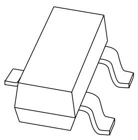


PBHV9040T

500 V, 0.25 A PNP high-voltage low V_{CEsat} (BISS) transistor

Rev. 01 — 13 February 2008 Product data sheet

1. Product profile

1.1 General description

PNP high-voltage low V_{CEsat} Breakthrough In Small Signal (BISS) transistor in a SOT23 (TO-236AB) small Surface-Mounted Device (SMD) plastic package.

NPN complement: PBHV8540T.

1.2 Features

- High voltage
- Low collector-emitter saturation voltage V_{CEsat}
- High collector current capability I_C and I_{CM}
- High collector current gain (h_{FE}) at high I_C
- AEC-Q101 qualified

1.3 Applications

- Electronic ballast for fluorescent lighting
- LED driver for LED chain module
- LCD backlighting
- High Intensity Discharge (HID) front lighting
- Automotive motor management
- Hook switch for wired telecom
- Switch mode power supply

1.4 Quick reference data

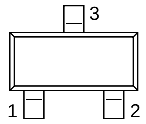
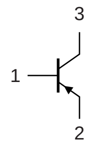
Table 1. Quick reference data

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
V_{CESM}	collector-emitter peak voltage	V_{BE} = 0 V	-	-	–500	V
V_{CEO}	collector-emitter voltage	open base	-	-	–400	V
I_C	collector current		-	-	–0.25	A
h_{FE}	DC current gain	V_{CE} = –10 V; I_C = –50 mA	100	200	-	

founded by Philips

2. Pinning information

Table 2. Pinning

Pin	Description	Simplified outline	Symbol
1	base		 sym013
2	emitter		
3	collector		

3. Ordering information

Table 3. Ordering information

Type number	Package		
	Name	Description	Version
PBHV9040T	-	plastic surface-mounted package; 3 leads	SOT23

4. Marking

Table 4. Marking codes

Type number	Marking code[1]
PBHV9040T	W5*

[1] * = -: made in Hong Kong
* = p: made in Hong Kong
* = t: made in Malaysia
* = W: made in China

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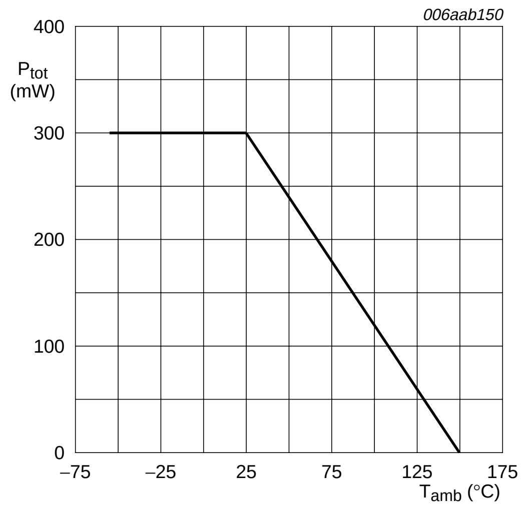
5. Limiting values

Table 5. Limiting values

In accordance with the Absolute Maximum Rating System (IEC 60134).

Symbol	Parameter	Conditions		Min	Max	Unit
V_{CBO}	collector-base voltage	open emitter		-	–500	V
V_{CEO}	collector-emitter voltage	open base		-	–400	V
V_{CESM}	collector-emitter peak voltage	V_{BE} = 0 V		-	–500	V
V_{EBO}	emitter-base voltage	open collector		-	–6	V
I_C	collector current			-	–0.25	A
I_{CM}	peak collector current	single pulse; $t_p \leq 1$ ms		-	–0.5	A
I_{BM}	peak base current	single pulse; $t_p \leq 1$ ms		-	–100	mA
P_{tot}	total power dissipation	$T_{amb} \leq 25$ °C	[1]		300	mW
T_j	junction temperature			-	150	°C
T_{amb}	ambient temperature			–55	+150	°C
T_{stg}	storage temperature			–65	+150	°C

[1] Device mounted on an FR4 Printed-Circuit Board (PCB), single-sided copper, tin-plated and standard footprint.



