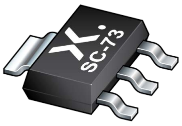


PBSS306PZ

100 V, 4.1 A PNP low VCEsat (BISS) transistor

Rev. 3 — 26 July 2011 Product data sheet

1. Product profile

1.1 General description

PNP low V_{CEsat} Breakthrough In Small Signal (BISS) transistor in a SOT223 (SC-73) small Surface-Mounted Device (SMD) plastic package.

NPN complement: PBSS306NZ.

1.2 Features and benefits

- 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 Printed-Circuit Board (PCB) area than for conventional transistors
- AEC-Q101 qualified

1.3 Applications

- High-voltage DC-to-DC conversion
- High-voltage MOSFET gate driving
- High-voltage motor control
- High-voltage power switches (e.g. motors, fans)
- Automotive applications

1.4 Quick reference data

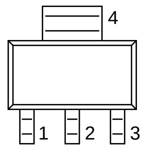
Table 1. Quick reference data

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
V_{CEO}	collector-emitter voltage	open base	-	-	-100	V
I_C	collector current		-	-	-4.1	A
I_{CM}	peak collector current	single pulse; $t_p \leq 1$ ms	-	-	-8.2	A
R_{CEsat}	collector-emitter saturation resistance	$I_C = -4$ A; $I_B = -400$ mA; pulsed; $t_p \leq 300$ µs; $\delta \leq 0.02$; $T_{amb} = 25$ °C	-	56	80	mΩ

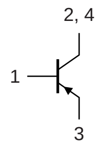
2. Pinning information

Table 2. Pinning information

Pin	Symbol	Description	Simplified outline	Graphic symbol
1	B	base		
2	C	collector		
3	E	emitter		
4	C	collector		



SOT223 (SC-73)



sym028

3. Ordering information

Table 3. Ordering information

Type number	Package		
	Name	Description	Version
PBSS306PZ	SC-73	plastic surface-mounted package with increased heatsink; 4 leads	SOT223

4. Marking

Table 4. Marking codes

Type number	Marking code
PBSS306PZ	S306PZ

5. Limiting values

Table 5. Limiting values

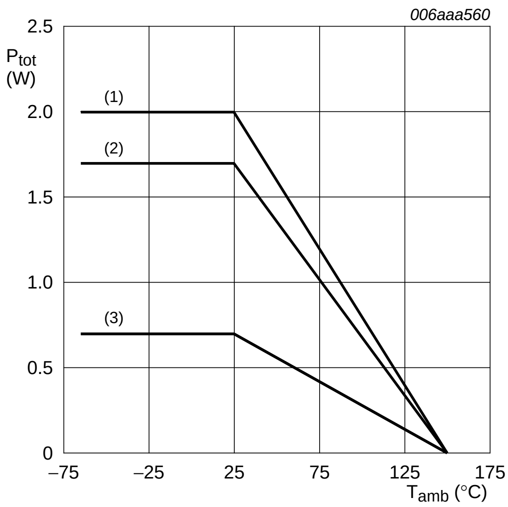
In accordance with the Absolute Maximum Rating System (IEC 60134).

Symbol	Parameter	Conditions		Min	Max	Unit
V_{CBO}	collector-base voltage	open emitter		-	-100	V
V_{CEO}	collector-emitter voltage	open base		-	-100	V
V_{EBO}	emitter-base voltage	open collector		-	-5	V
I_C	collector current			-	-4.1	A
I_{CM}	peak collector current	single pulse; $t_p \leq 1$ ms		-	-8.2	A
P_{tot}	total power dissipation	$T_{amb} \leq 25$ °C	[1]	-	0.7	W
			[2]	-	1.7	W
			[3]	-	2	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

