

# PMP4501G; PMP4501Y

NPN/NPN matched double transistors

Rev. 02 — 14 February 2006

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 SOT363 (SC-88) package are fully isolated internally.

Table 1: Product overview

Type number	Package		NPN/NPN $h_{FE1}/h_{FE2}$ 0.98 complement	PNP/PNP complement
	Philips	JEITA		
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	
<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

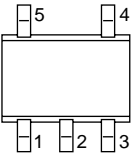
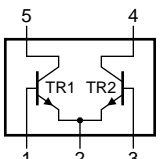
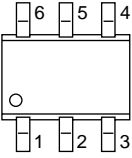
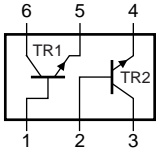
[1] The smaller of the two values is taken as the numerator.

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

**PHILIPS**

## 2. Pinning information

**Table 3: Pinning**

Pin	Description	Simplified outline	Symbol
<b>SOT353</b>			
1	base TR1		 <p>006aaa549</p>
2	emitter TR1, TR2		
3	base TR2		
4	collector TR2		
5	collector TR1		
<b>SOT363</b>			
1	base TR1		 <p>006aaa548</p>
2	base TR2		
3	collector TR2		
4	emitter TR2		
5	emitter TR1		
6	collector TR1		

## 3. Ordering information

**Table 4: Ordering information**

Type number	Package		
	Name	Description	Version
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>
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	[1] -	200	mW
<b>Per device</b>					
$P_{tot}$	total power dissipation	$T_{amb} \leq 25$ °C	[1] -	300	mW
$T_{stg}$	storage temperature		-65	+150	°C
$T_j$	junction temperature		-	150	°C
$T_{amb}$	ambient 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	[1] -	-	625	K/W
<b>Per device</b>						
$R_{th(j-a)}$	thermal resistance from junction to ambient	in free air	[1] -	-	416	K/W

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

## 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	$V_{CB} = 30\text{ V};$ $I_E = 0\text{ A}$	-	-	15	nA
		$V_{CB} = 30\text{ V};$ $I_E = 0\text{ A};$ $T_j = 150\text{ °C}$	-	-	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
$V_{BE}$	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

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

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
<b>Per device</b>						
$h_{FE1}/h_{FE2}$	$h_{FE}$ matching	$V_{CE} = 5\text{ V};$ $I_C = 2\text{ mA}$	[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.

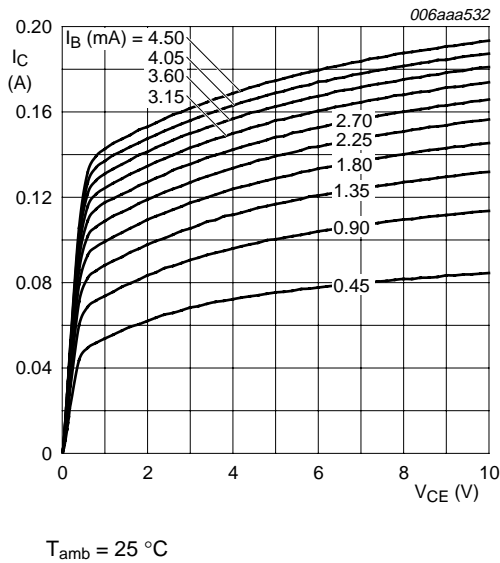


Fig 1. Collector current as a function of collector-emitter voltage; typical values

