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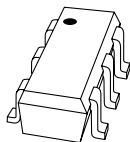
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Kind regards,

Team Nexperia



# PMBT3904YS

40 V, 200 mA NPN/NPN general-purpose double transistor

Rev. 01 — 12 May 2009

Product data sheet

## 1. Product profile

### 1.1 General description

NPN/NPN general-purpose double transistor in a SOT363 (SC-88) very small Surface-Mounted Device (SMD) plastic package.

Table 1. Product overview

Type number	Package		PNP/PNP complement	NPN/PNP complement	Package configuration
	NXP	JEITA			
PMBT3904YS	SOT363	SC-88	PMBT3906YS	PMBT3946YPN	very small

### 1.2 Features

- General-purpose double transistor
- Board-space reduction

### 1.3 Applications

- General-purpose switching and amplification

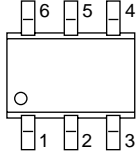
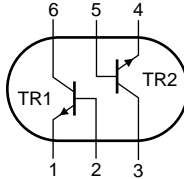
### 1.4 Quick reference data

Table 2. Quick reference data

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
<b>Per transistor</b>						
$V_{CEO}$	collector-emitter voltage	open base	-	-	40	V
$I_C$	collector current		-	-	200	mA
$h_{FE}$	DC current gain	$V_{CE} = 1\text{ V};$ $I_C = 10\text{ mA}$	100	180	300	

## 2. Pinning information

**Table 3. Pinning**

Pin	Description	Simplified outline	Graphic symbol
1	emitter TR1		
2	base TR1		
3	collector TR2		
4	emitter TR2		
5	base TR2		
6	collector TR1		

*sym020*

## 3. Ordering information

**Table 4. Ordering information**

Type number	Package		Version
	Name	Description	
PMBT3904YS	SC-88	plastic surface-mounted package; 6 leads	SOT363

## 4. Marking

**Table 5. Marking codes**

Type number	Marking code <sup>[1]</sup>
PMBT3904YS	BC*

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

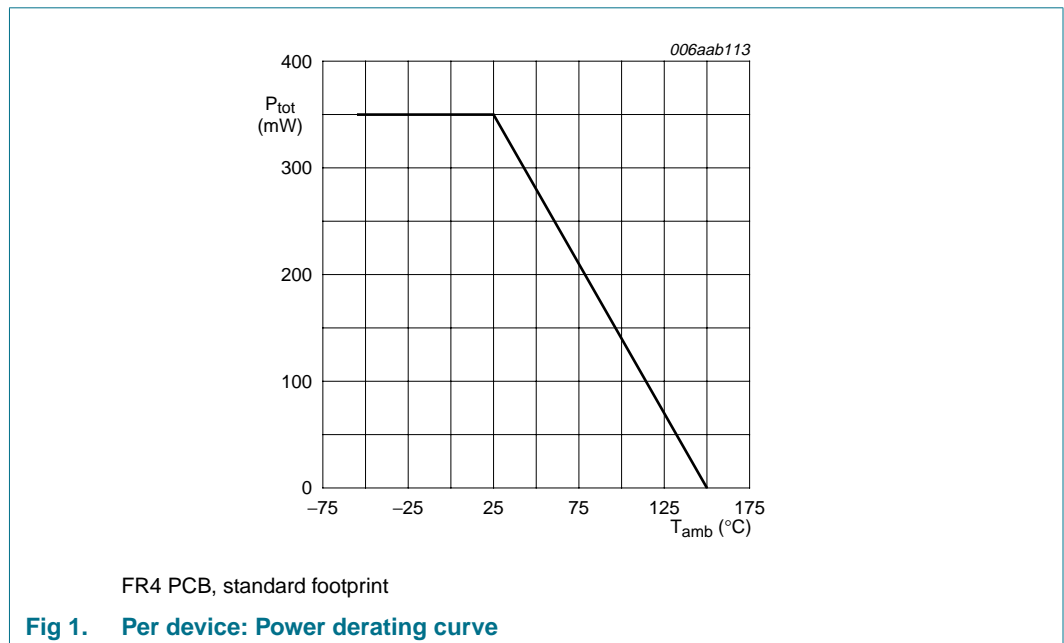
**5. Limiting values**

**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	-	60	V
$V_{CEO}$	collector-emitter voltage	open base	-	40	V
$V_{EBO}$	emitter-base voltage	open collector	-	6	V
$I_C$	collector current		-	200	mA
$I_{CM}$	peak collector current	single pulse; $t_p \leq 1$ ms	-	200	mA
$I_{BM}$	peak base current	single pulse; $t_p \leq 1$ ms	-	100	mA
$P_{tot}$	total power dissipation	$T_{amb} \leq 25$ °C	[1]	230	mW
<b>Per device</b>					
$P_{tot}$	total power dissipation	$T_{amb} \leq 25$ °C	[1]	350	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.

