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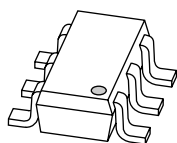Should be replaced with:
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Kind regards,

Team Nexperia

PBSS302ND

40 V, 4 A NPN low V_{CEsat} (BISS) transistor

Rev. 02 — 18 February 2008   **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: PBSS302PD.

1.2 Features

■ Ultra low collector-emitter saturation voltage V_{CEsat}
■ 4 A continuous collector current capability I_C
■ Up to 15 A peak current
■ Very low collector-emitter saturation resistance
■ High efficiency due to less heat generation

1.3 Applications

■ Power management functions
■ Charging circuits
■ DC-to-DC conversion
■ MOSFET gate driving
■ Power switches (e.g. motors, fans)
■ Thin Film Transistor (TFT) backlight inverter

1.4 Quick reference data
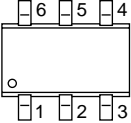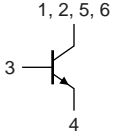
Table 1.   Quick reference data

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
V_{CEO}	collector-emitter voltage	open base	-	-	40	V
I_C	collector current	[1]	-	-	4	A
I_{CM}	peak collector current	single pulse; $t_p \leq 1$ ms	-	-	15	A
R_{CEsat}	collector-emitter saturation resistance	$I_C = 6$ A; $I_B = 600$ mA	[2] -	55	75	mΩ

[1]   Device mounted on a ceramic Printed-Circuit Board (PCB), Al_2O_3, standard footprint.

[2]   Pulse test: $t_p \leq 300$ μs; $\delta \leq 0.02$.

2. Pinning information

Table 2.   Pinning

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

sym014

3. Ordering information

Table 3.   Ordering information

Type number	Package			
	Name	Description		Version
PBSS302ND	SC-74	plastic surface-mounted package (TSOP6); 6 leads		SOT457

4. Marking

Table 4.   Marking codes

Type number	Marking code
PBSS302ND	C7

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		-	60	V
V_{CEO}	collector-emitter voltage	open base		-	40	V
V_{EBO}	emitter-base voltage	open collector		-	5	V
I_C	collector current		[1]	-	4	A
I_{CM}	peak collector current	single pulse; $t_p \leq 1$ ms		-	15	A
I_B	base current			-	0.8	A
I_{BM}	peak base current	single pulse; $t_p \leq 1$ ms		-	2	A
P_{tot}	total power dissipation	$T_{amb} \leq 25$ °C	[2]	-	360	mW
			[3]	-	600	mW
			[4]	-	750	mW
			[1]	-	1.1	W
			[2][5]	-	2.5	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 a ceramic PCB, Al$_2$O$_3$, standard footprint.

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

[3] Device mounted on an FR4 PCB, single-sided copper, tin-plated, mounting pad for collector 1 cm^2.

[4] Device mounted on an FR4 PCB, single-sided copper, tin-plated, mounting pad for collector 6 cm^2.

