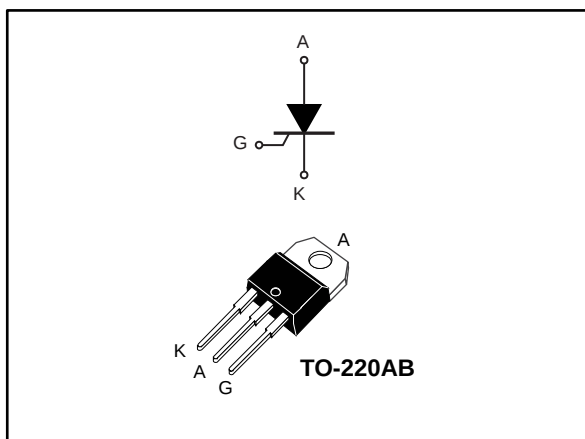


High temperature 20 A SCRs

Datasheet - production data



Description

Packaged in a non-isolated TO-220AB, this device offers high thermal performance during operation of up to 20 A_{RMS}, thanks to a junction temperature of up to 150 °C.

The combination of noise immunity and low gate triggering current allows to design strong and compact control circuit.

Table 1: Device summary

Order code	Package	V _{DRM} /V _{RRM}	I _{GT}
TN2010H-6T	TO-220AB	600 V	10 mA

Features

- High junction temperature: T_j = 150 °C
- High noise immunity dV/dt = 400 V/μs up to 150 °C
- Gate triggering current I_{GT} = 10 mA
- Peak off-state voltage V_{DRM}/V_{RRM} = 600 V
- High turn on current rise dI/dt = 100 A/μs
- ECOPACK®2 compliant component

Applications

- Motorbike voltage regulator circuits
- Inrush current limiting circuits
- Motor control circuits and starters
- Light dimmers
- Solid state relays

1 Characteristics

Table 2: Absolute maximum ratings (limiting values), $T_j = 25\text{ °C}$ unless otherwise specified

Symbol	Parameter		Value	Unit
$I_{T(RMS)}$	RMS on-state current (180 ° conduction angle)		$T_c = 132\text{ °C}$ 20	A
$I_{T(AV)}$	Average on-state current (180 ° conduction angle)		$T_c = 132\text{ °C}$ 12.7	A
			$T_c = 137\text{ °C}$ 10	
			$T_c = 140\text{ °C}$ 8	
I_{TSM}	Non repetitive surge peak on-state current (T_j initial = 25 °C)		$t_p = 8.3\text{ ms}$ 197	A
			$t_p = 10\text{ ms}$ 180	
I^2t	I^2t value for fusing		$t_p = 10\text{ ms}$ 162	A ² s
di/dt	Critical rate of rise of on-state current $I_G = 2 \times I_{GT}$, $t_r \leq 100\text{ ns}$		$f = 60\text{ Hz}$ 100	A/ μ s
V_{DSM}/V_{RSM}	Non repetitive surge peak off-state voltage		$t_p = 10\text{ ms}$ 700	V
I_{GM}	Peak gate current	$t_p = 20\text{ }\mu$ s	$T_j = 150\text{ °C}$ 4	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	Operating junction temperature range		-40 to +150	°C
T_L	Maximum lead temperature for soldering during 10 s		260	°C

Table 3: Electrical characteristics ($T_j = 25\text{ °C}$ unless otherwise specified)

