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## High voltage fast-switching NPN power transistor

### Features

- High voltage capability
- Low spread of dynamic parameters
- Very high switching speed

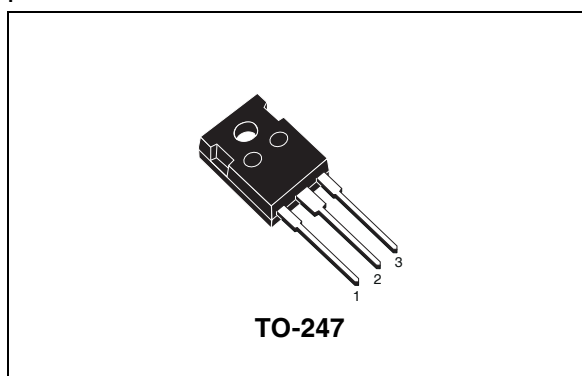
### Applications

- Switching mode power supplies

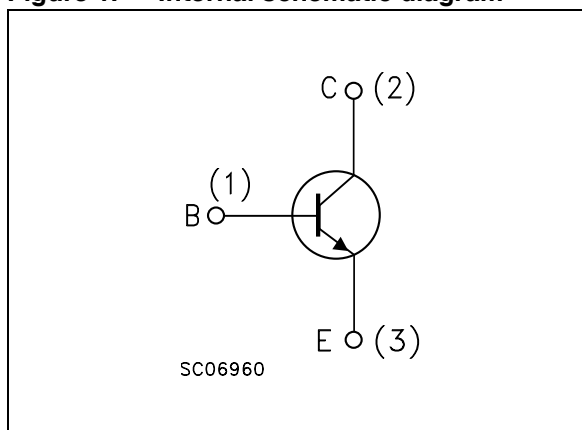
### Description

The device is manufactured using high voltage Multi Epitaxial Planar technology for high switching speeds and high voltage capability.

It uses a Hollow Emitter structure to enhance switching speeds.



**Figure 1. Internal schematic diagram**



**Table 1. Device summary**

Order code	Marking	Package	Packaging
STWH13009	WH13009	TO-247	Tube

# 1 Absolute maximum ratings

**Table 2. Absolute maximum ratings**

Symbol	Parameter	Value	Unit
$V_{CEV}$	Collector-emitter voltage ( $V_{BE} = -1.5V$ )	700	V
$V_{CEO}$	Collector-emitter voltage ( $I_B = 0$ )	400	V
$V_{EBO}$	Emitter-base voltage ( $I_C = 0$ )	12	V
$I_C$	Collector current	12	A
$I_{CM}$	Collector peak current ( $t_p < ms$ )	24	A
$I_B$	Base current	6	A
$I_{BM}$	Base peak current ( $t_p < ms$ )	12	A
$P_{TOT}$	Total dissipation at $T_{case} = 25^\circ C$	125	W
$T_{stg}$	Storage temperature	-65 to 150	$^\circ C$
$T_J$	Max. operating junction temperature	150	$^\circ C$

**Table 3. Thermal data**

Symbol	Parameters	Value	Unit
$R_{thj-case}$	Thermal resistance junction-case max	1	$^\circ C/W$

