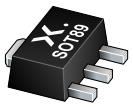

PBSS5540X

40 V, 5 A PNP low VCEsat (BISS) transistor

20 March 2018 Product data sheet

1. General description

PNP low V_{CEsat} transistor in a medium power SOT89 (SC-62) package.

NPN complement: PBSS4540X.

2. Features and benefits

- Low collector-emitter saturation voltage V_{CEsat}
- High collector current capability: I_C and I_{CM}
- High efficiency leading to less heat generation.
- AEC-Q101 qualified

3. Applications

- Supply line switching circuits
- Battery management applications
- DC/DC converter applications
- Strobe flash units
- Medium power driver (e.g. relays, buzzers and motors).

4. Quick reference data

Table 1. Quick reference data

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
V_{CEO}	collector-emitter voltage	open base		-	-	-40	V
I_C	collector current			-	-	-4	A
I_{CM}	peak collector current	single pulse; $t_p \leq$ 1 ms		-	-	-10	A
h_{FE}	DC current gain	V_{CE} = -2 V; I_C = -0.5 A; T_{amb} = 25 °C		250	-	-	
R_{CEsat}	collector-emitter saturation resistance	I_C = -5 A; I_B = -500 mA; $t_p \leq$ 300 µs; pulsed; $\delta \leq$ 0.02 ; T_{amb} = 25 °C		-	45	75	mΩ

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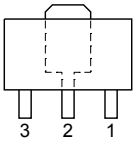
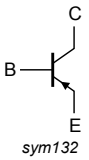
5. Pinning information

Table 2. Pinning information

Pin	Symbol	Description	Simplified outline	Graphic symbol
1	E	emitter	 SOT89	 sym132
2	C	collector		
3	B	base		

6. Ordering information

Table 3. Ordering information

Type number	Package		
	Name	Description	Version
PBSS5540X	SOT89	plastic surface-mounted package; die pad for good heat transfer; 3 leads	SOT89

7. Marking

Table 4. Marking codes

Type number	Marking code[1]
PBSS5540X	%1G

[1] % = placeholder for manufacturing site code

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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		-	-40	V
V_{CEO}	collector-emitter voltage	open base		-	-40	V
V_{EBO}	emitter-base voltage	open collector		-	-6	V
I_C	collector current			-	-4	A
I_{CRM}	repetitive peak collector current	$\delta \leq 0.2$; $t_p \leq 10$ ms		-	-5	A
I_{CM}	peak collector current	single pulse; $t_p \leq 1$ ms		-	-10	A
I_B	base current			-	-1	A
I_{BM}	peak base current	single pulse; $t_p \leq 1$ ms		-	-2	A
P_{tot}	total power dissipation		[1] [2]	-	2.5	W
		$T_{amb} \leq 25$ °C	[2]	-	0.55	W
			[3]	-	1	W
			[4]	-	1.4	W
			[5]	-	1.6	W
T_j	junction temperature			-	150	°C
T_{amb}	ambient temperature			-65	150	°C
T_{stg}	storage temperature			-65	150	°C

[1] Pulsed $t_p \leq 10$ ms; $\delta \leq 0.2$
[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, single-sided copper, tin-plated, mounting pad for collector 6 cm^2.
[5] Device mounted on a 7 cm^2 ceramic printed-circuit board, 1 cm^2 single-sided copper and tin-plated.

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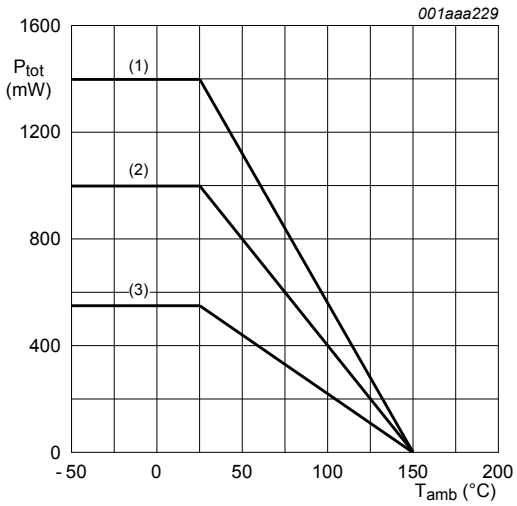

