

## Low voltage fast-switching NPN power transistor

### Features

- Very low collector to emitter saturation voltage
- High current gain characteristic
- Fast-switching speed

### Applications

- Emergency lighting
- Voltage regulators
- Relay drivers
- High efficiency low voltage switching applications

### Description

The device is manufactured in NPN planar technology by using a "base island" layout. the resulting transistor shows exceptional high gain performance coupled with very low saturation voltage.

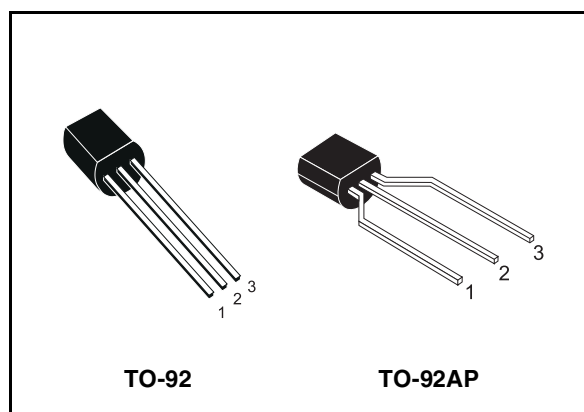


Figure 1. Internal schematic diagram

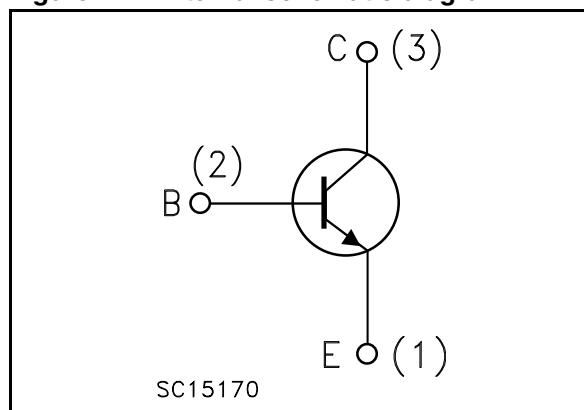


Table 1. Device summary

Order code	Marking	Package	Packaging
STSA851	SA851	TO-92	Bulk
STSA851-AP	SA851	TO-92AP	Ammopack

## Contents

<b>1</b>	<b>Electrical ratings</b> .....	<b>3</b>
<b>2</b>	<b>Electrical characteristics</b> .....	<b>4</b>
2.1	Electrical characteristics (curves) .....	5
2.2	Test circuit .....	6
<b>3</b>	<b>Package mechanical data</b> .....	<b>7</b>
<b>4</b>	<b>Revision history</b> .....	<b>10</b>

# 1 Electrical ratings

**Table 2. Absolute maximum rating**

Symbol	Parameter	Value	Unit
$V_{CBO}$	Collector-base voltage ( $I_E = 0$ )	150	V
$V_{CEO}$	Collector-emitter voltage ( $I_B = 0$ )	60	V
$V_{EBO}$	Emitter-base voltage ( $I_C = 0$ )	7	V
$I_C$	Collector current	5	A
$I_{CM}$	Collector peak current ( $t_P < 5$ ms)	20	A
$I_B$	Base current	1	A
$P_{tot}$	Total dissipation at $T_{amb} = 25$ °C	1.1	W
$T_{stg}$	Storage temperature	-65 to 150	°C
$T_J$	Max. operating junction temperature	150	°C

**Table 3. Thermal data**

Symbol	Parameter	Value	Unit
$R_{thj-amb}$	Thermal resistance junction-ambient	max 114	°C/W

