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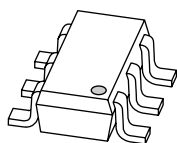
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Kind regards,

Team Nexperia



# PBSS4032ND

30 V, 3.5 A NPN low  $V_{CEsat}$  (BISS) transistor

Rev. 01 — 30 January 2010

Product data sheet

## 1. Product profile

### 1.1 General description

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

PNP complement: PBSS4032PD.

### 1.2 Features

- Low collector-emitter saturation voltage  $V_{CEsat}$
- Optimized switching time
- High collector current capability  $I_C$  and  $I_{CM}$
- High collector current gain ( $h_{FE}$ ) at high  $I_C$
- High energy efficiency due to less heat generation
- AEC-Q101 qualified
- Smaller required Printed-Circuit Board (PCB) area than for conventional transistors

### 1.3 Applications

- DC-to-DC conversion
- Battery-driven devices
- Power management
- Charging circuits

### 1.4 Quick reference data

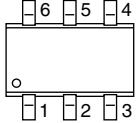
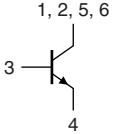
Table 1. Quick reference data

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$V_{CEO}$	collector-emitter voltage	open base	-	-	30	V
$I_C$	collector current		-	-	3.5	A
$I_{CM}$	peak collector current	single pulse; $t_p \leq 1$ ms	-	-	6	A
$R_{CEsat}$	collector-emitter saturation resistance	$I_C = 4$ A; $I_B = 400$ mA	<a href="#">[1]</a> -	50	75	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	collector		
2	collector		
3	base		
4	emitter		
5	collector		
6	collector		

## 3. Ordering information

Table 3. Ordering information

Type number	Package		
	Name	Description	Version
PBSS4032ND	SC-74	plastic surface-mounted package; 6 leads	SOT457

## 4. Marking

Table 4. Marking codes

Type number	Marking code
PBSS4032ND	ZF

## 5. Limiting values

Table 5. Limiting values

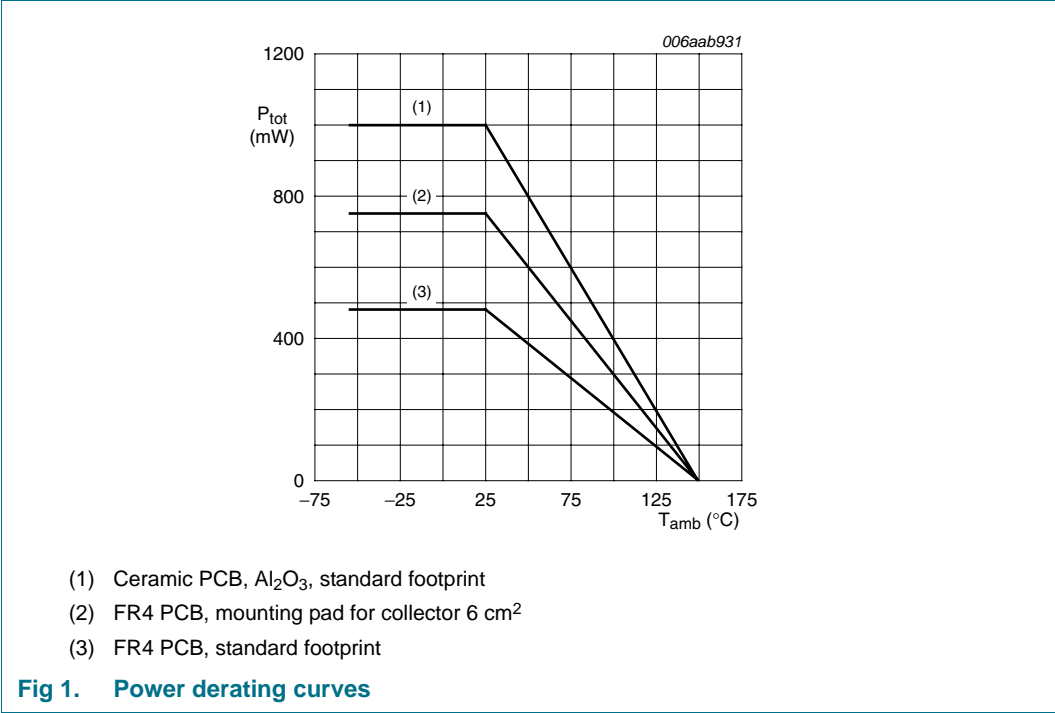
In accordance with the Absolute Maximum Rating System (IEC 60134).

