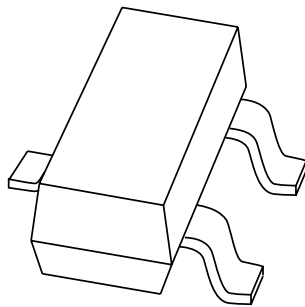


DATA SHEET



PMBS3904/L

NPN general purpose transistor

Product specification

2000 Nov 29

NPN general purpose transistor

PMBS3904/L

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

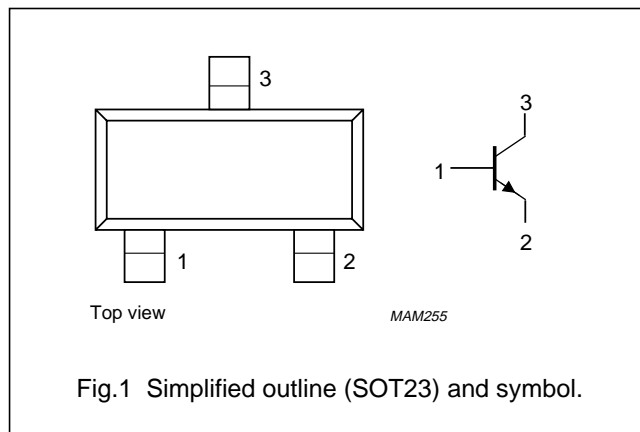
NPN transistor in a SOT23 plastic package.
PNP complement: PMBS3906/L.

MARKING

TYPE NUMBER	MARKING CODE
PMBS3904/L	aO4

PINNING

PIN	DESCRIPTION
1	base
2	emitter
3	collector



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	–	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} ≤ 25 °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. See standard mounting conditions SOT23.

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THERMAL CHARACTERISTICS

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

Note

- See standard mounting conditions SOT23.

CHARACTERISTICS

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

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	UNIT
I_{CBO}	collector cut-off current	$V_{CB} = 30\text{ V}; I_E = 0$	–	50	nA
I_{EBO}	emitter cut-off current	$V_{EB} = 5\text{ V}; I_C = 0$	–	50	nA
h_{FE}	DC current gain	$I_C = 0.1\text{ mA}; V_{CE} = 1\text{ V}$ $I_C = 1\text{ mA}; V_{CE} = 1\text{ V}$ $I_C = 10\text{ mA}; V_{CE} = 1\text{ V}$ $I_C = 50\text{ mA}; V_{CE} = 1\text{ V}; \text{note 1}$ $I_C = 100\text{ mA}; V_{CE} = 1\text{ V}; \text{note 1}$	40 70 100 60 30	– – 300 – –	
V_{CEsat}	saturation voltage	$I_C = 10\text{ mA}; I_B = 1\text{ mA}; \text{note 1}$	–	200	mV
		$I_C = 50\text{ mA}; I_B = 5\text{ mA}; \text{note 1}$	–	300	mV
V_{BEsat}	saturation voltage	$I_C = 10\text{ mA}; I_B = 1\text{ mA}; \text{note 1}$	–	850	mV
		$I_C = 50\text{ mA}; I_B = 5\text{ mA}; \text{note 1}$	–	950	mV
C_c	collector capacitance	$V_{CB} = 5\text{ V}; I_E = i_e = 0; f = 1\text{ MHz}$	–	4	pF
C_e	emitter capacitance	$V_{EB} = 0.5\text{ V}; I_E = i_e = 0; f = 1\text{ MHz}$	–	12	pF
f_T	transition frequency	$I_E = 10\text{ mA}; V_{CB} = 20\text{ V}; f = 100\text{ MHz}$	180	–	MHz
F	noise figure	$I_C = 100\text{ }\mu\text{A}; V_{CE} = 5\text{ V}; R_S = 1\text{ k}\Omega;$ $f = 10\text{ Hz to }15.7\text{ kHz}$	–	5	dB

Switching times (resistive load); see Fig.2

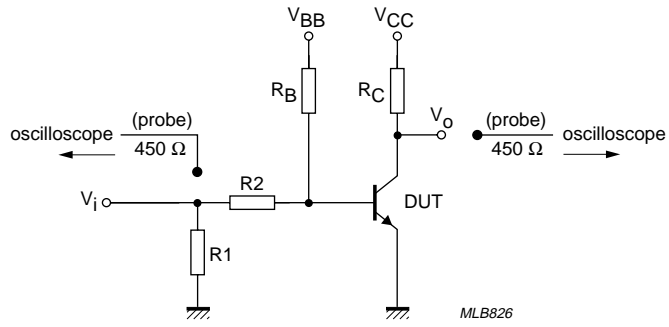
t_{on}	turn-on time	$I_{Con} = 10\text{ mA}; I_{Bon} = 1\text{ mA}; I_{Boff} = -1\text{ mA};$ $V_{CC} = 3\text{ V}; V_{BB} = -1.9\text{ V}$	–	110	ns
t_d	delay time		–	50	ns
t_r	rise time		–	60	ns
t_{off}	turn-off time		–	1200	ns
t_s	storage time		–	1000	ns
t_f	fall time		–	200	ns

Note

- Pulse test: $t_p \leq 300\text{ }\mu\text{s}; \delta \leq 0.02$.

