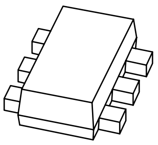

PBSS5160V

60 V, 1 A PNP low V_{CEsat} (BISS) transistor

Rev. 02 — 4 April 2005 Product data sheet

1. Product profile

1.1 General description

PNP low V_{CEsat} Breakthrough in Small Signals (BISS) transistor in a SOT666 plastic package. NPN complement: PBSS4160V.

1.2 Features

- Low collector-emitter saturation voltage V_{CEsat}
- High collector current capability I_C and I_{CM}
- High efficiency leading to less heat generation
- Reduces printed-circuit board area required
- Cost effective replacement for medium power transistors BCP52 and BCX52

1.3 Applications

- Major application segments
  - Automotive
  - Telecom infrastructure
  - Industrial
- Power management
  - DC-to-DC conversion
  - Supply line switching
- Peripheral driver
  - Driver in low supply voltage applications (e.g. lamps and LEDs)
  - Inductive load driver (e.g. relays, buzzers and motors)

1.4 Quick reference data

Table 1: Quick reference data

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
V_{CEO}	collector-emitter voltage	open base	-	-	–60	V
I_C	collector current (DC)	[1]	-	-	–1	A
I_{CM}	peak collector current		-	-	–2	A
R_{CEsat}	equivalent on-resistance	I_C = –1 A; I_B = –100 mA	-	220	330	mΩ

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

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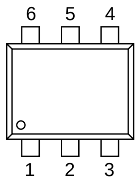
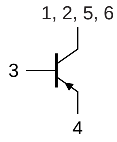
2. Pinning information

Table 2: Pinning

Pin	Description	Simplified outline	Symbol
1, 2, 5, 6	collector		 sym030
3	base		
4	emitter		

3. Ordering information

Table 3: Ordering information

Type number	Package		
	Name	Description	Version
PBSS5160V	-	plastic surface mounted package; 6 leads	SOT666

4. Marking

Table 4: Marking codes

Type number	Marking code
PBSS5160V	51

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		-	–80	V
V_{CEO}	collector-emitter voltage	open base		-	–60	V
V_{EBO}	emitter-base voltage	open collector		-	–5	V
I_C	collector current (DC)		[1]	-	–0.9	A
			[2]	-	–1	A
I_{CM}	peak collector current	t = 1 ms or limited by $T_{j(max)}$		-	–2	A
I_B	base current (DC)			-	–300	mA
I_{BM}	peak base current	$t_p \leq 300$ μs; $\delta \leq 0.02$		-	–1	A
P_{tot}	total power dissipation	$T_{amb} \leq 25$ °C	[1]	-	300	mW
			[2]	-	500	mW
T_j	junction temperature			-	150	°C
T_{amb}	ambient temperature			–65	+150	°C
T_{stg}	storage temperature			–65	+150	°C

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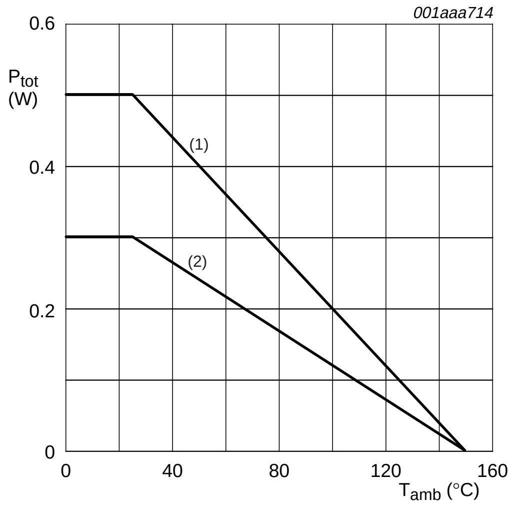
[1] Device mounted on a FR4 PCB, single-sided copper, tin-plated and standard footprint.

