



PBSS5440D

40 V, 4 A PNP low VCEsat transistor

26 September 2023

Product data sheet

1. General description

PNP low VCEsat single bipolar PNP transistor in a SOT457 (SC-74) SMD plastic package.

NPN complement: PBSS4440D

2. Features and benefits

- Ultra low collector-emitter saturation voltage VCEsat
- 4 A continuous collector current capability IC (DC)
- Up to 15 A peak current
- Very low collector-emitter saturation resistance
- High efficiency due to less heat generation
- AEC-Q101 qualified

3. Applications

- Power management functions
- Charging circuits
- DC-to-DC conversion
- MOSFET gate driving
- Power switches (e.g. motors, fans)
- Thin Film Transistor (TFT) backlight inverter

4. Quick reference data

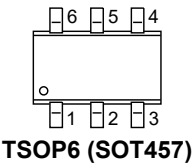
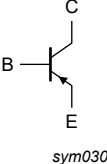
Table 1. Quick reference data

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	limited by T _{j(max)} ; 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)	 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
PBSS5440D	TSOP6	plastic, surface-mounted package (SC-74; TSOP6); 6 leads	SOT457

7. Marking

Table 4. Marking codes

Type number	Marking code
PBSS5440D	71

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		-	-40	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	limited by T _{j(max)} ; single pulse; t _p = 1 ms		-	-15	A
I _B	base current			-	-0.8	A
I _{BM}	peak base current	single pulse; t _p ≤ 300 μs		-	-2	A
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.

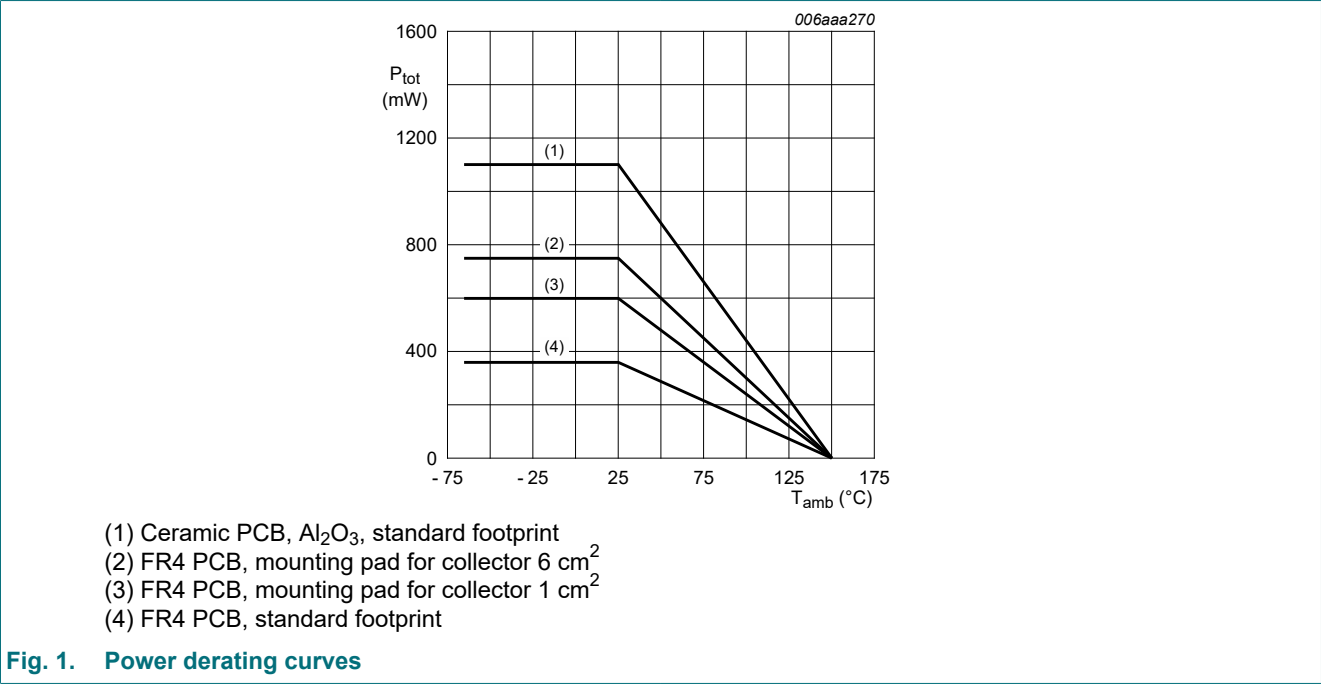


Fig. 1. Power derating curves

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]	-	-	160	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.

