PMBT3906

PNP switching transistor

Rev. 06 — 2 March 2010 Product data sheet

1. Product profile

1.1 General description

PNP switching transistor in a SOT23 (TO-236AB) small Surface-Mounted Device (SMD) plastic package.

NPN complement: PMBT3904.

1.2 Features and benefits

- Collector-emitter voltage V_{CEO} = −40 V
- Collector current capability I_C = −200 mA

1.3 Applications

- General amplification and switching

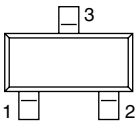
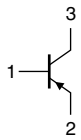
1.4 Quick reference data

Table 1. Quick reference data

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
V_{CEO}	collector-emitter voltage	open base	-	-	−40	V
I_C	collector current		-	-	−200	mA

2. Pinning information

Table 2. Pinning

Pin	Description	Simplified outline	Graphic symbol
1	base		
2	emitter		
3	collector		

006aab25

3. Ordering information

Table 3. Ordering information

Type number	Package		
	Name	Description	Version
PMBT3906	-	plastic surface-mounted package; 3 leads	SOT23

4. Marking

Table 4. Marking codes

Type number	Marking code[1]
PMBT3906	*2A

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

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		-	–40	V
V_{CEO}	collector-emitter voltage	open base		-	–40	V
V_{EBO}	emitter-base voltage	open collector		-	–6	V
I_C	collector current			-	–200	mA
I_{CM}	peak collector current			-	–200	mA
I_{BM}	peak base current			-	–100	mA
P_{tot}	total power dissipation	$T_{amb} \leq 25$ °C	[1]	-	250	mW
T_j	junction temperature			-	150	°C
T_{amb}	ambient temperature			–65	+150	°C
T_{stg}	storage temperature			–65	+150	°C

[1] Device mounted on an FR4 Printed-Circuit Board (PCB).

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]	-	-	500	K/W

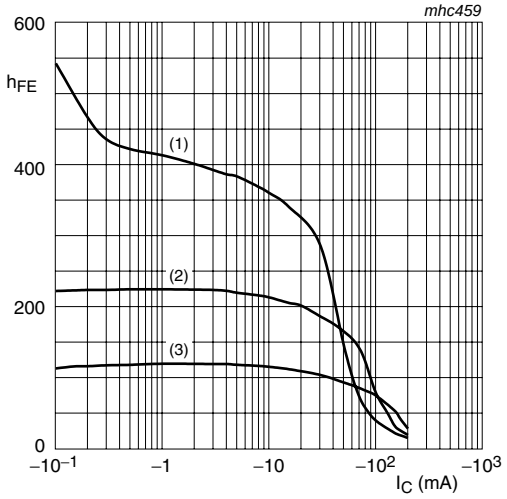
[1] Device mounted on an FR4 PCB.

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} = –30 V; I_E = 0 A	-	-	–50	nA
I_{EBO}	emitter-base cut-off current	V_{EB} = –6 V; I_C = 0 A	-	-	–50	nA
h_{FE}	DC current gain	V_{CE} = –1 V				
		I_C = –0.1 mA	60	-	-	
		I_C = –1 mA	80	-	-	
		I_C = –10 mA	100	-	300	
		I_C = –50 mA	60	-	-	
		I_C = –100 mA	30	-	-	
V_{CEsat}	collector-emitter saturation voltage	I_C = –10 mA; I_B = –1 mA	-	-	–250	mV
		I_C = –50 mA; I_B = –5 mA	-	-	–400	mV
V_{BEsat}	base-emitter saturation voltage	I_C = –10 mA; I_B = –1 mA	-	-	–850	mV
		I_C = –50 mA; I_B = –5 mA	-	-	–950	mV
t_d	delay time	I_{Con} = –10 mA; I_{Bon} = –1 mA; I_{Boff} = 1 mA	-	-	35	ns
t_r	rise time		-	-	35	ns
t_{on}	turn-on time		-	-	70	ns
t_s	storage time		-	-	225	ns
t_f	fall time		-	-	75	ns
t_{off}	turn-off time		-	-	300	ns
f_T	transition frequency	V_{CE} = –20 V; I_C = –10 mA; f = 100 MHz	250	-	-	MHz
C_c	collector capacitance	V_{CB} = –5 V; I_E = i_e = 0 A; f = 1 MHz	-	-	4.5	pF
C_e	emitter capacitance	V_{EB} = –500 mV; I_C = i_c = 0 A; f = 1 MHz	-	-	10	pF
NF	noise figure	I_C = –100 μA; V_{CE} = –5 V; R_S = 1 kΩ; f = 10 Hz to 15.7 kHz	-	-	4	dB



