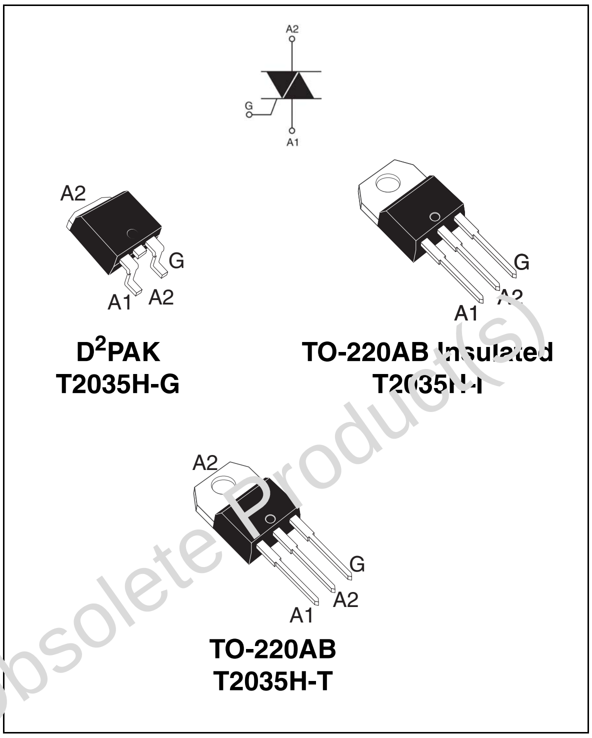
T2035H Series

Snubberless™ high temperature 20 A Triacs

Main features

Symbol	Value	Unit
$I_{T(RMS)}$	20	A
V_{DRM}/V_{RRM}	600	V
$I_{GT\ (Q1)}$	35	mA
$T_{j\ MAX}$	150	°C



Description

Specifically designed to operate at 150° C, the new 20 A T2035H Triacs provide an enhanced performance in terms of power loss and thermal dissipation. This facilitates the optimization of heatsink dimensioning, leading to improved space and cost effectiveness when compared to electro-mechanical solutions.

Based on ST Snubberless™ technology, the T2035H series offers high commutation switching capabilities and high noise immunity levels on the full range of T_j.

The T2035H series facilitates the optimization of the control of universal motors and inductive loads found in appliances such as vacuum cleaners, and washing machines.

The T2035H Triacs are also suitable for use in high temperature environment found in hot appliances such as cookers, ovens, hobs, electric heaters, and coffee machines.

Order code

Part number	Marking
T2035H-600G	T2035H-600G
T2035H-600G-TR	T2035H-600G
T2035H-600TRG	T2035H-600T
T2035H-600IRG	T2035H-600I

TM: Snubberless is a trademark of STMicroelectronics

1 Characteristics

Table 1. Absolute maximum ratings

Symbol	Parameter			Value	Unit
$I_{T(RMS)}$	RMS on-state current (full sine wave)	D^2PAK TO-220AB	T_c = 127° C	20	A
		TO-220AB Ins	T_c = 105° C		
I_{TSM}	Non repetitive surge peak on-state current (full cycle sine wave, T_j initial = 25° C)	F = 60 Hz	t = 16.7 ms	210	A
		F = 50 Hz	t = 20 ms	200	
I^2t	I^2t Value for fusing	tp = 10 ms		283	A^2s
dI/dt	Critical rate of rise of on-state current $I_G = 2xI_{GT}$, tr ≤100 ns	F = 120 Hz	T_j = 125° C	50	A/µs
V_{DSM}/V_{RSM}	Non repetitive surge peak off state voltage		T_j = 25° C	700	V
I_{GM}	Peak gate current	t_p = 20 µs	T_j = 150° C	4	A
$P_{G(AV)}$	Average gate power dissipation		T_j = 150° C	1	W
T_{stg} T_j	Storage junction temperature range Operating junction temperature range			-40 to +150 -30 to +150	°C
T_l	Maximum leads soldering temperature during 10 s			260	°C

Table 2. Electrical characteristics (T_j = 25° C, unless otherwise specified)

Symbol	Test conditions	Quadrant		Value	Unit
I_{GT} (1)	V_D = 12 V, R_L = 33 Ω	I - II - III	MAX	35	mA
V_{GT}		I - II - III	MAX	1.3	V
V_{GD}	$V_D = V_{DRM}$, R_L =3.3 kΩ, T_j = 150° C	I - II - III	MIN	0.15	V
I_H (2)	I_T = 100 mA		MAX	35	mA
I_L	$I_G = 1.2 \times I_{GT}$	I - III	MAX	50	mA
		II		80	
dV/dt (2)	V_D = 67% V_{DRM}, gate open, T_j = 150° C		MIN	300	V/µs
(dI/dt)c (2)	Without snubber, T_j = 150° C		MIN	8.9	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. Static electrical characteristics

