

# PEMB18; PUMB18

PNP/PNP resistor-equipped transistors;  
 $R1 = 4.7 \text{ k}\Omega$ ,  $R2 = 10 \text{ k}\Omega$

Rev. 5 — 21 December 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			
PEMB18	SOT666	-	PEMD18	PEMH18	ultra small and flat lead
PUMB18	SOT363	SC-88	PUMD18	PUMH18	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

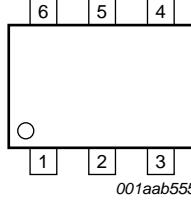
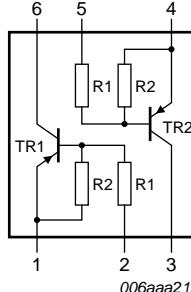
Symbol	Parameter	Conditions	Min	Typ	Max	Unit
<b>Per transistor</b>						
$V_{CEO}$	collector-emitter voltage	open base	-	-	-50	V
$I_o$	output current		-	-	-100	mA
$R1$	bias resistor 1 (input)		3.3	4.7	6.1	$\text{k}\Omega$
$R2/R1$	bias resistor ratio		1.7	2.1	2.6	



## 2. Pinning information

Table 3. Pinning

Pin	Description	Simplified outline	Graphic symbol
1	GND (emitter) TR1		
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		
	Name	Description	Version
PEMB18	-	plastic surface-mounted package; 6 leads	SOT666
PUMB18	SC-88	plastic surface-mounted package; 6 leads	SOT363

