PBSS5350Z

50 V, 3 A PNP low VCEsat (BISS) transistor

18 November 2019 Product data sheet

1. General description

PNP low V_{CEsat} Breakthrough In Small Signal (BISS) transistor in a medium power SOT223 (SC-73) Surface-Mounted Device (SMD) plastic package.

NPN complement: PBSS4350Z

2. Features and benefits

- Low collector-emitter saturation voltage V_{CEsat}
- High collector current capability: I_C and I_{CM}
- High collector current gain (h_{FE}) at high I_C
- High energy efficiency due to less heat generation
- AEC-Q101 qualified

3. Applications

- DC/DC converters
- Supply line switching
- Battery charger
- LED backlighting
- Linear voltage regulation (LDO)
- Driver in low supply voltage applications, e.g. lamps, LEDs
- Inductive load driver (for example relays, buzzers, motors)

4. Quick reference data

Table 1. Quick reference data

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
V_{CEO}	collector-emitter voltage	open base		-	-	-50	V
I_C	collector current			-	-	-3	A
I_{CM}	peak collector current	single pulse; $t_p \leq 1$ ms		-	-	-5	A
R_{CEsat}	collector-emitter saturation resistance	I_C = -2 A; I_B = -200 mA; T_{amb} = 25 °C	[1]	-	120	150	mΩ

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

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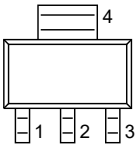
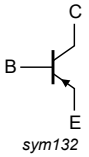
5. Pinning information

Table 2. Pinning information

Pin	Symbol	Description	Simplified outline	Graphic symbol
1	B	base	 SC-73 (SOT223)	 sym132
2	C	collector		
3	E	emitter		
4	C	collector		

6. Ordering information

Table 3. Ordering information

Type number	Package		
	Name	Description	Version
PBSS5350Z	SC-73	plastic, surface-mounted package with increased heatsink; 4 leads; 2.3 mm pitch; 6.5 mm x 3.5 mm x 1.65 mm body	SOT223

7. Marking

Table 4. Marking codes

Type number	Marking code
PBSS5350Z	PB5350

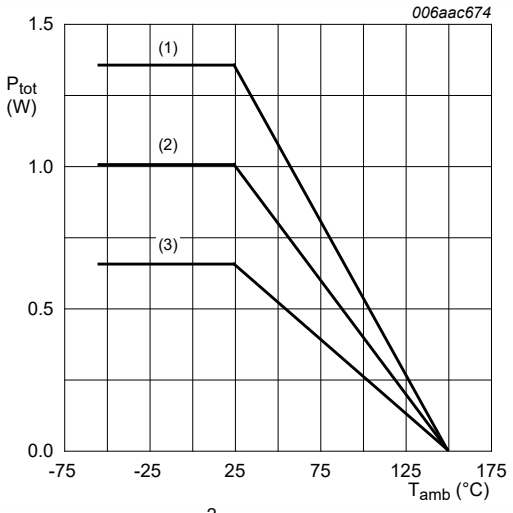
8. Limiting values

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		-	-60	V
V_{CEO}	collector-emitter voltage	open base		-	-50	V
V_{EBO}	emitter-base voltage	open collector		-	-6	V
I_C	collector current			-	-3	A
I_{CM}	peak collector current	single pulse; $t_p \leq 1$ ms		-	-5	A
I_{BM}	peak base current			-	-1	A
P_{tot}	total power dissipation		[1]	-	0.65	W
			[2]	-	1	W
			[3] [4]	-	1.35	W
			[5]	-	2	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 Printed-Circuit Board (PCB), 35 µm single-sided copper, tin-plated and standard footprint.
[2] Device mounted on an FR4 PCB, 35 µm single-sided copper, tin-plated, mounting pad for collector 1 cm^2.
[3] Device mounted on an FR4 PCB, 35 µm single-sided copper, tin-plated, mounting pad for collector 6 cm^2.
[4] Device mounted on an FR4 PCB, 70 µm single-sided copper, tin-plated, mounting pad for collector 1 cm^2.
[5] Device mounted on an FR4 PCB, 70 µm 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

