

# PBHV9115X

150 V, 1 A PNP high-voltage low  $V_{CEsat}$  (BISS) transistor

Rev. 01 — 10 March 2010

Product data sheet

## 1. Product profile

### 1.1 General description

PNP high-voltage low  $V_{CEsat}$  Breakthrough In Small Signal (BISS) transistor in a SOT89 (SC-62/TO-243) small and flat Surface-Mounted Device (SMD) plastic package.

### 1.2 Features and benefits

- High voltage
- Low collector-emitter saturation voltage  $V_{CEsat}$
- High collector current capability  $I_C$  and  $I_{CM}$
- High collector current gain ( $h_{FE}$ ) at high  $I_C$

### 1.3 Applications

- LED driver for LED chain module
- LCD backlighting
- Automotive motor management
- Hook switch for wired telecom
- Switch Mode Power Supply (SMPS)

### 1.4 Quick reference data

Table 1. Quick reference data

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$V_{CEO}$	collector-emitter voltage	open base	-	-	-150	V
$I_C$	collector current		-	-	-1	A
$h_{FE}$	DC current gain	$V_{CE} = -10$ V; $I_C = -50$ mA	100	220	-	

## 2. Pinning information

Table 2. Pinning

Pin	Description	Simplified outline	Graphic symbol
1	emitter		
2	collector		
3	base		



### 3. Ordering information

Table 3. Ordering information

Type number	Package		
	Name	Description	Version
PBHV9115X	SC-62	plastic surface-mounted package; collector pad for good heat transfer; 3 leads	SOT89

### 4. Marking

Table 4. Marking codes

Type number	Marking code <sup>[1]</sup>
PBHV9115X	*4G

- [1] \* = -: made in Hong Kong  
 \* = p: made in Hong Kong  
 \* = t: made in Malaysia  
 \* = W: made in China

