STN83003

High voltage fast-switching NPN power transistor

Features

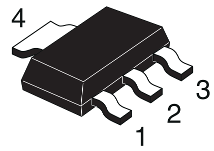
- High voltage capability
- Very high switching speed

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



SOT-223

Figure 1. Internal schematic diagram

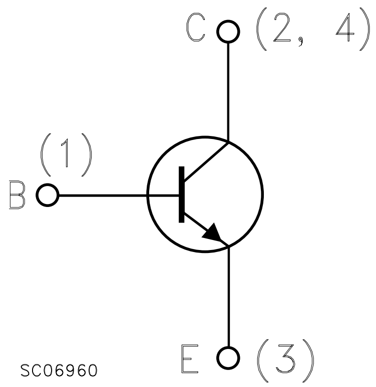


Table 1. Device summary

Part number	Marking	Package	Packaging
STN83003	N83003	SOT-223	Tape and reel

Contents

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, $t_P < 10$ 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 $T_a = 25$ °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 [(1)]	max	78	°C/W

1. Device mounted on PCB area of 1 cm².

2 Electrical characteristics

T_{case} = 25 °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} = 700 V V_{CE} = 700 V T_C = 125 °C			1 5	mA mA
$V_{(BR)EBO}$	Emitter-base breakdown voltage (I_C = 0)	I_E = 10 mA	12		18	V
$V_{CE(sus)}$ (1)	Collector-emitter sustaining voltage (I_B = 0)	I_C = 10 mA	400			V
$V_{CE(sat)}$ (1)	Collector-emitter saturation voltage	I_C = 0.35 A I_B = 50 mA I_C = 0.5 A I_B = 0.1 A			1 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}	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} = - I_{B2} = 70 mA $t_P \geq$ 25 µs	1.5	100 2.2 0.2	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		450 90		ns ns

1. Pulse test: pulse duration ≤ 300 µs, duty cycle ≤ 2 %.

2.1 Electrical characteristics (curves)

Figure 2. Safe operating area

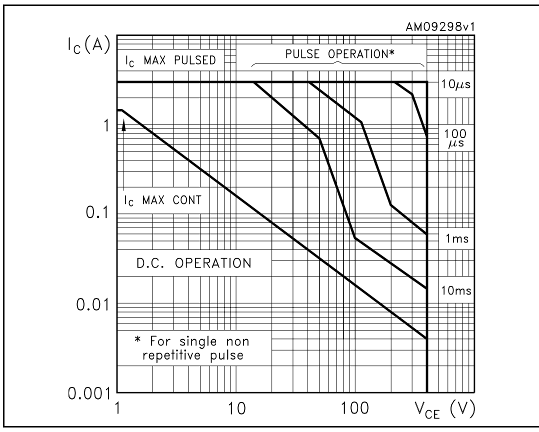


Figure 3. Derating curve

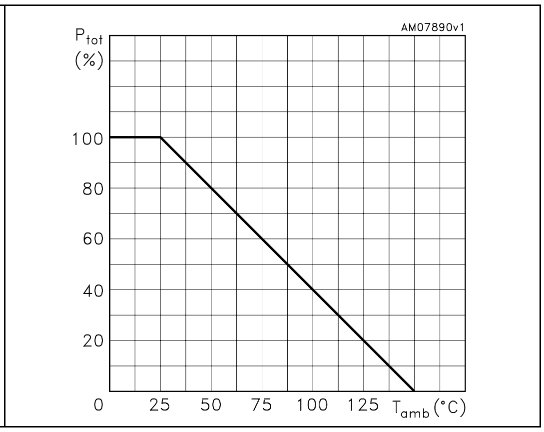


Figure 4. DC current gain (V_{CE} = 5 V)

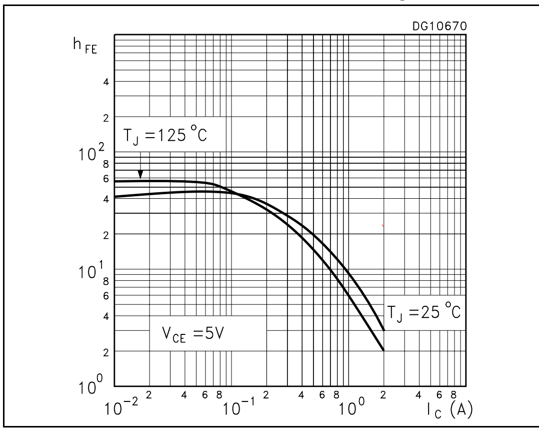


Figure 5. DC current gain (V_{CE} = 1 V)

