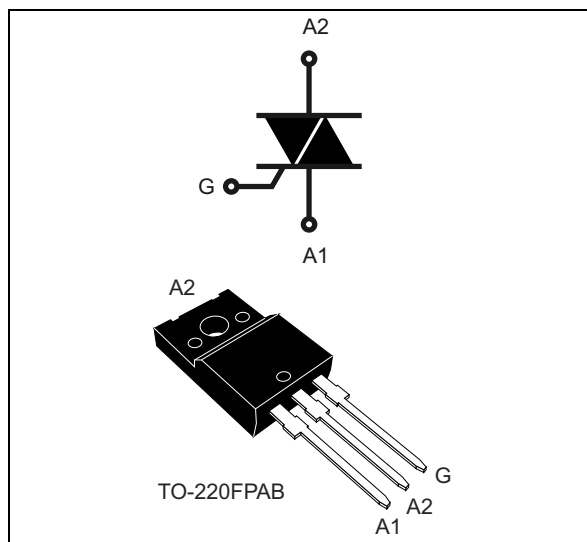




### Description

Available in through-hole fullpack package, the T1210T-8FP 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 thanks to its 10 mA gate current requirement. Provide UL certified insulation rated at 2000 VRMS.

Table 1. Device summary

| Symbol             | Value | Unit |
|--------------------|-------|------|
| $I_{T(rms)}$       | 12    | A    |
| $V_{DRM}, V_{RRM}$ | 800   | V    |
| $V_{DSM}, V_{RSM}$ | 900   | V    |
| $I_{GT}$           | 10    | mA   |

### Features

- Three triggering quadrants Triac
- ECOPACK<sup>®</sup>2 compliant component
- Complies with UL insulation safety standards (File ref: E81734)
- High performance Triac:
  - High  $T_j$  family
  - High  $di/dt$  family
  - High  $dV/dt$  family
- Insulated package TO-220FPAB:
  - Insulated voltage: 2000 VRMS

### Applications

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

# 1 Characteristics

**Table 2. Absolute maximum ratings ( $T_j = 25\text{ °C}$  unless otherwise stated)**

| Symbol             | Parameter                                                                                    |                         |                       | Value                          | Unit        |
|--------------------|----------------------------------------------------------------------------------------------|-------------------------|-----------------------|--------------------------------|-------------|
| $I_{T(rms)}$       | On-state rms current (full sine wave)                                                        |                         | $T_c = 99\text{ °C}$  | 12                             | A           |
| $I_{TSM}$          | Non repetitive surge peak on-state current (full cycle, $T_j$ initial = $25\text{ °C}$ )     | F = 50 Hz               | t = 20 ms             | 90                             | A           |
|                    |                                                                                              | F = 60 Hz               | t = 16.7 ms           | 95                             |             |
| $I^2t$             | $I^2t$ value for fusing, $T_j$ initial = $25\text{ °C}$                                      |                         | $t_p = 10\text{ ms}$  | 54                             | $A^2s$      |
| $V_{DRM}, V_{RRM}$ | 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 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           |
| $T_{stg}$<br>$T_j$ | Storage junction temperature range<br>Operating junction temperature range                   |                         |                       | - 40 to + 150<br>- 40 to + 150 | $^{\circ}C$ |
| $T_L$              | Maximum lead temperature for soldering during 10 s                                           |                         |                       | 260                            | $^{\circ}C$ |
| $V_{ins}$          | Insulation rms voltage, 1 minute                                                             |                         |                       | 2                              | kV          |

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

| Symbol            | Test conditions                                                      | Quadrant              |      | Value | Unit       |
|-------------------|----------------------------------------------------------------------|-----------------------|------|-------|------------|
| $I_{GT}^{(1)}$    | $V_D = 12\text{ V}$ , $R_L = 30\text{ }\Omega$                       | 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          |
| $V_{GD}$          | $V_D = V_{DRM}$ , $R_L = 3.3\text{ k}\Omega$ , $T_j = 150\text{ °C}$ | 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                    | Max. | 25    | mA         |
| $dV/dt^{(1)}$     | $V_D = V_R = 536\text{ V}$ , 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/ $\mu s$ |
| $(di/dt)_c^{(1)}$ | $(dV/dt)_c = 0.1\text{ V}/\mu s$                                     | $T_j = 125\text{ °C}$ | Min. | 11.7  | A/ms       |
|                   |                                                                      | $T_j = 150\text{ °C}$ |      | 8.2   |            |
| $(di/dt)_c^{(1)}$ | $(dV/dt)_c = 10\text{ V}/\mu s$                                      | $T_j = 125\text{ °C}$ | Min. | 6     | A/ms       |
|                   |                                                                      | $T_j = 150\text{ °C}$ |      | 2.7   |            |

