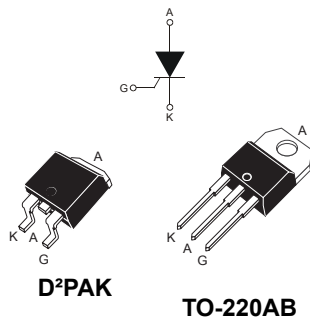


## High temperature 12 A SCRs



### Features

- High junction temperature:  $T_j = 150\text{ °C}$
- Medium current SCRs
- High noise immunity up to  $150\text{ °C}$
- RoHS (2002/95/EC) compliant
- $600\text{ V } V_{\text{DRM}}, V_{\text{RRM}}$

### Applications

- General purpose AC line load switching
- Motor control circuits
- Small home appliances
- Lighting
- Inrush current limiting circuits
- Overvoltage crowbar protection

### Description

Available in standard gate triggering levels, the TN1205H SCR series has very high switching capability up to a junction temperature of  $150\text{ °C}$ .

These products fit all modes of control found in applications such as overvoltage crowbar protection, motor control circuits in power tools and kitchen aids, inrush current limiting circuits, capacitive discharge ignition and voltage regulation circuits.

These products are particularly adapted for use in areas where the ambient temperature is high or the ventilation low, or where an increase of power density is required.

Through-hole or surface-mount packages provide performance in a limited space area.

#### Product status link

[TN1205H](#)

#### Product summary

$V_{\text{DRM}}, V_{\text{RRM}}$	600 V
$I_{\text{GT}}$	2 to 5 mA

# 1 Characteristics

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

Symbol	Parameter			Value	Unit	
$I_{T(RMS)}$	RMS on-state current (180° conduction angle))	D <sup>2</sup> PAK, TO-220AB	$T_c = 136\text{ °C}$	12	A	
$I_{T(AV)}$	Average on-state current (180° conduction angle)			7.6		
$I_{TSM}$	Non repetitive surge peak on-state current		$T_j = 25\text{ °C}$	$t_p = 8.3\text{ ms}$	126	A
				$t_p = 10\text{ ms}$	120	
$I^2t$	$I^2t$ value for fusing		$t_p = 10\text{ ms}$	72	A <sup>2</sup> s	
$di/dt$	Critical rate of rise of on-state current, $I_G = 2 \times I_{GT}$ , $t_r \leq 100\text{ ns}$ , $F = 60\text{ Hz}$		$T_j = 150\text{ °C}$	100	A/ $\mu$ s	
$V_{DSM}/V_{RSM}$	Non Repetitive peak off-state voltage		$t_p = 10\text{ ms}$	$V_{DRM}/V_{RRM} + 100$	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			5	V	
$T_{stg}$	Storage 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 2. Electrical characteristics ( $T_j = 25\text{ °C}$ , unless otherwise specified)**

Symbol	Test conditions			Value	Unit
$I_{GT}^{(1)}$	$V_D = 12\text{ V}$ , $R_L = 33\text{ }\Omega$		Max.	2	mA
			Max.	5	
$V_{GT}$			Max.	1.3	V
$V_{GD}$	$V_D = V_{DRM}$ , $R_L = 3.3\text{ k}\Omega$		Min.	0.2	V
$I_L$	$I_G = 1.2 \times I_{GT}$		Max.	40	mA
$I_H^{(2)}$	$I_T = 500\text{ mA}$ , gate open		Max.	20	mA
$dV/dt^{(2)}$	$V_D = 67\% V_{DRM}$ , gate open	$T_j = 125\text{ °C}$	Min.	200	V/ $\mu$ s
		$T_j = 150\text{ °C}$		100	
$t_{gt}$	$I_{TM} = 40\text{ A}$ , $V_D = 500\text{ V}$ , $I_G = 100\text{ mA}$ , $di_G/dt = 5\text{ A}/\mu\text{s}$		Typ.	1.9	$\mu$ s
$t_q$	$V_{DM} = 335\text{ V}$ , $T_j = 125\text{ °C}$ , $I_{TM} = 20\text{ A}$ , $V_R = 25\text{ V}$ , $(di_T/dt)_{Max} = 30\text{ A}/\mu\text{s}$ , $dV_D/dt = 50\text{ V}/\mu\text{s}$ , $R_{GK} = 100\text{ }\Omega$		Typ.	65	$\mu$ s

