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Tel: +86-755-8981 8866 Fax: +86-755-8427 6832
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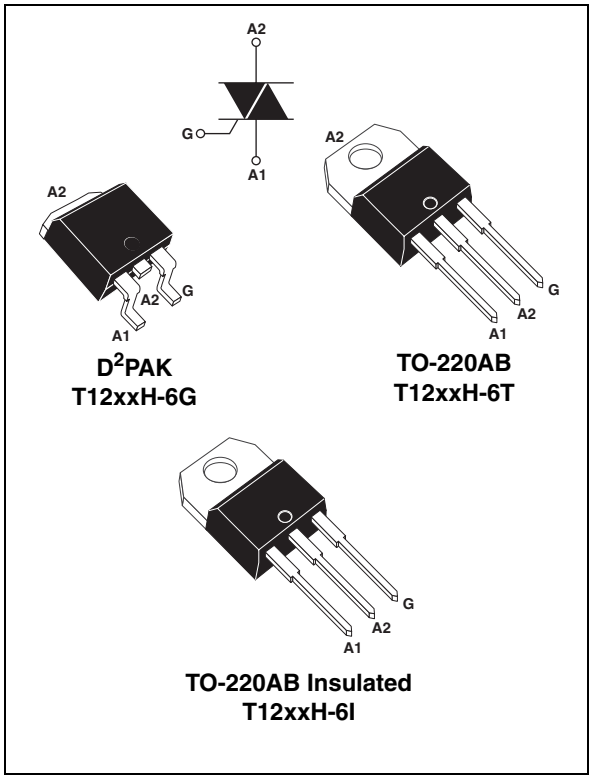
Address: A1208, Overseas Decoration Building, #122 Zhenhua RD., Futian, Shenzhen, China

# T1235H, T1250H

## High temperature 12 A Snubberless™ Triacs

## Features

- Medium current Triac
- 150 °C max. $T_j$ turn-off commutation
- Low thermal resistance with clip bonding
- Very high 3 quadrant commutation capability
- Packages are RoHS (2002/95/EC) compliant
- UL certified (ref. file E81734)




D²PAK
T12xxH-6G

TO-220AB
T12xxH-6T

TO-220AB Insulated
T12xxH-6I

## Applications

Especially designed to operate in high power density or universal motor applications such as vacuum cleaner and washing machine drum motor, these 12 A Triacs provide a very high switching capability up to junction temperatures of 150 °C.

The heatsink can be reduced, compared to traditional Triacs, according to the high performance at given junction temperatures.

## Description

Available in through-hole or surface mount packages, the T1235H and T1250H Triac series are suitable for general purpose mains power ac switching.

By using an internal ceramic pad, the T12xxH-6I provides voltage insulation (rated at 2500 V rms).

**Table 1. Device summary**

| Symbol | Value | Unit |
|---|---|---|
| $I_{T(RMS)}$ | 12 | A |
| $V_{DRM}/V_{RRM}$ | 600 | V |
| $I_{GT}$ | 35 or 50 | mA |

