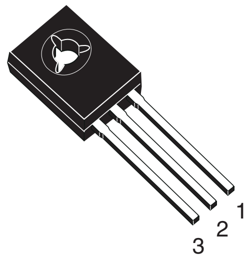
ST93003

High voltage fast-switching PNP power transistor



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

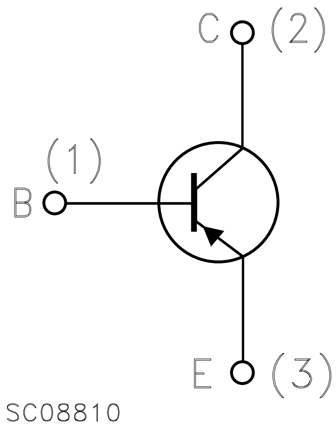


Table 1. Device summary

Order code	Marking	Package	Packaging
ST93003	93003	SOT-32	Tube

Contents

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, $t_p < 10$ µs)	$V_{(BR)EBO}$	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_{case}= 25 °C unless otherwise specified)

Table 3. On/off states

Symbol	Parameter	Test conditions	Value			Unit
			Min.	Typ.	Max.	
I_{CES}	Collector cut-off current (V_{BE}= 0)	V_{CE} = -500 V V_{CE} = -500 V, T_C = 125 °C			-1 -5	mA mA
$V_{(BR)EBO}$	Emitter-base breakdown voltage (I_C=0)	I_E = -10 mA	-5		-10	V
$V_{CEO(sus)}$ (1)	Collector-emitter sustaining voltage (I_B=0)	I_C = -10 mA	-400			V
$V_{CE(sat)}$ (1)	Collector-emitter saturation voltage	I_C = -0.5 A, I_B = -0.1 A I_C = -0.35 A, I_B = -50 mA			-0.5 -0.5	V V
$V_{BE(sat)}$ (1)	Base-emitter saturation voltage	I_C = -0.5 A, I_B = -0.1 A			-1	V
h_{FE} (1)	DC current gain	I_C = -10 mA, V_{CE} = -5 V I_C = -0.35 A, V_{CE} = -5 V I_C = -1 A, V_{CE} = -5 V	10 16 4	25	32	
t_r t_s t_f	**Resistive load** Rise time Storage time Fall time	I_C = -0.35 A, V_{CC} = 125 V, I_{B1} = -70 mA, I_{B2} = 70 mA $T_p \geq$ 25 µs *(see Figure 14)*	1.5	90 2.2 0.1	2.9	ns µs µs
t_s t_f	**Inductive load** Storage time Fall time	I_C = -0.5 A, I_{B1} = -0.1 A, $V_{BE(off)}$ = 5 V, L = 10 mH, V_{clamp} = 300 V *(see Figure 13)*		400 40		ns ns
E_{sb}	Avalanche energy	L = 4 mH, C = 1.8 nF, I_{BR} = 2.5 A, 25 °C < T_C < 125 °C	12			mJ