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



(1) FR4 PCB; 1 cm^2 collector mounting pad

(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]	-	-	415	K/W
			[2]	-	-	250	K/W

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

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

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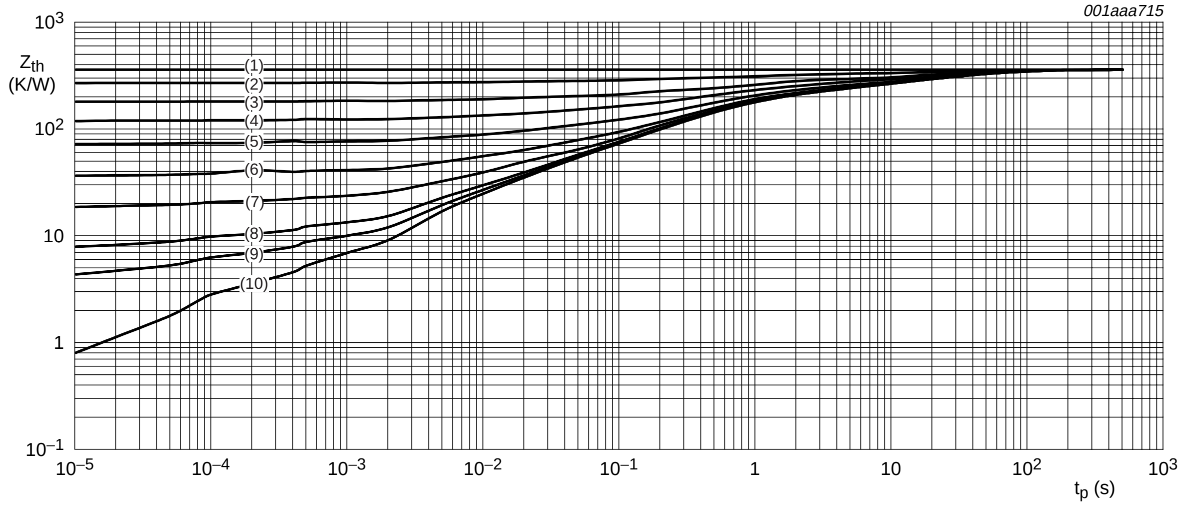

Mounted on FR4 PCB; standard footprint

(1) $\delta = 1$

(2) $\delta = 0.75$

(3) $\delta = 0.5$

(4) $\delta = 0.33$

(5) $\delta = 0.2$

(6) $\delta = 0.1$

(7) $\delta = 0.05$

(8) $\delta = 0.02$

(9) $\delta = 0.01$

(10) $\delta = 0$

Fig 2. Transient thermal impedance as a function of pulse time; typical values

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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} = –60 V; I_E = 0 A		-	-	–100	nA
		V_{CB} = –60 V; I_E = 0 A; T_j = 150 °C		-	-	–50	μA
I_{CES}	collector-emitter cut-off current	V_{CE} = –60 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} = –5 V; I_C = –1 mA		200	350	-	
		V_{CE} = –5 V; I_C = –500 mA	[1]	150	250	-	
		V_{CE} = –5 V; I_C = –1 A	[1]	100	160	-	
V_{CEsat}	collector-emitter saturation voltage	I_C = –100 mA; I_B = –1 mA		-	–110	–160	mV
		I_C = –500 mA; I_B = –50 mA		-	–120	–175	mV
		I_C = –1 A; I_B = –100 mA	[1]	-	–220	–330	mV
V_{BEsat}	base-emitter saturation voltage	I_C = –1 A; I_B = –50 mA		-	–0.95	–1.1	V
R_{CEsat}	equivalent on-resistance	I_C = –1 A; I_B = –100 mA	[1]	-	220	330	mΩ
V_{BEon}	base-emitter turn-on voltage	I_C = –1 A; V_{CE} = –5 V		-	–0.82	–0.9	V
t_d	delay time	V_{CC} = –10 V; I_C = –0.5 A; I_{Bon} = –0.025 A; I_{Boff} = 0.025 A		-	11	-	ns
t_r	rise time			-	30	-	ns
t_{on}	turn-on time			-	41	-	ns
t_s	storage time			-	205	-	ns
t_f	fall time			-	55	-	ns
t_{off}	turn-off time			-	260	-	ns
f_T	transition frequency	I_C = –50 mA; V_{CE} = –10 V; f = 100 MHz		150	220	-	MHz
C_c	collector capacitance	I_E = i_e = 0 A; V_{CB} = –10 V; f = 1 MHz		-	9	15	pF

