



PBHV9414Z

140 V, 4 A PNP high-voltage low VCEsat (BISS) transistor

24 January 2014

Product data sheet

1. General description

PNP high-voltage low V_{CEsat} Breakthrough Small Signal (BISS) 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
- AEC-Q101 qualified

3. Applications

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

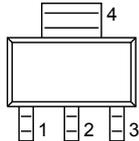
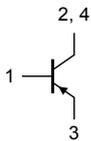
4. Quick reference data

Table 1. Quick reference data

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
V_{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; $t_p \leq 300$ μ s; $\delta \leq 0.02$; $T_{amb} = 25$ °C	-	100	150	m Ω

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		
	Name	Description	Version
PBHV9414Z	SC-73	plastic surface-mounted package with increased heatsink; 4 leads	SOT223

7. Marking

Table 4. Marking codes

Type number	Marking code
PBHV9414Z	V9414Z

8. Limiting values

Table 5. Limiting values

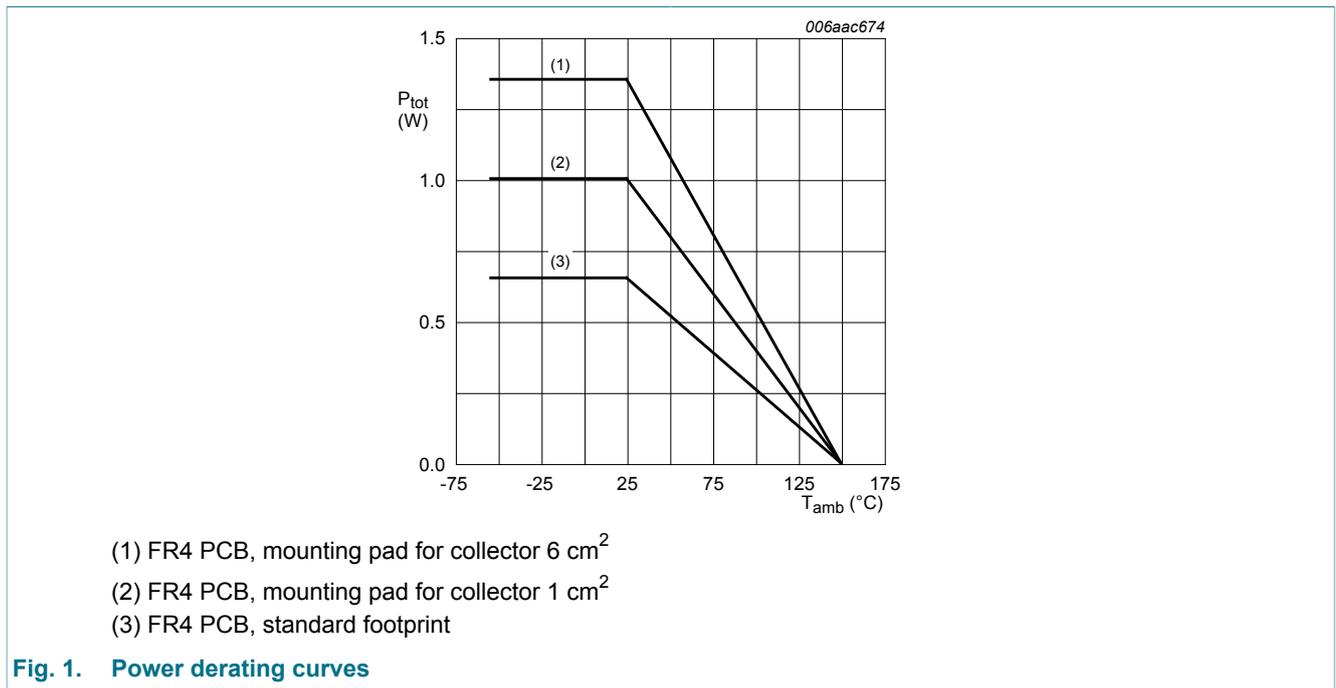
In accordance with the Absolute Maximum Rating System (IEC 60134).