Symbol	Parameter	Conditions	Min	Max	Unit
$V_{CBO}$	collector-base voltage	open emitter	-	30	V
$V_{CEO}$	collector-emitter voltage	open base	-	30	V
$V_{EBO}$	emitter-base voltage	open collector	-	5	V
$I_C$	collector current		-	3.5	A
$I_{CM}$	peak collector current	single pulse; $t_p \leq 1$ ms	-	6	A
$I_B$	base current		-	0.5	A

**Table 5. Limiting values ...continued**  
*In accordance with the Absolute Maximum Rating System (IEC 60134).*

Symbol	Parameter	Conditions	Min	Max	Unit
P <sub>tot</sub>	total power dissipation	T <sub>amb</sub> ≤ 25 °C	[1] -	480	mW
			[2] -	750	mW
			[3] -	1	W
T <sub>j</sub>	junction temperature		-	150	°C
T <sub>amb</sub>	ambient temperature		-55	+150	°C
T <sub>stg</sub>	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 6 cm<sup>2</sup>.  
[3] 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] -	-	260	K/W
			[2] -	-	160	K/W
			[3] -	-	125	K/W
$R_{th(j-sp)}$	thermal resistance from junction to solder point		-	-	45	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 6 cm<sup>2</sup>.  
[3] Device mounted on a ceramic PCB, Al<sub>2</sub>O<sub>3</sub>, standard footprint.

