

# PBSS9110D

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

Rev. 03 — 22 November 2009

Product data sheet

## 1. Product profile

### 1.1 General description

PNP low  $V_{CEsat}$  Breakthrough In Small Signal (BISS) transistor in a SOT457 (SC-74) small Surface-Mounted Device (SMD) plastic package.

NPN complement: PBSS8110D.

### 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 $\Omega$

[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, 2, 5, 6	collector		 sym030
3	base		
4	emitter		

## 3. Ordering information

**Table 3. Ordering information**

Type number	Package		
	Name	Description	Version
PBSS9110D	SC-74	plastic surface-mounted package (TSOP6); 6 leads	SOT457

## 4. Marking

**Table 4. Marking codes**

Type number	Marking code
PBSS9110D	A7

## 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]	-	300	mW
			[2]	-	550	mW
			[3]	-	700	mW

**Table 5. Limiting values ...continued**

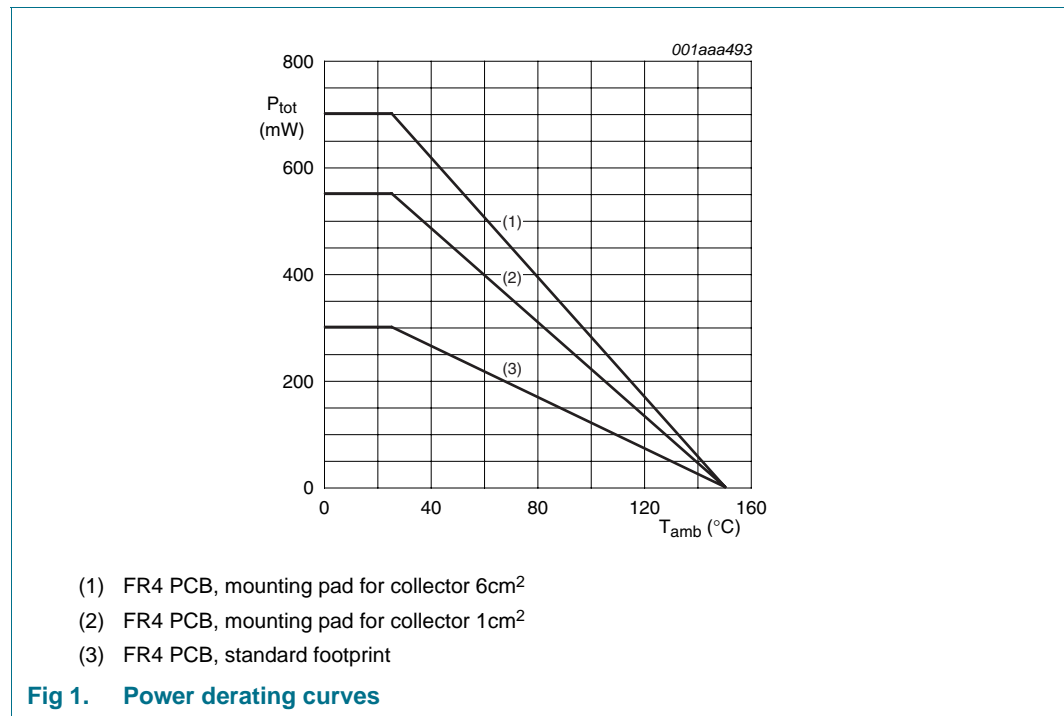
In accordance with the Absolute Maximum Rating System (IEC 60134).

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 1cm<sup>2</sup>.

