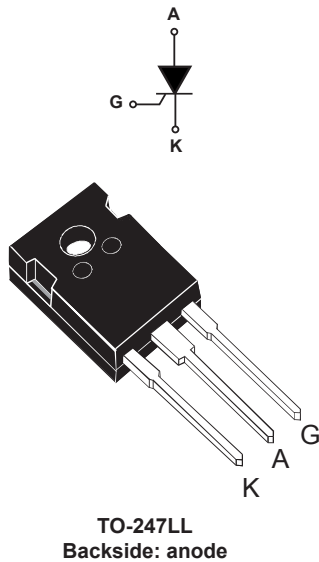


## 40 A - 1200 V SCR in TO-247LL package



## Features

- Max. repetitive blocking voltage =  $V_{DRM}$ ,  $V_{RRM}$  = 1200 V
- $I_{GT}$  maximum = 50 mA
- RMS on state current  $I_{TRMS}$  : 40 A
- High static and dynamic commutation:
  - $di/dt$  = 100 A/ $\mu$ s
  - $dV/dt$  = 2000 V/ $\mu$ s
- **ECOPACK2** component (RoHS and HF compliance)

## Applications

- Solar / Wind renewable energy inverters and rectifiers
- Solid state relay (SSR)
- Uninterruptible power supply (UPS)
- Industrial SMPS
- Bypass
- AC DC inrush current limiter (ICL)
- AC DC voltage controlled rectifier
- Battery charger
- Industrial welding systems
- Soft starter
- Heating systems

## Description

The **TN4050-12WL** SCR is suitable in industrial application where high immunity is required with a lower gate current.

Available in through-hole high power package TO-247LL (long lead) with anode in backside.

Product status link	
<a href="#">TN4050-12WL</a>	
Product summary	
$I_{T(RMS)}$	40 A
$I_{T(AV)}$	25 A
$V_{DRM}/V_{RRM}$	1200 V
$I_{GTmax.}$	50 mA
Package	TO-247LL

# 1 Characteristics

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

Symbol	Parameter		Value	Unit	
$I_{T(RMS)}$	On-state RMS current (180 ° conduction angle)		40	A	
$I_{T(AV)}$	Average on-state current (180 ° conduction angle)				
$I_{TSM}$	Non repetitive surge peak on-state current ( $T_j$ initial = 25 °C), $V_R = 0$ V		$t_p = 8.3$ ms	435	A
			$t_p = 10$ ms	400	
$I^2t$	$I^2t$ value for fusing		$t_p = 10$ ms	800	A <sup>2</sup> s
$di/dt$	Critical rate of rise of on-state current $I_G = 100$ mA, $di_g/dt = 1$ A/ $\mu$ s		$T_j = 25$ °C	100	A/ $\mu$ s
$I_{GM}$	Maximum peak positive gate current	$t_p = 20$ $\mu$ s	$T_j = 125$ °C	8	A
$V_{GM}$	Maximum peak positive gate voltage			5	V
$V_{DRM}, V_{RRM}$	Repetitive peak off-state voltage (50-60 Hz)			1200	V
$P_{G(AV)}$	Average gate power dissipation		$T_j = 125$ °C	1	W
$V_{RGM}$	Maximum peak reverse gate voltage			3.5	V
$T_{stg}$	Storage junction temperature range			-40 to +150	°C
$T_j$	Operating junction temperature range			-40 to +125	

**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	mA
			Max.	50	
$V_{GT}$			Max.	1.5	V
$V_{GD}$	$V_D = V_{DRM}$ , $R_L = 3.3$ k $\Omega$	$T_j = 125$ °C	Min.	0.2	V
$I_H$	$I_T = 500$ mA, gate open		Max.	100	mA
$I_L$	$I_G = 1.2 \times I_{GT}$		Max.	130	mA
$dV/dt$	$V_D = 67\%$ $V_{DRM}$ , gate open	$T_j = 125$ °C	Min.	2	kV/ $\mu$ s
$t_{gt}$	$I_T = 40$ A, $V_D = 67\%$ $V_{DRM}$ , $I_G = 100$ mA, $(di_G/dt)_{max} = 0.2$ A/ $\mu$ s		Typ.	2	$\mu$ s
$t_q$	$I_{TM} = 40$ A, $V_D = 67\%$ $V_{DRM}$ (800 V), $di_{TM}/dt = 30$ A/ $\mu$ s, $V_R = 25$ V, $dV_D/dt = 200$ V/ $\mu$ s	$T_j = 125$ °C	Typ.	100	$\mu$ s

