



PBSS303PD-Q

60 V, 3 A PNP low V_{CEsat} 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
- Qualified according to AEC-Q101 and recommended for use in automotive applications

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

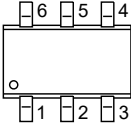
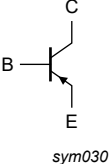
Table 1. Quick reference data

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 ≤ 1 ms		-	-	-6	A
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

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

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-Q	TSOP6	plastic, surface-mounted package (SC-74; TSOP6); 6 leads	SOT457

7. Marking

Table 4. Marking codes

Type number	Marking code
PBSS303PD-Q	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 ≤ 1 ms		-	-6	A
I _B	base current			-	-800	mA
I _{BM}	peak base current	single pulse; t _p ≤ 1 ms		-	-2	A
P _{tot}	total power dissipation	T _{amb} ≤ 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, Al₂O₃, standard footprint.
- [3] Device mounted on an FR4 PCB, single-sided copper, tin-plated, mounting pad for collector 1 cm².
- [4] Device mounted on an FR4 PCB, single-sided copper, tin-plated, mounting pad for collector 6 cm².
- [5] Pulse test: t_p ≤ 10 ms; δ ≤ 10 %.

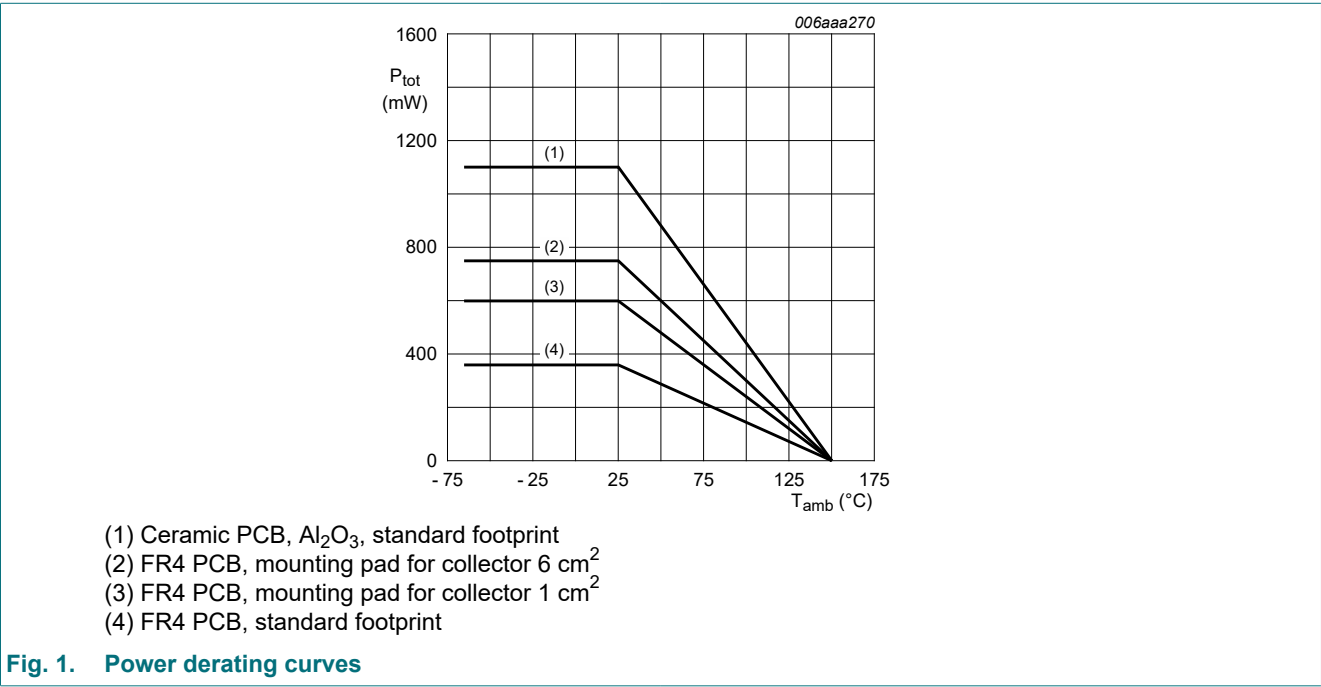


Fig. 1. Power derating curves

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 cm².
- [3] Device mounted on an FR4 PCB, single-sided copper, tin-plated, mounting pad for collector 6 cm².
- [4] Device mounted on a ceramic PCB, Al₂O₃, standard footprint.
- [5] Pulse test: t_p ≤ 10 ms; δ ≤ 10 %.