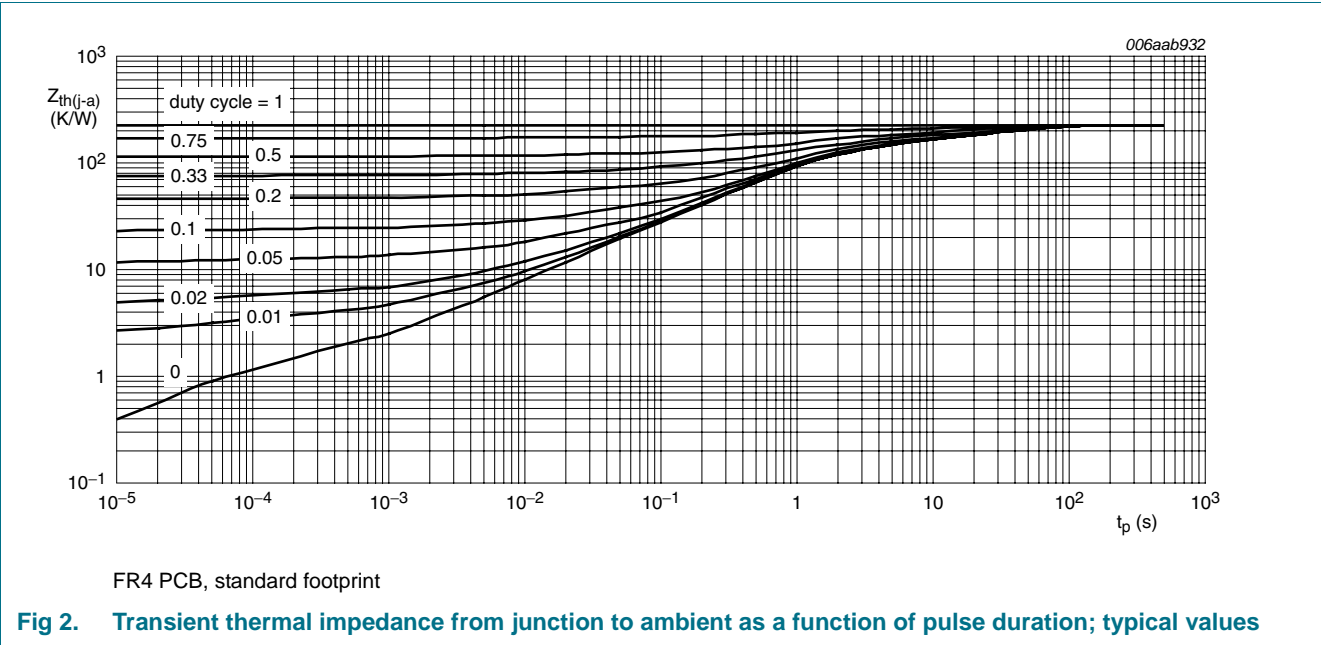
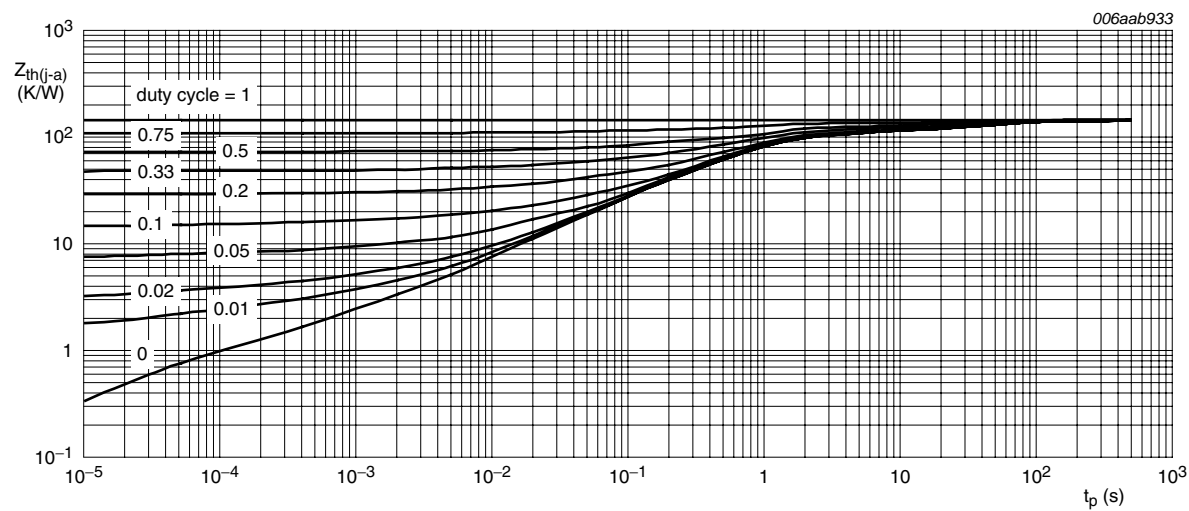
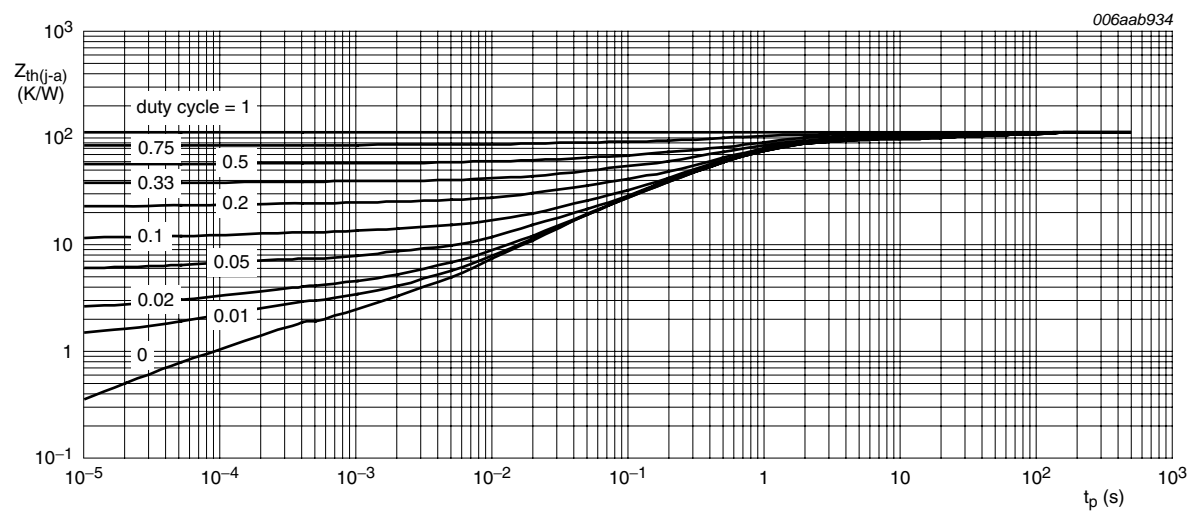


Fig 2. Transient thermal impedance from junction to ambient as a function of pulse duration; typical values



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

Fig 3. 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 4. Transient thermal impedance from junction to ambient as a function of pulse duration; typical values

