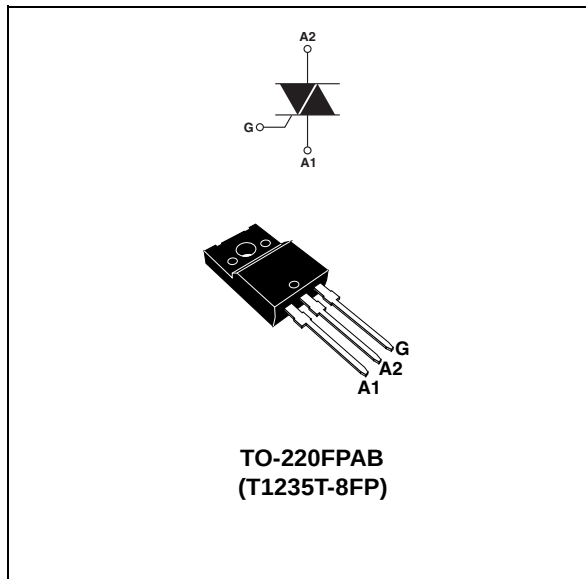


## 12 A Snubberless™ Triac

Datasheet — production data



**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   |

### Features

- Medium current Triac
- High static and dynamic commutation
- Three quadrants
- ECOPACK®2 compliant component
- Complies with UL standards (File ref: E81734)

### Applications

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

### Description

Available in through-hole full pack package, the T1235T-8FP 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 circuit when the limits defined in this datasheet are respected.

Provides UL certified insulation rated at 2 kV.

TM: Snubberless is a trademark of STMicroelectronics

# 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)                                                        |                         | $T_c = 99\text{ °C}$  | 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<br>$I_G = 2 \times I_{GT}, t_r \leq 100\text{ ns}$ |                         | 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 specified)**

| Symbol         | Test conditions                                                | Quadrant              |      | Value | Unit       |
|----------------|----------------------------------------------------------------|-----------------------|------|-------|------------|
| $I_{GT}^{(1)}$ | $V_D = 12\text{ V}, R_L = 30\text{ }\Omega$                    | I - II - III          | Min. | 1.75  | mA         |
|                |                                                                |                       | Max. | 35    |            |
| $V_{GT}$       | $V_D = 12\text{ V}, R_L = 30\text{ }\Omega$                    | 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          |
| $I_H^{(2)}$    | $I_T = 500\text{ mA}$                                          |                       | Max. | 40    | mA         |
| $I_L$          | $I_G = 1.2 I_{GT}$                                             | I - III               | Max. | 60    | mA         |
|                |                                                                | II                    |      | 65    |            |
| $dV/dt$        | $V_D = 536\text{ V}$ , gate open                               | $T_j = 125\text{ °C}$ | Min. | 2000  | V/ $\mu s$ |
|                | $V_D = 402\text{ V}$ , gate open                               | $T_j = 150\text{ °C}$ |      | 1000  | V/ $\mu s$ |
| $(di/dt)_c$    | Without snubber ( $dV/dt)_c > 20\text{ V}/\mu s$ )             | $T_j = 125\text{ °C}$ | Min. | 12    | A/ms       |
|                |                                                                | $T_j = 150\text{ °C}$ |      | 6     |            |

1. Minimum  $I_{GT}$  is guaranteed at 5% of  $I_{GT}$  max.

2. 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   | 60    | $^\circ\text{C/W}$ |

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

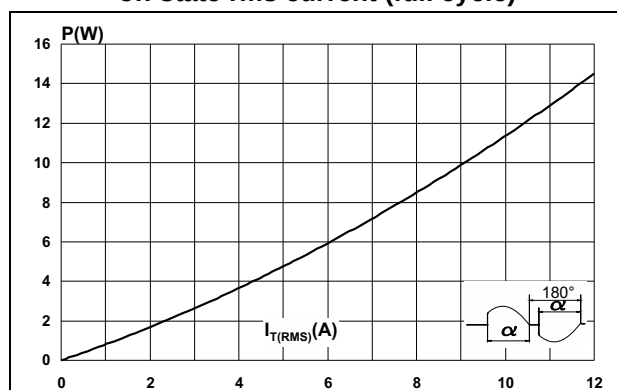


Figure 2. On-state rms current versus case temperature (full cycle)

