

### High temperature 12 A SCRs

#### Datasheet - production data

#### **Features**

- High junction temperature: T<sub>i</sub> = 150 °C
- Medium current SCRs
- High noise immunity up to 150 °C
- RoHS (2002/95/EC) compliant
- 600 V V<sub>DRM</sub>, V<sub>RRM</sub>

#### **Application**

- General purpose AC line load switching
- Motor control circuits
- Small home appliances
- Lighting
- Inrush current limiting circuits
- Over-voltage crowbar protection

### **Description**

Available in standard gate triggering levels, the TN1205H SCR series has very high switching capability up to junction temperature of 150 °C.

These products fit all modes of control found in applications such as overvoltage crowbar protection, motor control circuits in power tools and kitchen aids, inrush current limiting circuits, capacitive discharge ignition and voltage regulation circuits.

These products are particulary adapted for use in areas where the ambient temperature is high or the ventilation low, or where an increase of power density is required.

Through-hole or surface-mount packages provide performance in a limited space area.

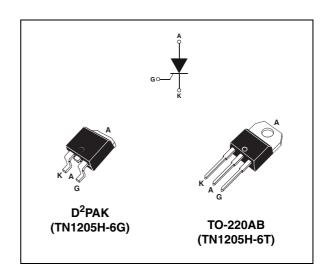


Table 1. Device summary

| Order code | Package            | V <sub>DRM</sub> ,<br>V <sub>RRM</sub> | I <sub>GT</sub> |  |
|------------|--------------------|--|-----------------|--|
| TN1205H-6T | TO-220AB           | 600 V                                  | 2 to 5 mA       |  |
| TN1205H-6G | D <sup>2</sup> PAK | 000 V                                  | 2 to 3 IIIA     |  |

Characteristics TN1205H

### 1 Characteristics

 Table 2.
 Absolute ratings (limiting values)

| Symbol                             | Parameter   |                                  |                         | Value                                       | Unit             |
|------------------------------------|---|----------------------------------|-------------------------|---|------------------|
| I <sub>T(RMS)</sub>                | On-state rms current (180° conduction angle)  | TO220-AB, T 126 °C               |                         | 12  | Α                |
| I <sub>T(AV)</sub>                 | Average on-state current (180° conduction angle)  | $D^2$ PAK $T_c = 136 ^{\circ}$ C |                         | 7.6   | Α                |
|                                    | Non repetitive aurea peak on state aureant  | $t_{p} = 8.3 \text{ ms}$         | T _ 25 °C               | 126   | Α                |
| I <sub>TSM</sub>                   | Non repetitive surge peak on-state current  | $t_p = 10 \text{ ms}$            | T <sub>j</sub> = 25 °C  | 120   |                  |
| l <sup>2</sup> t                   | $I^2$ t Value for fusing $t_p = 10 \text{ ms}$  |                                  |                         |   | A <sup>2</sup> S |
| $V_{DSM}$ , $V_{RSM}$              | Non repetitive surge peak off-state voltage $t_p =$   |                                  | t <sub>p</sub> = 10 ms  | V <sub>DRM</sub> , V <sub>RRM</sub><br>+100 | V                |
| dI/dt                              | Critical rate of rise of on-state current $I_G = 2 \times I_{GT}$ , $I_{CT} = 100 \text{ ns}$ |                                  | T <sub>j</sub> = 150 °C | 100   | A/µs             |
| I <sub>GM</sub>                    | Peak gate current $t_p = 20 \mu s$  |                                  | T <sub>j</sub> = 150 °C | 4   | Α                |
| P <sub>G(AV)</sub>                 | Average gate power dissipation $T_j = 150 ^{\circ}\text{C}$                                   |                                  |                         |   | W                |
| $V_{RGM}$                          | Maximum peak reverse gate voltage   |                                  |                         | 5   | V                |
| T <sub>stg</sub><br>T <sub>j</sub> | Storage junction temperature range Operating junction temperature range                       |                                  |                         | - 40 to + 150                               | °C               |
| T <sub>L</sub>                     | 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 |
|--|---|-------------------------|---------|-------|------|
|  | V 40 V D 20 O   |                         |         | 2     | mΛ   |
| $I_{GT}$ $V_D = 12 \text{ V}, R_L = 33 \Omega$ |   | MAX.                    | 5       | mA    |      |
| V <sub>GT</sub>                                | $V_D = V_{DRM}, R_L = 3.3 \text{ k}\Omega$  |                         | MAX.    | 1.3   | ٧    |
| V <sub>GD</sub>                                | $V_D = V_{DRM}, R_L = 3.3 \text{ k}\Omega$ MIN.   |                         | MIN.    | 0.2   | V    |
| I <sub>H</sub>                                 | I <sub>T</sub> = 500 mA gate open MAX   |                         | MAX.    | 20    | mA   |
| ΙL   | I <sub>G</sub> = 1.2 I <sub>GT</sub>  |                         | MAX.    | 40    | mA   |
| dV/dt  | V = 679/ V gata apan  | T <sub>j</sub> = 125 °C | MIN.    | 200   | V/µs |
| u v/ut   | V <sub>D</sub> = 67% V <sub>DRM</sub> gate open   | T <sub>j</sub> = 150 °C | IVIIIN. | 100   | ν/μ5 |
| t <sub>gt</sub>                                | $I_{TM} = 40 \text{ A}, V_D = 500 \text{ V}, I_G = 100 \text{ mA}, dI_G/dt = 5 \text{ A/}\mu\text{s}$   |                         | typ.    | 1.9   | μs   |
| t <sub>q</sub>                                 | $ \begin{array}{c} V_{DM} = 335 \text{ V, Tj} = 125 \text{ °C, } I_{TM} = 20 \text{ A, } V_{R} = 25 \text{ V, } (dI_{T}/dt)_{Max} = 30 \text{ A/}\mu\text{s,} \\ dV_{D}/dt = 50 \text{ V/}\mu\text{s, } R_{GK} = 100 \Omega \end{array} $ |                         | typ.    | 65    | μs   |

