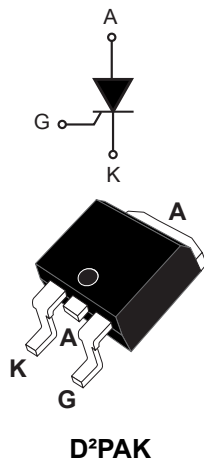


## High temperature 30 A, 600 V D<sup>2</sup>PAK thyristor SCRs



### Features

- High junction temperature:  $T_j = 150\text{ °C}$
- High noise immunity  $dV/dt = 1000\text{ V}/\mu\text{s}$  up to  $150\text{ °C}$
- Gate triggering current  $I_{GT} = 15\text{ mA}$
- Peak off-state voltage  $V_{DRM}/V_{RRM} = 600\text{ V}$
- High turn-on current rise  $di/dt = 100\text{ A}/\mu\text{s}$
- **ECOPACK2** compliant

### Applications

- General purpose AC line load switching
- Motorbike voltage regulator circuits
- Inrush current limiting circuits
- Motor control circuits and starters
- Heating resistor control, Solid State Relays
- Lighting

### Description

Thanks to its operating junction temperature up to  $150\text{ °C}$ , the **TN3015H-6G** SCR in D<sup>2</sup>PAK package offers high thermal performance operation up to 30 A RMS in a compact SMD design.

Its trade-off noise immunity ( $dV/dt = 1000\text{ V}/\mu\text{s}$ ) versus its gate triggering current ( $I_{GT} = 15\text{ mA}$ ) and its turn-on current rise ( $di/dt = 100\text{ A}/\mu\text{s}$ ) allows to design robust and compact control circuit for voltage regulator in motorbikes and industrial drives, overvoltage crowbar protection, motor control circuits in power tools and kitchen appliances and inrush current limiting circuits.

Product status	
TN3015H-6G	
Product summary	
Order code	TN3015H-6G
Package	D <sup>2</sup> PAK
$V_{DRM}/V_{RRM}$	600 V
$T_j$	$150\text{ °C}$
$I_{GT}$	15 mA

# 1 Characteristics

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

Symbol	Parameter		Value	Unit
$I_{T(RMS)}$	RMS on-state current (180 ° conduction angle)		$T_c = 127\text{ °C}$ 30	A
$I_{T(AV)}$	Average on-state current (180 ° conduction angle)		$T_c = 127\text{ °C}$ 19	A
			$T_c = 134\text{ °C}$ 15	
			$T_c = 141\text{ °C}$ 10	
$I_{TSM}$	Non repetitive surge peak on-state current ( $T_j$ initial = 25 °C)		$t_p = 8.3\text{ ms}$ 295	A
			$t_p = 10\text{ ms}$ 270	
$I^2t$	$I^2t$ value for fusing ( $T_j$ initial = 25 °C)		$t_p = 10\text{ ms}$ 364	A <sup>2</sup> s
$di/dt$	$I_G = 2 \times I_{GT}$ , $tr \leq 100\text{ ns}$ Critical rate of rise of on-state current	$f = 60\text{ Hz}$	$T_j = 25\text{ °C}$ 100	A/ $\mu$ s
$V_{DRM}/V_{RRM}$	Repetitive peak off-state voltage		600	V
$V_{DSM}/V_{RSM}$	Non repetitive surge peak off-state voltage	$t_p = 10\text{ ms}$	$T_j = 25\text{ °C}$ $V_{DRM}/V_{RRM} + 100$	V
$I_{GM}$	Peak gate current	$t_p = 20\text{ }\mu\text{s}$	$T_j = 150\text{ °C}$ 4	A
$P_{G(AV)}$	Average gate power dissipation		$T_j = 150\text{ °C}$ 1	W
$V_{RGM}$	Maximum peak reverse gate voltage		$T_j = 25\text{ °C}$ 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.	6	mA
			Max.	15	
$V_{GT}$			Max.	1.3	V
$V_{GD}$	$V_D = V_{DRM}$ , $R_L = 3.3\text{ k}\Omega$	$T_j = 150\text{ °C}$	Min.	0.15	V
$I_H$	$I_T = 500\text{ mA}$ , gate open		Max.	60	mA
$I_L$	$I_G = 1.2 \times I_{GT}$		Max.	75	mA
$dV/dt$	$V_D = 402\text{ V}$ , gate open	$T_j = 150\text{ °C}$	Min.	1000	V/ $\mu$ s
$t_{gt}$	$I_T = 60\text{ A}$ , $V_D = 600\text{ V}$ , $I_G = 100\text{ mA}$ , $(di_G/dt)_{max} = 0.2\text{ A}/\mu\text{s}$		Typ.	1.9	$\mu$ s
$t_q$	$I_T = 30\text{ A}$ , $V_D = 402\text{ V}$ , $(di/dt)_{off} = 30\text{ A}/\mu\text{s}$ , $V_R = 25\text{ V}$ , $dV_D/dt = 50\text{ V}/\mu\text{s}$	$T_j = 150\text{ °C}$	Typ.	80	$\mu$ s