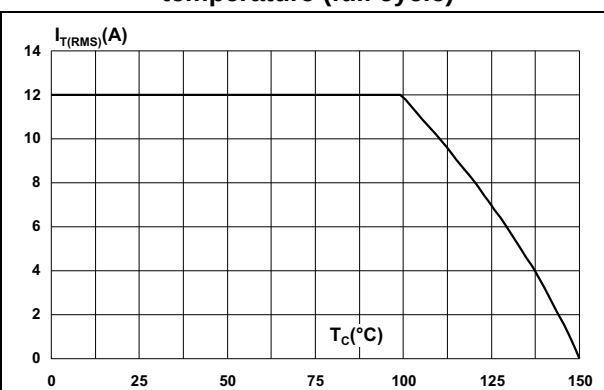


Figure 3. On-state rms current versus ambient temperature (free air convection)

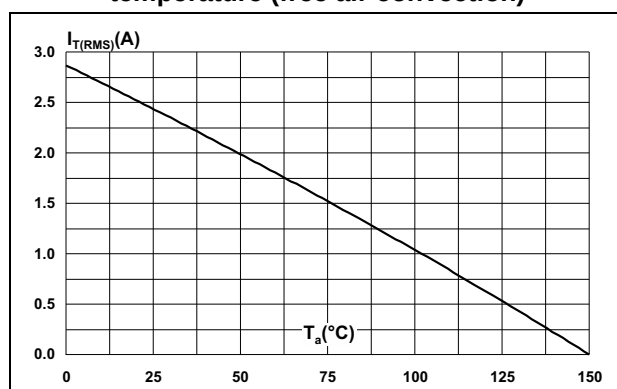


Figure 4. Relative variation of thermal impedance versus pulse duration

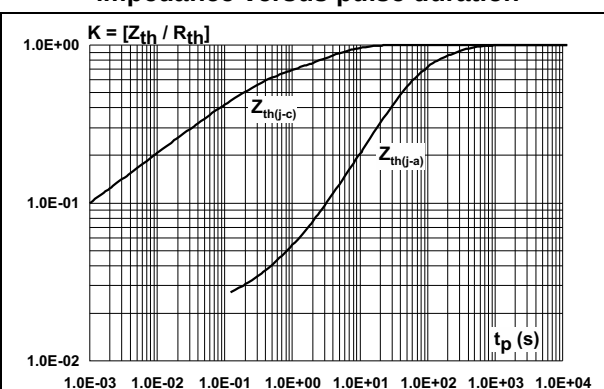


Figure 5. On-state characteristics (maximum values)