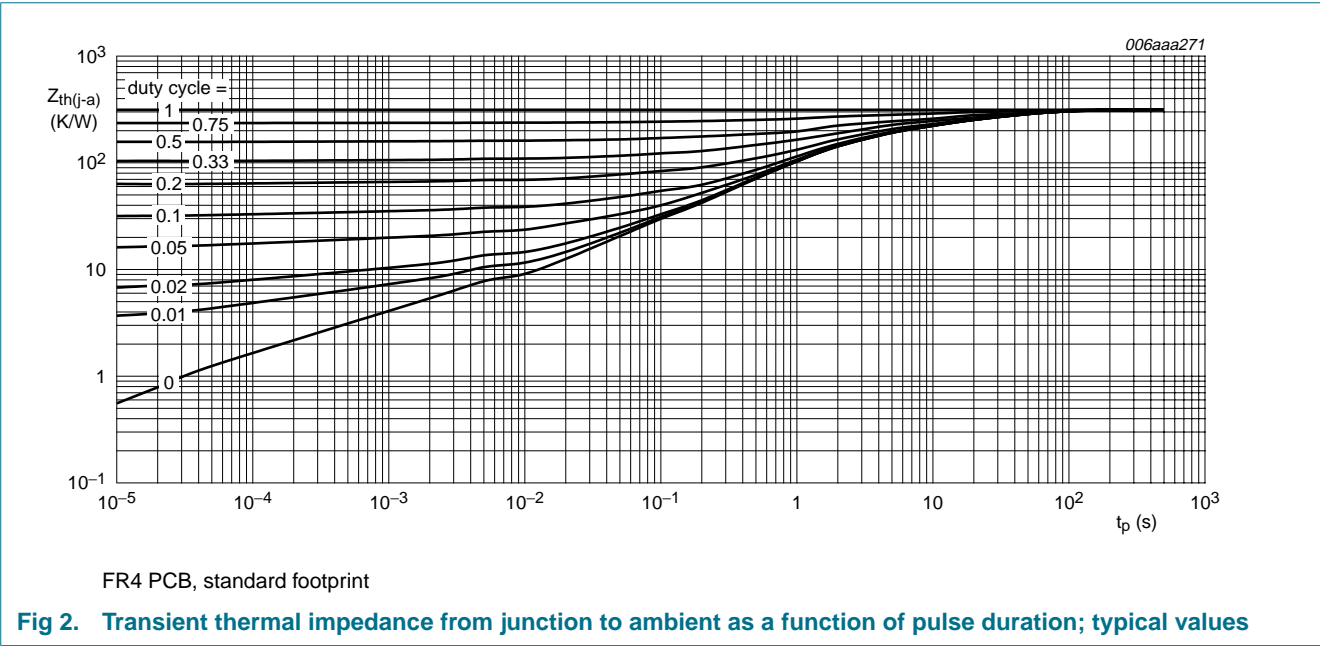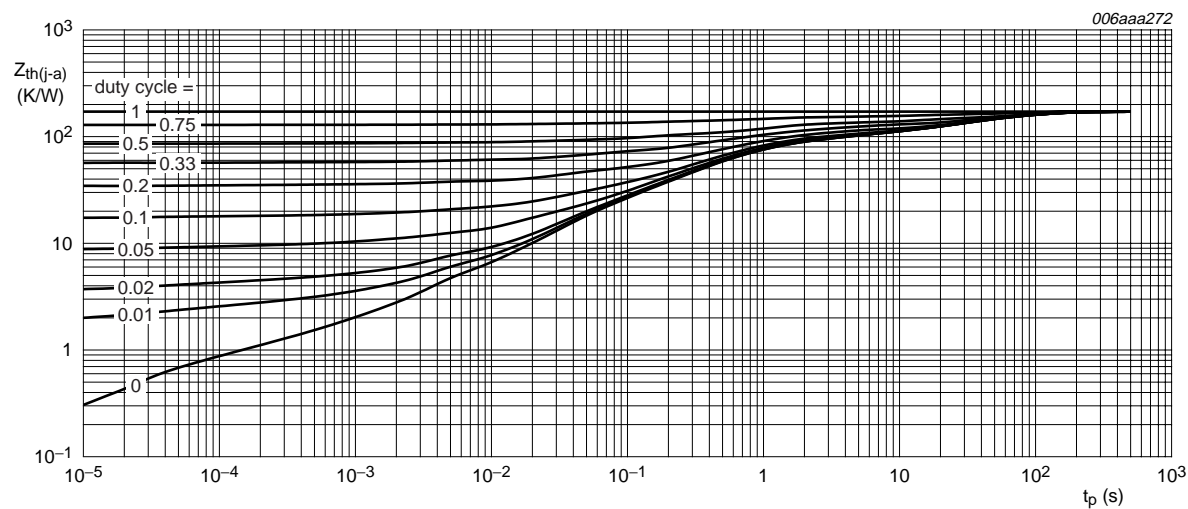[5] Operated under pulsed conditions: Duty cycle $\delta \leq 10$ % and pulse width t$_p \leq 10$ ms.