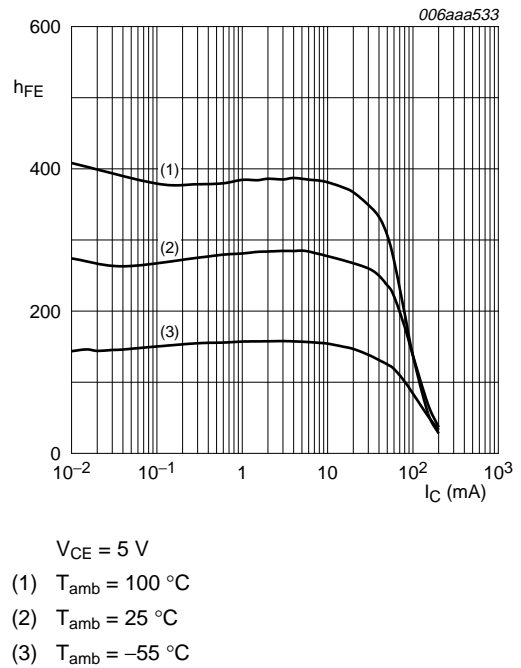


Fig 2. DC current gain as a function of collector current; typical values

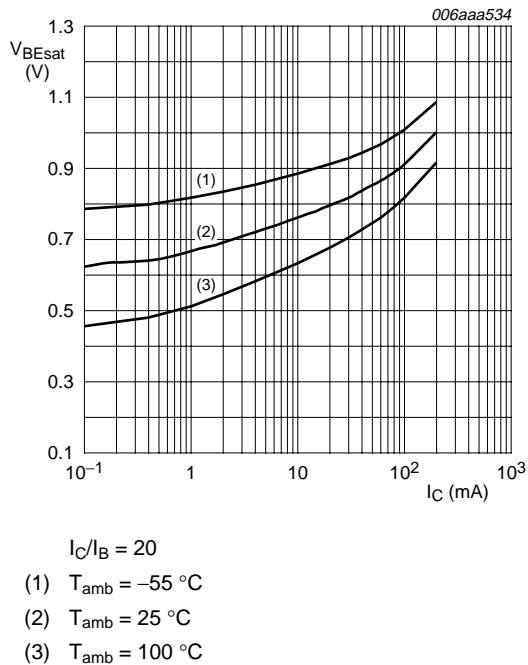


Fig 3. Base-emitter saturation voltage as a function of collector current; typical values

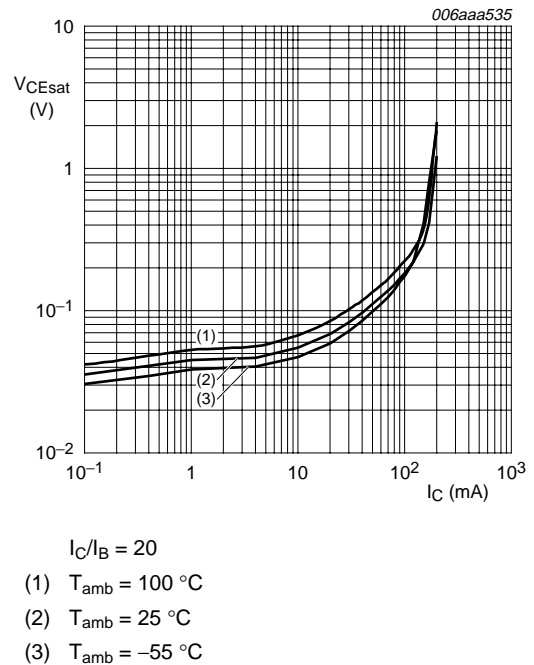
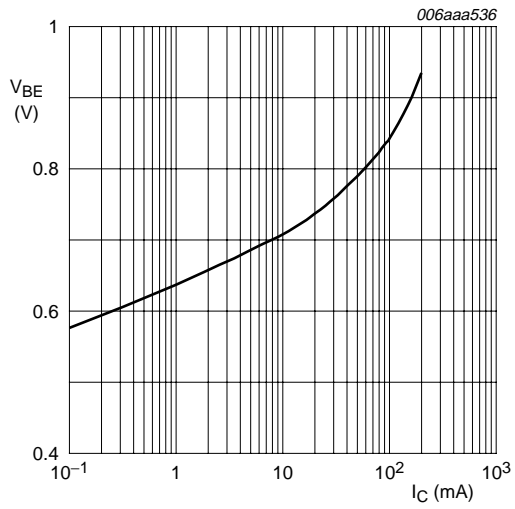
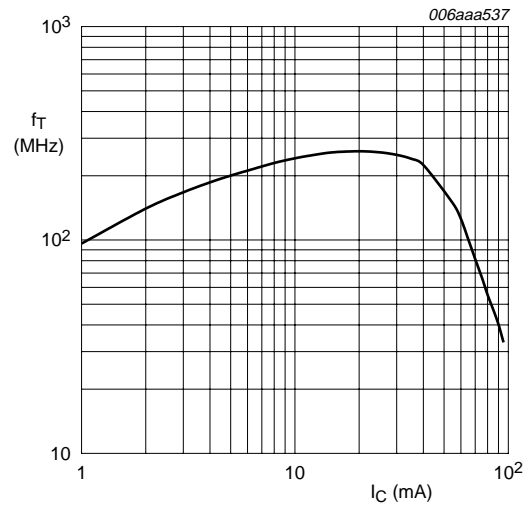


