

## 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

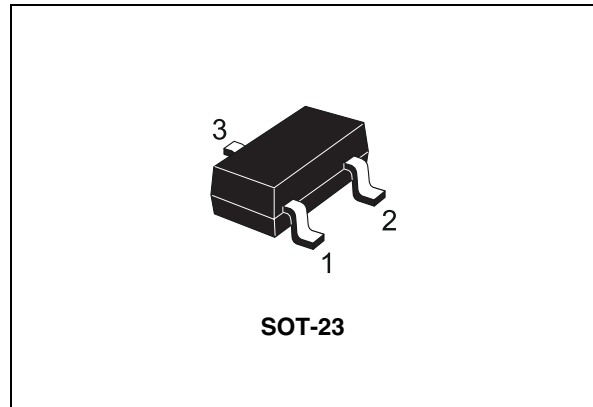
### Description

The device is an 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.

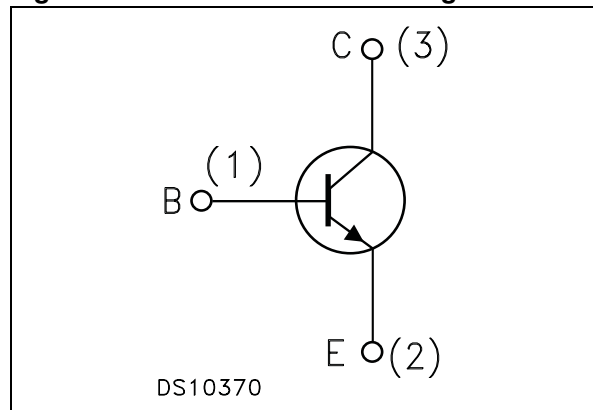
The complementary PNP is the 2STR2160.

### Applications

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



**Figure 1. Internal schematic diagram**



**Table 1. Device summary**

Order code	Marking	Package	Packing
2STR1160	160	SOT-23	Tape and reel

## Content

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# 1 Electrical ratings

**Table 2. Absolute maximum rating**

Symbol	Parameter	Value	Unit
$V_{CBO}$	Collector-base voltage ( $I_E = 0$ )	60	V
$V_{CEO}$	Collector-emitter voltage ( $I_B = 0$ )	60	V
$V_{EBO}$	Emitter-base voltage ( $I_C = 0$ )	5	V
$I_C$	Collector current	1	A
$I_{CM}$	Collector peak current ( $t_p < 5\text{ms}$ )	2	A
$P_{tot}$	Total dissipation at $T_{amb} = 25^\circ\text{C}$	0.5	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	250	$^\circ\text{C/W}$

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 ( $I_{\text{E}} = 0$ )	$V_{\text{CB}} = 60 \text{ V}$			0.1	$\mu\text{A}$
$I_{\text{EBO}}$	Emitter cut-off current ( $I_{\text{C}} = 0$ )	$V_{\text{EB}} = 5 \text{ V}$			0.1	$\mu\text{A}$
$V_{(\text{BR})\text{CBO}}$	Collector-base breakdown voltage ( $I_{\text{E}} = 0$ )	$I_{\text{C}} = 100 \mu\text{A}$	60			V
$V_{(\text{BR})\text{CEO}}^{(1)}$	Collector-emitter breakdown voltage ( $I_{\text{B}} = 0$ )	$I_{\text{C}} = 10 \text{ mA}$	60			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	$I_{\text{C}} = 0.5 \text{ A}$ $I_{\text{B}} = 50 \text{ mA}$ $I_{\text{C}} = 1 \text{ A}$ $I_{\text{B}} = 100 \text{ mA}$		130 210	210 430	mV mV
$V_{\text{BE}(\text{sat})}^{(1)}$	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	$I_{\text{C}} = 0.5 \text{ A}$ $V_{\text{CE}} = 2\text{V}$ $I_{\text{C}} = 1 \text{ A}$ $V_{\text{CE}} = 2\text{V}$ $I_{\text{C}} = 2 \text{ A}$ $V_{\text{CE}} = 2\text{V}$	180 85	250 130 30	560	
$t_{\text{on}}$ $t_{\text{off}}$	Resistive load Turn-on time Turn-off time	$I_{\text{C}} = 1.5 \text{ A}$ $V_{\text{CC}} = 10 \text{ V}$ $I_{\text{B1}} = -I_{\text{B2}} = 150 \text{ mA}$ $V_{\text{BB}(\text{off})} = -5 \text{ V}$		220 500		ns ns

