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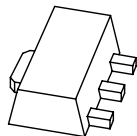
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Kind regards,

Team Nexperia



# PBSS8110X

100 V, 1 A NPN low  $V_{CEsat}$  (BISS) transistor

Rev. 02 — 11 December 2009

Product data sheet

## 1. Product profile

### 1.1 General description

NPN low  $V_{CEsat}$  Breakthrough In Small Signal (BISS) transistor in a SOT89 (SC-62/TO-243) SMD plastic package.

PNP complement: PBSS9110X.

### 1.2 Features

- SOT89 package
- Low collector-emitter saturation voltage  $V_{CEsat}$
- High collector current capability:  $I_C$  and  $I_{CM}$
- High efficiency leading to less heat generation

### 1.3 Applications

- Major application segments:
  - ◆ Automotive 42 V power
  - ◆ Telecom infrastructure
  - ◆ Industrial
- Peripheral driver:
  - ◆ Driver in low supply voltage applications (e.g. lamps and LEDs)
  - ◆ Inductive load driver (e.g. relays, buzzers and motors)
- DC-to-DC converter

### 1.4 Quick reference data

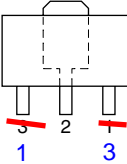
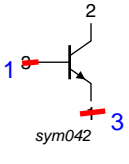
Table 1. Quick reference data

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$V_{CEO}$	collector-emitter voltage	open base	-	-	100	V
$I_C$	collector current (DC)		-	-	1	A
$I_{CM}$	peak collector current	single pulse; $t_p \leq 1$ ms	-	-	3	A
$R_{CEsat}$	collector-emitter saturation resistance	$I_C = 1$ A; $I_B = 100$ mA	[1] -	165	200	m $\Omega$

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

## 2. Pinning information

**Table 2. Pinning**

Pin	Description	Simplified outline	Symbol
3	emitter		
2	collector		
1	base		

Note: Pin numbering is according to standard SOT89 package

## 3. Ordering information

**Table 3. Ordering information**

Type number	Package		Version
	Name	Description	
PBSS8110X	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>
PBSS8110X	*4B

- [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**

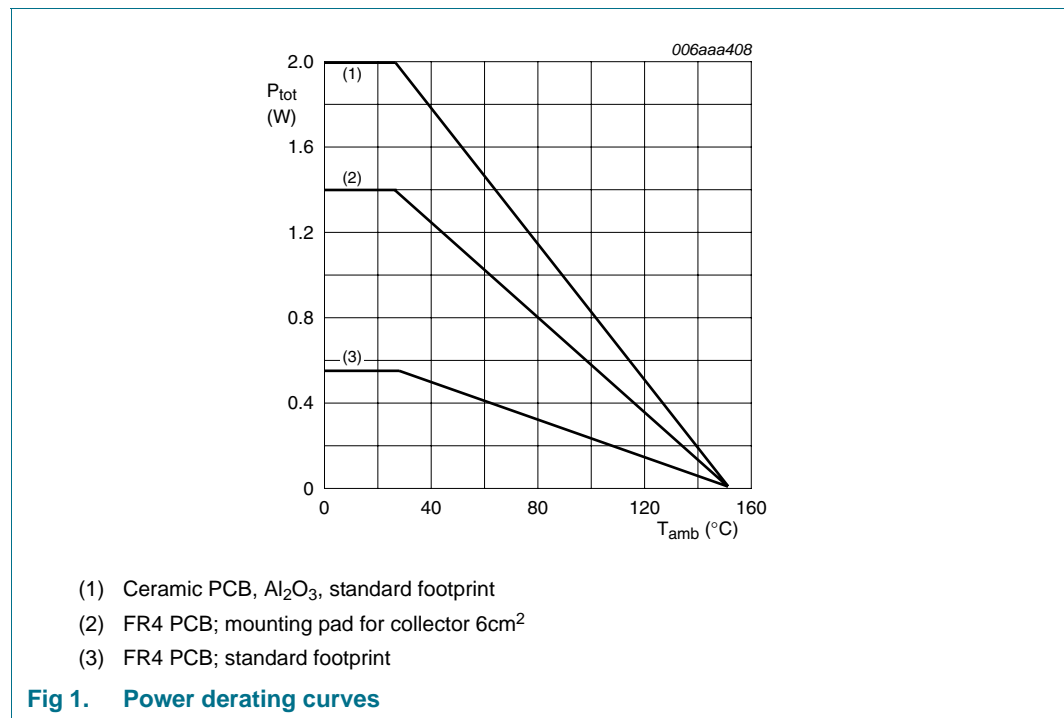
In accordance with the Absolute Maximum Rating System (IEC 60134).

Symbol	Parameter	Conditions	Min	Max	Unit	
$V_{CBO}$	collector-base voltage	open emitter	-	120	V	
$V_{CEO}$	collector-emitter voltage	open base	-	100	V	
$V_{EBO}$	emitter-base voltage	open collector	-	5	V	
$I_C$	collector current (DC)		-	1	A	
$I_{CM}$	peak collector current	single pulse; $t_p \leq 1$ ms	-	3	A	
$I_B$	base current (DC)		-	300	mA	
$P_{tot}$	total power dissipation	$T_{amb} \leq 25$ °C	[1]	-	0.55	W
			[2]	-	1.4	W
			[3]	-	2.0	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 Printed-Circuit Board (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 6cm<sup>2</sup>.

