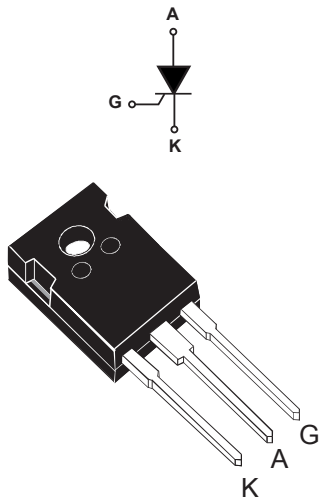
TN6050-12WL

Datasheet

60 A - 1200 V SCR in TO-247LL package



TO-247LL
Backside: anode

Features

- Max. repetitive blocking voltage = V_{DRM}, V_{RRM} = 1200 V
- I_{GT} maximum = 50 mA
- RMS on state current I_{TRMS} = 60 A
- High static and dynamic commutation:
  - dI/dt = 100 A/µs
  - dV/dt = 2000 V/µs
- 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

Product status
TN6050-12WL

Product summary	
$I_{T(RMS)}$	60 A
$I_{T(AV)}$	38 A
V_{DRM}/V_{RRM}	1200 V
I_{GT} max.	50 mA
Package	TO-247LL

Description

The TN6050-12WL 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.

1 Characteristics

Table 1. Absolute maximum ratings (limiting values)

Symbol	Parameter			Value	Unit
$I_{T(RMS)}$	On-state RMS current (180 ° conduction angle)		T_c = 99 °C	60	A
$I_{T(AV)}$	Average on-state current (180 ° conduction angle)			38	
I_{TSM}	Non repetitive surge peak on-state current (T_j initial = 25 °C), V_R = 0 V		t_p = 8.3 ms	767	A
			t_p = 10 ms	700	
I^2t	I^2t value for fusing		t_p = 10 ms	2450	A^2s
dI/dt	Critical rate of rise of on-state current I_G = 100 mA, dI_g/dt = 1 A/µs		T_j = 25 °C	100	A/µs
I_{GM}	Maximum peak positive gate current	t_p = 20 µs	T_j = 125 °C	8	A
V_{GM}	Maximum peak positive gate voltage			5	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 Ω		Min.	8	mA
			Max.	50	
V_{GT}			Max.	1.3	V
V_{GD}	V_D = V_{DRM}, R_L = 3.3 kΩ	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 x I_{GT}		Max.	130	mA
dV/dt	V_D = 67% V_{DRM}, gate open	T_j = 125 °C	Min.	2	kV/µs
t_{gt}	I_T = 120 A, V_D = 67% V_{DRM}, I_G = 100 mA, (dI_G/dt) max = 0.2 A/µs		Typ.	2	µs
t_q	I_T = 60 A, V_D = 67% V_{DRM} (800 V), dI_{TM}/dt = 30 A/µs, V_R = 25 V, dV/dt = 200 V/µs	T_j = 125 °C	Typ.	100	µs

Table 3. Static characteristics

Symbol	Test conditions			Value	Unit
V_{TM}	I_{TM} = 120 A, t_p = 380 µs	T_j = 25 °C	Max.	1.75	V
V_{TO}	Threshold voltage	T_j = 125 °C	Max.	0.93	
R_D	Dynamic resistance	T_j = 125 °C	Max.	7.1	mΩ
I_{DRM}, I_{RRM}	V_{DRM} = V_{RRM} = 1200 V	T_j = 25 °C	Max.	10	µA
		T_j = 125 °C		6.5	mA

Table 4. **Thermal parameters**

Symbol	Parameter		Value	Unit
$R_{th(j-c)}$	Junction to case (DC)	Max.	0.41	°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

