PBSS5160T

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

Rev. 04 — 15 January 2010 Product data sheet

1. Product profile

1.1 General description

PNP low V_{CEsat} Breakthrough In Small Signal (BISS) transistor in a small SOT23 (TO-236AB) Surface-Mounted Device (SMD) plastic package.

NPN complement: PBSS4160T.

1.2 Features

- Low collector-emitter saturation voltage V_{CEsat}
- High collector current capability I_C and I_{CM}
- High efficiency due to less heat generation
- Reduces Printed-Circuit Board (PCB) 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 drivers (e.g. relays, buzzers and motors)

1.4 Quick reference data

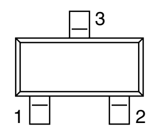
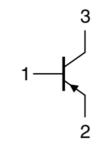
Table 1. Quick reference data

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
V_{CEO}	collector-emitter voltage	open base	-	-	–60	V
I_C	collector current		-	-	–1	A
I_{CM}	peak collector current	t = 1 ms or limited by $T_{j(max)}$	-	-	–2	A
R_{CEsat}	collector-emitter saturation resistance	I_C = –1 A; I_B = –100 mA [1]	-	220	330	mΩ

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

2. Pinning information

Table 2. Pinning

Pin	Description	Simplified outline	Graphic symbol
1	base		
2	emitter		
3	collector		

3. Ordering information

Table 3. Ordering information

Type number	Package		
	Name	Description	Version
PBSS5160T	-	plastic surface-mounted package; 3 leads	SOT23

4. Marking

Table 4. Marking codes

Type number	Marking code[1]
PBSS5160T	*U6

[1] * = -: made in Hong Kong
* = p: made in Hong Kong
* = t: made in Malaysia
* = W: made in China

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		[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			-	–300	mA
I_{BM}	peak base current	$t_p \leq 300\ \mu s$; $\delta \leq 0.02$		-	–1	A

Table 5. Limiting values *...continued*

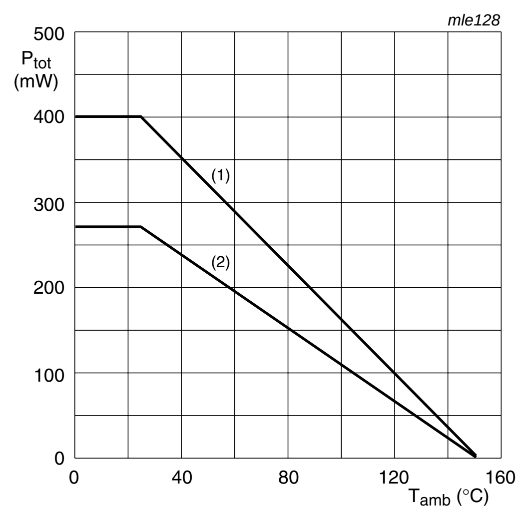
In accordance with the Absolute Maximum Rating System (IEC 60134).

Symbol	Parameter	Conditions		Min	Max	Unit
P_{tot}	total power dissipation	$T_{amb} \leq 25$ °C	[1]	-	270	mW
			[2]	-	400	mW
			[1][3]	-	1.25	W
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.

[3] Operated under pulse conditions: duty cycle $\delta \leq 20$ %, pulse width $t_p \leq 10$ ms.



