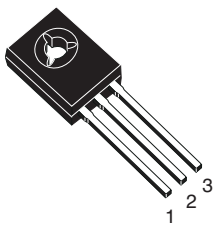
ST13003, ST13003-K

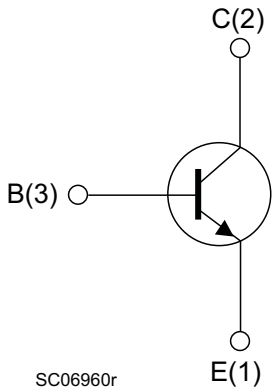
High voltage fast-switching NPN power transistor

Datasheet - production data



SOT-32

Figure 1. Internal schematic diagram



Features

- High voltage capability
- Low spread of dynamic parameters
- Very high switching speed

Applications

- 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.

Table 1. Device summary

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

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_C = 25 °C	40	W
T_{STG}	Storage temperature	-55 to 150	°C
T_J	Operating junction temperature	-40 to 150	°C

Table 3. Thermal data

Symbol	Parameter	Value	Unit
R_{thJC}	Thermal resistance junction-case max.	3.1	°C/W

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	9		18	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 = 1 A I_B = 0.25 A I_C = 1.5 A I_B = 0.5 A			0.5 1 1.5	V V V
$V_{BE(sat)}$ (1)	Base-emitter saturation voltage	I_C = 0.5 A I_B = 0.1 A I_C = 1 A I_B = 0.25 A			1 1.2	V V
h_{FE}	DC current gain	I_C = 0.5 A V_{CE} = 2 V I_C = 1 A V_{CE} = 2 V	8 5		20 25	
t_r t_s t_f	Resistive load Rise time Storage time Fall time	V_{CC} = 125 V I_C = 1 A I_{B1} = 0.2 A I_{B2} = - 0.2 A t_p = 25 μs			1 4 0.7	μs μs μs
t_s	Inductive load Storage time	I_C = 1 A I_{B1} = 0.2 A V_{BE} = - 5 V L = 50 mH V_{Clamp} = 300 V		0.8		μs

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

2.1 Electrical characteristics (curves)

Figure 2. Safe operating areas

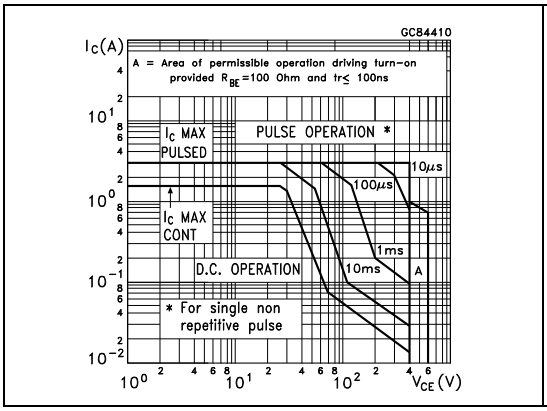


Figure 3. Derating curve

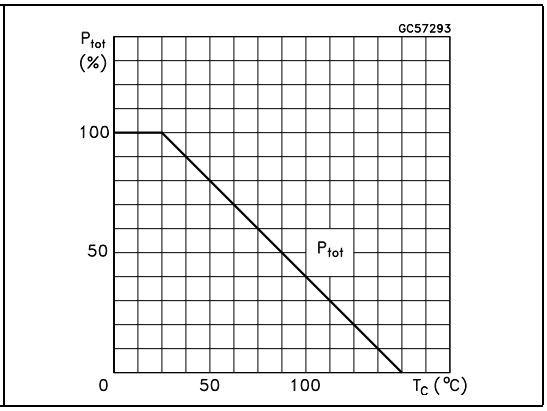


Figure 4. Output characteristics

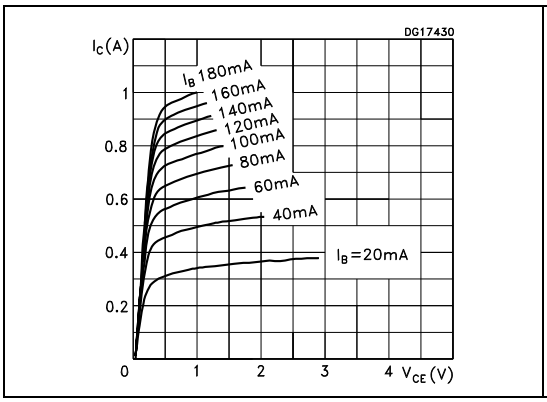


Figure 5. Reverse biased safe operating areas

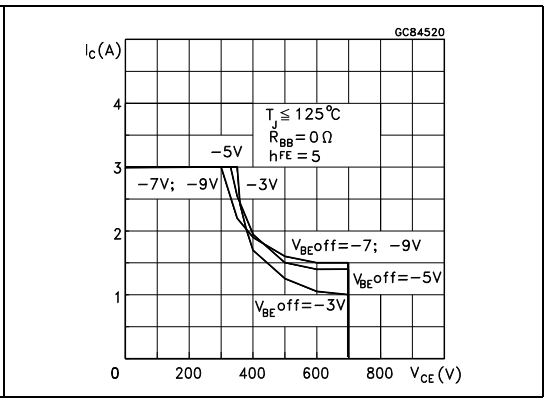


Figure 6. DC current gain (V_{CE} = 1 V)

