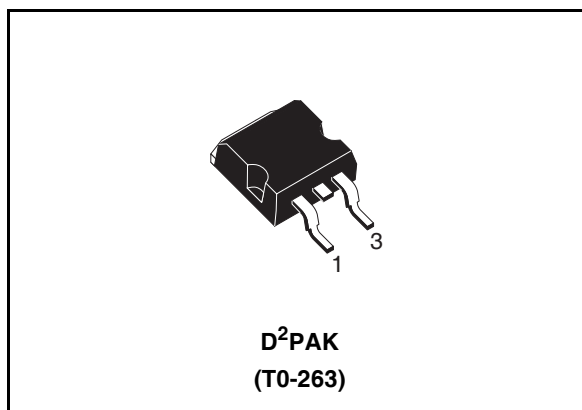


## High voltage fast-switching NPN power transistor

### General features

- Improved specification: Lower leakage current, Tighter gain range, DC current gain preselection, Tighter storage time range
- High voltage capability
- Integrated free-wheeling diode
- Low spread of dynamic parameters
- Minimum lot-to-lot spread for reliable operation
- Very high switching speed
- Fully characterized at 125 °C
- Large RBSOA
- In compliance with the 2002/93/EC European Directive



### Description

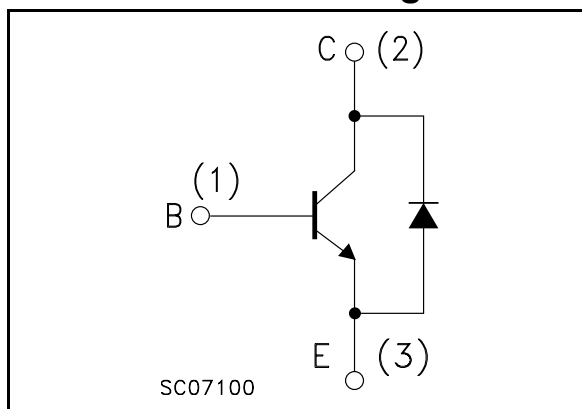
The device is manufactured using high voltage Multi-Epitaxial Planar technology for high switching speeds and medium voltage capability.

It uses a Cellular Emitter structure to enhance switching speeds.

### Applications

- Electronic transformers for halogen lamps
- Switch mode power supplies

### Internal schematic diagram



### Order codes

Part Number	Marking	Package	Packing
STB13007DT4	B13007D	D <sup>2</sup> PAK	Tape & Reel

# 1 Electrical ratings

**Table 1. Absolute maximum rating**

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 ( $I_C = 0$ )	9	V
$I_C$	Collector current	8	A
$I_{CM}$	Collector peak current ( $t_p < 5ms$ )	16	A
$I_B$	Base current	4	A
$I_{BM}$	Base peak current ( $t_p < 5ms$ )	8	A
$P_{tot}$	Total dissipation at $T_C = 25^\circ C$	80	W
$T_{stg}$	Storage temperature	-65 to 150	$^\circ C$
$T_J$	Max. operating junction temperature	150	$^\circ C$

**Table 2. Thermal data**

Symbol	Parameter	Value	Unit
$R_{thj-case}$	Thermal resistance junction-case	max 1.56	$^\circ C/W$
$R_{thj-amb}$	Thermal resistance junction-amb	max 62.5	$^\circ C/W$

