



PBHV9540Z

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

17 July 2023

Product data sheet

1. General description

PNP high-voltage low V_{CEsat} transistor in a medium power SOT223 (SC-73) Surface-Mounted Device (SMD) plastic package.

NPN complement: PBHV8140Z

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
- Medium power SMD plastic package
- AEC-Q101 qualified

3. Applications

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

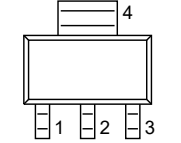
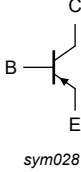
4. Quick reference data

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	$V_{CE} = -10\text{ V}$; $I_C = -50\text{ mA}$; pulsed; $t_p \leq 300\text{ }\mu\text{s}$; $\delta \leq 0.02$; $T_{amb} = 25\text{ }^\circ\text{C}$	100	155	-	

5. Pinning information

Table 2. Pinning information

Pin	Symbol	Description	Simplified outline	Graphic symbol
1	B	base	 SC-73 (SOT223)	 sym028
2	C	collector		
3	E	emitter		
4	C	collector		

6. Ordering information

Table 3. Ordering information

Type number	Package		Version
	Name	Description	
PBHV9540Z	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
PBHV9540Z	V9540Z

8. Limiting values

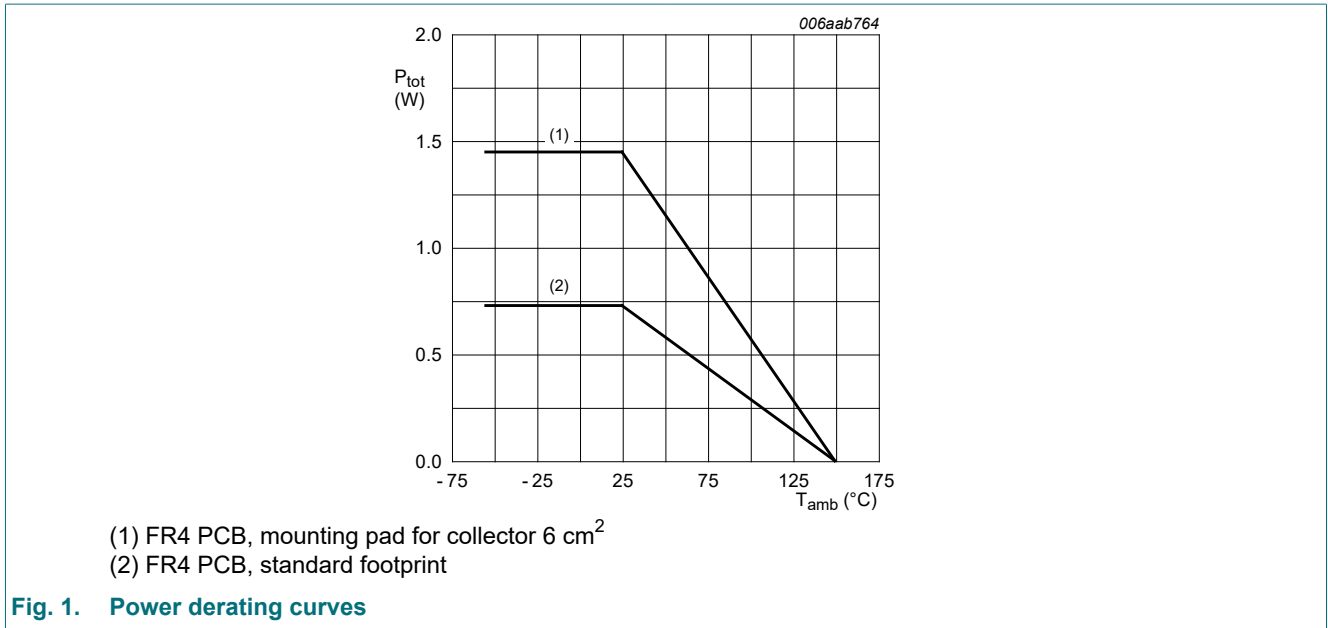
Table 5. Limiting values

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]	-	1.45	W
			[2]	-	0.73	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, mounting pad for collector 6 cm².

[2] Device mounted on an FR4 PCB, single-sided copper, tin-plated and standard footprint.



