



PBSS4360X

60 V, 3 A NPN low V_{CEsat} BISS transistor

9 June 2017

Product data sheet

1. General description

NPN low V_{CEsat} Breakthrough in Smal Signal (BISS) transistor in a medium power SOT89 (SC-62) flat lead Surface-Mounted Device (SMD) plastic package.

PNP complement: PBSS5360X

2. Features and benefits

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

3. Applications

- DC-to-DC conversion
- Supply line switching
- Battery charger
- LCD backlighting
- Driver in low supply voltage applications (e.g. lamps and LEDs)
- Inductive load driver (e.g. relays, buzzers and motors)

4. Quick reference data

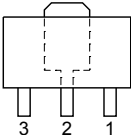
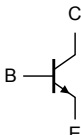
Table 1. Quick reference data

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
V _{CEO}	collector-emitter voltage	open base		-	-	60	V
I _C	collector current			-	-	3	A
I _{CM}	peak collector current	single pulse; t _p ≤ 1 ms		-	-	6	A
R _{CEsat}	collector-emitter saturation resistance	I _C = 2 A; I _B = 200 mA; T _{amb} = 25 °C	[1]	-	-	140	mΩ

[1] Pulse test: t_p ≤ 300 μs; δ ≤ 0.02

5. Pinning information

Table 2. Pinning information

Pin	Symbol	Description	Simplified outline	Graphic symbol
1	E	emitter	 SOT89	 sym123
2	C	collector		
3	B	base		

6. Ordering information

Table 3. Ordering information

Type number	Package		
	Name	Description	Version
PBSS4360X	SOT89	plastic, surface-mounted package; 3 leads; 1.5 mm pitch; 4.5 mm x 2.5 mm x 1.5 mm body	SOT89

