

PBSS9110Z

100 V, 1 A PNP low V_{CEsat} (BISS) transistor

Rev. 03 — 11 December 2009

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: PBSS8110Z.

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

- 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

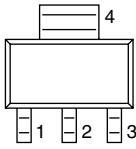
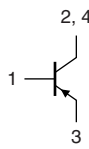
Table 1. Quick reference data

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
V_{CEO}	collector-emitter voltage	open base	-	-	-100	V
I_C	collector current		-	-	-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] -	170	320	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	base		
2	collector		
3	emitter		
4	collector		

3. Ordering information

Table 3. Ordering information

Type number	Package		
	Name	Description	Version
PBSS9110Z	SC-73	plastic surface-mounted package with increased heat sink; 4 leads	SOT223

4. Marking

Table 4. Marking codes

Type number	Marking code
PBSS9110Z	PB9110

5. Limiting values

Table 5. Limiting values

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

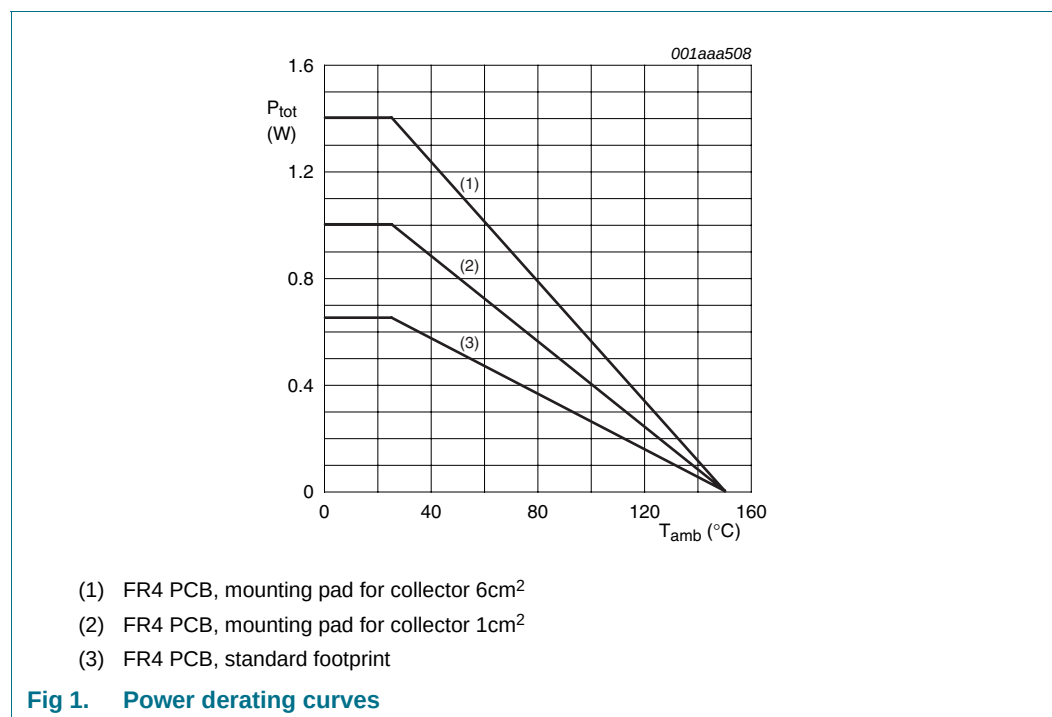
Symbol	Parameter	Conditions	Min	Max	Unit	
V _{CBO}	collector-base voltage	open emitter	-	−120	V	
V _{CEO}	collector-emitter voltage	open base	-	−100	V	
V _{EBO}	emitter-base voltage	open collector	-	−5	V	
I _C	collector current		-	−1	A	
I _{CM}	peak collector current	single pulse; t _p ≤ 1 ms	-	−3	A	
I _B	base current		-	−0.3	A	
P _{tot}	total power dissipation	T _{amb} ≤ 25 °C	[1]	-	0.65	W
			[2]	-	1	W
			[3]	-	1.4	W

Table 5. Limiting values ...continued

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

Symbol	Parameter	Conditions	Min	Max	Unit
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 1cm².
 [3] Device mounted on an FR4 PCB, single-sided copper, tin-plated, mounting pad for collector 6cm².

