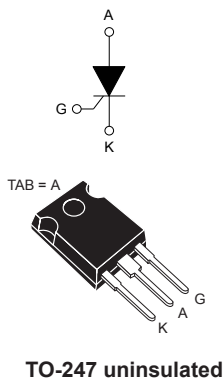


## 80 A 800 V high temperature thyristor (SCR) in TO-247 package



### Features

- High junction temperature:  $T_j = 150\text{ °C}$
- Blocking voltage:  $V_{DRM} = V_{RRM} = 800\text{ V}$
- Nominal current:  $I_{T(RMS)} = 80\text{ A}$
- Gate triggering current:  $I_{GT\text{ max.}} = 50\text{ mA}$
- High noise immunity:  $dV/dt > 1\text{ kV}/\mu\text{s}$
- Through hole package TO-247
- Increase of thermal margin due to extended  $T_j$  up to  $150\text{ °C}$
- Low  $I_D$  and  $I_R$  in blocking state
- [Ecopack2](#) (includes halogen free & RoHS compliance)

### Applications

- AC-DC rectifier controlled bridge
- Variable speed motor drive
- Battery charging system
- AC solid state relay
- By pass switch of UPS
- Industrial welding systems
- Motor soft starter systems

#### Product status link

[TM8050H-8W](#)

#### Product summary

$I_{T(RMS)}$	80 A
$V_{DRM}/V_{RRM}$	800 V
$I_{GT}$	50 mA
$T_j$	150 °C

### Description

Available in through hole package TO-247, the [TM8050H-8W](#) is an 800 V SCR thyristor suitable for applications where high power switching ( $I_{T(RMS)} = 80\text{ A}$ ) and low power dissipation ( $V_{TM} = 1.55\text{ V}$  at 160 A) are key features. These features make it ideal for motorbike voltage regulator, by-pass AC switch, controlled rectifier bridge, solid state relay, battery charger, welding equipment and motor driver applications.

# 1 Characteristics

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

Symbol	Parameter			Value	Unit
$I_{T(RMS)}$	RMS on-state current (180 ° conduction angle)		$T_C = 126\text{ °C}$	80	A
$I_{T(AV)}$	Average on-state current (180 ° conduction angle)			50	A
$I_{TSM}$	Non repetitive surge peak on-state current, $V_R = 0\text{ V}$	$t_p = 8.3\text{ ms}$	$T_j\text{ initial} = 25\text{ °C}$	731	A
		$t_p = 10\text{ ms}$		670	
$I^2t$	$I^2t$ value for fusing		$T_j = 25\text{ °C}$	2245	A <sup>2</sup> s
$V_{RRM} / V_{DRM}$	Maximum repetitive symmetric blocking voltage			800	V
$di/dt$	Critical rate of rise of on-state current $I_G = 2 \times I_{GT}$ , $t_r \leq 100\text{ ns}$	$f = 50\text{ Hz}$	$T_j = 25\text{ °C}$	200	A/ $\mu$ s
$I_{GM}$	Peak gate current	$t_p = 20\text{ }\mu$ s	$T_j = 150\text{ °C}$	8	A
$P_{G(AV)}$	Average gate power dissipation		$T_j = 150\text{ °C}$	1	W
$V_{RGM}$	Maximum peak reverse gate voltage			5	V
$T_{stg}$	Storage junction temperature range			-40 to +150	°C
$T_j$	Maximum operating junction temperature			-40 to +150	°C

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

Symbol	Test Conditions		Value	Unit	
$I_{GT}$	$V_D = 12\text{ V}$ , $R_L = 33\text{ }\Omega$	Min.	2.5	mA	
		Max.	50		
$V_{GT}$	$V_D = 12\text{ V}$ , $R_L = 33\text{ }\Omega$	Max.	1.5	V	
$V_{GD}$	$V_D = V_{DRM}$ , $R_L = 3.3\text{ k}\Omega$	$T_j = 150\text{ °C}$	Min.	0.2	V
$I_H$	$I_T = 500\text{ mA}$ , gate open		Max.	100	mA
$I_L$	$I_G = 1.2 \times I_{GT}$		Max.	125	mA
$t_{gt}$	$I_T = 80\text{ A}$ , $V_D = V_{DRM}$ , $I_G = 200\text{ mA}$ , $di_G/dt = 0.2\text{ A}/\mu$ s		Typ.	3	$\mu$ s
$dV/dt$	$V_D = 67\%$ $V_{DRM}$ , gate open	$T_j = 150\text{ °C}$	Min.	1000	V/ $\mu$ s
$t_q$	$I_T = 33\text{ A}$ , $di_T/dt = 10\text{ A}/\mu$ s, $V_R = 75\text{ V}$ , $V_D = 400\text{ V}$ , $dV_D/dt = 20\text{ V}/\mu$ s, $t_p = 100\text{ }\mu$ s	$T_j = 150\text{ °C}$	Max.	150	$\mu$ s