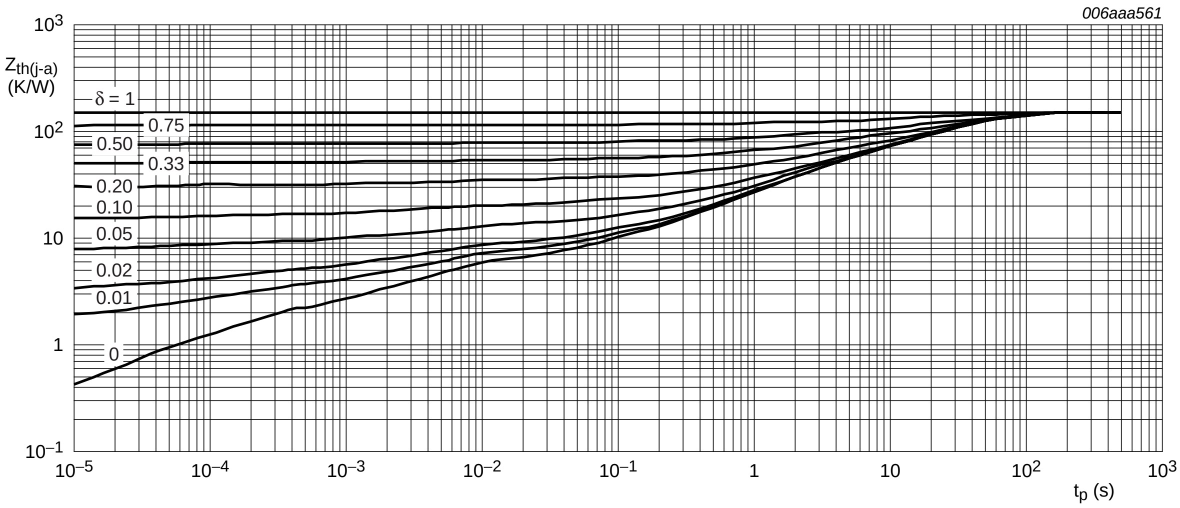
Table 6. Thermal characteristics

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
$R_{th(j-a)}$	thermal resistance from junction to ambient	in free air	[1]	-	-	179	K/W
			[2]	-	-	74	K/W
			[3]	-	-	63	K/W
$R_{th(j-sp)}$	thermal resistance from junction to solder point			-	-	15	K/W

[1] Device mounted on an FR4 PCB, single-sided copper, tin-plated and standard footprint.

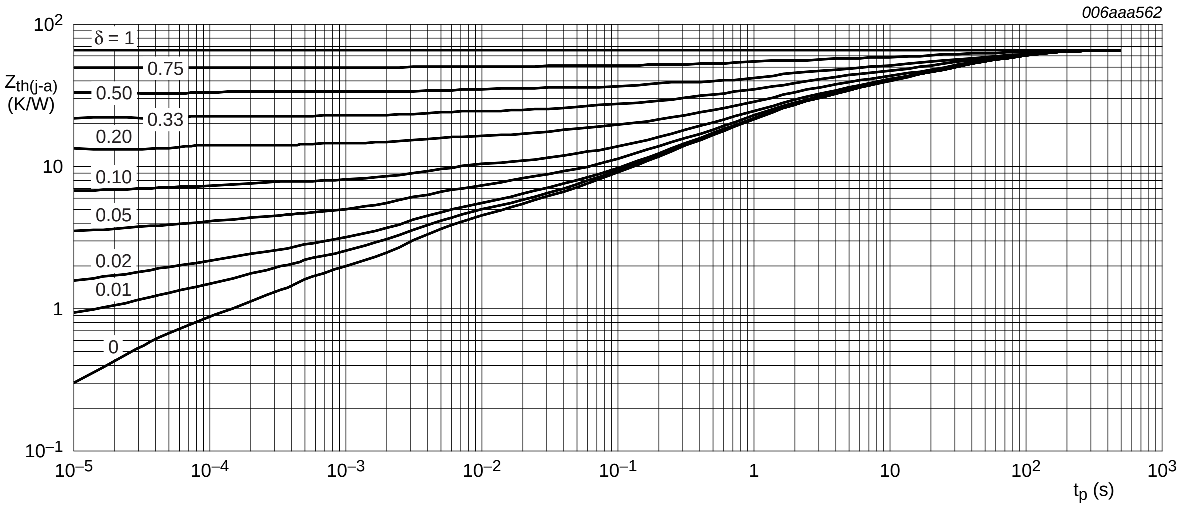
[2] Device mounted on an FR4 PCB, single-sided copper, tin-plated, mounting pad for collector 6 cm^2.