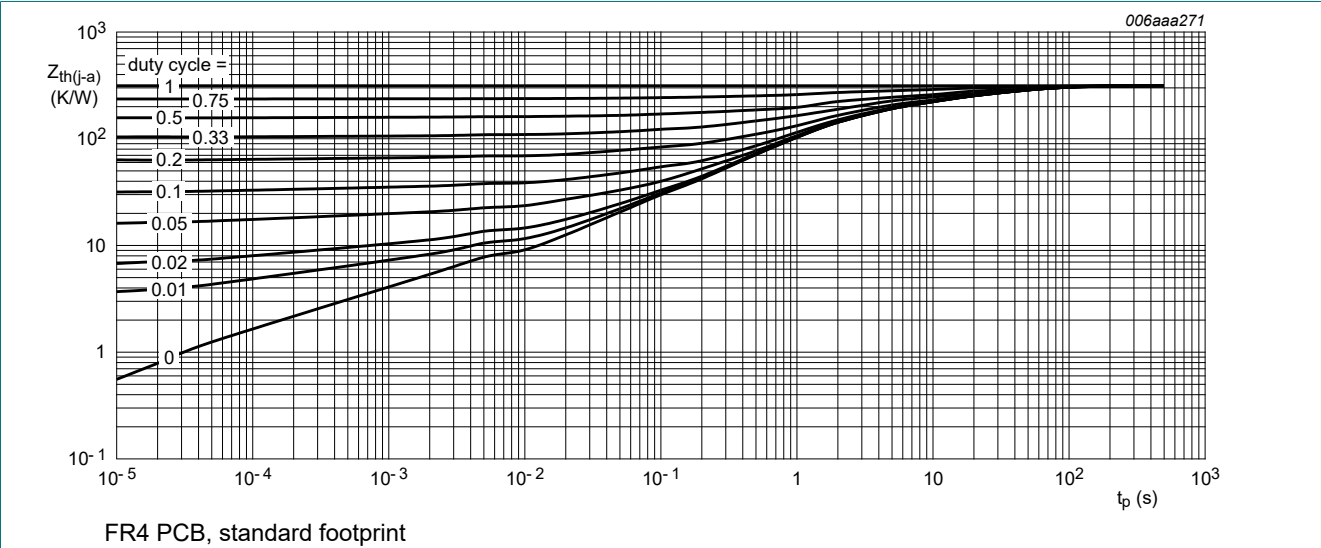


Fig. 2. Transient thermal impedance from junction to ambient as a function of pulse duration; typical values

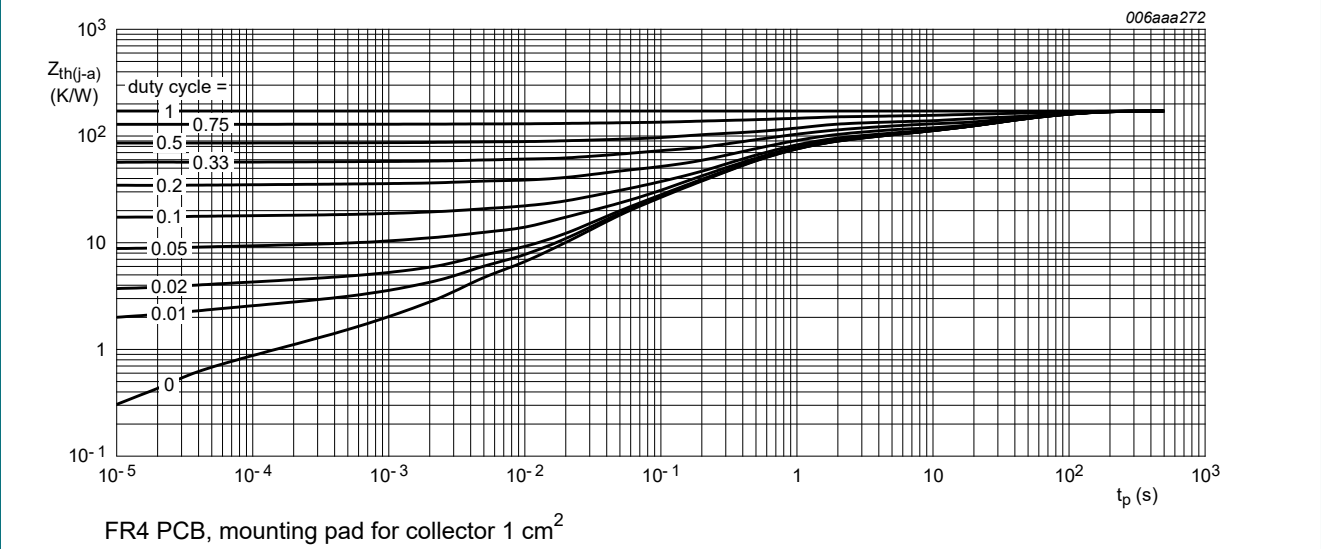
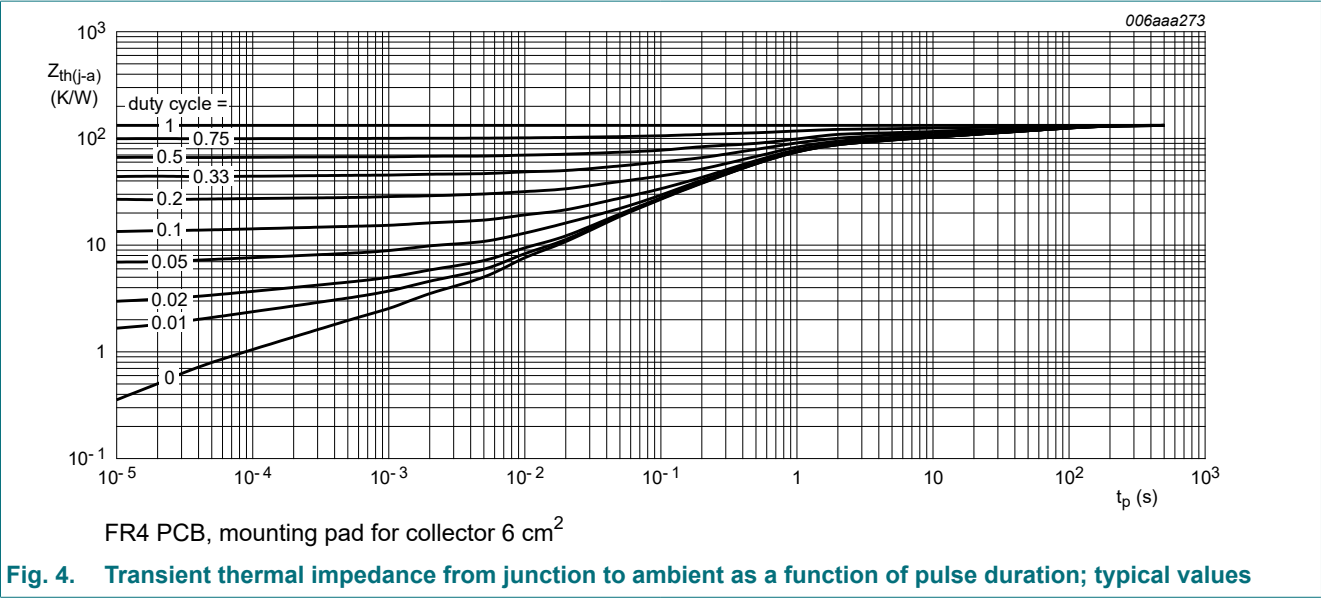


