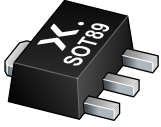




**THE DATASHEET OF  
PBSS4350X,115**





# PBSS4350X

50 V, 3 A NPN low V<sub>CEsat</sub> transistor

16 May 2022

Product data sheet

## 1. General description

NPN low V<sub>CEsat</sub> transistor in a SOT89 plastic package.

PNP complement: PBSS5350X

## 2. Features and benefits

- SOT89 (SC-62) package
- Low collector-emitter saturation voltage V<sub>CEsat</sub>
- High collector current capability: I<sub>C</sub> and I<sub>CM</sub>
- Higher efficiency leading to less heat generation
- Reduced printed-circuit board requirements
- AEC-Q101 qualified

## 3. Applications

- Power management
  - DC/DC converters
  - Supply line switching
  - Battery charger
  - LCD backlighting
- Peripheral drivers
  - Driver in low supply voltage applications (e.g. lamps and LEDs)
  - Inductive load driver (e.g. relays, buzzers and motors)

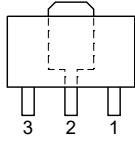
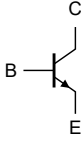
## 4. Quick reference data

Table 1. Quick reference data

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
V <sub>CB0</sub>	collector-base voltage	open emitter	-	-	50	V
I <sub>C</sub>	collector current		-	-	3	A
I <sub>CM</sub>	peak collector current	limited by T <sub>j(max)</sub>	-	-	5	A
R <sub>CEsat</sub>	collector-emitter saturation resistance	I <sub>C</sub> = 2 A; I <sub>B</sub> = 200 mA; pulsed; t <sub>p</sub> ≤ 300 μs; δ ≤ 0.02; T <sub>amb</sub> = 25 °C	-	100	130	mΩ

## 5. Pinning information

Table 2. Pinning information

Pin	Symbol	Description	Simplified outline	Graphic symbol
1	E	emitter	 <p style="text-align: center;"><b>SOT89</b></p>	 <p style="text-align: center;">sym123</p>
2	C	collector		
3	B	base		

## 6. Ordering information

Table 3. Ordering information

Type number	Package		
	Name	Description	Version
<a href="#">PBSS4350X</a>	SOT89	plastic, surface-mounted package; 3 leads; 1.5 mm pitch; 4.5 mm x 2.5 mm x 1.5 mm body	<a href="#">SOT89</a>

## 7. Marking

Table 4. Marking codes

Type number	Marking code
PBSS4350X	S43

## 8. Limiting values

Table 5. Limiting values

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

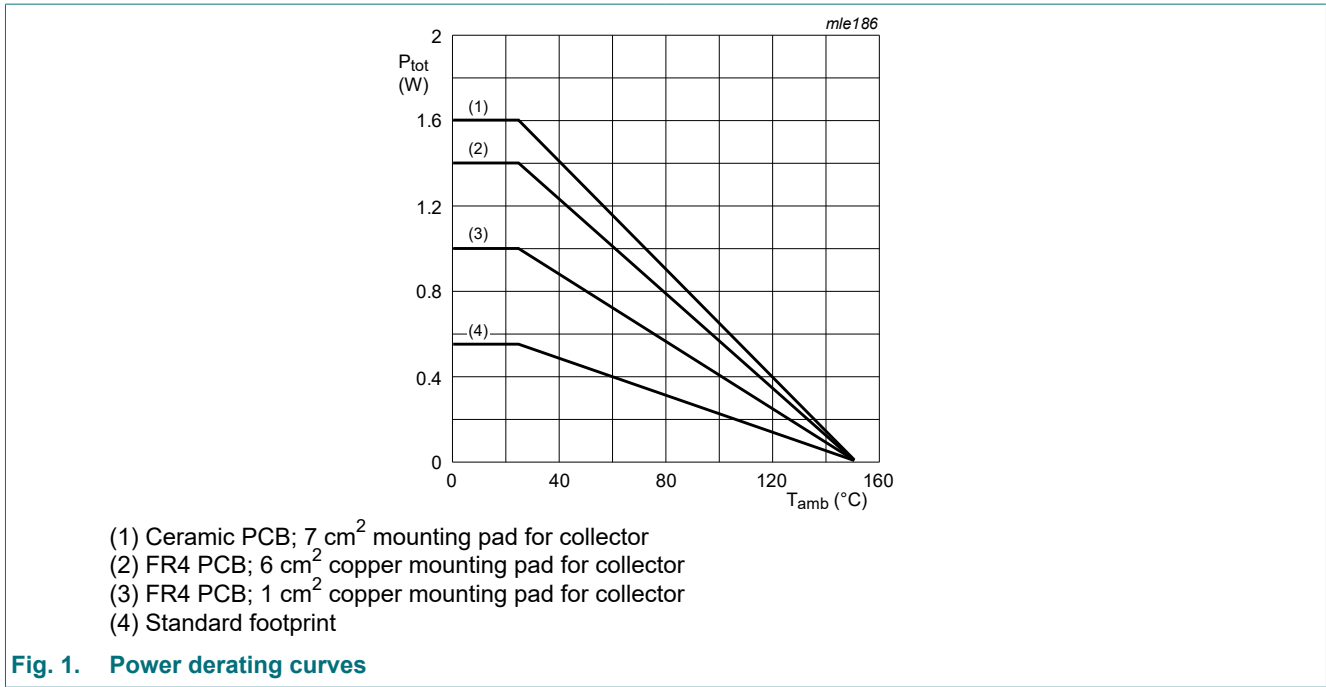
Symbol	Parameter	Conditions		Min	Max	Unit
$V_{CBO}$	collector-base voltage	open emitter		-	50	V
$V_{CEO}$	collector-emitter voltage	open base		-	50	V
$V_{EBO}$	emitter-base voltage	open collector		-	5	V
$I_C$	collector current			-	3	A
$I_{CM}$	peak collector current	limited by $T_{j(max)}$		-	5	A
$I_B$	base current			-	0.5	A
$P_{tot}$	total power dissipation	$T_{amb} \leq 25\text{ }^\circ\text{C}$	[1]	-	550	mW
			[2]	-	1	W
			[3]	-	1.4	W
			[4]	-	1.6	W
$T_j$	junction temperature			-	150	$^\circ\text{C}$
$T_{amb}$	ambient temperature			-65	150	$^\circ\text{C}$
$T_{stg}$	storage temperature			-65	150	$^\circ\text{C}$

