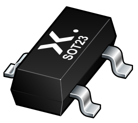

PBSS4160T

60 V, 1 A NPN low VCEsat (BISS) transistor

1 April 2023 — Product data sheet

1. General description

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

2. Features and benefits

- 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

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).

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]	-	-	1	A
I_{CM}	peak collector current	or limited by $T_{j(max)}$; t_p = 1 ms		-	-	2	A
R_{CEsat}	collector-emitter saturation resistance	I_C = 1 A; I_B = 100 mA; pulsed; $t_p \leq$ 300 µs; $\delta \leq$ 0.02; T_{amb} = 25 °C		-	200	250	mΩ

[1] Device mounted on an FR4 PCB, single-sided copper, tin-plated, mounting pad for collector 1 cm^2.

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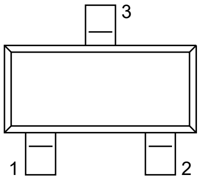
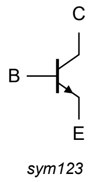
5. Pinning information

Table 2. Pinning information

Pin	Symbol	Description	Simplified outline	Graphic symbol
1	B	base	 SOT23	
2	E	emitter		
3	C	collector		

6. Ordering information

Table 3. Ordering information

Type number	Package		
	Name	Description	Version
PBSS4160T	SOT23	plastic, surface-mounted package; 3 terminals; 1.9 mm pitch; 2.9 mm x 1.3 mm x 1 mm body	SOT23

7. Marking

Table 4. Marking codes

Type number	Marking code[1]
PBSS4160T	%U5

[1] % = placeholder for manufacturing site code

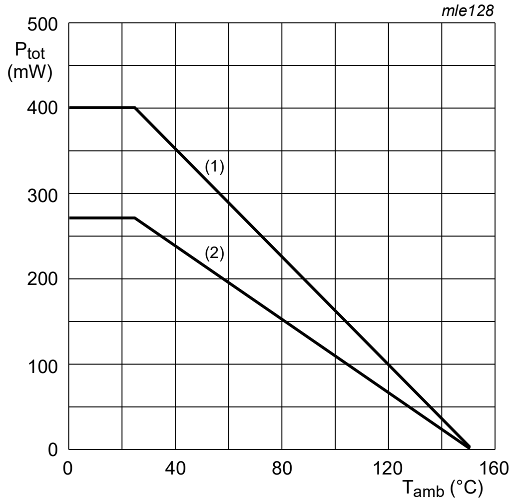
8. Limiting values

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	or limited by $T_{j(max)}$; t_p = 1 ms		-	2	A
I_B	base current			-	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]	-	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] Pulsed; $t_p \leq 10$ ms; $\delta \leq 0.02$



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

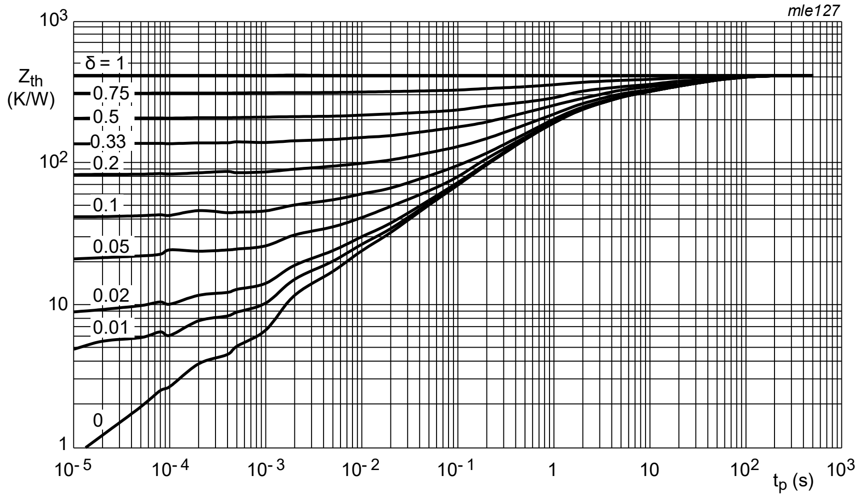
Fig. 1. Power derating curves

9. 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] Pulsed; $t_p \leq 10$ ms; $\delta \leq 0.02$.



