

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

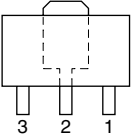
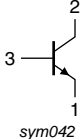
Table 1. Quick reference data

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 Ω

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

2. Pinning information

Table 2. Pinning

Pin	Description	Simplified outline	Symbol
1	emitter		 sym042
2	collector		
3	base		

3. Ordering information

Table 3. Ordering information

Type number	Package		
	Name	Description	Version
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 ^[1]
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

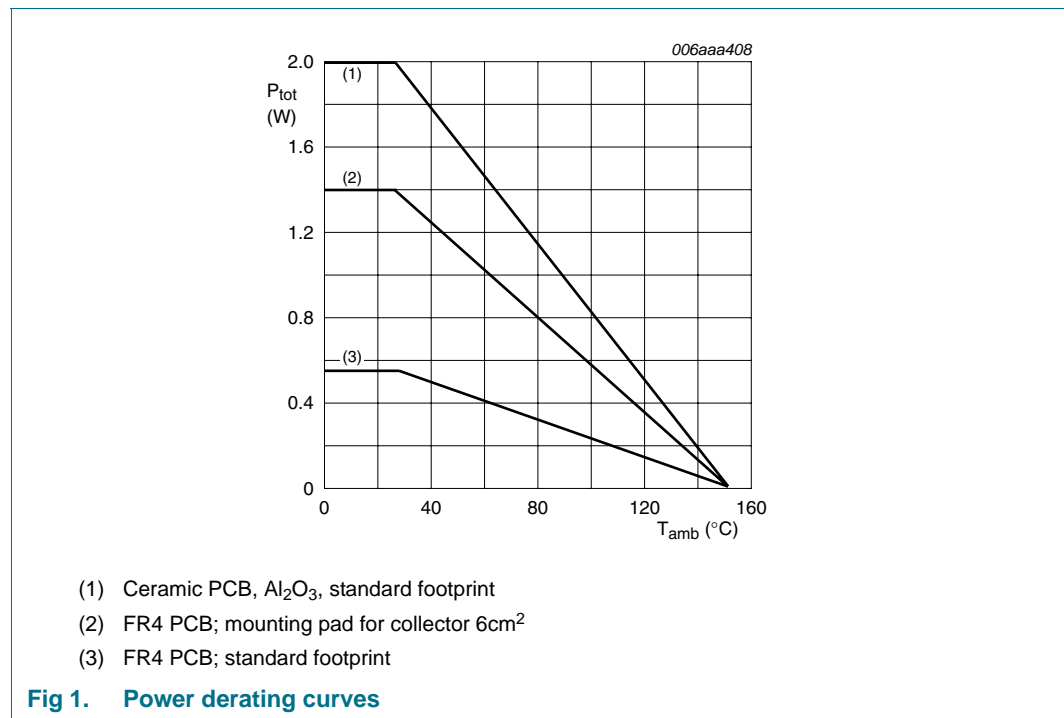
In accordance with the Absolute Maximum Rating System (IEC 60134).

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 6cm².

[3] Device mounted on a ceramic PCB, Al₂O₃, standard footprint.



