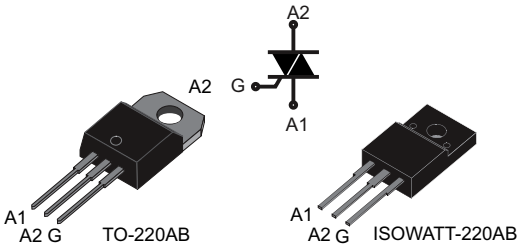
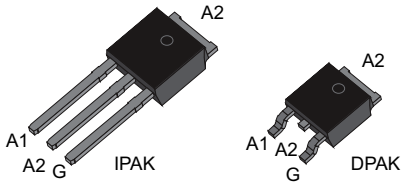
T4 series

4 A Triacs

Datasheet – production data





Features

- Three quadrants Triac
- 600 to 800 V V_{DRM}/V_{RRM}
- UL certified (ref. file E81734)

Applications

- General purpose AC inductive loads
- Motor control circuits
- Small home appliances

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, electro valves, kitchen aid equipments, power tools, dishwashers. Available in a fully insulated package, the T4yy-xxxW version complies with UL standards (ref.E81734).

Table 1. Main characteristics

Symbol	Value	Unit
$I_{T(rms)}$	4	A
V_{DRM}, V_{RRM}	600 to 800	V
I_{GT}	5 to 35	mA

Table 2. Device summary

Symbol	Marking
T405-xxxB	see *Table 12*
T405-xxxB-TR	
T405-xxxH	
T405-xxxT	
T405-xxxW	
T410-xxxB	
T410-xxxB-TR	
T410-xxxH	
T410-xxxT	
T410-xxxW	
T435-xxxB	
T435-xxxB-TR	
T435-xxxH	
T435-xxxT	
T435-xxxW	

xxx = Voltage: 600 V, 700 V or 800 V (see *Table 11*).

1 Characteristics

Table 3. Absolute maximum ratings (T_j = 25 °C unless otherwise stated)

Symbol	Parameter			Value	Unit
$I_{T(rms)}$	On-state rms 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 + 150	°C

Table 4. Electrical characteristics (T_j = 25 °C, unless otherwise stated)

Symbol	Test conditions	Quadrant		Value			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}	V_D = 12 V, R_L = 30 Ω	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	Max.	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			0.9	2.0		
	(without snubber)					2.5	

1. Minimum I_{GT} is guaranteed 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_{TM} (1)	I_{TM} = 8.5 A, t_p = 380 µs	T_j = 25 °C	Max.	1.56	V
V_{t0} (1)	Threshold voltage	T_j = 125 °C	Max.	0.89	V
R_d (1)	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

1. 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 (DC)	$S^{(1)}$ = 0.5 cm²	DPAK	70	°C/W
	Junction to ambient (DC)		ISOWATT220AB, TO-220AB	60	
			IPAK	100	

1. S = Copper surface under tab.

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

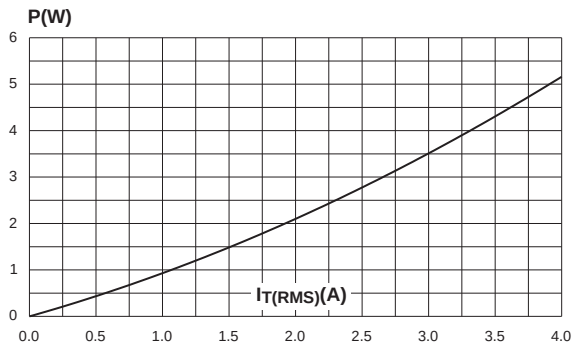


Figure 2. RMS on-state current versus case temperature (full cycle)

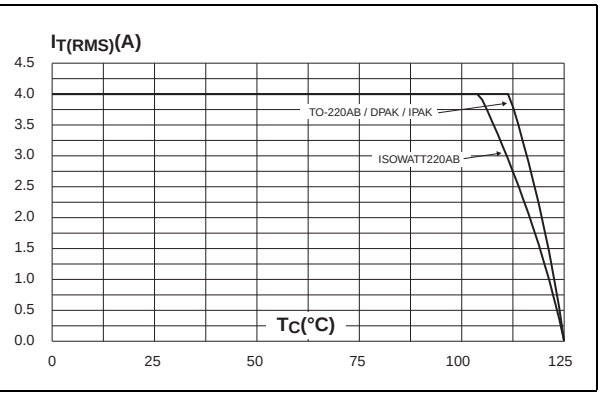


Figure 3. RMS on-state current versus ambient temperature (printed circuit board FR4, copper thickness: 35µm) (full cycle)