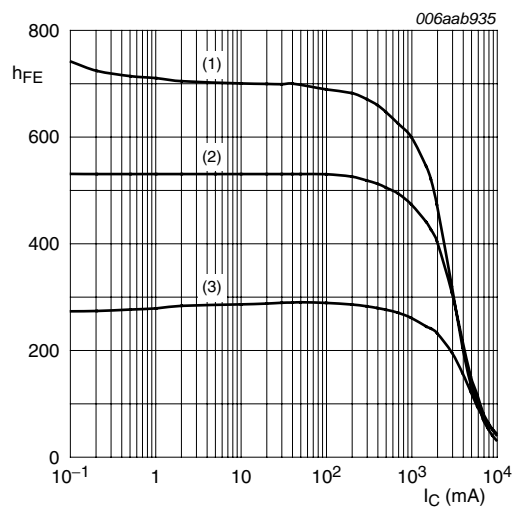
## 7. Characteristics

**Table 7. Characteristics**

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

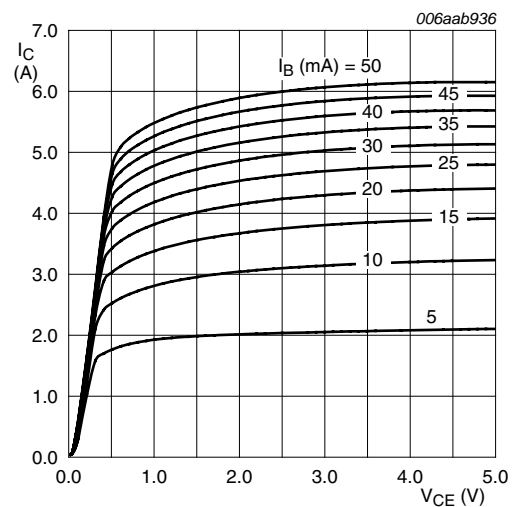
Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$I_{CBO}$	collector-base cut-off current	$V_{CB} = 30\text{ V}; I_E = 0\text{ A}$	-	-	100	nA
		$V_{CB} = 30\text{ V}; I_E = 0\text{ A}; T_j = 150\text{ }^{\circ}\text{C}$	-	-	50	$\mu\text{A}$
$I_{CES}$	collector-emitter cut-off current	$V_{CE} = 24\text{ V}; V_{BE} = 0\text{ V}$	-	-	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	$V_{CE} = 2\text{ V}; I_C = 500\text{ mA}$	[1] 300	500	-	
		$V_{CE} = 2\text{ V}; I_C = 1\text{ A}$	[1] 300	460	-	
		$V_{CE} = 2\text{ V}; I_C = 2\text{ A}$	[1] 250	400	-	
		$V_{CE} = 2\text{ V}; I_C = 4\text{ A}$	[1] 120	200	-	
		$V_{CE} = 2\text{ V}; I_C = 6\text{ A}$	[1] 60	100	-	
$V_{CEsat}$	collector-emitter saturation voltage	$I_C = 500\text{ mA}; I_B = 50\text{ mA}$	[1] -	70	100	mV
		$I_C = 1\text{ A}; I_B = 50\text{ mA}$	[1] -	110	155	mV
		$I_C = 1\text{ A}; I_B = 10\text{ mA}$	[1] -	155	220	mV
		$I_C = 2\text{ A}; I_B = 40\text{ mA}$	[1] -	180	250	mV
		$I_C = 3\text{ A}; I_B = 300\text{ mA}$	[1] -	180	250	mV
		$I_C = 4\text{ A}; I_B = 400\text{ mA}$	[1] -	200	300	mV
$R_{CEsat}$	collector-emitter saturation resistance	$I_C = 4\text{ A}; I_B = 400\text{ mA}$	[1] -	50	75	$\text{m}\Omega$
$V_{BEsat}$	base-emitter saturation voltage	$I_C = 1\text{ A}; I_B = 100\text{ mA}$	[1] -	0.78	0.9	V
		$I_C = 3\text{ A}; I_B = 300\text{ mA}$	[1] -	0.98	1.1	V
$V_{BEon}$	base-emitter turn-on voltage	$V_{CE} = 2\text{ V}; I_C = 2\text{ A}$	-	0.79	0.85	V
$t_d$	delay time	$V_{CC} = 12.5\text{ V}; I_C = 1\text{ A}; I_{Bon} = 0.05\text{ A}; I_{Boff} = -0.05\text{ A}$	-	23	-	ns
$t_r$	rise time		-	25	-	ns
$t_{on}$	turn-on time		-	48	-	ns
$t_s$	storage time		-	140	-	ns
$t_f$	fall time		-	65	-	ns
$t_{off}$	turn-off time		-	205	-	ns
$f_T$	transition frequency	$V_{CE} = 10\text{ V}; I_C = 100\text{ mA}; f = 100\text{ MHz}$	-	135	-	MHz
$C_c$	collector capacitance	$V_{CB} = 10\text{ V}; I_E = I_C = 0\text{ A}; f = 1\text{ MHz}$	-	44	-	pF