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

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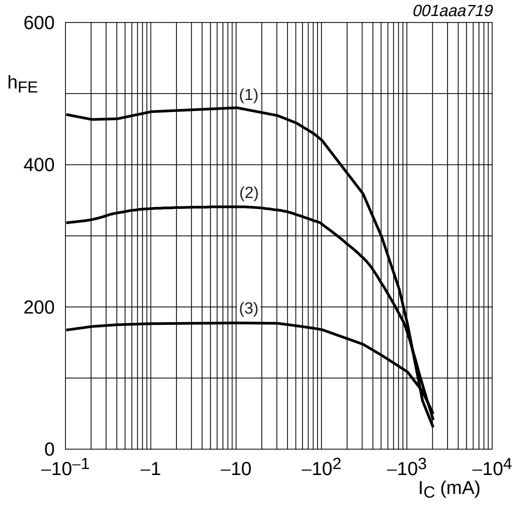


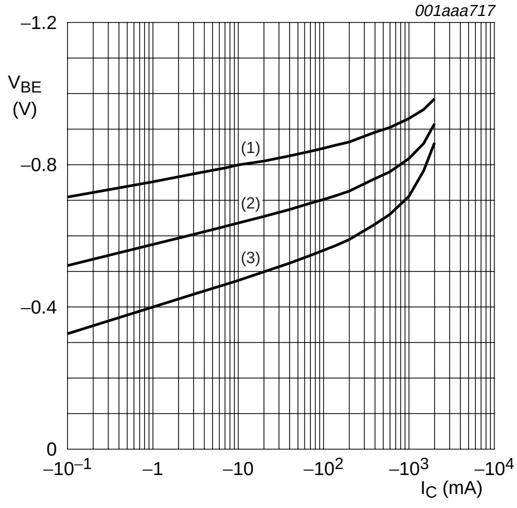
V_{CE} = −5 V

(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



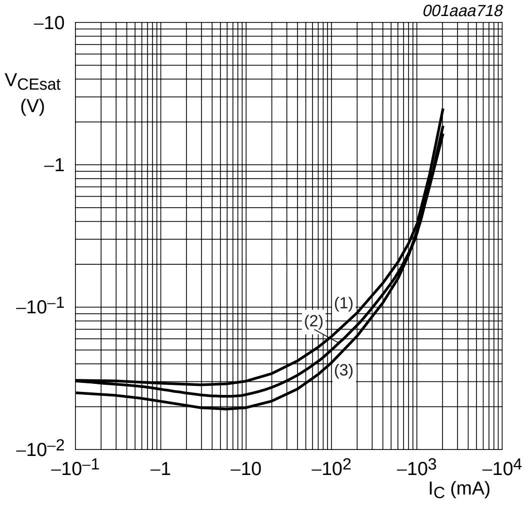
V_{CE} = −5 V

(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



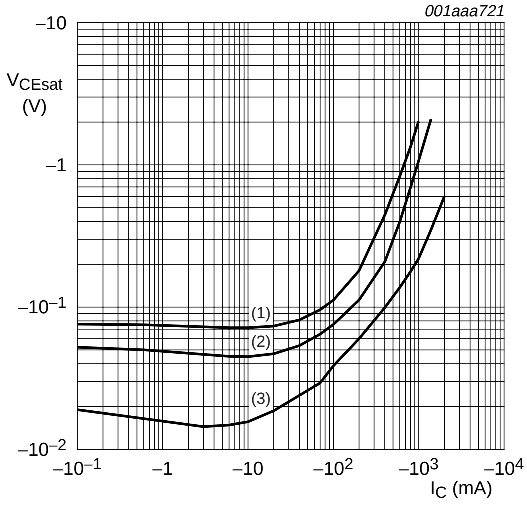
I_C/I_B = 20

(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

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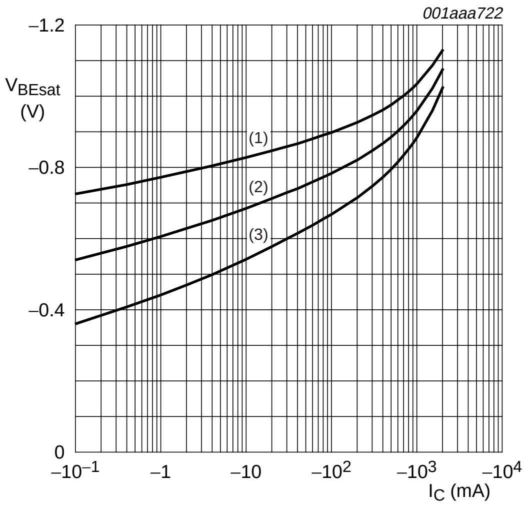


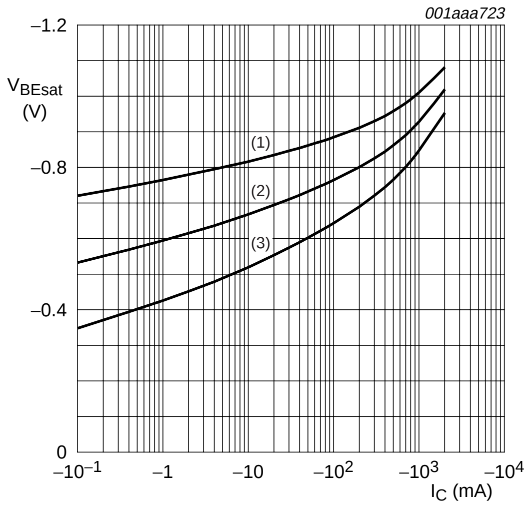
$I_C/I_B = 10$

