



PBHV8540X

500 V, 0.5 A NPN high-voltage low V_{CEsat} transistor

8 October 2024

Product data sheet

1. General description

NPN high-voltage low V_{CEsat} transistor in a SOT89 (SC-62) medium power and flat lead Surface-Mounted Device (SMD) plastic package.

PNP complement: PBHV9040X

2. Features and benefits

- High voltage
- 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

3. Applications

- LED driver for LED chain module
- LCD backlighting
- Automotive motor management
- Hook switch for wired telecom
- Switch Mode Power Supply (SMPS)

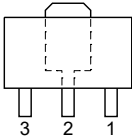
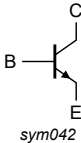
4. Quick reference data

Table 1. Quick reference data

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
V_{CESM}	collector-emitter peak voltage	$V_{BE} = 0\text{ V}$	-	-	500	V
V_{CEO}	collector-emitter voltage	open base	-	-	400	V
I_C	collector current		-	-	0.5	A
h_{FE}	DC current gain	$V_{CE} = 10\text{ V}; I_C = 50\text{ mA}; T_{amb} = 25\text{ °C}$	100	200	-	

5. Pinning information

Table 2. Pinning information

Pin	Symbol	Description	Simplified outline	Graphic symbol
1	E	emitter	 SOT89	 sym042
2	C	collector		
3	B	base		

6. Ordering information

Table 3. Ordering information

Type number	Package		
	Name	Description	Version
PBHV8540X	SOT89	plastic, surface-mounted package; 3 leads; 1.5 mm pitch; 4.5 mm x 2.5 mm x 1.5 mm body	SOT89

7. Marking

Table 4. Marking codes

Type number	Marking code[1]
PBHV8540X	% 4D

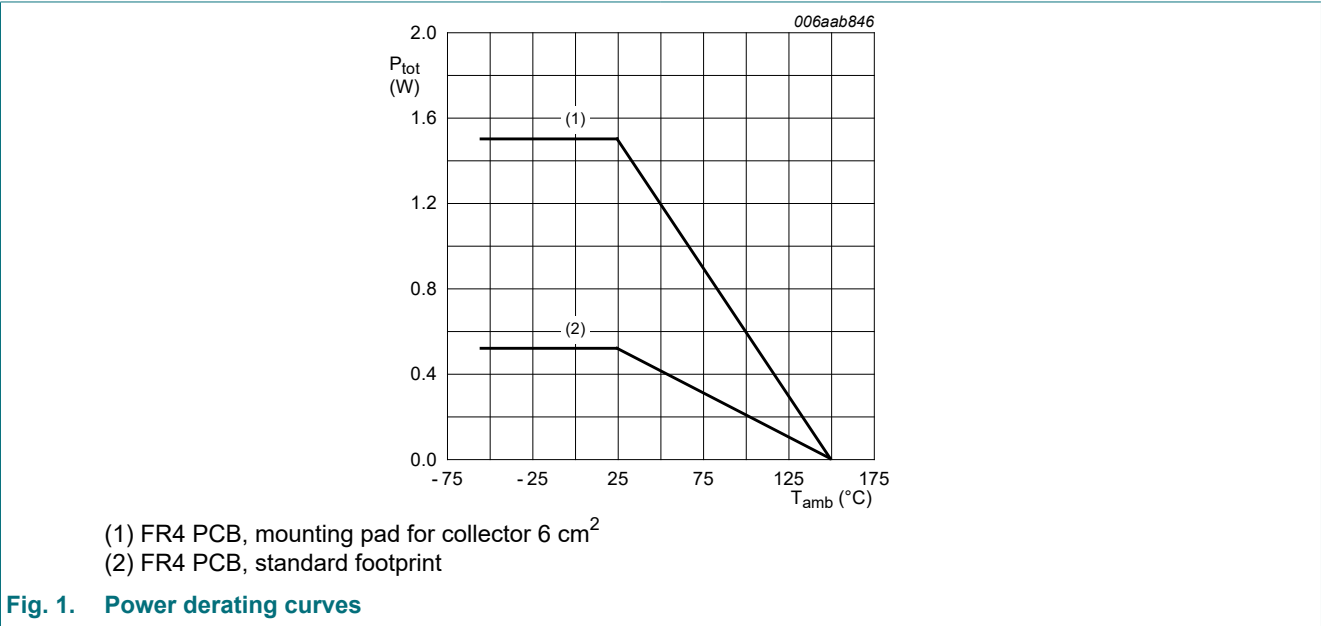
[1] % = placeholder for manufacturing site code

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		-	500	V
V _{CEO}	collector-emitter voltage	open base		-	400	V
V _{CESM}	collector-emitter peak voltage	V _{BE} = 0 V		-	500	V
V _{EBO}	emitter-base voltage	open collector		-	6	V
I _C	collector current			-	0.5	A
I _{CM}	peak collector current	single pulse; t _p ≤ 1 ms		-	1	A
I _{BM}	peak base current			-	200	mA
P _{tot}	total power dissipation	T _{amb} ≤ 25 °C	[1]	-	0.52	W
			[2]	-	1.5	W
T _j	junction temperature			-	150	°C
T _{amb}	ambient temperature			-55	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.



