PBSS4240X

40 V, 2 A NPN low VCEsat (BISS) transistor

15 October 2012 Product data sheet

1. Product profile

1.1 General description

NPN low V_{CEsat} Breakthrough In Small Signal (BISS) transistor in a medium power and flat lead SOT89 Surface-Mounted Device (SMD) plastic package. PNP complement: PBSS5240X.

1.2 Features and benefits

- Low collector-emitter saturation voltage V_{CEsat}
- High collector current capability I_C and I_{CM}
- High efficiency due to less heat generation

1.3 Applications

- DC-to-DC conversion
- Supply line switching
- Battery charger
- LCD backlighting
- Driver in low supply voltage applications (e.g. lamps and LEDs)
- Inductive load driver (e.g. relays, buzzers and motors)

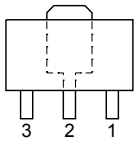
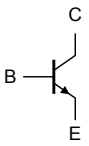
1.4 Quick reference data

Table 1. Quick reference data

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
V_{CEO}	collector-emitter voltage	open base		-	-	40	V
I_C	collector current			-	-	2	A
I_{CM}	peak collector current			-	-	3	A
R_{CEsat}	collector-emitter saturation resistance	I_C = 1 A; I_B = 100 mA; pulsed; $t_p \leq 300$ µs; $\delta \leq 0.02$; T_{amb} = 25 °C		-	-	260	mΩ
I_{CRM}	repetitive peak collector current	$t_p \leq 20$ ms; $\delta \leq 0.33$; pulsed		-	-	2.5	A

2. Pinning information

Table 2. Pinning information

Pin	Symbol	Description	Simplified outline	Graphic symbol
1	E	emitter	 SOT89	 sym123
2	C	collector		
3	B	base		

3. Ordering information

Table 3. Ordering information

Type number	Package		
	Name	Description	Version
PBSS4240X	SOT89	plastic surface-mounted package; die pad for good heat transfer; 3 leads	SOT89

4. Marking

Table 4. Marking codes

Type number	Marking code
PBSS4240X	S47

5. Limiting values

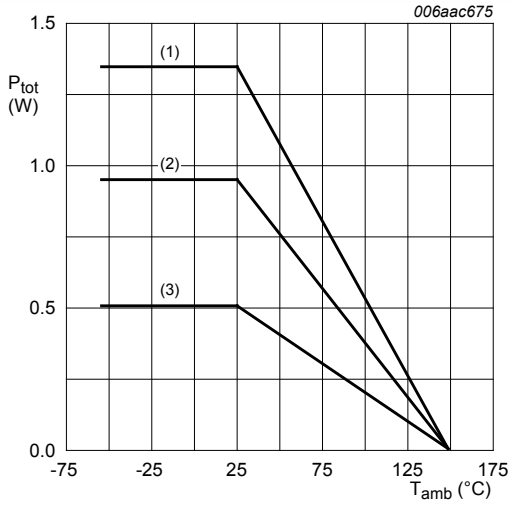
Table 5. Limiting values

In accordance with the Absolute Maximum Rating System (IEC 60134).

Symbol	Parameter	Conditions		Min	Max	Unit
V_{CBO}	collector-base voltage	open emitter		-	40	V
V_{CEO}	collector-emitter voltage	open base		-	40	V
V_{EBO}	emitter-base voltage	open collector		-	5	V
I_C	collector current			-	2	A
I_{CRM}	repetitive peak collector current	$\delta \leq 0.33$; $t_p \leq 20$ ms; pulsed		-	2.5	A
I_{CM}	peak collector current			-	3	A
I_B	base current			-	300	mA
I_{BM}	peak base current			-	1	A
P_{tot}	total power dissipation		[1]	-	0.5	W
			[2]	-	0.95	W

Symbol	Parameter	Conditions		Min	Max	Unit
			[3]	-	1.35	W
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 PCB, single-sided copper, tin-plated and standard footprint.
[2] Device mounted on an FR4 PCB, single-sided copper, tin-plated, mounting pad for collector 1 cm^2.
[3] Device mounted on an FR4 PCB, single-sided copper, tin-plated, mounting pad for collector 6 cm^2.