**TM**: Snubberless is a trademark of STMicroelectronics

# 1 Characteristics

**Table 2. Absolute maximum ratings**

| Symbol | Parameter | | | Value | Unit |
|---|---|---|---|---|---|
| $I_{T(RMS)}$ | On-state rms current (full sine wave) | $D^2PAK$, TO-220AB | $T_c$ = 130 °C | 12 | A |
| | | TO-220AB Ins | $T_c$ = 120 °C | | |
| $I_{TSM}$ | Non repetitive surge peak on-state current (full cycle, $T_j$ initial = 25 °C) | F = 50 Hz | t = 20 ms | 120 | A |
| | | F = 60 Hz | t = 16.7 ms | 126 | |
| $I^2t$ | $I^2t$ Value for fusing | $t_p$ = 10 ms | | 95 | $A^2s$ |
| dI/dt | Critical rate of rise of on-state current $I_G$ = 2 x $I_{GT}$ , $t_r \leq$ 100 ns | F = 120 Hz | $T_j$ = 150 °C | 50 | A/µs |
| $V_{DSM}/V_{RSM}$ | Non repetitive surge peak off-state voltage | $t_p$ = 10 ms | $T_j$ = 25 °C | $V_{DRM}/V_{RRM}$ + 100 | V |
| $I_{GM}$ | Peak gate current | $t_p$ = 20 µs | $T_j$ = 150 °C | 4 | A |
| $P_{G(AV)}$ | Average gate power dissipation | | $T_j$ = 150 °C | 1 | W |
| $T_{stg}$<br>$T_j$ | Storage junction temperature range<br>Operating junction temperature range | | | - 40 to + 150<br>- 40 to + 150 | °C |

**Table 3. Electrical characteristics ($T_j$ = 25 °C, unless otherwise specified)**

| Symbol | Test conditions | Quadrant | | Value | | Unit |
|---|---|---|---|---|---|---|
| | | | | T1235H | T1250H | |
| $I_{GT}$ (1) | $V_D$ = 12 V, $R_L$ = 33 Ω | I - II - III | MAX. | 35 | 50 | mA |
| $V_{GT}$ | | I - II - III | MAX. | 1.0 | | V |
| $V_{GD}$ | $V_D = V_{DRM}$, $R_L$ = 3.3 kΩ | I - II - III | MIN. | 0.15 | | V |
| $I_H$ (2) | $I_T$ = 500 mA | | MAX. | 35 | 75 | mA |
| $I_L$ | $I_G$ = 1.2 $I_{GT}$ | I - III | MAX. | 50 | 90 | mA |
| | | II | | 80 | 110 | |
| dV/dt (2) | $V_D$ = 67% $V_{DRM}$, gate open, $T_j$ = 150 °C | | MIN. | 1000 | 1500 | V/µs |
| (dI/dt)c (2) | Without snubber, $T_j$ = 150 °C | | MIN. | 16 | 21 | A/ms |

1. minimum $I_{GT}$ is guaranted at 20% 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 A, $t_p$ = 380 µs | $T_j$ = 25 °C | MAX. | 1.5 | V |
| $V_{t0}$ (1) | Threshold voltage | $T_j$ = 150 °C | MAX. | 0.80 | V |
| $R_d$ (1) | Dynamic resistance | $T_j$ = 150 °C | MAX. | 30 | mΩ |
| $I_{DRM}$ $I_{RRM}$ (2) | $V_{DRM}$ = $V_{RRM}$ | $T_j$ = 25 °C | MAX. | 5 | µA |
| | | $T_j$ = 150 °C | MAX. | 3.9 | mA |
| | $V_D/V_R$ = 400 V (at peak mains voltage) | $T_j$ = 150 °C | MAX. | 3.2 | |
| | $V_D/V_R$ = 200 V (at peak mains voltage) | $T_j$ = 150 °C | MAX. | 2.7 | |

1. for both polarities of A2 referenced to A1
2. $t_p$ = 380 µs

**Table 5. Thermal resistance**

| Symbol | Parameter | | | Value | Unit |
|---|---|---|---|---|---|
| $R_{th(j-c)}$ | Junction to case (AC) | | $D^2PAK$ / TO-220AB | 1.4 | °C/W |
| | | | TO-220AB Ins | 3.3 | |
| $R_{th(j-a)}$ | Junction to ambient | S = 1 $cm^2$ | $D^2PAK$ | 45 | |
| | | | TO-220AB / TO-220AB Ins | 60 | |

