

### Features

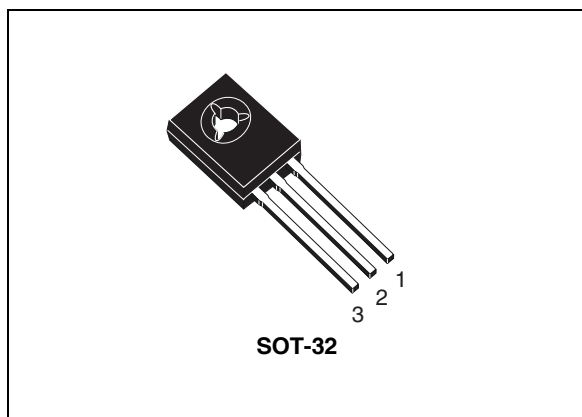
- High voltage capability
- Low spread of dynamic parameters
- Minimum lot-to-lot spread for reliable operation
- Very high switching speed

### Application

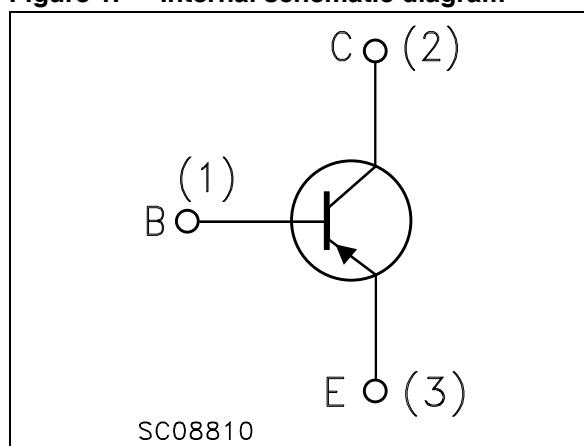
- Electronic ballast for fluorescent lighting

### 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 ST93003 is expressly designed for a new solution to be used in compact fluorescent lamps, where it is coupled with the ST83003, its complementary NPN transistor.



**Figure 1. Internal schematic diagram**



**Table 1. Device summary**

Order code	Marking	Package	Packaging
ST93003	93003	SOT-32	Tube

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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 $T_C = 25$ °C	40	W
$T_{stg}$	Storage temperature	-65 to 150	°C
$T_j$	Max. operating junction temperature	150	°C

## 2 Electrical characteristics

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

**Table 3. On/off states**

Symbol	Parameter	Test conditions	Value			Unit
			Min.	Typ.	Max.	
$I_{\text{CES}}$	Collector cut-off current ( $V_{\text{BE}} = 0$ )	$V_{\text{CE}} = -500\text{ V}$			-1	mA
		$V_{\text{CE}} = -500\text{ V}, T_{\text{C}} = 125\text{ °C}$			-5	mA
$V_{(\text{BR})\text{EBO}}$	Emitter-base breakdown voltage ( $I_{\text{C}} = 0$ )	$I_{\text{E}} = -10\text{ mA}$	-5		-10	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
		$I_{\text{C}} = -0.35\text{ A}, I_{\text{B}} = -50\text{ mA}$			-0.5	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			
$t_{\text{r}}$ $t_{\text{s}}$ $t_{\text{f}}$	<b>Resistive load</b> Rise time Storage time Fall time	$I_{\text{C}} = -0.35\text{ A}, V_{\text{CC}} = 125\text{ V},$ $I_{\text{B}1} = -70\text{ mA}, I_{\text{B}2} = 70\text{ mA}$ $T_{\text{p}} \geq 25\text{ }\mu\text{s}$ (see Figure 14)	1.5			
				90		
				2.2	2.9	ns $\mu\text{s}$ $\mu\text{s}$
$t_{\text{s}}$ $t_{\text{f}}$	<b>Inductive load</b> Storage time Fall time	$I_{\text{C}} = -0.5\text{ A}, I_{\text{B}1} = -0.1\text{ A},$ $V_{\text{BE(off)}} = 5\text{ V},$ $L = 10\text{ mH}, V_{\text{clamp}} = 300\text{ V}$ (see Figure 13)				
				400	40	ns ns
$E_{\text{sb}}$	Avalanche energy	$L = 4\text{ mH}, C = 1.8\text{ nF},$ $I_{\text{BR}} = 2.5\text{ A}, 25\text{ °C} < T_{\text{C}} < 125\text{ °C}$	12			mJ

