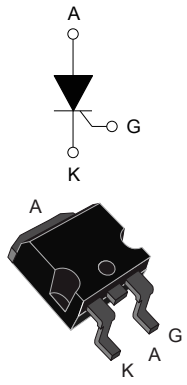
TN3050H-12GY-TR

Datasheet

30 A – 1200 V automotive grade SCR Thyristor



D²PAK

Features

- AEC-Q101 qualified
- High junction temperature: T_j = 150 °C
- AC off state voltage: +/- 1200 V
- Nominal on-state current: 30 A_{RMS}
- High noise immunity: 1000 V/µs
- Max. gate triggering current: 50 mA
- ECOPACK®2 compliant component

Applications

- Automotive applications: on board and off board battery charger
- Renewable energy inverters
- Solid state relay
- 3-Phase heating or motor soft start control
- UPS (uninterruptible power supply)
- Bypass SSR / hybrid relay
- Inrush current limiter in battery charger
- AC-DC voltage controlled rectifier
- Industrial welding systems

Product status link
TN3050H-12GY-TR

Product summary	
$I_{T(RMS)}$	30 A
V_{DRM}/V_{RRM}	1200 V
V_{DSM}/V_{RSM}	1400 V
I_{GT}	50 mA
T_j	150 °C

Description

The TN3050H-12GY-TR is an automotive grade SCR Thyristor designed for applications such as automotive on-board chargers, AC solid state relays and stationary battery chargers.

Rated for a 30 A_{RMS} power switching, This SCR Thyristor offers superior performance in terms of peak voltage robustness (up to 1400 V) and surge current handling (sine wave pulse up to 300 A). Its key features allow the design of functions such as a 42 A_{RMS} AC switch (dual back-to-back SCRs) and a 38 A average AC-DC controlled rectifier bridge for inrush current limitation.

Available in D²PAK package, it is ideal for compact SMD designs on surface mount boards or insulated metal substrate boards.

1 Characteristics

Table 1. Absolute ratings (limiting values)

Symbol	Parameter			Value	Unit
$I_{T(RMS)}$	RMS on-state current (180 ° conduction angle)		T_C = 126 °C	30	A
$I_{T(AV)}$	Average on-state current (180 ° conduction angle)			19	A
I_{TSM}[1]	Non repetitive surge peak on-state current, V_R = 0 V	t_p = 8.3 ms	T_j initial = 25 °C	330	A
		t_p = 10 ms		300	
V_{DRM} / V_{RRM}	Repetitive off-state voltage (50-60 Hz)		T_j = 150 °C	1200	V
dI/dt	Critical rate of rise of on-state current I_G = 2 x I_{GT} , tr ≤ 100 ns	f = 50 Hz	T_j = 150 °C	200	A/µs
V_{GM}	Peak forward gate voltage	t_p = 20 µs	T_j = 150 °C	10	V
I_{GM}	Peak forward gate current			8	A
$P_{G(AV)}$	Average gate power dissipation		T_j = 150 °C	1	W
V_{RGM}	Peak reverse gate voltage		T_j = 25 °C	5	V
T_{stg}	Storage junction temperature range			-40 to +150	°C
T_j	Operating junction temperature			-40 to +150	°C

1. *ST recommend I^2t value for fusing = 450 A^2s for T_j = 25 °C and t_P = 10 ms*

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}	V_D = 12 V, R_L = 33 Ω		Max.	1.3	V
V_{GD}	V_D = 2/3 x V_{DRM}, R_L = 3.3 kΩ	T_j = 150 °C	Min.	0.2	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 = 60 A , V_D = 2/3 x V_{DRM}, I_G = 100 mA, dI_G/dt = 0.2 A/µs		Typ.	1	µs
dV/dt	V_D = 2/3 x V_{DRM}, gate open	T_j = 150 °C	Min.	1000	V/µs
t_q	I_T = 20 A, dI_T/dt = 10 A/µs, V_R = 75 V, V_D = 2/3 x V_{DRM}, dV_D/dt = 20 V/µs, t_P = 100 µs	T_j = 150 °C	Typ.	150	µs
V_{TM}	I_{TM} = 60 A, t_P = 380 µs		Max.	1.65	V
V_{TO}	Threshold voltage	T_j = 150 °C	Max.	0.88	V
R_D	Dynamic resistance	T_j = 150 °C	Max.	14	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.	5	mA
I_{DSM}/I_{RSM}	V_D = V_{DSM}, V_R = V_{RSM}	T_j = 25 °C	Max.	10	µA

