

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.

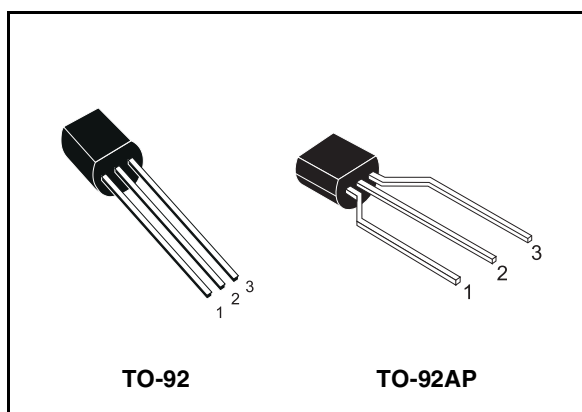


Figure 1. Internal schematic diagram

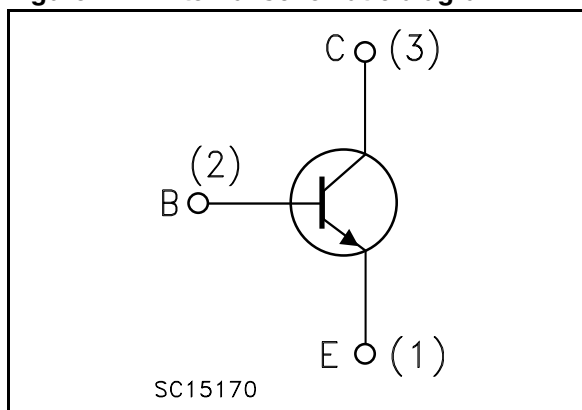


Table 1. Device summary

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

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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_{CBO}	Collector cut-off current ($I_{\text{E}} = 0$)	$V_{\text{CB}} = 120\text{ V}$			50	nA
		$V_{\text{CB}} = 120\text{ V}$ $T_{\text{C}} = 100\text{ °C}$			1	μA
I_{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	$I_{\text{C}} = 100\text{ mA}$ $I_{\text{B}} = 5\text{ mA}$		10	50	mV
		$I_{\text{C}} = 1\text{ A}$ $I_{\text{B}} = 50\text{ mA}$		70	120	mV
		$I_{\text{C}} = 2\text{ A}$ $I_{\text{B}} = 50\text{ mA}$		140	200	mV
		$I_{\text{C}} = 5\text{ A}$ $I_{\text{B}} = 200\text{ mA}$		320	450	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_{FE}	DC current gain	$I_{\text{C}} = 10\text{ mA}$ $V_{\text{CE}} = 1\text{ V}$	150	300		
		$I_{\text{C}} = 2\text{ A}$ $V_{\text{CE}} = 1\text{ V}$	150	270	350	
		$I_{\text{C}} = 5\text{ A}$ $V_{\text{CE}} = 1\text{ V}$	90	140		
		$I_{\text{C}} = 10\text{ A}$ $V_{\text{CE}} = 1\text{ V}$	30	50		
f_{T}	Transition frequency	$V_{\text{CE}} = 10\text{ V}$ $I_{\text{C}} = 100\text{ mA}$		130		MHz
C_{CBO}	Collector-base capacitance	$V_{\text{CB}} = 10\text{ V}$ $f = 1\text{ MHz}$		45		pF
t_{on} t_{s} t_{f}	Resistive load Turn-on time	$I_{\text{C}} = 1\text{ A}$ $V_{\text{CC}} = 10\text{ V}$ $I_{\text{B1}} = -I_{\text{B2}} = 0.1\text{ A}$		55		ns
	Storage time			1.35		μs
	Fall time			120		ns