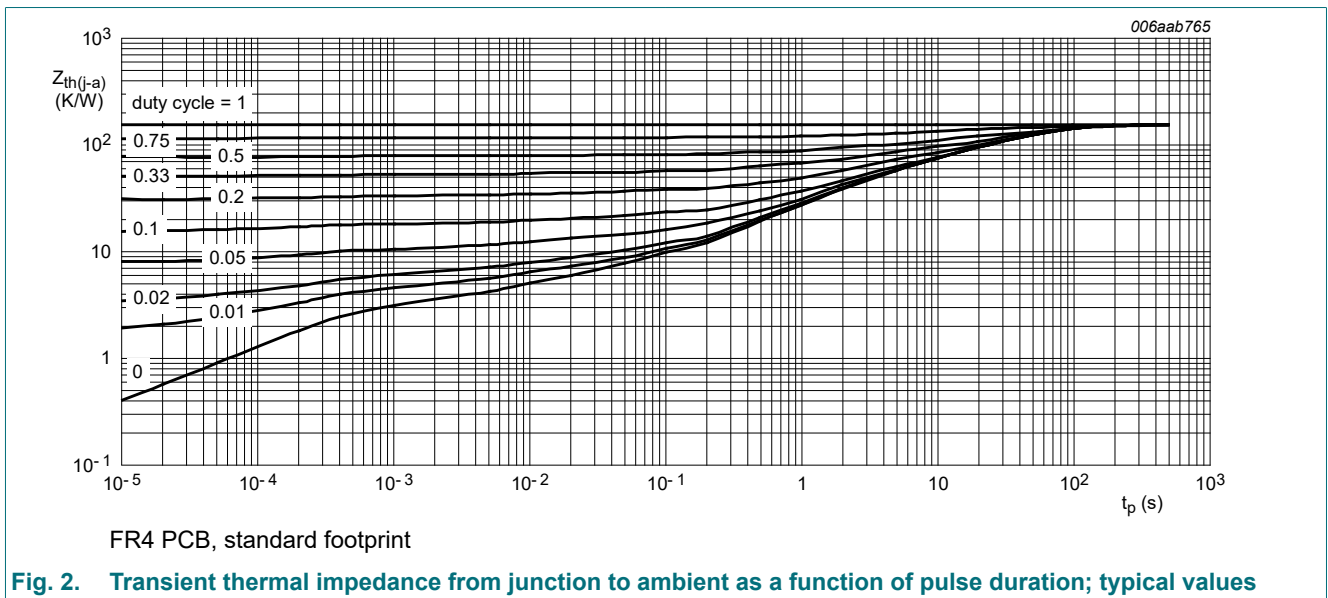
9. Thermal characteristics

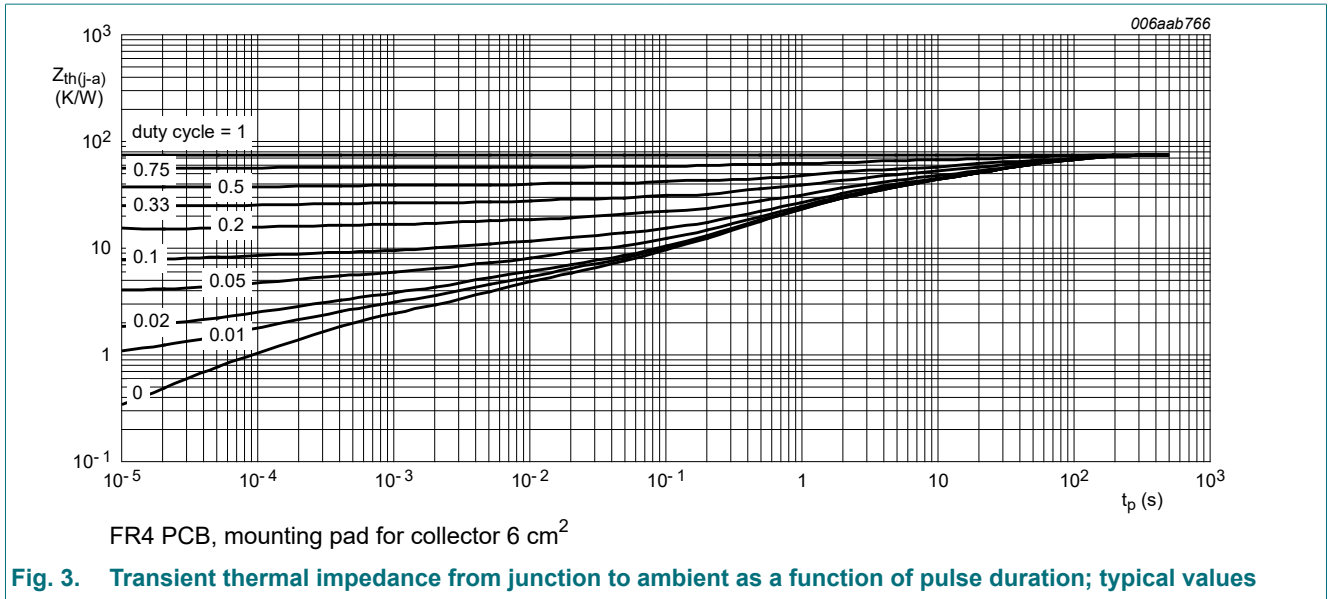
Table 6. Thermal characteristics

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
R _{th(j-a)}	thermal resistance from junction to ambient	in free air	[1]	-	-	170	K/W
			[2]	-	-	85	K/W
R _{th(j-sp)}	thermal resistance from junction to solder point			-	-	15	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.





10. Characteristics

Table 7. Characteristics

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
I _{CB0}	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 _{EBO}	emitter-base cut-off current	V _{EB} = -4 V; I _C = 0 A; T _{amb} = 25 °C	-	-	-100	nA
I _{CES}	collector-emitter cut-off current	V _{CE} = -320 V; V _{BE} = 0 V; T _{amb} = 25 °C	-	-	-100	nA
h _{FE}	DC current gain	V _{CE} = -10 V; I _C = -50 mA; pulsed; t _p ≤ 300 µs; δ ≤ 0.02; T _{amb} = 25 °C	100	155	-	
		V _{CE} = -10 V; I _C = -100 mA; pulsed; t _p ≤ 300 µs; δ ≤ 0.02; T _{amb} = 25 °C	100	155	-	
		V _{CE} = -10 V; I _C = -300 mA; pulsed; t _p ≤ 300 µs; δ ≤ 0.02; T _{amb} = 25 °C	80	145	-	
		V _{CE} = -10 V; I _C = -500 mA; pulsed; t _p ≤ 300 µs; δ ≤ 0.02; T _{amb} = 25 °C	65	130	-	
V _{CEsat}	collector-emitter saturation voltage	I _C = -100 mA; I _B = -10 mA; T _{amb} = 25 °C	-	-100	-190	mV