**Table 3. Static characteristics**

Symbol	Test conditions			Value	Unit
$V_{TM}$	$I_{TM} = 60 \text{ A}$ , $t_p = 380 \text{ } \mu\text{s}$	$T_j = 25 \text{ }^\circ\text{C}$	Max.	1.6	V
$V_{TO}$	Threshold voltage	$T_j = 150 \text{ }^\circ\text{C}$	Max.	0.84	
$R_D$	Dynamic resistance	$T_j = 150 \text{ }^\circ\text{C}$	Max.	14	m $\Omega$
$I_{DRM}$ , $I_{RRM}$	$V_D = V_{DRM}$ , $V_R = V_{RRM}$	$T_j = 25 \text{ }^\circ\text{C}$	Max.	10	$\mu\text{A}$
		$T_j = 150 \text{ }^\circ\text{C}$		5	mA

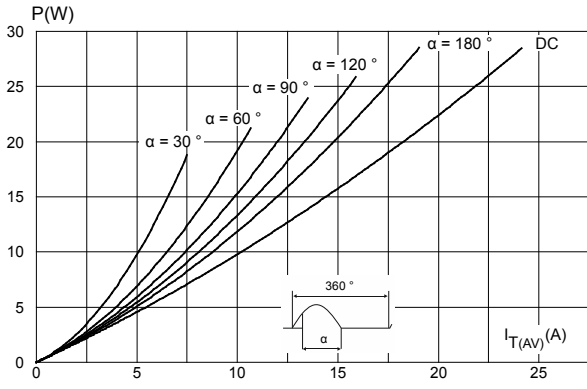
**Table 4. Thermal parameters**

Symbol	Parameter	Value	Unit
$R_{th(j-c)}$	Junction to case (DC)	Max. 0.85	$^\circ\text{C/W}$
$R_{th(j-a)}$	Junction to ambient <sup>(1)</sup> $S(1) = 1 \text{ cm}^2$	Typ. 45	

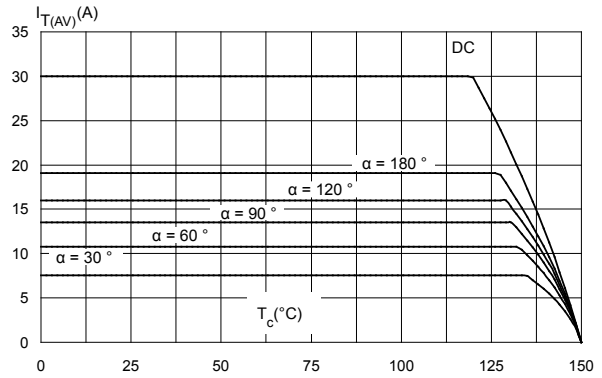
1. S : Copper pad under tab, on PCB FR4

## 1.1 Characteristics curves

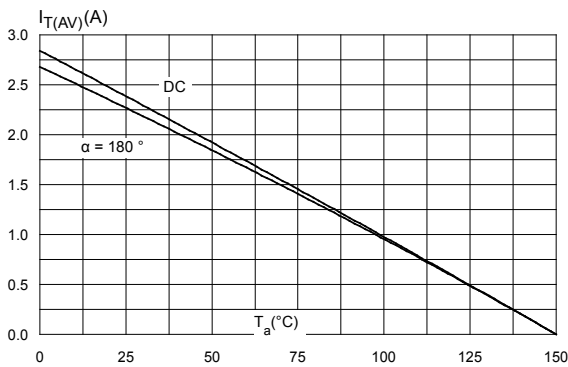
**Figure 1. Maximum power dissipation versus average on-state current**



