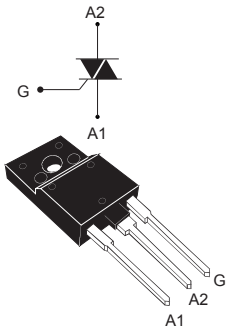
T4050-6PF

Datasheet

40 A Snubberless™ Triac



TO-3PF

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/µs
- 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

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

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.

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 °C	40	A
I_{TSM}	Non repetitive surge peak on-state current (full cycle, T_j initial = 25 °C)	t = 16.7 ms	420	A
		t = 20 ms	400	
I^2t	I^2t value for fusing	t_p = 10 ms	1000	A^2s
dI/dt	Critical rate of rise of on-state current, I_G = 2 x I_{GT}, tr ≤ 100 ns	F = 120 Hz, T_j = 25 °C	50	A/µs
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 ms, T_j = 25 °C	700	V
I_{GM}	Peak gate current	t_p = 20 µs, T_j = 125 °C	8	A
V_{GM}	Peak gate voltage		8	V
$P_{G(AV)}$	Average gate power dissipation	T_j = 125 °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 °C, unless otherwise specified)

Symbol	Test conditions	Quadrants; T_j		Value	Unit
I_{GT} (1)	V_D = 12 V, R_L = 33 Ω	I - II - III	Max.	50	mA
V_{GT}			Max.	1.3	V
V_{GD}	V_D = 600 V, R_L = 3.3 kΩ	I - II - III T_j = 125 °C	Min.	0.2	V
I_L	I_G = 1.2 x I_{GT}	I - III	Max.	70	mA
		II	Max.	160	mA
I_H (2)	I_T = 500 mA, gate open		Max.	85	mA
dV/dt (2)	V_D = 402 V, gate open	T_j = 125 °C	Min.	1000	V/µs
(dI/dt)c (2)	Snubberless™ (dV/dt)c > 20 V/µs	T_j = 125 °C	Min.	25.1	A/ms

1. *Minimum I_{GT} is guaranteed at 5% of I_{GT} 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 A, t_p = 380 µs	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 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

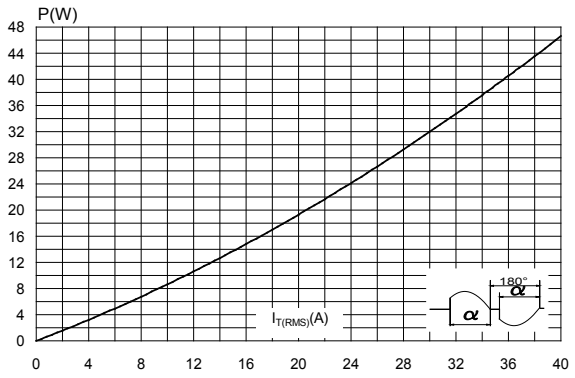


Figure 2. On-state RMS current versus case temperature

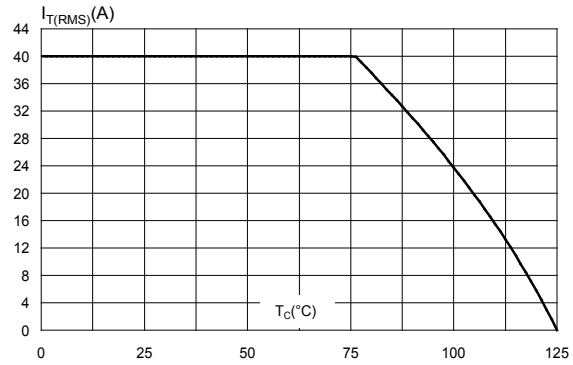


Figure 3. On-state RMS current versus ambient temperature (free air convection)