**Table 3. Static characteristics**

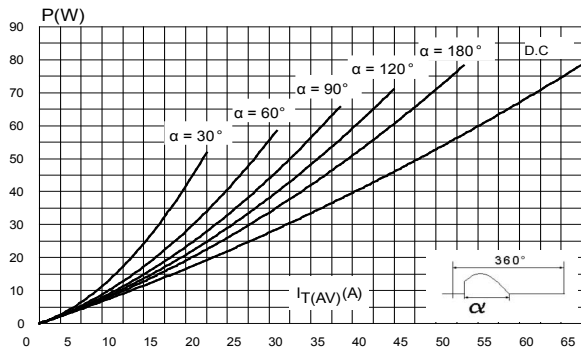
Symbol	Test conditions		Value	Unit		
$V_{TM}$	$I_{TM} = 160\text{ A}$ , $t_p = 380\text{ }\mu$ s	$T_j = 25\text{ °C}$	Max.	1.55	V	
$V_{TO}$	On state threshold voltage		$T_j = 150\text{ °C}$	Max.		0.85
$R_D$	On state dynamic resistance		$T_j = 150\text{ °C}$	Max.	5.5	m $\Omega$
$I_{DRM}$	$V_D = V_{DRM} = V_R = V_{RRM} = 800\text{ V}$	$T_j = 25\text{ °C}$	Max.	20	$\mu$ A	
$I_{RRM}$		$T_j = 150\text{ °C}$	Max.	2.5	mA	

**Table 4. Thermal parameters**

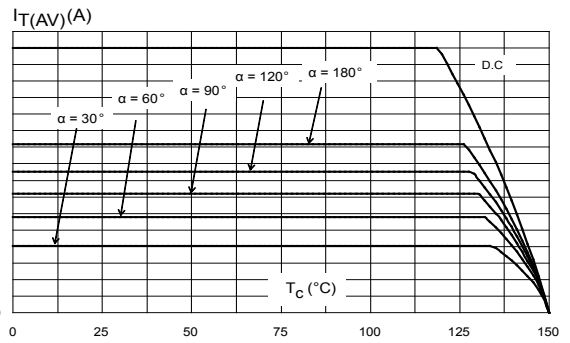
Symbol	Parameter	Value	Unit
$R_{th(j-c)}$	Junction to case (DC,max.)	0.30	°C/W
$R_{th(j-a)}$	Junction to ambient DC (typ.)	50	

## 1.1 Characteristics curves

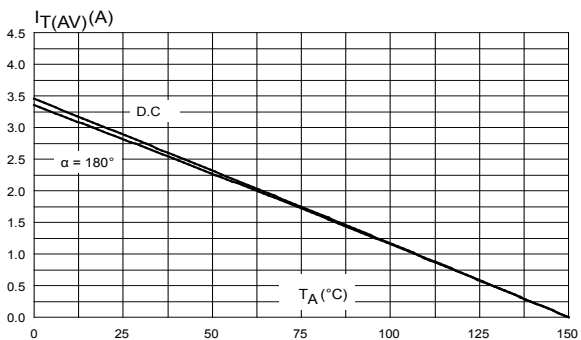
**Figure 1. Maximum average power dissipation versus average on-state current**



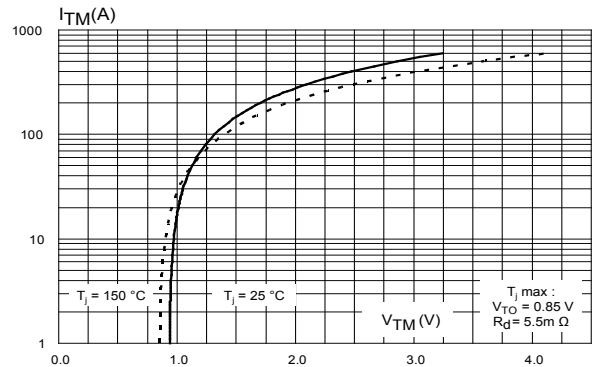
**Figure 2. Average and DC on-state current versus case temperature**



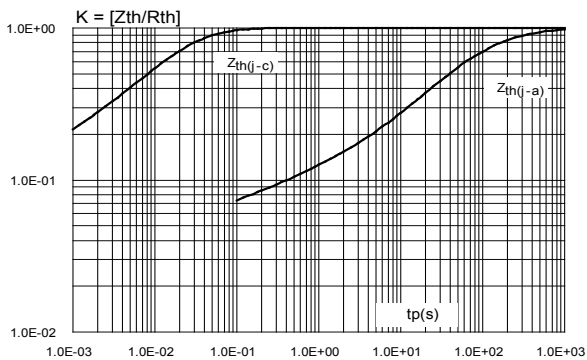
**Figure 3. Average and D.C. on state current versus ambient temperature**



