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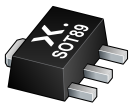


PBSS4360X

60 V, 3 A NPN low VCEsat BISS transistor

9 June 2017 — Product data sheet

1. General description

NPN low V_{CEsat} Breakthrough in Smal Signal (BISS) transitor in a medium power SOT89 (SC-62) flat lead Surface-Mounted Device (SMD) plastic package.

PNP complement: PBSS5360X

2. Features and benefits

- Low collector-emitter saturation voltage V_{CEsat}
- High collector current capability I_C and I_{CM}
- High energy efficiency due to less heat generation
- AEC-Q101 qualified

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)

4. Quick reference data

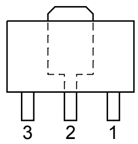
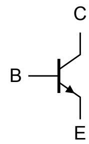
Table 1. Quick reference data

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
V_{CEO}	collector-emitter voltage	open base		-	-	60	V
I_C	collector current			-	-	3	A
I_{CM}	peak collector current	single pulse; $t_p \leq$ 1 ms		-	-	6	A
R_{CEsat}	collector-emitter saturation resistance	I_C = 2 A; I_B = 200 mA; T_{amb} = 25 °C	[1]	-	-	140	mΩ

[1] Pulse test: $t_p \leq$ 300 µs; $\delta \leq$ 0.02

5. Pinning information

Table 2. Pinning information

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

6. Ordering information

Table 3. Ordering information

Type number	Package		
	Name	Description	Version
PBSS4360X	SOT89	plastic, surface-mounted package; 3 leads; 1.5 mm pitch; 4.5 mm x 2.5 mm x 1.5 mm body	SOT89

7. Marking

Table 4. Marking codes

Type number	Marking code
PBSS4360X	S40

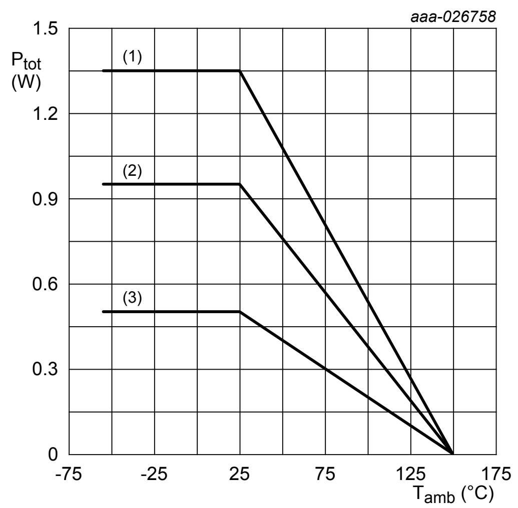
8. Limiting values

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		-	80	V
V_{CEO}	collector-emitter voltage	open base		-	60	V
V_{EBO}	emitter-base voltage	open collector		-	7	V
I_C	collector current			-	3	A
I_{CM}	peak collector current	single pulse; $t_p \leq$ 1 ms		-	6	A
I_B	base current			-	500	mA
I_{BM}	peak base current	single pulse; $t_p \leq$ 1 ms		-	1	A
P_{tot}	total power dissipation	$T_{amb} \leq$ 25 °C	[1]	-	500	mW
			[2]	-	950	mW
			[3]	-	1.35	W
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 Printed-Circuit Board (PCB), single-sided copper, tin-plated; mounting pad for collector 1 cm^2.
[3] Device mounted on an FR4 Printed-Circuit Board (PCB), single-sided copper, tin-plated; mounting pad for collector 6 cm^2.



