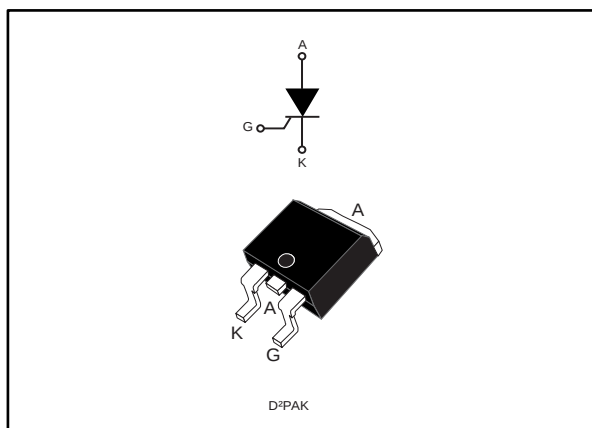


High temperature 20 A SCRs

Datasheet - production data



Features

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

Applications

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

Description

This device offers high thermal performance during operation of up to 20 A_{RMS} , thanks to a junction temperature of up to $150\text{ }^{\circ}\text{C}$.

Its D²PAK package allows modern SMD designs as well as compact back to back configuration.

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

Table 1: Device summary

Order code	Package	V_{DRM}/V_{RRM}	I_{GT}
TN2010H-6G	D ² PAK	600 V	10 mA

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

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}	$I_{TM} = 40\text{ A}$, $V_D = 402\text{ V}$, $I_G = 20\text{ mA}$, $(di_G/dt)_{\max} = 0.2\text{ A}/\mu$ 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	m Ω
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)	$S^{(1)} = 2.5\text{ cm}^2$	Typ.	45	