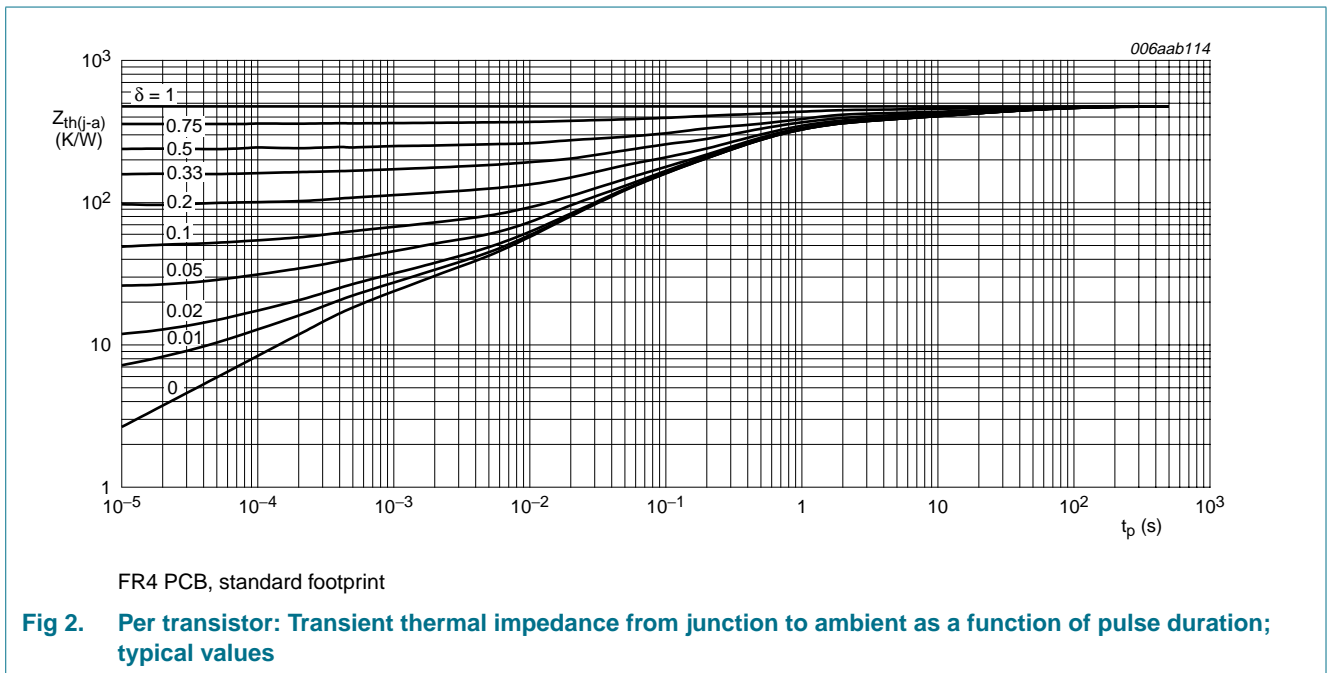


## 6. Thermal characteristics

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]	-	543	K/W
$R_{th(j-sp)}$	thermal resistance from junction to solder point		-	-	290	K/W
<b>Per device</b>						
$R_{th(j-a)}$	thermal resistance from junction to ambient	in free air	[1]	-	357	K/W

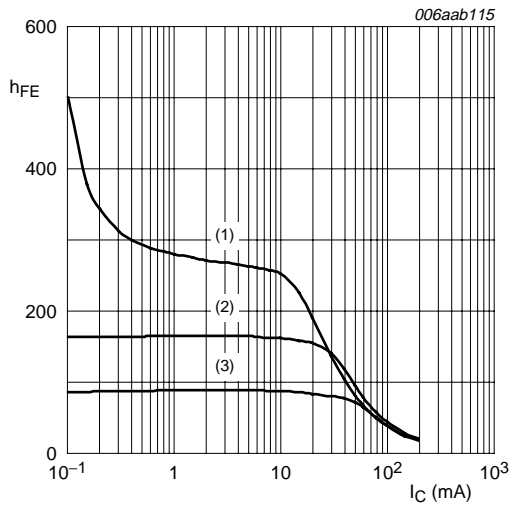
[1] Device mounted on an FR4 PCB, single-sided copper, tin-plated and standard footprint.



