

PMBT3906

PNP switching transistor

Rev. 05 — 4 October 2007

Product data sheet

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NXP Semiconductors

PNP switching transistor

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FEATURES

- Collector current capability $I_C = -200\text{ mA}$
- Collector-emitter voltage $V_{CEO} = -40\text{ V}$.

APPLICATIONS

- General amplification and switching.

DESCRIPTION

PNP switching transistor in a SOT23 plastic package.
NPN complement: PMBT3904.

MARKING

TYPE NUMBER	MARKING CODE ⁽¹⁾
PMBT3906	*2A

Note

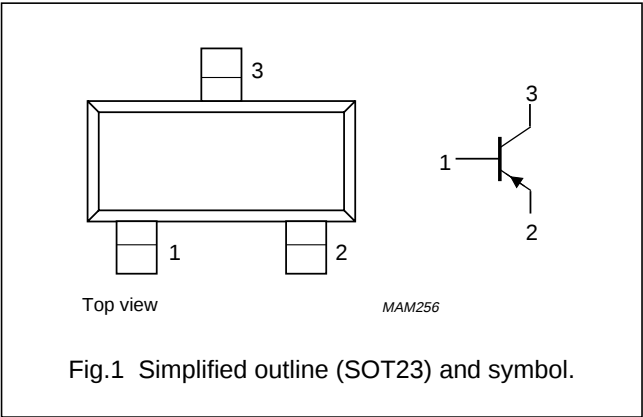
1. * = p: Made in Hong Kong.
* = t: Made in Malaysia.
* = W: Made in China.

QUICK REFERENCE DATA

SYMBOL	PARAMETER	MAX.	UNIT
V_{CEO}	collector-emitter voltage	-40	V
I_C	collector current (DC)	-200	mA

PINNING

PIN	DESCRIPTION
1	base
2	emitter
3	collector



ORDERING INFORMATION

TYPE NUMBER	PACKAGE		
	NAME	DESCRIPTION	VERSION
PMBT3906	–	plastic surface mounted package; 3 leads	SOT23

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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 (DC)		–	–200	mA
I_{CM}	peak collector current		–	–200	mA
I_{BM}	peak base current		–	–100	mA
P_{tot}	total power dissipation	$T_{amb} \leq 25\text{ °C}$; note 1	–	250	mW
T_{stg}	storage temperature		–65	+150	°C
T_j	junction temperature		–	150	°C
T_{amb}	operating ambient temperature		–65	+150	°C

Note

1. Transistor mounted on an FR4 printed-circuit board.

THERMAL CHARACTERISTICS

SYMBOL	PARAMETER	CONDITIONS	VALUE	UNIT
$R_{th(j-a)}$	thermal resistance from junction to ambient	note 1	500	K/W

Note

1. Transistor mounted on an FR4 printed-circuit board.

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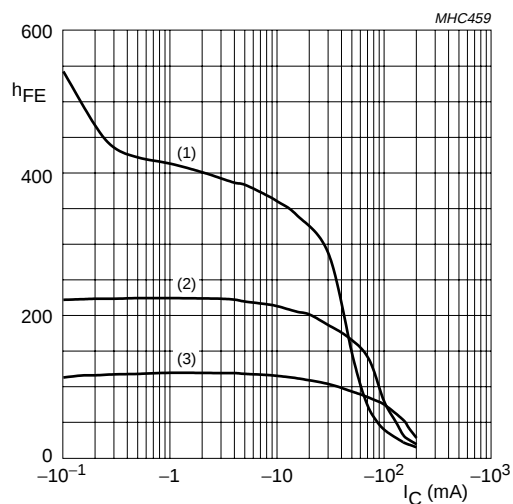
CHARACTERISTICS

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

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	UNIT
I_{CBO}	collector cut-off current	$I_E = 0$; $V_{CB} = -30\text{ V}$	–	–50	nA
I_{EBO}	emitter cut-off current	$I_C = 0$; $V_{EB} = -6\text{ V}$	–	–50	nA
h_{FE}	DC current gain	$V_{CE} = -1\text{ V}$; see Fig.2 $I_C = -0.1\text{ mA}$ $I_C = -1\text{ mA}$ $I_C = -10\text{ mA}$ $I_C = -50\text{ mA}$ $I_C = -100\text{ mA}$	60 80 100 60 30	– – 300 – –	
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
C_c	collector capacitance	$I_E = I_E = 0$; $V_{CB} = -5\text{ V}$; $f = 1\text{ MHz}$	–	4.5	pF
C_e	emitter capacitance	$I_C = I_C = 0$; $V_{EB} = -500\text{ mV}$; $f = 1\text{ MHz}$	–	10	pF
f_T	transition frequency	$I_C = -10\text{ mA}$; $V_{CE} = -20\text{ V}$; $f = 100\text{ MHz}$	250	–	MHz
F	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
Switching times (between 10% and 90% levels); see Fig.7					
t_d	delay time	$I_{Con} = -10\text{ mA}$; $I_{Bon} = -1\text{ mA}$; $I_{Boff} = 1\text{ mA}$	–	35	ns
t_r	rise time		–	35	ns
t_s	storage time		–	225	ns
t_f	fall time		–	75	ns

