

PBSS301PX

12 V, 5.3 A PNP low V_{CEsat} (BISS) transistor

Rev. 02 — 17 November 2009

Product data sheet

1. Product profile

1.1 General description

PNP low V_{CEsat} Breakthrough In Small Signal (BISS) transistor in a SOT89 (SC-62/TO-243) small and flat lead Surface-Mounted Device (SMD) plastic package.

NPN complement: PBSS301NX.

1.2 Features

- Low collector-emitter saturation voltage V_{CEsat}
- High collector current capability I_C and I_{CM}
- High collector current gain (h_{FE}) at high I_C
- High efficiency due to less heat generation
- Smaller required Printed-Circuit Board (PCB) area than for conventional transistors

1.3 Applications

- DC-to-DC conversion
- MOSFET gate driving
- Motor control
- Charging circuits
- Power switches (e.g. motors, fans)

1.4 Quick reference data

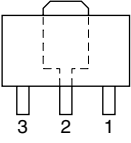
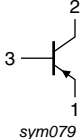
Table 1. Quick reference data

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
V_{CEO}	collector-emitter voltage	open base	-	-	-12	V
I_C	collector current		-	-	-5.3	A
I_{CM}	peak collector current	single pulse; $t_p \leq 1$ ms	-	-	-10.6	A
R_{CEsat}	collector-emitter saturation resistance	$I_C = -4$ A; $I_B = -200$ mA	[1] -	28	40	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
PBSS301PX	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]
PBSS301PX	*5H

- [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

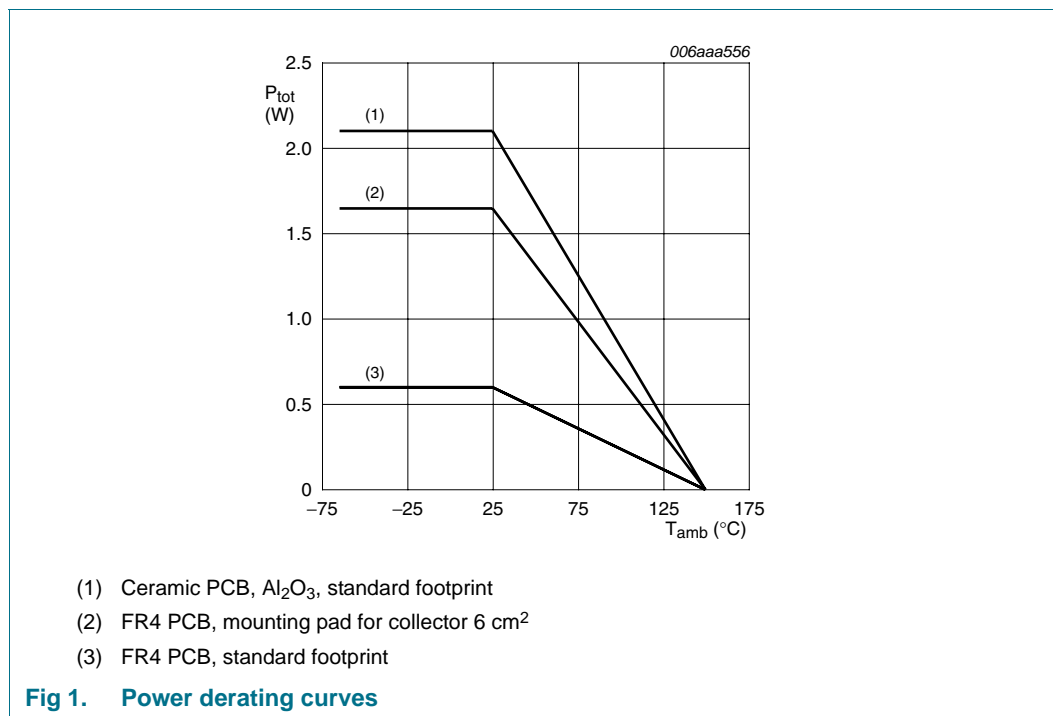
In accordance with the Absolute Maximum Rating System (IEC 60134).

Symbol	Parameter	Conditions	Min	Max	Unit	
V_{CBO}	collector-base voltage	open emitter	-	-12	V	
V_{CEO}	collector-emitter voltage	open base	-	-12	V	
V_{EBO}	emitter-base voltage	open collector	-	-5	V	
I_C	collector current		-	-5.3	A	
I_{CM}	peak collector current	single pulse; $t_p \leq 1$ ms	-	-10.6	A	
P_{tot}	total power dissipation	$T_{amb} \leq 25$ °C	[1]	-	0.6	W
			[2]	-	1.65	W
			[3]	-	2.1	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 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 6 cm².

