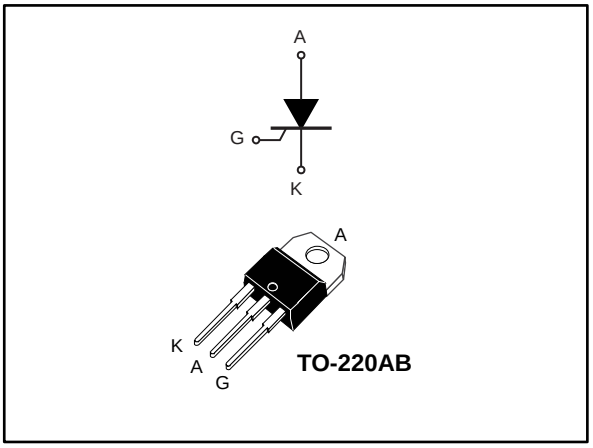
# TN2010H-6T

## High temperature 20 A SCRs

Datasheet - production data




## Description

Packaged in a non-isolated TO-220AB, this device offers high thermal performance during operation of up to 20 $A_{RMS}$, thanks to a junction temperature of up to 150 °C.

The combination of noise immunity and low gate triggering current allows to design strong and compact control circuit.

**Table 1: Device summary**

| Order code | Package | $V_{DRM}/V_{RRM}$ | $I_{GT}$ |
|---|---|---|---|
| TN2010H-6T | TO-220AB | 600 V | 10 mA |

## Features

- High junction temperature: $T_j$ = 150 °C
- High noise immunity dV/dt = 400 V/µs up to 150 °C
- Gate triggering current $I_{GT}$ = 10 mA
- Peak off-state voltage $V_{DRM}/V_{RRM}$ = 600 V
- High turn on current rise dI/dt = 100 A/µs
- ECOPACK®2 compliant component

## Applications

- Motorbike voltage regulator circuits
- Inrush current limiting circuits
- Motor control circuits and starters
- Light dimmers
- Solid state relays



This is information on a product in full production.

# 1 Characteristics

**Table 2: Absolute maximum ratings (limiting values), $T_j$ = 25 °C unless otherwise specified**

| Symbol | Parameter | | | Value | Unit |
|---|---|---|---|---|---|
| $I_{T(RMS)}$ | RMS on-state current (180 ° conduction angle) | | $T_c$ = 132 °C | 20 | A |
| $I_{T(AV)}$ | Average on-state current (180 ° conduction angle) | | $T_c$ = 132 °C | 12.7 | A |
| | | | $T_c$ = 137 °C | 10 | |
| | | | $T_c$ = 140 °C | 8 | |
| $I_{TSM}$ | Non repetitive surge peak on-state current ( $T_j$ initial = 25 °C) | | $t_p$ = 8.3 ms | 197 | A |
| | | | $t_p$ = 10 ms | 180 | |
| $I^2t$ | $I^2t$ value for fusing | | $t_p$ = 10 ms | 162 | $A^2s$ |
| dI/dt | Critical rate of rise of on-state current $I_G$ = 2 x $I_{GT}$, tr ≤ 100 ns | | f = 60 Hz | 100 | A/µs |
| $V_{DSM}/V_{RSM}$ | Non repetitive surge peak off-state voltage | | $t_p$ = 10 ms | 700 | 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 | | | 5 | V |
| $T_{stg}$ | Storage junction temperature range | | | -40 to +150 | °C |
| $T_j$ | Operating junction temperature range | | | -40 to +150 | °C |
| $T_L$ | Maximum lead temperature for soldering during 10 s | | | 260 | °C |

