



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

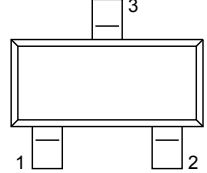
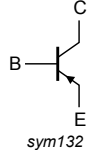
Symbol	Parameter	Conditions	Min	Typ	Max	Unit	
V_{CEO}	collector-emitter voltage	open base	-	-	-50	V	
I_C	collector current		-	-	-2	A	
I_{CM}	peak collector current	pulsed	[1]	-	-	-3	A
		single pulse; $t_p < 1$ ms		-	-	-5	A
R_{CEsat}	collector-emitter saturation resistance	$I_C = -2$ A; $I_B = -200$ mA; $T_{amb} = 25$ °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	 <p>TO-236AB (SOT23)</p>	 <p>sym132</p>
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} ≤ 25 °C	[2]	360	mW
			[3]	575	mW
			[4]	600	mW
			[5]	700	mW
			[1] [2]	1.44	W
T _j	junction temperature		-	175	°C
T _{amb}	ambient temperature		-55	175	°C
T _{stg}	storage temperature		-65	175	°C

- [1] Pulse conditions: pulse width t_p ≤ 100 ms; duty cycle δ ≤ 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 cm².
- [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 cm².

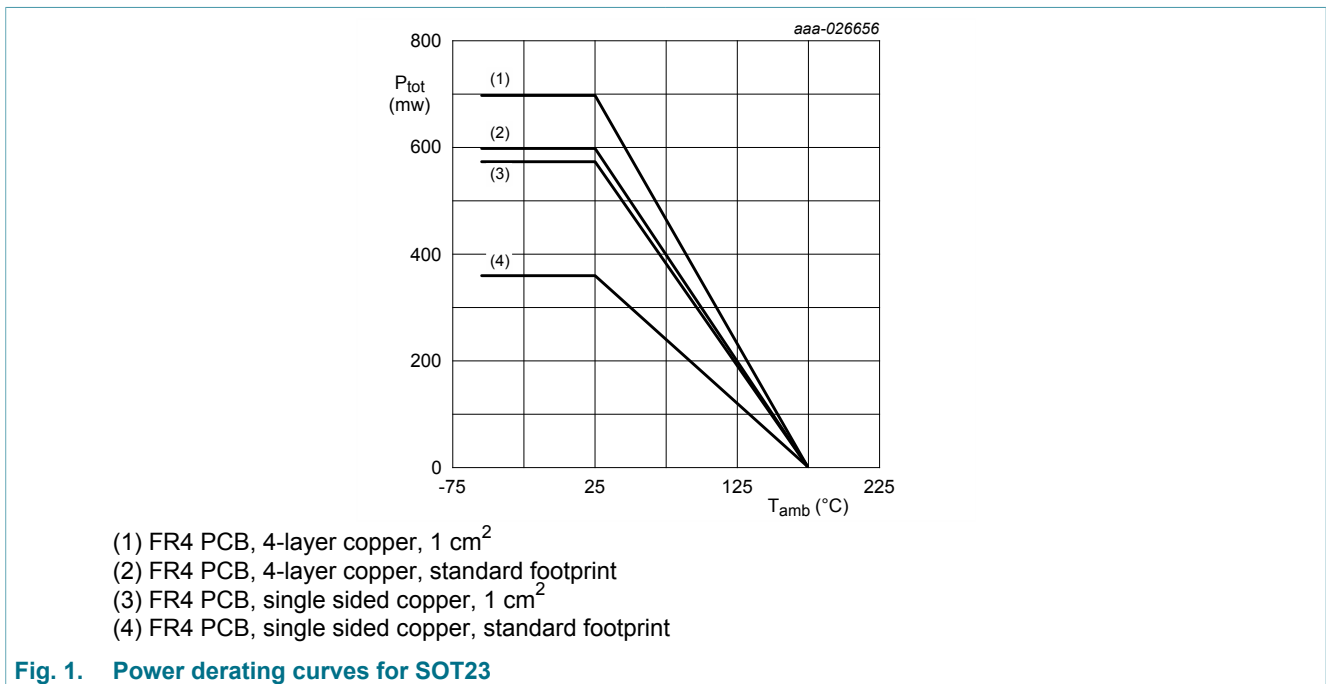
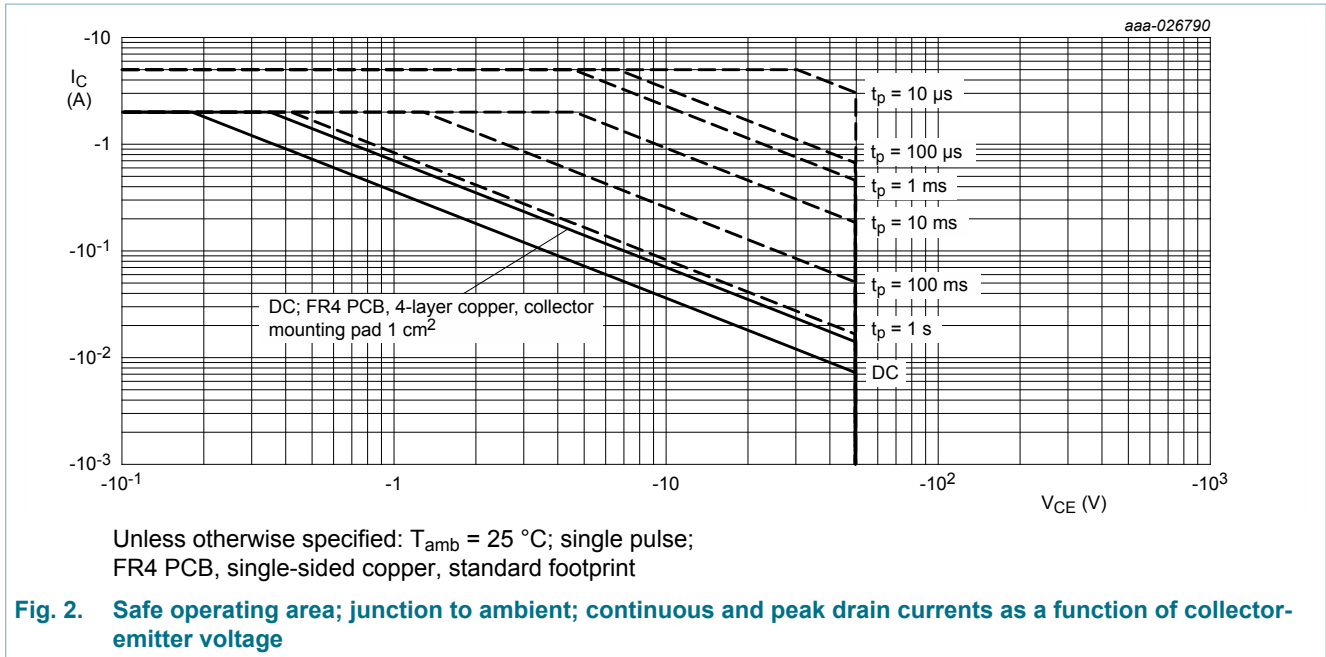


