

PBSS8110Z

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

Rev. 02 — 8 January 2007

Product data sheet

1. Product profile

1.1 General description

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

PNP complement: PBSS9110Z.

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

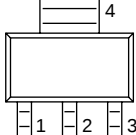
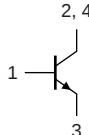
Table 1. Quick reference data

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] -	160	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	base		
2	collector		
3	emitter		
4	collector		

3. Ordering information

Table 3. Ordering information

Type number	Package		
	Name	Description	Version
PBSS8110Z	SC-73	plastic surface-mounted package with increased heat sink; 4 leads	SOT223

4. Marking

Table 4. Marking codes

Type number	Marking code
PBSS8110Z	PB8110

5. Limiting values

Table 5. Limiting values

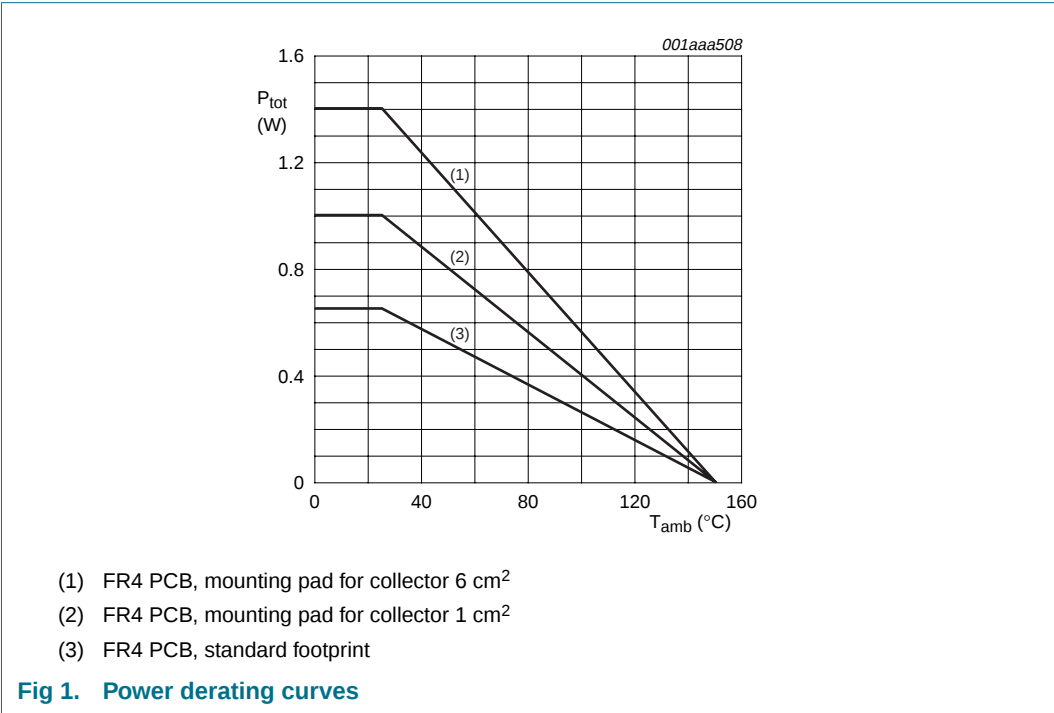
In accordance with the Absolute Maximum Rating System (IEC 60134).

