

### 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
- $600\text{ V } V_{\text{DRM}}, V_{\text{RRM}}$

### Application

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

### Description

Available in standard gate triggering levels, the TN1205H SCR series has very high switching capability up to 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.

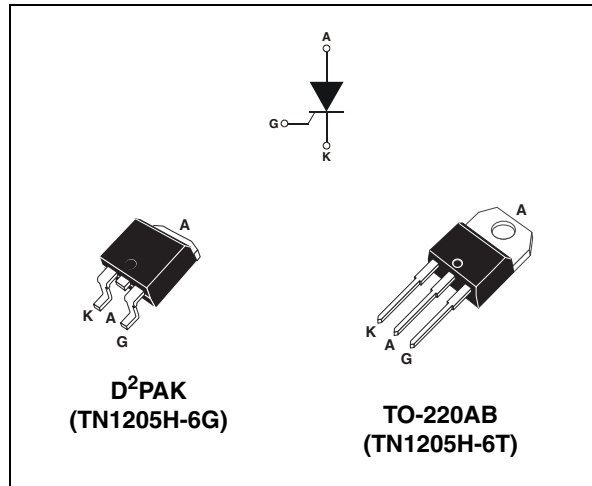


Table 1. Device summary

Order code	Package	$V_{\text{DRM}}, V_{\text{RRM}}$	$I_{\text{GT}}$
TN1205H-6T	TO-220AB	600 V	2 to 5 mA
TN1205H-6G	D <sup>2</sup> PAK		

# 1 Characteristics

**Table 2. Absolute ratings (limiting values)**

Symbol	Parameter			Value	Unit	
$I_{T(RMS)}$	On-state rms current (180° conduction angle)	TO220-AB, D <sup>2</sup> PAK	$T_c = 136\text{ °C}$	12	A	
$I_{T(AV)}$	Average on-state current (180° conduction angle)			7.6	A	
$I_{TSM}$	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	
$V_{DSM}, V_{RSM}$	Non repetitive surge peak off-state voltage		$t_p = 10\text{ ms}$	$V_{DRM}, V_{RRM} + 100$	V	
$di/dt$	Critical rate of rise of on-state current $I_G = 2 \times I_{GT}$ , $t_r \leq 100\text{ ns}$	F = 60 Hz	$T_j = 150\text{ °C}$	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 gate power dissipation		$T_j = 150\text{ °C}$	1	W	
$V_{RGM}$	Maximum peak reverse gate voltage			5	V	
$T_{stg}$ $T_j$	Storage junction temperature range 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
$I_{GT}$	$V_D = 12\text{ V}, R_L = 33\text{ }\Omega$	MIN.	2	mA
		MAX.	5	
$V_{GT}$	$V_D = V_{DRM}, R_L = 3.3\text{ k}\Omega$	MAX.	1.3	V
$V_{GD}$	$V_D = V_{DRM}, R_L = 3.3\text{ k}\Omega$	MIN.	0.2	V
$I_H$	$I_T = 500\text{ mA}$ gate open	MAX.	20	mA
$I_L$	$I_G = 1.2 I_{GT}$	MAX.	40	mA
$dV/dt$	$V_D = 67\% V_{DRM}$ gate open	$T_j = 125\text{ °C}$	200	V/ $\mu$ s
		$T_j = 150\text{ °C}$	100	
$t_{gt}$	$I_{TM} = 40\text{ A}, V_D = 500\text{ V}, I_G = 100\text{ mA}, di_G/dt = 5\text{ A}/\mu$ s	typ.	1.9	$\mu$ s
$t_q$	$V_{DM} = 335\text{ V}, T_j = 125\text{ °C}, I_{TM} = 20\text{ A}, V_R = 25\text{ V}, (di_T/dt)_{Max} = 30\text{ A}/\mu$ s, $dV_D/dt = 50\text{ V}/\mu$ s, $R_{GK} = 100\text{ }\Omega$	typ.	65	$\mu$ s

