

PBSS5350X

50 V, 3 A PNP low V_{CEsat} transistor

16 May 2022

Product data sheet

1. General description

PNP low V_{CEsat} transistor in a SOT89 plastic package.

NPN complement: PBSS4350X

2. Features and benefits

- SOT89 (SC-62) package
- Low collector-emitter saturation voltage V_{CEsat}
- High collector current capability: I_C and I_{CM}
- 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)

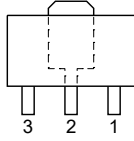
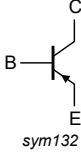
4. Quick reference data

Table 1. Quick reference data

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
V _{CEO}	collector-emitter voltage	open base	-	-	-50	V
I _C	collector current		-	-	-3	A
I _{CM}	peak collector current	limited by T _{j(max)}	-	-	-5	A
R _{CEsat}	collector-emitter saturation resistance	I _C = -2 A; I _B = -200 mA; pulsed; t _p ≤ 300 μs; δ ≤ 0.02; T _{amb} = 25 °C	-	90	135	mΩ

5. Pinning information

Table 2. Pinning information

Pin	Symbol	Description	Simplified outline	Graphic symbol
1	E	emitter	 <p style="text-align: center;">SOT89</p>	 <p style="text-align: center;"><i>sym132</i></p>
2	C	collector		
3	B	base		

6. Ordering information

Table 3. Ordering information

Type number	Package		
	Name	Description	Version
PBSS5350X	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
PBSS5350X	S46

8. Limiting values

Table 5. Limiting values

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

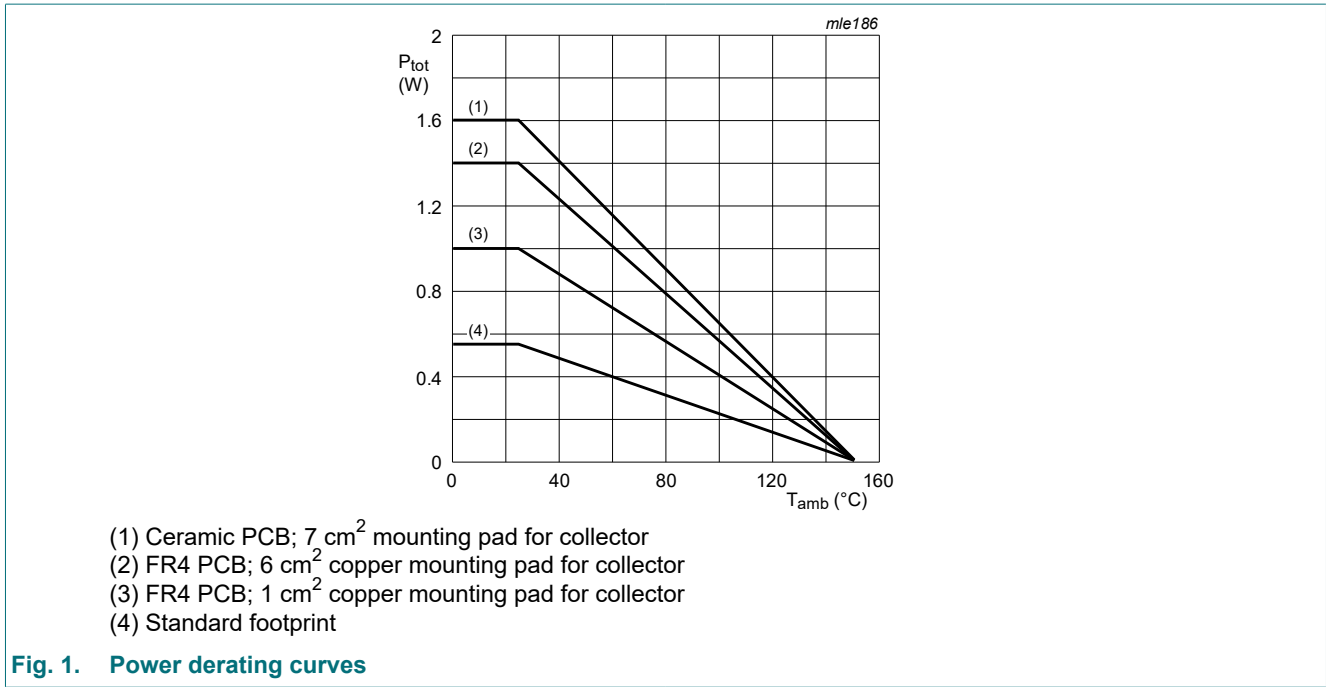
Symbol	Parameter	Conditions		Min	Max	Unit
V_{CBO}	collector-base voltage	open emitter		-	-50	V
V_{CEO}	collector-emitter voltage	open base		-	-50	V
V_{EBO}	emitter-base voltage	open collector		-	-5	V
I_C	collector current			-	-3	A
I_{CM}	peak collector current	limited by $T_{j(max)}$		-	-5	A
I_B	base current			-	-0.5	A
P_{tot}	total power dissipation	$T_{amb} \leq 25\text{ °C}$	[1]	-	550	mW
			[2]	-	1	W
			[3]	-	1.4	W
			[4]	-	1.6	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 and standard footprint.

