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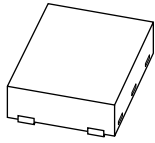
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Kind regards,

Team Nexperia



# PBSS5580PA

80 V, 4 A PNP low  $V_{CEsat}$  (BISS) transistor

Rev. 01 — 6 May 2010

Product data sheet

## 1. Product profile

### 1.1 General description

PNP low  $V_{CEsat}$  Breakthrough In Small Signal (BISS) transistor, encapsulated in an ultra thin SOT1061 leadless small Surface-Mounted Device (SMD) plastic package with medium power capability.

NPN complement: PBSS4580PA.

### 1.2 Features and benefits

- Low collector-emitter saturation voltage  $V_{CEsat}$
- High collector current capability  $I_C$  and  $I_{CM}$
- Smaller required Printed-Circuit Board (PCB) area than for conventional transistors
- Exposed heat sink for excellent thermal and electrical conductivity
- Leadless small SMD plastic package with medium power capability

### 1.3 Applications

- Loadswitch
- Battery-driven devices
- Power management
- Charging circuits
- Power switches (e.g. motors, fans)

### 1.4 Quick reference data

Table 1. Quick reference data

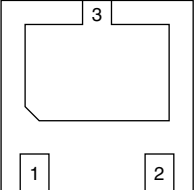
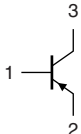
Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$V_{CEO}$	collector-emitter voltage	open base	-	-	-80	V
$I_C$	collector current		-	-	-4	A
$I_{CM}$	peak collector current	single pulse; $t_p \leq 1$ ms	-	-	-5	A
$R_{CEsat}$	collector-emitter saturation resistance	$I_C = -4$ A; $I_B = -200$ mA	<a href="#">[1]</a> -	65	105	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	Graphic symbol
1	base	 <p>Transparent top view</p>	 <p>sym013</p>
2	emitter		
3	collector		

## 3. Ordering information

Table 3. Ordering information

Type number	Package		
	Name	Description	Version
PBSS5580PA	HUSON3	plastic thermal enhanced ultra thin small outline package; no leads; three terminals; body $2 \times 2 \times 0.65$ mm	SOT1061

## 4. Marking

Table 4. Marking codes

Type number	Marking code
PBSS5580PA	AF

## 5. Limiting values

Table 5. Limiting values

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

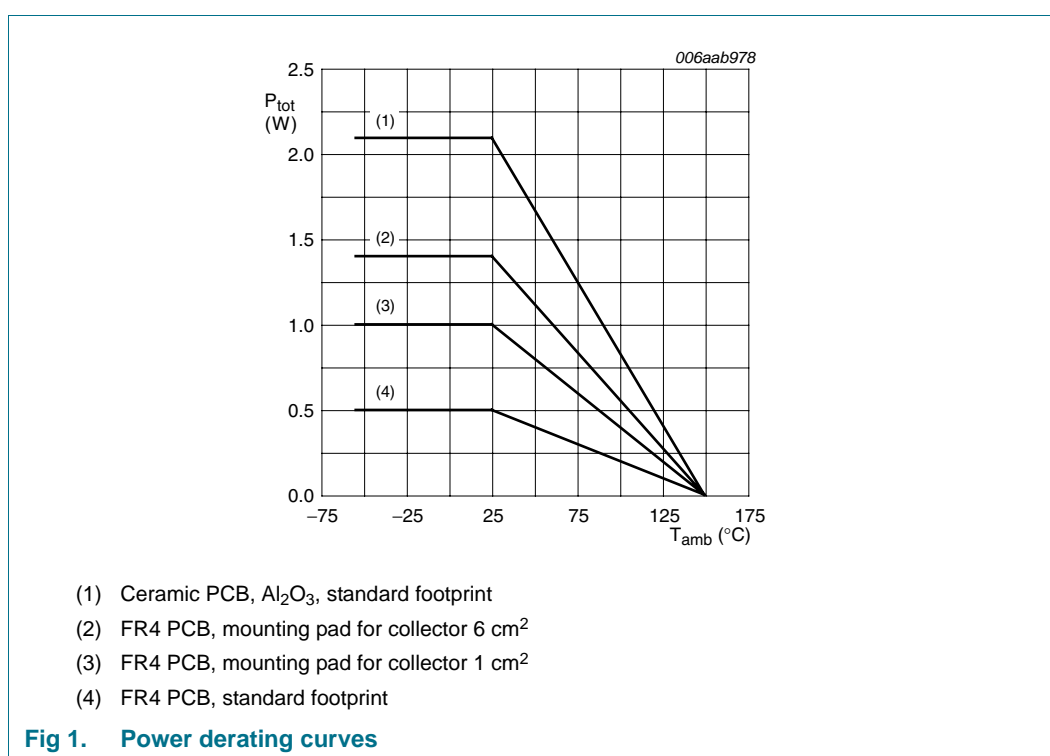
Symbol	Parameter	Conditions	Min	Max	Unit
V <sub>CBO</sub>	collector-base voltage	open emitter	-	−80	V
V <sub>CEO</sub>	collector-emitter voltage	open base	-	−80	V
V <sub>EBO</sub>	emitter-base voltage	open collector	-	−7	V
I <sub>C</sub>	collector current		-	−4	A
I <sub>CM</sub>	peak collector current	single pulse; t <sub>p</sub> ≤ 1 ms	-	−5	A
I <sub>B</sub>	base current		-	−600	mA
P <sub>tot</sub>	total power dissipation	T <sub>amb</sub> ≤ 25 °C	[1] -	500	mW
			[2] -	1	W
			[3] -	1.4	W
			[4] -	2.1	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		-55	+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>.  
 [4] Device mounted on a ceramic PCB, Al<sub>2</sub>O<sub>3</sub>, standard footprint.

