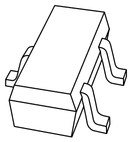

PBSS2515E

15 V, 0.5 A NPN low V_{CEsat} (BISS) transistor

Rev. 01 — 18 April 2005 Product data sheet

1. Product profile

1.1 General description

NPN low V_{CEsat} Breakthrough in Small Signal (BISS) transistor in a SOT416 (SC-75) SMD plastic package.

PNP complement: PBSS3515E.

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

- DC-to-DC conversion
- MOSFET gate driving
- Motor control
- Charging circuits
- Low power switches (e.g. motors, fans)
- Portable 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	-	-	15	V
I_C	collector current (DC)		-	-	0.5	A
I_{CM}	peak collector current	single pulse; $t_p \leq 1$ ms	-	-	1	A
R_{CEsat}	collector-emitter saturation resistance	$I_C = 500$ mA; $I_B = 50$ mA [1]	-	300	500	mΩ

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

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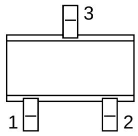
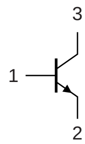
2. Pinning information

Table 2: Pinning

Pin	Description	Simplified outline	Symbol
1	base		
2	emitter		
3	collector		

3. Ordering information

Table 3: Ordering information

Type number	Package		
	Name	Description	Version
PBSS2515E	SC-75	plastic surface mounted package; 3 leads	SOT416

4. Marking

Table 4: Marking codes

Type number	Marking code
PBSS2515E	1Q

5. Limiting values

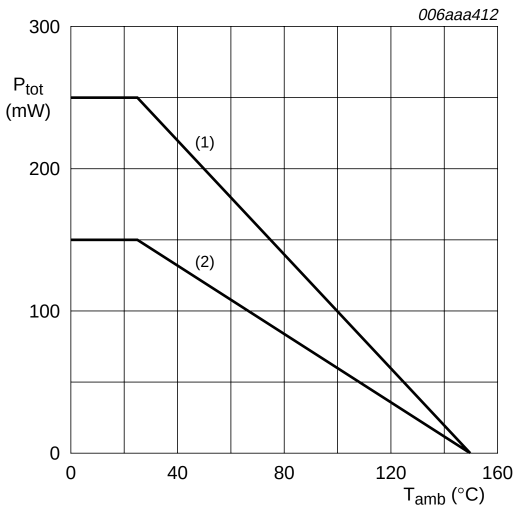
Table 5: Limiting values

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

Symbol	Parameter	Conditions	Min	Max	Unit
V_{CBO}	collector-base voltage	open emitter	-	15	V
V_{CEO}	collector-emitter voltage	open base	-	15	V
V_{EBO}	emitter-base voltage	open collector	-	6	V
I_C	collector current (DC)		-	0.5	A
I_{CM}	peak collector current	single pulse; $t_p \le 1$ ms	-	1	A
I_{BM}	peak base current	single pulse; $t_p \le 1$ ms	-	100	mA
P_{tot}	total power dissipation	$T_{amb} \le 25$ °C [1]	-	150	mW
		[2]	-	250	mW
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 1 cm^2.



