

PEMB1; PUMB1

PNP/PNP resistor-equipped transistors;
R1 = 22 k Ω , R2 = 22 k Ω

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/PNP complement	NPN/NPN complement	Package configuration
	NXP	JEITA			
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	Typ	Max	Unit
Per transistor						
V _{CEO}	collector-emitter voltage	open base	-	-	-50	V
I _O	output current		-	-	-100	mA
R1	bias resistor 1 (input)		15.4	22	28.6	k Ω
R2/R1	bias resistor ratio		0.8	1	1.2	

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2. Pinning information

Table 3. Pinning

Pin	Description	Simplified outline	Graphic symbol
1	GND (emitter) TR1	<p>001aab555</p>	<p>006aaa212</p>
2	input (base) TR1		
3	output (collector) TR2		
4	GND (emitter) TR2		
5	input (base) TR2		
6	output (collector) TR1		

3. Ordering information

Table 4. Ordering information

Type number	Package		Version
	Name	Description	
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 ^[1]
PEMB1	Z4
PUMB1	B*3

[1] * = placeholder for manufacturing site code

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5. Limiting values

Table 6. Limiting values

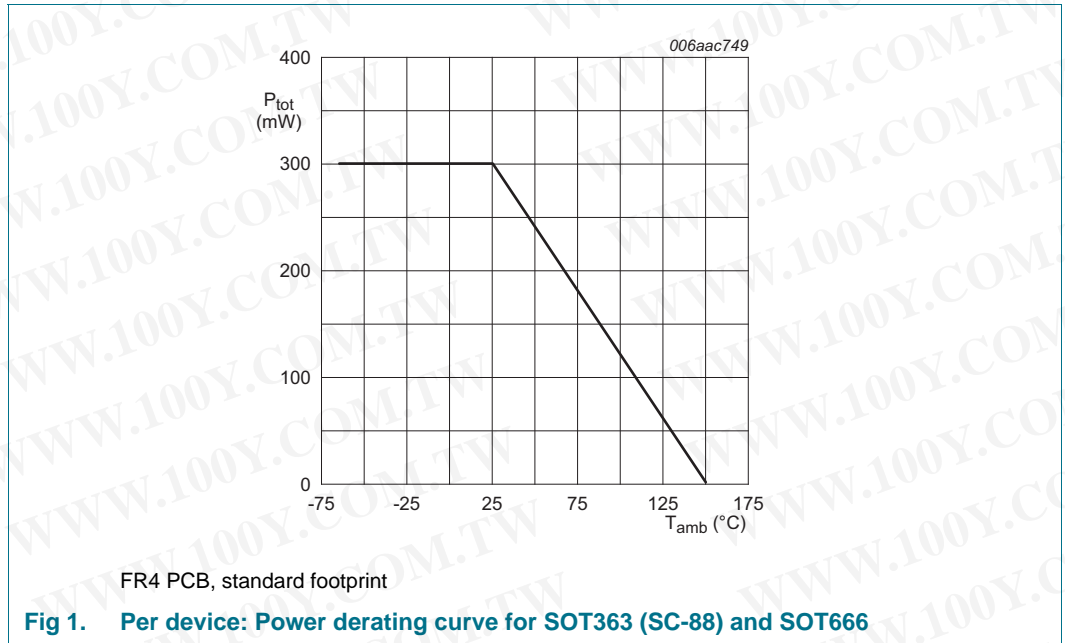
In accordance with the Absolute Maximum Rating System (IEC 60134).

Symbol	Parameter	Conditions	Min	Max	Unit	
Per transistor						
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	
I _O	output current		-	-100	mA	
I _{CM}	peak collector current	single pulse; t _p ≤ 1 ms	-	-100	mA	
P _{tot}	total power dissipation	T _{amb} ≤ 25 °C				
		PEMB1 (SOT666)	[1][2]	-	200	mW
		PUMB1 (SOT363)	[1]	-	200	mW
Per device						
P _{tot}	total power dissipation	T _{amb} ≤ 25 °C				
		PEMB1 (SOT666)	[1][2]	-	300	mW
		PUMB1 (SOT363)	[1]	-	300	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.

[2] Reflow soldering is the only recommended soldering method.

