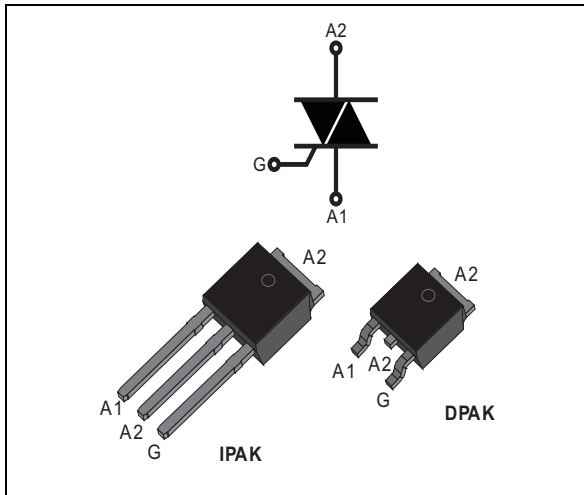


4 A sensitive Triacs

Datasheet - production data



Description

Sensitive Triacs are intended in general purpose applications where high surge current capability is required. These Triacs feature a gate current capability sensitivities of 5 mA or 10 mA depending on the quadrant.

Table 1. Device summary

| Symbol | Value | Unit |
|--------------------|-----------------------|------|
| $I_{T(rms)}$ | 4 | A |
| V_{DRM}, V_{RRM} | 600 | V |
| V_{DSM}, V_{RSM} | 700 | V |
| I_{GT} | 5 / 10 ⁽¹⁾ | mA |

1. Quadrant I,II,III = 5 mA, quadrant IV = 10 mA.

Features

- MCU direct gate drive
- 4 quadrants Triac
- ECOPACK[®]2 compliant component

Applications

- Motor control circuits
- Small home appliances
- Fan speed controller
- Pump and valve drive
- Mahjong machines
- Lighting dimmers

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) | I _{PAK} , DPAK | $T_c = 110\text{ °C}$ | 4 | A | |
| I_{TSM} | Non repetitive surge peak on-state current (full cycle, T_j initial = 25 °C) | | | $t_p = 20\text{ ms}$ | 35 | A |
| | | | | $t_p = 16.7\text{ ms}$ | 38 | |
| I^2t | I^2t value for fusing | | $t_p = 10\text{ ms}$ | 6 | A ² s | |
| di/dt | Critical rate of rise of on-state current $I_G = 2 \times I_{GT}$, $t_r \leq 100\text{ ns}$ | | $F = 100\text{ Hz}$ | 50 | A/ μ s | |
| I_{GM} | Peak gate current | $t_p = 20\text{ }\mu$ s | $T_j = 125\text{ °C}$ | 4 | A | |
| $P_{G(AV)}$ | Average gate power dissipation | | $T_j = 125\text{ °C}$ | 0.5 | W | |
| T_{stg} T_j | Storage junction temperature range Operating junction temperature range | | | - 40 to + 150 - 40 to + 125 | °C | |
| V_{DSM} , V_{RSM} | Non repetitive surge peak off-state voltage | | $t_p = 10\text{ ms}$ | 700 | V | |

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

| Symbol | Test conditions | Quadrant | | Value | Unit |
|-------------------|--|-----------------------|------|---------|------------|
| | | | | T405Q | |
| $I_{GT}^{(1)}$ | $V_D = 12\text{ V}$, $R_L = 30\text{ }\Omega$ | I - II - III IV | Max. | 5 10 | mA |
| V_{GT} | $V_D = 12\text{ V}$, $R_L = 30\text{ }\Omega$ | All | Max. | 1.3 | V |
| V_{GD} | $V_D = V_{DRM}$, $R_L = 3.3\text{ k}\Omega$, $T_j = 125\text{ °C}$ | All | Min. | 0.2 | V |
| $I_H^{(2)}$ | $I_T = 100\text{ mA}$ | | Max. | 10 | mA |
| I_L | $I_G = 1.2 I_{GT}$ | I - III - IV | Max. | 10 | mA |
| | | II | Max. | 15 | |
| $dV/dt^{(2)}$ | $V_D = 67\% V_{DRM}$, gate open | $T_j = 125\text{ °C}$ | Min. | 10 | V/ μ s |
| $(di/dt)_c^{(2)}$ | $(dV/dt)_c = 2\text{ V}/\mu$ s | $T_j = 125\text{ °C}$ | Min. | 1.8 | A/ms |