6. Thermal characteristics

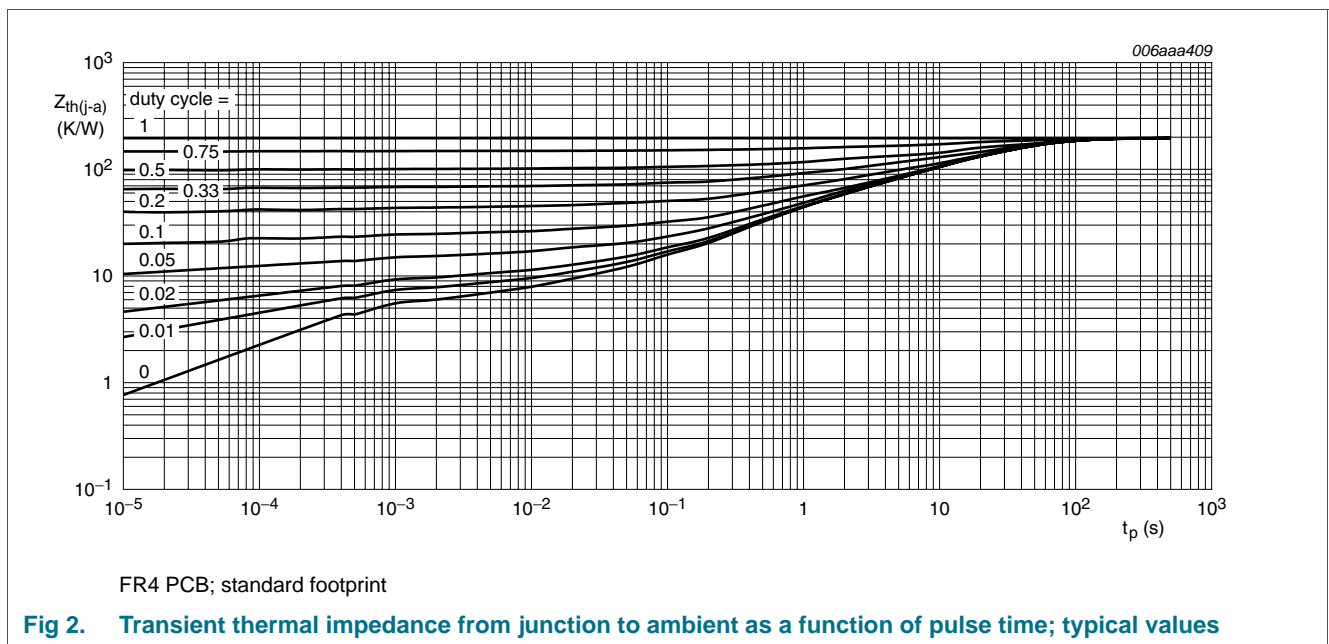
Table 6. Thermal characteristics

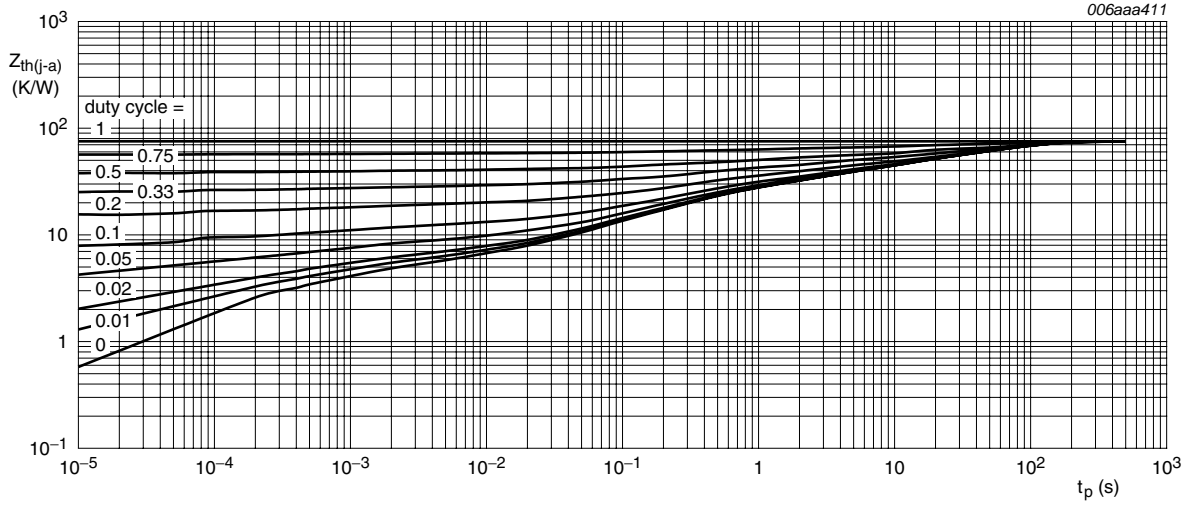
Symbol	Parameter	Conditions	Min	Typ	Max	Unit	
$R_{th(j-a)}$	thermal resistance from junction to ambient	in free air	[1]	-	-	227	K/W
			[2]	-	-	89	K/W
			[3]	-	-	63	K/W
$R_{th(j-sp)}$	thermal resistance from junction to solder point		-	-	16	K/W	

[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 6cm².