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6. Thermal characteristics

Table 7. Thermal characteristics

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
Per transistor						
R _{th(j-a)}	thermal resistance from junction to ambient	in free air				
	PEMB1 (SOT666)		[1][2]	-	625	K/W
	PUMB1 (SOT363)		[1]	-	625	K/W
Per device						
R _{th(j-a)}	thermal resistance from junction to ambient	in free air				
	PEMB1 (SOT666)		[1][2]	-	417	K/W
	PUMB1 (SOT363)		[1]	-	417	K/W

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

[2] Reflow soldering is the only recommended soldering method.

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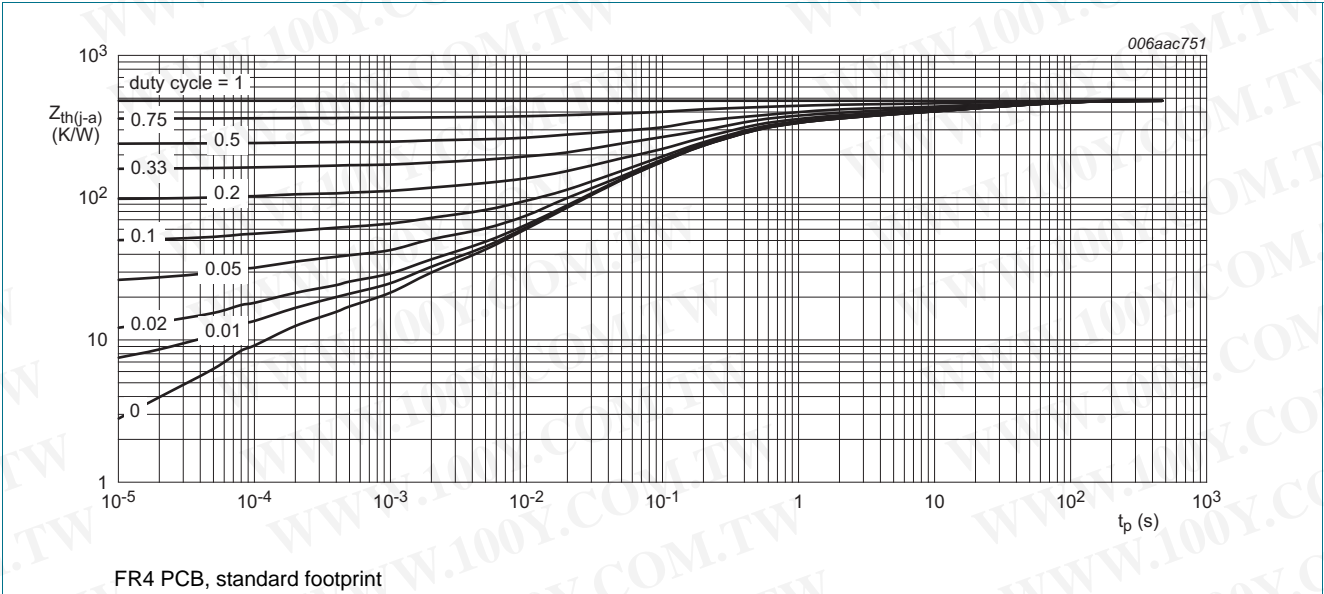


Fig 2. Per transistor: Transient thermal impedance from junction to ambient as a function of pulse duration for PEMB1 (SOT666); typical values