FR4 PCB, standard footprint

Fig 1. Power derating curve SOT23 (TO-236AB)

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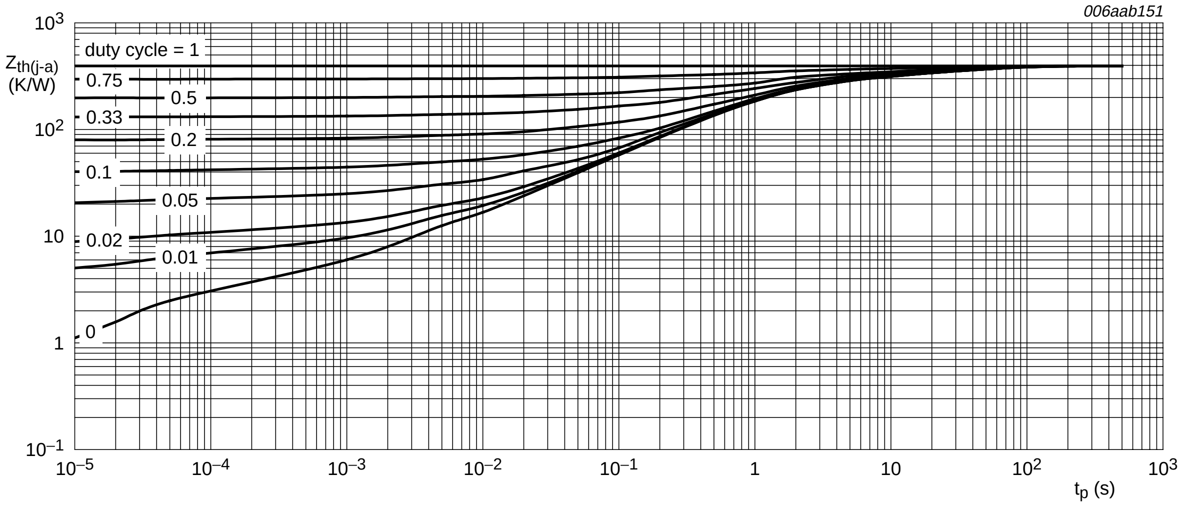
6. Thermal characteristics

Table 6. Thermal characteristics

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
$R_{th(j-a)}$	thermal resistance from junction to ambient	in free air	[1]	-	-	417	K/W
$R_{th(j-sp)}$	thermal resistance from junction to solder point			-	-	70	K/W

[1] Device mounted on an FR4 PCB, single-sided copper, tin-plated and standard footprint.



FR4 PCB, standard footprint

Fig 2. Transient thermal impedance from junction to ambient as a function of pulse duration for SOT23 (TO-236AB)

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7. Characteristics

Table 7. Characteristics

T_{amb} = 25 °C unless otherwise specified.

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
I_{CBO}	collector-base cut-off current	V_{CB} = –320 V; I_E = 0 A		-	-	–100	nA
		V_{CB} = –320 V; I_E = 0 A; T_j = 150 °C		-	-	–10	µA
I_{CES}	collector-emitter cut-off current	V_{CE} = –320 V; V_{BE} = 0 V		-	-	–100	nA
I_{EBO}	emitter-base cut-off current	V_{EB} = –4 V; I_C = 0 A		-	-	–100	nA
h_{FE}	DC current gain	V_{CE} = –10 V					
		I_C = –50 mA		100	200	-	
		I_C = –100 mA		80	200	-	
		I_C = –250 mA	[1]	10	25	-	
V_{CEsat}	collector-emitter saturation voltage	I_C = –100 mA; I_B = –20 mA		-	–110	–200	mV
V_{BEsat}	base-emitter saturation voltage	I_C = –100 mA; I_B = –20 mA	[1]	-	–1	–1.1	V
f_T	transition frequency	V_{CE} = –10 V; I_E = –10 mA; f = 100 MHz		-	55	-	MHz
C_c	collector capacitance	V_{CB} = –20 V; I_E = i_e = 0 A; f = 1 MHz		-	7	-	pF
C_e	emitter capacitance	V_{EB} = –0.5 V; I_C = i_c = 0 A; f = 1 MHz		-	150	-	pF
t_d	delay time	V_{CC} = –2 V; I_C = –0.15 A; I_{Bon} = –0.03 A; I_{Boff} = 0.03 A		-	9	-	ns
t_r	rise time			-	1810	-	ns
t_{on}	turn-on time			-	1819	-	ns
t_s	storage time			-	715	-	ns
t_f	fall time			-	1085	-	ns
t_{off}	turn-off time			-	1900	-	ns