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 |
|------------------------|---|-------------------------------------|------|-------|---------------|
| $V_{TM}^{(1)}$ | $I_{TM} = 5 \text{ A}$, $t_p = 380 \text{ } \mu\text{s}$ | $T_j = 25 \text{ } ^\circ\text{C}$ | Max. | 1.5 | V |
| $V_{t0}^{(1)}$ | Threshold voltage | $T_j = 125 \text{ } ^\circ\text{C}$ | Max. | 0.85 | V |
| $R_d^{(1)}$ | Dynamic resistance | $T_j = 125 \text{ } ^\circ\text{C}$ | Max. | 100 | m Ω |
| I_{DRM} I_{RRM} | $V_{DRM} = V_{RRM}$ | $T_j = 25 \text{ } ^\circ\text{C}$ | Max. | 5 | μA |
| | | $T_j = 125 \text{ } ^\circ\text{C}$ | | 1 | mA |

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 | $^\circ\text{C/W}$ | |
| $R_{th(j-a)}$ | Junction to ambient | $S^{(1)} = 0.5 \text{ cm}^2$ | DPAK | 70 | $^\circ\text{C/W}$ |
| | | | IPAK | 100 | $^\circ\text{C/W}$ |

1. S = Copper surface under tab.

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

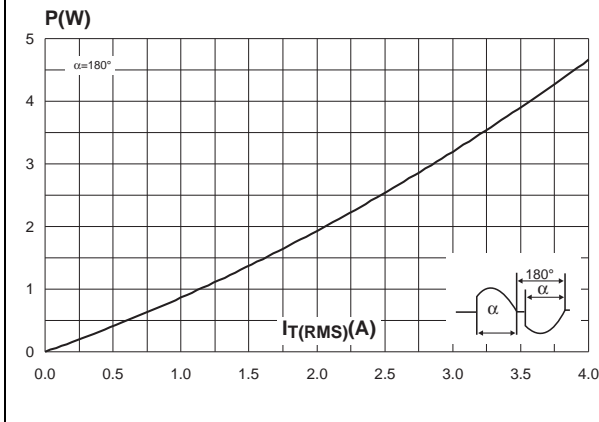


Figure 2. RMS on-state current versus case temperature

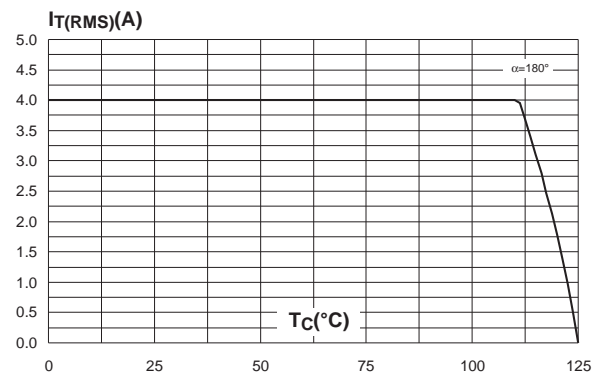


Figure 3. Relative variation of thermal impedance versus pulse duration

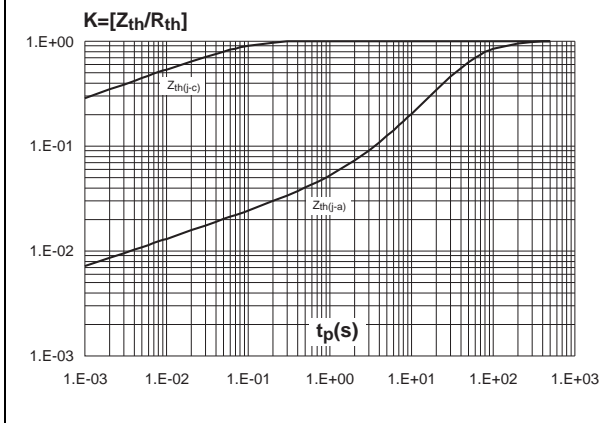


Figure 4. On-state characteristics (maximum values)

