



# PBHV8550X

500 V, 150 mA NPN high-voltage low V<sub>CEsat</sub> (BISS) transistor

8 June 2020

Product data sheet

## 1. General description

NPN high-voltage low V<sub>CEsat</sub> Breakthrough In Small Signal (BISS) transistor in a medium power SOT89 (SC-62) flat lead Surface-Mounted Device (SMD) plastic package.

## 2. Features and benefits

- High voltage
- Low collector-emitter saturation voltage V<sub>CEsat</sub>
- High collector current capability I<sub>C</sub> and I<sub>CM</sub>
- High collector current gain (h<sub>FE</sub>) at high I<sub>C</sub>
- AEC-Q101 qualified

## 3. Applications

- Electronic ballasts
- LED driver for LED chain module
- LCD backlighting
- Automotive motor management
- Flyback converters
- Switch Mode Power Supply (SMPS)

## 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	-	-	500	V
I <sub>C</sub>	collector current		-	-	150	mA
h <sub>FE</sub>	DC current gain	V <sub>CE</sub> = 10 V; I <sub>C</sub> = 30 mA; T <sub>amb</sub> = 25 °C	50	100	-	

## 5. Pinning information

Table 2. Pinning information

Pin	Symbol	Description	Simplified outline	Graphic symbol
1	E	emitter	<p>SOT89</p>	<p>sym123</p>
2	C	collector		
3	B	base		

## 6. Ordering information

Table 3. Ordering information

Type number	Package		
	Name	Description	Version
PBHV8550X	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
PBHV8550X	C8

## 8. Limiting values

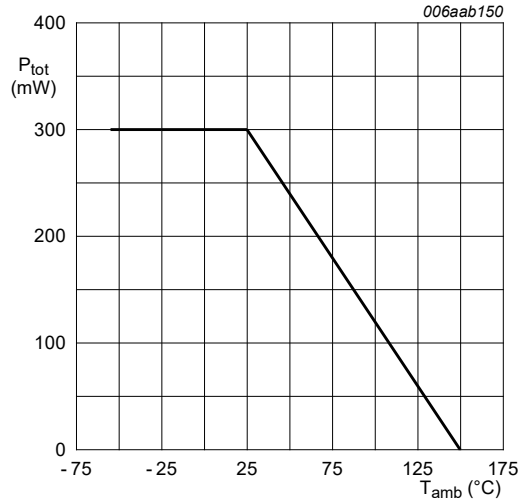
Table 5. Limiting values

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

Symbol	Parameter	Conditions		Min	Max	Unit
$V_{CBO}$	collector-base voltage	open emitter		-	500	V
$V_{CEO}$	collector-emitter voltage	open base		-	500	V
$V_{CESM}$	collector-emitter peak voltage	$V_{BE} = 0$ V		-	500	V
$V_{EBO}$	emitter-base voltage	open collector		-	6	V
$I_C$	collector current			-	150	mA
$I_{CM}$	peak collector current	single pulse; $t_p \leq 1$ ms		-	0.5	A
$I_{BM}$	peak base current			-	200	mA
$P_{tot}$	total power dissipation	$T_{amb} \leq 25$ °C	[1]	-	520	mW
			[2]	-	1.5	W
$T_j$	junction temperature			-	150	°C
$T_{amb}$	ambient temperature			-55	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 6 cm<sup>2</sup>.



