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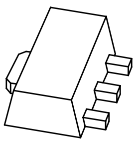
Team Nexperia



PBSS303PX

30 V, 5.1 A PNP low V_{CEsat} (BISS) transistor

Rev. 02 — 20 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: PBSS303NX.

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

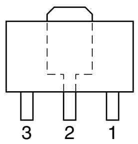
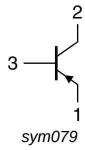
Table 1. Quick reference data

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
V_{CEO}	collector-emitter voltage	open base		-	-	–30	V
I_C	collector current			-	-	–5.1	A
I_{CM}	peak collector current	single pulse; $t_p \leq 1$ ms		-	-	–10.2	A
R_{CEsat}	collector-emitter saturation resistance	$I_C = –4$ A; $I_B = –200$ mA	[1]	-	32	48	mΩ

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

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
PBSS303PX	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]
PBSS303PX	*5K

[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

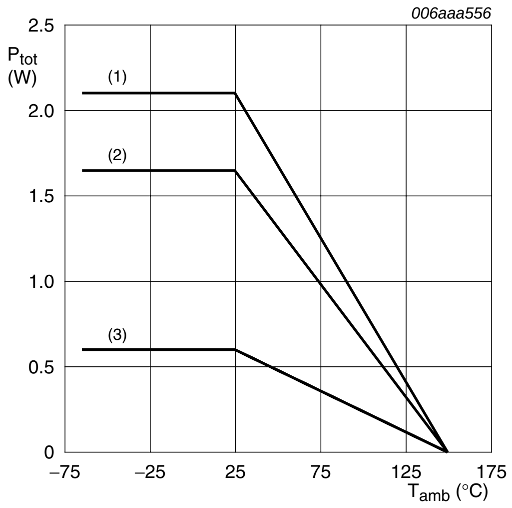
In accordance with the Absolute Maximum Rating System (IEC 60134).

Symbol	Parameter	Conditions		Min	Max	Unit
V_{CBO}	collector-base voltage	open emitter		-	–30	V
V_{CEO}	collector-emitter voltage	open base		-	–30	V
V_{EBO}	emitter-base voltage	open collector		-	–5	V
I_C	collector current			-	–5.1	A
I_{CM}	peak collector current	single pulse; $t_p \leq 1$ ms		-	–10.2	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 cm^2.

[3] Device mounted on a ceramic PCB, Al_2O_3, standard footprint.



