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Kind regards,

Team Nexperia

# PEMH9; PIMH9; PUMH9

NPN/NPN resistor-equipped transistors;  
R1 = 10 k $\Omega$ , R2 = 47 k $\Omega$

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

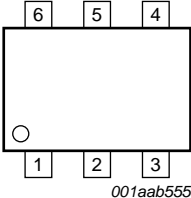
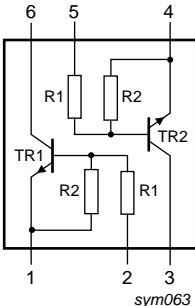
Table 2. Quick reference data

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
<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)		7	10	13	k $\Omega$
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		

## 3. Ordering information

Table 4. Ordering information

Type number	Package		Version
	Name	Description	
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 <sup>[1]</sup>
PEMH9	H9
PIMH9	H9
PUMH9	H*9

[1] \* = placeholder for manufacturing site code

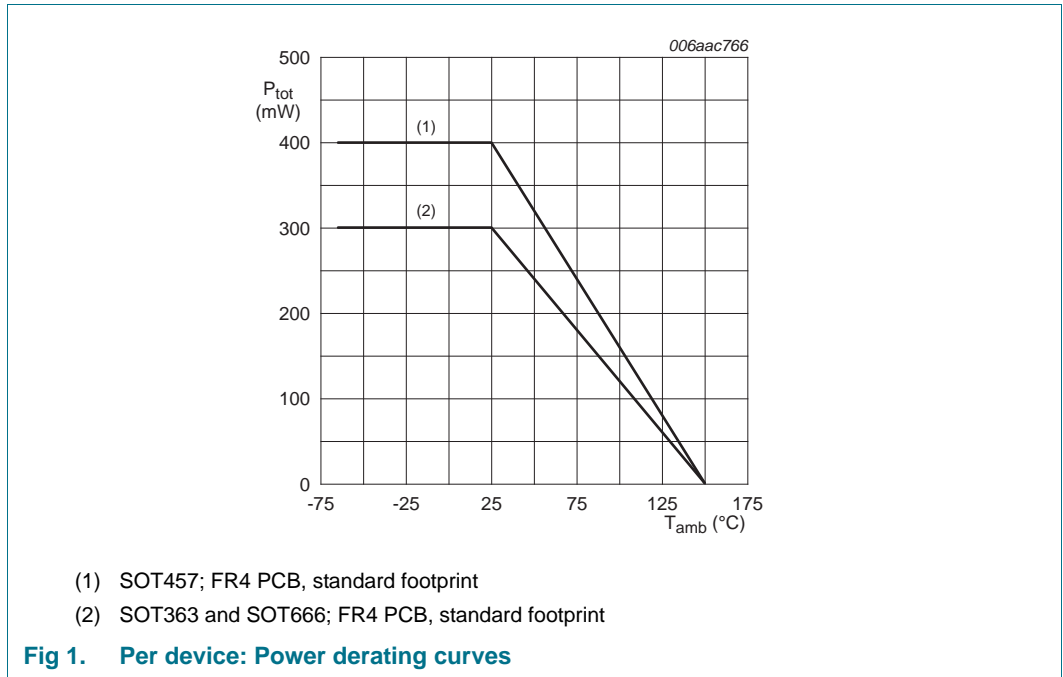
## 5. Limiting values

**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 <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	-	6	V		
V <sub>I</sub>	input voltage	positive	-	+40	V		
		negative	-	-6	V		
I <sub>O</sub>	output current		-	100	mA		
I <sub>CM</sub>	peak collector current	single pulse; t <sub>p</sub> ≤ 1 ms	-	100	mA		
P <sub>tot</sub>	total power dissipation	T <sub>amb</sub> ≤ 25 °C					
			PEMH9 (SOT666)	[1]	-	200	mW
			PIMH9 (SOT457)	[1]		250	mW
			PUMH9 (SOT363)	[1]	-	200	mW
<b>Per device</b>							
P <sub>tot</sub>	total power dissipation	T <sub>amb</sub> ≤ 25 °C					
			PEMH9 (SOT666)	[1]	-	300	mW
			PIMH9 (SOT457)	[1]		400	mW
			PUMH9 (SOT363)	[1]	-	300	mW
T <sub>j</sub>	junction temperature		-	150	°C		
T <sub>amb</sub>	ambient temperature		-55	+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.