(1) FR4 PCB, single-sided copper, 6 cm^2
(2) FR4 PCB, single-sided copper, 1 cm^2
(3) FR4 PCB, single-sided copper, standard footprint

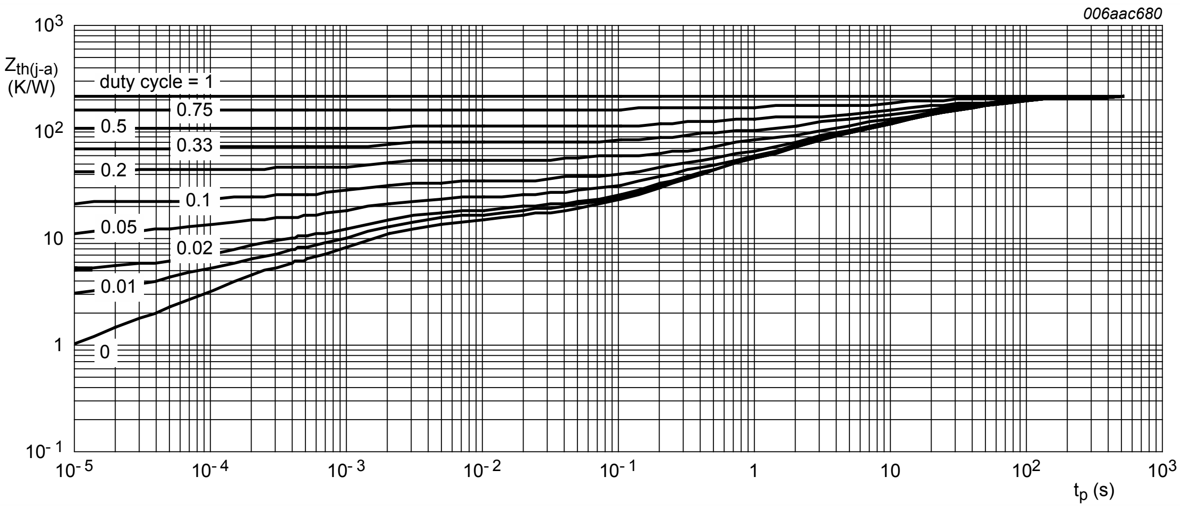
Fig. 1. Power derating curves

9. Thermal characteristics

Table 6. Thermal characteristics

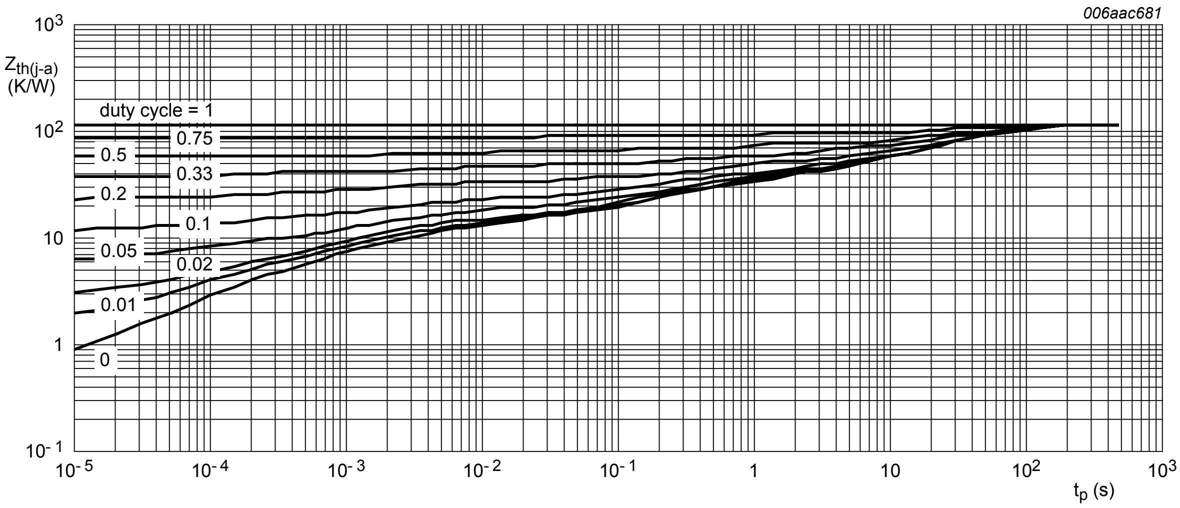
Symbol	Parameter	Conditions		Min	Typ	Max	Unit
$R_{th(j-a)}$	thermal resistance from junction to ambient	in free air	[1]	-	-	250	K/W
			[2]	-	-	132	K/W
			[3]	-	-	93	K/W

[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.



