



## 2STX2220

### High Gain Low Voltage PNP Power Transistor

#### General features

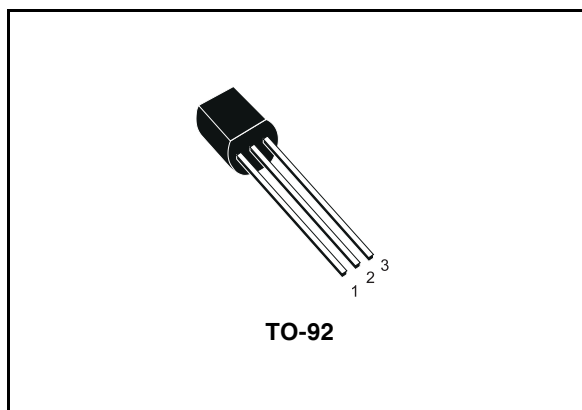
- Very low Collector to Emitter saturation voltage
- D.C. Current gain,  $h_{FE} > 100$
- 1.5 A continuous collector current
- In compliance with the 2002/93/EC European Directive

#### Description

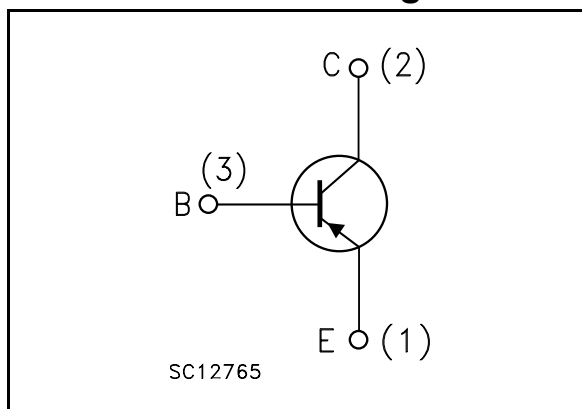
The device is a PNP transistor manufactured using new "PB-HDC" (Power Bipolar High Density Current) technology. The resulting transistor shows exceptional high gain performances coupled with very low saturation voltage.

#### Applications

- Power management in portable equipment
- Switching regulator in battery charger applications



#### Internal schematic diagram



#### Order codes

Part Number	Marking	Package	Packing
2STX2220	X2220	TO-92	Bulk

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# 1 Electrical ratings

**Table 1. Absolute maximum rating**

Symbol	Parameter	Value	Unit
$V_{CBO}$	Collector-base voltage ( $I_E = 0$ )	-20	V
$V_{CEO}$	Collector-emitter voltage ( $I_B = 0$ )	-20	V
$V_{EBO}$	Emitter-base voltage ( $I_C = 0$ )	-5	V
$I_C$	Collector current	-1.5	A
$I_{CM}$	Collector peak current ( $t_P < 5\text{ms}$ )	-3	A
$I_B$	Base current	-0.1	A
$I_{BM}$	Base peak current ( $t_P < 5\text{ms}$ )	-0.2	A
$P_{tot}$	Total dissipation at $T_{amb} = 25^\circ\text{C}$	0.9	W
$T_{stg}$	Storage temperature	-65 to 150	$^\circ\text{C}$
$T_J$	Max. operating junction temperature	150	$^\circ\text{C}$

**Table 2. Thermal data**

Symbol	Parameter	Value	Unit
$R_{thj-case}$	Thermal resistance junction-case max	44.6	$^\circ\text{C/W}$
$R_{thj-amb}$	Thermal resistance junction-amb max	139	$^\circ\text{C/W}$

