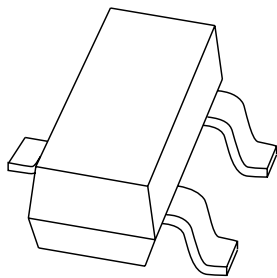


DATA SHEET



PMBS3904

NPN general purpose transistor

Product specification
Supersedes data of 1999 Apr 22

2004 Feb 02

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

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

PINNING

| PIN | DESCRIPTION |
|-----|-------------|
| 1 | base |
| 2 | emitter |
| 3 | collector |

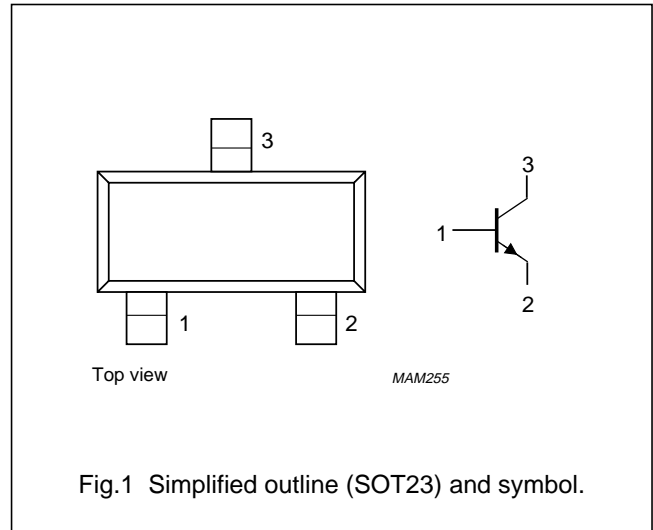


Fig.1 Simplified outline (SOT23) and symbol.

ORDERING INFORMATION

| TYPE NUMBER | PACKAGE | | |
|-------------|---------|--|---------|
| | NAME | DESCRIPTION | VERSION |
| PMBS3904 | – | plastic surface mounted package; 3 leads | SOT23 |

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 capability | | – | 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 | – | 250 | mW |
| T _{stg} | storage temperature | | –65 | +150 | °C |
| T _j | junction temperature | | – | 150 | °C |
| T _{amb} | operating ambient temperature | | –65 | +150 | °C |

NPN general purpose transistor

PMBS3904

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.

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 | $I_C = 0; V_{EB} = 5\text{ V}$ | – | 50 | nA |
| h_{FE} | DC current gain | $V_{CE} = 1\text{ V}$; note 1; (see Fig.2) $I_C = 0.1\text{ mA}$ $I_C = 1\text{ mA}$ $I_C = 10\text{ mA}$ $I_C = 50\text{ mA}$ $I_C = 100\text{ mA}$ | 40 70 100 60 30 | – – 300 – – | |
| V_{CEsat} | collector-emitter saturation voltage | $I_C = 10\text{ mA}; I_B = 1\text{ mA}$ | – | 200 | mV |
| | | $I_C = 50\text{ mA}; I_B = 5\text{ mA}$ | – | 300 | mV |
| V_{BEsat} | base-emitter saturation voltage | $I_C = 10\text{ mA}; I_B = 1\text{ mA}$ | 650 | 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 | pF |
| C_e | emitter capacitance | $I_C = i_c = 0; V_{EB} = 0.5\text{ V}; f = 1\text{ MHz}$ | – | 12 | pF |
| f_T | transition frequency | $I_C = 10\text{ mA}; V_{CE} = 20\text{ V}; f = 100\text{ MHz}$ | 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 (between 10% and 90% levels); (see Fig.3)

| | | | | | |
|-----------|---------------|---|---|------|----|
| 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

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

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PMBS3904

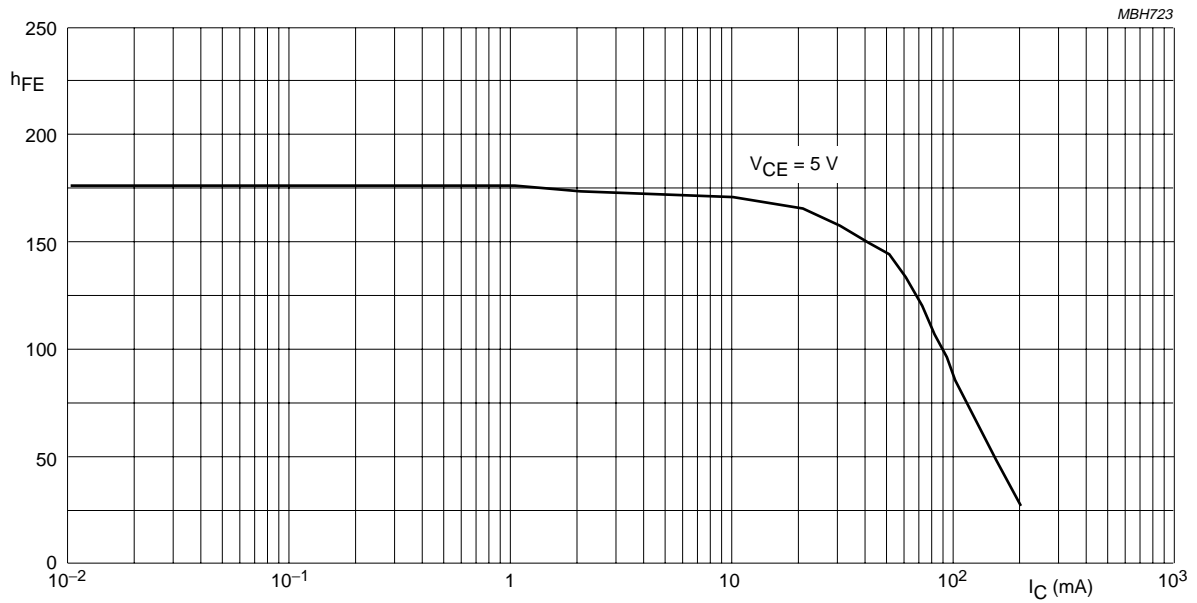
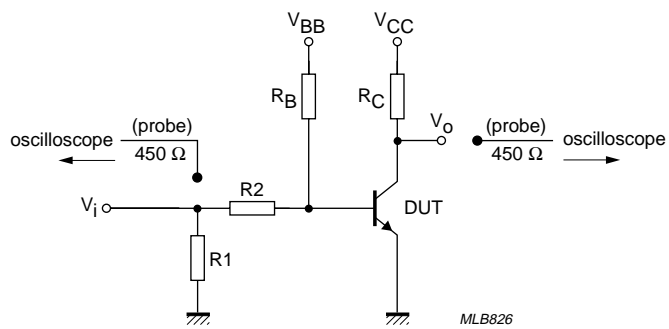


