



# PBHV9414Z-Q

140 V, 4 A PNP high-voltage low  $V_{CEsat}$  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.

## 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  $I_C$
- Qualified according to AEC-Q101 and recommended for use in automotive applications

## 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
$V_{CEO}$	collector-emitter voltage	open base	-	-	-140	V
$I_C$	collector current		-	-	-4	A
$I_{CM}$	peak collector current	single pulse; $t_p \leq 1$ ms	-	-	-10	A
$R_{CEsat}$	collector-emitter saturation resistance	$I_C = -1$ A; $I_B = -100$ mA; pulsed; $t_p \leq 300$ $\mu$ s; $\delta \leq 0.02$ ; $T_{amb} = 25$ °C	-	100	150	m $\Omega$

## 5. Pinning information

Table 2. Pinning information

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

## 6. Ordering information

Table 3. Ordering information

Type number	Package		
	Name	Description	Version
<a href="#">PBHV9414Z-Q</a>	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	<a href="#">SOT223</a>

## 7. Marking

Table 4. Marking codes

Type number	Marking code
PBHV9414Z-Q	V9414Z

## 8. Limiting values

Table 5. Limiting values

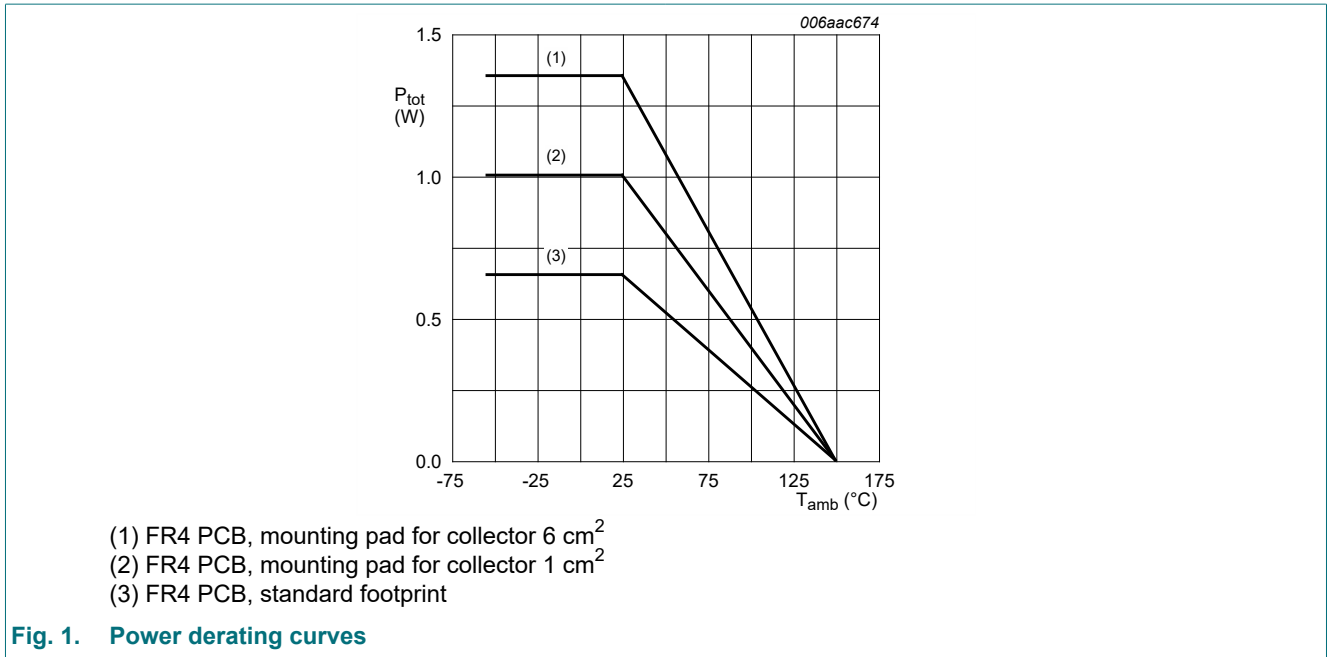
In accordance with the Absolute Maximum Rating System (IEC 60134).

Symbol	Parameter	Conditions		Min	Max	Unit
$V_{CBO}$	collector-base voltage	open emitter		-	-180	V
$V_{CEO}$	collector-emitter voltage	open base		-	-140	V
$V_{EBO}$	emitter-base voltage	open collector		-	-7	V
$I_C$	collector current			-	-4	A
$I_{CM}$	peak collector current	single pulse; $t_p \leq 1$ ms		-	-10	A
$I_B$	base current			-	-500	mA
$P_{tot}$	total power dissipation	$T_{amb} \leq 25$ °C	[1]	-	0.65	W
			[2]	-	1	W
			[3]	-	1.35	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 Printed-Circuit Board (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 cm<sup>2</sup>.

