

Description

Available in through-hole package, the T1610T-8T 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 due to its 10 mA gate current requirement.

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 quadrants
- ECOPACK[®]2 compliant component

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) | | $T_c = 129\text{ °C}$ | 16 | A |
| I_{TSM} | Non repetitive surge peak on-state current (full cycle, T_j initial = 25 °C) | $f = 50\text{ Hz}$ | $t = 20\text{ ms}$ | 120 | A |
| | | $f = 60\text{ Hz}$ | $t = 16.7\text{ ms}$ | 126 | |
| I^2t | I^2t value for fusing, T_j initial = 25 °C | | $t_p = 10\text{ ms}$ | 95 | A^2s |
| 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 $I_G = 2 \times I_{GT}, t_r \leq 100\text{ ns}$ | | $F = 100\text{ Hz}$ | 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 | $^{\circ}C$ |

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} | $V_D = V_{DRM}, R_L = 3.3\text{ k}\Omega, T_j = 125\text{ °C}$ | 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 | |
| $dV/dt^{(1)}$ | $V_D = V_R = 536\text{ V}$, gate open | $T_j = 125\text{ °C}$ | Min. | 250 | $V/\mu s$ |
| | $V_D = V_R = 402\text{ V}$, gate open | $T_j = 150\text{ °C}$ | | 170 | $V/\mu s$ |
| $(dI/dt)^{(1)}$ | $(dV/dt)_c = 0.1\text{ V}/\mu s$ | $T_j = 125\text{ °C}$ | Min. | 21.6 | A/ms |
| | | $T_j = 150\text{ °C}$ | | 15.1 | |
| $(dI/dt)^{(1)}$ | $(dV/dt)_c = 10\text{ V}/\mu s$ | $T_j = 125\text{ °C}$ | Min. | 11.3 | A/ms |
| | | $T_j = 150\text{ °C}$ | | 5 | |

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 |
| $V_{t0}^{(1)}$ | 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 Ω |
| I_{DRM} I_{RRM} | $V_{DRM} = V_{RRM} = 800 \text{ V}$ | $T_j = 25 \text{ }^\circ\text{C}$ | Max. | 7.5 | μA |
| | | $T_j = 125 \text{ }^\circ\text{C}$ | | 1 | mA |
| | $V_{DRM} = V_{RRM} = 600 \text{ V}$ | $T_j = 150 \text{ }^\circ\text{C}$ | Max. | 3 | |

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) | 1.1 | $^\circ\text{C/W}$ |
| $R_{th(j-a)}$ | Junction to ambient (DC) | 60 | $^\circ\text{C/W}$ |

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

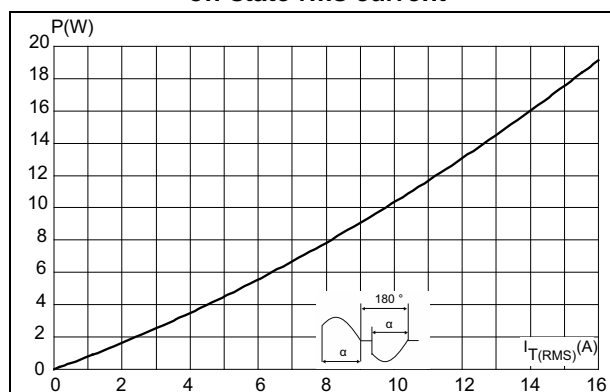


Figure 2. On-state rms current versus case temperature

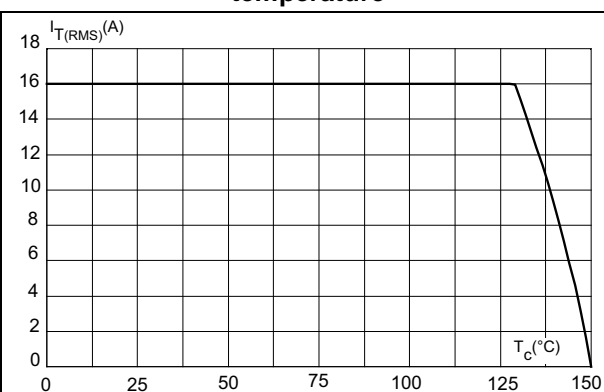


Figure 3. On-state rms current versus ambient temperature (free air convection)