(1) FR4 PCB, mounting pad for collector 6 cm^2
(2) FR4 PCB, mounting pad for collector 1 cm^2
(3) FR4 PCB, standard footprint

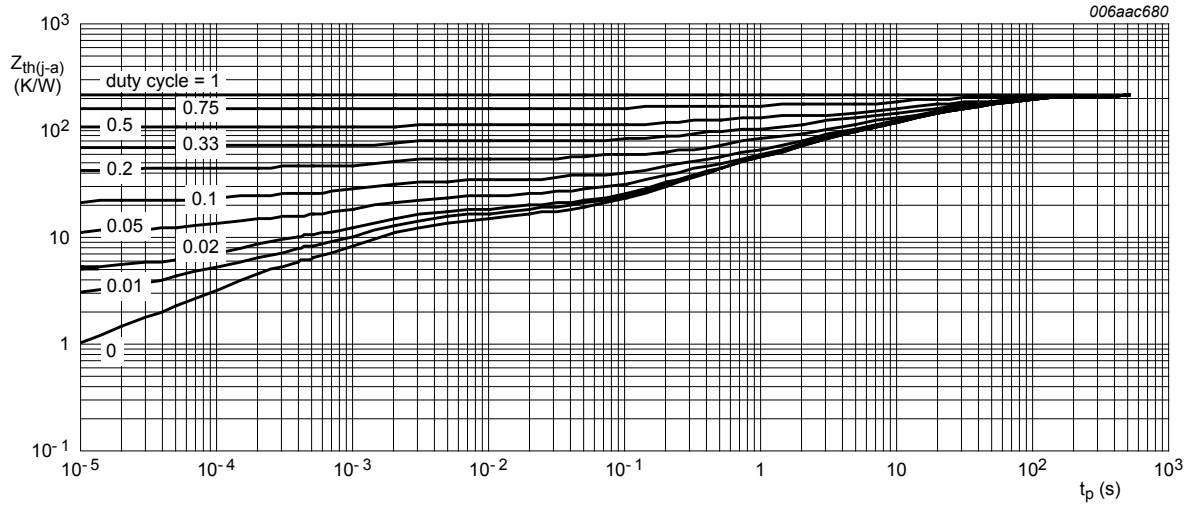
Fig. 1. Power derating curves

6. Thermal characteristics

Table 6. Thermal characteristics

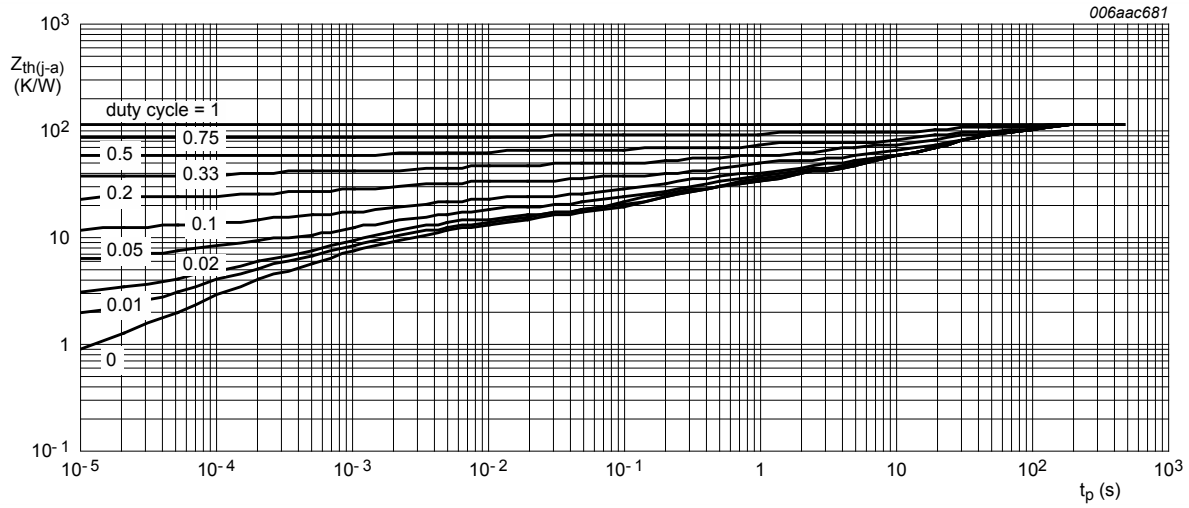
Symbol	Parameter	Conditions		Min	Typ	Max	Unit
$R_{th(j-a)}$	thermal resistance from junction to ambient	in free air	[1]	-	-	250	K/W
			[2]	-	-	132	K/W
			[3]	-	-	93	K/W
$R_{th(j-sp)}$	thermal resistance from junction to solder point			-	-	16	K/W

[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, mounting pad for collector 1 cm^2.
[3] Device mounted on an FR4 PCB, single-sided copper, tin-plated, mounting pad for collector 6 cm^2.