1. For both polarities of A2 referenced to A1

Table 4. Static characteristics

| Symbol                 | Test conditions                                         |                                   |      | Value | Unit          |
|------------------------|---------------------------------------------------------|-----------------------------------|------|-------|---------------|
| $V_T^{(1)}$            | $I_{TM} = 17\text{ A}$ , $t_p = 380\text{ }\mu\text{s}$ | $T_j = 25\text{ }^\circ\text{C}$  | 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. | 37    | m $\Omega$    |
| $I_{DRM}$<br>$I_{RRM}$ | $V_{DRM} = V_{RRM} = 800\text{ V}$                      | $T_j = 25\text{ }^\circ\text{C}$  | Max. | 7.5   | $\mu\text{A}$ |
|                        |                                                         | $T_j = 125\text{ }^\circ\text{C}$ |      | 1     | mA            |
|                        | $V_{DRM} = V_{RRM} = 600\text{ V}$                      | $T_j = 150\text{ }^\circ\text{C}$ | Max. | 2.7   |               |

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)    | 3.5   | $^\circ\text{C/W}$ |
| $R_{th(j-a)}$ | Junction to ambient (DC) | 60    | $^\circ\text{C/W}$ |

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

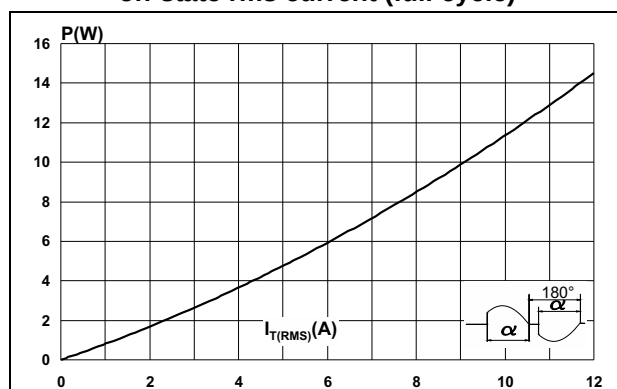


Figure 2. On-state rms current versus case temperature (full cycle)

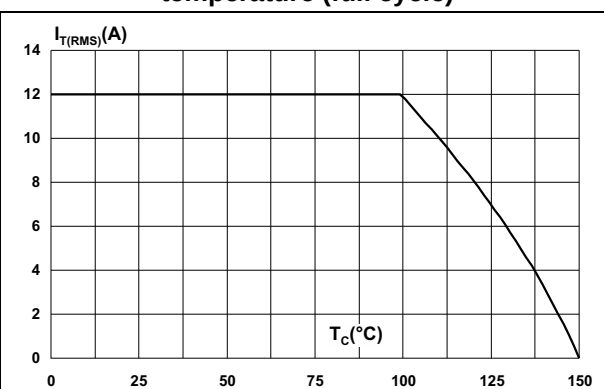


Figure 3. On-state rms current versus ambient temperature (free air convection)

