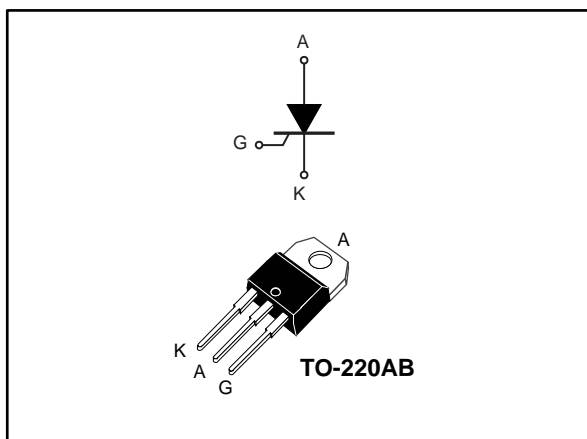


## High temperature 20 A SCRs

Datasheet - production data


**Description**

Packaged in a non-isolated TO-220AB, this device offers high thermal performance during operation of up to 20 A<sub>RMS</sub>, 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 <sub>DRM</sub> /V <sub>RRM</sub> | I <sub>GT</sub> |
|------------|----------|------------------------------------|-----------------|
| TN2010H-6T | TO-220AB | 600 V                              | 10 mA           |

**Features**

- High junction temperature: T<sub>j</sub> = 150 °C
- High noise immunity dV/dt = 400 V/μs up to 150 °C
- Gate triggering current I<sub>GT</sub> = 10 mA
- Peak off-state voltage V<sub>DRM</sub>/V<sub>RRM</sub> = 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

# 1 Characteristics

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

| Symbol            | Parameter   |                         | Value                 | Unit             |
|-------------------|---|-------------------------|-----------------------|------------------|
| $I_{T(RMS)}$      | RMS on-state current<br>(180 ° conduction angle)  | $T_c = 132\text{ °C}$   | 20                    | A                |
| $I_{T(AV)}$       | Average on-state current<br>(180 ° conduction angle)  | $T_c = 132\text{ °C}$   | 12.7                  | A                |
|                   |   | $T_c = 137\text{ °C}$   | 10                    |                  |
|                   |   | $T_c = 140\text{ °C}$   | 8                     |                  |
| $I_{TSM}$         | Non repetitive surge peak on-state current<br>( $T_j$ initial = 25 °C)                          | $t_p = 8.3\text{ ms}$   | 197                   | A                |
|                   |   | $t_p = 10\text{ ms}$    | 180                   |                  |
| $I^2t$            | $I^2t$ value for fusing   | $t_p = 10\text{ ms}$    | 162                   | A <sup>2</sup> s |
| $di/dt$           | Critical rate of rise of on-state current<br>$I_G = 2 \times I_{GT}$ , $t_r \leq 100\text{ ns}$ | $f = 60\text{ Hz}$      | 100                   | A/ $\mu$ s       |
| $V_{DSM}/V_{RSM}$ | Non repetitive surge peak off-state voltage   | $t_p = 10\text{ ms}$    | 700                   | V                |
| $I_{GM}$          | Peak gate current   | $t_p = 20\text{ }\mu$ s | $T_j = 150\text{ °C}$ | A                |
| $P_{G(AV)}$       | Average gate power dissipation  | $T_j = 150\text{ °C}$   | 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 ( $T_j = 25\text{ °C}$  unless otherwise specified)**

| Symbol   | Test conditions   |                       | Value | Unit |            |
|----------|---|-----------------------|-------|------|------------|
| $I_{GT}$ | $V_D = 12\text{ V}$ , $R_L = 33\text{ }\Omega$  | Typ.                  | 5     | mA   |            |
|          |   | Max.                  | 10    |      |            |
| $V_{GT}$ |   | Max.                  | 1.3   | V    |            |
| $V_{GD}$ | $V_D = V_{DRM}$ , $R_L = 3.3\text{ k}\Omega$  | $T_j = 150\text{ °C}$ | Min.  | 0.1  | V          |
| $I_H$    | $I_T = 500\text{ mA}$ , gate open   |                       | Max.  | 40   | mA         |
| $I_L$    | $I_G = 1.2 \times I_{GT}$   |                       | Max.  | 60   | mA         |
| $dV/dt$  | $V_D = 402\text{ V}$ , gate open  | $T_j = 150\text{ °C}$ | Min.  | 400  | V/ $\mu$ s |
| $t_{gt}$ | $I_{TM} = 40\text{ A}$ , $V_D = 402\text{ V}$ , $I_G = 20\text{ mA}$ , $(di/dt)_{max} = 0.2\text{ A}/\mu$ s                                 |                       | Typ.  | 1.9  | $\mu$ s    |
| $t_q$    | $I_{TM} = 40\text{ A}$ , $V_D = 402\text{ V}$ , $(di/dt)_{off} = 30\text{ A}/\mu$ s,<br>$V_R = 25\text{ V}$ , $dV_D/dt = 40\text{ V}/\mu$ s | $T_j = 150\text{ °C}$ | Typ.  | 70   | $\mu$ s    |