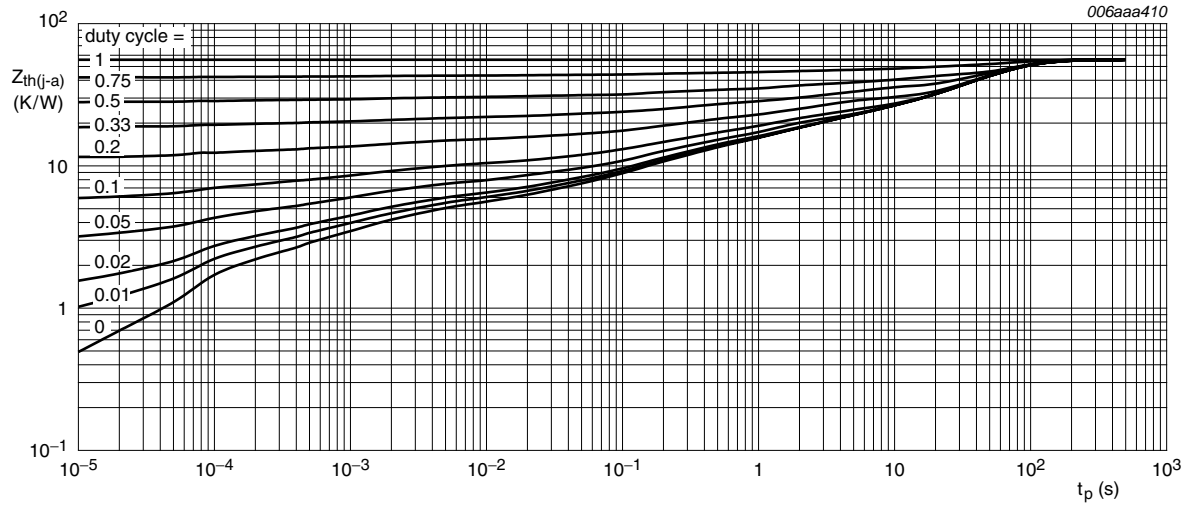
[3] Device mounted on a ceramic PCB, Al₂O₃, standard footprint.





FR4 PCB; mounting pad for collector 6cm²

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



Ceramic PCB, Al₂O₃, standard footprint

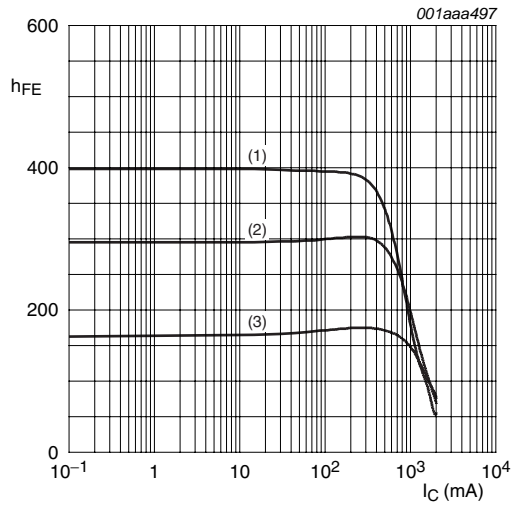
Fig 4. Transient thermal impedance from junction to ambient as a function of pulse time; typical values

