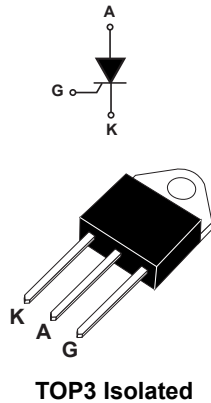


40 A, 1200 V standard SCR



Features

- Max. repetitive blocking voltage = V_{DRM} , V_{RRM} = 1200 V
- I_{GT} maximum = 50 mA
- High static and dynamic commutation:
 - di/dt = 100 A/ μ s
 - dV/dt = 2000 V/ μ s
- ECOPACK2 component (RoHS and HF compliance)
- Complies with UL 1557 standard (file ref : E81734)

Application

- Solar / Wind renewable energy inverters and rectifiers
- Solid state relay (SSR)
- Uninterruptible power supply (UPS)
- Industrial SMPS
- Bypass
- AC DC inrush current limiter (ICL)
- Battery charger
- AC DC voltage controlled rectifier
- Industrial welding systems
- Off board automotive battery charger
- Soft starter
- Heating systems

Description

The TN4050-12PI SCR is suitable in industrial applications where high immunity is required with a lower gate current and ceramic isolated tab, UL1557 certified rated at 2.5 kV RMS and UL94-V0 resin compliance.

Available in through-hole high power package TOP3 isolated tab.

Product status

TN4050-12PI

Product summary

| | |
|-------------------|---------------|
| Order code | TN4050-12PI |
| Package | TOP3 isolated |
| $I_{T(RMS)}$ | 40 A |
| V_{DRM}/V_{RRM} | 1200 V |
| I_{GT} | 50 mA |

1 Characteristics

Table 1. Absolute maximum ratings (limiting values)

| Symbol | Parameter | | Value | Unit | |
|--------------|---|--------------------|----------------|-------------|------------------|
| $I_{T(RMS)}$ | On-state RMS current (180 ° conduction angle) | | 40 | A | |
| $I_{T(AV)}$ | Average on-state current (180 ° conduction angle) | | | | |
| I_{TSM} | Non repetitive surge peak on-state current (T_j initial = 25 °C) | | $t_p = 8.3$ ms | 420 | A |
| | | | $t_p = 10$ ms | 400 | |
| I^2t | I^2t value for fusing | | $t_p = 10$ ms | 800 | A ² s |
| di/dt | Critical rate of rise of on-state current $I_G = 100$ mA, $di_g/dt = 1$ A/ μ s | $f = 60$ Hz | $T_j = 125$ °C | 100 | A/ μ s |
| I_{GM} | Maximum peak positive gate current | $t_p = 20$ μ s | $T_j = 125$ °C | 8 | A |
| V_{GM} | Maximum peak positive gate voltage | | | 5 | V |
| $P_{G(AV)}$ | Average gate power dissipation | | $T_j = 125$ °C | 1 | W |
| V_{RGM} | Maximum peak reverse gate voltage | | | 3.5 | V |
| T_{stg} | Storage junction temperature range | | | -40 to +150 | °C |
| T_j | Operating junction temperature range | | | -40 to +125 | |

Table 2. 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. | 10 | mA | |
| | | | Max. | 50 | | |
| V_{GT} | | | Max. | 1.5 | V | |
| V_{GD} | $V_D = V_{DRM}$, $R_L = 3.3$ k Ω | $T_j = 125$ °C | Min. | 0.2 | V | |
| I_H | $I_T = 500$ mA, gate open | | Max. | 100 | mA | |
| I_L | $I_G = 1.2 \times I_{GT}$ | | Max. | 130 | mA | |
| dV/dt | $V_D = 67\%$ V_{DRM} , gate open | $T_j = 125$ °C | Min. | 2 | kV/ μ s | |
| t_{gt} | $I_T = 40$ A, $V_D = V_{DRM}$, $I_G = 200$ mA, (di_G/dt) max = 0.2 A/ μ s | | Typ. | 2 | μ s | |
| t_q | $I_{TM} = 40$ A, $V_D = 800$ V, $di_{TM}/dt = 30$ A/ μ s, $V_R = 75$ V, $dV_D/dt = 20$ V/ μ s | | $T_j = 125$ °C | Typ. | 100 | μ s |