## 2 Electrical characteristics

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

**Table 4. Electrical characteristics**

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$I_{\text{CBO}}$	Collector cut-off current ( $I_{\text{E}} = 0$ )	$V_{\text{CB}} = 120\text{ V}$ $V_{\text{CB}} = 120\text{ V}$ $T_{\text{C}} = 100\text{ °C}$			50 1	nA $\mu\text{A}$
$I_{\text{EBO}}$	Emitter cut-off current ( $I_{\text{C}} = 0$ )	$V_{\text{EB}} = 7\text{ V}$			10	nA
$V_{(\text{BR})\text{CBO}}^{(1)}$	Collector-base breakdown Voltage ( $I_{\text{E}} = 0$ )	$I_{\text{C}} = 100\text{ }\mu\text{A}$	150			V
$V_{(\text{BR})\text{CEO}}^{(1)}$	Collector-emitter breakdown Voltage ( $I_{\text{B}} = 0$ )	$I_{\text{C}} = 10\text{ mA}$	60			V
$V_{(\text{BR})\text{EBO}}^{(1)}$	Emitter-base breakdown Voltage ( $I_{\text{C}} = 0$ )	$I_{\text{E}} = 100\text{ }\mu\text{A}$	7			V
$V_{\text{CE}(\text{sat})}^{(1)}$	Collector-emitter saturation voltage	$I_{\text{C}} = 100\text{ mA}$ $I_{\text{B}} = 5\text{ mA}$ $I_{\text{C}} = 1\text{ A}$ $I_{\text{B}} = 50\text{ mA}$ $I_{\text{C}} = 2\text{ A}$ $I_{\text{B}} = 50\text{ mA}$ $I_{\text{C}} = 5\text{ A}$ $I_{\text{B}} = 200\text{ mA}$		10 70 140 320	50 120 200 450	mV mV mV mV
$V_{\text{BE}(\text{sat})}^{(1)}$	Base-emitter saturation voltage	$I_{\text{C}} = 4\text{ A}$ $I_{\text{B}} = 200\text{ mA}$		1	1.15	V
$h_{\text{FE}}$	DC current gain	$I_{\text{C}} = 10\text{ mA}$ $V_{\text{CE}} = 1\text{ V}$ $I_{\text{C}} = 2\text{ A}$ $V_{\text{CE}} = 1\text{ V}$ $I_{\text{C}} = 5\text{ A}$ $V_{\text{CE}} = 1\text{ V}$ $I_{\text{C}} = 10\text{ A}$ $V_{\text{CE}} = 1\text{ V}$	150 150 90 30	300 270 140 50	350	
$f_{\text{T}}$	Transition frequency	$V_{\text{CE}} = 10\text{ V}$ $I_{\text{C}} = 100\text{ mA}$		130		MHz
$C_{\text{CBO}}$	Collector-base capacitance	$V_{\text{CB}} = 10\text{ V}$ $f = 1\text{ MHz}$		45		pF
$t_{\text{on}}$ $t_{\text{s}}$ $t_{\text{f}}$	Resistive load Turn-on time Storage time Fall time	$I_{\text{C}} = 1\text{ A}$ $V_{\text{CC}} = 10\text{ V}$ $I_{\text{B1}} = -I_{\text{B2}} = 0.1\text{ A}$		55 1.35 120		ns $\mu\text{s}$ ns

