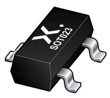

PBSS5350TH

50 V, 3 A PNP low VCEsat (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 genereation
- 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

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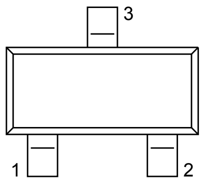
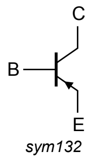
5. Pinning information

Table 2. Pinning information

Pin	Symbol	Description	Simplified outline	Graphic symbol
1	B	base	 TO-236AB (SOT23)	
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	$T_{amb} \leq 25$ °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

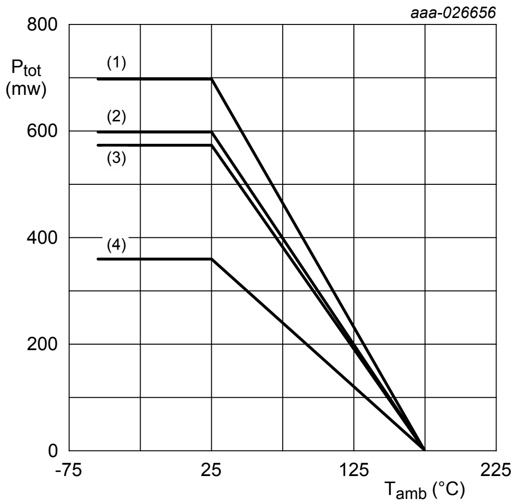
[1] Pulse conditions: pulse width $t_p \leq 100$ ms; duty cycle $\delta \leq 0.25$

[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.

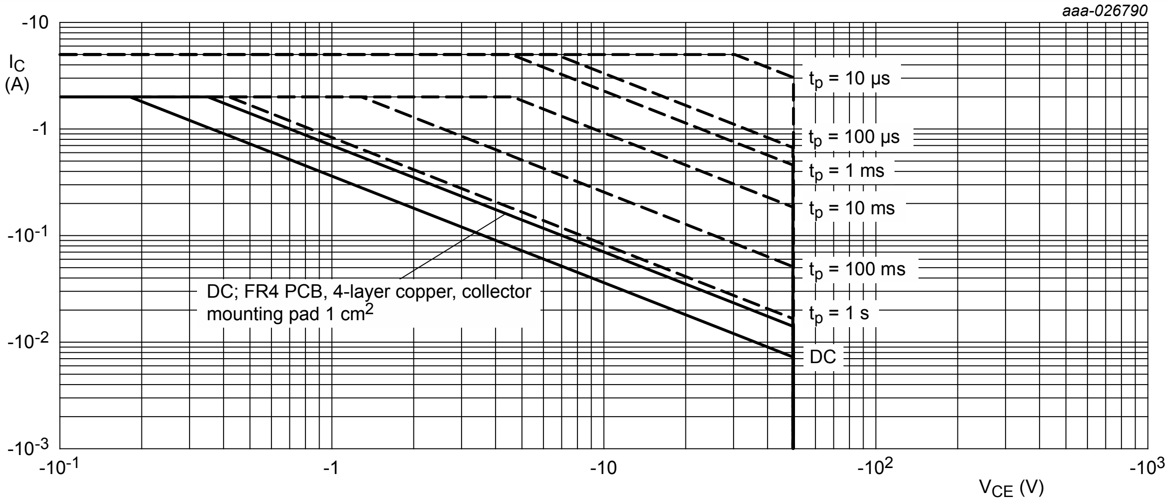
[4] Device mounted on an FR4 PCB, 4-layer copper, tin-plated and standard footprint.

