

## Low voltage fast-switching NPN power transistor

### Features

- Very low collector-emitter saturation voltage
- High current gain characteristic
- Fast switching speed
- Miniature SOT-23 plastic package for surface mounting circuits

### Applications

- LED
- Battery charger
- Voltage and relay driver
- Voltage regulation

### Description

The 2STR1215 is a NPN transistor manufactured using new "PB-HCD" (power bipolar high current density) technology. The resulting transistor shows exceptional high gain performances coupled with very low saturation voltage. The complementary PNP is the 2STR2215.

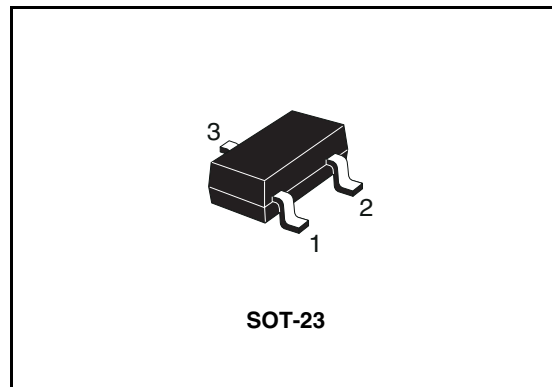


Figure 1. Internal schematic diagram

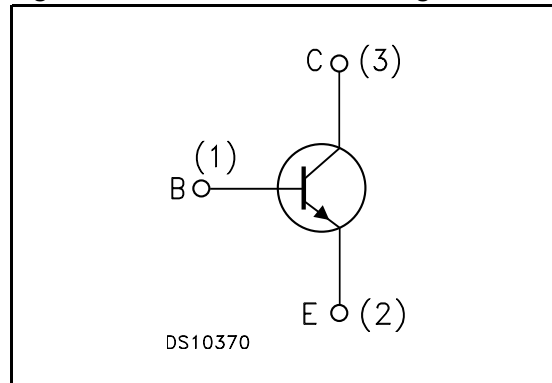


Table 1. Device summary

Order code	Marking	Package	Packaging
2STR1215	115	SOT-23	Tape and reel

# 1 Electrical ratings

**Table 2. Absolute maximum ratings**

Symbol	Parameter	Value	Unit
$V_{CBO}$	Collector-base voltage ( $I_E = 0$ )	15	V
$V_{CEO}$	Collector-emitter voltage ( $I_B = 0$ )	15	V
$V_{EBO}$	Emitter-base voltage ( $I_C = 0$ )	5	V
$I_C$	Collector current	1.5	A
$I_{CM}$	Collector peak current ( $t_P < 5$ ms)	3	A
$P_{tot}$	Total dissipation at $T_{amb} = 25$ °C	0.5	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
$R_{thj-amb}^{(1)}$	Thermal resistance junction-amb max	250	°C/W