Fig. 3. Transient thermal impedance from junction to ambient as a function of pulse duration; typical values



10. Characteristics

Table 7. Characteristics

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
I_{CBO}	collector-base cut-off current	$V_{CB} = -30 \text{ V}$; $I_E = 0 \text{ A}$; $T_{amb} = 25 \text{ }^{\circ}\text{C}$	-	-	-100	nA
		$V_{CB} = -30 \text{ V}$; $I_E = 0 \text{ A}$; $T_j = 150 \text{ }^{\circ}\text{C}$	-	-	-50	μA
I_{EBO}	emitter-base cut-off current	$V_{EB} = -5 \text{ V}$; $I_C = 0 \text{ A}$; $T_{amb} = 25 \text{ }^{\circ}\text{C}$	-	-	-100	nA
I_{CES}	collector-emitter cut-off current	$V_{CE} = -30 \text{ V}$; $V_{BE} = 0 \text{ V}$; $T_{amb} = 25 \text{ }^{\circ}\text{C}$	-	-	-100	nA
h_{FE}	DC current gain	$V_{CE} = -2 \text{ V}$; $I_C = -0.5 \text{ A}$; $T_{amb} = 25 \text{ }^{\circ}\text{C}$	200	-	-	
		$V_{CE} = -2 \text{ V}$; $I_C = -1 \text{ A}$; pulsed; $t_p \leq 300 \text{ } \mu\text{s}$; $\delta \leq 0.02$; $T_{amb} = 25 \text{ }^{\circ}\text{C}$	200	-	-	
		$V_{CE} = -2 \text{ V}$; $I_C = -2 \text{ A}$; pulsed; $t_p \leq 300 \text{ } \mu\text{s}$; $\delta \leq 0.02$; $T_{amb} = 25 \text{ }^{\circ}\text{C}$	175	-	-	
		$V_{CE} = -2 \text{ V}$; $I_C = -4 \text{ A}$; pulsed; $t_p \leq 300 \text{ } \mu\text{s}$; $\delta \leq 0.02$; $T_{amb} = 25 \text{ }^{\circ}\text{C}$	80	-	-	
		$V_{CE} = -2 \text{ V}$; $I_C = -6 \text{ A}$; pulsed; $t_p \leq 300 \text{ } \mu\text{s}$; $\delta \leq 0.02$; $T_{amb} = 25 \text{ }^{\circ}\text{C}$	30	-	-	
V_{CEsat}	collector-emitter saturation voltage	$I_C = -0.5 \text{ A}$; $I_B = -50 \text{ mA}$; $T_{amb} = 25 \text{ }^{\circ}\text{C}$	-	-46	-60	mV
		$I_C = -1 \text{ A}$; $I_B = -50 \text{ mA}$; $T_{amb} = 25 \text{ }^{\circ}\text{C}$	-	-70	-110	mV
		$I_C = -2 \text{ A}$; $I_B = -200 \text{ mA}$; $T_{amb} = 25 \text{ }^{\circ}\text{C}$	-	-120	-180	mV
		$I_C = -4 \text{ A}$; $I_B = -400 \text{ mA}$; pulsed; $t_p \leq 300 \text{ } \mu\text{s}$; $\delta \leq 0.02$; $T_{amb} = 25 \text{ }^{\circ}\text{C}$	-	-220	-300	mV
		$I_C = -6 \text{ A}$; $I_B = -600 \text{ mA}$; pulsed; $t_p \leq 300 \text{ } \mu\text{s}$; $\delta \leq 0.02$; $T_{amb} = 25 \text{ }^{\circ}\text{C}$	-	-320	-450	mV
R_{CEsat}	collector-emitter saturation resistance		-	55	75	m Ω
V_{BEsat}	base-emitter saturation voltage	$I_C = -0.5 \text{ A}$; $I_B = -50 \text{ mA}$; $T_{amb} = 25 \text{ }^{\circ}\text{C}$	-	-0.8	-0.85	V
		$I_C = -1 \text{ A}$; $I_B = -50 \text{ mA}$; $T_{amb} = 25 \text{ }^{\circ}\text{C}$	-	-0.84	-0.9	V
		$I_C = -1 \text{ A}$; $I_B = -100 \text{ mA}$; pulsed; $t_p \leq 300 \text{ } \mu\text{s}$; $\delta \leq 0.02$; $T_{amb} = 25 \text{ }^{\circ}\text{C}$	-	-0.84	-1	V
		$I_C = -4 \text{ A}$; $I_B = -400 \text{ mA}$; pulsed; $t_p \leq 300 \text{ } \mu\text{s}$; $\delta \leq 0.02$; $T_{amb} = 25 \text{ }^{\circ}\text{C}$	-	-1	-1.1	V
V_{BEon}	base-emitter turn-on voltage	$V_{CE} = -2 \text{ V}$; $I_C = -2 \text{ A}$; $T_{amb} = 25 \text{ }^{\circ}\text{C}$	-	-0.8	-1	V
t_d	delay time	$V_{CC} = -10 \text{ V}$; $I_C = -2 \text{ A}$; $I_{Bon} = -0.1 \text{ A}$; $I_{Boff} = 0.1 \text{ A}$; $T_{amb} = 25 \text{ }^{\circ}\text{C}$	-	12	-	ns
t_r	rise time		-	43	-	ns
t_{on}	turn-on time		-	55	-	ns
t_s	storage time		-	240	-	ns
t_f	fall time		-	80	-	ns
t_{off}	turn-off time		-	320	-	ns
f_T	transition frequency	$V_{CE} = -10 \text{ V}$; $I_C = -0.1 \text{ A}$; $f = 100 \text{ MHz}$; $T_{amb} = 25 \text{ }^{\circ}\text{C}$	-	110	-	MHz
C_c	collector capacitance	$V_{CB} = -10 \text{ V}$; $I_E = 0 \text{ A}$; $i_e = 0 \text{ A}$; $f = 1 \text{ MHz}$; $T_{amb} = 25 \text{ }^{\circ}\text{C}$	-	50	-	pF