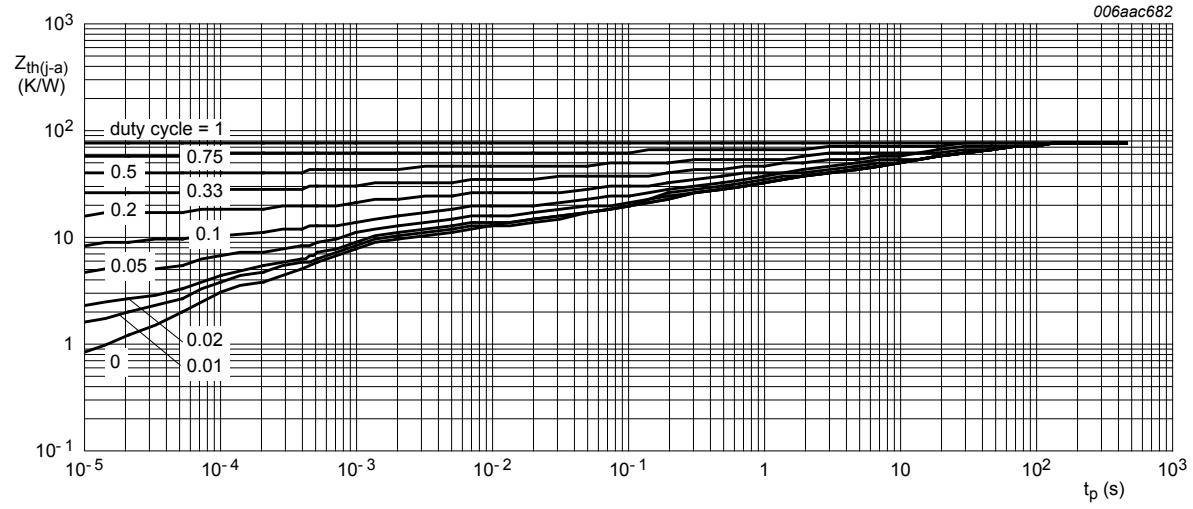
FR4 PCB, standard footprint

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



FR4 PCB, mounting pad for collector 6 cm^2

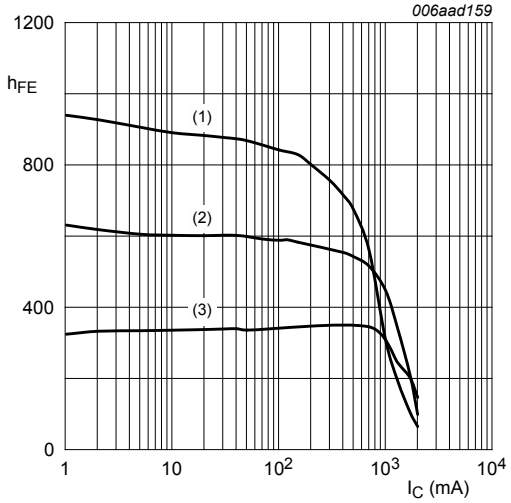
Fig. 4. Transient thermal impedance from junction to ambient as a function of pulse duration; typical values

