



PBSS303PZ-Q

30 V, 5.3 A PNP low V_{CEsat} transistor

29 August 2024

Product data sheet

1. General description

PNP low V_{CEsat} transistor in a SOT223 (SC-73) small Surface-Mounted Device (SMD) plastic package.

NPN complement: PBSS303NZ-Q

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
- High efficiency due to less heat generation
- Qualified according to AEC-Q101 and recommended for use in automotive applications

3. Applications

- DC-to-DC conversion
- MOSFET gate driving
- Motor control
- Charging circuits
- Power switches (e.g. motors, fans)

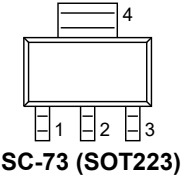
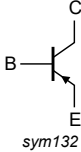
4. Quick reference data

Table 1. Quick reference data

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
V_{CEO}	collector-emitter voltage	open base	-	-	-30	V
I_C	collector current		-	-	-5.3	A
I_{CM}	peak collector current	single pulse; $t_p \leq 1$ ms	-	-	-10.6	A
R_{CEsat}	collector-emitter saturation resistance	$I_C = -4$ A; $I_B = -200$ mA; pulsed; $t_p \leq 300$ μ s; $\delta \leq 0.02$; $T_{amb} = 25$ °C	-	36	53	m Ω

5. Pinning information

Table 2. Pinning information

Pin	Symbol	Description	Simplified outline	Graphic symbol
1	B	base	 <p>SC-73 (SOT223)</p>	
2	C	collector		
3	E	emitter		
4	C	collector		

6. Ordering information

Table 3. Ordering information

Type number	Package		
	Name	Description	Version
PBSS303PZ-Q	SC-73	plastic, surface-mounted package with increased heatsink; 4 leads; 2.3 mm pitch; 6.5 mm x 3.5 mm x 1.65 mm body	SOT223

7. Marking

Table 4. Marking codes

Type number	Marking code
PBSS303PZ-Q	S303PZ

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	-	-30	V	
V_{CEO}	collector-emitter voltage	open base	-	-30	V	
V_{EBO}	emitter-base voltage	open collector	-	-5	V	
I_C	collector current		-	-5.3	A	
I_{CM}	peak collector current	single pulse; $t_p \leq 1$ ms	-	-10.6	A	
P_{tot}	total power dissipation	$T_{amb} \leq 25$ °C	[1]	-	0.7	W
			[2]	-	1.7	W
			[3]	-	2	W
T_j	junction temperature		-	150	°C	
T_{amb}	ambient temperature		-65	150	°C	
T_{stg}	storage temperature		-65	150	°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 6 cm².
- [3] Device mounted on a ceramic PCB, Al₂O₃, standard footprint.

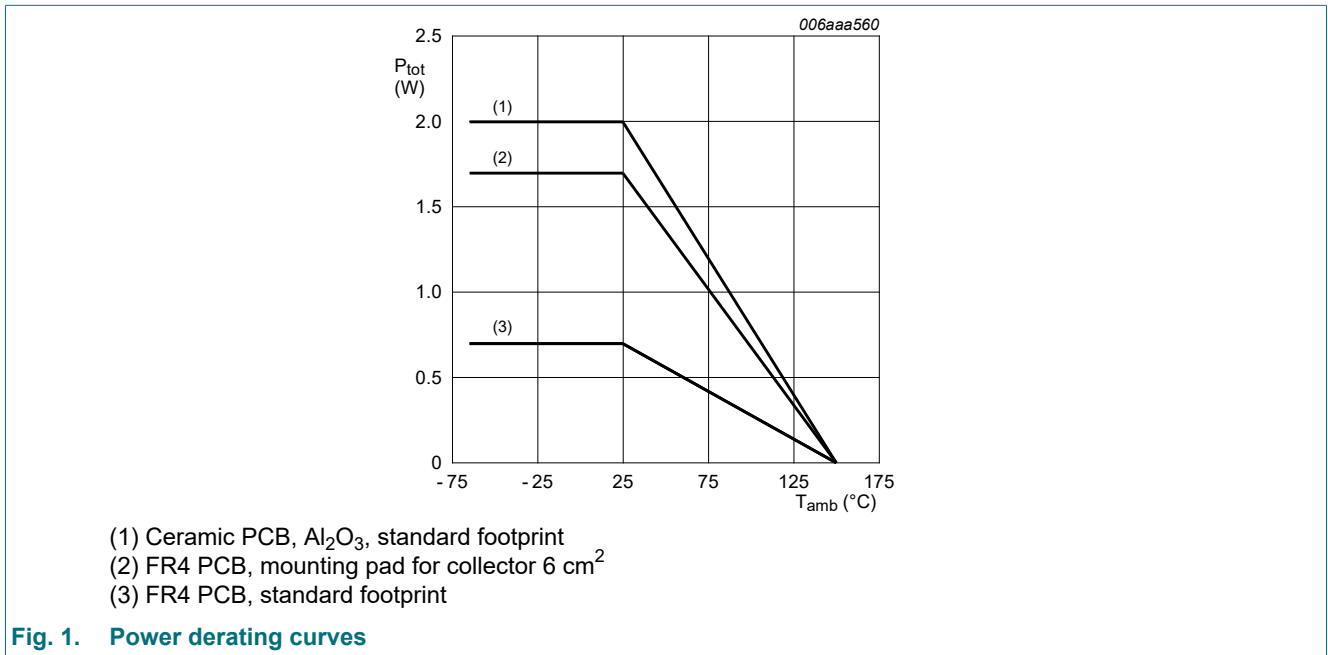


Fig. 1. Power derating curves

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]	-	-	179	K/W
			[2]	-	-	74	K/W
			[3]	-	-	63	K/W
$R_{th(j-sp)}$	thermal resistance from junction to solder point			-	-	15	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 6 cm².