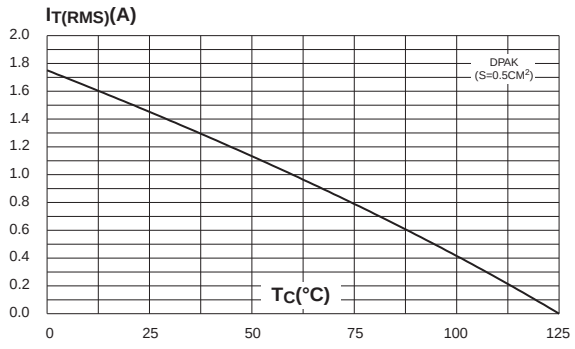


Figure 4. Relative variation of thermal impedance versus pulse duration

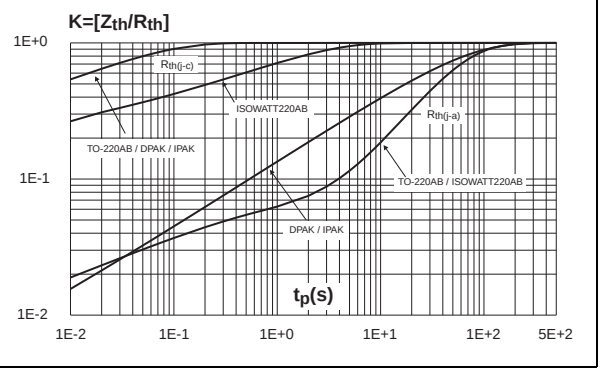


Figure 5. On-state characteristics (maximum values)

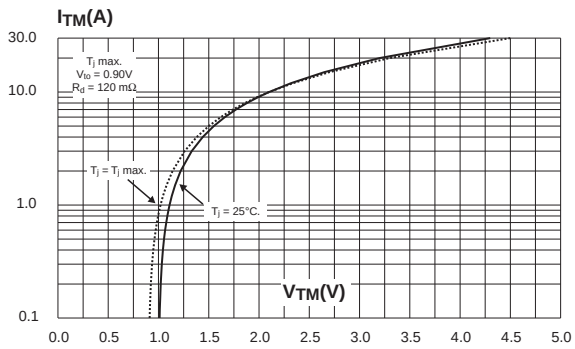


Figure 6. Surge peak on-state current versus number of cycles

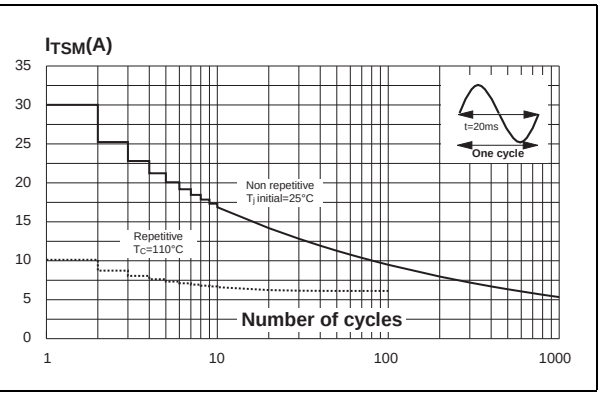


Figure 7. Non-repetitive surge peak on-state current for a sinusoidal pulse with width t_p < 10 ms and corresponding value of I^2t

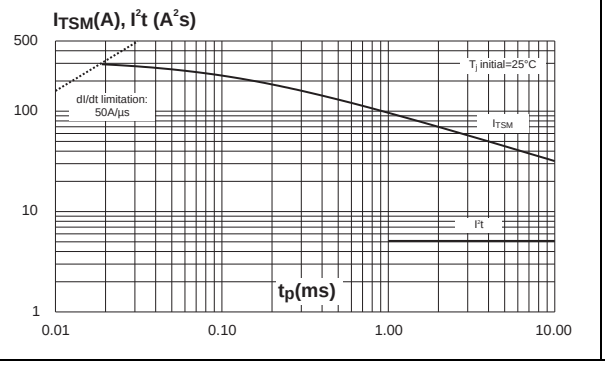


Figure 8. Relative variation of gate trigger current, holding current and latching current versus junction temperature (typical values)

