BCP69 series

20 V, 2 A PNP medium power transistors

Rev. 9 — 21 November 2024 Product data sheet

1. General description

PNP medium power transistors in a SOT223 (SC-73) Surface-Mounted Device (SMD) plastic package.

2. Features and benefits

- High current
- Three current gain selections
- High power dissipation capability
- AEC-Q101 qualified

3. Applications

- Linear voltage regulators
- High-side switches
- Battery-driven devices
- Power management
- MOSFET drivers
- Amplifiers

4. Quick reference data

Table 1. Quick reference data

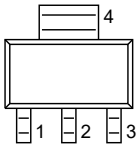
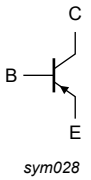
T_{amb} = 25 °C unless otherwise specified.

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
V_{CEO}	collector-emitter voltage	open base		-	-	-20	V
I_C	collector current			-	-	-2	A
I_{CM}	peak collector current	single pulse; $t_p \leq 1$ ms		-	-	-3	A
h_{FE}	DC current gain						
	BCP69	V_{CE} = -1 V; I_C = -500 mA; T_{amb} = 25 °C	[1]	85	-	375	
	BCP69-16		[1]	100	-	250	
	BCP69-25		[1]	160	-	375	

[1] pulsed; $t_p \leq 300$ µs; $\delta \leq 0.02$

5. Pinning information

Table 2. Pinning

Pin	Symbol	Description	Simplified outline	Graphic symbol
1	B	base		 sym028
2	C	collector		
3	E	emitter		
4	C	collector		

6. Ordering information

Table 3. Ordering information

Type number	Package		
	Name	Description	Version
BCP69	-	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
BCP69-16			
BCP69-25			

7. Marking

Table 4. Marking

Type number	Marking code
BCP69	BCP69
BCP69-16	BCP69/16
BCP69-25	BCP69/25

8. Limiting values

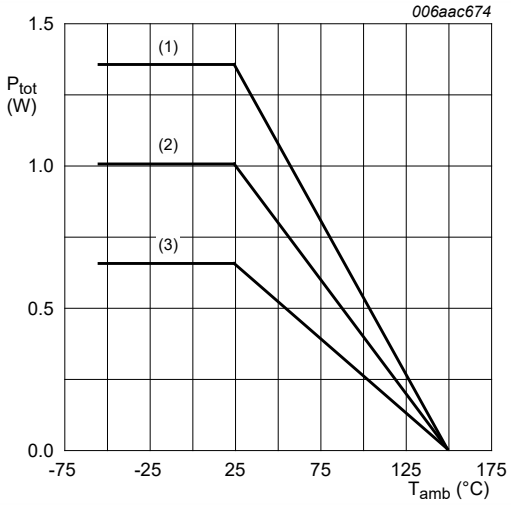
Table 5. Limiting values

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

T_{amb} = 25 °C unless otherwise specified.

Symbol	Parameter	Conditions		Min	Max	Unit
V_{CBO}	collector-base voltage	open emitter		-	-32	V
V_{CEO}	collector-emitter voltage	open base		-	-20	V
V_{EBO}	emitter-base voltage	open collector		-	-5	V
I_C	collector current			-	-2	A
I_{CM}	peak collector current	single pulse; $t_p \leq 1$ ms		-	-3	A
I_B	base current			-	-0.4	A
I_{BM}	peak base current	single pulse; $t_p \leq 1$ ms		-	-0.4	A
P_{tot}	total power dissipation	$T_{amb} \leq 25$ °C	[1]	-	0.65	W
			[2]	-	1.00	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^2.
[3] Device mounted on an FR4 PCB; single-sided copper; tin-plated; mounting pad for collector 6 cm^2.



