

## Description

The TN1515-600B is a 15 A thyristor SCR housed in DPAK package. It fits any high voltage application that requires a high power density and compact housing design.

**Table 1. Device summary**

| Symbol            | Value | Unit |
|-------------------|-------|------|
| $I_{T(RMS)}$      | 15    | A    |
| $V_{DRM}/V_{RRM}$ | 600   | V    |
| $I_{GT(Q_1)}$     | 15    | mA   |

## Features

- On-state RMS current,  $I_{T(RMS)}$ : 15 A
- Repetitive peak off-state voltage,  $V_{DRM}/V_{RRM}$ : 600 V
- Triggering gate current,  $I_{GT}$ : 15 mA
- DPAK surface mount package

## Application

- Universal motor DC phase control
- Power supply crowbar circuit
- Power Supply inrush limiter
- Motor soft start controller
- AC-DC voltage regulator

## Benefits

- High AC surge current density
- Compact DPAK foot print

# 1 Characteristics

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

| Symbol             | Parameter  |                         | Value                 | Unit                           |                  |
|--------------------|--|-------------------------|-----------------------|--------------------------------|------------------|
| $I_{T(RMS)}$       | On-state RMS current (180° conduction angle)   |                         | $T_c = 109\text{ °C}$ | 15                             | A                |
| $I_{T(AV)}$        | Average on-state current (180° conduction angle)   |                         | $T_c = 109\text{ °C}$ | 9.5                            | A                |
| $I_{TSM}$          | Non repetitive surge peak on-state current   | $t_p = 8.3\text{ ms}$   | $T_j = 25\text{ °C}$  | 165                            | A                |
|                    |  | $t_p = 10\text{ ms}$    |                       | 150                            |                  |
| $I^2t$             | $I^2t$ value for fusing  | $t_p = 10\text{ ms}$    | $T_j = 25\text{ °C}$  | 113                            | A <sup>2</sup> S |
| $di/dt$            | Critical rate of rise of on-state current $I_G = 2 \times I_{GT}$ , $t_r \leq 100\text{ ns}$ | $F = 120\text{ Hz}$     | $T_j = 125\text{ °C}$ | 50                             | A/ $\mu$ s       |
| $I_{GM}$           | Peak gate current  | $t_p = 20\text{ }\mu$ s | $T_j = 125\text{ °C}$ | 4                              | A                |
| $P_{G(AV)}$        | Average gate power dissipation   |                         | $T_j = 125\text{ °C}$ | 1                              | W                |
| $T_{stg}$<br>$T_j$ | Storage junction temperature range<br>Operating junction temperature range                   |                         |                       | - 40 to + 150<br>- 40 to + 125 | °C               |
| $V_{RGM}$          | Maximum peak reverse gate voltage  |                         |                       | 5                              | V                |

**Table 3. Standard electrical characteristics ( $T_j = 25\text{ °C}$ , unless otherwise specified)**

| Symbol                 | Test conditions                                    |                       | Values |      | Unit       |
|------------------------|--|-----------------------|--------|------|------------|
| $I_{GT}$               | $V_{out} = 12\text{ V}$ , $R_L = 33\text{ }\Omega$ | $T_j = 25\text{ °C}$  | MIN.   | 2    | mA         |
|                        |  |                       | MAX.   | 15   |            |
| $V_{GT}$               | $V_{out} = 12\text{ V}$ , $R_L = 33\text{ }\Omega$ |                       | MAX.   | 1.3  | V          |
| $V_{GD}$               | $V_D = V_{DRM}$ , $R_L = 3.3\text{ k}\Omega$       | $T_j = 125\text{ °C}$ | MIN.   | 0.2  | V          |
| $I_H$                  | $I_T = 500\text{ mA}$                              |                       | MAX.   | 40   | mA         |
| $I_L$                  | $I_G = 1.2 I_{GT}$                                 |                       | MAX.   | 60   | mA         |
| $dV/dt$                | $V_D = 67\% V_{DRM}$ , gate open                   | $T_j = 125\text{ °C}$ | MIN.   | 200  | V/ $\mu$ s |
| $V_{TM}$               | $I_{TM} = 30\text{ A}$ $t_p = 380\text{ }\mu$ s    | $T_j = 25\text{ °C}$  | MAX.   | 1.6  | V          |
| $V_{TO}$               | Threshold voltage                                  |                       | MAX.   | 0.85 | V          |
| $R_D$                  | Dynamic resistance                                 |                       | MAX.   | 25   | m $\Omega$ |
| $I_{DRM}$<br>$I_{RRM}$ | $V_D/V_R = V_{DRM} = V_{RRM}$                      | $T_j = 25\text{ °C}$  | MAX.   | 5    | $\mu$ A    |
|                        |  | $T_j = 125\text{ °C}$ |        | 2    | mA         |

