



PBSS5350TH

50 V, 3 A PNP low V_{CEsat} (BISS) transistor

21 June 2017

Product data sheet

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.

2. Features and benefits

- Low collector-emitter saturation voltage V_{CEsat}
- High collector current capability: I_C and I_{CM}
- High collector current gain (h_{FE}) at high I_C
- Higher efficiency leading to less heat generation
- High temperature applications up to 175 °C
- AEC-Q101 qualified

3. Applications

- Power management
- DC-to-DC conversion
- Supply line switches
- Battery charger switches
- Peripheral drivers
- Driver in low supply voltage applications (e.g. lamps and LEDs)
- Inductive load driver

4. Quick reference data

Table 1. Quick reference data

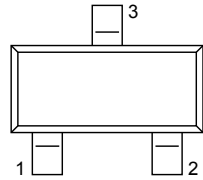
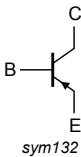
Symbol	Parameter	Conditions		Min	Typ	Max	Unit
V_{CEO}	collector-emitter voltage	open base		-	-	-50	V
I_C	collector current			-	-	-2	A
I_{CM}	peak collector current	pulsed	[1]	-	-	-3	A
		single pulse; $t_p < 1$ ms		-	-	-5	A
R_{CEsat}	collector-emitter saturation resistance	$I_C = -2$ A; $I_B = -200$ mA; $T_{amb} = 25$ °C	[2]	-	-	135	mΩ

[1] Pulse conditions: pulse width $t_p \leq 100$ ms; duty cycle $\delta \leq 0.25$

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

5. Pinning information

Table 2. Pinning information

Pin	Symbol	Description	Simplified outline	Graphic symbol
1	B	base	 TO-236AB (SOT23)	 sym132
2	E	emitter		
3	C	collector		

6. Ordering information

Table 3. Ordering information

Type number	Package		
	Name	Description	Version
PBSS5350TH	TO-236AB	plastic surface-mounted package; 3 leads	SOT23

7. Marking

Table 4. Marking codes

Type number	Marking code[1]
PBSS5350TH	FJ%

[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		-	-50	V
V_{CEO}	collector-emitter voltage	open base		-	-50	V
V_{EBO}	emitter-base voltage	open collector		-	-7	V
I_C	collector current			-	-2	A
I_{CM}	peak collector current	pulsed	[1]	-	-3	A
		single pulse; $t_p < 1$ ms		-	-5	A
I_B	base current			-	-500	mA
P_{tot}	total power dissipation	$T_{amb} \leq 25\text{ }^{\circ}\text{C}$	[2]	-	360	mW
			[3]	-	575	mW
			[4]	-	600	mW
			[5]	-	700	mW
			[1] [2]	-	1.44	W
T_j	junction temperature			-	175	$^{\circ}\text{C}$
T_{amb}	ambient temperature			-55	175	$^{\circ}\text{C}$
T_{stg}	storage temperature			-65	175	$^{\circ}\text{C}$

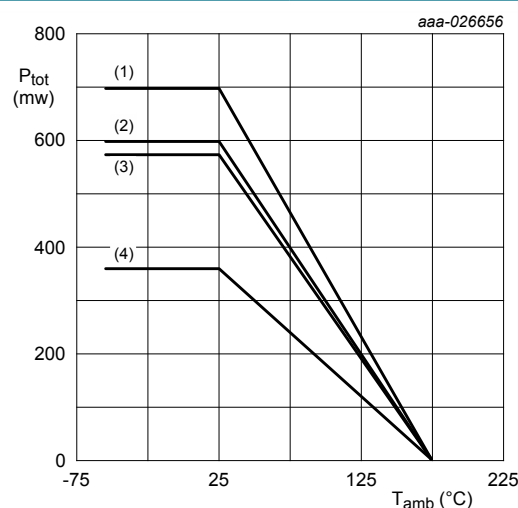
[1] Pulse conditions: pulse width $t_p \leq 100$ ms; duty cycle $\delta \leq 0.25$

[2] Device mounted on an FR4 PCB, single-sided copper, tin-plated and standard footprint.