1. Minimum  $I_{GT}$  is guaranteed at 20% of  $I_{GT}$  max.
2. For both polarities of A2 referenced to A1.

**Table 3. Static characteristics**

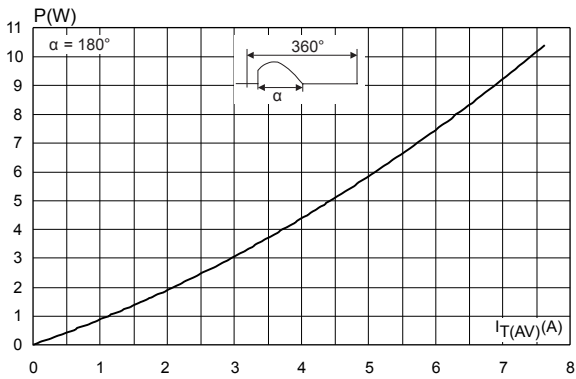
Symbol	Test conditions		Max. value	Unit
$V_T$	$I_{TM} = 24 \text{ A}$ , $t_p = 380 \mu\text{s}$	$T_j = 25 \text{ }^\circ\text{C}$	1.6	V
$V_{TD}$	Threshold voltage	$T_j = 150 \text{ }^\circ\text{C}$	0.80	V
$R_D$	Dynamic resistance	$T_j = 150 \text{ }^\circ\text{C}$	30	m $\Omega$
$I_{DRM}/I_{RRM}$	$V_{DRM} = V_{RRM}$	$T_j = 25 \text{ }^\circ\text{C}$	5	$\mu\text{A}$
		$T_j = 125 \text{ }^\circ\text{C}$	1	mA
		$T_j = 150 \text{ }^\circ\text{C}$	3	mA

**Table 4. Thermal resistance**

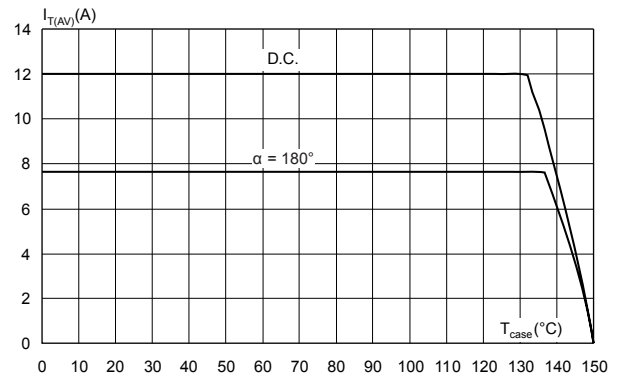
Symbol	Parameter		Value	Unit
$R_{th(j-c)}$	Junction to case (DC)		1.3	$^\circ\text{C/W}$
$R_{th(j-a)}$	Junction to ambient DC ( $S_{cu} = 1 \text{ cm}^2$ )	D <sup>2</sup> PAK	45	$^\circ\text{C/W}$
		TO-220AB	60	

### 1.1 Characteristics curves

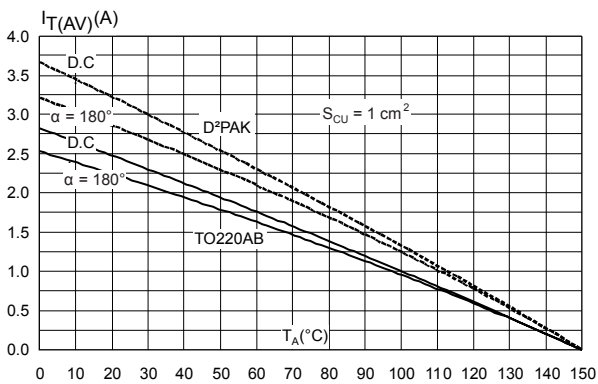
**Figure 1. Maximum power dissipation versus on-state RMS current**