[3] Device mounted on a ceramic PCB, Al<sub>2</sub>O<sub>3</sub>, standard footprint.



## 6. Thermal characteristics

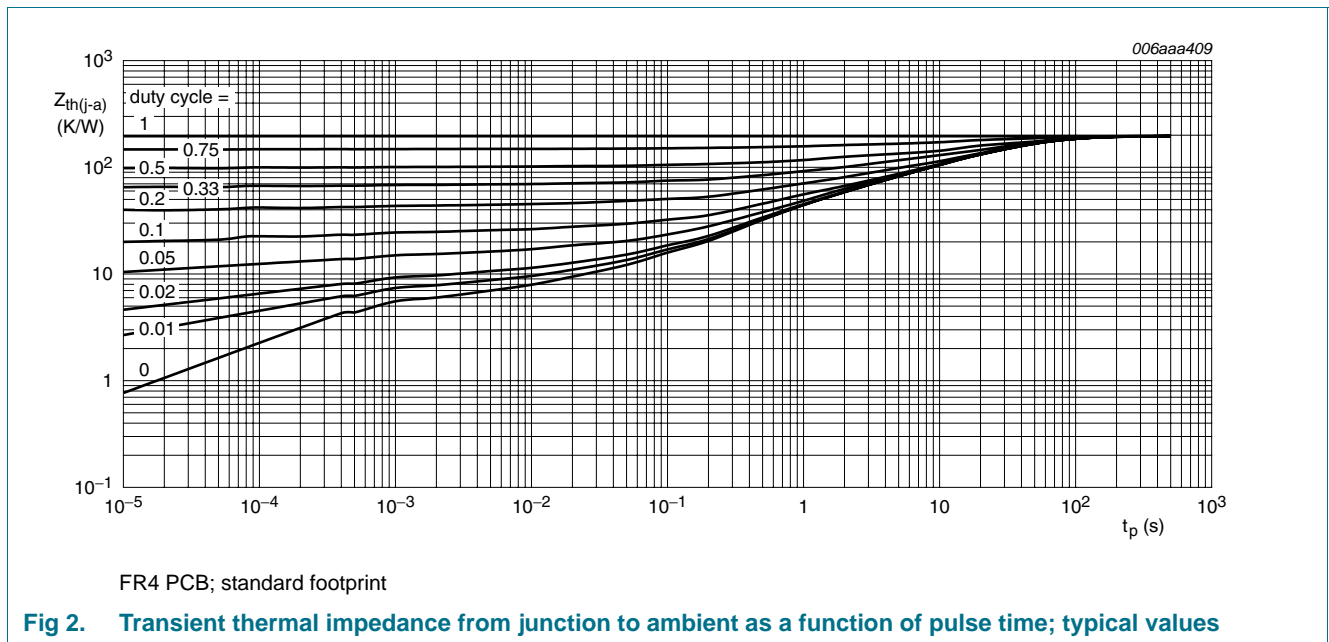
**Table 6. Thermal characteristics**

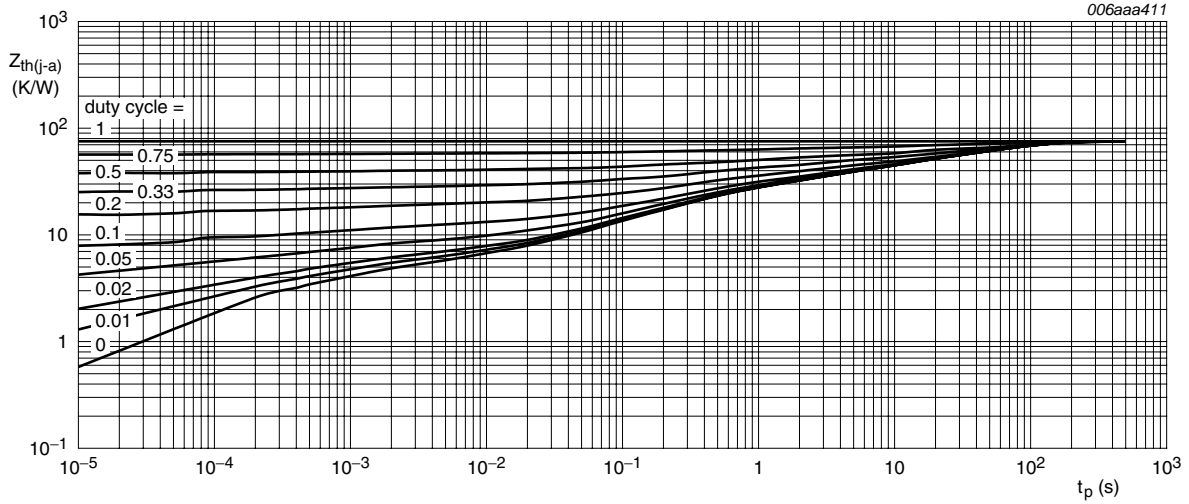
Symbol	Parameter	Conditions	Min	Typ	Max	Unit	
$R_{th(j-a)}$	thermal resistance from junction to ambient	in free air	[1]	-	-	227	K/W
			[2]	-	-	89	K/W
			[3]	-	-	63	K/W
$R_{th(j-sp)}$	thermal resistance from junction to solder point		-	-	16	K/W	

[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 6cm<sup>2</sup>.