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

(2) FR4 PCB, standard footprint

Fig 1. Power derating curves

6. Thermal characteristics

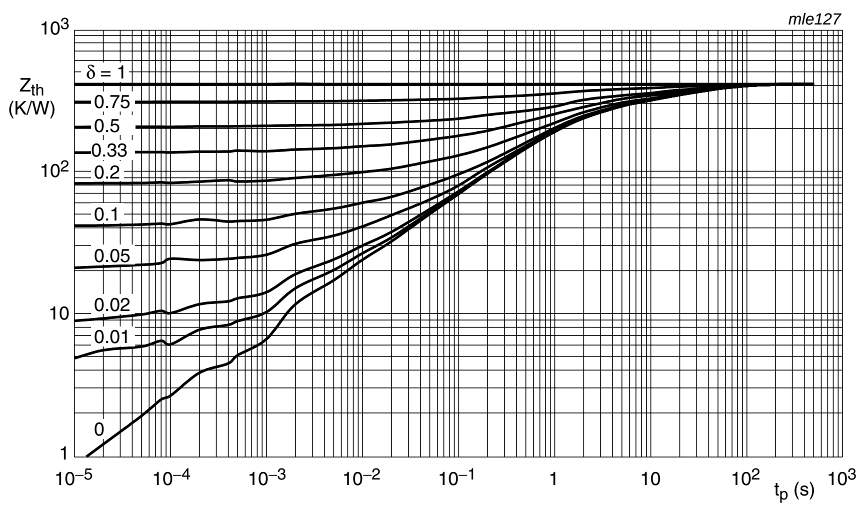
Table 6. Thermal characteristics

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
$R_{th(j-a)}$	thermal resistance from junction to ambient	in free air	[1]	-	-	465	K/W
			[2]	-	-	312	K/W
			[1][3]	-	-	100	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.

[3] Operated under pulse conditions: duty cycle $\delta \leq 20$ %, pulse width $t_p \leq 10$ ms.



FR4 PCB, standard footprint

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

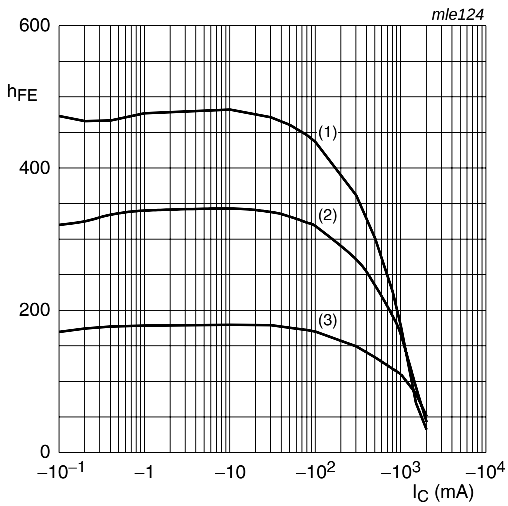
7. Characteristics

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} = –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	-	
		I_C = –500 mA	[1]	150	250	-	
		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}	collector-emitter saturation resistance	I_C = –1 A; I_B = –100 mA	[1]	-	220	330	mΩ
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	V_{CE} = –10 V; I_C = –50 mA; f = 100 MHz		150	220	-	MHz
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; $\delta \leq 0.02$.