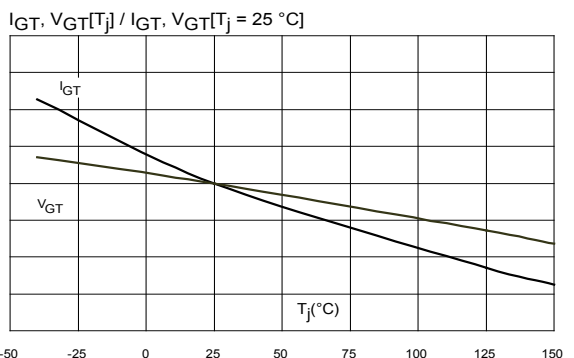
**Figure 4. On-state characteristics (maximum values)**



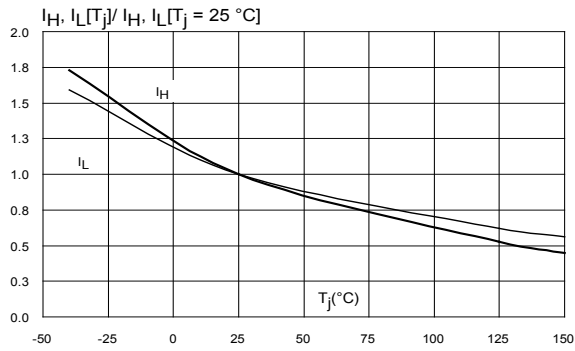
**Figure 5. Relative variation of thermal impedance junction to case and junction to ambient versus pulse duration**



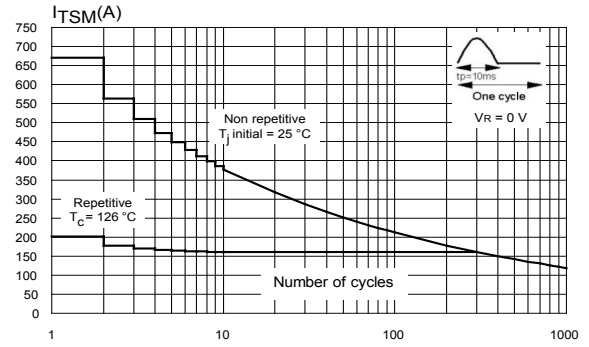
**Figure 6. Relative variation of gate trigger current and gate voltage versus junction temperature**



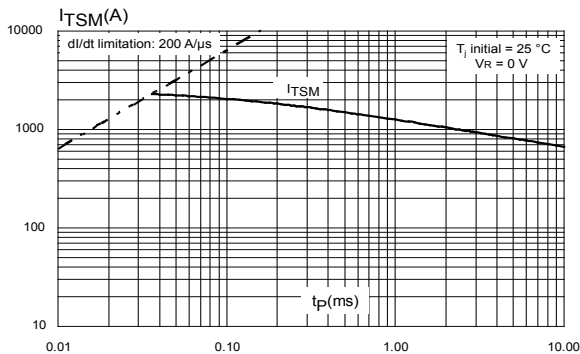
**Figure 7. Relative variation of holding current and latching current versus junction temperature (typical values)**



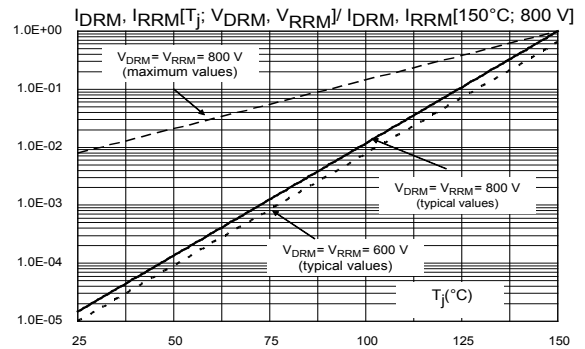
**Figure 8. Surge peak on state current versus number of cycles**



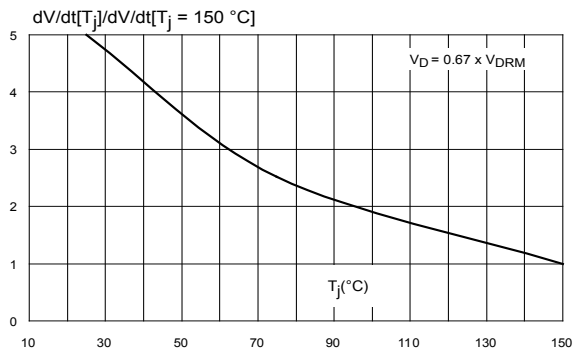
**Figure 9. Non repetitive surge peak on state current for a half cycle sine pulse versus pulse width  $t_p < 10\text{ ms}$**