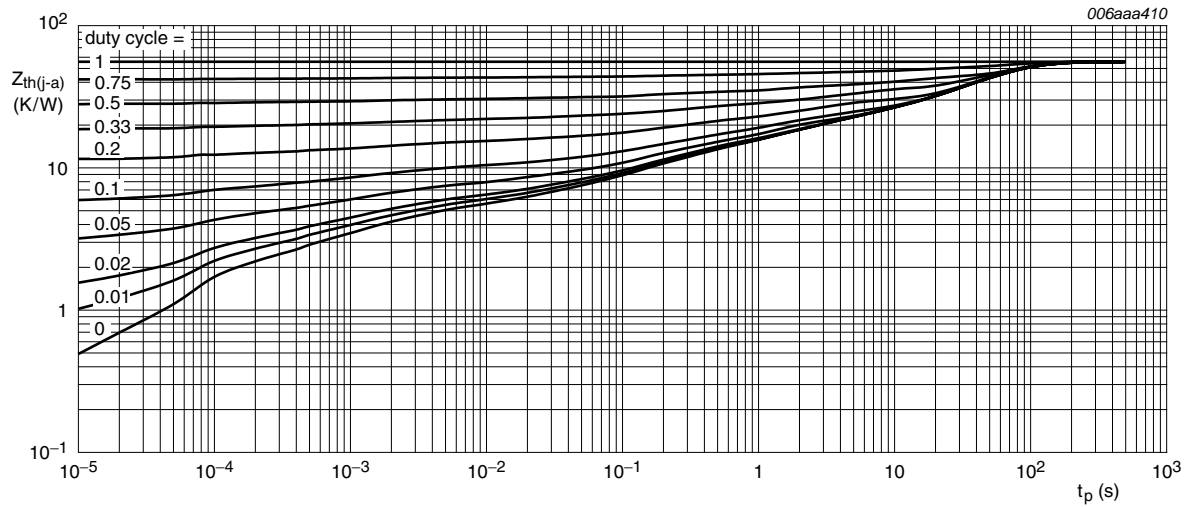
[3] Device mounted on a ceramic PCB, Al<sub>2</sub>O<sub>3</sub>, standard footprint.





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

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



Ceramic PCB, Al<sub>2</sub>O<sub>3</sub>, standard footprint

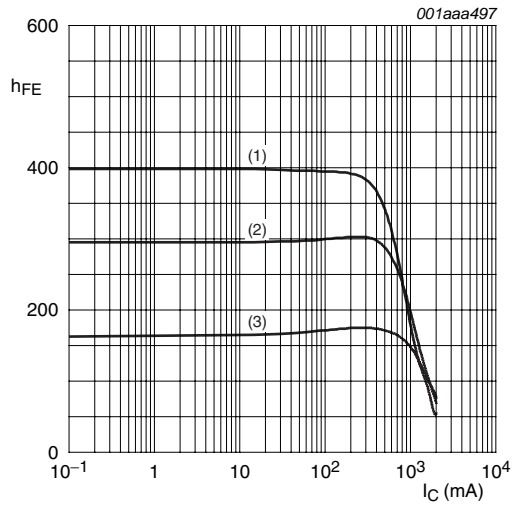
Fig 4. Transient thermal impedance from junction to ambient as a function of pulse time; typical values

