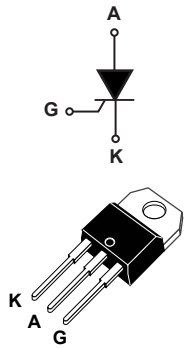
# TN3015H-6I

Datasheet

## High temperature 30 A, 600 V TO220 insulated thyristor SCRs




**TO-220AB insulated**

## Features

- High junction temperature: $T_j$ = 150 °C
- High noise immunity dV/dt = 1000 V/µs up to 150 °C
- Peak off-state voltage $V_{DRM}/V_{RRM}$ = 600 V
- High turn-on current rise dI/dt = 100 A/µs
- ECOPACK2 compliant
- Insulated package TO-220AB:
  - Insulated voltage: 2500 $V_{RMS}$
  - Complies with UL 1557 (File ref : E81734)

## Applications

- General purpose AC line load switching
- Motorbike voltage regulator circuits
- Inrush current limiting circuits
- Motor control circuits and starters
- Heating resistor control, Solid State Relays
- Lighting

## Description

Thanks to its operating junction temperature up to 150°C, the TN3015H-6I offers high thermal performance operation up to 30 A rms.

Its trade-off noise immunity (dV/dt = 1000 V/µs) versus its gate triggering current ($I_{GT}$ = 15 mA) and its turn-on current rise (dI/dt = 100 A/µs) allows to design robust and compact control circuit for voltage regulator in motorbikes and industrial drives, overvoltage crowbar protection, motor control circuits in power tools and kitchen appliances and inrush current limiting circuits.

| Product status |
|---|
| TN3015H-6I |

| Product summary | |
|---|---|
| **Order code** | TN3015H-6I |
| **Package** | TO-220AB Ins. |
| **$V_{DRM}/V_{RRM}$** | 600 V |
| **$T_j$** | 150 °C |
| **$I_{GT}$** | 15 mA |

# 1 Characteristics

**Table 1. Absolute maximum ratings (limiting values)**

| Symbol | Parameter | | | Value | Unit |
|---|---|---|---|---|---|
| $I_{T(RMS)}$ | RMS on-state current (180 ° conduction angle) | | $T_c$ = 96 °C | 30 | A |
| $I_{T(AV)}$ | Average on-state current (180 ° conduction angle) | | $T_c$ = 96 °C | 19 | A |
| | | | $T_c$ = 111 °C | 15 | |
| | | | $T_c$ = 127 °C | 10 | |
| $I_{TSM}$ | Non repetitive surge peak on-state current ($T_j$ initial = 25 °C) | | $t_p$ = 8.3 ms | 295 | A |
| | | | $t_p$ = 10 ms | 270 | |
| $I^2t$ | $I^2t$ value for fusing ($T_j$ initial = 25 °C) | | $t_p$ = 10 ms | 364 | $A^2s$ |
| dI/dt | $I_G$ = 2 x $I_{GT}$, tr ≤ 100 ns<br>Critical rate of rise of on-state current | f = 60 Hz | $T_j$ = 25 °C | 100 | A/µs |
| $V_{DRM}/V_{RRM}$ | Repetitive peak off-state voltage | | | 600 | V |
| $V_{DSM}/V_{RSM}$ | 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 |
| $V_{RGM}$ | Maximum peak reverse gate voltage | | $T_j$ = 25 °C | 5 | V |
| $T_{stg}$ | Storage junction temperature range | | | -40 to +150 | °C |
| $T_j$ | Maximum operating junction temperature | | | -40 to +150 | °C |
| $T_l$ | Maximum lead temperature soldering during 10 s | | | 260 | °C |
| $V_{ins}$ | Insulation RMS voltage, 1 minute | | | 2500 | V |