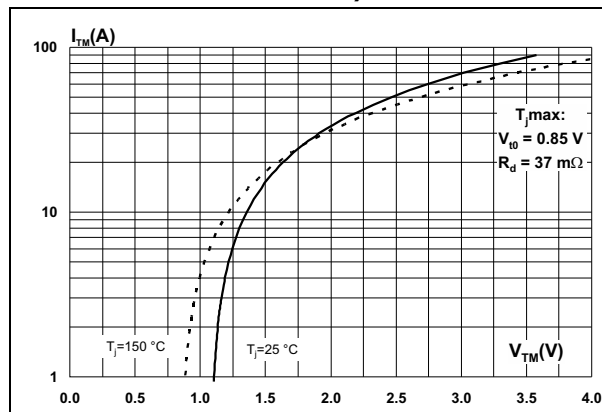


Figure 6. Surge peak on-state current versus number of cycles

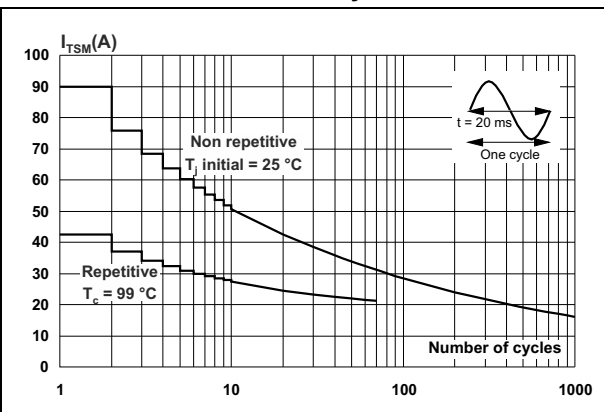
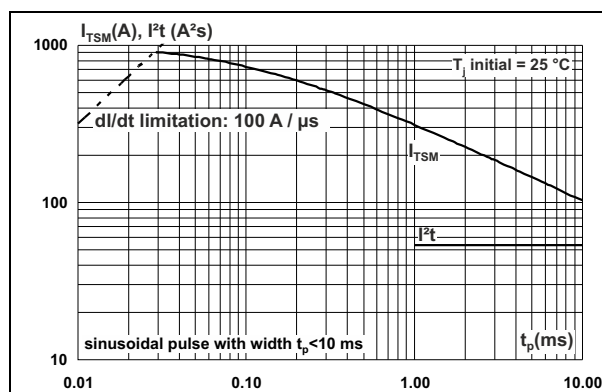
Figure 7. Non repetitive surge peak on-state current and corresponding values of  $I^2t$ 

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

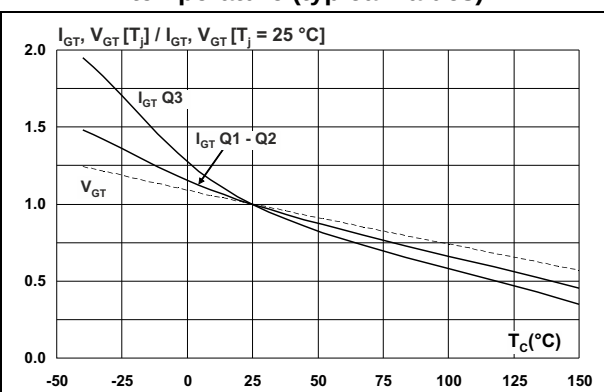


Figure 9. Relative variation of static dV/dt immunity versus junction temperature (typical values)

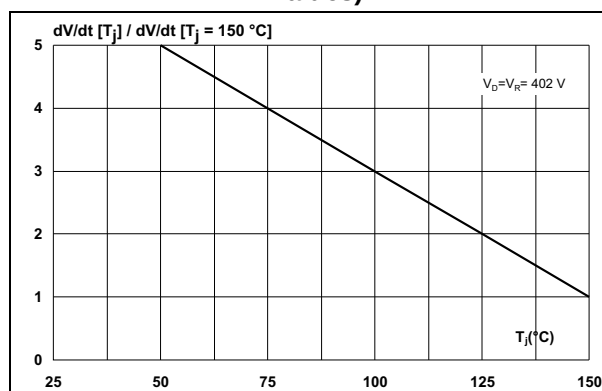


Figure 10. Relative variation of holding current and latching current versus junction temperature (typical values)

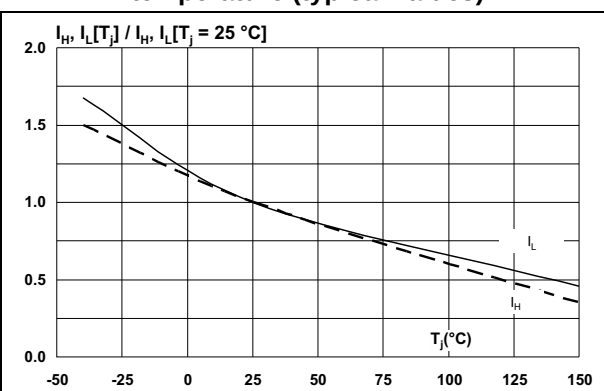


Figure 11. Relative variation of critical rate of decrease of main current  $(di/dt)_c$  versus reappplied  $(dV/dt)_c$

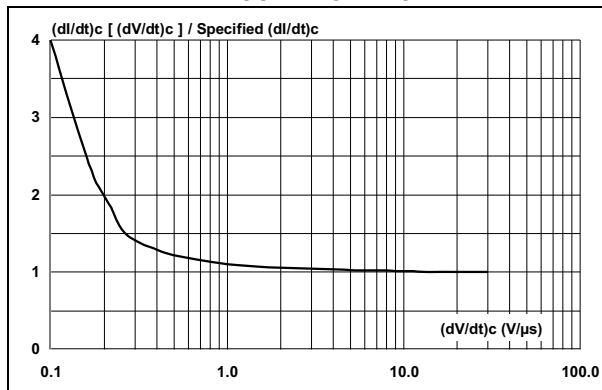


Figure 12. Relative variation of critical rate of decrease of main current  $(di/dt)_c$  versus junction temperature (typical values)

