

# PBSS4360X

60 V, 3 A NPN low  $V_{CEsat}$  BISS transistor

9 June 2017

Product data sheet

## 1. General description

NPN low  $V_{CEsat}$  Breakthrough in Smal Signal (BISS) transistor in a medium power SOT89 (SC-62) flat lead Surface-Mounted Device (SMD) plastic package.

PNP complement: PBSS5360X

## 2. Features and benefits

- Low collector-emitter saturation voltage  $V_{CEsat}$
- High collector current capability  $I_C$  and  $I_{CM}$
- High energy efficiency due to less heat generation
- AEC-Q101 qualified

## 3. Applications

- DC-to-DC conversion
- Supply line switching
- Battery charger
- LCD backlighting
- Driver in low supply voltage applications (e.g. lamps and LEDs)
- Inductive load driver (e.g. relays, buzzers and motors)

## 4. Quick reference data

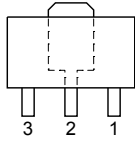
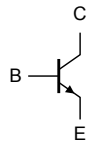
Table 1. Quick reference data

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$V_{CEO}$	collector-emitter voltage	open base	-	-	60	V
$I_C$	collector current		-	-	3	A
$I_{CM}$	peak collector current	single pulse; $t_p \leq 1$ ms	-	-	6	A
$R_{CEsat}$	collector-emitter saturation resistance	$I_C = 2$ A; $I_B = 200$ mA; $T_{amb} = 25$ °C	[1]	-	140	m $\Omega$

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

## 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;"><i>sym123</i></p>
2	C	collector		
3	B	base		

## 6. Ordering information

Table 3. Ordering information

Type number	Package		
	Name	Description	Version
PBSS4360X	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
PBSS4360X	S40