[2] Device mounted on an FR4 PCB, single-sided copper, tin-plated, mounting pad for collector 1 cm².

[3] Device mounted on an FR4 PCB, single-sided copper, tin-plated, mounting pad for collector 6 cm².

[4] Device mounted on a ceramic printed-circuit board 7 cm², single-sided copper, tin-plated.

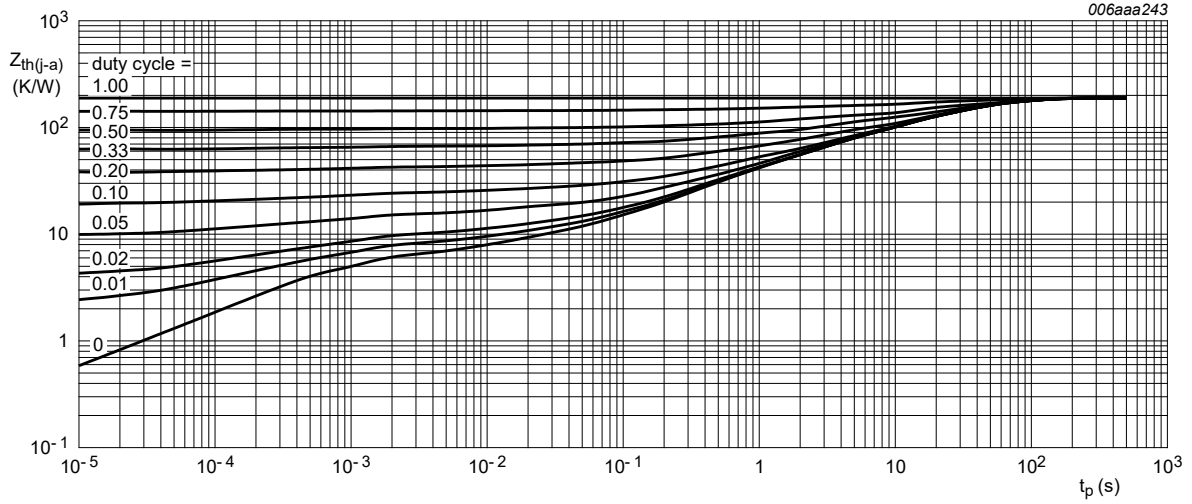


9. Thermal characteristics

Table 6. Thermal characteristics

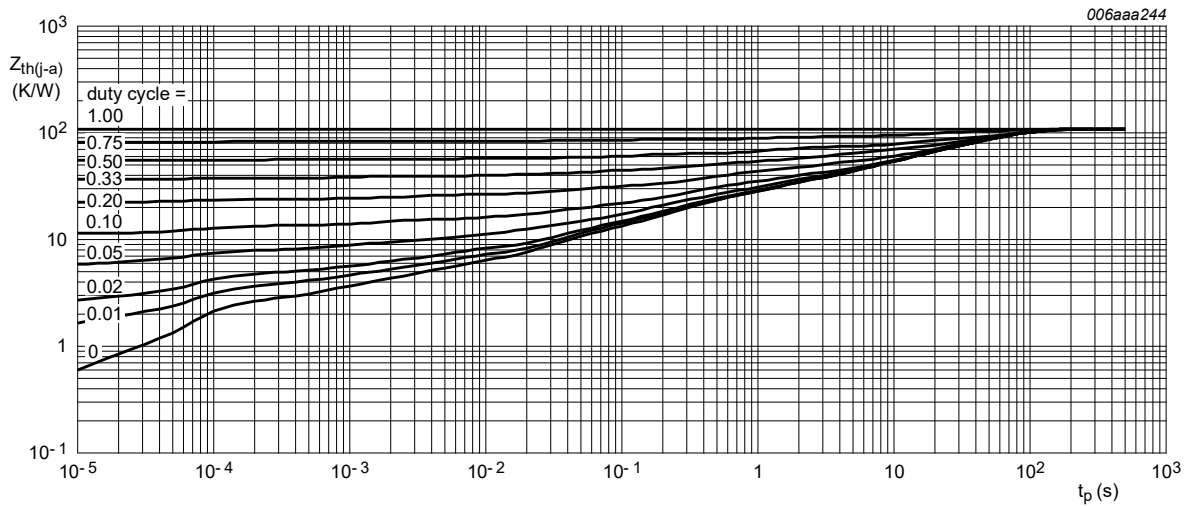
Symbol	Parameter	Conditions		Min	Typ	Max	Unit
R _{th(j-a)}	thermal resistance from junction to ambient	in free air	[1]	-	-	225	K/W
			[2]	-	-	125	K/W
			[3]	-	-	90	K/W
			[4]	-	-	80	K/W
R _{th(j-sp)}	thermal resistance from junction to solder point			-	-	16	K/W

