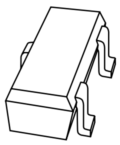

PBSS4160K

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

Rev. 01 — 29 April 2004 Objective data sheet

1. Product profile

1.1 General description

NPN low V_{CEsat} (BISS) transistor in a SOT346 (SC59) plastic package. PNP complement: PBSS5160K.

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 of medium power transistor BCP55 and BCX55.

1.3 Applications

- Major application segments
  - Automotive 42 V power
  - 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		-	-	60	V
I_C	collector current (DC)		-	-	1	A
I_{CM}	peak collector current		-	-	2	A
R_{CEsat}	equivalent on-resistance		-	-	280	mΩ

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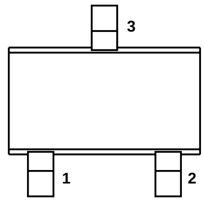
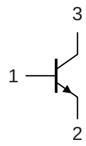
2. Pinning information

Table 2: Discrete pinning

Pin	Description	Simplified outline	Symbol
1	base	 Top view	 sym021
2	emitter		
3	collector		

3. Ordering information

Table 3: Ordering information

Type number	Package		
	Name	Description	Version
PBSS4160K	-	plastic surface mounted package; 3 leads	SOT346

4. Marking

Table 4: Marking

Type number	Marking code [1]
PBSS4160K	*XB

[1] * = t: 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
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_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]	-	250	mW
			[2]	-	425	mW
T_j	junction temperature			-	150	°C
T_{amb}	operating ambient temperature			–65	+150	°C
T_{stg}	storage temperature			–65	+150	°C

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

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

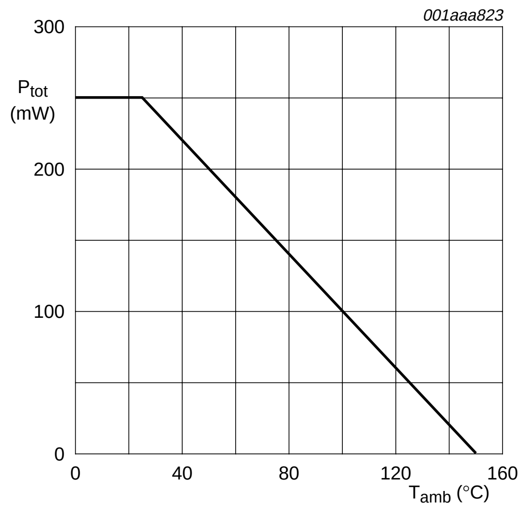


Fig 1. Power derating curve.

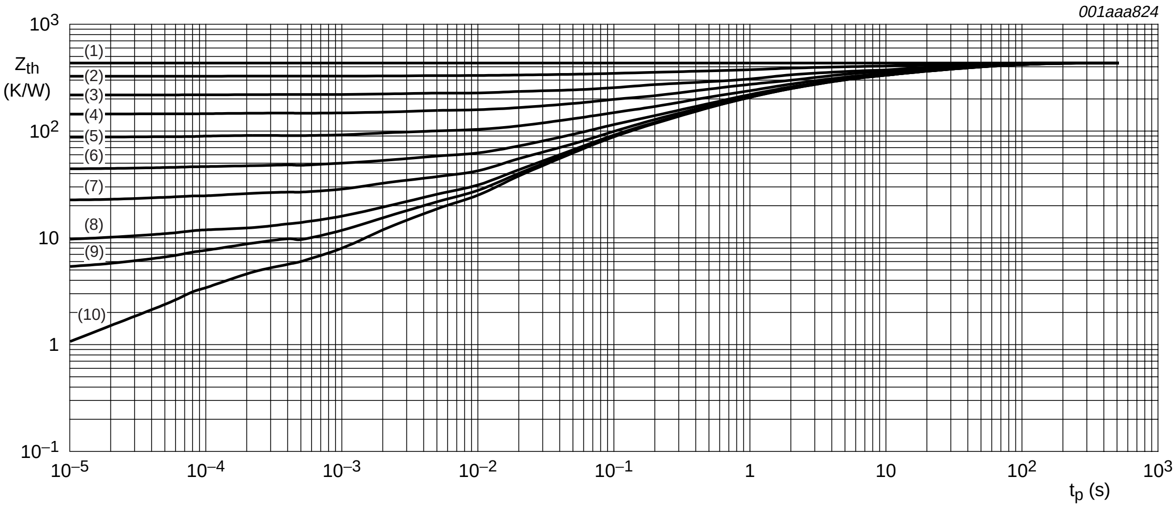
6. Thermal characteristics

Table 6: Thermal characteristics

Symbol	Parameter	Conditions		Typ	Unit
$R_{th(j-a)}$	thermal resistance from junction to ambient	in free air	[1]	500	K/W
			[2]	294	K/W

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

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



(1) δ = 1.0.
(2) δ = 0.75.
(3) δ = 0.5.
(4) δ = 0.33.
(5) δ = 0.2.
(6) δ = 0.1.
(7) δ = 0.05.
(8) δ = 0.02.
(9) δ = 0.01.
(10) δ = 0.