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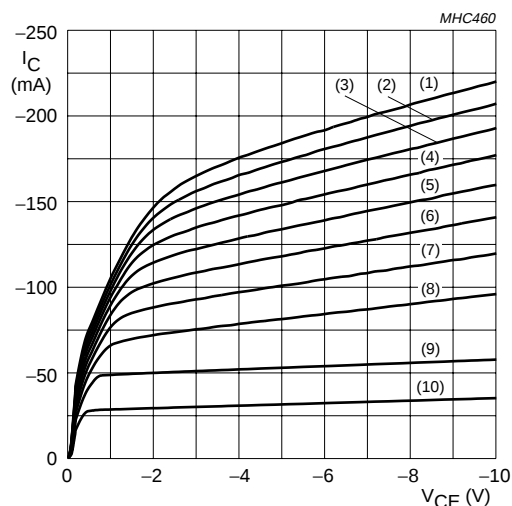
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$V_{CE} = -1 \text{ V}$.

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

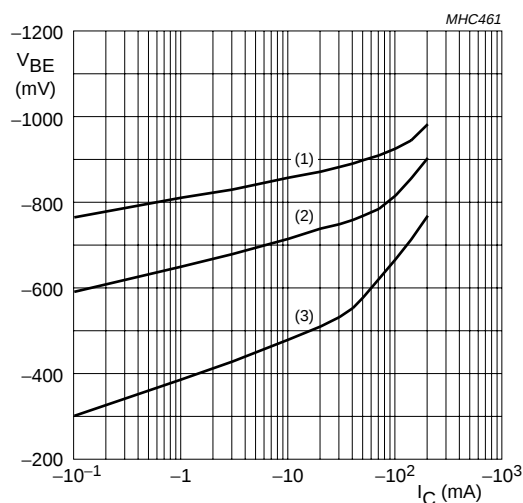
Fig.2 DC current gain; typical values.



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

- (1) $I_B = -1.5 \text{ mA}$.
- (2) $I_B = -1.35 \text{ mA}$.
- (3) $I_B = -1.2 \text{ mA}$.
- (4) $I_B = -1.05 \text{ mA}$.
- (5) $I_B = -0.9 \text{ mA}$.
- (6) $I_B = -0.75 \text{ mA}$.
- (7) $I_B = -0.6 \text{ mA}$.
- (8) $I_B = -0.45 \text{ mA}$.
- (9) $I_B = -0.3 \text{ mA}$.
- (10) $I_B = -0.15 \text{ mA}$.

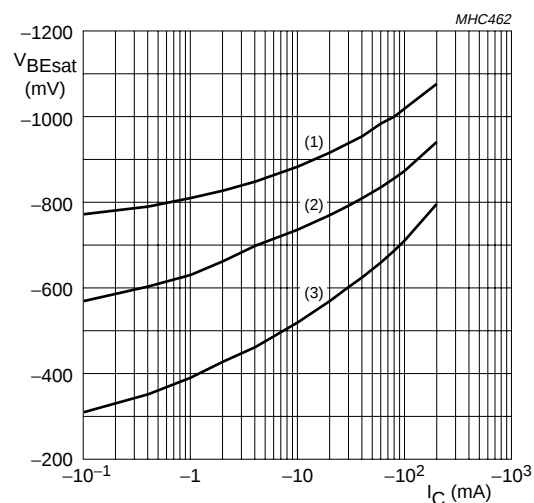
Fig.3 Collector current as a function of collector-emitter voltage.



$V_{CE} = -1 \text{ V}$.

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

Fig.4 Base-emitter voltage as a function of collector current.



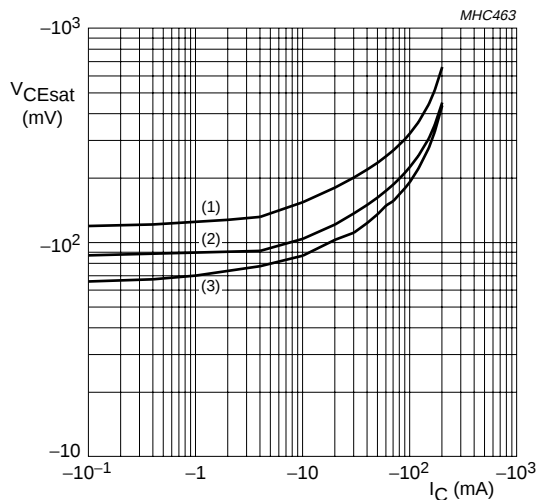
$I_C/I_B = 10$.

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

Fig.5 Base-emitter saturation voltage as a function of collector current.