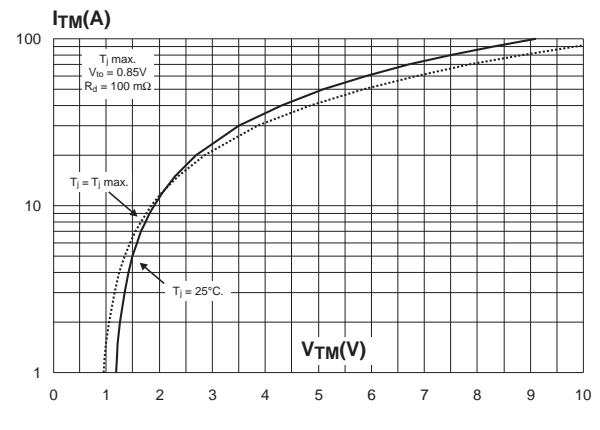


Figure 5. Surge peak on-state current versus number of cycles

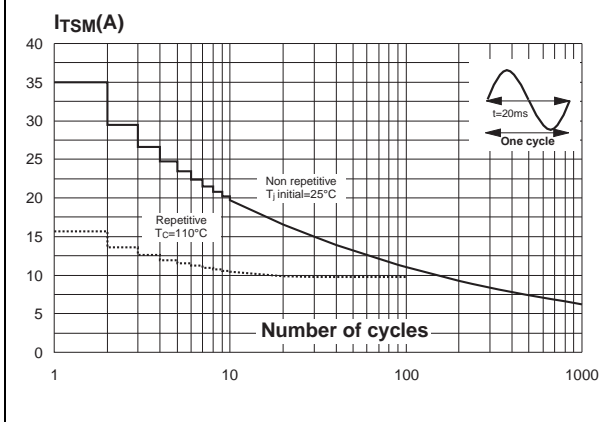


Figure 6. Non-repetitive surge peak on-state current for a sinusoidal pulse with width tp < 10 ms

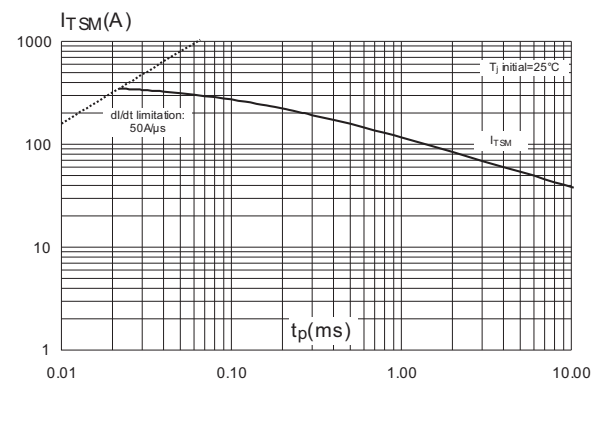


Figure 7. Relative variation of gate trigger current, holding current and latching current versus junction temperature (typical values)

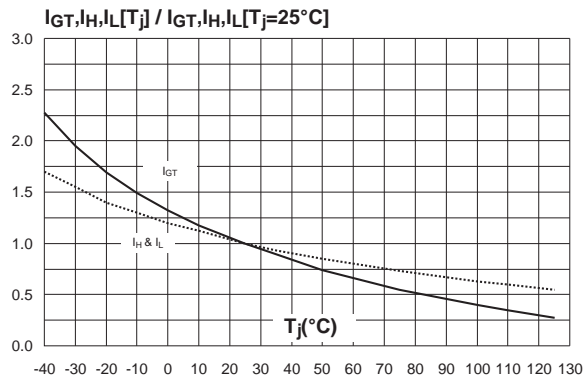


Figure 8. Relative variation of critical rate of decrease of main current versus (dV/dt)_c (typical values)

