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Kind regards,

Team Nexperia

# PEMH10; PUMH10

NPN/NPN resistor-equipped transistors;  
R1 = 2.2 k $\Omega$ , R2 = 47k $\Omega$

Rev. 3 — 20 December 2011

Product data sheet

## 1. Product profile

### 1.1 General description

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

Table 1. Product overview

Type number	Package		NPN/PNP complement	PNP/PNP complement	Package configuration
	NXP	JEITA			
PEMH10	SOT666	-	PEMD10	PEMB10	ultra small and flat lead
PUMH10	SOT363	SC-88	PUMD10	PUMB10	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

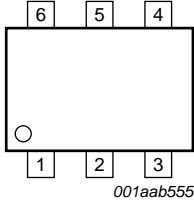
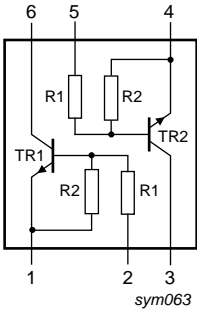
Table 2. Quick reference data

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
<b>Per transistor</b>						
V <sub>CEO</sub>	collector-emitter voltage	open base	-	-	50	V
I <sub>O</sub>	output current		-	-	100	mA
R1	bias resistor 1 (input)		1.54	2.20	2.86	k $\Omega$
R2/R1	bias resistor ratio		17	21	26	



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
PEMH10	-	plastic surface-mounted package; 6 leads	SOT666
PUMH10	SC-88	plastic surface-mounted package; 6 leads	SOT363

4. Marking

Table 5. Marking codes

Type number	Marking code <sup>[1]</sup>
PEMH10	10
PUMH10	H*0

[1] \* = placeholder for manufacturing site code.

## 5. Limiting values

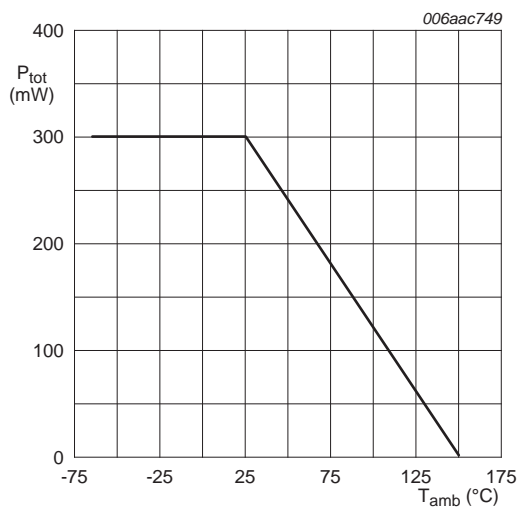
**Table 6. Limiting values**

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

Symbol	Parameter	Conditions	Min	Max	Unit	
Per transistor						
V <sub>CBO</sub>	collector-base voltage	open emitter	-	50	V	
V <sub>CEO</sub>	collector-emitter voltage	open base	-	50	V	
V <sub>EBO</sub>	emitter-base voltage	open collector	-	5	V	
V <sub>I</sub>	input voltage					
	positive		-	+12	V	
	negative		-	−5	V	
I <sub>O</sub>	output current		-	100	mA	
I <sub>CM</sub>	peak collector current		-	100	mA	
P <sub>tot</sub>	total power dissipation	T <sub>amb</sub> ≤ 25 °C	[1]			
	PEMH10 (SOT666)		[2]	-	200	mW
	PUMH10 (SOT363)		-	-	200	mW
Per device						
P <sub>tot</sub>	total power dissipation	T <sub>amb</sub> ≤ 25 °C	[1]			
	PEMH10 (SOT666)		[2]	-	300	mW
	PUMH10 (SOT363)		-	-	300	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.