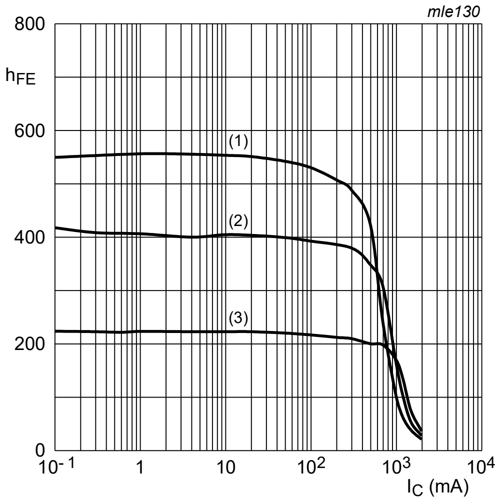
FR4 PCB, single sided copper, standard footprint

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

10. Characteristics

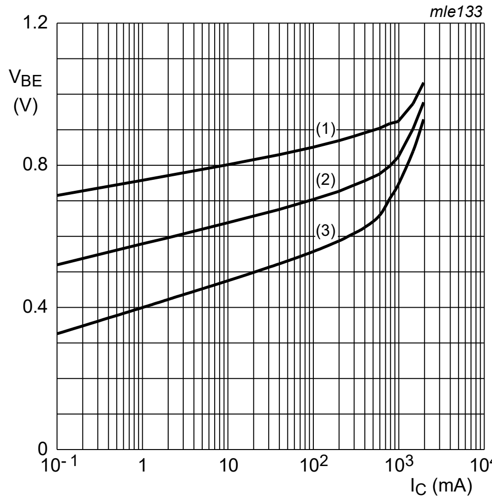
Table 7. Characteristics

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
I_{CBO}	collector-base cut-off current	V_{CB} = 60 V; I_E = 0 A; T_{amb} = 25 °C	-	-	100	nA
		V_{CB} = 60 V; I_E = 0 A; T_j = 150 °C	-	-	50	µA
I_{EBO}	emitter-base cut-off current	V_{EB} = 5 V; I_C = 0 A; T_{amb} = 25 °C	-	-	100	nA
I_{CES}	collector-emitter cut-off current	V_{CE} = 60 V; V_{BE} = 0 V; T_{amb} = 25 °C	-	-	100	nA
h_{FE}	DC current gain	V_{CE} = 5 V; I_C = 1 mA; T_{amb} = 25 °C	250	400	-	
		V_{CE} = 5 V; I_C = 500 mA; pulsed; $t_p \leq$ 300 µs; $\delta \leq$ 0.02; T_{amb} = 25 °C	200	350	-	
		V_{CE} = 5 V; I_C = 1 A; pulsed; $t_p \leq$ 300 µs; $\delta \leq$ 0.02; T_{amb} = 25 °C	100	150	-	
V_{CEsat}	collector-emitter saturation voltage	I_C = 100 mA; I_B = 1 mA; T_{amb} = 25 °C	-	90	110	mV
		I_C = 500 mA; I_B = 50 mA; T_{amb} = 25 °C	-	110	140	mV
		I_C = 1 A; I_B = 100 mA; pulsed; $t_p \leq$ 300 µs; $\delta \leq$ 0.02; T_{amb} = 25 °C	-	200	250	mV
R_{CEsat}	collector-emitter saturation resistance		-	200	250	mΩ
V_{BEsat}	base-emitter saturation voltage	I_C = 1 A; I_B = 50 mA; T_{amb} = 25 °C	-	0.95	1.1	V
V_{BEon}	base-emitter turn-on voltage	V_{CE} = 5 V; I_C = 1 A; T_{amb} = 25 °C	-	0.82	0.9	V
f_T	transition frequency	V_{CE} = 10 V; I_C = 50 mA; f = 100 MHz; T_{amb} = 25 °C	150	220	-	MHz
C_c	collector capacitance	V_{CB} = 10 V; I_E = 0 A; i_e = 0 A; f = 1 MHz; T_{amb} = 25 °C	-	5.5	10	pF