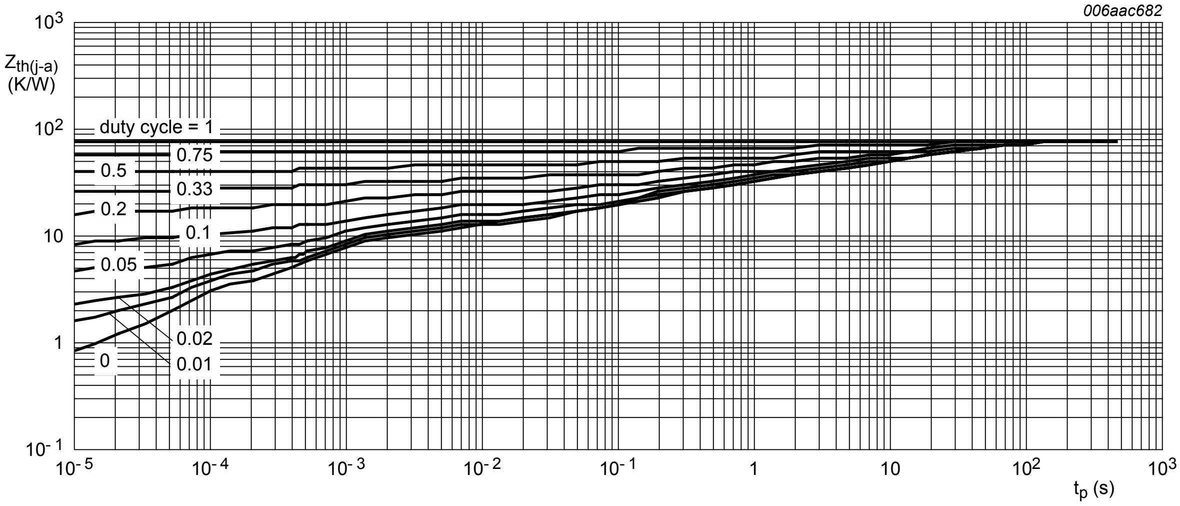
FR4 PCB, standard footprint

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

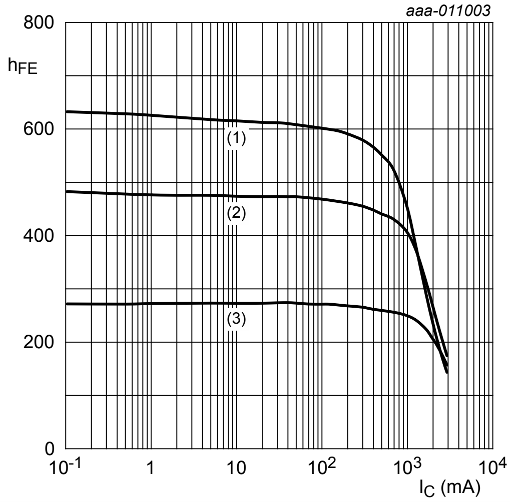
Fig. 4. Transient thermal impedance from junction to ambient as a function of pulse duration; typical values

