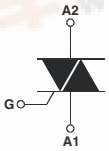
T4 Series

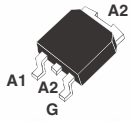
4A TRIACs

SNUBBERLESS™ & LOGIC LEVEL

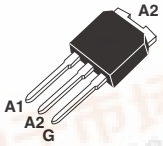
Table 1: Main Features

Symbol	Value	Unit
$I_{T(RMS)}$	4	A
V_{DRM}/V_{RRM}	600 to 800	V
$I_{GT\ (Q_1)}$	5 to 35	mA

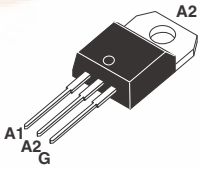




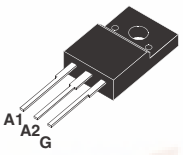
DPAK
(T4-B)



IPAK
(T4-H)



TO-220AB
(T4-T)



ISOWATT220AB
(T4-W)

DESCRIPTION

Based on ST's Snubberless / Logic level technology providing high commutation performances, the **T4** series is suitable for use on AC inductive loads.

They are recommended for applications using universal motors, electrovalves.... such as kitchen aid equipments, power tools, dishwashers,...

Available in a fully insulated package, the T4...-...W version complies with UL standards (ref. E81734).

Table 2: Order Codes

Part Number	Marking
T405-xxxB	See page table 8 on page 9
T405-xxxB-TR	
T405-xxxH	
T405-xxxT	
T405-xxxW	
T410-xxxB	
T410-xxxB-TR	
T410-xxxH	
T4105-xxxT	
T410-xxxW	
T435-xxxB	
T435-xxxB-TR	
T435-xxxH	
T435-xxxT	
T435-xxxW	

Table 3: Absolute Maximum Ratings

Symbol	Parameter			Value	Unit
$I_{T(RMS)}$	RMS on-state current (full sine wave)	IPAK/DPAK/ TO-220AB	T_c = 110°C	4	A
		ISOWATT220AB	T_c = 105°C		
I_{TSM}	Non repetitive surge peak on-state current (full cycle, T_j initial = 25°C)	F = 50 Hz	t = 20 ms	30	A
		F = 60 Hz	t = 16.7 ms	31	
I^2t	I^2t Value for fusing	t_p = 10 ms		5.1	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
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} T_j	Storage junction temperature range Operating junction temperature range			- 40 to + 150 - 40 to + 125	°C

Tables 4: Electrical Characteristics (T_j = 25°C, unless otherwise specified)

Symbol	Test Conditions	Quadrant		T4			Unit
				T405	T410	T435	
I_{GT} (1)	V_D = 12 V R_L = 30 Ω	I - II - III	MAX.	5	10	35	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 = 100 mA		MAX.	10	15	35	mA
I_L	I_G = 1.2 I_{GT}	I - III	MAX.	10	25	50	mA
		II		15	30	60	
dV/dt (2)	V_D = 67 %V_{DRM} gate open T_j = 125°C		MIN.	20	40	400	V/µs
(dI/dt)c (2)	(dV/dt)c = 0.1 V/µs T_j = 125°C		MIN.	1.8	2.7	-	A/ms
	(dV/dt)c = 10 V/µs T_j = 125°C			0.9	2.0	-	
	Without snubber T_j = 125°C			-	-	2.5	

Note 1: minimum I_{GT} is guaranted at 5% of I_{GT} max.

Note 2: for both polarities of A2 referenced to A1.

Table 5: Static Characteristics

Symbol	Test Conditions			Value	Unit
V_T (2)	I_{TM} = 5.5 A t_p = 380 µs	T_j = 25°C	MAX.	1.56	V
V_{to} (2)	Threshold voltage	T_j = 125°C	MAX.	0.89	V
R_d (2)	Dynamic resistance	T_j = 125°C	MAX.	120	mΩ
I_{DRM} I_{RRM}	$V_{DRM} = V_{RRM}$	T_j = 25°C	MAX.	5	µA
		T_j = 125°C		1	mA

Note 1: minimum I_{GT} is guaranted at 5% of I_{GT} max.
Note 2: for both polarities of A2 referenced to A1.