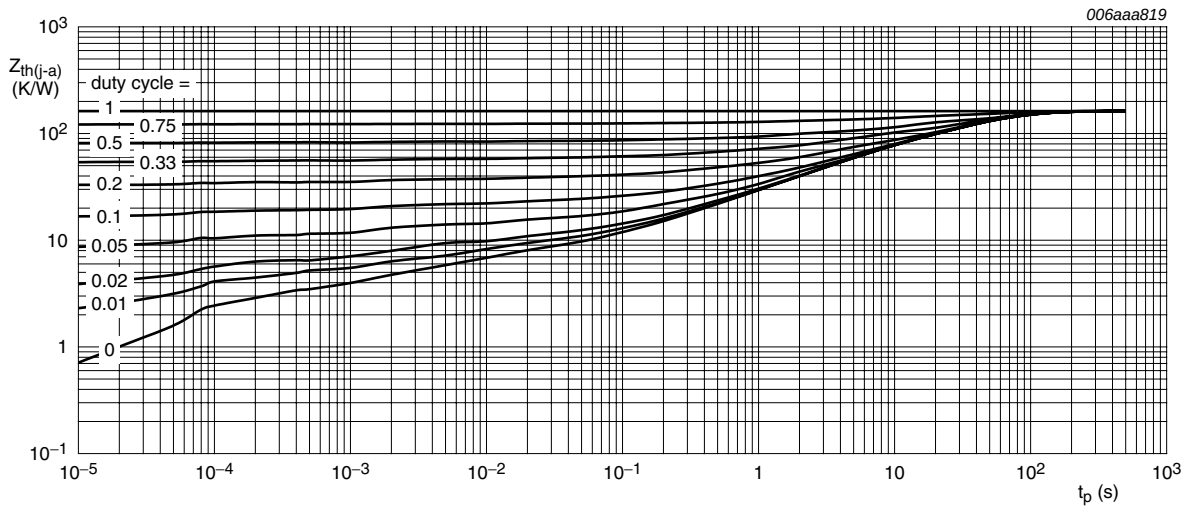


6. Thermal characteristics

Table 6. Thermal characteristics

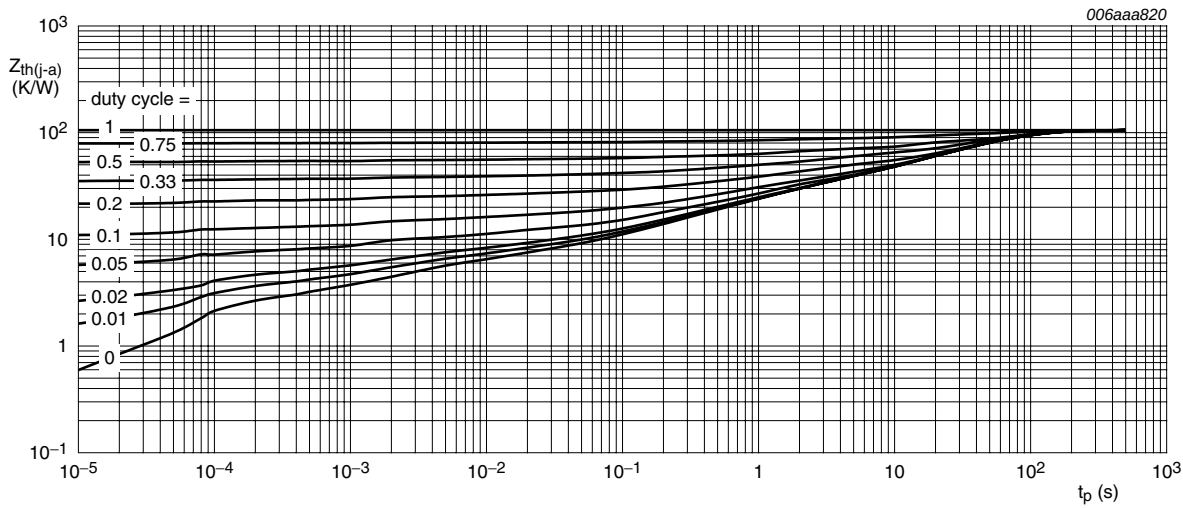
Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$R_{th(j-a)}$	thermal resistance from junction to ambient	in free air	[1]	-	192	K/W
			[2]	-	125	K/W
			[3]	-	89	K/W
$R_{th(j-sp)}$	thermal resistance from junction to solder point		-	-	17	K/W

- [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 1cm².
 [3] Device mounted on an FR4 PCB, single-sided copper, tin-plated, mounting pad for collector 6cm².



