STX13003

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.
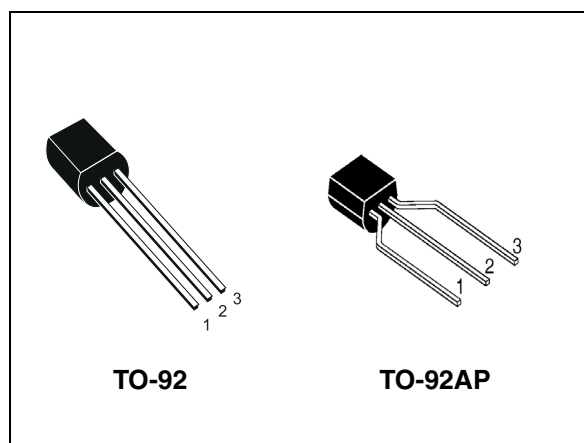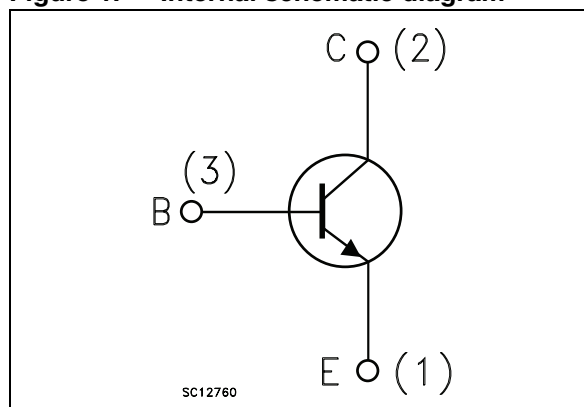

TO-92   **TO-92AP**

Figure 1.   Internal schematic diagram

SC12760

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_{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 $I_C = 1$ A $I_C = 1.5$ A	$I_B = 100$ mA $I_B = 250$ mA $I_B = 500$ mA			0.5 1 1.5	V V V
$V_{BE(sat)}$[1]	Base-emitter saturation voltage	$I_C = 0.5$ A $I_C = 1$ A	$I_B = 100$ mA $I_B = 250$ mA			1 1.2	V V
h_{FE}	DC current gain	$I_C = 0.5$ A $I_C = 1$ A	$V_{CE} = 2$ V $V_{CE} = 2$ V	8 5		25 25	
t_r t_s t_f	Resistive load Rise time Storage time Fall time	$I_C = 1$ A $I_{B1} = -I_{B2} = 200$ mA $V_{CC} = 125$ V	$t_p = 25$ μs *Figure 12*			1 4 0.7	μs μs μs
t_s	Inductive Load Storage time	$I_C = 1$ A $I_{B1} = 200$ mA L = 50 mH *Figure 13*	$V_{clamp} = 300$ V $V_{BE(off)} = -5$ V $R_{BB} = 0$		0.8		μs

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

2.1 Electrical characteristics (curves)

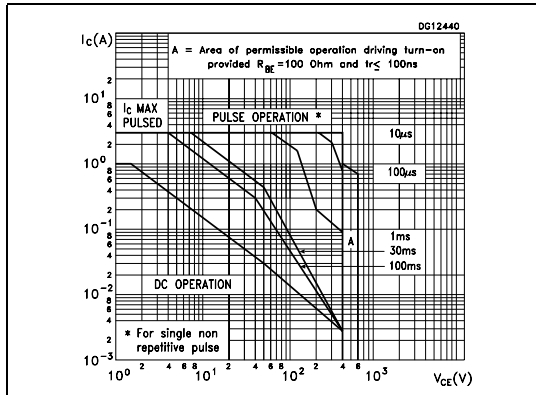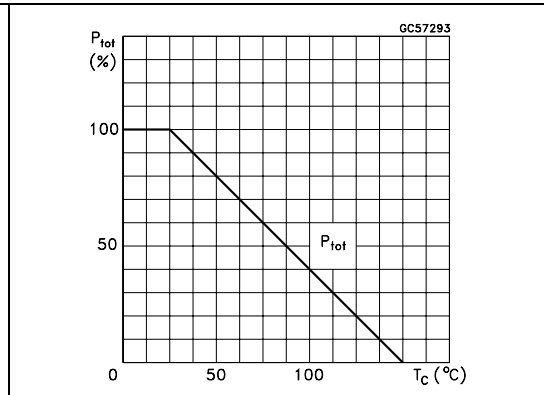Figure 2. Safe operating area