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]	-	-	240	K/W
			[2]	-	-	83	K/W
$R_{th(j-sp)}$	thermal resistance from junction to solder point			-	-	20	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.

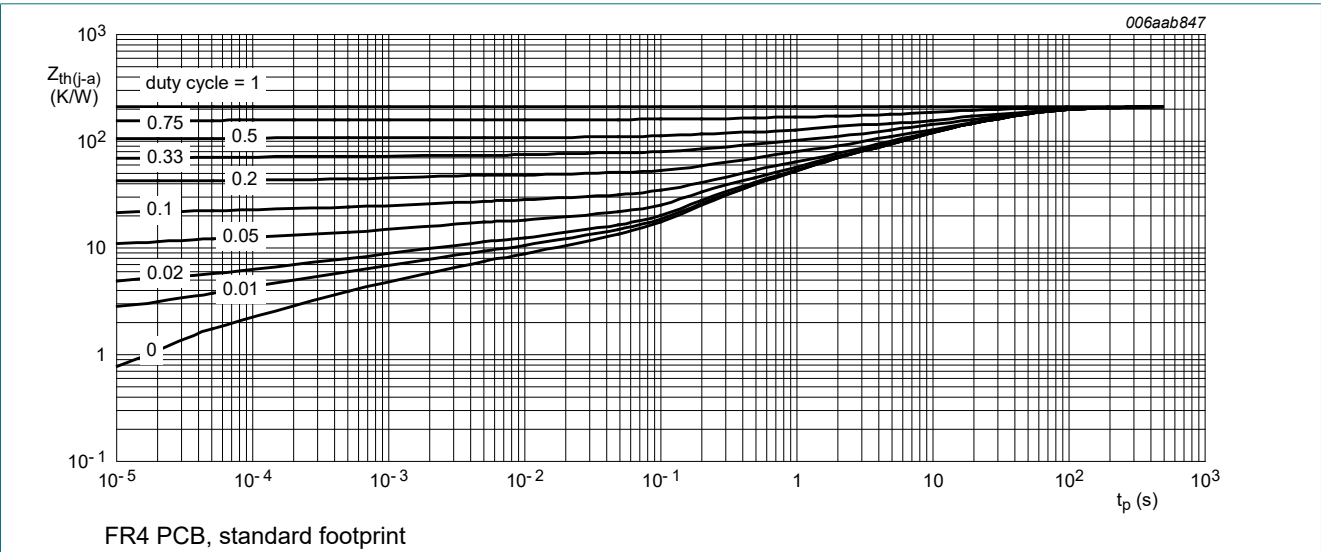


Fig. 2. Transient thermal impedance from junction to ambient as a function of pulse duration; typical values

