



# PBSS5250TH

50 V, 2 A PNP low V<sub>CEsat</sub> (BISS) transistor

9 August 2017

Product data sheet

## 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.

## 2. Features and benefits

- Low collector-emitter saturation voltage V<sub>CEsat</sub>
- High collector current capability: I<sub>C</sub> and I<sub>CM</sub>
- High collector current gain (h<sub>FE</sub>) at high I<sub>C</sub>
- 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

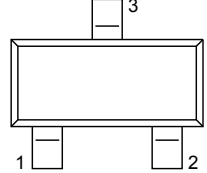
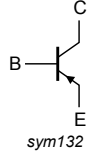
Table 1. Quick reference data

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
V <sub>CEO</sub>	collector-emitter voltage	open base	-	-	-50	V
I <sub>C</sub>	collector current		-	-	-2	A
I <sub>CM</sub>	peak collector current	single pulse; t <sub>p</sub> ≤ 1 ms	-	-	-3	A
R <sub>CEsat</sub>	collector-emitter saturation resistance	I <sub>C</sub> = -2 A; I <sub>B</sub> = -200 mA; T <sub>amb</sub> = 25 °C	[1]	-	150	mΩ

[1] Pulse test: t<sub>p</sub> ≤ 300 μs; δ ≤ 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
PBSS5250TH	TO-236AB	plastic surface-mounted package; 3 leads	SOT23

