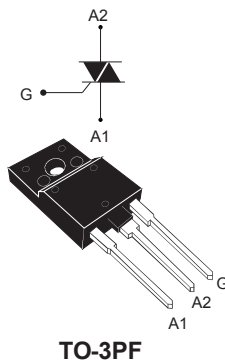


40 A Snubberless™ Triac



Features

- High current Triac
- High surge current = 400 A
- Max. blocking voltage = V_{DRM} , V_{RRM} = 600 V
- Max. surge voltage = V_{DSM} , V_{RSM} = 700 V
- I_{GT} maximum = 50 mA
- High static and dynamic commutation:
 - $(di/dt)_c$ = 25.1 A/ms
 - dV/dt = 1000 V/ μ s
- UL1557 certified (file ref. 81734) = 2.5 kV
- Snubberless™ device
- ECOPACK®2 compliant (RoHS and HF compliance)

Applications

- Heater, ventilation and air conditioning (HVAC)
- Solid state relay (SSR)
- Motor soft starter
- SMPS inrush current limiter

Description

The device is packaged in a through-hole TO-3PF full plastic insulated.

The T4050-6PF is optimized for the ON/OFF function or phase angle control in applications such as static relays, heating regulation, induction motor starting circuits, light dimmers, motor speed controllers and in many other industrial applications where high immunity and high surge current are required.

| Product status link | |
|---------------------------|-------|
| T4050-6PF | |
| Product summary | |
| $I_{T(RMS)}$ | 40 A |
| V_{DRM} , V_{RRM} | 600 V |
| V_{DSM} , V_{RSM} | 700 V |
| I_{GT} | 50 mA |

1 Characteristics

Table 1. Absolute maximum ratings (limiting values)

| Symbol | Parameter | Value | Unit |
|-------------------|--|---|--------------------------|
| $I_{T(RMS)}$ | RMS on-state current (full sine wave) | $T_c = 76\text{ °C}$ | 40 A |
| I_{TSM} | Non repetitive surge peak on-state current (full cycle, T_j initial = 25 °C) | $t = 16.7\text{ ms}$ | 420 |
| | | $t = 20\text{ ms}$ | 400 |
| I^2t | I^2t value for fusing | $t_p = 10\text{ ms}$ | 1000 A ² s |
| di/dt | Critical rate of rise of on-state current, $I_G = 2 \times I_{GT}$, $tr \leq 100\text{ ns}$ | $F = 120\text{ Hz}$, $T_j = 25\text{ °C}$ | 50 A/ μ s |
| V_{DRM}/V_{RRM} | Repetitive peak off-state voltage (50-60 Hz) | | 600 V |
| V_{DSM}/V_{RSM} | Non repetitive peak off-state voltage | $t_p = 10\text{ ms}$, $T_j = 25\text{ °C}$ | 700 V |
| I_{GM} | Peak gate current | $t_p = 20\text{ }\mu\text{s}$, $T_j = 125\text{ °C}$ | 8 A |
| V_{GM} | Peak gate voltage | | 8 V |
| $P_{G(AV)}$ | Average gate power dissipation | $T_j = 125\text{ °C}$ | 1 W |
| $V_{ins.}$ | Insulation RMS voltage, 1 minute (UL1557 file E81734) | | 2.5 kV |
| T_{stg} | Storage temperature range | | -40 to +150 °C |
| T_j | Operating junction temperature range | | -40 to +125 °C |
| T_L | Maximum lead temperature for soldering during 10 s | | 260 °C |