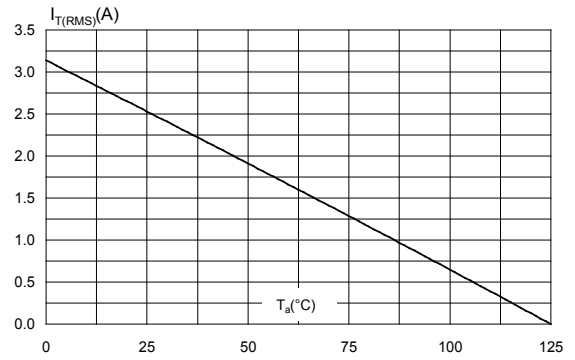


Figure 4. Relative variation of thermal impedance versus pulse duration

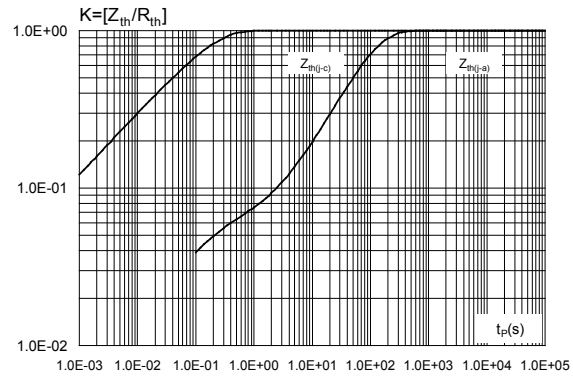


Figure 5. Relative variation of gate trigger voltage and current versus junction temperature (typical values)

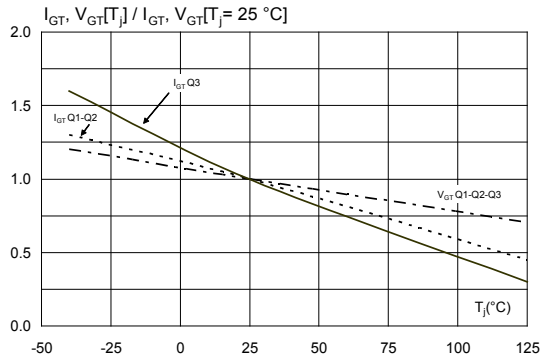


Figure 6. Relative variation of holding current and latching current versus junction temperature (typical values)

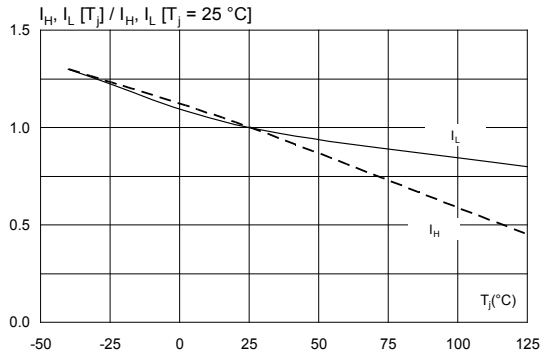


Figure 7. Relative variation of static dV/dt immunity versus junction temperature

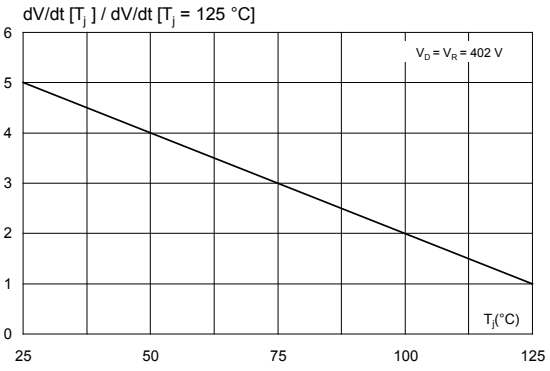


Figure 8. Relative variation of critical rate of decrease of main current versus junction temperature

