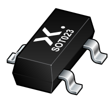

PBSS5350TH

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 ≤ 100 ms; duty cycle δ ≤ 0.25
[2] Pulse test: t_p ≤ 300 µs; δ ≤ 0.02

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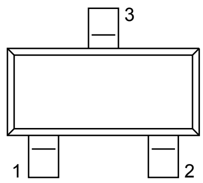
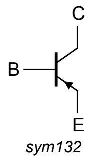
5. Pinning information

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

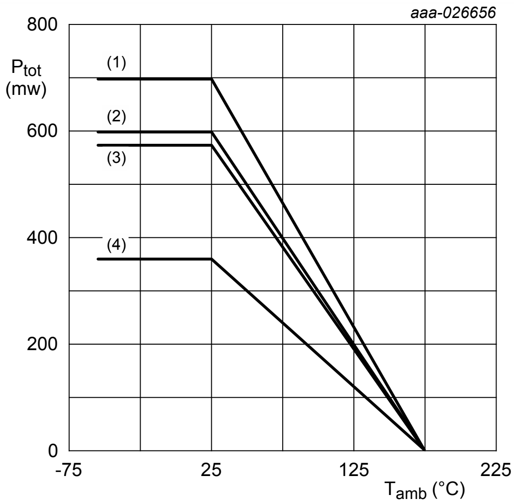
8. Limiting values

Table 5. Limiting values

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

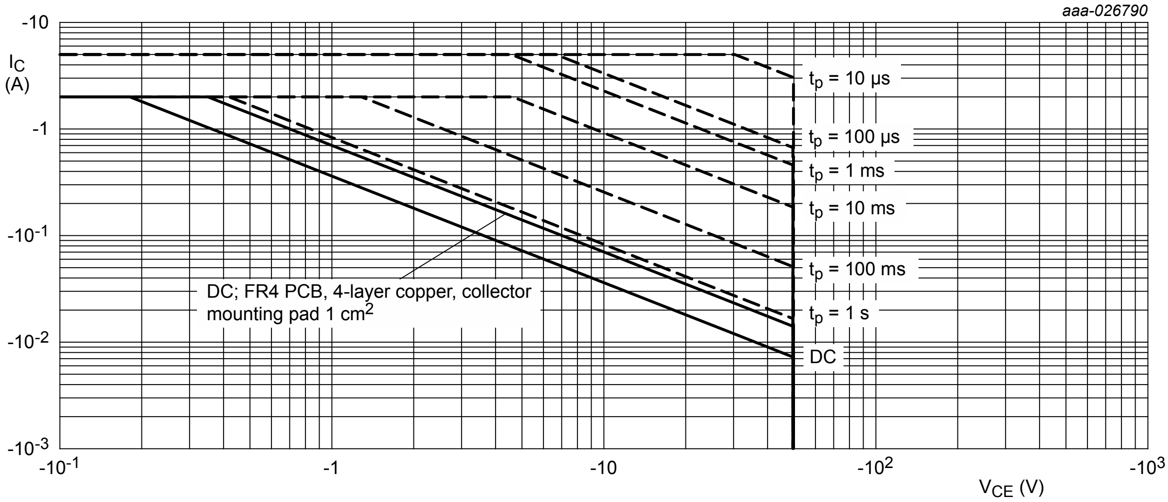
Symbol	Parameter	Conditions		Min	Max	Unit
V_{CBO}	collector-base voltage	open emitter		-	-50	V
V_{CEO}	collector-emitter voltage	open base		-	-50	V
V_{EBO}	emitter-base voltage	open collector		-	-7	V
I_C	collector current			-	-2	A
I_{CM}	peak collector current	pulsed	[1]	-	-3	A
		single pulse; t_p < 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