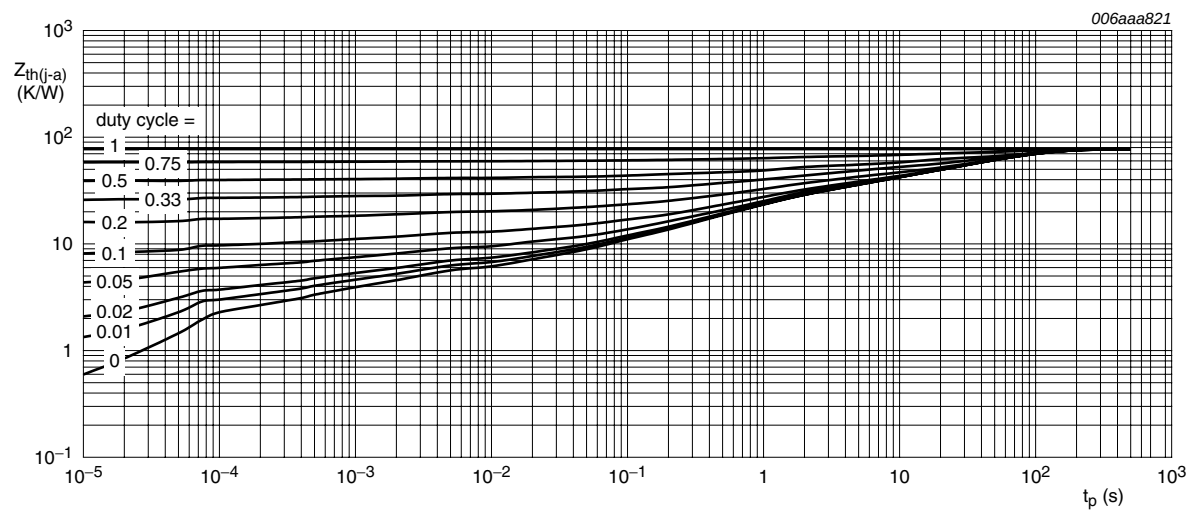
FR4 PCB, standard footprint

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



FR4 PCB, mounting pad for collector 1cm²

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



FR4 PCB, mounting pad for collector 6cm²

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

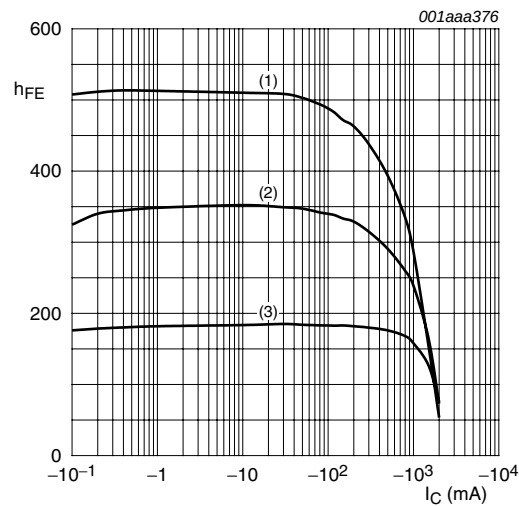
7. Characteristics

Table 7. Characteristics

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

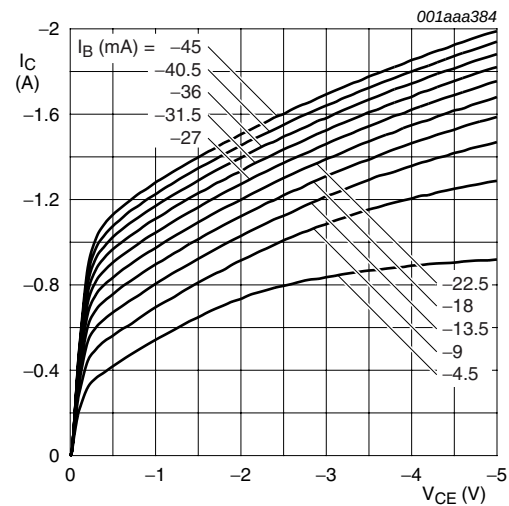
Symbol	Parameter	Conditions	Min	Typ	Max	Unit
I_{CBO}	collector-base cut-off current	$V_{CB} = -80\text{ V}; I_E = 0\text{ A}$	-	-	-100	nA
		$V_{CB} = -80\text{ V}; I_E = 0\text{ A}; T_j = 150\text{ }^{\circ}\text{C}$	-	-	-50	μA
I_{CES}	collector-emitter cut-off current	$V_{CE} = -80\text{ V}; V_{BE} = 0\text{ V}$	-	-	-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	$V_{CE} = -5\text{ V}; I_C = -1\text{ mA}$	150	-	-	
		$V_{CE} = -5\text{ V}; I_C = -250\text{ mA}$	150	-	-	
		$V_{CE} = -5\text{ V}; I_C = -0.5\text{ A}$	[1] 150	-	450	
		$V_{CE} = -5\text{ V}; I_C = -1\text{ A}$	[1] 125	-	-	
