

# PMP4501V; PMP4501G; PMP4501Y

NPN/NPN matched double transistors

Rev. 04 — 28 August 2009

Product data sheet

## 1. Product profile

### 1.1 General description

NPN/NPN matched double transistors in small Surface-Mounted Device (SMD) plastic packages. The transistors in the SOT666 and SOT363 (SC-88) packages are fully isolated internally.

Table 1. Product overview

Type number	Package		NPN/NPN $h_{FE1}/h_{FE2}$ 0.98 complement	PNP/PNP complement
	NXP	JEITA		
PMP4501V	SOT666	-	PMP4201V	PMP5501V
PMP4501G	SOT353	SC-88A	PMP4201G	PMP5501G
PMP4501Y	SOT363	SC-88	PMP4201Y	PMP5501Y

### 1.2 Features

- Current gain matching
- Base-emitter voltage matching
- Common emitter configuration for SOT353 types
- Application-optimized pinout

### 1.3 Applications

- Current mirror
- Differential amplifier

### 1.4 Quick reference data

Table 2. Quick reference data

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
<b>Per transistor</b>						
$V_{CEO}$	collector-emitter voltage	open base	-	-	45	V
$I_C$	collector current		-	-	100	mA
$h_{FE}$	DC current gain	$V_{CE} = 5\text{ V};$ $I_C = 2\text{ mA}$	200	290	450	

**Table 2. Quick reference data ...continued**

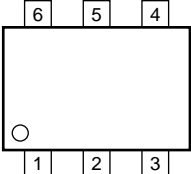
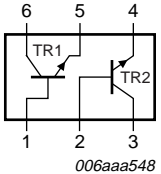
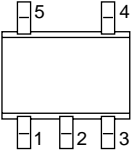
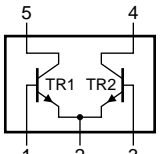
Symbol	Parameter	Conditions	Min	Typ	Max	Unit
<b>Per device</b>						
$h_{FE1}/h_{FE2}$	$h_{FE}$ matching	$V_{CE} = 5\text{ V};$ $I_C = 2\text{ mA}$	[1] 0.95	1	-	
$V_{BE1}-V_{BE2}$	$V_{BE}$ matching	$V_{CE} = 5\text{ V};$ $I_C = 2\text{ mA}$	[2] -	-	2	mV

[1] The smaller of the two values is taken as the numerator.

[2] The smaller of the two values is subtracted from the larger value.

## 2. Pinning information

**Table 3. Pinning**

Pin	Description	Simplified outline	Symbol
<b>SOT666; SOT363</b>			
1	base TR1		
2	base TR2		
3	collector TR2		
4	emitter TR2		
5	emitter TR1		
6	collector TR1		
<b>SOT353</b>			
1	base TR1		
2	emitter TR1, TR2		
3	base TR2		
4	collector TR2		
5	collector TR1		

## 3. Ordering information

**Table 4. Ordering information**

Type number	Package		Version
	Name	Description	
PMP4501V	-	plastic surface-mounted package; 6 leads	SOT666
PMP4501G	SC-88A	plastic surface-mounted package; 5 leads	SOT353
PMP4501Y	SC-88	plastic surface-mounted package; 6 leads	SOT363

## 4. Marking

**Table 5. Marking codes**

Type number	Marking code <sup>[1]</sup>
PMP4501V	EB
PMP4501G	R6*
PMP4501Y	S8*

- [1] \* = -: made in Hong Kong  
 \* = p: made in Hong Kong  
 \* = t: made in Malaysia  
 \* = W: made in China

## 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>					
$V_{CBO}$	collector-base voltage	open emitter	-	50	V
$V_{CEO}$	collector-emitter voltage	open base	-	45	V
$V_{EBO}$	emitter-base voltage	open collector	-	6	V
$I_C$	collector current		-	100	mA
$I_{CM}$	peak collector current	single pulse; $t_p \leq 1$ ms	-	200	mA
$P_{tot}$	total power dissipation	$T_{amb} \leq 25$ °C			
	SOT666		<sup>[1][2]</sup> -	200	mW
	SOT353		<sup>[1]</sup> -	200	mW
	SOT363		<sup>[1]</sup> -	200	mW
<b>Per device</b>					
$P_{tot}$	total power dissipation	$T_{amb} \leq 25$ °C			
	SOT666		<sup>[1][2]</sup> -	300	mW
	SOT353		<sup>[1]</sup> -	300	mW
	SOT363		<sup>[1]</sup> -	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.