## 2 Electrical characteristics

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

**Table 3. Electrical characteristics**

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$I_{\text{CES}}$	Collector cut-off current ( $V_{\text{BE}} = 0\text{V}$ )	$V_{\text{CE}} = 700\text{V}$ $V_{\text{CE}} = 700\text{V}$ $T_{\text{C}} = 100^{\circ}\text{C}$			10 0.5	$\mu\text{A}$ mA
$I_{\text{CEO}}$	Collector cut-off current ( $I_{\text{B}} = 0$ )	$V_{\text{CE}} = 400\text{V}$			100	$\mu\text{A}$
$I_{\text{EBO}}$	Emitter cut-off current ( $I_{\text{C}} = 0$ )	$V_{\text{EB}} = 9\text{V}$			100	$\mu\text{A}$
$V_{\text{CEO(sus)}}^{(1)}$	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	$I_{\text{C}} = 2\text{A}$ $I_{\text{B}} = 0.4\text{A}$ $I_{\text{C}} = 5\text{A}$ $I_{\text{B}} = 1\text{A}$ $I_{\text{C}} = 8\text{A}$ $I_{\text{B}} = 2\text{A}$ $I_{\text{C}} = 5\text{A}$ $I_{\text{B}} = 1\text{A}$ $T_{\text{C}} = 100^{\circ}\text{C}$			0.8 1.5 2 3	V V V V
$V_{\text{BE(sat)}}^{(1)}$	Base-emitter saturation voltage	$I_{\text{C}} = 2\text{A}$ $I_{\text{B}} = 0.4\text{A}$ $I_{\text{C}} = 5\text{A}$ $I_{\text{B}} = 1\text{A}$ $I_{\text{C}} = 5\text{A}$ $I_{\text{B}} = 1\text{A}$ $T_{\text{C}} = 100^{\circ}\text{C}$			1.2 1.6 1.5	V V V
$h_{\text{FE}}$	DC current gain	$I_{\text{C}} = 2\text{A}$ $V_{\text{CE}} = 5\text{V}$ $I_{\text{C}} = 5\text{A}$ $V_{\text{CE}} = 5\text{V}$	18 8		40 25	
$V_{\text{f}}$	Diode forward voltage	$I_{\text{C}} = 3\text{A}$			2.5	V
$t_{\text{s}}$ $t_{\text{f}}$	Inductive load Storage time Fall time	$I_{\text{C}} = 5\text{A}$ $V_{\text{Clamp}} = 250\text{V}$ $I_{\text{B1}} = 1\text{A}$ $V_{\text{BE(off)}} = -5\text{V}$ $R_{\text{BB}} = 0\Omega$ $L = 200\mu\text{H}$ (see fig. 11)		1.7 90	2.3 150	$\mu\text{s}$ ns
$t_{\text{s}}$ $t_{\text{f}}$	Inductive load Storage time Fall time	$I_{\text{C}} = 5\text{A}$ $V_{\text{Clamp}} = 250\text{V}$ $I_{\text{B1}} = 1\text{A}$ $V_{\text{BE(off)}} = -5\text{V}$ $R_{\text{BB}} = 0\Omega$ $L = 200\mu\text{H}$ $T_{\text{C}} = 125^{\circ}\text{C}$ (see fig. 11)		2.2 150		$\mu\text{s}$ ns

