

## Description

Available in through-hole fullpack package, the T1610T-8FP Triac can be used for the on/off or phase angle control function in general purpose AC switching. This device can be directly driven by a microcontroller thanks to its 10 mA gate current requirement.

Provides UL certified insulation rated at 1500 V rms.

**Table 1. Device summary**

Symbol	Value	Unit
$I_{T(rms)}$	16	A
$V_{DRM}, V_{RRM}$	800	V
$V_{DSM}, V_{RSM}$	900	V
$I_{GT}$	10	mA

## Features

- Medium current Triac
- Three triggering quadrants Triac
- ECOPACK<sup>®</sup>2 compliant component
- Complies with UL standards (File ref: E81734)
- 16 A high performance Triac:
  - High  $T_j$  family
  - High  $di/dt$  family
  - High  $dV/dt$  family

## Applications

- General purpose AC line load switching
- Motor control circuits
- Small home appliances
- Lighting
- Inrush current limiting circuits
- Overvoltage crowbar protection

# 1 Characteristics

**Table 2. Absolute ratings (limiting values,  $T_j = 25\text{ °C}$  unless otherwise stated)**

Symbol	Parameter		Value	Unit	
$I_{T(rms)}$	On-state rms current (full sine wave)		$T_c = 87\text{ °C}$	16	A
$I_{TSM}$	Non repetitive surge peak on-state current (full cycle, $T_j$ initial = $25\text{ °C}$ )	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 = $25\text{ °C}$		$t_p = 10\text{ ms}$	95	A <sup>2</sup> s
$V_{DRM}, V_{RRM}$	Repetitive surge peak off-state voltage		$T_j = 150\text{ °C}$	600	V
			$T_j = 125\text{ °C}$	800	
$V_{DSM}, V_{RSM}$	Non repetitive surge peak off-state voltage		$t_p = 10\text{ ms}$	900	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	100	A/ $\mu$ s
$I_{GM}$	Peak gate current	$t_p = 20\text{ }\mu$ s	$T_j = 150\text{ °C}$	4	A
$P_{G(AV)}$	Average gate power dissipation		$T_j = 150\text{ °C}$	1	W
$T_{stg}$ $T_j$	Storage junction temperature range Operating junction temperature range			- 40 to + 150 - 40 to + 150	$^{\circ}$ C
$T_L$	Maximum lead temperature for soldering during 10 s			260	$^{\circ}$ C
$V_{ins}$	Insulation rms voltage, 1 minute			1500	V

**Table 3. Electrical characteristics ( $T_j = 25\text{ °C}$ , unless otherwise specified)**

Symbol	Test conditions	Quadrant		Value	Unit
$I_{GT}$	$V_D = 12\text{ V}, R_L = 30\text{ }\Omega$	I - II - III	Min.	0.5	mA
			Max.	10	
$V_{GT}$	$V_D = 12\text{ V}, R_L = 30\text{ }\Omega$	I - II - III	Max.	1.3	V
$V_{GD}$	$V_D = V_{DRM}, R_L = 3.3\text{ k}\Omega, T_j = 150\text{ °C}$	I - II - III	Min.	0.2	V
$I_H^{(1)}$	$I_T = 500\text{ mA}$		Max.	15	mA
$I_L$	$I_G = 1.2 I_{GT}$	I - III	Max.	20	mA
		II		25	
dV/dt <sup>(1)</sup>	$V_D = V_R = 536\text{ V}, \text{ gate open}$	$T_j = 125\text{ °C}$	Min.	250	V/ $\mu$ s
	$V_D = V_R = 402\text{ V}, \text{ gate open}$	$T_j = 150\text{ °C}$		170	V/ $\mu$ s
(di/dt) <sub>c</sub> <sup>(1)</sup>	(dV/dt) <sub>c</sub> = 0.1 V/ $\mu$ s	$T_j = 125\text{ °C}$	Min.	21.6	A/ms
		$T_j = 150\text{ °C}$		15.1	
(di/dt) <sub>c</sub> <sup>(1)</sup>	(dV/dt) <sub>c</sub> = 10 V/ $\mu$ s	$T_j = 125\text{ °C}$	Min.	11.3	A/ms
		$T_j = 150\text{ °C}$		5.0	