[1] Pulse test: $t_p \leq 300$ µs; $\delta \leq 0.02$.

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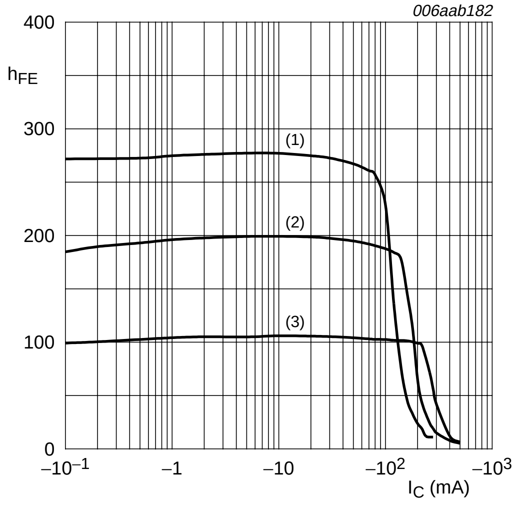


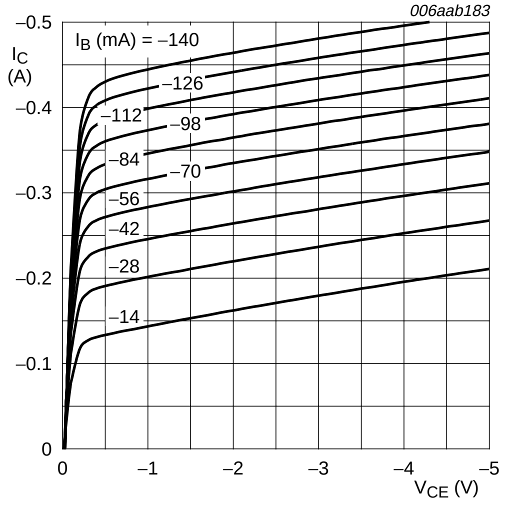
V_{CE} = −10 V

(1) T_{amb} = 100 °C

(2) T_{amb} = 25 °C

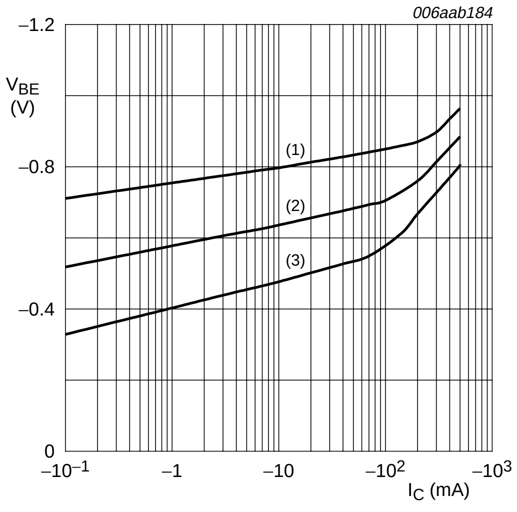
(3) T_{amb} = −55 °C

Fig 3. DC current gain as a function of collector current; typical values



T_{amb} = 25 °C

Fig 4. Collector current as a function of collector-emitter voltage; typical values