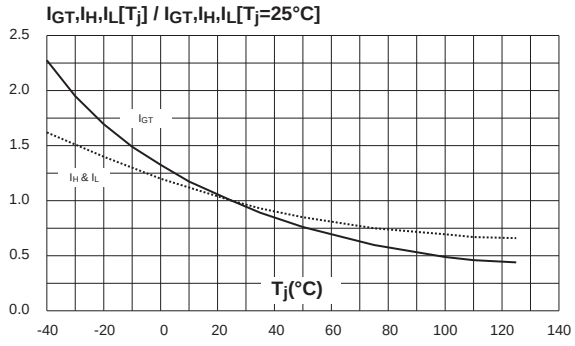


Figure 9. Relative variation of critical rate of decrease of main current versus (dV/dt)c (typical values)

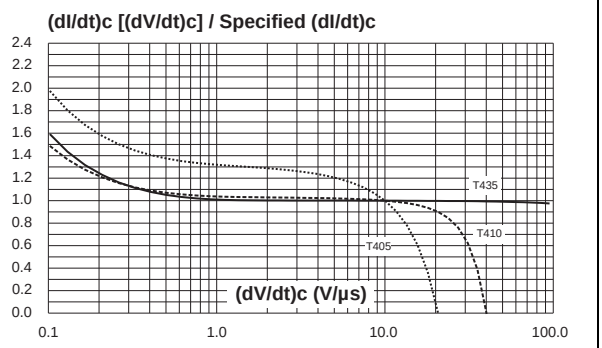


Figure 10. Relative variation of critical rate of decrease of main current versus junction temperature

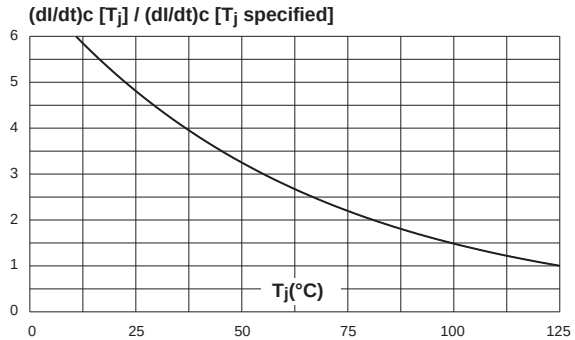
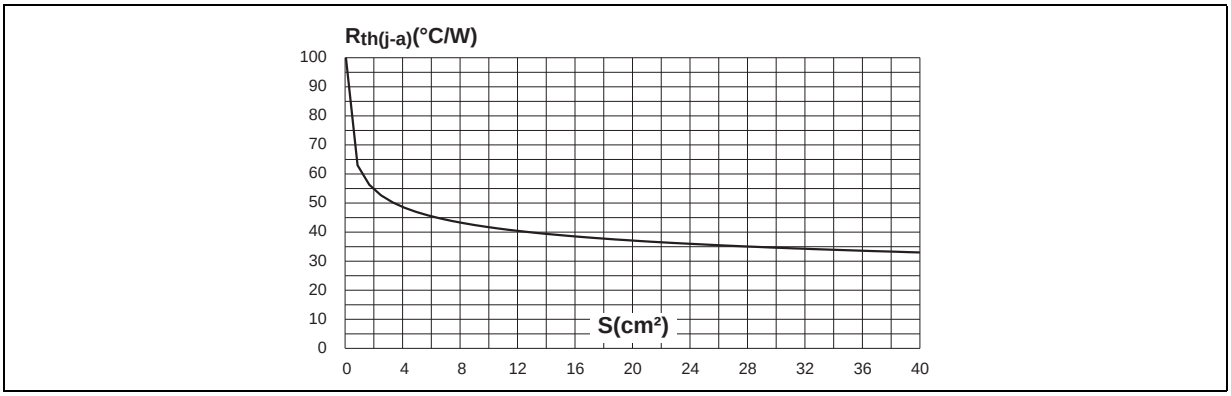


Figure 11. DPAK thermal resistance junction to ambient versus copper surface under tab (printed circuit board FR4, copper thickness: 35 µm)

