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Kind regards,

Team Nexperia

PEMH9; PIMH9; PUMH9

NPN/NPN resistor-equipped transistors; R1 = 10 kΩ, R2 = 47 kΩ

Rev. 5 — 12 November 2013 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		PNP/PNP complement	NPN/PNP complement	Package configuration
	NXP	JEITA			
PEMH9	SOT666	-	PEMB9	PEMD9	ultra small and flat lead
PIMH9	SOT457	SC-74	-	-	small
PUMH9	SOT363	SC-88	PUMB9	PUMD9	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

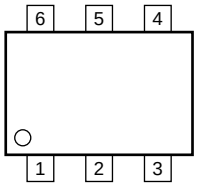
Table 2. Quick reference data

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)		7	10	13	kΩ
R2/R1	bias resistor ratio		3.7	4.7	5.7	

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		



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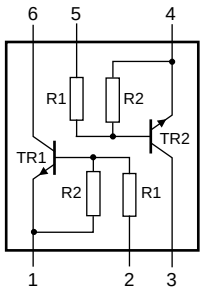

sym063

3. Ordering information

Table 4. Ordering information

Type number	Package		
	Name	Description	Version
PEMH9	-	plastic surface-mounted package; 6 leads	SOT666
PIMH9	SC-74	plastic surface-mounted package (TSOP6); 6 leads	SOT457
PUMH9	SC-88	plastic surface-mounted package; 6 leads	SOT363

4. Marking

Table 5. Marking codes

Type number	Marking code[1]
PEMH9	H9
PIMH9	H9
PUMH9	H*9

[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		-	6	V
V_I	input voltage					
	positive			-	+40	V
	negative			-	–6	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				
	PEMH9 (SOT666)		[1]	-	200	mW
	PIMH9 (SOT457)		[1]		250	mW
	PUMH9 (SOT363)		[1]	-	200	mW
Per device						
P_{tot}	total power dissipation	$T_{amb} \leq 25$ °C				
	PEMH9 (SOT666)		[1]	-	300	mW
	PIMH9 (SOT457)		[1]		400	mW
	PUMH9 (SOT363)		[1]	-	300	mW
T_j	junction temperature			-	150	°C
T_{amb}	ambient temperature			–55	+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.

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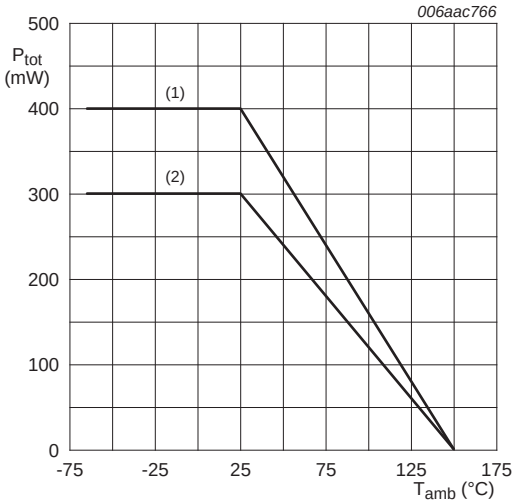

(1) SOT457; FR4 PCB, standard footprint

(2) SOT363 and SOT666; FR4 PCB, standard footprint

Fig 1. Per device: Power derating curves

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				
	PEMH9 (SOT666)	[1]	-	-	625	K/W
	PIMH9 (SOT457)	[1]	-	-	500	K/W
	PUMH9 (SOT363)	[1]	-	-	625	K/W
Per device						
$R_{th(j-a)}$	thermal resistance from junction to ambient	in free air				
	PEMH9 (SOT666)	[1]	-	-	417	K/W
	PIMH9 (SOT457)	[1]	-	-	313	K/W
	PUMH9 (SOT363)	[1]	-	-	417	K/W

