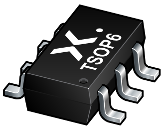


PBSS303PD

60 V, 3 A PNP low VCEsat transistor

15 September 2023 — Product data sheet

1. General description

PNP low V_{CEsat} transistor in a SOT457 (SC-74) small Surface-Mounted Device (SMD) plastic package.

NPN complement: PBSS303ND

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
- Smaller required Printed-Circuit Board (PCB) area than for conventional transistors
- AEC-Q101 qualified

3. Applications

- High-voltage DC-to-DC conversion
- High-voltage MOSFET gate driving
- High-voltage motor control
- High-voltage power switches (e.g. motors, fans)
- Thin Film Transistor (TFT) backlight inverter
- Automotive applications

4. Quick reference data

Table 1. Quick reference data

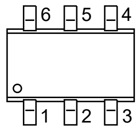
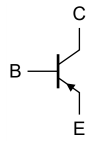
Symbol	Parameter	Conditions		Min	Typ	Max	Unit
V_{CEO}	collector-emitter voltage	open base		-	-	-60	V
I_C	collector current		[1]	-	-	-3	A
I_{CM}	peak collector current	single pulse; $t_p \leq$ 1 ms		-	-	-6	A
R_{CEsat}	collector-emitter saturation resistance	I_C = -2 A; I_B = -200 mA; pulsed; $t_p \leq$ 300 µs; $\delta \leq$ 0.02; T_{amb} = 25 °C		-	75	100	mΩ

[1] Device mounted on a ceramic PCB, Al_2O_3, standard footprint.

nexperia

5. Pinning information

Table 2. Pinning information

Pin	Symbol	Description	Simplified outline	Graphic symbol
1	C	collector	 TSOP6 (SOT457)	 sym030
2	C	collector		
3	B	base		
4	E	emitter		
5	C	collector		
6	C	collector		

6. Ordering information

Table 3. Ordering information

Type number	Package		
	Name	Description	Version
PBSS303PD	TSOP6	plastic, surface-mounted package (SC-74; TSOP6); 6 leads	SOT457

7. Marking

Table 4. Marking codes

Type number	Marking code
PBSS303PD	AH

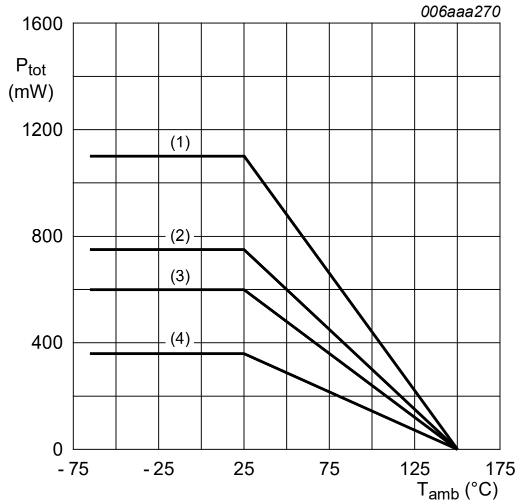
8. Limiting values

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		-	-60	V
V_{CEO}	collector-emitter voltage	open base		-	-60	V
V_{EBO}	emitter-base voltage	open collector		-	-5	V
I_C	collector current		[1]	-	-1	A
			[2]	-	-3	A
I_{CM}	peak collector current	single pulse; $t_p \leq$ 1 ms		-	-6	A
I_B	base current			-	-800	mA
I_{BM}	peak base current	single pulse; $t_p \leq$ 1 ms		-	-2	A
P_{tot}	total power dissipation	$T_{amb} \leq$ 25 °C	[1]	-	360	mW
			[3]	-	600	mW
			[4]	-	750	mW
			[2]	-	1.1	W
			[1] [5]	-	2.5	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 a ceramic PCB, Al_2O_3, 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] Pulse test: $t_p \leq 10$ ms; $\delta \leq 10$ %.



