



# PBSS5540Z

40 V low V<sub>CEsat</sub> PNP transistor

20 September 2019

Product data sheet

## 1. General description

PNP low V<sub>CEsat</sub> transistor in a SOT223 plastic package. NPN complement: PBSS4540Z.

## 2. Features and benefits

- Low collector-emitter saturation voltage
- High current capability
- Improved device reliability due to reduced heat generation.
- AEC-Q101 qualified

## 3. Applications

- Supply line switching circuits
- Battery management applications
- DC/DC converter applications
- Strobe flash units
- Heavy duty battery powered equipment (motor and lamp drivers)
- MOSFET driver applications.

## 4. Quick reference data

Table 1. Quick reference data

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
V <sub>CEO</sub>	collector-emitter voltage	open base	-	-	-40	V
I <sub>C</sub>	collector current		-	-	-5	A
I <sub>CM</sub>	peak collector current	single pulse; t <sub>p</sub> ≤ 1 ms	-	-	-10	A
R <sub>CEsat</sub>	collector-emitter saturation resistance	I <sub>C</sub> = -2 A; I <sub>B</sub> = -200 mA; t <sub>p</sub> ≤ 300 μs; pulsed; δ ≤ 0.02; T <sub>amb</sub> = 25 °C	-	55	80	mΩ

## 5. Pinning information

Table 2. Pinning information

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

## 6. Ordering information

Table 3. Ordering information

Type number	Package		
	Name	Description	Version
PBSS5540Z	SC-73	plastic surface-mounted package with increased heatsink; 4 leads	SOT223

## 7. Marking

Table 4. Marking codes

Type number	Marking code
PBSS5540Z	PB5540

## 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	-	-40	V	
$V_{CEO}$	collector-emitter voltage	open base	-	-40	V	
$V_{EBO}$	emitter-base voltage	open collector	-	-6	V	
$I_C$	collector current		-	-5	A	
$I_{CM}$	peak collector current	single pulse; $t_p \leq 1$ ms	-	-10	A	
$I_{BM}$	peak base current		-	-2	A	
$P_{tot}$	total power dissipation	$T_{amb} \leq 25$ °C	[1]	-	1.35	W
			[2]	-	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 PCB, single-sided copper, tin-plated, mounting pad for collector 1 cm<sup>2</sup>.

[2] Device mounted on an FR4 PCB, single-sided copper, tin-plated, mounting pad for collector 6 cm<sup>2</sup>.

## 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]	-	-	92	K/W
			[2]	-	-	62	K/W

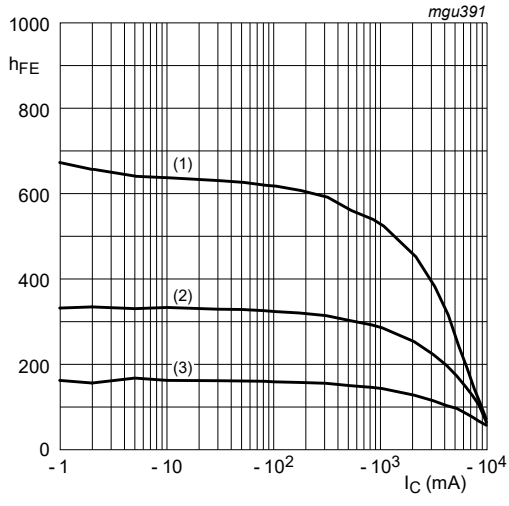
[1] Device mounted on an FR4 PCB, single-sided copper, tin-plated, mounting pad for collector 1 cm<sup>2</sup>.

[2] Device mounted on an FR4 PCB, single-sided copper, tin-plated, mounting pad for collector 6 cm<sup>2</sup>.