Symbol	Test conditions			Value	Unit
V_{TM} (1)	I_{TM}= 28 A, t_p = 380 µs	Tj = 25° C	MAX	1.5	V
V_{TO} (1)		Tj = 150° C	MAX	0.80	V
R_D (1)		Tj = 150° C	MAX	21	mΩ
I_{DRM} I_{RRM}	V_{DRM} = V_{RRM}	Tj = 25° C	MAX	5	µA
		Tj = 150° C		7.4	mA
	V_D/V_R = 400 V (at peak mains voltage)	Tj = 150° C		4.8	

1. for both polarities of A2 referenced to A1

Table 4. Thermal resistance

Symbol	Parameter			Value	Unit
$R_{th\ (j-c)}$	Junction to case for full (AC)		D²PAK TO-220AB	1	°C/W
			TO-220AB Ins	1.9	
$R_{th\ (j-a)}$	Junction to ambient	S = 1 cm²	D²PAK	45	
			TO-220AB TO-220AB Ins	60	

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

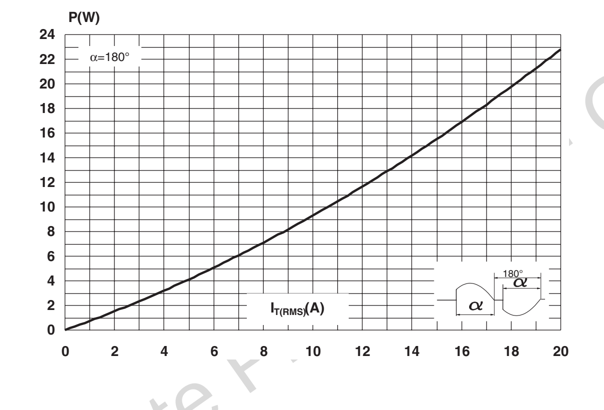


Figure 2. RMS on-state current versus case temperature

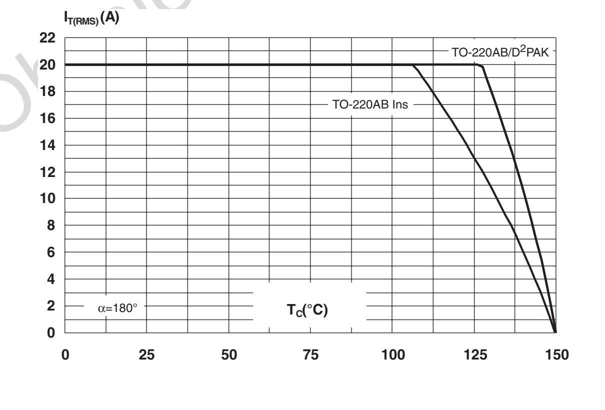


Figure 3. RMS on-state current vs ambient temperature (epoxy printed circuit board FR4 e_{cu} = 35 µm)

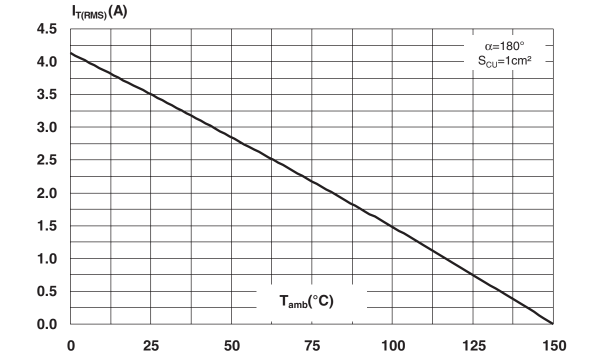


Figure 4. Relative variation of thermal impedance vs pulse duration

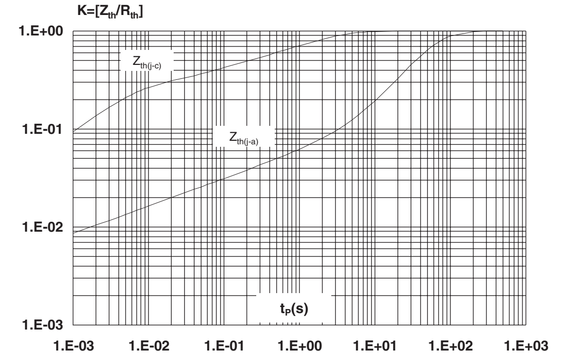


Figure 5. On-state characteristics (maximum values)