(1) Ceramic PCB, Al_2O_3, standard footprint
(2) FR4 PCB, mounting pad for collector 6 cm^2
(3) FR4 PCB, mounting pad for collector 1 cm^2
(4) FR4 PCB, standard footprint

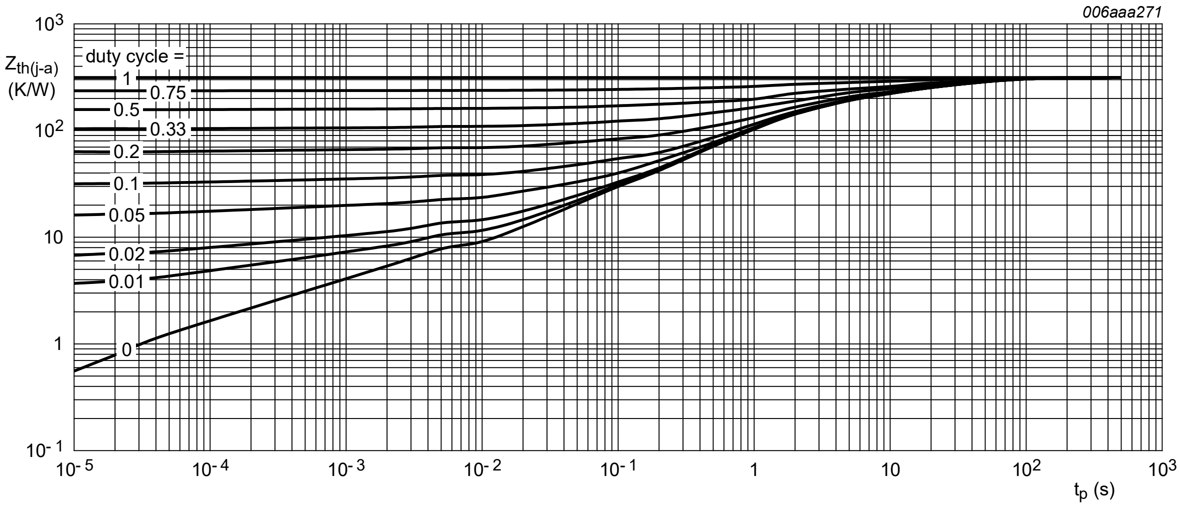
Fig. 1. Power derating curves

9. Thermal characteristics

Table 6. Thermal characteristics

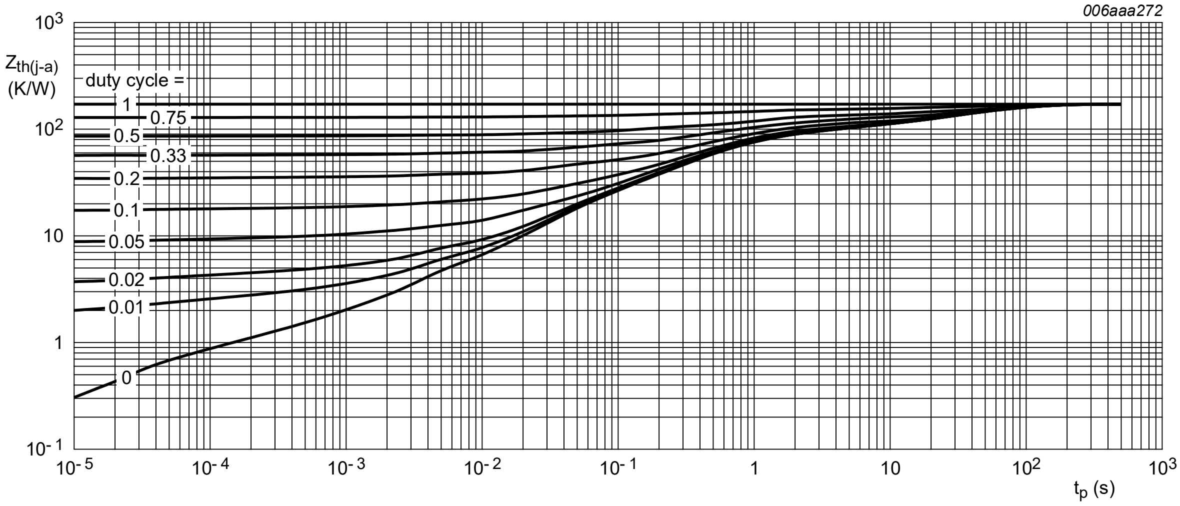
Symbol	Parameter	Conditions		Min	Typ	Max	Unit
$R_{th(j-a)}$	thermal resistance from junction to ambient	in free air	[1]	-	-	350	K/W
			[2]	-	-	208	K/W
			[3]	-	-	167	K/W
			[4]	-	-	113	K/W
			[1] [5]	-	-	50	K/W
$R_{th(j-sp)}$	thermal resistance from junction to solder point			-	-	45	K/W

[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, single-sided copper, tin-plated, mounting pad for collector 6 cm^2.
[4] Device mounted on a ceramic PCB, Al_2O_3, standard footprint.
[5] Pulse test: $t_p \leq 10$ ms; $\delta \leq 10$ %.