## 10. Characteristics

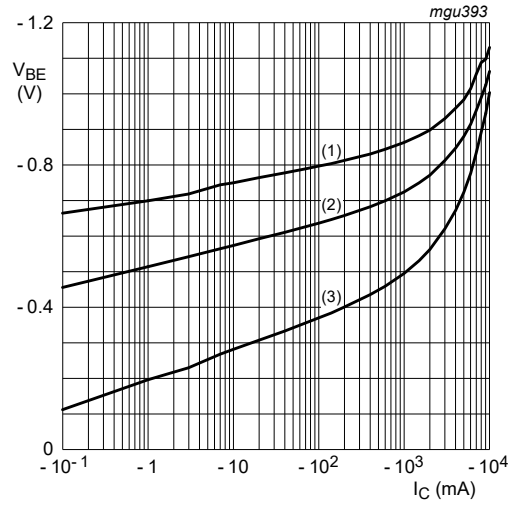
Table 7. Characteristics

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$V_{(BR)CBO}$	collector-base breakdown voltage	$I_C = -100 \mu\text{A}; I_E = 0 \text{ A}$	-40	-	-	V
$V_{(BR)CEO}$	collector-emitter breakdown voltage	$I_C = -10 \text{ mA}; I_B = 0 \text{ A}; T_{\text{amb}} = 25 \text{ }^\circ\text{C}$	-40	-	-	V
$V_{(BR)EBO}$	emitter-base breakdown voltage (collector open)	$I_E = -100 \mu\text{A}; I_B = 0 \text{ mA}; T_{\text{amb}} = 25 \text{ }^\circ\text{C}$	-6	-	-	V
$I_{CBO}$	collector-base cut-off current	$V_{CB} = -30 \text{ V}; I_E = 0 \text{ A}; T_{\text{amb}} = 25 \text{ }^\circ\text{C}$	-	-	-100	nA
		$V_{CB} = -30 \text{ V}; I_E = 0 \text{ A}; T_j = 150 \text{ }^\circ\text{C}$	-	-	-50	$\mu\text{A}$
$I_{EBO}$	emitter-base cut-off current	$V_{EB} = -5 \text{ V}; I_C = 0 \text{ A}; T_{\text{amb}} = 25 \text{ }^\circ\text{C}$	-	-	-100	nA
$h_{FE}$	DC current gain	$V_{CE} = -2 \text{ V}; I_C = -500 \text{ mA}; T_{\text{amb}} = 25 \text{ }^\circ\text{C}$	250	350	-	
		$V_{CE} = -2 \text{ V}; I_C = -1 \text{ A}; t_p \leq 300 \mu\text{s};$ pulsed; $\delta \leq 0.02; T_{\text{amb}} = 25 \text{ }^\circ\text{C}$	200	300	-	
		$V_{CE} = -2 \text{ V}; I_C = -2 \text{ A}; t_p \leq 300 \mu\text{s};$ pulsed; $\delta \leq 0.02; T_{\text{amb}} = 25 \text{ }^\circ\text{C}$	150	250	-	
		$V_{CE} = -2 \text{ V}; I_C = -5 \text{ A}; t_p \leq 300 \mu\text{s};$ pulsed; $\delta \leq 0.02; T_{\text{amb}} = 25 \text{ }^\circ\text{C}$	50	150	-	
$V_{CEsat}$	collector-emitter saturation voltage	$I_C = -500 \text{ mA}; I_B = -5 \text{ mA}; T_{\text{amb}} = 25 \text{ }^\circ\text{C}$	-	-80	-120	mV
		$I_C = -1 \text{ A}; I_B = -10 \text{ mA}; T_{\text{amb}} = 25 \text{ }^\circ\text{C}$	-	-120	-170	mV
		$I_C = -2 \text{ A}; I_B = -200 \text{ mA}; T_{\text{amb}} = 25 \text{ }^\circ\text{C}$	-	-110	-160	mV
		$I_C = -5 \text{ A}; I_B = -500 \text{ mA}; T_{\text{amb}} = 25 \text{ }^\circ\text{C}$	-	-250	-375	mV
$R_{CEsat}$	collector-emitter saturation resistance	$I_C = -2 \text{ A}; I_B = -200 \text{ mA}; t_p \leq 300 \mu\text{s};$ pulsed; $\delta \leq 0.02; T_{\text{amb}} = 25 \text{ }^\circ\text{C}$	-	55	80	m $\Omega$
$V_{BEsat}$	base-emitter saturation voltage	$I_C = -5 \text{ A}; I_B = -500 \text{ mA}; T_{\text{amb}} = 25 \text{ }^\circ\text{C}$	-	-	-1.3	V
$V_{BEon}$	base-emitter turn-on voltage	$V_{CE} = -2 \text{ V}; I_C = -2 \text{ A}; T_{\text{amb}} = 25 \text{ }^\circ\text{C}$	-	-0.8	-1.25	V
$f_T$	transition frequency	$V_{CE} = -10 \text{ V}; I_C = -100 \text{ mA}; f = 100 \text{ MHz};$ $T_{\text{amb}} = 25 \text{ }^\circ\text{C}$	60	120	-	MHz
$C_c$	collector capacitance	$V_{CB} = -10 \text{ V}; I_E = 0 \text{ A}; i_e = 0 \text{ A};$ $f = 1 \text{ MHz}; T_{\text{amb}} = 25 \text{ }^\circ\text{C}$	-	90	105	pF