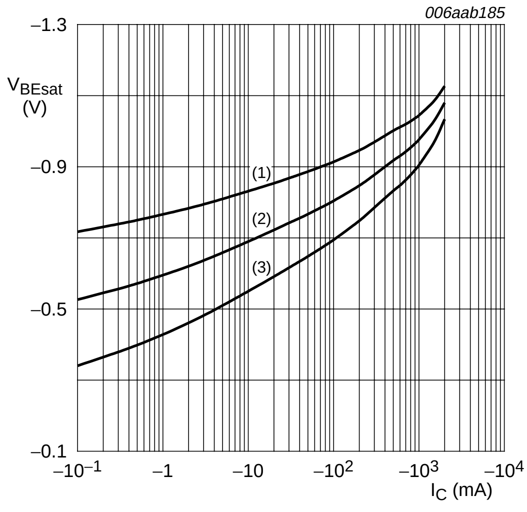
V_{CE} = −10 V

(1) T_{amb} = −55 °C

(2) T_{amb} = 25 °C

(3) T_{amb} = 100 °C

Fig 5. Base-emitter voltage as a function of collector current; typical values



I_C/I_B = 5

(1) T_{amb} = −55 °C

(2) T_{amb} = 25 °C

(3) T_{amb} = 100 °C

Fig 6. Base-emitter saturation voltage as a function of collector current; typical values

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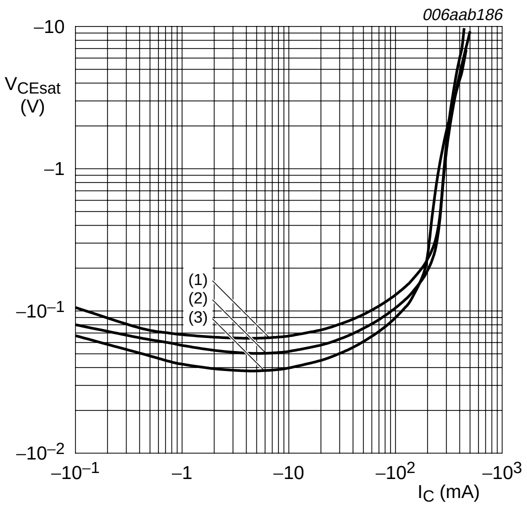


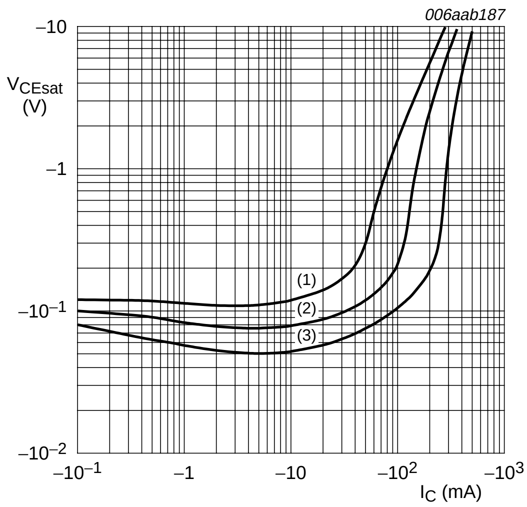
$I_C/I_B = 5$

(1) T_{amb} = 100 °C

(2) T_{amb} = 25 °C

(3) T_{amb} = –55 °C

Fig 7. Collector-emitter saturation voltage as a function of collector current; typical values



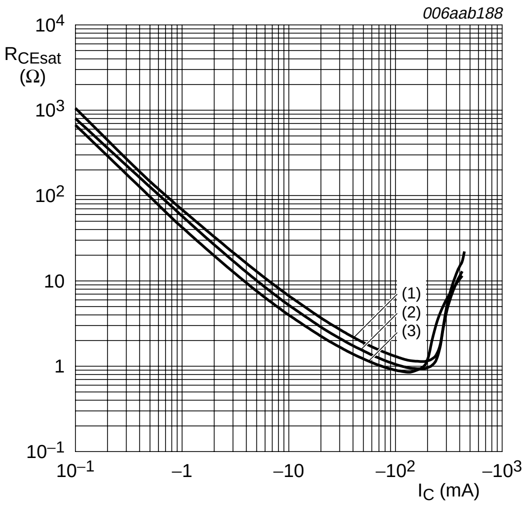
T_{amb} = 25 °C

(1) $I_C/I_B = 20$

(2) $I_C/I_B = 10$

(3) $I_C/I_B = 5$

Fig 8. Collector-emitter saturation voltage as a function of collector current; typical values



