

## Low voltage fast-switching PNP power bipolar transistor

### Features

- Very low collector-emitter saturation voltage
- High current gain characteristic
- Fast switching speed
- Surface mounting device in medium power SOT-223 package

### Applications

- Emergency lighting
- LED
- CCFL drivers (back lighting)
- Voltage regulation
- Relay driver

### Description

The device is a PNP 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.

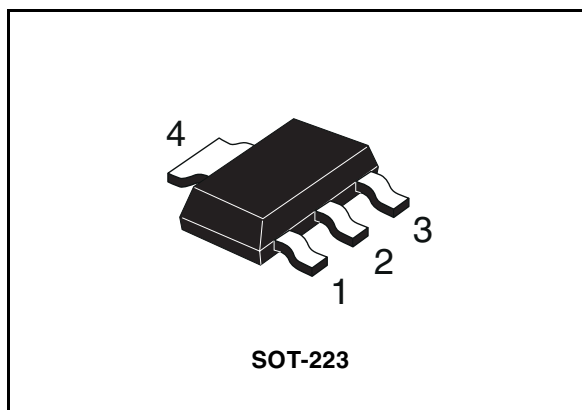


Figure 1. Internal schematic diagram

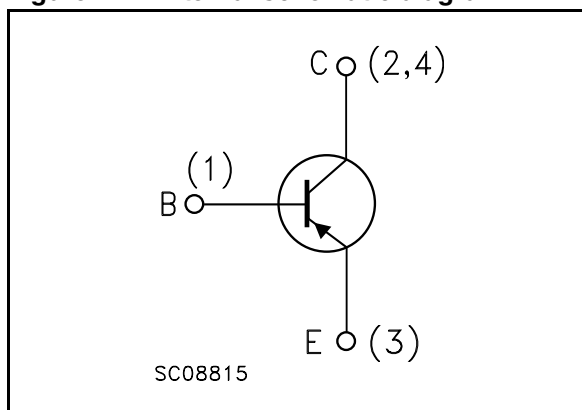


Table 1. Device summary

Order code	Marking	Package	Packaging
2STN2540	N2540	SOT-223	Tape and reel

# 1 Electrical ratings

**Table 2. Absolute maximum rating**

Symbol	Parameter	Value	Unit
$V_{CBO}$	Collector-base voltage ( $I_E = 0$ )	-40	V
$V_{CEO}$	Collector-emitter voltage ( $I_B = 0$ )	-40	V
$V_{EBO}$	Emitter-base voltage ( $I_C = 0$ )	-6	V
$I_C$	Collector current	-5	A
$I_{CM}$	Collector peak current ( $t_P < 5\text{ms}$ )	-10	A
$I_{BM}$	Base peak current ( $t_P < 5\text{ms}$ )	-2	A
$P_{tot}$	Total dissipation at $T_{amb} = 25\text{ °C}$	1.6	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	78	°C/W