## 2 Electrical characteristics

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

**Table 4. Electrical characteristics**

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$I_{\text{CEV}}$	Collector cut-off current ( $V_{\text{BE}} = -1.5\text{V}$ )	$V_{\text{CE}} = 700\text{ V}$			10	$\mu\text{A}$
		$V_{\text{CE}} = 700\text{ V}$ $T_{\text{C}} = 100^{\circ}\text{C}$			500	$\mu\text{A}$
$I_{\text{EBO}}$	Emitter cut-off current ( $I_{\text{C}} = 0$ )	$V_{\text{EB}} = 10\text{ V}$			10	$\mu\text{A}$
$V_{\text{CEO(sus)}}^{(1)}$	Collector-emitter sustaining voltage ( $I_{\text{B}} = 0$ )	$I_{\text{C}} = 10\text{ mA}$	400			V
$V_{\text{CE(sat)}}^{(1)}$	Collector-emitter saturation voltage	$I_{\text{C}} = 4\text{ A}$ $I_{\text{B}} = 0.8\text{ A}$		0.2	0.5	V
		$I_{\text{C}} = 5\text{ A}$ $I_{\text{B}} = 1\text{ A}$		0.25	0.6	V
		$I_{\text{C}} = 8\text{ A}$ $I_{\text{B}} = 1.6\text{ A}$		0.35	1	V
		$I_{\text{C}} = 12\text{ A}$ $I_{\text{B}} = 2.4\text{ A}$		0.6	2	V
$V_{\text{BE(sat)}}^{(1)}$	Base-emitter saturation voltage	$I_{\text{C}} = 5\text{ A}$ $I_{\text{B}} = 1\text{ A}$			1.2	V
		$I_{\text{C}} = 8\text{ A}$ $I_{\text{B}} = 1.6\text{ A}$			1.6	V
$h_{\text{FE}}^{(1)}$	DC current gain	$I_{\text{C}} = 5\text{ A}$ $V_{\text{CE}} = 5\text{ V}$	18		30	
		$I_{\text{C}} = 8\text{ A}$ $V_{\text{CE}} = 5\text{ V}$	11		23	
$t_{\text{s}}$ $t_{\text{f}}$	Inductive load	$V_{\text{CC}} = 250\text{ V}$ $I_{\text{C}} = 5\text{ A}$				
	Storage time	$I_{\text{B1}} = 1\text{ A}$ $I_{\text{B2}} = -2\text{ A}$		1.7	2.5	$\mu\text{s}$
	Fall time	$L = 200\text{ }\mu\text{H}$		100	140	ns