Fig. 1. Power derating curves for SOT23

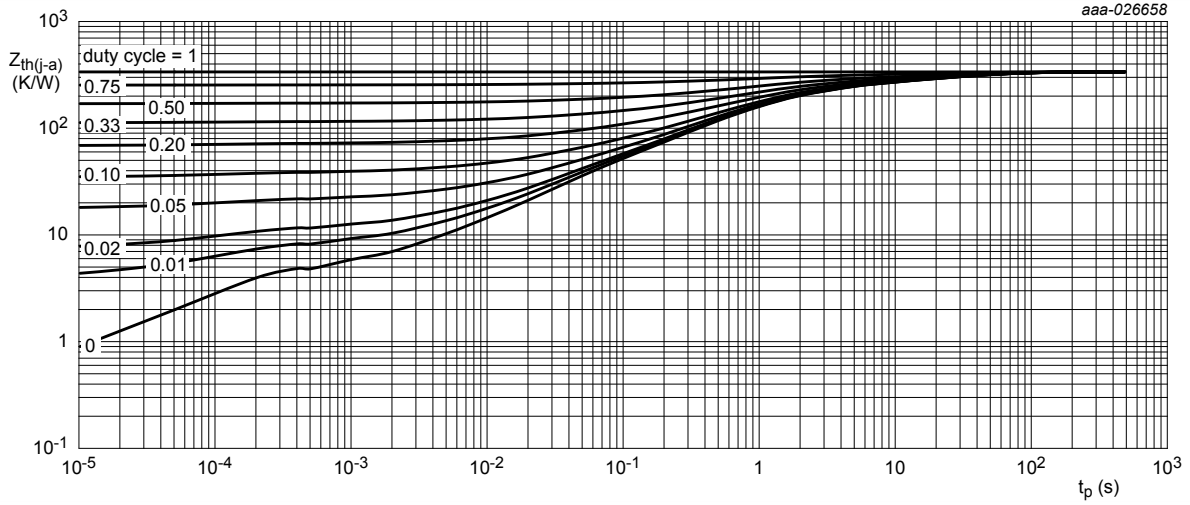


9. Thermal characteristics

Table 6. Thermal characteristics

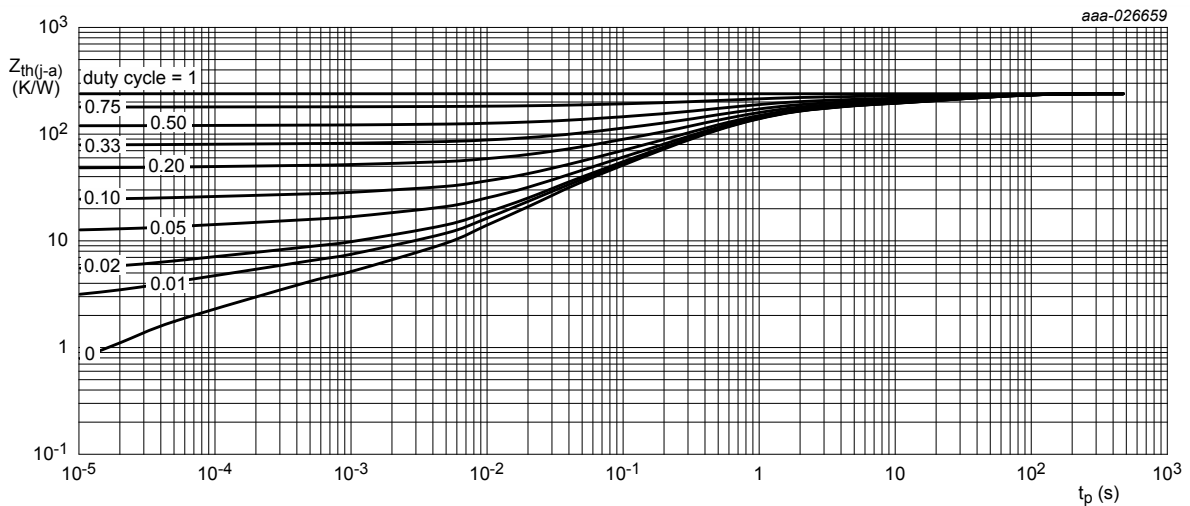
Symbol	Parameter	Conditions		Min	Typ	Max	Unit
$R_{th(j-a)}$	thermal resistance from junction to ambient	in free air	[1]	-	-	417	K/W
			[2]	-	-	261	K/W
			[3]	-	-	250	K/W
			[4]	-	-	215	K/W
			[1] [5]	-	-	104	K/W
$R_{th(j-sp)}$	thermal resistance from junction to solder point			75		K/W	