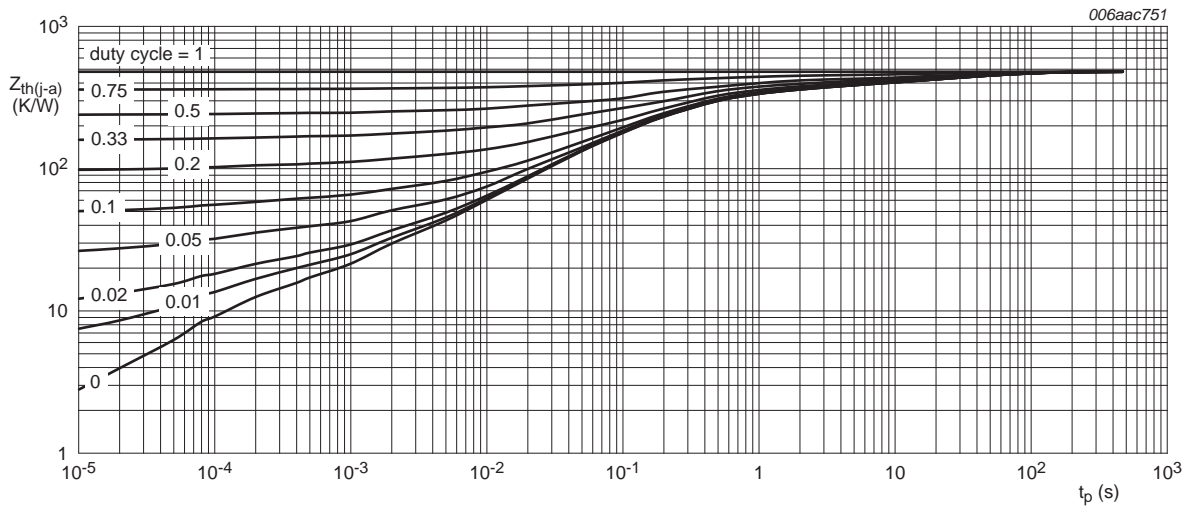


6. Thermal characteristics

Table 7. Thermal characteristics

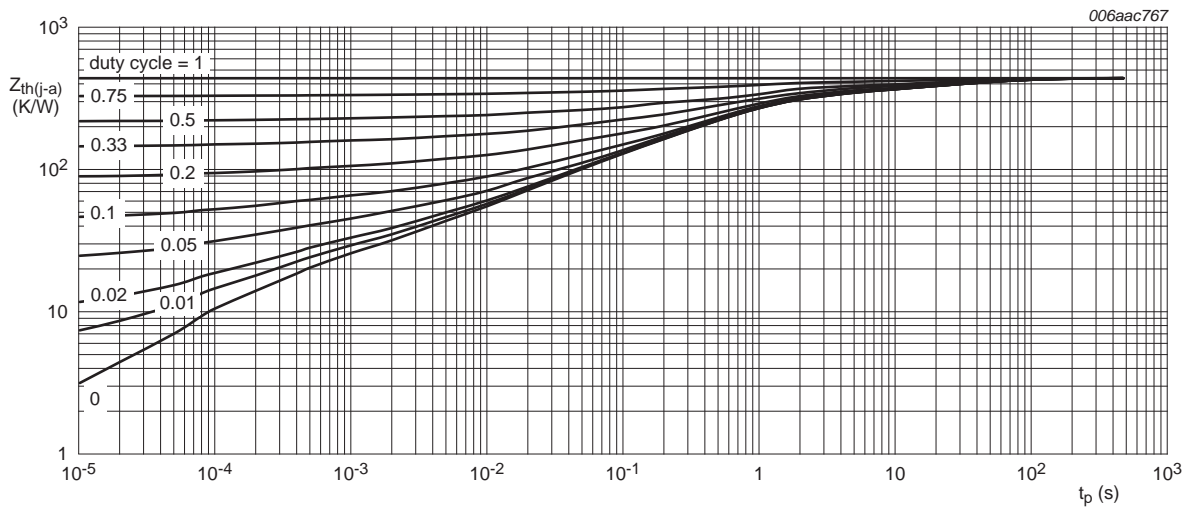
Symbol	Parameter	Conditions	Min	Typ	Max	Unit
<b>Per transistor</b>						
$R_{th(j-a)}$	thermal resistance from junction to ambient	in free air				
	PEMH9 (SOT666)		[1]	-	625	K/W
	PIMH9 (SOT457)		[1]	-	500	K/W
	PUMH9 (SOT363)		[1]	-	625	K/W
<b>Per device</b>						
$R_{th(j-a)}$	thermal resistance from 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.



