



# 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

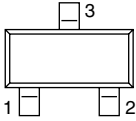
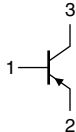
Table 1. Quick reference data

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	m $\Omega$

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

## 2. Pinning information

Table 2. Pinning

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

006aab25

## 3. Ordering information

Table 3. Ordering information

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

## 4. Marking

Table 4. Marking codes

Type number	Marking code <sup>[1]</sup>
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).

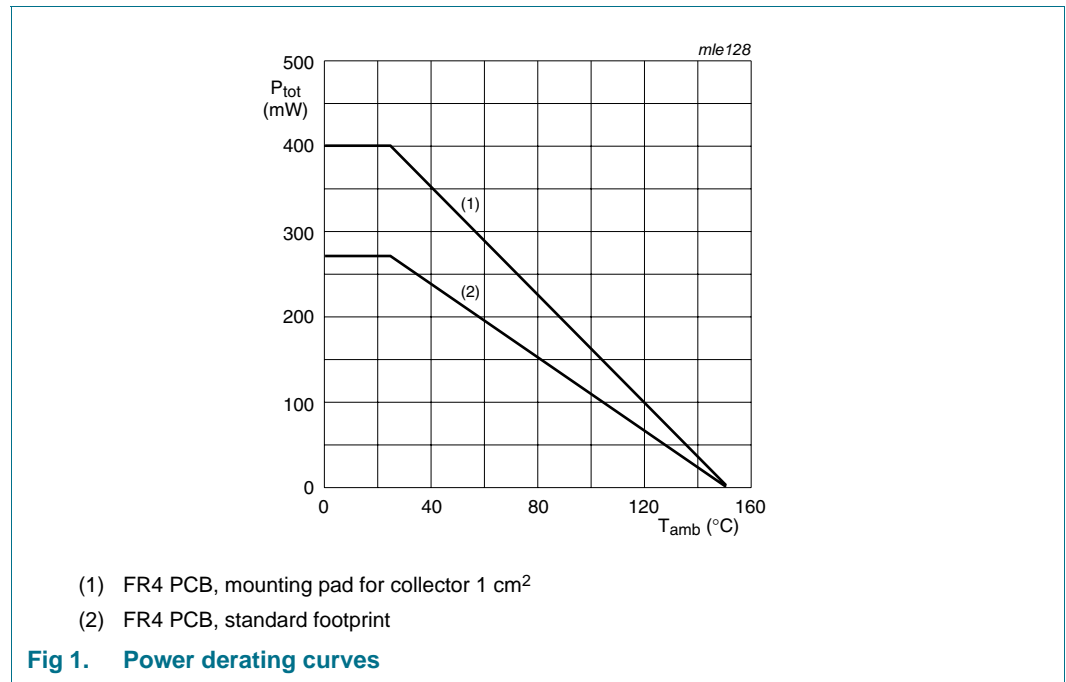
Symbol	Parameter	Conditions	Min	Max	Unit
$V_{CBO}$	collector-base voltage	open emitter	-	-80	V
$V_{CEO}$	collector-emitter voltage	open base	-	-60	V
$V_{EBO}$	emitter-base voltage	open collector	-	-5	V
$I_C$	collector current		<sup>[1]</sup> -	-0.9	A
			<sup>[2]</sup> -	-1	A
$I_{CM}$	peak collector current	$t = 1$ 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	$T_{amb} \leq 25\text{ °C}$	[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<sup>2</sup>.
- [3] Operated under pulse conditions: duty cycle  $\delta \leq 20\%$ , pulse width  $t_p \leq 10\text{ ms}$ .

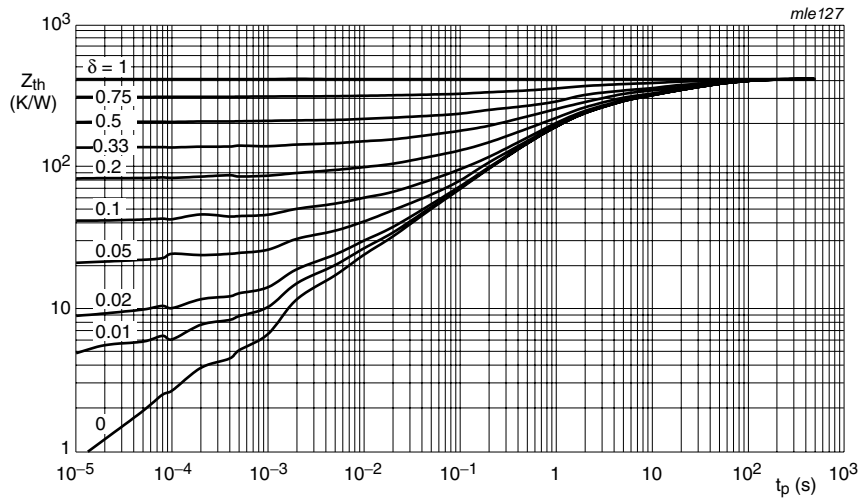


## 6. Thermal characteristics

**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<sup>2</sup>.
- [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**