**Table 4. Static characteristics**

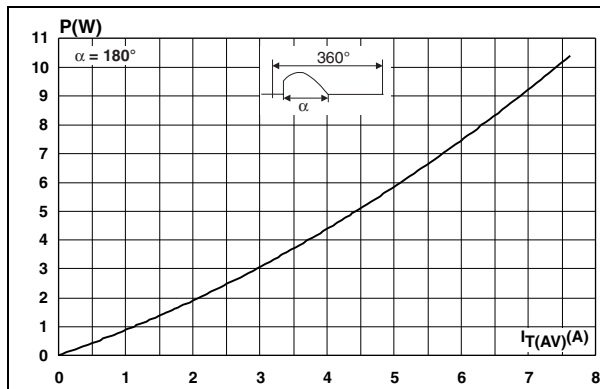
Symbol	Test conditions		Value	Unit	
$V_T$	$I_{TM} = 24\text{ A}$ , $t_p = 380\ \mu\text{s}$	$T_j = 25\text{ }^\circ\text{C}$	MAX.	1.6	V
$V_{TD}$	Threshold voltage	$T_j = 150\text{ }^\circ\text{C}$		0.8	V
$R_d$	Dynamic resistance	$T_j = 150\text{ }^\circ\text{C}$		30	m $\Omega$
$I_{DRM}$ $I_{RRM}$	$V_{DRM} = V_{RRM}$	$T_j = 25\text{ }^\circ\text{C}$		5	$\mu\text{A}$
		$T_j = 125\text{ }^\circ\text{C}$	1	mA	
		$T_j = 150\text{ }^\circ\text{C}$	3		

**Table 5. Thermal resistance**

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

1. S = Copper surface under tab

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



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

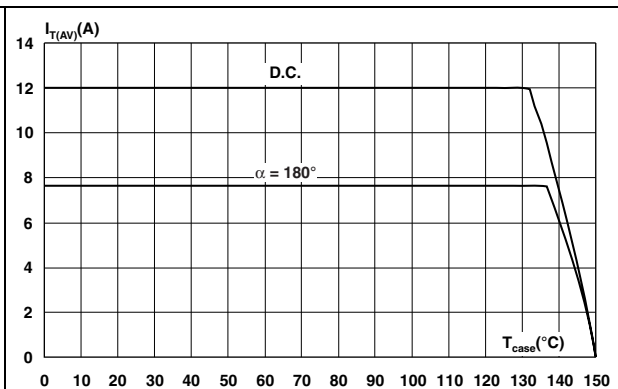


Figure 3. Average and DC on-state current vs. ambient temperature

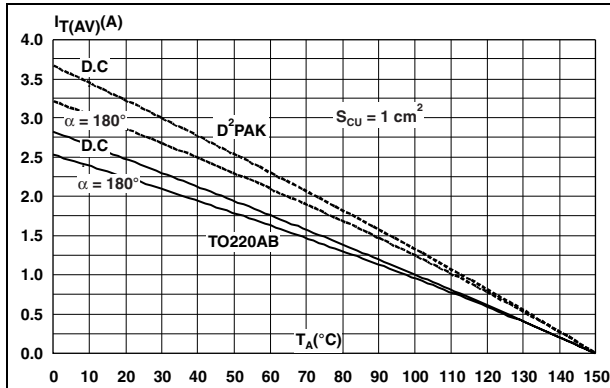


Figure 4. Relative variation of thermal impedance vs. pulse duration

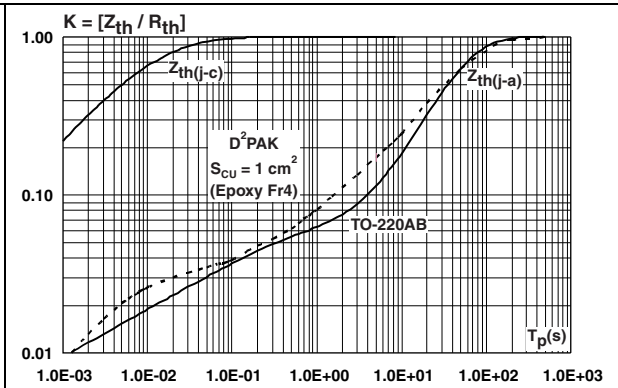


Figure 5. Relative variation of  $I_{GT}, V_{GT}, I_H, I_L$  vs. junction temperature (typical values)

