

### 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.

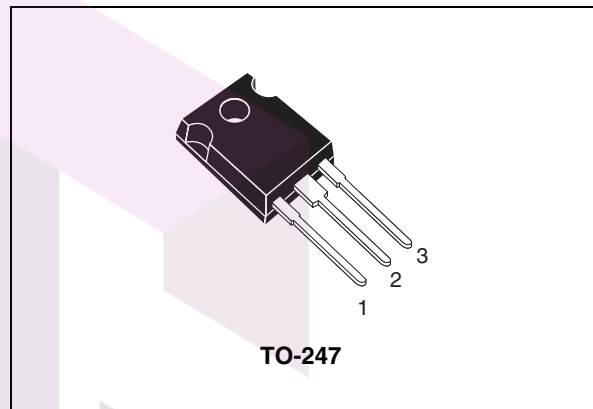


Figure 1. Internal schematic diagram

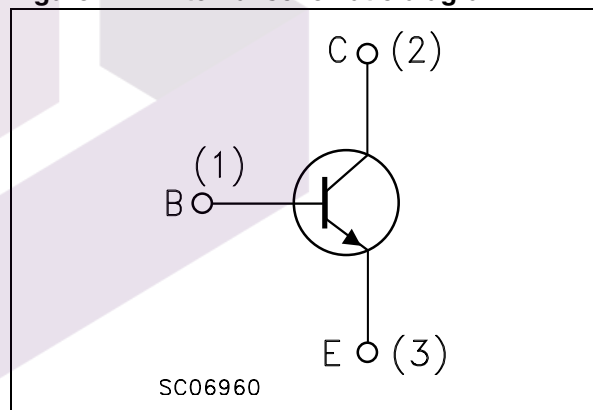


Table 1. Device summary

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

1. 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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# 1 Electrical ratings

**Table 2. Absolute maximum rating**

Symbol	Parameter	Value	Unit
$V_{CEV}$	Collector-emitter voltage ( $V_{BE} = -1.5\text{ V}$ )	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 ( $t_P < 5\text{ms}$ )	24	A
$I_B$	Base current	6	A
$I_{BM}$	Base peak current ( $t_P < 5\text{ms}$ )	12	A
$P_{tot}$	Total dissipation at $T_C = 25^\circ\text{C}$	125	W
$T_{stg}$	Storage temperature	-65 to 150	$^\circ\text{C}$
$T_J$	Max. operating junction temperature	150	$^\circ\text{C}$

**Table 3. Thermal data**

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

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## 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 ( $V_{\text{BE}} = -1.5 \text{ V}$ )	$V_{\text{CE}} = 700 \text{ V}$ $V_{\text{CE}} = 700 \text{ V}$ $T_{\text{C}} = 100^{\circ}\text{C}$			10 500	$\mu\text{A}$ $\mu\text{A}$
$I_{\text{EBO}}$	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	$I_{\text{C}} = 4 \text{ A}$ $I_{\text{B}} = 0.8 \text{ A}$ $I_{\text{C}} = 5 \text{ A}$ $I_{\text{B}} = 1 \text{ A}$ $I_{\text{C}} = 8 \text{ A}$ $I_{\text{B}} = 1.6 \text{ A}$ $I_{\text{C}} = 12 \text{ A}$ $I_{\text{B}} = 3 \text{ A}$			0.85 0.9 1.25 2.5	V V V V
$V_{\text{BE(sat)}}^{(1)}$	Base-emitter saturation voltage	$I_{\text{C}} = 5 \text{ A}$ $I_{\text{B}} = 1 \text{ A}$ $I_{\text{C}} = 8 \text{ A}$ $I_{\text{B}} = 1.6 \text{ A}$			1.2 1.6	V V
$h_{\text{FE}}^{(1)(2)}$	DC current gain	$I_{\text{C}} = 5 \text{ A}$ $V_{\text{CE}} = 5 \text{ V}$ Group L Group H $I_{\text{C}} = 8 \text{ A}$ $V_{\text{CE}} = 5 \text{ V}$	15 23 10		28 36 30	
$t_{\text{s}}$ $t_{\text{f}}$	Inductive load Storage time Fall time	$I_{\text{C}} = 5 \text{ A}$ $V_{\text{CC}} = 250 \text{ V}$ $I_{\text{B1}} = 1 \text{ A}$ $I_{\text{B2}} = -2 \text{ A}$ $L = 200 \mu\text{H}$ see <a href="#">Figure 9</a>		1.6 60	2.5 110	$\mu\text{s}$ ns
$t_{\text{s}}$ $t_{\text{f}}$	Inductive load Storage time Fall time	$I_{\text{C}} = 5 \text{ A}$ $V_{\text{CC}} = 125 \text{ V}$ $I_{\text{B1}} = - I_{\text{B2}} = 1.6 \text{ A}$ $L = 200 \mu\text{H}$ $t_{\text{c}} = 125^{\circ}\text{C}$ see <a href="#">Figure 9</a>		2.3 110		$\mu\text{s}$ ns

