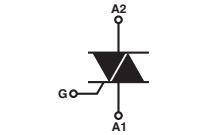
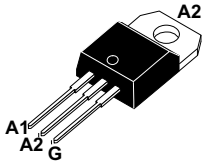
# T1610H

## 16 A Triac, high temperature and logic level

**Datasheet – production data**




**TO-220AB**
**(T1610H-6T)**

## Features

- Junction temperature up to 150 °C max.
- Logic level gate current: 10 mA
- Repetitive peak off-state voltage: 600 V
- High $I_{TSM}$
- High thermal cycling performance

## Applications

- Electric heater
- Water heater, room heater
- Coffee machine
- Hand dryer
- Thermostat

## Description

This clip technology Triac has very high thermal cycling performance, and the design structure presents a higher $I_{TSM}$. The 150 °C maximum junction temperature of this device offers easier thermal management. Its 10 mA gate current offers direct drive from a microcontroller, mainly for resistive load control.

**Table 1. Device summary**

| Order code | Package | $V_{DRM}$, $V_{RRM}$ | $I_{GT}$ | $I_{T(RMS)}$ |
|---|---|---|---|---|
| T1610H-6T | TO-220AB | 600 V | 10 mA | 16 A |

# 1 Characteristics

**Table 2. Absolute maximum rating ($T_j$ = 25 °C, unless otherwise specified)**

| Symbol | Parameter | | Value | Unit |
|---|---|---|---|---|
| $I_{T(RMS)}$ | On-state rms current (180° conduction angle) | $T_c$ = 133 °C | 16 | A |
| $I_{TSM}$ | Non repetitive surge peak on-state current, $T_j$ initial = 25 °C | $t_p$ = 16.7 ms | 168 | A |
| | | $t_p$ = 20ms | 160 | |
| $I^2t$ | $I^2t$ Value for fusing | $t_p$ = 10 ms | 169 | $A^2s$ |
| dI/dt | Critical rate of rise of on-state current, $I_G$ = 2 x $I_{GT}$, tr ≤ 100 ns | F = 60 Hz | 100 | A/µs |
| $V_{DRM}$, $V_{RRM}$ | Repetitive peak off-state voltage | $T_j$ = 150 °C | 600 | V |
| $V_{DSM}$, $V_{RSM}$ | Non repetitive peak off-state voltage | $t_p$ = 10 ms | 700 | V |
| $I_{GM}$ | Peak gate current | $t_p$ = 20 µs | 4 | A |
| $P_{GM}$ | Peak gate power dissipation | $t_p$ = 20 µs | 10 | W |
| $P_{G(AV)}$ | Average gate power dissipation | | 1 | W |
| $T_{stg}$<br>$T_j$ | Storage junction temperature range<br>Operating junction temperature range | | -40 to +150 | °C |
| $T_L$ | Lead temperature for soldering during 10 s | | 260 | °C |

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

| Symbol | Test conditions | | Quadrant | | Value | Unit |
|---|---|---|---|---|---|---|
| $I_{GT}$ | $V_D$ = 12 V, $R_L$ = 33 Ω | | I - II - III | MIN. | 0.5 | mA |
| | | | | MAX. | 10 | mA |
| $V_{GT}$ | $V_D$ = 12 V, RL = 33 Ω | | 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. | 0.2 | V |
| $I_H$ | $I_T$ = 500 mA, gate open | | – | MAX. | 15 | mA |
| $I_L$ | $I_G$ = 1.2 $I_{GT}$ | | I - II - III | MAX. | 30 | mA |
| dV/dt | $V_D$ = 67% x $V_{DRM}$, $V_{RRM}$, gate open | $T_j$ = 150 °C | – | MIN. | 100 | V/µs |
| (dI/dt)c | (dV/dt)c = 0.1 V/µs | $T_j$ = 150 °C | – | MIN. | 8.5 | A/ms |
| | (dV/dt)c = 10 V/µs | | – | | 3 | |
| $t_{gt}$ | $I_{TM}$ = 13 A, $V_D$ = 400 V, $I_G$ = 100 mA,<br>$dI_G/dt$ = 100 mA/µs, $R_L$ = 30 Ω | | – | TYP. | 2 | µs |