[3] Device mounted on an FR4 PCB, single-sided copper, tin-plated, mounting pad for collector 6 cm<sup>2</sup>.

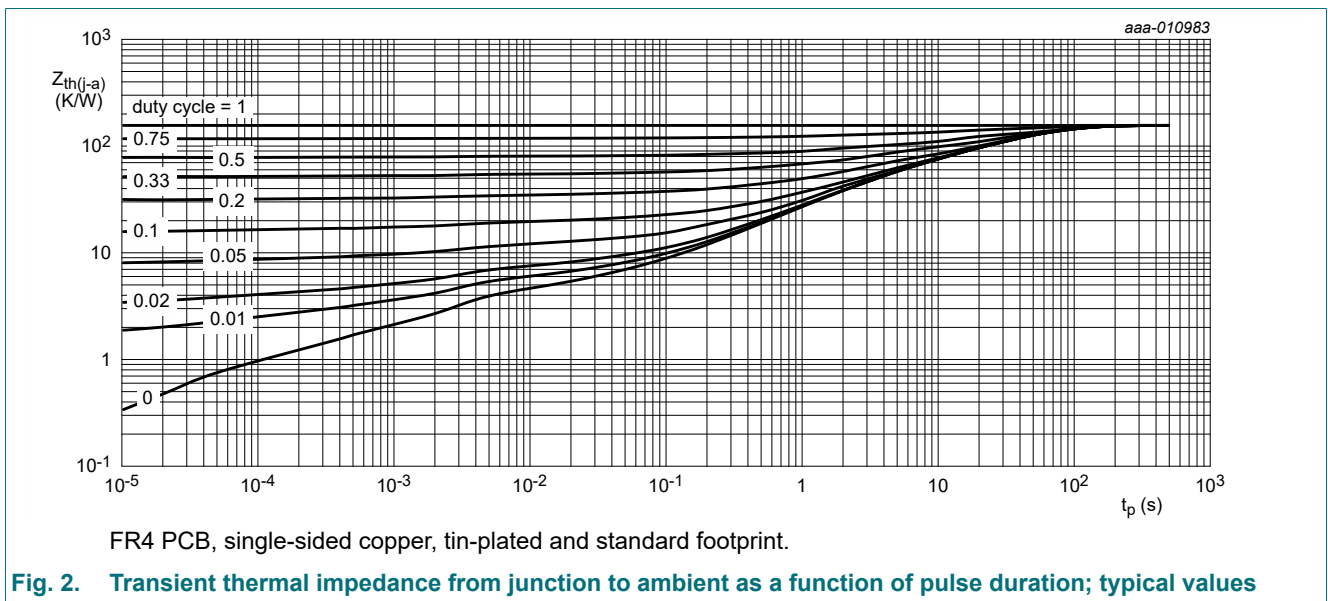


## 9. Thermal characteristics

Table 6. Thermal characteristics

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
R <sub>th(j-a)</sub>	thermal resistance from junction to ambient	in free air	[1]	-	-	192	K/W
			[2]	-	-	125	K/W
			[3]	-	-	93	K/W
R <sub>th(j-sp)</sub>	thermal resistance from junction to solder point			-	-	16	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 cm<sup>2</sup>.
- [3] Device mounted on an FR4 PCB, single-sided copper, tin-plated, mounting pad for collector 6 cm<sup>2</sup>.



