

High voltage fast-switching NPN power transistor

Features

- High voltage capability
- Very high switching speed

Applications

- Compact fluorescent lamps (CFLs)
- 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.

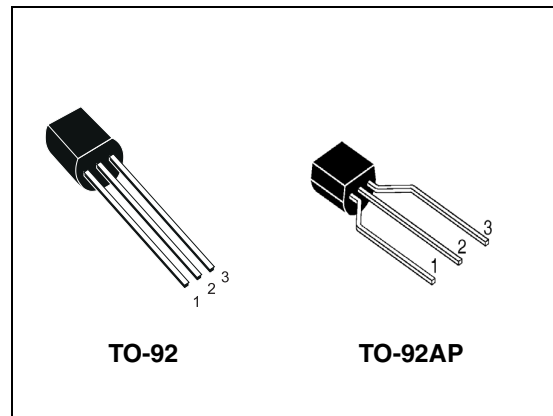


Figure 1. Internal schematic diagram

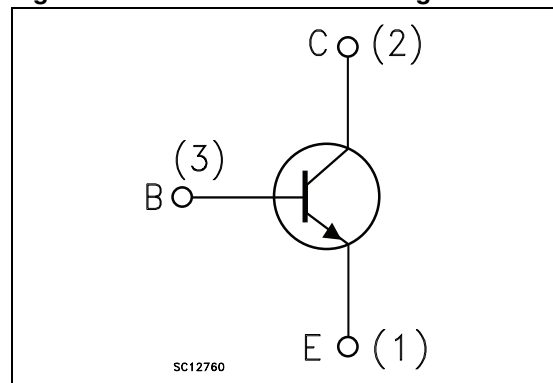


Table 1. Device summary ⁽¹⁾

Order codes	Marking	Package	Packaging
STX13003	X13003	TO-92	Bag
STX13003G	X13003G	TO-92	Bag
STX13003-AP	X13003	TO-92AP	Ammopack
STX13003G-AP	X13003G	TO-92AP	Ammopack

1. The letter "G" in the order code suffix identifies the product as ECOPACK@2 grade. Please see Section 3 for details.

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 ($I_C = 0$, $I_B = 0.5$ A, $t_P < 10$ ms)	$V_{(BR)EBO}$	V
I_C	Collector current	1	A
I_{CM}	Collector peak current ($t_P < 5$ ms)	3	A
I_B	Base current	0.5	A
I_{BM}	Base peak current ($t_P < 5$ ms)	1.5	A
P_{TOT}	Total dissipation at $T_C = 25$ °C	1.5	W
T_{stg}	Storage temperature	-65 to 150	°C
T_J	Max. operating junction temperature	150	

Table 3. Thermal data

Symbol	Parameter	Value	Unit
R_{thJC}	Thermal resistance junction-case max	83	°C/W

2 Electrical characteristics

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

Table 4. Electrical characteristics

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
I_{CES}	Collector cut-off current ($V_{\text{BE}} = 0$)	$V_{\text{CE}} = 700\text{ V}$ $V_{\text{CE}} = 700\text{ V}$ $T_{\text{C}} = 125\text{ }^{\circ}\text{C}$			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	$I_{\text{C}} = 0.5\text{ A}$ $I_{\text{B}} = 100\text{ mA}$ $I_{\text{C}} = 1\text{ A}$ $I_{\text{B}} = 250\text{ mA}$ $I_{\text{C}} = 1.5\text{ A}$ $I_{\text{B}} = 500\text{ mA}$			0.5 1 1.5	V V V
$V_{\text{BE(sat)}}^{(1)}$	Base-emitter saturation voltage	$I_{\text{C}} = 0.5\text{ A}$ $I_{\text{B}} = 100\text{ mA}$ $I_{\text{C}} = 1\text{ A}$ $I_{\text{B}} = 250\text{ mA}$			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		25 25	
t_{r} t_{s} t_{f}	Resistive load Rise time Storage time Fall time	$I_{\text{C}} = 1\text{ A}$ $t_{\text{p}} = 25\text{ }\mu\text{s}$ $I_{\text{B1}} = -I_{\text{B2}} = 200\text{ mA}$ $V_{\text{CC}} = 125\text{ V}$ <i>Figure 12</i>			1 4 0.7	μs μs μs
t_{s}	Inductive Load Storage time	$I_{\text{C}} = 1\text{ A}$ $V_{\text{clamp}} = 300\text{ V}$ $I_{\text{B1}} = 200\text{ mA}$ $V_{\text{BE(off)}} = -5\text{ V}$ $L = 50\text{ mH}$ $R_{\text{BB}} = 0$ <i>Figure 13</i>		0.8		μs