(1) FR4 PCB, single-sided copper, mounting pad for collector 6 cm^2
(2) FR4 PCB, single-sided copper, mounting pad for collector 1 cm^2
(3) FR4 PCB, single-sided copper, standard footprint

Fig. 1. Power derating curves

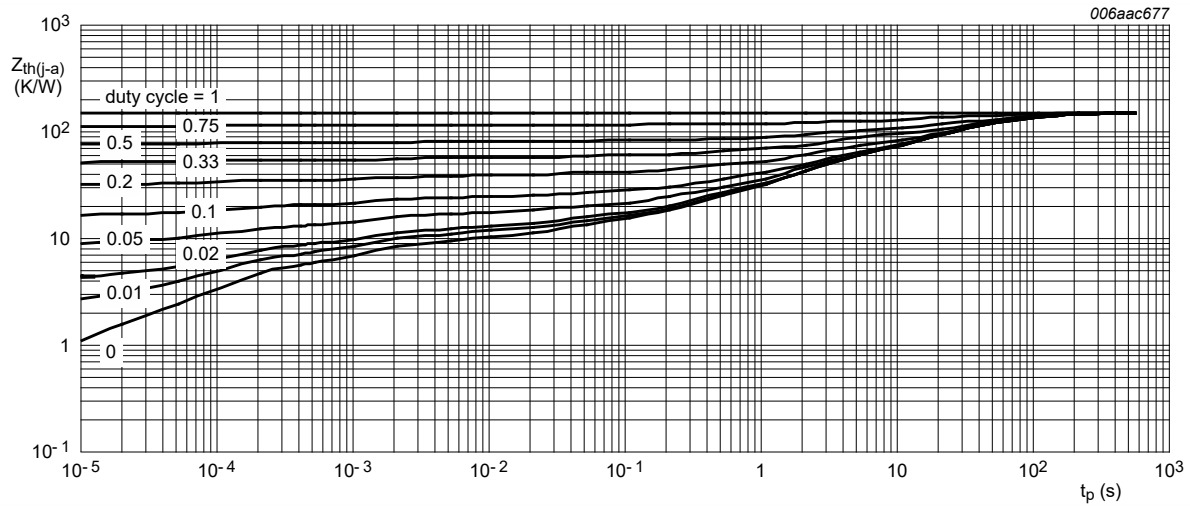
9. Thermal characteristics

Table 6. Thermal characteristics

T_{amb} = 25 °C unless otherwise specified.

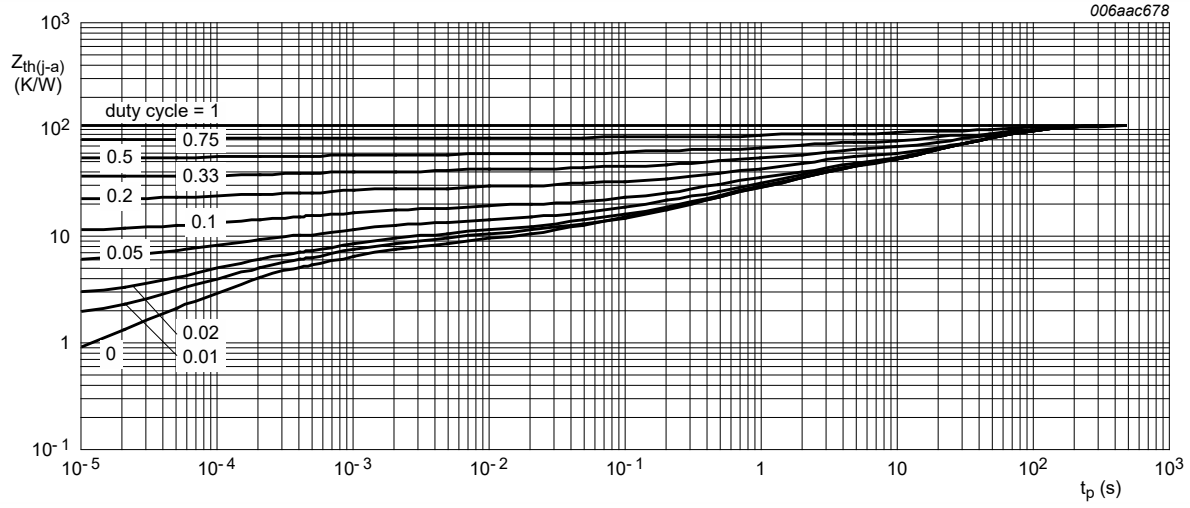
Symbol	Parameter	Conditions		Min	Typ	Max	Unit
$R_{th(j-a)}$	thermal resistance from junction to ambient	in free air	[1]	-	-	192	K/W
			[2]	-	-	125	K/W
			[3]	-	-	93	K/W
$R_{(j-sp)}$	thermal resistance from junction to solder point			-	-	16	K/W

[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 cm^2.
[3] Device mounted on an FR4 PCB; single-sided copper; tin-plated; mounting pad for collector 6 cm^2.



