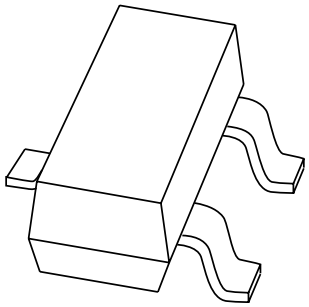
DATA SHEET



PBSS4160T

60 V, 1 A

NPN low V_{CEsat} (BISS) transistor

Product specification

Supersedes data of 2003 Jun 24

2004 May 12

Philips
Semiconductors

PHILIPS

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

PBSS4160T

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
- Cost effective replacement for medium power transistor BCP55 and BCX55.

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).

DESCRIPTION

NPN low V_{CEsat} transistor in a SOT23 plastic package.
PNP complement: PBSS5160T.

MARKING

TYPE NUMBER	MARKING CODE(1)
PBSS4160T	*U5

Note

1. * = p: made in Hong Kong
   * = t: made in Malaysia
   * = W: made in China.

QUICK REFERENCE DATA

SYMBOL	PARAMETER	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	250	mΩ

PINNING

PIN	DESCRIPTION
1	base
2	emitter
3	collector

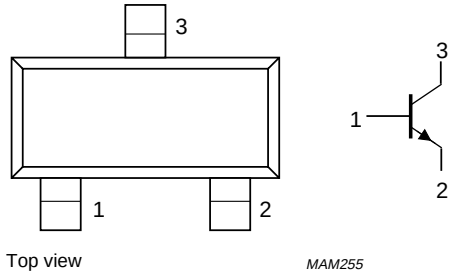


Fig.1 Simplified outline (SOT23) and symbol.

ORDERING INFORMATION

TYPE NUMBER	PACKAGE		
	NAME	DESCRIPTION	VERSION
PBSS4160T	–	plastic surface mounted package; 3 leads	SOT23

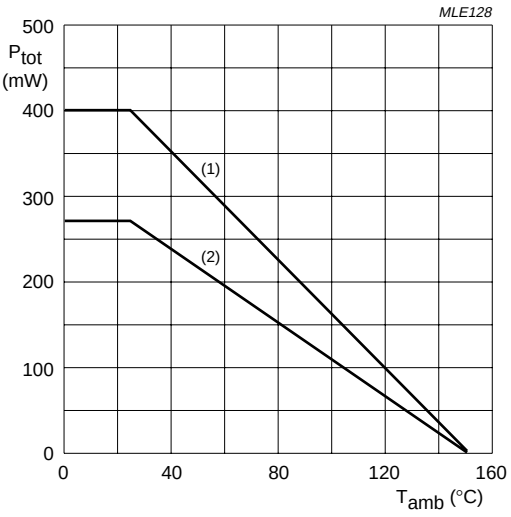
LIMITING VALUES

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)	note 1	–	0.9	A
		note 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; note 1	–	270	mW
		$T_{amb} \leq 25$ °C; note 2	–	400	mW
		$T_{amb} \leq 25$ °C; notes 1 and 3	–	1.25	W
T_{stg}	storage temperature		−65	+150	°C
T_j	junction temperature		–	150	°C
T_{amb}	operating ambient temperature		−65	+150	°C

Notes

1. Device mounted on an FR4 printed-circuit board, single-sided copper, tin-plated, standard footprint.
2. Device mounted on an FR4 printed-circuit board, single-sided copper, tin-plated, 1 cm^2 collector mounting pad.
3. Operated under pulsed conditions: duty cycle $\delta \leq 20\%$, pulse width $t_p \leq 10$ ms.



(1) Device mounted with 1 cm^2 collector tab.
(2) Device mounted on standard footprint.