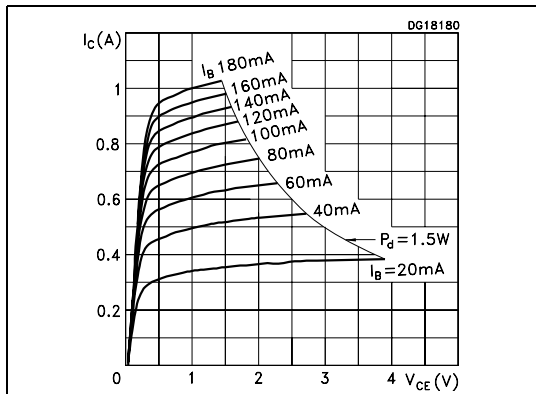Figure 3. Derating curve

Figure 4. Output characteristics
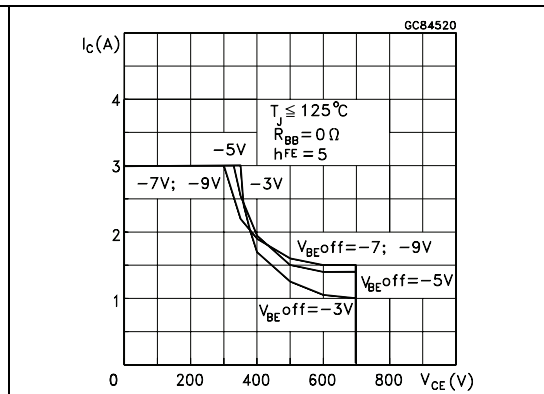

Figure 5. Reverse biased safe operating area

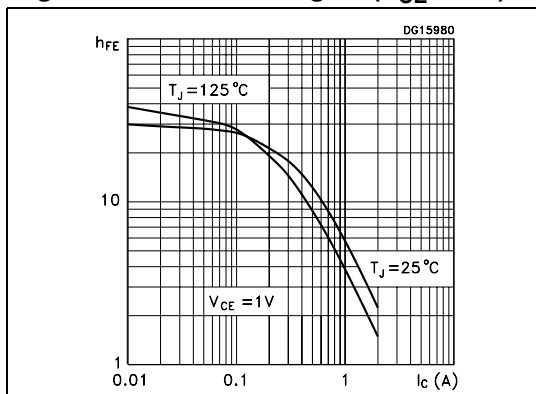Figure 6. DC current gain (V_{CE} = 1 V)
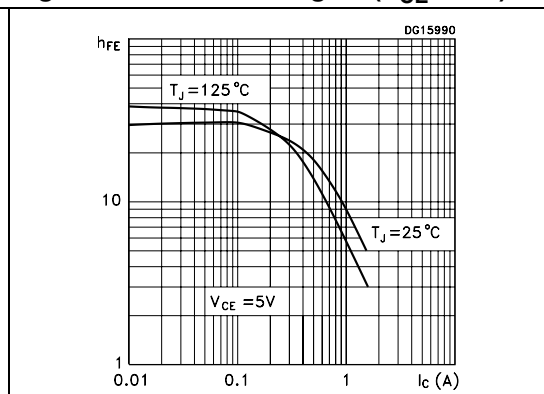