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



## 6. Thermal characteristics

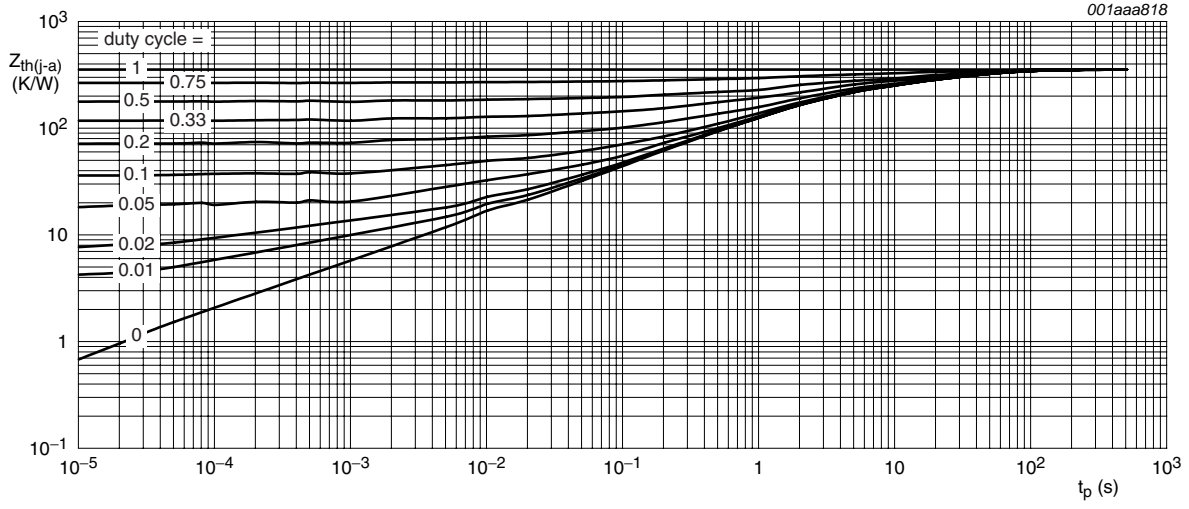
**Table 6. Thermal characteristics**

Symbol	Parameter	Conditions	Min	Typ	Max	Unit	
$R_{th(j-a)}$	thermal resistance from junction to ambient	in free air	[1]	-	-	416	K/W
			[2]	-	-	227	K/W
			[3]	-	-	178	K/W
$R_{th(j-sp)}$	thermal resistance from junction to solder point		-	-	83	K/W	

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

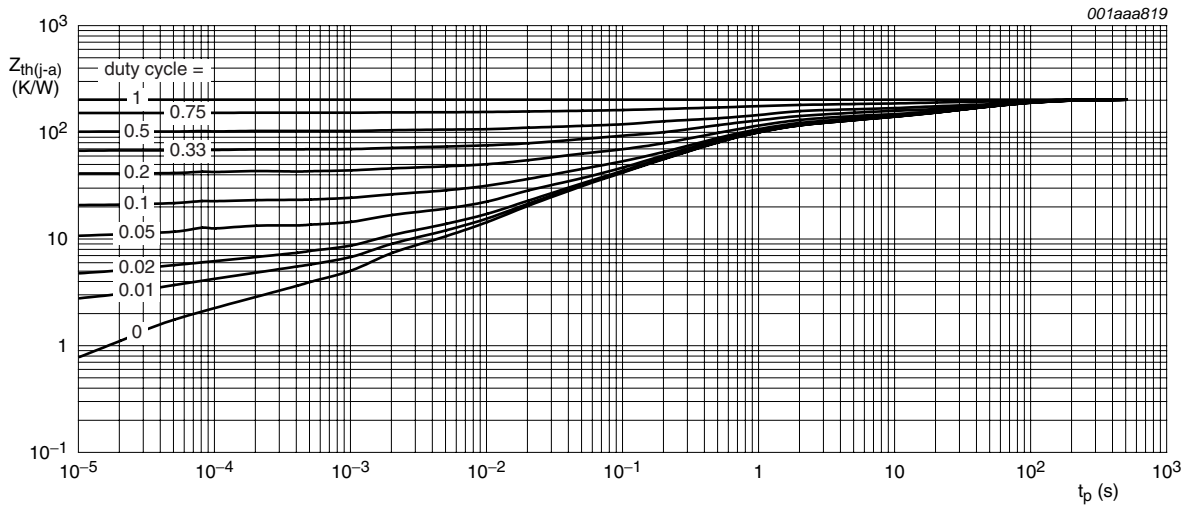
[2] Device mounted on an FR4 PCB, single-sided copper, tin-plated, mounting pad for collector 1cm<sup>2</sup>.