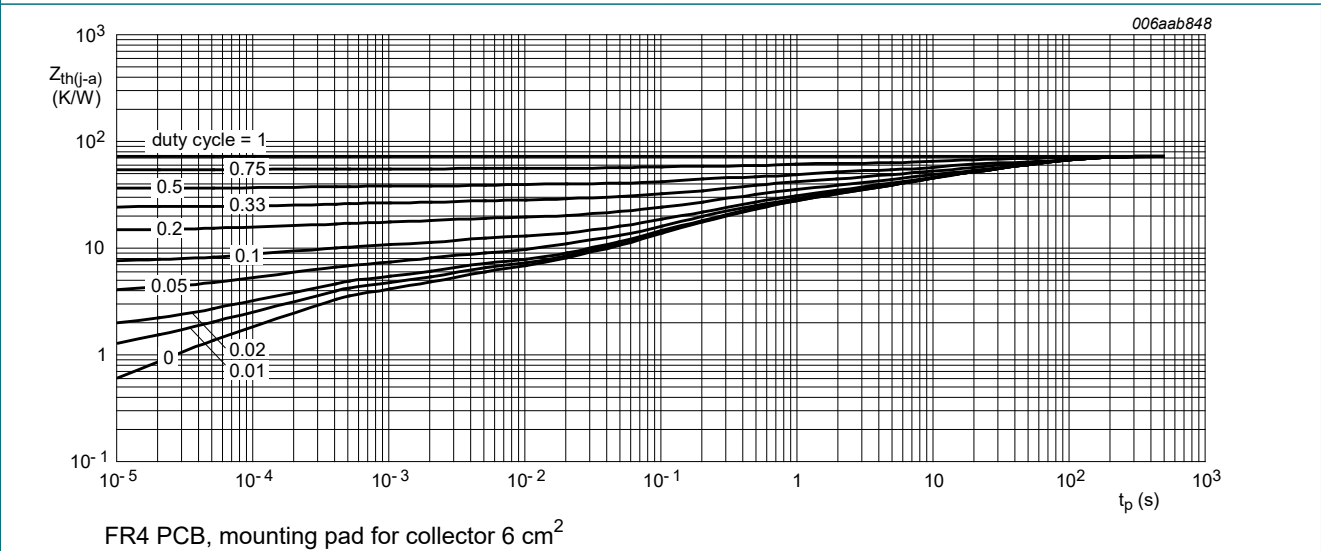


Fig. 3. Transient thermal impedance from junction to ambient as a function of pulse duration; typical values

10. Characteristics

Table 7. Characteristics

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
I _{CBO}	collector-base cut-off current	V _{CB} = 320 V; I _E = 0 A; T _{amb} = 25 °C		-	-	100	nA
		V _{CB} = 320 V; I _E = 0 A; T _j = 150 °C		-	-	10	μA
I _{CES}	collector-emitter cut-off current	V _{CE} = 320 V; V _{BE} = 0 V; T _{amb} = 25 °C		-	-	100	nA
I _{EBO}	emitter-base cut-off current	V _{EB} = 4 V; I _C = 0 A; T _{amb} = 25 °C		-	-	100	nA
h _{FE}	DC current gain	V _{CE} = 10 V; I _C = 50 mA; T _{amb} = 25 °C		100	200	-	
		V _{CE} = 10 V; I _C = 100 mA; t _p ≤ 300 μs; δ ≤ 0.02; T _{amb} = 25 °C; pulsed		80	150	-	
		V _{CE} = 10 V; I _C = 300 mA; pulsed; t _p ≤ 300 μs; δ ≤ 0.02; T _{amb} = 25 °C		10	20	-	
V _{CEsat}	collector-emitter saturation voltage	I _C = 100 mA; I _B = 10 mA; T _{amb} = 25 °C		-	100	200	mV
		I _C = 100 mA; I _B = 20 mA; T _{amb} = 25 °C		-	60	90	mV
		I _C = 300 mA; I _B = 60 mA; T _{amb} = 25 °C		-	135	250	mV
V _{BEsat}	base-emitter saturation voltage	I _C = 300 mA; I _B = 60 mA; pulsed; t _p ≤ 300 μs; δ ≤ 0.02; T _{amb} = 25 °C		-	0.91	1.1	V
t _d	delay time	V _{CC} = 6 V; I _C = 0.5 A; I _{Bon} = 0.1 A; I _{Boff} = -0.1 A; T _{amb} = 25 °C		-	50	-	ns
t _r	rise time			-	6200	-	ns
t _{on}	turn-on time			-	6250	-	ns
t _s	storage time			-	800	-	ns
t _f	fall time			-	2200	-	ns
t _{off}	turn-off time			-	3000	-	ns
f _T	transition frequency	V _{CE} = 10 V; I _C = 100 mA; f = 100 MHz; T _{amb} = 25 °C		-	30	-	MHz
C _c	collector capacitance	V _{CB} = 20 V; I _E = 0 A; i _e = 0 A; f = 1 MHz; T _{amb} = 25 °C		-	4	-	pF
C _e	emitter capacitance	V _{EB} = 0.5 V; I _C = 0 A; i _c = 0 A; f = 1 MHz; T _{amb} = 25 °C		-	165	-	pF

