



## STN93003

High voltage fast-switching  
PNP power transistor

### General features

- Medium voltage capability
- Low spread of dynamic parameters
- Minimum lot-to-lot spread for reliable operation
- Very high switching speed
- SOT-223 plastic package for surface mounting circuits
- Tape and reel packing

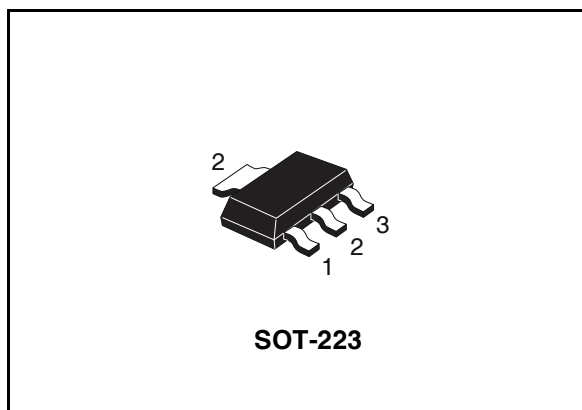
### Applications

- Electronics ballasts for fluorescent lighting
- Switch mode power supplies

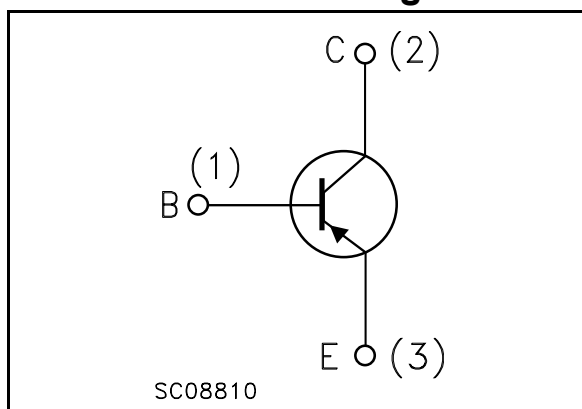
### Description

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



### Internal schematic diagram



### Order codes

Part Number	Marking	Package	Packing
STN93003	N93003	SOT-223	Tape & reel

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# 1 Electrical ratings

**Table 1. Absolute maximum rating**

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 ( $I_C = 0$ , $I_B = 0.75A$ , $t_p < 10\mu s$ , $T_j < 150^\circ C$ )	$V_{(BR)EBO}$	V
$I_C$	Collector current	-1.5	A
$I_{CM}$	Collector peak current ( $t_p < 5ms$ )	-3	A
$I_B$	Base current	-0.75	A
$I_{BM}$	Base peak current ( $t_p < 5ms$ )	-1.5	A
$P_{tot}$	Total dissipation at $T_c = 25^\circ C$	1.6	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
$R_{thj-amb}$	Thermal resistance junction-ambient <sup>(1)</sup> max	78	$^\circ C/W$

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

## 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
$I_{\text{CEV}}$	Collector cut-off current ( $V_{\text{BE}} = 0$ )	$V_{\text{CE}} = -500\text{V}$ $V_{\text{CE}} = -500\text{V}$ $T_j = 125^{\circ}\text{C}$			-1 -5	mA mA
$V_{(\text{BR})\text{EBO}}$	Emitter-base breakdown voltage ( $I_{\text{C}} = 0$ )	$I_{\text{E}} = -10\text{mA}$	-5		-10	V
$V_{\text{CE(sus)}}^{(1)}$	Collector-emitter sustaining voltage ( $I_{\text{B}} = 0$ )	$I_{\text{C}} = -10\text{mA}$ $L = 25\text{mH}$	-400			V
$V_{\text{CE(sat)}}^{(1)}$	Collector-emitter saturation voltage	$I_{\text{C}} = -0.35\text{A}$ $I_{\text{B}} = -50\text{mA}$ $I_{\text{C}} = -0.5\text{A}$ $I_{\text{B}} = -0.1\text{A}$			-0.5 -0.5	V 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
$h_{\text{FE}}$	DC current gain	$I_{\text{C}} = -10\text{mA}$ $V_{\text{CE}} = -5\text{V}$ $I_{\text{C}} = -0.35\text{A}$ $V_{\text{CE}} = -5\text{V}$ $I_{\text{C}} = -1\text{A}$ $V_{\text{CE}} = -5\text{V}$	10 16 4	25	32	
$t_{\text{r}}$ $t_{\text{s}}$ $t_{\text{f}}$	Resistive load Rise time Storage time Fall time	$I_{\text{C}} = -0.35\text{A}$ $V_{\text{CC}} = 125\text{V}$ $I_{\text{B1}} = -I_{\text{B2}} = -70\text{mA}$ $T_{\text{P}} \geq 25\mu\text{s}$ (see figure 10)	1.5	90 2.2 0.1	2.9	ns $\mu\text{s}$ $\mu\text{s}$
$t_{\text{s}}$ $t_{\text{f}}$	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 figure 9)		400 40		ns ns
$E_{\text{sb}}$ $t_{\text{f}}$	Avalanche Energy	$L = 4\text{mH}$ $25^{\circ}\text{C} < T_{\text{C}} < 125^{\circ}\text{C}$ $I_{\text{BR}} \leq -2.5\text{A}$ $C = 1.8\text{nF}$	12			mJ