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

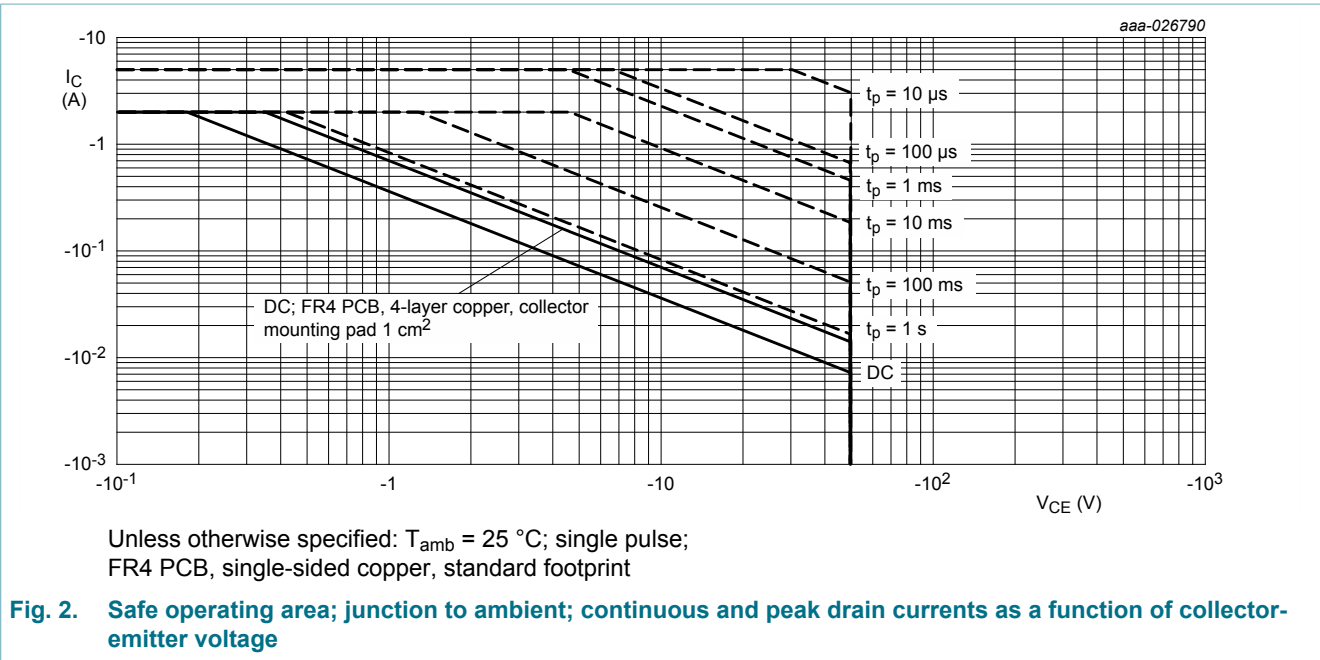
[4] Device mounted on an FR4 PCB, 4-layer copper, tin-plated and standard footprint.

[5] Device mounted on an FR4 PCB, 4-layer copper, tin-plated, mounting pad for collector 1 cm^2 .



- (1) FR4 PCB, 4-layer copper, 1 cm^2
 (2) FR4 PCB, 4-layer copper, standard footprint
 (3) FR4 PCB, single sided copper, 1 cm^2
 (4) FR4 PCB, single sided copper, standard footprint