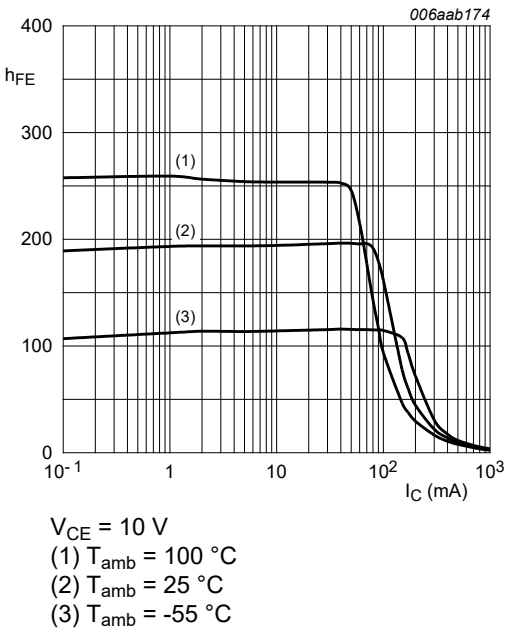


Fig. 4. DC current gain as a function of collector current; typical values

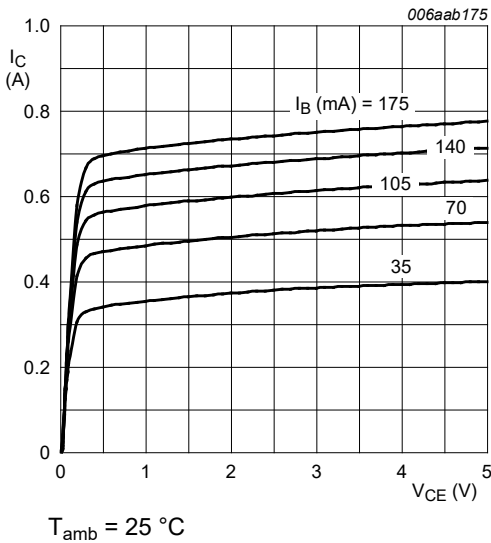


Fig. 5. Collector current as a function of collector-emitter voltage; typical values

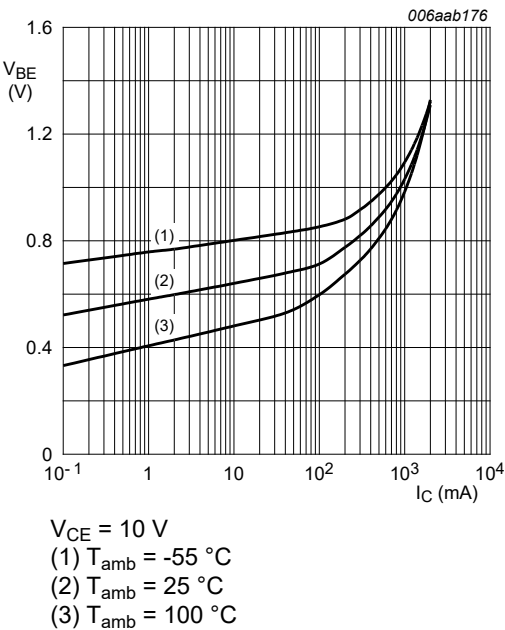


Fig. 6. Base-emitter voltage as a function of collector current; typical values

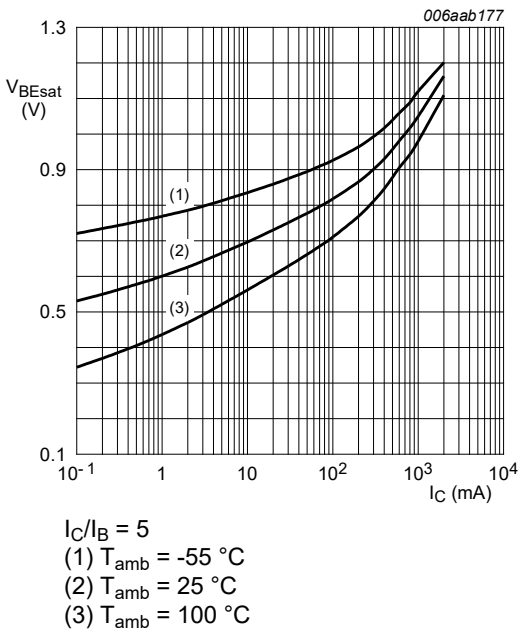


Fig. 7. Base-emitter saturation voltage as a function of collector current; typical values

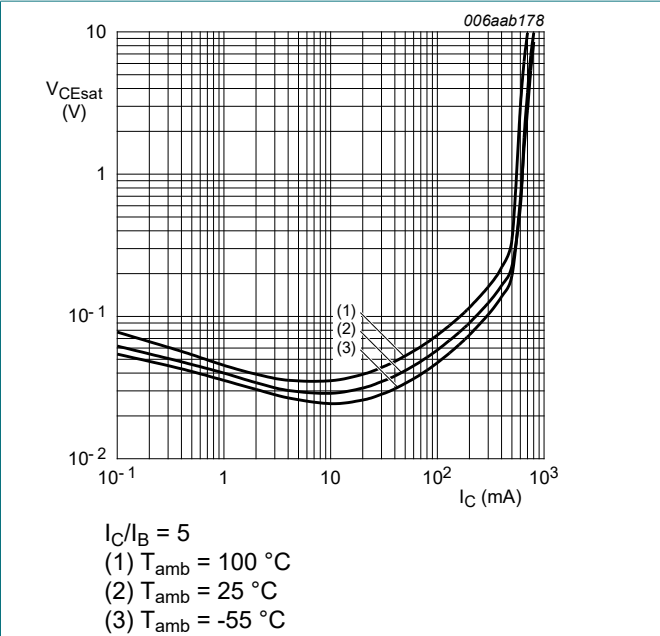


Fig. 8. Collector-emitter saturation voltage as a function of collector current; typical values