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

2.1 Electrical characteristics (curves)

Figure 2. Output characteristics

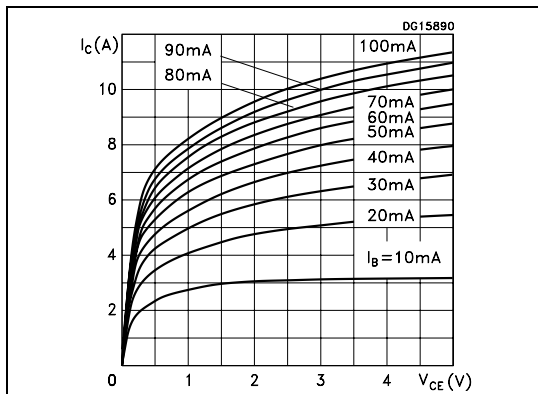


Figure 3. DC current gain

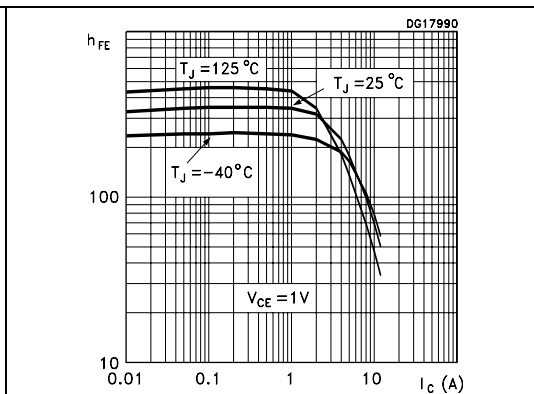


Figure 4. Collector-emitter saturation voltage

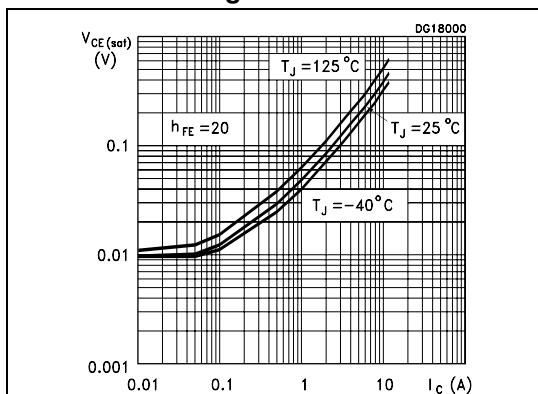


Figure 5. Collector-emitter saturation voltage

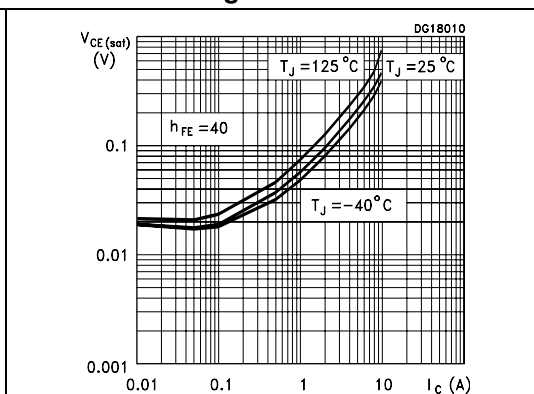


