

PBHV8540Z,115 Datasheet

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DiGi Electronics Part Number	PBHV8540Z,115-DG
Manufacturer	Nexperia USA Inc.
Manufacturer Product Number	PBHV8540Z,115
Description	TRANS NPN 400V 0.5A SOT223
Detailed Description	Bipolar (BJT) Transistor NPN 400 V 500 mA 30MHz 1 .4 W Surface Mount SOT-223



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Purchase and inquiry

Manufacturer Product Number:

PBHV8540Z,115

Series:

-

Transistor Type:

NPN

Voltage - Collector Emitter Breakdown (Max):

400 V

Current - Collector Cutoff (Max):

100nA

Power - Max:

1.4 W

Operating Temperature:

150°C (TJ)

Qualification:

AEC-Q100

Package / Case:

TO-261-4, TO-261AA

Base Product Number:

PBHV8540

Manufacturer:

Nexperia USA Inc.

Product Status:

Active

Current - Collector (Ic) (Max):

500 mA

Vce Saturation (Max) @ Ib, Ic:

250mV @ 60mA, 300mA

DC Current Gain (hFE) (Min) @ Ic, Vce:

10 @ 300mA, 10V

Frequency - Transition:

30MHz

Grade:

Automotive

Mounting Type:

Surface Mount

Supplier Device Package:

SOT-223

Environmental & Export classification

RoHS Status:

ROHS3 Compliant

REACH Status:

REACH Unaffected

HTSUS:

8541.29.0075

Moisture Sensitivity Level (MSL):

1 (Unlimited)

ECCN:

EAR99



PBHV8540Z

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 SOT223 (SC-73) medium power Surface-Mounted Device (SMD) plastic package.

PNP complement: PBHV9040Z

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

- Electronic ballast for fluorescent lighting
- LED driver for LED chain module
- LCD backlighting
- High Intensity Discharge (HID) front lighting
- Automotive motor management
- Hook switch for wired telecom
- Switch mode power supply

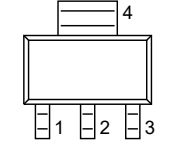
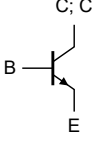
4. Quick reference data

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	B	base	 <p>SC-73 (SOT223)</p>	 <p>sym016</p>
2	C	collector		
3	E	emitter		
4	C	collector		

6. Ordering information

Table 3. Ordering information

Type number	Package		
	Name	Description	Version
PBHV8540Z	SC-73	plastic, surface-mounted package with increased heatsink; 4 leads; 2.3 mm pitch; 6.5 mm x 3.5 mm x 1.65 mm body	SOT223

7. Marking

Table 4. Marking codes

Type number	Marking code
PBHV8540Z	V8540Z

8. Limiting values

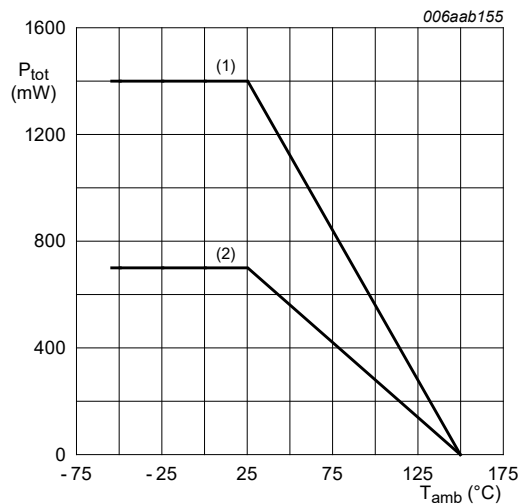
Table 5. Limiting values

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; $t_p \leq 1$ ms	-	1	A	
I_{BM}	peak base current		-	200	mA	
P_{tot}	total power dissipation	$T_{amb} \leq 25$ °C	[1]	-	0.7	W
			[2]	-	1.4	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.



(1) FR4 PCB, mounting pad for collector 6 cm²

(2) 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]	-	-	175	K/W
			[2]	-	-	89	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.

