

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

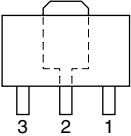
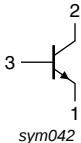
Table 1. Quick reference data

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		
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

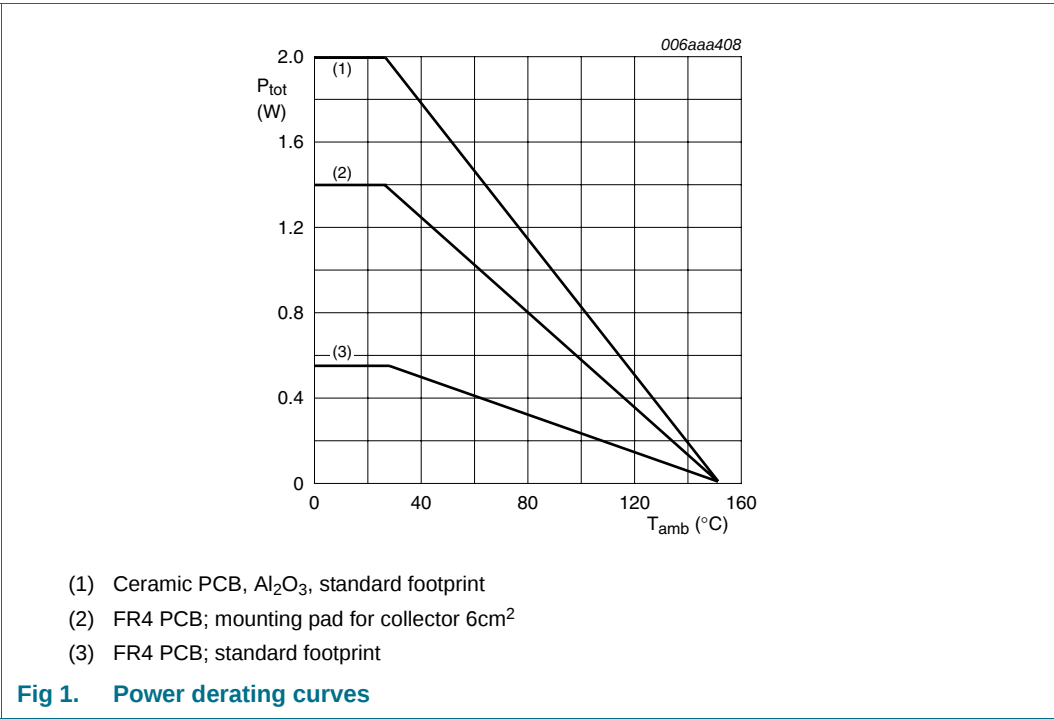
- [1] * = -: made in Hong Kong
* = p: made in Hong Kong
* = t: made in Malaysia
* = W: made in China

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 ≤ 1 ms	-	3	A
I _B	base current (DC)		-	300	mA
P _{tot}	total power dissipation	T _{amb} ≤ 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.