1. Pulsed duration = 300  $\mu\text{s}$ , duty cycle  $\geq 1.5\%$ .

## 2.1 Electrical characteristics (curves)

Figure 2. Output characteristics

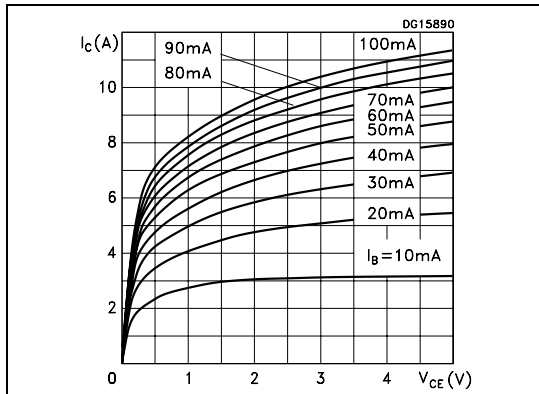


Figure 3. DC current gain

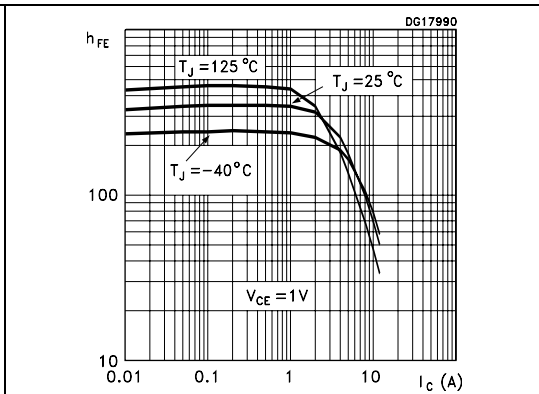


Figure 4. Collector-emitter saturation voltage

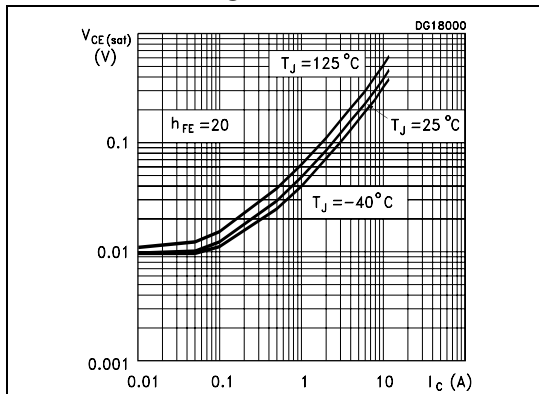


Figure 5. Collector-emitter saturation voltage

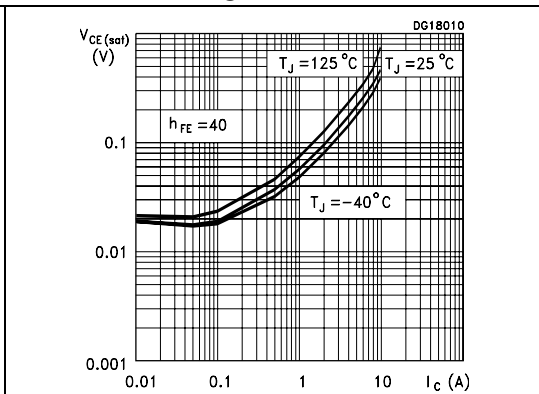


