

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
	NXP	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



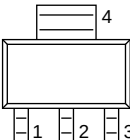
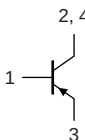
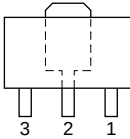
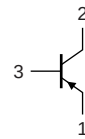
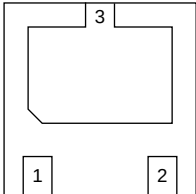
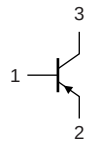
Table 2. Quick reference data ...continued

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

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

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 ≤ 1 ms	-	−3	A		
I _B	base current		-	−0.4	A		
I _{BM}	peak base current	single pulse; t _p ≤ 1 ms	-	−0.4	A		
P _{tot}	total power dissipation	T _{amb} ≤ 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		

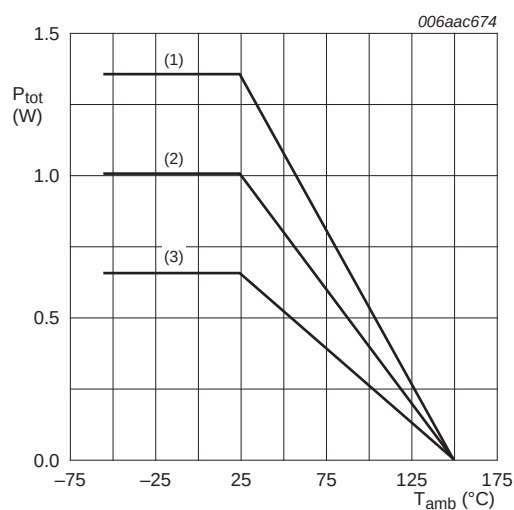
[1] Device mounted on an FR4 Printed-Circuit Board (PCB), single-sided copper, tin-plated and standard footprint.

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

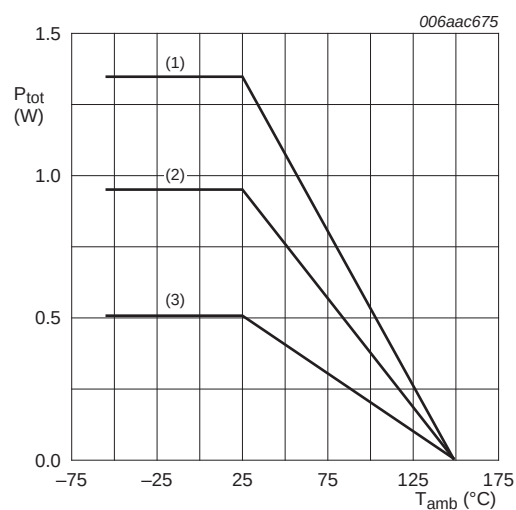
[3] Device mounted on an FR4 PCB, single-sided copper, tin-plated, mounting pad for collector 6 cm².

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

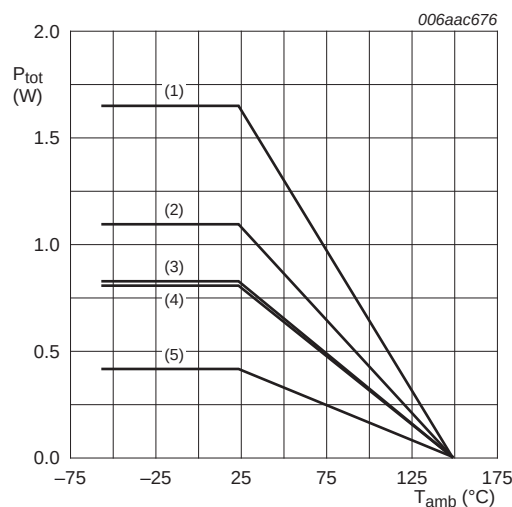
[5] Device mounted on an FR4 PCB, 4-layer copper, tin-plated, mounting pad for collector 1 cm².