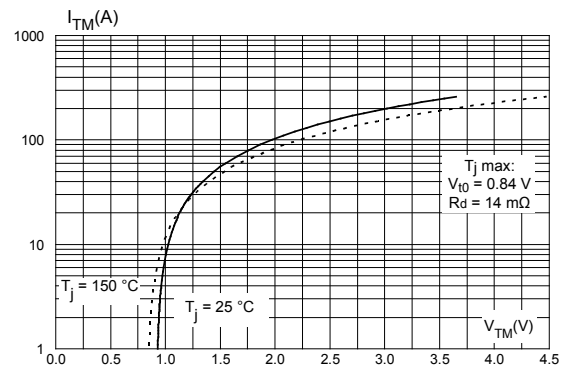
**Figure 2. Average and DC on-state current versus case temperature**



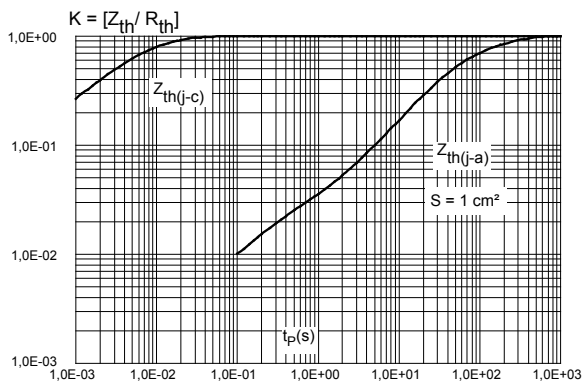
**Figure 3. Average and D.C. on state current versus ambient temperature**



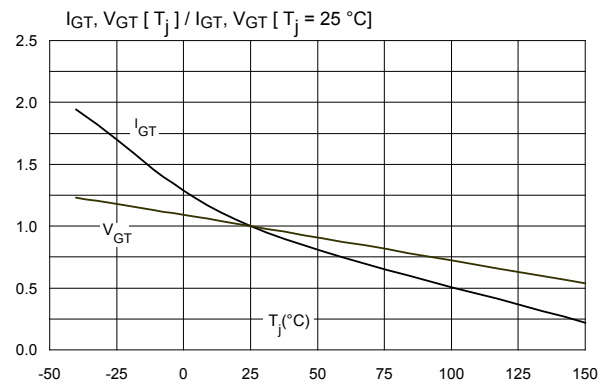
**Figure 4. On-state characteristics (maximum values)**



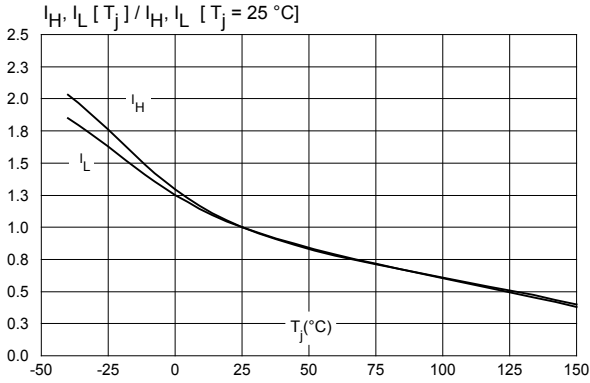
**Figure 5. Relative variation of thermal impedance junction to case and junction to ambient versus pulse duration**