1. Device mounted on PCB area of 1cm<sup>2</sup>

## 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 ( $I_{\text{E}} = 0$ )	$V_{\text{CB}} = 15 \text{ V}$			0.1	$\mu\text{A}$
$I_{\text{EBO}}$	Emitter cut-off current ( $I_{\text{C}} = 0$ )	$V_{\text{EB}} = 4 \text{ V}$			0.1	$\mu\text{A}$
$V_{(\text{BR})\text{CBO}}$	Collector-base breakdown voltage ( $I_{\text{E}} = 0$ )	$I_{\text{C}} = 100 \mu\text{A}$	15			V
$V_{(\text{BR})\text{CEO}}^{(1)}$	Collector-emitter breakdown voltage ( $I_{\text{B}} = 0$ )	$I_{\text{C}} = 10 \text{ mA}$	15			V
$V_{(\text{BR})\text{EBO}}$	Emitter-base breakdown voltage ( $I_{\text{C}} = 0$ )	$I_{\text{E}} = 100 \mu\text{A}$	5			V
$V_{\text{CE}(\text{sat})}^{(1)}$	Collector-emitter saturation voltage	$I_{\text{C}} = 0.1 \text{ A}$ $I_{\text{B}} = 1 \text{ mA}$ $I_{\text{C}} = 1 \text{ A}$ $I_{\text{B}} = 100 \text{ mA}$ $I_{\text{C}} = 2 \text{ A}$ $I_{\text{B}} = 200 \text{ mA}$		0.25 0.4	0.15 0.5 0.85	V V V
$V_{\text{BE}(\text{sat})}^{(1)}$	Base-emitter saturation voltage	$I_{\text{C}} = 1 \text{ A}$ $I_{\text{B}} = 100 \text{ mA}$		0.9	1.25	V
$h_{\text{FE}}^{(1)}$	DC current gain	$I_{\text{C}} = 50 \text{ mA}$ $V_{\text{CE}} = 2 \text{ V}$ $I_{\text{C}} = 0.5 \text{ A}$ $V_{\text{CE}} = 2 \text{ V}$ $I_{\text{C}} = 1 \text{ A}$ $V_{\text{CE}} = 2 \text{ V}$ $I_{\text{C}} = 2 \text{ A}$ $V_{\text{CE}} = 2 \text{ V}$	200 200 130 80	280	560	
$C_{\text{CBO}}$	Collector-base capacitance ( $I_{\text{E}} = 0$ )	$V_{\text{CB}} = 10 \text{ V}$ $f = 1 \text{ MHz}$		16		pF
$t_{\text{on}}$ $t_{\text{off}}$	Resistive load Turn-on time Turn-off time	$I_{\text{C}} = 1.5 \text{ A}$ $V_{\text{CC}} = 10 \text{ V}$ $I_{\text{B}1} = -I_{\text{B}2} = 150 \text{ mA}$		60 310		ns ns