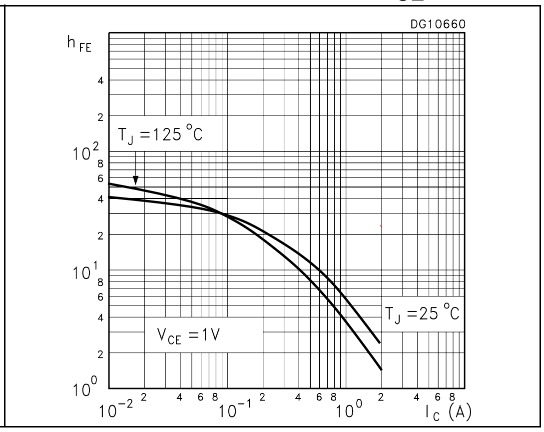


Figure 6. Collector-emitter saturation voltage

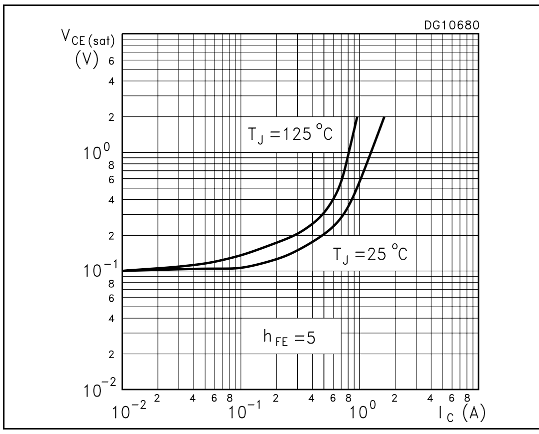


Figure 7. Base-emitter saturation voltage

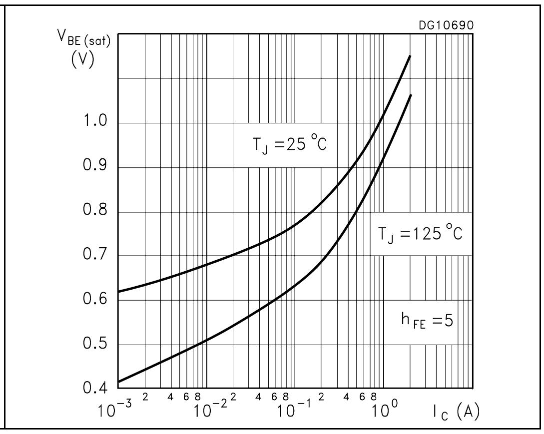


Figure 8. Resistive load fall time

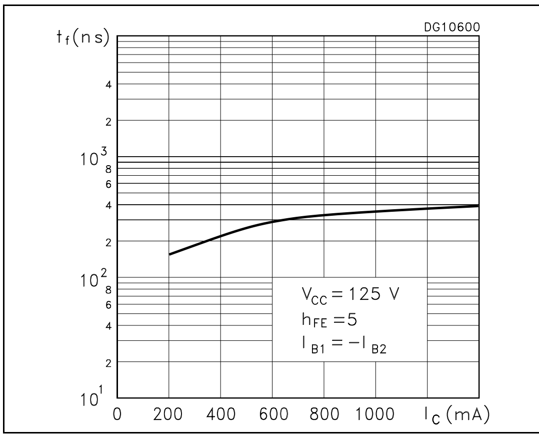


