

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

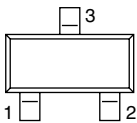
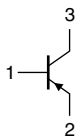
1.4 Quick reference data

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	$T_{amb} \leq 25\text{ °C}$	^[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

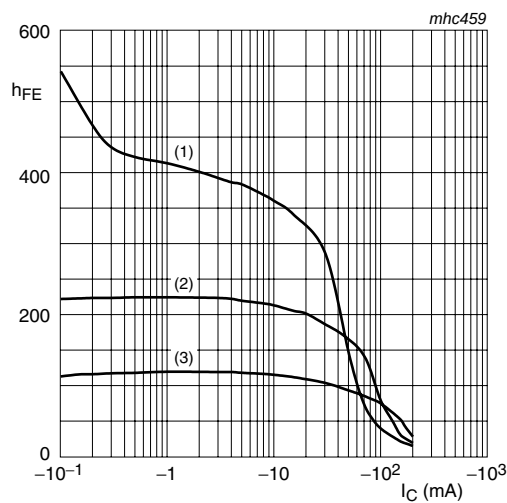
[1] Device mounted on an FR4 PCB.

7. Characteristics

Table 7. Characteristics

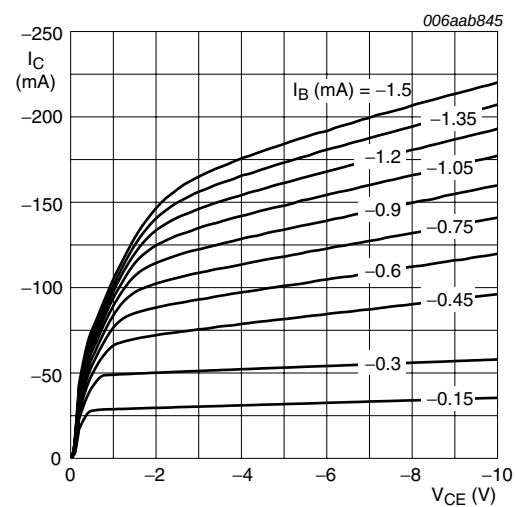
$T_{amb} = 25\text{ }^{\circ}\text{C}$ unless otherwise specified.

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
I_{CBO}	collector-base cut-off current	$V_{CB} = -30\text{ V}$; $I_E = 0\text{ A}$	-	-	-50	nA
I_{EBO}	emitter-base cut-off current	$V_{EB} = -6\text{ V}$; $I_C = 0\text{ A}$	-	-	-50	nA
h_{FE}	DC current gain	$V_{CE} = -1\text{ V}$				
		$I_C = -0.1\text{ mA}$	60	-	-	
		$I_C = -1\text{ mA}$	80	-	-	
		$I_C = -10\text{ mA}$	100	-	300	
		$I_C = -50\text{ mA}$	60	-	-	
		$I_C = -100\text{ mA}$	30	-	-	
V_{CEsat}	collector-emitter saturation voltage	$I_C = -10\text{ mA}$; $I_B = -1\text{ mA}$	-	-	-250	mV
		$I_C = -50\text{ mA}$; $I_B = -5\text{ mA}$	-	-	-400	mV
V_{BEsat}	base-emitter saturation voltage	$I_C = -10\text{ mA}$; $I_B = -1\text{ mA}$	-	-	-850	mV
		$I_C = -50\text{ mA}$; $I_B = -5\text{ mA}$	-	-	-950	mV
t_d	delay time	$I_{Con} = -10\text{ mA}$;	-	-	35	ns
t_r	rise time	$I_{Bon} = -1\text{ mA}$;	-	-	35	ns
t_{on}	turn-on time	$I_{Boff} = 1\text{ mA}$	-	-	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	$V_{CE} = -20\text{ V}$; $I_C = -10\text{ mA}$; $f = 100\text{ MHz}$	250	-	-	MHz
C_c	collector capacitance	$V_{CB} = -5\text{ V}$; $I_E = I_C = 0\text{ A}$; $f = 1\text{ MHz}$	-	-	4.5	pF
C_e	emitter capacitance	$V_{EB} = -500\text{ mV}$; $I_C = I_E = 0\text{ A}$; $f = 1\text{ MHz}$	-	-	10	pF
NF	noise figure	$I_C = -100\text{ }\mu\text{A}$; $V_{CE} = -5\text{ V}$; $R_S = 1\text{ k}\Omega$; $f = 10\text{ Hz to }15.7\text{ kHz}$	-	-	4	dB



