

1 Characteristics

Table 1. Absolute maximum ratings (limiting values)

Symbol	Parameter			Value	Unit
$I_{T(RMS)}$	On-state RMS current (full sine wave)			$T_c = 129\text{ }^{\circ}\text{C}$	A
I_{TSM}	Non repetitive surge peak on-state current (T_j initial = $25\text{ }^{\circ}\text{C}$)	F = 50 Hz	t = 20 ms	120	A
		F = 60 Hz	t = 16.7 ms	126	
I^2t	I^2t value for fusing, (T_j initial = $25\text{ }^{\circ}\text{C}$)			$t_p = 10\text{ ms}$	A^2s
V_{DRM}, V_{RRM}	Repetitive surge peak off-state voltage			$T_j = 150\text{ }^{\circ}\text{C}$	V
				$T_j = 125\text{ }^{\circ}\text{C}$	
V_{DSM}, V_{RSM}	Non repetitive surge peak off-state voltage			$t_p = 10\text{ ms}$	V
di/dt	Critical rate of rise of on-state current $I_G = 2 \times I_{GT}$, $t_r \leq 100\text{ ns}$			F = 100 Hz	$\text{A}/\mu\text{s}$
I_{GM}	Peak gate current	$t_p = 20\text{ }\mu\text{s}$	$T_j = 150\text{ }^{\circ}\text{C}$	4	A
$P_{G(AV)}$	Average gate power dissipation			$T_j = 150\text{ }^{\circ}\text{C}$	W
T_{stg}	Storage junction temperature range			-40 to +150	$^{\circ}\text{C}$
T_j	Operating junction temperature range			-40 to +150	$^{\circ}\text{C}$
T_L	Maximum lead temperature soldering during 10 s			260	$^{\circ}\text{C}$

Table 2. Electrical characteristics ($T_j = 25\text{ }^{\circ}\text{C}$ unless otherwise specified)

Symbol	Test conditions			Value	Unit
I_{GT}	$V_D = 12\text{ V}$, $R_L = 30\ \Omega$	I - II - III	Min.	0.5	mA
			Max.	10	
V_{GT}	$V_D = 12\text{ V}$, $R_L = 30\ \Omega$	I - II - III	Max.	1.3	V
V_{GD}	$V_D = V_{DRM}$, $R_L = 3.3\text{ k}\Omega$, $T_j = 125\text{ }^\circ\text{C}$	I - II - III	Min.	0.2	V
$I_H^{(1)}$	$I_T = 500\text{ mA}$		Max.	15	mA
I_L	$I_G = 1.2 \times I_{GT}$	I - III	Max.	20	mA
		II		25	
$dV/dt^{(1)}$	$V_D = V_R = 536\text{ V}$, gate open	$T_j = 125\text{ }^\circ\text{C}$	Min.	250	V/ μs
	$V_D = V_R = 402\text{ V}$, gate open	$T_j = 150\text{ }^\circ\text{C}$		170	
$(di/dt)^{(1)}$	$(dV/dt)_c = 0.1\text{ V}/\mu\text{s}$	$T_j = 125\text{ }^\circ\text{C}$	Min.	21.6	A/ms
		$T_j = 150\text{ }^\circ\text{C}$		15.1	
	$(dV/dt)_c = 10\text{ V}/\mu\text{s}$	$T_j = 125\text{ }^\circ\text{C}$		11.3	
		$T_j = 150\text{ }^\circ\text{C}$		5	

1. For both polarities of A2 referenced to A1

Table 3. Static characteristics

Symbol	Test conditions			Value	Unit
$V_T^{(1)}$	$I_{TM} = 22.6 \text{ A}$, $t_p = 380 \text{ } \mu\text{s}$	$T_J = 25 \text{ } ^\circ\text{C}$	Max.	1.55	V
$V_{TO}^{(1)}$	Threshold voltage	$T_J = 150 \text{ } ^\circ\text{C}$	Max.	0.85	
$R_d^{(1)}$	Dynamic resistance	$T_J = 150 \text{ } ^\circ\text{C}$	Max.	27	m Ω
I_{DRM} , I_{RRM}	$V_D = V_R = 800 \text{ V}$	$T_J = 25 \text{ } ^\circ\text{C}$	Max.	7.5	μA
		$T_J = 125 \text{ } ^\circ\text{C}$		1.0	mA
	$V_D = V_R = 600 \text{ V}$	$T_J = 150 \text{ } ^\circ\text{C}$	Max.	3.0	