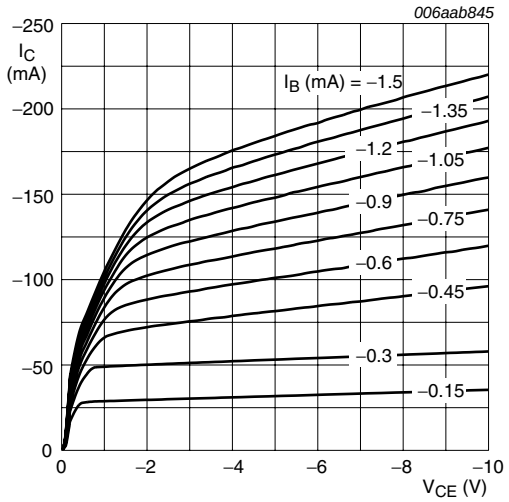
V_{CE} = −1 V

(1) T_{amb} = 150 °C

(2) T_{amb} = 25 °C

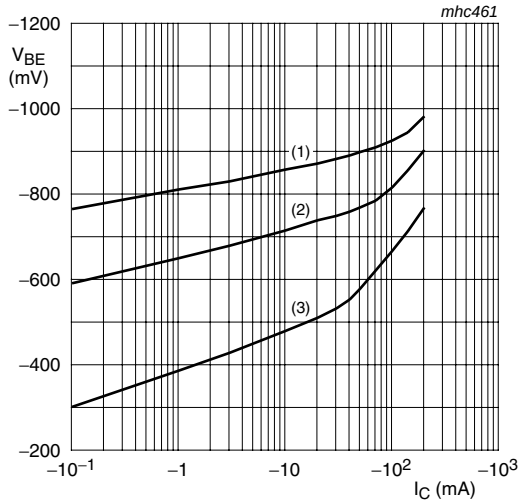
(3) T_{amb} = −55 °C

Fig 1. DC current gain as a function of collector current; typical values



T_{amb} = 25 °C

Fig 2. Collector current as a function of collector-emitter voltage; typical values