[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<sup>2</sup>.

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

[4] Device mounted on a ceramic PCB 7 cm<sup>2</sup>, single-sided copper, tin-plated.

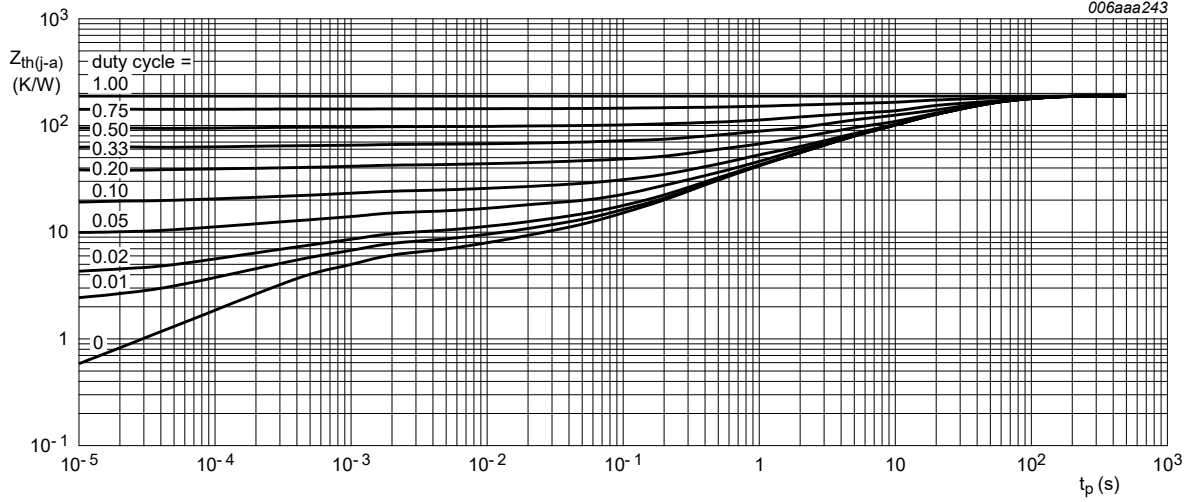


## 9. Thermal characteristics

**Table 6. Thermal characteristics**

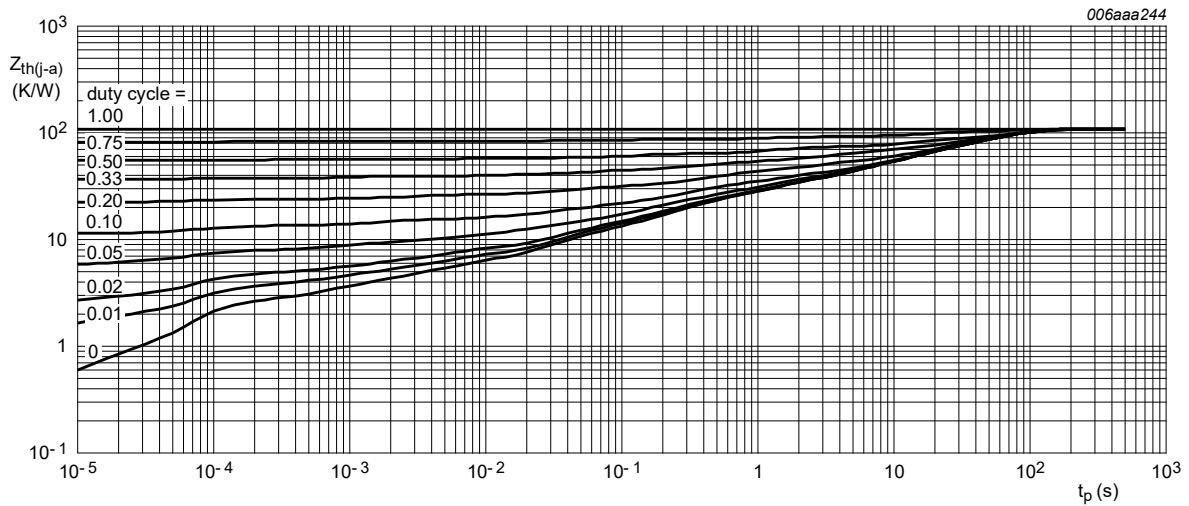
Symbol	Parameter	Conditions		Min	Typ	Max	Unit
R <sub>th(j-a)</sub>	thermal resistance from junction to ambient	in free air	[1]	-	-	225	K/W
			[2]	-	-	125	K/W
			[3]	-	-	90	K/W
			[4]	-	-	80	K/W
R <sub>th(j-sp)</sub>	thermal resistance from junction to solder point			-	-	16	K/W

