# T1210T-6I, T1220T-6I
# T1225T-6I, T1235T-6I



## Entry level Snubberless™, logic level and standard 12 A TRIACs

### Features

- Medium current TRIAC
- High static and dynamic commutation
- Low thermal resistance with clip bonding
- Packages is RoHS (2002/95/EC) compliant
- $V_{RM}$ = 600 V
- Insulated packaged rated at 2500 V rms

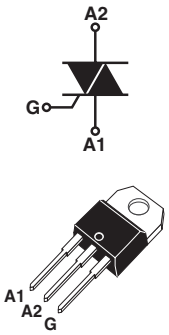
### Applications

- Entry-level and value-sensitive applications
- General purpose AC line load switching
- Motor control circuits in power tools
- Small home appliances, lighting
- Inrush current limiting circuits
- Overvoltage crowbar protection

### Description

Available in through-hole, the T12T series of TRIACs can be used as on/off or phase angle control function in general purpose AC switching where high commutation capability is required.

Initially planned for power tools (T series) equipment, this series can be used in many value sensitive appliances thanks to the guidance on parameters provided in the following pages.




**TO-220AB insulated (T12xxT-6I)**

**Table 1. Device summary**

| Order code | Symbol | Value |
|---|---|---|
| T1220T-6I<br>T1235T-6I | $I_{GT}$ 3Q Snubberless | 20 / 35 mA |
| T1225T-6I | $I_{GT}$ 4Q standard | 25 mA |
| T1210T-6I | $I_{GT}$ 3Q logic level | 10 mA |

**TM**: Snubberless is a trademark of STMicroelectronics

# 1 Characteristics

**Table 2. Absolute maximum ratings (limiting values; $T_j$ = 25 °C, unless otherwise specified)**



| Symbol | Parameter | | | Value | Unit |
|---|---|---|---|---|---|
| $I_{T(RMS)}$ | On-state rms current (full sine wave) | | $T_c$ = 88 °C | 12 | A |
| $I_{TSM}$ | Non repetitive surge peak on-state current (full cycle, $T_j$ initial = 25 °C) | F = 50 Hz | $t_p$ = 20 ms | 90 | A |
| | | F = 60 Hz | $t_p$ = 16.7 ms | 95 | |
| $I^2t$ | $I^2t$ Value for fusing | $t_p$ = 10 ms | | 60 | $A^2s$ |
| dI/dt | Critical rate of rise of on-state current $I_G$ = 2 x $I_{GT}$ $t_r \leq$ 100 ns | F = 60 Hz | $T_j$ = 125 °C | 50 | A/µs |
| $V_{DSM}$ / $V_{RSM}$ | Non repetitive surge peak off-state voltage | $t_p$ = 10 ms | $T_j$ = 25 °C | $V_{DRM}/V_{RRM}$ + 100 | V |
| $I_{GM}$ | 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 |
| $T_{stg}$ | Storage junction temperature range | | | - 40 to + 150 | °C |
| $T_j$ | Operating junction temperature range | | | - 40 to + 125 | °C |

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

| Symbol | Test conditions | Quadrant | | T12xxT | | | | Unit |
|---|---|---|---|---|---|---|---|---|
| | | | | T1210T | T1220T | T1225T | T1235T | |
| $I_{GT}$ (1) | $V_D$ = 12 V $R_L$ = 30 Ω | I - II - III | MAX. | 10 | 20 | 25 | 35 | mA |
| | | IV | | | | 40 | | |
| $V_{GT}$ | $V_D = V_{DRM}$, $R_L$ = 3.3 kΩ, $T_j$ = 25 °C | ALL | MAX. | 1.3 | | | | V |
| $V_{GD}$ | $V_D = V_{DRM}$, $R_L$ = 3.3 kΩ, $T_j$ = 125 °C | ALL | MIN. | 0.2 | | | | V |
| $I_H$ (2) | $I_T$ = 500 mA | | MAX. | 10 | 15 | 20 | 30 | mA |
| $I_L$ | $I_G$ = 1.2 $I_{GT}$ | I - III | MAX. | 20 | 35 | 40 | 50 | mA |
| | | IV | | | | 40 | | |
| | | II | | 30 | 40 | 60 | 80 | |
| dV/dt (2) | $V_D$ = 67% $V_{DRM}$, gate open | $T_j$ = 125 °C | MIN. | 100 | 1000 | 100 | 2000 | V/µs |
| | | $T_j$ = 150 °C(3) | | 50 | 500 | 50 | 1000 | |
| (di/dt)c (2) | (dV/dt)c = 0.1 V/µs | $T_j$ = 125 °C | MIN. | 7 | | 7 | | A/ms |
| | (dV/dt)c = 10 V/µs | | | 3 | | 3 | | |
| | Without snubber | | | | 6 | | 12 | |
| | (dV/dt)c = 0.1 V/µs | $T_j$ = 150 °C(3) | | 3 | | 3 | | |
| | (dV/dt)c = 10 V/µs | | | 1 | | 1 | | |
| | Without snubber | | | | 3 | | 10 | |