Symbol	Test conditions		Value	Unit
I_{GT}	$V_D = 12\text{ V}$, $R_L = 33\text{ }\Omega$		Typ. 5	mA
			Max. 10	
V_{GT}			Max. 1.3	V
V_{GD}	$V_D = V_{DRM}$, $R_L = 3.3\text{ k}\Omega$	$T_j = 150\text{ °C}$	Min. 0.1	V
I_H	$I_T = 500\text{ mA}$, gate open		Max. 40	mA
I_L	$I_G = 1.2 \times I_{GT}$		Max. 60	mA
dV/dt	$V_D = 402\text{ V}$, gate open	$T_j = 150\text{ °C}$	Min. 400	V/ μ s
t_{gt}	$I_{TM} = 40\text{ A}$, $V_D = 402\text{ V}$, $I_G = 20\text{ mA}$, $(di/dt)_{\max} = 0.2\text{ A}/\mu$ s		Typ. 1.9	μ s
t_q	$I_{TM} = 40\text{ A}$, $V_D = 402\text{ V}$, $(di/dt)_{\text{off}} = 30\text{ A}/\mu$ s, $V_R = 25\text{ V}$, $dV_D/dt = 40\text{ V}/\mu$ s	$T_j = 150\text{ °C}$	Typ. 70	μ s

Table 4: Static characteristics

Symbol	Test conditions			Value	Unit
V_{TM}	$I_{TM} = 40\text{ A}$, $t_p = 380\text{ }\mu\text{s}$	$T_j = 25\text{ }^\circ\text{C}$	Max.	1.6	V
V_{TO}	Threshold voltage	$T_j = 150\text{ }^\circ\text{C}$	Max.	0.82	
R_D	Dynamic resistance	$T_j = 150\text{ }^\circ\text{C}$	Max.	17.5	$\text{m}\Omega$
I_{DRM} , I_{RRM}	$V_D = V_{DRM}$, $V_R = V_{RRM}$	$T_j = 25\text{ }^\circ\text{C}$	Max.	5	μA
		$T_j = 125\text{ }^\circ\text{C}$		2	mA
		$T_j = 150\text{ }^\circ\text{C}$		3.9	

Table 5: Thermal parameters

Symbol	Parameter		Value	Unit
$R_{th(j-c)}$	Junction to case (DC)	Max.	1.0	$^\circ\text{C/W}$
$R_{th(j-a)}$	Junction to ambient (DC)	Typ.	60	