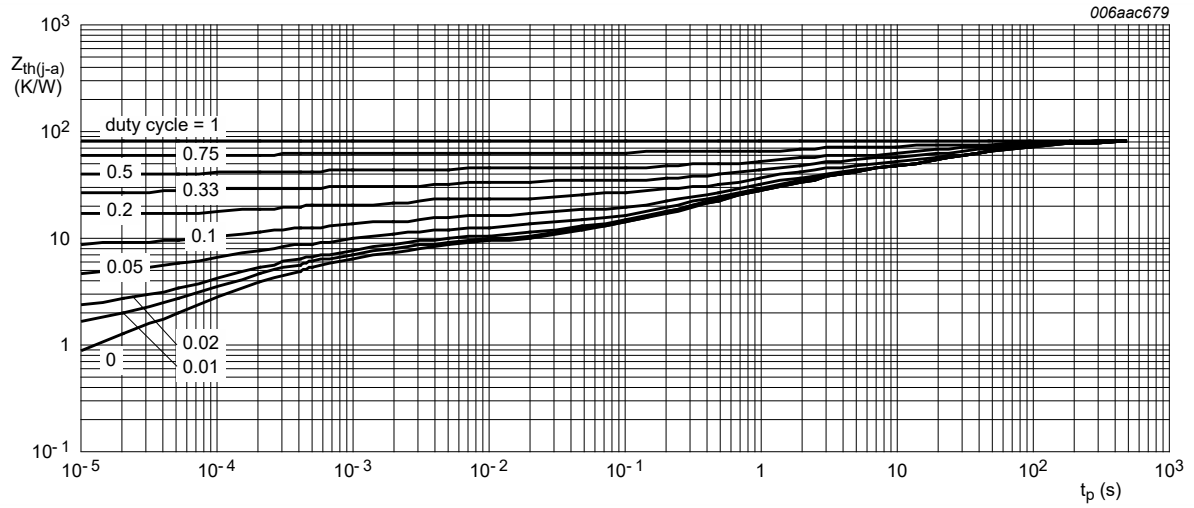
FR4 PCB; single-sided copper; tin-plated and standard footprint

Fig. 2. 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 1 cm^2

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 cm^2

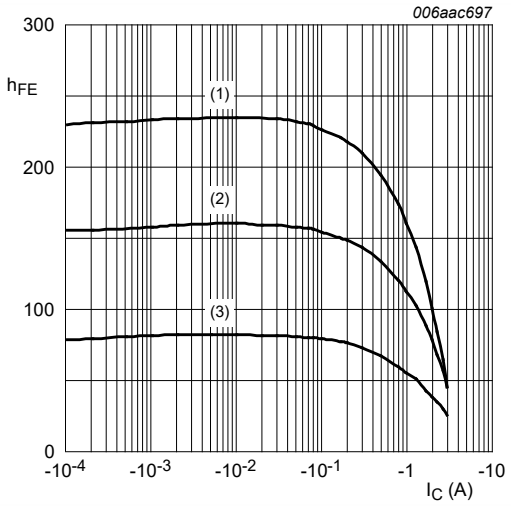
Fig. 4. Transient thermal impedance from junction to ambient as a function of pulse duration; typical values