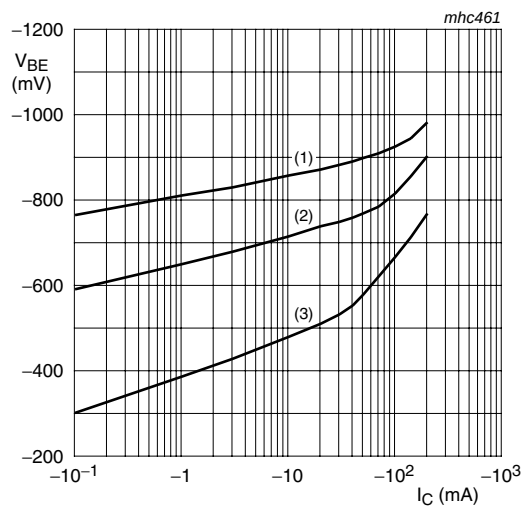
- $V_{CE} = -1\text{ V}$
- (1) $T_{amb} = 150^\circ\text{C}$
 - (2) $T_{amb} = 25^\circ\text{C}$
 - (3) $T_{amb} = -55^\circ\text{C}$

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



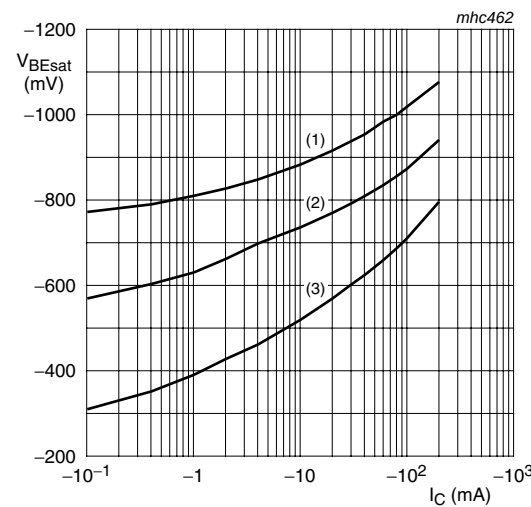
$T_{amb} = 25^\circ\text{C}$

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



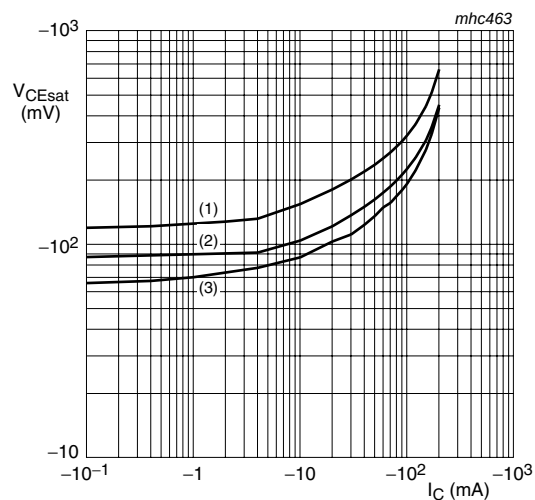
- $V_{CE} = -1\text{ V}$
- (1) $T_{amb} = -55^\circ\text{C}$
 - (2) $T_{amb} = 25^\circ\text{C}$
 - (3) $T_{amb} = 150^\circ\text{C}$

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



- $I_C/I_B = 10$
- (1) $T_{amb} = -55^\circ\text{C}$
 - (2) $T_{amb} = 25^\circ\text{C}$
 - (3) $T_{amb} = 150^\circ\text{C}$

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



$$I_C/I_B = 10$$

- (1) $T_{amb} = 150\text{ }^{\circ}\text{C}$
- (2) $T_{amb} = 25\text{ }^{\circ}\text{C}$
- (3) $T_{amb} = -55\text{ }^{\circ}\text{C}$