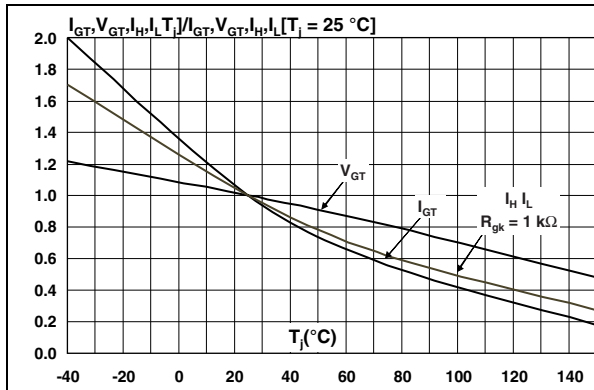


Figure 6. Relative variation of static dV/dt immunity vs. junction temperature (typical values)

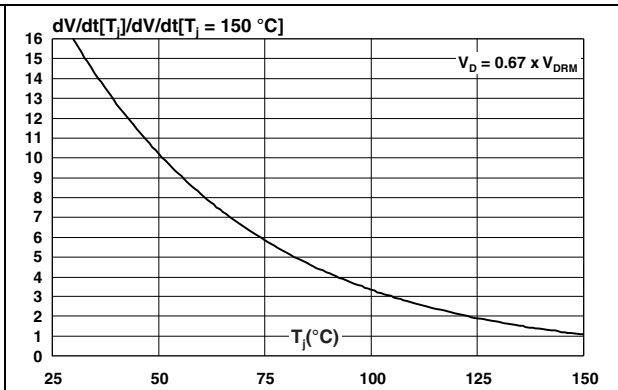


Figure 7. Surge peak on-state current vs. number of cycles

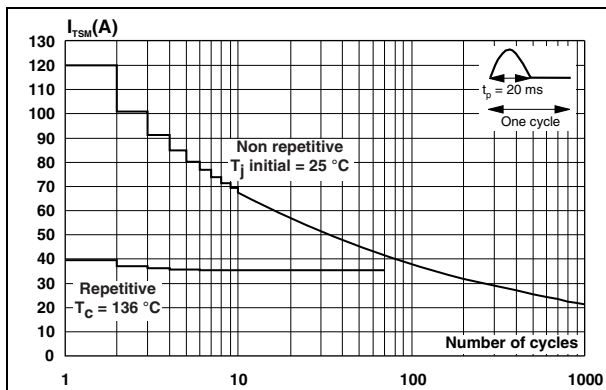


Figure 8. Non repetitive surge peak on-state current and corresponding value of  $I^2t$  vs. sinusoidal pulse width

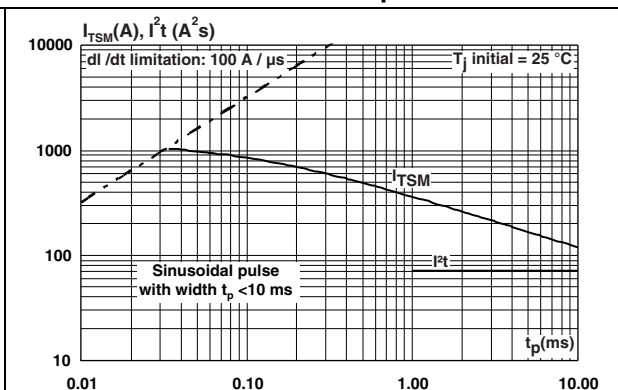


Figure 9. On-state characteristics (maximum values)

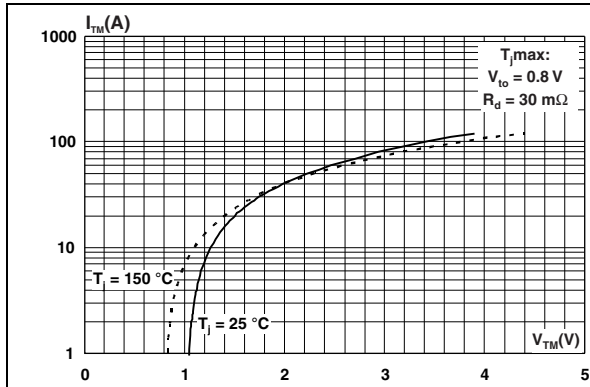


Figure 10. Relative variation of leakage current vs. junction temperature for different values of blocking voltage