**Figure 10. Relative variation of leakage current versus junction temperature for different values of blocking voltage**



**Figure 11. Relative variation of static dV/dt immunity versus junction temperature (typical values)**



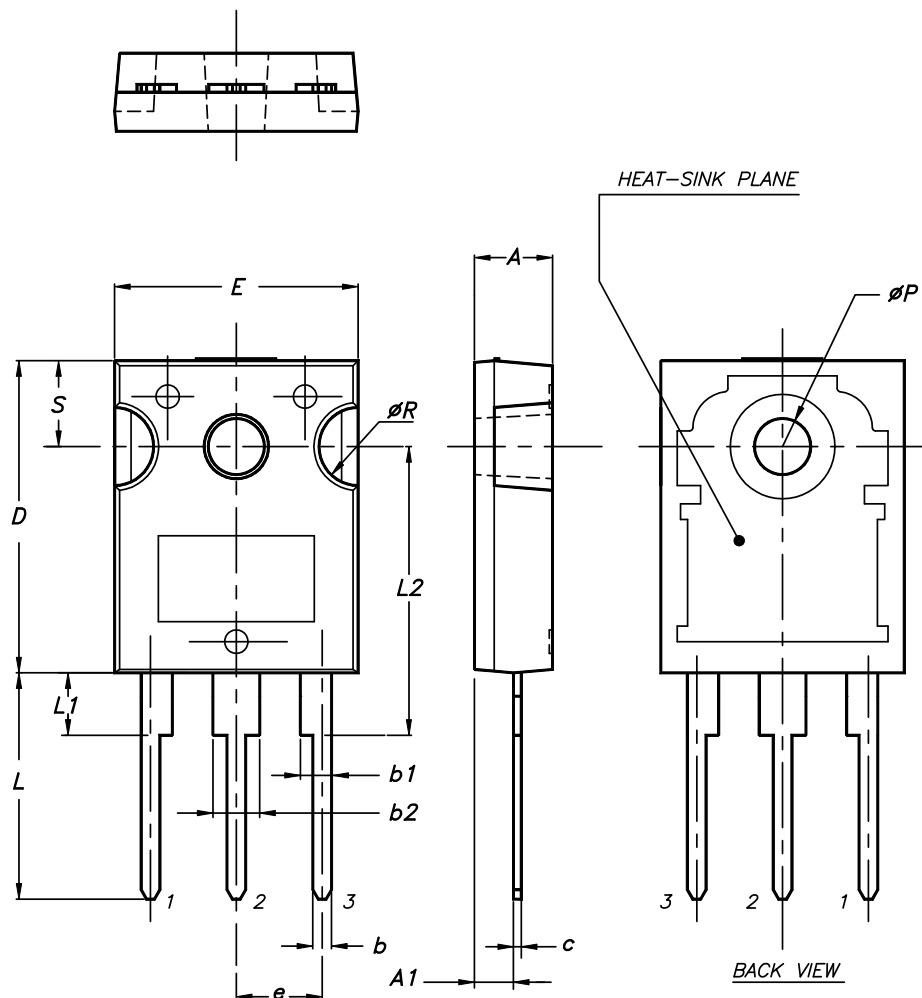
## 2 Package information

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](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 5. 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

Figure 13. Ordering information scheme

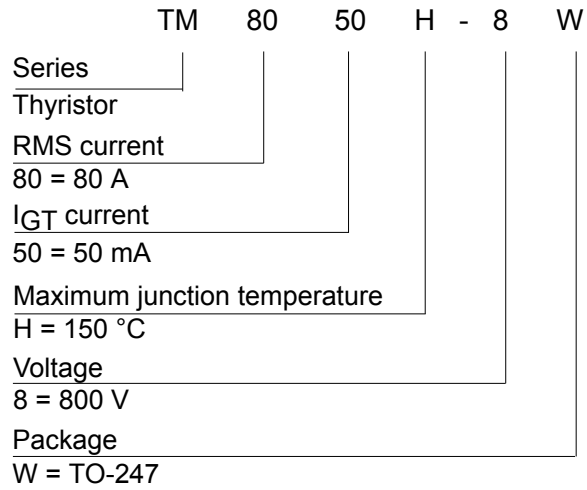


Table 6. Ordering information

Order code	Marking	Package	Weight	Base qty.	Delivery mode
TM8050H-8W	TM8050H8	TO-247	4.43 g	30	Tube



## Revision history

**Table 7. Document revision history**

Date	Revision	Changes
03-May-2016	1	Initial release.
08-Aug-2019	2	Updated <a href="#">Table 1</a> , <a href="#">Figure 8</a> and <a href="#">Figure 9</a> . Minor text change.

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