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

(2) FR4 PCB, standard footprint

Fig 1. Power derating curves

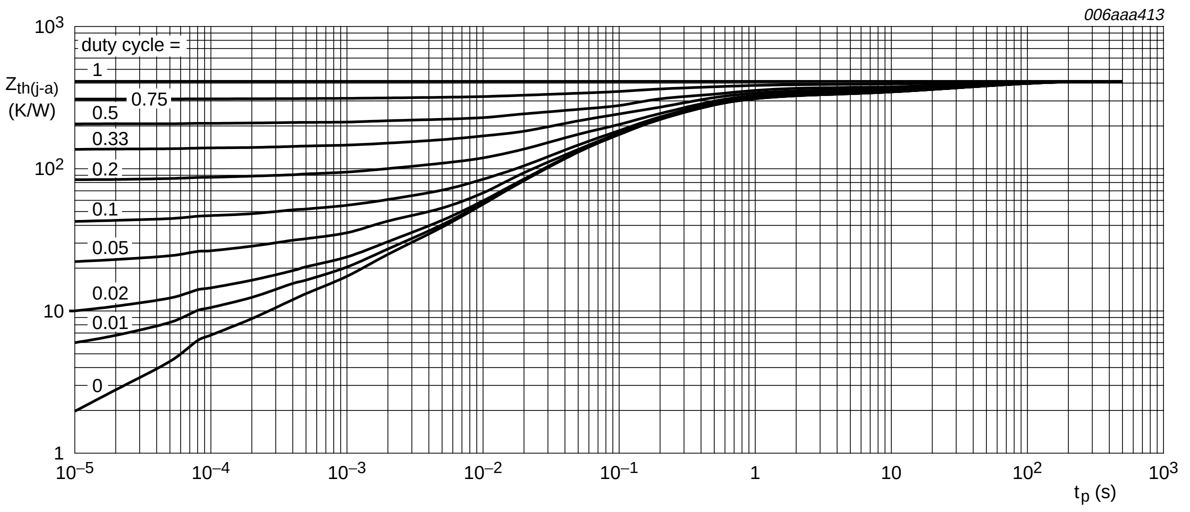
6. Thermal characteristics

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]	-	-	833	K/W
			[2]	-	-	500	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.



FR4 PCB, mounting pad for collector 1 cm^2

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

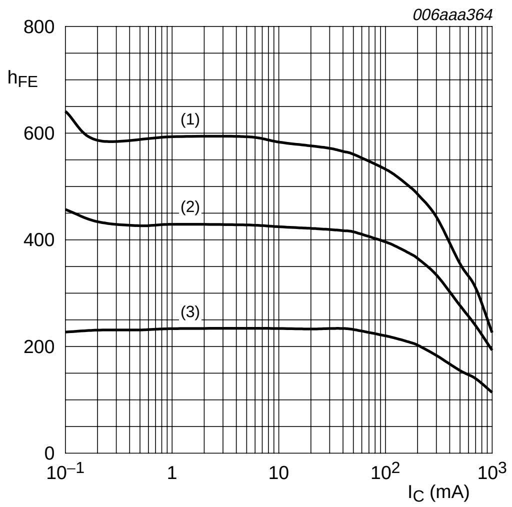
7. Characteristics

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} = 15 V; I_E = 0 A		-	-	100	nA
		V_{CB} = 15 V; I_E = 0 A; T_j = 150 °C		-	-	50	µA
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 = 10 mA		200	-	-	
		V_{CE} = 2 V; I_C = 100 mA	[1]	150	-	-	
		V_{CE} = 2 V; I_C = 500 mA	[1]	90	-	-	
V_{CEsat}	collector-emitter saturation voltage	I_C = 10 mA; I_B = 0.5 mA		-	-	25	mV
		I_C = 200 mA; I_B = 10 mA		-	-	150	mV
		I_C = 500 mA; I_B = 50 mA	[1]	-	-	250	mV
R_{CEsat}	collector-emitter saturation resistance	I_C = 500 mA; I_B = 50 mA	[1]	-	300	500	mΩ
V_{BEsat}	base-emitter saturation voltage	I_C = 500 mA; I_B = 50 mA	[1]	-	-	1.1	V
V_{BEon}	base-emitter turn-on voltage	V_{CE} = 2 V; I_C = 100 mA	[1]	-	-	0.9	V
f_T	transition frequency	V_{CE} = 5 V; I_C = 100 mA; f = 100 MHz		250	420	-	MHz
C_c	collector capacitance	V_{CB} = 10 V; I_E = i_e = 0 A; f = 1 MHz		-	4.4	6	pF