[3] Device mounted on an FR4 PCB, single-sided copper, tin-plated, mounting pad for collector 6cm<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 1cm<sup>2</sup>

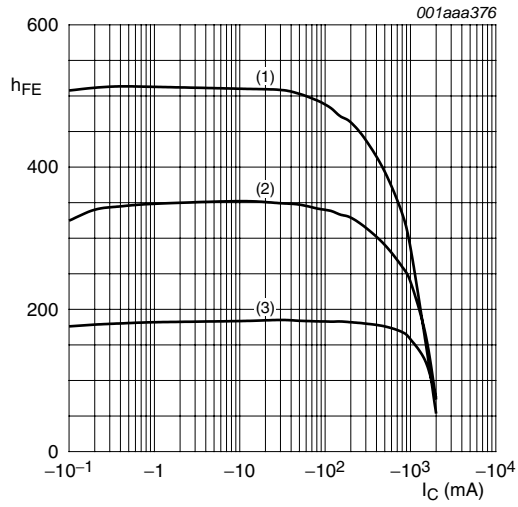
Fig 3. Transient thermal impedance from junction to ambient as a function of pulse duration; typical values

## 7. Characteristics

**Table 7. Characteristics**
 $T_{amb} = 25\text{ }^{\circ}\text{C}$  unless otherwise specified.

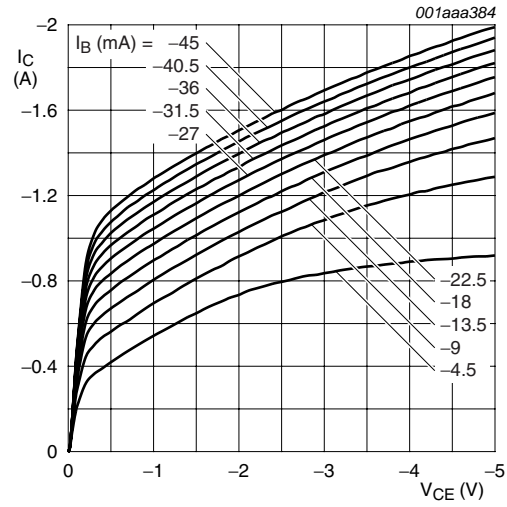
Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$I_{CBO}$	collector-base cut-off current	$V_{CB} = -80\text{ V}; I_E = 0\text{ A}$	-	-	-100	nA
		$V_{CB} = -80\text{ V}; I_E = 0\text{ A}; T_j = 150\text{ }^{\circ}\text{C}$	-	-	-50	$\mu\text{A}$
$I_{CES}$	collector-emitter cut-off current	$V_{CE} = -80\text{ V}; V_{BE} = 0\text{ V}$	-	-	-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	$V_{CE} = -5\text{ V}; I_C = -1\text{ mA}$	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
		$I_C = -0.5\text{ A}; I_B = -50\text{ mA}$	[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	$V_{CE} = -5\text{ V}; I_C = -1\text{ A}$	-	-	-1.0	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	$V_{CB} = -10\text{ V}; I_E = I_e = 0\text{ A}; f = 1\text{ MHz}$	-	-	17	pF

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



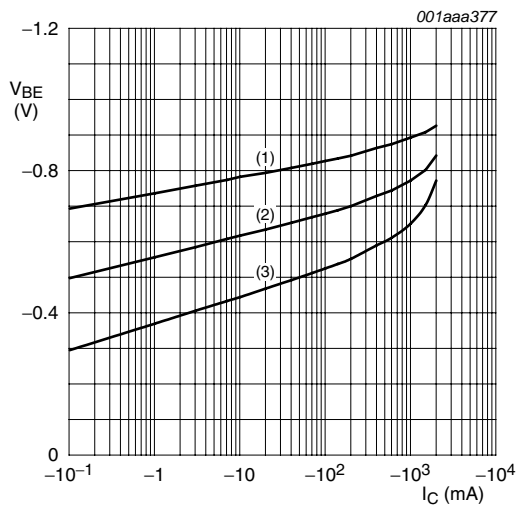
$V_{CE} = -10$  V  
 (1)  $T_{amb} = 100$  °C  
 (2)  $T_{amb} = 25$  °C  
 (3)  $T_{amb} = -55$  °C