7. Marking

Table 4. Marking codes

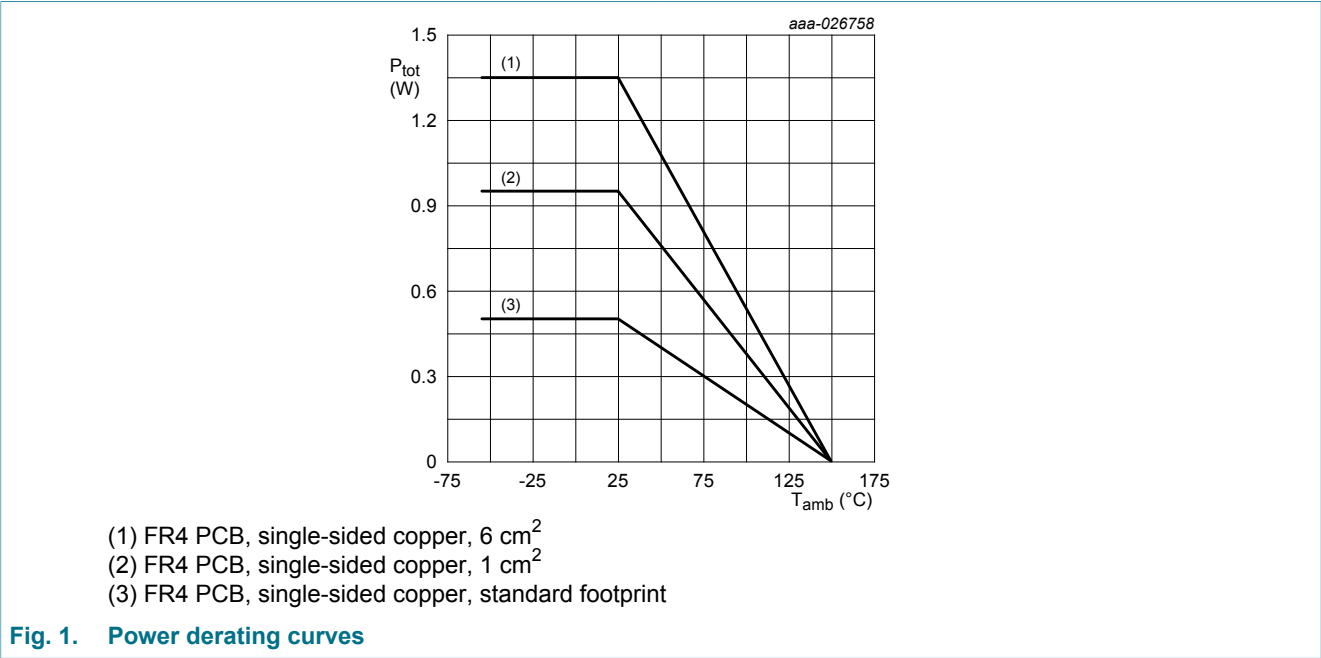
Type number	Marking code
PBSS4360X	S40

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		-	80	V
V _{CEO}	collector-emitter voltage	open base		-	60	V
V _{EBO}	emitter-base voltage	open collector		-	7	V
I _C	collector current			-	3	A
I _{CM}	peak collector current	single pulse; t _p ≤ 1 ms		-	6	A
I _B	base current			-	500	mA
I _{BM}	peak base current	single pulse; t _p ≤ 1 ms		-	1	A
P _{tot}	total power dissipation	T _{amb} ≤ 25 °C	[1]	-	500	mW
			[2]	-	950	mW
			[3]	-	1.35	W
T _j	junction temperature			-	150	°C
T _{amb}	ambient temperature			-55	150	°C
T _{stg}	storage temperature			-65	150	°C

- [1] Device mounted on an FR4 Printed-Circuit Board (PCB), single-sided copper, tin-plated and standard footprint.
[2] Device mounted on an FR4 Printed-Circuit Board (PCB), single-sided copper, tin-plated; mounting pad for collector 1 cm².
[3] Device mounted on an FR4 Printed-Circuit Board (PCB), single-sided copper, tin-plated; mounting pad for collector 6 cm².



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]	-	-	250	K/W
			[2]	-	-	132	K/W
			[3]	-	-	93	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, single-sided copper, tin-plated; mounting pad for collector 6 cm².

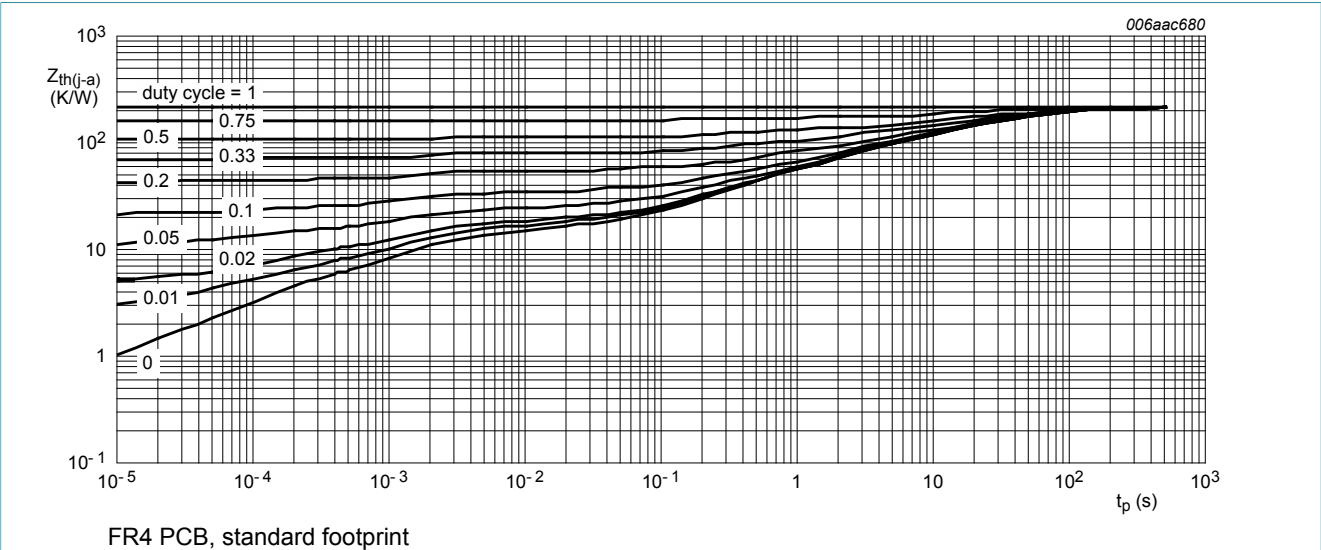


Fig. 2. Transient thermal impedance from junction to ambient as a function of pulse duration; typical values

