



# PBSS4160X

60 V, 1 A NPN low  $V_{CEsat}$  BISS transistor

23 May 2017

Product data sheet

## 1. General description

NPN low  $V_{CEsat}$  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

- 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 switches
- 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

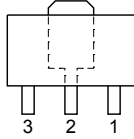
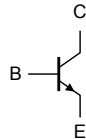
Table 1. Quick reference data

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$V_{CEO}$	collector-emitter voltage	open base	-	-	60	V
$I_C$	collector current		-	-	1	A
$I_{CM}$	peak collector current	single pulse; $t_p \leq 1$ ms	-	-	2	A
$h_{FE}$	DC current gain	$V_{CE} = 10$ V; $I_C = 500$ mA; $T_{amb} = 25$ °C	[1]	170	-	360

[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
PBSS4160X	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
PBSS4160X	S41

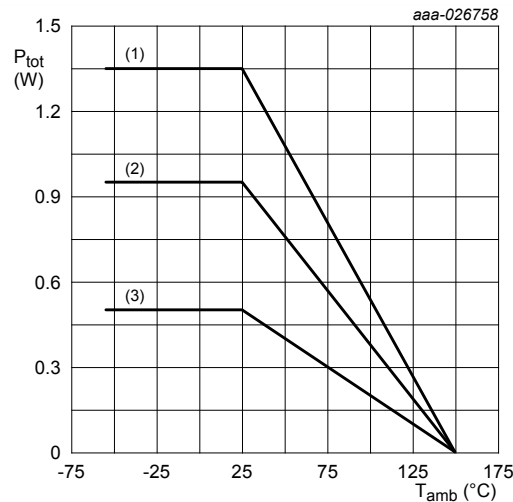
## 8. Limiting values

**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	-	60	V	
$V_{CEO}$	collector-emitter voltage	open base	-	60	V	
$V_{EBO}$	emitter-base voltage	open collector	-	7	V	
$I_C$	collector current		-	1	A	
$I_{CM}$	peak collector current	single pulse; $t_p \leq 1$ ms	-	2	A	
$I_B$	base current		-	300	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>.



- (1) FR4 PCB, single-sided copper, 6 cm<sup>2</sup>  
 (2) FR4 PCB, single-sided copper, 1 cm<sup>2</sup>  
 (3) FR4 PCB, single-sided copper, standard footprint

