

High voltage fast-switching NPN 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 (CFL)
- SMPS for battery charger

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.

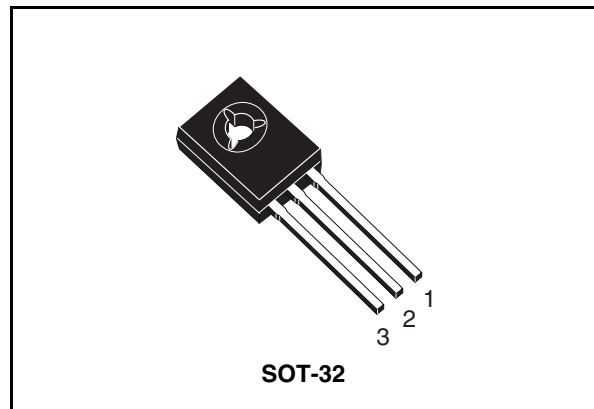


Figure 1. Internal schematic diagram

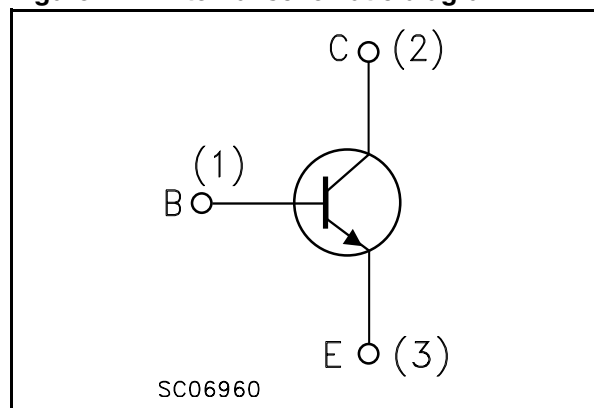


Table 1. Device summary

Part number	Marking	Package	Packaging
ST13003-K	13003	SOT-32	Bag

1 Electrical ratings

Table 2. Absolute maximum rating

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 ($I_C = 0$, $I_B = 0.75A$, $t_p < 10\mu s$)	$V_{(BR)EBO}$	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 $T_C = 25^\circ C$	40	W
T_{stg}	Storage temperature	-55 to 150	$^\circ C$
T_J	Max. operating junction temperature	150	$^\circ C$

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_{CES}	Collector cut-off current ($V_{\text{BE}} = 0$)	$V_{\text{CE}} = 700\text{V}$ $V_{\text{CE}} = 700\text{V}$ $T_{\text{C}} = 125^{\circ}\text{C}$			1 5	mA mA
$V_{(\text{BR})\text{EBO}}$	Emitter-Base breakdown voltage ($I_{\text{C}} = 0$)	$I_{\text{E}} = 10\text{mA}$	9		18	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	$I_{\text{C}} = 0.5\text{A}$ $I_{\text{B}} = 0.1\text{A}$ $I_{\text{C}} = 1\text{A}$ $I_{\text{B}} = 0.25\text{A}$ $I_{\text{C}} = 1.5\text{A}$ $I_{\text{B}} = 0.5\text{A}$			0.5 1 1.5	V V V
$V_{\text{BE(sat)}}^{(1)}$	Base-emitter saturation voltage	$I_{\text{C}} = 0.5\text{A}$ $I_{\text{B}} = 0.1\text{A}$ $I_{\text{C}} = 1\text{A}$ $I_{\text{B}} = 0.25\text{A}$			1 1.2	V V
h_{FE}	DC current gain	$I_{\text{C}} = 0.5\text{A}$ $V_{\text{CE}} = 2\text{V}$ $I_{\text{C}} = 1\text{A}$ $V_{\text{CE}} = 2\text{V}$	8 5		20 25	
t_{r} t_{s} t_{f}	Resistive load Rise time Storage time Fall time	$V_{\text{CC}} = 125\text{V}$ $I_{\text{C}} = 1\text{A}$ $I_{\text{B1}} = 0.2\text{A}$ $I_{\text{B2}} = -0.2\text{A}$ $T_{\text{p}} = 25\mu\text{s}$			1 4 0.7	μs μs μs
t_{s}	Inductive load Storage time	$I_{\text{C}} = 1\text{A}$ $I_{\text{B1}} = 0.2\text{A}$ $V_{\text{BE}} = -5\text{V}$ $L = 50\text{mH}$ $V_{\text{Clamp}} = 300\text{V}$		0.8		μs