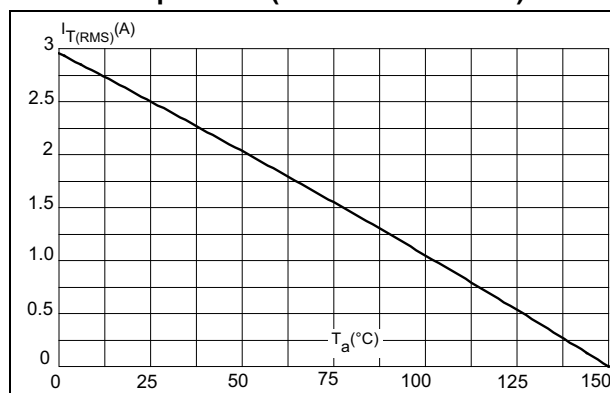


Figure 4. Relative variation of thermal impedance versus pulse duration

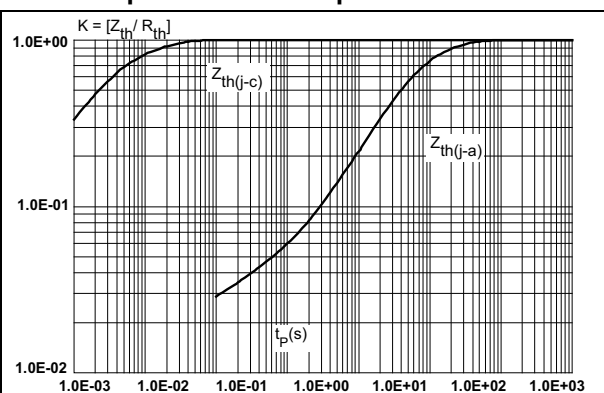


Figure 5. On-state characteristics (maximum values)

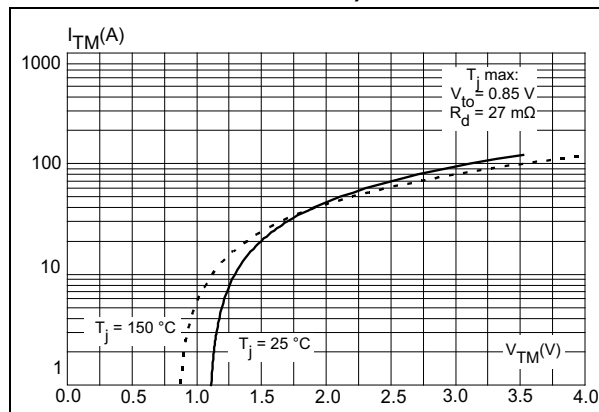


Figure 6. Surge peak on-state current versus number of cycles

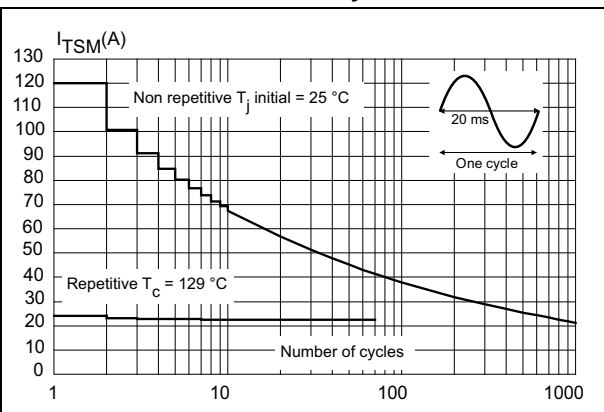


Figure 7. Non repetitive surge peak on-state current

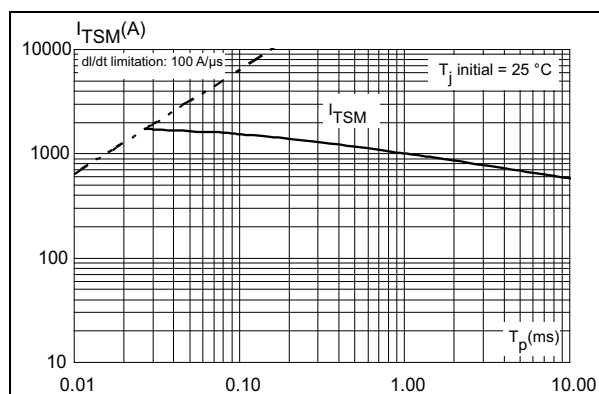


Figure 8. Relative variation of gate trigger current and gate voltage versus junction temperature (typical values)