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



SOT363 and SOT666; FR4 PCB, standard footprint

**Fig 1. Per device: Power derating curve**

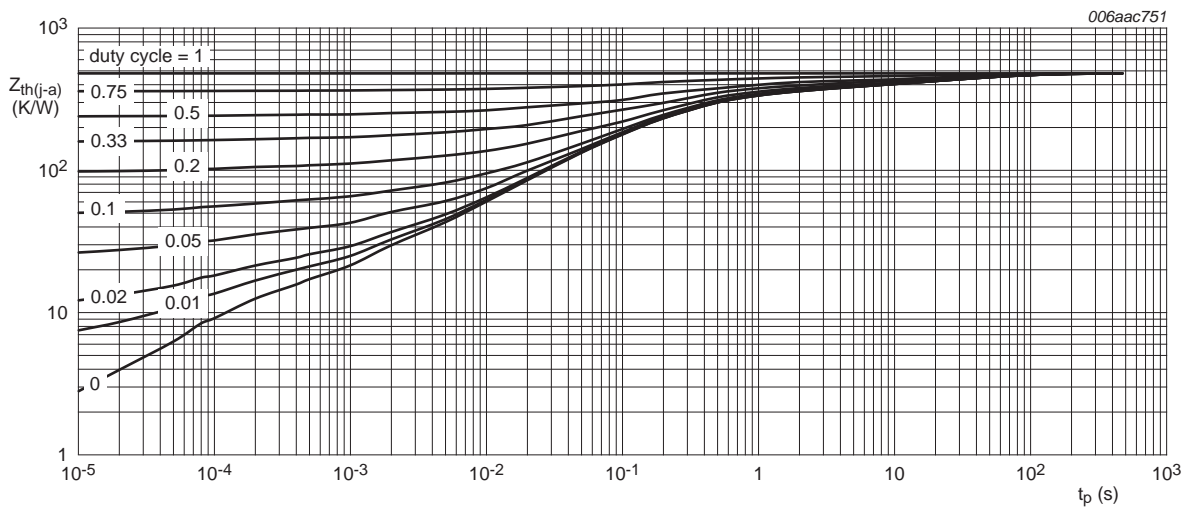
## 6. Thermal characteristics

**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	[1]			
	PEMH10 (SOT666)		[2]	-	625	K/W
	PUMH10 (SOT363)		-	-	625	K/W
<b>Per device</b>						
$R_{th(j-a)}$	thermal resistance from junction to ambient	in free air	[1]			
	PEMH10 (SOT666)		[2]	-	417	K/W
	PUMH10 (SOT363)		-	-	417	K/W

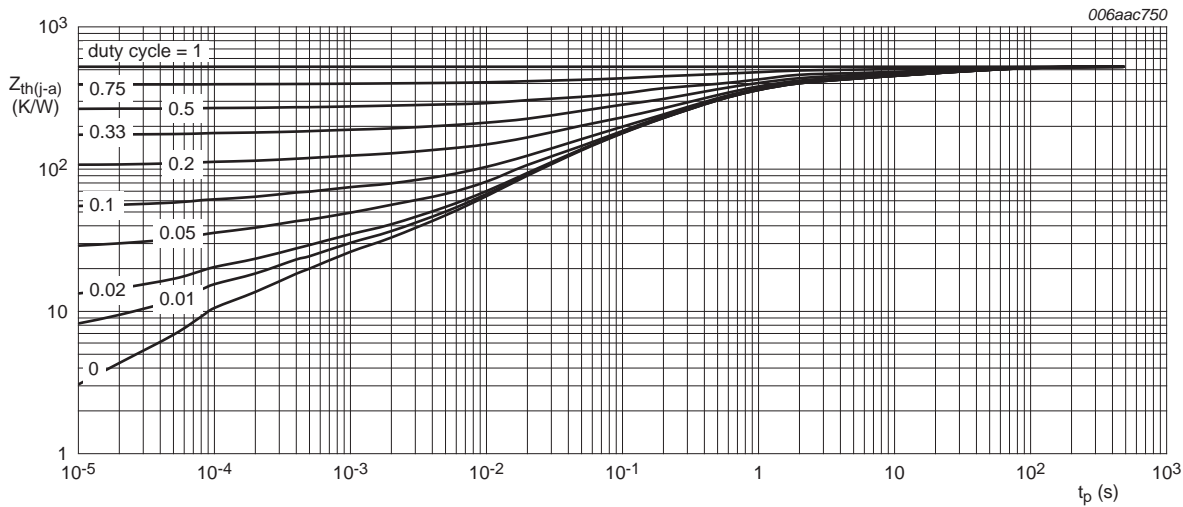
[1] Device mounted on an FR4 PCB, single-sided copper, tin-plated and standard footprint.