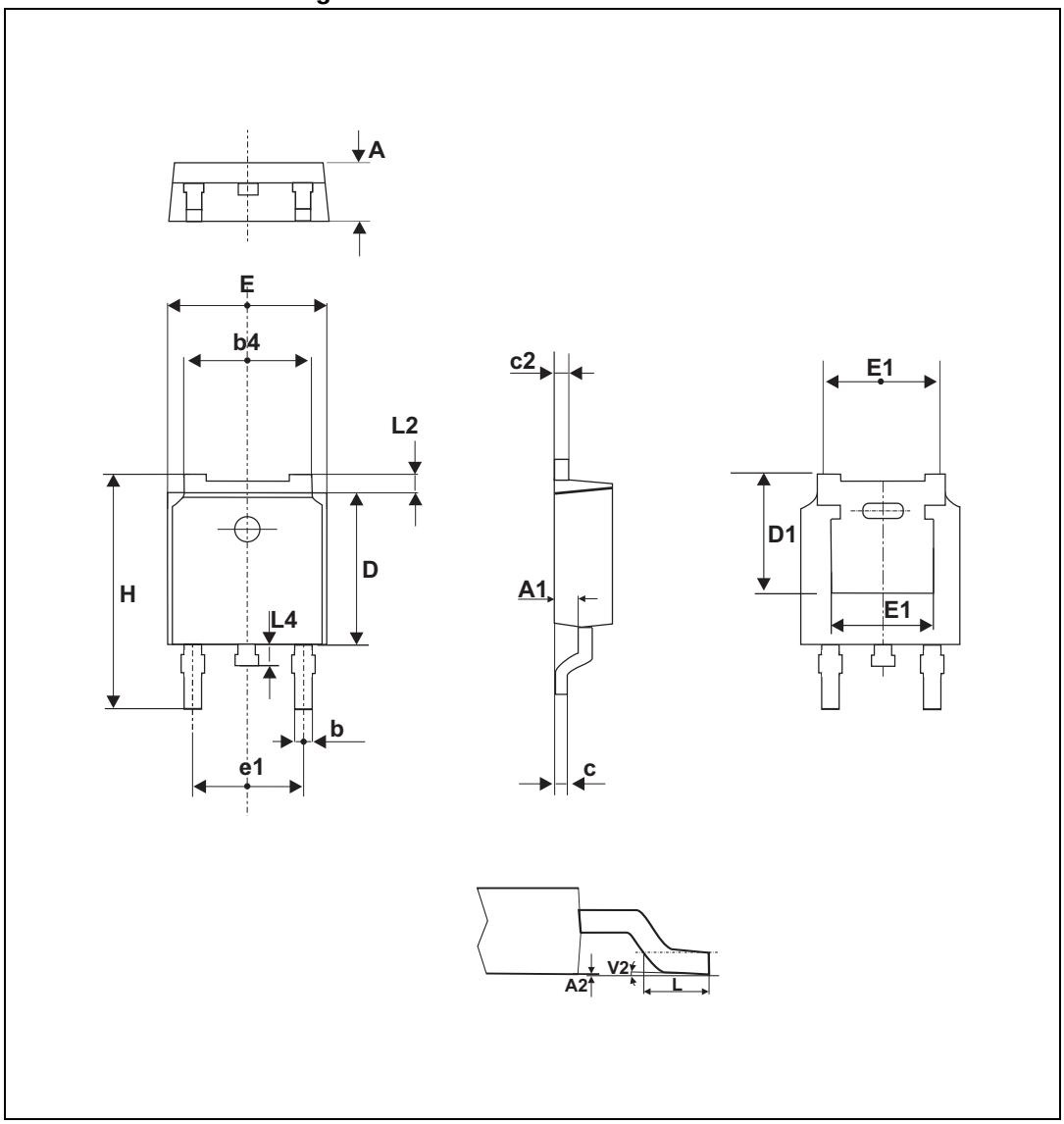


2 Package information

- Epoxy meets UL94, V0
- Lead-free package
- Recommended torque: 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.

Figure 12. DPAK dimension definitions



Note: this package drawing may slightly differ from the physical package. However, all the specified dimensions are guaranteed.