- [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 cm².
- [3] Device mounted on an FR4 PCB, single-sided copper, tin-plated, mounting pad for collector 6 cm².
- [4] Device mounted on a ceramic printed-circuit board 7 cm², single-sided copper, tin-plated.



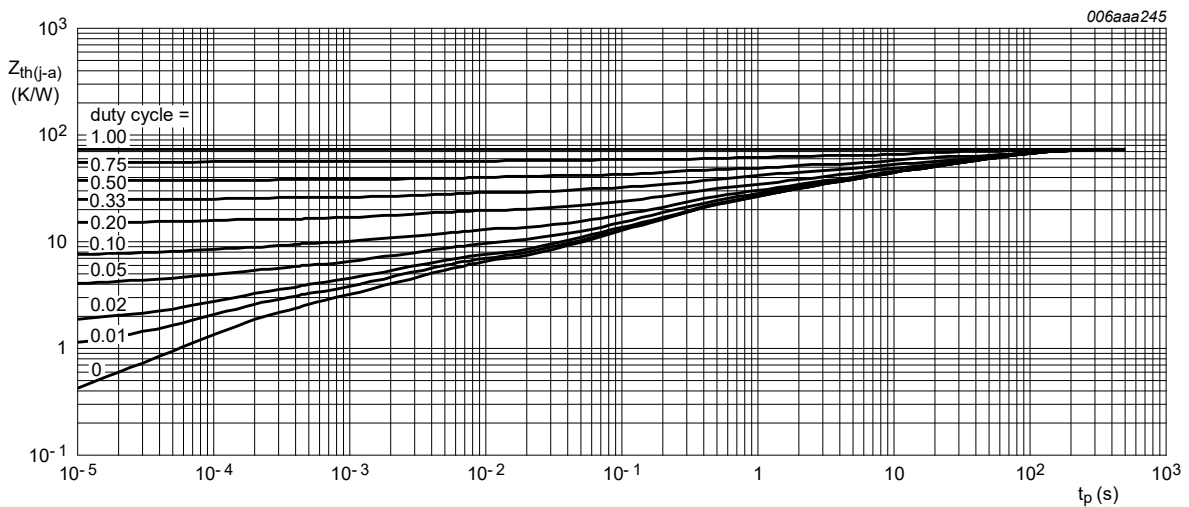
Mounted on FR4 PCB; standard footprint.

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



Mounted on FR4 PCB; mounting pad for collector 1 cm²

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



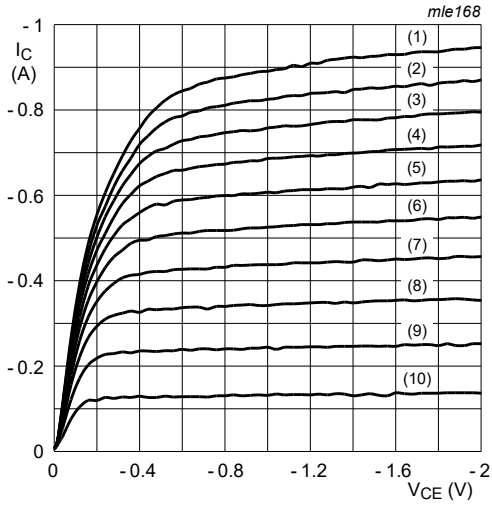
Mounted on FR4 PCB; mounting pad for collector 6 cm²