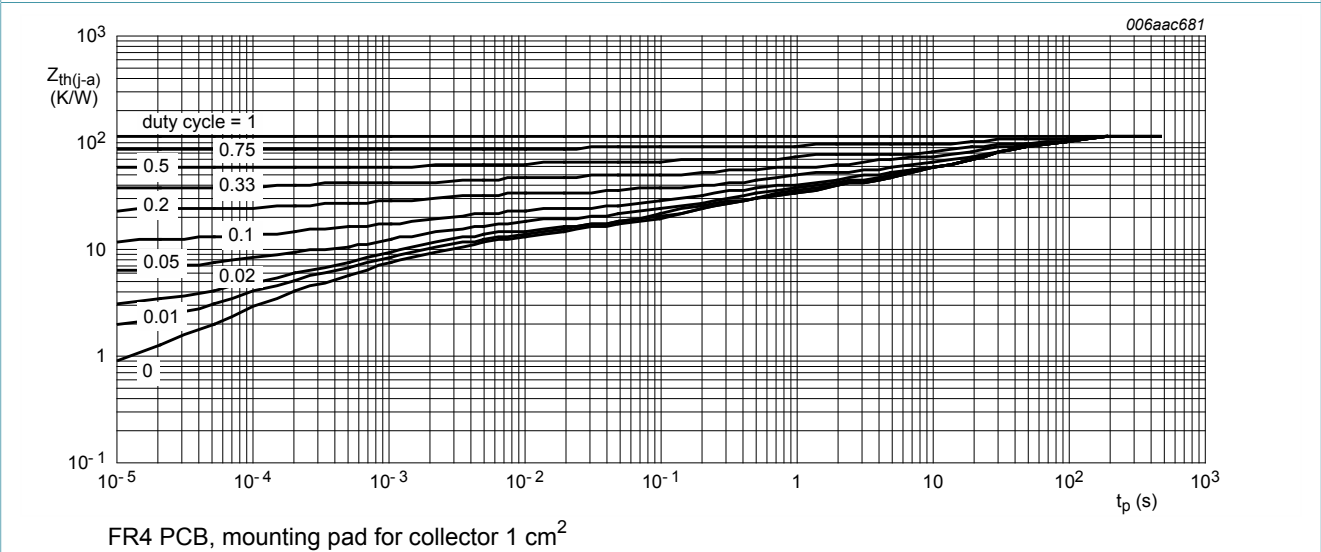
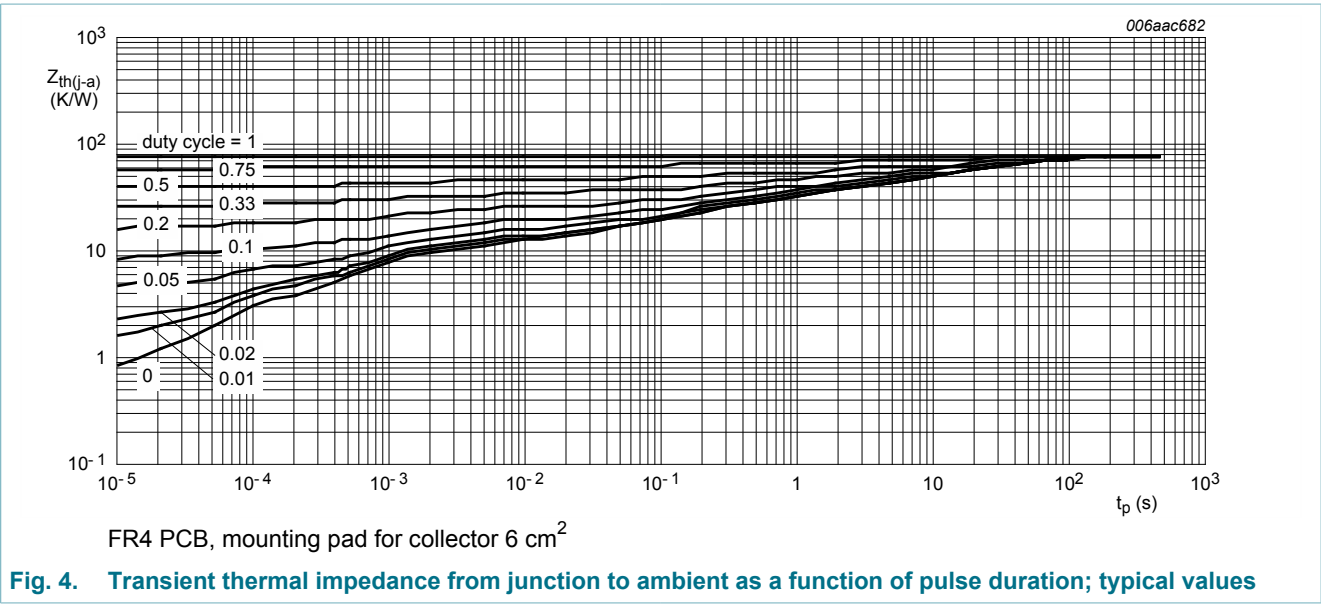