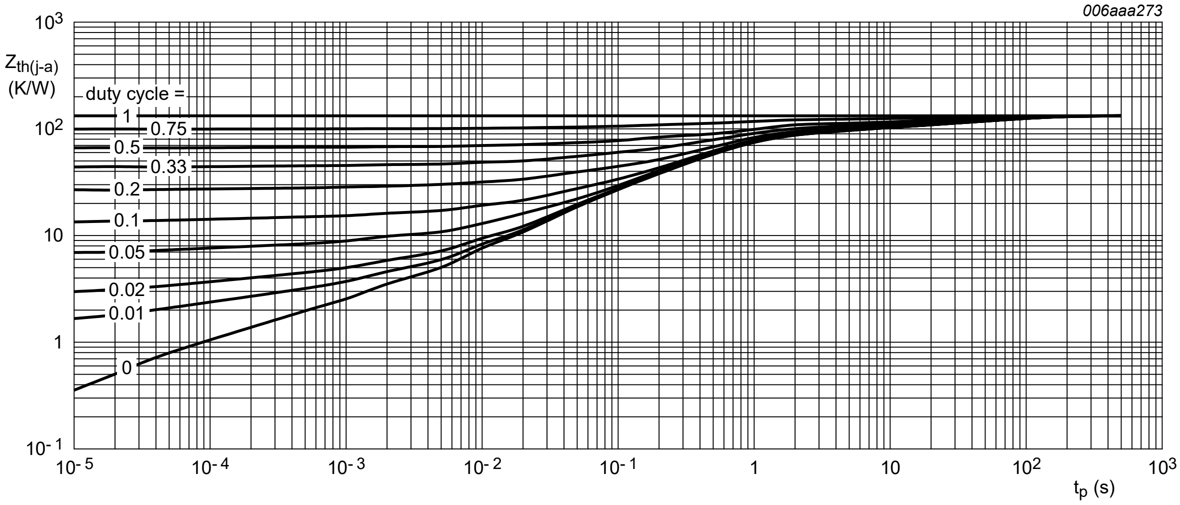
FR4 PCB, standard footprint

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



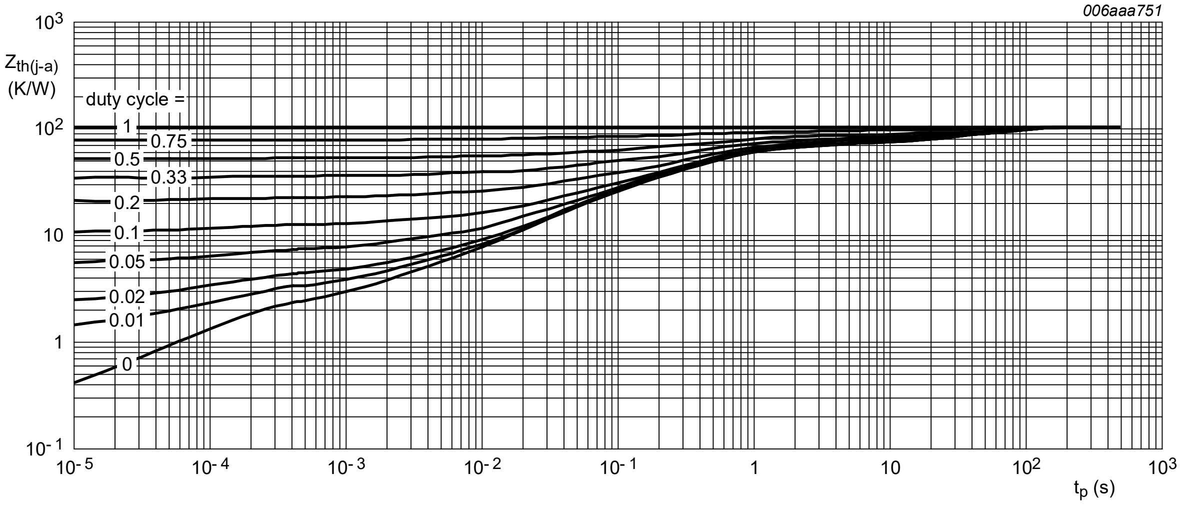
FR4 PCB, mounting pad for collector 1 cm^2