(1) Ceramic PCB, Al_2O_3, standard footprint

(2) FR4 PCB, mounting pad for collector 6 cm^2

(3) FR4 PCB, standard footprint

Fig 1. Power derating curves

6. Thermal characteristics

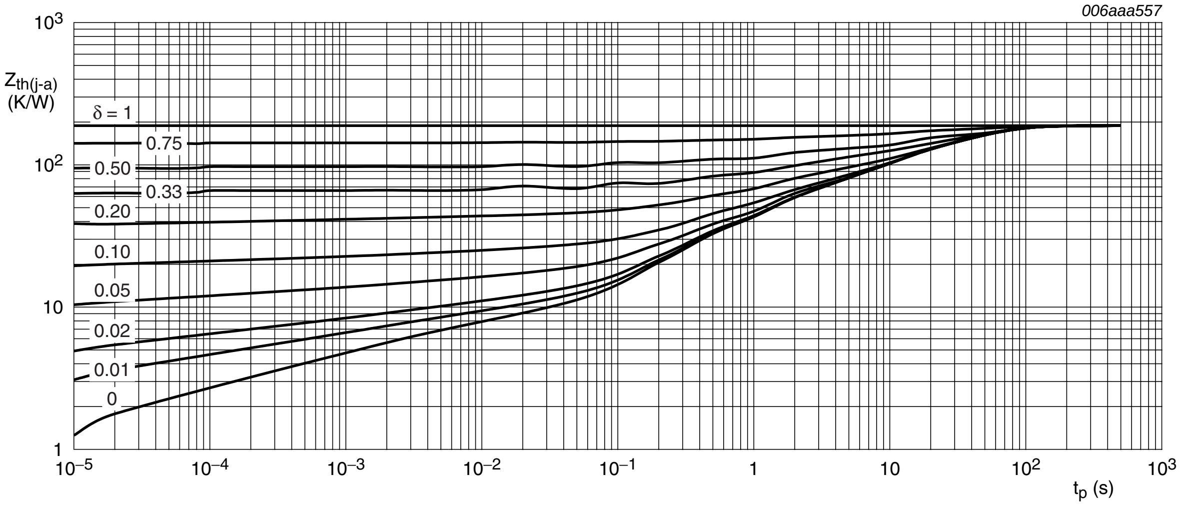
Table 6. Thermal characteristics

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.

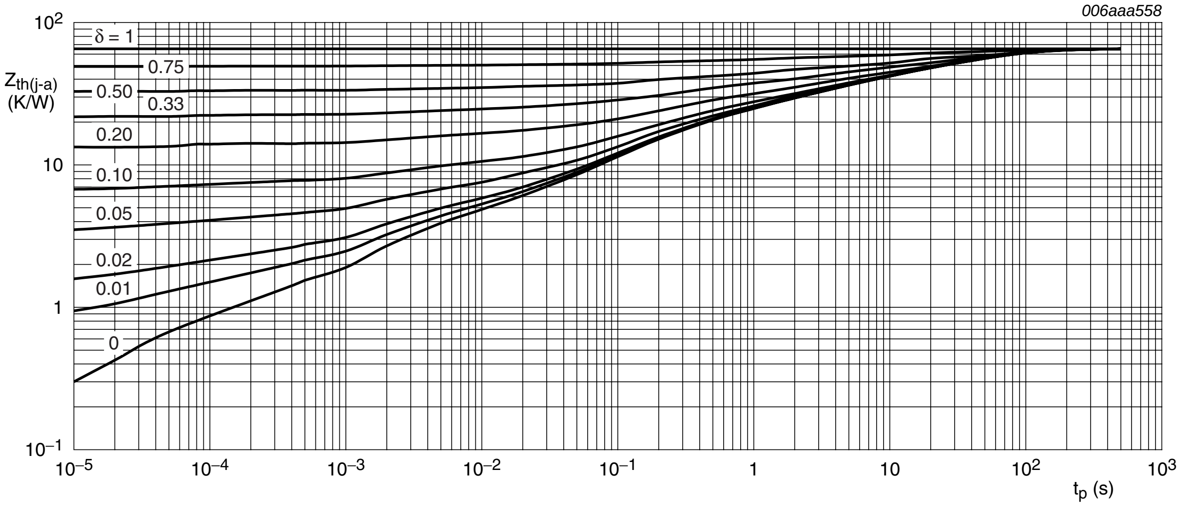
[2] Device mounted on an FR4 PCB, single-sided copper, tin-plated, mounting pad for collector 6 cm^2.

[3] Device mounted on a ceramic PCB, Al_2O_3, standard footprint.