10. Characteristics

Table 7. Characteristics

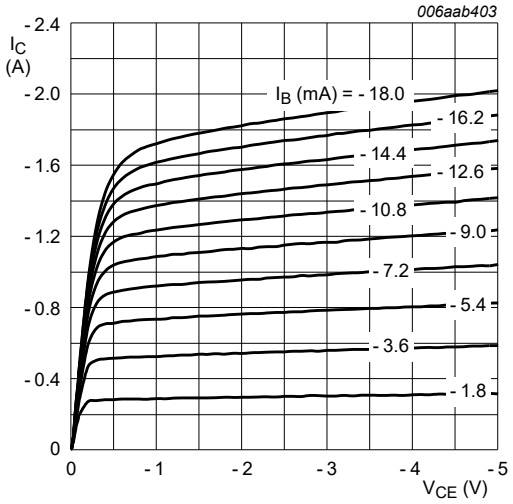
Symbol	Parameter	Conditions		Min	Typ	Max	Unit
I_{CBO}	collector-base cut-off current	V_{CB} = -25 V; I_E = 0 A T_{amb} = 25 °C		-	-	-100	nA
		V_{CB} = -25 V; I_E = 0 A; T_j = 150 °C		-	-	-10	µA
I_{EBO}	emitter-base cut-off current	V_{EB} = -5 V; I_C = 0 A T_{amb} = 25 °C		-	-	-100	nA
h_{FE}	DC current gain						
	BCP69	V_{CE} = -10 V; I_C = -5 mA T_{amb} = 25 °C	[1]	50	-	-	
		V_{CE} = -1 V; I_C = -500 mA T_{amb} = 25 °C	[1]	85	-	375	
		V_{CE} = -1 V; I_C = -1 A T_{amb} = 25 °C	[1]	60	-	-	
		V_{CE} = -1 V; I_C = -2 A T_{amb} = 25 °C	[1]	40	-	-	
	BCP69-16	V_{CE} = -10 V; I_C = -5 mA T_{amb} = 25 °C	[1]	50	-	-	
		V_{CE} = -1 V; I_C = -500 mA T_{amb} = 25 °C	[1]	100	-	250	
		V_{CE} = -1 V; I_C = -1 A T_{amb} = 25 °C	[1]	60	-	-	
		V_{CE} = -1 V; I_C = -2 A T_{amb} = 25 °C	[1]	40	-	-	
	BCP69-25	V_{CE} = -10 V; I_C = -5 mA T_{amb} = 25 °C	[1]	50	-	-	
		V_{CE} = -1 V; I_C = -500 mA T_{amb} = 25 °C	[1]	160	-	375	
		V_{CE} = -1 V; I_C = -1 A T_{amb} = 25 °C	[1]	60	-	-	
		V_{CE} = -1 V; I_C = -2 A T_{amb} = 25 °C	[1]	40	-	-	
V_{CEsat}	collector-emitter saturation voltage	I_C = -1 A; I_B = -100 mA T_{amb} = 25 °C	[1]	-	-	-0.5	V
		I_C = -2 A; I_B = -200 mA T_{amb} = 25 °C	[1]	-	-	-0.6	V
V_{BE}	base-emitter voltage	V_{CE} = -10 V; I_C = -5 mA T_{amb} = 25 °C	[1]	-	-	-0.7	V
		V_{CE} = -1 V; I_C = -1 A T_{amb} = 25 °C	[1]	-	-	-1	V
C_c	collector capacitance	V_{CB} = -10 V; I_E = i_e = 0 A; f = 1 MHz T_{amb} = 25 °C		-	28	-	pF
f_T	transition frequency	V_{CE} = -5 V; I_C = -50 mA; f = 100 MHz T_{amb} = 25 °C		40	140	-	MHz

[1] pulsed; $t_p \leq 300$ µs; $\delta \leq 0.02$



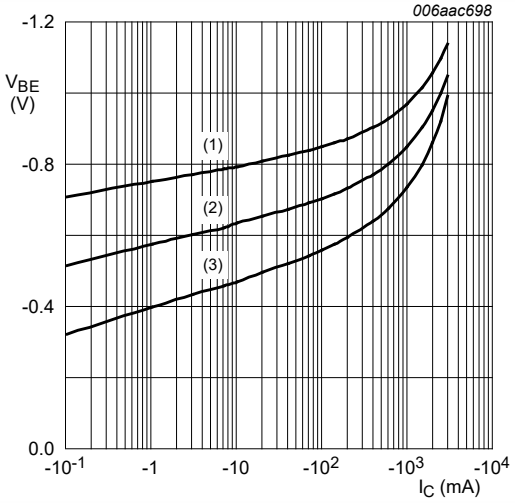
V_{CE} = -1 V
(1) T_{amb} = 100 °C
(2) T_{amb} = 25 °C
(3) T_{amb} = -55 °C

Fig. 5. hFE selection -16: DC current gain as a function of collector current; typical values