		I _C = -100 mA; I _B = -20 mA; pulsed; t _p ≤ 300 µs; δ ≤ 0.02; T _{amb} = 25 °C	-	-65	-110	mV
		I _C = -300 mA; I _B = -60 mA; pulsed; t _p ≤ 300 µs; δ ≤ 0.02; T _{amb} = 25 °C	-	-110	-210	mV
		I _C = -500 mA; I _B = -100 mA; pulsed; t _p ≤ 300 µs; δ ≤ 0.02; T _{amb} = 25 °C	-	-180	-320	mV
R _{CEsat}	collector-emitter saturation resistance		-	360	640	mΩ
V _{BEsat}	base-emitter saturation voltage	I _C = -100 mA; I _B = -20 mA; pulsed; t _p ≤ 300 µs; δ ≤ 0.02; T _{amb} = 25 °C	-	-0.75	-0.9	V

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

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
t_d	delay time	$V_{CC} = -2 \text{ V}; I_C = -0.15 \text{ A}; I_{B\text{on}} = -0.03 \text{ A}; I_{B\text{off}} = 0.03 \text{ A}; T_{\text{amb}} = 25 \text{ }^\circ\text{C}$	-	55	-	ns
t_r	rise time		-	1775	-	ns
t_{on}	turn-on time		-	1830	-	ns
t_s	storage time		-	1545	-	ns
t_f	fall time		-	920	-	ns
t_{off}	turn-off time		-	2465	-	ns
f_T	transition frequency	$V_{CE} = -10 \text{ V}; I_C = -10 \text{ mA}; f = 100 \text{ MHz}$	-	30	-	MHz
C_c	collector capacitance	$V_{CB} = -20 \text{ V}; I_E = 0 \text{ A}; i_e = 0 \text{ A}; f = 1 \text{ MHz}; T_{\text{amb}} = 25 \text{ }^\circ\text{C}$	-	20	-	pF
C_e	emitter capacitance	$V_{EB} = -0.5 \text{ V}; I_C = 0 \text{ A}; i_c = 0 \text{ A}; f = 1 \text{ MHz}; T_{\text{amb}} = 25 \text{ }^\circ\text{C}$	-	540	-	pF