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

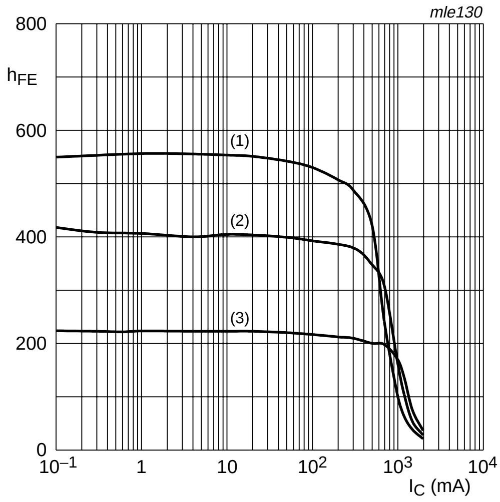
7. Characteristics

Table 7: Characteristics

T_j = 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; 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		250	<tbd>	-	
		V_{CE} = 5 V; I_C = 500 mA	[1]	200	<tbd>	-	
		V_{CE} = 5 V; I_C = 1 A	[1]	100	<tbd>	-	
V_{CEsat}	collector-emitter saturation voltage	I_C = 100 mA; I_B = 1 mA		-	<tbd>	110	mV
		I_C = 500 mA; I_B = 50 mA		-	<tbd>	150	mV
		I_C = 1 A; I_B = 100 mA	[1]	-	<tbd>	280	mV
V_{BEsat}	base-emitter saturation voltage	I_C = 1 A; I_B = 50 mA		-	<tbd>	1.1	V
R_{CEsat}	equivalent on-resistance	I_C = 1 A; I_B = 100 mA	[1]	-	<tbd>	280	mΩ
V_{BEon}	base-emitter turn-on voltage	V_{CE} = 5 V; I_C = 1 A		-	<tbd>	0.9	V
f_T	transition frequency	I_C = 50 mA; V_{CE} = 10 V; f = 100 MHz		150	220	-	MHz
C_c	collector capacitance	V_{CB} = 10 V; I_E = I_e = 0 A; f = 1 MHz		-	5.5	10	pF

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



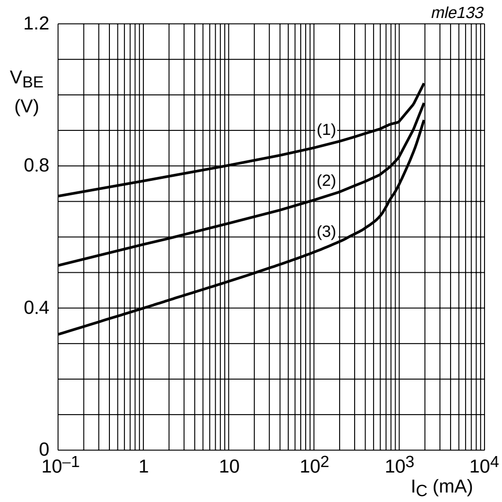
V_{CE} = 5 V.

(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.



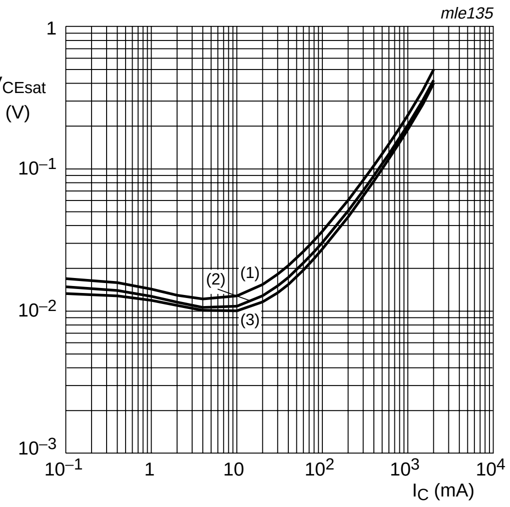
V_{CE} = 5 V.

(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.



