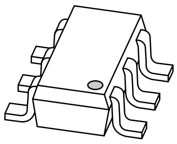


PBSS305ND

100 V, 3 A NPN low V_{CEsat} (BISS) transistor

Rev. 01 — 10 April 2006 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: PBSS305PD.

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)
- Thin Film Transistor (TFT) backlight inverter
- Automotive applications

1.4 Quick reference data

Table 1. Quick reference data

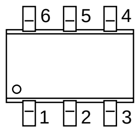
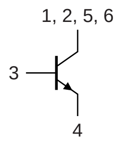
Symbol	Parameter	Conditions		Min	Typ	Max	Unit
V_{CEO}	collector-emitter voltage	open base		-	-	100	V
I_C	collector current		[1]	-	-	3	A
I_{CM}	peak collector current	single pulse; $t_p \leq 1$ ms		-	-	4	A
R_{CEsat}	collector-emitter saturation resistance	$I_C = 2$ A; $I_B = 200$ mA	[2]	-	73	95	mΩ

[1] Device mounted on a ceramic 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		 sym014
2	collector		
3	base		
4	emitter		
5	collector		
6	collector		

3. Ordering information

Table 3. Ordering information

Type number	Package		
	Name	Description	Version
PBSS305ND	SC-74	plastic surface-mounted package (TSOP6); 6 leads	SOT457

4. Marking

Table 4. Marking codes

Type number	Marking code
PBSS305ND	AG

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		-	100	V
V_{CEO}	collector-emitter voltage	open base		-	100	V
V_{EBO}	emitter-base voltage	open collector		-	5	V
I_C	collector current		[1]	-	1	A
			[2]	-	3	A
I_{CM}	peak collector current	single pulse; $t_p \leq 1$ ms		-	4	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	[1]	-	360	mW
			[3]	-	600	mW
			[4]	-	750	mW
			[2]	-	1.1	W
			[1][5]	-	2.5	W
T_j	junction temperature			-	150	°C
T_{amb}	ambient temperature			–65	+150	°C
T_{stg}	storage temperature			–65	+150	°C

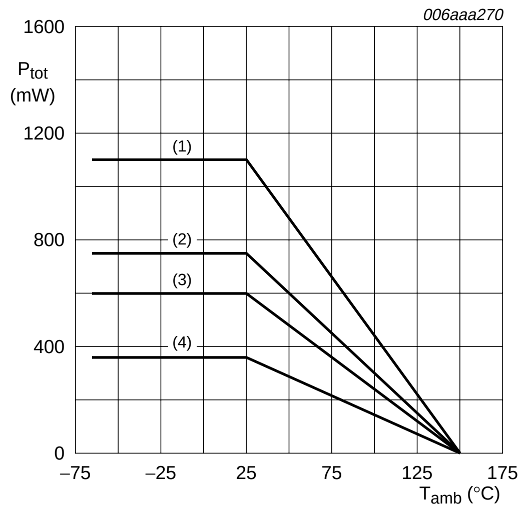
[1] Device mounted on an FR4 PCB, single-sided copper, tin-plated and standard footprint.

[2] Device mounted on a ceramic PCB, Al_2O_3, 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] Pulse test: $t_p \leq 10$ ms; $\delta \leq 10$ %.



(1) Ceramic PCB, Al_2O_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]	-	-	160	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

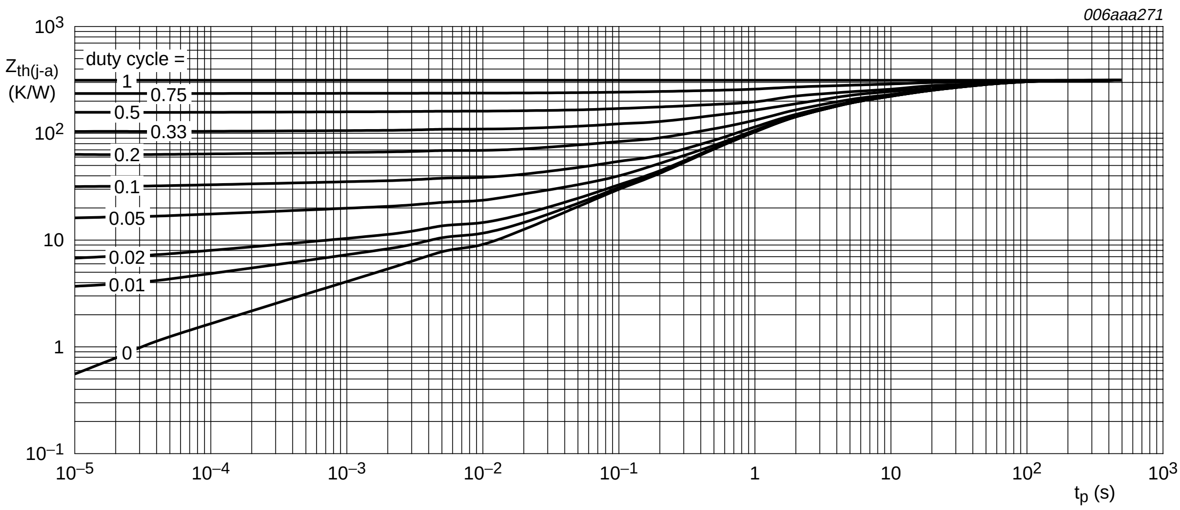
[1] Device mounted on an FR4 PCB, single-sided copper, tin-plated and standard footprint.

