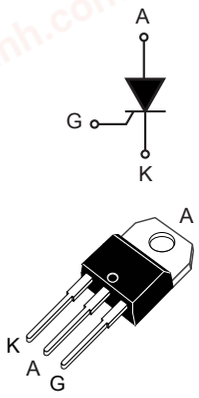
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TN4015H-8T

Datasheet

40 A 800 V high temperature SCR thyristors in TO-220 package



TO-220AB

Features

- High junction temperature: T_j = 150 °C
- 800 V V_{DRM} / V_{RRM}
- 900 V V_{DSM} / V_{RSM}
- Low I_{GT}: 15 mA
- High static immunity dV/dt = 1000 V/µs at 150 °C
- High turn-on rise dI/dt at 200 A/µs
- Halogen-free molding, lead-free plating
- ECOPACK2 compliant

Application

- Inrush current limiting circuits in AC/DC converters
- General purpose AC line load switching
- Heating resistor control, solid state relays

Description

Thanks to its junction temperature T_j up to 150 °C, the TN4015H-8T offers high thermal performance operation up to 40 A RMS in a TO-220AB package.

Its trade-off noise immunity (dV/dt = 1000 V/µs) versus its gate triggering current (I_{GT} = 15 mA) and its turn-on current rise (dI/dt = 200 A/µs) allow to design robust and compact control circuit in AC/DC converters for inrush current limiting circuits and industrial drives, such as overvoltage crowbar protection, motor control circuits and power tools.

Product status
TN4015H-8T

Product summary	
Order code	TN4015H-8T
Package	TO-220AB
$I_{T(RMS)}$	40 A
V_{DRM}/V_{RRM}	800 V
T_J (max.)	150 °C

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1 Characteristics

Table 1. Absolute maximum ratings (limiting values), T_j = 25 °C unless otherwise specified

Symbol	Parameter		Value	Unit
$I_{T(RMS)}$	RMS on-state current (180 ° conduction angle)	T_c = 125 °C	40	A
$I_{T(AV)}$	Average on-state current (180 ° conduction angle)	T_c = 125 °C	25	A
		T_c = 129 °C	22	
		T_c = 132 °C	20	
I_{TSM}	Non repetitive surge peak on-state current (T_j initial = 25 °C)	t_p = 8.3 ms	440	A
		t_p = 10 ms	400	
I^2t	I^2t value for fusing	t_p = 10 ms	800	A^2s
dI/dt	I_G = 2 x I_{GT}, tr ≤ 100 ns Critical rate of rise of on-state current	f = 50 Hz	200	A/µs
V_{DRM}/V_{RRM}	Repetitive peak off-state voltage	T_j = 150 °C	800	V
V_{DSM}/V_{RSM}	Non repetitive surge peak off-state voltage	t_p = 10 ms	900	V
I_{GM}	Peak gate current (t_p = 20 µs)	T_j = 150 °C	4	A
$P_{G(AV)}$	Average gate power dissipation	T_j = 150 °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
T_l	Maximum lead temperature soldering during 10 s		260	°C

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.	5	mA
			Max.	15	
V_{GT}			Max.	1.3	V
V_{GD}	V_D = V_{DRM}, R_L = 3.3 kΩ	T_j = 150 °C	Min.	0.2	V
I_H	I_T = 500 mA, gate open		Max.	50	mA
I_L	I_G = 1.2 x I_{GT}		Max.	70	mA
dV/dt	V_D = 536 V, gate open	T_j = 150 °C	Min.	1000	V/µs
t_{gt}	I_{TM} = 80 A, V_D = 536 V, I_G = 30 mA, (dI_G/dt) = 0.2 A/µs		Typ.	1.9	µs
t_q	I_T = 80 A, t_P = 100 µs, $(dI/dt)_{OFF}$ = 10 A/µs, V_D = 536 V, V_R = 25 V, dV_D/dt = 40 V/µs	T_j = 125 °C	Typ.	70	µs
		T_j = 150 °C	Typ.	85	µs

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Table 3. Static characteristics

Symbol	Test conditions			Value	Unit
V_{TM}	I_{TM} = 80 A, t_p = 380 µs	T_j = 25 °C	Max.	1.55	V
V_{TO}	Threshold voltage	T_j = 150 °C	Max.	0.85	
R_D	Dynamic resistance	T_j = 150 °C	Max.	9.5	mΩ
I_{DRM}, I_{RRM}	V_D = V_{DRM}, V_R = V_{RRM}	T_j = 25 °C	Max.	2	µA
		T_j = 150 °C		9	mA