- [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<sup>2</sup>.
- [3] Device mounted on an FR4 PCB, single-sided copper, tin-plated, mounting pad for collector 6 cm<sup>2</sup>.
- [4] Device mounted on a ceramic PCB 7 cm<sup>2</sup>, single-sided copper, tin-plated.



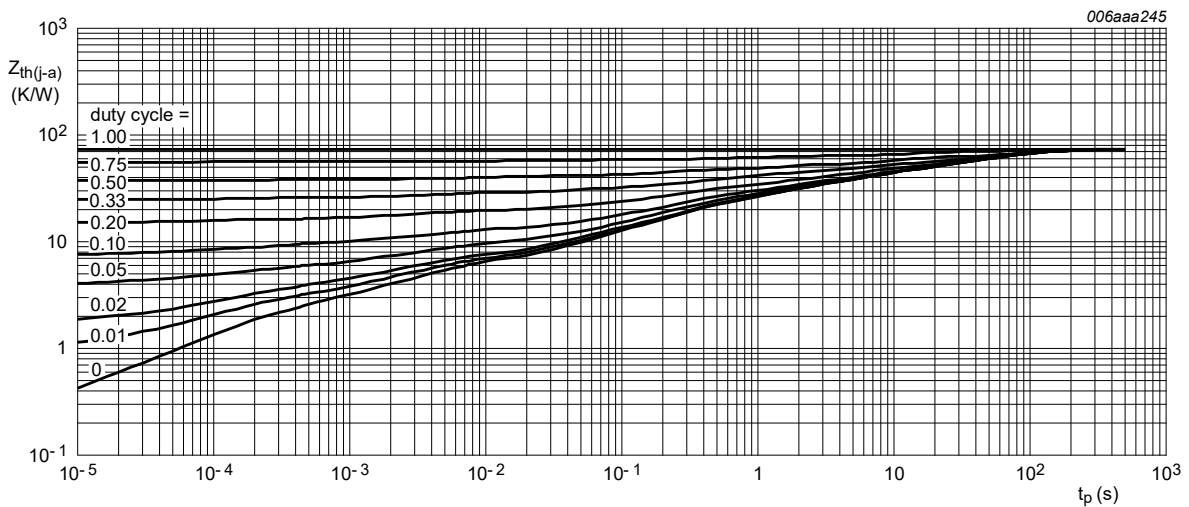
Mounted on FR4 PCB; standard footprint.

Fig. 2. Transient thermal impedance as a function of pulse duration; typical values



Mounted on FR4 PCB; mounting pad for collector 1 cm<sup>2</sup>

Fig. 3. Transient thermal impedance as a function of pulse duration; typical values



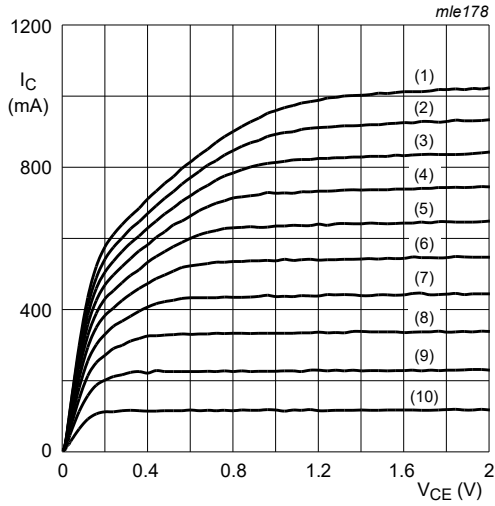
Mounted on FR4 PCB; mounting pad for collector 6 cm<sup>2</sup>

Fig. 4. Transient thermal impedance as a function of pulse duration; typical values