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



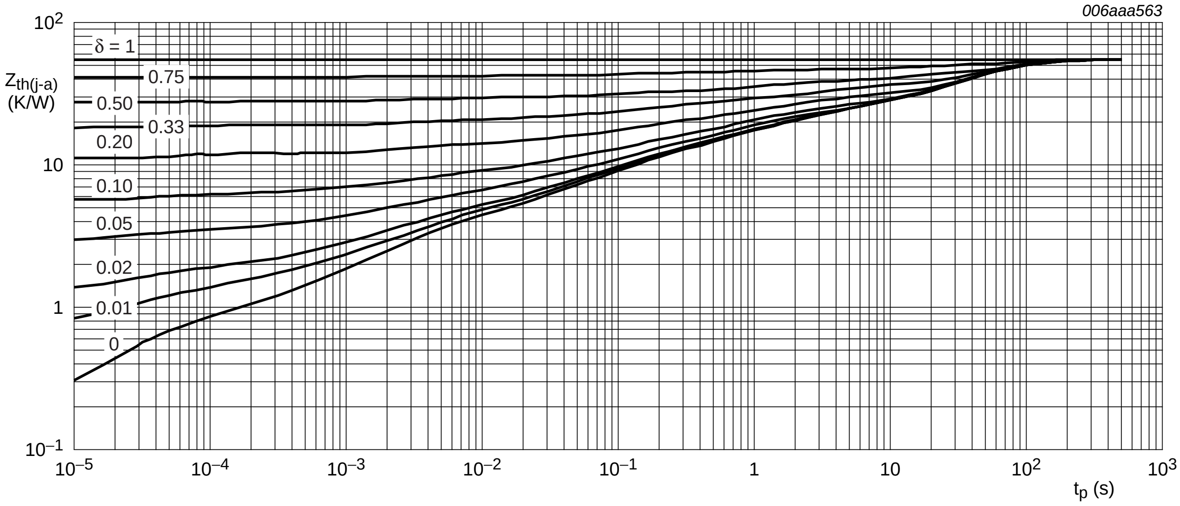
FR4 PCB, standard footprint

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

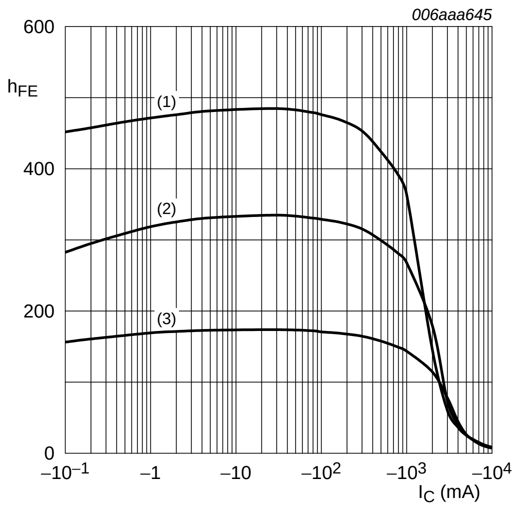
7. Characteristics

Table 7. Characteristics

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
I_{CBO}	collector-base cut-off current	V_{CB} = -80 V; I_E = 0 A; T_{amb} = 25 °C	-	-	-100	nA
		V_{CB} = -80 V; I_E = 0 A; T_j = 150 °C; T_{amb} = 25 °C	-	-	-50	µA
I_{CES}	collector-emitter cut-off current	V_{CE} = -48 V; V_{BE} = 0 V; T_{amb} = 25 °C	-	-	-100	nA
I_{EBO}	emitter-base cut-off current	V_{EB} = -5 V; I_C = 0 A; T_{amb} = 25 °C	-	-	-100	nA
h_{FE}	DC current gain	V_{CE} = -2 V; I_C = -0.5 A; pulsed; t_p ≤ 300 µs; δ ≤ 0.02 ; T_{amb} = 25 °C	200	300	-	
		V_{CE} = -2 V; I_C = -1 A; pulsed; t_p ≤ 300 µs; δ ≤ 0.02 ; T_{amb} = 25 °C	150	260	-	
		V_{CE} = -2 V; I_C = -2 A; pulsed; t_p ≤ 300 µs; δ ≤ 0.02 ; T_{amb} = 25 °C	100	175	-	
		V_{CE} = -2 V; I_C = -4 A; pulsed; t_p ≤ 300 µs; δ ≤ 0.02 ; T_{amb} = 25 °C	25	40	-	
V_{CEsat}	collector-emitter saturation voltage	I_C = -0.5 A; I_B = -50 mA; pulsed; t_p ≤ 300 µs; δ ≤ 0.02 ; T_{amb} = 25 °C	-	-45	-65	mV
		I_C = -1 A; I_B = -50 mA; pulsed; t_p ≤ 300 µs; δ ≤ 0.02 ; T_{amb} = 25 °C	-	-90	-130	mV
		I_C = -4 A; I_B = -400 mA; pulsed; t_p ≤ 300 µs; δ ≤ 0.02 ; T_{amb} = 25 °C	-	-225	-320	mV
		I_C = -4.1 A; I_B = -410 mA; pulsed; t_p ≤ 300 µs; δ ≤ 0.02 ; T_{amb} = 25 °C	-	-230	-325	mV
R_{CEsat}	collector-emitter saturation resistance	I_C = -4 A; I_B = -400 mA; pulsed; t_p ≤ 300 µs; δ ≤ 0.02 ; T_{amb} = 25 °C	-	56	80	mΩ