[3] Device mounted on a ceramic PCB, Al₂O₃, standard footprint.

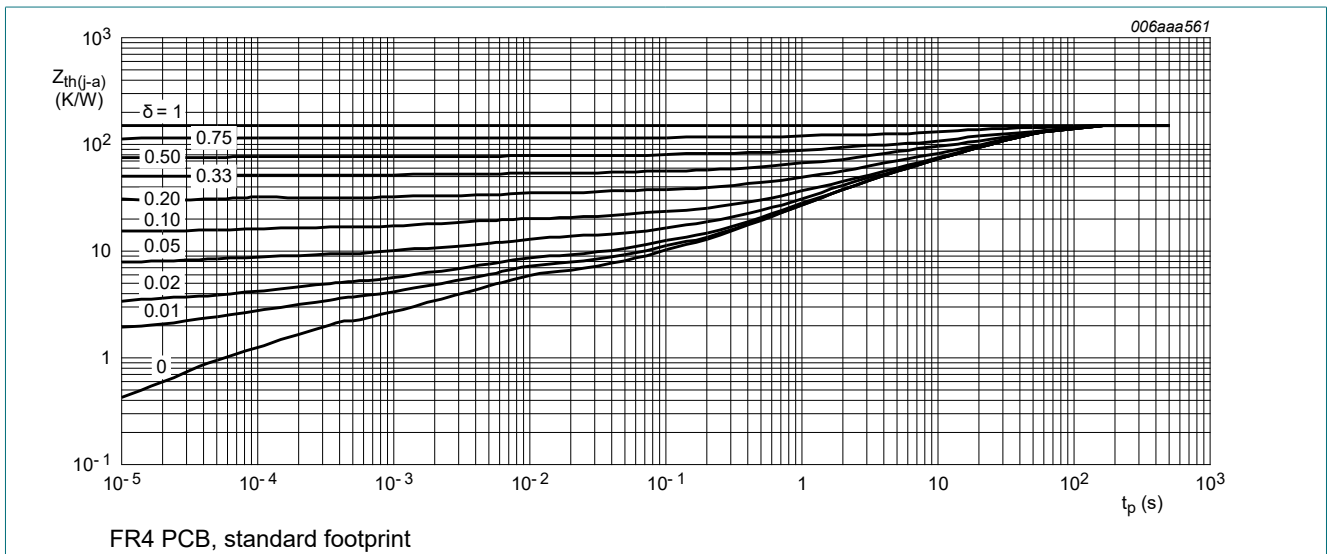


Fig. 2. Transient thermal impedance from junction to ambient as a function of pulse duration; typical values