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

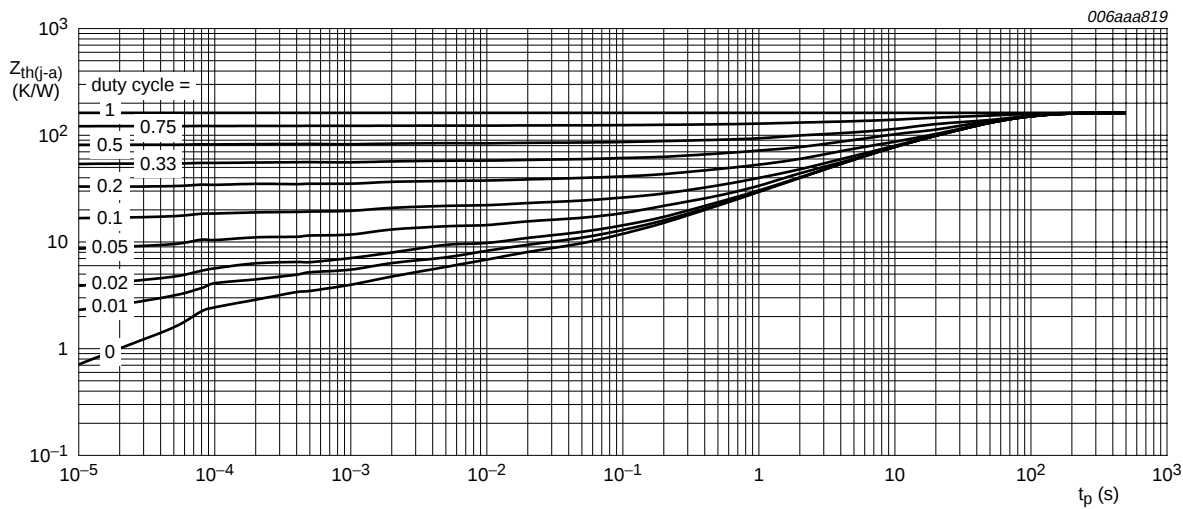


6. Thermal characteristics

Table 6. Thermal characteristics

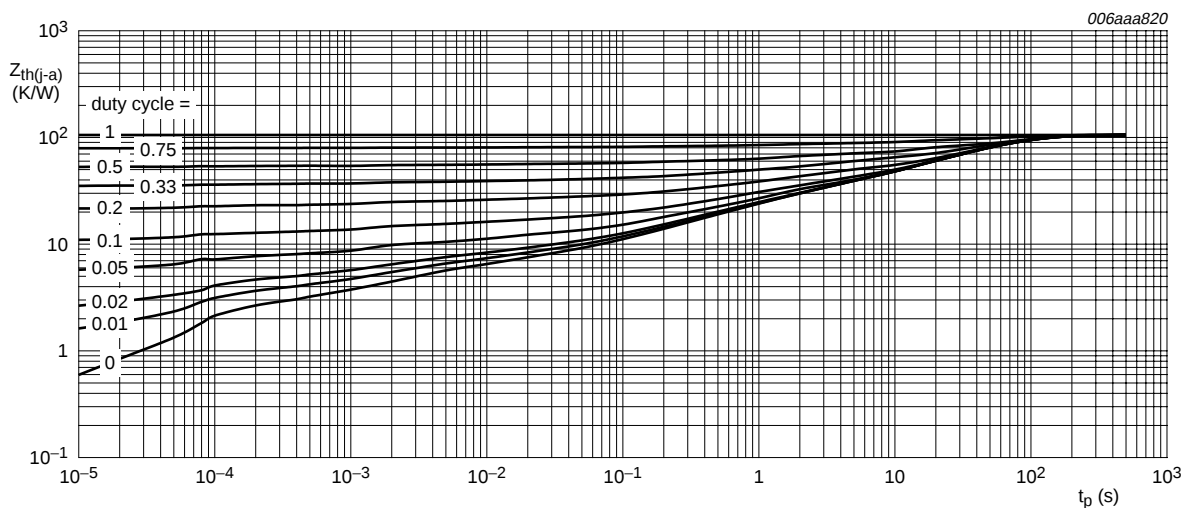
Symbol	Parameter	Conditions	Min	Typ	Max	Unit
R _{th(j-a)}	thermal resistance from junction to ambient	in free air	[1]	-	-	192 K/W
			[2]	-	-	125 K/W
			[3]	-	-	89 K/W
R _{th(j-sp)}	thermal resistance from junction to solder point		-	-	17	K/W