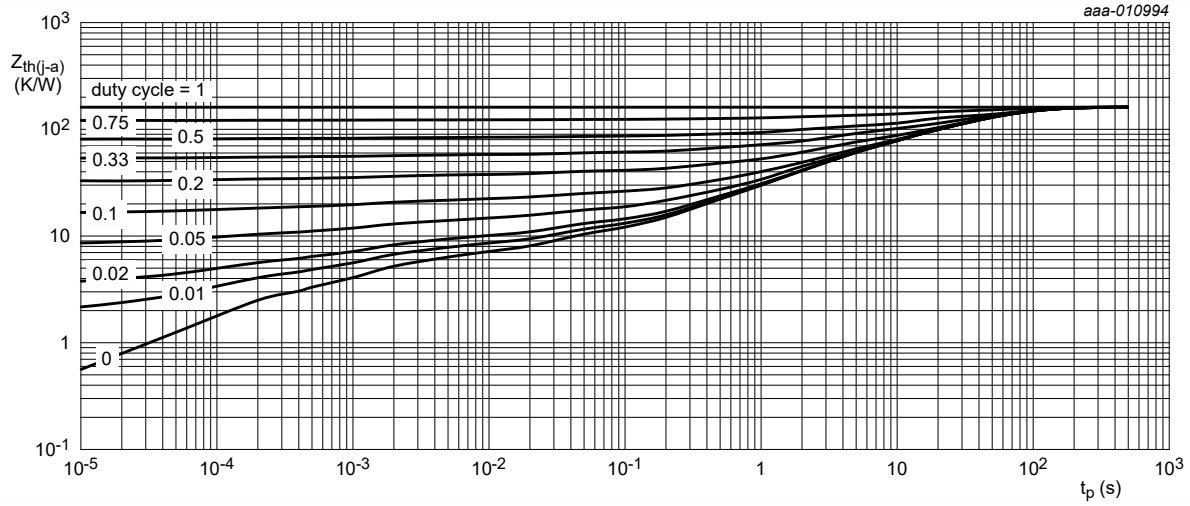
Fig. 1. Power derating curves

9. Thermal characteristics

Table 6. Thermal characteristics

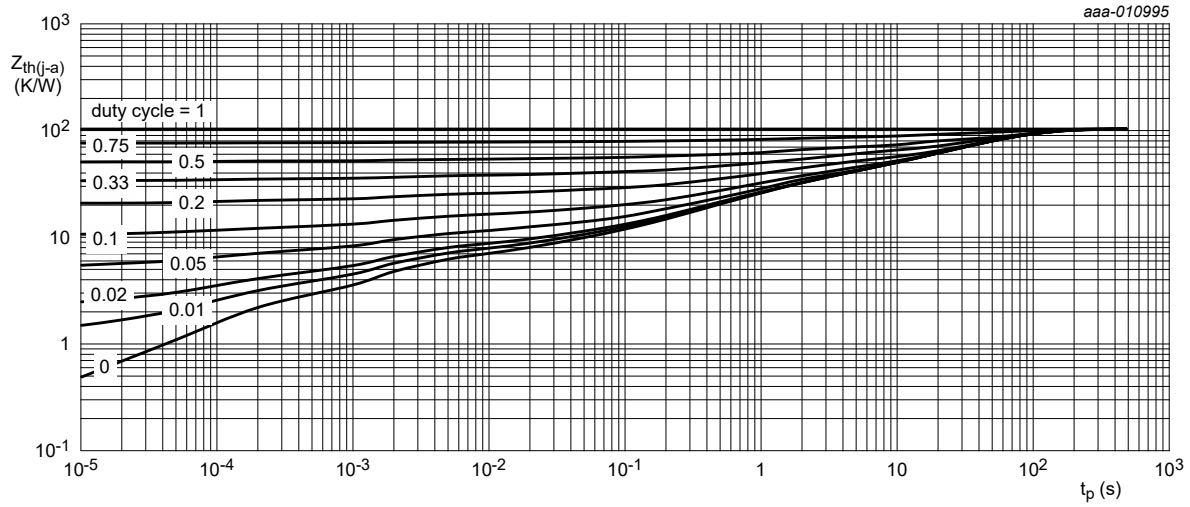
Symbol	Parameter	Conditions		Min	Typ	Max	Unit
$R_{th(j-a)}$	thermal resistance from junction to ambient	in free air	[1]	-	-	192	K/W
			[2]	-	-	125	K/W
			[3] [4]	-	-	92	K/W
			[5]	-	-	62.5	K/W
$R_{th(j-sp)}$	thermal resistance from junction to solder point			-	-	16	K/W