V_{CEsat}	collector-emitter saturation voltage	$I_C = -250\text{ mA}; I_B = -25\text{ mA}$	-	-	-120	mV
		$I_C = -500\text{ mA}; I_B = -50\text{ mA}$	[1] -	-	-180	mV
		$I_C = -1\text{ A}; I_B = -100\text{ mA}$	[1] -	-	-320	mV
R_{CEsat}	collector-emitter saturation resistance	$I_C = -1\text{ A}; I_B = -100\text{ mA}$	[1] -	170	320	$\text{m}\Omega$
V_{BEsat}	base-emitter saturation voltage	$I_C = -1\text{ A}; I_B = -100\text{ mA}$	[1] -	-	-1.1	V
V_{BEon}	base-emitter turn-on voltage	$V_{CE} = -5\text{ V}; I_C = -1\text{ A}$	[1] -	-	-1.0	V
t_d	delay time	$V_{CC} = -10\text{ V}; I_C = -0.5\text{ A}; I_{Bon} = -0.025\text{ A}; I_{Boff} = 0.025\text{ A}$	-	20	-	ns
t_r	rise time		-	60	-	ns
t_{on}	turn-on time		-	80	-	ns
t_s	storage time		-	290	-	ns
t_f	fall time		-	120	-	ns
t_{off}	turn-off time		-	410	-	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	$V_{CB} = -10\text{ V}; I_E = I_C = 0\text{ A}; f = 1\text{ MHz}$	-	-	17	pF

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



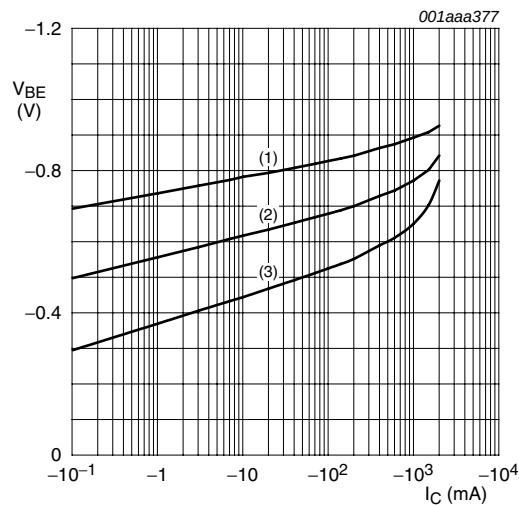
- $V_{CE} = -10\text{ V}$
- (1) $T_{amb} = 100\text{ }^{\circ}\text{C}$
 - (2) $T_{amb} = 25\text{ }^{\circ}\text{C}$
 - (3) $T_{amb} = -55\text{ }^{\circ}\text{C}$