**Table 4. Static characteristics**

| Symbol | Test conditions | | | Value | Unit |
|---|---|---|---|---|---|
| $V_{TM}$ | $I_{TM}$ = 22.5 A, $t_p$ = 380 µs | $T_j$ = 25 °C | MAX. | 1.55 | V |
| $V_{to}$ | Threshold voltage | $T_j$ = 150 °C | | 0.80 | V |
| $R_d$ | Dynamic resistance | $T_j$ = 150 °C | | 22 | mΩ |
| $I_{DRM}$, $I_{RRM}$ | $V_D = V_{DRM}$, $V_R = V_{RRM}$ | $T_j$ = 25 °C | | 5 | µA |
| | | $T_j$ = 150 °C | | 2 | mA |

**Table 5. Thermal resistance**

| Symbol | Parameter | Value | Unit |
|---|---|---|---|
| $R_{th(j-c)}$ | Junction to case (AC) | 1.0 | °C/W |
| $R_{th(j-a)}$ | Junction to ambient (AC) | 60 | °C/W |

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

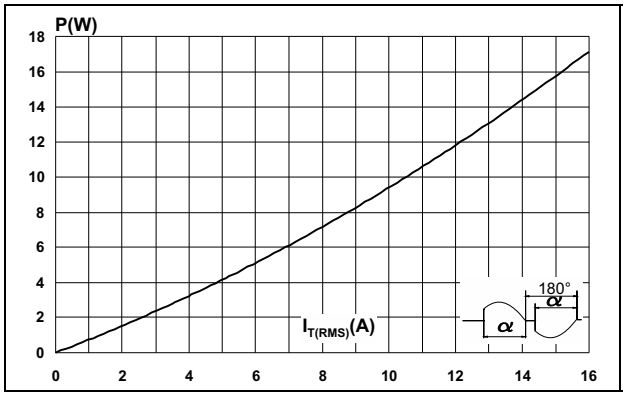



**Figure 2. On-state rms current versus case temperature (full cycle)**

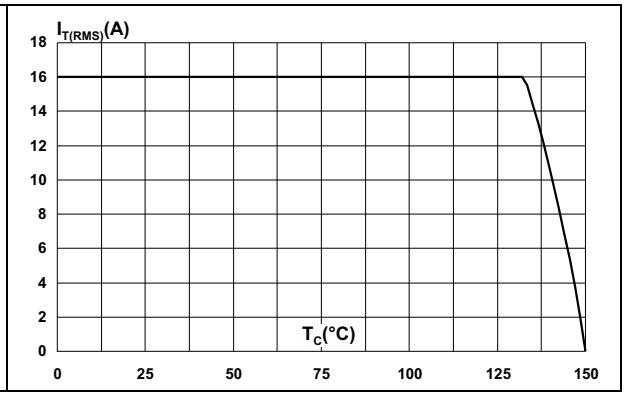