(1) FR4 PCB; 6 cm^2 mounting pad for collector
(2) FR4 PCB; 1 cm^2 mounting pad for collector
(3) FR4; standard footprint

Fig. 1. Power derating curves

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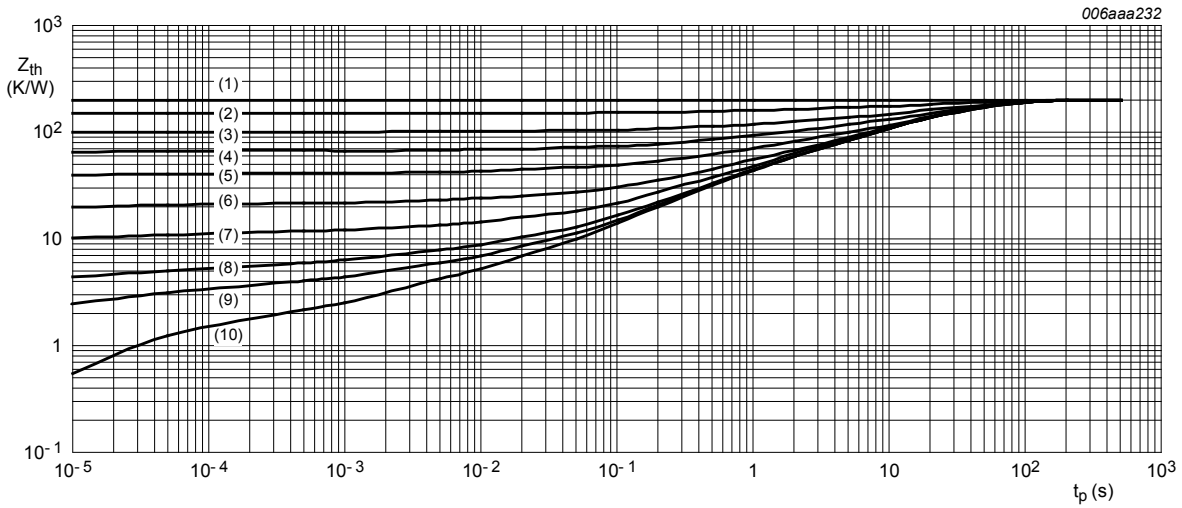
9. Thermal characteristics

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] [2]	-	-	50	K/W
			[1]	-	-	225	K/W
			[3]	-	-	125	K/W
			[4]	-	-	90	K/W
			[5]	-	-	80	K/W
$R_{th(j-sp)}$	thermal resistance from junction to solder point			-	-	16	K/W

[1] Device mounted on an FR4 PCB, single-sided copper, tin-plated and standard footprint.
[2] Pulse test: $t_p \leq 10$ ms; $\delta \leq 0.2$.
[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, single-sided copper, tin-plated, mounting pad for collector 6 cm^2.
[5] Device mounted on a 7 cm^2 ceramic printed-circuit board, 1 cm^2 single-sided copper and tin-plated.



Mounted on FR4 PCB; standard footprint
(1) δ = 1
(2) δ = 0.75
(3) δ = 0.5
(4) δ = 0.33
(5) δ = 0.2
(6) δ = 0.1
(7) δ = 0.05
(8) δ = 0.02
(9) δ = 0.01
(10) δ = 0

Fig. 2. Transient thermal impedance as a function of pulse duration; typical values