1. Pulsed: pulse duration = 300 µs, duty cycle 1.5%

2.1 Electrical characteristics (curves)

Figure 2. Safe operating area

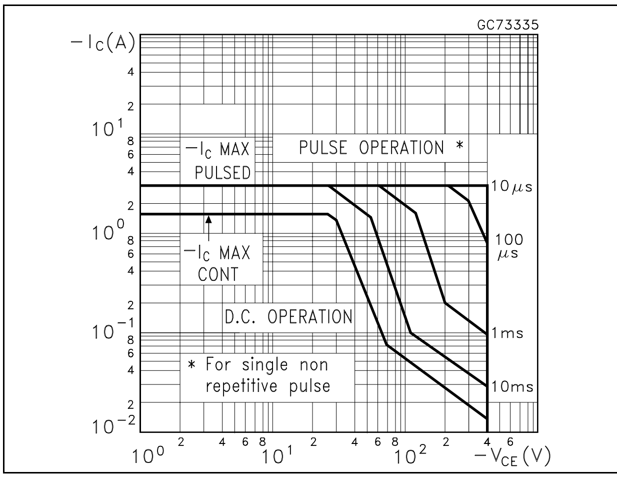


Figure 3. Derating

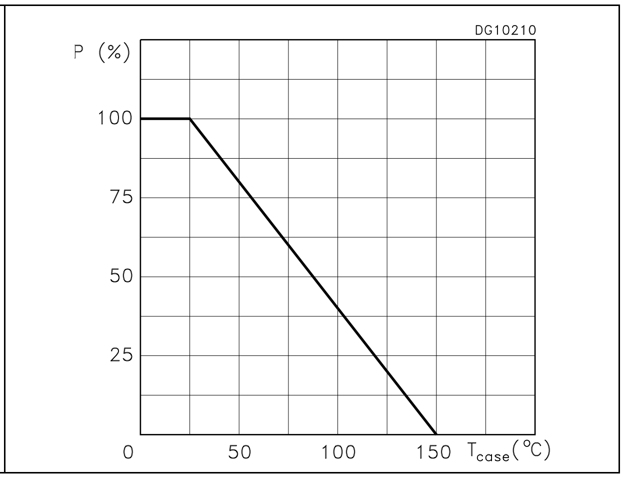


Figure 4. DC current gain

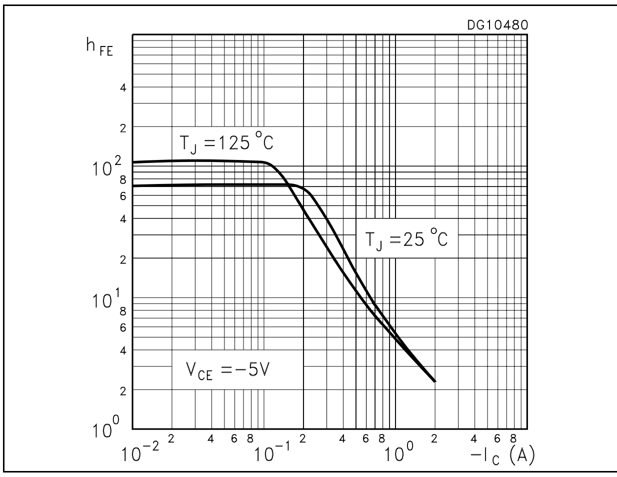


Figure 5. DC current gain

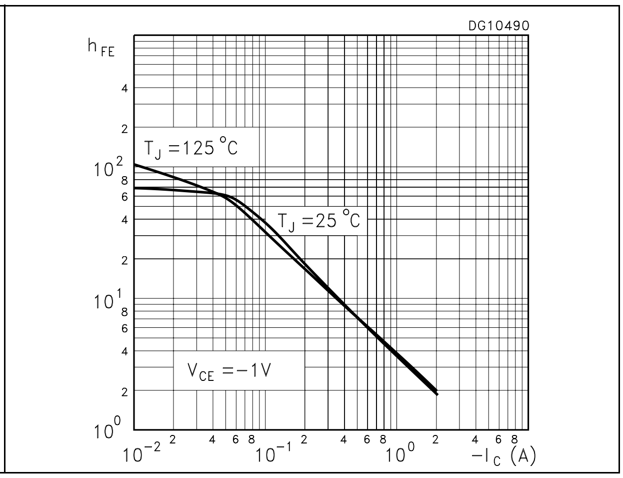