FR4 PCB, standard footprint

Fig. 1. Power derating curve

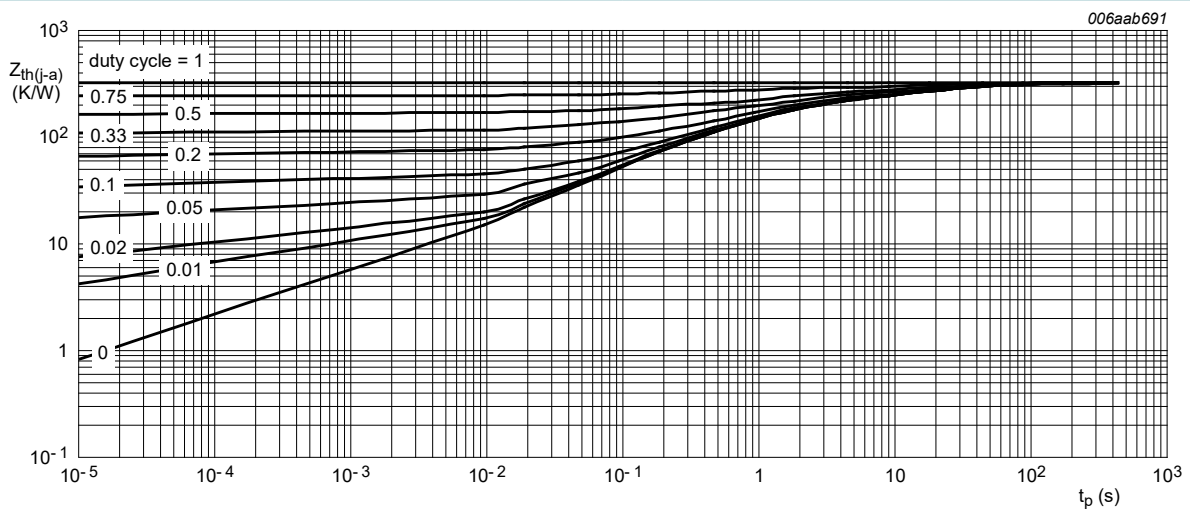
## 9. Thermal characteristics

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]	-	-	241	K/W
			[2]	-	-	84	K/W
R <sub>th(j-sp)</sub>	thermal resistance from junction to solder point			-	-	20	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 6 cm<sup>2</sup>.