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

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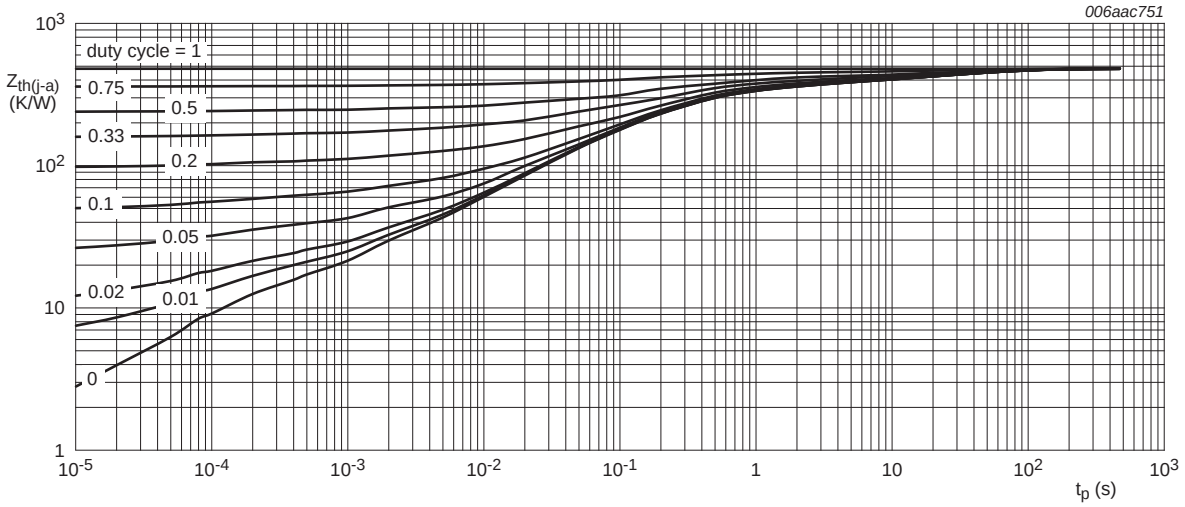
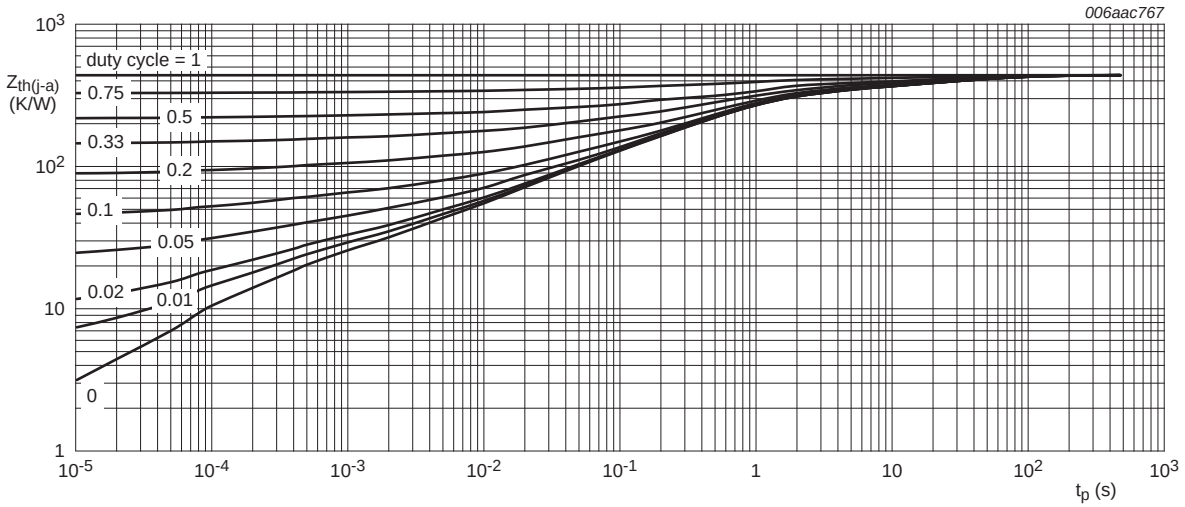


FR4 PCB, standard footprint

Fig 2. Per transistor: Transient thermal impedance from junction to ambient as a function of pulse duration for PEMH9 (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 PIMH9 (SOT457); typical values