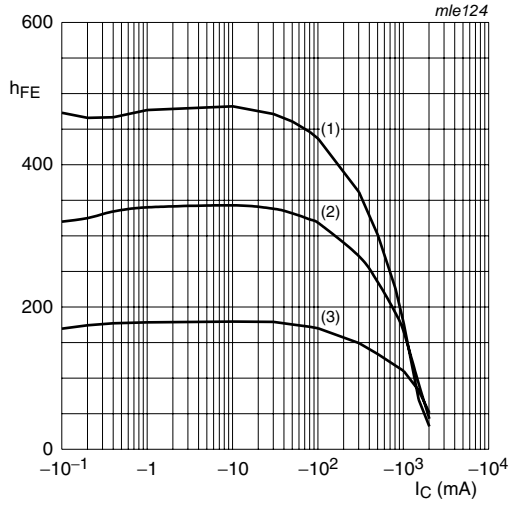
## 7. Characteristics

**Table 7. Characteristics**

$T_{amb} = 25\text{ °C}$  unless otherwise specified.

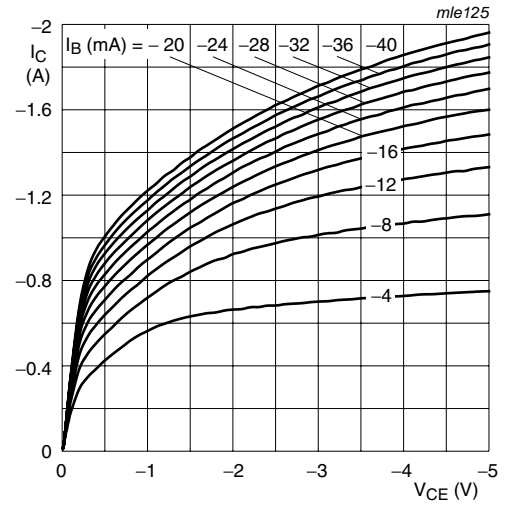
Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$I_{CBO}$	collector-base cut-off current	$V_{CB} = -60\text{ V}; I_E = 0\text{ A}$	-	-	-100	nA
		$V_{CB} = -60\text{ V}; I_E = 0\text{ A}; T_j = 150\text{ °C}$	-	-	-50	$\mu\text{A}$
$I_{CES}$	collector-emitter cut-off current	$V_{CE} = -60\text{ V}; V_{BE} = 0\text{ V}$	-	-	-100	nA
$I_{EBO}$	emitter-base cut-off current	$V_{EB} = -5\text{ V}; I_C = 0\text{ A}$	-	-	-100	nA
$h_{FE}$	DC current gain	$V_{CE} = -5\text{ V}$				
		$I_C = -1\text{ mA}$	200	350	-	
		$I_C = -500\text{ mA}$	[1] 150	250	-	
		$I_C = -1\text{ A}$	[1] 100	160	-	
$V_{CEsat}$	collector-emitter saturation voltage	$I_C = -100\text{ mA}; I_B = -1\text{ mA}$	-	-110	-160	mV
		$I_C = -500\text{ mA}; I_B = -50\text{ mA}$	-	-120	-175	mV
		$I_C = -1\text{ A}; I_B = -100\text{ mA}$	[1] -	-220	-330	mV
$R_{CEsat}$	collector-emitter saturation resistance	$I_C = -1\text{ A}; I_B = -100\text{ mA}$	[1] -	220	330	$\text{m}\Omega$
$V_{BEsat}$	base-emitter saturation voltage	$I_C = -1\text{ A}; I_B = -50\text{ mA}$	-	-0.95	-1.1	V
$V_{BEon}$	base-emitter turn-on voltage	$V_{CE} = -5\text{ V}; I_C = -1\text{ A}$	-	-0.82	-0.9	V
$f_T$	transition frequency	$V_{CE} = -10\text{ V}; I_C = -50\text{ mA}; f = 100\text{ MHz}$	150	220	-	MHz
$C_C$	collector capacitance	$V_{CB} = -10\text{ V}; I_E = I_C = 0\text{ A}; f = 1\text{ MHz}$	-	9	15	pF