**Fig 4. DC current gain as a function of collector current; typical values**



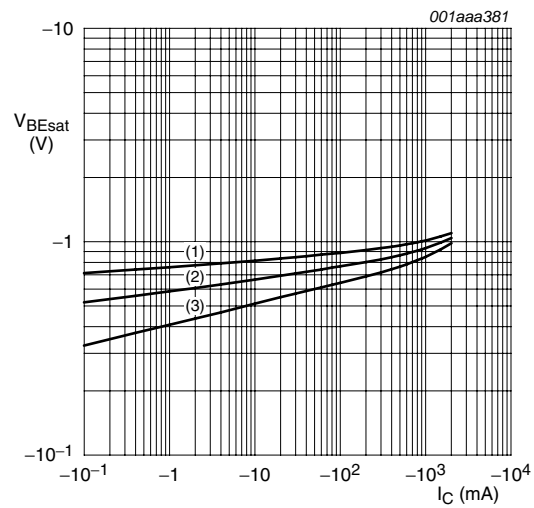
$T_{amb} = 25$  °C

**Fig 5. Collector current as a function of collector-emitter voltage; typical values**



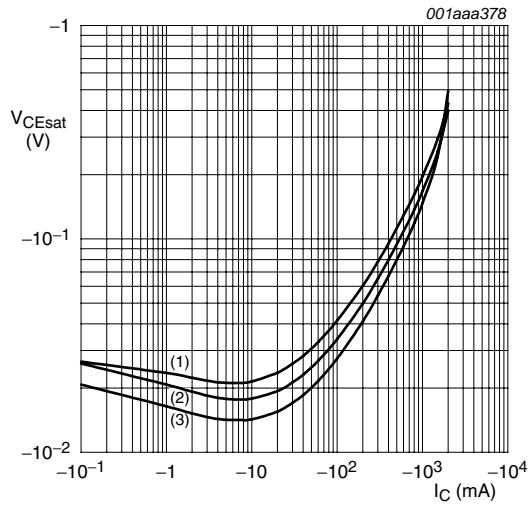
$V_{CE} = -10$  V  
 (1)  $T_{amb} = -55$  °C  
 (2)  $T_{amb} = 25$  °C  
 (3)  $T_{amb} = 100$  °C

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



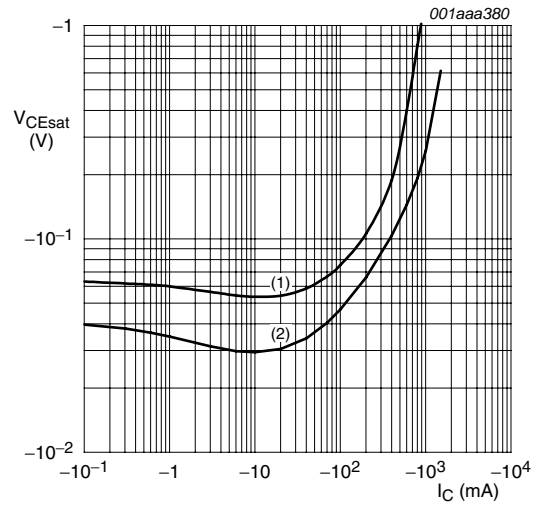
$I_C/I_B = 10$   
 (1)  $T_{amb} = -55$  °C  
 (2)  $T_{amb} = 25$  °C  
 (3)  $T_{amb} = 100$  °C

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



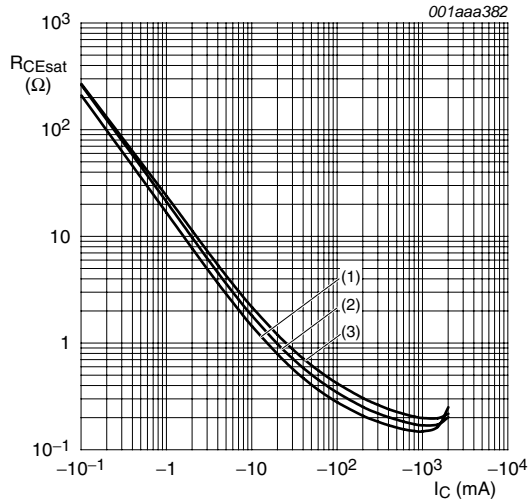
$I_C/I_B = 10$   
 (1)  $T_{amb} = 100\text{ °C}$   
 (2)  $T_{amb} = 25\text{ °C}$   
 (3)  $T_{amb} = -55\text{ °C}$