**Table 3. Static characteristics**

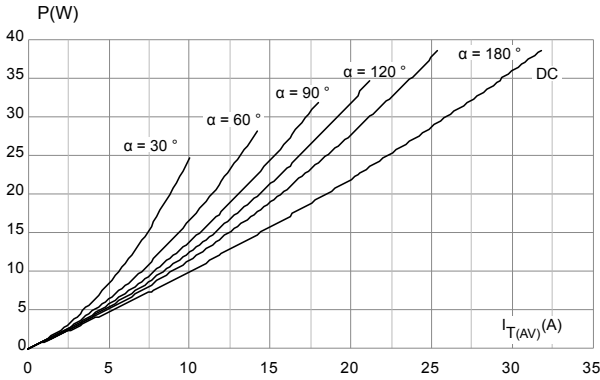
Symbol	Test conditions			Value	Unit
$V_{TM}$	$I_{TM} = 80 \text{ A}$ , $t_p = 380 \text{ } \mu\text{s}$	$T_j = 25 \text{ }^\circ\text{C}$	Max.	1.75	V
$V_{TO}$	Threshold voltage	$T_j = 125 \text{ }^\circ\text{C}$	Max.	0.9	
$R_D$	Dynamic resistance	$T_j = 125 \text{ }^\circ\text{C}$	Max.	9.8	m $\Omega$
$I_{DRM}$ , $I_{RRM}$	$V_{DRM} = V_{RRM} = 1200 \text{ V}$	$T_j = 25 \text{ }^\circ\text{C}$	Max.	10	$\mu\text{A}$
		$T_j = 125 \text{ }^\circ\text{C}$		5	mA

**Table 4. Thermal parameters**

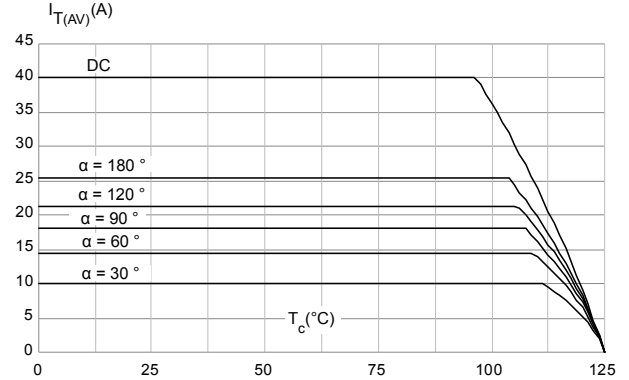
Symbol	Parameter		Value	Unit
$R_{th(j-c)}$	Junction to case (DC)	Max.	0.55	$^\circ\text{C/W}$
$R_{th(j-a)}$	Junction to ambient (DC)	Typ.	50	

## 1.1 Characteristics curves

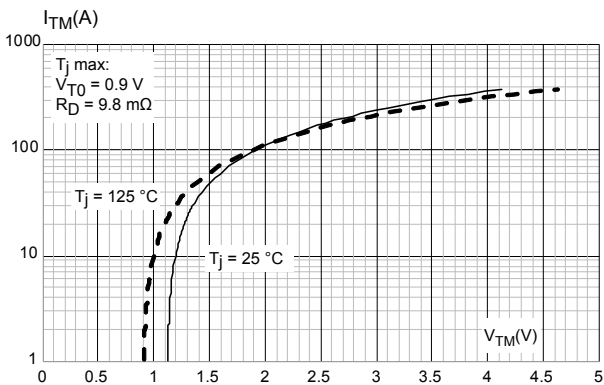
**Figure 1. Maximum average power dissipation versus average on-state current**