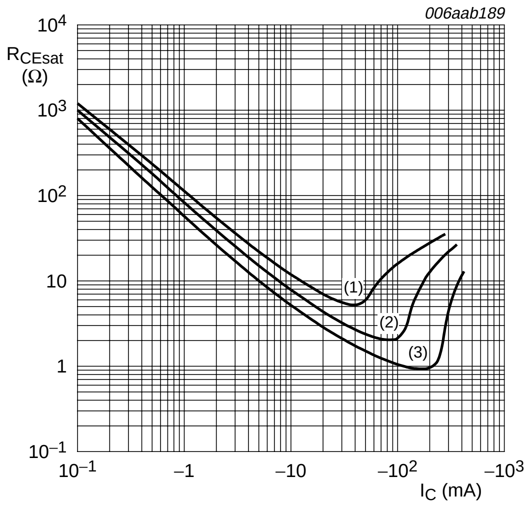
$I_C/I_B = 5$

(1) T_{amb} = 100 °C

(2) T_{amb} = 25 °C

(3) T_{amb} = –55 °C

Fig 9. Collector-emitter saturation resistance as a function of collector current; typical values



T_{amb} = 25 °C

(1) $I_C/I_B = 20$

(2) $I_C/I_B = 10$

(3) $I_C/I_B = 5$

Fig 10. Collector-emitter saturation resistance as a function of collector current; typical values

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8. Test information

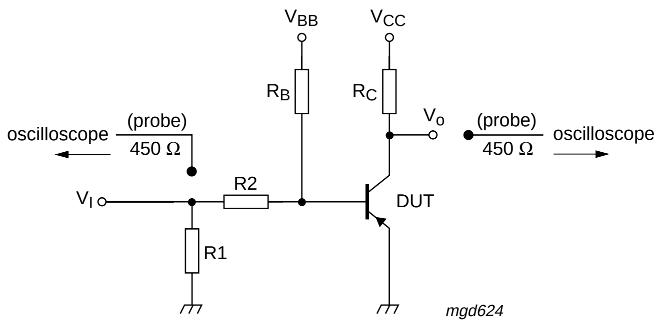

Fig 11. Test circuit for switching times

8.1 Quality information

This product has been qualified in accordance with the Automotive Electronics Council (AEC) standard *Q101 - Stress test qualification for discrete semiconductors*, and is suitable for use in automotive applications.

9. Package outline

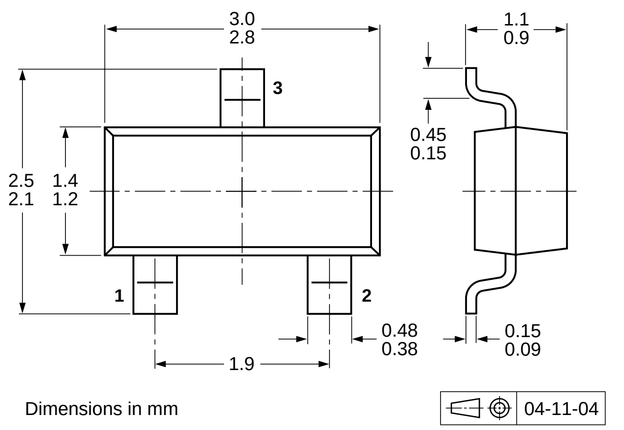

Fig 12. Package outline SOT23 (TO-236AB)

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10. Packing information

Table 8. Packing methods

The indicated -xxx are the last three digits of the 12NC ordering code.[1]

Type number	Package	Description	Packing quantity	
			3000	10000
PBHV9040T	SOT23	4 mm pitch, 8 mm tape and reel	-215	-235

[1] For further information and the availability of packing methods, see Section 14.