Table 2. Electrical characteristics ($T_j = 25\text{ °C}$, unless otherwise specified)

| Symbol | Test conditions | Quadrants; T_j | Value | Unit |
|-------------------|---|---------------------------------------|-------|------|
| $I_{GT}^{(1)}$ | $V_D = 12\text{ V}$, $R_L = 33\text{ }\Omega$ | I - II - III | Max. | 50 |
| V_{GT} | | | Max. | 1.3 |
| V_{GD} | $V_D = 600\text{ V}$, $R_L = 3.3\text{ k}\Omega$ | I - II - III $T_j = 125\text{ °C}$ | Min. | 0.2 |
| I_L | $I_G = 1.2 \times I_{GT}$ | I - III | Max. | 70 |
| | | II | Max. | 160 |
| $I_H^{(2)}$ | $I_T = 500\text{ mA}$, gate open | | Max. | 85 |
| $dV/dt^{(2)}$ | $V_D = 402\text{ V}$, gate open | $T_j = 125\text{ °C}$ | Min. | 1000 |
| $(di/dt)_c^{(2)}$ | Snubberless™ ($dV/dt)_c > 20\text{ V}/\mu\text{s}$ | $T_j = 125\text{ °C}$ | Min. | 25.1 |

1. Minimum I_{GT} is guaranteed at 5% of $I_{GT\text{ max}}$

2. For both polarities of A2 referenced to A1.

Table 3. Static electrical characteristics

| Symbol | Test conditions | T_j | | Value | Unit |
|-------------------|---|--------|------|-------|------|
| $V_{TM}^{(1)}$ | $I_{TM} = 60 \text{ A}$, $t_p = 380 \mu\text{s}$ | 25 °C | Max. | 1.4 | V |
| $V_{TO}^{(1)}$ | Threshold voltage | 125 °C | Max. | 0.85 | V |
| $R_D^{(1)}$ | Dynamic resistance | 125 °C | Max. | 10 | mΩ |
| I_{DRM}/I_{RRM} | $V_{DRM} = V_{RRM} = 600 \text{ V}$ | 25 °C | Max. | 5 | μA |
| | | 125 °C | | 7.5 | mA |

1. For both polarities of A2 referenced to A1.

Table 4. Thermal resistance

| Symbol | Parameter | | Value | Unit |
|---------------|-----------------------|------|-------|------|
| $R_{th(j-c)}$ | Junction to case (AC) | Max. | 1.45 | °C/W |
| | | Typ. | 1.1 | |
| $R_{th(j-a)}$ | Junction to ambient | Typ. | 50 | |

1.1 Characteristics (curves)

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

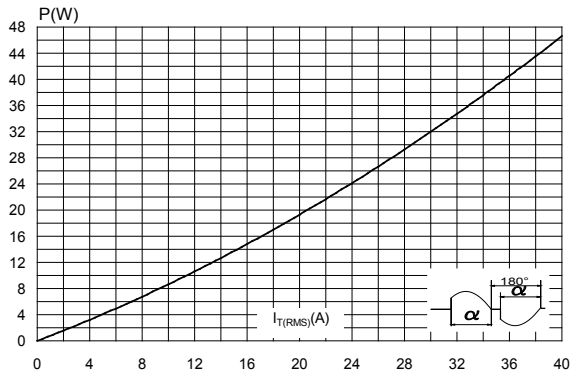


Figure 2. On-state RMS current versus case temperature

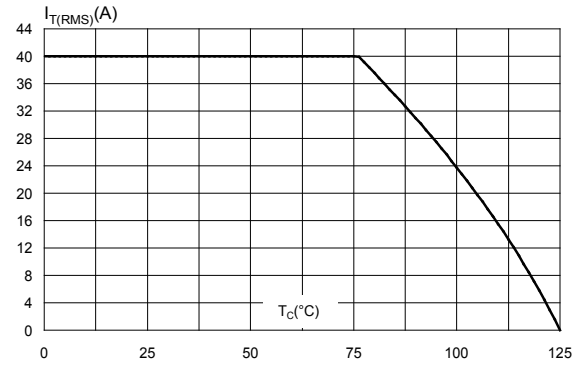


Figure 3. On-state RMS current versus ambient temperature (free air convection)

