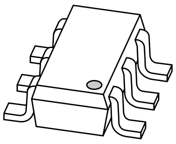


PBSS4160DPN

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

Rev. 01 — 3 June 2004 Objective data sheet

1. Product profile

1.1 General description

NPN/PNP low V_{CEsat} (BISS) transistor pair in a SOT457 (SC-74) plastic package.

1.2 Features

- Low collector-emitter saturation voltage V_{CEsat}
- High collector current capability I_C and I_{CM}
- High efficiency, reduces heat generation
- Reduces printed-circuit board area required.

1.3 Applications

- Power management
  - DC-to-DC conversion
  - Supply line switching
- Peripheral driver
  - Inductive load drivers (e.g. relays, buzzers and motors)
  - Driver in low supply voltage applications (e.g. lamps and LEDs).

1.4 Quick reference data

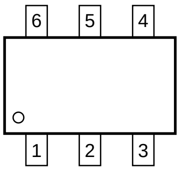
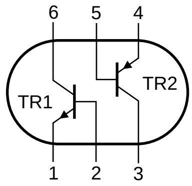
Table 1: Quick reference data

Symbol	Parameter	Conditions	Min	Typ	Max		Unit
					NPN	PNP	
V_{CEO}	collector-emitter voltage		-	-	60	–60	V
I_C	collector current (DC)		-	-	1	–1	A
I_{CRP}	repetitive peak collector current		-	-	2	–1.5	A
R_{CEsat}	equivalent on-resistance		-	-	250	330	mΩ

PHILIPS

2. Pinning information

Table 2: Discrete pinning

Pin	Description	Simplified outline	Symbol
1, 4	emitter TR1; TR2	 SOT457	 sym019
2, 5	base TR1; TR2		
6, 3	collector TR1; TR2		

3. Ordering information

Table 3: Ordering information

Type number	Package		
	Name	Description	Version
PBSS4160DPN	-	plastic surface mounted package; 6 leads	SOT457

4. Marking

Table 4: Marking

Type number	Marking code [1]
PBSS4160DPN	B4

[1] Made in Malaysia.

5. Limiting values

Table 5: Limiting values

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

Symbol	Parameter	Conditions		Min	Max	Unit
Per transistor unless otherwise specified; for the PNP transistor with negative polarity						
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	A
I_{CM}	peak collector current	t = 1 ms or limited by $T_{j(max)}$		-	2	A
I_{CRP}	repetitive peak collector current					
	NPN		[1]	-	2	A
	PNP		[1]	-	1.5	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	[2]	-	310	mW
			[3]	-	370	mW
			[1]	-	1.1	W
T_j	junction temperature			-	150	°C
T_{amb}	operating ambient temperature			–65	+150	°C
T_{stg}	storage temperature			–65	+150	°C
Per device						
P_{tot}	total power dissipation	$T_{amb} \leq 25$ °C	[3]	-	600	mW

[1] Device mounted on a ceramic circuit board, Al_2O_3, standard footprint.

[2] Device mounted on a FR4 printed-circuit board, single-sided copper, tin-plated, standard footprint.

[3] Device mounted on a FR4 printed-circuit board, single-sided copper, tin-plated, mounting pad for collector 1 cm^2.

6. Thermal characteristics

Table 6: Thermal characteristics

Symbol	Parameter	Conditions		Typ	Unit
Per transistor					
$R_{th(j-a)}$	thermal resistance from junction to ambient	in free air	[1]	340	K/W
			[2]	110	K/W

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

[2] Device mounted on a ceramic circuit board, Al_2O_3, standard footprint.