## 7. Characteristics

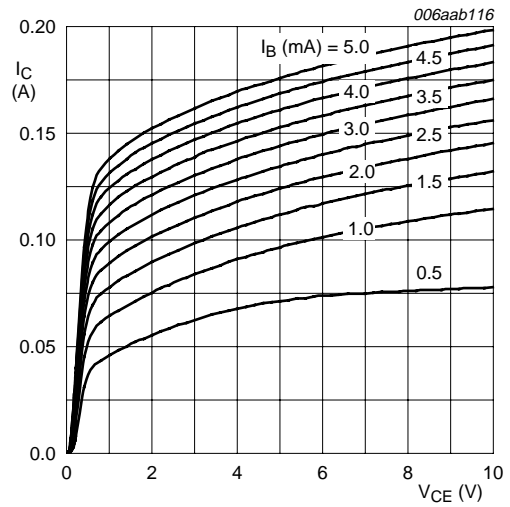
**Table 8. Characteristics**
*T<sub>amb</sub> = 25 °C unless otherwise specified.*

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
<b>Per transistor</b>						
I <sub>CBO</sub>	collector-base cut-off current	V <sub>CB</sub> = 30 V; I <sub>E</sub> = 0 A	-	-	50	nA
I <sub>EBO</sub>	emitter-base cut-off current	V <sub>EB</sub> = 6 V; I <sub>C</sub> = 0 A	-	-	50	nA
h <sub>FE</sub>	DC current gain	V <sub>CE</sub> = 1 V				
		I <sub>C</sub> = 0.1 mA	60	180	-	
		I <sub>C</sub> = 1 mA	80	180	-	
		I <sub>C</sub> = 10 mA	100	180	300	
		I <sub>C</sub> = 50 mA	60	105	-	
V <sub>CEsat</sub>	collector-emitter saturation voltage	I <sub>C</sub> = 10 mA; I <sub>B</sub> = 1 mA	-	75	200	mV
		I <sub>C</sub> = 50 mA; I <sub>B</sub> = 5 mA	-	120	300	mV
V <sub>BEsat</sub>	base-emitter saturation voltage	I <sub>C</sub> = 10 mA; I <sub>B</sub> = 1 mA	650	750	850	mV
		I <sub>C</sub> = 50 mA; I <sub>B</sub> = 5 mA	-	850	950	mV
f <sub>T</sub>	transition frequency	V <sub>CE</sub> = 20 V; I <sub>C</sub> = 10 mA; f = 100 MHz	300	-	-	MHz
C <sub>c</sub>	collector capacitance	V <sub>CB</sub> = 5 V; I <sub>E</sub> = i <sub>e</sub> = 0 A; f = 1 MHz	-	-	4	pF
C <sub>e</sub>	emitter capacitance	V <sub>BE</sub> = 0.5 V; I <sub>C</sub> = i <sub>c</sub> = 0 A; f = 1 MHz	-	-	8	pF
NF	noise figure	V <sub>CE</sub> = 5 V; I <sub>C</sub> = 100 μA; R <sub>S</sub> = 1 kΩ; f = 10 Hz to 15.7 kHz	-	-	5	dB
t <sub>d</sub>	delay time	V <sub>CC</sub> = 3 V; I <sub>C</sub> = 10 mA;	-	-	35	ns
t <sub>r</sub>	rise time	I <sub>Bon</sub> = 1 mA; I <sub>Boff</sub> = -1 mA	-	-	35	ns
t <sub>on</sub>	turn-on time		-	-	70	ns
t <sub>s</sub>	storage time		-	-	200	ns
t <sub>f</sub>	fall time		-	-	50	ns
t <sub>off</sub>	turn-off time		-	-	250	ns



