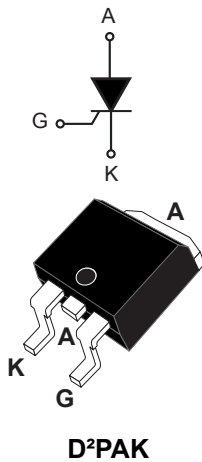


16 A 800 V high temperature SCR thyristor in D<sup>2</sup>PAK package


### Features

- High junction temperature:  $T_{jmax.} = 150\text{ °C}$
- $V_{DRM} / V_{RRM} = 800\text{ V}$
- $V_{DSM} / V_{RSM} = 900\text{ V}$
- Tight  $I_{GT}$  spread: 5 to 8 mA
- High static immunity  $dV/dt = 500\text{ V}/\mu\text{s}$  at  $150\text{ °C}$
- High turn-on rise  $dI/dt$  at  $100\text{ A}/\mu\text{s}$
- Halogen-free molding, lead-free plating
- ECOPACK2 compliant

### Applications

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

### Description

Thanks to its operating junction temperature up to  $150\text{ °C}$ , the TN1605H-8G offers high thermal performance operation up to 16 A rms in a D<sup>2</sup>PAK SMD package. Its trade-off noise immunity ( $dV/dt = 500\text{ V}/\mu\text{s}$ ) versus its gate triggering current (maximum  $I_{GT} = 8\text{ mA}$ ) and its turn-on current rise ( $dI/dt = 100\text{ A}/\mu\text{s}$ ) allows 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

TN1605H-8G

#### Product summary

Order code	TN1605H-8G
Package	D <sup>2</sup> PAK
$I_{T(RMS)}$	16 A
$V_{DRM}/V_{RRM}$	800 V
$T_j\text{ max.}$	$150\text{ °C}$

# 1 Characteristics

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

Symbol	Parameter	Value	Unit
$I_{T(RMS)}$	RMS on-state current (180° conduction angle)	$T_C = 134\text{ °C}$ 16	A
$I_{T(AV)}$	Average on-state current (180 ° conduction angle)	$T_C = 134\text{ °C}$ 10	A
		$T_C = 139\text{ °C}$ 8	
		$T_C = 142\text{ °C}$ 6	
$I_{TSM}$	Non repetitive surge peak on-state current ( $T_j$ initial = 25 °C)	$t_p = 8.3\text{ ms}$ 177	A
		$t_p = 10\text{ ms}$ 160	
$I^2t$	$I^2t$ value for fusing	$t_p = 10\text{ ms}$ 128	A <sup>2</sup> s
$V_{DRM}, V_{RRM}$	Repetitive peak off-state voltage	800	V
$V_{DSM}, V_{RSM}$	Non repetitive peak off-state voltage	$t_p = 10\text{ ms}$ $V_{DRM} / V_{RRM} + 100\text{ V}$	V
$di/dt$	Critical rate of rise of on-state current $I_G = 2 \times I_{GT}, t_r < 100\text{ ns}$	$f = 60\text{ Hz}$ 100	A/ $\mu$ s
$I_{GM}$	Peak gate current	$t_p = 20\text{ }\mu$ s $T_j = 150\text{ °C}$ 4	A
$P_{G(AV)}$	Average peak 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	
$T_l$	Maximum lead temperature soldering during 10 s	260	

**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. 5	mA
		Max. 8	
$V_{GT}$		1.3	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. 30	mA
$I_L$	$I_G = 1.2 \times I_{GT}$ max.	Max. 40	mA
$dV/dt$	$V_{OUT} = 536\text{ V}$ , gate open $T_j = 150\text{ °C}$	Min. 500	V/ $\mu$ s
$t_{gt}$	$I_T = 32\text{ A}, V_D = 536\text{ V}, I_G = 12\text{ mA}$ , $(di_G/dt)_{max} = 0.2\text{ A}/\mu$ s	Typ. 1.9	$\mu$ s
$t_q$	$I_T = 32\text{ A}, V_D = 536\text{ V}, V_R = 25\text{ V}, dV_D/dt = 40\text{ V}/\mu$ s	$T_j = 25\text{ °C}$ Typ. 25	$\mu$ s
		$T_j = 150\text{ °C}$ Typ. 85	$\mu$ s