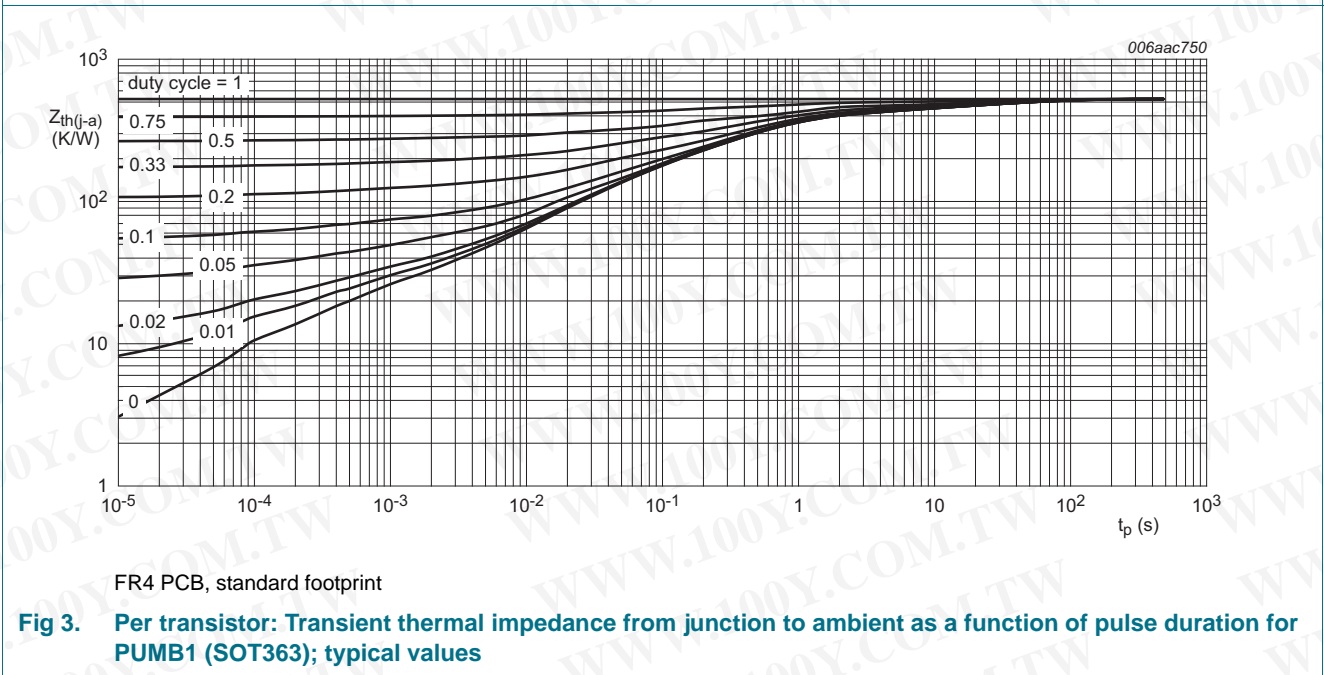


Fig 3. Per transistor: Transient thermal impedance from junction to ambient as a function of pulse duration for PUMB1 (SOT363); typical values

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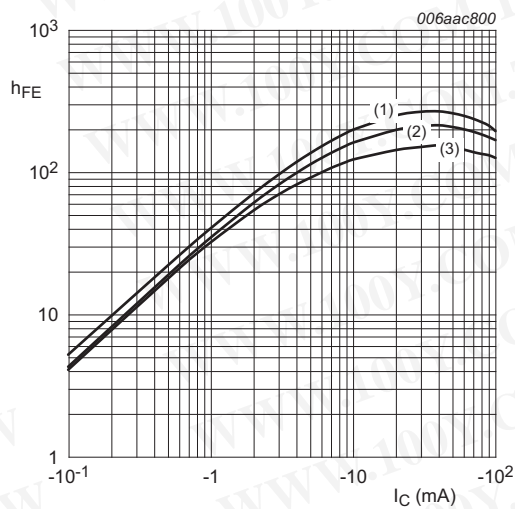
7. Characteristics

Table 8. Characteristics
 $T_{amb} = 25\text{ °C}$ unless otherwise specified.

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
Per transistor						
I_{CBO}	collector-base cut-off current	$V_{CB} = -50\text{ V}; I_E = 0\text{ A}$	-	-	-100	nA
I_{CEO}	collector-emitter cut-off current	$V_{CE} = -30\text{ V}; I_B = 0\text{ A}$	-	-	-100	nA
		$V_{CE} = -30\text{ V}; I_B = 0\text{ A}; T_J = 150\text{ °C}$	-	-	-5	μA
I_{EBO}	emitter-base cut-off current	$V_{EB} = -5\text{ V}; I_C = 0\text{ A}$	-	-	-180	μA
h_{FE}	DC current gain	$V_{CE} = -5\text{ V}; I_C = -5\text{ mA}$	60	-	-	
V_{CEsat}	collector-emitter saturation voltage	$I_C = -10\text{ mA}; I_B = -0.5\text{ mA}$	-	-	-150	mV
$V_{I(off)}$	off-state input voltage	$V_{CE} = -5\text{ V}; I_C = -100\text{ μA}$	-	-1.1	-0.8	V
$V_{I(on)}$	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_c	collector capacitance	$V_{CB} = -10\text{ V}; I_E = i_e = 0\text{ A}; f = 1\text{ MHz}$	-	-	3	pF
f_T	transition frequency	$V_{CE} = -5\text{ V}; I_C = -10\text{ mA}; f = 100\text{ MHz}$	-	180	-	MHz

