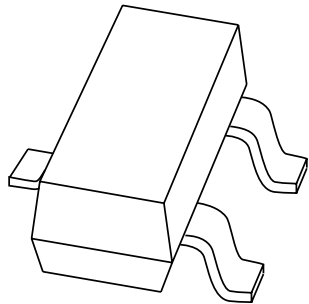


# DATA SHEET



## **PMBT4401** NPN switching transistor

Product specification  
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 <sup>(1)</sup>
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

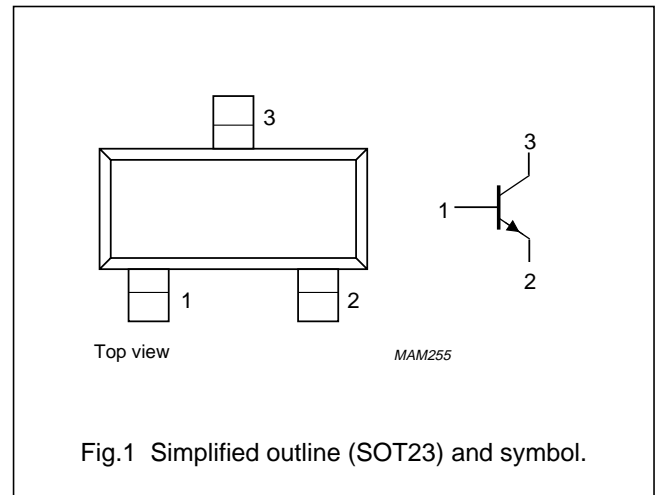


Fig.1 Simplified outline (SOT23) and symbol.

### 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 <sub>CBO</sub>	collector-base voltage	open emitter	–	60	V
V <sub>CEO</sub>	collector-emitter voltage	open base	–	40	V
V <sub>EBO</sub>	emitter-base voltage	open collector	–	6	V
I <sub>C</sub>	collector current (DC)		–	600	mA
I <sub>CM</sub>	peak collector current		–	800	mA
I <sub>BM</sub>	peak base current		–	200	mA
P <sub>tot</sub>	total power dissipation	T <sub>amb</sub> ≤ 25 °C; note 1	–	250	mW
T <sub>stg</sub>	storage temperature		–65	+150	°C
T <sub>j</sub>	junction temperature		–	150	°C
T <sub>amb</sub>	operating ambient temperature		–65	+150	°C

### Note

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

## NPN switching transistor

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## 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)			
		$I_C = 0.1\text{ mA}$ $I_C = 1\text{ mA}$ $I_C = 10\text{ mA}$ $I_C = 150\text{ mA}$ ; note 1	20 40 80 100	– – – 300	
$V_{CEsat}$	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
<b>Switching times (between 10% and 90% levels); (see Fig.3)</b>					
$t_{on}$	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:  $t_p \leq 300\text{ }\mu\text{s}$ ;  $\delta \leq 0.02$ .

NPN switching transistor

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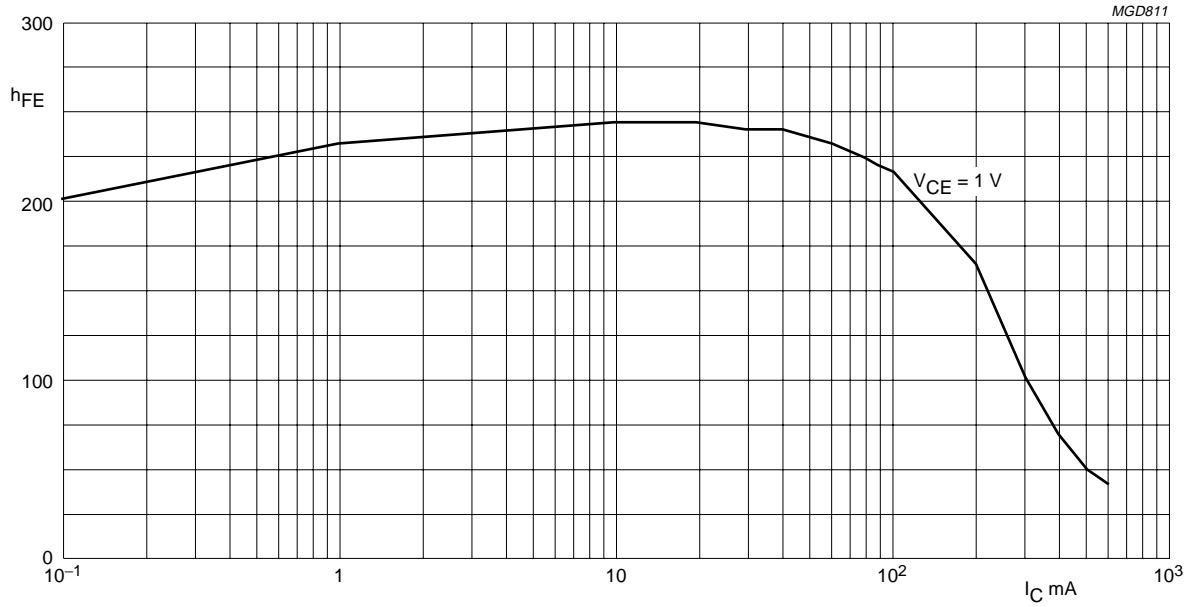
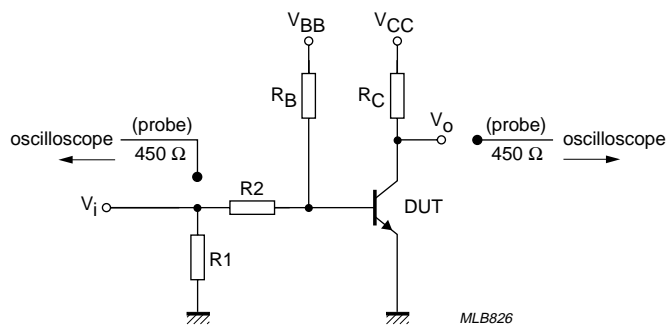