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

## 2.1 Typical characteristic (curves)

Figure 2. DC current gain (@  $V_{CE}=1\text{ V}$ ) Figure 3. DC current gain (@  $V_{CE}=2\text{ V}$ )

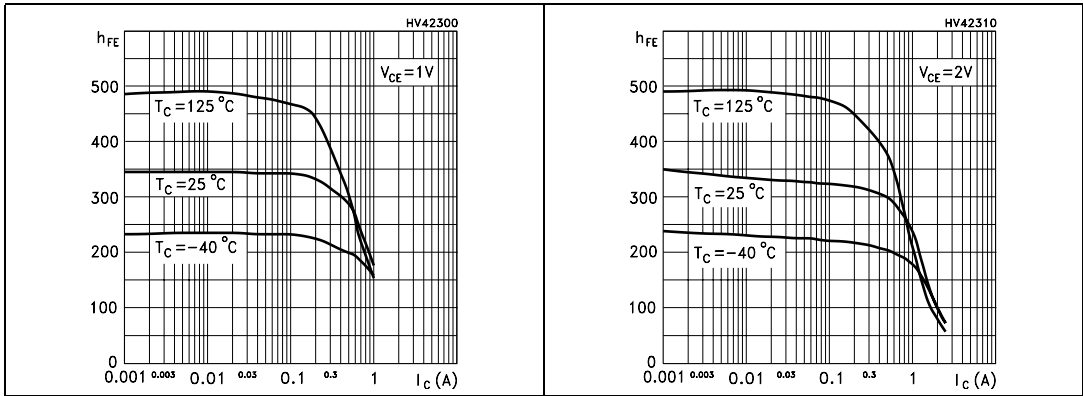