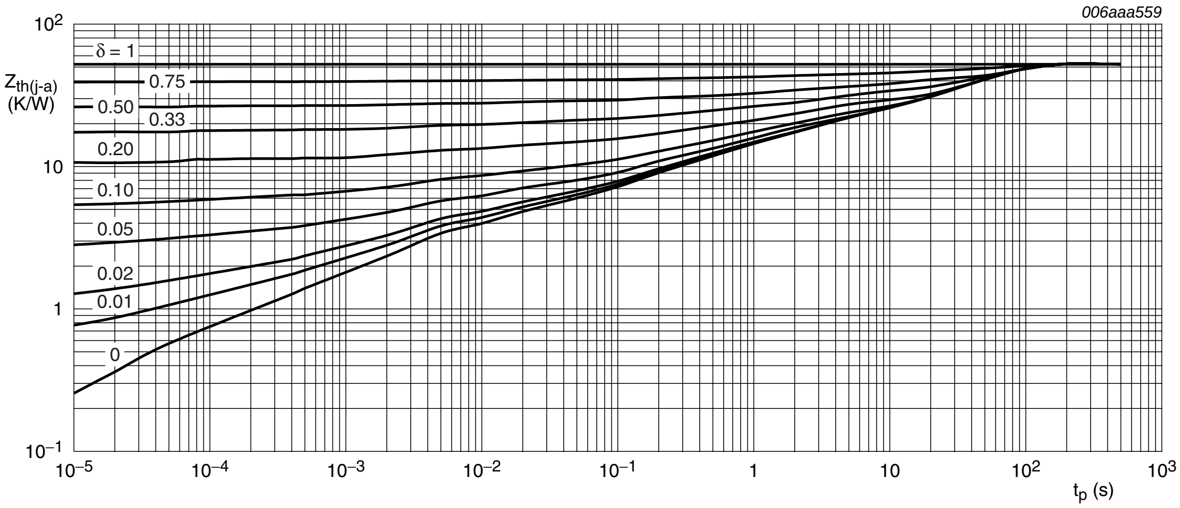
FR4 PCB, standard footprint

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



FR4 PCB, mounting pad for collector 6 cm^2

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



Ceramic PCB, Al_2O_3, standard footprint

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

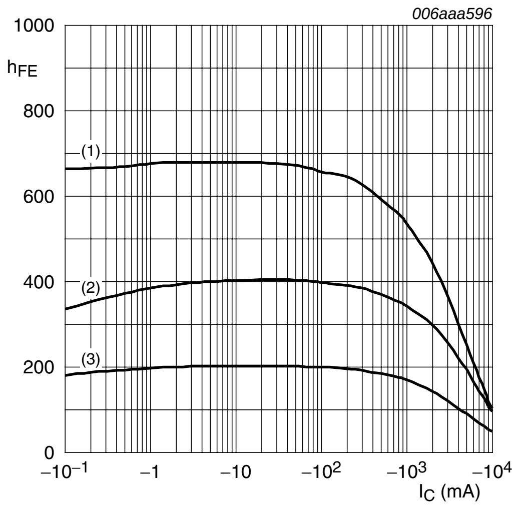
7. Characteristics

Table 7. Characteristics

T_{amb} = 25 °C unless otherwise specified.

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
I_{CBO}	collector-base cut-off current	V_{CB} = −30 V; I_E = 0 A		-	-	−100	nA
		V_{CB} = −30 V; I_E = 0 A; T_j = 150 °C		-	-	−50	µA
I_{EBO}	emitter-base cut-off current	V_{EB} = −5 V; I_C = 0 A		-	-	−100	nA
h_{FE}	DC current gain	V_{CE} = −2 V; I_C = −0.5 A	[1]	250	400	-	
		V_{CE} = −2 V; I_C = −1 A	[1]	250	370	-	
		V_{CE} = −2 V; I_C = −2 A	[1]	200	310	-	
		V_{CE} = −2 V; I_C = −4 A	[1]	150	220	-	
		V_{CE} = −2 V; I_C = −6 A	[1]	100	160	-	
V_{CEsat}	collector-emitter saturation voltage	I_C = −0.5 A; I_B = −50 mA	[1]	-	−25	−35	mV
		I_C = −1 A; I_B = −50 mA	[1]	-	−50	−70	mV
		I_C = −1 A; I_B = −10 mA	[1]	-	−75	−105	mV
		I_C = −2 A; I_B = −40 mA	[1]	-	−90	−130	mV
		I_C = −4 A; I_B = −200 mA	[1]	-	−130	−190	mV
		I_C = −4 A; I_B = −400 mA	[1]	-	−120	−175	mV
		I_C = −4 A; I_B = −40 mA	[1]	-	−230	−350	mV
		I_C = −5.1 A; I_B = −255 mA	[1]	-	−160	−230	mV
R_{CEsat}	collector-emitter saturation resistance	I_C = −4 A; I_B = −200 mA	[1]	-	32	48	mΩ
		I_C = −4 A; I_B = −40 mA	[1]	-	58	88	mΩ
V_{BEsat}	base-emitter saturation voltage	I_C = −1 A; I_B = −100 mA	[1]	-	−0.82	−0.9	V
		I_C = −4 A; I_B = −400 mA	[1]	-	−0.93	−1.05	V
V_{BEon}	base-emitter turn-on voltage	V_{CE} = −2 V; I_C = −2 A	[1]	-	−0.76	−0.85	V
t_d	delay time	V_{CC} = −12.5 V; I_C = −3 A; I_{Bon} = −0.15 A; I_{Boff} = 0.15 A		-	15	-	ns
t_r	rise time			-	55	-	ns
t_{on}	turn-on time			-	70	-	ns
t_s	storage time			-	215	-	ns
t_f	fall time			-	105	-	ns
t_{off}	turn-off time			-	320	-	ns
f_T	transition frequency	V_{CE} = −10 V; I_C = −0.1 A; f = 100 MHz		-	130	-	MHz
C_c	collector capacitance	V_{CB} = −10 V; I_E = i_e = 0 A; f = 1 MHz		-	110	160	pF