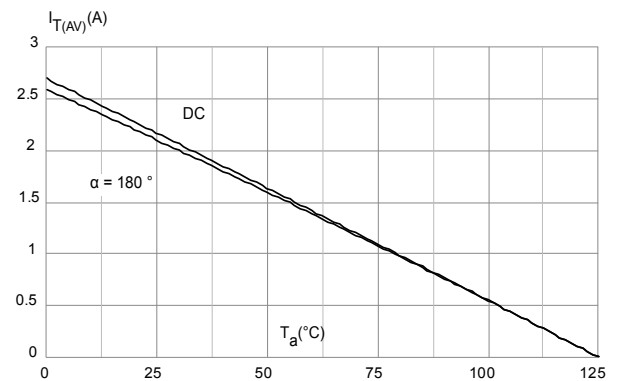
**Figure 2. Average and DC on-state current versus case temperature**



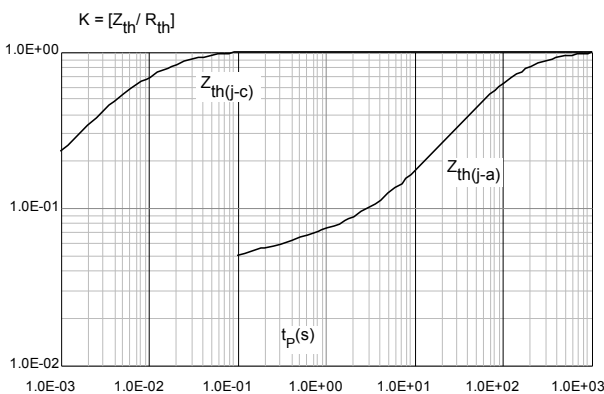
**Figure 3. On-state characteristics (maximum values)**



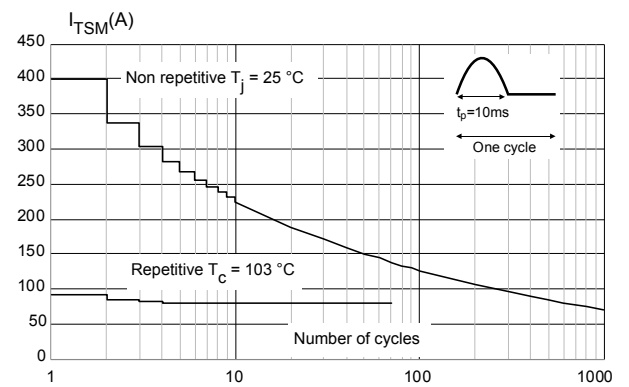
**Figure 4. Average and D.C. on-state current versus ambient temperature**



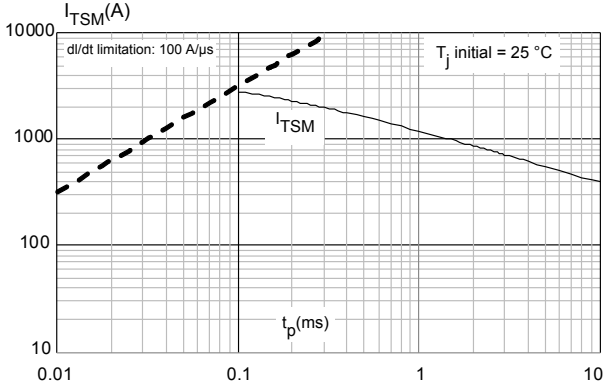
**Figure 5. Relative variation of thermal impedance junction to case and junction to ambient versus pulse duration**



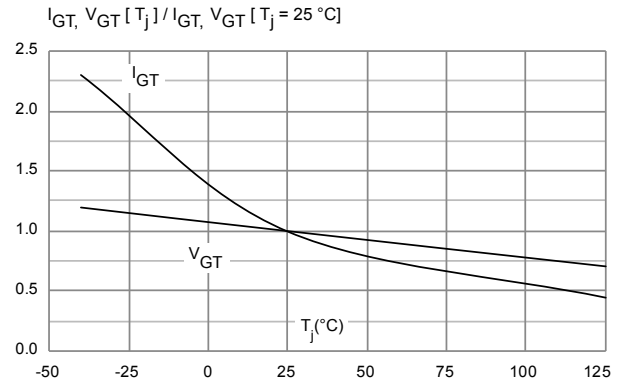
**Figure 6. Surge peak on-state current versus number of cycles**