## 4. Marking

Table 5. Marking codes

Type number	Marking code <sup>[1]</sup>
PEMB18	6A
PUMB18	B8*

[1] \* = placeholder for manufacturing site code

## 5. Limiting values

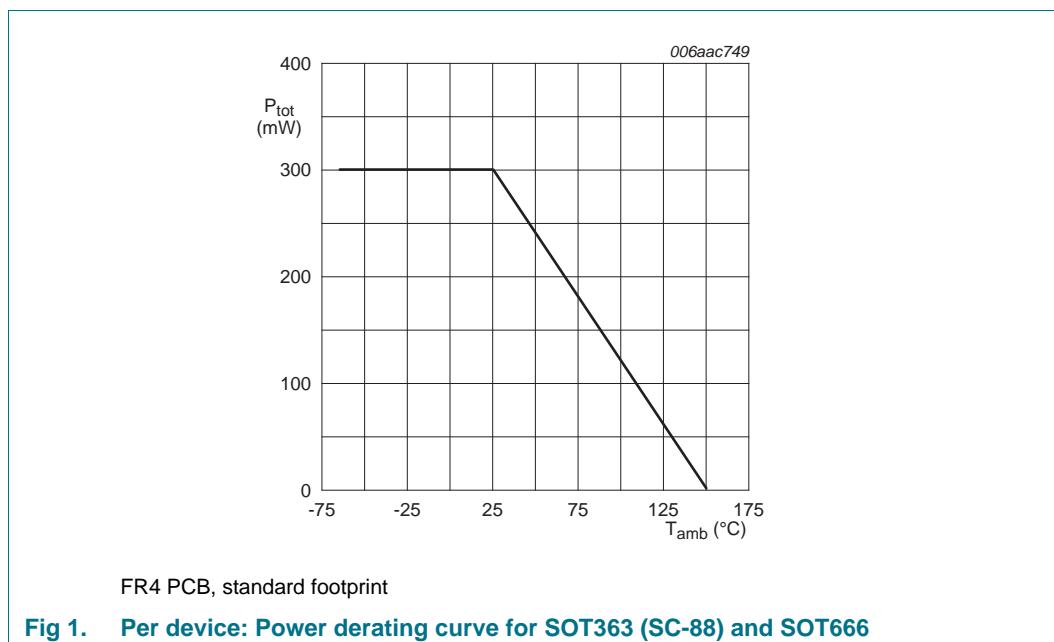
**Table 6. Limiting values**

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

Symbol	Parameter	Conditions	Min	Max	Unit	
<b>Per transistor</b>						
$V_{CBO}$	collector-base voltage	open emitter	-	-50	V	
$V_{CEO}$	collector-emitter voltage	open base	-	-50	V	
$V_{EBO}$	emitter-base voltage	open collector	-	-7	V	
$V_I$	input voltage					
	positive		-	+7	V	
	negative		-	-20	V	
$I_O$	output current		-	-100	mA	
$I_{CM}$	peak collector current	single pulse; $t_p \leq 1 \text{ ms}$	-	-100	mA	
$P_{tot}$	total power dissipation	$T_{amb} \leq 25 \text{ }^{\circ}\text{C}$				
	PEMB18 (SOT666)		[1][2]	-	200	mW
	PUMB18 (SOT363)		[1]	-	200	mW
<b>Per device</b>						
$P_{tot}$	total power dissipation	$T_{amb} \leq 25 \text{ }^{\circ}\text{C}$				
	PEMB18 (SOT666)		[1][2]	-	300	mW
	PUMB18 (SOT363)		[1]	-	300	mW
$T_j$	junction temperature		-	150	$^{\circ}\text{C}$	
$T_{amb}$	ambient temperature		-65	+150	$^{\circ}\text{C}$	
$T_{stg}$	storage temperature		-65	+150	$^{\circ}\text{C}$	

[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.



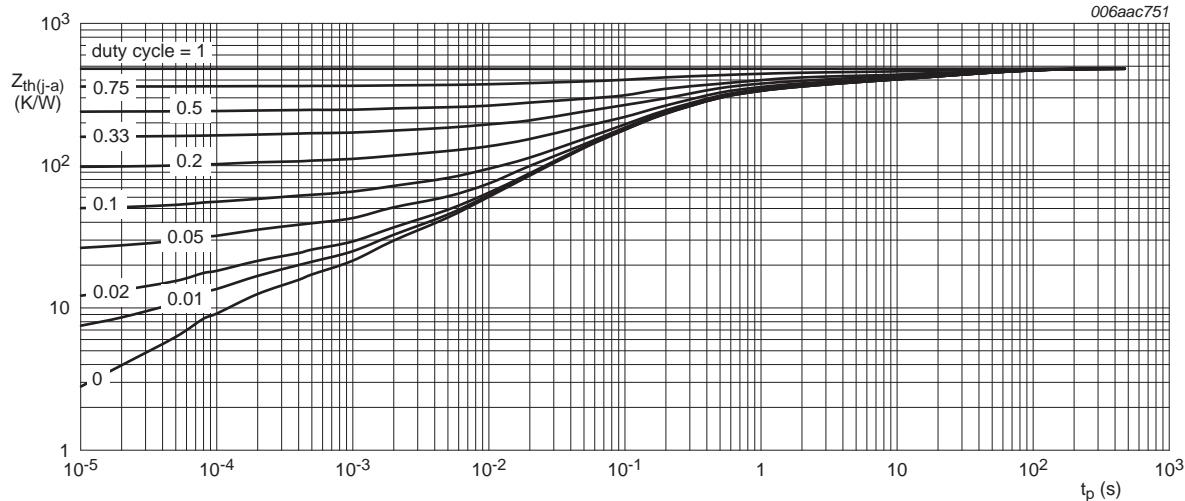
## 6. Thermal characteristics

Table 7. Thermal characteristics

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
<b>Per transistor</b>						
$R_{th(j-a)}$	thermal resistance from junction to ambient	in free air				
	PEMB18 (SOT666)		[1][2]	-	-	625 K/W
	PUMB18 (SOT363)		[1]	-	-	625 K/W
<b>Per device</b>						
$R_{th(j-a)}$	thermal resistance from junction to ambient	in free air				
	PEMB18 (SOT666)		[1][2]	-	-	417 K/W
	PUMB18 (SOT363)		[1]	-	-	417 K/W