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

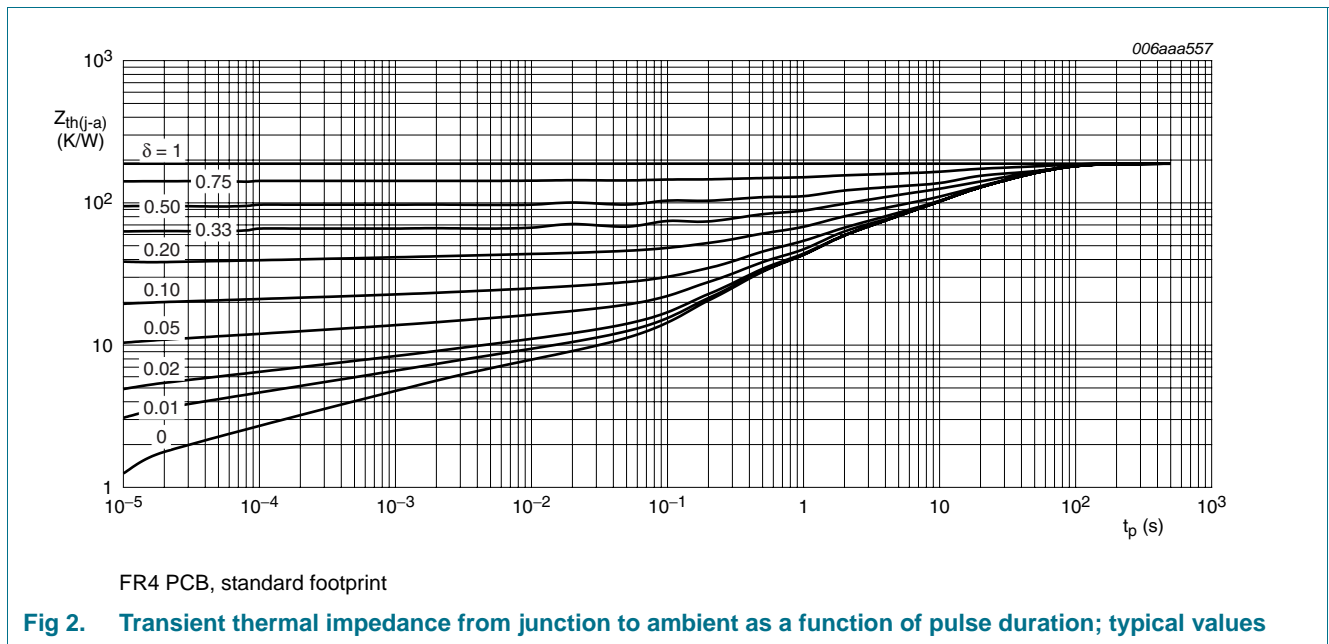


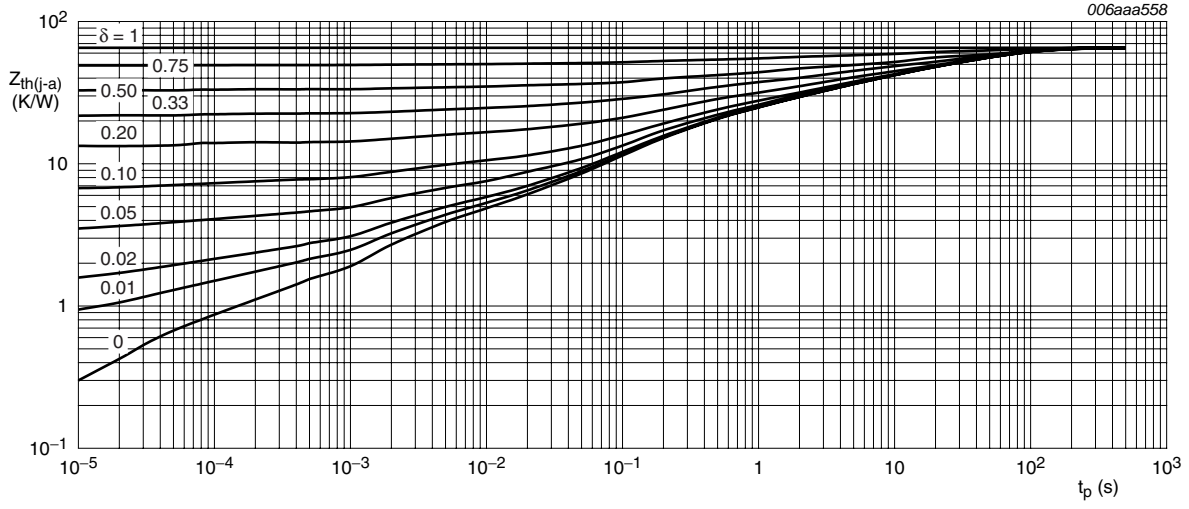
6. Thermal characteristics

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]	-	-	208	K/W
			[2]	-	-	76	K/W
			[3]	-	-	60	K/W
$R_{th(j-sp)}$	thermal resistance from junction to solder point		-	-	20	K/W	