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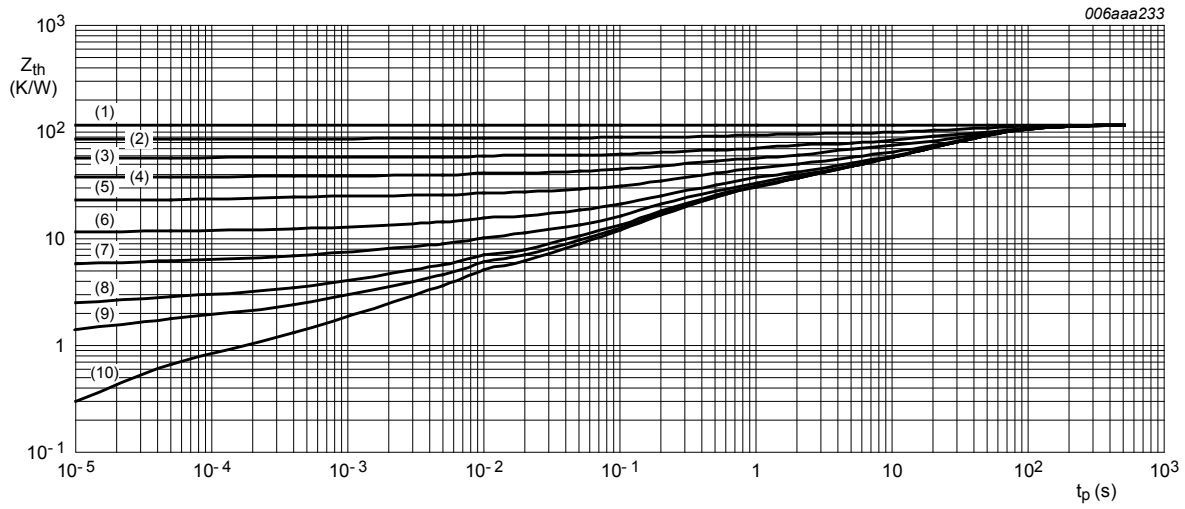

Mounted on FR4 PCB; mounting pad for collector 1 cm^2

(1) δ = 1
(2) δ = 0.75
(3) δ = 0.5
(4) δ = 0.33
(5) δ = 0.2
(6) δ = 0.1
(7) δ = 0.05
(8) δ = 0.02
(9) δ = 0.01
(10) δ = 0

Fig. 3. Transient thermal impedance as a function of pulse duration; typical values

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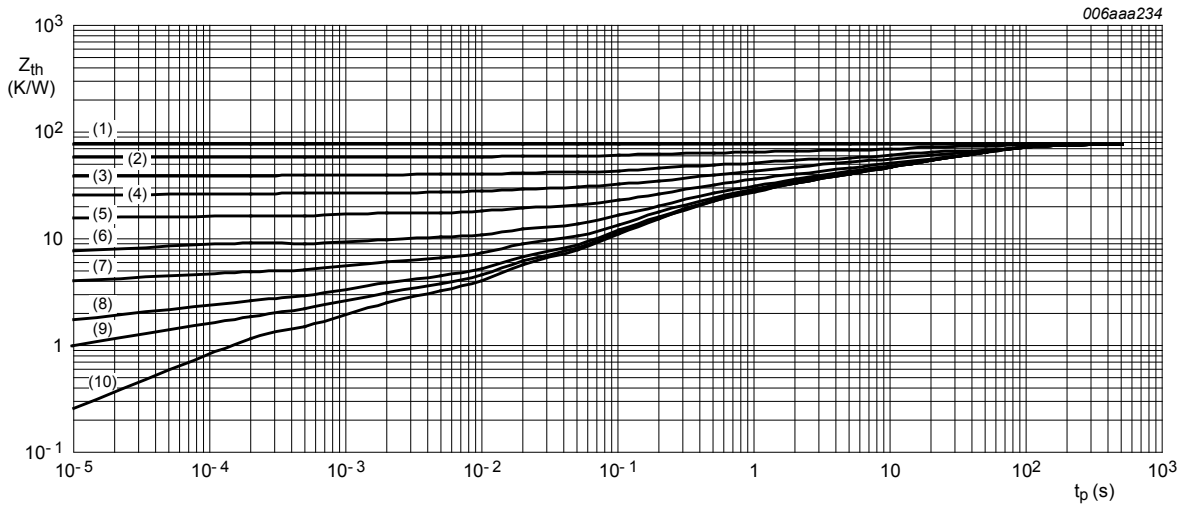