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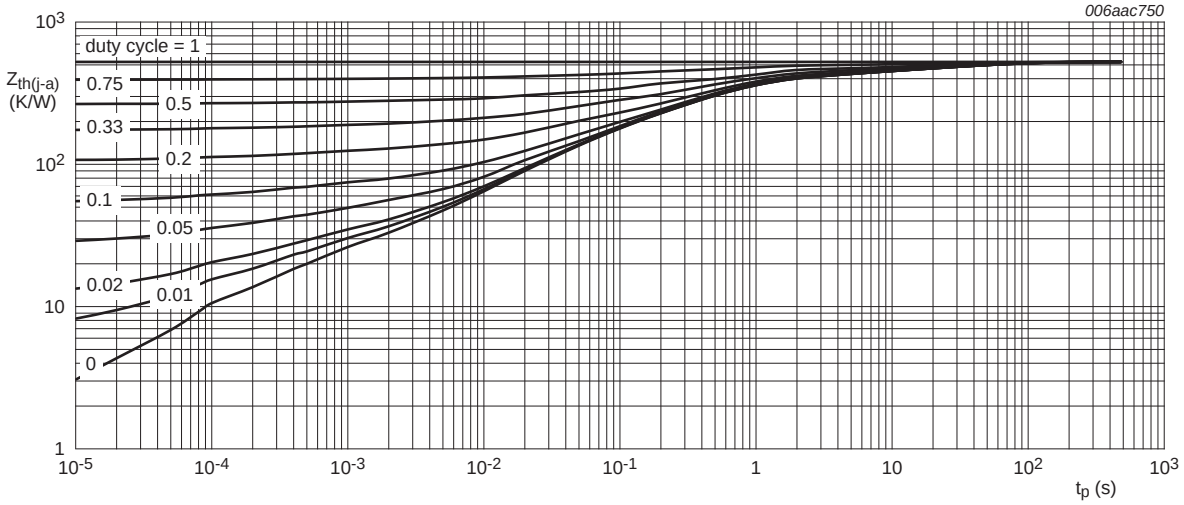

FR4 PCB, standard footprint

Fig 4. Per transistor: Transient thermal impedance from junction to ambient as a function of pulse duration for PUMH9 (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	-	-	100	nA
		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	-	-	150	μA
h_{FE}	DC current gain	V_{CE} = 5 V; I_C = 5 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	-	0.7	0.5	V
$V_{I(on)}$	on-state input voltage	V_{CE} = 0.3 V; I_C = 1 mA	1.4	0.8	-	V
R1	bias resistor 1 (input)		7	10	13	kΩ
R2/R1	bias resistor ratio		3.7	4.7	5.7	
C_c	collector capacitance	V_{CB} = 10 V; I_E = i_e = 0 A; f = 1 MHz	-	-	2.5	pF
f_T	transition frequency	V_{CE} = 5 V; I_C = 10 mA; f = 100 MHz [1]	-	230	-	MHz

[1] Characteristics of built-in transistor

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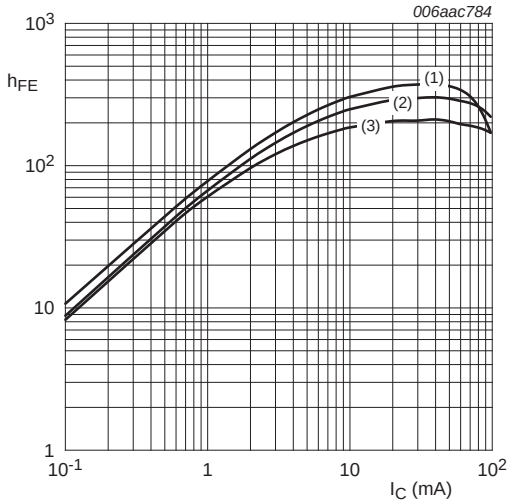


