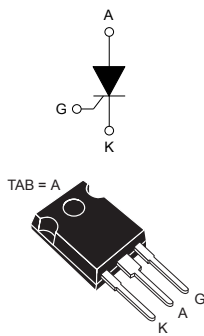



## 30 A, 1200 V automotive grade SCR Thyristor



TO-247 uninsulated

## Features

- AEC-Q101 qualified 
- High junction temperature:  $T_j = 150\text{ }^\circ\text{C}$
- AC off state voltage: +/- 1200 V
- Nominal on-state current:  $30\text{ A}_{\text{RMS}}$
- High noise immunity:  $1000\text{ V}/\mu\text{s}$
- Max. gate triggering current: 50 mA
- ECOPACK2 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

## Description

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

This SCR Thyristor, rated for a 30 A RMS power switching, offers superior performance in peak voltage robustness up to 1400 V and surge current handling up to 300 A sine wave pulse. 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 through-hole TO-247 package, this power package allows a thermal operation up to 30 A RMS with a higher case temperature of  $126\text{ }^\circ\text{C}$ .

Product status	
TN3050H-12WY	
Product summary	
$I_{\text{T(RMS)}}$	30 A
$V_{\text{DRM}}/V_{\text{RRM}}$	1200 V
$V_{\text{DSM}}/V_{\text{RSM}}$	1400 V
$I_{\text{GT}}$	50 mA
$T_j$	$150\text{ }^\circ\text{C}$

# 1 Characteristics

**Table 1. Absolute ratings (limiting values)**

Symbol	Parameter		Value	Unit
$I_{T(RMS)}$	RMS on-state current (180 ° conduction angle)		30	A
$I_{T(AV)}$	Average on-state current (180 ° conduction angle)			
$I_{TSM}^{(1)}$	Non repetitive surge peak on-state current, $V_R = 0$ V	$t_p = 8.3$ ms	330	A
		$t_p = 10$ ms		
$V_{DRM}/V_{RRM}$	Repetitive off-state voltage (50-60 Hz)		1200	V
$di/dt$	$I_G = 2 \times I_{GT}$ , $t_r \leq 100$ ns Critical rate of rise of on-state current	$f = 50$ Hz	200	A/ $\mu$ s
$I_{GM}$	Peak forward gate current	$t_p = 20$ $\mu$ s	8	A
$P_{G(AV)}$	Average gate power dissipation		1	W
$T_{stg}$	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<sup>2</sup>s for  $T_j = 25$  °C and  $t_p = 10$  ms

**Table 2. Electrical characteristics ( $T_j = 25$  °C unless otherwise specified)**

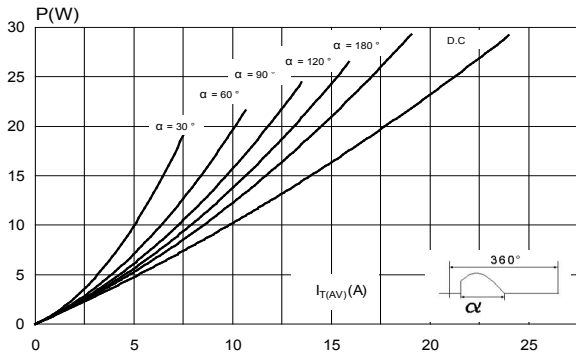
Symbol	Test Conditions		Value	Unit
$I_{GT}$	$V_D = 12$ V, $R_L = 33$ $\Omega$		Min.	10
			Max.	50
$V_{GT}$	$V_D = 12$ V, $R_L = 33$ $\Omega$		Max.	1.3
$V_{GD}$	$V_D = 2/3 \times V_{DRM}$ , $R_L = 3.3$ k $\Omega$	$T_j = 150$ °C	Min.	0.2
$I_H$	$I_T = 500$ mA, gate open		Max.	100
$I_L$	$I_G = 1.2 \times I_{GT}$		Max.	125
$t_{gt}$	$I_T = 60$ A, $V_D = 2/3 \times V_{DRM}$ , $I_G = 100$ mA, $di_G/dt = 0.2$ A/ $\mu$ s		Typ.	1
$dV/dt$	$V_D = 2/3 \times V_{DRM}$ , gate open	$T_j = 150$ °C	Min.	1000
$t_q$	$I_T = 20$ A, $di_T/dt = 10$ A/ $\mu$ s, $V_R = 75$ V, $V_D = 2/3 \times V_{DRM}$ , $dV_D/dt = 20$ V/ $\mu$ s, $t_p = 100$ $\mu$ s	$T_j = 150$ °C	Typ.	150
$V_{TM}$	$I_{TM} = 60$ A, $t_p = 380$ $\mu$ s		Max.	1.65
$V_{TO}$	Threshold voltage		$T_j = 150$ °C	Max.
$R_D$	Dynamic resistance		$T_j = 150$ °C	Max.
$I_{DRM}/I_{RRM}$	$V_D = V_{DRM}$ , $V_R = V_{RRM}$	$T_j = 25$ °C	Max.	5
		$T_j = 125$ °C	Max.	3
		$T_j = 150$ °C	Max.	5
$I_{DSM}/I_{RSM}$	$V_D = V_{DSM}$ , $V_R = V_{RSM}$	$T_j = 25$ °C	Max.	10