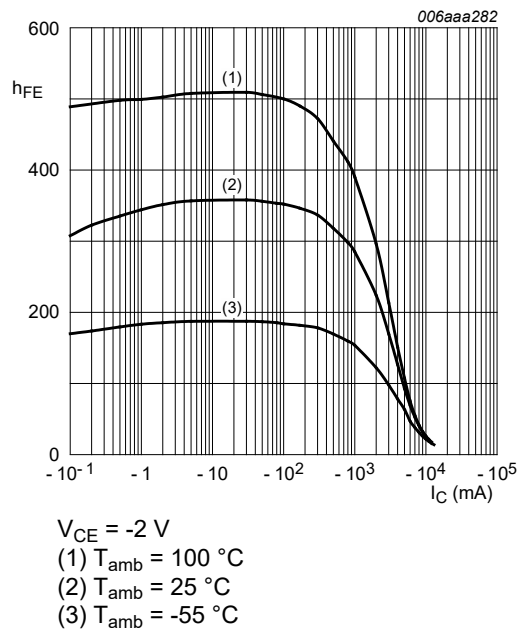


Fig. 5. DC current gain as a function of collector current; typical values

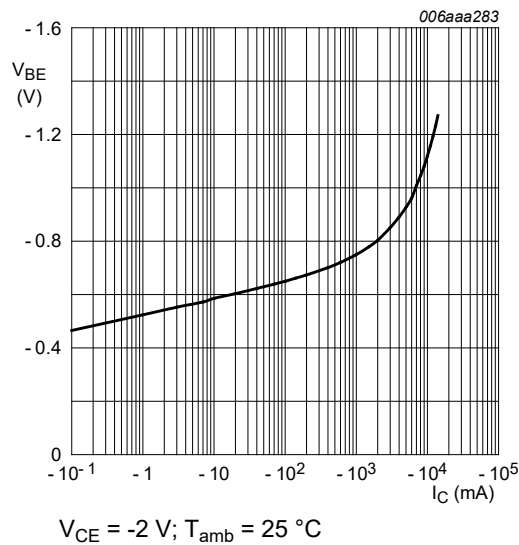


Fig. 6. Base-emitter voltage as a function of collector current; typical values

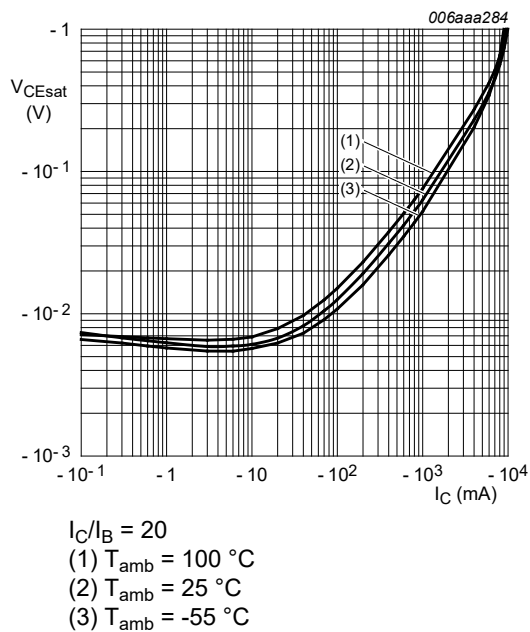


Fig. 7. Collector-emitter saturation voltage as a function of collector current; typical values

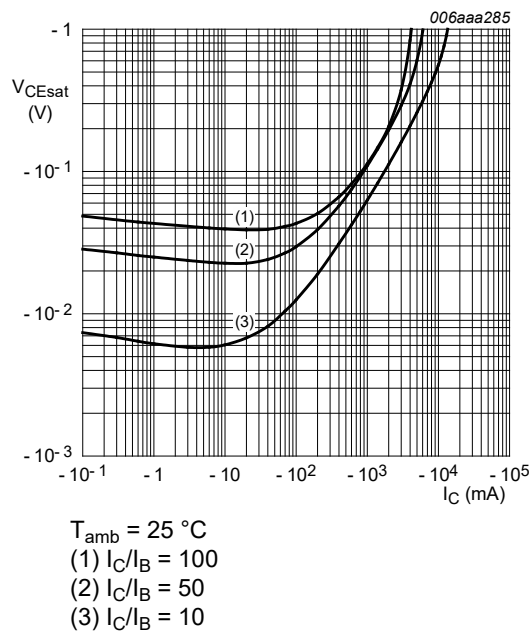


Fig. 8. Collector-emitter saturation voltage as a function of collector current; typical values

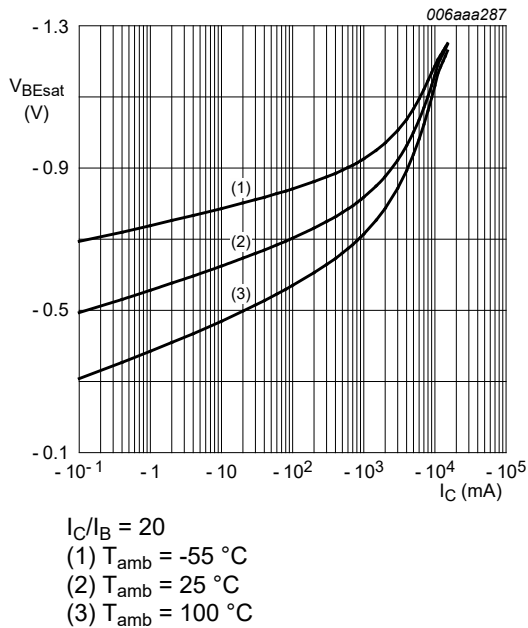


Fig. 9. Base-emitter saturation voltage as a function of collector current; typical values

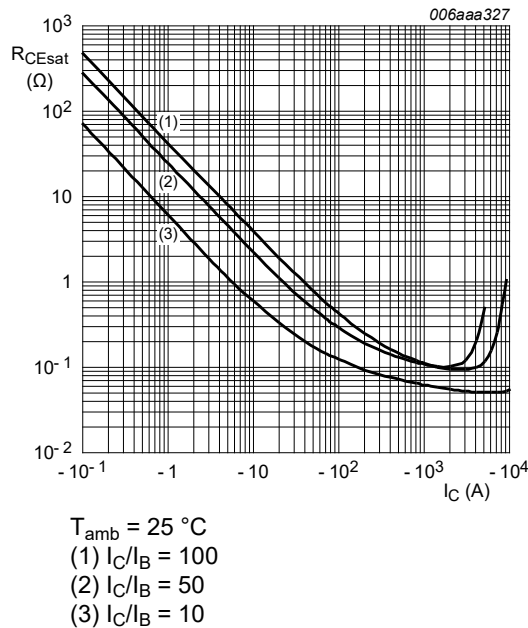


Fig. 10. Collector-emitter saturation resistance as a function of collector current; typical values