1. For both polarities of A2 referenced to A1

Table 4. Static characteristics

Symbol	Test conditions			Value	Unit
$V_T^{(1)}$	$I_{TM} = 22.6 \text{ A}$ , $t_p = 380 \mu\text{s}$	$T_j = 25 \text{ }^\circ\text{C}$	Max.	1.55	V
$V_{i0}^{(1)}$	Threshold voltage	$T_j = 150 \text{ }^\circ\text{C}$	Max.	0.85	V
$R_d^{(1)}$	Dynamic resistance	$T_j = 150 \text{ }^\circ\text{C}$	Max.	27	m $\Omega$
$I_{DRM}$ $I_{RRM}$	$V_{DRM} = V_{RRM} = 800 \text{ V}$	$T_j = 25 \text{ }^\circ\text{C}$	Max.	7.5	$\mu\text{A}$
		$T_j = 125 \text{ }^\circ\text{C}$		1	mA
	$V_{DRM} = V_{RRM} = 600 \text{ V}$	$T_j = 150 \text{ }^\circ\text{C}$	Max.	3.0	

1. For both polarities of A2 referenced to A1

Table 5. Thermal resistance

Symbol	Parameter	Value	Unit
$R_{th(j-c)}$	Junction to case (AC)	3.3	$^\circ\text{C/W}$
$R_{th(j-a)}$	Junction to ambient (DC)	60	$^\circ\text{C/W}$

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

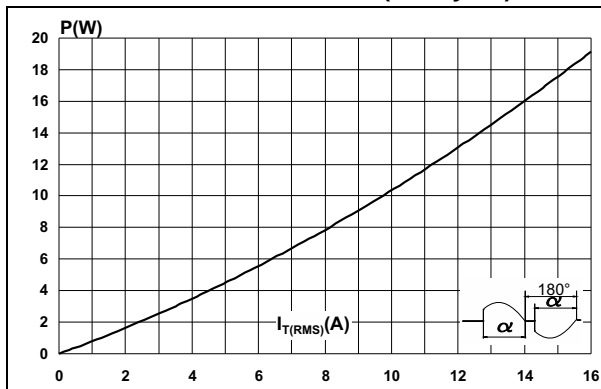


Figure 2. On-state rms current versus case temperature (full cycle)

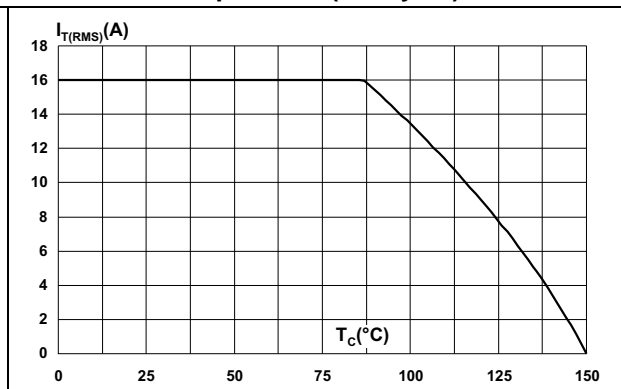


Figure 3. On-state rms current versus ambient temperature (free air convection)