- [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 $\delta \leq 0.25$



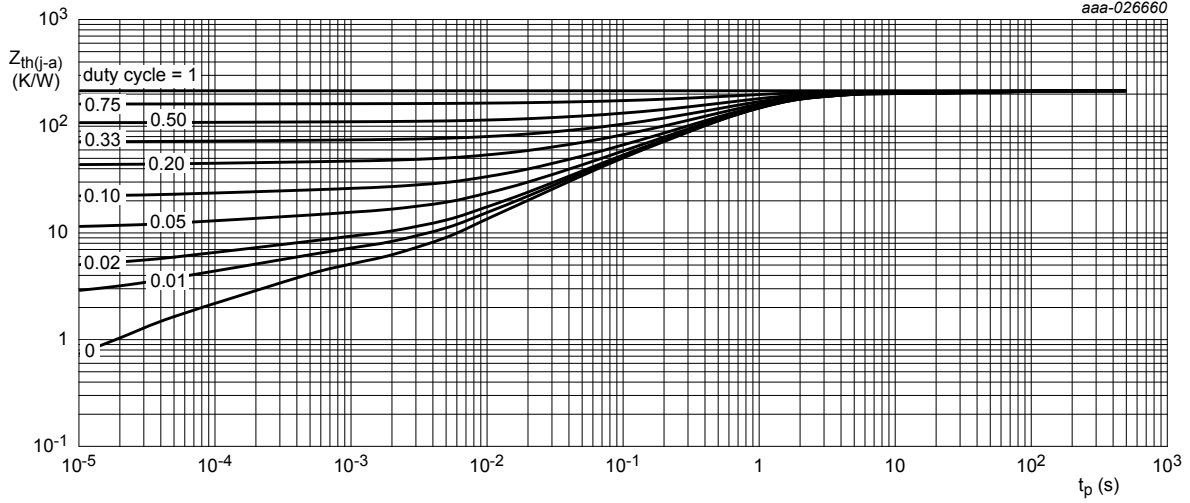
FR4 PCB, single sided copper, standard footprint

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



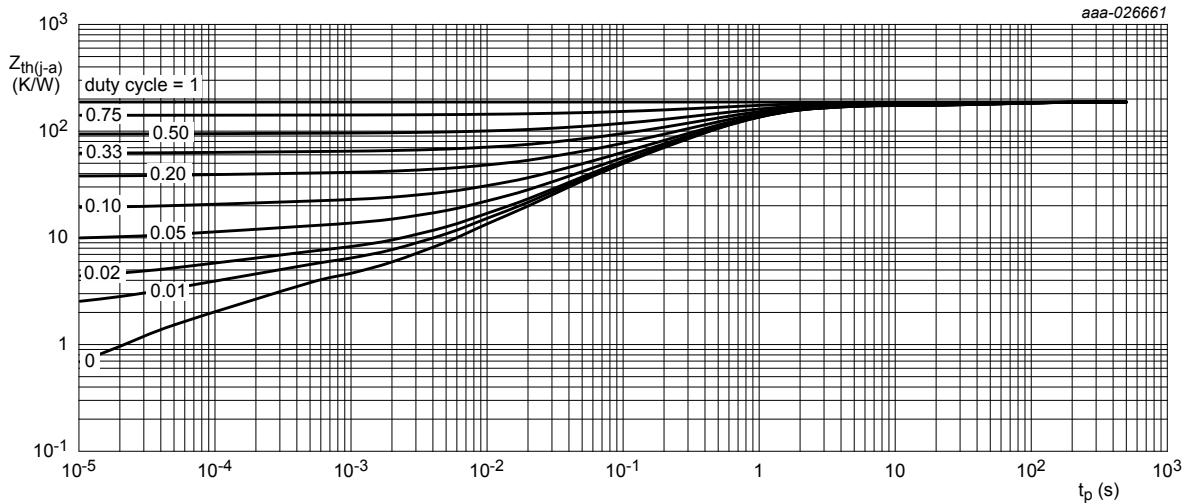
FR4 PCB, single sided copper, mounting pad for drain 1 cm²

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



FR4 PCB, 4-layer copper, standard footprint

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



FR4 PCB, 4-layer copper, mounting pad for collector 1 cm²

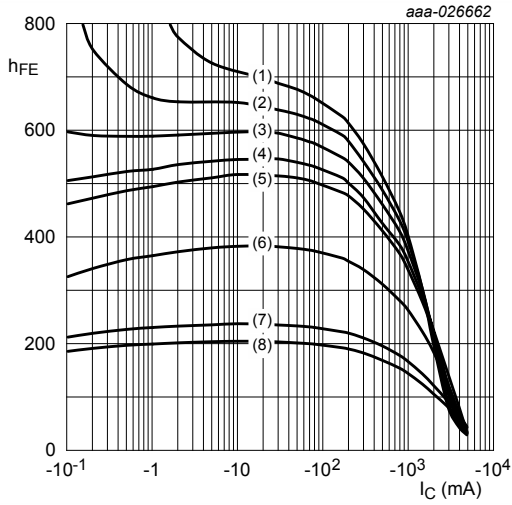
Fig. 6. Transient thermal impedance from junction to ambient as a function of pulse duration; typical values

