# TN1205H

## High temperature 12 A SCRs

**Datasheet – production data**

## Features

- High junction temperature: $T_j$ = 150 °C
- Medium current SCRs
- High noise immunity up to 150 °C
- RoHS (2002/95/EC) compliant
- 600 V $V_{DRM}$, $V_{RRM}$

## Application

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

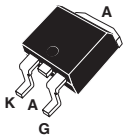
## Description

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

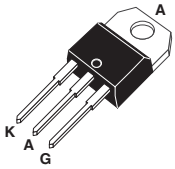
These products fit all modes of control found in applications such as overvoltage crowbar protection, motor control circuits in power tools and kitchen aids, inrush current limiting circuits, capacitive discharge ignition and voltage regulation circuits.

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.


**D²PAK**
**(TN1205H-6G)**




**TO-220AB**
**(TN1205H-6T)**

**Table 1. Device summary**

| Order code | Package | $V_{DRM}$, $V_{RRM}$ | $I_{GT}$ |
|---|---|---|---|
| TN1205H-6T | TO-220AB | 600 V | 2 to 5 mA |
| TN1205H-6G | D²PAK | | |

# 1 Characteristics

**Table 2. Absolute ratings (limiting values)**

| Symbol | Parameter | | | Value | Unit |
|---|---|---|---|---|---|
| $I_{T(RMS)}$ | On-state rms current (180° conduction angle) | TO220-AB, $D^2PAK$ | $T_c$ = 136 °C | 12 | A |
| $I_{T(AV)}$ | Average on-state current (180° conduction angle) | | | 7.6 | A |
| $I_{TSM}$ | Non repetitive surge peak on-state current | $t_p$ = 8.3 ms | $T_j$ = 25 °C | 126 | A |
| | | $t_p$ = 10 ms | | 120 | |
| $I^2t$ | $I^2t$ Value for fusing | | $t_p$ = 10 ms | 72 | $A^2S$ |
| $V_{DSM}$, $V_{RSM}$ | Non repetitive surge peak off-state voltage | | $t_p$ = 10 ms | $V_{DRM}$, $V_{RRM}$ +100 | V |
| dI/dt | Critical rate of rise of on-state current $I_G$ = 2 x $I_{GT}$, $t_r \leq 100$ ns | F = 60 Hz | $T_j$ = 150 °C | 100 | A/µs |
| $I_{GM}$ | 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 |
| $T_{stg}$<br>$T_j$ | Storage junction temperature range<br>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 | | MIN. | 2 | mA |
| | | | MAX. | 5 | |
| $V_{GT}$ | $V_D$ = $V_{DRM}$, $R_L$ = 3.3 kΩ | | MAX. | 1.3 | V |
| $V_{GD}$ | $V_D$ = $V_{DRM}$, $R_L$ = 3.3 kΩ | | MIN. | 0.2 | V |
| $I_H$ | $I_T$ = 500 mA gate open | | MAX. | 20 | mA |
| $I_L$ | $I_G$ = 1.2 $I_{GT}$ | | MAX. | 40 | mA |
| dV/dt | $V_D$ = 67% $V_{DRM}$ gate open | $T_j$ = 125 °C | MIN. | 200 | V/µs |
| | | $T_j$ = 150 °C | | 100 | |
| $t_{gt}$ | $I_{TM}$ = 40 A, $V_D$ = 500 V, $I_G$ = 100 mA, $dI_G/dt$ = 5 A/µs | | typ. | 1.9 | µs |
| $t_q$ | $V_{DM}$ = 335 V, Tj =125 °C, $I_{TM}$ = 20 A, $V_R$ = 25 V, $(dI_T/dt)_{Max}$ = 30 A/µs, $dV_D/dt$ = 50 V/µs, $R_{GK}$ = 100 Ω | | typ. | 65 | µs |

**Table 4. Static characteristics**

| Symbol | Test conditions | | | Value | Unit |
|---|---|---|---|---|---|
| $V_T$ | $I_{TM}$ = 24 A, $t_p$ = 380 µs | $T_j$ = 25 °C | MAX. | 1.6 | V |
| $V_{TD}$ | Threshold voltage | $T_j$ = 150 °C | | 0.8 | V |
| $R_d$ | Dynamic resistance | $T_j$ = 150 °C | | 30 | mΩ |
| $I_{DRM}$ $I_{RRM}$ | $V_{DRM}$ = $V_{RRM}$ | $T_j$ = 25 °C | | 5 | µA |
| | | $T_j$ = 125 °C | | 1 | mA |
| | | $T_j$ = 150 °C | | 3 | |