[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



Unless otherwise specified: T_{amb} = 25 °C; single pulse;
FR4 PCB, single-sided copper, standard footprint

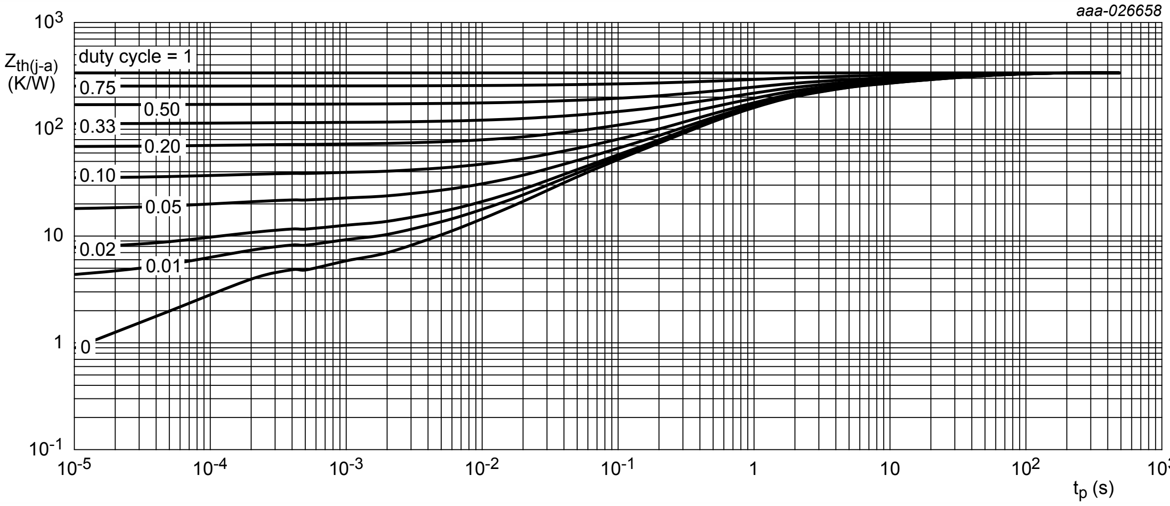
Fig. 2. Safe operating area; junction to ambient; continuous and peak drain currents as a function of collector-emitter voltage

9. Thermal characteristics

Table 6. Thermal characteristics

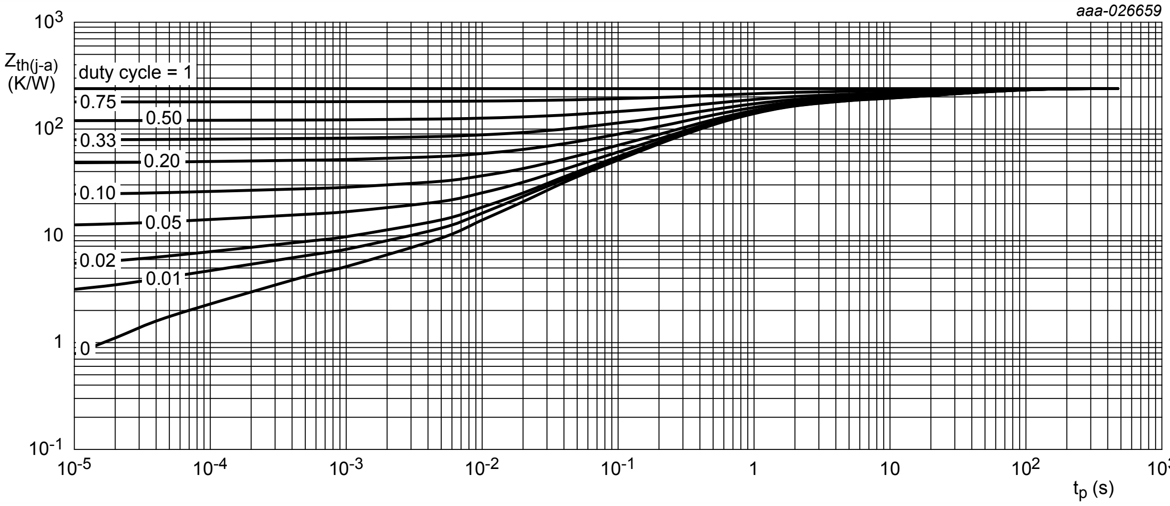
Symbol	Parameter	Conditions		Min	Typ	Max	Unit
$R_{th(j-a)}$	thermal resistance from junction to ambient	in free air	[1]	-	-	417	K/W
			[2]	-	-	261	K/W
			[3]	-	-	250	K/W
			[4]	-	-	215	K/W
			[1] [5]	-	-	104	K/W
$R_{th(j-sp)}$	thermal resistance from junction to solder point			-	75	-	K/W