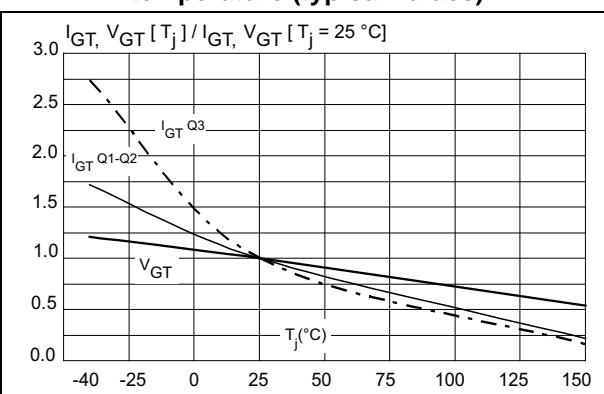


Figure 9. Relative variation of critical rate of decrease of main current versus junction temperature (typical values)

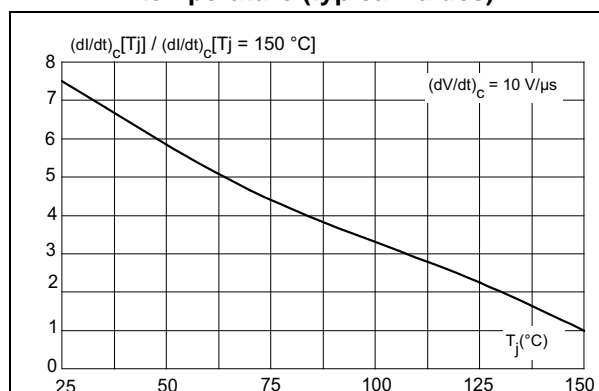


Figure 10. Relative variation of holding current and latching current versus junction temperature (typical values)

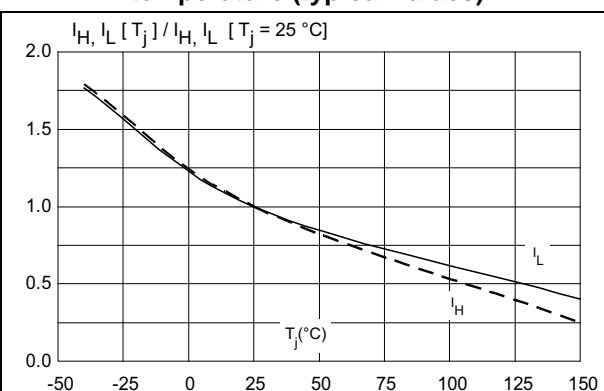


Figure 11. Relative variation of critical rate of decrease of main current $(di/dt)_C$ versus reapplied $(dV/dt)_C$ (maximum values)

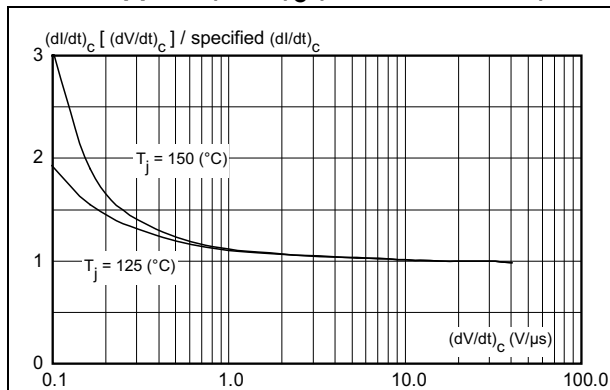


Figure 12. Relative variation of static dV/dt immunity versus junction temperature (typical values)

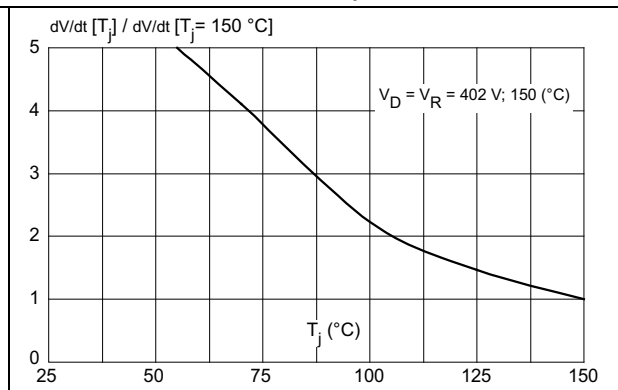
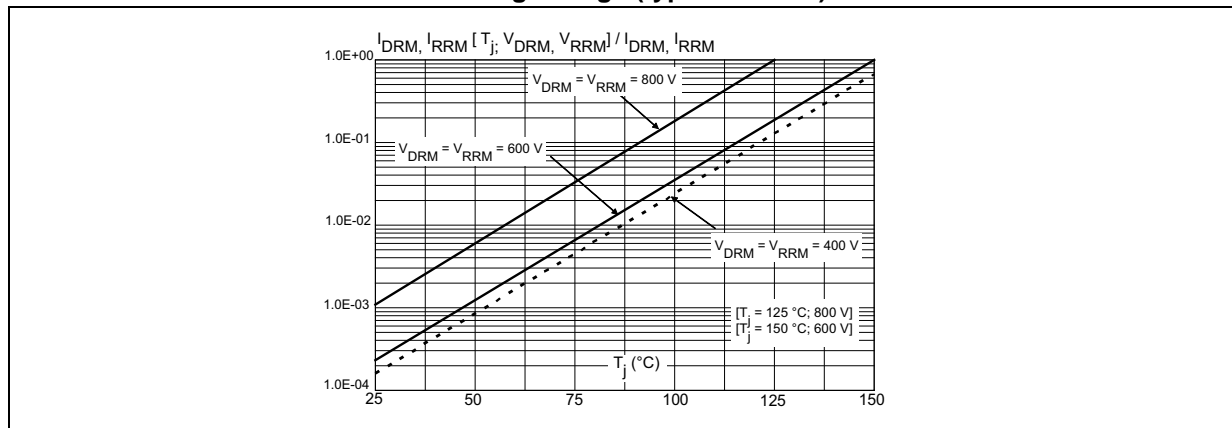