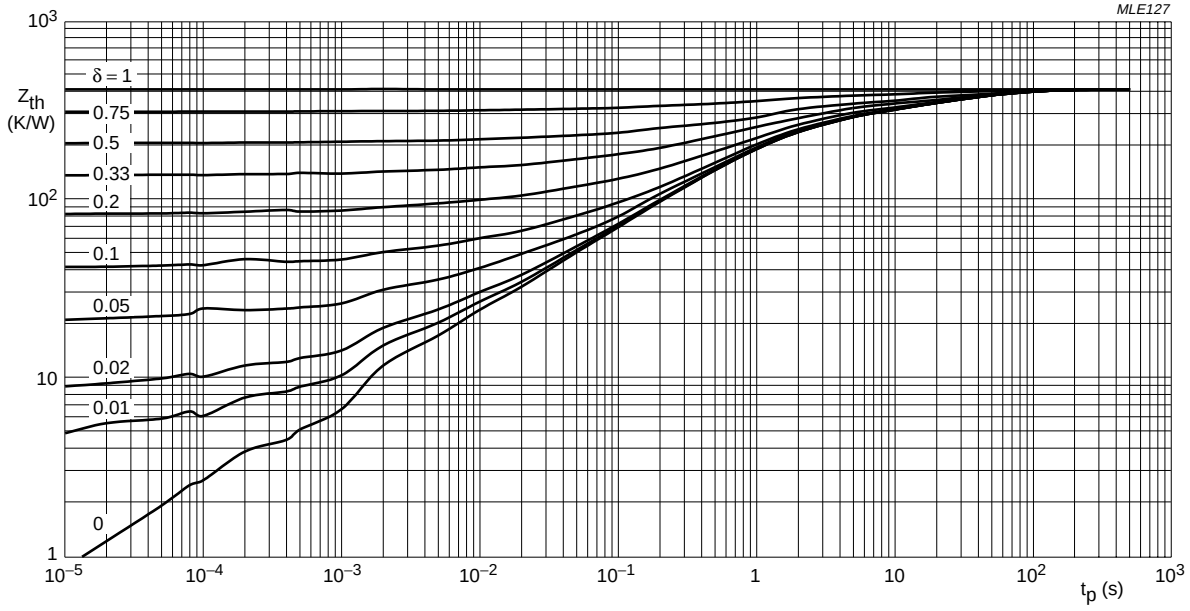
Fig.2 Power derating curves.

THERMAL CHARACTERISTICS

SYMBOL	PARAMETER	CONDITIONS	VALUE	UNIT
$R_{th(j-a)}$	thermal resistance from junction to ambient	in free air; note 1	465	K/W
		in free air; note 2	312	K/W
		in free air; notes 1 and 3	100	K/W

Notes

1. Device mounted on an FR4 printed-circuit board, single-sided copper, tin-plated and standard footprint.
2. Device mounted on an FR4 printed-circuit board, single-sided copper, tin-plated and 1 cm^2 collector mounting pad.
3. Operated under pulsed conditions: duty cycle $\delta \leq 20\%$, pulse width $t_p \leq 10$ ms.



Mounted on printed-circuit board; standard footprint.

Fig.3 Transient thermal impedance as a function of pulse time; typical values.

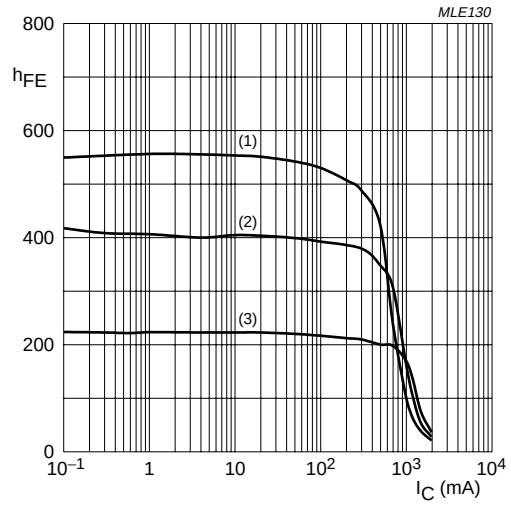
CHARACTERISTICS

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 A	–	–	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	400	–	
		V_{CE} = 5 V; I_C = 500 mA; note 1	200	350	–	
		V_{CE} = 5 V; I_C = 1 A; note 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; note 1	–	200	250	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; note 1	–	200	250	mΩ
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
C_c	collector capacitance	V_{CB} = 10 V; I_E = I_e = 0 A; f = 1 MHz	–	5.5	10	pF