Table 3. Thermal parameters

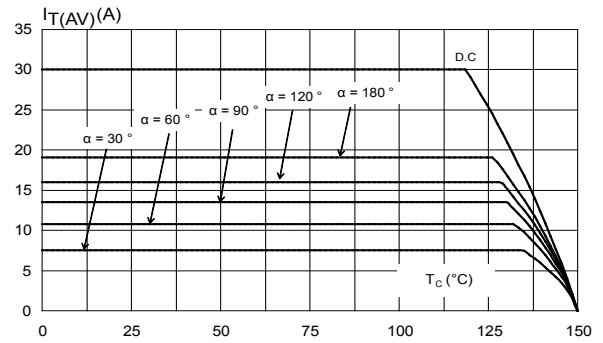
Symbol	Parameter	Value	Unit
$R_{th(j-c)}$	Junction to case (DC, max.)	0.8	°C/W
$R_{th(j-a)}$	Junction to ambient (typ.)	50	

## 1.1 Characteristics curves

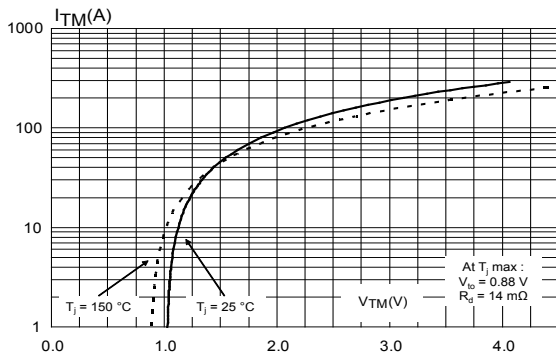
**Figure 1. Maximum average power dissipation versus average on-state current**



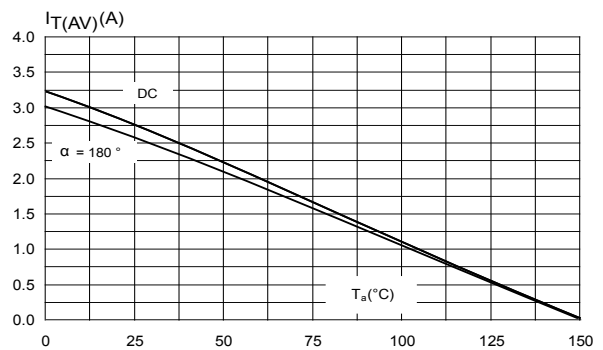
**Figure 2. Average and DC on-state current versus case temperature**



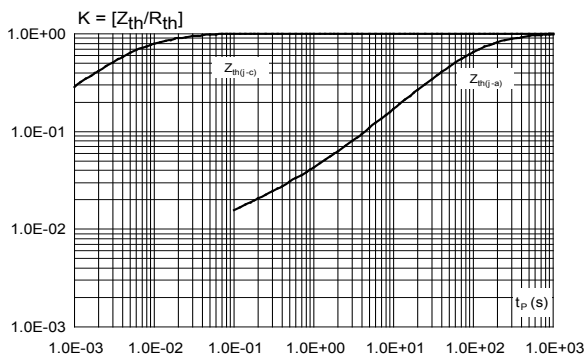
**Figure 3. On-state characteristics (maximum values)**



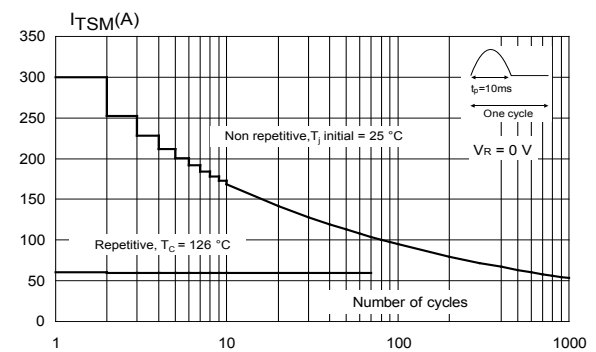
**Figure 4. Average and D.C. on-state current versus ambient temperature**



