

# **T4 Series**

# **4A TRIACs**

SNUBBERLESS™ & LOGIC LEVEL

**Table 1: Main Features** 

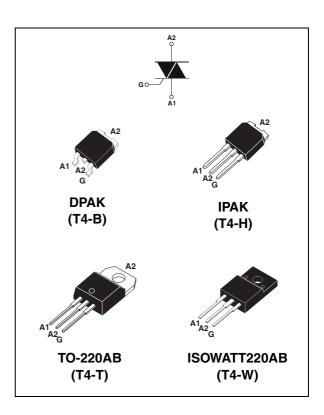
Symbol	Value	Unit
I <sub>T(RMS)</sub>	4	Α
V <sub>DRM</sub> /V <sub>RRM</sub>	600 to 800	V
I <sub>GT (Q₁)</sub>	5 to 35	mA

#### **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	
T405-xxxB-TR	
T405-xxxH	
T405-xxxT	
T405-xxxW	
T410-xxxB	
T410-xxxB-TR	See page table 8 on
T410-xxxH	page 9
T4105-xxxT	page 3
T410-xxxW	
T435-xxxB	
T435-xxxB-TR	
T435-xxxH	
T435-xxxT	
T435-xxxW	

## **T4 Series**

**Table 3: Absolute Maximum Ratings** 

Symbol	Parame	eter		Value	Unit
I <sub>T(RMS)</sub>	RMS on-state current (full sine wave)	IPAK/DPAK/ TO-220AB	T <sub>c</sub> = 110°C	4	Α
, ,	wave	ISOWATT220AB	T <sub>c</sub> = 105°C		
I <sub>TSM</sub>	Non repetitive surge peak on-state		t = 20 ms	30	Α
.121/1	current (full cycle, $T_j$ initial = 25°C)	F = 60 Hz	t = 16.7 ms	31	^
l <sup>2</sup> t	I't Value for fusing	t <sub>p</sub> = 10 ms	5.1	A <sup>2</sup> s	
dI/dt	Critical rate of rise of on-state current $I_G = 2 \times I_{GT}$ , $t_r \le 100 \text{ ns}$	$F = 120 \text{ Hz}$ $T_j = 125^{\circ}\text{C}$		50	A/µs
I <sub>GM</sub>	Peak gate current	4	Α		
P <sub>G(AV)</sub>	Average gate power dissipation	1	W		
T <sub>stg</sub> T <sub>j</sub>	Storage junction temperature range Operating junction temperature range	- 40 to + 150 - 40 to + 125	°C		

Tables 4: Electrical Characteristics ( $T_j = 25^{\circ}C$ , unless otherwise specified)

Symbol	Test Conditions	Quadrant			Unit		
Symbol	rest Conditions	Quaurant		T405	T410	T435	- Ollit
I <sub>GT</sub> (1)	V <sub>D</sub> = 12 V R <sub>I</sub> = 30 Ω	1 - 11 - 111	MAX.	5	10	35	mA
V <sub>GT</sub>	AD - 15 A 11 - 20 25	I - II - III	MAX.		1.3	l	V
V <sub>GD</sub>	$\begin{aligned} V_D &= V_{DRM} & R_L &= 3.3 \text{ k}\Omega \\ T_j &= 125 ^{\circ}\text{C} & \text{I - II - III} \end{aligned}$		MIN.	0.2		V	
I <sub>H</sub> (2)	I <sub>T</sub> = 100 mA	1	MAX.	10	15	35	mA
I <sub>L</sub> I <sub>G</sub> = 1.2 I <sub>GT</sub>	I <sub>G</sub> = 1.2 I <sub>GT</sub>	1 - 111	MAX.	10	25	50	mA
'L	G = 1.2   G	II		15	30	60	
dV/dt (2)	$V_D = 67 \text{ %}V_{DRM}$ gate open $T_j = 125 \text{ °C}$		MIN.	20	40	400	V/µs
	$(dV/dt)c = 0.1 V/\mu s$ $T_j = 125^{\circ}C$			1.8	2.7	-	
(dl/dt)c (2)	$(dV/dt)c = 10 V/\mu s$ $T_j = 125^{\circ}C$		MIN.	0.9	2.0	-	A/ms
	Without snubber $T_j = 125^{\circ}C$			-	-	2.5	