Table 6: Thermal resistance

Symbol	Parameter			Value	Unit
$R_{th(j-c)}$	Junction to case (AC)		IPAK / DPAK / TO-220AB	2.6	°C/W
			ISOWATT220AB	4.0	
$R_{th(j-a)}$	Junction to ambient	S = 0.5 cm^2	DPAK	70	°C/W
			TO-220AB / ISOWATT220AB	60	
			IPAK	100	

S = Copper surface under tab.

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

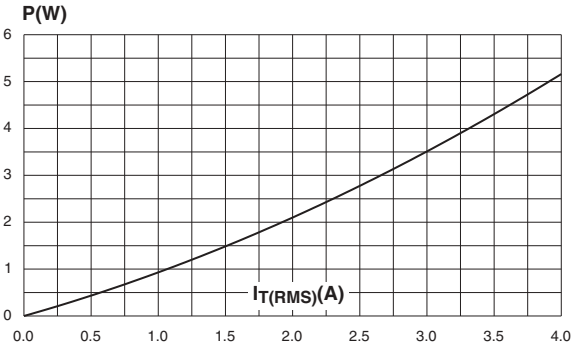


Figure 2: RMS on-state current versus case temperature (full cycle)

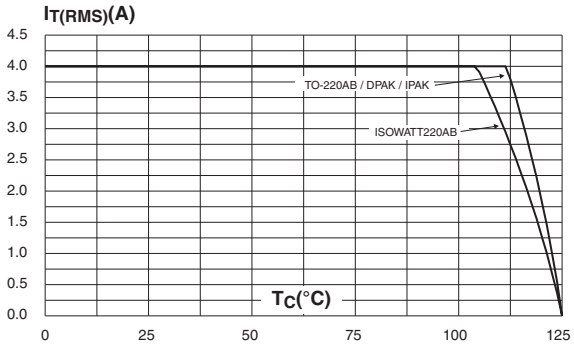


Figure 3: RMS on-state current versus ambient temperature (printed circuit board FR4, copper thickness: 35µm) (full cycle)

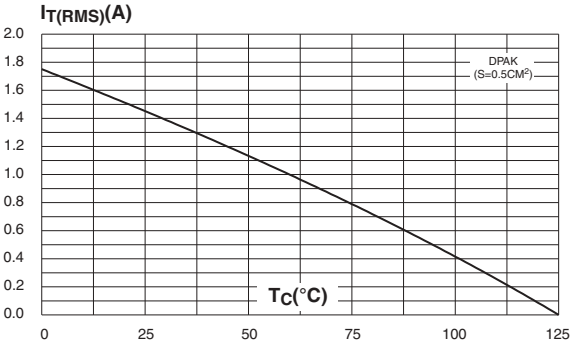


Figure 4: Relative variation of thermal impedance versus pulse duration

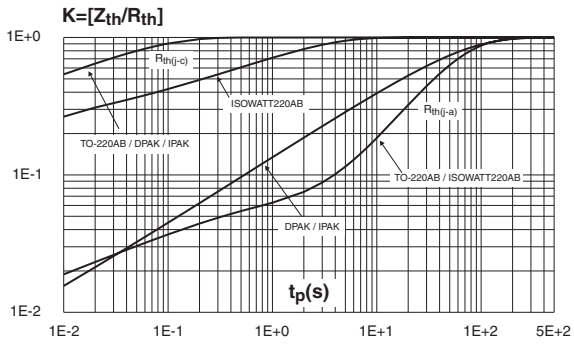


Figure 5: On-state characteristics (maximum values)

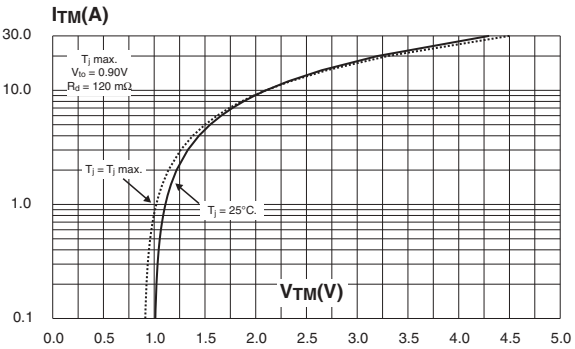


Figure 6: Surge peak on-state current versus number of cycles

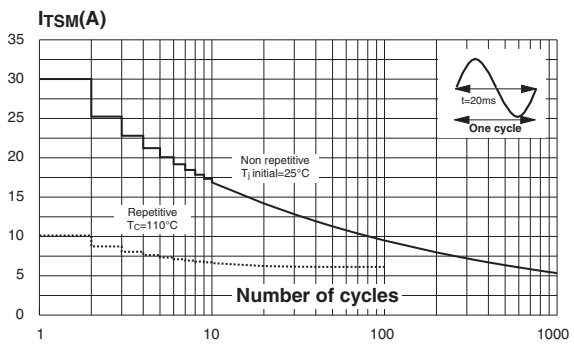


Figure 7: Non-repetitive surge peak on-state current for a sinusoidal pulse with width $t_p < 10$ ms and corresponding value of I^2t