## 10. Characteristics

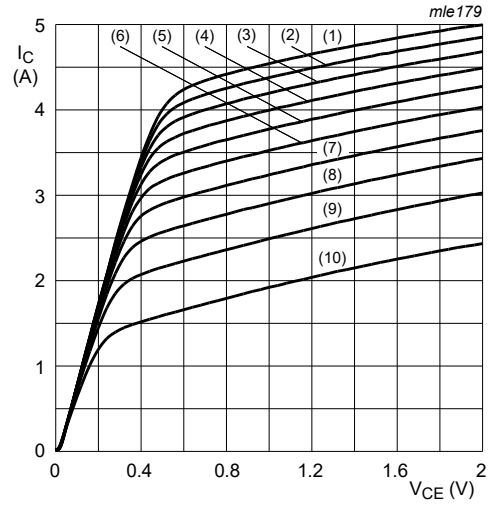
Table 7. Characteristics

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$V_{(BR)CBO}$	collector-base breakdown voltage	$I_C = 100 \mu\text{A}; I_E = 0 \text{ A}; T_{\text{amb}} = 25 \text{ }^\circ\text{C}$	50	-	-	V
$V_{(BR)CEO}$	collector-emitter breakdown voltage	$I_C = 10 \text{ mA}; I_B = 0 \text{ A}; T_{\text{amb}} = 25 \text{ }^\circ\text{C}$	50	-	-	V
$V_{(BR)EBO}$	emitter-base breakdown voltage (collector open)	$I_E = 100 \mu\text{A}; I_C = 0 \text{ A}; T_{\text{amb}} = 25 \text{ }^\circ\text{C}$	5	-	-	V
$I_{CBO}$	collector-base cut-off current	$V_{CB} = 50 \text{ V}; I_E = 0 \text{ A}; T_{\text{amb}} = 25 \text{ }^\circ\text{C}$	-	-	100	nA
		$V_{CB} = 50 \text{ V}; I_E = 0 \text{ A}; T_J = 150 \text{ }^\circ\text{C}$	-	-	50	$\mu\text{A}$
$I_{CES}$	collector-emitter cut-off current	$V_{CE} = 50 \text{ V}; V_{BE} = 0 \text{ V}; T_{\text{amb}} = 25 \text{ }^\circ\text{C}$	-	-	100	nA
$I_{EBO}$	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	$V_{CE} = 2 \text{ V}; I_C = 0.1 \text{ A}; \text{pulsed}; t_p \leq 300 \mu\text{s}; \delta \leq 2; T_{\text{amb}} = 25 \text{ }^\circ\text{C}$	300	-	-	
		$V_{CE} = 2 \text{ V}; I_C = 0.5 \text{ A}; \text{pulsed}; t_p \leq 300 \mu\text{s}; \delta \leq 0.02; T_{\text{amb}} = 25 \text{ }^\circ\text{C}$	300	-	-	
		$V_{CE} = 2 \text{ V}; I_C = 1 \text{ A}; \text{pulsed}; t_p \leq 300 \mu\text{s}; \delta \leq 0.02; T_{\text{amb}} = 25 \text{ }^\circ\text{C}$	300	-	700	
		$V_{CE} = 2 \text{ V}; I_C = 2 \text{ A}; \text{pulsed}; t_p \leq 300 \mu\text{s}; \delta \leq 0.02; T_{\text{amb}} = 25 \text{ }^\circ\text{C}$	200	-	-	
		$V_{CE} = 2 \text{ V}; I_C = 3 \text{ A}; \text{pulsed}; t_p \leq 300 \mu\text{s}; \delta \leq 0.02; T_{\text{amb}} = 25 \text{ }^\circ\text{C}$	100	-	-	
$V_{CEsat}$	collector-emitter saturation voltage	$I_C = 0.5 \text{ A}; I_B = 50 \text{ mA}; T_{\text{amb}} = 25 \text{ }^\circ\text{C}$	-	-	80	mV
		$I_C = 1 \text{ A}; I_B = 50 \text{ mA}; T_{\text{amb}} = 25 \text{ }^\circ\text{C}$	-	-	160	mV
		$I_C = 2 \text{ A}; I_B = 100 \text{ mA}; \text{pulsed}; t_p \leq 300 \mu\text{s}; \delta \leq 0.02; T_{\text{amb}} = 25 \text{ }^\circ\text{C}$	-	-	280	mV
		$I_C = 2 \text{ A}; I_B = 200 \text{ mA}; \text{pulsed}; t_p \leq 300 \mu\text{s}; \delta \leq 0.02; T_{\text{amb}} = 25 \text{ }^\circ\text{C}$	-	-	260	mV
		$I_C = 3 \text{ A}; I_B = 300 \text{ mA}; \text{pulsed}; t_p \leq 300 \mu\text{s}; \delta \leq 0.02; T_{\text{amb}} = 25 \text{ }^\circ\text{C}$	-	-	370	mV
$R_{CEsat}$	collector-emitter saturation resistance	$I_C = 2 \text{ A}; I_B = 200 \text{ mA}; \text{pulsed}; t_p \leq 300 \mu\text{s}; \delta \leq 0.02; T_{\text{amb}} = 25 \text{ }^\circ\text{C}$	-	100	130	$\text{m}\Omega$
$V_{BEsat}$	base-emitter saturation voltage	$I_C = 2 \text{ A}; I_B = 100 \text{ mA}; T_{\text{amb}} = 25 \text{ }^\circ\text{C}$	-	-	1.1	V
		$I_C = 3 \text{ A}; I_B = 300 \text{ mA}; \text{pulsed}; t_p \leq 300 \mu\text{s}; \delta \leq 0.02; T_{\text{amb}} = 25 \text{ }^\circ\text{C}$	-	-	1.2	V
$V_{BEon}$	base-emitter turn-on voltage	$V_{CE} = 2 \text{ V}; I_C = 1 \text{ A}; T_{\text{amb}} = 25 \text{ }^\circ\text{C}$	-	-	1.1	V
$f_T$	transition frequency	$V_{CE} = 5 \text{ V}; I_C = 100 \text{ mA}; f = 100 \text{ MHz}; T_{\text{amb}} = 25 \text{ }^\circ\text{C}$	100	-	-	MHz
$C_c$	collector capacitance	$V_{CB} = 10 \text{ V}; I_E = 0 \text{ A}; i_e = 0 \text{ A}; f = 1 \text{ MHz}; T_{\text{amb}} = 25 \text{ }^\circ\text{C}$	-	-	25	pF