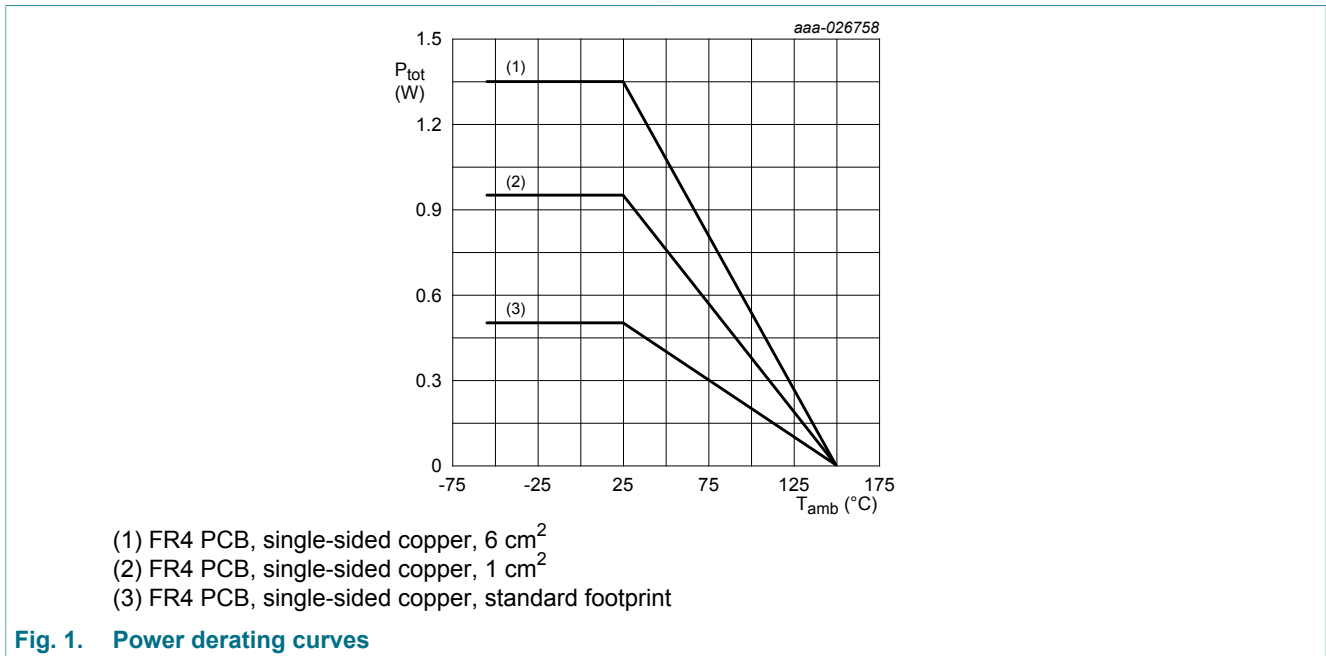
## 8. Limiting values

**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		-	80	V
$V_{CEO}$	collector-emitter voltage	open base		-	60	V
$V_{EBO}$	emitter-base voltage	open collector		-	7	V
$I_C$	collector current			-	3	A
$I_{CM}$	peak collector current	single pulse; $t_p \leq 1$ ms		-	6	A
$I_B$	base current			-	500	mA
$I_{BM}$	peak base current	single pulse; $t_p \leq 1$ ms		-	1	A
$P_{tot}$	total power dissipation	$T_{amb} \leq 25$ °C	[1]	-	500	mW
			[2]	-	950	mW