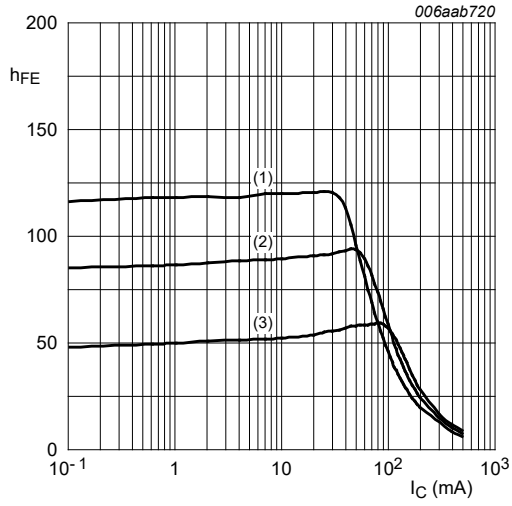
FR4 PCB, standard footprint

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

## 10. Characteristics

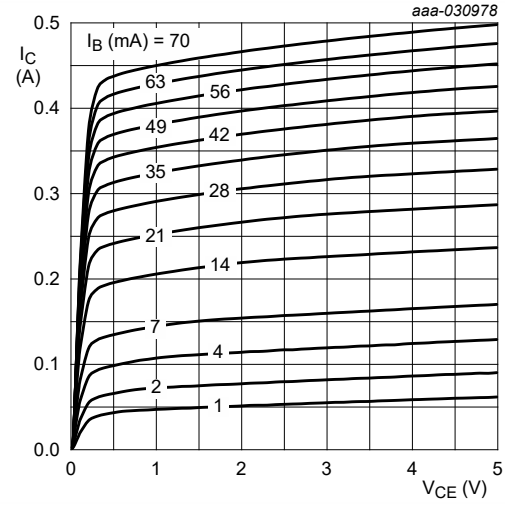
Table 7. Characteristics

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$V_{(BR)CBO}$	collector-base breakdown voltage	$I_C = 100 \mu\text{A}$ ; $I_E = 0 \text{ A}$ ; $T_{\text{amb}} = 25 \text{ }^\circ\text{C}$	500	-	-	V
$V_{(BR)CES}$	collector-emitter breakdown voltage (base shorted)	$I_C = 2.5 \text{ mA}$ ; $V_{BE} = 0 \text{ V}$ ; $T_{\text{amb}} = 25 \text{ }^\circ\text{C}$	500	-	-	V
$V_{(BR)EBO}$	emitter-base breakdown voltage (collector open)	$I_E = 100 \mu\text{A}$ ; $I_C = 0 \text{ A}$ ; $T_{\text{amb}} = 25 \text{ }^\circ\text{C}$	6	-	-	V
$I_{CBO}$	collector-base cut-off current	$V_{CB} = 360 \text{ V}$ ; $I_E = 0 \text{ A}$ ; $T_{\text{amb}} = 25 \text{ }^\circ\text{C}$	-	-	100	nA
		$V_{CB} = 360 \text{ V}$ ; $I_E = 0 \text{ A}$ ; $T_j = 150 \text{ }^\circ\text{C}$	-	-	50	$\mu\text{A}$
$I_{CES}$	collector-emitter cut-off current	$V_{CE} = 360 \text{ V}$ ; $V_{BE} = 0 \text{ V}$ ; $T_{\text{amb}} = 25 \text{ }^\circ\text{C}$	-	-	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	$V_{CE} = 10 \text{ V}$ ; $I_C = 30 \text{ mA}$ ; $T_{\text{amb}} = 25 \text{ }^\circ\text{C}$	50	100	-	
		$V_{CE} = 10 \text{ V}$ ; $I_C = 50 \text{ mA}$ ; $t_p \leq 300 \mu\text{s}$ ; pulsed; $\delta \leq 0.02$ ; $T_{\text{amb}} = 25 \text{ }^\circ\text{C}$	50	100	-	
$V_{CEsat}$	collector-emitter saturation voltage	$I_C = 20 \text{ mA}$ ; $I_B = 2 \text{ mA}$ ; $T_{\text{amb}} = 25 \text{ }^\circ\text{C}$	-	60	75	mV
		$I_C = 50 \text{ mA}$ ; $I_B = 6 \text{ mA}$ ; $t_p \leq 300 \mu\text{s}$ ; pulsed; $\delta \leq 0.02$ ; $T_{\text{amb}} = 25 \text{ }^\circ\text{C}$	-	65	90	mV
$V_{BEsat}$	base-emitter saturation voltage	$I_C = 50 \text{ mA}$ ; $I_B = 5 \text{ mA}$ ; $t_p \leq 300 \mu\text{s}$ ; pulsed; $\delta \leq 0.02$ ; $T_{\text{amb}} = 25 \text{ }^\circ\text{C}$	-	0.75	0.9	V
$t_d$	delay time	$V_{CC} = 20 \text{ V}$ ; $I_C = 0.05 \text{ A}$ ; $I_{B\text{on}} = 5 \text{ mA}$ ; $I_{B\text{off}} = -5 \text{ mA}$ ; $T_{\text{amb}} = 25 \text{ }^\circ\text{C}$	-	80	-	ns
$t_r$	rise time		-	2700	-	ns
$t_{\text{on}}$	turn-on time		-	2780	-	ns
$t_s$	storage time		-	3400	-	ns
$t_f$	fall time		-	800	-	ns
$t_{\text{off}}$	turn-off time		-	4200	-	ns
$f_T$	transition frequency		$V_{CE} = 10 \text{ V}$ ; $I_C = 10 \text{ mA}$ ; $f = 100 \text{ MHz}$ ; $T_{\text{amb}} = 25 \text{ }^\circ\text{C}$	-	35	-
$C_c$	collector capacitance	$V_{CB} = 20 \text{ V}$ ; $I_E = 0 \text{ A}$ ; $i_e = 0 \text{ A}$ ; $f = 1 \text{ MHz}$ ; $T_{\text{amb}} = 25 \text{ }^\circ\text{C}$	-	4	-	pF
$C_e$	emitter capacitance	$V_{EB} = 0.5 \text{ V}$ ; $I_C = 0 \text{ A}$ ; $i_c = 0 \text{ A}$ ; $f = 1 \text{ MHz}$ ; $T_{\text{amb}} = 25 \text{ }^\circ\text{C}$	-	200	-	pF



