



PBSS302ND

40 V, 4 A NPN low V_{CEsat} transistor

9 October 2024

Product data sheet

1. General description

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

PNP complement: PBSS302PD

2. Features and benefits

- Ultra low collector-emitter saturation voltage V_{CEsat}
- 4 A continuous collector current capability I_C
- Up to 15 A peak current
- Very low collector-emitter saturation resistance
- High efficiency due to less heat generation

3. Applications

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

4. Quick reference data

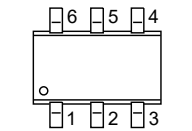
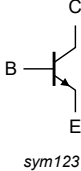
Table 1. Quick reference data

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
V _{CEO}	collector-emitter voltage	open base		-	-	40	V
I _C	collector current		[1]	-	-	4	A
I _{CM}	peak collector current	single pulse; t _p ≤ 1 ms		-	-	15	A
R _{CEsat}	collector-emitter saturation resistance	I _C = 6 A; I _B = 600 mA; pulsed; t _p ≤ 300 μs; δ ≤ 0.02; T _{amb} = 25 °C		-	55	75	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)	 sym123
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
PBSS302ND	TSOP6	plastic, surface-mounted package (SC-74; TSOP6); 6 leads	SOT457

7. Marking

Table 4. Marking codes

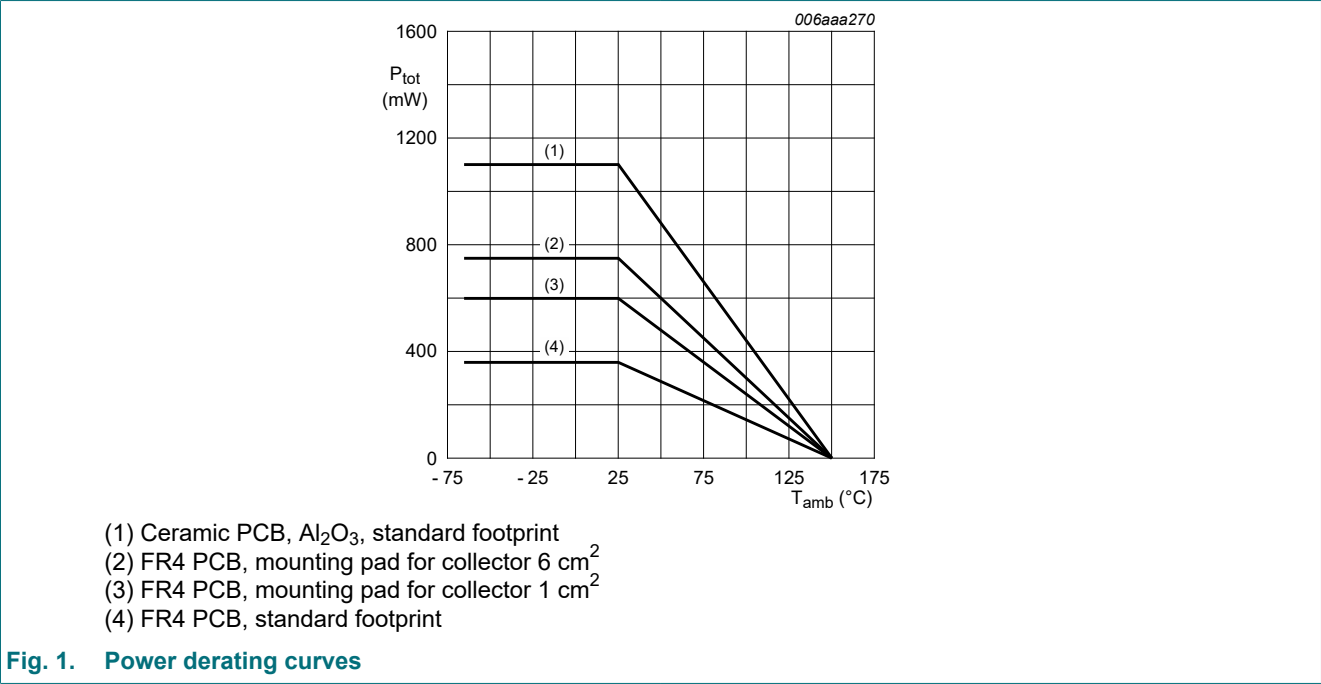
Type number	Marking code
PBSS302ND	C7

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		-	40	V
V _{EBO}	emitter-base voltage	open collector		-	5	V
I _C	collector current		[1]	-	4	A
I _{CM}	peak collector current	single pulse; t _p ≤ 1 ms		-	15	A
I _B	base current			-	0.8	A
I _{BM}	peak base current	single pulse; t _p ≤ 1 ms		-	2	mA
P _{tot}	total power dissipation	T _{amb} ≤ 25 °C	[2]	-	360	mW
			[3]	-	600	mW
			[4]	-	750	mW
			[1]	-	1.1	W
			[2] [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 a ceramic PCB, Al₂O₃, standard footprint.
- [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 cm².
- [4] Device mounted on an FR4 PCB, single-sided copper, tin-plated, mounting pad for collector 6 cm².
- [5] Operated under pulsed conditions: Duty cycle δ ≤ 10 % and pulse width t_p ≤ 10 ms.