Table 7. Characteristics *...continued*

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
V_{BEsat}	base-emitter saturation voltage	I_C = -1 A; I_B = -100 mA; pulsed; $t_p \leq$ 300 μs; δ ≤ 0.02 ; T_{amb} = 25 °C	-	-0.81	-0.9	V
		I_C = -4 A; I_B = -400 mA; pulsed; $t_p \leq$ 300 μs; δ ≤ 0.02 ; T_{amb} = 25 °C	-	-0.93	-1.05	V
V_{BEon}	base-emitter turn-on voltage	V_{CE} = -2 V; I_C = -2 A; pulsed; $t_p \leq$ 300 μs; δ ≤ 0.02 ; T_{amb} = 25 °C	-	-0.78	-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; T_{amb} = 25 °C	-	15	-	ns
t_r	rise time		-	185	-	ns
t_{on}	turn-on time		-	200	-	ns
t_s	storage time		-	150	-	ns
t_f	fall time		-	175	-	ns
t_{off}	turn-off time		-	325	-	ns
f_T	transition frequency	V_{CE} = -10 V; I_C = -100 mA; f = 100 MHz; T_{amb} = 25 °C	-	100	-	MHz
C_c	collector capacitance	V_{CB} = -10 V; I_E = 0 A; i_e = 0 A; f = 1 MHz; T_{amb} = 25 °C	-	50	80	pF



