



## STN93003

High voltage fast-switching  
PNP power transistor

### Features

- High voltage capability
- Very high switching speed

### Application

- Electronics ballasts 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 STN93003 is expressly designed for a new solution to be used in compact fluorescent lamps, where it is coupled with the STN83003, its complementary NPN transistor.

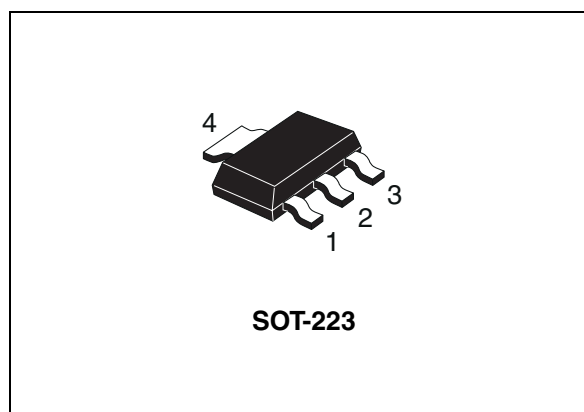


Figure 1. Internal schematic diagram

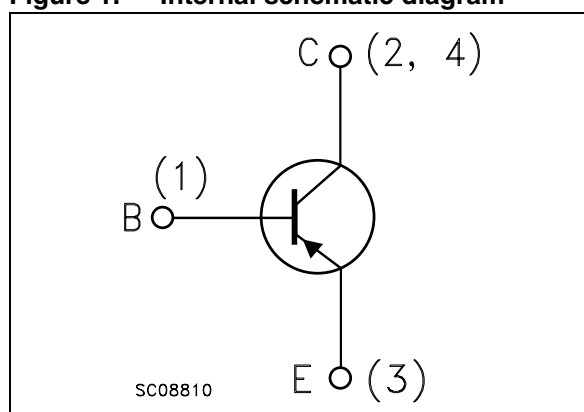


Table 1. Device summary

Part Number	Marking	Package	Packaging
STN93003	N93003	SOT-223	Tape and reel

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# 1 Electrical ratings

**Table 2. Absolute maximum ratings**

Symbol	Parameter	Value	Unit
$V_{CES}$	Collector-emitter voltage ( $V_{BE} = 0$ )	-500	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 $T_a = 25$ °C	1.6	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
$R_{thJA}$	Thermal resistance junction-ambient <sup>(1)</sup> max	78	°C/W

1. Device mounted on PCB area of 1 cm<sup>2</sup>.

## 2 Electrical characteristics

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

**Table 4. Electrical characteristics**

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$I_{CES}$	Collector cut-off current ( $V_{BE} = 0$ )	$V_{CE} = -500\text{ V}$			-1	mA
		$V_{CE} = -500\text{ V}$ $T_C = 125\text{ °C}$			-5	mA
$V_{(BR)EBO}$	Emitter-base breakdown voltage ( $I_C = 0$ )	$I_E = -10\text{ mA}$	-5		-10	V
$V_{CE(sus)}^{(1)}$	Collector-emitter sustaining voltage ( $I_B = 0$ )	$I_C = -10\text{ mA}$	-400			V
$V_{CE(sat)}^{(1)}$	Collector-emitter saturation voltage	$I_C = -0.35\text{ A}$ $I_B = -50\text{ mA}$			-0.5	V
		$I_C = -0.5\text{ A}$ $I_B = -0.1\text{ A}$			-0.5	V
$V_{BE(sat)}^{(1)}$	Base-emitter saturation voltage	$I_C = -0.5\text{ A}$ $I_B = -0.1\text{ A}$			-1	V
$h_{FE}$	DC current gain	$I_C = -10\text{ mA}$ $V_{CE} = -5\text{ V}$	10			
		$I_C = -0.35\text{ A}$ $V_{CE} = -5\text{ V}$	16	25	32	
		$I_C = -1\text{ A}$ $V_{CE} = -5\text{ V}$	4			
$t_r$ $t_s$ $t_f$	Resistive load Rise time Storage time Fall time	$I_C = -0.35\text{ A}$ $V_{CC} = 125\text{ V}$ $I_{B1} = -I_{B2} = -70\text{ mA}$ $t_p \geq 25\text{ }\mu\text{s}$		90		ns
			1.5	2.2	2.9	$\mu\text{s}$
				0.1		$\mu\text{s}$
$t_s$ $t_f$	Inductive load Storage time Fall time	$I_C = 0.5\text{ A}$ $I_{B1} = 0.1\text{ A}$ $V_{BE(off)} = -5\text{ V}$ $L = 10\text{ mH}$ $V_{Clamp} = 300\text{ V}$		400		ns
				40		ns
$E_{sb}$	Avalanche energy	$L = 4\text{ mH}$ $25\text{ °C} < T_C < 125\text{ °C}$ $I_{BR} \leq -2.5\text{ A}$ $C = 1.8\text{ nF}$	12			mJ