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

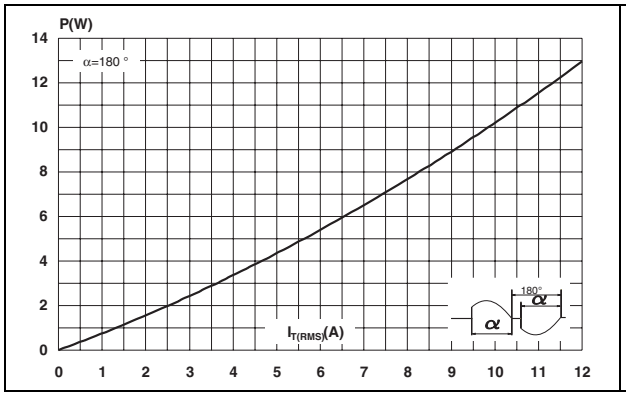



**Figure 2. On-state rms current versus case temperature (full cycle)**

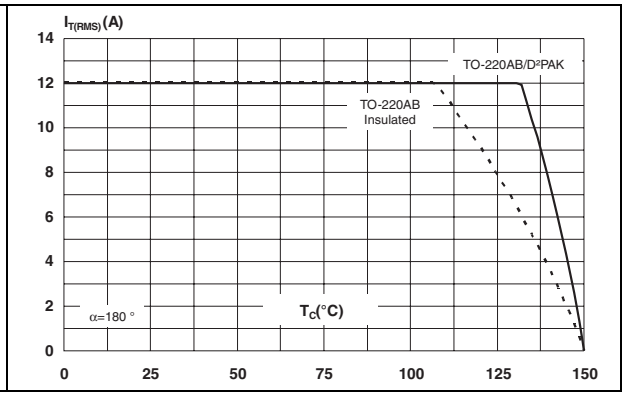



**Figure 3. On-state rms current versus ambient temperature**

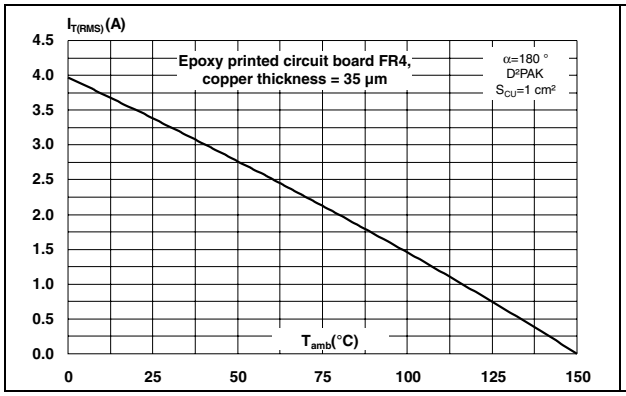



**Figure 4. Variation of thermal impedance versus pulse duration**

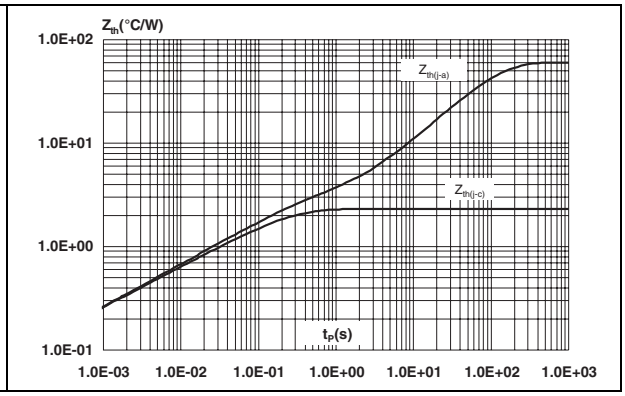



**Figure 5. On-state characteristics (maximum values)**

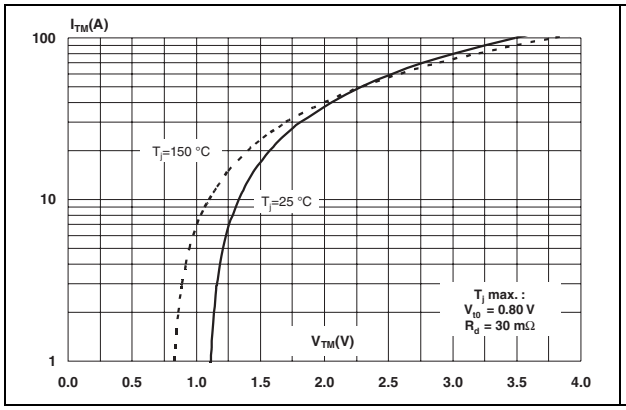