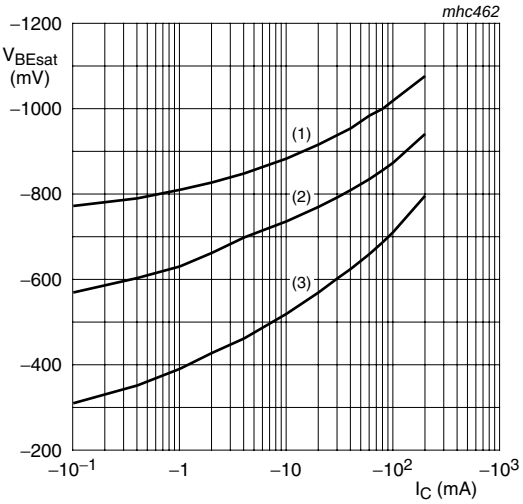
V_{CE} = −1 V

(1) T_{amb} = −55 °C

(2) T_{amb} = 25 °C

(3) T_{amb} = 150 °C

Fig 3. Base-emitter voltage as a function of collector current; typical values



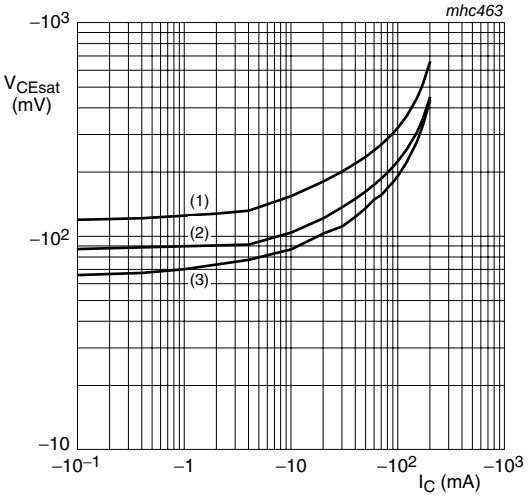
I_C/I_B = 10

(1) T_{amb} = −55 °C

(2) T_{amb} = 25 °C

(3) T_{amb} = 150 °C

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



I_C/I_B = 10

(1) T_{amb} = 150 °C

(2) T_{amb} = 25 °C

(3) T_{amb} = −55 °C

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

8. Test information

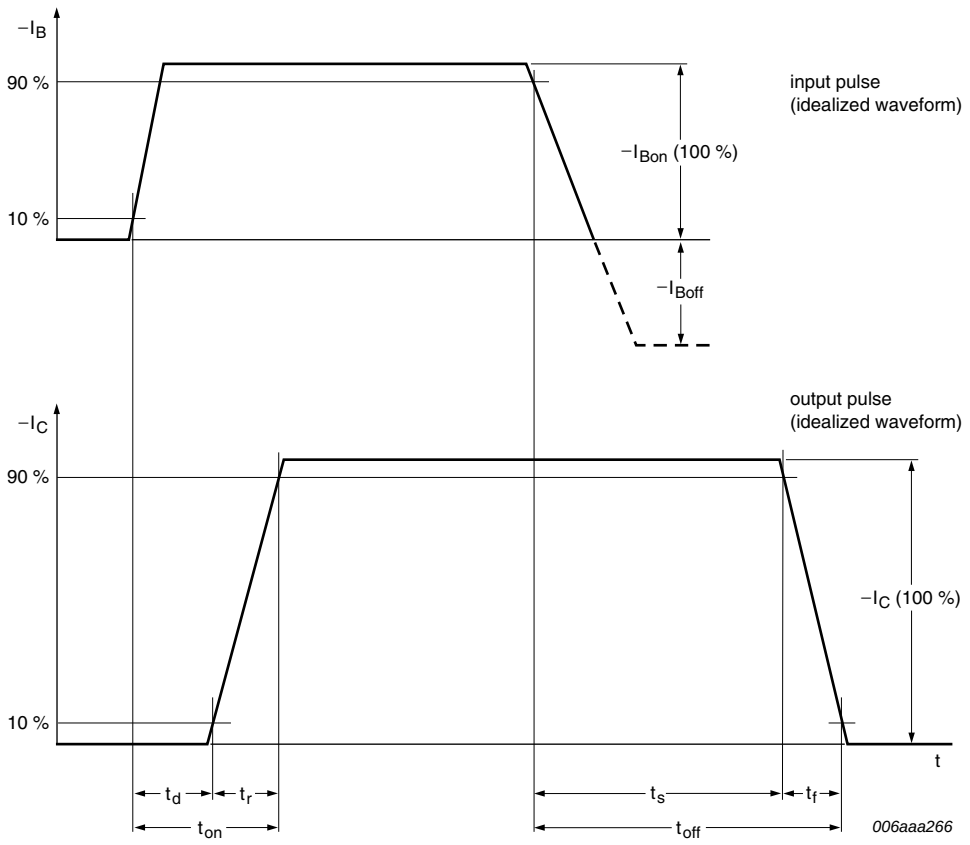
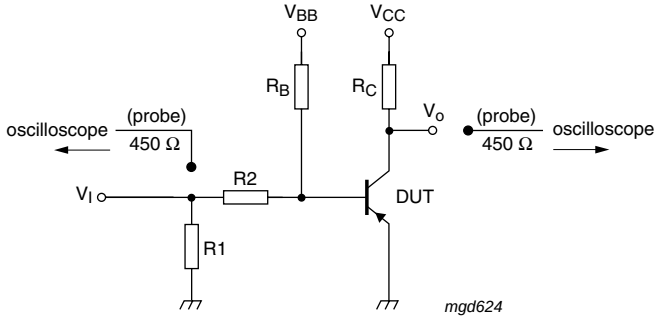


Fig 6. BISS transistor switching time definition



V_I = 5 V; T = 500 μs; t_p = 10 μs; $t_r = t_f \leq 3$ ns

R1 = 56 Ω; R2 = 2.5 kΩ; R_B = 3.9 kΩ; R_C = 270 Ω

V_{BB} = 1.9 V; V_{CC} = −3 V

Oscilloscope: input impedance Z_i = 50 Ω

Fig 7. Test circuit for switching times

9. Package outline

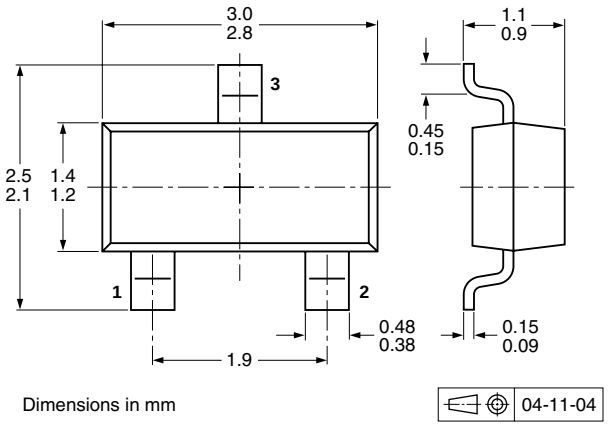


Fig 8. Package outline SOT23 (TO-236AB)

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
PMBT3906	SOT23	4 mm pitch, 8 mm tape and reel	-215	-235

[1] For further information and the availability of packing methods, see Section 13.

11. Revision history

Table 9. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
PMBT3906_6	20100302	Product data sheet	-	PMBT3906_N_5
Modifications:	• The format of this data sheet has been redesigned to comply with the new identity guidelines of NXP Semiconductors. • Legal texts have been adapted to the new company name where appropriate. • Section 4 “Marking”: amended • Table 7 “Characteristics”: F redefined to NF noise figure • Section 8 “Test information”: added • Figure 6: added • Figure 8: superseded by minimized package outline drawing • Section 10 “Packing information”: added • Section 12 “Legal information”: updated			
PMBT3906_N_5	20071004	Product data sheet	-	PMBT3906_4
PMBT3906_4	20040121	Product specification	-	PMBT3906_3
PMBT3906_3	19990427	Product specification	-	PMBT3906_CNV_2
PMBT3906_CNV_2	19970505	Product specification	-	-

12. Legal information

12.1 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.nexperia.com.

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14. Contents

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Date of release: 02 March 2010

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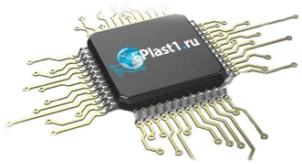

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