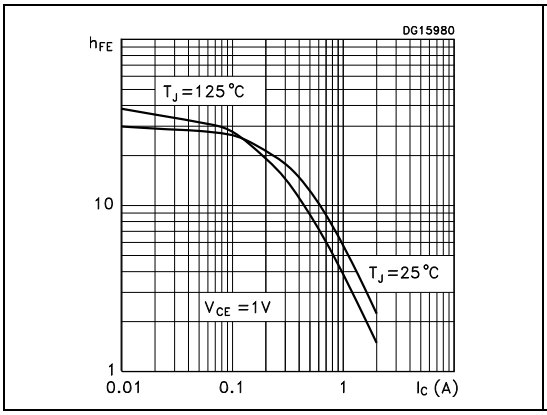


Figure 7. DC current gain (V_{CE} = 5 V)

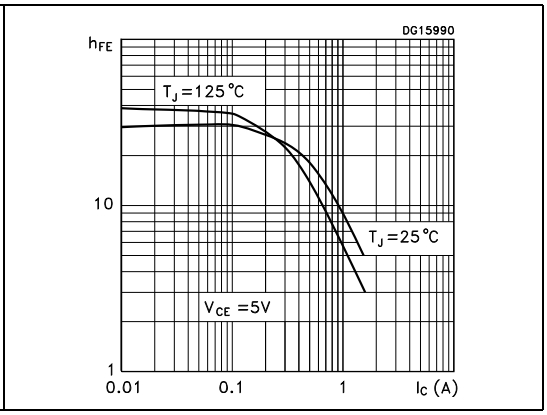


Figure 8. Collector-emitter saturation voltage

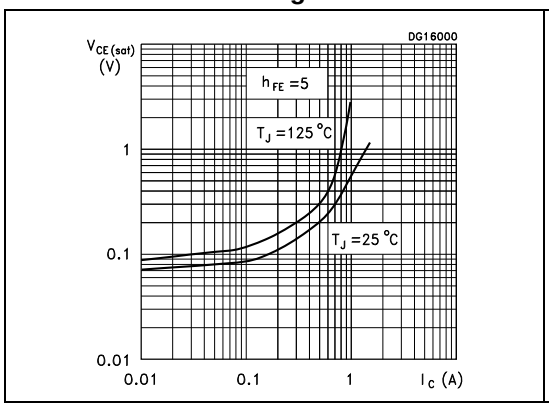


Figure 9. Base-emitter saturation voltage

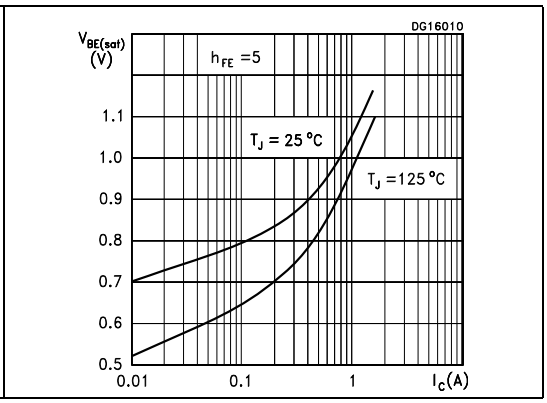


Figure 10. Inductive load switching time

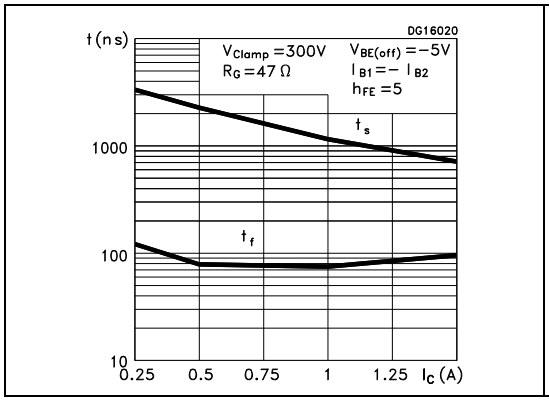
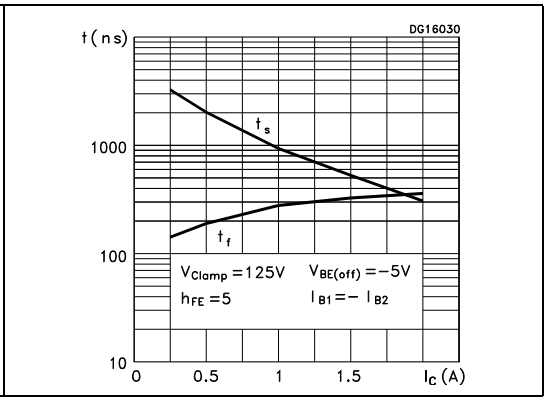
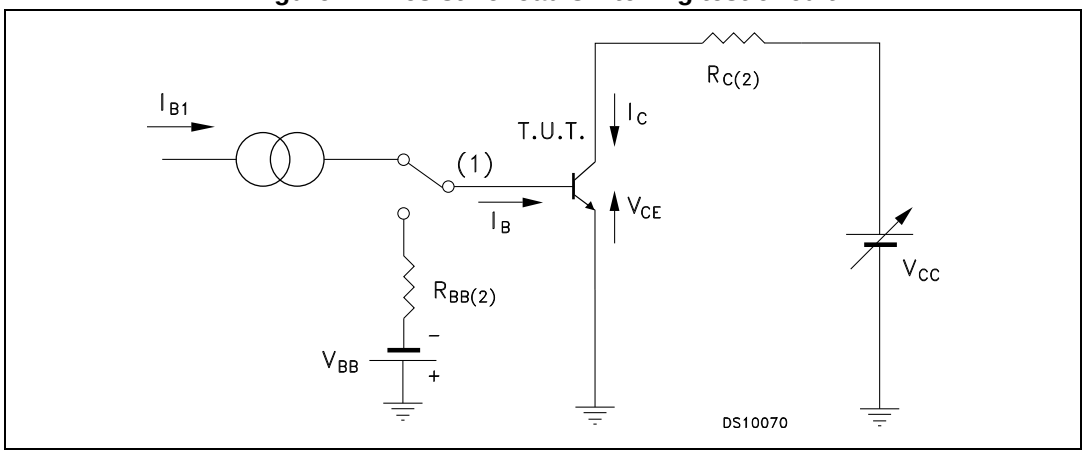