1. Pulse test: pulse duration $\leq 300\text{ }\mu\text{s}$, duty cycle $\leq 2\%$.

2.1 Electrical characteristics (curves)

Figure 2. Safe operating area

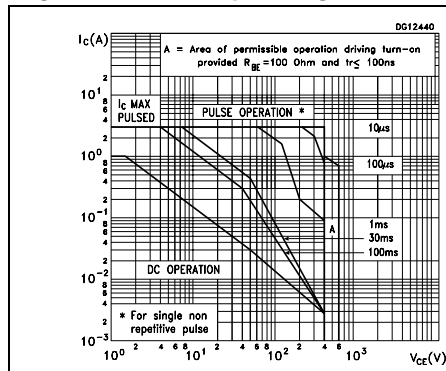


Figure 3. Derating curve

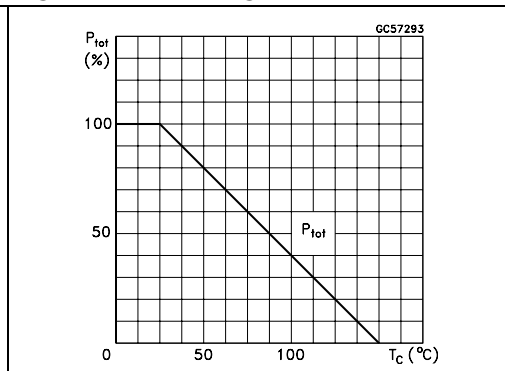


Figure 4. Output characteristics

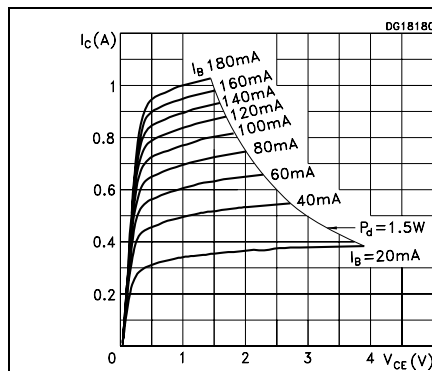


Figure 5. Reverse biased safe operating area