Table 7. DPAK dimension values

Ref.	Dimensions					
	Millimeters			Inches		
	Min.	Typ.	Max.	Min.	Typ.	Max.
A	2.18		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
b4	4.95		5.46	0.195		0.215
c	0.46		0.61	0.018		0.024
c2	0.46		0.60	0.018		0.023
D	5.97		6.22	0.235		0.244
D1	5.10			0.201		
E	6.35		6.73	0.250		0.264
E1		4.32			0.170	
e1	4.40		4.70	0.173		0.185
H	9.35		10.40	0.368		0.409
L	1.00		1.78	0.039		0.070
L2			1.27			0.05
L4	0.60		1.02	0.023		0.040
V2	0°		8°	0°		8°

Figure 13. Footprint (dimensions in mm)

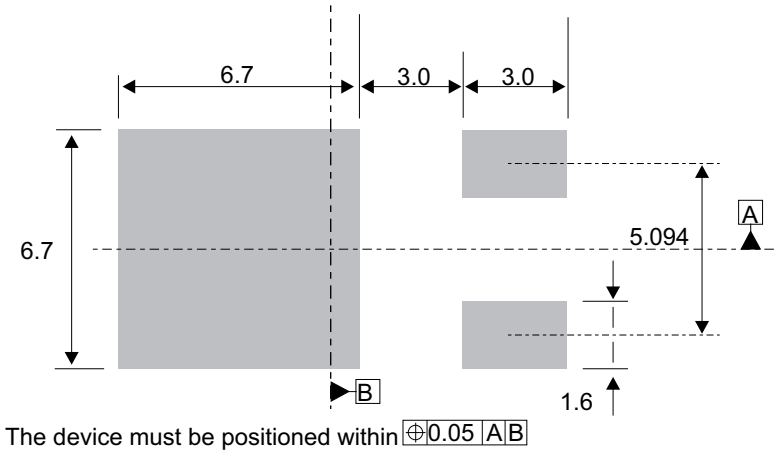


Figure 14. ISOWATT220AB dimension definitions

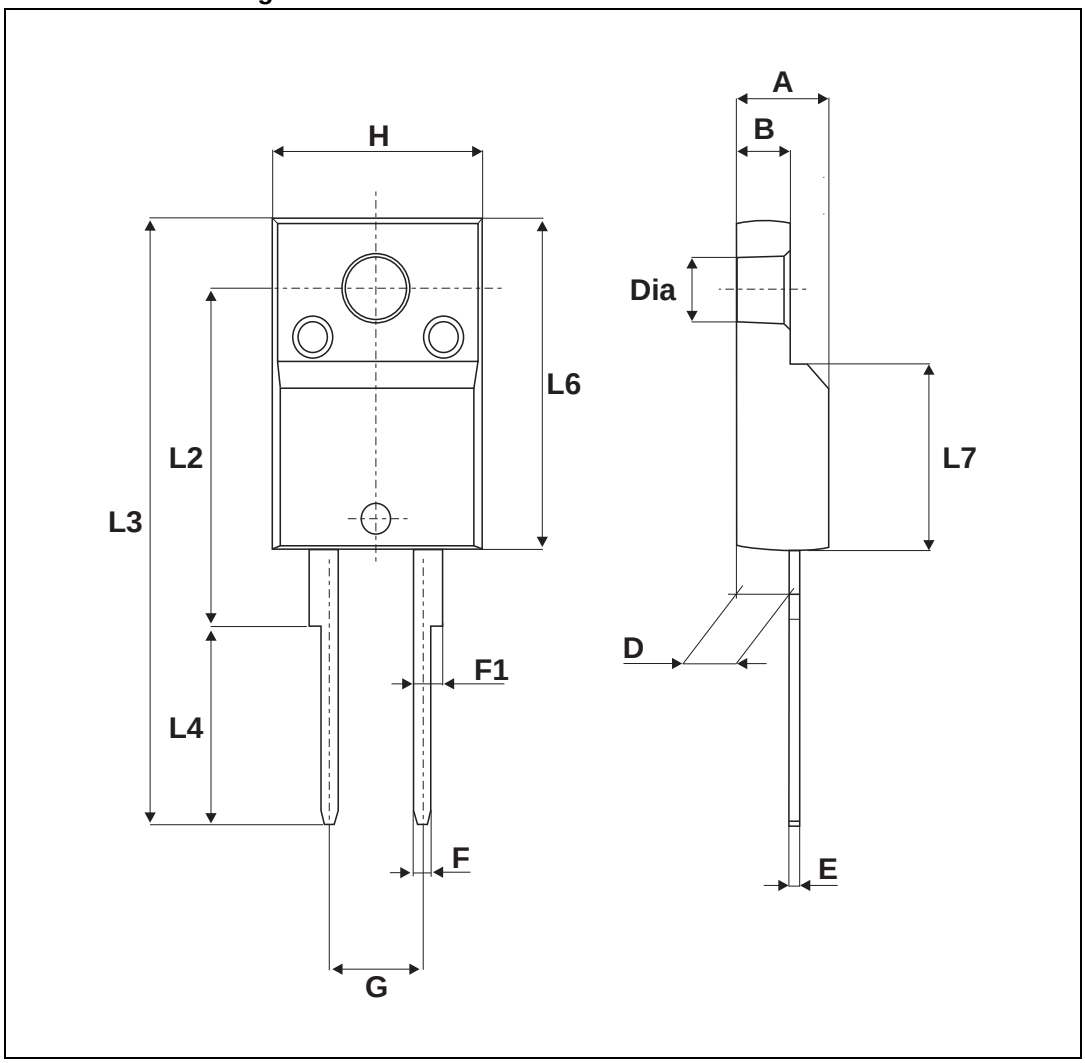
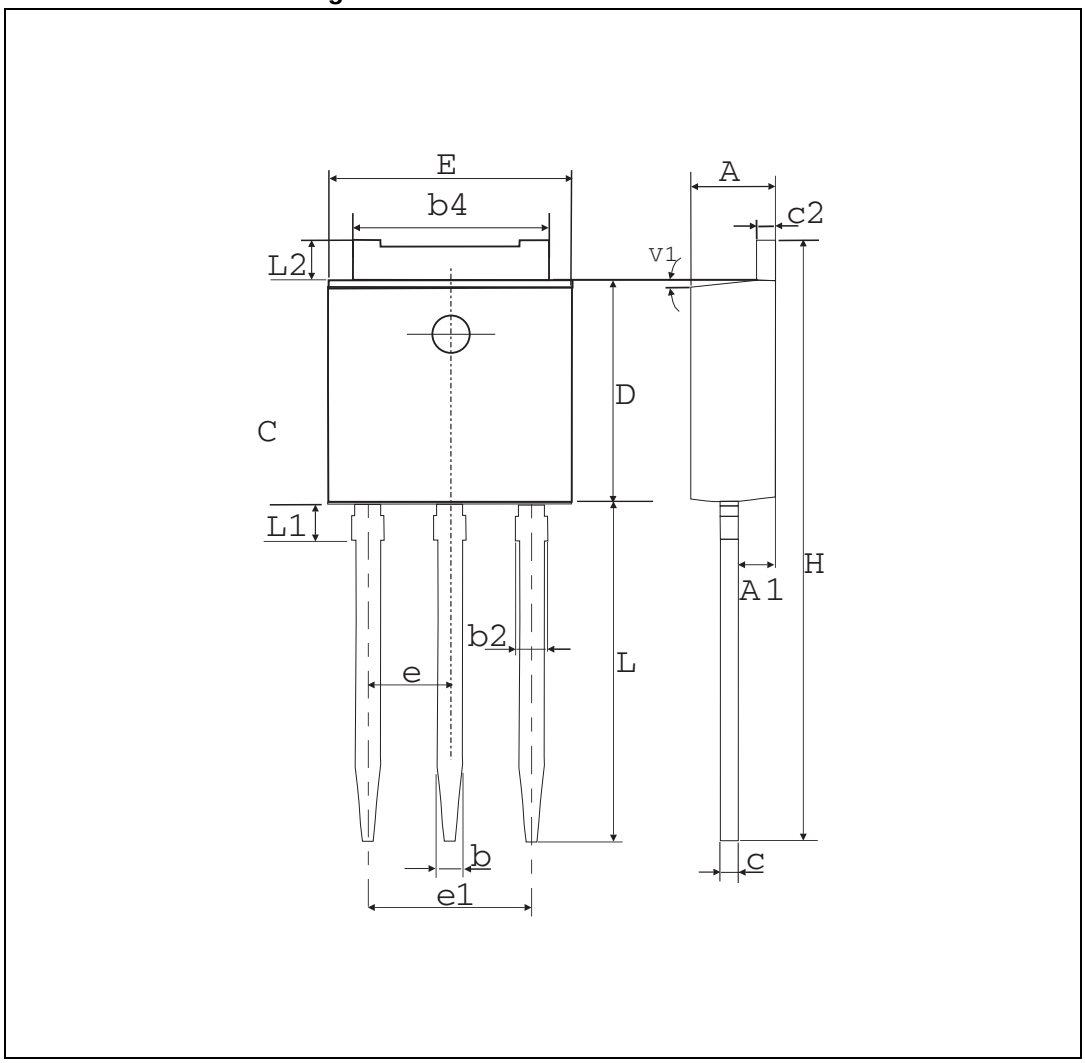


Table 8. ISOWATT220AB dimension values

Ref.	Dimensions					
	Millimeters			Inches		
	Min.	Typ.	Max.	Min.	Typ.	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 15. IPAK dimension definitions



Note: this package drawing may slightly differ from the physical package. However, all the specified dimensions are guaranteed.

