



# PBSS5540Z

40 V low  $V_{CEsat}$  PNP transistor

20 September 2019

Product data sheet

## 1. General description

PNP low  $V_{CEsat}$  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
$V_{CEO}$	collector-emitter voltage	open base	-	-	-40	V
$I_C$	collector current		-	-	-5	A
$I_{CM}$	peak collector current	single pulse; $t_p \leq 1$ ms	-	-	-10	A
$R_{CEsat}$	collector-emitter saturation resistance	$I_C = -2$ A; $I_B = -200$ mA; $t_p \leq 300$ $\mu$ s; pulsed; $\delta \leq 0.02$ ; $T_{amb} = 25$ °C	-	55	80	m $\Omega$

## 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

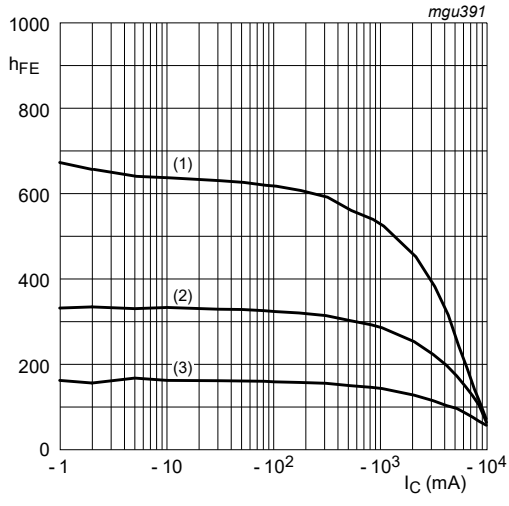
[1] Device mounted on an FR4 PCB, single-sided copper, tin-plated, mounting pad for collector 1 cm<sup>2</sup>.

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

## 10. Characteristics

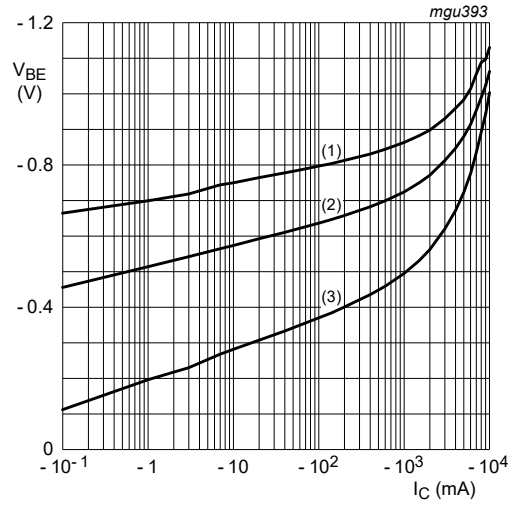
Table 7. Characteristics

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



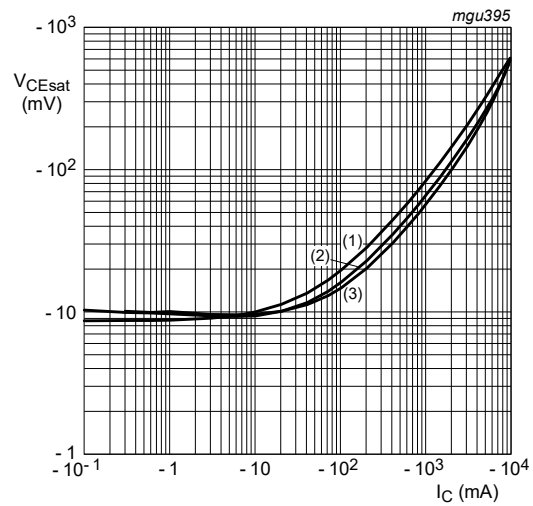
$V_{CE} = -2\text{ V}$   
 (1)  $T_{amb} = 150\text{ }^{\circ}\text{C}$   
 (2)  $T_{amb} = 25\text{ }^{\circ}\text{C}$   
 (3)  $T_{amb} = -55\text{ }^{\circ}\text{C}$