Table 3. Static characteristics

| Symbol | Test conditions | | Value | Unit | | |
|-----------------------|--------------------------------------|---------------|----------------|------|-----|------------|
| V_{TM} | $I_{TM} = 80$ A, $t_p = 380$ μ s | $T_j = 25$ °C | Max. | 1.75 | V | |
| V_{TO} | Threshold voltage | | Max. | 0.9 | | |
| R_D | Dynamic resistance | | $T_j = 125$ °C | Max. | 9.8 | m Ω |
| I_{DRM} , I_{RRM} | $V_{DRM} = V_{RRM} = 1200$ V | | $T_j = 25$ °C | Max. | 10 | μ A |
| | | | $T_j = 125$ °C | | 5 | mA |

Table 4. Thermal parameters

| Symbol | Parameter | | Value | Unit |
|---------------|--------------------------|------|-------|------|
| $R_{th(j-c)}$ | Junction to case (DC) | Typ. | 1.1 | °C/W |
| $R_{th(j-a)}$ | Junction to ambient (DC) | | 50 | |

1.1 Characteristics curves

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

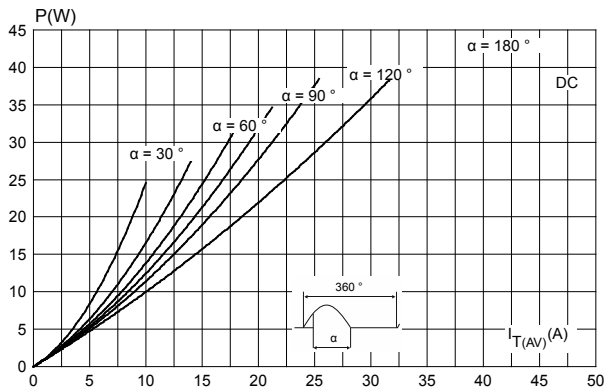


Figure 2. Average and DC on-state current versus case temperature

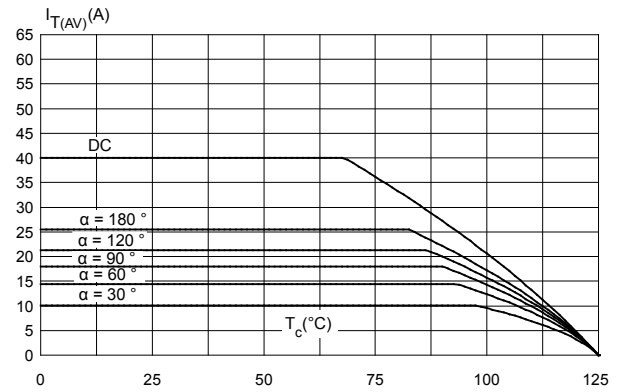


Figure 3. On-state characteristics (maximum values)

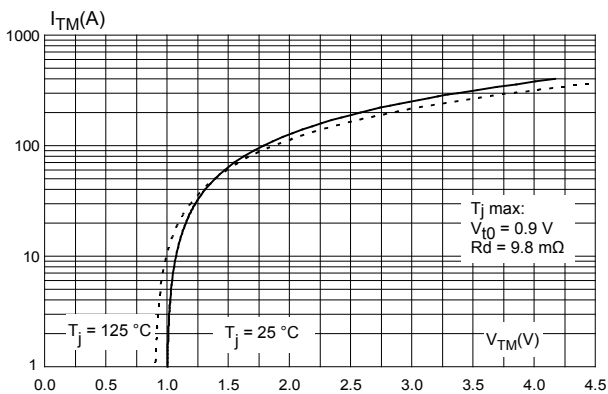


Figure 4. Average and D.C. on-state current versus ambient temperature

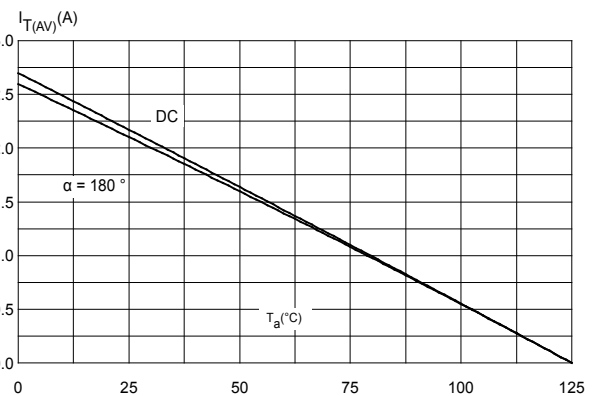


Figure 5. Relative variation of thermal impedance junction to case and junction to ambient versus pulse duration

