

PEMH2; PUMH2

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

Rev. 5 — 5 December 2011

Product data sheet

1. Product profile

1.1 General description

NPN/NPN double 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			
PEMH2	SOT666	-	PEMD12	PEMB2	ultra small and flat lead
PUMH2	SOT363	SC-88	PUMD12	PUMB2	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

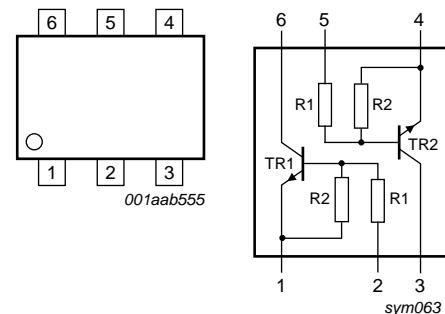
Symbol	Parameter	Conditions	Min	Typ	Max	Unit
Per transistor						
V_{CEO}	collector-emitter voltage	open base	-	-	50	V
I_o	output current		-	-	100	mA
R1	bias resistor 1 (input)		33	47	61	$\text{k}\Omega$
R2/R1	bias resistor ratio		0.8	1	1.2	



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		Version
	Name	Description	
PEMH2	-	plastic surface-mounted package; 6 leads	SOT666
PUMH2	SC-88	plastic surface-mounted package; 6 leads	SOT363

4. Marking

Table 5. Marking codes

Type number	Marking code ^[1]
PEMH2	Z2
PUMH2	2*H

[1] * = placeholder for manufacturing site code

5. Limiting values

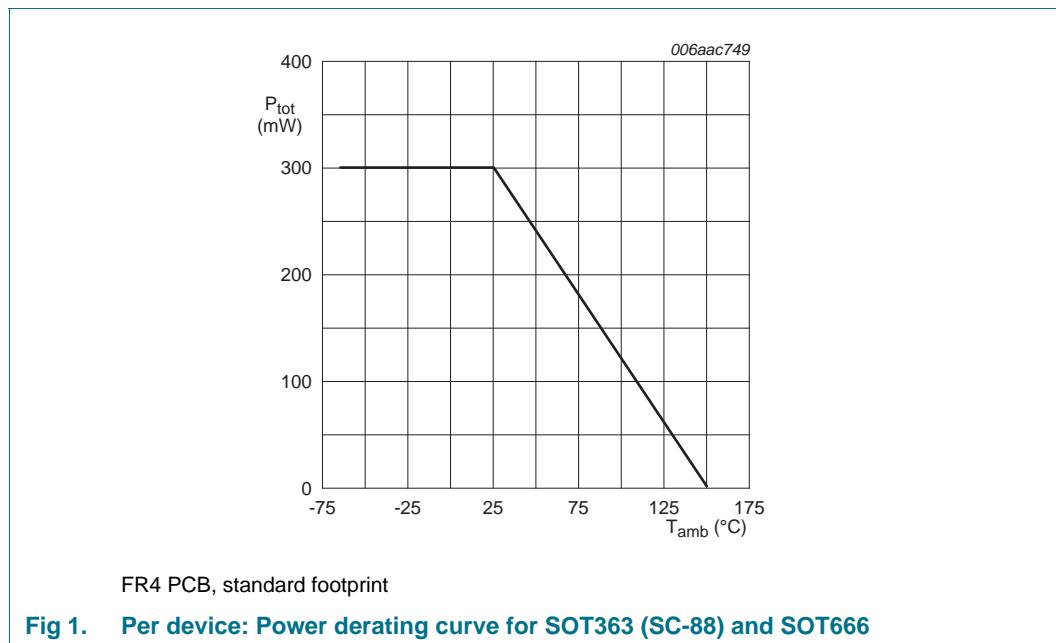
Table 6. Limiting values

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

Symbol	Parameter	Conditions	Min	Max	Unit
Per transistor					
V _{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		-	+40	V
	negative		-	-10	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			
	PEMH2 (SOT666)		[1][2]	-	mW
	PUMH2 (SOT363)		[1]	-	mW
Per device					
P _{tot}	total power dissipation	T _{amb} ≤ 25 °C			
	PEMH2 (SOT666)		[1][2]	-	mW
	PUMH2 (SOT363)		[1]	-	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.