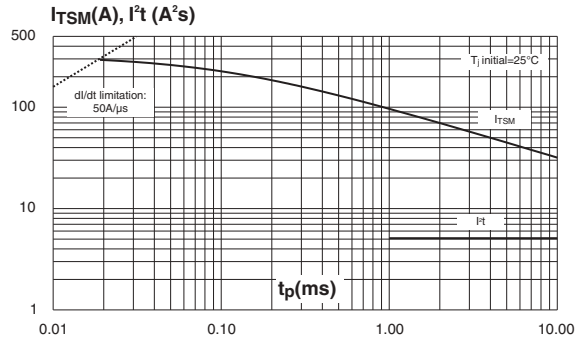


Figure 8: Relative variation of gate trigger current, holding current and latching current versus junction temperature (typical values)

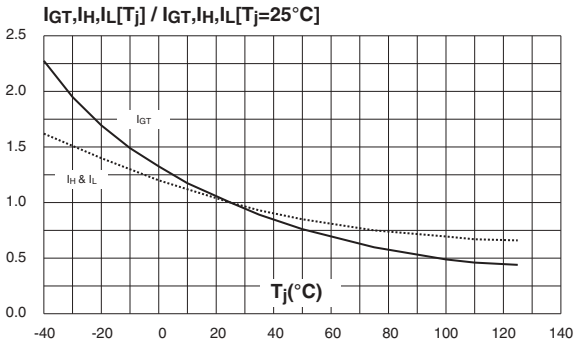


Figure 9: Relative variation of critical rate of decrease of main current versus (dV/dt)c (typical values)

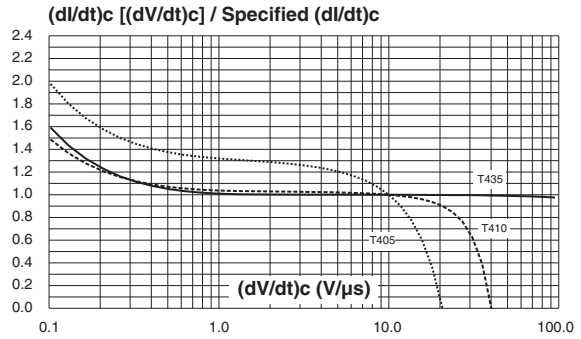


Figure 10: Relative variation of critical rate of decrease of main current versus junction temperature

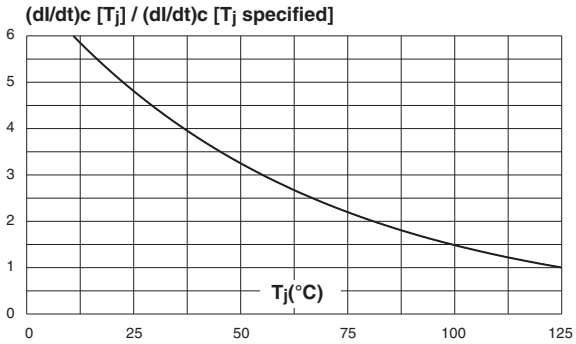


Figure 11: DPAK thermal resistance junction to ambient versus copper surface under tab (printed circuit board FR4, copper thickness: 35 µm)