### 5. Limiting values

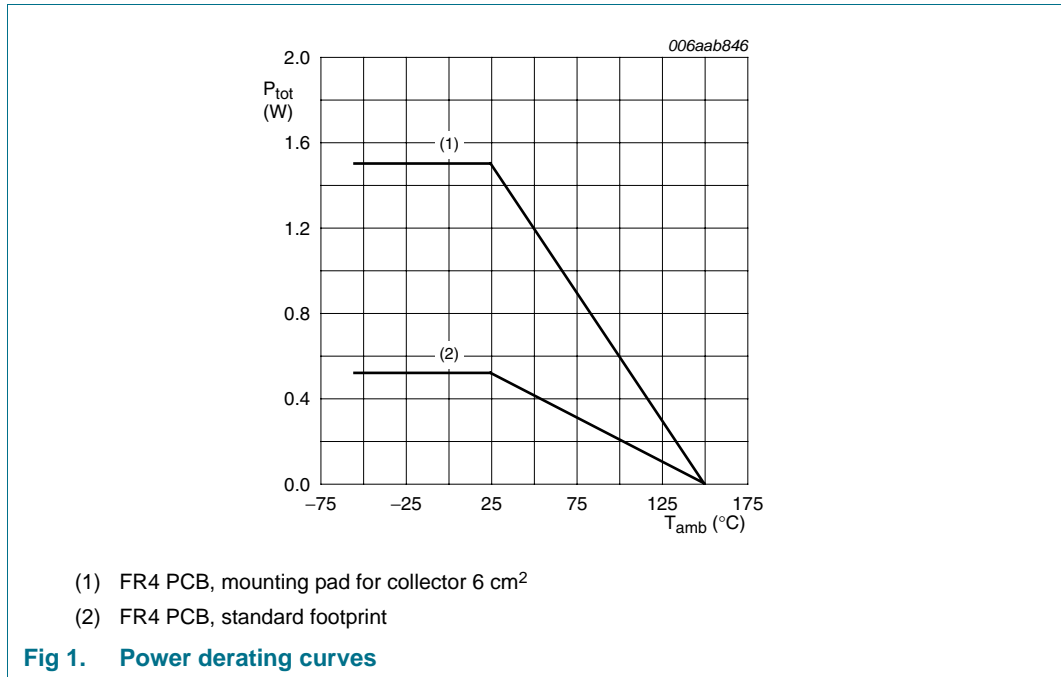
Table 5. Limiting values

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

Symbol	Parameter	Conditions	Min	Max	Unit
$V_{CBO}$	collector-base voltage	open emitter	-	-200	V
$V_{CEO}$	collector-emitter voltage	open base	-	-150	V
$V_{CESM}$	collector-emitter peak voltage	$V_{BE} = 0$ V	-	-200	V
$V_{EBO}$	emitter-base voltage	open collector	-	-6	V
$I_C$	collector current		-	-1	A
$I_{CM}$	peak collector current	single pulse; $t_p \leq 1$ ms	-	-2	A
$I_{BM}$	peak base current	single pulse; $t_p \leq 1$ ms	-	-400	mA
$P_{tot}$	total power dissipation	$T_{amb} \leq 25$ °C	<a href="#">[1]</a> <a href="#">[2]</a>	520 1.5	mW 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 Printed-Circuit Board (PCB), single-sided copper, tin-plated and standard footprint.

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



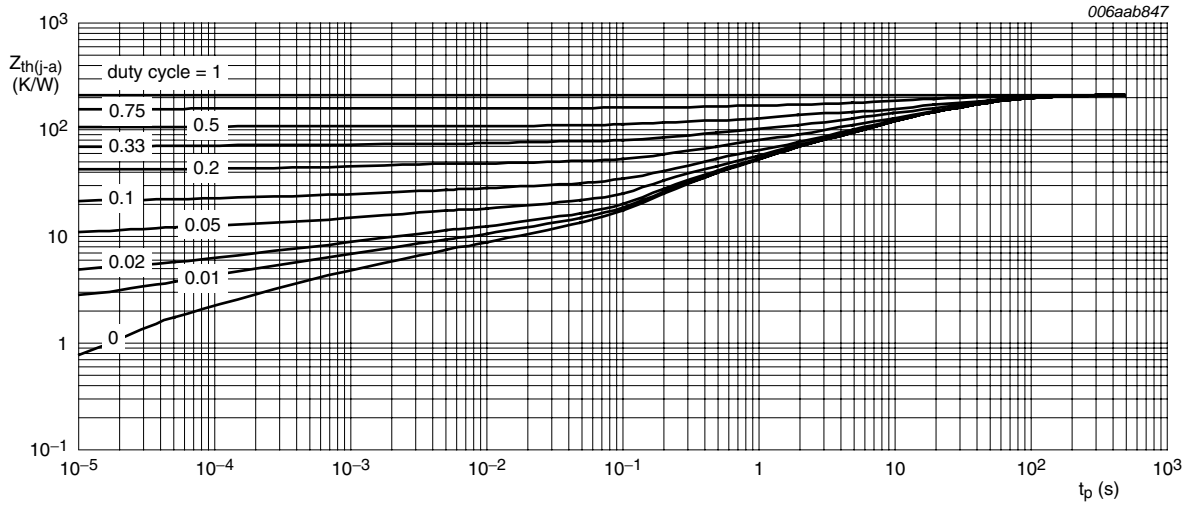
## 6. Thermal characteristics

**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]	-	240	K/W
			[2]	-	80	K/W
R <sub>th(j-sp)</sub>	thermal resistance from junction to solder point		-	-	20	K/W