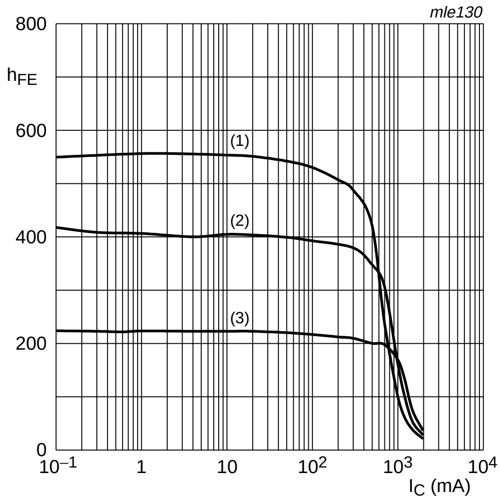
7. Characteristics

Table 7: Characteristics

T_j = 25 °C unless otherwise specified.

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
Per transistor unless otherwise specified; for the PNP transistor with negative polarity							
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
V_{BEsat}	base-emitter saturation voltage	I_C = 1 A; I_B = 50 mA		-	0.95	1.1	V
V_{BEon}	base-emitter turn-on voltage	V_{CE} = 5 V; I_C = 1 A		-	0.82	0.9	V
f_T	transition frequency	I_C = 50 mA; V_{CE} = 10 V; f = 100 MHz		150	220	-	MHz
TR1 (NPN)							
h_{FE}	DC current gain	V_{CE} = 5 V; I_C = 1 mA		250	400	-	
		V_{CE} = 5 V; I_C = 500 mA	[1]	200	350	-	
		V_{CE} = 5 V; I_C = 1 A	[1]	100	150	-	
V_{CEsat}	collector-emitter saturation voltage	I_C = 100 mA; I_B = 1 mA		-	90	110	mV
		I_C = 500 mA; I_B = 50 mA		-	110	140	mV
		I_C = 1 A; I_B = 100 mA	[1]	-	200	250	mV
R_{CEsat}	equivalent on-resistance	I_C = 1 A; I_B = 100 mA	[1]	-	200	250	mΩ
C_c	collector capacitance	V_{CB} = 10 V; I_E = I_e = 0 A; f = 1 MHz		-	5.5	10	pF
TR2 (PNP)							
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
R_{CEsat}	equivalent on-resistance	I_C = –1 A; I_B = –100 mA	[1]	-	220	330	mΩ
C_c	collector capacitance	V_{CB} = –10 V; I_E = I_e = 0 A; f = 1 MHz		-	9	15	pF

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



TR1 (NPN)

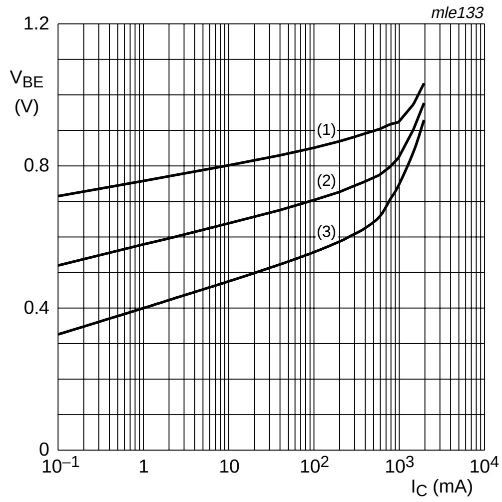
V_{CE} = 5 V.

(1) T_{amb} = 100 °C.

(2) T_{amb} = 25 °C.

(3) T_{amb} = –55 °C.

Fig 1. DC current gain as a function of collector current; typical values.



TR1 (NPN)

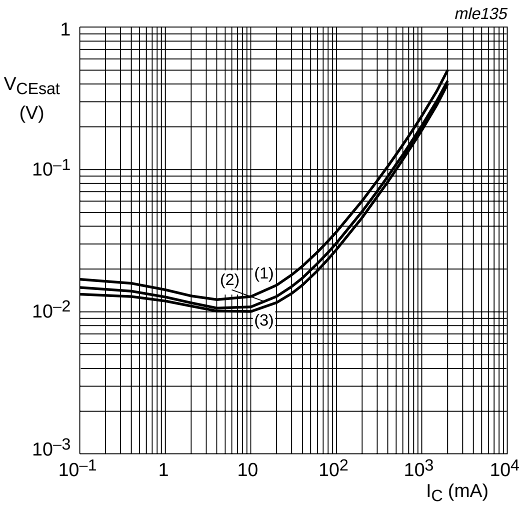
V_{CE} = 5 V.

