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Kind regards,

Team Nexperia



# 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
	NXP	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

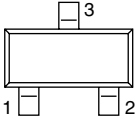
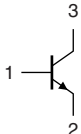
Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$V_{CE0}$	collector-emitter voltage	open base				
	PMBT2222		-	-	30	V
	PMBT2222A		-	-	40	V
$I_C$	collector current		-	-	600	mA
$h_{FE}$	DC current gain	$V_{CE} = 10\text{ V};$ $I_C = 150\text{ mA}$	[1] 100	-	300	
	PMBT2222	$V_{CE} = 10\text{ V};$ $I_C = 500\text{ mA}$	[1] 30	-	-	
	PMBT2222A	$V_{CE} = 10\text{ V};$ $I_C = 500\text{ mA}$	[1] 40	-	-	

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



## 2. Pinning information

Table 3. Pinning

Pin	Description	Simplified outline	Graphic symbol
1	base		 <small>sym021</small>
2	emitter		
3	collector		

## 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 <sup>[1]</sup>
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 <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		-	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	[1] -	250	mW
T <sub>j</sub>	junction temperature		-	150	°C
T <sub>amb</sub>	ambient temperature		-65	+150	°C
T <sub>stg</sub>	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 <sub>th(j-a)</sub>	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<sub>j</sub> = 25 °C unless otherwise specified.*

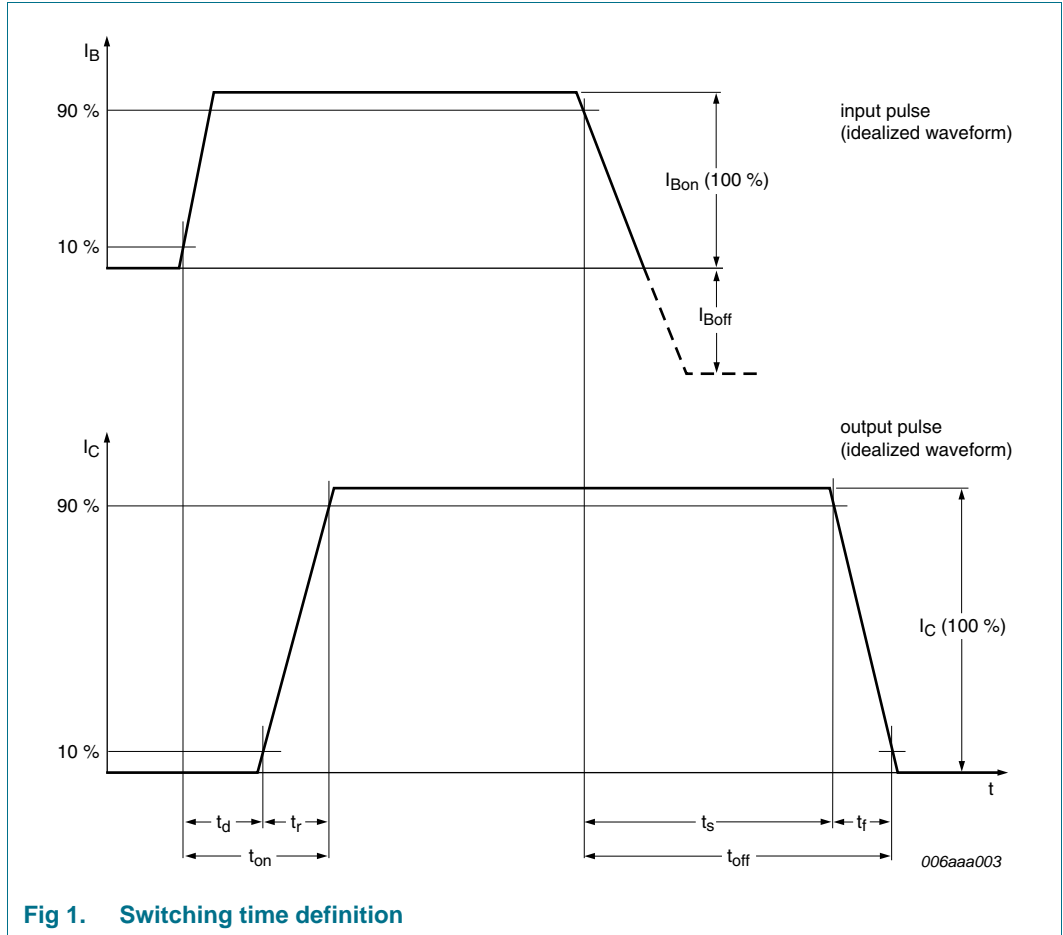
Symbol	Parameter	Conditions	Min	Typ	Max	Unit	
I <sub>CBO</sub>	collector-base cut-off current	PMBT2222	V <sub>CB</sub> = 50 V; I <sub>E</sub> = 0 A	-	-	10	nA
			V <sub>CB</sub> = 50 V; I <sub>E</sub> = 0 A; T <sub>j</sub> = 125 °C	-	-	10	μA
	collector-base cut-off current	PMBT2222A	V <sub>CB</sub> = 60 V; I <sub>E</sub> = 0 A	-	-	10	nA
			V <sub>CB</sub> = 60 V; I <sub>E</sub> = 0 A; T <sub>j</sub> = 125 °C	-	-	10	μA
I <sub>EBO</sub>	emitter-base cut-off current	V <sub>EB</sub> = 5 V; I <sub>C</sub> = 0 A	-	-	10	nA	
h <sub>FE</sub>	DC current gain		V <sub>CE</sub> = 10 V; I <sub>C</sub> = 0.1 mA	35			
			V <sub>CE</sub> = 10 V; I <sub>C</sub> = 1 mA	50	-	-	
			V <sub>CE</sub> = 10 V; I <sub>C</sub> = 10 mA	75	-	-	
			V <sub>CE</sub> = 10 V; I <sub>C</sub> = 10 mA; T <sub>amb</sub> = -55 °C	35	-	-	
			V <sub>CE</sub> = 10 V; I <sub>C</sub> = 150 mA	[1] 100	-	300	
			V <sub>CE</sub> = 1 V; I <sub>C</sub> = 150 mA	[1] 50	-	-	
	DC current gain		V <sub>CE</sub> = 10 V; I <sub>C</sub> = 500 mA	[1]			
		PMBT2222		30	-	-	
		PMBT2222A		40	-	-	
V <sub>CEsat</sub>	collector-emitter saturation voltage		I <sub>C</sub> = 150 mA; I <sub>B</sub> = 15 mA	[1]			
		PMBT2222		-	-	400	mV
	PMBT2222A		-	-	300	mV	
	collector-emitter saturation voltage		I <sub>C</sub> = 500 mA; I <sub>B</sub> = 50 mA	[1]			
		PMBT2222		-	-	1.6	V
		PMBT2222A		-	-	1	V