(1) Ceramic PCB, Al$_2$O$_3$, standard footprint

(2) FR4 PCB, mounting pad for collector 6 cm^2

(3) FR4 PCB, mounting pad for collector 1 cm^2

(4) FR4 PCB, standard footprint

Fig 1.   Power derating curves
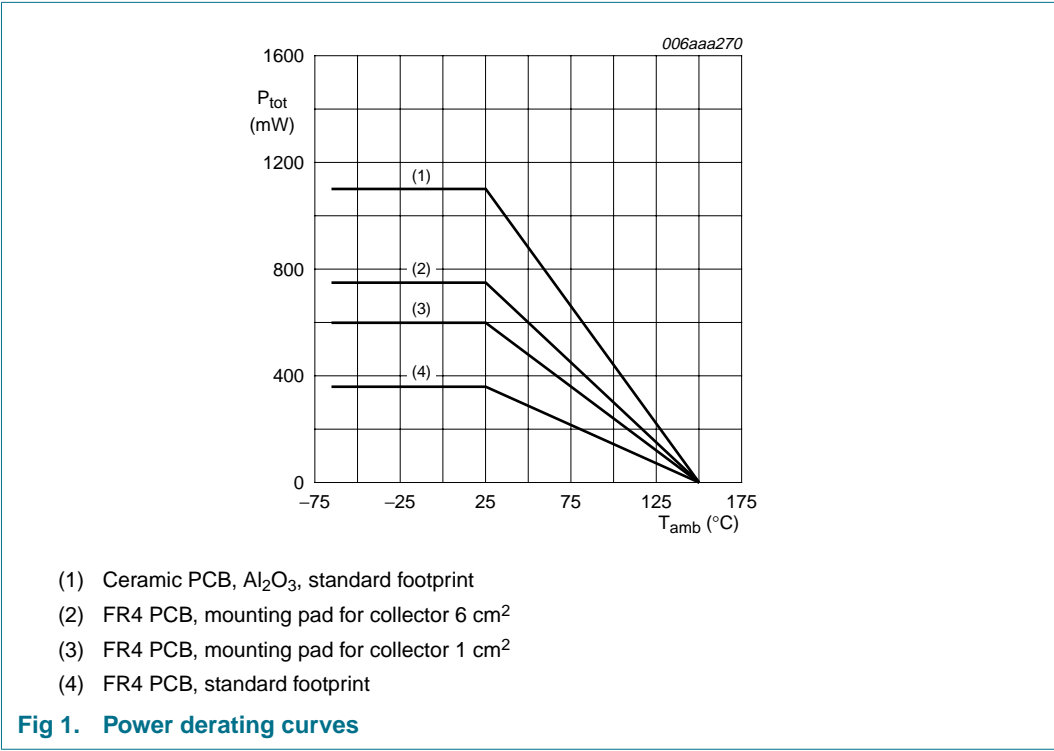
6. Thermal characteristics

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]	-	-	350	K/W
			[2]	-	-	208	K/W
			[3]	-	-	167	K/W
			[4]	-	-	113	K/W
			[1][5]	-	-	50	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 1 cm^2.

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

[4] Device mounted on a ceramic PCB, Al$_2$O$_3$, standard footprint.

[5] Operated under pulsed conditions: Duty cycle δ ≤ 10 % and pulse width t$_p$ ≤ 10 ms.

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
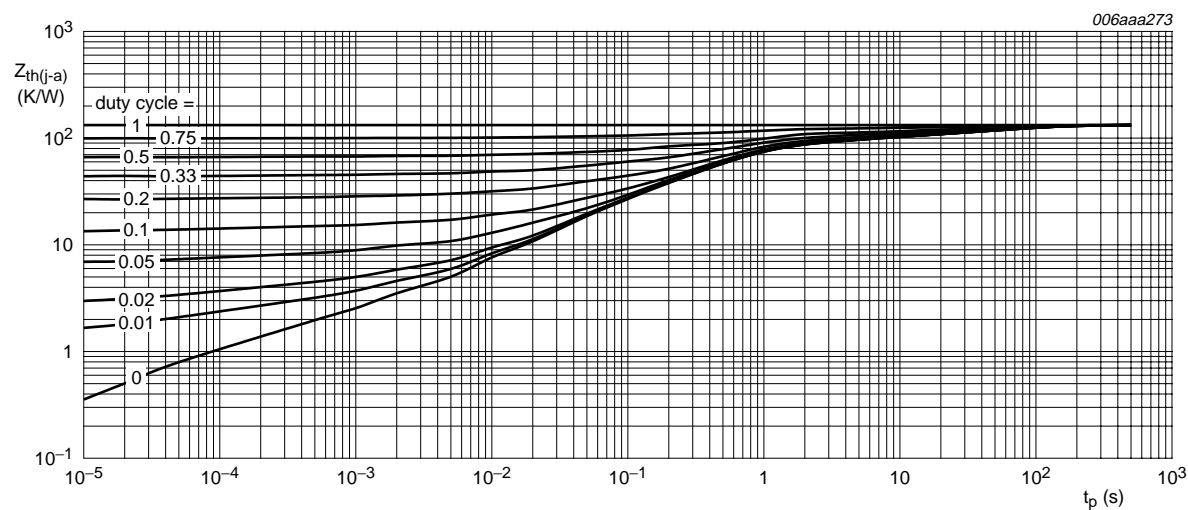

FR4 PCB, mounting pad for collector 6 cm²

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 °C unless otherwise specified.