Table 4. Thermal resistance

| Symbol        | Parameter             | Value                        | Unit          |
|---------------|-----------------------|------------------------------|---------------|
| $R_{th(j-c)}$ | Junction to case (DC) | 1.2                          | $^{\circ}C/W$ |
| $R_{th(j-a)}$ | Junction to ambient   | $S^{(1)} = 0.5 \text{ cm}^2$ | $^{\circ}C/W$ |

1. S = Copper surface under tab

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

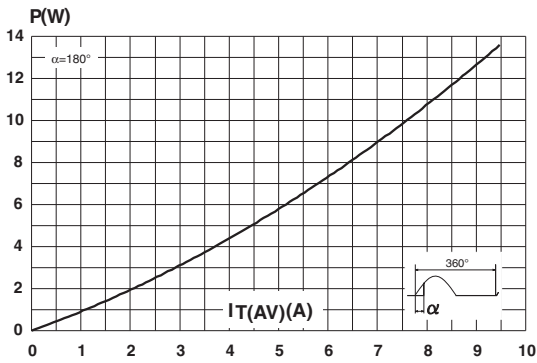


Figure 2. Average and DC on-state current versus case temperature

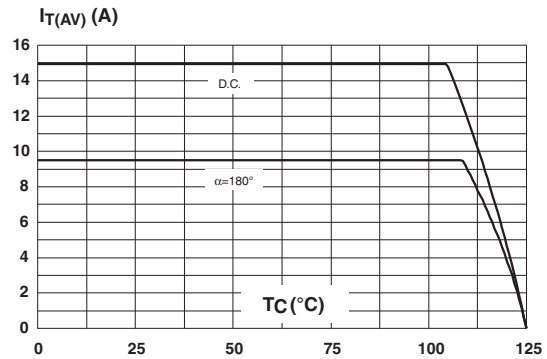


Figure 3. Average and DC on-state current versus ambient temperature, PCB FR4, copper thickness 35 μm

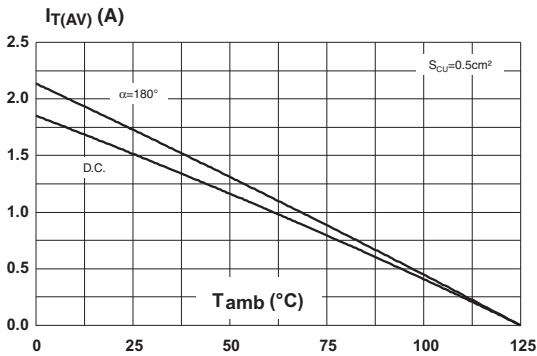
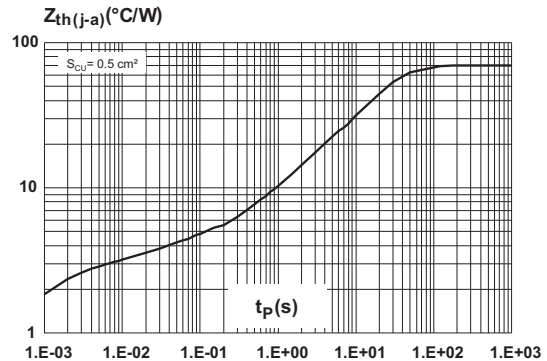
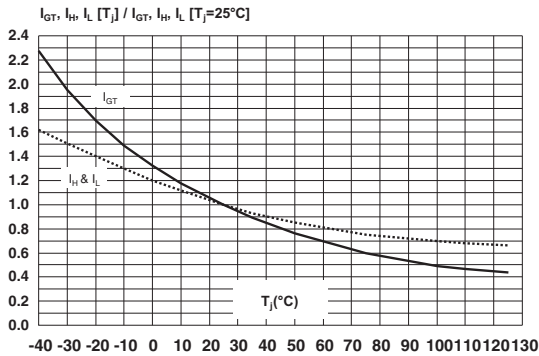


