



STN690A

Medium Current, High Performance, Low Voltage NPN Transistor

General features

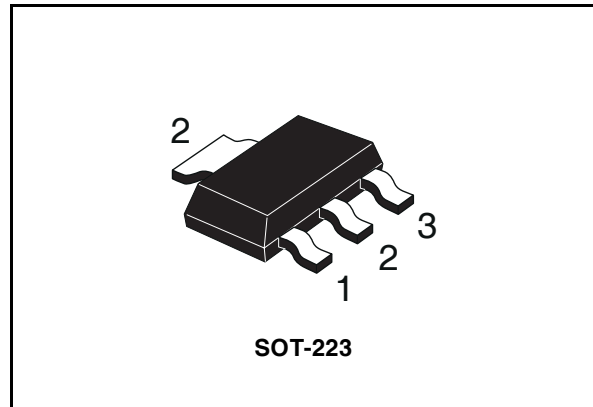
- Very low Collector to Emitter saturation voltage
- D.C. Current gain, $h_{FE} > 100$
- 3A continuous collector current
- 40V breakdown voltage ($V_{(BR)CER}$)
- In compliance with the 2002/93/EC European Directive

Description

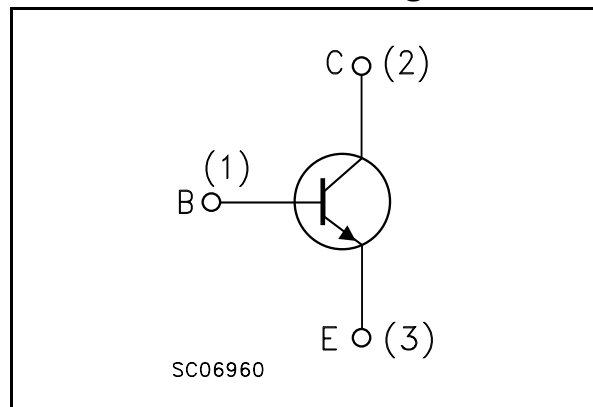
The device is manufactured in low voltage NPN Planar Technology by using a "Base Island" layout. The resulting transistor shows exceptional high gain performance coupled with very low saturation voltage.

Applications

- Power management in portable equipment
- Voltage regulation in bias supply circuits
- Switching regulator in battery charger applications
- Heavy load driver



Internal schematic diagram



Order codes

Part Number	Marking	Package	Packing
STN690A	N690A	SOT-223	Tape & reel

Contents

1	Electrical ratings	3
2	Electrical characteristics	4
2.1	Electrical characteristics (curves)	5
2.2	Test circuits	6
3	Package mechanical data	7
4	Revision history	9

1 Electrical ratings

Table 1. Absolute maximum rating

Symbol	Parameter	Value	Unit
V_{CBO}	Collector-base voltage ($I_E = 0$)	40	V
V_{CER}	Collector-emitter voltage ($R_{BE} = 47\Omega$)	40	V
V_{CEO}	Collector-emitter voltage ($I_B = 0$)	30	V
V_{EBO}	Emitter-base voltage ($I_C = 0$)	5	V
I_C	Collector current	3	A
I_{CM}	Collector peak current ($t_P < 5ms$)	6	A
P_{tot}	Total dissipation at $T_{amb} = 25^\circ C$	1.6	W
T_{stg}	Storage temperature	-65 to 150	$^\circ C$
T_J	Max. operating junction temperature	150	$^\circ C$

Table 2. Thermal data

Symbol	Parameter	Value	Unit
$R_{thj-amb}$	Thermal resistance junction-amb ⁽¹⁾ max	78	$^\circ C/W$