**Figure 3. On-state rms current versus ambient temperature (free air convection)**

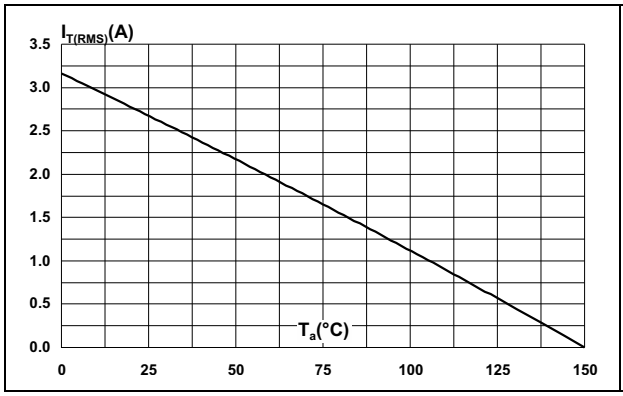



**Figure 4. Relative variation of thermal impedance versus pulse duration**

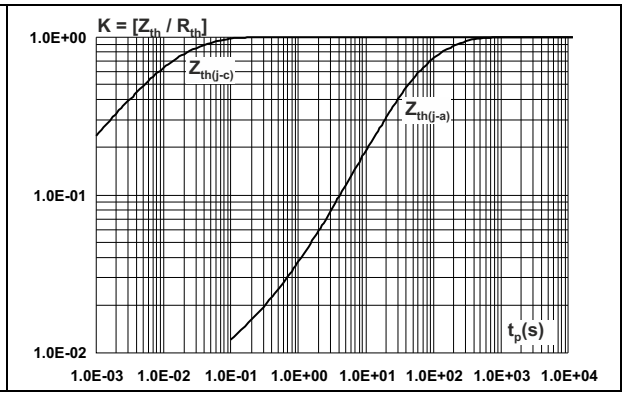


**Figure 5. Relative variation of gate trigger current and voltage versus junction temperature (typical values)**

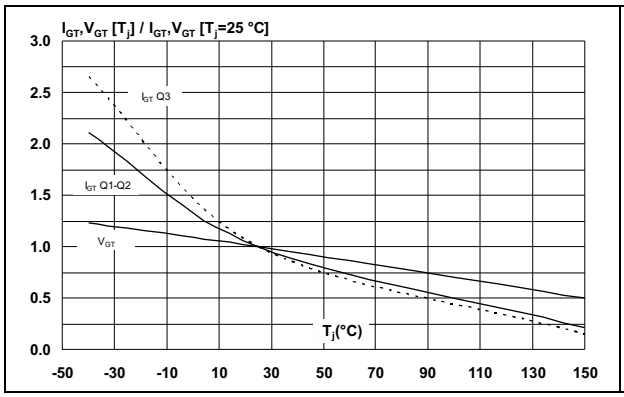



**Figure 6. Relative variation of holding and latching current versus junction temperature (typical values)**

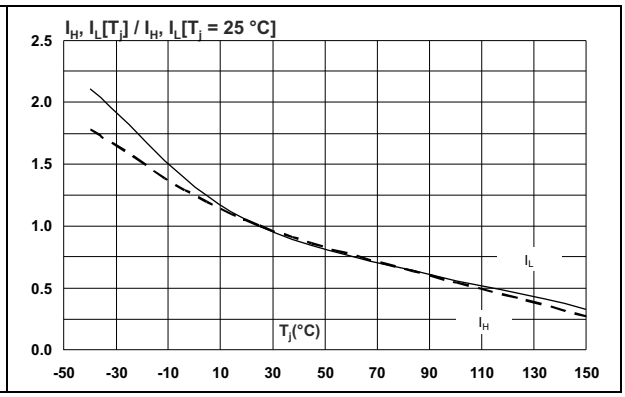



**Figure 7. Relative variation of dV/dt immunity versus junction temperature (typical values)**

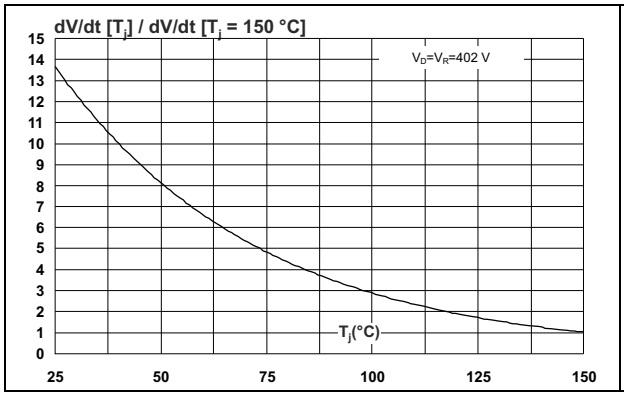



**Figure 8. Relative variation of critical rate of decrease of main current (di/dt)c versus junction temperature (typical values)**