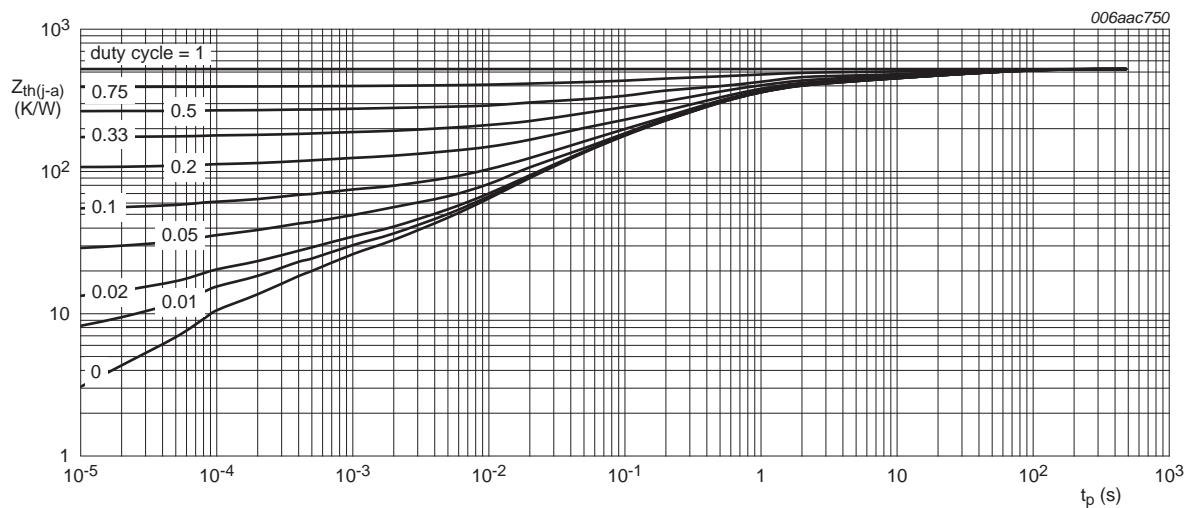
[1] Device mounted on an FR4 PCB, single-sided copper, tin-plated and standard footprint.

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



FR4 PCB, standard footprint

**Fig 2. Per transistor: Transient thermal impedance from junction to ambient as a function of pulse duration for PEMB18 (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 PUMB18 (SOT363); typical values**

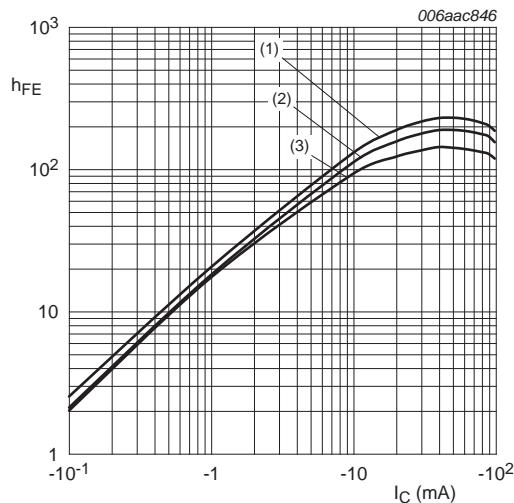
## 7. Characteristics

**Table 8. Characteristics**

$T_{amb} = 25 \text{ }^{\circ}\text{C}$  unless otherwise specified.