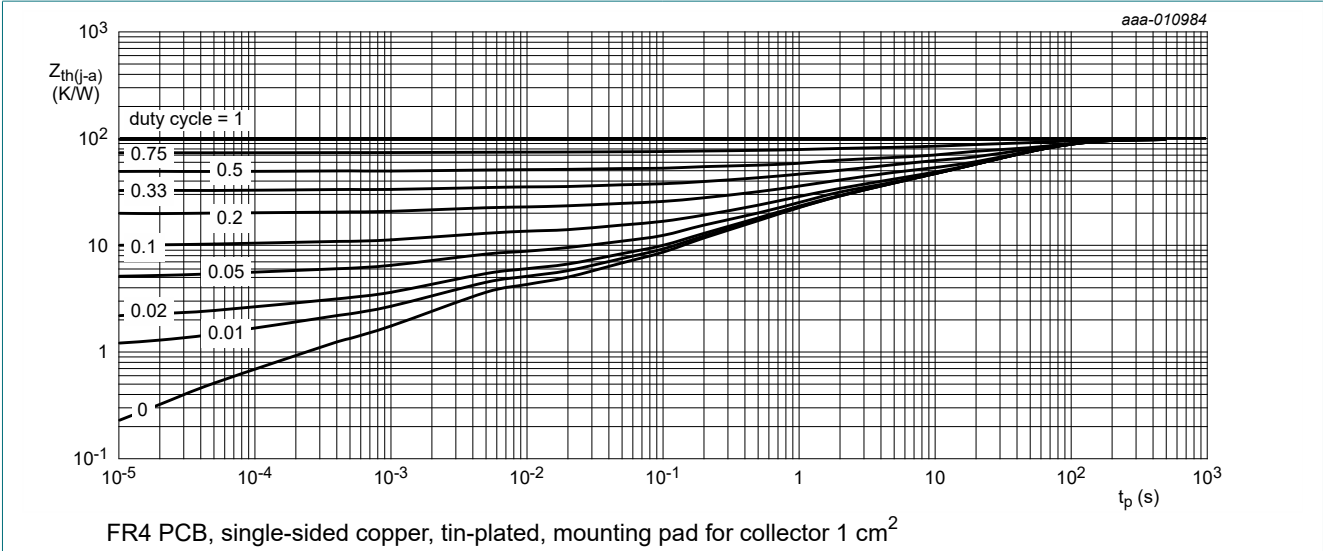


Fig. 3. Transient thermal impedance from junction to ambient as a function of pulse duration; typical values

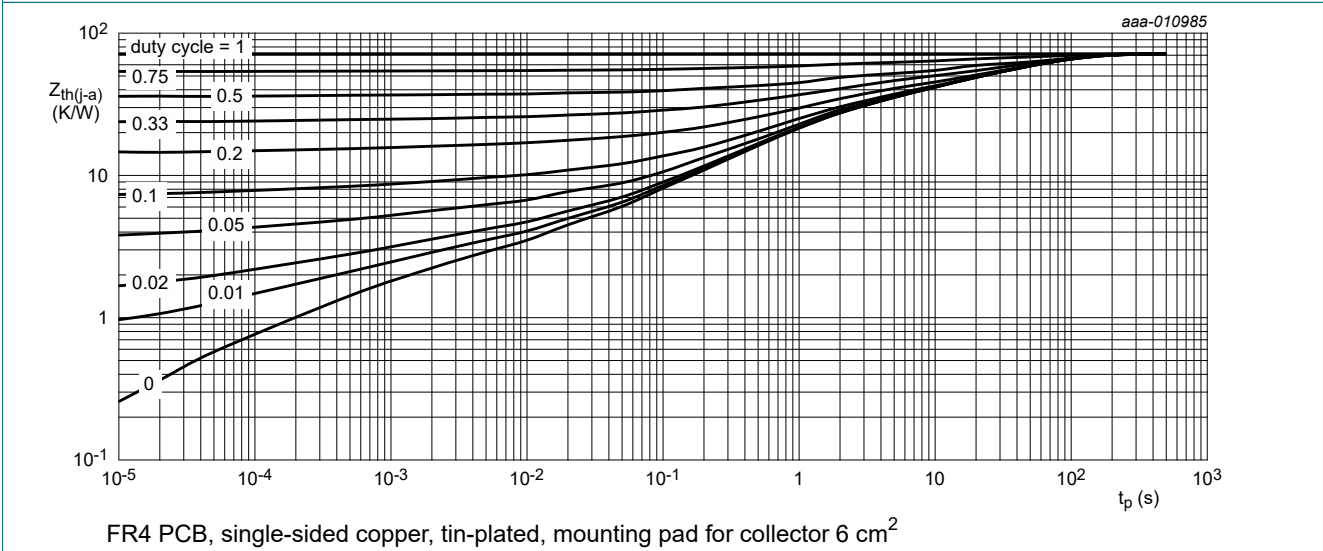
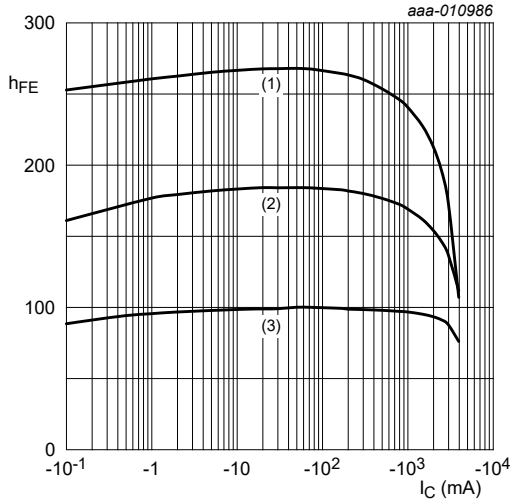