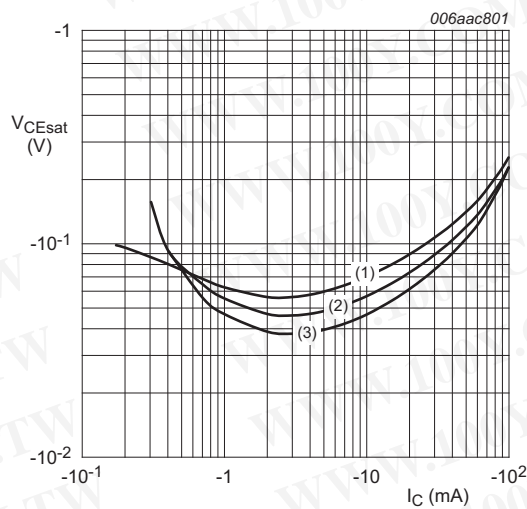
[1] Characteristics of built-in transistor

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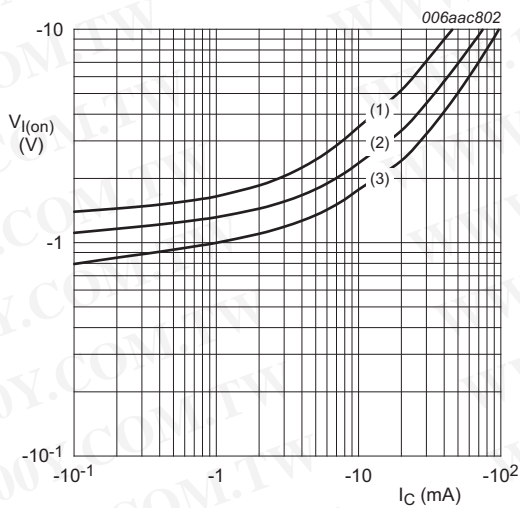
$V_{CE} = -5 \text{ V}$
 (1) $T_{amb} = 100 \text{ }^\circ\text{C}$
 (2) $T_{amb} = 25 \text{ }^\circ\text{C}$
 (3) $T_{amb} = -40 \text{ }^\circ\text{C}$

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



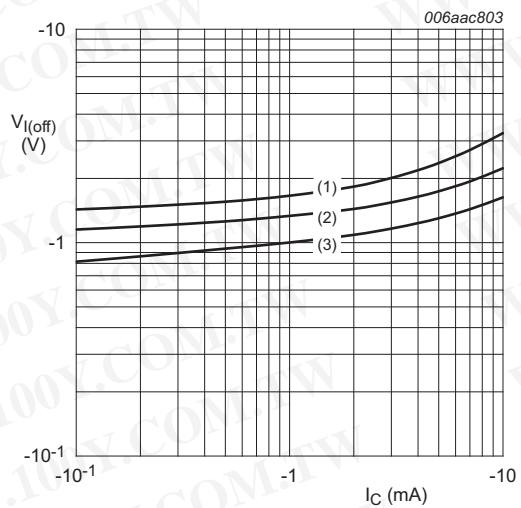
$I_C/I_B = 20$
 (1) $T_{amb} = 100 \text{ }^\circ\text{C}$
 (2) $T_{amb} = 25 \text{ }^\circ\text{C}$
 (3) $T_{amb} = -40 \text{ }^\circ\text{C}$