**Table 5. Thermal resistance**

| Symbol | Parameter | | | Value Max. | Unit |
|---|---|---|---|---|---|
| $R_{th(j-c)}$ | Junction to case (DC) | | | 1.3 | °C/W |
| $R_{th(j-a)}$ | Junction to ambient (DC) | $S^{(1)}$ = 1 $cm^2$ | $D^2PAK$ | 45 | °C/W |
| | | | TO-220AB | 60 | |

1. S = Copper surface under tab

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

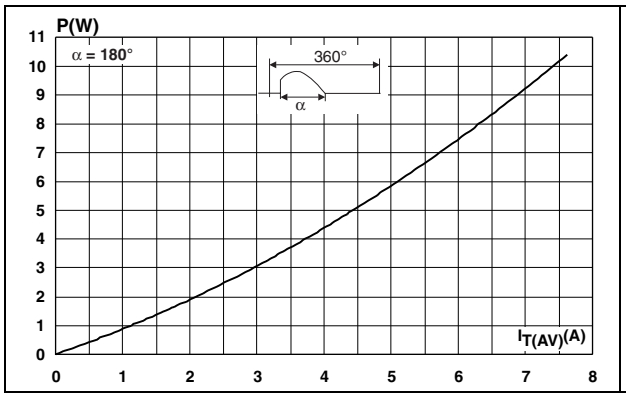



**Figure 2. Average and DC on-state current vs. case temperature**

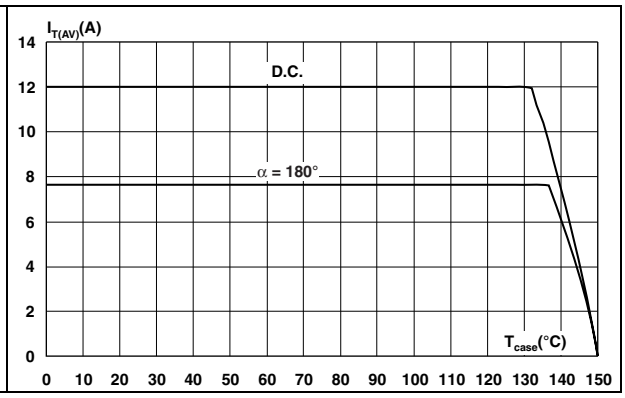