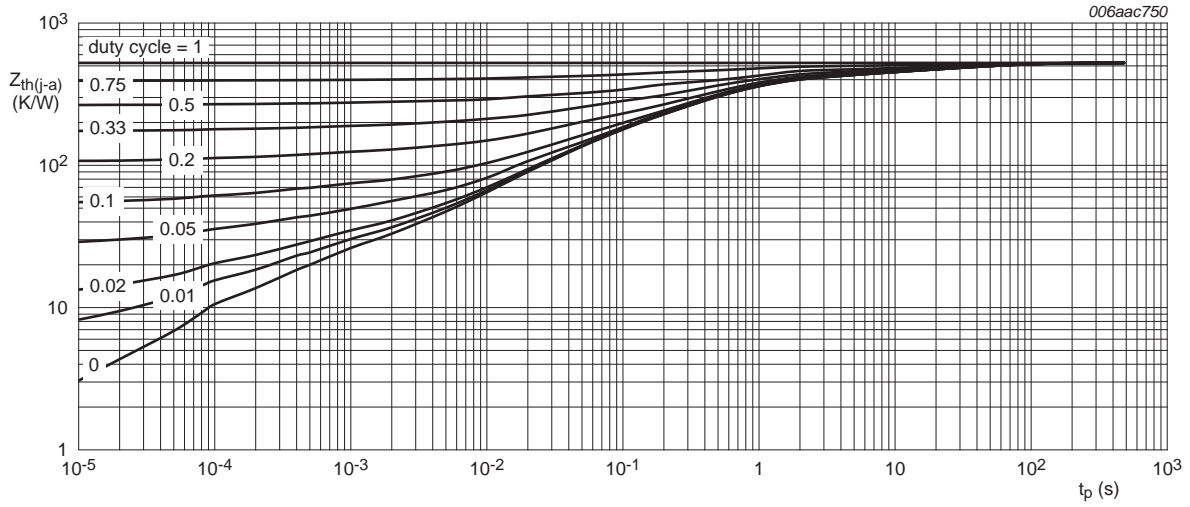
FR4 PCB, standard footprint

**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**



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**

## 7. Characteristics

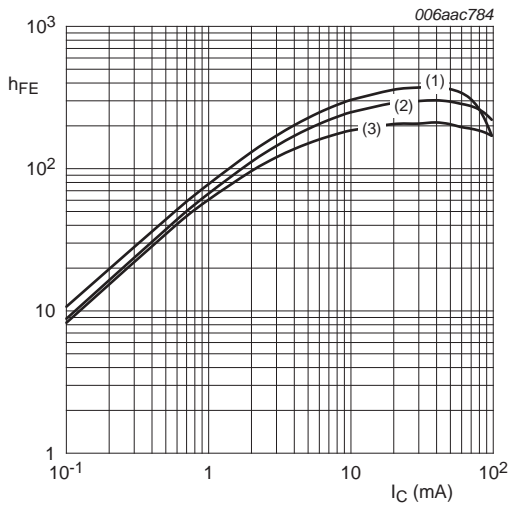
**Table 8. Characteristics**

$T_{amb} = 25\text{ °C}$  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
		$V_{CE} = 30\text{ V}; I_B = 0\text{ A}; T_j = 150\text{ °C}$	-	-	5	μA
$I_{EBO}$	emitter-base cut-off current	$V_{EB} = 5\text{ V}; I_C = 0\text{ A}$	-	-	150	μA
$h_{FE}$	DC current gain	$V_{CE} = 5\text{ V}; I_C = 5\text{ mA}$	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	$V_{CE} = 5\text{ V}; I_C = 100\text{ μA}$	-	0.7	0.5	V
$V_{I(on)}$	on-state input voltage	$V_{CE} = 0.3\text{ V}; I_C = 1\text{ mA}$	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	$V_{CB} = 10\text{ V}; I_E = i_e = 0\text{ A}; f = 1\text{ MHz}$	-	-	2.5	pF
$f_T$	transition frequency	$V_{CE} = 5\text{ V}; I_C = 10\text{ mA}; f = 100\text{ MHz}$	[1]	230	-	MHz