## 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				
	SOT666		[1][2]	-	625	K/W
	SOT353		[1]	-	625	K/W
	SOT363		[1]	-	625	K/W
<b>Per device</b>						
$R_{th(j-a)}$	thermal resistance from junction to ambient	in free air				
	SOT666		[1][2]	-	416	K/W
	SOT353		[1]	-	416	K/W
	SOT363		[1]	-	416	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.

## 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	$V_{CB} = 30\text{ V};$ $I_E = 0\text{ A}$	-	-	15	nA
		$V_{CB} = 30\text{ V};$ $I_E = 0\text{ A};$ $T_j = 150\text{ }^{\circ}\text{C}$	-	-	5	$\mu\text{A}$
$I_{EBO}$	emitter-base cut-off current	$V_{EB} = 5\text{ V};$ $I_C = 0\text{ A}$	-	-	100	nA
$h_{FE}$	DC current gain	$V_{CE} = 5\text{ V};$ $I_C = 10\text{ }\mu\text{A}$	-	250	-	
		$V_{CE} = 5\text{ V};$ $I_C = 2\text{ mA}$	200	290	450	
$V_{CEsat}$	collector-emitter saturation voltage	$I_C = 10\text{ mA};$ $I_B = 0.5\text{ mA}$	-	50	200	mV
		$I_C = 100\text{ mA};$ $I_B = 5\text{ mA}$	-	200	400	mV
$V_{BEsat}$	base-emitter saturation voltage	$I_C = 10\text{ mA};$ $I_B = 0.5\text{ mA}$	[1]	-	760	mV
		$I_C = 100\text{ mA};$ $I_B = 5\text{ mA}$	[1]	-	910	mV

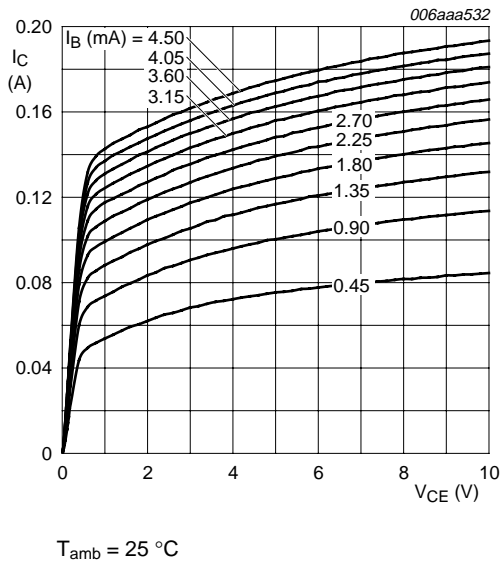
**Table 8. Characteristics ...continued** $T_{amb} = 25^{\circ}\text{C}$  unless otherwise specified

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$V_{BE}$	base-emitter voltage	$V_{CE} = 5\text{ V};$ $I_C = 2\text{ mA}$	[2] 610	660	710	mV
		$V_{CE} = 5\text{ V};$ $I_C = 10\text{ mA}$	[2] -	-	770	mV
$C_c$	collector capacitance	$V_{CB} = 10\text{ V};$ $I_E = i_e = 0\text{ A};$ $f = 1\text{ MHz}$	-	-	1.5	pF
$C_e$	emitter capacitance	$V_{EB} = 0.5\text{ V};$ $I_C = i_c = 0\text{ A};$ $f = 1\text{ MHz}$	-	11	-	pF
$f_T$	transition frequency	$V_{CE} = 5\text{ V};$ $I_C = 10\text{ mA};$ $f = 100\text{ MHz}$	100	250	-	MHz
NF	noise figure	$V_{CE} = 5\text{ V};$ $I_C = 0.2\text{ mA};$ $R_S = 2\text{ k}\Omega;$ $f = 10\text{ Hz to}$ $15.7\text{ kHz}$	-	2.8	-	dB
		$V_{CE} = 5\text{ V};$ $I_C = 0.2\text{ mA};$ $R_S = 2\text{ k}\Omega;$ $f = 1\text{ kHz};$ $B = 200\text{ Hz}$	-	3.3	-	dB
<b>Per device</b>						
$h_{FE1}/h_{FE2}$	$h_{FE}$ matching	$V_{CE} = 5\text{ V};$ $I_C = 2\text{ mA}$	[3] 0.95	1	-	
$V_{BE1}-V_{BE2}$	$V_{BE}$ matching	$V_{CE} = 5\text{ V};$ $I_C = 2\text{ mA}$	[4] -	-	2	mV

