PMBT2222AYS

40 V, 600 mA, double NPN switching transistor

24 June 2015 — Product data sheet

1. General description

Double NPN switching transistor in a very small SOT363 (TSSOP6) Surface-Mounted Device (SMD) plastic package.

Double PNP complement: PMBT2907AYS

2. Features and benefits

- Double general-purpose switching transistor
- High current (max. 600 mA)
- Voltage max. 40 V
- AEC-Q101 qualified

3. Applications

- Switching and linear amplification

4. Quick reference data

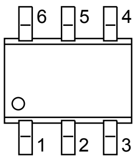
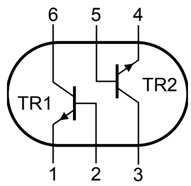
Table 1. Quick reference data

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
Per transistor							
V_{CEO}	collector-emitter voltage	open base		-	-	40	V
I_C	collector current			-	-	600	mA
Per transistor							
h_{FE}	DC current gain	V_{CE} = 10 V; I_C = 150 mA; $t_p \leq$ 300 µs; $\delta \leq$ 0.02; T_{amb} = 25 °C		100	-	300	
		V_{CE} = 10 V; I_C = 500 mA; $t_p \leq$ 300 µs; $\delta \leq$ 0.02; T_{amb} = 25 °C		40	-	-	

nexperia

5. Pinning information

Table 2. Pinning information

Pin	Symbol	Description	Simplified outline	Graphic symbol
1	E	emitter TR1	 TSSOP6 (SOT363)	 sym020
2	B	base TR1		
3	C	collector TR2		
4	E	emitter TR2		
5	B	base TR2		
6	C	collector TR1		

6. Ordering information

Table 3. Ordering information

Type number	Package		
	Name	Description	Version
PMBT2222AYS	TSSOP6	plastic surface-mounted package; 6 leads	SOT363

7. Marking

Table 4. Marking codes

Type number	Marking code [1]
PMBT2222AYS	BF%

[1] % = placeholder for manufacturing site code

8. Limiting values

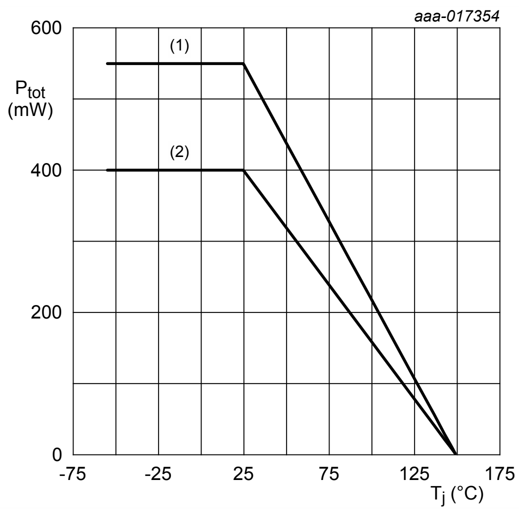
Table 5. Limiting values

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		-	75	V
V_{CEO}	collector-emitter voltage	open base		-	40	V
V_{EBO}	emitter-base voltage	open collector		-	6	V
I_C	collector current			-	600	mA
I_{CM}	peak collector current	single pulse; $t_p \leq 1$ ms		-	800	mA
I_{BM}	peak base current			-	200	mA
P_{tot}	total power dissipation	$T_{amb} \leq 25$ °C	[1]	-	250	mW
			[2]	-	300	mW
Per device						
P_{tot}	total power dissipation	$T_{amb} \leq 25$ °C	[1]	-	400	mW
			[2]	-	550	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.

[2] Device mounted on an FR4 PCB; single-sided copper; tin-plated and mounting pad for collector 1 cm^2.



(1) FR4 PCB; mounting pad for collector 1 cm^2

(2) FR4 PCB; standard footprint

Fig. 1. Per device: Power derating curves SOT363 (SC-88)