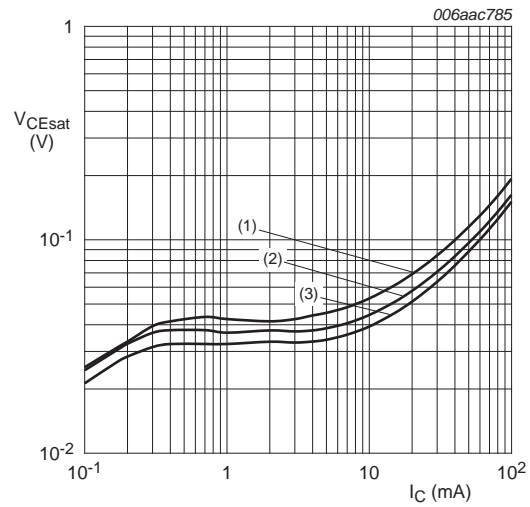
[1] Characteristics of built-in transistor





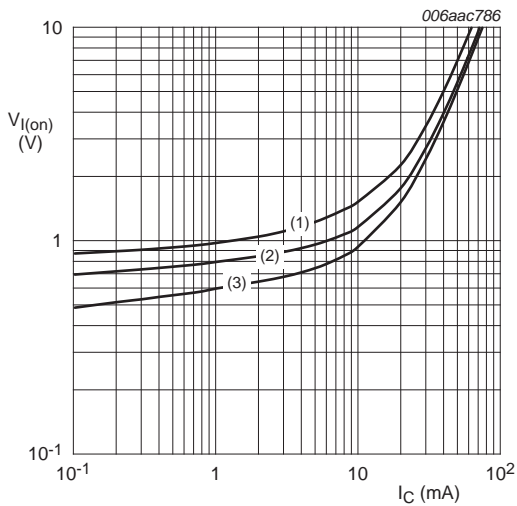
$V_{CE} = 5\text{ V}$   
 (1)  $T_{amb} = 100\text{ }^{\circ}\text{C}$   
 (2)  $T_{amb} = 25\text{ }^{\circ}\text{C}$   
 (3)  $T_{amb} = -40\text{ }^{\circ}\text{C}$

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



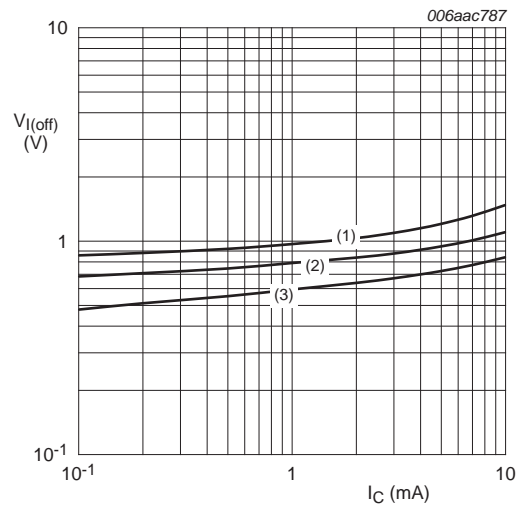
$I_C/I_B = 20$   
 (1)  $T_{amb} = 100\text{ }^{\circ}\text{C}$   
 (2)  $T_{amb} = 25\text{ }^{\circ}\text{C}$   
 (3)  $T_{amb} = -40\text{ }^{\circ}\text{C}$