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



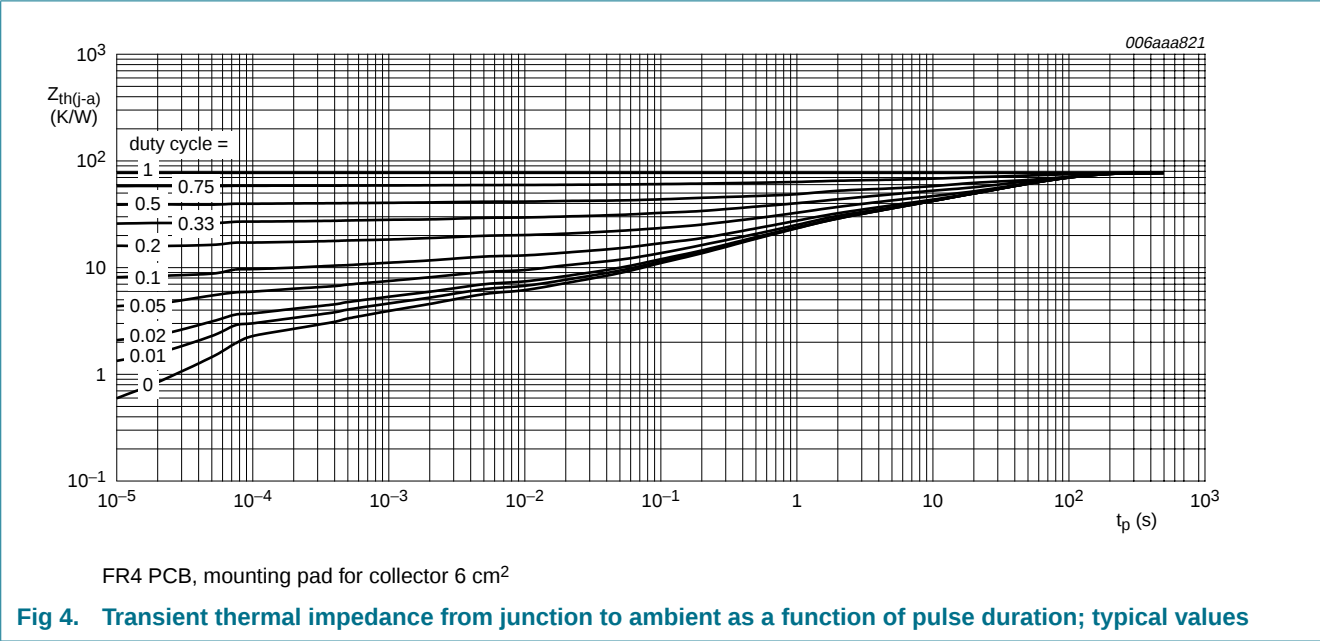
FR4 PCB, standard footprint

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



FR4 PCB, mounting pad for collector 1 cm²

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



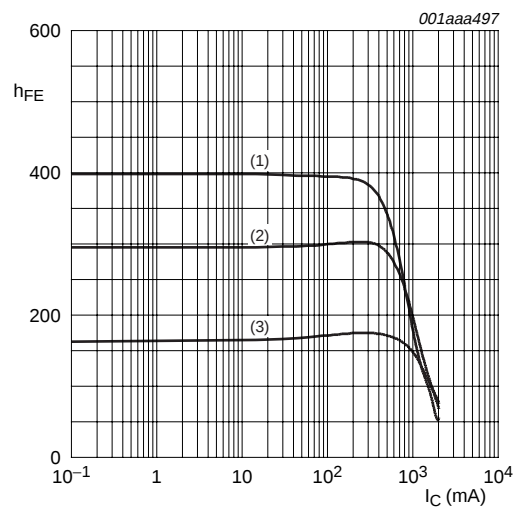
7. Characteristics

Table 7. Characteristics

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

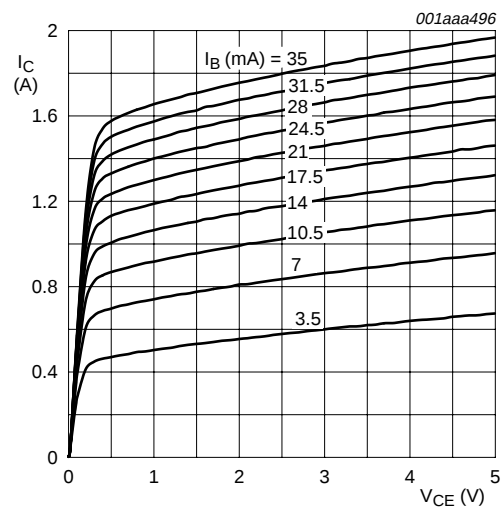
Symbol	Parameter	Conditions	Min	Typ	Max	Unit
I_{CBO}	collector-base cut-off current	$V_{CB} = 80\text{ V}; I_E = 0\text{ A}$	-	-	100	nA
		$V_{CB} = 80\text{ V}; I_E = 0\text{ A}; T_j = 150\text{ }^{\circ}\text{C}$	-	-	50	μA
I_{CES}	collector-emitter cut-off current	$V_{CE} = 80\text{ V}; V_{BE} = 0\text{ V}$	-	-	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	$V_{CE} = 10\text{ V}; I_C = 1\text{ mA}$	150	-	-	
		$V_{CE} = 10\text{ V}; I_C = 250\text{ mA}$	150	-	500	