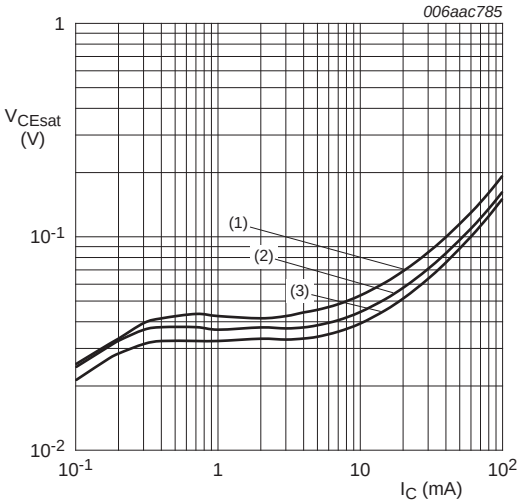
V_{CE} = 5 V

(1) T_{amb} = 100 °C

(2) T_{amb} = 25 °C

(3) T_{amb} = −40 °C

Fig 5. DC current gain as a function of collector current; typical values



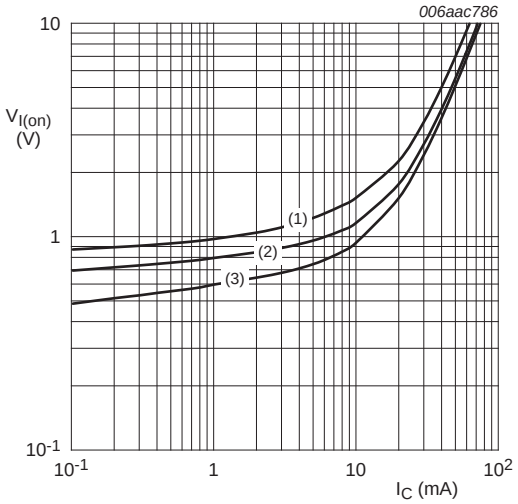
I_C/I_B = 20

(1) T_{amb} = 100 °C

(2) T_{amb} = 25 °C

(3) T_{amb} = −40 °C

Fig 6. Collector-emitter saturation voltage as a function of collector current; typical values



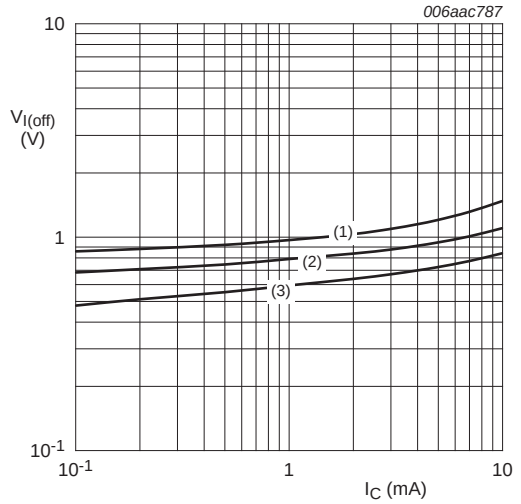
V_{CE} = 0.3 V

(1) T_{amb} = −40 °C

(2) T_{amb} = 25 °C

(3) T_{amb} = 100 °C

Fig 7. 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 8. Off-state input voltage as a function of collector current; typical values

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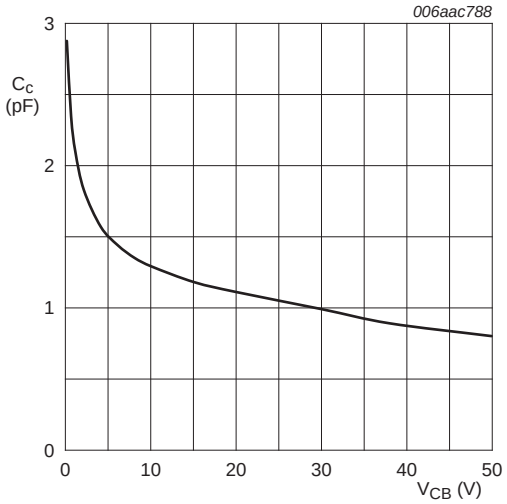
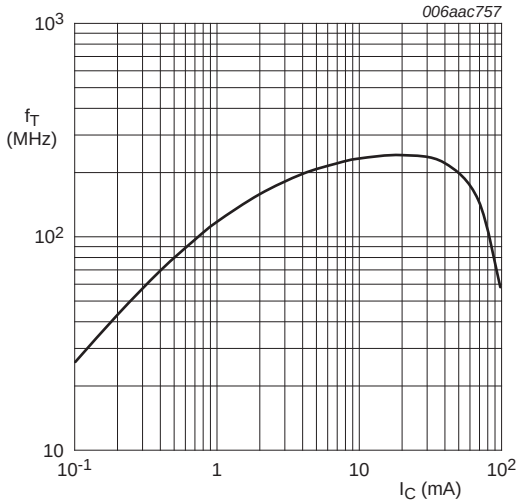


f = 1 MHz; T_{amb} = 25 °C

Fig 9. Collector capacitance as a function of collector-base voltage; typical values



V_{CE} = 5 V; T_{amb} = 25 °C

Fig 10. 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.