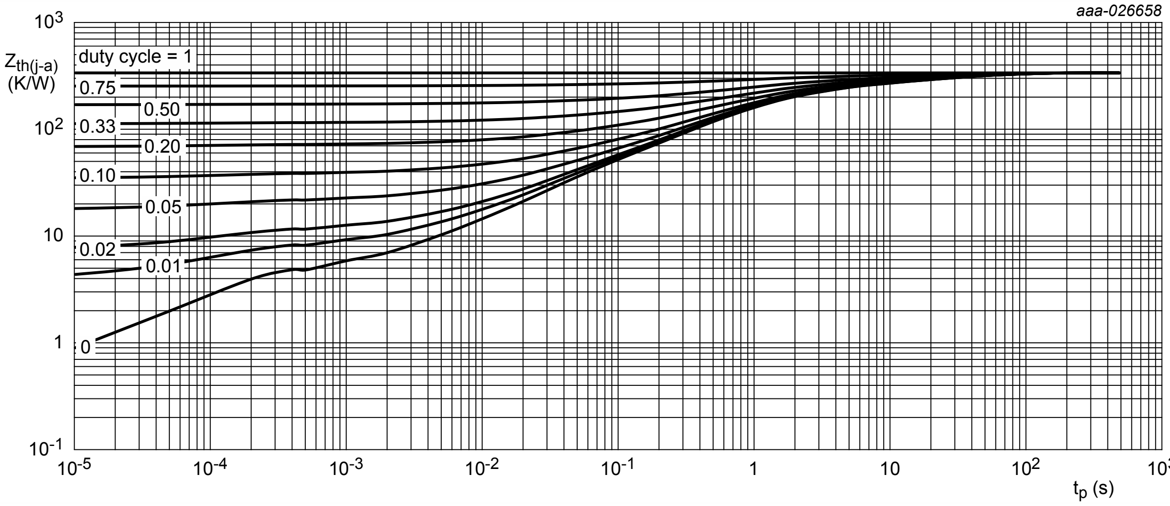
Fig. 2. Safe operating area; junction to ambient; continuous and peak drain currents as a function of collector-emitter voltage

9. Thermal characteristics

Table 6. Thermal characteristics

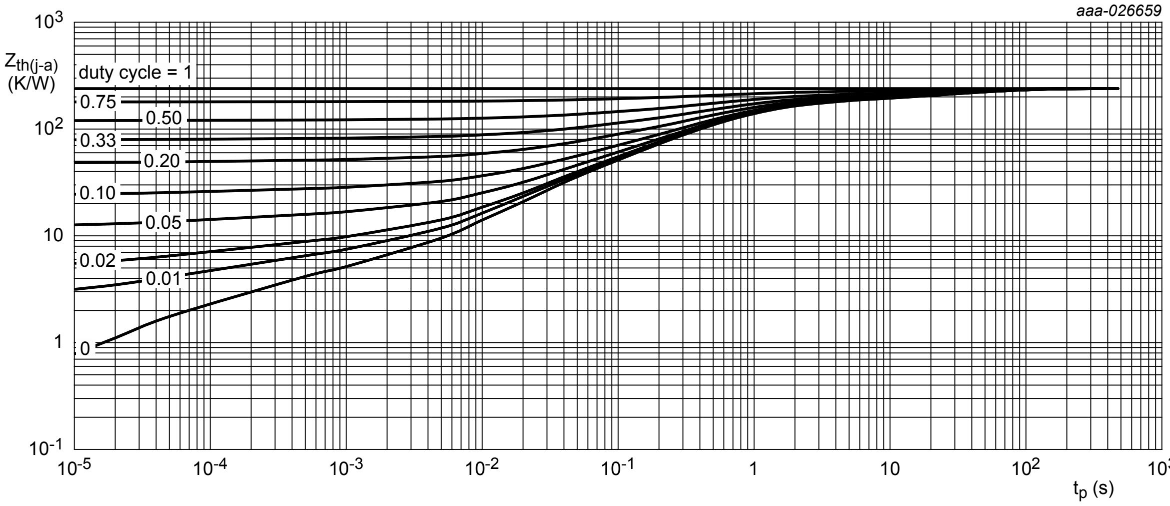
Symbol	Parameter	Conditions		Min	Typ	Max	Unit
$R_{th(j-a)}$	thermal resistance from junction to ambient	in free air	[1]	-	-	417	K/W
			[2]	-	-	261	K/W
			[3]	-	-	250	K/W
			[4]	-	-	215	K/W
			[1] [5]	-	-	104	K/W
$R_{th(j-sp)}$	thermal resistance from junction to solder point			-	75	-	K/W