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



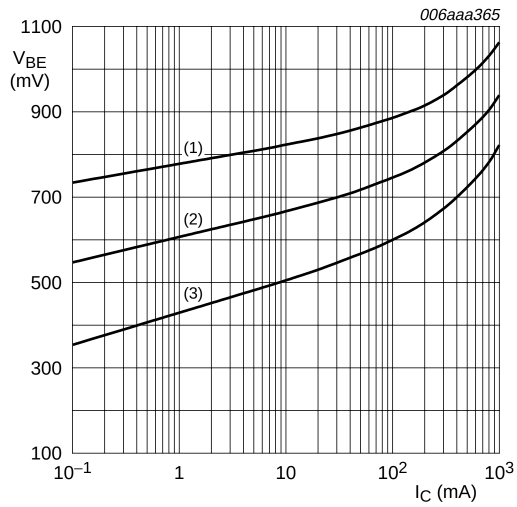
V_{CE} = 2 V

(1) T_{amb} = 100 °C

(2) T_{amb} = 25 °C

(3) T_{amb} = –55 °C

Fig 3. DC current gain as a function of collector current; typical values



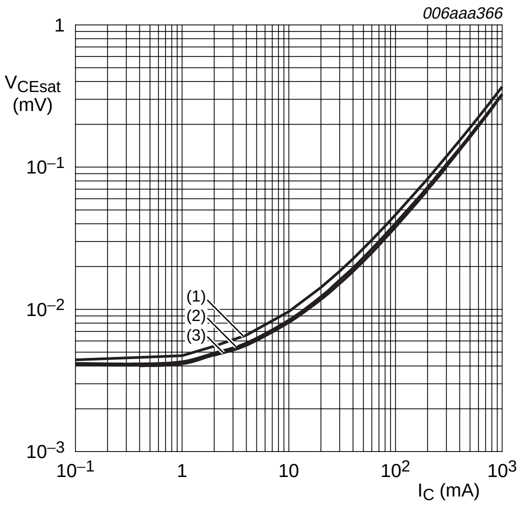
V_{CE} = 2 V

(1) T_{amb} = –55 °C

(2) T_{amb} = 25 °C

(3) T_{amb} = 100 °C

Fig 4. Base-emitter voltage as a function of collector current; typical values



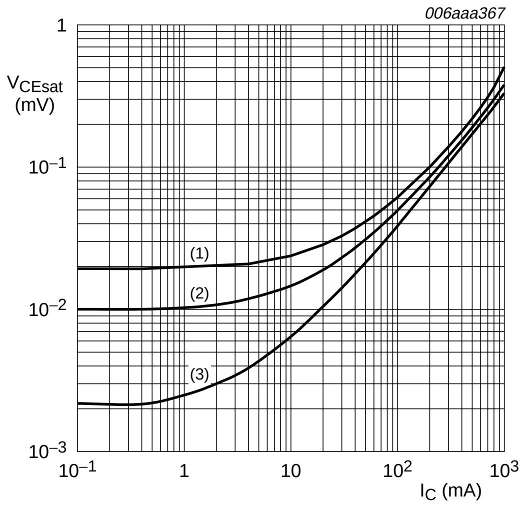
I_C/I_B = 20

(1) T_{amb} = 100 °C

(2) T_{amb} = 25 °C

(3) T_{amb} = –55 °C

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



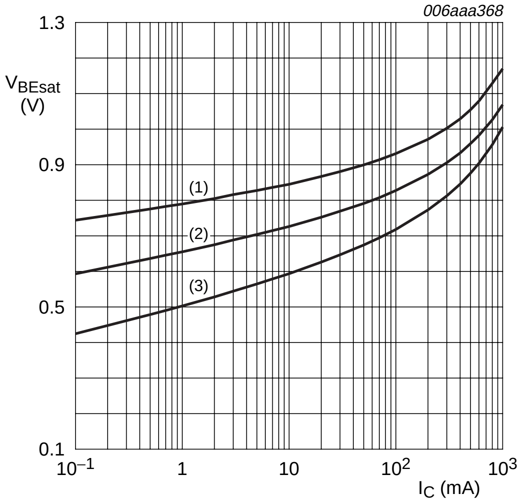
T_{amb} = 25 °C