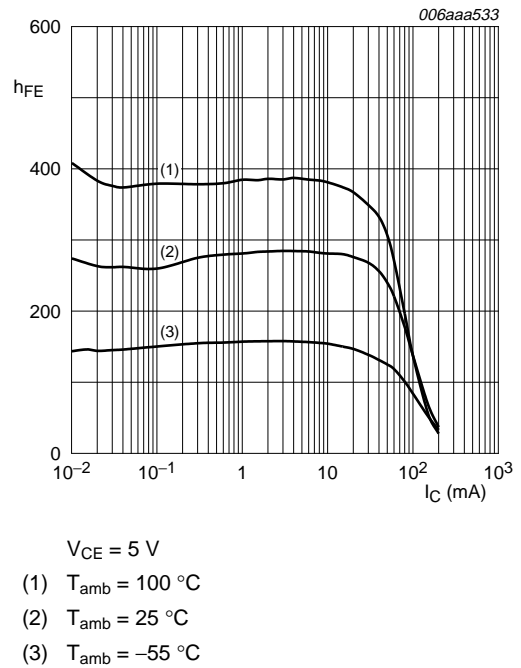
[1]  $V_{BEsat}$  decreases by about 1.7 mV/K with increasing temperature.[2]  $V_{BE}$  decreases by about 2 mV/K with increasing temperature.

[3] The smaller of the two values is taken as the numerator.

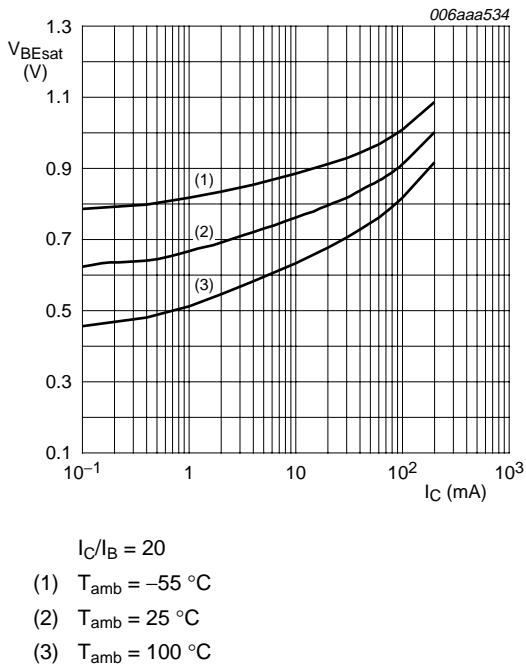
[4] The smaller of the two values is subtracted from the larger value.



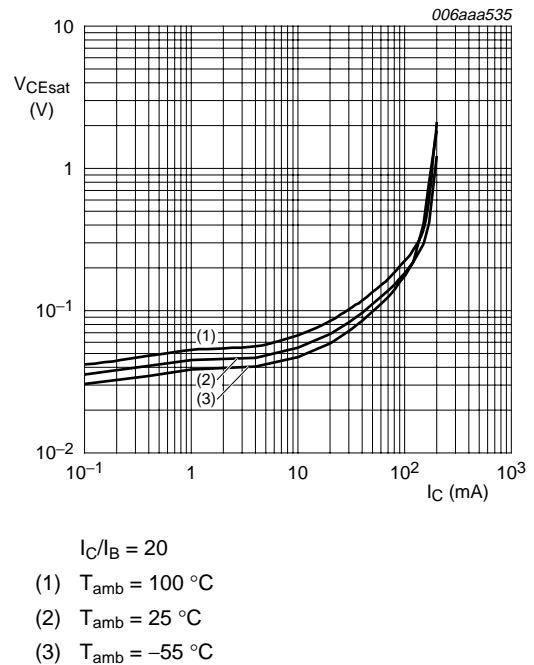
**Fig 1. Collector current as a function of collector-emitter voltage; typical values**



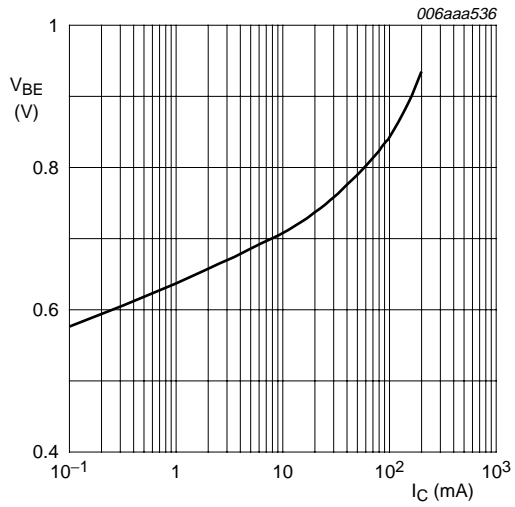
**Fig 2. DC current gain as a function of collector current; typical values**



