

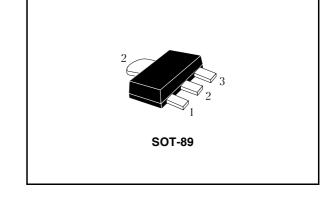
### High gain Low Voltage PNP power transistor

#### **Features**

- Very low Collector to Emitter saturation voltage
- D.C. Current gain, h<sub>FE</sub> >100
- 1.5 A continuous collector current

#### **Applications**

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



#### **Description**

The device in 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

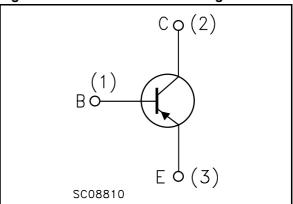


Table 1. Device summary

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

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2STF2220 Electrical ratings

# 1 Electrical ratings

Table 2. Absolute maximum rating

Symbol	Parameter	Value	Unit
V <sub>CBO</sub>	Collector-base voltage (I <sub>E</sub> = 0)	-20	V
V <sub>CEO</sub>	Collector-emitter voltage (I <sub>B</sub> = 0)	-20	V
V <sub>EBO</sub>	Emitter-base voltage (I <sub>C</sub> = 0)	-5	V
I <sub>C</sub>	Collector current	-1.5	Α
I <sub>CM</sub>	Collector peak current (t <sub>P</sub> < 5ms)	-3	Α
I <sub>B</sub>	Base current	-0.1	Α
I <sub>BM</sub>	Base peak current (t <sub>P</sub> < 5ms)	-0.2	Α
P <sub>tot</sub>	Total dissipation at T <sub>amb</sub> = 25°C	1.4	W
T <sub>stg</sub>	Storage temperature	-65 to 150	°C
T <sub>J</sub>	Max. operating junction temperature	150	°C

Table 3. Thermal data

Symbol	Parameter	Value	Unit
R <sub>thj-amb</sub> <sup>(1)</sup>	Thermal resistance junction-amb max	89	°C/W

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

Electrical characteristics 2STF2220

# 2 Electrical characteristics

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

Table 4. Electrical characteristics

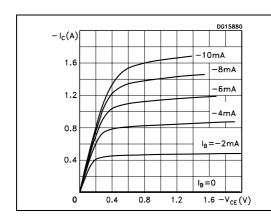
Symbol	Parameter	Test Conditions	Min.	Тур.	Max.	Unit
I <sub>CBO</sub>	Collector cut-off current (I <sub>E</sub> =0)	V <sub>CB</sub> = -20V			-0.1	μА
I <sub>EBO</sub>	Emitter cut-off current (I <sub>C</sub> =0)	V <sub>EB</sub> = -5V			-0.1	μА
V <sub>(BR)CEO</sub> (2)	Collector-emitter breakdown voltage (I <sub>B</sub> = 0)	I <sub>C</sub> = -10mA	-20			V
V <sub>(BR)EBO</sub>	Emitter-base breakdown voltage (I <sub>C</sub> = 0)	I <sub>E</sub> = -100μA	-5			V
V <sub>CE(sat)</sub> (2)	Collector-emitter saturation voltage	$I_C = -0.5A$ $I_B = -50mA$ $I_C = -1.5A$ $I_B = -150mA$			-0.25 -0.45	V V
V <sub>BE(sat)</sub> (2)	Base-emitter saturation voltage	$I_C = -0.5A$ $I_B = -50mA$ $I_C = -1.5A$ $I_B = -150mA$			-1 -1.1	V V
V <sub>BE(on)</sub> (2)	Base-emitter on voltage	$I_C = -1A$ $V_{CE} = -2V$			-1	٧
h <sub>FE</sub> <sup>(2)</sup>	DC current gain	$\begin{split} & I_{C} = -100 \text{mA} & V_{CE} = -2V \\ & I_{C} = -500 \text{mA} & V_{CE} = -2V \\ & I_{C} = -1.5 \text{A} & V_{CE} = -2V \\ & I_{C} = -3 \text{A} & V_{CE} = -2V \end{split}$	200 170 120 75		600	
C <sub>CBO</sub>	Collector-base capacitance	$I_E = 0$ $V_{CB} = -10V$ f = 1MHz		30		pF
t <sub>on</sub> t <sub>off</sub>	Resistive load Turn-on time Turn-off time	$I_C = -1.5A$ $V_{CC} = -10V$ $I_{B1} = -I_{B2} = -150mA$		60 250		ns ns

