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Should be replaced with:

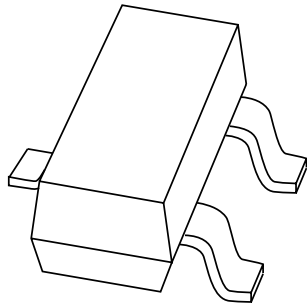
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Kind regards,

Team Nexperia

DATA SHEET



PMBT4401 NPN switching transistor

Product data sheet
Supersedes data of 1999 Apr 15

2004 Jan 21

NPN switching transistor

PMBT4401

FEATURES

- High current (max. 600 mA)
- Low voltage (max. 40 V).

APPLICATIONS

- Industrial and consumer switching applications.

DESCRIPTION

NPN switching transistor in a SOT23 plastic package.
PNP complement: PMBT4403.

MARKING

| TYPE NUMBER | MARKING CODE ⁽¹⁾ |
|-------------|-----------------------------|
| PMBT4401 | *2X |

Note

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

PINNING

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

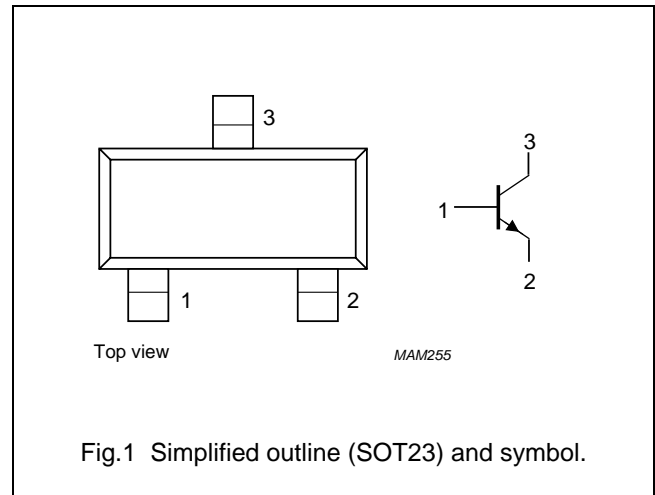


Fig.1 Simplified outline (SOT23) and symbol.

ORDERING INFORMATION

| TYPE NUMBER | PACKAGE | | |
|-------------|---------|--|---------|
| | NAME | DESCRIPTION | VERSION |
| PMBT4401 | - | 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 (DC) | | - | 600 | mA |
| I _{CM} | peak collector current | | - | 800 | 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. Transistor mounted on an FR4 printed-circuit board.

NPN switching transistor

PMBT4401

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-base cut-off current | $I_E = 0$; $V_{CB} = 60\text{ V}$ | – | 50 | nA |
| I_{EBO} | emitter-base 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) | | | |
| | | $I_C = 0.1\text{ mA}$ | 20 | – | |
| | | $I_C = 1\text{ mA}$ | 40 | – | |
| | | $I_C = 10\text{ mA}$ | 80 | – | |
| | | $I_C = 150\text{ mA}$; note 1 | 100 | 300 | |
| | | $I_C = 500\text{ mA}$; $V_{CE} = 2\text{ V}$; note 1 | 40 | – | |
| V_{CEsat} | collector-emitter saturation voltage | $I_C = 150\text{ mA}$; $I_B = 15\text{ mA}$; note 1 | – | 400 | mV |
| | | $I_C = 500\text{ mA}$; $I_B = 50\text{ mA}$; note 1 | – | 750 | mV |
| V_{BEsat} | base-emitter saturation voltage | $I_C = 150\text{ mA}$; $I_B = 15\text{ mA}$; note 1 | – | 950 | mV |
| | | $I_C = 500\text{ mA}$; $I_B = 50\text{ mA}$; note 1 | – | 1.2 | V |
| C_c | collector capacitance | $I_E = I_e = 0$; $V_{CB} = 5\text{ V}$; $f = 1\text{ MHz}$ | – | 8 | pF |
| C_e | emitter capacitance | $I_C = I_c = 0$; $V_{EB} = 500\text{ mV}$; $f = 1\text{ MHz}$ | – | 30 | pF |
| f_T | transition frequency | $I_C = 20\text{ mA}$; $V_{CE} = 10\text{ V}$; $f = 100\text{ MHz}$ | 250 | – | MHz |
| Switching times (between 10% and 90% levels); (see Fig.3) | | | | | |
| t_{on} | turn-on time | $I_{Con} = 150\text{ mA}$; $I_{Bon} = 15\text{ mA}$; $I_{Boff} = -15\text{ mA}$ | – | 35 | ns |
| t_d | delay time | | – | 15 | ns |
| t_r | rise time | | – | 20 | ns |
| t_{off} | turn-off time | | – | 250 | ns |
| t_s | storage time | | – | 200 | ns |
| t_f | fall time | | – | 60 | ns |

