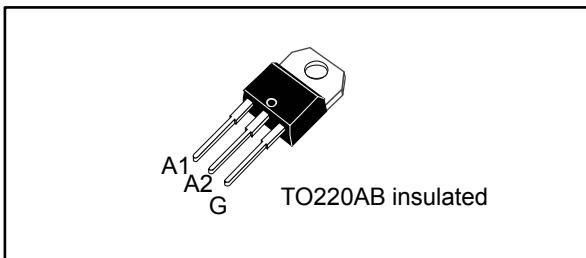


12 A Snubberless™ Triac

Datasheet -production data



Features

- High static dV/dt
- High dynamic turn-off commutation (dl/dt)c
- 150 °C maximum T_j
- Three quadrants
- Built-in ceramic for tab insulation
- Compliance to UL1557 standard (ref : E81734)
- ECOPACK®2 compliant component
- Complies with UL94,V0
- Surge capability V_{DSM}, V_{RSM} = 900 V

Benefits

- High immunity to false turn-on thanks to high static dV/dt
- Better turn-off in high temperature environments thanks to (dl/dt)c
- Increase of thermal margin due to extended working T_j up to 150 °C
- Better thermal resistance due to the ceramic inside the package

Applications

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

Description

Available in through-hole package, the T1235T-8I Triac can be used for the on/off or phase angle control function in general purpose AC switching where high commutation capability is required. This device can be used without a snubber RC circuit when the limits defined are respected.

TO-220AB insulated provides tab insulation, UL1557 certified, rated at 2.5 kV RMS and UL-94, V0 resin compliance.

Package environmentally friendly Ecopack®2 graded (RoHS and Halogen Free compliance).

Snubberless™ is a trademark of STMicroelectronics.

Figure 1: Functional diagram

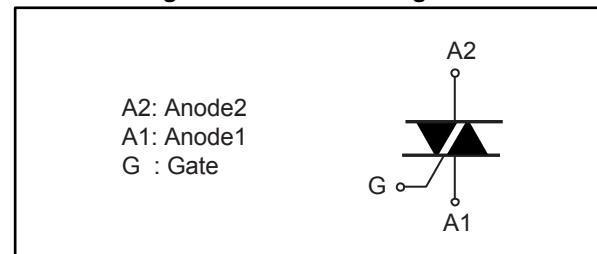


Table 1: Device summary

| Symbol | Value | Unit |
|----------------------------------|-------|------|
| I _{T(RMS)} | 12 | A |
| V _{DRM/V_{RRM}} | 800 | V |
| V _{DSM/V_{RSM}} | 900 | V |
| I _{GT} | 35 | mA |

1 Characteristics

Table 2: Absolute maximum ratings (limiting values)

| Symbol | Parameter | | Value | Unit | |
|-------------------|---|-------------------------|---------------------|------------------------|---|
| $I_{T(RMS)}$ | RMS on-state current (full sine wave) | $T_c = 114^\circ C$ | 12 | A | |
| I_{TSM} | Non repetitive surge peak on-state current, T_j initial = 25 °C | $t_p = 16.7 \text{ ms}$ | 95 | A | |
| | | $t_p = 20 \text{ ms}$ | 90 | | |
| I^2t | I^2t value for fusing | T_j initial = 25 °C | 54 | A^2s | |
| dl/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 | $\text{A}/\mu\text{s}$ | |
| V_{DRM}/V_{RRM} | Repetitive peak off-state voltage | $T_j = 150^\circ C$ | 600 | V | |
| | | $T_j = 125^\circ C$ | 800 | V | |
| V_{DSM}/V_{RSM} | Non Repetitive peak off-state voltage | $t_p = 10 \text{ ms}$ | 900 | V | |
| I_{GM} | Peak gate current | $t_p = 20 \mu\text{s}$ | $T_j = 150^\circ C$ | 4 | A |
| $P_{G(AV)}$ | Average gate power dissipation | $T_j = 150^\circ C$ | 1 | W | |
| T_{stg} | Storage junction temperature range | | -40 to +150 | °C | |
| T_j | Operating junction temperature range | | -40 to +150 | °C | |
| T_L | Maximum lead temperature for soldering during 10 s | | 260 | °C | |
| V_{ins} | Insulation RMS voltage, 1 minute, UL1557 certified (E81734) | | 2.5 | kV | |