[1] Device mounted on an FR4 PCB, 35 µm single-sided copper, tin-plated and standard footprint.
[2] Device mounted on an FR4 PCB, 35 µm single-sided copper, tin-plated, mounting pad for collector 1 cm^2.
[3] Device mounted on an FR4 PCB, 35 µm single-sided copper, tin-plated, mounting pad for collector 6 cm^2.
[4] Device mounted on an FR4 PCB, 70 µm single-sided copper, tin-plated, mounting pad for collector 1 cm^2.
[5] Device mounted on an FR4 PCB, 70 µm single-sided copper, tin-plated, mounting pad for collector 6 cm^2.



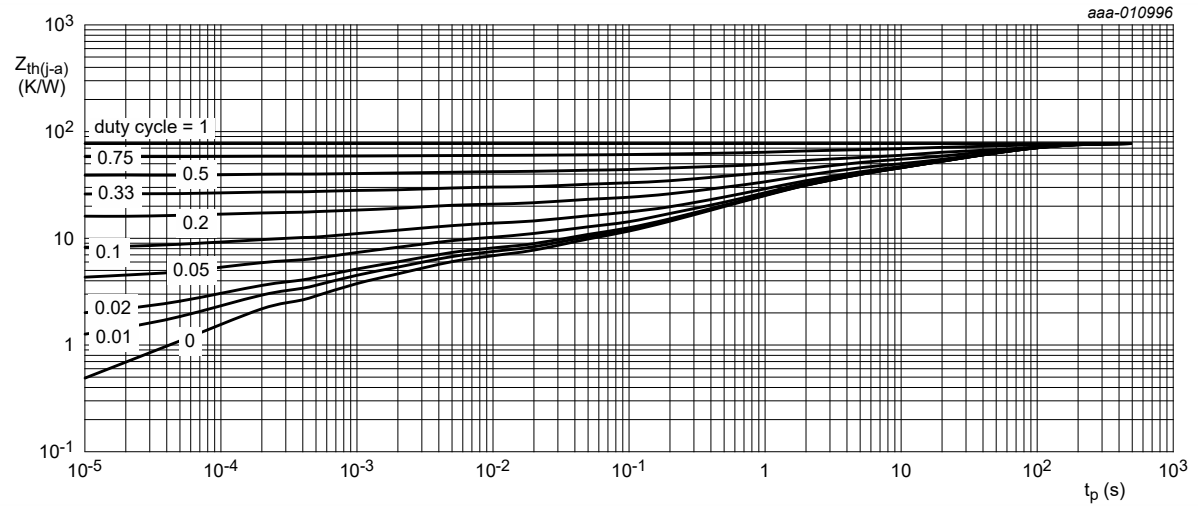
FR4 PCB, 35 µm single-sided copper, tin-plated and standard footprint.