Table 4. Thermal parameters

Symbol	Parameter		Value	Unit
$R_{th(j-c)}$	Junction to case (DC)	Max.	0.7	°C/W
$R_{th(j-a)}$	Junction to ambient	Typ.	60	

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1.1 Characteristics (curves)

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

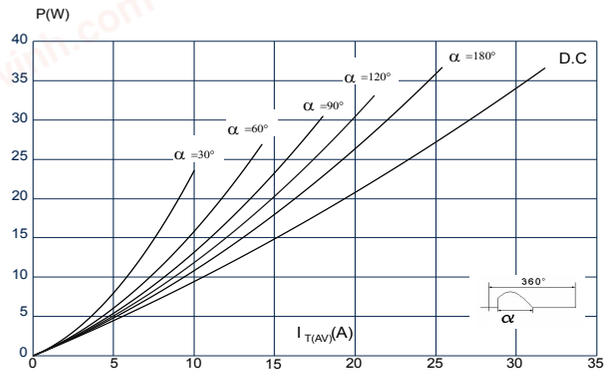


Figure 2. Average and DC on-state current versus case temperature

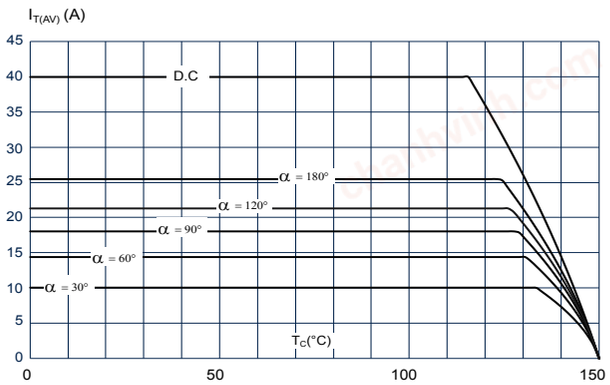


Figure 3. Average and D.C. on state current versus ambient temperature

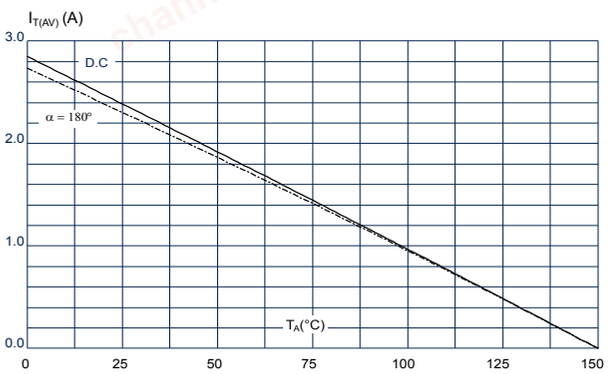


Figure 4. Relative variation of thermal impedance junction to case and junction to ambiant versus pulse duration

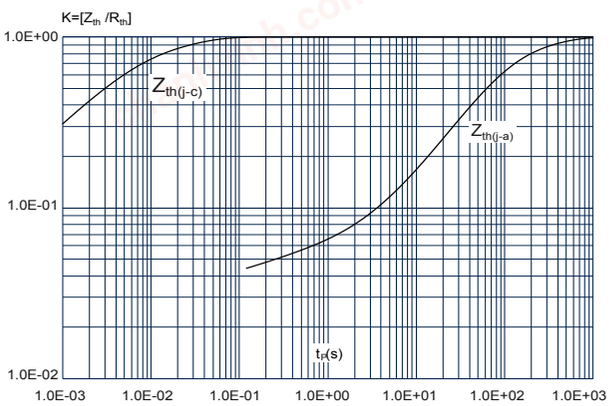


Figure 5. Relative variation of gate trigger current and gate voltage versus junction temperature