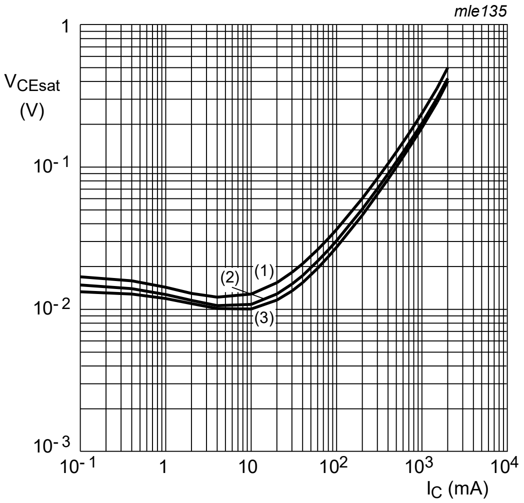
V_{CE} = 5 V
(1) T_{amb} = 100 °C
(2) T_{amb} = 25 °C
(3) T_{amb} = −55 °C

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



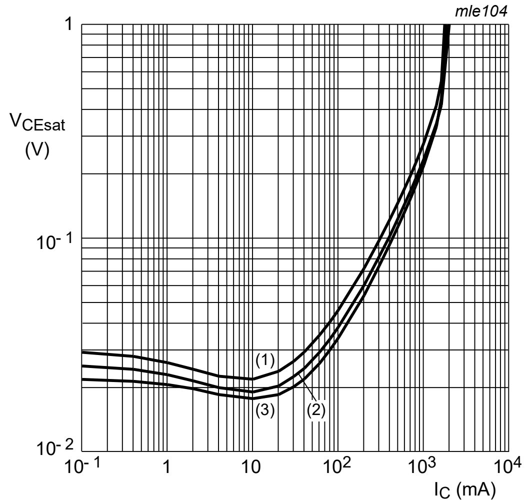
V_{CE} = 5 V
(1) T_{amb} = −55 °C
(2) T_{amb} = 25 °C
(3) T_{amb} = 100 °C

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



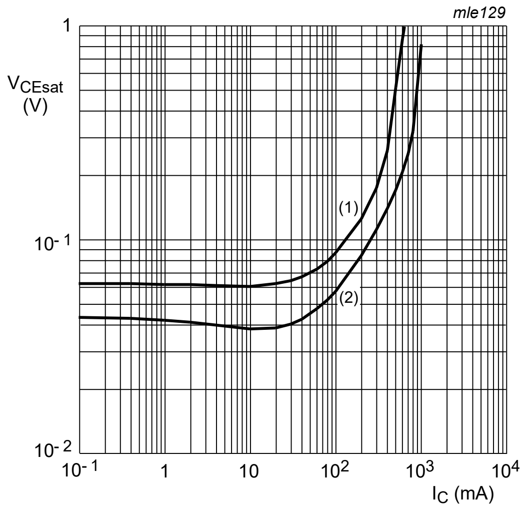
I_C/I_B = 10
(1) T_{amb} = 100 °C
(2) T_{amb} = 25 °C
(3) T_{amb} = −55 °C

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



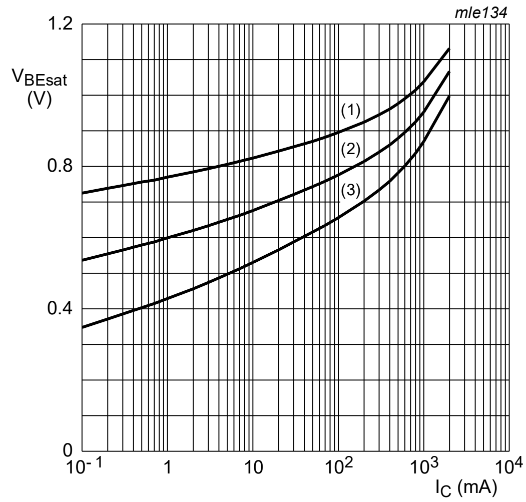
I_C/I_B = 20
(1) T_{amb} = 100 °C
(2) T_{amb}= 25 °C
(3) T_{amb} = −55 °C