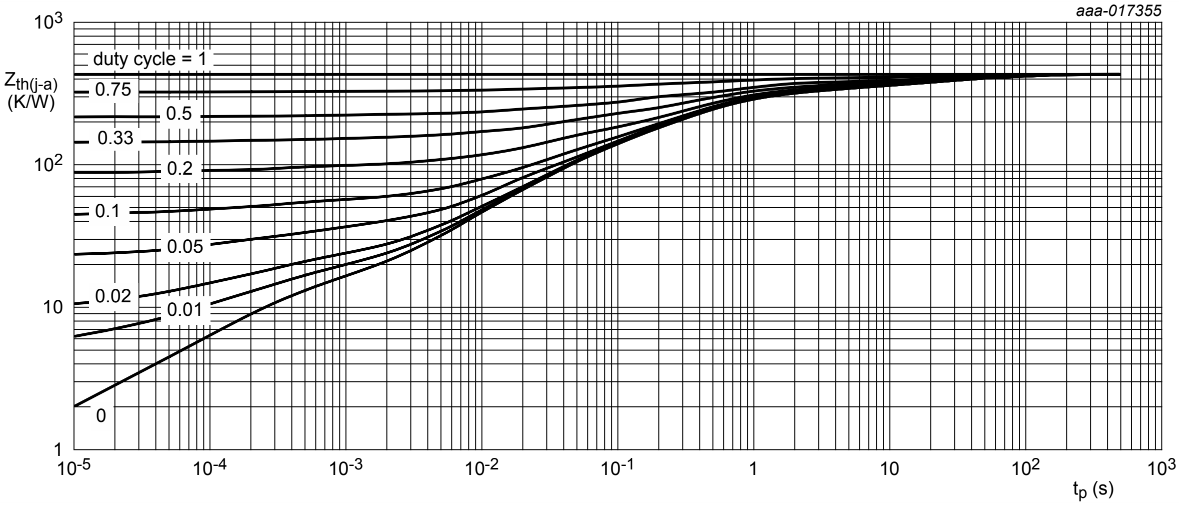
9. Thermal characteristics

Table 6. 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]	-	-	500	K/W
			[2]	-	-	417	K/W
Per device							
$R_{th(j-a)}$	thermal resistance from junction to ambient	in free air	[1]	-	-	313	K/W
			[2]	-	-	227	K/W

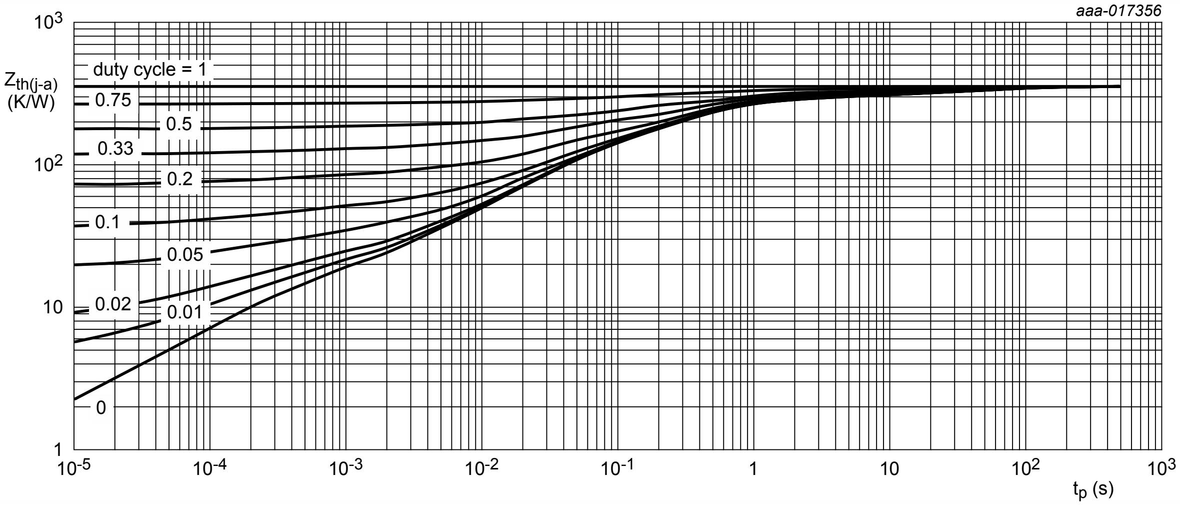
[1] Device mounted on an FR4 PCB; single-sided copper; tin-plated and standard footprint.

[2] Device mounted on an FR4 PCB; single-sided copper; tin-plated and mounting pad for collector 1 cm^2.