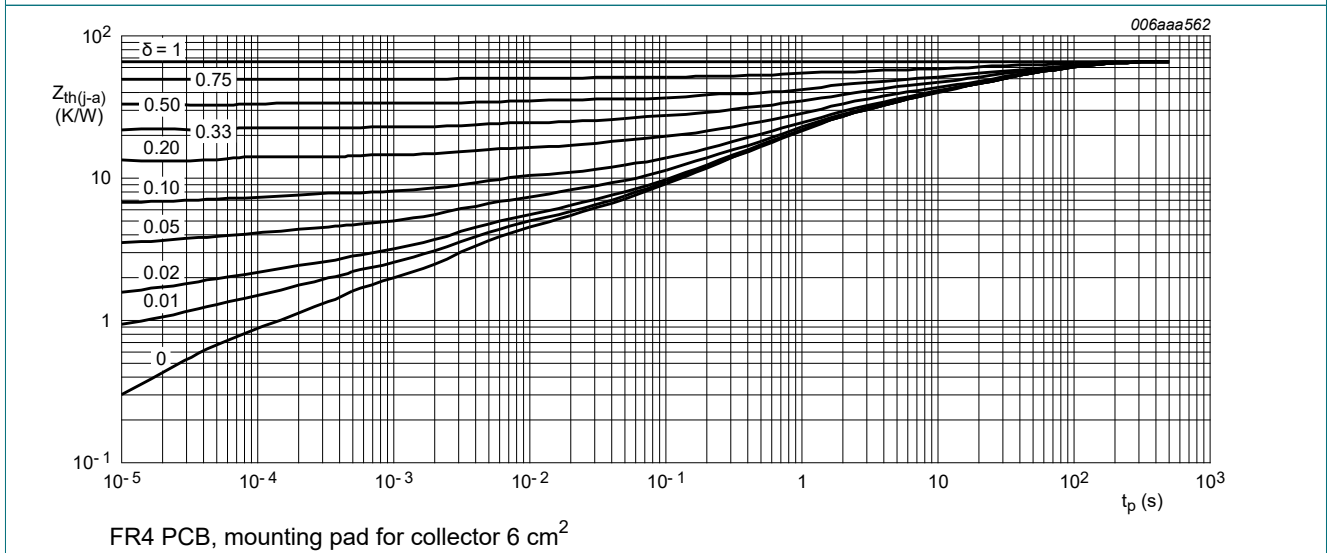
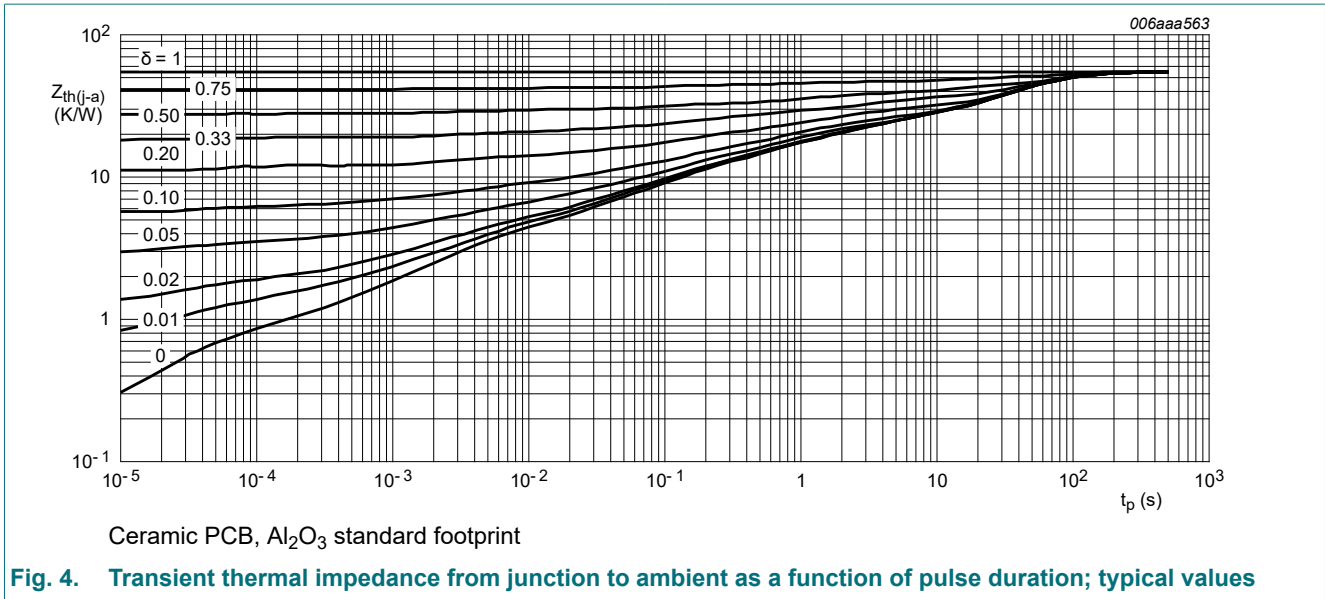


Fig. 3. Transient thermal impedance from junction to ambient as a function of pulse duration; typical values



10. Characteristics

Table 7. Characteristics

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
I _{CBO}	collector-base cut-off current	V _{CB} = -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; pulsed; t _p ≤ 300 μs; δ ≤ 0.02; T _{amb} = 25 °C	250	400	-	
		V _{CE} = -2 V; I _C = -1 A; pulsed; t _p ≤ 300 μs; δ ≤ 0.02; T _{amb} = 25 °C	250	350	-	
		V _{CE} = -2 V; I _C = -2 A; pulsed; t _p ≤ 300 μs; δ ≤ 0.02; T _{amb} = 25 °C	200	300	-	
		V _{CE} = -2 V; I _C = -4 A; pulsed; t _p ≤ 300 μs; δ ≤ 0.02; T _{amb} = 25 °C	130	200	-	
		V _{CE} = -2 V; I _C = -7 A; pulsed; t _p ≤ 300 μs; δ ≤ 0.02; T _{amb} = 25 °C	80	120	-	
V _{CEsat}	collector-emitter saturation voltage	I _C = -0.5 A; I _B = -50 mA; pulsed; t _p ≤ 300 μs; δ ≤ 0.02; T _{amb} = 25 °C	-	-25	-35	mV
		I _C = -1 A; I _B = -50 mA; pulsed; t _p ≤ 300 μs; δ ≤ 0.02; T _{amb} = 25 °C	-	-50	-70	mV
		I _C = -1 A; I _B = -10 mA; pulsed; t _p ≤ 300 μs; δ ≤ 0.02; T _{amb} = 25 °C	-	-75	-105	mV
		I _C = -2 A; I _B = -40 mA; pulsed; t _p ≤ 300 μs; δ ≤ 0.02; T _{amb} = 25 °C	-	-100	-140	mV