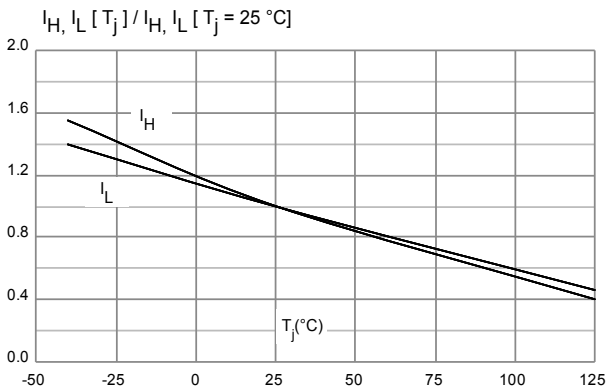
**Figure 7. Non repetitive surge peak on-state current for a sinusoidal pulse with width  $t_p < 10$  ms**



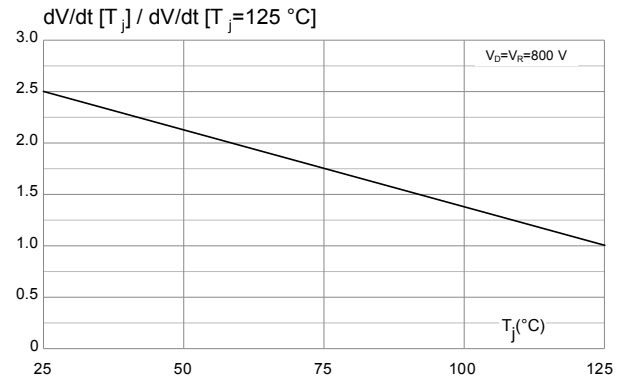
**Figure 8. Relative variation of gate trigger current and gate trigger voltage versus junction temperature (typical value)**



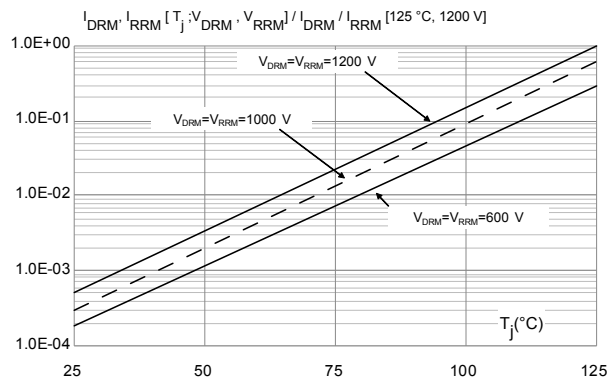
**Figure 9. Relative variation of holding and latching current versus junction temperature (typical value)**