1. For both polarities of A2 referenced to A1

Table 4. Thermal parameters

Symbol	Parameter	Value	Unit
$R_{th(j-c)}$	Junction to case (AC)	1.1	$^\circ\text{C/W}$
$R_{th(j-a)}$	Junction to ambient	60	$^\circ\text{C/W}$

1.1 Characteristics (curves)

Figure 1. Maximum power dissipation versus on-state RMS current

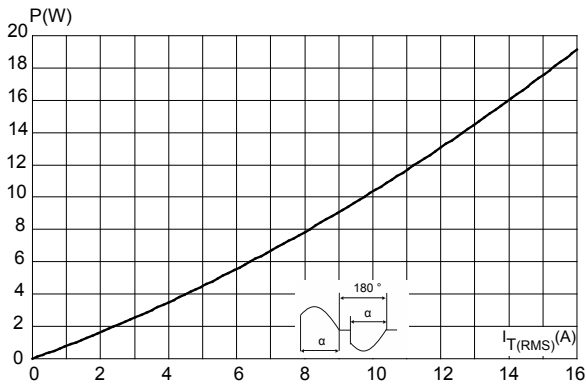


Figure 2. On-state RMS current versus case temperature

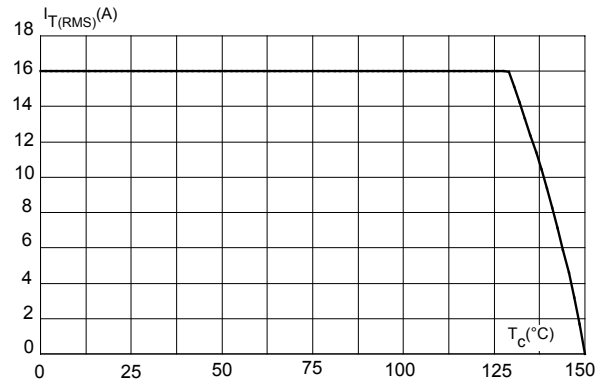


Figure 3. On-state RMS current versus ambient temperature (free air convection)

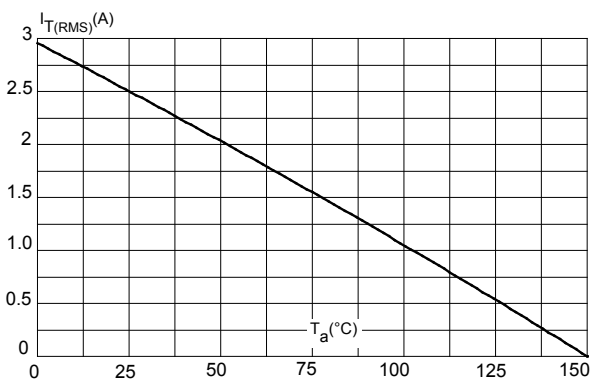


Figure 4. Relative variation of thermal impedance versus pulse duration

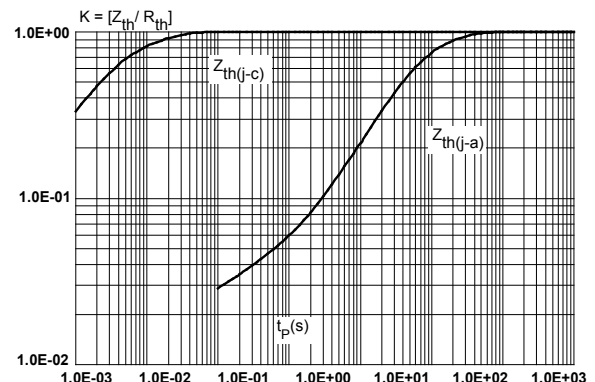


Figure 5. Relative variation of gate trigger voltage and current versus junction temperature (typical values)

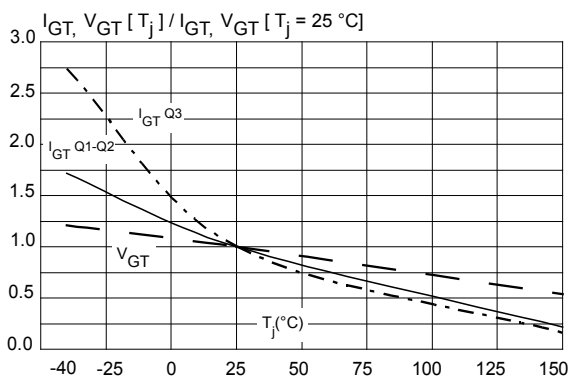


Figure 6. Relative variation of holding current and latching current versus junction temperature (typical values)