Fig. 4. Transient thermal impedance from junction to ambient as a function of pulse duration; typical values

## 10. Characteristics

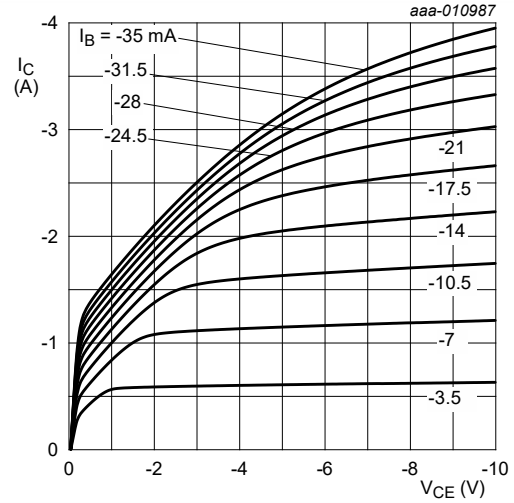
Table 7. Characteristics

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
I <sub>CBO</sub>	collector-base cut-off current	V <sub>CB</sub> = -150 V; I <sub>E</sub> = 0 A; T <sub>amb</sub> = 25 °C	-	-	-100	nA
		V <sub>CB</sub> = -150 V; I <sub>E</sub> = 0 A; T <sub>j</sub> = 150 °C	-	-	-50	μA
I <sub>EBO</sub>	emitter-base cut-off current	V <sub>EB</sub> = -6 V; I <sub>C</sub> = 0 A; T <sub>amb</sub> = 25 °C	-	-	-100	nA
I <sub>CES</sub>	collector-emitter cut-off current	V <sub>CE</sub> = -115 V; V <sub>BE</sub> = 0 V; T <sub>amb</sub> = 25 °C	-	-	-100	nA
h <sub>FE</sub>	DC current gain	V <sub>CE</sub> = -5 V; I <sub>C</sub> = -10 mA; T <sub>amb</sub> = 25 °C	100	160	-	
		V <sub>CE</sub> = -5 V; I <sub>C</sub> = -1 A; pulsed; t <sub>p</sub> ≤ 300 μs; δ ≤ 0.02; T <sub>amb</sub> = 25 °C	100	150	300	
		V <sub>CE</sub> = -5 V; I <sub>C</sub> = -3 A; pulsed; t <sub>p</sub> ≤ 300 μs; δ ≤ 0.02; T <sub>amb</sub> = 25 °C	75	100	-	
		V <sub>CE</sub> = -5 V; I <sub>C</sub> = -4 A; pulsed; t <sub>p</sub> ≤ 300 μs; δ ≤ 0.02; T <sub>amb</sub> = 25 °C	35	50	-	
V <sub>CEsat</sub>	collector-emitter saturation voltage	I <sub>C</sub> = -100 mA; I <sub>B</sub> = -5 mA; pulsed; t <sub>p</sub> ≤ 300 μs; δ ≤ 0.02; T <sub>amb</sub> = 25 °C	-	-45	-60	mV
		I <sub>C</sub> = -500 mA; I <sub>B</sub> = -50 mA; pulsed; t <sub>p</sub> ≤ 300 μs; δ ≤ 0.02; T <sub>amb</sub> = 25 °C	-	-60	-100	mV
		I <sub>C</sub> = -1 A; I <sub>B</sub> = -100 mA; pulsed; t <sub>p</sub> ≤ 300 μs; δ ≤ 0.02; T <sub>amb</sub> = 25 °C	-	-100	-150	mV
		I <sub>C</sub> = -3 A; I <sub>B</sub> = -300 mA; t <sub>p</sub> ≤ 300 μs; δ ≤ 0.02; T <sub>amb</sub> = 25 °C; pulsed	-	-275	-370	mV
		I <sub>C</sub> = -4 A; I <sub>B</sub> = -400 mA; pulsed; t <sub>p</sub> ≤ 300 μs; δ ≤ 0.02; T <sub>amb</sub> = 25 °C	-	-420	-550	mV
R <sub>CEsat</sub>	collector-emitter saturation resistance	I <sub>C</sub> = -1 A; I <sub>B</sub> = -100 mA; pulsed; t <sub>p</sub> ≤ 300 μs; δ ≤ 0.02; T <sub>amb</sub> = 25 °C	-	100	150	mΩ
V <sub>BEsat</sub>	base-emitter saturation voltage		-	-	-1.2	V
V <sub>BEon</sub>	base-emitter turn-on voltage	V <sub>CE</sub> = -5 V; I <sub>C</sub> = -1 A; t <sub>p</sub> ≤ 300 μs; pulsed; δ ≤ 0.02; T <sub>amb</sub> = 25 °C	-	-	-1.1	V