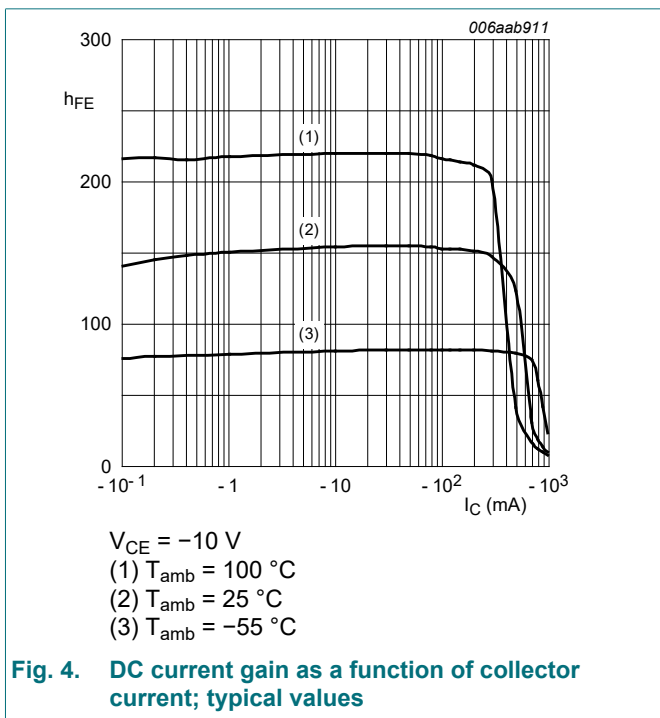


Fig. 4. DC current gain as a function of collector current; typical values

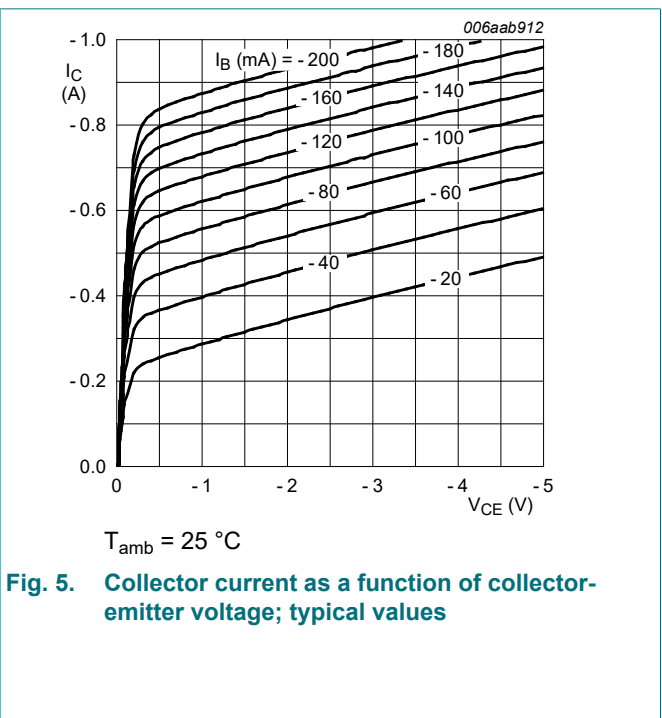
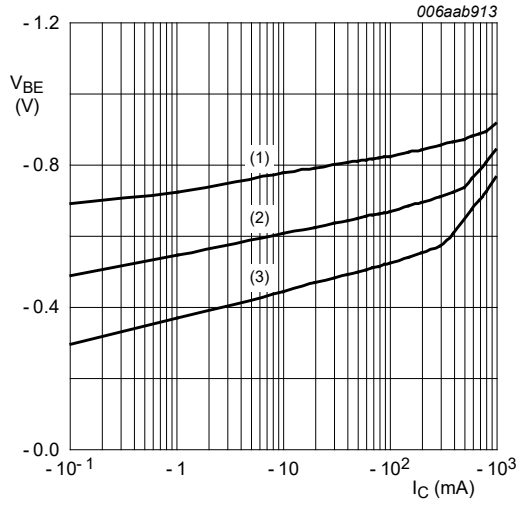
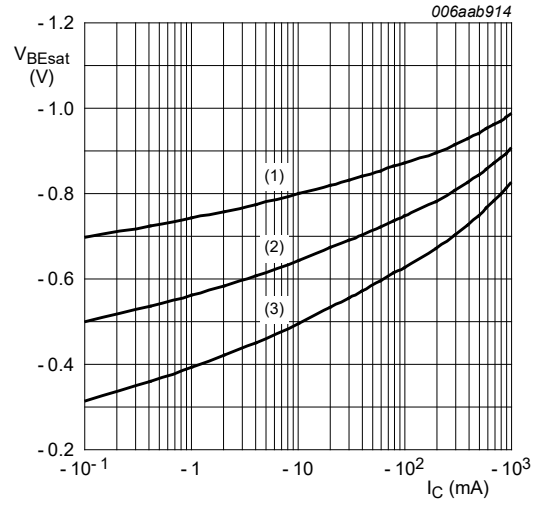