		I _C = -4 A; I _B = -200 mA; pulsed; t _p ≤ 300 μs; δ ≤ 0.02; T _{amb} = 25 °C	-	-145	-210	mV
		I _C = -4 A; I _B = -400 mA; pulsed; t _p ≤ 300 μs; δ ≤ 0.02; T _{amb} = 25 °C	-	-135	-190	mV
		I _C = -4 A; I _B = -40 mA; pulsed; t _p ≤ 300 μs; δ ≤ 0.02; T _{amb} = 25 °C	-	-245	-370	mV
		I _C = -5.3 A; I _B = -265 mA; pulsed; t _p ≤ 300 μs; δ ≤ 0.02; T _{amb} = 25 °C	-	-185	-265	mV
R _{CEsat}	collector-emitter saturation resistance	I _C = -4 A; I _B = -200 mA; pulsed; t _p ≤ 300 μs; δ ≤ 0.02; T _{amb} = 25 °C	-	36	53	mΩ
		I _C = -4 A; I _B = -40 mA; pulsed; t _p ≤ 300 μs; δ ≤ 0.02; T _{amb} = 25 °C	-	61	92	mΩ
V _{BEsat}	base-emitter saturation voltage	I _C = -1 A; I _B = -100 mA; pulsed; t _p ≤ 300 μs; δ ≤ 0.02; T _{amb} = 25 °C	-	-0.82	-0.9	V
		I _C = -4 A; I _B = -400 mA; pulsed; t _p ≤ 300 μs; δ ≤ 0.02; T _{amb} = 25 °C	-	-0.93	-1.05	V
V _{BEon}	base-emitter turn-on voltage	V _{CE} = -2 V; I _C = -2 A; pulsed; t _p ≤ 300 μs; δ ≤ 0.02; T _{amb} = 25 °C	-	-0.76	-0.85	V
t _d	delay time	V _{CC} = -12.5 V; I _C = -3 A; I _{Bon} = -0.15 A; I _{Boff} = 0.15 A; T _{amb} = 25 °C	-	15	-	ns
t _r	rise time		-	55	-	ns
t _{on}	turn-on time		-	70	-	ns
t _s	storage time		-	215	-	ns
t _f	fall time		-	105	-	ns
t _{off}	turn-off time		-	320	-	ns