1. Minimum $I_{GT}$ is guaranted at 5% of $I_{GT}$ max.
2. For both polarities of A2 referenced to A1.
3. Derating information for excess temperature above $T_j$ max.

**Table 4. Static characteristics**

| Symbol | Test conditions | | Value | | Unit |
|---|---|---|---|---|---|
| $V_T$ (1) | $I_{TM}$ = 17 A, $t_p$ = 380 µs | $T_j$ = 25 °C | Max. | 1.55 | V |
| $V_{TO}$ (1) | Threshold voltage | $T_j$ = 125 °C | Max. | 0.85 | V |
| $R_D$ (1) | Dynamic resistance | $T_j$ = 125 °C | Max. | 35 | mΩ |
| $I_{DRM}$ $I_{RRM}$ | $V_{DRM} = V_{RRM}$ | $T_j$ = 25 °C | Max. | 5 | µA |
| | | $T_j$ = 125 °C | | 1 | mA |
| | $V_D$ = 0.9 x $V_{DRM}$ | $T_j$ = 150 °C(2) | Typ. | 1.9 | |

1. For both polarities of A2 referenced to A1.
2. Derating information for excess temperature above $T_j$ max.

**Table 5. Thermal resistance**

| Symbol | Parameter | Value | Unit |
|---|---|---|---|
| $R_{th(j-c)}$ | Junction to case (AC) | 2.6 | °C/W |
| $R_{th(j-a)}$ | Junction to ambient (DC) | 60 | °C/W |