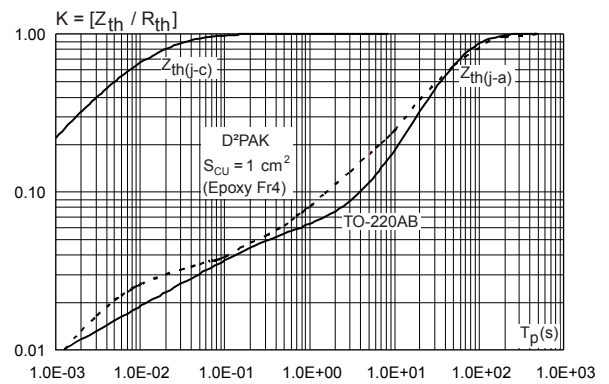
**Figure 2. Average and DC on-state current versus case temperature**



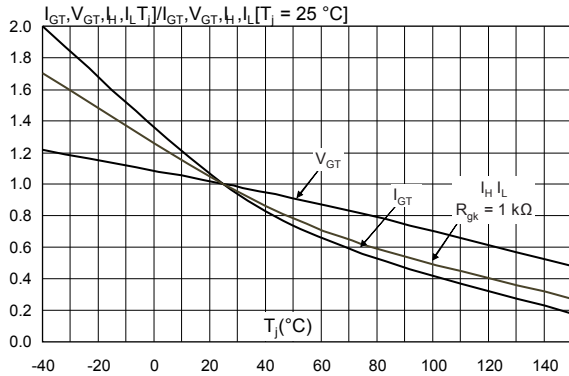
**Figure 3. Average and DC on-state current versus ambient temperature**



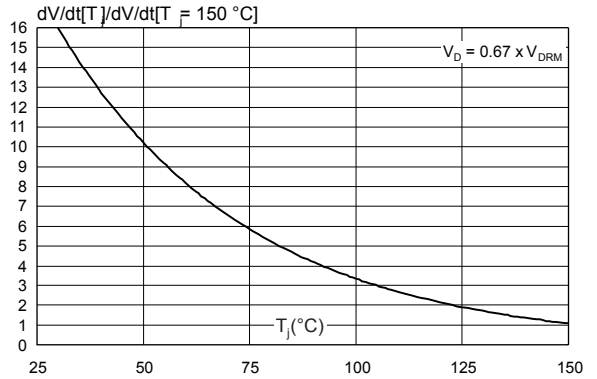
**Figure 4. Variation of thermal impedance versus pulse duration**



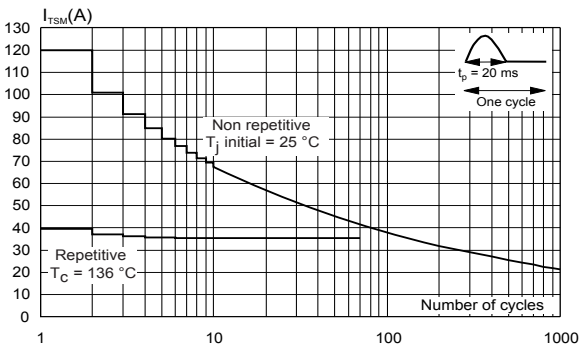
**Figure 5. Relative variation of  $I_{GT}$ ,  $V_{GT}$ ,  $I_H$ ,  $I_L$  versus junction temperature (typical values)**



**Figure 6. Relative variation of static dV/dt immunity versus junction temperature (typical values)**



**Figure 7. Surge peak on-state current versus number of cycles**



**Figure 8. Non repetitive surge peak on-state current and corresponding value of  $I^2t$  versus sinusoidal pulse width**