[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 cm^2.
[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^2.
[5] Operated under pulse conditions: pulse width t_p ≤ 100 ms; duty cycle δ ≤ 0.25



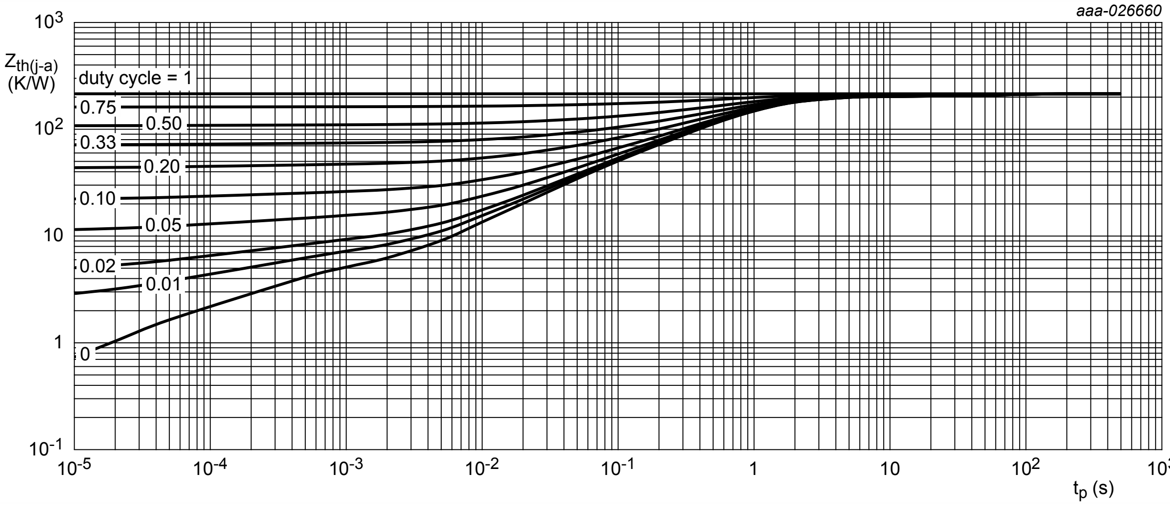
FR4 PCB, single sided copper, standard footprint

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



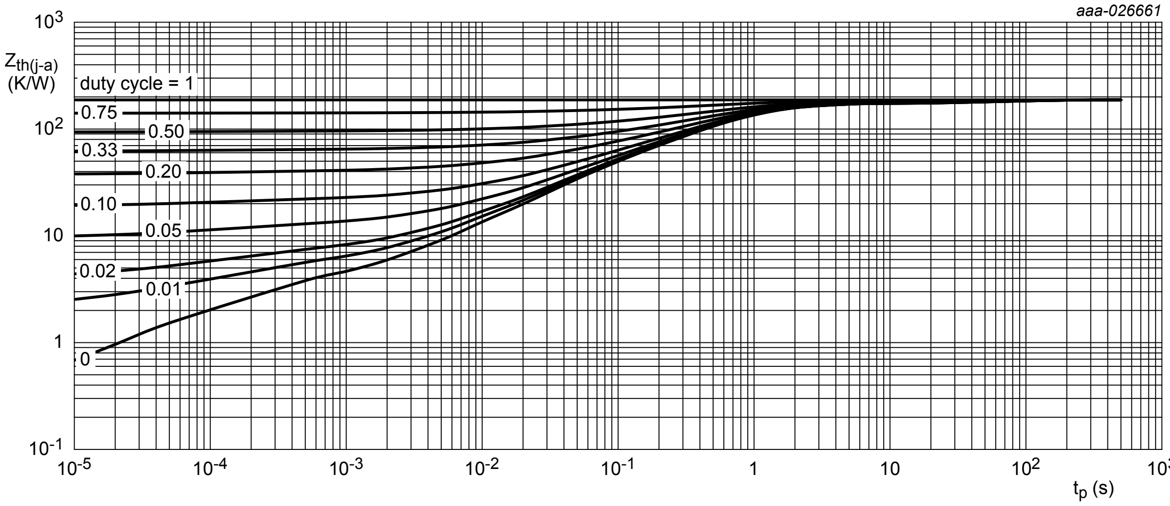
FR4 PCB, single sided copper, mounting pad for drain 1 cm^2