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

## 2.1 Electrical characteristics (curves)

Figure 1. DC Current Gain

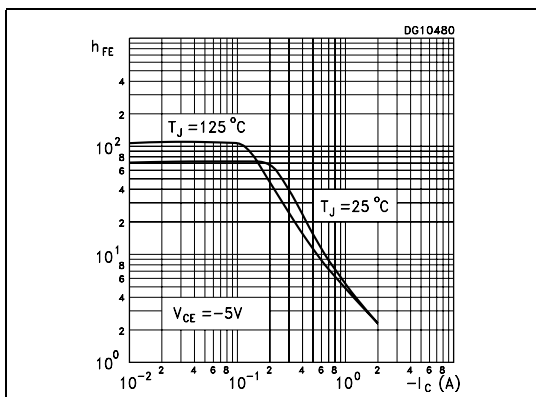


Figure 2. DC Current Gain

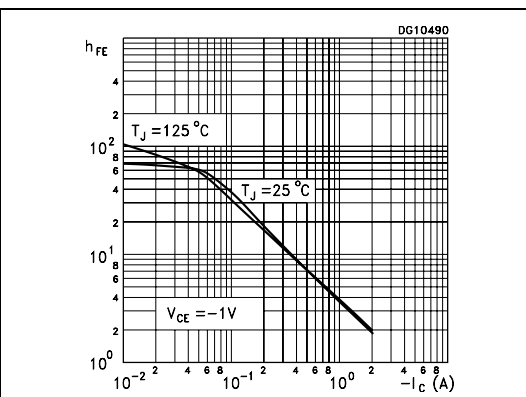


Figure 3. Collector-emitter saturation voltage

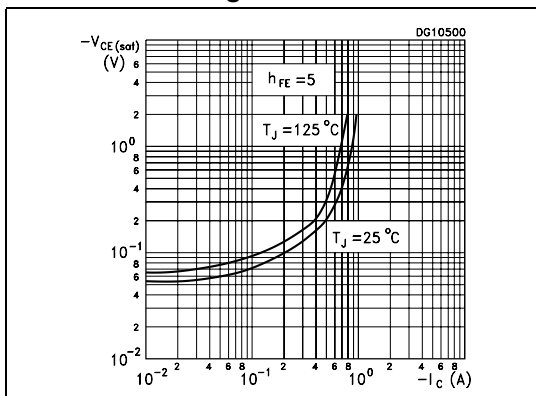


Figure 4. Base-emitter saturation voltage

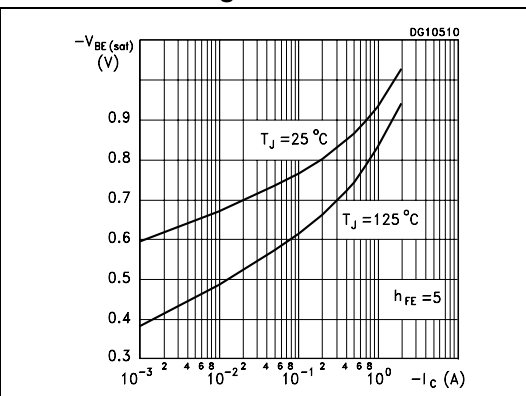