Fig. 1. Power derating curves for SOT23

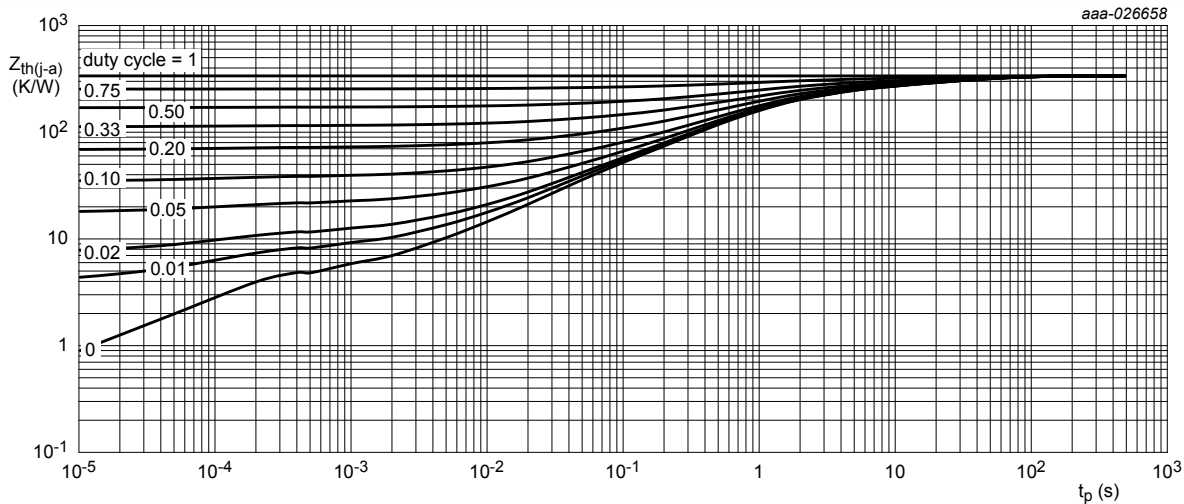


9. Thermal characteristics

Table 6. Thermal characteristics

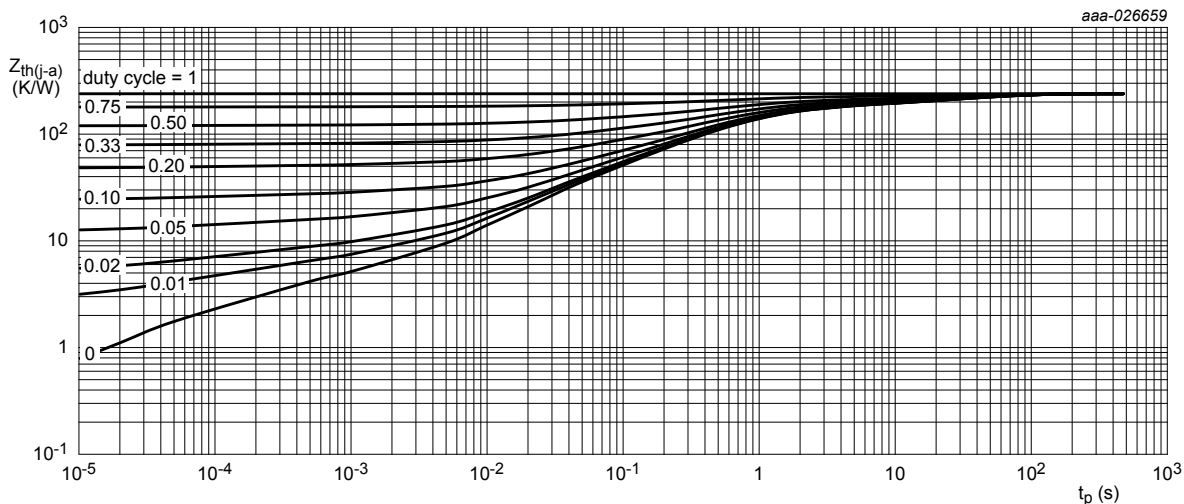
Symbol	Parameter	Conditions		Min	Typ	Max	Unit
$R_{th(j-a)}$	thermal resistance from junction to ambient	in free air	[1]	-	-	417	K/W
			[2]	-	-	261	K/W
			[3]	-	-	250	K/W
			[4]	-	-	215	K/W
			[1] [5]	-	-	104	K/W
$R_{th(j-sp)}$	thermal resistance from junction to solder point			-	75	-	K/W

- [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 cm².
- [3] Device mounted on an FR4 PCB, 4-layer copper, tin-plated and standard footprint.
- [4] Device mounted on an FR4 PCB, 4-layer copper, tin-plated, mounting pad for collector 1 cm².
- [5] Operated under pulse conditions: pulse width $t_p \leq 100\text{ ms}$; duty cycle $\delta \leq 0.25$



FR4 PCB, single sided copper, standard footprint

Fig. 3. Transient thermal impedance from junction to ambient as a function of pulse duration; typical values



FR4 PCB, single sided copper, mounting pad for drain 1 cm²

Fig. 4. Transient thermal impedance from junction to ambient as a function of pulse duration; typical values

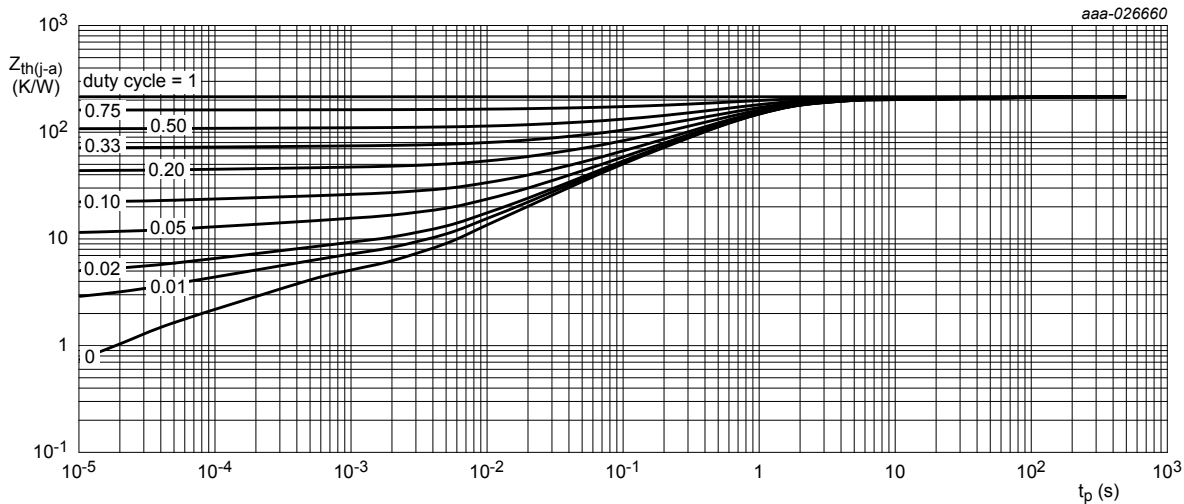


Fig. 5. Transient thermal impedance from junction to ambient as a function of pulse duration; typical values