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



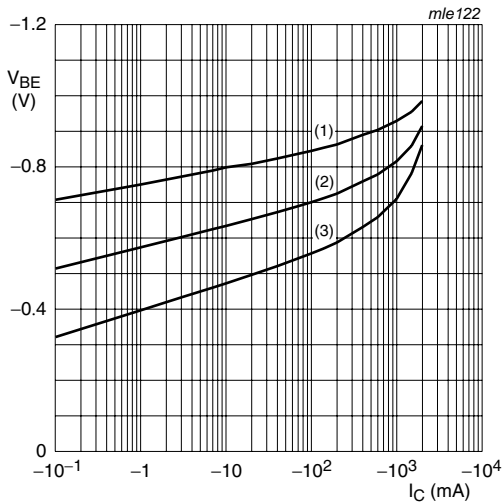
$V_{CE} = -5\text{ V}$   
 (1)  $T_{amb} = 100\text{ °C}$   
 (2)  $T_{amb} = 25\text{ °C}$   
 (3)  $T_{amb} = -55\text{ °C}$

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



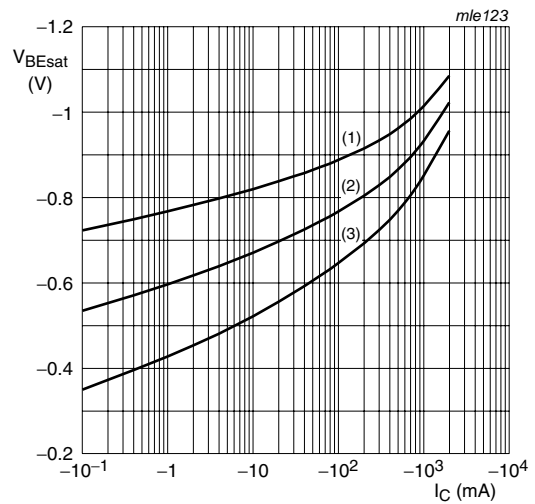
$T_{amb} = 25\text{ °C}$

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



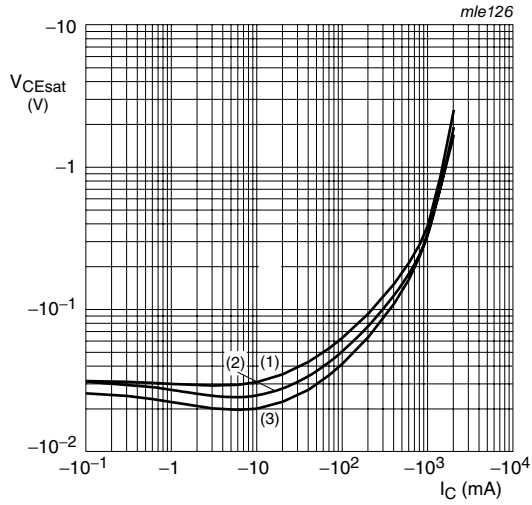
$V_{CE} = -5\text{ V}$   
 (1)  $T_{amb} = -55\text{ °C}$   
 (2)  $T_{amb} = 25\text{ °C}$   
 (3)  $T_{amb} = 100\text{ °C}$

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



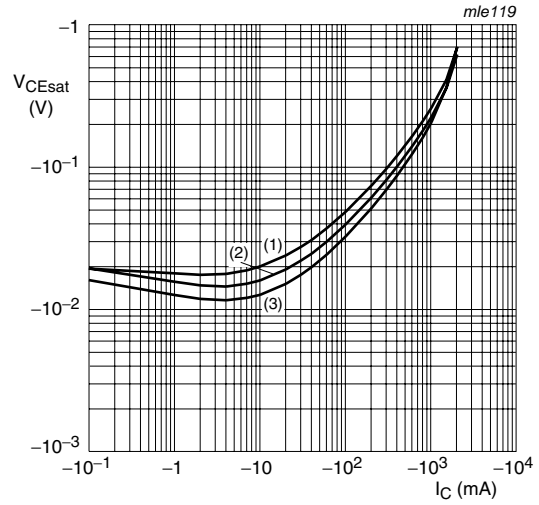
$I_C/I_B = 20$   
 (1)  $T_{amb} = -55\text{ °C}$   
 (2)  $T_{amb} = 25\text{ °C}$   
 (3)  $T_{amb} = 100\text{ °C}$

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



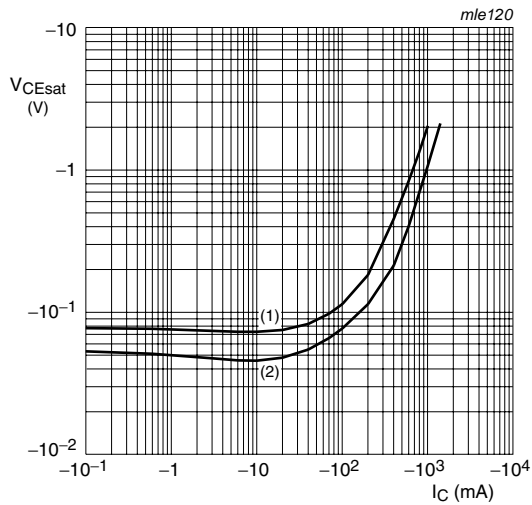
- $I_C/I_B = 20$
- (1)  $T_{amb} = 100\text{ °C}$
  - (2)  $T_{amb} = 25\text{ °C}$
  - (3)  $T_{amb} = -55\text{ °C}$