Fig. 5. Collector current as a function of collector-emitter voltage; typical values



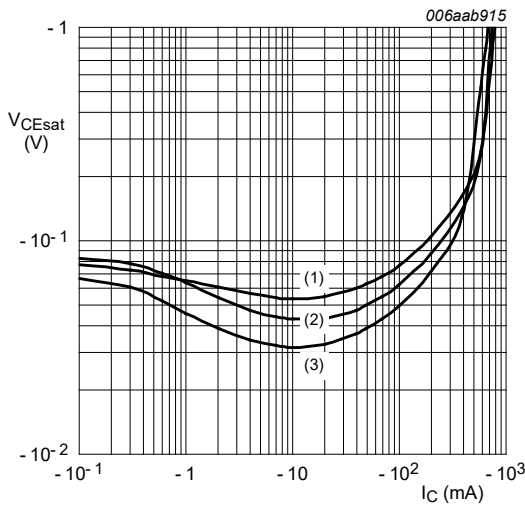
$V_{CE} = -10\text{ V}$
 (1) $T_{amb} = -55\text{ °C}$
 (2) $T_{amb} = 25\text{ °C}$
 (3) $T_{amb} = 100\text{ °C}$

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



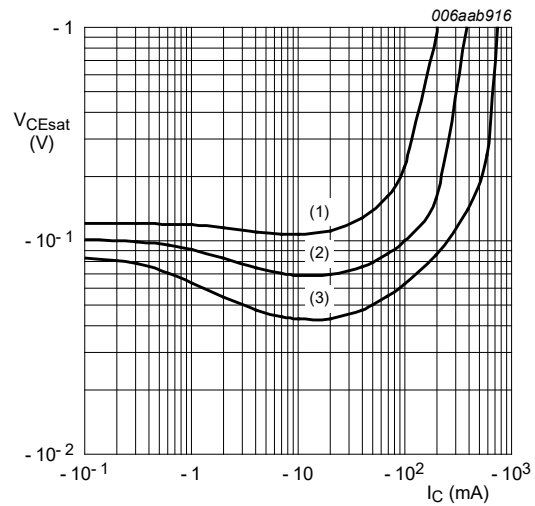
$I_C/I_B = 5$
 (1) $T_{amb} = -55\text{ °C}$
 (2) $T_{amb} = 25\text{ °C}$
 (3) $T_{amb} = 100\text{ °C}$

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

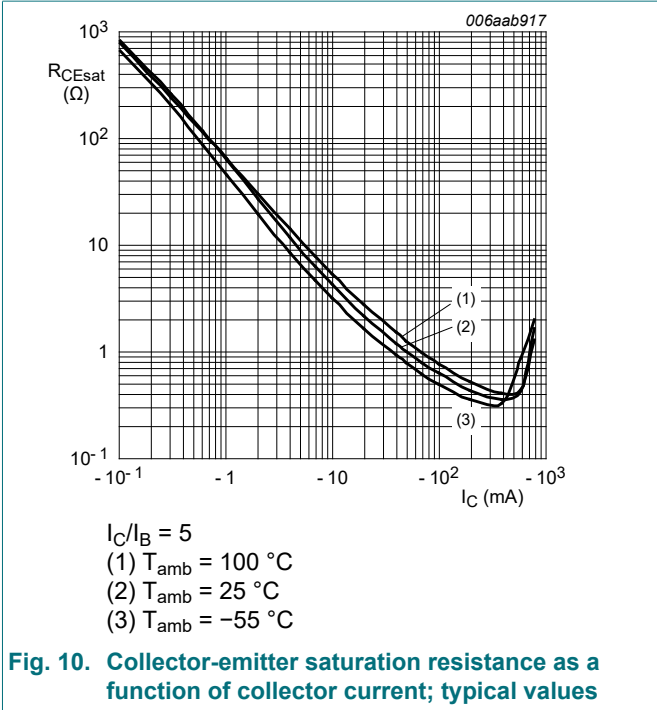


Fig. 10. Collector-emitter saturation resistance as a function of collector current; typical values