Figure 5. Resistive load fall time

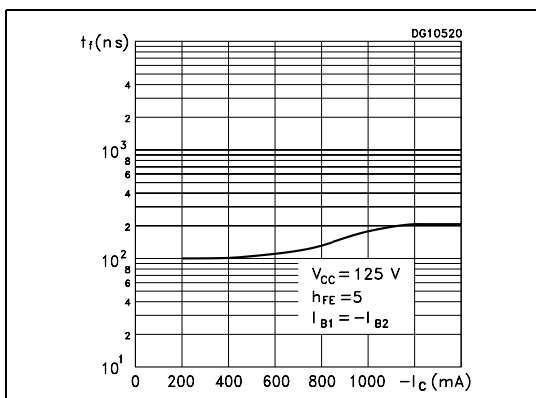


Figure 6. Resistive load storage time

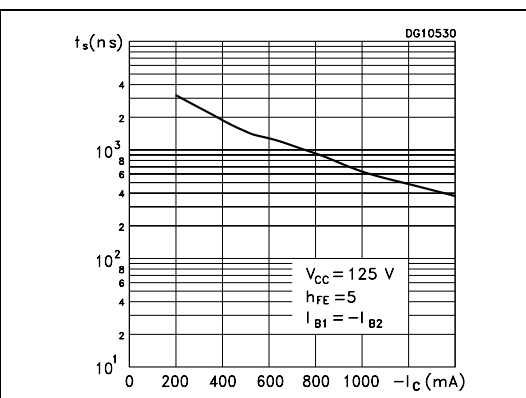
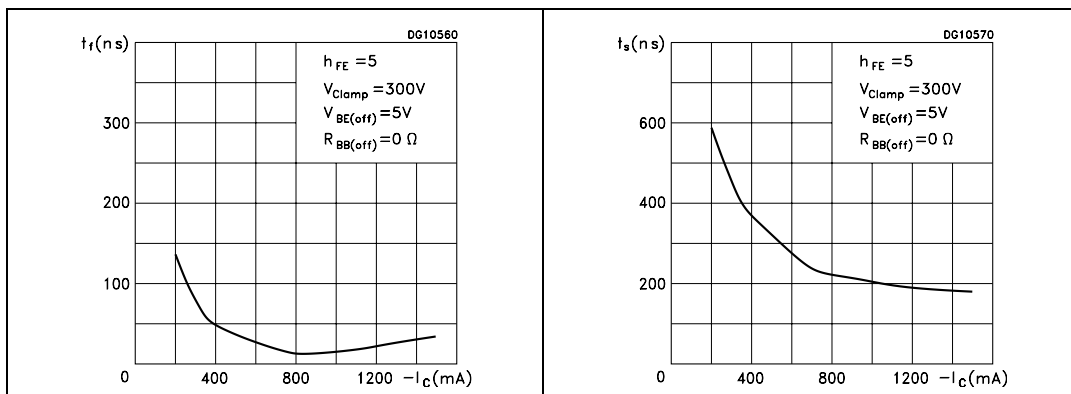


Figure 7. Inductive load fall time

Figure 8. Inductive load storage time



## 2.2 Test circuits

Figure 9. Inductive load switching test circuit

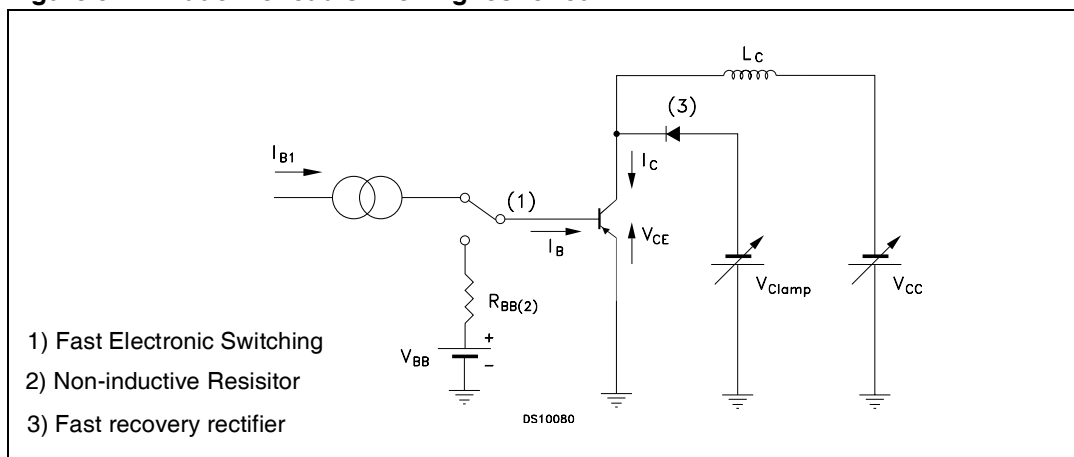
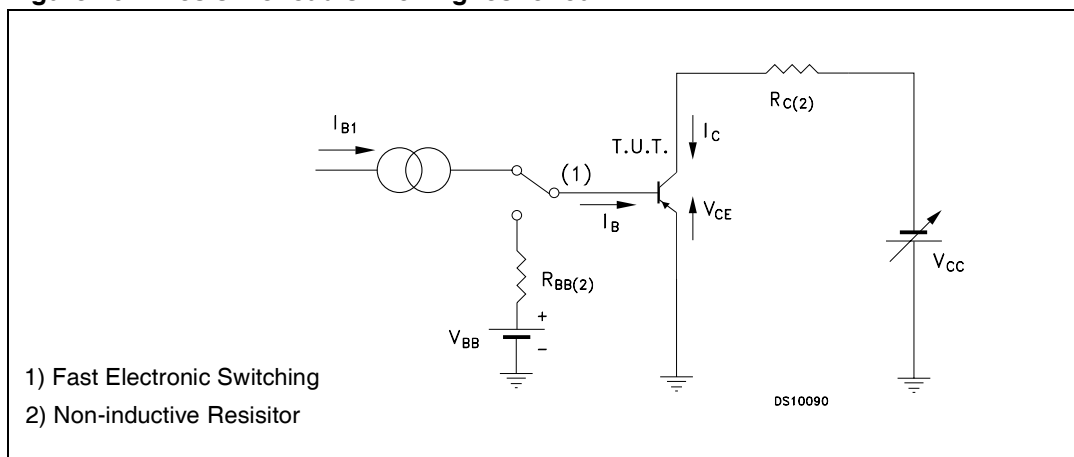