Figure 13. Relative variation of leakage current versus junction temperature for different values of blocking voltage (typical values)



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® 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

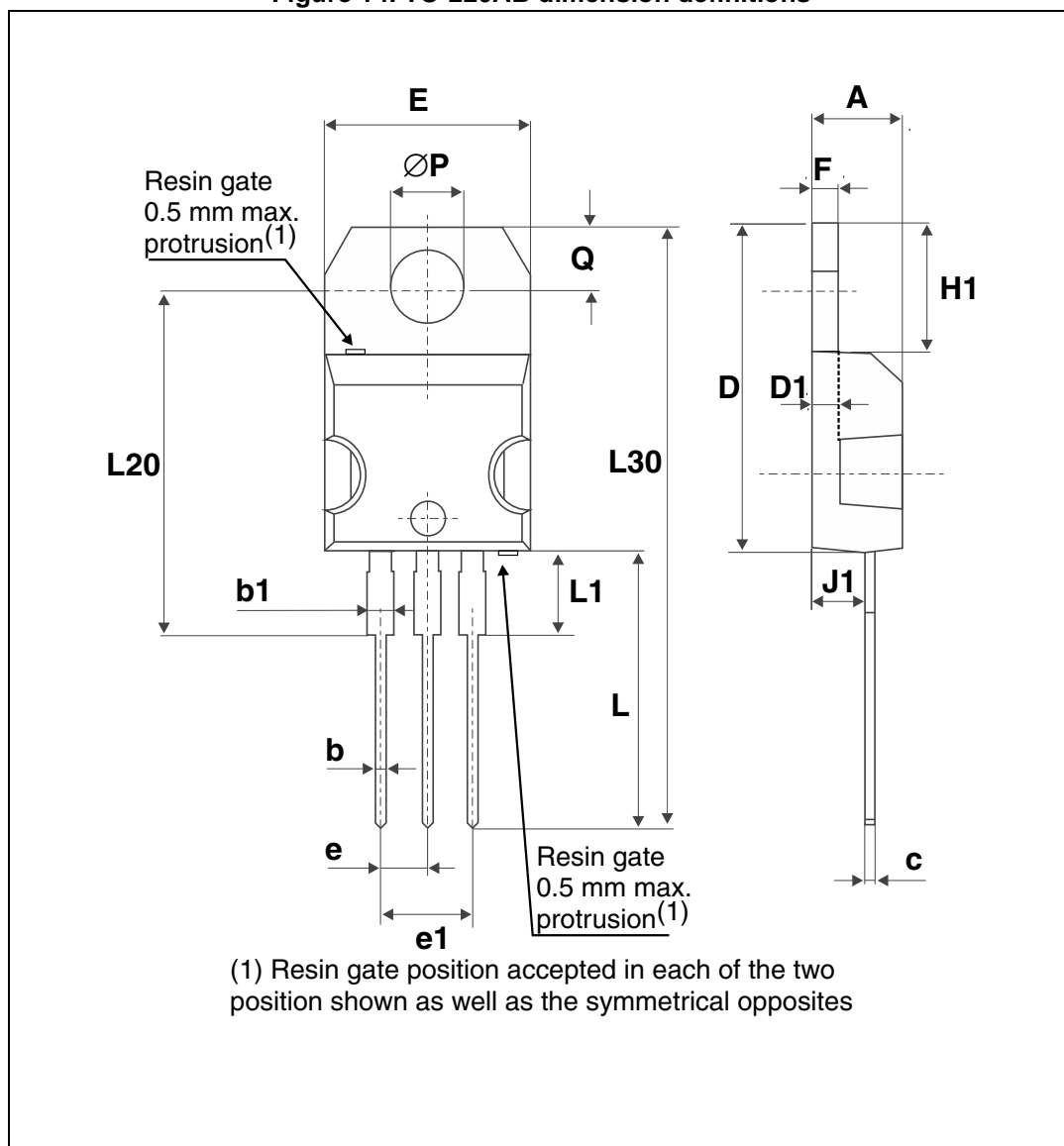


Table 6. TO-220AB dimension values

| Ref. | Dimensions | | | |
|------|-------------|-------|-----------|-------|
| | Millimeters | | Inches | |
| | Min. | Max. | Min. | Max. |
| A | 4.40 | 4.60 | 0.17 | 0.18 |
| b | 0.61 | 0.88 | 0.024 | 0.035 |
| b1 | 1.14 | 1.70 | 0.045 | 0.067 |
| c | 0.48 | 0.70 | 0.019 | 0.027 |
| D | 15.25 | 15.75 | 0.60 | 0.62 |
| D1 | 1.27 typ. | | 0.05 typ. | |
| E | 10 | 10.40 | 0.39 | 0.41 |
| e | 2.40 | 2.70 | 0.094 | 0.106 |
