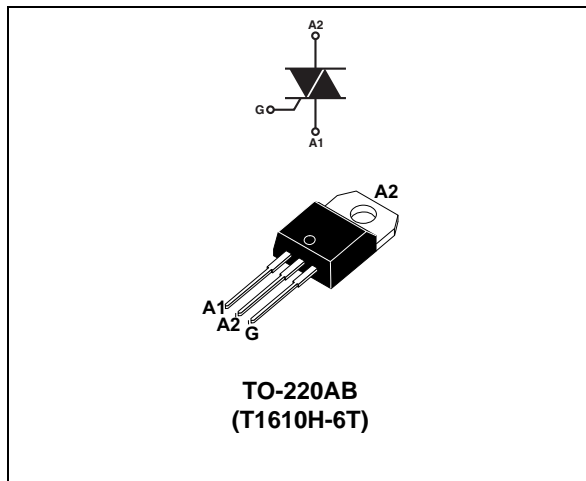


16 A Triac, high temperature and logic level

Datasheet – production data



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 ($T_j = 25\text{ °C}$, unless otherwise specified)

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

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

| Symbol | Test conditions | Quadrant | | Value | Unit | |
|----------|---|-----------------------|------|-------|---------|------------|
| I_{GT} | $V_D = 12\text{ V}$, $R_L = 33\text{ }\Omega$ | I - II - III | MIN. | 0.5 | mA | |
| | | | MAX. | 10 | mA | |
| V_{GT} | $V_D = 12\text{ V}$, $R_L = 33\text{ }\Omega$ | 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 | $I_T = 500\text{ mA}$, gate open | – | MAX. | 15 | mA | |
| I_L | $I_G = 1.2 I_{GT}$ | I - II - III | MAX. | 30 | mA | |
| dV/dt | $V_D = 67\% \times V_{DRM}$, V_{RRM} , gate open | $T_j = 150\text{ °C}$ | – | MIN. | 100 | V/ μ s |
| (di/dt)c | (dV/dt)c = 0.1 V/ μ s | $T_j = 150\text{ °C}$ | – | MIN. | 8.5 | A/ms |
| | (dV/dt)c = 10 V/ μ s | | – | | 3 | |
| t_{gt} | $I_{TM} = 13\text{ A}$, $V_D = 400\text{ V}$, $I_G = 100\text{ mA}$, $di_G/dt = 100\text{ mA}/\mu\text{s}$, $R_L = 30\text{ }\Omega$ | – | TYP. | 2 | μ s | |

Table 4. Static characteristics

| Symbol | Test conditions | | Value | Unit | |
|--------------------------|---|------------------------------------|-------|------|---------------|
| V_{TM} | $I_{TM} = 22.5 \text{ A}$, $t_p = 380 \mu\text{s}$ | $T_j = 25 \text{ }^\circ\text{C}$ | MAX. | 1.55 | V |
| V_{to} | Threshold voltage | $T_j = 150 \text{ }^\circ\text{C}$ | | 0.80 | V |
| R_d | Dynamic resistance | $T_j = 150 \text{ }^\circ\text{C}$ | | 22 | m Ω |
| I_{DRM} , I_{RRM} | $V_D = V_{DRM}$, $V_R = V_{RRM}$ | $T_j = 25 \text{ }^\circ\text{C}$ | | 5 | μA |
| | | $T_j = 150 \text{ }^\circ\text{C}$ | 2 | mA | |

Table 5. Thermal resistance

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

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

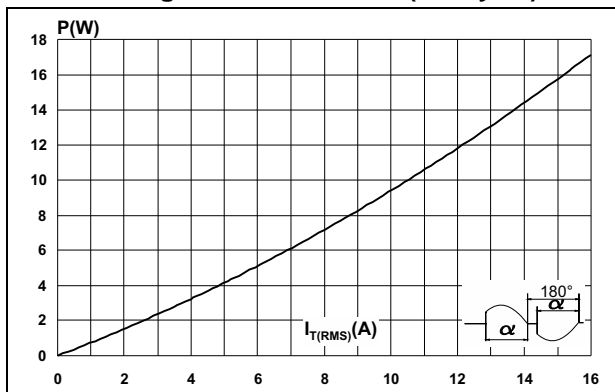


Figure 2. On-state rms current versus case temperature (full cycle)