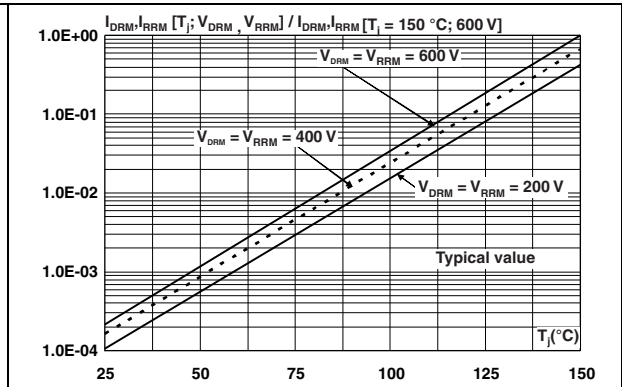
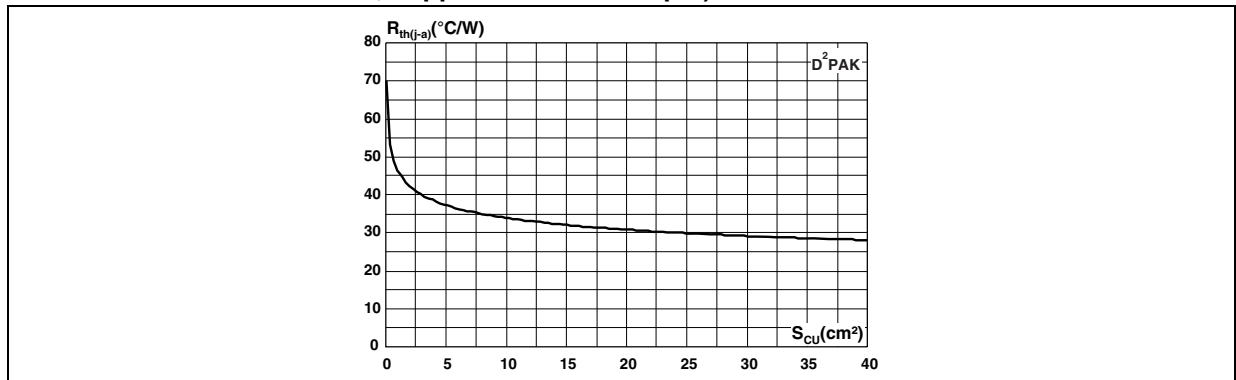
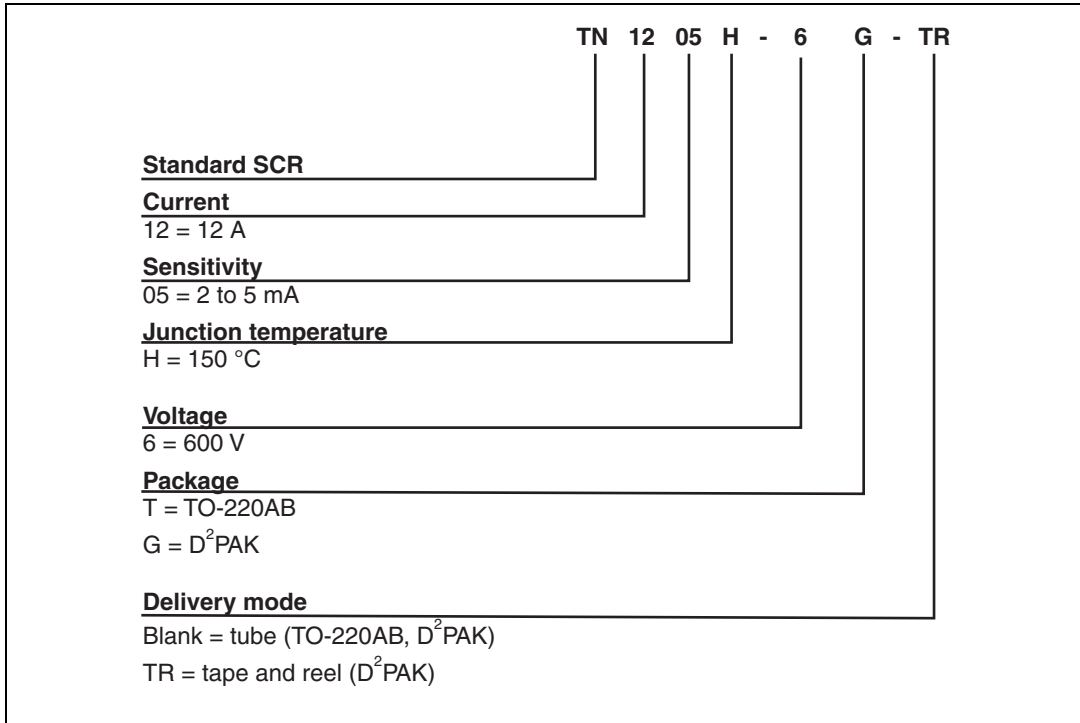


