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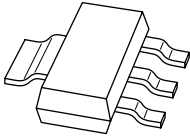
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Kind regards,

Team Nexperia



# 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

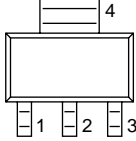
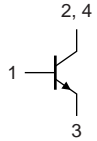
Table 1. Quick reference data

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 $\Omega$

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

## 2. Pinning information

**Table 2. Pinning**

Pin	Description	Simplified outline	Symbol
1	base		
2	collector		
3	emitter		
4	collector		

*sym016*

## 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).*

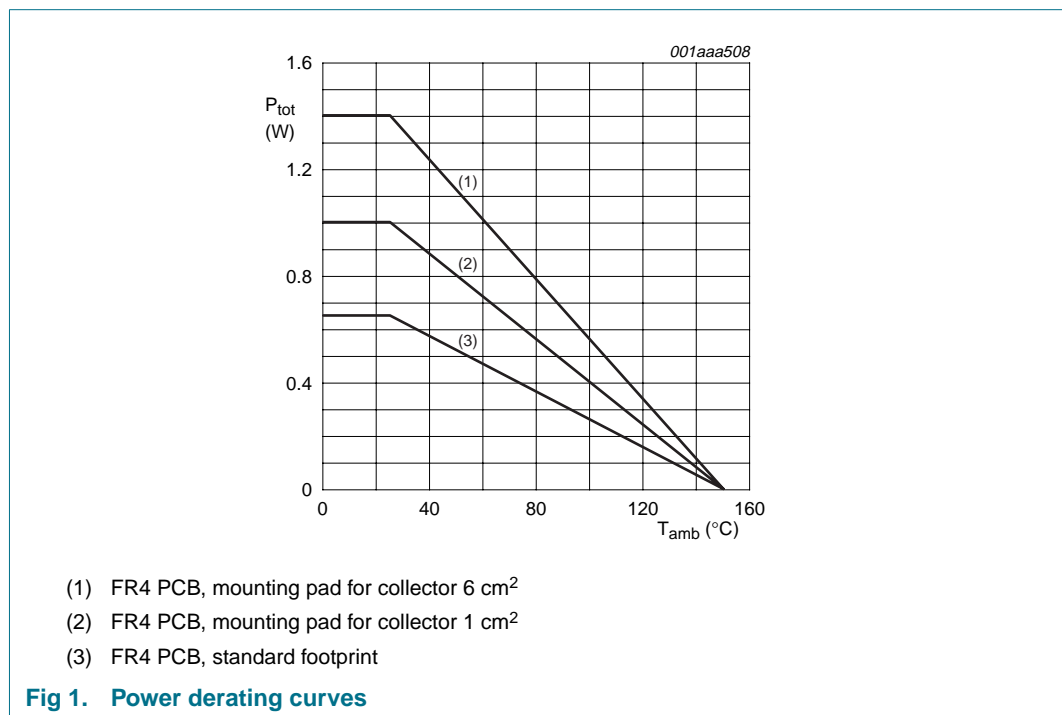
Symbol	Parameter	Conditions	Min	Max	Unit	
$V_{CBO}$	collector-base voltage	open emitter	-	120	V	
$V_{CEO}$	collector-emitter voltage	open base	-	100	V	
$V_{EBO}$	emitter-base voltage	open collector	-	5	V	
$I_C$	collector current		-	1	A	
$I_{CM}$	peak collector current	single pulse; $t_p \leq 1$ ms	-	3	A	
$I_B$	base current		-	0.3	A	
$P_{tot}$	total power dissipation	$T_{amb} \leq 25$ °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 cm<sup>2</sup>.
- [3] Device mounted on an FR4 PCB, single-sided copper, tin-plated, mounting pad for collector 6 cm<sup>2</sup>.