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



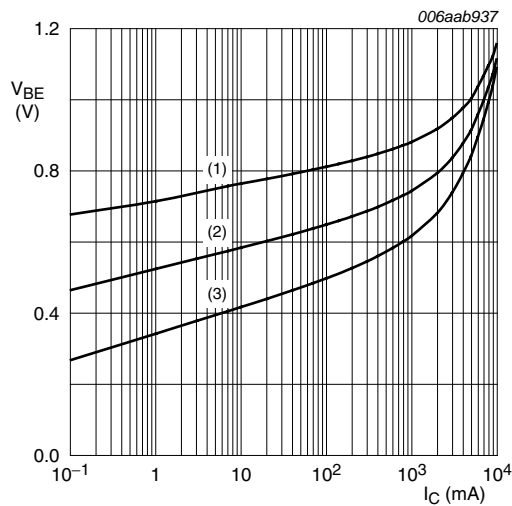
$V_{CE} = 2\text{ V}$   
(1)  $T_{amb} = 100\text{ }^{\circ}\text{C}$   
(2)  $T_{amb} = 25\text{ }^{\circ}\text{C}$   
(3)  $T_{amb} = -55\text{ }^{\circ}\text{C}$

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



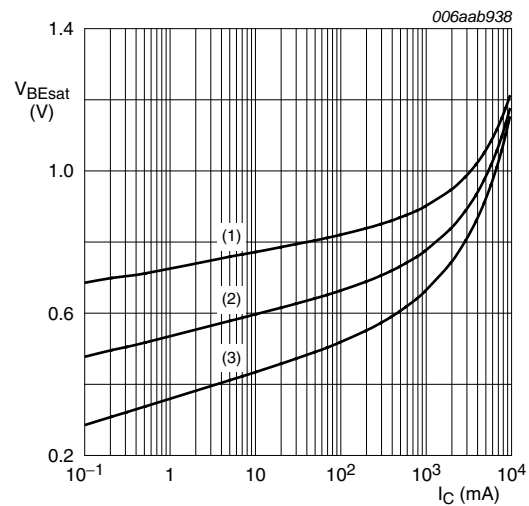
$T_{amb} = 25\text{ }^{\circ}\text{C}$

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



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

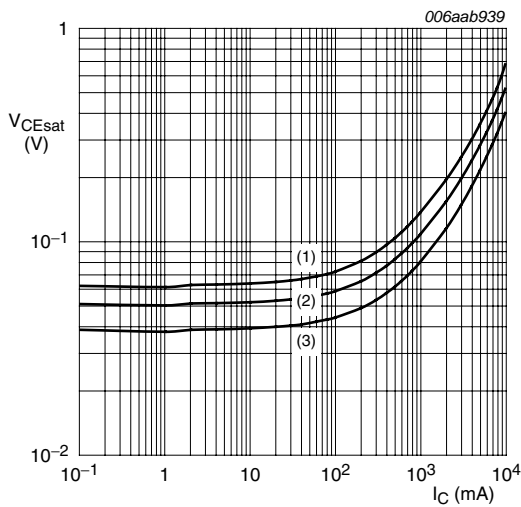
Fig 7. Base-emitter voltage as a function of collector current; typical values



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

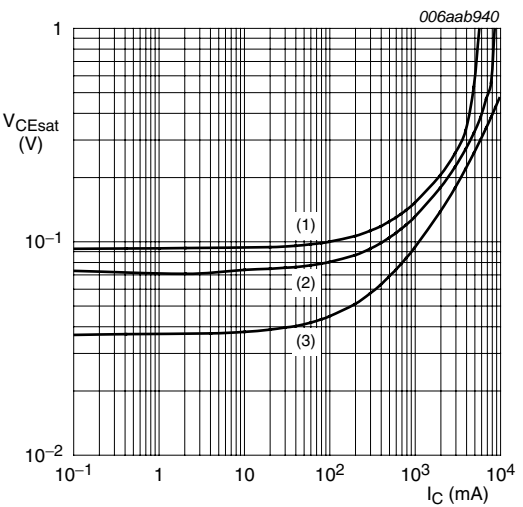
Fig 8. Base-emitter saturation voltage as a function of collector current; typical values