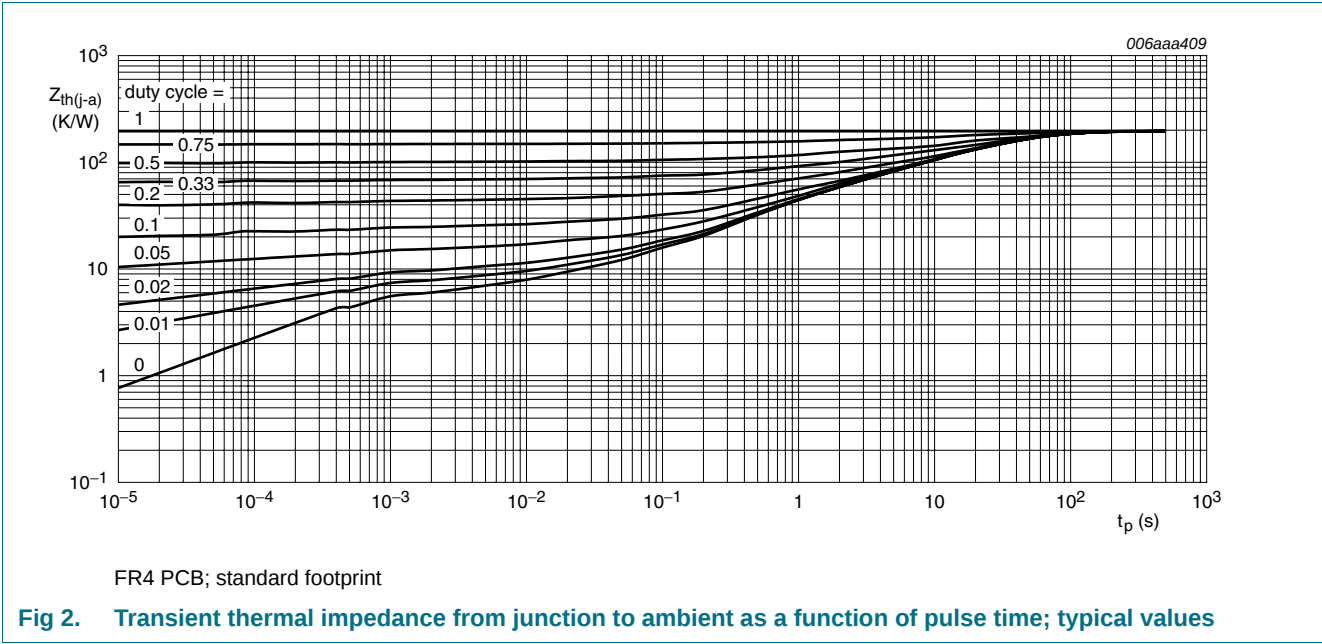
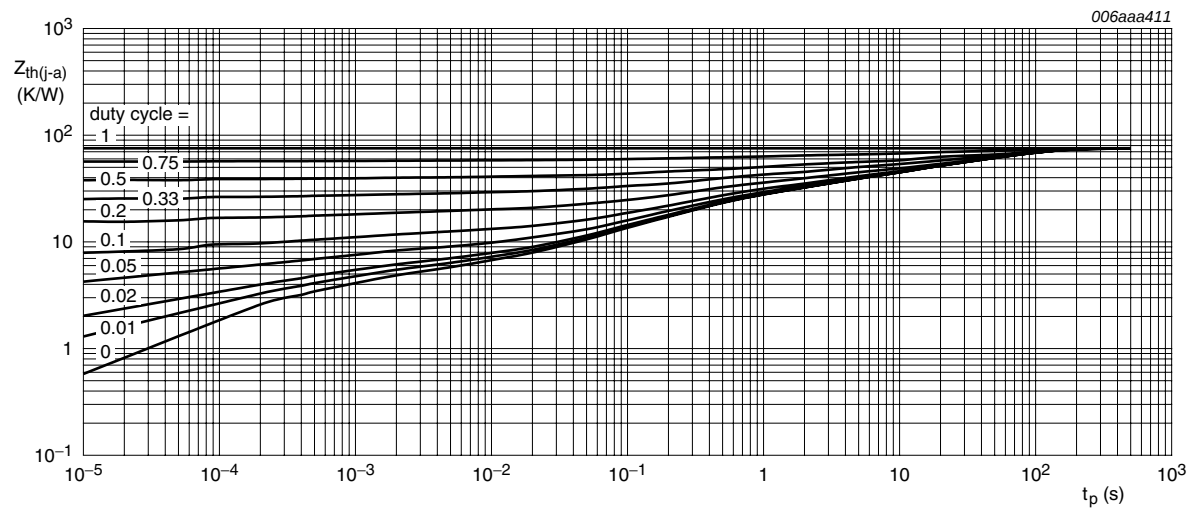
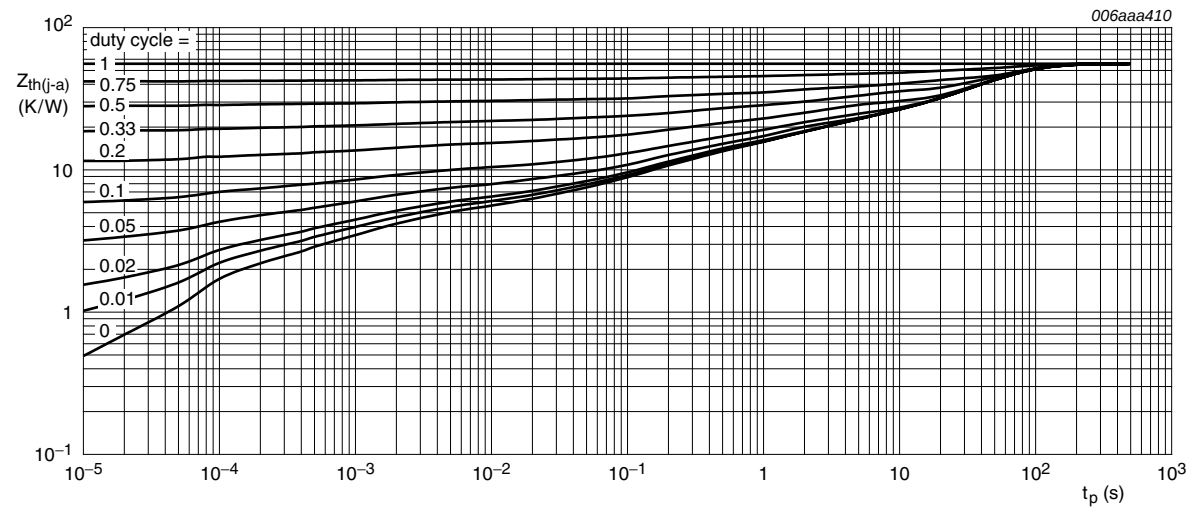