**Fig 3. Base-emitter saturation voltage as a function of collector current; typical values**

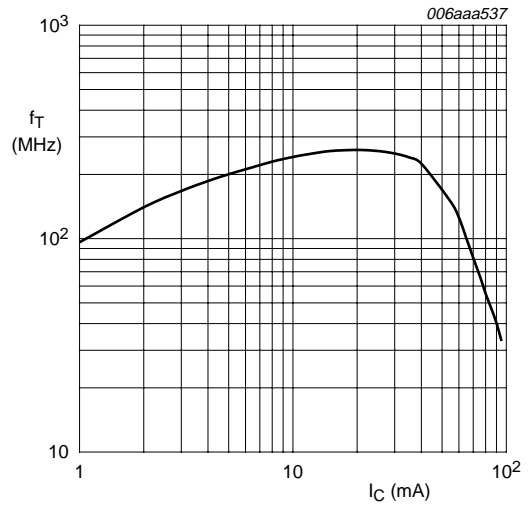


**Fig 4. Collector-emitter saturation voltage as a function of collector current; typical values**



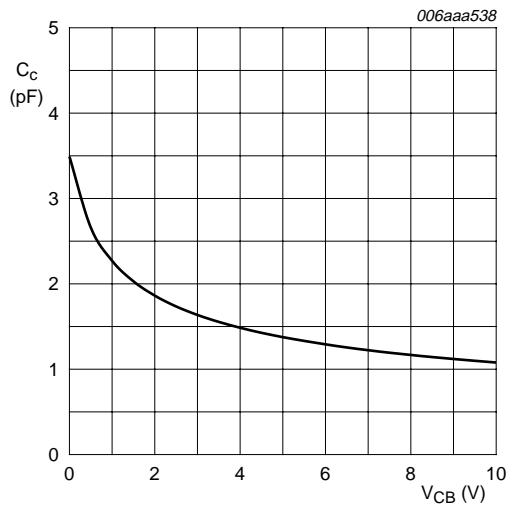
$V_{CE} = 5$  V;  $T_{amb} = 25$  °C

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



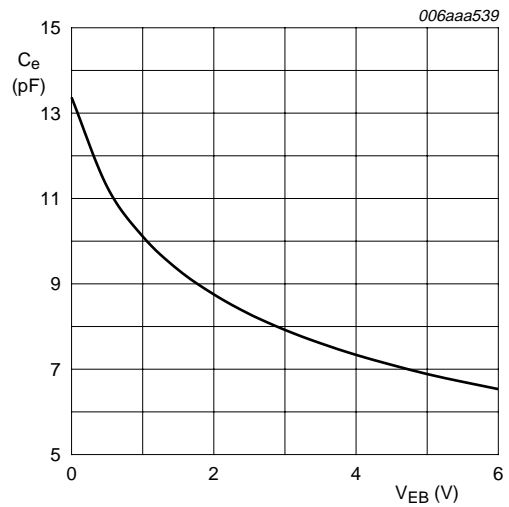
$V_{CE} = 5$  V;  $T_{amb} = 25$  °C

**Fig 6. Transition frequency as a function of collector current; typical values**



$f = 1$  MHz;  $T_{amb} = 25$  °C