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
I$_{CBO}$	collector-base cut-off current	V$_{CB}$ = 40 V; I$_E$ = 0 A		-	-	0.1	µA
		V$_{CB}$ = 40 V; I$_E$ = 0 A; T$_j$ = 150 °C		-	-	50	µA
I$_{CES}$	collector-emitter cut-off current	V$_{CE}$ = 30 V; V$_{BE}$ = 0 V		-	-	0.1	µA
I$_{EBO}$	emitter-base cut-off current	V$_{EB}$ = 5 V; I$_C$ = 0 A		-	-	0.1	µA
h$_{FE}$	DC current gain	V$_{CE}$ = 2 V; I$_C$ = 0.5 A		300	500	-	
		V$_{CE}$ = 2 V; I$_C$ = 1 A	[1]	300	475	-	
		V$_{CE}$ = 2 V; I$_C$ = 2 A	[1]	250	385	-	
		V$_{CE}$ = 2 V; I$_C$ = 4 A	[1]	100	190	-	
		V$_{CE}$ = 2 V; I$_C$ = 6 A	[1]	50	100	-	
V$_{CEsat}$	collector-emitter saturation voltage	I$_C$ = 0.5 A; I$_B$ = 50 mA		-	35	60	mV
		I$_C$ = 1 A; I$_B$ = 50 mA		-	65	110	mV
		I$_C$ = 2 A; I$_B$ = 200 mA		-	115	180	mV
		I$_C$ = 4 A; I$_B$ = 400 mA	[1]	-	220	300	mV
		I$_C$ = 6 A; I$_B$ = 600 mA	[1]	-	330	450	mV
R$_{CEsat}$	collector-emitter saturation resistance	I$_C$ = 6 A; I$_B$ = 600 mA	[1]	-	55	75	mΩ
V$_{BEsat}$	base-emitter saturation voltage	I$_C$ = 0.5 A; I$_B$ = 50 mA		-	0.79	0.85	V
		I$_C$ = 1 A; I$_B$ = 50 mA		-	0.81	0.9	V
		I$_C$ = 1 A; I$_B$ = 100 mA	[1]	-	0.83	1	V
		I$_C$ = 4 A; I$_B$ = 400 mA	[1]	-	1.0	1.1	V
V$_{BEon}$	base-emitter turn-on voltage	V$_{CE}$ = 2 V; I$_C$ = 2 A		-	0.79	1.0	V
t$_d$	delay time	V$_{CC}$ = 10 V; I$_C$ = 2 A; I$_{Bon}$ = 0.1 A; I$_{Boff}$ = −0.1 A		-	12	-	ns
t$_r$	rise time			-	52	-	ns
t$_{on}$	turn-on time			-	64	-	ns
t$_s$	storage time			-	390	-	ns
t$_f$	fall time			-	120	-	ns
t$_{off}$	turn-off time			-	510	-	ns
f$_T$	transition frequency	V$_{CE}$ = 10 V; I$_C$ = 0.1 A; f = 100 MHz		-	150	-	MHz
C$_c$	collector capacitance	V$_{CB}$ = 10 V; I$_E$ = i$_e$ = 0 A; f = 1 MHz		-	30	-	pF

[1]   Pulse test: t$_p$ ≤ 300 µs; δ ≤ 0.02.

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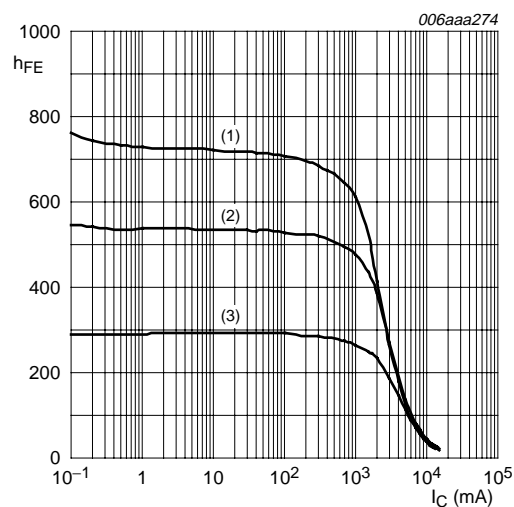
V$_{CE}$ = 2 V

(1) T$_{amb}$ = 100 °C

(2) T$_{amb}$ = 25 °C

(3) T$_{amb}$ = −55 °C

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

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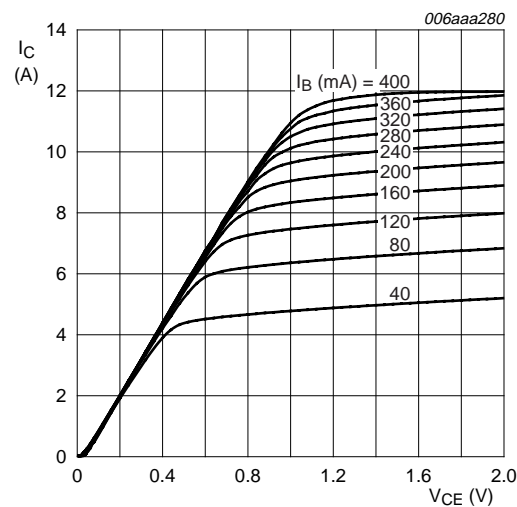
T$_{amb}$ = 25 °C