11. Soldering

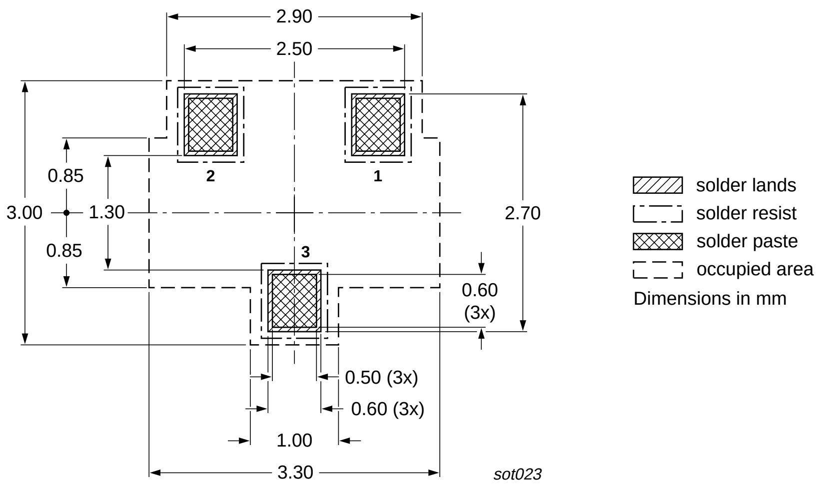

Fig 13. Reflow soldering footprint SOT23 (TO-236AB)

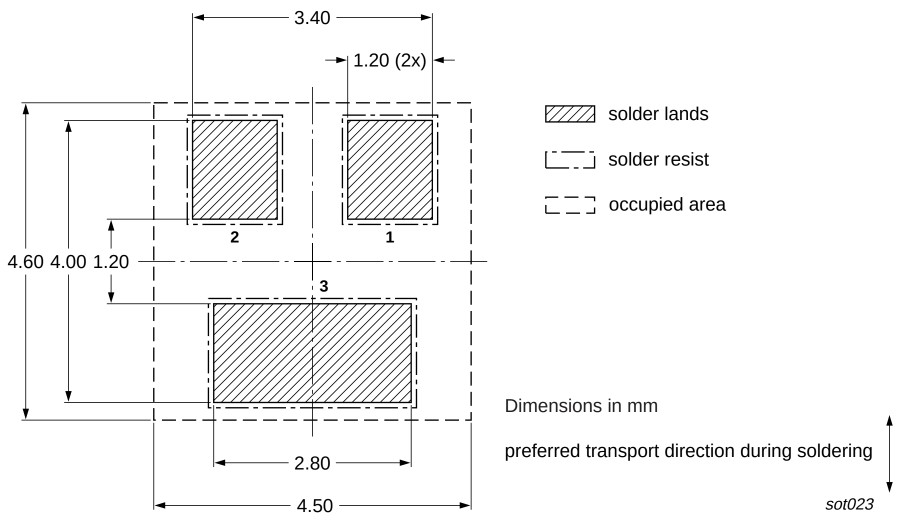

Fig 14. Wave soldering footprint SOT23 (TO-236AB)

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12. Revision history

Table 9. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
PBHV9040T_1	20080212	Product data sheet	-	-

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13. Legal information

13.1 Data sheet status

Document status[1][2]	Product status[3]	Definition
Objective [short] data sheet	Development	This document contains data from the objective specification for product development.
Preliminary [short] data sheet	Qualification	This document contains data from the preliminary specification.
Product [short] data sheet	Production	This document contains the product specification.

[1] Please consult the most recently issued document before initiating or completing a design.

[2] The term 'short data sheet' is explained in section "Definitions".

[3] The product status of device(s) described in this document may have changed since this document was published and may differ in case of multiple devices. The latest product status information is available on the Internet at URL http://www.nxp.com.

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