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



FR4 PCB, mounting pad for collector 6 cm^2

Fig. 4. Transient thermal impedance from junction to ambient as a function of pulse duration; typical values



Ceramic PCB, Al_2O_3, standard footprint

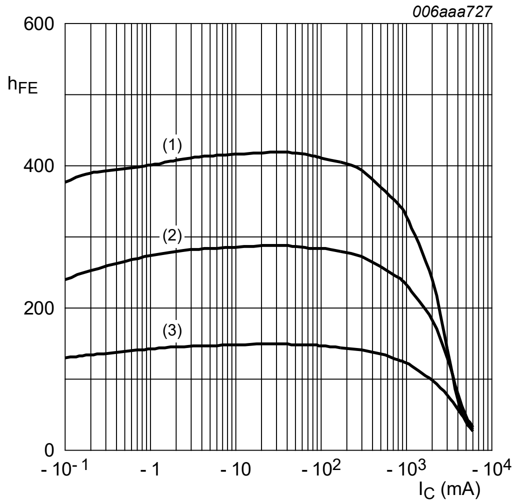
Fig. 5. Transient thermal impedance from junction to ambient as a function of pulse duration; typical values

10. Characteristics

Table 7. Characteristics

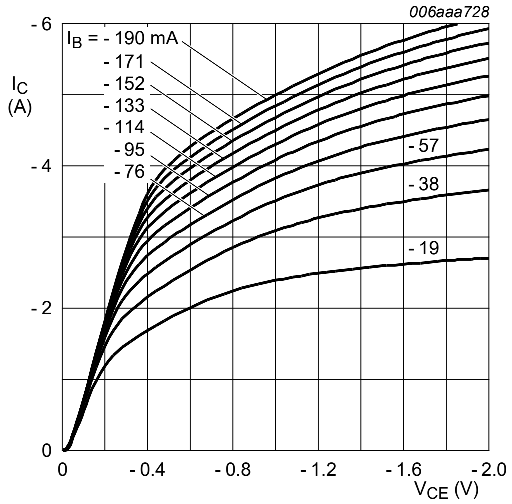
Symbol	Parameter	Conditions	Min	Typ	Max	Unit
I_{CBO}	collector-base cut-off current	V_{CB} = -60 V; I_E = 0 A; T_{amb} = 25 °C	-	-	-100	nA
		V_{CB} = -60 V; I_E = 0 A; T_j = 150 °C	-	-	-50	µA
I_{EBO}	emitter-base cut-off current	V_{EB} = -5 V; I_C = 0 A; T_{amb} = 25 °C	-	-	-100	nA
I_{CES}	collector-emitter cut-off current	V_{CE} = -48 V; V_{BE} = 0 V; T_{amb} = 25 °C	-	-	-100	nA
h_{FE}	DC current gain	V_{CE} = -2 V; I_C = -500 mA; pulsed; t_p ≤ 300 µs; δ ≤ 0.02; T_{amb} = 25 °C	180	265	-	
		V_{CE} = -2 V; I_C = -1 A; pulsed; t_p ≤ 300 µs; δ ≤ 0.02; T_{amb} = 25 °C	160	235	-	
		V_{CE} = -2 V; I_C = -2 A; pulsed; t_p ≤ 300 µs; δ ≤ 0.02; T_{amb} = 25 °C	130	185	-	
		V_{CE} = -2 V; I_C = -3 A; pulsed; t_p ≤ 300 µs; δ ≤ 0.02; T_{amb} = 25 °C	95	135	-	
		V_{CE} = -2 V; I_C = -4 A; pulsed; t_p ≤ 300 µs; δ ≤ 0.02; T_{amb} = 25 °C	60	80	-	
		V_{CE} = -2 V; I_C = -5 A; pulsed; t_p ≤ 300 µs; δ ≤ 0.02; T_{amb} = 25 °C	35	50	-	
		V_{CE} = -2 V; I_C = -6 A; pulsed; t_p ≤ 300 µs; δ ≤ 0.02; T_{amb} = 25 °C	20	30	-	
V_{CEsat}	collector-emitter saturation voltage	I_C = -500 mA; I_B = -50 mA; T_{amb} = 25 °C	-	-55	-70	mV
		I_C = -1 A; I_B = -50 mA; T_{amb} = 25 °C	-	-100	-135	mV
		I_C = -2 A; I_B = -200 mA; pulsed; t_p ≤ 300 µs; δ ≤ 0.02; T_{amb} = 25 °C	-	-150	-200	mV
		I_C = -3 A; I_B = -150 mA; pulsed; t_p ≤ 300 µs; δ ≤ 0.02; T_{amb} = 25 °C	-	-275	-365	mV
		I_C = -3 A; I_B = -300 mA; pulsed; t_p ≤ 300 µs; δ ≤ 0.02; T_{amb} = 25 °C	-	-210	-290	mV
		I_C = -4 A; I_B = -400 mA; pulsed; t_p ≤ 300 µs; δ ≤ 0.02; T_{amb} = 25 °C	-	-285	-385	mV
		I_C = -5 A; I_B = -500 mA; pulsed; t_p ≤ 300 µs; δ ≤ 0.02; T_{amb} = 25 °C	-	-375	-495	mV
		I_C = -6 A; I_B = -600 mA; pulsed; t_p ≤ 300 µs; δ ≤ 0.02; T_{amb} = 25 °C	-	-515	-675	mV
R_{CEsat}	collector-emitter saturation resistance	I_C = -2 A; I_B = -200 mA; pulsed; t_p ≤ 300 µs; δ ≤ 0.02; T_{amb} = 25 °C	-	75	100	mΩ
V_{BEsat}	base-emitter saturation voltage	I_C = -500 mA; I_B = -50 mA; T_{amb} = 25 °C	-	-0.78	-0.87	V
		I_C = -1 A; I_B = -50 mA; T_{amb} = 25 °C	-	-0.8	-0.89	V
		I_C = -1 A; I_B = -100 mA; pulsed; t_p ≤ 300 µs; δ ≤ 0.02; T_{amb} = 25 °C	-	-0.83	-0.92	V
		I_C = -3 A; I_B = -150 mA; pulsed; t_p ≤ 300 µs; δ ≤ 0.02; T_{amb} = 25 °C	-	-0.92	-0.99	V
		I_C = -3 A; I_B = -300 mA; pulsed; t_p ≤ 300 µs; δ ≤ 0.02; T_{amb} = 25 °C	-	-0.94	-1.02	V
V_{BEon}	base-emitter turn-on voltage	V_{CE} = -2 V; I_C = -2 A; T_{amb} = 25 °C	-	-0.8	-1	V