Fig 4. Collector-emitter saturation voltage as a function of collector current; typical values



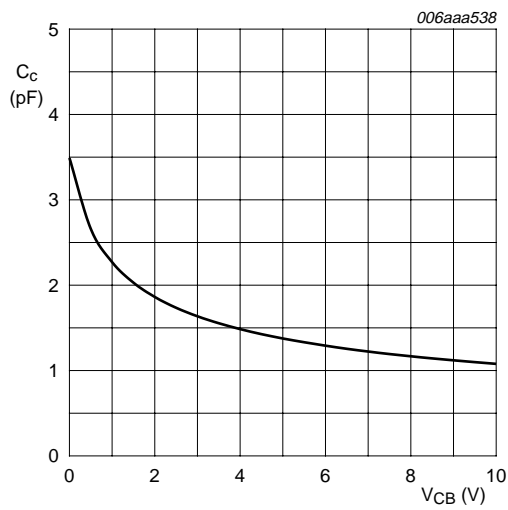
$V_{CE} = 5$  V;  $T_{amb} = 25$  °C

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



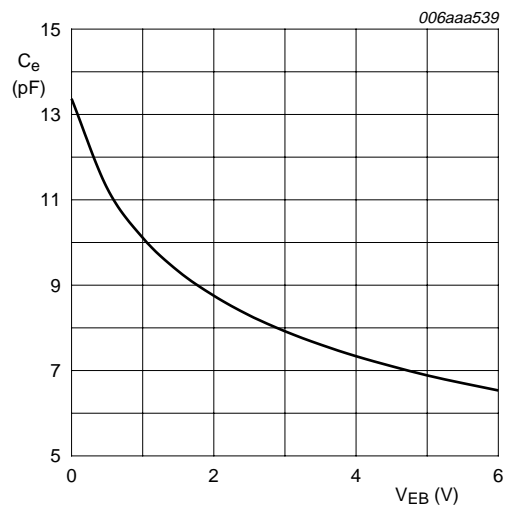
$V_{CE} = 5$  V;  $T_{amb} = 25$  °C

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



$T_{amb} = 25$  °C;  $f = 1$  MHz

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



$T_{amb} = 25$  °C;  $f = 1$  MHz

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

## 8. Application information

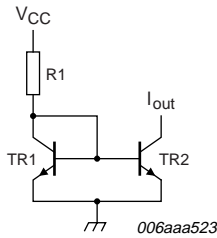


Fig 9. Current mirror

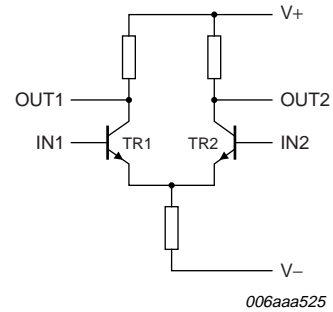


Fig 10. Differential amplifier

## 9. Package outline

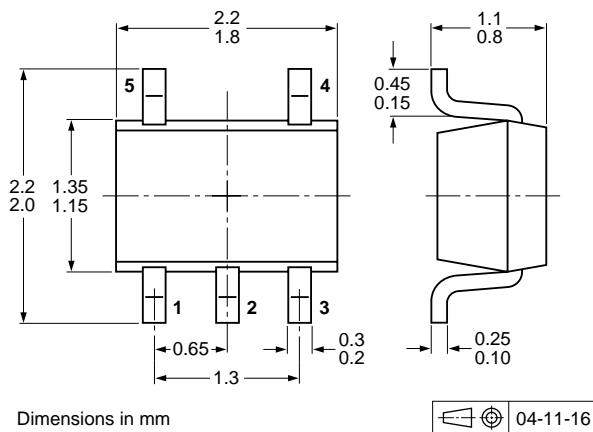


Fig 11. Package outline SOT353 (SC-88A)

