THE DATASHEET OF

PEMB13

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PEMB13; PUMB13

PNP/PNP resistor-equipped transistors; R1 = 4.7 kΩ, R2 = 47 kΩ

Rev. 4 — 7 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			
PEMB13	SOT666	-	PEMD13	PEMH13	ultra small and flat lead
PUMB13	SOT363	SC-88	PUMD13	PUMH13	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

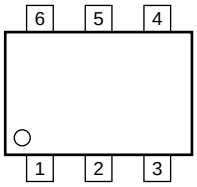
Table 2. Quick reference data

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)		3.3	4.7	6.1	kΩ
R2/R1	bias resistor ratio		8	10	12	

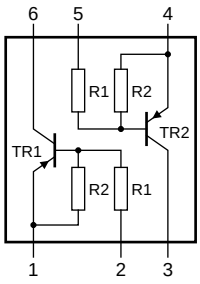
2. Pinning information

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		



001aab555



006aaa212

3. Ordering information

Table 4. Ordering information

Type number	Package		
	Name	Description	Version
PEMB13	-	plastic surface-mounted package; 6 leads	SOT666
PUMB13	SC-88	plastic surface-mounted package; 6 leads	SOT363

4. Marking

Table 5. Marking codes

Type number	Marking code[1]
PEMB13	45
PUMB13	B*5

[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).

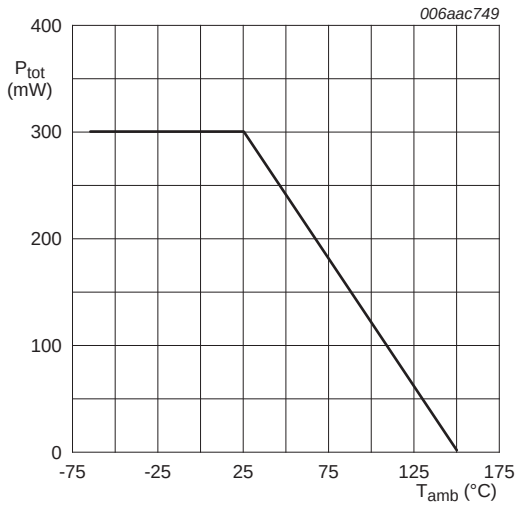
Symbol	Parameter	Conditions		Min	Max	Unit
Per transistor						
V_{CBO}	collector-base voltage	open emitter		-	–50	V
V_{CEO}	collector-emitter voltage	open base		-	–50	V
V_{EBO}	emitter-base voltage	open collector		-	–5	V
V_I	input voltage					
	positive			-	+5	V
	negative			-	–30	V
I_O	output current			-	–100	mA
I_{CM}	peak collector current	single pulse; $t_p \leq 1$ ms		-	–100	mA
P_{tot}	total power dissipation	$T_{amb} \leq 25$ °C				
	PEMB13 (SOT666)		[1][2]	-	200	mW
	PUMB13 (SOT363)		[1]	-	200	mW
Per device						
P_{tot}	total power dissipation	$T_{amb} \leq 25$ °C				
	PEMB13 (SOT666)		[1][2]	-	300	mW
	PUMB13 (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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FR4 PCB, standard footprint

