# PBSS5160T



# 60 V, 1 A PNP low V<sub>CEsat</sub> (BISS) transistor Rev. 04 — 15 January 2010

Product data sheet

#### **Product profile**

#### 1.1 General description

PNP low V<sub>CEsat</sub> 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<sub>CEsat</sub>
- High collector current capability I<sub>C</sub> and I<sub>CM</sub>
- 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	Тур	Max	Unit
$V_{CEO}$	collector-emitter voltage	open base	-	-	-60	V
I <sub>C</sub>	collector current		-	-	-1	Α
I <sub>CM</sub>	peak collector current	t = 1  ms or limited by $T_{j(max)}$	-	-	-2	Α
R <sub>CEsat</sub>	collector-emitter saturation resistance	$I_C = -1 A;$ $I_B = -100 \text{ mA}$	<u>[1]</u> _	220	330	mΩ

<sup>[1]</sup> Pulse test:  $t_p \le 300 \ \mu s$ ;  $\delta \le 0.02$ .



# 2. Pinning information

Table 2. Pinning

IUDIO E.	9		
Pin	Description	Simplified outline	Graphic symbol
1	base		_
2	emitter		3
3	collector	1 2	1——————————————————————————————————————
			006aab25

# 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 <sup>[1]</sup>
PBSS5160T	*U6

<sup>[1] \* = -:</sup> made in Hong Kong

# 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 <sub>CEO</sub>	collector-emitter voltage	open base	-	-60	V
$V_{EBO}$	emitter-base voltage	open collector	-	<b>-5</b>	V
I <sub>C</sub>	collector current		<u>[1]</u> _	-0.9	Α
			[2] _	-1	Α
I <sub>CM</sub>	peak collector current	t = 1  ms or limited by $T_{j(max)}$	-	-2	Α
I <sub>B</sub>	base current		-	-300	mA
I <sub>BM</sub>	peak base current	$t_p \leq 300~\mu s;~\delta \leq 0.02$	-	-1	Α

<sup>\* =</sup> p: made in Hong Kong

<sup>\* =</sup> t: made in Malaysia

<sup>\* =</sup> W: made in China

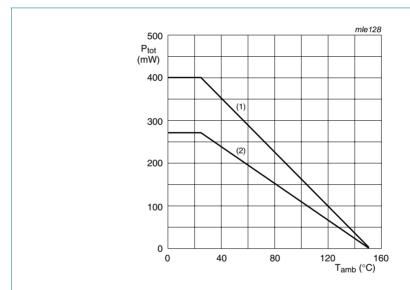
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Table 5. Limiting values ...continued

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

Symbol	Parameter	Conditions	Min	Max	Unit
$P_{tot}$	total power dissipation	$T_{amb} \leq 25 ^{\circ}C$	<u>[1]</u> _	270	mW
			[2] _	400	mW
			[1][3]	1.25	W
Tj	junction temperature		-	150	°C
T <sub>amb</sub>	ambient temperature		-65	+150	°C
T <sub>stg</sub>	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  $\delta \le$  20 %, pulse width  $t_p \le$  10 ms.



- (1) FR4 PCB, mounting pad for collector 1 cm<sup>2</sup>
- (2) FR4 PCB, standard footprint

Fig 1. Power derating curves

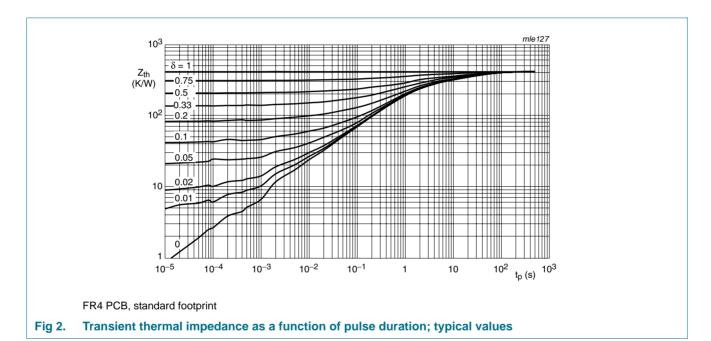
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#### 6. Thermal characteristics

Table 6. Thermal characteristics

Symbol	Parameter	Conditions	Min	Тур	Max	Unit
$R_{th(j-a)}$	thermal resistance from	in free air	<u>[1]</u> -	-	465	K/W
junction to ambient		[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  $\delta \le 20$  %, pulse width  $t_p \le 10$  ms.