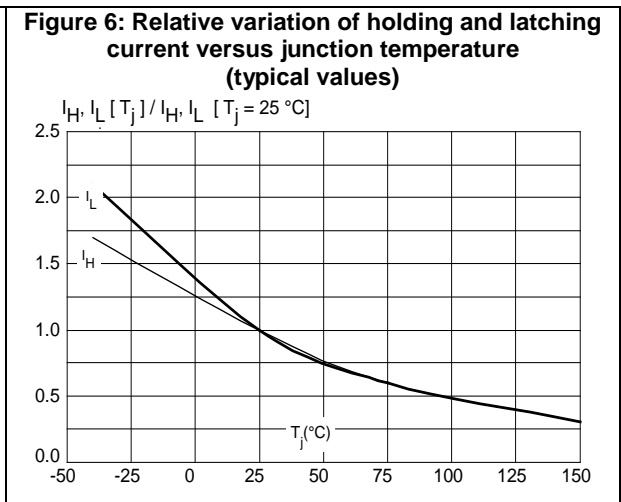
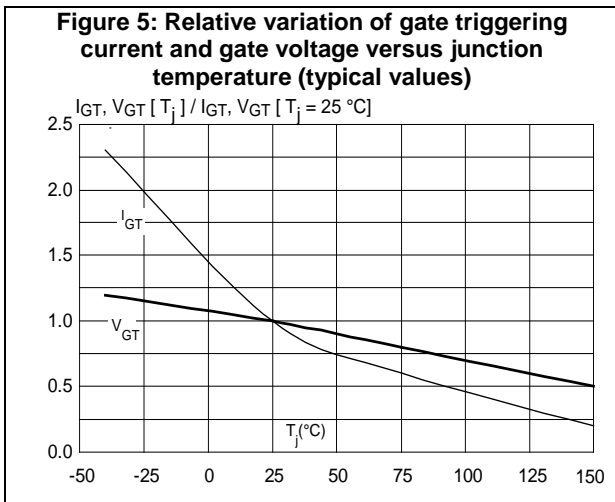
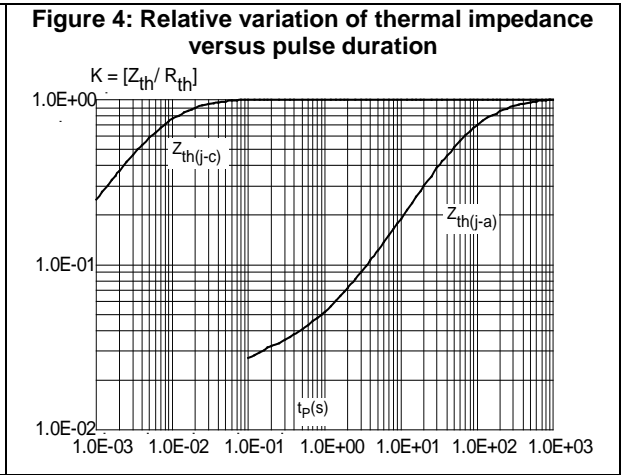
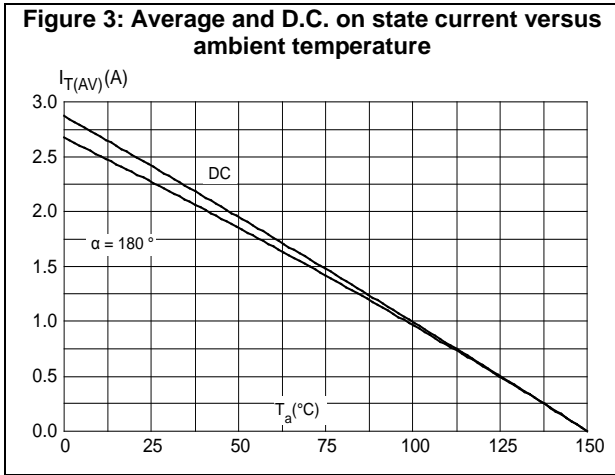
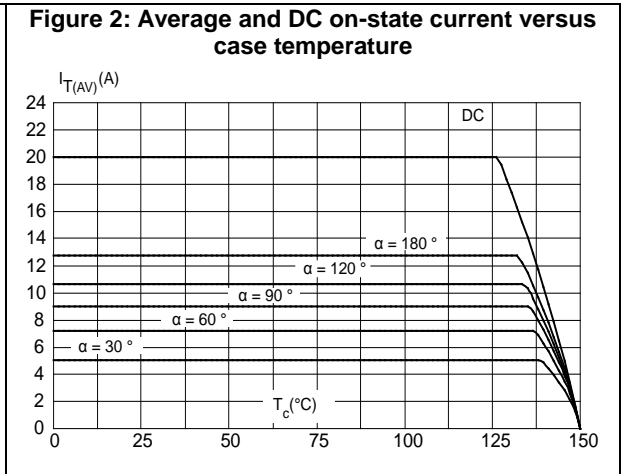
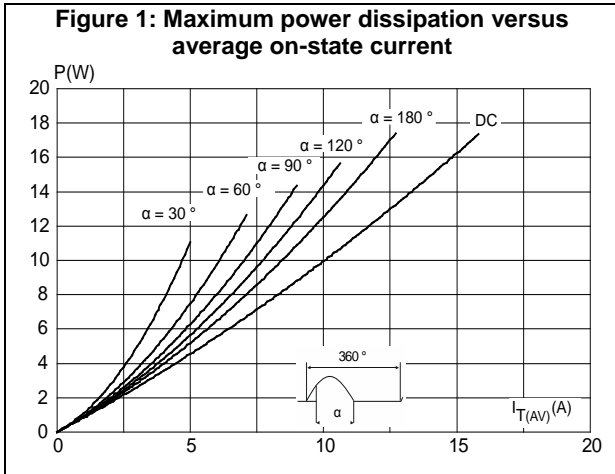
Table 4: Static characteristics