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
t_d	delay time	V_{CC} = -9.2 V; I_C = -2 A; I_{Bon} = -0.1 A; I_{Boff} = 0.1 A; T_{amb} = 25 °C		-	13	-	ns
t_r	rise time			-	53	-	ns
t_{on}	turn-on time			-	66	-	ns
t_s	storage time			-	230	-	ns
t_f	fall time			-	76	-	ns
t_{off}	turn-off time			-	306	-	ns
f_T	transition frequency	V_{CE} = -10 V; I_C = -100 mA; f = 100 MHz; T_{amb} = 25 °C		-	110	-	MHz
C_c	collector capacitance	V_{CB} = -10 V; I_E = 0 A; i_e = 0 A; f = 1 MHz; T_{amb} = 25 °C		-	58	-	pF



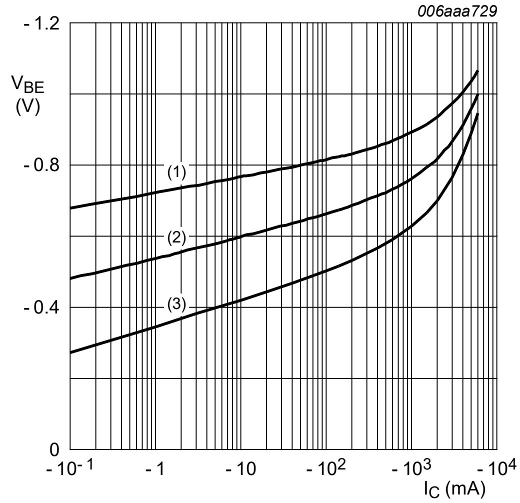
V_{CE} = −2 V
(1) T_{amb} = 100 °C
(2) T_{amb} = 25 °C
(3) T_{amb} = −55 °C

Fig. 6. DC current gain as a function of collector current; typical values



T_{amb} = 25 °C

Fig. 7. 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. 8. Base-emitter voltage as a function of collector current; typical values