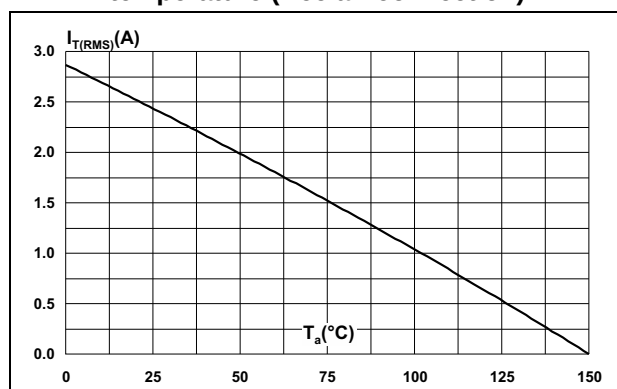


Figure 4. Relative variation of thermal impedance versus pulse duration

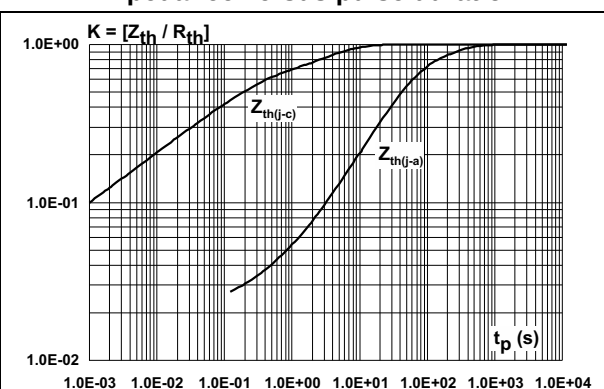


Figure 5. On-state characteristics (maximum values)

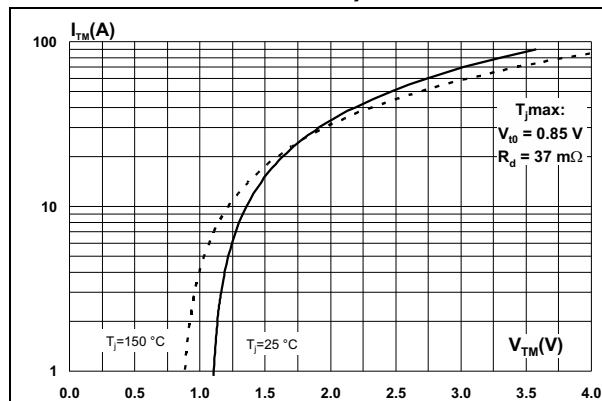


Figure 6. Surge peak on-state current versus number of cycles

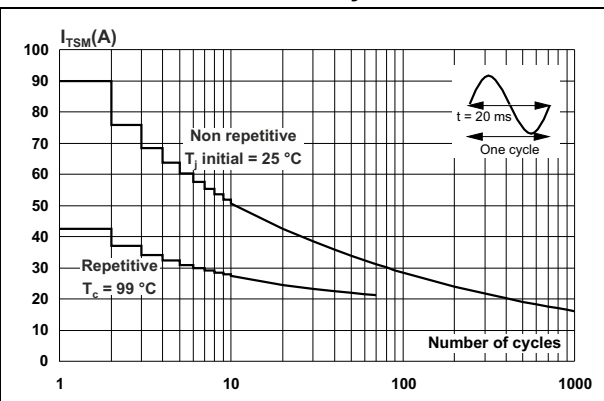
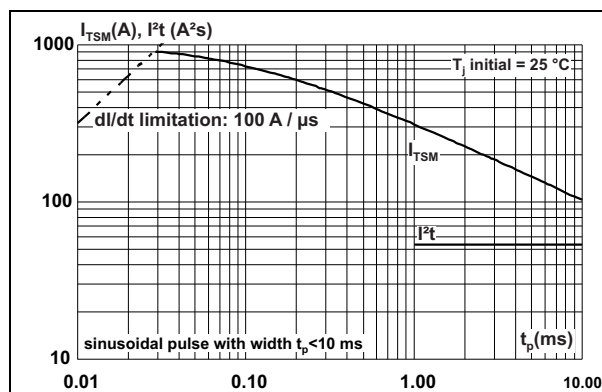
Figure 7. Non repetitive surge peak on-state current and corresponding values of  $I^2t$ 