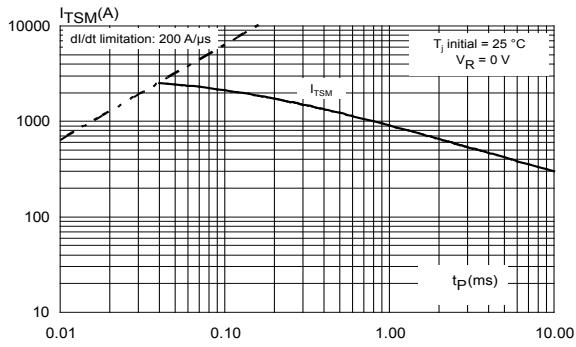
**Figure 5. Relative variation of thermal impedance junction to case and junction to ambient versus pulse duration**



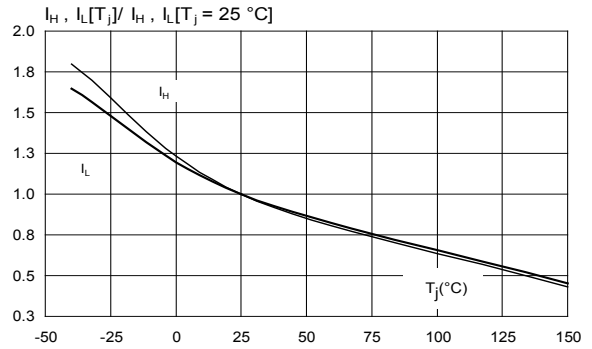
**Figure 6. Surge peak on-state current versus number of cycles**



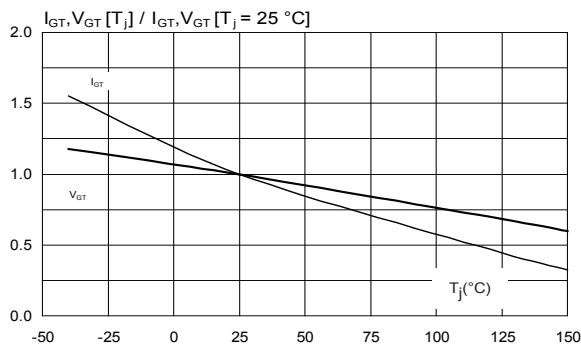
**Figure 7. Non repetitive surge peak on-state current for a sinusoidal pulse ( $t_p < 10$  ms)**



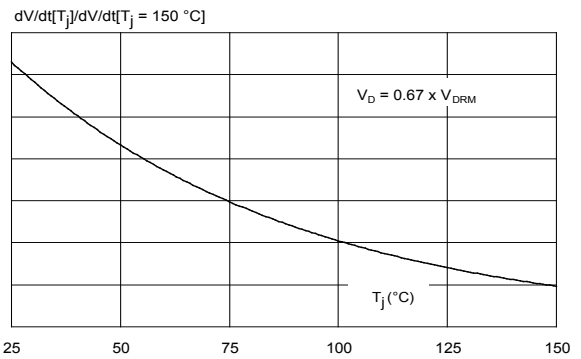
**Figure 8. Relative variation of holding and latching current versus junction temperature (typical values)**



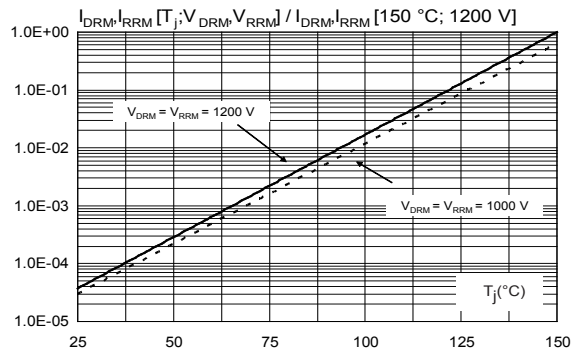
**Figure 9. Relative variation of gate triggering current and voltage versus junction temperature**