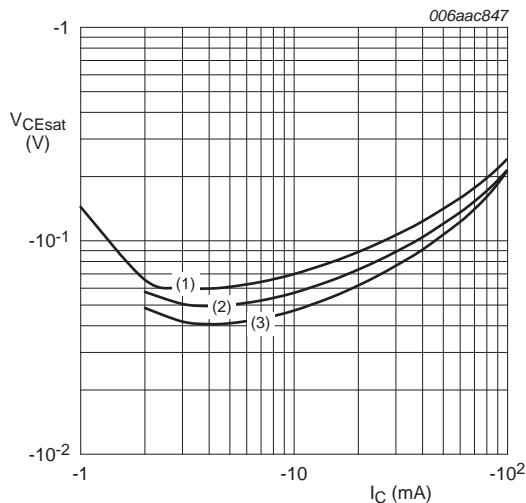
Symbol	Parameter	Conditions	Min	Typ	Max	Unit
<b>Per transistor</b>						
$I_{CBO}$	collector-base cut-off current	$V_{CB} = -50 \text{ V}$ ; $I_E = 0 \text{ A}$	-	-	-100	nA
$I_{CEO}$	collector-emitter cut-off current	$V_{CE} = -30 \text{ V}$ ; $I_B = 0 \text{ A}$	-	-	-1	$\mu\text{A}$
		$V_{CE} = -30 \text{ V}$ ; $I_B = 0 \text{ A}$ ; $T_j = 150 \text{ }^{\circ}\text{C}$	-	-	-5	$\mu\text{A}$
$I_{EBO}$	emitter-base cut-off current	$V_{EB} = -5 \text{ V}$ ; $I_C = 0 \text{ A}$	-	-	-600	$\mu\text{A}$
$h_{FE}$	DC current gain	$V_{CE} = -5 \text{ V}$ ; $I_C = -10 \text{ mA}$	50	-	-	
$V_{CEsat}$	collector-emitter saturation voltage	$I_C = -10 \text{ mA}$ ; $I_B = -0.5 \text{ mA}$	-	-	-100	mV
$V_{I(off)}$	off-state input voltage	$V_{CE} = -5 \text{ V}$ ; $I_C = -100 \mu\text{A}$	-	-0.9	-0.3	V
$V_{I(on)}$	on-state input voltage	$V_{CE} = -0.3 \text{ V}$ ; $I_C = -20 \text{ mA}$	-2.5	-1.5	-	V
$R1$	bias resistor 1 (input)		3.3	4.7	6.1	$\text{k}\Omega$
$R2/R1$	bias resistor ratio		1.7	2.1	2.6	
$C_c$	collector capacitance	$V_{CB} = -10 \text{ V}$ ; $I_E = i_e = 0 \text{ A}$ ; $f = 1 \text{ MHz}$	-	-	3	pF
$f_T$	transition frequency	$V_{CE} = -5 \text{ V}$ ; $I_C = -10 \text{ mA}$ ; [1]	-	180	-	MHz

[1] Characteristics of built-in transistor



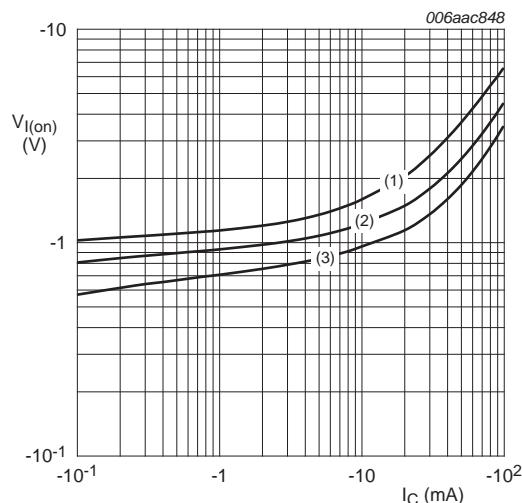
$V_{CE} = -5 \text{ V}$   
 (1)  $T_{amb} = 100 \text{ }^{\circ}\text{C}$   
 (2)  $T_{amb} = 25 \text{ }^{\circ}\text{C}$   
 (3)  $T_{amb} = -40 \text{ }^{\circ}\text{C}$

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



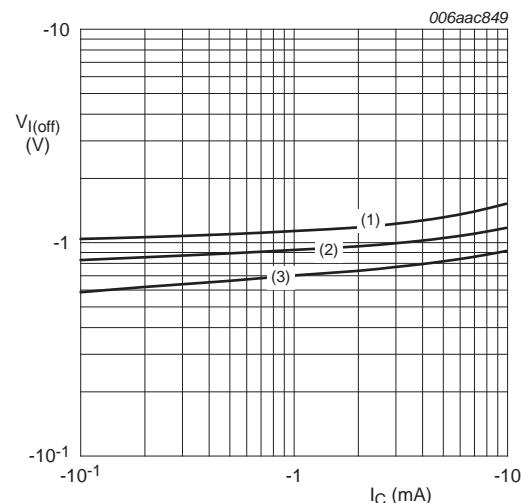
$I_C/I_B = 20$   
 (1)  $T_{amb} = 100 \text{ }^{\circ}\text{C}$   
 (2)  $T_{amb} = 25 \text{ }^{\circ}\text{C}$   
 (3)  $T_{amb} = -40 \text{ }^{\circ}\text{C}$