**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>.

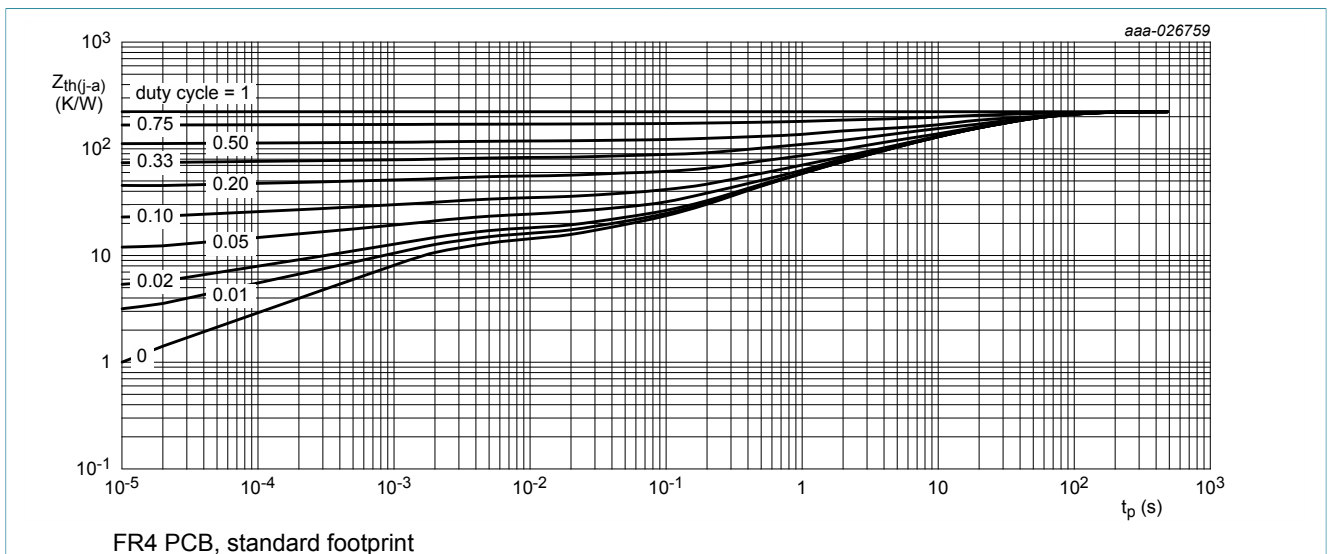


Fig. 2. Transient thermal impedance from junction to ambient as a function of pulse duration; typical values

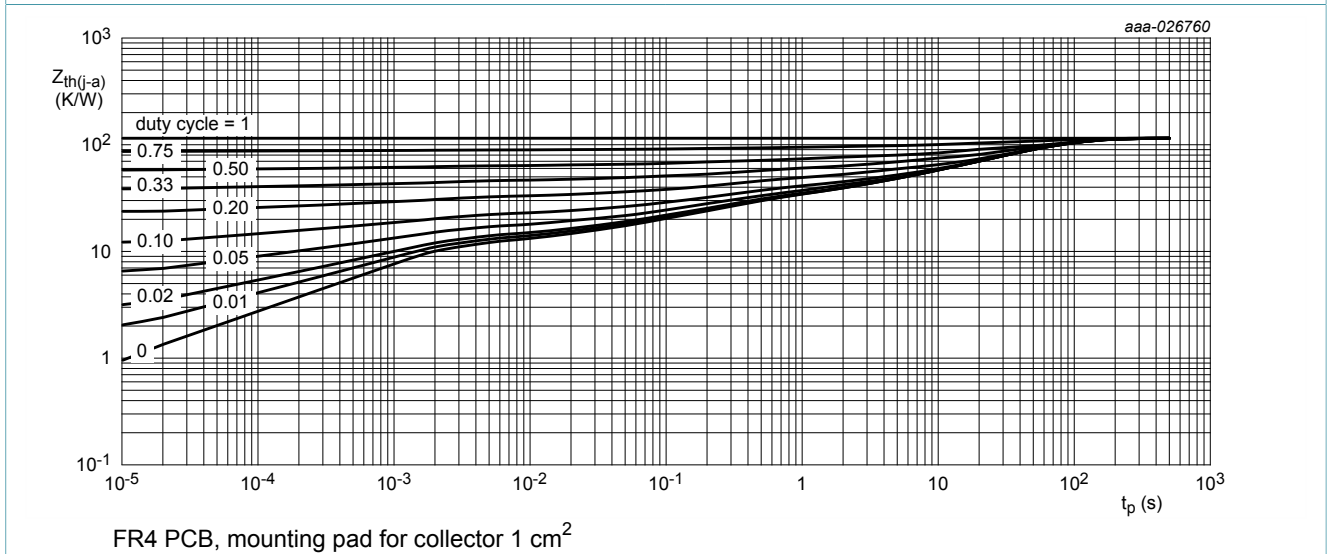
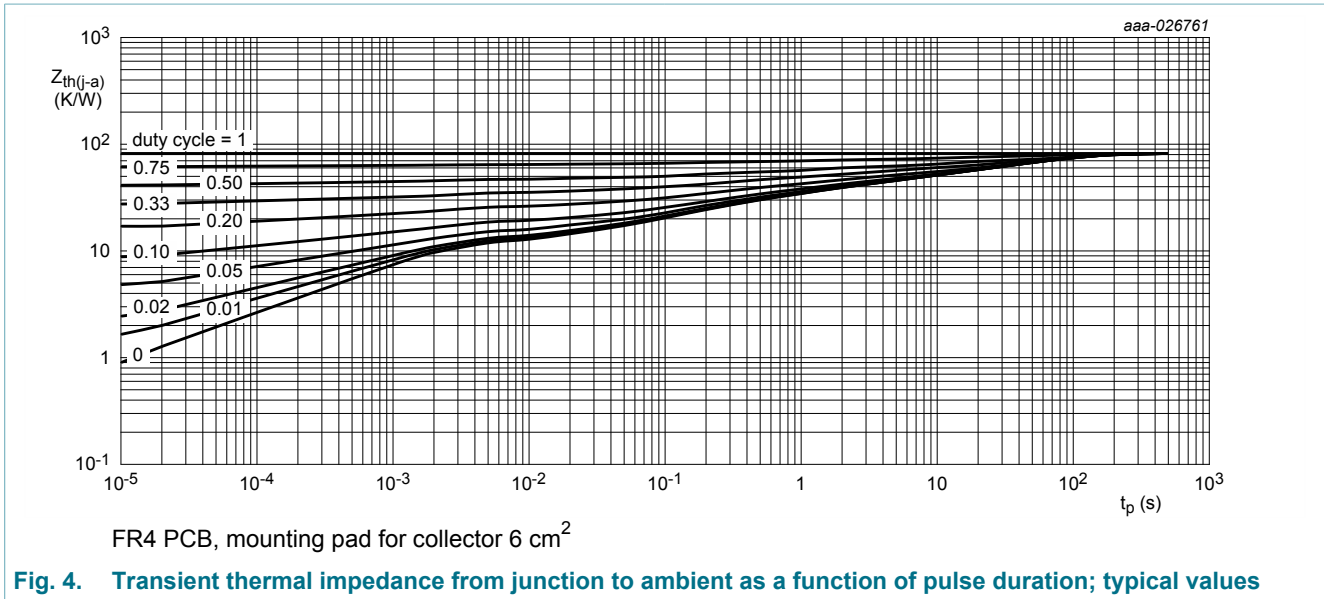