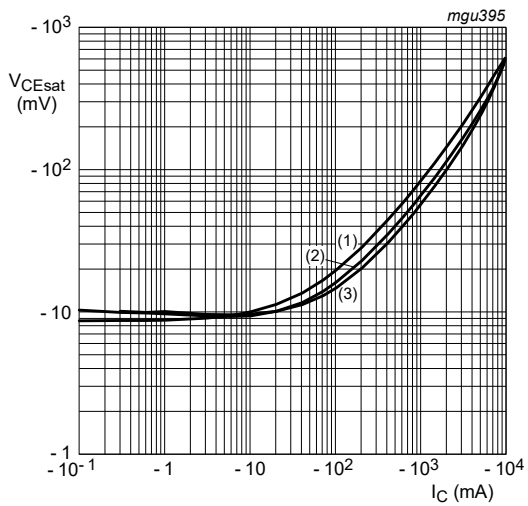
$V_{CE} = -2\text{ V}$   
 (1)  $T_{amb} = 150\text{ °C}$   
 (2)  $T_{amb} = 25\text{ °C}$   
 (3)  $T_{amb} = -55\text{ °C}$

**Fig. 1. DC current gain as a function of collector current; typical values**



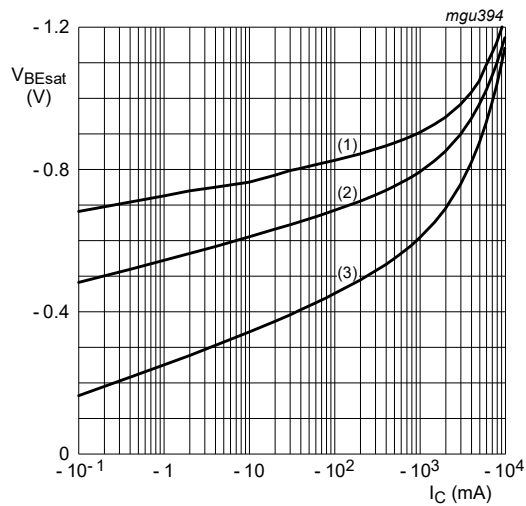
$V_{CE} = -2\text{ V}$   
 (1)  $T_{amb} = 150\text{ °C}$   
 (2)  $T_{amb} = 25\text{ °C}$   
 (3)  $T_{amb} = -55\text{ °C}$

**Fig. 2. Base-emitter voltage as a function of collector current; typical values**



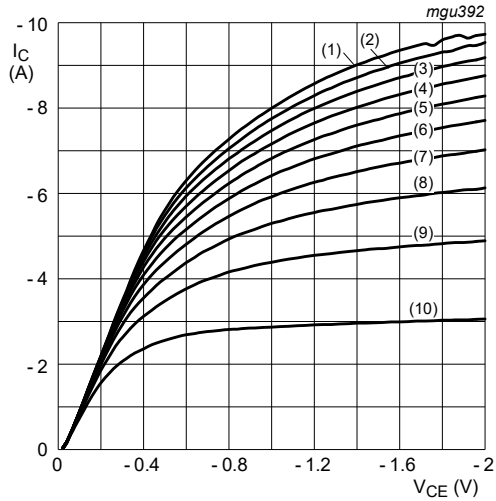
$I_C/I_B = 20$   
 (1)  $T_{amb} = 150\text{ °C}$   
 (2)  $T_{amb} = 25\text{ °C}$   
 (3)  $T_{amb} = -55\text{ °C}$