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



FR4 PCB, standard footprint

Fig 2. Transient thermal impedance from junction to ambient as a function of pulse duration for PEMH10 (SOT666); typical values



FR4 PCB, standard footprint

Fig 3. Transient thermal impedance from junction to ambient as a function of pulse duration for PUMH10 (SOT363); typical values

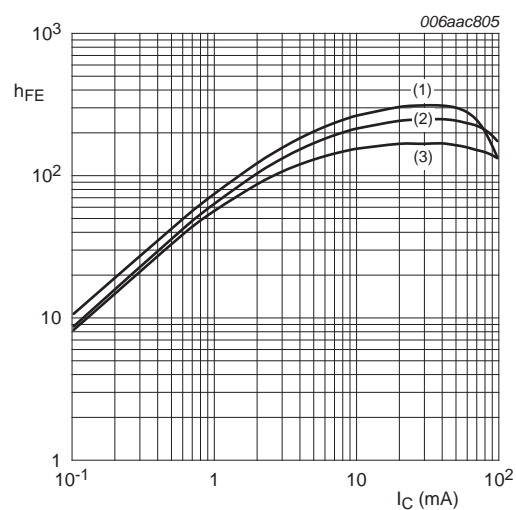
## 7. Characteristics

**Table 8. Characteristics**

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

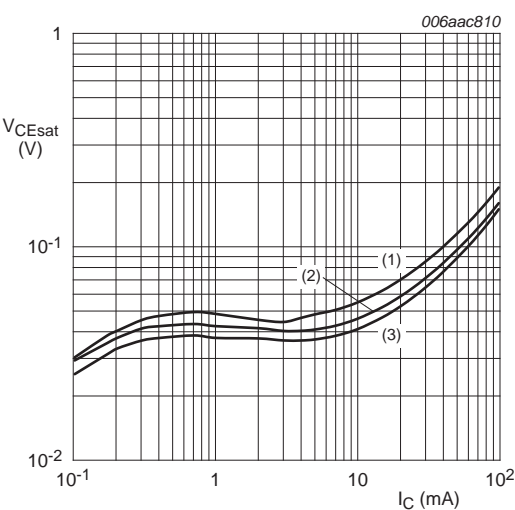
Symbol	Parameter	Conditions	Min	Typ	Max	Unit
<b>Per transistor</b>						
$I_{CBO}$	collector-base cut-off current	$V_{CB} = 50\text{ V}; I_E = 0\text{ A}$	-	-	100	nA
$I_{CEO}$	collector-emitter cut-off current	$V_{CE} = 30\text{ V}; I_B = 0\text{ A}$	-	-	100	nA
		$V_{CE} = 30\text{ V}; I_B = 0\text{ A}; T_j = 150\text{ }^{\circ}\text{C}$	-	-	5	$\mu\text{A}$
$I_{EBO}$	emitter-base cut-off current	$V_{EB} = 5\text{ V}; I_C = 0\text{ A}$	-	-	180	$\mu\text{A}$
$h_{FE}$	DC current gain	$V_{CE} = 5\text{ V}; I_C = 10\text{ mA}$	100	-	-	
$V_{CEsat}$	collector-emitter saturation voltage	$I_C = 5\text{ mA}; I_B = 0.25\text{ mA}$	-	-	100	mV
$V_{I(off)}$	off-state input voltage	$V_{CE} = 5\text{ V}; I_C = 100\text{ }\mu\text{A}$	-	0.6	0.5	V
$V_{I(on)}$	on-state input voltage	$V_{CE} = 0.3\text{ V}; I_C = 5\text{ mA}$	1.1	0.75	-	V
R1	bias resistor 1 (input)		1.54	2.20	2.86	k $\Omega$
R2/R1	bias resistor ratio		17	21	26	
$C_c$	collector capacitance	$V_{CB} = 10\text{ V}; I_E = i_e = 0\text{ A}; f = 1\text{ MHz}$	-	-	2.5	pF
$f_T$	transition frequency	$V_{CB} = 5\text{ V}; I_C = 10\text{ mA}; f = 100\text{ MHz}$	[1] -	230	-	MHz

[1] Characteristics of built-in transistor.



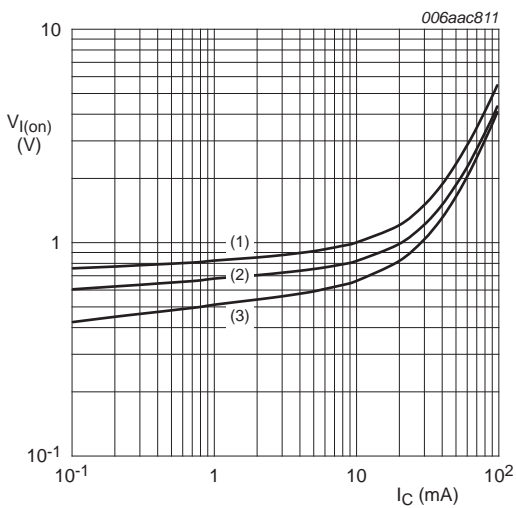
$V_{CE} = 5\text{ V}$   
(1)  $T_{amb} = 100^\circ\text{C}$   
(2)  $T_{amb} = 25^\circ\text{C}$   
(3)  $T_{amb} = -40^\circ\text{C}$