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] Operated under pulsed conditions: Duty cycle $\delta \leq 10\%$ and pulse width $t_p \leq 10$ ms.

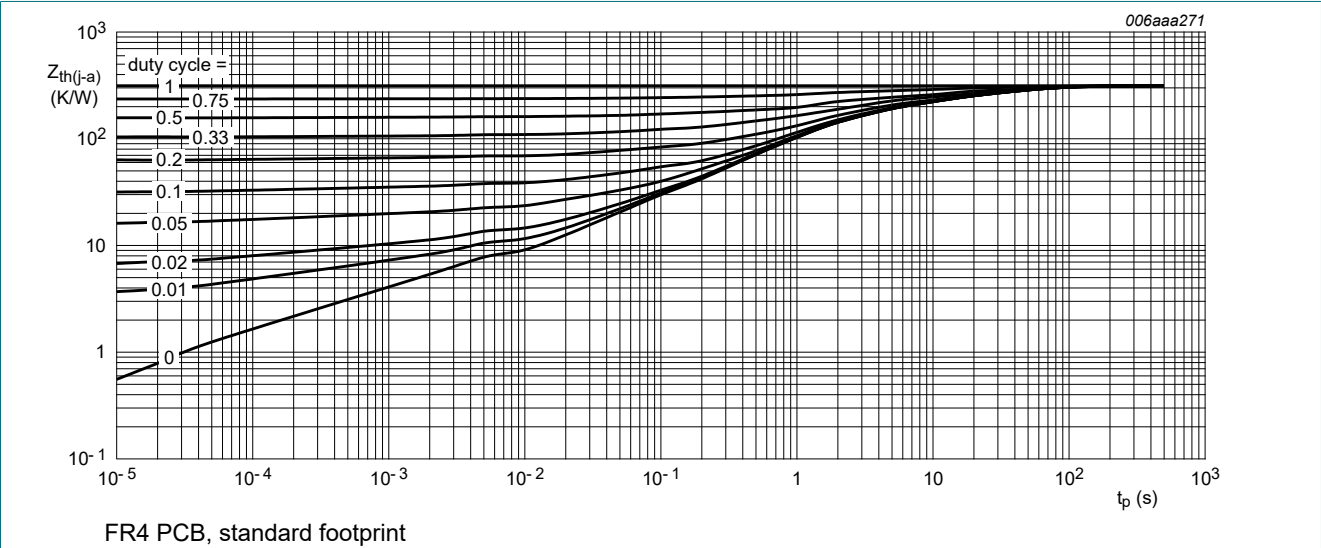


Fig. 2. Transient thermal impedance from junction to ambient as a function of pulse duration; typical values