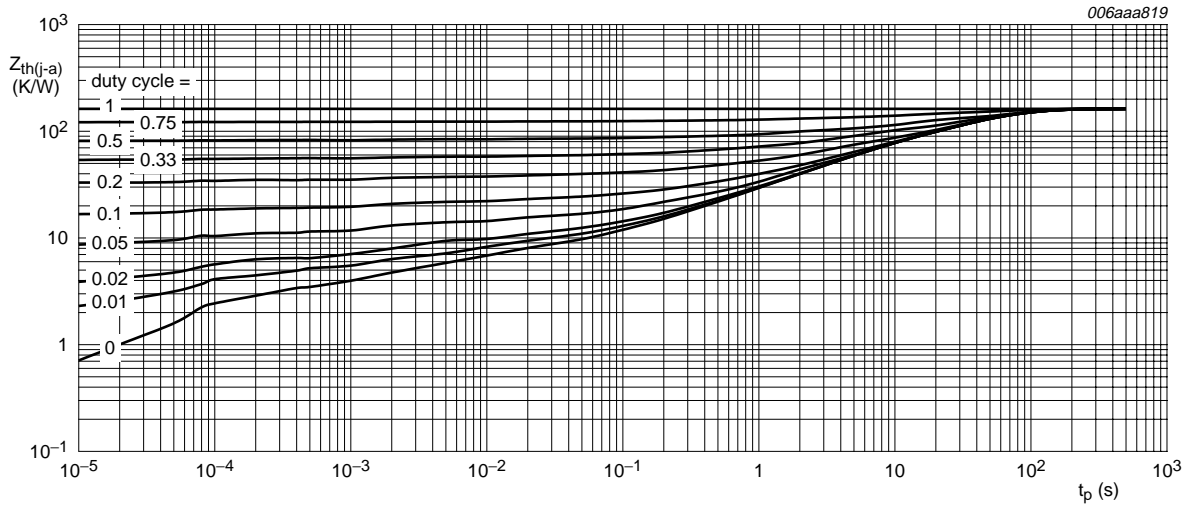


## 6. Thermal characteristics

**Table 6. Thermal characteristics**

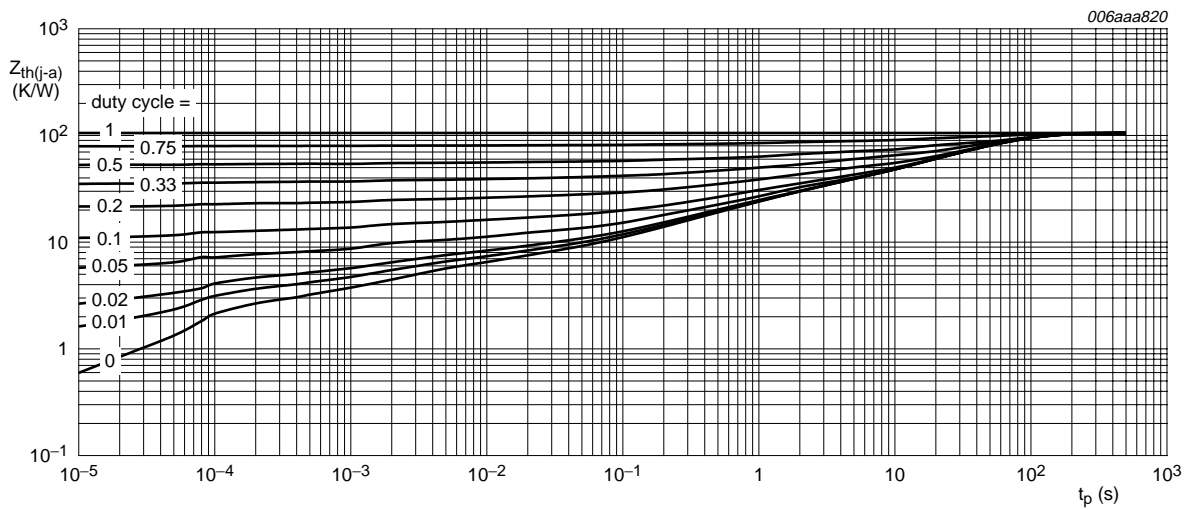
Symbol	Parameter	Conditions	Min	Typ	Max	Unit	
$R_{th(j-a)}$	thermal resistance from junction to ambient	in free air	[1]	-	-	192	K/W
			[2]	-	-	125	K/W
			[3]	-	-	89	K/W
$R_{th(j-sp)}$	thermal resistance from junction to solder point		-	-	17	K/W	

- [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 cm<sup>2</sup>.
- [3] Device mounted on an FR4 PCB, single-sided copper, tin-plated, mounting pad for collector 6 cm<sup>2</sup>.