10. Characteristics

Table 7. Characteristics

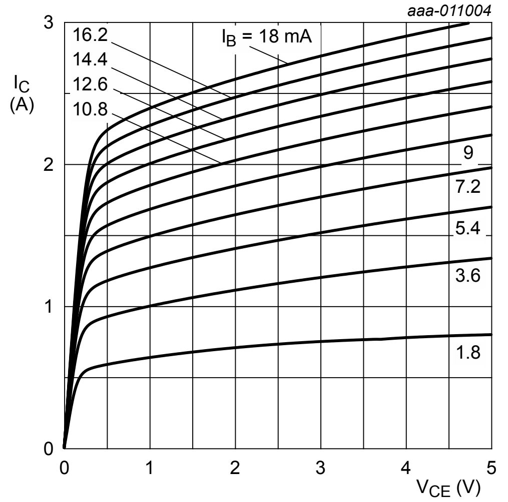
Symbol	Parameter	Conditions		Min	Typ	Max	Unit
I_{CBO}	collector-base cut-off current	V_{CB} = 48 V; I_E = 0 A; T_{amb} = 25 °C		-	-	100	nA
		V_{CB} = 48 V; I_E = 0 A; T_j = 150 °C		-	-	50	µA
I_{CES}	collector-emitter cut-off current	V_{CE} = 48 V; V_{BE} = 0 V; T_{amb} = 25 °C		-	-	100	nA
I_{EBO}	emitter-base 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 = 50 mA; T_{amb} = 25 °C		200	-	-	
		V_{CE} = 5 V; I_C = 500 mA; T_{amb} = 25 °C	[1]	200	-	-	
		V_{CE} = 5 V; I_C = 1 A; T_{amb} = 25 °C	[1]	200	-	-	
		V_{CE} = 5 V; I_C = 2 A; T_{amb} = 25 °C	[1]	120	-	-	
		V_{CE} = 5 V; I_C = 3 A; T_{amb} = 25 °C	[1]	75	-	-	
V_{CEsat}	collector-emitter saturation voltage	I_C = 500 mA; I_B = 50 mA; T_{amb} = 25 °C	[1]	-	-	75	mV
		I_C = 1 A; I_B = 100 mA; T_{amb} = 25 °C	[1]	-	-	150	mV
		I_C = 2 A; I_B = 200 mA; T_{amb} = 25 °C	[1]	-	-	275	mV
		I_C = 3 A; I_B = 300 mA; T_{amb} = 25 °C	[1]	-	-	400	mV
R_{CEsat}	collector-emitter saturation resistance	I_C = 2 A; I_B = 200 mA; T_{amb} = 25 °C	[1]	-	-	140	mΩ
V_{BEsat}	base-emitter saturation voltage	I_C = 1 A; I_B = 100 mA; T_{amb} = 25 °C	[1]	-	-	1.2	V
V_{BEon}	base-emitter turn-on voltage	V_{CE} = 5 V; I_C = 1 A; T_{amb} = 25 °C	[1]	-	-	1.1	V
f_T	transition frequency	V_{CE} = 10 V; I_C = 50 mA; f = 100 MHz; T_{amb} = 25 °C		75	145	-	MHz
C_c	collector capacitance	V_{CB} = 10 V; I_E = 0 A; i_e = 0 A; f = 1 MHz; T_{amb} = 25 °C		-	11	14	pF

[1] Pulse test: $t_p \leq 300$ µs; $\delta \leq 0.02$



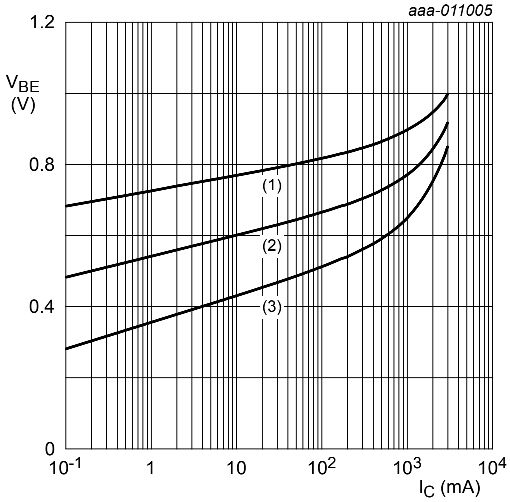
V_{CE} = 5 V
(1) T_{amb} = 100 °C
(2) T_{amb} = 25 °C
(3) T_{amb} = −55 °C