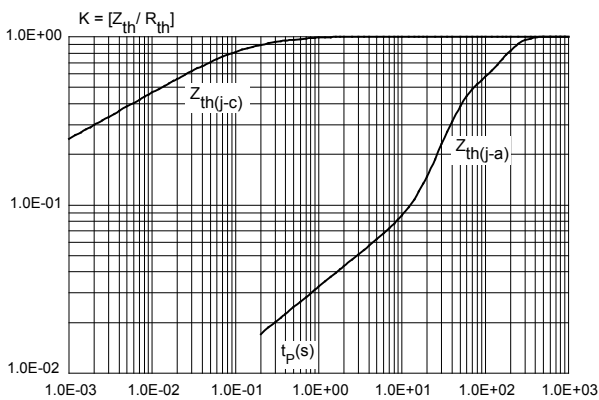


Figure 6. Surge peak on-state current versus number of cycles

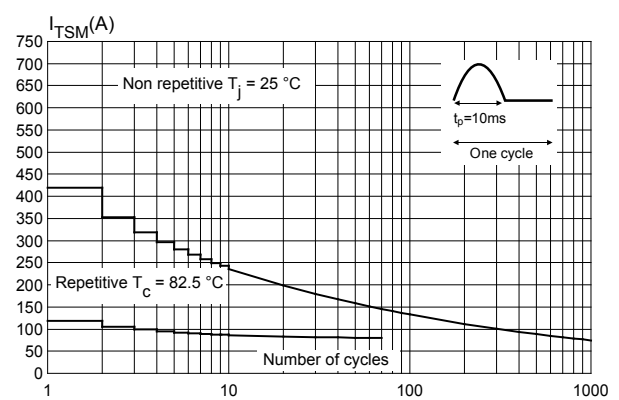


Figure 7. Non repetitive surge peak on-state current for a sinusoidal pulse with width $t_p < 10$ ms

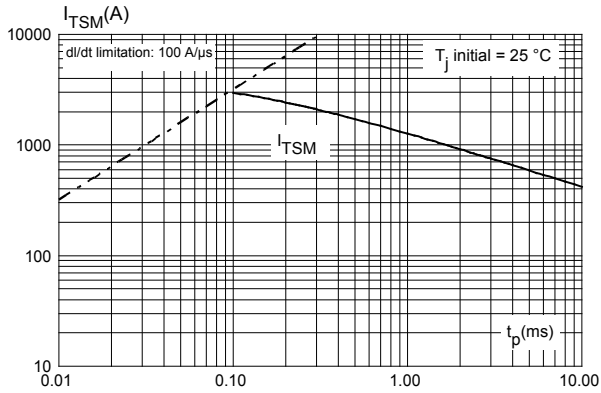


Figure 8. Relative variation of gate trigger current and gate trigger voltage versus junction temperature (typical value)

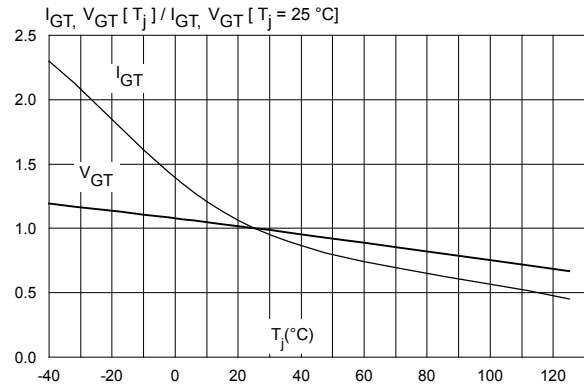


Figure 9. Relative variation of holding and latching current versus junction temperature (typical value)

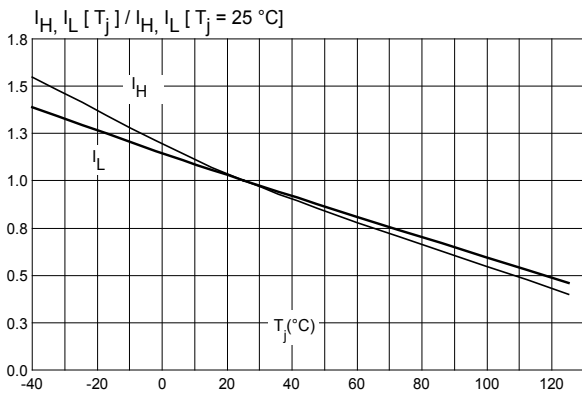


Figure 10. Relative variation of static dV/dt immunity versus junction temperature