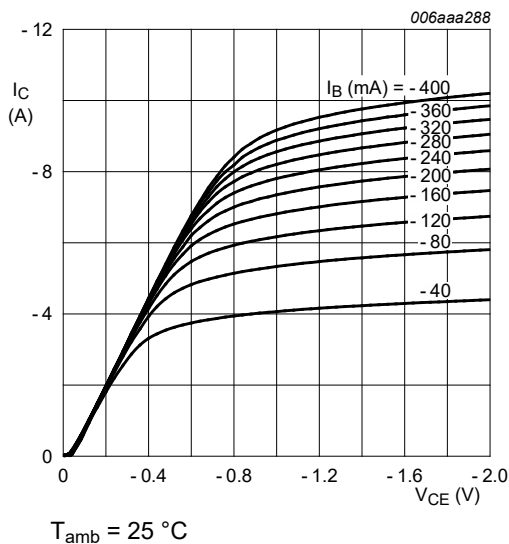


Fig. 11. Collector current as a function of collector-emitter voltage; typical values

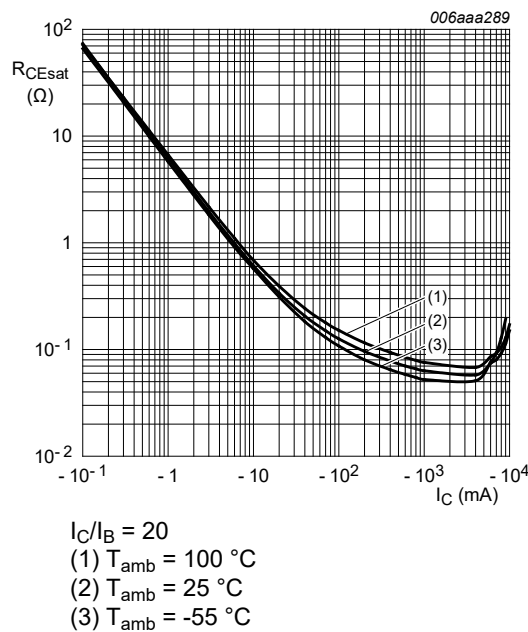


Fig. 12. Collector-emitter saturation resistance as a function of collector current; typical values

