

## High voltage fast-switching NPN power transistor

### Features

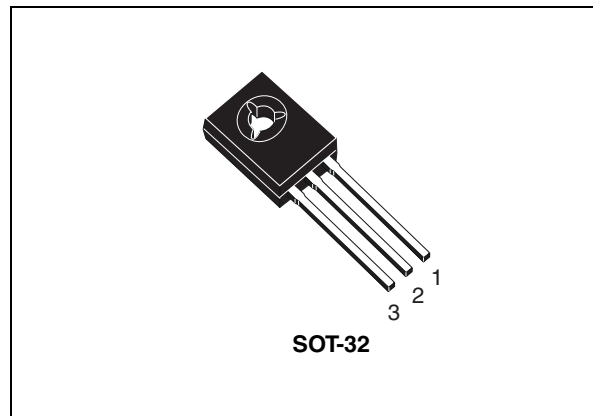
- High voltage capability
- Very high switching speed

### Application

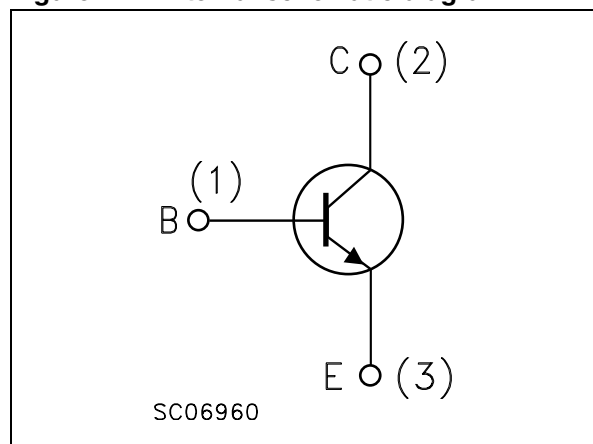
- Electronic ballast for fluorescent lighting

### Description

The device is manufactured using high voltage multi epitaxial planar technology for high switching speeds and high voltage capability. It uses a cellular emitter structure with planar edge termination to enhance switching speeds while maintaining the wide RBSOA. The ST83003 is expressly designed for a new solution to be used in compact fluorescent lamps, where it is coupled with the ST93003, its complementary PNP transistor.



**Figure 1. Internal schematic diagram**



**Table 1. Device summary**

Order code	Marking	Package	Packaging
ST83003	83003	SOT-32	Bag

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# 1 Electrical ratings

**Table 2. Absolute maximum ratings**

Symbol	Parameter	Value	Unit
$V_{CES}$	Collector-emitter voltage ( $V_{BE} = 0$ )	700	V
$V_{CEO}$	Collector-emitter voltage ( $I_B = 0$ )	400	V
$V_{EBO}$	Emitter-base voltage ( $I_C = 0$ , $I_B = 0.75$ A, $t_p < 10$ $\mu$ s)	$V_{(BR)EBO}$	V
$I_C$	Collector current	1.5	A
$I_{CM}$	Collector peak current ( $t_p < 5$ ms)	3	A
$I_B$	Base current	0.75	A
$I_{BM}$	Base peak current ( $t_p < 5$ ms)	1.5	A
$P_{TOT}$	Total dissipation at $T_c = 25$ °C	40	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
$R_{thJC}$	Thermal resistance junction-case max	3.1	°C/W