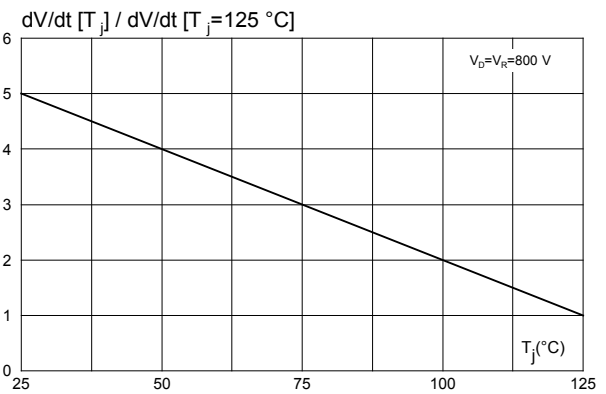
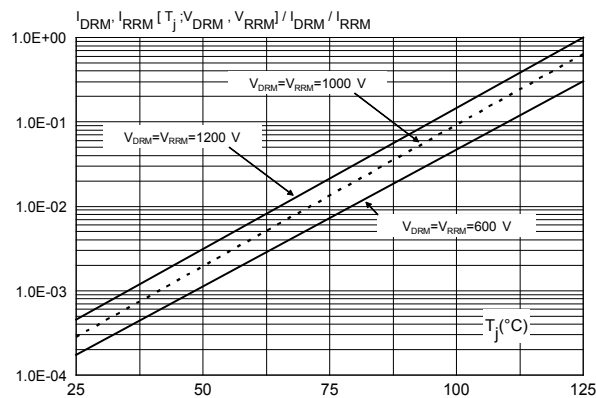


Figure 11. Relative variation of leakage current versus junction temperature for different values of blocking voltage (typical values)



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. ECOPACK is an ST trademark.

2.1 TOP3 Isolated package information

- **ECOPACK** (lead-free plating and halogen free package compliance)
- Lead-free package leads finishing
- Halogen-free molding compound resin meets UL94 standard level V0
- Recommended torque: 1.05 N·m (max. torque: 1.2 N·m)