[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.

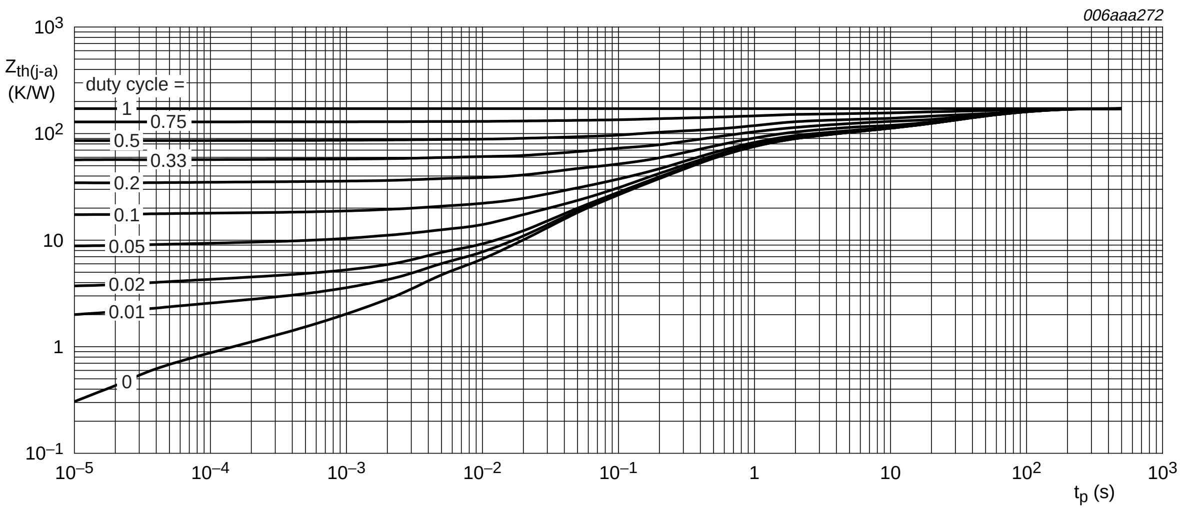
[4] Device mounted on a ceramic PCB, Al_2O_3, standard footprint.

[5] Pulse test: $t_p \leq 10$ ms; $\delta \leq 10$ %.