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



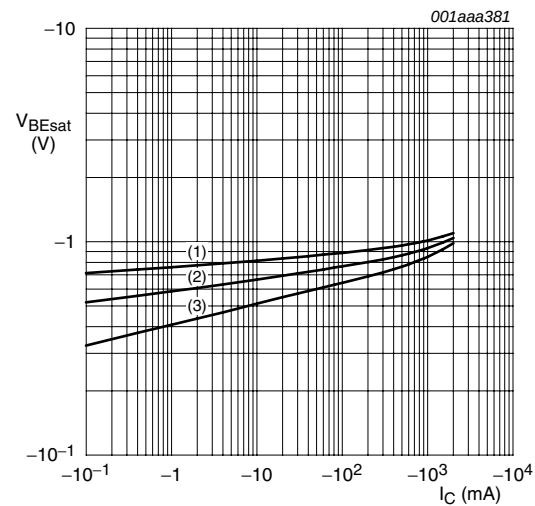
$T_{amb} = 25\text{ }^{\circ}\text{C}$

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



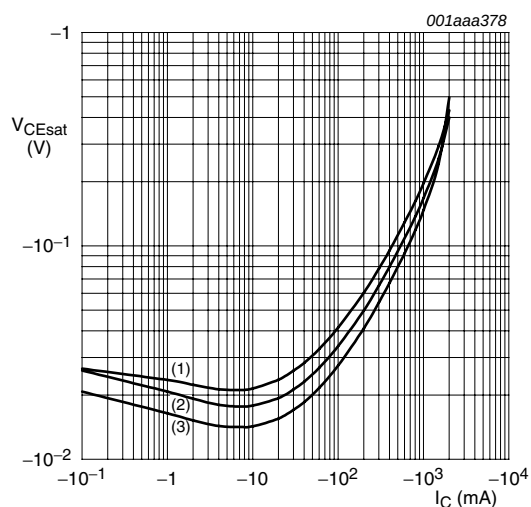
- $V_{CE} = -10\text{ V}$
- (1) $T_{amb} = -55\text{ }^{\circ}\text{C}$
 - (2) $T_{amb} = 25\text{ }^{\circ}\text{C}$
 - (3) $T_{amb} = 100\text{ }^{\circ}\text{C}$

Fig 7. Base-emitter 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) $T_{amb} = 100\text{ }^{\circ}\text{C}$

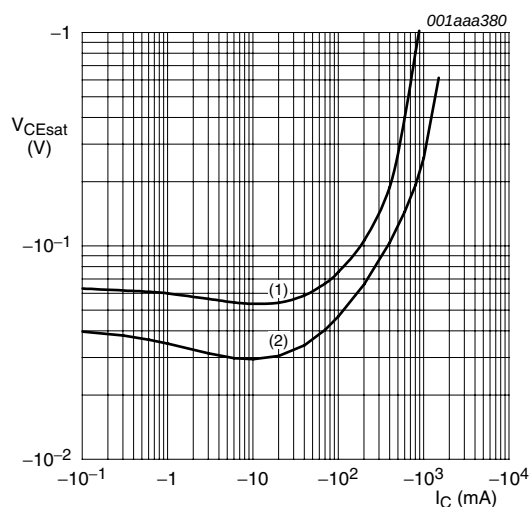
Fig 8. Base-emitter saturation voltage as a function of collector current; typical values



$$I_C/I_B = 10$$

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

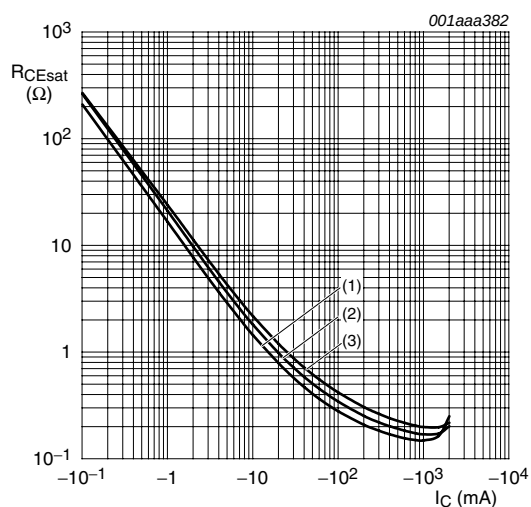
Fig 9. Collector-emitter saturation voltage as a function of collector current; typical values