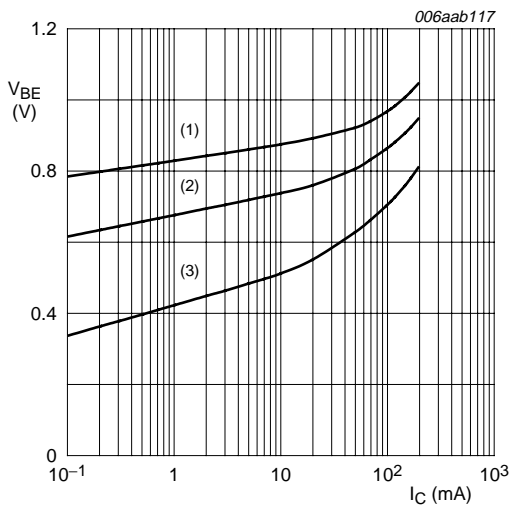
$V_{CE} = 1\text{ V}$   
 (1)  $T_{amb} = 150\text{ }^{\circ}\text{C}$   
 (2)  $T_{amb} = 25\text{ }^{\circ}\text{C}$   
 (3)  $T_{amb} = -55\text{ }^{\circ}\text{C}$

**Fig 3. DC current gain as a function of collector current; typical values**



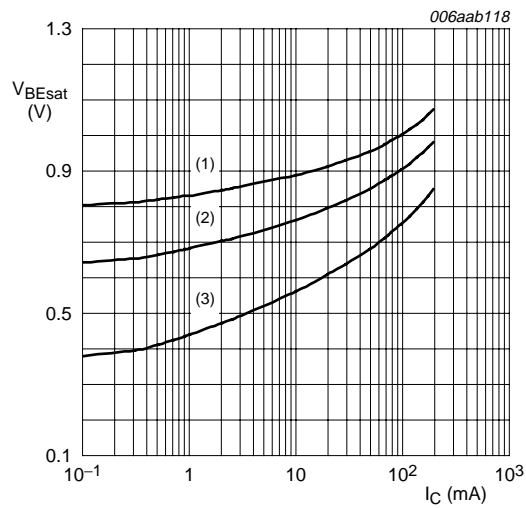
$T_{amb} = 25\text{ }^{\circ}\text{C}$

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



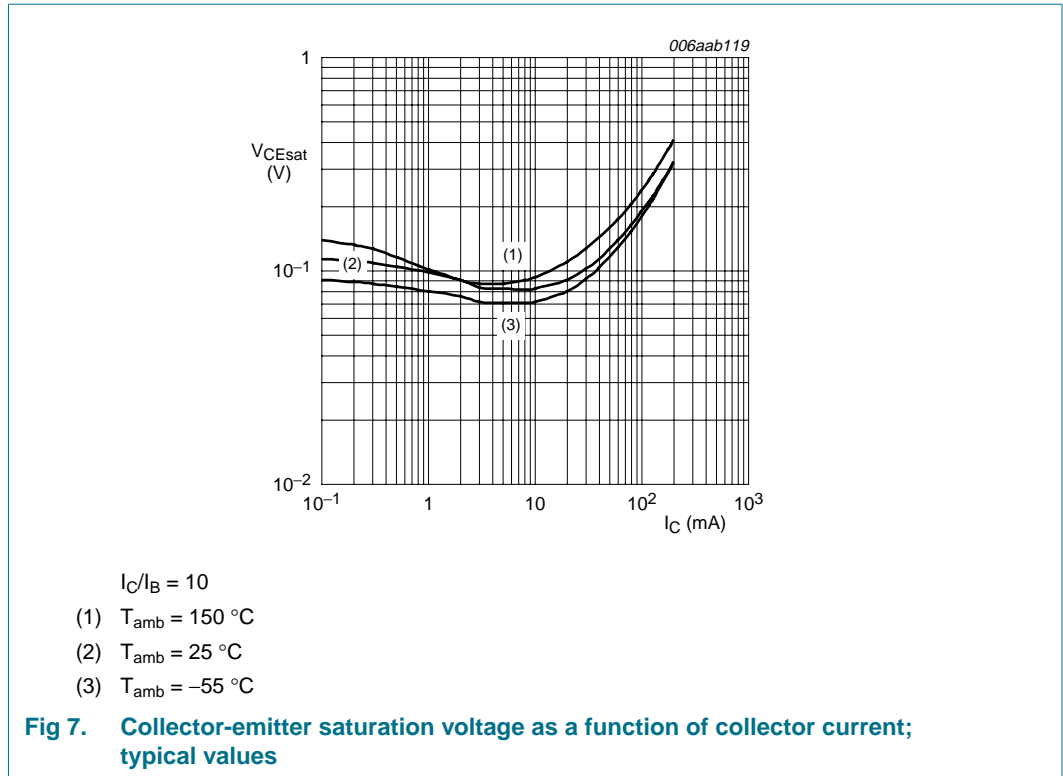
$V_{CE} = 1\text{ V}$   
 (1)  $T_{amb} = -55\text{ }^{\circ}\text{C}$   
 (2)  $T_{amb} = 25\text{ }^{\circ}\text{C}$   
 (3)  $T_{amb} = 150\text{ }^{\circ}\text{C}$