Figure 9. Resistive load storage time

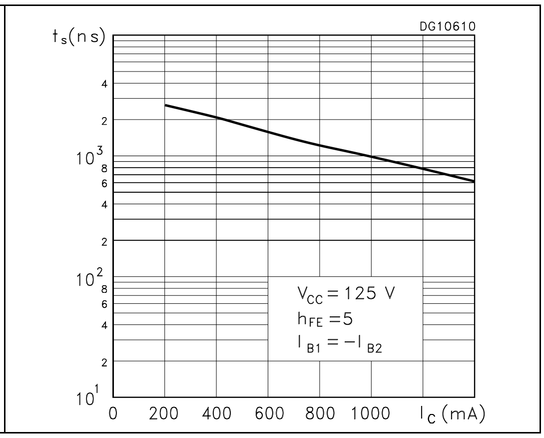


Figure 10. Inductive load fall time

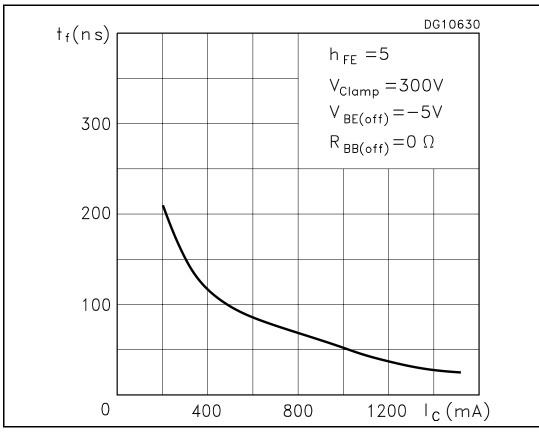


Figure 11. Inductive load storage time

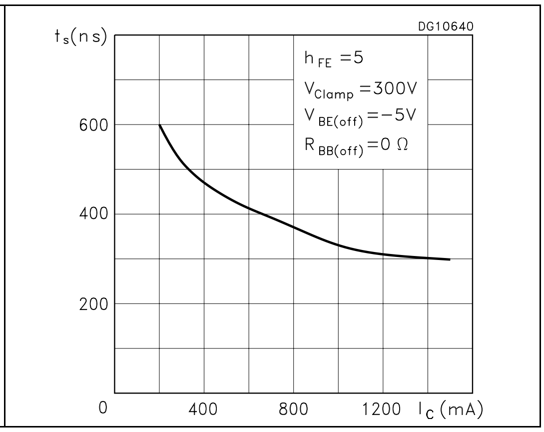
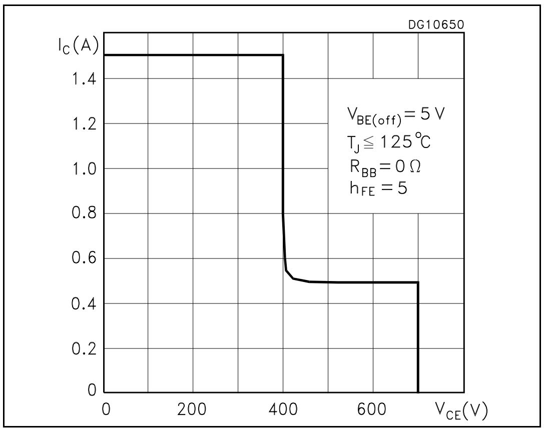
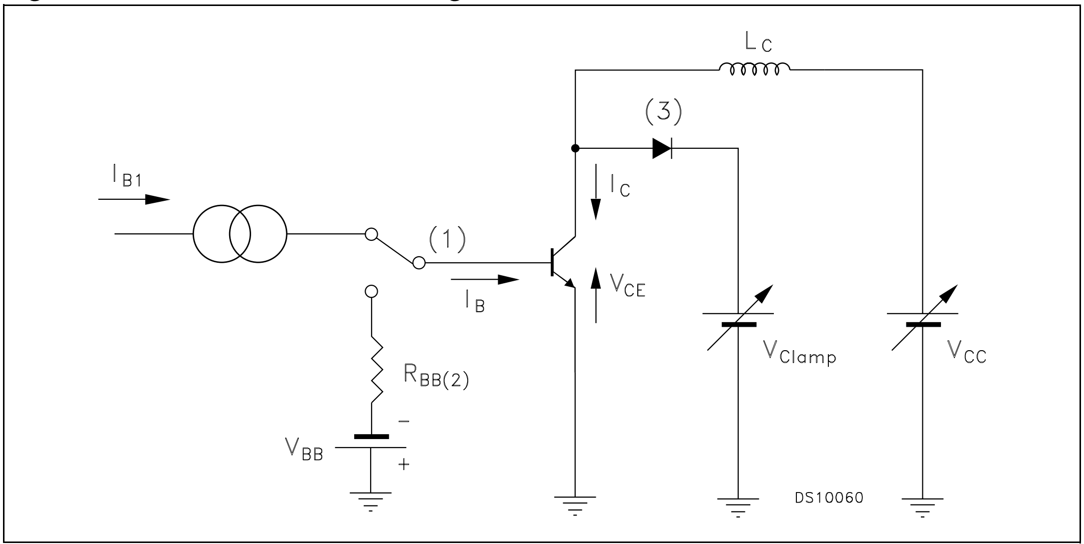