Fig. 3. Transient thermal impedance from junction to ambient as a function of pulse duration; typical values

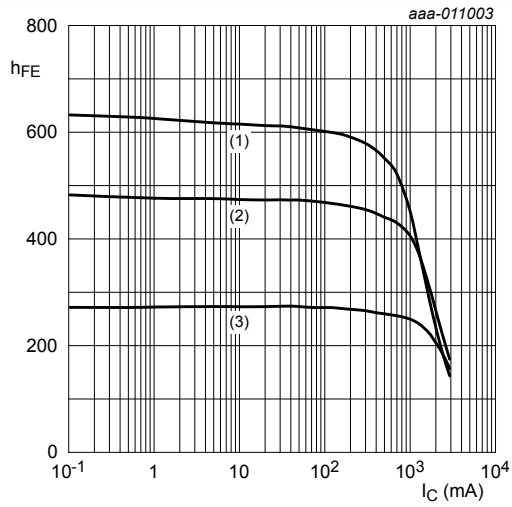


10. Characteristics

Table 7. Characteristics

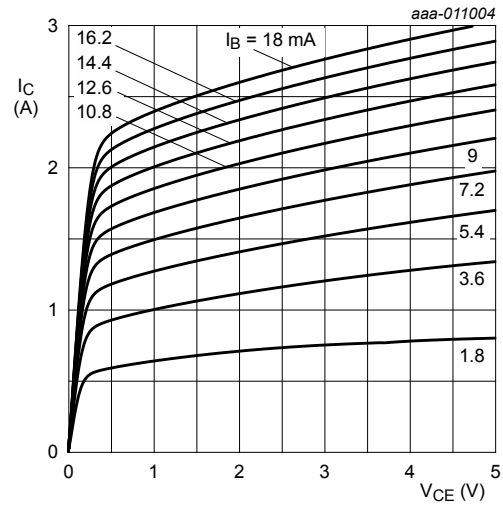
Symbol	Parameter	Conditions		Min	Typ	Max	Unit
I_{CBO}	collector-base cut-off current	$V_{CB} = 48 \text{ V}; I_E = 0 \text{ A}; T_{amb} = 25 \text{ }^{\circ}\text{C}$		-	-	100	nA
		$V_{CB} = 48 \text{ V}; I_E = 0 \text{ A}; T_J = 150 \text{ }^{\circ}\text{C}$		-	-	50	μA
I_{CES}	collector-emitter cut-off current	$V_{CE} = 48 \text{ V}; V_{BE} = 0 \text{ V}; T_{amb} = 25 \text{ }^{\circ}\text{C}$		-	-	100	nA
I_{EBO}	emitter-base cut-off current	$V_{EB} = 5 \text{ V}; I_C = 0 \text{ A}; T_{amb} = 25 \text{ }^{\circ}\text{C}$		-	-	100	nA
h_{FE}	DC current gain	$V_{CE} = 5 \text{ V}; I_C = 50 \text{ mA}; T_{amb} = 25 \text{ }^{\circ}\text{C}$		200	-	-	
		$V_{CE} = 5 \text{ V}; I_C = 500 \text{ mA}; T_{amb} = 25 \text{ }^{\circ}\text{C}$	[1]	200	-	-	
		$V_{CE} = 5 \text{ V}; I_C = 1 \text{ A}; T_{amb} = 25 \text{ }^{\circ}\text{C}$	[1]	200	-	-	
		$V_{CE} = 5 \text{ V}; I_C = 2 \text{ A}; T_{amb} = 25 \text{ }^{\circ}\text{C}$	[1]	120	-	-	
		$V_{CE} = 5 \text{ V}; I_C = 3 \text{ A}; T_{amb} = 25 \text{ }^{\circ}\text{C}$	[1]	75	-	-	
