BCP69; BC869; BC69PA

20 V, 2 A PNP medium power transistors

Rev. 7 — 12 October 2011 | Product data sheet

1. Product profile

1.1 General description

PNP medium power transistor series in Surface-Mounted Device (SMD) plastic packages.

Table 1. Product overview

Type number[1]	Package			NPN complement
	Nexperia	JEITA	JEDEC	
BCP69	SOT223	SC-73	-	BCP68
BC869	SOT89	SC-62	TO-243	BC868
BC69PA	SOT1061	-	-	BC68PA

[1] Valid for all available selection groups.

1.2 Features and benefits

- High current
- Three current gain selections
- High power dissipation capability
- Exposed heatsink for excellent thermal and electrical conductivity (SOT89, SOT1061)
- Leadless very small SMD plastic package with medium power capability (SOT1061)
- AEC-Q101 qualified

1.3 Applications

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

1.4 Quick reference data

Table 2. Quick reference data

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

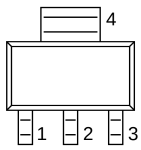
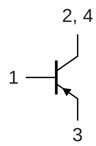
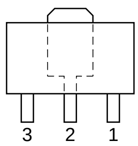
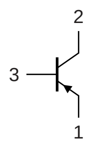
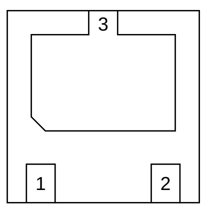
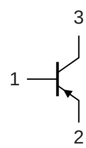
Table 2. Quick reference data *...continued*

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
h_{FE}	DC current gain	V_{CE} = –1 V; I_C = –500 mA	[1]	85	-	375	
	h_{FE} selection -16	V_{CE} = –1 V; I_C = –500 mA	[1]	100	-	250	
	h_{FE} selection -25	V_{CE} = –1 V; I_C = –500 mA	[1]	160	-	375	

[1] Pulse test: $t_p \leq 300\ \mu s$; $\delta = 0.02$.

2. Pinning information

Table 3. Pinning

Pin	Description	Simplified outline	Graphic symbol
SOT223			
1	base		 sym028
2	collector		
3	emitter		
4	collector		
SOT89			
1	emitter		 006aaa231
2	collector		
3	base		
SOT1061			
1	base	 Transparent top view	 sym013
2	emitter		
3	collector		

3. Ordering information

Table 4. Ordering information

Type number[1]	Package		
	Name	Description	Version
BCP69	SC-73	plastic surface-mounted package with increased heatsink; 4 leads	SOT223
BC869	SC-62	plastic surface-mounted package; exposed die pad for good heat transfer; 3 leads	SOT89
BC69PA	HUSON3	plastic thermal enhanced ultra thin small outline package; no leads; 3 terminals; body 2 × 2 × 0.65 mm	SOT1061

[1] Valid for all available selection groups.

4. Marking

Table 5. Marking codes

Type number	Marking code
BCP69	BCP69
BCP69-16	BCP69/16
BCP69-25	BCP69/25
BC869	CEC
BC869-16	CGC
BC869-25	CHC
BC69PA	B3
BC69-16PA	BM
BC69-25PA	BN

5. Limiting values

Table 6. 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		-	–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				
	BCP69		[1]	-	0.65	W
			[2]	-	1.00	W
			[3]	-	1.35	W
	BC869		[1]	-	0.50	W
			[2]	-	0.95	W
			[3]	-	1.35	W
	BC69PA		[1]	-	0.42	W
			[2]	-	0.83	W
			[3]	-	1.10	W
			[4]	-	0.81	W
			[5]	-	1.65	W
T_j	junction temperature			-	150	°C
T_{amb}	ambient temperature			–55	+150	°C
T_{stg}	storage temperature			–65	+150	°C

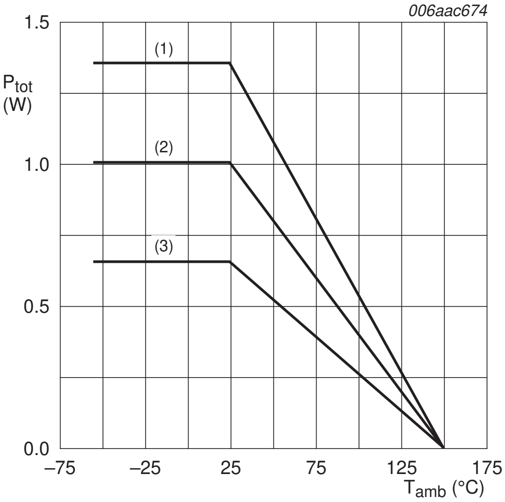
[1] Device mounted on an FR4 Printed-Circuit Board (PCB), single-sided copper, tin-plated and standard footprint.

[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.

[4] Device mounted on an FR4 PCB, 4-layer copper, tin-plated and standard footprint.

[5] Device mounted on an FR4 PCB, 4-layer copper, tin-plated, mounting pad for collector 1 cm^2.

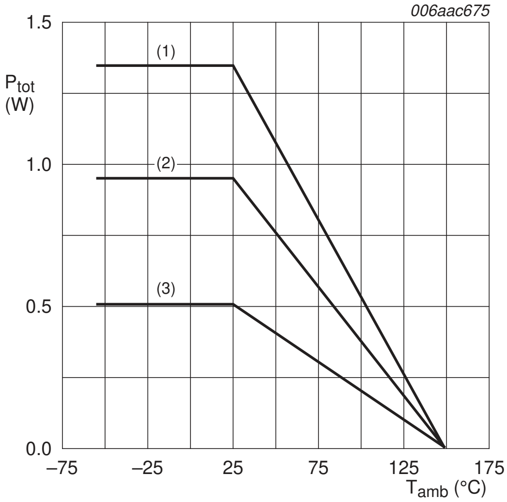


(1) FR4 PCB, mounting pad for collector 6 cm^2

(2) FR4 PCB, mounting pad for collector 1 cm^2

(3) FR4 PCB, standard footprint

Fig 1. Power derating curves SOT223

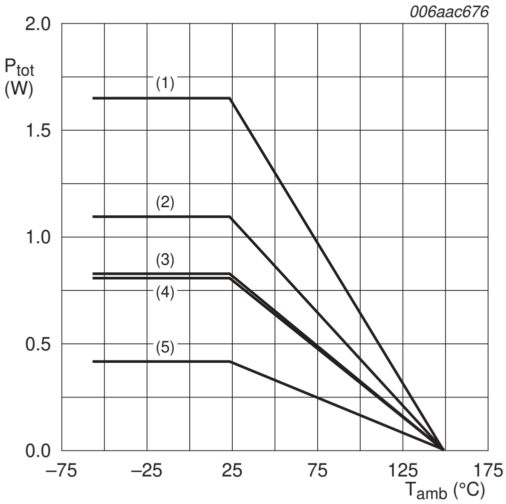


(1) FR4 PCB, mounting pad for collector 6 cm^2

(2) FR4 PCB, mounting pad for collector 1 cm^2

(3) FR4 PCB, standard footprint

Fig 2. Power derating curves SOT89



(1) FR4 PCB, 4-layer copper, mounting pad for collector 1 cm^2

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

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

(4) FR4 PCB, 4-layer copper, standard footprint

(5) FR4 PCB, single-sided copper, standard footprint

Fig 3. Power derating curves SOT1061

6. Thermal characteristics

Table 7. Thermal characteristics

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
$R_{th(j-a)}$	thermal resistance from junction to ambient	in free air					
	BCP69		[1]	-	-	192	K/W
			[2]	-	-	125	K/W
			[3]	-	-	93	K/W
	BC869		[1]	-	-	250	K/W
			[2]	-	-	132	K/W
			[3]	-	-	93	K/W
	BC69PA		[1]	-	-	298	K/W
			[2]	-	-	151	K/W
			[3]	-	-	114	K/W
			[4]	-	-	154	K/W
			[5]	-	-	76	K/W
$R_{th(j-sp)}$	thermal resistance from junction to solder point						
	BCP69			-	-	16	K/W
	BC869			-	-	16	K/W
	BC69PA			-	-	20	K/W