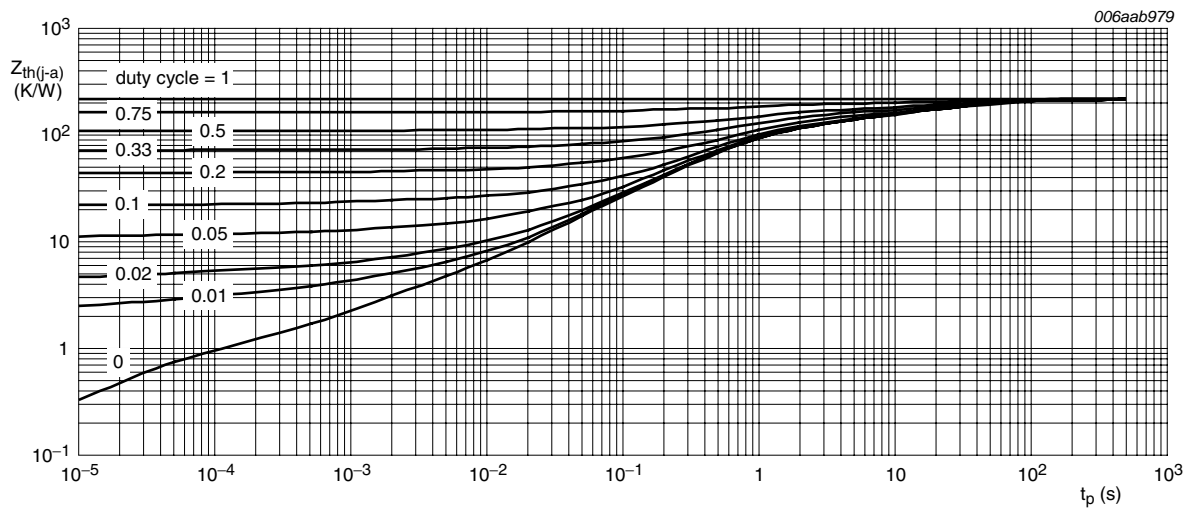


## 6. Thermal characteristics

**Table 6.** Thermal characteristics

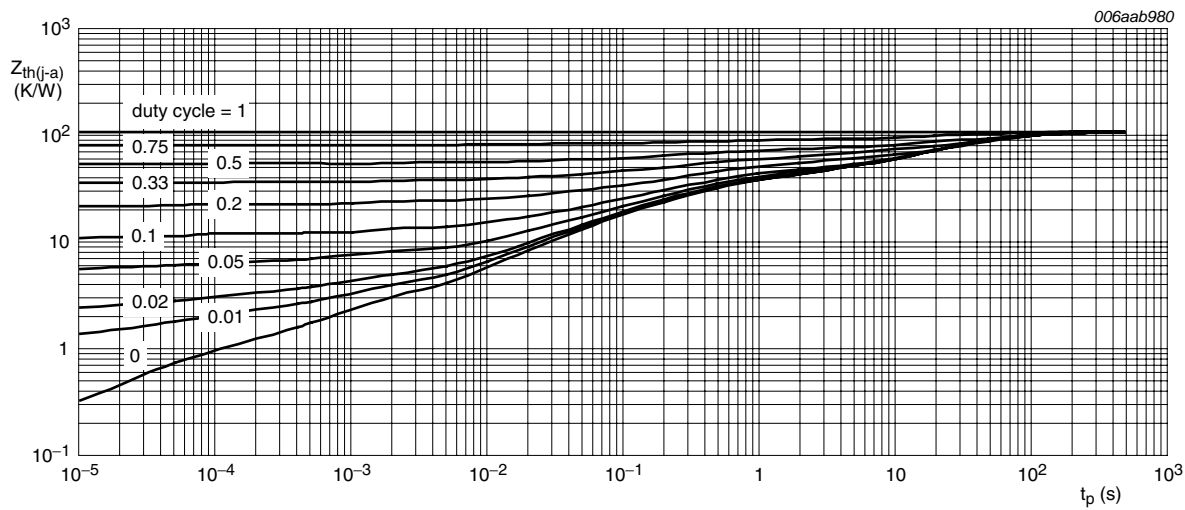
Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$R_{th(j-a)}$	thermal resistance from junction to ambient	in free air	[1]	-	250	K/W
			[2]	-	125	K/W
			[3]	-	90	K/W
			[4]	-	60	K/W