1. Pulsed duration = 300 ms, duty cycle  $\leq 1.5\%$
2. 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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## 2.1 Electrical characteristics (curves)

Figure 2. Safe operating area

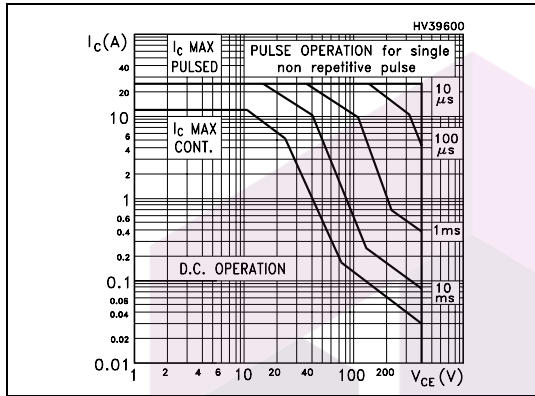


Figure 3. Derating curve

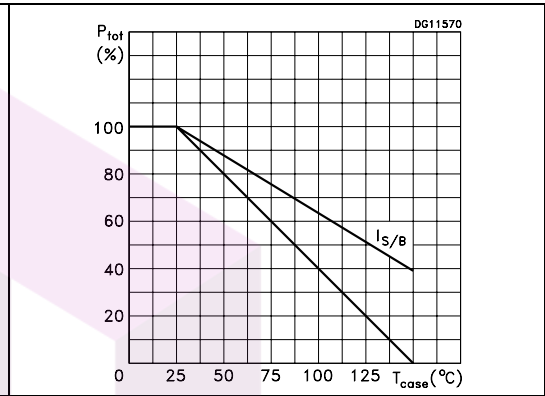