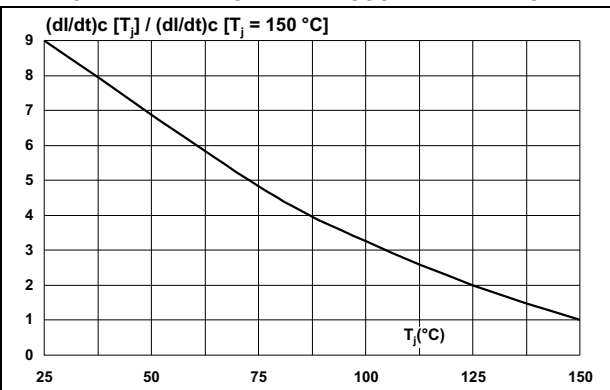
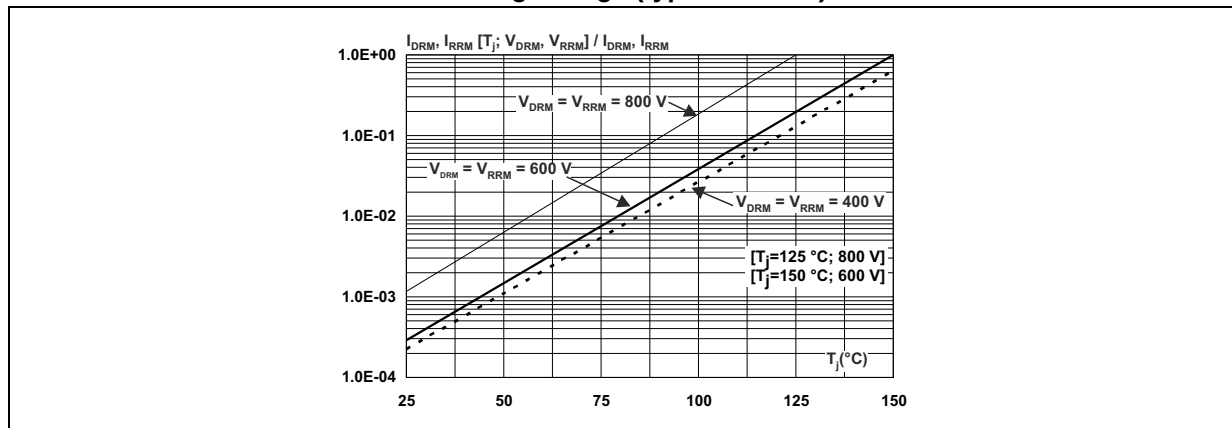


Figure 13. Relative variation of leakage current versus junction temperature for different values of blocking voltage (typical values)



## 2 Package information

- 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<sup>®</sup> packages, depending on their level of environmental compliance. ECOPACK<sup>®</sup> specifications, grade definitions and product status are available at: [www.st.com](http://www.st.com). ECOPACK<sup>®</sup> is an ST trademark.