1.1 Characteristics (curves)

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

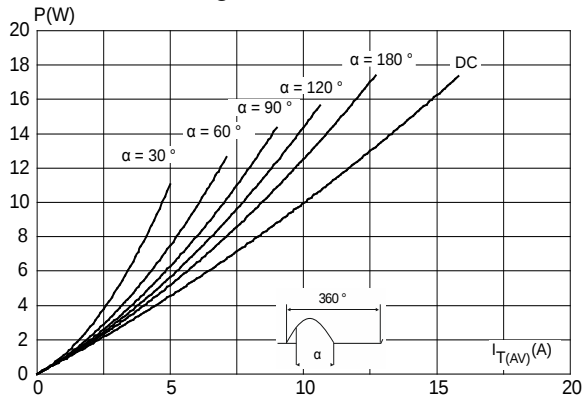


Figure 2: Average and DC on-state current versus case temperature

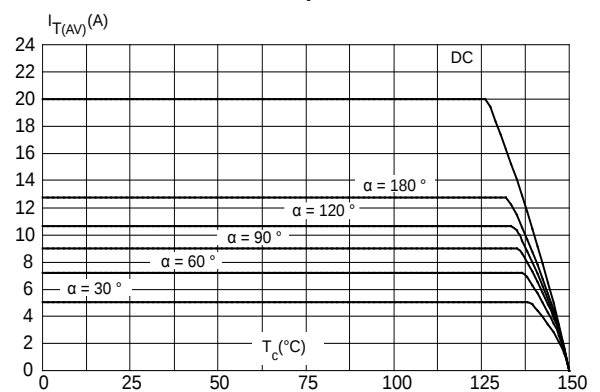


Figure 3: Average and D.C. on state current versus ambient temperature

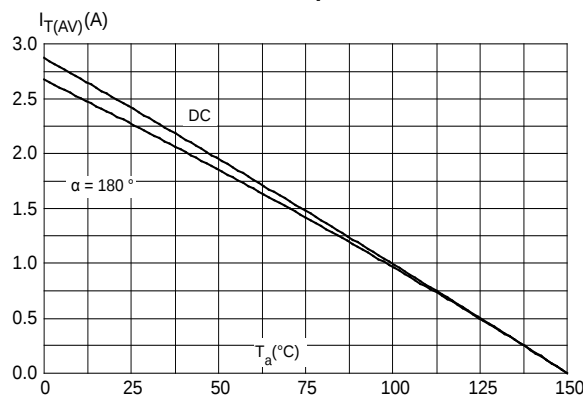


Figure 4: Relative variation of thermal impedance versus pulse duration

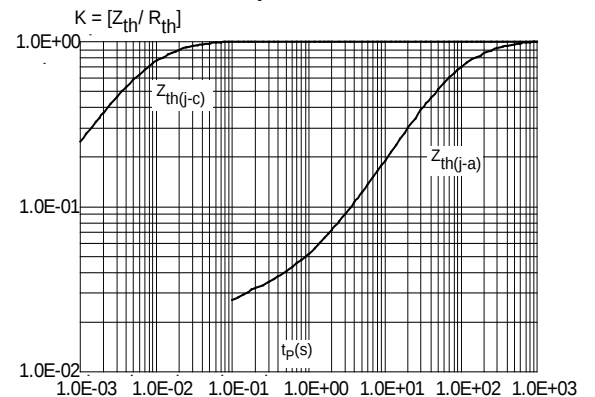


Figure 5: Relative variation of gate triggering current and gate voltage versus junction temperature (typical values)

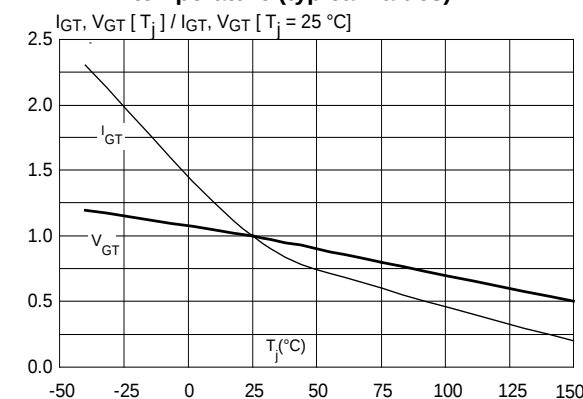


Figure 6: Relative variation of holding and latching current versus junction temperature (typical values)

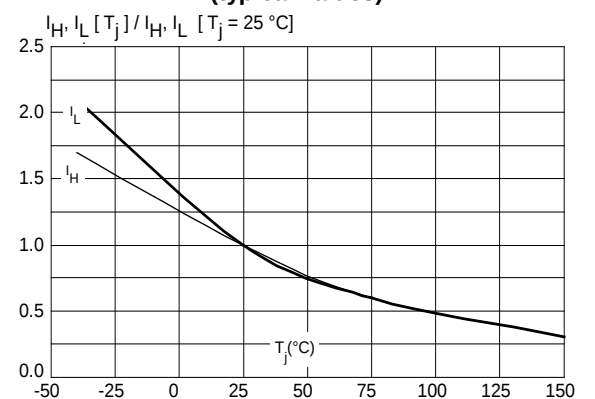


Figure 7: Relative variation of static dV/dt immunity versus junction temperature (typical values)