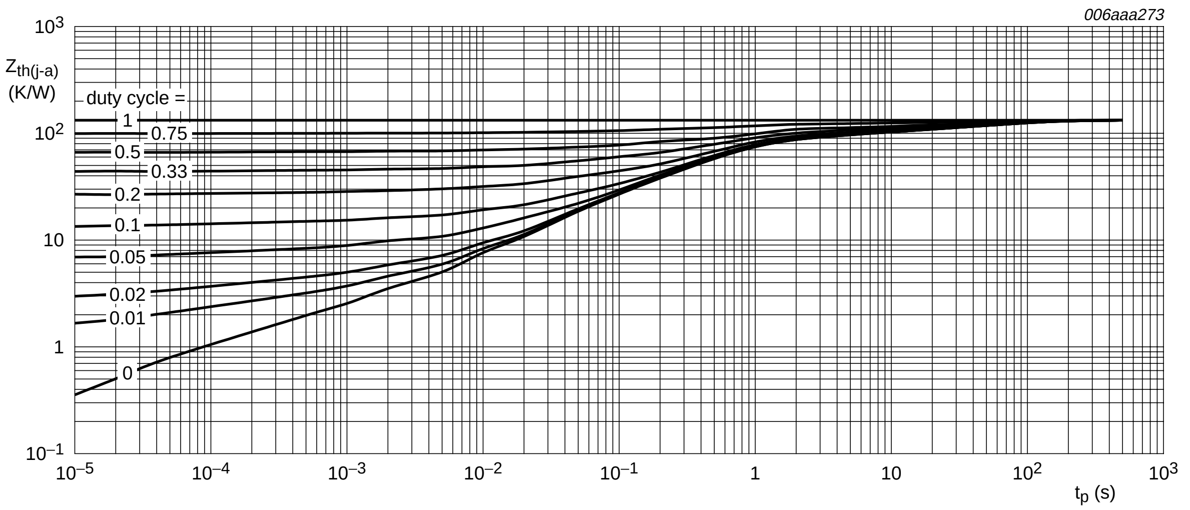
FR4 PCB, standard footprint

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



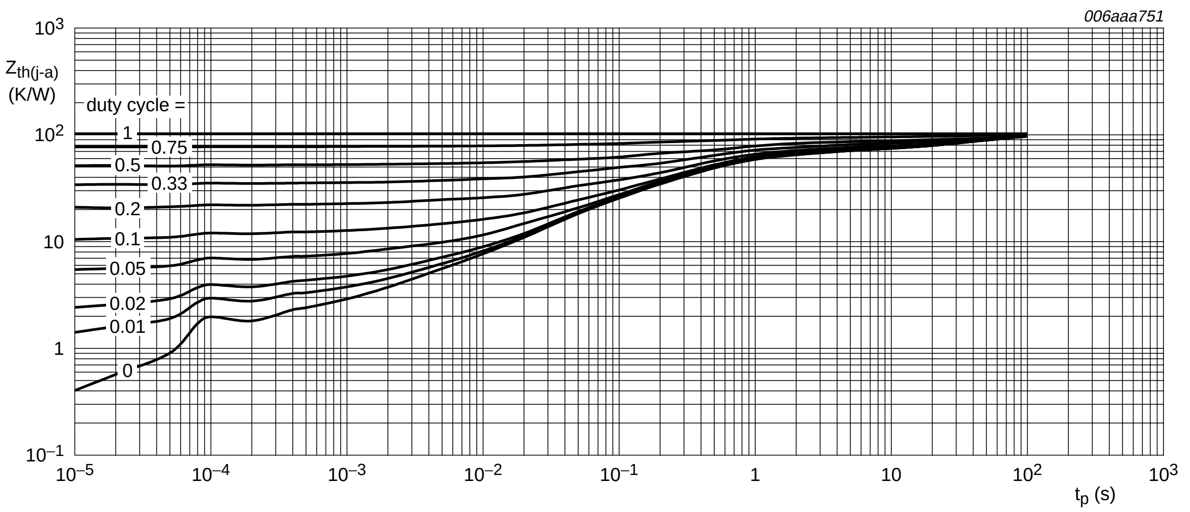
FR4 PCB, mounting pad for collector 1 cm^2

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^2

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



Ceramic PCB, Al_2O_3, standard footprint

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

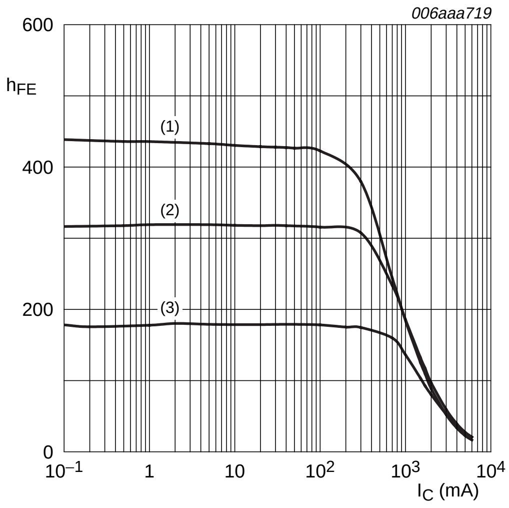
7. Characteristics

Table 7. Characteristics

T_{amb} = 25 °C unless otherwise specified.