		$V_{CE} = 10\text{ V}; I_C = 0.5\text{ A}$	[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
		$I_C = 500\text{ mA}; I_B = 50\text{ mA}$	[1] -	-	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] -	160	200	$\text{m}\Omega$
V_{BEsat}	base-emitter saturation voltage	$I_C = 1\text{ A}; I_B = 100\text{ mA}$	[1] -	-	1.05	V
V_{BEon}	base-emitter turn-on voltage	$V_{CE} = 10\text{ V}; I_C = 1\text{ A}$	[1] -	-	0.9	V
t_d	delay time	$V_{CC} = 10\text{ V}; I_C = 0.5\text{ A}; I_{Bon} = 0.025\text{ A}; I_{Boff} = -0.025\text{ A}$	-	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	$V_{CB} = 10\text{ V}; I_E = i_e = 0\text{ A}; f = 1\text{ MHz}$	-	-	7.5	pF

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



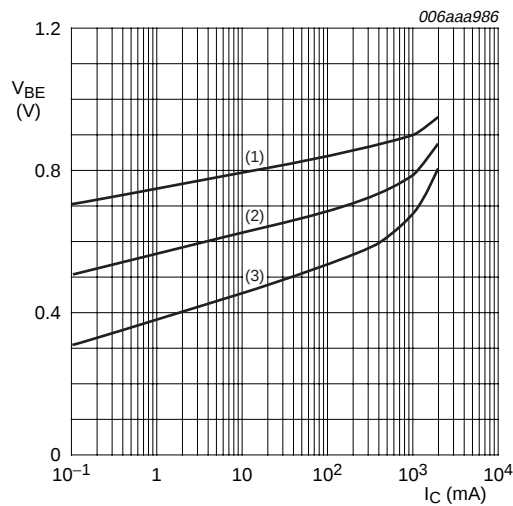
$V_{CE} = 10\text{ V}$
(1) $T_{amb} = 100\text{ }^{\circ}\text{C}$
(2) $T_{amb} = 25\text{ }^{\circ}\text{C}$
(3) $T_{amb} = -55\text{ }^{\circ}\text{C}$