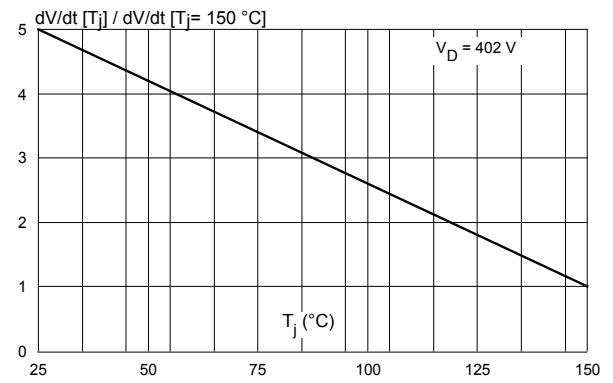
**Figure 6. Relative variation of gate trigger current and gate voltage versus junction temperature (typical values)**



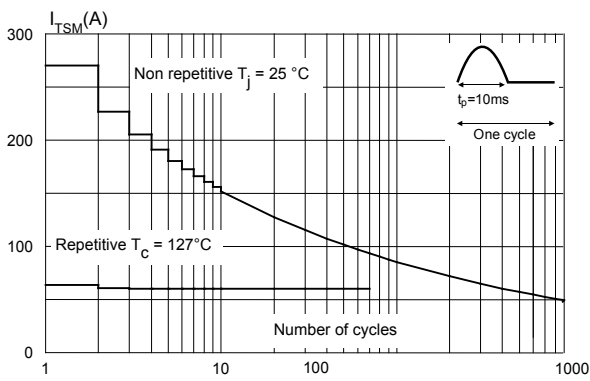
**Figure 7. Relative variation of holding and latching current versus junction temperature (typical values)**



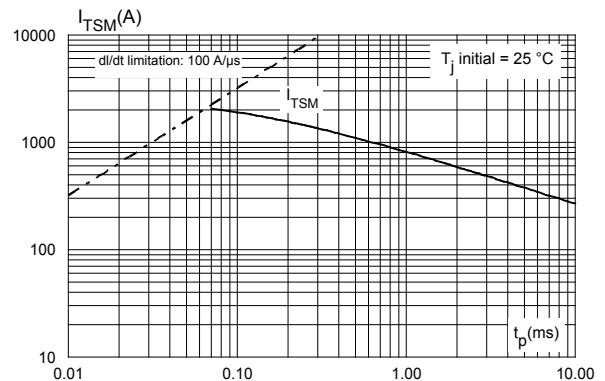
**Figure 8. Relative variation of static dV/dt immunity versus junction temperature (typical values)**



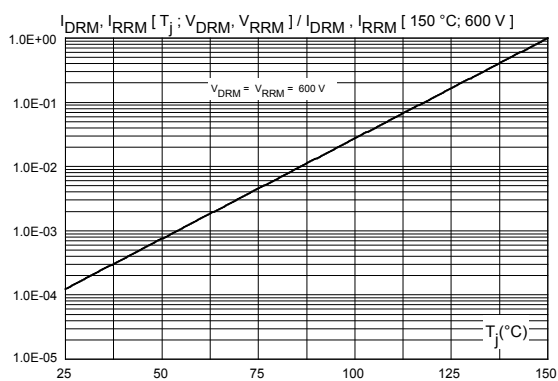
**Figure 9. Surge peak on-state current versus number of cycles**



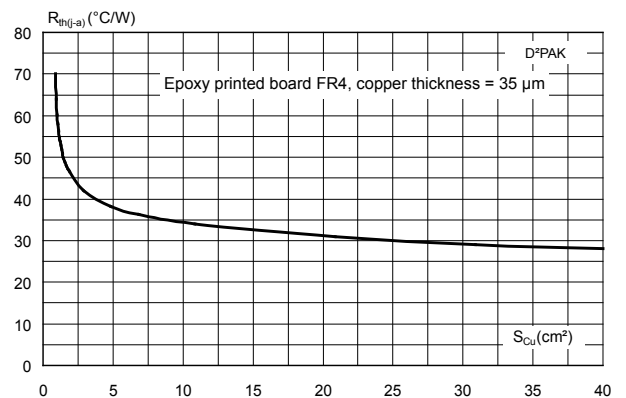
**Figure 10. Non repetitive surge peak on-state current for a sinusoidal pulse with width  $t_p < 10$  ms**