1. Device mounted on PCB area of 1 cm².

2 Electrical characteristics

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

Table 3. Electrical characteristics

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
I_{CBO}	Collector cut-off current ($I_{\text{E}} = 0$)	$V_{\text{CB}} = 30\text{V}$ $V_{\text{CB}} = 30\text{V}; T_{\text{C}} = 100^{\circ}\text{C}$			10 100	μA μA
I_{EBO}	Emitter cut-off current ($I_{\text{C}} = 0$)	$V_{\text{EB}} = 4\text{V}$			10	μA
$V_{(\text{BR})\text{CEO}}^{(2)}$	Collector-emitter breakdown voltage ($I_{\text{B}} = 0$)	$I_{\text{C}} = 10\text{mA}$	30			V
$V_{(\text{BR})\text{CER}}^{(2)}$	Collector-emitter breakdown voltage ($R_{\text{BE}} = 47\Omega$)	$I_{\text{C}} = 10\text{mA}$	40			V
$V_{(\text{BR})\text{CBO}}$	Collector-base breakdown voltage ($I_{\text{E}} = 0$)	$I_{\text{C}} = 100\mu\text{A}$	40			V
$V_{(\text{BR})\text{EBO}}$	Emitter-base breakdown voltage ($I_{\text{C}} = 0$)	$I_{\text{E}} = 100\mu\text{A}$	5			V
$V_{\text{CE(sat)}}^{(2)}$	Collector-emitter saturation voltage	$I_{\text{C}} = 0.5\text{A}$ $I_{\text{B}} = 5\text{mA}$ $I_{\text{C}} = 1.2\text{A}$ $I_{\text{B}} = 20\text{mA}$ $I_{\text{C}} = 2\text{A}$ $I_{\text{B}} = 20\text{mA}$ $I_{\text{C}} = 3\text{A}$ $I_{\text{B}} = 100\text{mA}$ $I_{\text{C}} = 3\text{A}$ $I_{\text{B}} = 100\text{mA}$ $T_{\text{J}} = 100^{\circ}\text{C}$		0.08 0.1 0.175 0.2 0.3	0.15 0.22 0.35 0.4	V V V V V
$V_{\text{BE(sat)}}^{(2)}$	Base-emitter saturation voltage	$I_{\text{C}} = 1\text{A}$ $I_{\text{B}} = 10\text{mA}$		0.8	1	V
$V_{\text{BE(on)}}^{(2)}$	Base-emitter on voltage	$I_{\text{C}} = 1\text{A}$ $V_{\text{CE}} = 2\text{V}$		0.8	1	V
$h_{\text{FE}}^{(2)}$	DC current gain	$I_{\text{C}} = 10\text{mA}$ $V_{\text{CE}} = 2\text{V}$ $I_{\text{C}} = 500\text{mA}$ $V_{\text{CE}} = 2\text{V}$ $I_{\text{C}} = 1\text{A}$ $V_{\text{CE}} = 2\text{V}$ $I_{\text{C}} = 2\text{A}$ $V_{\text{CE}} = 1\text{V}$ $I_{\text{C}} = 3\text{A}$ $V_{\text{CE}} = 1\text{V}$	100 100 100 100 90	200 200	400 400	

Table 3. Electrical characteristics

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
f_t	Transition frequency	$I_C = 50\text{mA}$ $V_{CE} = 5\text{V}$ $f = 50\text{MHz}$		100		MHz
t_d	Resistive load Delay time	$I_C = 3\text{A}$ $V_{CC} = 20\text{V}$		50		ns
t_r	Rise time	$I_{B1} = -I_{B2} = 60\text{mA}$		120		ns
t_s	Storage time	(see figure 7)		465		ns
t_f	Fall time			80		ns

