

# 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.

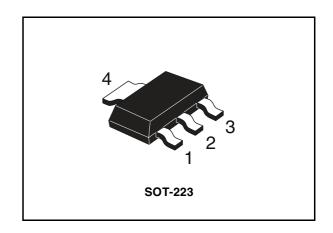


Figure 1. Internal schematic diagram

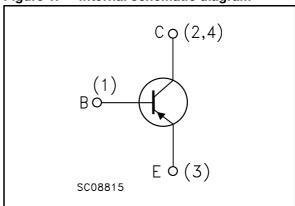


Table 1. Device summary

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

Electrical ratings 2STN2540

# 1 Electrical ratings

Table 2. Absolute maximum rating

Symbol	Parameter	Value	Unit
V <sub>CBO</sub>	Collector-base voltage (I <sub>E</sub> = 0)	-40	V
V <sub>CEO</sub>	Collector-emitter voltage (I <sub>B</sub> = 0)	-40	V
V <sub>EBO</sub>	Emitter-base voltage ( $I_C = 0$ )	-6	V
I <sub>C</sub>	Collector current	-5	Α
I <sub>CM</sub>	Collector peak current (t <sub>P</sub> < 5ms)	-10	Α
I <sub>BM</sub>	Base peak current (t <sub>P</sub> < 5ms)	-2	Α
P <sub>tot</sub>	Total dissipation at T <sub>amb</sub> = 25 °C	1.6	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	78	°C/W

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

# 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> = -30 V			-0.1	μА
I <sub>EBO</sub>	Emitter cut-off current (I <sub>C</sub> =0)	V <sub>EB</sub> = -5 V			-0.1	μА
V <sub>CE(sat)</sub> (1)	Collector-emitter saturation voltage	$I_C = -0.5 \text{ A}$ $I_B = -5 \text{ mA}$ $I_C = -1 \text{ A}$ $I_B = -10 \text{ mA}$ $I_C = -2 \text{ A}$ $I_B = -200 \text{ mA}$ $I_C = -5 \text{ A}$ $I_B = -500 \text{ mA}$		-80 -120 -140 -350	-120 -180 -200 -450	mV mV mV
V <sub>BE(sat)</sub> (1)	Base-emitter saturation voltage	$I_C = -5 \text{ A}$ $I_B = -500 \text{ mA}$			-1.3	V
V <sub>BE(on)</sub> (1)	Base-emitter on voltage	V <sub>CE</sub> = -2 V I <sub>C</sub> = -2 A			-1.25	V
h <sub>FE</sub> <sup>(1)</sup>	DC current gain	$\begin{split} I_{C} &= -0.5 \text{ A} & V_{CE} = -2 \text{ V} \\ I_{C} &= -1 \text{ A} & V_{CE} = -2 \text{ V} \\ I_{C} &= -2 \text{ A} & V_{CE} = -2 \text{ V} \\ I_{C} &= -5 \text{ A} & V_{CE} = -2 \text{ V} \end{split}$	250 200 150 50			
C <sub>CBO</sub>	Collector-base capacitance	$I_E = 0$ $V_{CB} = -10 \text{ V}$ $f = 1 \text{ MHz}$		80		pF
t <sub>on</sub> t <sub>s</sub>	Resistive load Turn-on time Storage time Fall time	$I_C = -1 \text{ A}$ $V_{CC} = -10 \text{ V}$ $-I_{B1} = I_{B2} = -0.1 \text{ A}$ $T_p = 30  \mu\text{s}$		75 426 62		ns ns ns

<sup>1.</sup> Pulsed duration = 300 µs, duty cycle ≤ 1.5%

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Electrical characteristics 2STN2540

## 2.1 Electrical characteristics (curves)

Figure 2. Output characteristics

Figure 3. DC current gain

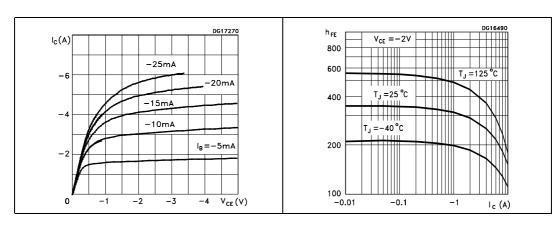


Figure 4. Collector-emitter saturation voltage

Figure 5. Base-emitter saturation voltage

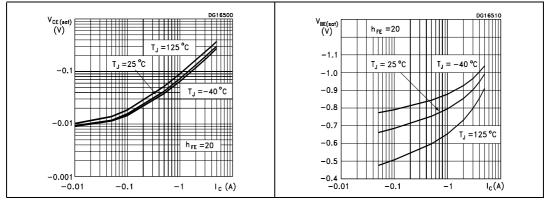
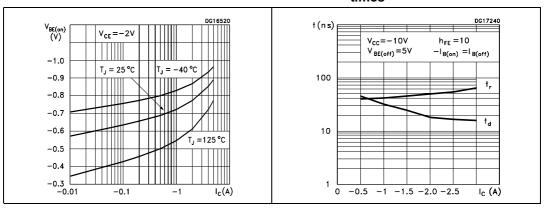


Figure 6. Base-emitter on voltage

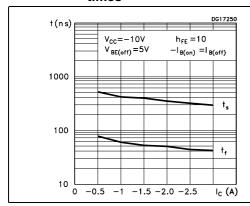
Figure 7. Resistive load switching times

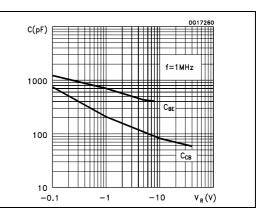


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Figure 8. Resistive load switching times

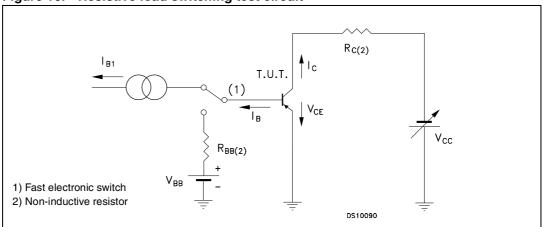
Figure 9. Capacitance





## 2.2 Test circuit

Figure 10. Resistive load switching test circuit



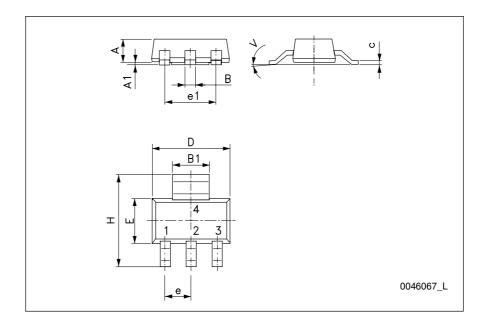
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## 3 Package mechanical data

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-223 mechanical data

DIM.	mm.				
	min.	typ	max.		
Α			1.80		
A1	0.02		0.1		
В	0.60	0.70	0.85		
B1	2.90	3.00	3.15		
С	0.24	0.26	0.35		
D	6.30	6.50	6.70		
е		2.30			
e1		4.60			
E	3.30	3.50	3.70		
Н	6.70	7.00	7.30		
V			10 °		



Revision history 2STN2540

# 4 Revision history

Table 5. Document revision history

Date	Revision	Changes
23-Oct-2003	1	Initial release
03-Nov-2006 2 Added new graphics: fig.2, fig. 7, fig.8, fig.9.		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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