**Figure 10. Relative variation of the static dV/dt immunity versus junction temperature (typical values)**



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



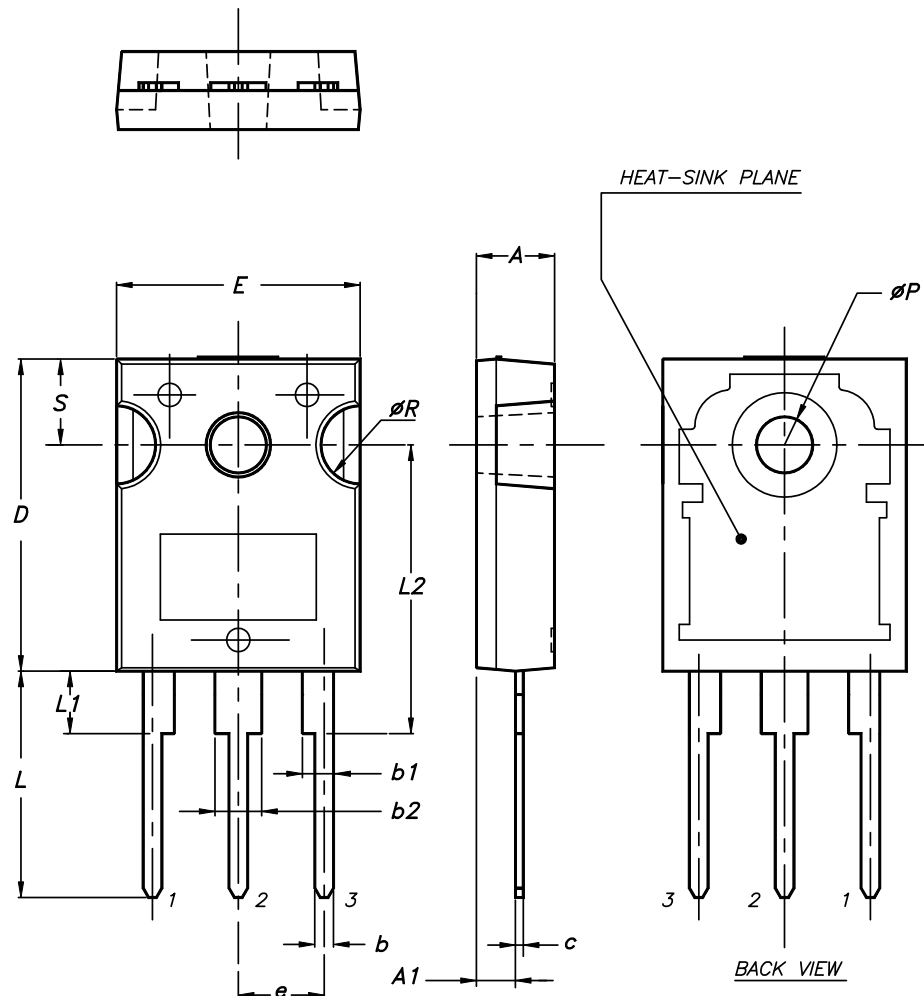
## 2 Package information

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](http://www.st.com). ECOPACK is an ST trademark.

### 2.1 TO-247 package information

- Epoxy meets UL 94,V0
- Recommended torque value: 0.8 N·m
- Maximum torque value: 1 N·m

Figure 12. TO-247 package outline



0075325\_9

**Table 4. TO-247 package mechanical data**

Dim.	Dimensions					
	Millimeters			Inches <sup>(1)</sup>		
	Min.	Typ.	Max.	Min.	Typ.	Max.
A	4.85		5.15	0.1909		0.2028
A1	2.20		2.60	0.0866		0.1024
b	1.0		1.40	0.0394		0.0551
b1	2.0		2.40	0.0787		0.0945
b2	3.0		3.40	0.1181		0.1339
c	0.40		0.80	0.0157		0.0315
D <sup>(2)</sup>	19.85		20.15	0.7815		0.7933
E	15.45		15.75	0.6083		0.6201
e	5.30	5.45	5.60	0.2087	0.2146	0.2205
L	14.20		14.80	0.5591		0.5827
L1	3.70		4.30	0.1457		0.1693
L2		18.50			0.7283	
ØP <sup>(3)</sup>	3.55		3.65	0.1398		0.1437
ØR	4.50		5.50	0.1772		0.2165
S	5.30	5.50	5.70	0.2087	0.2165	0.2244

1. Inch dimensions given only for reference
2. Dimension D plus gate protrusion does not exceed 20.5 mm
3. Resin thickness around the mounting hole is not less than 0.9 mm

### 3 Ordering information

**Table 5. Ordering information**

Order code	Marking	Package	Weight	Base qty.	Delivery mode
TN3050H-12WY	TN3050H12Y	TO-247	4.4 g	50	Tube



## Revision history

**Table 6. Document revision history**

Date	Revision	Changes
16-Sep-2016	1	Initial release.
03-Oct-2016	2	Updated Table 3. Thermal parameters.
15-Jan-2019	3	Updated Table 5. Ordering information.
05-Aug-2019	4	Updated Section Description and Table 1. Absolute ratings (limiting values).
31-Mar-2020	5	Updated Figure 6 and Figure 7.

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