1. Pulsed duration = 300 ms, duty cycle  $\geq 1.5\%$ .

## 2.1 Electrical characteristic (curves)

Figure 2. Safe operating area

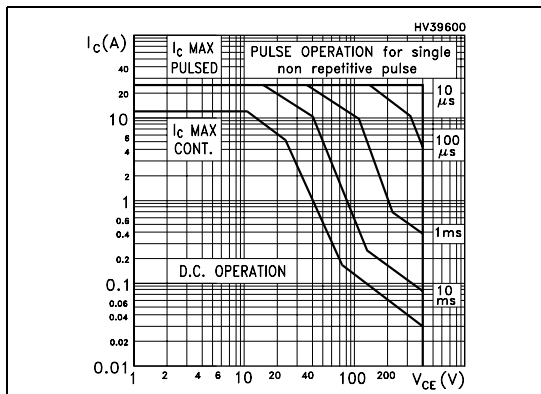


Figure 3. Derating curve

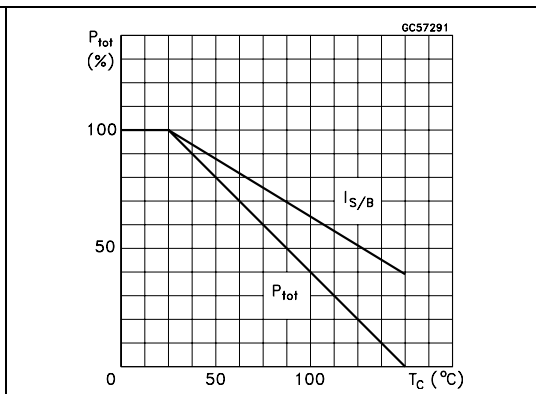


Figure 4. DC current gain

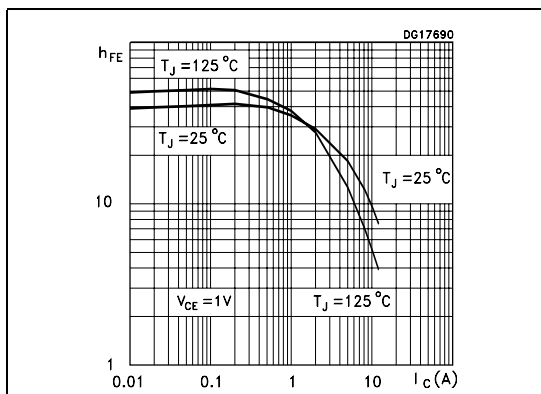


Figure 5. DC current gain

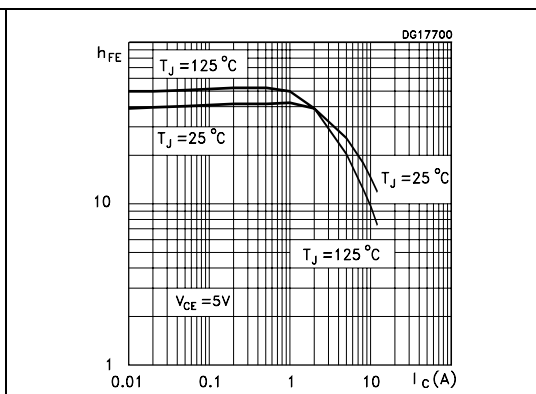


Figure 6. Collector-emitter saturation voltage

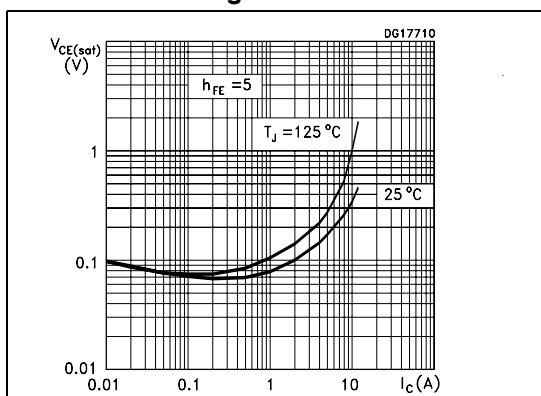
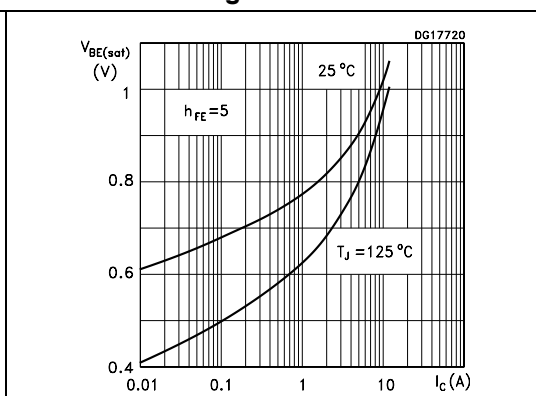
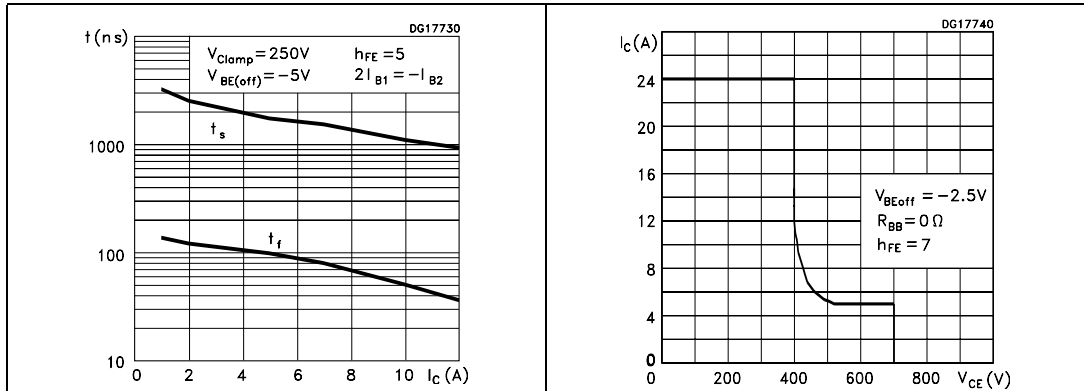