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

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

**Table 5: Static Characteristics** 

Symbol	Test C	Value	Unit		
V <sub>T</sub> (2)	$I_{TM} = 5.5 \text{ A}$ $t_p = 380  \mu\text{s}$	$T_j = 25^{\circ}C$	MAX.	1.56	V
V <sub>to</sub> (2)	Threshold voltage	T <sub>j</sub> = 125°C	MAX.	0.89	V
R <sub>d</sub> (2)	Dynamic resistance	T <sub>j</sub> = 125°C	MAX.	120	mΩ
I <sub>DRM</sub> V <sub>DRM</sub> = V <sub>RRM</sub>		T <sub>j</sub> = 25°C	MAX.	5	μΑ
I <sub>RRM</sub>	*DRIM *RRIM	T <sub>j</sub> = 125°C	IVI/A/A.	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		Value	Unit		
R <sub>th(j-c)</sub>	Junction to case (AC)		IPAK / DPAK / TO-220AB		°C/W
' 'th(j-c)			ISOWATT220AB	4.0	
		$S = 0.5 \text{ cm}^2$	DPAK	70	
R <sub>th(j-a)</sub>	Junction to ambient		TO-220AB / ISOWATT220AB	60	°C/W
			IPAK	100	

S = Copper surface under tab.

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

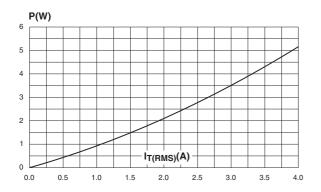


Figure 3: RMS on-state current versus ambient temperature (printed circuit board FR4, copper thickness: 35µm) (full cycle)

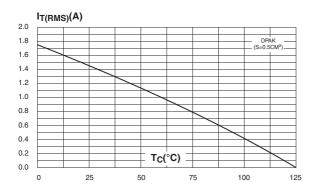


Figure 5: On-state characteristics (maximum values)

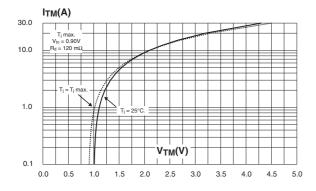


Figure 2: RMS on-state current versus case temperature (full cycle)

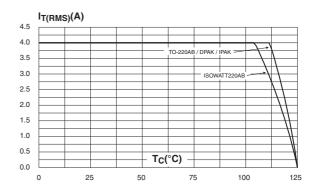


Figure 4: Relative variation of thermal impedance versus pulse duration

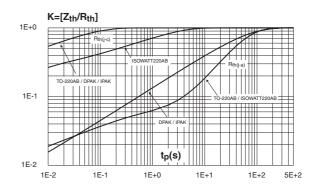
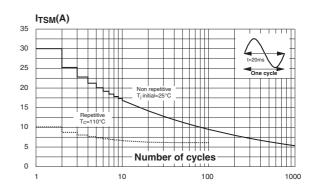


Figure 6: Surge peak on-state current versus number of cycles



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Figure 7: Non-repetitive surge peak on-state current for a sinusoidal pulse with width  $t_{\rm p}$  < 10 ms and corresponding value of  $l^2t$ 

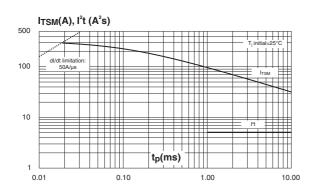


Figure 9: Relative variation of critical rate of decrease of main current versus (dV/dt)c (typical values)

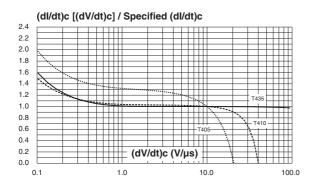


Figure 11: DPAK thermal resistance junction to ambient versus copper surface under tab (printed circuit board FR4, copper thickness: 35 μm)

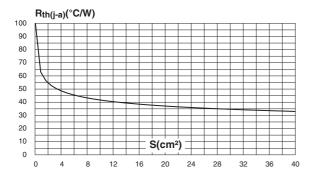


Figure 8: Relative variation of gate trigger current, holding current and latching current versus junction temperature (typical values)

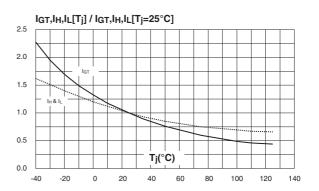
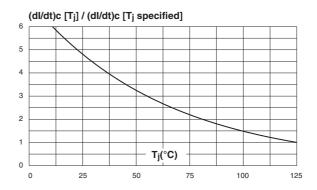
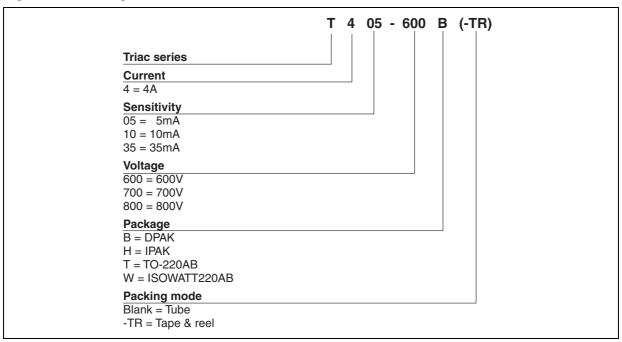