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
f_T	transition frequency	$V_{CE} = -10\text{ V}$; $I_C = -100\text{ mA}$; $f = 100\text{ MHz}$; $T_{amb} = 25\text{ °C}$	-	130	-	MHz
C_c	collector capacitance	$V_{CB} = -10\text{ V}$; $I_E = 0\text{ A}$; $i_e = 0\text{ A}$; $f = 1\text{ MHz}$; $T_{amb} = 25\text{ °C}$	-	110	160	pF

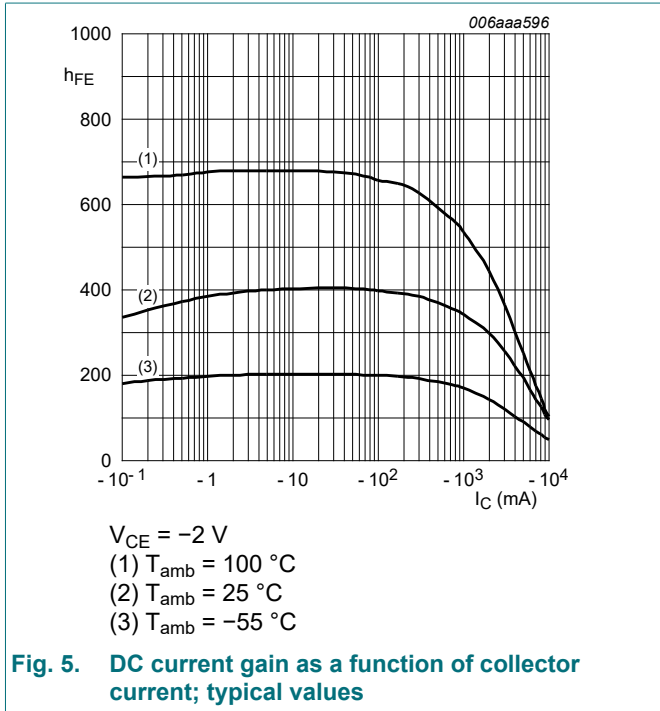


Fig. 5. DC current gain as a function of collector current; typical values

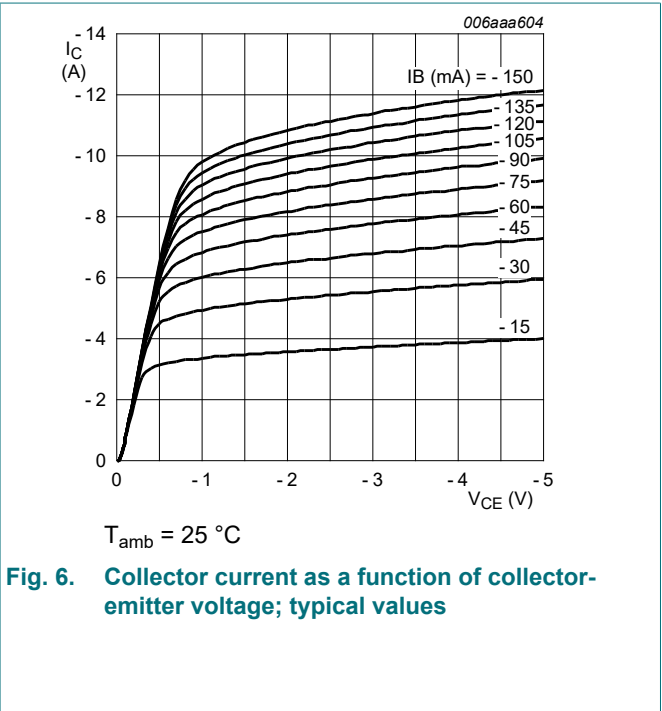


Fig. 6. Collector current as a function of collector-emitter voltage; typical values