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



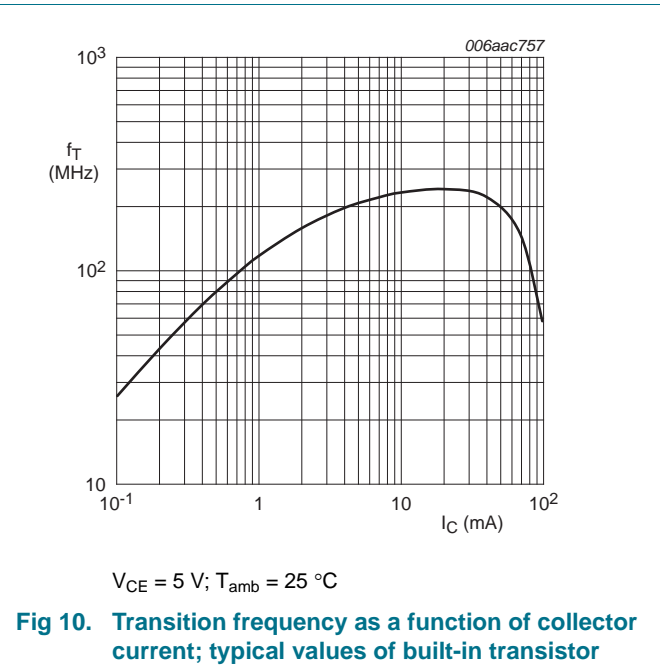
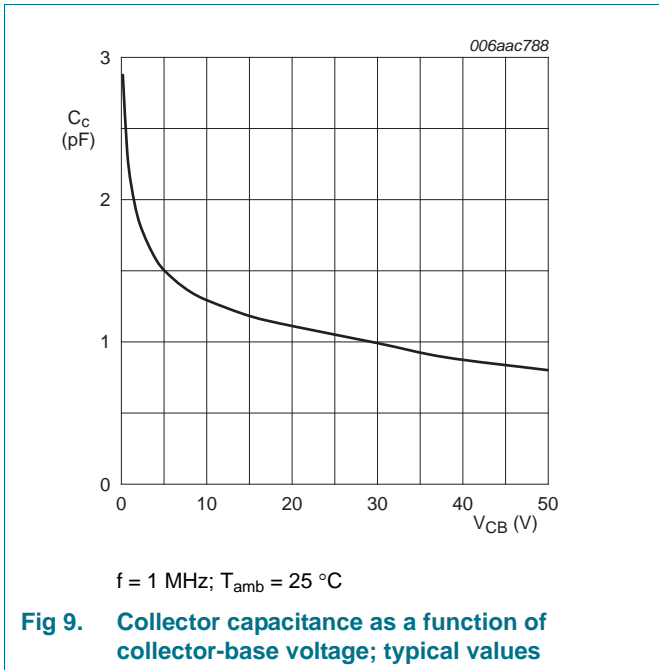
$V_{CE} = 0.3\text{ V}$   
 (1)  $T_{amb} = -40\text{ }^{\circ}\text{C}$   
 (2)  $T_{amb} = 25\text{ }^{\circ}\text{C}$   
 (3)  $T_{amb} = 100\text{ }^{\circ}\text{C}$