Mounted on FR4 printed-circuit board; mounting pad for collector 6 cm^2

(1) δ = 1
(2) δ = 0.75
(3) δ = 0.5
(4) δ = 0.33
(5) δ = 0.2
(6) δ = 0.1
(7) δ = 0.05
(8) δ = 0.02
(9) δ = 0.01
(10) δ = 0

Fig. 4. Transient thermal impedance as a function of pulse duration; typical values

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10. Characteristics

Table 7. Characteristics

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
I_{CBO}	collector-base cut-off current	V_{CB} = -30 V; I_E = 0 A; T_{amb} = 25 °C		-	-	-100	nA
		V_{CB} = -30 V; I_E = 0 A; T_j = 150 °C		-	-	-50	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 = -0.5 A; T_{amb} = 25 °C		250	-	-	
		V_{CE} = -2 V; I_C = -1 A; $t_p \leq$ 300 µs; pulsed; $\delta \leq$ 0.02 ; T_{amb} = 25 °C		200	-	-	
		V_{CE} = -2 V; I_C = -2 A; $t_p \leq$ 300 µs; pulsed; $\delta \leq$ 0.02 ; T_{amb} = 25 °C		150	-	-	
		V_{CE} = -2 V; I_C = -5 A; $t_p \leq$ 300 µs; pulsed; $\delta \leq$ 0.02 ; T_{amb} = 25 °C		50	-	-	
V_{CEsat}	collector-emitter saturation voltage	I_C = -0.5 A; I_B = -5 mA; T_{amb} = 25 °C		-	-	-120	mV
		I_C = -1 A; I_B = -10 mA; T_{amb} = 25 °C		-	-	-170	mV
		I_C = -2 A; I_B = -200 mA; T_{amb} = 25 °C		-	-	-160	mV
		I_C = -4 A; I_B = -200 mA; $t_p \leq$ 300 µs; pulsed; $\delta \leq$ 0.02 ; T_{amb} = 25 °C		-	-	-340	mV
		I_C = -5 A; I_B = -500 mA; $t_p \leq$ 300 µs; pulsed; $\delta \leq$ 0.02 ; T_{amb} = 25 °C		-	-	-375	mV
R_{CEsat}	collector-emitter saturation resistance			-	45	75	mΩ
V_{BEsat}	base-emitter saturation voltage	I_C = -4 A; I_B = -200 mA; $t_p \leq$ 300 µs; pulsed; $\delta \leq$ 0.02 ; T_{amb} = 25 °C		-	-	-1.1	V
		I_C = -5 A; I_B = -500 mA; $t_p \leq$ 300 µs; pulsed; $\delta \leq$ 0.02 ; T_{amb} = 25 °C		-	-	-1.2	V
V_{BEon}	base-emitter turn-on voltage	V_{CE} = -2 V; I_C = -2 A; T_{amb} = 25 °C		-	-	-1	V
f_T	transition frequency	V_{CE} = -10 V; I_C = -0.1 A; f = 100 MHz; T_{amb} = 25 °C		60	-	-	MHz
C_c	collector capacitance	V_{CB} = -10 V; I_E = 0 A; i_e = 0 A; f = 1 MHz; T_{amb} = 25 °C		-	-	105	pF