**Table 3. Static characteristics**

Symbol	Test conditions			Value	Unit
$V_{TM}$	$I_{TM} = 32 \text{ A}$ , $t_p = 380 \mu\text{s}$	$T_j = 25 \text{ }^\circ\text{C}$	Max.	1.55	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.	25	m $\Omega$
$I_{DRM}$ , $I_{RRM}$	$V_D = V_{DRM}$ ; $V_R = V_{RRM}$	$T_j = 25 \text{ }^\circ\text{C}$	Max.	1	$\mu\text{A}$
		$T_j = 150 \text{ }^\circ\text{C}$		3.5	mA

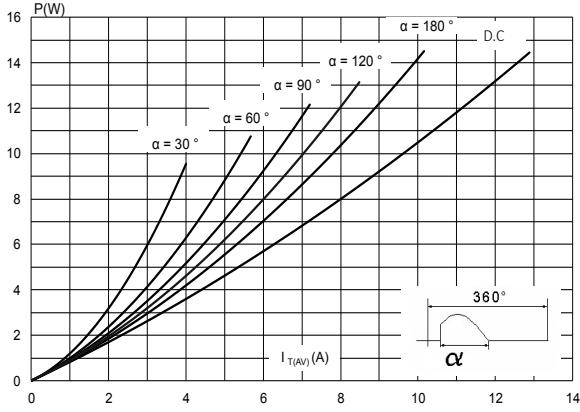
**Table 4. Thermal parameters**

Symbol	Parameter	Value	Unit
$R_{th(j-c)}$	Junction to case (DC)	Max.	1.1
$R_{th(j-a)}$	Junction to ambient, $S = 2.5 \text{ cm}^2$ <sup>(1)</sup> , $e_{CU} = 70 \mu\text{m}$	Typ.	45

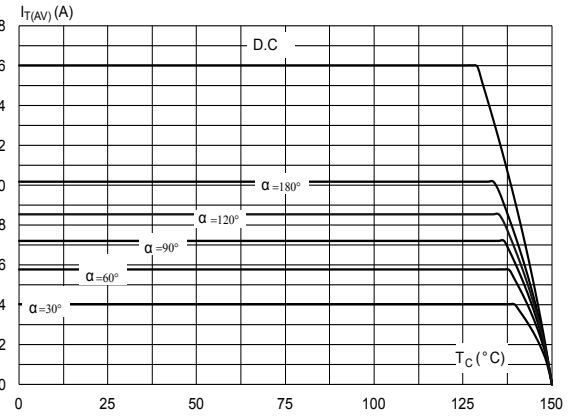
1. Copper surface under tab, on PCB FR4

## 1.1 Characteristics curves

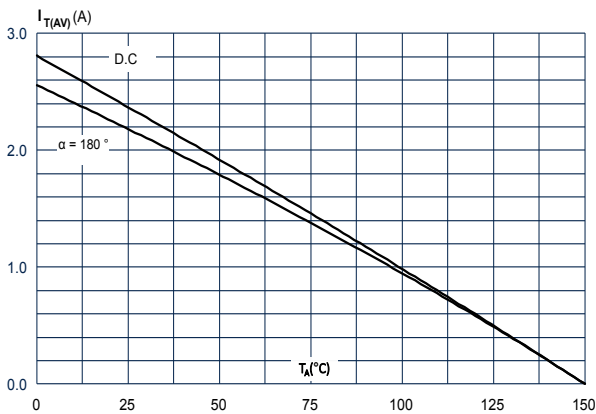
**Figure 1. Maximum average power dissipation versus average on-state current**



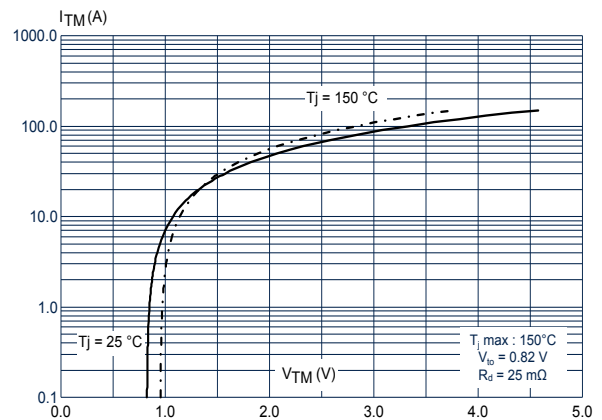
**Figure 2. Average and DC on-state current versus case temperature**