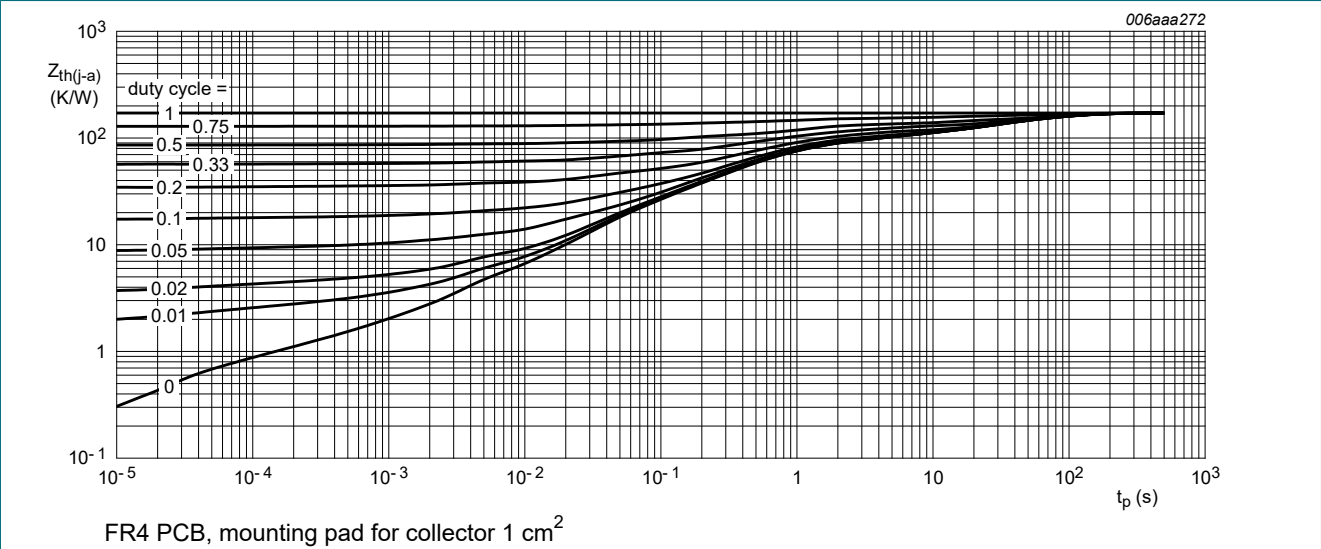
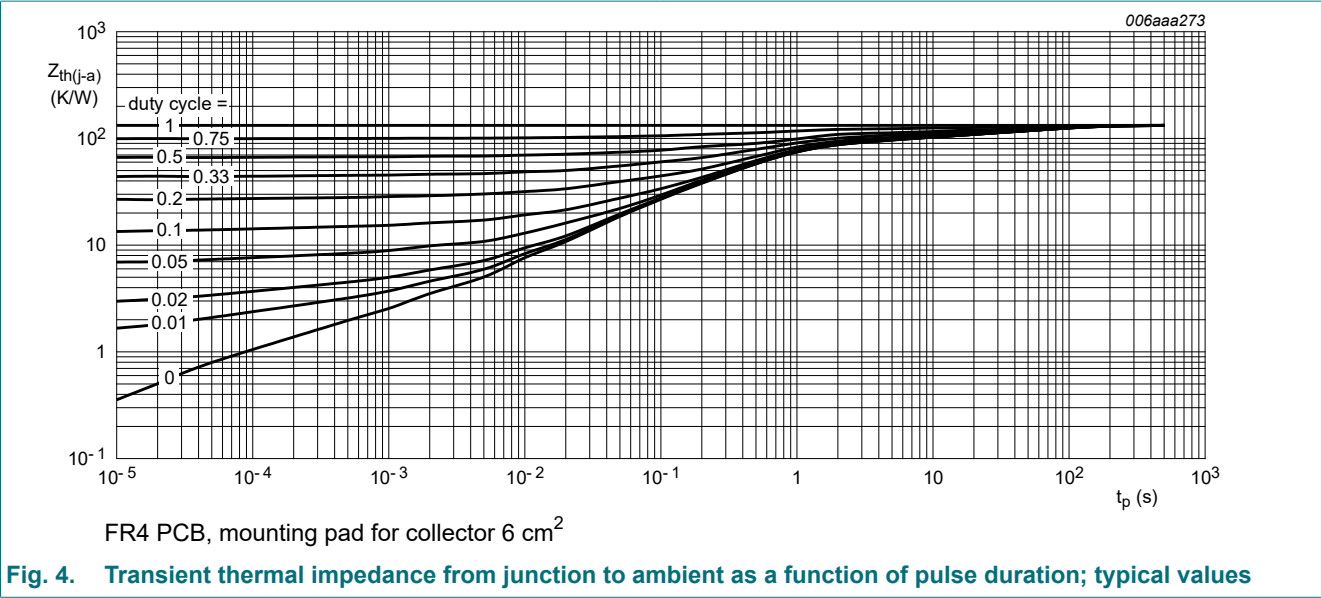


Fig. 3. Transient thermal impedance from junction to ambient as a function of pulse duration; typical values