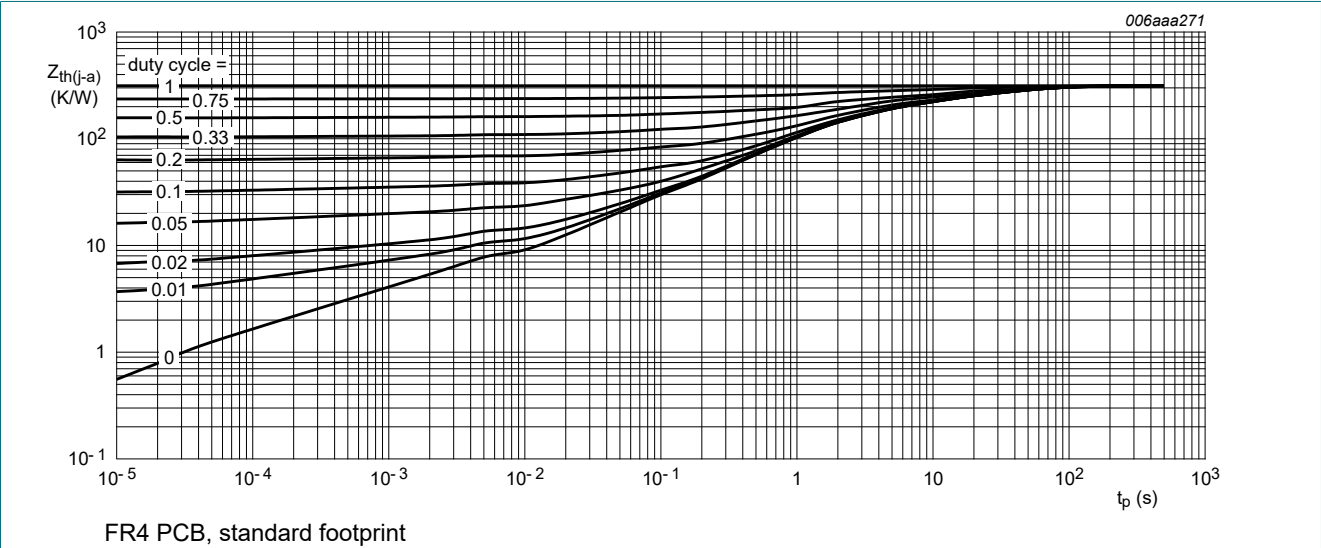


Fig. 2. Transient thermal impedance from junction to ambient as a function of pulse duration; typical values

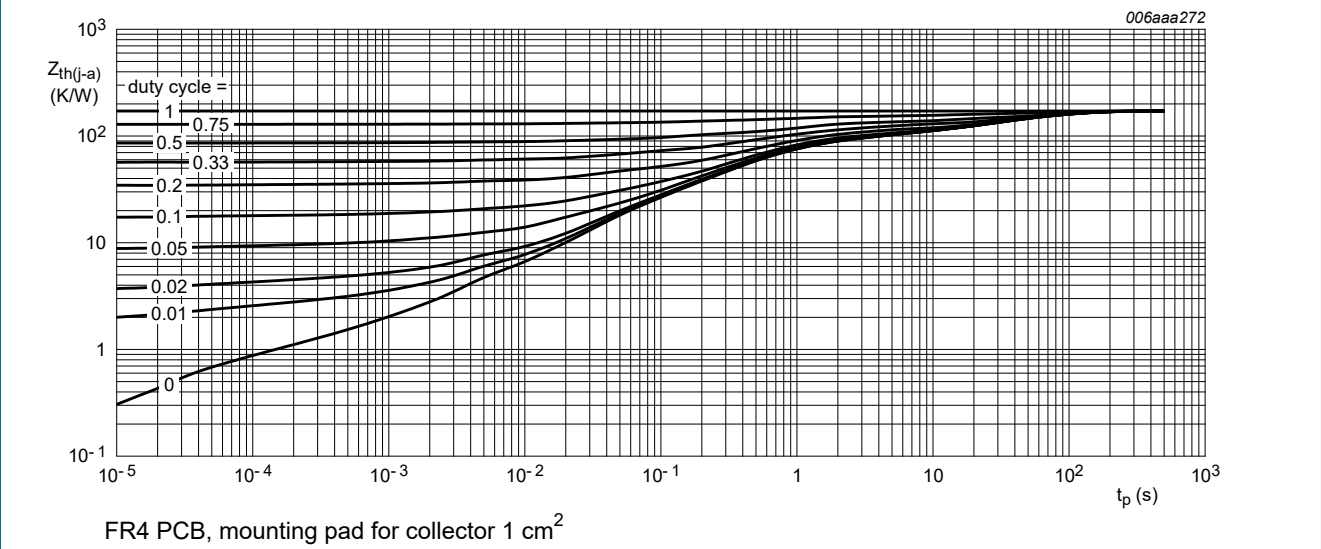


Fig. 3. Transient thermal impedance from junction to ambient as a function of pulse duration; typical values