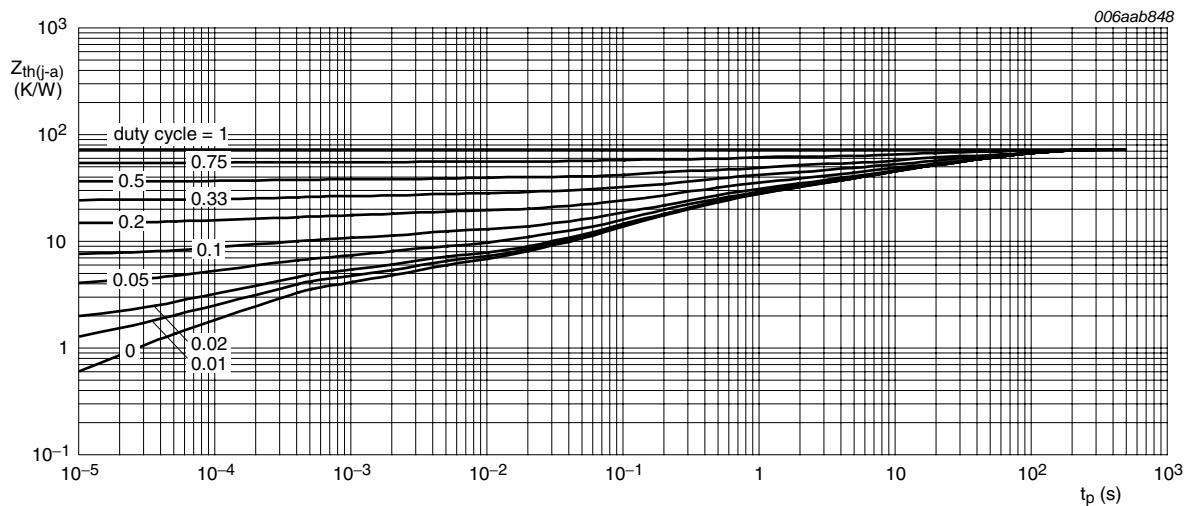
[1] Device mounted on an FR4 PCB, single-sided copper, tin-plated and standard footprint.

[2] Device mounted on an FR4 PCB, single-sided copper, tin-plated and 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**



FR4 PCB, mounting pad for collector 6 cm<sup>2</sup>

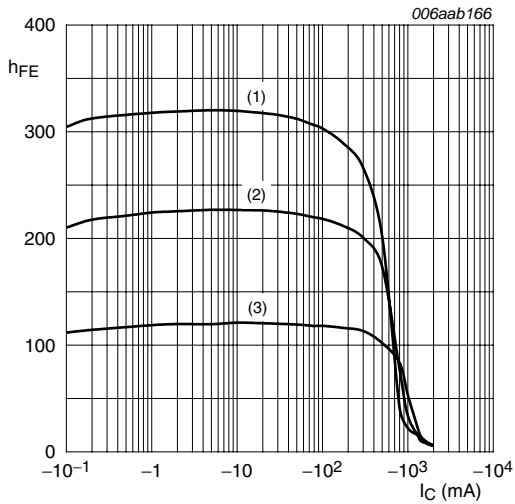
**Fig 3. Transient thermal impedance from junction to ambient as a function of pulse duration; typical values**