## 7. Characteristics

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

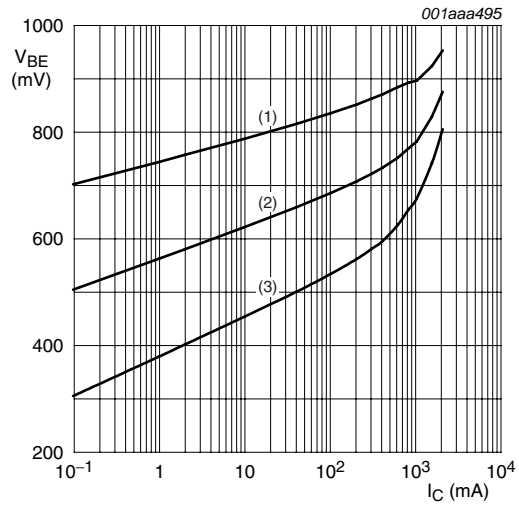
Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$I_{CBO}$	collector-base cut-off current	$V_{CB} = 80\text{ V}; I_E = 0\text{ A}$	-	-	100	nA
		$V_{CB} = 80\text{ V}; I_E = 0\text{ A}; T_j = 150\text{ }^{\circ}\text{C}$	-	-	50	$\mu\text{A}$
$I_{CES}$	collector-emitter cut-off current	$V_{CE} = 80\text{ V}; V_{BE} = 0\text{ V}$	-	-	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	$V_{CE} = 10\text{ V}; I_C = 1\text{ mA}$	150	-	-	
		$V_{CE} = 10\text{ V}; I_C = 250\text{ mA}$	150	-	500	
		$V_{CE} = 10\text{ V}; I_C = 500\text{ mA}$	[1] 100	-	-	
		$V_{CE} = 10\text{ V}; I_C = 1\text{ A}$	[1] 80	-	-	
$V_{CEsat}$	collector-emitter saturation voltage	$I_C = 100\text{ mA}; I_B = 10\text{ mA}$	-	-	40	mV
		$I_C = 500\text{ mA}; I_B = 50\text{ mA}$	-	-	120	mV
		$I_C = 1\text{ A}; I_B = 100\text{ mA}$	[1] -	-	200	mV
$R_{CEsat}$	collector-emitter saturation resistance	$I_C = 1\text{ A}; I_B = 100\text{ mA}$	[1] -	165	200	$\text{m}\Omega$
$V_{BEsat}$	base-emitter saturation voltage	$I_C = 1\text{ A}; I_B = 100\text{ mA}$	-	-	1.05	V
$V_{BEon}$	base-emitter turn-on voltage	$V_{CE} = 10\text{ V}; I_C = 1\text{ A}$	-	-	0.9	V
$t_d$	delay time	$V_{CC} = 10\text{ V}; I_C = 0.5\text{ A}; I_{Bon} = 0.025\text{ A}; I_{Boff} = -0.025\text{ A}$	-	25	-	ns
$t_r$	rise time		-	220	-	ns
$t_{on}$	turn-on time		-	245	-	ns
$t_s$	storage time		-	365	-	ns
$t_f$	fall time		-	185	-	ns
$t_{off}$	turn-off time		-	550	-	ns
$f_T$	transition frequency		$V_{CE} = 10\text{ V}; I_C = 50\text{ mA}; f = 100\text{ MHz}$	100	-	-
$C_c$	collector capacitance	$V_{CB} = 10\text{ V}; I_E = I_C = 0\text{ A}; f = 1\text{ MHz}$	-	-	7.5	pF

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



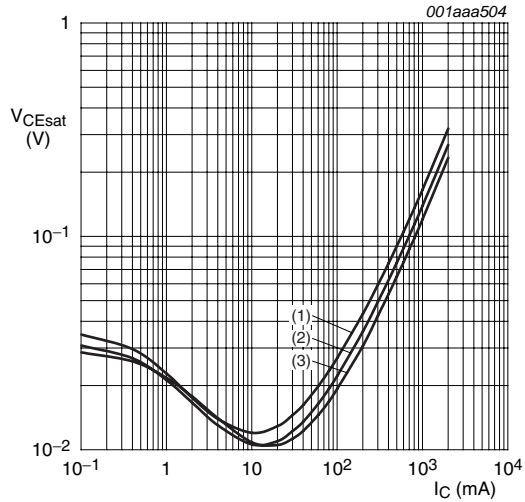
$V_{CE} = 10\text{ V}$   
 (1)  $T_{amb} = 100\text{ }^\circ\text{C}$   
 (2)  $T_{amb} = 25\text{ }^\circ\text{C}$   
 (3)  $T_{amb} = -55\text{ }^\circ\text{C}$

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



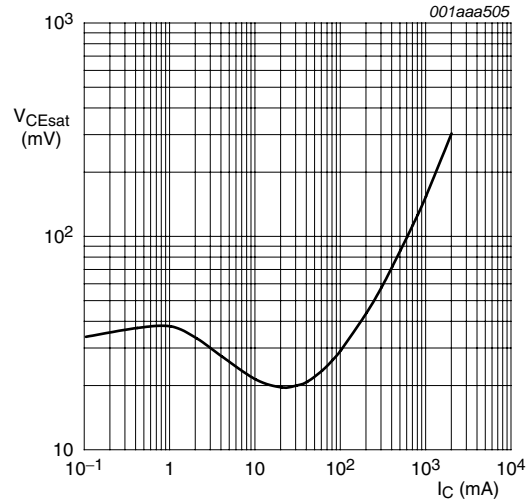
$V_{CE} = 10\text{ V}$   
 (1)  $T_{amb} = -55\text{ }^\circ\text{C}$   
 (2)  $T_{amb} = 25\text{ }^\circ\text{C}$   
 (3)  $T_{amb} = 100\text{ }^\circ\text{C}$