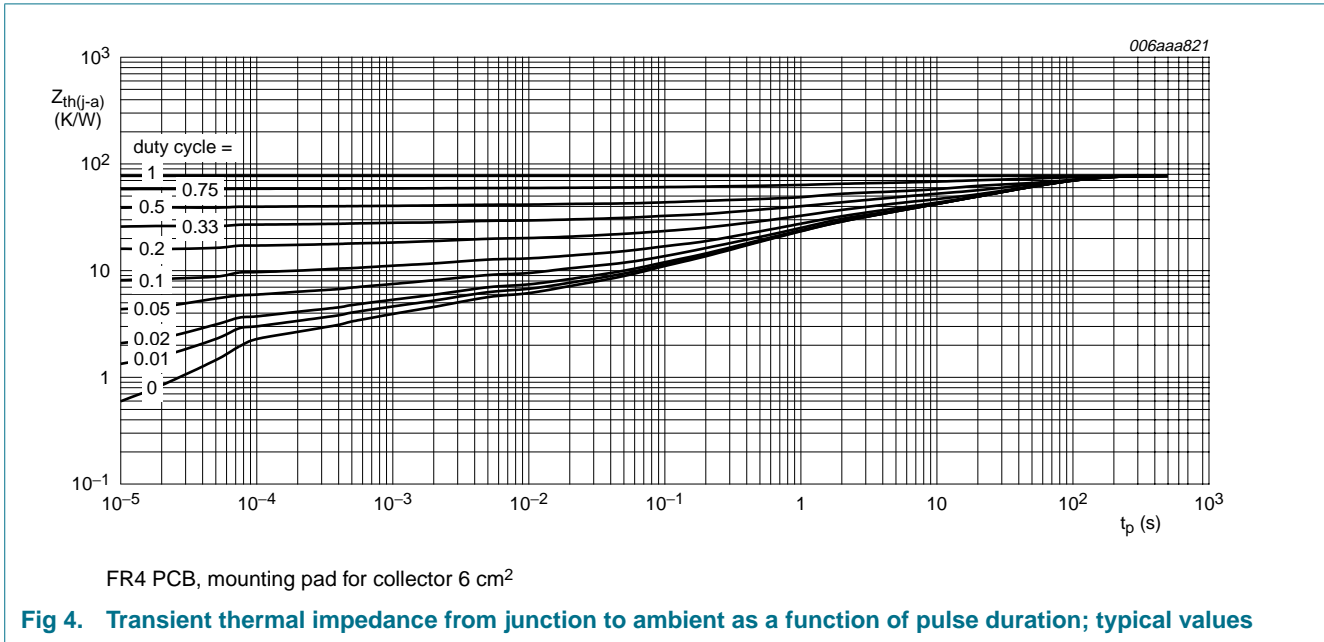
FR4 PCB, standard footprint

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



FR4 PCB, mounting pad for collector 1 cm<sup>2</sup>

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



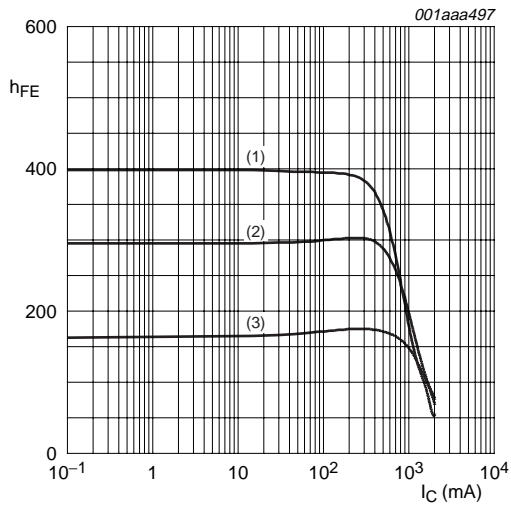
## 7. Characteristics

**Table 7. Characteristics**

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

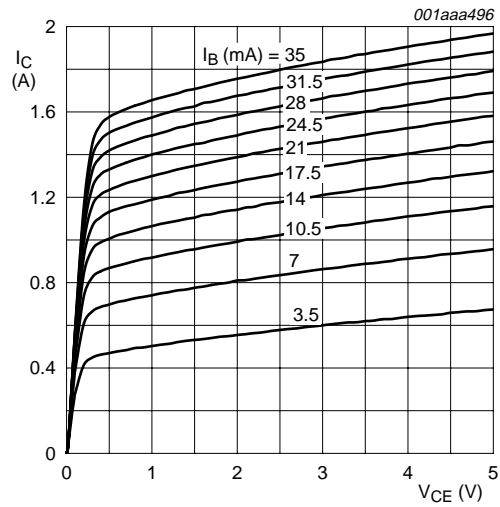
Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$I_{CBO}$	collector-base cut-off current	$V_{CB} = 80\text{ V}; I_E = 0\text{ A}$	-	-	100	nA
		$V_{CB} = 80\text{ V}; I_E = 0\text{ A}; T_j = 150^\circ\text{C}$	-	-	50	$\mu\text{A}$
$I_{CES}$	collector-emitter cut-off current	$V_{CE} = 80\text{ V}; V_{BE} = 0\text{ V}$	-	-	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:  $t_p \leq 300\ \mu\text{s}; \delta \leq 0.02$ .