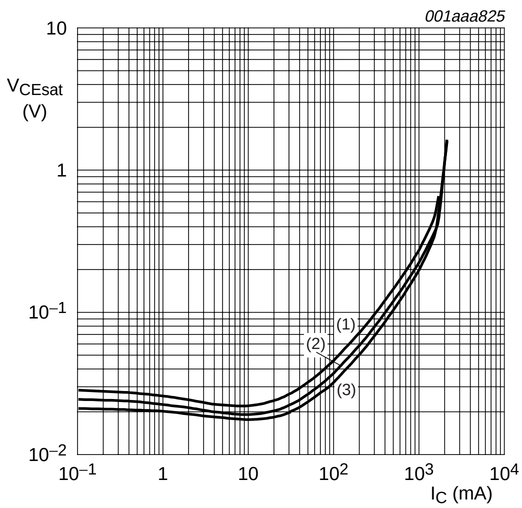
I_C/I_B = 10.

(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.



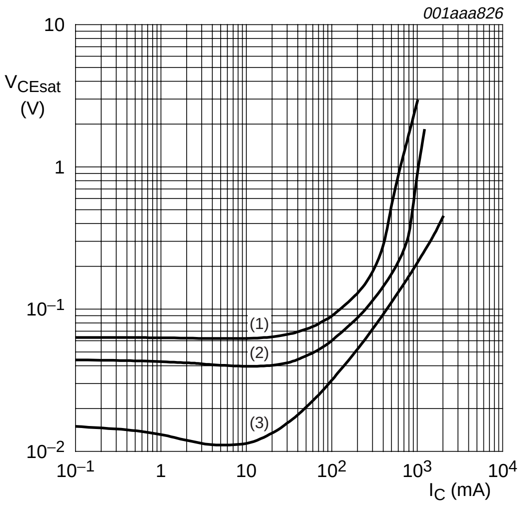
I_C/I_B = 20.

(1) T_{amb} = 100 °C.

(2) T_{amb} = 25 °C.

(3) T_{amb} = −55 °C.

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



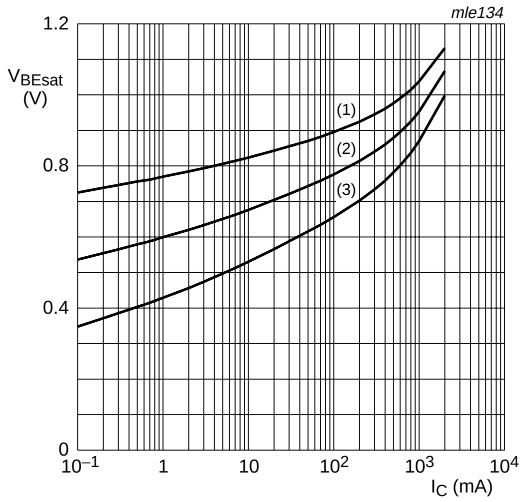
T_{amb} = 25 °C.

(1) I_C/I_B = 100.

(2) I_C/I_B = 50.

(3) I_C/I_B = 10.

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



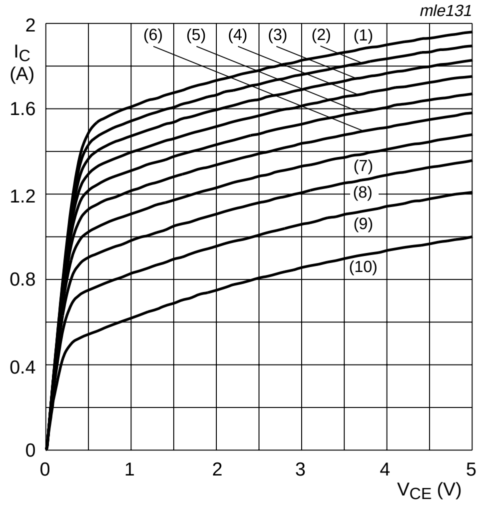
I_C/I_B = 20.

(1) T_{amb} = –55 °C.

(2) T_{amb} = 25 °C.

(3) T_{amb} = 100 °C.

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



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.

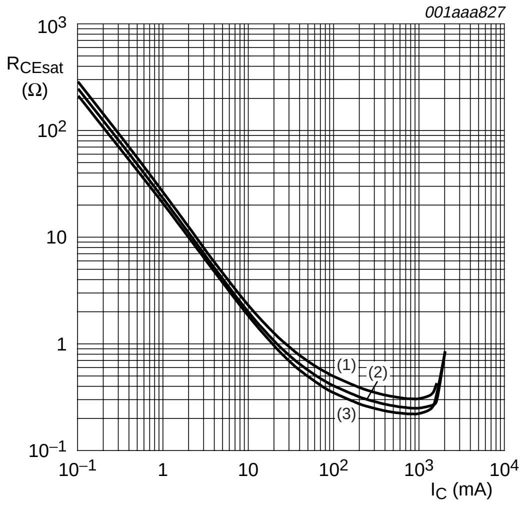
(7) I_B = –24 mA.