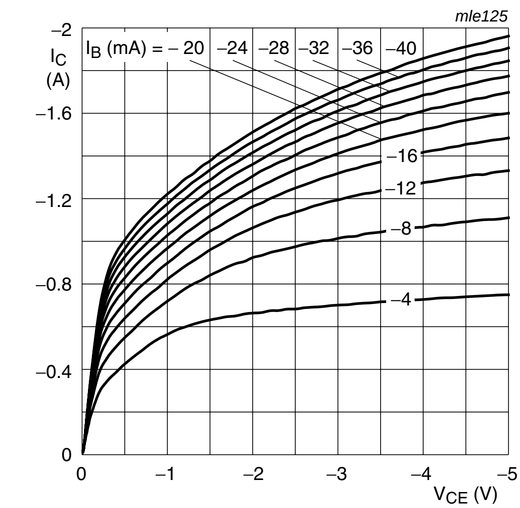
V_{CE} = −5 V

(1) T_{amb} = 100 °C

(2) T_{amb} = 25 °C

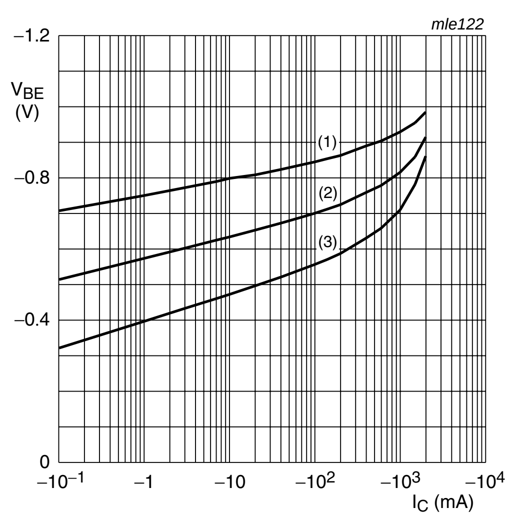
(3) T_{amb} = −55 °C

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



T_{amb} = 25 °C

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



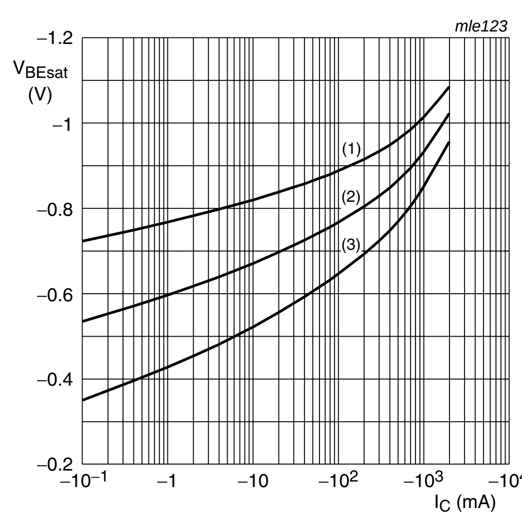
V_{CE} = −5 V

(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



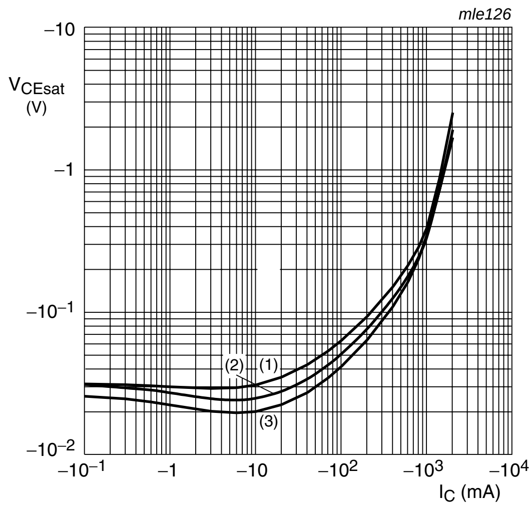
I_C/I_B = 20

(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



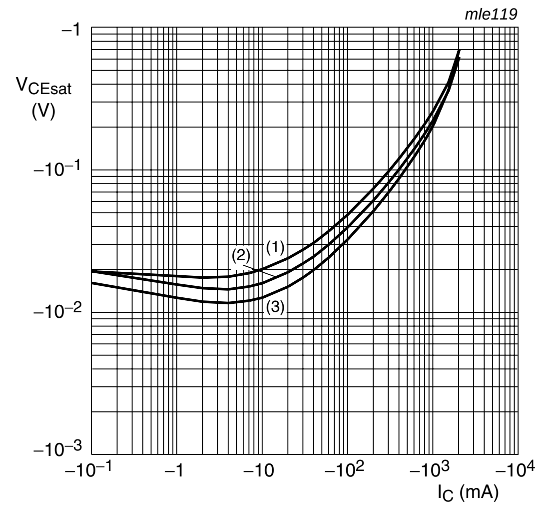
$I_C/I_B = 20$

(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



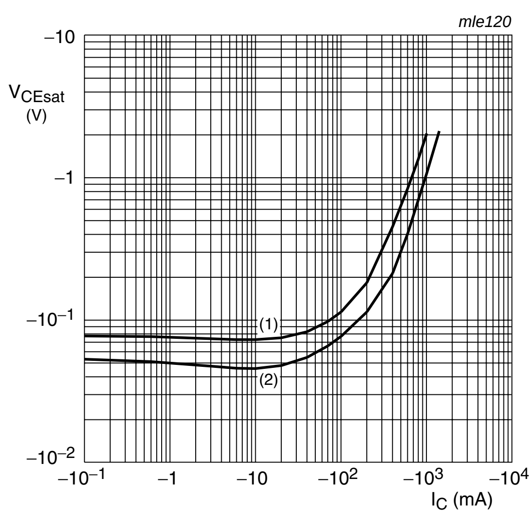
$I_C/I_B = 10$

(1) $T_{amb} = 100$ °C

(2) $T_{amb} = 25$ °C

(3) $T_{amb} = -55$ °C

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

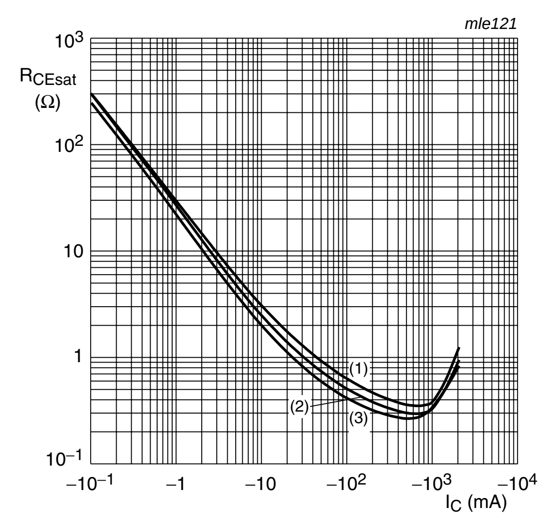


$T_{amb} = 25$ °C

(1) $I_C/I_B = 100$

(2) $I_C/I_B = 50$

Fig 9. 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 10. Collector-emitter saturation resistance as a function of collector current; typical values

8. Package outline

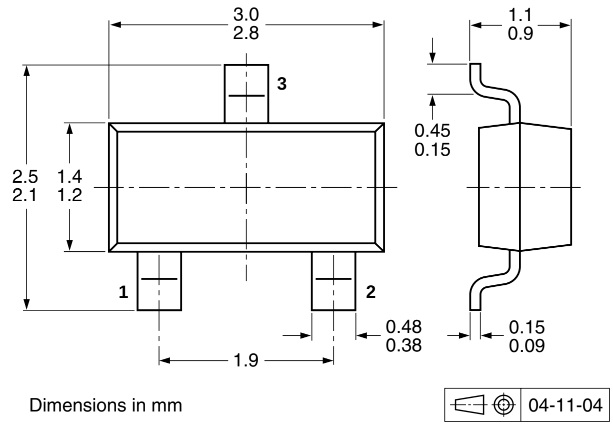


Fig 11. Package outline SOT23 (TO-236AB)

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**
PBSS5160T	SOT23	4 mm pitch, 8 mm tape and reel	-215	-235

[1] For further information and the availability of packing methods, see Section 12.

10. Revision history

Table 9. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
PBSS5160T_4	20100115	Product data sheet	-	PBSS5160T_N_3
Modifications:	• The format of this data sheet has been redesigned to comply with the new identity guidelines of NXP Semiconductors. • Legal texts have been adapted to the new company name where appropriate. • Table 1 “Quick reference data”: amended • Section 4 “Marking”: amended • Figure 4: updated • Figure 11: superseded by minimized package outline drawing • Section 9 “Packing information”: added • Section 11 “Legal information”: updated			
PBSS5160T_N_3	20080718	Product data sheet	-	PBSS5160T_2
PBSS5160T_2	20040527	Product specification	-	PBSS5160T_1
PBSS5160T_1	20030623	Product specification	-	-

11. Legal information

11.1 Data sheet status

Document status[1][2]	Product status[3]	Definition
Objective [short] data sheet	Development	This document contains data from the objective specification for product development.
Preliminary [short] data sheet	Qualification	This document contains data from the preliminary specification.
Product [short] data sheet	Production	This document contains the product specification.

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

[2] The term 'short data sheet' is explained in section "Definitions".

[3] The product status of device(s) described in this document may have changed since this document was published and may differ in case of multiple devices. The latest product status information is available on the Internet at URL http://www.nexperia.com.

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13. Contents

Date of release: 15 January 2010