Figure 7. Base-emitter saturation voltage

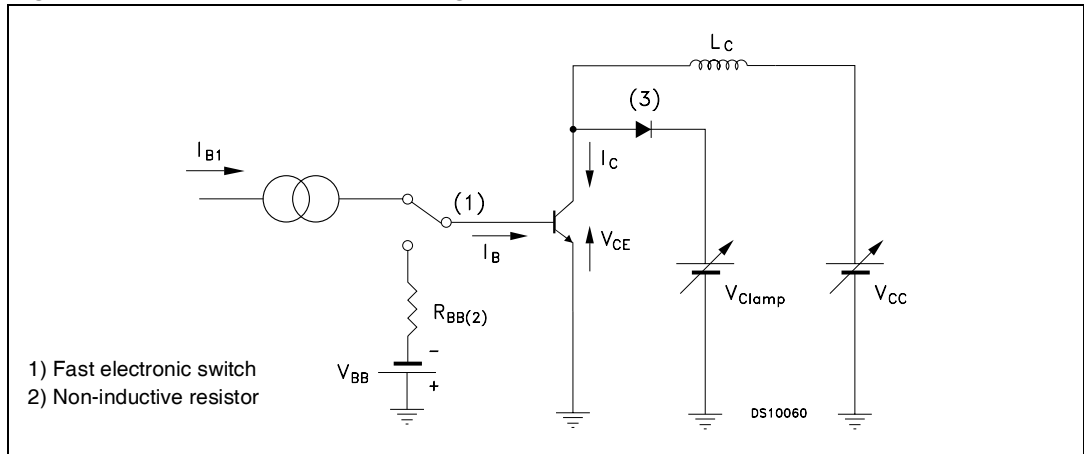


**Figure 8. Inductive load switching time** **Figure 9. Reverse biased safe operating area**



## 2.2 Test circuit

**Figure 10. Inductive load switching test circuit**

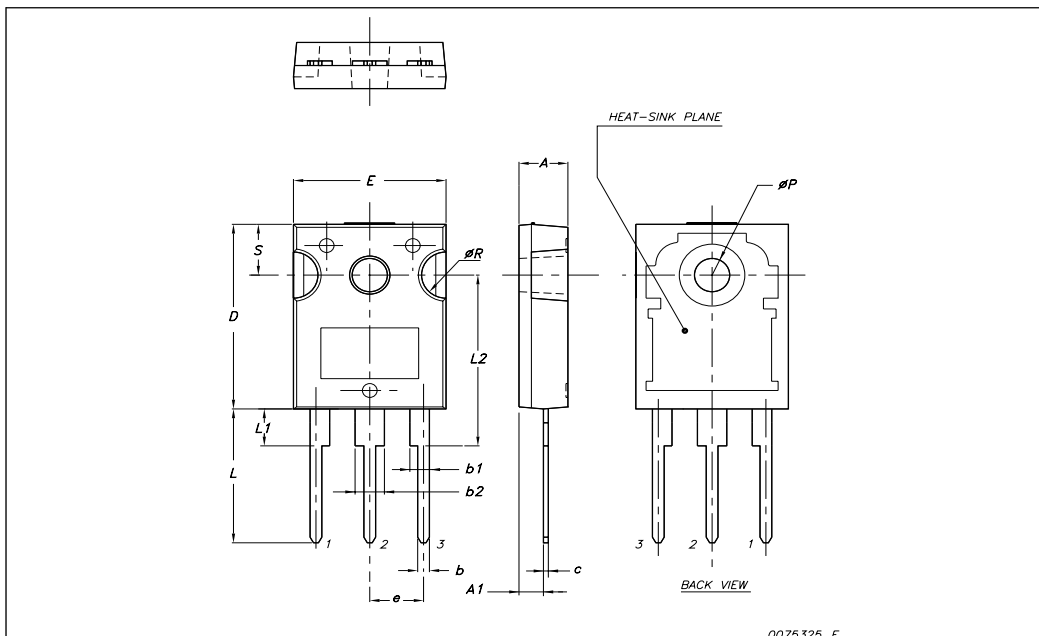


### 3 Package mechanical data

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](http://www.st.com)

## TO-247 Mechanical data

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



## 4 Revision history

**Table 5. Document revision history**

Date	Revision	Changes
19-Oct-2007	1	Initial Release

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