[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



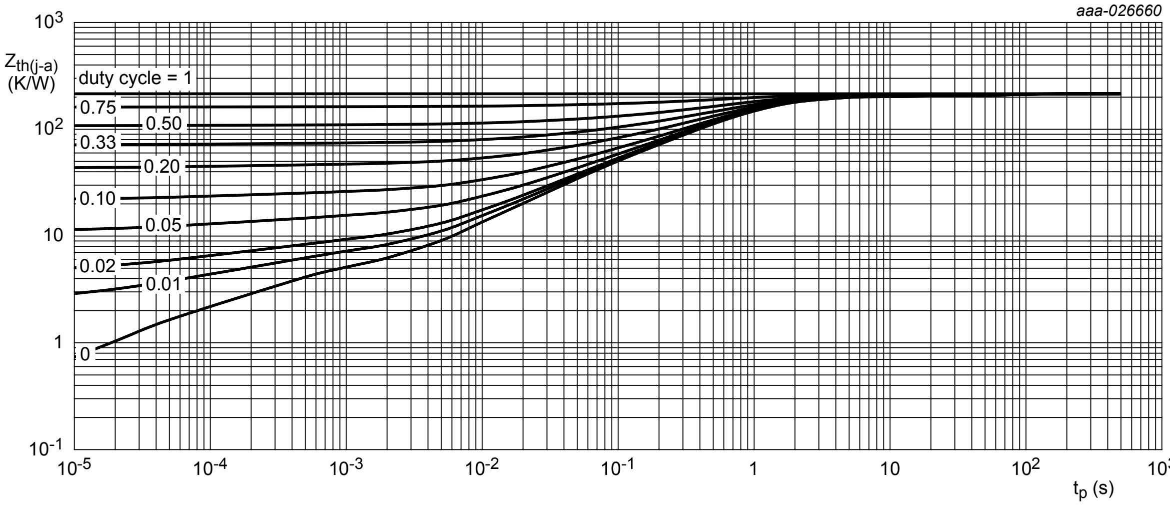
FR4 PCB, single sided copper, standard footprint

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



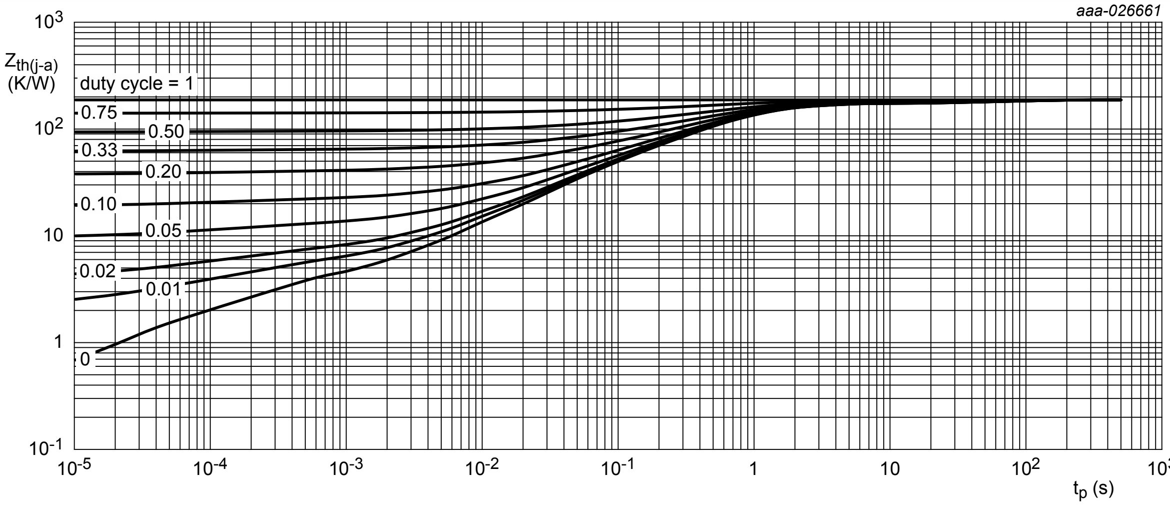
FR4 PCB, single sided copper, mounting pad for drain 1 cm^2

