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
Per transistor							
V_{CEO}	collector-emitter voltage	open base		-	-	45	V
I_C	collector current			-	-	100	mA
h_{FE}	DC current gain	V_{CE} = 5 V; I_C = 2 mA		200	290	450	
Per device							
h_{FE1}/h_{FE2}	h_{FE} matching	V_{CE} = 5 V; I_C = 2 mA	[1]	0.95	1	-	
$V_{BE1} - V_{BE2}$	V_{BE} matching	V_{CE} = 5 V; I_C = 2 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.

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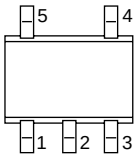
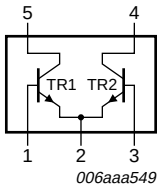
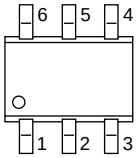
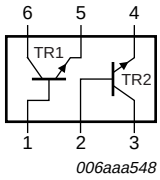
2. Pinning information

Table 3: Pinning

Pin	Description	Simplified outline	Symbol
SOT353			
1	base TR1		
2	emitter TR1, TR2		
3	base TR2		
4	collector TR2		
5	collector TR1		
SOT363			
1	base TR1		
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 [1]
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
Per transistor						
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
Per device						
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
Per transistor							
$R_{th(j-a)}$	thermal resistance from junction to ambient	in free air	[1]	-	-	625	K/W
Per device							
$R_{th(j-a)}$	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 °C unless otherwise specified.

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
Per transistor							
I_{CBO}	collector-base cut-off current	V_{CB} = 30 V; I_E = 0 A		-	-	15	nA
		V_{CB} = 30 V; I_E = 0 A; T_j = 150 °C		-	-	5	µA
I_{EBO}	emitter-base cut-off current	V_{EB} = 5 V; I_C = 0 A		-	-	100	nA
h_{FE}	DC current gain	V_{CE} = 5 V; I_C = 10 µA		-	250	-	
		V_{CE} = 5 V; I_C = 2 mA		200	290	450	
V_{CEsat}	collector-emitter saturation voltage	I_C = 10 mA; I_B = 0.5 mA		-	50	200	mV
		I_C = 100 mA; I_B = 5 mA		-	200	400	mV
V_{BEsat}	base-emitter saturation voltage	I_C = 10 mA; I_B = 0.5 mA	[1]	-	760	-	mV
		I_C = 100 mA; I_B = 5 mA	[1]	-	910	-	mV
V_{BE}	base-emitter voltage	V_{CE} = 5 V; I_C = 2 mA	[2]	610	660	710	mV
		V_{CE} = 5 V; I_C = 10 mA	[2]	-	-	770	mV
C_c	collector capacitance	V_{CB} = 10 V; $I_E = i_e$ = 0 A; f = 1 MHz		-	-	1.5	pF
C_e	emitter capacitance	V_{EB} = 0.5 V; $I_C = i_c$ = 0 A; f = 1 MHz		-	11	-	pF
f_T	transition frequency	V_{CE} = 5 V; I_C = 10 mA; f = 100 MHz		100	250	-	MHz
NF	noise figure	V_{CE} = 5 V; I_C = 0.2 mA; R_S = 2 kΩ; f = 10 Hz to 15.7 kHz		-	2.8	-	dB
		V_{CE} = 5 V; I_C = 0.2 mA; R_S = 2 kΩ; f = 1 kHz; B = 200 Hz		-	3.3	-	dB

Table 8: Characteristics *...continued*

T_{amb} = 25 °C unless otherwise specified.

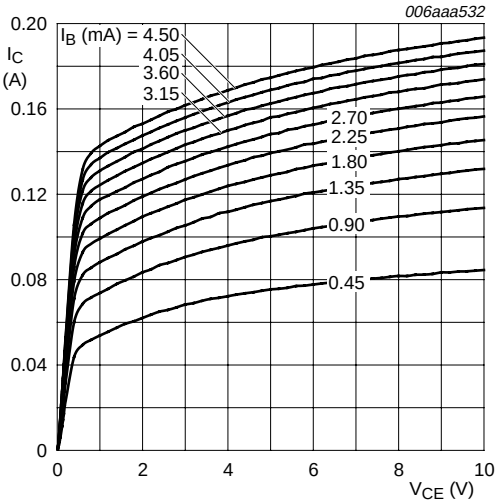
Symbol	Parameter	Conditions		Min	Typ	Max	Unit
Per device							
h_{FE1}/h_{FE2}	h_{FE} matching	V_{CE} = 5 V; I_C = 2 mA	[3]	0.95	1	-	
$V_{BE1} - V_{BE2}$	V_{BE} matching	V_{CE} = 5 V; I_C = 2 mA	[4]	-	-	2	mV

[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.