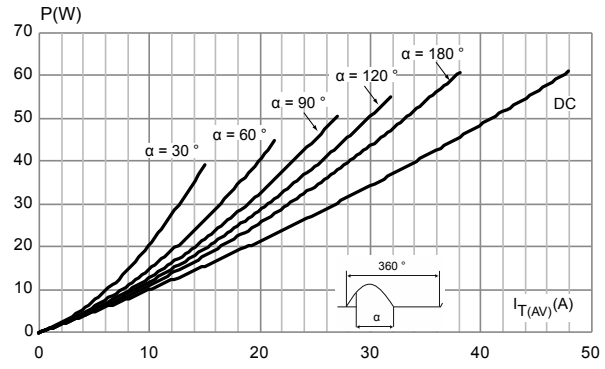


Figure 2. Average and DC on-state current versus case temperature

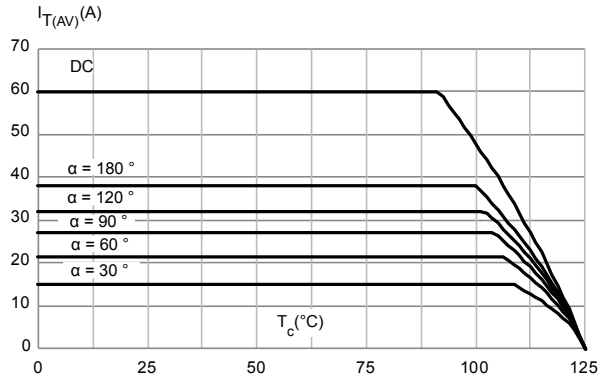


Figure 3. On-state characteristics (maximum values)

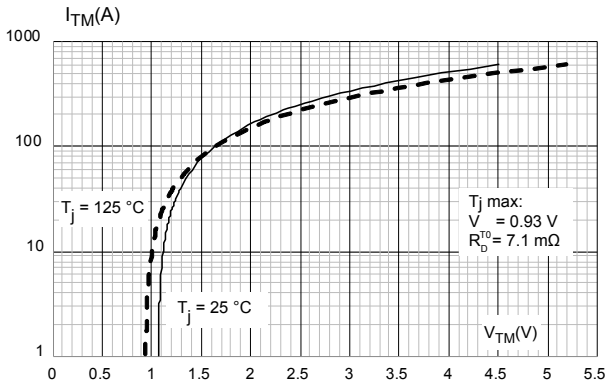


Figure 4. Average and D.C. on-state current versus ambient temperature

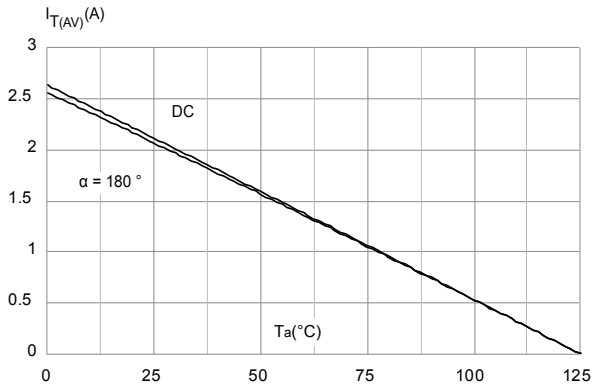


Figure 5. Relative variation of thermal impedance junction to case and junction to ambient versus pulse duration

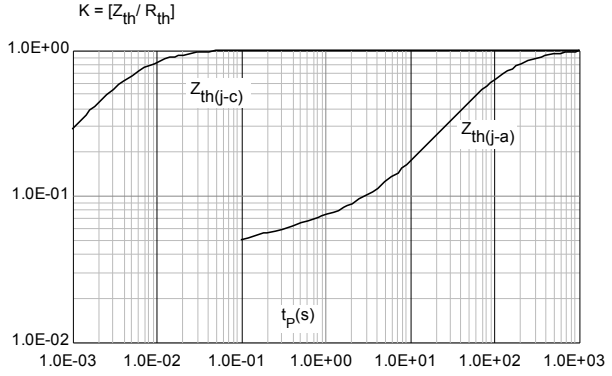


Figure 6. Surge peak on-state current versus number of cycles

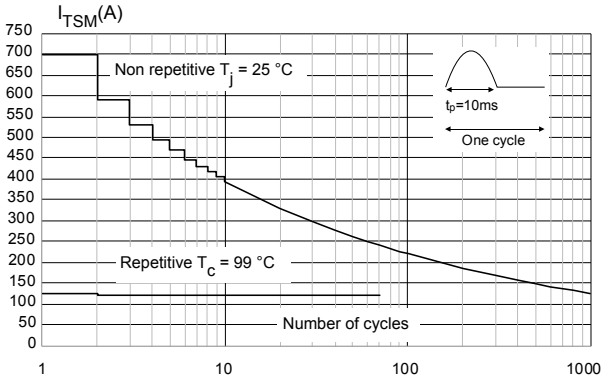


Figure 7. Non repetitive surge peak on-state current for a sinusoidal pulse with width t_p < 10 ms