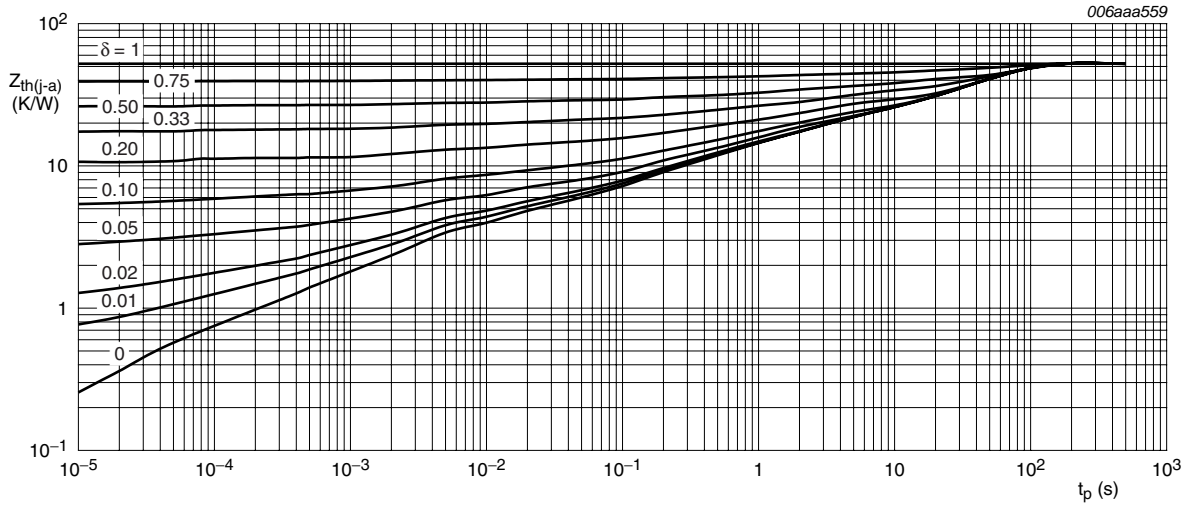
- [1] Device mounted on an FR4 PCB, single-sided copper, tin-plated and standard footprint.
- [2] Device mounted on an FR4 PCB, single-sided copper, tin-plated, mounting pad for collector 6 cm².
- [3] Device mounted on a ceramic PCB, Al₂O₃, standard footprint.





FR4 PCB, mounting pad for collector 6 cm²

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



Ceramic PCB, Al₂O₃, standard footprint

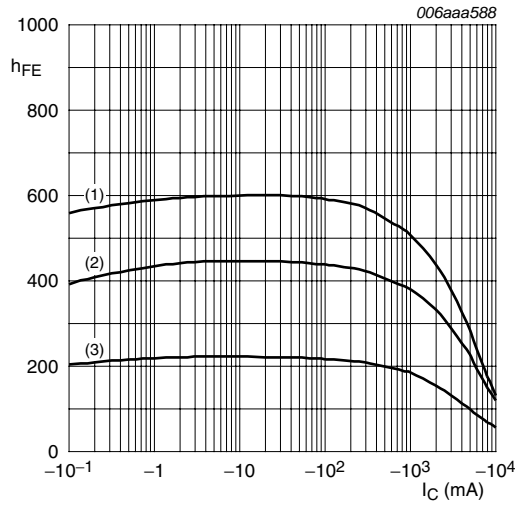
Fig 4. Transient thermal impedance from junction to ambient as a function of pulse duration; typical values