Notes:⁽¹⁾S = Copper surface under tab

1.1 Characteristics (curves)

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

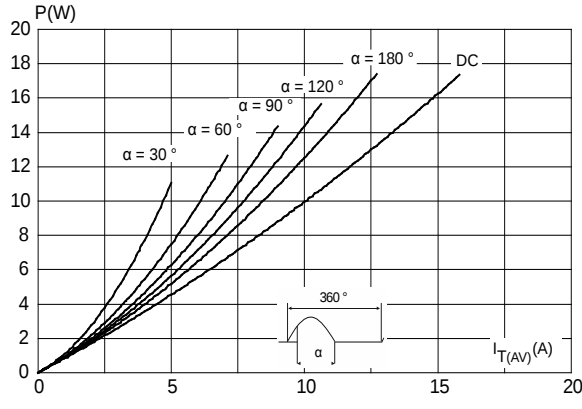


Figure 2: Average and DC on-state current versus case temperature

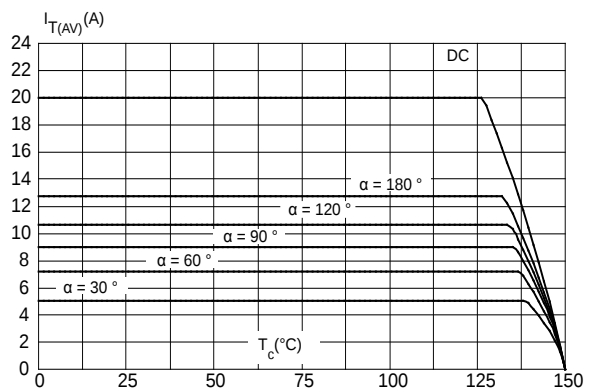


Figure 3: Average and D.C. on state current versus ambient temperature

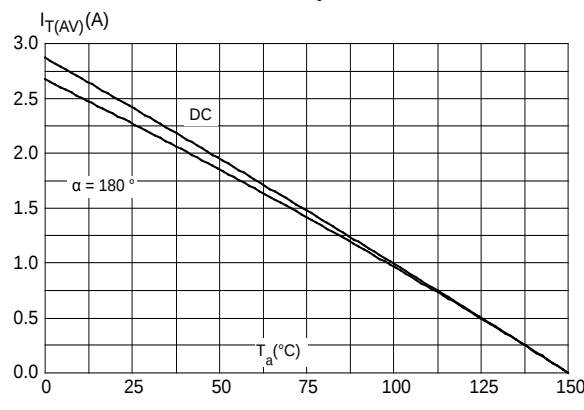


Figure 4: Relative variation of thermal impedance versus pulse duration

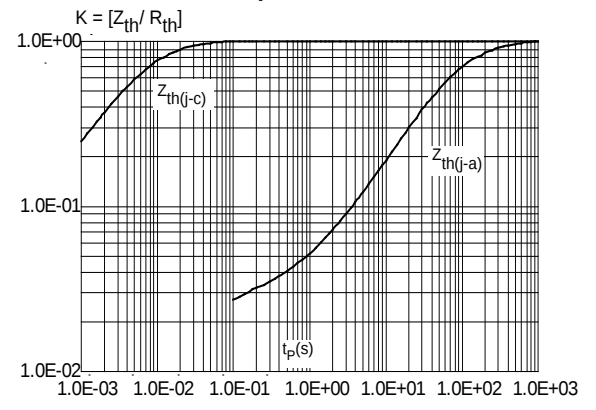


Figure 5: Relative variation of gate triggering current and gate voltage versus junction temperature (typical values)

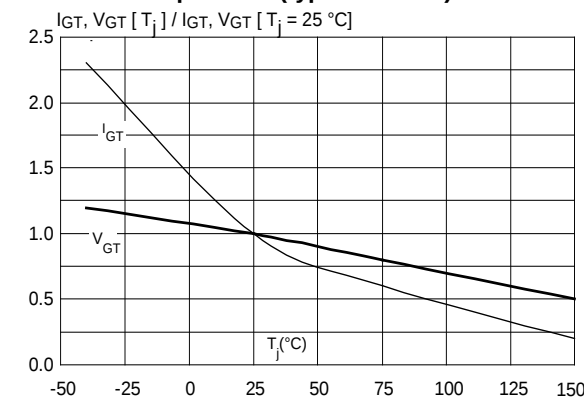


Figure 6: Relative variation of holding and latching current versus junction temperature (typical values)

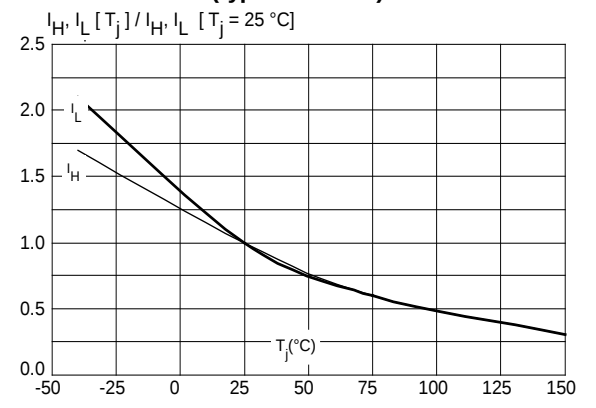


Figure 7: Relative variation of static dV/dt immunity versus junction temperature (typical values)

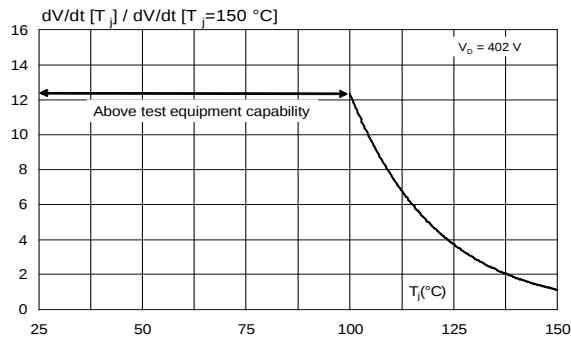


Figure 8: Surge peak on-state current versus number of cycles

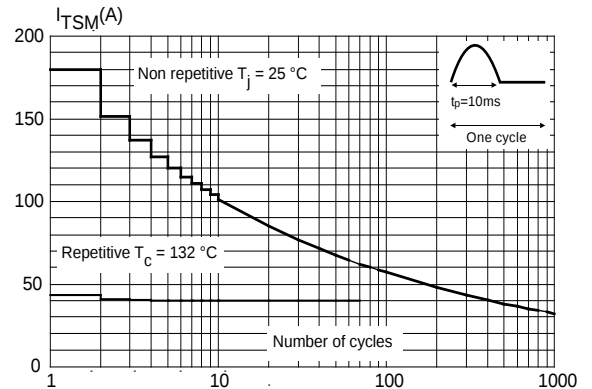


Figure 9: Non repetitive surge peak on-state current for a sinusoidal pulse with width $t_p < 10$ ms