**Table 8. Characteristics ...continued** $T_j = 25\text{ °C}$  unless otherwise specified.

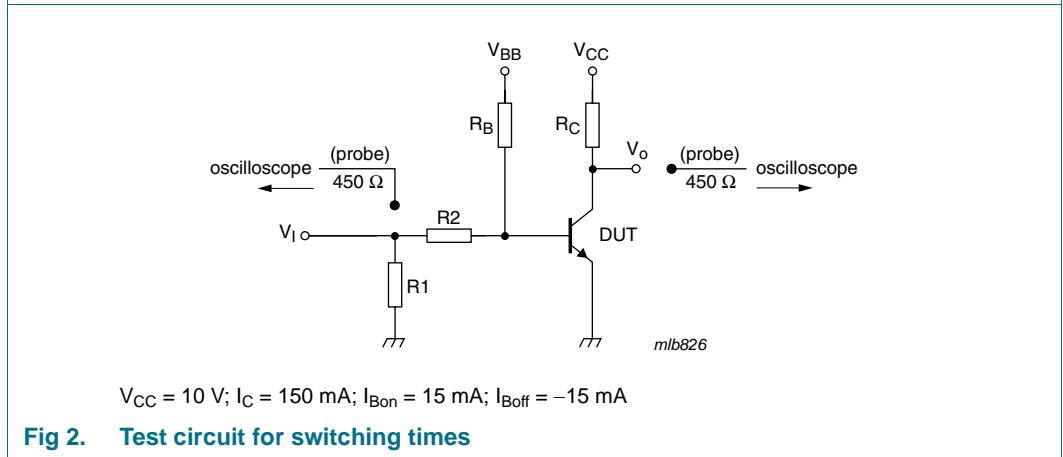
Symbol	Parameter	Conditions	Min	Typ	Max	Unit	
$V_{BEsat}$	base-emitter saturation voltage	$I_C = 150\text{ mA};$ $I_B = 15\text{ mA}$	[1]				
			PMBT2222	-	-	1.3	V
	PMBT2222A	0.6	-	1.2	V		
	base-emitter saturation voltage	$I_C = 500\text{ mA};$ $I_B = 50\text{ mA}$	[1]				
			PMBT2222	-	-	2.6	V
	PMBT2222A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

