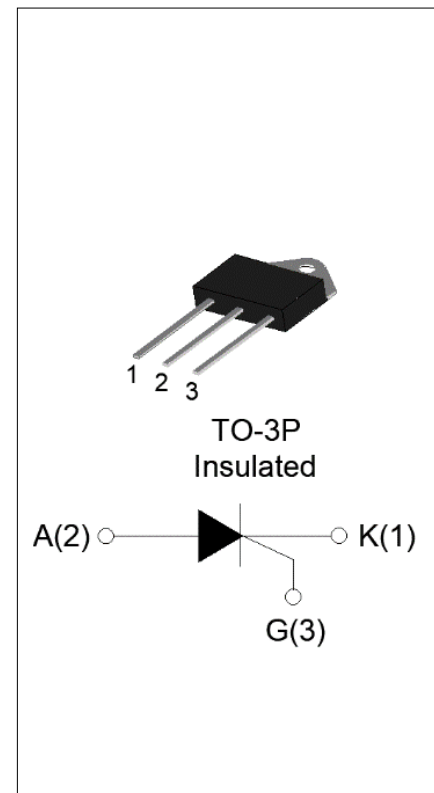


## DESCRIPTION:

With high ability to withstand the shock loading of large current, TN4050-12PI SCR provides high dV/dt rate with strong resistance to electromagnetic interference. It is especially recommended for use on solid state relay, motorcycle, power charger, T-tools etc. From all three terminals to external heatsink, TN4050-12PI provides a rated insulation voltage of 2500 V<sub>RMS</sub>, complying with UL standards (File ref: E252906). Package TO-3P is RoHS compliant.

## MAIN FEATURES

| Symbol            | Value | Unit |
|-------------------|-------|------|
| $I_{T(RMS)}$      | 40    | A    |
| $V_{DRM}/V_{RRM}$ | 1200  | V    |
| $I_{GT}$          | ≤45   | mA   |



## ABSOLUTE MAXIMUM RATINGS

| Parameter                                                                                            | Symbol       | Value   | Unit             |
|------------------------------------------------------------------------------------------------------|--------------|---------|------------------|
| Storage junction temperature range                                                                   | $T_{stg}$    | -40-150 | °C               |
| Operating junction temperature range                                                                 | $T_j$        | -40-125 | °C               |
| Repetitive peak off-state voltage ( $T_j=25^{\circ}C$ )                                              | $V_{DRM}$    | 1200    | V                |
| Repetitive peak reverse voltage ( $T_j=25^{\circ}C$ )                                                | $V_{RRM}$    | 1200    | V                |
| Average on-state current ( $T_c \leq 66^{\circ}C$ )                                                  | $I_{T(AV)}$  | 25      | A                |
| RMS on-state current ( $T_c \leq 66^{\circ}C$ )                                                      | $I_{T(RMS)}$ | 40      | A                |
| Non repetitive surge peak on-state current ( $t_p=10ms$ , $T_j=25^{\circ}C$ )                        | $I_{TSM}$    | 500     | A                |
| Non repetitive surge peak on-state current ( $t_p=8.3ms$ , $T_j=25^{\circ}C$ )                       |              | 540     |                  |
| $I^2t$ value for fusing ( $t_p=10ms$ , $T_j=25^{\circ}C$ )                                           | $I^2t$       | 1250    | A <sup>2</sup> s |
| Critical rate of rise of on-state current ( $I_G=2 \times I_{GT}$ , $f=100Hz$ , $T_j=125^{\circ}C$ ) | $di/dt$      | 200     | A/ $\mu s$       |

|                                                                              |             |     |    |
|------------------------------------------------------------------------------|-------------|-----|----|
| Peak gate current ( $t_p=20\mu s$ , $T_j=125^\circ C$ )                      | $I_{GM}$    | 10  | A  |
| Average gate power dissipation ( $T_j=125^\circ C$ )                         | $P_{G(AV)}$ | 1   | W  |
| Peak gate power                                                              | $P_{GM}$    | 20  | W  |
| Peak pulse voltage<br>( $T_j=25^\circ C$ ; non-repetitive, off-state; FIG.7) | $V_{pp}$    | 0.7 | kV |