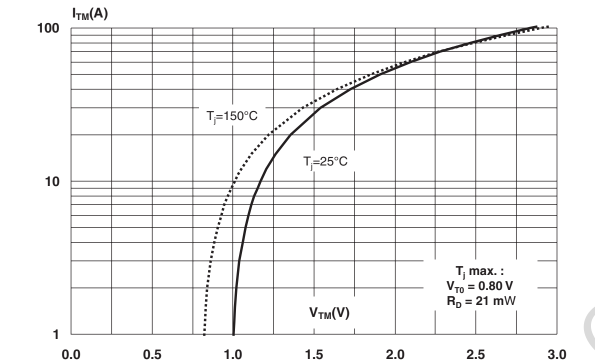


Figure 6. Surge peak on-state current vs number of cycles

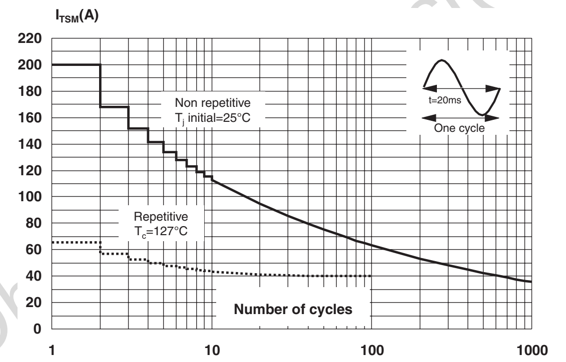


Figure 7. Non repetitive surge peak on-state current (sinusoidal pulse width tp<10 ms) and value of I²t

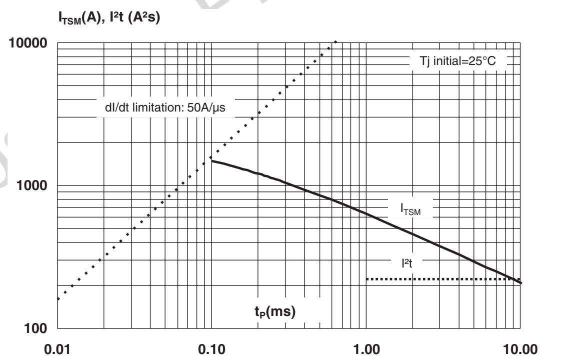


Figure 8. Relative variation of gate trigger current, holding current and latching current vs junction temperature (typical values)

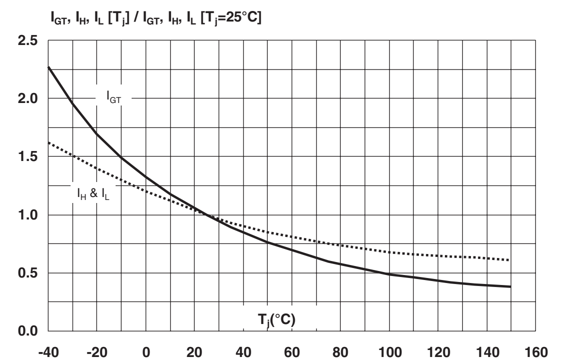


Figure 9. Relative variation of critical rate of decrease of main current (di/dt)c vs reapplied (dV/dt)c

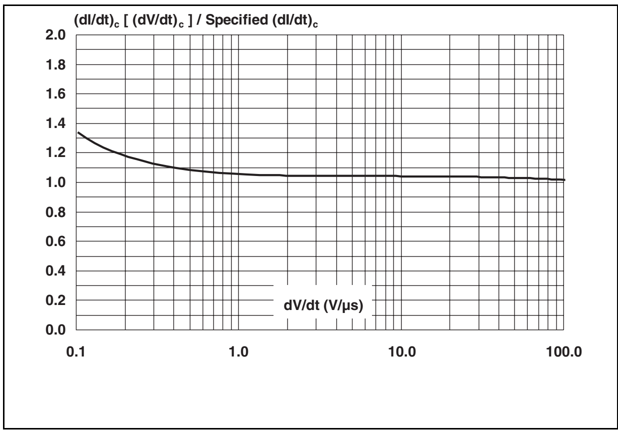


Figure 10. Relative variation of critical rate of decrease of main current (di/dt)c versus junction temperature