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

10. Characteristics

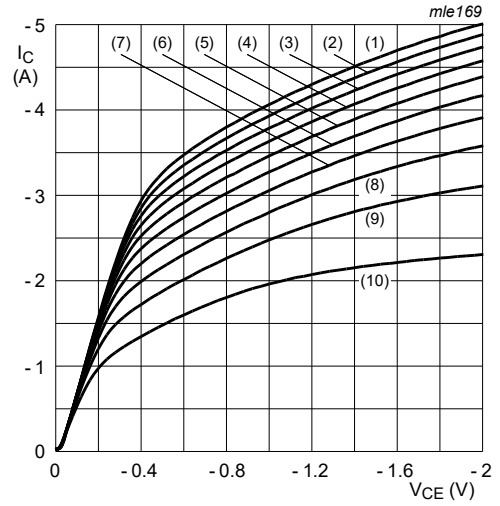
Table 7. Characteristics

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	μA
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	$V_{CE} = -2 \text{ V}$; $I_C = 0.1 \text{ A}$; single pulse; $t_p \leq 300 \mu\text{s}$; $\delta \leq 0.02$; $T_{\text{amb}} = 25 \text{ }^\circ\text{C}$	200	-	-	
		$V_{CE} = -2 \text{ V}$; $I_C = -0.5 \text{ A}$; pulsed; $t_p \leq 300 \mu\text{s}$; $\delta \leq 0.02$; $T_{\text{amb}} = 25 \text{ }^\circ\text{C}$	200	-	-	
		$V_{CE} = -2 \text{ V}$; $I_C = -1 \text{ A}$; pulsed; $t_p \leq 300 \mu\text{s}$; $\delta \leq 0.02$; $T_{\text{amb}} = 25 \text{ }^\circ\text{C}$	200	-	450	
		$V_{CE} = -2 \text{ V}$; $I_C = -2 \text{ A}$; pulsed; $t_p \leq 300 \mu\text{s}$; $\delta \leq 0.02$; $T_{\text{amb}} = 25 \text{ }^\circ\text{C}$	130	-	-	
		$V_{CE} = -2 \text{ V}$; $I_C = -3 \text{ A}$; pulsed; $t_p \leq 300 \mu\text{s}$; $\delta \leq 0.02$; $T_{\text{amb}} = 25 \text{ }^\circ\text{C}$	80	-	-	
V_{CEsat}	collector-emitter saturation voltage	$I_C = -0.5 \text{ A}$; $I_B = -50 \text{ mA}$; $T_{\text{amb}} = 25 \text{ }^\circ\text{C}$	-	-	-90	mV
		$I_C = -1 \text{ A}$; $I_B = -50 \text{ mA}$; $T_{\text{amb}} = 25 \text{ }^\circ\text{C}$	-	-	-180	mV
		$I_C = -2 \text{ A}$; $I_B = -100 \text{ mA}$; $T_{\text{amb}} = 25 \text{ }^\circ\text{C}$	-	-	-320	mV
		$I_C = -2 \text{ A}$; $I_B = -200 \text{ mA}$; pulsed; $t_p \leq 300 \mu\text{s}$; $\delta \leq 0.02$; $T_{\text{amb}} = 25 \text{ }^\circ\text{C}$	-	-	-270	mV
		$I_C = -3 \text{ A}$; $I_B = -300 \text{ mA}$; pulsed; $t_p \leq 300 \mu\text{s}$; $\delta \leq 0.02$; $T_{\text{amb}} = 25 \text{ }^\circ\text{C}$	-	-	-390	mV
R_{CEsat}	collector-emitter saturation resistance	$I_C = -2 \text{ A}$; $I_B = -200 \text{ mA}$; pulsed; $t_p \leq 300 \mu\text{s}$; $\delta \leq 0.02$; $T_{\text{amb}} = 25 \text{ }^\circ\text{C}$	-	90	135	m Ω
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
		$I_C = -3 \text{ A}$; $I_B = -300 \text{ mA}$; 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	$V_{CB} = -10 \text{ V}$; $I_E = 0 \text{ A}$; $i_e = 0 \text{ A}$; $f = 1 \text{ MHz}$; $T_{\text{amb}} = 25 \text{ }^\circ\text{C}$	-	-	35	pF