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^2

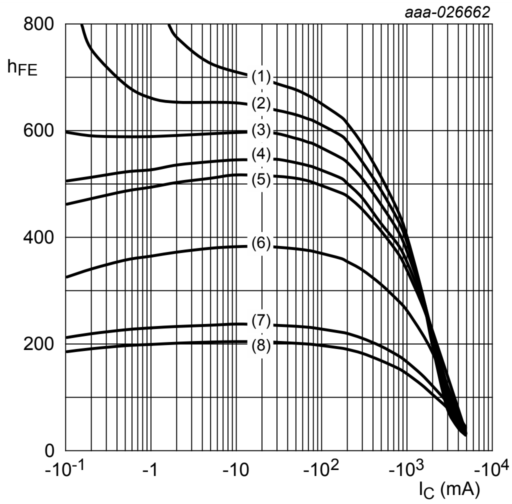
Fig. 6. Transient thermal impedance from junction to ambient as a function of pulse duration; typical values

10. Characteristics

Table 7. Characteristics

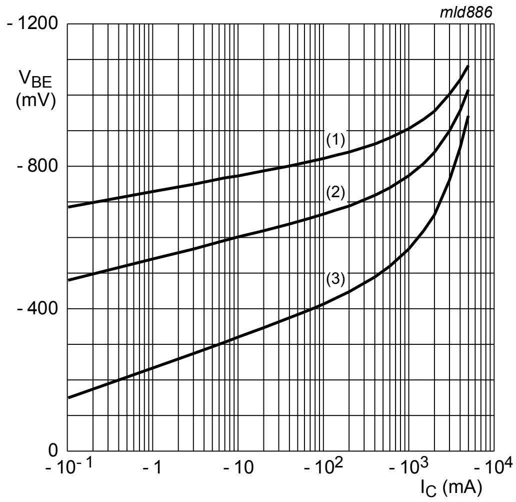
Symbol	Parameter	Conditions		Min	Typ	Max	Unit
$V_{(BR)CBO}$	collector-base breakdown voltage	I_C = -100 μA; I_E = 0 A; T_{amb} = 25 °C		-50	-	-	V
$V_{(BR)CEO}$	collector-emitter breakdown voltage	I_C = -10 mA; I_B = 0 A; T_{amb} = 25 °C		-50	-	-	V
$V_{(BR)EBO}$	emitter-base breakdown voltage (collector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

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



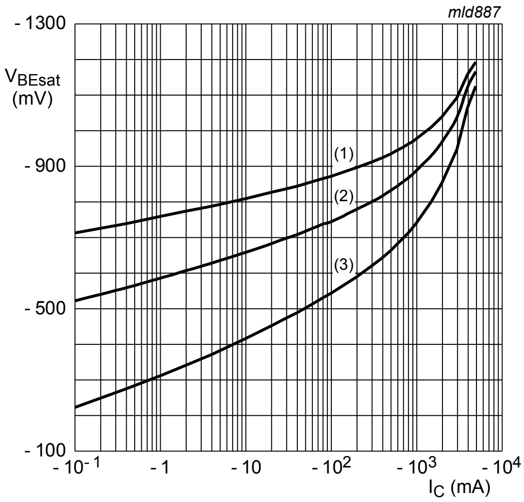
V_{CE} = - 2 V
(1) T_{amb} = 175 °C
(2) T_{amb} = 150 °C
(3) T_{amb} = 125 °C
(4) T_{amb} = 100 °C
(5) T_{amb} = 85 °C
(6) T_{amb} = 25 °C
(7) T_{amb} = -40 °C
(8) T_{amb} = -55 °C