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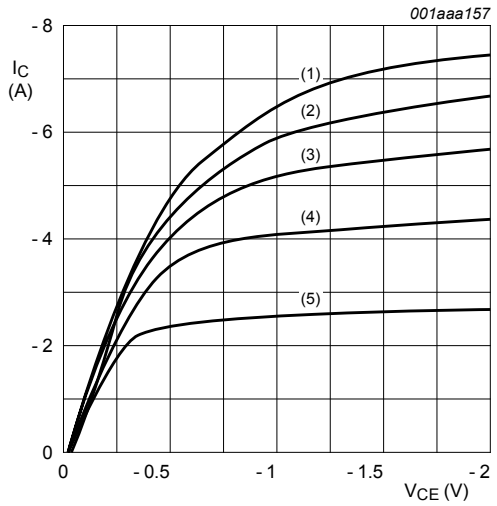
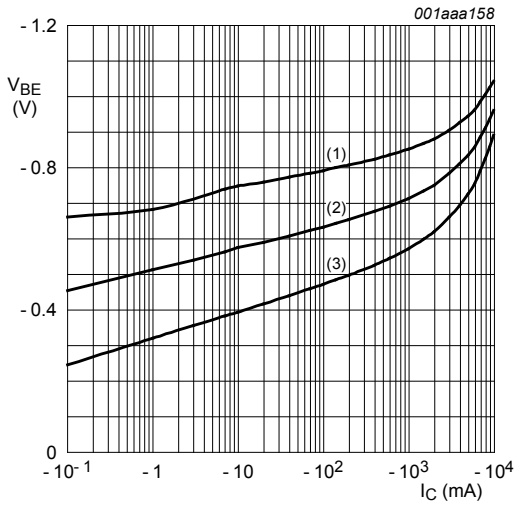


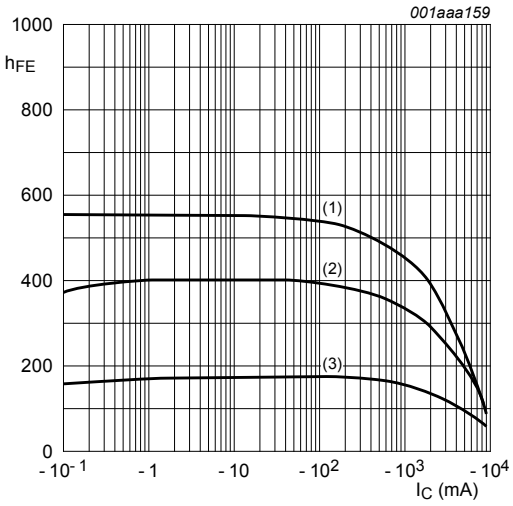
(1) I_B = −55 mA
(2) I_B = −44 mA
(3) I_B = −33 mA
(4) I_B = −22 mA
(5) I_B = −11 mA

Fig. 5. Collector current as a function of collector-emitter voltage; typical values



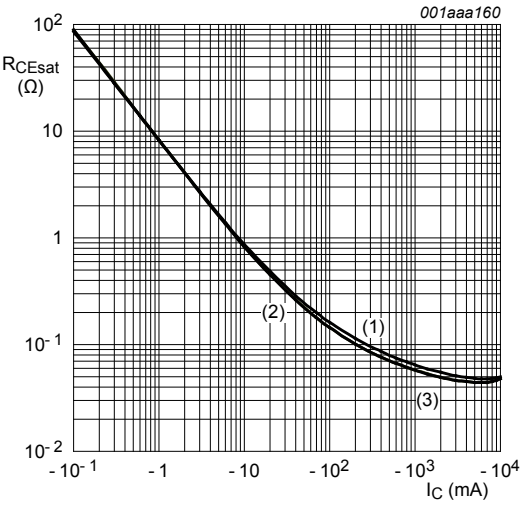
V_{CE} = −2 V
(1) T_{amb} = −55 °C
(2) T_{amb} = 25 °C
(3) T_{amb} = 100 °C

Fig. 6. Base-emitter voltage as a function of collector current; typical values



V_{CE} = −2 V
(1) T_{amb} = 100 °C
(2) T_{amb} = 25 °C
(3) T_{amb} = −55 °C

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



I_C/I_B = 20
(1) T_{amb} = 100 °C
(2) T_{amb} = 25 °C
(3) T_{amb} = −55 °C

Fig. 8. Equivalent on-resistance as a function of collector current; typical values