Note

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

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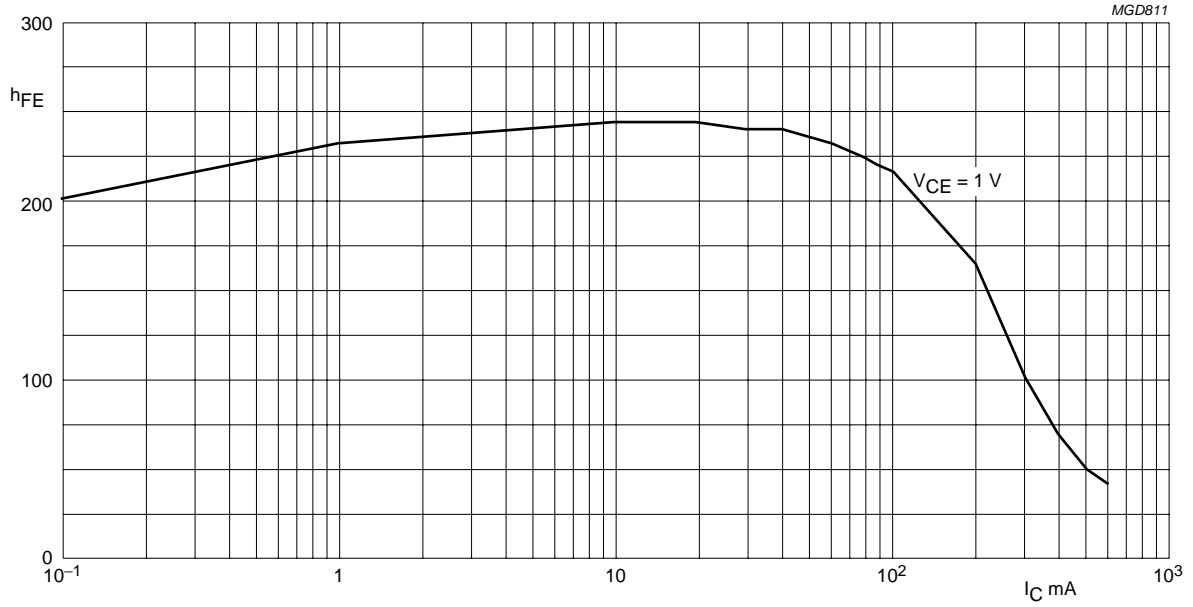
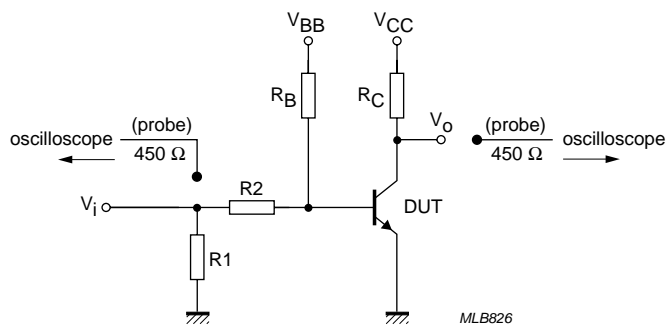


Fig.2 DC current gain; typical values.