Fig 2. Transient thermal impedance from junction to ambient as a function of pulse time; typical values



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

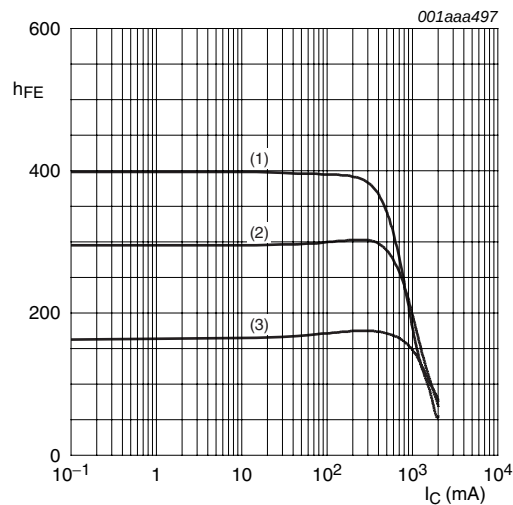
7. Characteristics

Table 7. Characteristics

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

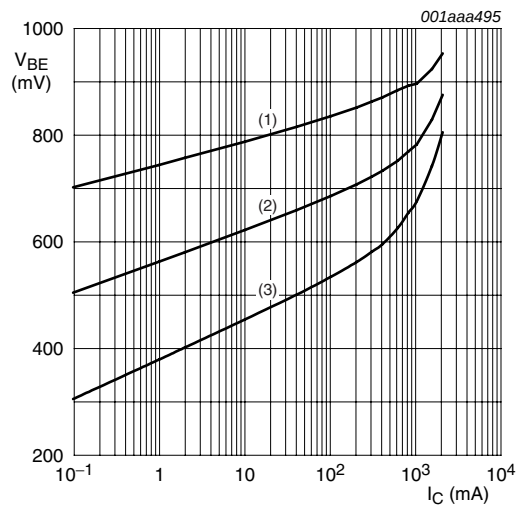
Symbol	Parameter	Conditions	Min	Typ	Max	Unit
I_{CBO}	collector-base cut-off current	$V_{CB} = 80\text{ V}; I_E = 0\text{ A}$	-	-	100	nA
		$V_{CB} = 80\text{ V}; I_E = 0\text{ A}; T_j = 150\text{ }^{\circ}\text{C}$	-	-	50	μA
I_{CES}	collector-emitter cut-off current	$V_{CE} = 80\text{ V}; V_{BE} = 0\text{ V}$	-	-	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	$V_{CC} = 10\text{ V}; I_C = 0.5\text{ A}; I_{B0n} = 0.025\text{ A}; I_{B0ff} = -0.025\text{ A}$	-	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	-	-	MHz
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: $t_p \leq 300\text{ }\mu\text{s}$; $\delta \leq 0.02$.