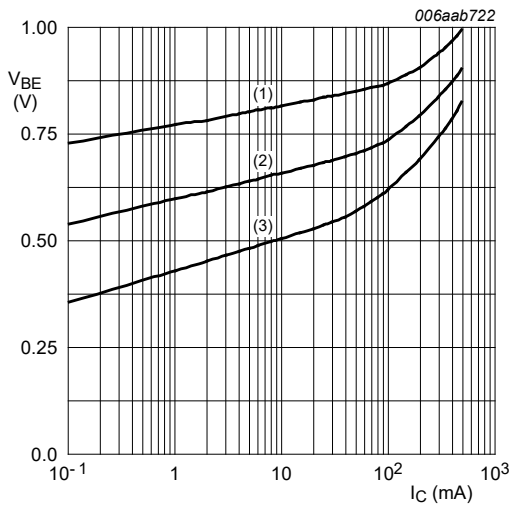
$V_{CE} = 10\text{ V}$   
 (1)  $T_{amb} = 100^\circ C$   
 (2)  $T_{amb} = 25^\circ C$   
 (3)  $T_{amb} = -55^\circ C$

Fig. 3. DC current gain as a function of collector current; typical values



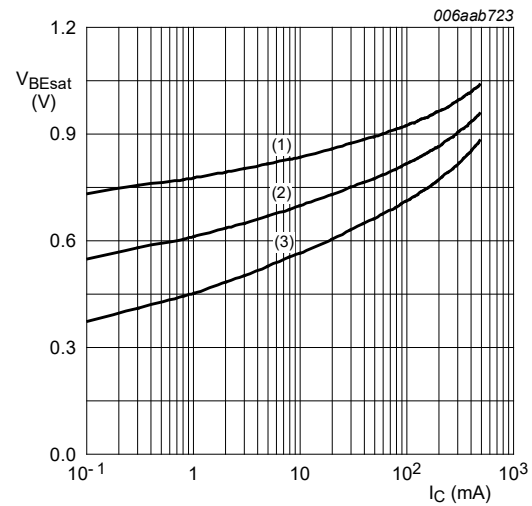
$T_{amb} = 25^\circ C$

Fig. 4. Collector current as a function of collector-emitter voltage; typical values



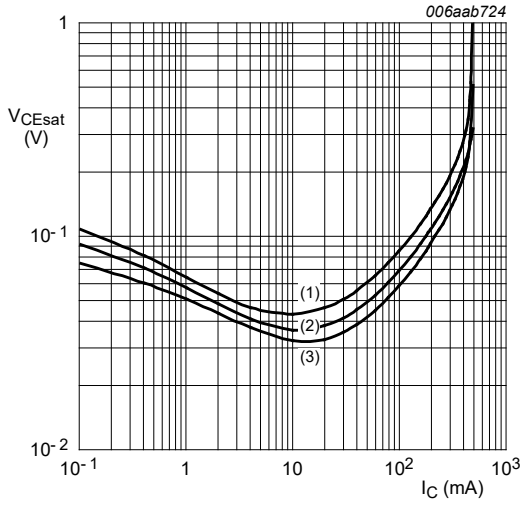
$V_{CE} = 10\text{ V}$   
 (1)  $T_{amb} = -55^\circ C$   
 (2)  $T_{amb} = 25^\circ C$   
 (3)  $T_{amb} = 100^\circ C$

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



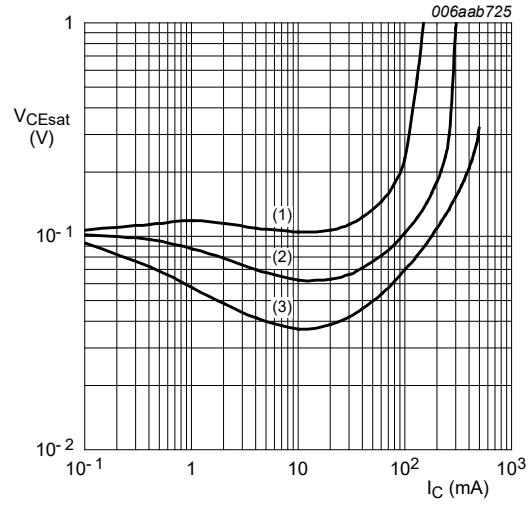
$I_C/I_B = 5$   
 (1)  $T_{amb} = -55^\circ C$   
 (2)  $T_{amb} = 25^\circ C$   
 (3)  $T_{amb} = 100^\circ C$