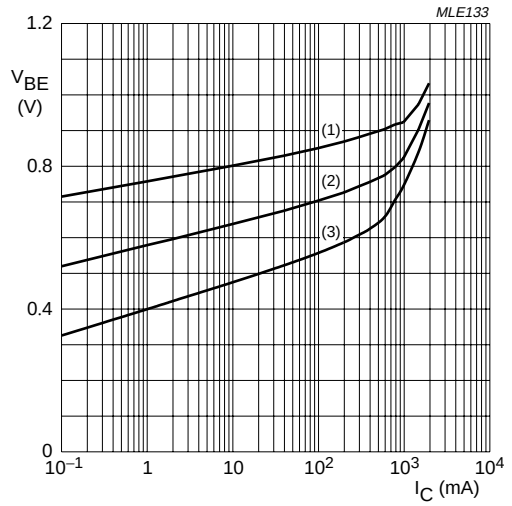
Note

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



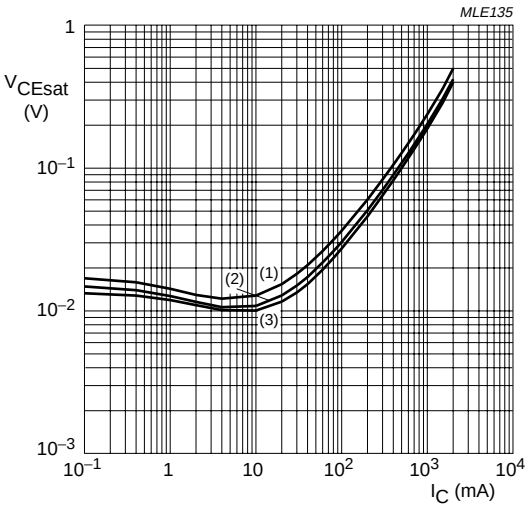
V_{CE} = 5 V.
(1) T_{amb} = 100 °C.
(2) T_{amb} = 25 °C.
(3) T_{amb} = –55 °C.

Fig.4 DC current gain as a function of collector current; typical values.



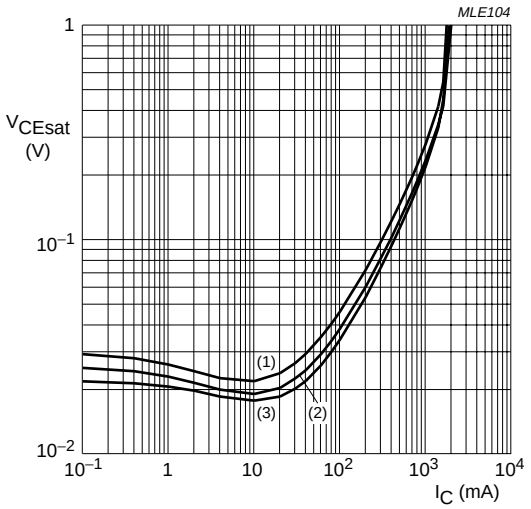
V_{CE} = 5 V.
(1) T_{amb} = –55 °C.
(2) T_{amb} = 25 °C.
(3) T_{amb} = 100 °C.