## 7. Characteristics

**Table 7. Characteristics**
 $T_{amb} = 25\text{ }^{\circ}\text{C}$  unless otherwise specified.

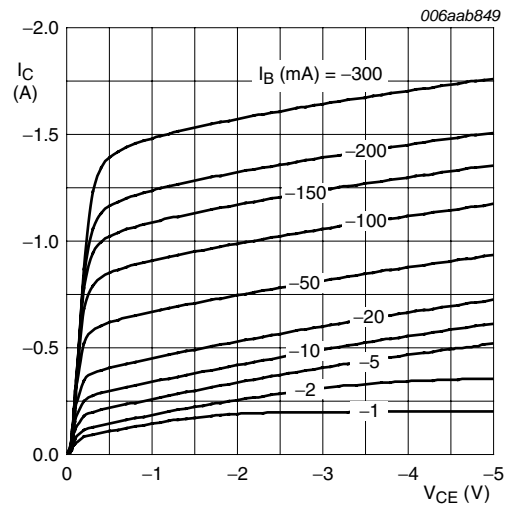
Symbol	Parameter	Conditions	Min	Typ	Max	Unit	
$I_{CBO}$	collector-base cut-off current	$V_{CB} = -120\text{ V};$ $I_E = 0\text{ A}$	-	-	-100	nA	
		$V_{CB} = -120\text{ V};$ $I_E = 0\text{ A}; T_j = 150\text{ }^{\circ}\text{C}$	-	-	-10	$\mu\text{A}$	
$I_{CES}$	collector-emitter cut-off current	$V_{CE} = -120\text{ V};$ $V_{BE} = 0\text{ V}$	-	-	-100	nA	
$I_{EBO}$	emitter-base cut-off current	$V_{EB} = -4\text{ V}; I_C = 0\text{ A}$	-	-	-100	nA	
$h_{FE}$	DC current gain	$V_{CE} = -10\text{ V}$					
		$I_C = -50\text{ mA}$	100	220	-		
		$I_C = -100\text{ mA}$	[1]	100	220	-	
		$I_C = -1\text{ A}$	[1]	10	30	-	
$V_{CEsat}$	collector-emitter saturation voltage	$I_C = -100\text{ mA};$ $I_B = -10\text{ mA}$	[1]	-	-60	-120	mV
		$I_C = -100\text{ mA};$ $I_B = -20\text{ mA}$	[1]	-	-50	-100	mV
		$I_C = -500\text{ mA};$ $I_B = -50\text{ mA}$	[1]	-	-200	-300	mV
$V_{BEsat}$	base-emitter saturation voltage	$I_C = -1\text{ A};$ $I_B = -100\text{ mA}$	[1]	-	-1	-1.2	V
$t_d$	delay time	$V_{CC} = -6\text{ V};$ $I_C = -0.5\text{ A};$ $I_{Bon} = -0.1\text{ A};$ $I_{Boff} = 0.1\text{ A}$	-	8	-	ns	
$t_r$	rise time		-	282	-	ns	
$t_{on}$	turn-on time		-	290	-	ns	
$t_s$	storage time		-	430	-	ns	
$t_f$	fall time		-	300	-	ns	
$t_{off}$	turn-off time		-	730	-	ns	
$f_T$	transition frequency	$V_{CE} = -10\text{ V};$ $I_C = -10\text{ mA};$ $f = 100\text{ MHz}$	-	115	-	MHz	
$C_c$	collector capacitance	$V_{CB} = -20\text{ V};$ $I_E = i_e = 0\text{ A};$ $f = 1\text{ MHz}$	-	10	-	pF	
$C_e$	emitter capacitance	$V_{EB} = -0.5\text{ V};$ $I_C = i_c = 0\text{ A};$ $f = 1\text{ MHz}$	-	150	-	pF	

[1] Pulse test:  $t_p \leq 300\text{ }\mu\text{s}; \delta \leq 0.02$ .



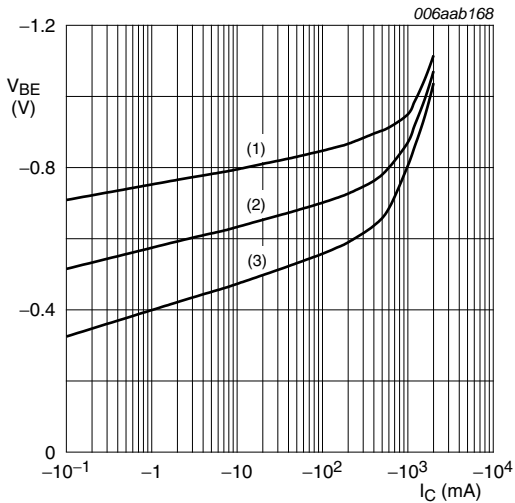
$V_{CE} = -10$  V  
 (1)  $T_{amb} = 100^\circ C$   
 (2)  $T_{amb} = 25^\circ C$   
 (3)  $T_{amb} = -55^\circ C$