## 2 Electrical characteristics

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

**Table 4. On/off states**

Symbol	Parameter	Test conditions	Value			Unit	
			Min.	Typ.	Max.		
$I_{\text{CES}}$	Collector cut-off current ( $V_{\text{BE}} = 0$ )	$V_{\text{CE}} = 700\text{ V}$			1	mA	
		$V_{\text{CE}} = 700\text{ V}, T_{\text{C}} = 125\text{ °C}$			5	mA	
$V_{(\text{BR})\text{EBO}}$	Emitter-base breakdown voltage ( $I_{\text{C}} = 0$ )	$I_{\text{E}} = 10\text{ mA}$	12		18	V	
$V_{\text{CEO(sus)}}^{(1)}$	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	$I_{\text{C}} = 0.5\text{ A}, I_{\text{B}} = 0.1\text{ A}$			0.5	V	
		$I_{\text{C}} = 0.35\text{ A}, I_{\text{B}} = 50\text{ mA}$			1	V	
$V_{\text{BE(sat)}}^{(1)}$	Base-emitter saturation voltage	$I_{\text{C}} = 0.5\text{ A}, I_{\text{B}} = 0.1\text{ A}$			1	V	
$h_{\text{FE}}^{(1)}$	DC current gain	$I_{\text{C}} = 10\text{ mA}, V_{\text{CE}} = 5\text{ V}$	10				
		$I_{\text{C}} = 0.35\text{ A}, V_{\text{CE}} = 5\text{ V}$	16	25	32		
		$I_{\text{C}} = 1\text{ A}, V_{\text{CE}} = 5\text{ V}$	4				
$t_{\text{r}}$ $t_{\text{s}}$ $t_{\text{f}}$	Resistive load Rise time Storage time Fall time	$I_{\text{C}} = 0.35\text{ A}, V_{\text{CC}} = 125\text{ V},$ $I_{\text{B1}} = 70\text{ mA}, I_{\text{B2}} = -70\text{ mA}$ $t_{\text{p}} \geq 25\text{ }\mu\text{s}$ see <a href="#">Figure 14</a>	1.5				
					100		ns
					2.2	2.9	$\mu\text{s}$
$t_{\text{s}}$ $t_{\text{f}}$	Inductive load Storage time Fall time	$I_{\text{C}} = 0.5\text{ A}, I_{\text{B1}} = 0.1\text{ A},$ $V_{\text{BE(off)}} = -5\text{ V},$ $L = 10\text{ mH}, V_{\text{clamp}} = 300\text{ V}$ see <a href="#">Figure 13</a>					
					450		ns
				90		ns	

1. Pulse test: pulse duration  $\leq 300\text{ }\mu\text{s}$ , duty cycle  $\leq 2\%$

## 2.1 Electrical characteristics (curves)

Figure 2. Safe operating area

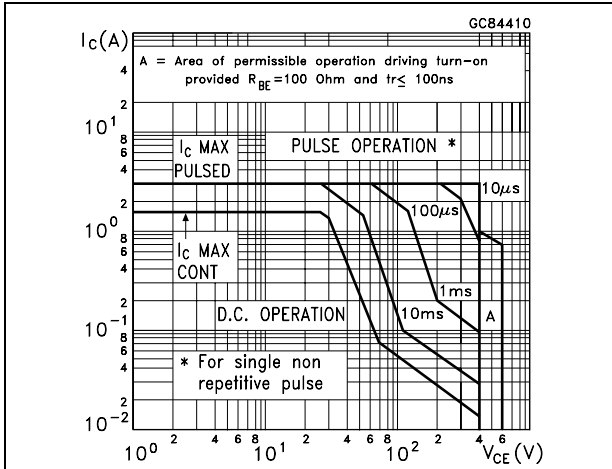


Figure 3. Derating

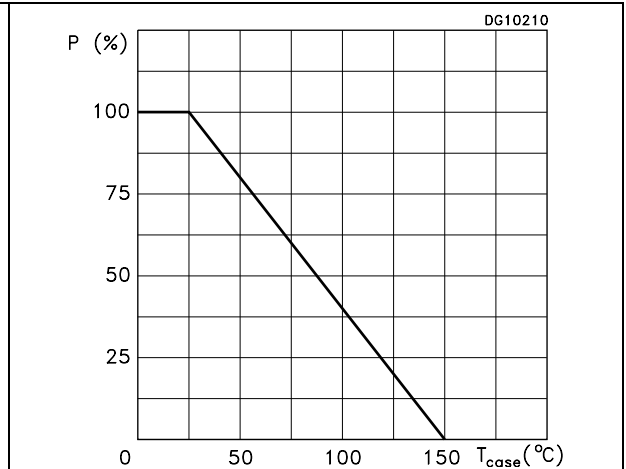


Figure 4. DC current gain ( $V_{CE} = 5\ \text{V}$ )