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

#### 2.1 Electrical characteristics (curves)

Figure 2. Output characteristics

Figure 3. Derating curve



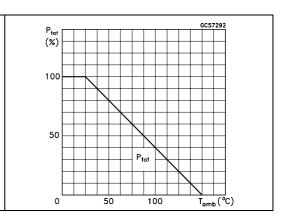
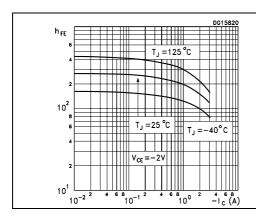


Figure 4. DC current gain

Figure 5. DC current gain



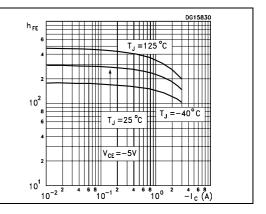
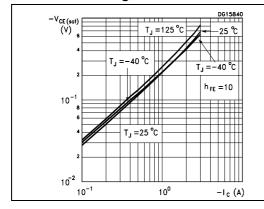
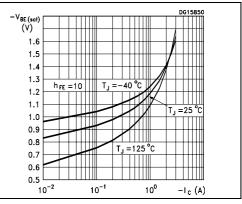


Figure 6. Collector-emitter saturation voltage

Figure 7. Base-emitter saturation voltage





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Electrical characteristics 2STF2220

Figure 8. Base-emitter on voltage

Figure 9. Capacitance curves

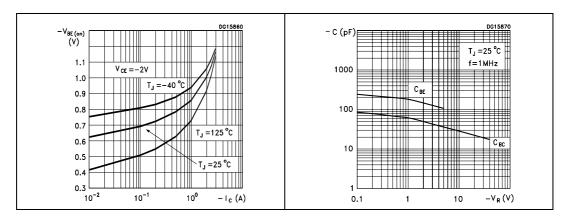
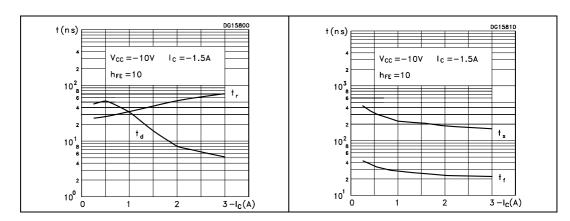
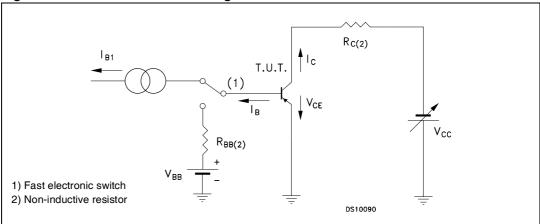


Figure 10. Switching time resistive load Figure 11. Switching time resistive load



#### 2.2 Test circuits

Figure 12. Resistive load switching test circuit

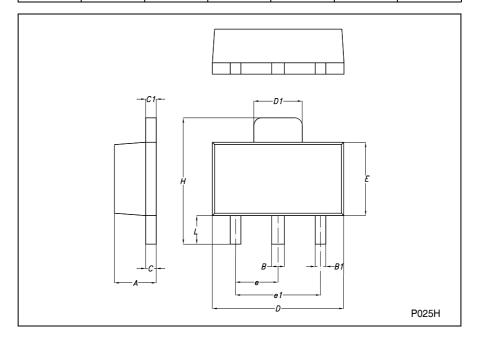


## 3 Package mechanical data

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

#### **SOT-89 MECHANICAL DATA**

DIM.	mm			mils		
Diwi.	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
Α	1.4		1.6	55.1		63.0
В	0.44		0.56	17.3		22.0
B1	0.36		0.48	14.2		18.9
С	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
е	1.42		1.57	55.9		61.8
e1	2.92		3.07	115.0		120.9
Н	3.94		4.25	155.1		167.3
L	0.89		1.2	35.0		47.2



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Revision history 2STF2220

# 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 Figure 3.	

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