- [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>.  
 [4] Device mounted on a ceramic PCB, Al<sub>2</sub>O<sub>3</sub>, standard footprint.



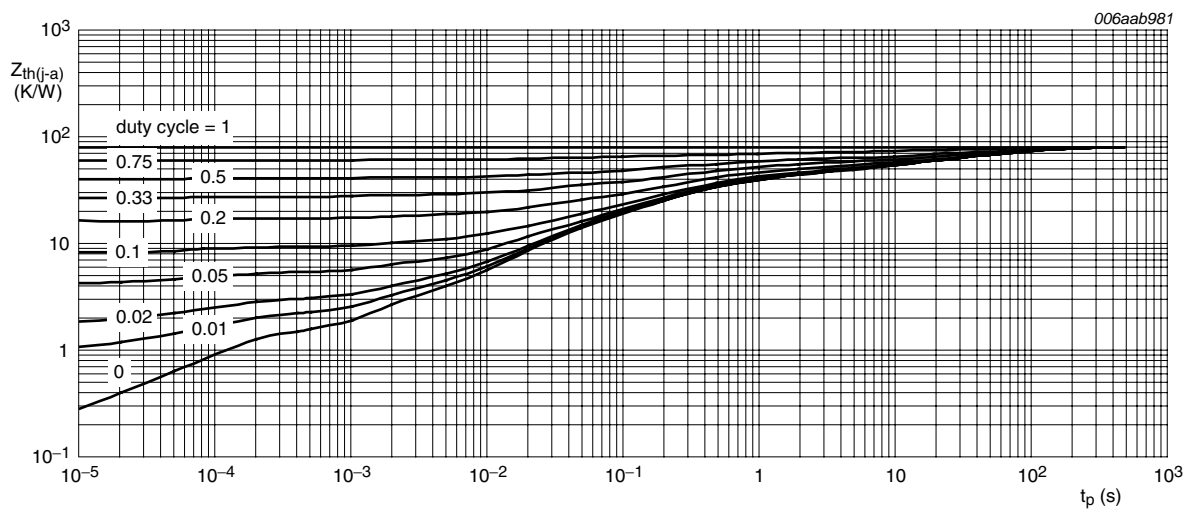
FR4 PCB, standard footprint

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



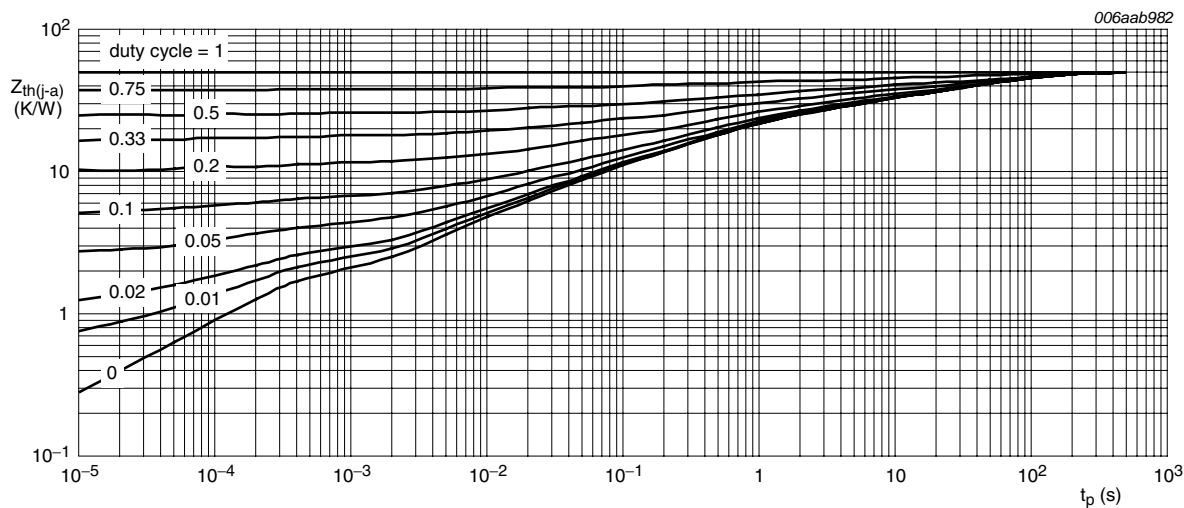
FR4 PCB, mounting pad for collector 1 cm<sup>2</sup>