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

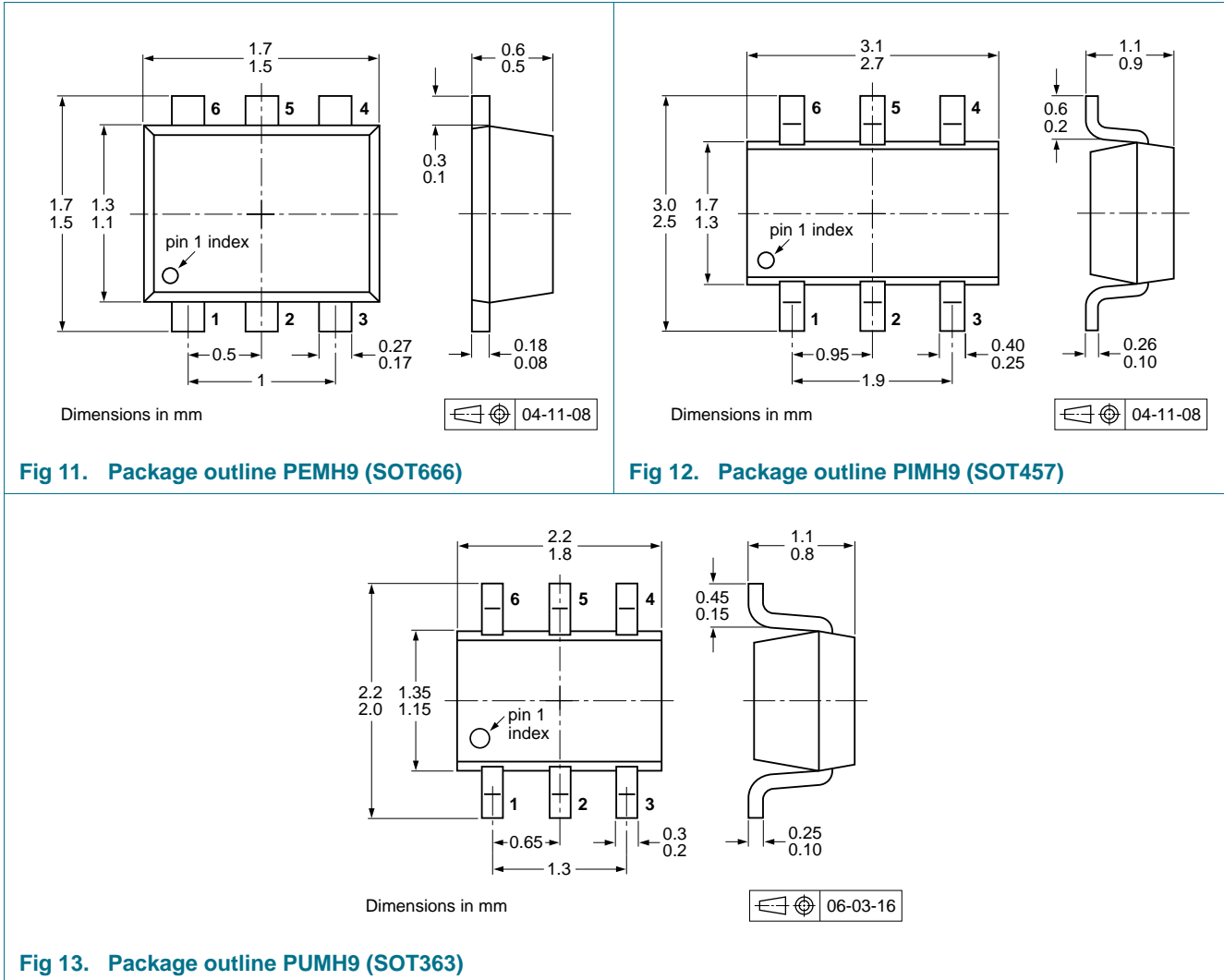


## 8. Test information

### 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



## 10. Soldering

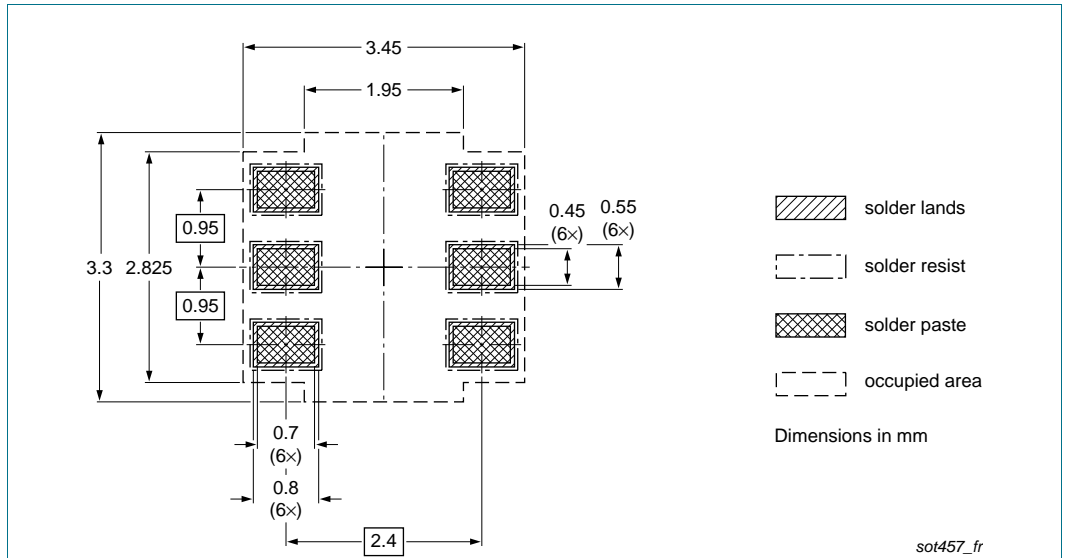


Fig 14. Reflow soldering footprint PIMH9 (SOT457)