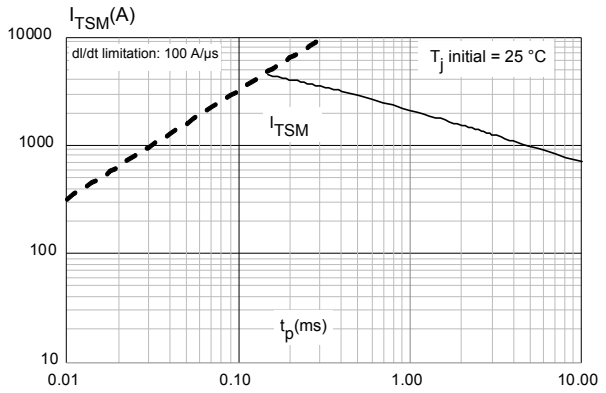


Figure 8. Relative variation of gate trigger current and gate trigger voltage versus junction temperature (typical value)

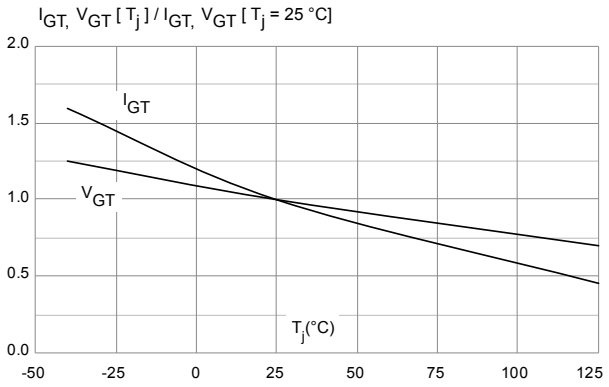


Figure 9. Relative variation of holding and latching current versus junction temperature (typical value)

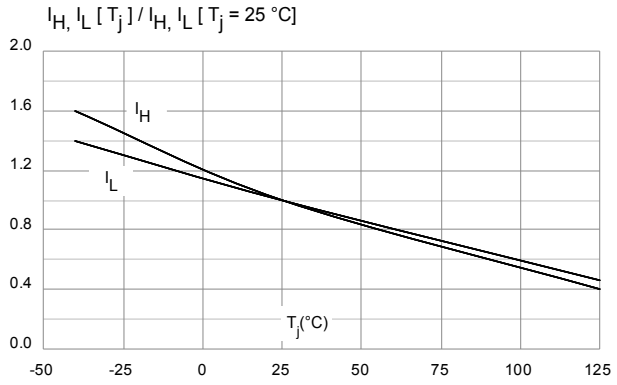


Figure 10. Relative variation of static dV/dt immunity versus junction temperature

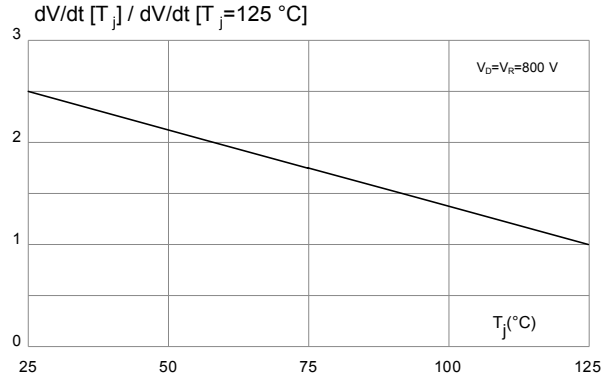
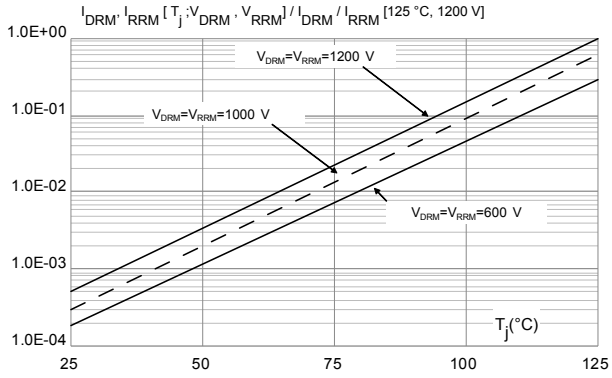