Note (1) Pulsed duration = 300  $\mu\text{s}$ , duty cycle  $\leq 1.5\%$

## 2.1 Electrical characteristics (curves)

Figure 1. Safe operating area

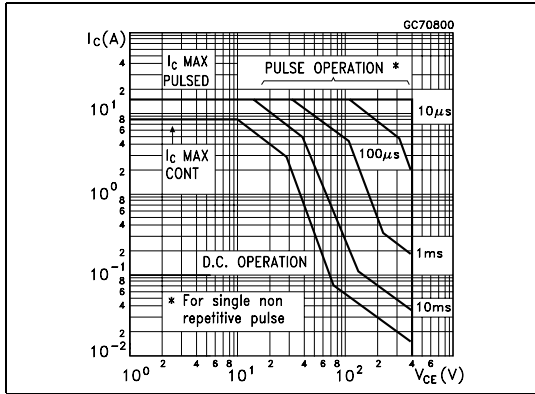


Figure 2. Derating curve

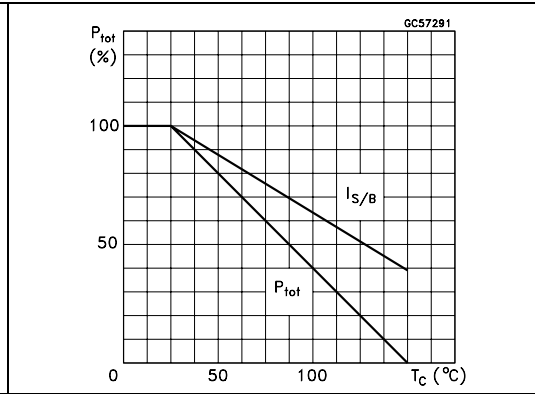


Figure 3. DC current gain

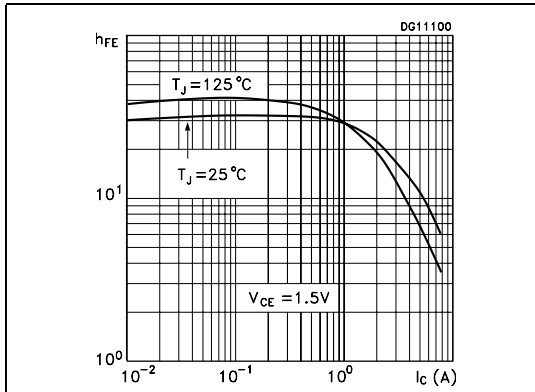


Figure 4. DC current gain

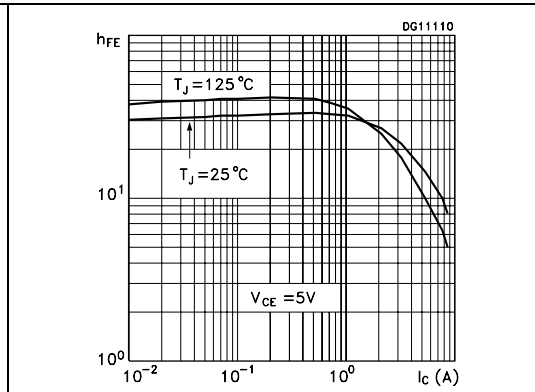


Figure 5. Collector-emitter saturation voltage

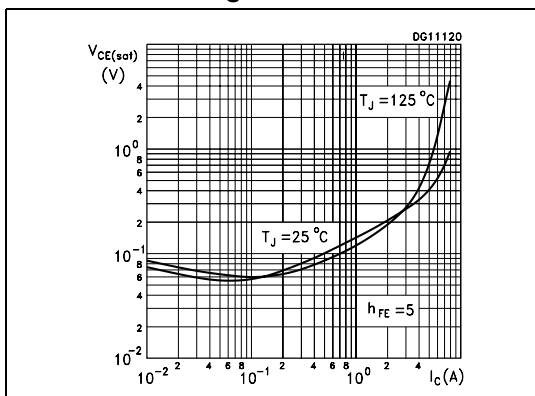


Figure 6. Base-emitter saturation voltage

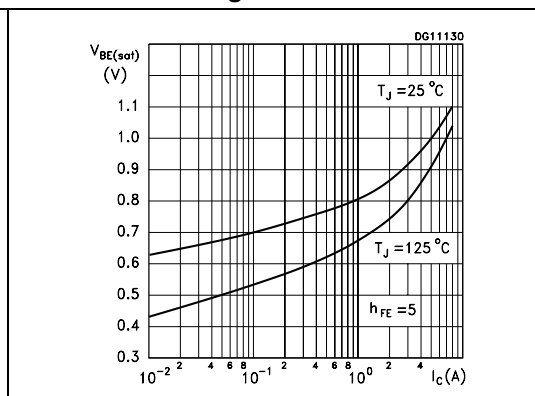


Figure 7. Diode forward voltage

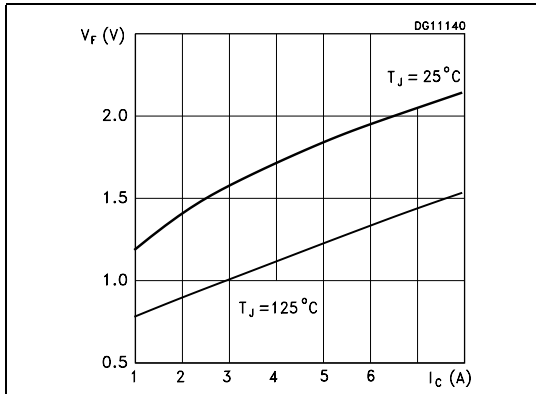


Figure 8. Switching times inductive load

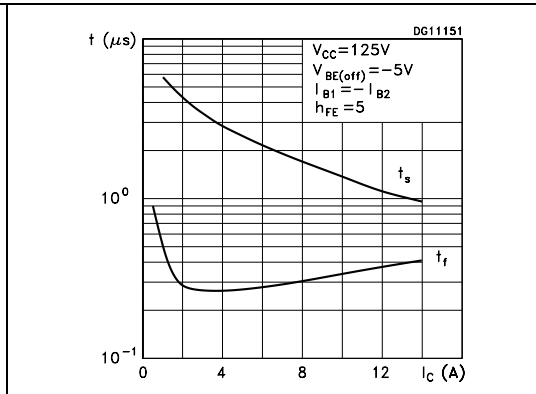


Figure 9. Switching times inductive load

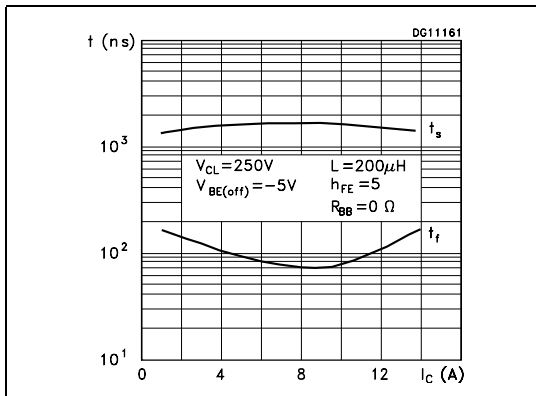
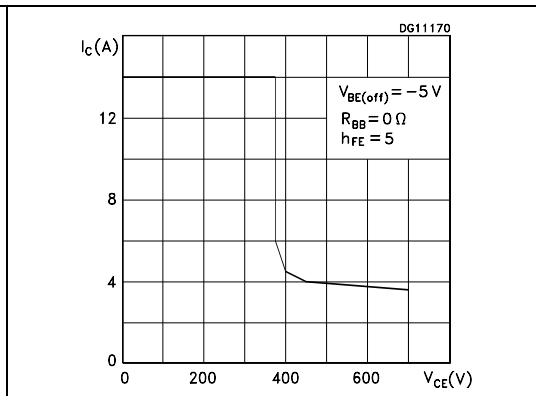
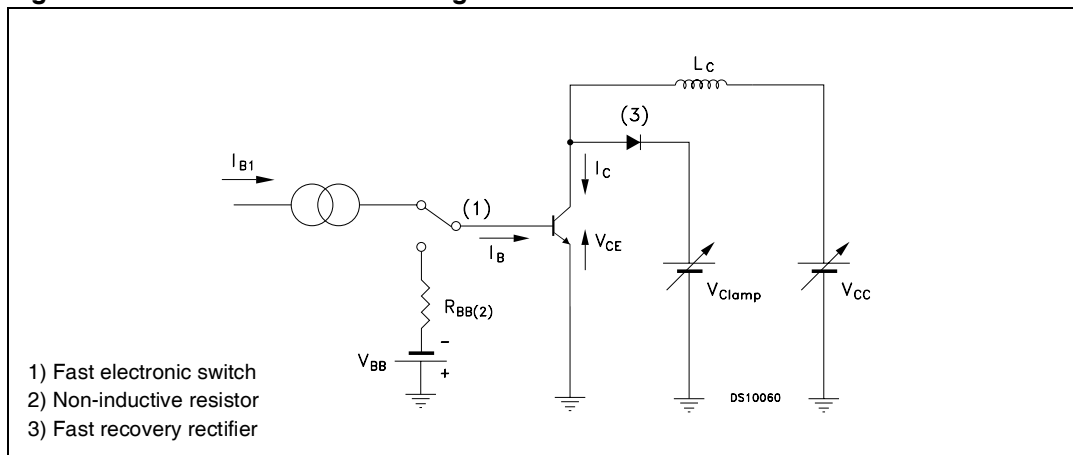


Figure 10. Reverse biased safe operating area