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

| Symbol | Test conditions | | | Value | Unit |
|---|---|---|---|---|---|
| $I_{GT}$ | $V_D$ = 12 V, $R_L$ = 33 Ω | | Typ. | 5 | mA |
| | | | Max. | 10 | |
| $V_{GT}$ | | | Max. | 1.3 | V |
| $V_{GD}$ | $V_D$ = $V_{DRM}$, $R_L$ = 3.3 kΩ | $T_j$ = 150 °C | Min. | 0.1 | V |
| $I_H$ | $I_T$ = 500 mA, gate open | | Max. | 40 | mA |
| $I_L$ | $I_G$ = 1.2 x $I_{GT}$ | | Max. | 60 | mA |
| dV/dt | $V_D$ = 402 V, gate open | $T_j$ = 150 °C | Min. | 400 | V/µs |
| $t_{gt}$ | $I_{TM}$ = 40 A, $V_D$ = 402 V, $I_G$ = 20 mA, ($dI_G/dt$) max = 0.2 A/µs | | Typ. | 1.9 | µs |
| $t_q$ | $I_{TM}$ = 40 A, $V_D$ = 402 V, ($d_I/dt$)off = 30 A/µs, $V_R$ = 25 V, $dV_D/dt$ = 40 V/µs | $T_j$ = 150 °C | Typ. | 70 | µs |

**Table 4: Static characteristics**

| Symbol | Test conditions | | | Value | Unit |
|---|---|---|---|---|---|
| $V_{TM}$ | $I_{TM}$ = 40 A, $t_p$ = 380 µs | $T_j$ = 25 °C | Max. | 1.6 | V |
| $V_{TO}$ | Threshold voltage | $T_j$ = 150 °C | Max. | 0.82 | |
| $R_D$ | Dynamic resistance | $T_j$ = 150 °C | Max. | 17.5 | mΩ |
| $I_{DRM}$, $I_{RRM}$ | $V_D = V_{DRM}$, $V_R = V_{RRM}$ | $T_j$ = 25 °C | Max. | 5 | µA |
| | | $T_j$ = 125 °C | | 2 | mA |
| | | $T_j$ = 150 °C | | 3.9 | |

**Table 5: Thermal parameters**

| Symbol | Parameter | | Value | Unit |
|---|---|---|---|---|
| $R_{th(j-c)}$ | Junction to case (DC) | Max. | 1.0 | °C/W |
| $R_{th(j-a)}$ | Junction to ambient (DC) | Typ. | 60 | |