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



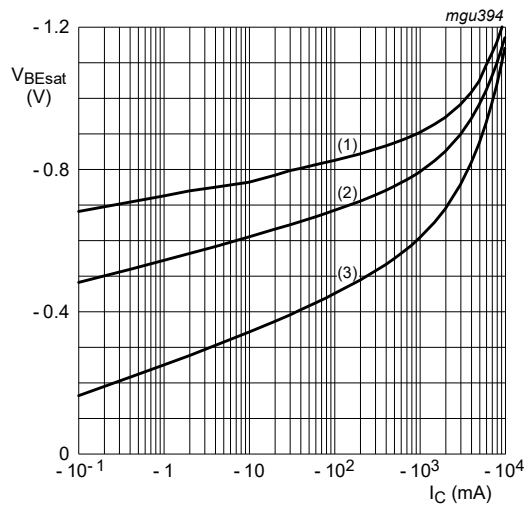
$V_{CE} = -2\text{ V}$   
 (1)  $T_{amb} = 150\text{ }^{\circ}\text{C}$   
 (2)  $T_{amb} = 25\text{ }^{\circ}\text{C}$   
 (3)  $T_{amb} = -55\text{ }^{\circ}\text{C}$

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



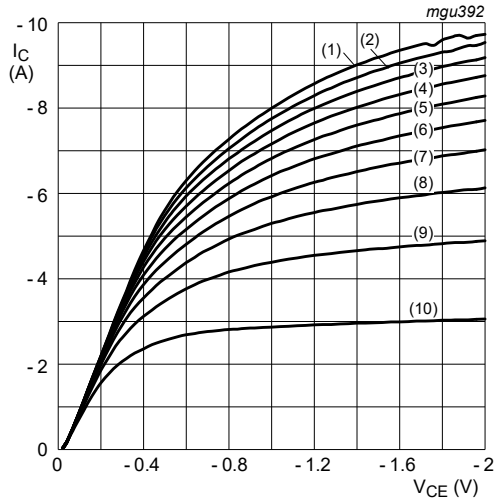
$I_C/I_B = 20$   
 (1)  $T_{amb} = 150\text{ }^{\circ}\text{C}$   
 (2)  $T_{amb} = 25\text{ }^{\circ}\text{C}$   
 (3)  $T_{amb} = -55\text{ }^{\circ}\text{C}$

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



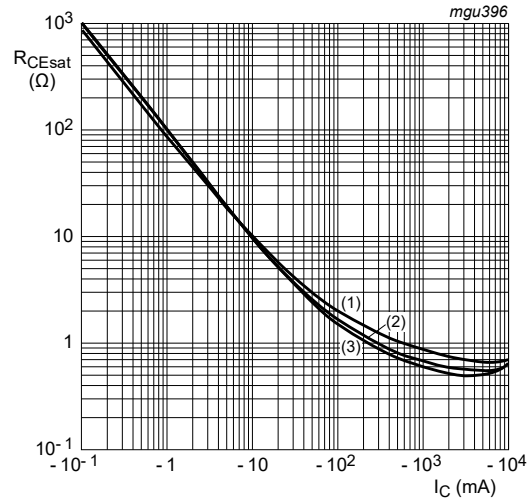
$I_C/I_B = 20$   
 (1)  $T_{amb} = 150\text{ }^{\circ}\text{C}$   
 (2)  $T_{amb} = 25\text{ }^{\circ}\text{C}$   
 (3)  $T_{amb} = -55\text{ }^{\circ}\text{C}$