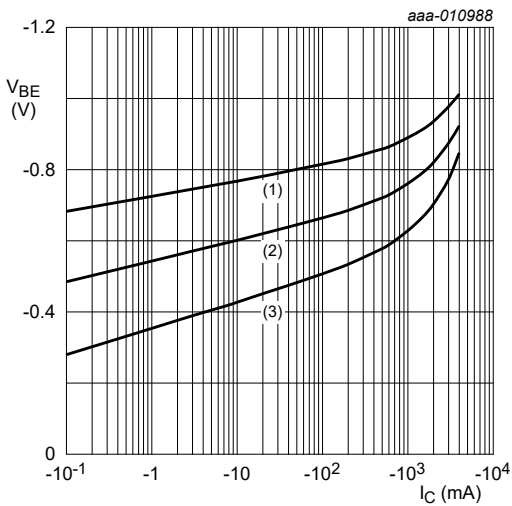
$V_{CE} = -10$  V  
 (1)  $T_{amb} = 100$  °C  
 (2)  $T_{amb} = 25$  °C  
 (3)  $T_{amb} = -55$  °C

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



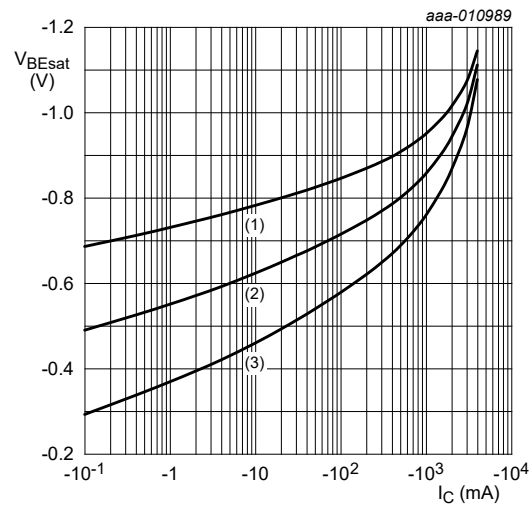
$T_{amb} = 25$  °C

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



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

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



$I_C/I_B = 20$   
 (1)  $T_{amb} = -55$  °C  
 (2)  $T_{amb} = 25$  °C  
 (3)  $T_{amb} = 100$  °C

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

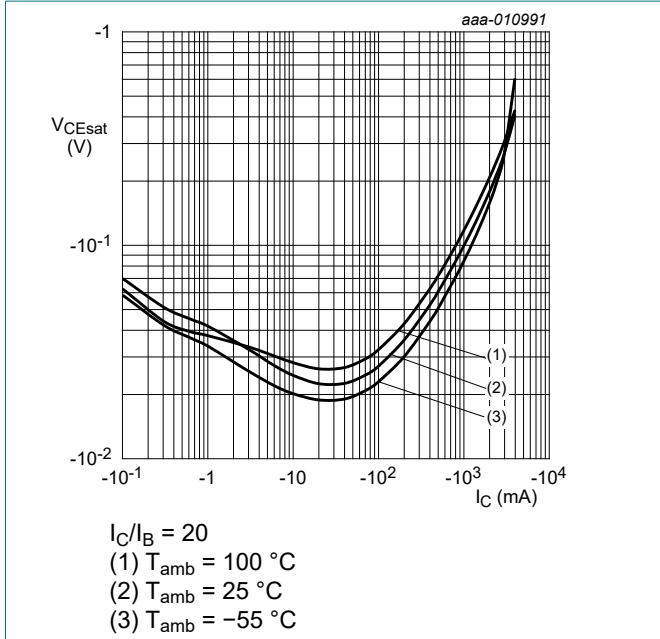


Fig. 9. Collector-emitter saturation voltage as a function of collector current; typical values