**Figure 10. Relative variation of static dV/dt immunity versus junction temperature**



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



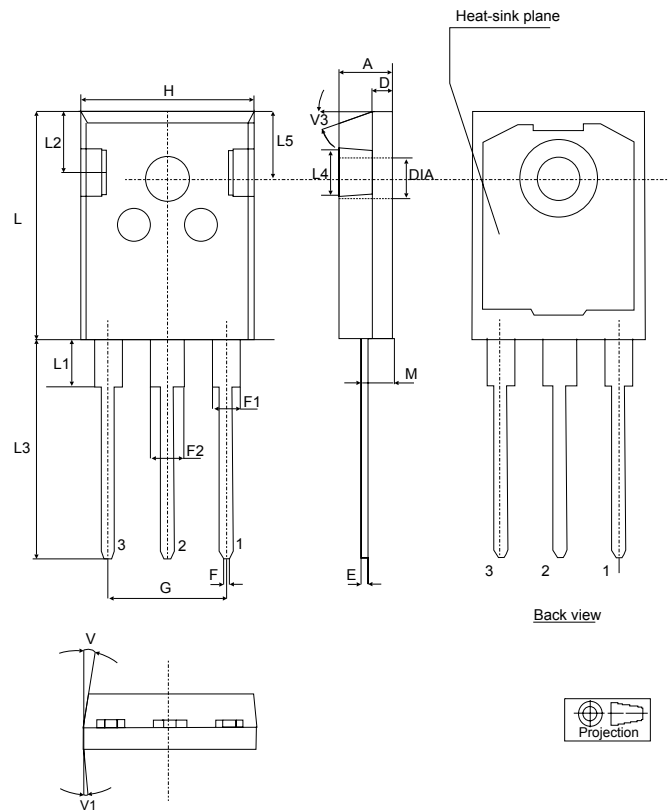
## 2 Package information

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

### 2.1 TO-247LL package information

- Molding epoxy resin is halogen free and meets UL94 level V0
- lead free plating of the package leads
- Cooling method: by conduction (C)
- Recommended torque value: 0.8 to 1.0 N·m

Figure 12. TO-247 long leads package outline



**Table 5. TO-247 long leads package mechanical data**

Dim.	mm.			Inches (only for reference)		
	Min.	Typ.	Max.	Min.	Typ.	Max.
A	4.90		5.15	0.1929		0.2028
D	1.85		2.10	0.0728		0.0827
E	0.55		0.67	0.0217		0.0264
F	1.07		1.32	0.0421		0.0520
F1	1.90		2.38	0.0748		0.0937
F2	2.87		3.38	0.1130		0.1331
G	10.90 BSC			0.429 BSC		
H	15.77		16.02	0.6209		0.6307
L	20.82		21.07	0.8197		0.8295
L1	4.16		4.47	0.1638		0.1760
L2	5.49		5.74	0.2161		0.2260
L3	20.05		20.30	0.7894		0.7992
L4	3.68		3.93	0.1449		0.1547
L5	6.04		6.29	0.2378		0.2476
M	2.25		2.55	0.0880		0.1010
V		10°			10°	
V1		3°			3°	
V3		20°			20°	
DIA	3.55		3.66	0.1398		0.1441

*Note: Resin thickness around the mounting hole is not less than 0.9 mm*

### 3 Ordering information

Figure 13. Ordering information scheme

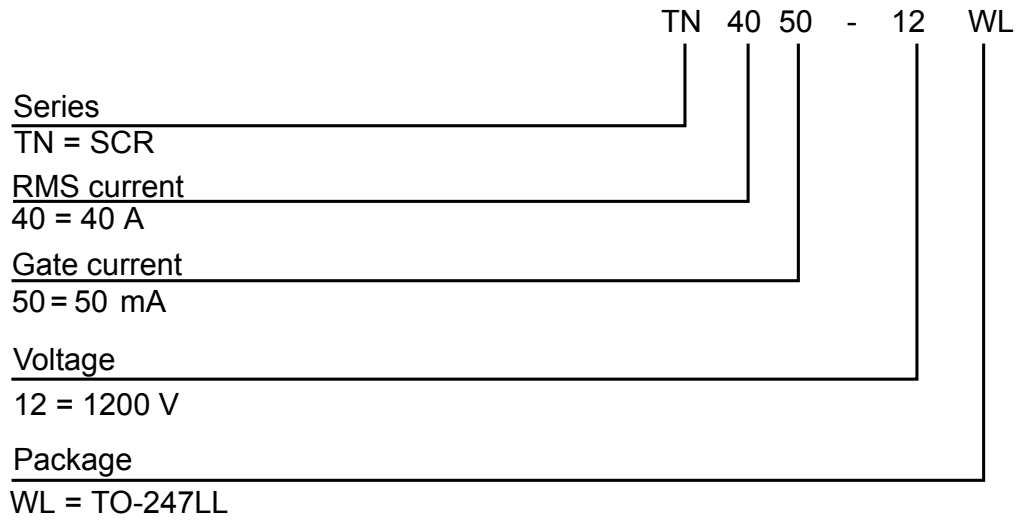


Table 6. Ordering information

Order code	Marking	Package	Weight	Base qty.	Delivery mode
TN4050-12WL	TN4050-12	TO-247LL	6.09 g	30	Tube



## Revision history

**Table 7. Document revision history**

Date	Revision	Changes
18-Feb-2020	1	Initial release.