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



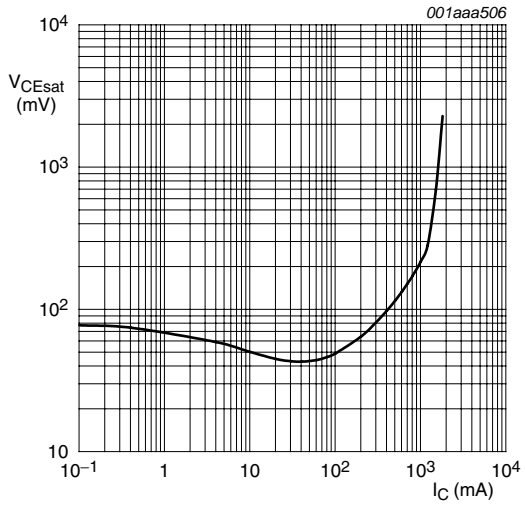
$I_C/I_B = 10$   
 (1)  $T_{amb} = 100\text{ }^\circ\text{C}$   
 (2)  $T_{amb} = 25\text{ }^\circ\text{C}$   
 (3)  $T_{amb} = -55\text{ }^\circ\text{C}$

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



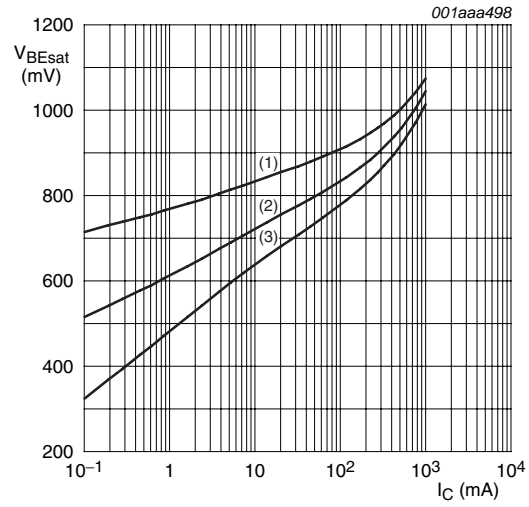
$I_C/I_B = 20; T_{amb} = 25\text{ }^\circ\text{C}$

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



$I_C/I_B = 50$ ;  $T_{amb} = 25\text{ }^\circ\text{C}$

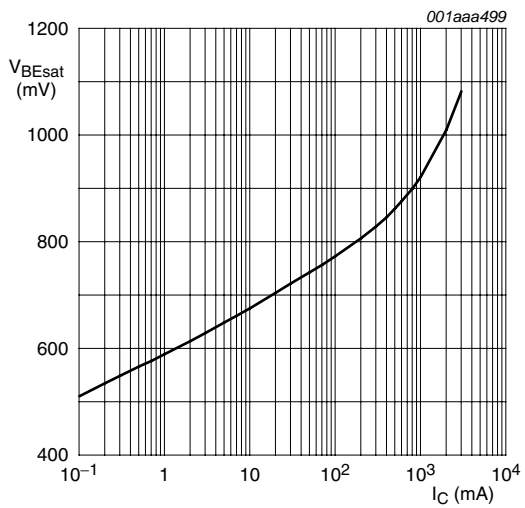
**Fig 9. Collector-emitter saturation voltage as a function of collector current; typical values**



$I_C/I_B = 10$

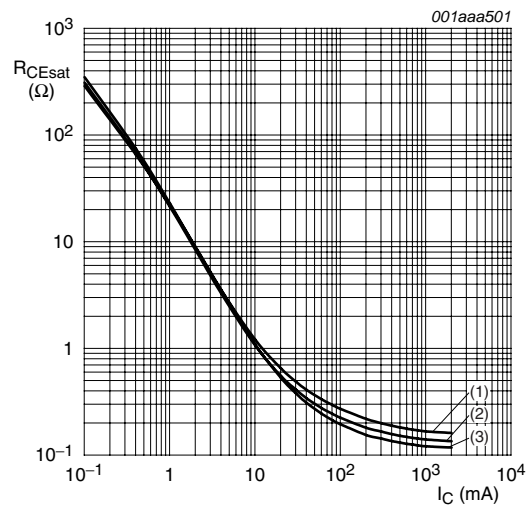
- (1)  $T_{amb} = -55\text{ }^\circ\text{C}$
- (2)  $T_{amb} = 25\text{ }^\circ\text{C}$
- (3)  $T_{amb} = 100\text{ }^\circ\text{C}$

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



$I_C/I_B = 20$ ;  $T_{amb} = 25\text{ }^\circ\text{C}$

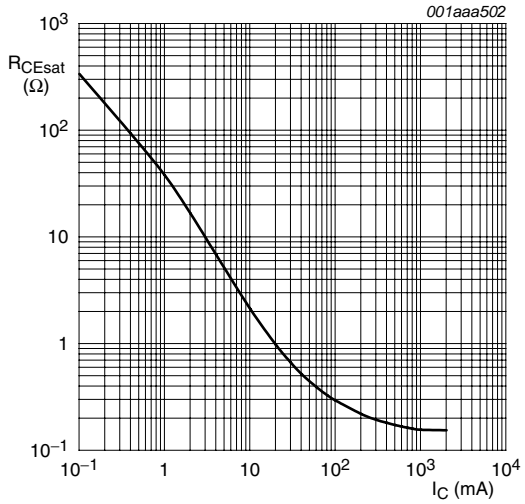
**Fig 11. Base-emitter saturation voltage as a function of collector current; typical values**