Fig. 3. Transient thermal impedance from junction to ambient as a function of pulse duration; typical values

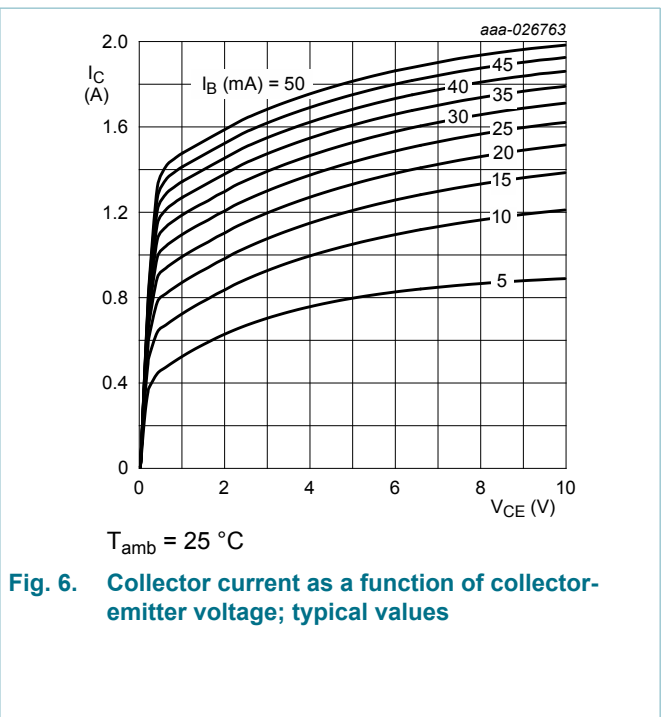
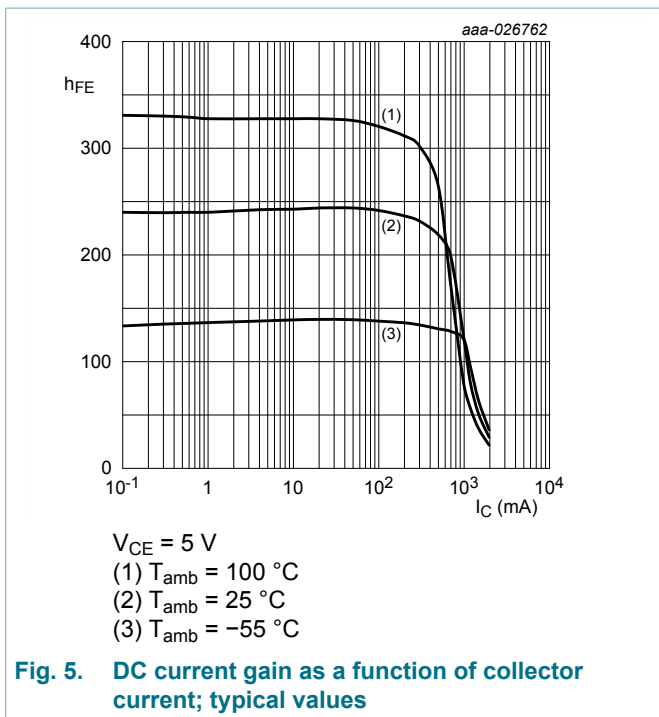