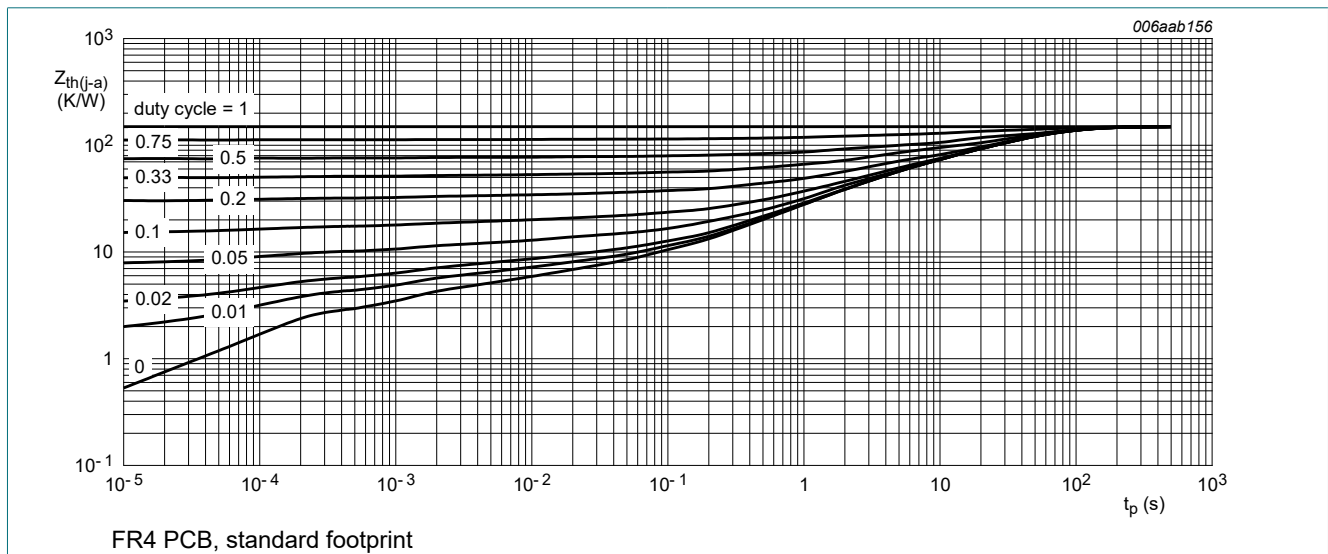


Fig. 2. Transient thermal impedance from junction to ambient as a function of pulse duration; typical values

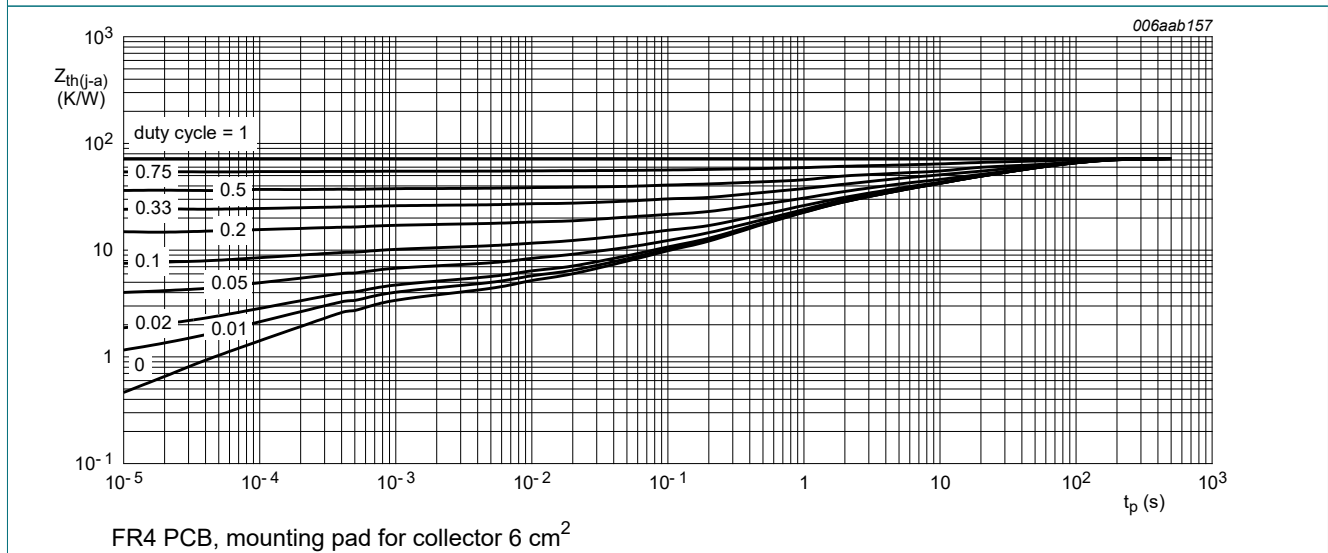
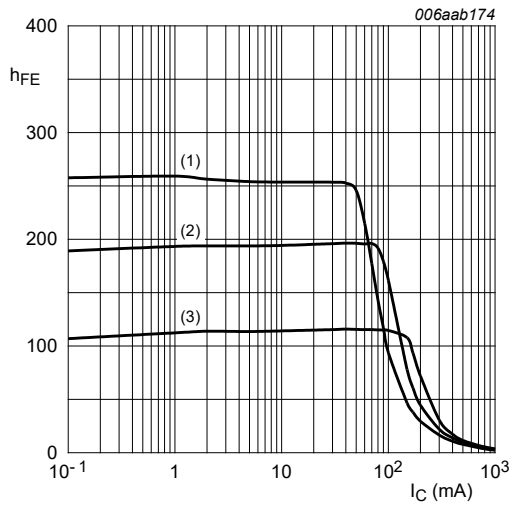