**Fig 4. DC current gain as a function of collector current; typical values**



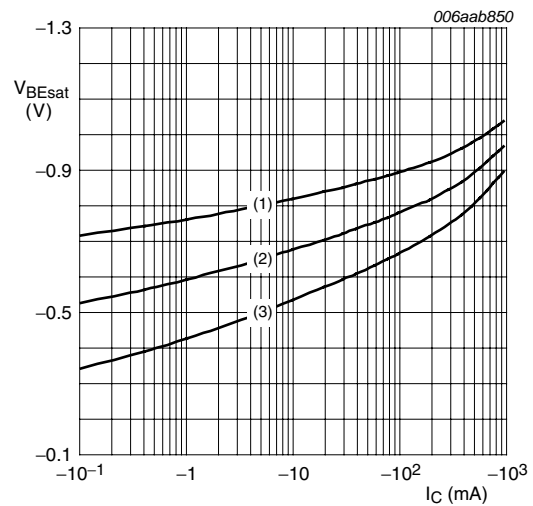
$T_{amb} = 25^\circ C$

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



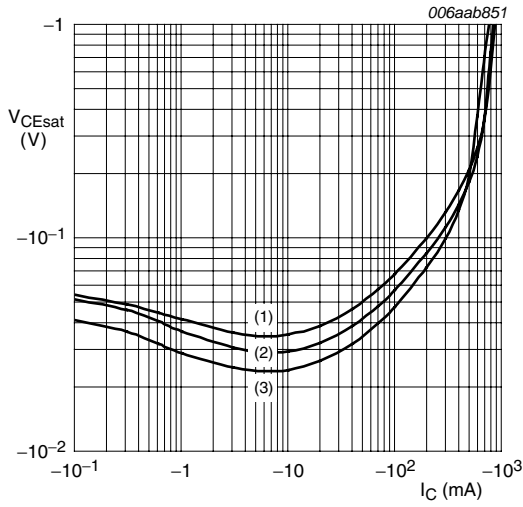
$V_{CE} = -10$  V  
 (1)  $T_{amb} = -55^\circ C$   
 (2)  $T_{amb} = 25^\circ C$   
 (3)  $T_{amb} = 100^\circ C$

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



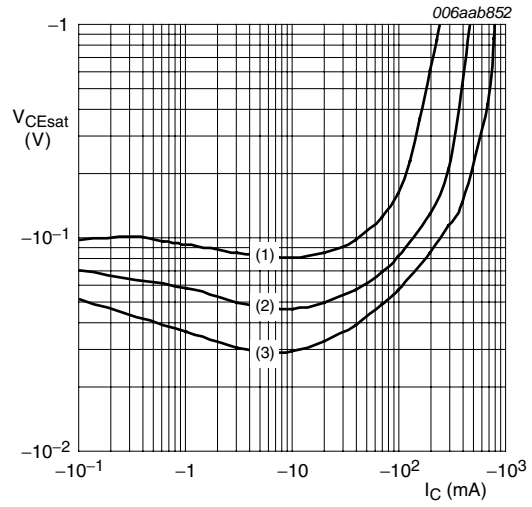
$I_C/I_B = 10$   
 (1)  $T_{amb} = -55^\circ C$   
 (2)  $T_{amb} = 25^\circ C$   
 (3)  $T_{amb} = 100^\circ C$