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

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Symbol	Parameter	Conditions	Min	Max	Unit
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 cm².
- [3] Device mounted on an FR4 PCB, single-sided copper, tin-plated, mounting pad for collector 6 cm².

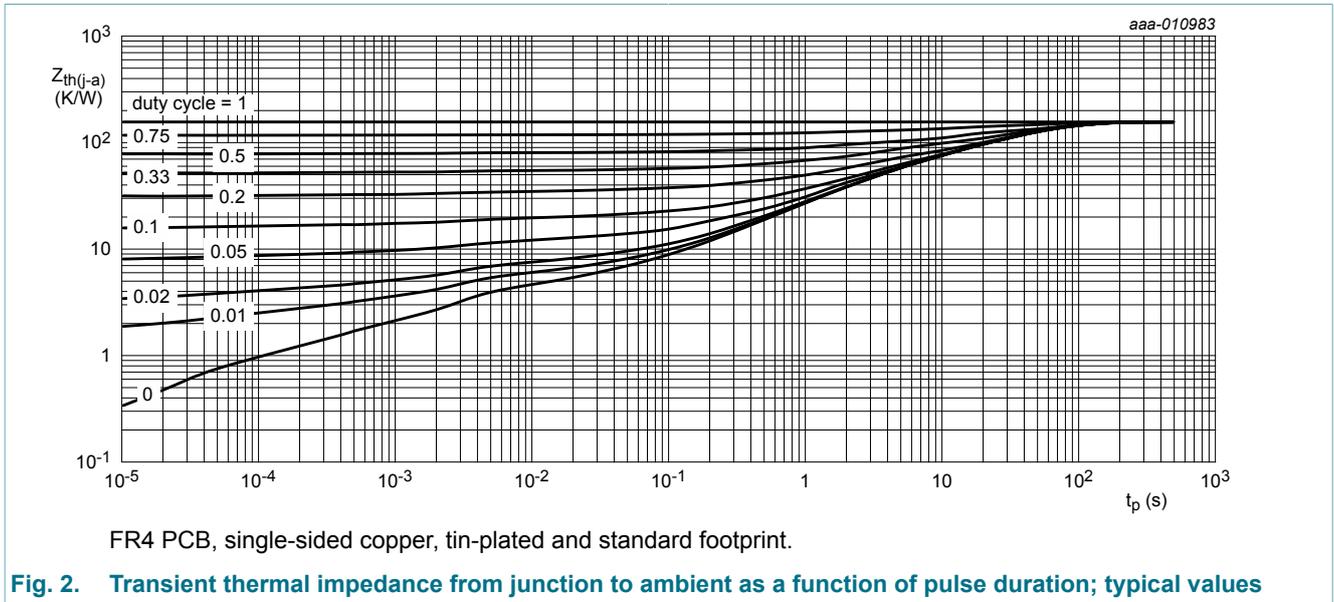


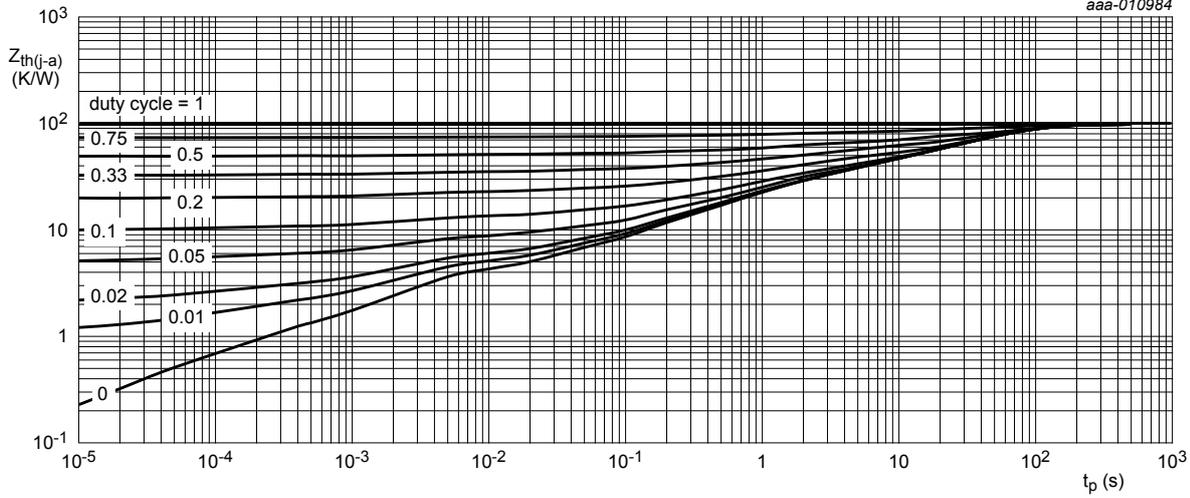
9. Thermal characteristics

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]	-	-	192	K/W