TN1205H Characteristics

Table 4. Static characteristics

| Symbol                               | Test conditions                                   |                         |        | Value | Unit |
|--------------------------------------|---|-------------------------|--------|-------|------|
| V <sub>T</sub>                       | $I_{TM} = 24 \text{ A}, t_p = 380 \ \mu \text{s}$ | T <sub>j</sub> = 25 °C  |        | 1.6   | V    |
| $V_{TD}$                             | Threshold voltage                                 | T <sub>j</sub> = 150 °C |        | 0.8   | V    |
| $R_d$                                | Dynamic resistance                                | T <sub>j</sub> = 150 °C | MAX.   | 30    | mΩ   |
|                                      |   | T <sub>j</sub> = 25 °C  | IVIAA. | 5     | μΑ   |
| I <sub>DRM</sub><br>I <sub>RRM</sub> |   | T <sub>j</sub> = 125 °C |        | 1     | - mA |
|                                      |   | T <sub>j</sub> = 150 °C |        | 3     |      |

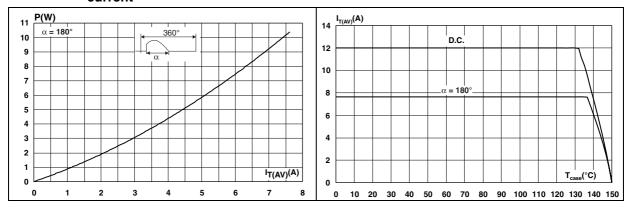
Table 5. Thermal resistance

| Symbol                      | Parameter                 |                            |                    | Value Max. | Unit |
|-----------------------------|---------------------------|----------------------------|--------------------|------------|------|
| R <sub>th(j-c)</sub>        | Junction to case (DC)     |                            |                    | 1.3        | °C/W |
| D. Lunction to ambient (DC) | Junction to ambient (DC)  | $S^{(1)} = 1 \text{ cm}^2$ | D <sup>2</sup> PAK | 45         | °C/W |
| R <sub>th(j-a)</sub>        | odificion to ambient (DC) |                            | TO-220AB           | 60         | C/VV |