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



FR4 PCB, 35 µm single-sided copper, tin-plated, 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, 35 µm single-sided copper, tin-plated, 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

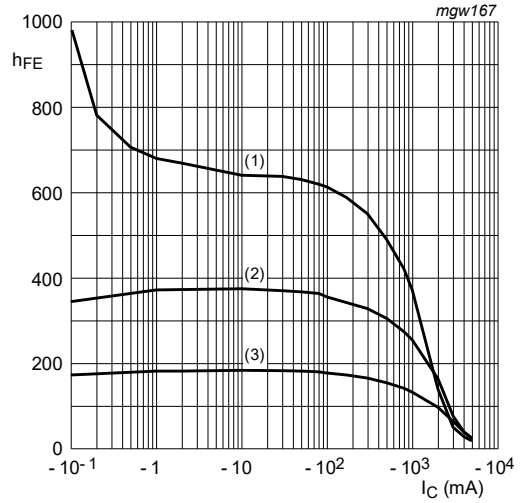
Table 7. Characteristics

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

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
$V_{(BR)CBO}$	collector-base breakdown voltage	I_C = -100 µA; I_E = 0 A		-60	-	-	V
$V_{(BR)CEO}$	collector-emitter breakdown voltage	I_C = -10 mA; I_B = 0 A		-50	-	-	V
$V_{(BR)EBO}$	emitter-base breakdown voltage (collector open)	I_E = -100 µA; I_C = 0 A		-6	-	-	V
I_{CBO}	collector-base cut-off current	V_{CB} = -50 V; I_E = 0 A		-	-	-100	nA
		V_{CB} = -50 V; I_E = 0 A; T_j = 150 °C		-	-	-50	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} = -2 V; I_C = -500 mA		200	-	-	
		V_{CE} = -2 V; I_C = -1 A	[1]	200	-	-	
		V_{CE} = -2 V; I_C = -2 A	[1]	100	-	-	
V_{CEsat}	collector-emitter saturation voltage	I_C = -500 mA; I_B = -50 mA		-	-	-100	mV
		I_C = -1 A; I_B = -50 mA		-	-	-180	mV
		I_C = -2 A; I_B = -200 mA	[1]	-	-	-300	mV
R_{CEsat}	collector-emitter saturation resistance	I_C = -2 A; I_B = -200 mA; T_{amb} = 25 °C	[1]	-	120	150	mΩ
V_{BEsat}	base-emitter saturation voltage	I_C = -2 A; I_B = -200 mA	[1]	-	-	-1.2	V
V_{BEon}	base-emitter turn-on voltage	V_{CE} = -2 V; I_C = -1 A; T_{amb} = 25 °C	[1]	-	-	-1.1	V
f_T	transition frequency	V_{CE} = -5 V; I_C = -100 mA; f = 100 MHz		100	-	-	MHz

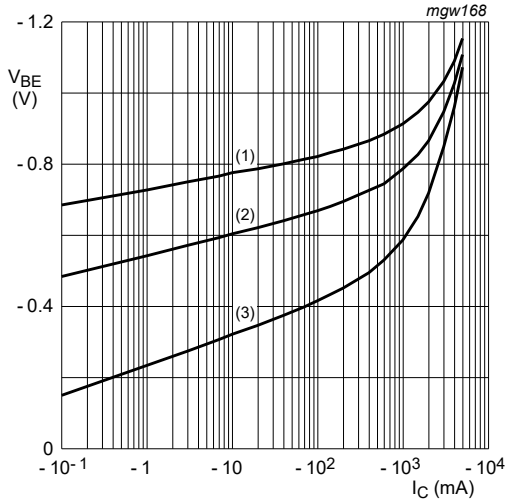
Symbol	Parameter	Conditions		Min	Typ	Max	Unit
C_c	collector capacitance	V_{CB} = -10 V; I_E = 0 A; i_e = 0 A; f = 1 MHz		-	-	40	pF

[1] Pulsed test: $t_p \leq 300\ \mu s$; $\delta \leq 0.02$



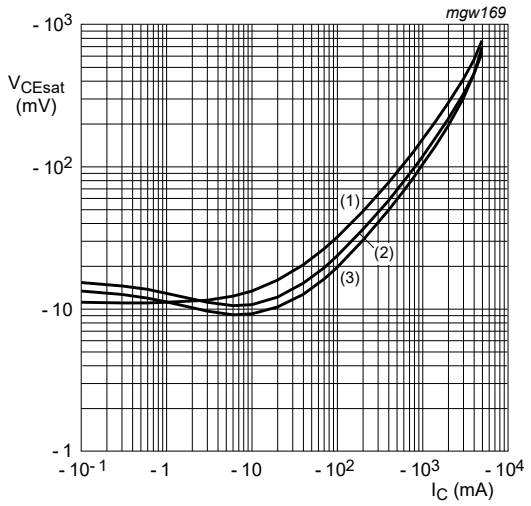
V_{CE} = -2 V
(1) T_{amb} = 150 °C
(2) T_{amb} = 25 °C
(3) T_{amb} = -55 °C