			[2]	-	-	125	K/W
			[3]	-	-	93	K/W
$R_{th(j-sp)}$	thermal resistance from junction to solder point			-	-	16	K/W

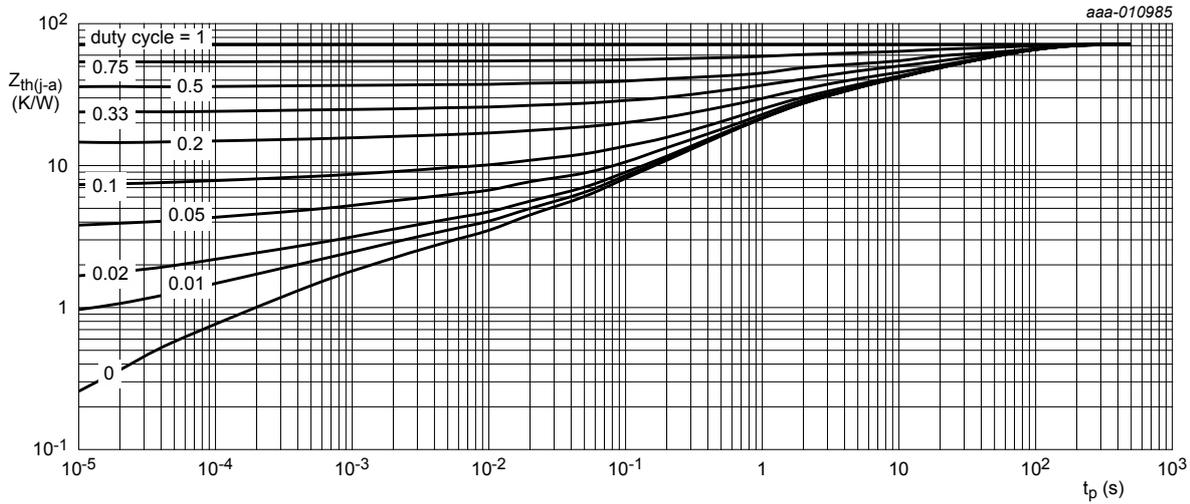
- [1] Device mounted on an FR4 PCB, single-sided copper, tin-plated and standard footprint.
- [2] Device mounted on an FR4 PCB, single-sided copper, tin-plated, mounting pad for collector 1 cm².
- [3] Device mounted on an FR4 PCB, single-sided copper, tin-plated, mounting pad for collector 6 cm².