**Fig. 3. Collector-emitter saturation voltage as a function of collector current; typical values**



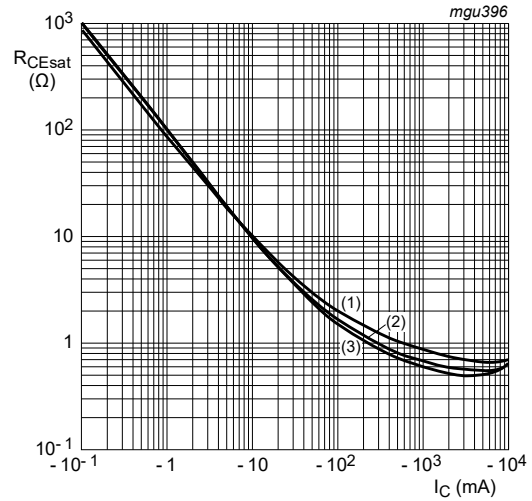
$I_C/I_B = 20$   
 (1)  $T_{amb} = 150\text{ °C}$   
 (2)  $T_{amb} = 25\text{ °C}$   
 (3)  $T_{amb} = -55\text{ °C}$

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



- $T_{amb} = 25\text{ }^\circ\text{C}$
- (1)  $I_B = -150\text{ mA}$
  - (2)  $I_B = -135\text{ mA}$
  - (3)  $I_B = -120\text{ mA}$
  - (4)  $I_B = -105\text{ mA}$
  - (5)  $I_B = -90\text{ mA}$
  - (6)  $I_B = -75\text{ mA}$
  - (7)  $I_B = -60\text{ mA}$
  - (8)  $I_B = -45\text{ mA}$
  - (9)  $I_B = -30\text{ mA}$
  - (10)  $I_B = -15\text{ mA}$

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



- $I_C/I_B = 20$
- (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. 6.** Collector-emitter equivalent on-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