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



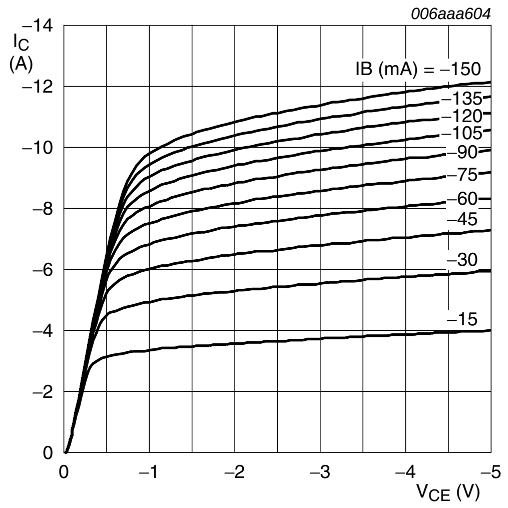
V_{CE} = −2 V

(1) T_{amb} = 100 °C

(2) T_{amb} = 25 °C

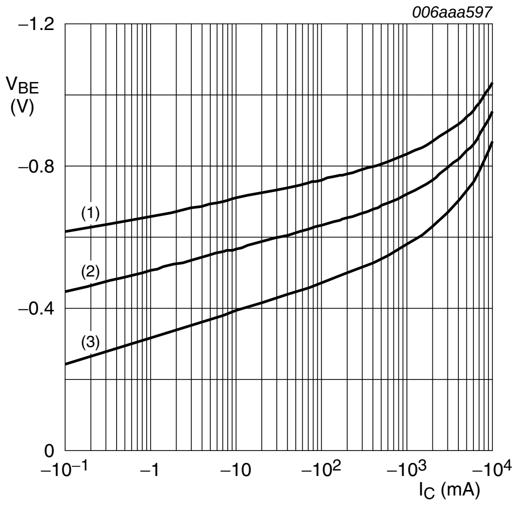
(3) T_{amb} = −55 °C

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



T_{amb} = 25 °C

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



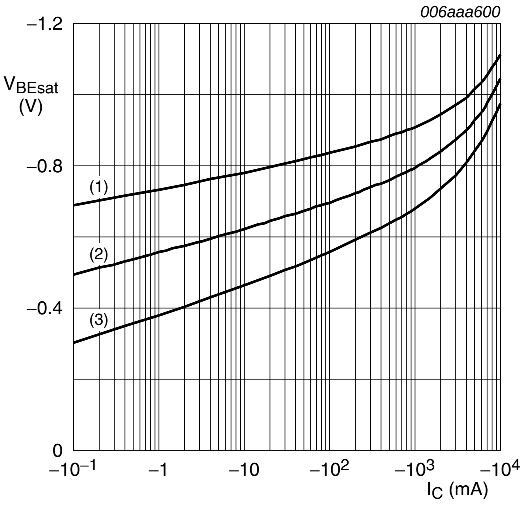
V_{CE} = −2 V

(1) T_{amb} = −55 °C

(2) T_{amb} = 25 °C