Table 9. IPAK dimension values

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
b	0.64		0.90	0.025		0.035
b2			0.95			0.037
b4	5.20		5.43	0.204		0.213
c	0.45		0.60	0.017		0.023
c2	0.46		0.60	0.018		0.023
D	6		6.20	0.236		0.244
E	6.40		6.70	0.252		0.263
e		2.28			0.090	
e1	4.40		4.60	0.173		0.181
H		16.10			0.634	
L	9		9.60	0.354		0.377
L1	0.8		1.20	0.031		0.047
L2		0.80	1.25		0.031	0.049
V1		10°			10°	

Figure 16. TO-220AB (NIns. & Ins. 20-up) dimension definitions

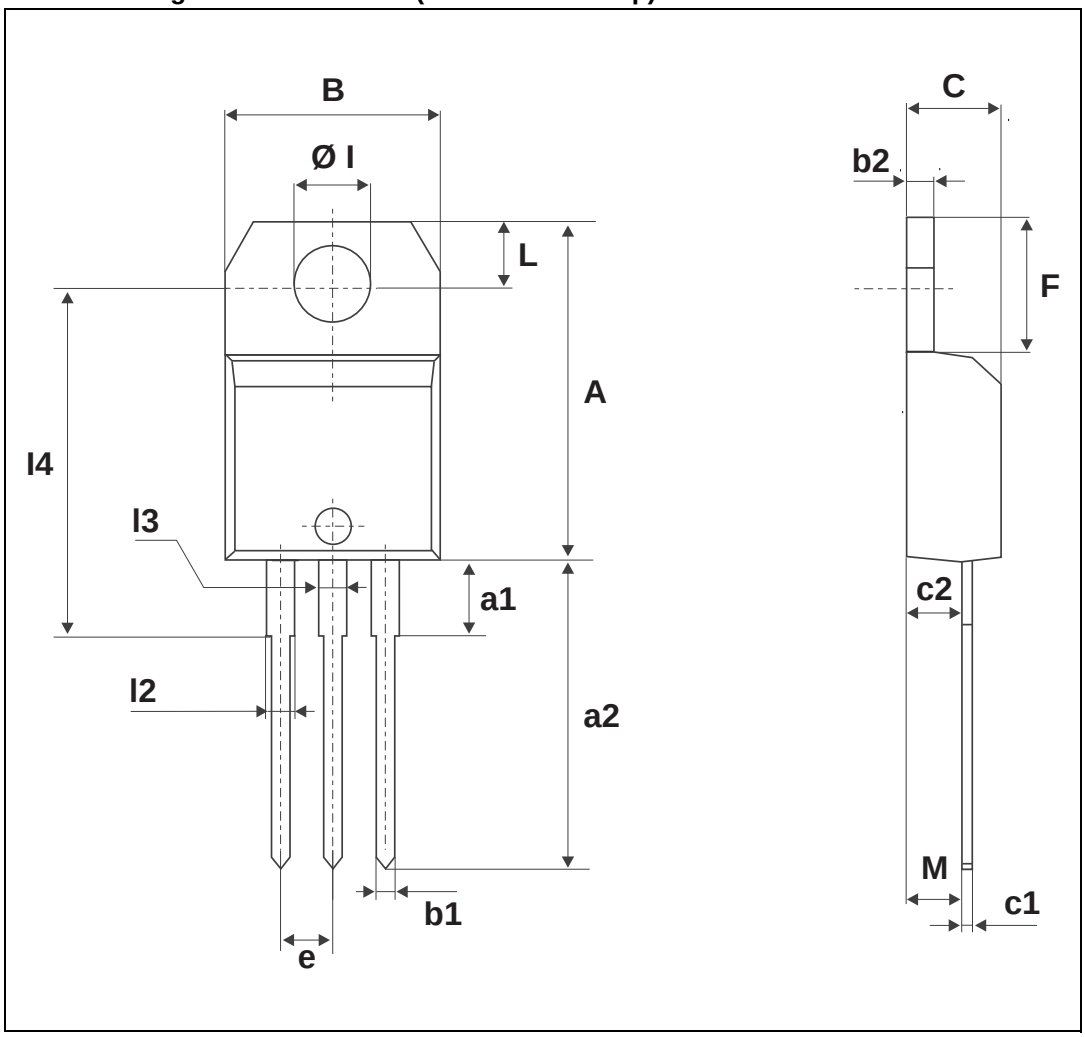


Table 10. TO-220AB (NIns. & Ins. 20-up) dimension values

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	

3 Ordering information

Figure 17. Order information scheme

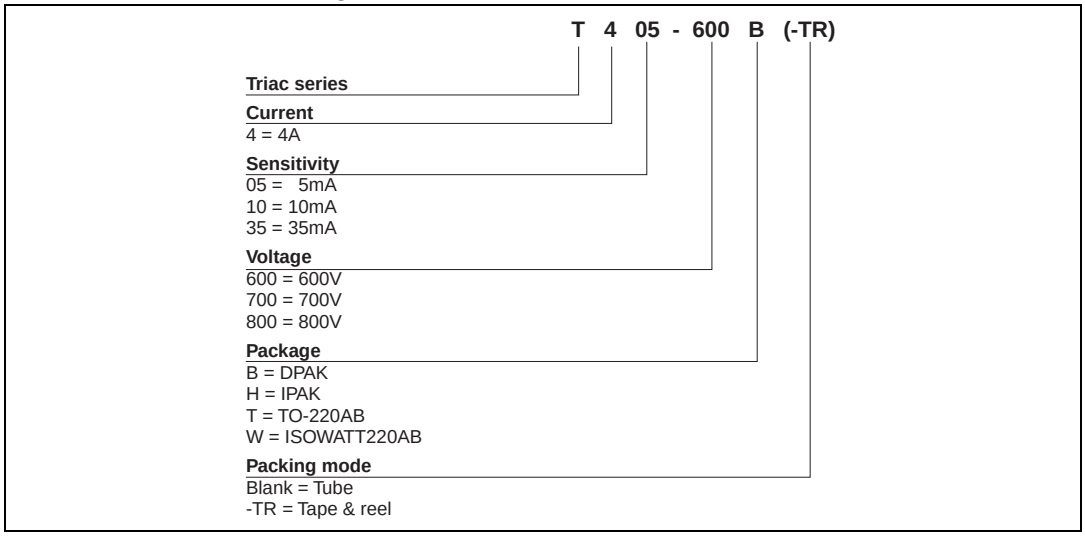


Table 11. Product Selector

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

Blank = Unavailable

Table 12. Ordering information

Order code	Marking	Package	Weight	Base qty	Delivery mode
T405-600B	T4 0560	DPAK	0.3 g	75	Tube
T410-600B	T4 1060				
T435-600B	T4 3560				
T405-700B	T4 0570				
T435-700B	T4 3570				