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

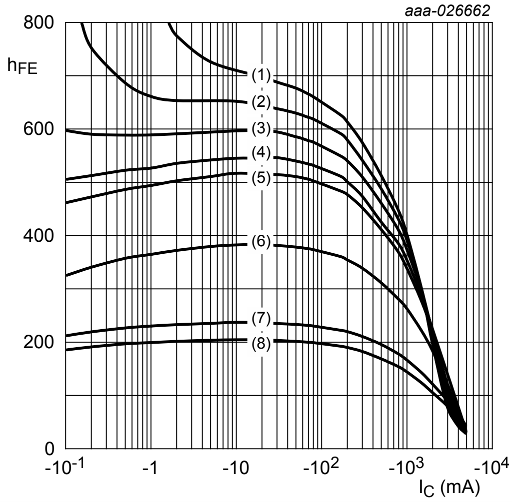
Fig. 6. Transient thermal impedance from junction to ambient as a function of pulse duration; typical values

10. Characteristics

Table 7. Characteristics

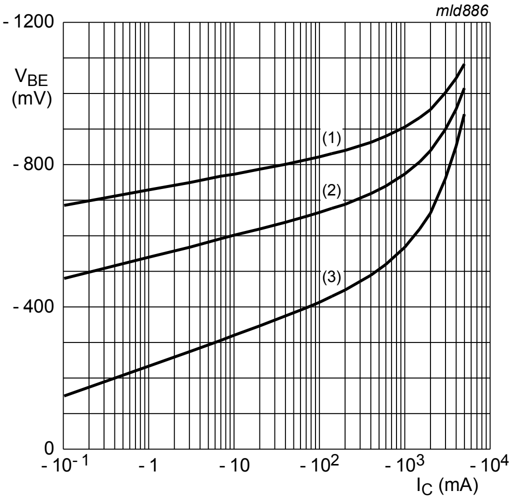
Symbol	Parameter	Conditions		Min	Typ	Max	Unit
$V_{(BR)CBO}$	collector-base breakdown voltage	I_C = -100 µA; I_E = 0 A; T_{amb} = 25 °C		-50	-	-	V
$V_{(BR)CEO}$	collector-emitter breakdown voltage	I_C = -10 mA; I_B = 0 A; T_{amb} = 25 °C		-50	-	-	V
$V_{(BR)EBO}$	emitter-base breakdown voltage (collector 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; $\delta \leq 0.02$



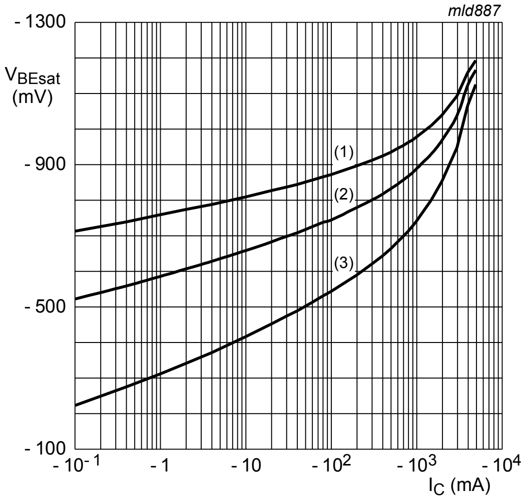
V_{CE} = - 2 V
(1) T_{amb} = 175 °C
(2) T_{amb} = 150 °C
(3) T_{amb} = 125 °C
(4) T_{amb} = 100 °C
(5) T_{amb} = 85 °C
(6) T_{amb} = 25 °C
(7) T_{amb} = -40 °C
(8) T_{amb} = -55 °C

