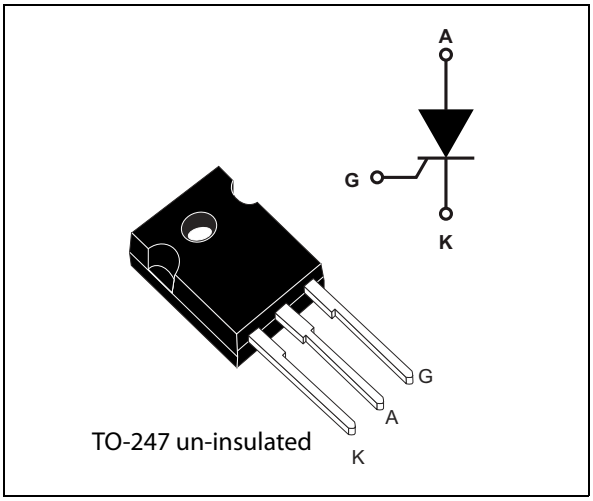
TN5050H-12WY

50 A 1200 V automotive grade SCR

Datasheet – production data



TO-247 un-insulated

Features

- On-state current: 50 A rms
- Blocking voltage: 1200 V
- High static and dynamic commutation:
  - dI/dt = 200 A/µs
  - dV/dt = 1000 V/µs
- AEC-Q101
- I_{GT} = 50 mA
- ECOPACK®2 compliant component

Applications

- Automotive:
  - on board, off board battery charger
- Solar, wind renewable energy inverters
- Solid state relay
- UPS:
  - Bypass
  - ICL (inrush current limiter)
  - Battery charger
- Industrial welding systems
- Voltage control rectifier

Description

Available in TO-247 high power package, the TN5050H-12WY autograde is suitable in applications such as automotive / stationary battery charger, renewable energy generator, interruptible power supply, solid state relay, welding equipment and motor drive applications. Its power switching, voltage robustness and power dissipation performances are the key features for functions such as a 80 A AC switch, an AC phasing inverter and an AC-DC controlled rectifier bridge.

The TN5050H-12WY is an automotive grade product and offers a superior performance in surge current handling, thermal cooling capabilities and overvoltage robustness.

Table 1. Device summary

Symbol	Value	Unit
$I_{T(RMS)}$	50	A
V_{DRM}, V_{RRM}	1200	V
V_{DSM}, V_{RSM}	1300	V
I_{GT}	50	mA
T_j	150	°C

1 Characteristics

Table 2. Absolute ratings (limiting values, T_j = 25 °C unless otherwise stated)

Symbol	Parameter			Value	Unit
V_{DRM}/V_{RMM}	Repetitive off-state voltage (50-60 Hz)		T_j = 150 °C	1200	V
$I_{T(RMS)}$	On-state rms current (180° conduction angle)		T_c = 137 °C	50	A
$I_{T(AV)}$	Average on-state current (180° conduction angle)			32	
$I_{T(RMS)}$	On-state rms current (180° conduction angle)		T_c = 125 °C	80	A
$I_{T(AV)}$	Average on-state current (180° conduction angle)			51	
I_{TSM} (1)	Non repetitive surge peak on-state current (T_j initial = 25 °C)		t_p = 8.3 ms	633	A
			t_p = 10 ms	580	
dI/dt	Critical rate of rise of on-state current I_G = 2 x I_{GT}, $t_r \leq$ 100 ns	F = 50 Hz	T_j = 150 °C	200	A/µs
I_{GM}	Forward peak gate current	T_j = 150 °C	t_p = 20 µs	8	A
$P_{G(AV)}$	Average gate power dissipation		T_j = 150 °C	1	W
T_{stg}	Storage junction temperature range			- 40 to + 150	°C
T_j	Operating junction temperature range			- 40 to + 150	°C