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

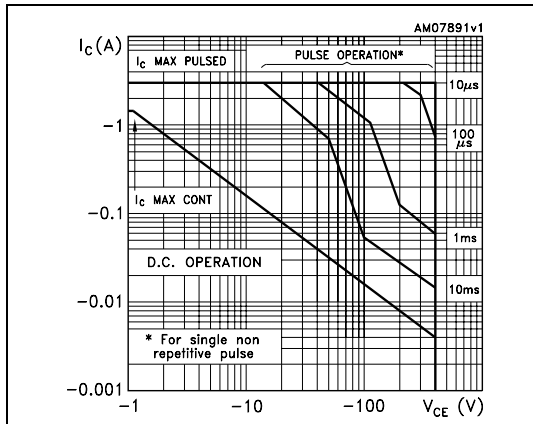


Figure 3. Derating curve

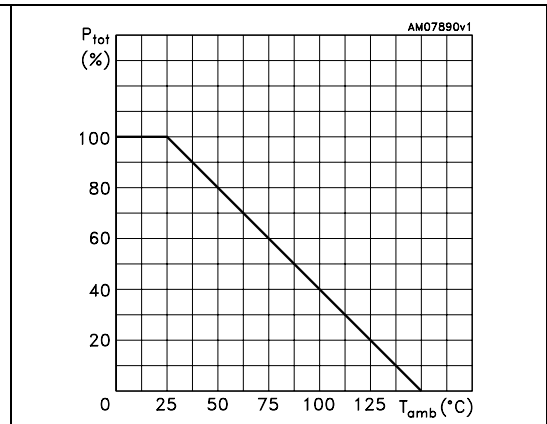


Figure 4. DC current gain ( $V_{CE} = -5 V$ )

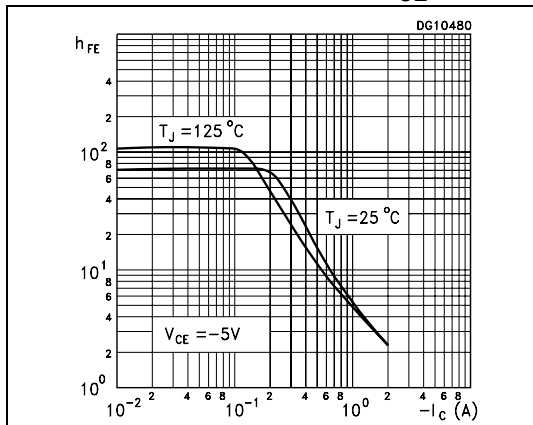


Figure 5. DC current gain ( $V_{CE} = -1 V$ )