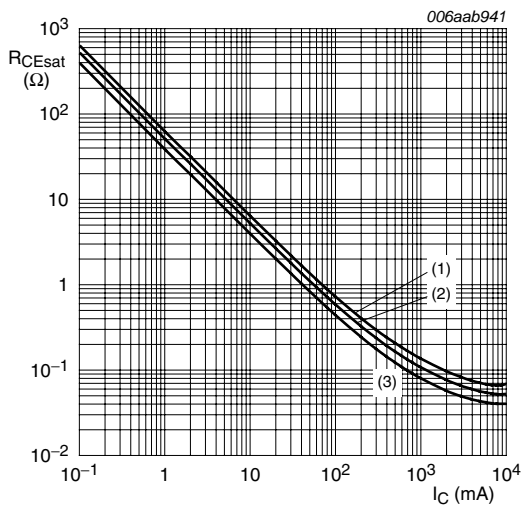
- $I_C/I_B = 20$
- (1)  $T_{amb} = 100\text{ }^{\circ}\text{C}$
  - (2)  $T_{amb} = 25\text{ }^{\circ}\text{C}$
  - (3)  $T_{amb} = -55\text{ }^{\circ}\text{C}$

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



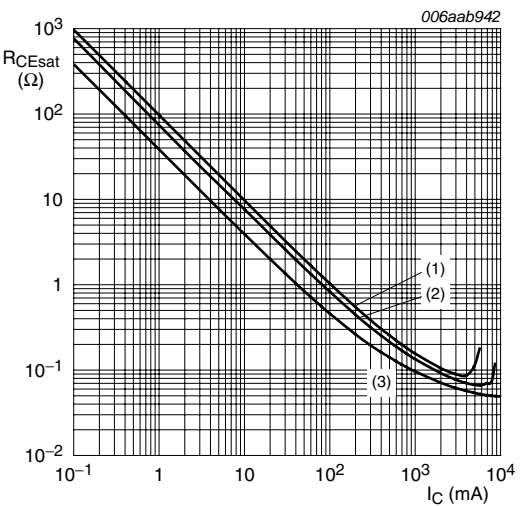
- $T_{amb} = 25\text{ }^{\circ}\text{C}$
- (1)  $I_C/I_B = 100$
  - (2)  $I_C/I_B = 50$
  - (3)  $I_C/I_B = 10$

Fig 10. 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 11. 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 12. Collector-emitter saturation resistance as a function of collector current; typical values