Table 3. Thermal parameters

Symbol	Parameter		Value	Unit
$R_{th(j-c)}$	Junction to case (DC, max.)	D²PAK	0.8	°C/W
$R_{th(j-a)}$	Junction to ambient (DC, typ., S_{cu} = 1 cm^2)		45	

1.1 Characteristics (curves)

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

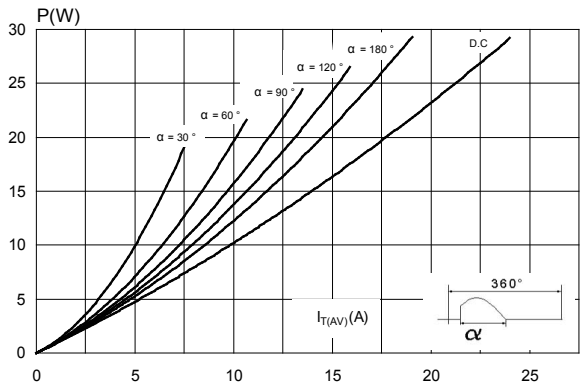


Figure 2. Average and DC on-state current versus case temperature

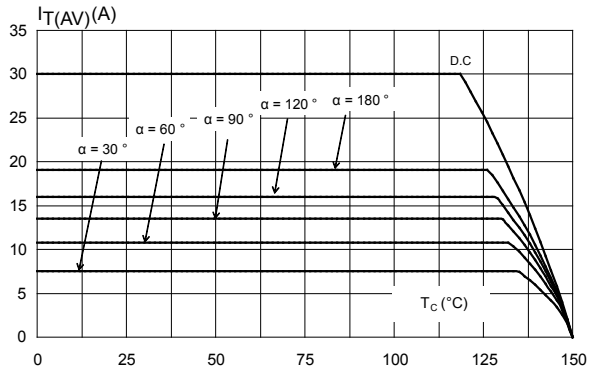


Figure 3. On-state characteristics (maximum values)

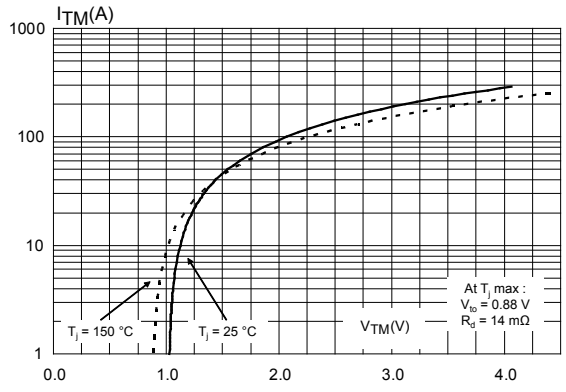


Figure 4. Average and D.C. on-state current versus ambient temperature

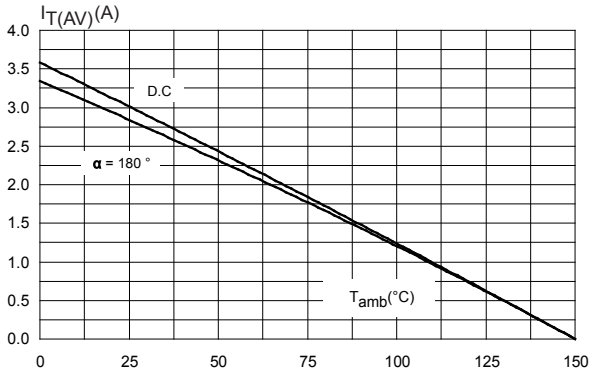


Figure 5. Relative variation of thermal impedance junction to case and junction to ambient versus pulse duration