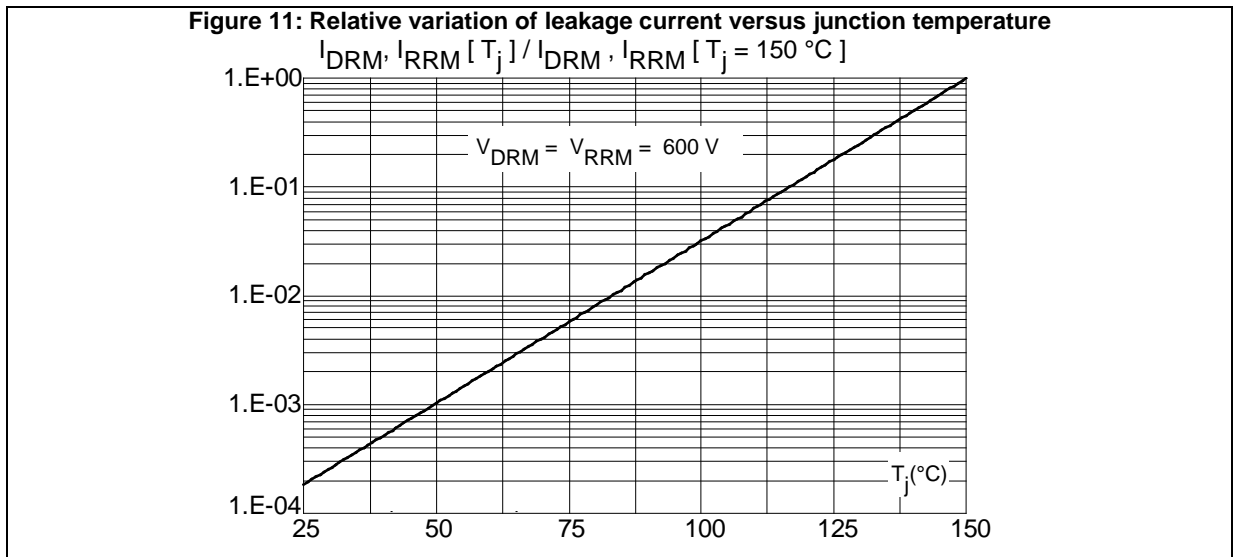
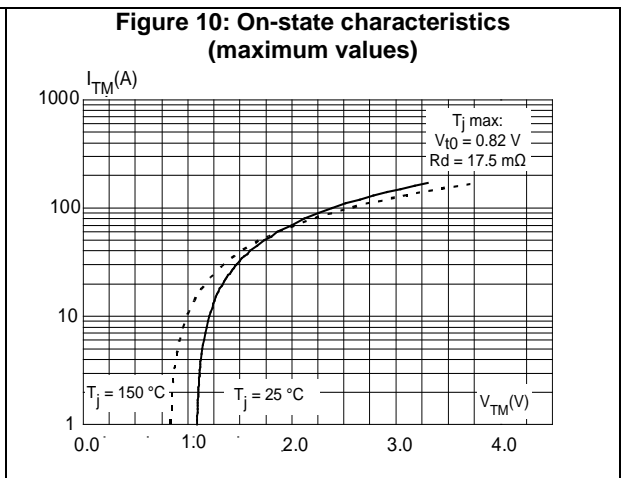
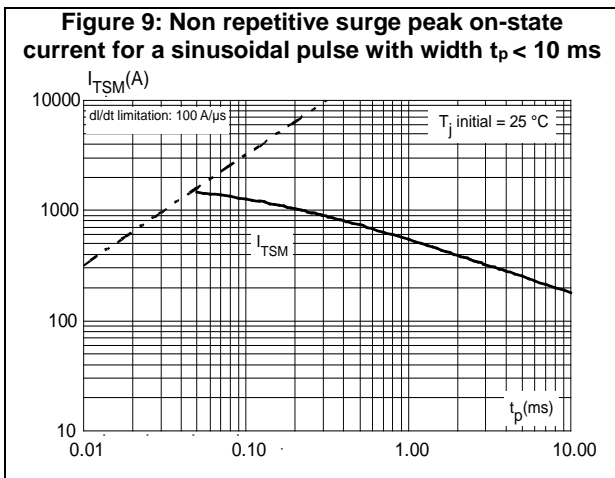
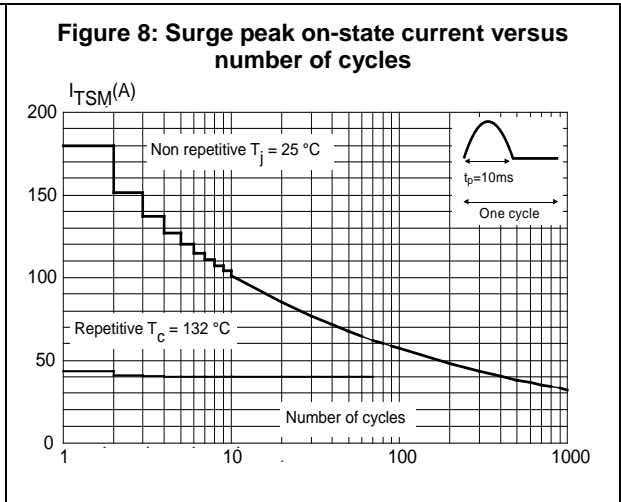
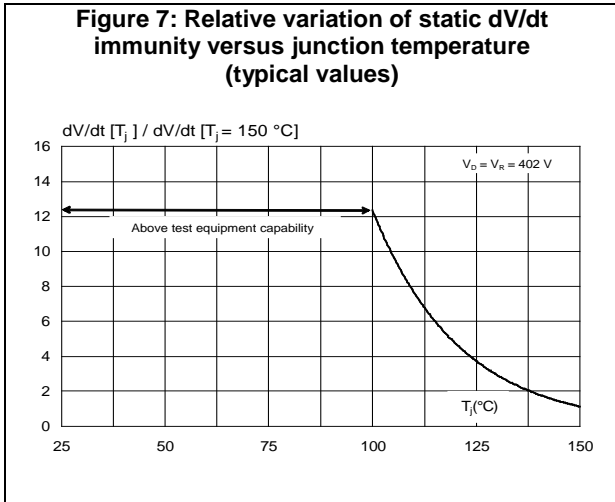
| Symbol                | Test conditions                                   |                                    |      | Value | Unit          |
|-----------------------|---|------------------------------------|------|-------|---------------|
| $V_{TM}$              | $I_{TM} = 40 \text{ A}$ , $t_p = 380 \mu\text{s}$ | $T_j = 25 \text{ }^\circ\text{C}$  | Max. | 1.6   | V             |
| $V_{TO}$              | Threshold voltage                                 | $T_j = 150 \text{ }^\circ\text{C}$ | Max. | 0.82  |               |
| $R_D$                 | Dynamic resistance                                | $T_j = 150 \text{ }^\circ\text{C}$ | Max. | 17.5  | m $\Omega$    |
| $I_{DRM}$ , $I_{RRM}$ | $V_D = V_{DRM}$ , $V_R = V_{RRM}$                 | $T_j = 25 \text{ }^\circ\text{C}$  | Max. | 5     | $\mu\text{A}$ |
|                       |   | $T_j = 125 \text{ }^\circ\text{C}$ |      | 2     | mA            |
|                       |   | $T_j = 150 \text{ }^\circ\text{C}$ |      | 3.9   |               |