Figure 11. Thermal resistance junction to ambient vs. copper surface under tab ( $D^2$ PAK, printed circuit board FR4, copper thickness: 35  $\mu\text{m}$ )



## 2 Ordering information scheme

Figure 12. Ordering information scheme



### 3 Package information

- Epoxy meets UL94, V0
- Lead-free package

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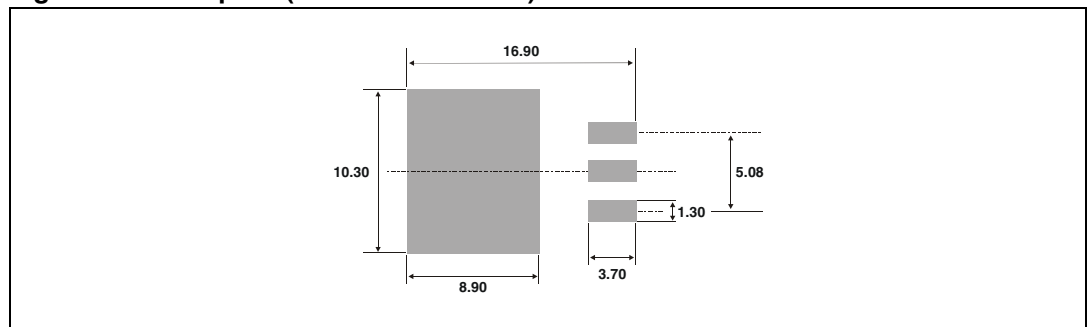
**Table 6. TO-220AB dimensions**

Ref.	Dimensions					
	Millimeters			Inches		
	Min.	Typ.	Max.	Min.	Typ.	Max.
A	15.20		15.90	0.598		0.625
a1		3.75			0.147	
a2	13.00		14.00	0.511		0.551
B	10.00		10.40	0.393		0.409
b1	0.61		0.88	0.024		0.034
b2	1.23		1.32	0.048		0.051
C	4.40		4.60	0.173		0.181
c1	0.49		0.70	0.019		0.027
c2	2.40		2.72	0.094		0.107
e	2.40		2.70	0.094		0.106
F	6.20		6.60	0.244		0.259
ØI	3.75		3.85	0.147		0.151
I4	15.80	16.40	16.80	0.622	0.646	0.661
L	2.65		2.95	0.104		0.116
I2	1.14		1.70	0.044		0.066
I3	1.14		1.70	0.044		0.066
M		2.60			0.102	

Table 7. D<sup>2</sup>PAK Dimensions

Ref.	Dimensions					
	Millimeters			Inches		
	Min.	Typ.	Max.	Min.	Typ.	Max.
A	4.30		4.60	0.169		0.181
A1	2.49		2.69	0.098		0.106
A2	0.03		0.23	0.001		0.009
B	0.70		0.93	0.027		0.037
B2	1.25	1.40		0.048	0.055	
C	0.45		0.60	0.017		0.024
C2	1.21		1.36	0.047		0.054
D	8.95		9.35	0.352		0.368
E	10.00		10.28	0.393		0.405
G	4.88		5.28	0.192		0.208
L	15.00		15.85	0.590		0.624
L2	1.27		1.40	0.050		0.055
L3	1.40		1.75	0.055		0.069
R	0.40			0.016		
V2	0°		8°	0°		8°

Figure 13. Footprint (dimensions in mm)





## 4 Ordering information

**Table 8. 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

## 5 Revision history

**Table 9. Document revision history**

Date	Revision	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 <a href="#">Table 3</a> .
26-Apr-2012	4	Moved junction temperature to top of features list. Description reworded for readability. No technical changes.

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