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



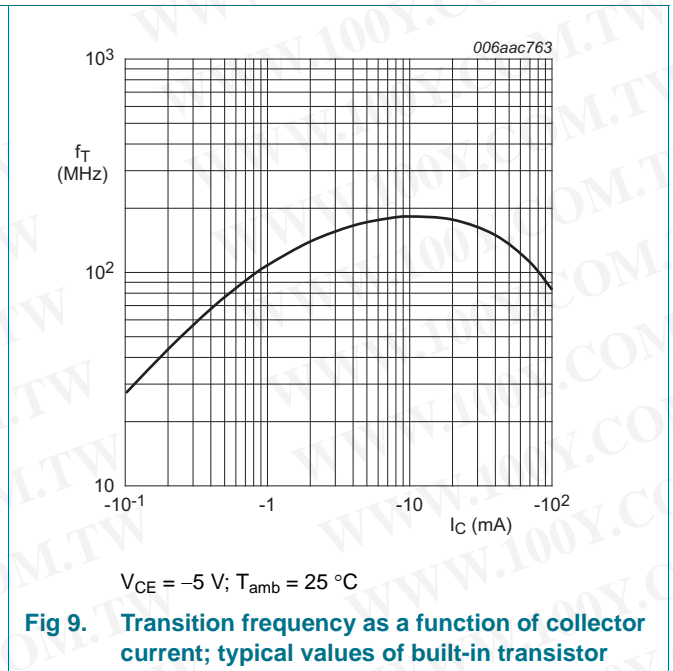
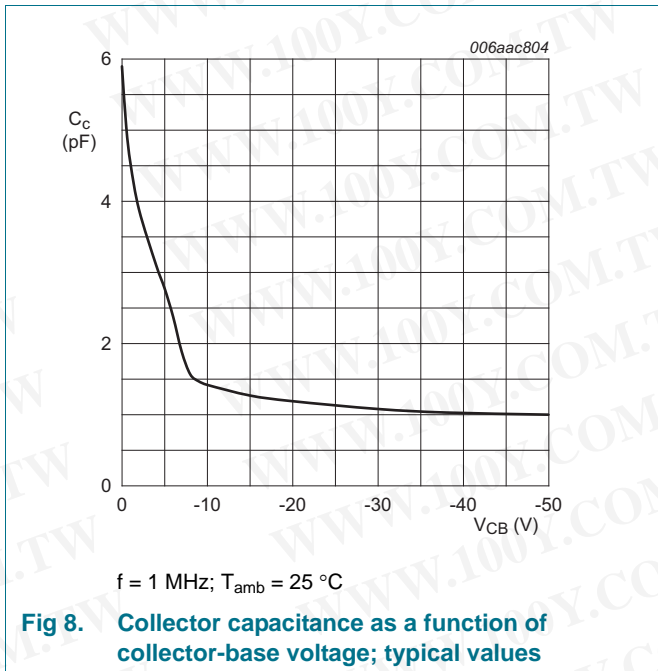
$V_{CE} = -0.3 \text{ V}$
 (1) $T_{amb} = -40 \text{ }^\circ\text{C}$
 (2) $T_{amb} = 25 \text{ }^\circ\text{C}$
 (3) $T_{amb} = 100 \text{ }^\circ\text{C}$

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



$V_{CE} = -5 \text{ V}$
 (1) $T_{amb} = -40 \text{ }^\circ\text{C}$
 (2) $T_{amb} = 25 \text{ }^\circ\text{C}$
 (3) $T_{amb} = 100 \text{ }^\circ\text{C}$

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

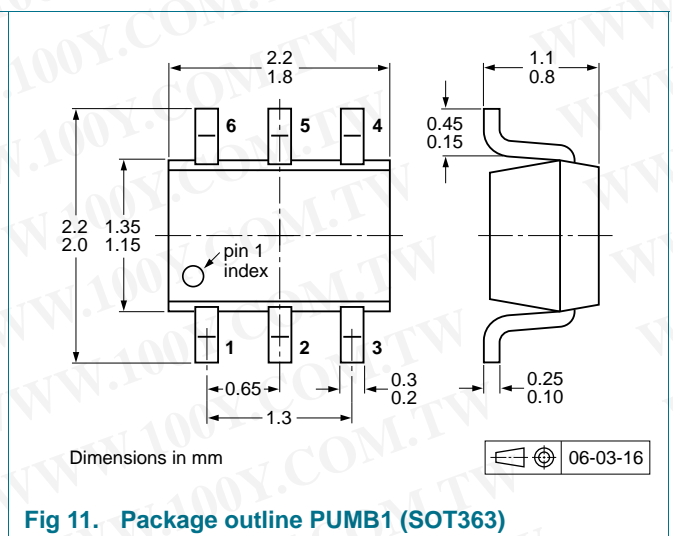
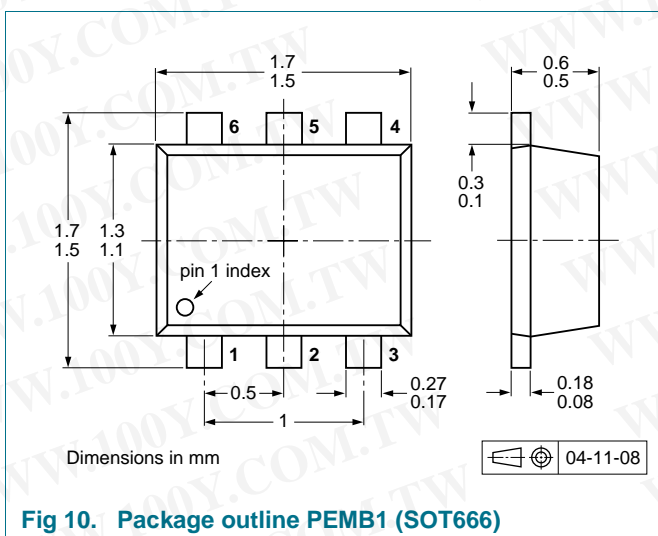