7. Characteristics

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

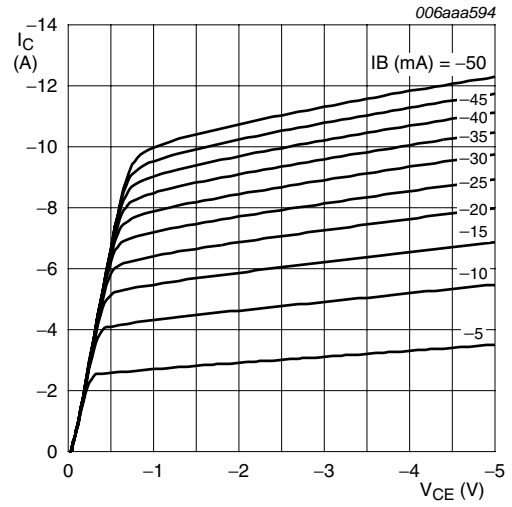
Symbol	Parameter	Conditions	Min	Typ	Max	Unit
I_{CBO}	collector-base cut-off current	$V_{CB} = -12\text{ V}; I_E = 0\text{ A}$	-	-	-100	nA
		$V_{CB} = -12\text{ V}; I_E = 0\text{ A}; T_j = 150\text{ }^{\circ}\text{C}$	-	-	-50	μA
I_{EBO}	emitter-base cut-off current	$V_{EB} = -5\text{ V}; I_C = 0\text{ A}$	-	-	-100	nA
h_{FE}	DC current gain	$V_{CE} = -2\text{ V}; I_C = -0.5\text{ A}$	[1] 250	400	-	
		$V_{CE} = -2\text{ V}; I_C = -1\text{ A}$	[1] 250	380	-	
		$V_{CE} = -2\text{ V}; I_C = -2\text{ A}$	[1] 200	335	-	
		$V_{CE} = -2\text{ V}; I_C = -4\text{ A}$	[1] 150	250	-	
		$V_{CE} = -2\text{ V}; I_C = -6\text{ A}$	[1] 130	200	-	
V_{CEsat}	collector-emitter saturation voltage	$I_C = -0.5\text{ A}; I_B = -50\text{ mA}$	[1] -	-20	-30	mV
		$I_C = -1\text{ A}; I_B = -50\text{ mA}$	[1] -	-40	-60	mV
		$I_C = -1\text{ A}; I_B = -10\text{ mA}$	[1] -	-60	-90	mV
		$I_C = -2\text{ A}; I_B = -40\text{ mA}$	[1] -	-70	-100	mV
		$I_C = -4\text{ A}; I_B = -200\text{ mA}$	[1] -	-115	-160	mV
		$I_C = -4\text{ A}; I_B = -400\text{ mA}$	[1] -	-110	-155	mV
		$I_C = -4\text{ A}; I_B = -40\text{ mA}$	[1] -	-150	-240	mV
		$I_C = -5.3\text{ A}; I_B = -265\text{ mA}$	[1] -	-145	-210	mV
R_{CEsat}	collector-emitter saturation resistance	$I_C = -4\text{ A}; I_B = -200\text{ mA}$	[1] -	28	40	$\text{m}\Omega$
		$I_C = -4\text{ A}; I_B = -40\text{ mA}$	[1] -	38	60	$\text{m}\Omega$
V_{BEsat}	base-emitter saturation voltage	$I_C = -1\text{ A}; I_B = -100\text{ mA}$	[1] -	-0.82	-0.9	V
		$I_C = -4\text{ A}; I_B = -400\text{ mA}$	[1] -	-0.93	-1.05	V
V_{BEon}	base-emitter turn-on voltage	$V_{CE} = -2\text{ V}; I_C = -2\text{ A}$	[1] -	-0.76	-0.85	V
t_d	delay time	$V_{CC} = -12.5\text{ V}; I_C = -3\text{ A}; I_{Bon} = -0.15\text{ A}; I_{Boff} = 0.15\text{ A}$	-	10	-	ns
t_r	rise time		-	55	-	ns
t_{on}	turn-on time		-	65	-	ns
t_s	storage time		-	165	-	ns
t_f	fall time		-	160	-	ns
t_{off}	turn-off time		-	325	-	ns
f_T	transition frequency	$V_{CE} = -10\text{ V}; I_C = -0.1\text{ A}; f = 100\text{ MHz}$	-	140	-	MHz
C_c	collector capacitance	$V_{CB} = -10\text{ V}; I_E = I_E = 0\text{ A}; f = 1\text{ MHz}$	-	190	250	pF

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



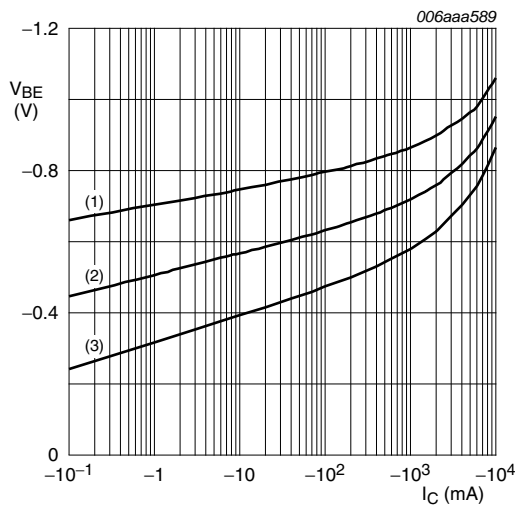
$V_{CE} = -2\text{ V}$
 (1) $T_{amb} = 100\text{ °C}$
 (2) $T_{amb} = 25\text{ °C}$
 (3) $T_{amb} = -55\text{ °C}$