## 7. Marking

Table 4. Marking codes

Type number	Marking code[1]
PBSS5250TH	FH%

[1] % = placeholder for manufacturing site code

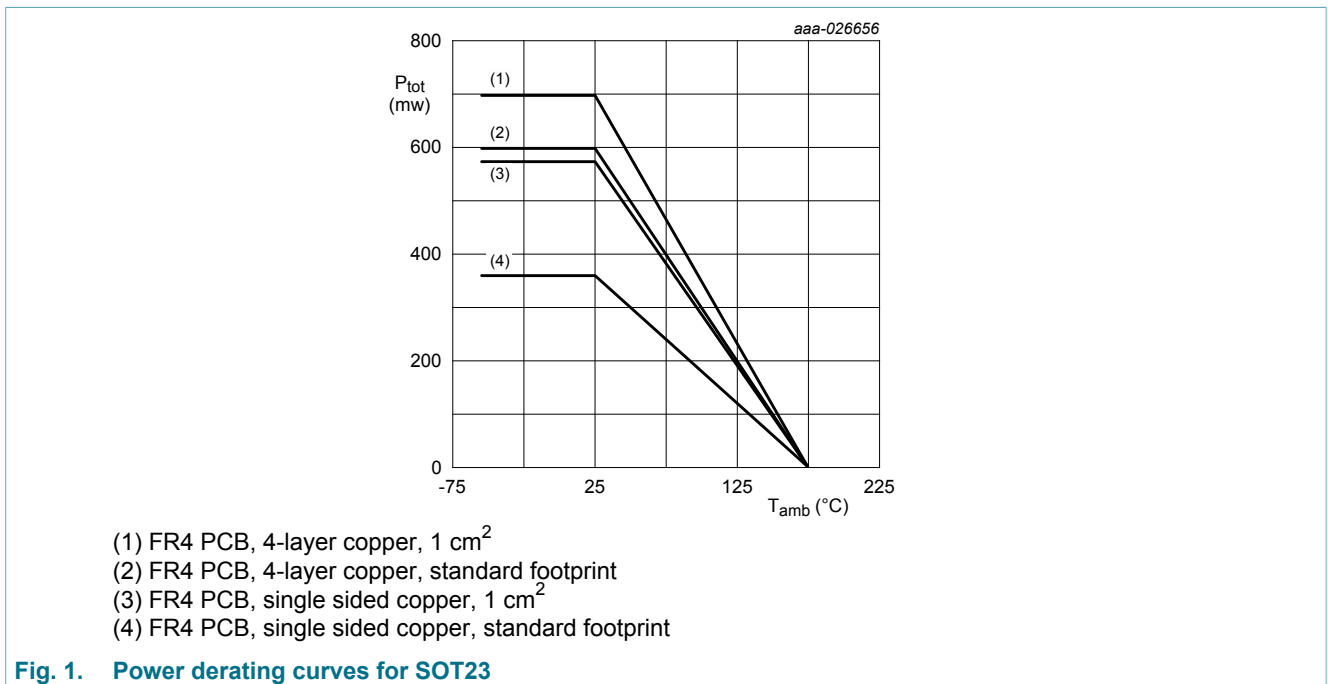
## 8. Limiting values

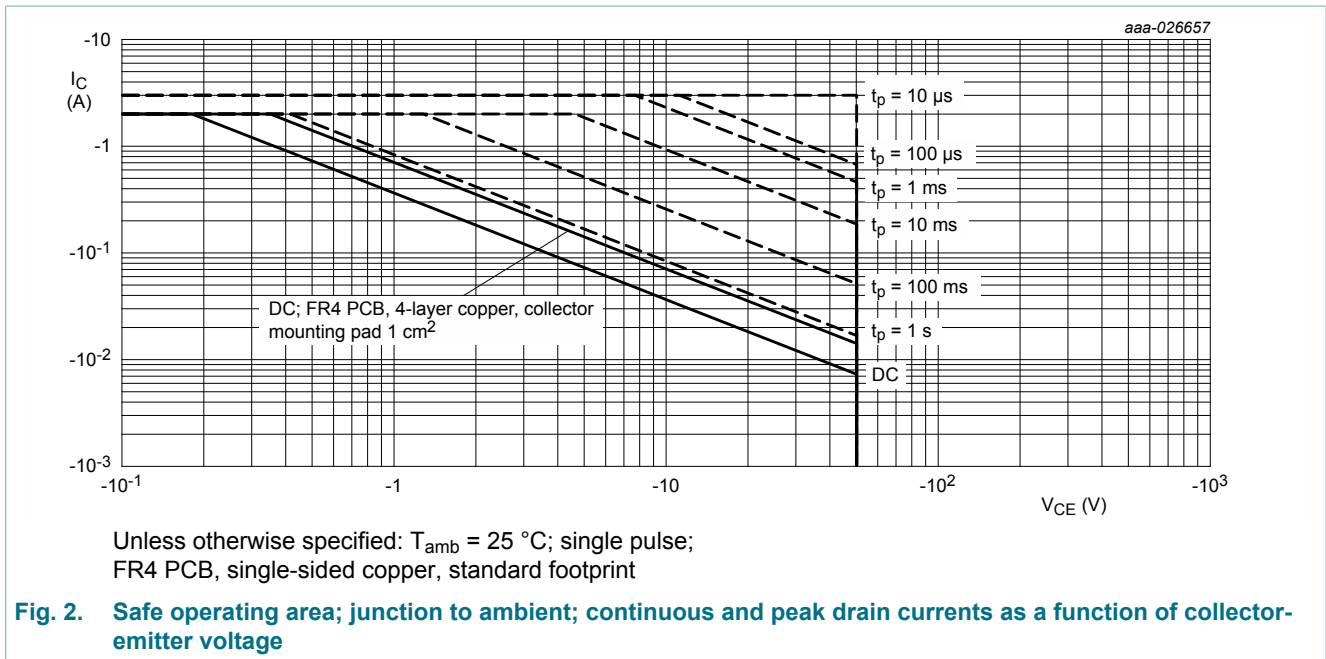
**Table 5. Limiting values**

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

Symbol	Parameter	Conditions		Min	Max	Unit
V <sub>CBO</sub>	collector-base voltage	open emitter		-	-50	V
V <sub>CEO</sub>	collector-emitter voltage	open base		-	-50	V
V <sub>EBO</sub>	emitter-base voltage	open collector		-	-7	V
I <sub>C</sub>	collector current			-	-2	A
I <sub>CM</sub>	peak collector current	single pulse; t <sub>p</sub> ≤ 1 ms		-	-3	A
I <sub>B</sub>	base current			-	-300	mA
P <sub>tot</sub>	total power dissipation	T <sub>amb</sub> ≤ 25 °C	[1]	-	360	mW
			[2]	-	575	mW
			[3]	-	600	mW
			[4]	-	700	mW
T <sub>j</sub>	junction temperature			-	175	°C
T <sub>amb</sub>	ambient temperature			-55	175	°C
T <sub>stg</sub>	storage temperature			-65	175	°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] 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 cm<sup>2</sup>.