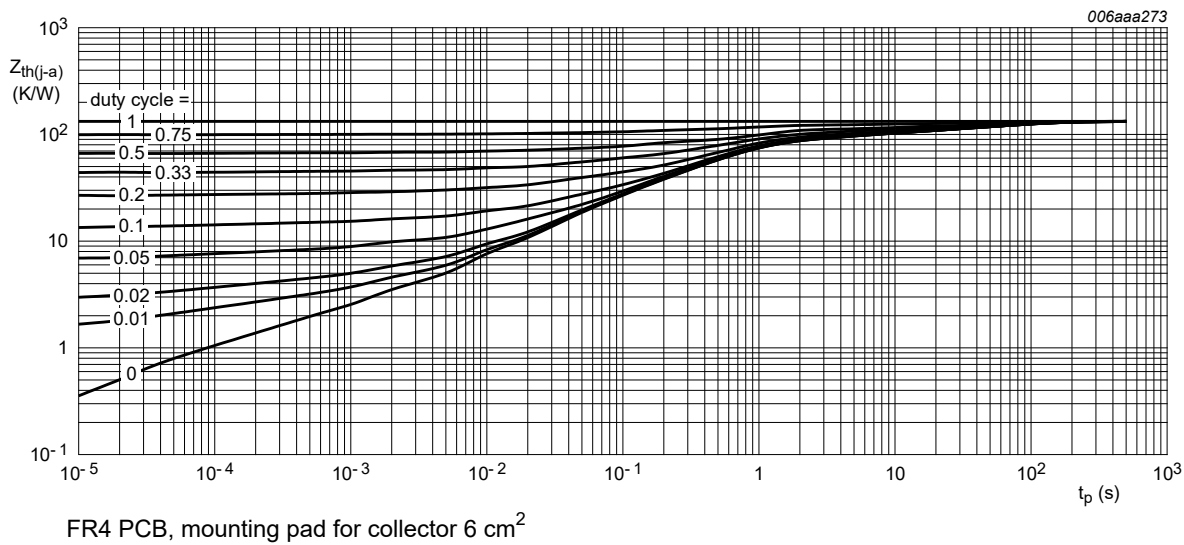


Fig. 4. Transient thermal impedance from junction to ambient as a function of pulse duration; typical values

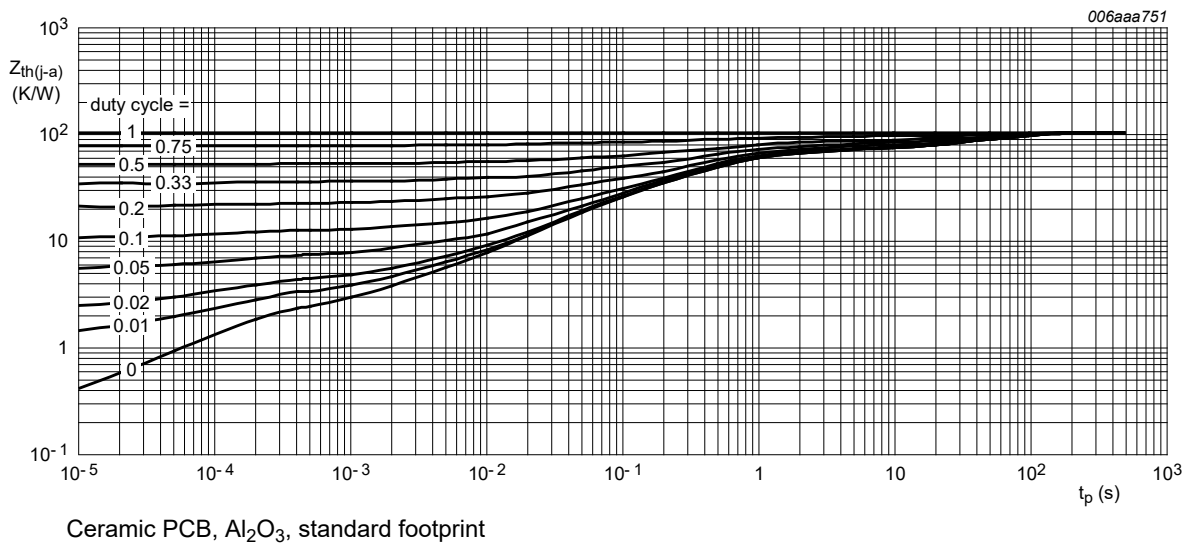


Fig. 5. Transient thermal impedance from junction to ambient as a function of pulse duration; typical values