(1) T_{amb} = –55 °C.

(2) T_{amb} = 25 °C.

(3) T_{amb} = 100 °C.

Fig 2. Base-emitter voltage as a function of collector current; typical values.



TR1 (NPN)

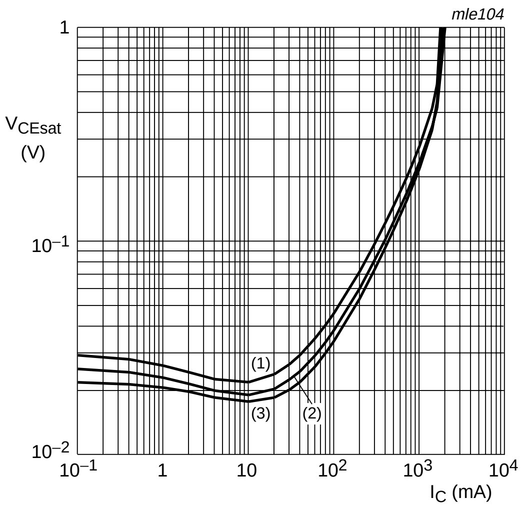
I_C/I_B = 10.

(1) T_{amb} = 100 °C.

(2) T_{amb} = 25 °C.

(3) T_{amb} = –55 °C.

Fig 3. Collector-emitter saturation voltage as a function of collector current; typical values.



TR1 (NPN)

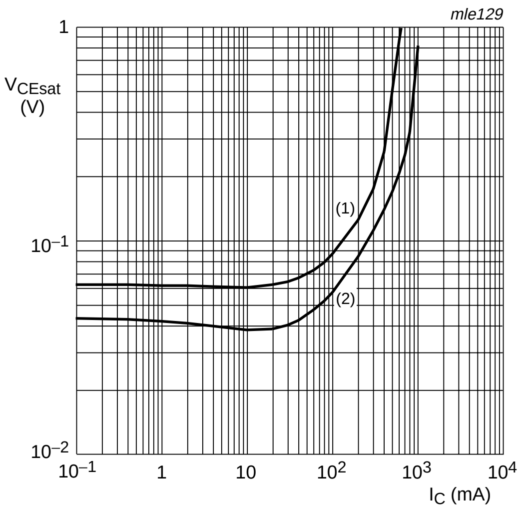
I_C/I_B = 20.

(1) T_{amb} = 100 °C.

(2) T_{amb} = 25 °C.

(3) T_{amb} = –55 °C.

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



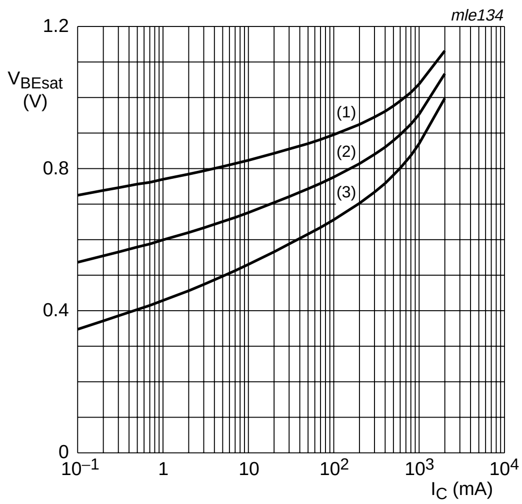
TR1 (NPN)

T_{amb} = 25 °C.

(1) I_C/I_B = 100.

(2) I_C/I_B = 50.