## 8. Test information

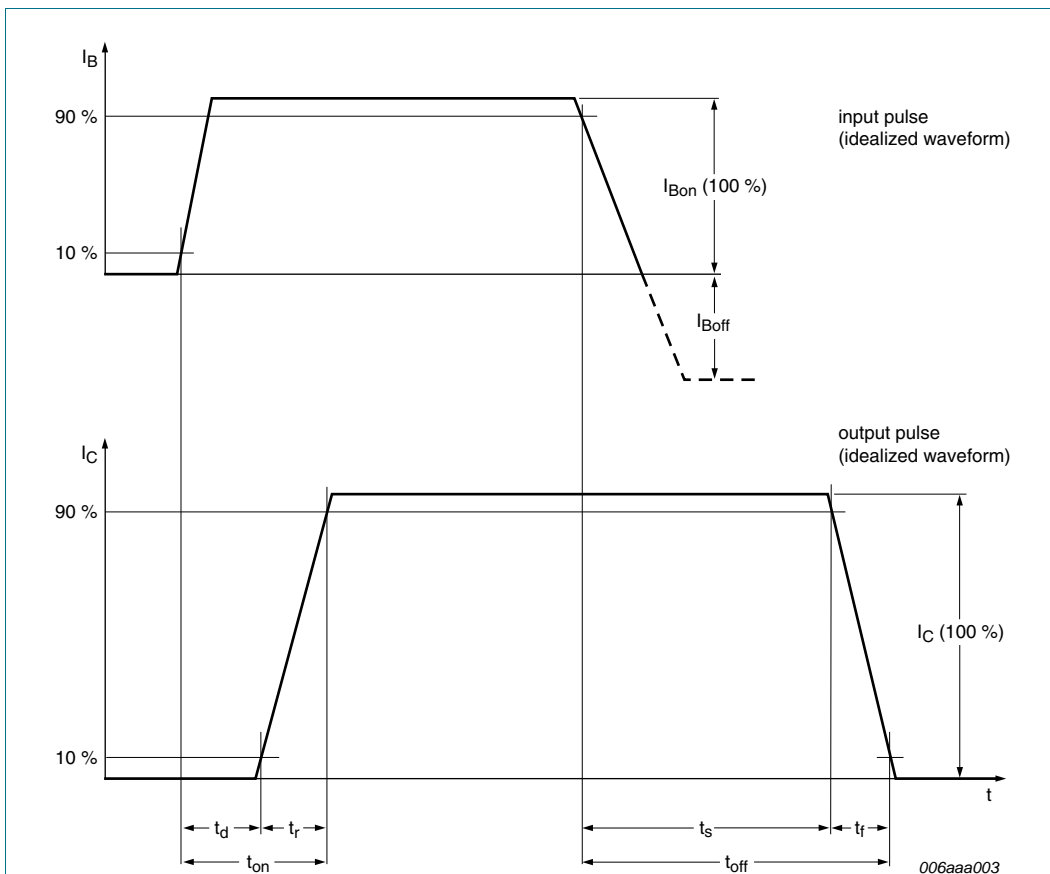


Fig 13. BISS transistor switching time definition

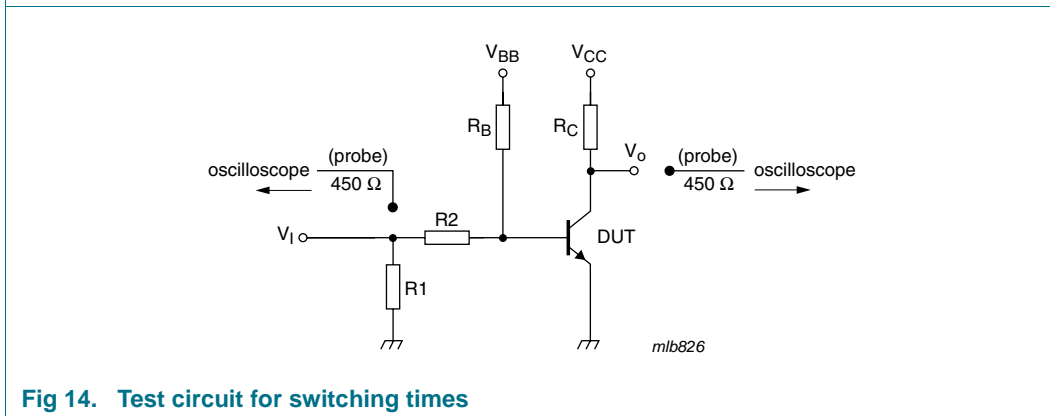
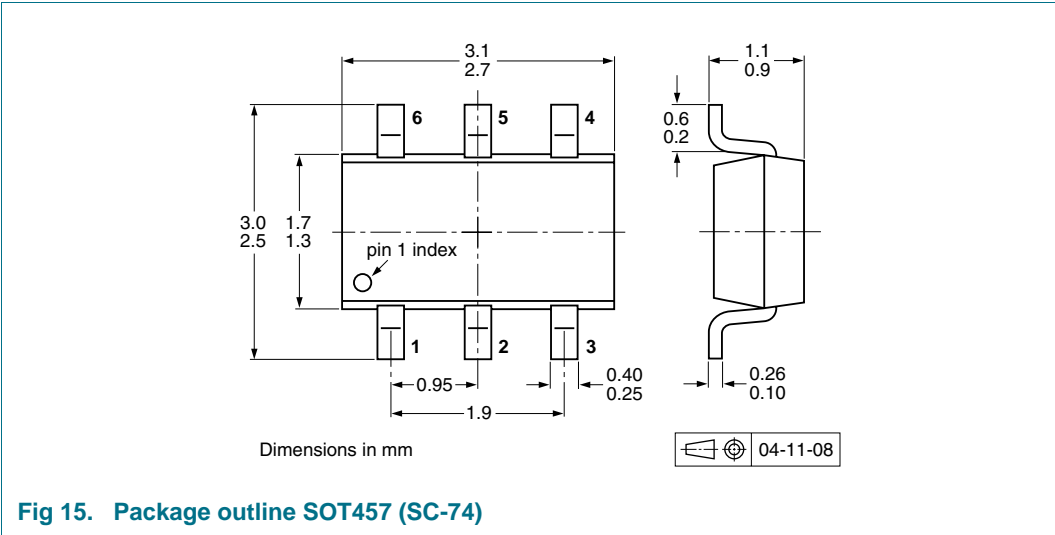


Fig 14. Test circuit for switching times

### 8.1 Quality information

This product has been qualified in accordance with the Automotive Electronics Council (AEC) standard Q101 - *Stress test qualification for discrete semiconductors*, and is suitable for use in automotive applications.