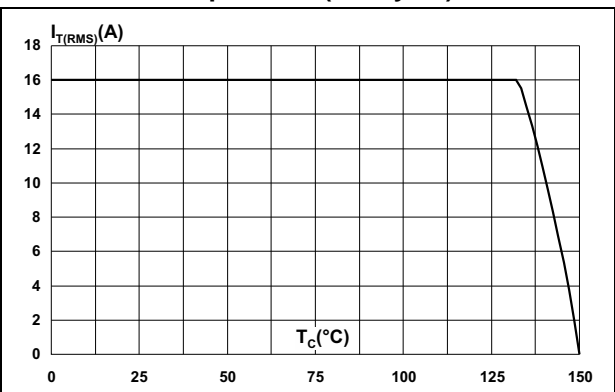


Figure 3. On-state rms current versus ambient temperature (free air convection)

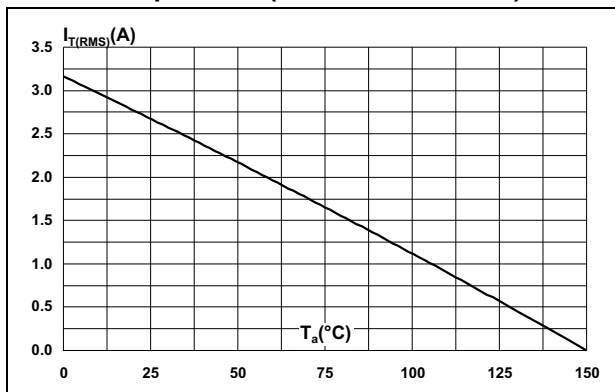


Figure 4. Relative variation of thermal impedance versus pulse duration

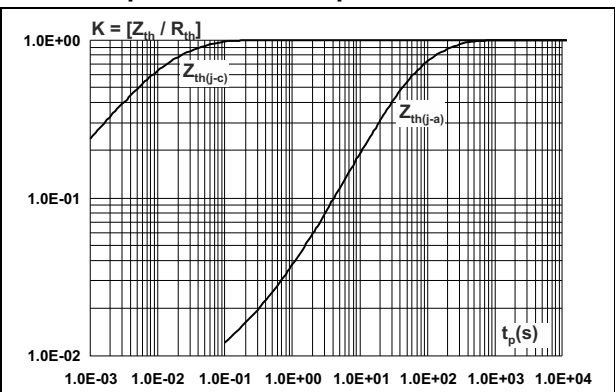


Figure 5. Relative variation of gate trigger current and voltage versus junction temperature (typical values)

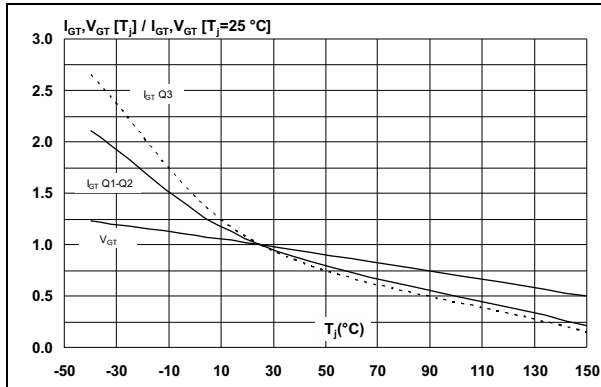


Figure 6. Relative variation of holding and latching current versus junction temperature (typical values)

