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Team Nexperia

# PEMB1; PUMB1

### PNP/PNP resistor-equipped transistors; R1 = 22 k $\Omega$ , R2 = 22 k $\Omega$

Rev. 3 — 28 November 2011

**Product data sheet** 

### 1. Product profile

#### 1.1 General description

PNP/PNP double Resistor-Equipped Transistors (RET) in Surface-Mounted Device (SMD) plastic packages.

Table 1. Product overview

Type number	Package		-	NPN/NPN	Package
	NXP	JEITA	complement	complement	configuration
PEMB1	SOT666	-	PEMD2	PEMH1	ultra small and flat lead
PUMB1	SOT363	SC-88	PUMD2	PUMH1	very small

#### 1.2 Features and benefits

- 100 mA output current capability
- Built-in bias resistors
- Simplifies circuit design
- Reduces component count
- Reduces pick and place costs
- AEC-Q101 qualified

### 1.3 Applications

- Low current peripheral driver
- Control of IC inputs
- Replaces general-purpose transistors in digital applications

#### 1.4 Quick reference data

Table 2. Quick reference data

Symbol	Parameter	Conditions	Min	Тур	Max	Unit
Per transist	or					
$V_{CEO}$	collector-emitter voltage	open base	-	-	-50	V
Io	output current		-	-	-100	mA
R1	bias resistor 1 (input)		15.4	22	28.6	kΩ
R2/R1	bias resistor ratio		0.8	1	1.2	



### 2. Pinning information

Table 3. Pinning

Pin Description Simplified out	llar Ossable somebal
` ′ ′	line Graphic symbol
2 input (base) TR1	6 5 4
3 output (collector) TR2	
4 GND (emitter) TR2	
5 input (base) TR2	TR1
6 output (collector) TR1	R2 R1
	1 2 3 006aaa212

# 3. Ordering information

Table 4. Ordering information

Type number	Package		
	Name	Description	Version
PEMB1	-	plastic surface-mounted package; 6 leads	SOT666
PUMB1	SC-88	plastic surface-mounted package; 6 leads	SOT363

### 4. Marking

Table 5. Marking codes

Type number	Marking code <sup>[1]</sup>
PEMB1	Z4
PUMB1	B*3

[1] \* = placeholder for manufacturing site code

## 5. Limiting values

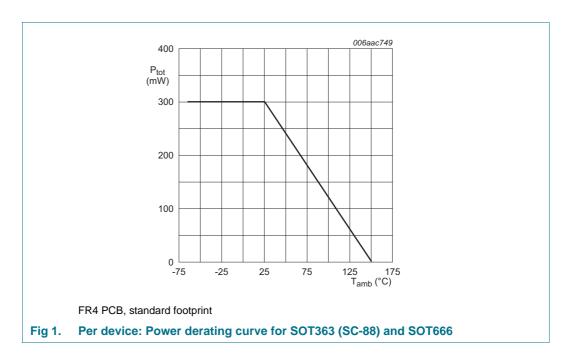
Table 6. Limiting values

In accordance with the Absolute Maximum Rating System (IEC 60134).

Symbol	Parameter	Conditions	Min	Max	Unit
Per transis	stor				
$V_{CBO}$	collector-base voltage	open emitter	-	-50	V
$V_{CEO}$	collector-emitter voltage	open base	-	-50	V
$V_{EBO}$	emitter-base voltage	open collector	-	-10	V
$V_{I}$	input voltage				
	positive		-	+10	V
	negative		-	-40	V
Io	output current		-	-100	mA
I <sub>CM</sub>	peak collector current	single pulse; $t_p \le 1 \text{ ms}$	-	-100	mA
P <sub>tot</sub>	total power dissipation	$T_{amb} \le 25  ^{\circ}C$			
	PEMB1 (SOT666)		[1][2] _	200	mW
	PUMB1 (SOT363)		<u>[1]</u> _	200	mW
Per device	)				
P <sub>tot</sub>	total power dissipation	$T_{amb} \le 25  ^{\circ}C$			
	PEMB1 (SOT666)		[1][2] _	300	mW
	PUMB1 (SOT363)		<u>[1]</u> -	300	mW
Tj	junction temperature		-	150	°C
T <sub>amb</sub>	ambient temperature		-65	+150	°C
T <sub>stg</sub>	storage temperature		-65	+150	°C

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

<sup>[2]</sup> Reflow soldering is the only recommended soldering method.