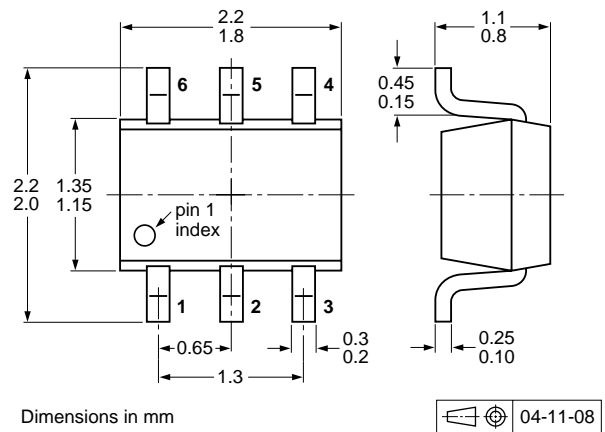


Fig 12. Package outline SOT363 (SC-88)



## 10. Packing information

**Table 9: Packing methods**

The indicated -xxx are the last three digits of the 12NC ordering code. [\[1\]](#)

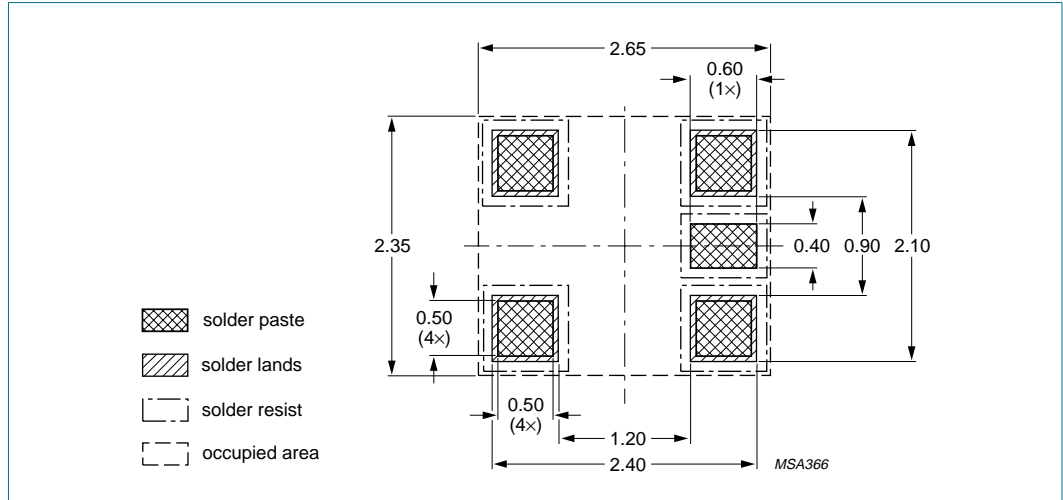
Type number	Package	Description	Packing quantity	
			3000	10000
PMP4501G	SOT353	4 mm pitch, 8 mm tape and reel	-115	-135
PMP4501Y	SOT363	4 mm pitch, 8 mm tape and reel; T1 <a href="#">[2]</a>	-115	-135
		4 mm pitch, 8 mm tape and reel; T2 <a href="#">[3]</a>	-125	-165

[1] For further information and the availability of packing methods, see [Section 17](#).