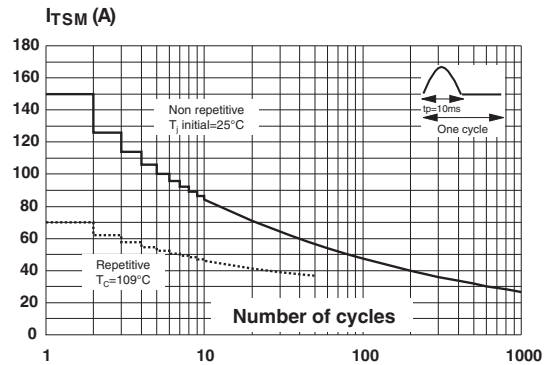
Figure 4. Thermal impedance junction to ambient versus pulse duration, PCB FR4, copper thickness 35 μm



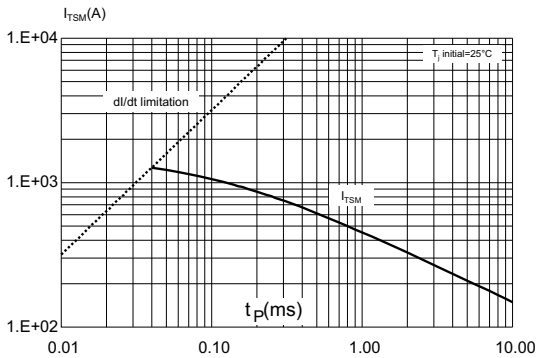
**Figure 5. Relative variation of gate trigger current, holding current and latching current versus junction temperature (typical values)**



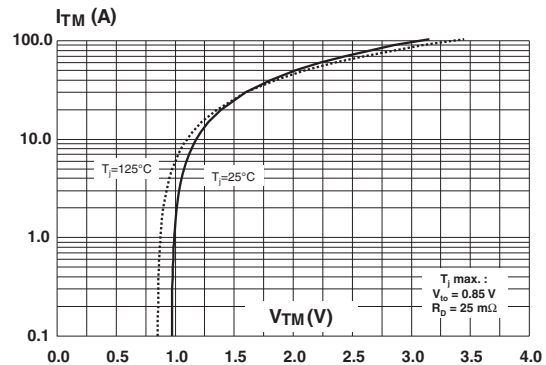
**Figure 6. Surge peak on-state current versus number of cycles**



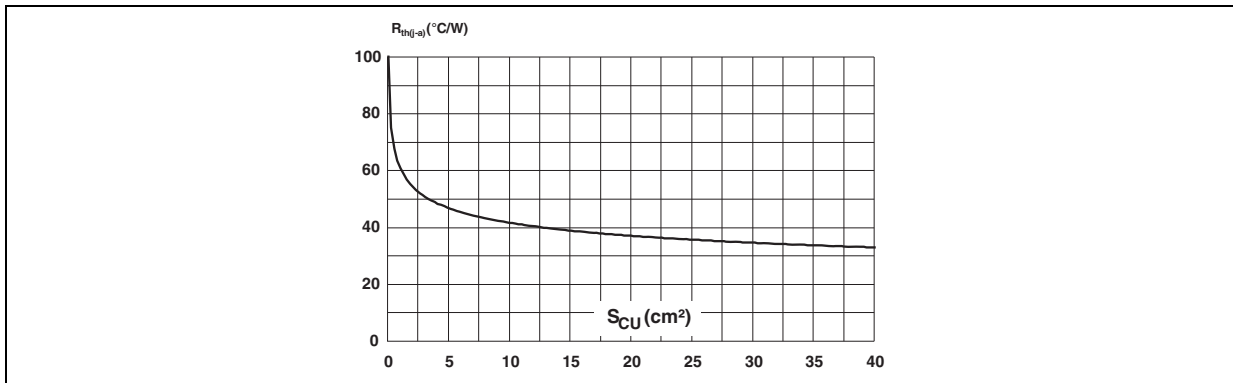
**Figure 7. Non-repetitive surge peak on-state current for a sinusoidal pulse with width  $t_p < 10$  ms**