## 1.1 Characteristics (curves)

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

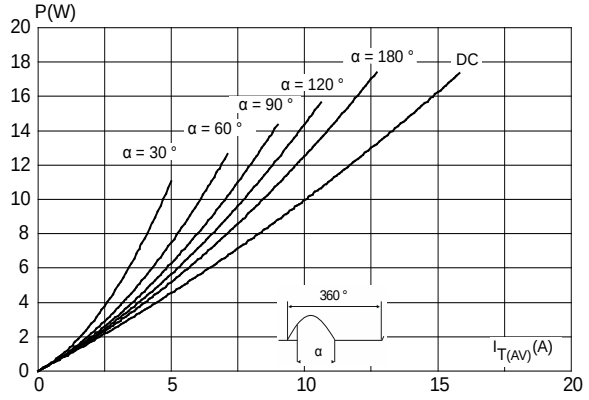



**Figure 2: Average and DC on-state current versus case temperature**

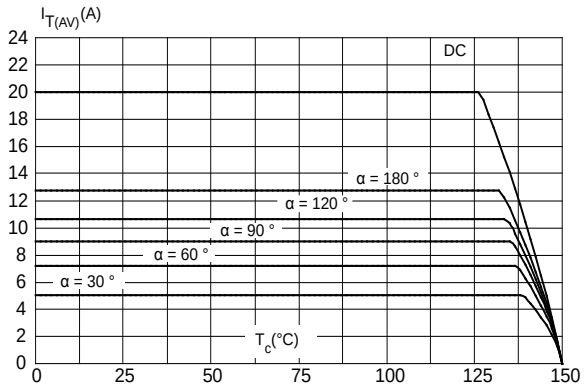



**Figure 3: Average and D.C. on state current versus ambient temperature**

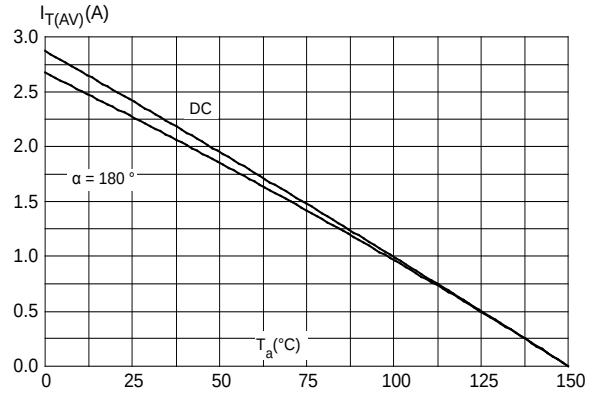



**Figure 4: Relative variation of thermal impedance versus pulse duration**

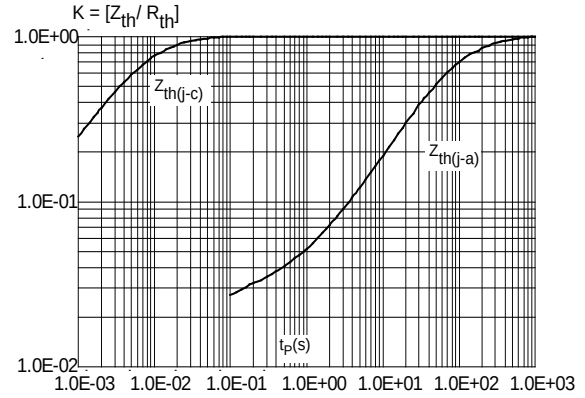



**Figure 5: Relative variation of gate triggering current and gate voltage versus junction temperature (typical values)**