7. Characteristics

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

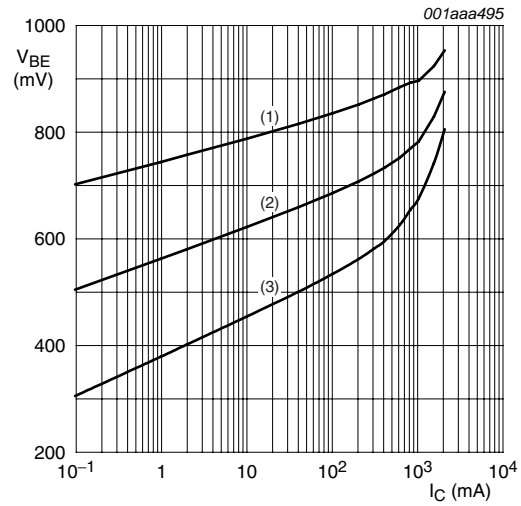
Symbol	Parameter	Conditions	Min	Typ	Max	Unit
I_{CBO}	collector-base cut-off current	$V_{CB} = 80\text{ V}; I_E = 0\text{ A}$	-	-	100	nA
		$V_{CB} = 80\text{ V}; I_E = 0\text{ A}; T_j = 150\text{ }^{\circ}\text{C}$	-	-	50	μA
I_{CES}	collector-emitter cut-off current	$V_{CE} = 80\text{ V}; V_{BE} = 0\text{ V}$	-	-	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	$V_{CB} = 10\text{ V}; I_E = I_e = 0\text{ A}; f = 1\text{ MHz}$	-	-	7.5	pF

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



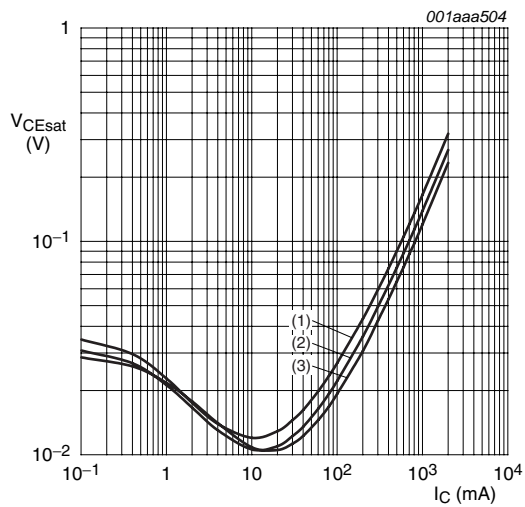
$V_{CE} = 10\text{ V}$
 (1) $T_{amb} = 100\text{ }^\circ\text{C}$
 (2) $T_{amb} = 25\text{ }^\circ\text{C}$
 (3) $T_{amb} = -55\text{ }^\circ\text{C}$

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



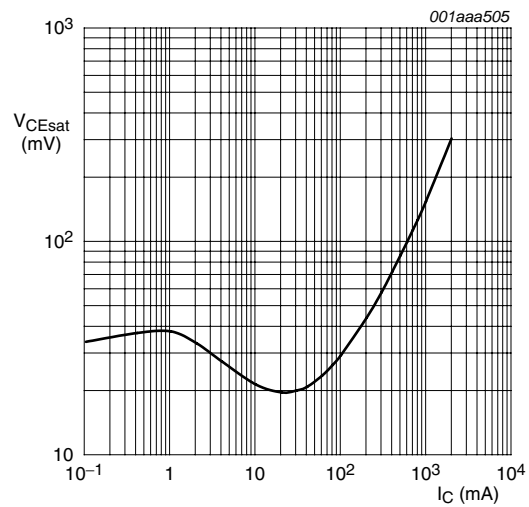
$V_{CE} = 10\text{ V}$
 (1) $T_{amb} = -55\text{ }^\circ\text{C}$
 (2) $T_{amb} = 25\text{ }^\circ\text{C}$
 (3) $T_{amb} = 100\text{ }^\circ\text{C}$