## 10. Characteristics

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		-	-	10	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> = 10 V; I <sub>C</sub> = 500 mA; T <sub>amb</sub> = 25 °C	[1]	170	-	360	
		V <sub>CE</sub> = 5 V; I <sub>C</sub> = 1 A; T <sub>amb</sub> = 25 °C	[1]	50	-	-	
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]	-	-	200	mV
R <sub>CEsat</sub>	collector-emitter saturation resistance			-	-	0.4	Ω
V <sub>BEsat</sub>	base-emitter saturation voltage		[1]	-	-	1.2	V
V <sub>BE</sub>	base-emitter voltage	V <sub>CE</sub> = 5 V; I <sub>C</sub> = 1 A; T <sub>amb</sub> = 25 °C	[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		-	180	-	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		-	6	-	pF

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



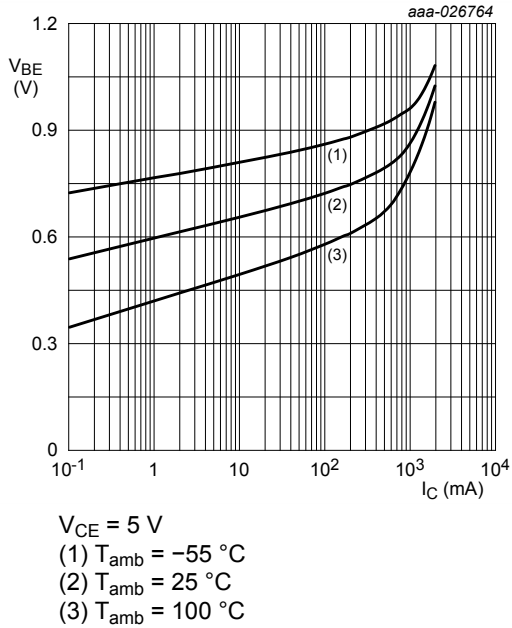


Fig. 7. Base-emitter voltage as a function of collector current; typical values

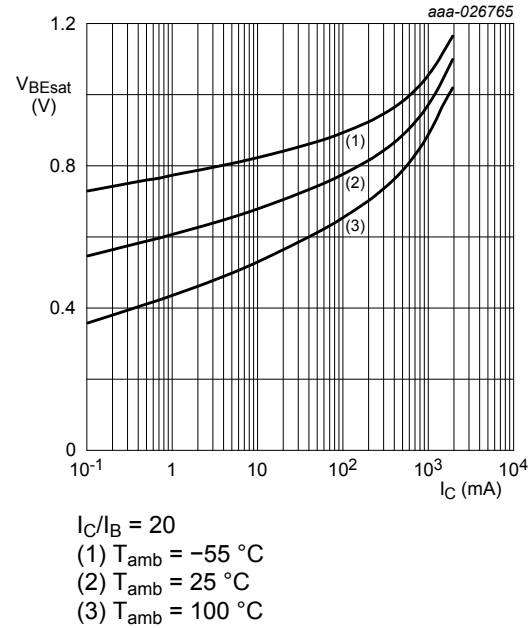


Fig. 8. Base-emitter saturation voltage as a function of collector current; typical values