Fig 1. Per device: Power derating curve for SOT363 (SC-88) and SOT666

6. Thermal characteristics

Table 7. Thermal characteristics

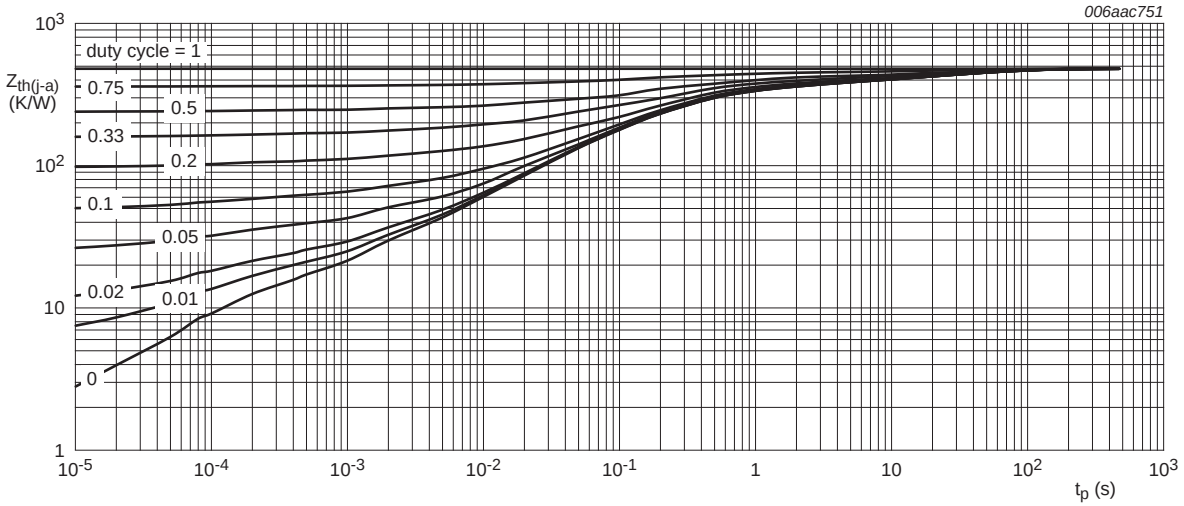
Symbol	Parameter	Conditions		Min	Typ	Max	Unit
Per transistor							
$R_{th(j-a)}$	thermal resistance from junction to ambient	in free air					
	PEMB13 (SOT666)		[1][2]	-	-	625	K/W
	PUMB13 (SOT363)		[1]	-	-	625	K/W
Per device							
$R_{th(j-a)}$	thermal resistance from junction to ambient	in free air					
	PEMB13 (SOT666)		[1][2]	-	-	417	K/W
	PUMB13 (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.

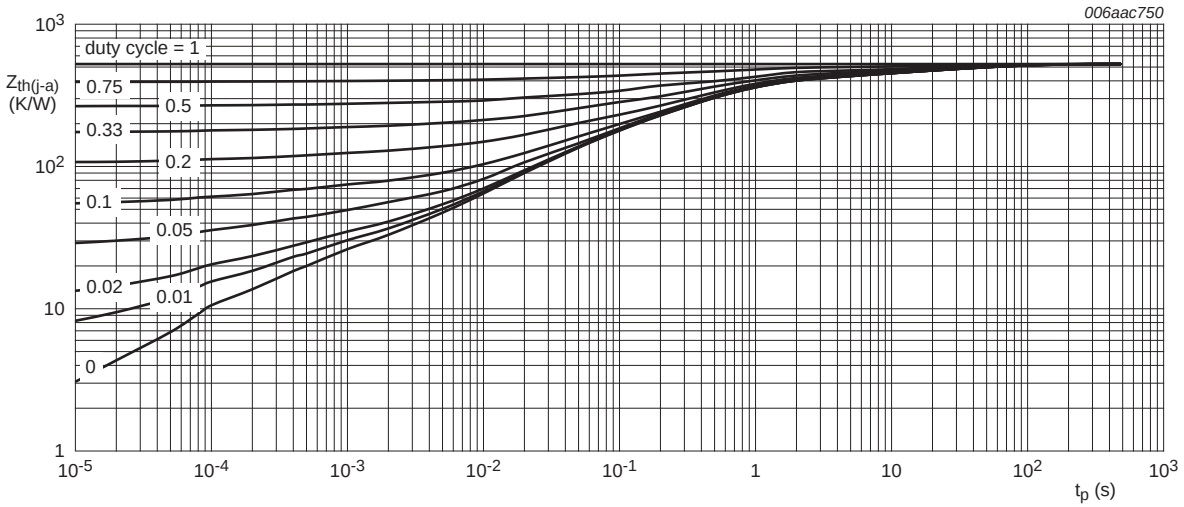
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FR4 PCB, standard footprint