			[3]	-	1.35	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 Printed-Circuit Board (PCB), single-sided copper, tin-plated; mounting pad for collector 1 cm<sup>2</sup>.
- [3] Device mounted on an FR4 Printed-Circuit Board (PCB), single-sided copper, tin-plated; mounting pad for collector 6 cm<sup>2</sup>.



**Fig. 1. Power derating curves**

## 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]	-	-	250	K/W
			[2]	-	-	132	K/W
			[3]	-	-	93	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>.

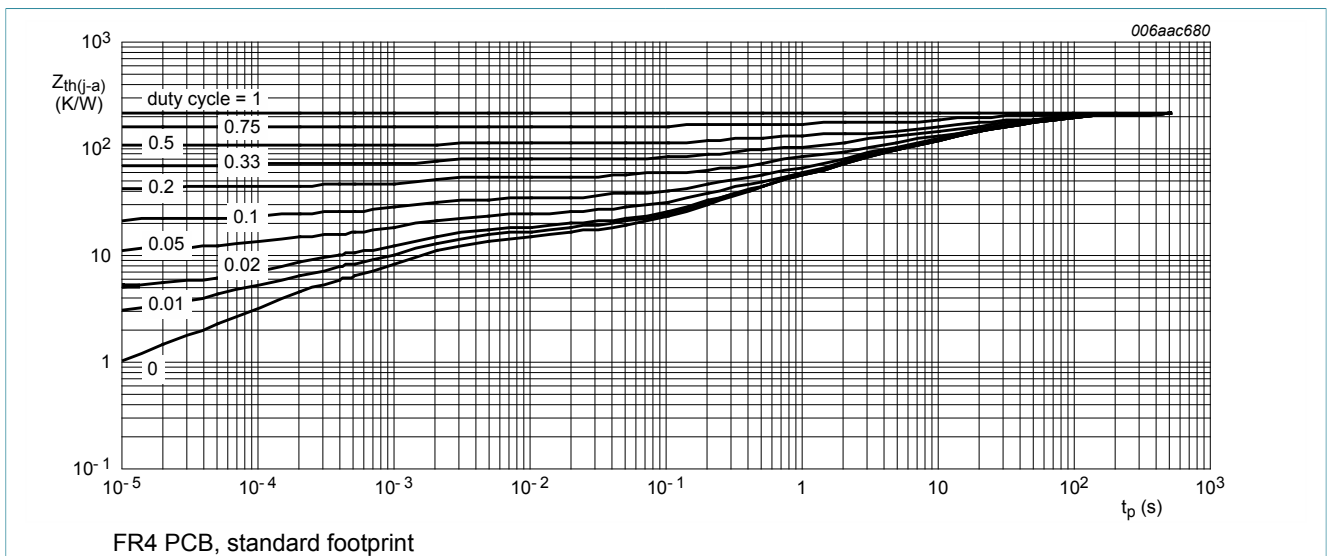


Fig. 2. Transient thermal impedance from junction to ambient as a function of pulse duration; typical values