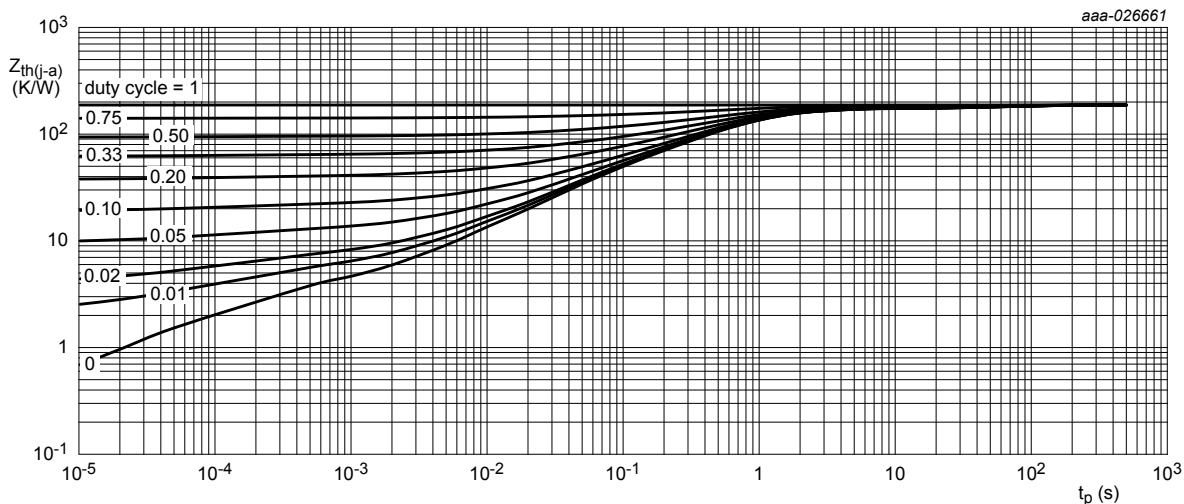


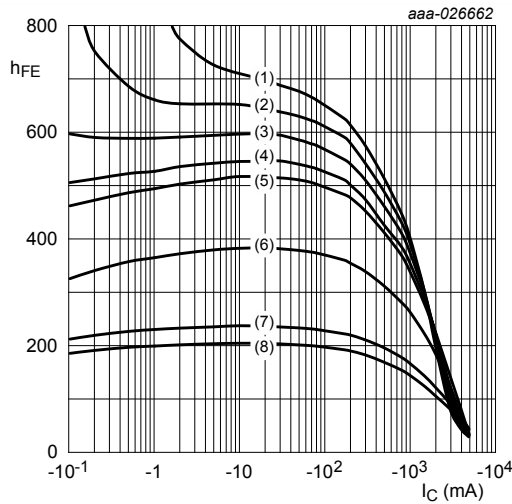
Fig. 6. Transient thermal impedance from junction to ambient as a function of pulse duration; typical values

10. Characteristics

Table 7. Characteristics

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
$V_{(BR)CBO}$	collector-base breakdown voltage	$I_C = -100\ \mu\text{A}$; $I_E = 0\ \text{A}$; $T_{\text{amb}} = 25\ ^\circ\text{C}$		-50	-	-	V
$V_{(BR)CEO}$	collector-emitter breakdown voltage	$I_C = -10\ \text{mA}$; $I_B = 0\ \text{A}$; $T_{\text{amb}} = 25\ ^\circ\text{C}$		-50	-	-	V
$V_{(BR)EBO}$	emitter-base breakdown voltage (collector open)	$I_C = 0\ \text{A}$; $I_E = -100\ \mu\text{A}$; $T_{\text{amb}} = 25\ ^\circ\text{C}$		-7	-	-	V
I_{CBO}	collector-base cut-off current	$V_{CB} = -50\ \text{V}$; $I_E = 0\ \text{A}$; $T_{\text{amb}} = 25\ ^\circ\text{C}$		-	-	-100	nA
		$V_{CB} = -50\ \text{V}$; $I_E = 0\ \text{A}$; $T_j = 150\ ^\circ\text{C}$		-	-	-5	μA
I_{EBO}	emitter-base cut-off current	$V_{EB} = -5\ \text{V}$; $I_C = 0\ \text{A}$; $T_{\text{amb}} = 25\ ^\circ\text{C}$		-	-	-100	nA
h_{FE}	DC current gain	$V_{CE} = -2\ \text{V}$; $I_C = -100\ \text{mA}$; $T_{\text{amb}} = 25\ ^\circ\text{C}$	[1]	200	-	-	
		$V_{CE} = -2\ \text{V}$; $I_C = -500\ \text{mA}$; $T_{\text{amb}} = 25\ ^\circ\text{C}$	[1]	200	-	-	
		$V_{CE} = -2\ \text{V}$; $I_C = -1\ \text{A}$; $T_{\text{amb}} = 25\ ^\circ\text{C}$	[1]	200	-	-	
		$V_{CE} = -2\ \text{V}$; $I_C = -2\ \text{A}$; $T_{\text{amb}} = 25\ ^\circ\text{C}$	[1]	130	-	-	
		$V_{CE} = -2\ \text{V}$; $I_C = -3\ \text{A}$; $T_{\text{amb}} = 25\ ^\circ\text{C}$	[1]	80	-	-	
V_{CEsat}	collector-emitter saturation voltage	$I_C = -500\ \text{mA}$; $I_B = -50\ \text{mA}$; $T_{\text{amb}} = 25\ ^\circ\text{C}$	[1]	-	-	-90	mV
		$I_C = -1\ \text{A}$; $I_B = -50\ \text{mA}$; $T_{\text{amb}} = 25\ ^\circ\text{C}$	[1]	-	-	-180	mV
		$I_C = -2\ \text{A}$; $I_B = -100\ \text{mA}$; $T_{\text{amb}} = 25\ ^\circ\text{C}$	[1]	-	-	-320	mV
		$I_C = -2\ \text{A}$; $I_B = -200\ \text{mA}$; $T_{\text{amb}} = 25\ ^\circ\text{C}$	[1]	-	-	-270	mV
		$I_C = -3\ \text{A}$; $I_B = -300\ \text{mA}$; $T_{\text{amb}} = 25\ ^\circ\text{C}$	[1]	-	-	-390	mV
R_{CEsat}	collector-emitter saturation resistance	$I_C = -2\ \text{A}$; $I_B = -200\ \text{mA}$; $T_{\text{amb}} = 25\ ^\circ\text{C}$	[1]	-	-	135	m Ω
V_{BEsat}	base-emitter saturation voltage	$I_C = -2\ \text{A}$; $I_B = -100\ \text{mA}$; $T_{\text{amb}} = 25\ ^\circ\text{C}$	[1]	-	-	-1.1	V
		$I_C = -3\ \text{A}$; $I_B = -300\ \text{mA}$; $T_{\text{amb}} = 25\ ^\circ\text{C}$	[1]	-	-	-1.2	V
V_{BE}	base-emitter voltage	$V_{CE} = -2\ \text{V}$; $I_C = -1\ \text{A}$; $T_{\text{amb}} = 25\ ^\circ\text{C}$	[1]	-	-	-1.2	V
f_T	transition frequency	$V_{CE} = -5\ \text{V}$; $I_C = -100\ \text{mA}$; $f = 100\ \text{MHz}$; $T_{\text{amb}} = 25\ ^\circ\text{C}$		100	-	-	MHz
C_c	collector capacitance	$V_{CB} = -10\ \text{V}$; $I_E = 0\ \text{A}$; $i_e = 0\ \text{A}$; $f = 1\ \text{MHz}$; $T_{\text{amb}} = 25\ ^\circ\text{C}$		-	-	35	pF