Figure 7. DC current gain (V_{CE} = 5 V)
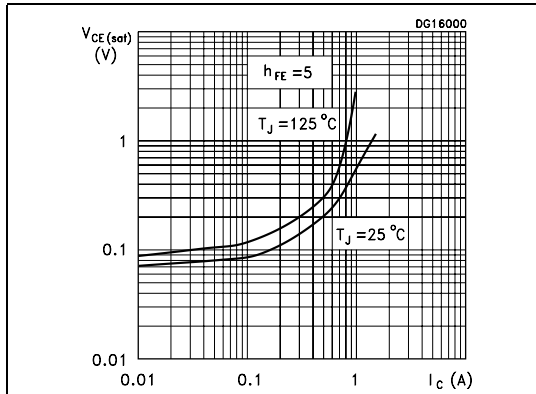
Figure 8.   Collector-emitter saturation   Figure 9.   Base-emitter saturation
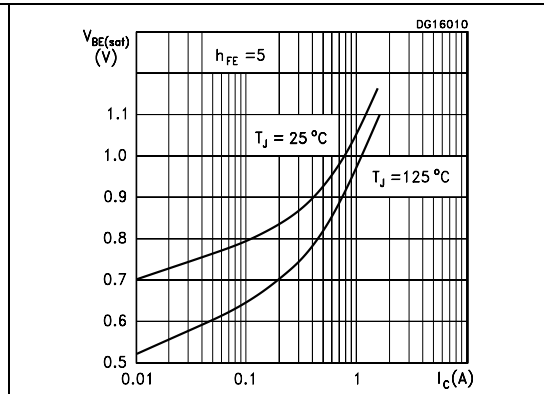**   voltage   voltage**

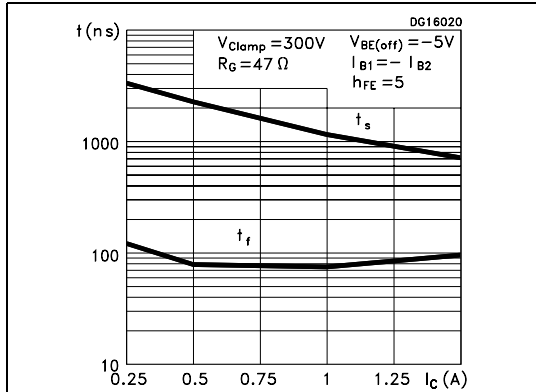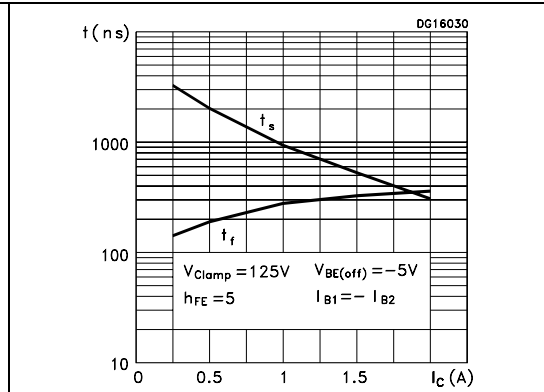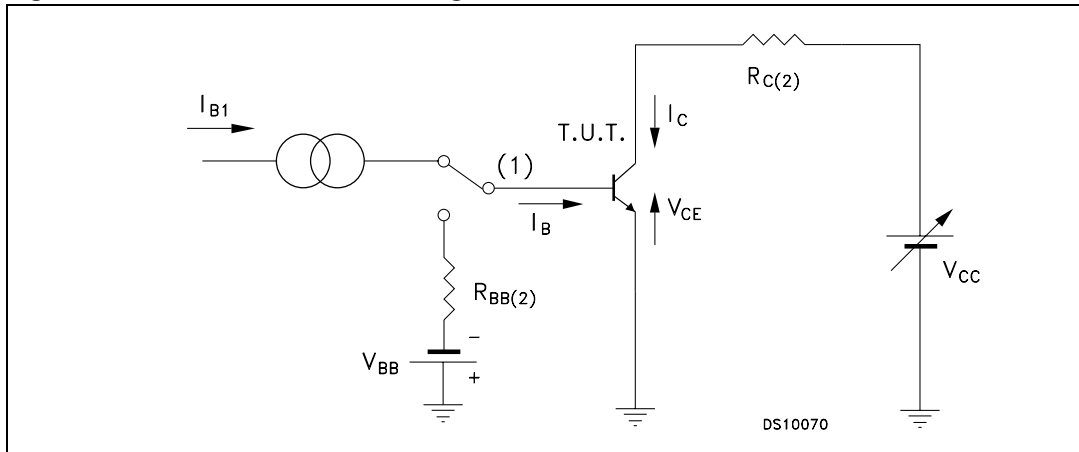**Figure 10.   Inductive load switching time   Figure 11.   Resistive load switching time**