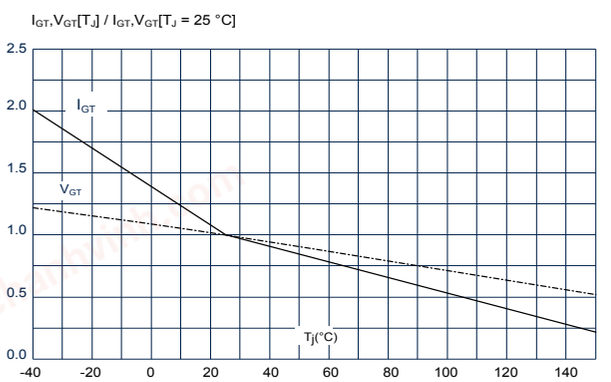
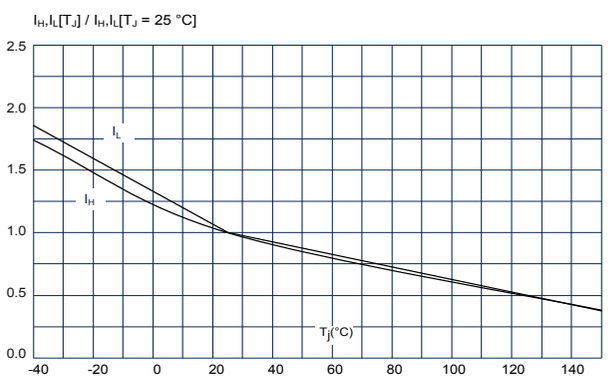


Figure 6. Relative variation of holding and latching current versus junction temperature



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Figure 7. Relative variation of static dV/dt immunity versus junction temperature

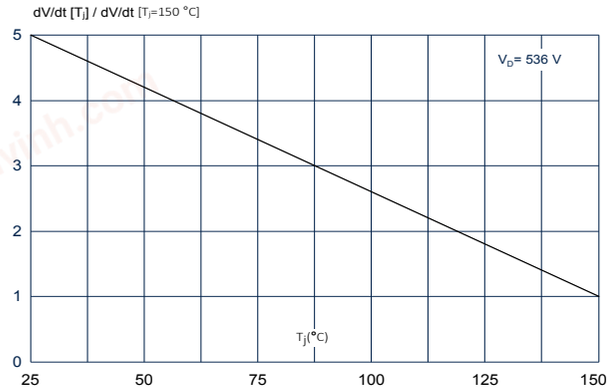


Figure 8. Surge peak on-state current versus number of cycles

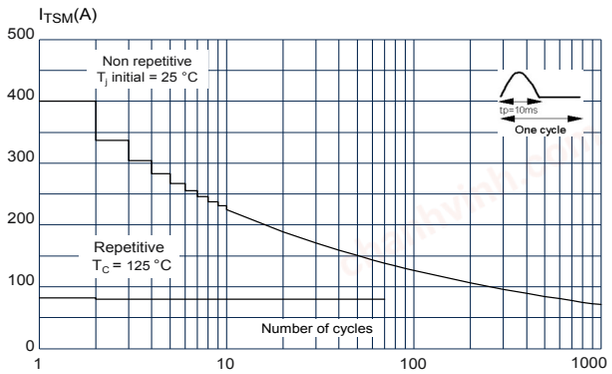


Figure 9. Non repetitive surge peak on-state current for a sinusoidal pulse with width t_p < 10 ms

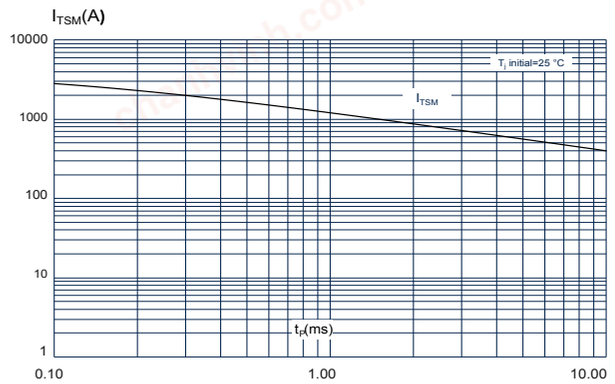


Figure 10. On-state characteristics (maximum values)