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



TR1 (NPN)

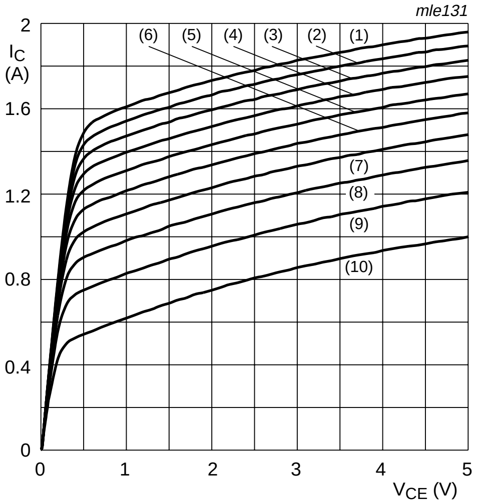
I_C/I_B = 20.

(1) T_{amb} = –55 °C.

(2) T_{amb} = 25 °C.

(3) T_{amb} = 100 °C.

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



TR1 (NPN)

T_{amb} = 25 °C.

(1) I_B = 60 mA.

(2) I_B = 54 mA.

(3) I_B = 48 mA.

(4) I_B = 42 mA.

(5) I_B = 36 mA.

(6) I_B = 30 mA.

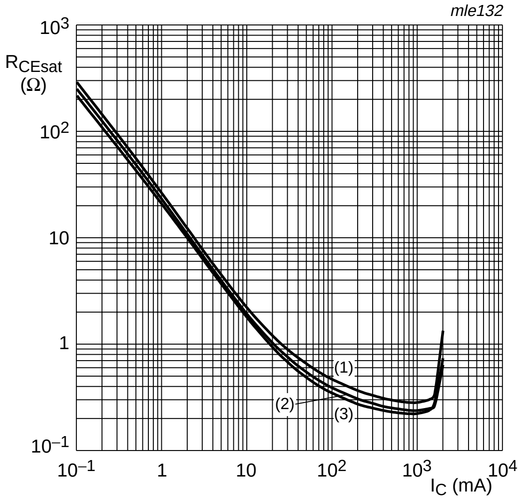
(7) I_B = 24 mA.

(8) I_B = 18 mA.

(9) I_B = 12 mA.

(10) I_B = 6 mA.

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



TR1 (NPN)

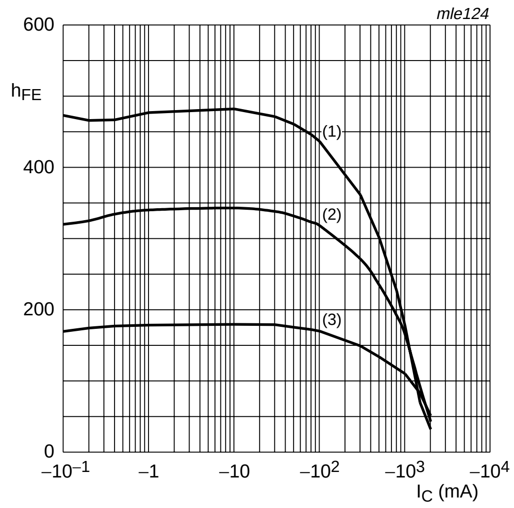
I_C/I_B = 20.

(1) T_{amb} = 100 °C.

(2) T_{amb} = 25 °C.

(3) T_{amb} = −55 °C.

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



TR2 (PNP)

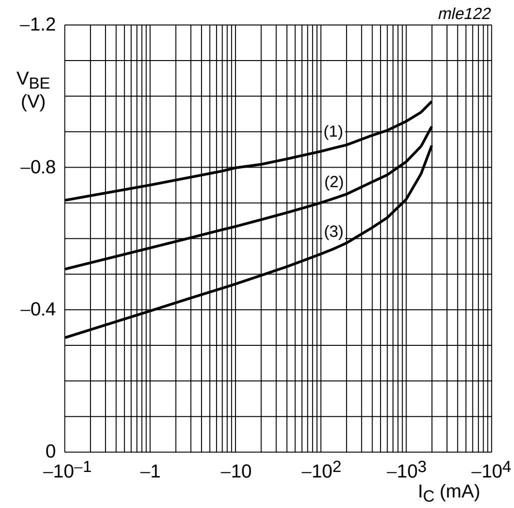
V_{CE} = −5 V.

