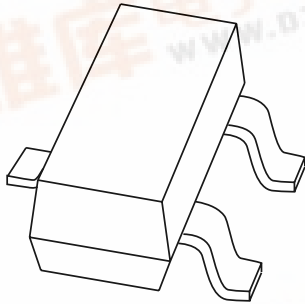


DISCRETE SEMICONDUCTORS

DATA SHEET



PMBT2222; PMBT2222A **NPN switching transistors**

Product specification
Supersedes data of 1997 Sep 09

1999 Apr 27

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

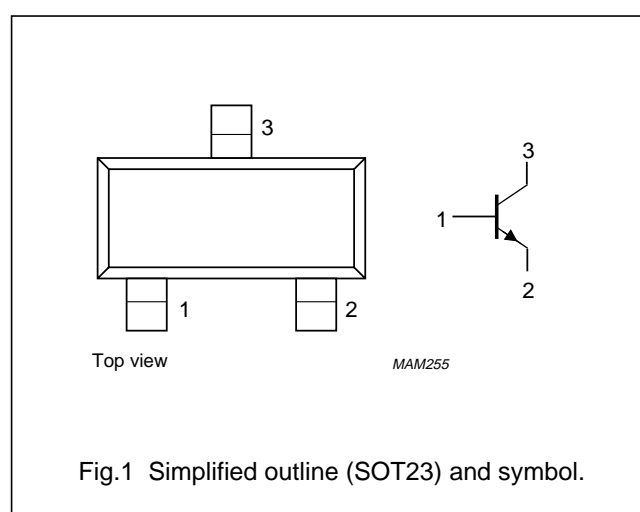
TYPE NUMBER	MARKING CODE ⁽¹⁾
PMBT2222	*1B
PMBT2222A	*1P

Note

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

PINNING

PIN	DESCRIPTION
1	base
2	emitter
3	collector



LIMITING VALUES

In accordance with the Absolute Maximum Rating System (IEC 134).

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	UNIT
V_{CBO}	collector-base voltage	open emitter			
	PMBT2222		–	60	V
	PMBT2222A		–	75	V
V_{CEO}	collector-emitter voltage	open base			
	PMBT2222		–	30	V
	PMBT2222A		–	40	V
V_{EBO}	emitter-base voltage	open collector			
	PMBT2222		–	5	V
	PMBT2222A		–	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	$T_{amb} \leq 25\text{ °C}$; 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 transistors

PMBT2222; PMBT2222A

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

$T_j = 25\text{ °C}$ unless otherwise specified.

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	UNIT
I_{CBO}	collector cut-off current PMBT2222	$I_E = 0; V_{CB} = 50\text{ V}$	–	10	nA
		$I_E = 0; V_{CB} = 50\text{ V}; T_j = 125\text{ °C}$	–	10	μA
	collector cut-off current PMBT2222A	$I_E = 0; V_{CB} = 60\text{ V}$	–	10	nA
		$I_E = 0; V_{CB} = 60\text{ V}; T_j = 125\text{ °C}$	–	10	μA
I_{EBO}	emitter cut-off current PMBT2222A	$I_C = 0; V_{EB} = 5\text{ V}$	–	10	nA
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	–	
		$I_C = 10\text{ mA}; V_{CE} = 10\text{ V}; T_{amb} = -55\text{ °C}$	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	$I_C = 150\text{ mA}; I_B = 15\text{ mA}; \text{note 1}$	–	400	mV
			–	300	mV
	collector-emitter saturation voltage PMBT2222 PMBT2222A	$I_C = 500\text{ mA}; I_B = 50\text{ mA}; \text{note 1}$	–	1.6	V
			–	1	V
V_{BEsat}	base-emitter saturation voltage PMBT2222 PMBT2222A	$I_C = 150\text{ mA}; I_B = 15\text{ mA}; \text{note 1}$	–	1.3	V
			0.6	1.2	V
	base-emitter saturation voltage PMBT2222 PMBT2222A	$I_C = 500\text{ mA}; I_B = 50\text{ mA}; \text{note 1}$	–	2.6	V
			–	2	V
C_c	collector capacitance	$I_E = i_e = 0; V_{CB} = 10\text{ V}; f = 1\text{ MHz}$	–	8	pF

NPN switching transistors

PMBT2222; PMBT2222A

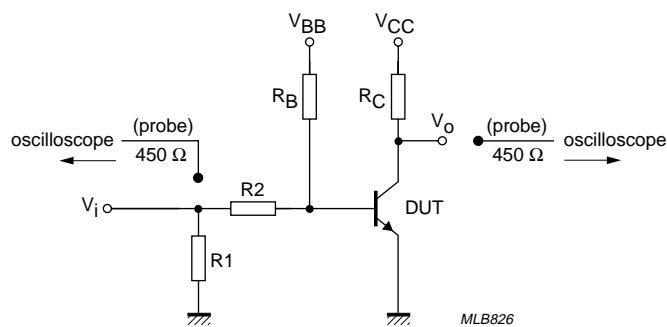
SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	UNIT
C_e	emitter capacitance	$I_C = i_c = 0$; $V_{EB} = 500 \text{ mV}$; $f = 1 \text{ MHz}$	-	30	
	PMBT2222			25	
f_T	transition frequency	$I_C = 20 \text{ mA}$; $V_{CE} = 20 \text{ V}$; $f = 100 \text{ MHz}$	250	-	MHz
	PMBT2222A		300	-	MHz
F	noise figure	$I_C = 100 \mu\text{A}$; $V_{CE} = 5 \text{ V}$; $R_S = 1 \text{ k}\Omega$; $f = 1 \text{ kHz}$	-	4	dB

Switching times (between 10% and 90% levels); (see Fig.2)

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



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

Fig.2 Test circuit for switching times.