(3) T_{amb} = 100 °C

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



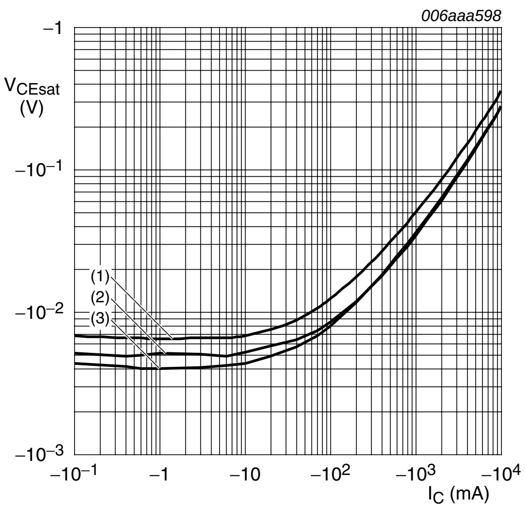
I_C/I_B = 20

(1) T_{amb} = −55 °C

(2) T_{amb} = 25 °C

(3) T_{amb} = 100 °C

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



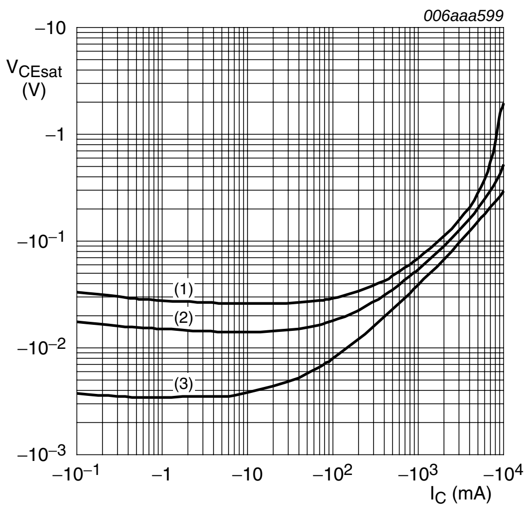
$I_C/I_B = 20$

(1) $T_{amb} = 100$ °C

(2) $T_{amb} = 25$ °C

(3) $T_{amb} = -55$ °C

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