**Figure 6. Surge peak on-state current versus number of cycles**

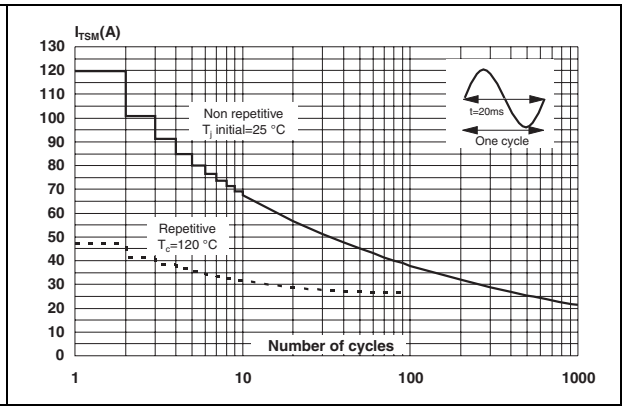


**Figure 7. Non-repetitive surge peak on-state current for a sinusoidal pulse with**

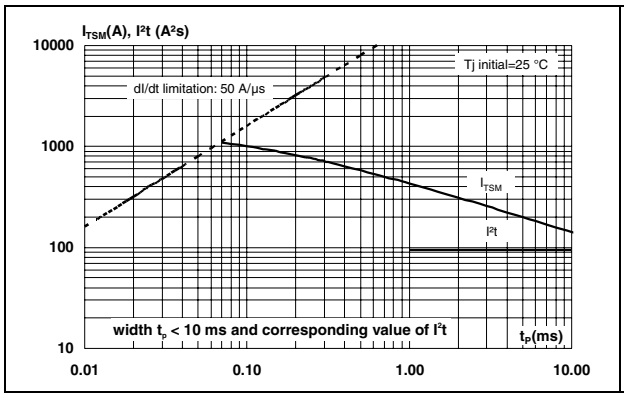



**Figure 8. Relative variation of $I_{GT}$,$I_H$, $I_L$ vs junction temperature (typical values)**

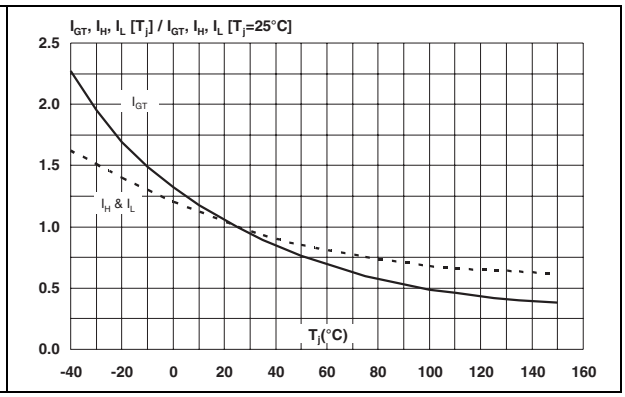