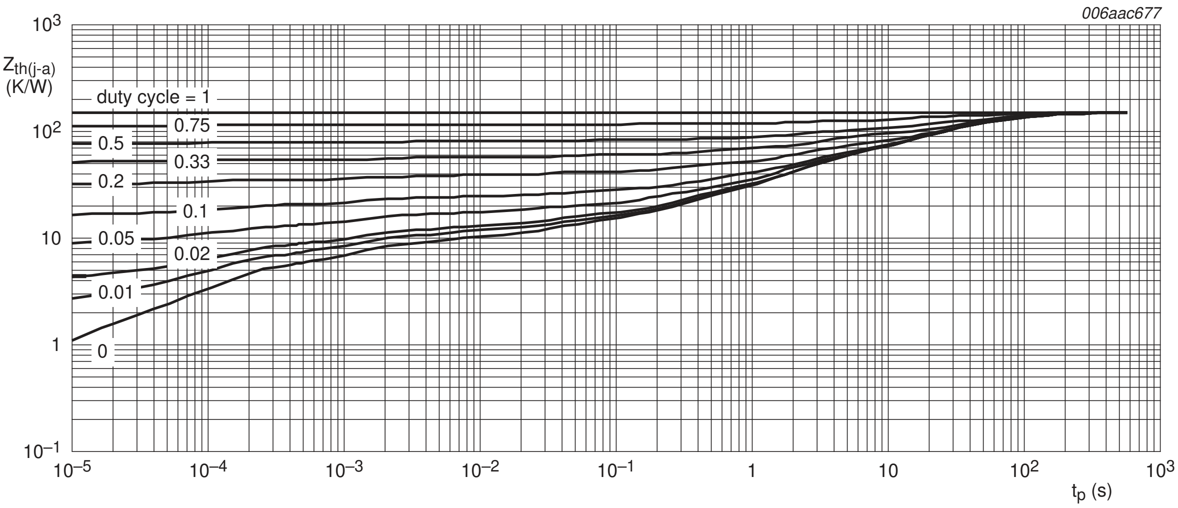
[1] Device mounted on an FR4 PCB, single-sided copper, tin-plated and standard footprint.

[2] Device mounted on an FR4 PCB, single-sided copper, tin-plated, mounting pad for collector 1 cm^2.

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

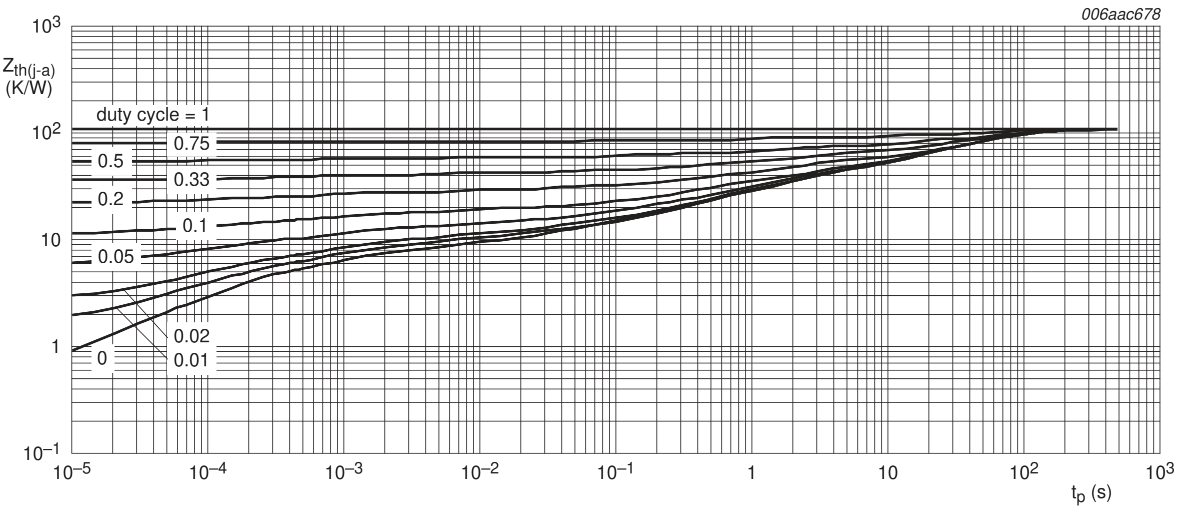
[4] Device mounted on an FR4 PCB, 4-layer copper, tin-plated and standard footprint.

[5] Device mounted on an FR4 PCB, 4-layer copper, tin-plated, mounting pad for collector 1 cm^2.



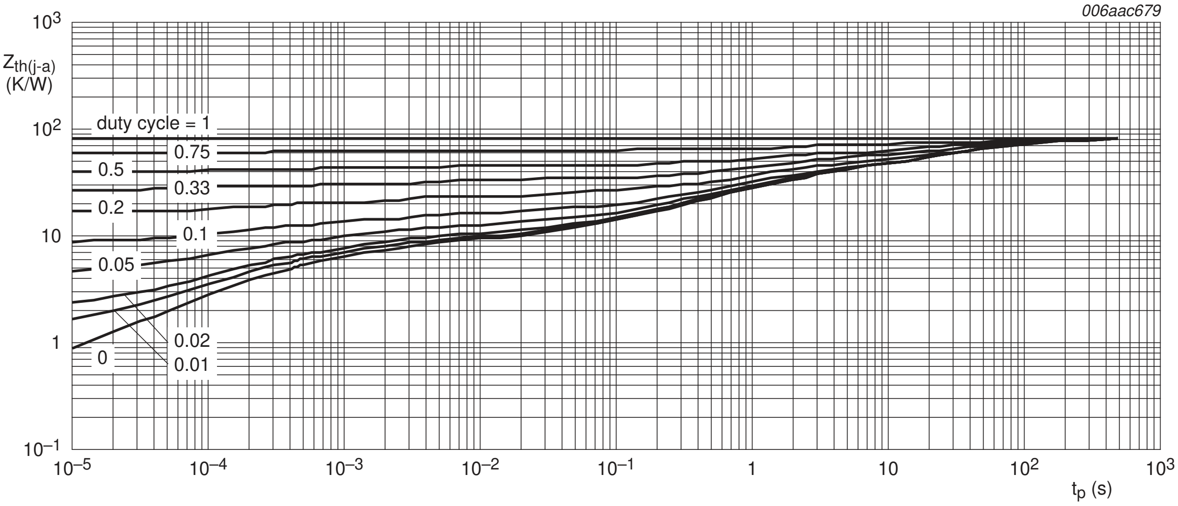
FR4 PCB, standard footprint

Fig 4. Transient thermal impedance from junction to ambient as a function of pulse duration for SOT223; typical values