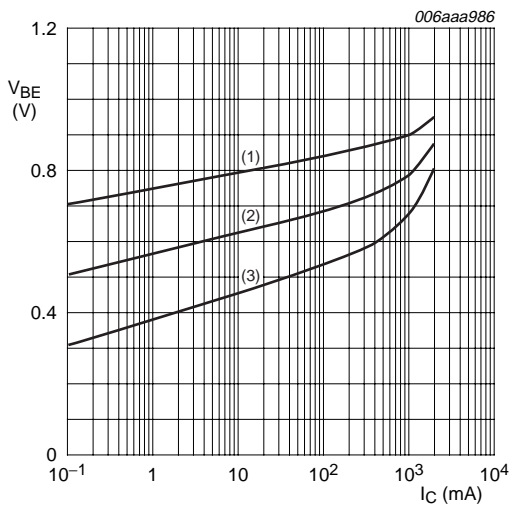
$V_{CE} = 10 V$   
 (1)  $T_{amb} = 100^\circ C$   
 (2)  $T_{amb} = 25^\circ C$   
 (3)  $T_{amb} = -55^\circ C$

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



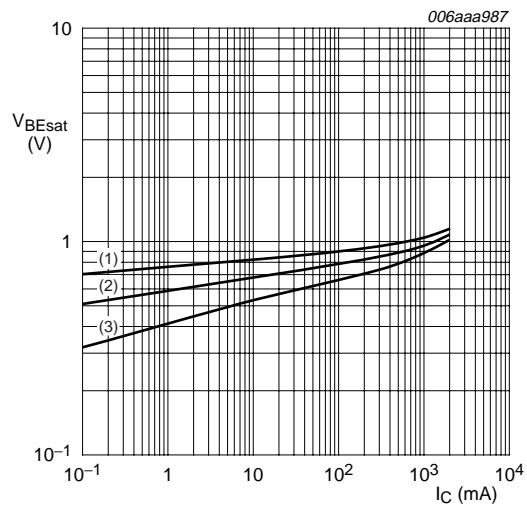
$T_{amb} = 25^\circ C$

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



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

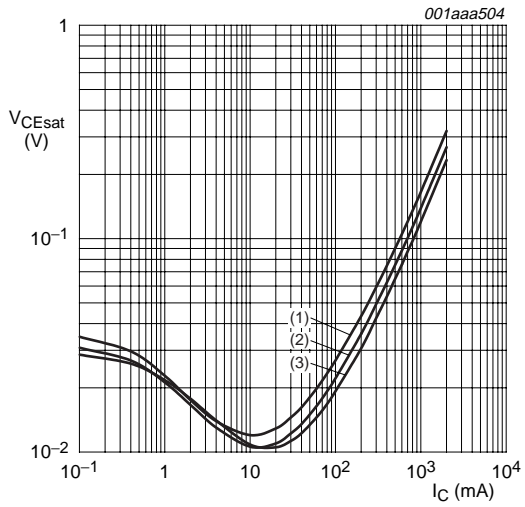
**Fig 7. Base-emitter voltage as a function of collector current; typical values**



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

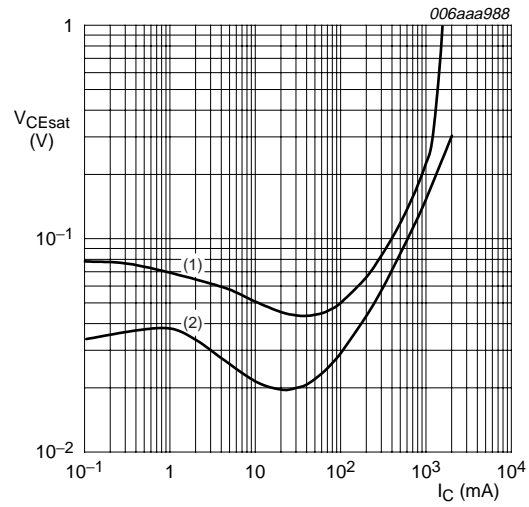
**Fig 8. Base-emitter saturation voltage as a function of collector current; typical values**