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



FR4 PCB, mounting pad for collector 6 cm<sup>2</sup>

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



Ceramic PCB, Al<sub>2</sub>O<sub>3</sub>, standard footprint

Fig 5. Transient thermal impedance from junction to ambient as a function of pulse duration; typical values

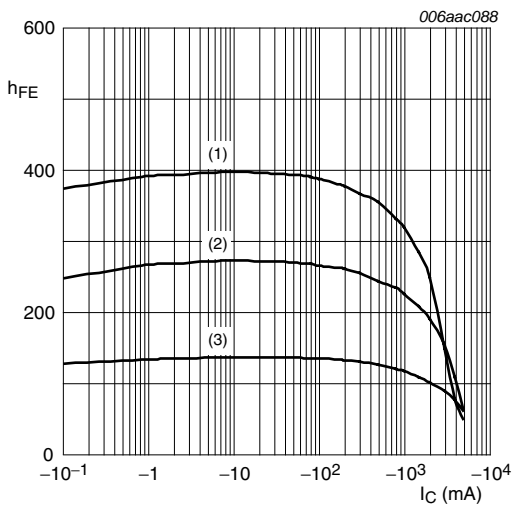
## 7. Characteristics

**Table 7. Characteristics**

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

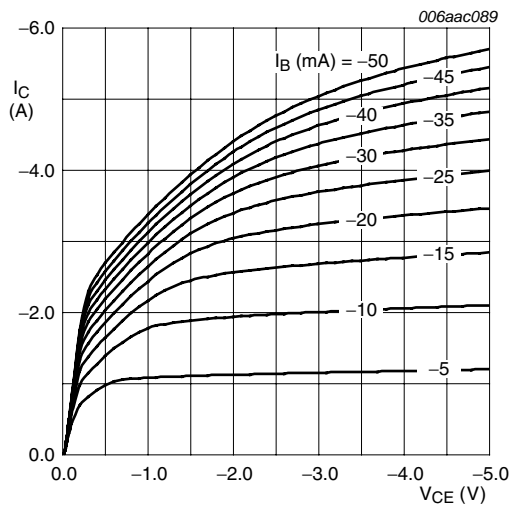
Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$I_{CBO}$	collector-base cut-off current	$V_{CB} = -64\text{ V}; I_E = 0\text{ A}$	-	-	-100	nA
		$V_{CB} = -64\text{ V}; I_E = 0\text{ A}; T_j = 150\text{ }^{\circ}\text{C}$	-	-	-50	$\mu\text{A}$
$I_{CES}$	collector-emitter cut-off current	$V_{CE} = -64\text{ V}; V_{BE} = 0\text{ V}$	-	-	-100	nA
$I_{EBO}$	emitter-base cut-off current	$V_{EB} = -5\text{ V}; I_C = 0\text{ A}$	-	-	-100	nA
$h_{FE}$	DC current gain	$V_{CE} = -2\text{ V}$	[1]			
		$I_C = -0.5\text{ A}$	180	265	-	
		$I_C = -1\text{ A}$	160	240	-	
		$I_C = -2\text{ A}$	140	200	-	
		$I_C = -4\text{ A}$	70	110	-	
$V_{CEsat}$	collector-emitter saturation voltage	$I_C = -0.5\text{ A}; I_B = -50\text{ mA}$	[1]	-	-40	-60 mV
		$I_C = -1\text{ A}; I_B = -50\text{ mA}$	[1]	-	-75	-120 mV
		$I_C = -4\text{ A}; I_B = -400\text{ mA}$	[1]	-	-205	-320 mV
		$I_C = -4\text{ A}; I_B = -200\text{ mA}$	[1]	-	-265	-420 mV
$R_{CEsat}$	collector-emitter saturation resistance	$I_C = -4\text{ A}; I_B = -200\text{ mA}$	[1]	-	65	105 $\text{m}\Omega$
$V_{BEsat}$	base-emitter saturation voltage	$I_C = -1\text{ A}; I_B = -10\text{ mA}$	[1]	-	-0.75	-0.9 V
		$I_C = -4\text{ A}; I_B = -200\text{ mA}$	[1]	-	-0.95	-1.1 V
$V_{BEon}$	base-emitter turn-on voltage	$V_{CE} = -2\text{ V}; I_C = -2\text{ A}$	[1]	-	-0.75	-0.9 V
$t_d$	delay time	$V_{CC} = -9\text{ V}; I_C = -2\text{ A}; I_{Bon} = -0.1\text{ A}; I_{Boff} = 0.1\text{ A}$	-	18	-	ns
$t_r$	rise time		-	82	-	ns
$t_{on}$	turn-on time		-	100	-	ns
$t_s$	storage time		-	360	-	ns
$t_f$	fall time		-	85	-	ns
$t_{off}$	turn-off time		-	445	-	ns
$f_T$	transition frequency	$V_{CE} = -10\text{ V}; I_C = -100\text{ mA}; f = 100\text{ MHz}$	70	110	-	MHz
$C_c$	collector capacitance	$V_{CB} = -10\text{ V}; I_E = I_e = 0\text{ A}; f = 1\text{ MHz}$	-	45	60	pF

