STX690A

High performance low voltage NPN transistor

Features

- Very low collector to emitter saturation voltage
- DC current gain, h_{FE} > 100
- 3 A continuous collector current
- 40 V breakdown voltage $V_{(BR)CER}$

Applications

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

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.

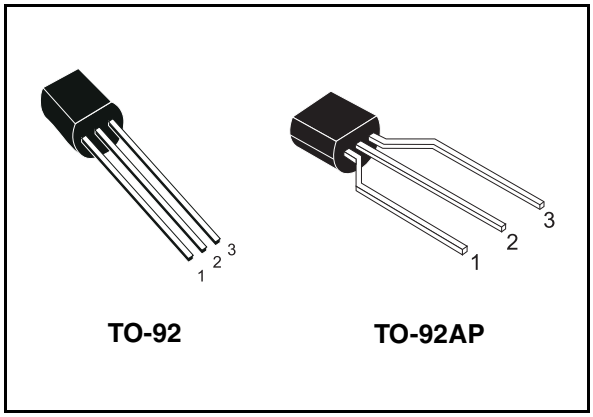


Figure 1. Internal schematic diagram

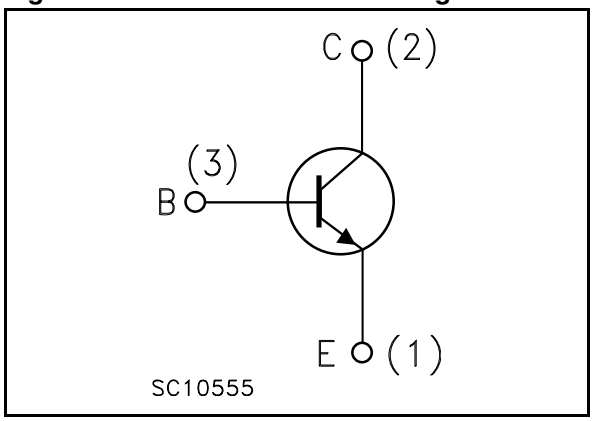


Table 1. Device summary

Order code	Marking	Package	Packaging
STX690A	X690A	TO-92	Bulk
STX690A-AP	X690A	TO-92 AP	Ammopack

1 Electrical ratings

Table 2. Absolute maximum ratings

Symbol	Parameter	Value	Unit
V_{CBO}	Collector-base voltage (I_E = 0)	40	V
V_{CER}	Collector-emitter voltage (R_{BE} = 47 Ω)	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 < 5 ms)	6	A
P_{tot}	Total dissipation at T_{amb} = 25 °C	0.9	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
$R_{thj\text{-}amb}$	Thermal resistance junction-amb	max	139	°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_{CBO}	Collector cut-off current (I_E = 0)	V_{CB} = 30 V V_{CB} = 30 V; T_C = 100 °C			10 100	µA µA
I_{EBO}	Emitter cut-off current (I_C = 0)	V_{EB} = 4 V			10	µA
$V_{(BR)CEO}$ (1)	Collector-emitter breakdown voltage (I_B = 0)	I_C = 10 mA	30			V
$V_{(BR)CER}$ (1)	Collector-emitter breakdown voltage (R_{BE} = 47 Ω)	I_C = 10 mA	40			V
$V_{(BR)CBO}$	Collector-base breakdown voltage (I_E = 0)	I_C = 100 µA	40			V
$V_{(BR)EBO}$	Emitter-base breakdown voltage (I_C = 0)	I_E = 100 µA	5			V
$V_{CE(sat)}$ (1)	Collector-emitter saturation voltage	I_C = 0.5 A I_B = 5 mA I_C = 1.2 A I_B = 20 mA I_C = 2 A I_B = 20 mA I_C = 3 A I_B = 100 mA I_C = 3 A I_B = 100 mA T_C = 100 °C		0.08 0.1 0.175 0.2 0.3	0.15 0.22 0.35 0.4	V V V V V
$V_{BE(sat)}$ (1)	Base-emitter saturation voltage	I_C = 1 A I_B = 10 mA		0.8	1	V
$V_{BE(on)}$ (1)	Base-emitter on voltage	I_C = 1 A V_{CE} = 2 V		0.8	1	V
h_{FE} (1)	DC current gain	I_C = 10 mA V_{CE} = 2 V I_C = 500 mA V_{CE} = 2 V I_C = 1 A V_{CE} = 2 V I_C = 2 A V_{CE} = 1 V I_C = 3 A V_{CE} = 1 V	100 100 100 100 90	200 200 160 130	400 400	

Table 4. Electrical characteristics (continued)

