

## High voltage fast-switching NPN power transistor

### Features

- High voltage capability
- Low spread of dynamic parameters
- Low base-drive requirements
- Very high switching speed
- Fully characterized at 125 °C

### Applications

- Electronic transformer for halogen lamps
- Electronic ballast for fluorescent lighting
- Switch mode power supplies.

### Description

The BUL810 is manufactured using high voltage multiepitaxial mesa technology for cost-effective high performance. It uses a hollow emitter structure to enhance switching speeds.

The BUL series is designed for use in lighting applications and low cost switch-mode power supplies.

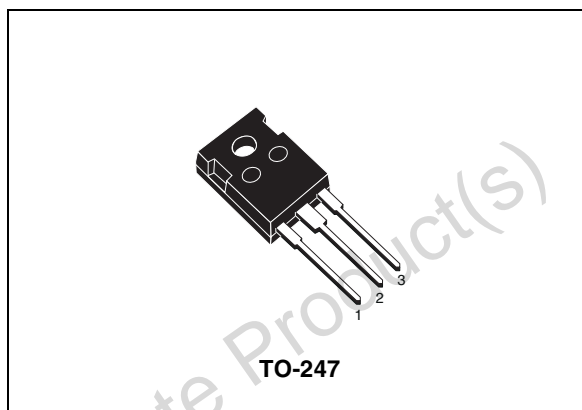


Figure 1. Internal schematic diagram

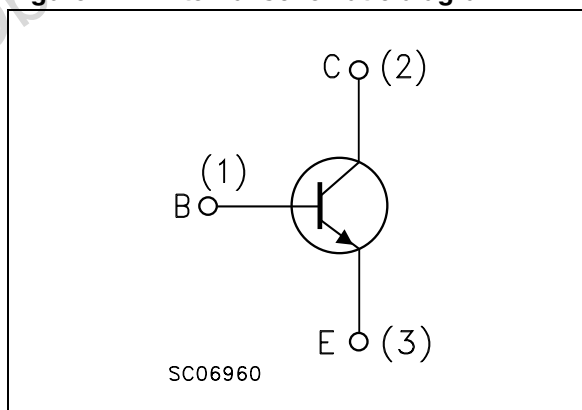


Table 1. Device summary

Order code	Marking	Package	Packaging
BUL810	BUL810	TO-247	Tube

# 1 Electrical ratings

**Table 2. Absolute maximum ratings**

Symbol	Parameter	Value	Unit
$V_{CES}$	Collector-emitter voltage ( $V_{BE} = 0$ )	1000	V
$V_{CEO}$	Collector-emitter voltage ( $I_B = 0$ )	450	V
$V_{EBO}$	Emitter-base voltage ( $I_C = 0$ )	9	V
$I_C$	Collector current	15	A
$I_{CM}$	Collector peak current ( $t_P < 5$ ms)	22	A
$I_B$	Base current	5	A
$I_{BM}$	Base peak current ( $t_P < 5$ ms)	10	A
$P_{tot}$	Total dissipation at $T_C = 25$ °C	125	W
$T_{stg}$	Storage temperature	-65 to 150	°C
$T_J$	Max. operating junction temperature	150	°C

**Table 3. Thermal data**

Symbol	Parameter	Value	Unit
$R_{thj-case}$	Thermal resistance junction-case max	1	°C/W
$R_{thj-amb}$	Thermal resistance junction-ambient max	30	°C/W