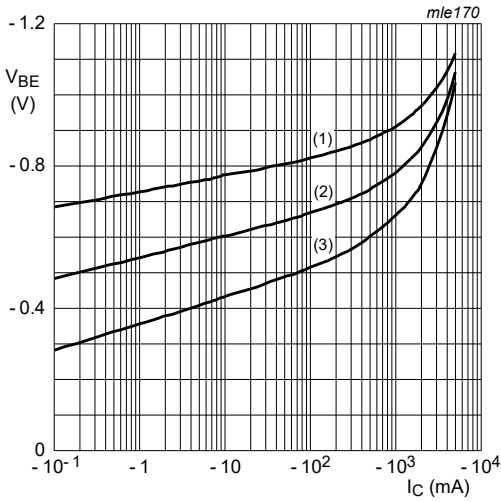
$T_{amb} = 25\text{ }^{\circ}\text{C}$
 (1) $I_B = -3500\text{ }\mu\text{A}$
 (2) $I_B = -3150\text{ }\mu\text{A}$
 (3) $I_B = -2800\text{ }\mu\text{A}$
 (4) $I_B = -2450\text{ }\mu\text{A}$
 (5) $I_B = -2100\text{ }\mu\text{A}$
 (6) $I_B = -1750\text{ }\mu\text{A}$
 (7) $I_B = -1400\text{ }\mu\text{A}$
 (8) $I_B = -1050\text{ }\mu\text{A}$
 (9) $I_B = -700\text{ }\mu\text{A}$
 (10) $I_B = -350\text{ }\mu\text{A}$

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



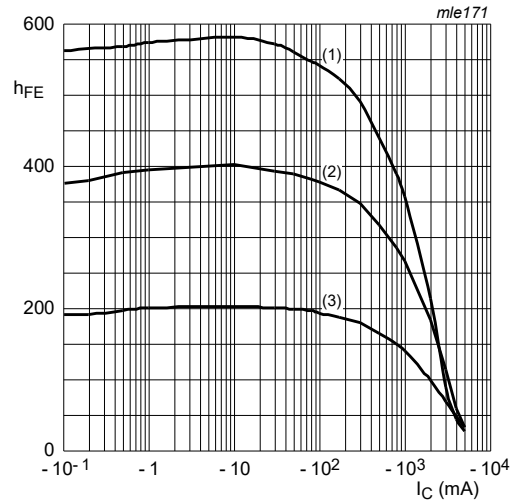
$T_{amb} = 25\text{ }^{\circ}\text{C}$
 (1) $I_B = -140\text{ mA}$
 (2) $I_B = -126\text{ mA}$
 (3) $I_B = -112\text{ mA}$
 (4) $I_B = -98\text{ mA}$
 (5) $I_B = -84\text{ mA}$
 (6) $I_B = -70\text{ mA}$
 (7) $I_B = -56\text{ mA}$
 (8) $I_B = -42\text{ mA}$
 (9) $I_B = -28\text{ mA}$
 (10) $I_B = -14\text{ mA}$