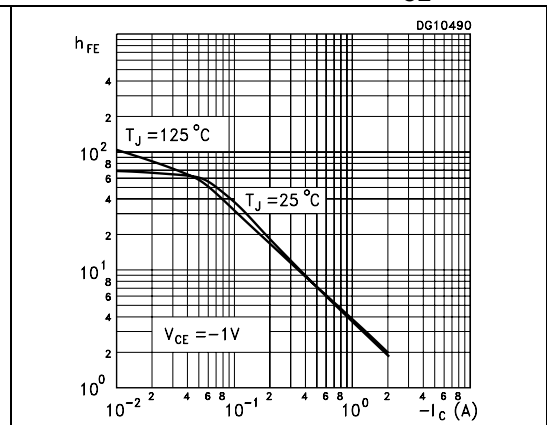


Figure 6. Collector-emitter saturation voltage

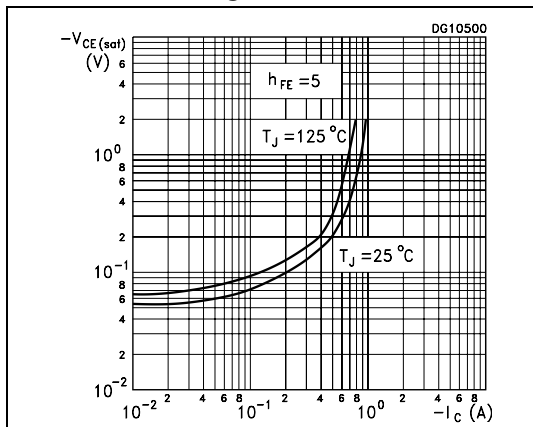


Figure 7. Base-emitter saturation voltage

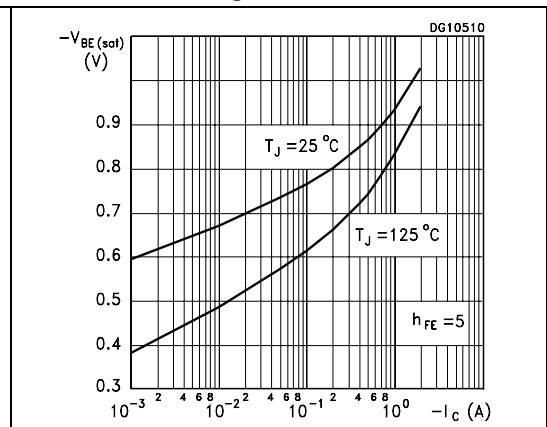


Figure 8. Resistive load fall time

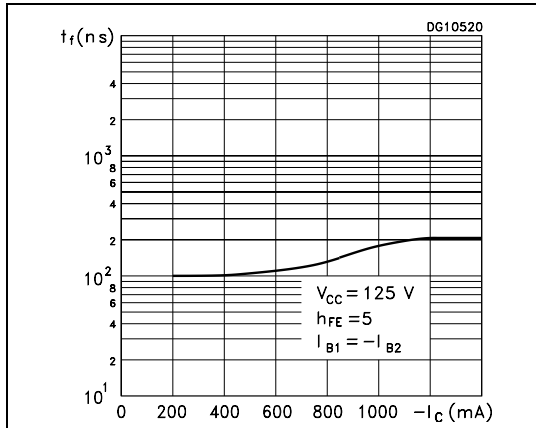