FR4 PCB, standard footprint

Fig. 2. Per transistor: Transient thermal impedance from junction to ambient as a function of pulse duration; typical values



FR4 PCB, mounting pad for collector 1 cm^2

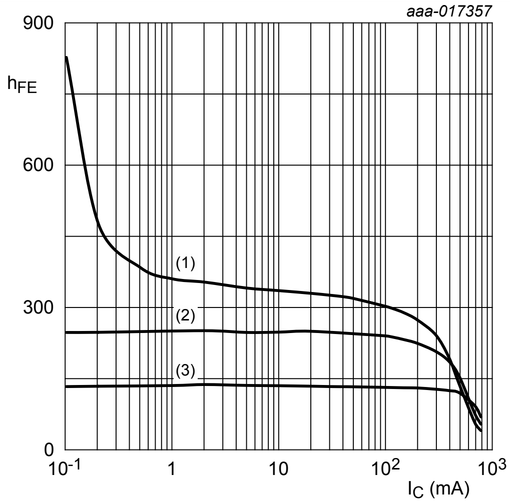
Fig. 3. Per Transistor: Transient thermal impedance from junction to ambient as a function of pulse duration; typical values

10. Characteristics

Table 7. Characteristics

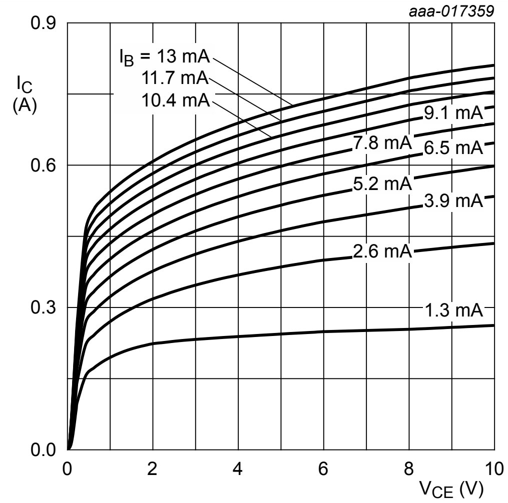
Symbol	Parameter	Conditions		Min	Typ	Max	Unit
Per transistor							
I_{CBO}	collector-base cut-off current	V_{CB} = 60 V; I_E = 0 A; T_{amb} = 25 °C		-	-	10	nA
		V_{CB} = 60 V; I_E = 0 A; T_j = 125 °C		-	-	10	µA
I_{EBO}	emitter-base cut-off current	V_{EB} = 5 V; I_C = 0 A; T_{amb} = 25 °C		-	-	10	nA
h_{FE}	DC current gain	V_{CE} = 10 V; I_C = 0.1 mA; T_{amb} = 25 °C		35	-	-	
		V_{CE} = 10 V; I_C = 1 mA; T_{amb} = 25 °C		50	-	-	
		V_{CE} = 10 V; I_C = 10 mA; T_{amb} = 25 °C		75	-	-	
		V_{CE} = 10 V; I_C = 150 mA; t_p ≤ 300 µs; δ ≤ 0.02; T_{amb} = 25 °C		100	-	300	
		V_{CE} = 1 V; I_C = 150 mA; t_p ≤ 300 µs; δ ≤ 0.02; T_{amb} = 25 °C		50	-	-	
		V_{CE} = 10 V; I_C = 500 mA; t_p ≤ 300 µs; δ ≤ 0.02; T_{amb} = 25 °C		40	-	-	
V_{CEsat}	collector-emitter saturation voltage	I_C = 150 mA; I_B = 15 mA; t_p ≤ 300 µs; δ ≤ 0.02; T_{amb} = 25 °C		-	-	300	mV
		I_C = 500 mA; I_B = 50 mA; t_p ≤ 300 µs; δ ≤ 0.02; T_{amb} = 25 °C		-	-	1	V
V_{BEsat}	base-emitter saturation voltage	I_C = 150 mA; I_B = 15 mA; t_p ≤ 300 µs; δ ≤ 0.02; T_{amb} = 25 °C		0.6	-	1.2	V
		I_C = 500 mA; I_B = 50 mA; t_p ≤ 300 µs; δ ≤ 0.02; T_{amb} = 25 °C		-	-	2	V
t_d	delay time	I_C = 150 mA; I_{Bon} = 15 mA; I_{Boff} = -15 mA; T_{amb} = 25 °C		-	-	10	ns
t_r	rise time			-	-	25	ns
t_{on}	turn-on time			-	-	35	ns
t_s	storage time			-	-	200	ns
t_f	fall time			-	-	60	ns
t_{off}	turn-off time			-	-	250	ns
C_C	collector capacitance	V_{CB} = 10 V; I_E = 0 A; i_e = 0 A; f = 1 MHz; T_{amb} = 25 °C		-	-	8	pF
C_E	emitter capacitance	V_{EB} = 500 mV; I_C = 0 A; f = 1 MHz; T_{amb} = 25 °C		-	-	25	pF
f_T	transition frequency	V_{CE} = 20 V; I_C = 20 mA; f = 100 MHz; T_{amb} = 25 °C		300	-	-	MHz