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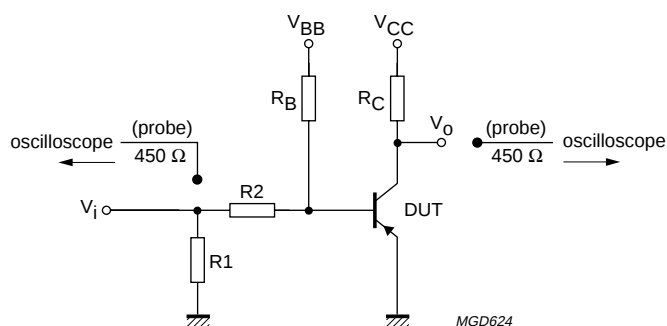
$I_C/I_B = 10$.

(1) $T_{amb} = 25\text{ }^{\circ}\text{C}$.

(2) $T_{amb} = 150\text{ }^{\circ}\text{C}$.

(3) $T_{amb} = -55\text{ }^{\circ}\text{C}$.

Fig.6 Collector-emitter saturation voltage as a function of collector current.



$V_i = 5\text{ V}$; $T = 500\text{ }\mu\text{s}$; $t_p = 10\text{ }\mu\text{s}$; $t_r = t_f \leq 3\text{ ns}$.

$R_1 = 56\text{ }\Omega$; $R_2 = 2.5\text{ k}\Omega$; $R_B = 3.9\text{ k}\Omega$; $R_C = 270\text{ }\Omega$.

$V_{BB} = 1.9\text{ V}$; $V_{CC} = -3\text{ V}$.

Oscilloscope: input impedance $Z_i = 50\text{ }\Omega$.

Fig.7 Test circuit for switching times.

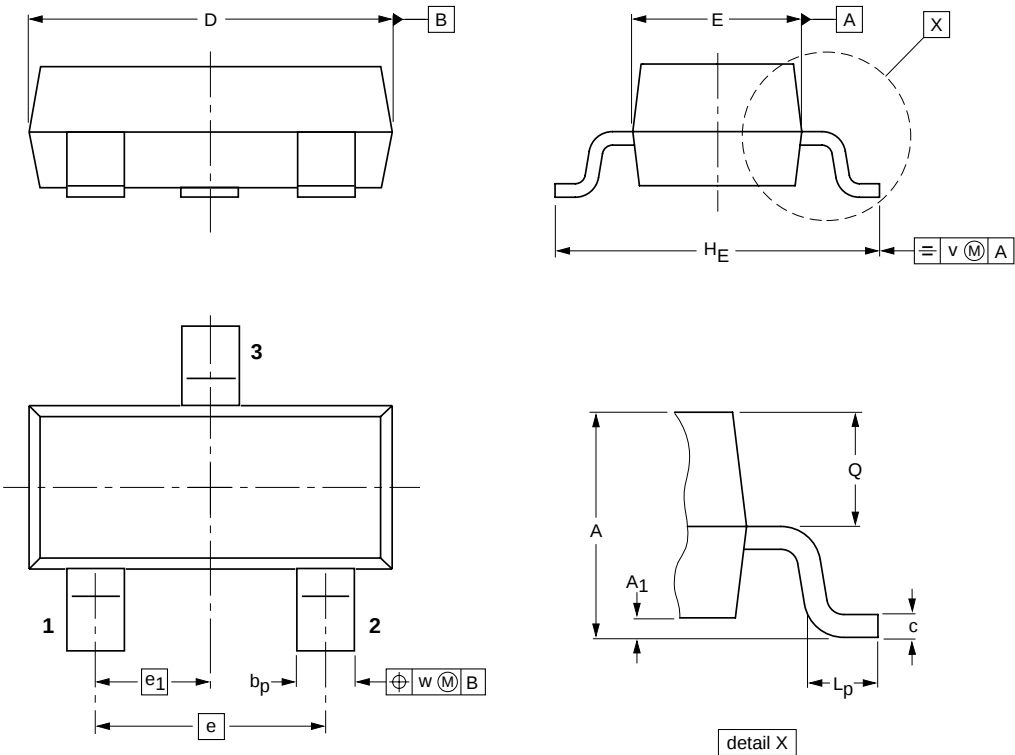
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PACKAGE OUTLINE

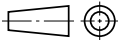
Plastic surface mounted package; 3 leads

SOT23



DIMENSIONS (mm are the original dimensions)

UNIT	A	A ₁ max.	b _p	c	D	E	e	e ₁	H _E	L _p	Q	v	w
mm	1.1 0.9	0.1	0.48 0.38	0.15 0.09	3.0 2.8	1.4 1.2	1.9	0.95	2.5 2.1	0.45 0.15	0.55 0.45	0.2	0.1

OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	EIAJ			
SOT23		TO-236AB				97-02-28 99-09-13

Legal information

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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Revision history

Table 1. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
PMBT3906_N_5	20071004	Product data sheet	-	PMBT3906_4
Modifications:	• Marking code corrected (page 2)			
PMBT3906_4 (9397 750 12535)	20040121	Product specification	-	PMBT3906_3
PMBT3906_3 (9397 750 05816)	19990427	Product specification	-	PMBT3906_2
PMBT3906_CNV_2 (9397 750 02091)	19970505	Product specification	-	-

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