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



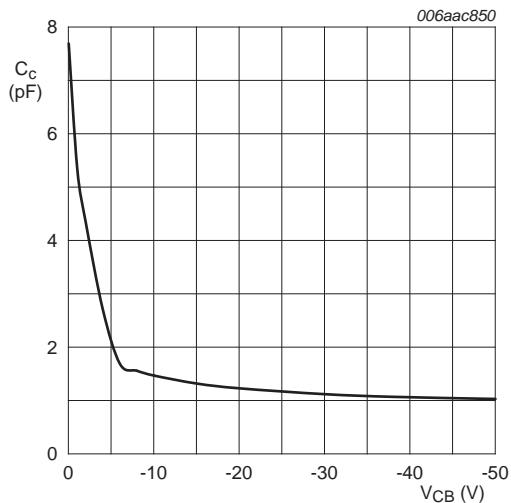
$V_{CE} = -0.3 \text{ V}$   
 (1)  $T_{amb} = -40 \text{ }^{\circ}\text{C}$   
 (2)  $T_{amb} = 25 \text{ }^{\circ}\text{C}$   
 (3)  $T_{amb} = 100 \text{ }^{\circ}\text{C}$

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



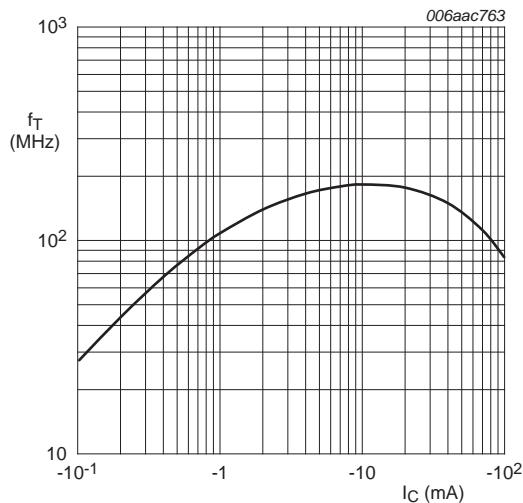
$V_{CE} = -5 \text{ V}$   
 (1)  $T_{amb} = -40 \text{ }^{\circ}\text{C}$   
 (2)  $T_{amb} = 25 \text{ }^{\circ}\text{C}$   
 (3)  $T_{amb} = 100 \text{ }^{\circ}\text{C}$

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



$f = 1 \text{ MHz}$ ;  $T_{\text{amb}} = 25 \text{ }^{\circ}\text{C}$

**Fig 8.** Collector capacitance as a function of collector-base voltage; typical values



$V_{CE} = -5 \text{ V}$ ;  $T_{\text{amb}} = 25 \text{ }^{\circ}\text{C}$

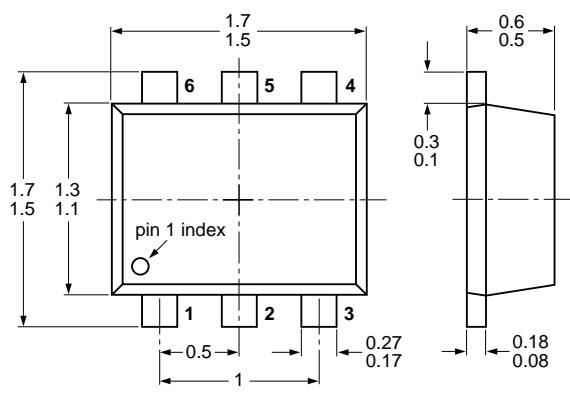
**Fig 9.** Transition frequency as a function of collector current; typical values of built-in transistor