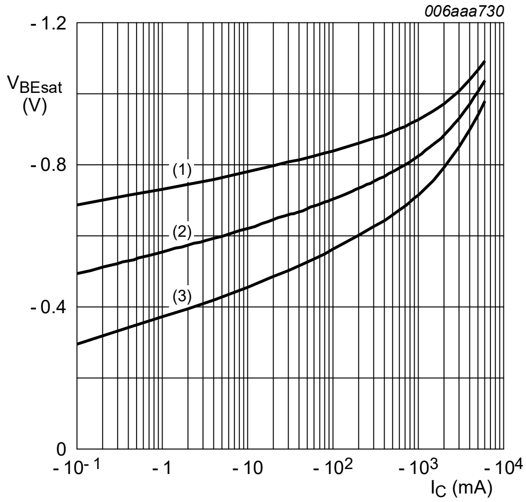
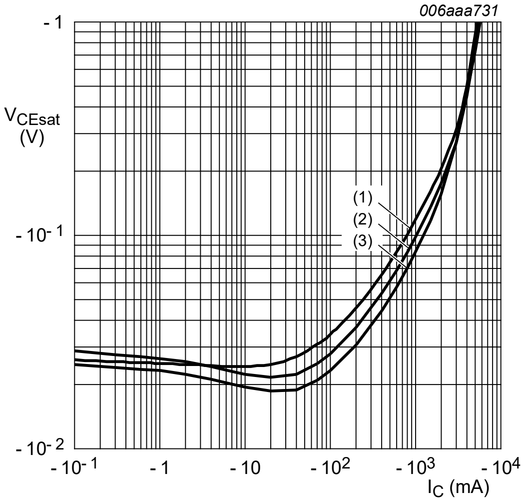
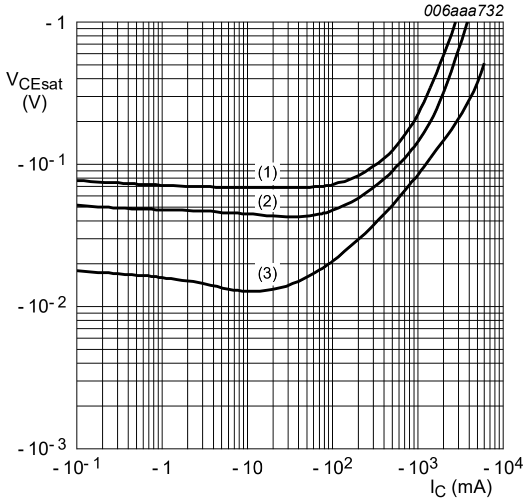


Fig. 9. Base-emitter saturation voltage as a function of collector current; typical values



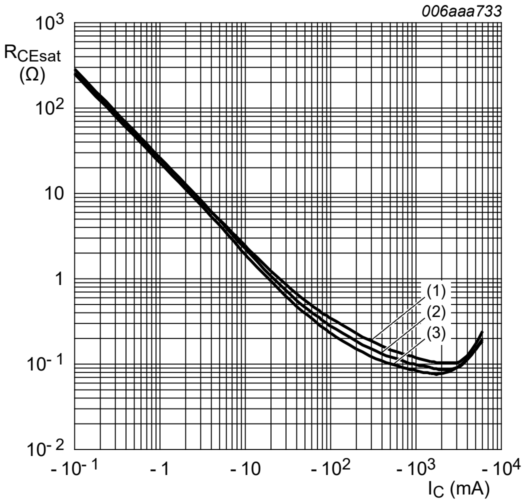
I_C/I_B = 20
(1) T_{amb} = 100 °C
(2) T_{amb} = 25 °C
(3) T_{amb} = −55 °C

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



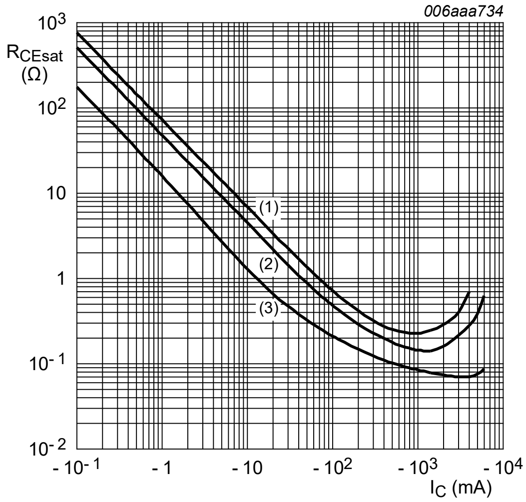
T_{amb} = 25 °C
(1) I_C/I_B = 100
(2) I_C/I_B = 50
(3) I_C/I_B = 10

Fig. 11. Collector-emitter saturation voltage 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. 12. Collector-emitter saturation resistance 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. 13. 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.