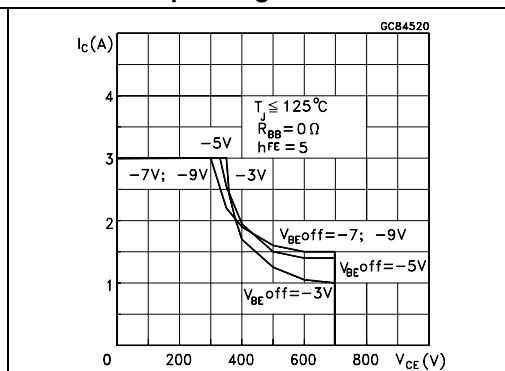
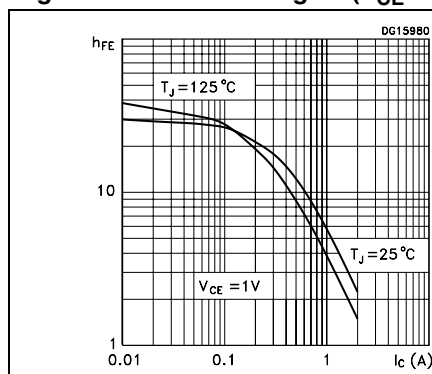
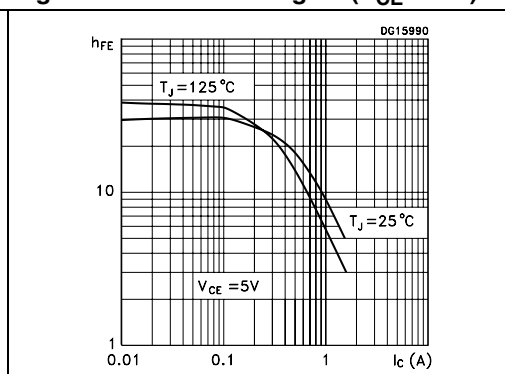
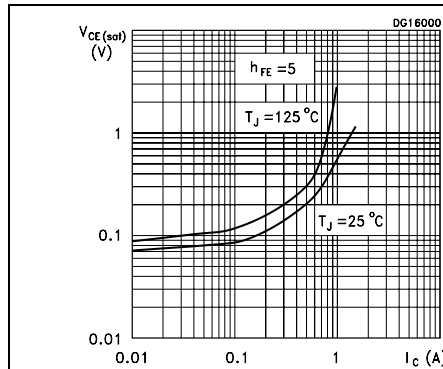
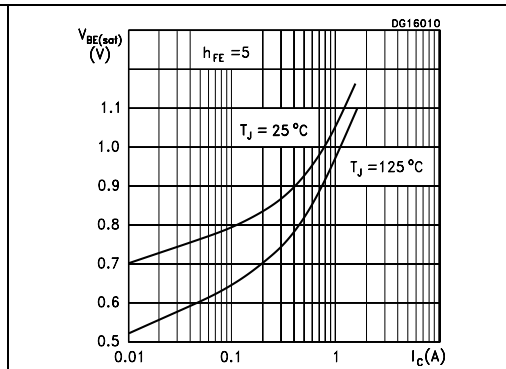
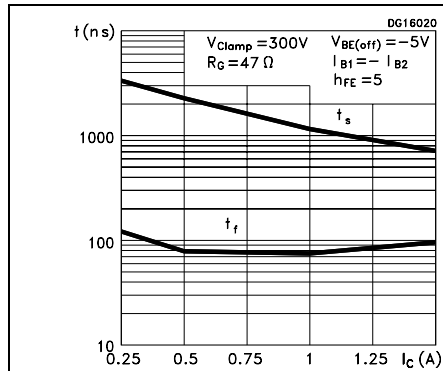
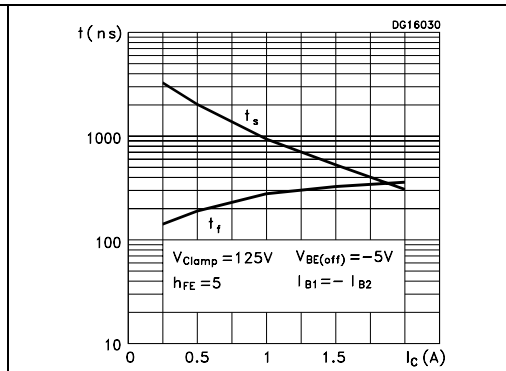
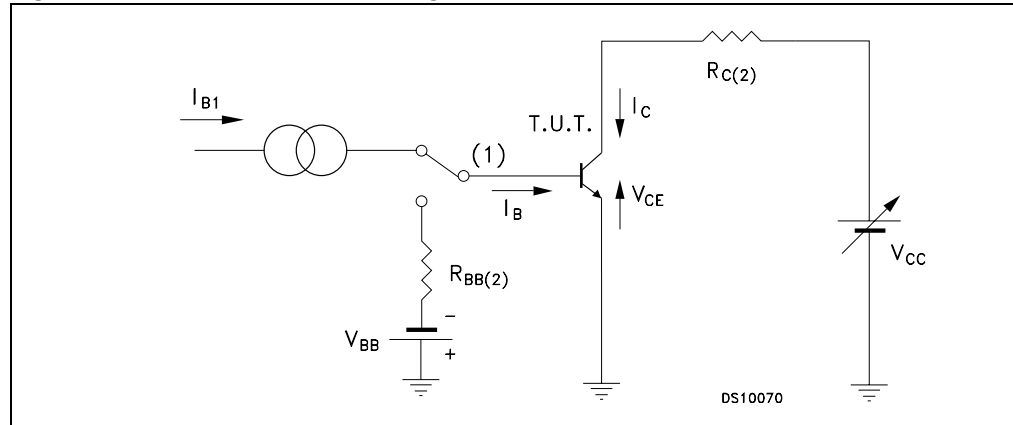
Figure 6. DC current gain ($V_{CE} = 1$ V)Figure 7. DC current gain ($V_{CE} = 5$ V)