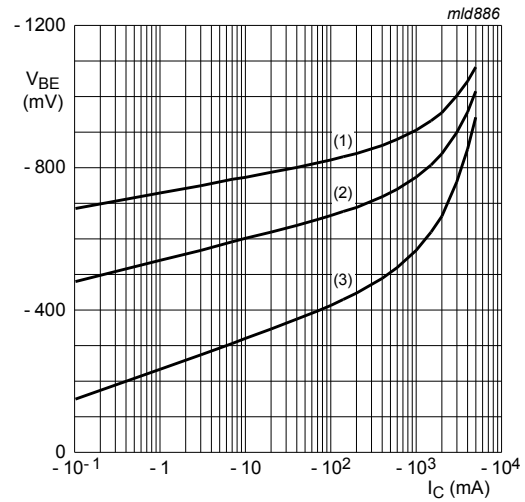
[1] Pulse test: $t_p \leq 300\ \mu\text{s}$; $\delta \leq 0.02$



$V_{CE} = -2 \text{ V}$

- (1) $T_{amb} = 175 \text{ }^{\circ}\text{C}$
- (2) $T_{amb} = 150 \text{ }^{\circ}\text{C}$
- (3) $T_{amb} = 125 \text{ }^{\circ}\text{C}$
- (4) $T_{amb} = 100 \text{ }^{\circ}\text{C}$
- (5) $T_{amb} = 85 \text{ }^{\circ}\text{C}$
- (6) $T_{amb} = 25 \text{ }^{\circ}\text{C}$
- (7) $T_{amb} = -40 \text{ }^{\circ}\text{C}$
- (8) $T_{amb} = -55 \text{ }^{\circ}\text{C}$

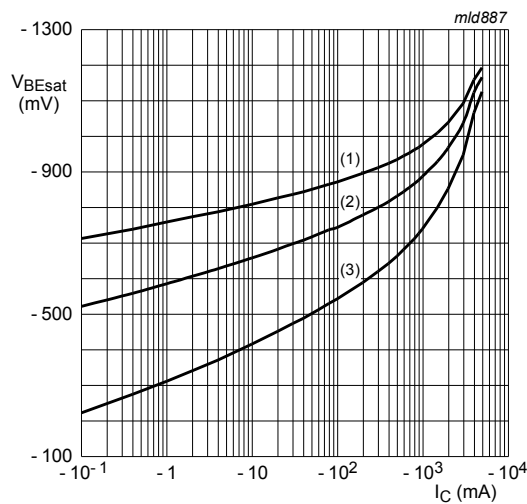
Fig. 7. DC current gain as a function of collector current; typical values



$V_{CE} = -2 \text{ V}$

- (1) $T_{amb} = -55 \text{ }^{\circ}\text{C}$
- (2) $T_{amb} = 25 \text{ }^{\circ}\text{C}$
- (3) $T_{amb} = 150 \text{ }^{\circ}\text{C}$