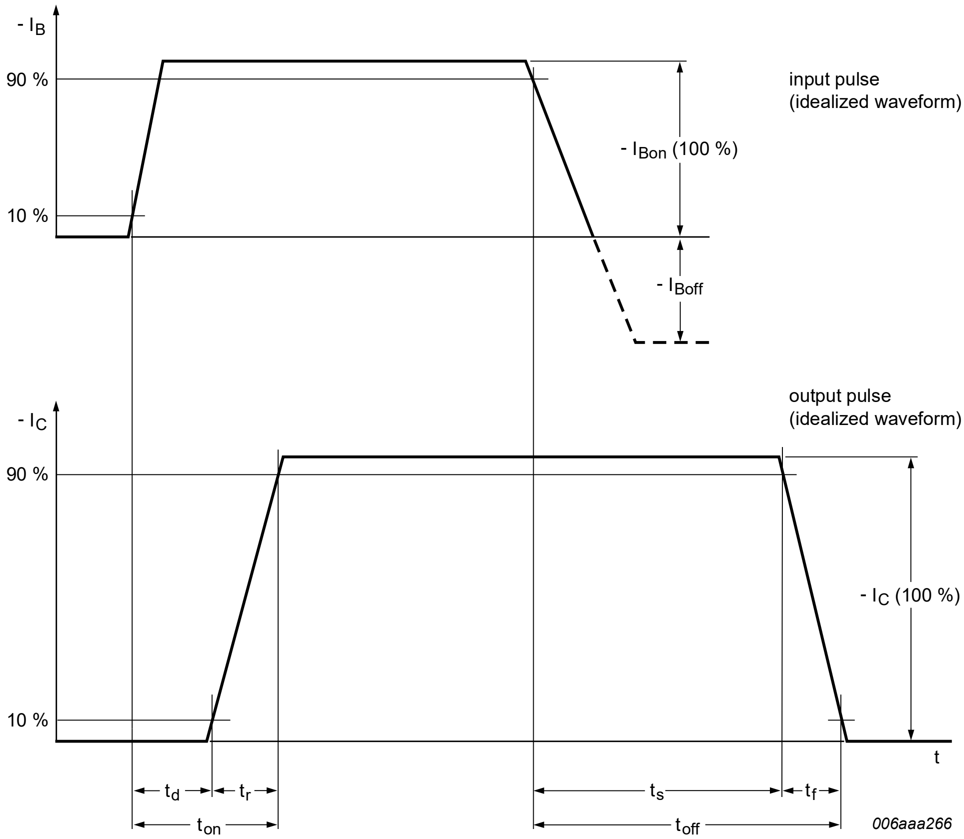
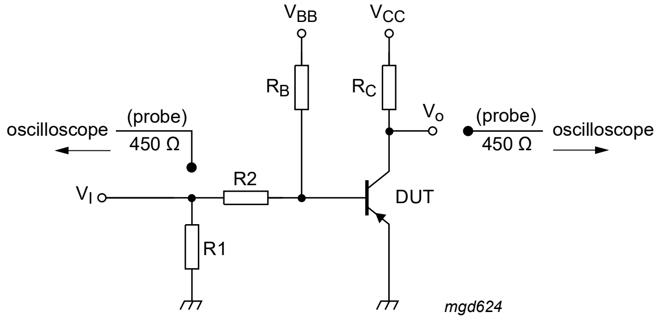


Fig. 14. Transistor switching time definition



V_{cc} = -9.2 V; I_C = -2 A; I_{Bon} = -0.1 A; I_{Boff} = 0.1 A

Fig. 15. Test circuit for switching times

12. Package outline

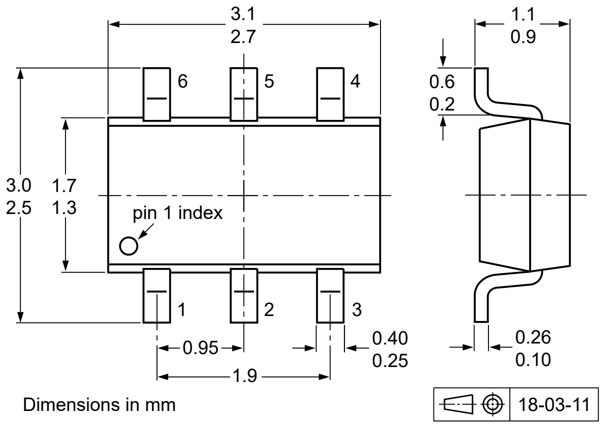


Fig. 16. Package outline TSOP6 (SOT457)