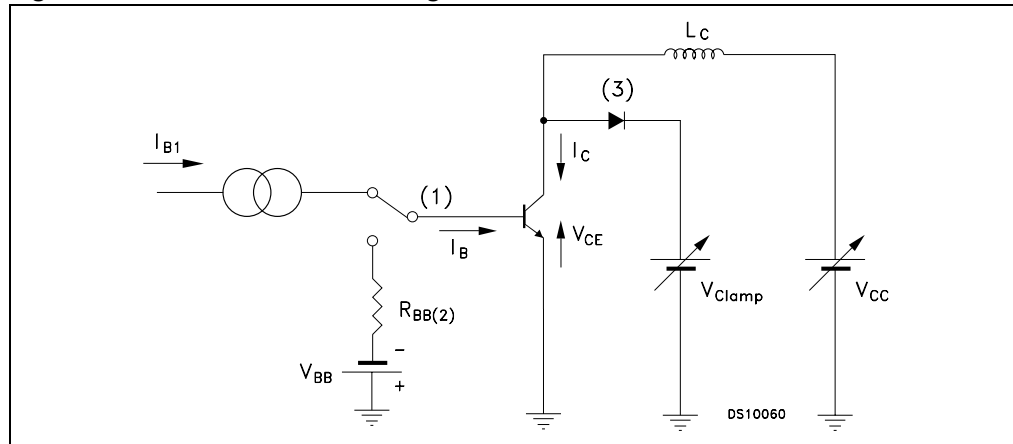
Figure 8. Collector-emitter saturation voltage**Figure 9. Base-emitter saturation voltage****Figure 10. Inductive load switching time****Figure 11. Resistive load switching time**

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

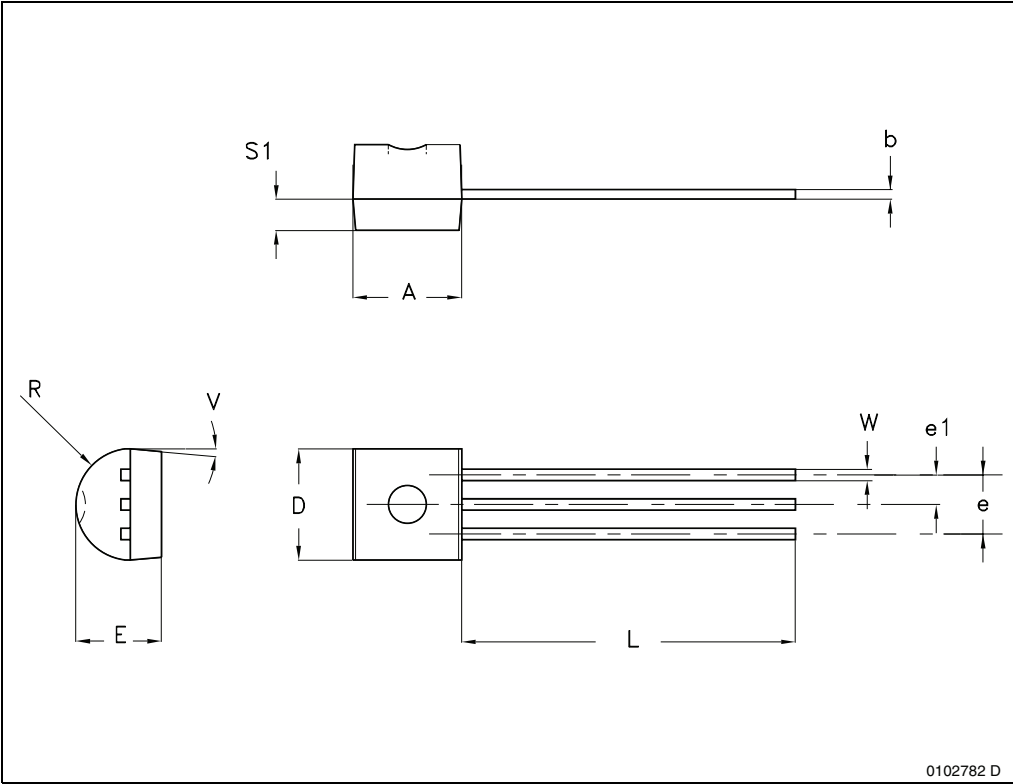
3 Package mechanical data

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.