Fig.2 DC current gain; typical values.



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

Fig.3 Test circuit for switching times.

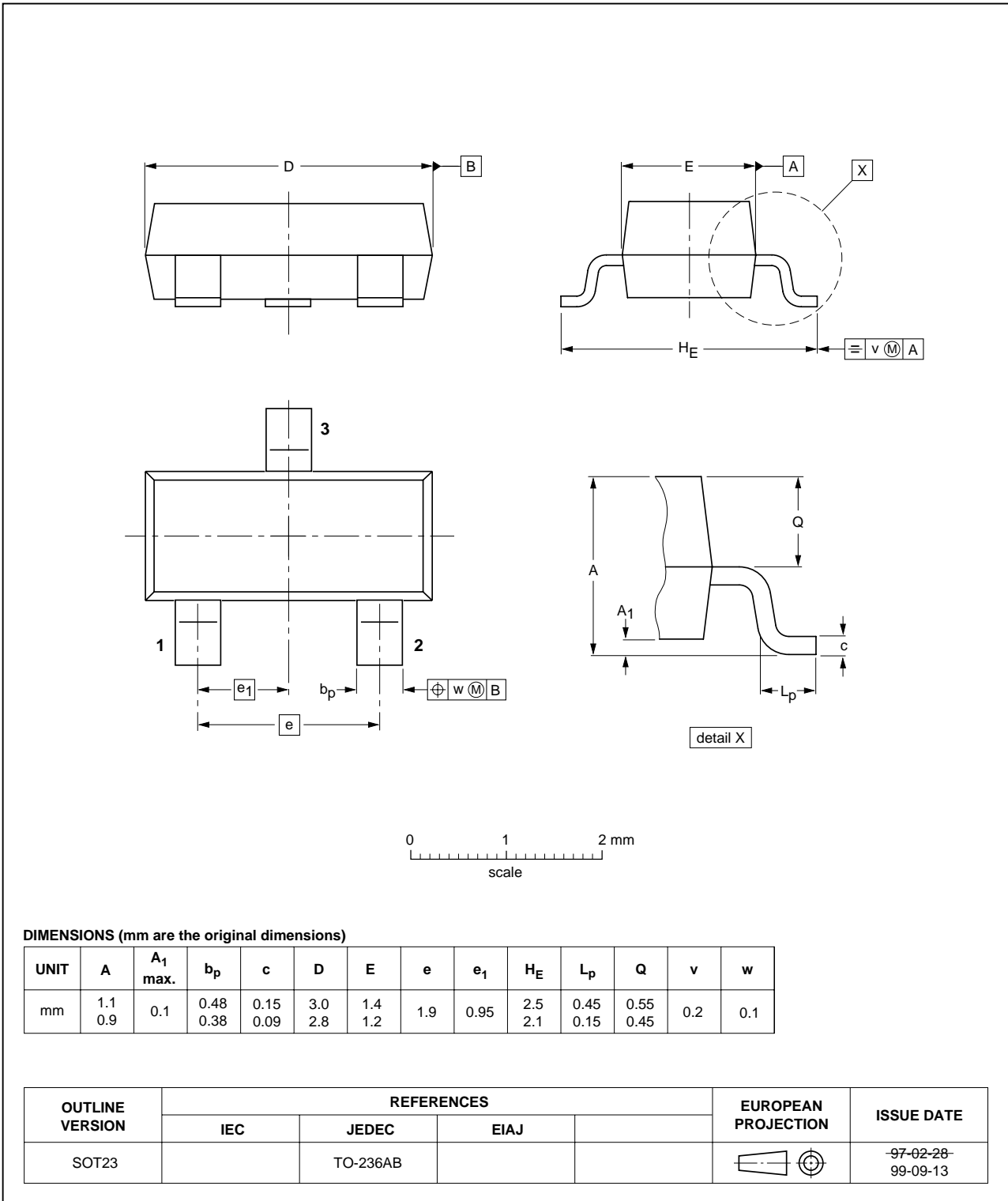
NPN switching transistor

PMBT4401

PACKAGE OUTLINE

Plastic surface mounted package; 3 leads

SOT23



## NPN switching transistor

PMBT4401

## DATA SHEET STATUS

LEVEL	DATA SHEET STATUS <sup>(1)</sup>	PRODUCT STATUS <sup>(2)(3)</sup>	DEFINITION
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