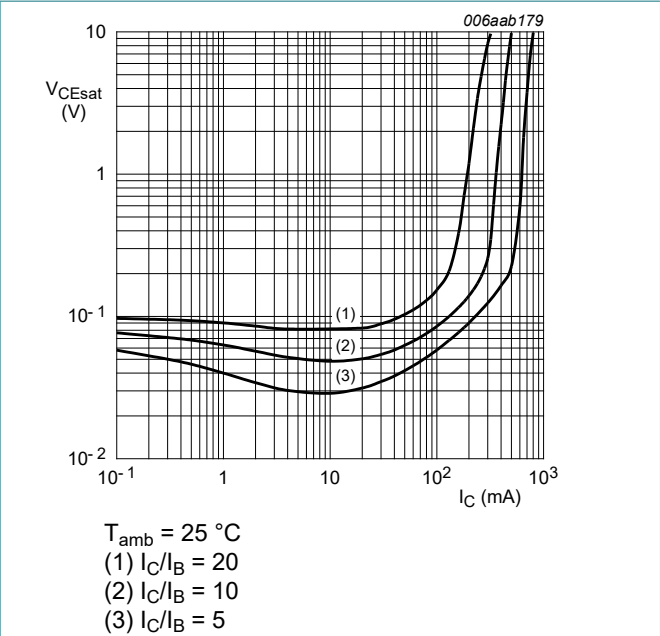


Fig. 9. Collector-emitter saturation voltage as a function of collector current; typical values

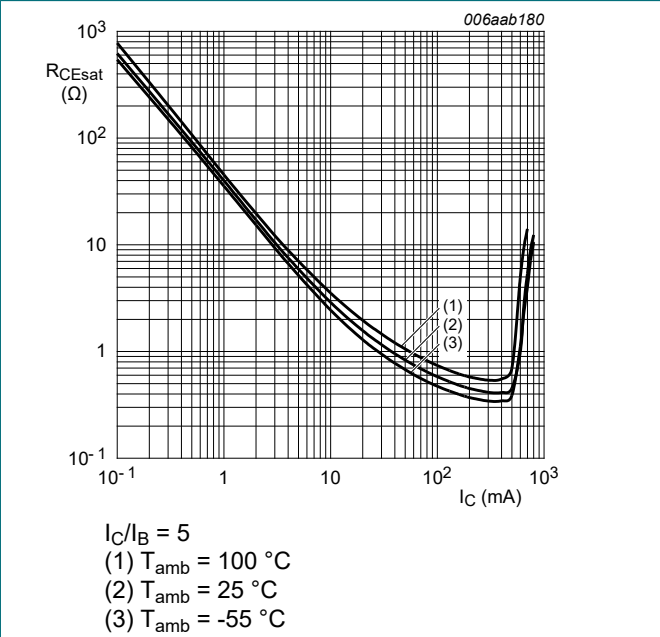


Fig. 10. Collector-emitter saturation resistance as a function of collector current; typical values

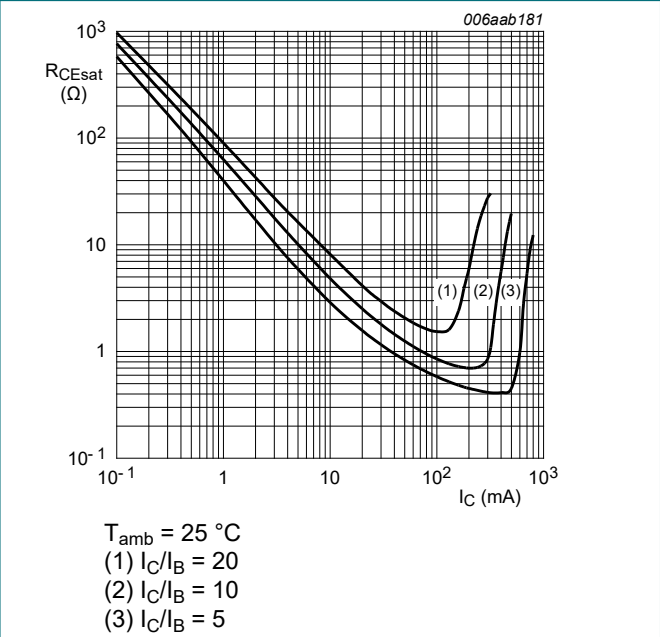


Fig. 11. Collector-emitter saturation resistance as a function of collector current; typical values

