PMBT2222; PMBT2222A

NPN switching transistors

Rev. 6 — 12 November 2010 Product data sheet

1. Product profile

1.1 General description

NPN switching transistors in a small SOT23 (TO-236AB) Surface-Mounted Device (SMD) plastic package.

Table 1. Product overview

Type number	Package		PNP complement
	Nexperia	JEDEC	
PMBT2222	SOT23	TO-236AB	PMBT2907
PMBT2222A			PMBT2907A

1.2 Features and benefits

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

1.3 Applications

- Switching and linear amplification

1.4 Quick reference data

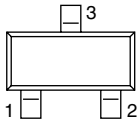
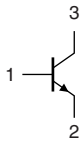
Table 2. Quick reference data

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
V_{CEO}	collector-emitter voltage	open base					
	PMBT2222			-	-	30	V
	PMBT2222A			-	-	40	V
I_C	collector current			-	-	600	mA
h_{FE}	DC current gain	V_{CE} = 10 V; I_C = 150 mA	[1]	100	-	300	
	PMBT2222	V_{CE} = 10 V; I_C = 500 mA	[1]	30	-	-	
	PMBT2222A	V_{CE} = 10 V; I_C = 500 mA	[1]	40	-	-	

[1] Pulse test: $t_p \leq 300\ \mu s$; $\delta \leq 0.02$.

2. Pinning information

Table 3. Pinning

Pin	Description	Simplified outline	Graphic symbol
1	base		
2	emitter		
3	collector		

sym021

3. Ordering information

Table 4. Ordering information

Type number	Package		
	Name	Description	Version
PMBT2222	-	plastic surface-mounted package; 3 leads	SOT23
PMBT2222A			

4. Marking

Table 5. Marking codes

Type number	Marking code[1]
PMBT2222	*1B
PMBT2222A	*1P

[1] * = placeholder for manufacturing site code

5. Limiting values

Table 6. 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				
	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			-	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	[1]	-	250	mW
T_j	junction temperature			-	150	°C
T_{amb}	ambient temperature			–65	+150	°C
T_{stg}	storage temperature			–65	+150	°C

[1] Device mounted on an FR4 Printed-Circuit Board (PCB), single-sided copper, tin-plated and standard footprint.

6. Thermal characteristics

Table 7. Thermal characteristics

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
$R_{th(j-a)}$	thermal resistance from junction to ambient	in free air	[1]	-	-	500	K/W

[1] Device mounted on an FR4 PCB, single-sided copper, tin-plated and standard footprint.

7. Characteristics

Table 8. Characteristics

T_j = 25 °C unless otherwise specified.

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
I_{CBO}	collector-base cut-off current						
	PMBT2222	V_{CB} = 50 V; I_E = 0 A		-	-	10	nA
		V_{CB} = 50 V; I_E = 0 A; T_j = 125 °C		-	-	10	µA
	collector-base cut-off current						
	PMBT2222A	V_{CB} = 60 V; I_E = 0 A		-	-	10	nA
		V_{CB} = 60 V; I_E = 0 A; T_j = 125 °C		-	-	10	µA
I_{EBO}	emitter-base cut-off current	V_{EB} = 5 V; I_C = 0 A		-	-	10	nA
h_{FE}	DC current gain	V_{CE} = 10 V; I_C = 0.1 mA		35			
		V_{CE} = 10 V; I_C = 1 mA		50	-	-	
		V_{CE} = 10 V; I_C = 10 mA		75	-	-	
		V_{CE} = 10 V; I_C = 10 mA; T_{amb} = −55 °C		35	-	-	
		V_{CE} = 10 V; I_C = 150 mA	[1]	100	-	300	
		V_{CE} = 1 V; I_C = 150 mA	[1]	50	-	-	
	DC current gain	V_{CE} = 10 V; I_C = 500 mA	[1]				
	PMBT2222			30	-	-	
	PMBT2222A			40	-	-	
V_{CEsat}	collector-emitter saturation voltage	I_C = 150 mA; I_B = 15 mA	[1]				
	PMBT2222			-	-	400	mV
	PMBT2222A			-	-	300	mV
	collector-emitter saturation voltage	I_C = 500 mA; I_B = 50 mA	[1]				
	PMBT2222			-	-	1.6	V
	PMBT2222A			-	-	1	V

Table 8. Characteristics *...continued*

T_j = 25 °C unless otherwise specified.