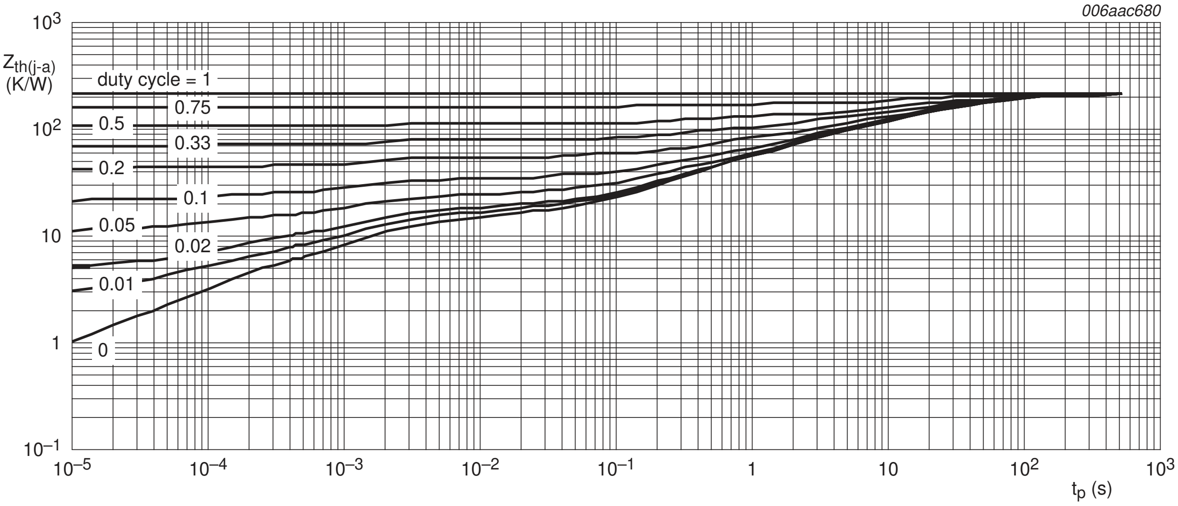
FR4 PCB, mounting pad for collector 1 cm^2

Fig 5. Transient thermal impedance from junction to ambient as a function of pulse duration for SOT223; typical values



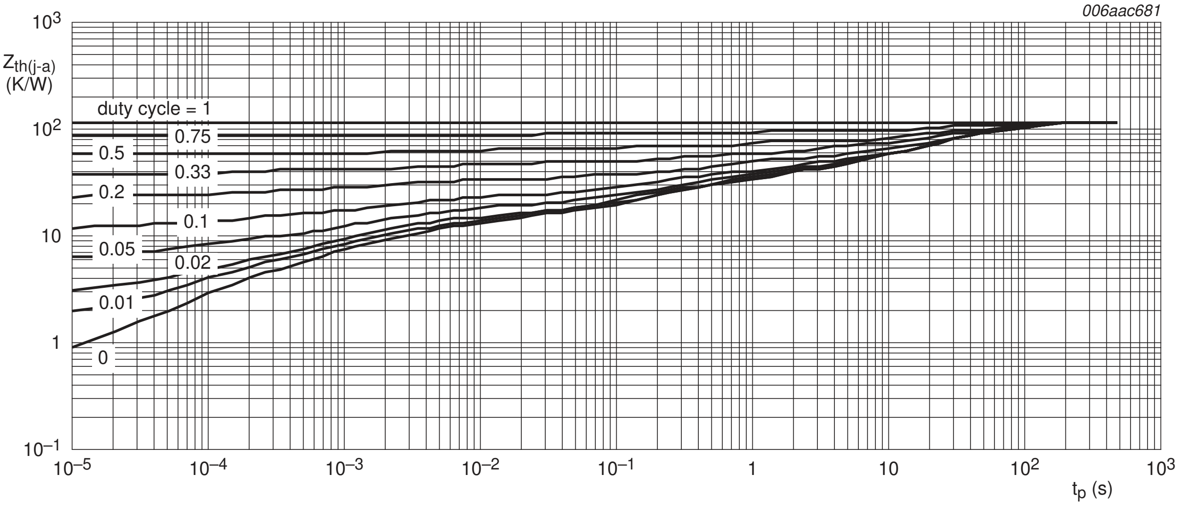
FR4 PCB, mounting pad for collector 6 cm^2

Fig 6. **Transient thermal impedance from junction to ambient as a function of pulse duration for SOT223; typical values**



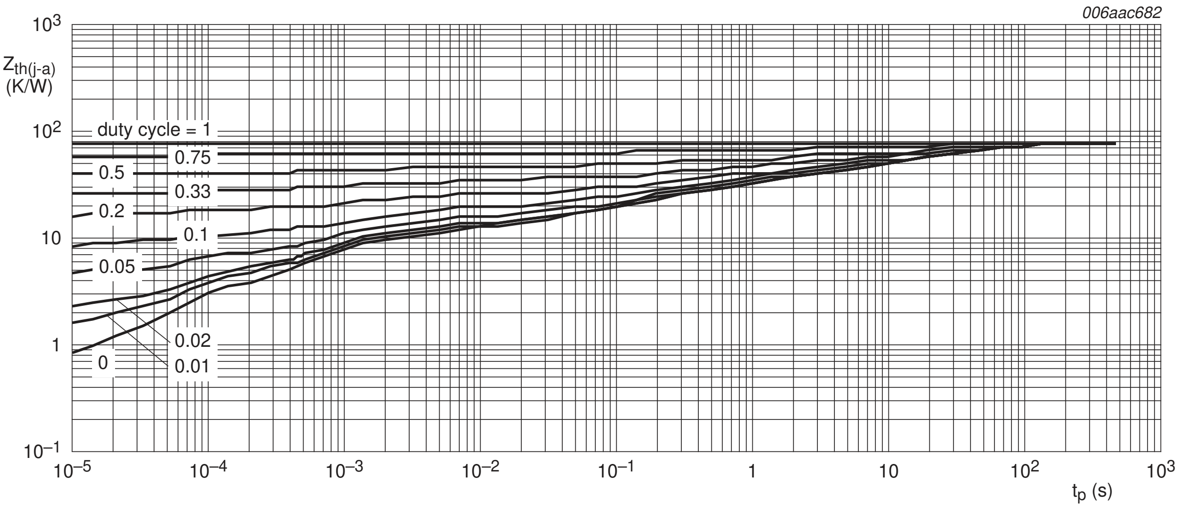
FR4 PCB, standard footprint

Fig 7. **Transient thermal impedance from junction to ambient as a function of pulse duration for SOT89; typical values**