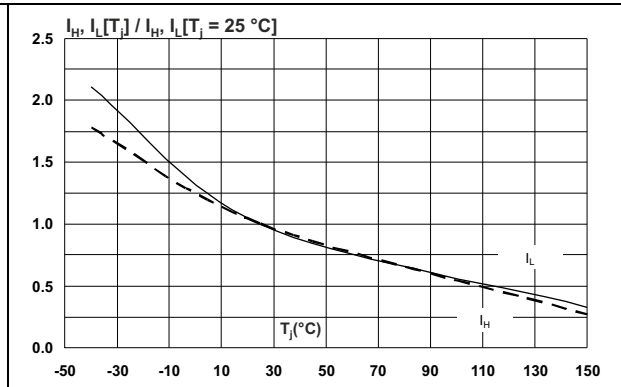


Figure 7. Relative variation of dV/dt immunity versus junction temperature (typical values)

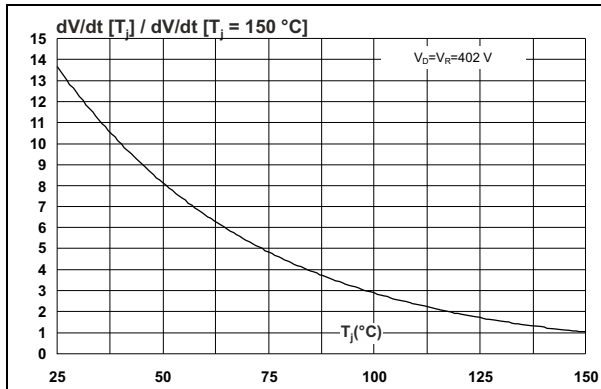


Figure 8. Relative variation of critical rate of decrease of main current (di/dt)c versus junction temperature (typical values)

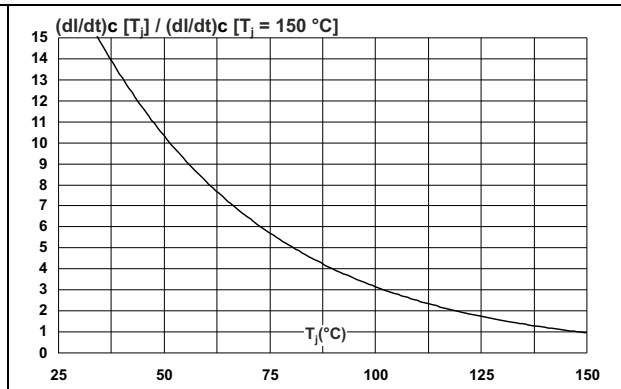


Figure 9. Relative variation of critical rate of decrease of main current (di/dt)c versus reapplied (dV/dt)c

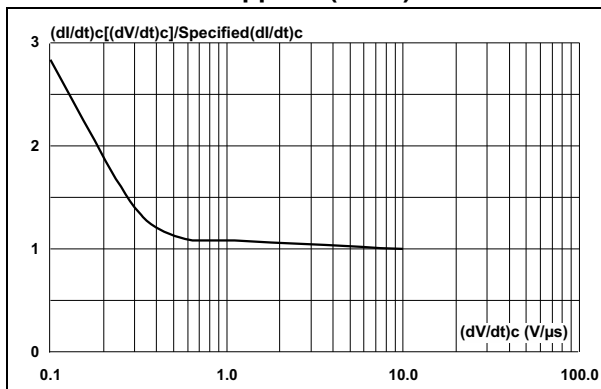


Figure 10. Surge peak on-state current versus number of cycles

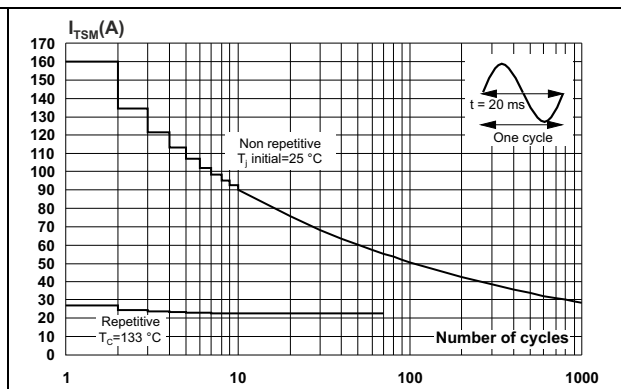


Figure 11. Non repetitive surge peak on-state current for a sinusoidal pulse with width $t_p < 10$ ms, and corresponding value of I^2t