$$T_{amb} = 25\text{ °C}$$

- (1) $I_C/I_B = 50$
- (2) $I_C/I_B = 20$

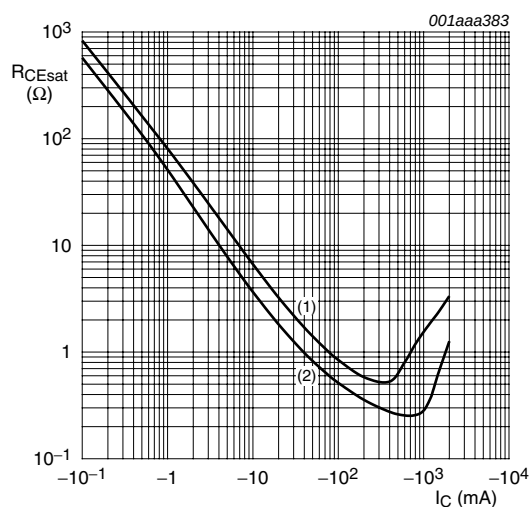
Fig 10. Collector-emitter saturation voltage as a function of collector current; typical values



$$I_C/I_B = 10$$

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

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



$$T_{amb} = 25\text{ °C}$$

- (1) $I_C/I_B = 50$
- (2) $I_C/I_B = 20$

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

8. Test information

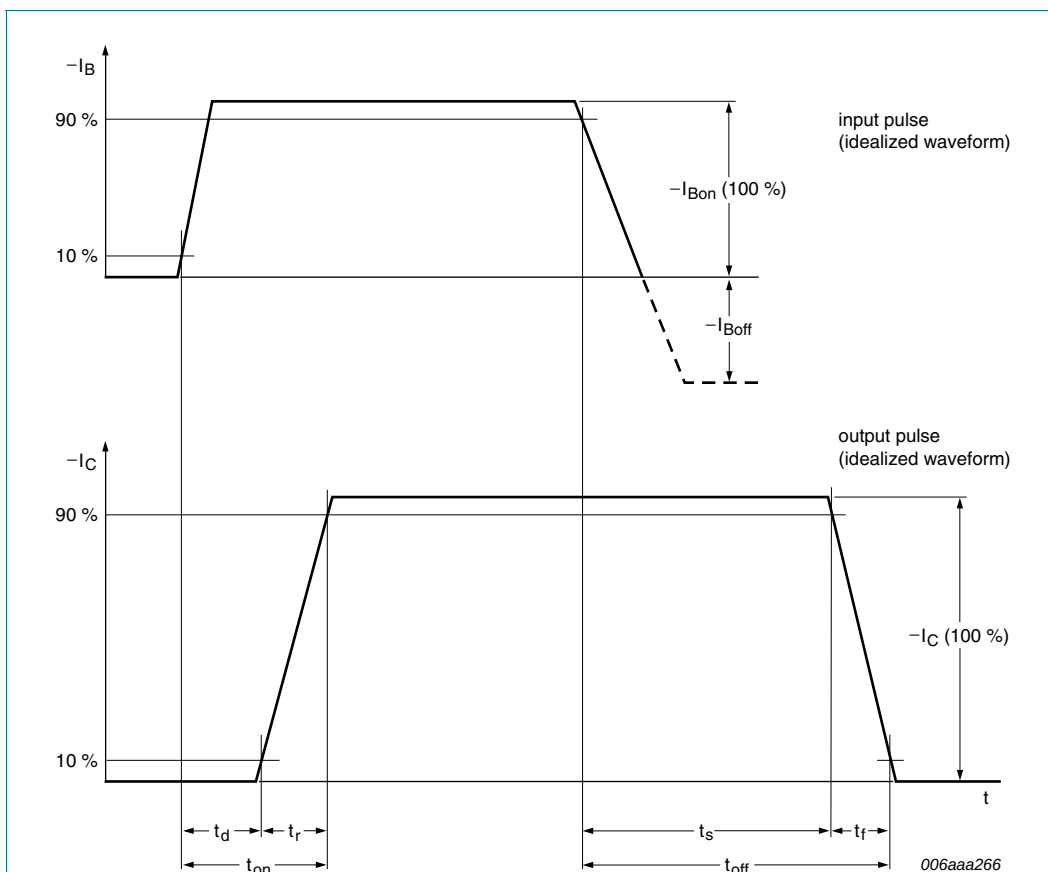
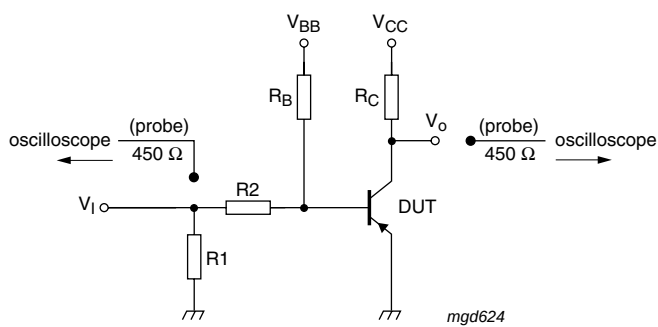