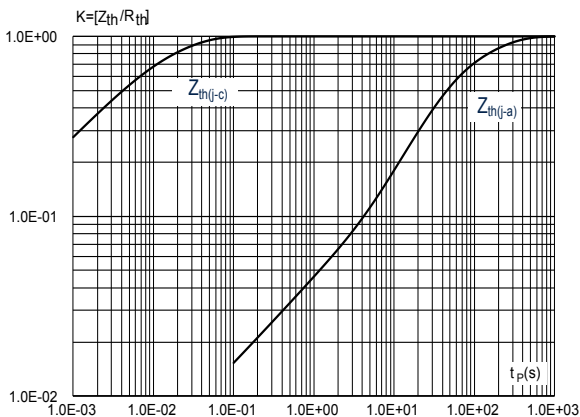
**Figure 3. Average and D.C. on-state current versus ambient temperature**



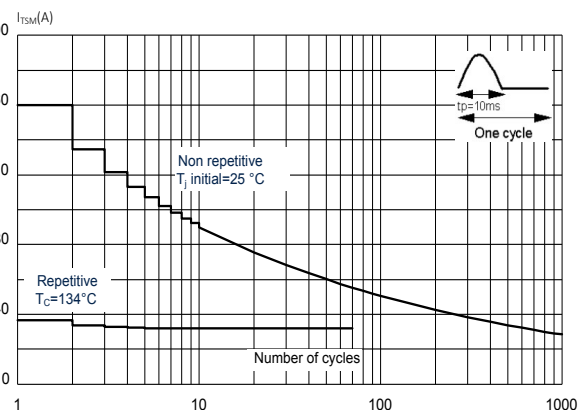
**Figure 4. On-state characteristics (maximum values)**



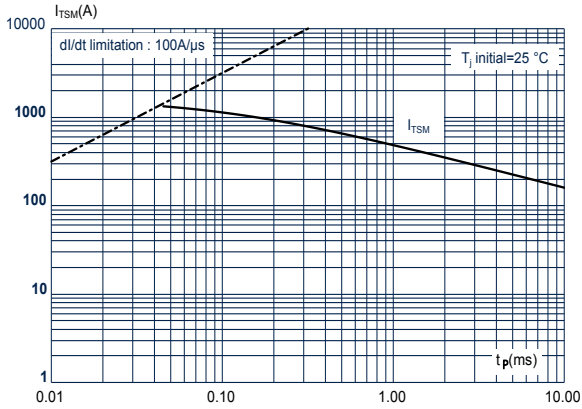
**Figure 5. Relative variation of thermal impedance junction to case and junction to ambient versus pulse duration**



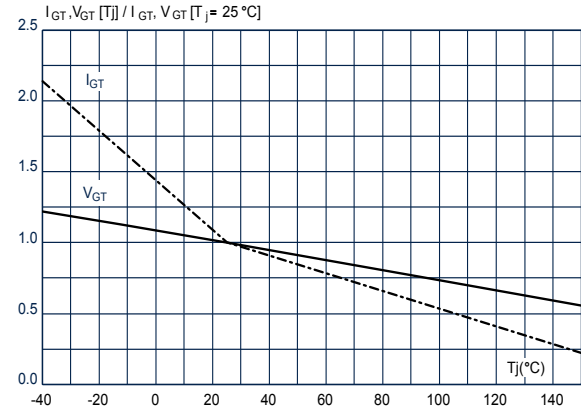
**Figure 6. Surge peak on-state current versus number of cycles**



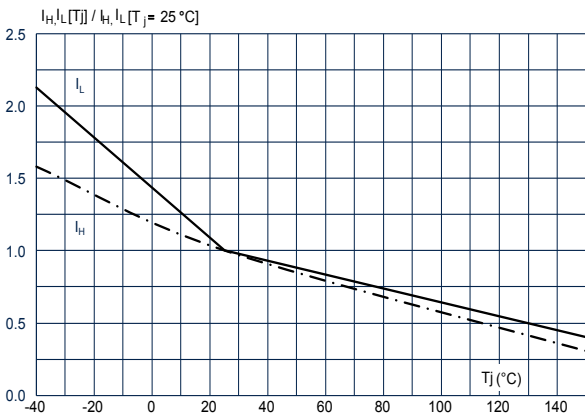
**Figure 7. Non repetitive surge peak on-state current for a sinusoidal pulse with width  $t_p < 10$  ms**



