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## High voltage NPN power transistor

### Features

- High voltage capability
- High DC current gain
- Minimum lot-to-lot spread for reliable operation

### Applications

- Switching mode power supply
- Battery charger

### Description

The device is manufactured using high voltage multi epitaxial planar technology for high switching speeds and high voltage withstand capability. The device is designed for use in SMPS and battery charger.

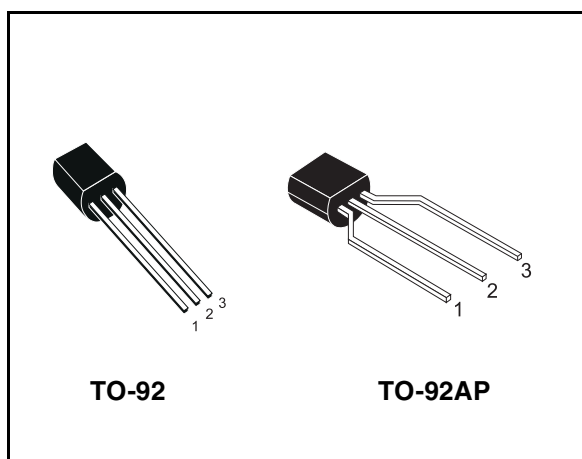


Figure 1. Internal schematic diagram

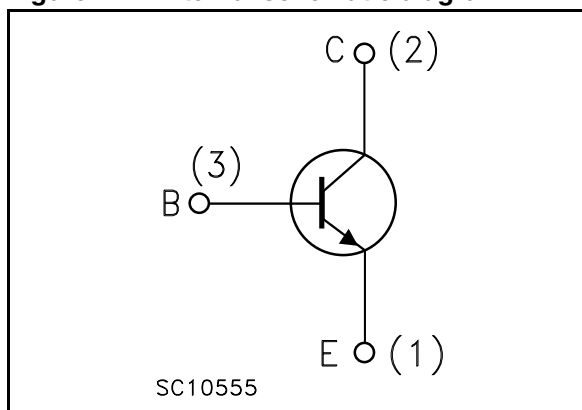


Table 1. Device summary

Order code	Marking	Package	Packaging
STX616	X616	TO-92	Bulk
STX616-AP	X616	TO-92AP	Ammopack

# 1 Electrical characteristics

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

**Table 2. Absolute maximum rating**

Symbol	Parameter	Value	Unit
$V_{\text{CES}}$	Collector-emitter voltage ( $V_{\text{BE}} = 0$ )	980	V
$V_{\text{CEO}}$	Collector-emitter voltage ( $I_{\text{B}} = 0$ )	500	V
$V_{\text{EBO}}$	Emitter-base voltage ( $I_{\text{C}} = 0$ )	12	V
$I_{\text{C}}$	Collector current	1.5	A
$I_{\text{CM}}$	Collector peak current ( $t_{\text{P}} < 5\text{ms}$ )	2.4	A
$I_{\text{B}}$	Base current	0.8	A
$I_{\text{BM}}$	Base peak current ( $t_{\text{P}} < 5\text{ms}$ )	1.2	A
$P_{\text{tot}}$	Total dissipation at $T_{\text{C}} = 25^{\circ}\text{C}$	2.8	W
$T_{\text{stg}}$	Storage temperature	-65 to 150	$^{\circ}\text{C}$
$T_{\text{J}}$	Max. operating junction temperature	150	$^{\circ}\text{C}$

**Table 3. Thermal data**

Symbol	Parameter	Value	Unit
$R_{\text{thj-case}}$	Thermal resistance junction-case	max 44.6	$^{\circ}\text{C}/\text{W}$
$R_{\text{thj-amb}}$	Thermal resistance junction-ambient	max 150	$^{\circ}\text{C}/\text{W}$