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



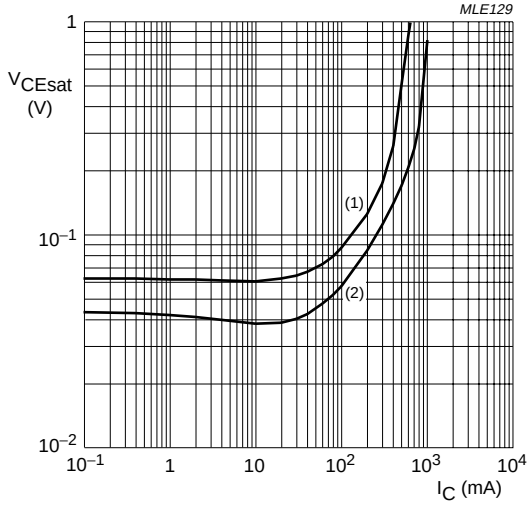
I_C/I_B = 10.
(1) T_{amb} = 100 °C.
(2) T_{amb} = 25 °C.
(3) T_{amb} = –55 °C.

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



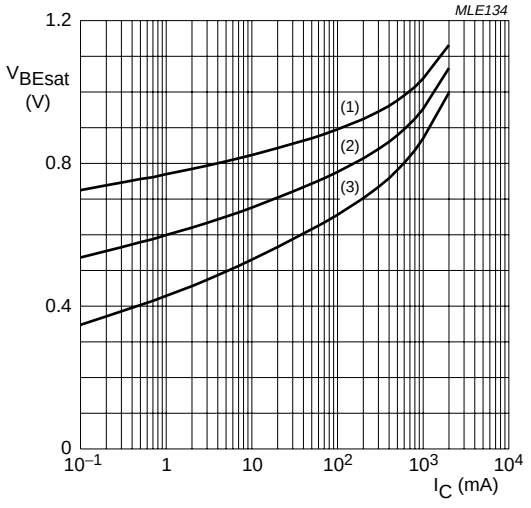
I_C/I_B = 20.
(1) T_{amb} = 100 °C.
(2) T_{amb} = 25 °C.
(3) T_{amb} = –55 °C.

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



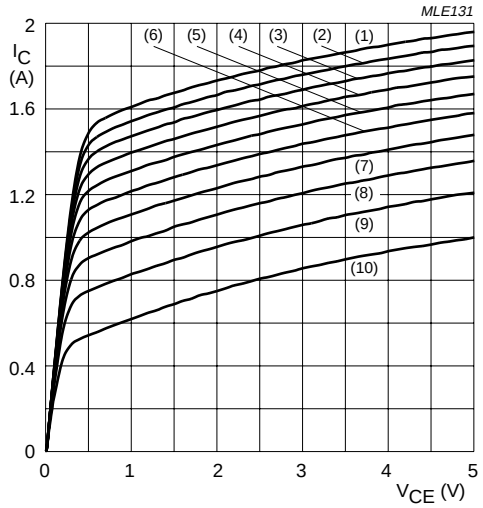
T_{amb} = 25 °C.
(1) I_C/I_B = 100.
(2) I_C/I_B = 50.

Fig.8 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.

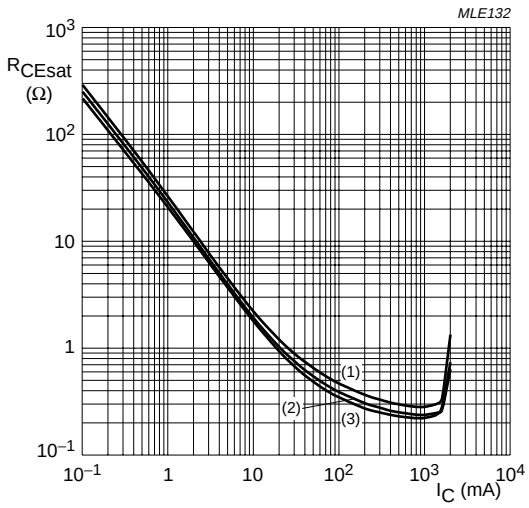
Fig.9 Base-emitter saturation voltage as a function of collector current; typical values.