**Figure 3. Average and DC on-state current vs. ambient temperature**

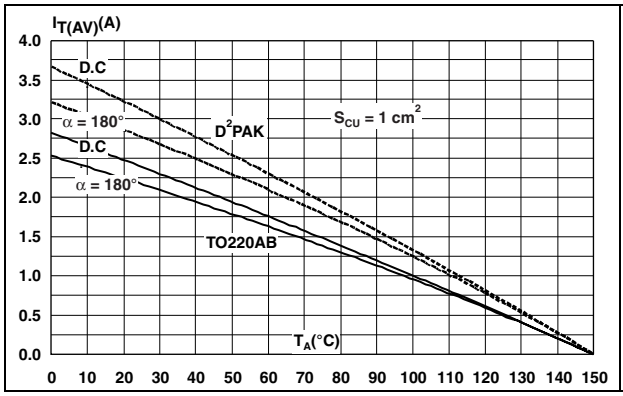



**Figure 4. Relative variation of thermal impedance vs. pulse duration**

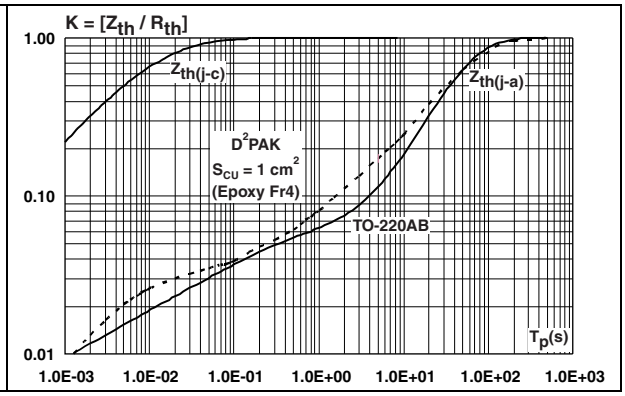



**Figure 5. Relative variation of $I_{GT}$,$V_{GT}$, $I_H$, $I_L$ vs. junction temperature (typical values)**

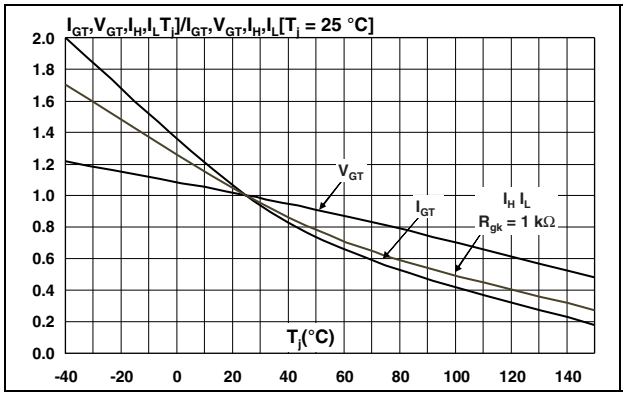



**Figure 6. Relative variation of static dV/dt immunity vs. junction temperature (typical values)**

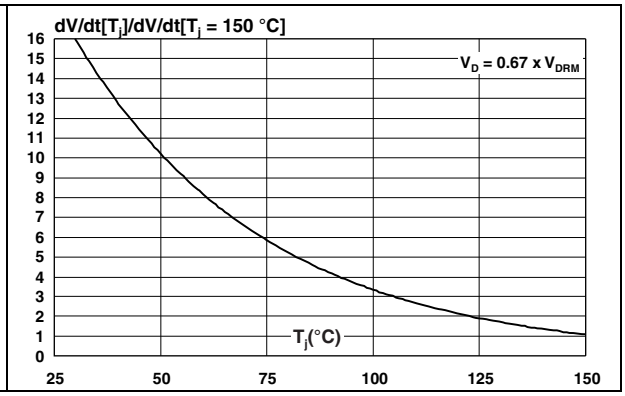



**Figure 7. Surge peak on-state current vs. number of cycles**

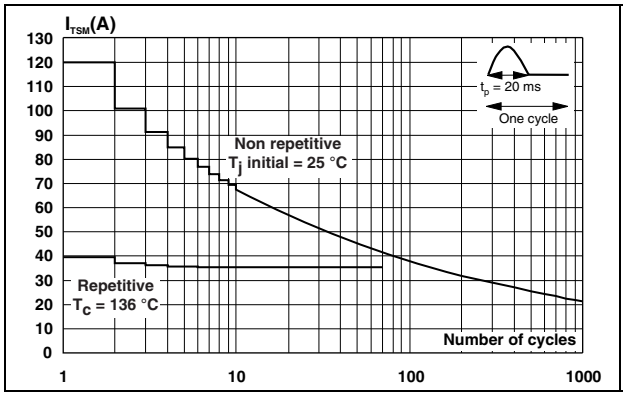