10. Characteristics

Table 7. Characteristics

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

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
t_d	delay time	$V_{CC} = -9.2\text{ V}; I_C = -2\text{ A}; I_{B\text{on}} = -0.1\text{ A};$ $I_{B\text{off}} = 0.1\text{ A}; T_{\text{amb}} = 25\text{ }^\circ\text{C}$	-	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	$V_{CE} = -10\text{ V}; I_C = -100\text{ mA}; f = 100\text{ MHz};$ $T_{\text{amb}} = 25\text{ }^\circ\text{C}$	-	110	-	MHz
C_c	collector capacitance	$V_{CB} = -10\text{ V}; I_E = 0\text{ A}; i_e = 0\text{ A};$ $f = 1\text{ MHz}; T_{\text{amb}} = 25\text{ }^\circ\text{C}$	-	58	-	pF

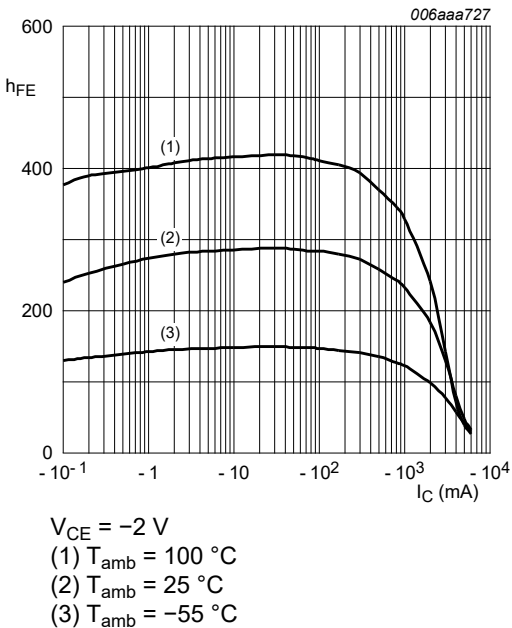


Fig. 6. DC current gain as a function of collector current; typical values

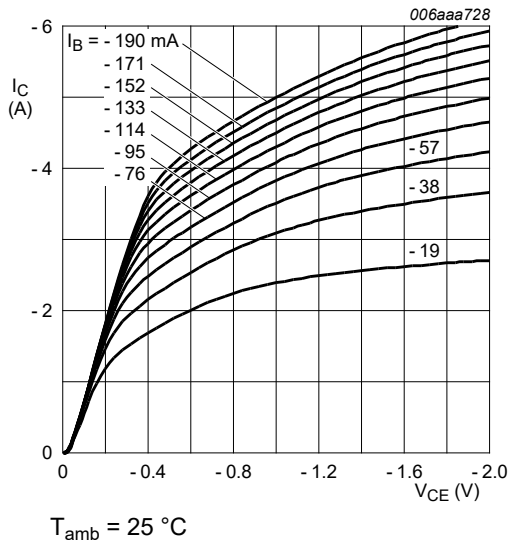


Fig. 7. Collector current as a function of collector-emitter voltage; typical values

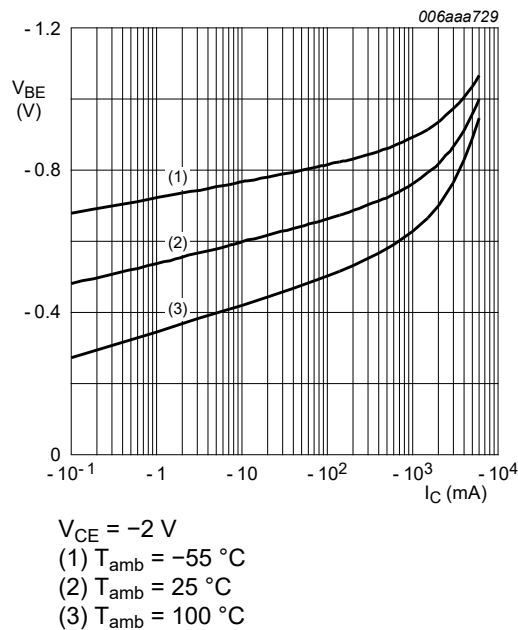


Fig. 8. Base-emitter voltage as a function of collector current; typical values

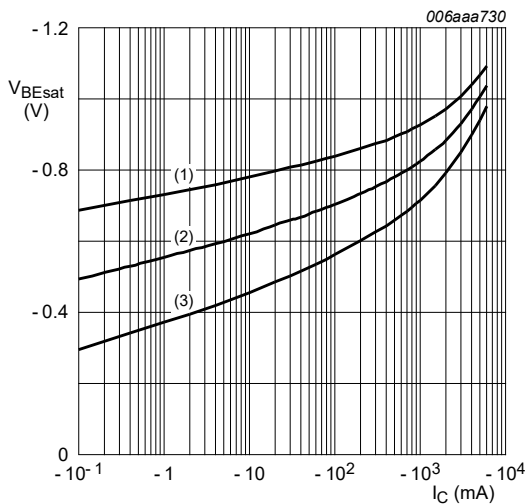


Fig. 9. Base-emitter saturation voltage as a function of collector current; typical values