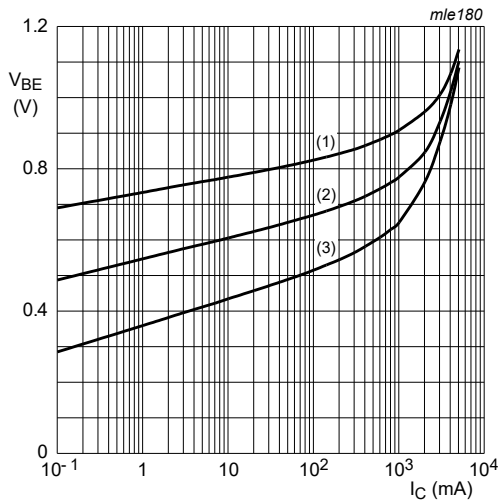
$T_{amb} = 25\text{ }^\circ\text{C}$   
 (1)  $I_B = 2600\text{ }\mu\text{A}$   
 (2)  $I_B = 2340\text{ }\mu\text{A}$   
 (3)  $I_B = 2080\text{ }\mu\text{A}$   
 (4)  $I_B = 1820\text{ }\mu\text{A}$   
 (5)  $I_B = 1560\text{ }\mu\text{A}$   
 (6)  $I_B = 1300\text{ }\mu\text{A}$   
 (7)  $I_B = 1040\text{ }\mu\text{A}$   
 (8)  $I_B = 780\text{ }\mu\text{A}$   
 (9)  $I_B = 520\text{ }\mu\text{A}$   
 (10)  $I_B = 260\text{ }\mu\text{A}$

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



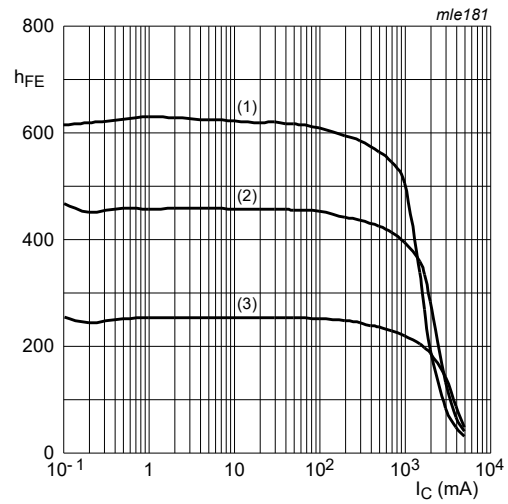
$T_{amb} = 25\text{ }^\circ\text{C}$   
 (1)  $I_B = 120\text{ mA}$   
 (2)  $I_B = 108\text{ mA}$   
 (3)  $I_B = 96\text{ mA}$   
 (4)  $I_B = 84\text{ mA}$   
 (5)  $I_B = 72\text{ mA}$   
 (6)  $I_B = 60\text{ mA}$   
 (7)  $I_B = 48\text{ mA}$   
 (8)  $I_B = 36\text{ mA}$   
 (9)  $I_B = 24\text{ mA}$   
 (10)  $I_B = 12\text{ mA}$

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



$V_{CE} = 2\text{ V}$   
 (1)  $T_{amb} = -55\text{ }^\circ\text{C}$   
 (2)  $T_{amb} = 25\text{ }^\circ\text{C}$   
 (3)  $T_{amb} = 100\text{ }^\circ\text{C}$

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



$V_{CE} = 2\text{ V}$   
 (1)  $T_{amb} = 100\text{ }^\circ\text{C}$   
 (2)  $T_{amb} = 25\text{ }^\circ\text{C}$   
 (3)  $T_{amb} = -55\text{ }^\circ\text{C}$