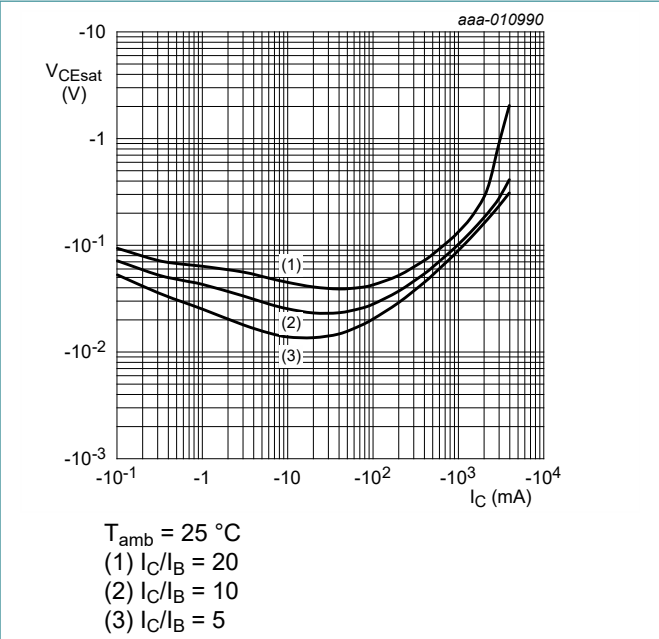


Fig. 10. Collector-emitter saturation voltage as a function of collector current; typical values

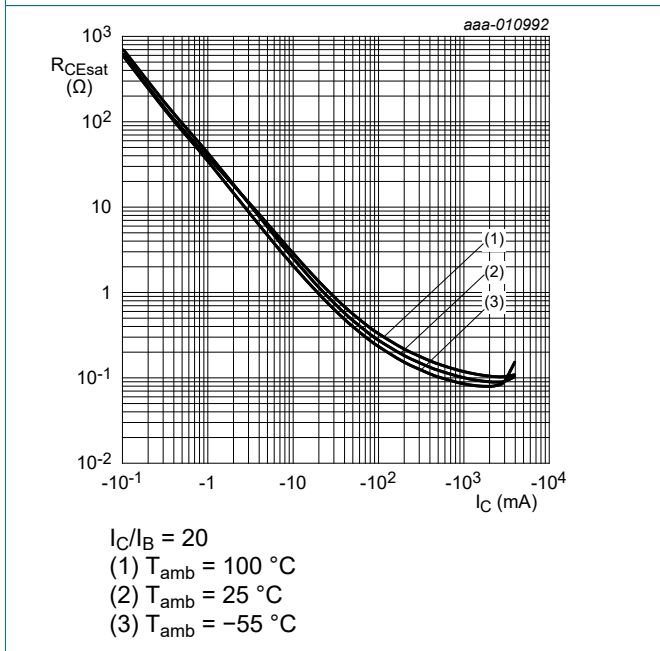


Fig. 11. Collector-emitter saturation resistance as a function of collector current; typical values

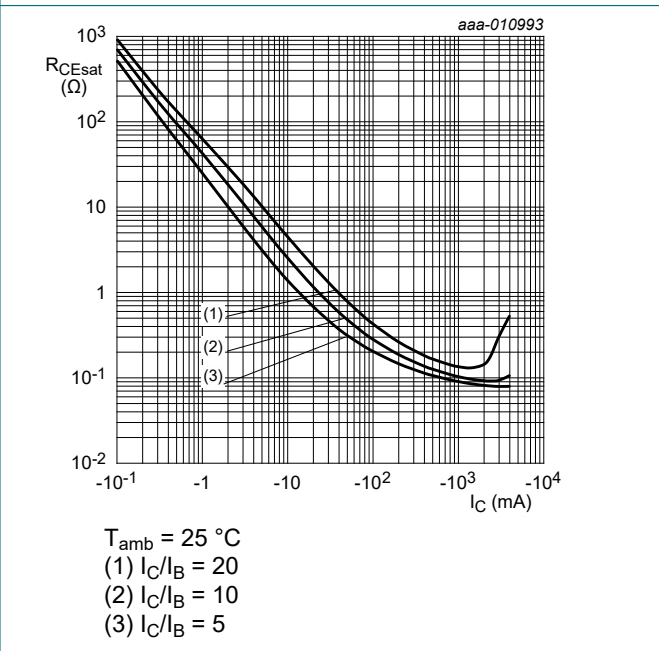


Fig. 12. Collector-emitter saturation resistance as a function of collector current; typical values