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



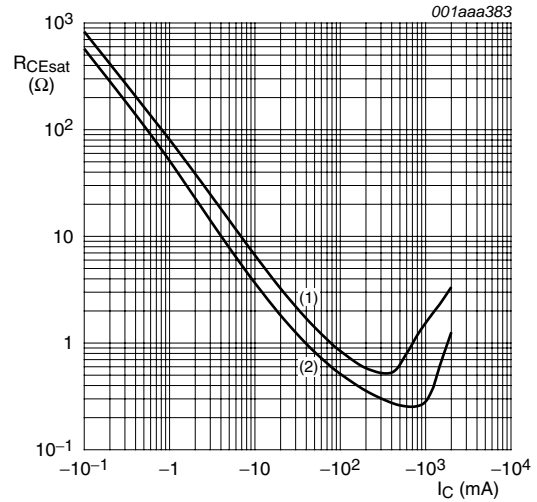
$T_{amb} = 25\text{ °C}$   
 (1)  $I_C/I_B = 50$   
 (2)  $I_C/I_B = 20$

**Fig 9. 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 10. 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 11. Collector-emitter saturation resistance as a function of collector current; typical values**

8. Test information

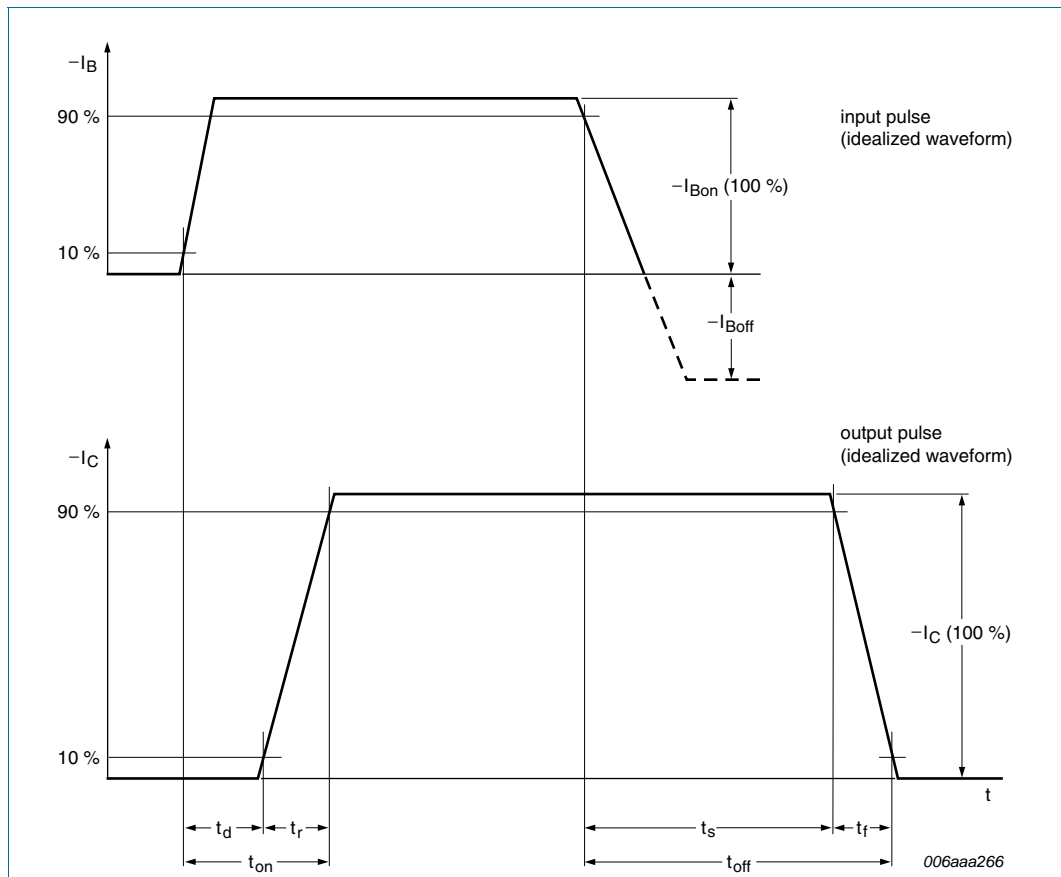
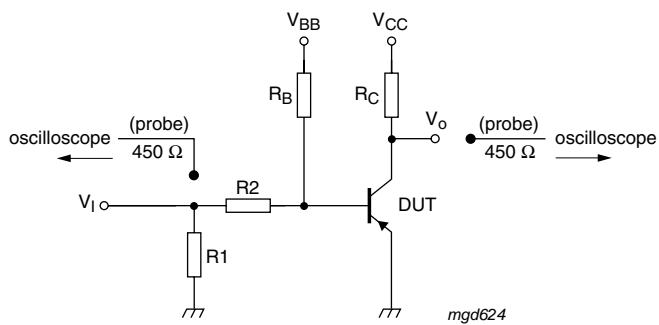