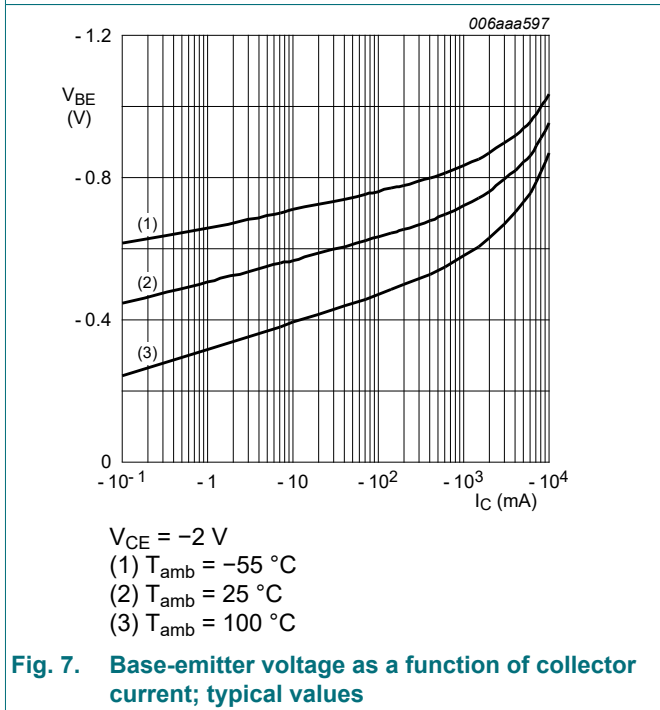


Fig. 7. Base-emitter voltage as a function of collector current; typical values

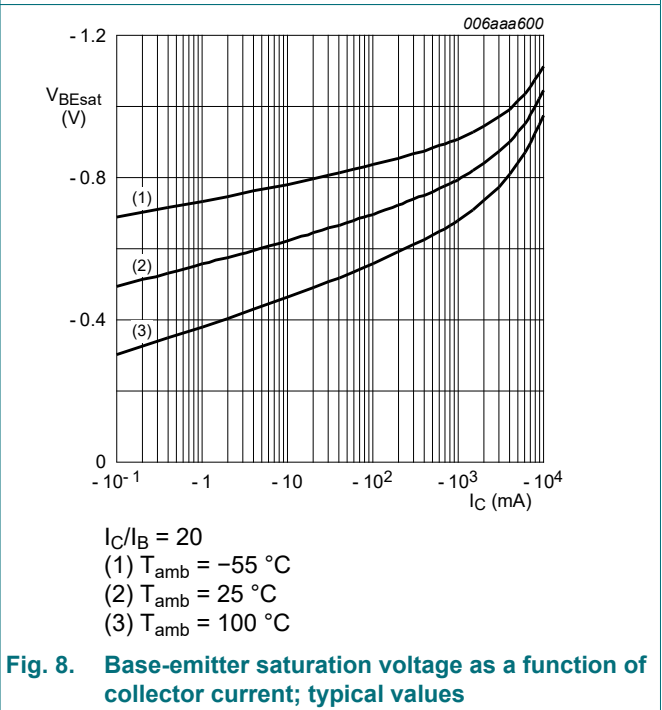
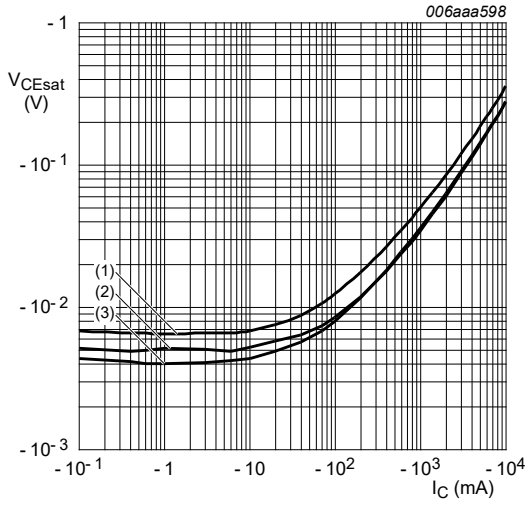
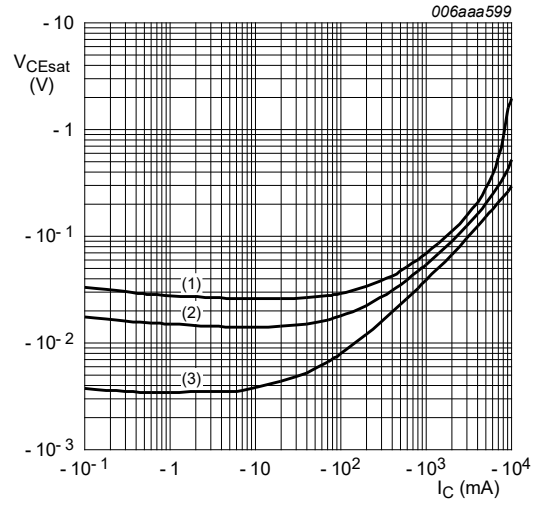


Fig. 8. Base-emitter saturation voltage as a function of collector current; typical values



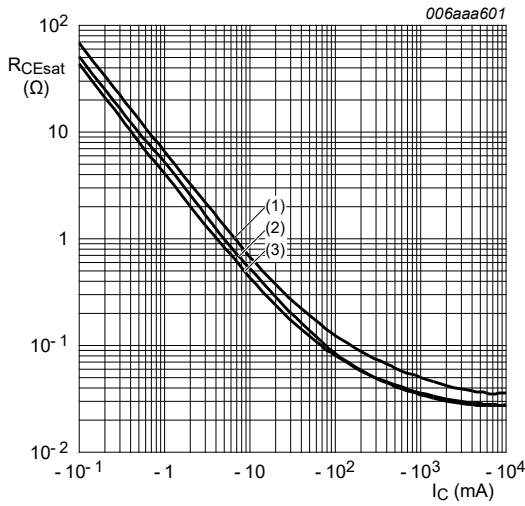
$I_C/I_B = 20$
 (1) $T_{amb} = 100\text{ °C}$
 (2) $T_{amb} = 25\text{ °C}$
 (3) $T_{amb} = -55\text{ °C}$