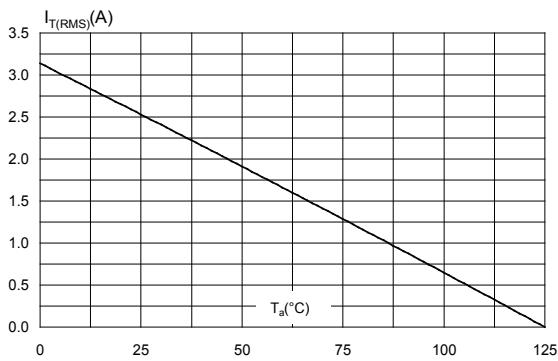


Figure 4. Relative variation of thermal impedance versus pulse duration

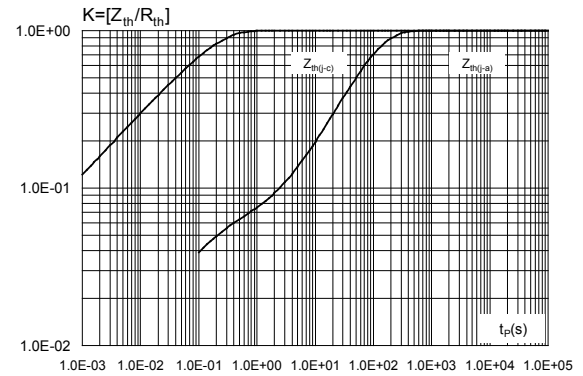


Figure 5. Relative variation of gate trigger voltage and current versus junction temperature (typical values)

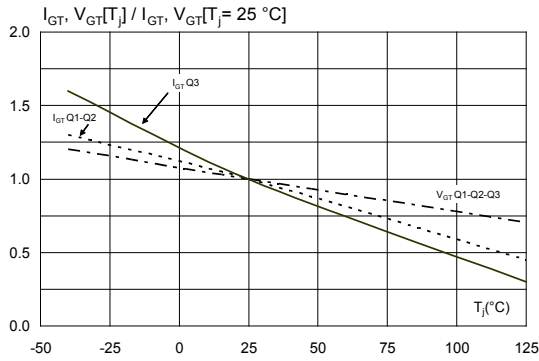


Figure 6. Relative variation of holding current and latching current versus junction temperature (typical values)

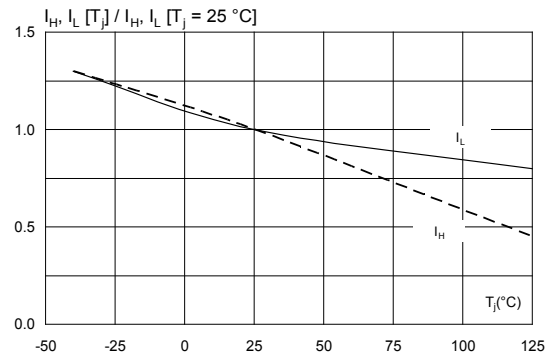


Figure 7. Relative variation of static dV/dt immunity versus junction temperature

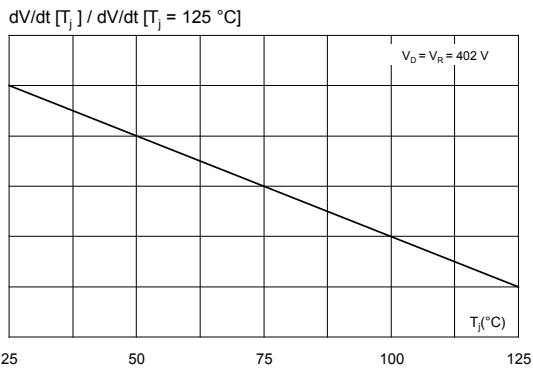


Figure 8. Relative variation of critical rate of decrease of main current versus junction temperature