### ELECTRICAL CHARACTERISTICS ( $T_j=25^\circ C$ unless otherwise specified)

| Symbol    | Test Condition                                        | Value |      |      | Unit       |
|-----------|-------------------------------------------------------|-------|------|------|------------|
|           |                                                       | MIN.  | TYP. | MAX. |            |
| $I_{GT}$  | $V_D=12V$ $R_L=33\Omega$                              | -     | -    | 45   | mA         |
| $V_{GT}$  |                                                       | -     | -    | 1    | V          |
| $V_{GD}$  | $V_D=V_{DRM}$ $T_j=125^\circ C$ $R_L=3.3k\Omega$      | 0.2   | -    | -    | V          |
| $I_L$     | $I_G=1.2I_{GT}$                                       | -     | -    | 120  | mA         |
| $I_H$     | $I_T=500mA$                                           | -     | -    | 100  | mA         |
| $dV/dt$   | $V_D=800V$ Gate Open $T_j=125^\circ C$                | 1500  | -    | -    | V/ $\mu s$ |
| $t_{on}$  | $I_G=50mA$ $I_A=500mA$ $I_R=50mA$<br>$T_j=25^\circ C$ | -     | 5    | -    | $\mu s$    |
| $t_{off}$ |                                                       | -     | 100  | -    |            |

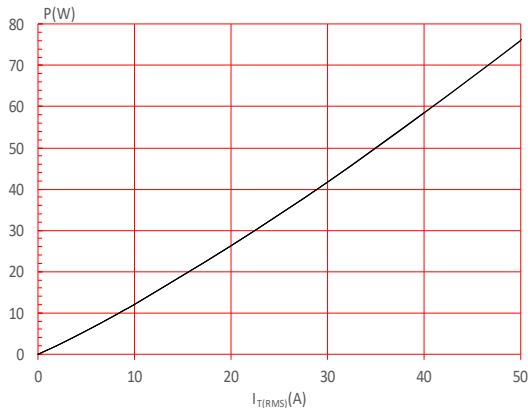
### STATIC CHARACTERISTICS

| Symbol    | Parameter                   |                   | Value(MAX.) | Unit       |
|-----------|-----------------------------|-------------------|-------------|------------|
| $V_{TM}$  | $I_{TM}=80A$ $t_p=380\mu s$ | $T_j=25^\circ C$  | 1.7         | V          |
| $V_{TO}$  | Threshold voltage           | $T_j=125^\circ C$ | 0.69        | V          |
| $R_D$     | Dynamic resistance          | $T_j=125^\circ C$ | 21          | m $\Omega$ |
| $I_{DRM}$ | $V_D=V_{DRM}$ $V_R=V_{RRM}$ | $T_j=25^\circ C$  | 10          | $\mu A$    |
| $I_{RRM}$ |                             | $T_j=125^\circ C$ | 5           | mA         |

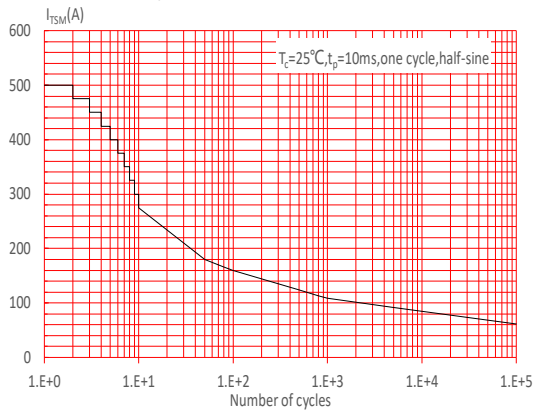
### THERMAL RESISTANCES

| Symbol        | Parameter                | Value | Unit         |
|---------------|--------------------------|-------|--------------|
| $R_{th(j-c)}$ | junction to case (DC)    | 1     | $^\circ C/W$ |
| $R_{th(j-a)}$ | junction to ambient (DC) | 50    | $^\circ C/W$ |

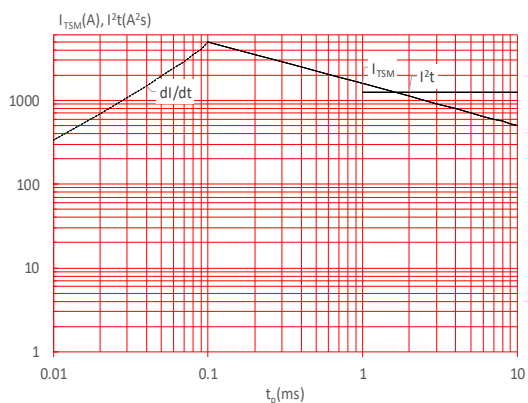
**FIG.1:** Maximum power dissipation versus RMS on-state current



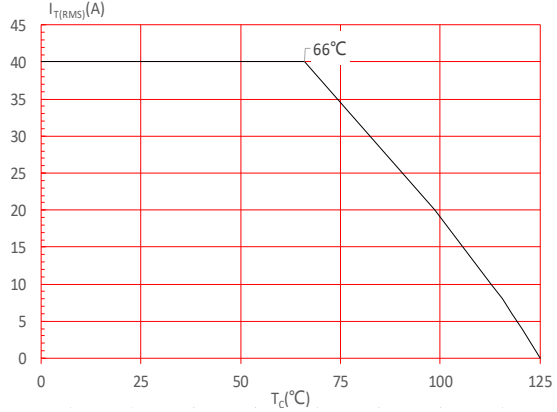
**FIG.3:** Surge peak on-state current versus number of cycles