## 2.2 Test circuits

Figure 11. Inductive load switching test circuit

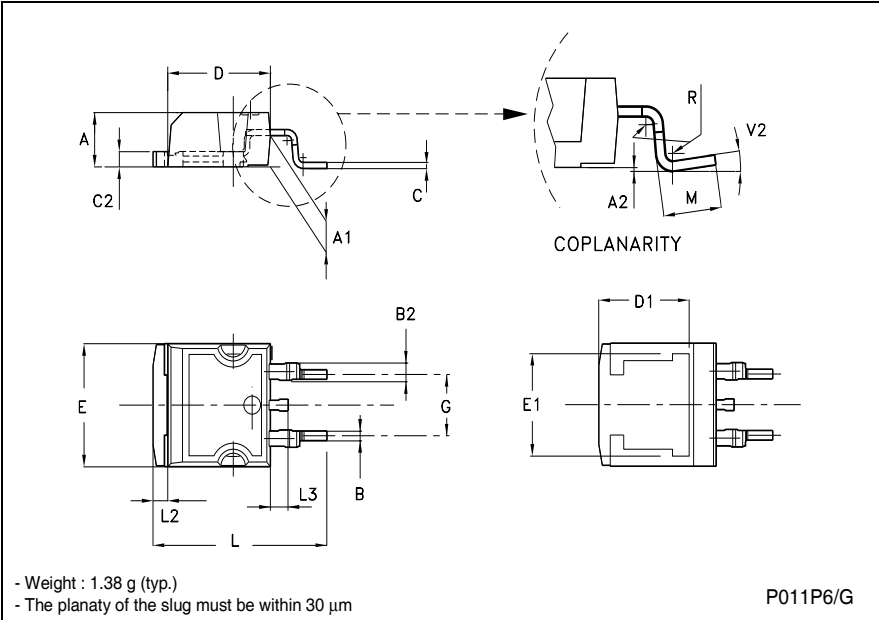


### 3 Package mechanical data

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-263 (D<sup>2</sup>PAK) MECHANICAL DATA**

DIM.	mm			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
A	4.40		4.60	0.173		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		0.036
B2	1.14		1.70	0.044		0.067
C	0.45		0.60	0.017		0.023
C2	1.23		1.36	0.048		0.053
D	8.95		9.35	0.352		0.368
D1		8.00			0.315	
E	10.00		10.40	0.393		0.409
E1		8.50			0.334	
G	4.88		5.28	0.192		0.208
L	15.00		15.85	0.590		0.624
L2	1.27		1.4	0.050		0.055
L3	1.40		1.75	0.055		0.068
M	2.40		3.2	0.094		0.126
R		0.40			0.016	
V2	0°		8°	0°		8°



## 4 Revision history

**Table 4. Revision history**

Date	Revision	Changes
19-Jun-2006	1	Initial release.
27-Apr-2007	2	The package's mechanical data has been update on page 7



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