10. Characteristics

Table 7. Characteristics

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
I _{CBO}	collector-base cut-off current	V _{CB} = 40 V; I _E = 0 A; T _{amb} = 25 °C		-	-	100	nA
		V _{CB} = 40 V; I _E = 0 A; T _j = 150 °C		-	-	50	μA
I _{CES}	collector-emitter cut-off current	V _{CE} = 30 V; V _{BE} = 0 V; T _{amb} = 25 °C		-	-	100	nA
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		300	500	-	
		V _{CE} = 2 V; I _C = 1 A; pulsed; t _p ≤ 300 μs; δ ≤ 0.02; T _{amb} = 25 °C		300	475	-	
		V _{CE} = 2 V; I _C = 2 A; pulsed; t _p ≤ 300 μs; δ ≤ 0.02; T _{amb} = 25 °C		250	385	-	
		V _{CE} = 2 V; I _C = 4 A; pulsed; t _p ≤ 300 μs; δ ≤ 0.02; T _{amb} = 25 °C		100	190	-	
		V _{CE} = 2 V; I _C = 6 A; pulsed; t _p ≤ 300 μs; δ ≤ 0.02; T _{amb} = 25 °C		50	100	-	
V _{CEsat}	collector-emitter saturation voltage	I _C = 0.5 A; I _B = 50 mA; T _{amb} = 25 °C		-	35	60	mV
		I _C = 1 A; I _B = 50 mA; T _{amb} = 25 °C		-	65	110	mV
		I _C = 2 A; I _B = 200 mA; T _{amb} = 25 °C		-	115	180	mV
		I _C = 4 A; I _B = 400 mA; pulsed; t _p ≤ 300 μs; δ ≤ 0.02; T _{amb} = 25 °C		-	220	300	mV
		I _C = 6 A; I _B = 600 mA; pulsed; t _p ≤ 300 μs; δ ≤ 0.02; T _{amb} = 25 °C		-	330	450	mV
R _{CEsat}	collector-emitter saturation resistance			-	55	75	mΩ
V _{BEsat}	base-emitter saturation voltage	I _C = 0.5 A; I _B = 50 mA; T _{amb} = 25 °C		-	0.79	0.85	V
		I _C = 1 A; I _B = 50 mA; T _{amb} = 25 °C		-	0.81	0.9	V
		I _C = 1 A; I _B = 100 mA; pulsed; t _p ≤ 300 μs; δ ≤ 0.02; T _{amb} = 25 °C		-	0.83	1	V
		I _C = 4 A; I _B = 400 mA; pulsed; t _p ≤ 300 μs; δ ≤ 0.02; T _{amb} = 25 °C		-	1	1.1	V
V _{BEon}	base-emitter turn-on voltage	V _{CE} = 2 V; I _C = 2 A; T _{amb} = 25 °C		-	0.79	1	V
t _d	delay time	V _{CC} = 10 V; I _C = 2 A; I _{Bon} = 0.1 A; I _{Boff} = -0.1 A; T _{amb} = 25 °C		-	12	-	ns
t _r	rise time			-	52	-	ns
t _{on}	turn-on time			-	64	-	ns
t _s	storage time			-	390	-	ns
t _f	fall time			-	120	-	ns
t _{off}	turn-off time			-	510	-	ns
f _T	transition frequency	V _{CE} = 10 V; I _C = 0.1 A; f = 100 MHz; T _{amb} = 25 °C		-	150	-	MHz
C _c	collector capacitance	V _{CB} = 10 V; I _E = 0 A; i _e = 0 A; f = 1 MHz; T _{amb} = 25 °C		-	30	-	pF

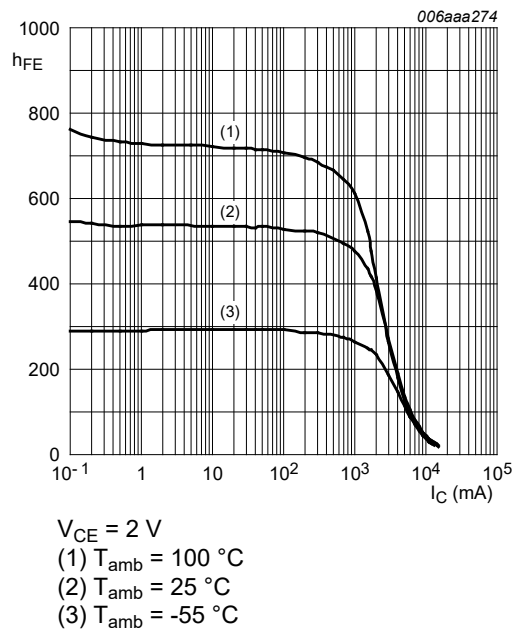


Fig. 5. DC current gain as a function of collector current; typical values

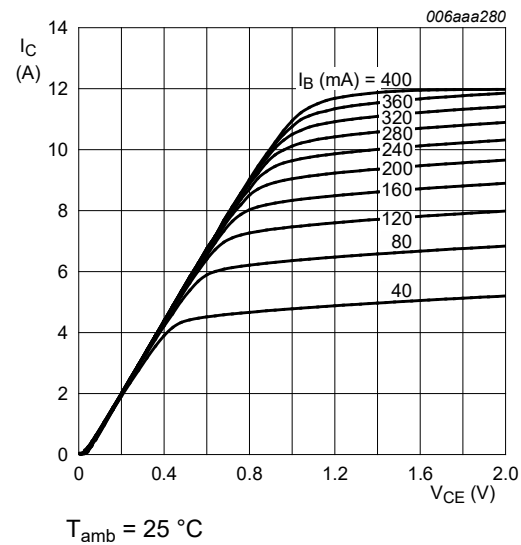


Fig. 6. Collector current as a function of collector-emitter voltage; typical values