**Figure 11. Relative variation of leakage current versus junction temperature**



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



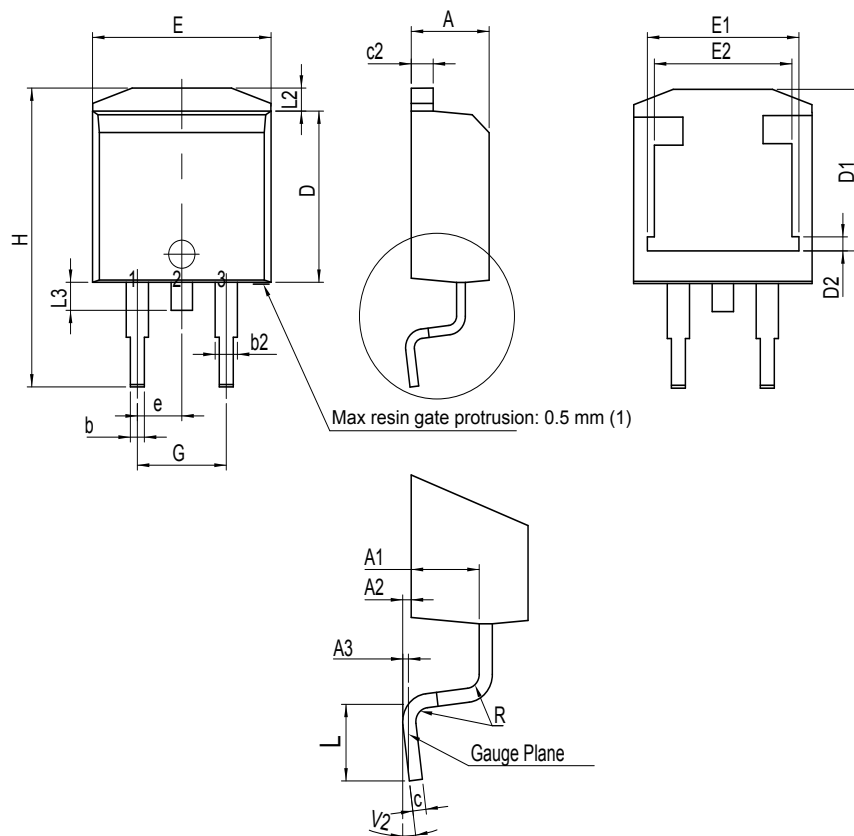
## 2 Package information

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

- ECOPACK<sup>®</sup>2 compliant
- Lead-free package leads finishing
- Molding compound resin is halogen-free and meets UL 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	1.27		1.40	0.0500		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)