FR4 PCB, single-sided copper, tin-plated, mounting pad for collector 1 cm²

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



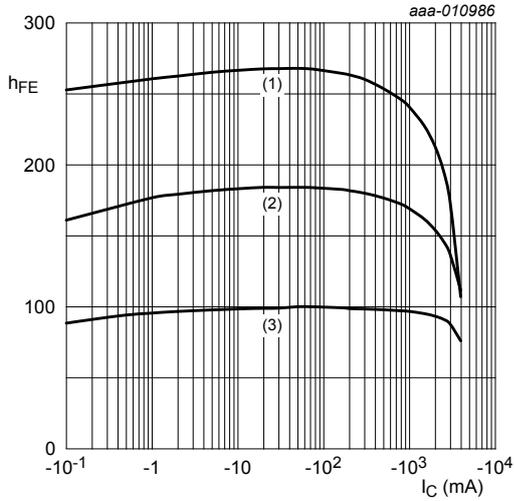
FR4 PCB, single-sided copper, tin-plated, mounting pad for collector 6 cm²

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 _{CBO}	collector-base cut-off current	V _{CB} = -150 V; I _E = 0 A; T _{amb} = 25 °C	-	-	-100	nA
		V _{CB} = -150 V; I _E = 0 A; T _j = 150 °C	-	-	-50	μA
I _{CES}	collector-emitter cut-off current	V _{CE} = -115 V; V _{BE} = 0 V; T _{amb} = 25 °C	-	-	-100	nA
I _{EBO}	emitter-base cut-off current	V _{EB} = -6 V; I _C = 0 A; T _{amb} = 25 °C	-	-	-100	nA
h _{FE}	DC current gain	V _{CE} = -5 V; I _C = -10 mA; T _{amb} = 25 °C	100	160	-	
		V _{CE} = -5 V; I _C = -1 A; pulsed; t _p ≤ 300 μs; δ ≤ 0.02; T _{amb} = 25 °C	100	150	300	
		V _{CE} = -5 V; I _C = -3 A; pulsed; t _p ≤ 300 μs; δ ≤ 0.02; T _{amb} = 25 °C	75	100	-	
		V _{CE} = -5 V; I _C = -4 A; pulsed; t _p ≤ 300 μs; δ ≤ 0.02; T _{amb} = 25 °C	35	50	-	
V _{CEsat}	collector-emitter saturation voltage	I _C = -100 mA; I _B = -5 mA; pulsed; t _p ≤ 300 μs; δ ≤ 0.02; T _{amb} = 25 °C	-	-45	-60	mV
		I _C = -500 mA; I _B = -50 mA; pulsed; t _p ≤ 300 μs; δ ≤ 0.02; T _{amb} = 25 °C	-	-60	-100	mV
		I _C = -1 A; I _B = -100 mA; pulsed; t _p ≤ 300 μs; δ ≤ 0.02; T _{amb} = 25 °C	-	-100	-150	mV
		I _C = -3 A; I _B = -300 mA; t _p ≤ 300 μs; δ ≤ 0.02; T _{amb} = 25 °C; pulsed	-	-275	-370	mV
		I _C = -4 A; I _B = -400 mA; pulsed; t _p ≤ 300 μs; δ ≤ 0.02; T _{amb} = 25 °C	-	-420	-550	mV
R _{CEsat}	collector-emitter saturation resistance	I _C = -1 A; I _B = -100 mA; pulsed; t _p ≤ 300 μs; δ ≤ 0.02; T _{amb} = 25 °C	-	100	150	mΩ
V _{BEsat}	base-emitter saturation voltage	I _C = -1 A; I _B = -100 mA; pulsed; t _p ≤ 300 μs; δ ≤ 0.02; T _{amb} = 25 °C	-	-	-1.2	V
V _{BEon}	base-emitter turn-on voltage	V _{CE} = -5 V; I _C = -1 A; t _p ≤ 300 μs; δ ≤ 0.02; T _{amb} = 25 °C; pulsed	-	-	-1.1	V