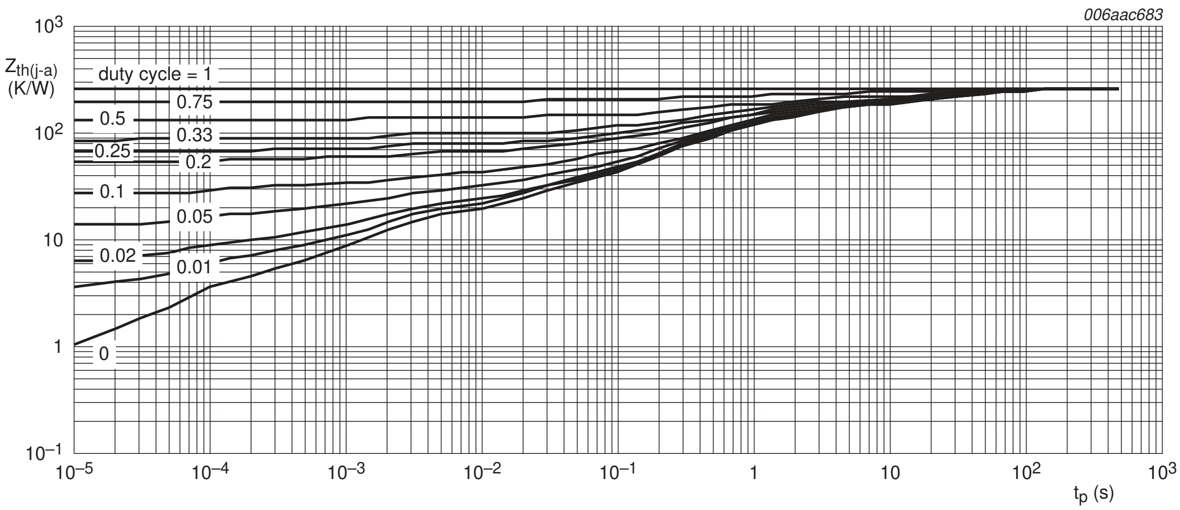
FR4 PCB, mounting pad for collector 1 cm^2

Fig 8. Transient thermal impedance from junction to ambient as a function of pulse duration for SOT89; typical values



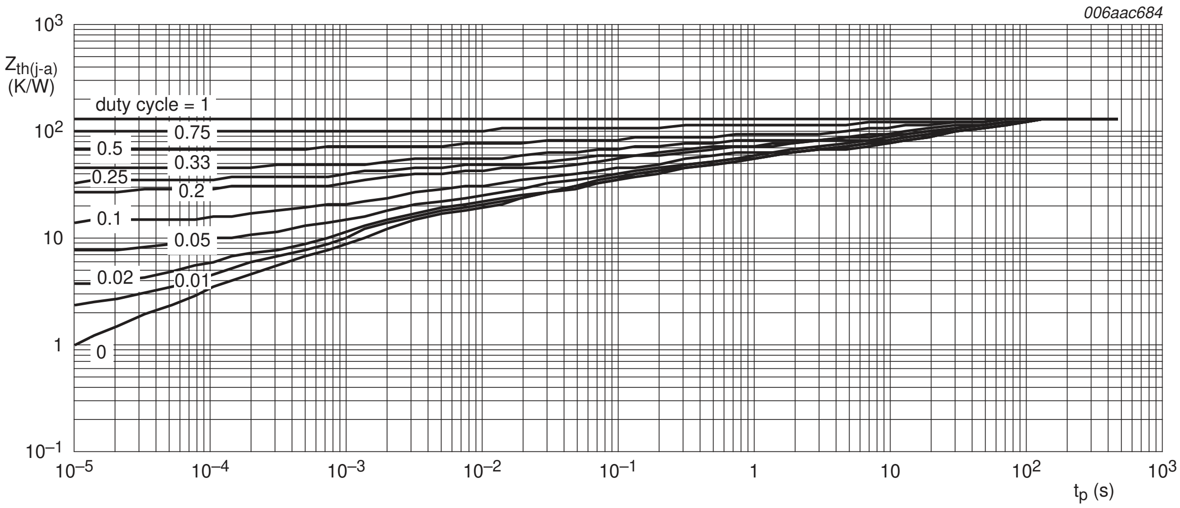
FR4 PCB, mounting pad for collector 6 cm^2

Fig 9. Transient thermal impedance from junction to ambient as a function of pulse duration for SOT89; typical values



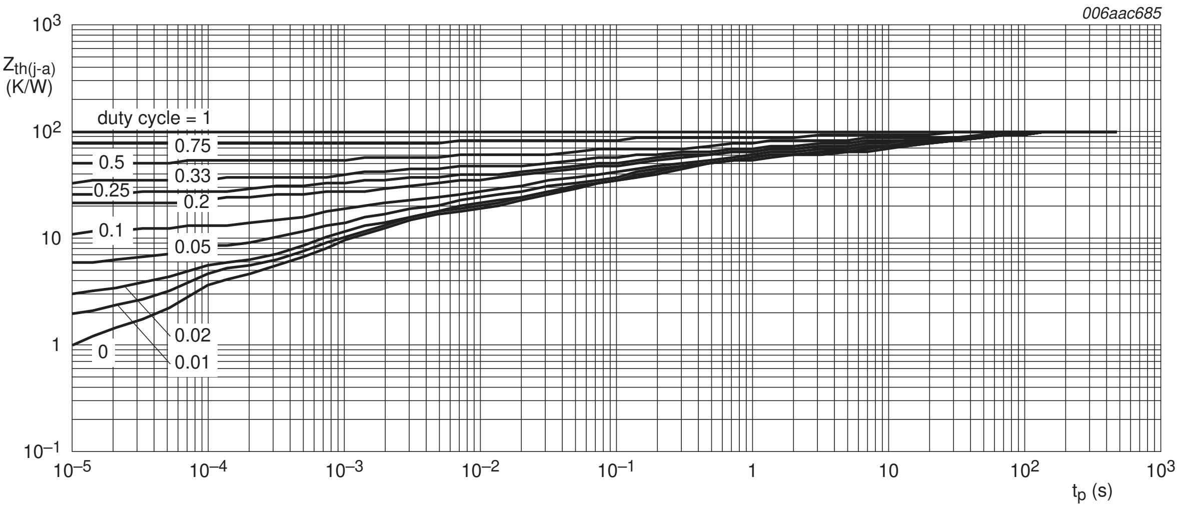
FR4 PCB, single-sided copper, standard footprint

Fig 10. Transient thermal impedance from junction to ambient as a function of pulse duration for SOT1061; typical values



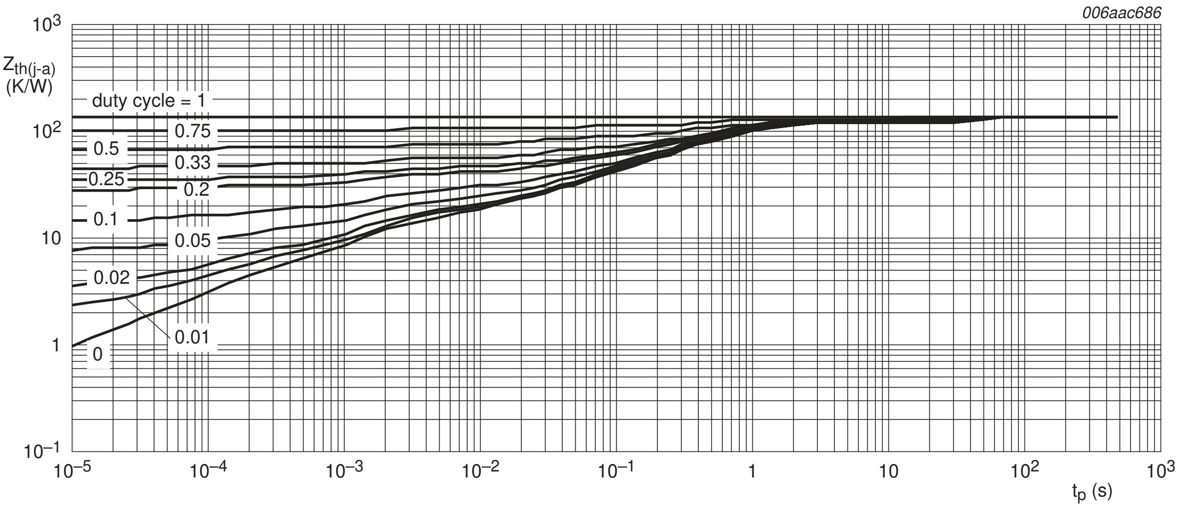
FR4 PCB, single-sided copper, mounting pad for collector 1 cm^2