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



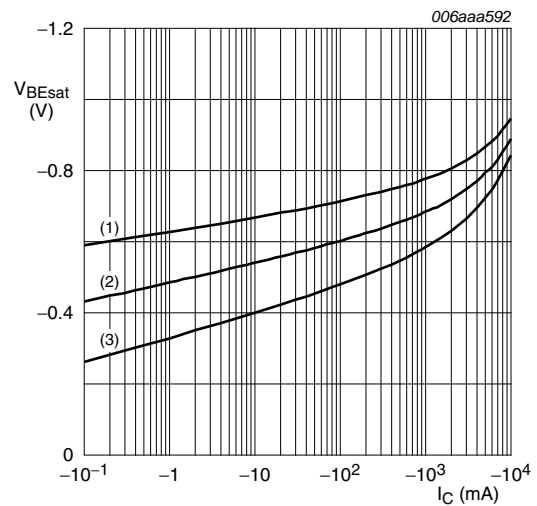
$T_{amb} = 25\text{ °C}$

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



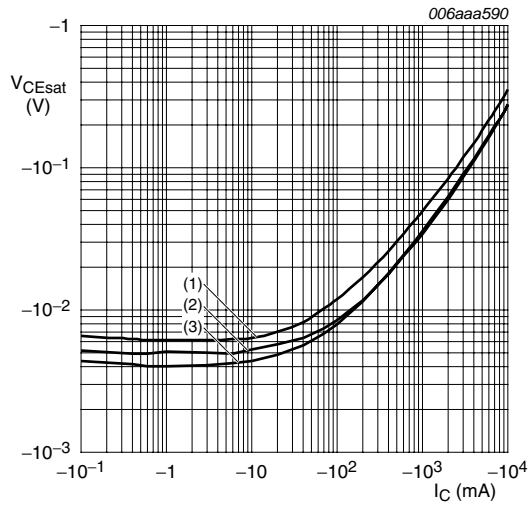
$V_{CE} = -2\text{ V}$
 (1) $T_{amb} = -55\text{ °C}$
 (2) $T_{amb} = 25\text{ °C}$
 (3) $T_{amb} = 100\text{ °C}$

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



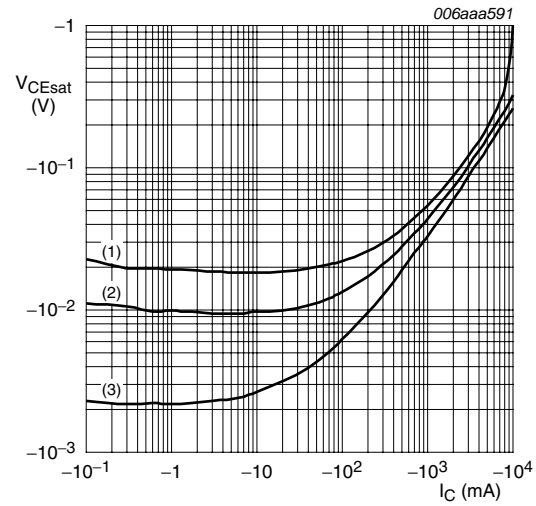
$I_C/I_B = 20$
 (1) $T_{amb} = -55\text{ °C}$
 (2) $T_{amb} = 25\text{ °C}$
 (3) $T_{amb} = 100\text{ °C}$

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



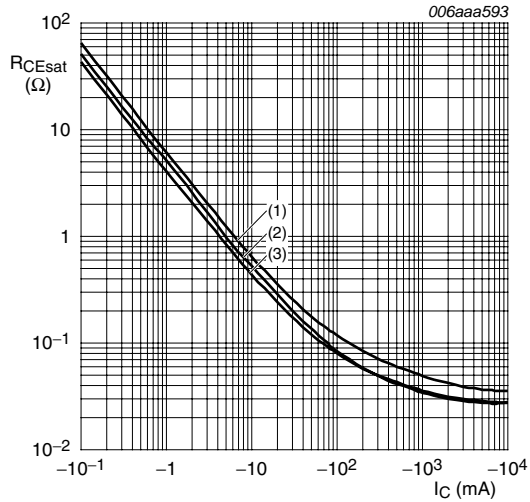
$I_C/I_B = 20$
 (1) $T_{amb} = 100\text{ °C}$
 (2) $T_{amb} = 25\text{ °C}$
 (3) $T_{amb} = -55\text{ °C}$

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



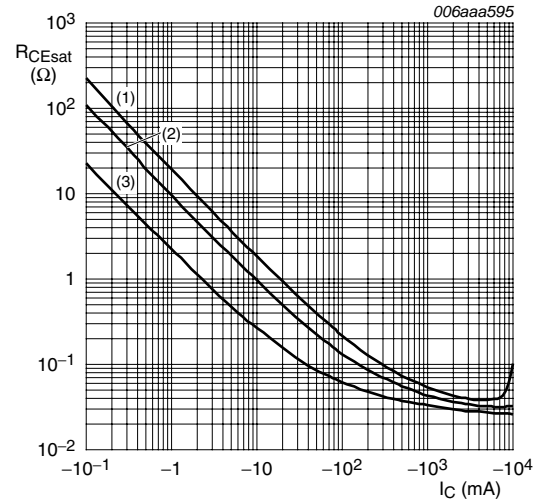
$T_{amb} = 25\text{ °C}$
 (1) $I_C/I_B = 100$
 (2) $I_C/I_B = 50$
 (3) $I_C/I_B = 10$