Fig. 3. Transient thermal impedance from junction to ambient as a function of pulse duration; typical values

10. Characteristics

Table 7. Characteristics

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
I_{CBO}	collector-base cut-off current	$V_{CB} = 320 \text{ V}; I_E = 0 \text{ A}; T_{amb} = 25 \text{ }^\circ\text{C}$	-	-	100	nA
		$V_{CB} = 320 \text{ V}; I_E = 0 \text{ A}; T_j = 150 \text{ }^\circ\text{C}$	-	-	10	μA
I_{CES}	collector-emitter cut-off current	$V_{CE} = 320 \text{ V}; V_{BE} = 0 \text{ V}; T_{amb} = 25 \text{ }^\circ\text{C}$	-	-	100	nA
I_{EBO}	emitter-base cut-off current	$V_{EB} = 4 \text{ V}; I_C = 0 \text{ A}; T_{amb} = 25 \text{ }^\circ\text{C}$	-	-	100	nA
h_{FE}	DC current gain	$V_{CE} = 10 \text{ V}; I_C = 50 \text{ mA}; T_{amb} = 25 \text{ }^\circ\text{C}$	100	200	-	
		$V_{CE} = 10 \text{ V}; I_C = 100 \text{ mA}; T_{amb} = 25 \text{ }^\circ\text{C}$	80	150	-	
		$V_{CE} = 10 \text{ V}; I_C = 300 \text{ mA}; \text{pulsed}; t_p \leq 300 \text{ } \mu\text{s}; \delta \leq 0.02; T_{amb} = 25 \text{ }^\circ\text{C}$	10	20	-	
V_{CEsat}	collector-emitter saturation voltage	$I_C = 100 \text{ mA}; I_B = 10 \text{ mA}; T_{amb} = 25 \text{ }^\circ\text{C}$	-	100	200	mV
		$I_C = 100 \text{ mA}; I_B = 20 \text{ mA}; T_{amb} = 25 \text{ }^\circ\text{C}$	-	60	90	mV
		$I_C = 300 \text{ mA}; I_B = 60 \text{ mA}; T_{amb} = 25 \text{ }^\circ\text{C}$	-	135	250	mV
V_{BEsat}	base-emitter saturation voltage	$I_C = 300 \text{ mA}; I_B = 60 \text{ mA}; \text{pulsed}; t_p \leq 300 \text{ } \mu\text{s}; \delta \leq 0.02; T_{amb} = 25 \text{ }^\circ\text{C}$	-	0.91	1.1	V
t_d	delay time	$V_{CC} = 6 \text{ V}; I_C = 0.5 \text{ A}; I_{Bon} = 0.1 \text{ A}; I_{Boff} = -0.1 \text{ A}; T_{amb} = 25 \text{ }^\circ\text{C}$	-	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		$V_{CE} = 10 \text{ V}; I_C = 100 \text{ mA}; f = 100 \text{ MHz}; T_{amb} = 25 \text{ }^\circ\text{C}$	-	30	-
C_c	collector capacitance	$V_{CB} = 20 \text{ V}; I_E = 0 \text{ A}; i_e = 0 \text{ A}; f = 1 \text{ MHz}; T_{amb} = 25 \text{ }^\circ\text{C}$	-	4	-	pF
C_e	emitter capacitance	$V_{EB} = 0.5 \text{ V}; I_C = 0 \text{ A}; i_c = 0 \text{ A}; f = 1 \text{ MHz}; T_{amb} = 25 \text{ }^\circ\text{C}$	-	165	-	pF