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

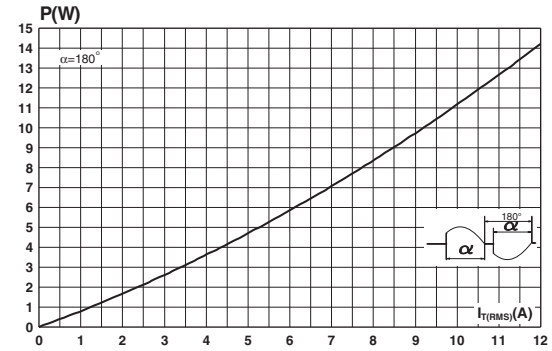



**Figure 2. On-state rms current versus case temperature (full cycle)**

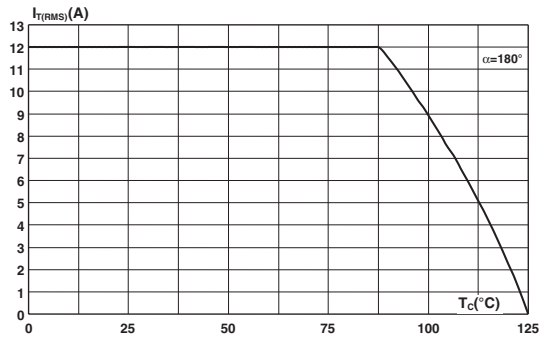



**Figure 3. On-state rms current versus ambient temperature**

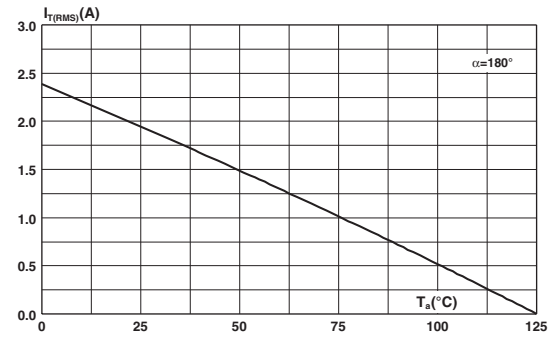



**Figure 4. Relative variation of thermal impedance versus pulse duration**

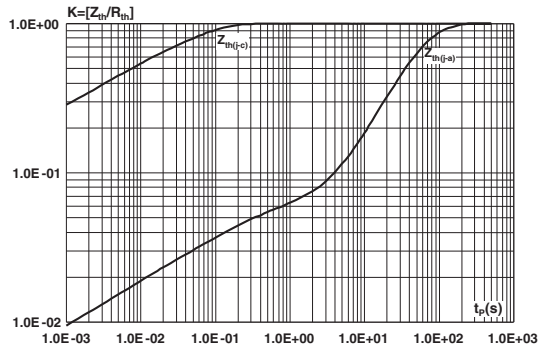



**Figure 5. On state characteristics (maximum values)**

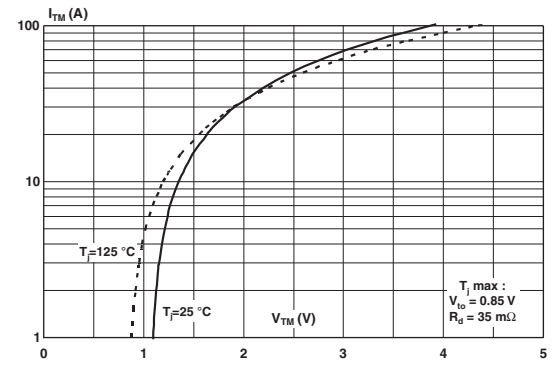



**Figure 6. Surge peak on state current versus number of cycles**

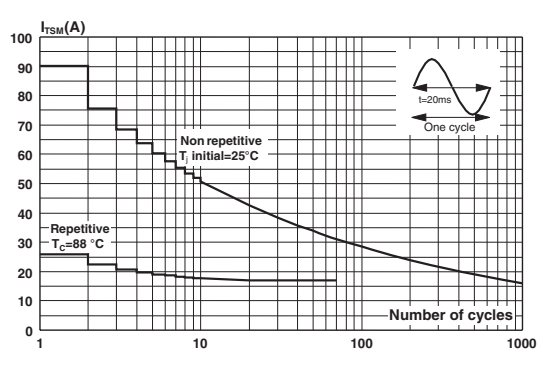