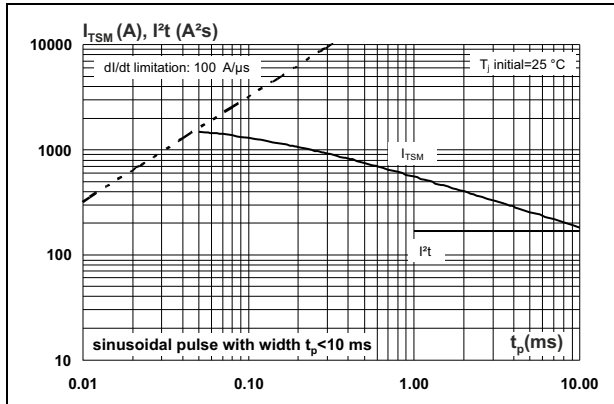


Figure 12. On-state characteristics (maximum values)

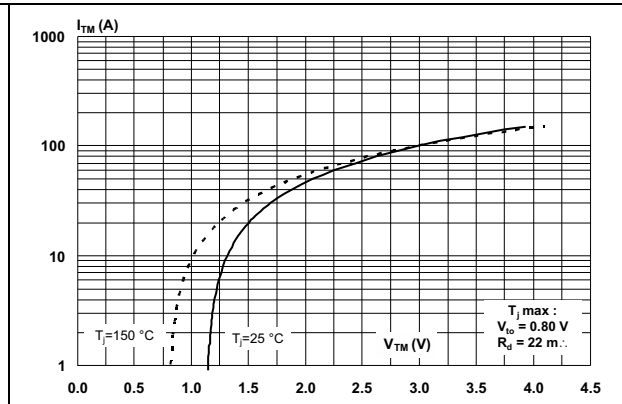
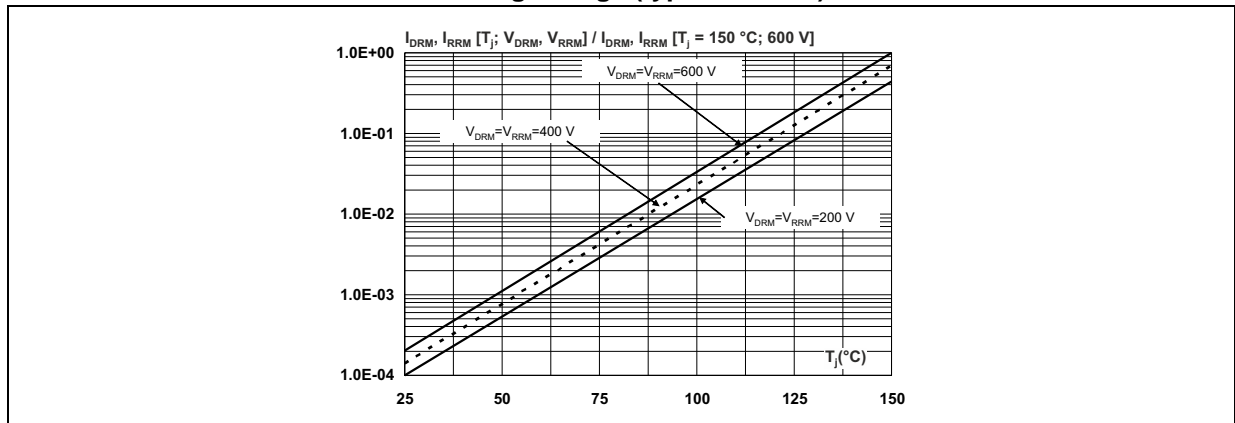


Figure 13. Relative variation of leakage current versus junction temperature for different values of blocking voltage (typical values)



2 Package information

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

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.