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



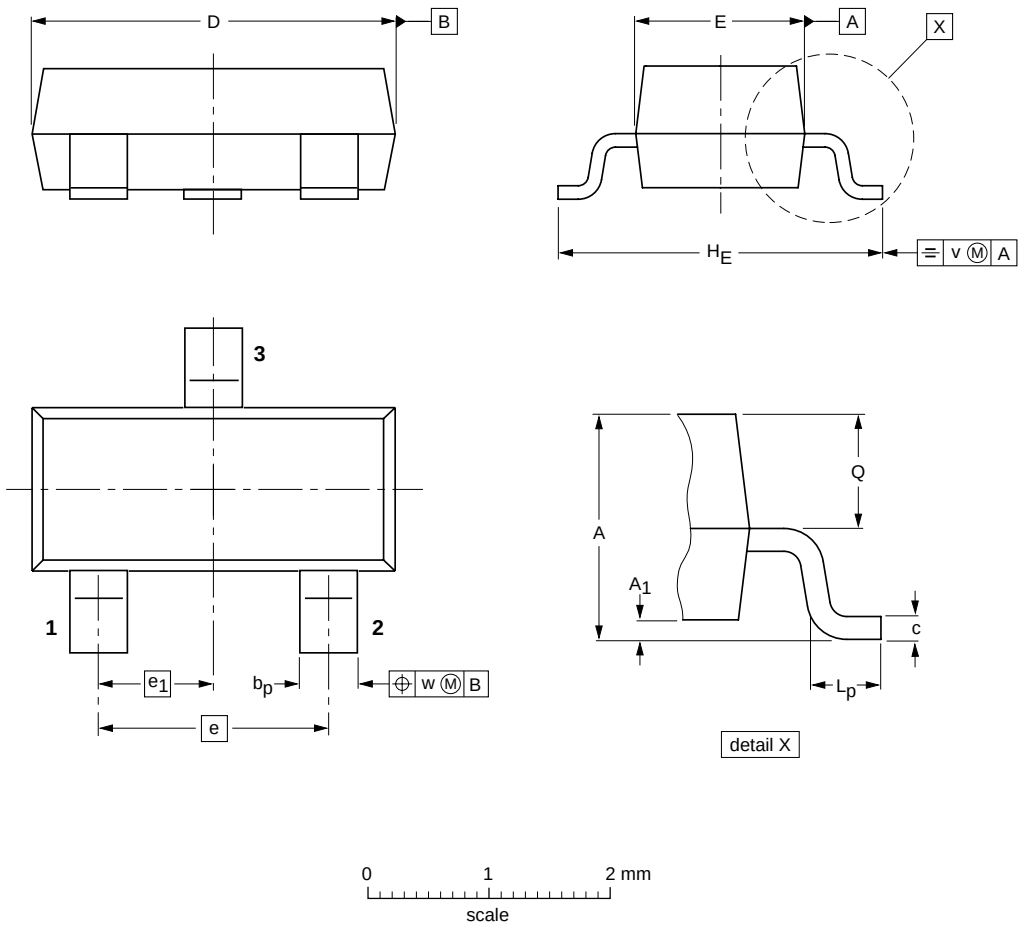
I_C/I_B = 20.

(1) T_{amb} = 100 °C. (2) T_{amb} = 25 °C. (3) T_{amb} = −55 °C.

Fig.11 Equivalent on-resistance as a function of collector current; typical values.

PACKAGE OUTLINE

Plastic surface mounted package; 3 leads **SOT23**



DIMENSIONS (mm are the original dimensions)

UNIT	A	A_1 max.	b_p	c	D	E	e	e_1	H_E	L_p	Q	v	w
mm	1.1 0.9	0.1	0.48 0.38	0.15 0.09	3.0 2.8	1.4 1.2	1.9	0.95	2.5 2.1	0.45 0.15	0.55 0.45	0.2	0.1

OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	EIAJ			
SOT23		TO-236AB				~~97-02-28~~ 99-09-13

DATA SHEET STATUS

LEVEL	DATA SHEET STATUS(1)	PRODUCT STATUS(2)(3)	DEFINITION
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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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Printed in The Netherlands R75/02/pp10 Date of release: 2004 May 12 Document order number: 9397 750 13198

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