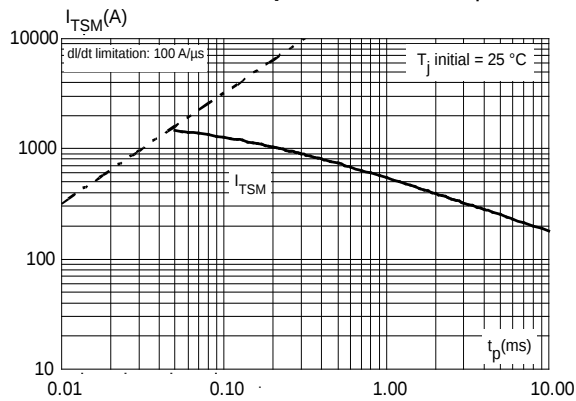


Figure 10: On-state characteristics (maximum values)

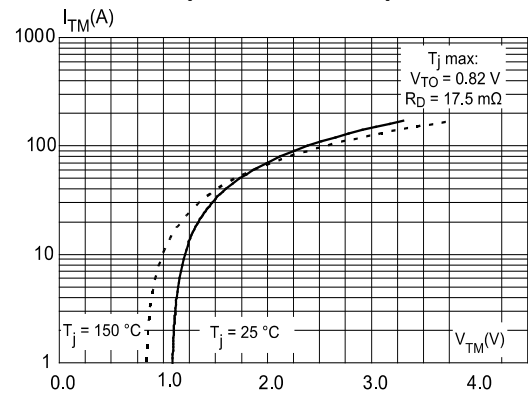


Figure 11: Relative variation of leakage current versus junction temperature

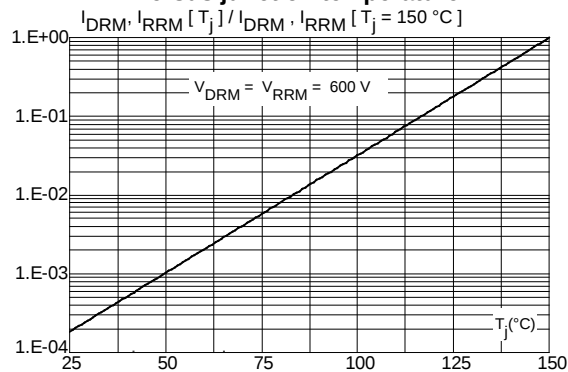
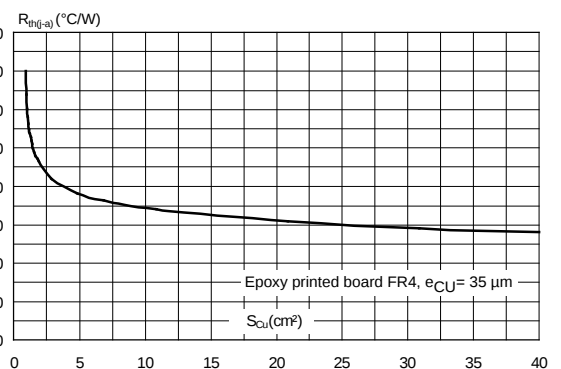


Figure 12: Thermal resistance junction to ambient versus copper surface under tab (typical values)



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.