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
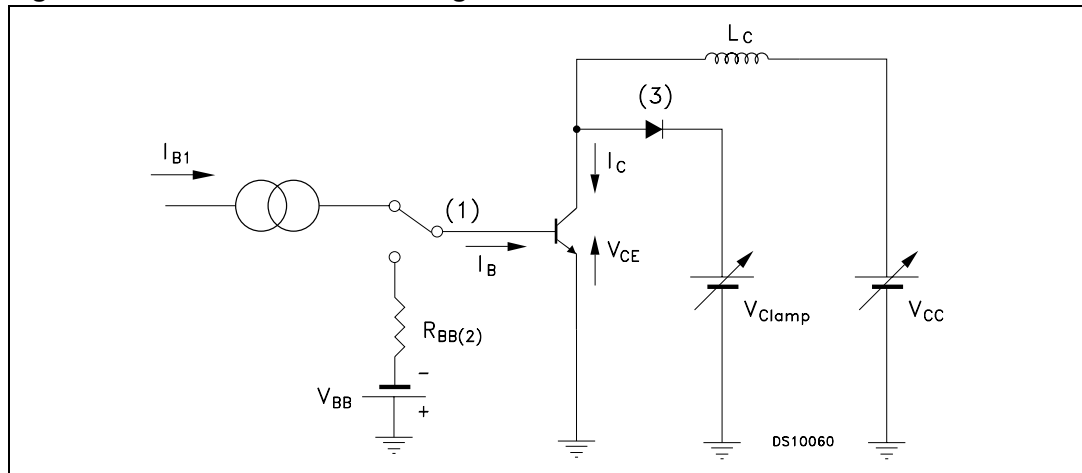
1. Fast electronic switch

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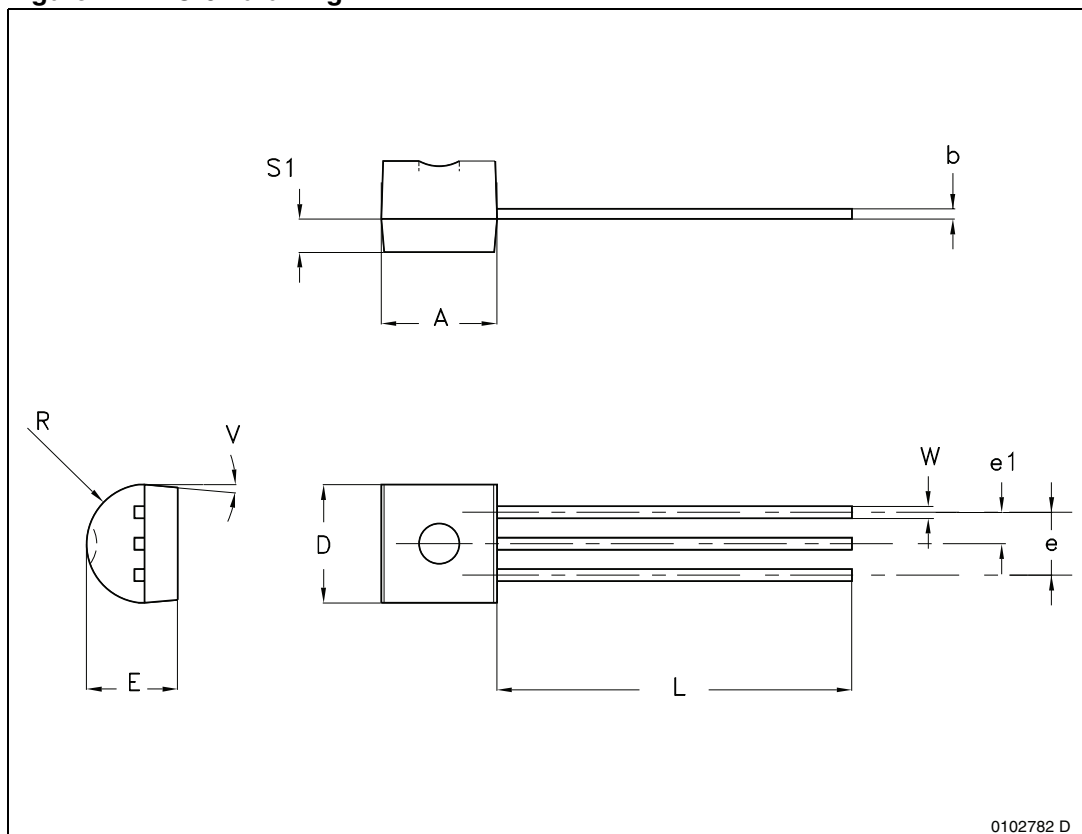
TO-92 ammopack shipment (suffix"-AP") mechanical data