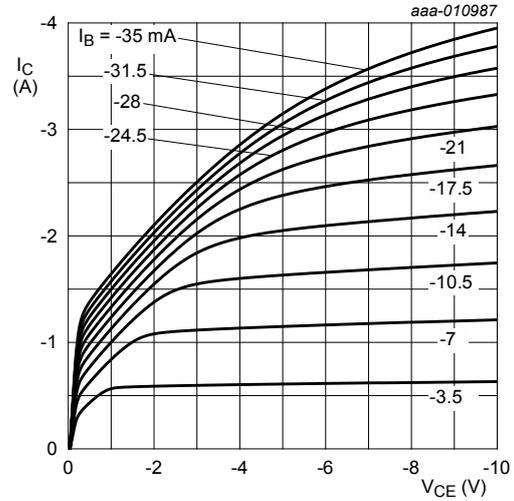
$V_{CE} = -10\text{ V}$

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

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

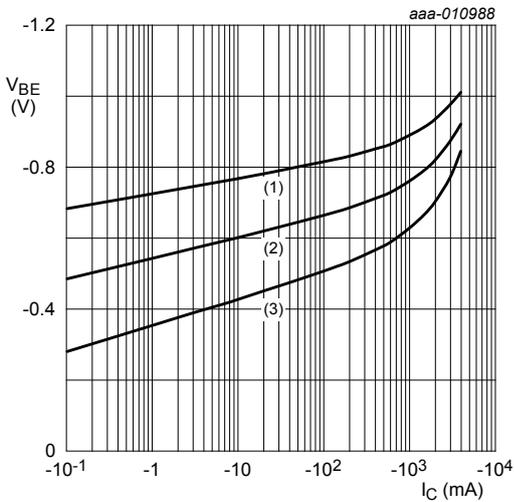
(3) $T_{amb} = -55\text{ }^\circ\text{C}$

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



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

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



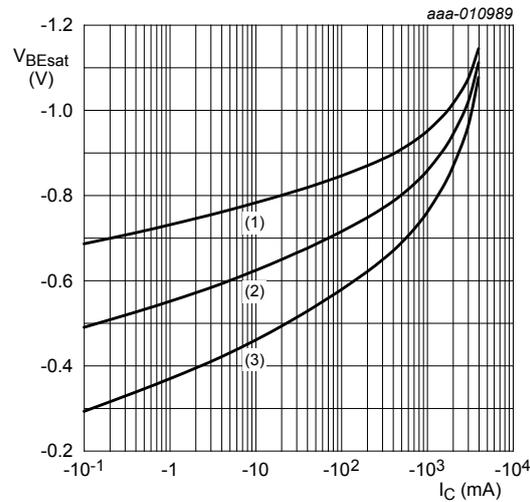
$V_{CE} = -10\text{ V}$

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



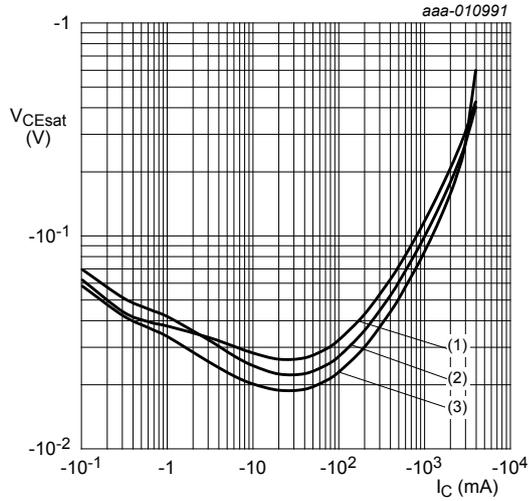
$I_C/I_B = 20$

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

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

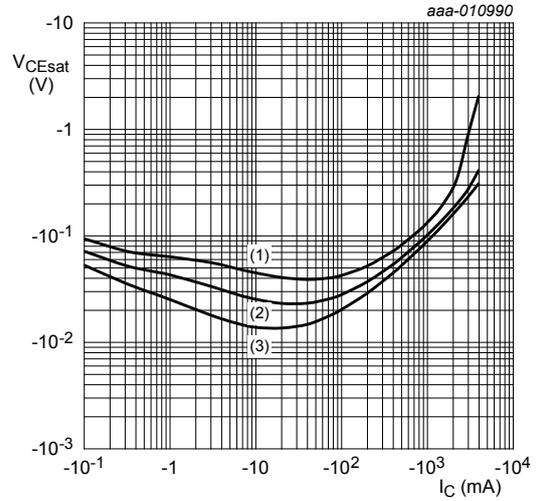
(3) $T_{amb} = 100\text{ }^\circ\text{C}$

