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## High gain Low Voltage PNP power transistor

### Features

- Very low Collector to Emitter saturation voltage
- D.C. Current gain,  $h_{FE} > 100$
- 1.5 A continuous collector current

### Applications

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

### 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.

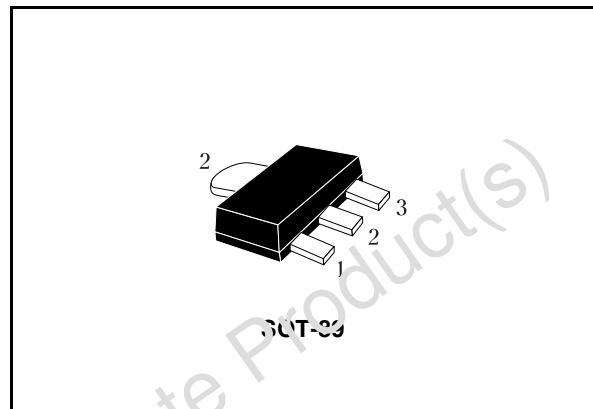


Figure 1. Internal schematic diagram

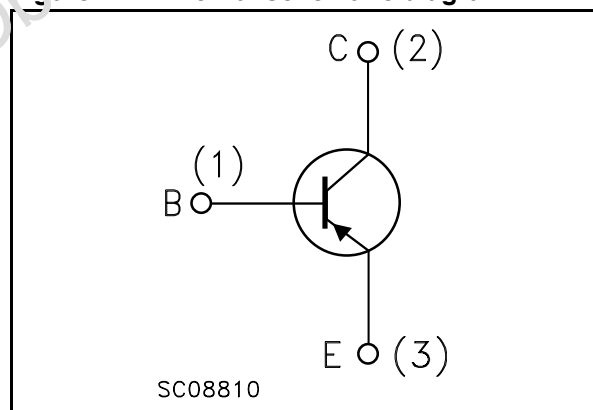


Table 1. Device summary

Order code	Marking	Package	Packaging
2STF2220	2220	SOT-89	Tape & reel

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## Contents

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# 1 Electrical ratings

**Table 2. 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 $T_{amb} = 25^\circ\text{C}$	1.4	W
$T_{stg}$	Storage temperature	-65 to 150	$^\circ\text{C}$
$T_J$	Max. operating junction temperature	150	$^\circ\text{C}$

**Table 3. Thermal data**

Symbol	Parameter	Value	Unit
$R_{thj-amb}^{(1)}$	Thermal resistance junction-amb max	89	$^\circ\text{C}/\text{W}$

(1) Device mounted on PCB area of  $1\text{cm}^2$

## 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
$I_{\text{CBO}}$	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			
$C_{\text{CBQ}}$	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	$I_{\text{C}} = -1.5\text{A}$ $V_{\text{CC}} = -10\text{V}$		60		ns
	Turn-off time	$I_{\text{B}1} = -I_{\text{B}2} = -150\text{mA}$		250		ns