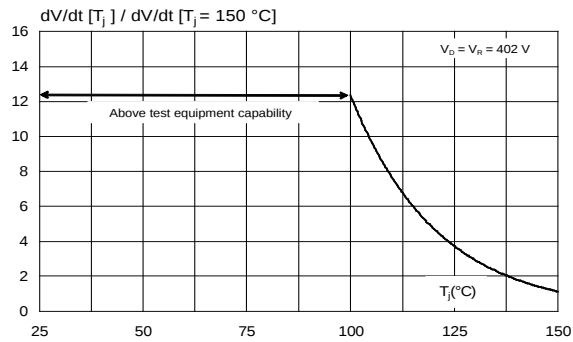


Figure 8: Surge peak on-state current versus number of cycles

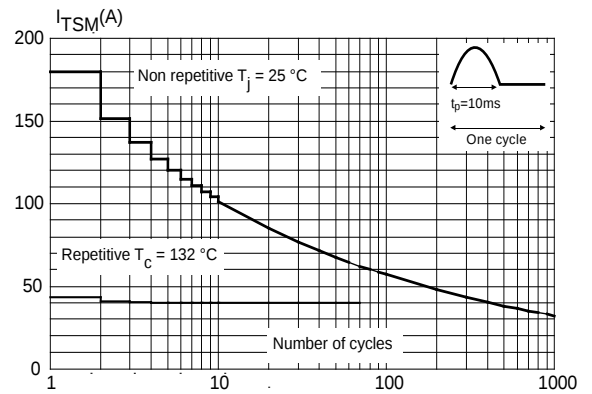


Figure 9: Non repetitive surge peak on-state current for a sinusoidal pulse with width $t_p < 10$ ms

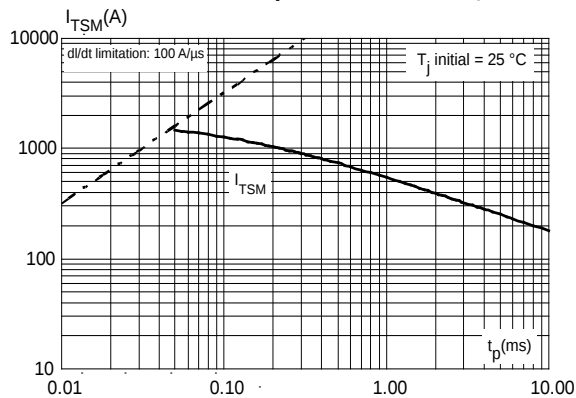


Figure 10: On-state characteristics (maximum values)

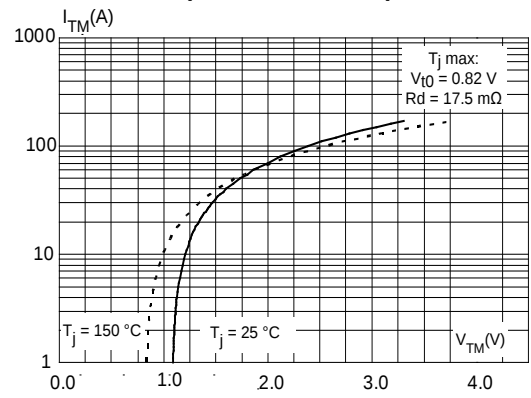
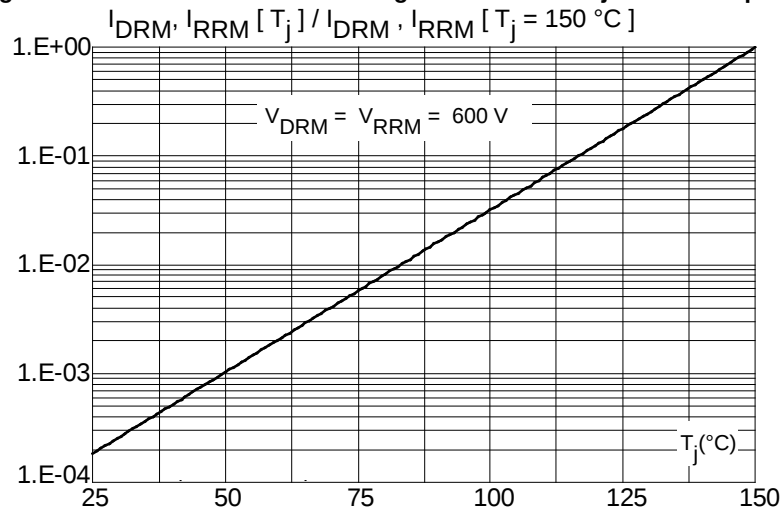


Figure 11: Relative variation of leakage current versus junction temperature



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.