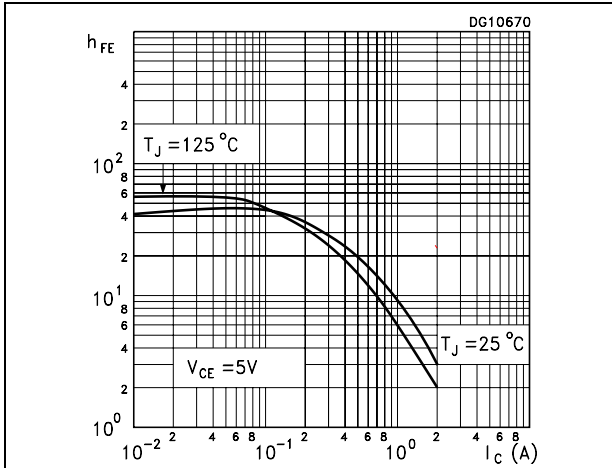


Figure 5. DC current gain ( $V_{CE} = 1\ \text{V}$ )

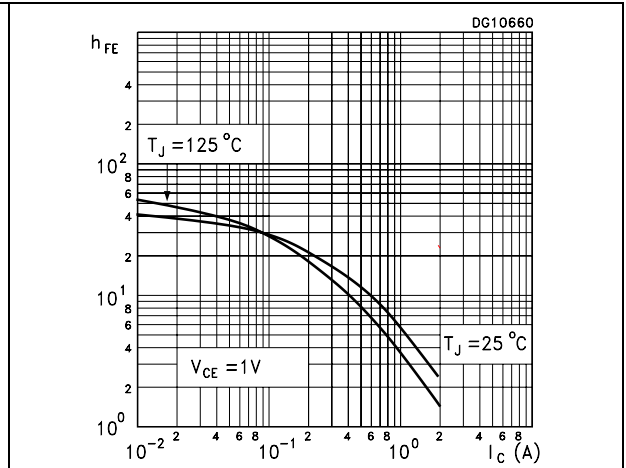


Figure 6. Collector emitter saturation voltage

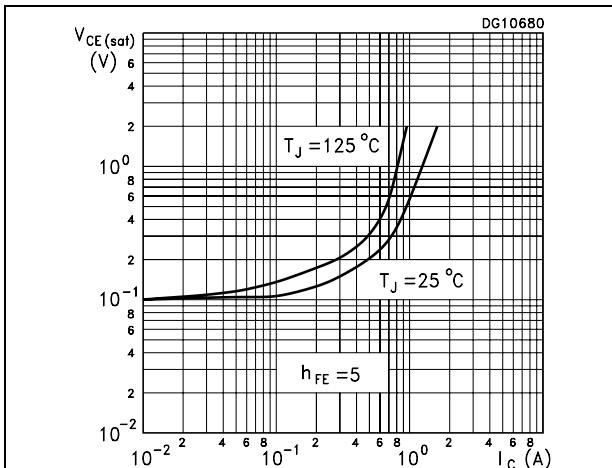


Figure 7. Base emitter saturation voltage

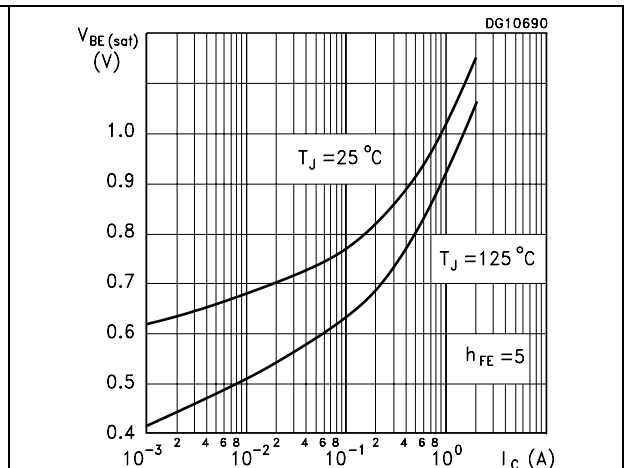