Figure 4. Base-emitter on voltage Figure 5. Base-emitter saturation voltage

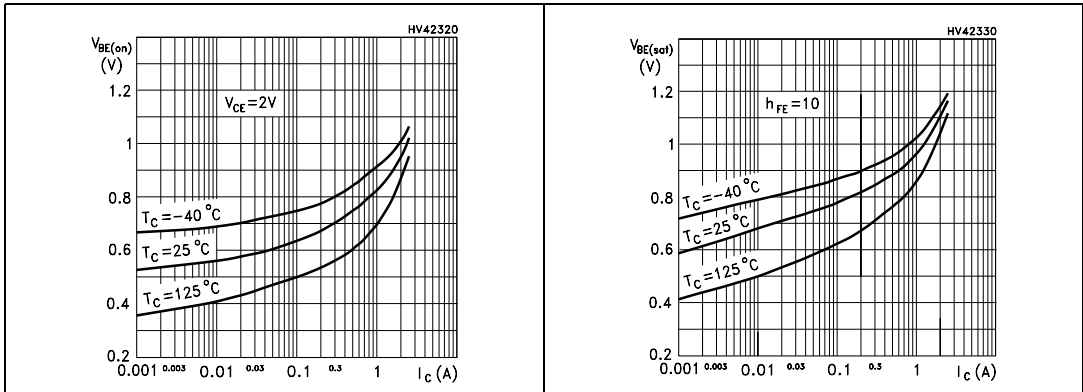


Figure 6. Collector-emitter saturation voltage Figure 7. Capacitance curves

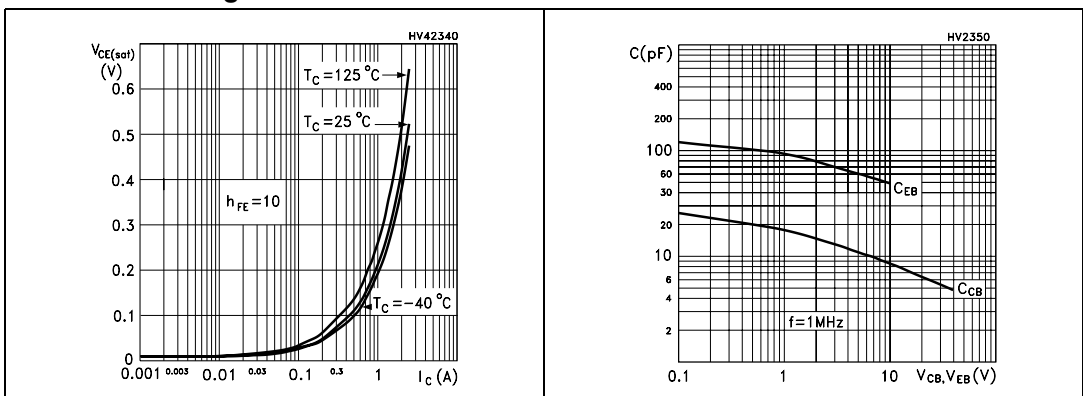
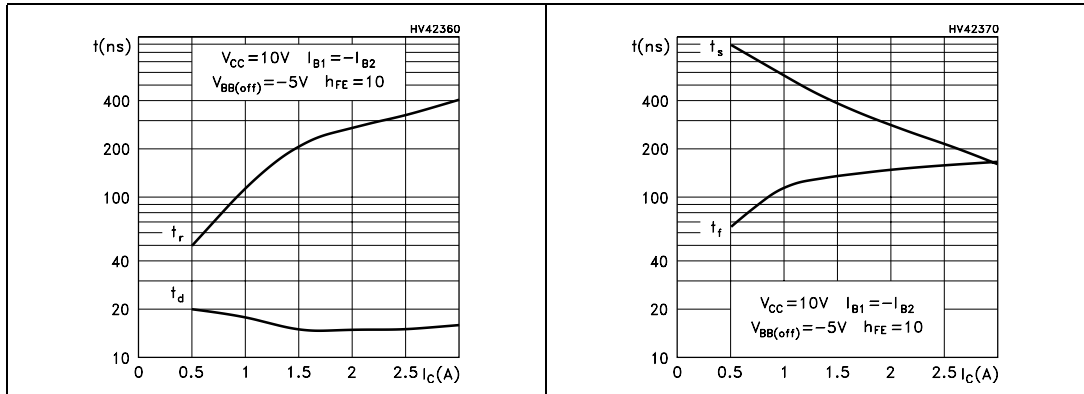