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
NF	noise figure	V_{CE} = 5 V; I_C = 100 μA; R_S = 1 kΩ; f = 1 kHz		-	-	4	dB



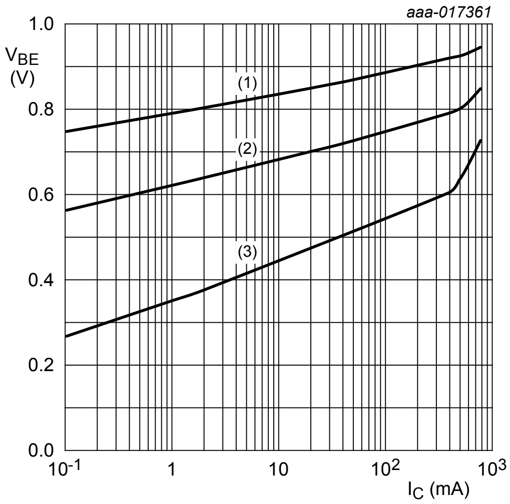
V_{CE} = 10 V
(1) T_{amb} = 100 °C
(2) T_{amb} = 25 °C
(3) T_{amb} = −55 °C

Fig. 4. DC current gain as a function of collector current; typical values



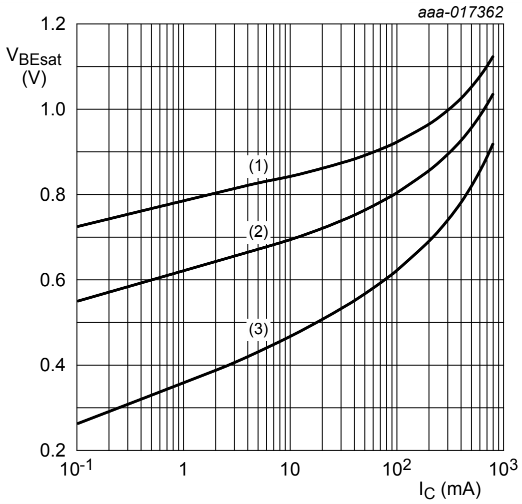
T_{amb} = 25 °C

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



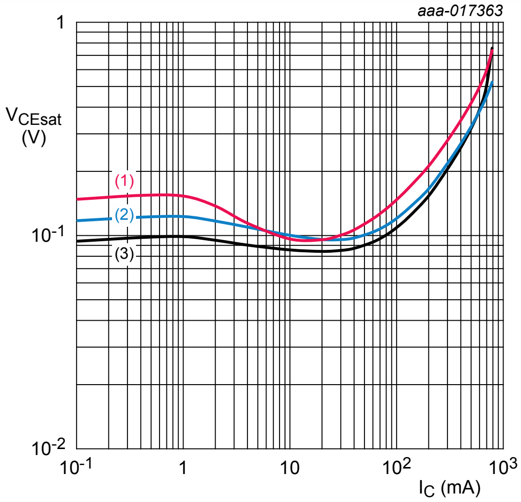
V_{CE} = 10 V
(1) T_{amb} = −55 °C
(2) T_{amb} = 25 °C
(3) T_{amb} = 150 °C

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



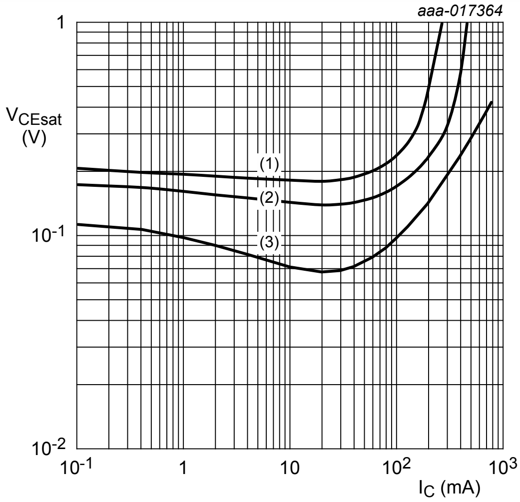
I_C/I_B = 10
(1) T_{amb} = −55 °C
(2) T_{amb} = 25 °C
(3) T_{amb} = 150 °C