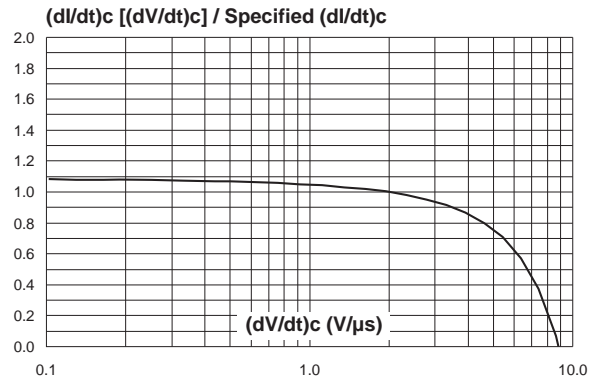


Figure 9. Relative variation of critical rate of decrease of main current versus junction temperature

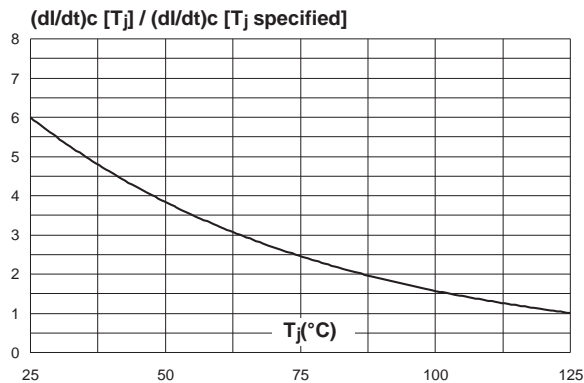


Figure 10. Relative variation of static dV/dt immunity versus junction temperature

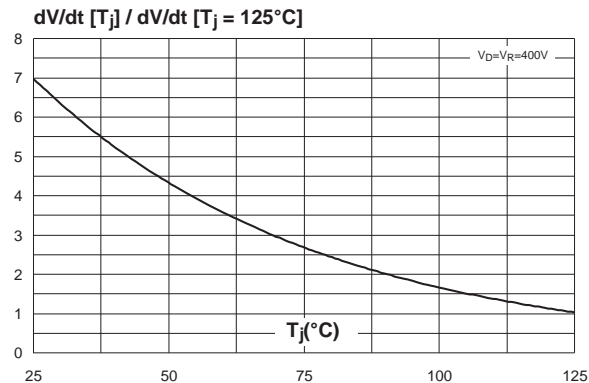
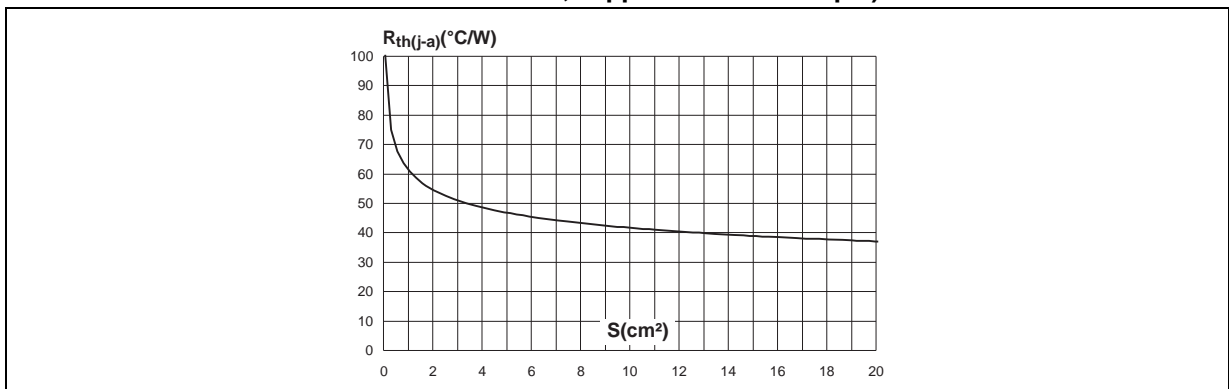


Figure 11. DPAK thermal resistance junction to ambient versus copper surface under tab (printed circuit board FR4, copper thickness: 35 μm)