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

## 2 Electrical characteristics

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

**Table 4. Electrical characteristics**

Symbol	Parameter	Test conditions	Min.	Typ.	Max.	Unit
$I_{\text{CBO}}$	Collector cut-off current ( $I_{\text{E}} = 0$ )	$V_{\text{CB}} = -30\text{ V}$			-0.1	$\mu\text{A}$
$I_{\text{EBO}}$	Emitter cut-off current ( $I_{\text{C}} = 0$ )	$V_{\text{EB}} = -5\text{ V}$			-0.1	$\mu\text{A}$
$V_{\text{CE(sat)}}^{(1)}$	Collector-emitter saturation voltage	$I_{\text{C}} = -0.5\text{ A}$ $I_{\text{B}} = -5\text{ mA}$		-80	-120	mV
		$I_{\text{C}} = -1\text{ A}$ $I_{\text{B}} = -10\text{ mA}$		-120	-180	mV
		$I_{\text{C}} = -2\text{ A}$ $I_{\text{B}} = -200\text{ mA}$		-140	-200	mV
		$I_{\text{C}} = -5\text{ A}$ $I_{\text{B}} = -500\text{ mA}$		-350	-450	mV
$V_{\text{BE(sat)}}^{(1)}$	Base-emitter saturation voltage	$I_{\text{C}} = -5\text{ A}$ $I_{\text{B}} = -500\text{ mA}$			-1.3	V
$V_{\text{BE(on)}}^{(1)}$	Base-emitter on voltage	$V_{\text{CE}} = -2\text{ V}$ $I_{\text{C}} = -2\text{ A}$			-1.25	V
$h_{\text{FE}}^{(1)}$	DC current gain	$I_{\text{C}} = -0.5\text{ A}$ $V_{\text{CE}} = -2\text{ V}$	250			
		$I_{\text{C}} = -1\text{ A}$ $V_{\text{CE}} = -2\text{ V}$	200			
		$I_{\text{C}} = -2\text{ A}$ $V_{\text{CE}} = -2\text{ V}$	150			
		$I_{\text{C}} = -5\text{ A}$ $V_{\text{CE}} = -2\text{ V}$	50			
$C_{\text{CBO}}$	Collector-base capacitance	$I_{\text{E}} = 0$ $V_{\text{CB}} = -10\text{ V}$ $f = 1\text{ MHz}$		80		pF
$t_{\text{on}}$ $t_{\text{s}}$ $t_{\text{f}}$	Resistive load	$I_{\text{C}} = -1\text{ A}$ $V_{\text{CC}} = -10\text{ V}$ $-I_{\text{B1}} = I_{\text{B2}} = -0.1\text{ A}$ $T_{\text{p}} = 30\text{ }\mu\text{s}$		75		ns
	Turn-on time			426		ns
	Storage time			62		ns
	Fall time					ns