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
V_{BEsat}	base-emitter saturation voltage	I_C = 150 mA; I_B = 15 mA	[1]				
	PMBT2222			-	-	1.3	V
	PMBT2222A			0.6	-	1.2	V
	base-emitter saturation voltage	I_C = 500 mA; I_B = 50 mA	[1]				
	PMBT2222			-	-	2.6	V
	PMBT2222A			-	-	2	V
C_c	collector capacitance	V_{CB} = 10 V; $I_E = i_e$ = 0 A; f = 1 MHz		-	-	8	pF
C_e	emitter capacitance	V_{EB} = 500 mV; $I_C = i_c$ = 0 A; f = 1 MHz					
	PMBT2222			-	-	30	pF
	PMBT2222A			-	-	25	pF
f_T	transition frequency	V_{CE} = 20 V; I_C = 20 mA; f = 100 MHz					
	PMBT2222			250	-	-	MHz
	PMBT2222A			300	-	-	MHz
NF	noise figure	V_{CE} = 5 V; I_C = 100 μA; R_S = 1 kΩ; f = 1 kHz		-	-	4	dB
t_d	delay time	V_{CC} = 10 V; I_C = 150 mA; I_{Bon} = 15 mA; I_{Boff} = −15 mA		-	-	15	ns
t_r	rise time			-	-	20	ns
t_{on}	turn-on time			-	-	35	ns
t_s	storage time			-	-	200	ns
t_f	fall time			-	-	60	ns
t_{off}	turn-off time			-	-	250	ns

[1] Pulse test: $t_p \leq 300$ μs; $\delta \leq 0.02$.

8. Test information

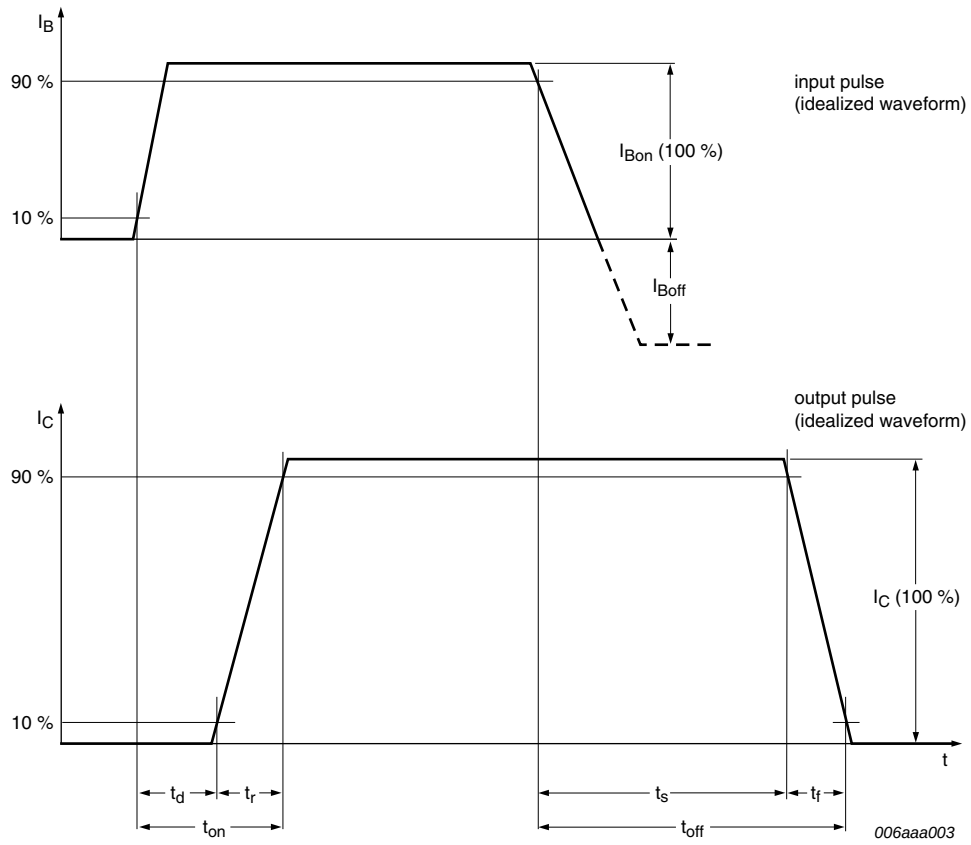
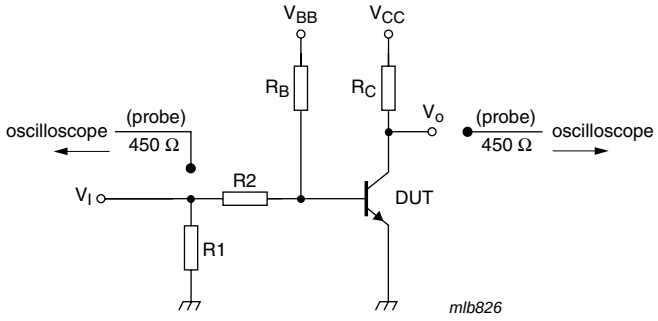