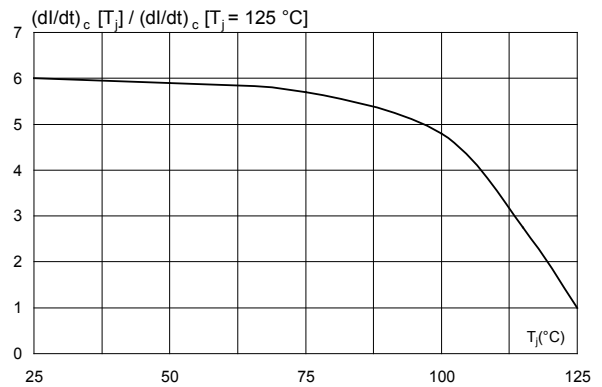


Figure 9. Surge peak on-state current versus number of cycles

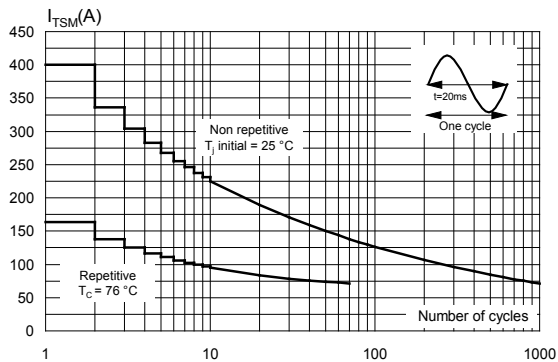


Figure 10. Non repetitive surge peak on-state current for a sinusoidal pulse with width $t_p < 10$ ms

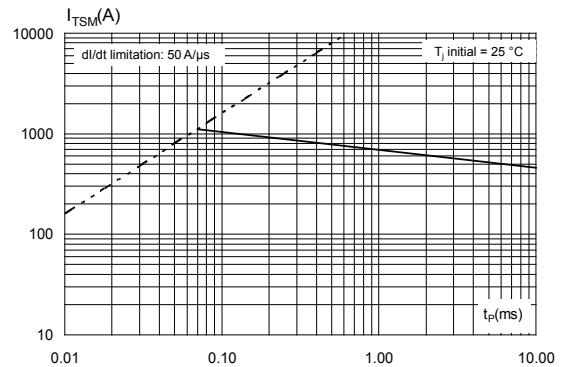


Figure 11. On-state characteristics (maximum values)

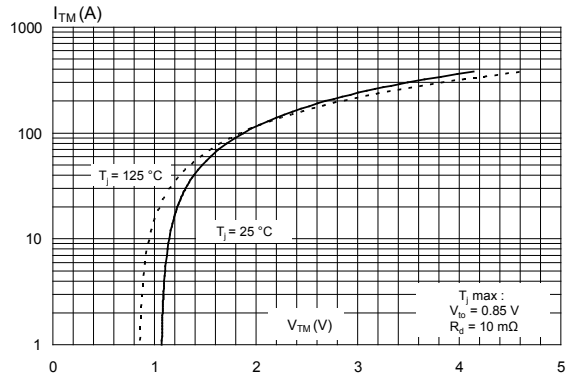
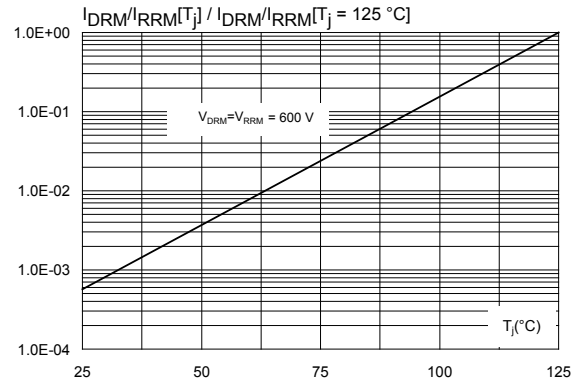