10. Characteristics

Table 7. Characteristics

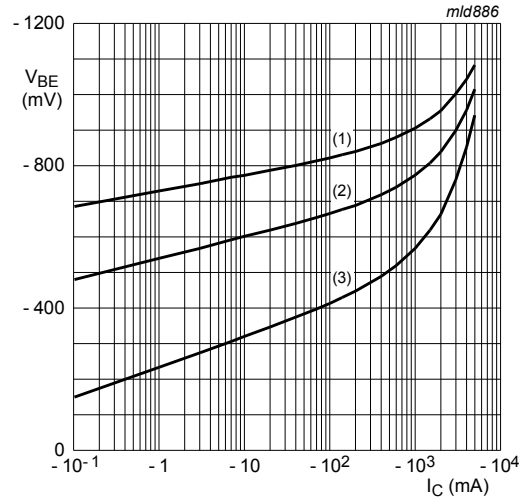
Symbol	Parameter	Conditions		Min	Typ	Max	Unit
$V_{(BR)CBO}$	collector-base breakdown voltage	$I_C = -100 \mu\text{A}$; $I_E = 0 \text{ A}$; $T_{\text{amb}} = 25 \text{ }^\circ\text{C}$		-50	-	-	V
$V_{(BR)CEO}$	collector-emitter breakdown voltage	$I_C = -10 \text{ mA}$; $I_B = 0 \text{ A}$; $T_{\text{amb}}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

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



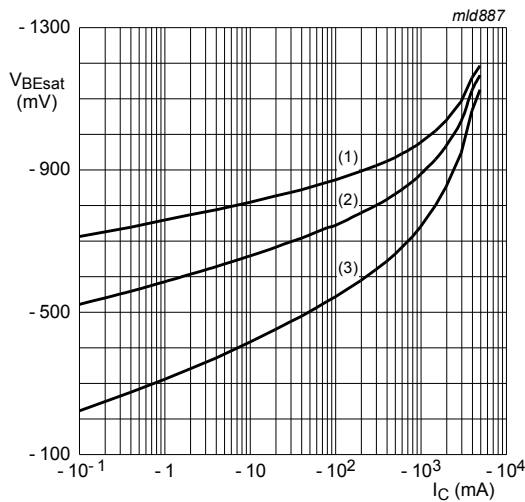
$V_{CE} = -2\text{ V}$
 (1) $T_{amb} = 175\text{ °C}$
 (2) $T_{amb} = 150\text{ °C}$
 (3) $T_{amb} = 125\text{ °C}$
 (4) $T_{amb} = 100\text{ °C}$
 (5) $T_{amb} = 85\text{ °C}$
 (6) $T_{amb} = 25\text{ °C}$
 (7) $T_{amb} = -40\text{ °C}$
 (8) $T_{amb} = -55\text{ °C}$

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



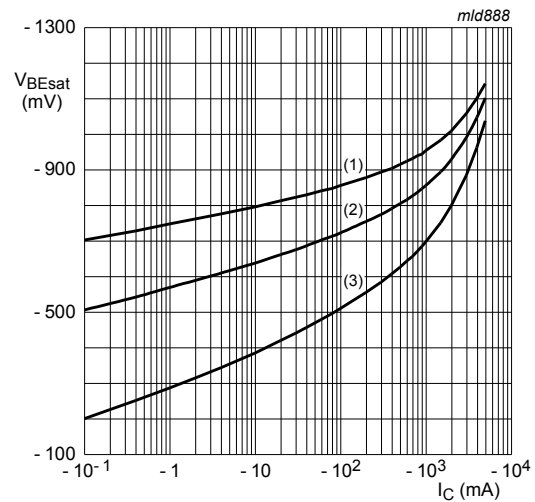
$V_{CE} = -2\text{ V}$
 (1) $T_{amb} = -55\text{ °C}$
 (2) $T_{amb} = 25\text{ °C}$
 (3) $T_{amb} = 150\text{ °C}$