1. ST recommends I^2t value for fusing = 1680 A^2s for T_j = 25 °C and T_p = 10 ms.

Table 3. 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}	V_D = 12 V, R_L = 33 Ω		Max.	1	V
V_{GD}	V_D = 2/3 X V_{DRM}, R_L = 3.3 kΩ	T_j = 150 °C	Min.	0.15	V
I_H	I_T = 500 mA, gate open		Max.	100	mA
I_L	I_G = 1.2 X I_{GT}		Max.	125	mA
t_{gt}	I_T = 50 A, V_D = V_{DRM}, I_G = 200 mA, dI_G/dt = 0.2 A/µs		Typ	3	µs
dV/dt	V_D = 2/3 X V_{DRM}, gate open	T_j = 150 °C	Min.	1000	V/µs
t_q	I_T = 33 A, V_D = 800 V, V_R = 75 V, t_P = 100 µs, dI_T/dt = 10 A/µs, dV_D/dt = 20 V/µs	T_j = 150 °C	Typ	150	µs
V_{TM}	I_{TM} = 100 A, t_P = 380 µs		Max.	1.55	V
V_{TO}	Threshold voltage	T_j = 150 °C	Max.	0.88	V
R_D	Dynamic resistance	T_j = 150 °C	Max.	6	mΩ
I_{DRM}/I_{RRM}	V_D = V_{DRM}, V_R = V_{RRM}	T_j = 25 °C	Max.	5	µA
		T_j = 125 °C	Max.	3	mA
		T_j = 150 °C	Max.	7.5	mA
I_{DSM}/I_{RSM}	V_D = V_{DSM}, V_R = V_{RSM}	T_j = 25 °C	Max.	10	µA

Table 4. Thermal resistance

Symbol	Parameter		Value	Unit
$R_{th(j-c)}$	Junction to case (DC)	TO-247	0.3	°C/W
$R_{th(j-a)}$	Junction to ambient		50	°C/W

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

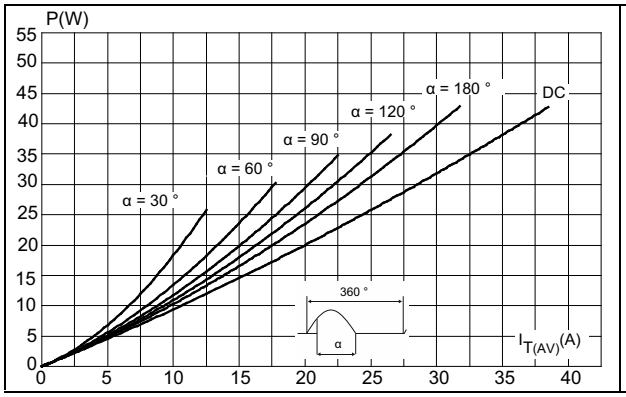


Figure 2. Correlation between maximum average power dissipation and maximum allowable temperatures (T_{amb} and T_{case})