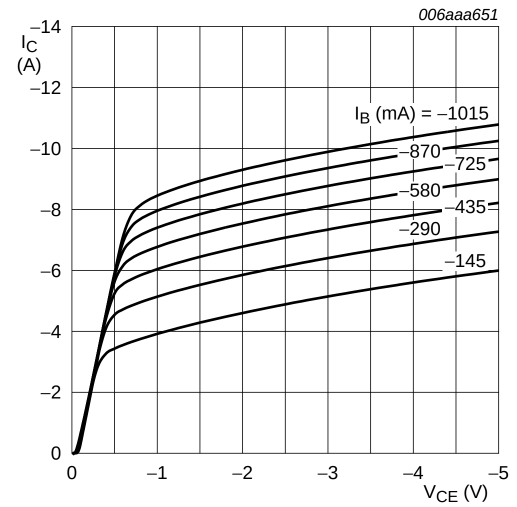
V_{CE} = -2 V

(1) T_{amb} = 100 °C

(2) T_{amb} = 25 °C

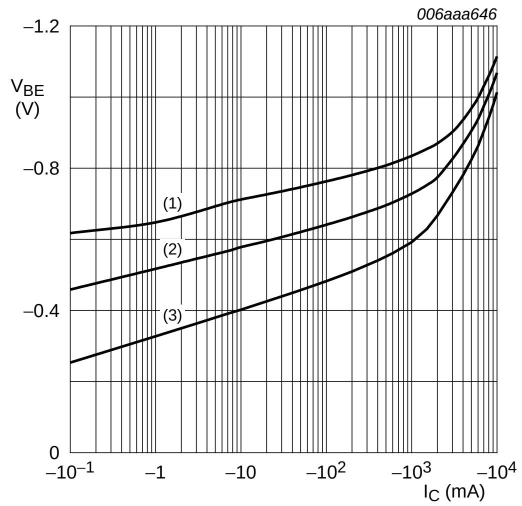
(3) T_{amb} = −55 °C

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



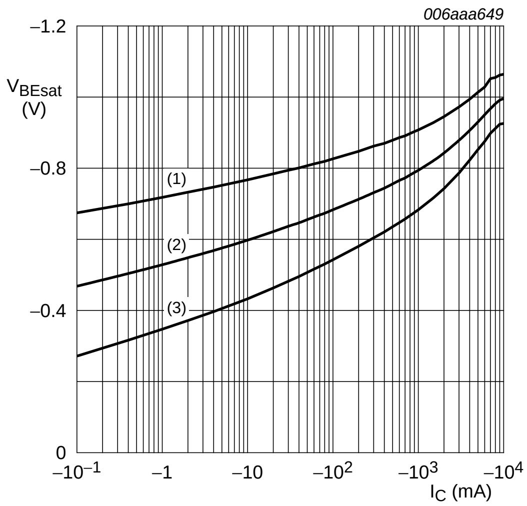
V_{CE} = -2 V

(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



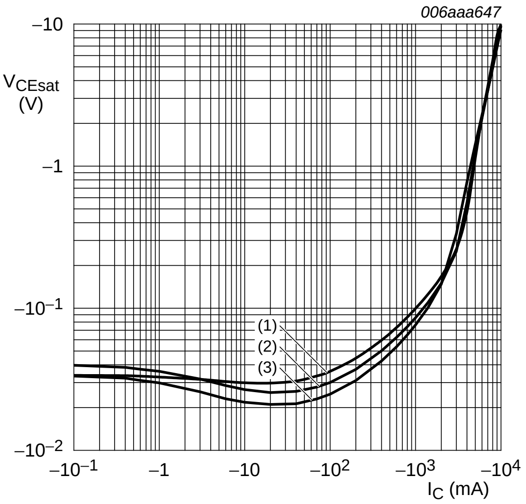
I_C/I_B = 20

(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