**Figure 7. Non repetitive surge peak on state current for a sinusoidal**

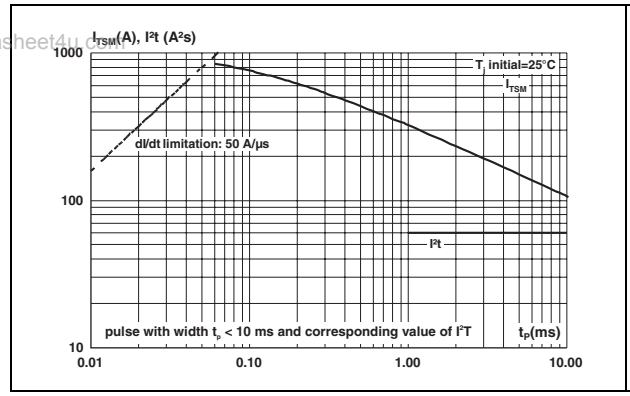



**Figure 8. Relative variation of gate trigger current and gate trigger voltage versus junction temperature**

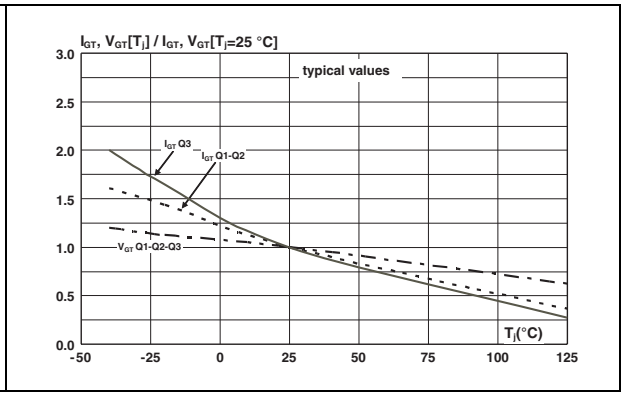



**Figure 9. Relative variation of holding current and latching current versus junction temperature**

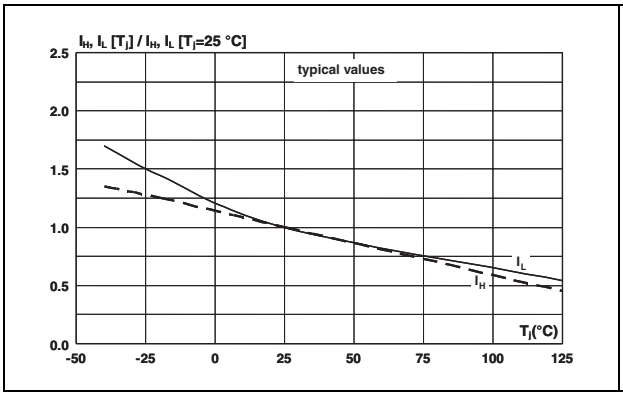



**Figure 10. Relative variation of critical rate of decrease of main current versus (dV/dt)c**

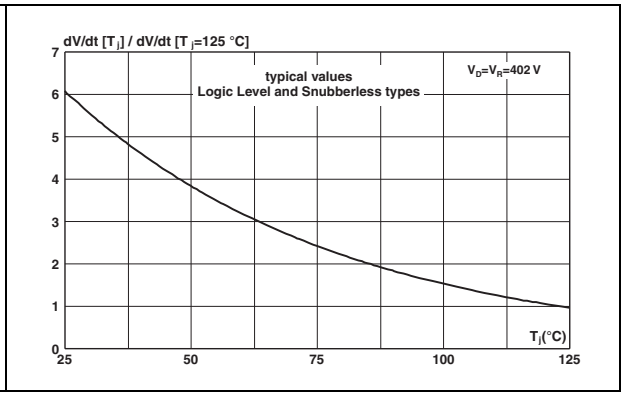



**Figure 11. Relative variation of critical rate of decrease of main current versus junction temperature**

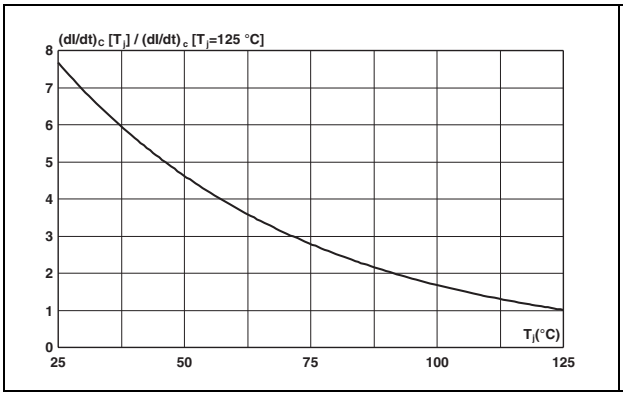
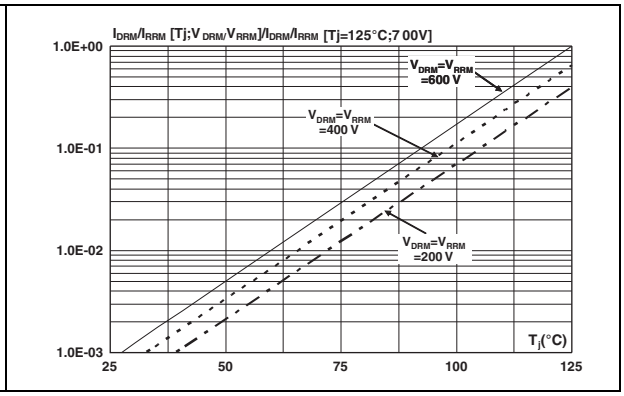