**Figure 9. Relative variation of critical rate of decrease of main current (dI/dt)c versus reapplied (dV/dt)c**

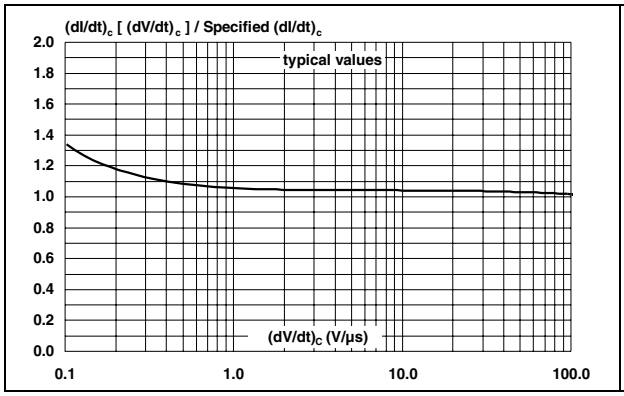



**Figure 10. Relative variation of critical rate of decrease of main current versus junction temperature**

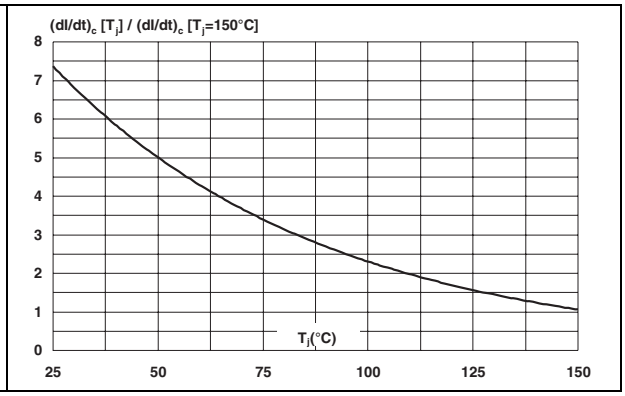



**Figure 11. Leakage current versus junction temperature for different values of blocking voltage (typical values)**

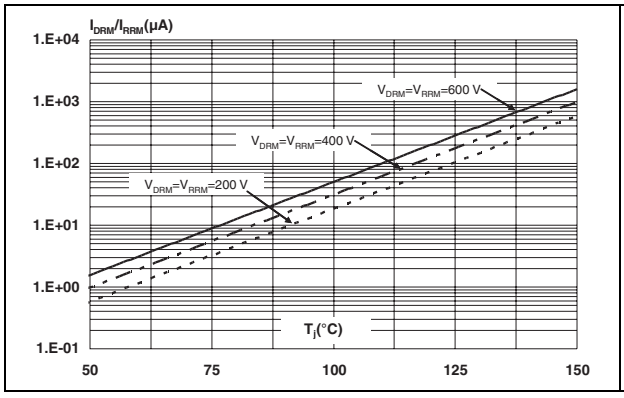
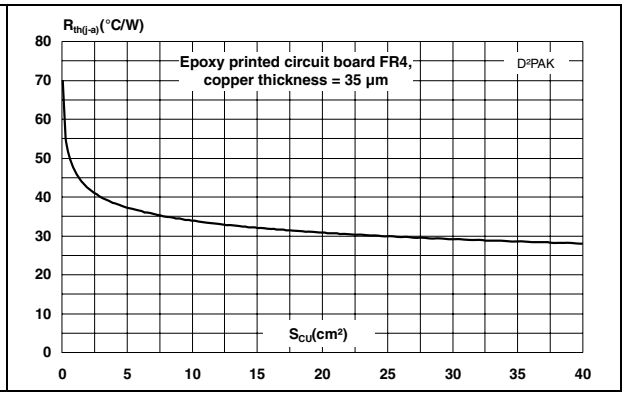
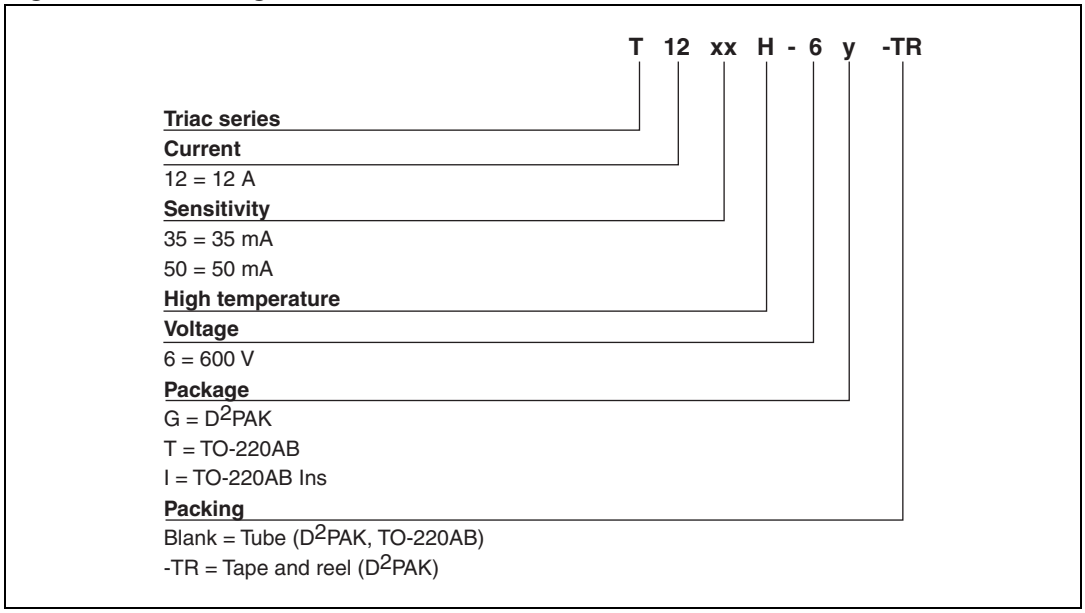