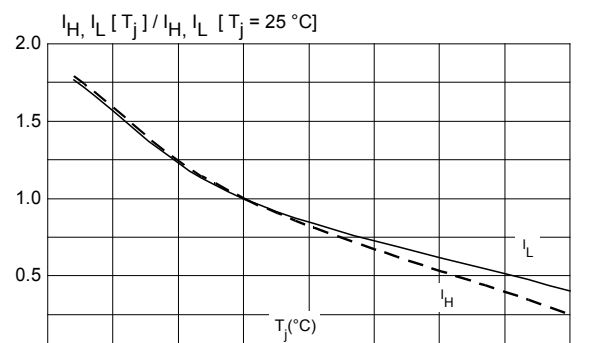


Figure 7. Surge peak on-state current versus number of cycles

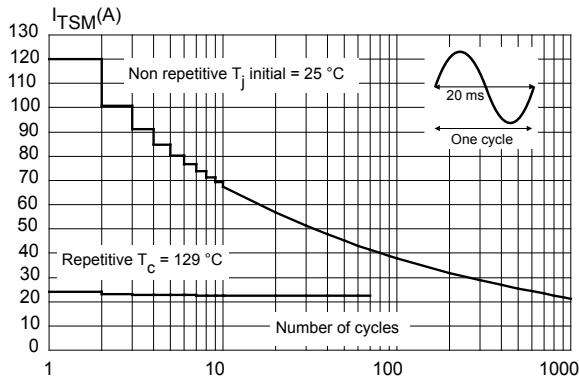


Figure 8. Non repetitive surge peak on-state current

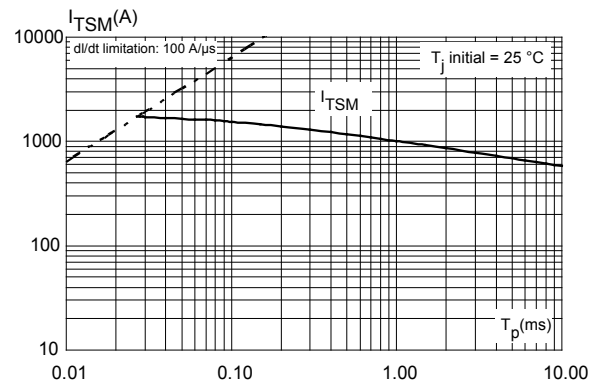


Figure 9. On-state characteristics (maximum values)

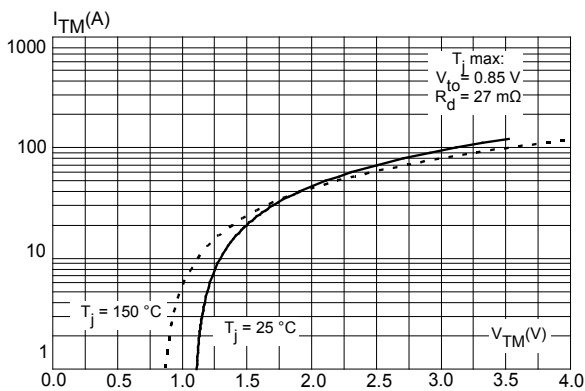


Figure 10. Relative variation of critical rate of decrease of main current versus junction temperature (typical values)

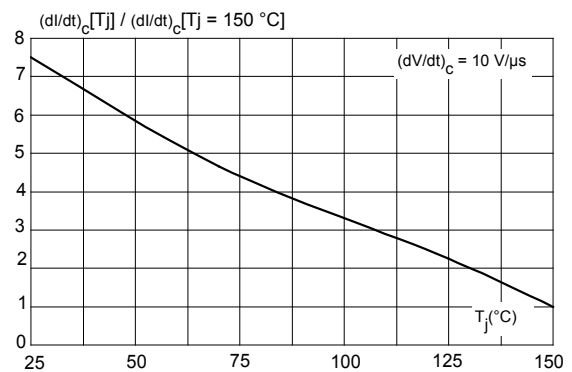


Figure 11. Relative variation of static dV/dt immunity versus junction temperature (typical values)