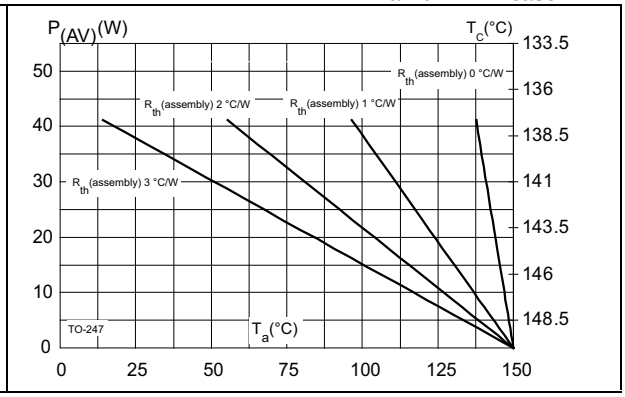


Figure 3. Average and D.C. on-state current versus case temperature

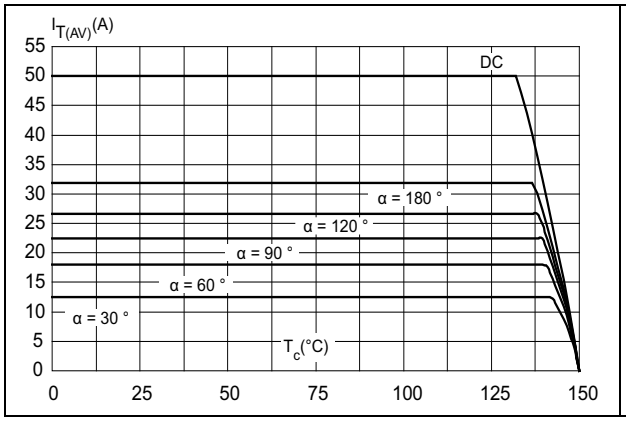


Figure 4. Average and D.C. on-state current versus ambient temperature

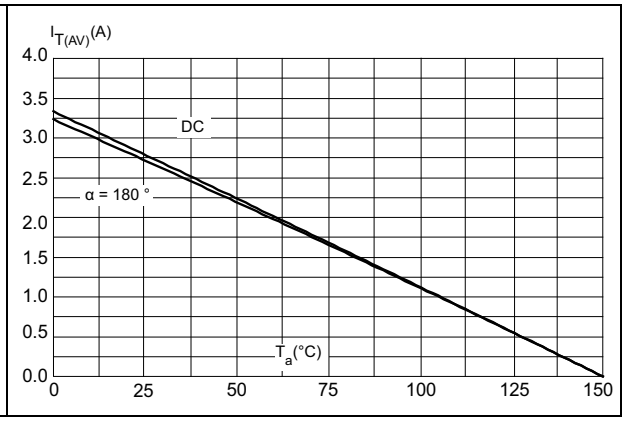


Figure 5. Relative variation of thermal impedance junction to case and junction to ambient versus pulse duration

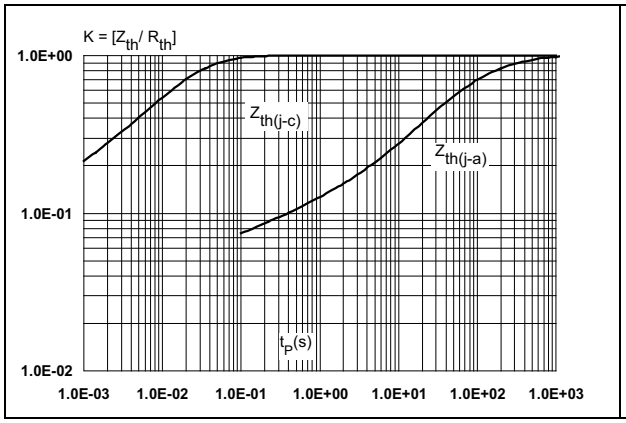


Figure 6. Relative variation of gate trigger current and gate voltage versus junction temperature (typical values)

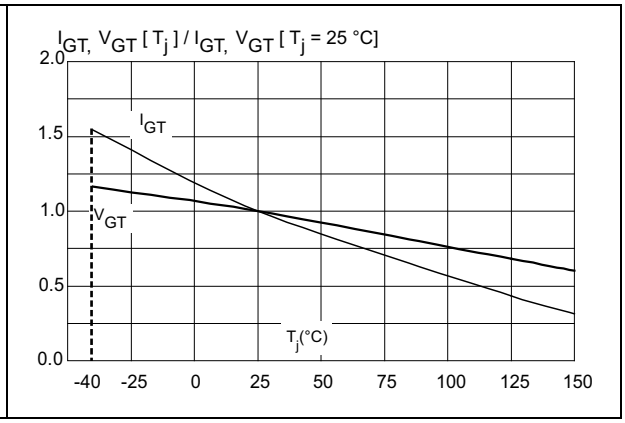


Figure 7. Relative variation of holding and latching current versus junction temperature (typical values)