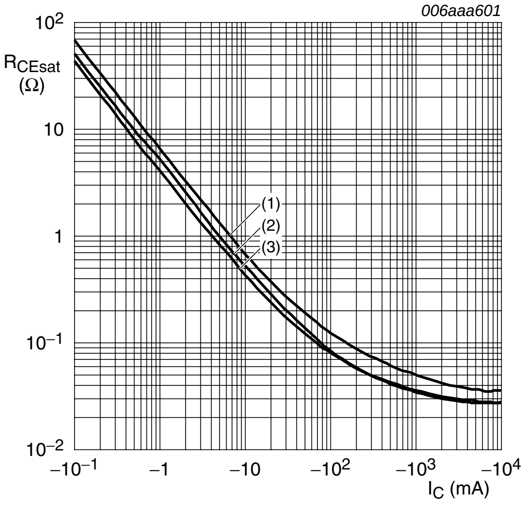
$T_{amb} = 25$ °C

(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



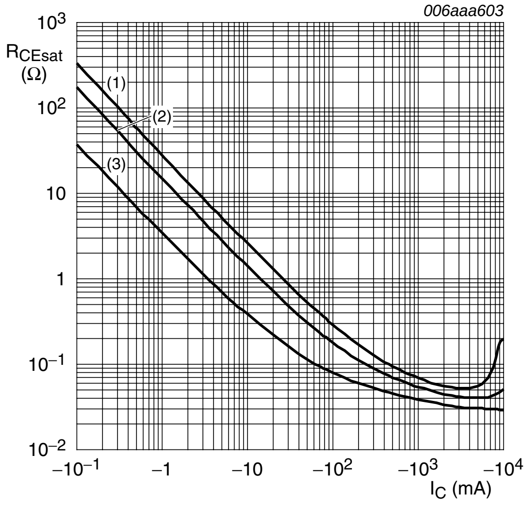
$I_C/I_B = 20$

(1) $T_{amb} = 100$ °C

(2) $T_{amb} = 25$ °C

(3) $T_{amb} = -55$ °C

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



$T_{amb} = 25$ °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

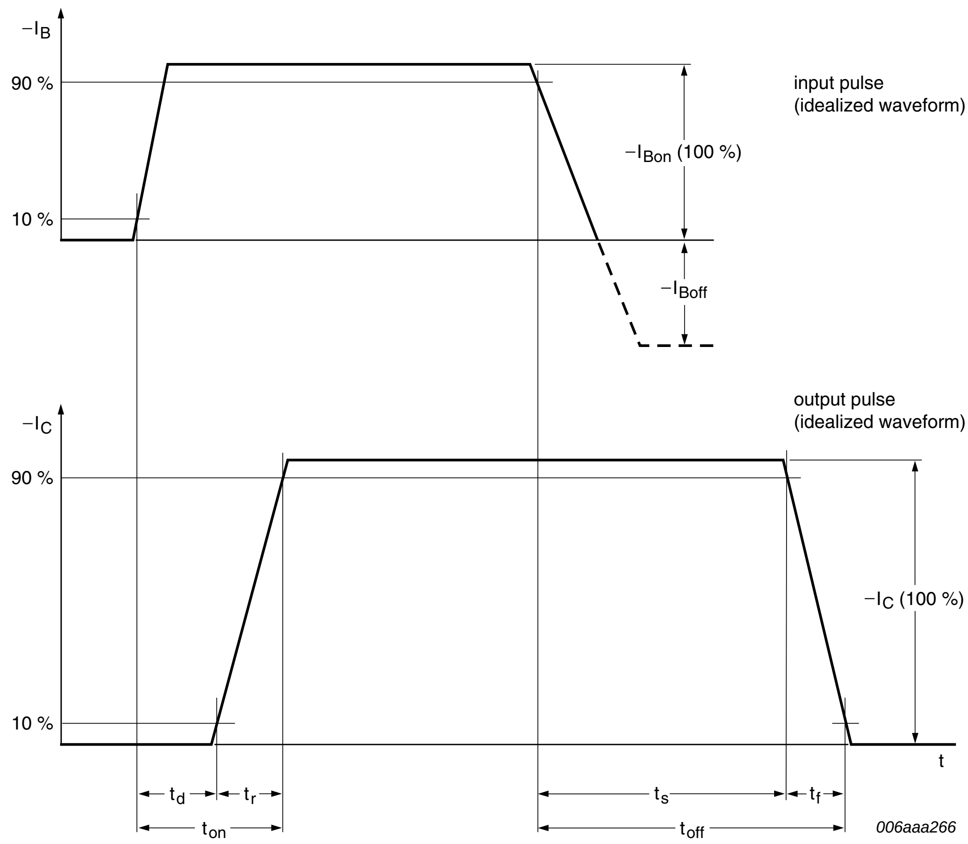
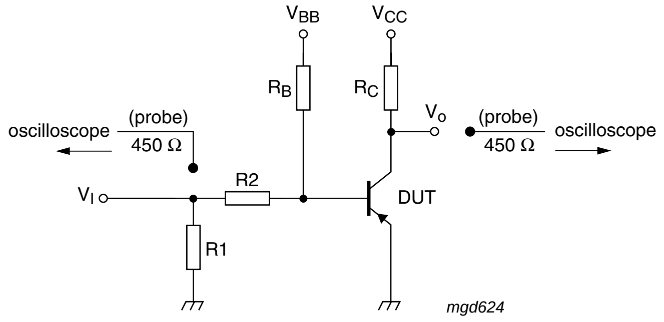


