



## STN690A

### Medium Current, High Performance, Low Voltage NPN Transistor

#### General features

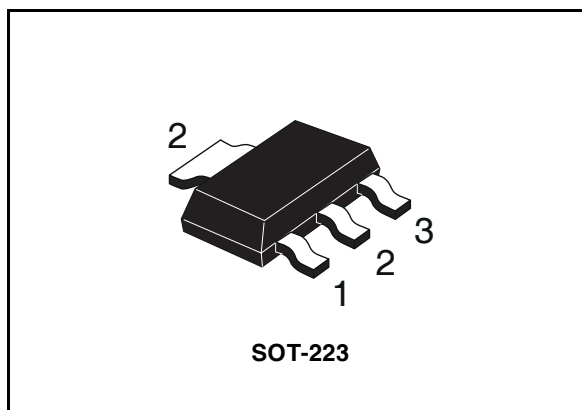
- Very low Collector to Emitter saturation voltage
- D.C. Current gain,  $h_{FE} > 100$
- 3A continuous collector current
- 40V breakdown voltage ( $V_{(BR)CER}$ )
- In compliance with the 2002/93/EC European Directive

#### Description

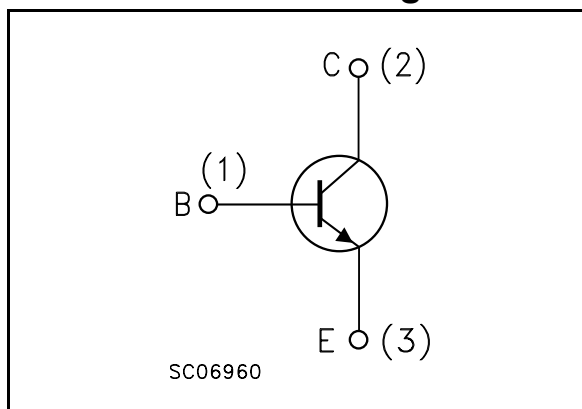
The device is manufactured in low voltage NPN Planar Technology by using a "Base Island" layout. The resulting transistor shows exceptional high gain performance coupled with very low saturation voltage.

#### 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

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## 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 circuits .....	6
<b>3</b>	<b>Package mechanical data</b> .....	<b>7</b>
<b>4</b>	<b>Revision history</b> .....	<b>9</b>

# 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 <sup>(1)</sup> max	78	$^\circ C/W$

1. Device mounted on PCB area of 1 cm<sup>2</sup>.

## 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
$I_{\text{CBO}}$	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	$\mu\text{A}$ $\mu\text{A}$
$I_{\text{EBO}}$	Emitter cut-off current ( $I_{\text{C}} = 0$ )	$V_{\text{EB}} = 4\text{V}$			10	$\mu\text{A}$
$V_{(\text{BR})\text{CEO}}^{(2)}$	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
$V_{\text{CE}(\text{sat})}^{(2)}$	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
$V_{\text{BE}(\text{sat})}^{(2)}$	Base-emitter saturation voltage	$I_{\text{C}} = 1\text{A}$ $I_{\text{B}} = 10\text{mA}$		0.8	1	V
$V_{\text{BE}(\text{on})}^{(2)}$	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	

