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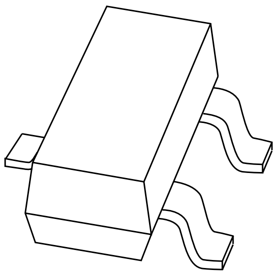
Team Nexperia

DATA SHEET



MMBT2222A
NPN switching transistor

Product data sheet
Supersedes data of 2000 Apr 11

2004 Jan 16

founded by Philips

NPN switching transistor MMBT2222A

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 complement: PMBT2907A.

MARKING

TYPE NUMBER	MARKING CODE(1)
MMBT2222A	7C*

Note

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

PINNING

PIN	DESCRIPTION
1	base
2	emitter
3	collector

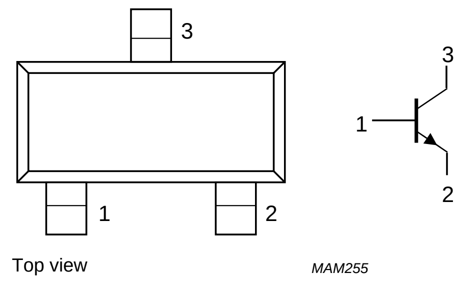


Fig.1 Simplified outline (SOT23) and symbol.

ORDERING INFORMATION

TYPE NUMBER	PACKAGE		
	NAME	DESCRIPTION	VERSION
MMBT2222A	–	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	–	75	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	$T_{amb} \leq 25$ °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.

THERMAL CHARACTERISTICS

SYMBOL	PARAMETER	CONDITIONS	VALUE	UNIT
$R_{th(j\text{-}a)}$	thermal resistance from junction to ambient	note 1	500	K/W

Note

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

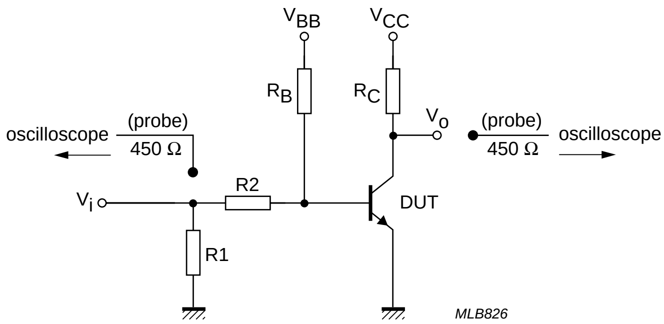
CHARACTERISTICS

T_j = 25 °C unless otherwise specified.

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	UNIT
I_{CBO}	collector cut-off current	$I_E = 0$; $V_{CB} = 60$ V	–	10	nA
		$I_E = 0$; $V_{CB} = 60$ V; $T_j = 125$ °C	–	10	μA
I_{EBO}	emitter cut-off current	$I_C = 0$; $V_{EB} = 5$ V	–	10	nA
h_{FE}	DC current gain	$I_C = 0.1$ mA; $V_{CE} = 10$ V	35	–	
		$I_C = 1$ mA; $V_{CE} = 10$ V	50	–	
		$I_C = 10$ mA; $V_{CE} = 10$ V	75	–	
		$I_C = 10$ mA; $V_{CE} = 10$ V; $T_{amb} = -55$ °C	35	–	
		$I_C = 150$ mA; $V_{CE} = 10$ V	100	300	
		$I_C = 150$ mA; $V_{CE} = 1$ V	50	–	
		$I_C = 500$ mA; $V_{CE} = 10$ V	40	–	
V_{CEsat}	collector-emitter saturation voltage	$I_C = 150$ mA; $I_B = 15$ mA; note 1	–	300	mV
		$I_C = 500$ mA; $I_B = 50$ mA; note 1	–	1	V
V_{BEsat}	base-emitter saturation voltage	$I_C = 150$ mA; $I_B = 15$ mA; note 1	0.6	1.2	V
		$I_C = 500$ mA; $I_B = 50$ mA; note 1	–	2	V
C_c	collector capacitance	$I_E = i_e = 0$; $V_{CB} = 10$ V; f = 1 MHz	–	8	pF
C_e	emitter capacitance	$I_C = i_c = 0$; $V_{EB} = 500$ mV; f = 1 MHz	–	25	pF
f_T	transition frequency	$I_C = 20$ mA; $V_{CE} = 20$ V; f = 100 MHz	300	–	MHz
F	noise figure	$I_C = 100$ μA; $V_{CE} = 5$ V; $R_S = 1$ kΩ; f = 1 kHz	–	4	dB
Switching times (between 10% and 90% levels); (see Fig.2)					
t_{on}	turn-on time	$I_{Con} = 150$ mA; $I_{Bon} = 15$ mA; $I_{Boff} = -15$ 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: $t_p \leq 300$ μs; $\delta \leq 0.02$.