| e1 | 4.95 | 5.15 | 0.19 | 0.20 |
| F | 1.23 | 1.32 | 0.048 | 0.052 |
| H1 | 6.20 | 6.60 | 0.24 | 0.26 |
| J1 | 2.40 | 2.72 | 0.094 | 0.107 |
| L | 13 | 14 | 0.51 | 0.55 |
| L1 | 3.50 | 3.93 | 0.137 | 0.154 |
| L20 | 16.40 typ. | | 0.64 typ. | |
| L30 | 28.90 typ. | | 1.13 typ. | |
| ØP | 3.75 | 3.85 | 0.147 | 0.151 |
| Q | 2.65 | 2.95 | 0.104 | 0.116 |

3 **Ordering information**

Figure 15. Ordering information scheme

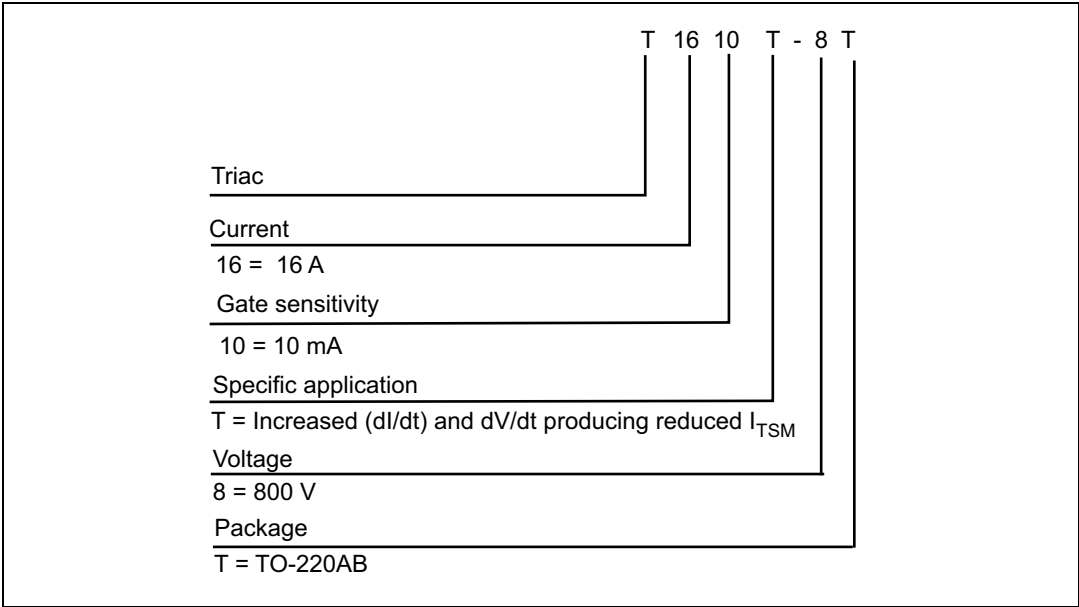


Table 7. Ordering information

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

4 **Revision history**

Table 8. Document revision history

| Date | Revision | Changes |
|-------------|----------|------------------|
| 23-Oct-2014 | 1 | Initial release. |

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