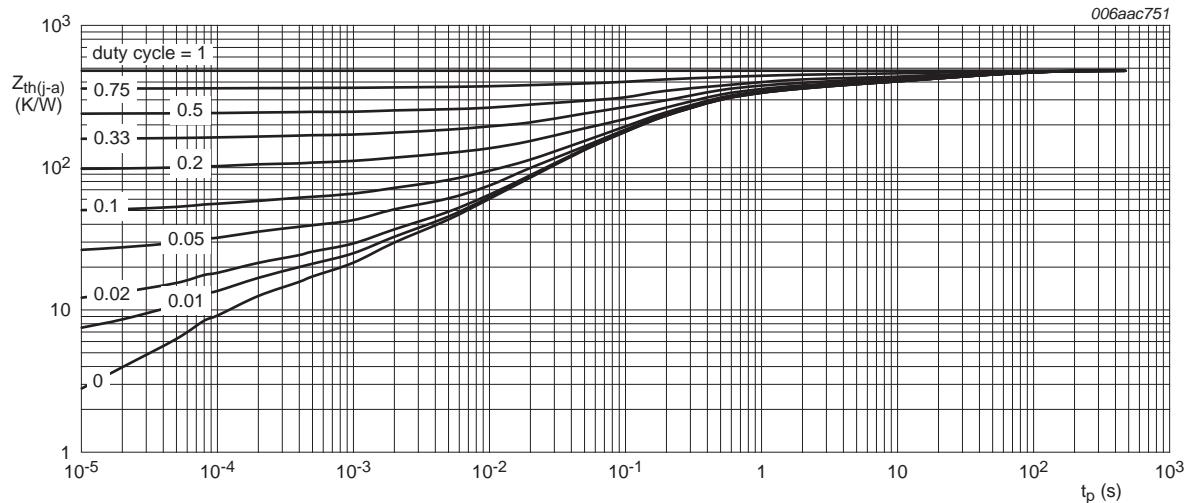
6. Thermal characteristics

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				
	PEMH2 (SOT666)		[1][2]	-	-	625 K/W
	PUMH2 (SOT363)		[1]	-	-	625 K/W
Per device						
$R_{th(j-a)}$	thermal resistance from junction to ambient	in free air				
	PEMH2 (SOT666)		[1][2]	-	-	417 K/W
	PUMH2 (SOT363)		[1]	-	-	417 K/W

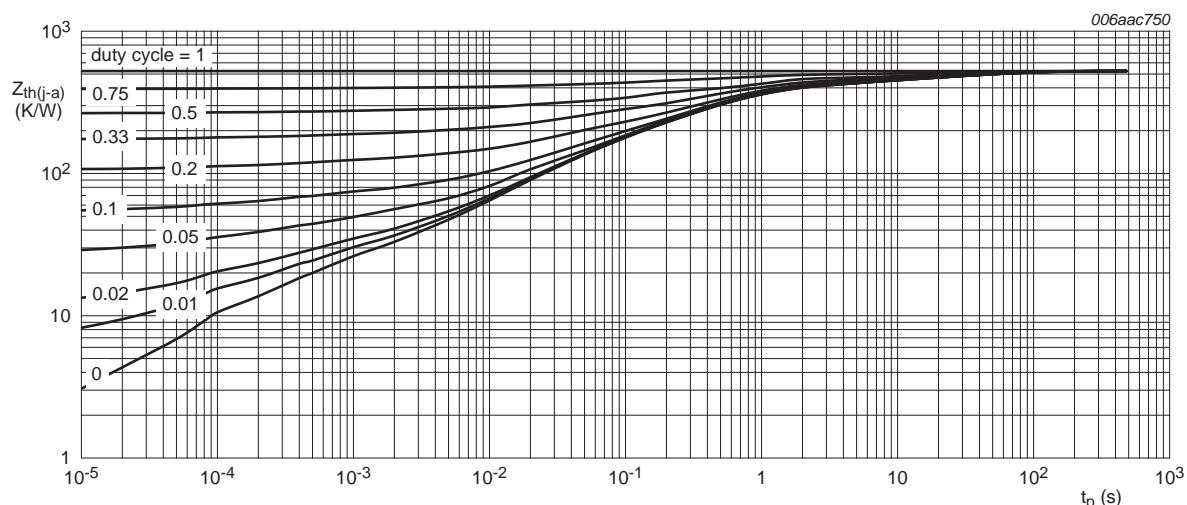
[1] Device mounted on an FR4 PCB, single-sided copper, tin-plated and standard footprint.