Fig 2. Per transistor: Transient thermal impedance from junction to ambient as a function of pulse duration for PEMB13 (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 PUMB13 (SOT363); typical values

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7. Characteristics

Table 8. Characteristics

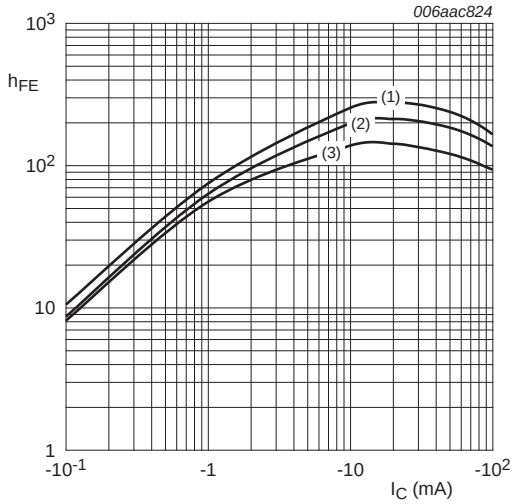
T_{amb} = 25 °C unless otherwise specified.

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
Per transistor						
I_{CBO}	collector-base cut-off current	V_{CB} = –50 V; I_E = 0 A	-	-	–100	nA
I_{CEO}	collector-emitter cut-off current	V_{CE} = –30 V; I_B = 0 A	-	-	–1	μA
		V_{CE} = –30 V; I_B = 0 A; T_j = 150 °C	-	-	–5	μA
I_{EBO}	emitter-base cut-off current	V_{EB} = –5 V; I_C = 0 A	-	-	–170	μA
h_{FE}	DC current gain	V_{CE} = –5 V; I_C = –10 mA	100	-	-	
V_{CEsat}	collector-emitter saturation voltage	I_C = –5 mA; I_B = –0.25 mA	-	-	–100	mV
$V_{I(off)}$	off-state input voltage	V_{CE} = –5 V; I_C = –100 μA	-	–0.6	–0.5	V
$V_{I(on)}$	on-state input voltage	V_{CE} = –0.3 V; I_C = –5 mA	–1.3	–0.9	-	V
R1	bias resistor 1 (input)		3.3	4.7	6.1	kΩ
R2/R1	bias resistor ratio		8	10	12	
C_c	collector capacitance	V_{CB} = –10 V; I_E = i_e = 0 A; f = 1 MHz	-	-	3	pF
f_T	transition frequency	V_{CE} = –5 V; I_C = –10 mA; f = 100 MHz [1]	-	180	-	MHz

[1] Characteristics of built-in transistor

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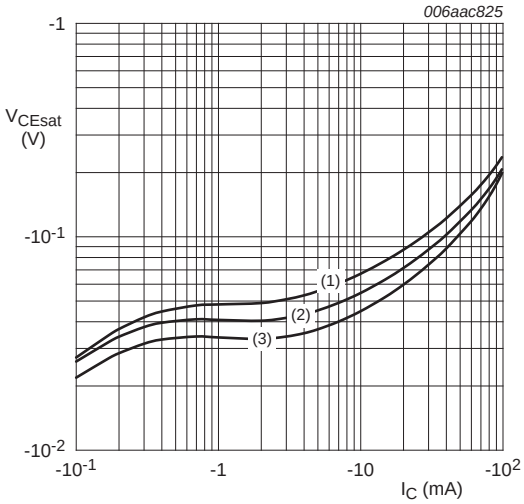
V_{CE} = −5 V