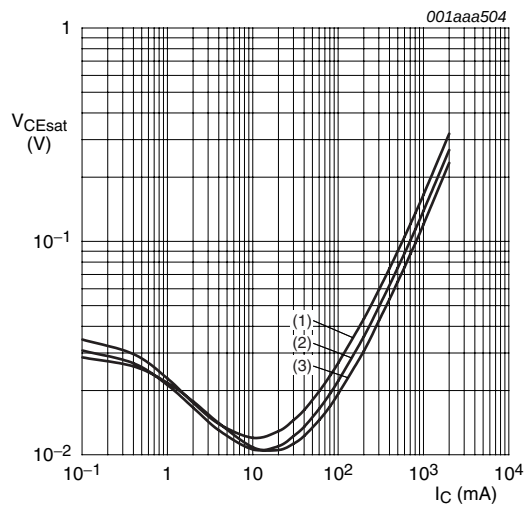
- $V_{CE} = 10\text{ V}$
(1) $T_{amb} = 100^\circ C$
(2) $T_{amb} = 25^\circ C$
(3) $T_{amb} = -55^\circ C$

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



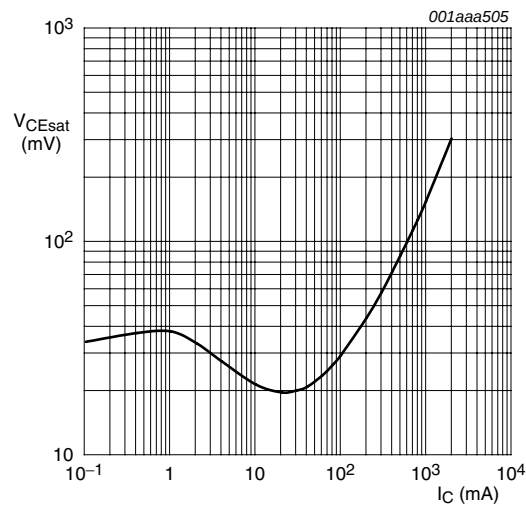
- $V_{CE} = 10\text{ V}$
(1) $T_{amb} = -55^\circ C$
(2) $T_{amb} = 25^\circ C$
(3) $T_{amb} = 100^\circ C$

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



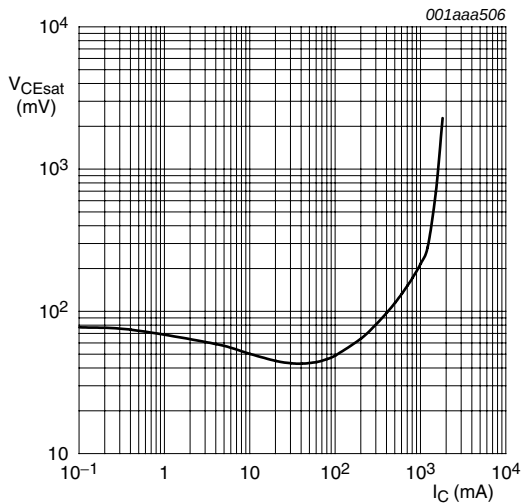
- $I_C/I_B = 10$
(1) $T_{amb} = 100^\circ C$
(2) $T_{amb} = 25^\circ C$
(3) $T_{amb} = -55^\circ C$

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



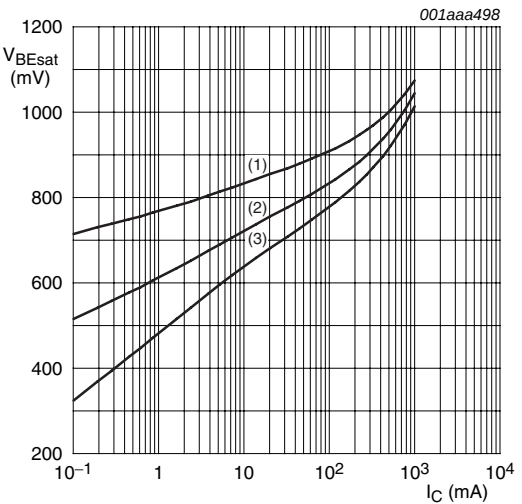
- $I_C/I_B = 20$; $T_{amb} = 25^\circ C$