Figure 10. Resistive load switching test circuit

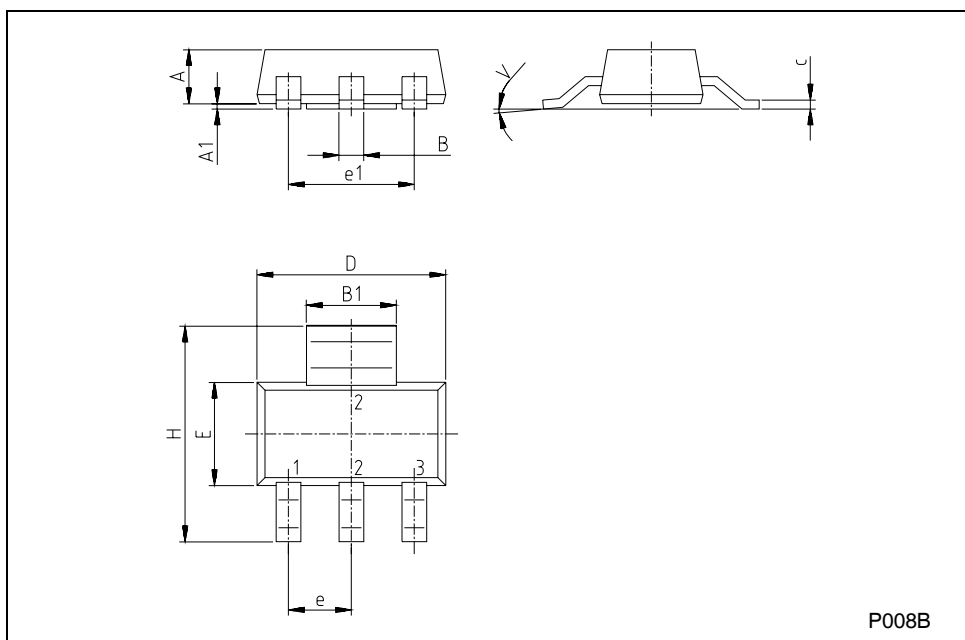


### 3 Package mechanical data

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)

**SOT-223 MECHANICAL DATA**

DIM.	mm			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
A			1.80			0.071
B	0.60	0.70	0.80	0.024	0.027	0.031
B1	2.90	3.00	3.10	0.114	0.118	0.122
c	0.24	0.26	0.32	0.009	0.010	0.013
D	6.30	6.50	6.70	0.248	0.256	0.264
e		2.30			0.090	
e1		4.60			0.181	
E	3.30	3.50	3.70	0.130	0.138	0.146
H	6.70	7.00	7.30	0.264	0.276	0.287
V			10°			10°
A1		0.02				





Revision history

**Table 4. Revision history**

Date	Revision	Changes
11-May-2006	1	Initial release.

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