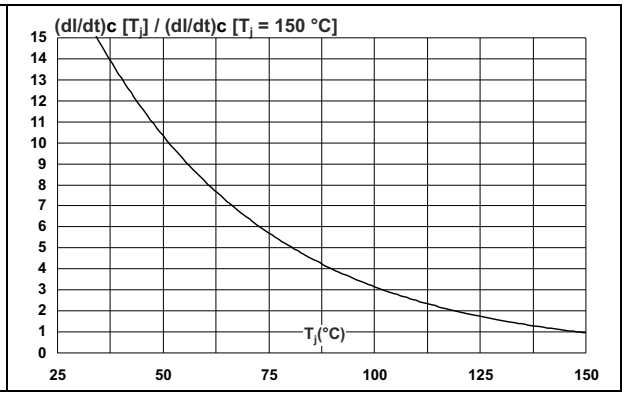



**Figure 9. Relative variation of critical rate of decrease of main current (di/dt)c versus reapplied (dV/dt)c**

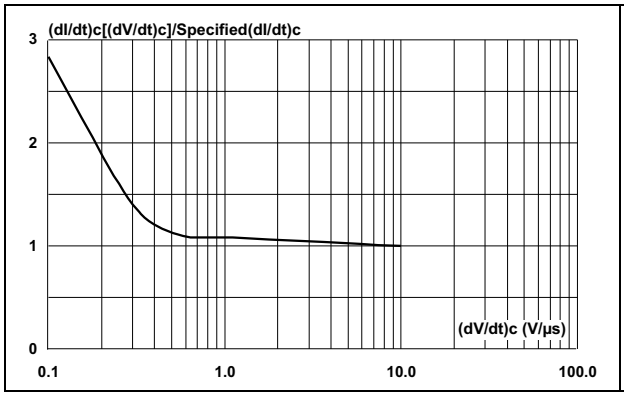



**Figure 10. Surge peak on-state current versus number of cycles**

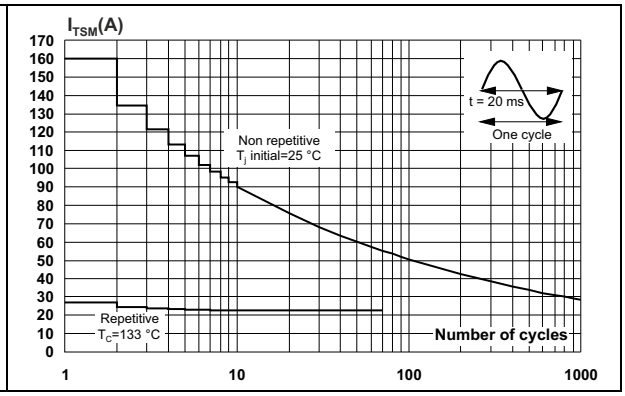


**Figure 11. Non repetitive surge peak on-state current for a sinusoidal pulse with width tp < 10 ms, and corresponding value of I²t**

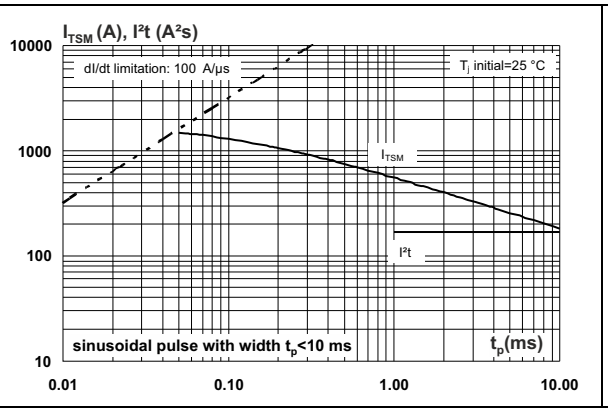



**Figure 12. On-state characteristics (maximum values)**

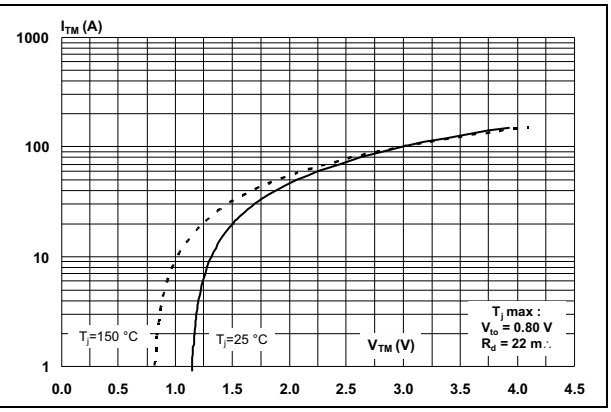
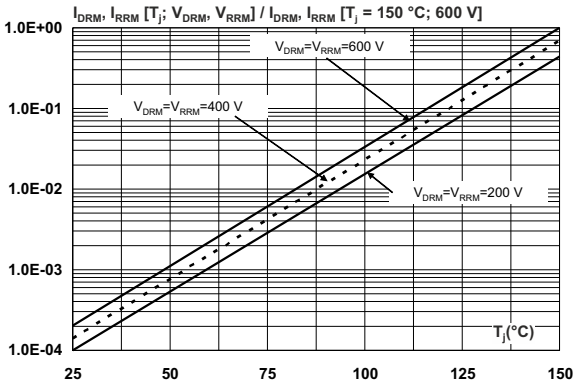



**Figure 13. Relative variation of leakage current versus junction temperature for different values of blocking voltage (typical values)**



# 2 Package information

- Epoxy meets UL94, V0
- Recommended torque value: 0.4 to 0.6 N·m

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**Figure 14. TO-220AB dimension definitions**