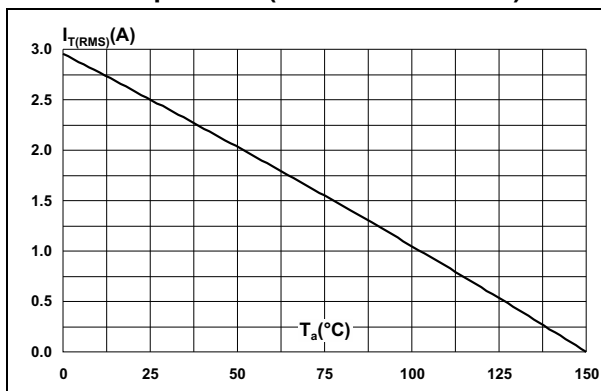


Figure 4. Relative variation of thermal impedance versus pulse duration

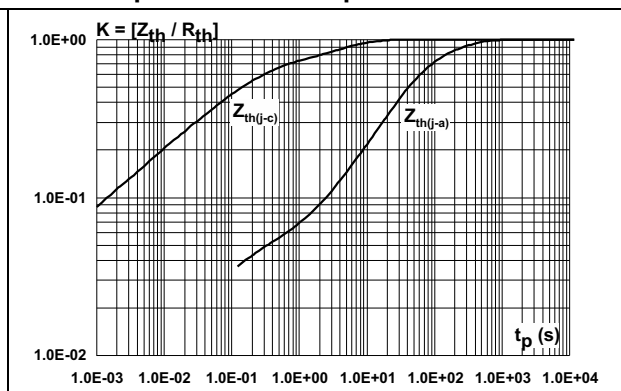


Figure 5. On-state characteristics (maximum values)

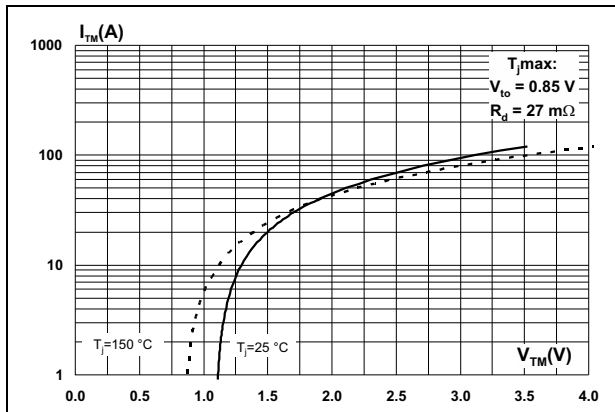


Figure 6. Surge peak on-state current versus number of cycles

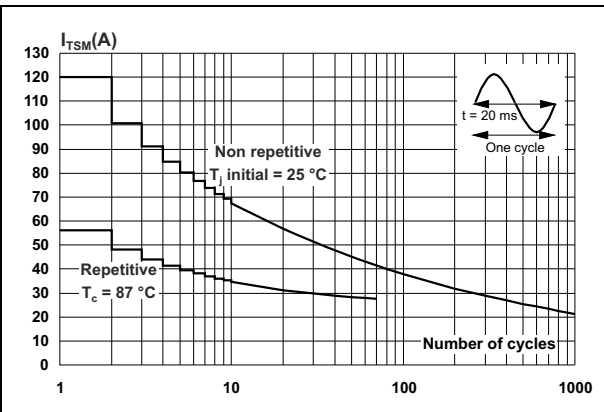


Figure 7. Non repetitive surge peak on-state current and corresponding values of I<sup>2</sup>t (half cycle)

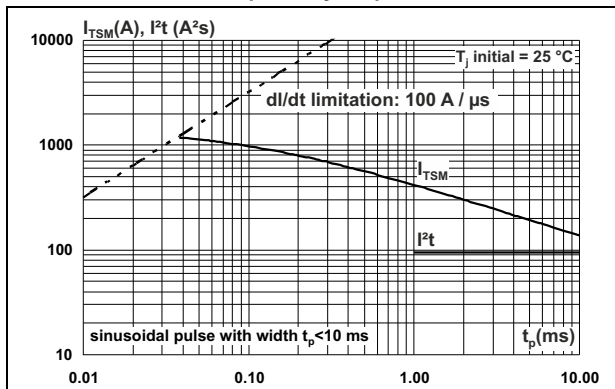


Figure 8. Relative variation of gate trigger current and gate voltage versus junction temperature (typical values)

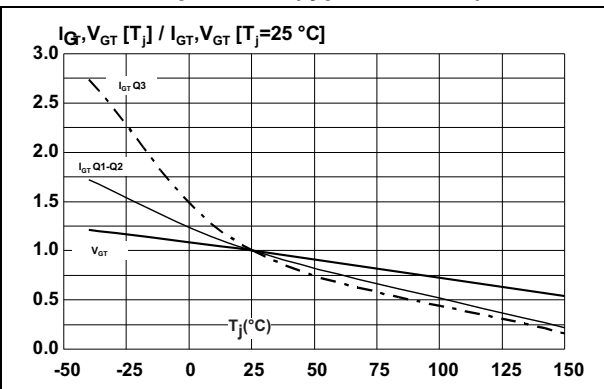


Figure 9. Relative variation of static dV/dt immunity versus junction temperature (typical values)