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

## 2.1 Electrical characteristics (curves)

Figure 2. Output characteristics

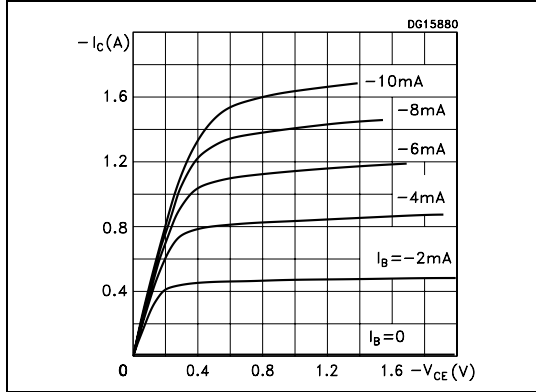


Figure 3. Derating curve

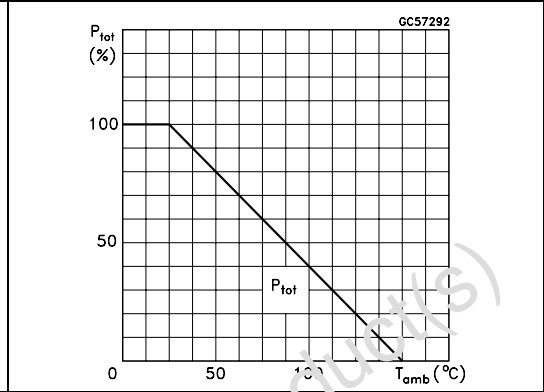


Figure 4. DC current gain

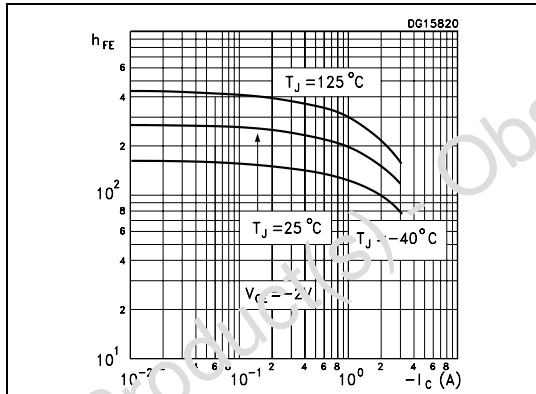


Figure 5. DC current gain

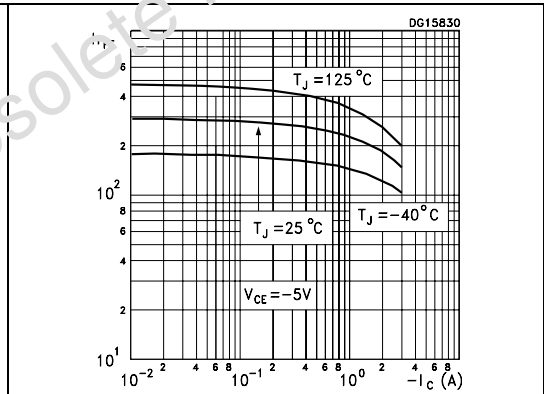


Figure 6. Collector-emitter saturation voltage