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



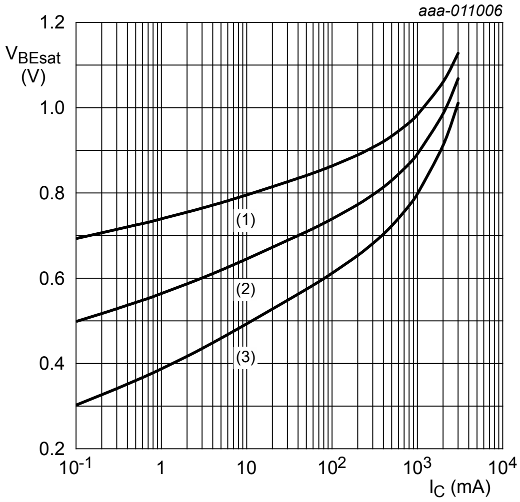
T_{amb} = 25 °C

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



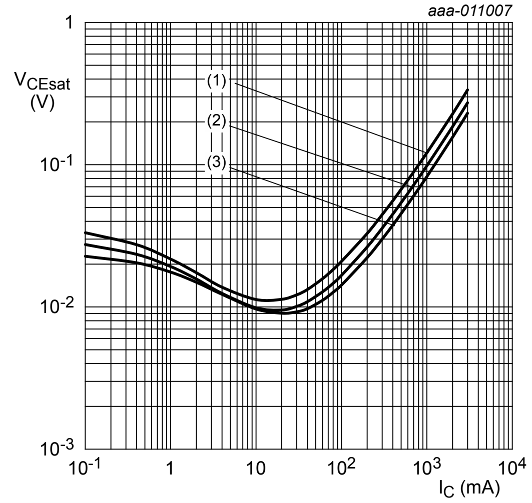
V_{CE} = 5 V
(1) T_{amb} = −55 °C
(2) T_{amb} = 25 °C
(3) T_{amb} = 100 °C

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



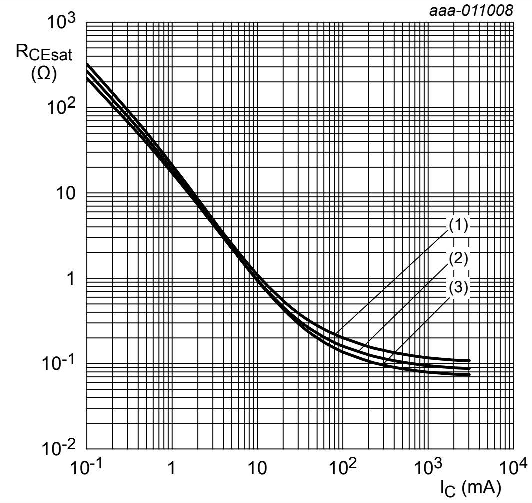
I_C/I_B = 20
(1) T_{amb} = −55 °C
(2) T_{amb} = 25 °C
(3) T_{amb} = 100 °C