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

## 2.1 Electrical characteristics (curves)

Figure 2. Safe operating area

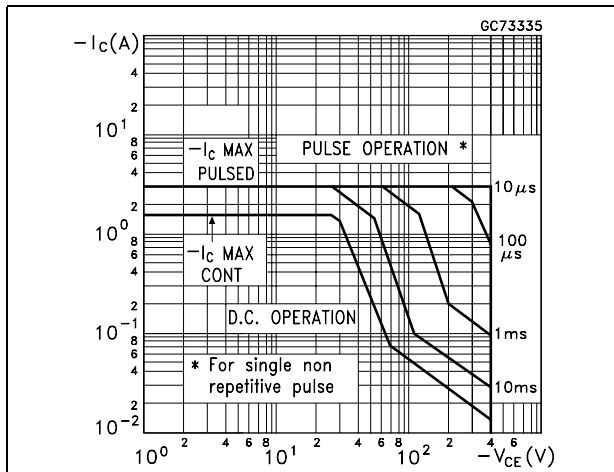


Figure 3. Derating

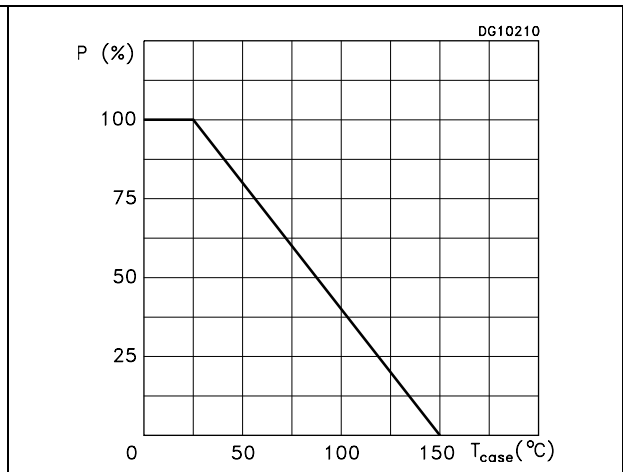


Figure 4. DC current gain

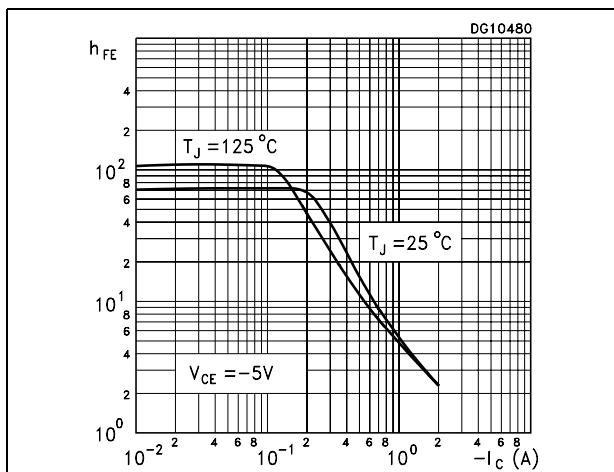


Figure 5. DC current gain

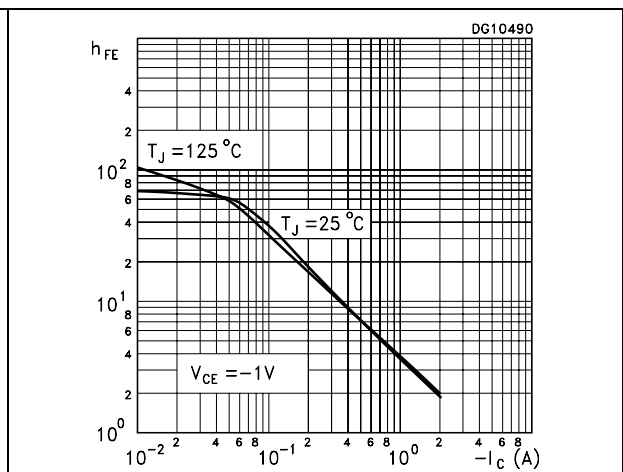


Figure 6. Collector emitter saturation voltage Figure 7. Base emitter saturation voltage