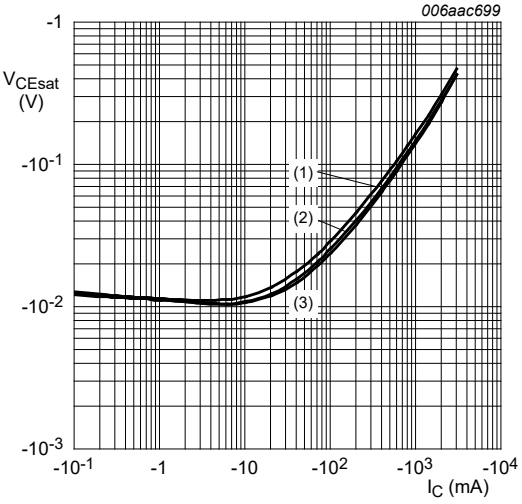
T_{amb} = 25 °C

Fig. 6. hFE selection -16: Collector current as a function of collector-emitter voltage; typical values



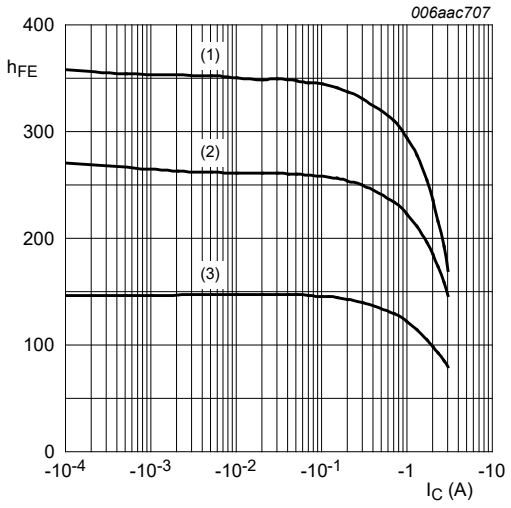
V_{CE} = -1 V
(1) T_{amb} = -55 °C
(2) T_{amb} = 25 °C
(3) T_{amb} = 100 °C

Fig. 7. hFE selection -16: Base-emitter voltage as a function of collector current; typical values



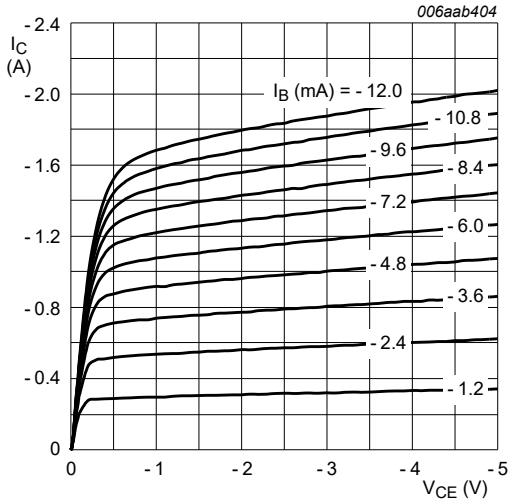
I_C/I_B = 10
(1) T_{amb} = 100 °C
(2) T_{amb} = 25 °C
(3) T_{amb} = -55 °C

Fig. 8. hFE selection -16: Collector-emitter saturation voltage as a function of collector current; typical values



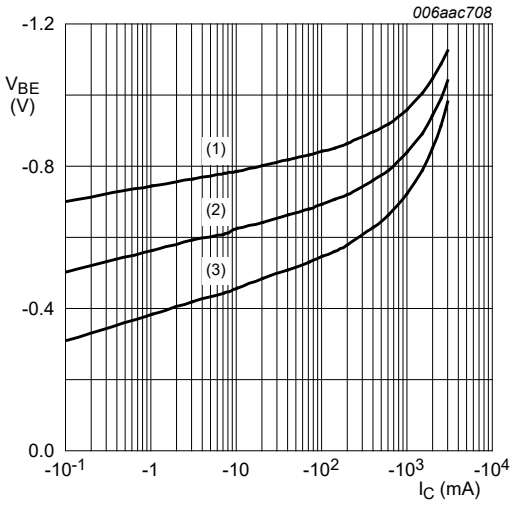
V_{CE} = -1 V
(1) T_{amb} = 100 °C
(2) T_{amb} = 25 °C
(3) T_{amb} = -55 °C