$I_C/I_B = 10$

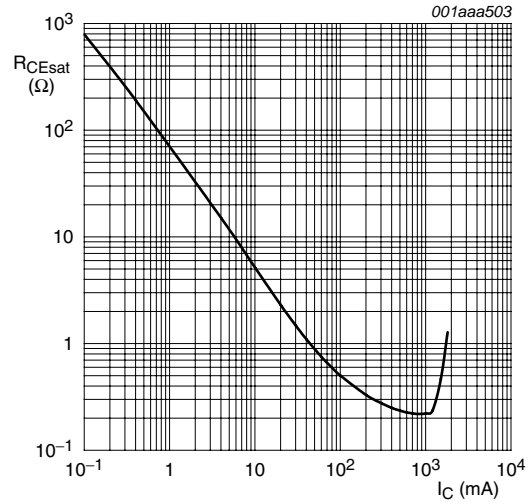
- (1)  $T_{amb} = 100\text{ }^\circ\text{C}$
- (2)  $T_{amb} = 25\text{ }^\circ\text{C}$
- (3)  $T_{amb} = -55\text{ }^\circ\text{C}$

**Fig 12. Collector-emitter saturation resistance as a function of collector current; typical values**



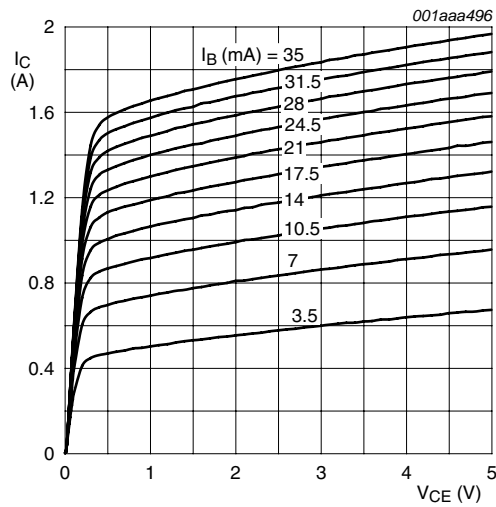
$I_C/I_B = 20$ ;  $T_{amb} = 25\text{ }^\circ\text{C}$

Fig 13. Collector-emitter saturation resistance as a function of collector current; typical values



$I_C/I_B = 50$ ;  $T_{amb} = 25\text{ }^\circ\text{C}$

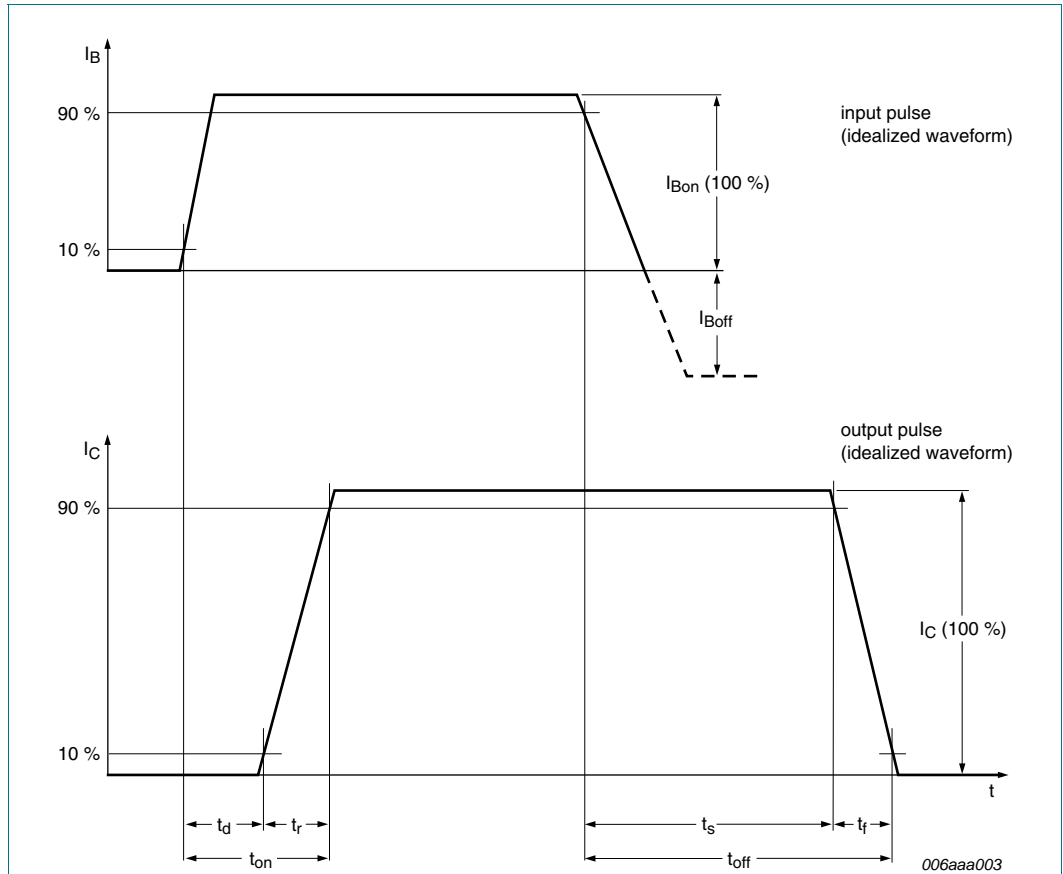
Fig 14. Collector-emitter saturation resistance as a function of collector current; typical values