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
I_{CBO}	collector-base cut-off current	V_{CB} = 100 V; I_E = 0 A		-	-	100	nA
		V_{CB} = 100 V; I_E = 0 A; T_j = 150 °C		-	-	50	µA
I_{CES}	collector-emitter cut-off current	V_{CE} = 80 V; V_{BE} = 0 V		-	-	100	nA
I_{EBO}	emitter-base cut-off current	V_{EB} = 5 V; I_C = 0 A		-	-	100	nA
h_{FE}	DC current gain	V_{CE} = 2 V; I_C = 0.5 A		170	275	-	
		V_{CE} = 2 V; I_C = 1 A	[1]	125	185	-	
		V_{CE} = 2 V; I_C = 2 A	[1]	70	95	-	
		V_{CE} = 2 V; I_C = 3 A	[1]	40	55	-	
		V_{CE} = 2 V; I_C = 4 A	[1]	25	40	-	
V_{CEsat}	collector-emitter saturation voltage	I_C = 0.5 A; I_B = 50 mA		-	45	60	mV
		I_C = 1 A; I_B = 50 mA		-	90	120	mV
		I_C = 2 A; I_B = 200 mA	[1]	-	145	190	mV
		I_C = 3 A; I_B = 150 mA	[1]	-	240	310	mV
		I_C = 3 A; I_B = 300 mA	[1]	-	215	280	mV
		I_C = 4 A; I_B = 400 mA	[1]	-	280	360	mV
R_{CEsat}	collector-emitter saturation resistance	I_C = 2 A; I_B = 200 mA	[1]	-	73	95	mΩ
V_{BEsat}	base-emitter saturation voltage	I_C = 0.5 A; I_B = 50 mA		-	0.79	0.87	V
		I_C = 1 A; I_B = 50 mA		-	0.81	0.89	V
		I_C = 1 A; I_B = 100 mA	[1]	-	0.83	0.92	V
		I_C = 3 A; I_B = 150 mA	[1]	-	0.93	0.99	V
		I_C = 3 A; I_B = 300 mA	[1]	-	0.95	1.02	V
V_{BEon}	base-emitter turn-on voltage	V_{CE} = 2 V; I_C = 2 A		-	0.83	1	V
t_d	delay time	V_{CC} = 9.2 V; I_C = 2 A; I_{Bon} = 0.1 A; I_{Boff} = –0.1 A		-	14	-	ns
t_r	rise time			-	341	-	ns
t_{on}	turn-on time			-	355	-	ns
t_s	storage time			-	246	-	ns
t_f	fall time			-	343	-	ns
t_{off}	turn-off time			-	589	-	ns
f_T	transition frequency	V_{CE} = 10 V; I_C = 100 mA; f = 100 MHz		-	140	-	MHz
C_c	collector capacitance	V_{CB} = 10 V; I_E = i_e = 0 A; f = 1 MHz		-	16	-	pF