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



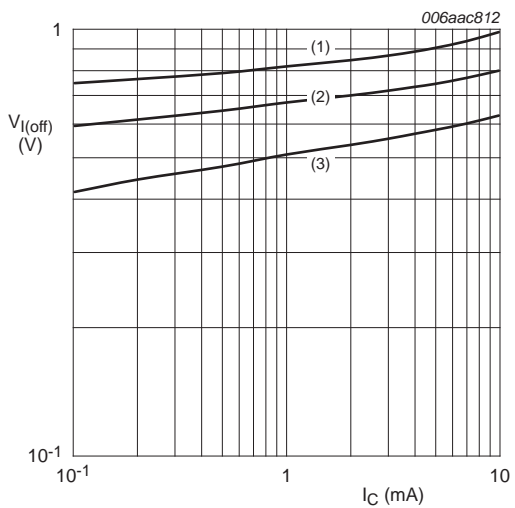
$I_C/I_B = 20$   
(1)  $T_{amb} = 100^\circ\text{C}$   
(2)  $T_{amb} = 25^\circ\text{C}$   
(3)  $T_{amb} = -40^\circ\text{C}$

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



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

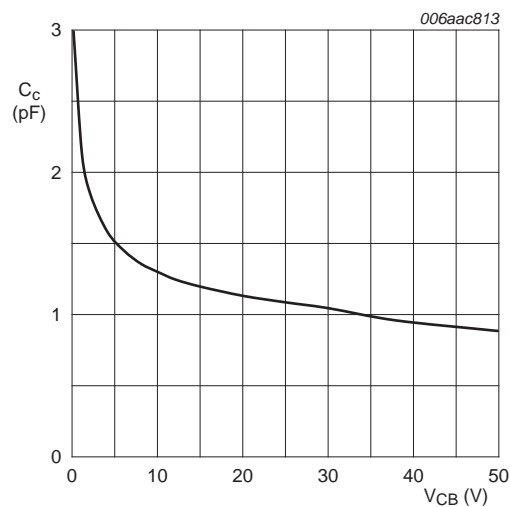
**Fig 6. On-state input voltage as a function of collector current; typical values**



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

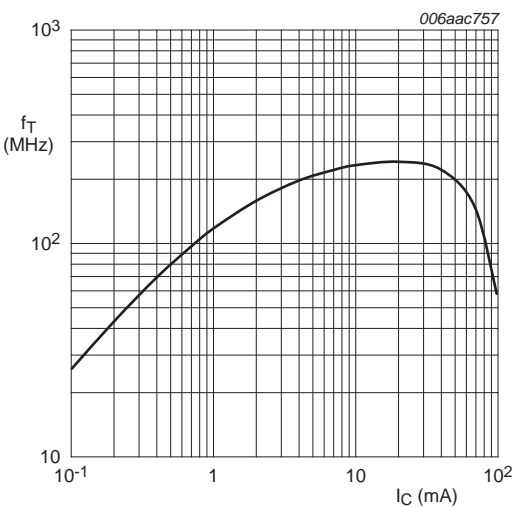
**Fig 7. Off-state input voltage as a function of collector current; typical values**





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

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



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

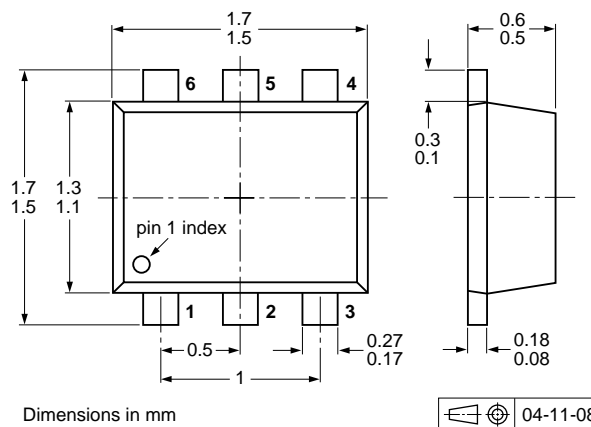
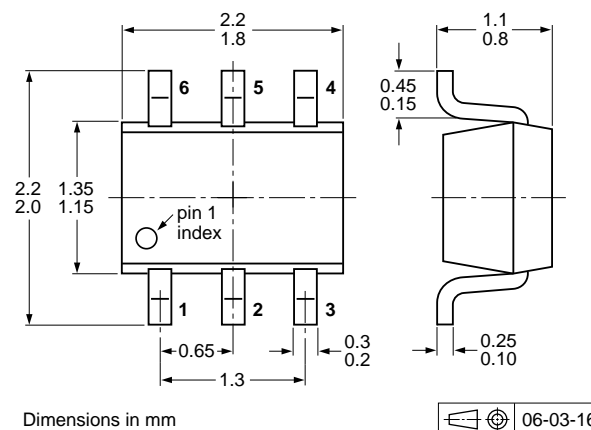
**Fig 9.** Transition frequency as a function of collector current; typical values of built-in transistor