1. Pulsed duration = 300 μs , duty cycle $\leq 1.5\%$

2.1 Electrical characteristics (curves)

Figure 2. Safe operating areas

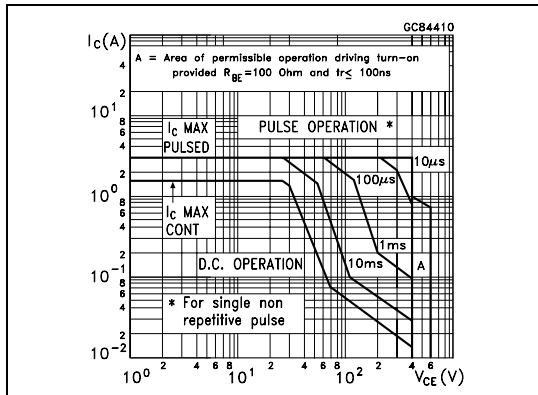


Figure 3. Derating curves

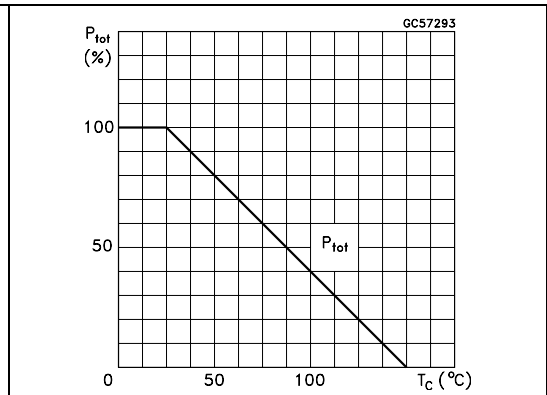


Figure 4. Output characteristics

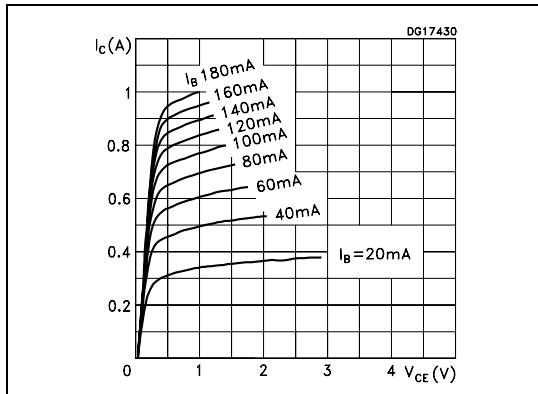


Figure 5. Reverse biased safe operating areas

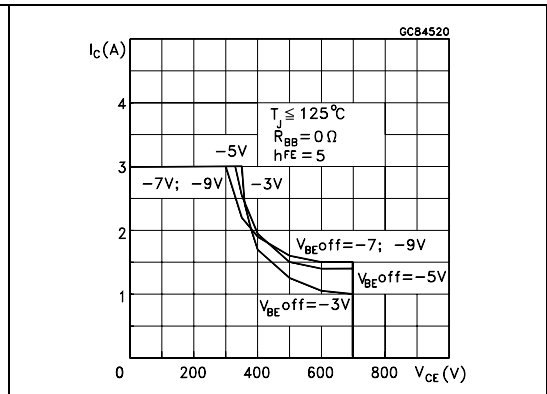


Figure 6. DC current gain