Figure 6. Base-emitter saturation voltage

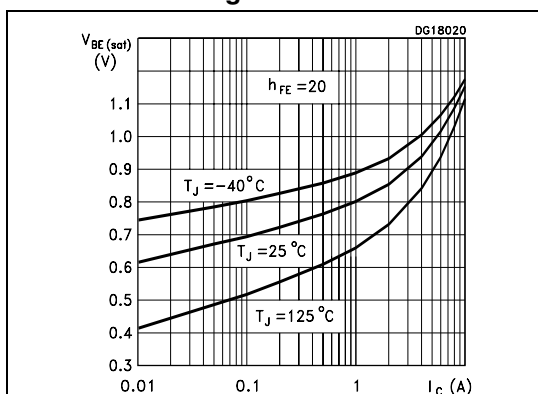


Figure 7. Base-emitter on voltage

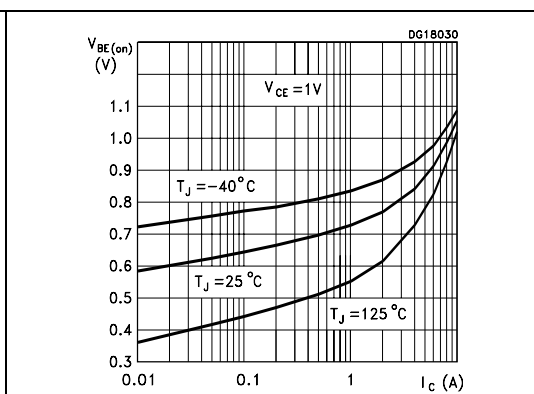


Figure 8. Switching times resistive load

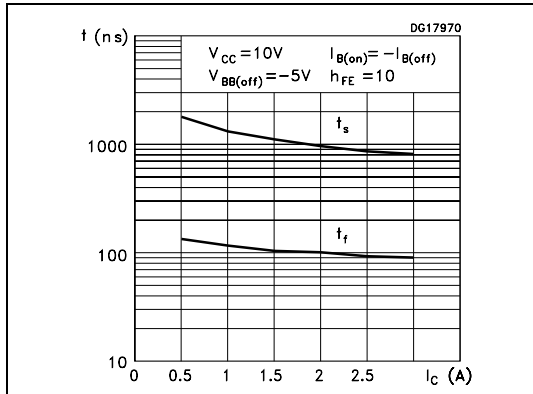


Figure 9. Switching times resistive load

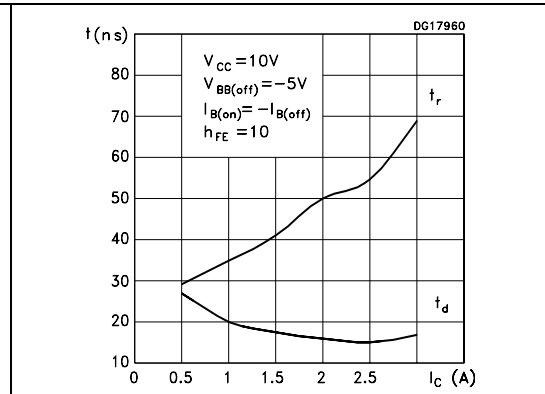
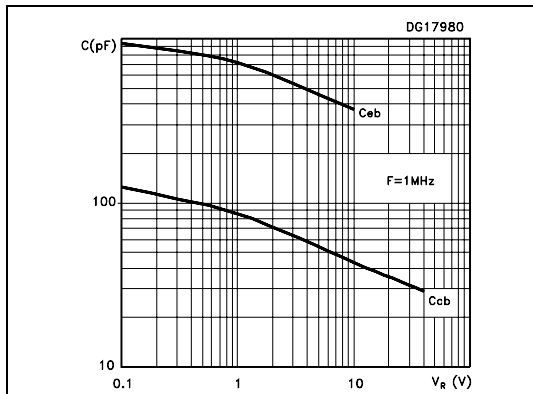
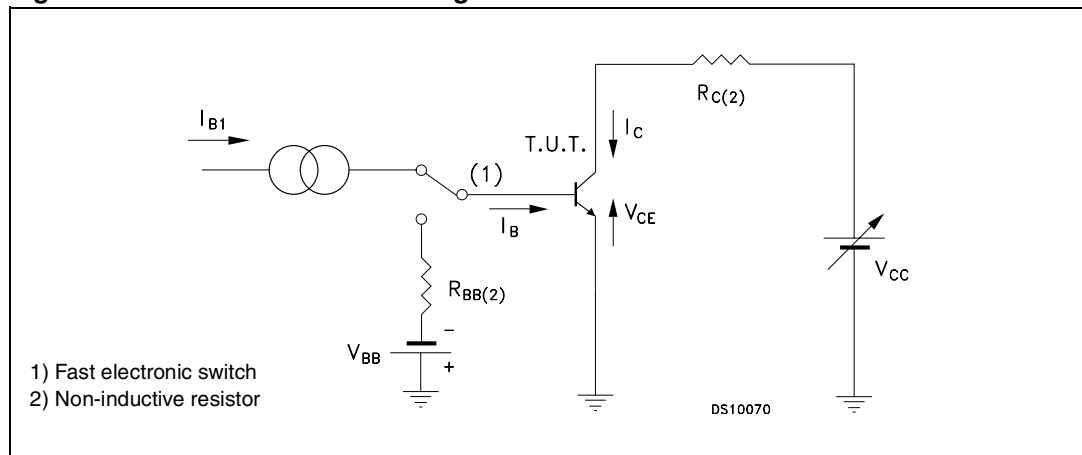