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



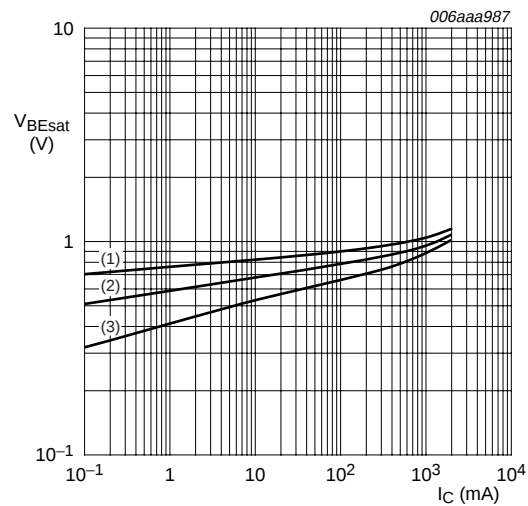
$T_{amb} = 25\text{ }^{\circ}\text{C}$

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



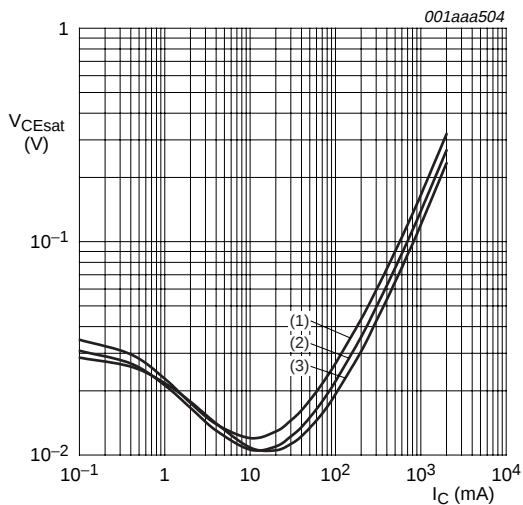
$V_{CE} = 10\text{ V}$
(1) $T_{amb} = -55\text{ }^{\circ}\text{C}$
(2) $T_{amb} = 25\text{ }^{\circ}\text{C}$
(3) $T_{amb} = 100\text{ }^{\circ}\text{C}$

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



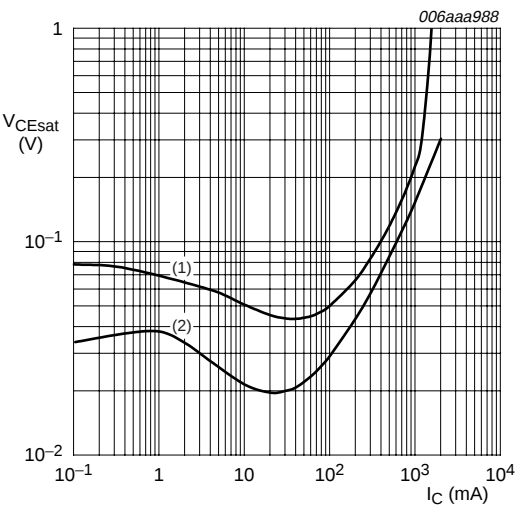
$I_C/I_B = 10$
(1) $T_{amb} = -55\text{ }^{\circ}\text{C}$
(2) $T_{amb} = 25\text{ }^{\circ}\text{C}$
(3) $T_{amb} = 100\text{ }^{\circ}\text{C}$

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



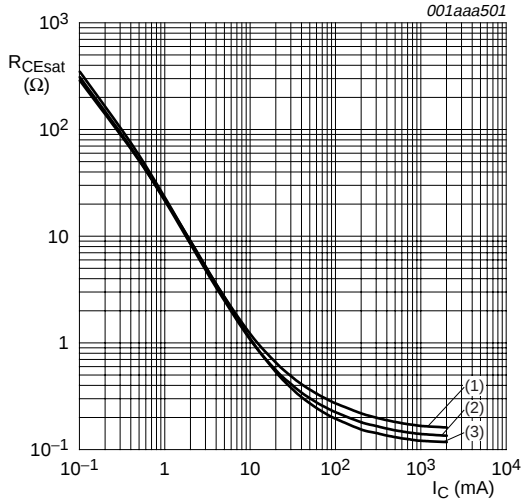
- $I_C/I_B = 10$
- (1) $T_{amb} = 100^\circ C$
 - (2) $T_{amb} = 25^\circ C$
 - (3) $T_{amb} = -55^\circ C$

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



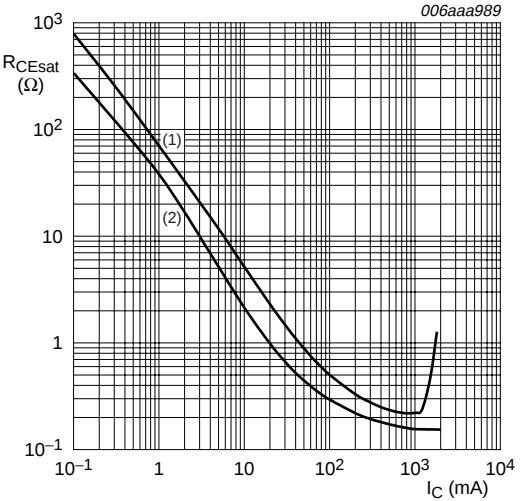
- $T_{amb} = 25^\circ C$
- (1) $I_C/I_B = 50$
 - (2) $I_C/I_B = 20$