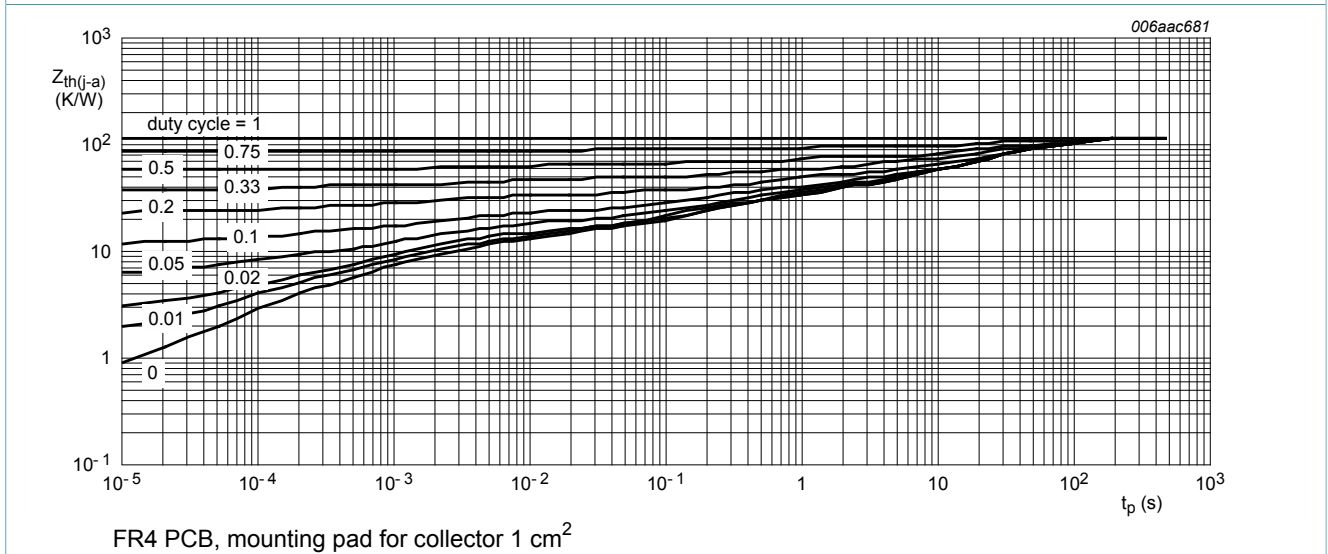
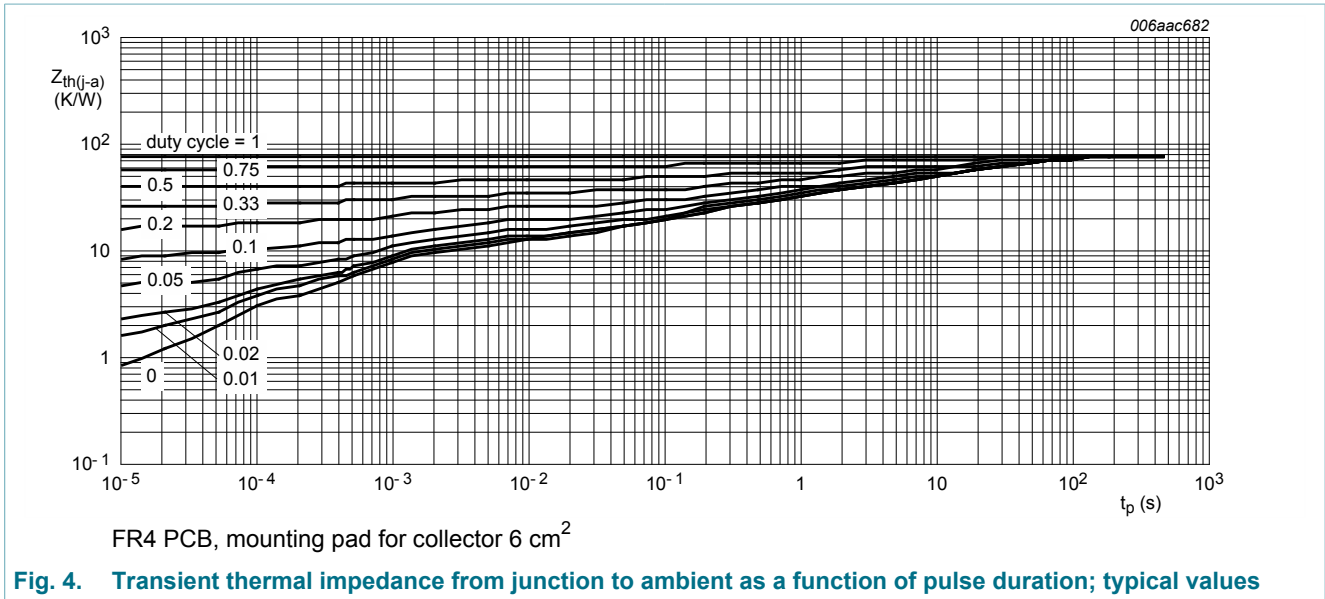