## 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 ( $I_{\text{E}} = 0$ )	$V_{\text{CB}} = -20\text{V}$			-0.1	$\mu\text{A}$
$I_{\text{EBO}}$	Emitter cut-off current ( $I_{\text{C}} = 0$ )	$V_{\text{EB}} = -5\text{V}$			-0.1	$\mu\text{A}$
$V_{(\text{BR})\text{CEO}}^{(2)}$	Collector-emitter breakdown voltage ( $I_{\text{B}} = 0$ )	$I_{\text{C}} = -10\text{mA}$	-20			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	$I_{\text{C}} = -0.5\text{A}$ $I_{\text{B}} = -50\text{mA}$			-0.25	V
		$I_{\text{C}} = -1.5\text{A}$ $I_{\text{B}} = -150\text{mA}$			-0.45	V
$V_{\text{BE}(\text{sat})}^{(2)}$	Base-emitter saturation voltage	$I_{\text{C}} = -0.5\text{A}$ $I_{\text{B}} = -50\text{mA}$			-1	V
		$I_{\text{C}} = -1.5\text{A}$ $I_{\text{B}} = -150\text{mA}$			-1.1	V
$V_{\text{BE}(\text{on})}^{(2)}$	Base-emitter on voltage	$I_{\text{C}} = -1\text{A}$ $V_{\text{CE}} = -2\text{V}$			-1	V
$h_{\text{FE}}^{(2)}$	DC current gain	$I_{\text{C}} = -100\text{mA}$ $V_{\text{CE}} = -2\text{V}$	200		600	
		$I_{\text{C}} = -500\text{mA}$ $V_{\text{CE}} = -2\text{V}$	170			
		$I_{\text{C}} = -1.5\text{A}$ $V_{\text{CE}} = -2\text{V}$	120			
		$I_{\text{C}} = -3\text{A}$ $V_{\text{CE}} = -2\text{V}$	75			
$C_{\text{CBO}}$	Collector-base capacitance	$I_{\text{E}} = 0$ $V_{\text{CB}} = -10\text{V}$ $f = 1\text{MHz}$		30		pF
$t_{\text{on}}$ $t_{\text{off}}$	Resistive load Turn-on time	$I_{\text{C}} = -1.5\text{A}$ $V_{\text{CC}} = -10\text{V}$ $I_{\text{B}1} = -I_{\text{B}2} = -150\text{mA}$		60		ns
	Turn-off time			250		ns

