

## STW13009

# High voltage fast-switching NPN power transistor

#### **Features**

- Low spread of dynamic parameters
- High voltage capability
- Minimum lot-to-lot spread for reliable operation
- Very high switching speed

#### **Application**

■ Switch mode power supplies

## **Description**

The device is manufactured using high voltage multi-epitaxial planar technology for high switching speeds and medium voltage capability. It uses a Hollow emitter structure to enhance switching speeds.

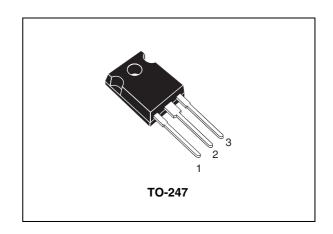


Figure 1. Internal schematic diagram

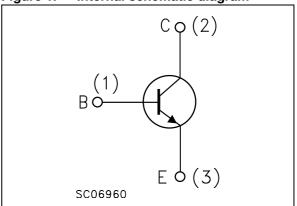


Table 1. Device summary

Order code	Marking <sup>(1)</sup>	Package	Packaging
STW13009	W13009 L	TO-247	Tube
317713009	W13009 H		Tube

Product is pre-selected in DC current gain (group L and group H). STMicroelectronics reserves the right to ship either groups according to production availability. Please contact your nearest STMicroelectronics sales office for delivery details.

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STW13009 Electrical ratings

# 1 Electrical ratings

Table 2. Absolute maximum rating

Symbol	Parameter	Value	Unit
V <sub>CEV</sub>	Collector-emitter voltage (V <sub>BE</sub> = -1.5 V)	700	V
V <sub>CEO</sub>	Collector-emitter voltage (I <sub>B</sub> = 0)	400	V
V <sub>EBO</sub>	Emitter-base voltage (I <sub>C</sub> = 0)	12	V
I <sub>C</sub>	Collector current	12	Α
I <sub>CM</sub>	Collector peak current (t <sub>P</sub> < 5ms)	24	Α
I <sub>B</sub>	Base current	6	Α
I <sub>BM</sub>	Base peak current (t <sub>P</sub> < 5ms)	12	Α
P <sub>tot</sub>	Total dissipation at T <sub>c</sub> = 25°C	125	W
T <sub>stg</sub>	Storage temperature	-65 to 150	°C
T <sub>J</sub>	Max. operating junction temperature	150	°C

Table 3. Thermal data

Symbol	Parameter	Value	Unit
R <sub>thj-case</sub>	Thermal resistance junction-case Max	1	°C/W

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Electrical characteristics STW13009

## 2 Electrical characteristics

 $(T_{case} = 25^{\circ}C \text{ unless otherwise specified})$ 

Table 4. Electrical characteristics

Symbol	Parameter	Test co	nditions	Min.	Тур.	Max.	Unit
I <sub>CEV</sub>	Collector cut-off current (V <sub>BE</sub> = -1.5 V)	V <sub>CE</sub> = 700 V V <sub>CE</sub> = 700 V	T <sub>C</sub> = 100°C			10 500	μ <b>Α</b> μ <b>Α</b>
I <sub>EBO</sub>	Emitter cut-off current (I <sub>C</sub> = 0)	V <sub>EB</sub> = 10 V				10	μА
V <sub>CEO(sus)</sub> (1)	Collector-emitter sustaining voltage (I <sub>B</sub> = 0)	I <sub>C</sub> = 10 mA		400			V
		I <sub>C</sub> = 4 A	$I_{B} = 0.8 A$			0.85	V
V (1)	Collector-emitter	$I_C = 5 A$	$I_B = 1 A$			0.9	V
V <sub>CE(sat)</sub> (1)	saturation voltage	I <sub>C</sub> = 8 A	$I_{B} = 1.6 A$			1.25	V
		$I_C = 12 A$	$I_B = 3 A$			2.5	V
v (1)	Base-emitter saturation	I <sub>C</sub> = 5 A	I <sub>B</sub> = 1 A			1.2	V
V <sub>BE(sat)</sub> (1)	voltage	$I_C = 8 A$	$I_{B} = 1.6 A$			1.6	V
		I <sub>C</sub> = 5 A	V <sub>CE</sub> = 5 V				
h <sub>FE</sub> (1)(2)	DC current gain	Group L		15		28	
''FE		Group H		23		36	
		$I_C = 8 A$	$V_{CE} = 5 V$	10		30	
	landunativa land	$I_C = 5 A$	$V_{CC} = 250 \text{ V}$				
+	Inductive load	I <sub>B1</sub> = 1 A	$I_{B2} = -2 A$			0.5	
t <sub>s</sub>	Storage time	L = 200 μH			1.6	2.5	μs
t <sub>f</sub>	Fall time	see Figure 9			60	110	ns
		I <sub>C</sub> = 5 A	V <sub>CC</sub> = 125 V				
t <sub>s</sub>	Inductive load Storage time Fall time	$I_{B1} = -I_{B2} = 1$ $L = 200 \mu H$ see <i>Figure 9</i>	.6 A $t_c = 125 ^{\circ}\text{C}$		2.3 110		μs ns