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



$I_C/I_B = 20$
 (1) $T_{amb} = 100\text{ °C}$
 (2) $T_{amb} = 25\text{ °C}$
 (3) $T_{amb} = -55\text{ °C}$

Fig 11. Collector-emitter saturation resistance as a function of collector current; typical values



$T_{amb} = 25\text{ °C}$
 (1) $I_C/I_B = 100$
 (2) $I_C/I_B = 50$
 (3) $I_C/I_B = 10$

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

8. Test information

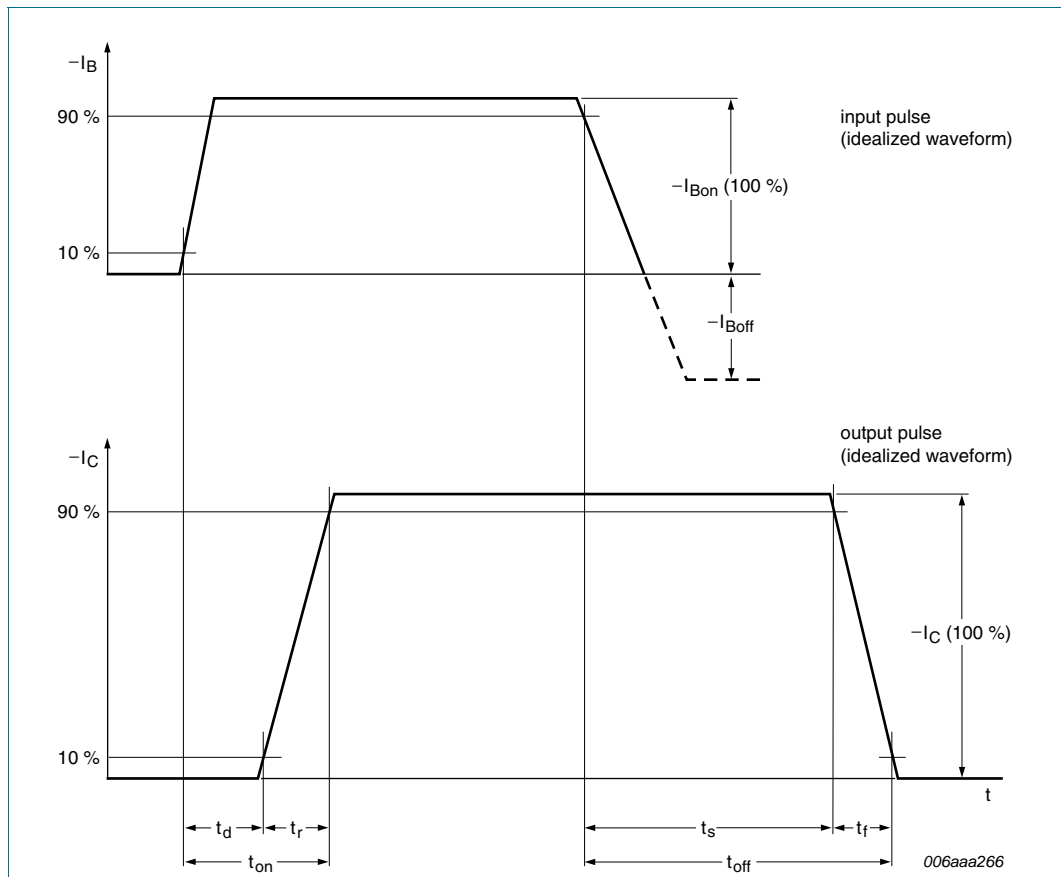
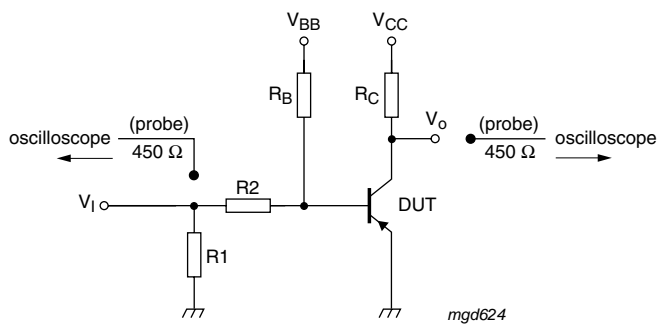


Fig 13. BISS transistor switching time definition



$V_{CC} = -12.5\text{ V}$; $I_C = -3\text{ A}$; $I_{Bon} = -0.15\text{ A}$; $I_{Boff} = 0.15\text{ A}$