Fig 1. Switching time definition



V_{CC} = 10 V; I_C = 150 mA; I_{Bon} = 15 mA; I_{Boff} = −15 mA

Fig 2. Test circuit for switching times

8.1 Quality information

This product has been qualified in accordance with the Automotive Electronics Council (AEC) standard *Q101 - Stress test qualification for discrete semiconductors*, and is suitable for use in automotive applications.

9. Package outline

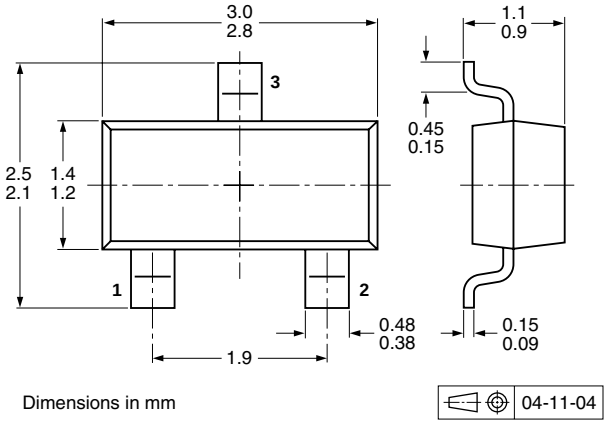


Fig 3. Package outline SOT23 (TO-236AB)

10. Packing information

Table 9. Packing methods

The indicated -xxx are the last three digits of the 12NC ordering code.[1]

Type number	Package	Description	Packing quantity	
			3000	10000
PMBT2222	SOT23	4 mm pitch, 8 mm tape and reel	-215	-235
PMBT2222A				

[1] For further information and the availability of packing methods, see Section 14.

11. Soldering

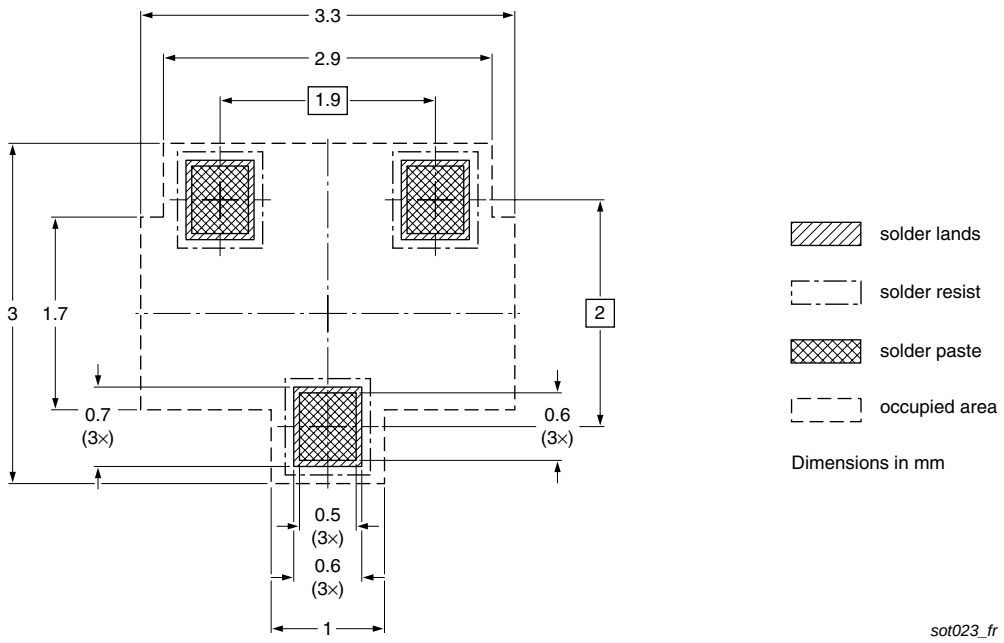


Fig 4. Reflow soldering footprint SOT23 (TO-236AB)