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

0050910S
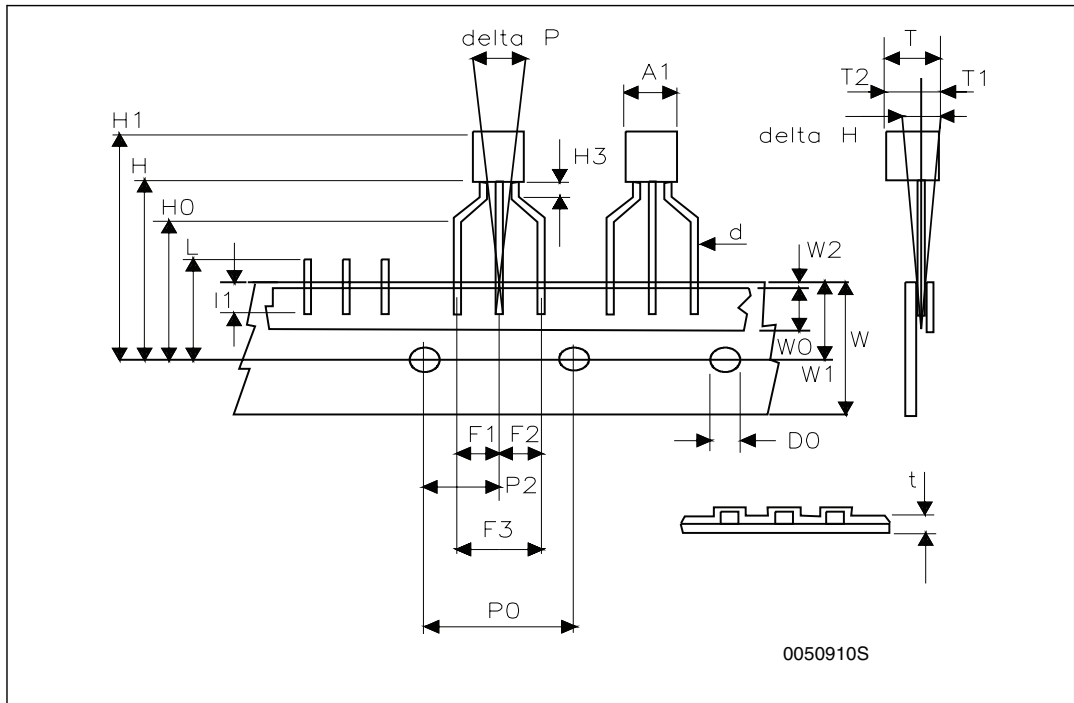
4 Revision history

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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