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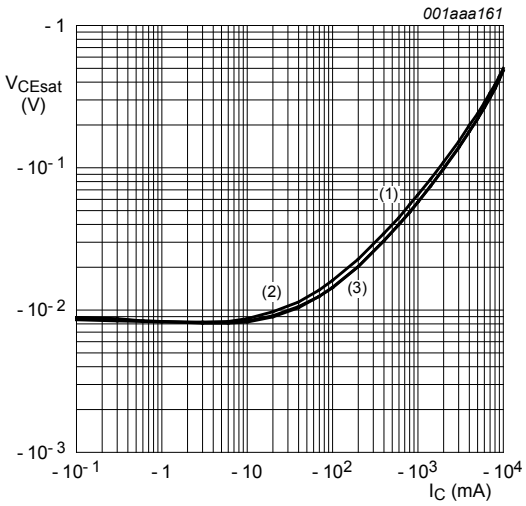
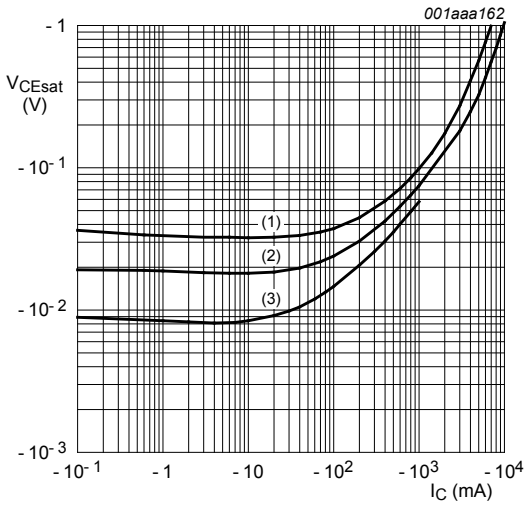


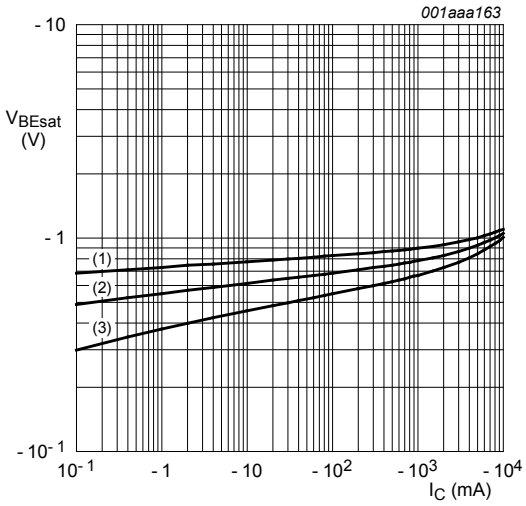
I_C/I_B = 20
(1) T_{amb} = 100 °C
(2) T_{amb} = 25 °C
(3) T_{amb} = −55 °C

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



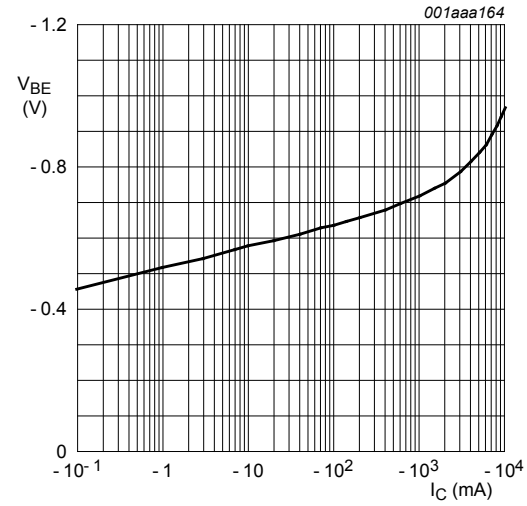
T_{amb} = 25 °C
(1) I_C/I_B = 100
(2) I_C/I_B = 50
(3) I_C/I_B = 10

Fig. 10. Collector-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} = 100 °C