(1) T_{amb} = 100 °C

(2) T_{amb} = 25 °C

(3) T_{amb} = −40 °C

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



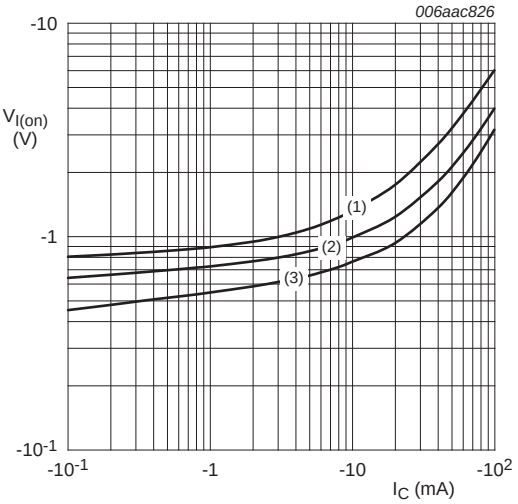
I_C/I_B = 20

(1) T_{amb} = 100 °C

(2) T_{amb} = 25 °C

(3) T_{amb} = −40 °C

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



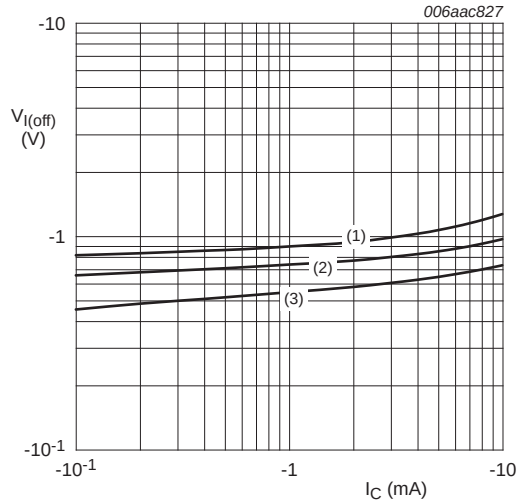
V_{CE} = −0.3 V

(1) T_{amb} = −40 °C

(2) T_{amb} = 25 °C

(3) T_{amb} = 100 °C

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



V_{CE} = −5 V

(1) T_{amb} = −40 °C

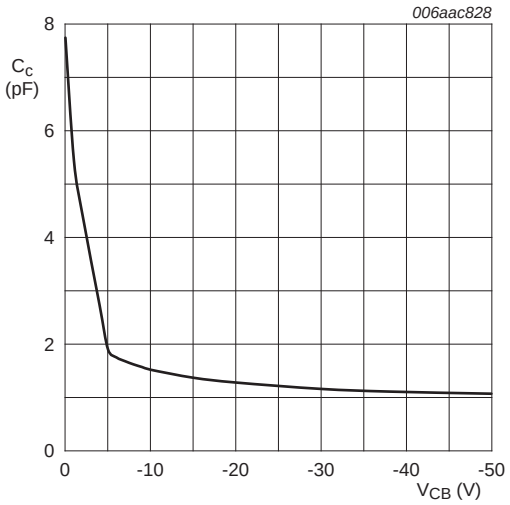
(2) T_{amb} = 25 °C

(3) T_{amb} = 100 °C

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

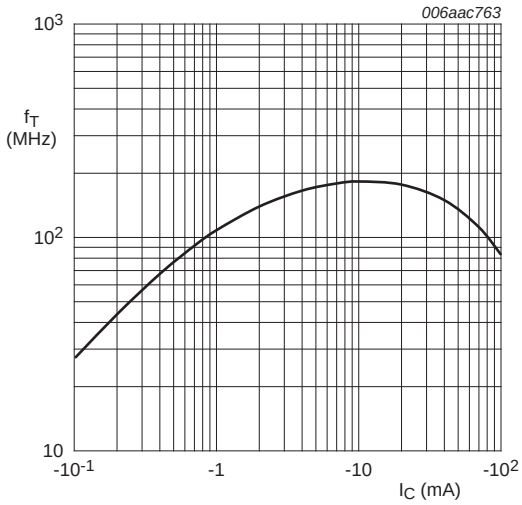
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f = 1 MHz; T_{amb} = 25 °C