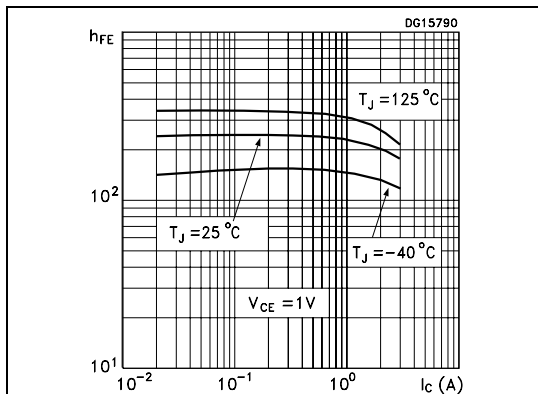
**Table 3. Electrical characteristics**

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

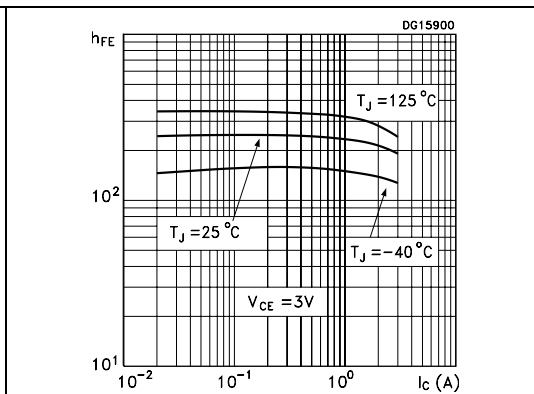
Note (2) Pulsed duration = 300  $\mu\text{s}$ , duty cycle  $\leq 1.5\%$

## 2.1 Electrical characteristics (curves)

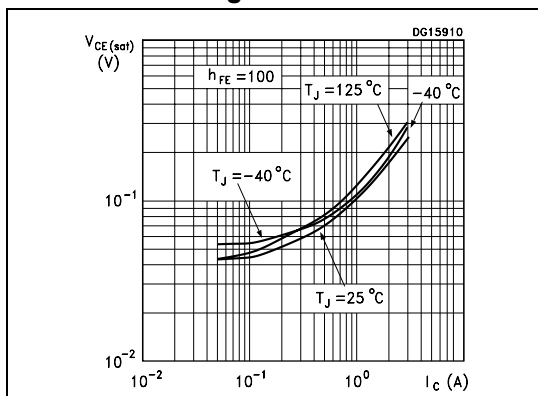
**Figure 1. DC current gain**



**Figure 2. DC current gain**



**Figure 3. Collector-emitter saturation voltage**



**Figure 4. Base-emitter saturation voltage**

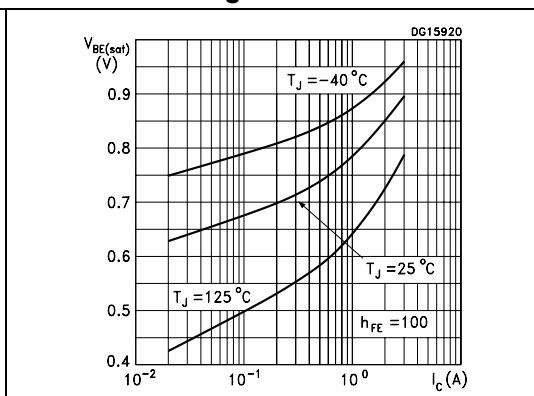
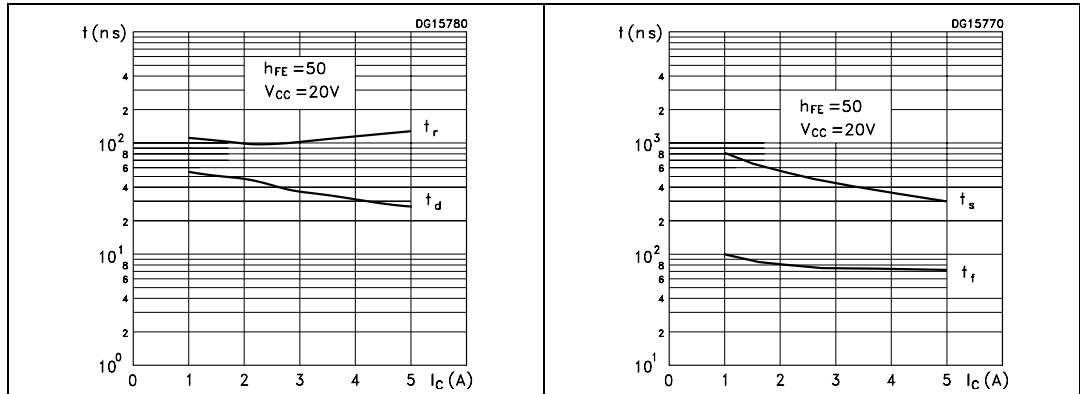
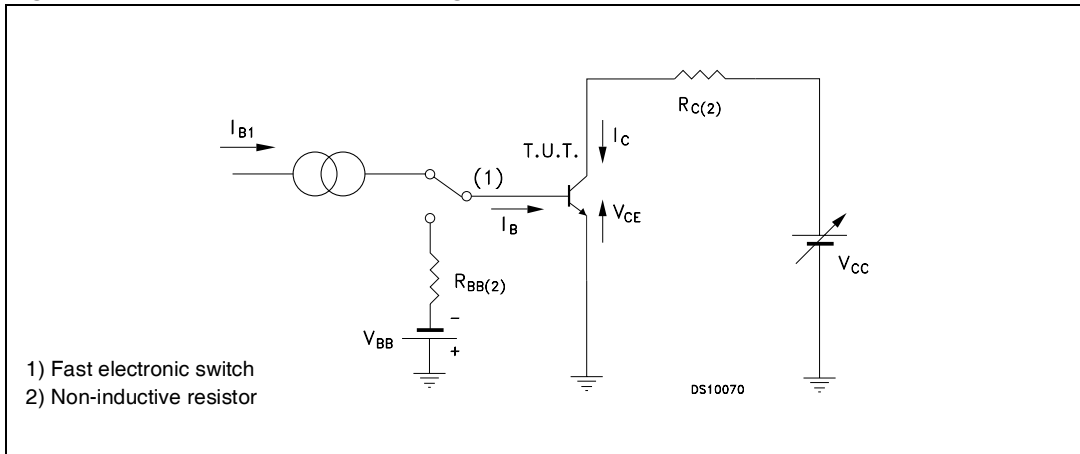