Figure 10: Relative variation of critical rate of decrease of main current versus junction temperature



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Figure 12: Ordering Information Scheme

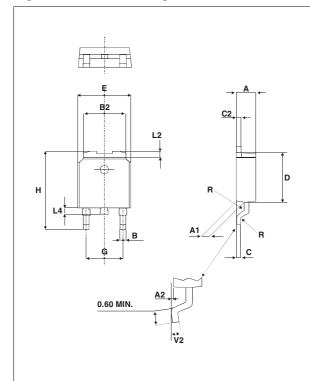


**Table 7: Product Selector** 

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

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Figure 13: DPAK Package Mechanical Data



	DIMENSIONS						
REF.	Millin	neters	Inches				
	Min.	Max	Min.	Max.			
Α	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			
В	0.64	0.90	0.025	0.035			
B2	5.20	5.40	0.204	0.212			
С	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			
Е	6.40	6.60	0.251	0.259			
G	4.40	4.60	0.173	0.181			
Н	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)

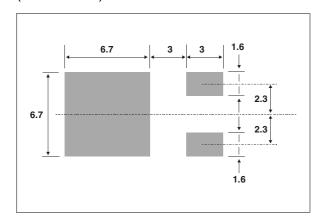
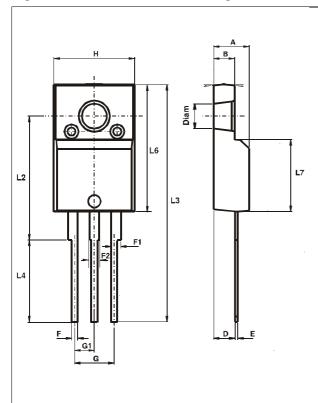
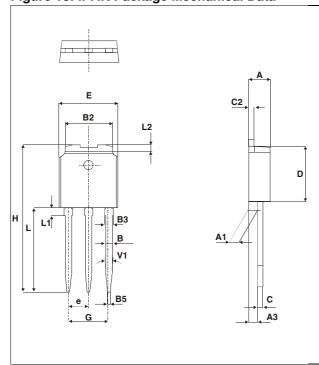


Figure 15: ISOWATT220AB Package Mechanical Data



	DIMENSIONS								
REF.	Millim	neters	Inches						
	Min.	Max.	Min.	Max.					
Α	4.40	4.60	0.173	0.181					
В	2.50	2.70	0.098	0.106					
D	2.50	2.75	0.098	0.108					
Е	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					
Н	10.00	10.40	0.394	0.409					
L2	16.00	typ.	0.630	0 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



		DIMENSIONS					
REF.	Mi	illimete	rs		;		
	Min.	Тур.	Max.	Min.	Тур.	Max.	
Α	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	
В	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		
С	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	
е		2.28			0.090		
G	4.40		4.60	0.173		0.181	
Н		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°		

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Figure 17: TO-220AB Package Mechanical Data

	DIMENSIONS						
REF.	Millimeters			Inches			
	Min.	Тур.	Max.	Min.	Тур.	Max.	
Α	15.20		15.90	0.598		0.625	
a1		3.75			0.147		
a2	13.00		14.00	0.511		0.551	
В	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	
С	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	
е	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	
14	15.80	16.40	16.80	0.622	0.646	0.661	
L	2.65		2.95	0.104		0.116	
12	1.14		1.70	0.044		0.066	
13	1.14		1.70	0.044		0.066	
М		2.60			0.102		

**Table 8: Ordering Information** 

Ordering type	Marking	Package	Weight	Base qty	Delivery mode
Т4хх-уууВ	Т4 ххуу	DPAK	0.3 g	75	Tube
T4xx-yyyB-TR	Т4 ххуу	DPAK	0.3 g	2500	Tape & reel
T4xx-yyyH	Т4 ххуу	IPAK	0.4 g	75	Tube
T4xx-yyyT	T4xx yyyT	TO-220AB	2.3 g	50	Tube
Т4хх-уууВ	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

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