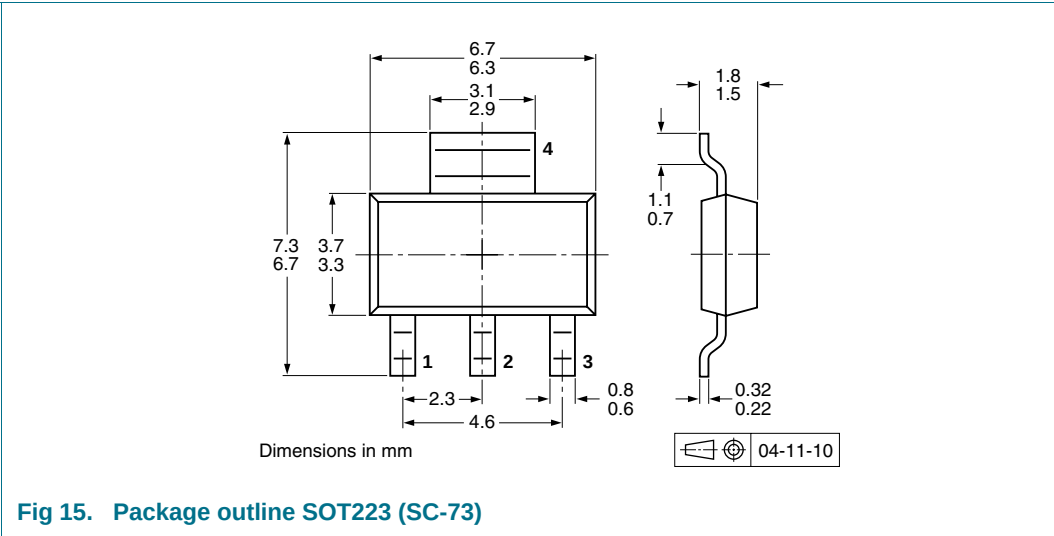
Fig 13. BISS transistor switching time definition



$V_{CC} = -10\text{ V}$; $I_C = -0.5\text{ A}$; $I_{Bon} = -0.025\text{ A}$; $I_{Boff} = 0.025\text{ A}$