## 2 Electrical characteristics

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

**Table 4. Electrical characteristics**

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$I_{\text{CES}}$	Collector cut-off current ( $V_{\text{BE}} = 0$ )	$V_{\text{CE}} = 1000\text{ V}$			100	$\mu\text{A}$
		$V_{\text{CE}} = 1000\text{ V}$ $T_{\text{C}} = 125\text{ °C}$			500	$\mu\text{A}$
$I_{\text{CEO}}$	Collector cut-off current ( $I_{\text{B}} = 0$ )	$V_{\text{CE}} = 450\text{ V}$			250	$\mu\text{A}$
$V_{\text{CEO(sus)}}^{(1)}$	Collector-emitter sustaining voltage ( $I_{\text{B}} = 0$ )	$I_{\text{C}} = 100\text{ mA}$	450			V
$V_{\text{EBO}}$	Emitter-base voltage ( $I_{\text{C}} = 0$ )	$I_{\text{E}} = 10\text{ mA}$	9			V
$V_{\text{CE(sat)}}^{(1)}$	Collector-emitter saturation voltage	$I_{\text{C}} = 5\text{ A}$ $I_{\text{B}} = 1\text{ A}$			1	V
		$I_{\text{C}} = 8\text{ A}$ $I_{\text{B}} = 1.6\text{ A}$			1.5	V
		$I_{\text{C}} = 12\text{ A}$ $I_{\text{B}} = 2.4\text{ A}$			5	V
$V_{\text{BE(sat)}}^{(1)}$	Base-emitter saturation voltage	$I_{\text{C}} = 5\text{ A}$ $I_{\text{B}} = 1\text{ A}$			1.3	V
		$I_{\text{C}} = 8\text{ A}$ $I_{\text{B}} = 1.6\text{ A}$			1.6	V
$h_{\text{FE}}^{(1)}$	DC current gain	$I_{\text{C}} = 10\text{ mA}$ $V_{\text{CE}} = 5\text{ V}$	10			
		$I_{\text{C}} = 5\text{ A}$ $V_{\text{CE}} = 5\text{ V}$	10		40	
$t_{\text{s}}$ $t_{\text{f}}$	Inductive load Storage time Fall time	$I_{\text{C}} = 8\text{ A}$ $I_{\text{B1}} = 1.6\text{ A}$		1.5	2.3	$\mu\text{s}$
		$V_{\text{CL}} = 350\text{ V}$ $L = 200\text{ }\mu\text{H}$ $V_{\text{BE(off)}} = -5\text{ V}$ $R_{\text{BB}} = 0.4\text{ }\Omega$		55	110	ns
$t_{\text{s}}$ $t_{\text{f}}$	Inductive load Storage time Fall time	$I_{\text{C}} = 8\text{ A}$ $I_{\text{B1}} = 1.6\text{ A}$		1.9		$\mu\text{s}$
		$V_{\text{CL}} = 350\text{ V}$ $L = 200\text{ }\mu\text{H}$ $V_{\text{BE(off)}} = -5\text{ V}$ $R_{\text{BB}} = 0.4\text{ }\Omega$ $T_{\text{C}} = 100\text{ °C}$		80		ns