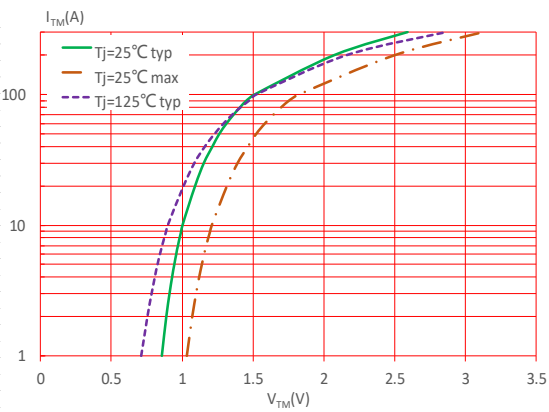
**FIG.5:** Non-repetitive surge peak on-state current for a sinusoidal pulse with width  $t_p < 10\text{ms}$ , and corresponding value of  $I^2t$  ( $di/dt < 200\text{A}/\mu\text{s}$ )



**FIG.2:** RMS on-state current versus case temperature



**FIG.4:** On-state characteristics



**FIG.6:** Relative variations of gate trigger current, holding current and latching current versus junction temperature

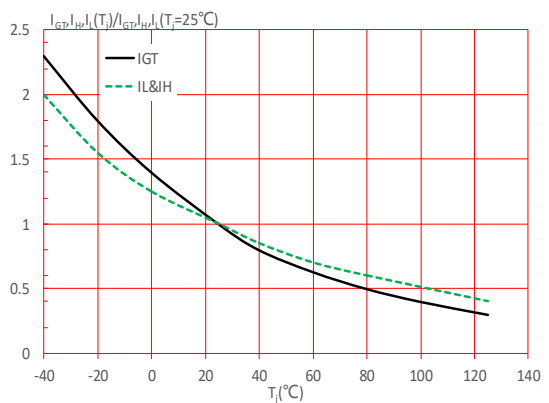
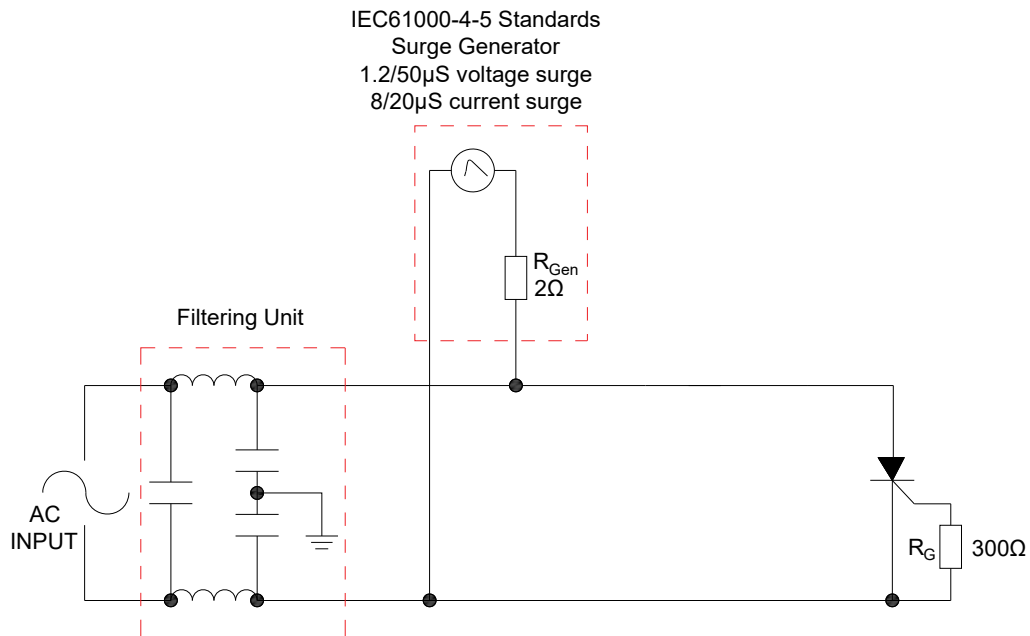
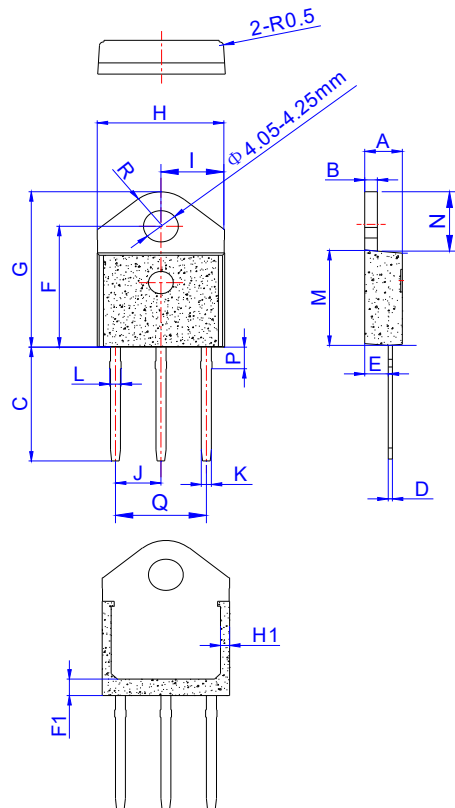