11. Test information

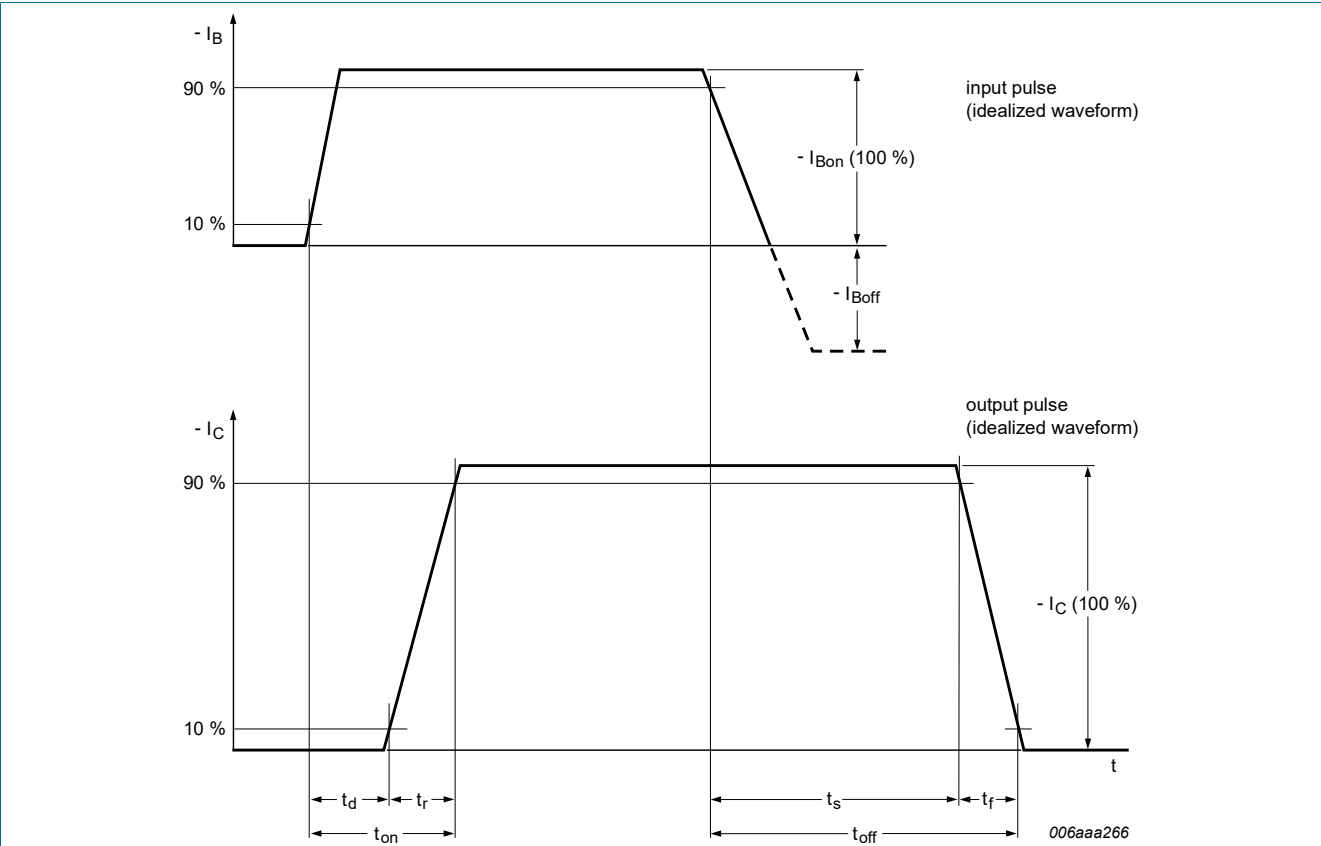


Fig. 13. Transistor switching time definition