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



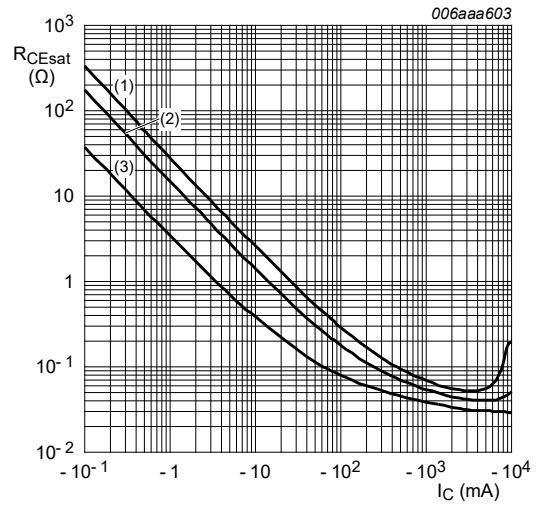
$T_{amb} = 25\text{ °C}$
 (1) $I_C/I_B = 100$
 (2) $I_C/I_B = 50$
 (3) $I_C/I_B = 10$

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



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

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



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

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

11. Test information

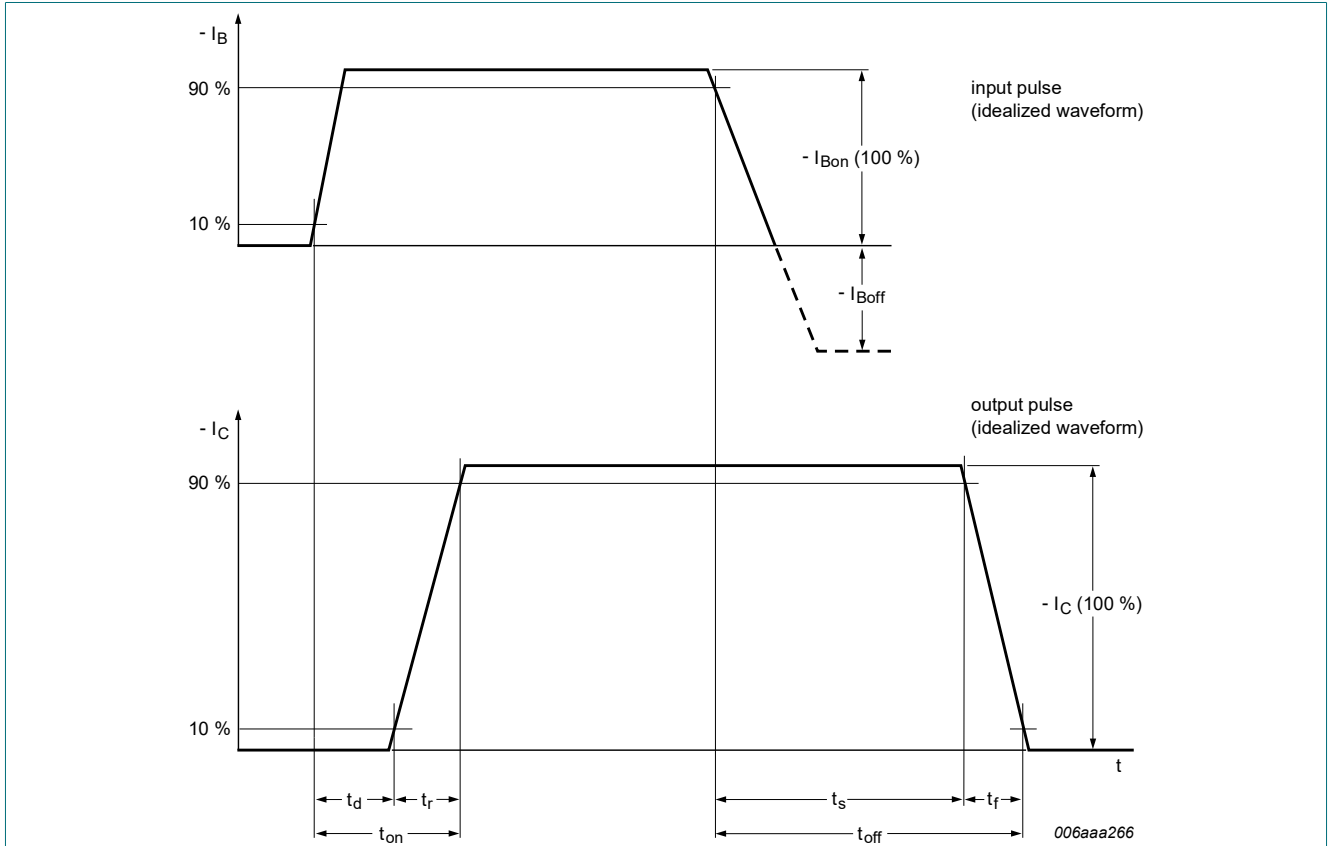


Fig. 13. Transistor switching time definition

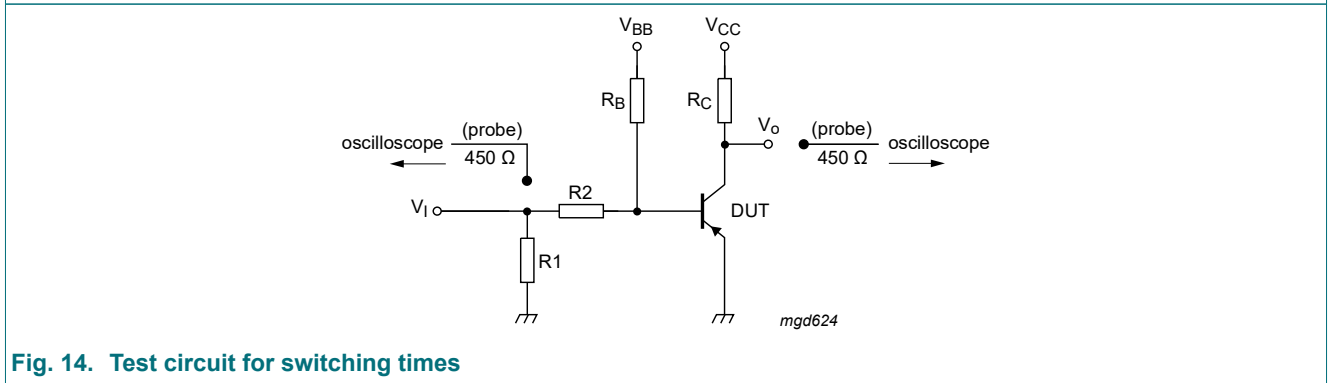


Fig. 14. Test circuit for switching times

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

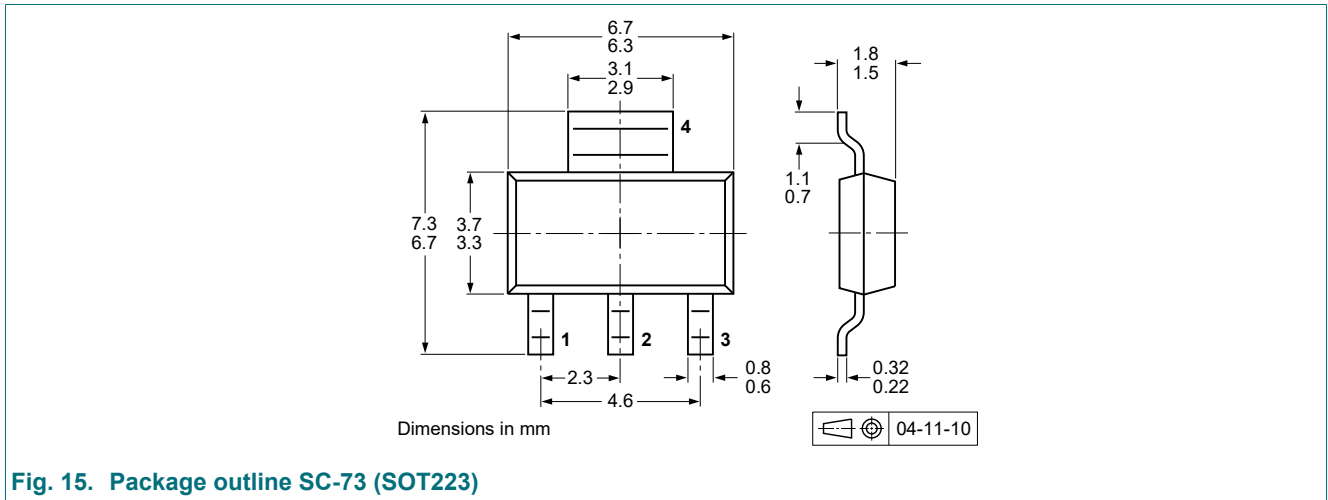


Fig. 15. Package outline SC-73 (SOT223)