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



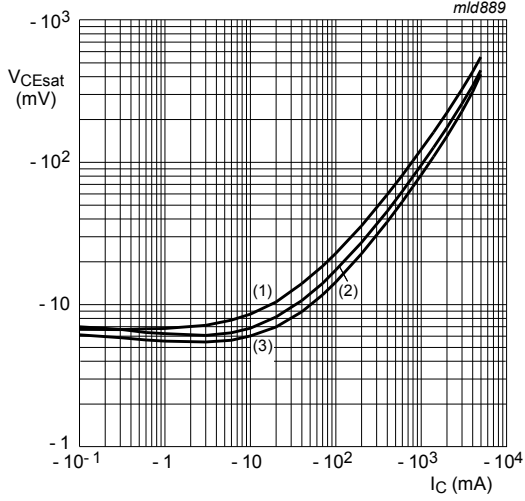
$I_C/I_B = 10$
 (1) $T_{amb} = -55\text{ °C}$
 (2) $T_{amb} = 25\text{ °C}$
 (3) $T_{amb} = 150\text{ °C}$

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



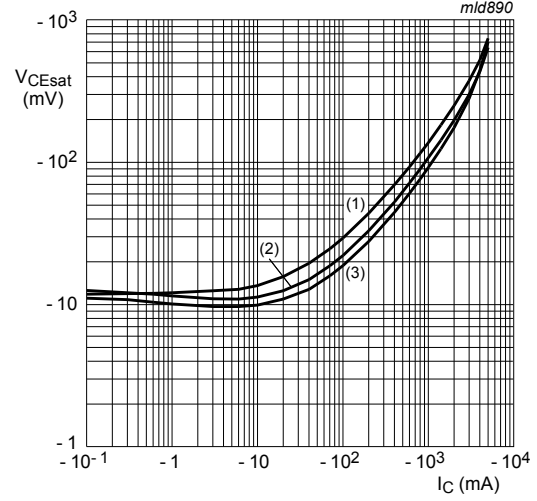
$I_C/I_B = 20$
 (1) $T_{amb} = -55\text{ °C}$
 (2) $T_{amb} = 25\text{ °C}$
 (3) $T_{amb} = 150\text{ °C}$

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



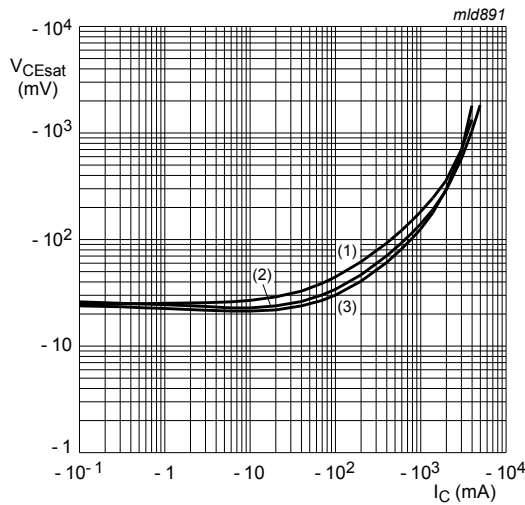
$I_C/I_B = 10$
 (1) $T_{amb} = 150\text{ °C}$
 (2) $T_{amb} = 25\text{ °C}$
 (3) $T_{amb} = -55\text{ °C}$

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



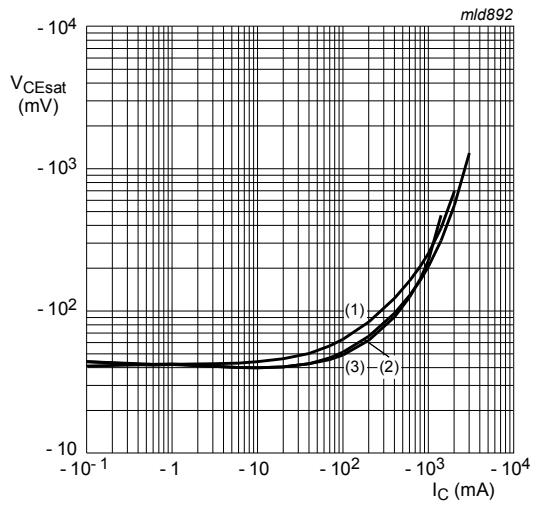
$I_C/I_B = 20$
 (1) $T_{amb} = 150\text{ °C}$
 (2) $T_{amb} = 25\text{ °C}$
 (3) $T_{amb} = -55\text{ °C}$