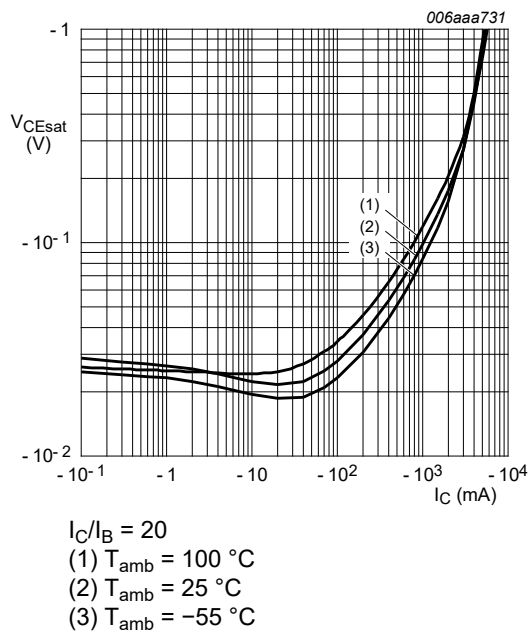


Fig. 10. Collector-emitter saturation voltage as a function of collector current; typical values

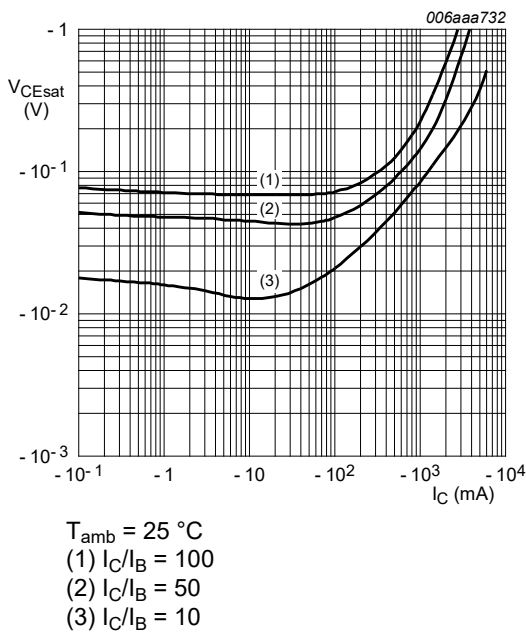
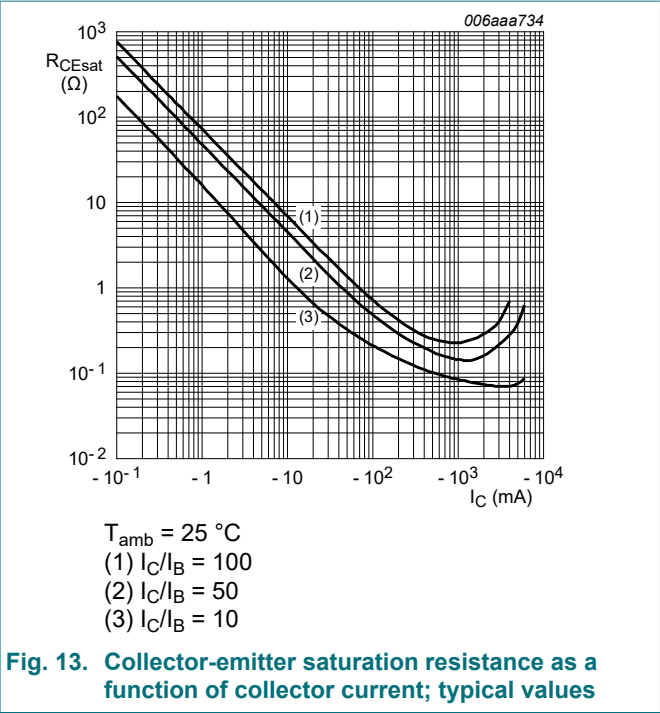
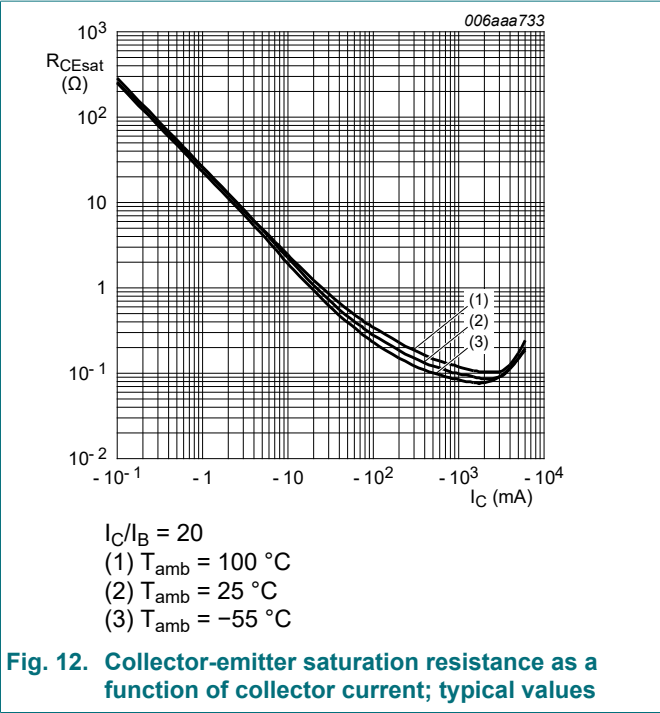