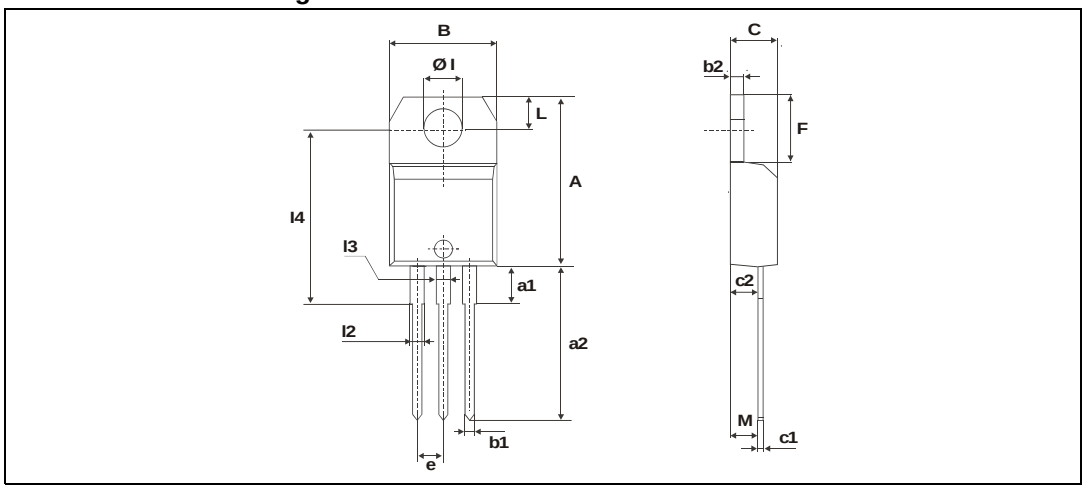

Table 6. TO-220AB dimension values

| 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 |
| I4 | 15.80 | 16.40 | 16.80 | 0.622 | 0.646 | 0.661 |
| L | 2.65 | | 2.95 | 0.104 | | 0.116 |
| I2 | 1.14 | | 1.70 | 0.044 | | 0.066 |
| I3 | 1.14 | | 1.70 | 0.044 | | 0.066 |
| M | | 2.60 | | | 0.102 | |

# 3 Ordering information

**Figure 15. Ordering information scheme**

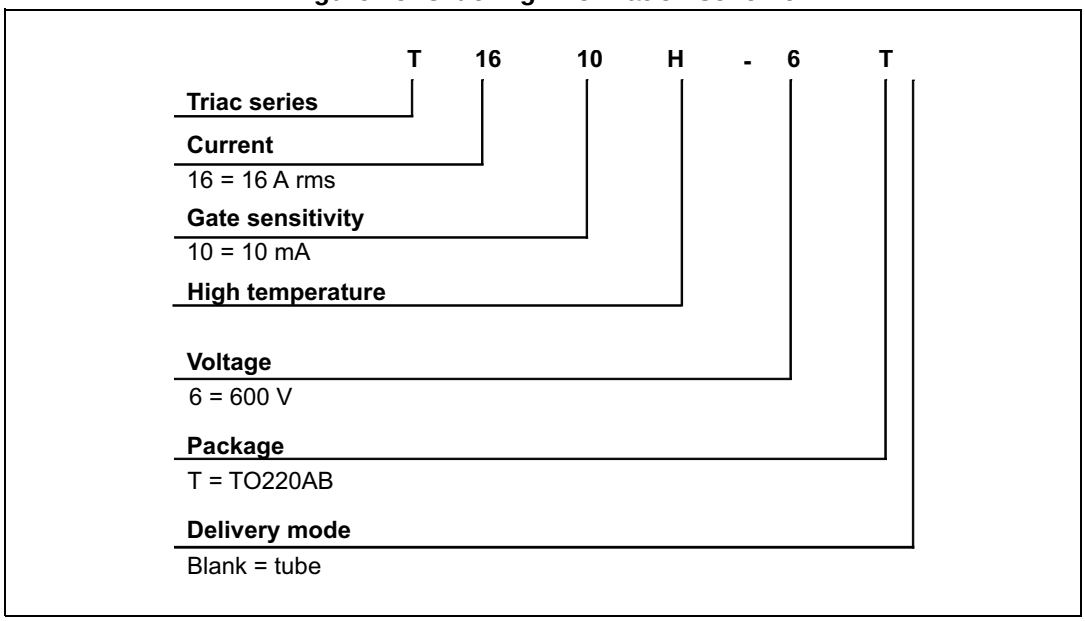


**Table 7. Ordering information**

| Order code | Marking | Package | Weight | Base qty | Delivery mode |
|---|---|---|---|---|---|
| T1610H-6T | T1610H-6T | TO-220AB | 2.3 | 50 | Tube |

# 4 Revision history

**Table 8. Document revision history**

| Date | Revision | Changes |
|---|---|---|
| 31-May-2013 | 1 | First issue. |

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