Figure 8. Resistive load fall time

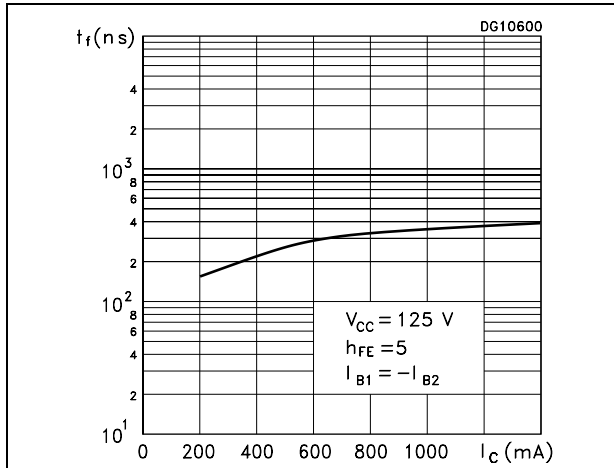


Figure 9. Resistive load storage time

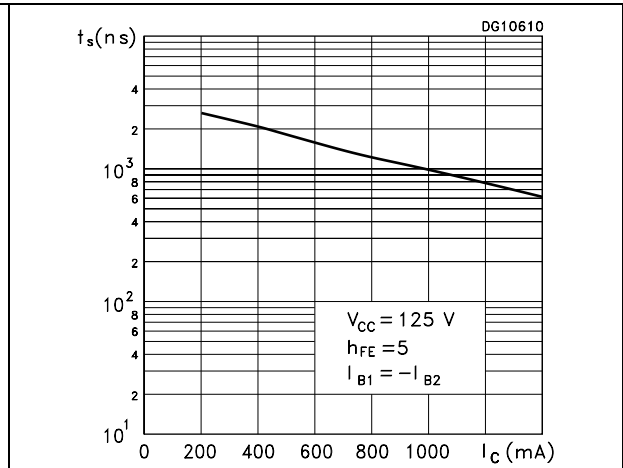


Figure 10. Inductive load fall time

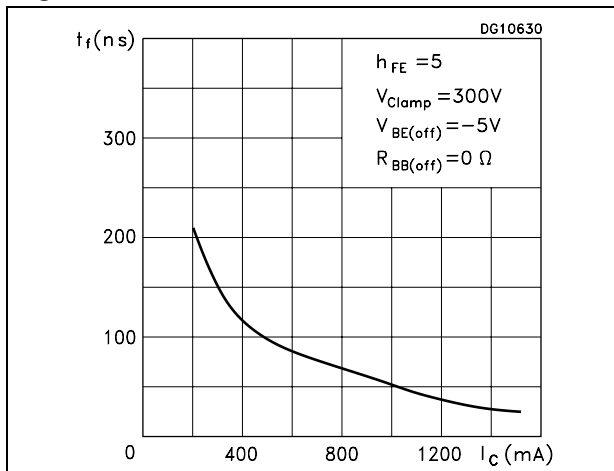


Figure 11. Inductive load storage time

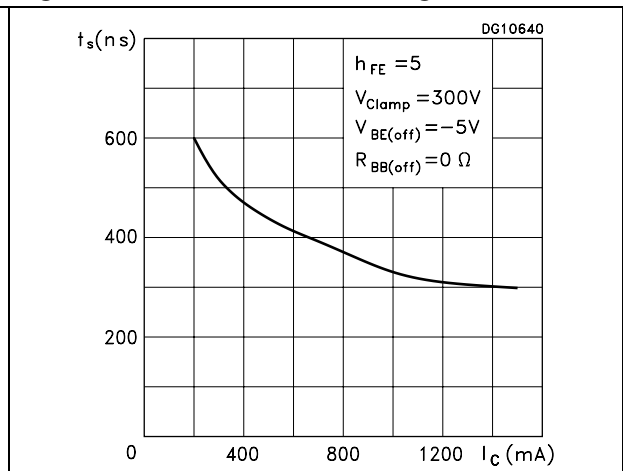