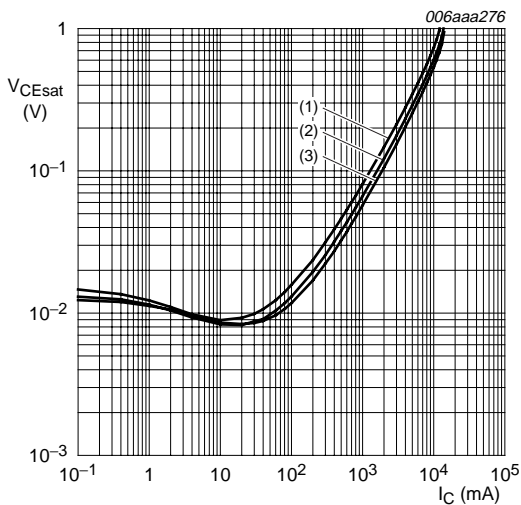**Fig 6. Collector current as a function of collector-emitter voltage; typical values**

006aaa275
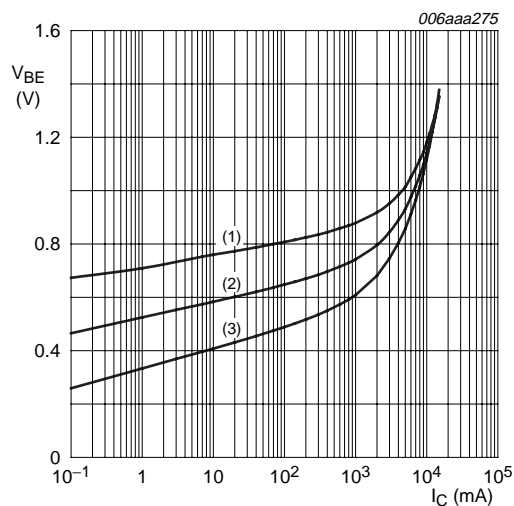
V$_{CE}$ = 2 V

(1) T$_{amb}$ = −55 °C

(2) T$_{amb}$ = 25 °C

(3) T$_{amb}$ = 100 °C

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

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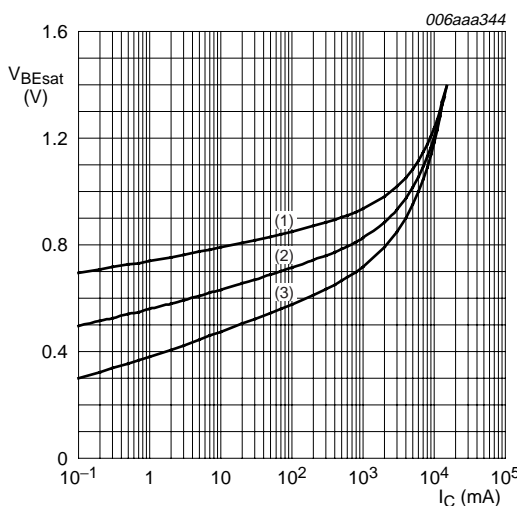
I$_C$/I$_B$ = 20

(1) T$_{amb}$ = −55 °C

(2) T$_{amb}$ = 25 °C

(3) T$_{amb}$ = 100 °C

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

PBSS302ND_2

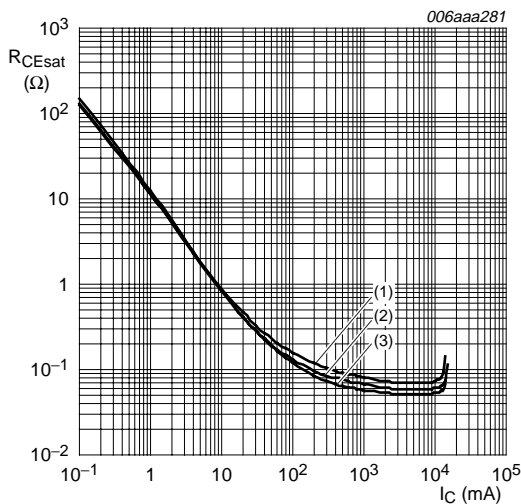**Product data sheet** **Rev. 02 — 18 February 2008** 7 of 14