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



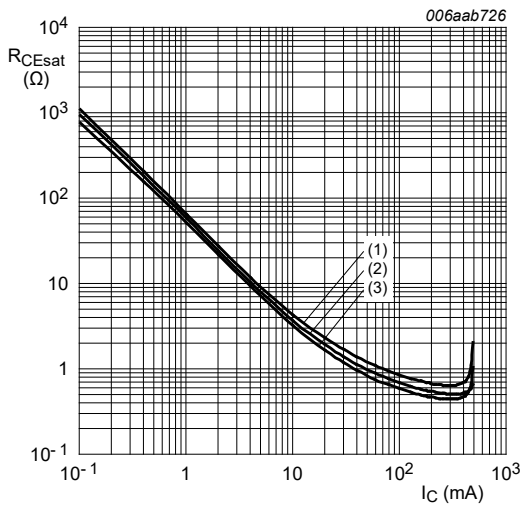
$I_C/I_B = 5$   
 (1)  $T_{amb} = 100\text{ °C}$   
 (2)  $T_{amb} = 25\text{ °C}$   
 (3)  $T_{amb} = -55\text{ °C}$

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



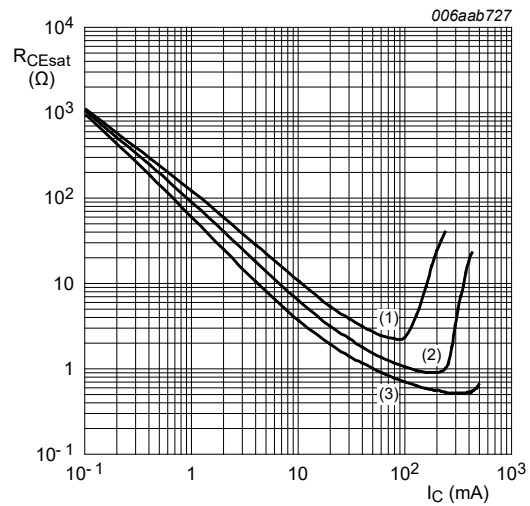
$T_{amb} = 25\text{ °C}$   
 (1)  $I_C/I_B = 20$   
 (2)  $I_C/I_B = 10$   
 (3)  $I_C/I_B = 5$

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



$I_C/I_B = 5$   
 (1)  $T_{amb} = 100\text{ °C}$   
 (2)  $T_{amb} = 25\text{ °C}$   
 (3)  $T_{amb} = -55\text{ °C}$

**Fig. 9. Collector-emitter saturation resistance as a function of collector current; typical values**



$T_{amb} = 25\text{ °C}$   
 (1)  $I_C/I_B = 20$   
 (2)  $I_C/I_B = 10$   
 (3)  $I_C/I_B = 5$