**Figure 8. On-state characteristics (maximum values)**



**Figure 9. Junction to ambient thermal resistance versus copper surface under tab, PCB FR4, copper thickness 35µm**



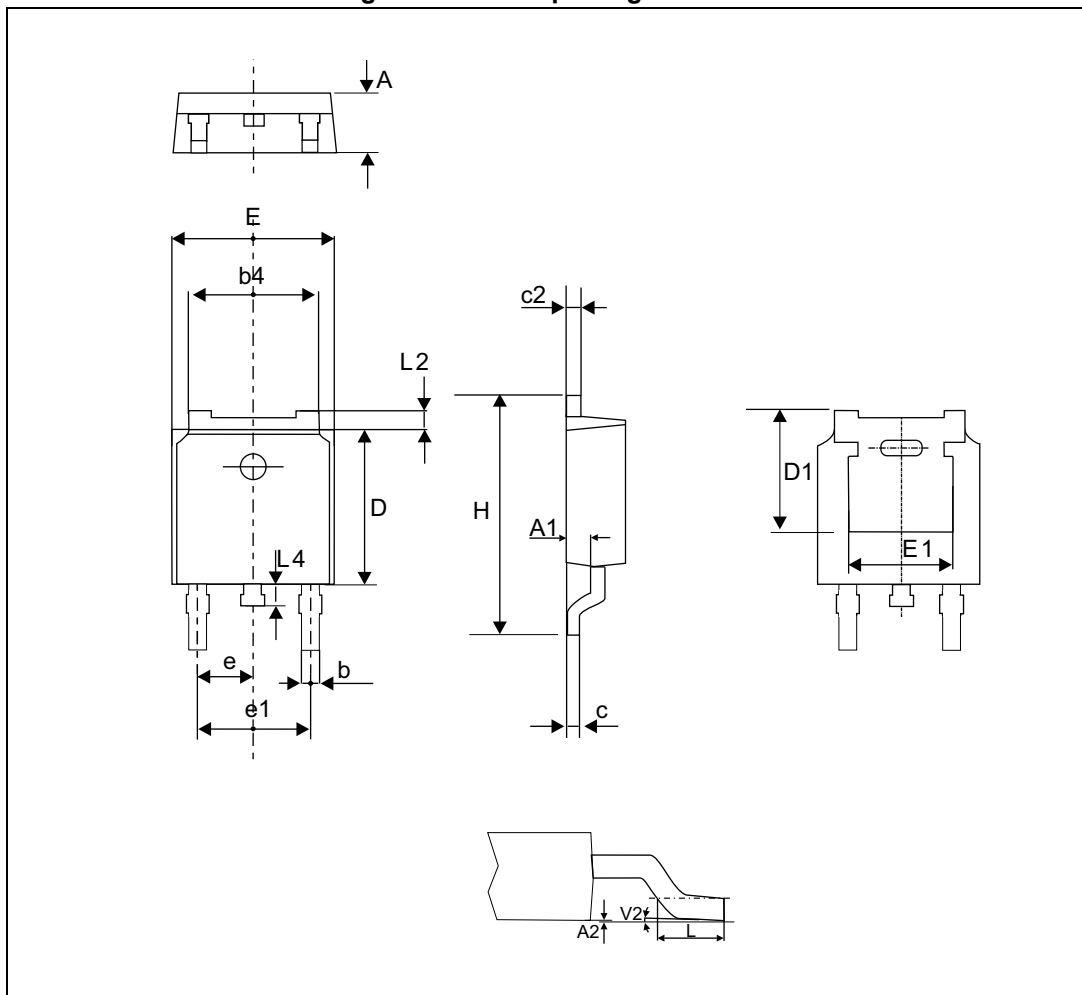
## 2 Package information

- Epoxy meets UL94, V0
- Lead-free packages
- Halogen-free molding resin
- Recommended torque: 0.4 to 0.6 N·m