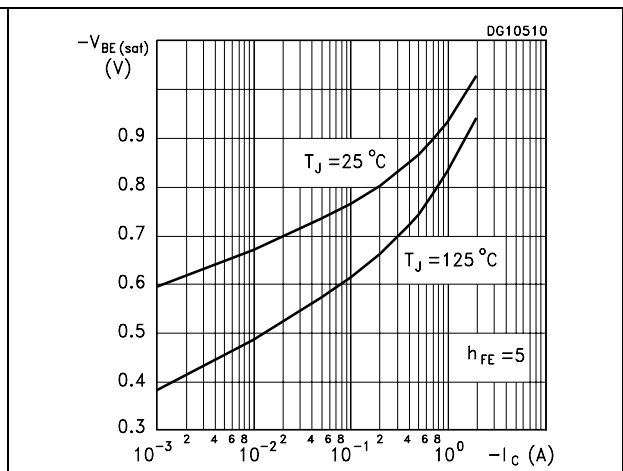
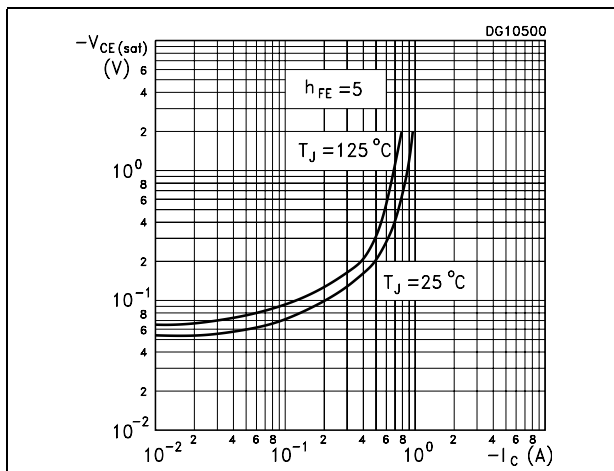