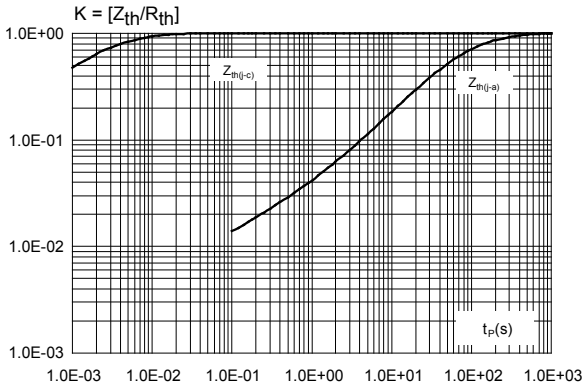


Figure 6. Thermal resistance junction to ambient versus copper surface under tab (printed circuit board FR4, copper thickness: 35 µm)

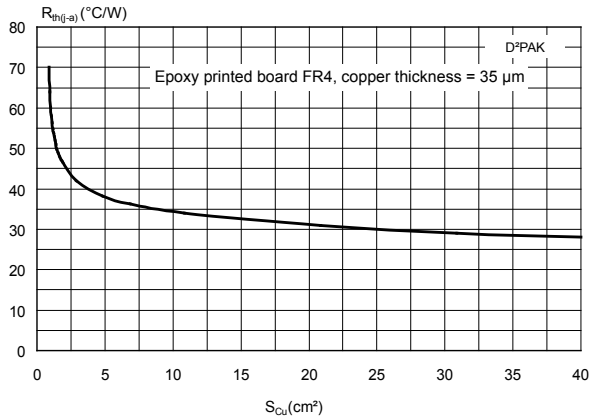


Figure 7. Surge peak on-state current versus number of cycles

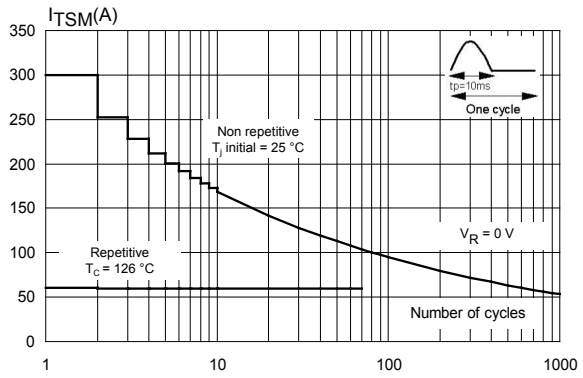


Figure 8. Non repetitive surge peak on-state current for a sinusoidal pulse (t_p < 10 ms)

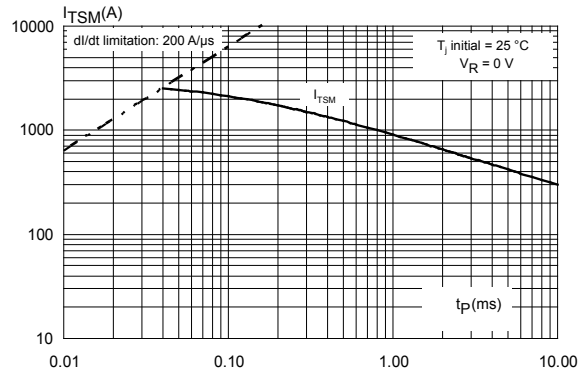


Figure 9. Relative variation of holding and latching current versus junction temperature (typical values)