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

8. Test information

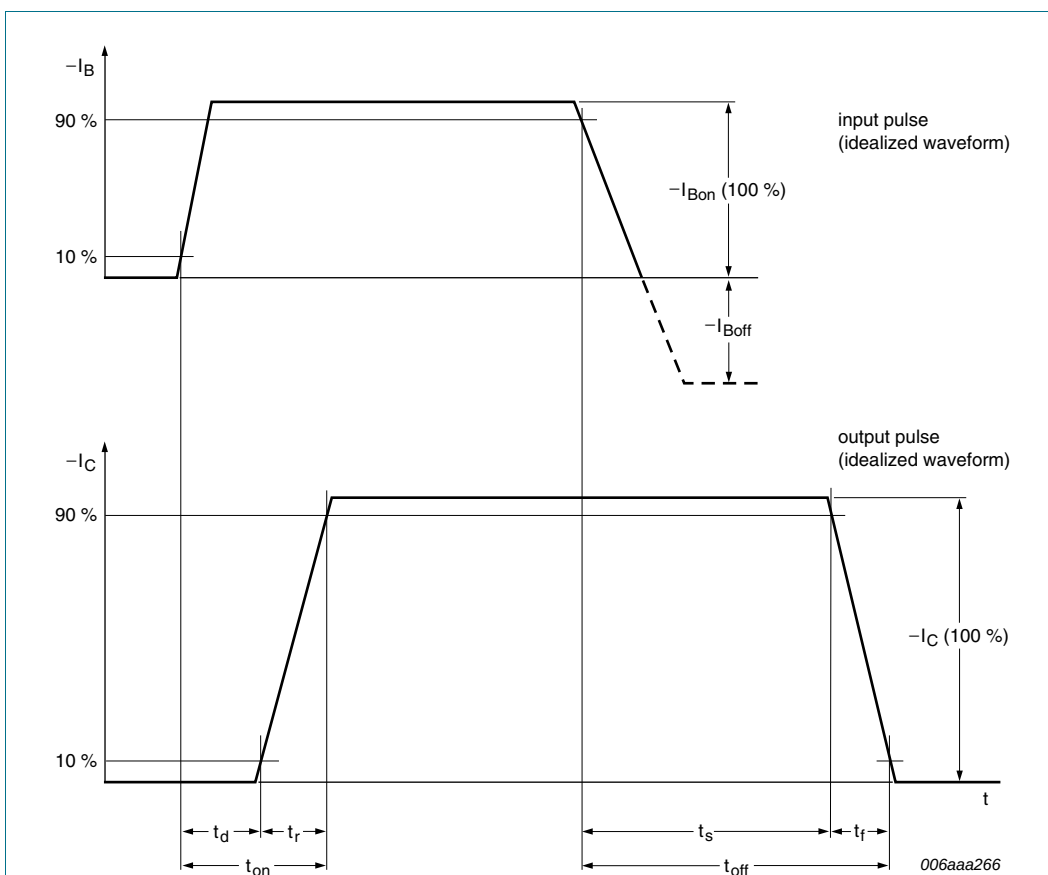
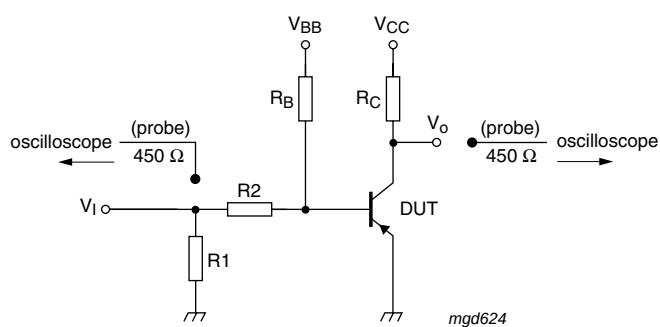


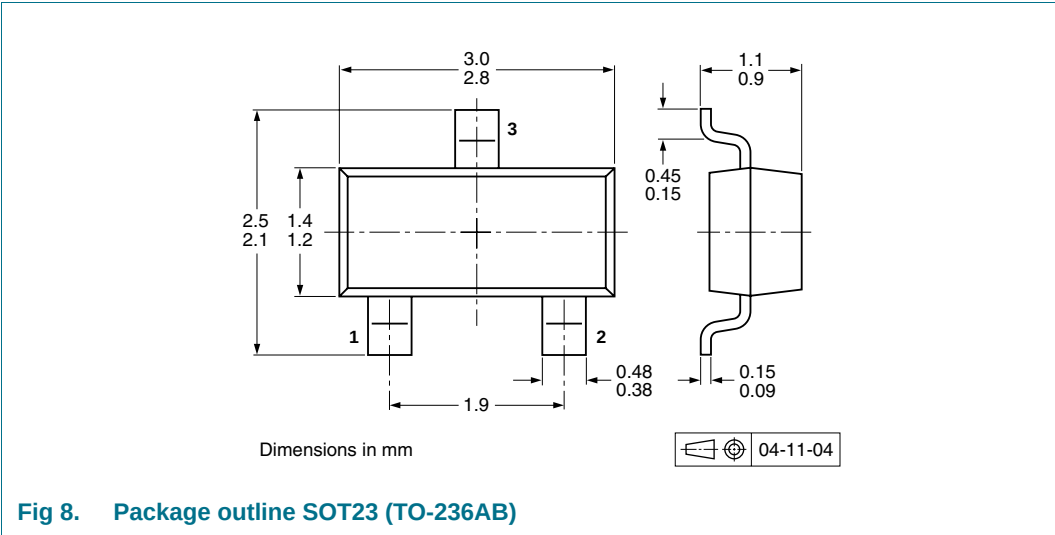
Fig 6. BISS transistor switching time definition



$V_I = 5 \text{ V}$; $T = 500 \text{ } \mu\text{s}$; $t_p = 10 \text{ } \mu\text{s}$; $t_r = t_f \leq 3 \text{ ns}$
 $R_1 = 56 \text{ } \Omega$; $R_2 = 2.5 \text{ k}\Omega$; $R_B = 3.9 \text{ k}\Omega$; $R_C = 270 \text{ } \Omega$
 $V_{BB} = 1.9 \text{ V}$; $V_{CC} = -3 \text{ V}$
 Oscilloscope: input impedance $Z_i = 50 \text{ } \Omega$

Fig 7. Test circuit for switching times

9. Package outline



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".

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Date of release: 2 March 2010

Document identifier: PMBT3906_6