Figure 8. Resistive load fall time

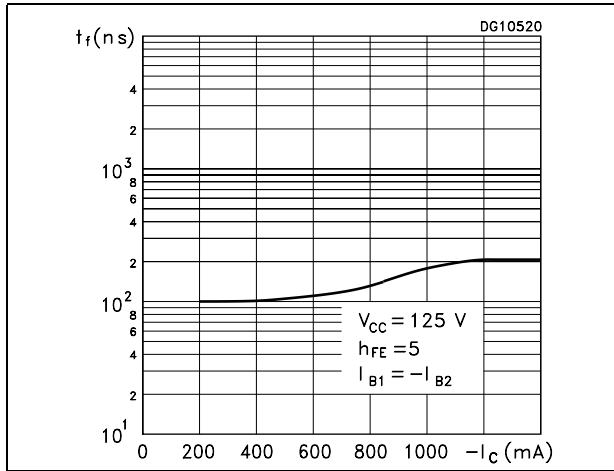


Figure 9. Resistive load storage time

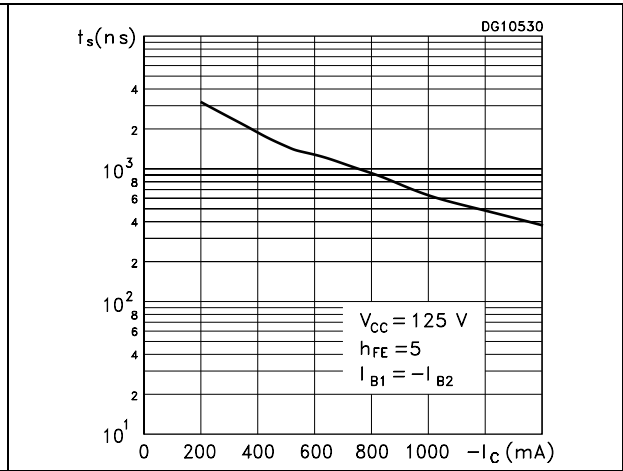


Figure 10. Inductive load fall time

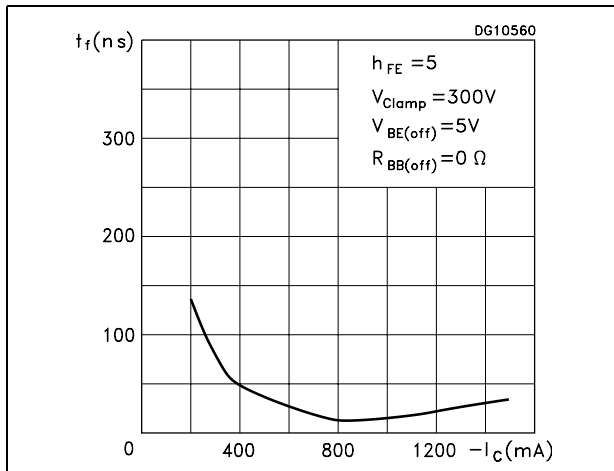


Figure 11. Inductive load storage time

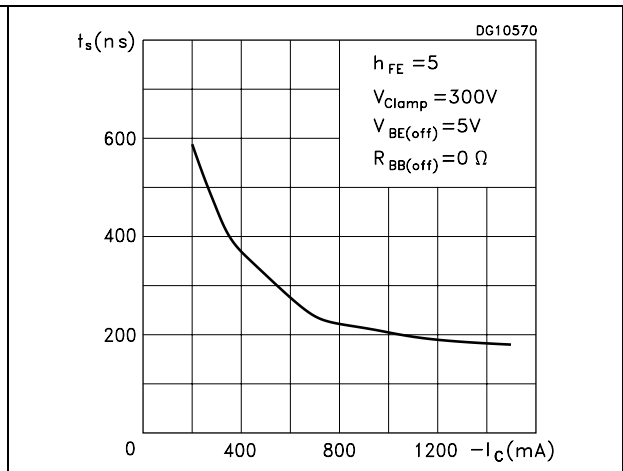
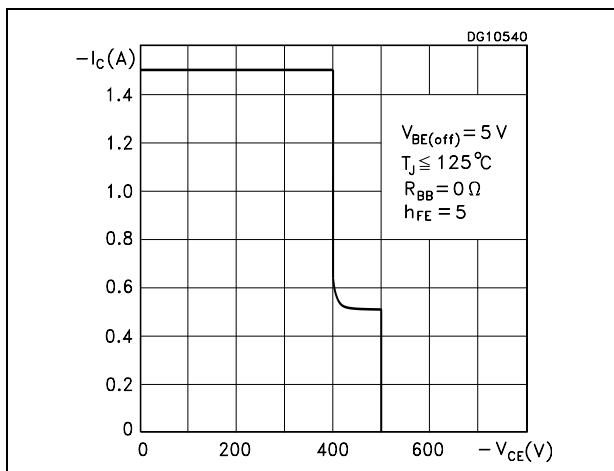


Figure 12. Reverse biased SOA



### 3 Test circuits

Figure 13. Inductive load switching

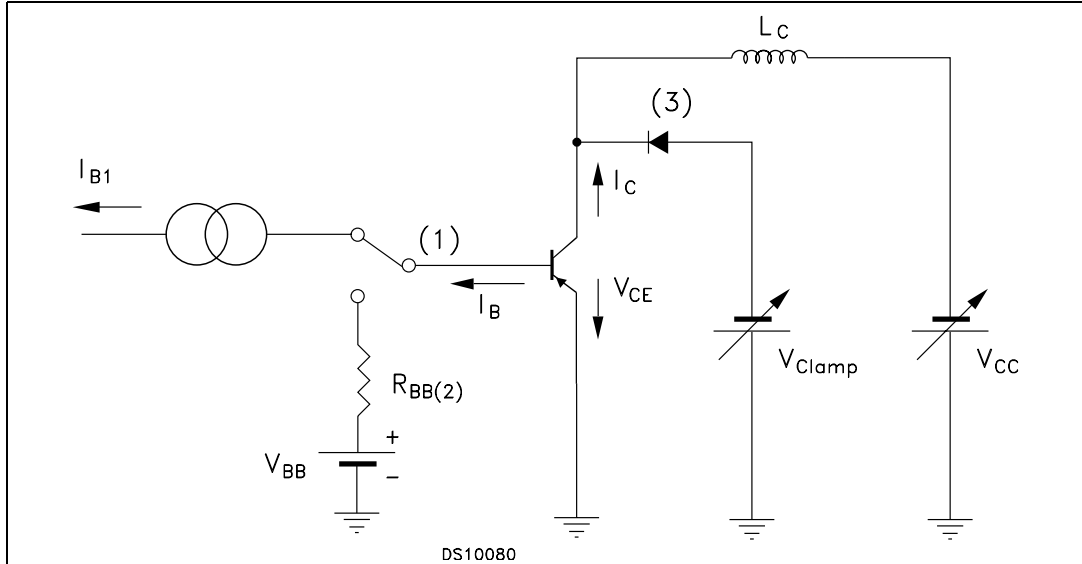
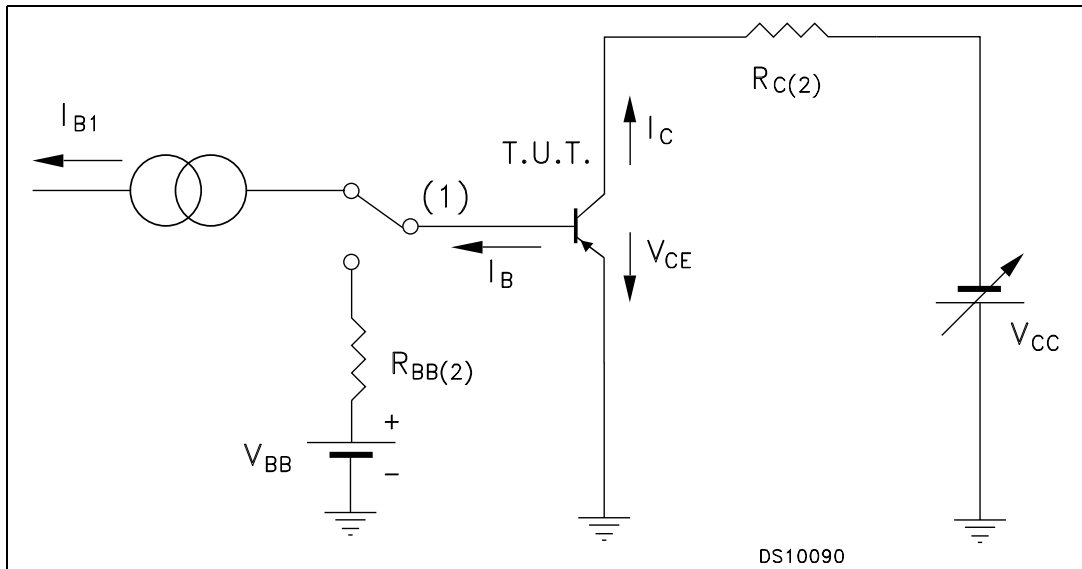