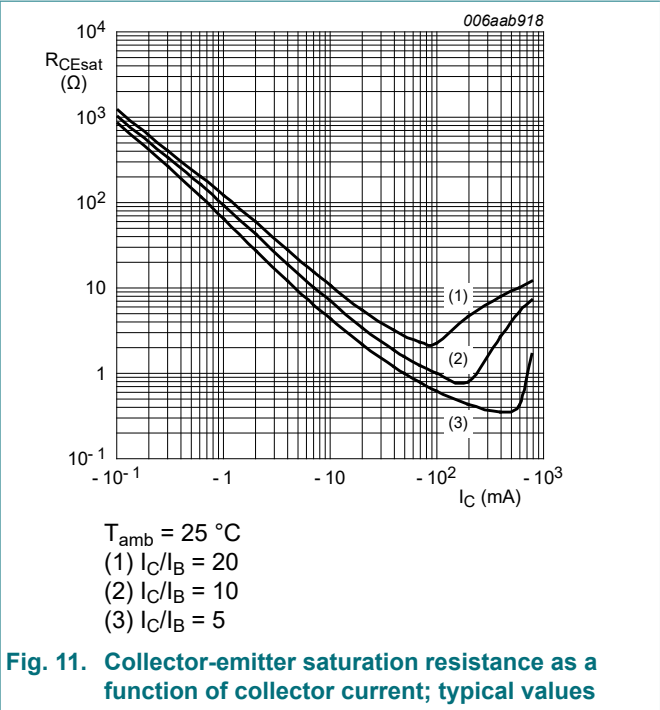


Fig. 11. Collector-emitter saturation resistance as a function of collector current; typical values