V_{CEsat}	collector-emitter saturation voltage	$I_C = 500 \text{ mA}; I_B = 50 \text{ mA}; T_{amb} = 25 \text{ }^{\circ}\text{C}$	[1]	-	-	75	mV
		$I_C = 1 \text{ A}; I_B = 100 \text{ mA}; T_{amb} = 25 \text{ }^{\circ}\text{C}$	[1]	-	-	150	mV
		$I_C = 2 \text{ A}; I_B = 200 \text{ mA}; T_{amb} = 25 \text{ }^{\circ}\text{C}$	[1]	-	-	275	mV
		$I_C = 3 \text{ A}; I_B = 300 \text{ mA}; T_{amb} = 25 \text{ }^{\circ}\text{C}$	[1]	-	-	400	mV
R_{CEsat}	collector-emitter saturation resistance	$I_C = 2 \text{ A}; I_B = 200 \text{ mA}; T_{amb} = 25 \text{ }^{\circ}\text{C}$	[1]	-	-	140	m Ω
V_{BEsat}	base-emitter saturation voltage	$I_C = 1 \text{ A}; I_B = 100 \text{ mA}; T_{amb} = 25 \text{ }^{\circ}\text{C}$	[1]	-	-	1.2	V
V_{BEon}	base-emitter turn-on voltage	$V_{CE} = 5 \text{ V}; I_C = 1 \text{ A}; T_{amb} = 25 \text{ }^{\circ}\text{C}$	[1]	-	-	1.1	V
f_T	transition frequency	$V_{CE} = 10 \text{ V}; I_C = 50 \text{ mA}; f = 100 \text{ MHz}; T_{amb} = 25 \text{ }^{\circ}\text{C}$		75	145	-	MHz
C_c	collector capacitance	$V_{CB} = 10 \text{ V}; I_E = 0 \text{ A}; i_e = 0 \text{ A}; f = 1 \text{ MHz}; T_{amb} = 25 \text{ }^{\circ}\text{C}$		-	11	14	pF

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



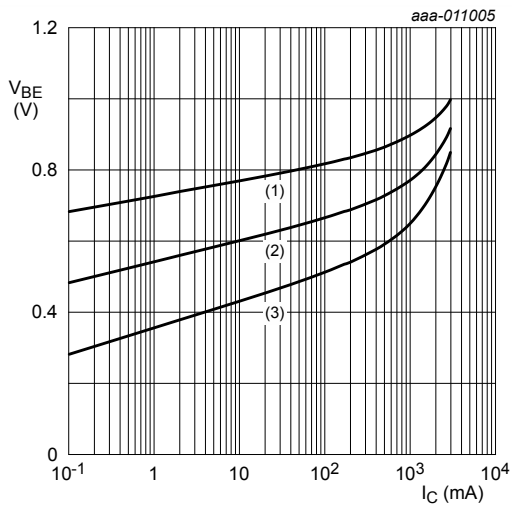
$V_{CE} = 5 \text{ V}$
 (1) $T_{amb} = 100 \text{ }^{\circ}\text{C}$
 (2) $T_{amb} = 25 \text{ }^{\circ}\text{C}$
 (3) $T_{amb} = -55 \text{ }^{\circ}\text{C}$