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

### 11. Test information

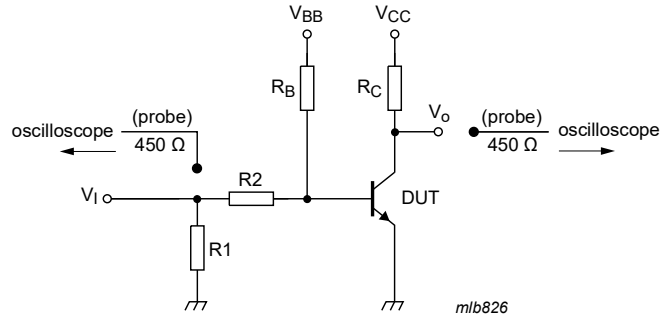


Fig. 11. Test circuit for switching times

#### 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

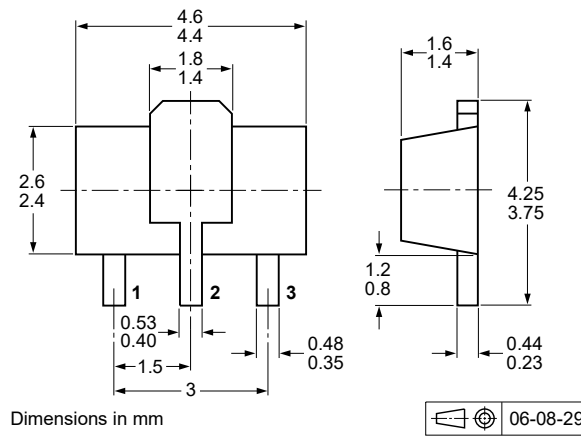


Fig. 12. Package outline SOT89

### 13. Soldering

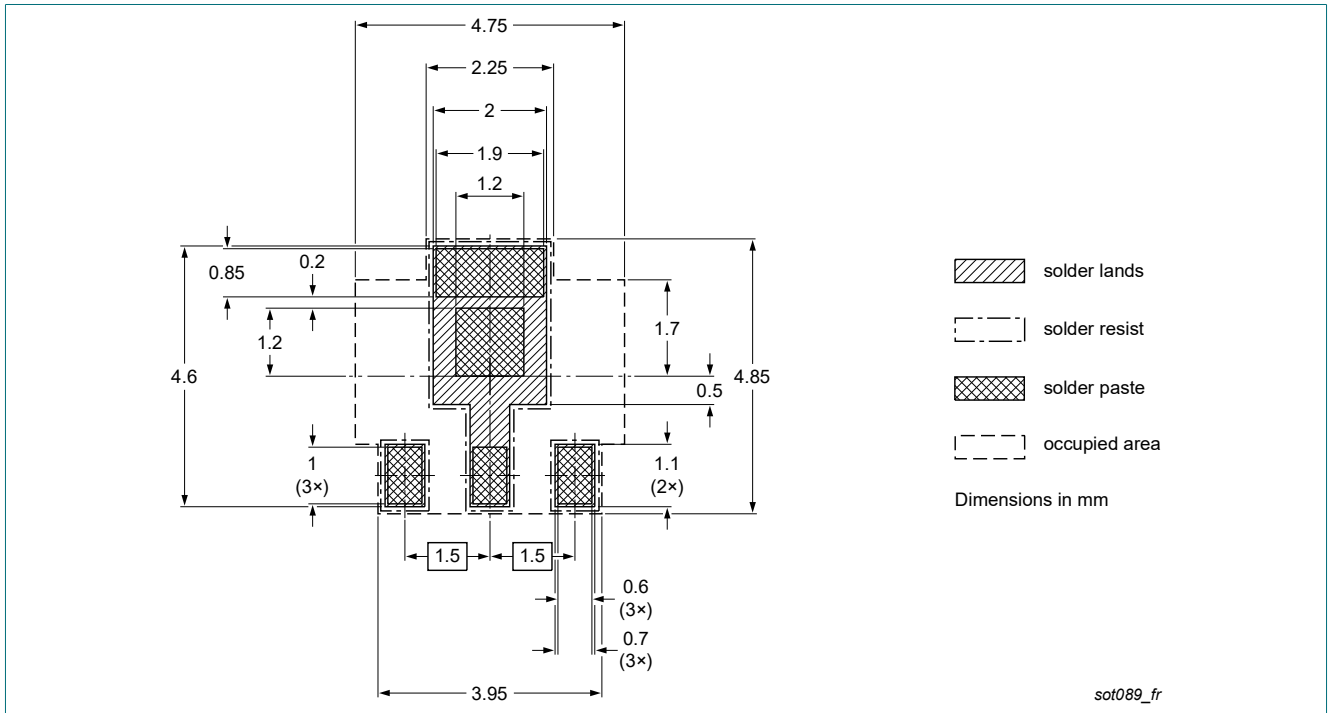


Fig. 13. Reflow soldering footprint for SOT89

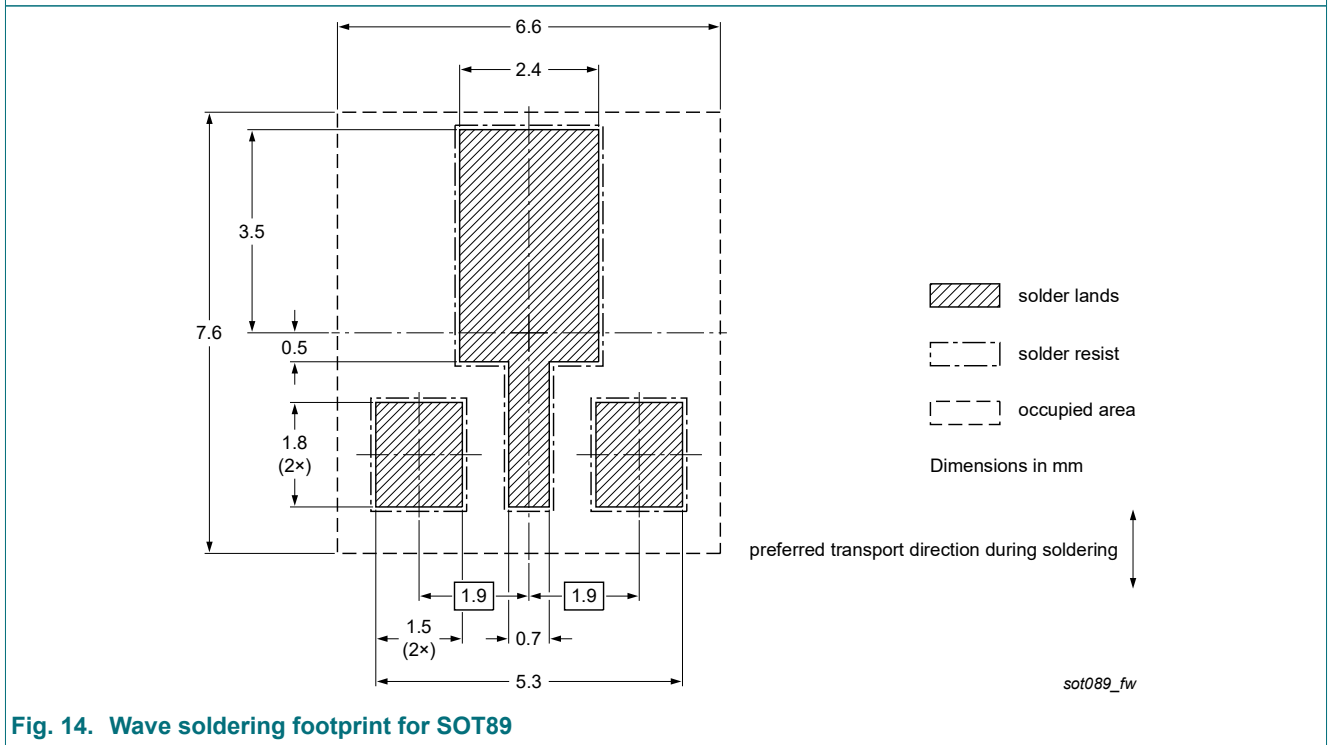


Fig. 14. Wave soldering footprint for SOT89



## 14. Revision history

**Table 8. Revision history**

Data sheet ID	Release date	Data sheet status	Change notice	Supersedes
PBHV8550X v.3	20200608	Product data sheet	-	PBHV8550X v.2
Modifications:	• Figure 4 updated with additional curves			
PBHV8550X v.2	20200214	Objective data sheet	-	PBHV8550X v.1
PBHV8550X v.1	20200130	Objective 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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## Contents

---

1. General description.....	1
2. Features and benefits.....	1
3. Applications.....	1
4. Quick reference data.....	1
5. Pinning information.....	1
6. Ordering information.....	2
7. Marking.....	2
8. Limiting values.....	2
9. Thermal characteristics.....	3
10. Characteristics.....	4
11. Test information.....	7
12. Package outline.....	7
13. Soldering.....	8
14. Revision history.....	9
15. Legal information.....	10

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