Fig 11. Transient thermal impedance from junction to ambient as a function of pulse duration for SOT1061; typical values



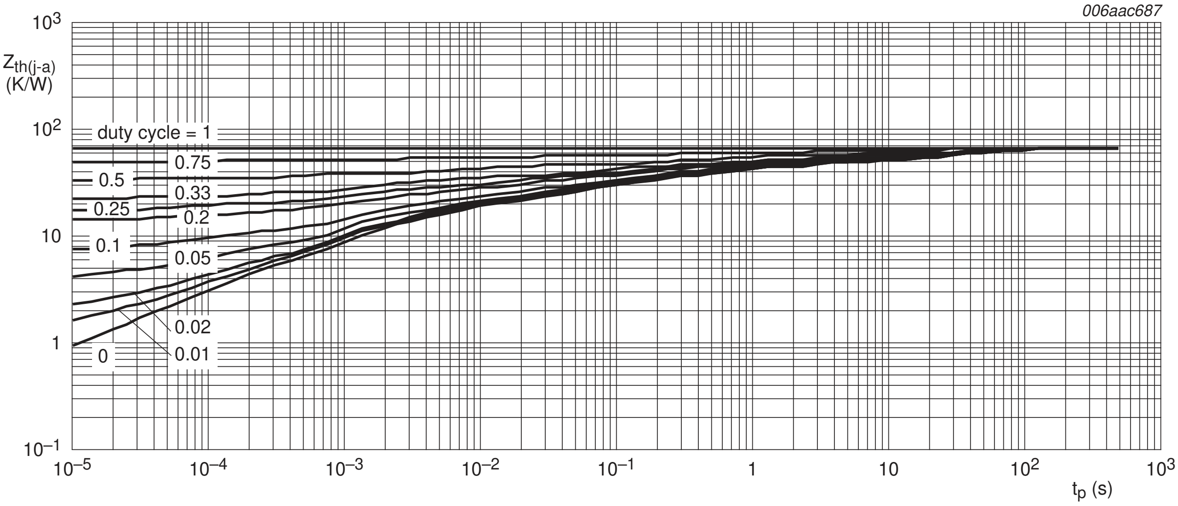
FR4 PCB, single-sided copper, mounting pad for collector 6 cm^2

Fig 12. Transient thermal impedance from junction to ambient as a function of pulse duration for SOT1061; typical values



FR4 PCB, 4-layer copper, standard footprint

Fig 13. Transient thermal impedance from junction to ambient as a function of pulse duration for SOT1061; typical values



FR4 PCB, 4-layer copper, mounting pad for collector 1 cm^2

Fig 14. Transient thermal impedance from junction to ambient as a function of pulse duration for SOT1061; typical values

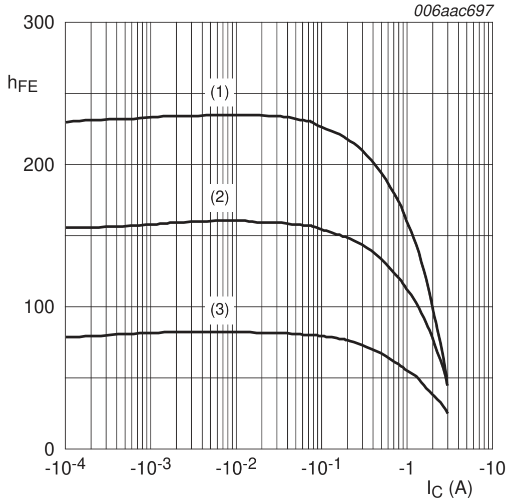
7. Characteristics

Table 8. Characteristics

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

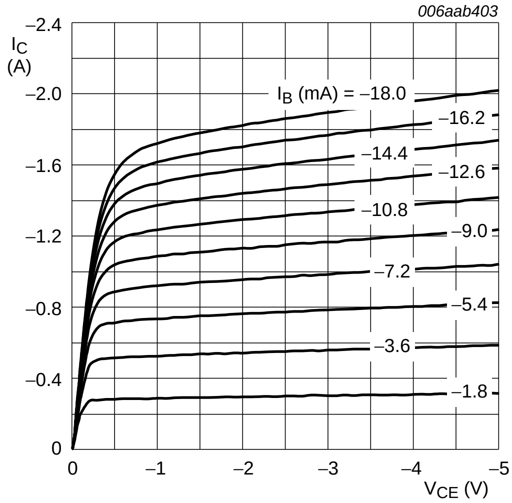
Symbol	Parameter	Conditions		Min	Typ	Max	Unit
I_{CBO}	collector-base cut-off current	$V_{CB} = -25$ V; $I_E = 0$ A		-	-	–100	nA
		$V_{CB} = -25$ V; $I_E = 0$ A; $T_j = 150$ °C		-	-	–10	μA
I_{EBO}	emitter-base cut-off current	$V_{EB} = -5$ V; $I_C = 0$ A		-	-	–100	nA
h_{FE}	DC current gain	$V_{CE} = -10$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

[1] Pulse test: $t_p \leq 300$ μs; $\delta = 0.02$.



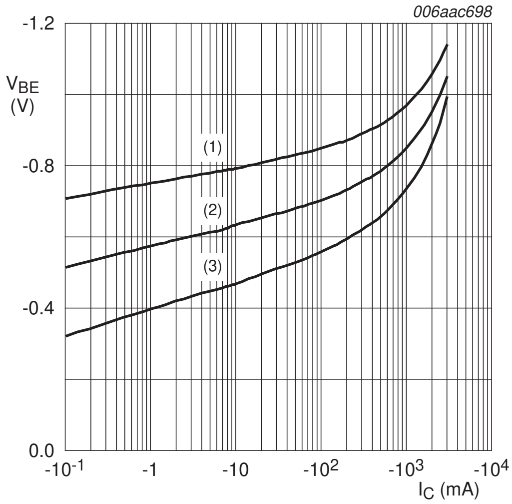
V_{CE} = −1 V
(1) T_{amb} = 100 °C
(2) T_{amb} = 25 °C
(3) T_{amb} = −55 °C

Fig 15. h_{FE} selection -16: DC current gain as a function of collector current; typical values