Figure 9. Resistive load storage time

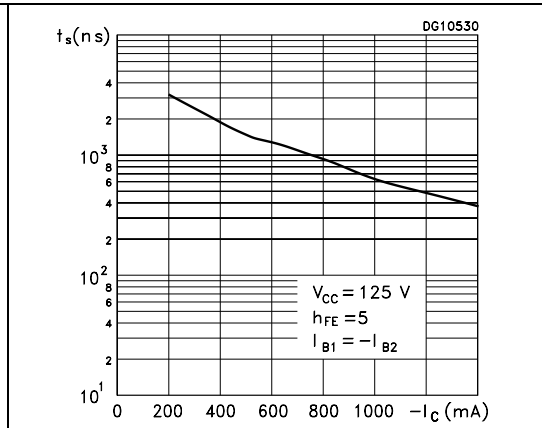


Figure 10. Inductive load fall time

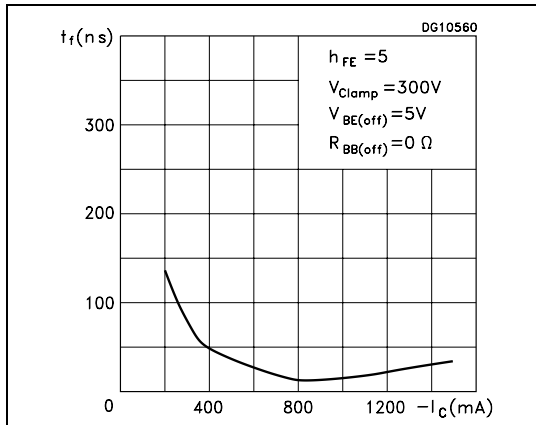


Figure 11. Inductive load storage time

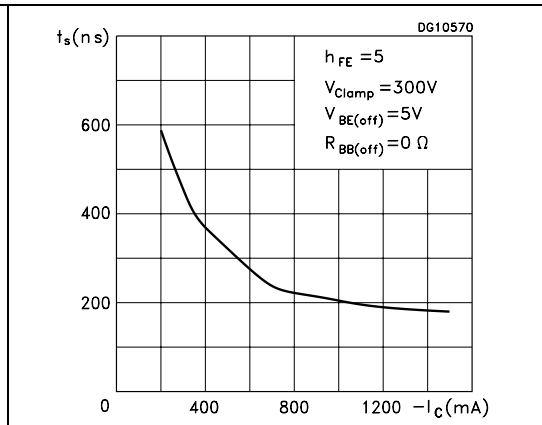
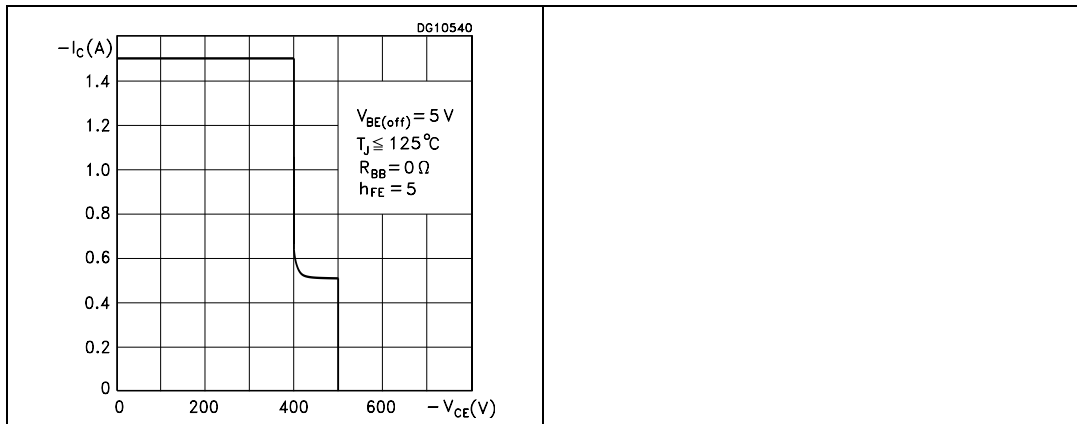
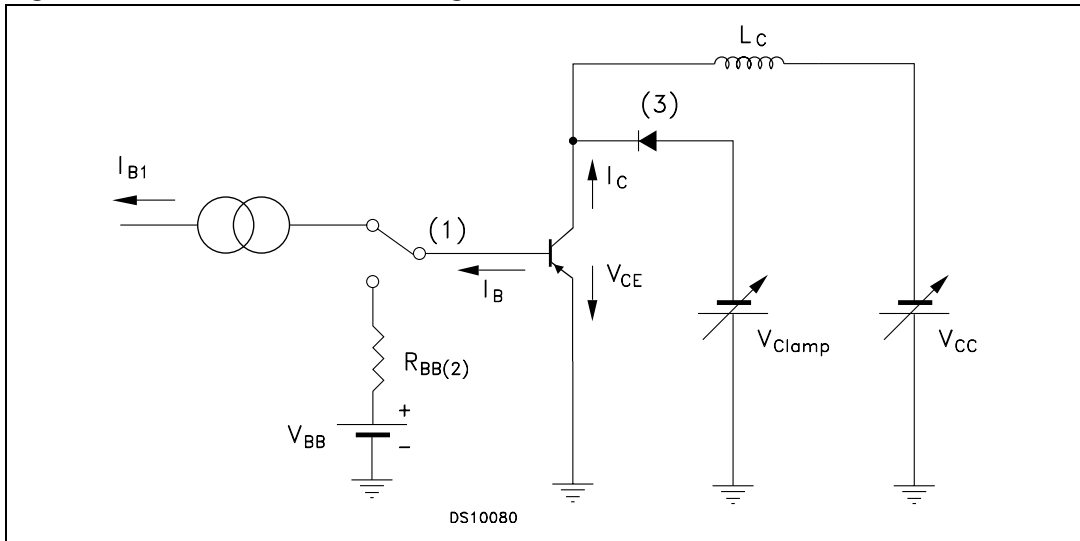