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



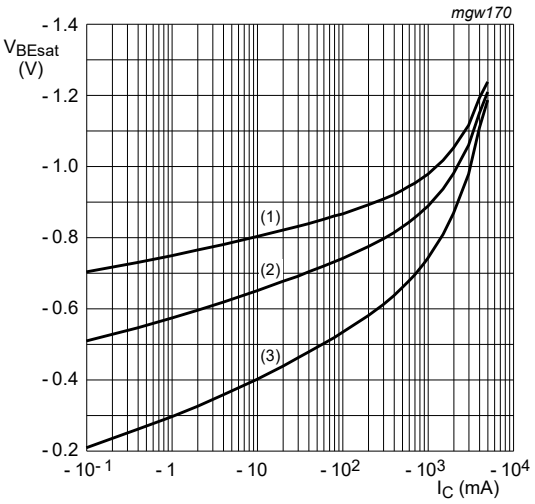
V_{CE} = -2 V
(1) T_{amb} = -55 °C
(2) T_{amb} = 25 °C
(3) T_{amb} = 150 °C

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



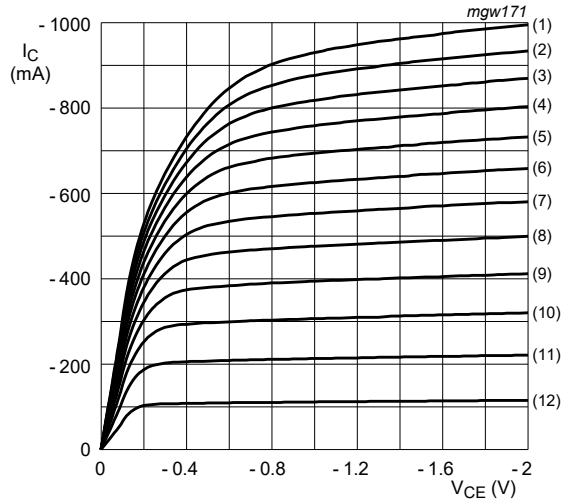
I_C/I_B = 10
(1) T_{amb} = 150 °C
(2) T_{amb} = 25 °C
(3) T_{amb} = -55 °C

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



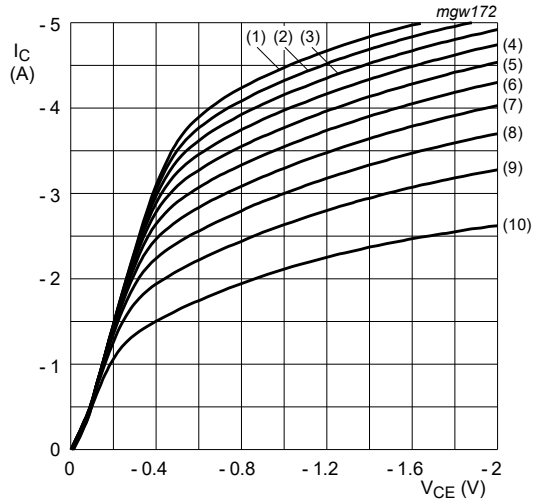
I_C/I_B = 10
(1) T_{amb} = -55 °C
(2) T_{amb} = 25 °C
(3) T_{amb} = 150 °C