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	10000
PBSS4032ND	SOT457	4 mm pitch, 8 mm tape and reel	<sup>[2]</sup> -115	-135
		4 mm pitch, 8 mm tape and reel	<sup>[3]</sup> -215	-235

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

[2] T1: normal taping

[3] T2: reverse taping

11. Soldering

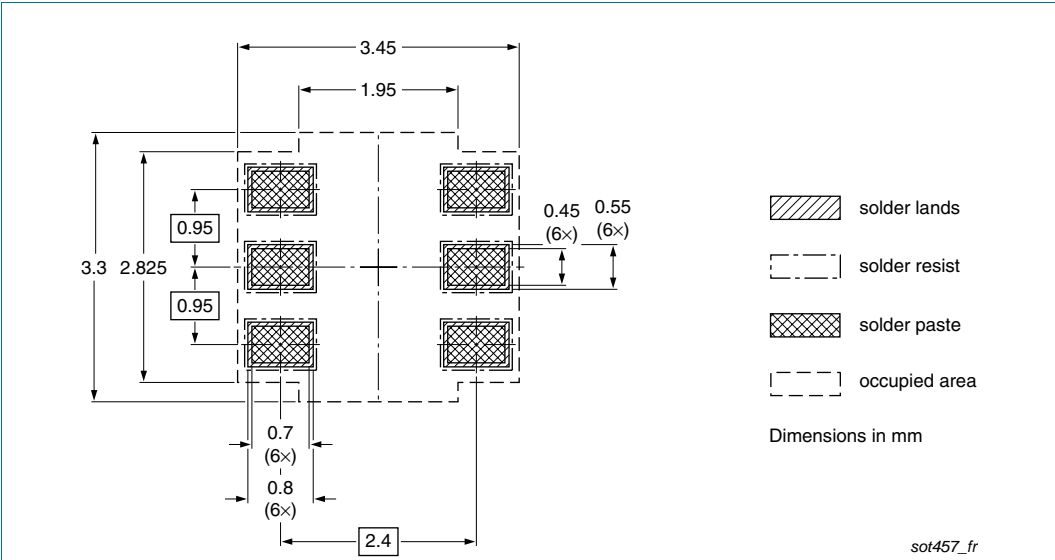


Fig 16. Reflow soldering footprint SOT457 (SC-74)

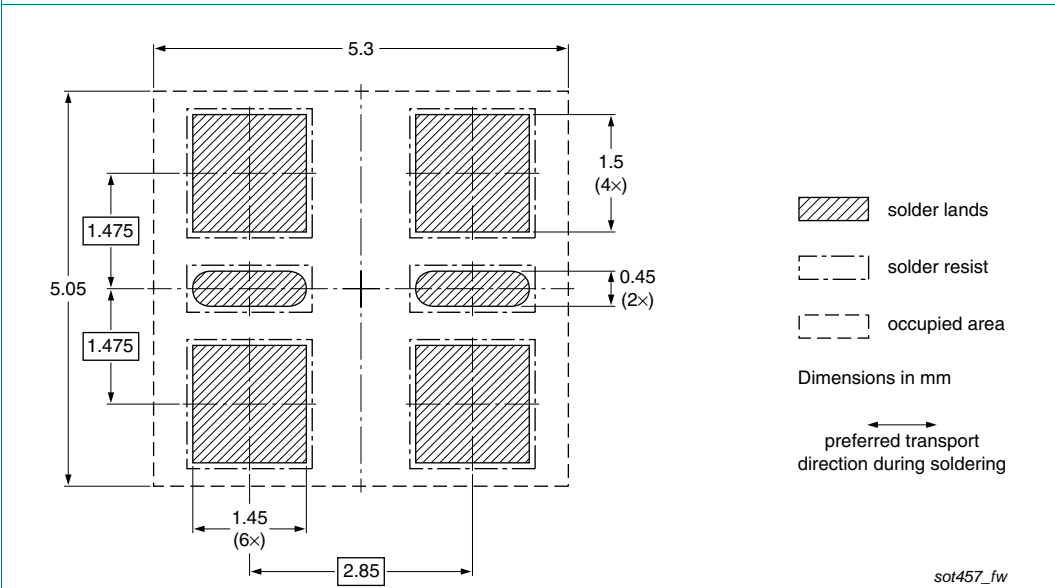


Fig 17. Wave soldering footprint SOT457 (SC-74)

12. Revision history

Table 9. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
PBSS4032ND_1	20100130	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.
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