11. Test information

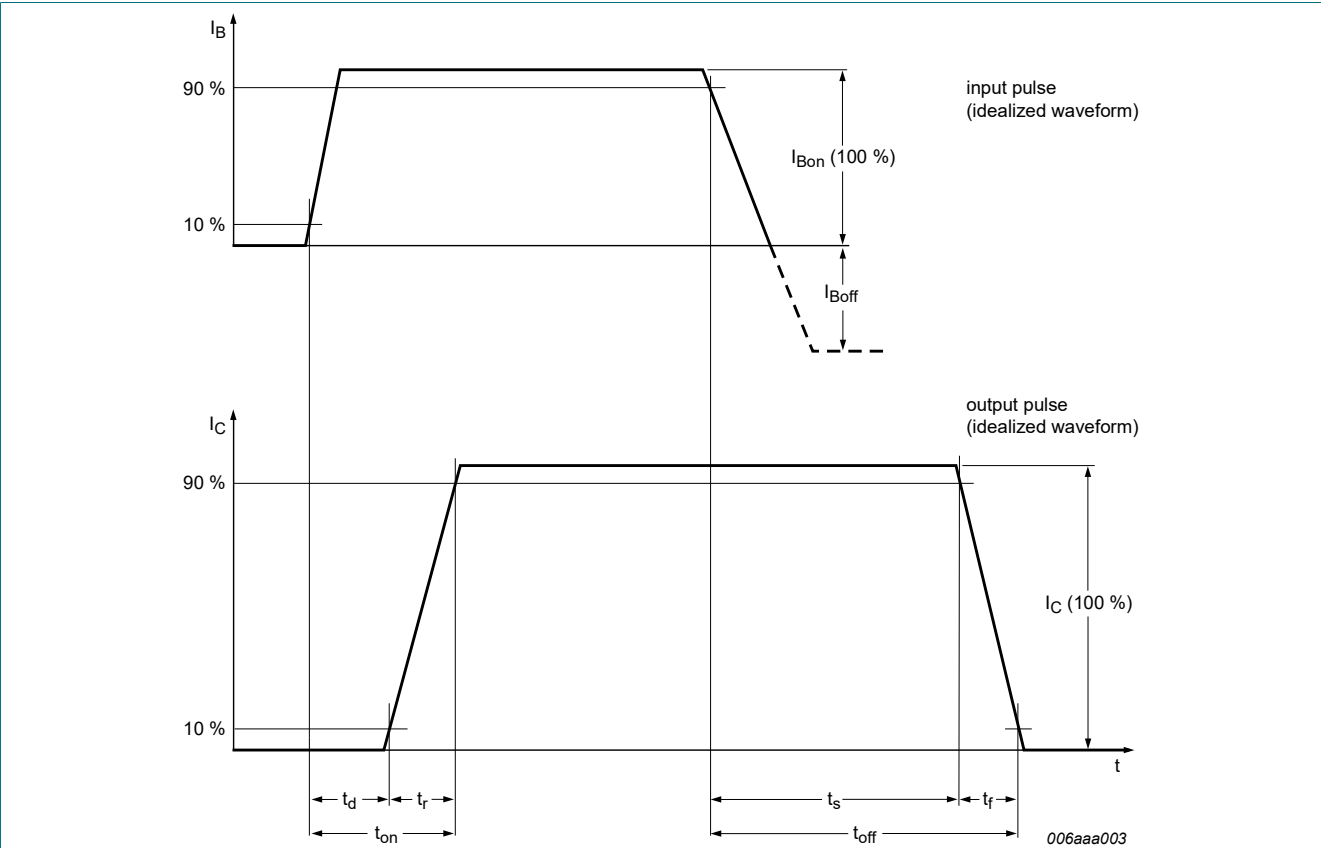


Fig. 12. Switching time definition