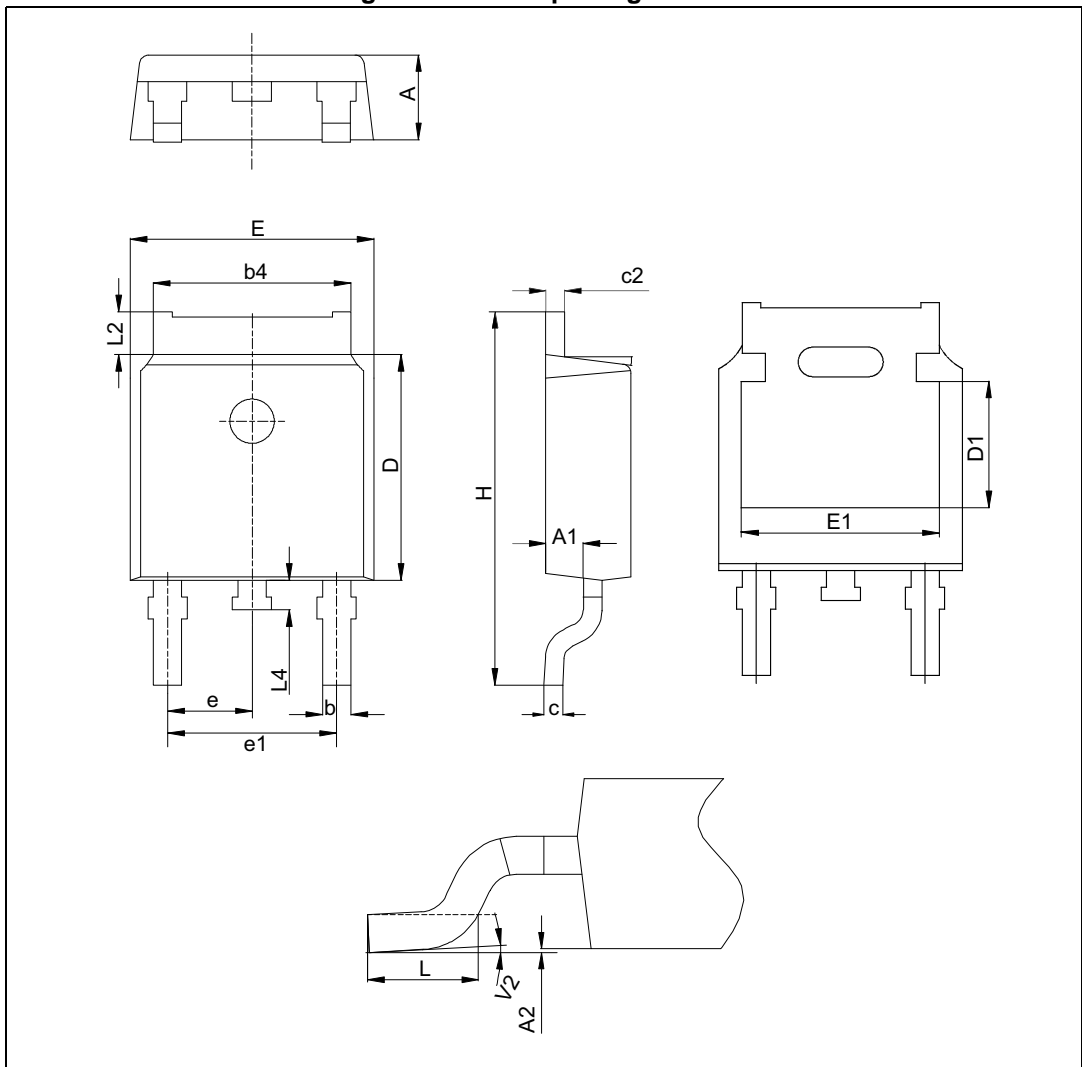
2 Package information

- 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.