Figure 12. Relative variation of Leakage current versus junction temperature



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 TO-3PF package information

- Epoxy meets UL94, V0
- Lead-free package and HF package
- Recommended torque: 0.8N·m (max. 1.0 N·m)

Figure 13. TO-3PF package outline

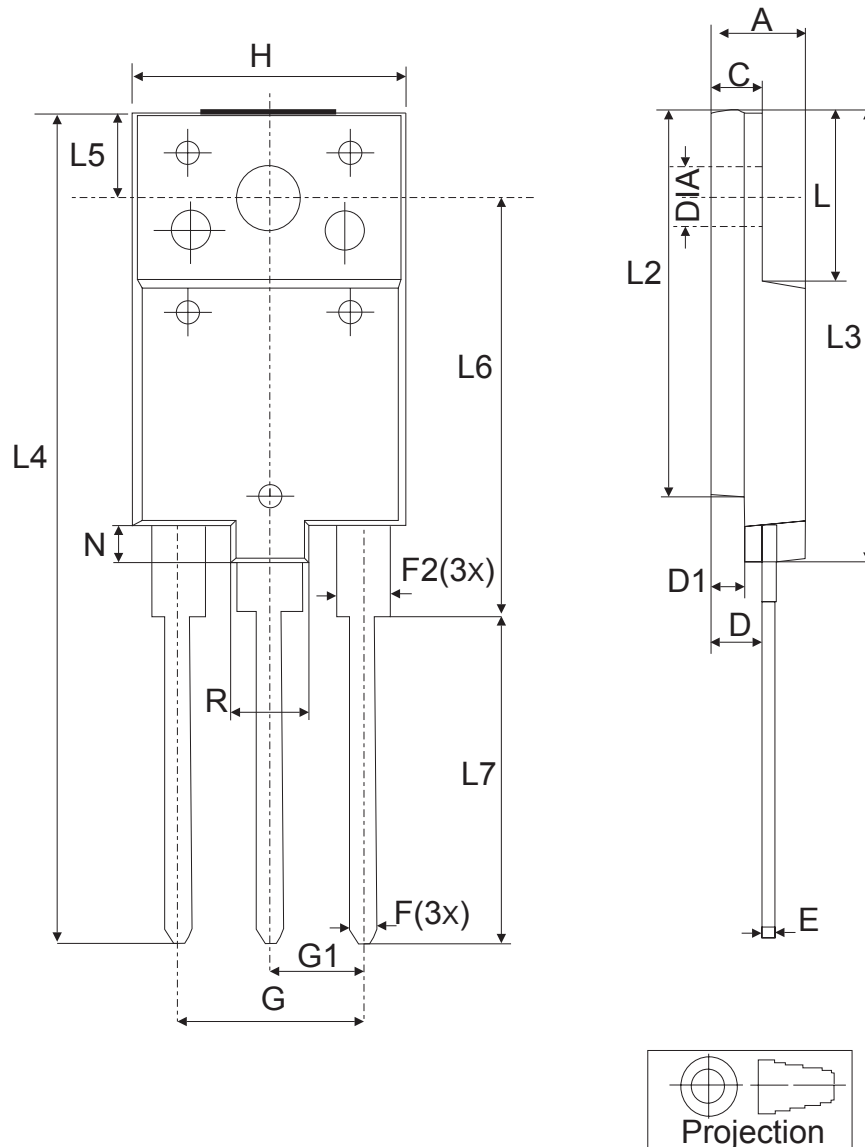


Table 5. TO-3PF mechanical data

| Ref. | Dimensions | | | | | |
|------|------------|-------|-------|-----------------------|--------|--------|
| | mm | | | Inches ⁽¹⁾ | | |
| | Min. | Typ. | Max. | Min. | Typ. | Max. |
| A | 5.30 | | 5.70 | 0.2087 | | 0.2244 |
| C | 2.80 | | 3.20 | 0.1102 | | 0.1260 |
| D | 3.10 | | 3.50 | 0.1220 | | 0.1378 |
| D1 | 1.80 | | 2.20 | 0.0709 | | 0.0866 |
| E | 0.80 | | 1.10 | 0.0315 | | 0.0433 |
| F | 0.65 | | 0.95 | 0.0256 | | 0.0374 |
| F2 | 1.80 | | 2.20 | 0.0709 | | 0.0866 |
| G | 10.30 | | 11.50 | 0.4055 | | 0.4528 |
| G1 | | 5.45 | | | 0.2146 | |
| H | 15.30 | | 15.70 | 0.6024 | | 0.6181 |
| L | 9.80 | 10.00 | 10.20 | 0.3858 | 0.3937 | 0.4016 |