Fig 12. BISS transistor switching time definition



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

Fig 13. Test circuit for switching times



## 9. Package outline

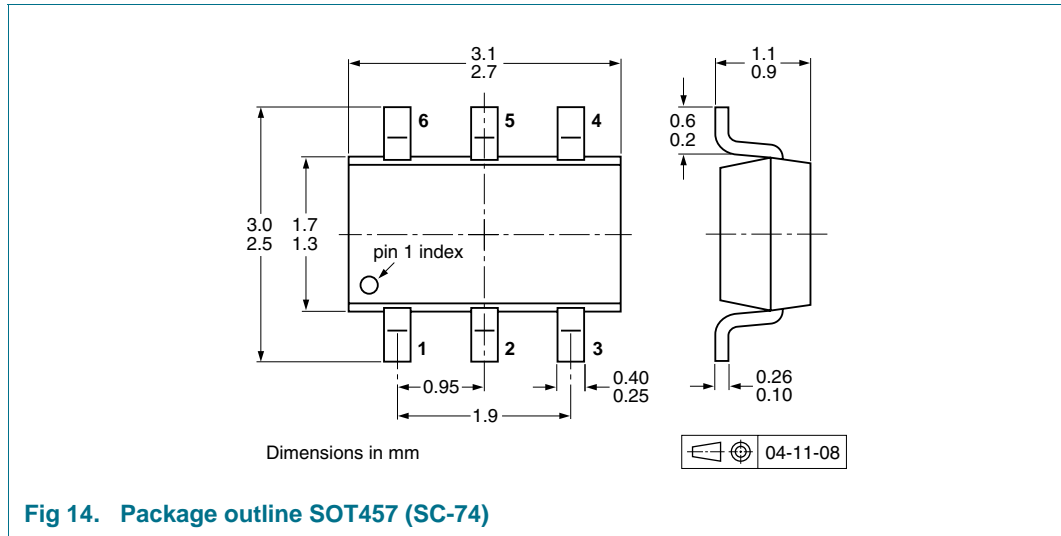


Fig 14. Package outline SOT457 (SC-74)