Fig. 7. Base-emitter saturation voltage as a function of collector current; typical values



$I_C/I_B = 20$
(1) T_{amb} = 150 °C
(2) T_{amb} = 25 °C
(3) T_{amb} = −55 °C

Fig. 8. Collector-emitter saturation voltage as a function of collector current; typical values



T_{amb} = 25 °C
(1) $I_C/I_B = 100$
(2) $I_C/I_B = 50$
(3) $I_C/I_B = 10$

Fig. 9. Collector-emitter saturation voltage as a function of collector current; typical values

11. Test information

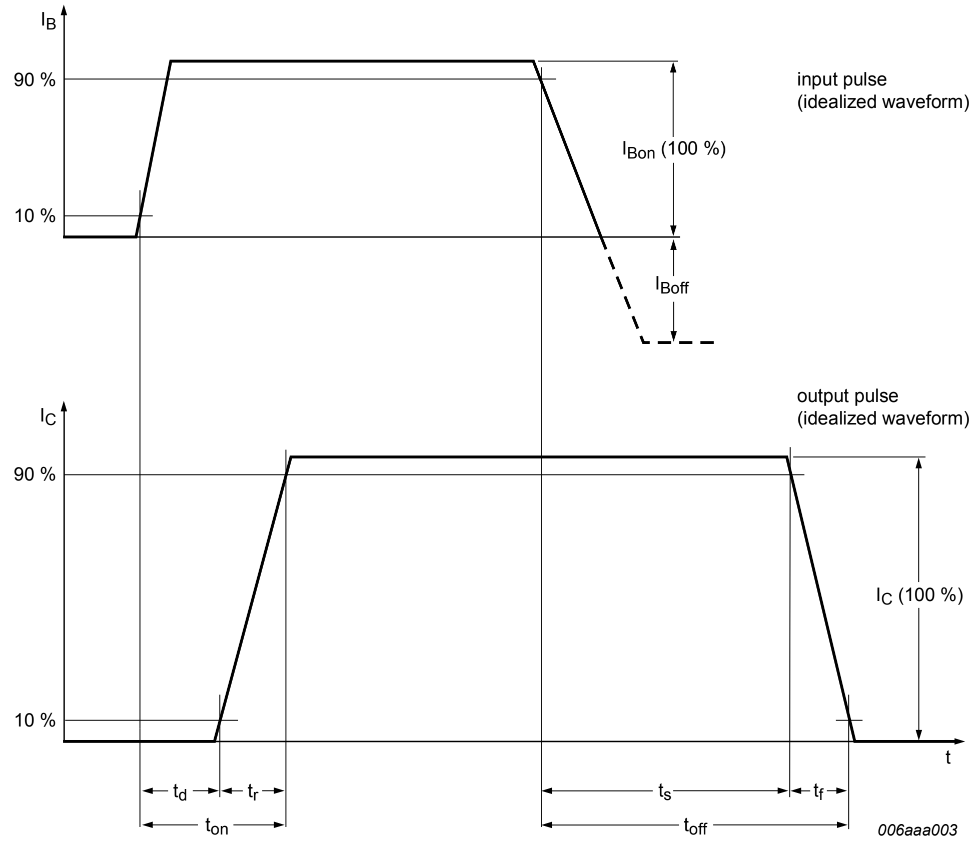


Fig. 10. BISS transistor switching time definition

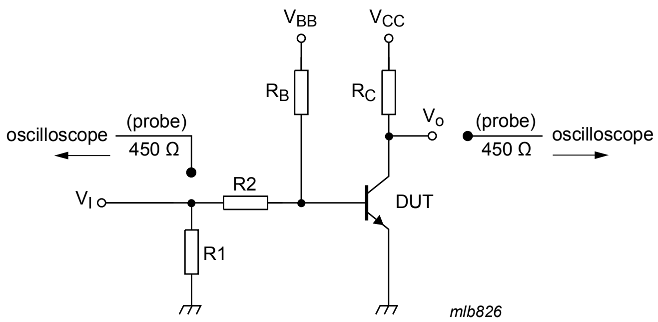


Fig. 11. Test circuit for switching times

11.1 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.