**Figure 12. Variation of thermal resistance junction to ambient versus copper surface under tab**



# 2 Ordering information scheme

**Figure 13. Ordering information scheme**

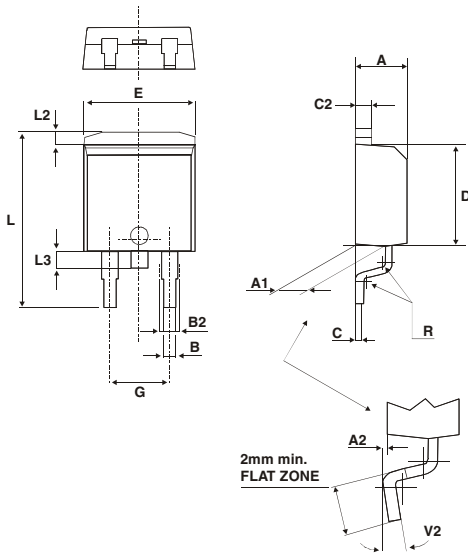


# 3 Package information

- Epoxy meets UL94, V0
- 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.

**Table 6. D²PAK dimensions**




| Ref. | Dimensions | | | | | |
|---|---|---|---|---|---|---|
| | Millimeters | | | Inches | | |
| | Min. | Typ. | Max. | Min. | Typ. | Max. |
| A | 4.30 | | 4.60 | 0.169 | | 0.181 |
| A1 | 2.49 | | 2.69 | 0.098 | | 0.106 |
| A2 | 0.03 | | 0.23 | 0.001 | | 0.009 |
| B | 0.70 | | 0.93 | 0.027 | | 0.037 |
| B2 | 1.25 | 1.40 | | 0.048 | 0.055 | |
| C | 0.45 | | 0.60 | 0.017 | | 0.024 |
| C2 | 1.21 | | 1.36 | 0.047 | | 0.054 |
| D | 8.95 | | 9.35 | 0.352 | | 0.368 |
| E | 10.00 | | 10.28 | 0.393 | | 0.405 |
| G | 4.88 | | 5.28 | 0.192 | | 0.208 |
| L | 15.00 | | 15.85 | 0.590 | | 0.624 |
| L2 | 1.27 | | 1.40 | 0.050 | | 0.055 |
| L3 | 1.40 | | 1.75 | 0.055 | | 0.069 |
| R | 0.40 | | | 0.016 | | |
| V2 | 0° | | 8° | 0° | | 8° |