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



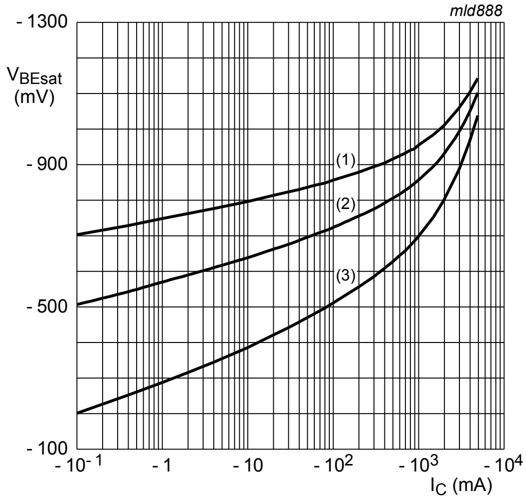
V_{CE} = −2 V
(1) T_{amb} = −55 °C
(2) T_{amb} = 25 °C
(3) T_{amb} = 150 °C

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



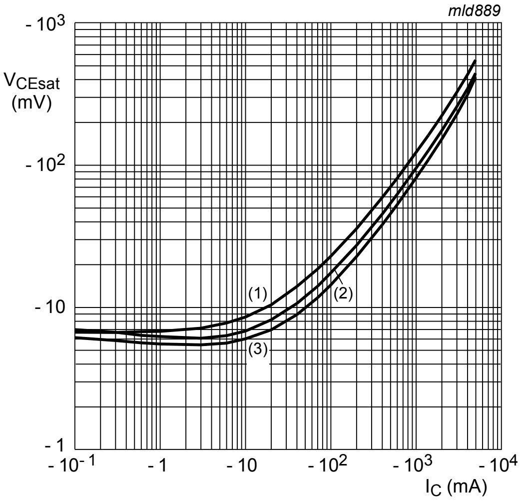
I_C/I_B = 10
(1) T_{amb} = −55 °C
(2) T_{amb} = 25 °C
(3) T_{amb} = 150 °C

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



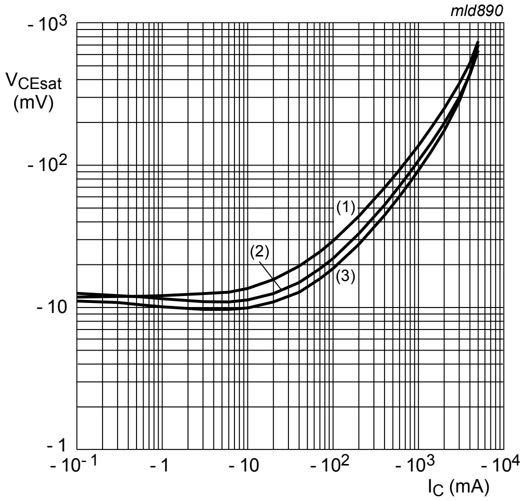
I_C/I_B = 20
(1) T_{amb} = −55 °C
(2) T_{amb} = 25 °C
(3) T_{amb} = 150 °C

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



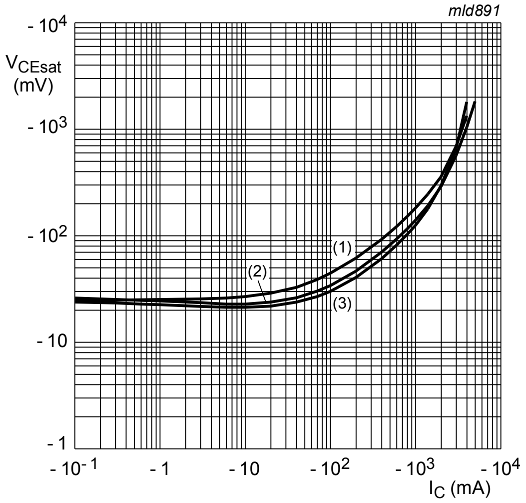
$I_C/I_B = 10$
(1) $T_{amb} = 150$ °C
(2) $T_{amb} = 25$ °C
(3) $T_{amb} = -55$ °C