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



V_{CE} = −5 V; T_{amb} = 25 °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

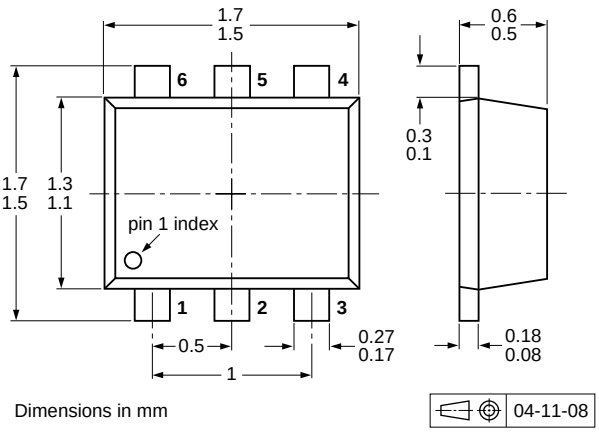


Fig 10. Package outline PEMB13 (SOT666)

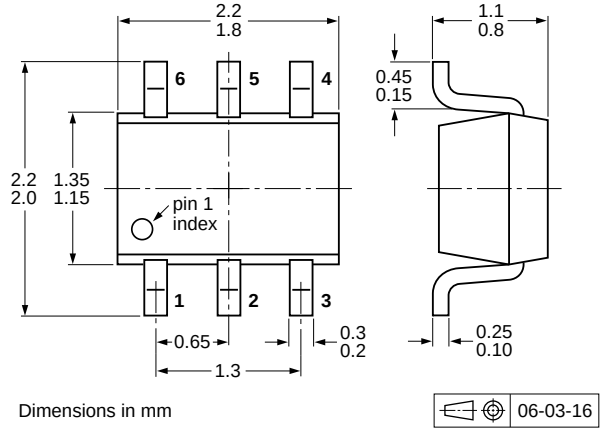


Fig 11. Package outline PUMB13 (SOT363)

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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]

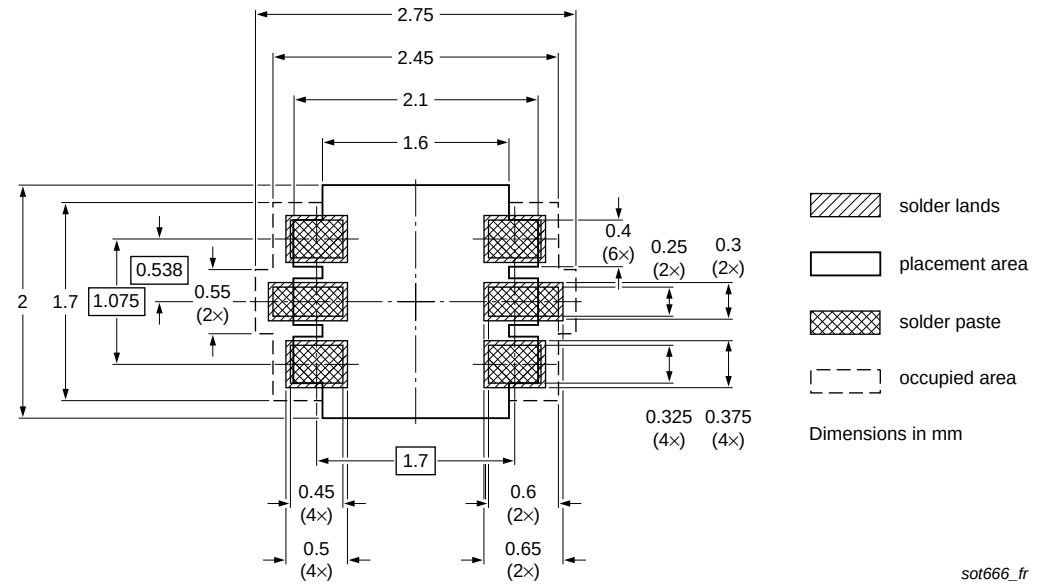
Type number	Package	Description		Packing quantity			
				3000	4000	8000	10000
PEMB13	SOT666	2 mm pitch, 8 mm tape and reel		-	-	-315	-
		4 mm pitch, 8 mm tape and reel		-	-115	-	-
PUMB13	SOT363	4 mm pitch, 8 mm tape and reel; T1	[2]	-115	-	-	-135
		4 mm pitch, 8 mm tape and reel; T2	[3]	-125	-	-	-165