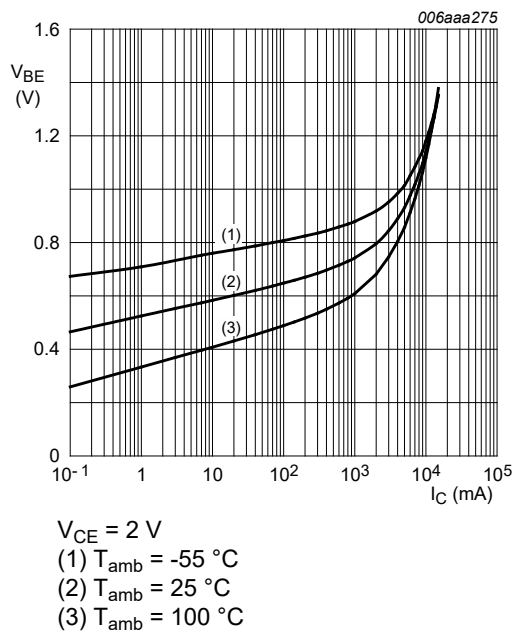


Fig. 7. Base-emitter voltage as a function of collector current; typical values

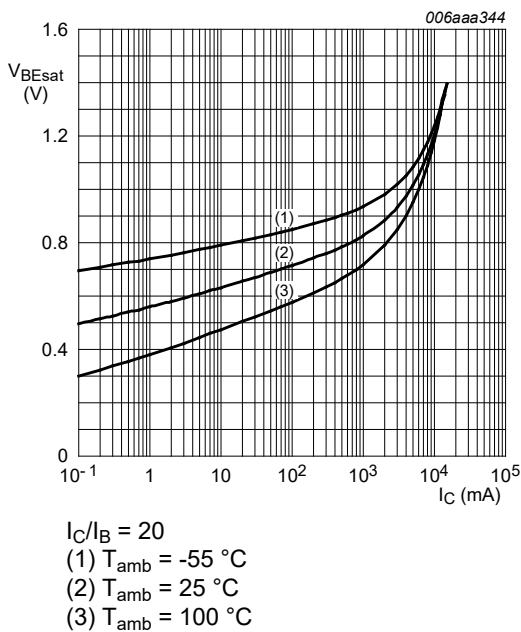


Fig. 8. Base-emitter saturation voltage as a function of collector current; typical values

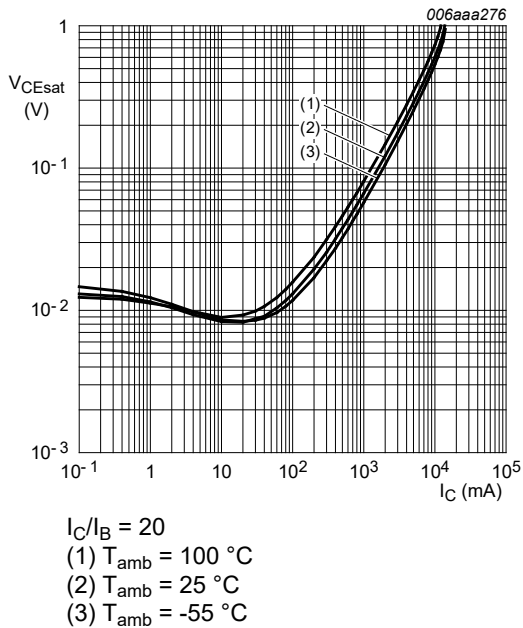


Fig. 9. Collector-emitter saturation voltage as a function of collector current; typical values

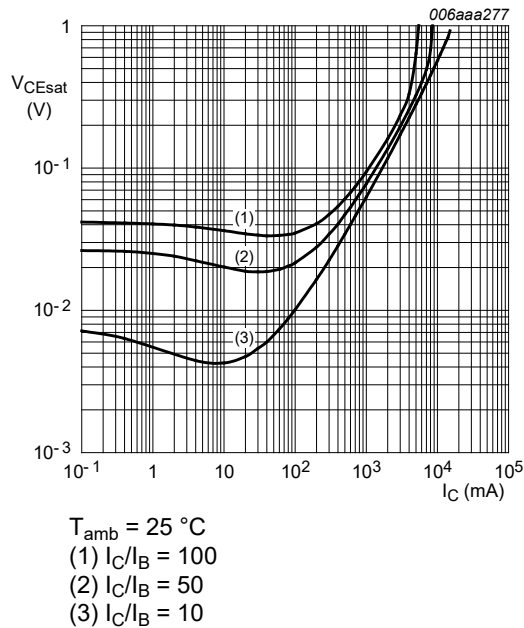


Fig. 10. Collector-emitter saturation voltage as a function of collector current; typical values

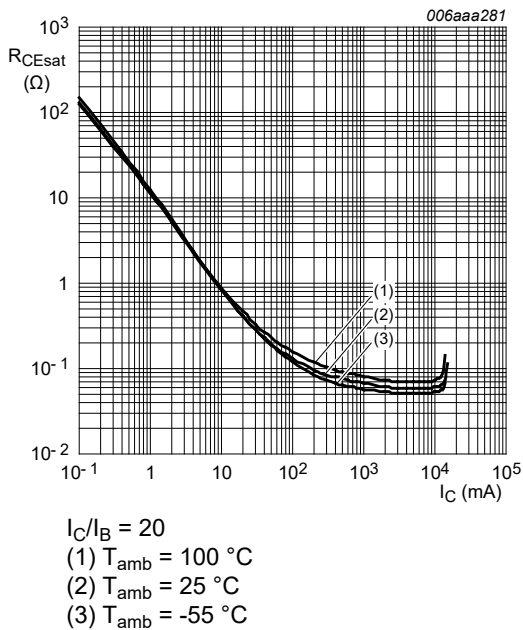


Fig. 11. Collector-emitter saturation resistance as a function of collector current; typical values