1. Pulsed duration = 300  $\mu\text{s}$ , duty cycle  $\leq 1.5\%$

## 2.1 Electrical characteristics (curves)

Figure 2. DC current gain

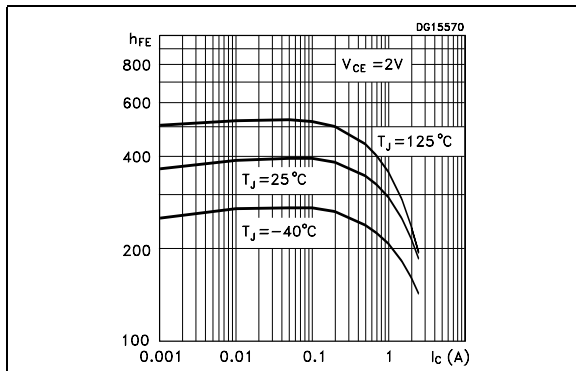


Figure 3. Collector-emitter saturation voltage

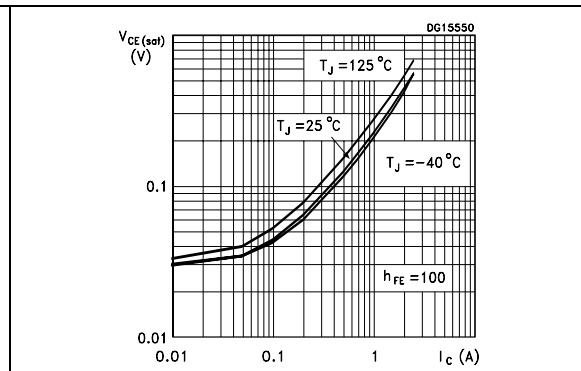


Figure 4. Base-emitter saturation voltage

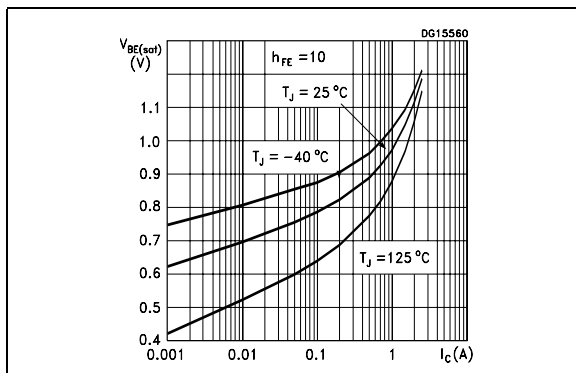


Figure 5. Resistive load switching time

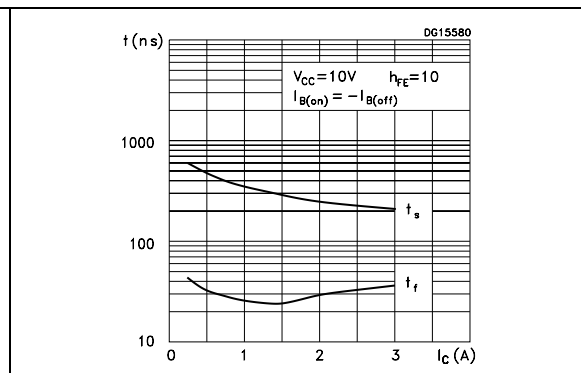


Figure 6. Resistive load switching time

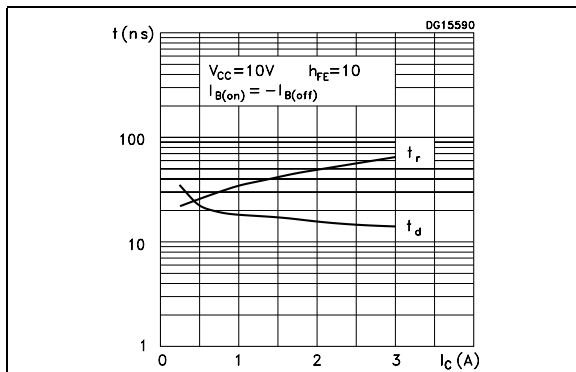
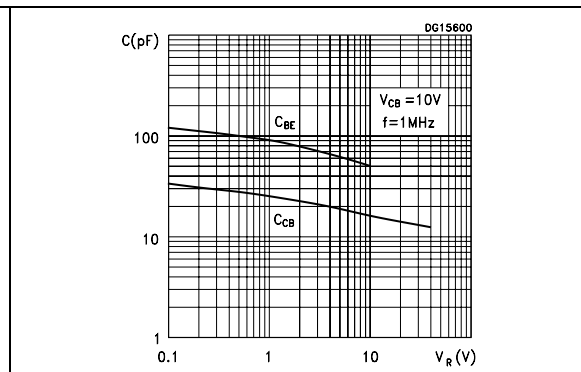
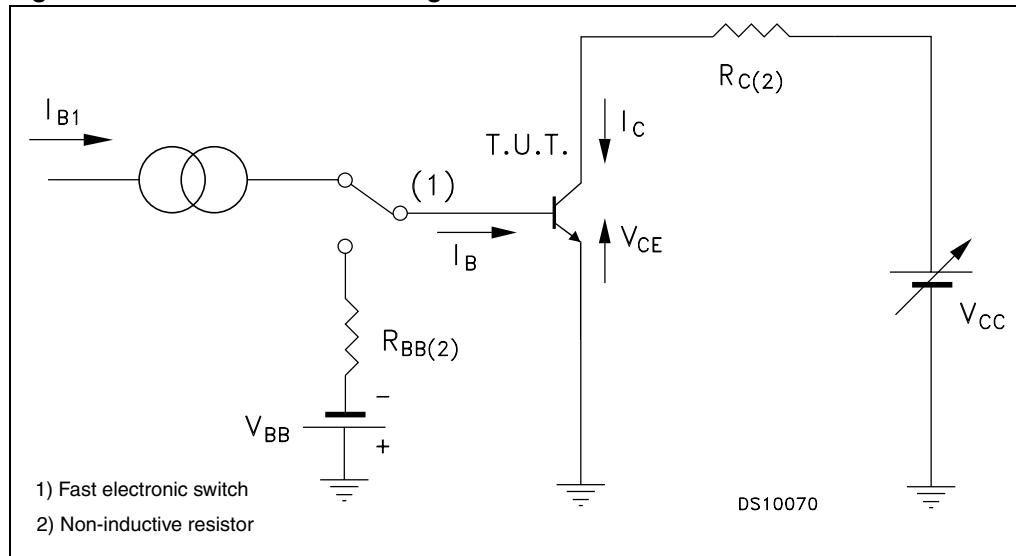