(1) T_{amb} = 100 °C.

(2) T_{amb} = 25 °C.

(3) T_{amb} = −55 °C.

Fig 9. DC current gain as a function of collector current; typical values.



TR2 (PNP)

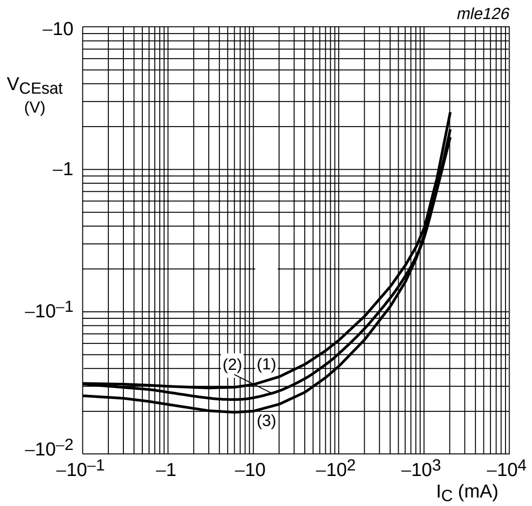
V_{CE} = −5 V.

(1) T_{amb} = −55 °C.

(2) T_{amb} = 25 °C.

(3) T_{amb} = 100 °C.

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



TR2 (PNP)

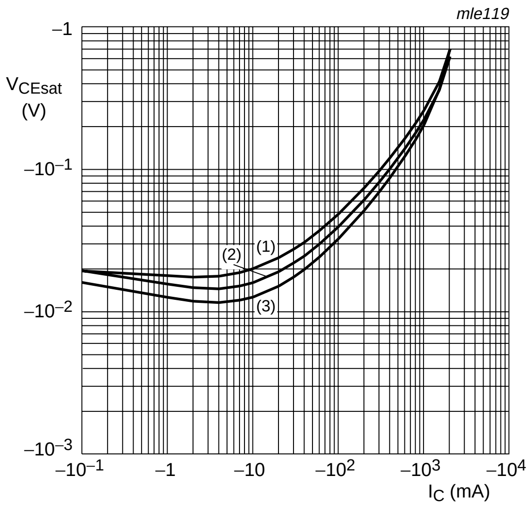
I_C/I_B = 20.

(1) T_{amb} = 100 °C.

(2) T_{amb} = 25 °C.

(3) T_{amb} = −55 °C.

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



TR2 (PNP)

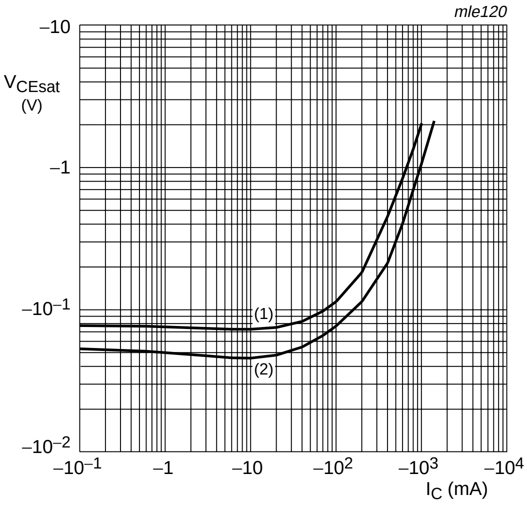
I_C/I_B = 10.

(1) T_{amb} = 100 °C.

(2) T_{amb} = 25 °C.

(3) T_{amb} = −55 °C.