(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) $T_{amb} = –55$ °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

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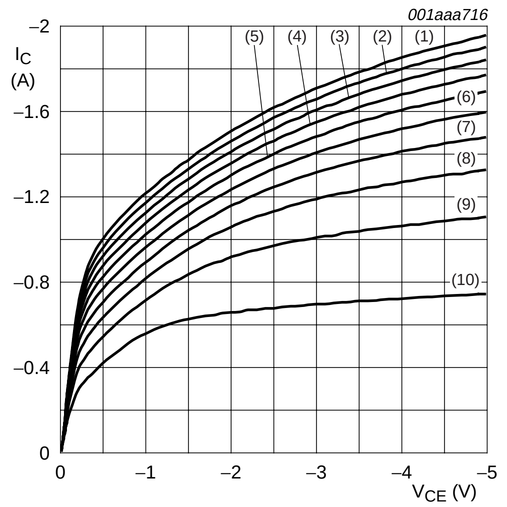


T_{amb} = 25 °C

(1) I_B = −40 mA

(2) I_B = −36 mA

(3) I_B = −32 mA

(4) I_B = −28 mA

(5) I_B = −24 mA

(6) I_B = −20 mA

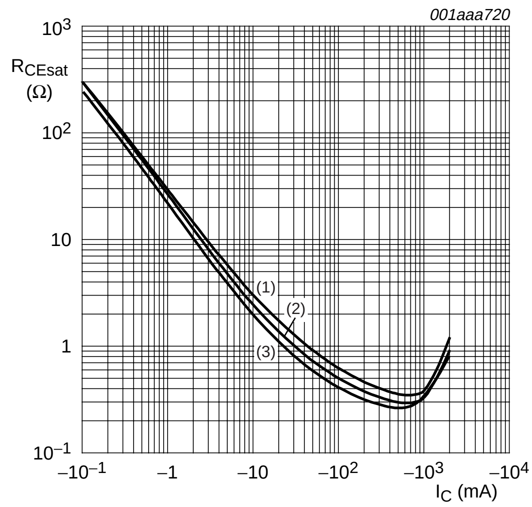
(7) I_B = −16 mA

(8) I_B = −12 mA

(9) I_B = −8 mA

(10) I_B = −4 mA

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



I_C/I_B = 20

(1) T_{amb} = 100 °C

(2) T_{amb} = 25 °C

(3) T_{amb} = −55 °C

Fig 10. Equivalent on-resistance as a function of collector current; typical values