12. Package outline

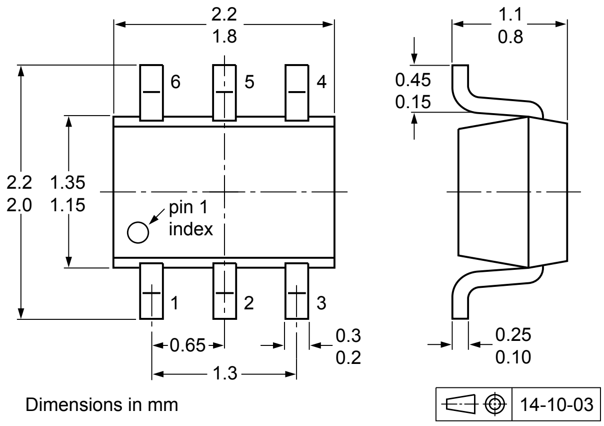


Fig. 12. Package outline TSSOP6 (SOT363)

13. Soldering

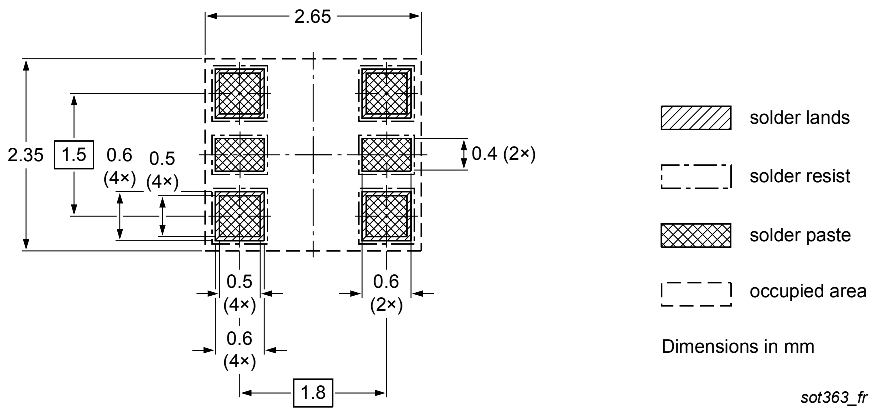


Fig. 13. Reflow soldering footprint for TSSOP6 (SOT363)

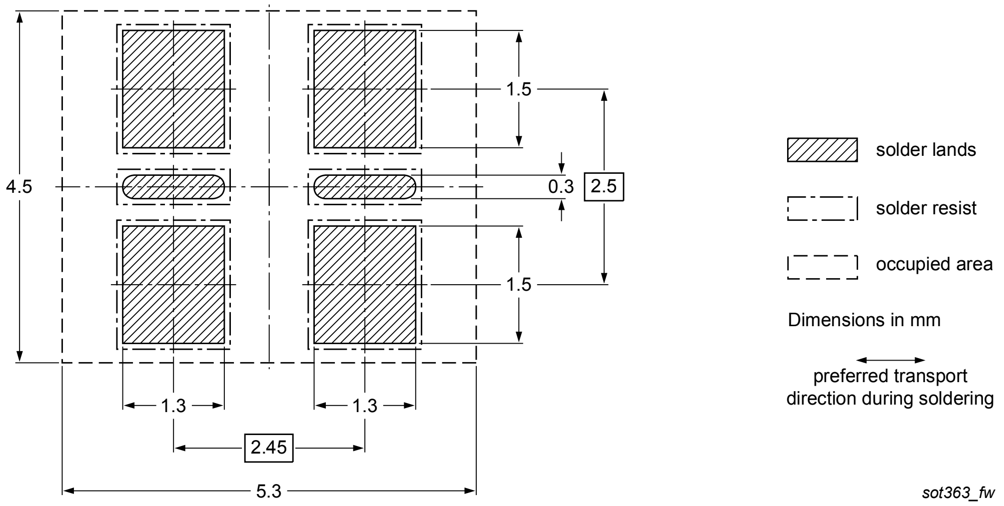


Fig. 14. Wave soldering footprint for TSSOP6 (SOT363)

14. Revision history

Table 8. Revision history

Data sheet ID	Release date	Data sheet status	Change notice	Supersedes
PMBT2222AYS v.1	20150624	Product data sheet	-	-

15. Legal information

15.1 Data sheet status

Document status [1][2]	Product status [3]	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.

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[2] The term 'short data sheet' is explained in section "Definitions".
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16. Contents

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