Fig. 3. Transient thermal impedance from junction to ambient as a function of pulse duration; typical values

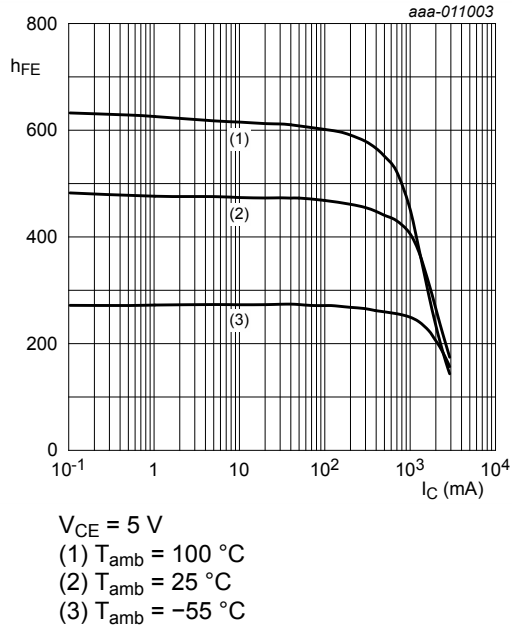


## 10. Characteristics

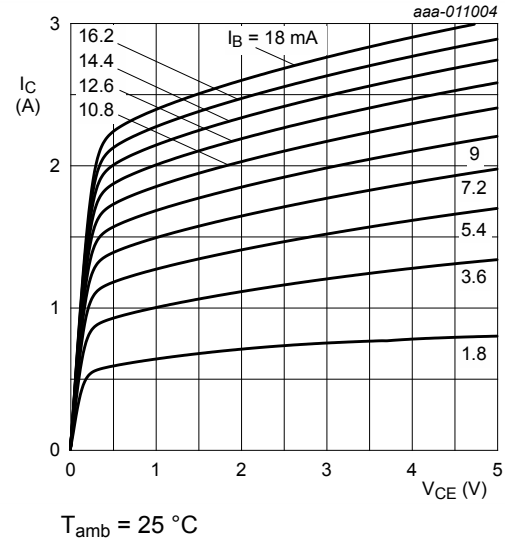
Table 7. Characteristics

Symbol	Parameter	Conditions	Min	Typ	Max	Unit	
I <sub>CBO</sub>	collector-base cut-off current	V <sub>CB</sub> = 48 V; I <sub>E</sub> = 0 A; T <sub>amb</sub> = 25 °C	-	-	100	nA	
		V <sub>CB</sub> = 48 V; I <sub>E</sub> = 0 A; T <sub>J</sub> = 150 °C	-	-	50	μA	
I <sub>CES</sub>	collector-emitter cut-off current	V <sub>CE</sub> = 48 V; V <sub>BE</sub> = 0 V; T <sub>amb</sub> = 25 °C	-	-	100	nA	
I <sub>EBO</sub>	emitter-base cut-off current	V <sub>EB</sub> = 5 V; I <sub>C</sub> = 0 A; T <sub>amb</sub> = 25 °C	-	-	100	nA	
h <sub>FE</sub>	DC current gain	V <sub>CE</sub> = 5 V; I <sub>C</sub> = 50 mA; T <sub>amb</sub> = 25 °C	200	-	-		
		V <sub>CE</sub> = 5 V; I <sub>C</sub> = 500 mA; T <sub>amb</sub> = 25 °C	[1]	200	-	-	
		V <sub>CE</sub> = 5 V; I <sub>C</sub> = 1 A; T <sub>amb</sub> = 25 °C	[1]	200	-	-	
		V <sub>CE</sub> = 5 V; I <sub>C</sub> = 2 A; T <sub>amb</sub> = 25 °C	[1]	120	-	-	
		V <sub>CE</sub> = 5 V; I <sub>C</sub> = 3 A; T <sub>amb</sub> = 25 °C	[1]	75	-	-	
V <sub>CEsat</sub>	collector-emitter saturation voltage	I <sub>C</sub> = 500 mA; I <sub>B</sub> = 50 mA; T <sub>amb</sub> = 25 °C	[1]	-	-	75	mV
		I <sub>C</sub> = 1 A; I <sub>B</sub> = 100 mA; T <sub>amb</sub> = 25 °C	[1]	-	-	150	mV
		I <sub>C</sub> = 2 A; I <sub>B</sub> = 200 mA; T <sub>amb</sub> = 25 °C	[1]	-	-	275	mV
		I <sub>C</sub> = 3 A; I <sub>B</sub> = 300 mA; T <sub>amb</sub> = 25 °C	[1]	-	-	400	mV
R <sub>CEsat</sub>	collector-emitter saturation resistance	I <sub>C</sub> = 2 A; I <sub>B</sub> = 200 mA; T <sub>amb</sub> = 25 °C	[1]	-	-	140	mΩ
V <sub>BEsat</sub>	base-emitter saturation voltage	I <sub>C</sub> = 1 A; I <sub>B</sub> = 100 mA; T <sub>amb</sub> = 25 °C	[1]	-	-	1.2	V
V <sub>BEon</sub>	base-emitter turn-on voltage	V <sub>CE</sub> = 5 V; I <sub>C</sub> = 1 A; T <sub>amb</sub> = 25 °C	[1]	-	-	1.1	V
f <sub>T</sub>	transition frequency	V <sub>CE</sub> = 10 V; I <sub>C</sub> = 50 mA; f = 100 MHz; T <sub>amb</sub> = 25 °C	75	145	-	MHz	
C <sub>c</sub>	collector capacitance	V <sub>CB</sub> = 10 V; I <sub>E</sub> = 0 A; i <sub>e</sub> = 0 A; f = 1 MHz; T <sub>amb</sub> = 25 °C	-	11	14	pF	