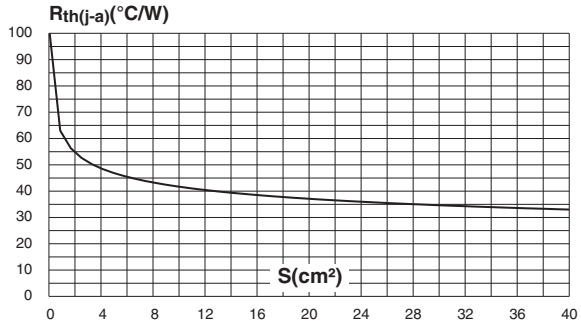


Figure 12: Ordering Information Scheme

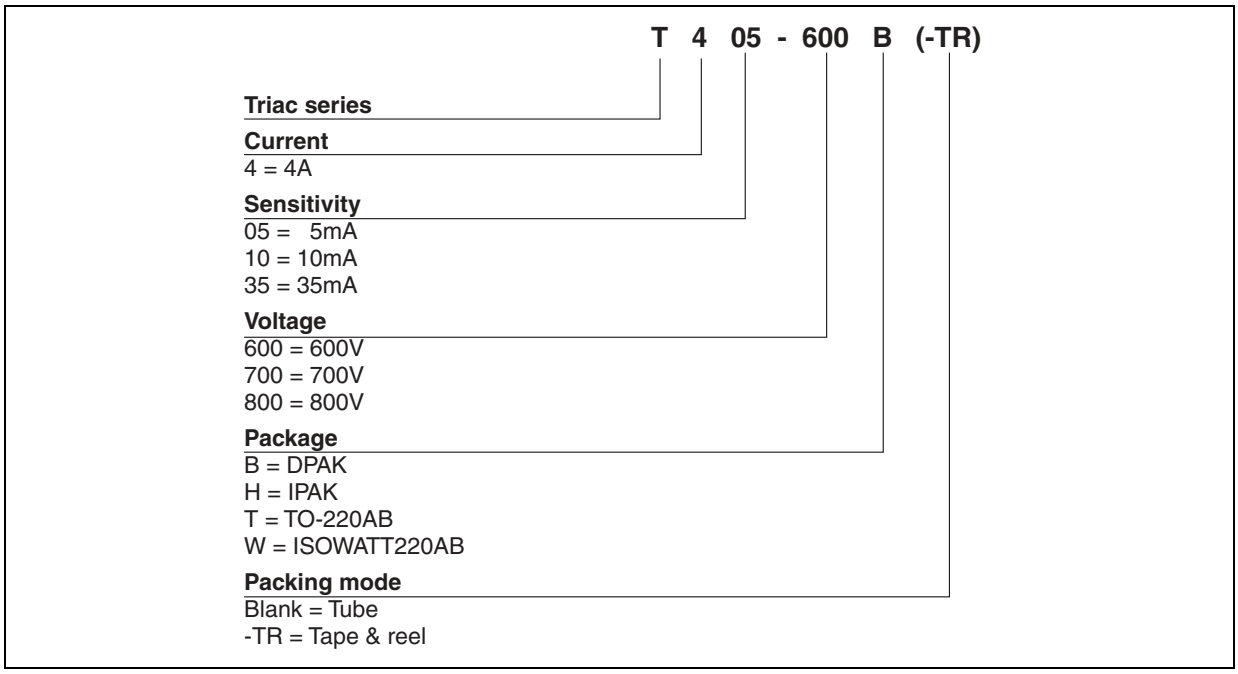
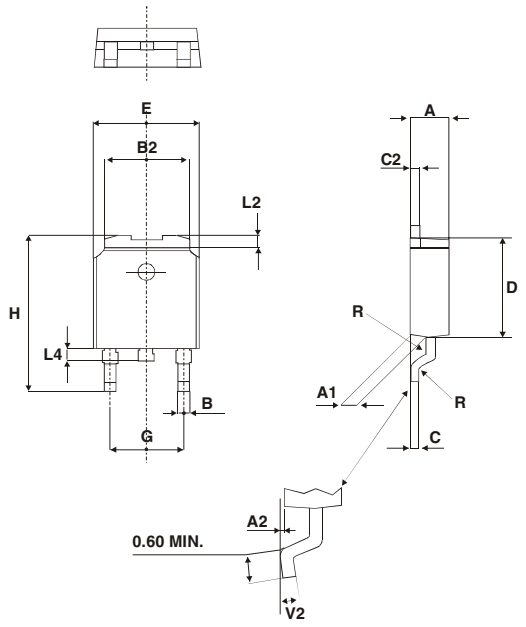