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



T_{amb} = 25 °C

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

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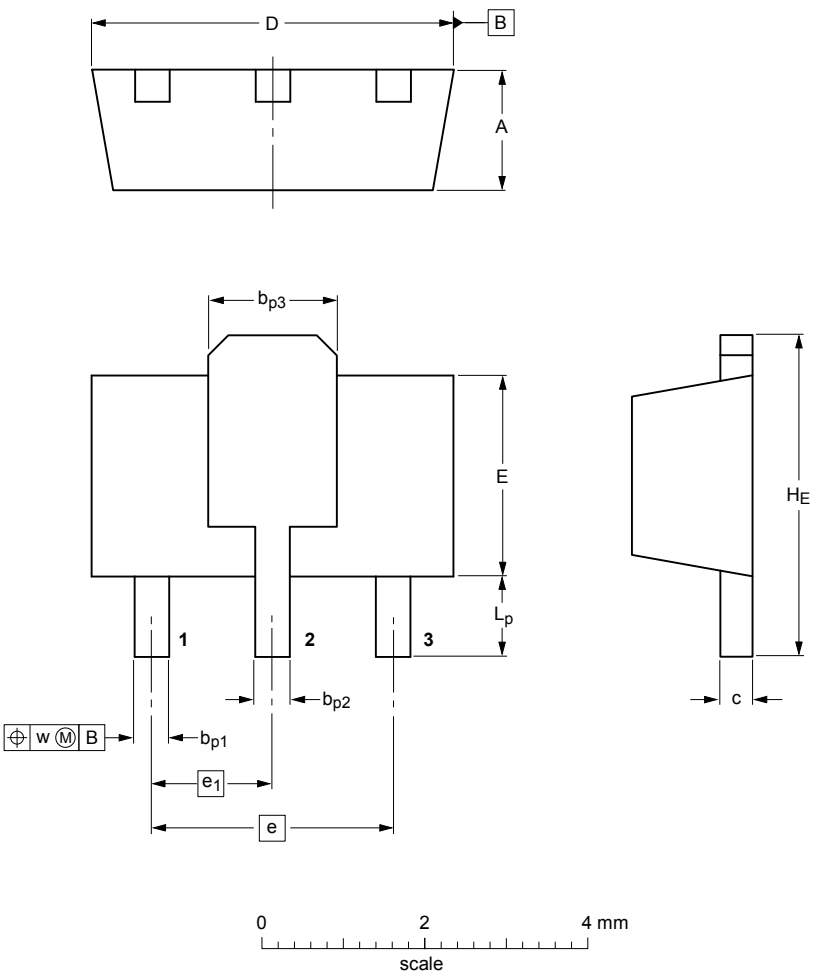
11. Package outline

Plastic surface-mounted package; exposed die pad for good heat transfer; 3 leads **SOT89**



DIMENSIONS (mm are the original dimensions)

UNIT	A	b_{p1}	b_{p2}	b_{p3}	c	D	E	e	e_1	H_E	L_p	w
mm	1.6 1.4	0.48 0.35	0.53 0.40	1.8 1.4	0.44 0.23	4.6 4.4	2.6 2.4	3.0	1.5	4.25 3.75	1.2 0.8	0.13

OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	JEITA			
SOT89		TO-243	SC-62			~~06-03-16~~ 06-08-29