(1) I_C/I_B = 100

(2) I_C/I_B = 50

(3) I_C/I_B = 10

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



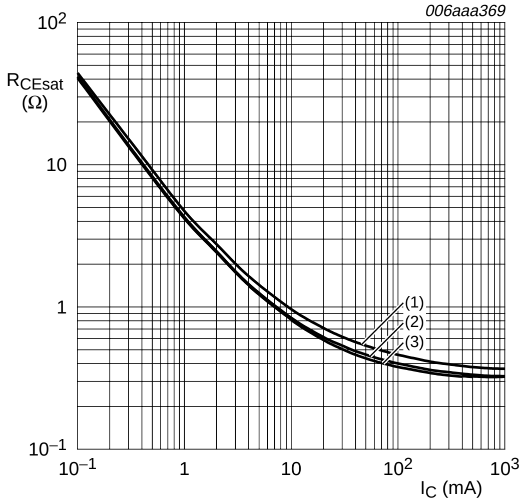
$I_C/I_B = 20$

(1) $T_{amb} = -55$ °C

(2) $T_{amb} = 25$ °C

(3) $T_{amb} = 100$ °C

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



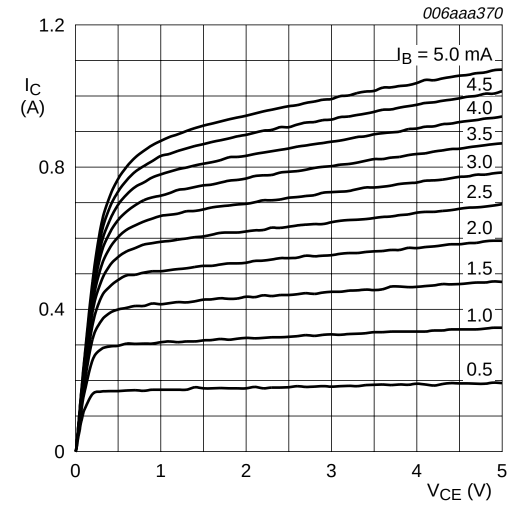
$I_C/I_B = 20$

(1) $T_{amb} = 100$ °C

(2) $T_{amb} = 25$ °C

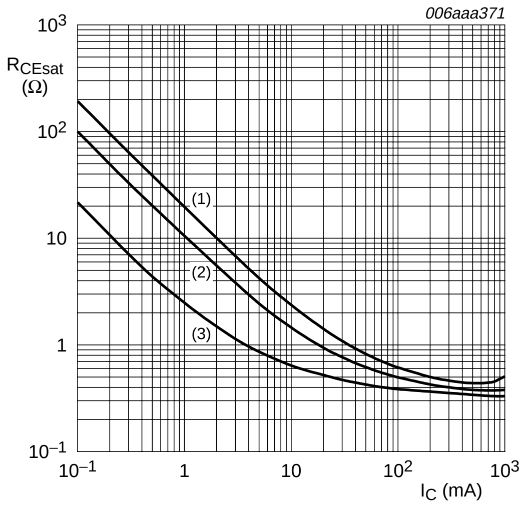
(3) $T_{amb} = -55$ °C

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



$T_{amb} = 25$ °C

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

8. Package outline

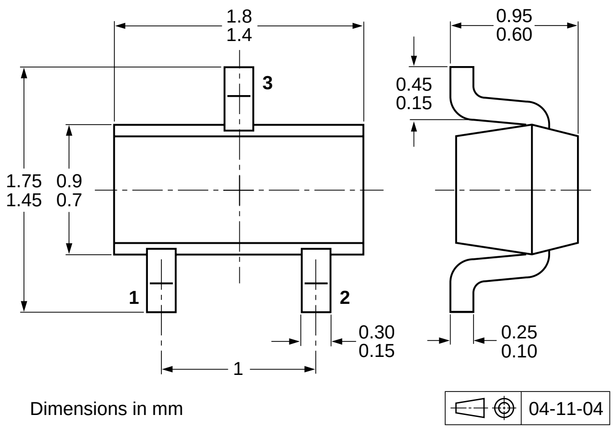


Fig 11. Package outline SOT416 (SC-75)