Figure 4. DC current gain

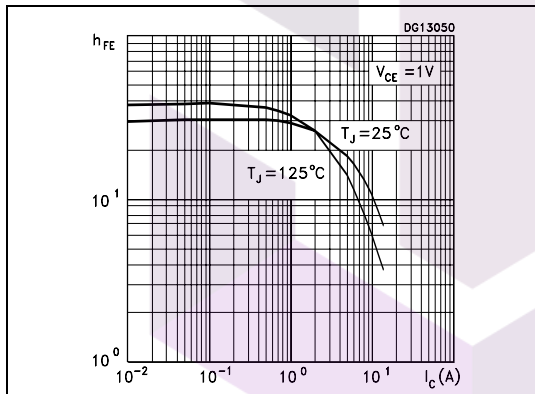


Figure 5. DC current gain

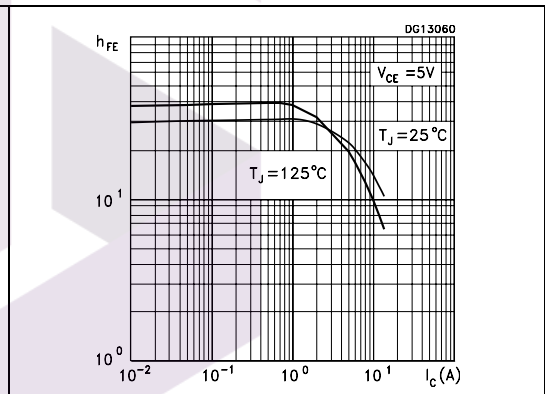


Figure 6. Collector-emitter saturation voltage

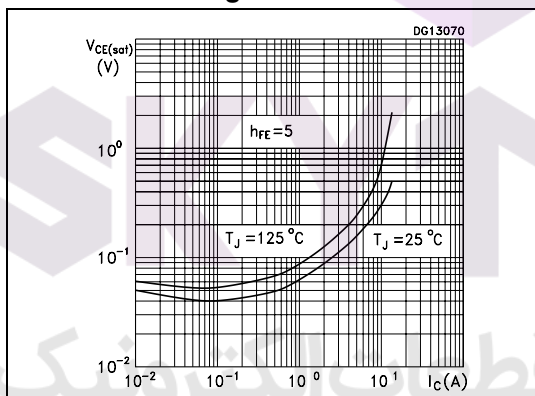
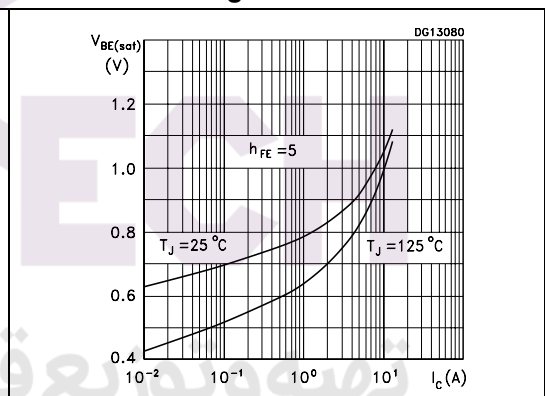
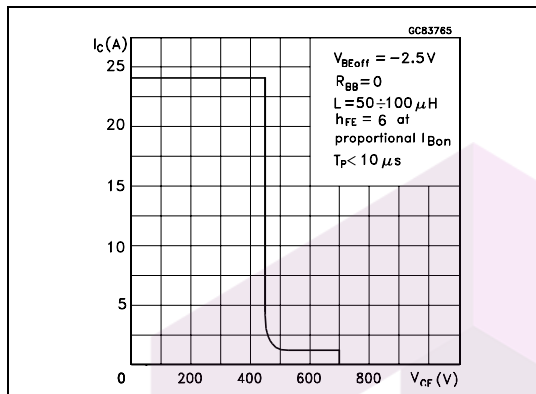