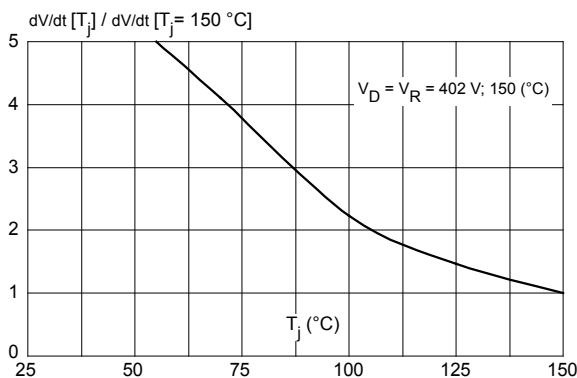


Figure 12. Relative variation of critical rate of decrease (di/dt)_c of main current versus reapplied (dV/dt)_c (maximum values)

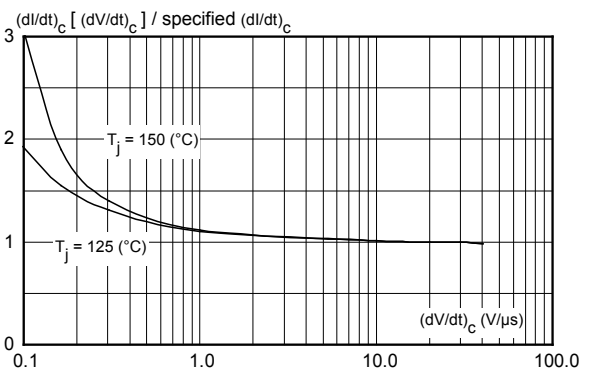
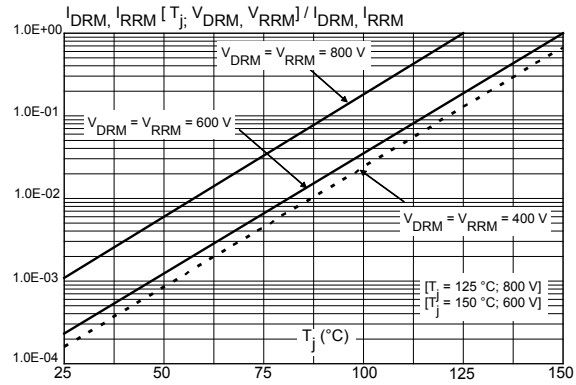


Figure 13. Relative variation of leakage current versus junction temperature for different values of blocking voltage (typical values)