- Epoxy meets UL94, V0
- Lead-free, halogen-free package

2.1 D²PAK package information

Figure 13: D²PAK package outline

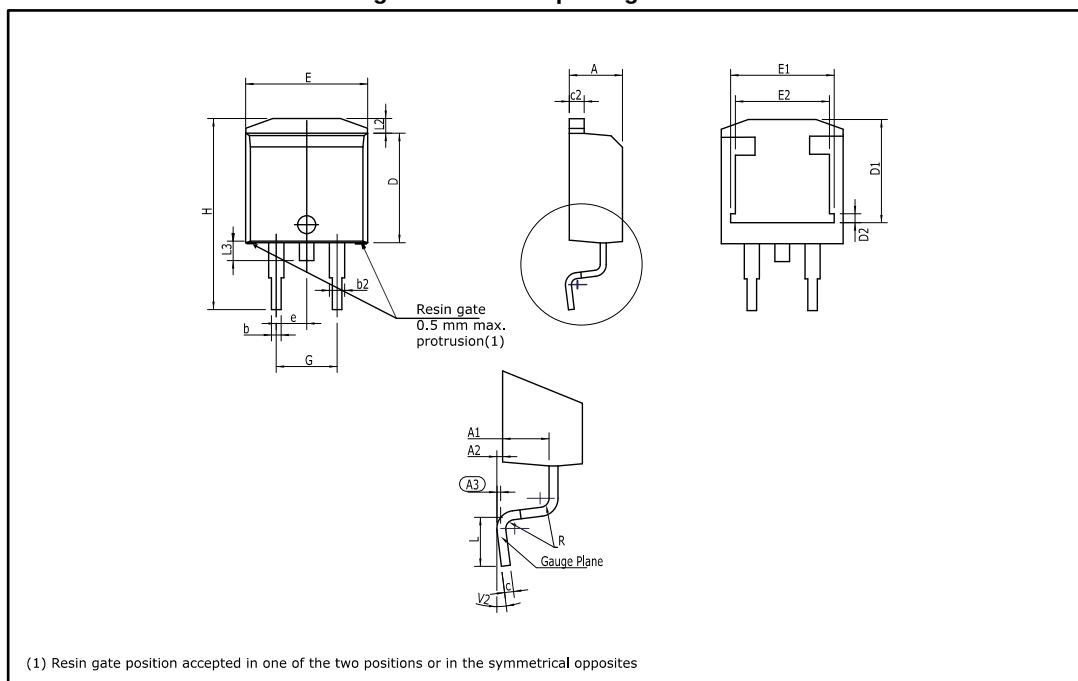
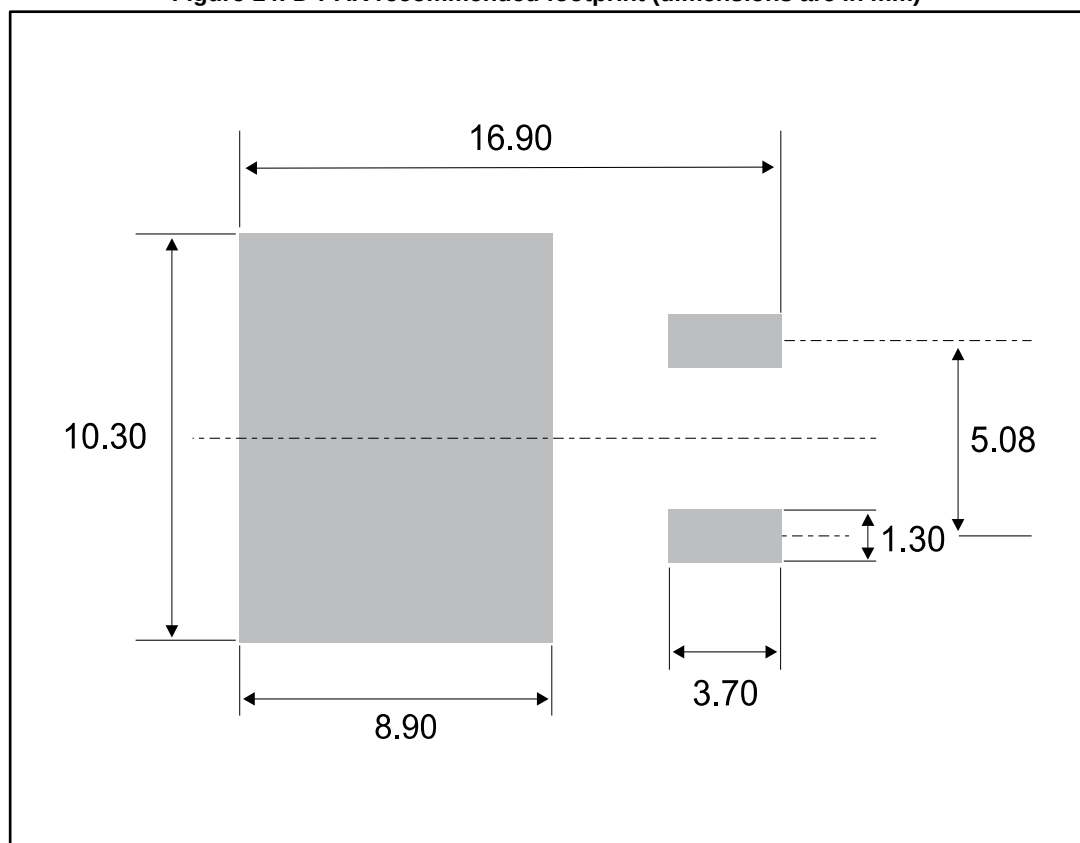