<sup>1.</sup> S = Copper surface under tab

Figure 1. Maximum average power dissipation vs. average on-state current

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



Characteristics TN1205H

Figure 3. Average and DC on-state current vs. ambient temperature

Figure 4. Relative variation of thermal impedance vs. pulse duration

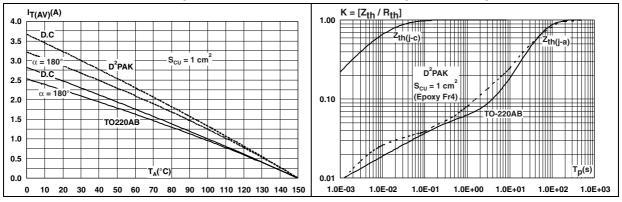


Figure 5. Relative variation of I<sub>GT</sub>, V<sub>GT</sub>, I<sub>H</sub>, I<sub>L</sub> vs. junction temperature (typical values)

Figure 6. Relative variation of static dV/dt immunity vs. junction temperature (typical values)

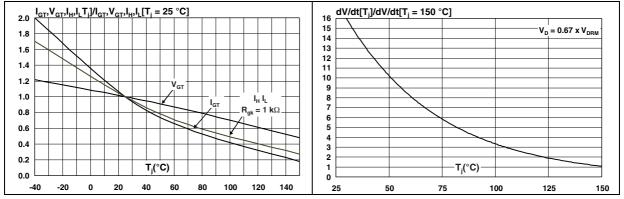
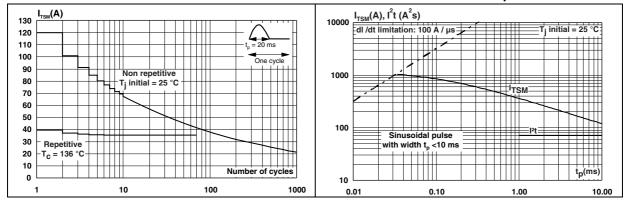


Figure 7. Surge peak on-state current vs. number of cycles

Figure 8. Non repetitive surge peak on-state current and corresponding value of I<sup>2</sup>t vs. sinusoidal pulse width



TN1205H Characteristics

Figure 9. On-state characteristics (maximum values)

Figure 10. Relative variation of leakage current vs. junction temperature for different values of blocking voltage

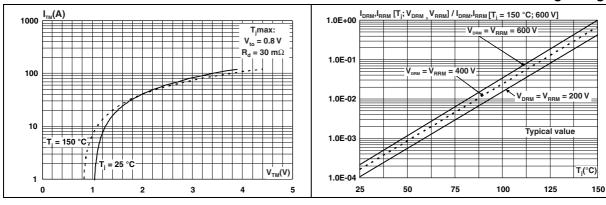
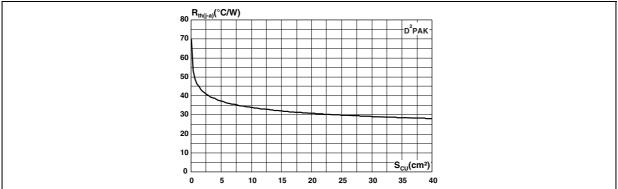
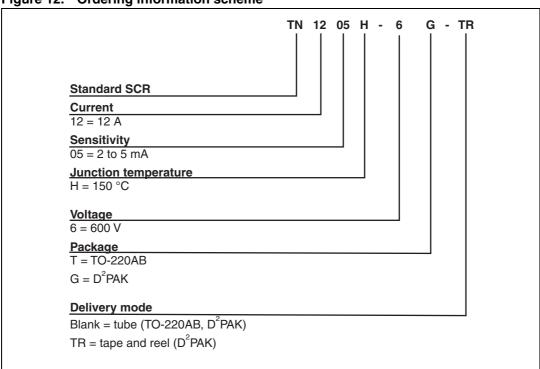