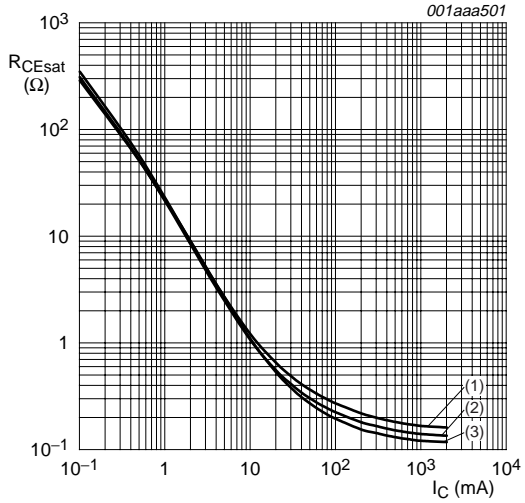
$I_C/I_B = 10$   
 (1)  $T_{amb} = 100\text{ °C}$   
 (2)  $T_{amb} = 25\text{ °C}$   
 (3)  $T_{amb} = -55\text{ °C}$

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



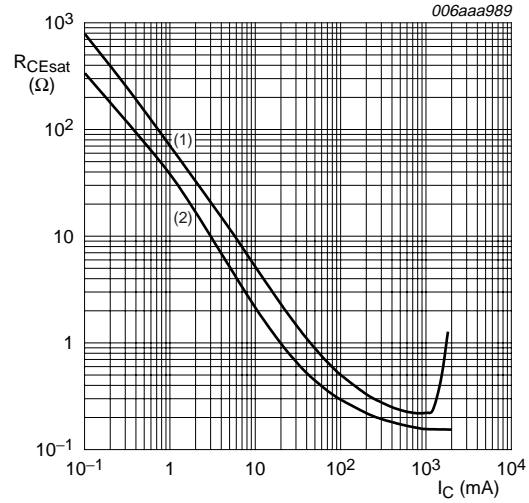
$T_{amb} = 25\text{ °C}$   
 (1)  $I_C/I_B = 50$   
 (2)  $I_C/I_B = 20$

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



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

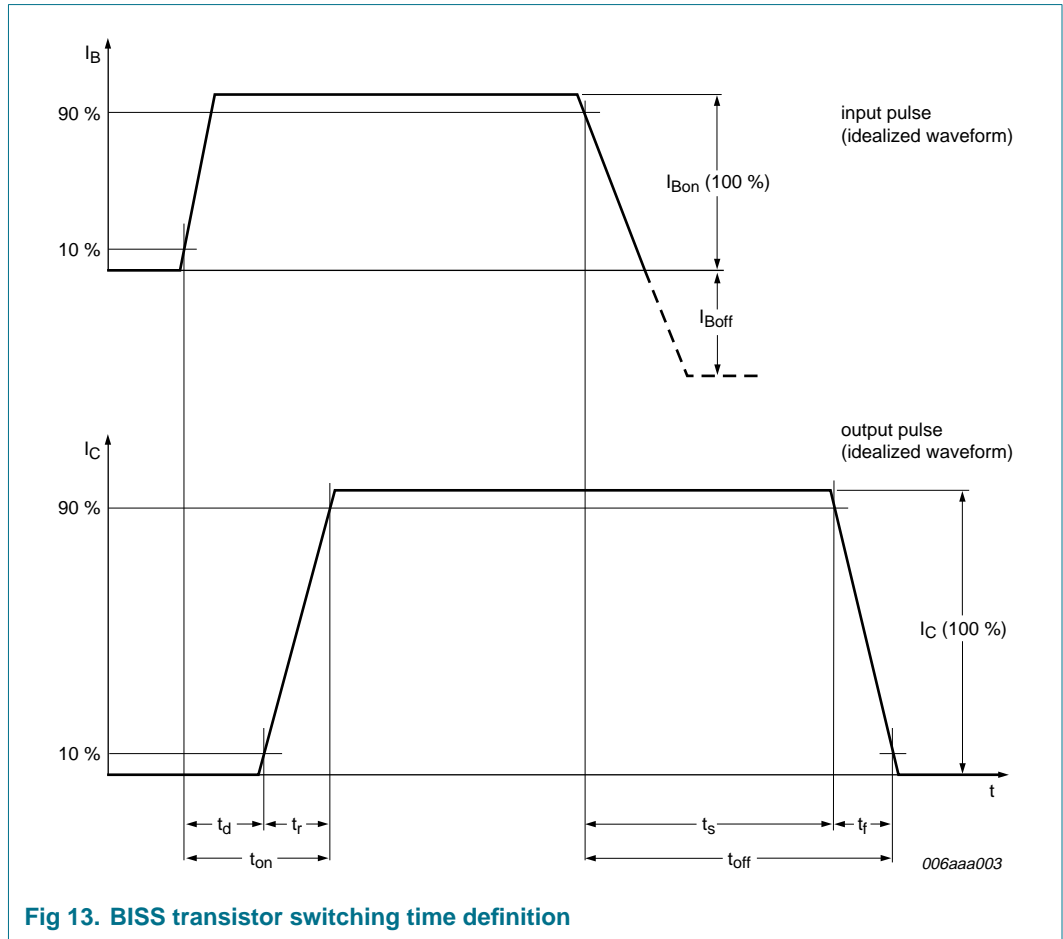
**Fig 11. Collector-emitter saturation resistance as a function of collector current; typical values**