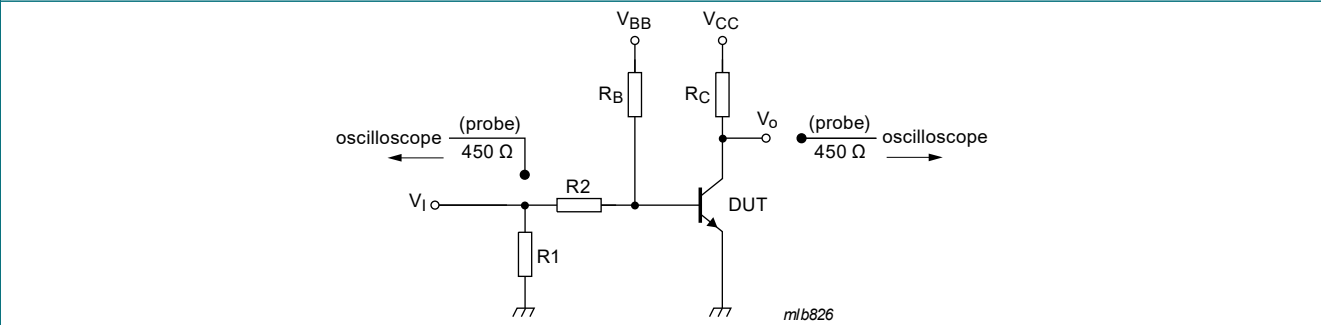
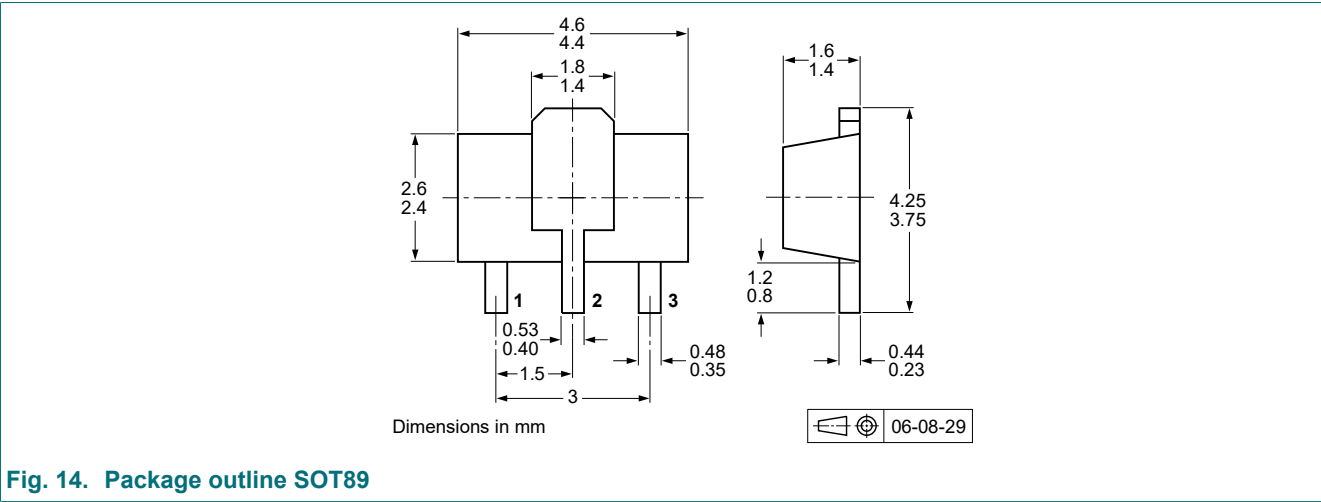
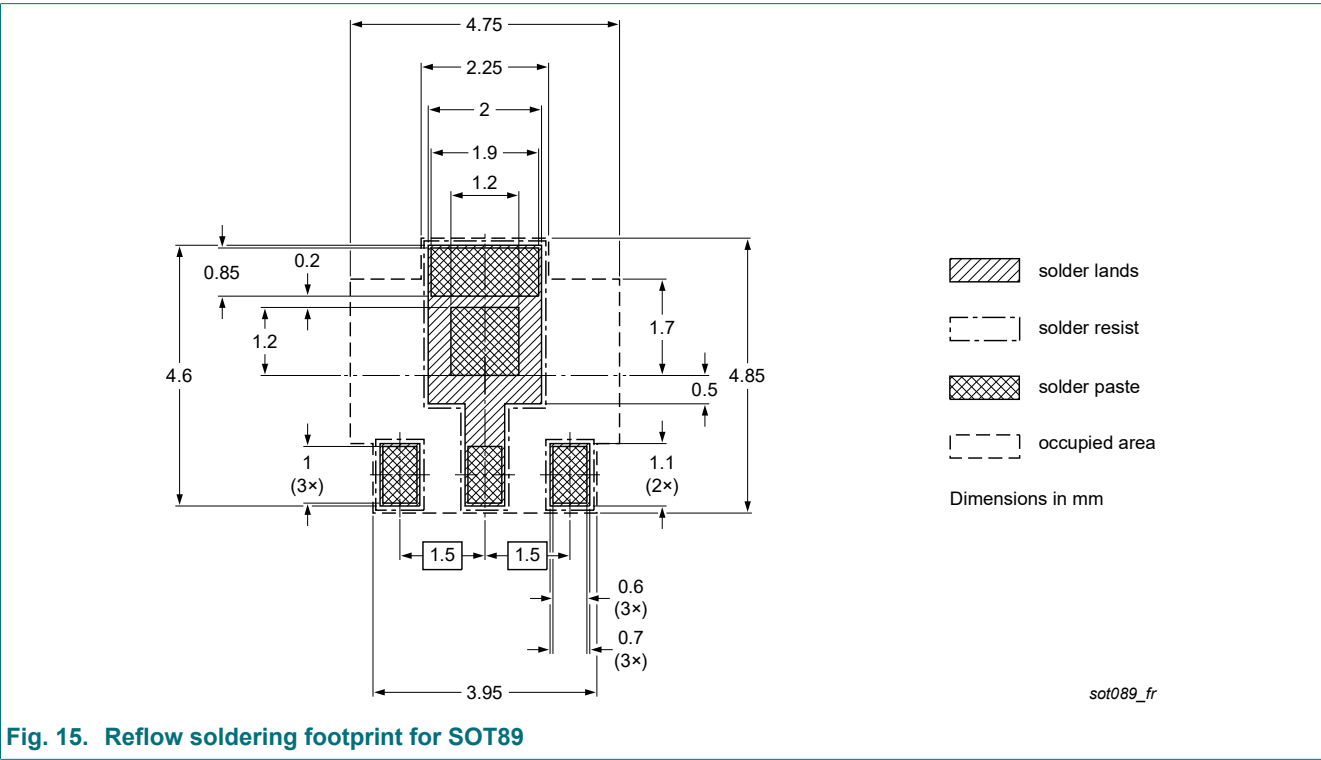