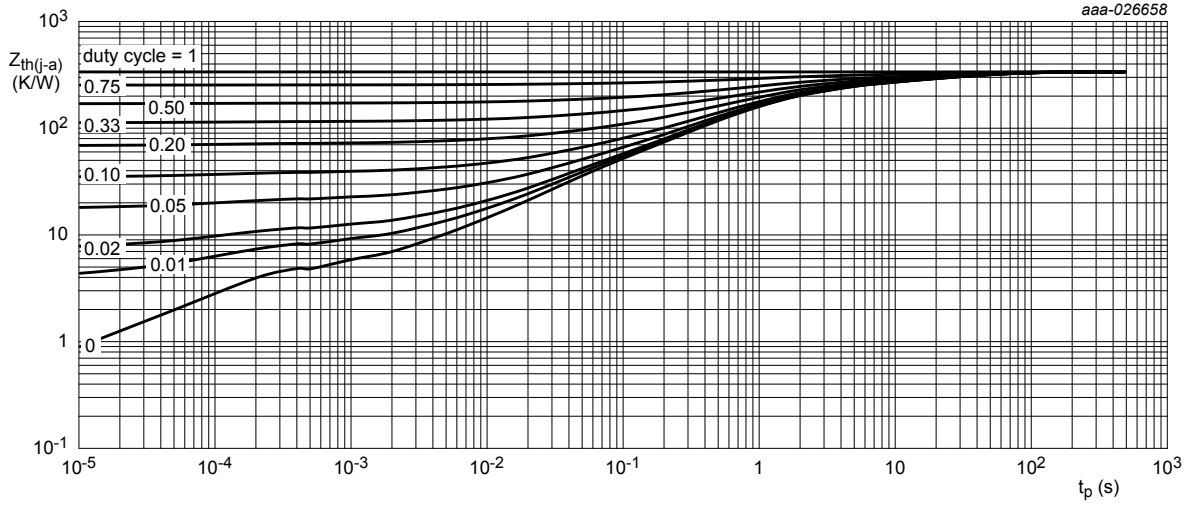


## 9. Thermal characteristics

Table 6. Thermal characteristics

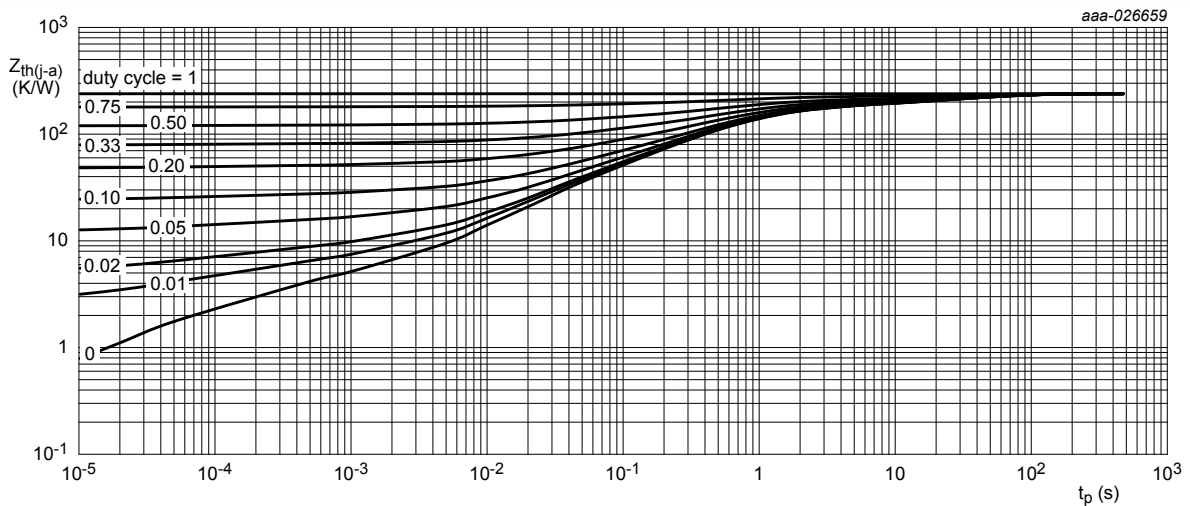
Symbol	Parameter	Conditions		Min	Typ	Max	Unit
$R_{th(j-a)}$	thermal resistance from junction to ambient	in free air	[1]	-	-	417	K/W
			[2]	-	-	261	K/W
			[3]	-	-	250	K/W
			[4]	-	-	215	K/W
$R_{th(j-sp)}$	thermal resistance from junction to solder point			-	75	-	K/W