Figure 11. Resistive load switching time



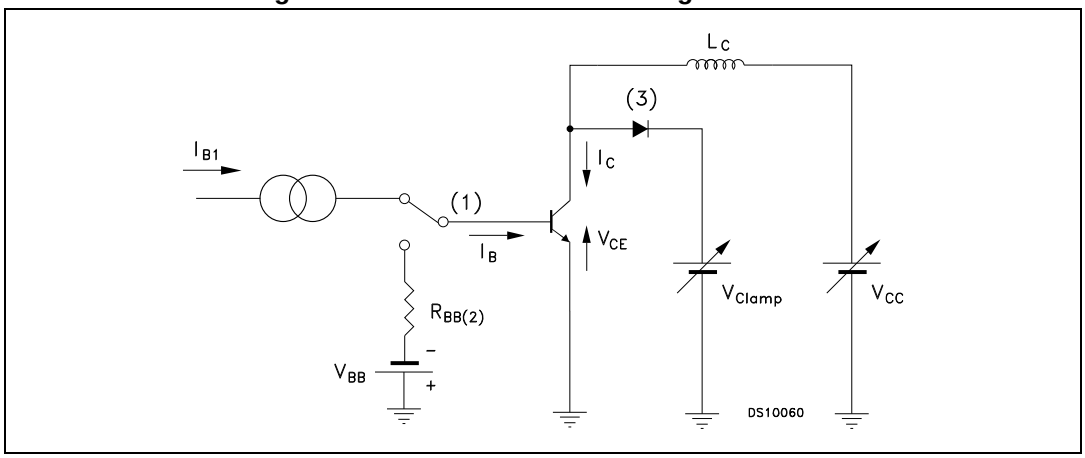
2.2 Test circuits

Figure 12. Resistive load switching test circuit



1. Fast electronic switch
2. Non-inductive resistor

Figure 13. Inductive load switching test circuit



1. Fast electronic switch
2. Non-inductive resistor
3. Fast recovery rectifier

3 Package mechanical data

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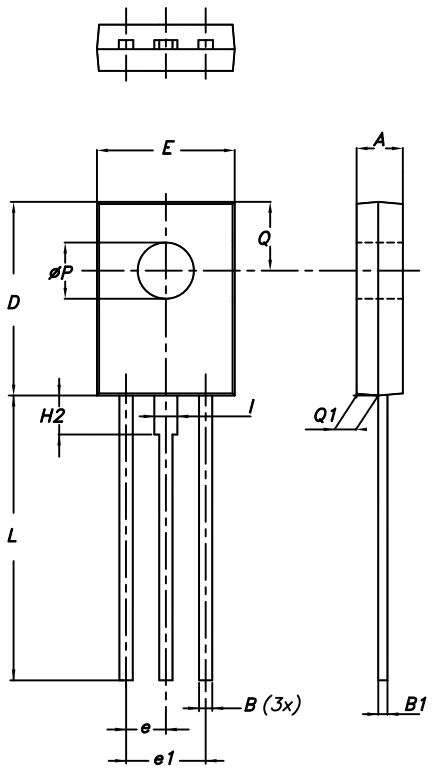
Table 5. SOT-32 (TO-126) mechanical data

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	

Figure 14. SOT-32 (TO-126) drawings



4 Revision history

Table 6. Document revision history

Date	Revision	Changes
23-May-2007	1	Initial release.
09-Jul-2008	2	Added *Table 1 on page 1*.
15-Dec-2009	3	Added *Table 3: Thermal data on page 2*.
15-Jun-2011	4	Modified: *Table 2*
18-Jun-2013	5	Added device ST13003.

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