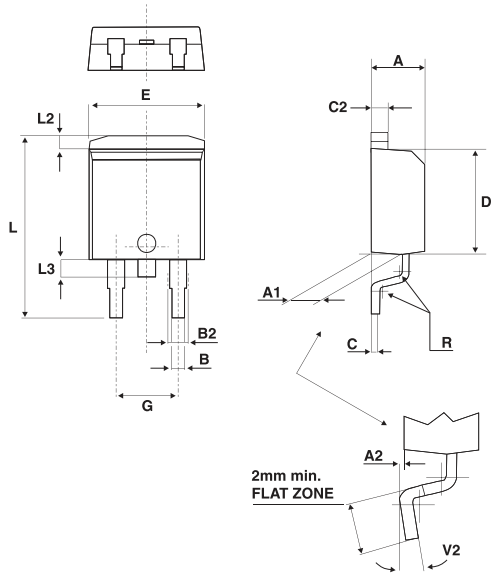
1. **BTB:** non insulated TO-220AB package

3 Package information

- Epoxy meets UL94, V0
- Recommended torque value: 0.4 to 0.6 N·m

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.

Table 8. D²PAK 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. Footprint (dimensions in mm)

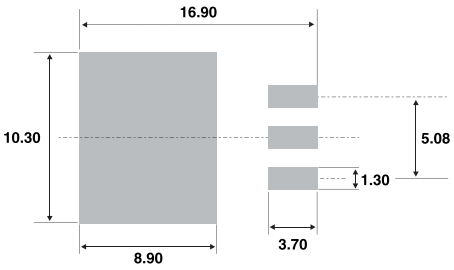
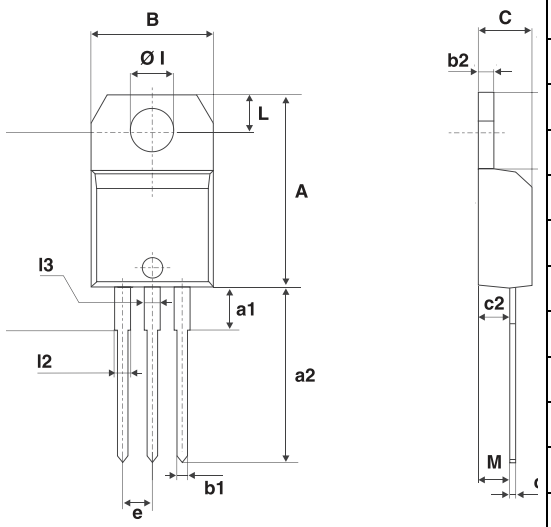


Table 9. TO-220AB (non-insulated and insulated) dimensions



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
ØI	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	

4 Ordering information

Table 10. Ordering information

Order code[1]	Marking[1]	Package	Weight	Base qty	Delivery mode
BTA16-xxxyzRG	BTA16xxxyz	TO-220AB	2.3 g	50	Tube
BTB16-xxxyzRG	BTB16xxxyz	TO-220AB	2.3 g	50	Tube
T1610-xxxG-TR	T1610xxxG	D^2PAK	1.5 g	1000	Tape and reel
T1635-xxxG	T1635xxxG			50	Tube
T1635-xxxG-TR	T1635xxxG			1000	Tape and reel

1. xxx = voltage, y = sensitivity, z = type

5 Revision history

Table 11. 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.
11-Mar-2010	9	Updated value for V_{DSM}/V_{RSM} in *Table 2*. Updated temperature in *Table 2* from 15 °C to 86 °C.

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