$V_i = 9.5 \text{ V}$; $T = 500 \mu\text{s}$; $t_p = 10 \mu\text{s}$; $t_r = t_f \leq 3 \text{ ns}$.
 $R_1 = 68 \Omega$; $R_2 = 325 \Omega$; $R_B = 325 \Omega$; $R_C = 160 \Omega$.
 $V_{BB} = -3.5 \text{ V}$; $V_{CC} = 29.5 \text{ V}$.
 Oscilloscope: input impedance $Z_i = 50 \Omega$.

Fig.3 Test circuit for switching times.

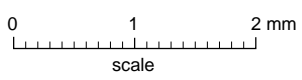
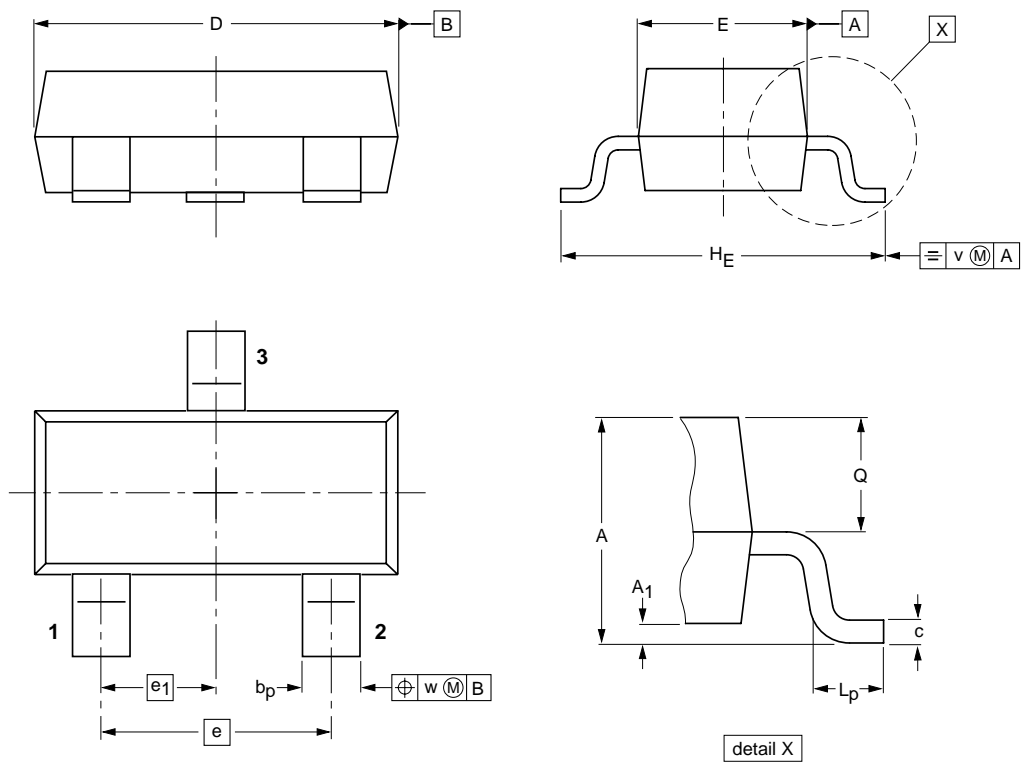
NPN switching transistor

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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 | JEITA | | | |
| SOT23 | | TO-236AB | | | | 04-11-04 06-03-16 |

NPN switching transistor

PMBT4401

DATA SHEET STATUS

| DOCUMENT STATUS ⁽¹⁾ | PRODUCT STATUS ⁽²⁾ | DEFINITION |
|--------------------------------|-------------------------------|---|
| Objective data sheet | Development | This document contains data from the objective specification for product development. |
| Preliminary data sheet | Qualification | This document contains data from the preliminary specification. |
| Product data sheet | Production | This document contains the product specification. |

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NXP Semiconductors

Customer notification

This data sheet was changed to reflect the new company name NXP Semiconductors, including new legal definitions and disclaimers. No changes were made to the technical content, except for package outline drawings which were updated to the latest version.

Contact information

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