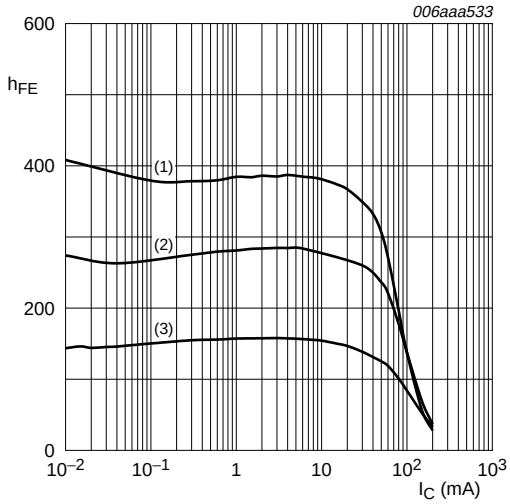
[3] The smaller of the two values is taken as the numerator.

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



T_{amb} = 25 °C

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



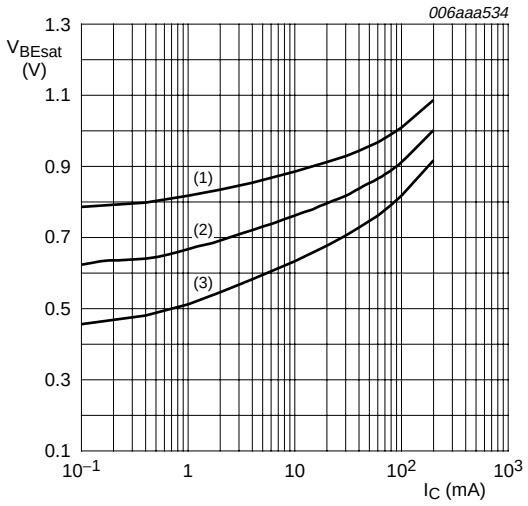
V_{CE} = 5 V

(1) T_{amb} = 100 °C

(2) T_{amb} = 25 °C

(3) T_{amb} = –55 °C

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



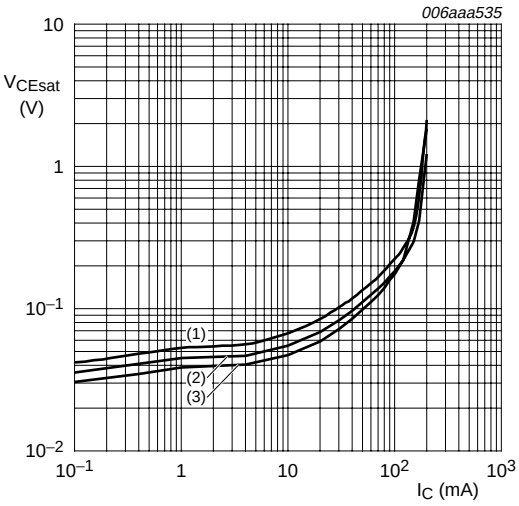
I_C/I_B = 20

(1) T_{amb} = –55 °C

(2) T_{amb} = 25 °C

(3) T_{amb} = 100 °C

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



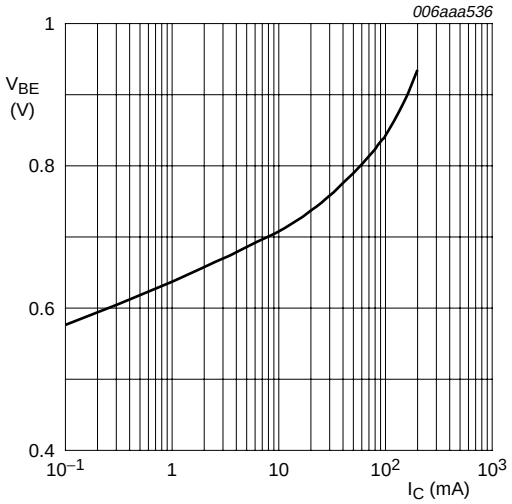
I_C/I_B = 20