T405-800B	T4 0580				
T410-800B	T4 1080				
T435-800B	T4 3580				
T405-600B-TR	T4 0560			2500	Tape and reel
T410-600B-TR	T4 1060				
T435-600B-TR	T4 3560				
T405-700B-TR	T4 0570			75	Tube
T435-700B-TR	T4 3570				
T405-800B-TR	T4 0580				
T410-800B-TR	T4 1080				
T435-800B-TR	T4 3580				
T405-600H	T4 0560	IPAK	0.4		
T410-600H	T4 1060				
T435-600H	T4 3560				
T405-800H	T4 0580				
T410-800H	T4 1080				
T435-800H	T4 3580				
T405-600T	T405-600T	TO-220AB	2.3	50	
T410-600T	T410-600T				
T435-600T	T435-600T				
T410-700T	T410-700T				
T410-800T	T410-800T				
T435-800T	T435-800T				
T405-600W	T405-600W	ISOWATT220AB	2.1		
T410-600W	T410-600W				
T435-600W	T435-600W				
T435-800W	T435-800W				

4 Revision history

Table 13. Document revision history

Date	Revision	Changes
Jun-2003	2	Last updated.
25-Mar-2005	3	Layout updated0 No content change.
25-Jan-2006	4	Markings changed in *Table 12*.
14-May-2014	5	Updated DPAK and IPAK package information and reformatted to current standard.
11-Feb-2015	6	Updated package silhouettes in cover page.