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



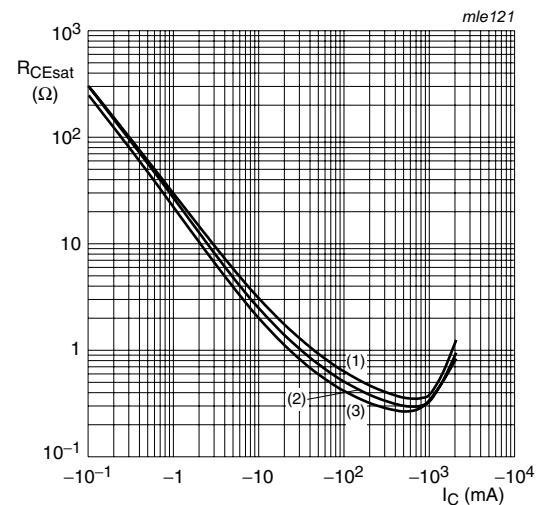
- $I_C/I_B = 10$
- (1)  $T_{amb} = 100\text{ °C}$
  - (2)  $T_{amb} = 25\text{ °C}$
  - (3)  $T_{amb} = -55\text{ °C}$

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



- $T_{amb} = 25\text{ °C}$
- (1)  $I_C/I_B = 100$
  - (2)  $I_C/I_B = 50$

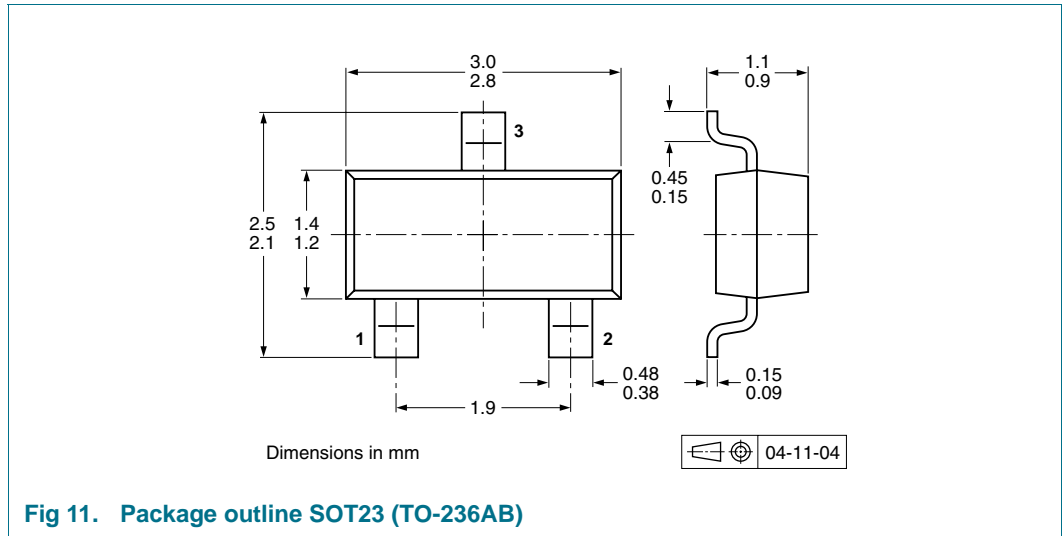
**Fig 9. Collector-emitter saturation voltage as a function of collector current; typical values**



- $I_C/I_B = 20$
- (1)  $T_{amb} = 100\text{ °C}$
  - (2)  $T_{amb} = 25\text{ °C}$
  - (3)  $T_{amb} = -55\text{ °C}$

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

## 8. Package outline



## 9. Packing information

**Table 8. Packing methods**

The indicated -xxx are the last three digits of the 12NC ordering code.<sup>[1]</sup>

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:	<ul style="list-style-type: none"> <li>• The format of this data sheet has been redesigned to comply with the new identity guidelines of NXP Semiconductors.</li> <li>• Legal texts have been adapted to the new company name where appropriate.</li> <li>• <a href="#">Table 1 “Quick reference data”</a>: amended</li> <li>• <a href="#">Section 4 “Marking”</a>: amended</li> <li>• <a href="#">Figure 4</a>: updated</li> <li>• <a href="#">Figure 11</a>: superseded by minimized package outline drawing</li> <li>• <a href="#">Section 9 “Packing information”</a>: added</li> <li>• <a href="#">Section 11 “Legal information”</a>: updated</li> </ul>			
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 <sup>[1][2]</sup>	Product status <sup>[3]</sup>	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".

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