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ST13003, ST13003-K

High voltage fast-switching NPN power transistor

Datasheet - production data

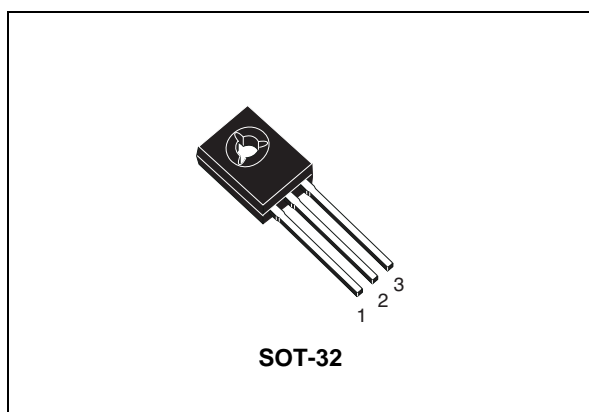
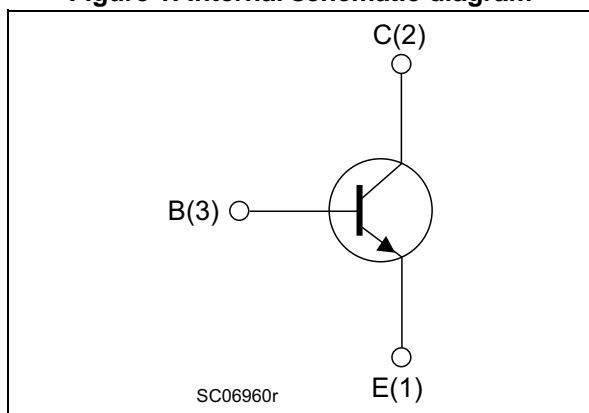


Figure 1. Internal schematic diagram



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

Electrical ratings

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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, $t_P < 10$ μ 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	-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

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Electrical characteristics

2 Electrical characteristics

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

Table 4. Electrical characteristics

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
I_{CES}	Collector cut-off current ($V_{BE} = 0$)	$V_{CE} = 700\text{ V}$ $V_{CE} = 700\text{ V}$ $T_C = 125\text{ °C}$			1 5	mA mA
$V_{(BR)EBO}$	Emitter-Base breakdown voltage ($I_C = 0$)	$I_E = 10\text{ mA}$	9		18	V
$V_{CEO(sus)}^{(1)}$	Collector-emitter sustaining voltage ($I_B = 0$)	$I_C = 10\text{ mA}$	400			V
$V_{CE(sat)}^{(1)}$	Collector-emitter saturation voltage	$I_C = 0.5\text{ A}$ $I_B = 0.1\text{ A}$ $I_C = 1\text{ A}$ $I_B = 0.25\text{ A}$ $I_C = 1.5\text{ A}$ $I_B = 0.5\text{ A}$			0.5 1 1.5	V V V
$V_{BE(sat)}^{(1)}$	Base-emitter saturation voltage	$I_C = 0.5\text{ A}$ $I_B = 0.1\text{ A}$ $I_C = 1\text{ A}$ $I_B = 0.25\text{ A}$			1 1.2	V V
h_{FE}	DC current gain	$I_C = 0.5\text{ A}$ $V_{CE} = 2\text{ V}$ $I_C = 1\text{ A}$ $V_{CE} = 2\text{ V}$	8 5		20 25	
t_r t_s t_f	Resistive load Rise time Storage time Fall time	$V_{CC} = 125\text{ V}$ $I_C = 1\text{ A}$ $I_{B1} = 0.2\text{ A}$ $I_{B2} = -0.2\text{ A}$ $t_p = 25\text{ }\mu\text{s}$			1 4 0.7	μs μs μs
t_s	Inductive load Storage time	$I_C = 1\text{ A}$ $I_{B1} = 0.2\text{ A}$ $V_{BE} = -5\text{ V}$ $L = 50\text{ mH}$ $V_{Clamp} = 300\text{ V}$		0.8		μs

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

Electrical characteristics

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2.1 Electrical characteristics (curves)