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

## 2.1 Electrical characteristics (curves)

Figure 1. Output characteristics

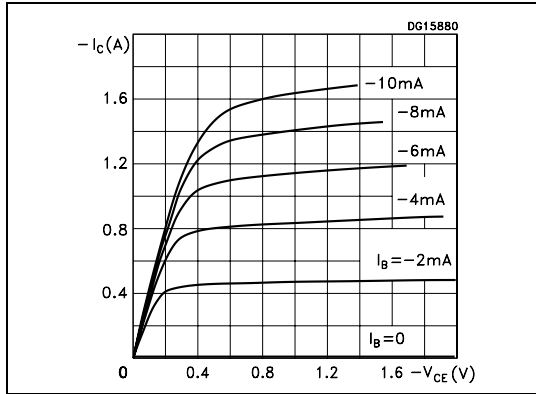


Figure 2. DC current gain

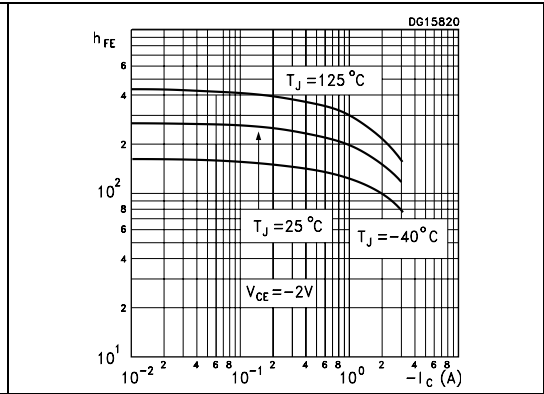


Figure 3. DC current gain

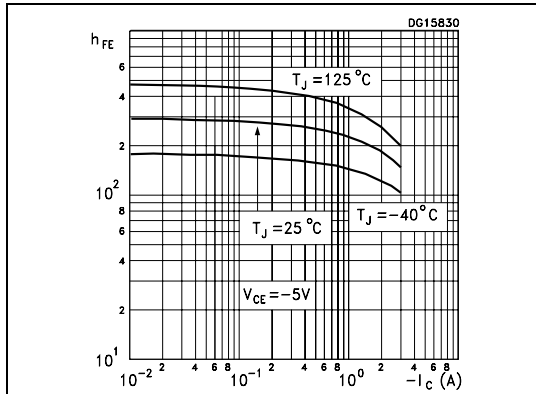


Figure 4. Collector-emitter saturation voltage

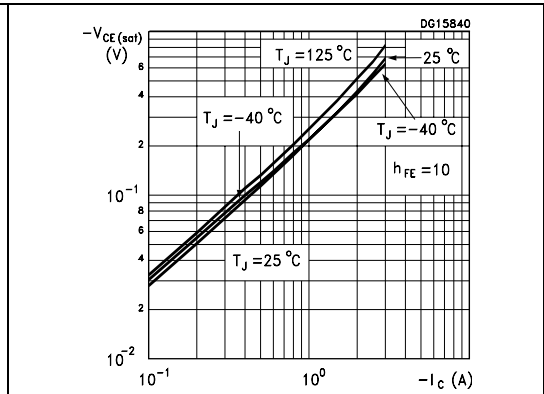


Figure 5. Base-emitter saturation voltage

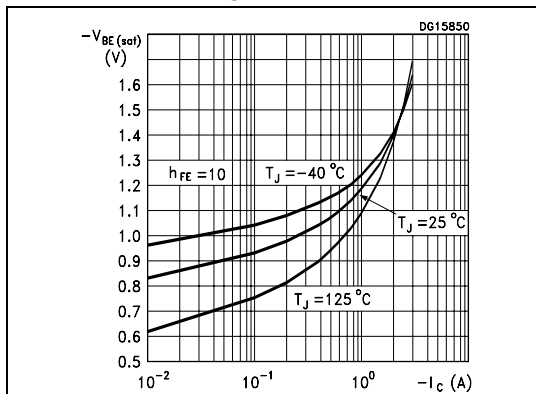


Figure 6. Base-emitter on voltage

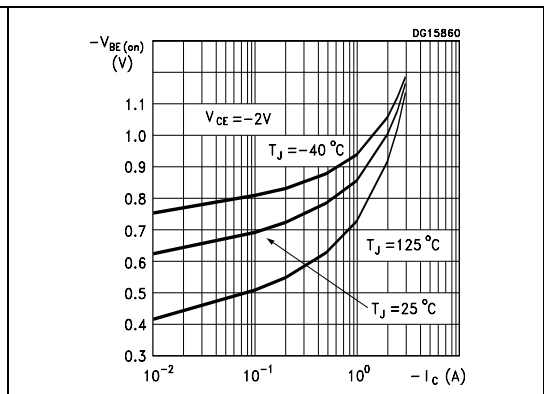


Figure 7. Capacitance curves

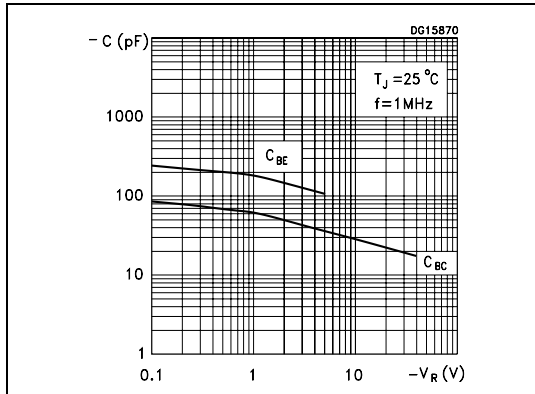