[2] T1: normal taping

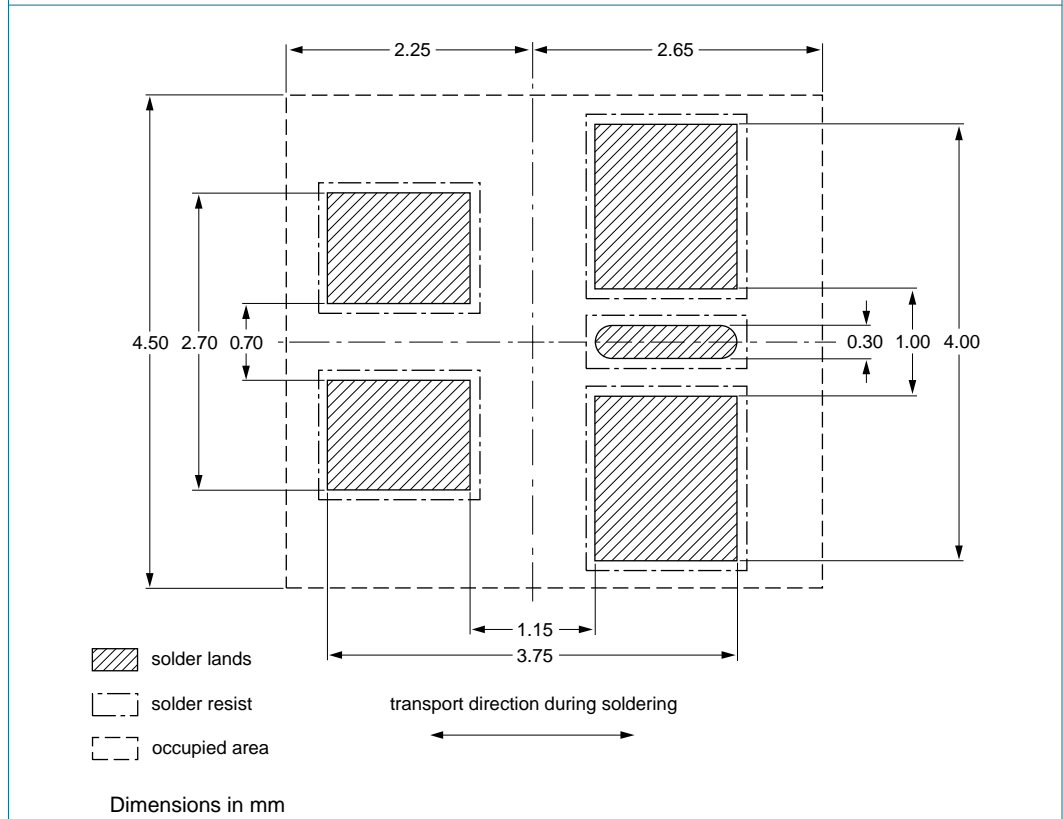
[3] T2: reverse taping

**11. Soldering**



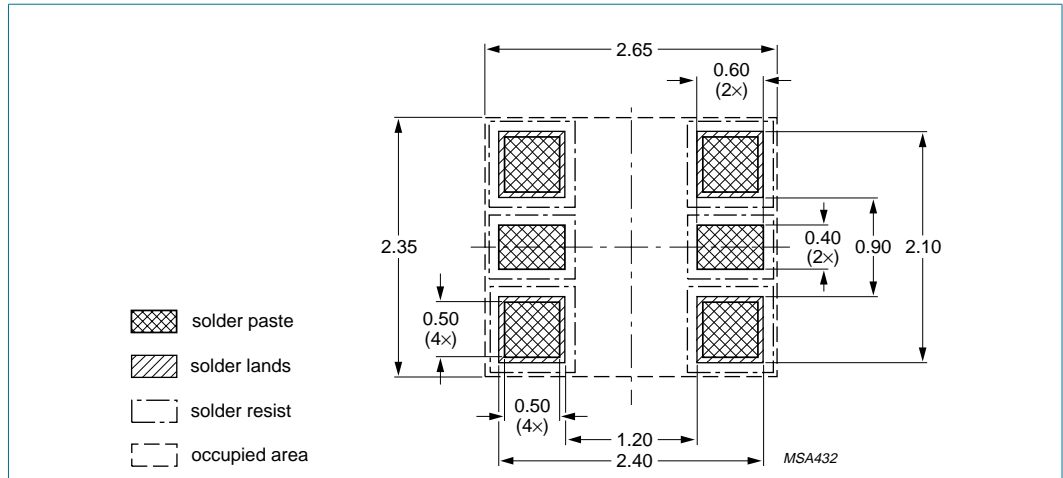
Dimensions in mm

**Fig 13. Reflow soldering footprint SOT353 (SC-88A)**



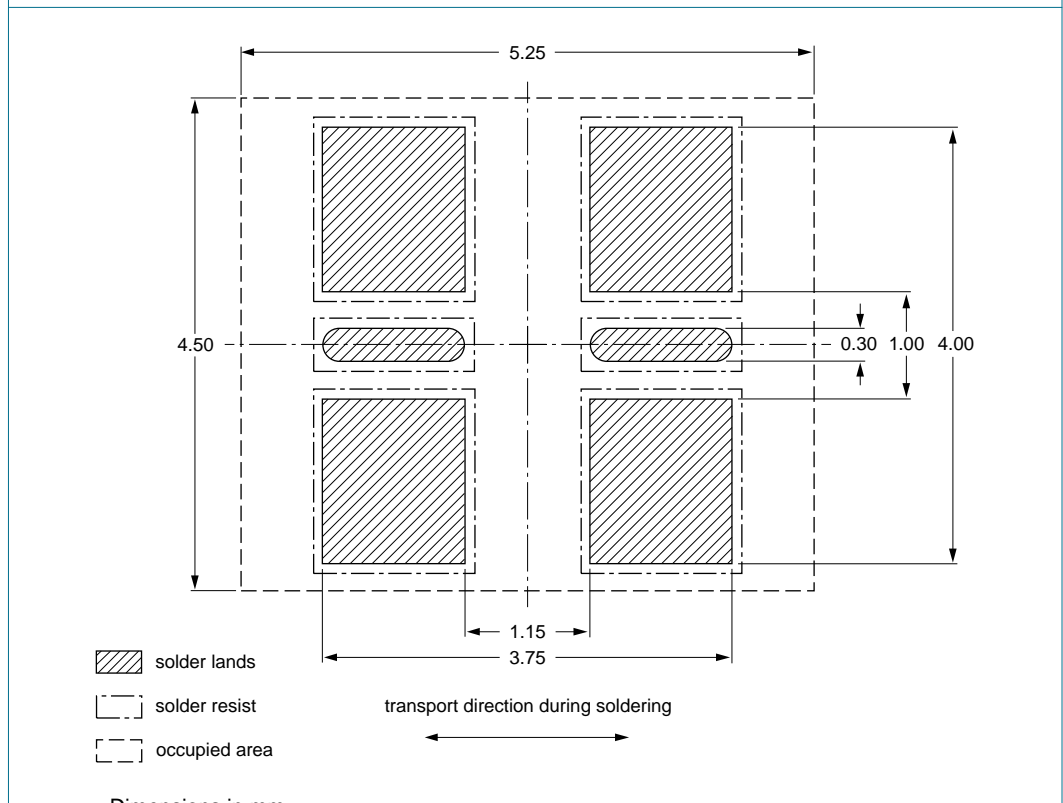
Dimensions in mm

**Fig 14. Wave soldering footprint SOT353 (SC-88A)**



Dimensions in mm

**Fig 15. Reflow soldering footprint SOT363 (SC-88)**



Dimensions in mm

**Fig 16. Wave soldering footprint SOT363 (SC-88)**

## 12. Revision history

**Table 10: Revision history**

Document ID	Release date	Data sheet status	Change notice	Doc. number	Supersedes
PMP4501G_Y_2	20060214	Product data sheet	-	-	PMP4501G_Y_1
Modifications:					
					<ul style="list-style-type: none"><li>• <a href="#">Table 1 "Product overview"</a>: value indication for <math>h_{FE1}/h_{FE2}</math> <math>h_{FE}</math> matching amended</li><li>• <a href="#">Table 2 "Quick reference data"</a>: value indication for <math>h_{FE1}/h_{FE2}</math> <math>h_{FE}</math> matching amended</li><li>• <a href="#">Table 8 "Characteristics"</a>: value indication for <math>h_{FE1}/h_{FE2}</math> <math>h_{FE}</math> matching amended</li></ul>
PMP4501G_Y_1	20060202	Product data sheet	-	-	-

## 13. Data sheet status

Level	Data sheet status <sup>[1]</sup>	Product status <sup>[2] [3]</sup>	Definition
I	Objective data	Development	This data sheet contains data from the objective specification for product development. Philips Semiconductors reserves the right to change the specification in any manner without notice.
II	Preliminary data	Qualification	This data sheet contains data from the preliminary specification. Supplementary data will be published at a later date. Philips Semiconductors reserves the right to change the specification without notice, in order to improve the design and supply the best possible product.
III	Product data	Production	This data sheet contains data from the product specification. Philips Semiconductors reserves the right to make changes at any time in order to improve the design, manufacturing and supply. Relevant changes will be communicated via a Customer Product/Process Change Notification (CPCN).