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9. Package outline

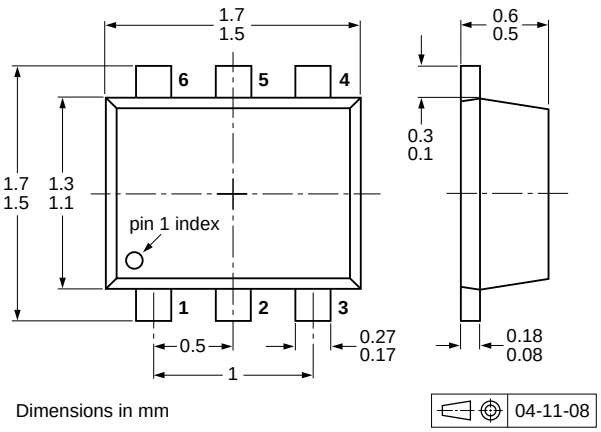

Fig 11. Package outline PEMH9 (SOT666)

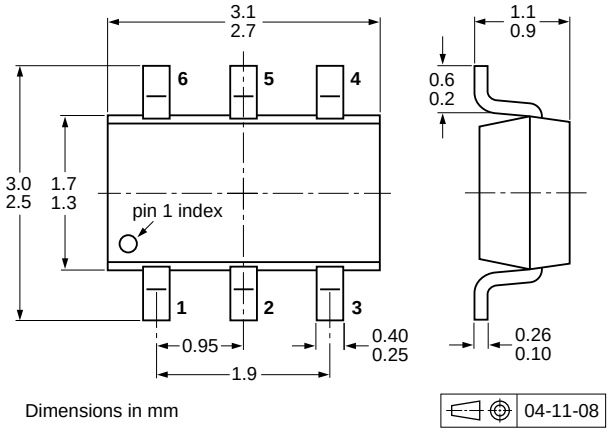

Fig 12. Package outline PIMH9 (SOT457)

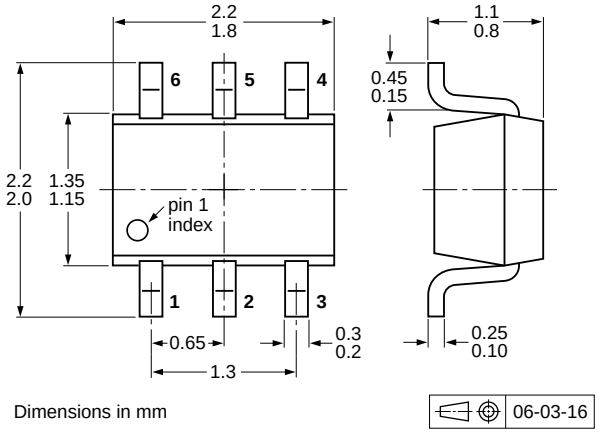

Fig 13. Package outline PUMH9 (SOT363)