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



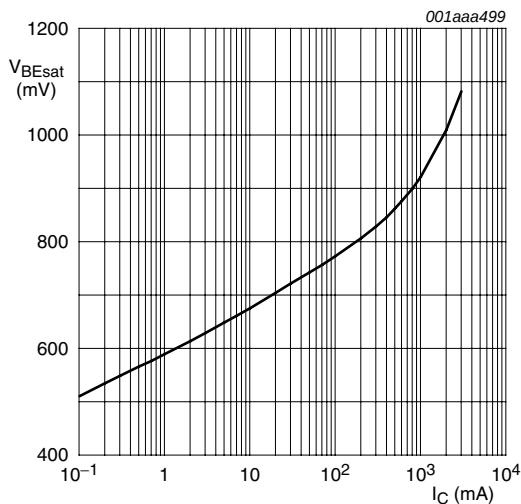
$I_C/I_B = 50$; $T_{amb} = 25\text{ }^{\circ}\text{C}$

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



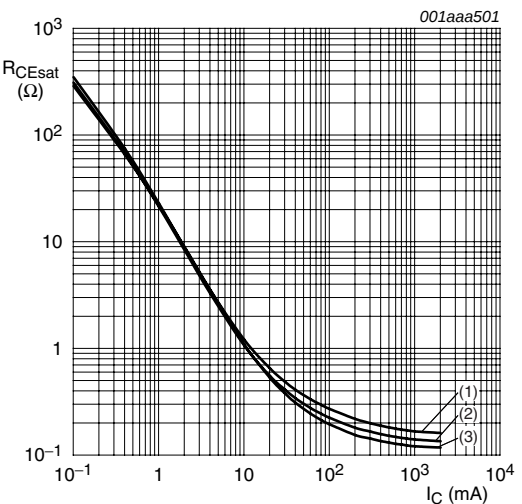
$I_C/I_B = 10$
(1) $T_{amb} = -55\text{ }^{\circ}\text{C}$
(2) $T_{amb} = 25\text{ }^{\circ}\text{C}$
(3) $T_{amb} = 100\text{ }^{\circ}\text{C}$

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



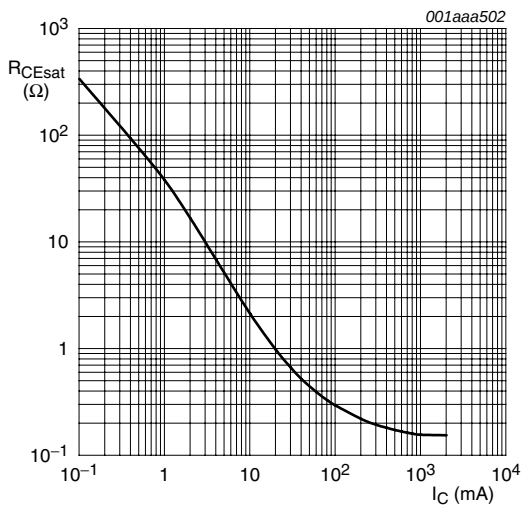
$I_C/I_B = 20$; $T_{amb} = 25\text{ }^{\circ}\text{C}$

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



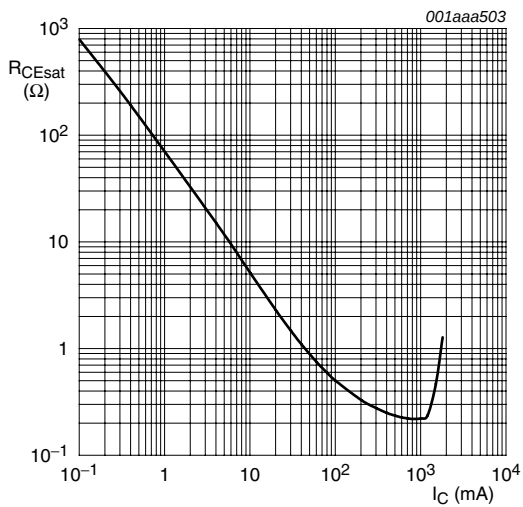
$I_C/I_B = 10$
(1) $T_{amb} = 100\text{ }^{\circ}\text{C}$
(2) $T_{amb} = 25\text{ }^{\circ}\text{C}$
(3) $T_{amb} = -55\text{ }^{\circ}\text{C}$