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

**8. Test information**



**Fig 1. Switching time definition**

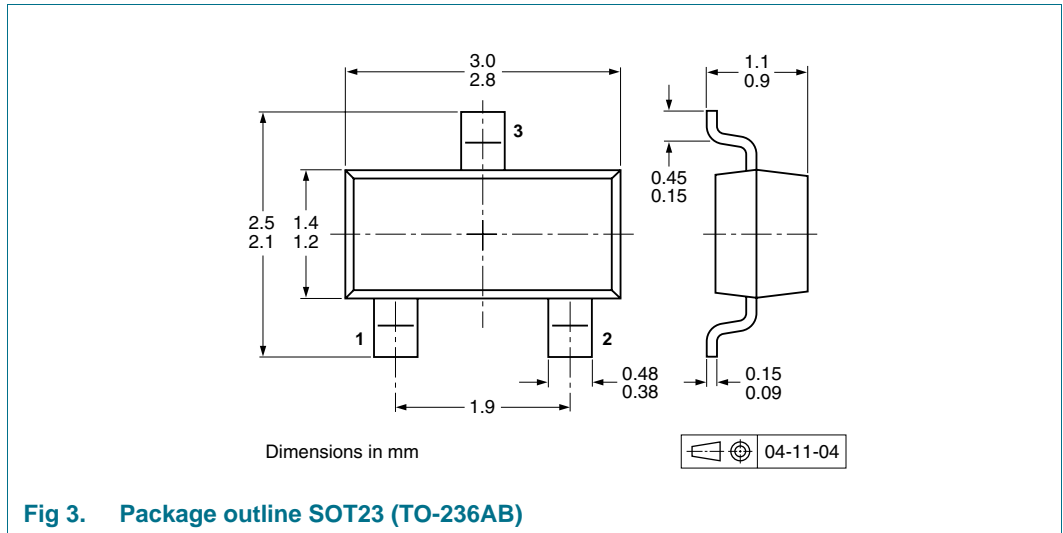


**Fig 2. Test circuit for switching times**

**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



## 10. Packing information

**Table 9. Packing methods**

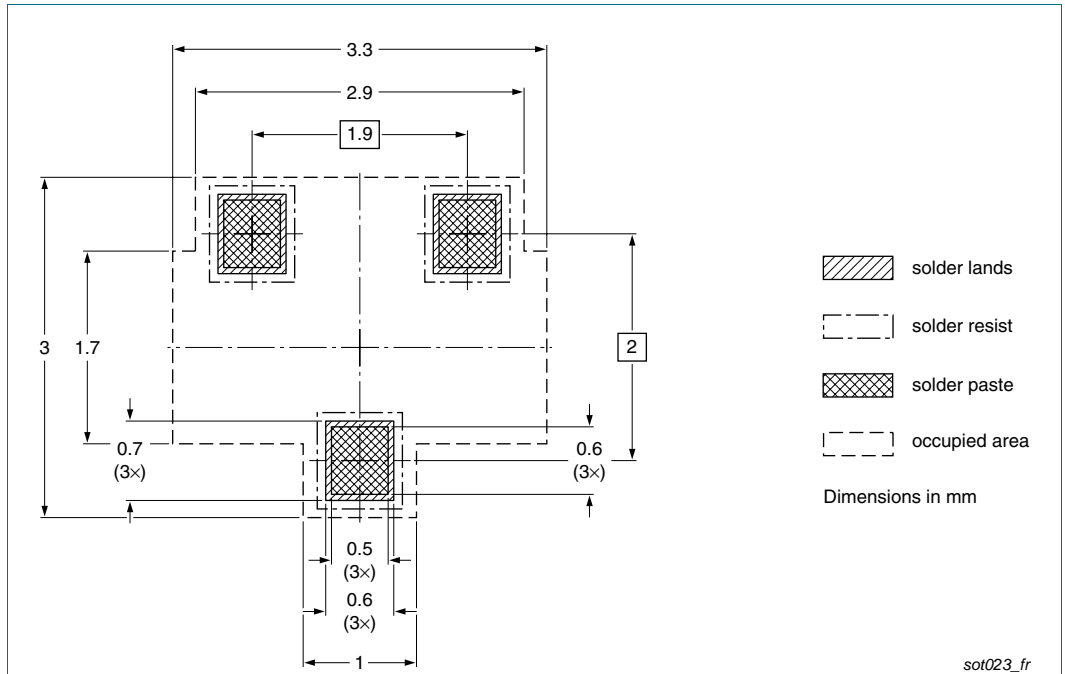
The indicated -xxx are the last three digits of the 12NC ordering code.<sup>[1]</sup>