2.1 DPAK package information

Figure 12. DPAK package outline



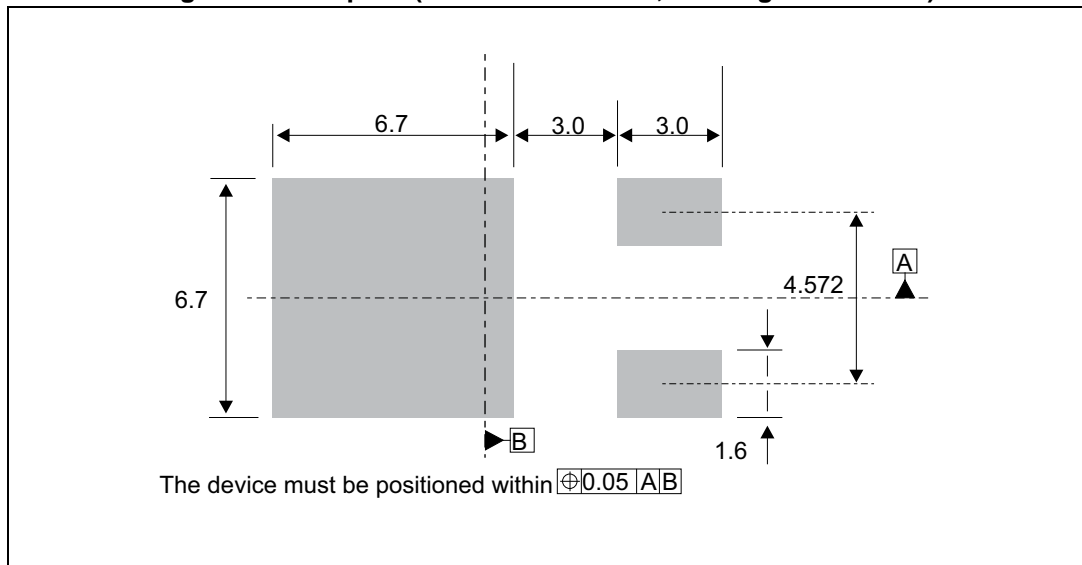
Note: This package drawing may slightly differ from the physical package. However, all the specified dimensions are guaranteed.

Table 6. DPAK package mechanical data

| Ref. | Dimensions | | | | | |
|------|-------------|-------|-------|-----------------------|--------|--------|
| | Millimeters | | | Inches ⁽¹⁾ | | |
| | Min. | Typ. | Max. | Min. | Typ. | Max. |
| A | 2.18 | | 2.40 | 0.0858 | | 0.0945 |
| A1 | 0.90 | | 1.10 | 0.0354 | | 0.0433 |
| A2 | 0.03 | | 0.23 | 0.0012 | | 0.0091 |
| b | 0.64 | | 0.90 | 0.0252 | | 0.0354 |
| b4 | 4.95 | | 5.46 | 0.1949 | | 0.2150 |
| c | 0.46 | | 0.61 | 0.0181 | | 0.0240 |
| c2 | 0.46 | | 0.60 | 0.0181 | | 0.0236 |
| D | 5.97 | | 6.22 | 0.2350 | | 0.2449 |
| D1 | 4.95 | | 5.60 | 0.1949 | | 0.2204 |
| E | 6.35 | | 6.73 | 0.2500 | | 0.2650 |
| E1 | 4.32 | | 5.50 | 0.1701 | | 0.2165 |
| e | | 2.286 | | | 0.0900 | |
| e1 | 4.40 | | 4.70 | 0.1732 | | 0.1850 |
| H | 9.35 | | 10.40 | 0.3681 | | 0.4094 |
| L | 1.00 | | 1.78 | 0.0394 | | 0.0701 |
| L2 | | 1.27 | | | 0.0500 | |
| L4 | 0.60 | | 1.02 | 0.0236 | | 0.0402 |
| V2 | -8° | | 8° | -8° | | 8° |