8. Test information

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



10. Packing information

Table 9. Packing methods

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

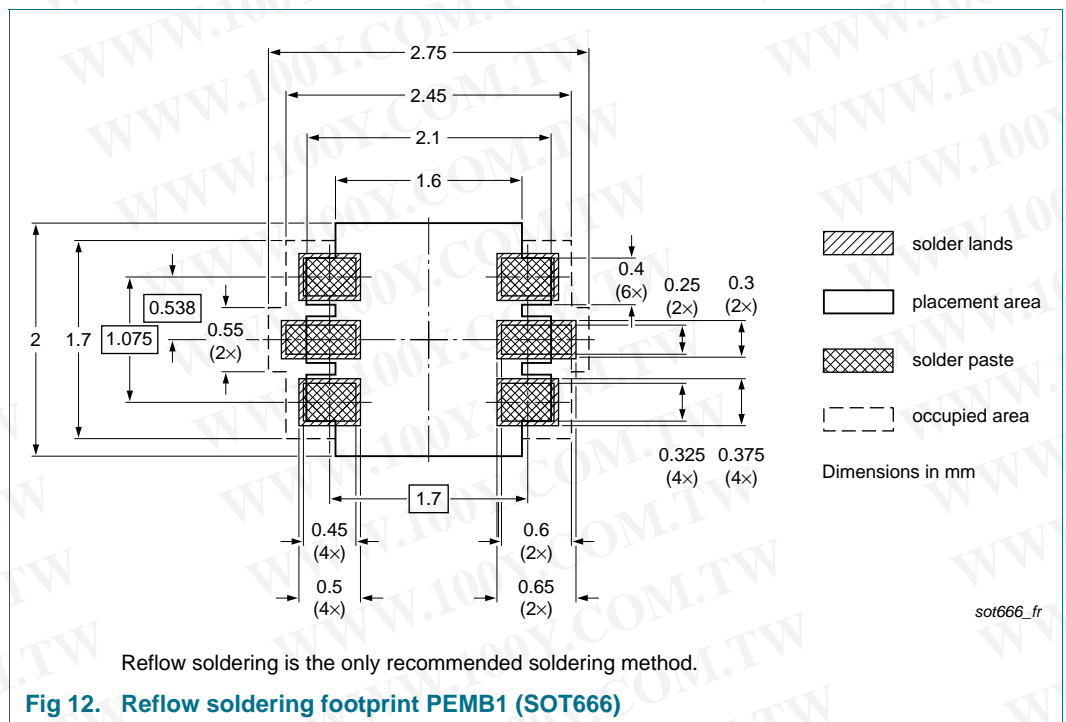
Type number	Package	Description	Packing quantity			
			3000	4000	8000	10000
PEMB1	SOT666	2 mm pitch, 8 mm tape and reel	-	-	-315	-
		4 mm pitch, 8 mm tape and reel	-	-115	-	-
PUMB1	SOT363	4 mm pitch, 8 mm tape and reel; T1 ^[2]	-115	-	-	-135
		4 mm pitch, 8 mm tape and reel; T2 ^[3]	-125	-	-	-165