Fig. 11. Collector-emitter saturation voltage as a function of collector current; typical values



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.

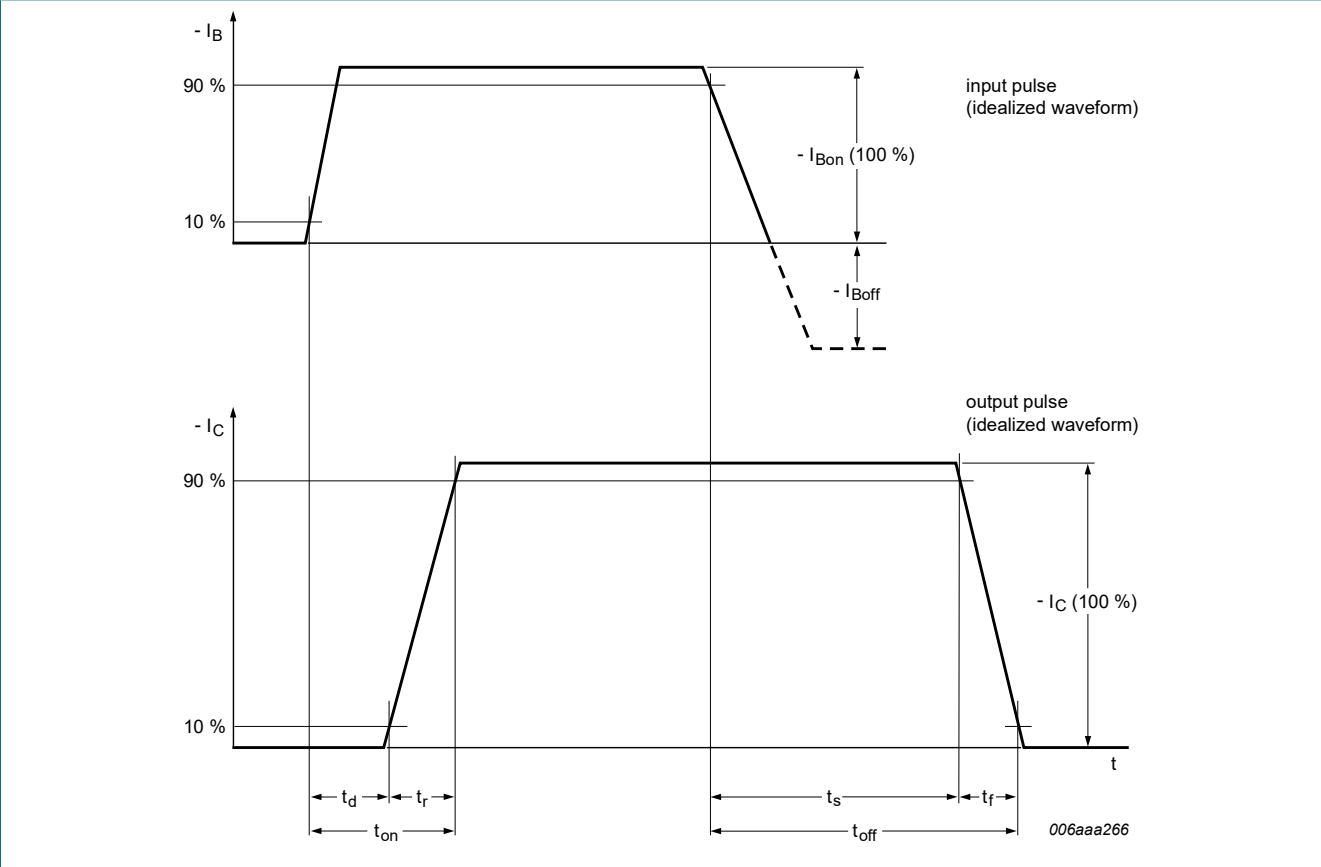