Fig. 9. hFE selection -25: DC current gain as a function of collector current; typical values



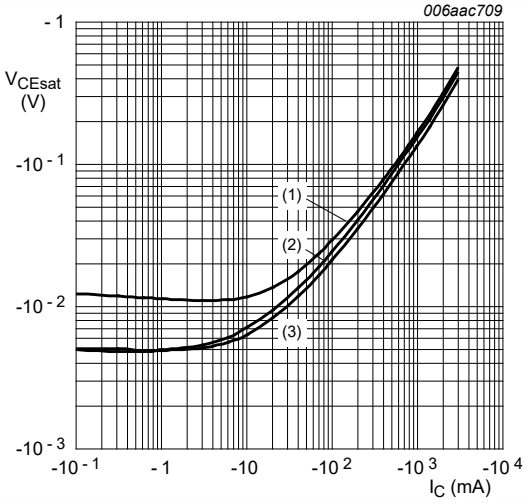
T_{amb} = 25 °C

Fig. 10. hFE selection -25: Collector current as a function of collector-emitter voltage; typical values



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

Fig. 11. hFE selection -25: Base-emitter voltage as a function of collector current; typical values



I_C/I_B = 10
(1) T_{amb} = 100 °C
(2) T_{amb} = 25 °C
(3) T_{amb} = -55 °C

Fig. 12. hFE selection -25: Collector-emitter saturation voltage 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

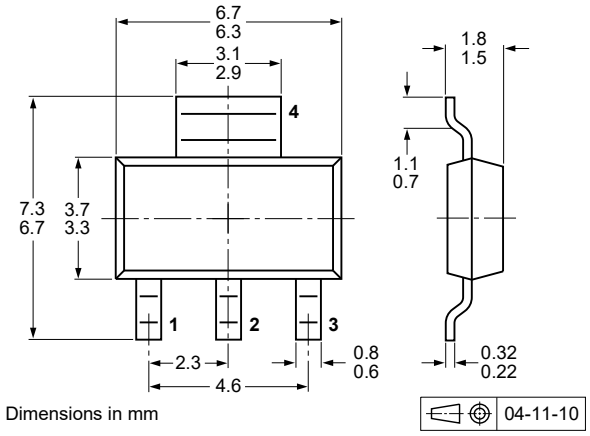


Fig. 13. Package outline SC-73 (SOT223)