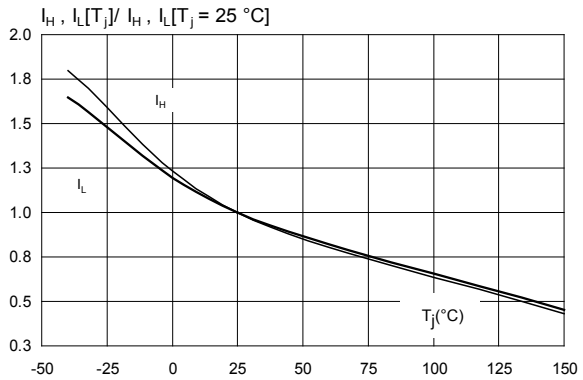


Figure 10. Relative variation of gate triggering current and voltage versus junction temperature

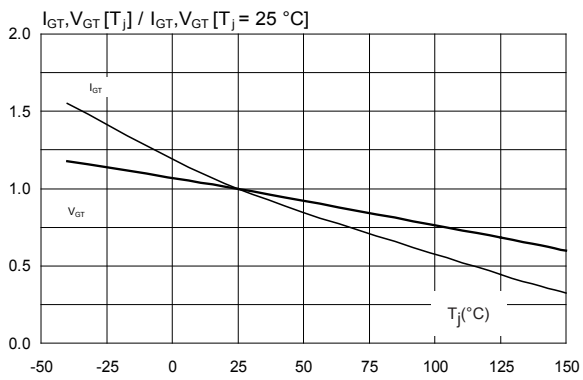


Figure 11. Relative variation of leakage current versus junction temperature for different values of blocking voltage

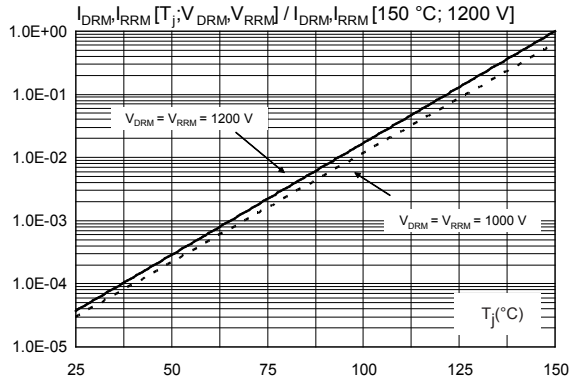
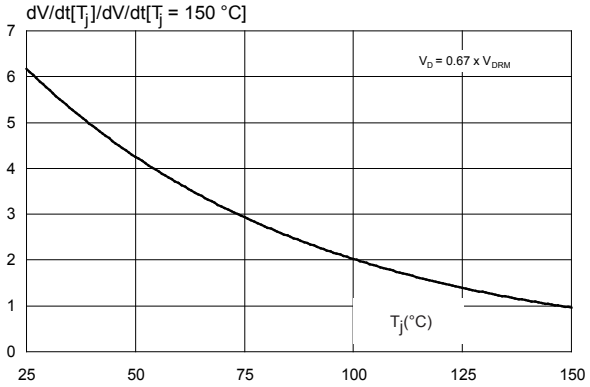


Figure 12. Relative variation of the static dV/dt immunity versus junction temperature (typical values)



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 D²PAK package information

- Package molding resin is halogen free and meets UL94 level V0
- Lead-free package leads
- Cooling method: by conduction (C)