Figure 14. TO-220AB dimension definitions

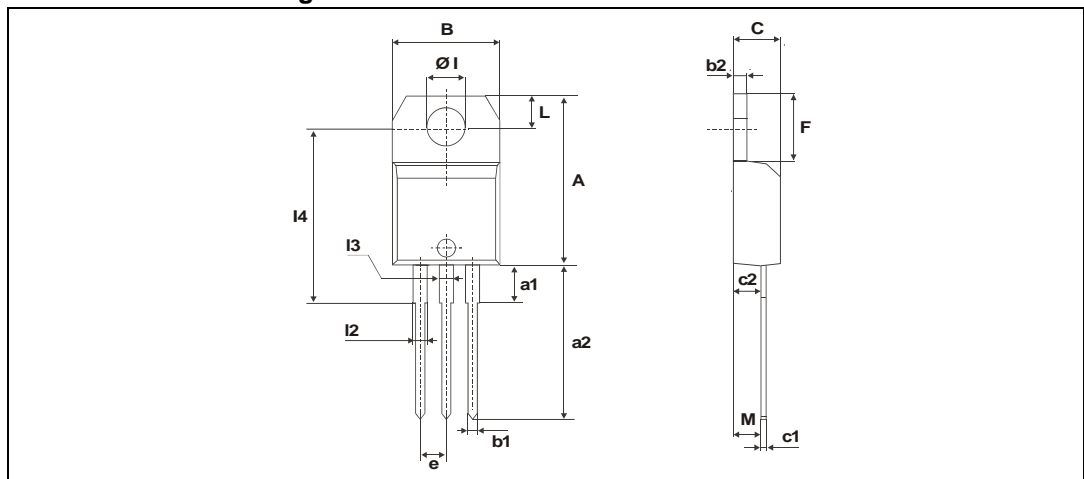


Table 6. TO-220AB dimension values

| 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

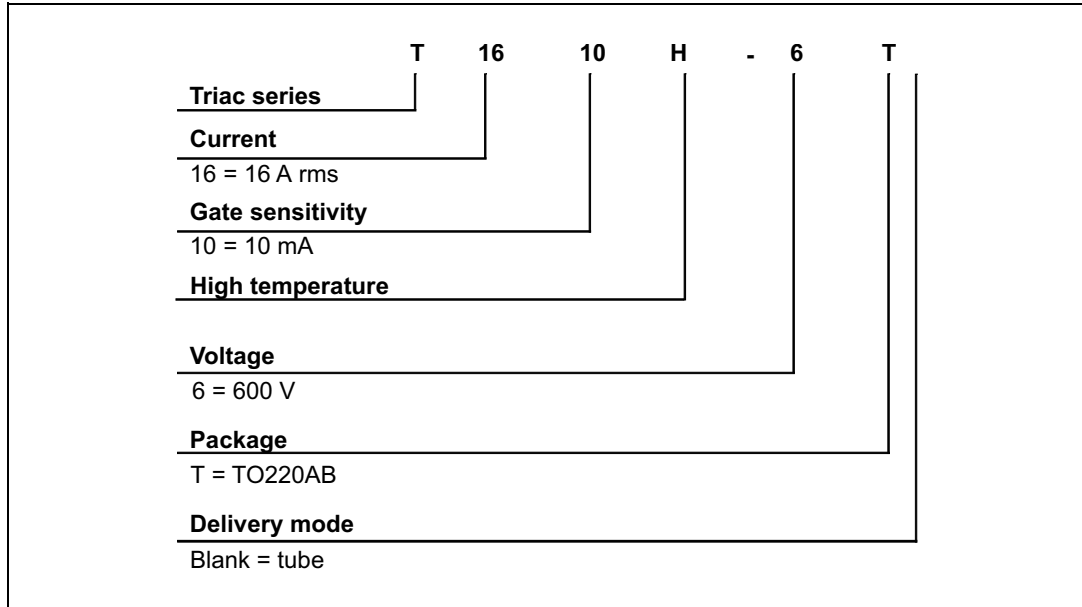


Table 7. Ordering information

| 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. |