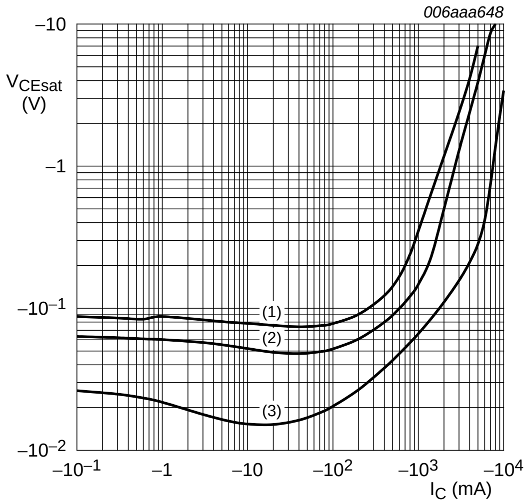
I_C/I_B = 20

(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



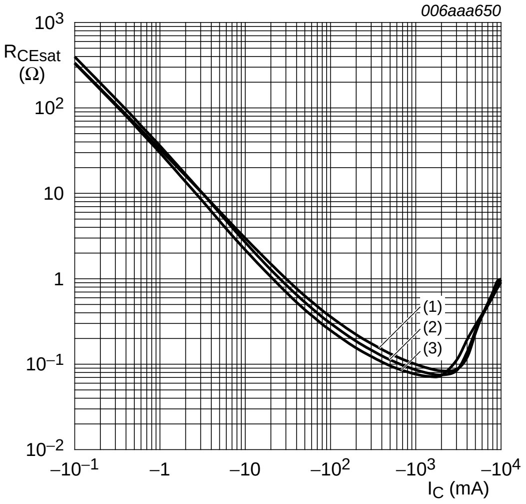
T_{amb} = 25 °C

(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



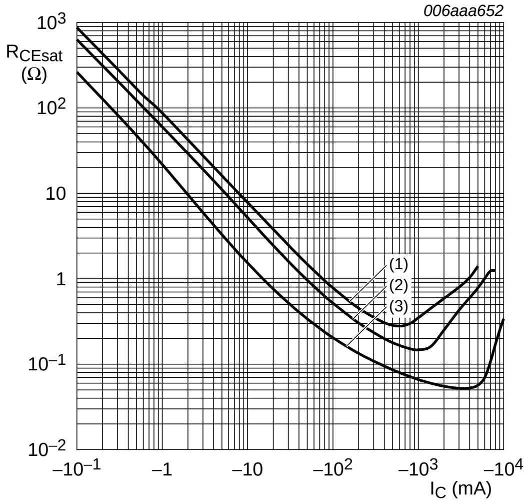
$I_C/I_B = 20$

(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

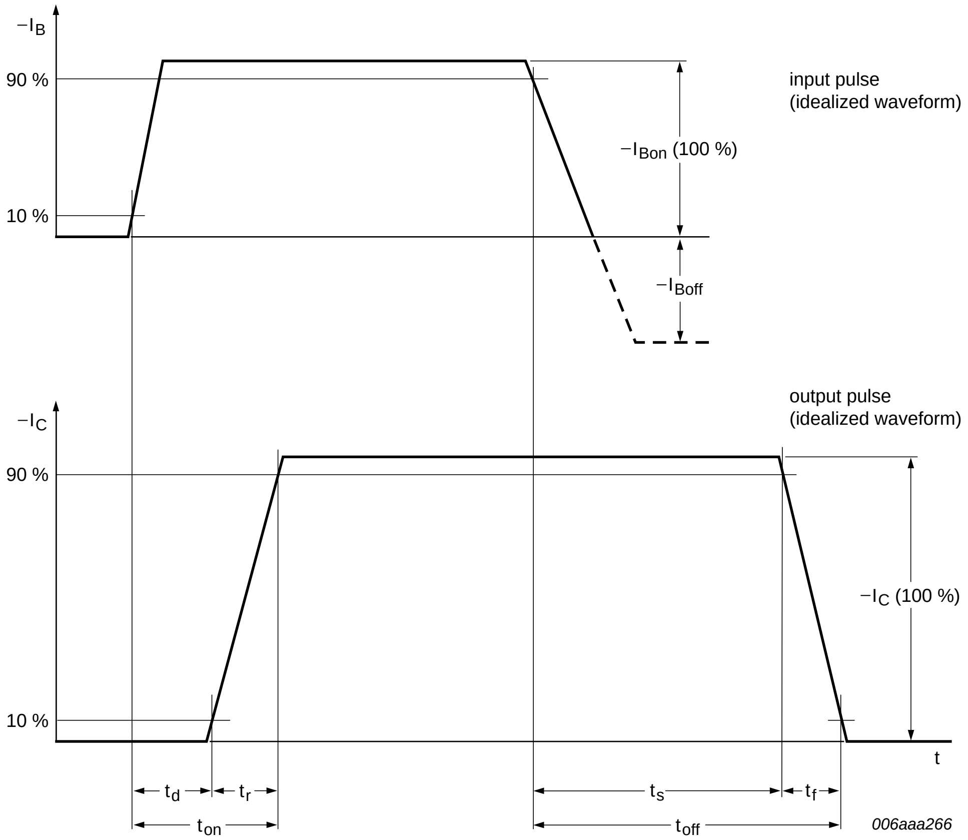
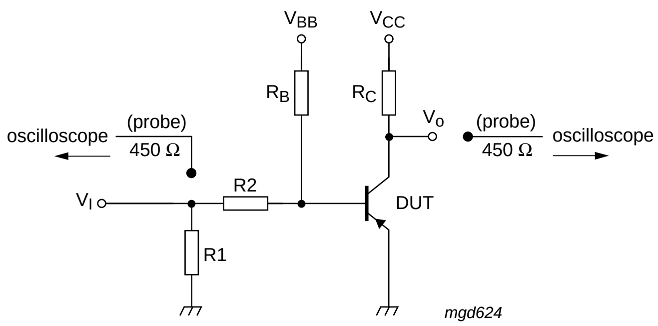