11. Test information

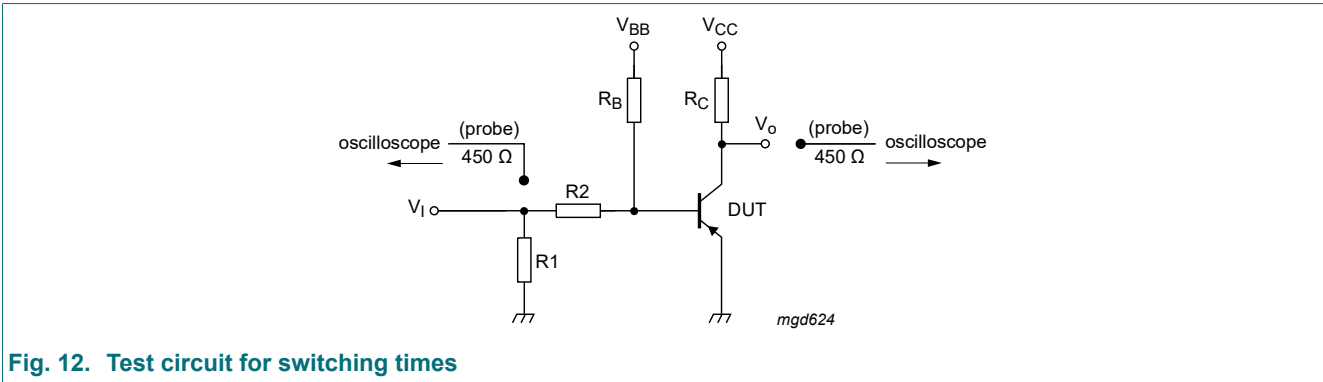


Fig. 12. Test circuit for switching times

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

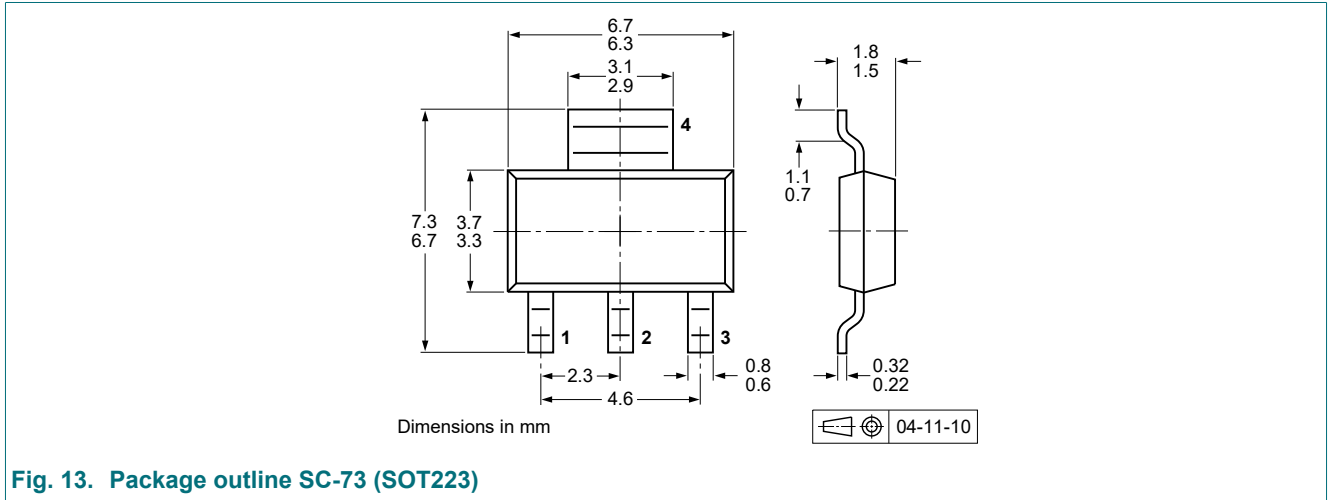


Fig. 13. Package outline SC-73 (SOT223)

13. Soldering

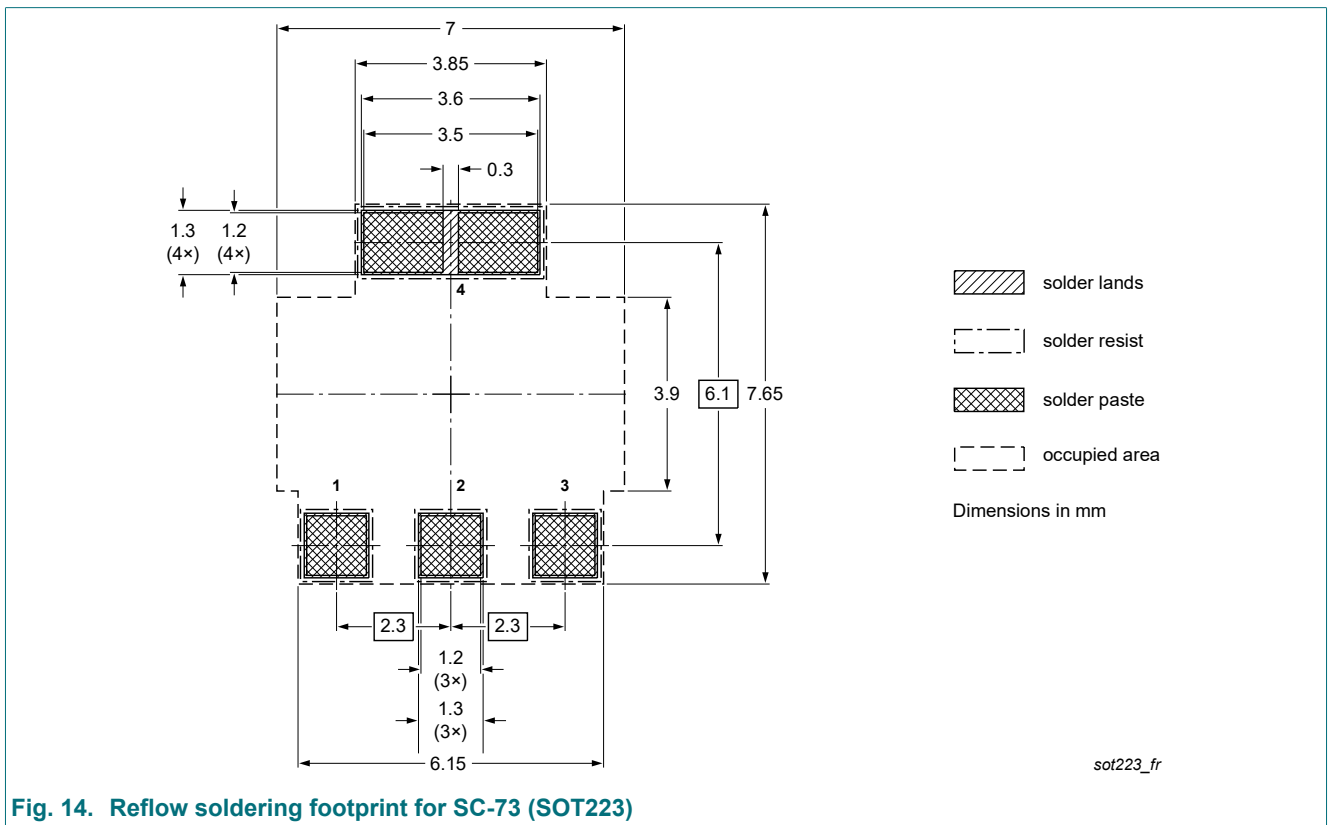


Fig. 14. Reflow soldering footprint for SC-73 (SOT223)