**Figure 14. Footprint (dimensions in mm)**

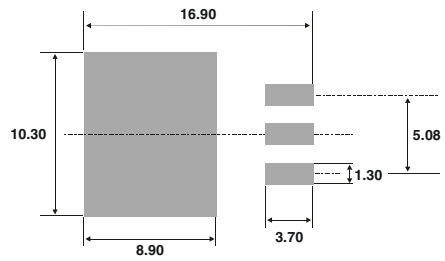
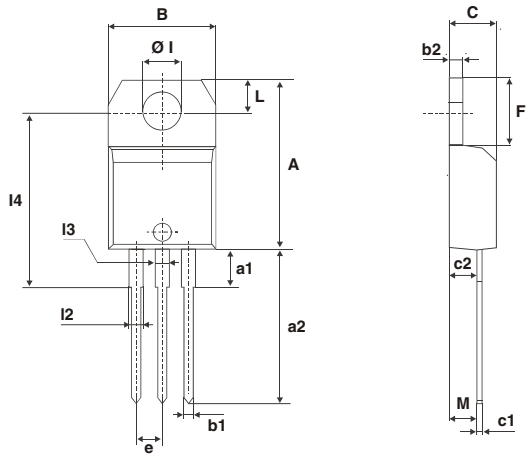


**Table 7. TO-220AB and TO-220AB Ins dimensions**




| Ref. | Dimensions | | | | | |
|---|---|---|---|---|---|---|
| | Millimeters | | | Inches | | |
| | Min. | Typ. | Max. | Min. | Typ. | Max. |
| A | 15.20 | | 15.90 | 0.598 | | 0.625 |
| a1 | | 3.75 | | | 0.147 | |
| a2 | 13.00 | | 14.00 | 0.511 | | 0.551 |
| B | 10.00 | | 10.40 | 0.393 | | 0.409 |
| b1 | 0.61 | | 0.88 | 0.024 | | 0.034 |
| b2 | 1.23 | | 1.32 | 0.048 | | 0.051 |
| C | 4.40 | | 4.60 | 0.173 | | 0.181 |
| c1 | 0.49 | | 0.70 | 0.019 | | 0.027 |
| c2 | 2.40 | | 2.72 | 0.094 | | 0.107 |
| e | 2.40 | | 2.70 | 0.094 | | 0.106 |
| F | 6.20 | | 6.60 | 0.244 | | 0.259 |
| ØI | 3.75 | | 3.85 | 0.147 | | 0.151 |
| I4 | 15.80 | 16.40 | 16.80 | 0.622 | 0.646 | 0.661 |
| L | 2.65 | | 2.95 | 0.104 | | 0.116 |
| I2 | 1.14 | | 1.70 | 0.044 | | 0.066 |
| I3 | 1.14 | | 1.70 | 0.044 | | 0.066 |
| M | | 2.60 | | | 0.102 | |

# 4 Ordering information

**Table 8. Ordering information**

| Order code | Marking | Package | Weight | Base qty | Delivery mode |
|---|---|---|---|---|---|
| T12xxH-6G | T12xxH 6G | $D^2PAK$ | 1.5 g | 50 | Tube |
| T12xxH-6G-TR | T12xxH 6G | $D^2PAK$ | 1.5 g | 1000 | Tape and reel |
| T12xxH-6T | T12xxH 6T | TO-220AB | 2.3 g | 50 | Tube |
| T12xxH-6I | T12xxH 6I | TO-220AB Ins | 2.3 g | 50 | Tube |

# 5 Revision history

**Table 9. Document revision history**

| Date | Revision | Changes |
|---|---|---|
| 17-Apr-2007 | 1 | First issue. |
| 20-Sep-2011 | 2 | Updated: *Features*, *Description* and *Figure 2*. |

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