Table 5. TO-92 mechanical data

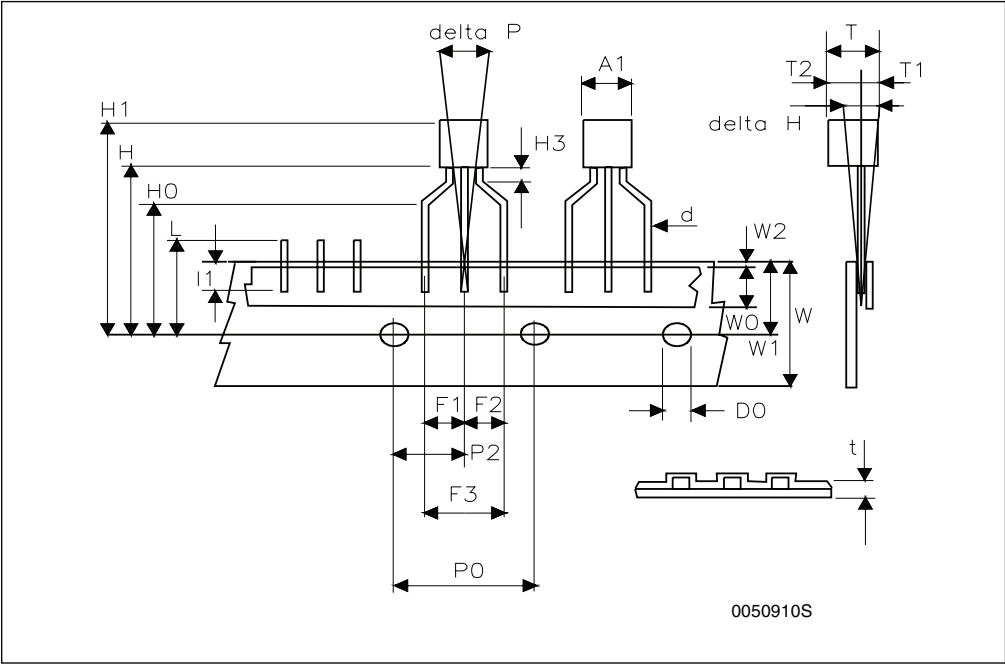
Dim.	mm.		
	Min.	Typ.	Max.
A	4.32		4.95
b	0.36		0.51
D	4.45		4.95
E	3.30		3.94
e	2.41		2.67
e1	1.14		1.40
L	12.70		15.49
R	2.16		2.41
S1	0.92		1.52
W	0.41		0.56
V		5°	

Figure 14. TO-92 drawing



TO-92 ammpack shipment (suffix"-AP") mechanical data

Dim.	mm		
	Min	Typ	Max
A1			4.80
T			3.80
T1			1.60
T2			2.30
d			0.48
P0	12.50	12.70	12.90
P2	5.65	6.35	7.05
F1,F2	2.44	2.54	2.94
F3	4.98	5.08	5.48
delta H	-2.00		2.00
W	17.50	18.00	19.00
W0	5.70	6.00	6.30
W1	8.50	9.00	9.25
W2			0.50
H	18.50		20.50
H3	0.5	1	1.5
H0	15.50	16.00	16.50
H1			25.00
D0	3.80	4.00	4.20
t			0.90
L			11.00
I1	3.00		
delta P	-1.00		1.00



4 Revision history

Table 6. Document revision history

Date	Revision	Changes
02-Jul-2008	5	Added halogen-free molding compound package.
06-Dec-2010	6	Added note Table 1 on page 1 .

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