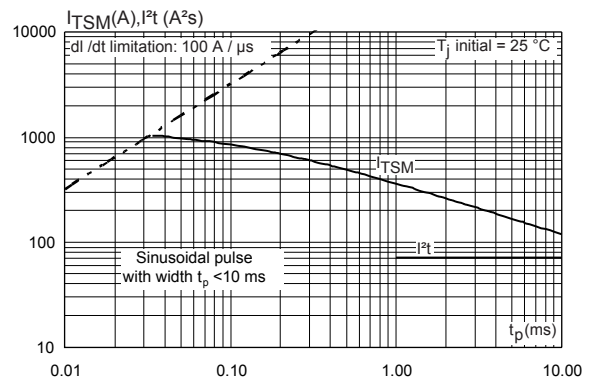


Figure 9. On-state characteristics (maximum values)

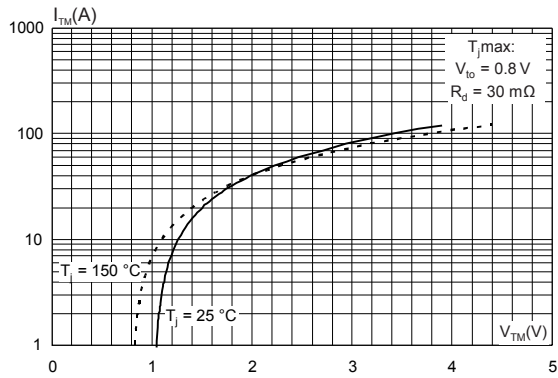


Figure 10. Relative variation of leakage current versus junction temperature for different values of blocking voltage

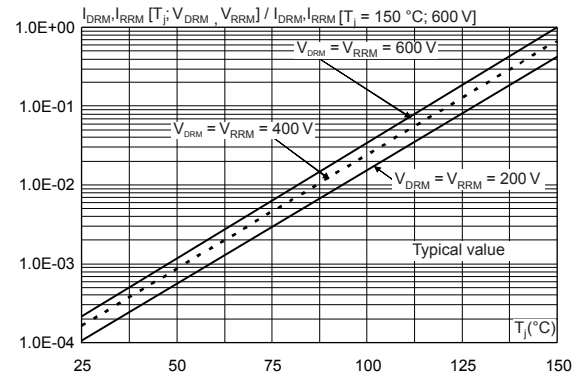
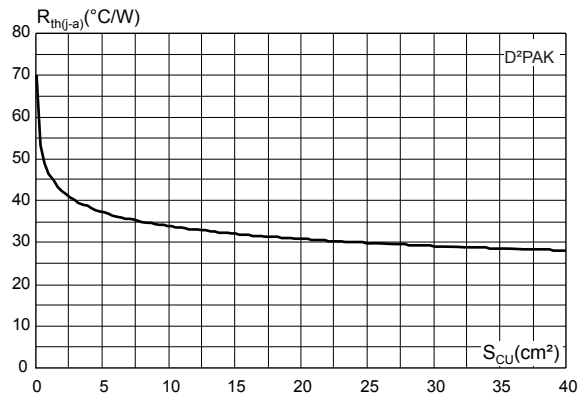


Figure 11. Thermal resistance junction to ambient versus copper surface under tab (D<sup>2</sup>PAK, printed circuit board FR4, copper thickness: 35 μm)