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

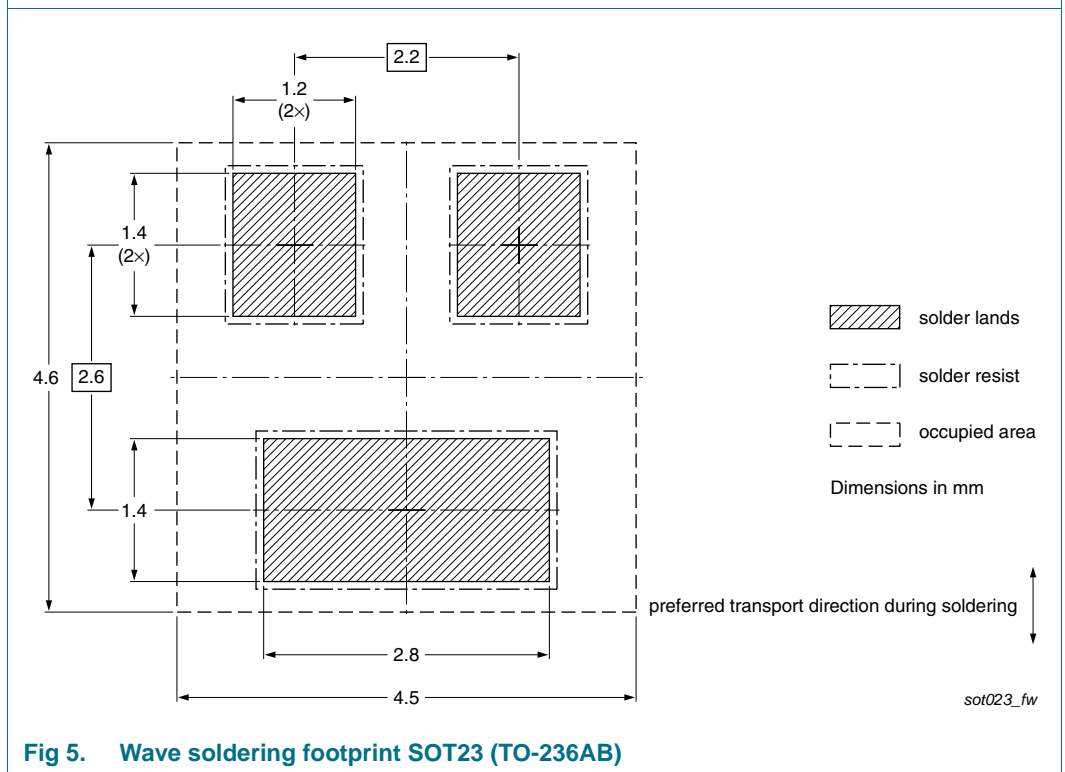
[1] For further information and the availability of packing methods, see [Section 14](#).



**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:		<ul style="list-style-type: none"><li>• <a href="#">Section 4 "Marking"</a>: updated</li><li>• <a href="#">Figure 1 "Switching time definition"</a>: added</li><li>• <a href="#">Section 8 "Test information"</a>: updated</li><li>• <a href="#">Section 10 "Packing information"</a>: added</li><li>• <a href="#">Section 11 "Soldering"</a>: added</li><li>• <a href="#">Section 13 "Legal information"</a>: updated</li></ul>		
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 <sup>[1][2]</sup>	Product status <sup>[3]</sup>	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".

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