Fig 14. Test circuit for switching times

9. Package outline

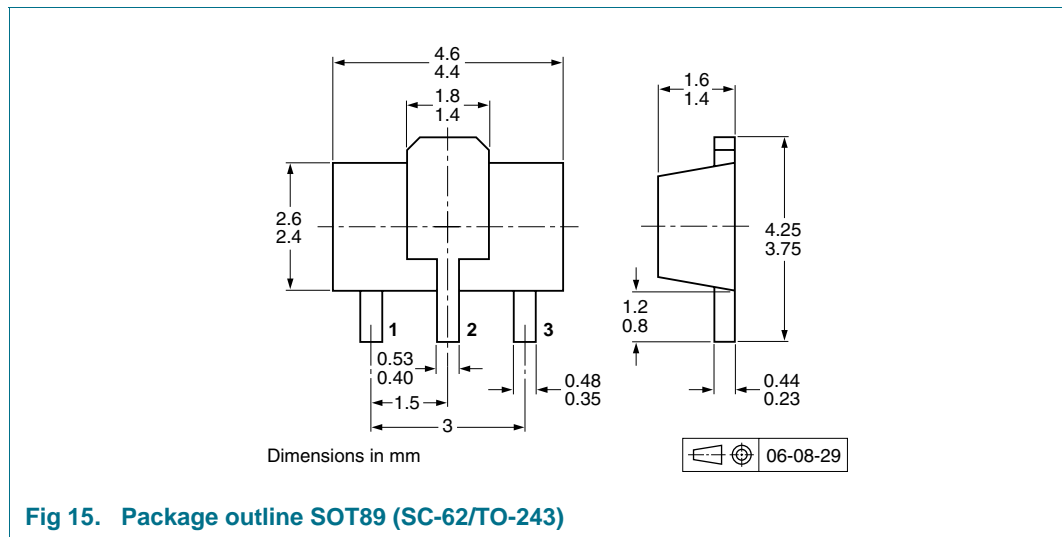


Fig 15. Package outline SOT89 (SC-62/TO-243)

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
PBSS301PX	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

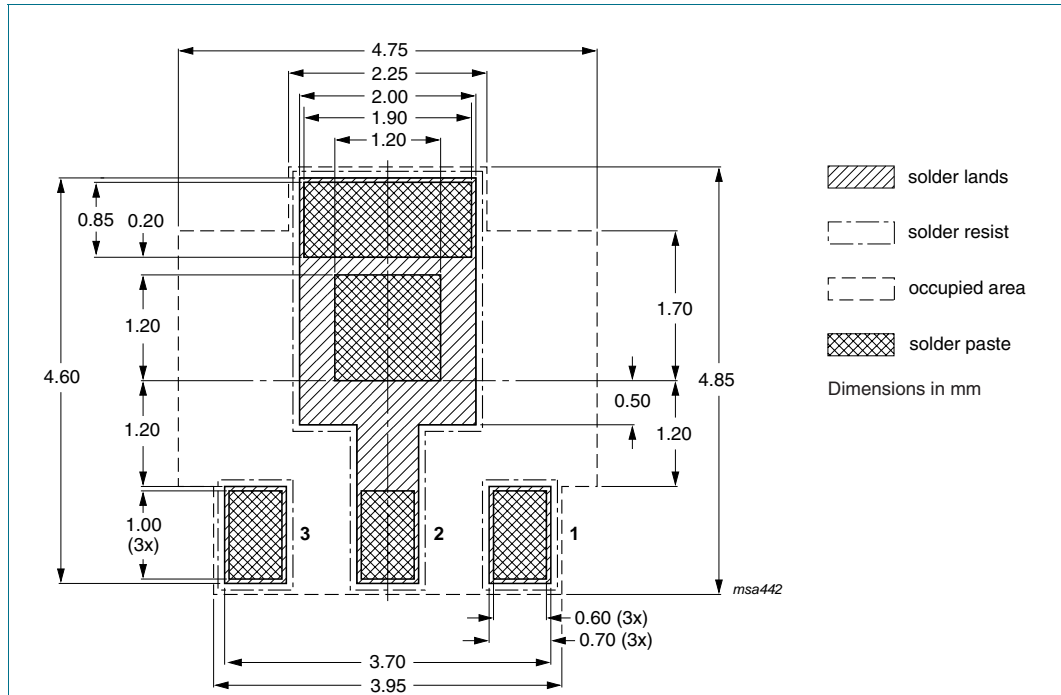
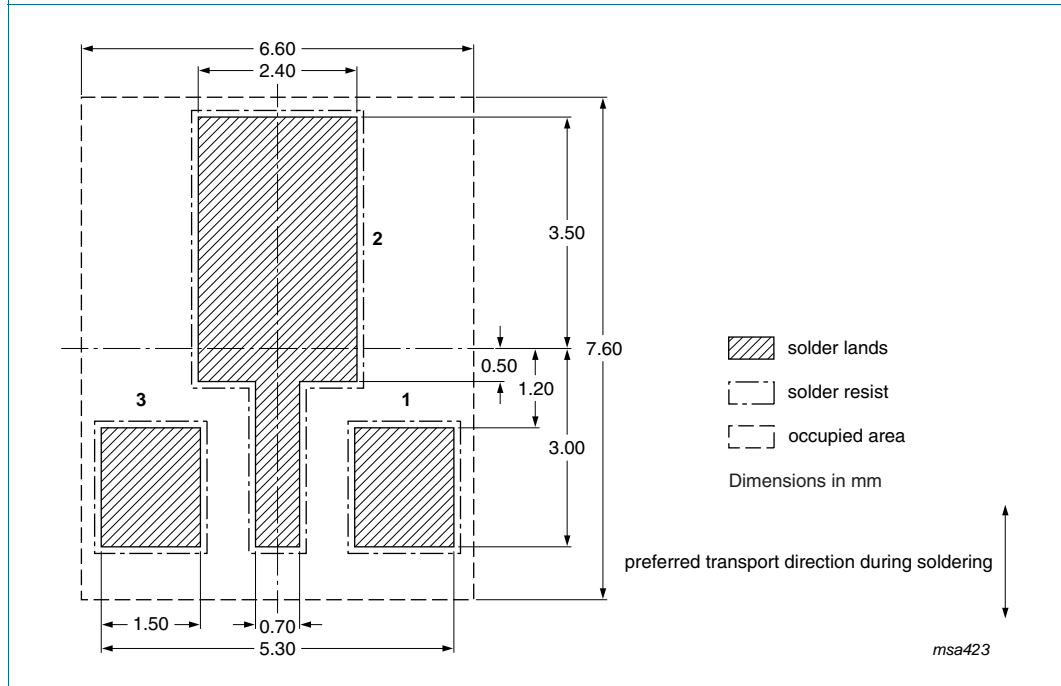