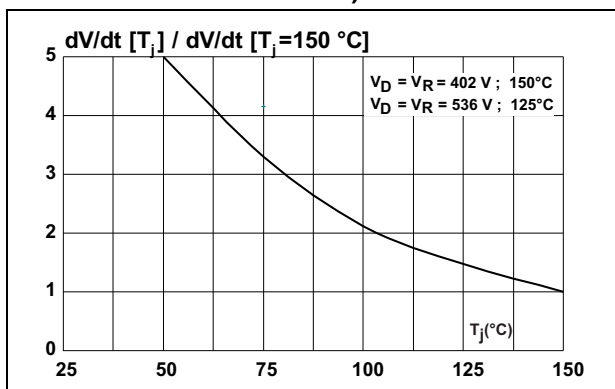


Figure 10. Relative variation of holding and latching current versus junction temperature (typical values)

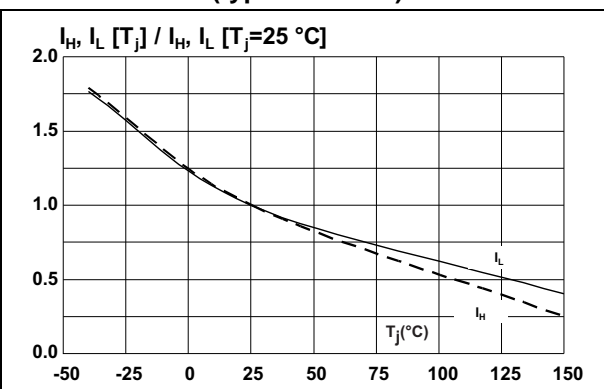


Figure 11. Relative variation of critical rate of decrease of main current  $(di/dt)_c$  versus reapplied  $(dV/dt)_c$  (typical values)

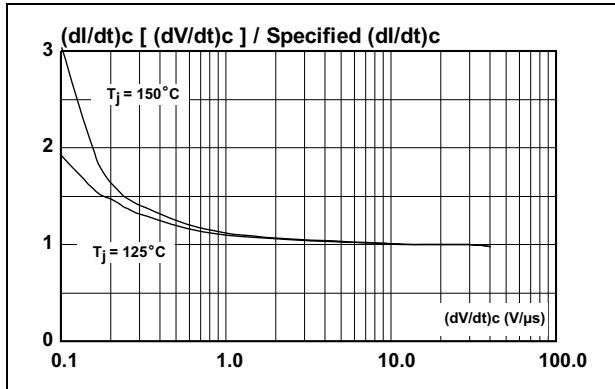


Figure 12. Relative variation of critical rate of decrease of main current  $(di/dt)_c$  versus junction temperature (typical values)