# 7. Characteristics

Table 7. Characteristics

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

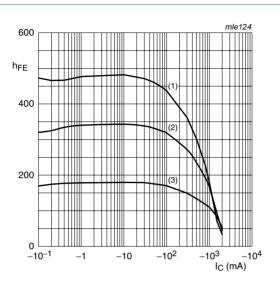
Symbol	Parameter	Conditions		Min	Тур	Max	Unit
I <sub>CBO</sub>	collector-base cut-off	$V_{CB} = -60 \text{ V}; I_E = 0 \text{ A}$		-	-	-100	nA
	current	$V_{CB} = -60 \text{ V}; I_E = 0 \text{ A};$ $T_j = 150 \text{ °C}$		-	-	-50	μΑ
I <sub>CES</sub>	collector-emitter cut-off current	$V_{CE} = -60 \text{ V}; V_{BE} = 0 \text{ V}$		-	-	-100	nA
I <sub>EBO</sub>	emitter-base cut-off current	$V_{EB} = -5 \text{ V}; I_C = 0 \text{ A}$		-	-	-100	nA
h <sub>FE</sub>	DC current gain	V <sub>CE</sub> = −5 V					
		$I_C = -1 \text{ mA}$		200	350	-	
		$I_C = -500 \text{ mA}$	[1]	150	250	-	
		$I_C = -1 A$	[1]	100	160	-	
V <sub>CEsat</sub> collector-emitter saturation voltage		$I_C = -100 \text{ mA}; I_B = -1 \text{ mA}$		-	-110	-160	mV
	saturation voltage	$I_C = -500 \text{ mA};$ $I_B = -50 \text{ mA}$		-	-120	<b>–175</b>	mV
		$I_C = -1 \text{ A}; I_B = -100 \text{ mA}$	[1]	-	-220	-330	mV
R <sub>CEsat</sub>	collector-emitter saturation resistance	$I_C = -1 A$ ; $I_B = -100 \text{ mA}$	[1]	-	220	330	mΩ
V <sub>BEsat</sub>	base-emitter saturation voltage	$I_C = -1 A$ ; $I_B = -50 \text{ mA}$		-	-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 <sub>T</sub>	transition frequency	$V_{CE} = -10 \text{ V};$ $I_{C} = -50 \text{ mA}; f = 100 \text{ MHz}$		150	220	-	MHz
C <sub>c</sub>	collector capacitance	$\begin{split} V_{CB} = -10 \ V; \ I_E = I_e = 0 \ A; \\ f = 1 \ MHz \end{split}$		-	9	15	pF

<sup>[1]</sup> Pulse test:  $t_p \le 300~\mu s;~\delta \le 0.02.$ 

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$$V_{CE} = -5 \text{ V}$$

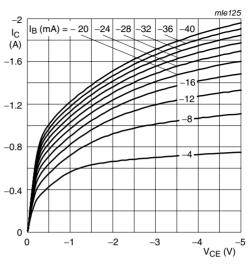
(1) 
$$T_{amb} = 100 \, ^{\circ}C$$

(2) 
$$T_{amb} = 25 \, ^{\circ}C$$

(3) 
$$T_{amb} = -55 \, ^{\circ}C$$

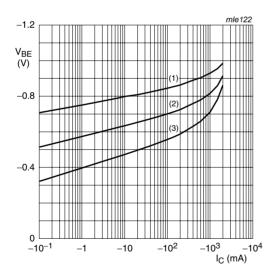
Fig 3. DC current gain as a function of collector current; typical values