Table 5: Thermal parameters

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

# 1.1 Characteristics (curves)





## 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](http://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

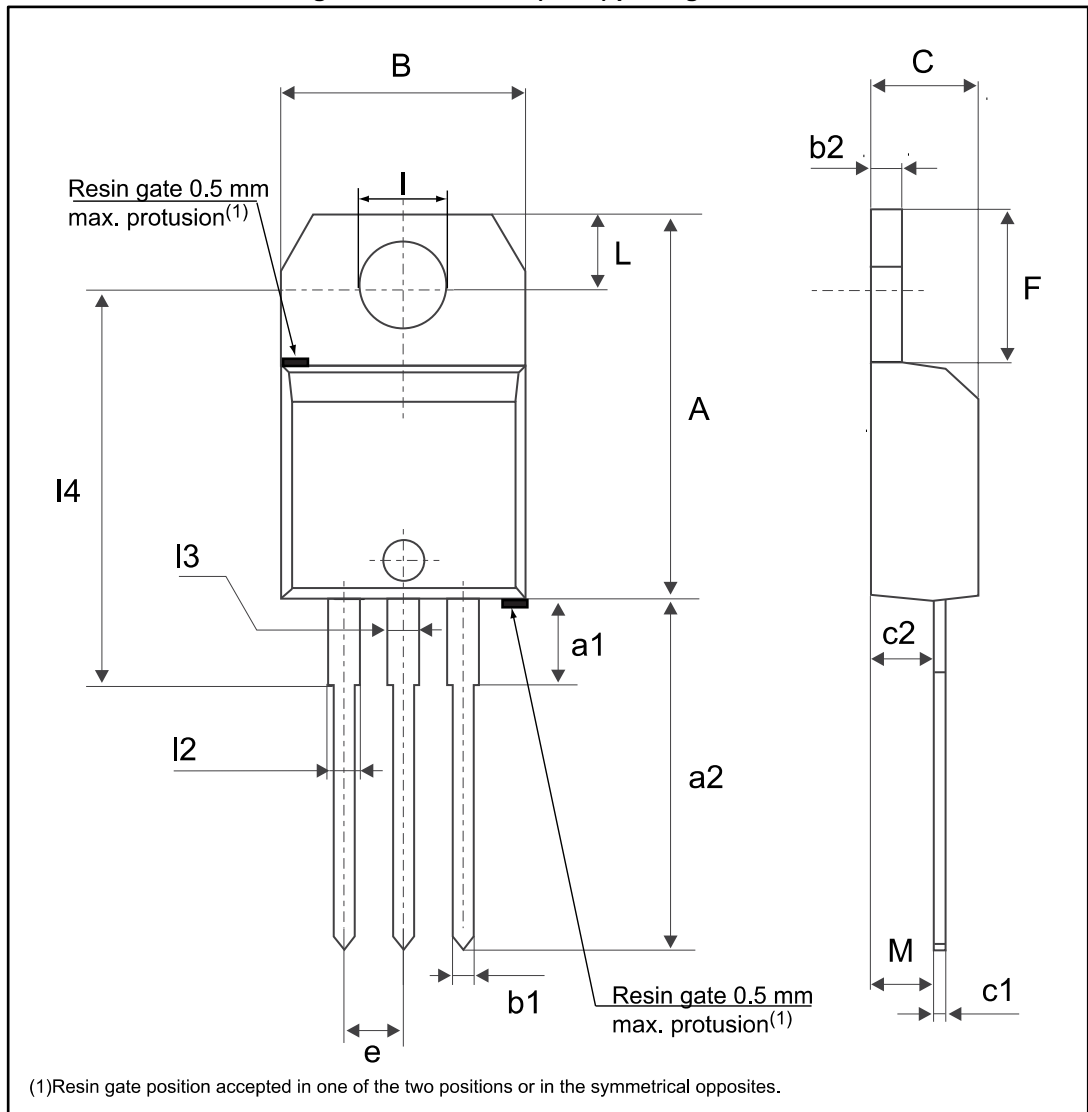


Table 6: TO-220AB (NIns.) package mechanical data

| Ref. | Dimensions  |       |       |                       |        |        |
|------|-------------|-------|-------|-----------------------|--------|--------|
|      | Millimeters |       |       | Inches <sup>(1)</sup> |        |        |
|      | 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 |