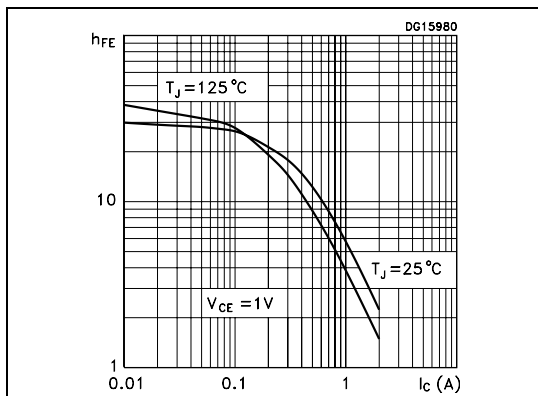


Figure 7. DC current gain

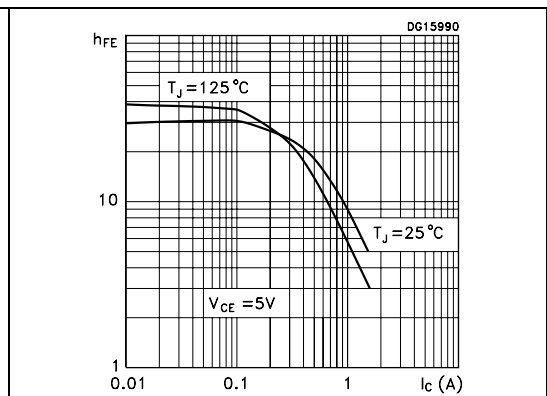


Figure 8. Collector-emitter saturation voltage

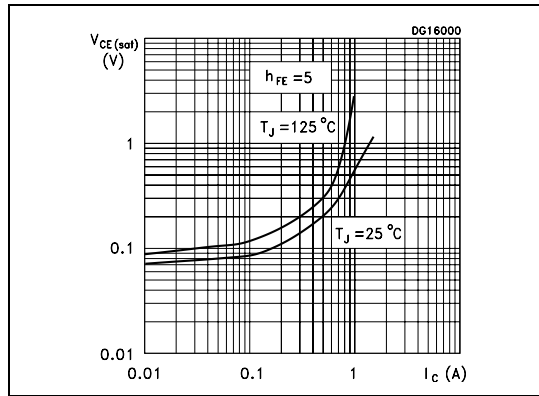


Figure 9. Base-emitter saturation voltage

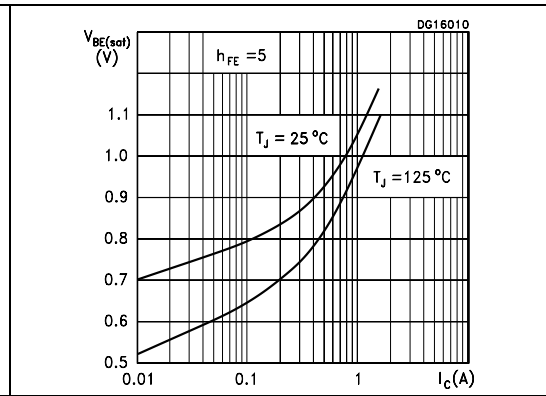
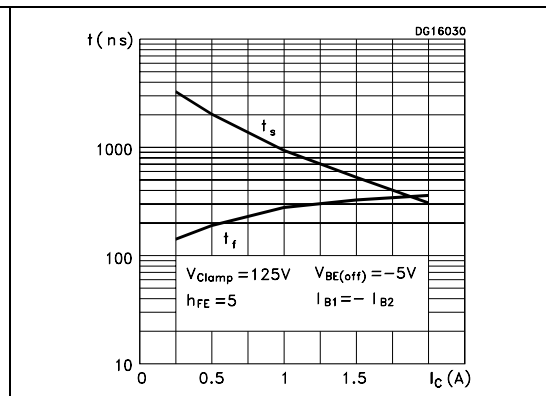
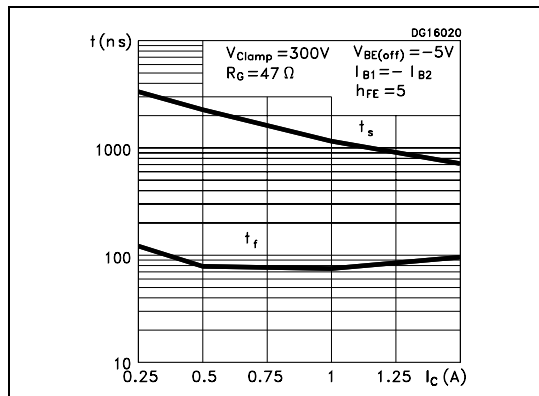


Figure 10. Inductive load switching time **Figure 11. Resistive load switching time**