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



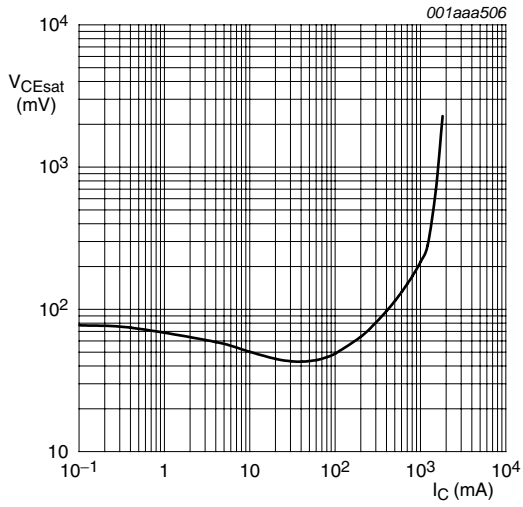
$I_C/I_B = 10$
 (1) $T_{amb} = 100\text{ }^\circ\text{C}$
 (2) $T_{amb} = 25\text{ }^\circ\text{C}$
 (3) $T_{amb} = -55\text{ }^\circ\text{C}$

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



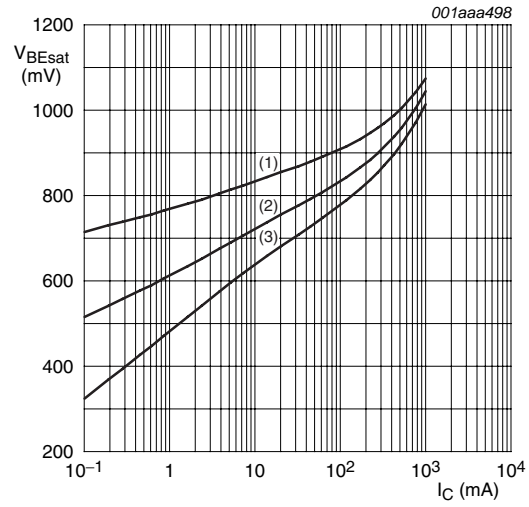
$I_C/I_B = 20; T_{amb} = 25\text{ }^\circ\text{C}$

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



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

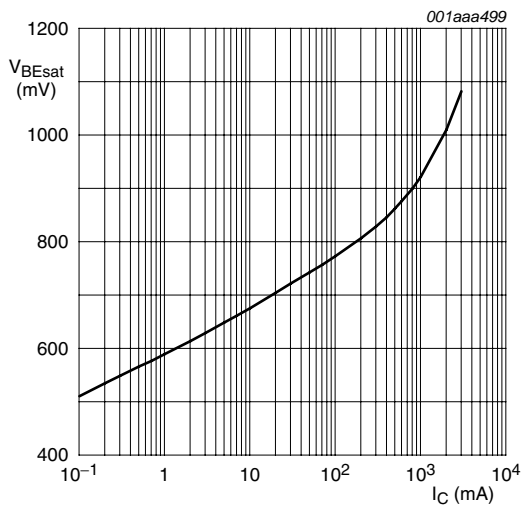
Fig 9. Collector-emitter saturation voltage as a function of collector current; typical values



$I_C/I_B = 10$

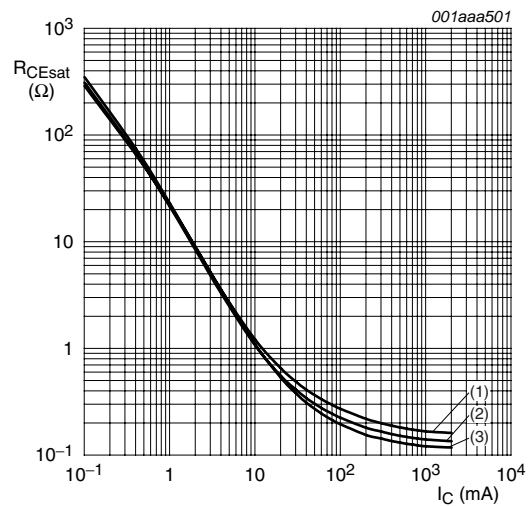
- (1) $T_{amb} = -55\text{ }^\circ\text{C}$
- (2) $T_{amb} = 25\text{ }^\circ\text{C}$
- (3) $T_{amb} = 100\text{ }^\circ\text{C}$