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



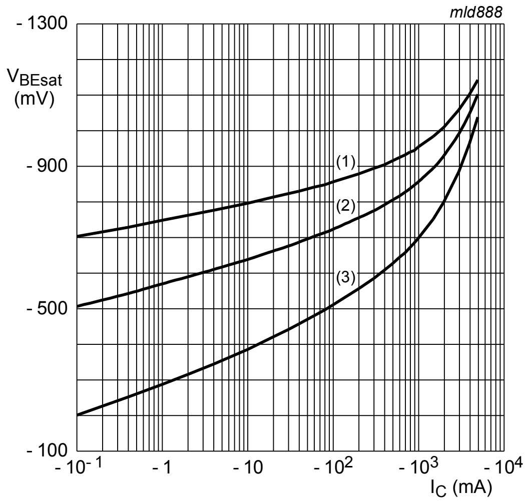
V_{CE} = −2 V
(1) T_{amb} = −55 °C
(2) T_{amb} = 25 °C
(3) T_{amb} = 150 °C

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



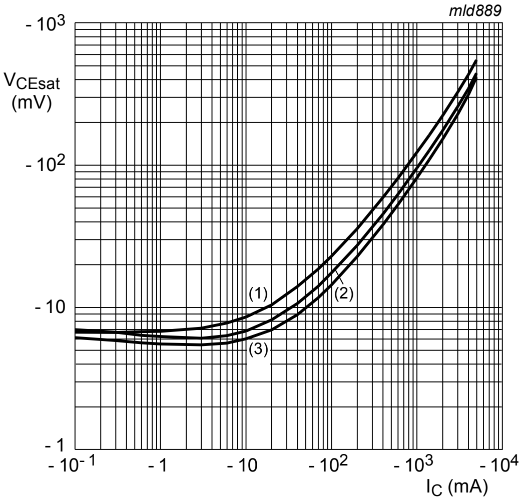
I_C/I_B = 10
(1) T_{amb} = −55 °C
(2) T_{amb} = 25 °C
(3) T_{amb} = 150 °C

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



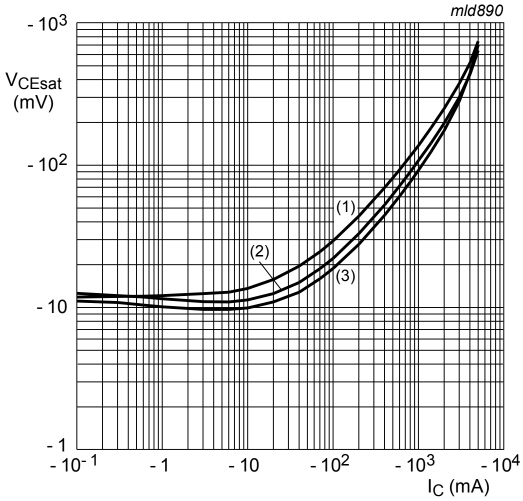
I_C/I_B = 20
(1) T_{amb} = −55 °C
(2) T_{amb} = 25 °C
(3) T_{amb} = 150 °C

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



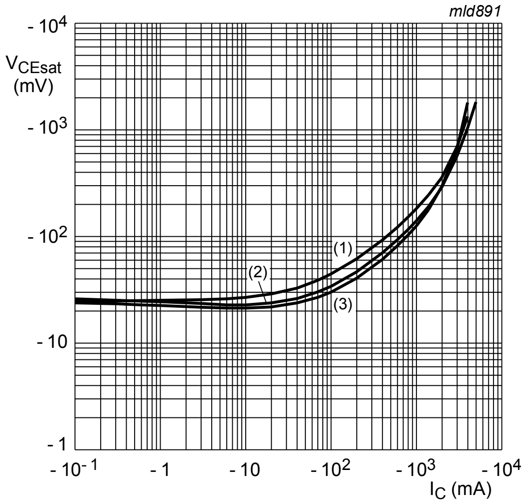
$I_C/I_B = 10$
(1) T_{amb} = 150 °C
(2) T_{amb} = 25 °C
(3) T_{amb} = −55 °C