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



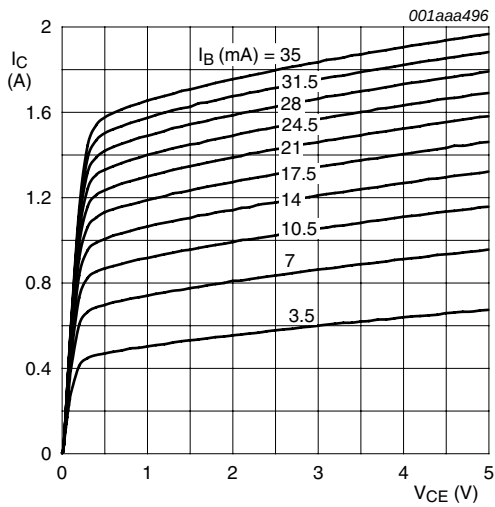
$I_C/I_B = 20$; $T_{amb} = 25\text{ }^{\circ}\text{C}$

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

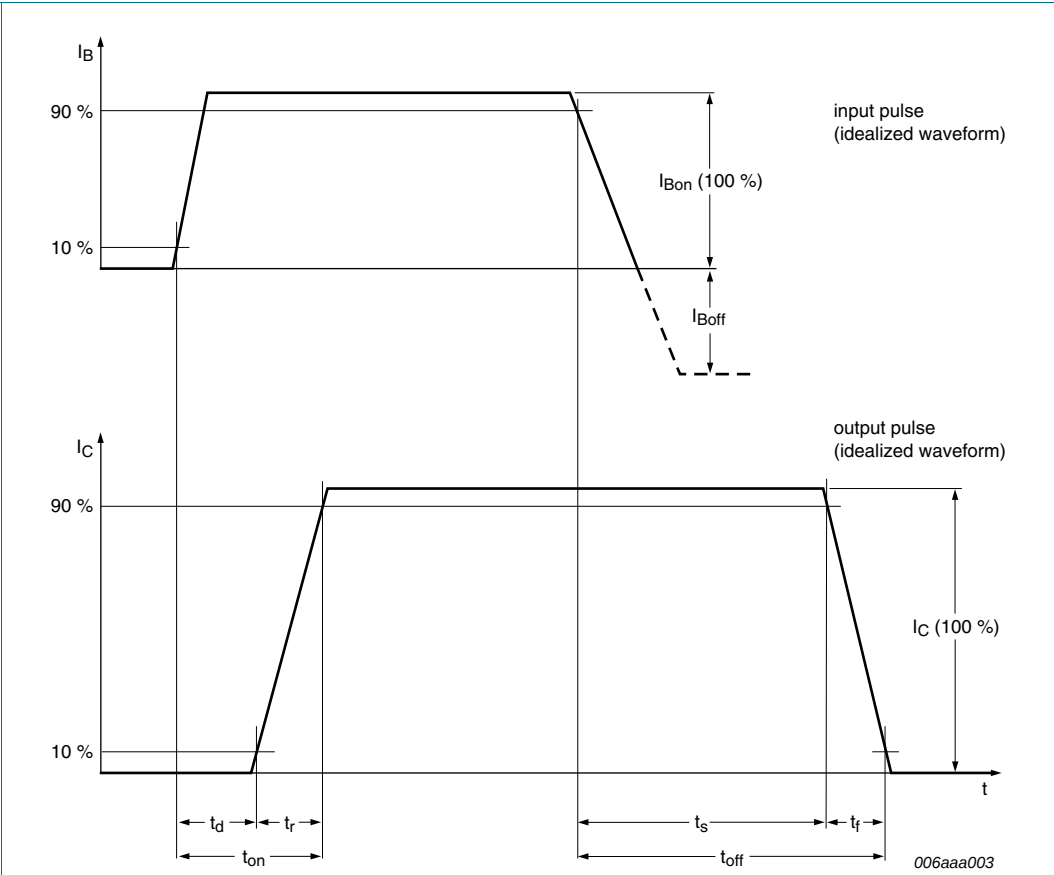


Fig 16. BISS transistor switching time definition

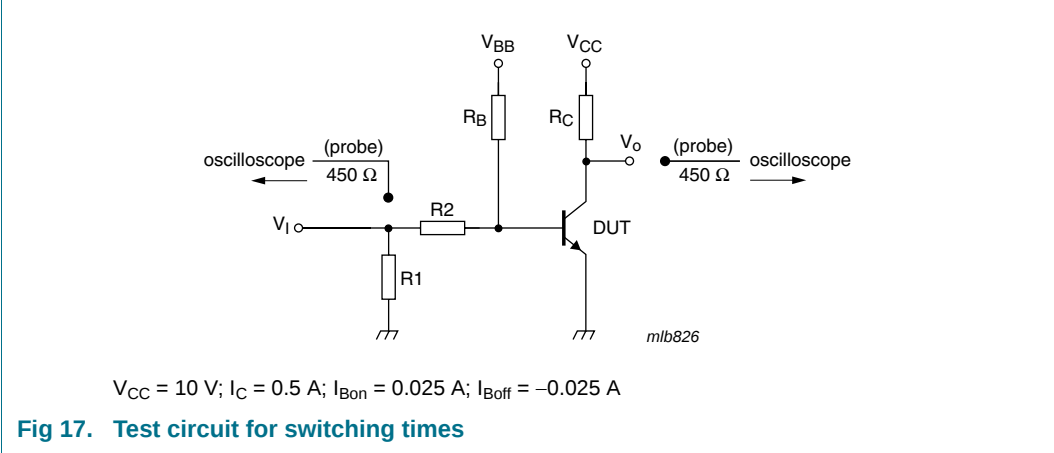
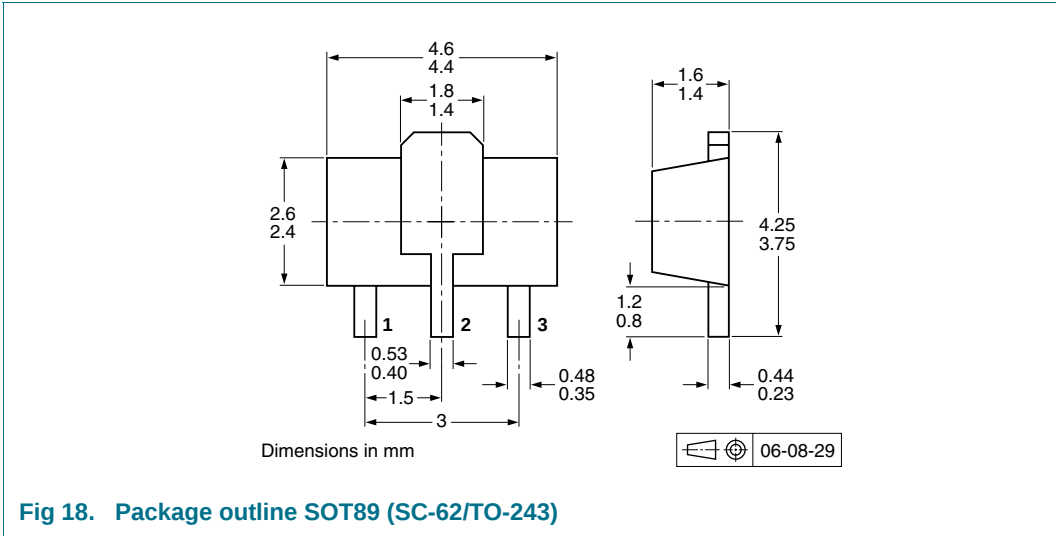