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



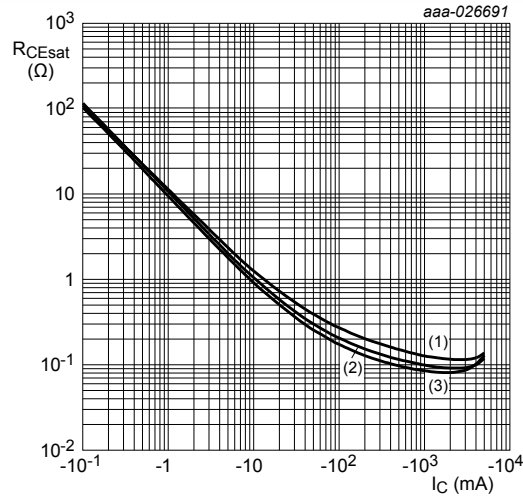
$I_C/I_B = 50$
 (1) $T_{amb} = 150\text{ °C}$
 (2) $T_{amb} = 25\text{ °C}$
 (3) $T_{amb} = -55\text{ °C}$

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



$I_C/I_B = 100$
 (1) $T_{amb} = 150\text{ °C}$
 (2) $T_{amb} = 25\text{ °C}$
 (3) $T_{amb} = -55\text{ °C}$

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



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

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

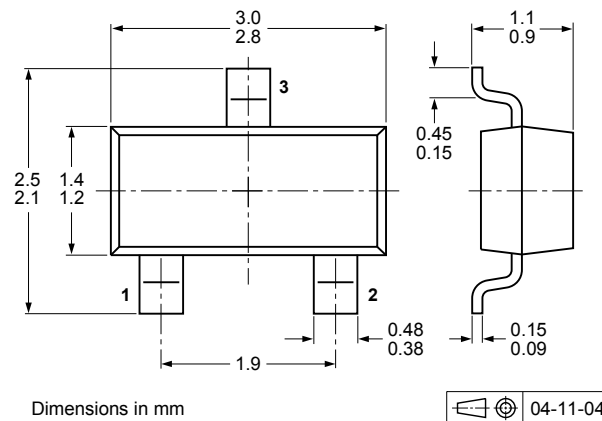


Fig. 16. Package outline TO-236AB (SOT23)