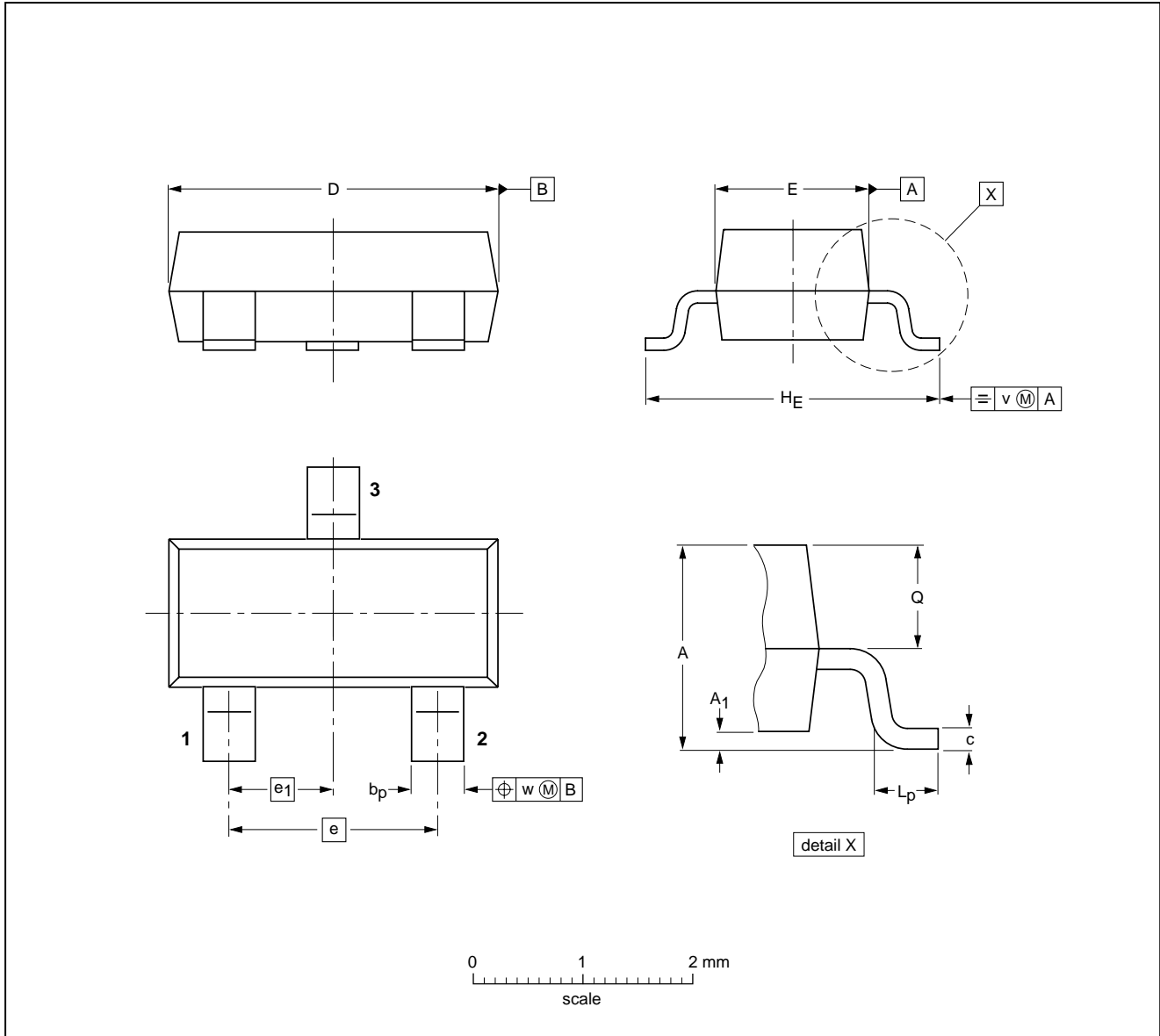
NPN switching transistors

PMBT2222; PMBT2222A

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						97-02-28

NPN switching transistors

PMBT2222; PMBT2222A

DEFINITIONS

Data sheet status	
Objective specification	This data sheet contains target or goal specifications for product development.
Preliminary specification	This data sheet contains preliminary data; supplementary data may be published later.
Product specification	This data sheet contains final product specifications.
Limiting values	
Limiting values given are in accordance with the Absolute Maximum Rating System (IEC 134). 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.	
Application information	
Where application information is given, it is advisory and does not form part of the specification.	

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NPN switching transistors

PMBT2222; PMBT2222A

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Printed in The Netherlands

115002/00/04/pp8

Date of release: 1999 Apr 27

Document order number: 9397 750 05822

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