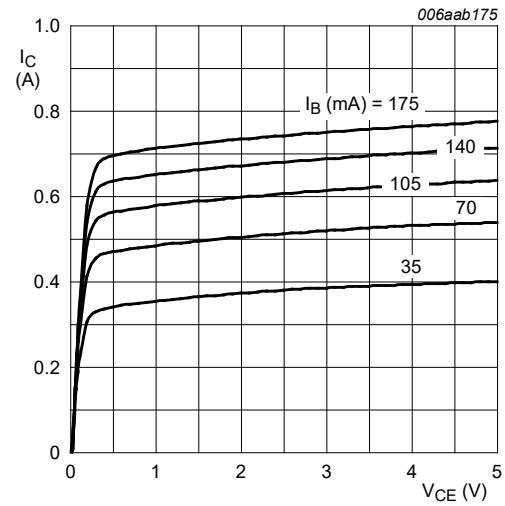
$V_{CE} = 10 \text{ V}$

(1) $T_{amb} = 100 \text{ }^\circ\text{C}$

(2) $T_{amb} = 25 \text{ }^\circ\text{C}$

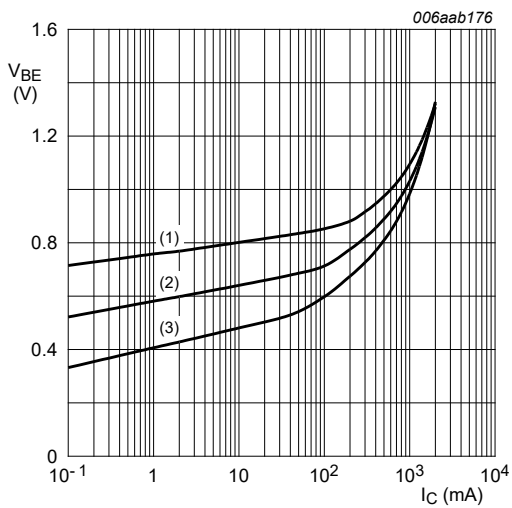
(3) $T_{amb} = -55 \text{ }^\circ\text{C}$