Figure 14. Resistive load switching



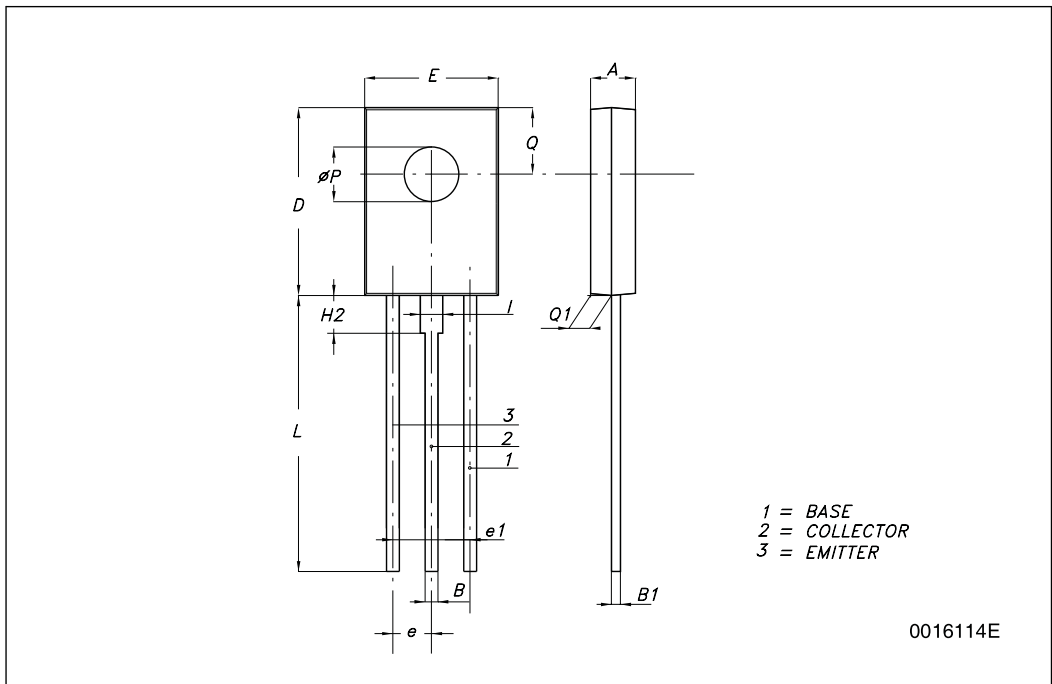
## 4 Package mechanical data

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-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 4. Document revision history**

Date	Revision	Changes
21-Jun-2004	2	
08-Jul-2008	3	– Mechanical data has been updated – The document has been reformatted

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