1. Pulse duration = 300  $\mu\text{s}$ , duty cycle  $\leq 1.5\%$

## 2.1 Electrical characteristics (curves)

Figure 2. Safe operating area

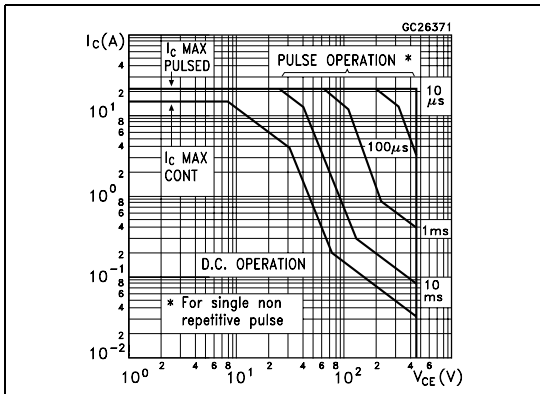


Figure 3. Derating curve

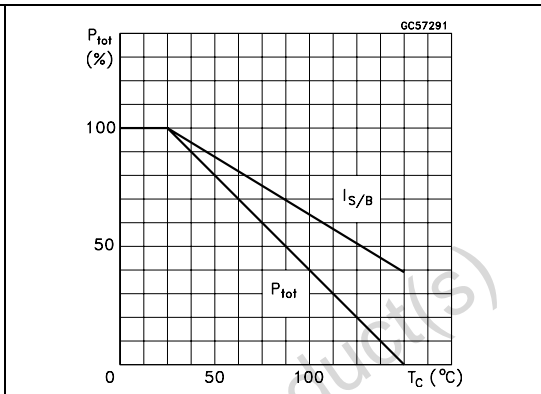


Figure 4. DC current gain

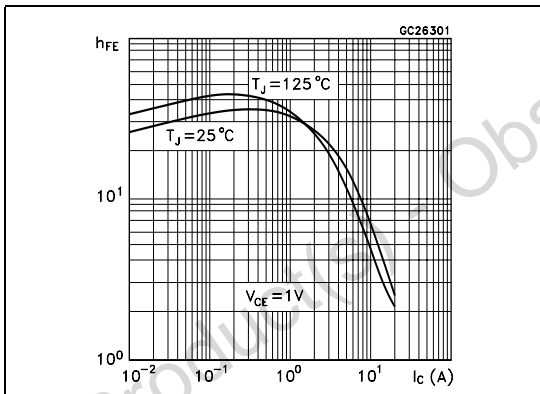


Figure 5. DC current gain

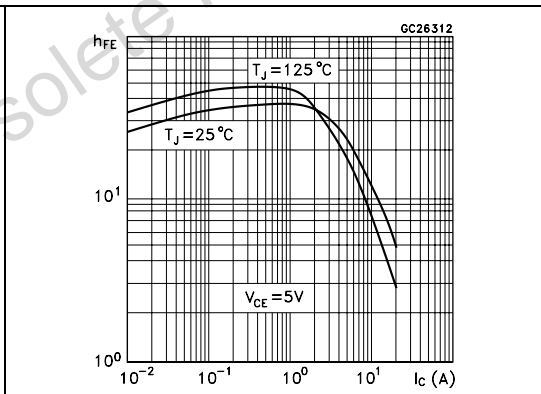


Figure 6. Collector-emitter saturation voltage

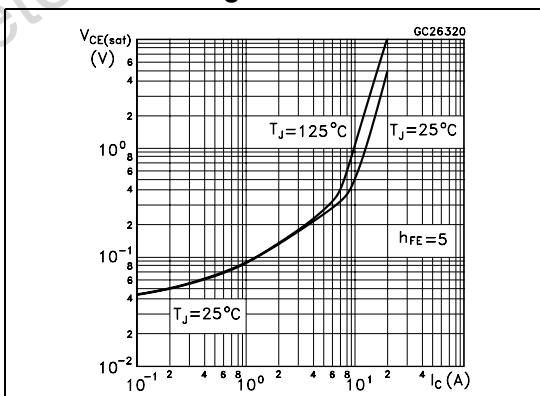


Figure 7. Base-emitter saturation voltage

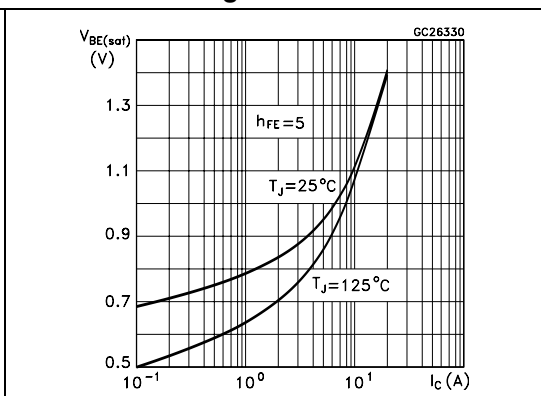


Figure 8. Inductive load fall time

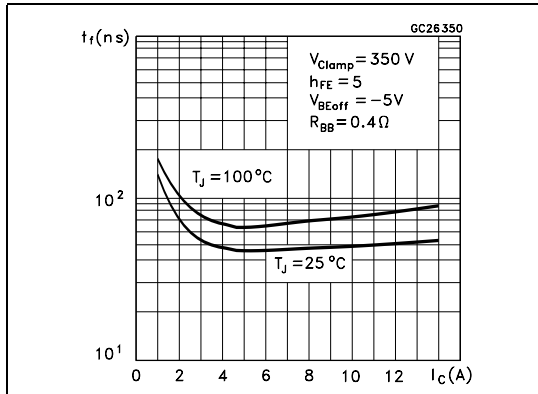


Figure 9. Inductive storage fall time

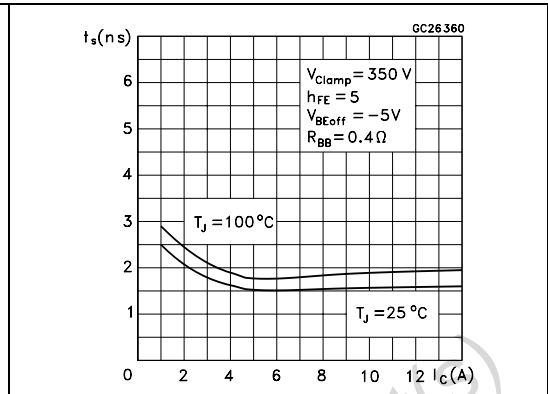