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

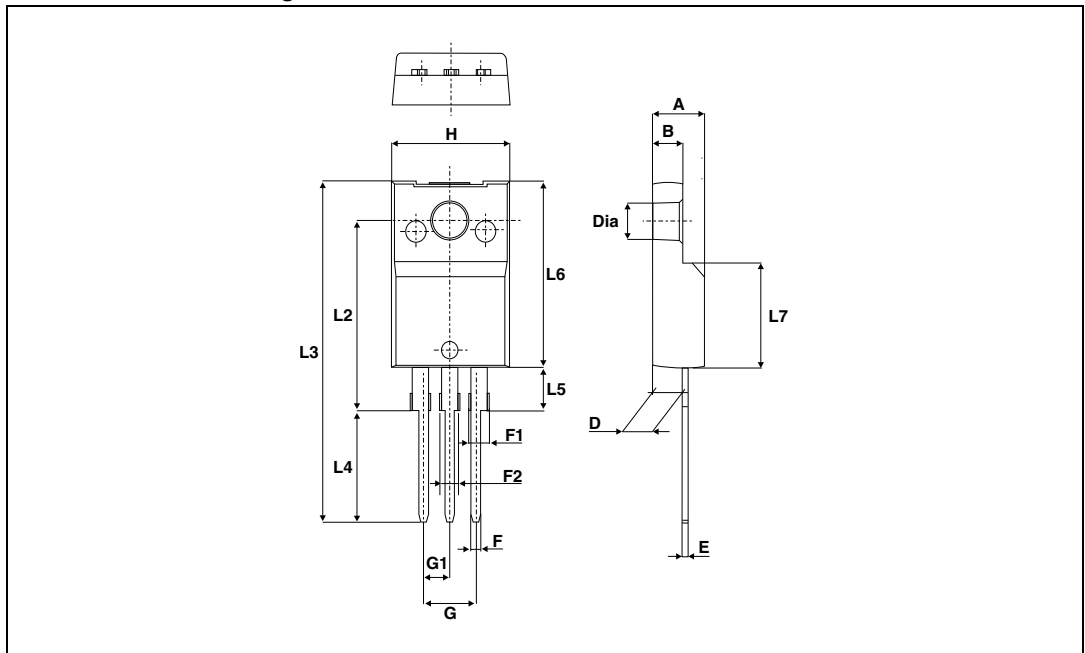


Table 6. TO-220FPAB dimension values

| 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

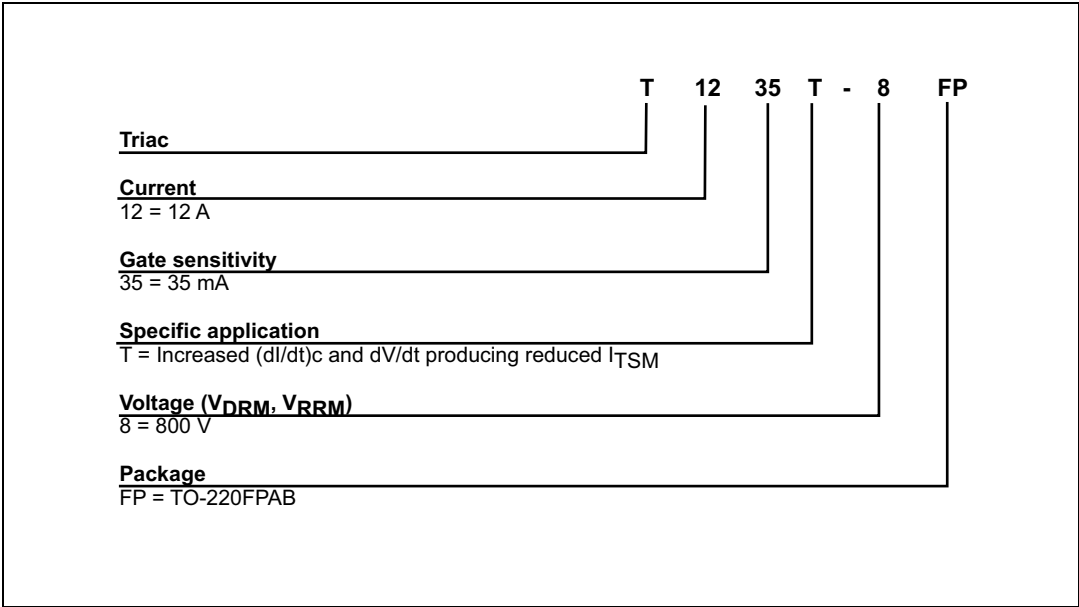


Table 7. Ordering information

| Order code | Marking    | Package    | Weight | Base qty | Delivery mode |
|------------|------------|------------|--------|----------|---------------|
| T1235T-8FP | T1235T-8FP | TO-220FPAB | 2.0 g  | 50       | Tube          |

### 4 Revision history

Table 8. Document revision history

| Date         | Revision | Changes                                                                                  |
|--------------|----------|------------------------------------------------------------------------------------------|
| 27-May-2013  | 1        | Initial release.                                                                         |
| 12-June-2013 | 2        | Added UL certification information.                                                      |
| 14-Jan-2015  | 3        | Updated <a href="#">Features</a> , <a href="#">Table 2</a> and <a href="#">Table 5</a> . |

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Тел: +7 (812) 336 43 04 (многоканальный)

Email: [org@lifeelectronics.ru](mailto:org@lifeelectronics.ru)

[www.lifeelectronics.ru](http://www.lifeelectronics.ru)