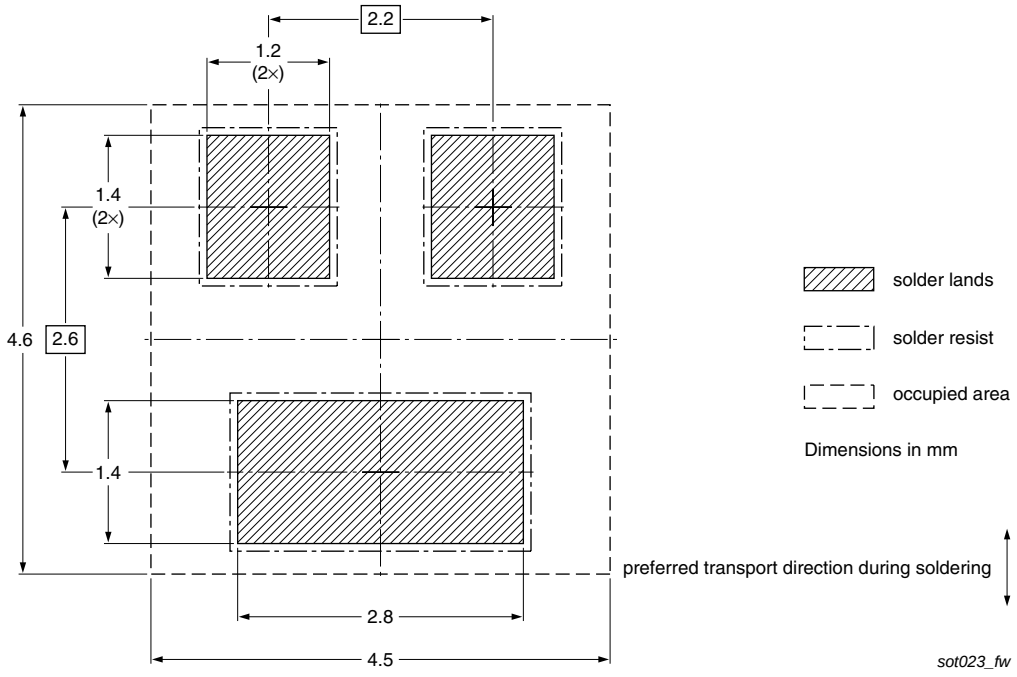


Fig 5. Wave soldering footprint SOT23 (TO-236AB)

12. Revision history

Table 10. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
PMBT2222_PMBT2222A v.6	20101112	Product data sheet	-	PMBT2222_2222A_5
Modifications:	• Section 4 “Marking”: updated • Figure 1 “Switching time definition”: added • Section 8 “Test information”: updated • Section 10 “Packing information”: added • Section 11 “Soldering”: added • Section 13 “Legal information”: updated			
PMBT2222_2222A_5	20040122	Product specification	-	PMBT2222_2222A_4
PMBT2222_2222A_4	19990427	Product specification	-	PMBT2222_3
PMBT2222_3	19970909	Product specification	-	-

13. Legal information

13.1 Data sheet status

Document status[1][2]	Product status[3]	Definition
Objective [short] data sheet	Development	This document contains data from the objective specification for product development.
Preliminary [short] data sheet	Qualification	This document contains data from the preliminary specification.
Product [short] data sheet	Production	This document contains the product specification.

[1] Please consult the most recently issued document before initiating or completing a design.

[2] The term 'short data sheet' is explained in section "Definitions".

[3] The product status of device(s) described in this document may have changed since this document was published and may differ in case of multiple devices. The latest product status information is available on the Internet at URL http://www.nexperia.com.

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15. Contents

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