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

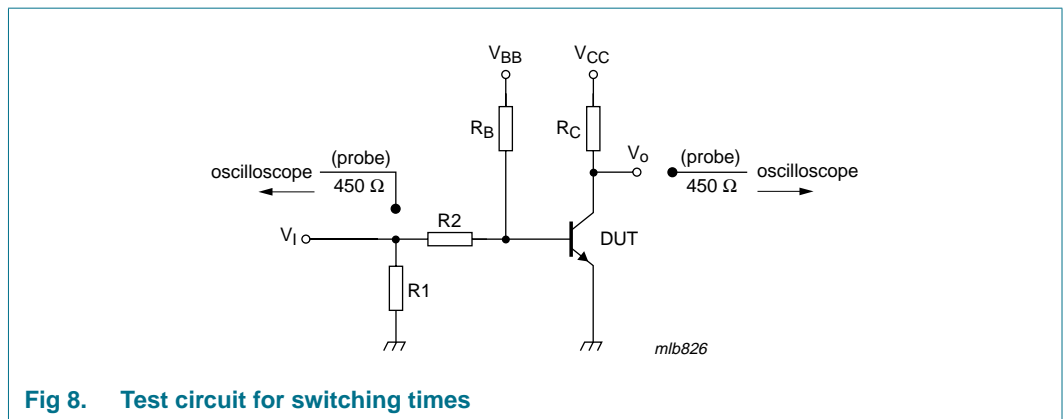


$I_C/I_B = 10$   
 (1)  $T_{amb} = -55\text{ }^{\circ}\text{C}$   
 (2)  $T_{amb} = 25\text{ }^{\circ}\text{C}$   
 (3)  $T_{amb} = 150\text{ }^{\circ}\text{C}$

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

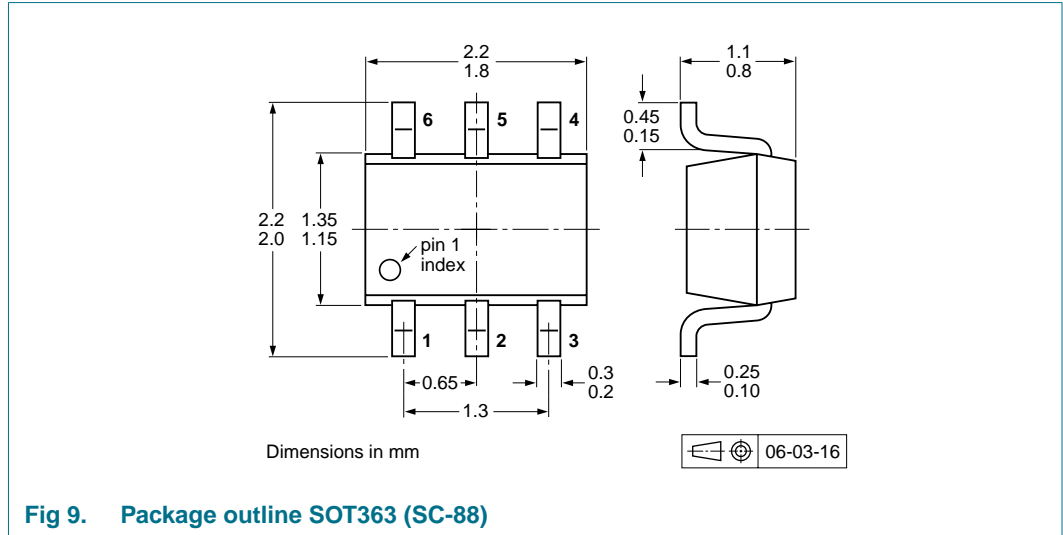


## 8. Test information





**9. Package outline**



**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	10000
PMBT3904YS	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 14](#).