$I_C/I_B = 20$

(1) $T_{amb} = 100 \,°C$

(2) $T_{amb} = 25 \,°C$

(3) $T_{amb} = -55 \,°C$

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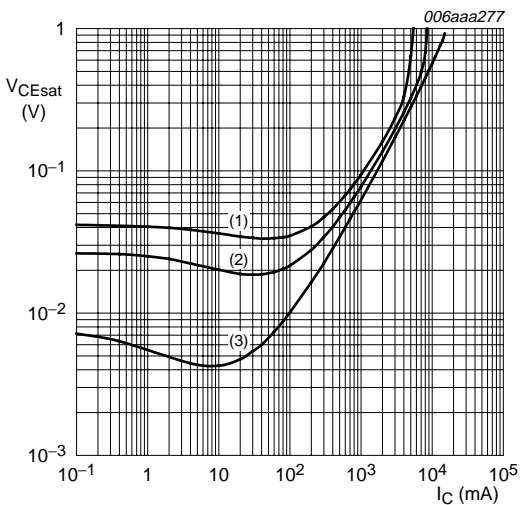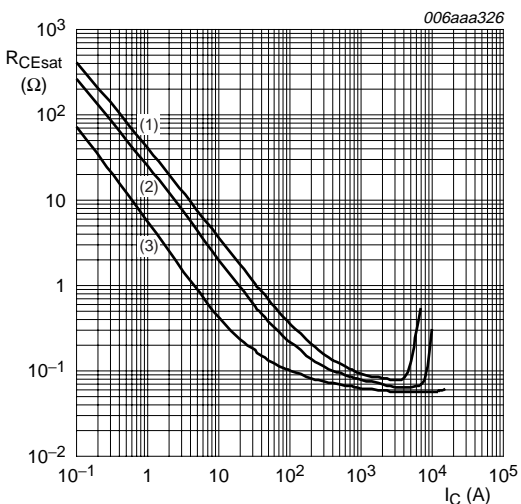

$T_{amb} = 25 \,°C$

(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) $T_{amb} = 100 \,°C$

(2) $T_{amb} = 25 \,°C$

(3) $T_{amb} = -55 \,°C$

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

$T_{amb} = 25 \,°C$

(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
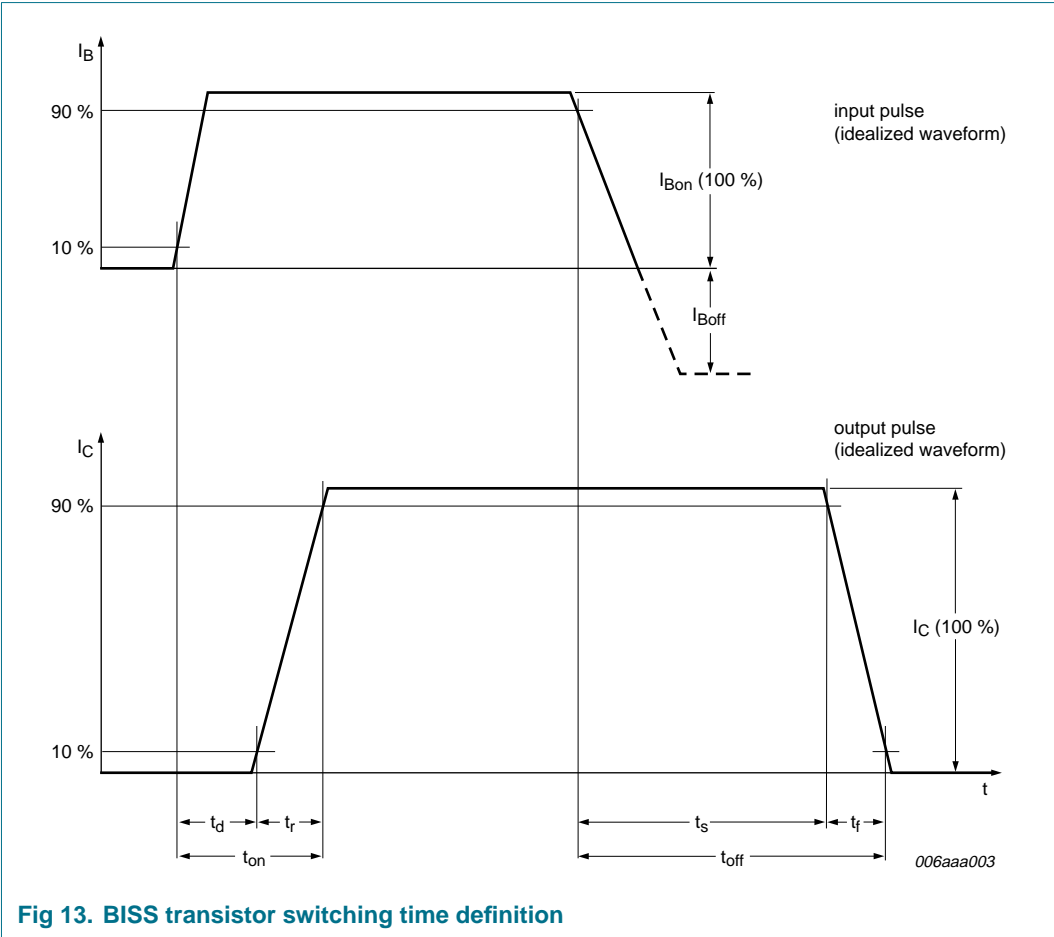
8. Test information
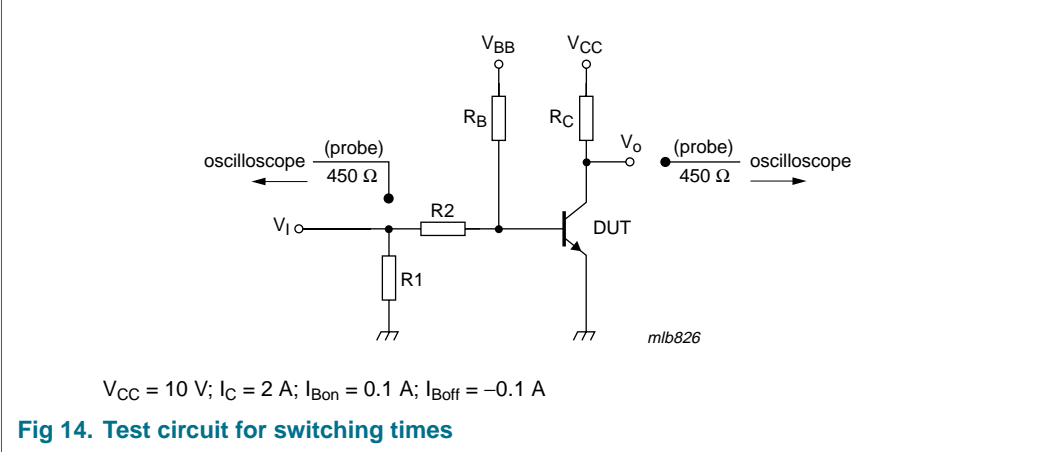