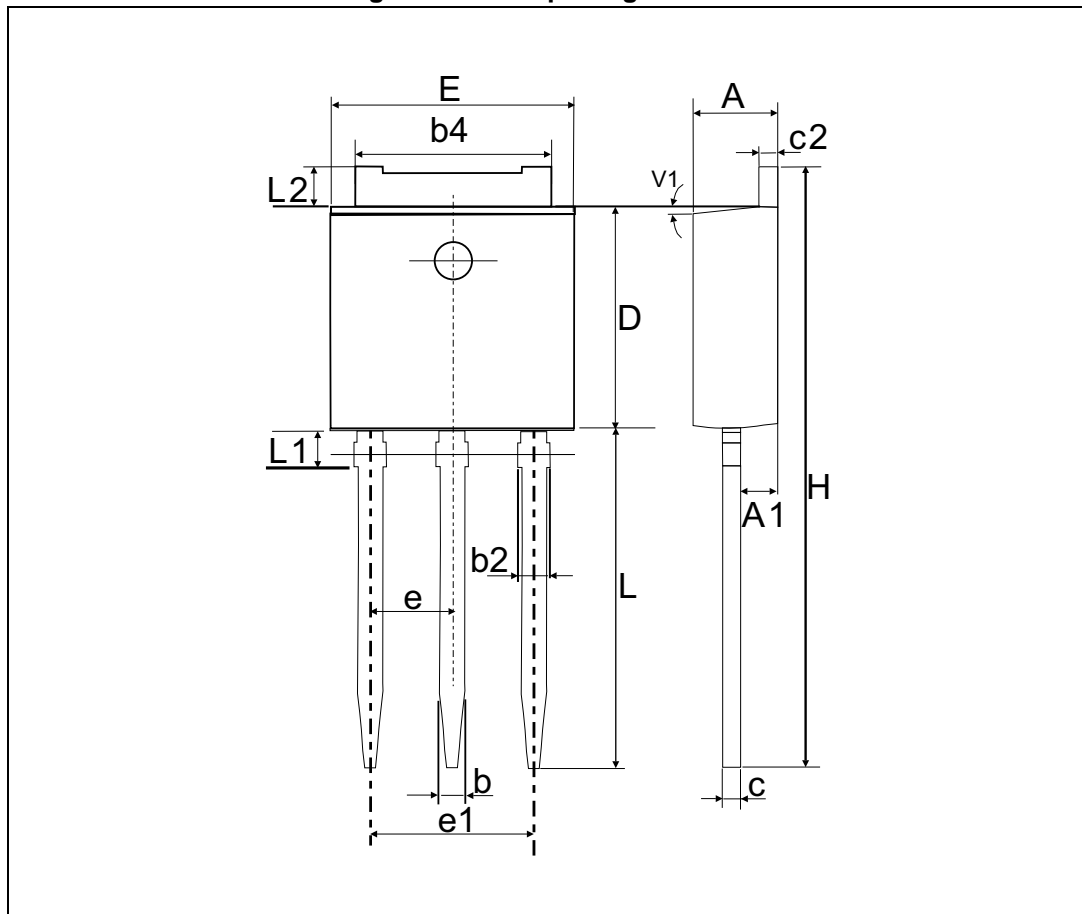
1. Inch dimensions are only for reference

Figure 13. Footprint (dimensions in mm, drawing not in scale)



2.2 IPAK package information

Figure 14. IPAK package outline



Note: This package drawing may slightly differ from the physical package. However, all the specified dimensions are guaranteed.

Table 7. IPAK package mechanical data

| Ref. | Dimensions | | | | | |
|------|-------------|-------|------|-----------------------|--------|--------|
| | Millimeters | | | Inches ⁽¹⁾ | | |
| | Min. | Typ. | Max. | Min. | Typ. | Max. |
| A | 2.20 | | 2.40 | 0.0866 | | 0.0945 |
| A1 | 0.90 | | 1.10 | 0.0354 | | 0.0433 |
| b | 0.64 | | 0.90 | 0.0252 | | 0.0354 |
| b2 | | | 0.95 | | | 0.0374 |
| b4 | 5.20 | | 5.43 | 0.2047 | | 0.2138 |
| c | 0.45 | | 0.60 | 0.0177 | | 0.0236 |
| c2 | 0.46 | | 0.60 | 0.0181 | | 0.0236 |
| D | 6 | | 6.20 | 0.2362 | | 0.2441 |
| E | 6.40 | | 6.65 | 0.2520 | | 0.2618 |
| e | | 2.28 | | | 0.0898 | |
| e1 | 4.40 | | 4.60 | 0.1732 | | 0.1811 |
| H | | 16.10 | | | 0.6339 | |
| L | 9 | | 9.60 | 0.3543 | | 0.3780 |
| L1 | 0.8 | | 1.20 | 0.0315 | | 0.0472 |
| L2 | | 0.80 | 1.25 | | 0.0315 | 0.0492 |
| V1 | | 10° | | | 10° | |