[2] T1: normal taping

[3] T2: reverse taping

11. Soldering

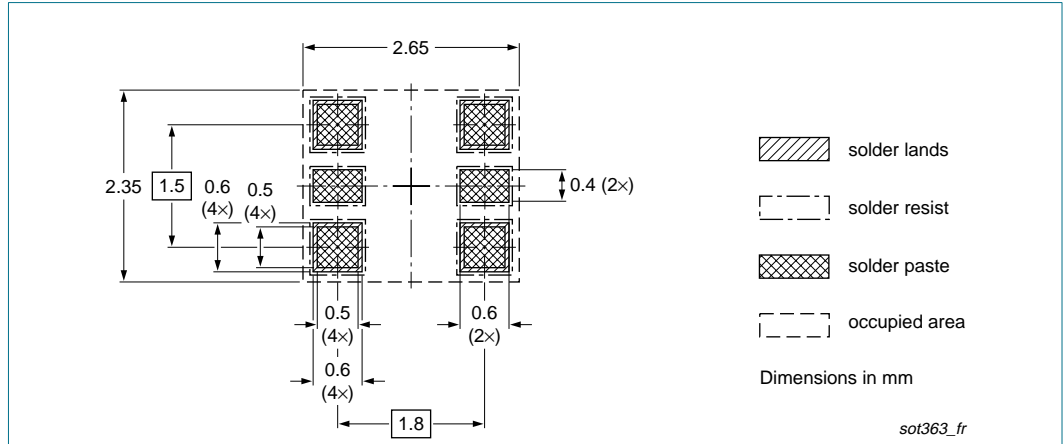


Fig 10. Reflow soldering footprint SOT363 (SC-88)

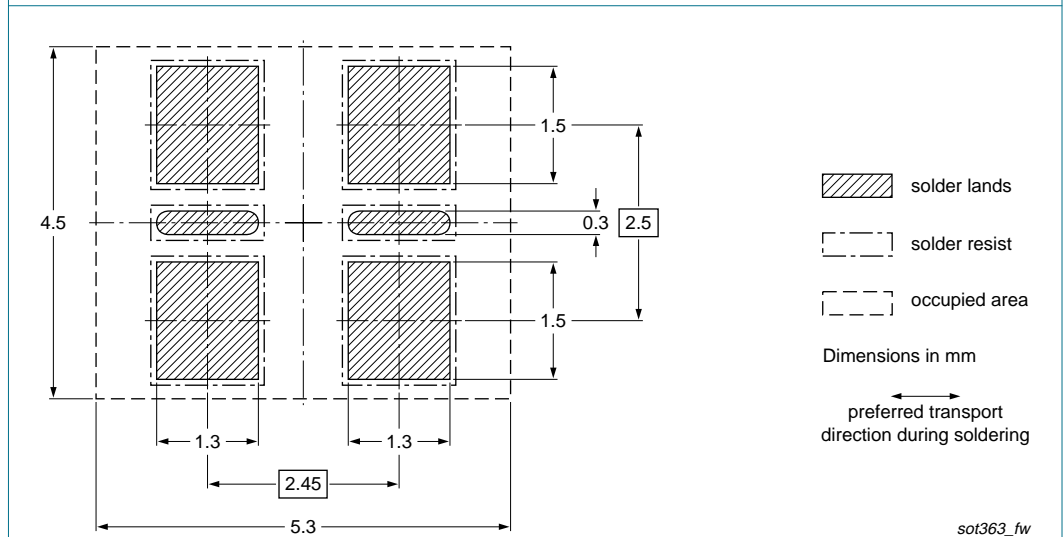


Fig 11. Wave soldering footprint SOT363 (SC-88)

## 12. Revision history

Table 10. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
PMBT3904YS_1	20090512	Product data sheet	-	-

## 13. Legal information

### 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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