7. Characteristics

Table 7. Characteristics

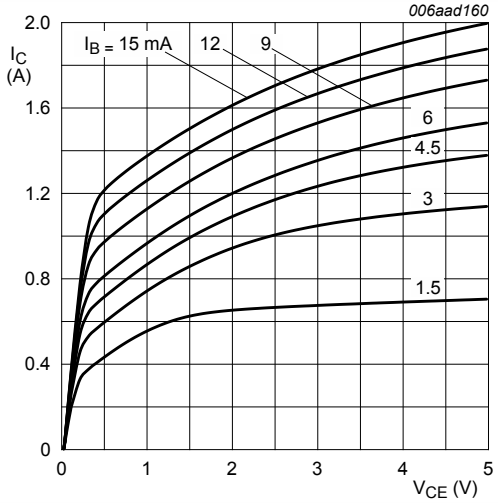
Symbol	Parameter	Conditions		Min	Typ	Max	Unit
I_{CBO}	collector-base cut-off current	V_{CB} = 40 V; I_E = 0 A; T_{amb} = 25 °C		-	-	100	nA
		V_{CB} = 40 V; I_E = 0 A; T_j = 150 °C		-	-	50	µA
I_{CEO}	collector-emitter cut-off current	V_{CE} = 30 V; I_B = 0 A; T_{amb} = 25 °C		-	-	100	nA
I_{EBO}	emitter-base cut-off current	V_{EB} = 5 V; I_C = 0 A; T_{amb} = 25 °C		-	-	100	nA
h_{FE}	DC current gain	V_{CE} = 5 V; I_C = 1 mA; T_{amb} = 25 °C		300	-	-	
		V_{CE} = 5 V; I_C = 500 mA; T_{amb} = 25 °C		300	-	900	
		V_{CE} = 5 V; I_C = 1 A; T_{amb} = 25 °C		200	-	-	
		V_{CE} = 5 V; I_C = 2 A; pulsed; $t_p \leq$ 300 µs; $\delta \leq$ 0.02 ; T_{amb} = 25 °C		75	-	-	
V_{CEsat}	collector-emitter saturation voltage	I_C = 100 mA; I_B = 1 mA; T_{amb} = 25 °C		-	-	80	mV
		I_C = 500 mA; I_B = 50 mA; T_{amb} = 25 °C		-	-	140	mV
		I_C = 1 A; I_B = 100 mA; pulsed; $t_p \leq$ 300 µs; $\delta \leq$ 0.02 ; T_{amb} = 25 °C		-	-	260	mV
		I_C = 2 A; I_B = 200 mA; pulsed; $t_p \leq$ 300 µs; $\delta \leq$ 0.02 ; T_{amb} = 25 °C		-	-	510	mV
R_{CEsat}	collector-emitter saturation resistance	I_C = 1 A; I_B = 100 mA; pulsed; $t_p \leq$ 300 µs; $\delta \leq$ 0.02 ; T_{amb} = 25 °C		-	-	260	mΩ

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
V_{BEsat}	base-emitter saturation voltage	I_C = 1 A; I_B = 100 mA; pulsed; $t_p \leq 300$ µs; $\delta \leq 0.02$; T_{amb} = 25 °C		-	-	1.2	V
V_{BEon}	base-emitter turn-on voltage	V_{CE} = 5 V; I_C = 1 A; pulsed; $t_p \leq 300$ µs; $\delta \leq 0.02$; T_{amb} = 25 °C		-	-	1.1	V
f_T	transition frequency	V_{CE} = 10 V; I_C = 50 mA; f = 100 MHz; T_{amb} = 25 °C		150	-	-	MHz
C_c	collector capacitance	V_{CB} = 10 V; I_E = 0 A; i_e = 0 A; f = 1 MHz; T_{amb} = 25 °C		-	-	10	pF



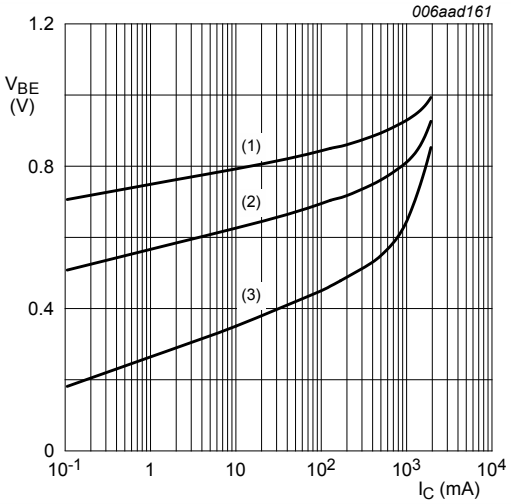
V_{CE} = 5 V
(1) T_{amb} = 150 °C
(2) T_{amb} = 25 °C
(3) T_{amb} = -55 °C