**Table 2. Electrical characteristics ($T_j$ = 25 °C unless otherwise specified)**

| Symbol | Test conditions | | | Value | Unit |
|---|---|---|---|---|---|
| $I_{GT}$ | $V_D$ = 12 V, $R_L$ = 33 Ω | | Min. | 6 | mA |
| | | | Max. | 15 | |
| $V_{GT}$ | | | Max. | 1.3 | V |
| $V_{GD}$ | $V_D$ = $V_{DRM}$, $R_L$ = 3.3 kΩ | $T_j$ = 150 °C | Min. | 0.15 | V |
| $I_H$ | $I_T$ = 500 mA, gate open | | Max. | 60 | mA |
| $I_L$ | $I_G$ = 1.2 x $I_{GT}$ | | Max. | 75 | mA |
| dV/dt | $V_D$ = 402 V, gate open | $T_j$ = 150 °C | Min. | 1000 | V/µs |
| $t_{gt}$ | $I_T$ = 60 A, $V_D$ = 600 V, $I_G$ = 100 mA, ($dI_G/dt$) max = 0.2 A/µs | | Typ. | 1.9 | µs |
| $t_q$ | $I_T$ = 30 A, $V_D$ = 402 V,(di/dt)off = 30 A/µs, $V_R$ = 25 V, $dV_D/dt$ = 50 V/µs | $T_j$ = 150 °C | Typ. | 80 | µs |

**Table 3. Static characteristics**

| Symbol | Test conditions | | | Value | Unit |
|---|---|---|---|---|---|
| $V_{TM}$ | $I_{TM}$ = 60 A, $t_p$ = 380 µs | $T_j$ = 25 °C | Max. | 1.6 | V |
| $V_{TO}$ | Threshold voltage | $T_j$ = 150 °C | Max. | 0.84 | |
| $R_D$ | Dynamic resistance | $T_j$ = 150 °C | Max. | 14 | mΩ |
| $I_{DRM}$, $I_{RRM}$ | $V_D = V_{DRM}$, $V_R = V_{RRM}$ | $T_j$ = 25 °C | Max. | 10 | µA |
| | | $T_j$ = 150 °C | | 5 | mA |

**Table 4. Thermal parameters**

| Symbol | Parameter | | Value | Unit |
|---|---|---|---|---|
| $R_{th(j-c)}$ | Junction to case | Max. | 1.9 | °C/W |
| $R_{th(j-a)}$ | Junction to ambient | Typ. | 60 | |