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



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

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



- $T_{amb} = 25^\circ C$
- (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

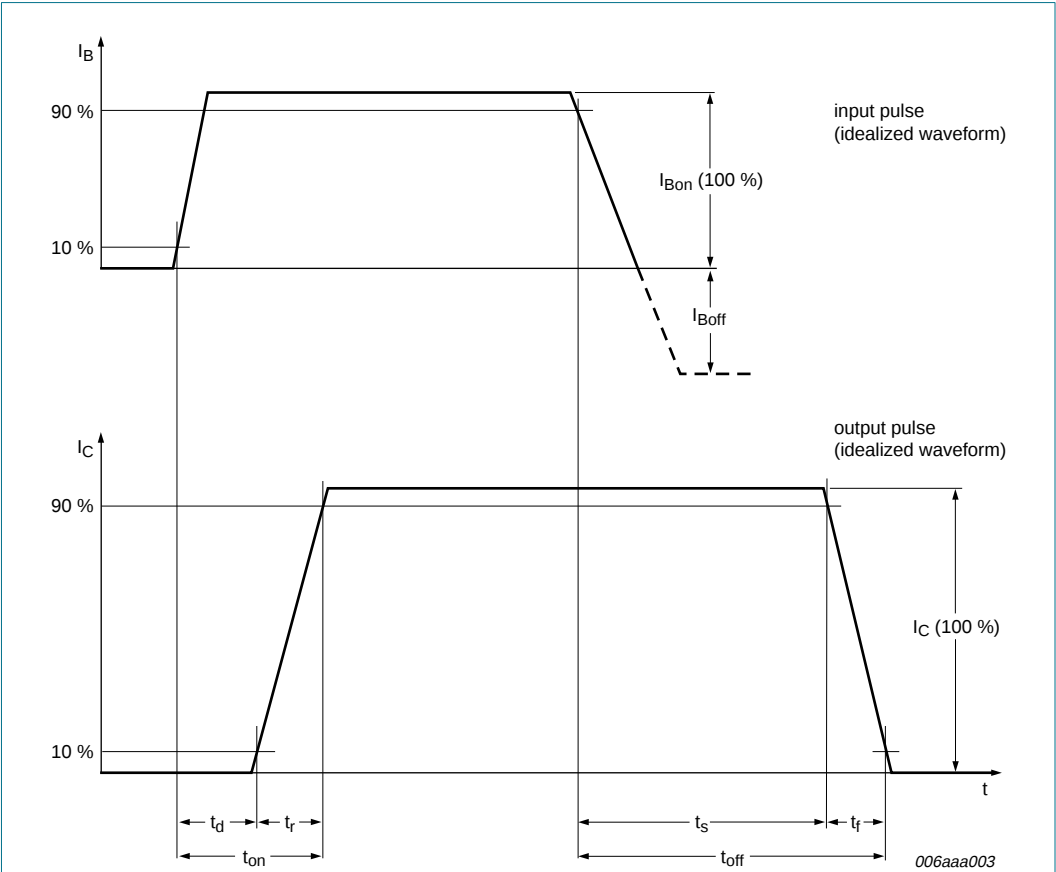
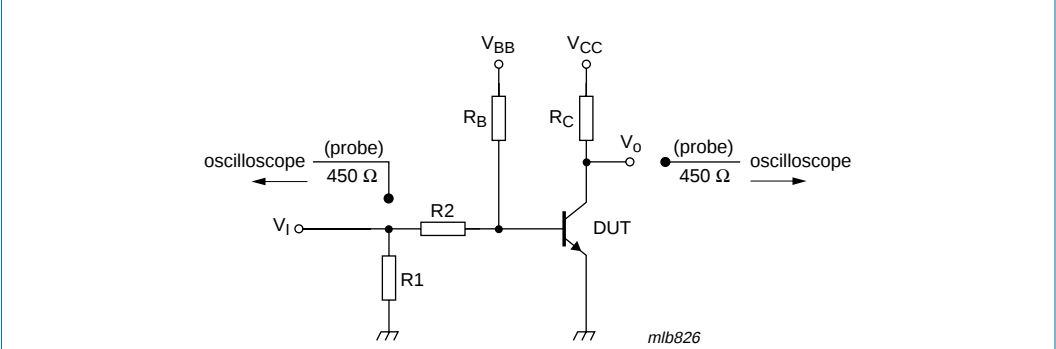