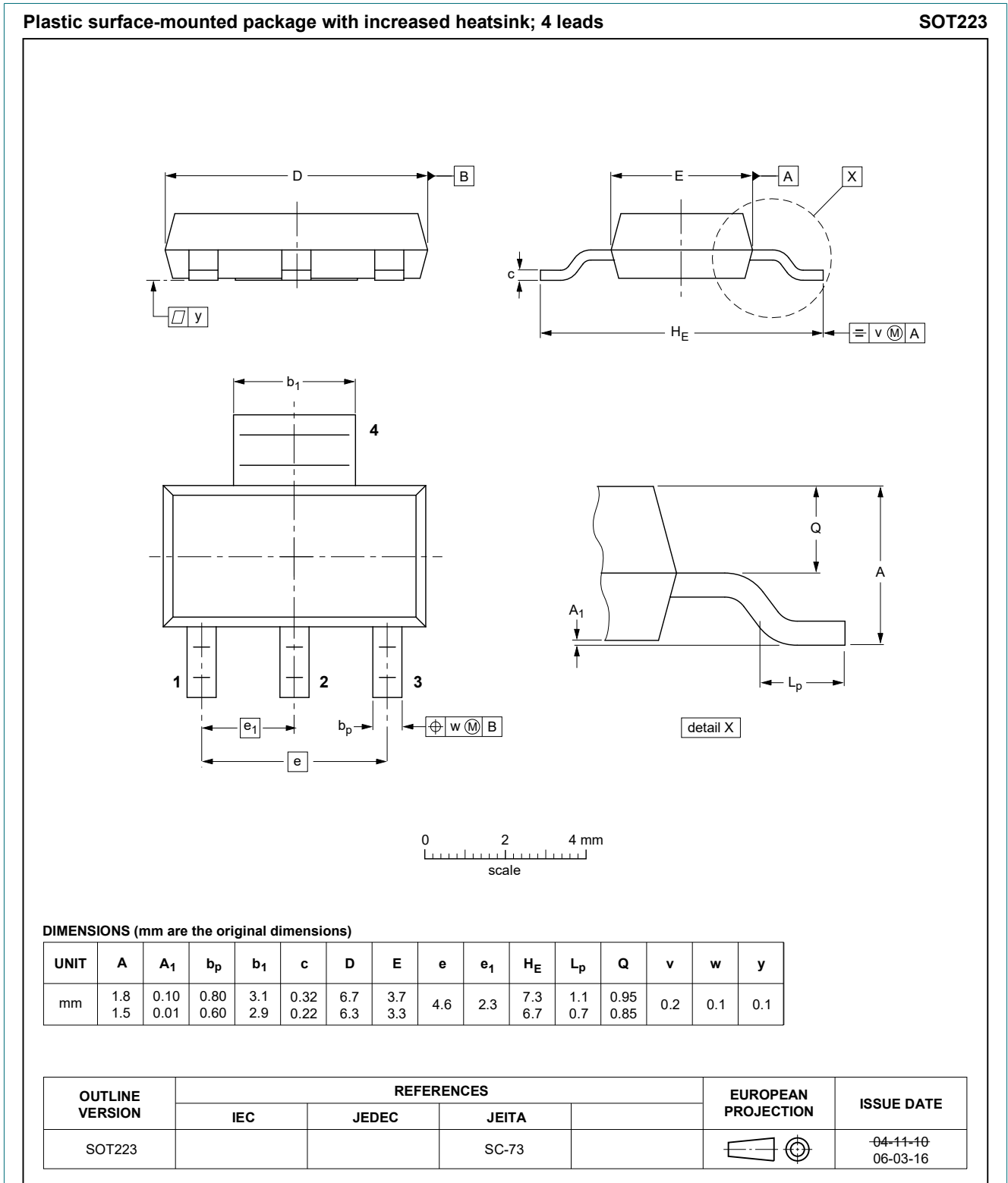


Fig. 7. Package outline SC-73 (SOT223)

### 13. Soldering

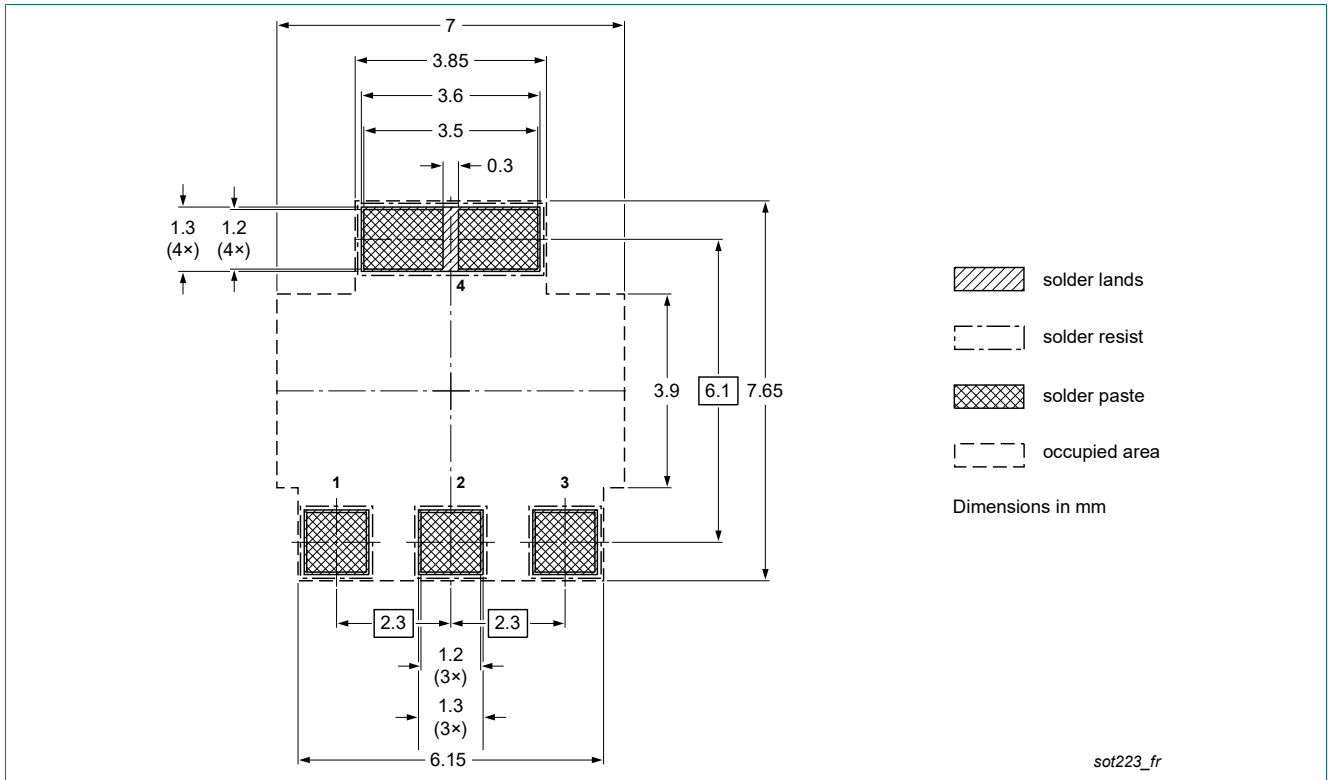


Fig. 8. Reflow soldering footprint for SC-73 (SOT223)