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

11. Test information

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

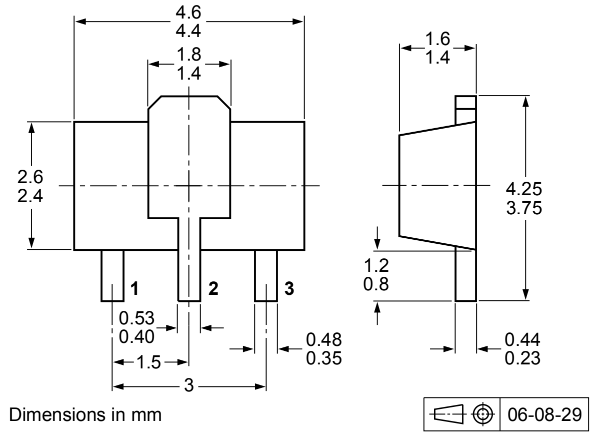


Fig. 11. Package outline SOT89

13. Soldering

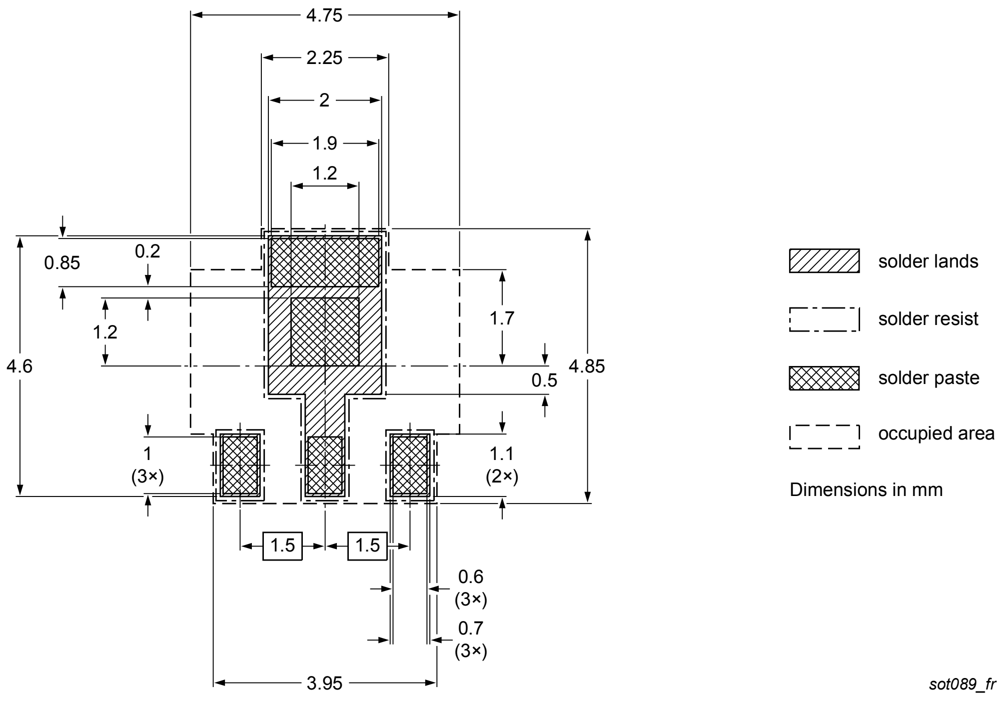


Fig. 12. Reflow soldering footprint for SOT89

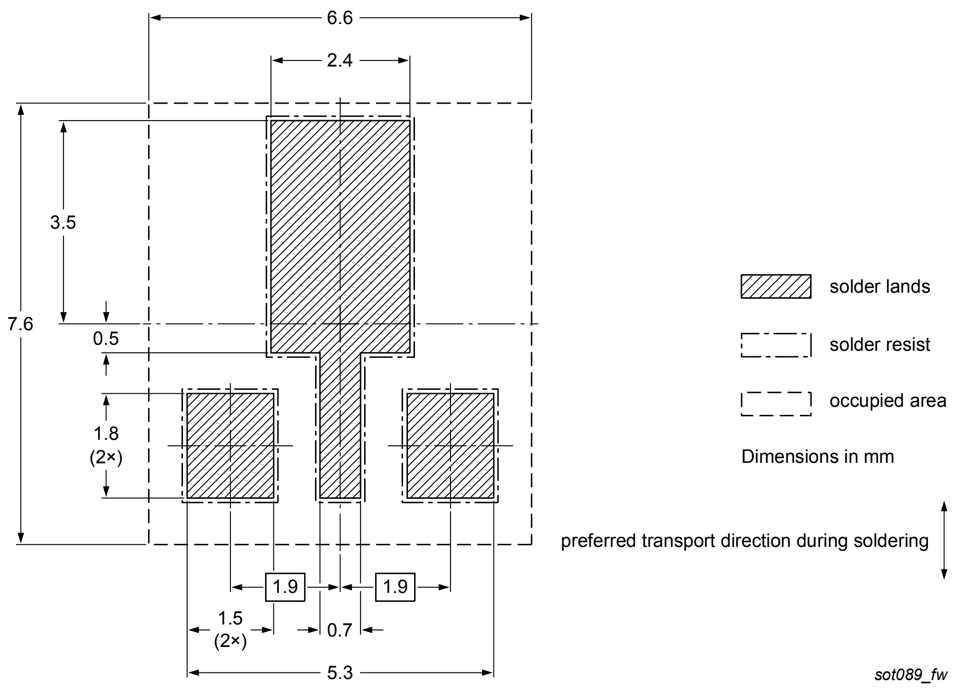


Fig. 13. Wave soldering footprint for SOT89

14. Revision history

Table 8. Revision history

Data sheet ID	Release date	Data sheet status	Change notice	Supersedes
PBSS4360X v.1	20170609	Product data sheet	-	-

15. Legal information

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.

[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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16. Contents

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Date of release: 9 June 2017