Figure 8. Switching time resistive load

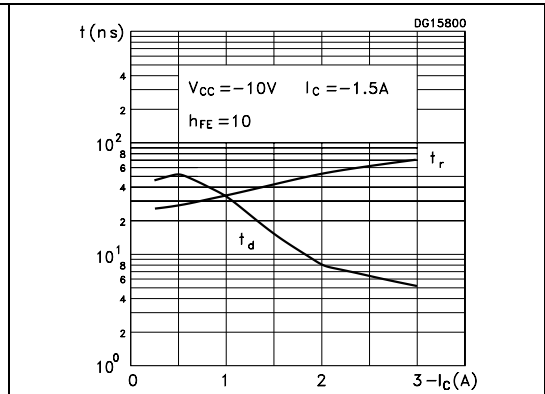
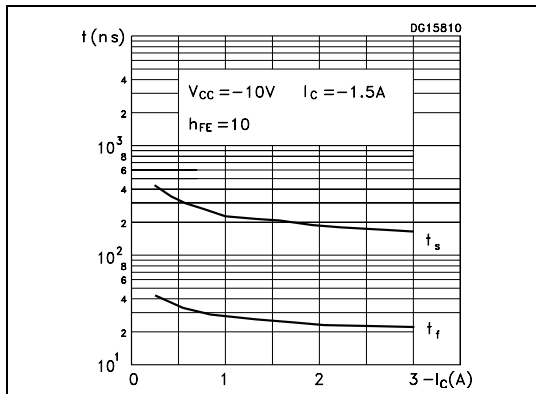
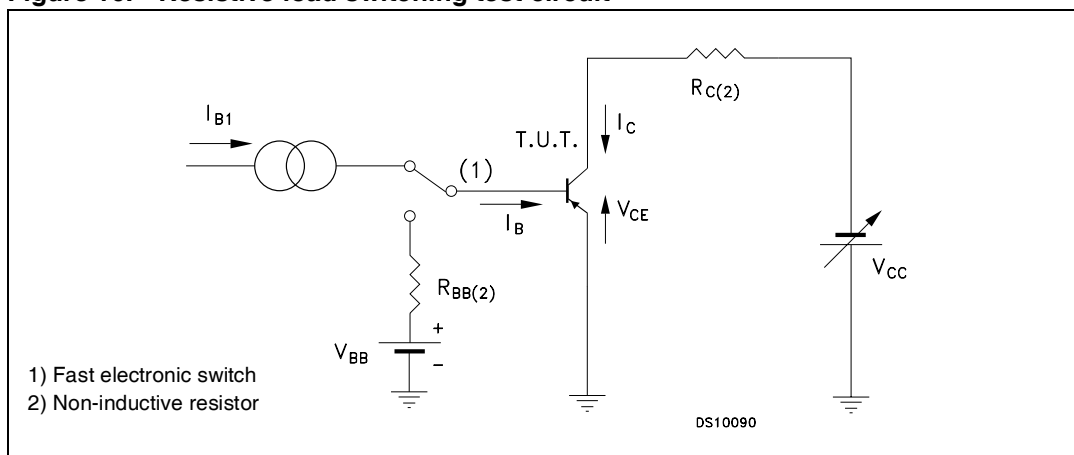


Figure 9. Switching time resistive load



## 2.2 Test circuits

Figure 10. Resistive load switching test circuit



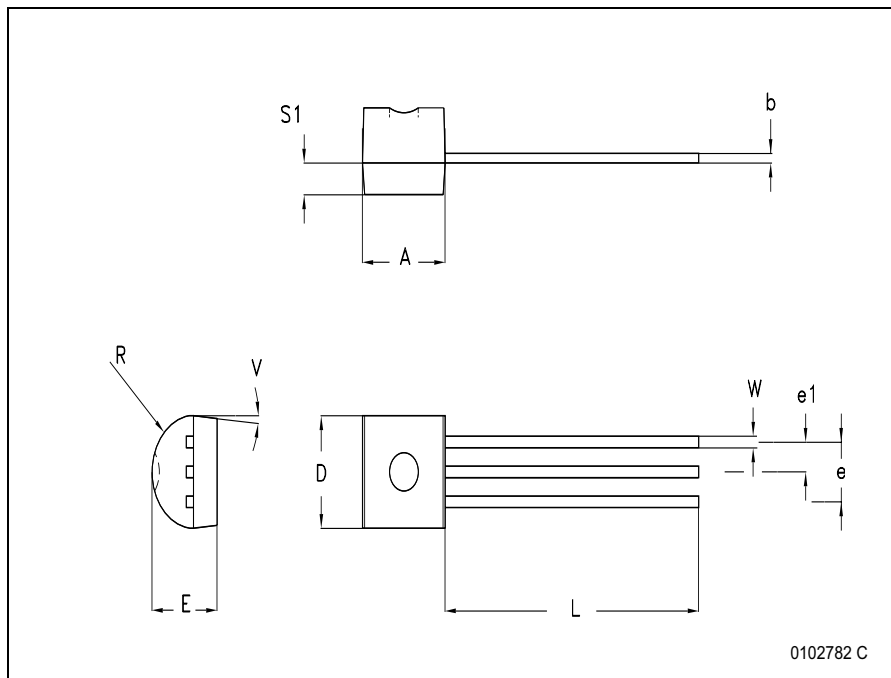
### 3 Package mechanical data

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)



## 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°	



## 4 Revision history

**Table 4. Revision history**

Date	Revision	Changes
19-Jun-2006	1	Initial release.
25-Sep-2006	2	New maturity code.

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