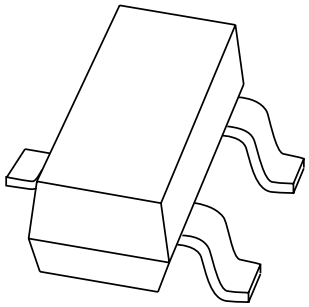
DATA SHEET



PMBS3904
NPN general purpose transistor

Product specification
Supersedes data of 1997 May 20

1999 Apr 22

Philips
Semiconductors

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NPN general purpose transistor PMBS3904

FEATURES

- Low current (max. 100 mA)
- Low voltage (max. 40 V).

APPLICATIONS

- General purpose switching and amplification, e.g. telephony and professional communication equipment.

DESCRIPTION

NPN transistor in a plastic SOT23 package.
PNP complement: PMBS3906.

MARKING

TYPE NUMBER	MARKING CODE(1)
PMBS3904	∗O4

Note

1. ∗ = p : Made in Hong Kong.
   ∗ = t : Made in Malaysia.

PINNING

PIN	DESCRIPTION
1	base
2	emitter
3	collector

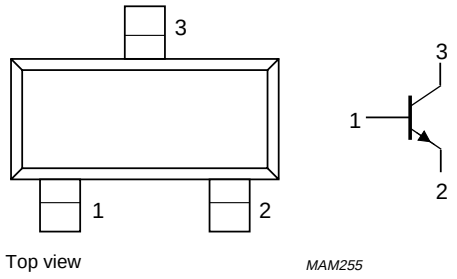


Fig.1 Simplified outline (SOT23) and symbol.

LIMITING VALUES

In accordance with the Absolute Maximum Rating System (IEC 134).

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	UNIT
V_{CBO}	collector-base voltage	open emitter	–	60	V
V_{CEO}	collector-emitter voltage	open base	–	40	V
V_{EBO}	emitter-base voltage	open collector	–	6	V
I_C	collector current (DC)		–	100	mA
I_{CM}	peak collector current		–	200	mA
I_{BM}	peak base current		–	200	mA
P_{tot}	total power dissipation	$T_{amb} \leq 25$ °C	–	250	mW
T_{stg}	storage temperature		–65	+150	°C
T_j	junction temperature		–	150	°C
T_{amb}	operating ambient temperature		–65	+150	°C

THERMAL CHARACTERISTICS

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

Note

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

CHARACTERISTICS

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

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	UNIT
I_{CBO}	collector cut-off current	I_E = 0; V_{CB} = 30 V	–	50	nA
I_{EBO}	emitter cut-off current	I_C = 0; V_{EB} = 5 V	–	50	nA
h_{FE}	DC current gain	V_{CE} = 1 V; note 1; (see Fig.2)			
		I_C = 0.1 mA	40	–	
		I_C = 1 mA	70	–	
		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	–	200	mV
		I_C = 50 mA; I_B = 5 mA	–	300	mV
V_{BEsat}	base-emitter saturation voltage	I_C = 10 mA; I_B = 1 mA	650	850	mV
		I_C = 50 mA; I_B = 5 mA	–	950	mV
C_c	collector capacitance	$I_E = i_e$ = 0; V_{CB} = 5 V; f = 1 MHz	–	4	pF
C_e	emitter capacitance	$I_C = i_c$ = 0; V_{EB} = 0.5 V; f = 1 MHz	–	12	pF
f_T	transition frequency	I_C = 10 mA; V_{CE} = 20 V; f = 100 MHz	180	–	MHz
F	noise figure	I_C = 100 μA; V_{CE} = 5 V; R_S = 1 kΩ; f = 10 Hz to 15.7 kHz	–	5	dB
Switching times (between 10% and 90% levels); (see Fig.3)					
t_{on}	turn-on time	I_{Con} = 10 mA; I_{Bon} = 1 mA; I_{Boff} = – 1 mA; V_{CC} = 3 V; V_{BB} = –1.9 V	–	110	ns
t_d	delay time		–	50	ns
t_r	rise time		–	60	ns
t_{off}	turn-off time		–	1200	ns
t_s	storage time		–	1000	ns
t_f	fall time		–	200	ns