Figure 7. Base-emitter saturation voltage



**Figure 8. Reverse biased operating area**

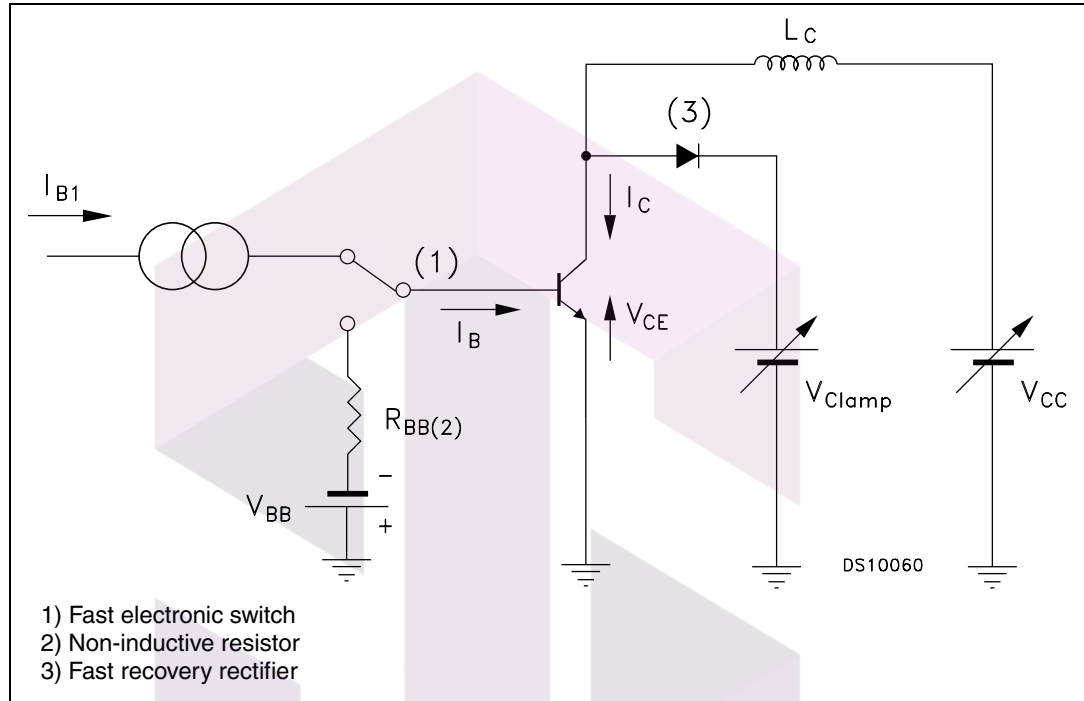


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### 3 Test circuit

Figure 9. Inductive load switching test circuit



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## 4 Package mechanical data

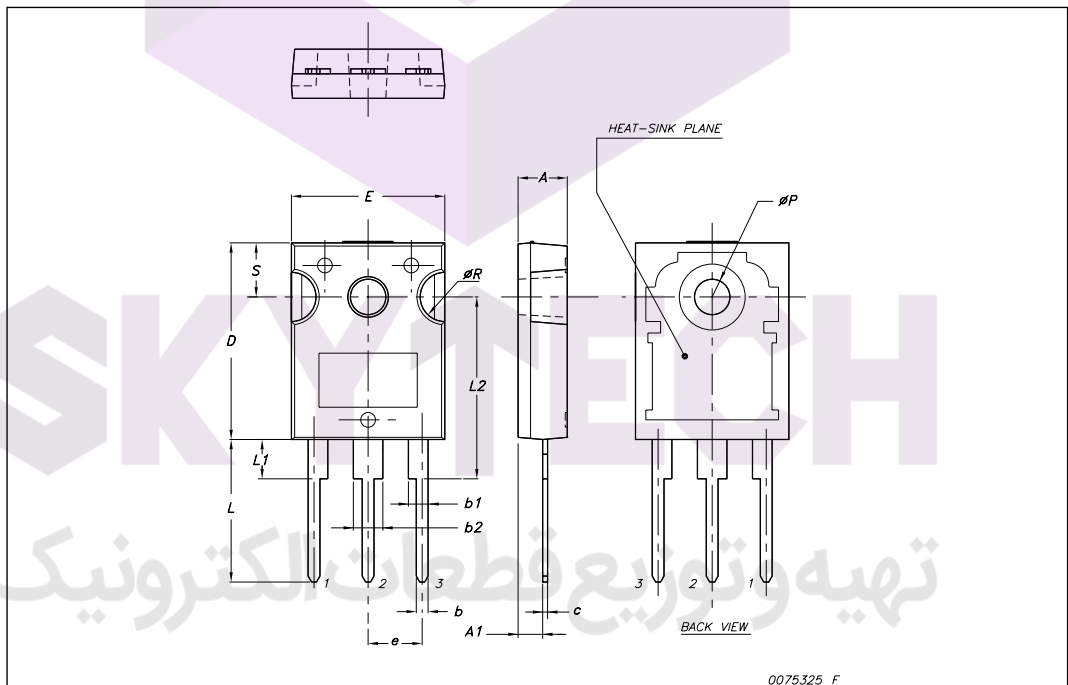
In order to meet environmental requirements, ST offers these devices in ECOPACK® packages. These packages have a Lead-free second level interconnect. The category of second level interconnect is marked on the package and on the inner box label, in compliance with JEDEC Standard JESD97. The maximum ratings 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](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	



## 5 Revision history

Table 5. Document revision history

Date	Revision	Changes
25-Oct-2007	1	Initial release



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