Figure 2. Safe operating areas

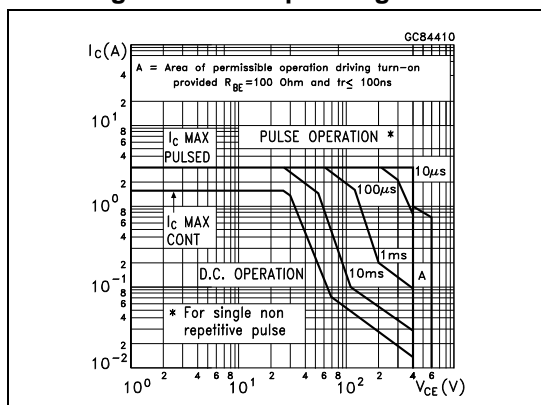


Figure 3. Derating curve

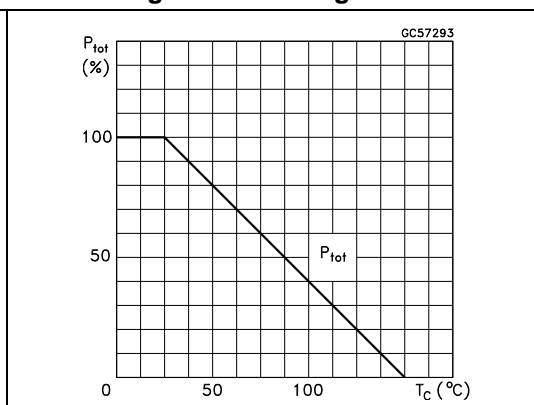


Figure 4. Output characteristics

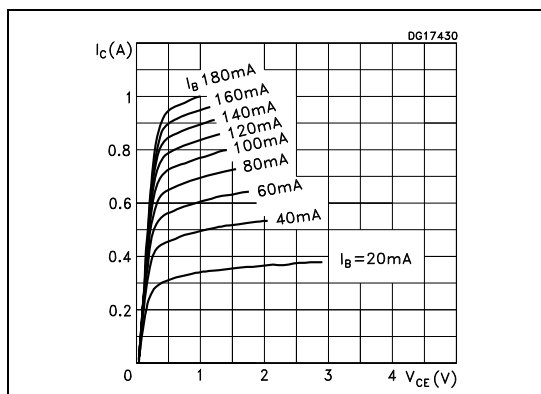


Figure 5. Reverse biased safe operating areas

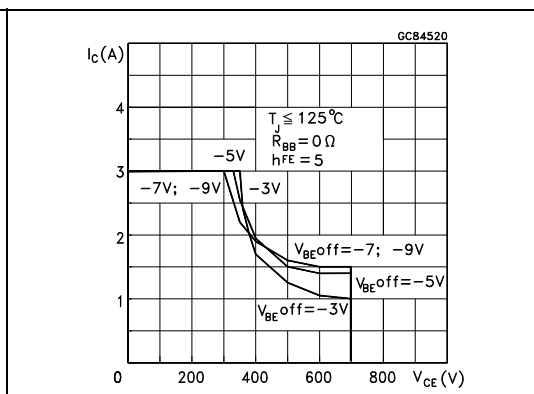


Figure 6. DC current gain ($V_{CE} = 1$ V)

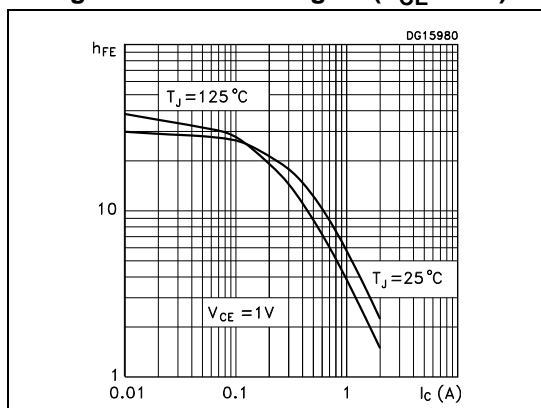
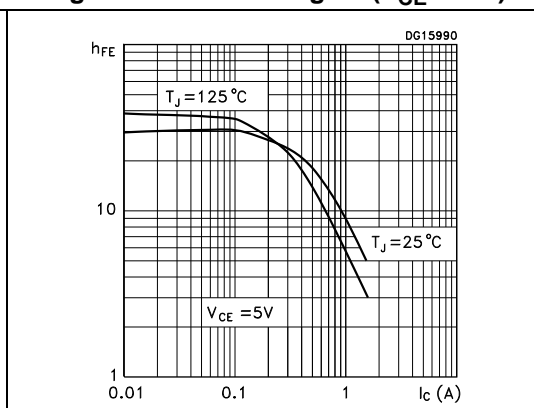


Figure 7. DC current gain ($V_{CE} = 5$ V)