Fig 17. Test circuit for switching times

9. Package outline



10. Packing information

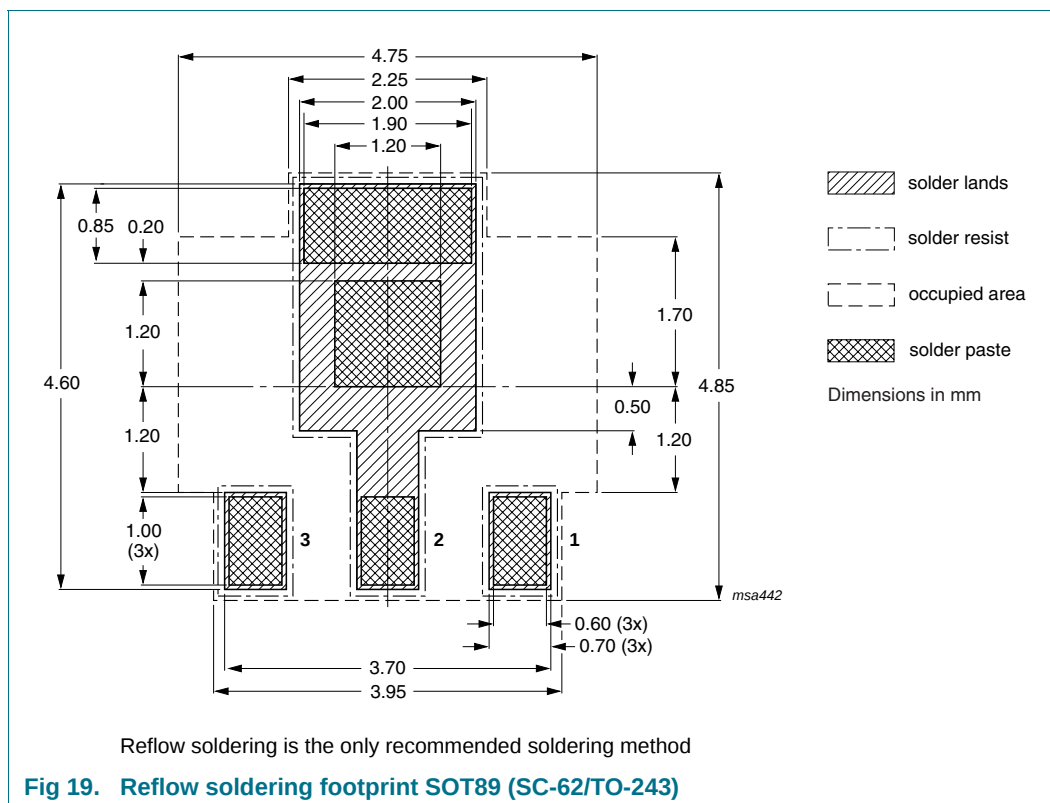
Table 8. Packing methods

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

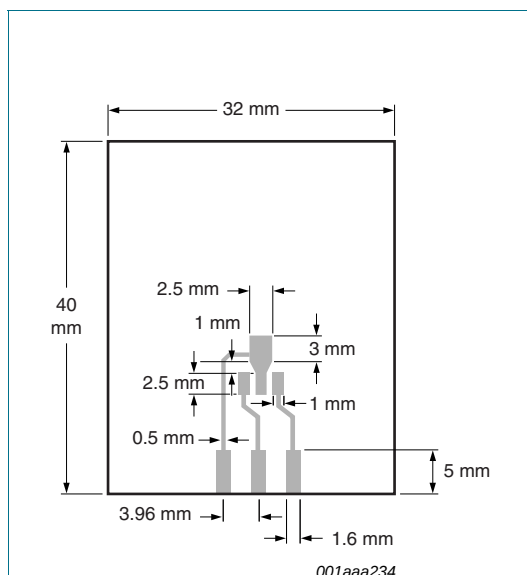


Fig 20. FR4 PCB, standard footprint

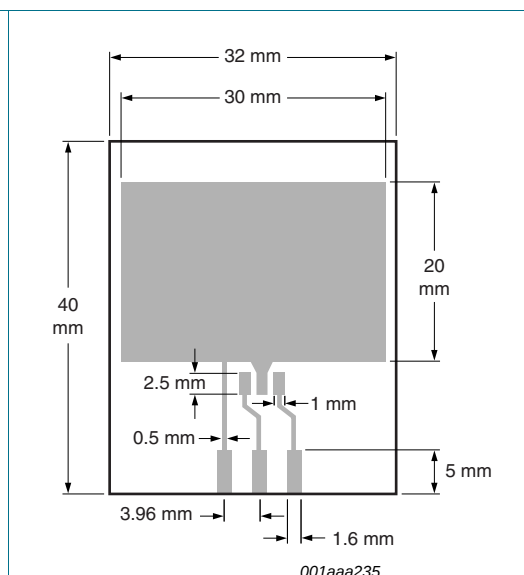


Fig 21. FR4 PCB, mounting pad for collector 6cm²

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:	• 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.
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[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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