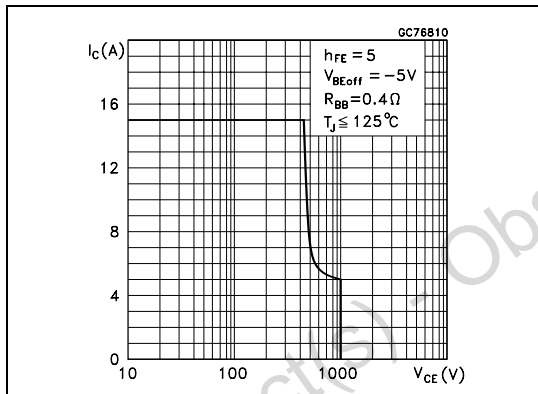
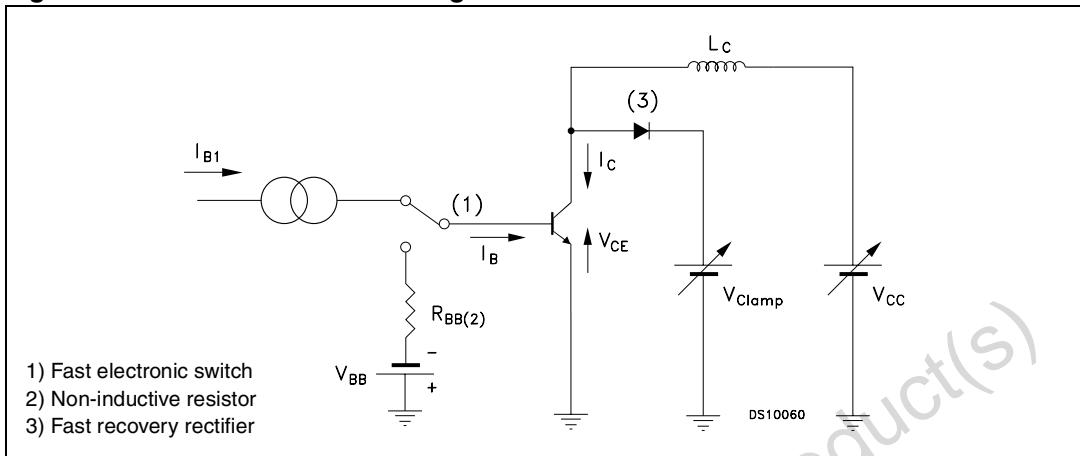


Figure 10. Reverse biased safe operating area



## 2.2 Test circuit

Figure 11. Inductive load switching test circuit



Obsolete Product(s) - Obsolete Product(s)

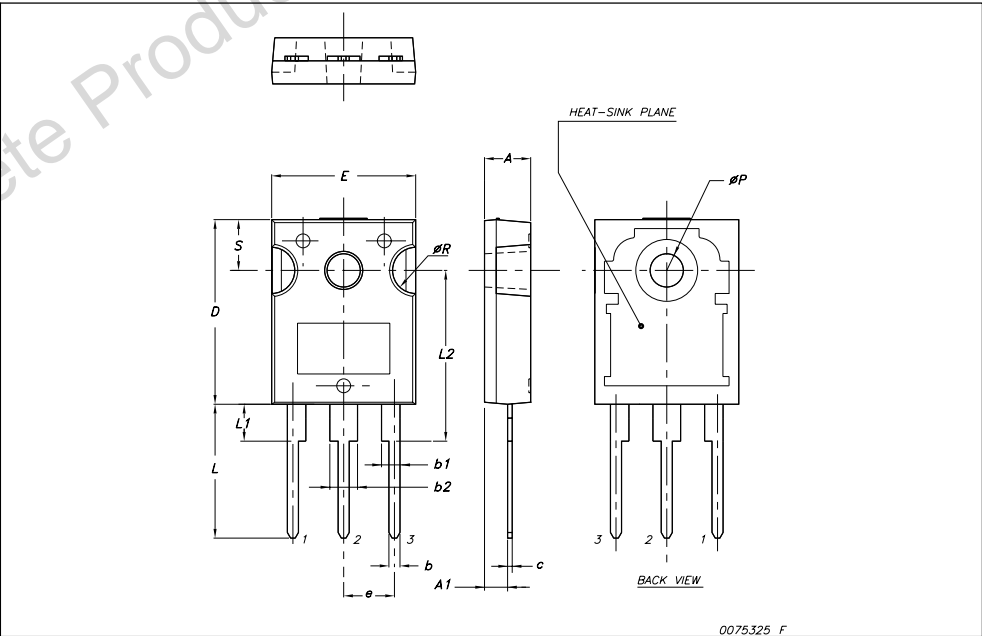
### 3 Package mechanical data

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)

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**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	



0075325 F



## 4 Revision history

Table 5. Document revision history

Date	Revision	Changes
01-Feb-2003	3	
12-Feb-2008	4	Package change from TO-218 to TO-247.

Obsolete Product(s) - Obsolete Product(s)

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