T<sub>amb</sub> = 25 °C

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



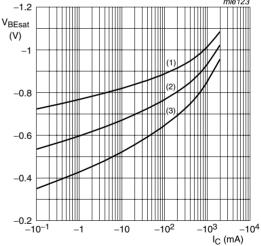
$$V_{CE} = -5 \text{ V}$$

(1) 
$$T_{amb} = -55 \, ^{\circ}C$$

(2) 
$$T_{amb} = 25 \, ^{\circ}C$$

(3) 
$$T_{amb} = 100 \, ^{\circ}C$$

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



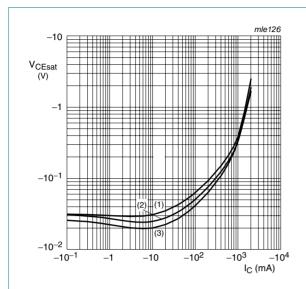
$$I_{\rm C}/I_{\rm B}=20$$

(1) 
$$T_{amb} = -55 \, ^{\circ}C$$

(2) 
$$T_{amb} = 25 \, ^{\circ}C$$

(3) 
$$T_{amb} = 100 \, ^{\circ}C$$

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



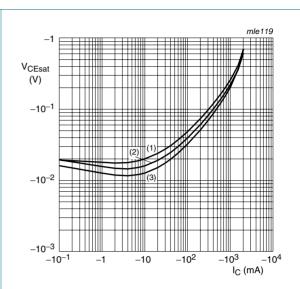
$$I_{\rm C}/I_{\rm B} = 20$$

(1) 
$$T_{amb} = 100 \, ^{\circ}C$$

(2) 
$$T_{amb} = 25 \, ^{\circ}C$$

(3) 
$$T_{amb} = -55 \, ^{\circ}C$$

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



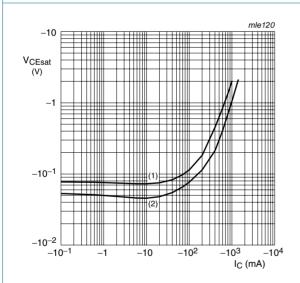
$$I_{\rm C}/I_{\rm B} = 10$$

(1) 
$$T_{amb} = 100 \, ^{\circ}C$$

(2) 
$$T_{amb} = 25 \, ^{\circ}C$$

(3) 
$$T_{amb} = -55 \, ^{\circ}C$$

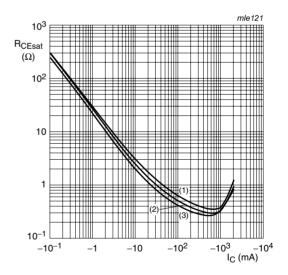
Fig 8. Collector-emitter saturation voltage as a function of collector current; typical values



(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



$$I_{\rm C}/I_{\rm B} = 20$$

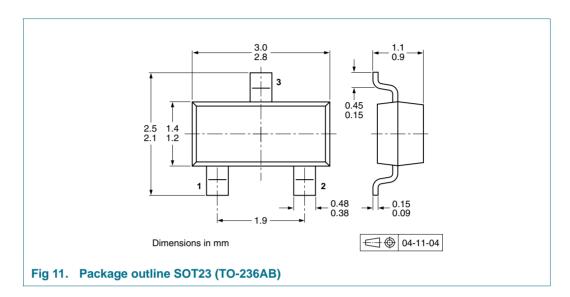
(1) 
$$T_{amb} = 100 \, ^{\circ}C$$

(2) 
$$T_{amb} = 25 \, ^{\circ}C$$

(3) 
$$T_{amb} = -55 \, ^{\circ}C$$

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.[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.

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# 10. Revision history

Table 9. Revision history

**Nexperia** 

Document ID	Release date	Data sheet status	Change notice	Supersedes		
PBSS5160T_4	20100115	Product data sheet	-	PBSS5160T_N_3		
Modifications:		of this data sheet has been re	edesigned to comply w	rith the new identity		
	<ul> <li>Legal texts h</li> </ul>	ave been adapted to the new	w company name whe	re appropriate.		
	• Table 1 "Qui	ck reference data": amended				
	Section 4 "Marking": amended					
	• Figure 4: updated					
	<ul> <li>Figure 11: superseded by minimized package outline drawing</li> </ul>					
	Section 9 "Packing information": added					
	<ul> <li>Section 11 "L</li> </ul>	<u>egal information"</u> : updated				
PBSS5160T_N_3	20080718	Product data sheet	-	PBSS5160T_2		
PBSS5160T_2	20040527	Product specification	-	PBSS5160T_1		
PBSS5160T_1	20030623	Product specification	-	-		

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#### 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"
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