Table 3: Electrical characteristics ($T_j = 25^\circ C$, unless otherwise specified)

| Symbol | Test conditions | Quadrants; T_j | | Value | Unit |
|------------------|---|---------------------|------|-------|------------------------|
| I_{GT} | $V_D = 12 \text{ V}$, $R_L = 33 \Omega$ | I - II - III | Min. | 1.75 | mA |
| | $V_D = 12 \text{ V}$, $R_L = 33 \Omega$ | I - II - III | Max. | 35 | mA |
| V_{GT} | $V_D = 12 \text{ V}$, $R_L = 33 \Omega$ | I - II - III | Max. | 1.3 | V |
| V_{GD} | $V_D = V_{DRM}$, $R_L = 3.3 \text{ k}\Omega$, $T_j = 150^\circ C$ | I - II - III | Min. | 0.2 | V |
| I_L | $I_G = 1.2 \times I_{GT}$ | I - III | Max. | 60 | mA |
| | $I_G = 1.2 \times I_{GT}$ | II | Max. | 80 | mA |
| $I_H^{(1)}$ | $I_T = 500 \text{ mA}$, gate open | | Max. | 40 | mA |
| $dV/dt^{(1)}$ | $V_D = 536 \text{ V}$, gate open | $T_j = 125^\circ C$ | Min. | 2000 | $\text{V}/\mu\text{s}$ |
| | $V_D = 402 \text{ V}$, gate open | $T_j = 150^\circ C$ | Min. | 1000 | $\text{V}/\mu\text{s}$ |
| $(dl/dt)c^{(1)}$ | Without snubber, $(dV/dt)c > 20 \text{ V}/\mu\text{s}$ | $T_j = 125^\circ C$ | Min. | 12 | A/ms |
| | | $T_j = 150^\circ C$ | Min. | 6 | A/ms |

Notes:

(1)For both polarities of A2 referenced to A1.

Table 4: Static characteristics

| Symbol | Test conditions | T _j | | Value | Unit |
|------------------------------------|--|----------------|------|-------|------|
| V _{TM⁽¹⁾} | I _T = 17 A, t _p = 380 µs | 25 °C | Max. | 1.60 | V |
| V _{TO⁽¹⁾} | Threshold on-state voltage | 150 °C | Max. | 0.85 | V |
| R _{D⁽¹⁾} | Dynamic resistance | 150 °C | Max. | 50 | mΩ |
| I _{DRM} /I _{RRM} | V _{DRM} = V _{RRM} = 800 V | 25 °C | Max. | 5 | µA |
| | | 125°C | | 1 | mA |
| | V _{DRM} = V _{RRM} = 600 V | 150 °C | Max. | 3.1 | mA |

Notes:

(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) | Max. 2.6 | °C/W |
| R _{th(j-a)} | Junction to ambient | Typ. 60 | |