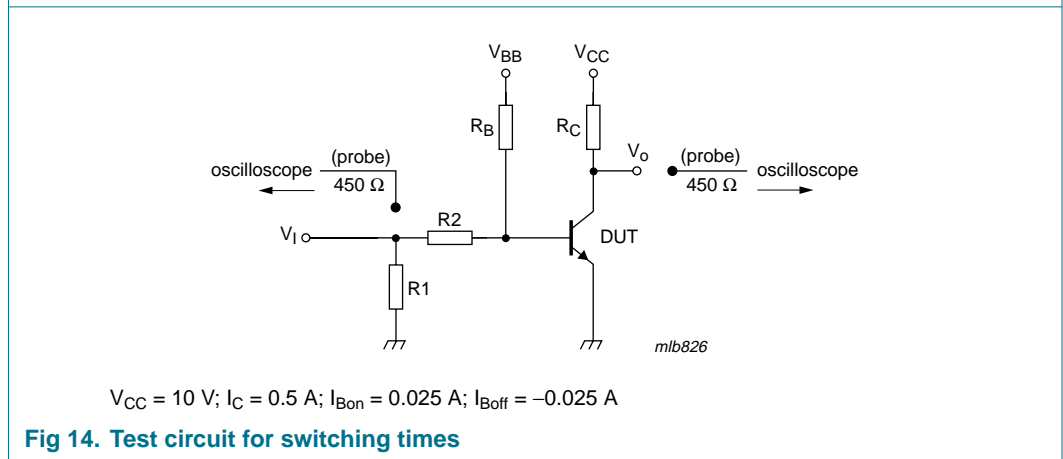
$T_{amb} = 25\text{ °C}$   
 (1)  $I_C/I_B = 50$   
 (2)  $I_C/I_B = 20$

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

**8. Test information**



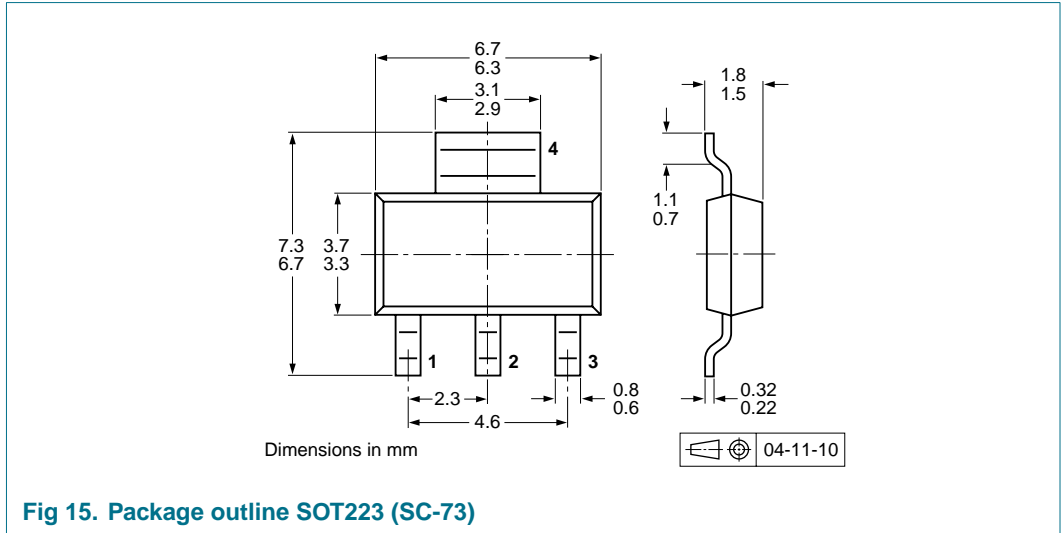
**Fig 13. BISS transistor switching time definition**