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



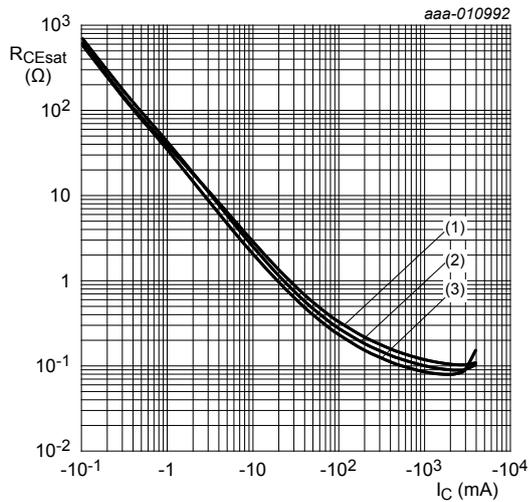
$I_C/I_B = 20$
 (1) $T_{amb} = 100\text{ }^\circ\text{C}$
 (2) $T_{amb} = 25\text{ }^\circ\text{C}$
 (3) $T_{amb} = -55\text{ }^\circ\text{C}$

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



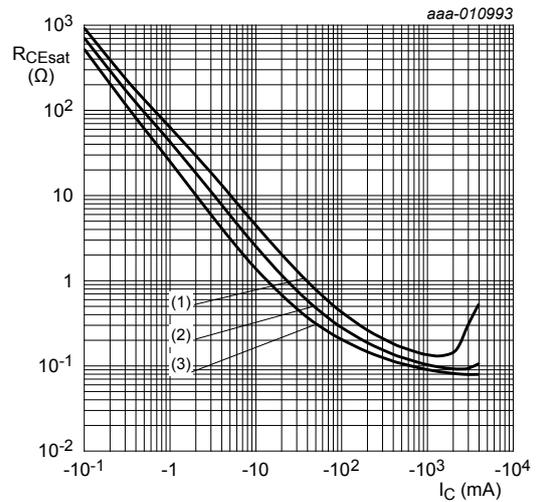
$T_{amb} = 25\text{ }^\circ\text{C}$
 (1) $I_C/I_B = 20$
 (2) $I_C/I_B = 10$
 (3) $I_C/I_B = 5$

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



$I_C/I_B = 20$
 (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. 11. Collector-emitter saturation resistance as a function of collector current; typical values



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

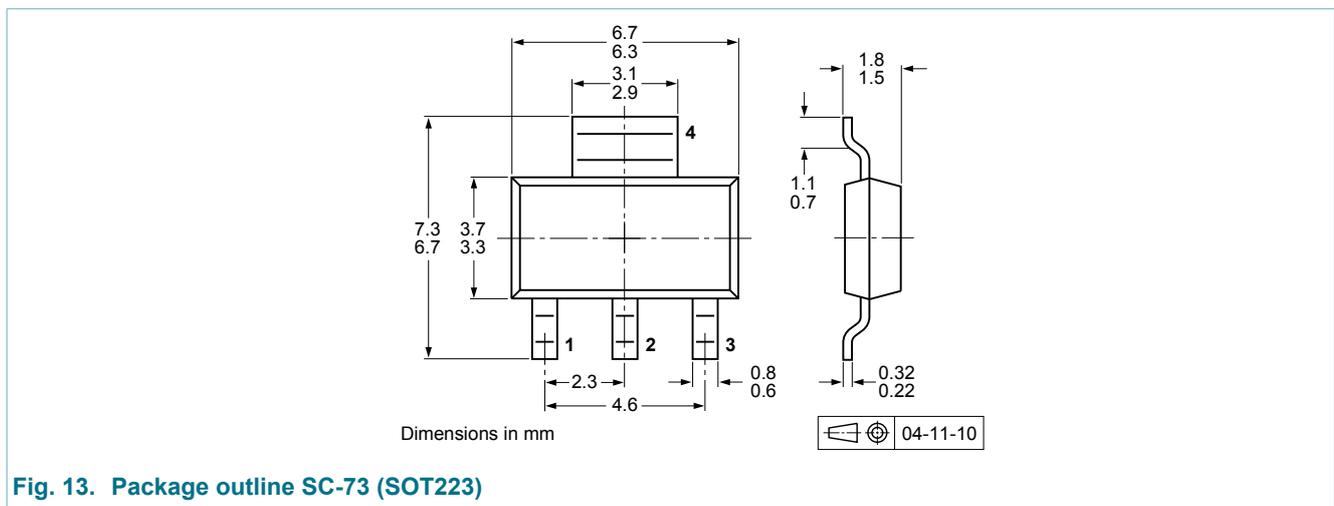
Fig. 12. Collector-emitter saturation resistance as a function of collector current; typical values