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



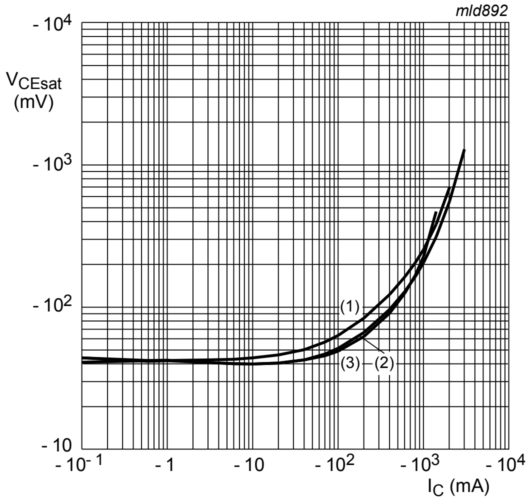
$I_C/I_B = 20$
(1) $T_{amb} = 150$ °C
(2) $T_{amb} = 25$ °C
(3) $T_{amb} = -55$ °C

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



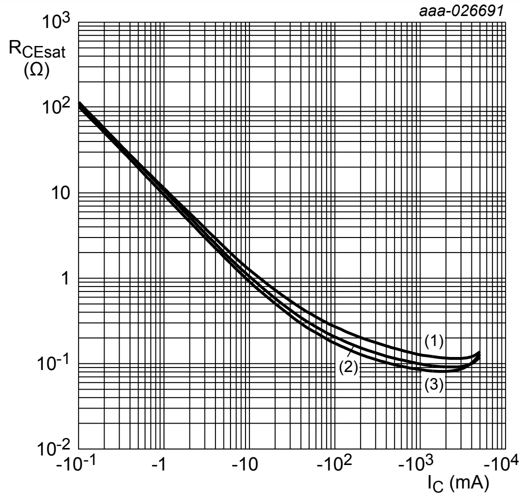
$I_C/I_B = 50$
(1) $T_{amb} = 150$ °C
(2) $T_{amb} = 25$ °C
(3) $T_{amb} = -55$ °C

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

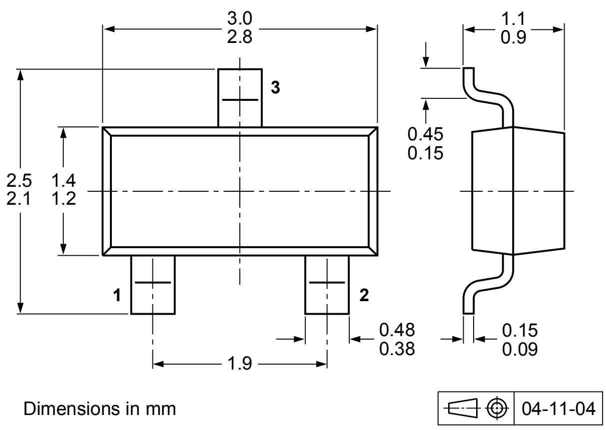


Fig. 16. Package outline TO-236AB (SOT23)