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

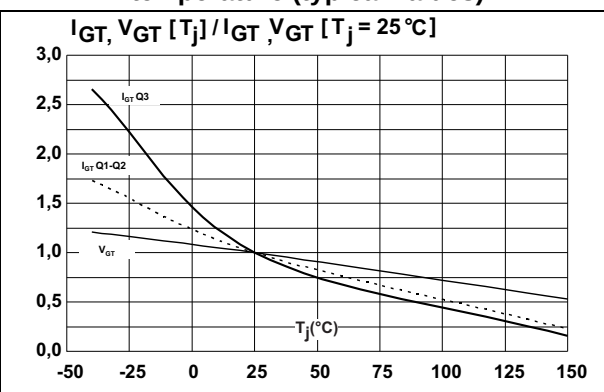


Figure 9. Relative variation of static dV/dt immunity versus junction temperature (typical values)

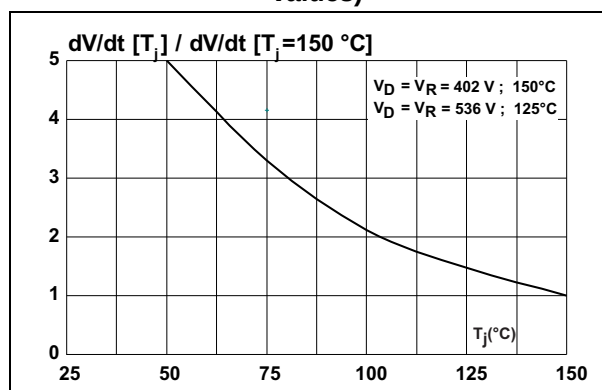
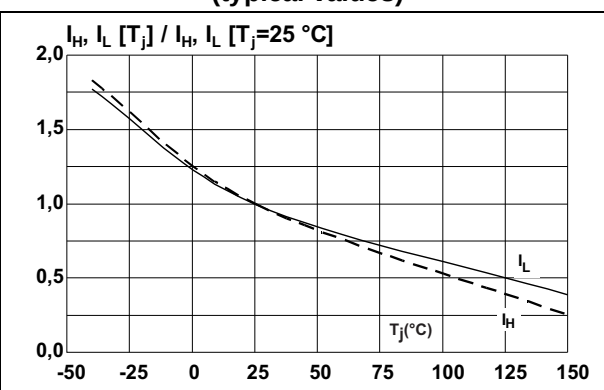
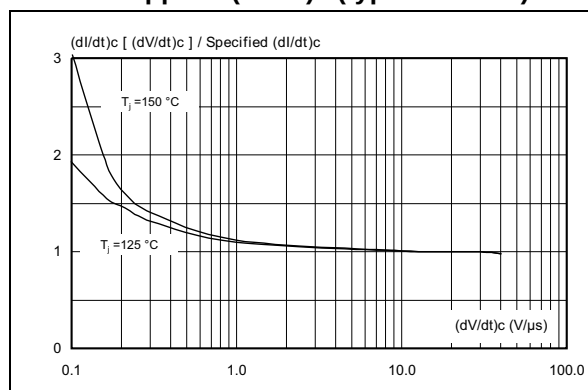


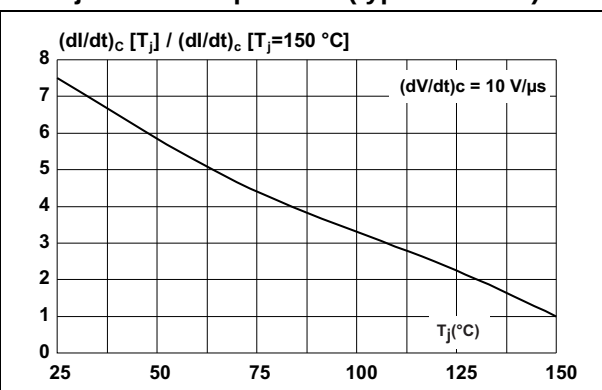
Figure 10. Relative variation of holding and latching current versus junction temperature (typical values)