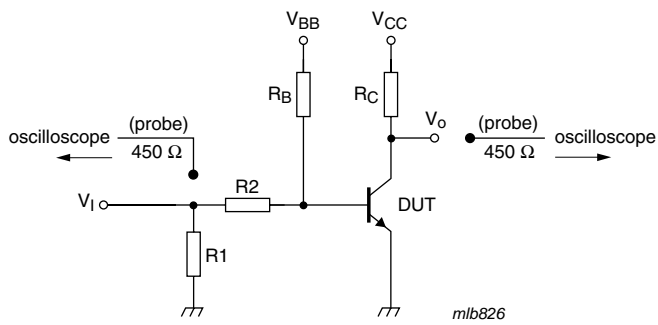
$T_{amb} = 25\text{ }^\circ\text{C}$

Fig 15. Collector current as a function of collector-emitter voltage; typical values

**8. Test information**



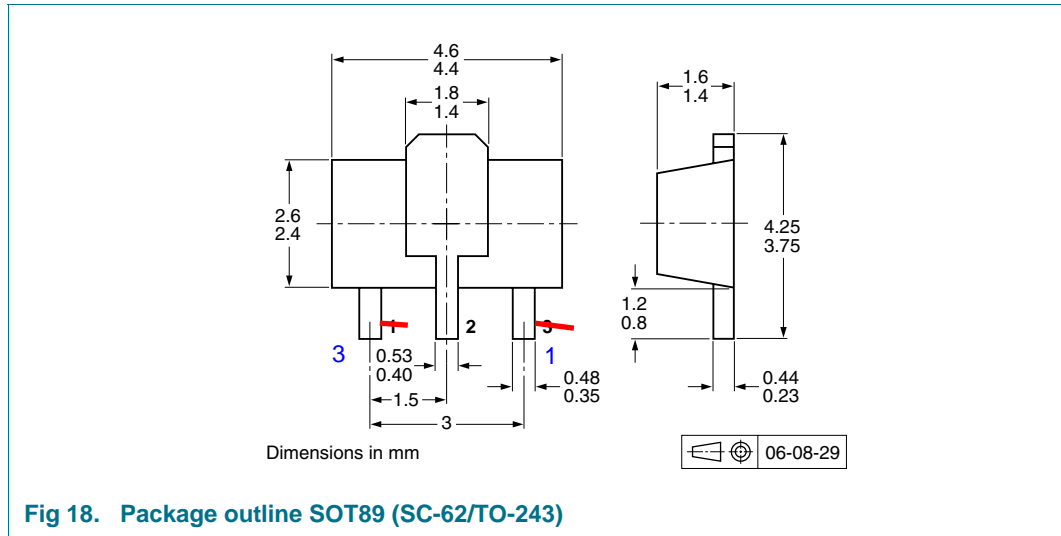
**Fig 16. BISS transistor switching time definition**



$V_{CC} = 10\text{ V}; I_C = 0.5\text{ A}; I_{Bon} = 0.025\text{ A}; I_{Boff} = -0.025\text{ A}$