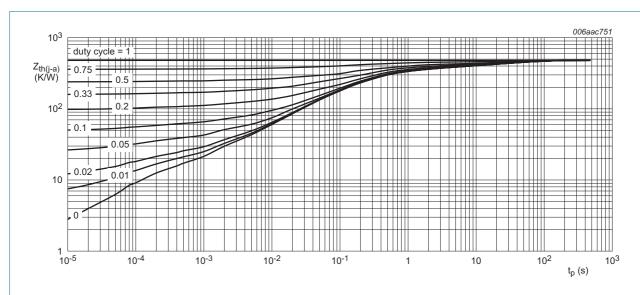
### 6. Thermal characteristics

Table 7. Thermal characteristics

Parameter	Conditions	Min	Тур	Max	Unit
Per transistor					
thermal resistance from junction to ambient	in free air				
PEMB1 (SOT666)		[1][2]	-	625	K/W
PUMB1 (SOT363)		<u>[1]</u> _	-	625	K/W
thermal resistance from junction to ambient	in free air				
PEMB1 (SOT666)		[1][2] _	-	417	K/W
PUMB1 (SOT363)		<u>[1]</u> -	-	417	K/W
	thermal resistance from junction to ambient  PEMB1 (SOT666)  PUMB1 (SOT363)  thermal resistance from junction to ambient  PEMB1 (SOT666)	thermal resistance from in free air junction to ambient  PEMB1 (SOT666)  PUMB1 (SOT363)  thermal resistance from in free air junction to ambient  PEMB1 (SOT666)	thermal resistance from in free air junction to ambient  PEMB1 (SOT666)  PUMB1 (SOT363)  11 -  thermal resistance from in free air junction to ambient  PEMB1 (SOT666)  11 2  -	thermal resistance from in free air junction to ambient  PEMB1 (SOT666)  PUMB1 (SOT363)  [1]  thermal resistance from in free air junction to ambient  PEMB1 (SOT666)  [1][2]	thermal resistance from in free air junction to ambient  PEMB1 (SOT666) [1][2] 625  PUMB1 (SOT363) [1] 625  thermal resistance from in free air junction to ambient  PEMB1 (SOT666) [1][2] 417

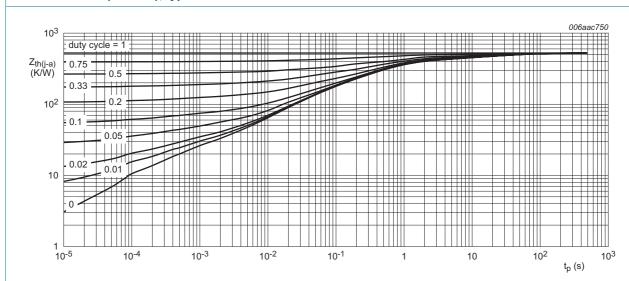
<sup>[1]</sup> Device mounted on an FR4 PCB, single-sided copper, tin-plated and standard footprint.

<sup>[2]</sup> Reflow soldering is the only recommended soldering method.