Fig.2 DC current gain; typical values.



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

Fig.3 Test circuit for switching times.

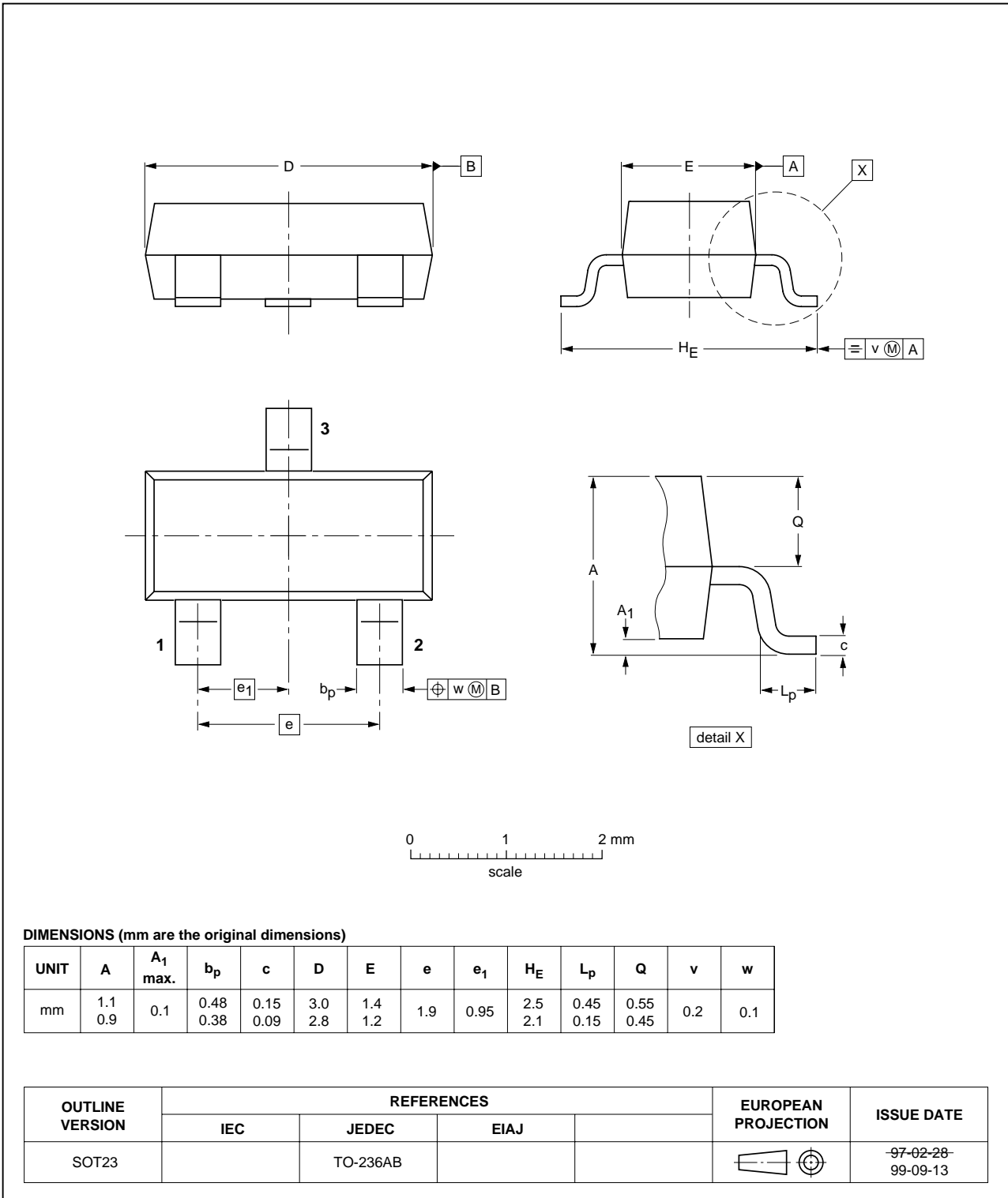
NPN general purpose transistor

PMBS3904

PACKAGE OUTLINE

Plastic surface mounted package; 3 leads

SOT23



NPN general purpose transistor

PMBS3904

DATA SHEET STATUS

| LEVEL | DATA SHEET STATUS ⁽¹⁾ | PRODUCT STATUS ⁽²⁾⁽³⁾ | DEFINITION |
|-------|----------------------------------|----------------------------------|--|
| I | Objective data | Development | This data sheet contains data from the objective specification for product development. Philips Semiconductors reserves the right to change the specification in any manner without notice. |
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