Fig. 8. DC current gain as a function of collector current; typical values

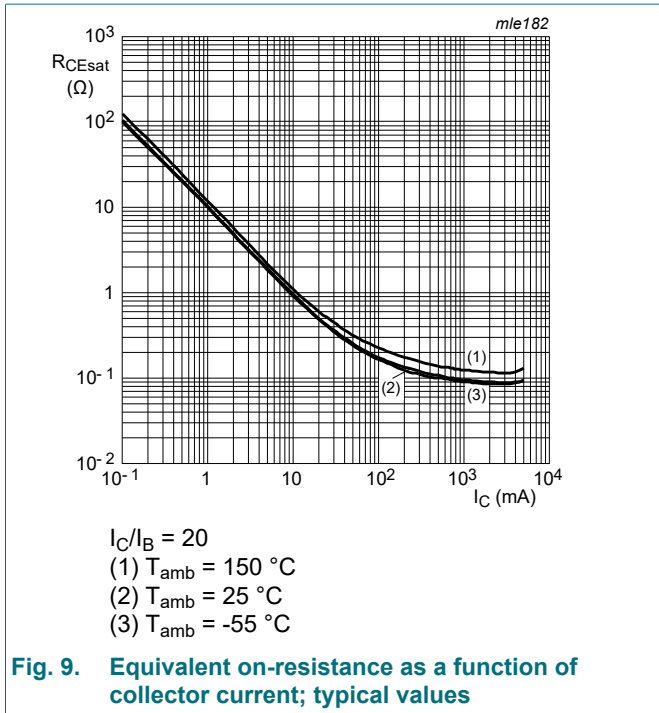


Fig. 9. Equivalent on-resistance as a function of collector current; typical values

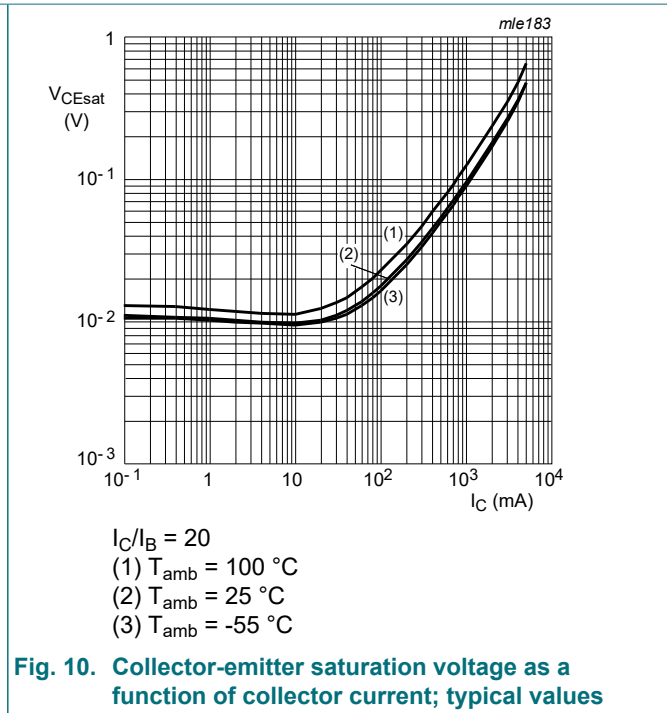


Fig. 10. Collector-emitter saturation voltage as a function of collector current; typical values

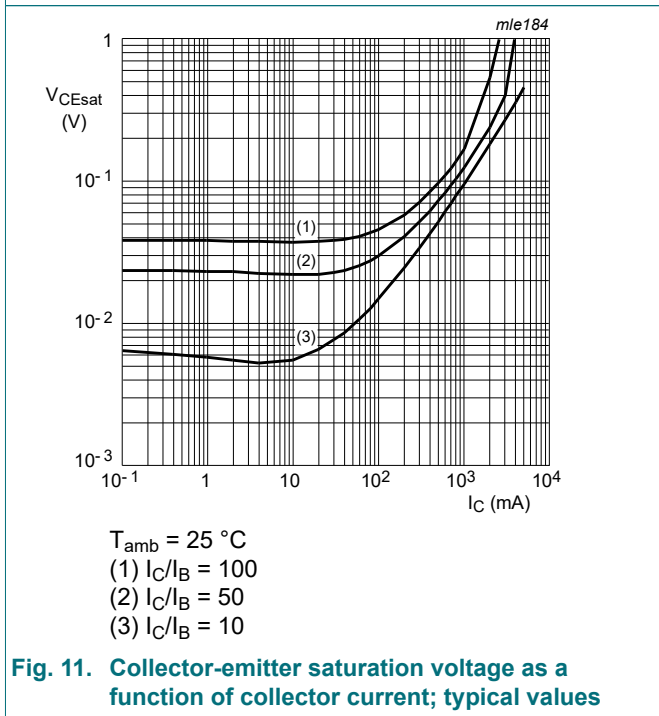


Fig. 11. Collector-emitter saturation voltage as a function of collector current; typical values