Note

1. Pulse test: $t_p \leq 300\ \mu s$; $\delta \leq 0.02$.

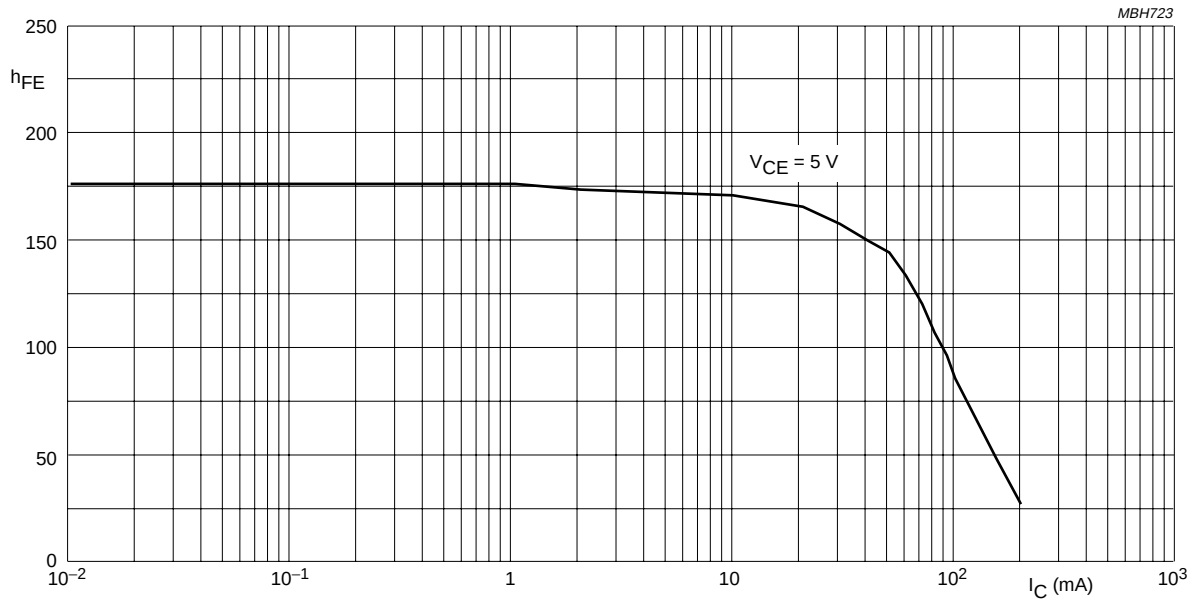
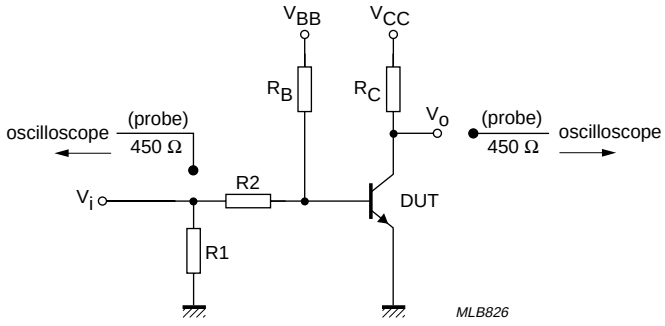


Fig.2 DC current gain; typical values.