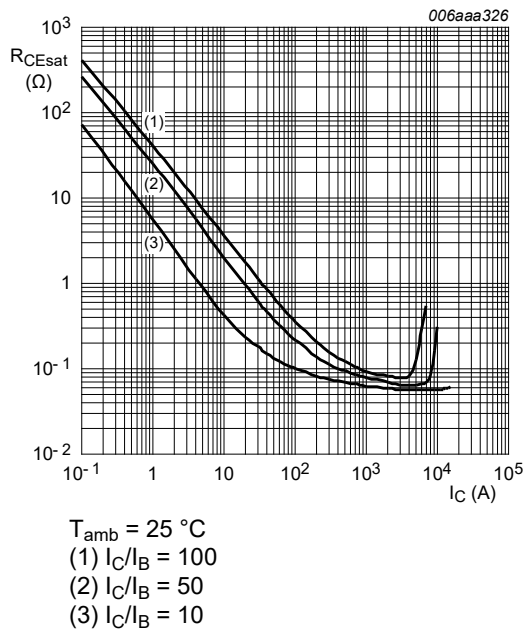


Fig. 12. Collector-emitter saturation resistance as a function of collector current; typical values

11. Test information

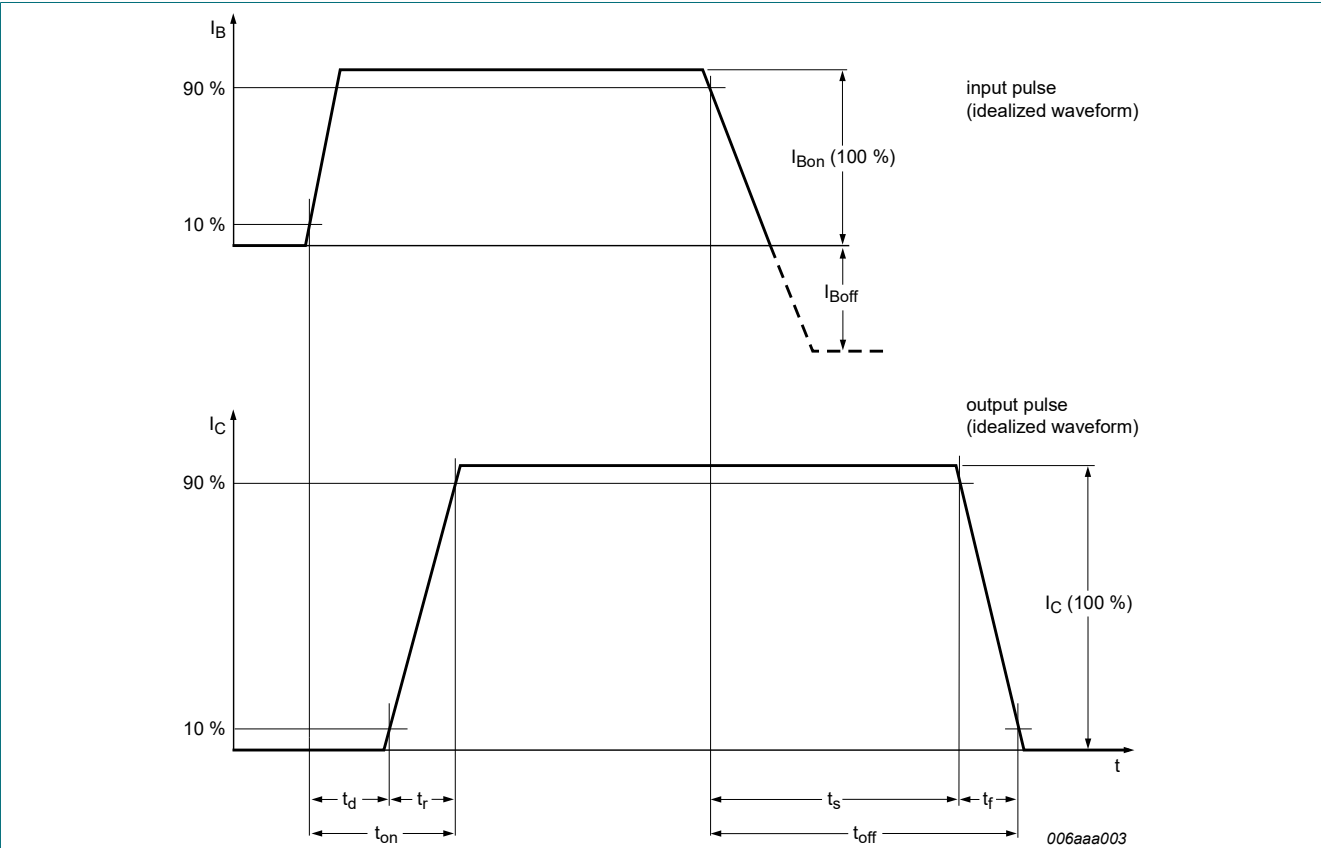


Fig. 13. Switching time definition

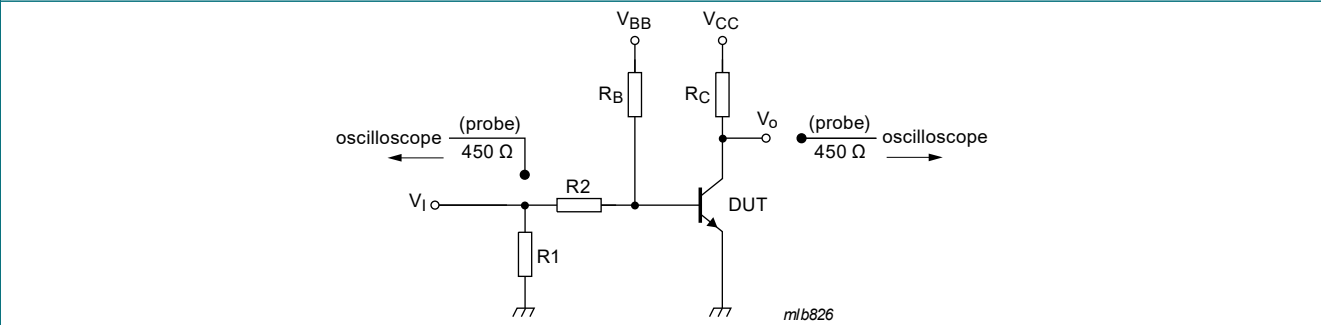
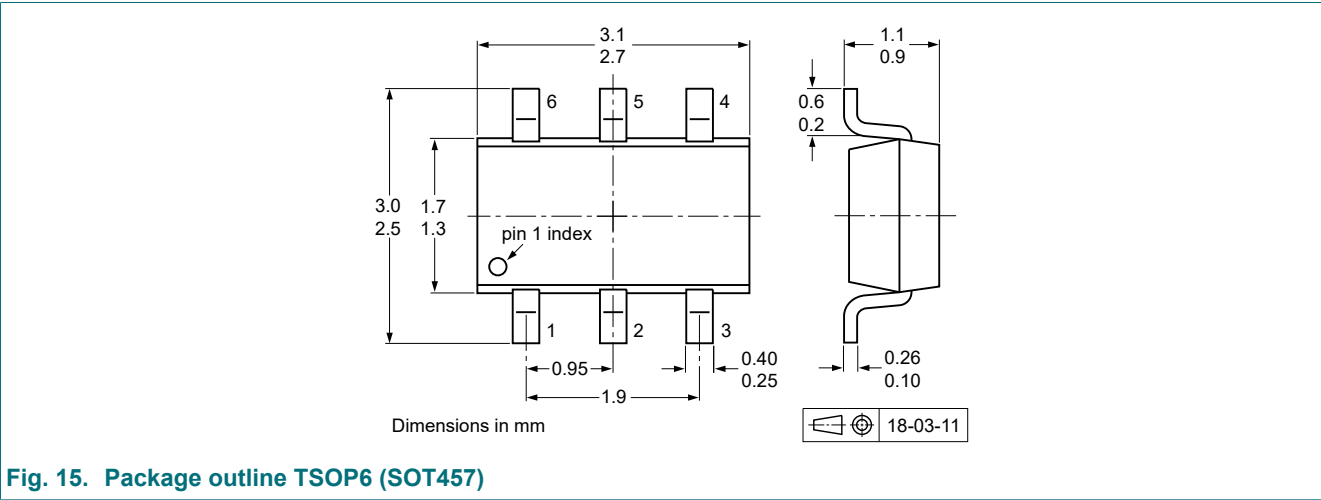
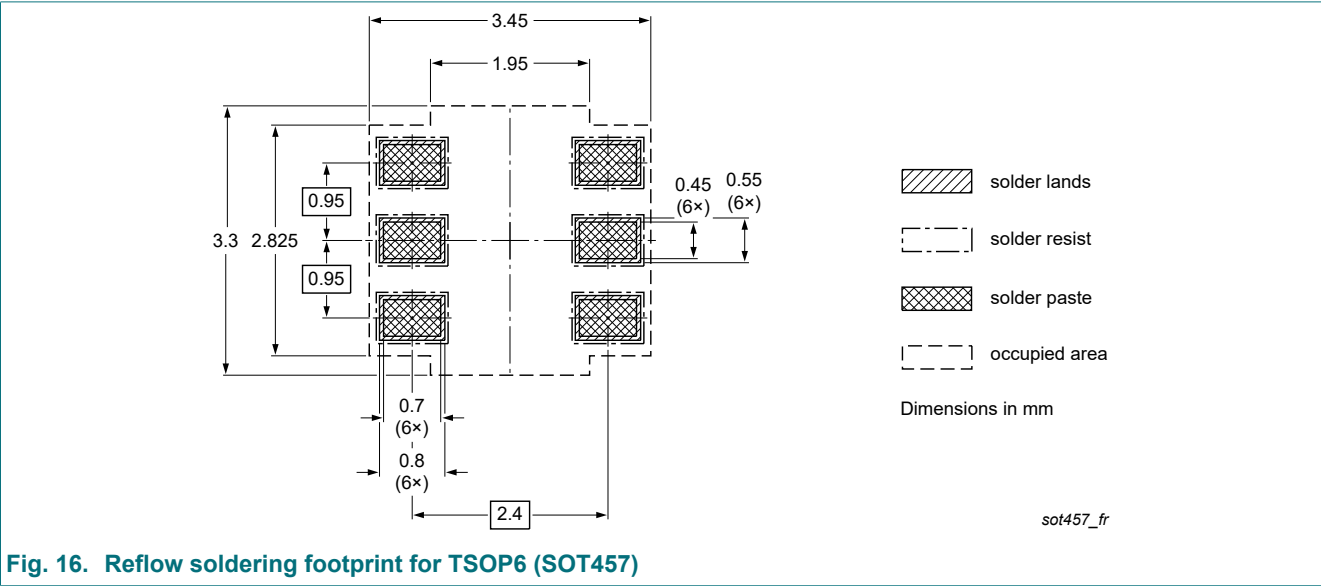