Fig. 5. DC current gain as a function of collector current; typical values



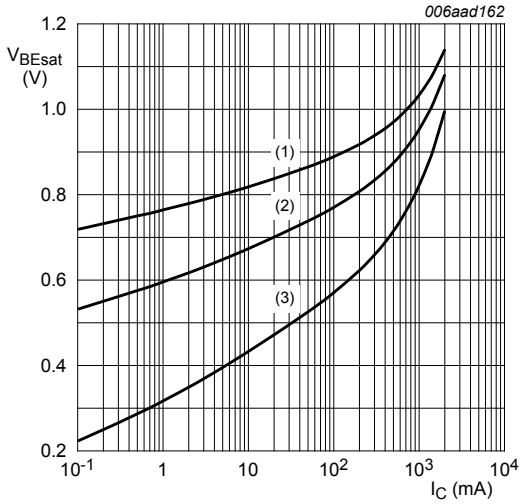
T_{amb} = 25 °C

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



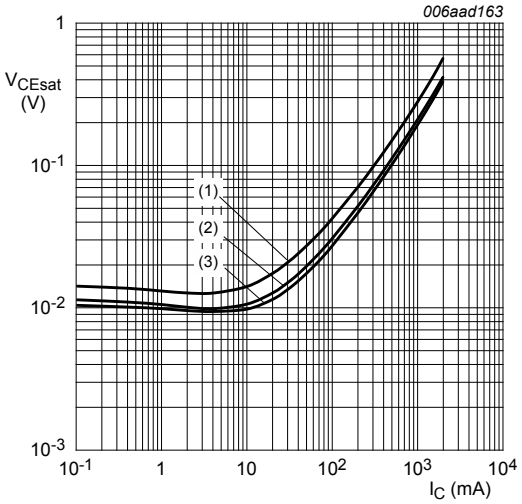
V_{CE} = 5 V
(1) T_{amb} = -55 °C
(2) T_{amb} = 25 °C
(3) T_{amb} = 150 °C

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



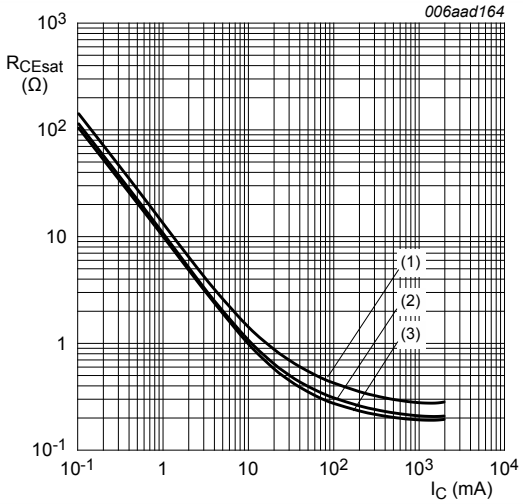
I_C/I_B = 20
(1) T_{amb} = -55 °C
(2) T_{amb} = 25 °C
(3) T_{amb} = 150 °C

Fig. 8. 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. 9. Collector-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. 10. Collector-emitter saturation resistance as a function of collector current; typical values