[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 PEMH2 (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 PUMH2 (SOT363); typical values

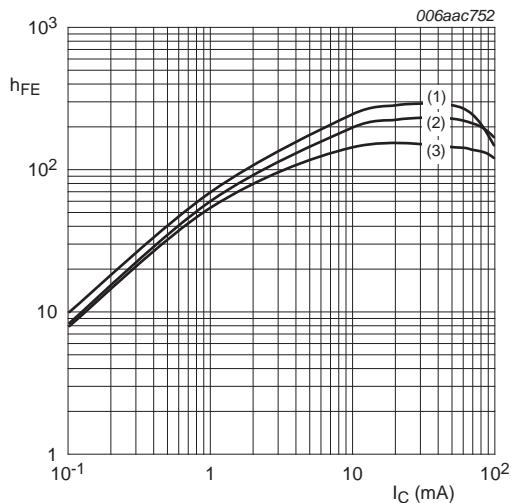
7. Characteristics

Table 8. Characteristics

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

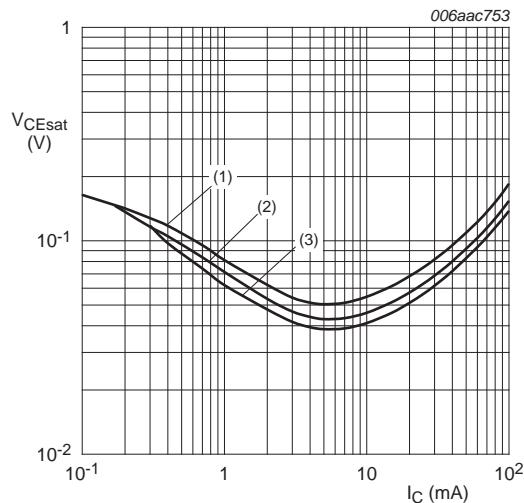
Symbol	Parameter	Conditions	Min	Typ	Max	Unit
Per transistor						
I_{CBO}	collector-base cut-off current	$V_{CB} = 50\text{ V}; I_E = 0\text{ A}$	-	-	100	nA
I_{CEO}	collector-emitter cut-off current	$V_{CE} = 30\text{ V}; I_B = 0\text{ A}$	-	-	1	μA
		$V_{CE} = 30\text{ V}; I_B = 0\text{ A}; T_j = 150^\circ\text{C}$	-	-	5	μA
I_{EBO}	emitter-base cut-off current	$V_{EB} = 5\text{ V}; I_C = 0\text{ A}$	-	-	90	μA
h_{FE}	DC current gain	$V_{CE} = 5\text{ V}; I_C = 5\text{ mA}$	80	-	-	
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	$V_{CE} = 5\text{ V}; I_C = 100\text{ μA}$	-	1.2	0.8	V
$V_{I(on)}$	on-state input voltage	$V_{CE} = 0.3\text{ V}; I_C = 2\text{ mA}$	3	1.6	-	V
$R1$	bias resistor 1 (input)		33	47	61	kΩ
$R2/R1$	bias resistor ratio		0.8	1	1.2	
C_c	collector capacitance	$V_{CB} = 10\text{ V}; I_E = i_e = 0\text{ A}; f = 1\text{ MHz}$			2.5	pF
f_T	transition frequency	$V_{CE} = 5\text{ V}; I_C = 10\text{ mA}; [1] f = 100\text{ MHz}$			230	MHz

[1] Characteristics of built-in transistor



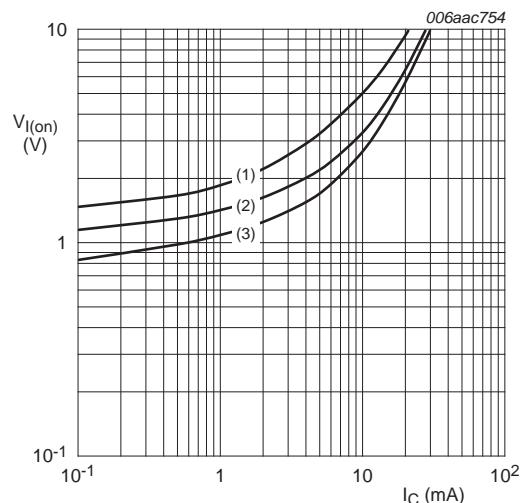
$V_{CE} = 5 \text{ V}$
 (1) $T_{amb} = 100 \text{ }^{\circ}\text{C}$
 (2) $T_{amb} = 25 \text{ }^{\circ}\text{C}$
 (3) $T_{amb} = -40 \text{ }^{\circ}\text{C}$