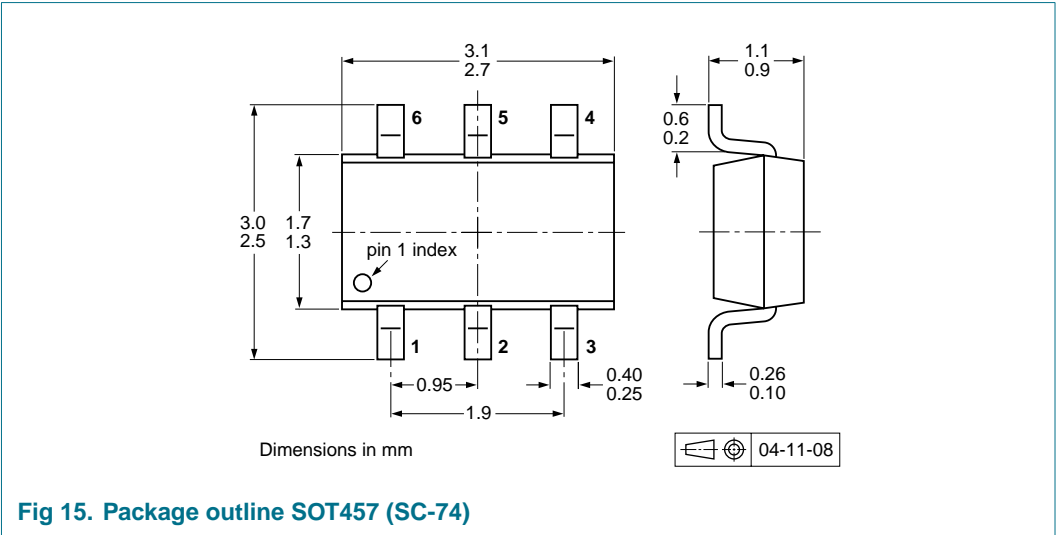**Fig 13. BISS transistor switching time definition**

V_{CC} = 10 V; I_C = 2 A; I_{Bon} = 0.1 A; I_{Boff} = −0.1 A

Fig 14. Test circuit for switching times

9. Package outline

Fig 15. 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.[1]

Type number	Package	Description		Packing quantity	
				3000	**10000**
PBSS302ND	SOT457	4 mm pitch, 8 mm tape and reel; T1	[2]	-115	-135
		4 mm pitch, 8 mm tape and reel; T2	[3]	-125	-165