**Fig 7. Collector capacitance as a function of collector-base voltage; typical values**



$f = 1$  MHz;  $T_{amb} = 25$  °C

**Fig 8. Emitter capacitance as a function of emitter-base voltage; typical values**

## 8. Application information

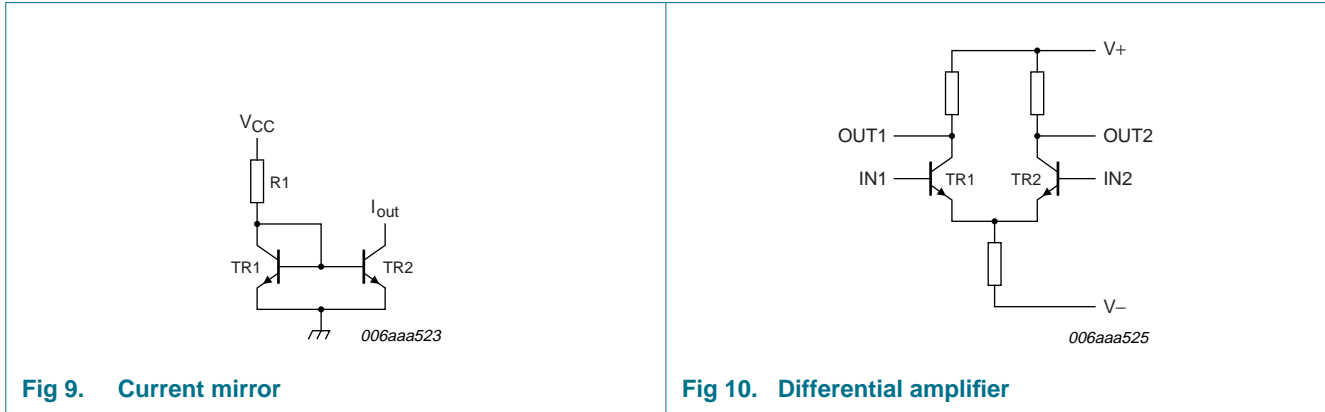


Fig 9. Current mirror

Fig 10. Differential amplifier

## 9. Package outline

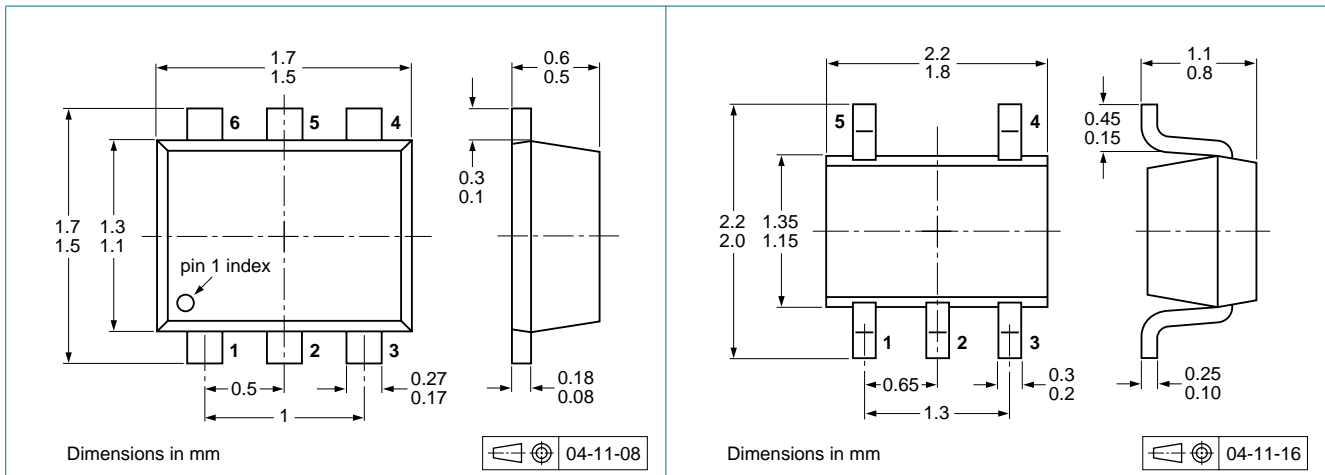


Fig 11. Package outline SOT666

Fig 12. Package outline SOT353 (SC-88A)