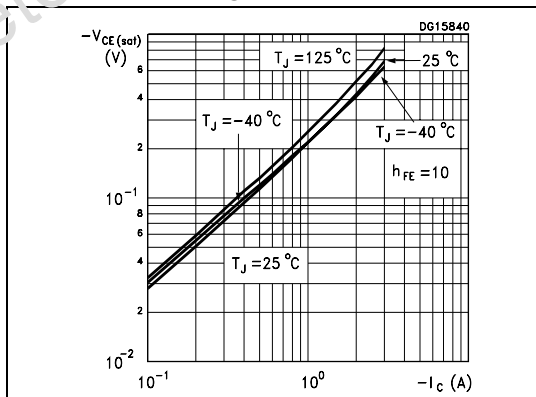


Figure 7. Base-emitter saturation voltage

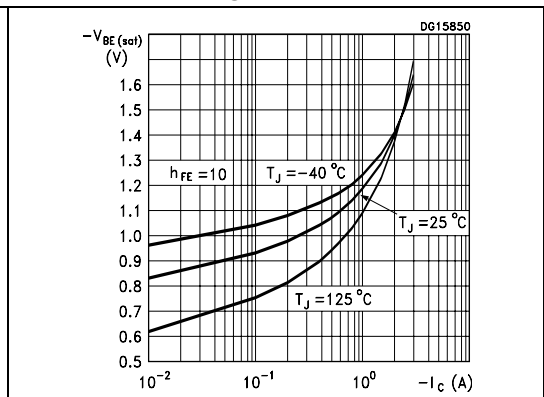


Figure 8. Base-emitter on voltage

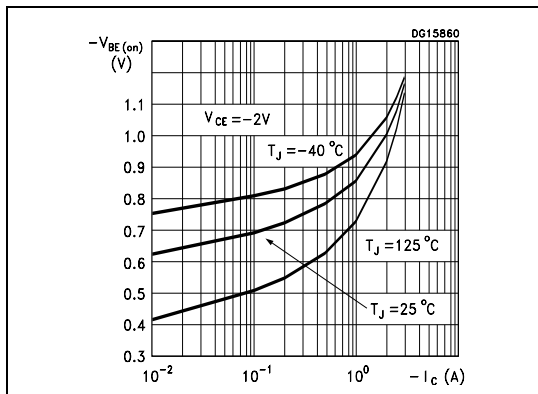


Figure 9. Capacitance curves

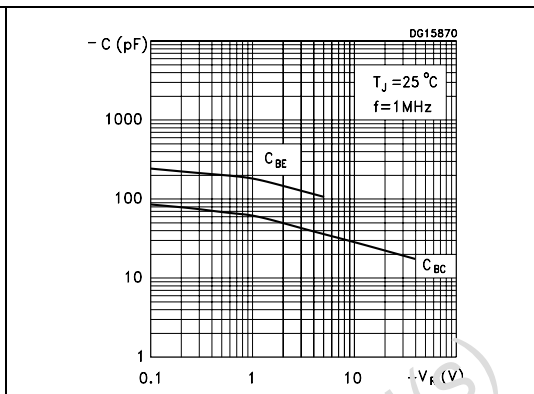


Figure 10. Switching time resistive load

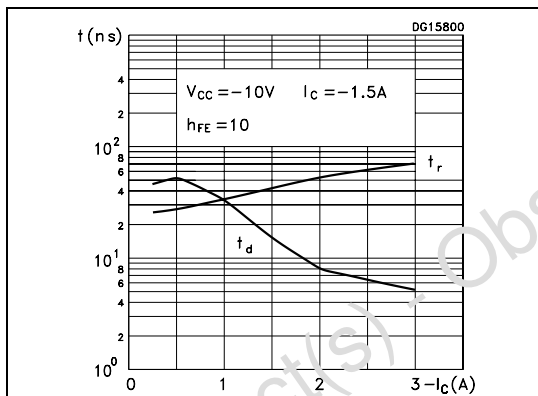
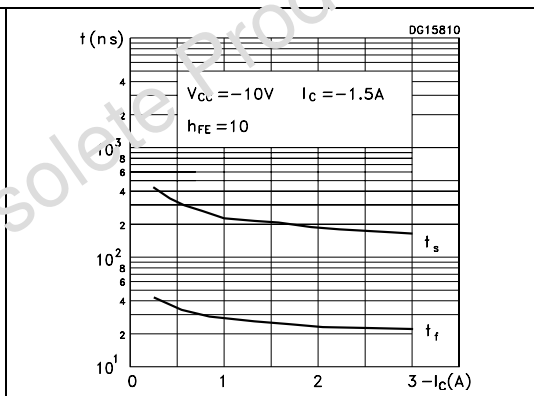
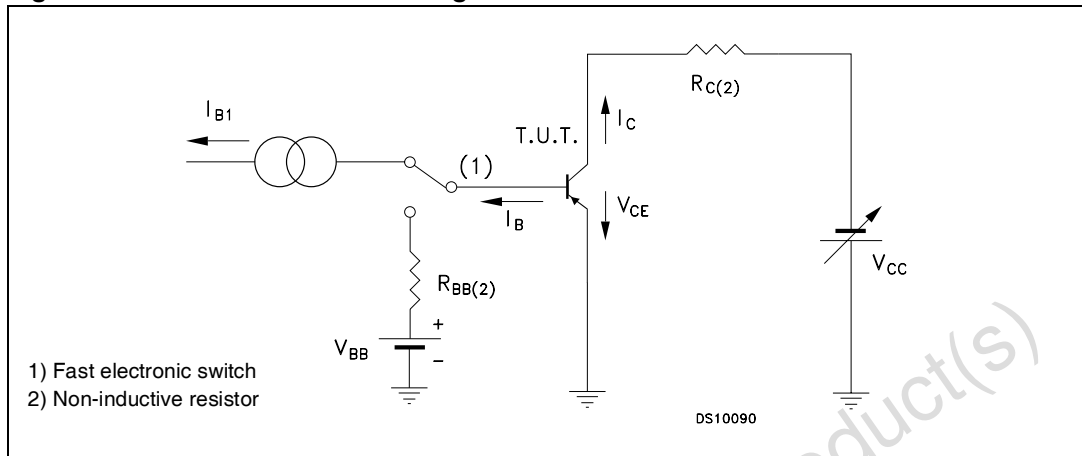