## 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 PEMH10 (SOT666)****Fig 11. Package outline PUMH10 (SOT363/SC-88)**

10. Packing information

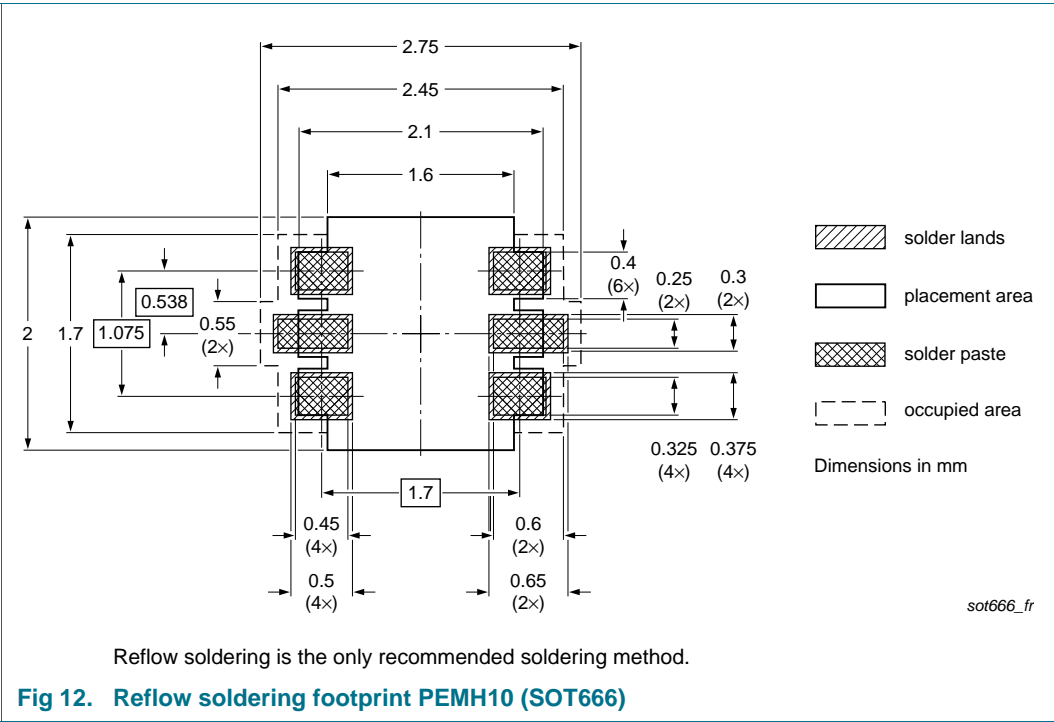
Table 9. Packing methods

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
PEMH10	SOT666	2 mm pitch, 8 mm tape and reel	-	-	-315	-
		4 mm pitch, 8 mm tape and reel	-	-115	-	-
PUMH10	SOT363	4 mm pitch, 8 mm tape and reel; T1 <sup>[2]</sup>	-115	-	-	-135
		4 mm pitch, 8 mm tape and reel; T2 <sup>[3]</sup>	-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