Fig 13. BISS transistor switching time definition



V_{CC} = –12.5 V; I_C = –3 A; I_{Bon} = –0.15 A; I_{Boff} = 0.15 A

Fig 14. Test circuit for switching times

9. Package outline

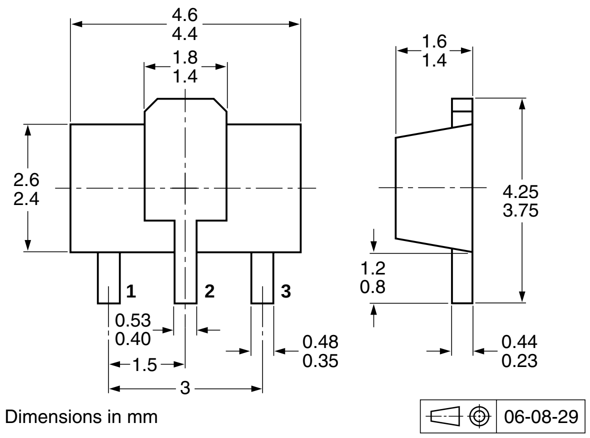


Fig 15. Package outline SOT89 (SC-62/TO-243)

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
PBSS303PX	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

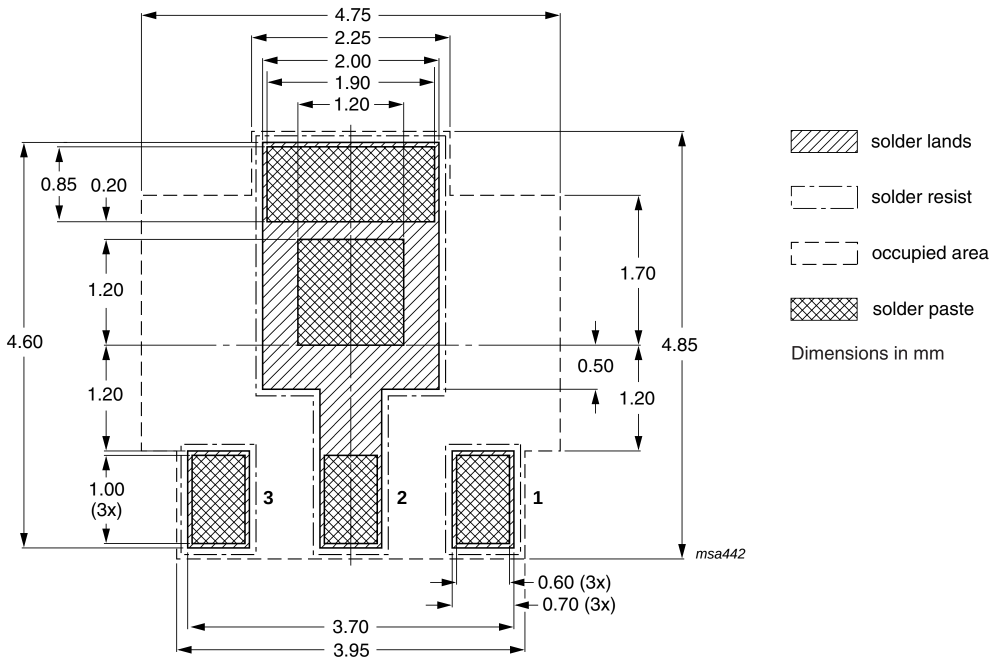
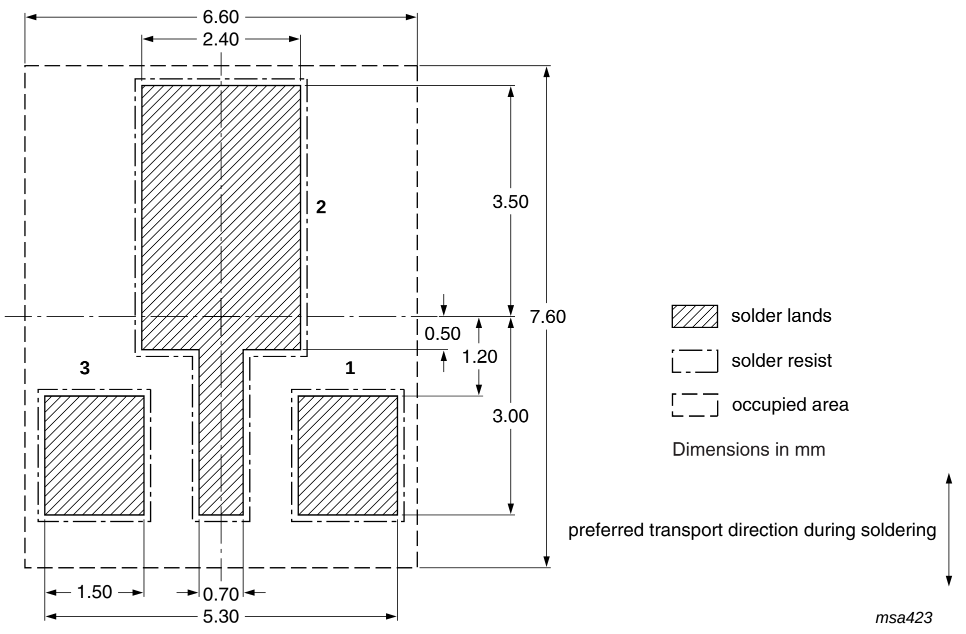