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10. Soldering

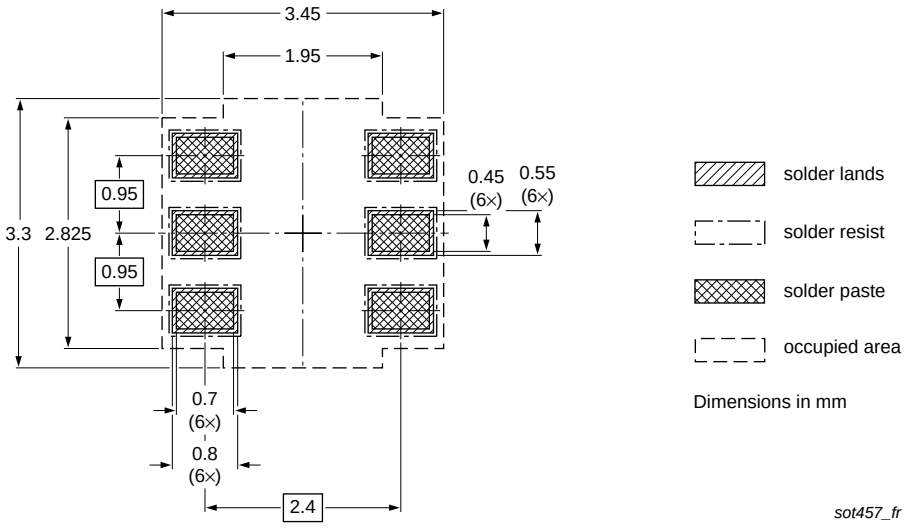

Fig 14. Reflow soldering footprint PIMH9 (SOT457)

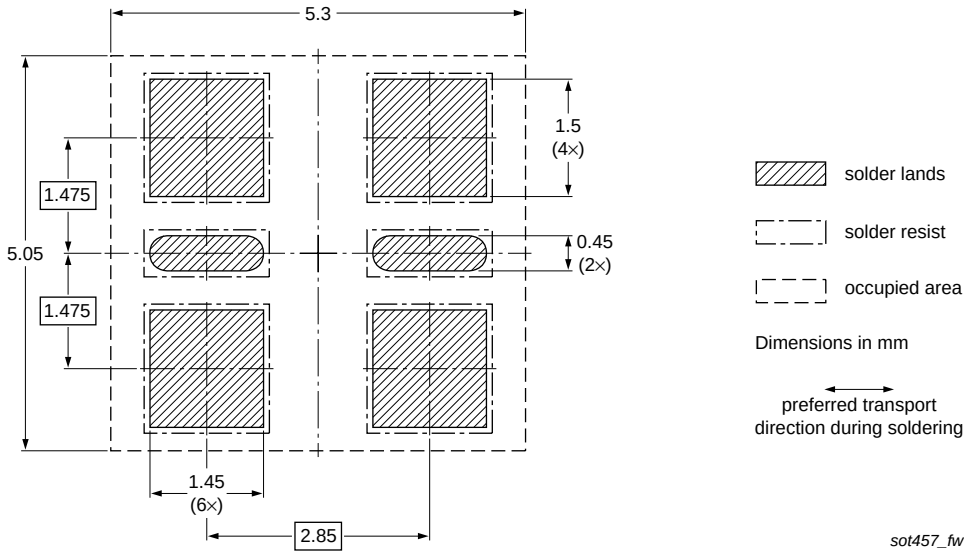

Fig 15. Wave soldering footprint PIMH9 (SOT457)

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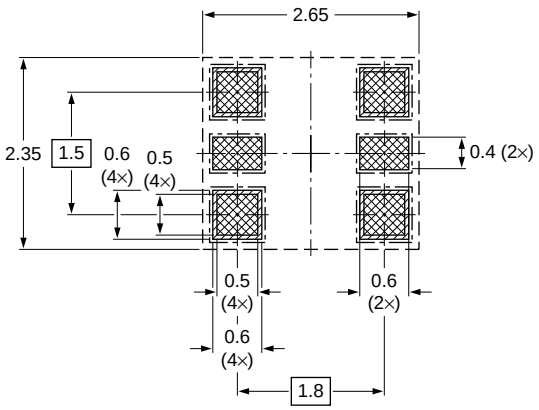

Fig 16. Reflow soldering footprint PUMH9 (SOT363)