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



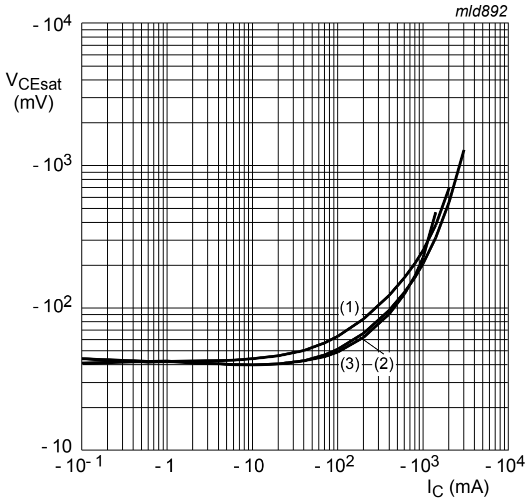
$I_C/I_B = 20$
(1) T_{amb} = 150 °C
(2) T_{amb} = 25 °C
(3) T_{amb} = −55 °C

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



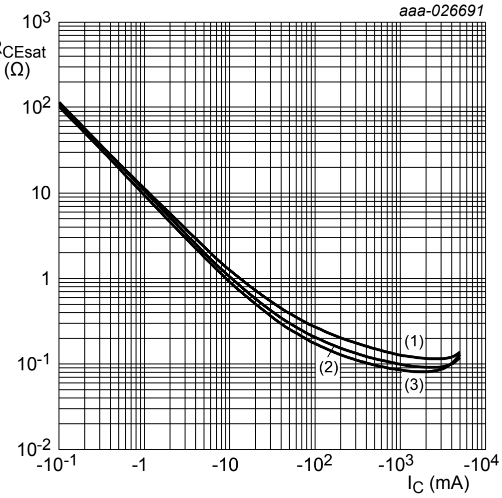
$I_C/I_B = 50$
(1) T_{amb} = 150 °C
(2) T_{amb} = 25 °C
(3) T_{amb} = −55 °C

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



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

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



$I_C/I_B = 20$

(1) T_{amb} = 150 °C

(2) T_{amb} = 25 °C

(3) T_{amb} = −55 °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

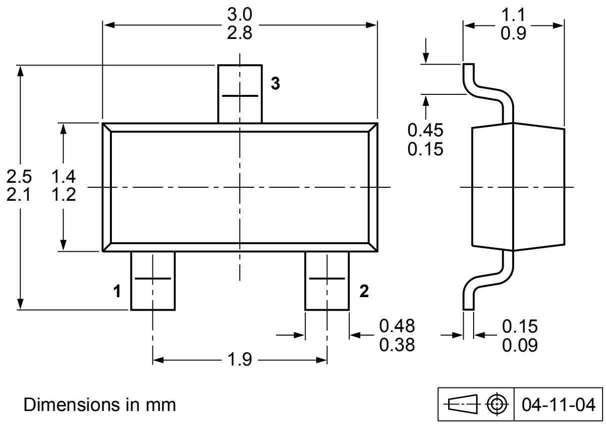


Fig. 16. Package outline TO-236AB (SOT23)