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



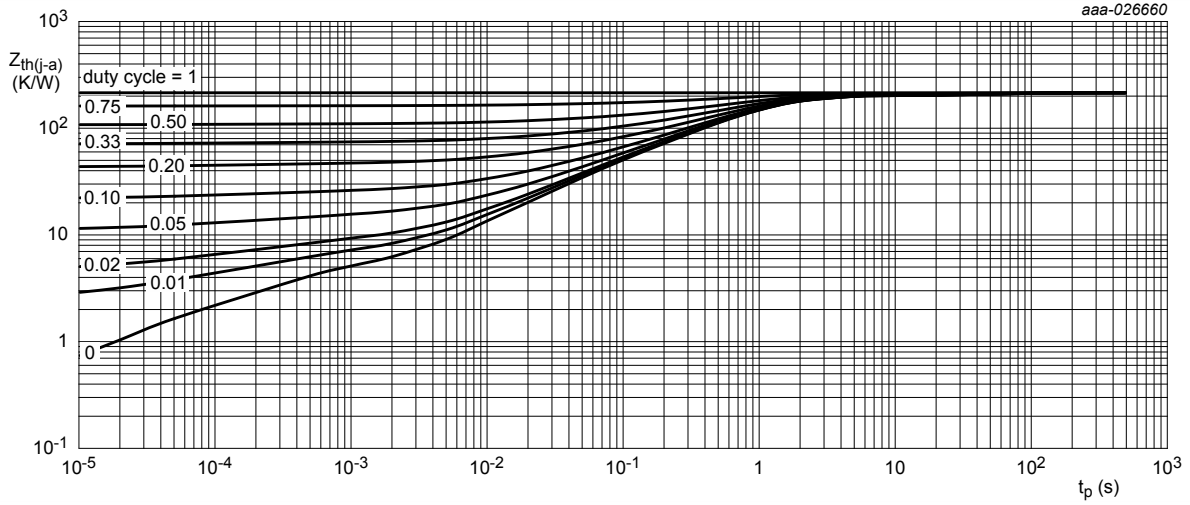
FR4 PCB, single sided copper, standard footprint

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



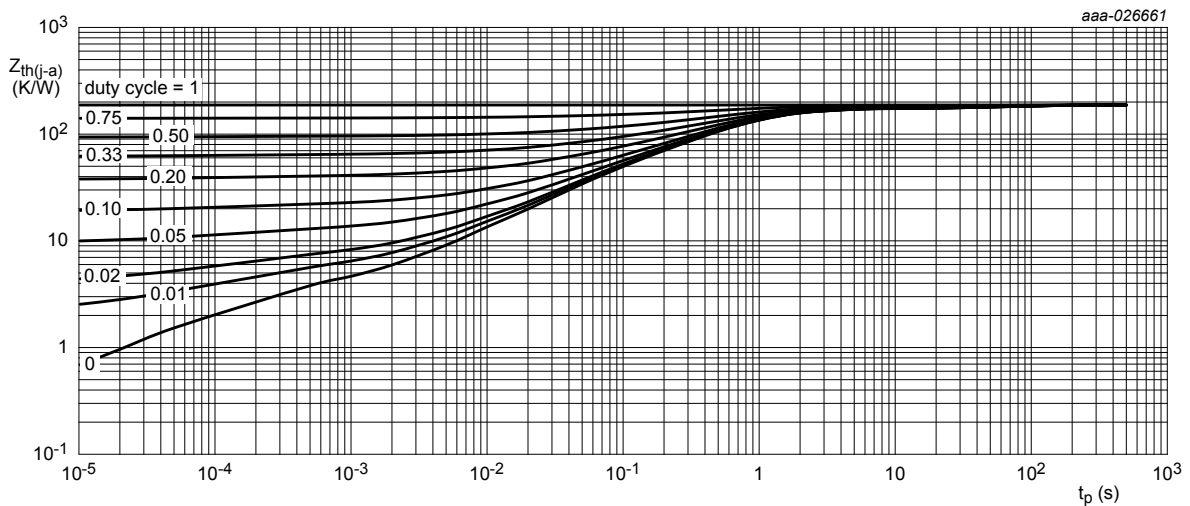
FR4 PCB, single sided copper, mounting pad for drain  $1 \text{ cm}^2$

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 cm<sup>2</sup>

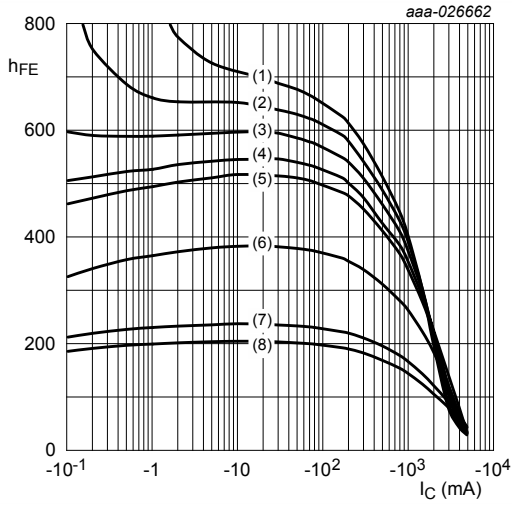
**Fig. 6. Transient thermal impedance from junction to ambient as a function of pulse duration; typical values**