## 11. Test information

### 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

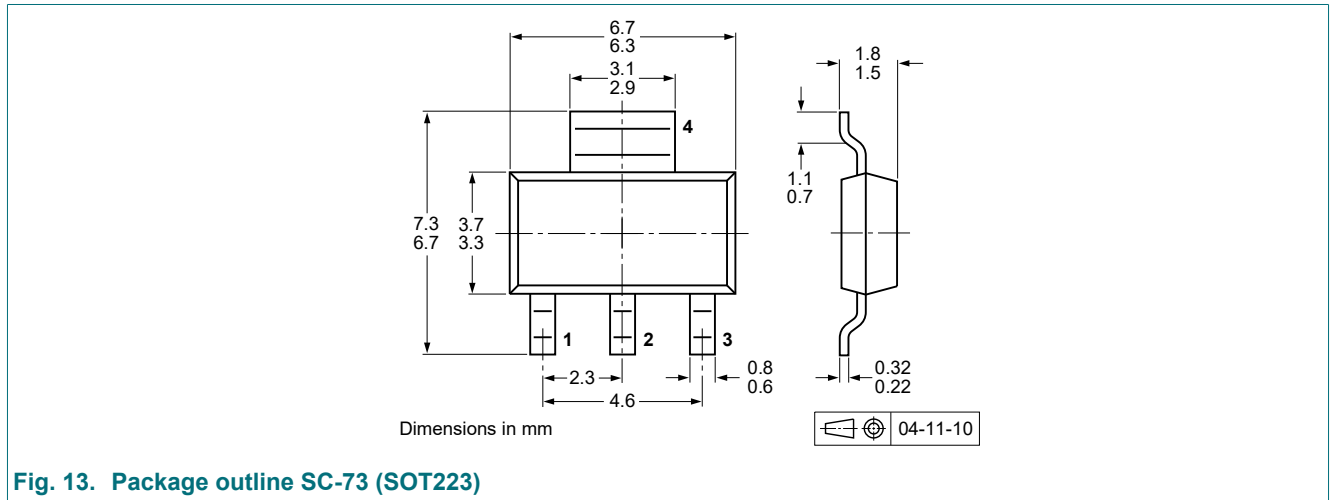


Fig. 13. Package outline SC-73 (SOT223)