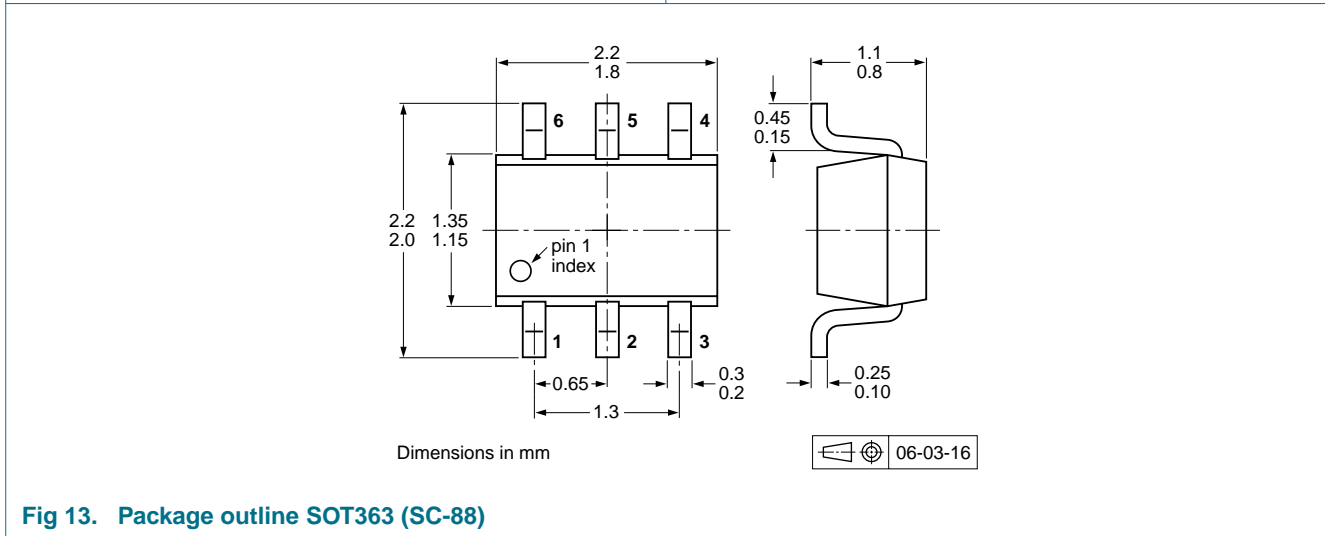


Fig 13. Package outline SOT363 (SC-88)



## 10. Packing information

**Table 9. Packing methods**

The indicated -xxx are the last three digits of the 12NC ordering code.<sup>[1]</sup>

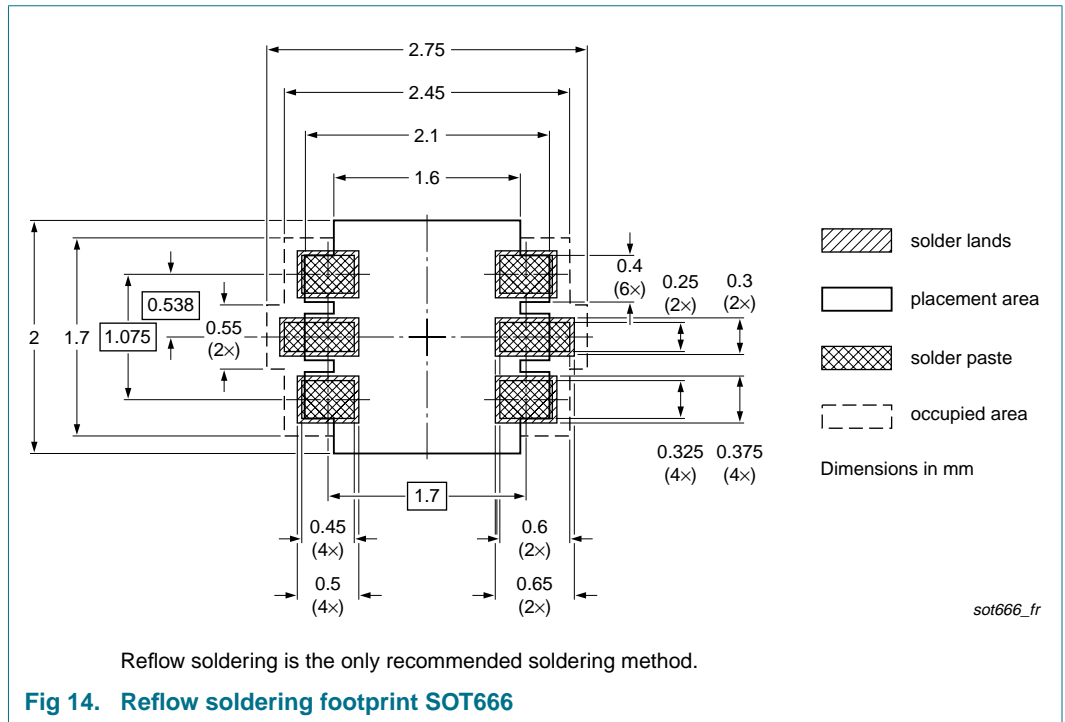
Type number	Package	Description	Packing quantity			
			3000	4000	8000	10000
PMP4501V	SOT666	2 mm pitch, 8 mm tape and reel	-	-	-315	-
		4 mm pitch, 8 mm tape and reel	-	-115	-	-
PMP4501G	SOT353	4 mm pitch, 8 mm tape and reel	-115	-	-	-135
PMP4501Y	SOT363	4 mm pitch, 8 mm tape and reel; T1 <sup>[2]</sup>	-115	-	-	-135
		4 mm pitch, 8 mm tape and reel; T2 <sup>[3]</sup>	-125	-	-	-165