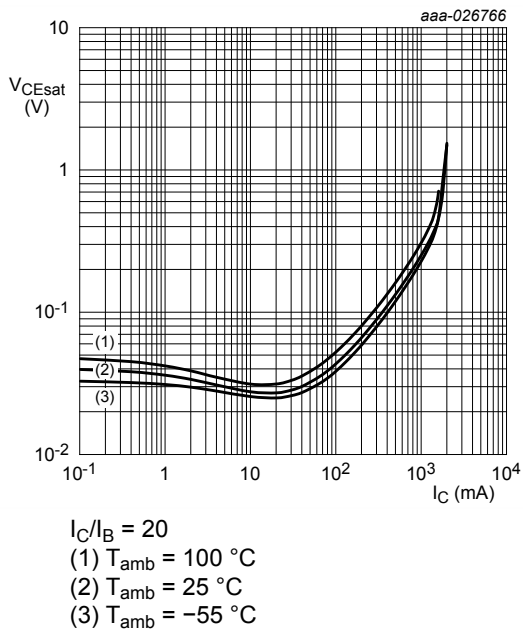


Fig. 9. Collector-emitter saturation voltage as a function of collector current; typical values

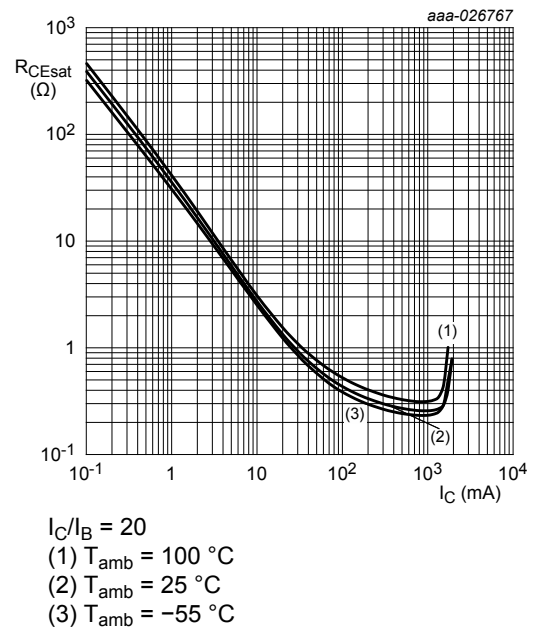
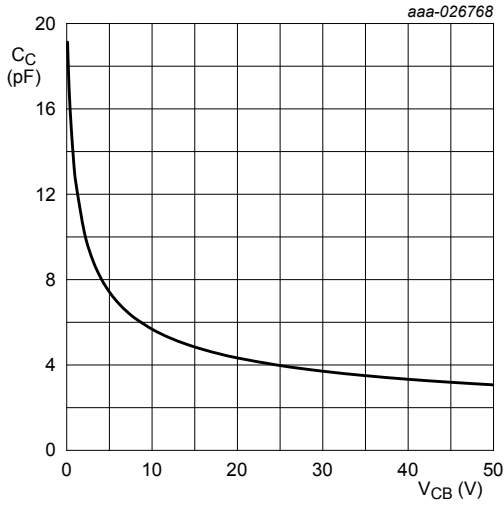
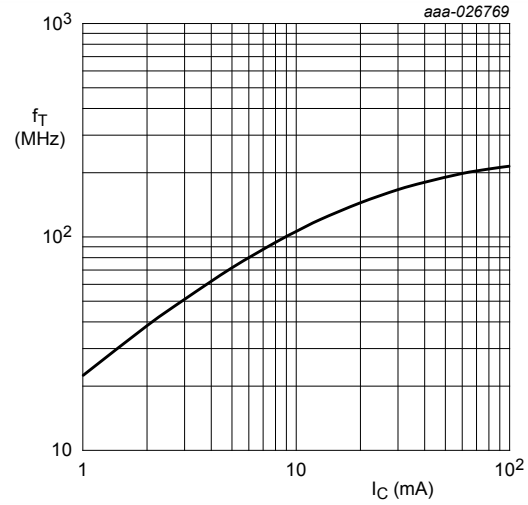