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



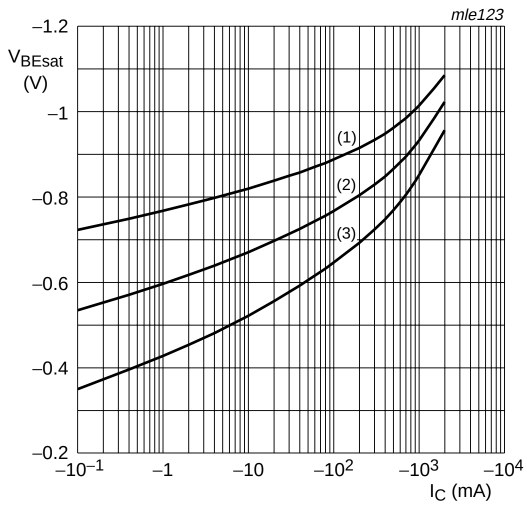
TR2 (PNP)

T_{amb} = 25 °C.

(1) I_C/I_B = 100.

(2) I_C/I_B = 50.

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



TR2 (PNP)

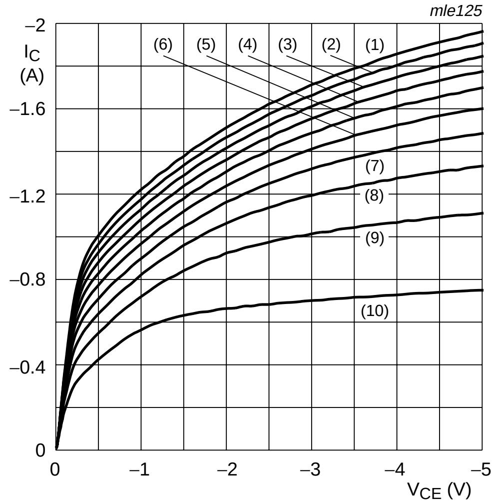
I_C/I_B = 20.

(1) T_{amb} = −55 °C.

(2) T_{amb} = 25 °C.

(3) T_{amb} = 100 °C.

Fig 14. Base-emitter saturation voltage as a function of collector current; typical values.



TR2 (PNP)

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.

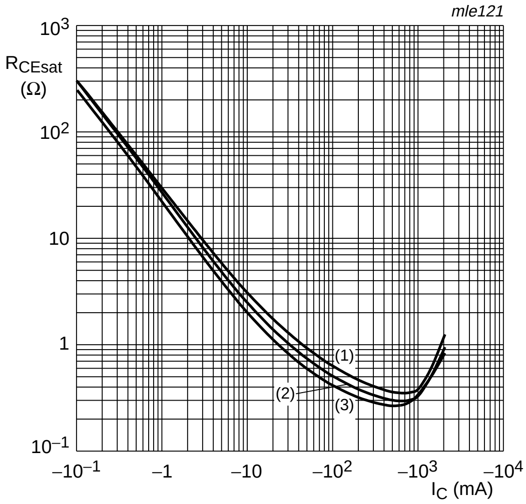
(7) I_B = −16 mA.

(8) I_B = −12 mA.

(9) I_B = −8 mA.

(10) I_B = −4 mA.

Fig 15. Collector current as a function of collector-emitter voltage; typical values.



TR2 (PNP)

I_C/I_B = 20.

(1) T_{amb} = 100 °C.