NPN general purpose transistor

PMBS3904/L



$V_i = 5\text{ V}$; $T = 500\ \mu\text{s}$; $t_p = 10\ \mu\text{s}$; $t_r = t_f \leq 3\ \text{ns}$
 $R_1 = 56\ \Omega$; $R_2 = 2.5\ \text{k}\Omega$; $R_B = 3.9\ \text{k}\Omega$; $R_C = 270\ \Omega$.
 Oscilloscope input impedance $Z_i = 50\ \Omega$.

Fig.2 Test circuit for switching times.

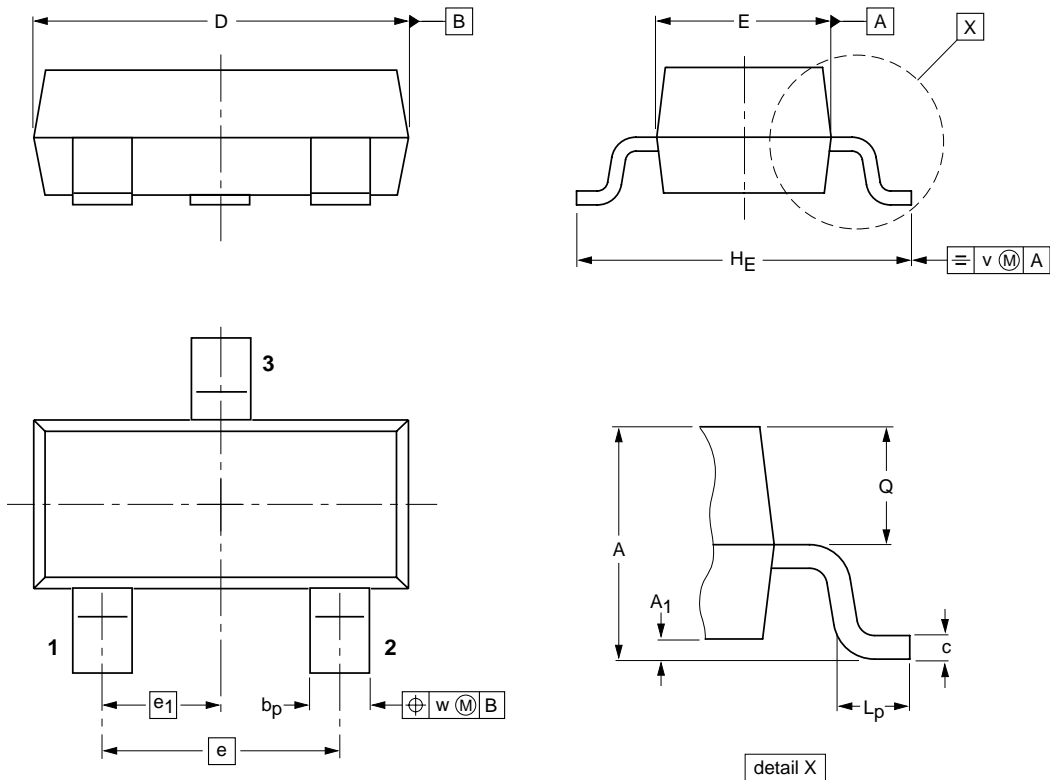
NPN general purpose transistor

PMBS3904/L

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

NPN general purpose transistor

PMBS3904/L

DATA SHEET STATUS

DATA SHEET STATUS	PRODUCT STATUS	DEFINITIONS ⁽¹⁾
Objective specification	Development	This data sheet contains the design target or goal specifications for product development. Specification may change in any manner without notice.
Preliminary specification	Qualification	This data sheet contains preliminary data, and supplementary data will be published at a later date. Philips Semiconductors reserves the right to make changes at any time without notice in order to improve design and supply the best possible product.
Product specification	Production	This data sheet contains final specifications. Philips Semiconductors reserves the right to make changes at any time without notice in order to improve design and supply the best possible product.

Note

1. Please consult the most recently issued data sheet before initiating or completing a design.

DEFINITIONS

Short-form specification — The data in a short-form specification is extracted from a full data sheet with the same type number and title. For detailed information see the relevant data sheet or data handbook.

Limiting values definition — Limiting values given are in accordance with the Absolute Maximum Rating System (IEC 60134). 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.

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