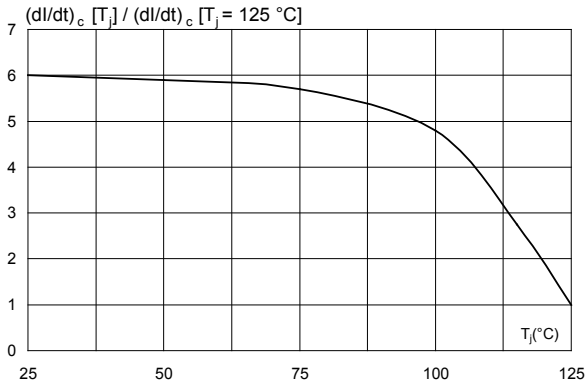


Figure 9. Surge peak on-state current versus number of cycles

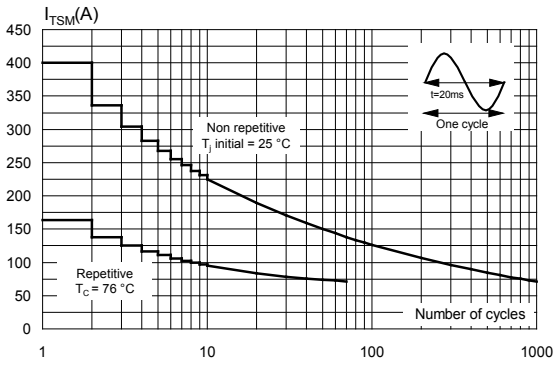


Figure 10. Non repetitive surge peak on-state current for a sinusoidal pulse with width t_p < 10 ms

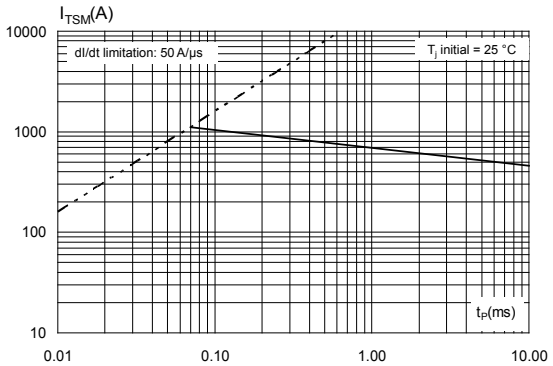


Figure 11. On-state characteristics (maximum values)

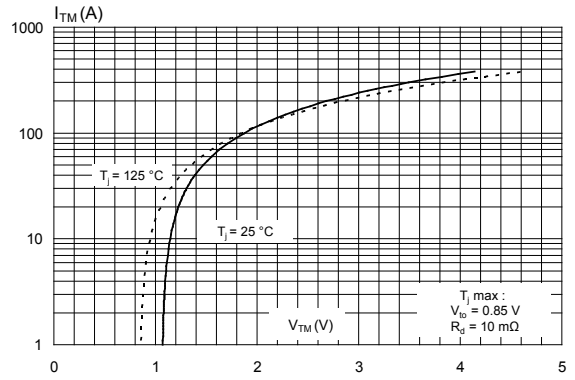
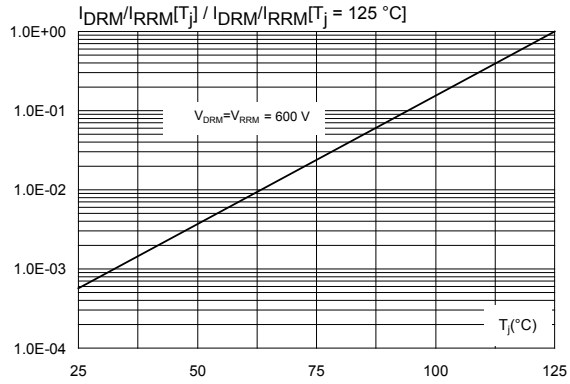