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### 2.1 DPAK package information

Figure 10. DPAK package outline

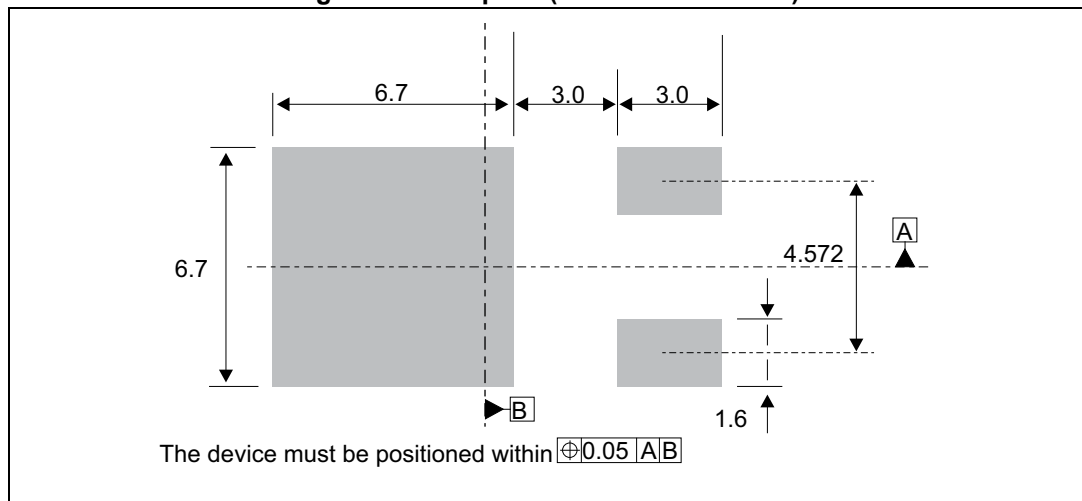


Note: This package drawing may slightly differ from the physical package. However, all the specified dimensions are guaranteed.

Table 5. DPAK package mechanical data

| Ref. | Dimensions  |       |       |        |      |        |
|------|-------------|-------|-------|--------|------|--------|
|      | Millimeters |       |       | Inches |      |        |
|      | Min.        | Typ.  | Max.  | Min.   | Typ. | Max.   |
| A    | 2.18        |       | 2.40  | 0.086  |      | 0.0944 |
| A1   | 0.9         |       | 1.10  | 0.035  |      | 0.0433 |
| A2   | 0.03        |       | 0.23  | 0.0011 |      | 0.0090 |
| b    | 0.64        |       | 0.90  | 0.0251 |      | 0.0354 |
| b4   | 4.95        |       | 5.46  | 0.1948 |      | 0.2149 |
| c    | 0.46        |       | 0.61  | 0.0181 |      | 0.0240 |
| c2   | 0.46        |       | 0.60  | 0.0181 |      | 0.0236 |
| D    | 5.97        |       | 6.22  | 0.2350 |      | 0.2448 |
| D1   | 4.95        |       |       | 0.1948 |      |        |
| E    | 6.35        |       | 6.73  | 0.2500 |      | 0.2649 |
| E1   | 4.32        |       |       | 0.1700 |      |        |
| e    |             | 2.286 |       |        | 0.09 |        |
| e1   |             | 4.572 |       |        | 0.18 |        |
| H    | 9.35        |       | 10.40 | 0.3681 |      | 0.4094 |
| L    | 1.0         |       | 1.78  | 0.039  |      | 0.0700 |
| L2   |             |       | 1.27  |        |      | 0.0500 |
| L4   | 0.6         |       | 1.02  | 0.023  |      | 0.0401 |
| V2   | -8°         |       | +8°   | -8°    |      | +8°    |

Figure 11. Footprint (dimensions in mm)



Note: This package drawing may slightly differ from the physical package. However, all the specified dimensions are guaranteed.