(1) T_{amb} = 100 °C

(2) T_{amb} = 25 °C

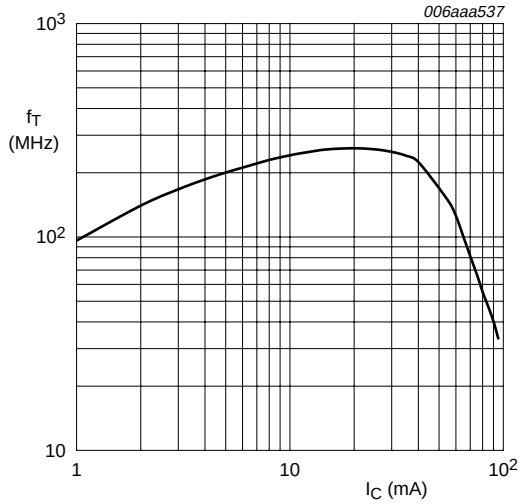
(3) T_{amb} = –55 °C

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



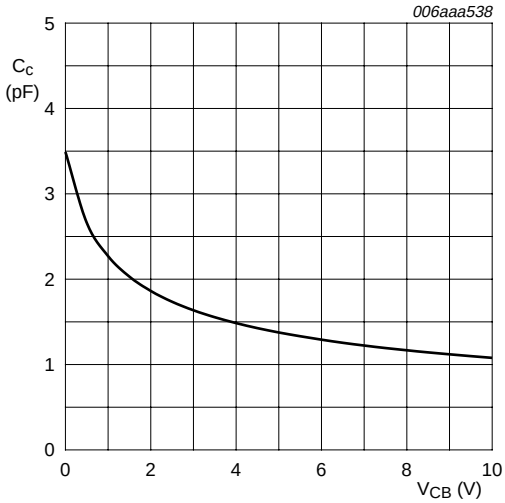
V_{CE} = 5 V; T_{amb} = 25 °C

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



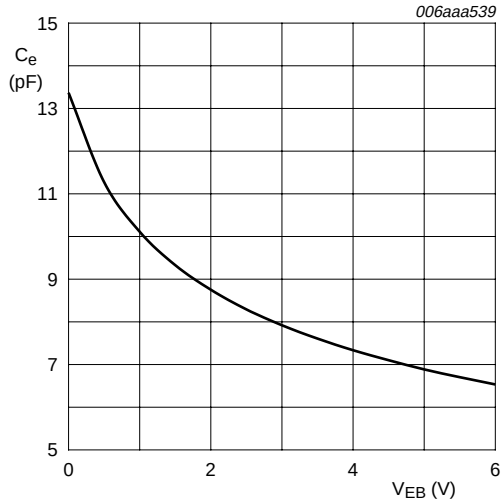
V_{CE} = 5 V; T_{amb} = 25 °C

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

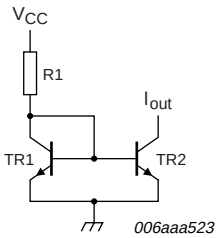


Fig 9. Current mirror

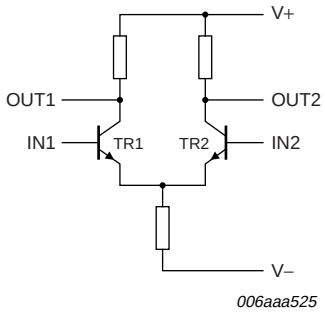


Fig 10. Differential amplifier

9. Package outline

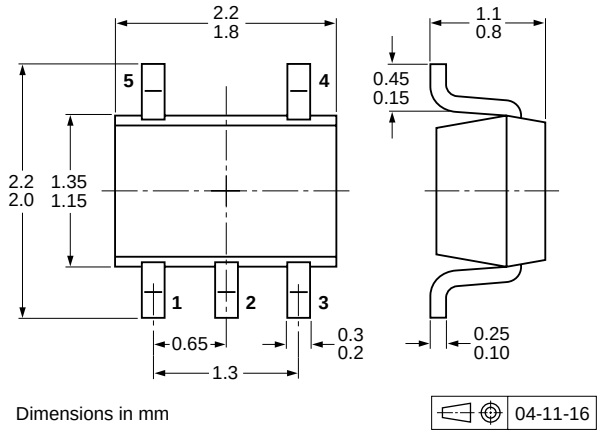


Fig 11. Package outline SOT353 (SC-88A)