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



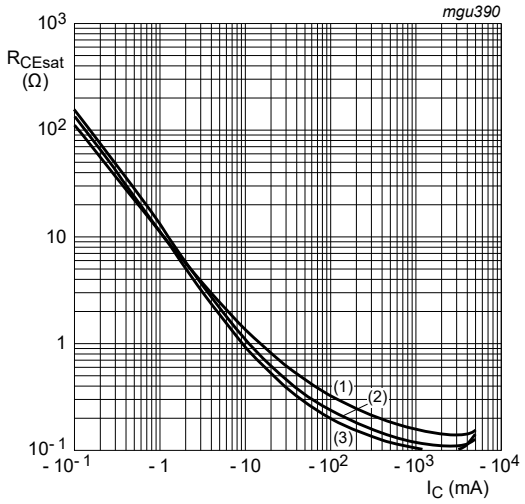
T_{amb} = 25 °C
(1) I_B = −3.96 mA
(2) I_B = −3.63 mA
(3) I_B = −3.30 mA
(4) I_B = −2.97 mA
(5) I_B = −2.64 mA
(6) I_B = −2.31 mA
(7) I_B = −1.98 mA
(8) I_B = −1.65 mA
(9) I_B = −1.32 mA
(10) I_B = −0.99 mA
(11) I_B = −0.66 mA
(12) I_B = −0.33 mA

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



T_{amb} = 25 °C
(1) I_B = −250 mA
(2) I_B = −225 mA
(3) I_B = −200 mA
(4) I_B = −175 mA
(5) I_B = −150 mA
(6) I_B = −125 mA
(7) I_B = −100 mA
(8) I_B = −75 mA
(9) I_B = −50 mA
(10) I_B = −25 mA

Fig. 10. Collector current as a function of collector-emitter voltage; typical values



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

Fig. 11. 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

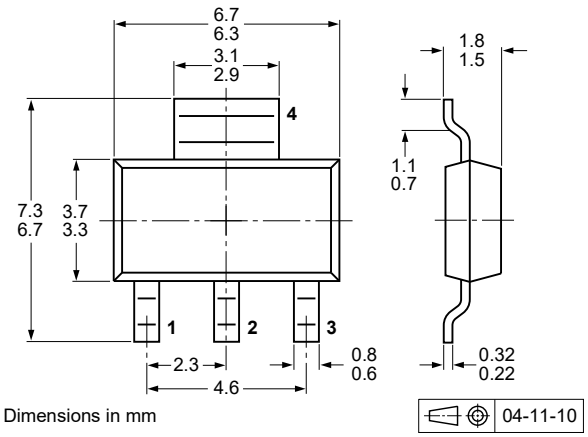


Fig. 12. Package outline SC-73 (SOT223)