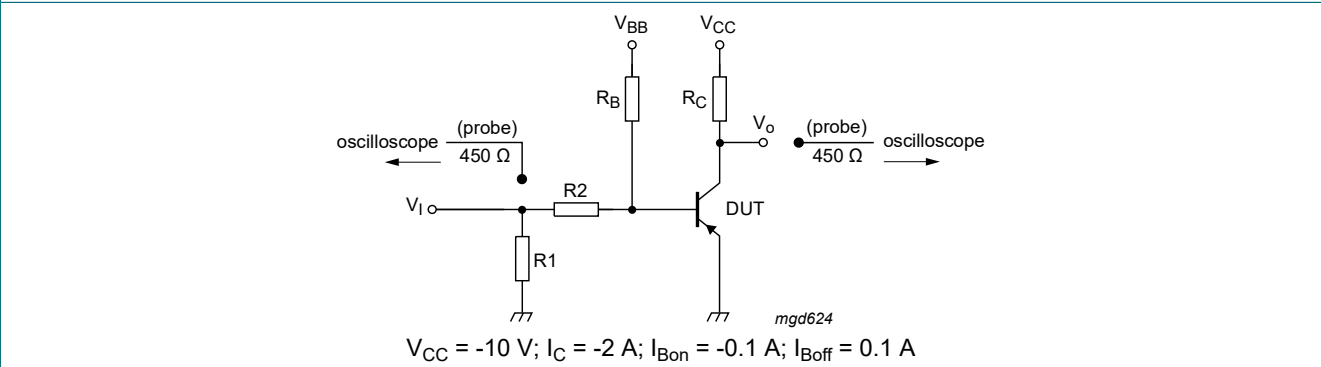
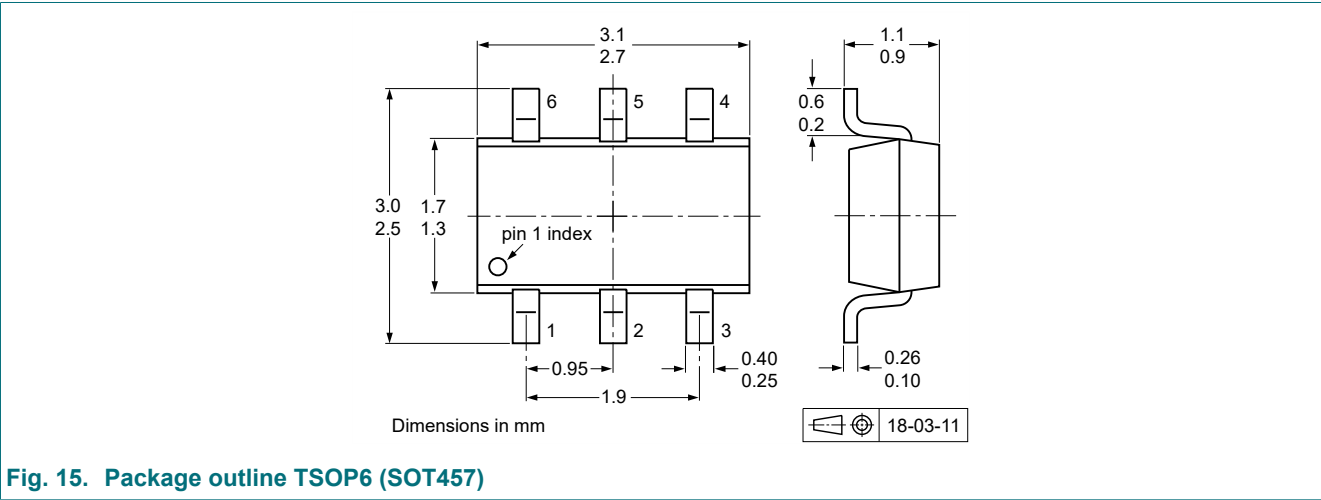