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



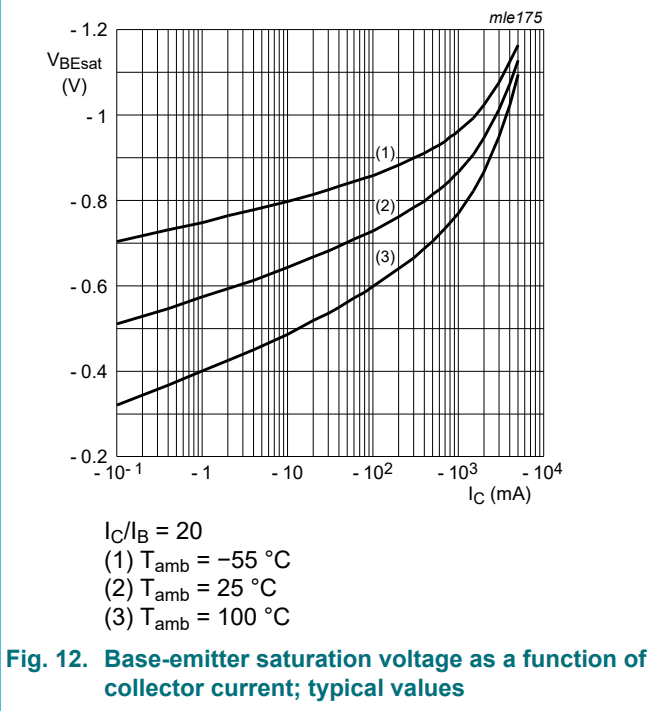
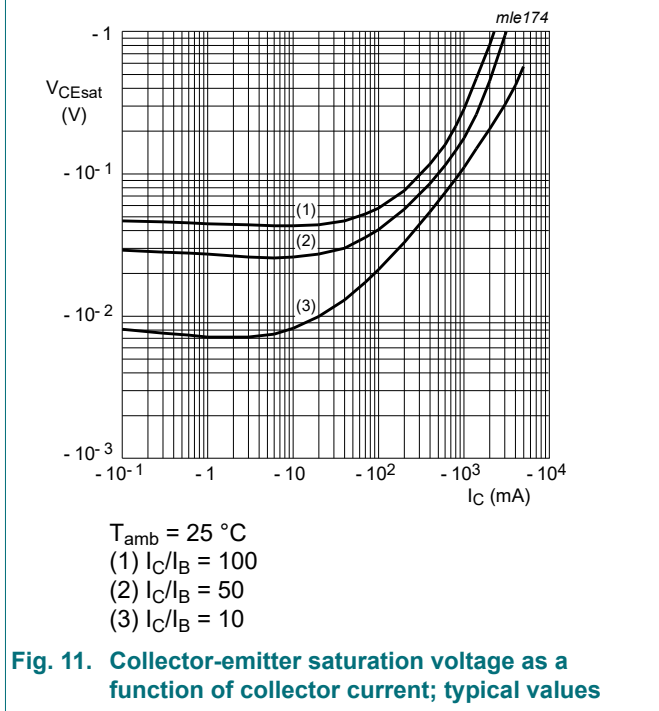
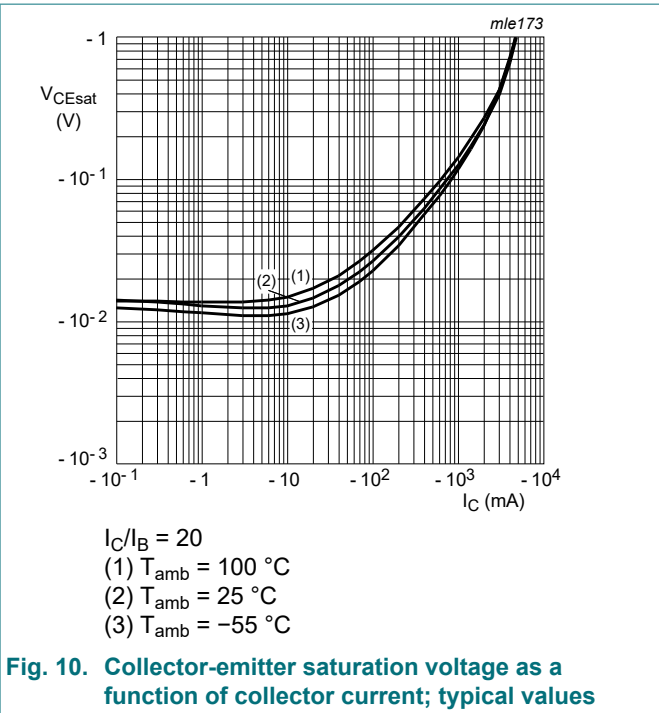
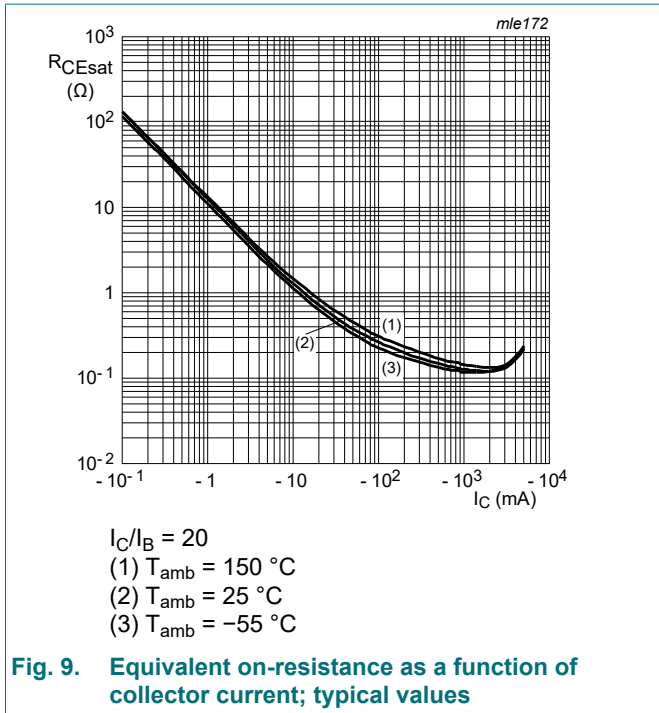
$V_{CE} = -2\text{ V}$
 (1) $T_{amb} = -55\text{ }^{\circ}\text{C}$
 (2) $T_{amb} = 25\text{ }^{\circ}\text{C}$
 (3) $T_{amb} = 100\text{ }^{\circ}\text{C}$