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



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

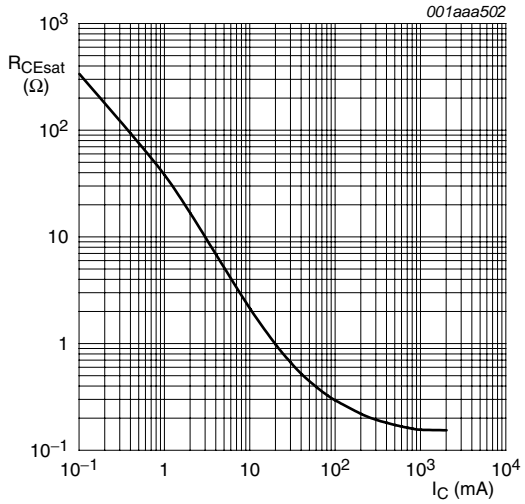
Fig 11. Base-emitter saturation voltage as a function of collector current; typical values



$I_C/I_B = 10$

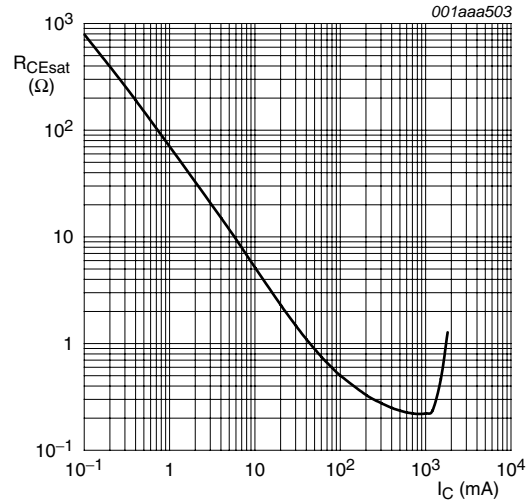
- (1) $T_{amb} = 100\text{ }^\circ\text{C}$
- (2) $T_{amb} = 25\text{ }^\circ\text{C}$
- (3) $T_{amb} = -55\text{ }^\circ\text{C}$

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



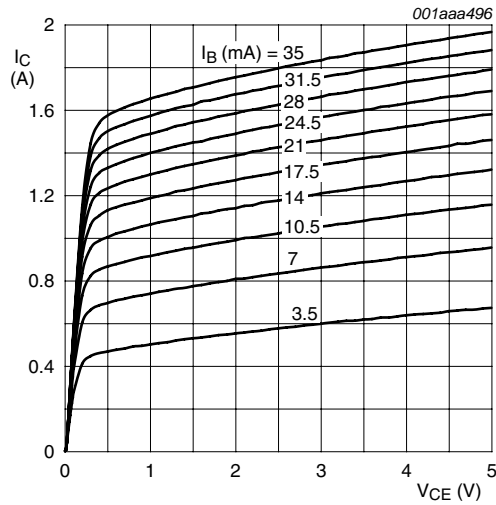
$I_C/I_B = 20$; $T_{amb} = 25\text{ °C}$