Figure 11. Relative variation of leakage current versus junction temperature for different values of blocking voltage (typical values)



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. 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

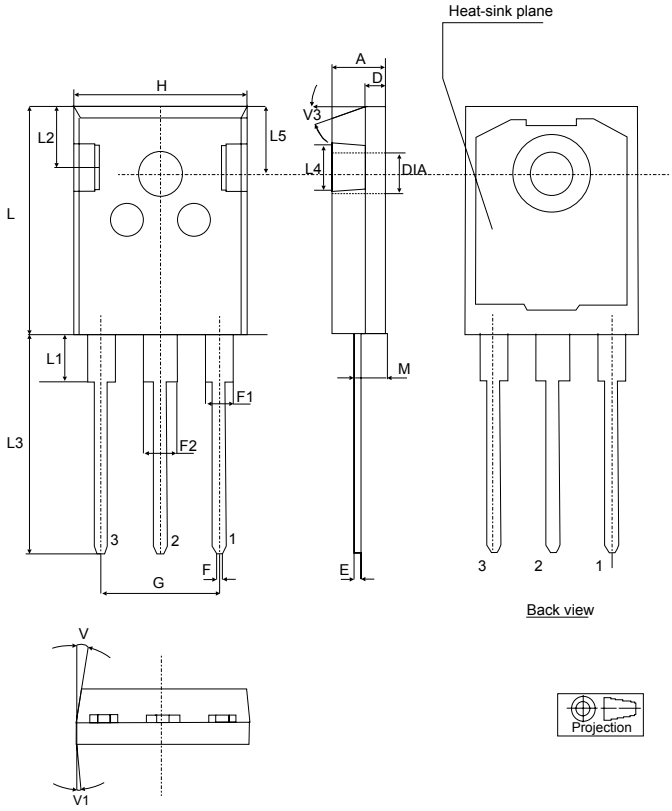


Table 5. **TO-247 long leads package mechanical data**

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**

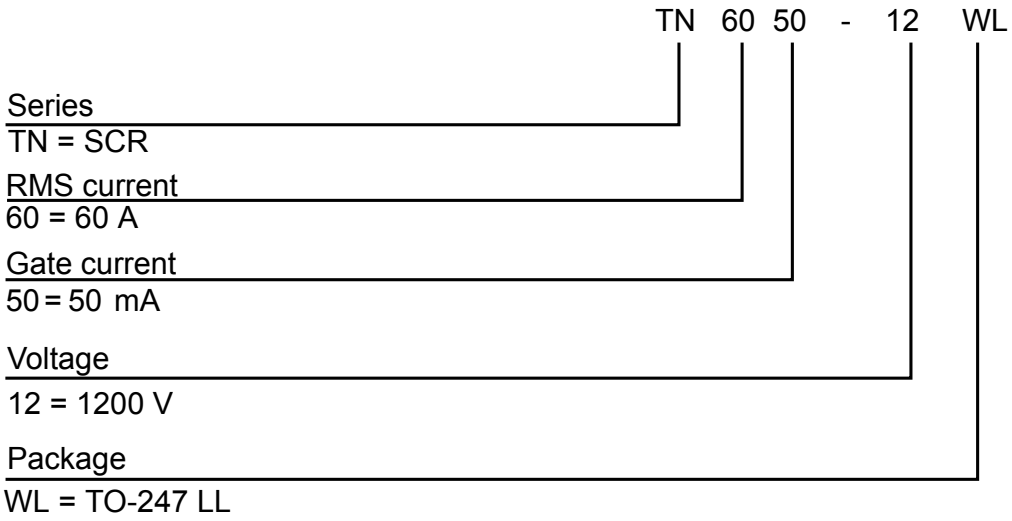


Table 6. **Ordering information**

Order code	Marking	Package	Weight	Base qty.	Delivery mode
TN6050-12WL	TN6050-12	TO-247LL	6.09 g	30	Tube

Revision history

Table 7. **Document revision history**

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

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