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



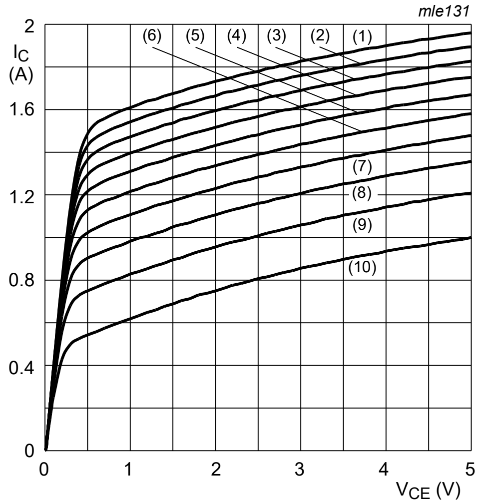
T_{amb} = 25 °C
(1) I_C/I_B = 100
(2) I_C/I_B = 50

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



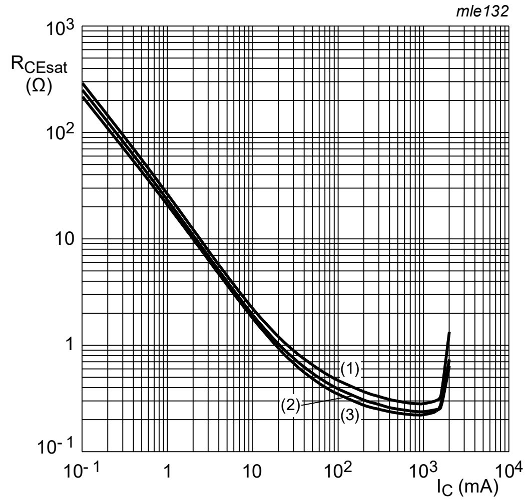
I_C/I_B = 20
(1) T_{amb} = −55 °C
(2) T_{amb} = 25 °C
(3) T_{amb} = 100 °C