Fig 14. Test circuit for switching times

9. Package outline



10. Packing information

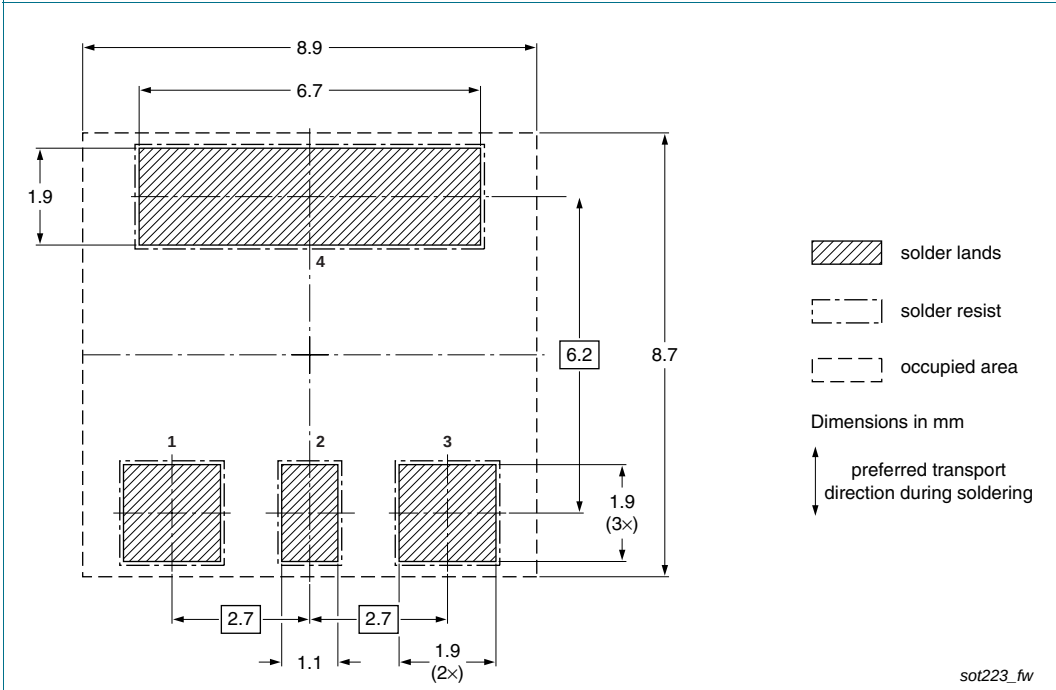
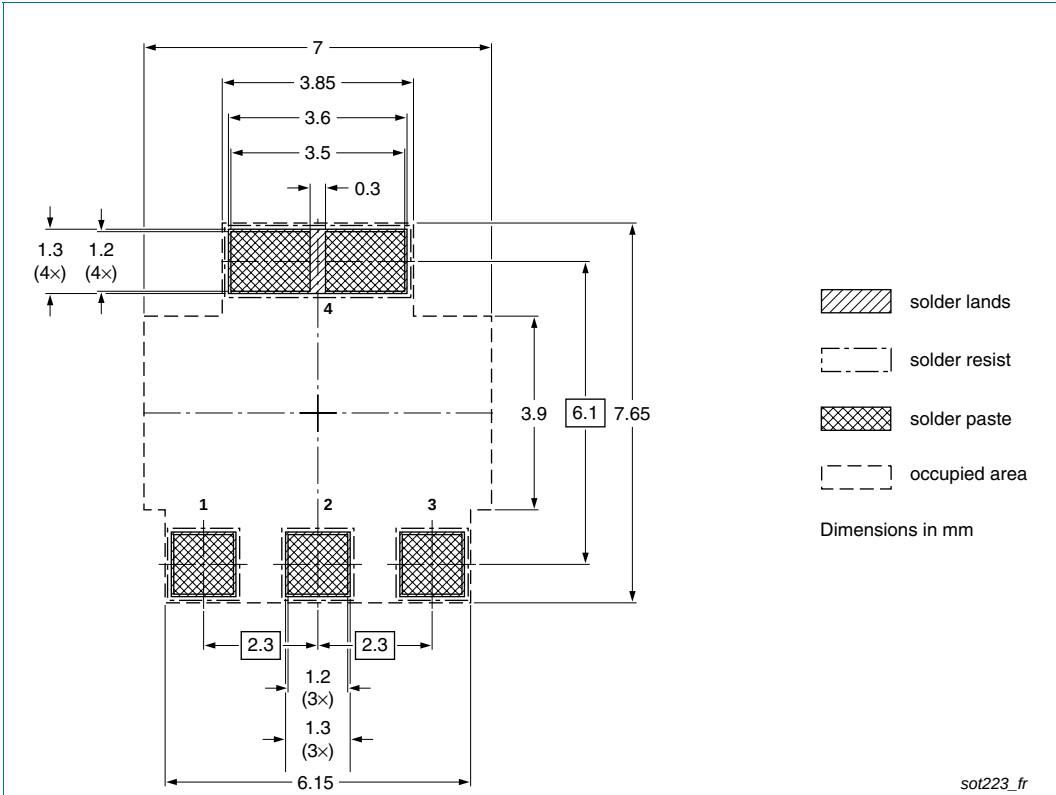
Table 8. Packing methods

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

Type number	Package	Description	Packing quantity	
			1000	4000
PBSS9110Z	SOT223	8 mm pitch, 12 mm tape and reel	-115	-135

[1] For further information and the availability of packing methods, see [Section 14](#).

11. Soldering



12. Revision history

Table 9. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
PBSS9110Z_3	20091211	Product data sheet	-	PBSS9110Z_2
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 16 "Reflow soldering footprint SOT223 (SC-73)": updated • Figure 17 "Wave soldering footprint SOT223 (SC-73)": updated			
PBSS9110Z_2	20060724	Product data sheet	-	PBSS9110Z_1
PBSS9110Z_1	20040609	Product data sheet	-	-

13. Legal information

13.1 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.nxp.com>.

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