| I2   | 1.14        |       | 1.70  | 0.0449                |        | 0.0669 |
| I3   | 1.14        |       | 1.70  | 0.0449                |        | 0.0669 |
| I4   | 15.80       | 16.40 | 16.80 | 0.6220                | 0.6457 | 0.6614 |
| M    |             | 2.6   |       |                       | 0.1024 |        |

**Notes:**

<sup>(1)</sup>Inch dimensions are for reference only.

### 3 Ordering information

Figure 13: Ordering information scheme

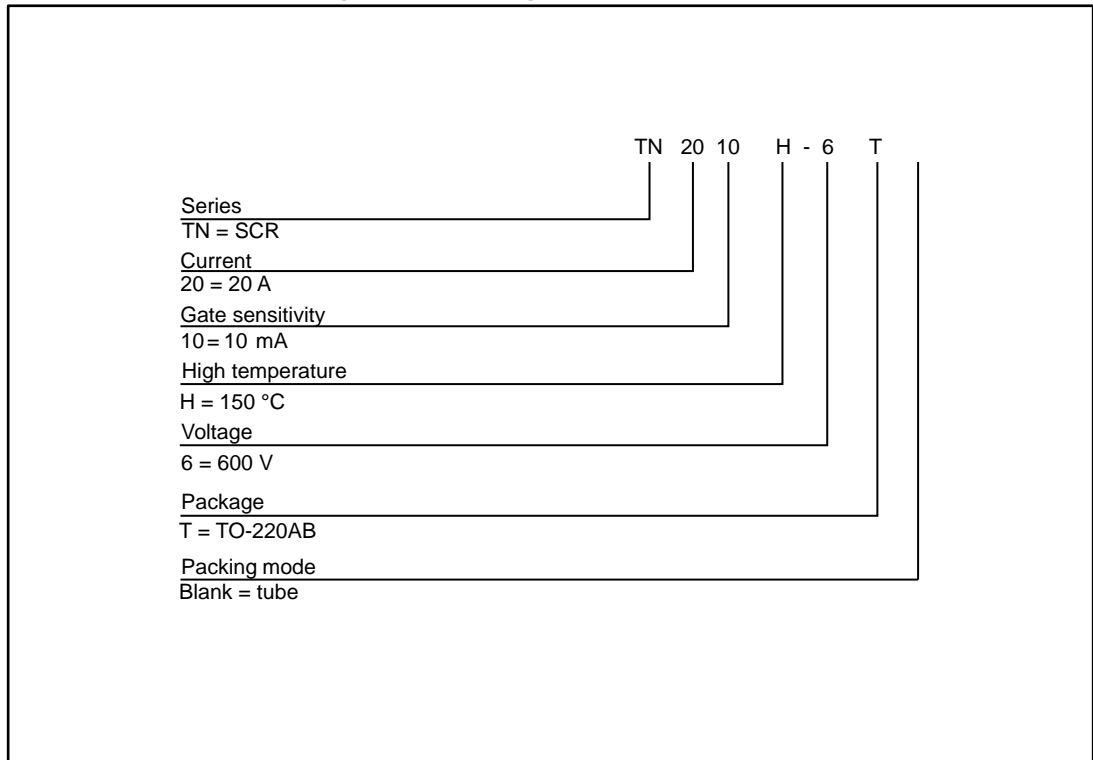


Table 7: Ordering information

| 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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