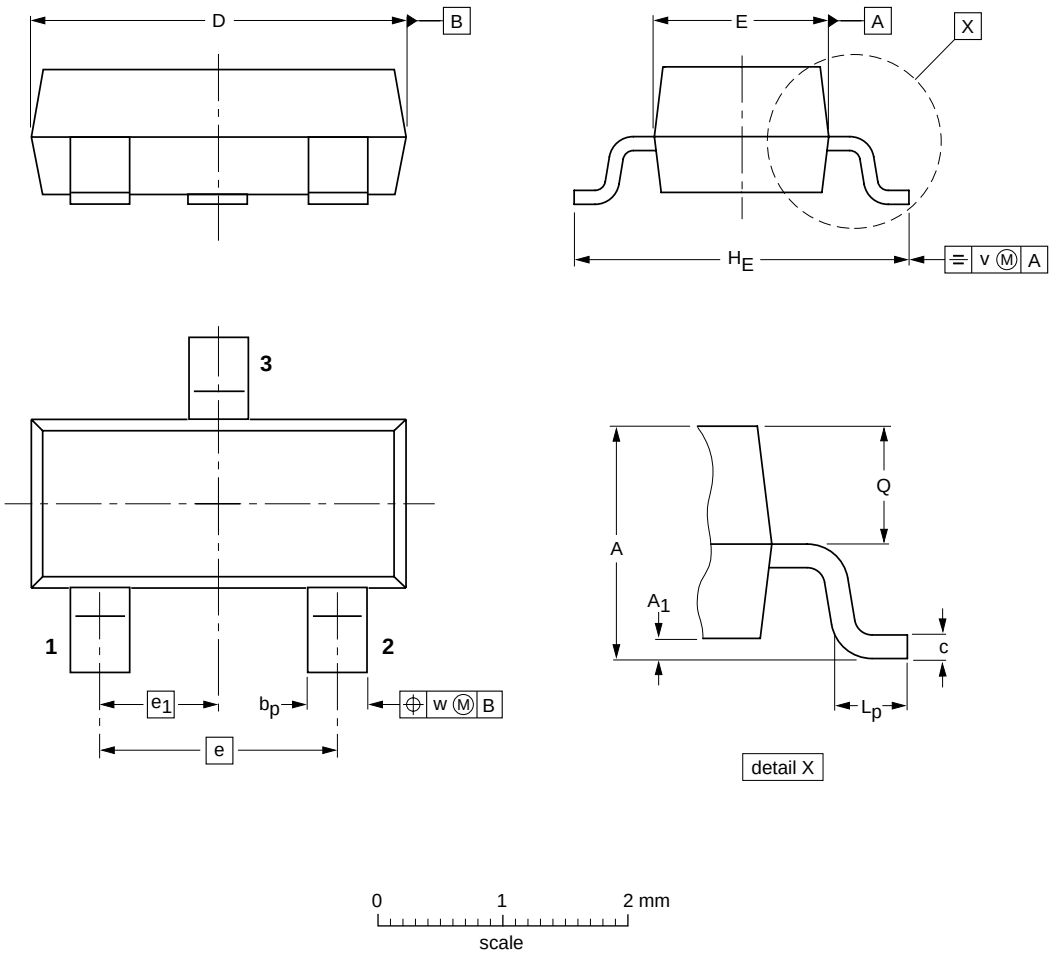


V_i = 5 V; T = 500 µs; t_p = 10 µs; t_r = t_f ≤ 3 ns.
R1 = 56 Ω; R2 = 2.5 kΩ; R_B = 3.9 kΩ; R_C = 270 Ω.
Oscilloscope: input impedance Z_i = 50 Ω.

Fig.3 Test circuit for switching times.

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						97-02-28

DEFINITIONS

Data Sheet Status	
Objective specification	This data sheet contains target or goal specifications for product development.
Preliminary specification	This data sheet contains preliminary data; supplementary data may be published later.
Product specification	This data sheet contains final product specifications.
Limiting values	
Limiting values given are in accordance with the Absolute Maximum Rating System (IEC 134). Stress above one or more of the limiting values may cause permanent damage to the device. These are stress ratings only and operation of the device at these or at any other conditions above those given in the Characteristics sections of the specification is not implied. Exposure to limiting values for extended periods may affect device reliability.	
Application information	
Where application information is given, it is advisory and does not form part of the specification.	

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