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



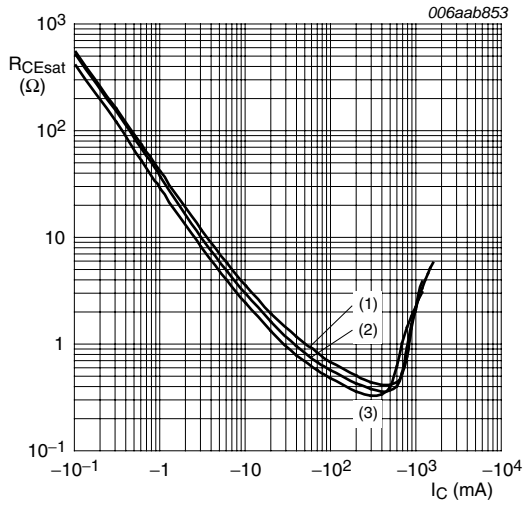
- $I_C/I_B = 10$
- (1)  $T_{amb} = 100\text{ °C}$
  - (2)  $T_{amb} = 25\text{ °C}$
  - (3)  $T_{amb} = -55\text{ °C}$

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



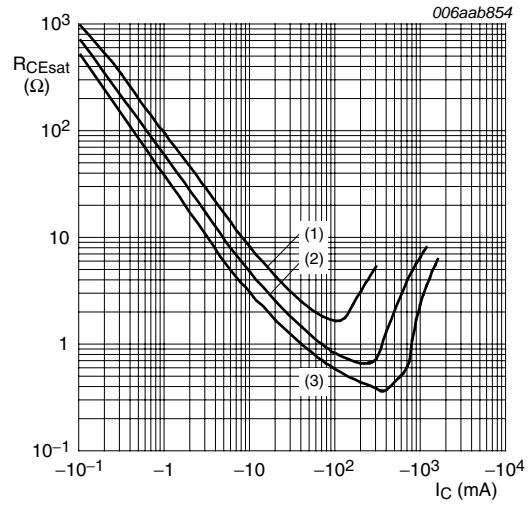
- $T_{amb} = 25\text{ °C}$
- (1)  $I_C/I_B = 50$
  - (2)  $I_C/I_B = 20$
  - (3)  $I_C/I_B = 10$

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



- $I_C/I_B = 10$
- (1)  $T_{amb} = 100\text{ °C}$
  - (2)  $T_{amb} = 25\text{ °C}$
  - (3)  $T_{amb} = -55\text{ °C}$

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



- $T_{amb} = 25\text{ °C}$
- (1)  $I_C/I_B = 50$
  - (2)  $I_C/I_B = 20$
  - (3)  $I_C/I_B = 10$