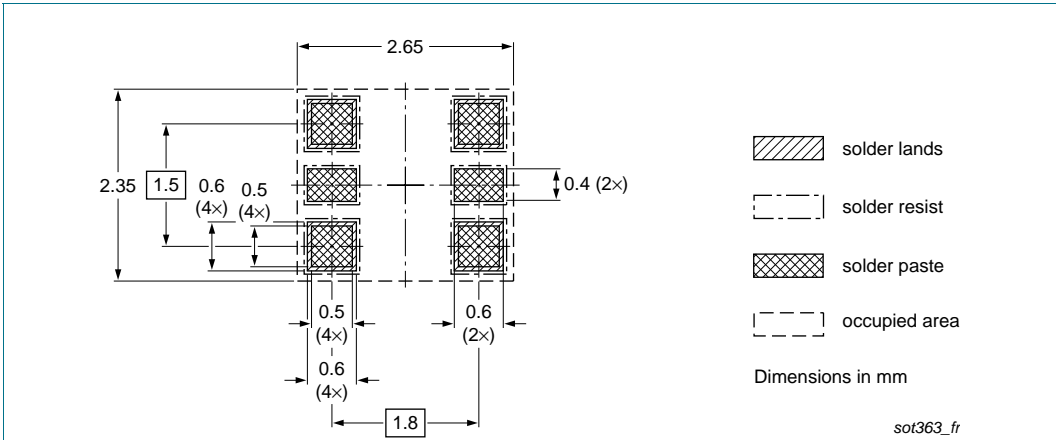


Fig 13. Reflow soldering footprint PUMH10 (SOT363/SC-88)

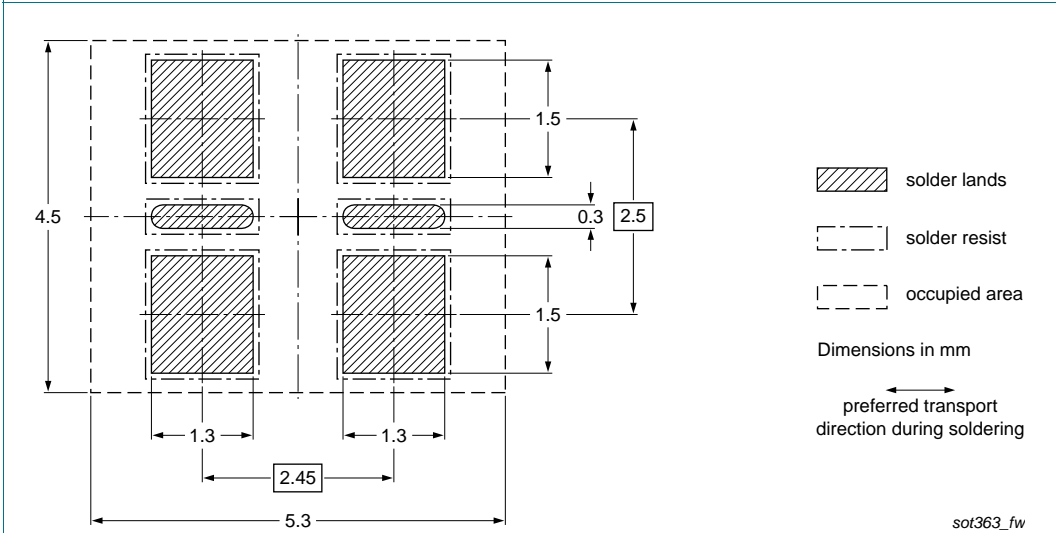


Fig 14. Wave soldering footprint PUMH10 (SOT363/SC-88)

## 12. Revision history

Table 10. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
PEMH10_ PUMH10 v.3	20111220	Product data sheet	-	PEMH10_ PUMH10 v.2
Modifications: <ul style="list-style-type: none"> <li>• The format of this document has been redesigned to comply with the new identity guidelines of NXP Semiconductors.</li> <li>• Legal texts have been adapted to the new company name where appropriate.</li> <li>• <a href="#">Section 1 "Product profile"</a>: updated</li> <li>• <a href="#">Section 4 "Marking"</a>: updated</li> <li>• <a href="#">Table 7 "Thermal characteristics"</a>: updated according to the latest measurements</li> <li>• <a href="#">Table 8 "Characteristics"</a>: I<sub>CEO</sub> updated according to the latest measurements, f<sub>T</sub> added, V<sub>i(off)</sub> redefined to V<sub>I(off)</sub> off-state input voltage, V<sub>i(on)</sub> redefined to V<sub>I(on)</sub> on-state input voltage.</li> <li>• <a href="#">Figure 1</a> to <a href="#">9</a>: added</li> <li>• <a href="#">Section 8 "Test information"</a>: added</li> <li>• <a href="#">Figure 10</a> and <a href="#">11</a>: replaced by minimized package outline drawings</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>				
PEMH10_ PUMH10 v.2	20031020	Product data sheet	-	PEMH10 v.1 PUMH10 v.1
PEMH10 v.1	20011022	Preliminary specification	-	-
PUMH10 v.1	20000801	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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