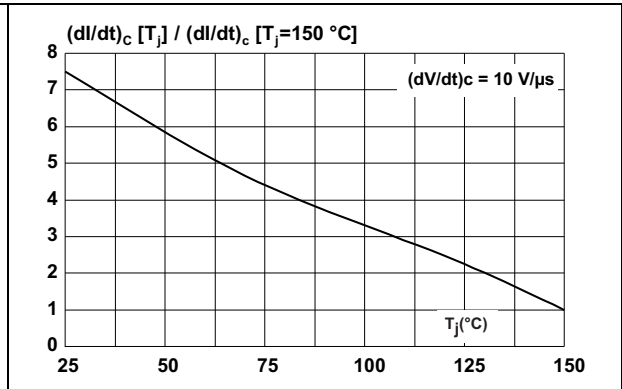
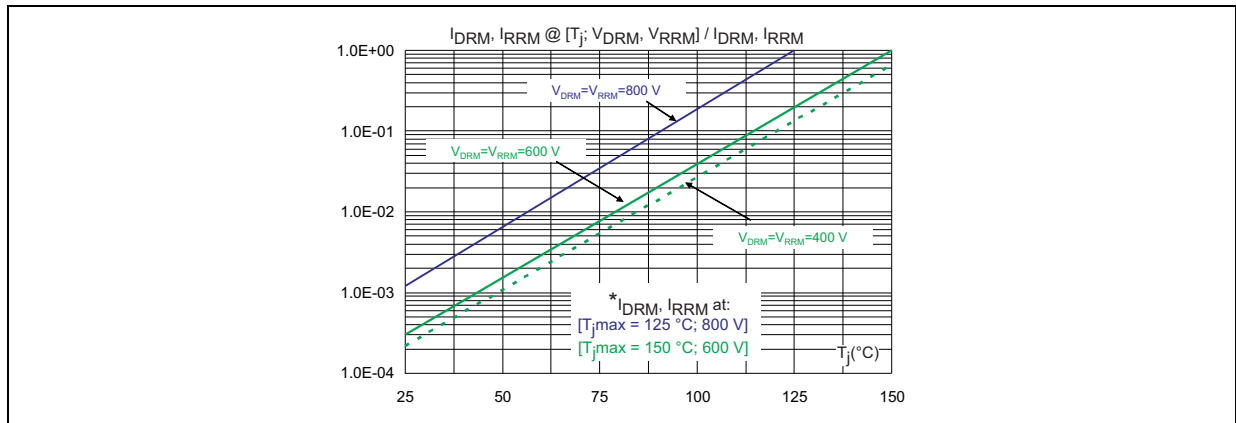


Figure 13. Relative variation of leakage current versus junction temperature for different values of blocking voltage (typical values)



## 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<sup>®</sup> packages, depending on their level of environmental compliance. ECOPACK<sup>®</sup> specifications, grade definitions and product status are available at: [www.st.com](http://www.st.com). ECOPACK<sup>®</sup> is an ST trademark.