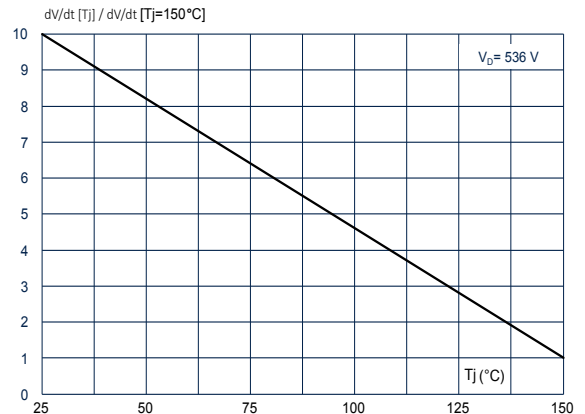
**Figure 8. Relative variation of holding current and latching current versus junction temperature (typical values)**



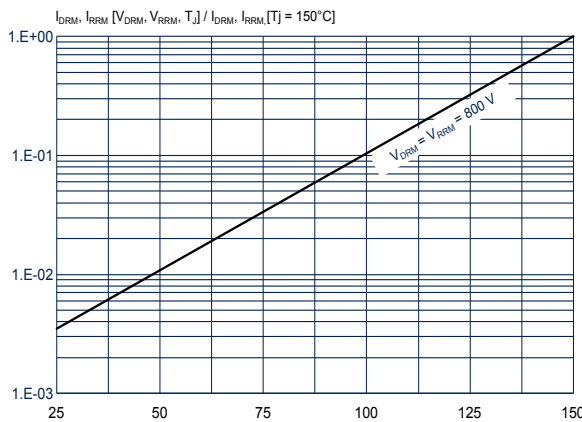
**Figure 9. Relative variation of gate triggering current and voltage versus junction temperature (typical values)**



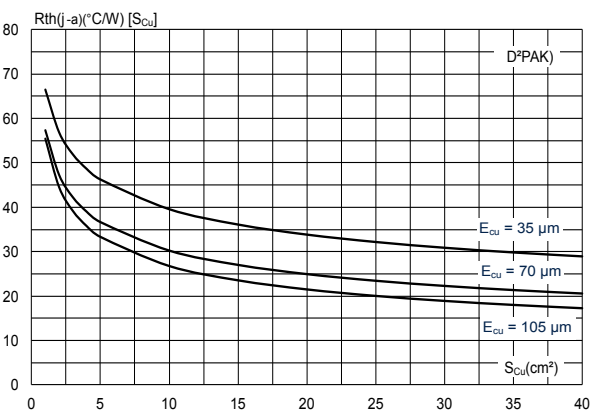
**Figure 10. Relative variation of static dV/dt immunity versus junction temperature (typical values)**