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

**8. Test information**

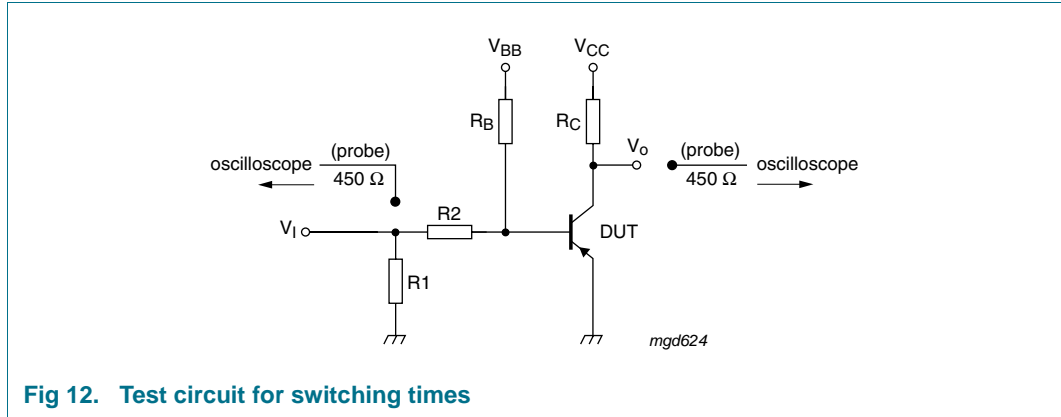


Fig 12. Test circuit for switching times

**9. Package outline**

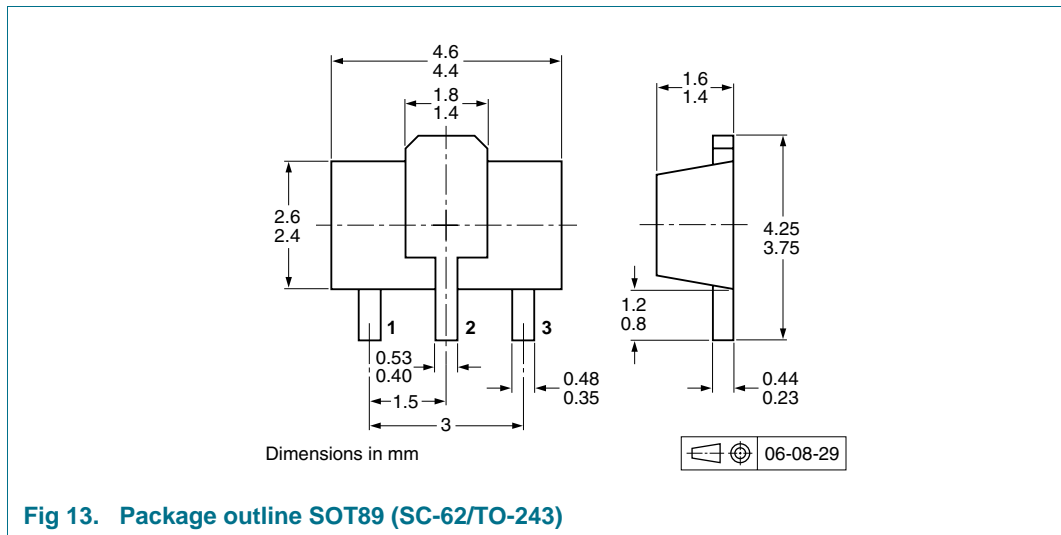


Fig 13. Package outline SOT89 (SC-62/TO-243)

**10. Packing information**

**Table 8. Packing methods**

The indicated -xxx are the last three digits of the 12NC ordering code.<sup>[1]</sup>

Type number	Package	Description	Packing quantity	
			1000	4000
PBHV9115X	SOT89	8 mm pitch, 12 mm tape and reel; T1	<sup>[2]</sup> -115	-135
		8 mm pitch, 12 mm tape and reel; T3	<sup>[3]</sup> -120	-

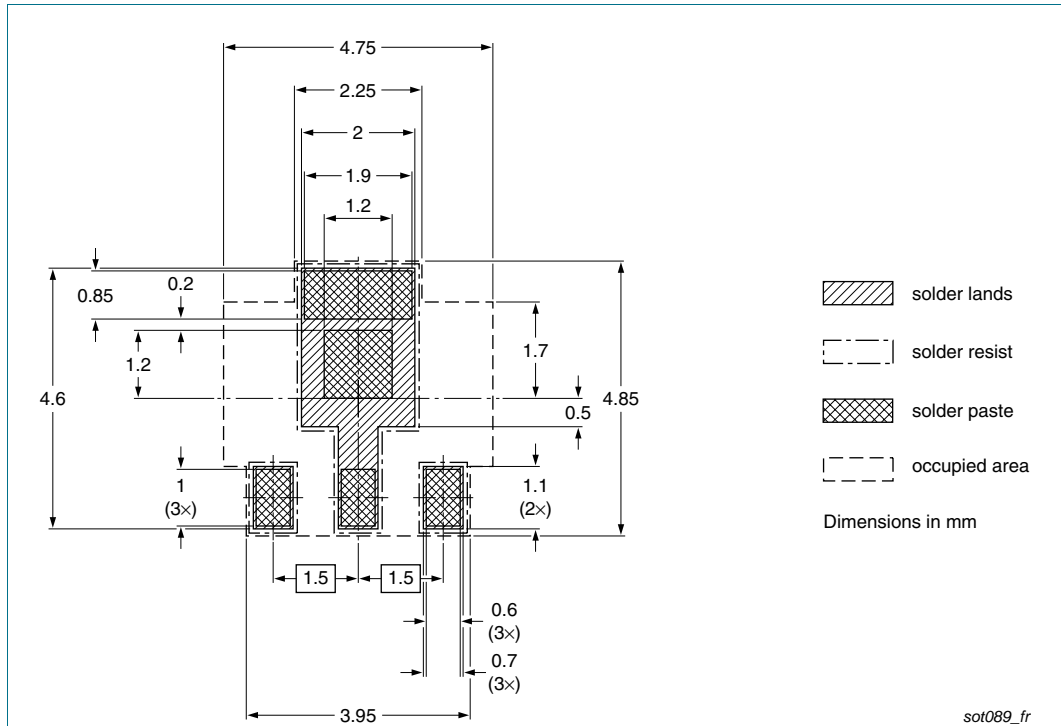
[1] For further information and the availability of packing methods, see [Section 14](#).