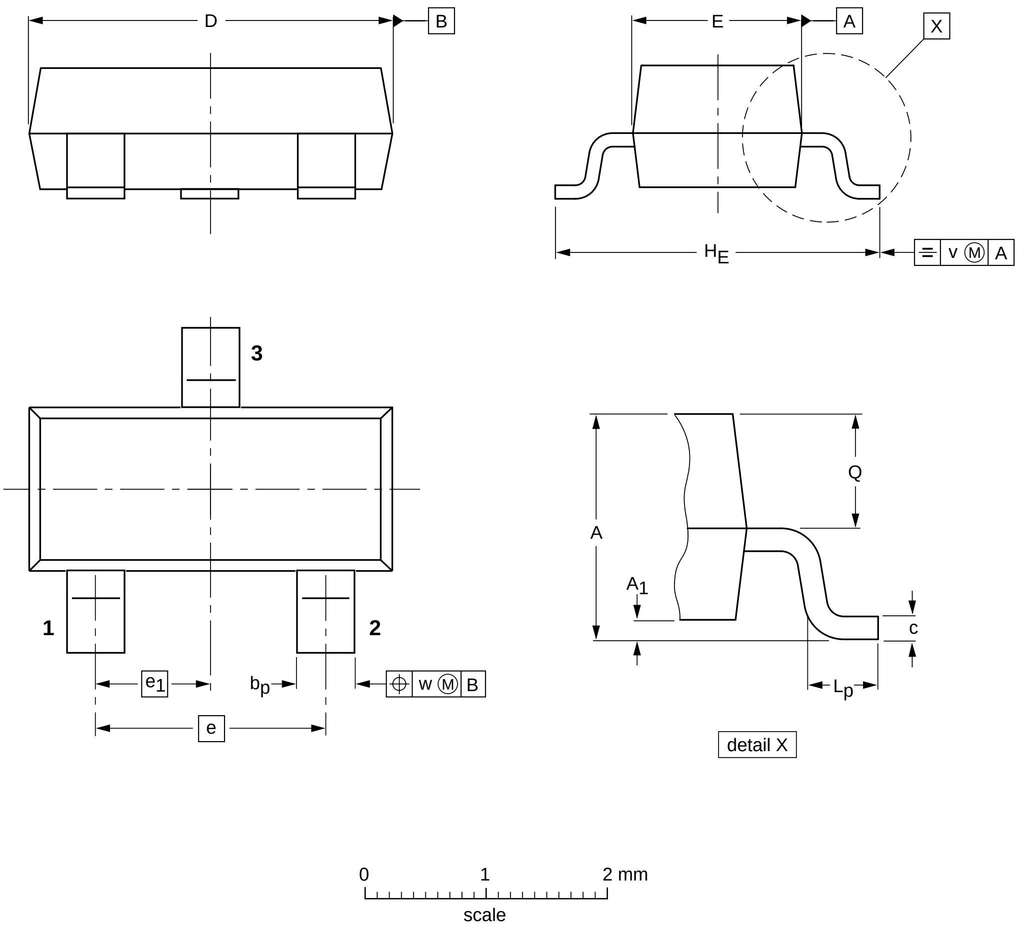


V_i = 9.5 V; T = 500 μs; t_p = 10 μs; t_r = t_f ≤ 3 ns.
R1 = 68 Ω; R2 = 325 Ω; R_B = 325 Ω; R_C = 160 Ω.
V_{BB} = −3.5 V; V_{CC} = 29.5 V.
Oscilloscope: input impedance Z_i = 50 Ω.

Fig.2 Test circuit for switching times.

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

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

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Contact information

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Printed in The Netherlands R75/02/pp7 Date of release: 2004 Jan 16 Document order number: 9397 750 12432

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