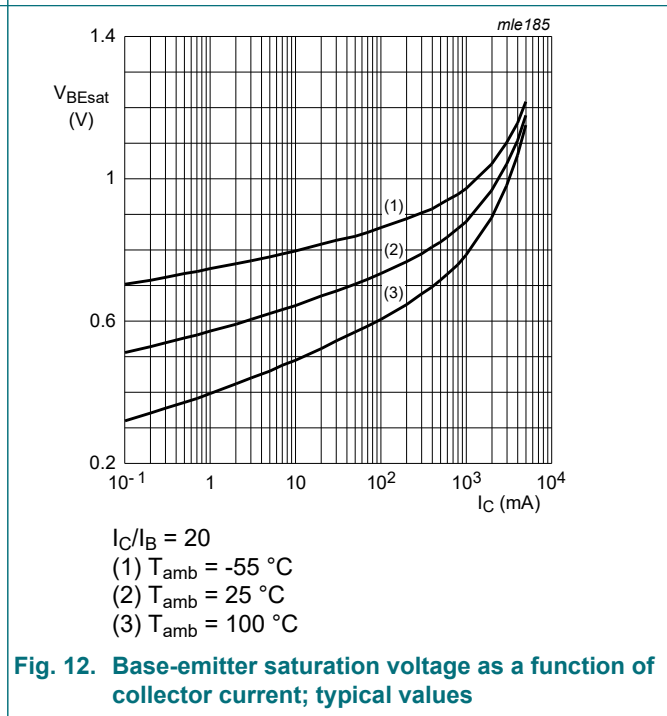


Fig. 12. Base-emitter saturation voltage as a function of collector current; typical values