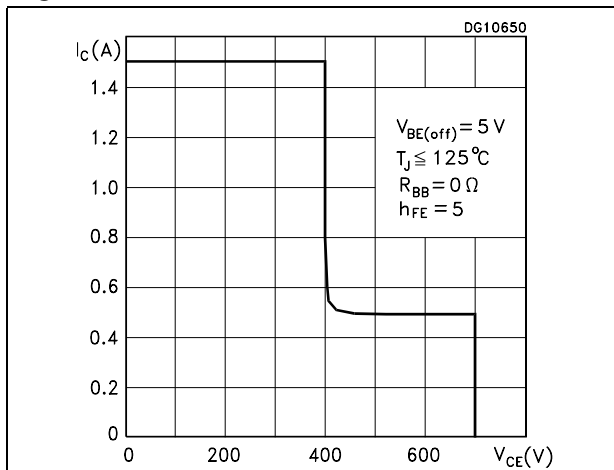
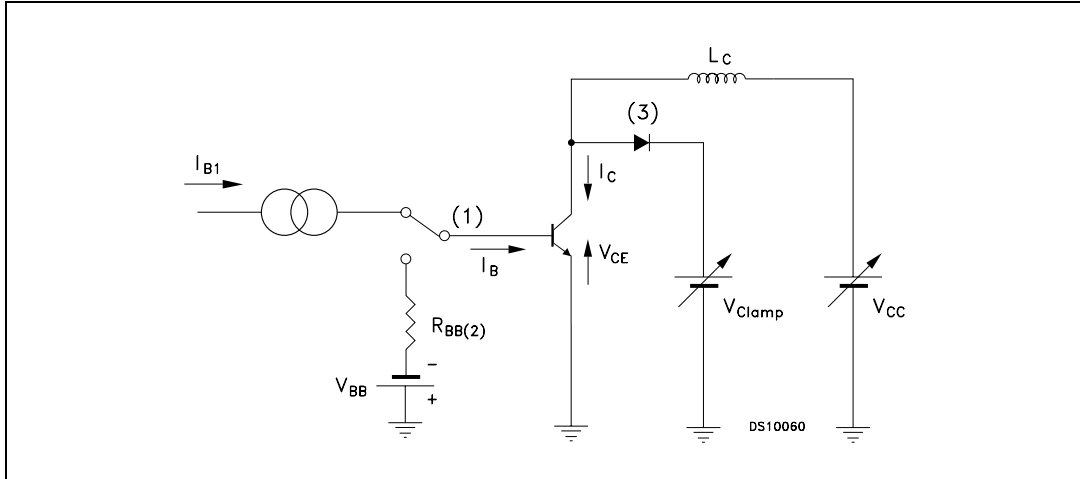


Figure 12. Reverse biased SOA



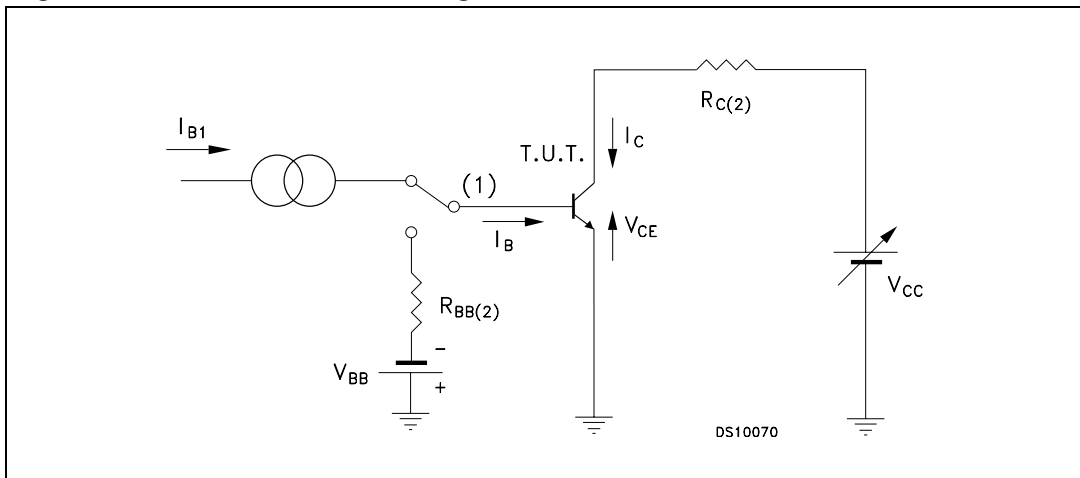
### 3 Test circuits

Figure 13. Inductive load switching



- 1. Fast electronic switch
- 2. Non-inductive resistor
- 3. Fast recovery rectifier