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



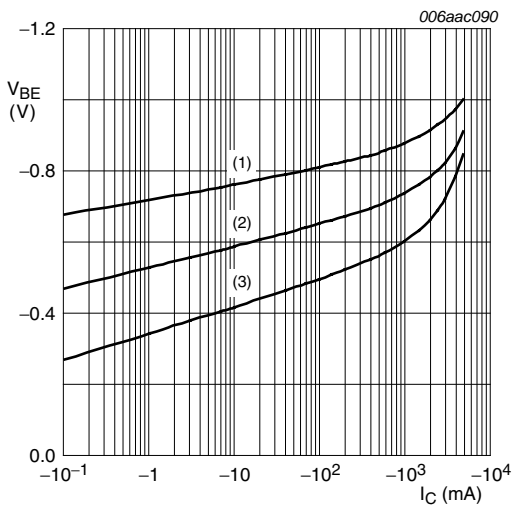
- $V_{CE} = -2\text{ V}$
- (1)  $T_{amb} = 100\text{ }^{\circ}\text{C}$
  - (2)  $T_{amb} = 25\text{ }^{\circ}\text{C}$
  - (3)  $T_{amb} = -55\text{ }^{\circ}\text{C}$

Fig 6. DC current gain as a function of collector current; typical values



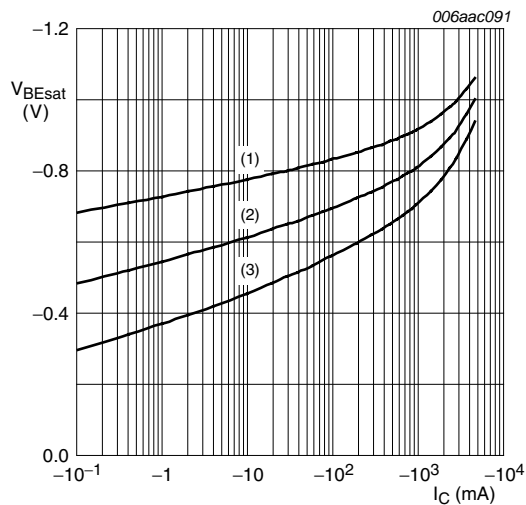
$T_{amb} = 25\text{ }^{\circ}\text{C}$

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



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

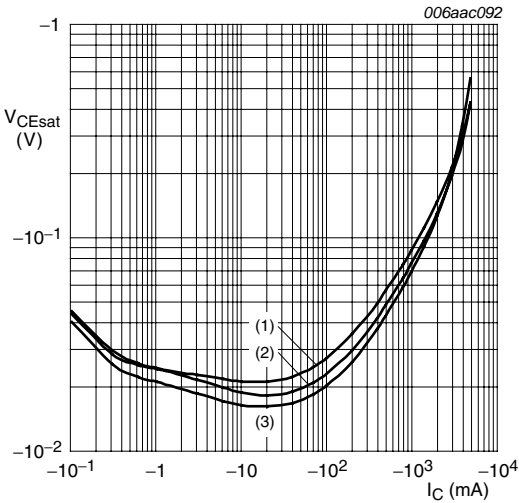
Fig 8. Base-emitter voltage as a function of collector current; typical values



- $I_C/I_B = 20$
- (1)  $T_{amb} = -55\text{ }^{\circ}\text{C}$
  - (2)  $T_{amb} = 25\text{ }^{\circ}\text{C}$
  - (3)  $T_{amb} = 100\text{ }^{\circ}\text{C}$