(8) I_B = –18 mA.

(9) I_B = –12 mA.

(10) I_B = –6 mA.

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



I_C/I_B = 20.

(1) T_{amb} = 100 °C.

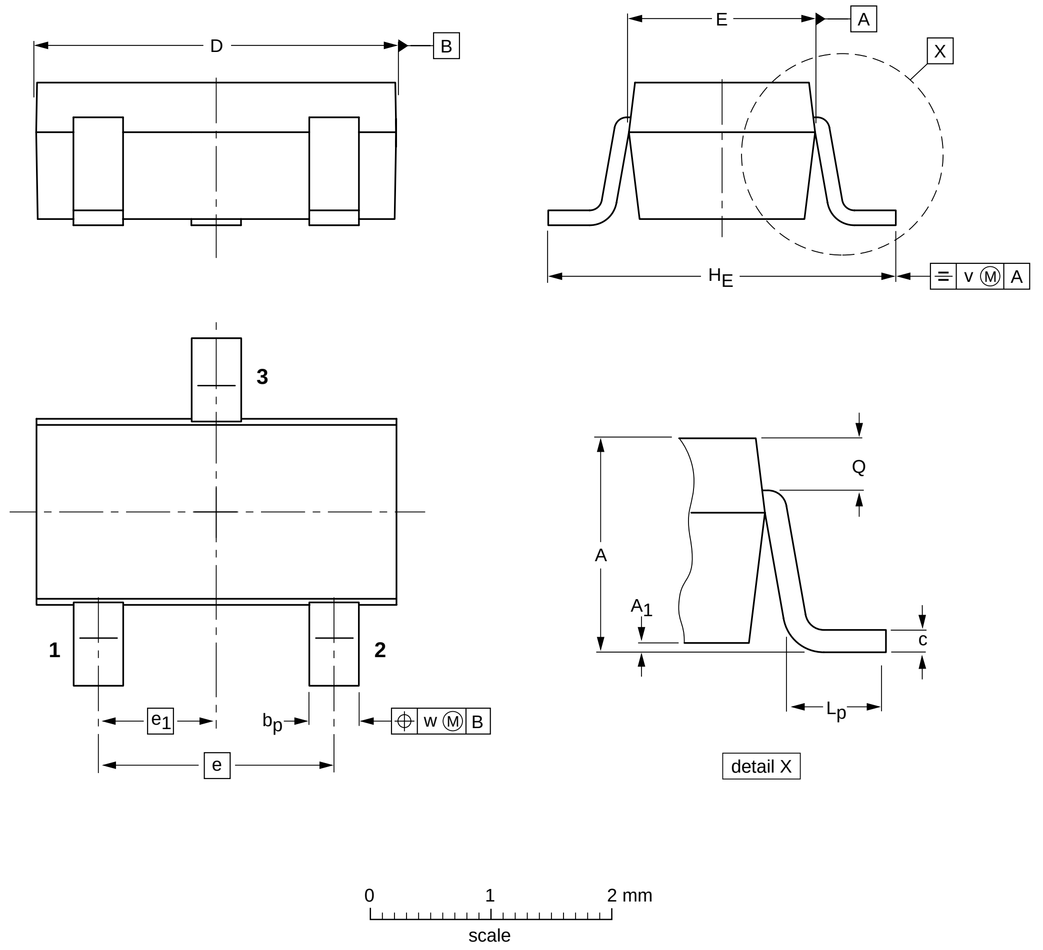
(2) T_{amb} = 25 °C.

(3) T_{amb} = –55 °C.

Fig 10. Collector-emitter equivalent on-resistance as a function of collector current; typical values.

8. Package outline

Plastic surface mounted package; 3 leads **SOT346**



DIMENSIONS (mm are the original dimensions)

UNIT	A	A_1	b_p	c	D	E	e	e_1	H_E	L_p	Q	v	w
mm	1.3 1.0	0.1 0.013	0.50 0.35	0.26 0.10	3.1 2.7	1.7 1.3	1.9	0.95	3.0 2.5	0.6 0.2	0.33 0.23	0.2	0.2

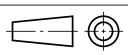
OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	EIAJ			
SOT346		TO-236	SC-59			98-07-17

Fig 11. Package outline.

9. Revision history

Table 8: Revision history

Document ID	Release date	Data sheet status	Change notice	Order number	Supersedes
PBSS4160K_1	20040429	Objective data	-	9397 750 12702	-

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).

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[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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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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14. Contents

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