13. Soldering

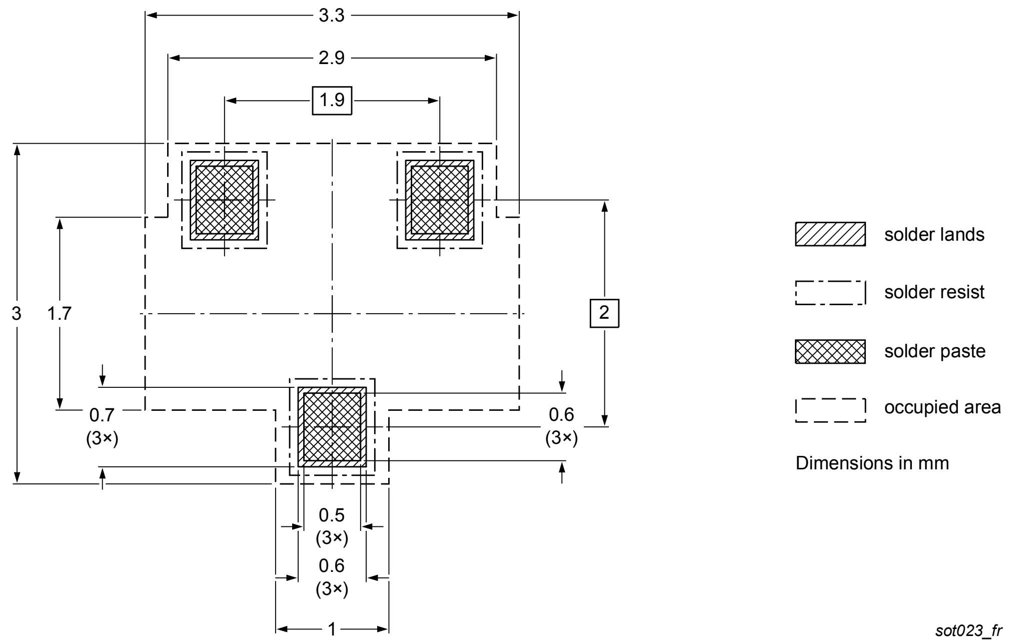


Fig. 17. Reflow soldering footprint for TO-236AB (SOT23)

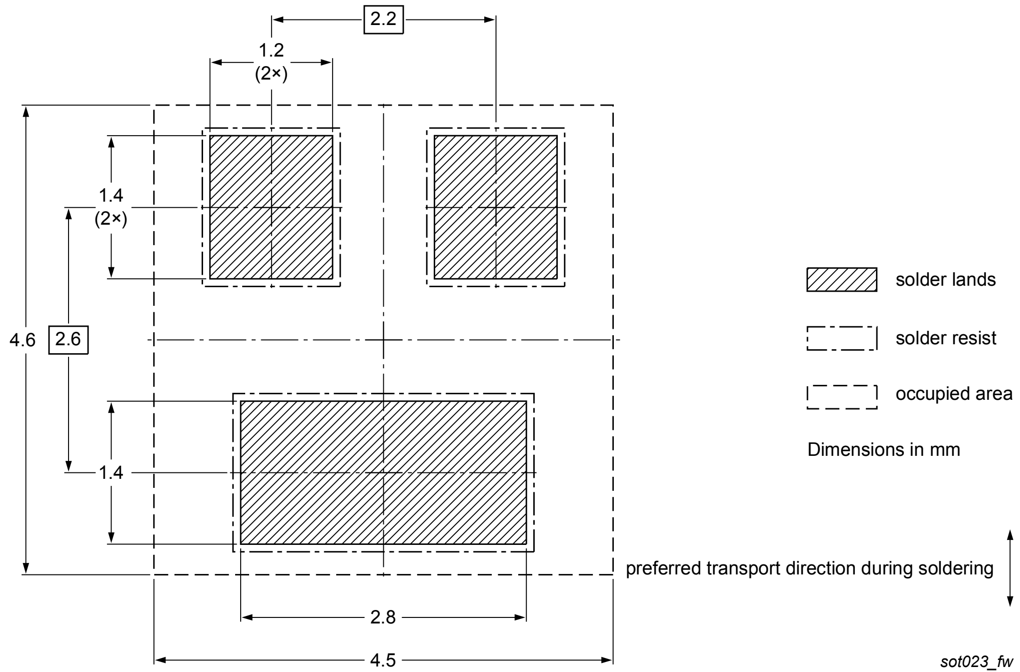


Fig. 18. Wave soldering footprint for TO-236AB (SOT23)

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.
[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 URL http://www.nexperia.com.

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16. Contents

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Date of release: 21 June 2017