Note (2) Pulsed duration = 300 μs , duty cycle $\leq 1.5\%$

2.1 Electrical characteristics (curves)

Figure 1. DC current gain

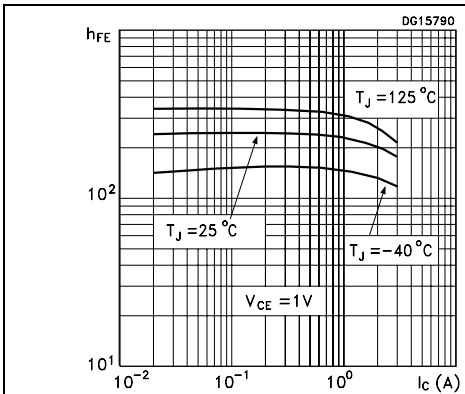


Figure 2. DC current gain

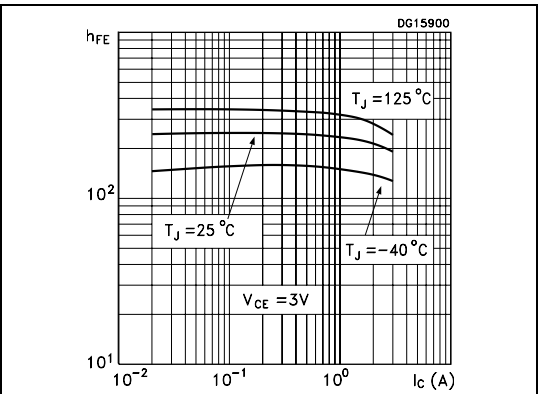


Figure 3. Collector-emitter saturation voltage

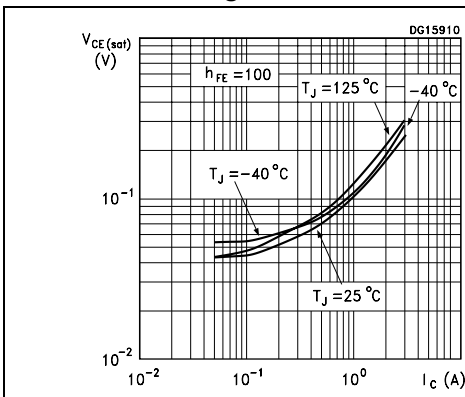


Figure 4. Base-emitter saturation voltage

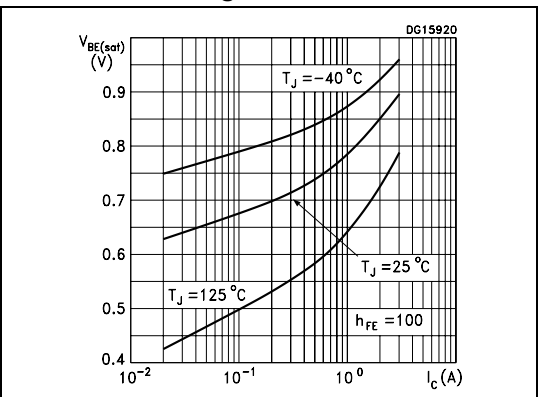
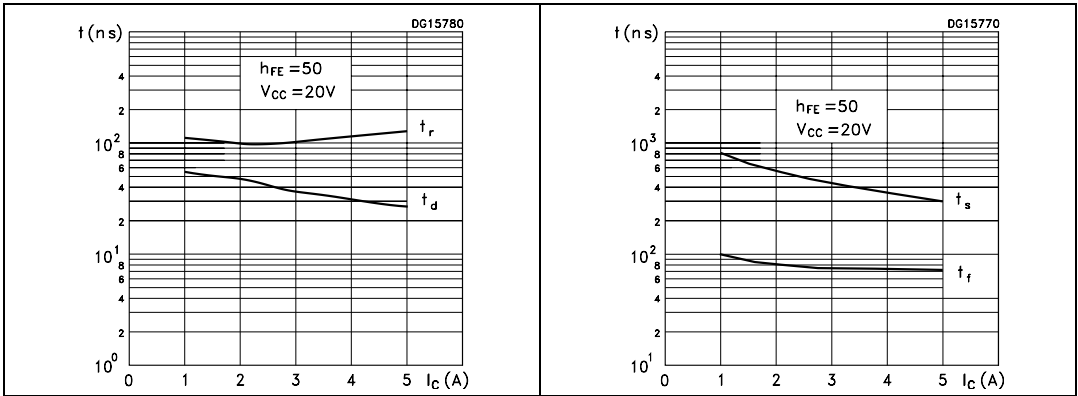
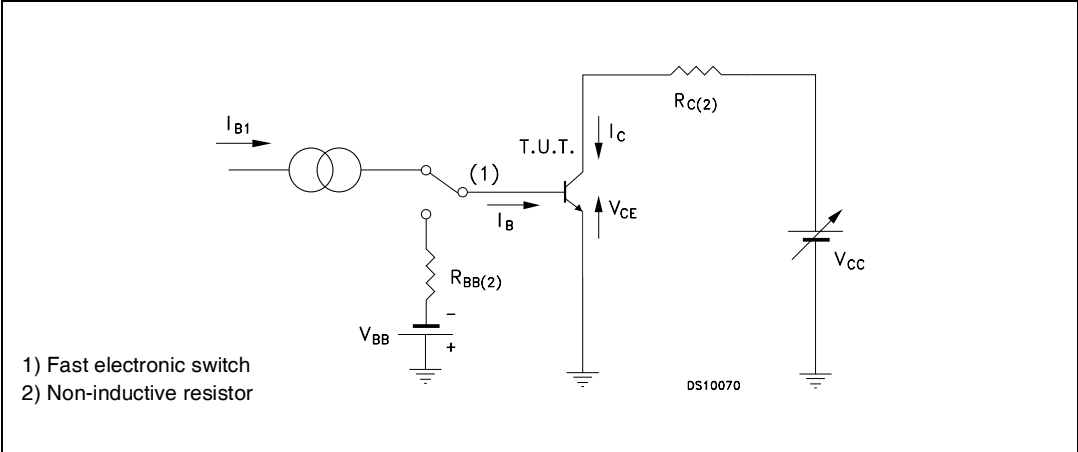


Figure 5. Switching time resistive load Figure 6. Switching time resistive load



2.2 Test circuits

Figure 7. 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

SOT-223 MECHANICAL DATA						
DIM.	mm			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
A			1.80			0.071
B	0.60	0.70	0.80	0.024	0.027	0.031
B1	2.90	3.00	3.10	0.114	0.118	0.122
c	0.24	0.26	0.32	0.009	0.010	0.013
D	6.30	6.50	6.70	0.248	0.256	0.264
e		2.30			0.090	
e1		4.60			0.181	
E	3.30	3.50	3.70	0.130	0.138	0.146
H	6.70	7.00	7.30	0.264	0.276	0.287
V			10°			10°
A1		0.02				

The mechanical drawing illustrates the SOT-223 package geometry. The top view shows dimensions A (height), B (lead width), B1 (lead spacing), c (lead thickness), D (body width), e (pitch), e1 (lead length), and A1 (lead thickness). The side view shows dimension H (total height) and V (lead angle). The bottom view shows dimension E (body height) and the three lead positions labeled 1, 2, and 3.

P008B

4 Revision history

Table 4. Revision history

Date	Revision	Changes
20-Oct-2006	1	Initial release.

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