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



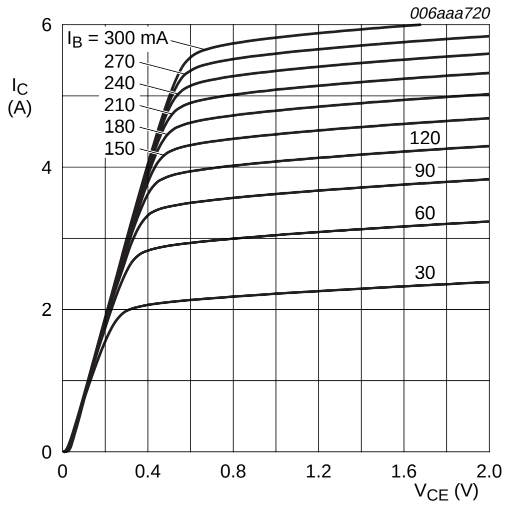
V_{CE} = 2 V

(1) T_{amb} = 100 °C

(2) T_{amb} = 25 °C

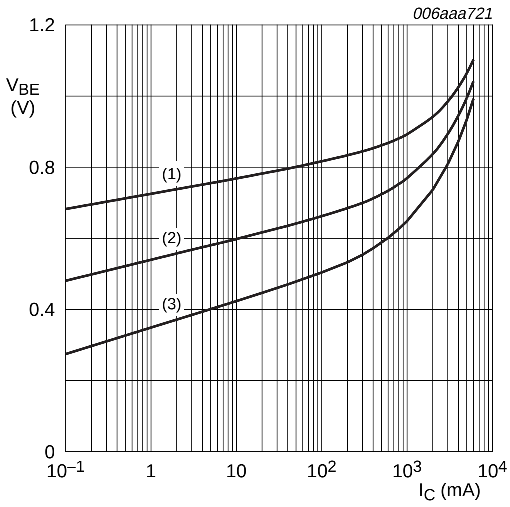
(3) T_{amb} = −55 °C

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



T_{amb} = 25 °C

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



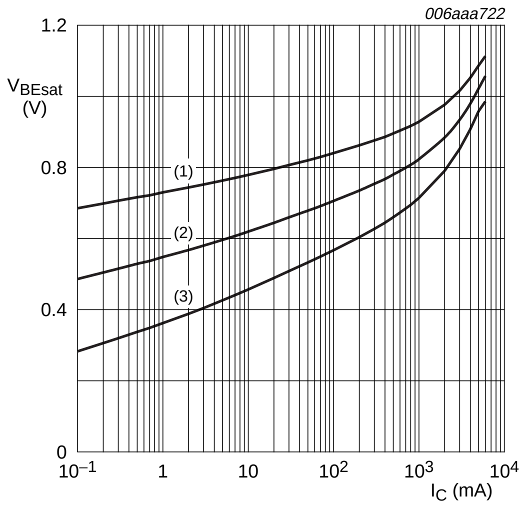
V_{CE} = 2 V

(1) T_{amb} = −55 °C

(2) T_{amb} = 25 °C

(3) T_{amb} = 100 °C

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



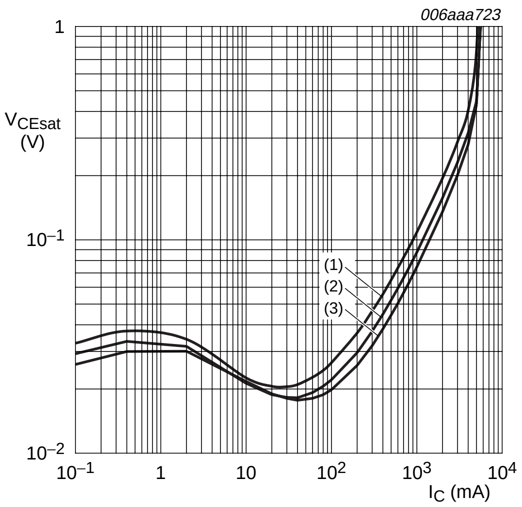
I_C/I_B = 20

(1) T_{amb} = −55 °C

(2) T_{amb} = 25 °C

(3) T_{amb} = 100 °C

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



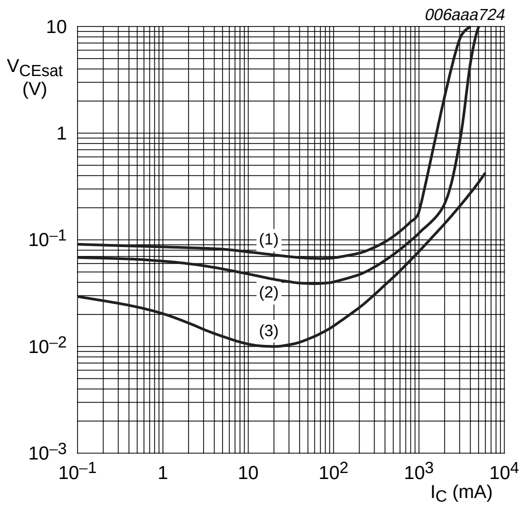