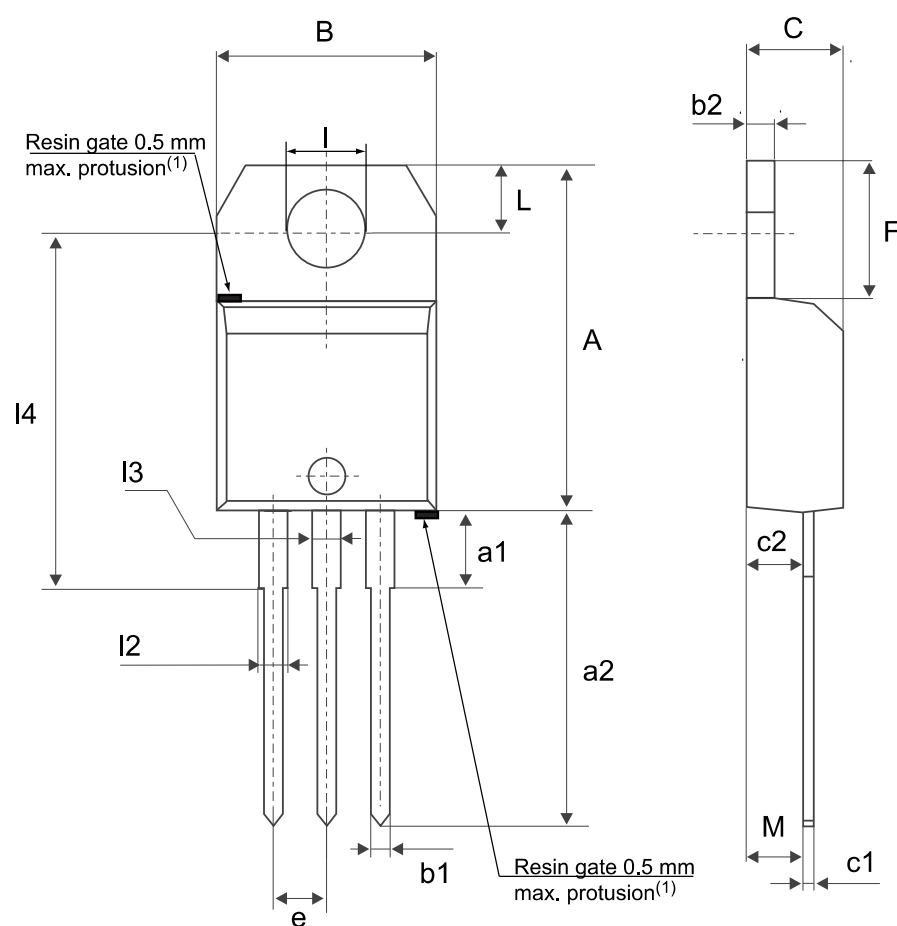
2 Package information

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.

2.1 TO-220AB package information

- Epoxy resin is halogen free and meets UL94 flammability standard, level V0
- Lead-free plating package leads
- Recommended torque: 0.4 to 0.6 N·m

Figure 14. TO-220AB package outline



(1) Resin gate position accepted in one of the two positions or in the symmetrical opposites.

Table 5. TO-220AB package mechanical data

Ref.	Dimensions					
	Millimeters			Inches		
	Min.	Typ.	Max.	Min.	Typ.	Max.
A	15.20		15.90	0.5984		0.6260
a1		3.75			0.1476	
a2	13.00		14.00	0.5118		0.5512
B	10.00		10.40	0.3937		0.4094
b1	0.61		0.88	0.0240		0.0346
b2	1.23		1.32	0.0484		0.0520
C	4.40		4.60	0.1732		0.1811
c1	0.49		0.70	0.0193		0.0276
c2	2.40		2.72	0.0945		0.1071
e	2.40		2.70	0.0945		0.1063
F	6.20		6.60	0.2441		0.2598
I	3.73		3.88	0.1469		0.1528
L	2.65		2.95	0.1043		0.1161
I2	1.14		1.70	0.0449		0.0669
I3	1.14		1.70	0.0449		0.0669
I4	15.80	16.40	16.80	0.6220	0.6457	0.6614
M		2.6			0.1024	

1. Inch dimensions are for reference only.

3 Ordering information

Figure 15. Ordering information scheme

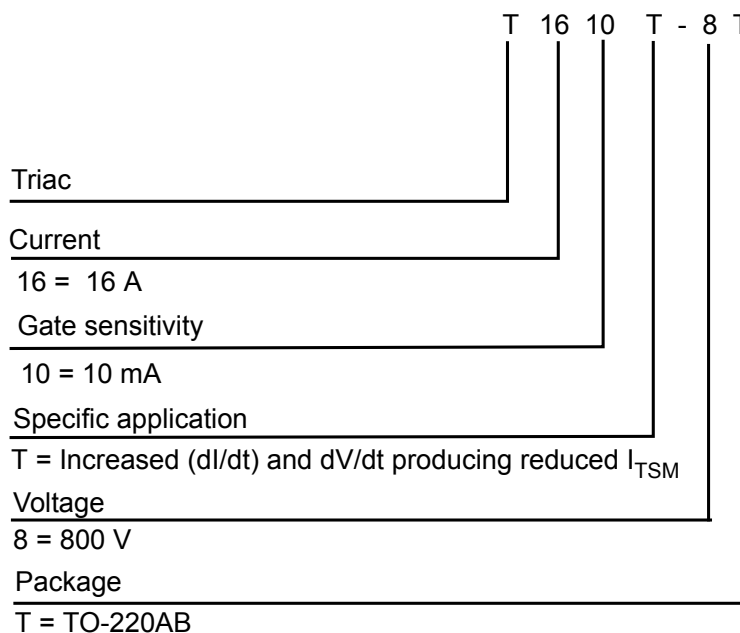


Table 6. Ordering information

Order code	Marking	Package	Weight	Base qty.	Delivery mode
T1610T-8T	T1610T-8T	TO-220AB	2.0 g	50	Tube

Revision history

Table 7. Document revision history

Date	Version	Changes
23-Oct-2014	1	Initial release.
17-Sep-2019	2	Updated Figure 14 and Table 5 .
23-Sep-2019	3	Updated Table 2 .

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