Figure 12. Reverse biased SOA



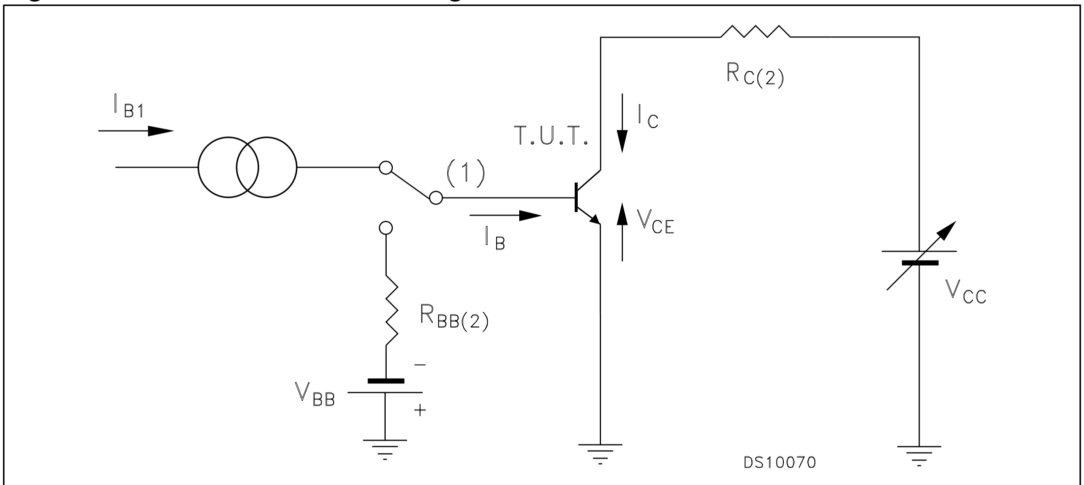
2.2 Test circuits

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



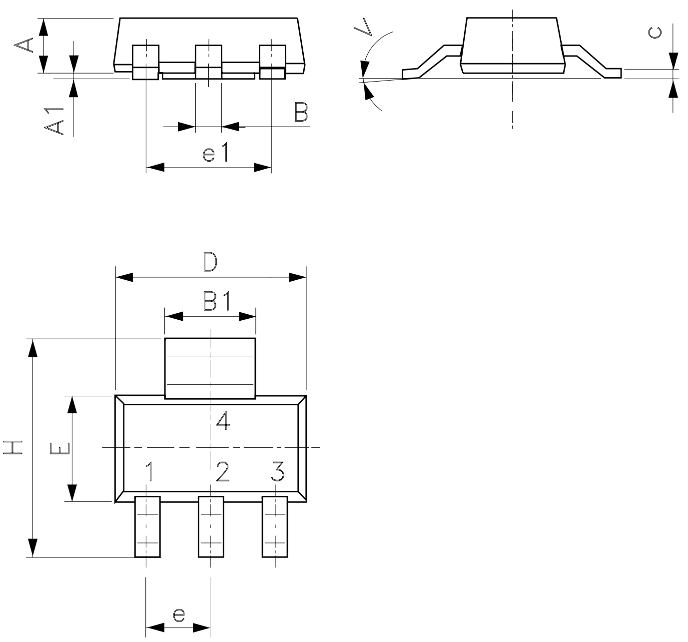
1. Fast electronic switching
2. Non-inductive resistor

3 Package mechanical data

In order to meet environmental requirements, ST offers these devices in different grades of ECOPACK® packages, depending on their level of environmental compliance. ECOPACK® specifications, grade definitions and product status are available at: *www.st.com*. ECOPACK® 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. Document revision history

Date	Revision	Changes
09-May-2006	1	Initial release.
17-Jan-2007	2	The device’s safe operating area curve has been added on page 5.
13-Dec-2010	3	Updated package mechanical data *on page 9*.