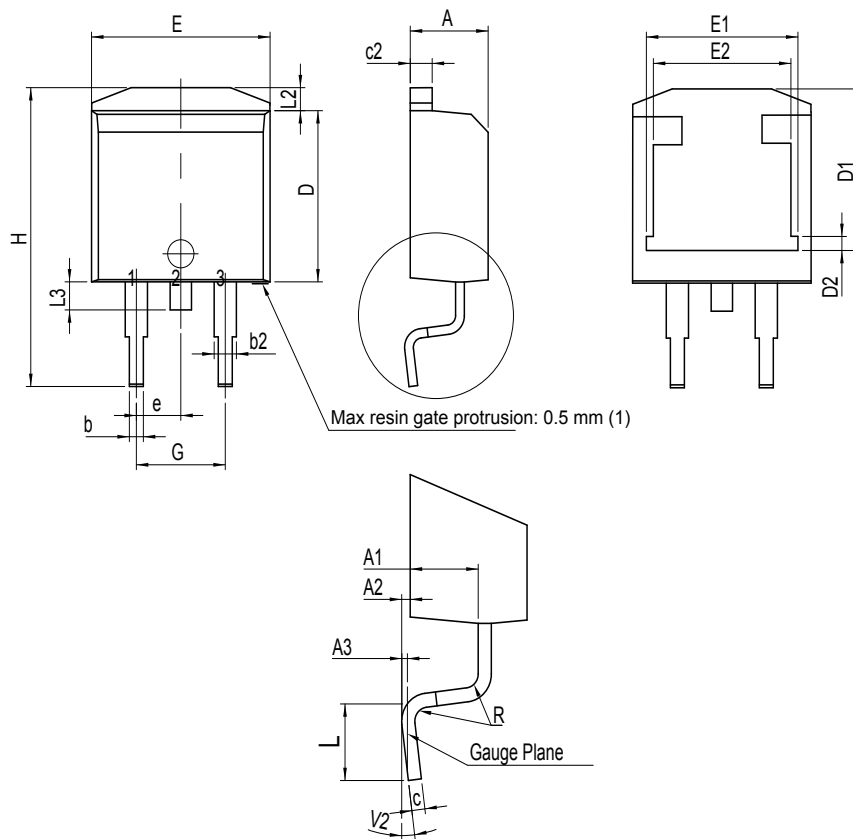
## 2 Package information

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 12. 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	0.0460		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 13. D<sup>2</sup>PAK recommended footprint (dimensions are in mm)

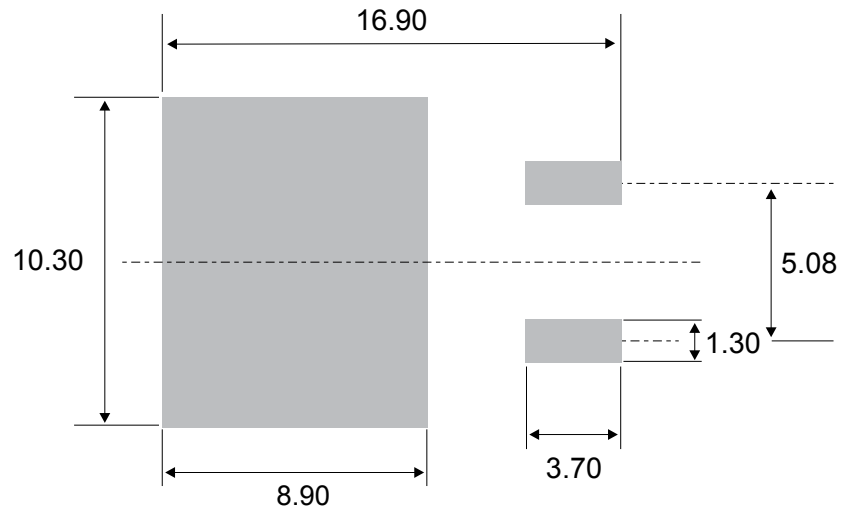
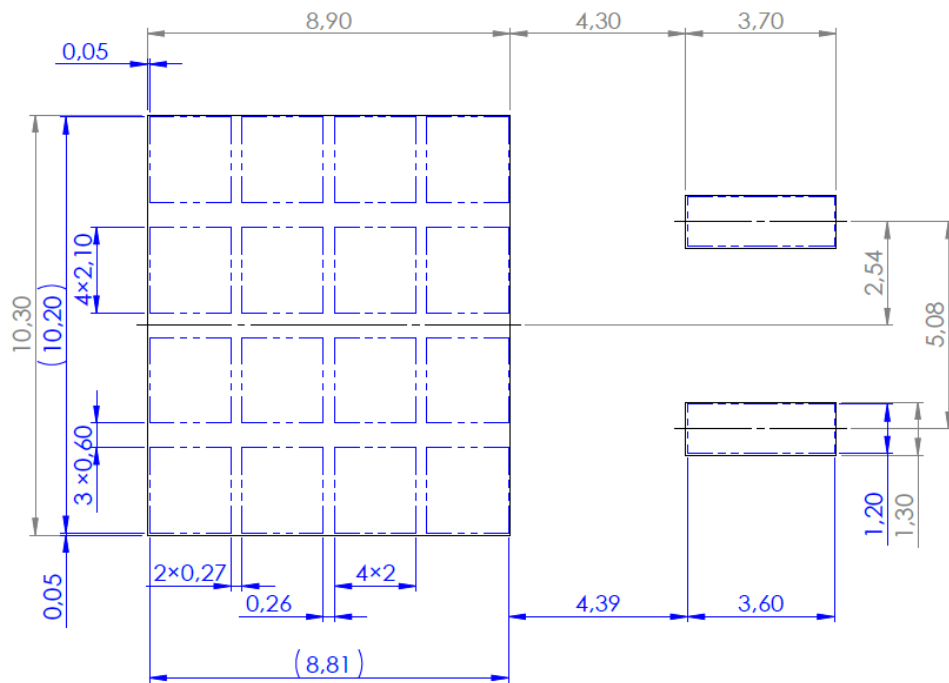