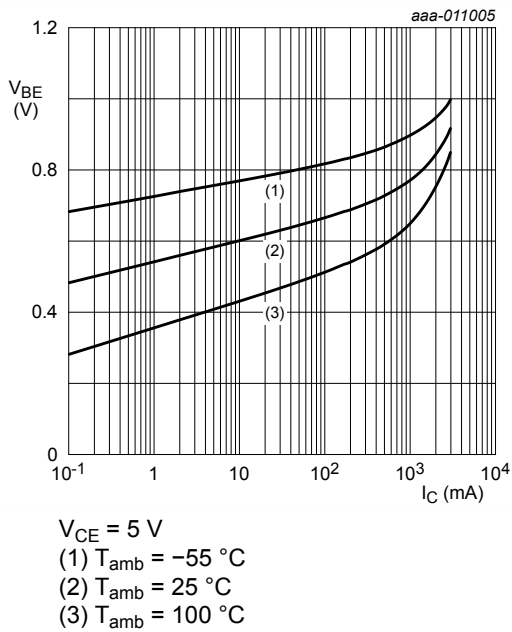
[1] Pulse test: t<sub>p</sub> ≤ 300 μs; δ ≤ 0.02



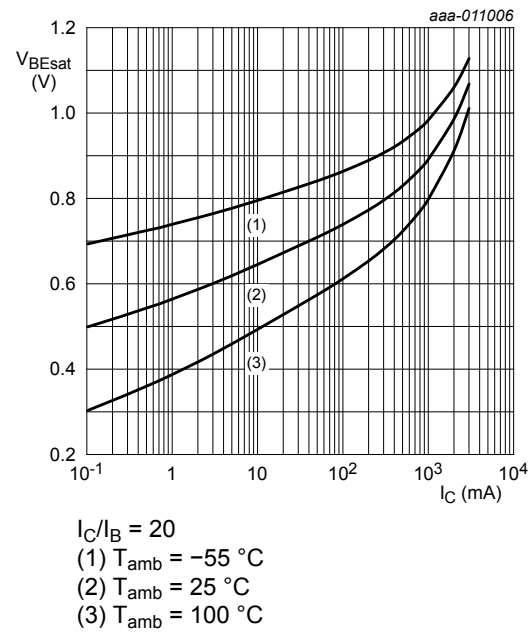
**Fig. 5. DC current gain as a function of collector current; typical values**



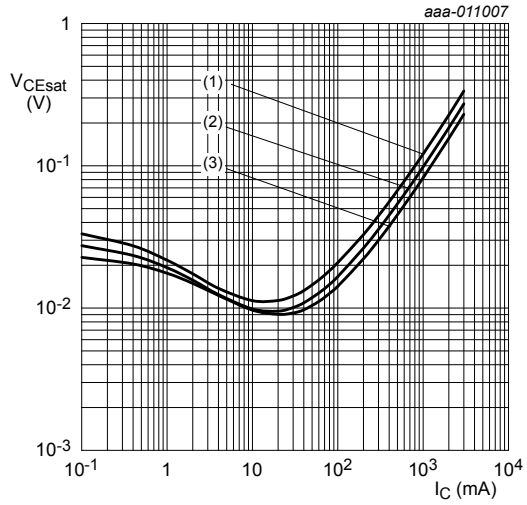
**Fig. 6. Collector current as a function of collector-emitter voltage; typical values**



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

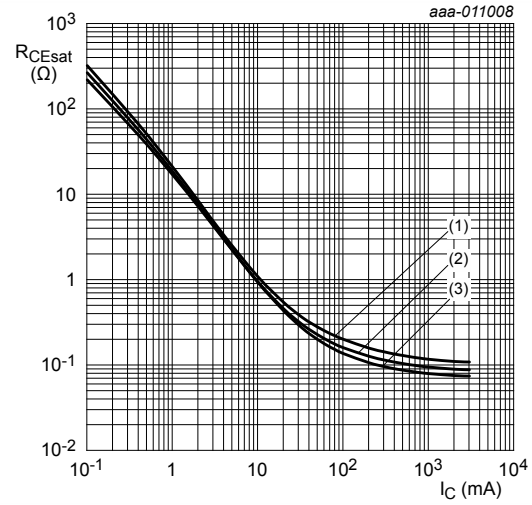


**Fig. 8. Base-emitter saturation voltage as a function of collector current; typical values**



$I_C/I_B = 20$   
 (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. 9.** Collector-emitter saturation voltage as a function of collector current; typical values