Figure 6. Base-emitter saturation voltage

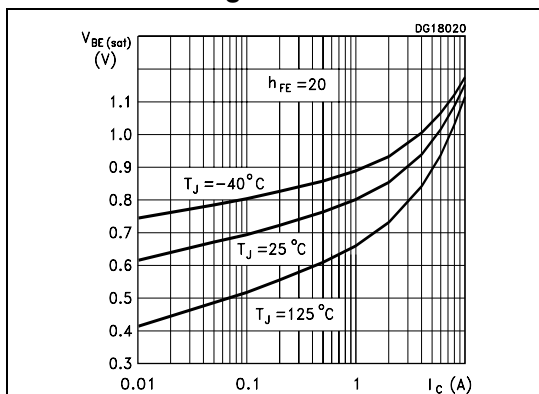


Figure 7. Base-emitter on voltage

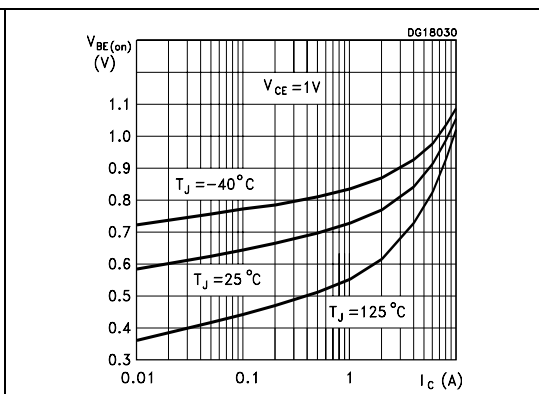


Figure 8. Switching times resistive load

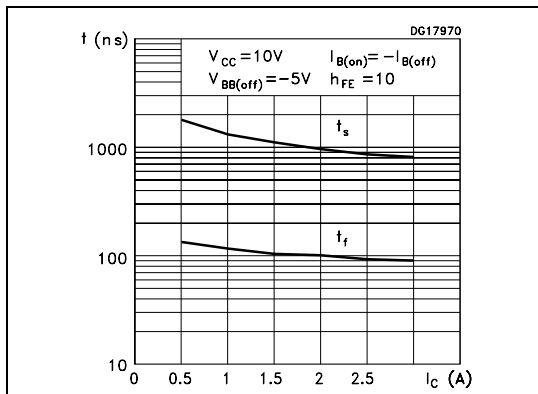


Figure 9. Switching times resistive load

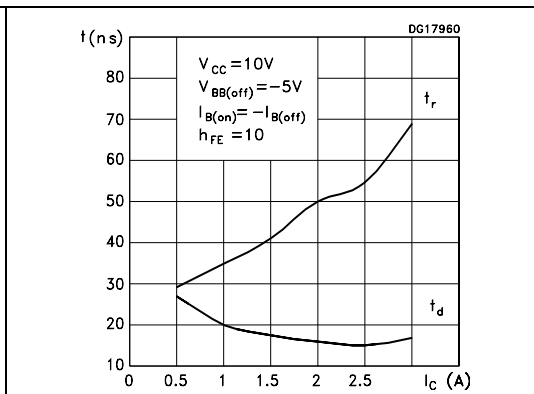
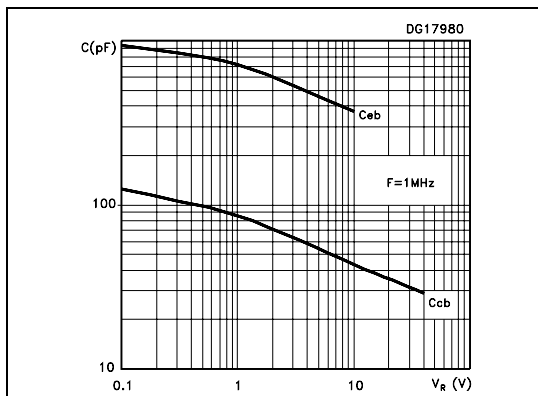
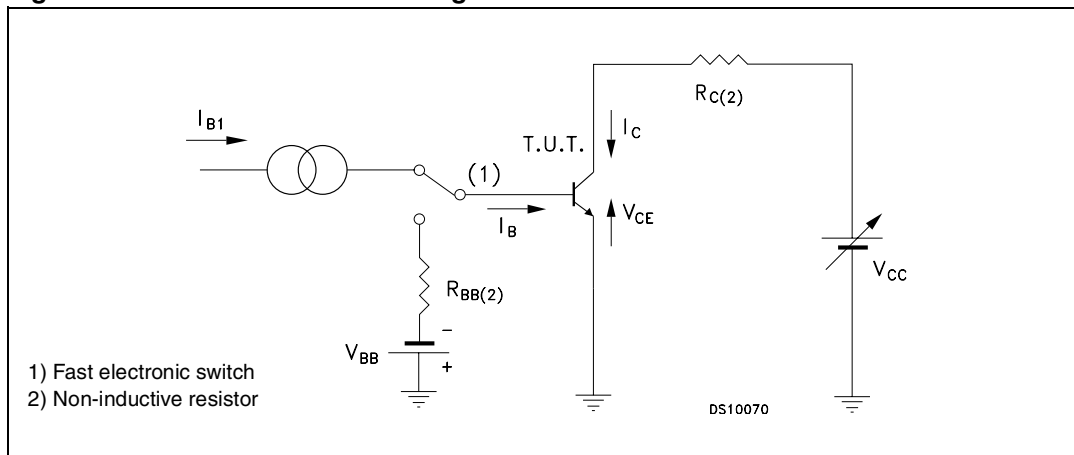