1. Inch dimensions are only for reference

3 Ordering information

Figure 15. Order information scheme

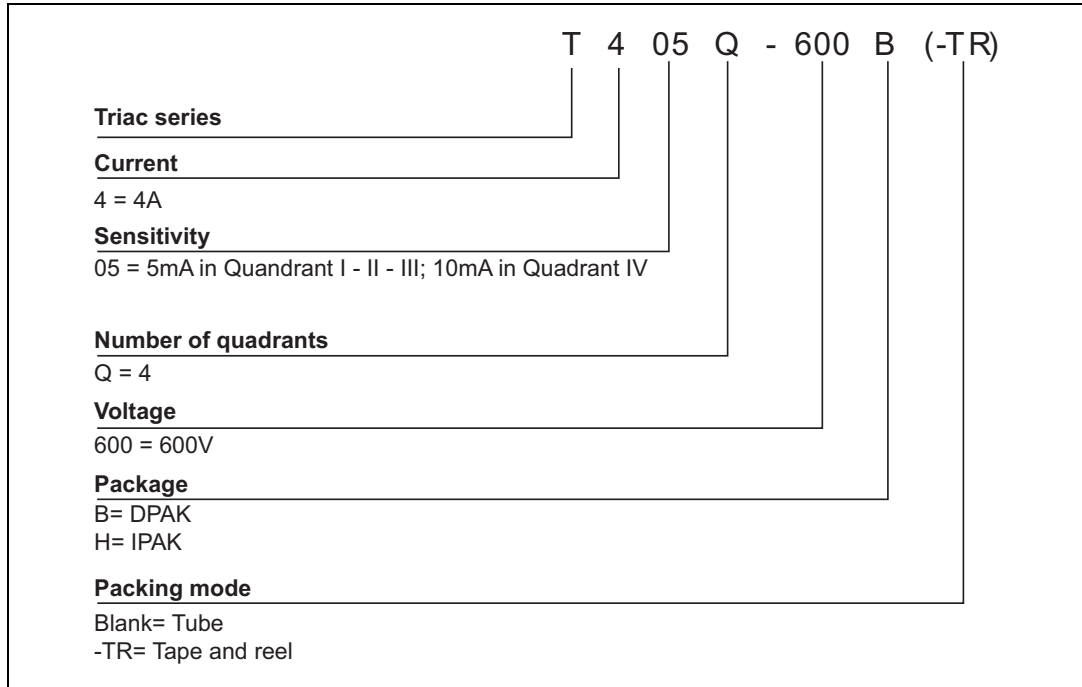


Table 8. Product selector

| Part Number | Voltage | Sensitivity | Type | Package |
|---------------|---------|-------------|-----------|---------|
| T405Q-600B-TR | 600 V | 5 / 10 mA | Sensitive | DPAK |
| T405Q-600H | 600 V | 5 / 10 mA | Sensitive | IPAK |

Table 9. Ordering information

| Order code | Marking | Package | Weight | Base qty | Delivery mode |
|---------------|-----------|---------|--------|----------|---------------|
| T405Q-600B-TR | T405Q 600 | DPAK | 0.3 g | 2500 | Tape and reel |
| T405Q-600H | T405Q 600 | IPAK | 0.4 g | 75 | Tube |

4 Revision history

Table 10. Document revision history

| Date | Revision | Changes |
|-------------|-----------------|--|
| July-2002 | 1 | First issue. |
| 29-May-2014 | 2 | Updated DPAK and IPAK package information and reformatted to current standard. |
| 25-Sep-2015 | 3 | Updated Features in cover page. Updated Table 3 and Section 2: Package information. |
| 11-Feb-2016 | 4 | Updated DPAK package information and reformatted to current standard. Added V_{DSM} parameter. |

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