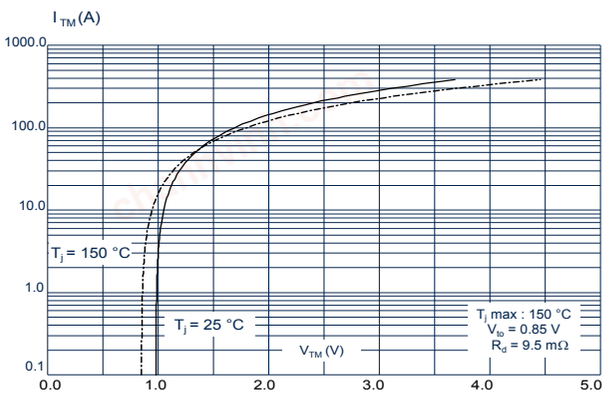


Figure 11. Relative variation of leakage current versus junction temperature

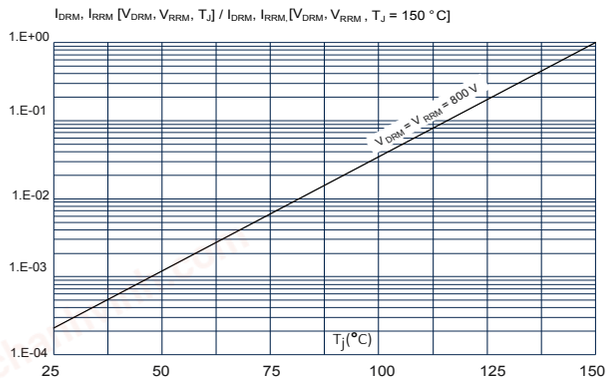
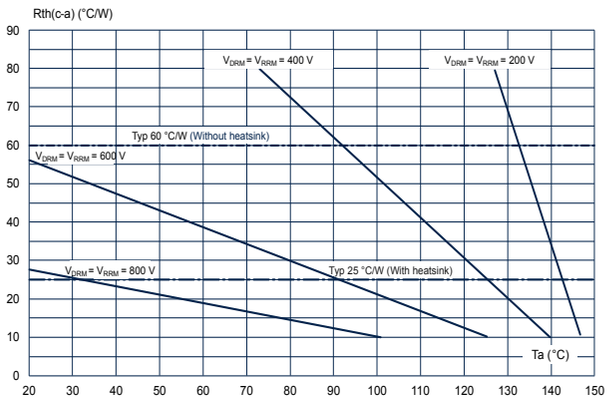


Figure 12. Recommended maximum case-to-ambient thermal resistance versus ambient temperature for different peak off-state voltages



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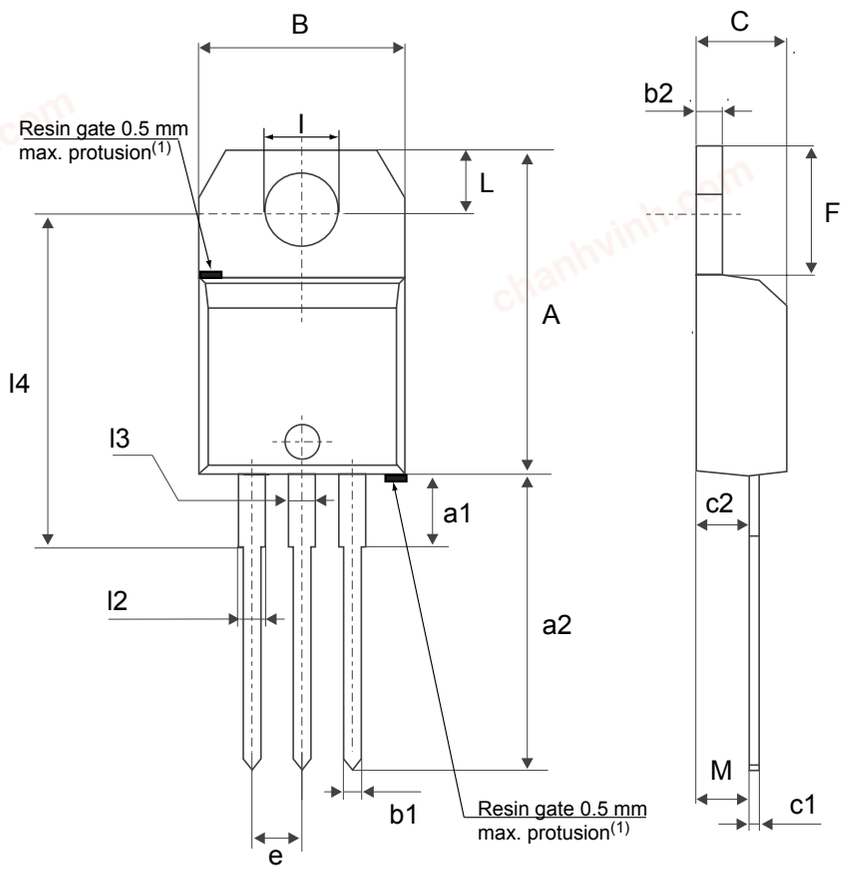
2 Package information