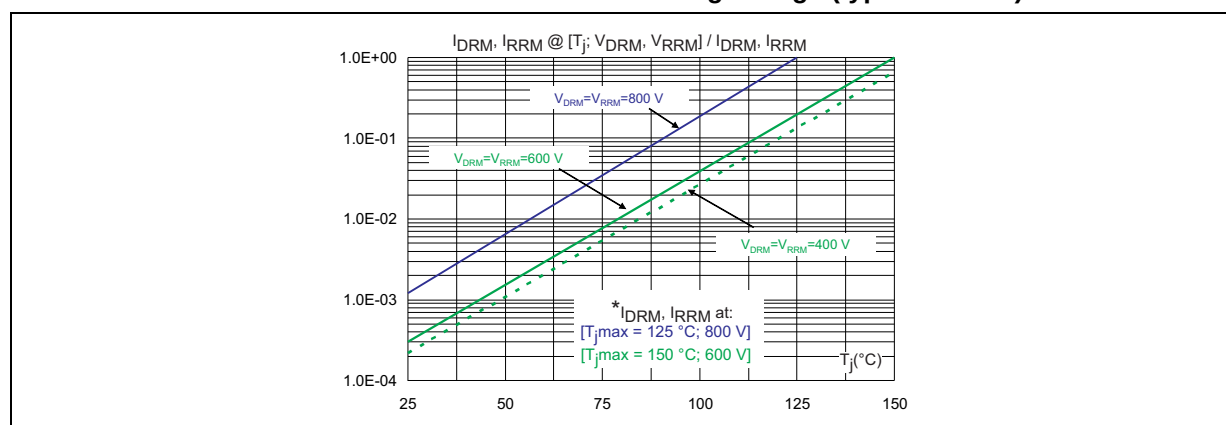
**Figure 11. Relative variation of critical rate of decrease of main current  $(di/dt)_c$  versus reapplied  $(dV/dt)_c$  (typical values)**



**Figure 12. Relative variation of critical rate of decrease of main current  $(di/dt)_c$  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](http://www.st.com). ECOPACK® is an ST trademark.