$V_{CC} = 10\text{ V}; I_C = 0.5\text{ A}; I_{B(on)} = 0.025\text{ A}; I_{B(off)} = -0.025\text{ A}$

**Fig 14. Test circuit for switching times**

**9. Package outline**



**10. Packing information**

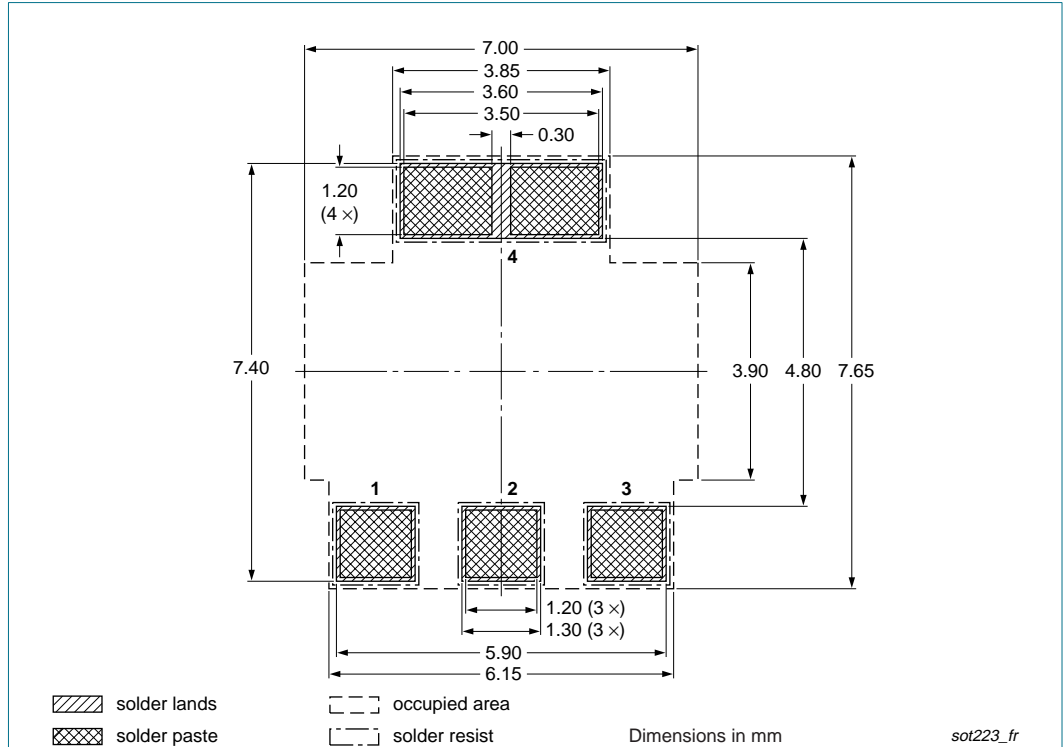
**Table 8. Packing methods**

The indicated -xxx are the last three digits of the 12NC ordering code.<sup>[1]</sup>