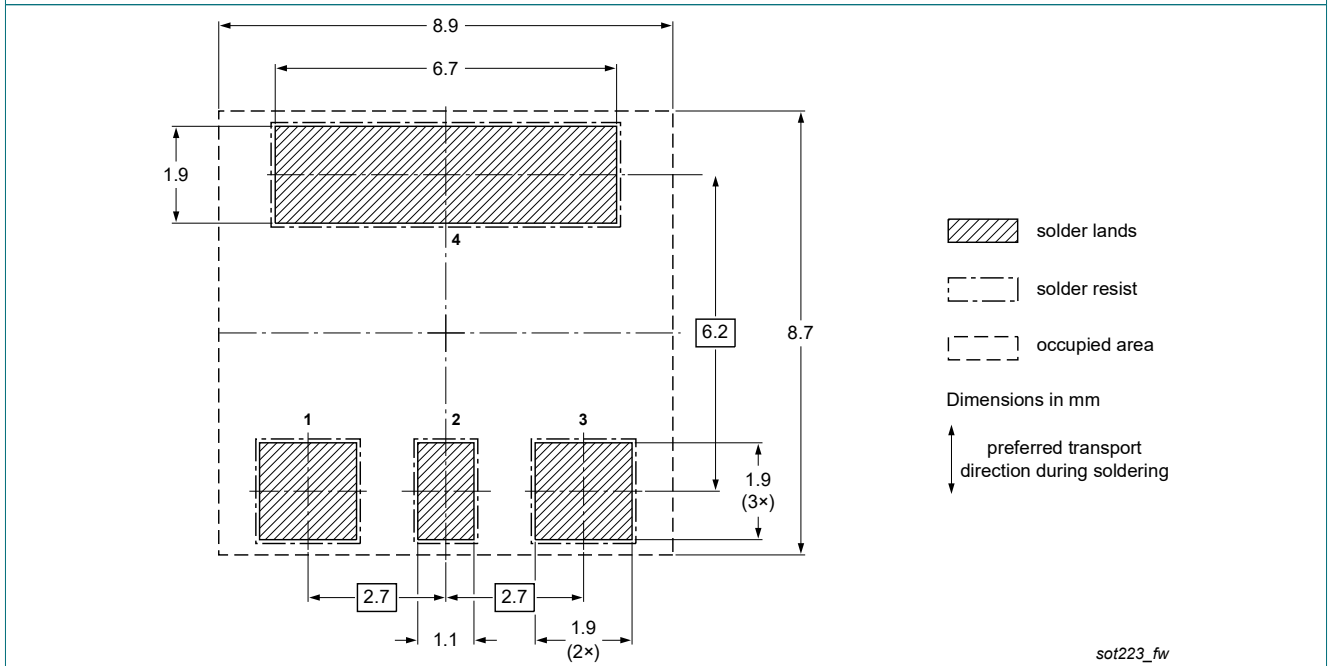


Fig. 9. Wave soldering footprint for SC-73 (SOT223)

## 14. Revision history

Table 8. Revision history

Data sheet ID	Release date	Data sheet status	Change notice	Supersedes
PBSS5540Z v.3	20190920	Product data sheet	-	PBSS5540Z v.2
Modifications:	<ul style="list-style-type: none"> <li>Automotive AEC-Q101 qualification added in sections "features and benefits", "Test information" and "Legal information"</li> <li>Characteristics: breakdown voltages added</li> <li>The format of this data sheet has been redesigned to comply with the identity guidelines of Nexperia.</li> <li>Legal texts have been adapted to the new company name where appropriate.</li> </ul>			
PBSS5540Z v.2	20010921	Product data sheet	-	PBSS5540Z v.1
PBSS5540Z v.1	20010126	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: 20 September 2019

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