Figure 10. Capacitance



2.2 Test circuit

Figure 11. Resistive load switching test circuit

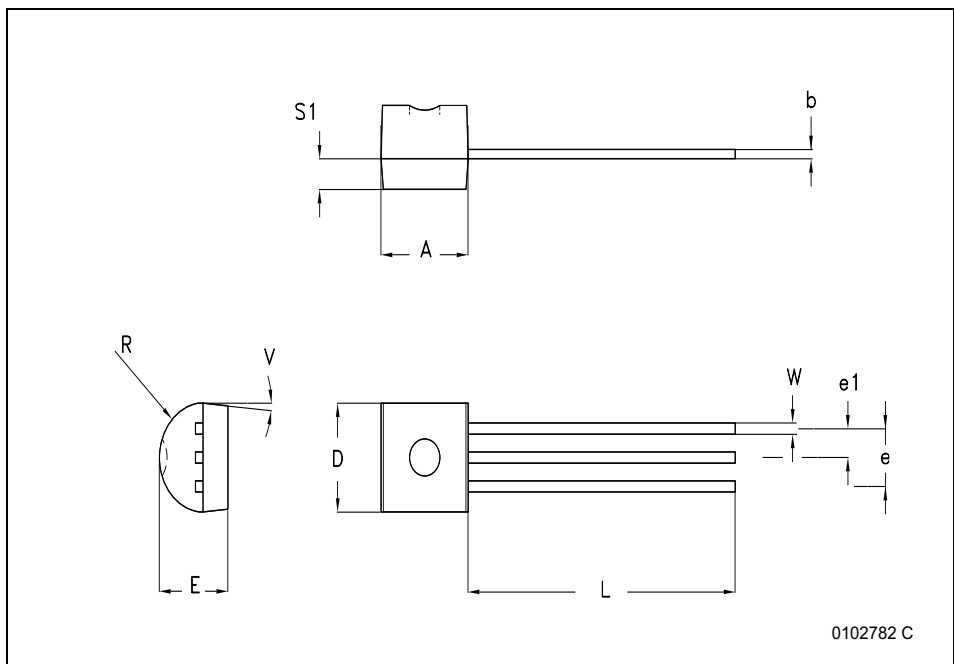


3 Package mechanical data

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

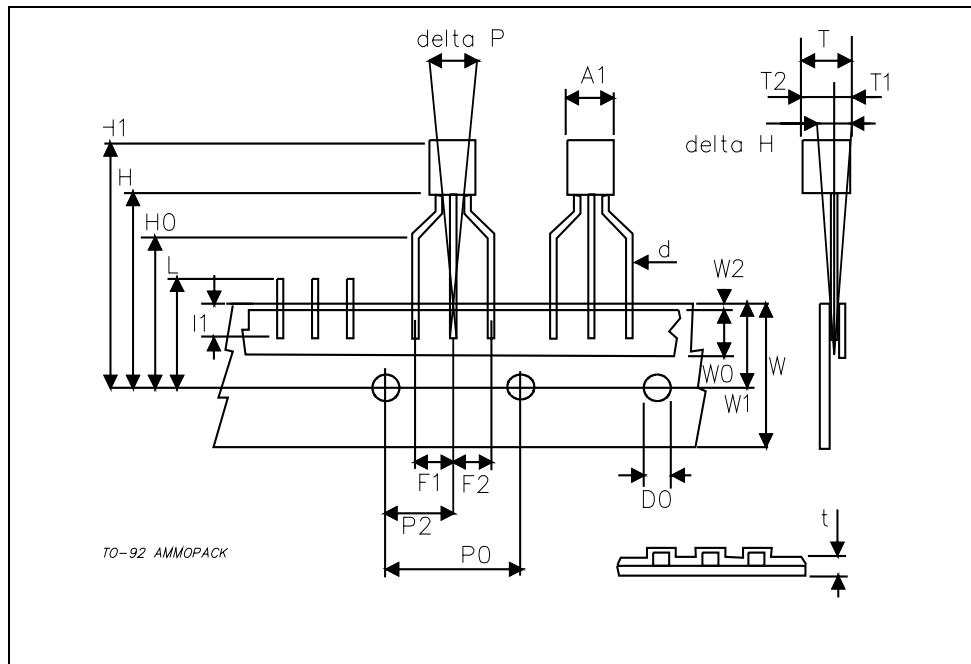
TO-92 BULK SHIPMENT MECHANICAL DATA

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°	



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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