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

## 2.1 Electrical characteristics (curves)

Figure 2. Output characteristics

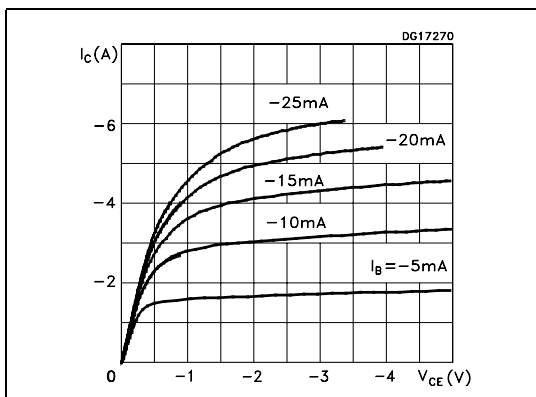


Figure 3. DC current gain

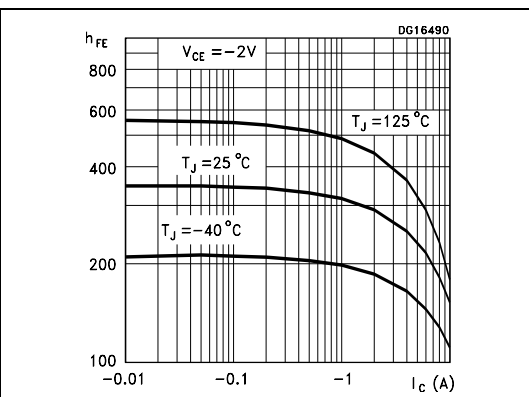


Figure 4. Collector-emitter saturation voltage

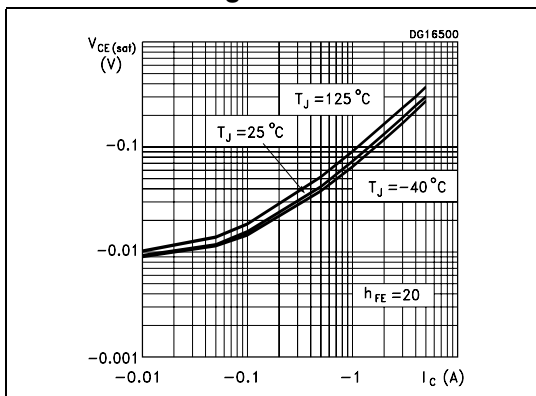


Figure 5. Base-emitter saturation voltage

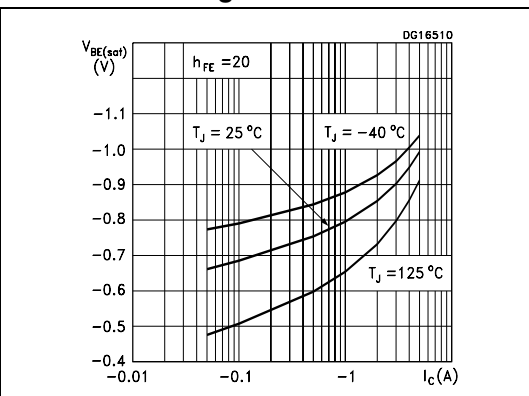


Figure 6. Base-emitter on voltage

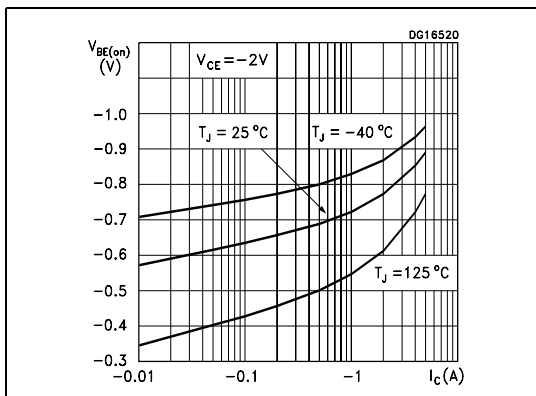


Figure 7. Resistive load switching times

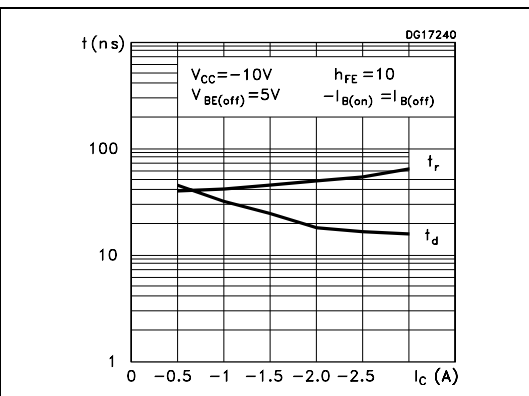


Figure 8. Resistive load switching times

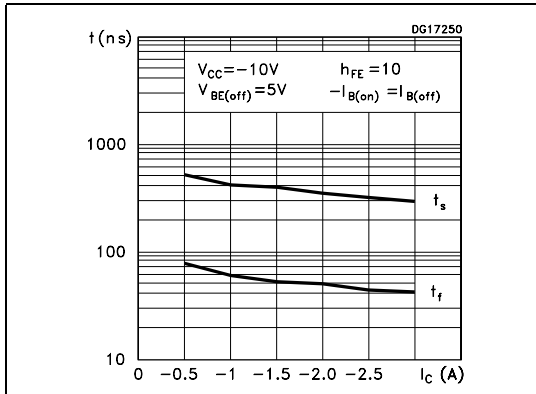
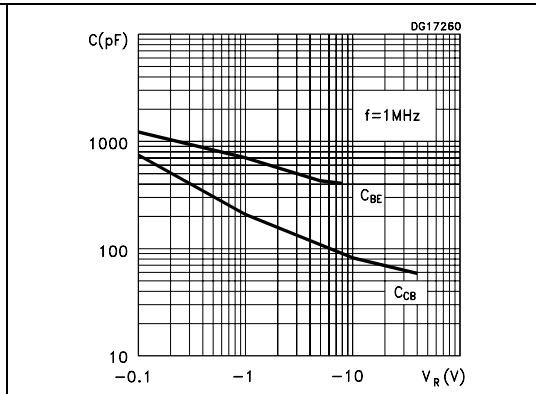
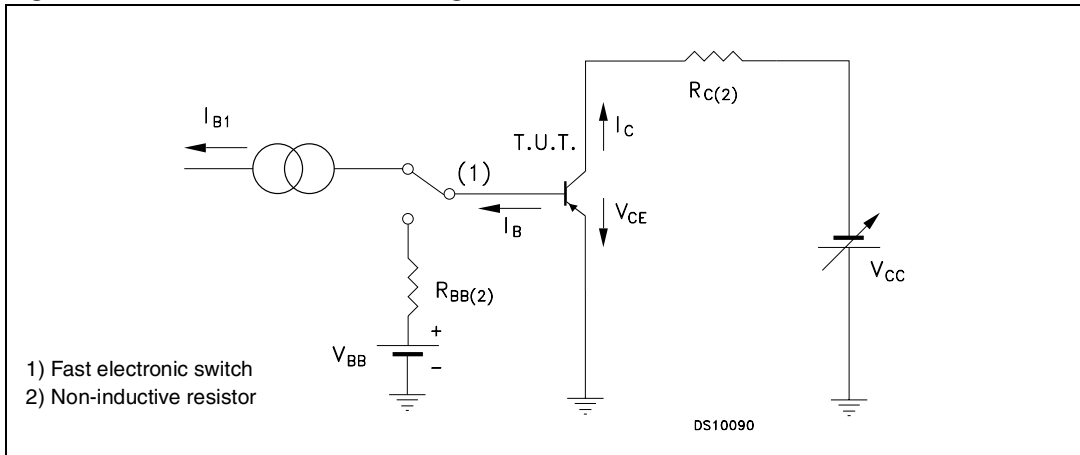