Table 7: Product Selector

Part Number	Voltage (xxx)			Sensitivity	Type	Package
	600 V	700 V	800 V			
T405-xxxB	X	X	X	5 mA	Logic level	DPAK
T405-xxxH	X	X	X	5 mA	Logic level	IPAK
T405-xxxT	X	X	X	5 mA	Logic level	TO-220AB
T405-xxxW	X	X	X	5 mA	Logic level	ISOWATT220AB
T410-xxxB	X	X	X	10 mA	Logic level	DPAK
T410-xxxH	X	X	X	10 mA	Logic Level	IPAK
T410-xxxT	X	X	X	10 mA	Logic Level	TO-220AB
T410-xxxW	X	X	X	10 mA	Logic Level	ISOWATT220AB
T435-xxxB	X	X	X	35 mA	Snubberless	DPAK
T435-xxxH	X	X	X	35 mA	Snubberless	IPAK
T435-xxxT	X	X	X	35 mA	Snubberless	TO-220AB
T435-xxxW	X	X	X	35 mA	Snubberless	ISOWATT220AB

Figure 13: DPAK Package Mechanical Data



REF.	DIMENSIONS			
	Millimeters		Inches	
	Min.	Max	Min.	Max.
A	2.20	2.40	0.086	0.094
A1	0.90	1.10	0.035	0.043
A2	0.03	0.23	0.001	0.009
B	0.64	0.90	0.025	0.035
B2	5.20	5.40	0.204	0.212
C	0.45	0.60	0.017	0.023
C2	0.48	0.60	0.018	0.023
D	6.00	6.20	0.236	0.244
E	6.40	6.60	0.251	0.259
G	4.40	4.60	0.173	0.181
H	9.35	10.10	0.368	0.397
L2	0.80 typ.		0.031 typ.	
L4	0.60	1.00	0.023	0.039
V2	0°	8°	0°	8°

Figure 14: DPAK Foot Print Dimensions
(in millimeters)

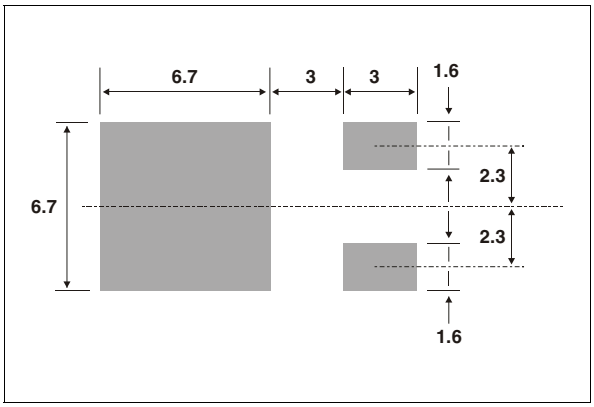
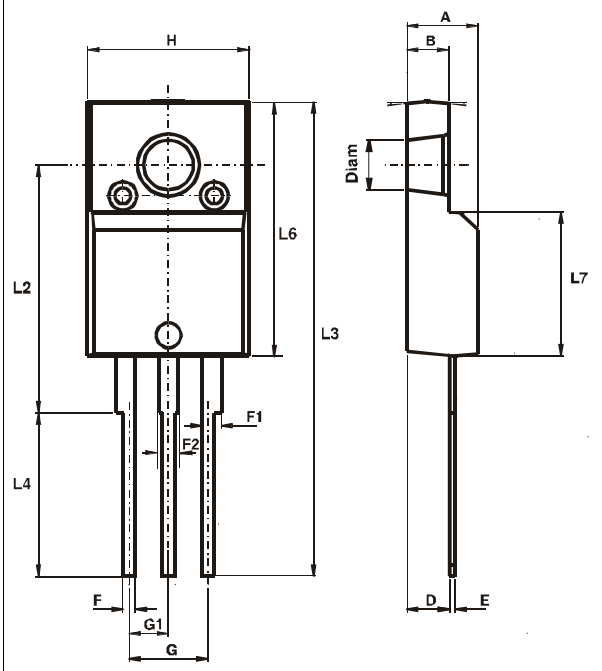
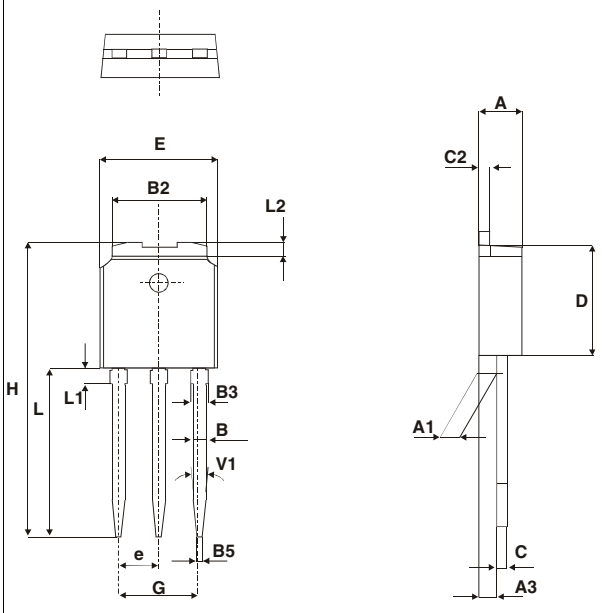