Figure 10. Capacitance



## 2.2 Test circuit

Figure 11. Resistive load switching test circuit

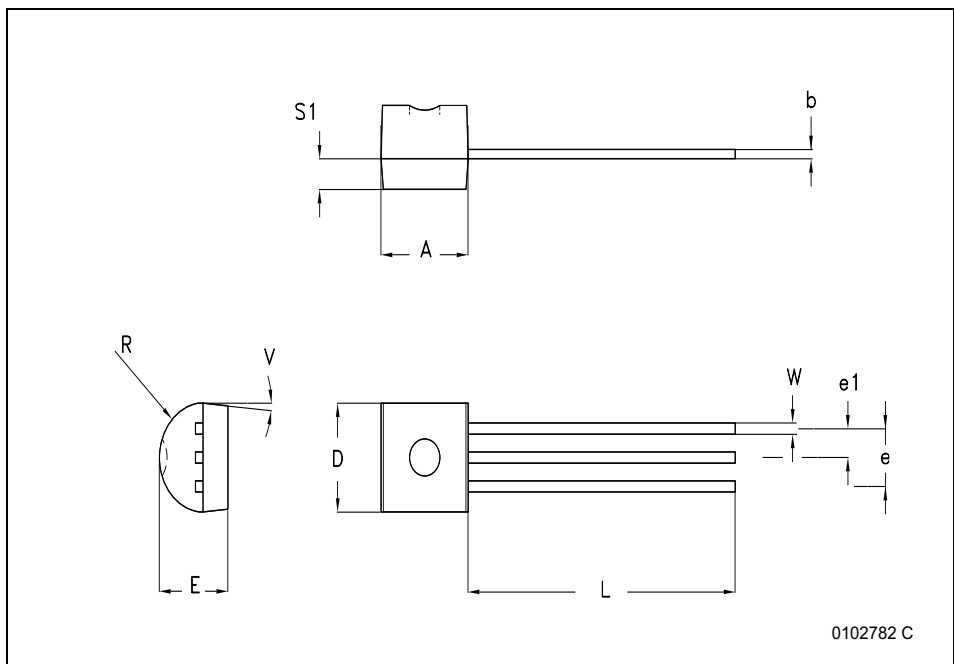


### 3 Package mechanical data

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](http://www.st.com)

TO-92 BULK SHIPMENT 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°	

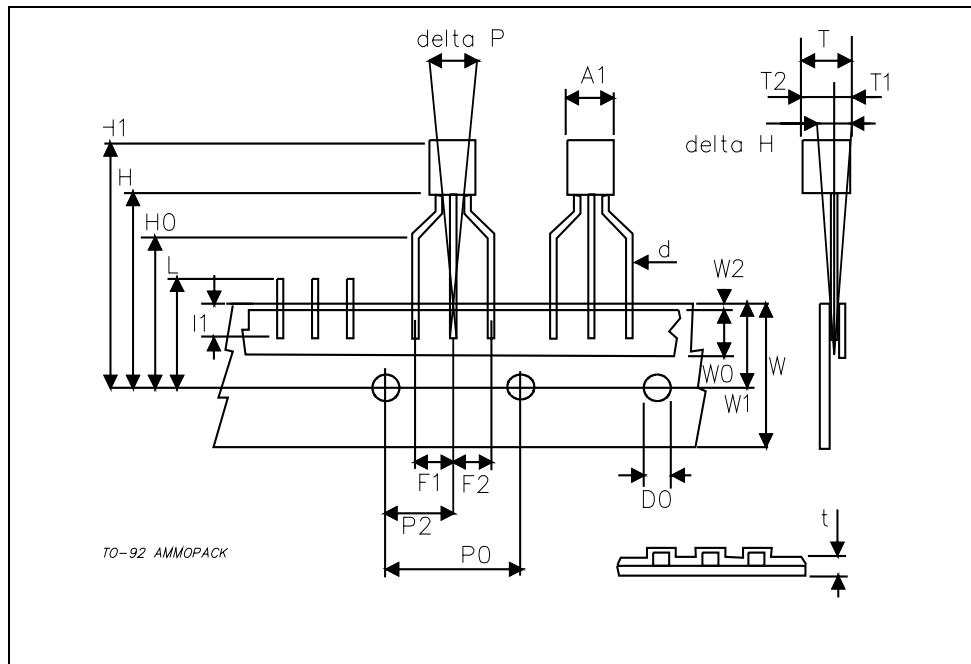


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**TO-92 AMMOPACK SHIPMENT (Suffix"-AP") MECHANICAL DATA**

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
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
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 5. Document revision history**

Date	Revision	Changes
05-Sep-2003	2	
25-Mar-2008	3	New graphics.

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