Figure 9. Capacitance



## 2.2 Test circuit

Figure 10. Resistive load switching test circuit

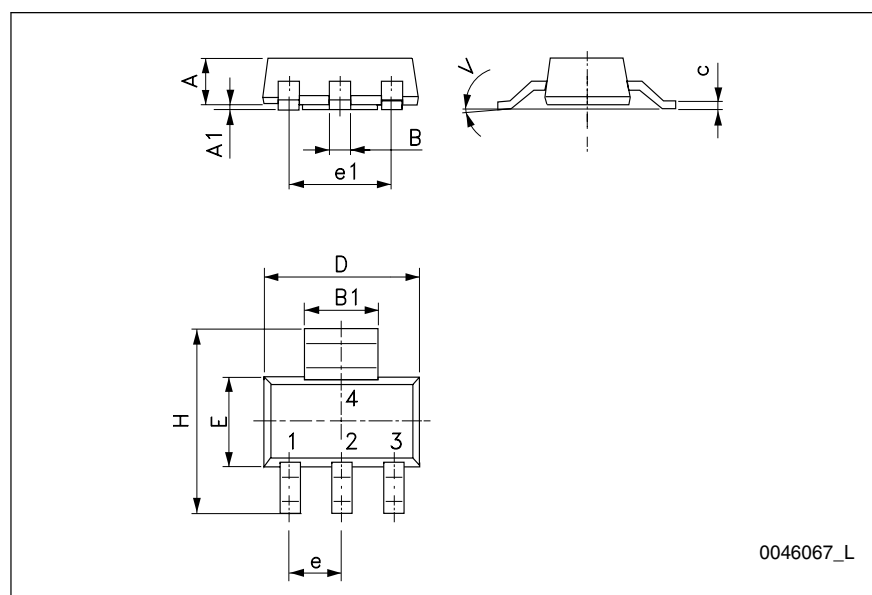


### 3 Package mechanical data

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)

## SOT-223 mechanical data

DIM.	mm.		
	min.	typ	max.
A			1.80
A1	0.02		0.1
B	0.60	0.70	0.85
B1	2.90	3.00	3.15
c	0.24	0.26	0.35
D	6.30	6.50	6.70
e		2.30	
e1		4.60	
E	3.30	3.50	3.70
H	6.70	7.00	7.30
V			10°



## 4 Revision history

**Table 5. Document revision history**

<b>Date</b>	<b>Revision</b>	<b>Changes</b>
23-Oct-2003	1	Initial release
03-Nov-2006	2	Added new graphics: fig.2, fig. 7, fig.8, fig.9.
14-Jan-2008	3	Document status promoted from preliminary data to datasheet.



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