## 1.1 Characteristics curves

**Figure 1. Maximum power dissipation versus average on-state current**

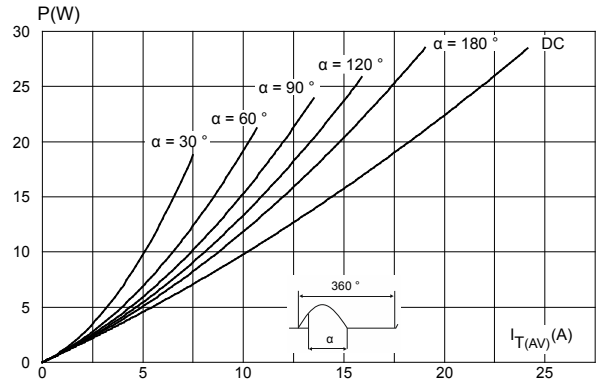



**Figure 2. Average and DC on-state current versus case temperature**

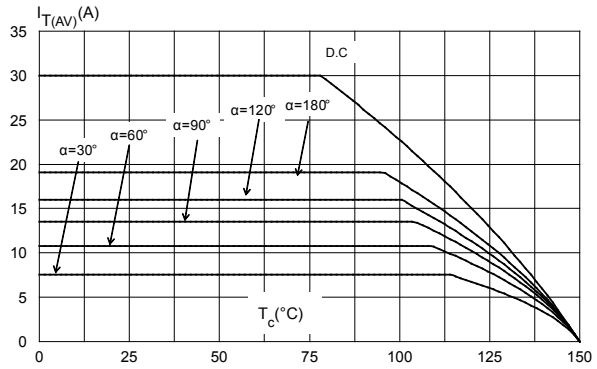



**Figure 3. Average and D.C. on state current versus ambient temperature**

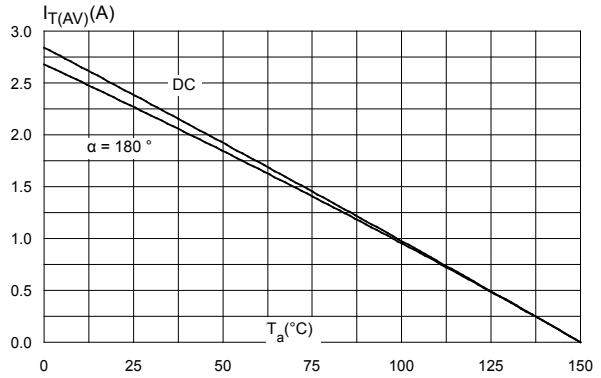



**Figure 4. On-state characteristics (maximum values)**

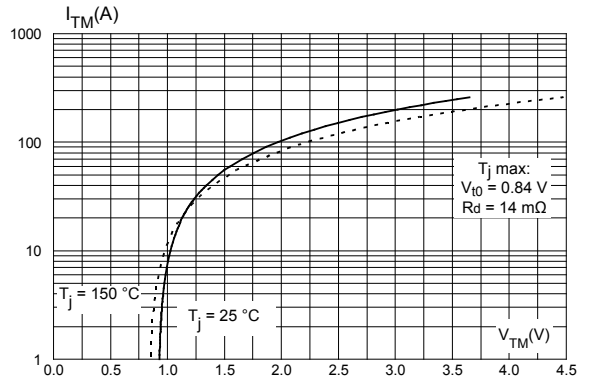



**Figure 5. Relative variation of thermal impedance junction to case and junction to ambient versus pulse duration**

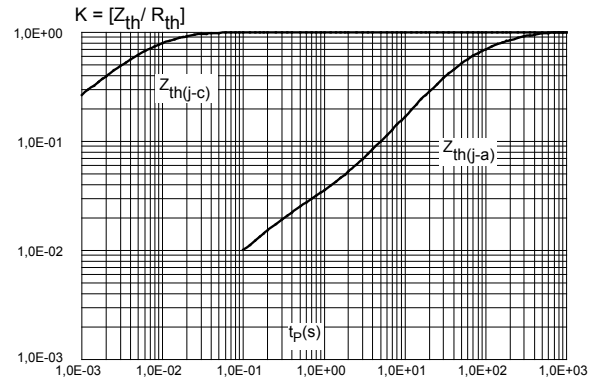