## 10. Packing information

**Table 8. Packing methods**

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

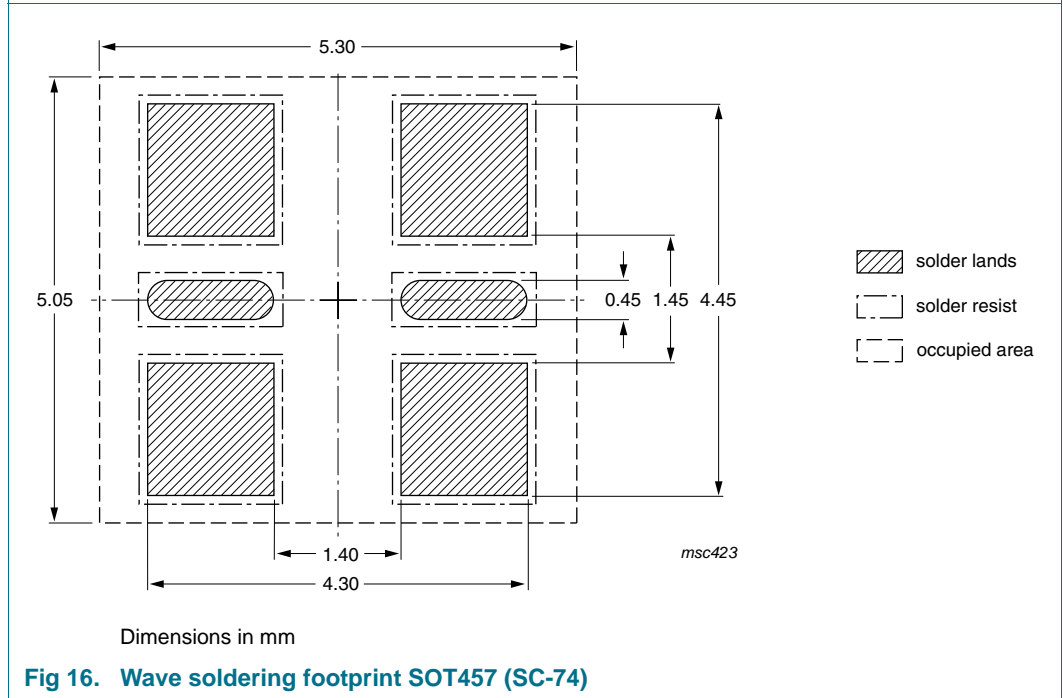
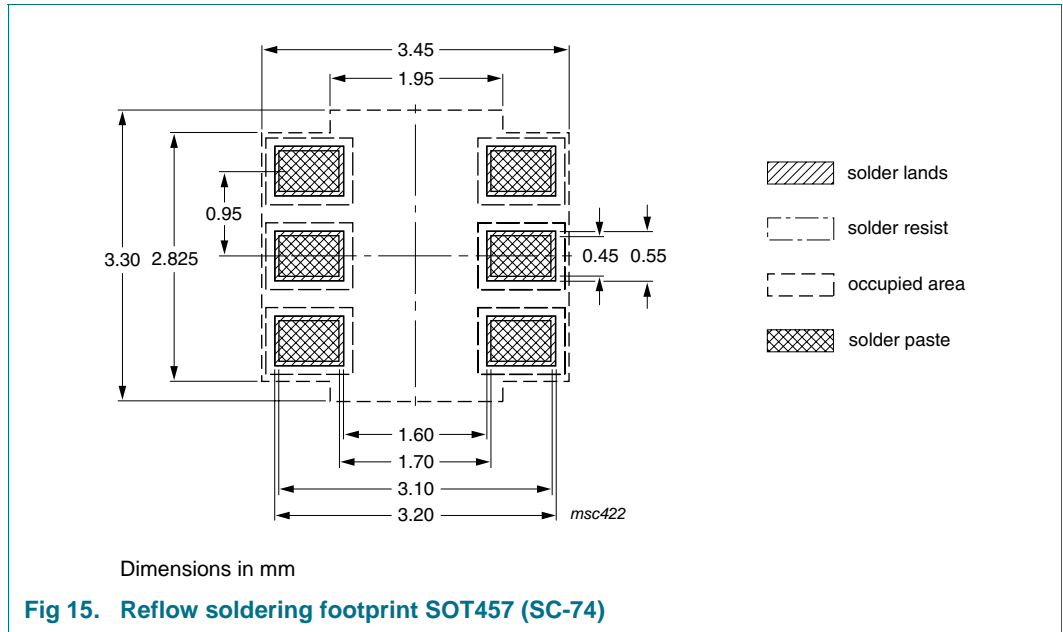
Type number	Package	Description	Packing quantity	
			3000	10000
PBSS9110D	SOT457	4 mm pitch, 8 mm tape and reel; T1	<sup>[2]</sup> -115	-135
		4 mm pitch, 8 mm tape and reel; T2	<sup>[3]</sup> -125	-165

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

[2] T1: normal taping

[3] T2: reverse taping

11. Soldering



## 12. Revision history

Table 9. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
PBSS9110D_3	20091122	Product data sheet	-	PBSS9110D_2
Modifications:		<ul style="list-style-type: none"><li>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.</li><li><a href="#">Figure 16 "Wave soldering footprint SOT457 (SC-74)": updated</a></li></ul>		
PBSS9110D_2	20060713	Product data sheet	-	PBSS9110D_1
PBSS9110D_1	20040611	Objective 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.

[2] The term 'short data sheet' is explained in section "Definitions".

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