Fig. 14. Transistor switching time definition

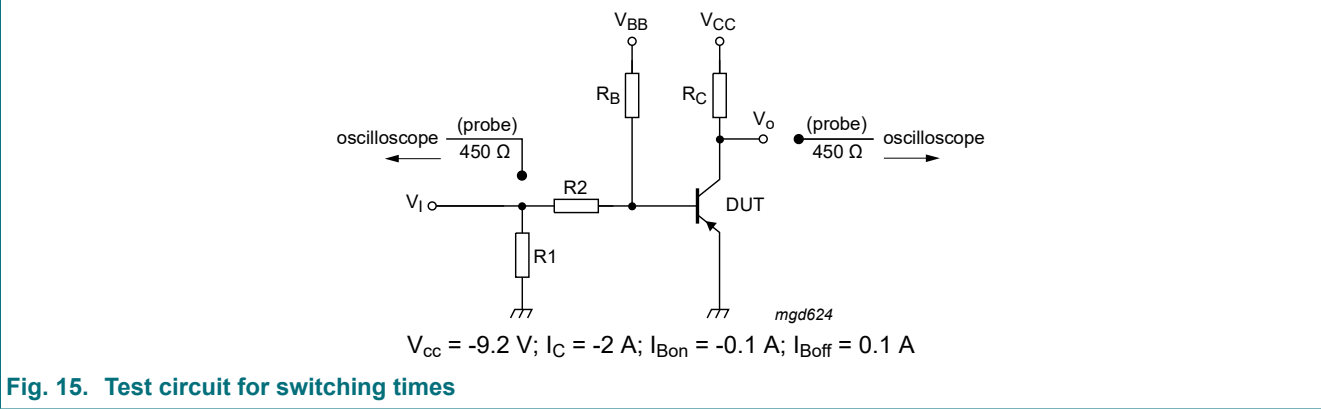
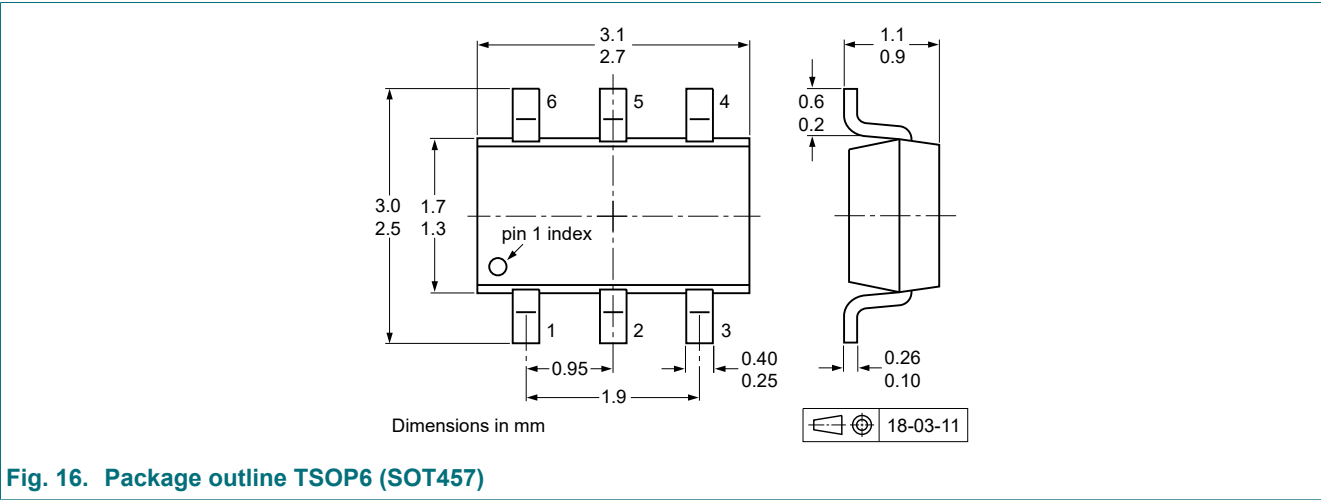
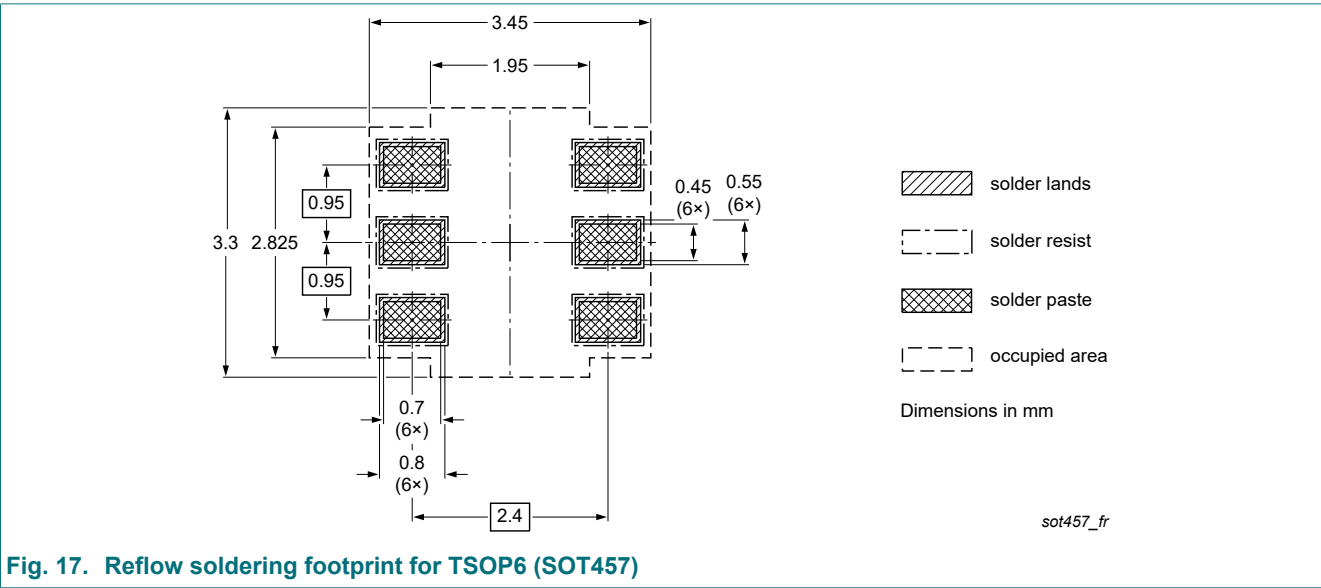