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



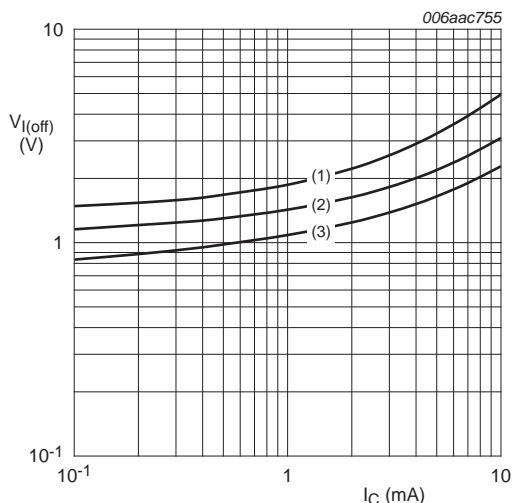
$I_C/I_B = 20$
 (1) $T_{amb} = 100 \text{ }^{\circ}\text{C}$
 (2) $T_{amb} = 25 \text{ }^{\circ}\text{C}$
 (3) $T_{amb} = -40 \text{ }^{\circ}\text{C}$

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



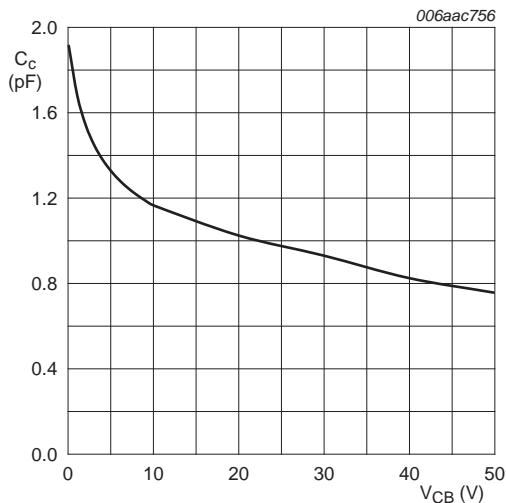
$V_{CE} = 0.3 \text{ V}$
 (1) $T_{amb} = -40 \text{ }^{\circ}\text{C}$
 (2) $T_{amb} = 25 \text{ }^{\circ}\text{C}$
 (3) $T_{amb} = 100 \text{ }^{\circ}\text{C}$

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



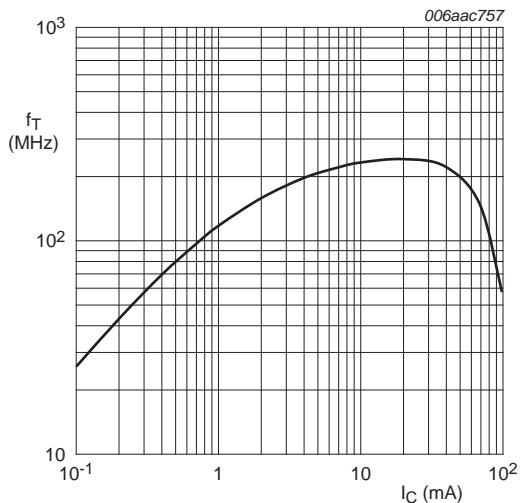
$V_{CE} = 5 \text{ V}$
 (1) $T_{amb} = -40 \text{ }^{\circ}\text{C}$
 (2) $T_{amb} = 25 \text{ }^{\circ}\text{C}$
 (3) $T_{amb} = 100 \text{ }^{\circ}\text{C}$

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



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

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

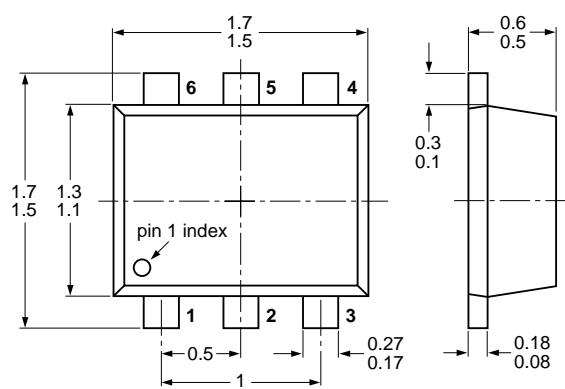


Fig 10. Package outline PEMH2 (SOT666)