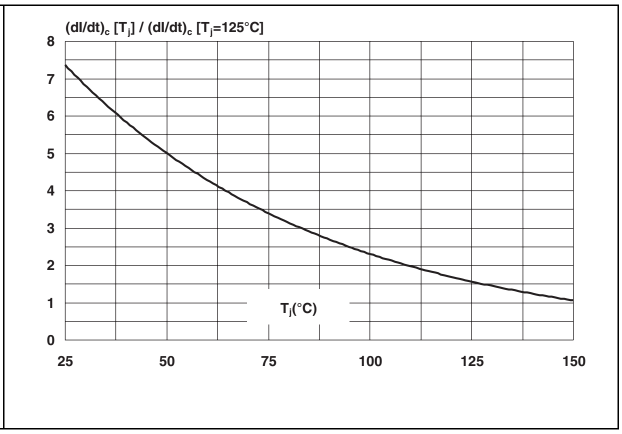


Figure 11. Leakage current versus junction temperature for different values of blocking voltage (typical values)

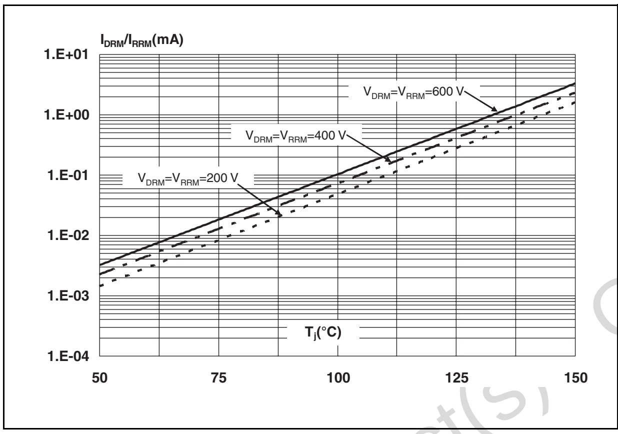


Figure 12. Acceptable repetitive peak off-state voltage versus case-ambient thermal resistance

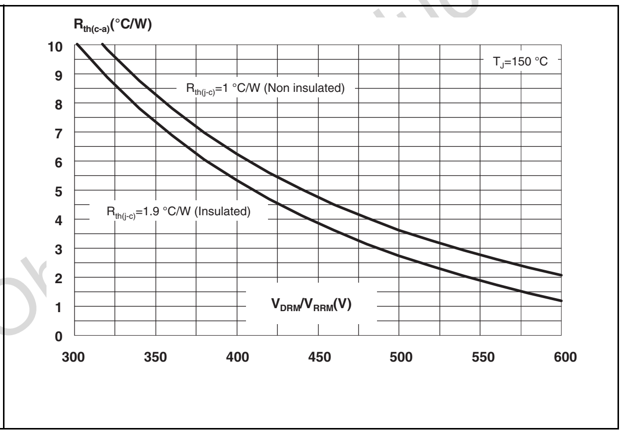
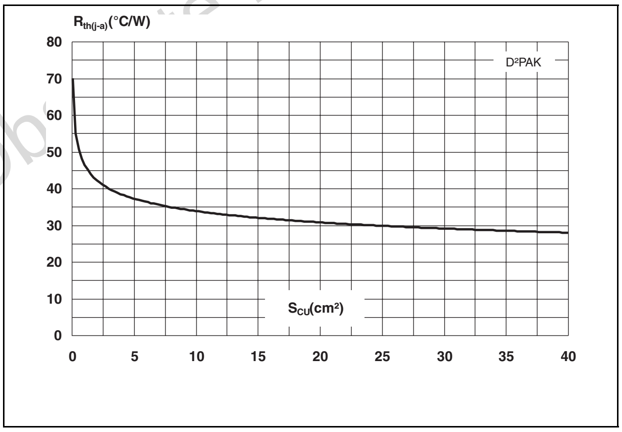


Figure 13. D^2PAK junction to ambient thermal resistance versus copper surface under tab (PCB FR4, copper thickness 35 µm)



2 Ordering information scheme

T 20 35 H - 600 T (-TR)

Triac series (T)

Current (20)
20 = 20 A

Sensitivity (35)
35 = 35 mA

High temperature (H)