13. Soldering

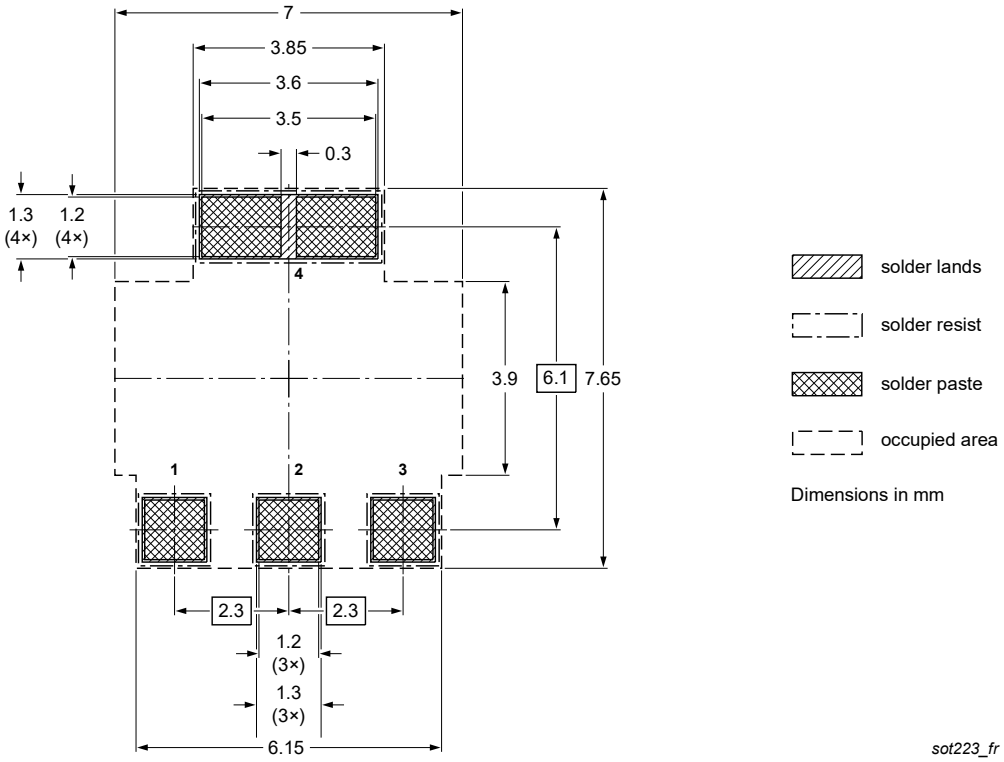


Fig. 13. Reflow soldering footprint for SC-73 (SOT223)

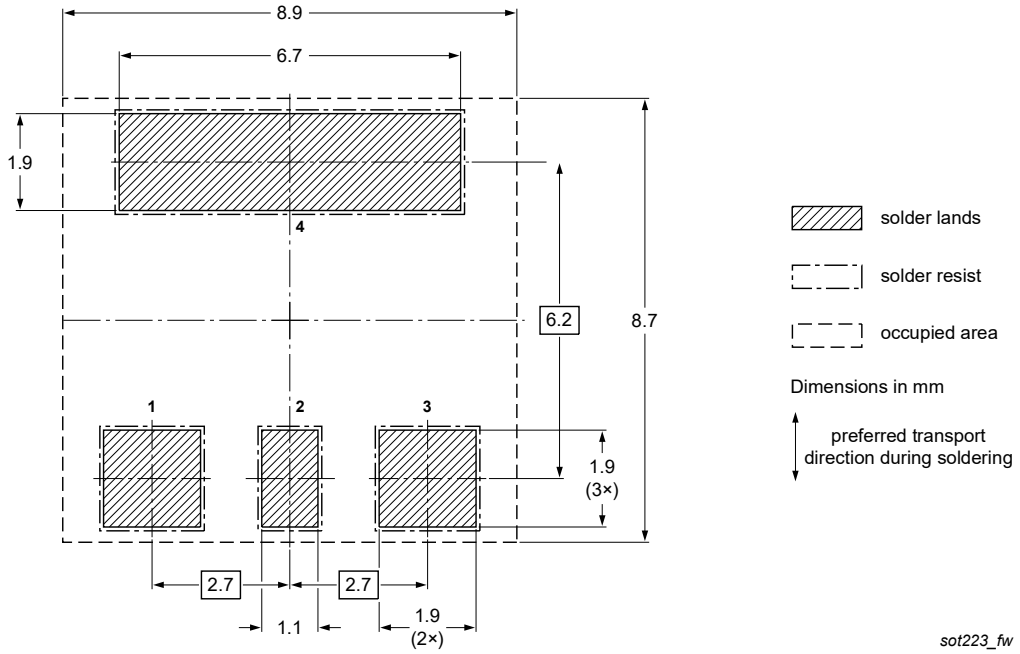


Fig. 14. Wave soldering footprint for SC-73 (SOT223)

14. Revision history

Table 8. Revision history

Data sheet ID	Release date	Data sheet status	Change notice	Supersedes
PBSS5350Z v.5	20191118	Product data sheet	-	PBSS5350Z v.4
Modifications:	• The format of this data sheet has been redesigned to comply with the identity guidelines of Nexperia. • Legal texts have been adapted to the new company name where appropriate.			
PBSS5350Z v.4	20030513	Product data sheet	-	PBSS5350Z v.3
PBSS5350Z v.3	20030120	Product data sheet	-	PBSS5350Z v.2
PBSS5350Z v.2	20011113	Product data sheet	-	PBSS5350Z v.1
PBSS5350Z v.1	20010717	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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Date of release: 18 November 2019