## 13. Soldering

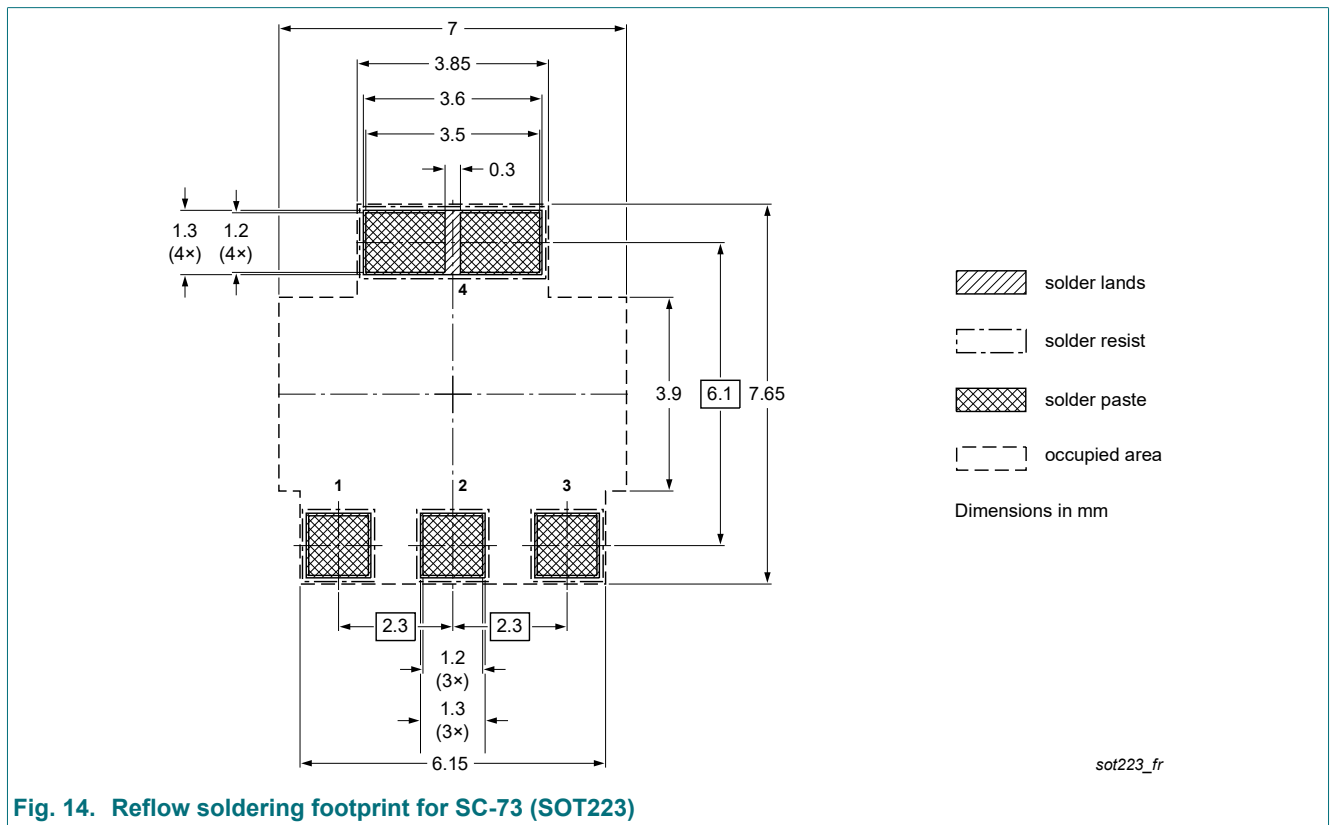


Fig. 14. Reflow soldering footprint for SC-73 (SOT223)



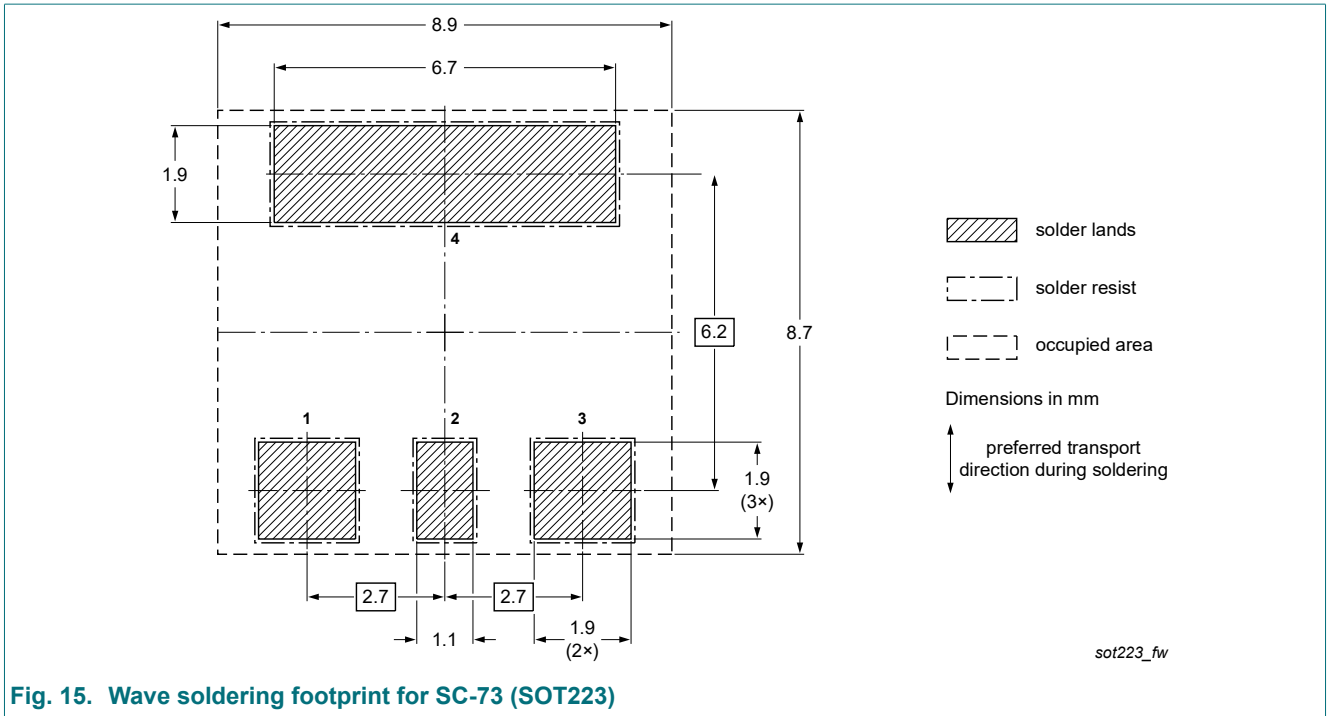


Fig. 15. Wave soldering footprint for SC-73 (SOT223)

## 14. Revision history

Table 8. Revision history

Data sheet ID	Release date	Data sheet status	Change notice	Supersedes
PBHV9414Z-Q v.1	20230717	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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