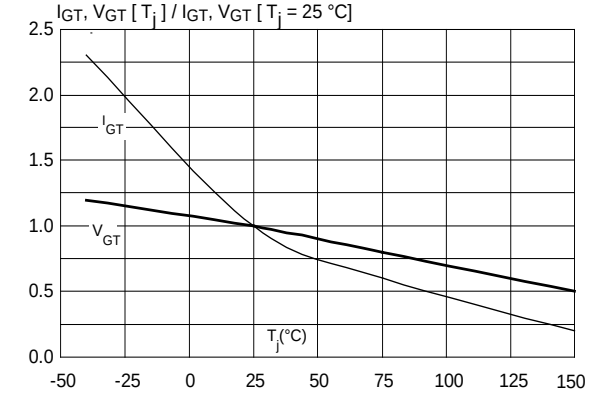



**Figure 6: Relative variation of holding and latching current versus junction temperature (typical values)**

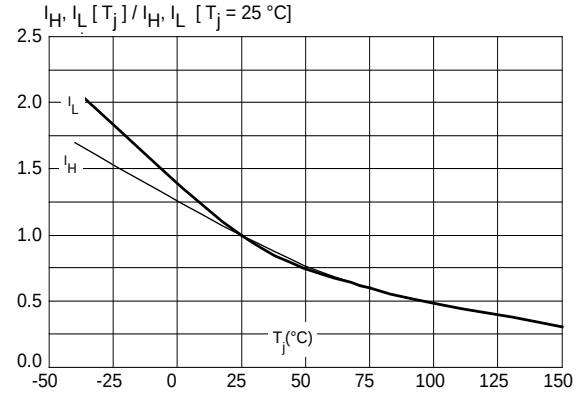


**Figure 7: Relative variation of static dV/dt immunity versus junction temperature (typical values)**

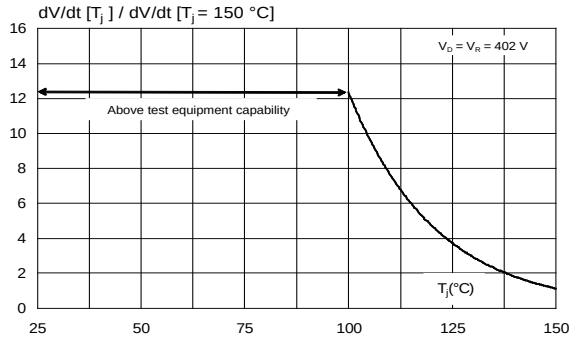



**Figure 8: Surge peak on-state current versus number of cycles**

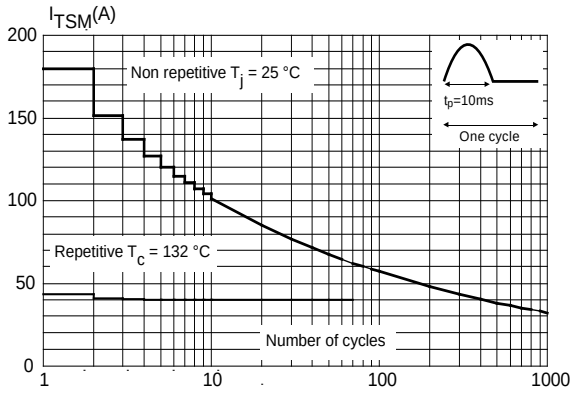



**Figure 9: Non repetitive surge peak on-state current for a sinusoidal pulse with width $t_p$ < 10 ms**

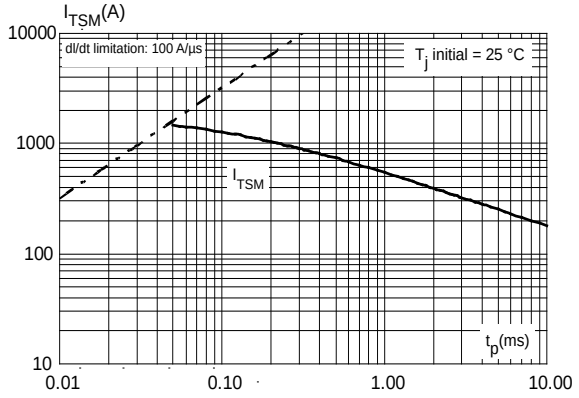



**Figure 10: On-state characteristics (maximum values)**

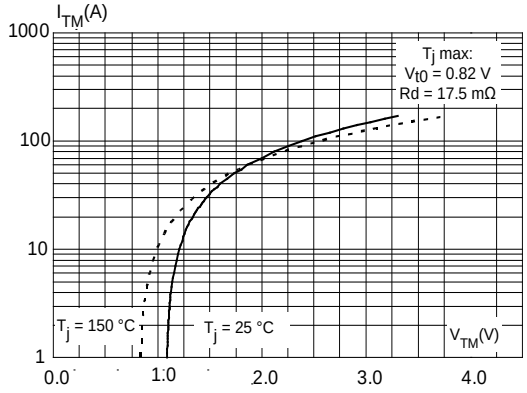
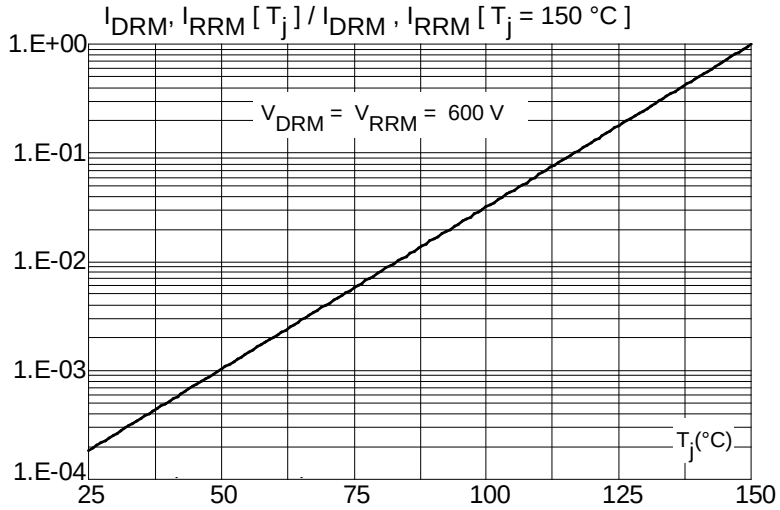