$I_C/I_B = 20$

(1) $T_{amb} = 100$ °C

(2) $T_{amb} = 25$ °C

(3) $T_{amb} = -55$ °C

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



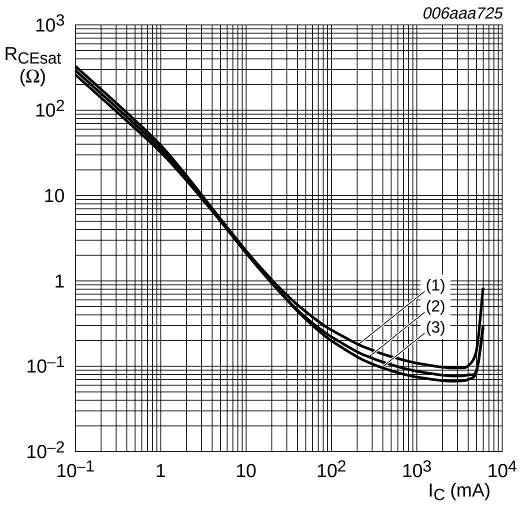
$T_{amb} = 25$ °C

(1) $I_C/I_B = 100$

(2) $I_C/I_B = 50$

(3) $I_C/I_B = 10$

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



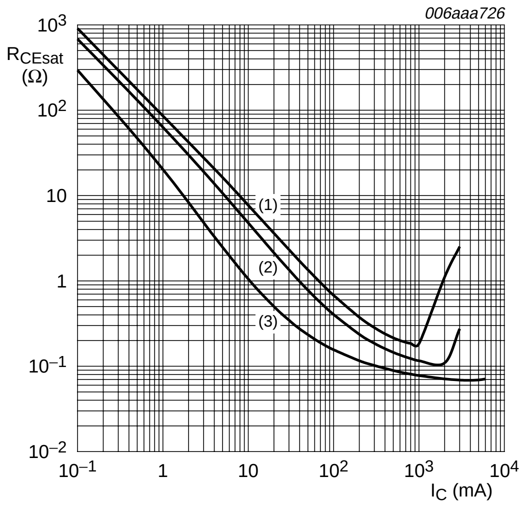
$I_C/I_B = 20$

(1) $T_{amb} = 100$ °C

(2) $T_{amb} = 25$ °C

(3) $T_{amb} = -55$ °C

Fig 12. 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 13. Collector-emitter saturation resistance as a function of collector current; typical values

8. Test information

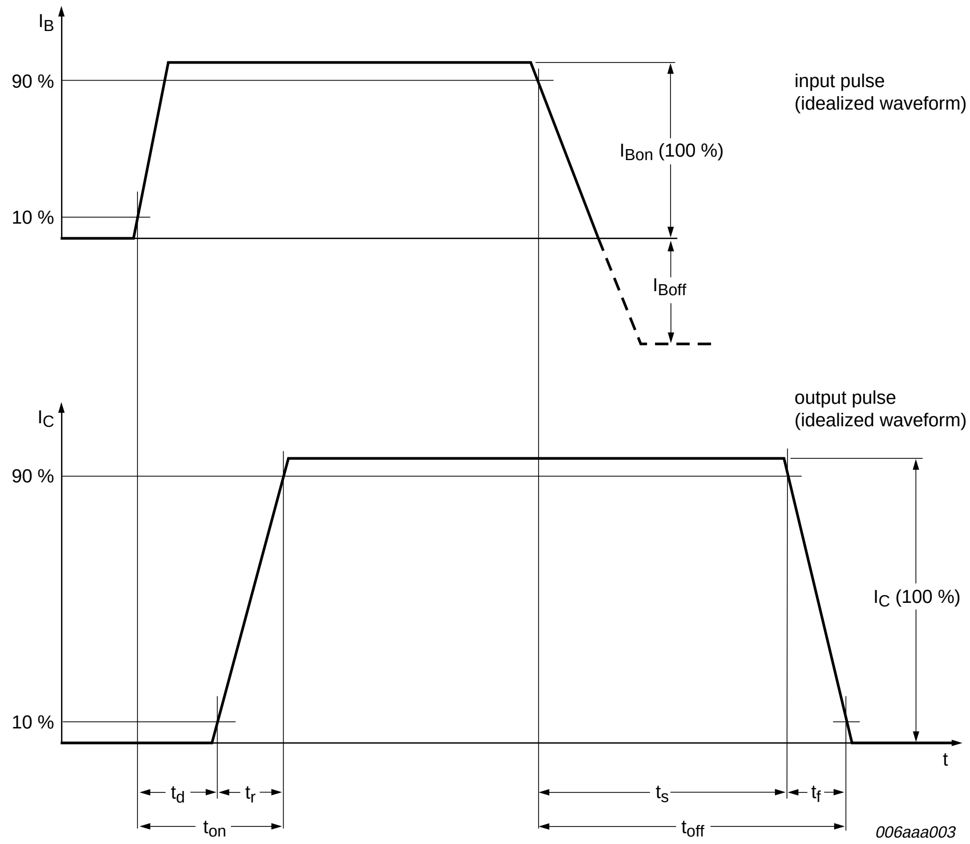
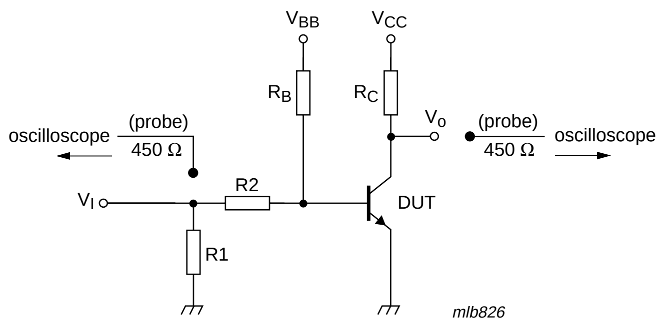