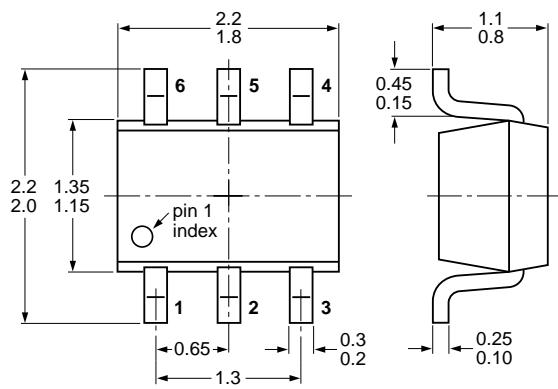


Fig 11. Package outline PUMH2 (SOT363)

10. Packing information

Table 9. Packing methods

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

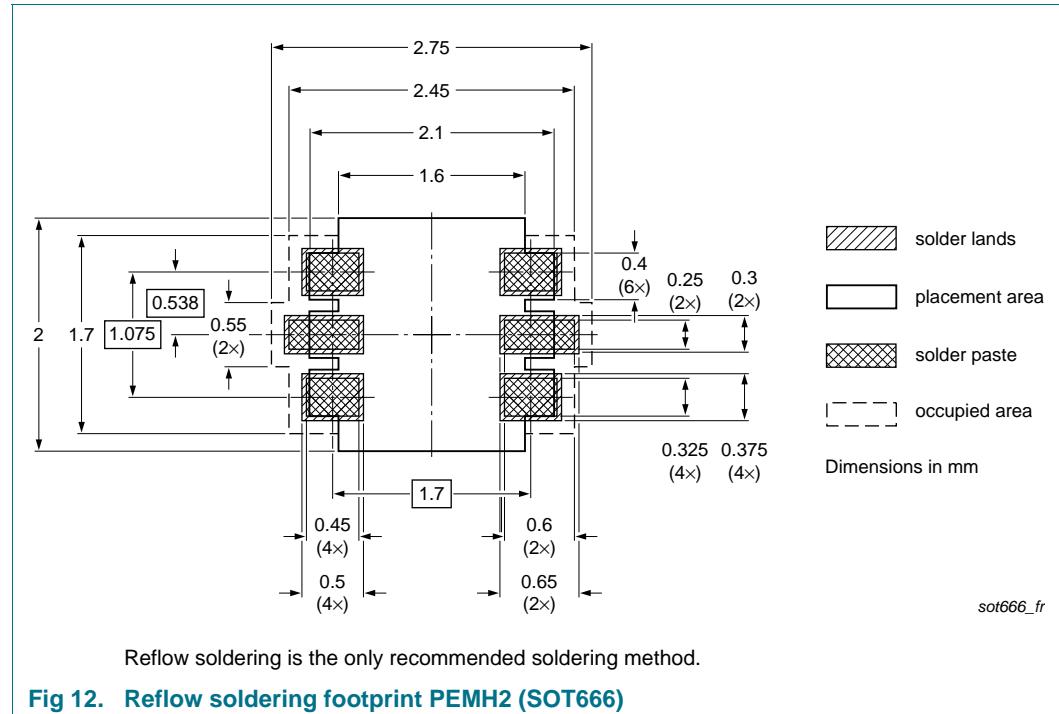
Type number	Package	Description	Packing quantity			
			3000	4000	8000	10000
PEMH2	SOT666	2 mm pitch, 8 mm tape and reel	-	-	-315	-
		4 mm pitch, 8 mm tape and reel	-	-115	-	-
PUMH2	SOT363	4 mm pitch, 8 mm tape and reel; T1	[2]	-115	-	-135
		4 mm pitch, 8 mm tape and reel; T2	[3]	-125	-	-165