13. Soldering

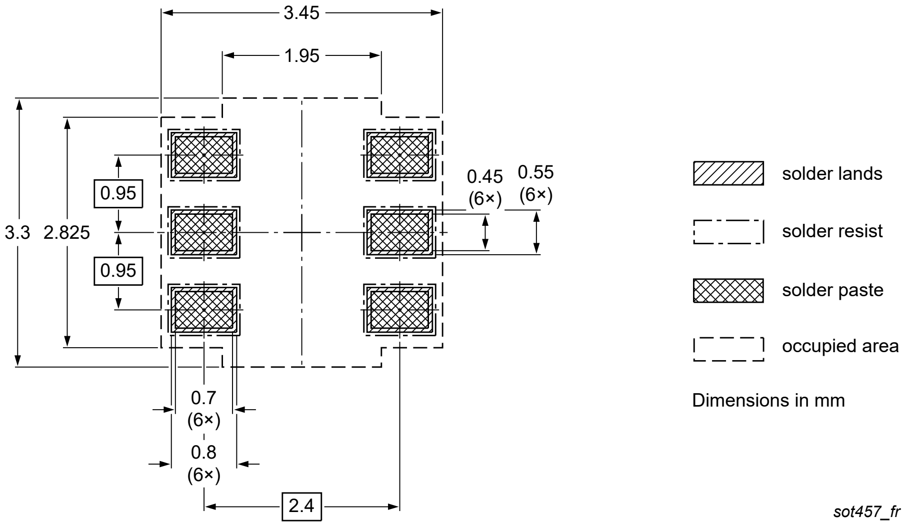


Fig. 17. Reflow soldering footprint for TSOP6 (SOT457)

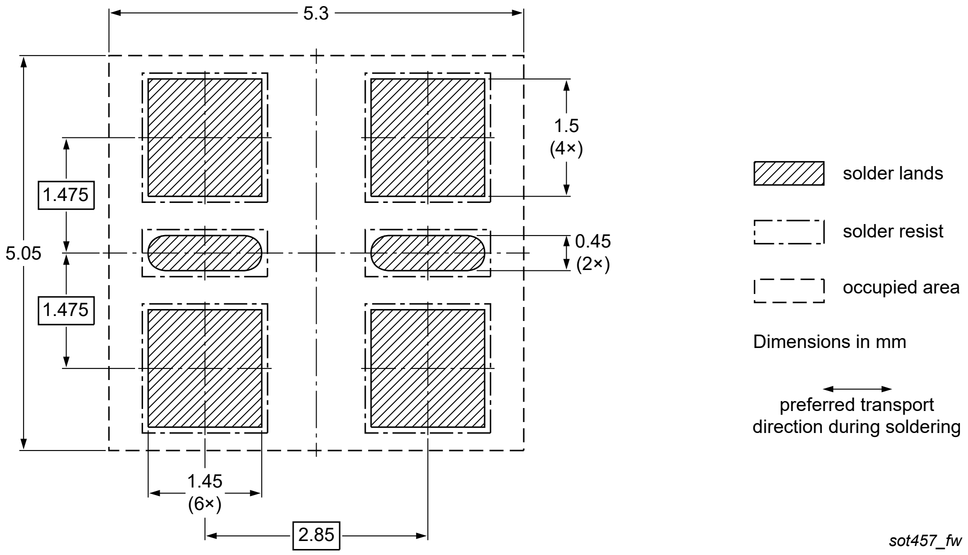


Fig. 18. Wave soldering footprint for TSOP6 (SOT457)

14. Revision history

Table 8. Revision history

Data sheet ID	Release date	Data sheet status	Change notice	Supersedes
PBSS303PD v.3	20230915	Product data sheet	-	PBSS303PD_2
Modifications:	• The format of this data sheet has been redesigned to comply with the identity guidelines of Nexperia. • Legal texts have been adapted to the new company name where appropriate. • Section "Packing information" removed.			
PBSS303PD_2	20091120	Product data sheet	-	PBSS303PD_1
PBSS303PD_1	20060531	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 https://www.nexperia.com.

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Contents

Date of release: 15 September 2023

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