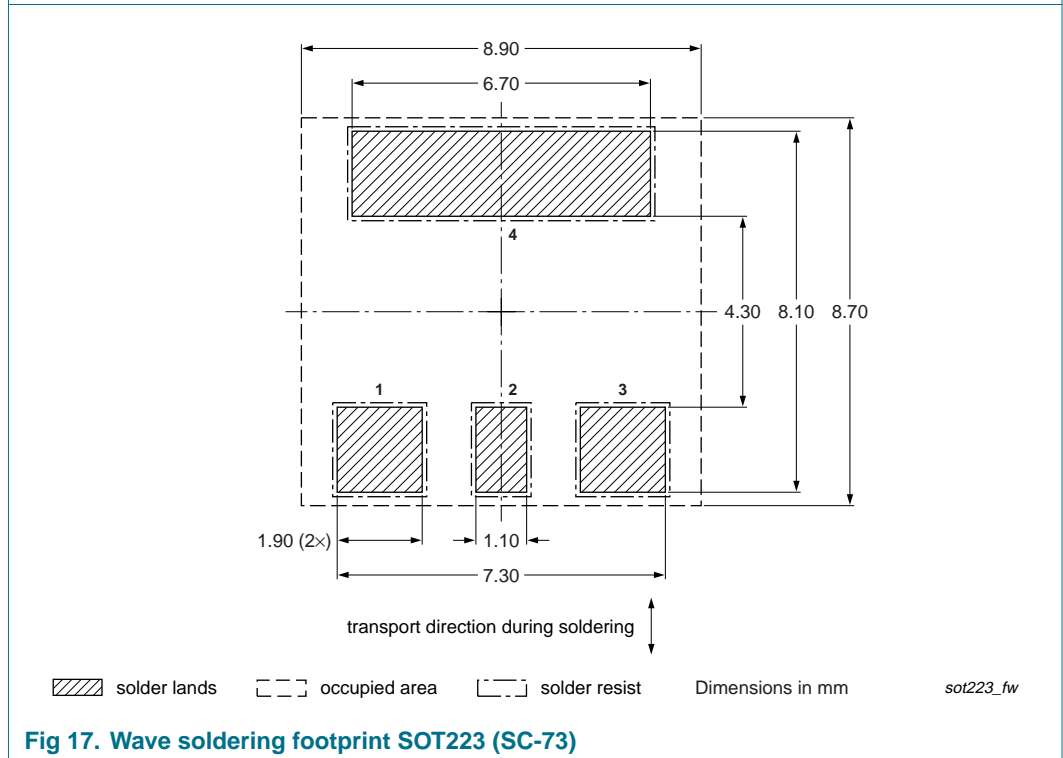
Type number	Package	Description	Packing quantity	
			1000	4000
PBSS8110Z	SOT223	8 mm pitch, 12 mm tape and reel	-115	-135

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

**11. Soldering**



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



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

## 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:	<ul style="list-style-type: none"> <li>• The format of this data sheet has been redesigned to comply with the new identity guidelines of NXP Semiconductors.</li> <li>• Legal texts have been adapted to the new company name where appropriate.</li> <li>• <a href="#">Section 1.1 “General description”</a>: amended</li> <li>• <a href="#">Section 1.2 “Features”</a>: amended</li> <li>• <a href="#">Section 1.3 “Applications”</a>: amended</li> <li>• <a href="#">Table 1 “Quick reference data”</a>: conditions for <math>I_{CM}</math> peak collector current adapted</li> <li>• <a href="#">Table 1</a>: <math>R_{CEsat}</math> equivalent on-resistance redefined to collector-emitter saturation resistance</li> <li>• <a href="#">Table 2 “Pinning”</a>: simplified outline drawing amended</li> <li>• <a href="#">Table 4 “Marking codes”</a>: amended</li> <li>• <a href="#">Table 5 “Limiting values”</a>: conditions for <math>I_{CM}</math> peak collector current adapted</li> <li>• <a href="#">Table 5</a>: <math>T_{amb}</math> operating ambient temperature redefined to ambient temperature</li> <li>• <a href="#">Table 6 “Thermal characteristics”</a>: amended</li> <li>• <a href="#">Table 6</a>: <math>R_{th(j-s)}</math> thermal resistance from junction to soldering point redefined to <math>R_{th(j-sp)}</math> thermal resistance from junction to solder point</li> <li>• <a href="#">Figure 2</a>: amended</li> <li>• <a href="#">Figure 2</a>: <math>Z_{th}</math> transient thermal impedance redefined to <math>Z_{th(j-a)}</math> transient thermal impedance from junction to ambient</li> <li>• <a href="#">Figure 2</a>: <math>t_p</math> pulse time redefined to pulse duration</li> <li>• <a href="#">Figure 3</a> and <a href="#">4</a>: added</li> <li>• <a href="#">Table 7</a>: <math>R_{CEsat}</math> equivalent on-resistance redefined to collector-emitter saturation resistance</li> <li>• <a href="#">Table 7</a>: switching times added</li> <li>• <a href="#">Figure 5</a>, <a href="#">6</a>, <a href="#">8</a> and <a href="#">12</a>: amended</li> <li>• <a href="#">Section 8 “Test information”</a>: added</li> <li>• <a href="#">Figure 15</a>: superseded by minimized package outline drawing</li> <li>• <a href="#">Section 10 “Packing information”</a>: added</li> <li>• <a href="#">Section 11 “Soldering”</a>: added</li> <li>• <a href="#">Section 13 “Legal information”</a>: updated</li> </ul>			
PBSS8110Z_1	20040426	Product data sheet	-	-

## 13. Legal information

### 13.1 Data sheet status

Document status <sup>[1][2]</sup>	Product status <sup>[3]</sup>	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.

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