Figure 8. Resistive load switching time Figure 9. Resistive load switching time



### 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)

**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

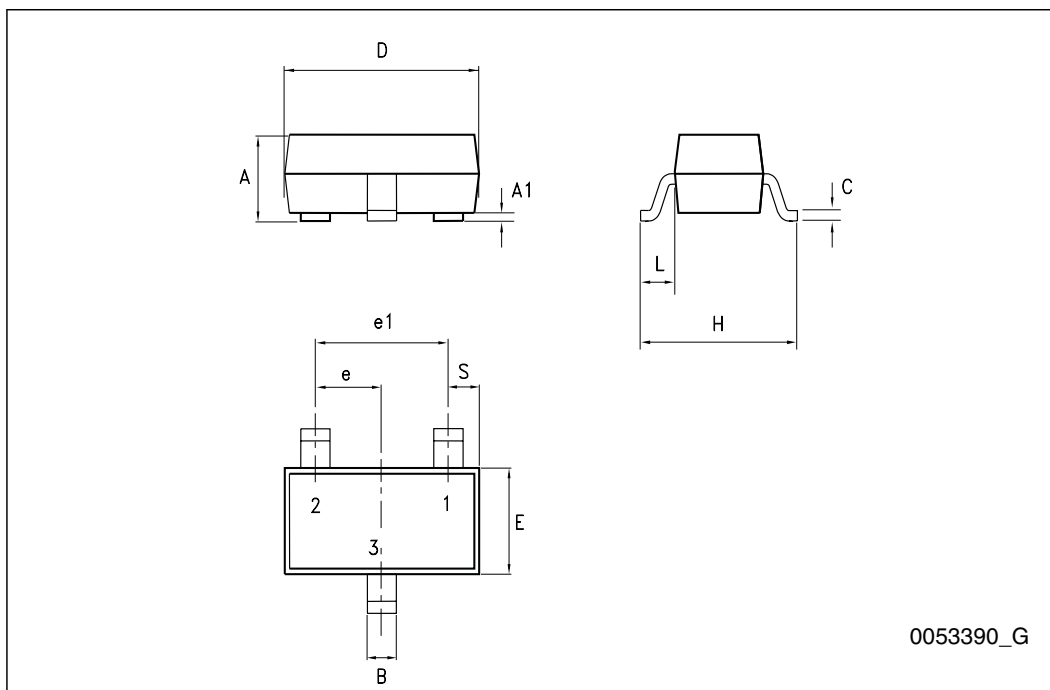
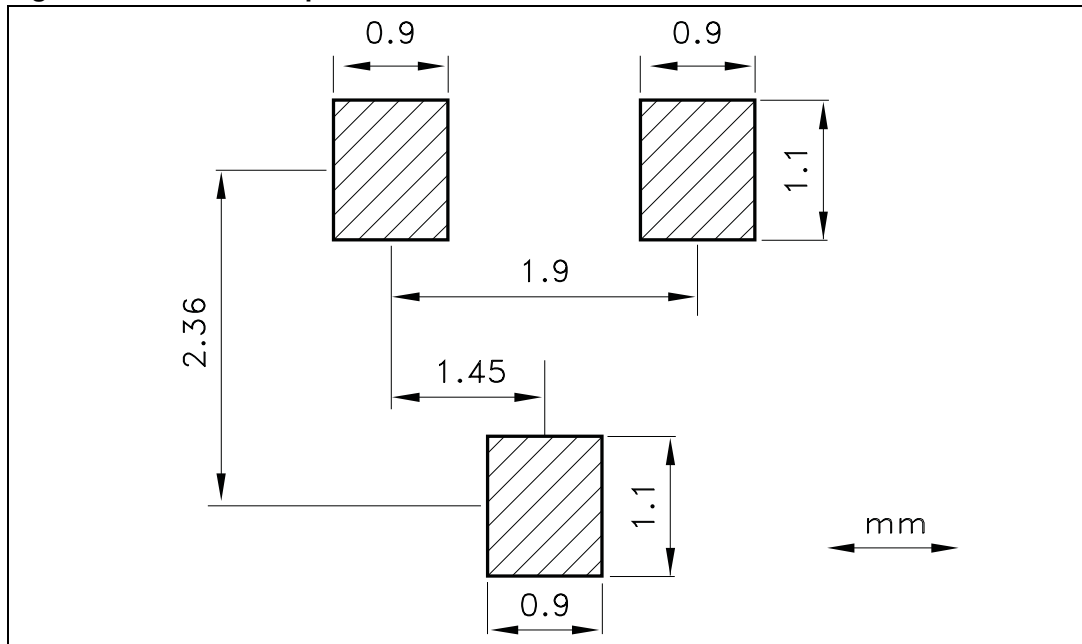




Figure 10. SOT-23 footprint



## 4 Revision history

**Table 5. Document revision history**

Date	Revision	Changes
12-Feb-2008	1	Initial release

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