FR4 PCB, standard footprint

Fig 2. Per transistor: Transient thermal impedance from junction to ambient as a function of pulse duration for PEMB1 (SOT666); typical values



FR4 PCB, standard footprint

Fig 3. Per transistor: Transient thermal impedance from junction to ambient as a function of pulse duration for PUMB1 (SOT363); typical values

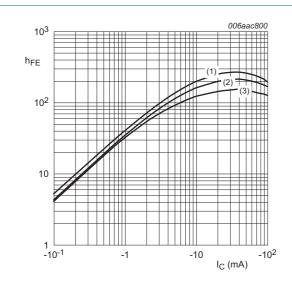
### 7. Characteristics

Table 8. Characteristics

 $T_{amb} = 25$  °C unless otherwise specified.

· arrib — = 0	e amose sarormes opes					
Symbol	Parameter	Conditions	Min	Тур	Max	Unit
Per trans	istor					
I <sub>CBO</sub>	collector-base cut-off current	$V_{CB} = -50 \text{ V}; I_E = 0 \text{ A}$	-	-	-100	nA
I <sub>CEO</sub>	collector-emitter cut-off	$V_{CE} = -30 \text{ V}; I_{B} = 0 \text{ A}$	-	-	-100	nA
	current	$V_{CE} = -30 \text{ V}; I_{B} = 0 \text{ A};$ $T_{j} = 150 ^{\circ}\text{C}$	-	-	-5	μА
I <sub>EBO</sub>	emitter-base cut-off current	$V_{EB} = -5 \text{ V}; I_C = 0 \text{ A}$	-	-	-180	μА
h <sub>FE</sub>	DC current gain	$V_{CE} = -5 \text{ V}; I_{C} = -5 \text{ mA}$	60	-	-	
V <sub>CEsat</sub>	collector-emitter saturation voltage	$I_C = -10 \text{ mA}; I_B = -0.5 \text{ mA}$	-	-	-150	mV
$V_{I(off)}$	off-state input voltage	$V_{CE} = -5 \text{ V}; I_{C} = -100 \mu\text{A}$	-	-1.1	-0.8	V
V <sub>I(on)</sub>	on-state input voltage	$V_{CE} = -0.3 \text{ V}; I_{C} = -5 \text{ mA}$	-2.5	-1.7	-	V
R1	bias resistor 1 (input)		15.4	22	28.6	kΩ
R2/R1	bias resistor ratio		0.8	1	1.2	
C <sub>c</sub>	collector capacitance	$V_{CB} = -10 \text{ V}; I_E = i_e = 0 \text{ A};$ f = 1 MHz	-	-	3	pF
f <sub>T</sub>	transition frequency	$V_{CE} = -5 \text{ V}; I_{C} = -10 \text{ mA};$ [1] $f = 100 \text{ MHz}$	-	180	-	MHz

<sup>[1]</sup> Characteristics of built-in transistor



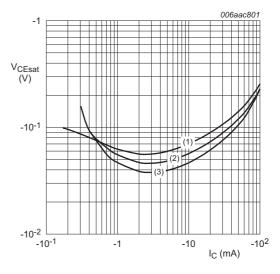
$$V_{CE} = -5 \text{ V}$$

(1) 
$$T_{amb} = 100 \, ^{\circ}C$$

(2) 
$$T_{amb} = 25 \, ^{\circ}C$$

(3) 
$$T_{amb} = -40 \, ^{\circ}C$$

Fig 4. DC current gain as a function of collector current; typical values



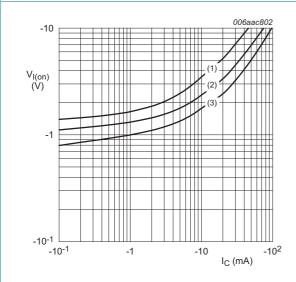
$$I_{\rm C}/I_{\rm B} = 20$$

(1) 
$$T_{amb} = 100 \, ^{\circ}C$$

(2) 
$$T_{amb} = 25 \, ^{\circ}C$$

(3) 
$$T_{amb} = -40 \, ^{\circ}C$$

Fig 5. Collector-emitter saturation voltage as a function of collector current; typical values