Figure 15: ISOWATT220AB Package Mechanical Data



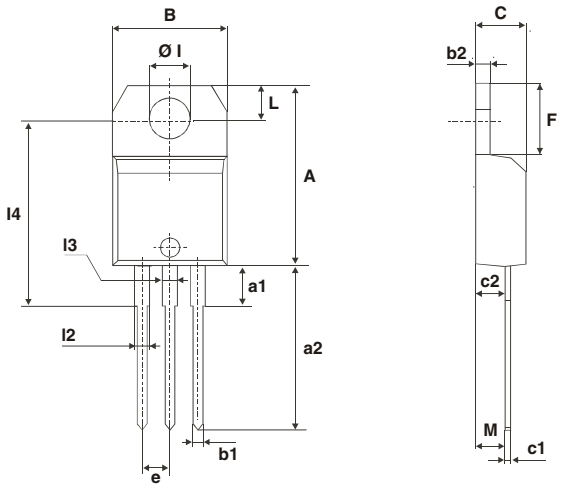
REF.	DIMENSIONS			
	Millimeters		Inches	
	Min.	Max.	Min.	Max.
A	4.40	4.60	0.173	0.181
B	2.50	2.70	0.098	0.106
D	2.50	2.75	0.098	0.108
E	0.40	0.70	0.016	0.028
F	0.75	1.00	0.030	0.039
F1	1.15	1.70	0.045	0.067
F2	1.15	1.70	0.045	0.067
G	4.95	5.20	0.195	0.205
G1	2.40	2.70	0.094	0.106
H	10.00	10.40	0.394	0.409
L2	16.00 typ.		0.630 typ.	
L3	28.60	30.60	1.125	1.205
L4	9.80	10.60	0.386	0.417
L6	15.90	16.40	0.626	0.646
L7	9.00	9.30	0.354	0.366
Diam	3.00	3.20	0.118	0.126

Figure 16: IPAK Package Mechanical Data



REF.	DIMENSIONS					
	Millimeters			Inches		
	Min.	Typ.	Max.	Min.	Typ.	Max.
A	2.20		2.40	0.086		0.094
A1	0.90		1.10	0.035		0.043
A3	0.70		1.30	0.027		0.051
B	0.64		0.90	0.025		0.035
B2	5.20		5.40	0.204		0.212
B3			0.95			0.037
B5		0.30			0.035	
C	0.45		0.60	0.017		0.023
C2	0.48		0.60	0.019		0.023
D	6		6.20	0.236		0.244
E	6.40		6.60	0.252		0.260
e		2.28			0.090	
G	4.40		4.60	0.173		0.181
H		16.10			0.634	
L	9		9.40	0.354		0.370
L1	0.8		1.20	0.031		0.047
L2		0.80	1		0.031	0.039
V1		10°			10°	

Figure 17: TO-220AB Package Mechanical Data



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
l4	15.80	16.40	16.80	0.622	0.646	0.661
L	2.65		2.95	0.104		0.116
l2	1.14		1.70	0.044		0.066
l3	1.14		1.70	0.044		0.066
M		2.60			0.102	

Table 8: Ordering Information

Ordering type	Marking	Package	Weight	Base qty	Delivery mode
T4xx-yyyB	T4 xxyy	DPAK	0.3 g	75	Tube
T4xx-yyyB-TR	T4 xxyy	DPAK	0.3 g	2500	Tape & reel
T4xx-yyyH	T4 xxyy	IPAK	0.4 g	75	Tube
T4xx-yyyT	T4xx yyyT	TO-220AB	2.3 g	50	Tube
T4xx-yyyB	T4xxyyyW	ISOWATT220AB	2.1 g	50	Tube

Note: xxx = voltage, yy = sensitivity

Table 9: Revision History

Date	Revision	Description of Changes
Jun-2003	5	Last update.
25-Mar-2005	6	Layout update. No content change.
25-Jan-2005	7	Markings changed in Table 8