**Fig 17. Test circuit for switching times**

## 9. Package outline



## 10. Packing information

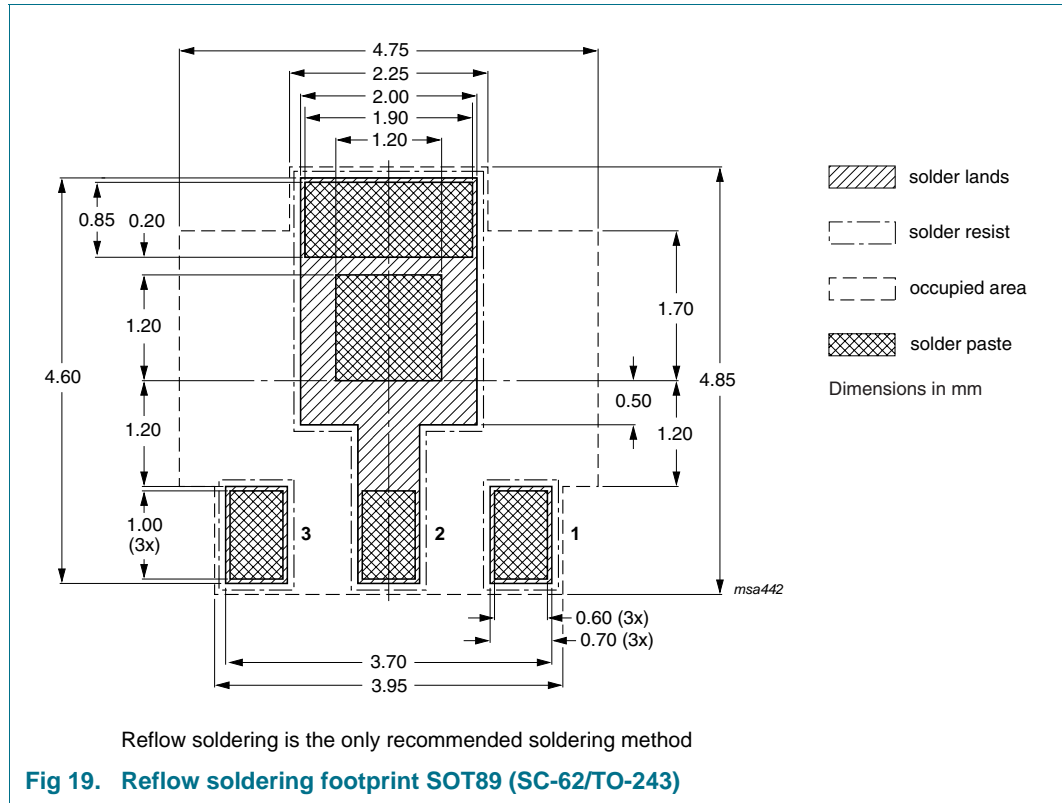
**Table 8. Packing methods**

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

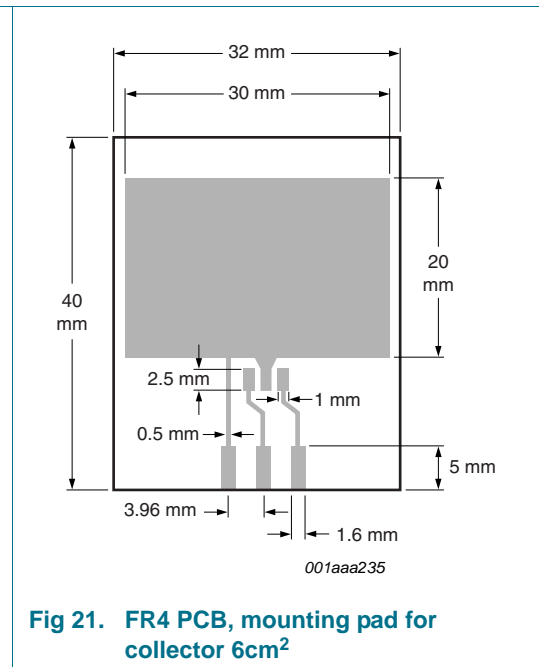
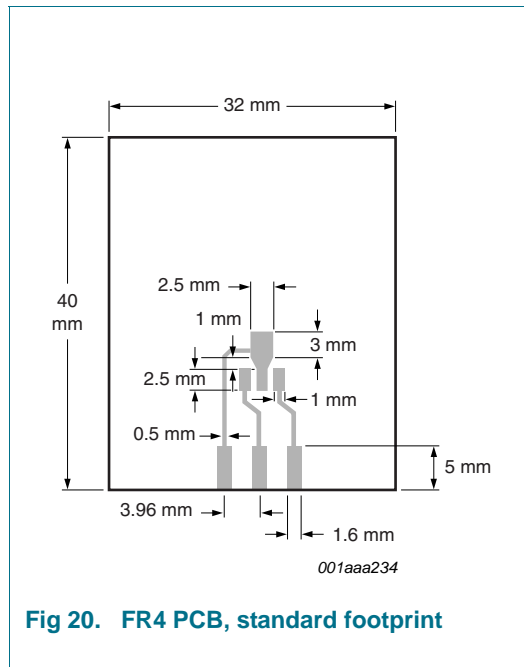
Type number	Package	Description	Packing quantity	
			1000	4000
PBSS8110X	SOT89	8 mm pitch, 12 mm tape and reel	-115	-135

[1] For further information and the availability of packing methods, see [Section 15](#).

## 11. Soldering



## 12. Mounting



## 13. Revision history

**Table 9.** Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
PBSS8110X_2	20091211	Product data sheet	-	PBSS8110X_1
Modifications:	<ul style="list-style-type: none"> <li>• This data sheet was changed to reflect the new company name NXP Semiconductors, including new legal definitions and disclaimers. No changes were made to the technical content.</li> <li>• <a href="#">Figure 5</a>: updated</li> <li>• <a href="#">Figure 7</a>: <math>V_{CEsat}</math> axis unit amended from mV to V</li> <li>• <a href="#">Figure 15</a>: updated</li> <li>• <a href="#">Figure 18 "Package outline SOT89 (SC-62/TO-243)"</a>: updated</li> <li>• <a href="#">Figure 19 "Reflow soldering footprint SOT89 (SC-62/TO-243)"</a>: updated</li> </ul>			
PBSS8110X_1	20050511	Product data sheet	-	-

## 14. Legal information

### 14.1 Data sheet status

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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