- Epoxy meets UL94, V0
- Lead-free, halogen-free package
- Recommended torque value (TO-220AB): 0.4 to 0.6 N.m

2.1 TO-220AB package information

Figure 12: TO-220AB (NIns.) package outline

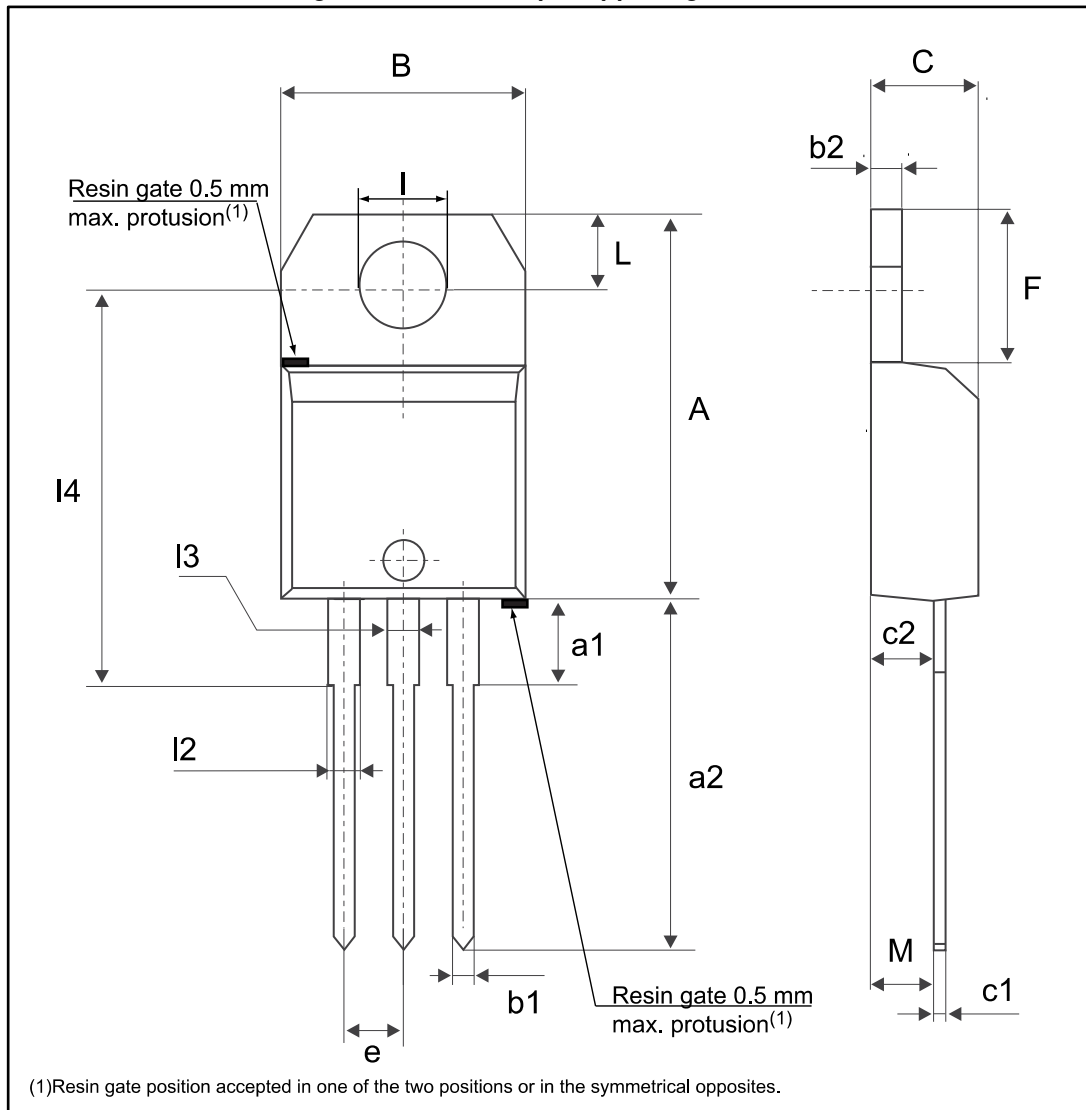


Table 6: TO-220AB (NIns.) package mechanical data

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	

Notes:⁽¹⁾Inch dimensions are for reference only.