### 3 Ordering information

Figure 12. Ordering information schema

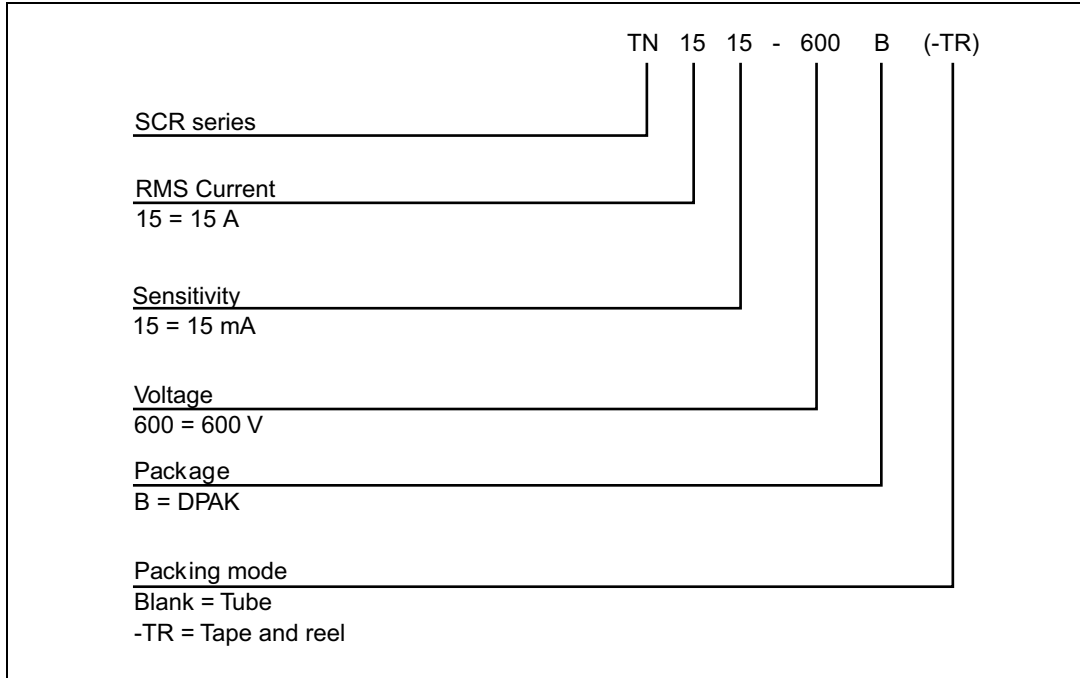


Table 6. Ordering information

| Order code     | Marking    | Package | Weight | Base qty | Delivery mode |
|----------------|------------|---------|--------|----------|---------------|
| TN1515-600B    | TN15 15600 | DPAK    | 0.3 g  | 75       | Tube          |
| TN1515-600B-TR | TN15 15600 | DPAK    | 0.3 g  | 2500     | Tape and reel |

### 4 Revision history

Table 7. Document revision history

| Date        | Revision | Changes  |
|-------------|----------|--|
| 13-Mar-2006 | 1        | Last update.   |
| 11-Jul-2007 | 2        | TO-220AB delivery mode changed from bulk to tube.  |
| 21-Sep-2015 | 3        | Updated <a href="#">Features</a> , <a href="#">Application</a> , <a href="#">Description</a> and <a href="#">Benefits</a> on cover page. Updated <a href="#">Figure 7</a> , package information and reformatted to current standard. |

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### Офис по работе с юридическими лицами:

105318, г.Москва, ул.Щербаковская д.3, офис 1107, 1118, ДЦ «Щербаковский»

Телефон: +7 495 668-12-70 (многоканальный)

Факс: +7 495 668-12-70 (доб.304)

E-mail: [info@moschip.ru](mailto:info@moschip.ru)

Skype отдела продаж:

moschip.ru

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