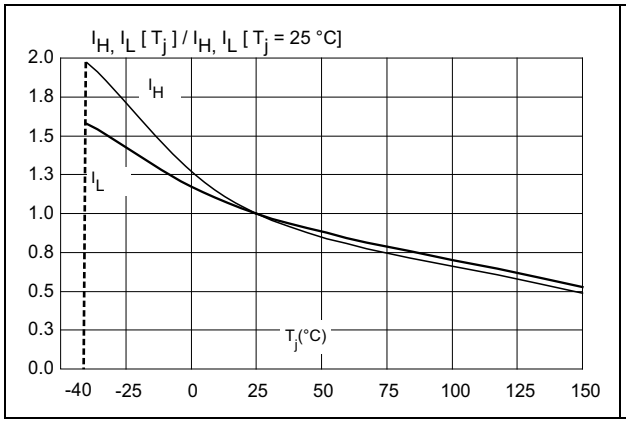


Figure 8. Surge peak on-state current versus number of cycles

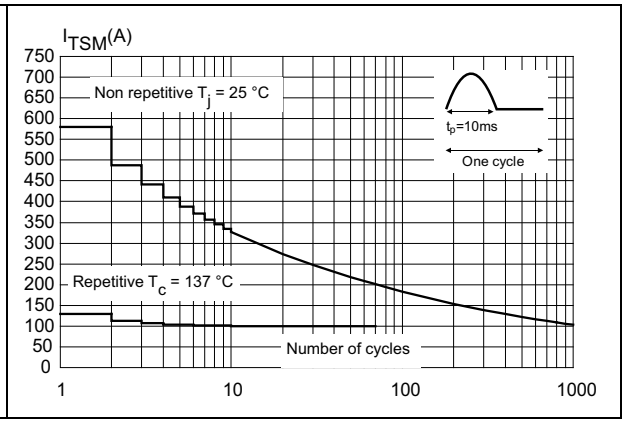


Figure 9. Non repetitive surge peak on-state current for a sinusoidal pulse (t_p < 10 ms)

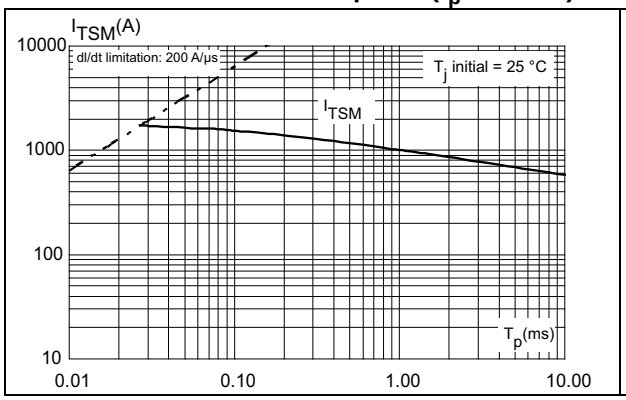


Figure 10. On-state characteristics (maximum values)

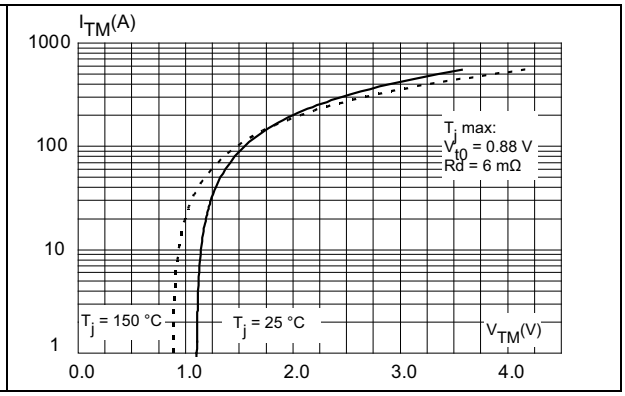
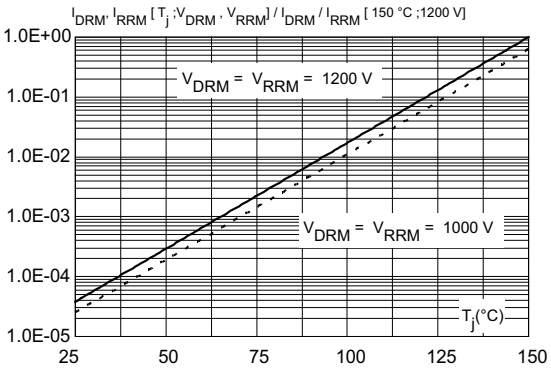


Figure 11. Relative variation of leakage current versus junction temperature for different values of blocking voltage (typical values)



2 Package information

- Epoxy meets UL94, V0
- Lead-free package

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.