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



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

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



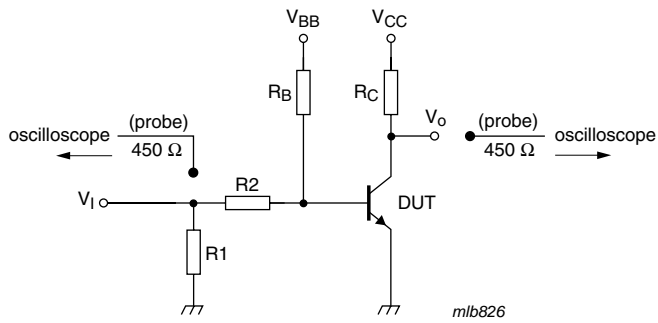
$T_{amb} = 25\text{ °C}$

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

8. Test information



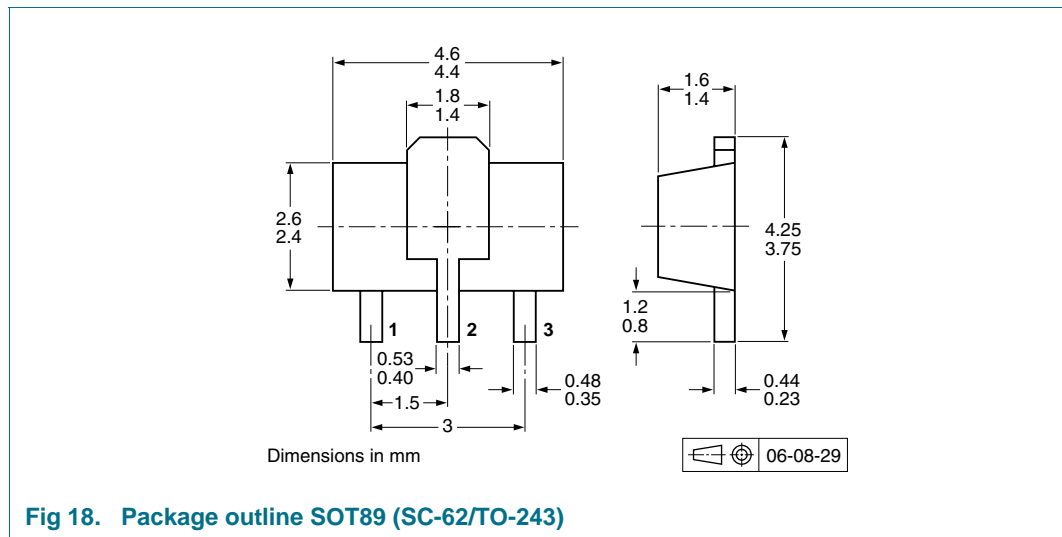
Fig 16. BISS transistor switching time definition



$V_{CC} = 10\text{ V}; I_C = 0.5\text{ A}; I_{B_{on}} = 0.025\text{ A}; I_{B_{off}} = -0.025\text{ A}$