13. Soldering

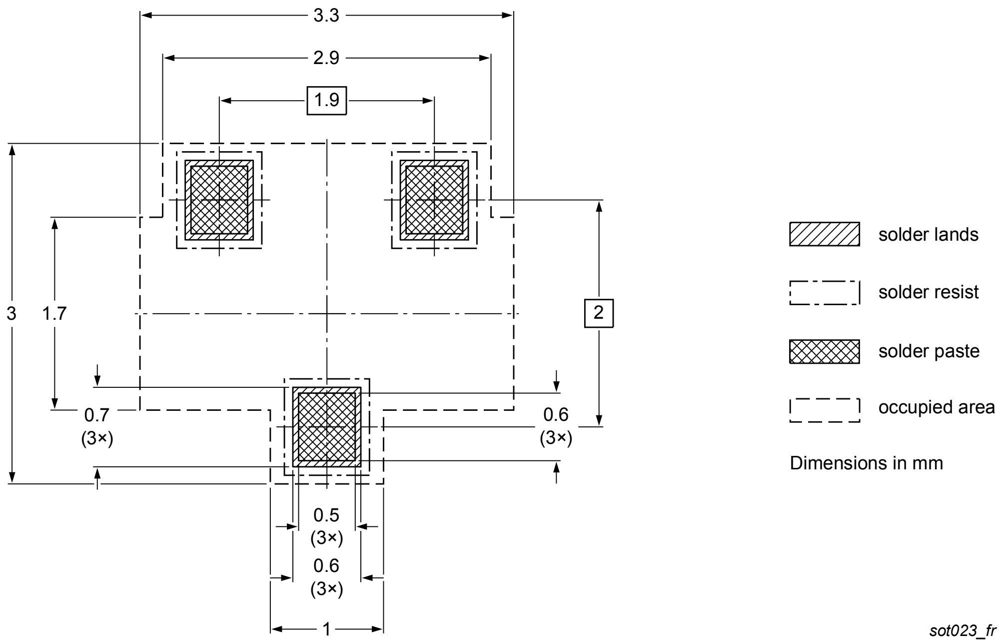


Fig. 17. Reflow soldering footprint for TO-236AB (SOT23)

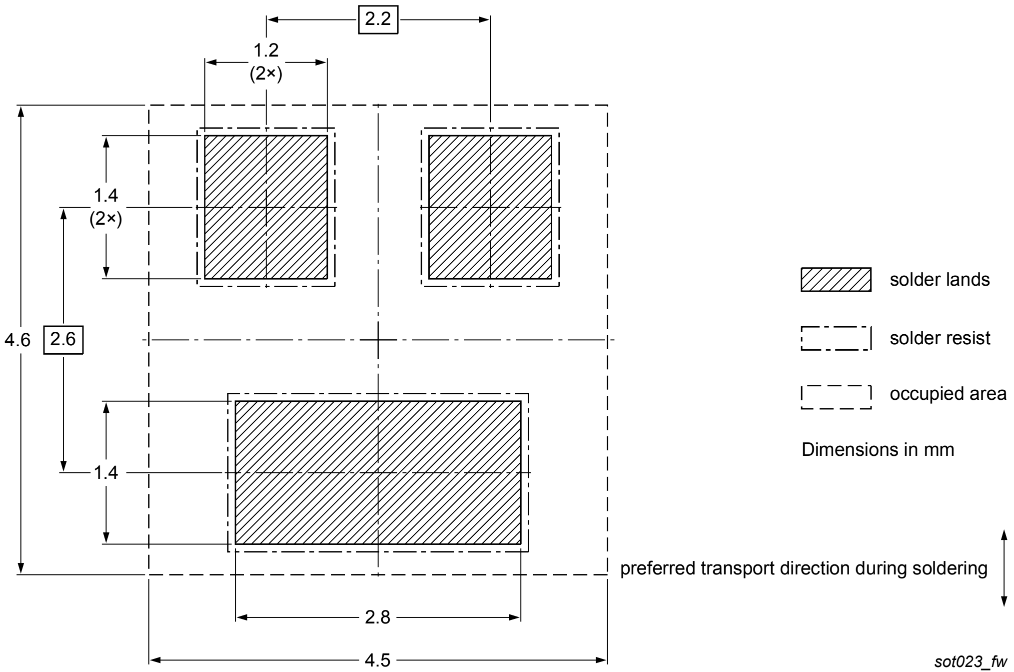


Fig. 18. Wave soldering footprint for TO-236AB (SOT23)

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".
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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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Date of release: 21 June 2017