**Figure 11: Relative variation of leakage current versus junction temperature**



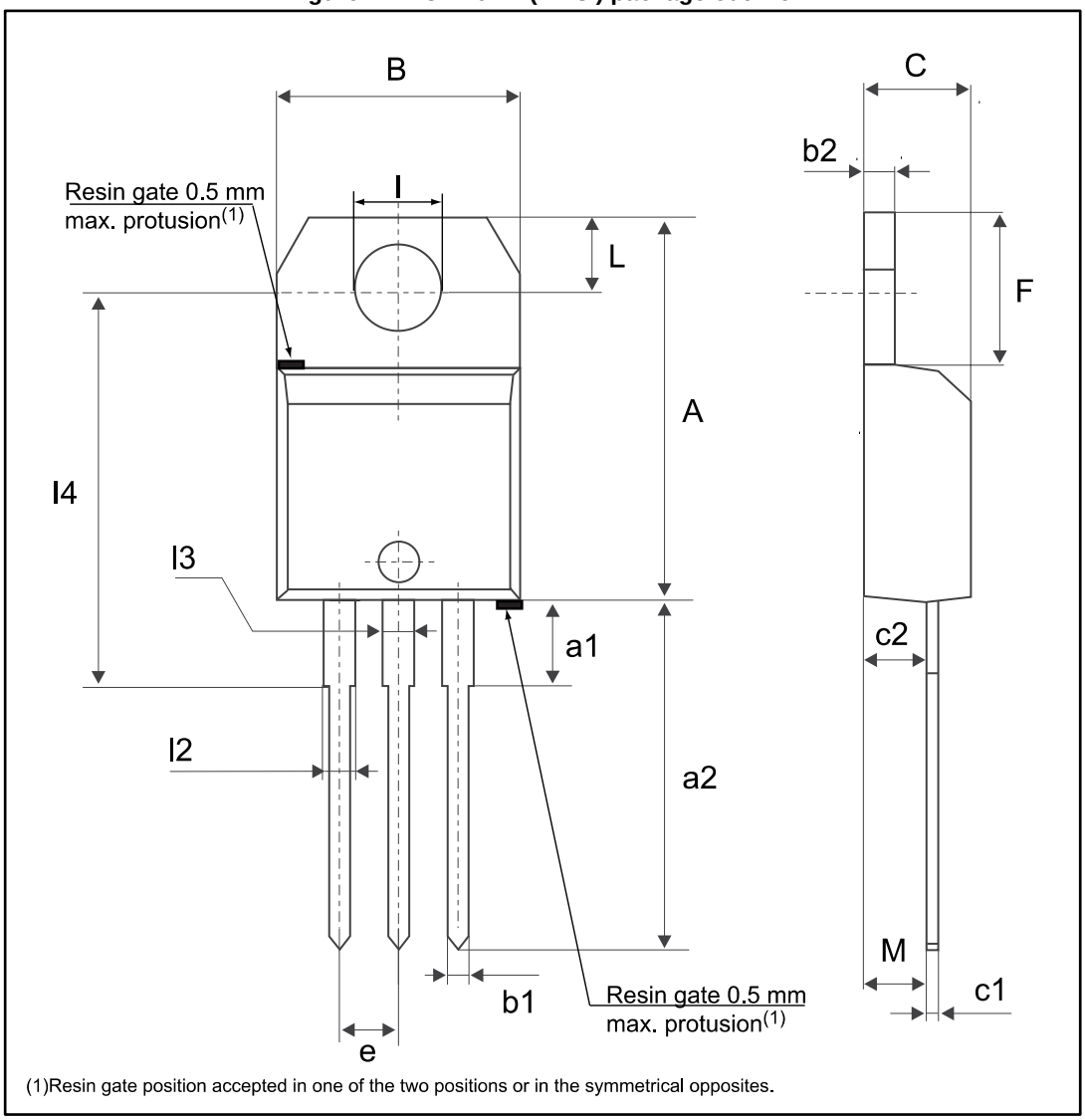
# 2 Package information

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.