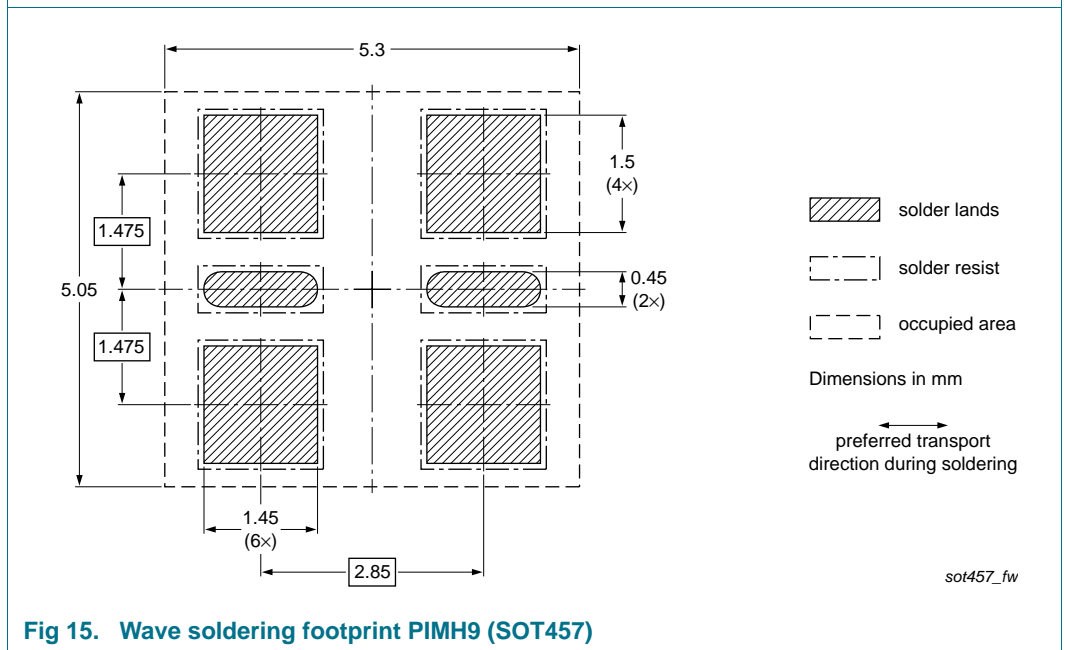
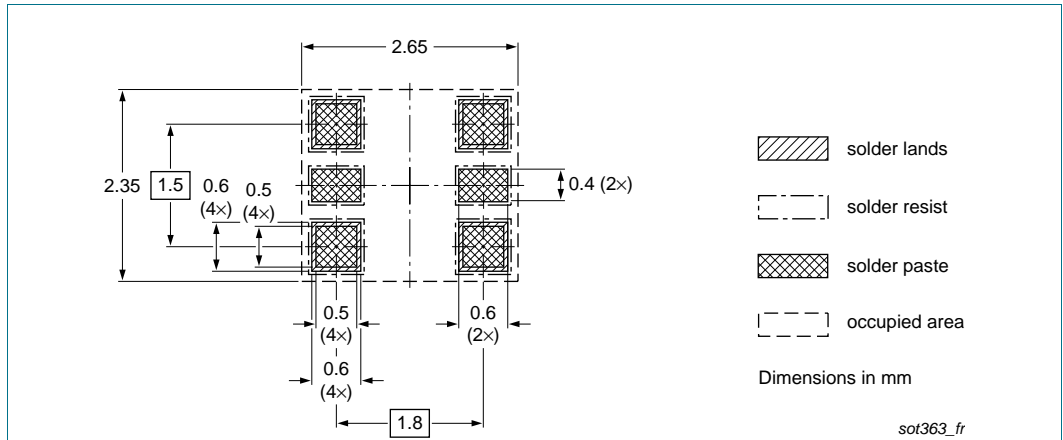
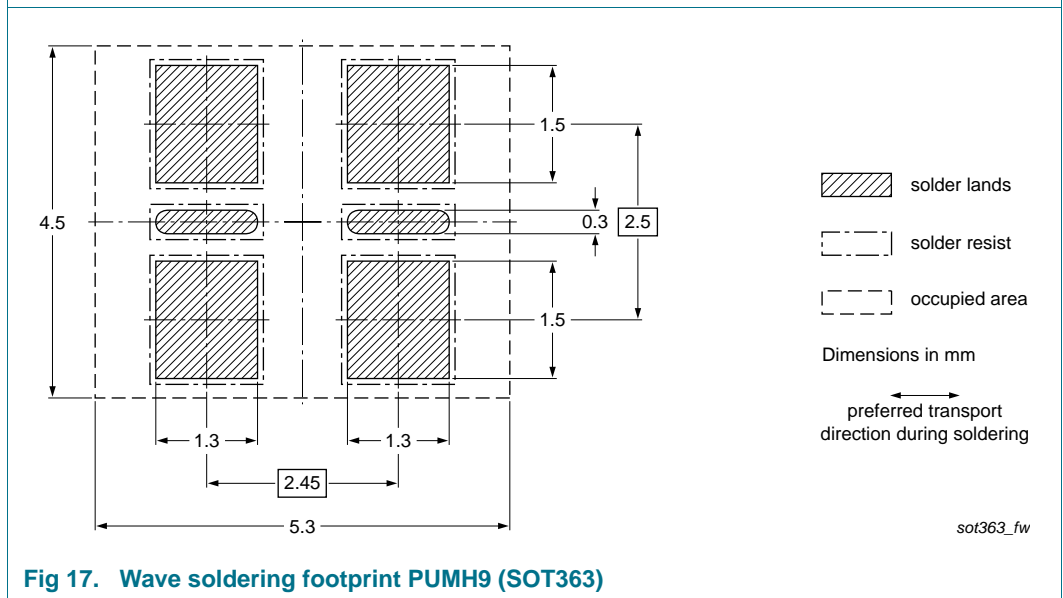