1.1 Characteristics (curves)

Figure 2: Maximum power dissipation versus on-state RMS current

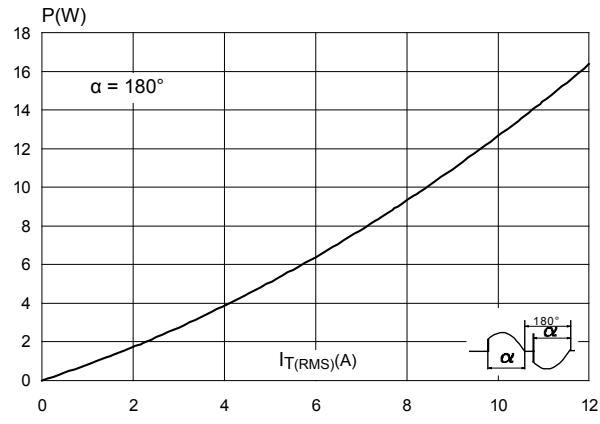


Figure 3: On-state RMS current versus case temperature

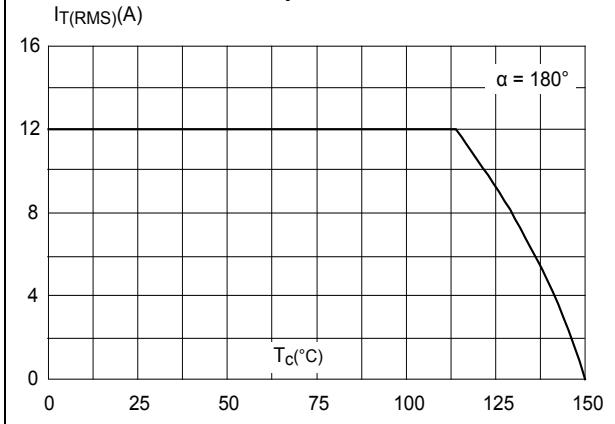


Figure 4: On-state RMS current versus ambient temperature (free air convection)

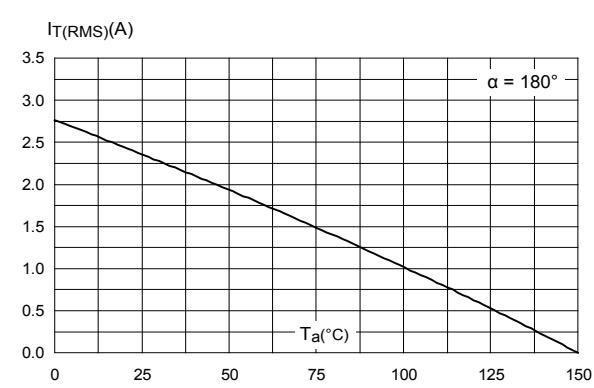


Figure 5: Relative variation of thermal impedance versus pulse duration

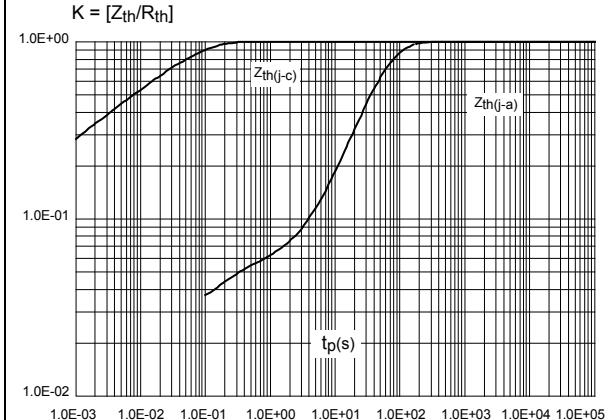


Figure 6: Relative variation of gate trigger voltage and current versus junction temperature (typical values)

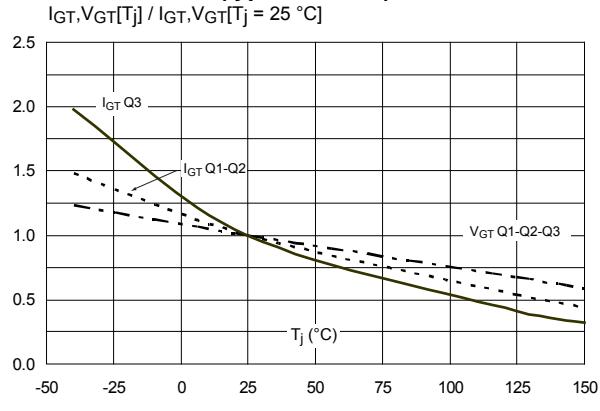


Figure 7: Relative variation of holding current and latching current versus junction temperature (typical values)