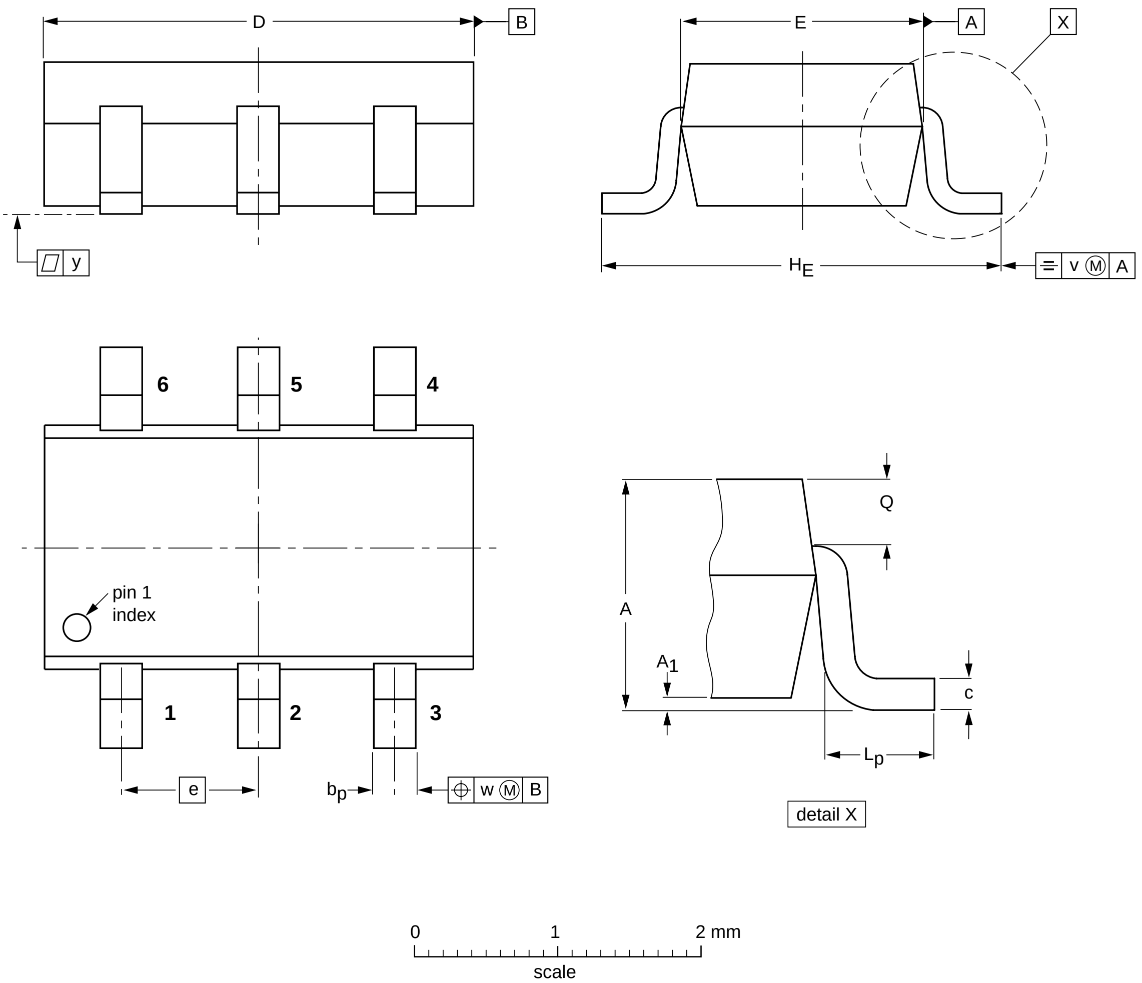
(2) T_{amb} = 25 °C.

(3) T_{amb} = −55 °C.

Fig 16. Collector-emitter equivalent on-resistance as a function of collector current; typical values.

8. Package outline

Plastic surface mounted package; 6 leads **SOT457**



DIMENSIONS (mm are the original dimensions)

UNIT	A	A_1	b_p	c	D	E	e	H_E	L_p	Q	v	w	y
mm	1.1 0.9	0.1 0.013	0.40 0.25	0.26 0.10	3.1 2.7	1.7 1.3	0.95	3.0 2.5	0.6 0.2	0.33 0.23	0.2	0.2	0.1

OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	EIAJ			
SOT457			SC-74			~~97-02-28~~ 01-05-04

Fig 17. Package outline.

9. Revision history

Table 8: Revision history

Document ID	Release date	Data sheet status	Change notice	Order number	Supersedes
PBSS4160DPN_1	20040603	Objective data	-	9397 750 12701	-

10. 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.

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

14. Contents

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