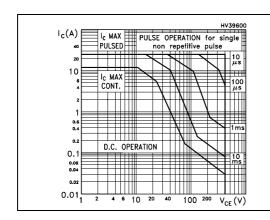
<sup>1.</sup> Pulsed duration = 300 ms, duty cycle ≤1.5 %

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### 2.1 Electrical characteristics (curves)

Figure 2. Safe operating area

Figure 3. Derating curve



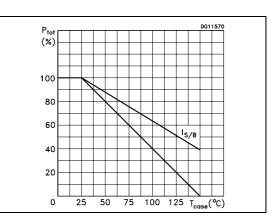
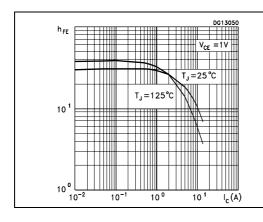


Figure 4. DC current gain

Figure 5. DC current gain



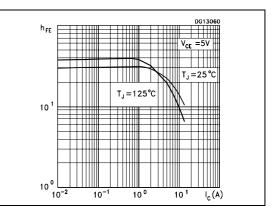
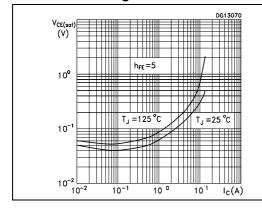
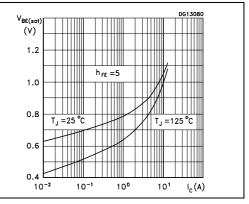


Figure 6. Collector-emitter saturation voltage

Figure 7. Base-emitter saturation voltage

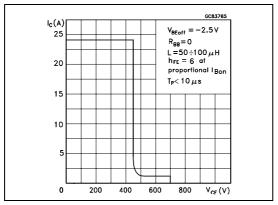




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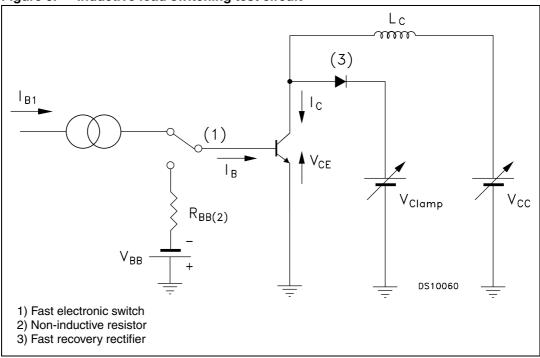
Figure 8. Reverse biased operating area



STW13009 Test circuit

# 3 Test circuit

Figure 9. Inductive load switching test circuit

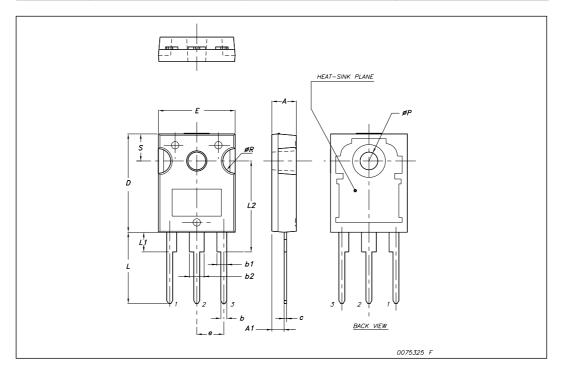


# 4 Package mechanical data

In order to meet environmental requirements, ST offers these devices in ECOPACK® packages. These packages have a Lead-free second level interconnect. The category of second level interconnect is marked on the package and on the inner box label, in compliance with JEDEC Standard JESD97. The maximum ratings related to soldering conditions are also marked on the inner box label. ECOPACK is an ST trademark. ECOPACK specifications are available at: www.st.com

#### **TO-247 Mechanical data**

Dim.	mm.				
	Min.	Тур	Max.		
Α	4.85		5.15		
A1	2.20		2.60		
b	1.0		1.40		
b1	2.0		2.40		
b2	3.0		3.40		
С	0.40		0.80		
D	19.85		20.15		
E	15.45		15.75		
е		5.45			
L	14.20		14.80		
L1	3.70		4.30		
L2		18.50			
øΡ	3.55		3.65		
øR	4.50		5.50		
S		5.50			



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Revision history STW13009

# 5 Revision history

Table 5. Document revision history

Date	Revision	Changes
25-Oct-2007	1	Initial release

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