3 Ordering information

Figure 13: Ordering information scheme

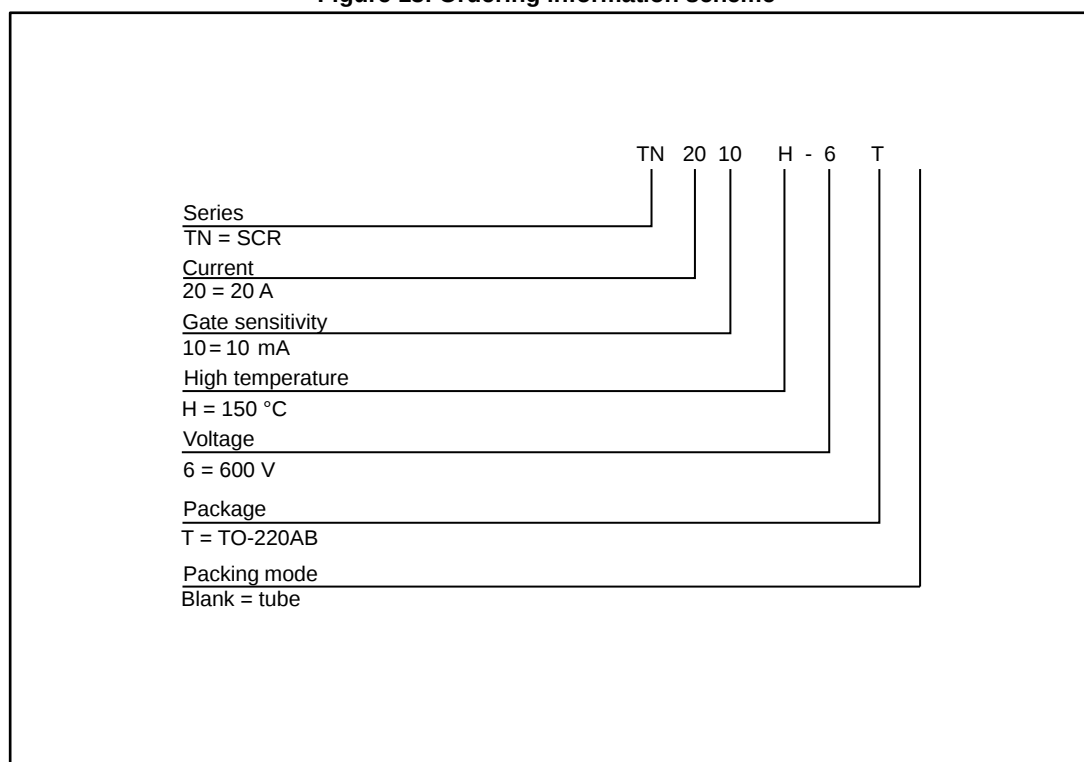


Table 7: Ordering information

Order code	Marking	Package	Weight	Base qty.	Delivery mode
TN2010H-6T	TN2010H6	TO-220AB	2.3 g	50	Tube

4 Revision history

Table 8: Document revision history

Date	Revision	Changes
29-Aug-2017	1	Initial release.

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