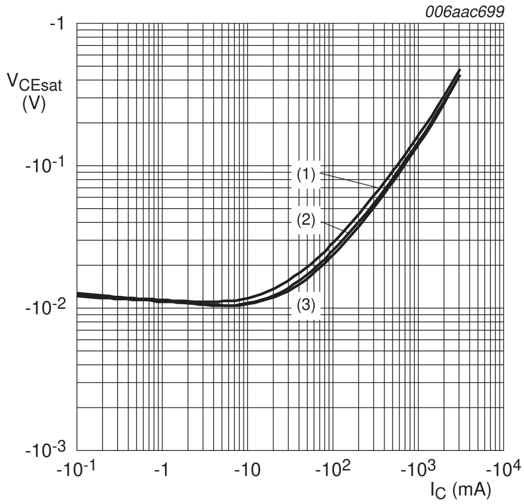
T_{amb} = 25 °C

Fig 16. h_{FE} selection -16: collector current as a function of collector-emitter voltage; typical values



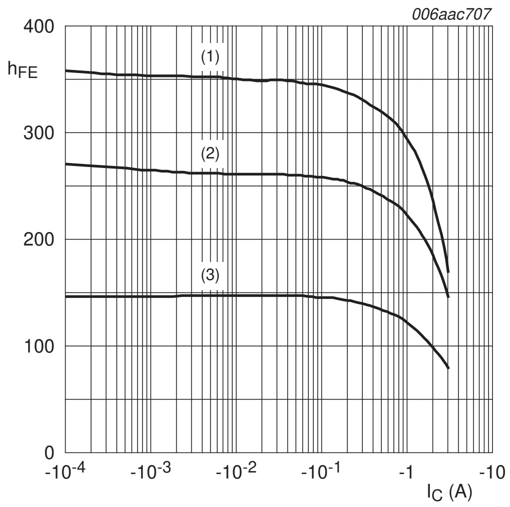
V_{CE} = −1 V
(1) T_{amb} = −55 °C
(2) T_{amb} = 25 °C
(3) T_{amb} = 100 °C

Fig 17. h_{FE} 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 18. h_{FE} selection -16: collector-emitter saturation voltage as a function of collector current; typical values



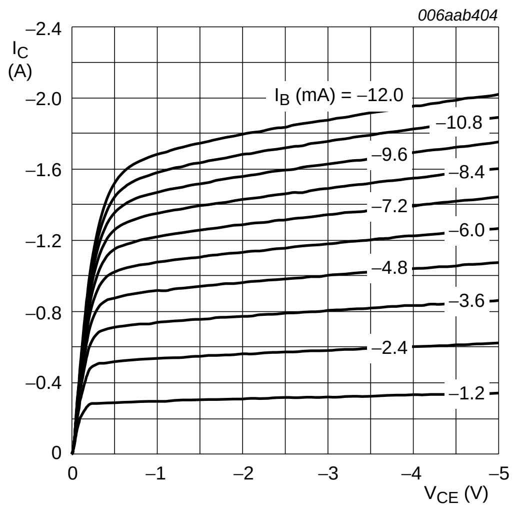
V_{CE} = −1 V

(1) T_{amb} = 100 °C

(2) T_{amb} = 25 °C

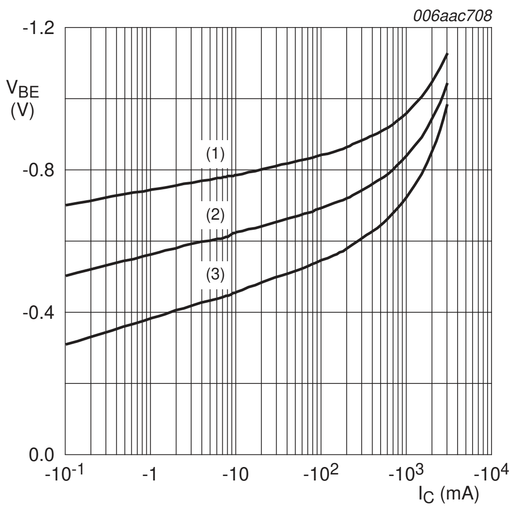
(3) T_{amb} = −55 °C

Fig 19. h_{FE} selection -25: DC current gain as a function of collector current; typical values



T_{amb} = 25 °C

Fig 20. h_{FE} selection -25: collector current as a function of collector-emitter voltage; typical values



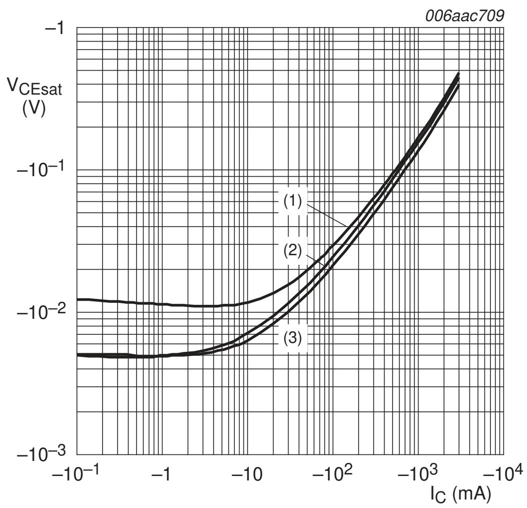
V_{CE} = −1 V

(1) T_{amb} = −55 °C

(2) T_{amb} = 25 °C

(3) T_{amb} = 100 °C

Fig 21. h_{FE} 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 22. h_{FE} selection -25: collector-emitter saturation voltage as a function of collector current; typical values

8. Test information

8.1 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.

9. Package outline

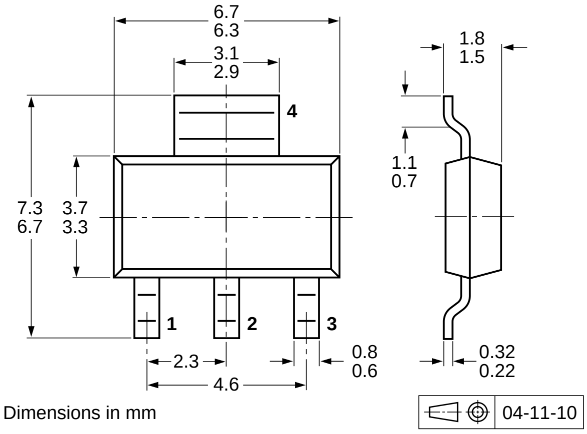


Fig 23. Package outline SOT223 (SC-73)

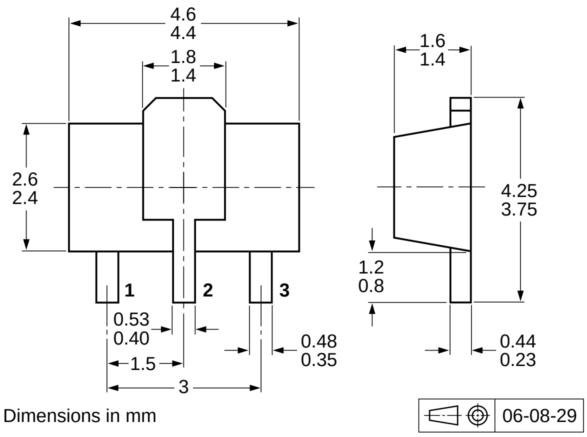


Fig 24. Package outline SOT89 (SC-62/TO-243)

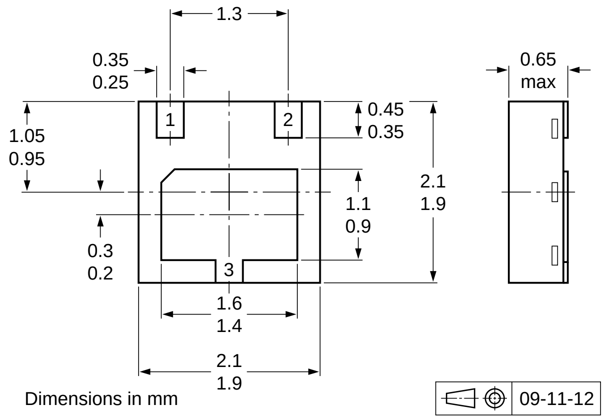


Fig 25. Package outline SOT1061 (HUSON3)

10. Packing information

Table 9. Packing methods

The indicated -xxx are the last three digits of the 12NC ordering code.[1]

Type number[2]	Package	Description		Packing quantity		
				1000	3000	4000
BCP69	SOT223	8 mm pitch, 12 mm tape and reel		-115	-	-135
BC869	SOT89	8 mm pitch, 12 mm tape and reel; T1	[3]	-115	-	-135
		8 mm pitch, 12 mm tape and reel; T3	[4]	-146	-	-
BC69PA	SOT1061	4 mm pitch, 8 mm tape and reel		-	-115	-

[1] For further information and the availability of packing methods, see Section 14.