Fig 13. BISS transistor switching time definition



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

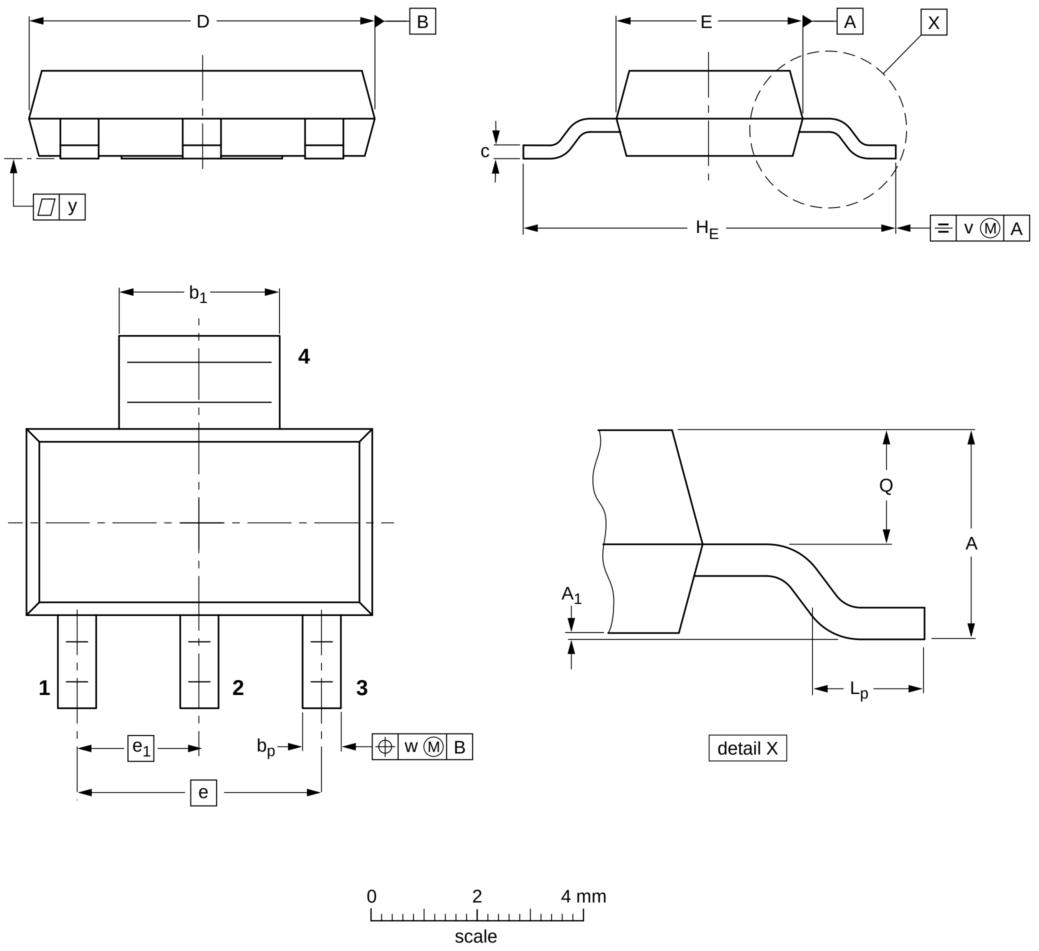
Fig 14. Test circuit for switching times

8.1 Quality information

This product has been qualified in accordance with the Automotive Electronics Council (AEC) standard Q101 - Stress test qualification for discrete semiconductors and is suitable for use in automotive applications.

9. Package outline

Plastic surface-mounted package with increased heatsink; 4 leads **SOT223**



DIMENSIONS (mm are the original dimensions)

UNIT	A	A_1	b_p	b_1	c	D	E	e	e_1	H_E	L_p	Q	v	w	y
mm	1.8 1.5	0.10 0.01	0.80 0.60	3.1 2.9	0.32 0.22	6.7 6.3	3.7 3.3	4.6	2.3	7.3 6.7	1.1 0.7	0.95 0.85	0.2	0.1	0.1

OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	JEITA			
SOT223			SC-73			~~04-11-10~~ 06-03-16

Fig 15. Package outline SOT223 (SC-73)