| L2 | 22.80 | | 23.20 | 0.8976 | | 0.9134 |
| L3 | 26.30 | | 26.70 | 1.0354 | | 0.0512 |
| L4 | 43.20 | | 44.40 | 1.7008 | | 1.7480 |
| L5 | 4.30 | | 4.70 | 0.1693 | | 0.1850 |
| L6 | 24.30 | | 24.70 | 0.9567 | | 0.9724 |
| L7 | 14.60 | | 15.00 | 0.5748 | | 0.5906 |
| N | 1.80 | | 2.20 | 0.0709 | | 0.0866 |
| R | 3.80 | | 4.20 | 0.1496 | | 0.1654 |
| Dia | 3.40 | | 3.80 | 0.1339 | | 0.1496 |

1. Inches given for reference only

3 Ordering information

Figure 14. Ordering information scheme

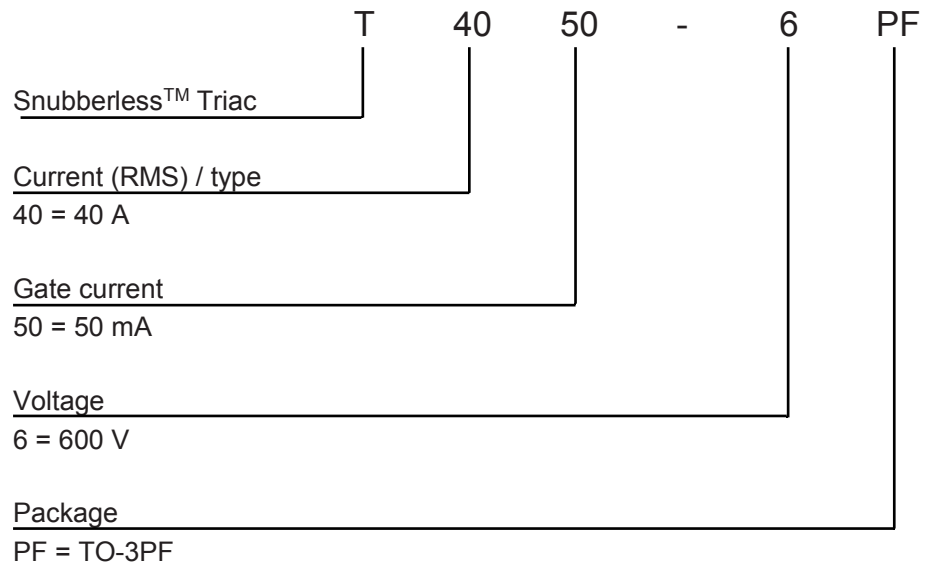


Table 6. Ordering information

| Order code | Marking | Package | Weight | Base qty. | Delivery mode |
|------------|-----------|---------|--------|-----------|---------------|
| T4050-6PF | T4050-6PF | TO-3PF | 5.2 g | 30 | Tube |

Revision history

Table 7. Document revision history

| Date | Version | Changes |
|-------------|---------|------------------|
| 03-Dec-2018 | 1 | Initial release. |

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