Fig 15. Wave soldering footprint PIMH9 (SOT457)



**Fig 16. Reflow soldering footprint PUMH9 (SOT363)**



**Fig 17. Wave soldering footprint PUMH9 (SOT363)**

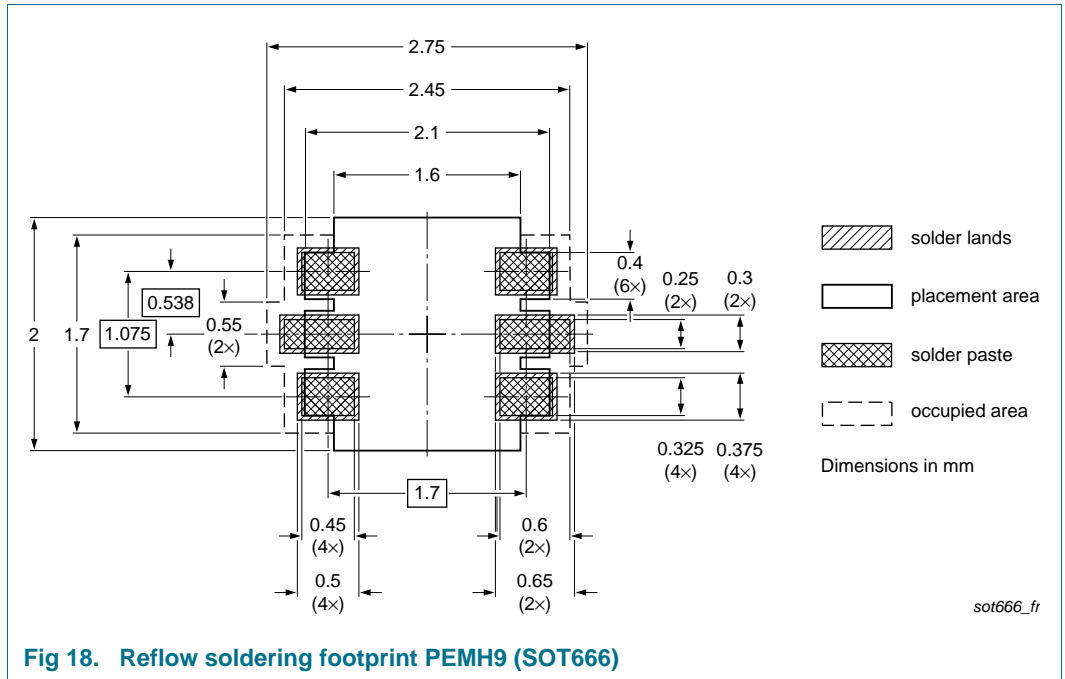


Fig 18. Reflow soldering footprint PEMH9 (SOT666)

## 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:	<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="#">Figure 1 to 10</a>: added</li> <li>• <a href="#">Section 5 “Limiting values”</a>: updated</li> <li>• <a href="#">Section 6 “Thermal characteristics”</a>: updated</li> <li>• <a href="#">Table 8 “Characteristics”</a>: <math>V_{i(on)}</math> redefined to <math>V_{I(on)}</math> on-state input voltage, <math>V_{i(off)}</math> redefined to <math>V_{I(off)}</math> off-state input voltage, <math>I_{CEO}</math> updated, <math>f_T</math> added</li> <li>• <a href="#">Section 8 “Test information”</a>: added</li> <li>• <a href="#">Section 9 “Package outline”</a>: superseded by minimized package outline drawings</li> <li>• <a href="#">Section 10 “Soldering”</a>: added</li> <li>• <a href="#">Section 12 “Legal information”</a>: updated</li> </ul>			
PIMH9_PUMH9_PEMH9 v.4	20040414	Product data sheet	-	PIMH9_PUMH9_PEMH9 v.3
PIMH9_PUMH9_PEMH9 v.3	20030915	Product specification	-	-

## 12. Legal information

### 12.1 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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