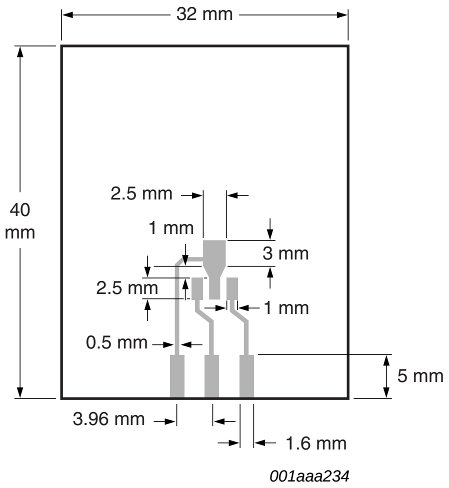
Fig 16. Reflow soldering footprint SOT89 (SC-62)



Not recommended for wave soldering

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

12. Mounting

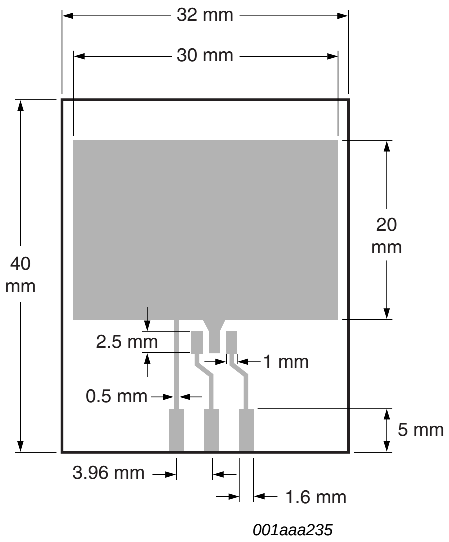


PCB thickness:

FR4 PCB = 1.6 mm

ceramic PCB = 0.635 mm

Fig 18. FR4 PCB, standard footprint; ceramic PCB, Al_2O_3, standard footprint SOT89 (SC-62)



PCB thickness = 1.6 mm

Fig 19. FR4 PCB, mounting pad for collector 6 cm^2 SOT89 (SC-62)

13. Revision history

Table 9. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
PBSS303PX_2	20091120	Product data sheet	-	PBSS303PX_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 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			
PBSS303PX_1	20060822	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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16. Contents

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Document identifier: PBSS303PX_2