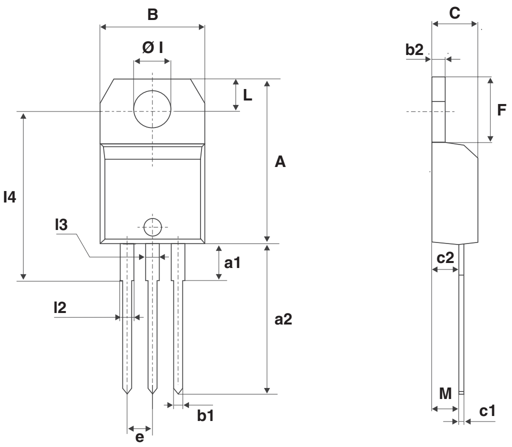
Voltage (600)
600 = 600 V

Package (T)
G = D^2PAK
T = TO-220AB
I = TO-220AB Insulated

Packing mode (-TR)
Blank = Tube (D^2PAK)
-TR = Tape and reel (D^2PAK)
RG = Tube (TO-220AB)

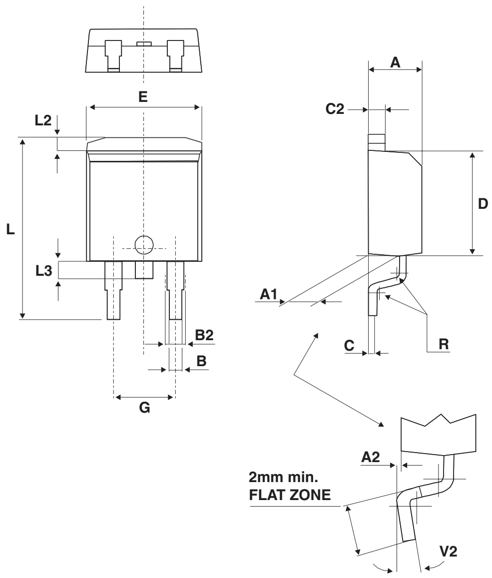
3 Package information

Table 5. TO-220AB and TO-220AB Insulated dimensions



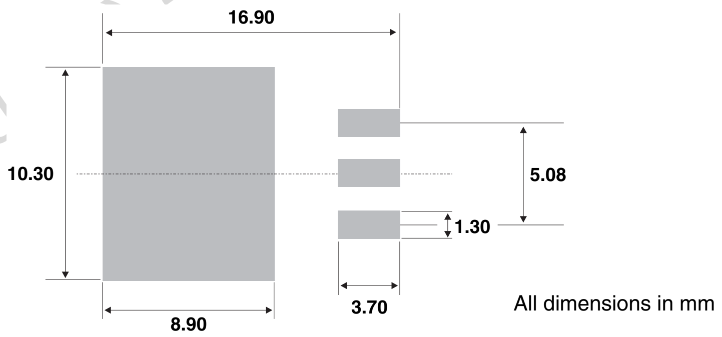
REF.	DIMENSIONS					
	Millimeters			Inches		
	Min.	Typ.	Max.	Min.	Typ.	Max.
A	15.20		15.90	0.598		0.625
a1		3.75			0.147	
a2	13.00		14.00	0.511		0.551
B	10.00		10.40	0.393		0.409
b1	0.61		0.88	0.024		0.034
b2	1.23		1.32	0.048		0.051
C	4.40		4.60	0.173		0.181
c1	0.49		0.70	0.019		0.027
c2	2.40		2.72	0.094		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
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 6. D^2PAK dimensions



REF.	DIMENSIONS			
	Millimeters		Inches	
	Min.	Max.	Min.	Max.
A	4.40	4.60	0.173	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	1.14	1.70	0.045	0.067
C	0.45	0.60	0.017	0.024
C2	1.23	1.36	0.048	0.054
D	8.95	9.35	0.352	0.368
E	10.00	10.40	0.393	0.409
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
M	2.40	3.20	0.094	0.126
R	0.40 typ.		0.016 typ.	
V2	0°	8°	0°	8°

Figure 14. D^2PAK Footprint



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

Part number	Marking	Package	Weight	Base Qty	Packing mode
T2035H-600G	T2035H-600G	D^2PAK	1.5 g	50	Tube
T2035H-600G-TR	T2035H-600G	D^2PAK	1.5 g	1000	Tape and Reel
T2035H-600TRG	T2035H-600T	TO-220AB	2.3 g	50	Tube
T2035H-600IRG	T2035H-600I	TO-220ABIns	2.3 g	50	Tube

5 Revision history

Date	Revision	Changes
13-Jul-2006	1	Initial release.
7-Sep-2006	2	Added TO-220AB Insulated package.