2.2 Test circuits

Figure 12. Resistive load switching test circuit

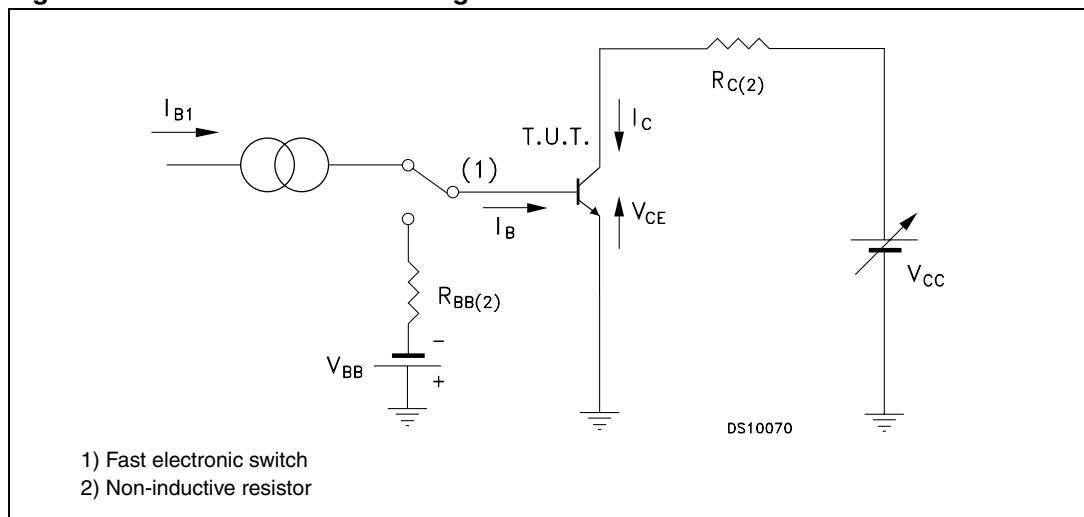
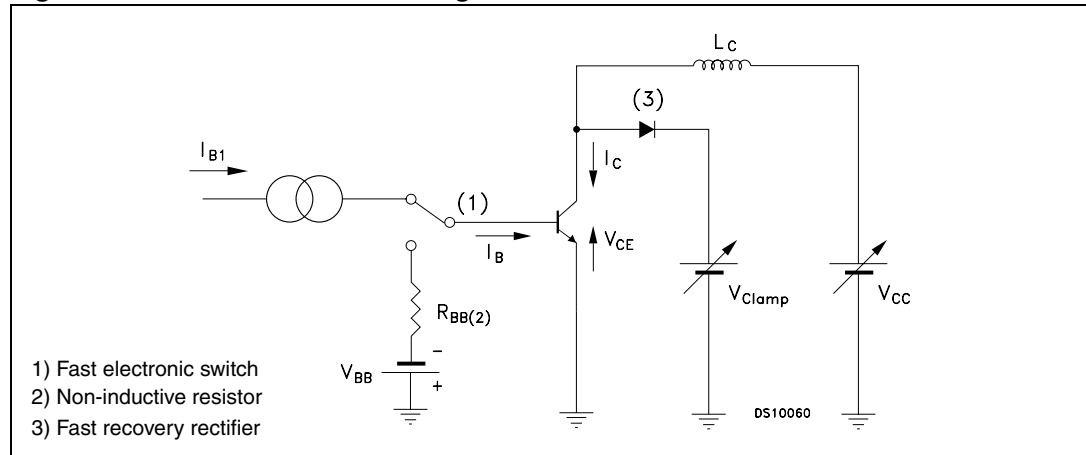


Figure 13. Inductive load switching test circuit

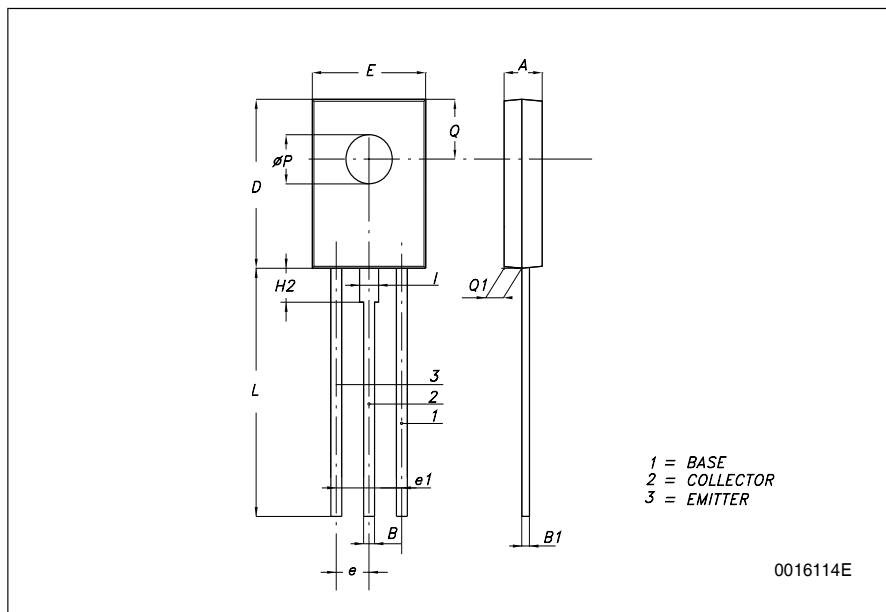


3 Package mechanical data

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

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	
l		1.27	



4 Revision history

Table 4. Document revision history

Date	Revision	Changes
23-May-2007	1	Initial release.
09-Jul-2008	2	Added Table 1 on page 1 .

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