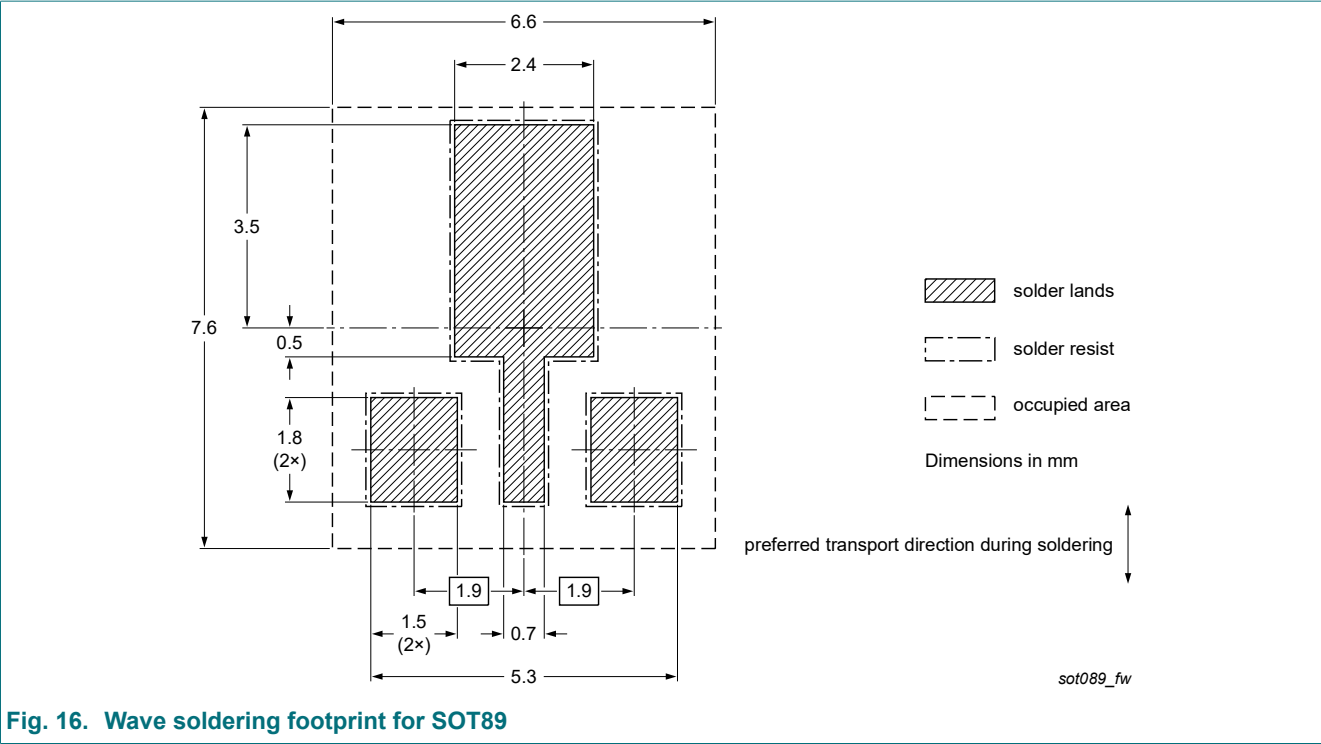
Fig. 13. Test circuit for switching times

12. Package outline



13. Soldering





14. Revision history

Table 8. Revision history

Data sheet ID	Release date	Data sheet status	Change notice	Supersedes
PBHV8540X v.3	20241008	Product data sheet	-	PBHV8540X v.2
Modifications:	<ul style="list-style-type: none">Product(s) changed to non-automotive qualification. Please refer to nexperia.com for automotive (-Q) product alternative(s).			
PBHV8540X v.2	20230712	Product data sheet	-	PBHV8540X v.1
PBHV8540X v.1	20131205	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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