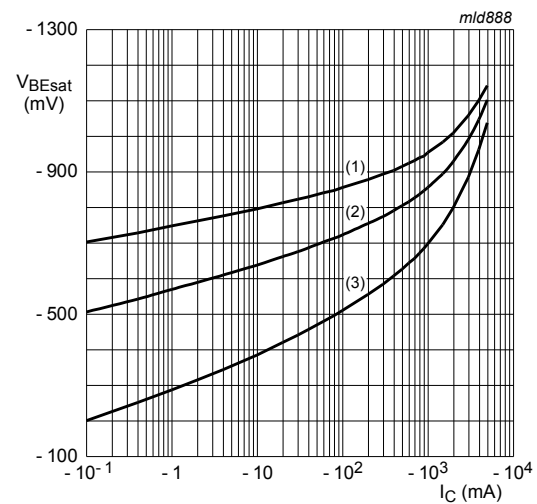
Fig. 8. Base-emitter voltage as a function of collector current; typical values



$I_C/I_B = 10$

- (1) $T_{amb} = -55 \text{ }^{\circ}\text{C}$
- (2) $T_{amb} = 25 \text{ }^{\circ}\text{C}$
- (3) $T_{amb} = 150 \text{ }^{\circ}\text{C}$

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



$I_C/I_B = 20$

- (1) $T_{amb} = -55 \text{ }^{\circ}\text{C}$
- (2) $T_{amb} = 25 \text{ }^{\circ}\text{C}$
- (3) $T_{amb} = 150 \text{ }^{\circ}\text{C}$

Fig. 10. Base-emitter saturation voltage as a function of collector current; typical values

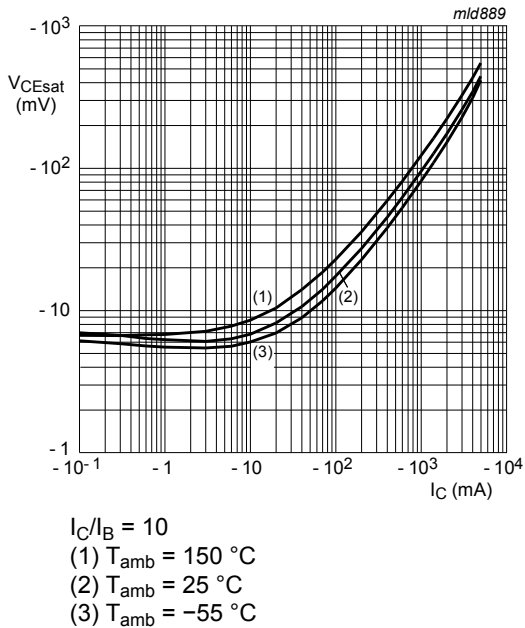


Fig. 11. Collector-emitter saturation voltage as a function of collector current; typical values

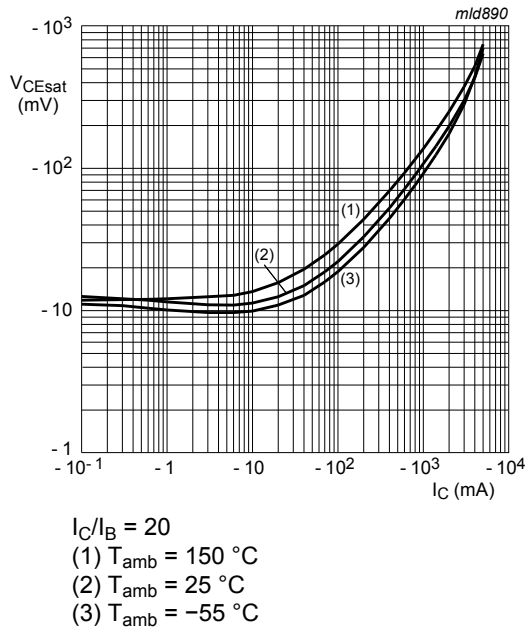


Fig. 12. Collector-emitter saturation voltage as a function of collector current; typical values

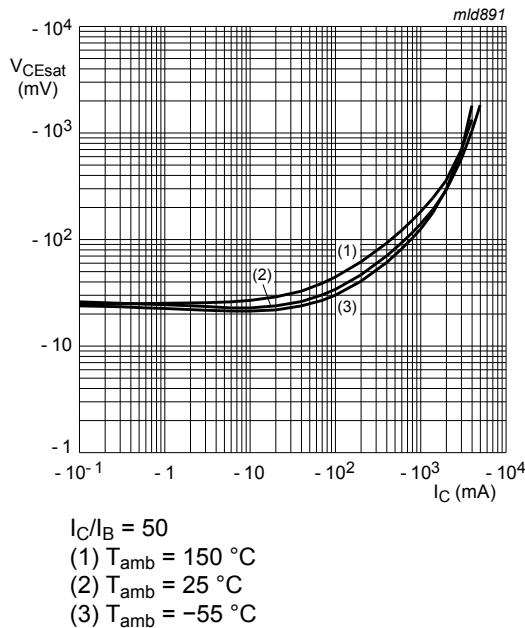


Fig. 13. Collector-emitter saturation voltage as a function of collector current; typical values