**Figure 6. Relative variation of gate trigger current and gate voltage versus junction temperature (typical values)**

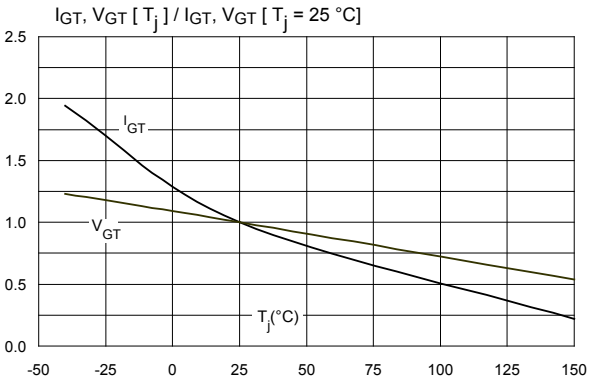


**Figure 7. Relative variation of holding and latching current versus junction temperature (typical values)**

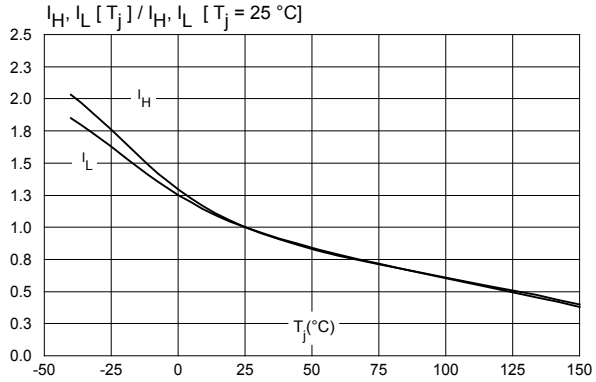



**Figure 8. Relative variation of static dV/dt immunity versus junction temperature (typical values)**

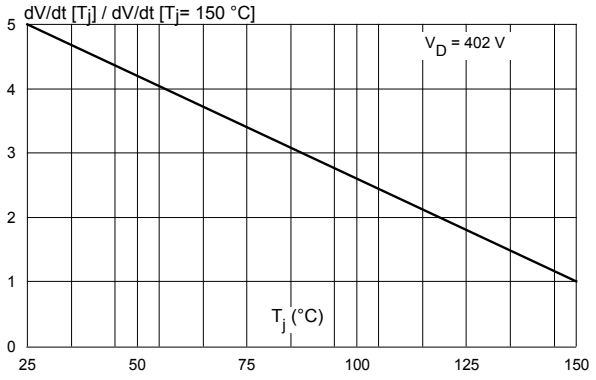



**Figure 9. Surge peak on-state current versus number of cycles**

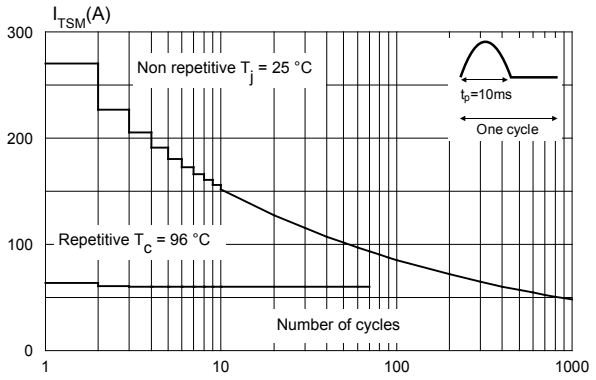



**Figure 10. Non repetitive surge peak on-state current for a sinusoidal pulse with width $t_p$ < 10 ms**

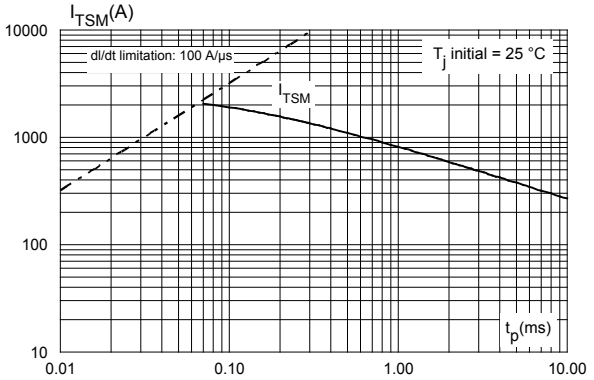
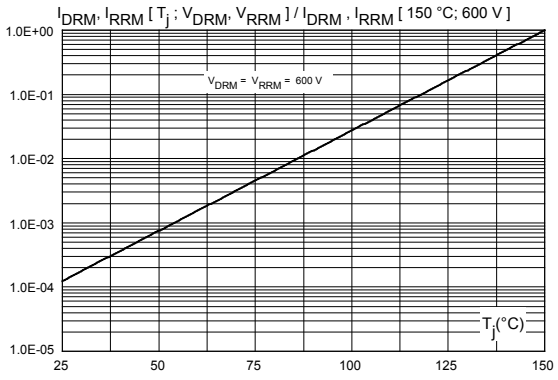