Figure 11. Switching time resistive load



## 2.2 Test circuits

Figure 12. Resistive load switching test circuit



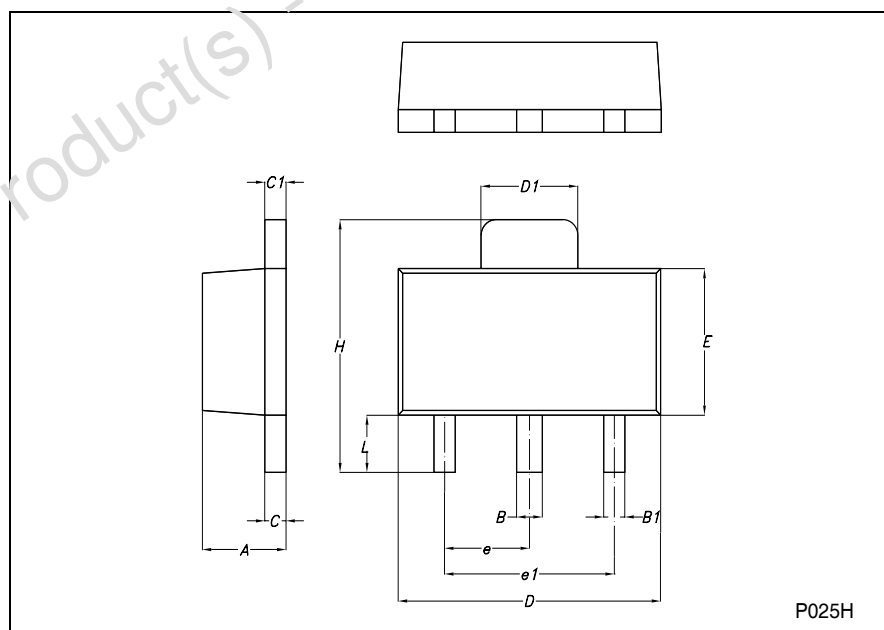
### 3 Package mechanical data

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)

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## SOT-89 MECHANICAL DATA

DIM.	mm			mils		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
A	1.4		1.6	55.1		63.0
B	0.44		0.56	17.3		22.0
B1	0.36		0.48	14.2		13.9
C	0.35		0.44	13.8		17.3
C1	0.35		0.44	13.8		17.3
D	4.4		4.6	173.2		181.1
D1	1.62		1.83	63.8		72.0
E	2.29		2.6	90.2		102.4
e	1.42		1.57	55.9		61.8
e1	2.92		3.07	115.0		120.9
H	3.94		4.25	155.1		167.3
L	0.89		1.2	35.0		47.2



## 4 Revision history

**Table 5. Document revision history**

Date	Revision	Changes
19-Jun-2006	1	Initial release.
27-Sep-2006	2	New maturity code.
18-Sep-2007	3	Added <a href="#">Figure 3</a> .

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