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

11. Package outline

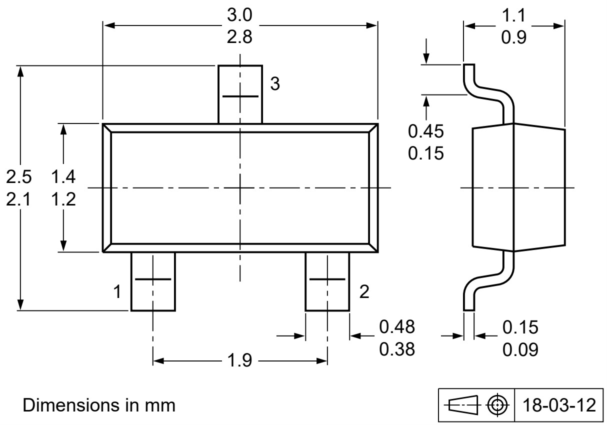


Fig. 11. Package outline SOT23

12. Soldering

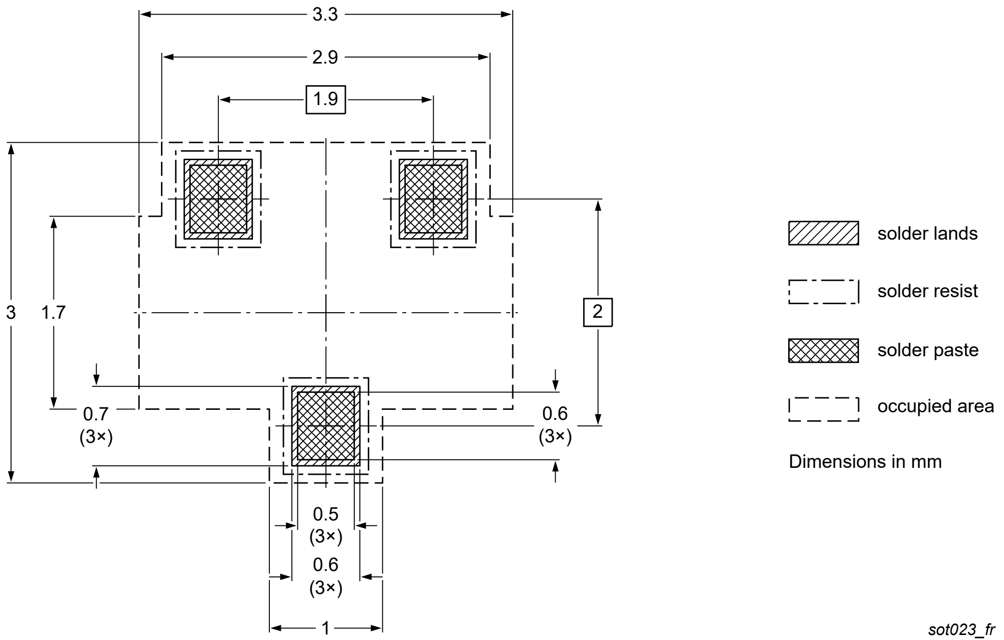


Fig. 12. Reflow soldering footprint for SOT23

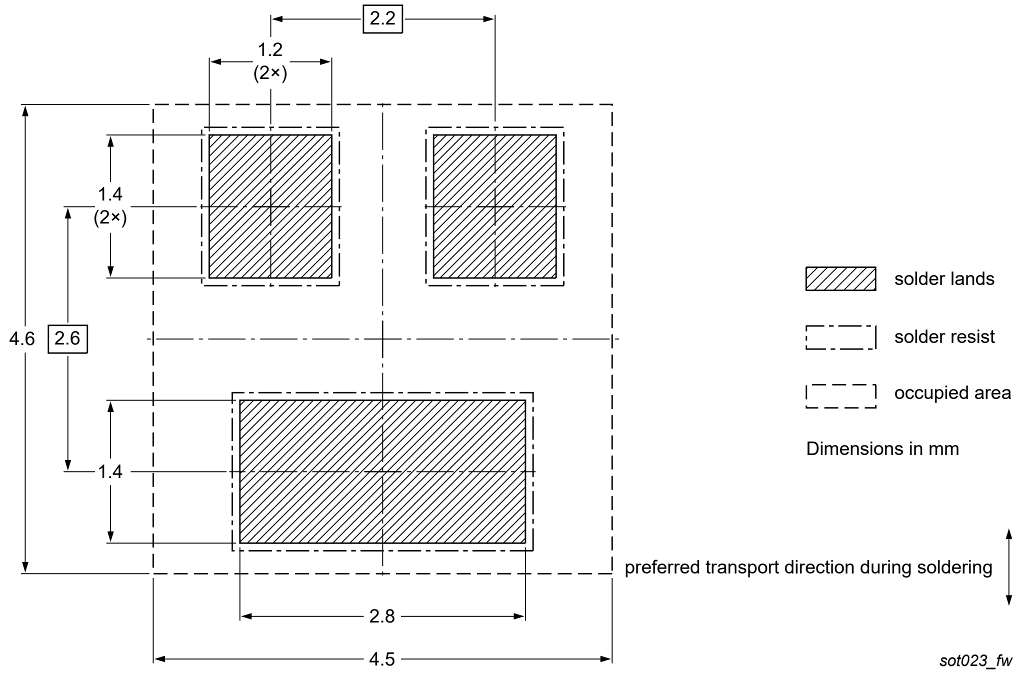


Fig. 13. Wave soldering footprint for SOT23

13. Revision history

Table 8. Revision history

Data sheet ID	Release date	Data sheet status	Change notice	Supersedes
PBSS4160T v.3	20230401	Product data sheet	-	PBSS4160T v.2
Modifications:	• The format of this data sheet has been redesigned to comply with the identity guidelines of Nexperia. • Legal texts have been adapted to the new company name where appropriate. • Product changed to non automotive. Please refer to the automotive product(s) with -Q.			
PBSS4160T v.2	20040512	Product data sheet	-	PBSS4160T v.1
PBSS4160T v.1	20030624	Product specification	-	-

14. Legal information

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 https://www.nexperia.com.

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