## 10. Characteristics

Table 7. Characteristics

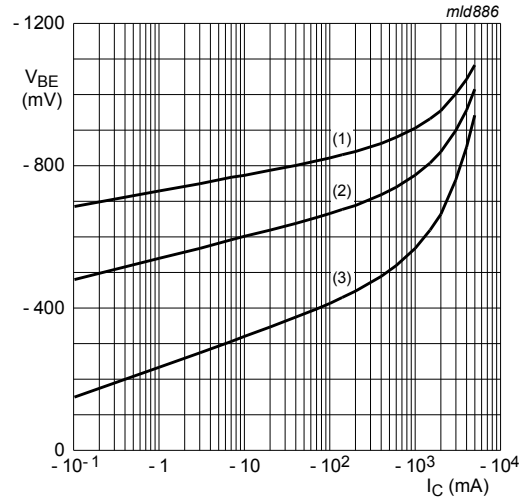
Symbol	Parameter	Conditions		Min	Typ	Max	Unit
$V_{(BR)CBO}$	collector-base breakdown voltage	$I_C = -100 \mu\text{A}$ ; $I_E = 0 \text{ A}$ ; $T_{\text{amb}} = 25 \text{ }^\circ\text{C}$		-50	-	-	V
$V_{(BR)CEO}$	collector-emitter breakdown voltage	$I_C = -10 \text{ mA}$ ; $I_B = 0 \text{ A}$ ; $T_{\text{amb}} = 25 \text{ }^\circ\text{C}$		-50	-	-	V
$V_{(BR)EBO}$	emitter-base breakdown voltage (collector open)	$I_C = 0 \text{ mA}$ ; $I_E = -100 \mu\text{A}$ ; $T_{\text{amb}} = 25 \text{ }^\circ\text{C}$		-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	$\mu\text{A}$
$I_{EBO}$	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	-	-	
$V_{CEsat}$	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
		$I_C = -2 \text{ A}$ ; $I_B = -200 \text{ mA}$ ; $T_{\text{amb}} = 25 \text{ }^\circ\text{C}$	[1]	-	-	-300	mV
$R_{CEsat}$	collector-emitter saturation resistance		[1]	-	-	150	m $\Omega$
$V_{BEsat}$	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
$V_{BE}$	base-emitter voltage	$V_{CE} = -2 \text{ V}$ ; $I_C = -1 \text{ A}$	[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:  $t_p \leq 300 \mu\text{s}$ ;  $\delta \leq 0.02$



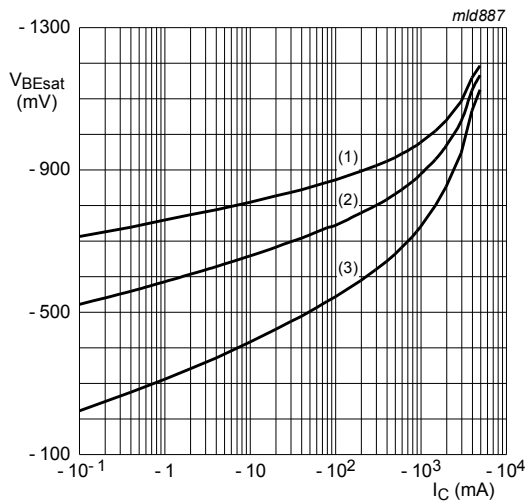
$V_{CE} = -2\text{ V}$   
 (1)  $T_{amb} = 175\text{ °C}$   
 (2)  $T_{amb} = 150\text{ °C}$   
 (3)  $T_{amb} = 125\text{ °C}$   
 (4)  $T_{amb} = 100\text{ °C}$   
 (5)  $T_{amb} = 85\text{ °C}$   
 (6)  $T_{amb} = 25\text{ °C}$   
 (7)  $T_{amb} = -40\text{ °C}$   
 (8)  $T_{amb} = -55\text{ °C}$

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



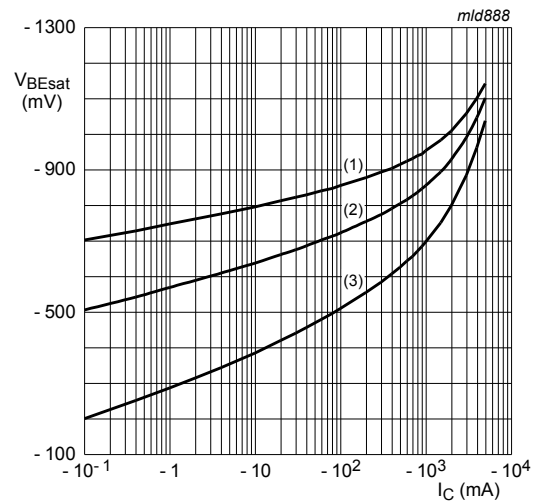
$V_{CE} = -2\text{ V}$   
 (1)  $T_{amb} = -55\text{ °C}$   
 (2)  $T_{amb} = 25\text{ °C}$   
 (3)  $T_{amb} = 150\text{ °C}$