Figure 12. Relative variation of Leakage current versus junction temperature



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

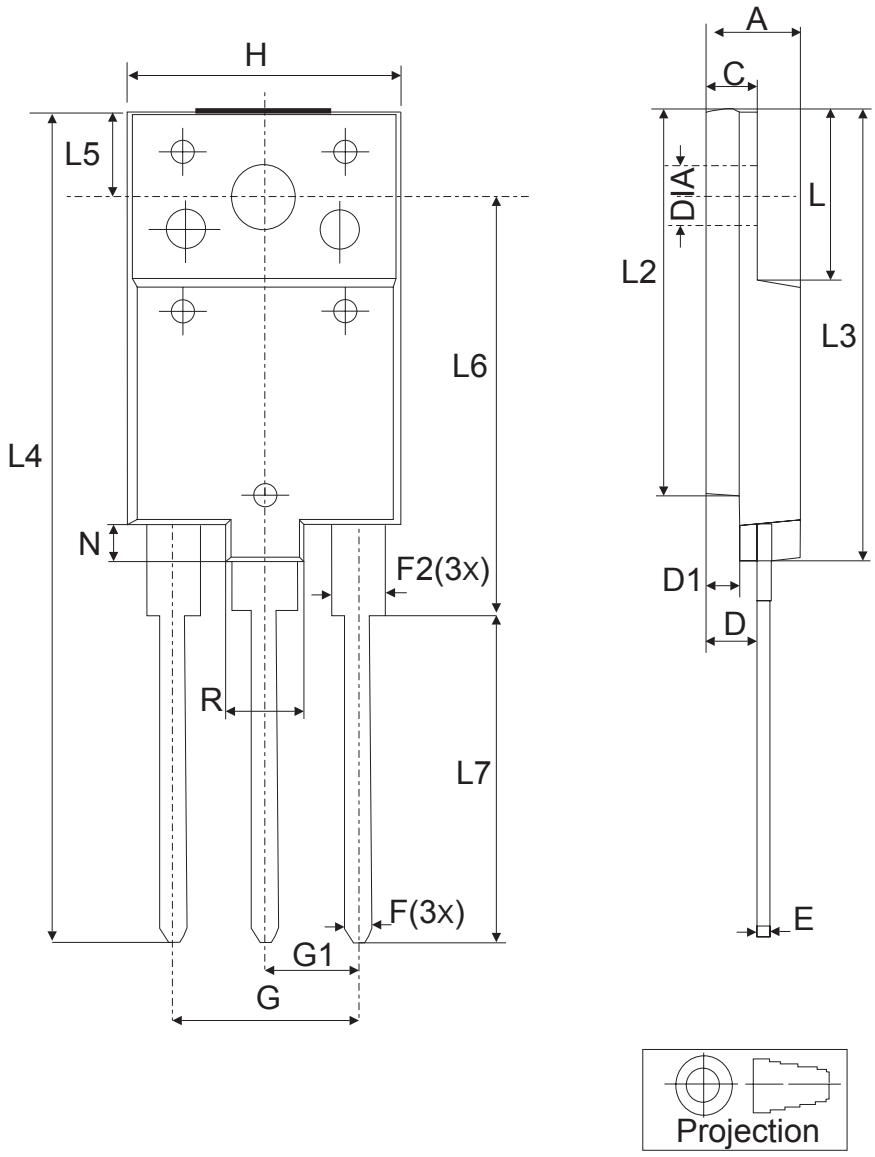


Table 5. **TO-3PF mechanical data**

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**

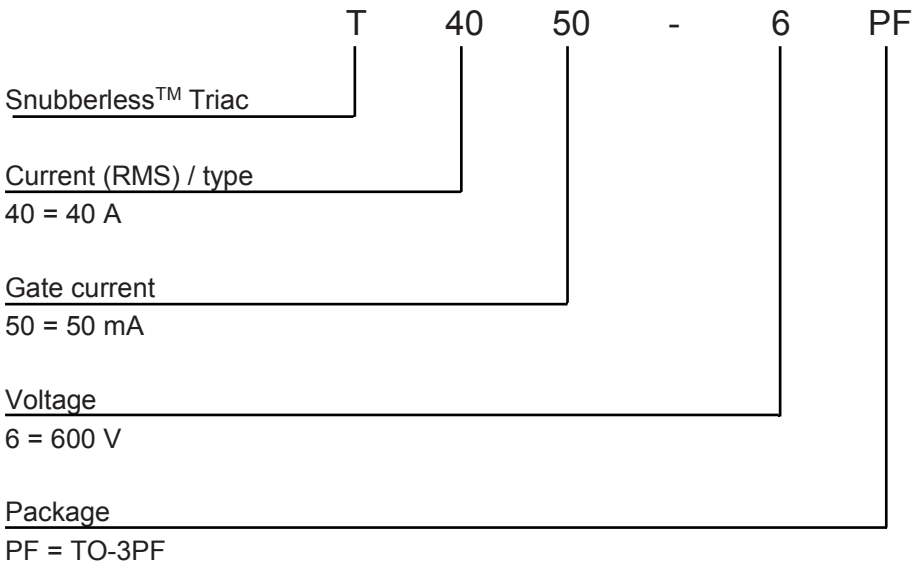


Table 6. **Ordering information**

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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