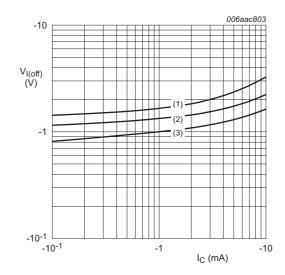
$$V_{CE} = -0.3 \text{ V}$$

(1) 
$$T_{amb} = -40 \, ^{\circ}C$$

(2) 
$$T_{amb} = 25 \, ^{\circ}C$$

(3) 
$$T_{amb} = 100 \, ^{\circ}C$$

Fig 6. On-state input voltage as a function of collector current; typical values



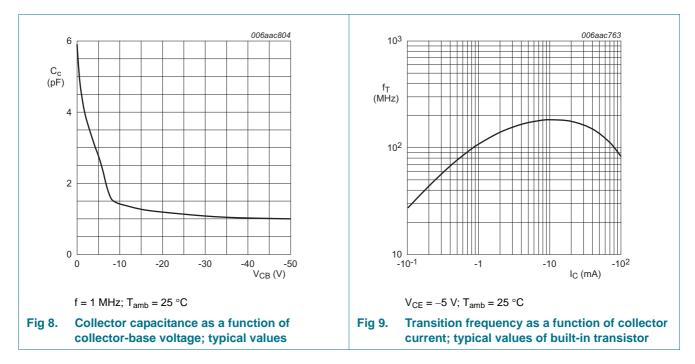
$$V_{CE} = -5 \text{ V}$$

(1) 
$$T_{amb} = -40 \, ^{\circ}C$$

(2) 
$$T_{amb} = 25 \, ^{\circ}C$$

(3) 
$$T_{amb} = 100 \, ^{\circ}C$$

Fig 7. Off-state input voltage as a function of collector current; typical values