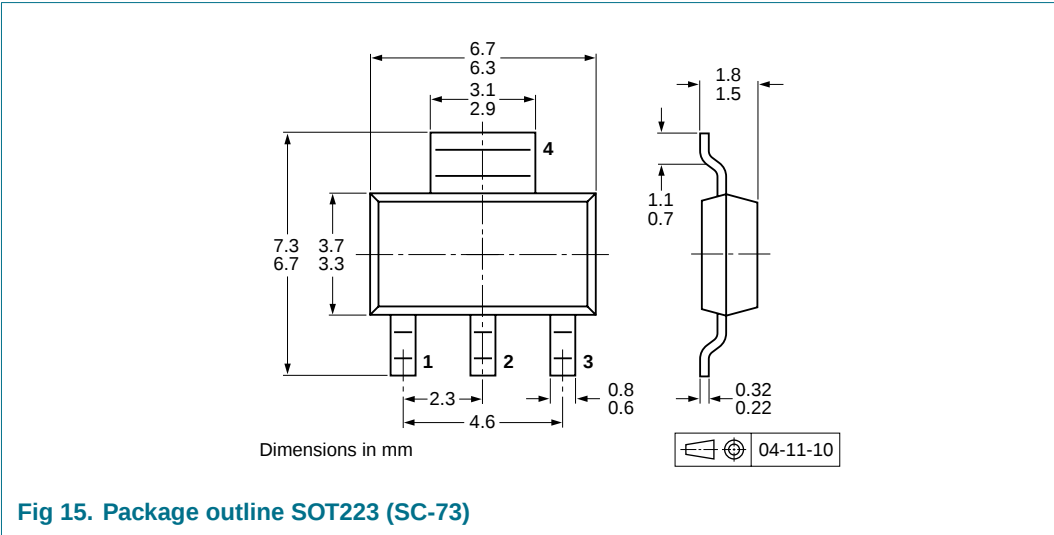
Fig 13. BISS transistor switching time definition