Figure 12. Package outline

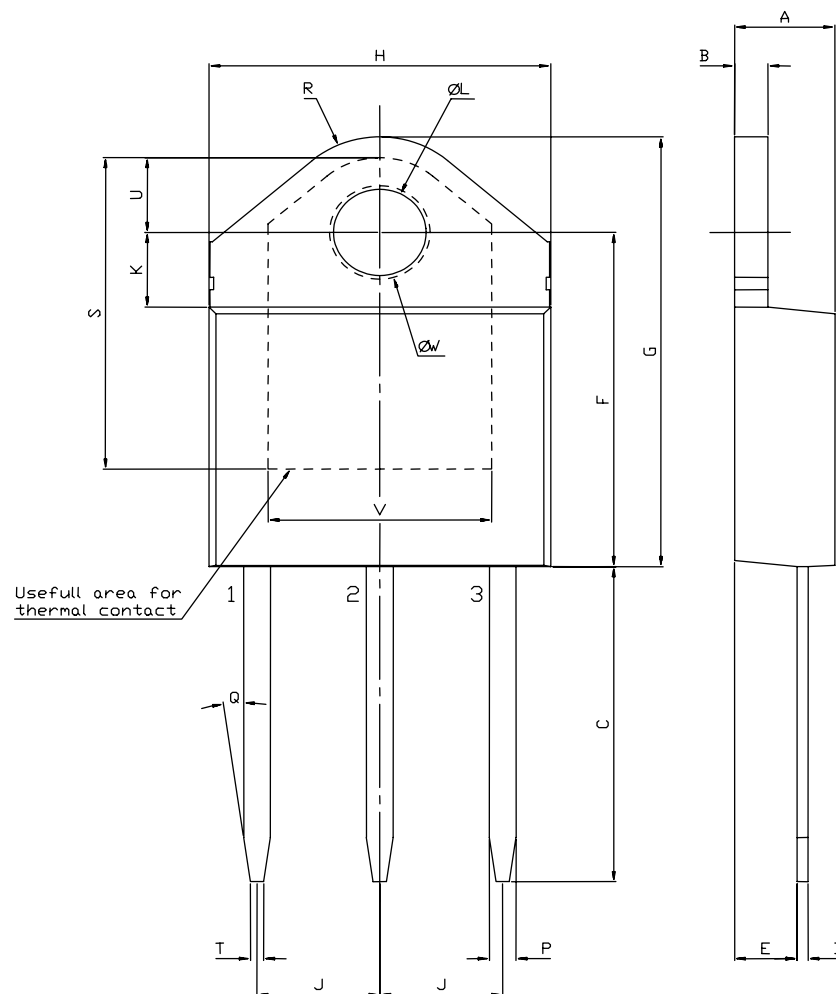


Table 5. Mechanical data

| Ref. | Dimensions | | | | | |
|------|------------|------|-------|-----------------------|--------|--------|
| | mm | | | Inches ⁽¹⁾ | | |
| | Min. | Typ. | Max. | Min. | Typ. | Max. |
| A | 4.40 | | 4.60 | 0.1732 | | 0.1811 |
| B | 1.45 | | 1.55 | 0.0571 | | 0.0610 |
| C | 14.35 | | 15.60 | 0.5650 | | 0.6142 |
| D | 0.50 | | 0.70 | 0.0197 | | 0.0276 |
| E | 2.70 | | 2.90 | 0.1063 | | 0.1142 |
| F | 15.80 | | 16.50 | 0.6220 | | 0.6496 |
| G | 20.40 | | 21.10 | 0.8031 | | 0.8307 |
| H | 15.10 | | 15.50 | 0.5945 | | 0.6102 |
| J | 5.40 | | 5.65 | 0.2126 | | 0.2224 |
| K | 3.40 | | 3.65 | 0.1339 | | 0.1437 |
| L | 4.08 | | 4.17 | 0.1606 | | 0.1642 |
| P | 1.10 | | 1.30 | 0.0430 | | 0.0510 |
| R | | 4.60 | | | 0.1811 | |

1. Inches given for reference only

3 Ordering information

Figure 13. Ordering information scheme

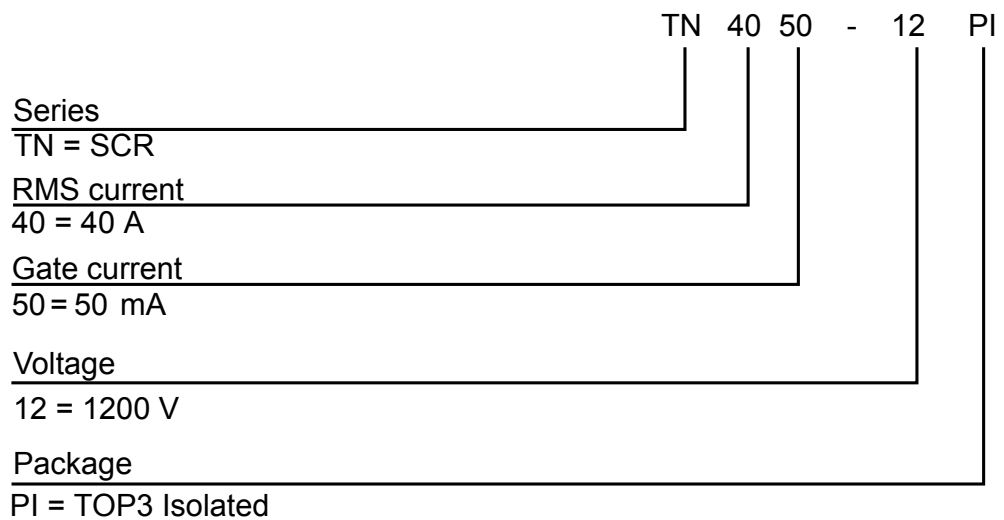


Table 6. Ordering information

| Order code | Marking | Package | Weight | Base qty. | Delivery mode |
|-------------|------------|---------------|--------|-----------|---------------|
| TN4050-12PI | TN405012PI | TOP3 Isolated | 4.48 g | 30 | Tube |

Revision history

Table 7. Document revision history

| Date | Revision | Changes |
|-------------|----------|--|
| 18-Feb-2019 | 1 | Initial release. |
| 27-Jul-2023 | 2 | Updated Table 5 . Mechanical data. |

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