## 8. Test information

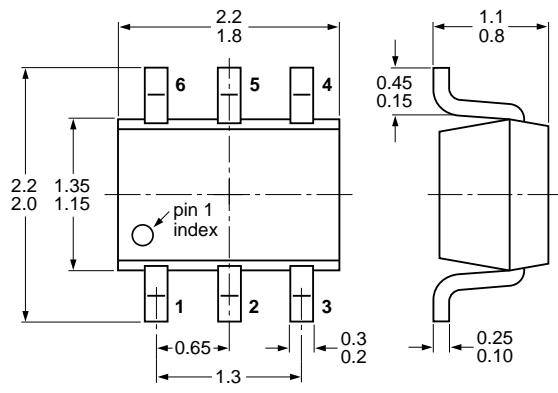
### 8.1 Quality information

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



**Fig 10.** Package outline PEMB18 (SOT666)



**Fig 11.** Package outline PUMB18 (SOT363)

## 10. Packing information

**Table 9. Packing methods**

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

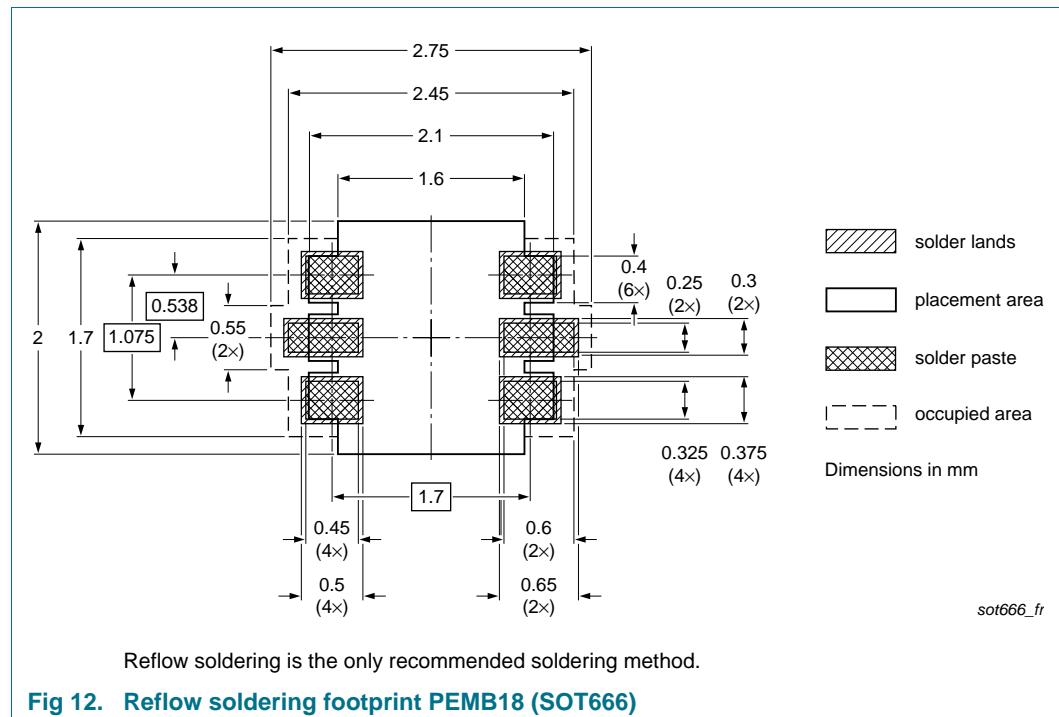
Type number	Package	Description	Packing quantity			
			3000	4000	8000	10000
PEMB18	SOT666	2 mm pitch, 8 mm tape and reel	-	-	-315	-
		4 mm pitch, 8 mm tape and reel	-	-115	-	-
PUMB18	SOT363	4 mm pitch, 8 mm tape and reel; T1	[2]	-115	-	-135
		4 mm pitch, 8 mm tape and reel; T2	[3]	-125	-	-165