13. Soldering

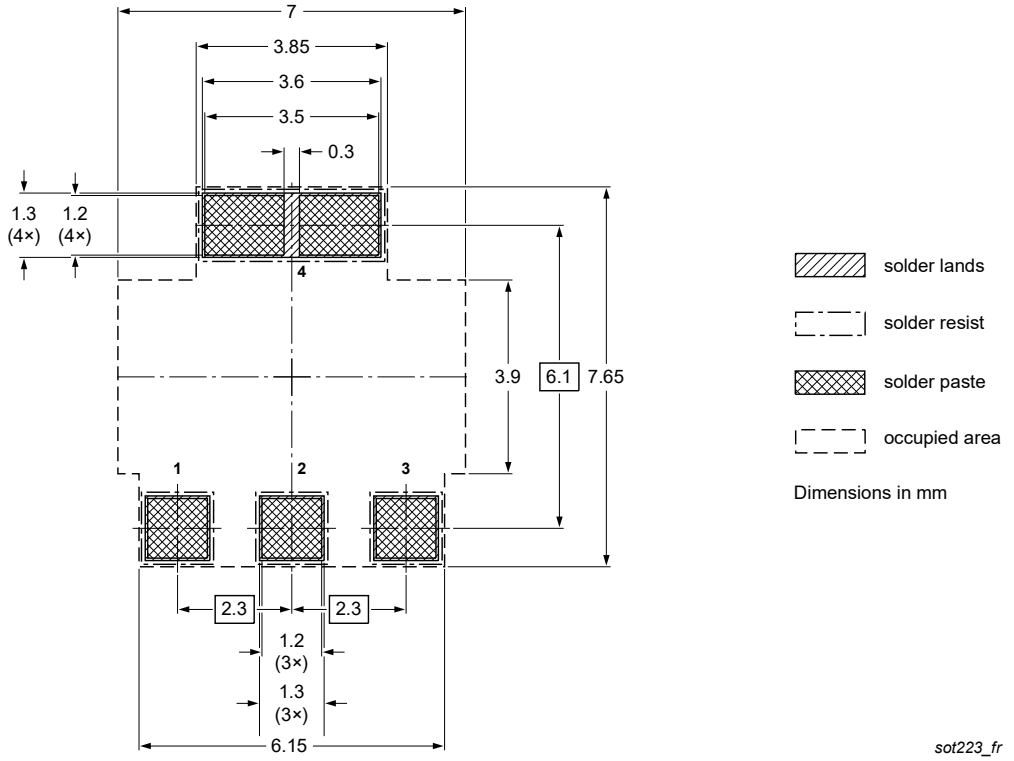


Fig. 14. Reflow soldering footprint for SC-73 (SOT223)

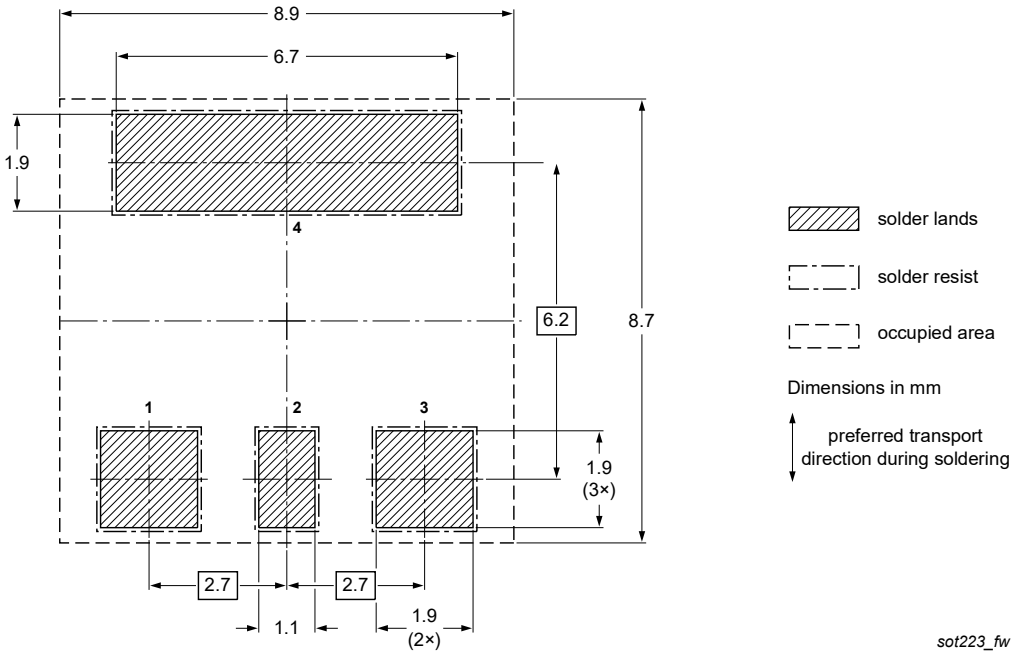


Fig. 15. Wave soldering footprint for SC-73 (SOT223)

14. Revision history

Table 8. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
BCP69_SER v.9	20241121	Product data sheet	-	BCP69_BC869_BC69PA v.8
Modifications:	• Quick reference data: conditions at h_{FE} corrected			
BCP69_SER v.8	20240704	Product data sheet	-	BCP69_BC869_BC69PA v.7
BCP69_BC869_BC69PA v.7	20111012	Product data sheet	-	BC869_6 BCP69_6
BC869_6	20041108	Product data sheet	-	BC869_5
BC869_5	20031202	Product specification	-	BC869_4
BC869_4	19990408	Product specification	-	BC869_3
BC869_3	19980716	Product specification	-	BC869_CNV_2
BC869_CNV_2	19970401	Product specification	-	-
BCP69_6	20081202	Product data sheet	-	BCP69_5
BCP69_5	20031125	Product specification	-	BCP69_4
BCP69_4	20021115	Product specification	-	BCP69_3
BCP69_3	19990408	Product specification	-	BCP69_CNV_2
BCP69_CNV_2	19970312	Product specification	-	-

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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Date of release: 21 November 2024

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