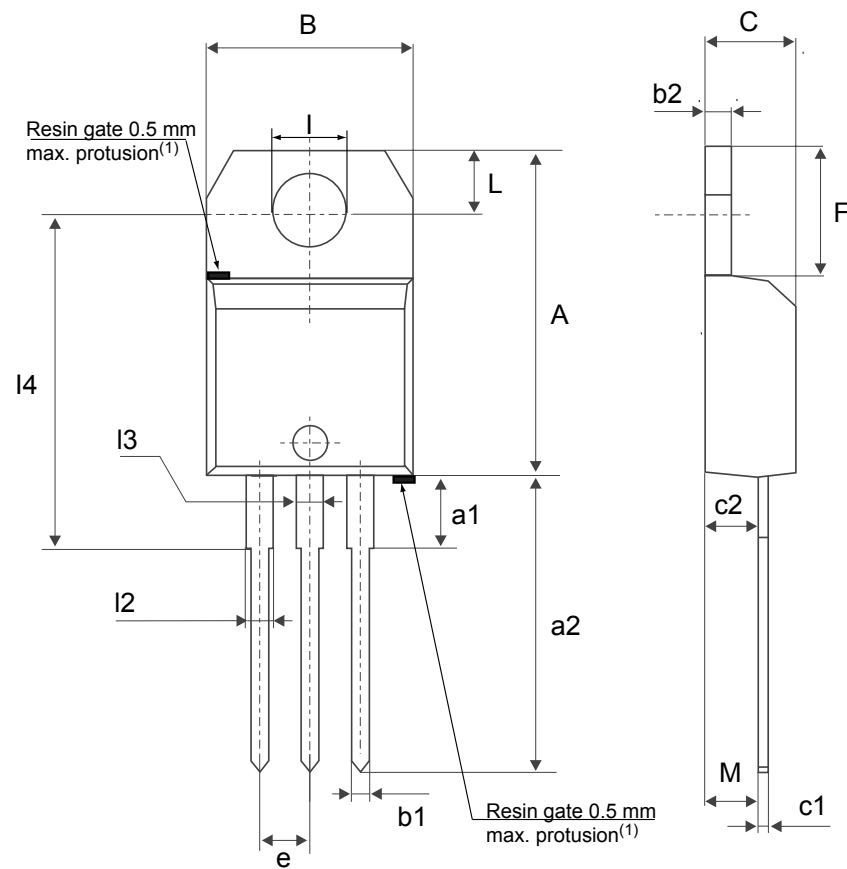
Figure 14. D<sup>2</sup>PAK stencil definitions (dimensions are in mm)



## 2.2 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: 0.4 to 0.6 N.m

Figure 15. TO-220AB package outline



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

**Table 6. TO-220AB package mechanical data**

Ref.	Dimensions					
	Millimeters			Inches <sup>(1)</sup>		
	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
l	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.