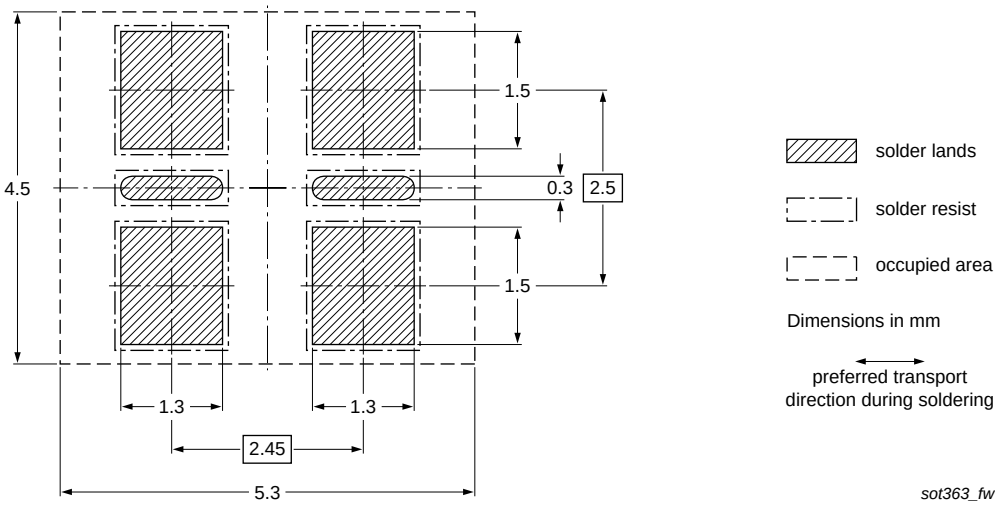

Fig 17. Wave soldering footprint PUMH9 (SOT363)

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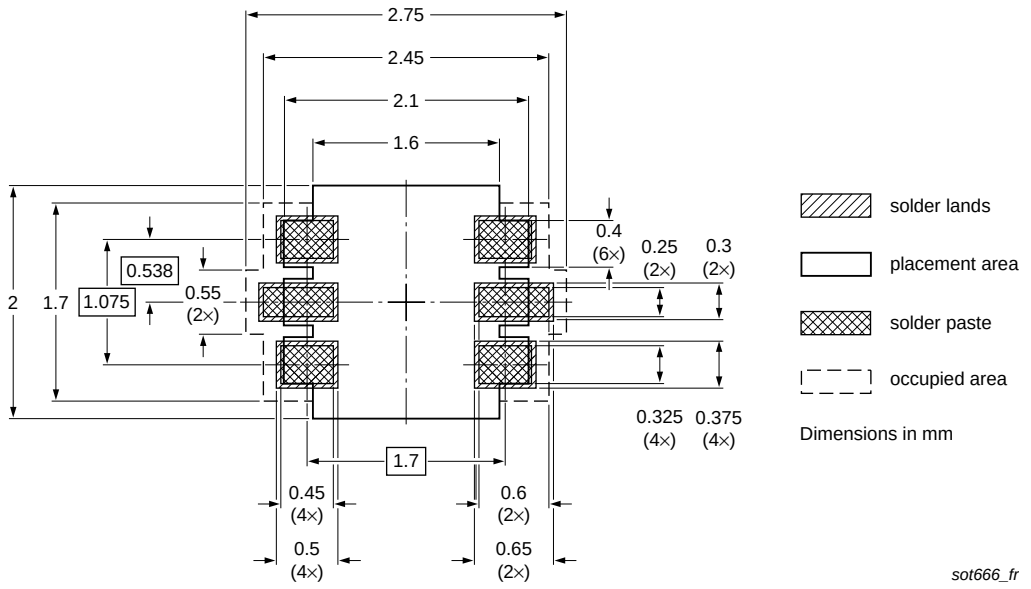

Fig 18. Reflow soldering footprint PEMH9 (SOT666)

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11. Revision history

Table 9. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
PEMH9_PIMH9_PUMH9 v.5	20131112	Product data sheet	-	PIMH9_PUMH9_PEMH9 v.4
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 10: 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 “Soldering”: added • Section 12 “Legal information”: updated			
PIMH9_PUMH9_PEMH9 v.4	20040414	Product data sheet	-	PIMH9_PUMH9_PEMH9 v.3
PIMH9_PUMH9_PEMH9 v.3	20030915	Product specification		-

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12. Legal information

12.1 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".

[3] The product status of device(s) described in this document may have changed since this document was published and may differ in case of multiple devices. The latest product status information is available on the Internet at URL http://www.nxp.com.

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13. Contact information

For more information, please visit: **http://www.nxp.com**

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