FIG.7: Test circuit for inductive and resistive loads to IEC-61000-4-5 standards.

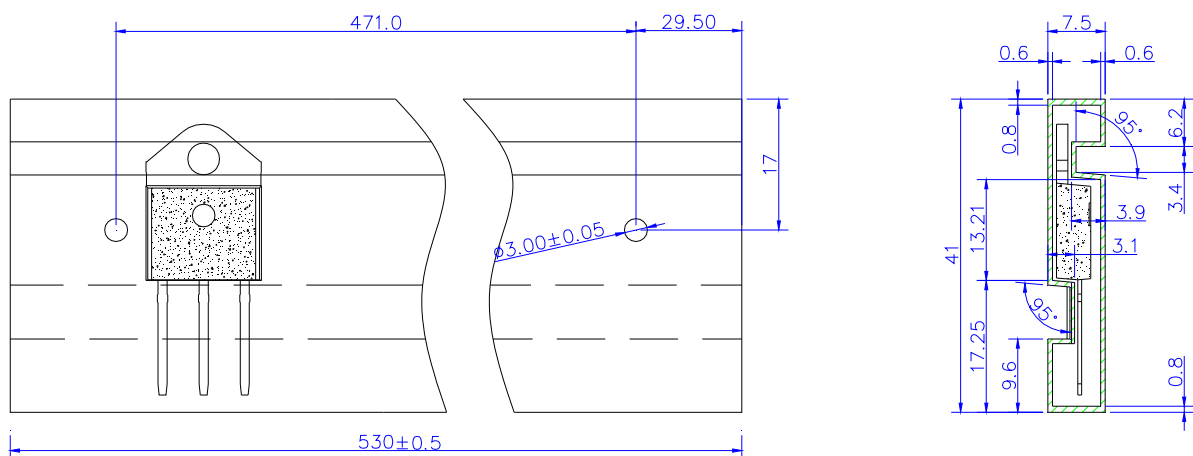


## PACKAGE MECHANICAL DATA



| Ref. | Dimensions  |      |       |        |       |       |
|------|-------------|------|-------|--------|-------|-------|
|      | Millimeters |      |       | Inches |       |       |
|      | Min.        | Typ. | Max.  | Min.   | Typ.  | Max.  |
| A    | 4.40        |      | 4.60  | 0.173  |       | 0.181 |
| B    | 1.45        |      | 1.55  | 0.057  |       | 0.061 |
| C    | 14.35       |      | 15.60 | 0.565  |       | 0.614 |
| D    | 0.50        |      | 0.70  | 0.020  |       | 0.028 |
| E    | 2.70        |      | 2.90  | 0.106  |       | 0.114 |
| F    | 15.80       |      | 16.50 | 0.622  |       | 0.650 |
| F1   | 2.45        |      | 2.85  | 0.096  |       | 0.112 |
| G    | 20.40       |      | 21.10 | 0.803  |       | 0.831 |
| H    | 15.10       |      | 15.50 | 0.594  |       | 0.610 |
| H1   | 1.10        |      | 1.50  | 0.043  |       | 0.059 |
| I    | 7.25        |      | 7.65  | 0.285  |       | 0.301 |
| J    | 5.40        |      | 5.65  | 0.213  |       | 0.222 |
| K    | 1.10        |      | 1.40  | 0.043  |       | 0.055 |
| L    | 1.25        |      | 1.45  | 0.049  |       | 0.057 |
| M    | 12.37       |      | 12.77 | 0.487  |       | 0.503 |
| N    | 7.80        |      | 8.20  | 0.307  |       | 0.323 |
| P    | 2.80        |      | 3.00  | 0.110  |       | 0.118 |
| Q    | 10.70       |      | 11.10 | 0.421  |       | 0.437 |
| R    |             | 4.35 |       |        | 0.171 |       |

## DELIVERY MODE



| PACKAGE | OUTLINE | TUBE<br>(PCS) | INNER BOX<br>(PCS) | PER CARTON |
|---------|---------|---------------|--------------------|------------|
| TO-3P   | TUBE    | 30            | 450                | 2,250      |