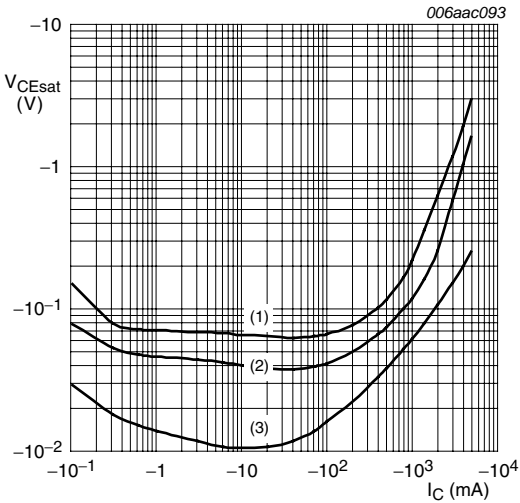
Fig 9. Base-emitter saturation voltage as a function of collector current; typical values





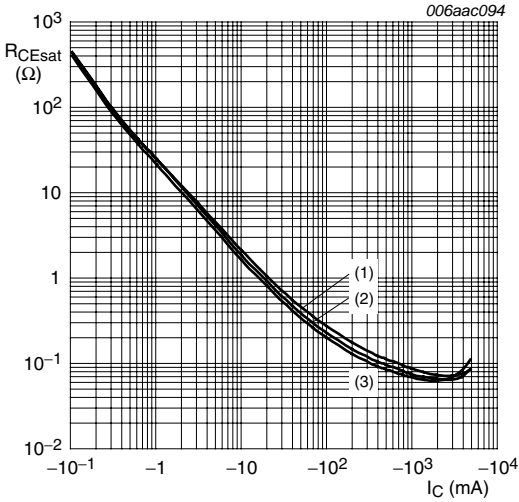
- $I_C/I_B = 20$
- (1)  $T_{amb} = 100\text{ }^{\circ}\text{C}$
  - (2)  $T_{amb} = 25\text{ }^{\circ}\text{C}$
  - (3)  $T_{amb} = -55\text{ }^{\circ}\text{C}$

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



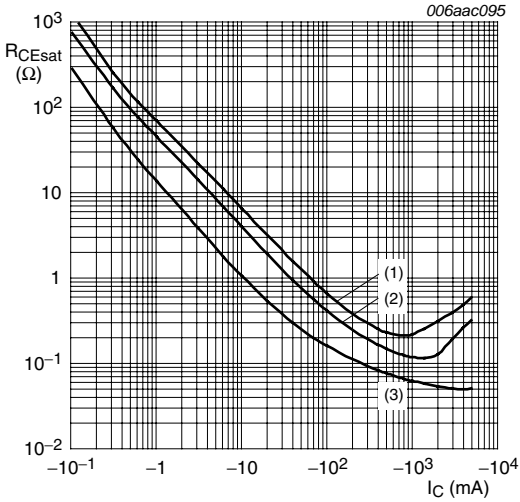
- $T_{amb} = 25\text{ }^{\circ}\text{C}$
- (1)  $I_C/I_B = 100$
  - (2)  $I_C/I_B = 50$
  - (3)  $I_C/I_B = 10$

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



- $I_C/I_B = 20$
- (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 12. Collector-emitter saturation resistance as a function of collector current; typical values



- $T_{amb} = 25\text{ }^{\circ}\text{C}$
- (1)  $I_C/I_B = 100$
  - (2)  $I_C/I_B = 50$
  - (3)  $I_C/I_B = 10$

Fig 13. Collector-emitter saturation resistance as a function of collector current; typical values