8. Package outline

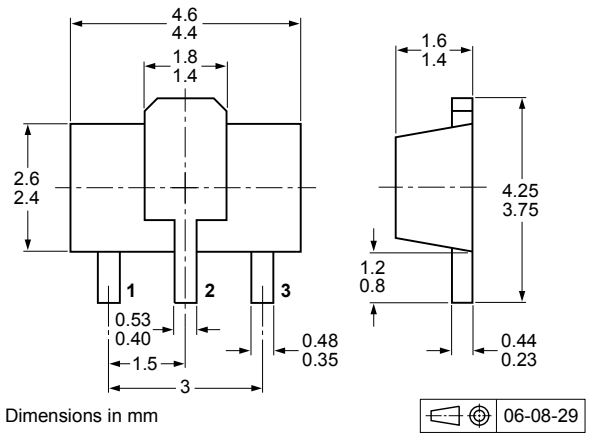


Fig. 11. Package outline SOT89

9. Soldering

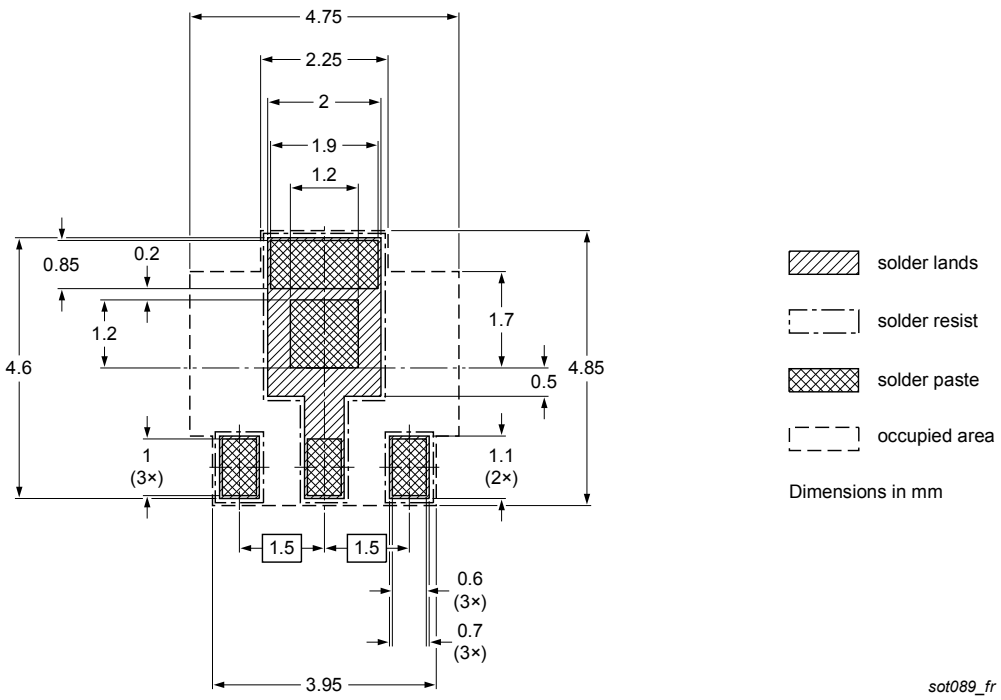


Fig. 12. Reflow soldering footprint for SOT89

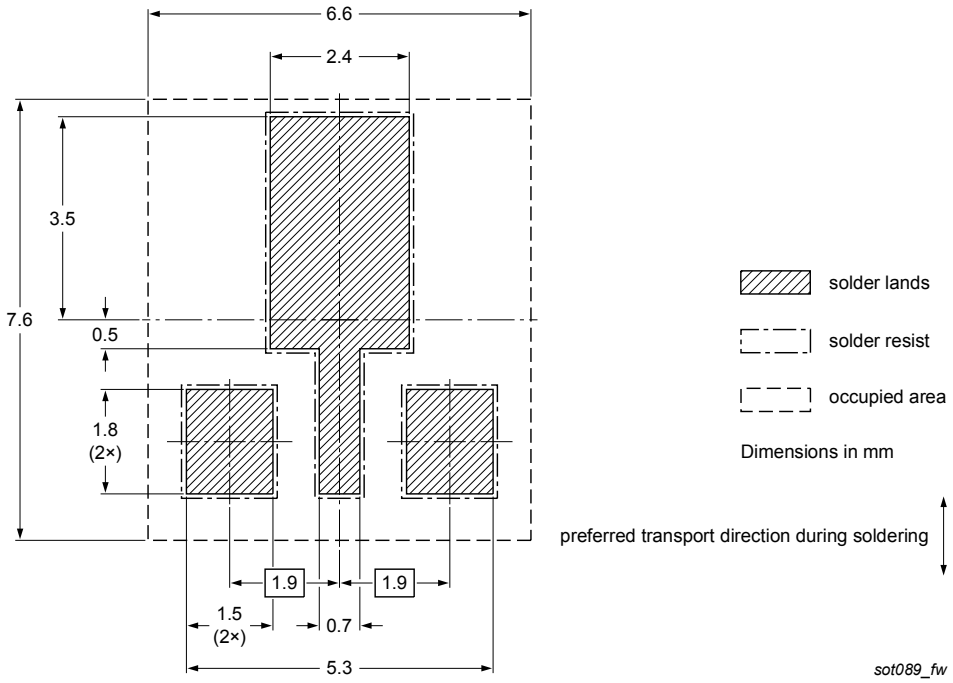


Fig. 13. Wave soldering footprint for SOT89

10. Revision history

Table 8. Revision history

Data sheet ID	Release date	Data sheet status	Change notice	Supersedes
PBSS4240X v.1	20121015	Product data sheet	-	-

11. Legal information

11.1 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.
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Date of release: 15 October 2012

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