[2] Valid for all available selection groups.

[3] T1: normal taping

[4] T3: 90° rotated taping

11. Soldering

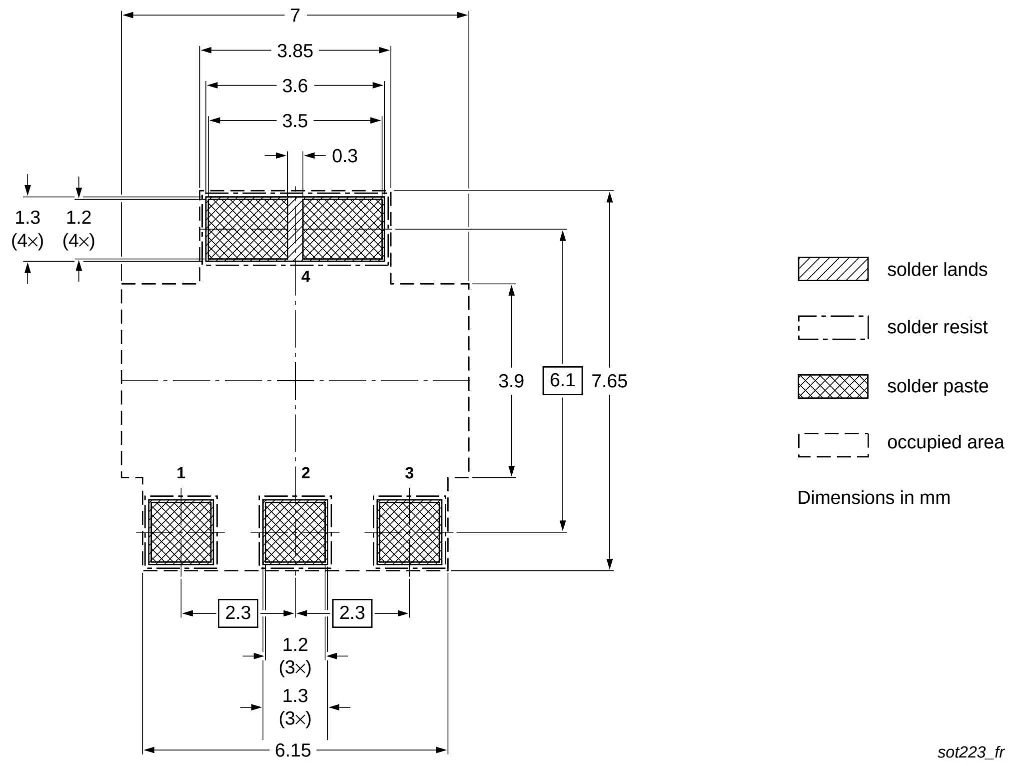


Fig 26. Reflow soldering footprint SOT223 (SC-73)

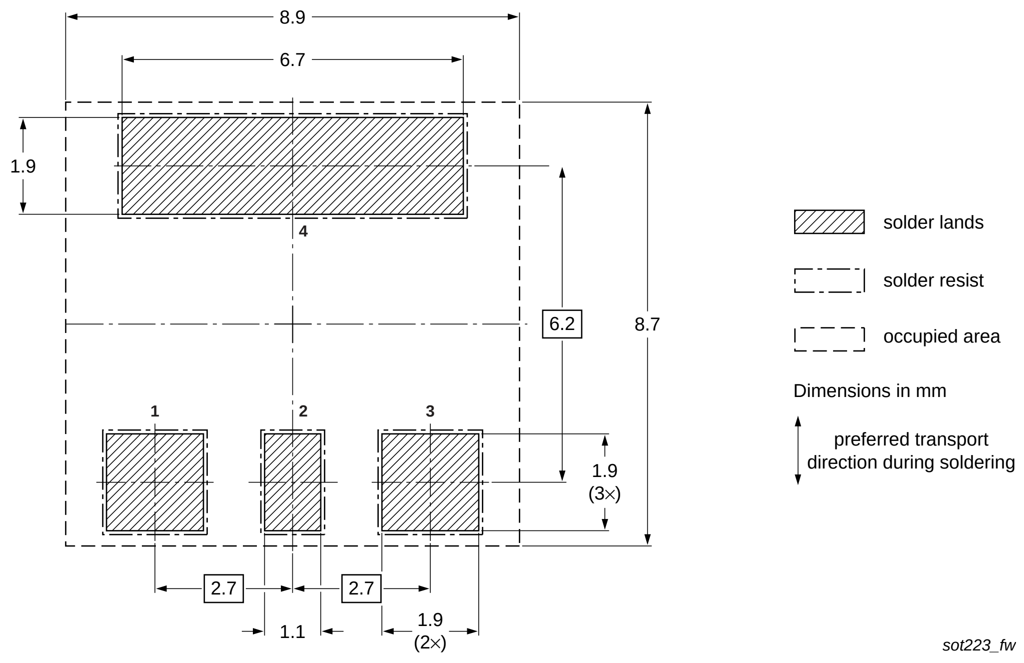


Fig 27. Wave soldering footprint SOT223 (SC-73)