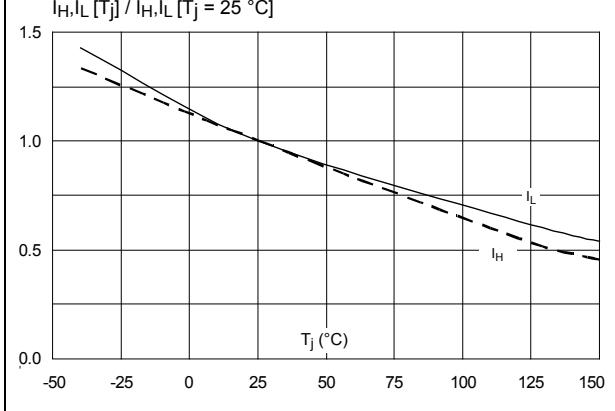
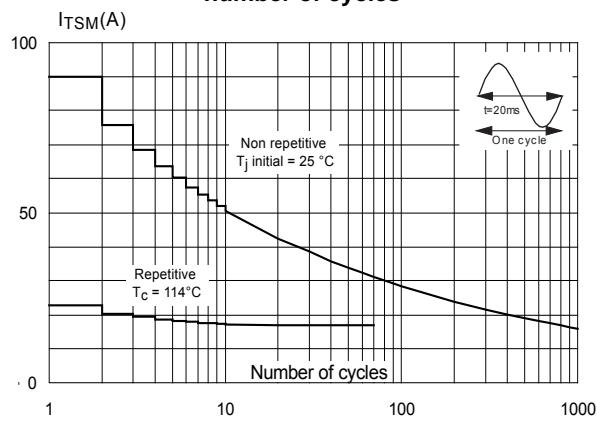
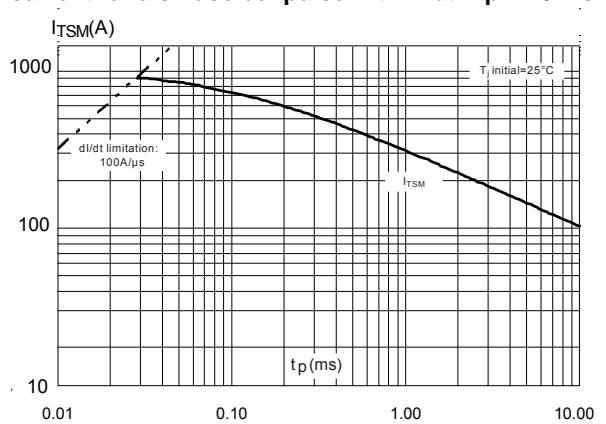
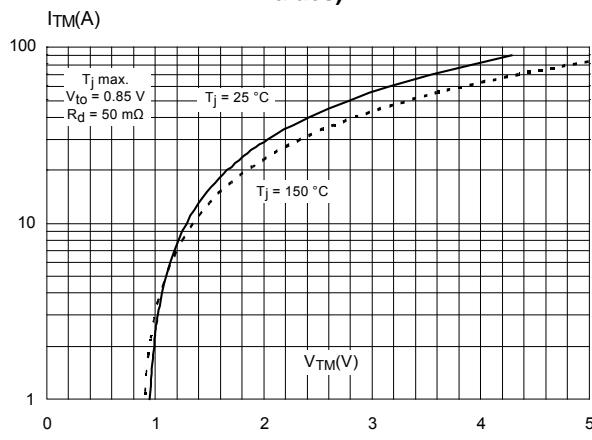