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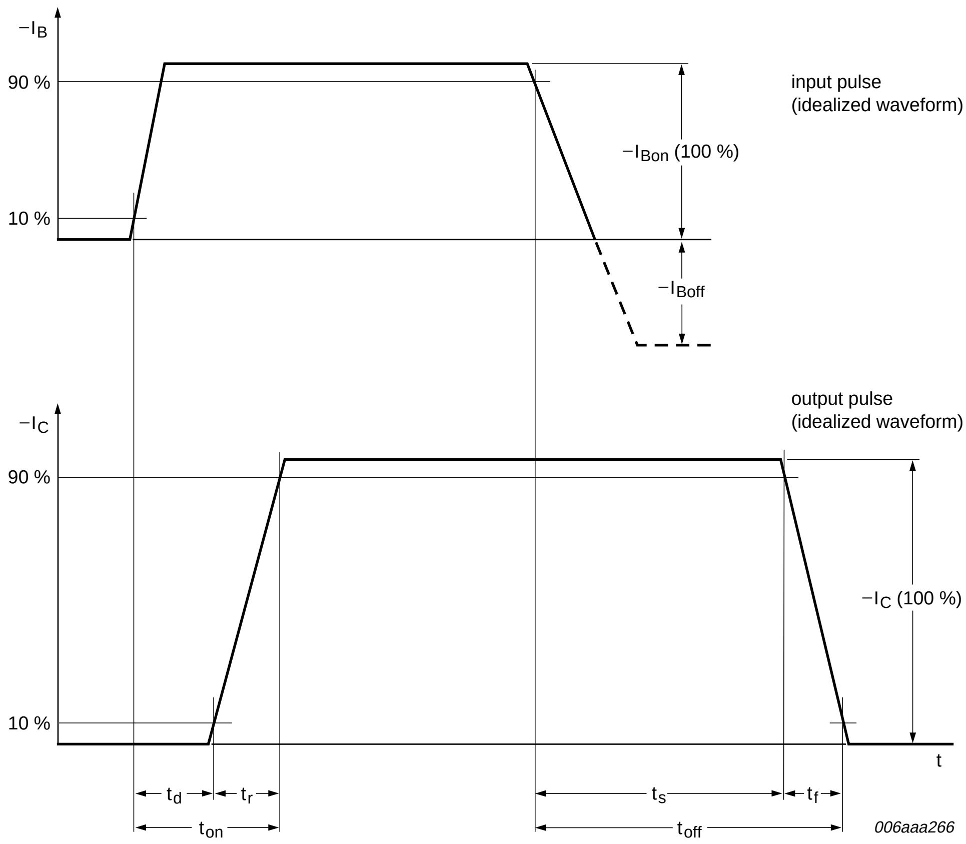
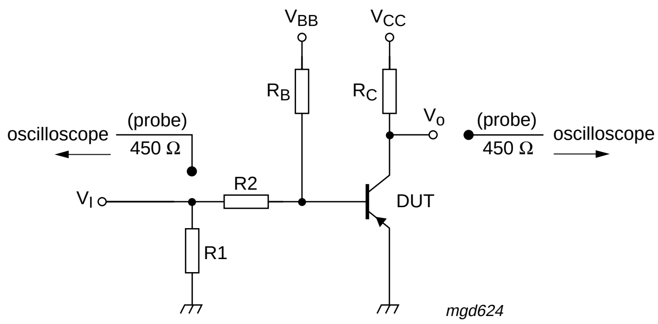