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



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

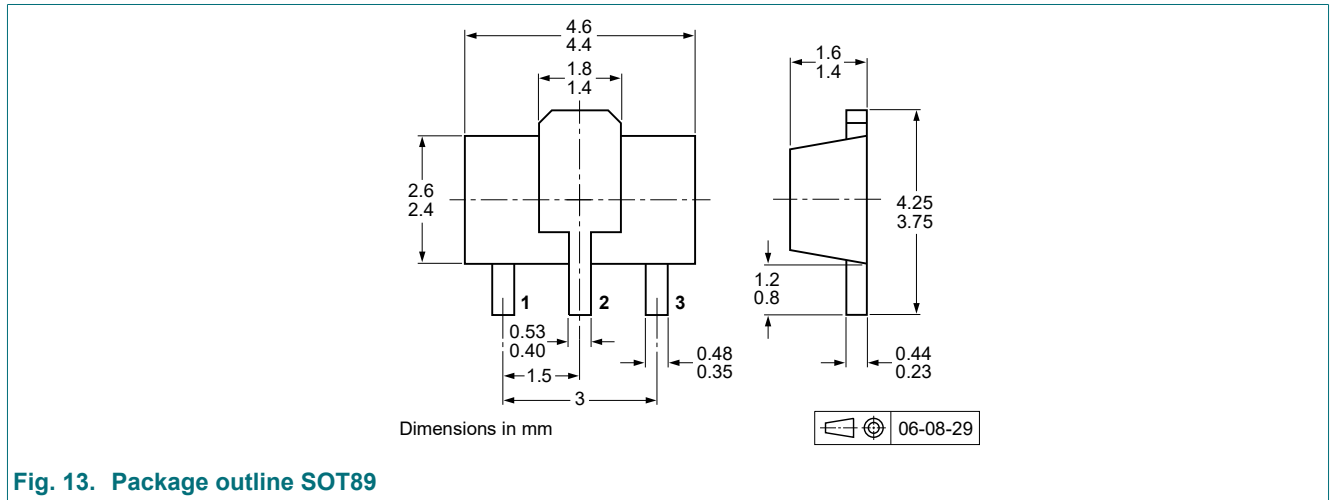


Fig. 13. Package outline SOT89

13. Soldering

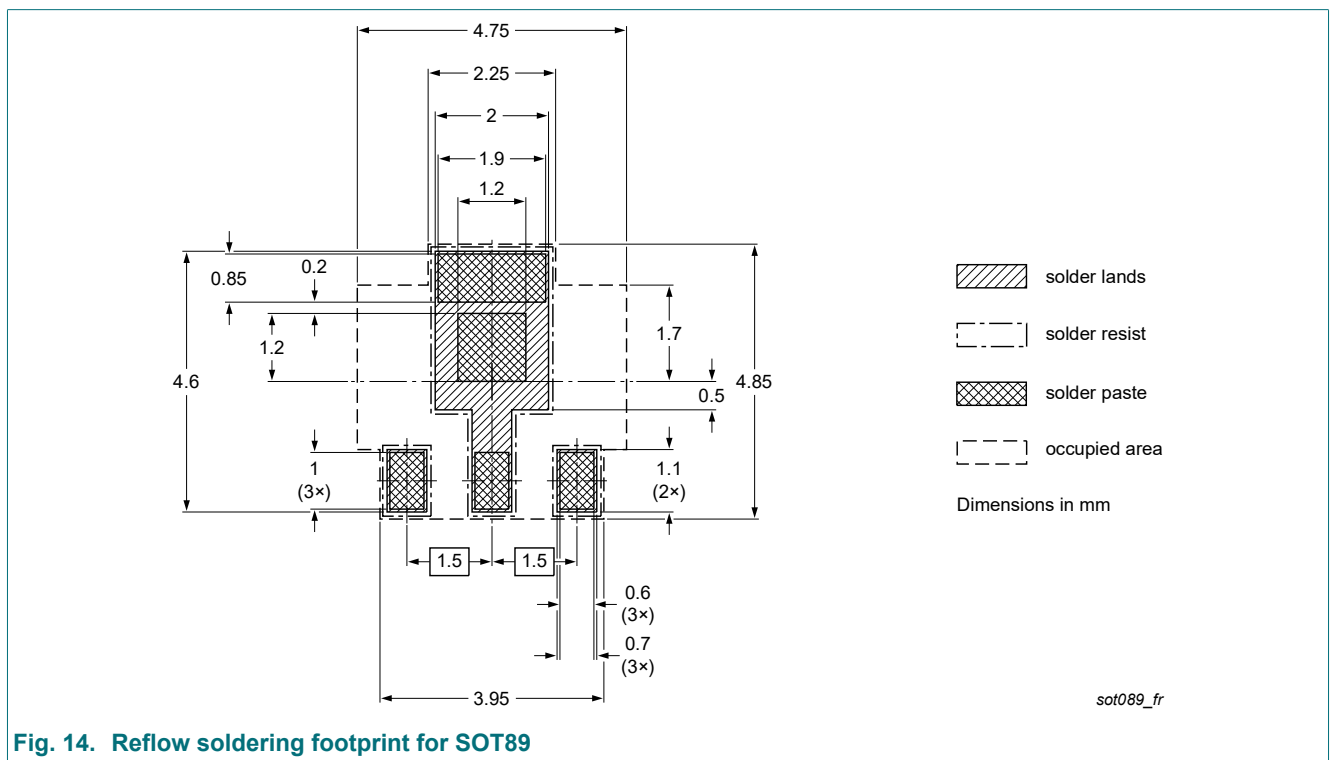


Fig. 14. Reflow soldering footprint for SOT89

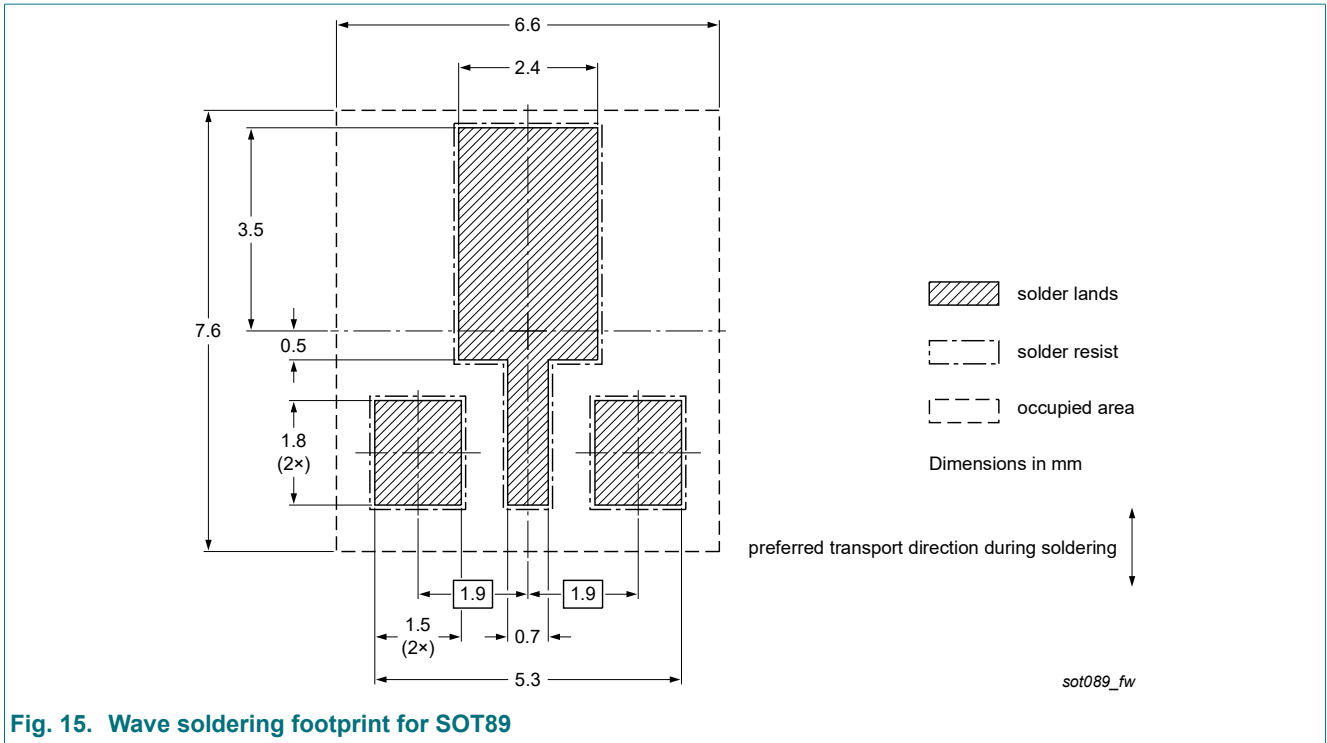


Fig. 15. Wave soldering footprint for SOT89

14. Revision history

Table 8. Revision history

Data sheet ID	Release date	Data sheet status	Change notice	Supersedes
PBSS5350X v.3	20220516	Product data sheet	-	PBSS5350X v.2
Modifications:	<ul style="list-style-type: none">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.			
PBSS5350X v.2	20041104	Product data sheet	-	PBSS5350X v.1
PBSS5350X 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".
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