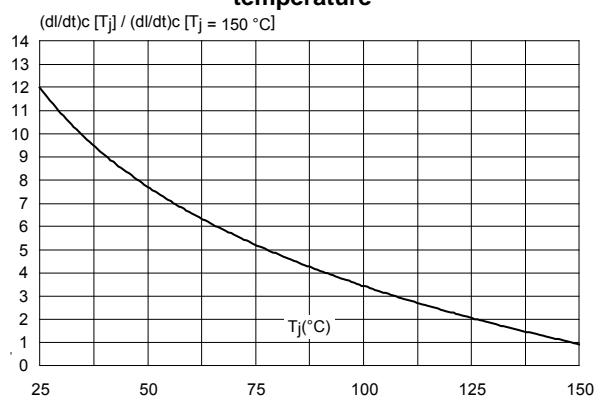
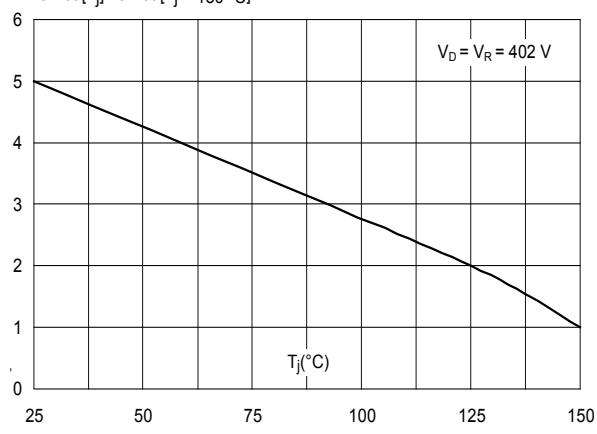
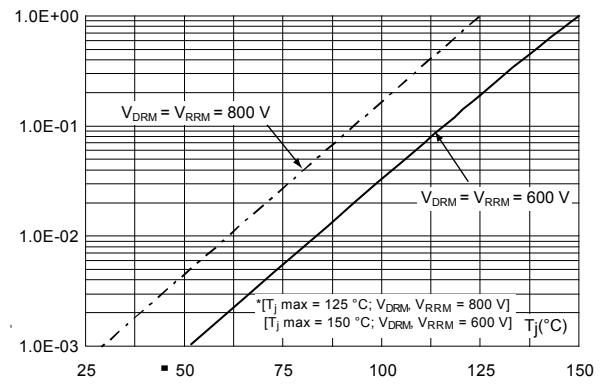