**Figure 8. Non repetitive surge peak on-state current and corresponding value of $I^2t$ vs. sinusoidal pulse width**

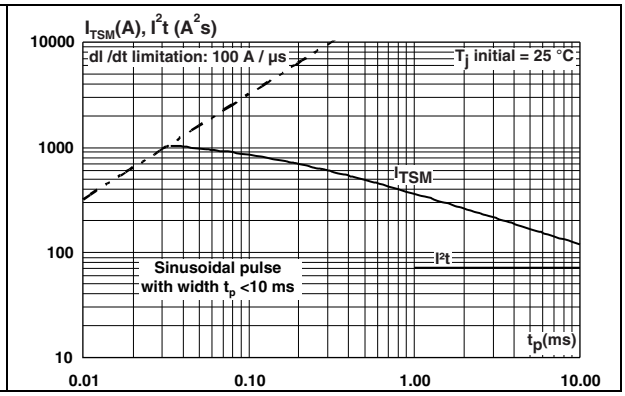


**Figure 9. On-state characteristics (maximum values)**

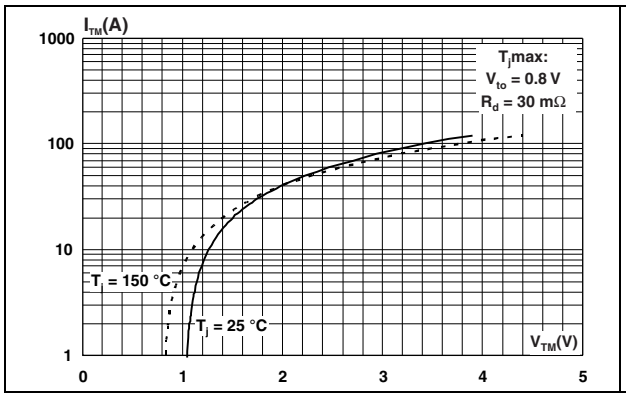



**Figure 10. Relative variation of leakage current vs. junction temperature for different values of blocking voltage**

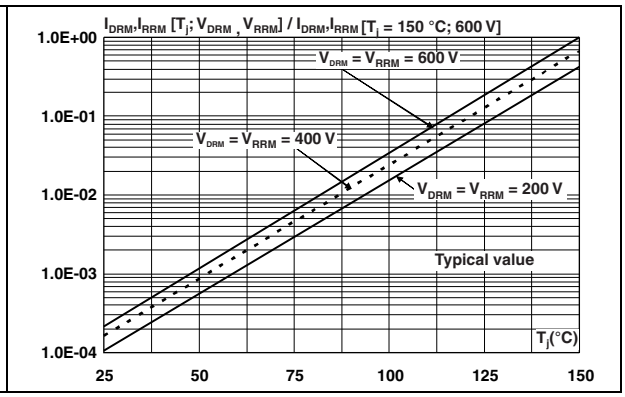
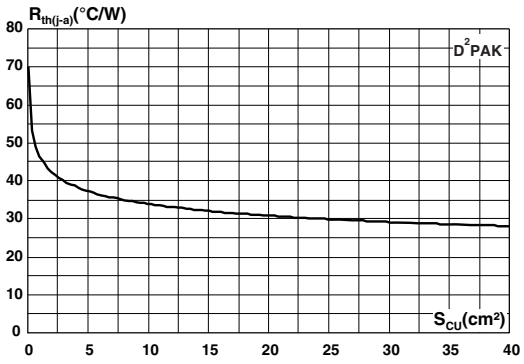
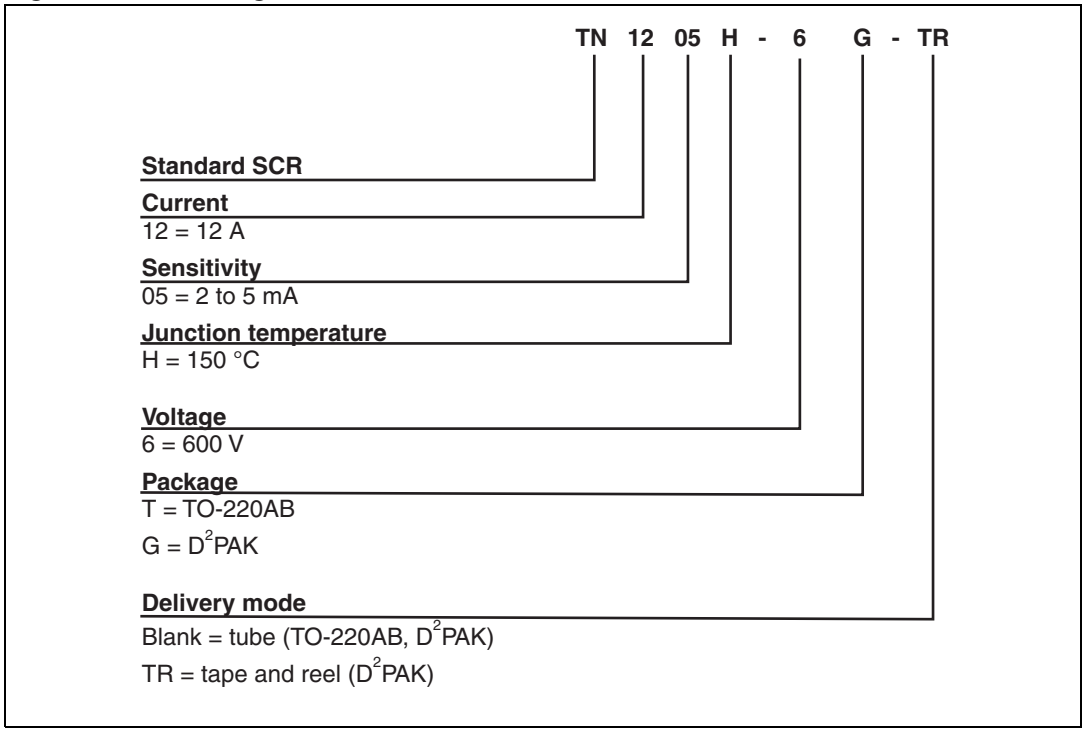