Figure 13. D²PAK package outline

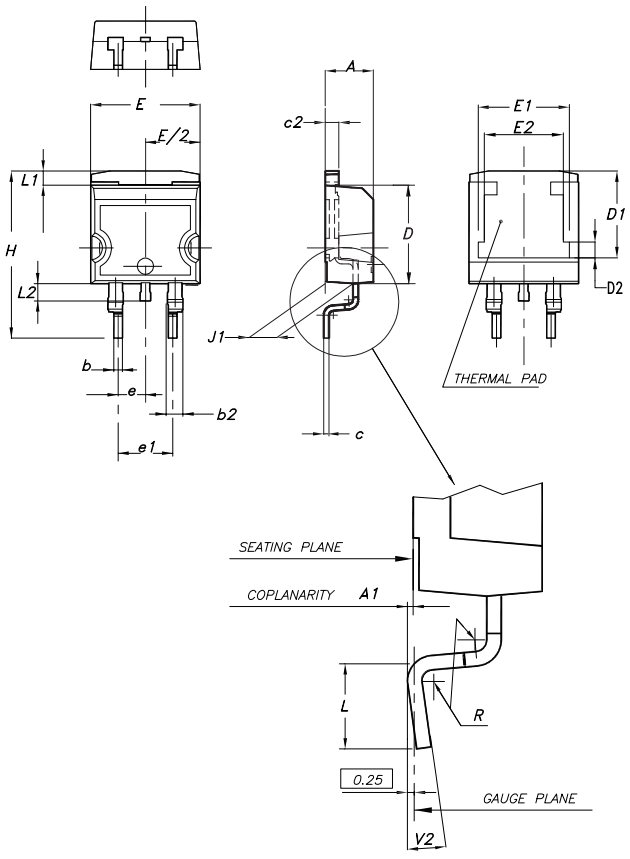
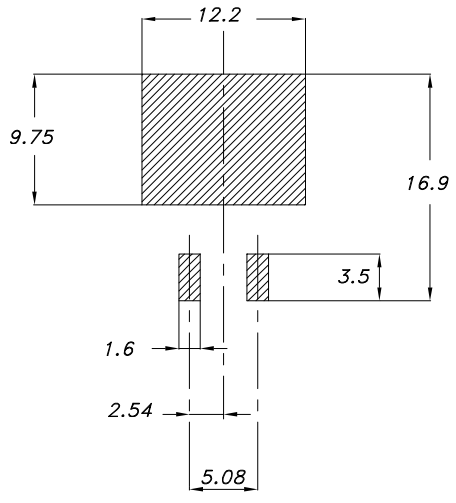


Table 4. D²PAK package mechanical data

Ref.	Dimensions					
	Millimeters			Inches[1]		
	Min.	Typ.	Max.	Min.	Typ.	Max.
A	4.40		4.60	0.1732		0.1811
A1	0.03		0.23	0.0012		0.0091
b	0.70		0.93	0.0276		0.0366
b2	1.14		1.70	0.0449		0.0669
c	0.45		0.60	0.0177		0.0236
c2	1.23		1.36	0.0484		0.0535
D	8.95		9.35	0.3524		0.3681
D1	7.50	7.75	8.00	0.2953	0.3051	0.3150
D2	1.10	1.30	1.50	0.0433	0.0511	0.0591
E	10		10.40	0.3937		0.4094
E1	8.50	8.70	8.90	0.3346	0.3425	0.3504
E2	6.85	7.05	7.25	0.2697	0.2776	0.2854
e		2.54			0.1000	
e1	4.88		5.28	0.1921		0.2079
H	15		15.85	0.5906		0.6240
J1	2.49		2.69	0.0980		0.1059
L	2.29		2.79	0.0902		0.1098
L1	1.27		1.40	0.0500		0.0551
L2	1.30		1.75	0.0512		0.0689
R		0.4			0.0157	
V2	0°		8°	0°		8°

1. *Dimensions in inches are given for reference only*

Figure 14. D²PAK recommended footprint (dimensions are in mm)



Footprint

3 Ordering information

Table 5. **Ordering information**

Order code	Marking	Package	Weight	Base qty.	Delivery mode
TN3050H-12GY-TR	TN3050H12Y	D²PAK	1.4 g	1000	Tape and reel

Revision history

Table 6. **Document revision history**

Date	Revision	Changes
01-Sep-2016	1	Initial release.
24-Aug-2017	2	Minor text changes to improve readability. Updated Section "Features", Table 2: "Absolute ratings (limiting values)" and Section 2: "Package information".
17-Sep-2019	3	Updated Section Description and Table 1. Absolute ratings (limiting values).