$I_C/I_B = 20$   
 (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. 10.** Collector-emitter saturation 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

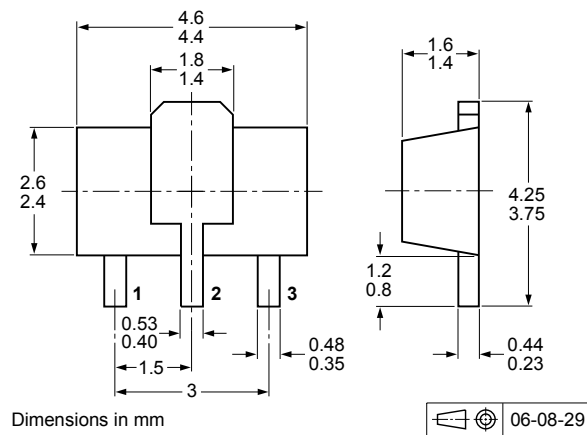


Fig. 11. Package outline SOT89

### 13. Soldering

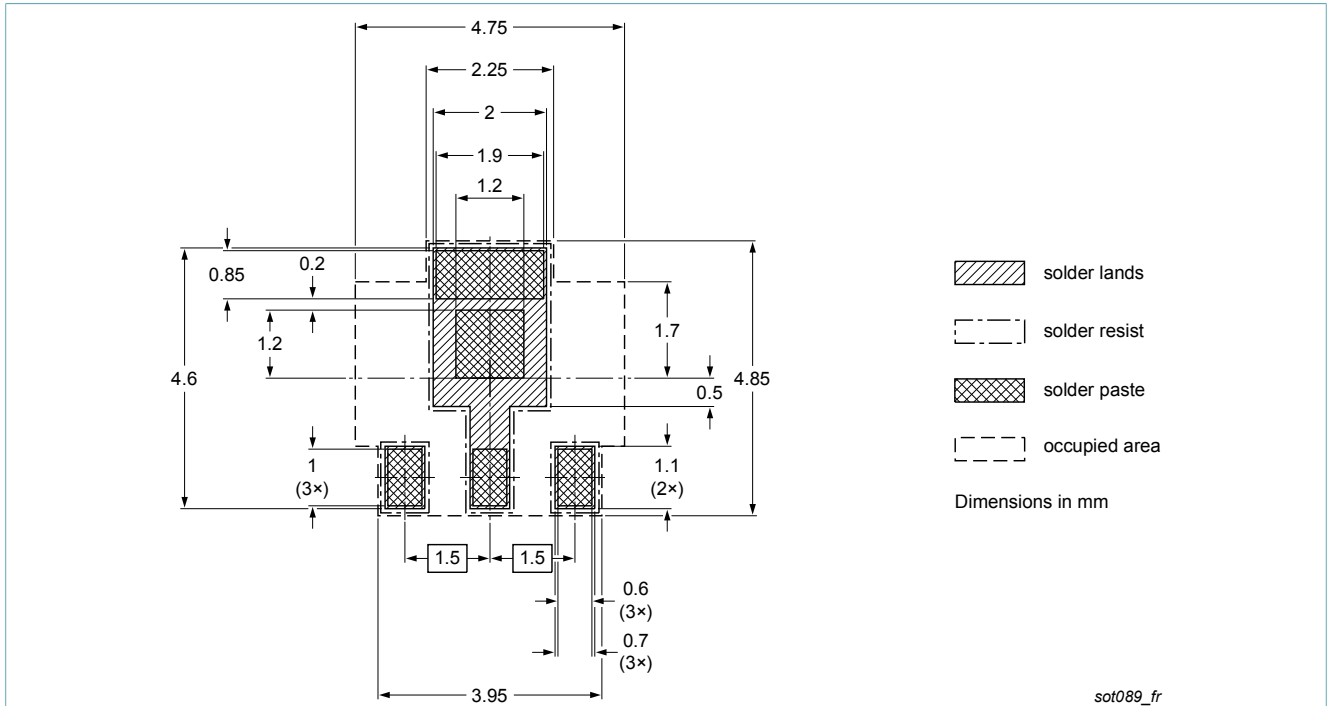


Fig. 12. Reflow soldering footprint for SOT89