8. Test information

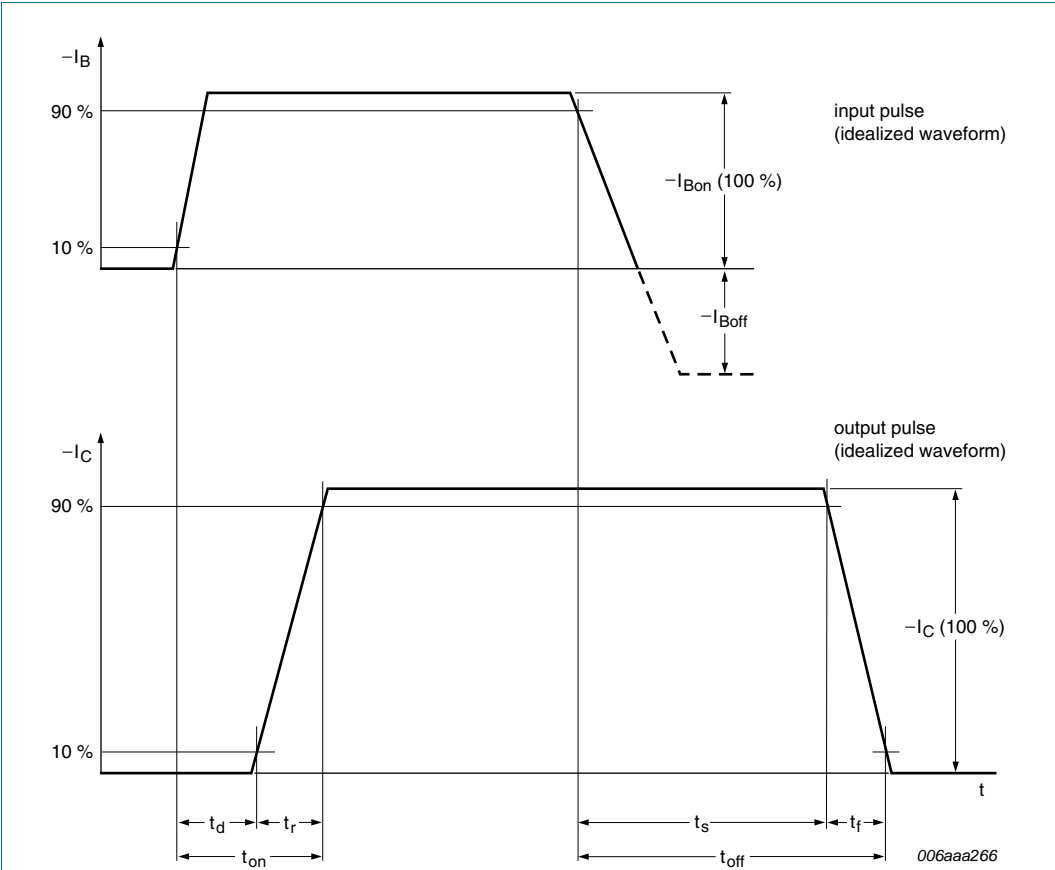
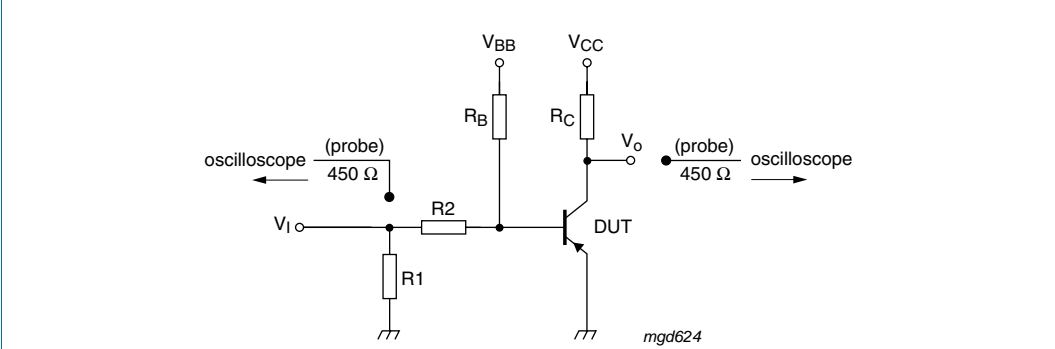


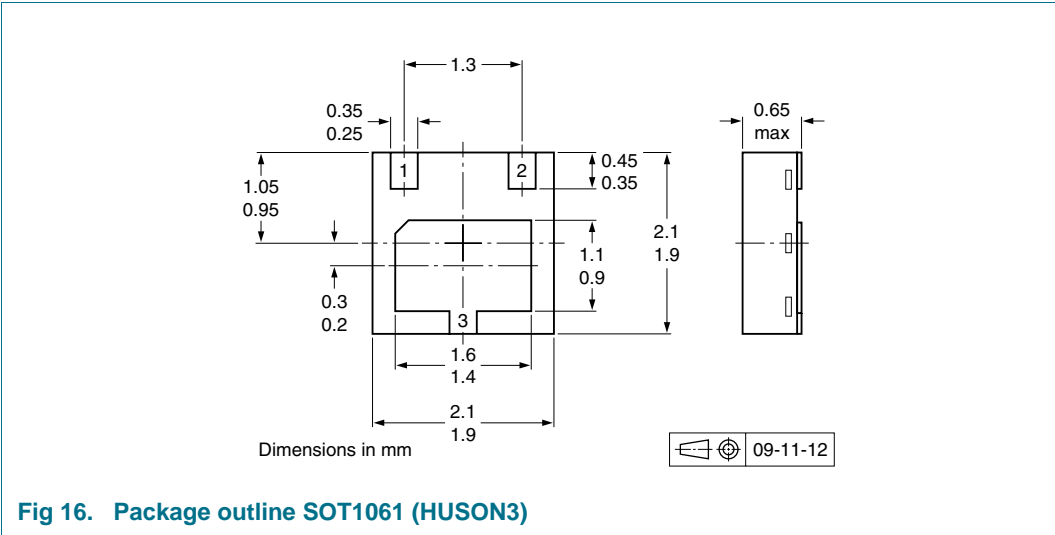
Fig 14. BISS transistor switching time definition