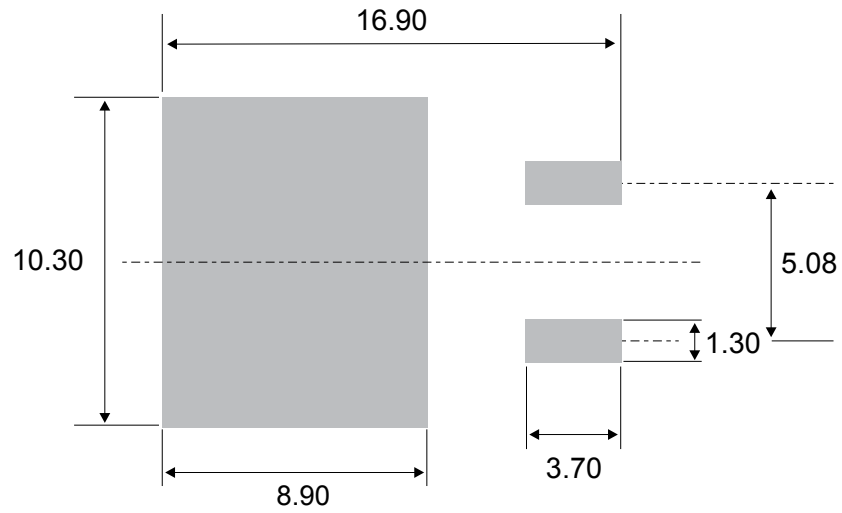
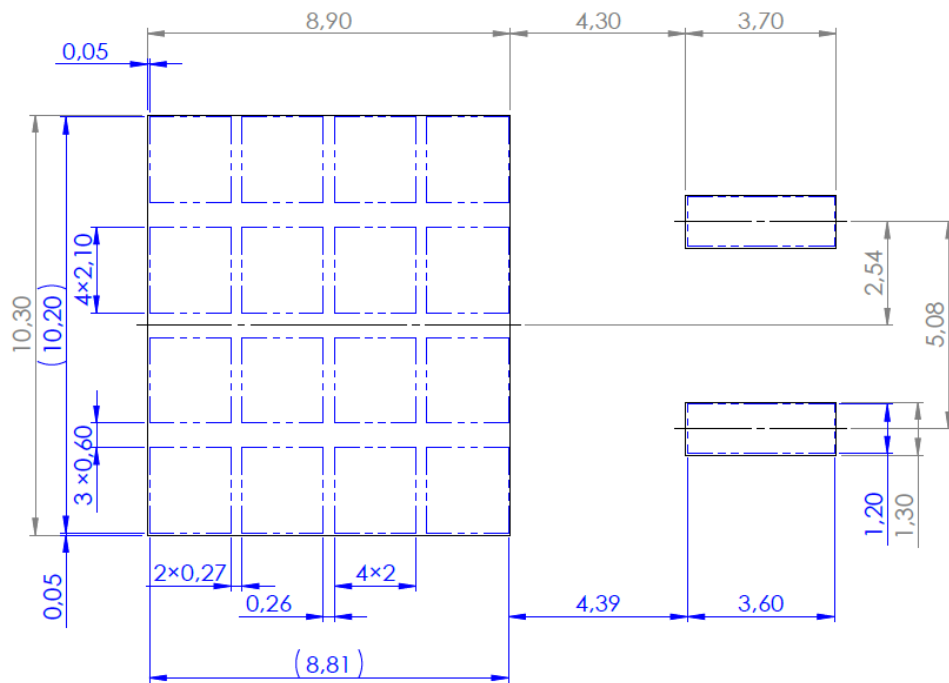


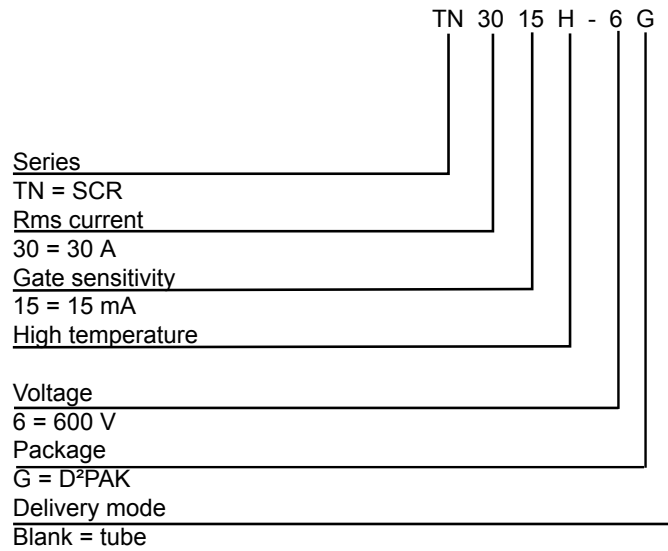
Figure 15. D<sup>2</sup>PAK stencil definitions (dimensions are in mm)





### 3 Ordering information

**Figure 16. Ordering information scheme**



**Table 6. Ordering information**

Order code	Marking	Package	Weight	Base qty.	Delivery mode
TN3015H-6G-TR	TN3015H6G	D <sup>2</sup> PAK	1.5 g	1000	Tape and Reel
TN3015H-6G				50	Tube

## Revision history

**Table 7. Document revision history**

Date	Revision	Changes
05-Jul-2019	1	Initial release.

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