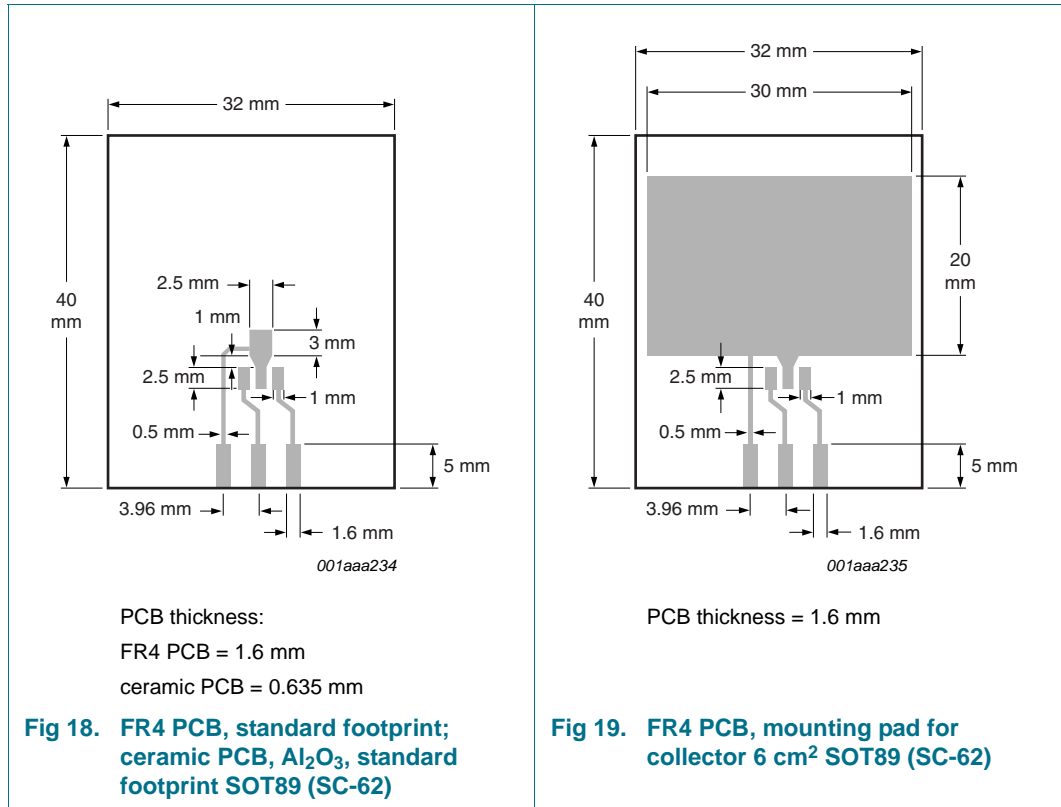
Fig 16. Reflow soldering footprint SOT89 (SC-62)



Not recommended for wave soldering

Fig 17. Wave soldering footprint SOT89 (SC-62)

12. Mounting



13. Revision history

Table 9. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
PBSS301PX_2	20091117	Product data sheet	-	PBSS301PX_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 15 "Package outline SOT89 (SC-62/TO-243)": updated • Figure 16 "Reflow soldering footprint SOT89 (SC-62)": updated • Figure 17 "Wave soldering footprint SOT89 (SC-62)": updated 			
PBSS301PX_1	20060821	Product data sheet	-	-

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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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