Fig 17. Test circuit for switching times

9. Package outline



10. Packing information

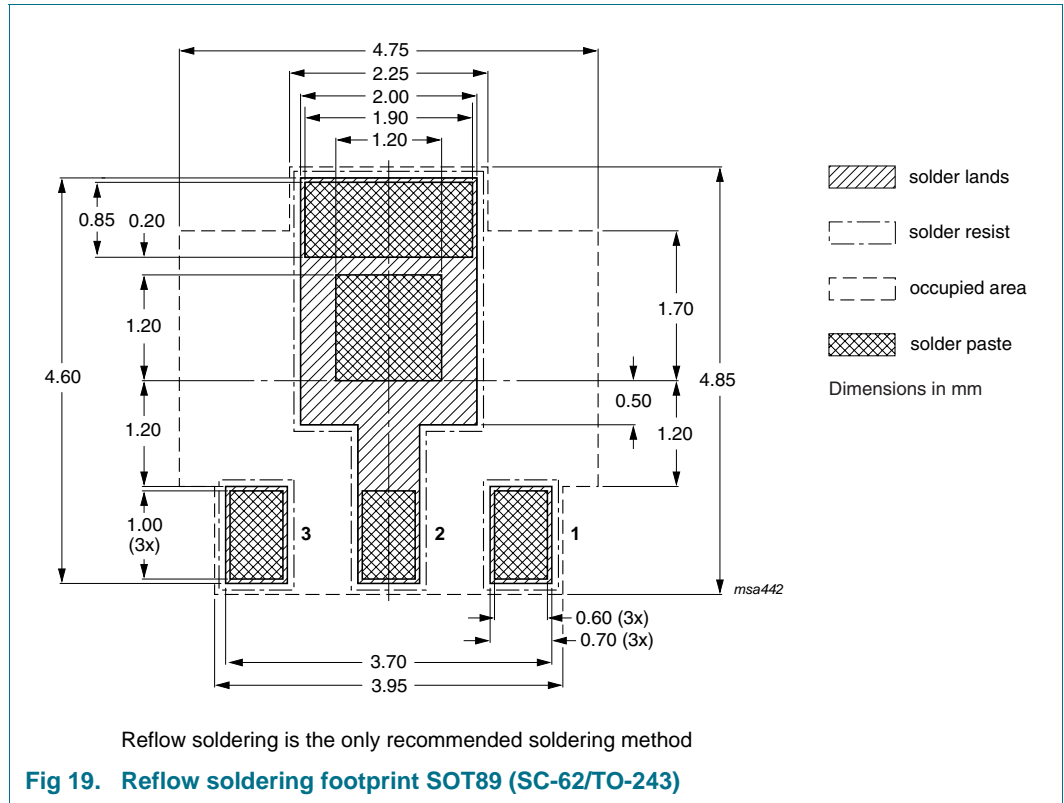
Table 8. Packing methods

The indicated -xxx are the last three digits of the 12NC ordering code.^[1]

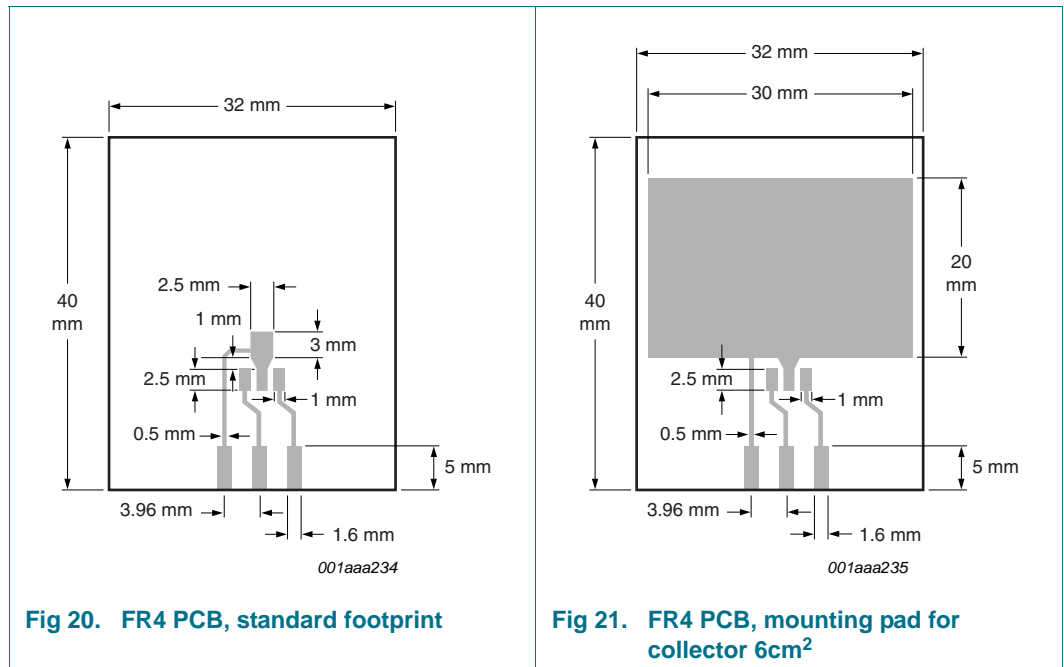
Type number	Package	Description	Packing quantity	
			1000	4000
PBSS8110X	SOT89	8 mm pitch, 12 mm tape and reel	-115	-135

[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"> • 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. • Figure 5: updated • Figure 7: V_{CEsat} axis unit amended from mV to V • Figure 15: updated • Figure 18 "Package outline SOT89 (SC-62/TO-243)": updated • Figure 19 "Reflow soldering footprint SOT89 (SC-62/TO-243)": updated 			
PBSS8110X_1	20050511	Product data sheet	-	-

14. Legal information

14.1 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".

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