Figure 12. Reverse biased SOA



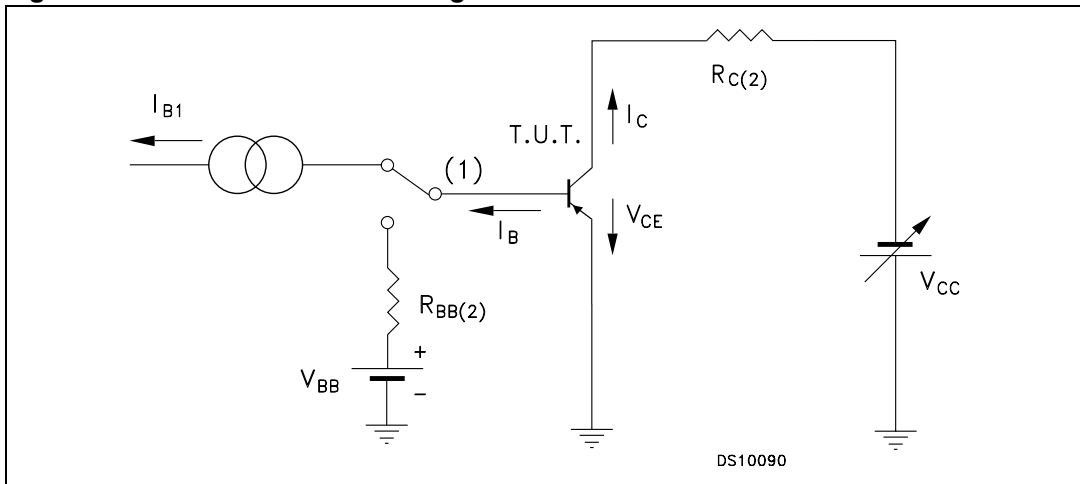
## 2.2 Test circuits

Figure 13. Inductive load switching test circuit



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

Figure 14. Resistive load switching test circuit



1. Fast electronic switching
2. Non-inductive resistor

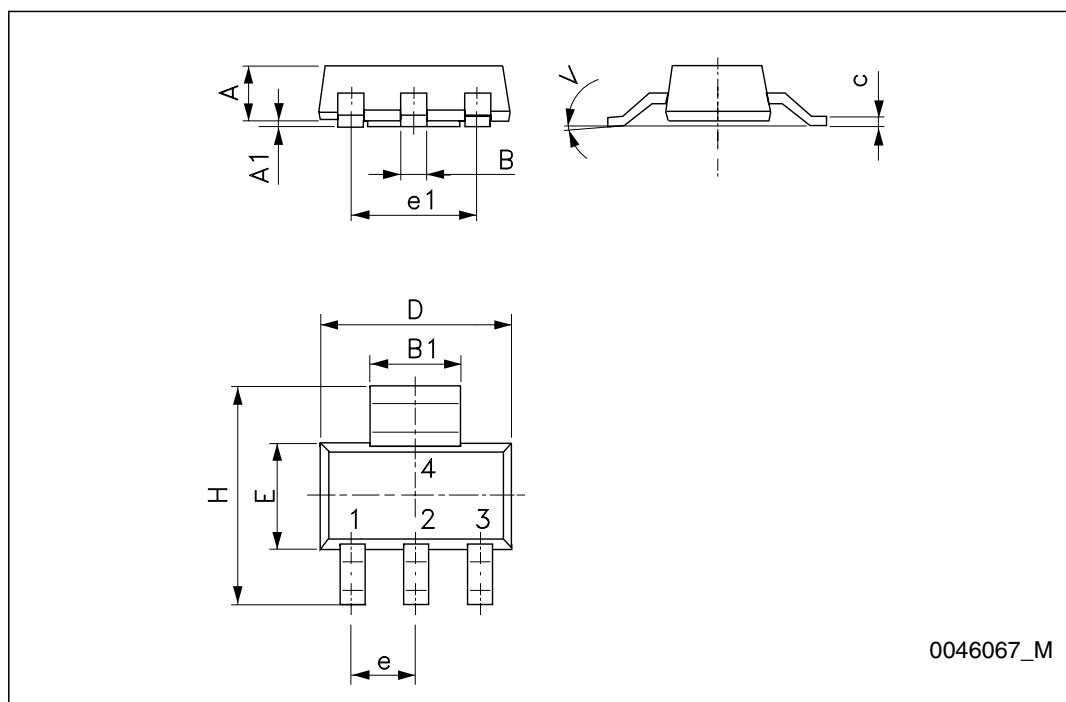
### 3 Package mechanical data

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-223 mechanical data

Dim.	mm.		
	Min.	Typ.	Max.
A			1.80
A1	0.02		0.1
B	0.60	0.70	0.85
B1	2.90	3.00	3.15
c	0.24	0.26	0.35
D	6.30	6.50	6.70
e		2.30	
e1		4.60	
E	3.30	3.50	3.70
H	6.70	7.00	7.30
V			10 °



## 4 Revision history

**Table 5. Revision history**

Date	Revision	Changes
11-May-2006	1	Initial release.
29-Nov-2010	2	Updated package mechanical data <a href="#">on page 9</a> .

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