Figure 6. Collector emitter saturation voltage

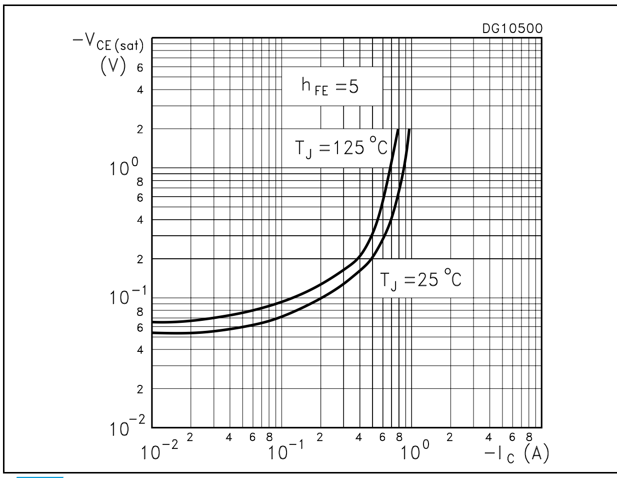


Figure 7. Base emitter saturation voltage

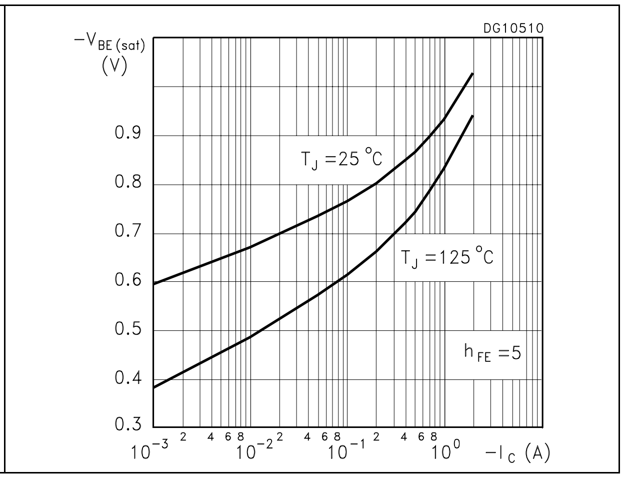


Figure 8. Resistive load fall time

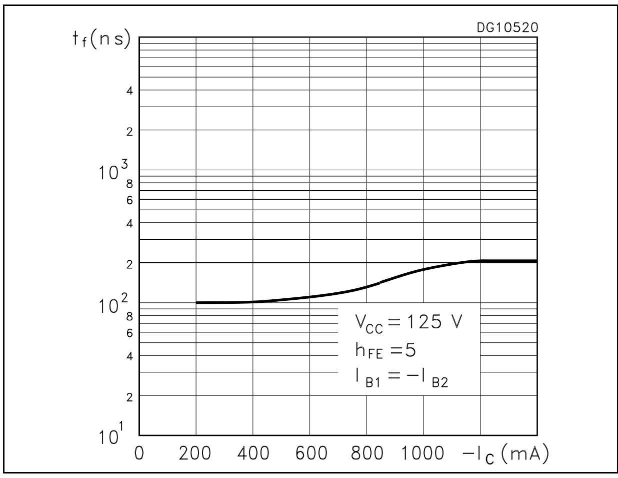


Figure 9. Resistive load storage time

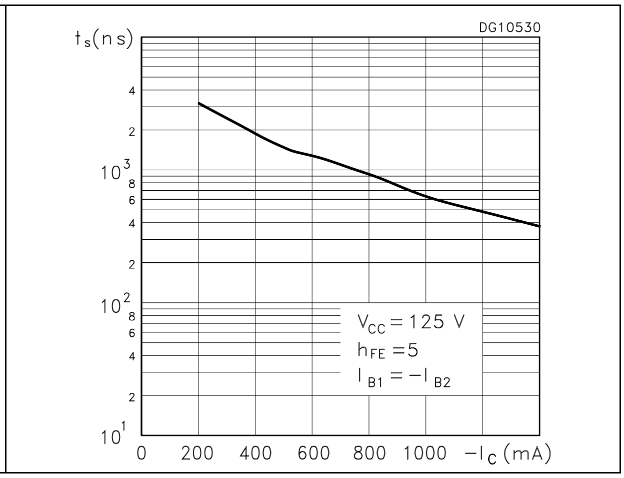