**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)  $T_{amb} = 150\text{ °C}$

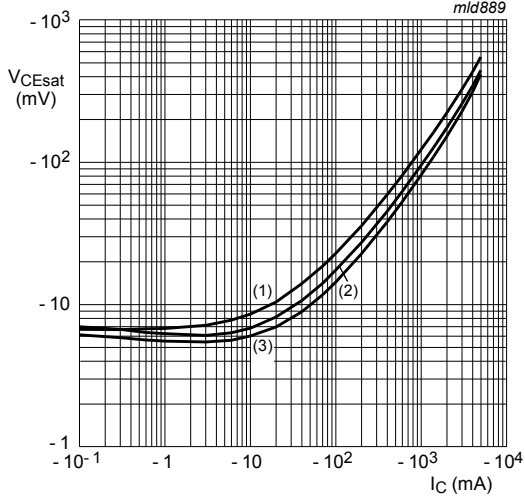
**Fig. 9. Base-emitter saturation voltage as a function of collector current; typical values**



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

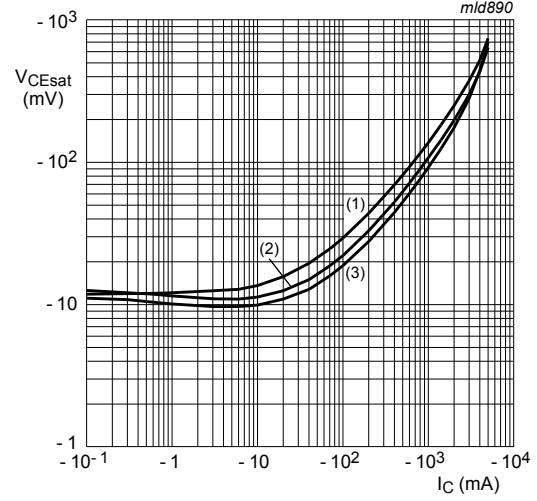
**Fig. 10. Base-emitter saturation voltage as a function of collector current; typical values**





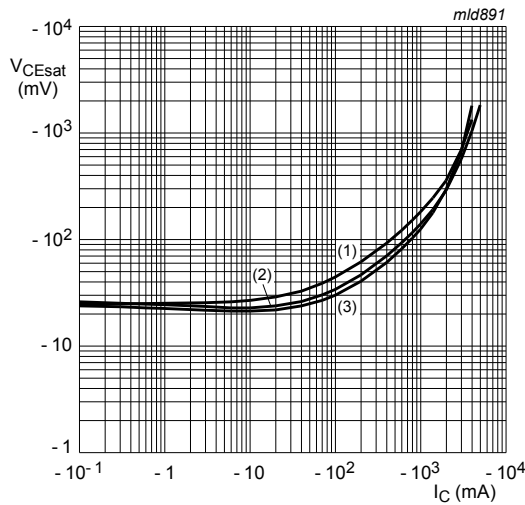
$I_C/I_B = 10$   
 (1)  $T_{amb} = 150\text{ °C}$   
 (2)  $T_{amb} = 25\text{ °C}$   
 (3)  $T_{amb} = -55\text{ °C}$

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



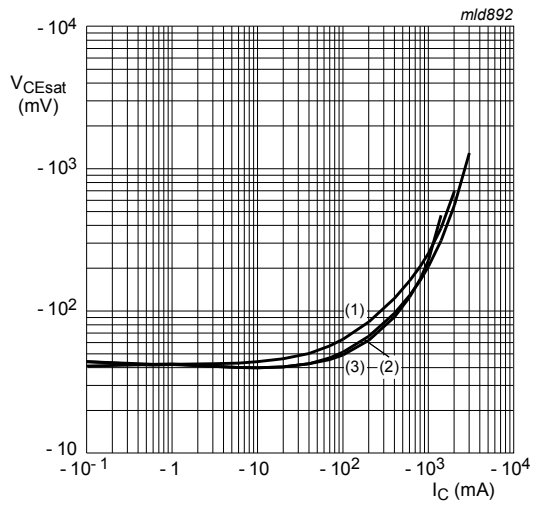
$I_C/I_B = 20$   
 (1)  $T_{amb} = 150\text{ °C}$   
 (2)  $T_{amb} = 25\text{ °C}$   
 (3)  $T_{amb} = -55\text{ °C}$