Figure 11. Thermal resistance junction to ambient vs. copper surface under tab (D<sup>2</sup>PAK, printed circuit board FR4, copper thickness: 35 μm)



## 2 Ordering information scheme

Figure 12. Ordering information scheme



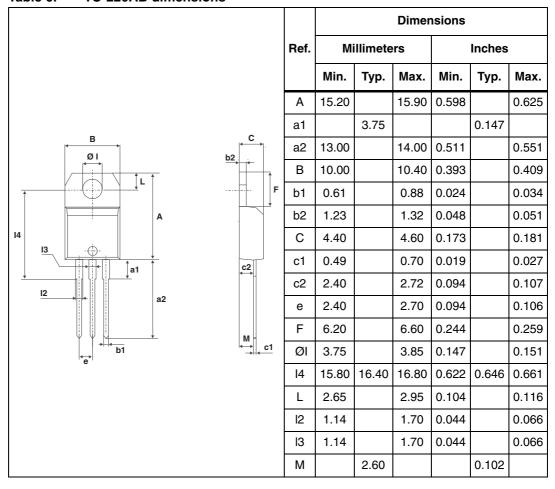
TN1205H Package information

### 3 Package information

- Epoxy meets UL94, V0
- Lead-free package

In order to meet environmental requirements, ST offers these devices in different grades of ECOPACK<sup>®</sup> packages, depending on their level of environmental compliance. ECOPACK<sup>®</sup> specifications, grade definitions and product status are available at: <a href="https://www.st.com">www.st.com</a>. ECOPACK<sup>®</sup> is an ST trademark.

Table 6. TO-220AB dimensions



Package information TN1205H

Table 7. D<sup>2</sup>PAK Dimensions

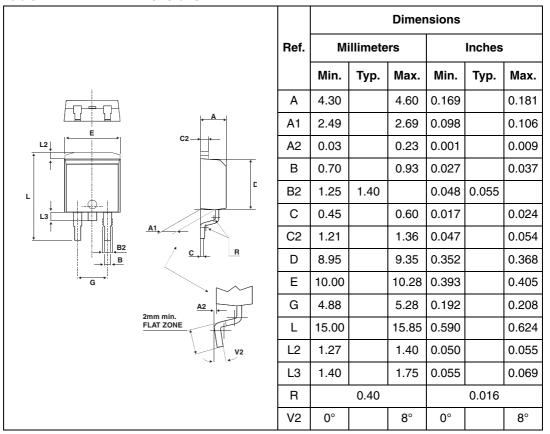
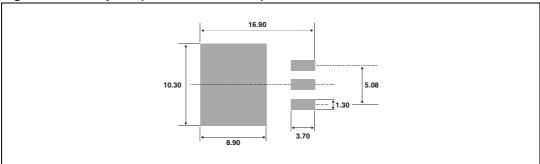


Figure 13. Footprint (dimensions in mm)



# 4 Ordering information

Table 8. Ordering information

| Order code    | Marking   | Package            | Weight | Base qty | Delivery mode |
|---------------|-----------|--------------------|--------|----------|---------------|
| TN1205H-6T    | TN1205H6T | TO-220AB           | 2.0 g  | 50       | Tube          |
| TN1205H-6G    | TN1205H6G | D <sup>2</sup> PAK | 1.5 g  | 50       | Tube          |
| TN1205H-6G-TR | TN1205H6G | D <sup>2</sup> PAK | 1.5 g  | 1000     | Tape and reel |

## 5 Revision history

Table 9. Document revision history

| Date        | Revision | Changes  |  |
|-------------|----------|--|--|
| 17-Feb-2011 | 1        | First issue.   |  |
| 26-Sep-2011 | 2        | Corrected typographical error in Features and Description.   |  |
| 17-Jan-2012 | 3        | Updated units for t <sub>gt</sub> in <i>Table 3</i> .  |  |
| 26-Apr-2012 | 4        | Moved junction temperature to top of features list.  Description reworded for readability. No technical changes. |  |

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