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-220AB package information

- Molding compound resin is halogen-free and meets flammability standard UL94 level 0
- Lead-free package leads finishing
- ECOPACK2 compliant
- Recommended torque value: 0.55 N·m
- Maximum torque value: 0.70 N·m

Figure 13. TO-220AB package outline



(1)Resin gate position accepted in one of the two positions or in the symmetrical opposites.

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Table 5. **TO-220AB package mechanical data**

Ref.	Dimensions					
	Millimeters			Inches[1]		
	Min.	Typ.	Max.	Min.	Typ.	Max.
A	15.20		15.90	0.5984		0.6260
a1		3.75			0.1476	
a2	13.00		14.00	0.5118		0.5512
B	10.00		10.40	0.3937		0.4094
b1	0.61		0.88	0.0240		0.0346
b2	1.23		1.32	0.0484		0.0520
C	4.40		4.60	0.1732		0.1811
c1	0.49		0.70	0.0193		0.0276
c2	2.40		2.72	0.0945		0.1071
e	2.40		2.70	0.0945		0.1063
F	6.20		6.60	0.2441		0.2598
I	3.73		3.88	0.1469		0.1528
L	2.65		2.95	0.1043		0.1161
l2	1.14		1.70	0.0449		0.0669
l3	1.14		1.70	0.0449		0.0669
l4	15.80	16.40	16.80	0.6220	0.6457	0.6614
M		2.6			0.1024	

1. *Inch dimensions are for reference only.*

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3 Ordering information

Figure 14. **Ordering information scheme**

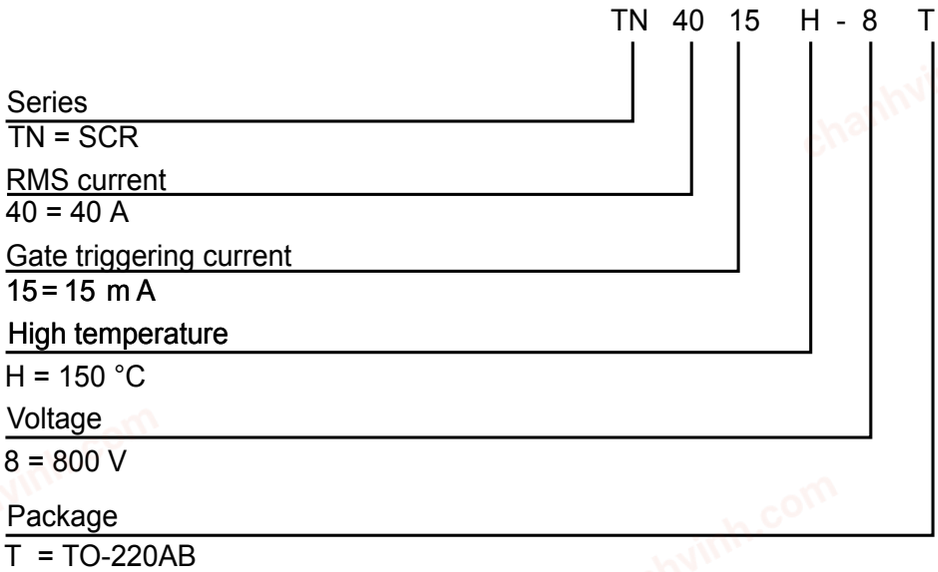


Table 6. **Ordering information**

Order code	Marking	Package	Weight	Base qty.	Delivery mode
TN4015H-8T	TN4015H8T	TO-220AB	1.9 g	50	Tube

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Revision history

Table 7. **Document revision history**

Date	Revision	Changes
19-Sep-2024	1	Initial release.
23-Jan-2025	2	Updated Table 1, Table 4, Figure 1, Figure 2, Figure 8, and Figure 12.

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