Figure 8: Surge peak on-state current versus number of cycles**Figure 9: Non repetitive surge peak on-state current for a sinusoidal pulse with width tp < 10 ms****Figure 10: On-state characteristics (maximum values)****Figure 11: Relative variation of critical rate of decrease of main current versus junction temperature****Figure 12: Relative variation of static dV/dt immunity versus junction temperature**

dV/dt [Tj] / dV/dt [Tj = 150 °C]

**Figure 13: Relative variation of leakage current versus junction temperature for different values of blocking voltage**I_{DRM}, I_{RRM} at [Tj] / I_{DRM}, I_{RRM} at [Tj max.]*

2 Package information

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.

- ECOPACK®2 (Lead-free plating and Halogen free package compliance)
- Lead-free package leads finishing
- Halogen-free molding compound resin meets UL94 standard level V0.
- Recommended torque (for package screwing assembly): 0.4 to 0.6 N·m

2.1 TO-220AB Insulated package information

Figure 14: TO-220AB Insulated package outline

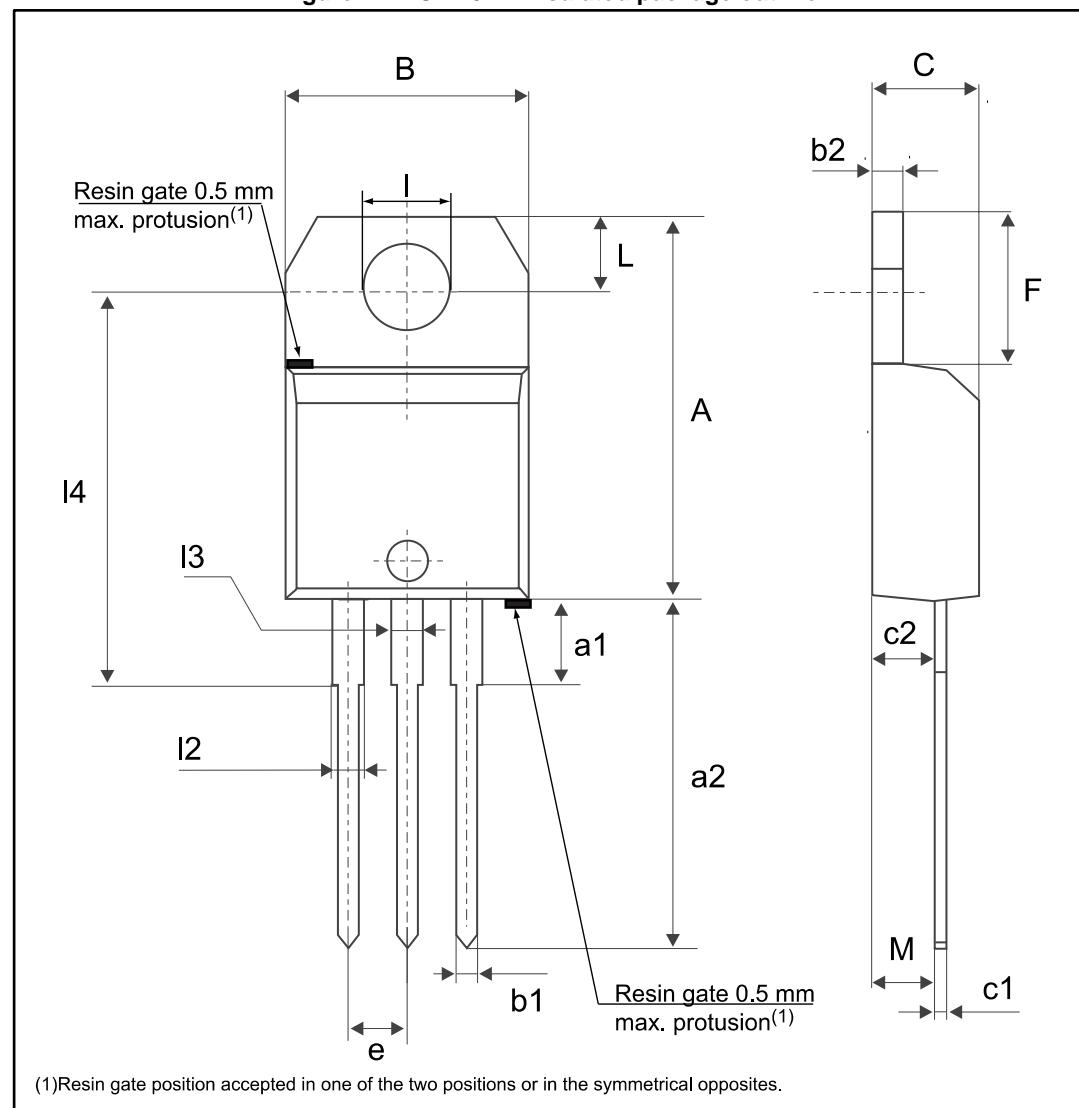


Table 6: TO-220AB Insulated package mechanical data

| Ref. | Dimensions | | | | | |
|------|-------------|-------|-------|-----------------------|--------|--------|
| | Millimeters | | | Inches ⁽¹⁾ | | |
| | Min. | Typ. | Max. | Min. | Typ. | Max. |
| A | 15.20 | | 15.90 | 0.5984 | | 0.6260 |