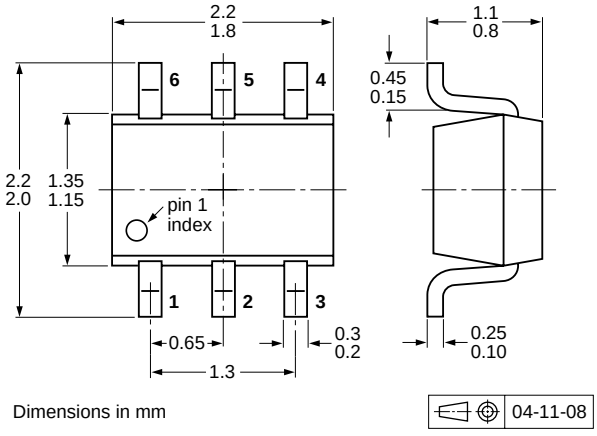


Fig 12. Package outline SOT363 (SC-88)

10. Packing information

Table 9: Packing methods

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

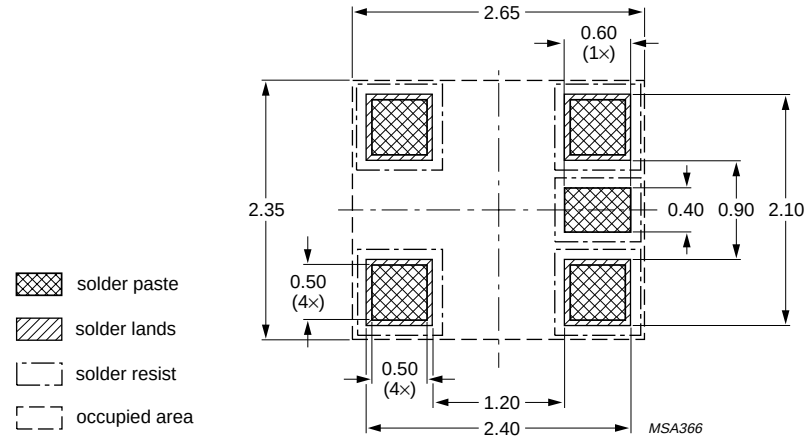
Type number	Package	Description		Packing quantity	
				3000	10000
PMP4501G	SOT353	4 mm pitch, 8 mm tape and reel		-115	-135
PMP4501Y	SOT363	4 mm pitch, 8 mm tape and reel; T1	[2]	-115	-135
		4 mm pitch, 8 mm tape and reel; T2	[3]	-125	-165