10. Soldering

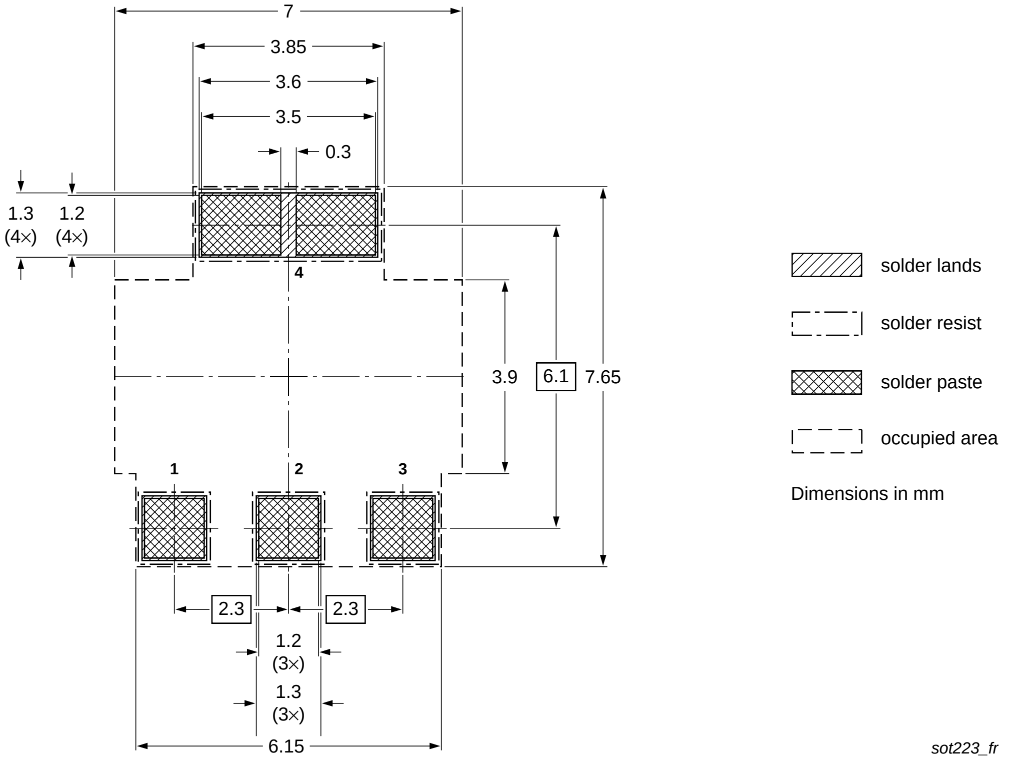


Fig 16. Reflow soldering footprint for SOT223 (SC-73)

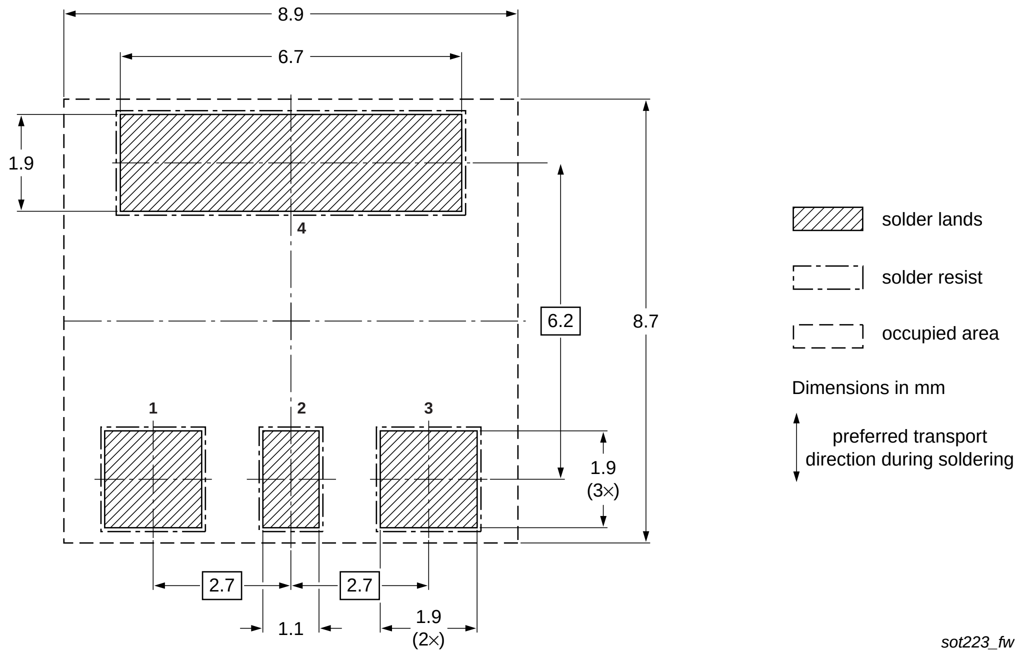


Fig 17. Wave soldering footprint for SOT223 (SC-73)

11. Revision history

Table 8. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
PBSS306PZ v.3	20110726	Product data sheet	-	PBSS306PZ v.2
Modifications:	• 1.2 "Features and benefits" updated • In 7 "Characteristics" new parameter added, I_{CES} • Fig 15. updated • 12 "Legal information" updated			
PBSS306PZ v.2	20091211	Product data sheet	-	PBSS306PZ v.1
PBSS306PZ v.1	20060920	Product data sheet	-	-

12. Legal information

12.1 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".

[3] The product status of device(s) described in this document may have changed since this document was published and may differ in case of multiple devices. The latest product status information is available on the Internet at URL http://www.nexperia.com.

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14. Contents

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Date of release: 26 July 2011