

# DATA SHEET



## **PMBT2222; PMBT2222A** NPN switching transistors

Product data sheet  
Supersedes data of 1999 Apr 27

2004 Jan 22

# NPN switching transistors

# PMBT2222; PMBT2222A

### FEATURES

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

### APPLICATIONS

- Switching and linear amplification.

### DESCRIPTION

NPN switching transistor in a SOT23 plastic package.  
PNP complements: PMBT2907 and PMBT2907A.

### MARKING

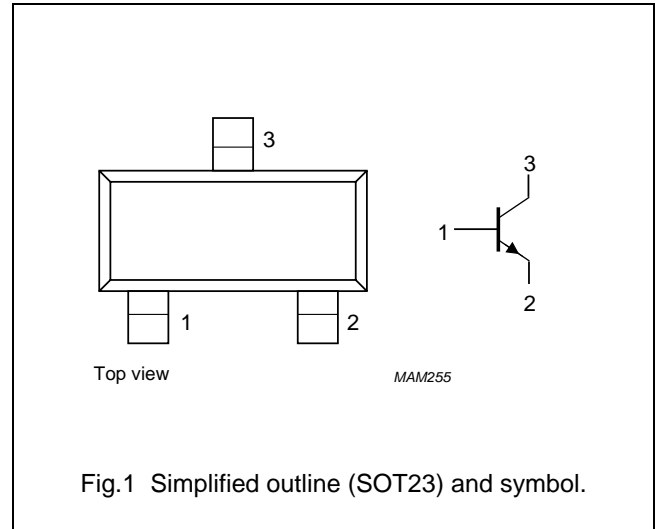
TYPE NUMBER	MARKING CODE <sup>(1)</sup>
PMBT2222	*1B
PMBT2222A	*1P

### Note

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

### PINNING

PIN	DESCRIPTION
1	base
2	emitter
3	collector



### ORDERING INFORMATION

TYPE NUMBER	PACKAGE		
	NAME	DESCRIPTION	VERSION
PMBT2222	-	plastic surface mounted package; 3 leads	SOT23
PMBT2222A			

## NPN switching transistors

## PMBT2222; PMBT2222A

**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			
	PMBT2222		–	60	V
	PMBT2222A	–	75	V	
V <sub>CEO</sub>	collector-emitter voltage	open base			
	PMBT2222		–	30	V
	PMBT2222A	–	40	V	
V <sub>EBO</sub>	emitter-base voltage	open collector			
	PMBT2222		–	5	V
	PMBT2222A	–	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.

**THERMAL CHARACTERISTICS**

SYMBOL	PARAMETER	CONDITIONS	VALUE	UNIT
R <sub>th(j-a)</sub>	thermal resistance from junction to ambient	note 1	500	K/W

**Note**

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

**CHARACTERISTICS**

T<sub>j</sub> = 25 °C unless otherwise specified.

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	UNIT	
I <sub>CBO</sub>	collector cut-off current	I <sub>E</sub> = 0; V <sub>CB</sub> = 50 V				
			PMBT2222	–	10	nA
			I <sub>E</sub> = 0; V <sub>CB</sub> = 50 V; T <sub>j</sub> = 125 °C	–	10	μA
	collector cut-off current	I <sub>E</sub> = 0; V <sub>CB</sub> = 60 V				
PMBT2222A			–	10	nA	
		I <sub>E</sub> = 0; V <sub>CB</sub> = 60 V; T <sub>j</sub> = 125 °C	–	10	μA	
I <sub>EBO</sub>	emitter cut-off current	I <sub>C</sub> = 0; V <sub>EB</sub> = 5 V	–	10	nA	
	PMBT2222A		–	10	nA	

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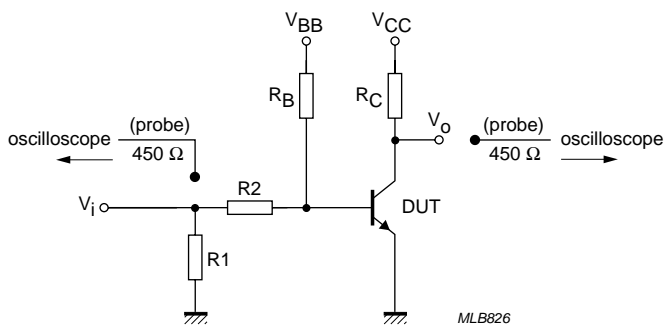
SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	UNIT
$h_{FE}$	DC current gain	$I_C = 0.1 \text{ mA}; V_{CE} = 10 \text{ V}$	35	–	
		$I_C = 1 \text{ mA}; V_{CE} = 10 \text{ V}$	50	–	
		$I_C = 10 \text{ mA}; V_{CE} = 10 \text{ V}$	75	–	
		$I_C = 10 \text{ mA}; V_{CE} = 10 \text{ V};$ $T_{amb} = -55 \text{ }^\circ\text{C}$	35	–	
		$I_C = 150 \text{ mA}; V_{CE} = 10 \text{ V}$	100	300	
		$I_C = 150 \text{ mA}; V_{CE} = 1 \text{ V}$	50	–	
	DC current gain PMBT2222 PMBT2222A	$I_C = 500 \text{ mA}; V_{CE} = 10 \text{ V}$	30 40	– –	
$V_{CEsat}$	collector-emitter saturation voltage PMBT2222 PMBT2222A	$I_C = 150 \text{ mA}; I_B = 15 \text{ mA};$ note 1	– –	400 300	mV mV
	collector-emitter saturation voltage PMBT2222 PMBT2222A	$I_C = 500 \text{ mA}; I_B = 50 \text{ mA};$ note 1	– –	1.6 1	V V
$V_{BEsat}$	base-emitter saturation voltage PMBT2222 PMBT2222A	$I_C = 150 \text{ mA}; I_B = 15 \text{ mA};$ note 1	– 0.6	1.3 1.2	V V
	base-emitter saturation voltage PMBT2222 PMBT2222A	$I_C = 500 \text{ mA}; I_B = 50 \text{ mA};$ note 1	– –	2.6 2	V V
$C_c$	collector capacitance	$I_E = I_e = 0; V_{CB} = 10 \text{ V}; f = 1 \text{ MHz}$	–	8	pF
$C_e$	emitter capacitance	$I_C = I_c = 0; V_{EB} = 500 \text{ mV}; f = 1 \text{ MHz}$	–	30	pF
	PMBT2222 PMBT2222A		–	25	pF
$f_T$	transition frequency	$I_C = 20 \text{ mA}; V_{CE} = 20 \text{ V}; f = 100 \text{ MHz}$	250	–	MHz
	PMBT2222 PMBT2222A		300	–	MHz
F	noise figure	$I_C = 100 \text{ } \mu\text{A}; V_{CE} = 5 \text{ V}; R_S = 1 \text{ k}\Omega;$ $f = 1 \text{ kHz}$	–	4	dB
<b>Switching times (between 10% and 90% levels); (see Fig.2)</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:  $t_p \leq 300 \text{ } \mu\text{s}; \delta \leq 0.02$ .

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

Fig.2 Test circuit for switching times.

NPN switching transistors

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PACKAGE OUTLINE

Plastic surface-mounted package; 3 leads

SOT23



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## DATA SHEET STATUS

DOCUMENT STATUS <sup>(1)</sup>	PRODUCT STATUS <sup>(2)</sup>	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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