Fig. 13. Package outline SOT89

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12. Soldering

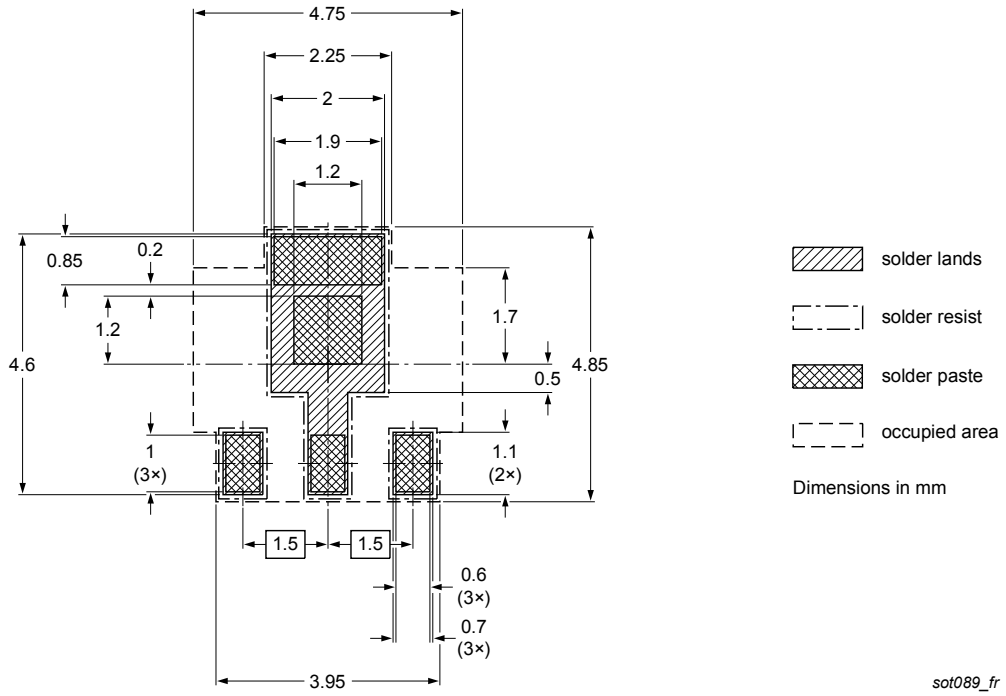

Fig. 14. Reflow soldering footprint for SOT89

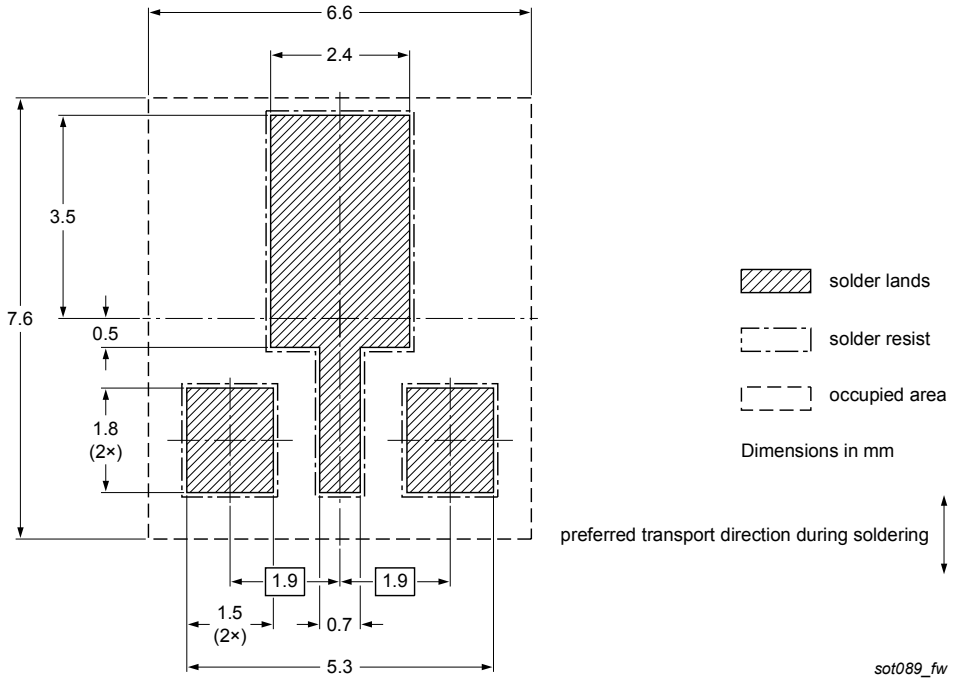

Fig. 15. Wave soldering footprint for SOT89

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