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

[2] T1: normal taping

[3] T2: reverse taping

11. Soldering



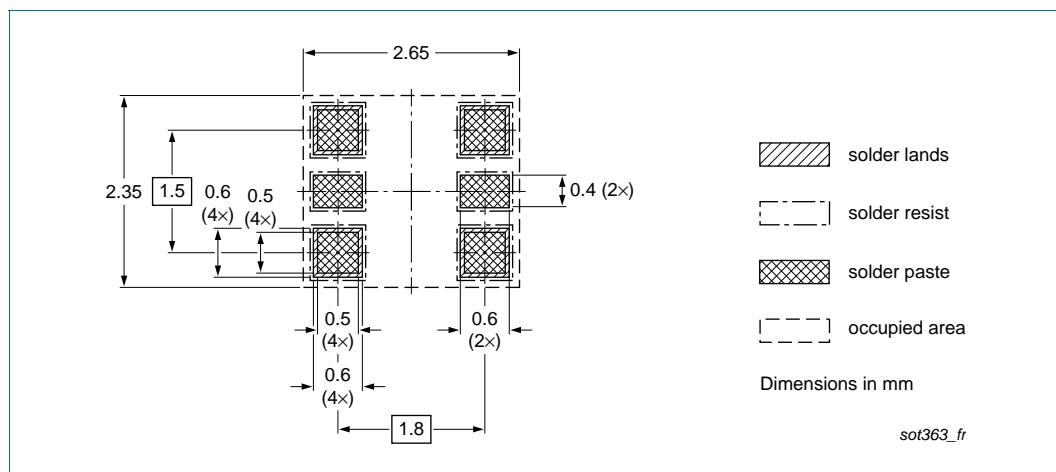


Fig 13. Reflow soldering footprint PUMH2 (SOT363)

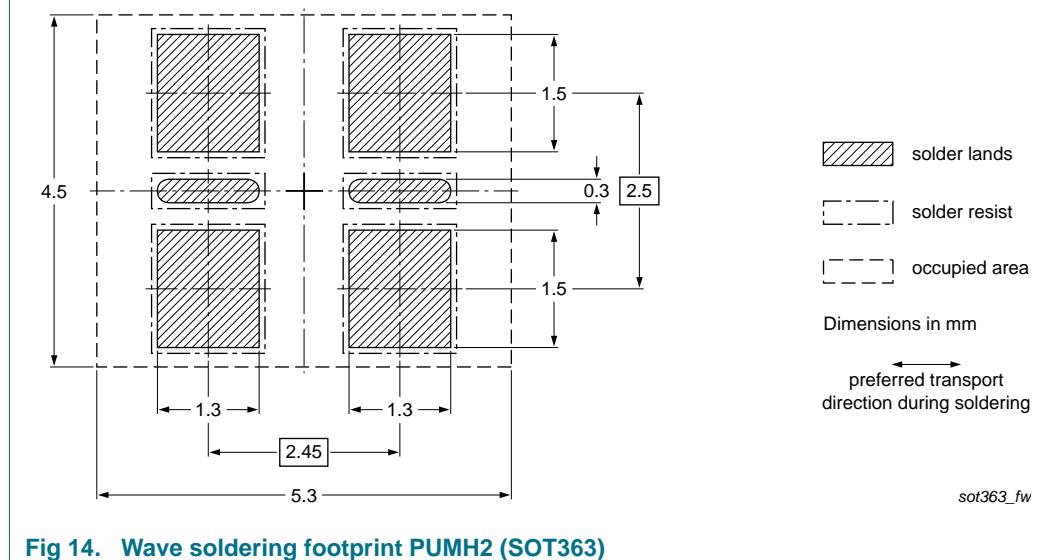


Fig 14. Wave soldering footprint PUMH2 (SOT363)

12. Revision history

Table 10. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
PEMH2_PUMH2 v.5	20111205	Product data sheet	-	PEMH2_PUMH2 v.4
Modifications:		• Table 1 “Product overview” : corrected		
PEMH2_PUMH2 v.4	20111116	Product data sheet	-	PEMH2_PUMH2 v.3
PEMH2_PUMH2 v.3	20040414	Product data sheet	-	PEMH2_PUMH2 v.2
PEMH2_PUMH2 v.2	20031002	Product specification	-	PEMH2 v.1 PUMH2 v.1
PEMH2 v.1	20011022	Preliminary specification	-	-
PUMH2 v.1	19990803	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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Date of release: 5 December 2011

Document identifier: PEMH2_PUMH2

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