Fig. 10. Collector-emitter saturation resistance as a function of collector current; typical values



$f = 1 \text{ MHz}$   
 $T_{amb} = 25 \text{ }^\circ\text{C}$

**Fig. 11. Collector capacitance as a function of collector-base voltage; typical values**



$V_{CE} = 10 \text{ V}$   
 $f = 100 \text{ MHz}$   
 $T_{amb} = 25 \text{ }^\circ\text{C}$

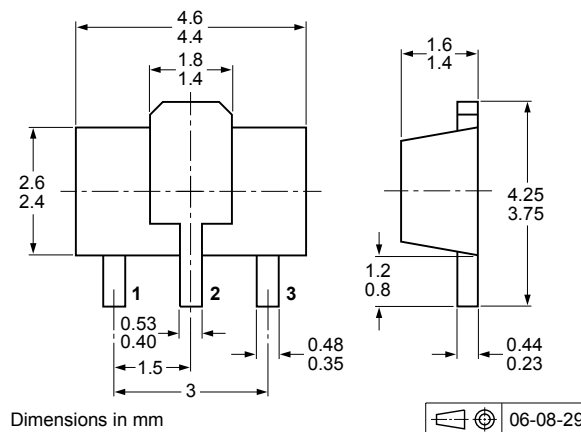
**Fig. 12. Transition frequency as a function of collector current; typical values**