11. Test information

11.1 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

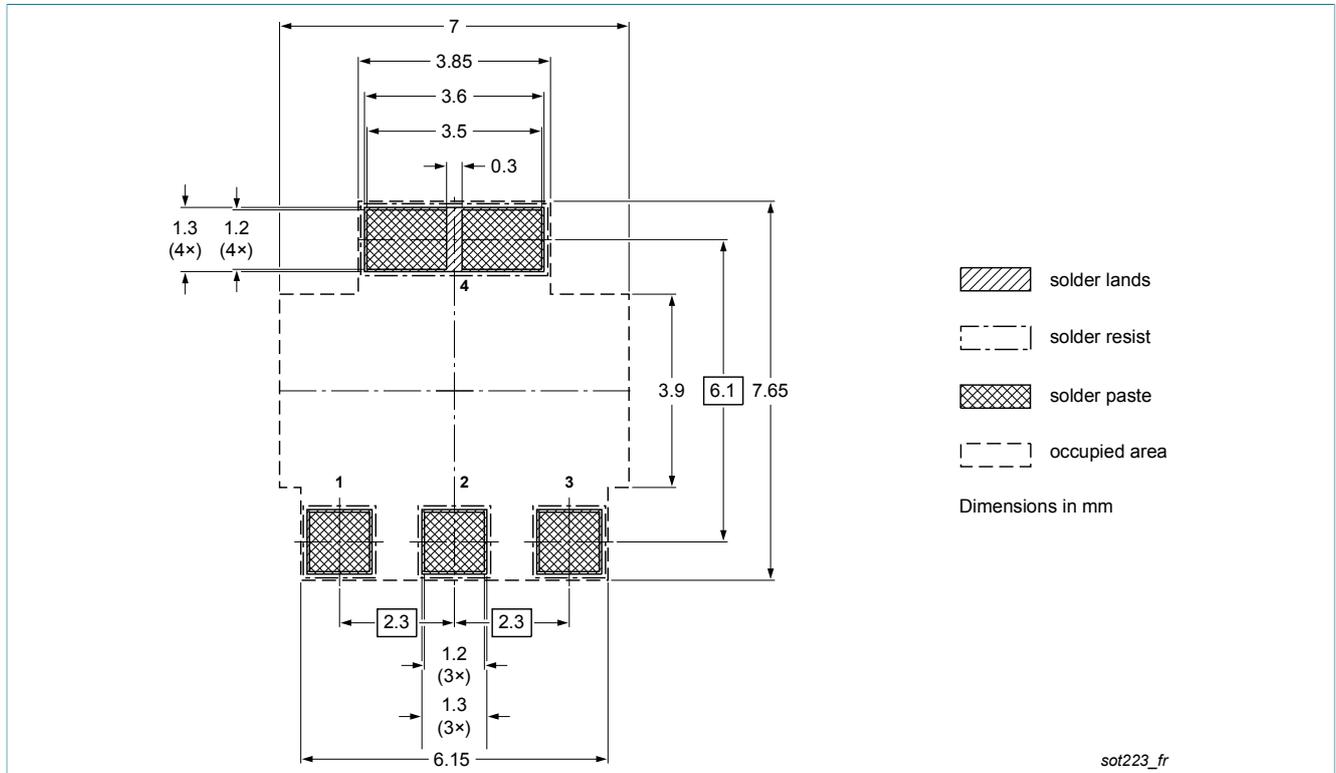


Fig. 14. Reflow soldering footprint for SC-73 (SOT223)

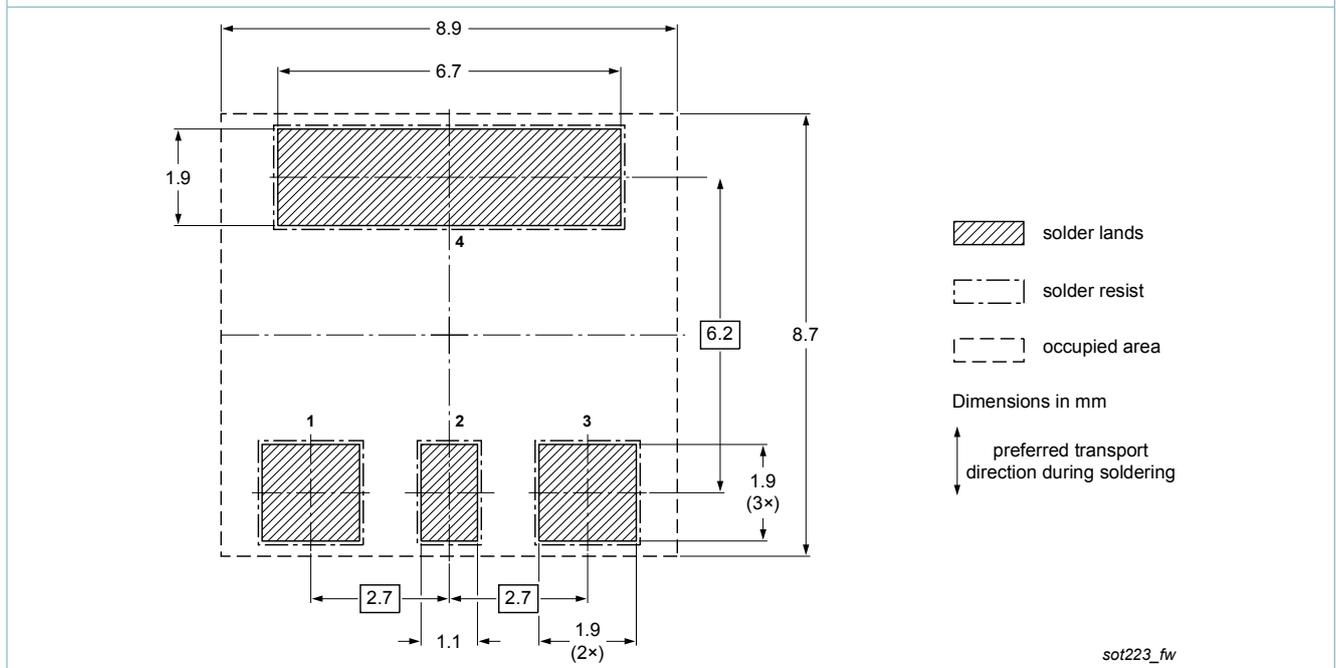


Fig. 15. Wave soldering footprint for SC-73 (SOT223)

14. Revision history

Table 8. Revision history

Data sheet ID	Release date	Data sheet status	Change notice	Supersedes
PBHV9414Z v.2	20140124	Product data sheet	-	PBHV9414Z v.1
Modifications:	<ul style="list-style-type: none">Product status changed			
PBHV9414Z v.1	20131001	Objective data sheet	-	-

15. Legal information

15.1 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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