13. Soldering

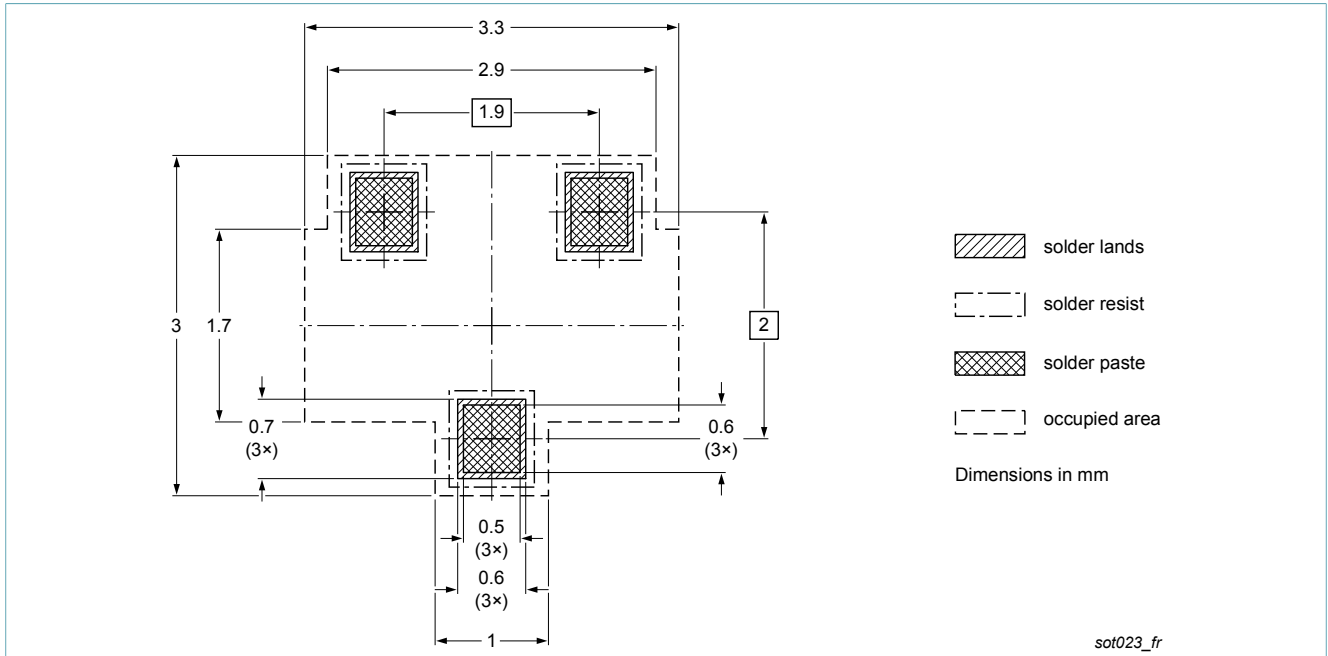


Fig. 17. Reflow soldering footprint for TO-236AB (SOT23)

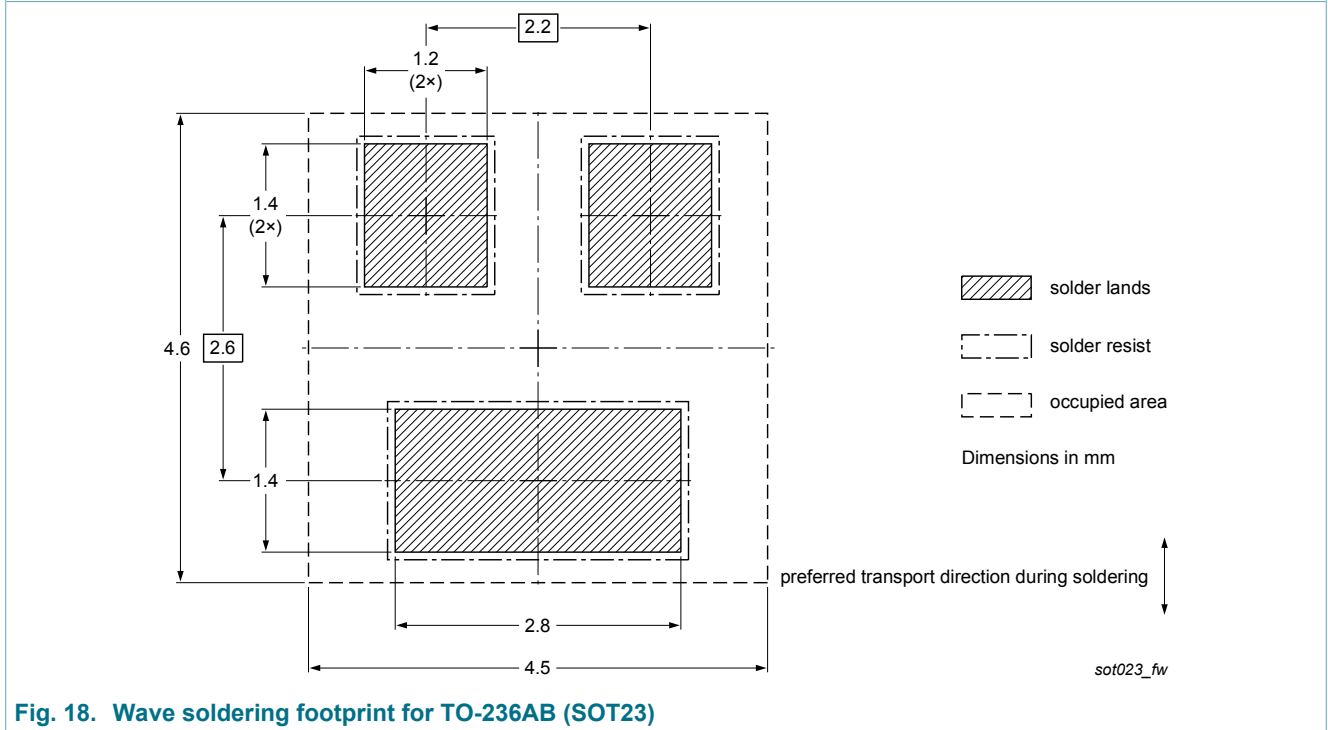


Fig. 18. Wave soldering footprint for TO-236AB (SOT23)

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.

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- [2] The term 'short data sheet' is explained in section "Definitions".
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Date of release: 21 June 2017

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