## 2 Electrical characteristics

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

**Table 4. Electrical characteristics**

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$I_{\text{CES}}$	Collector cut-off current ( $V_{\text{BE}} = 0$ )	$V_{\text{CE}} = 980\text{V}$ $V_{\text{CE}} = 980\text{V}$ $T_{\text{c}} = 125^{\circ}\text{C}$			50 0.5	$\mu\text{A}$ mA
$V_{\text{CE(sus)}}^{(1)}$	Collector-emitter sustaining voltage ( $I_{\text{B}} = 0$ )	$I_{\text{C}} = 10\text{mA}$	500			V
$V_{\text{EBO}}$	Emitter-base voltage ( $I_{\text{C}} = 0$ )	$I_{\text{E}} = 1\text{mA}$	12			V
$V_{\text{CE(sat)}}^{(1)}$	Collector-emitter saturation voltage	$I_{\text{C}} = 0.2\text{A}$ $I_{\text{B}} = 40\text{mA}$ $I_{\text{C}} = 1\text{A}$ $I_{\text{B}} = 200\text{mA}$			0.5 1	V V
$V_{\text{BE(sat)}}^{(1)}$	Base-emitter saturation voltage	$I_{\text{C}} = 0.2\text{A}$ $I_{\text{B}} = 40\text{mA}$ $I_{\text{C}} = 1\text{A}$ $I_{\text{B}} = 200\text{mA}$			1 1.4	V V
$h_{\text{FE}}^{(1)}$	DC current gain	$I_{\text{C}} = 500\mu\text{A}$ $V_{\text{CE}} = 2\text{V}$ $I_{\text{C}} = 200\text{mA}$ $V_{\text{CE}} = 5\text{V}$ $I_{\text{C}} = 500\text{mA}$ $V_{\text{CE}} = 5\text{V}$ $I_{\text{C}} = 1.5\text{A}$ $V_{\text{CE}} = 5\text{V}$	17 25 12 4			
$t_{\text{on}}$ $t_{\text{s}}$ $t_{\text{f}}$	RESISTIVE LOAD Turn-on time Storage time Fall time	$V_{\text{CC}} = 250\text{V}$ $I_{\text{C}} = 250\text{mA}$ $I_{\text{B1}} = 65\text{mA}$ $I_{\text{B2}} = -130\text{mA}$			0.2 5 0.65	$\mu\text{s}$ $\mu\text{s}$ $\mu\text{s}$
$t_{\text{on}}$ $t_{\text{s}}$ $t_{\text{f}}$	RESISTIVE LOAD Turn-on time Storage time Fall time	$V_{\text{CC}} = 250\text{V}$ $I_{\text{C}} = 0.8\text{A}$ $I_{\text{B1}} = 160\text{mA}$ $I_{\text{B2}} = -0.4\text{A}$			1 2.5 0.35	$\mu\text{s}$ $\mu\text{s}$ $\mu\text{s}$
$t_{\text{s}}$ $t_{\text{f}}$	INDUCTIVE LOAD Storage time Fall time	$V_{\text{cl}} = 300\text{V}$ $I_{\text{C}} = 250\text{mA}$ $I_{\text{B1}} = 65\text{mA}$ $I_{\text{B2}} = -130\text{mA}$ $L = 200\mu\text{H}$			5 0.5	$\mu\text{s}$ $\mu\text{s}$
$t_{\text{s}}$ $t_{\text{f}}$	INDUCTIVE LOAD Storage time Fall time	$V_{\text{cl}} = 300\text{V}$ $I_{\text{C}} = 0.8\text{A}$ $I_{\text{B1}} = 160\text{mA}$ $I_{\text{B2}} = -0.4\text{A}$ $L = 200\mu\text{H}$			2.5 0.25	$\mu\text{s}$ $\mu\text{s}$