**Figure 11. Thermal resistance junction to ambient vs. copper surface under tab ($D^2PAK$, printed circuit board FR4, copper thickness: 35 µm)**



# 2 Ordering information scheme

**Figure 12. Ordering information scheme**

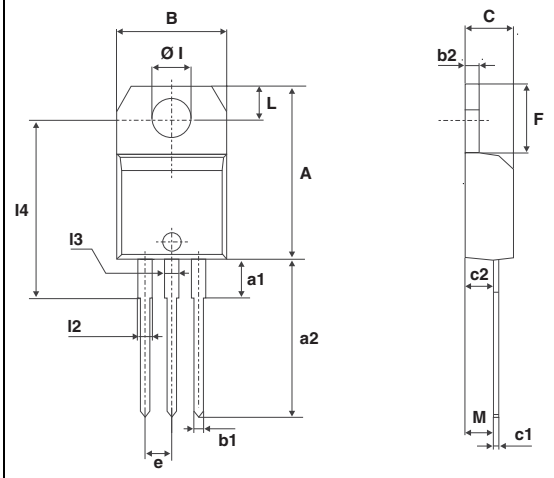


# 3 Package information

- Epoxy meets UL94, V0
- Lead-free package

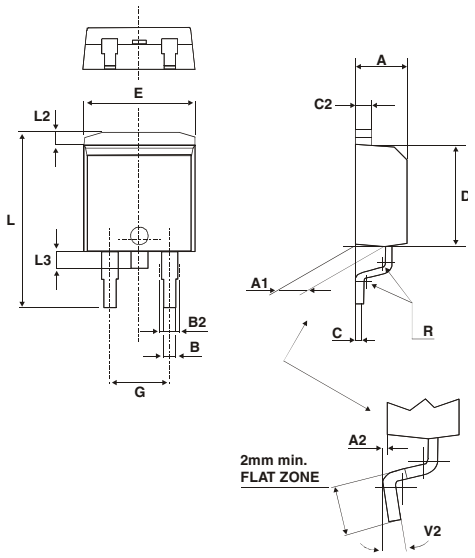
In order to meet environmental requirements, ST offers these devices in different grades of ECOPACK® packages, depending on their level of environmental compliance. ECOPACK® specifications, grade definitions and product status are available at: www.st.com. ECOPACK® is an ST trademark.

**Table 6. TO-220AB dimensions**



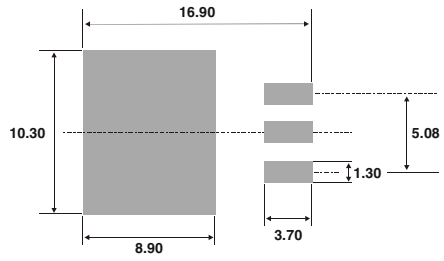

| Ref. | Dimensions | | | | | |
|---|---|---|---|---|---|---|
| | Millimeters | | | Inches | | |
| | Min. | Typ. | Max. | Min. | Typ. | Max. |
| A | 15.20 | | 15.90 | 0.598 | | 0.625 |
| a1 | | 3.75 | | | 0.147 | |
| a2 | 13.00 | | 14.00 | 0.511 | | 0.551 |
| B | 10.00 | | 10.40 | 0.393 | | 0.409 |
| 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 |
| l4 | 15.80 | 16.40 | 16.80 | 0.622 | 0.646 | 0.661 |
| L | 2.65 | | 2.95 | 0.104 | | 0.116 |
| l2 | 1.14 | | 1.70 | 0.044 | | 0.066 |
| l3 | 1.14 | | 1.70 | 0.044 | | 0.066 |
| M | | 2.60 | | | 0.102 | |

Table 7. 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 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 | $D^2PAK$ | 1.5 g | 50 | Tube |
| TN1205H-6G-TR | TN1205H6G | $D^2PAK$ | 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 $t_{gt}$ in *Table 3*. |
| 26-Apr-2012 | 4 | Moved junction temperature to top of features list.<br>Description reworded for readability. No technical changes. |

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