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



$T_{amb} = 25 \text{ }^\circ\text{C}$

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



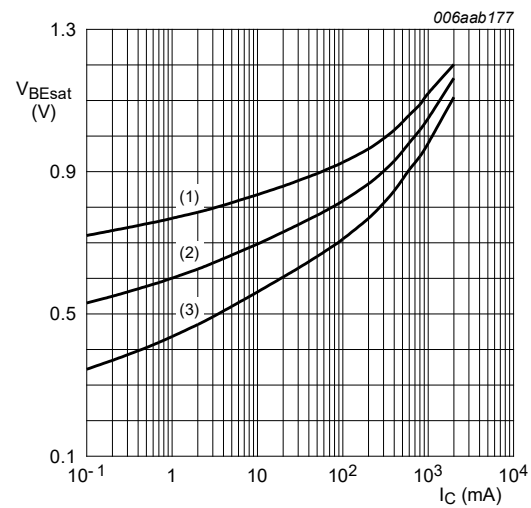
$V_{CE} = 10 \text{ V}$

(1) $T_{amb} = -55 \text{ }^\circ\text{C}$

(2) $T_{amb} = 25 \text{ }^\circ\text{C}$

(3) $T_{amb} = 100 \text{ }^\circ\text{C}$

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



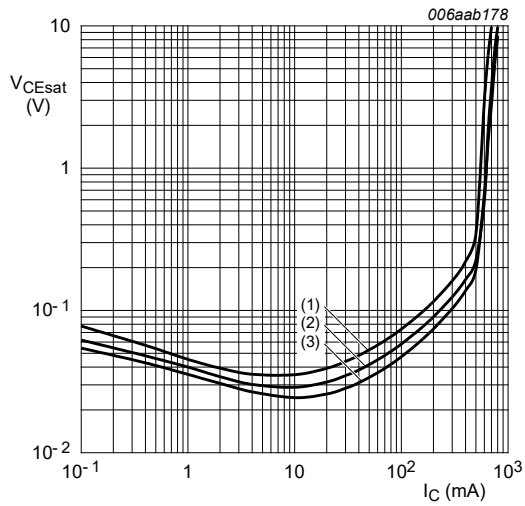
$I_C/I_B = 5$

(1) $T_{amb} = -55 \text{ }^\circ\text{C}$

(2) $T_{amb} = 25 \text{ }^\circ\text{C}$

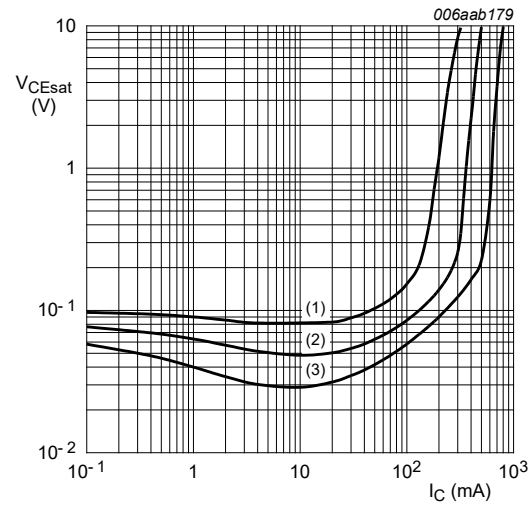
(3) $T_{amb} = 100 \text{ }^\circ\text{C}$

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



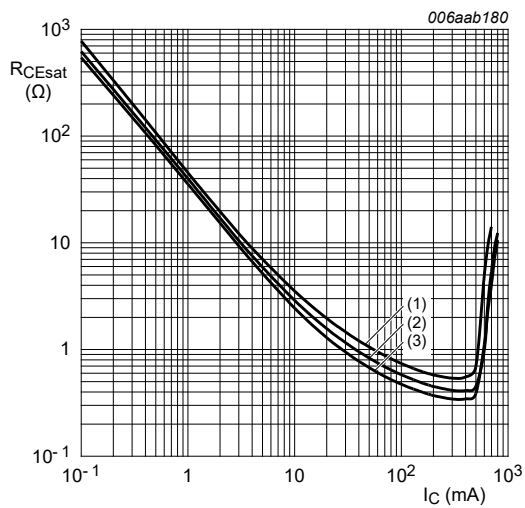
$I_C/I_B = 5$
 (1) $T_{amb} = 100\text{ °C}$
 (2) $T_{amb} = 25\text{ °C}$
 (3) $T_{amb} = -55\text{ °C}$

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



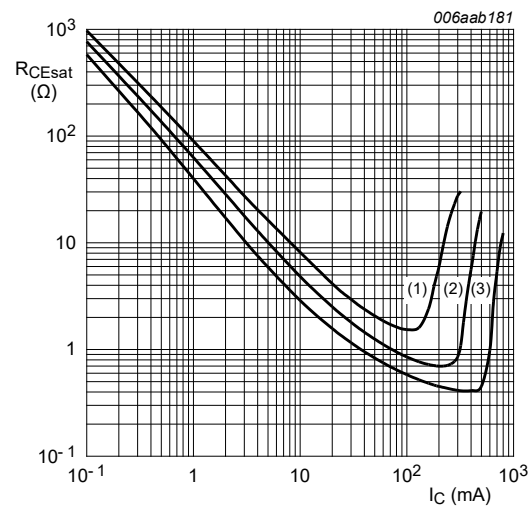
$T_{amb} = 25\text{ °C}$
 (1) $I_C/I_B = 20$
 (2) $I_C/I_B = 10$
 (3) $I_C/I_B = 5$

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



$I_C/I_B = 5$
 (1) $T_{amb} = 100\text{ °C}$
 (2) $T_{amb} = 25\text{ °C}$
 (3) $T_{amb} = -55\text{ °C}$

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



$T_{amb} = 25\text{ °C}$
 (1) $I_C/I_B = 20$
 (2) $I_C/I_B = 10$
 (3) $I_C/I_B = 5$