| a1 | | 3.75 | | | 0.1476 | |
| a2 | 13.00 | | 14.00 | 0.5118 | | 0.5512 |
| B | 10.00 | | 10.40 | 0.3937 | | 0.4094 |
| b1 | 0.61 | | 0.88 | 0.0240 | | 0.0346 |
| b2 | 1.23 | | 1.32 | 0.0484 | | 0.0520 |
| C | 4.40 | | 4.60 | 0.1732 | | 0.1811 |
| c1 | 0.49 | | 0.70 | 0.0193 | | 0.0276 |
| c2 | 2.40 | | 2.72 | 0.0945 | | 0.1071 |
| e | 2.40 | | 2.70 | 0.0945 | | 0.1063 |
| F | 6.20 | | 6.60 | 0.2441 | | 0.2598 |
| I | 3.73 | | 3.88 | 0.1469 | | 0.1528 |
| L | 2.65 | | 2.95 | 0.1043 | | 0.1161 |
| I2 | 1.14 | | 1.70 | 0.0449 | | 0.0669 |
| I3 | 1.14 | | 1.70 | 0.0449 | | 0.0669 |
| I4 | 15.80 | 16.40 | 16.80 | 0.6220 | 0.6457 | 0.6614 |
| M | | 2.6 | | | 0.1024 | |

Notes:

(1)Inch dimensions are for reference only.

3 Ordering information

Figure 15: Ordering information scheme

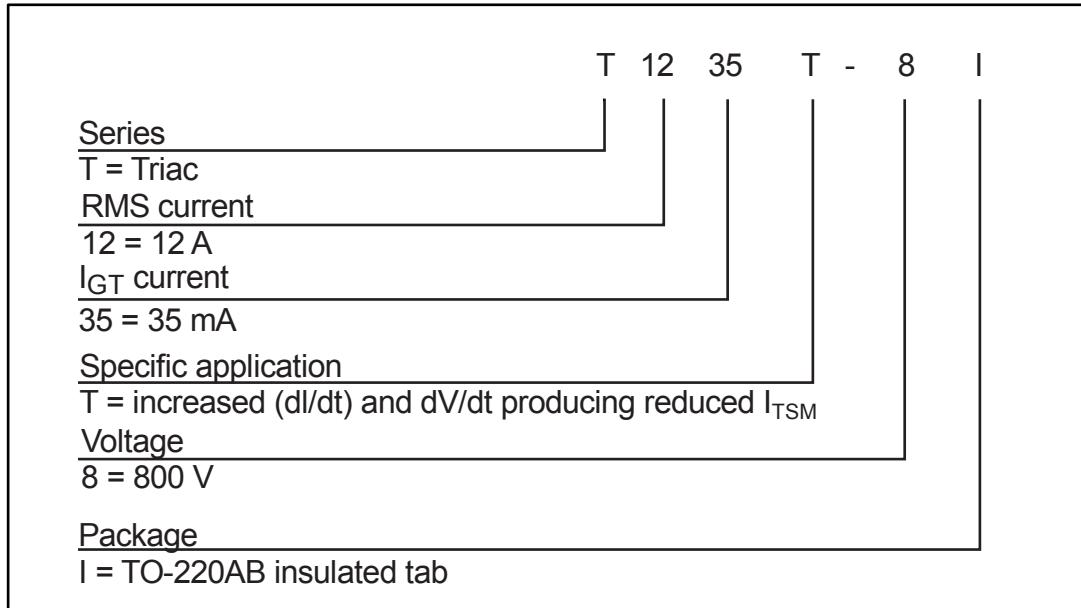


Table 7: Ordering information

| Order code | Marking | Package | Weight | Base qty. | Delivery mode |
|------------|-----------|--------------------|--------|-----------|---------------|
| T1235T-8I | T1235T-8I | TO-220AB insulated | 2.3 g | 50 | Tube |

4 Revision history

Table 8: Document revision history

| Date | Revision | Changes |
|-------------|----------|---|
| 17-Oct-2017 | 1 | Initial release. |
| 18-Dec-2017 | 2 | Updated Table 4: "Static characteristics" . |

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