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
f_t	Transition frequency	I_C = 50 mA V_{CE} = 5 V f = 50 MHz		100		MHz
	Resistive load					
t_d	Delay time	I_C = 3 A V_{CC} = 20 V		50		ns
t_r	Rise time	I_{B1} = -I_{B2} = 60 mA		120		ns
t_s	Storage time	see *Figure 8*		465		ns
t_f	Fall time			80		ns

1. Pulse duration = 300 µs, duty cycle ≤1.5%

2.1 Electrical characteristics (curves)

Figure 2. DC current gain

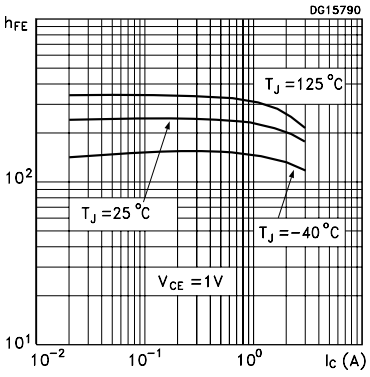


Figure 3. DC current gain

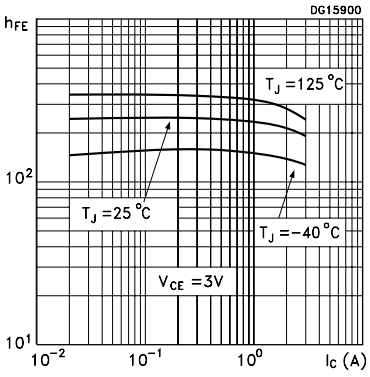


Figure 4. Collector-emitter saturation voltage

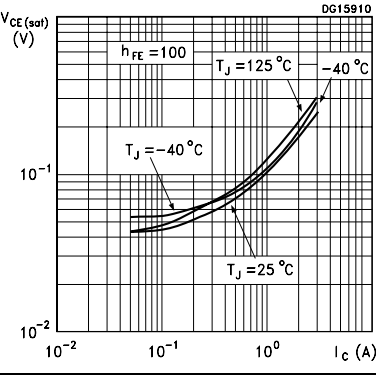


Figure 5. Base-emitter saturation voltage

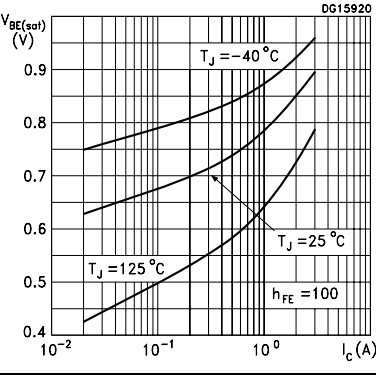


Figure 6. Switching time resistive load

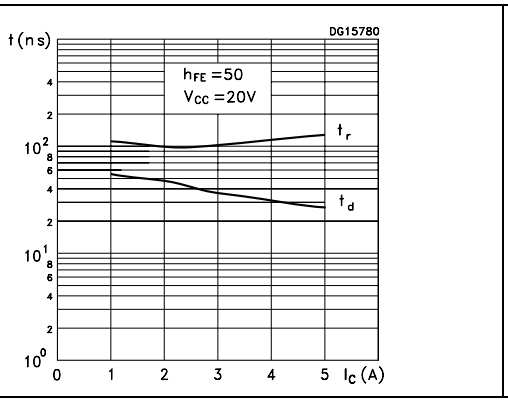
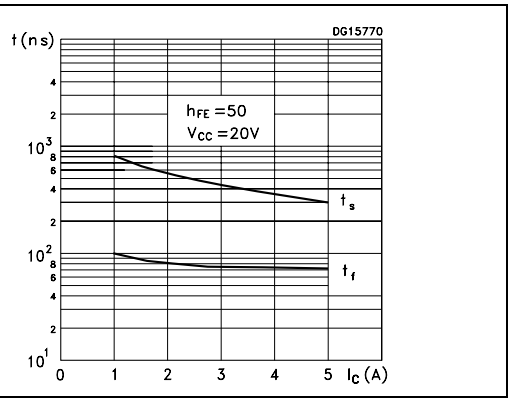
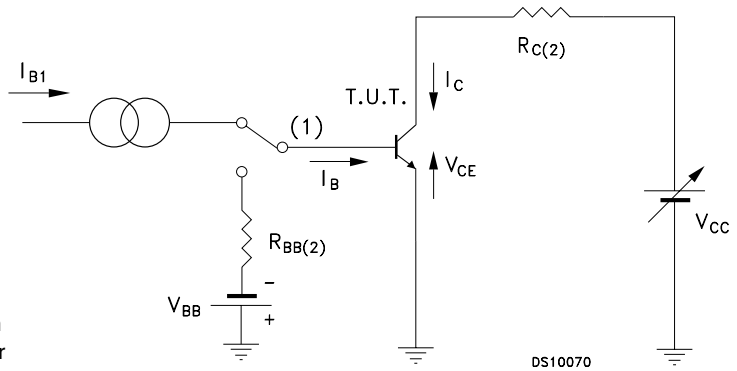