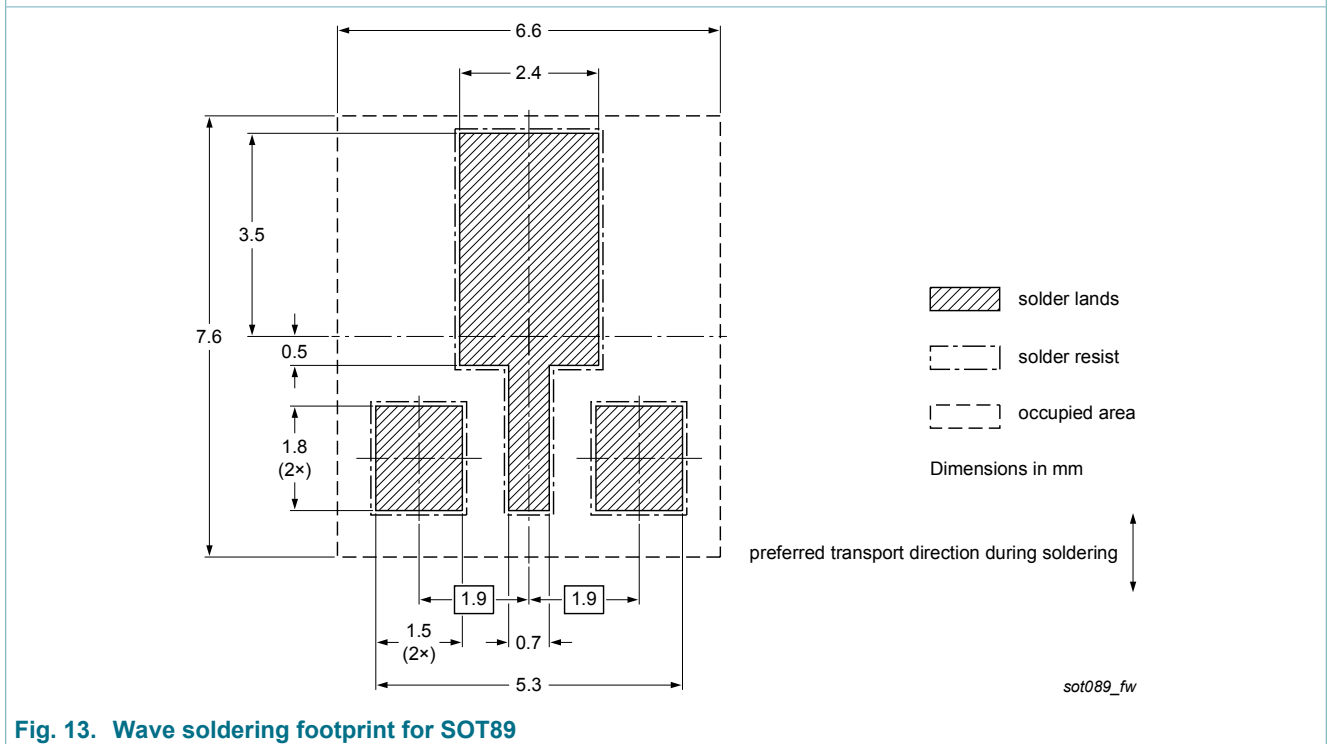


Fig. 13. Wave soldering footprint for SOT89

## 14. Revision history

Table 8. Revision history

Data sheet ID	Release date	Data sheet status	Change notice	Supersedes
PBSS4360X v.1	20170609	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.
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