Figure 10. Inductive load fall time

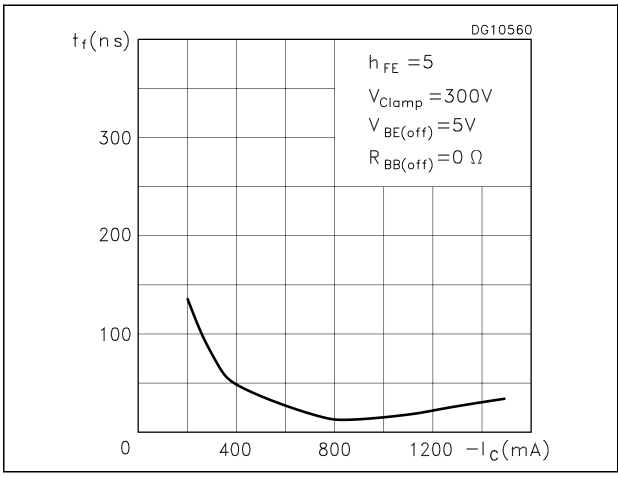


Figure 11. Inductive load storage time

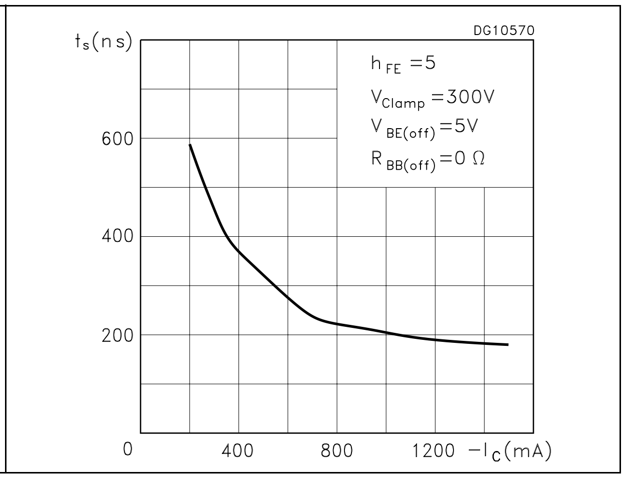
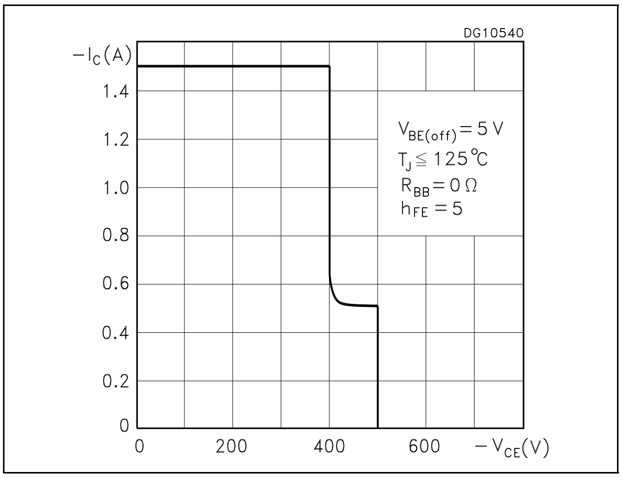


Figure 12. Reverse biased SOA



3 Test circuits

Figure 13. Inductive load switching

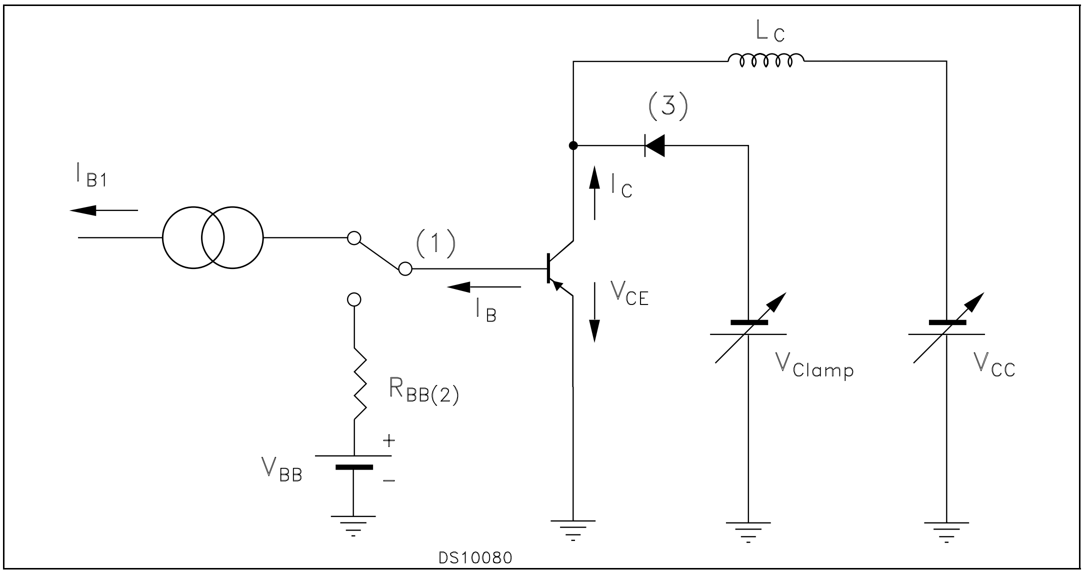
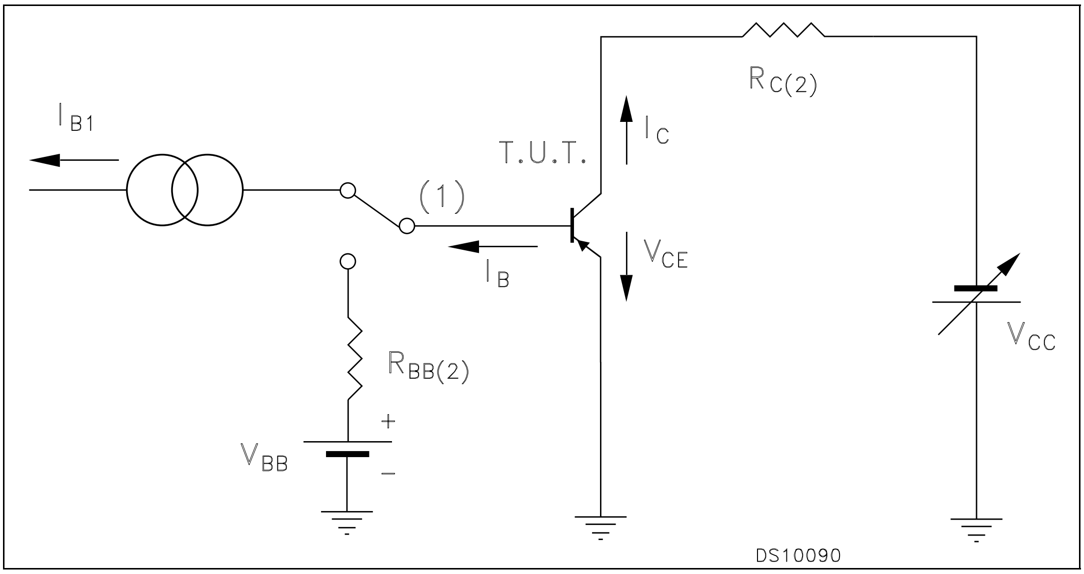