Figure 7. Switching time resistive load



2.2 Test circuit

Figure 8. Resistive load switching test circuit



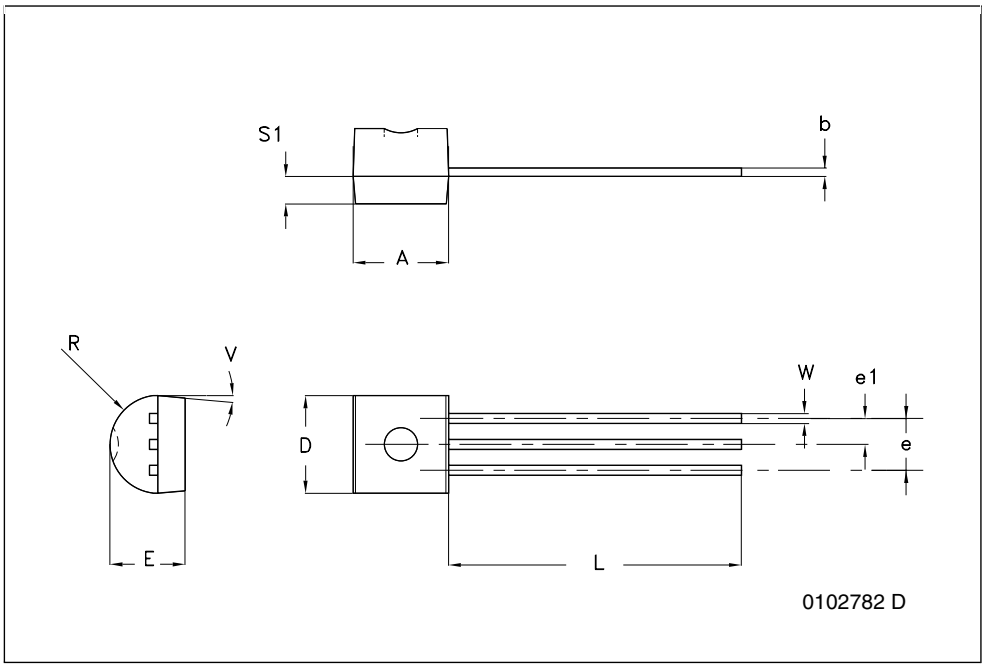
1) Fast electronic switch
2) Non-inductive resistor

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 products status are available at: www.st.com. ECOPACK is an ST trademark.

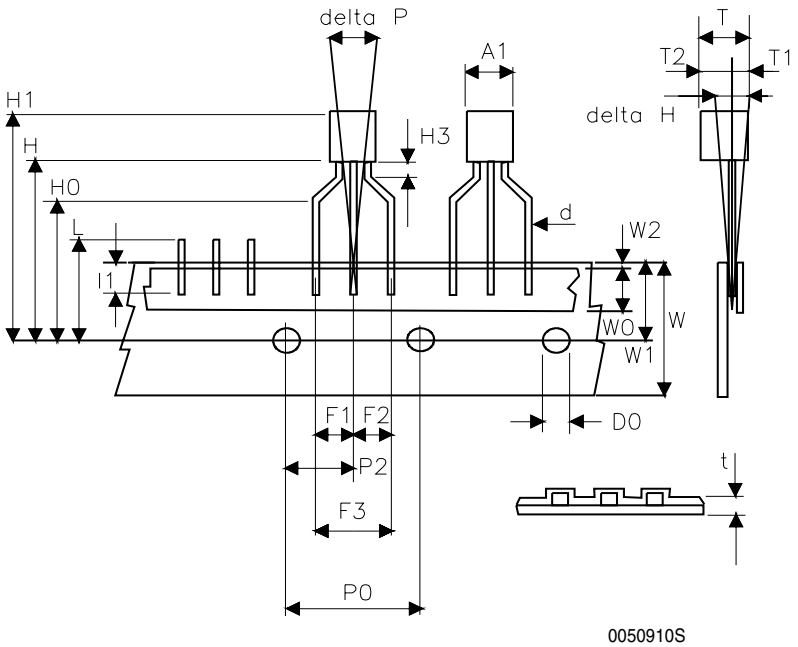
TO-92 bulk shipment mechanical data

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
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



4 Revision history

Table 5. Document revision history

Date	Revision	Changes
09-Feb-2009	1	Initial release.

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