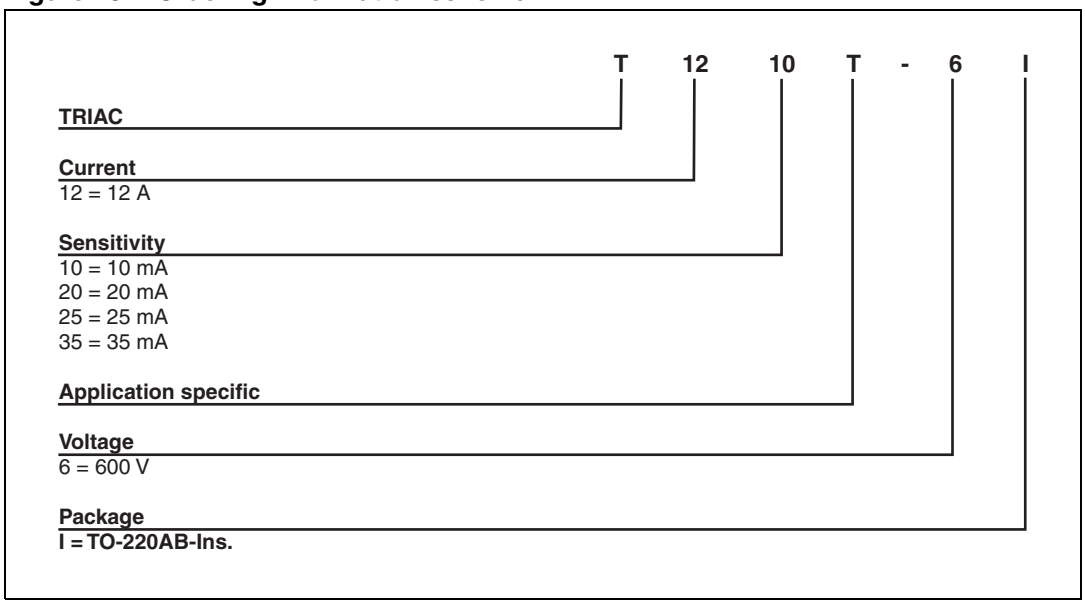

**Figure 12. Leakage current versus junction temperature for different values of blocking voltage (typical values)**



# 2 Ordering information scheme



**Figure 13. Ordering information scheme**



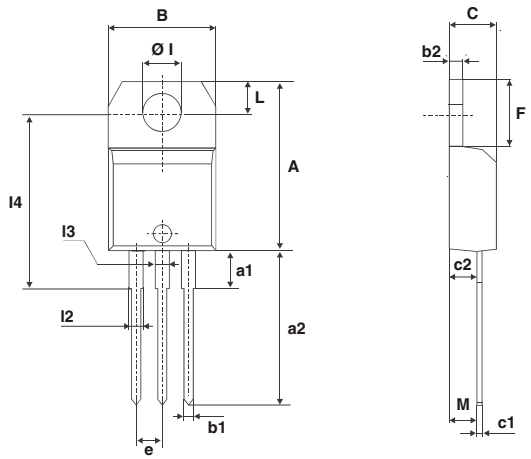
# 3 Package mechanical data



- Epoxy meets UL94, V0
- 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.

**Table 6. 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 | |

# 4 Ordering Information



**Table 7. Ordering information**

| Order code | Marking | Package | Weight | Base qty | Delivery mode |
|---|---|---|---|---|---|
| T1210T-6I | T1210T-6I | TO-220AB-ins. | 2.3 g | 50 | Tube |
| T1220T-6I | T1220T-6I | | | | |
| T1225T-6I | T1225T-6I | | | | |
| T1235T-6I | T1235T-6I | | | | |

# 5 Revision history

**Table 8. Document revision history**

| Date | Revision | Changes |
|---|---|---|
| 23-Mar-2009 | 1 | Initial release. |

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