**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

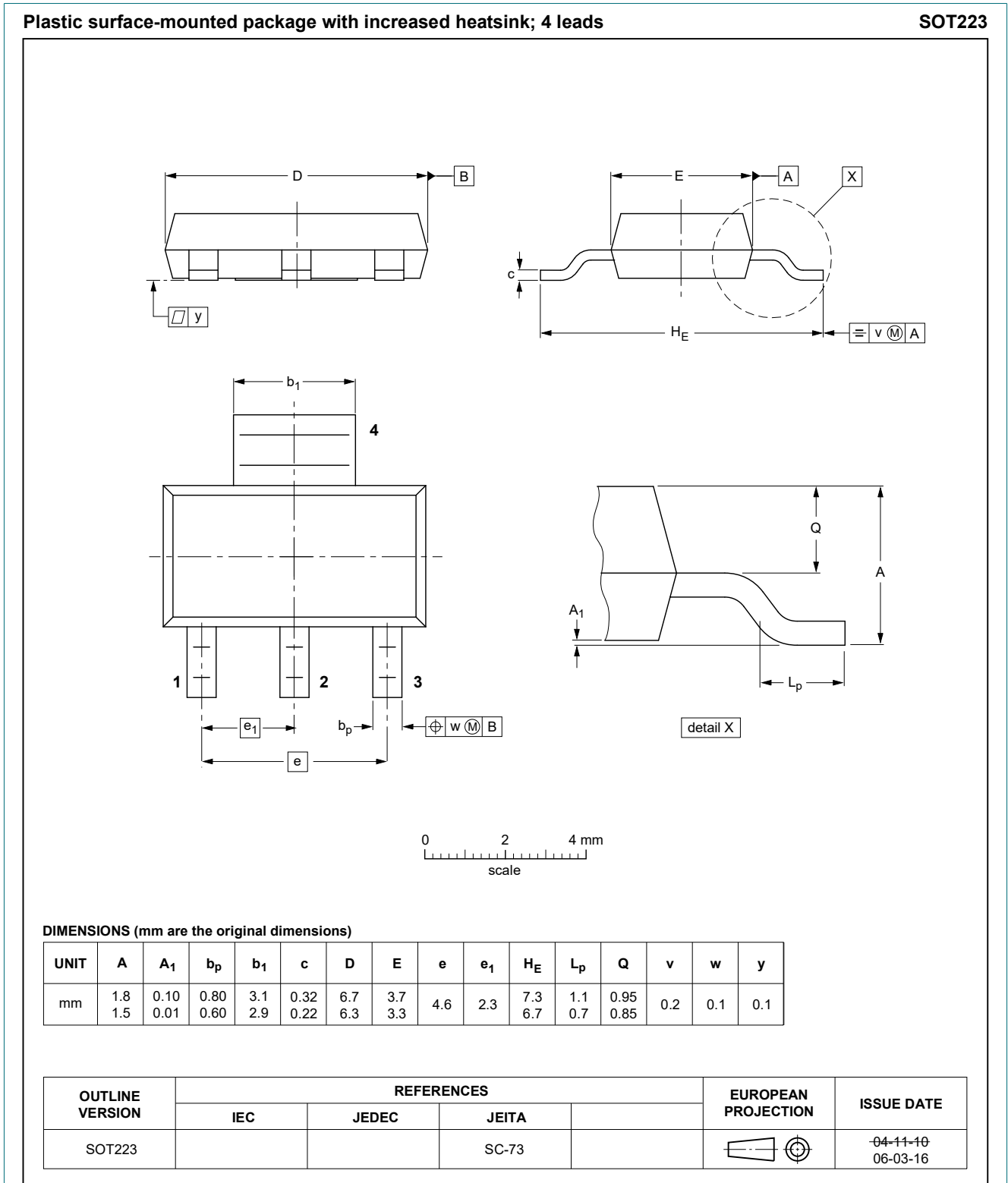
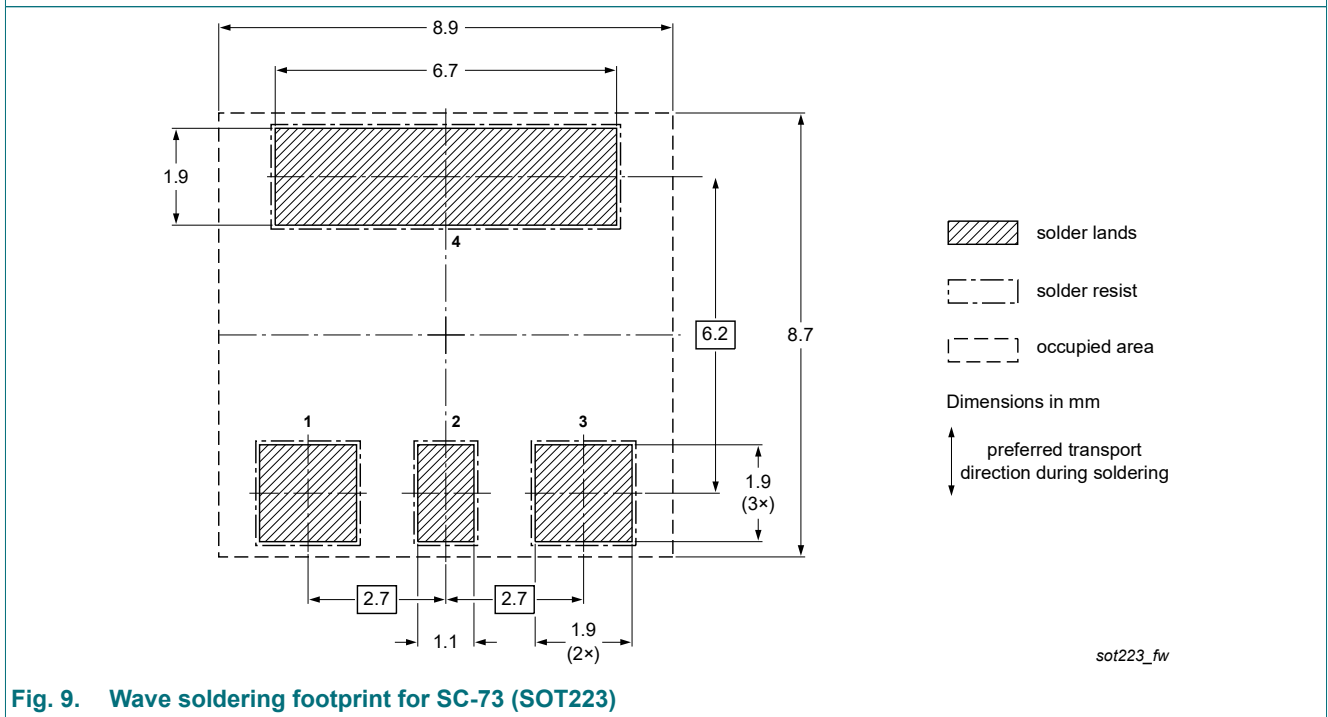
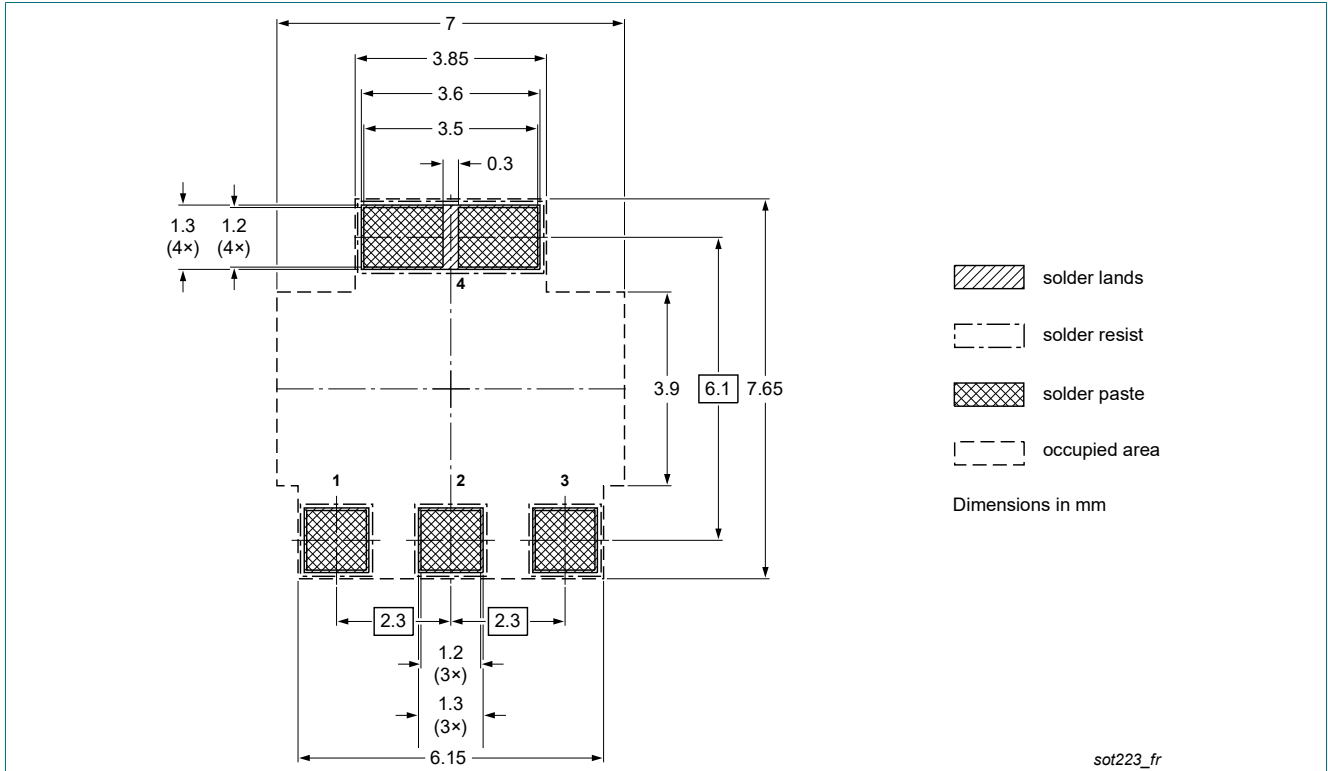


Fig. 7. Package outline SC-73 (SOT223)

13. Soldering



## 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".
- [3] The product status of device(s) described in this document may have changed since this document was published and may differ in case of multiple devices. The latest product status information is available on the internet at <https://www.nexperia.com>.

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