Figure 12. TO-247 dimension definitions

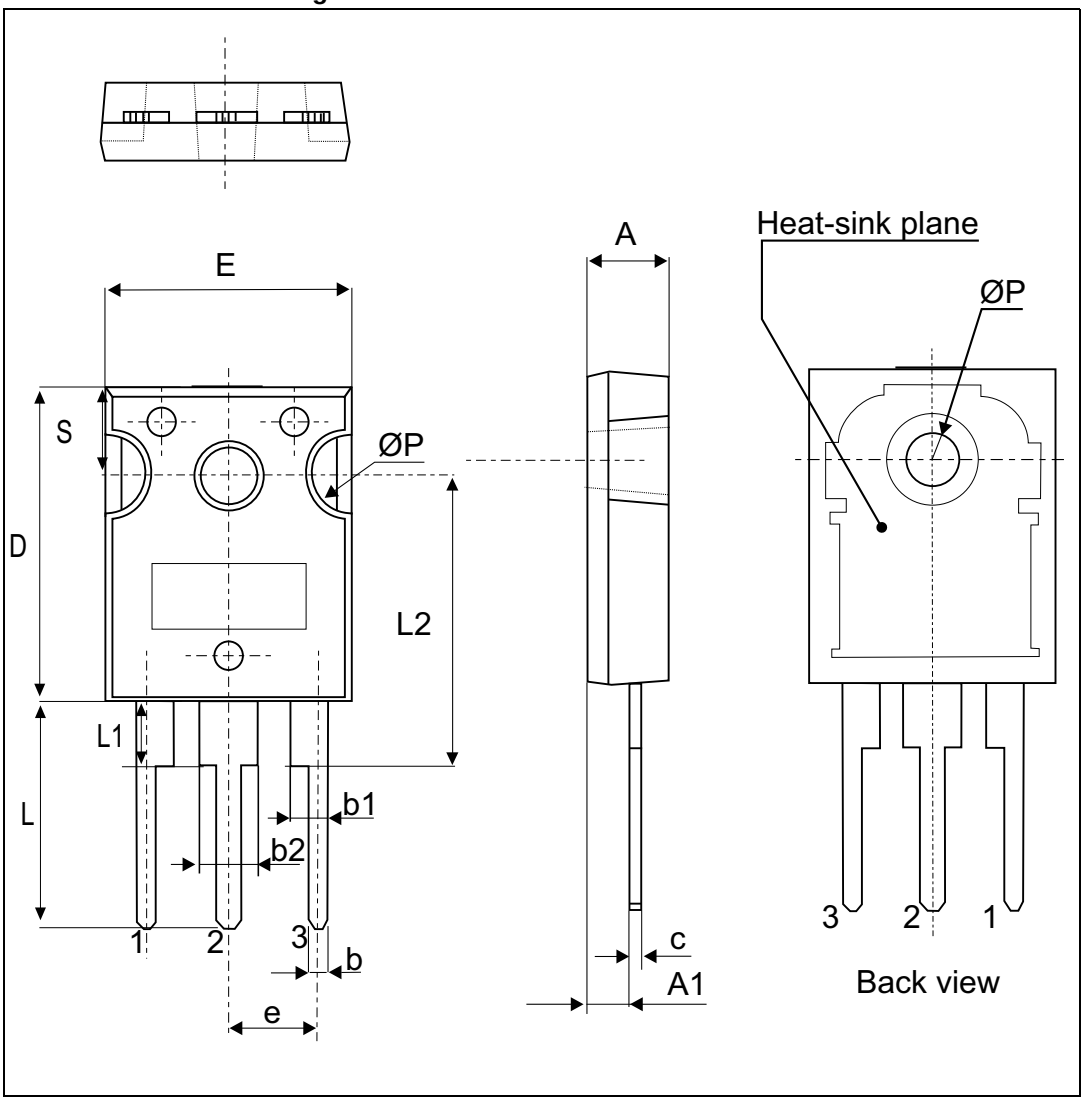


Table 5. TO-247 dimension values

Ref.	Dimensions					
	Millimeters			Inches		
	Min.	Typ.	Max.	Min.	Typ	Max.
A	4.85		5.15	0.191		0.203
A1	2.20		2.60	0.086		0.102
b	1.00		1.40	0.039		0.055
b1	2.00		2.40	0.078		0.094
b2	3.00		3.40	0.118		0.133
c	0.40		0.80	0.015		0.031
D(1)	19.85		20.15	0.781		0.793
E	15.45		15.75	0.608		0.620
e	5.30	5.45	5.60	0.209	0.215	0.220
L	14.20		14.80	0.559		0.582
L1	3.70		4.30	0.145		0.169
L2	18.50 typ.			0.728 typ.		
∅P(2)	3.55		3.65	0.139		0.143
∅R	4.50		5.50	0.177		0.217
S	5.30	5.50	5.70	0.209	0.216	0.224

1. Dimension D plus gate protrusion does not exceed 20.5 mm
2. Resin thickness around the mounting hole is not less than 0.9 mm

3 Ordering information

Table 6. Ordering information

Order code	Marking	Package	Weight	Base qty	Delivery mode
TN5050H-12WY	TN5050H12Y	TO-247	4.43 g	30	Tube

4 Revision history

Table 7. Document revision history

Date	Revision	Changes
07-Jan-2015	1	Initial release.