## 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

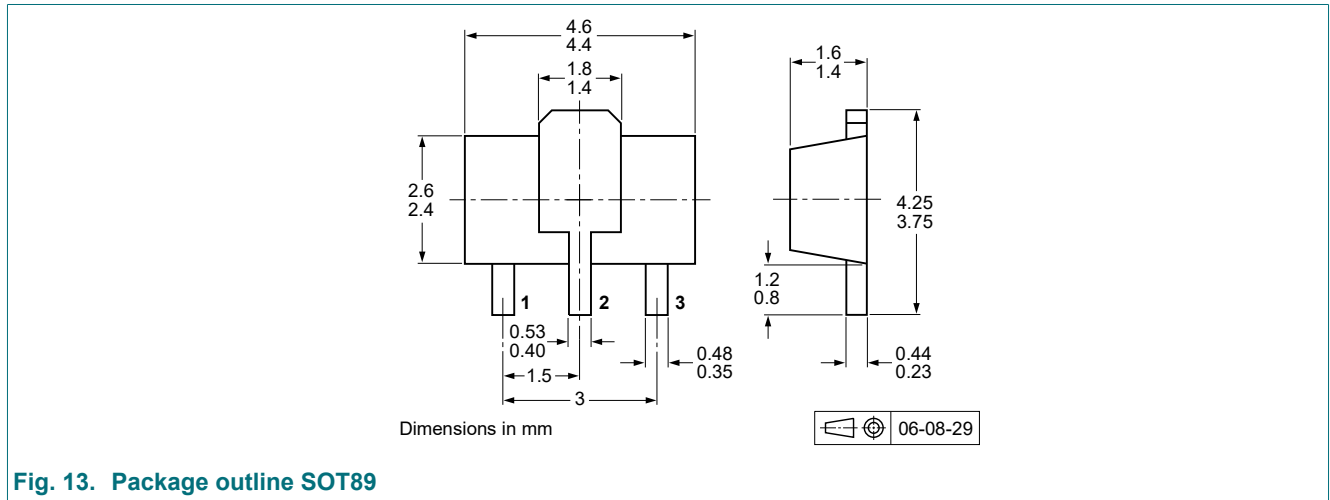


Fig. 13. Package outline SOT89

## 13. Soldering

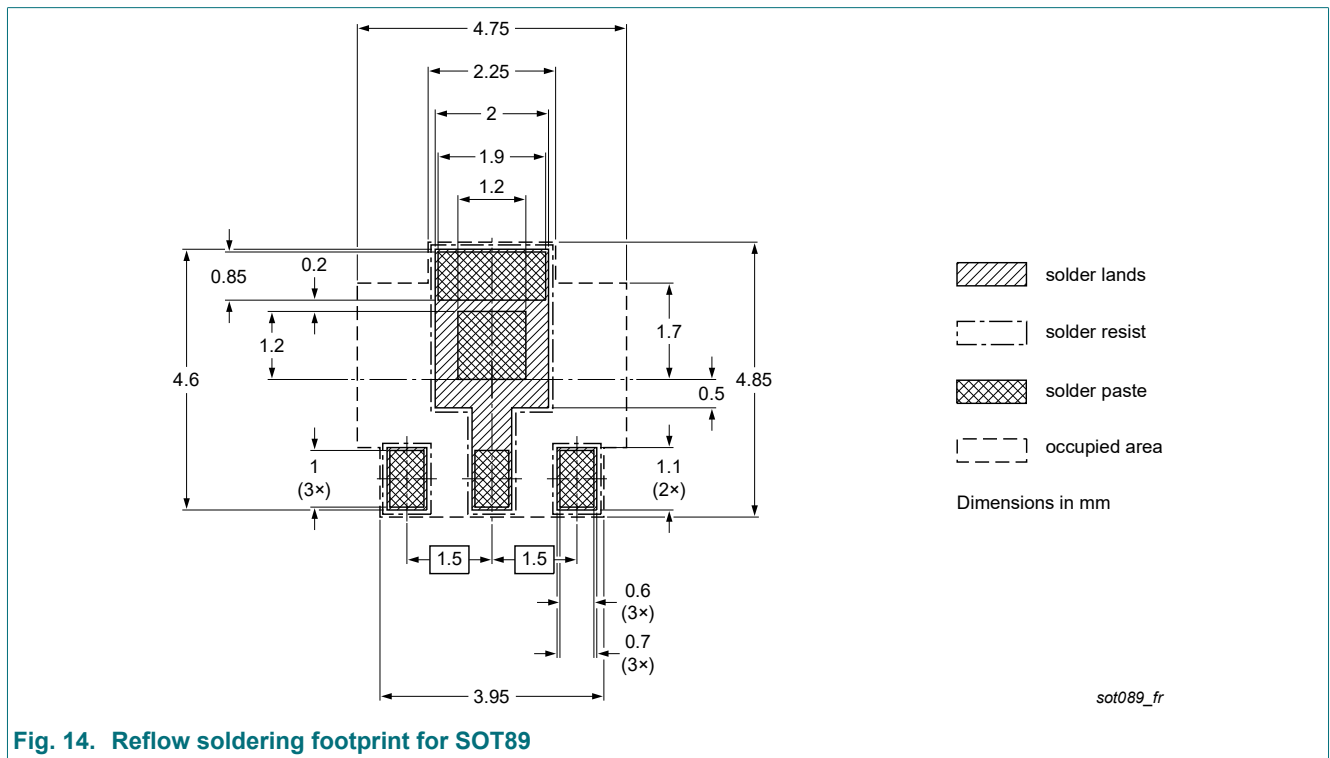


Fig. 14. Reflow soldering footprint for SOT89

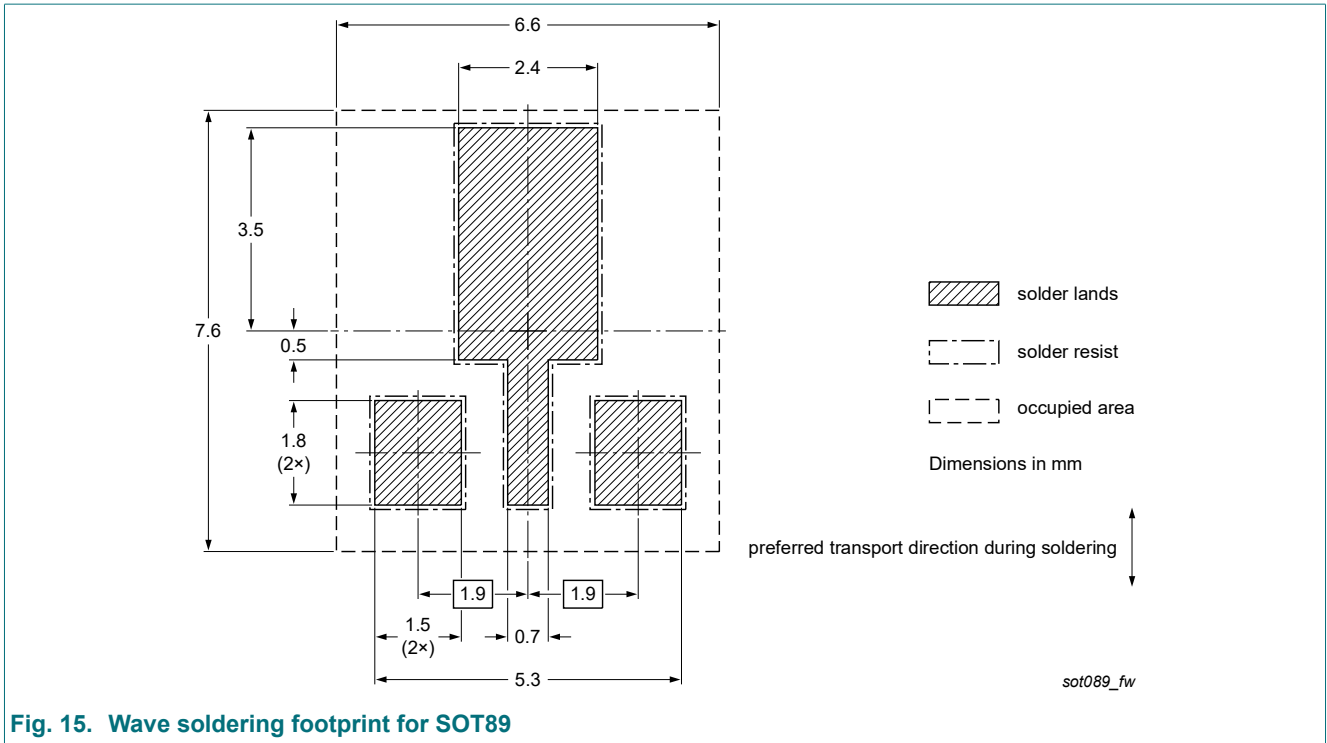


Fig. 15. Wave soldering footprint for SOT89

## 14. Revision history

**Table 8. Revision history**

Data sheet ID	Release date	Data sheet status	Change notice	Supersedes
PBSS4350X v.3	20220516	Product data sheet	-	PBSS4350X v.2
Modifications:	<ul style="list-style-type: none"><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>			
PBSS4350X v.2	20041104	Product data sheet	-	PBSS4350X v.1
PBSS4350X v.1	20031121	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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Date of release: 16 May 2022

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