Fig 14. BISS transistor switching time definition



V_{CC} = 9.2 V; I_C = 2 A; I_{Bon} = 0.1 A; I_{Boff} = –0.1 A

Fig 15. Test circuit for switching times

9. Package outline

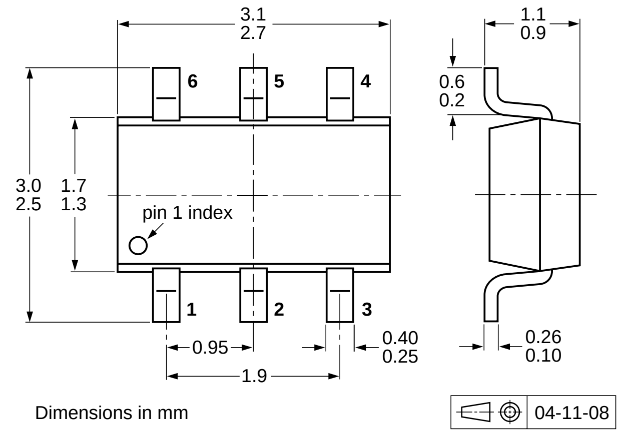


Fig 16. Package outline SOT457 (SC-74)

10. Packing information

Table 8. Packing methods

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

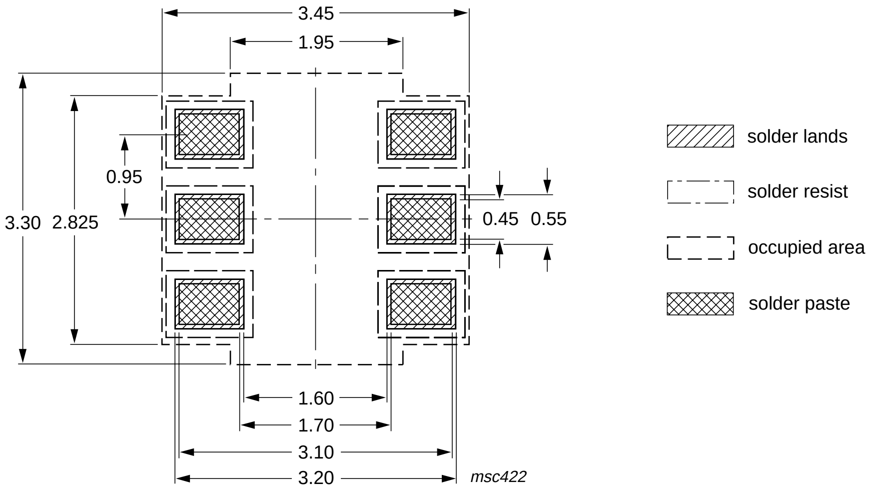
Type number	Package	Description		Packing quantity	
				3000	**10000**
PBSS305ND	SOT457	4 mm pitch, 8 mm tape and reel; T1	[2]	-115	-135
		4 mm pitch, 8 mm tape and reel; T2	[3]	-125	-165