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



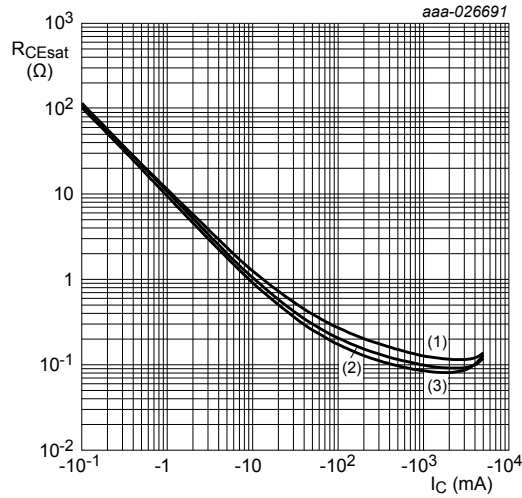
$I_C/I_B = 50$   
 (1)  $T_{amb} = 150\text{ °C}$   
 (2)  $T_{amb} = 25\text{ °C}$   
 (3)  $T_{amb} = -55\text{ °C}$

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

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

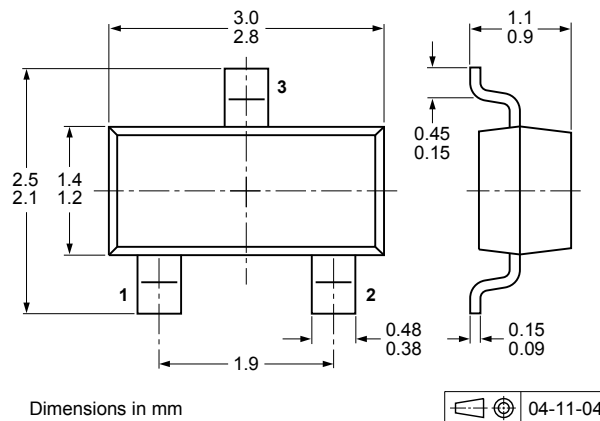


Fig. 16. Package outline TO-236AB (SOT23)