Fig. 5. DC current gain as a function of collector current; typical values



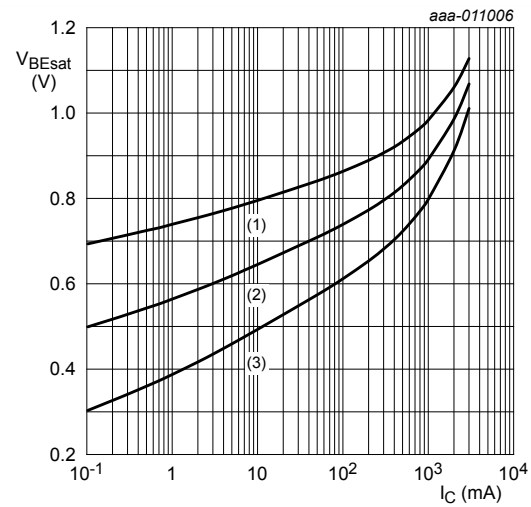
$T_{amb} = 25 \text{ }^{\circ}\text{C}$

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



$V_{CE} = 5 \text{ V}$
 (1) $T_{amb} = -55 \text{ }^{\circ}\text{C}$
 (2) $T_{amb} = 25 \text{ }^{\circ}\text{C}$
 (3) $T_{amb} = 100 \text{ }^{\circ}\text{C}$

Fig. 7. Base-emitter voltage as a function of collector current; typical values



$I_C/I_B = 20$
 (1) $T_{amb} = -55 \text{ }^{\circ}\text{C}$
 (2) $T_{amb} = 25 \text{ }^{\circ}\text{C}$
 (3) $T_{amb} = 100 \text{ }^{\circ}\text{C}$

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

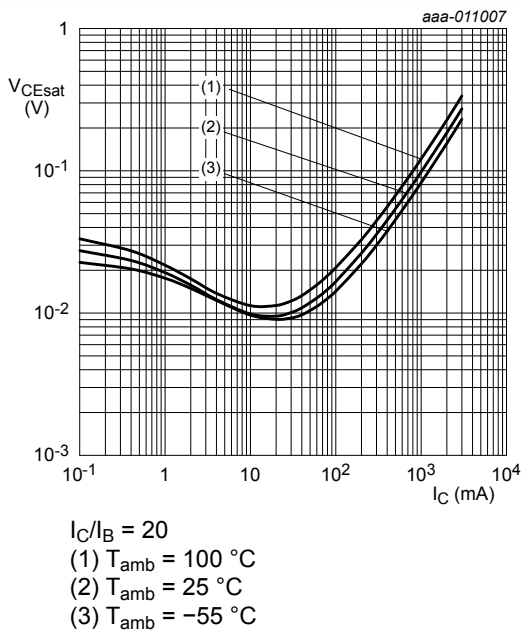


Fig. 9. Collector-emitter saturation voltage as a function of collector current; typical values

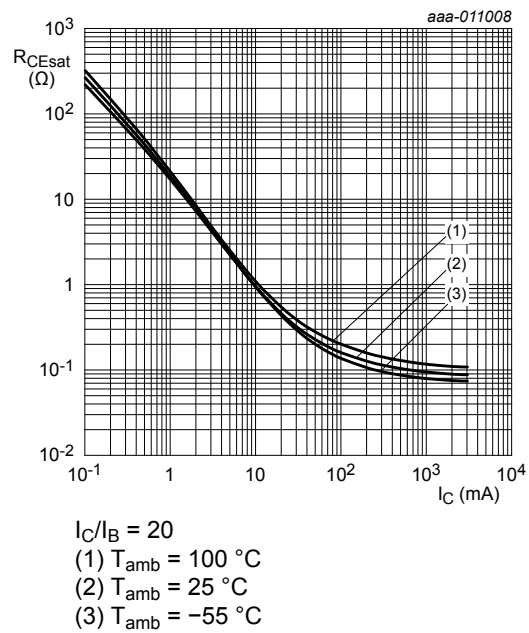


Fig. 10. Collector-emitter saturation resistance as a function of collector current; typical values