Figure 5. Switching time resistive load Figure 6. Switching time resistive load



## 2.2 Test circuits

Figure 7. Resistive load switching test circuit

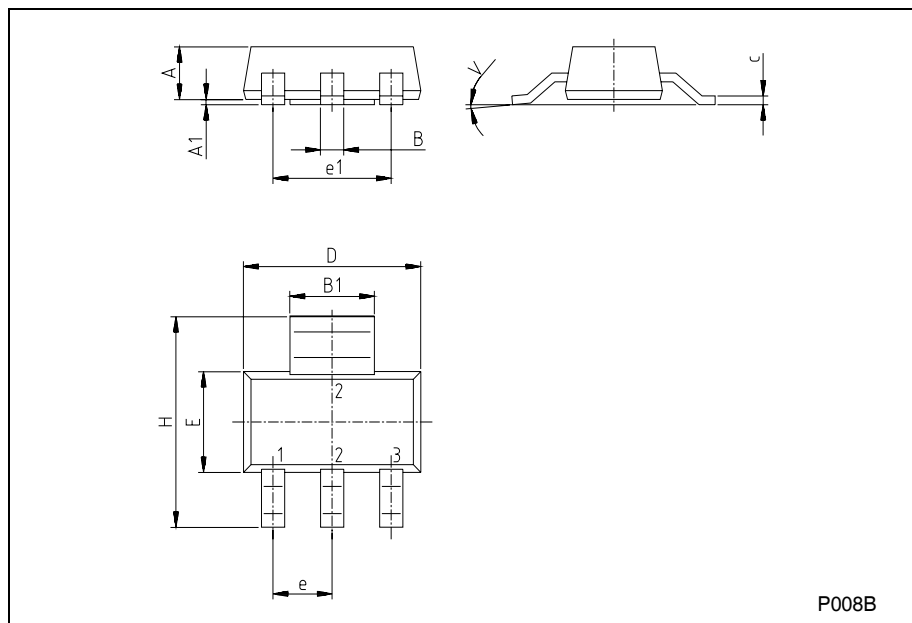


### 3 Package mechanical data

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](http://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				





## 4 Revision history

Table 4. Revision history

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

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