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

[2] T1: normal taping

[3] T2: reverse taping

11. Soldering



Reflow soldering is the only recommended soldering method.

Fig 12. Reflow soldering footprint PEMB13 (SOT666)

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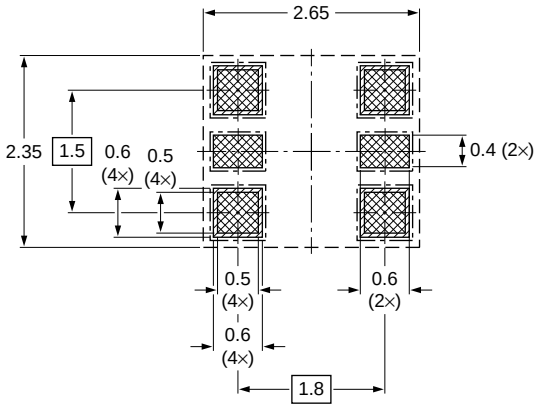


Fig 13. Reflow soldering footprint PUMB13 (SOT363)

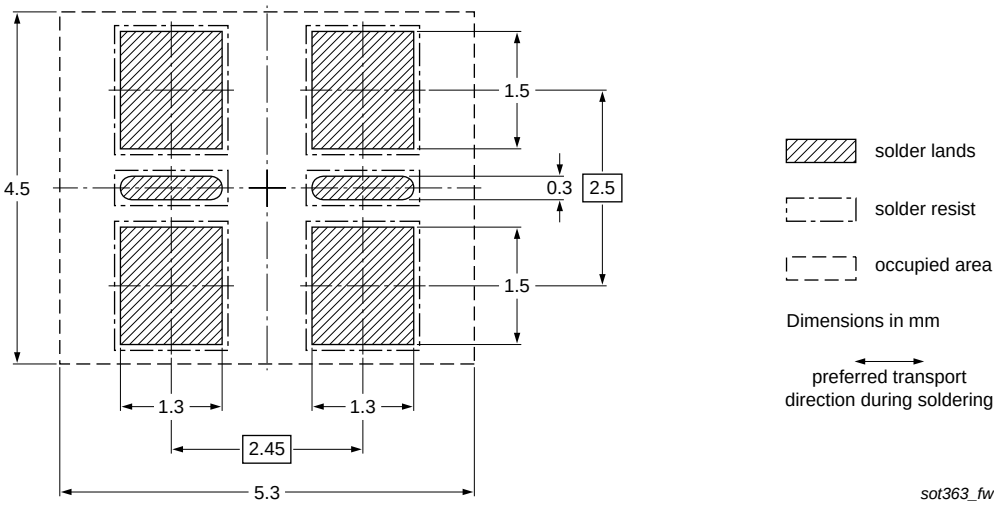


Fig 14. Wave soldering footprint PUMB13 (SOT363)

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12. Revision history

Table 10. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
PEMB13_PUMB13 v.4	20111207	Product data sheet	-	PEMB13_PUMB13 v.3
Modifications:	• 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			
PEMB13_PUMB13 v.3	20040415	Product data sheet	-	PEMB13_PUMB13 v.2
PEMB13_PUMB13 v.2	20031211	Product specification	-	PEMB13 v.1
PEMB13 v.1	20020114	Preliminary specification	-	-

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Preliminary [short] data sheet	Qualification	This document contains data from the preliminary specification.
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