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

[2] T1: normal taping

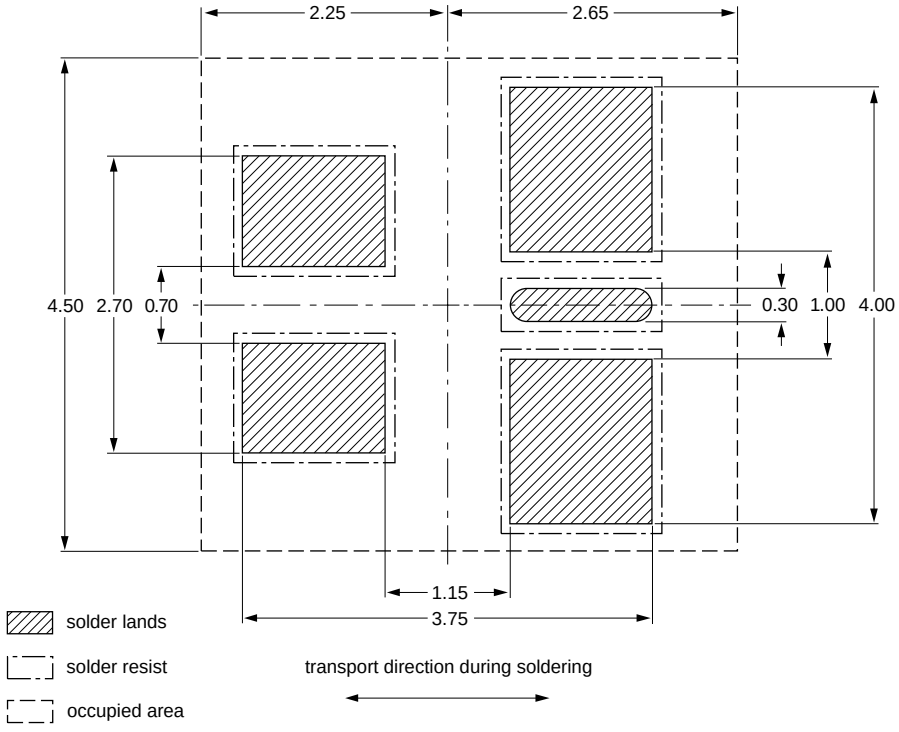
[3] T2: reverse taping

11. Soldering



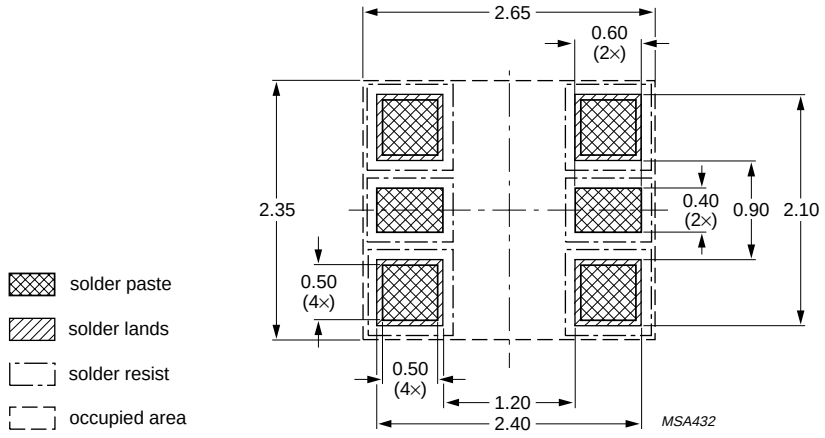
Dimensions in mm

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



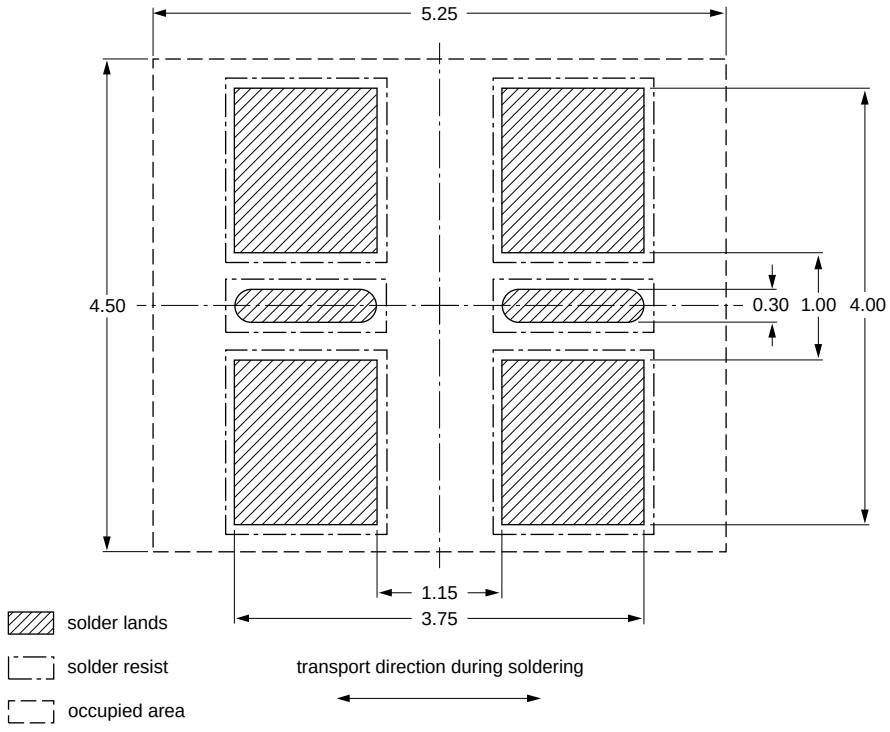
Dimensions in mm

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:	• Table 1 “Product overview”: value indication for h_{FE1}/h_{FE2} h_{FE} matching amended • Table 2 “Quick reference data”: value indication for h_{FE1}/h_{FE2} h_{FE} matching amended • Table 8 “Characteristics”: value indication for h_{FE1}/h_{FE2} h_{FE} matching amended				
PMP4501G_Y_1	20060202	Product data sheet	-	-	-

13. Data sheet status

Level	Data sheet status [1]	Product status [2] [3]	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.

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18. Contents

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