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

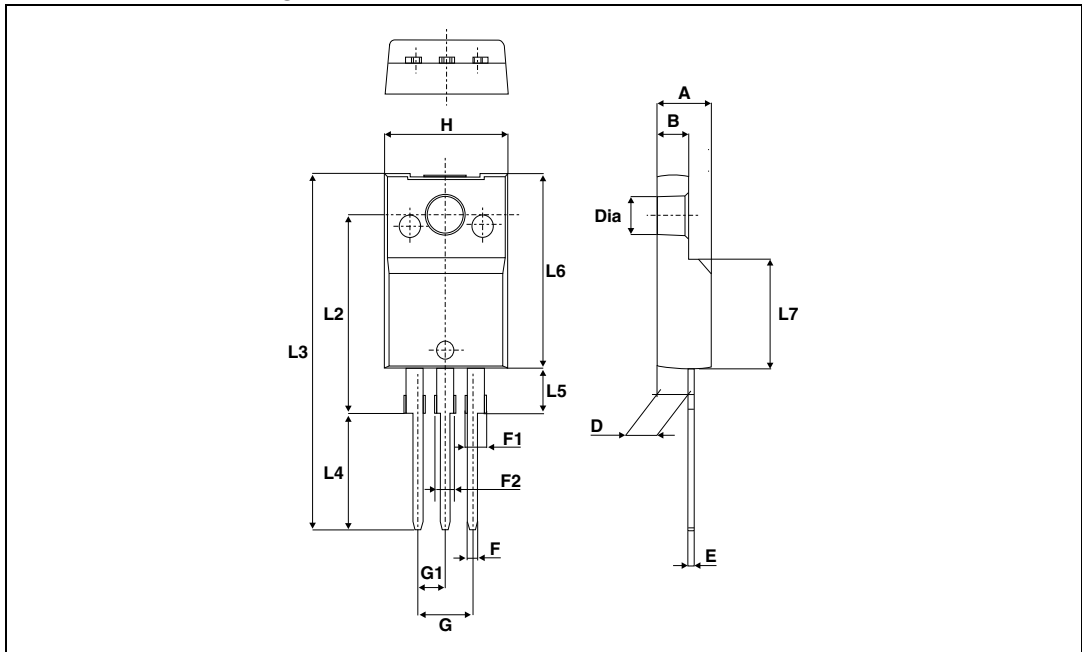


Table 6. TO-220FPAB dimension values

| Ref. | Dimensions  |      |           |       |
|------|-------------|------|-----------|-------|
|      | Millimeters |      | Inches    |       |
|      | Min.        | Max. | Min.      | Max.  |
| A    | 4.4         | 4.6  | 0.173     | 0.181 |
| B    | 2.5         | 2.7  | 0.098     | 0.106 |
| D    | 2.5         | 2.75 | 0.098     | 0.108 |
| E    | 0.45        | 0.70 | 0.018     | 0.027 |
| F    | 0.75        | 1    | 0.030     | 0.039 |
| F1   | 1.15        | 1.70 | 0.045     | 0.067 |
| F2   | 1.15        | 1.70 | 0.045     | 0.067 |
| G    | 4.95        | 5.20 | 0.195     | 0.205 |
| G1   | 2.4         | 2.7  | 0.094     | 0.106 |
| H    | 10          | 10.4 | 0.393     | 0.409 |
| L2   | 16 Typ.     |      | 0.63 Typ. |       |
| L3   | 28.6        | 30.6 | 1.126     | 1.205 |
| L4   | 9.8         | 10.6 | 0.386     | 0.417 |
| L5   | 2.9         | 3.6  | 0.114     | 0.142 |
| L6   | 15.9        | 16.4 | 0.626     | 0.646 |
| L7   | 9.00        | 9.30 | 0.354     | 0.366 |
| Dia. | 3.00        | 3.20 | 0.118     | 0.126 |

### 3 Ordering information

Figure 15. Ordering information scheme

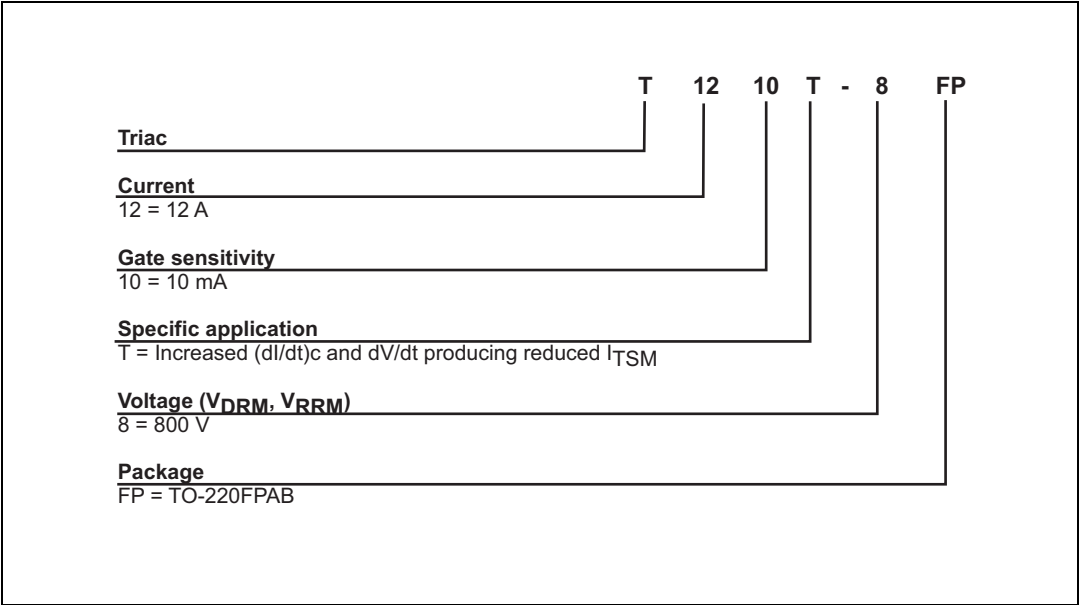


Table 7. Ordering information

| Order code | Marking    | Package    | Weight | Base qty | Delivery mode |
|------------|------------|------------|--------|----------|---------------|
| T1210T-8FP | T1210T-8FP | TO-220FPAB | 2.0 g  | 50       | Tube          |

### 4 Revision history

Table 8. Document revision history

| Date        | Revision | Changes                                                        |
|-------------|----------|----------------------------------------------------------------|
| 31-Jan-2014 | 1        | Initial release.                                               |
| 11-Feb-2015 | 2        | Updated <a href="#">Features</a> and <a href="#">Table 2</a> . |

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