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Electrical characteristics

Figure 8. Collector-emitter saturation voltage

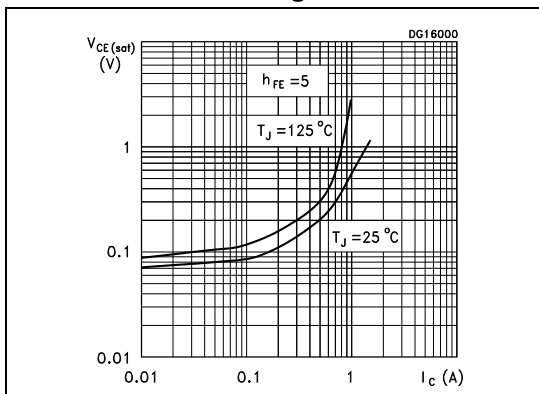


Figure 9. Base-emitter saturation voltage

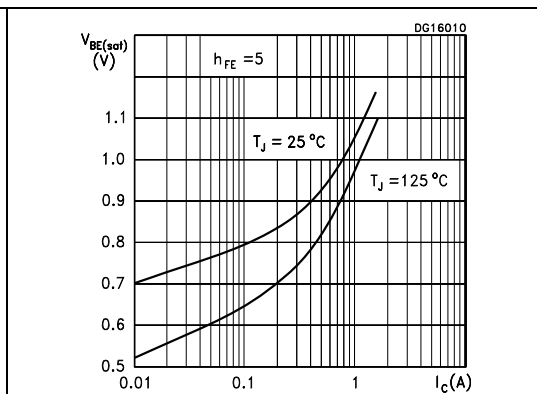


Figure 10. Inductive load switching time

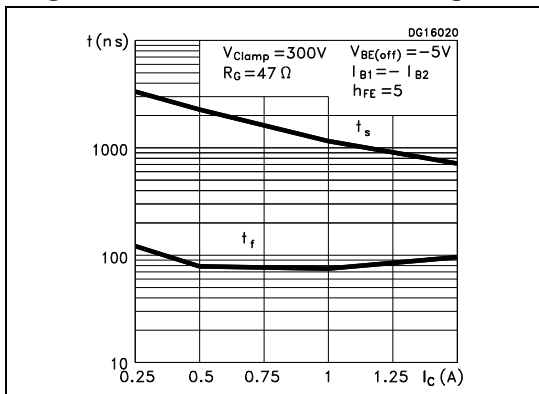
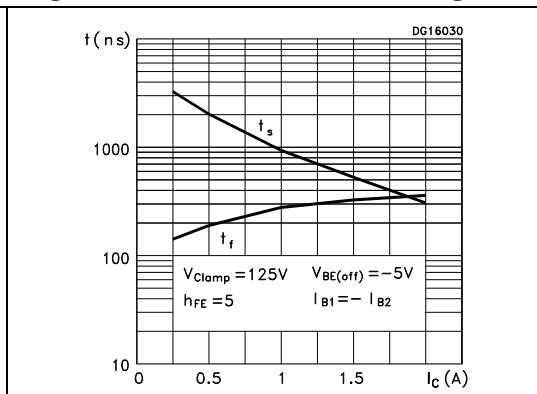