[2] T1: normal taping

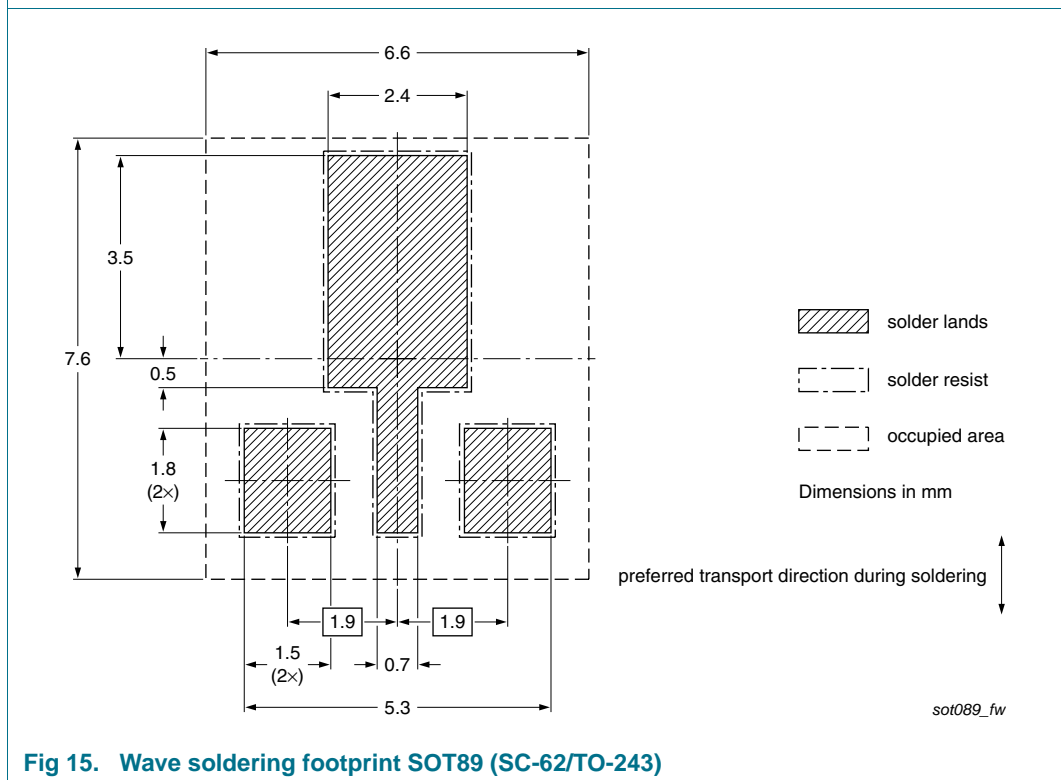
[3] T3: 90° taping



## 11. Soldering



**Fig 14. Reflow soldering footprint SOT89 (SC-62/TO-243)**



**Fig 15. Wave soldering footprint SOT89 (SC-62/TO-243)**

## 12. Revision history

Table 9. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
PBHV9115X_1	20100310	Product data sheet	-	-

## 13. Legal information

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Document status <sup>[1][2]</sup>	Product status <sup>[3]</sup>	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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