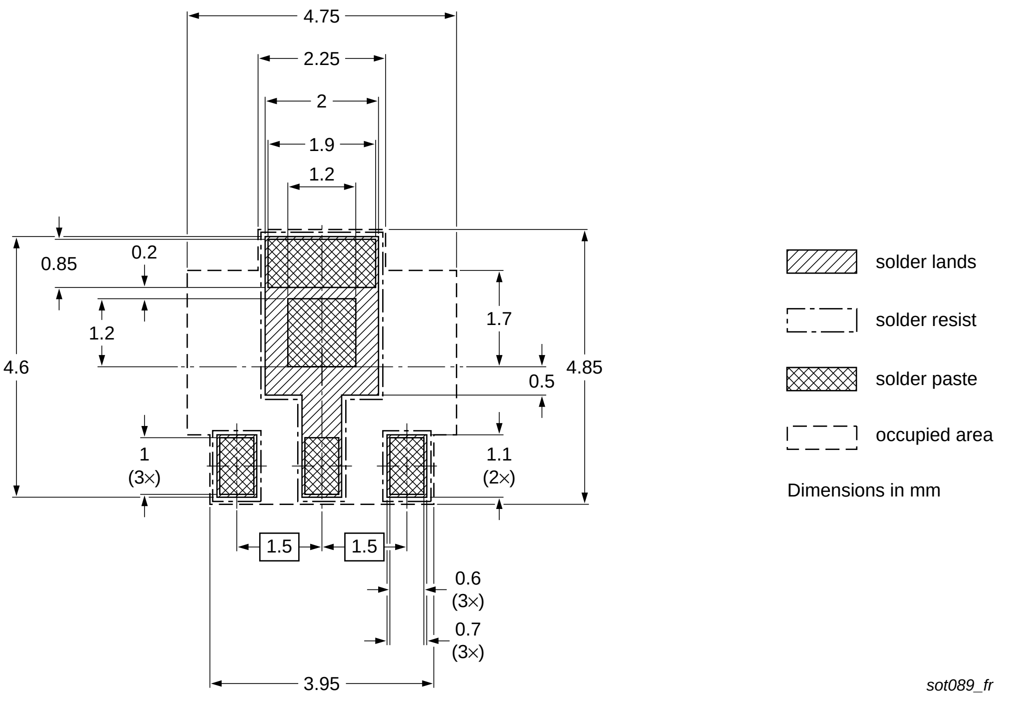


Fig 28. Reflow soldering footprint SOT89 (SC-62/TO-243)

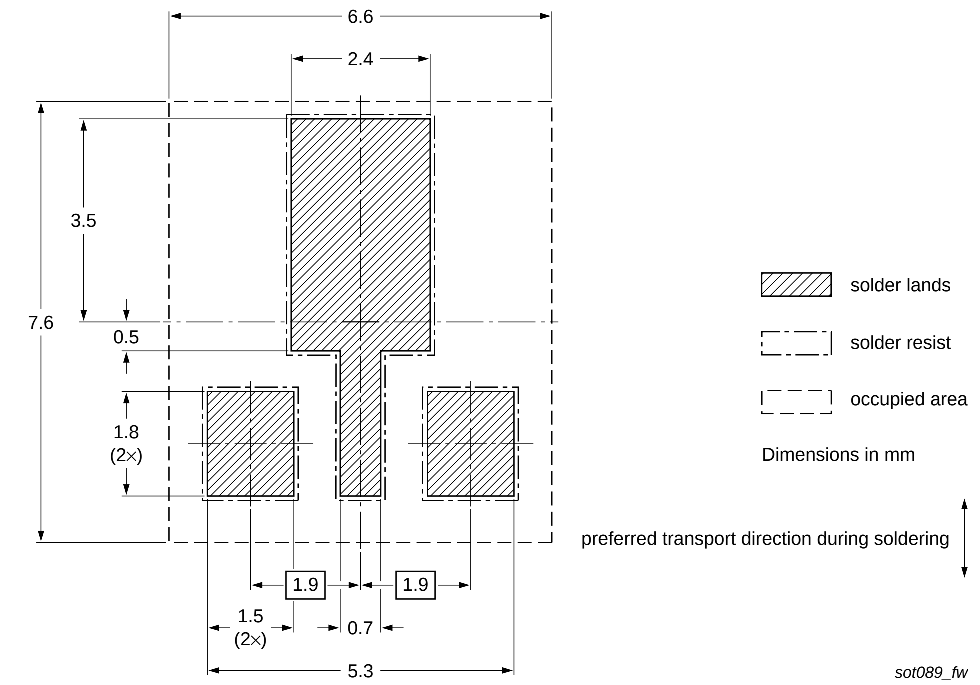
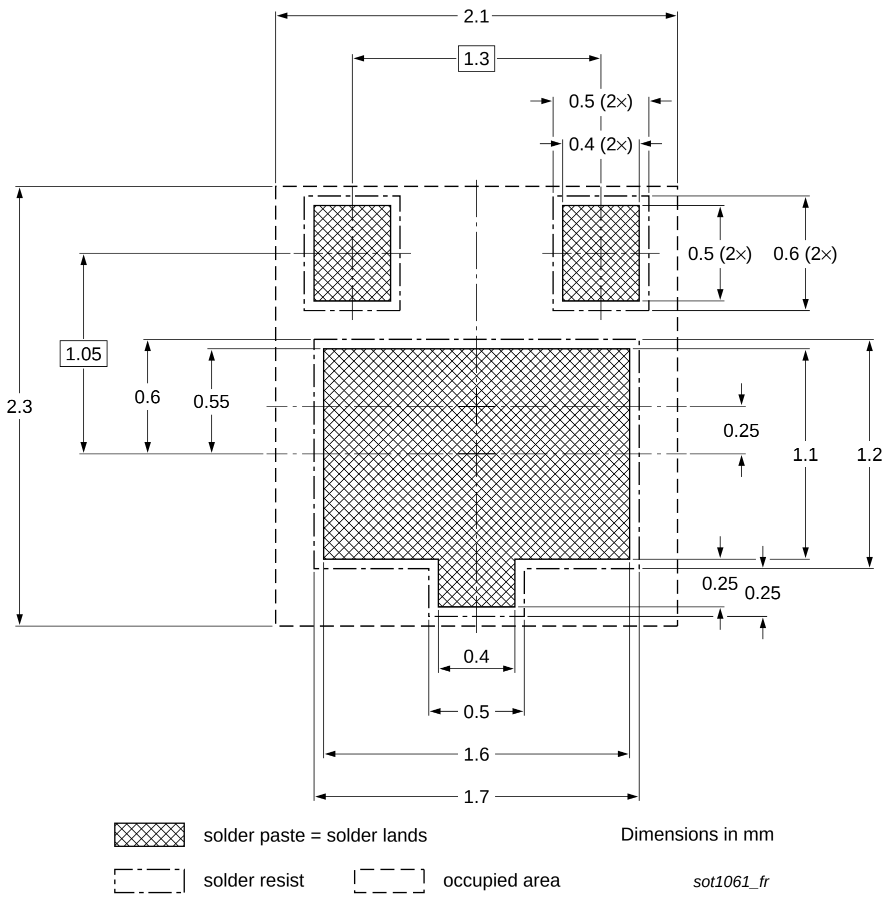


Fig 29. Wave soldering footprint SOT89 (SC-62/TO-243)



Reflow soldering is the only recommended soldering method.

Fig 30. Reflow soldering footprint SOT1061 (HUSON3)

12. Revision history

Table 10. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
BCP69_BC869_BC69PA v.7	20111012	Product data sheet	-	BC869_6 BCP69_6
Modifications:	• The format of this document has been redesigned to comply with the new identity guidelines of NXP Semiconductors. • Legal texts have been adapted to the new company name where appropriate. • Type number BC69PA added • Type number BCP69-16/DG and BCP69-16/IN removed • Section 1 "Product profile": updated • Section 2 "Pinning information": updated • Section 3 "Ordering information": updated • Section 4 "Marking": updated • Section 10 "Packing information":updated • Table 6, 7 and 8: updated according to latest measurements • Figure 1, 15 to 18 updated • Figure 2 to 14, 24 to 25, 28 to 30: added			
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	-	-

13. Legal information

13.1 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".

[3] The product status of device(s) described in this document may have changed since this document was published and may differ in case of multiple devices. The latest product status information is available on the Internet at URL http://www.nexperia.com.

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14. Contact information

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For sales office addresses, please send an email to: **salesaddresses@nexperia.com**

15. Contents

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