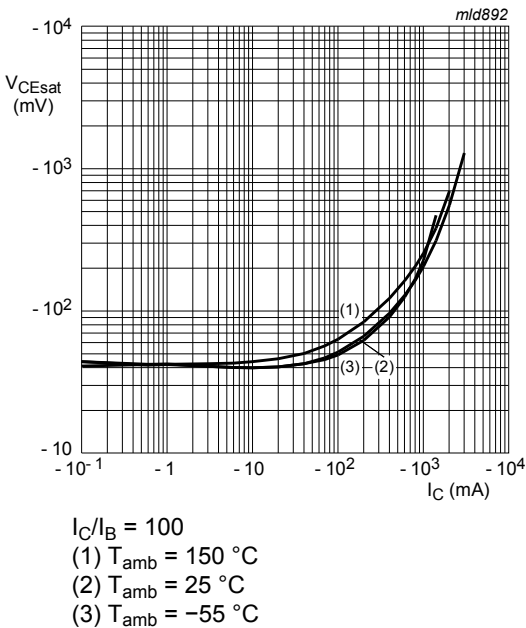
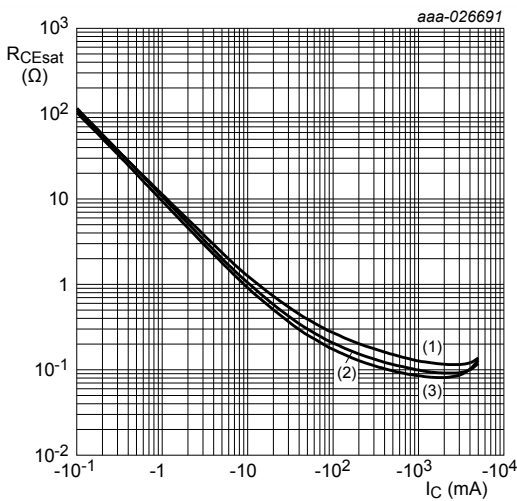


Fig. 14. Collector-emitter saturation voltage as a function of collector current; typical values



$I_C/I_B = 20$
(1) $T_{amb} = 150\text{ }^{\circ}\text{C}$
(2) $T_{amb} = 25\text{ }^{\circ}\text{C}$
(3) $T_{amb} = -55\text{ }^{\circ}\text{C}$

Fig. 15. Collector-emitter saturation resistance as a function of collector current; typical values

11. Test information

Quality information

This product has been qualified in accordance with the Automotive Electronics Council (AEC) standard Q101 - *Stress test qualification for discrete semiconductors*, and is suitable for use in automotive applications.

12. Package outline

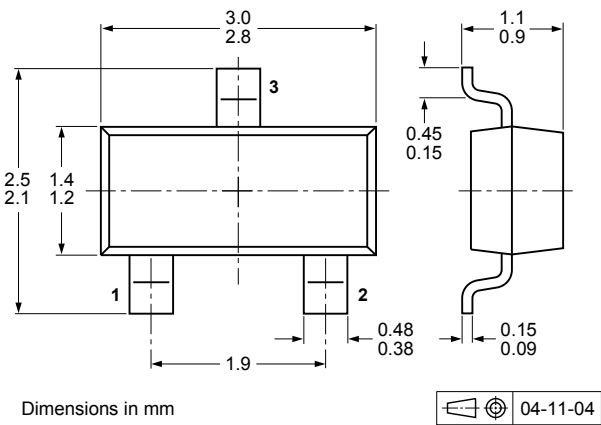


Fig. 16. Package outline TO-236AB (SOT23)