### 13. Soldering

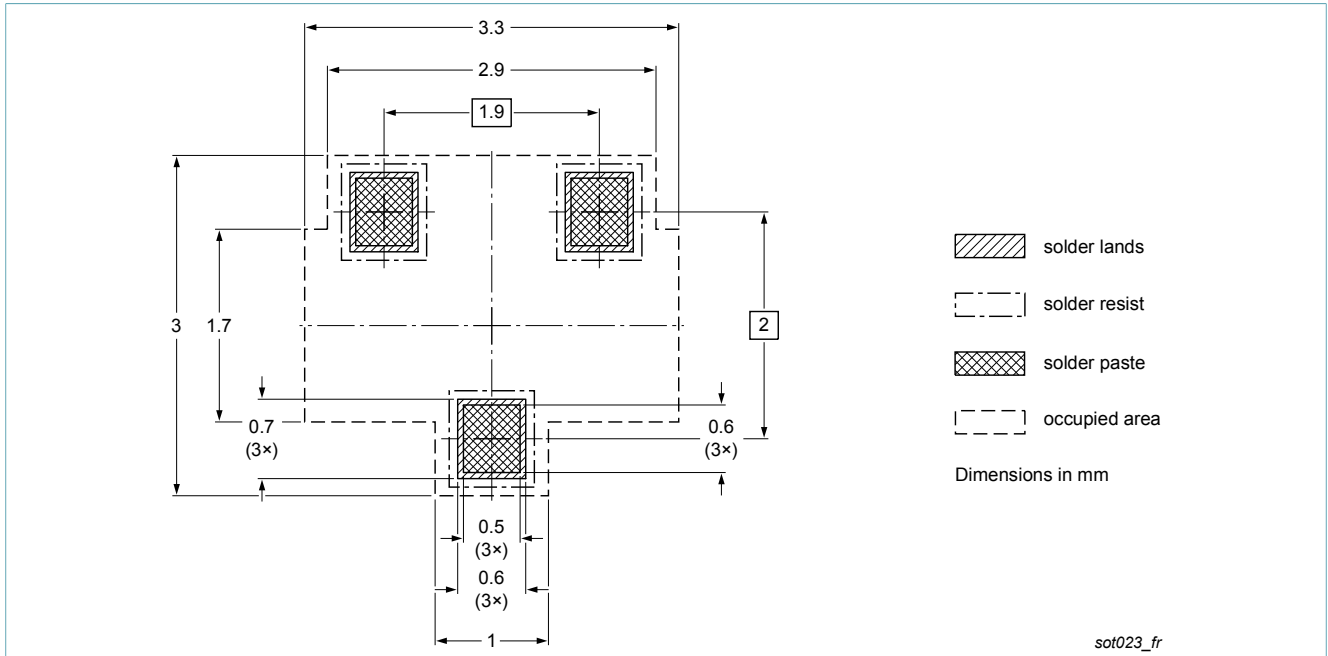


Fig. 17. Reflow soldering footprint for TO-236AB (SOT23)

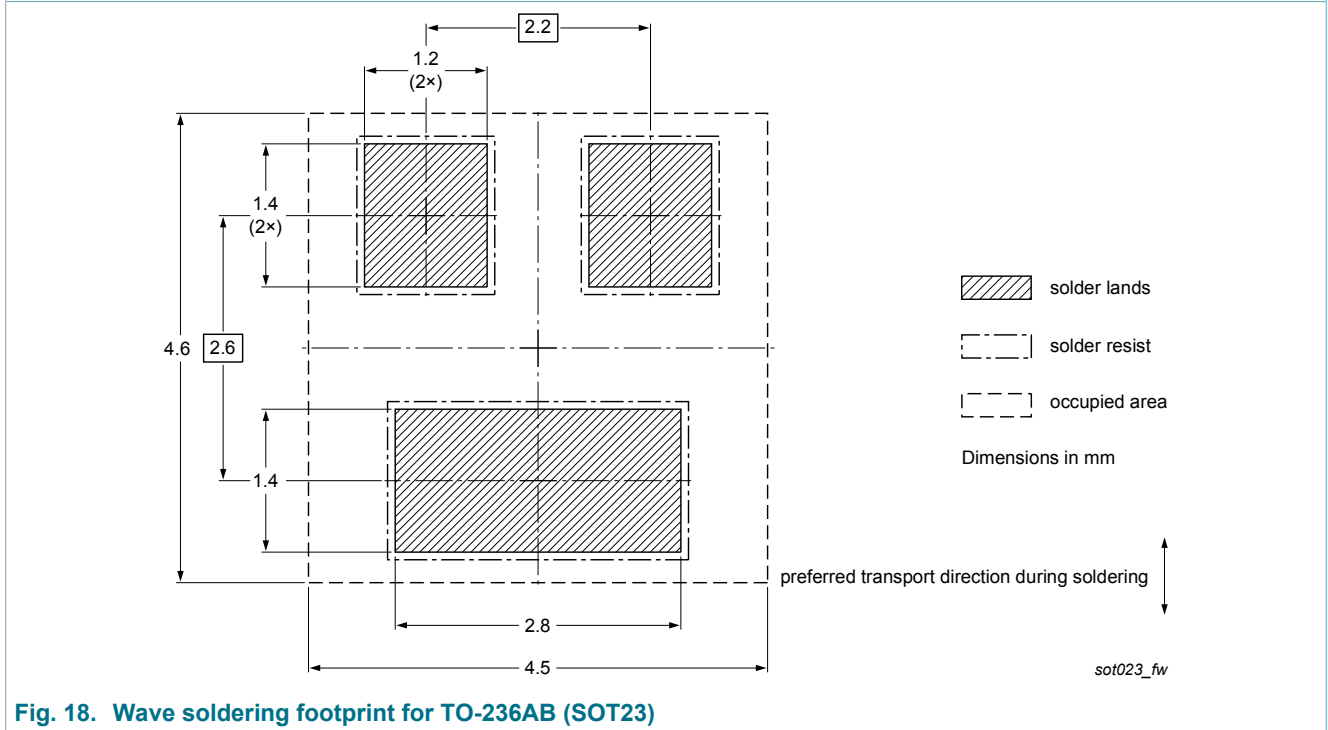


Fig. 18. Wave soldering footprint for TO-236AB (SOT23)

## 14. Revision history

Table 8. Revision history

Data sheet ID	Release date	Data sheet status	Change notice	Supersedes
PBSS5250TH v.2	20170809	Product data sheet	-	PBSS5250TH v.1
Modifications:	<ul style="list-style-type: none"><li><math>R_{th(j-sp)}</math> maximum value revised to typical value</li></ul>			
PBSS5250TH v.1	20170421	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.
- [2] The term 'short data sheet' is explained in section "Definitions".
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Date of release: 9 August 2017

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