Fig. 15. Test circuit for switching times

12. Package outline



13. Soldering



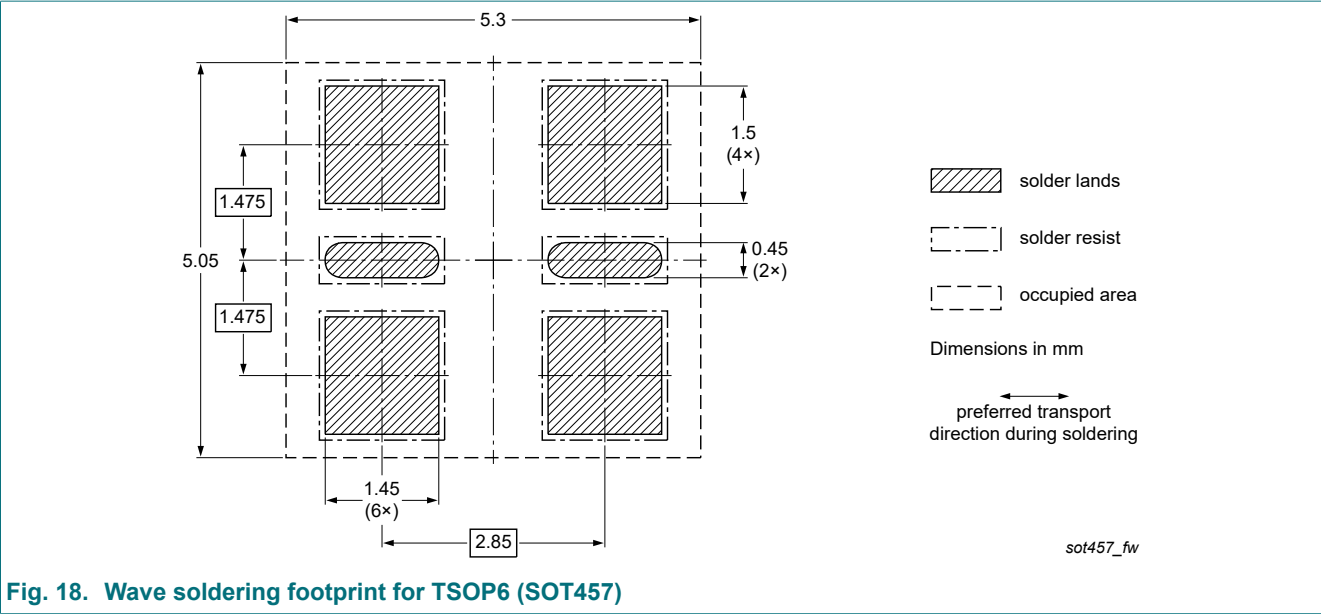


Fig. 18. Wave soldering footprint for TSOP6 (SOT457)

14. Revision history

Table 8. Revision history

Data sheet ID	Release date	Data sheet status	Change notice	Supersedes
PBSS303PD-Q v.1	20230915	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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- [2] The term 'short data sheet' is explained in section "Definitions".
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For sales office addresses, please send an email to: salesaddresses@nexperia.com

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