**Figure 11. Relative variation of leakage current versus junction temperature for 800 V blocking voltage**



**Figure 12. Thermal resistance junction to ambient versus copper surface under tab**



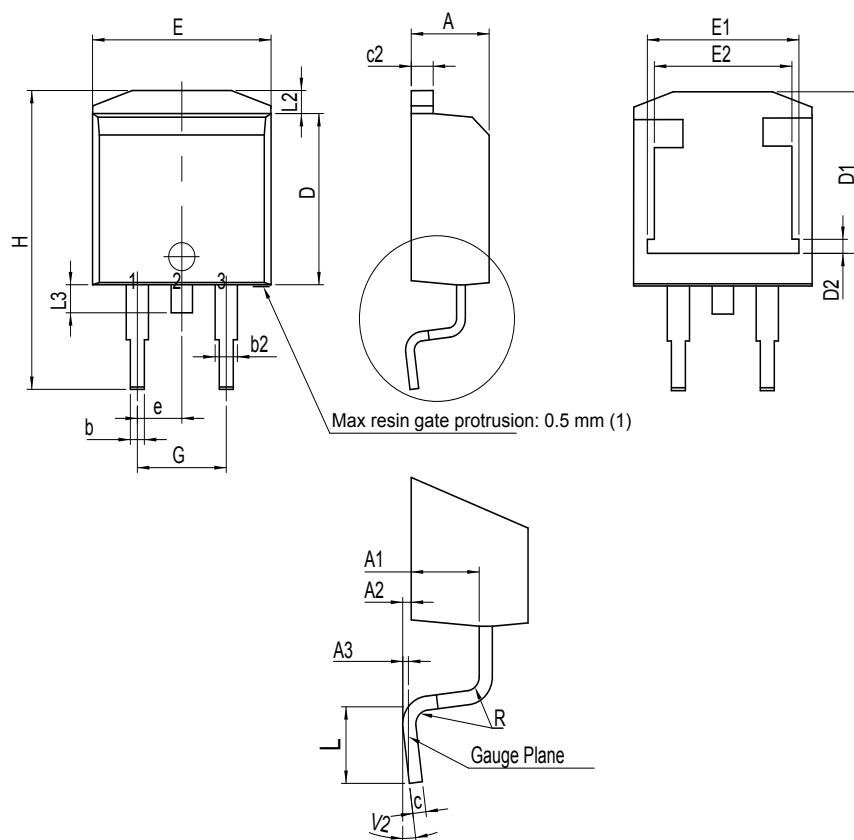
## 2 Package information

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 D<sup>2</sup>PAK package information

- **ECOPACK2** compliant
- Lead-free package leads finishing
- Molding compound resin is halogen-free and meets UL94 flammability standard level V0

Figure 13. D<sup>2</sup>PAK package outline



(1) Resin gate is accepted in each of position shown on the drawing, or their symmetrical.

**Table 5. D<sup>2</sup>PAK package mechanical data**

Ref.	Dimensions					
	Millimeters			Inches <sup>(1)</sup>		
	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			0.10000		
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	1.19		1.40	0.0468		0.0551
L3	1.40		1.75	0.0551		0.0689
R		0.40			0.0157	
V2 <sup>(2)</sup>	0°		8°	0°		8°

1. Dimensions in inches are given for reference only

2. Degrees

Figure 14. D<sup>2</sup>PAK recommended footprint (dimensions are in mm)

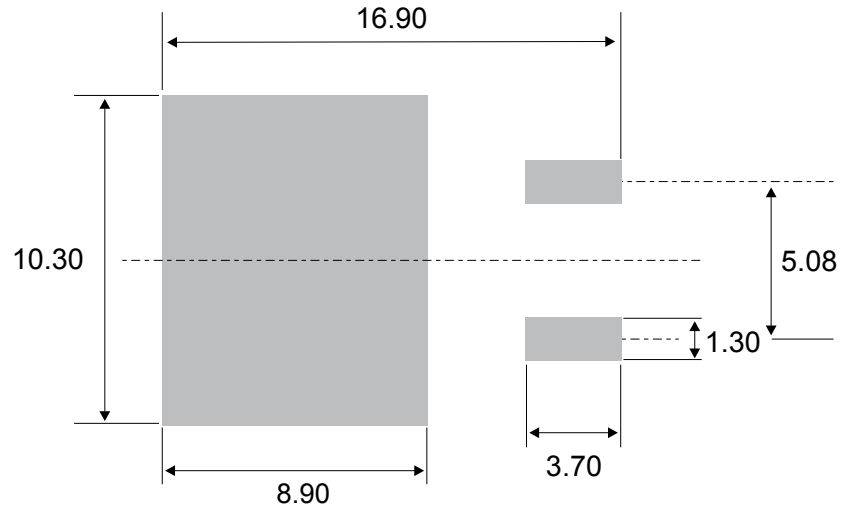
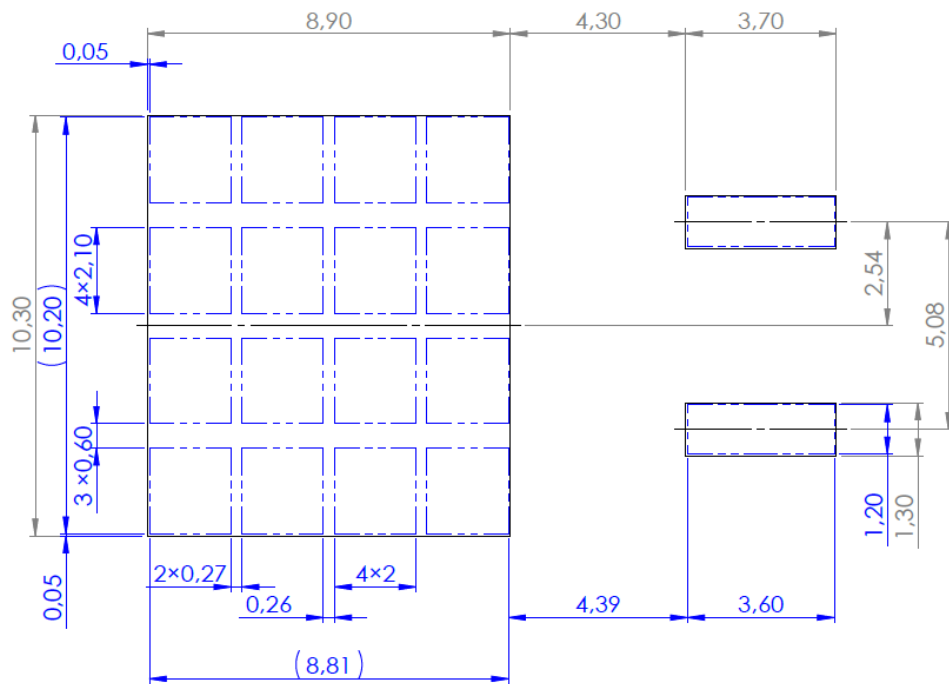