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

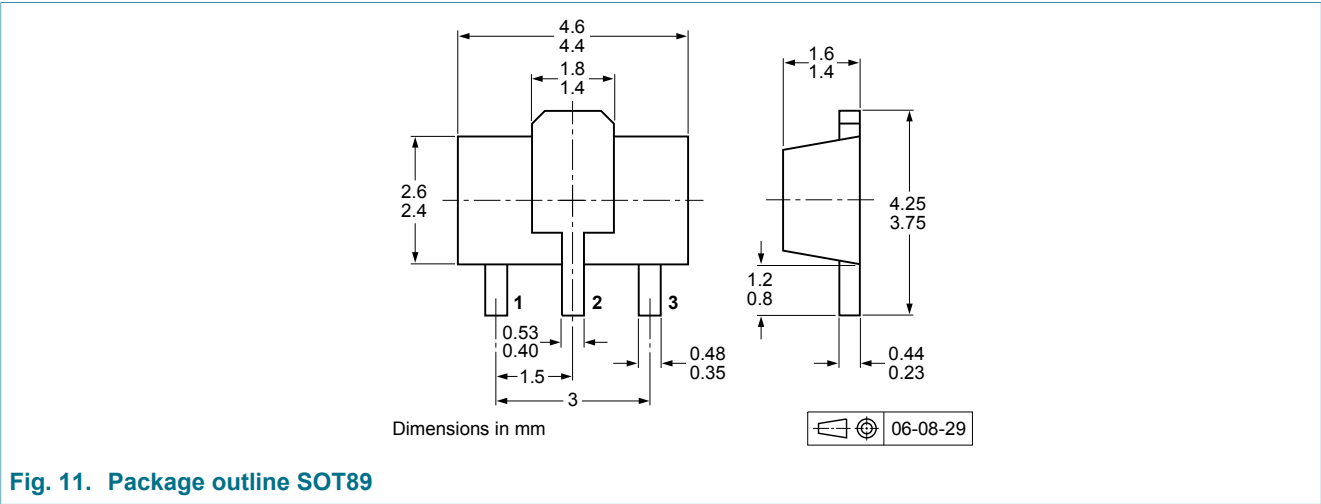


Fig. 11. Package outline SOT89

13. Soldering

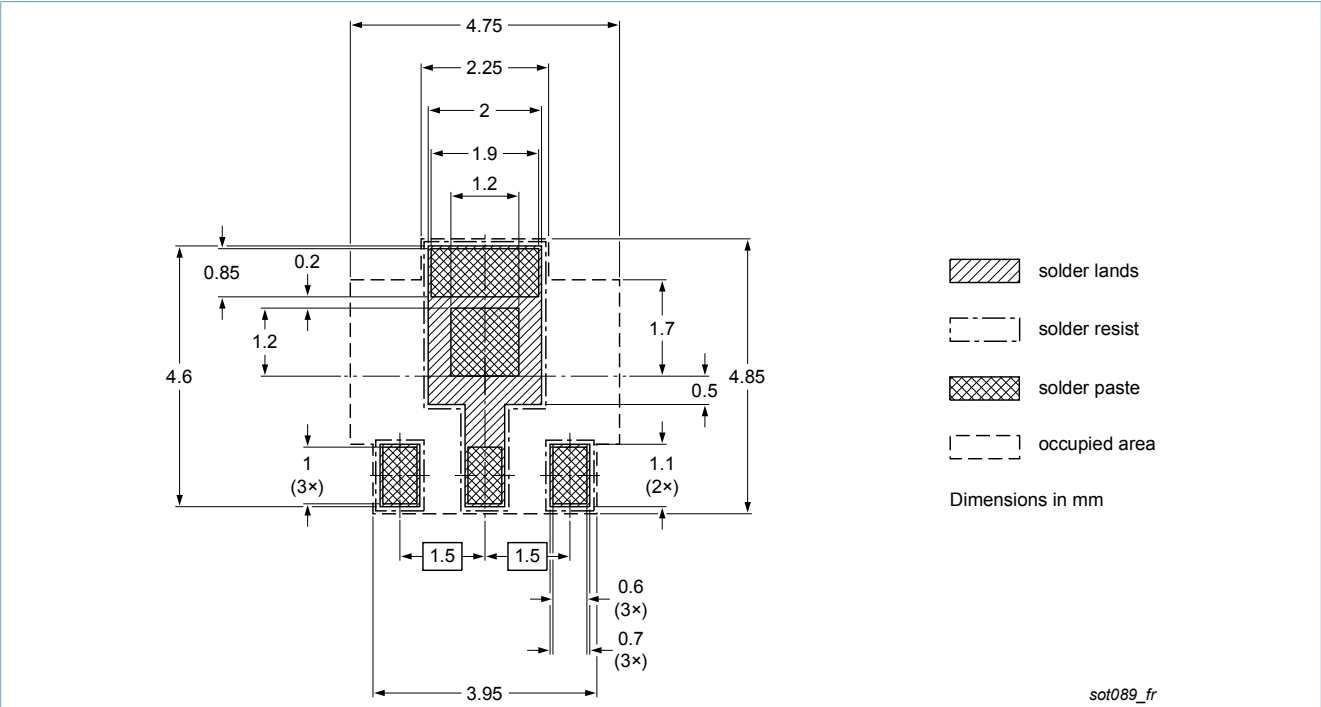


Fig. 12. Reflow soldering footprint for SOT89

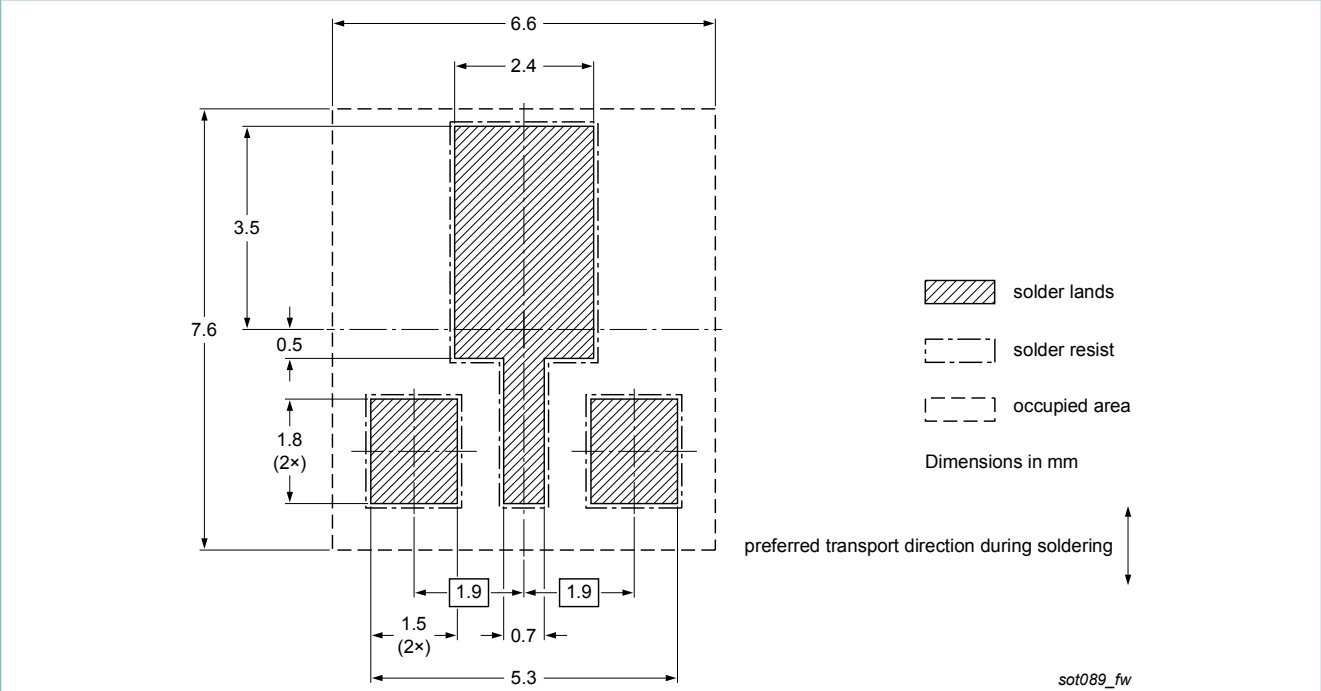


Fig. 13. Wave soldering footprint for SOT89

14. Revision history

Table 8. Revision history

Data sheet ID	Release date	Data sheet status	Change notice	Supersedes
PBSS4360X v.1	20170609	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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