Figure 11. Resistive load switching time

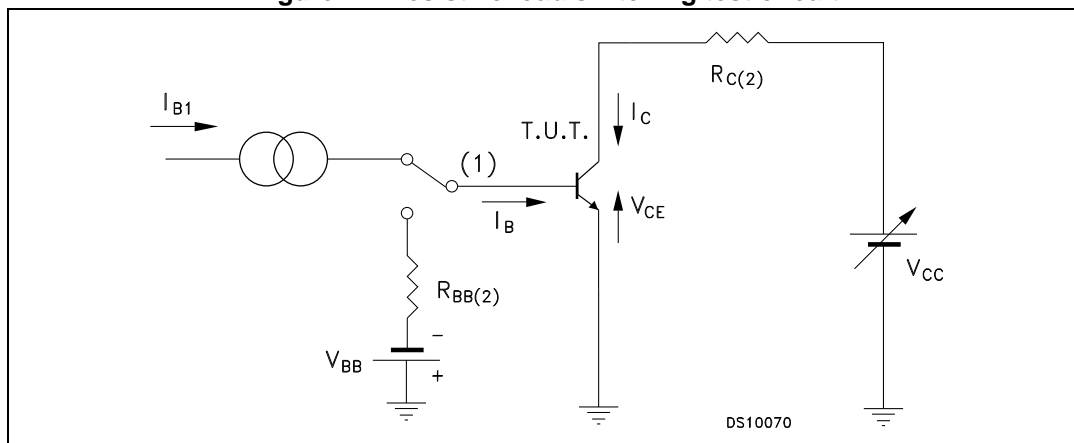


Electrical characteristics

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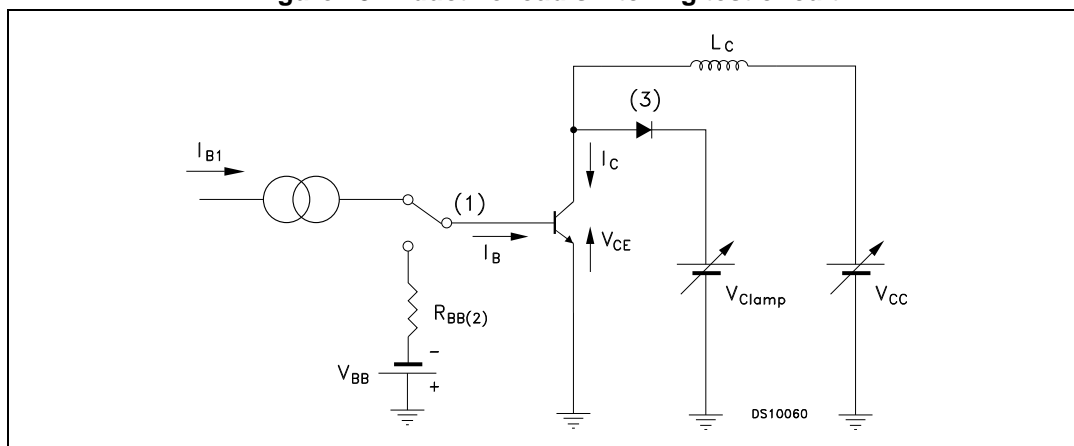
2.2 Test circuits

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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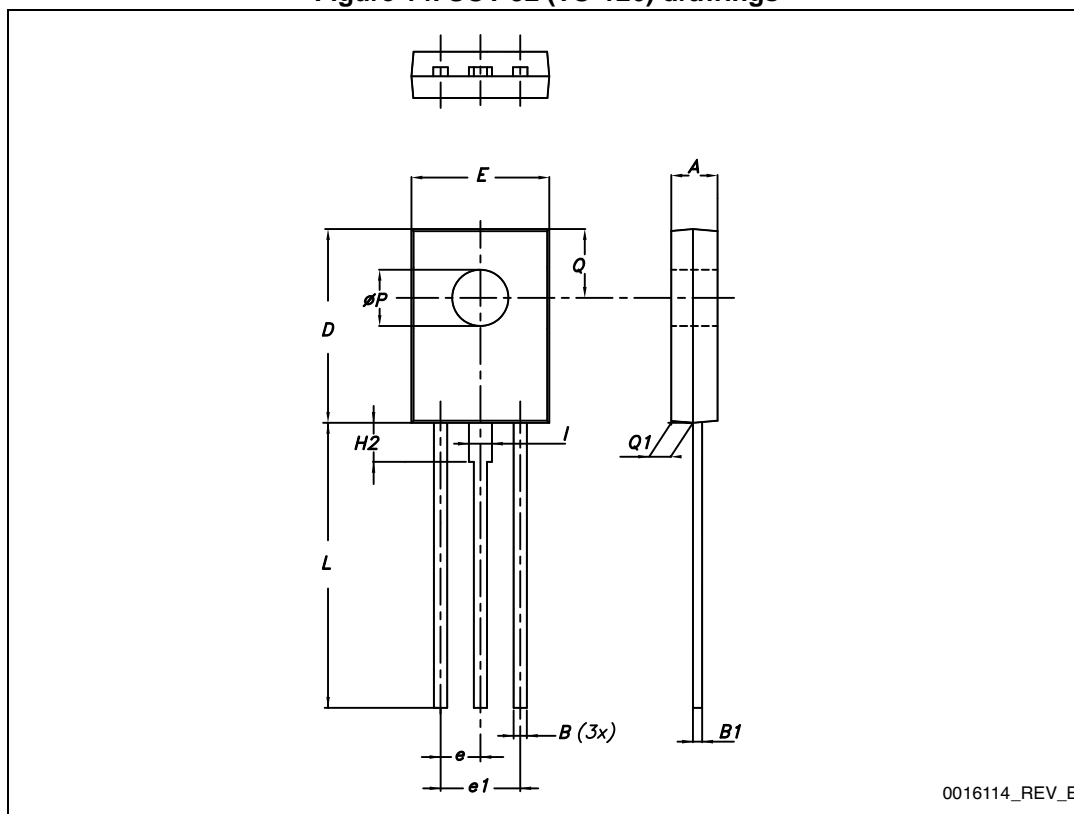
Package mechanical data

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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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