**Figure 11. Relative variation of leakage current versus junction temperature**



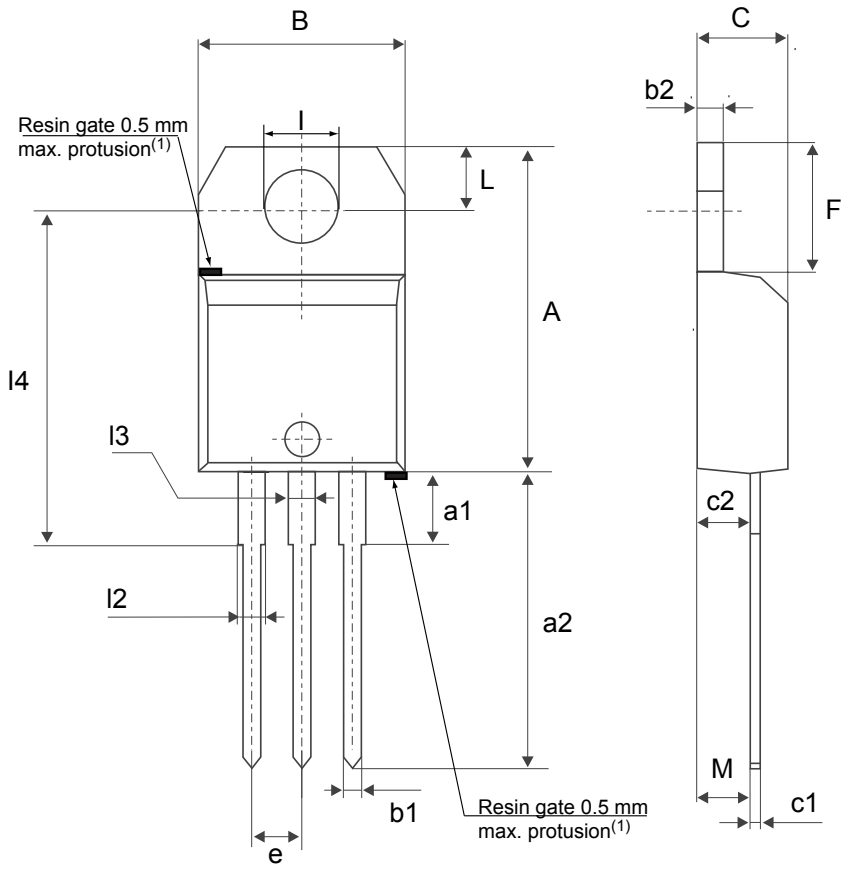
# 2 Package information

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.

## 2.1 TO-220AB insulated package information

- Molding compound resin is halogen-free and meets flammability standard UL94 level 0
- Lead-free package leads finishing
- ECOPACK2 compliant
- Recommended torque: 0.4 to 0.6 N.m

**Figure 12. TO-220AB insulated package outline**




(1)Resin gate position accepted in one of the two positions or in the symmetrical opposites.

**Table 5. 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 |
| l2 | 1.14 | | 1.70 | 0.0449 | | 0.0669 |
| l3 | 1.14 | | 1.70 | 0.0449 | | 0.0669 |
| l4 | 15.80 | 16.40 | 16.80 | 0.6220 | 0.6457 | 0.6614 |
| M | | 2.6 | | | 0.1024 | |

1. *Inch dimensions are for reference only.*

# 3 Ordering information

**Figure 13. Ordering information scheme**

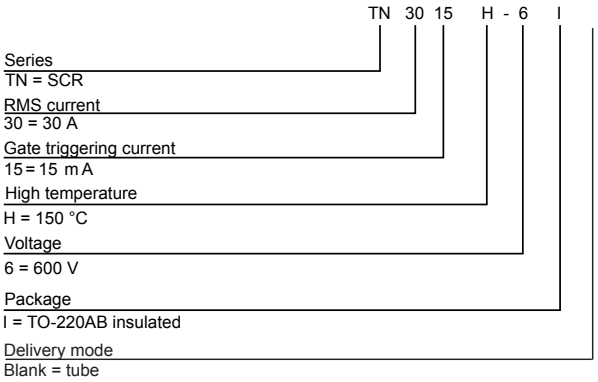



**Table 6. Ordering information**

| Order code | Marking | Package | Weight | Base qty. | Delivery mode |
|---|---|---|---|---|---|
| TN3015H-6I | TN3015H6I | TO-220AB ins. | 2.3 g | 50 | Tube |

## Revision history

Table 7. **Document revision history**

| Date | Revision | Changes |
|---|---|---|
| 22-May-2019 | 1 | Initial release. |