Figure 14. Resistive load switching



- 1. Fast electronic switch
- 2. Non-inductive resistor

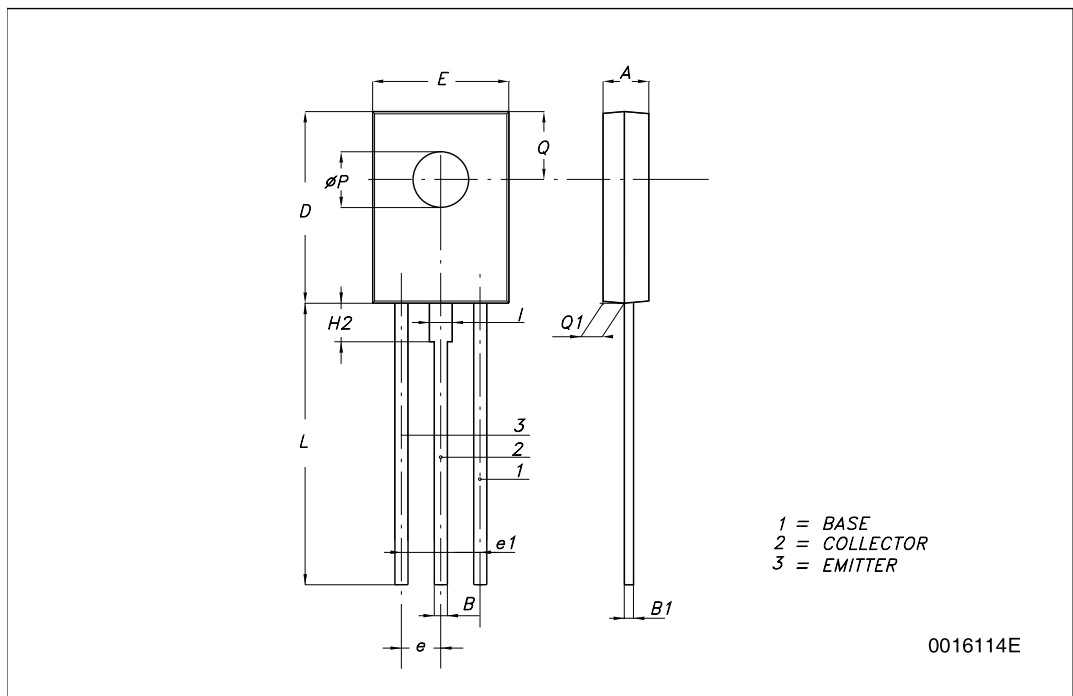
## 4 Package mechanical data

In order to meet environmental requirements, ST offers these devices in different grades of ECOPACK<sup>®</sup> packages, depending on their level of environmental compliance. ECOPACK<sup>®</sup> specifications, grade definitions and product status are available at: [www.st.com](http://www.st.com). ECOPACK<sup>®</sup> is an ST trademark.



**SOT-32 (TO-126) MECHANICAL DATA**

DIM.	mm.		
	MIN.	TYP	MAX.
A	2.4		2.9
B	0.64		0.88
B1	0.39		0.63
D	10.5		11.05
E	7.4		7.8
e	2.04	2.29	2.54
e1	4.07	4.58	5.08
L	15.3		16
P	2.9		3.2
Q		3.8	
Q1	1		1.52
H2		2.15	
I		1.27	



## 5 Revision history

**Table 5. Document revision history**

Date	Revision	Changes
16-Oct-2002	1	Initial release
08-Jul-2008	2	Mechanical data has been updated
08-Sep-2009	3	Updated packaging information <a href="#">Table 1 on page 1</a> .
03-Dec-2010	4	Added <a href="#">Table 3: Thermal data on page 3</a> .

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