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

Fig 14. Test circuit for switching times

9. Package outline



10. Packing information

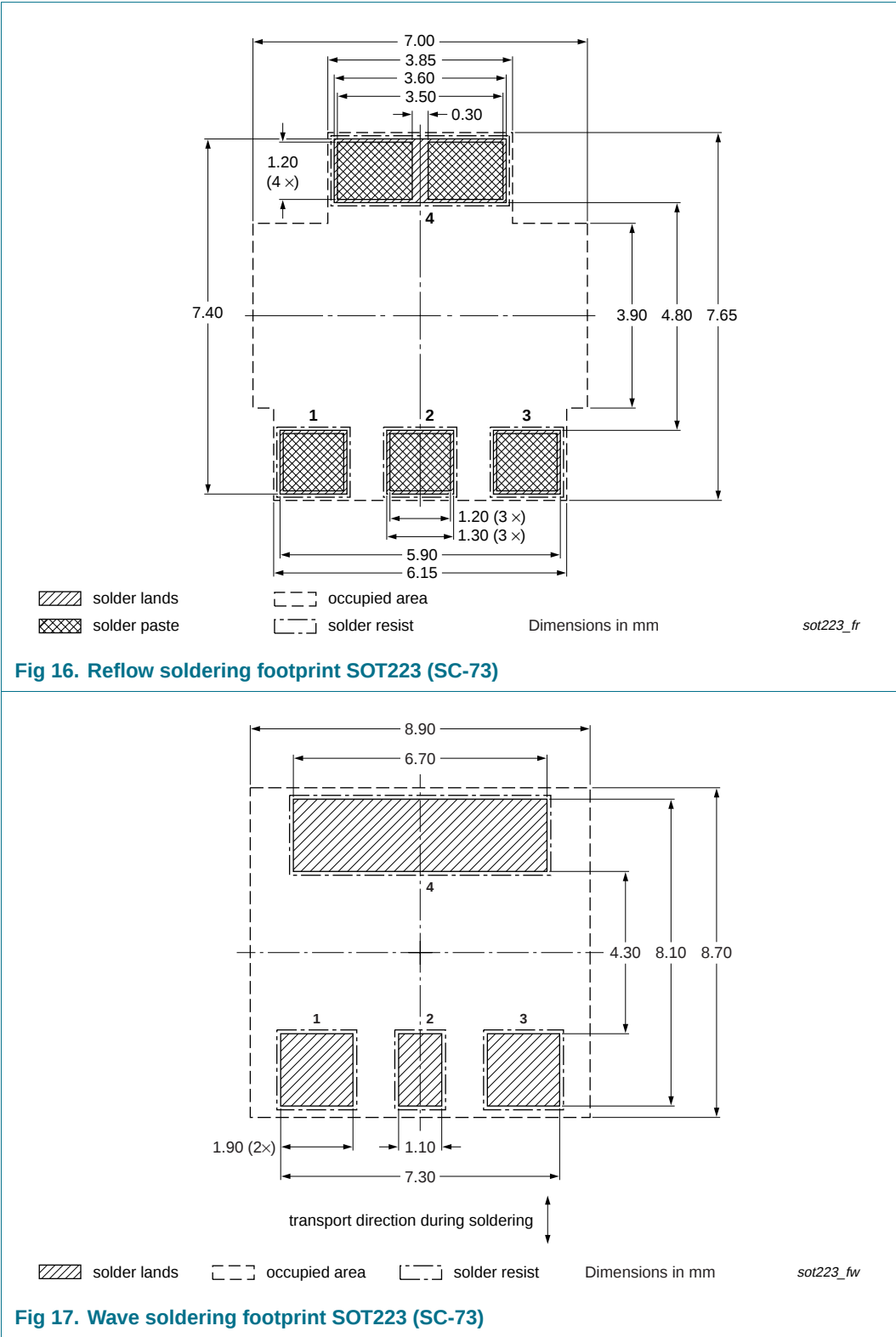
Table 8. Packing methods

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

Type number	Package	Description	Packing quantity	
			1000	4000
PBSS8110Z	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
PBSS8110Z_2	20070108	Product data sheet	-	PBSS8110Z_1
Modifications:	• The format of this data sheet has been redesigned to comply with the new identity guidelines of NXP Semiconductors. • Legal texts have been adapted to the new company name where appropriate. • Section 1.1 "General description": amended • Section 1.2 "Features": amended • Section 1.3 "Applications": amended • Table 1 "Quick reference data": conditions for I_{CM} peak collector current adapted • Table 1: R_{CEsat} equivalent on-resistance redefined to collector-emitter saturation resistance • Table 2 "Pinning": simplified outline drawing amended • Table 4 "Marking codes": amended • Table 5 "Limiting values": conditions for I_{CM} peak collector current adapted • Table 5: T_{amb} operating ambient temperature redefined to ambient temperature • Table 6 "Thermal characteristics": amended • Table 6: $R_{th(j-s)}$ thermal resistance from junction to soldering point redefined to $R_{th(j-sp)}$ thermal resistance from junction to solder point • Figure 2: amended • Figure 2: Z_{th} transient thermal impedance redefined to $Z_{th(j-a)}$ transient thermal impedance from junction to ambient • Figure 2: t_p pulse time redefined to pulse duration • Figure 3 and 4: added • Table 7: R_{CEsat} equivalent on-resistance redefined to collector-emitter saturation resistance • Table 7: switching times added • Figure 5, 6, 8 and 12: amended • Section 8 "Test information": added • Figure 15: superseded by minimized package outline drawing • Section 10 "Packing information": added • Section 11 "Soldering": added • Section 13 "Legal information": updated			
PBSS8110Z_1	20040426	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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Contact Us :

➤ Address :

401 Building No.5, JiuGe Business Center, Lane 2301, Yishan Rd
Minhang District, Shanghai , China

➤ Sales :

Direct +86 (21) 6401-6692

Email amall@ameya360.com

QQ 800077892

Skype ameyasales1 ameyasales2

➤ Customer Service :

Email service@ameya360.com

➤ Partnership :

Tel +86 (21) 64016692-8333

Email mkt@ameya360.com