Figure 14. Resistive load switching

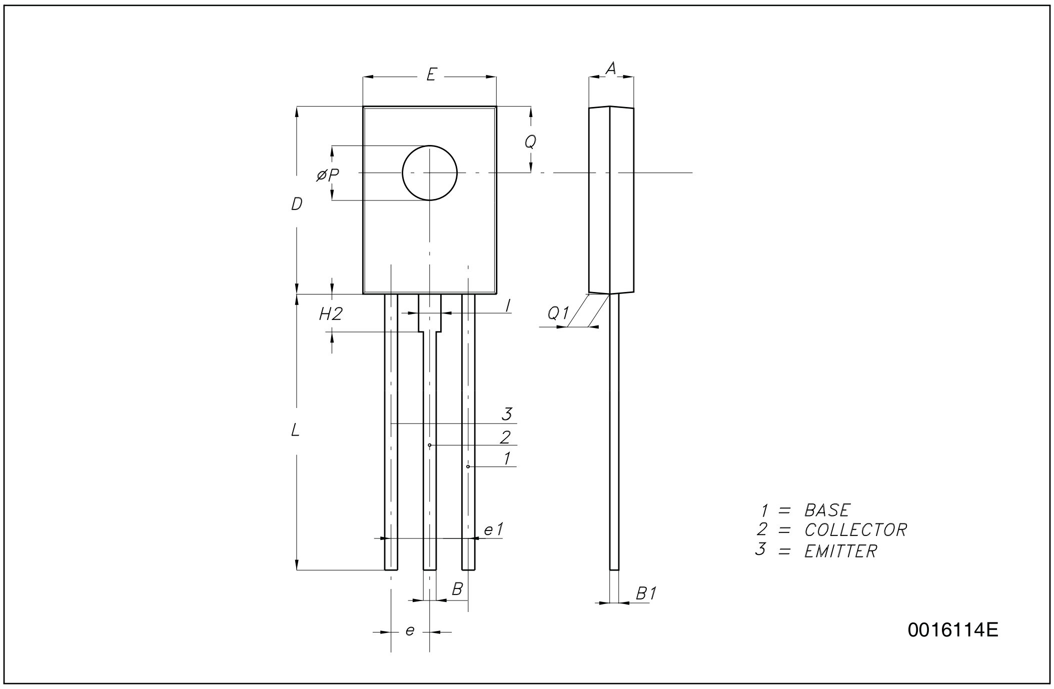


4 Package mechanical data

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*

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