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

[2]   T1: normal taping

[3]   T2: reverse taping

PBSS302ND_2

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11. Soldering

Dimensions in mm

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

Dimensions in mm

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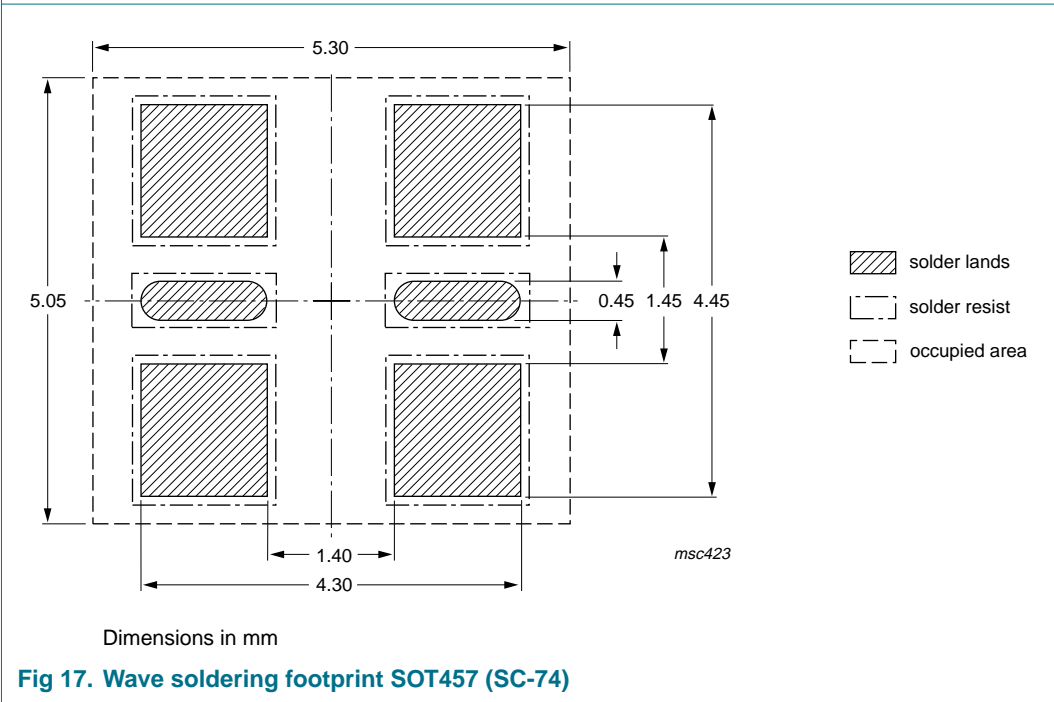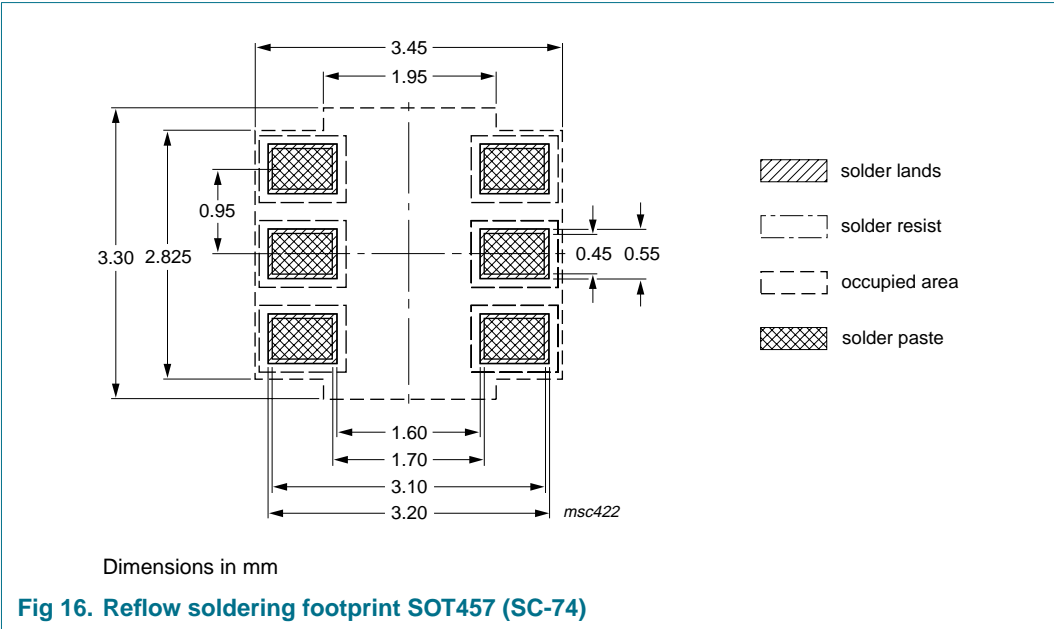
12. Revision history

Table 9.   Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
PBSS302ND_2	20080218	Product data sheet	-	PBSS302ND_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 1.4 "Quick reference data": I_{CM} conditions amended - Figure 2, 3, 4, and 6: amended - Table 5: I_{CM} conditions amended - Table 5: I_{BM} conditions amended - Table 6: typing error for maximum value on 6 cm^2 footprint amended - Table 7: typical values for h_{FE} added - Section 8 "Test information": added - Section 11 "Soldering": added - Section 13 "Legal information": updated			
PBSS302ND_1	20050419	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".

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