Figure 14. TO-220FPAB dimension definitions

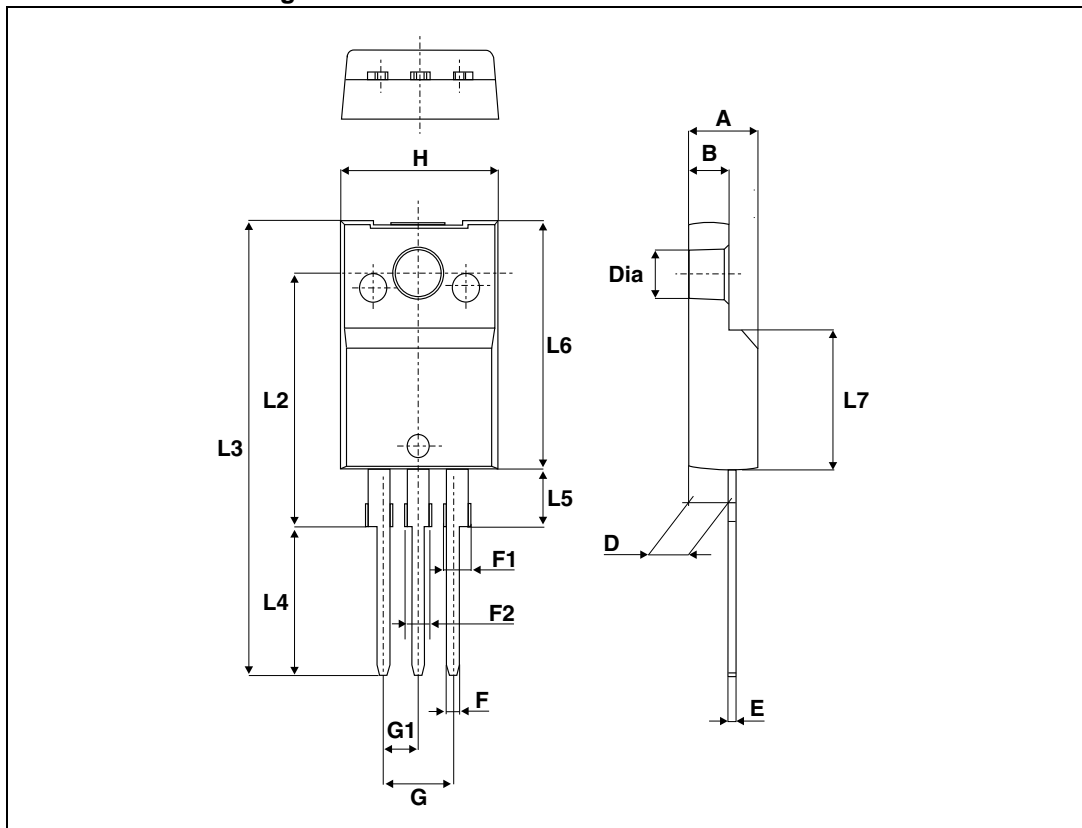


Table 6. TO-220FPAB dimension values

Ref.	Dimensions			
	Millimeters		Inches	
	Min.	Max.	Min.	Max.
A	4.4	4.6	0.173	0.181
B	2.5	2.7	0.098	0.106
D	2.5	2.75	0.098	0.108
E	0.45	0.70	0.018	0.027
F	0.75	1	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	2.4	2.7	0.094	0.106
H	10	10.4	0.393	0.409
L2	16 Typ.		0.63 Typ.	
L3	28.6	30.6	1.126	1.205
L4	9.8	10.6	0.386	0.417
L5	2.9	3.6	0.114	0.142
L6	15.9	16.4	0.626	0.646
L7	9.00	9.30	0.354	0.366
Dia.	3.00	3.20	0.118	0.126

### 3 Ordering information

Figure 15. Ordering information scheme

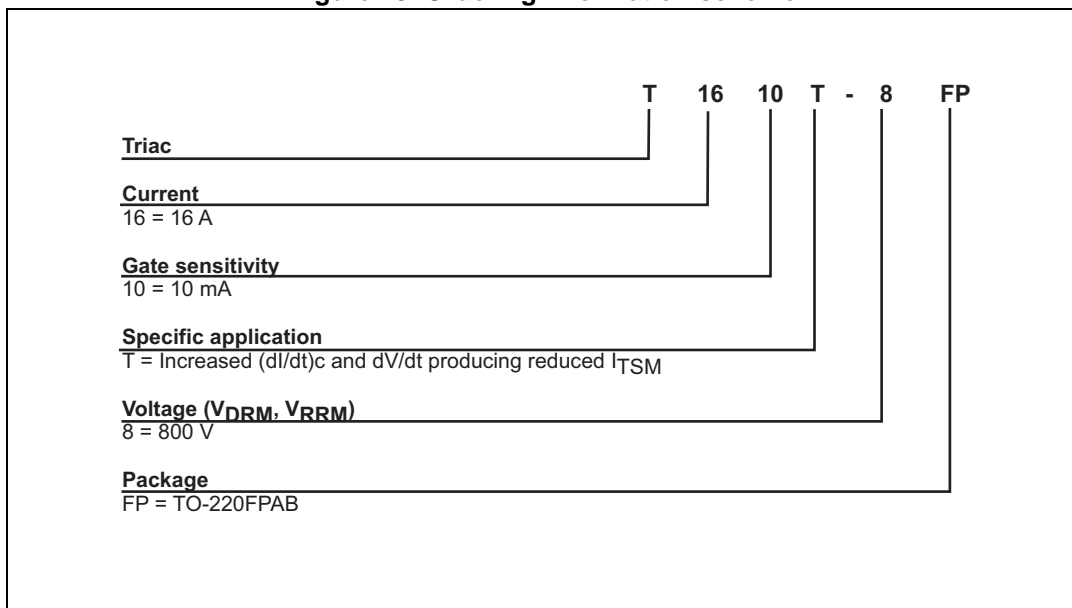


Table 7. Ordering information

Order code	Marking	Package	Weight	Base qty	Delivery mode
T1610T-8FP	T1610T-8FP	TO-220FPAB	2.0 g	50	Tube

### 4 Revision history

Table 8. Document revision history

Date	Revision	Changes
05-Feb-2014	1	Initial release.



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