13. Soldering

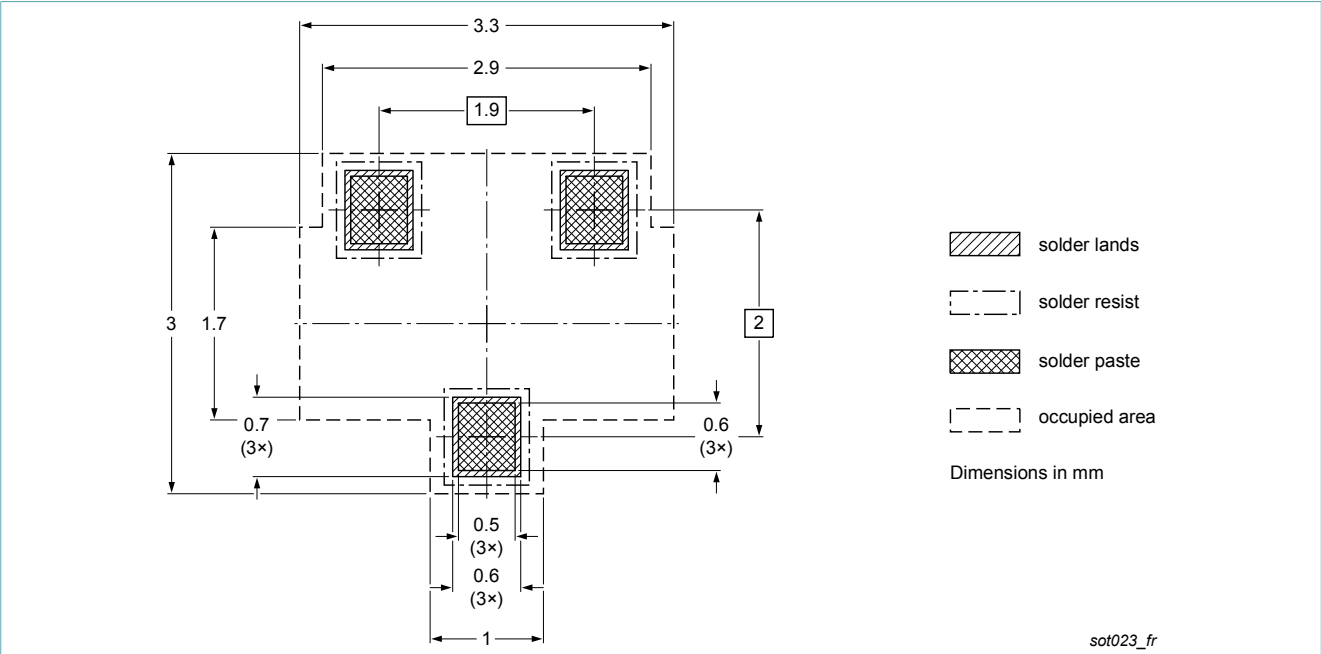


Fig. 17. Reflow soldering footprint for TO-236AB (SOT23)

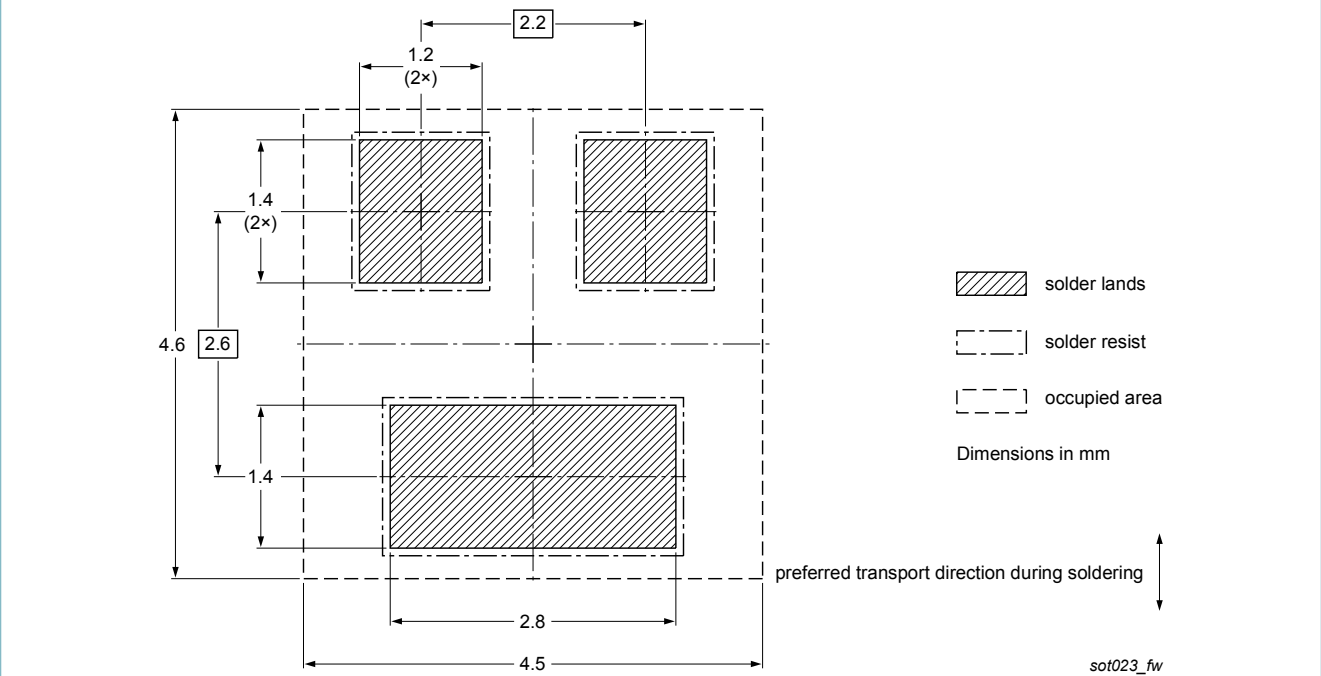


Fig. 18. Wave soldering footprint for TO-236AB (SOT23)

14. Revision history

Table 8. Revision history

Data sheet ID	Release date	Data sheet status	Change notice	Supersedes
PBSS5350TH v.1	20170621	Product data sheet	-	-

15. 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.
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16. Contents

1. General description..... 1

2. Features and benefits..... 1

3. Applications..... 1

4. Quick reference data..... 1

5. Pinning information.....2

6. Ordering information.....2

7. Marking.....2

8. Limiting values..... 3

9. Thermal characteristics..... 4

10. Characteristics.....7

11. Test information..... 10

12. Package outline..... 10

13. Soldering..... 11

14. Revision history.....12

15. Legal information..... 13

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