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

11. Test information

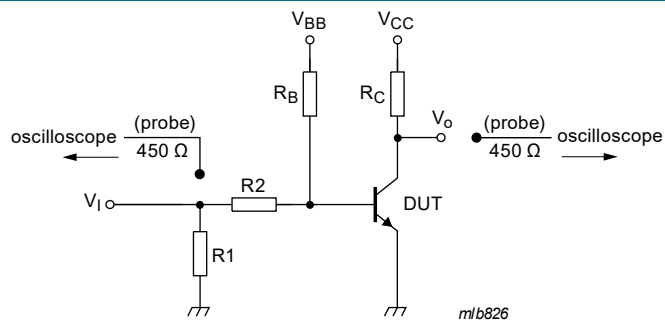


Fig. 12. Test circuit for switching times

12. Package outline

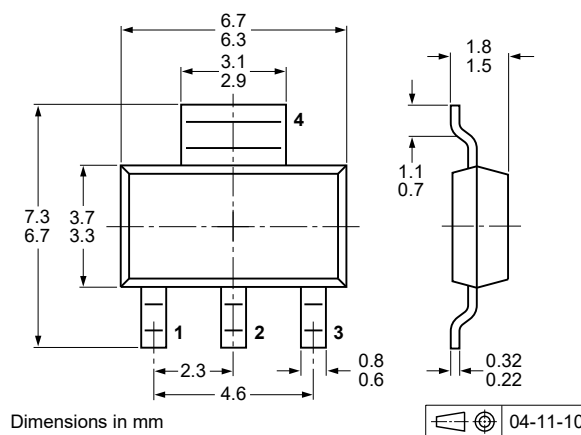
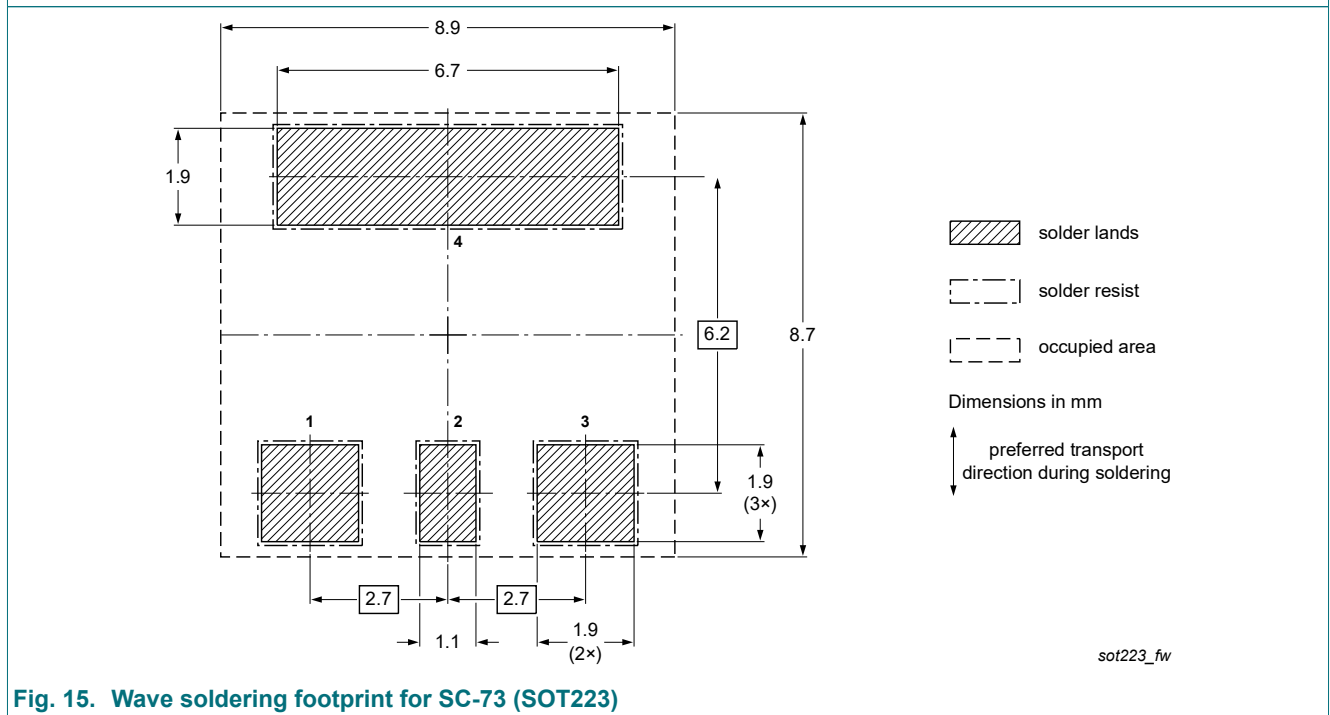
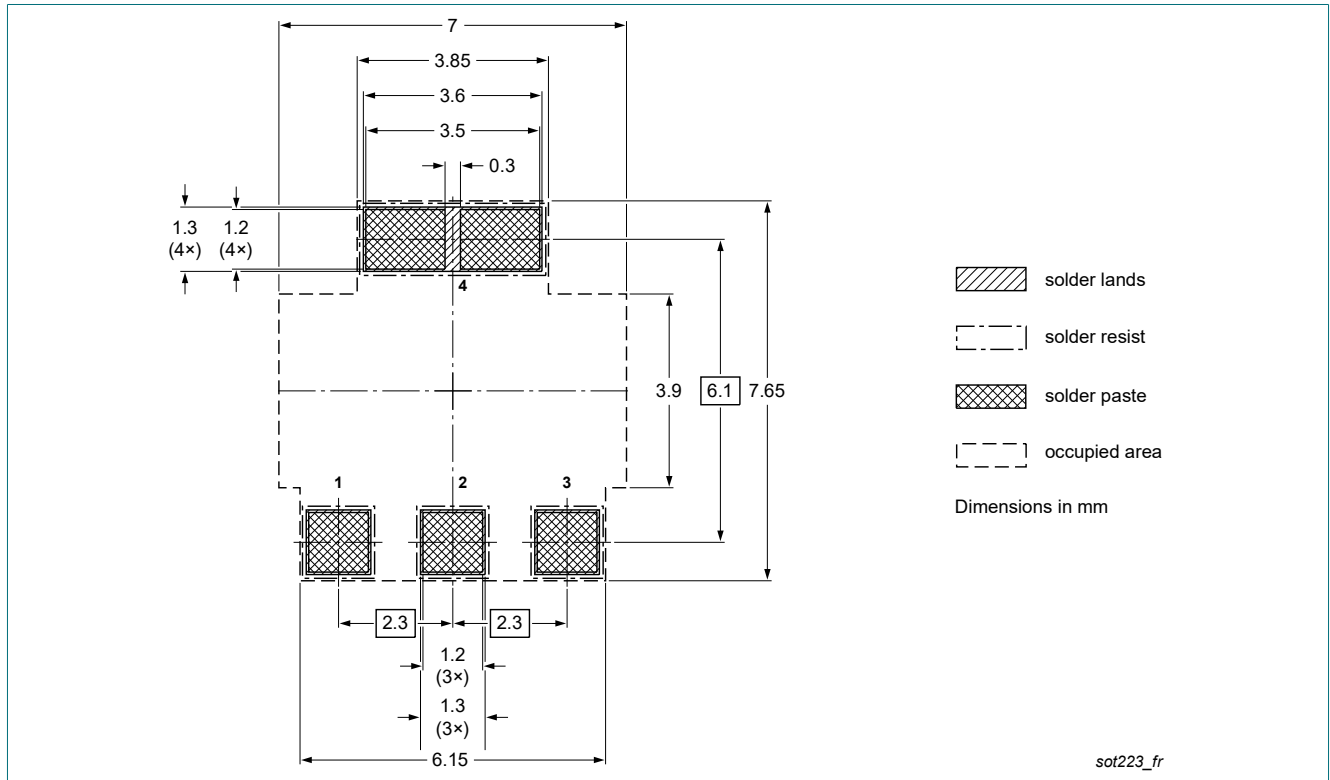


Fig. 13. Package outline SC-73 (SOT223)

13. Soldering



14. Revision history

Table 8. Revision history

Data sheet ID	Release date	Data sheet status	Change notice	Supersedes
PBHV8540Z v.4	20241008	Product data sheet	-	PBHV8540Z v.3
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). 			
PBHV8540Z v.3	20230717	Product data sheet	-	PBHV8540Z_2
PBHV8540Z_2	20090114	Product data sheet	-	PBHV8540Z_1
PBHV8540Z_1	20080207	Product data sheet	-	-

500 V, 0.5 A NPN high-voltage low VCEsat transistor

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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Date of release: 8 October 2024

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