Figure 15. D<sup>2</sup>PAK stencil definitions (dimensions are in mm)





### 3 Ordering information

Figure 16. Ordering information scheme

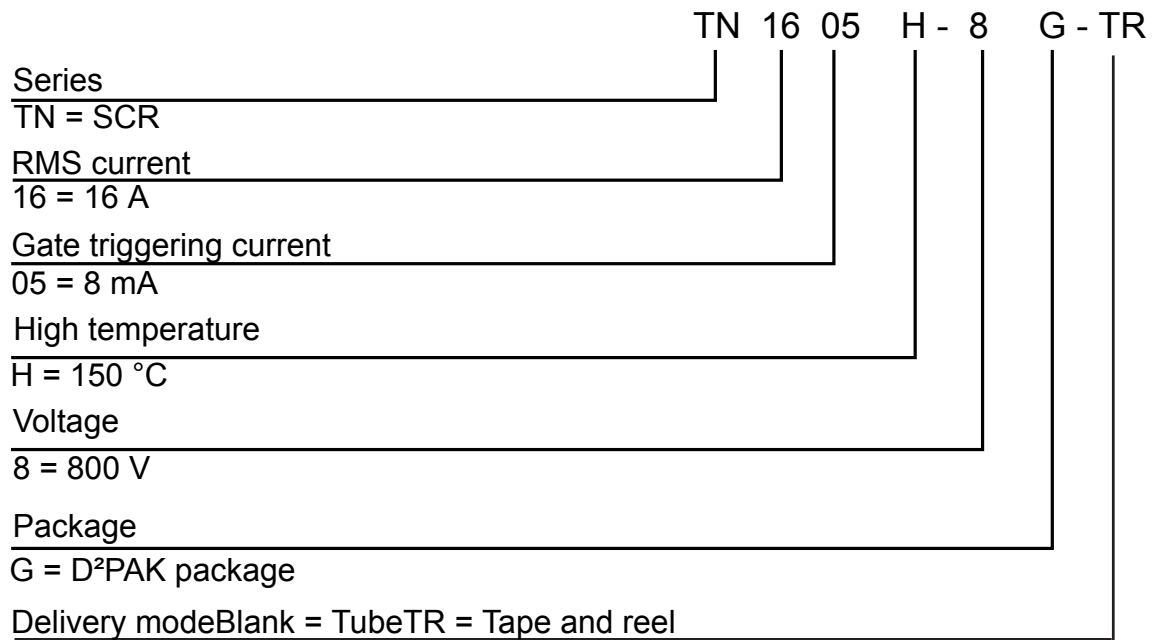


Table 6. Ordering information

Order code	Marking	Package	Weight	Base qty.	Delivery mode
TN1605H-8G	TN1605H8G	D <sup>2</sup> PAK	1.5 g	50	Tube
TN1605H-8G-TR				1000	Tape and reel

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## Revision history

**Table 7. Document revision history**

Date	Revision	Changes
05-Dec-2022	1	Initial release.

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