Figure 7. Capacitance



## 2.2 Test circuits

Figure 8. Resistive load switching test circuit

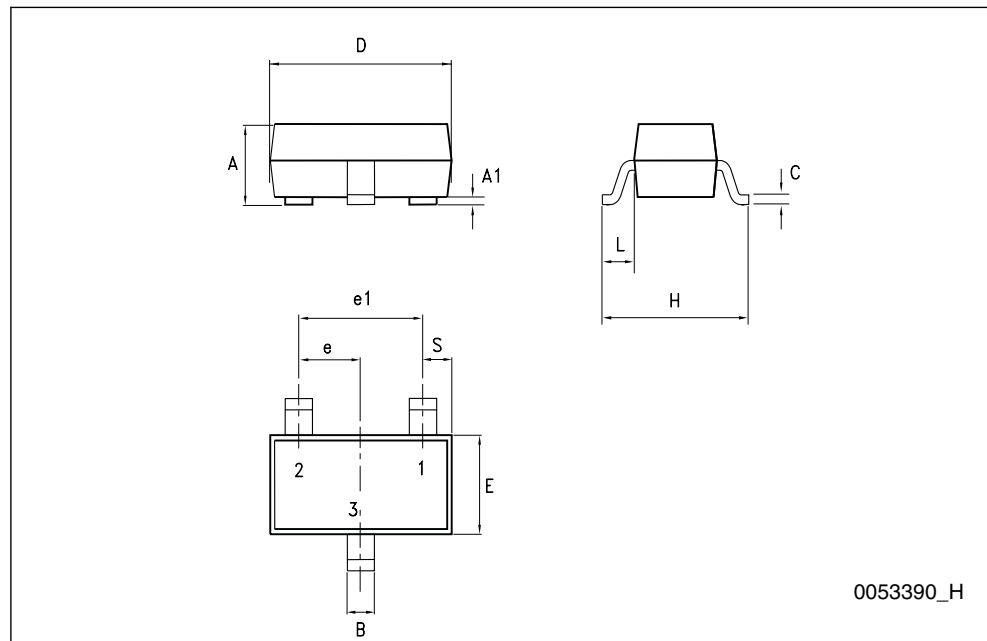


### 3 Package mechanical data

In order to meet environmental requirements, ST offers these devices in different grades of ECOPACK<sup>®</sup> packages, depending on their level of environmental compliance. ECOPACK<sup>®</sup> specifications, grade definitions and product status are available at: [www.st.com](http://www.st.com). ECOPACK<sup>®</sup> is an ST trademark.

## SOT-23 mechanical data

DIM.	mm.		
	min.	typ	max.
A	0.89		1.4
A1	0		0.1
B	0.3		0.51
C	0.085		0.18
D	2.75		3.04
e	0.85		1.05
e1	1.7		2.1
E	1.2		1.6
H	2.1		2.75
L		0.6	
S	0.35		0.65



## 4 Revision history

Table 5. Document revision history

Date	Revision	Changes
09-Feb-2006	1	Initial release
18-Jul-2006	2	New template
08-Sep-2008	3	Updated the SOT-23 mechanical data
08-Jan-2009	4	Updated <i>Figure 1: Internal schematic diagram</i> Updated statement ECOPACK®



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