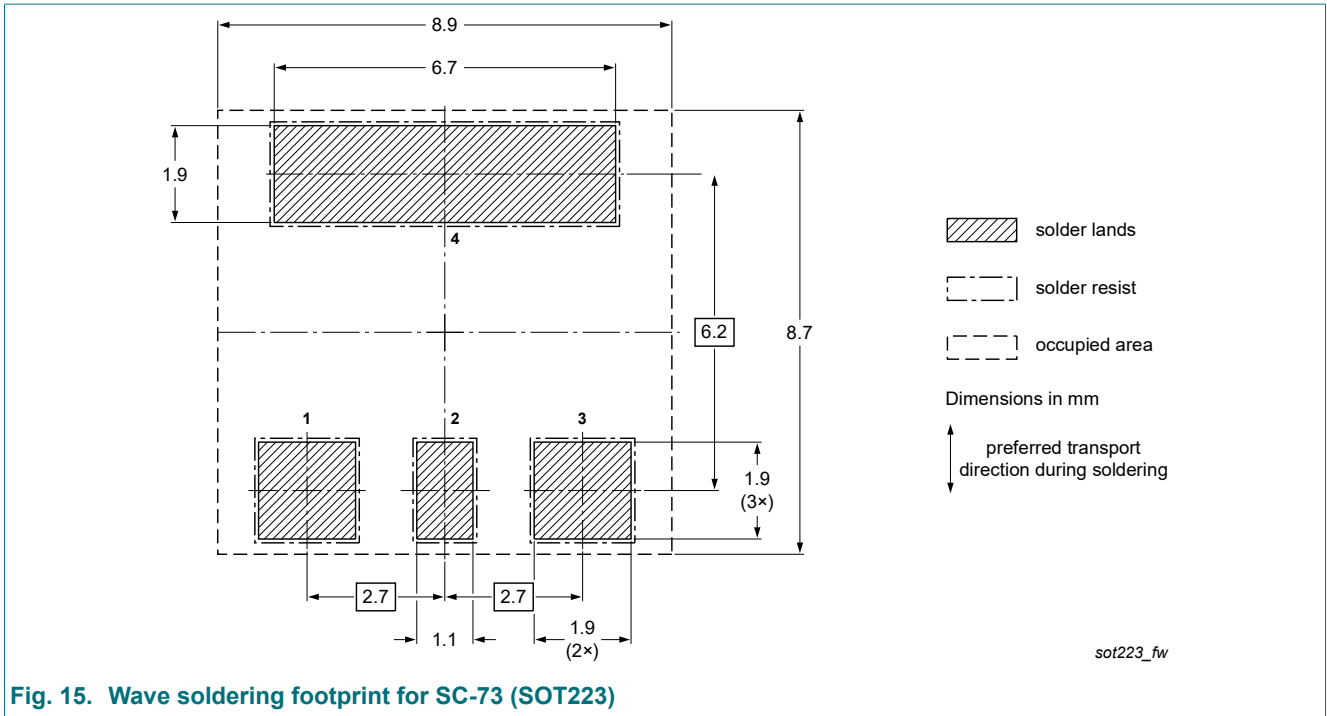


Fig. 15. Wave soldering footprint for SC-73 (SOT223)

14. Revision history

Table 8. Revision history

Data sheet ID	Release date	Data sheet status	Change notice	Supersedes
PBHV9540Z v.2	20230717	Product data sheet	-	PBHV9540Z_1
Modifications:	<ul style="list-style-type: none">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.Section "Packing information" removed.			
PBHV9540Z_1	20091211	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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Contents

1. General description.....	1
2. Features and benefits.....	1
3. Applications.....	1
4. Quick reference data.....	1
5. Pinning information.....	2
6. Ordering information.....	2
7. Marking.....	2
8. Limiting values.....	2
9. Thermal characteristics.....	3
10. Characteristics.....	4
11. Test information.....	7
12. Package outline.....	8
13. Soldering.....	8
14. Revision history.....	10
15. Legal information.....	11

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