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

[2] T1: normal taping

[3] T2: reverse taping

## 11. Soldering



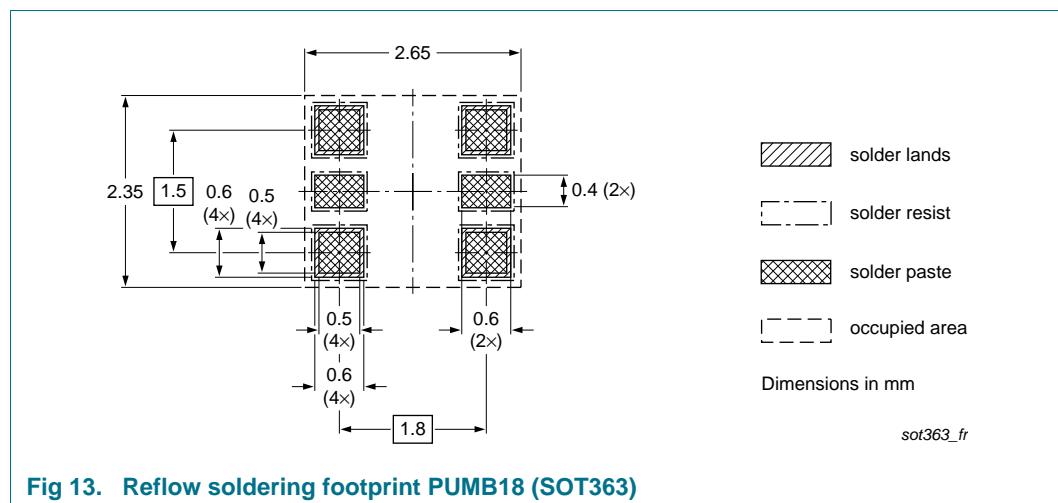


Fig 13. Reflow soldering footprint PUMB18 (SOT363)

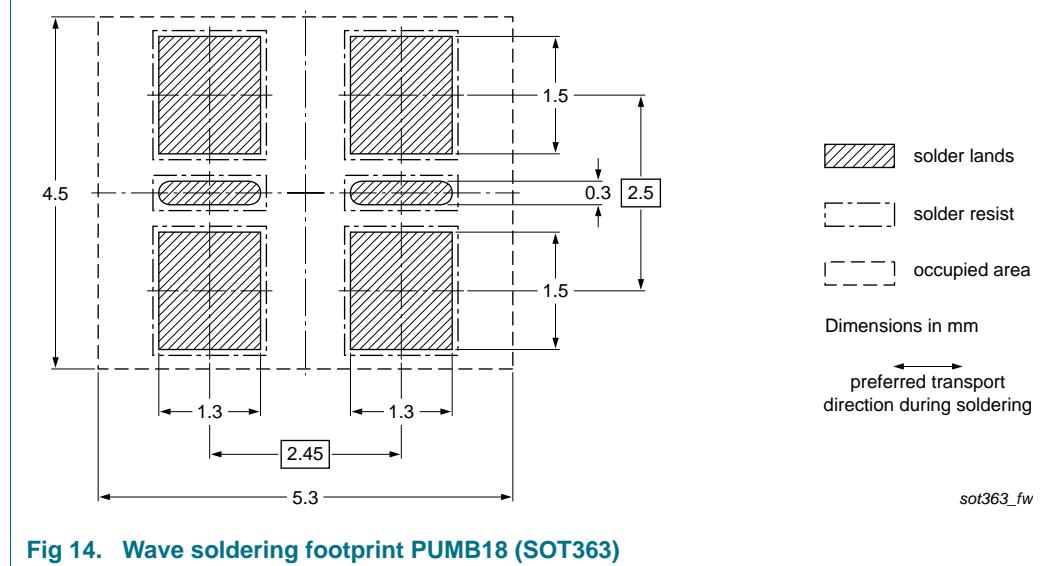


Fig 14. Wave soldering footprint PUMB18 (SOT363)

## 12. Revision history

**Table 10. Revision history**

Document ID	Release date	Data sheet status	Change notice	Supersedes
PEMB18_PUMB18 v.5	20111221	Product data sheet	-	PEMB18_PUMB18 v.4
Modifications:	<ul style="list-style-type: none"> <li>• <a href="#">Section 1 "Product profile"</a>: updated</li> <li>• <a href="#">Section 4 "Marking"</a>: updated</li> <li>• <a href="#">Figure 1 to 3, 8 and 9</a>: added</li> <li>• <a href="#">Section 6 "Thermal characteristics"</a>: updated</li> <li>• <a href="#">Figure 4 to 7</a>: updated</li> <li>• <a href="#">Table 8 "Characteristics"</a>: <math>I_{CEO}</math> and <math>V_{CEsat}</math> updated, <math>f_T</math> added</li> <li>• <a href="#">Section 8 "Test information"</a>: added</li> <li>• <a href="#">Section 11 "Soldering"</a>: added</li> <li>• <a href="#">Section 13 "Legal information"</a>: updated</li> </ul>			
PEMB18_PUMB18 v.4	20090901	Product data sheet	-	PEMB18_PUMB18 v.3
PEMB18_PUMB18 v.3	20050708	Product data sheet	-	PEMB18_PUMB18 v.2
PEMB18_PUMB18 v.2	20050202	Product data sheet	-	PUMB18 v.1
PUMB18 v.1	20031003	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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