### 3 Ordering information

Figure 16. Ordering information scheme

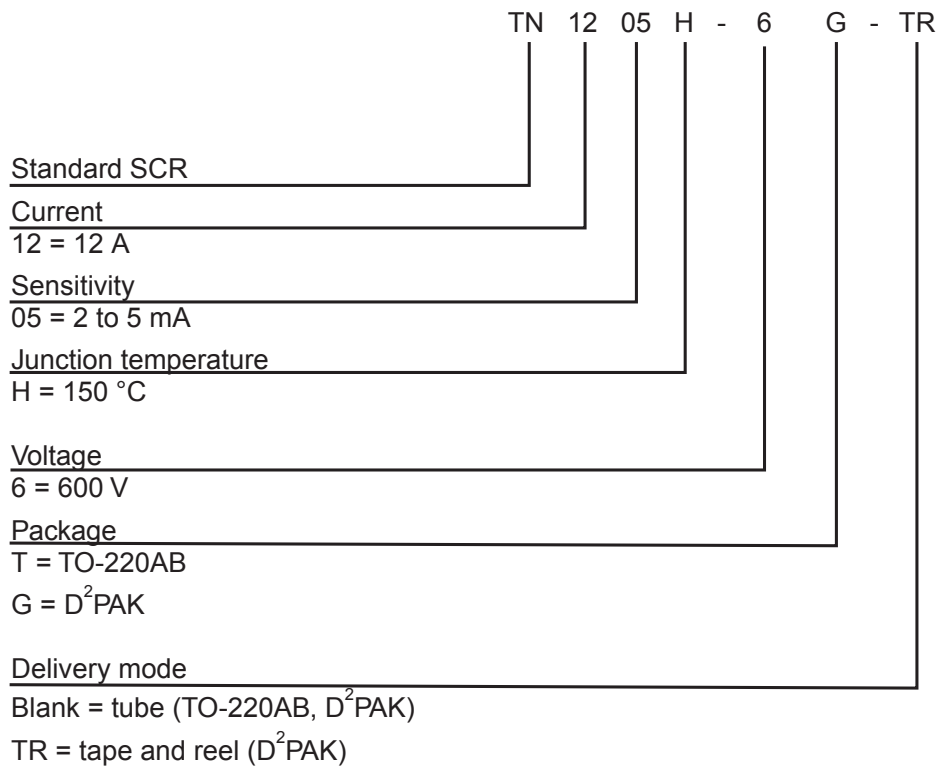


Table 7. Ordering information

Order code	Marking	Package	Weight	Base qty.	Delivery mode
TN1205H-6T	TN1205H6T	TO-220AB	2.0 g	50	Tube
TN1205H-6G	TN1205H6G	D <sup>2</sup> PAK	1.5 g	50	Tube
TN1205H-6G-TR	TN1205H6G	D <sup>2</sup> PAK	1.5 g	1000	Tape and reel

## Revision history

**Table 8. Document revision history**

Date	Version	Changes
17-Feb-2011	1	First issue.
26-Sep-2011	2	Corrected typographical error in Features and Description.
17-Jan-2012	3	Updated units for $t_{gt}$ in Table 3.
26-Apr-2012	4	Moved junction temperature to top of features list. Description reworded for readability. No technical changes.
24-Sep-2020	5	Updated Table 2. Electrical characteristics ( $T_j = 25\text{ °C}$ , unless otherwise specified).

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