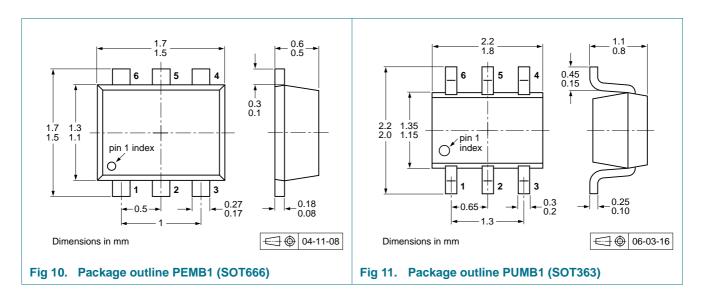


### 8. Test information

### 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



PEMB1\_PUMB1

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### 10. Packing information

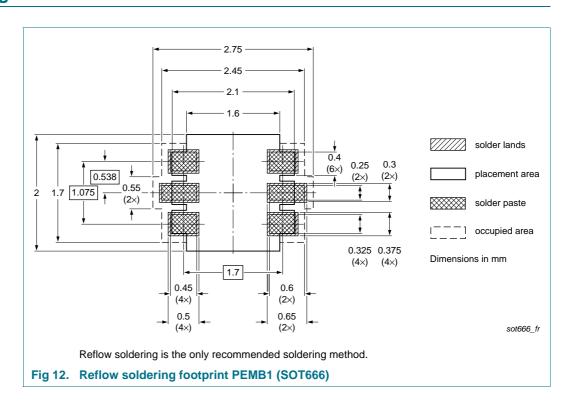
Table 9. Packing methods

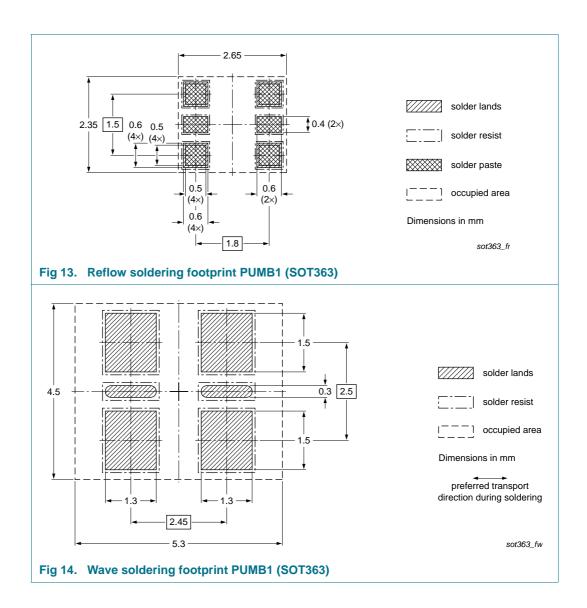
The indicated -xxx are the last three digits of the 12NC ordering code.[1]

Туре	Package	Description		Packing quantity			
number			3000	4000	8000	10000	
PEMB1 SOT666	2 mm pitch, 8 mm tape and reel	-	-	-315	-		
		4 mm pitch, 8 mm tape and reel	-	-115	-	-	
PUMB1 SOT363	4 mm pitch, 8 mm tape and reel; T1	-115	-	-	-135		
		4 mm pitch, 8 mm tape and reel; T2	-125	-	-	-165	

- [1] For further information and the availability of packing methods, see Section 14.
- [2] T1: normal taping
- [3] T2: reverse taping

### 11. Soldering





### 12. Revision history

#### Table 10. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes			
PEMB1_PUMB1 v.3	20111128	Product data sheet	-	PEMB1_PUMB1 v.2			
Modifications:		of this document has been NXP Semiconductors.	redesigned to comply w	ith the new identity			
	<ul> <li>Legal texts have been adapted to the new company name where appropriate.</li> </ul>						
	Section 1 "Product profile": updated						
<ul> <li>Section 4 "Marking": updated</li> </ul>							
	• Figure 1 to 9: added						
	Section 5 "Limiting values": updated						
	<ul> <li>Section 6 "Thermal characteristics": updated</li> </ul>						
	<ul> <li>Table 8 "Characteristics": V<sub>i(on)</sub> redefined to V<sub>I(on)</sub> on-state input voltage, V<sub>i(off)</sub> redefined to V<sub>I(off)</sub> off-state input voltage, I<sub>CEO</sub> updated, f<sub>T</sub> added</li> </ul>						
	Section 8 "Test information": added						
	<ul> <li>Section 9 "Package outline": superseded by minimized package outline drawings</li> </ul>						
	Section 10 "I	Packing information": adde	ed				
	Section 13 "I	<u>egal information"</u> : update	d				
PEMB1_PUMB1 v.2	20031015	Product data sheet	-	PEMB1 v.1			
PEMB1 v.1	20010913	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"
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PEMB1\_PUMB1

PEMB1; PUMB1

PNP/PNP resistor-equipped transistors; R1 = 22 k $\Omega$ , R2 = 22 k $\Omega$ 

**Quick reference data** — The Quick reference data is an extract of the product data given in the Limiting values and Characteristics sections of this document, and as such is not complete, exhaustive or legally binding.

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### 15. Contents

1	Product profile
1.1	General description 1
1.2	Features and benefits
1.3	Applications
1.4	Quick reference data 1
2	Pinning information 2
3	Ordering information 2
4	Marking 2
5	Limiting values 3
6	Thermal characteristics 4
7	Characteristics 6
8	Test information 8
8.1	Quality information 8
9	Package outline 8
10	Packing information 9
11	Soldering 9
12	Revision history 11
13	Legal information 12
13.1	Data sheet status
13.2	Definitions
13.3	Disclaimers
13.4	Trademarks13
14	Contact information
15	Contents

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**Телефон:** 8 (812) 309 58 32 (многоканальный)

Факс: 8 (812) 320-02-42

Электронная почта: <u>org@eplast1.ru</u>

Адрес: 198099, г. Санкт-Петербург, ул. Калинина,

дом 2, корпус 4, литера А.