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

[2] T1: normal taping

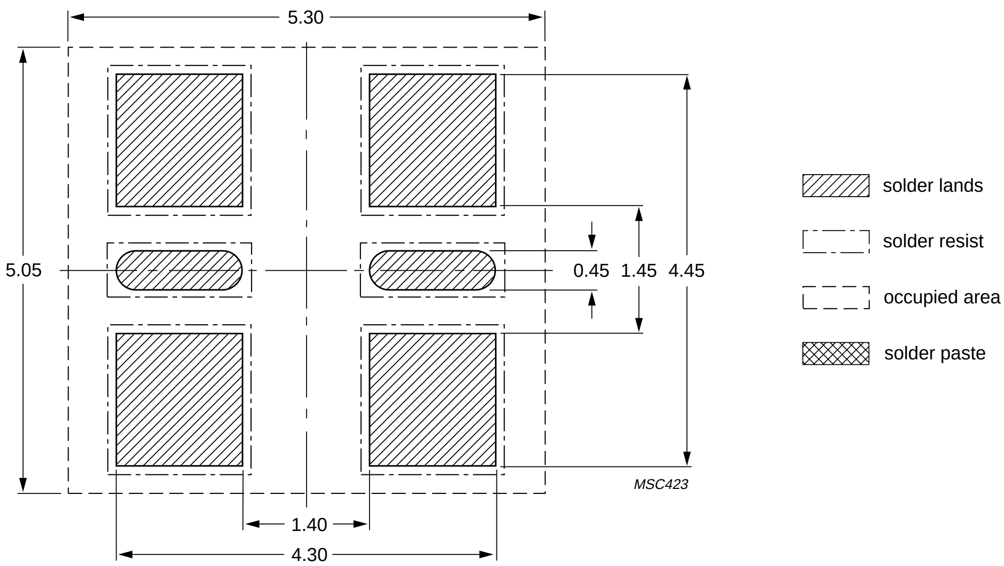
[3] T2: reverse taping

11. Soldering



Dimensions in mm

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



Dimensions in mm

Fig 18. Wave soldering footprint SOT457 (SC-74)

12. Revision history

Table 9. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
PBSS305ND_1	20060410	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”.

[3] The product status of device(s) described in this document may have changed since this document was published and may differ in case of multiple devices. The latest product status information is available on the Internet at URL http://www.semiconductors.philips.com.

13.2 Definitions

Draft — The document is a draft version only. The content is still under internal review and subject to formal approval, which may result in modifications or additions. Philips Semiconductors does not give any representations or warranties as to the accuracy or completeness of information included herein and shall have no liability for the consequences of use of such information.

Short data sheet — A short data sheet is an extract from a full data sheet with the same product type number(s) and title. A short data sheet is intended for quick reference only and should not be relied upon to contain detailed and full information. For detailed and full information see the relevant full data sheet, which is available on request via the local Philips Semiconductors sales office. In case of any inconsistency or conflict with the short data sheet, the full data sheet shall prevail.

13.3 Disclaimers

General — Information in this document is believed to be accurate and reliable. However, Philips Semiconductors does not give any representations or warranties, expressed or implied, as to the accuracy or completeness of such information and shall have no liability for the consequences of use of such information.

Right to make changes — Philips Semiconductors reserves the right to make changes to information published in this document, including without limitation specifications and product descriptions, at any time and without notice. This document supersedes and replaces all information supplied prior to the publication hereof.

Suitability for use — Philips Semiconductors products are not designed, authorized or warranted to be suitable for use in medical, military, aircraft, space or life support equipment, nor in applications where failure or malfunction of a Philips Semiconductors product can reasonably be expected to result in personal injury, death or severe property or environmental damage. Philips Semiconductors accepts no liability for inclusion and/or use of Philips Semiconductors products in such equipment or applications and therefore such inclusion and/or use is for the customer’s own risk.

Applications — Applications that are described herein for any of these products are for illustrative purposes only. Philips Semiconductors makes no representation or warranty that such applications will be suitable for the specified use without further testing or modification.

Limiting values — Stress above one or more limiting values (as defined in the Absolute Maximum Ratings System of IEC 60134) may cause permanent damage to the device. Limiting values are stress ratings only and operation of the device at these or any other conditions above those given in the Characteristics sections of this document is not implied. Exposure to limiting values for extended periods may affect device reliability.

Terms and conditions of sale — Philips Semiconductors products are sold subject to the general terms and conditions of commercial sale, as published at http://www.semiconductors.philips.com/profile/terms, including those pertaining to warranty, intellectual property rights infringement and limitation of liability, unless explicitly otherwise agreed to in writing by Philips Semiconductors. In case of any inconsistency or conflict between information in this document and such terms and conditions, the latter will prevail.

No offer to sell or license — Nothing in this document may be interpreted or construed as an offer to sell products that is open for acceptance or the grant, conveyance or implication of any license under any copyrights, patents or other industrial or intellectual property rights.

13.4 Trademarks

Notice: All referenced brands, product names, service names and trademarks are the property of their respective owners.

14. Contact information

For additional information, please visit: **http://www.semiconductors.philips.com**

For sales office addresses, send an email to: **sales.addresses@www.semiconductors.philips.com**

15. Contents

For more information, please visit: http://www.semiconductors.philips.com.
For sales office addresses, email to: sales.addresses@www.semiconductors.philips.com.

Date of release: 10 April 2006

Document identifier: PBSS305ND_1