## 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

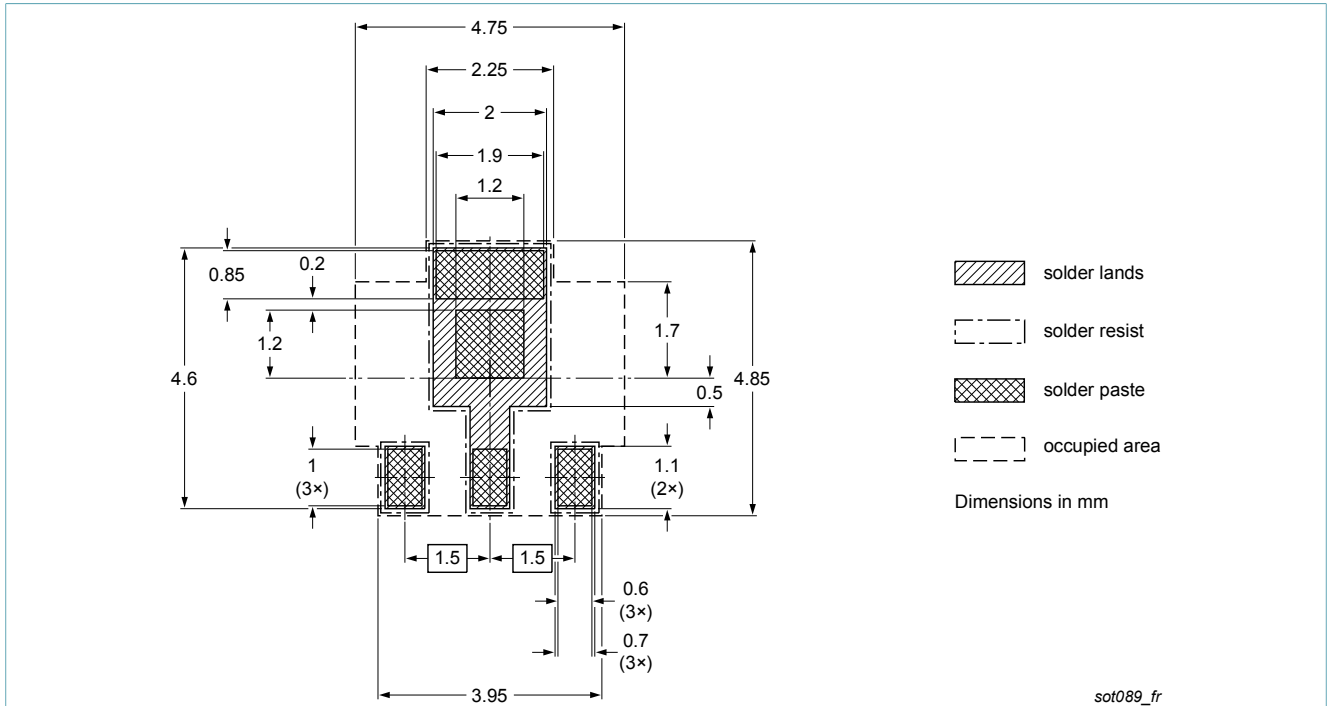


Fig. 14. Reflow soldering footprint for SOT89

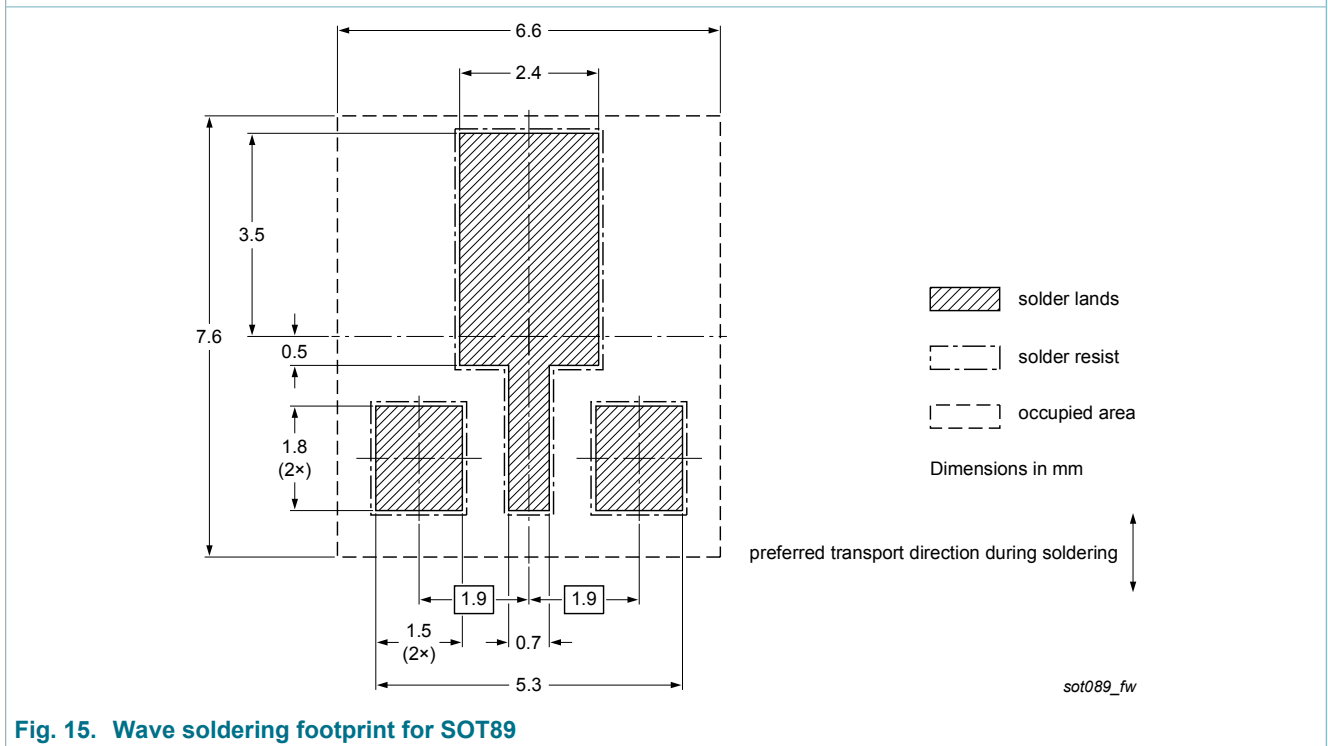


Fig. 15. Wave soldering footprint for SOT89

## 14. Revision history

Table 8. Revision history

Data sheet ID	Release date	Data sheet status	Change notice	Supersedes
PBSS4160X v.1	20170523	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.

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