Fig. 14. Test circuit for switching times

12. Package outline



13. Soldering



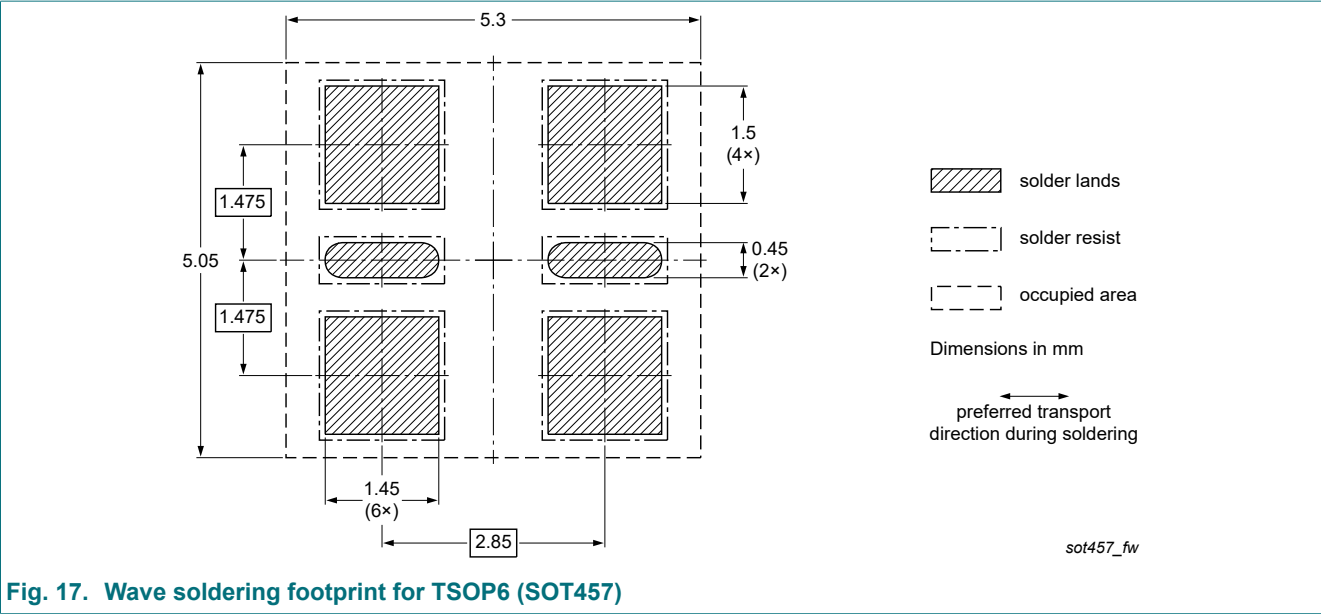


Fig. 17. Wave soldering footprint for TSOP6 (SOT457)

14. Revision history

Table 8. Revision history

Data sheet ID	Release date	Data sheet status	Change notice	Supersedes
PBSS302ND v.4	20241009	Product data sheet	-	PBSS302ND v.3
Modifications:	Product(s) changed to non-automotive qualification. Please refer to nexperia.com for automotive (-Q) product alternative(s).			
PBSS302ND v.3	20230420	Product data sheet	-	PBSS302ND_2
PBSS302ND_2	20080218	Product data sheet	-	PBSS302ND_1
PBSS302ND_1	20050419	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".
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