9. Packing information

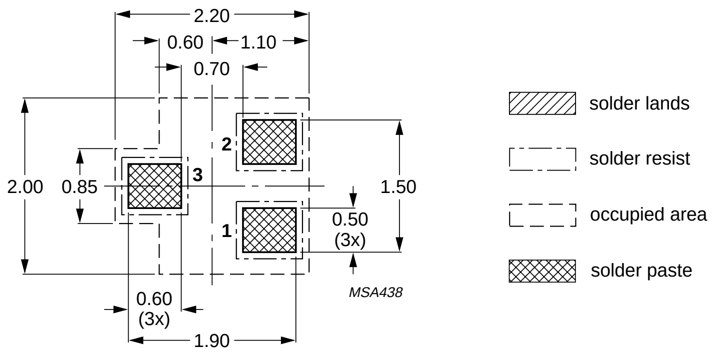
Table 8: Packing methods

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

Type number	Package	Description	Packing quantity	
			3000	10000
PBSS2515E	SOT416	4 mm pitch, 8 mm tape and reel	-115	-135

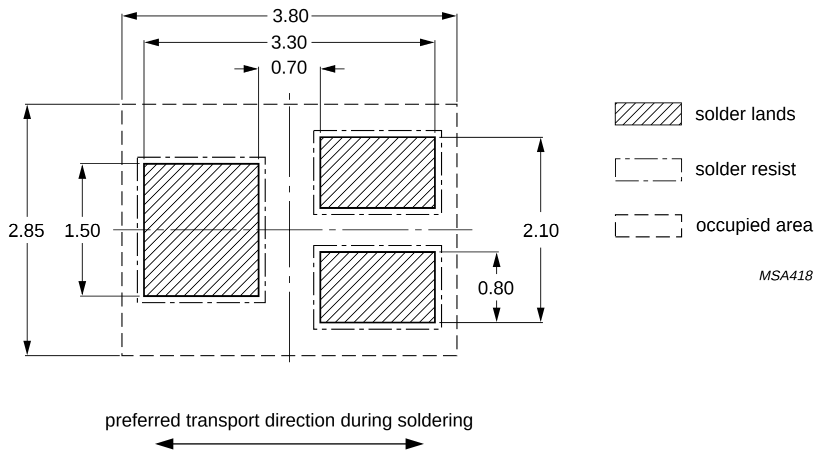
[1] For further information and the availability of packing methods, see Section 15.

10. Soldering



Dimensions in mm

Fig 12. Reflow soldering footprint



Dimensions in mm

Fig 13. Wave soldering footprint

11. Revision history

Table 9: Revision history

Document ID	Release date	Data sheet status	Change notice	Doc. number	Supersedes
PBSS2515E_1	20050418	Product data sheet	-	9397 750 14877	-

12. Data sheet status

Level	Data sheet status [1]	Product status [2] [3]	Definition
I	Objective data	Development	This data sheet contains data from the objective specification for product development. Philips Semiconductors reserves the right to change the specification in any manner without notice.
II	Preliminary data	Qualification	This data sheet contains data from the preliminary specification. Supplementary data will be published at a later date. Philips Semiconductors reserves the right to change the specification without notice, in order to improve the design and supply the best possible product.
III	Product data	Production	This data sheet contains data from the product specification. Philips Semiconductors reserves the right to make changes at any time in order to improve the design, manufacturing and supply. Relevant changes will be communicated via a Customer Product/Process Change Notification (CPCN).

[1] Please consult the most recently issued data sheet before initiating or completing a design.

[2] The product status of the device(s) described in this data sheet may have changed since this data sheet was published. The latest information is available on the Internet at URL http://www.semiconductors.philips.com.

[3] For data sheets describing multiple type numbers, the highest-level product status determines the data sheet status.

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Short-form specification — The data in a short-form specification is extracted from a full data sheet with the same type number and title. For detailed information see the relevant data sheet or data handbook.

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

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16. Contents

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