Fig. 14. Test circuit for switching times

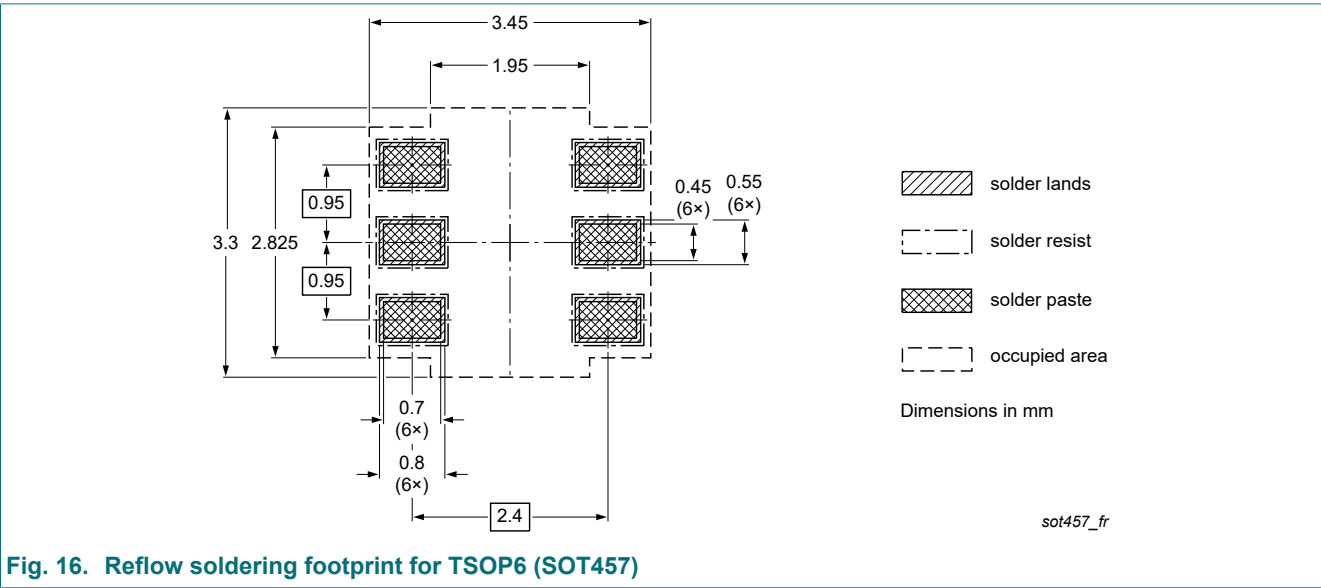
Quality information

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



13. Soldering



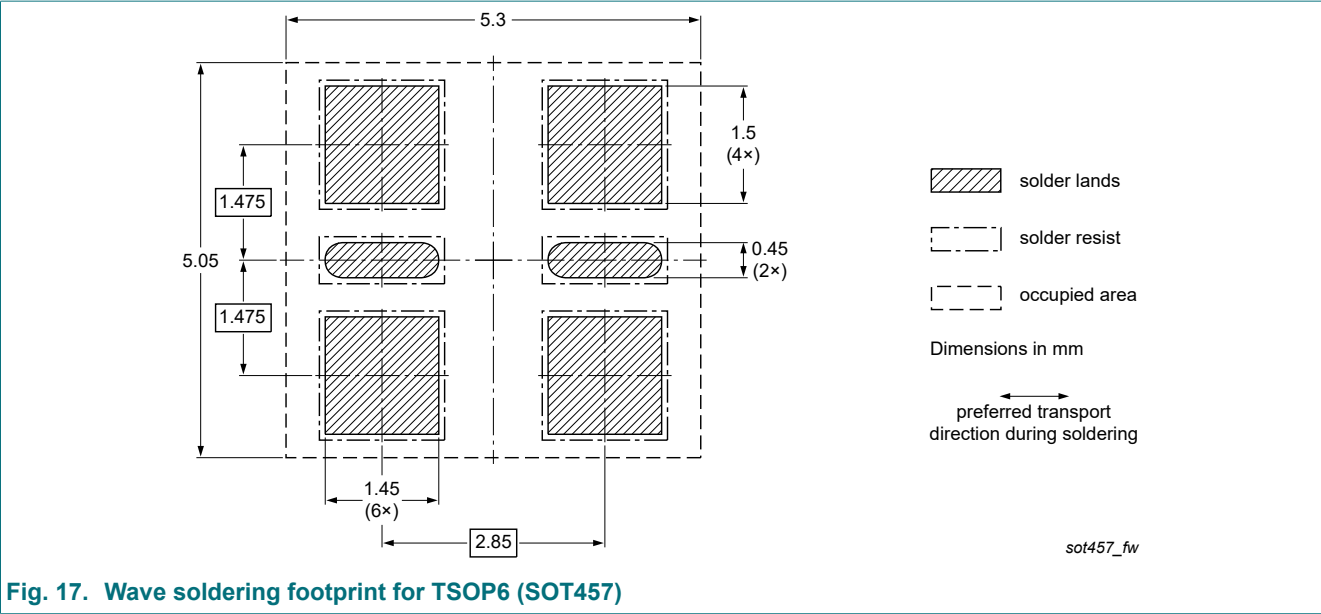


Fig. 17. Wave soldering footprint for TSOP6 (SOT457)

14. Revision history

Table 8. Revision history

Data sheet ID	Release date	Data sheet status	Change notice	Supersedes
PBSS5440D v.3	20230926	Product data sheet	-	PBSS5440D_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.			
PBSS5440D_2	20091214	Product data sheet	-	PBSS5440D_1
PBSS5440D_1	20050427	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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Date of release: 26 September 2023

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