- Epoxy meets UL94, V0
- Lead-free, halogen-free package
- Recommended torque value (TO-220AB): 0.4 to 0.6 N.m

## 2.1 TO-220AB package information

**Figure 12: TO-220AB (NIns.) package outline**




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

Table 6: TO-220AB (NIns.) 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 | |

**Notes:**

(1)Inch dimensions are for reference only.

# 3 Ordering information

**Figure 13: Ordering information scheme**

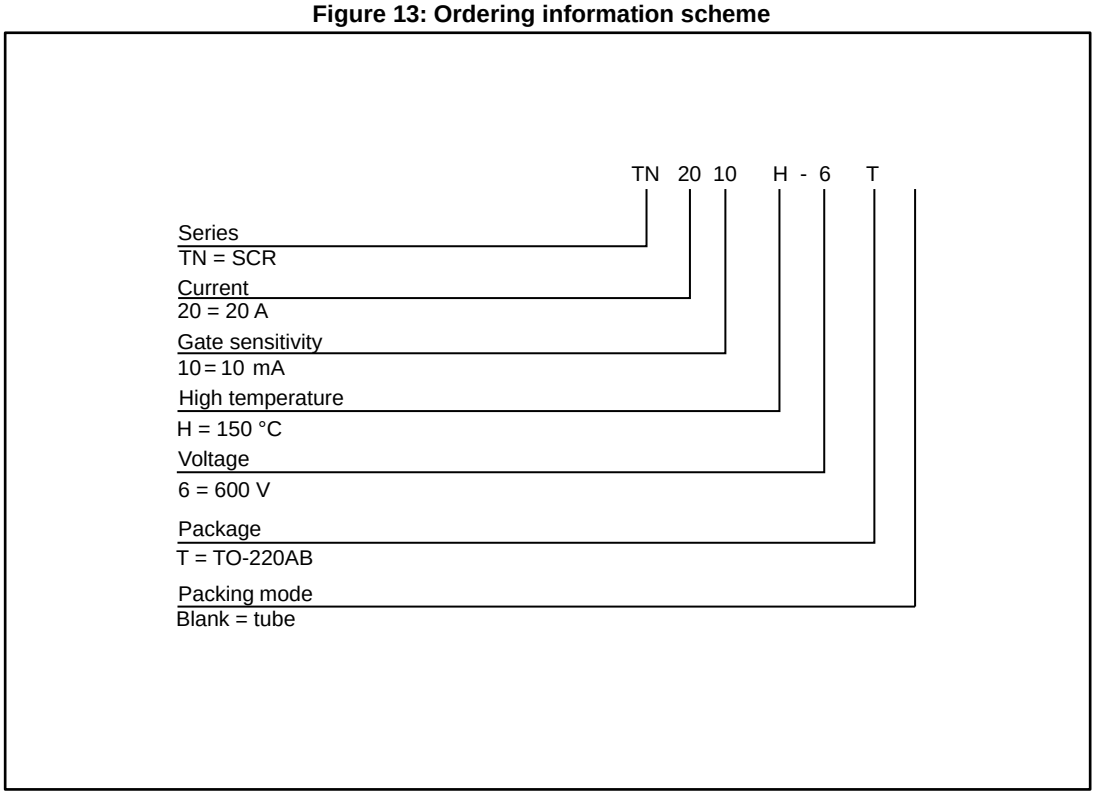



**Table 7: Ordering information**

| Order code | Marking | Package | Weight | Base qty. | Delivery mode |
|---|---|---|---|---|---|
| TN2010H-6T | TN2010H6 | TO-220AB | 2.3 g | 50 | Tube |

# 4 Revision history

**Table 8: Document revision history**

| Date | Revision | Changes |
|---|---|---|
| 29-Aug-2017 | 1 | Initial release. |

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