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

[2] T1: normal taping

[3] T2: reverse taping

11. Soldering



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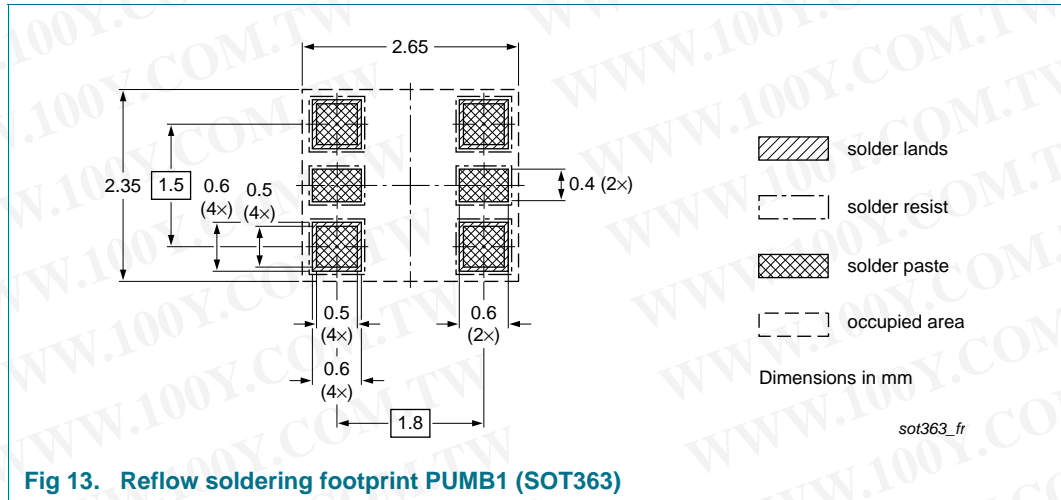


Fig 13. Reflow soldering footprint PUMB1 (SOT363)

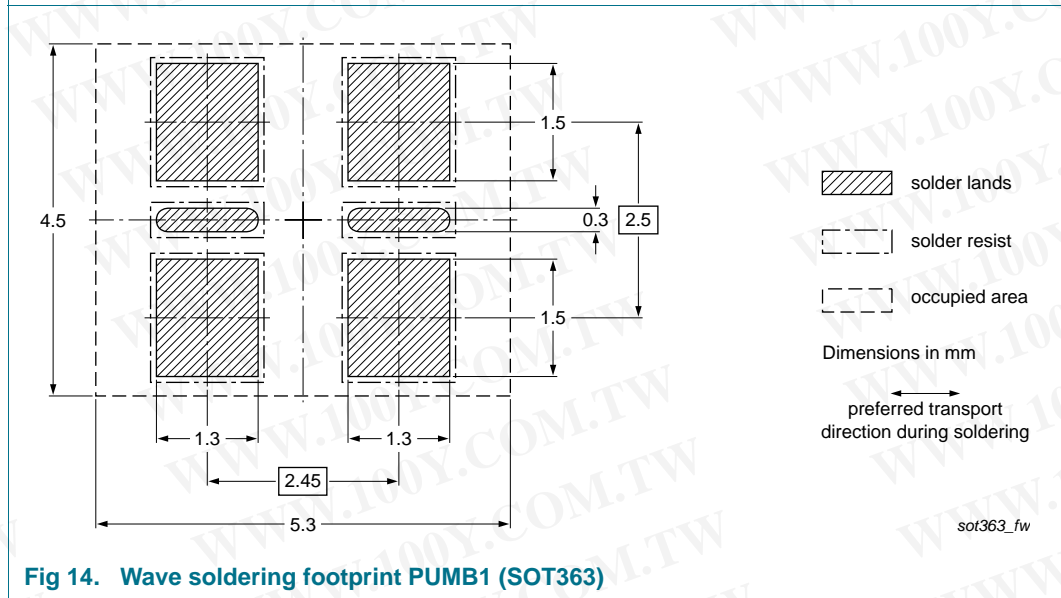


Fig 14. Wave soldering footprint PUMB1 (SOT363)

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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:	<ul style="list-style-type: none"> • The format of this document has been redesigned to comply with the new identity guidelines of NXP Semiconductors. • Legal texts have been adapted to the new company name where appropriate. • Section 1 "Product profile": updated • Section 4 "Marking": updated • Figure 1 to 9: added • Section 5 "Limiting values": updated • Section 6 "Thermal characteristics": updated • Table 8 "Characteristics": $V_{i(on)}$ redefined to $V_{I(on)}$ on-state input voltage, $V_{i(off)}$ redefined to $V_{I(off)}$ off-state input voltage, I_{CEO} updated, f_T added • Section 8 "Test information": added • Section 9 "Package outline": superseded by minimized package outline drawings • Section 10 "Packing information": added • Section 11 "Soldering": added • Section 13 "Legal information": updated 			
PEMB1_PUMB1 v.2	20031015	Product data sheet	-	PEMB1 v.1
PEMB1 v.1	20010913	Product specification	-	-

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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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