Table 6: D²PAK package mechanical data

Ref.	Dimensions					
	Millimeters			Inches ⁽¹⁾		
	Min.	Typ.	Max.	Min.	Typ.	Max.
A	4.30		4.60	0.1693		0.1811
A1	2.49		2.69	0.0980		0.1059
A2	0.03		0.23	0.0012		0.0091
A3		0.25			0.0098	
b	0.70		0.93	0.0276		0.0366
b2	1.25		1.7	0.0492		0.0669
c	0.45		0.60	0.0177		0.0236
c2	1.21		1.36	0.0476		0.0535
D	8.95		9.35	0.3524		0.3681
D1	7.50		8.00	0.2953		0.3150
D2	1.30		1.70	0.0512		0.0669
e	2.54			0.1		
E	10.00		10.28	0.3937		0.4047
E1	8.30		8.70	0.3268		0.3425
E2	6.85		7.25	0.2697		0.2854
G	4.88		5.28	0.1921		0.2079
H	15		15.85	0.5906		0.6240
L	1.78		2.28	0.0701		0.0898
L2	1.27		1.40	0.0500		0.0551
L3	1.40		1.75	0.0551		0.0689
R		0.40			0.0157	
V2	0°		8°	0°		8°

Notes:⁽¹⁾Dimensions in inches are given for reference only

Figure 14: D²PAK recommended footprint (dimensions are in mm)

3 Ordering information

Figure 15: Ordering information scheme

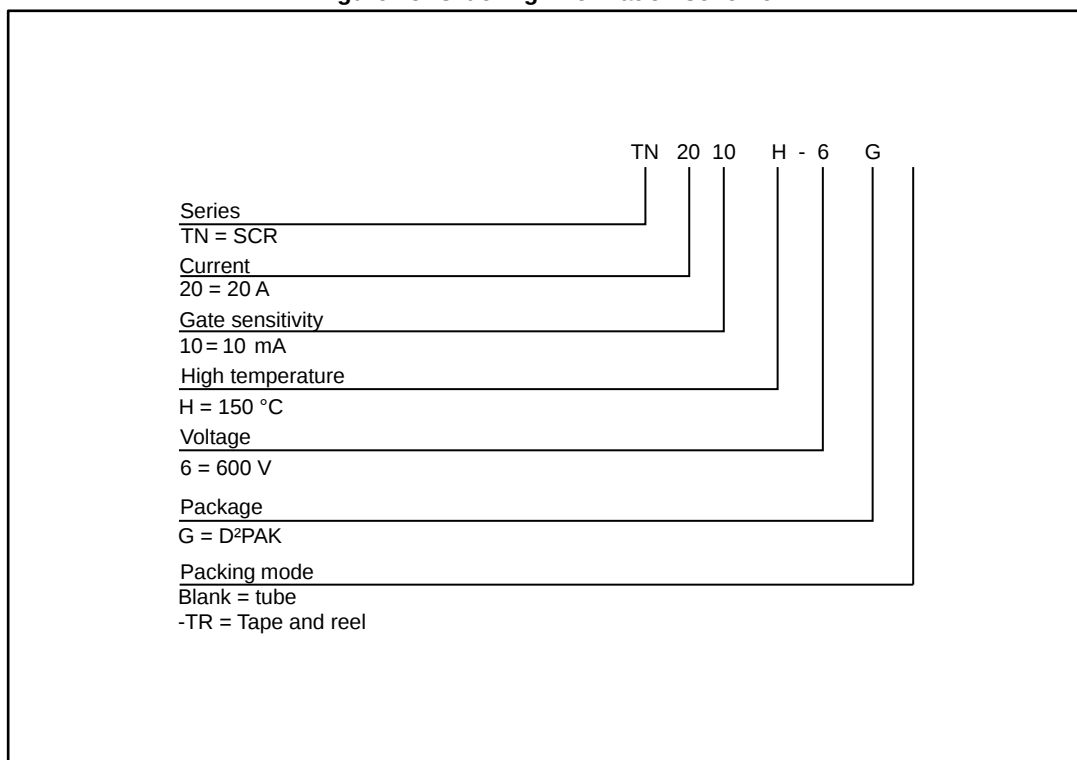


Table 7: Ordering information

Order code	Marking	Package	Weight	Base qty.	Delivery mode
TN2010H-6G	TN2010H6	D ² PAK	2.3 g	50	Tube
TN2010H-6G-TR				1000	Tape and reel

4 Revision history

Table 8: Document revision history

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

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