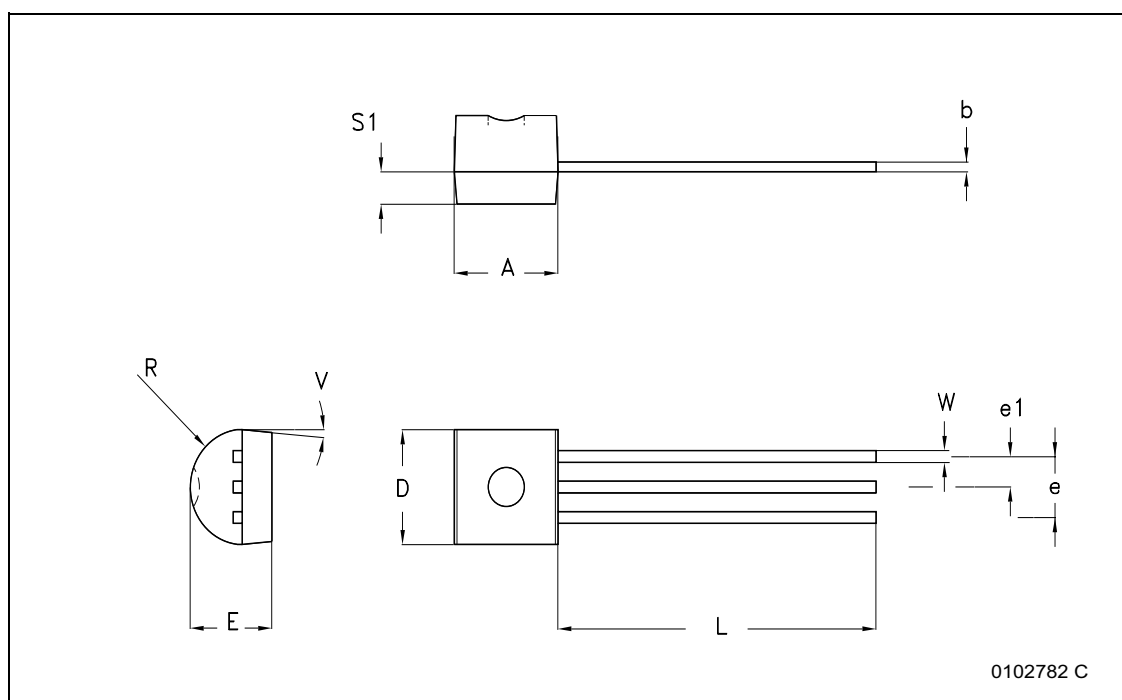
Note (1) Pulsed duration = 300  $\mu\text{s}$ , duty cycle  $\leq 5\%$

### 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)

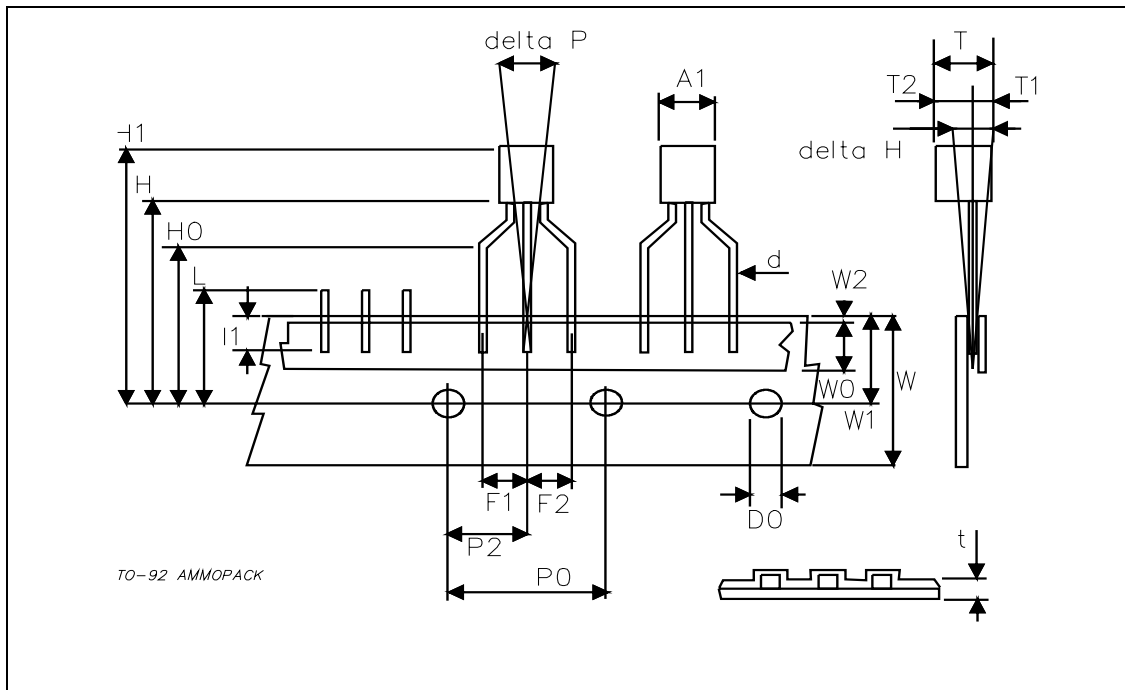
## TO-92 BULK SHIPMENT MECHANICAL DATA

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°	



**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
06-Jun-2007	1	Initial release.
22-Oct-2007	2	Added TO-92AP package.



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