$V_{CC} = -9\text{ V}$ ;  $I_C = -2\text{ A}$ ;  $I_{Bon} = -0.1\text{ A}$ ;  $I_{Boff} = 0.1\text{ A}$

Fig 15. Test circuit for switching times

9. Package outline



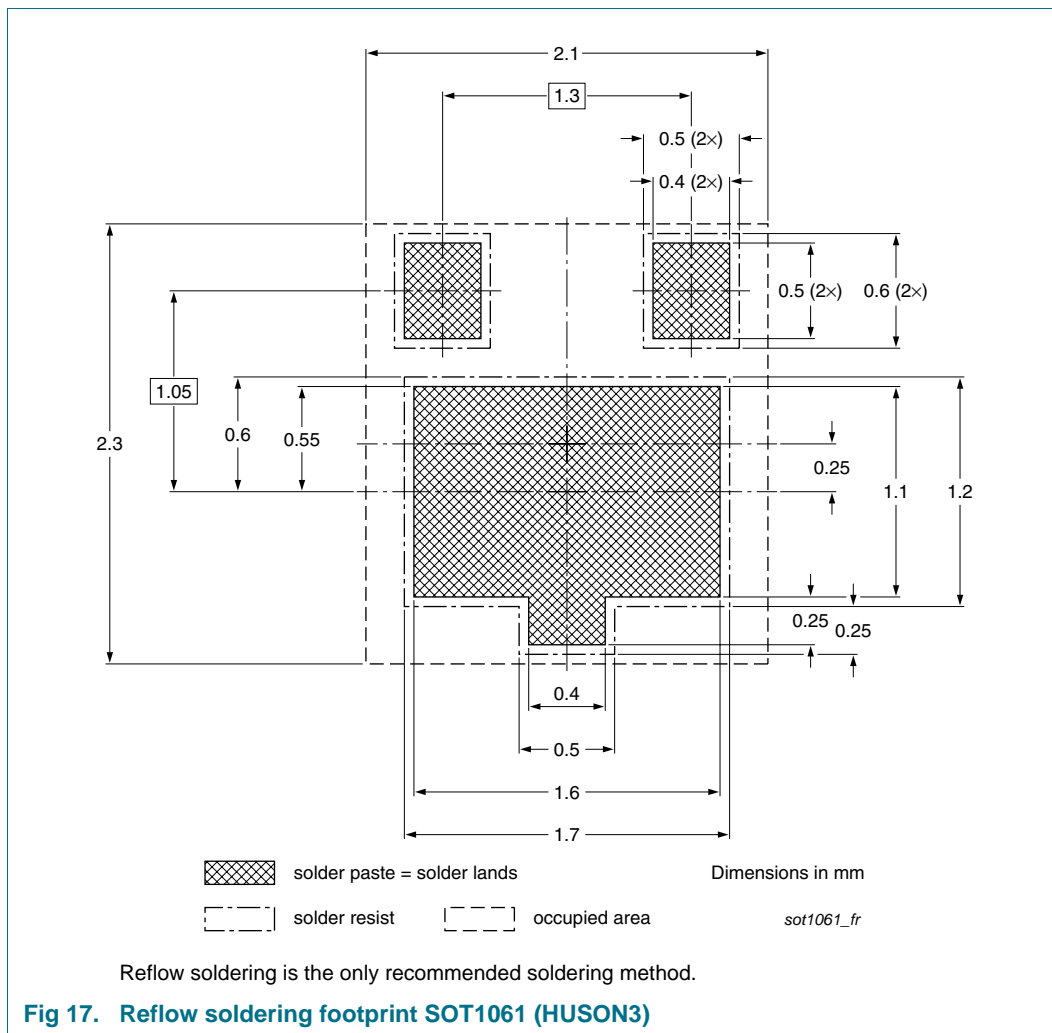
10. Packing information

**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
			3000
PBSS5580PA	SOT1061	4 mm pitch, 8 mm tape and reel	-115

[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
PBSS5580PA v.1	20100506	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.

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

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