[1] Please consult the most recently issued data sheet before initiating or completing a design.

[2] The product status of the device(s) described in this data sheet may have changed since this data sheet was published. The latest information is available on the Internet at URL <http://www.semiconductors.philips.com>.

[3] For data sheets describing multiple type numbers, the highest-level product status determines the data sheet status.

## 14. Definitions

**Short-form specification** — The data in a short-form specification is extracted from a full data sheet with the same type number and title. For detailed information see the relevant data sheet or data handbook.

**Limiting values definition** — Limiting values given are in accordance with the Absolute Maximum Rating System (IEC 60134). Stress above one or more of the limiting values may cause permanent damage to the device. These are stress ratings only and operation of the device at these or at any other conditions above those given in the Characteristics sections of the specification is not implied. Exposure to limiting values for extended periods may affect device reliability.

**Application information** — Applications that are described herein for any of these products are for illustrative purposes only. Philips Semiconductors makes no representation or warranty that such applications will be suitable for the specified use without further testing or modification.

## 15. Disclaimers

**Life support** — These products are not designed for use in life support appliances, devices, or systems where malfunction of these products can reasonably be expected to result in personal injury. Philips Semiconductors

## 17. Contact information

For additional information, please visit: <http://www.semiconductors.philips.com>

For sales office addresses, send an email to: [sales.addresses@www.semiconductors.philips.com](mailto:sales.addresses@www.semiconductors.philips.com)

customers using or selling these products for use in such applications do so at their own risk and agree to fully indemnify Philips Semiconductors for any damages resulting from such application.

**Right to make changes** — Philips Semiconductors reserves the right to make changes in the products - including circuits, standard cells, and/or software - described or contained herein in order to improve design and/or performance. When the product is in full production (status 'Production'), relevant changes will be communicated via a Customer Product/Process Change Notification (CPCN). Philips Semiconductors assumes no responsibility or liability for the use of any of these products, conveys no license or title under any patent, copyright, or mask work right to these products, and makes no representations or warranties that these products are free from patent, copyright, or mask work right infringement, unless otherwise specified.

## 16. Trademarks

**Notice** — All referenced brands, product names, service names and trademarks are the property of their respective owners.

## 18. Contents

<b>1</b>	<b>Product profile</b> .....	<b>1</b>
1.1	General description .....	1
1.2	Features .....	1
1.3	Applications .....	1
1.4	Quick reference data .....	1
<b>2</b>	<b>Pinning information</b> .....	<b>2</b>
<b>3</b>	<b>Ordering information</b> .....	<b>2</b>
<b>4</b>	<b>Marking</b> .....	<b>2</b>
<b>5</b>	<b>Limiting values</b> .....	<b>3</b>
<b>6</b>	<b>Thermal characteristics</b> .....	<b>3</b>
<b>7</b>	<b>Characteristics</b> .....	<b>4</b>
<b>8</b>	<b>Application information</b> .....	<b>8</b>
<b>9</b>	<b>Package outline</b> .....	<b>8</b>
<b>10</b>	<b>Packing information</b> .....	<b>9</b>
<b>11</b>	<b>Soldering</b> .....	<b>10</b>
<b>12</b>	<b>Revision history</b> .....	<b>12</b>
<b>13</b>	<b>Data sheet status</b> .....	<b>13</b>
<b>14</b>	<b>Definitions</b> .....	<b>13</b>
<b>15</b>	<b>Disclaimers</b> .....	<b>13</b>
<b>16</b>	<b>Trademarks</b> .....	<b>13</b>
<b>17</b>	<b>Contact information</b> .....	<b>13</b>



© Koninklijke Philips Electronics N.V. 2006

All rights are reserved. Reproduction in whole or in part is prohibited without the prior written consent of the copyright owner. The information presented in this document does not form part of any quotation or contract, is believed to be accurate and reliable and may be changed without notice. No liability will be accepted by the publisher for any consequence of its use. Publication thereof does not convey nor imply any license under patent- or other industrial or intellectual property rights.

Date of release: 14 February 2006  
Document number: PMP4501G\_Y\_2

Published in The Netherlands