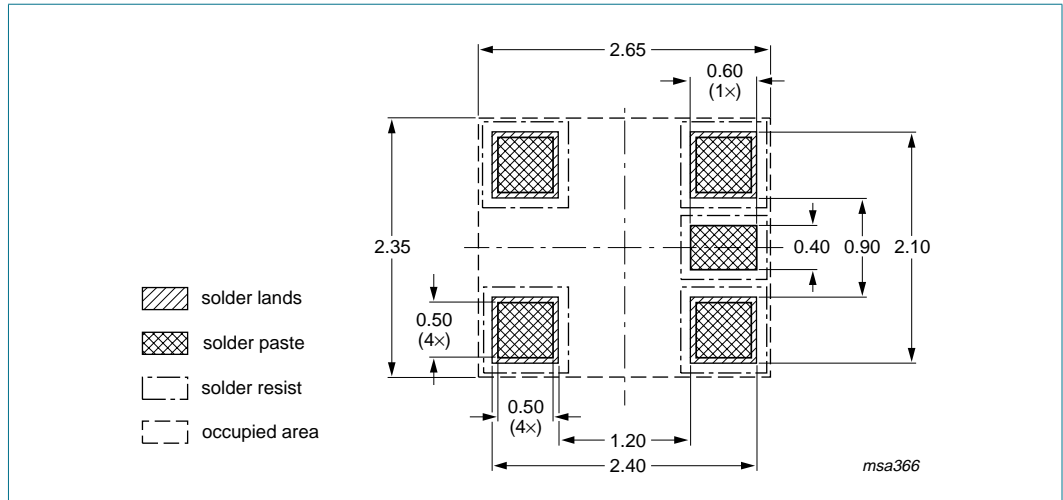
[1] For further information and the availability of packing methods, see [Section 14](#).