Fig 11. BISS transistor switching time definition



V_{CC} = –10 V; I_C = –0.5 A; I_{Bon} = –0.025 A; I_{Boff} = 0.025 A

Fig 12. Test circuit for switching times

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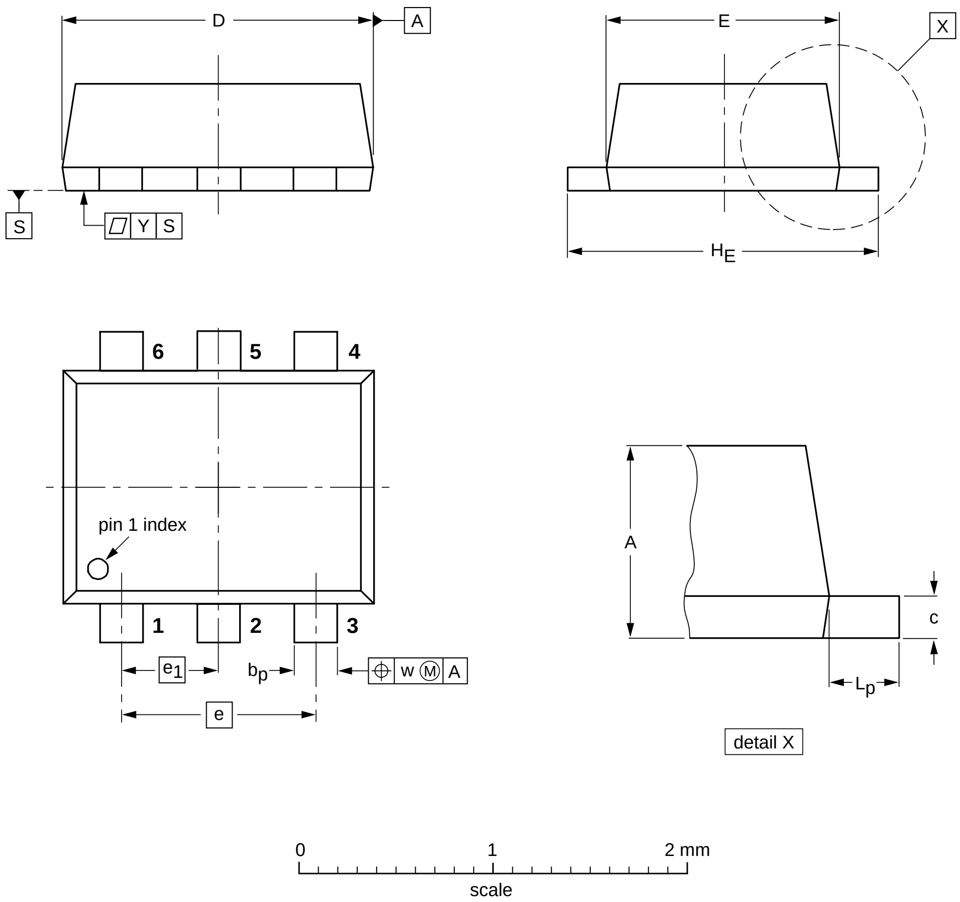
8. Package outline

Plastic surface mounted package; 6 leads **SOT666**



DIMENSIONS (mm are the original dimensions)

UNIT	A	b_p	c	D	E	e	e_1	H_E	L_p	w	y
mm	0.6 0.5	0.27 0.17	0.18 0.08	1.7 1.5	1.3 1.1	1.0	0.5	1.7 1.5	0.3 0.1	0.1	0.1

OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	JEITA			
SOT666						~~01-08-27~~ 04-11-08

Fig 13. Package outline SOT666

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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
PBSS5160V	SOT666	4 mm pitch, 8 mm tape and reel	-115

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

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10. Revision history

Table 9: Revision history

Document ID	Release date	Data sheet status	Change notice	Doc. number	Supersedes
PBSS5160V_2	20050404	Product data sheet	-	9397 750 14508	PBSS5160V_1
Modifications:	• Table 5 I_C value for standard footprint added • Table 7 Typical values for V_{BEsat} and V_{BEon} and switching time parameters t_d, t_r, t_{on}, t_s, t_f, t_{off} added • Table 7 Switching time parameters t_d, t_r, t_{on}, t_s, t_f and t_{off} added • Figure 11 “BISS transistor switching time definition” added • Figure 12 “Test circuit for switching times” added • Section 9 “Packing information” added				
PBSS5160V_1	20040420	Objective data sheet	-	9397 750 12883	-

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11. 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.

12. Definitions

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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15. Contents

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