13. Soldering

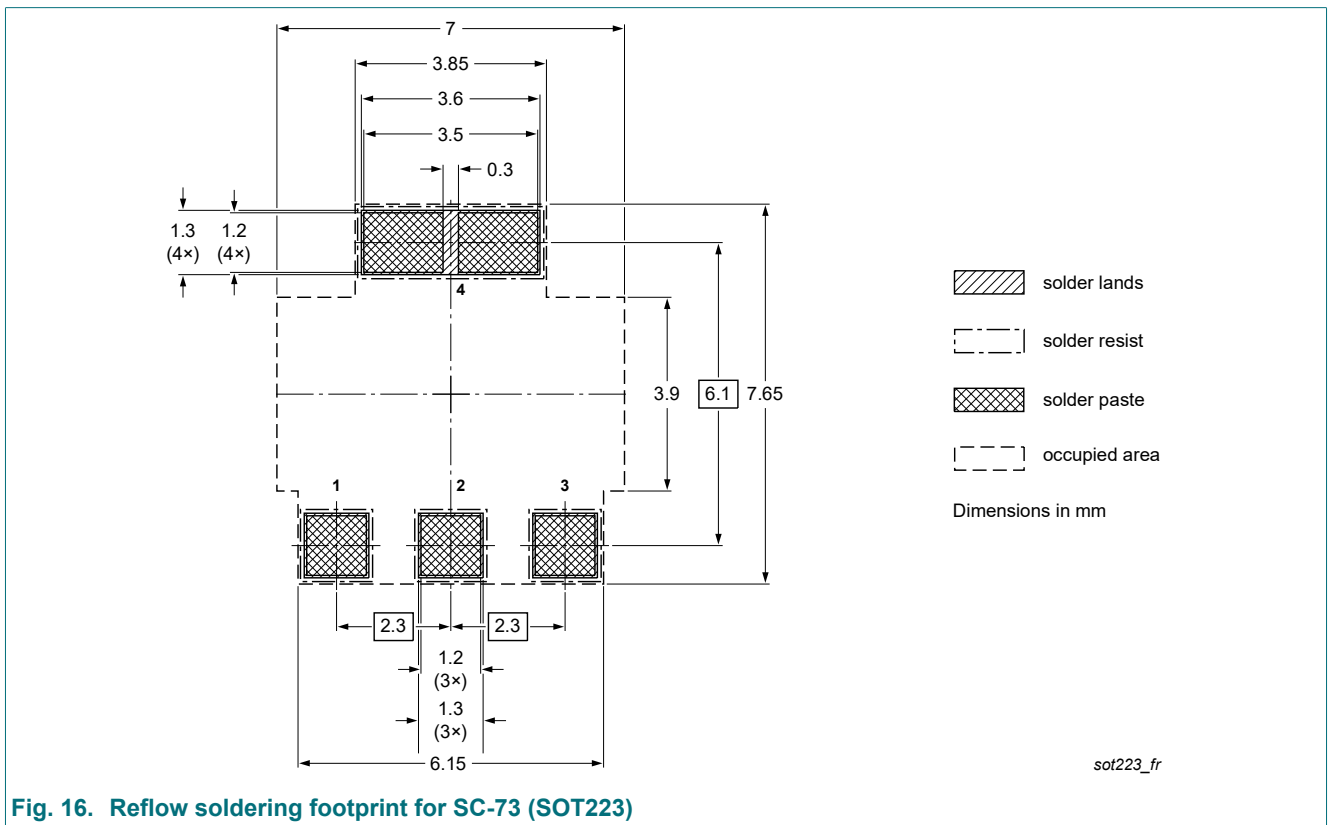


Fig. 16. Reflow soldering footprint for SC-73 (SOT223)

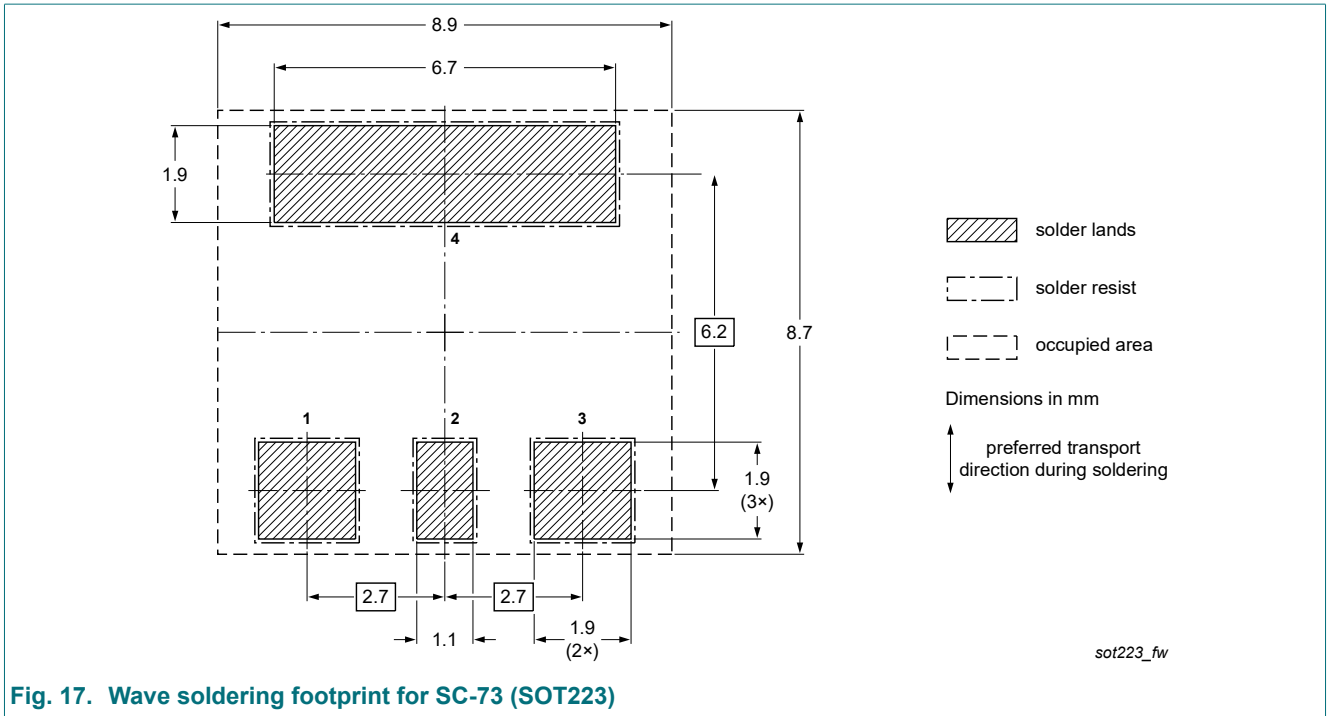


Fig. 17. Wave soldering footprint for SC-73 (SOT223)

14. Revision history

Table 8. Revision history

Data sheet ID	Release date	Data sheet status	Change notice	Supersedes
PBSS303PZ-Q v.1	20240829	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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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.....	6
11. Test information.....	9
12. Package outline.....	10
13. Soldering.....	10
14. Revision history.....	12
15. Legal information.....	13

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