[2] T1: normal taping

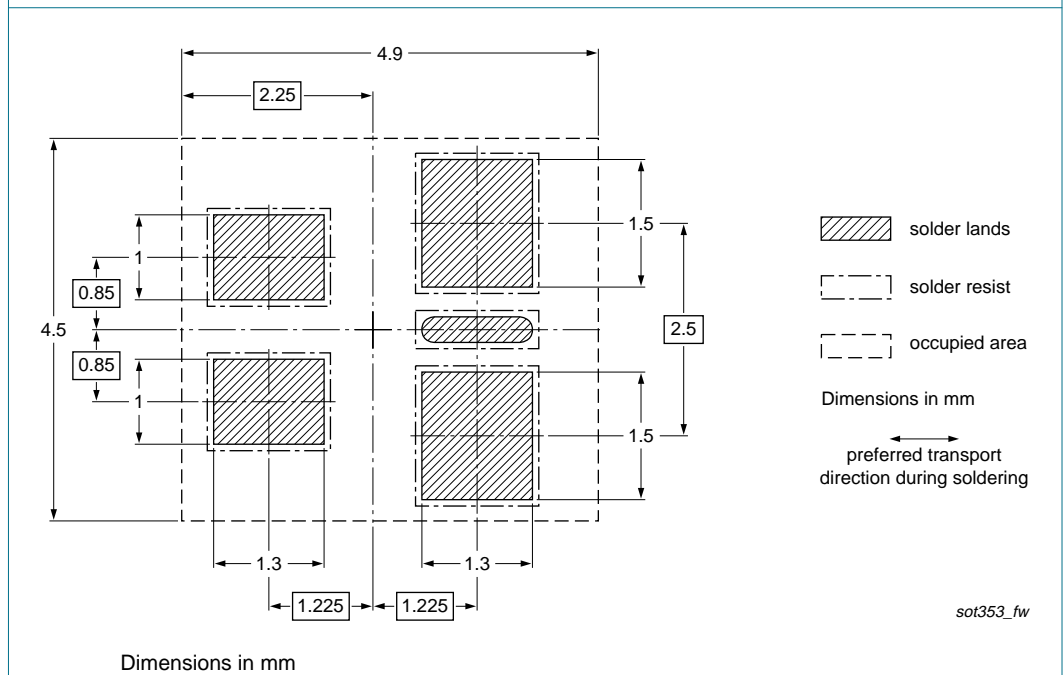
[3] T2: reverse taping

## 11. Soldering

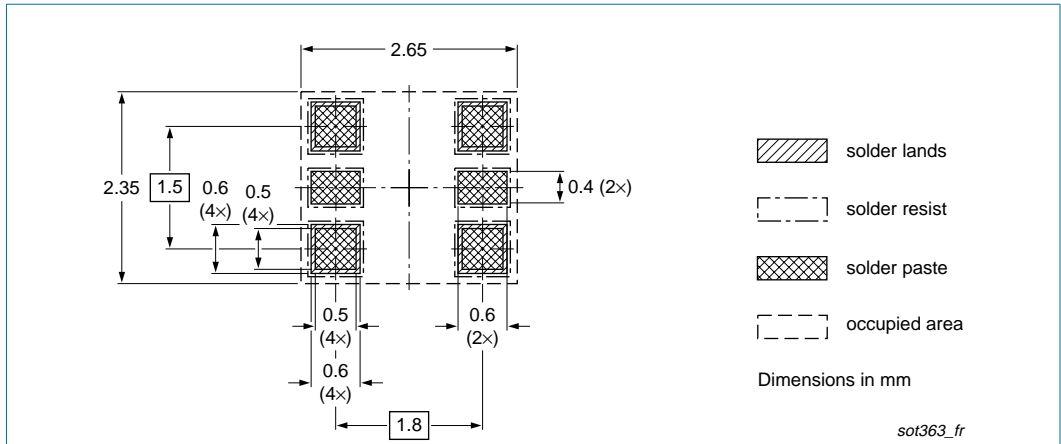




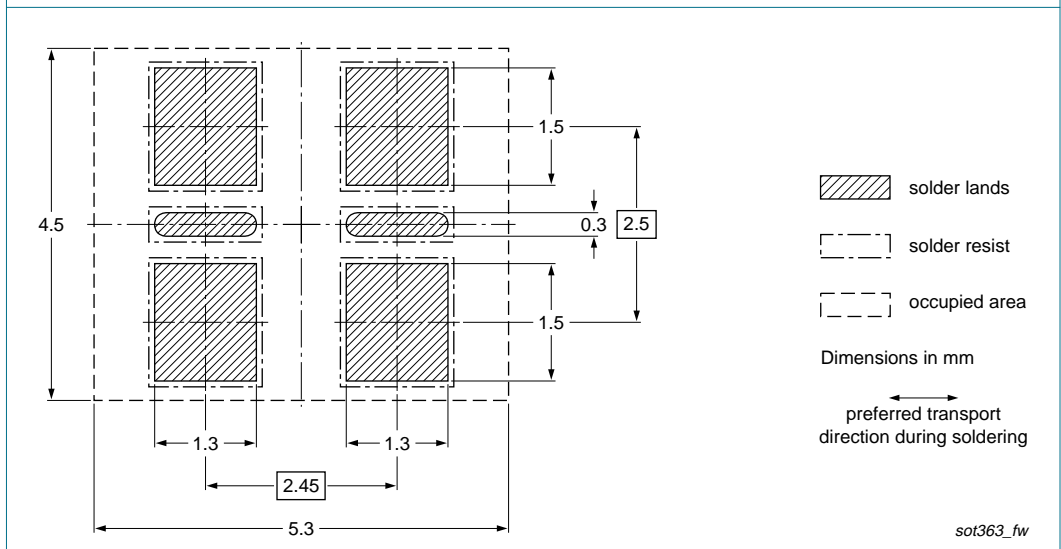
**Fig 15. Reflow soldering footprint SOT353 (SC-88A)**



**Fig 16. Wave soldering footprint SOT353 (SC-88A)**



**Fig 17. Reflow soldering footprint SOT363 (SC-88)**



**Fig 18. Wave soldering footprint SOT363 (SC-88)**

## 12. Revision history

**Table 10. Revision history**

Document ID	Release date	Data sheet status	Change notice	Supersedes
PMP4501V_G_Y_4	20090828	Product data sheet	-	PMP4501V_G_Y_3
Modifications:	<ul style="list-style-type: none"> <li>• This data sheet was changed to reflect the new company name NXP Semiconductors, including new legal definitions and disclaimers. No changes were made to the technical content.</li> <li>• <a href="#">Figure 14 "Reflow soldering footprint SOT666"</a>: updated</li> <li>• <a href="#">Figure 16 "Wave soldering footprint SOT353 (SC-88A)"</a>: updated</li> <li>• <a href="#">Figure 17 "Reflow soldering footprint SOT363 (SC-88)"</a>: updated</li> <li>• <a href="#">Figure 18 "Wave soldering footprint SOT363 (SC-88)"</a>: updated</li> </ul>			
PMP4501V_G_Y_3	20060919	Product data sheet	-	PMP4501G_Y_2
PMP4501G_Y_2	20060214	Product data sheet	-	PMP4501G_Y_1
PMP4501G_Y_1	20060202	Product data sheet	-	-

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### 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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