- (1) FR4 PCB, mounting pad for collector 6 cm²
- (2) FR4 PCB, mounting pad for collector 1 cm²
- (3) FR4 PCB, standard footprint

Fig 1. Power derating curves SOT223


- (1) FR4 PCB, mounting pad for collector 6 cm²
- (2) FR4 PCB, mounting pad for collector 1 cm²
- (3) FR4 PCB, standard footprint

Fig 2. Power derating curves SOT89


- (1) FR4 PCB, 4-layer copper, mounting pad for collector 1 cm²
- (2) FR4 PCB, single-sided copper, mounting pad for collector 6 cm²
- (3) FR4 PCB, single-sided copper, mounting pad for collector 1 cm²
- (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		

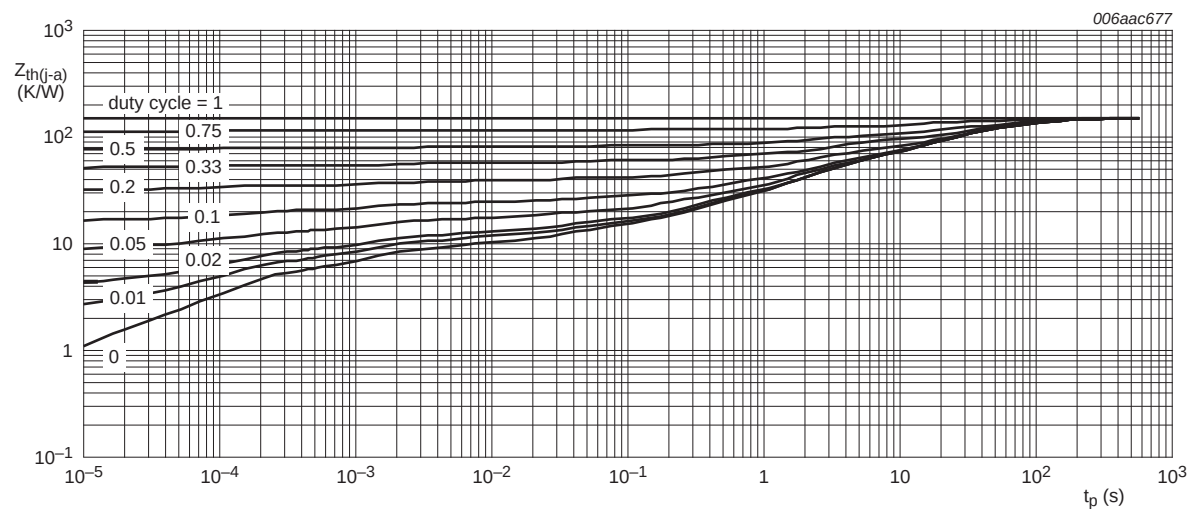
[1] Device mounted on an FR4 PCB, single-sided copper, tin-plated and standard footprint.

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

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

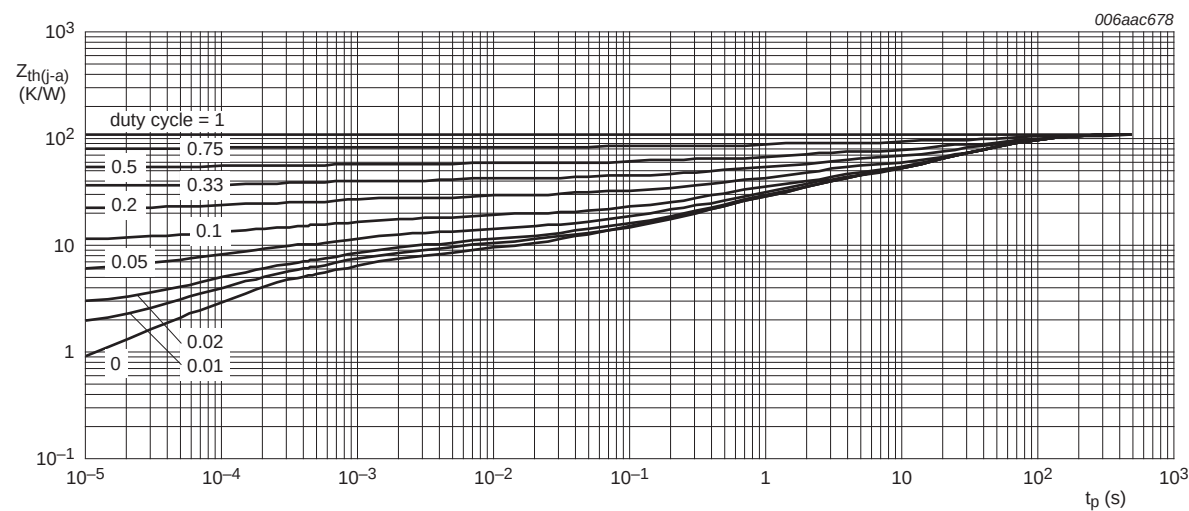
[4] Device mounted on an FR4 PCB, 4-layer copper, tin-plated and standard footprint.

[5] Device mounted on an FR4 PCB, 4-layer copper, tin-plated, mounting pad for collector 1 cm².



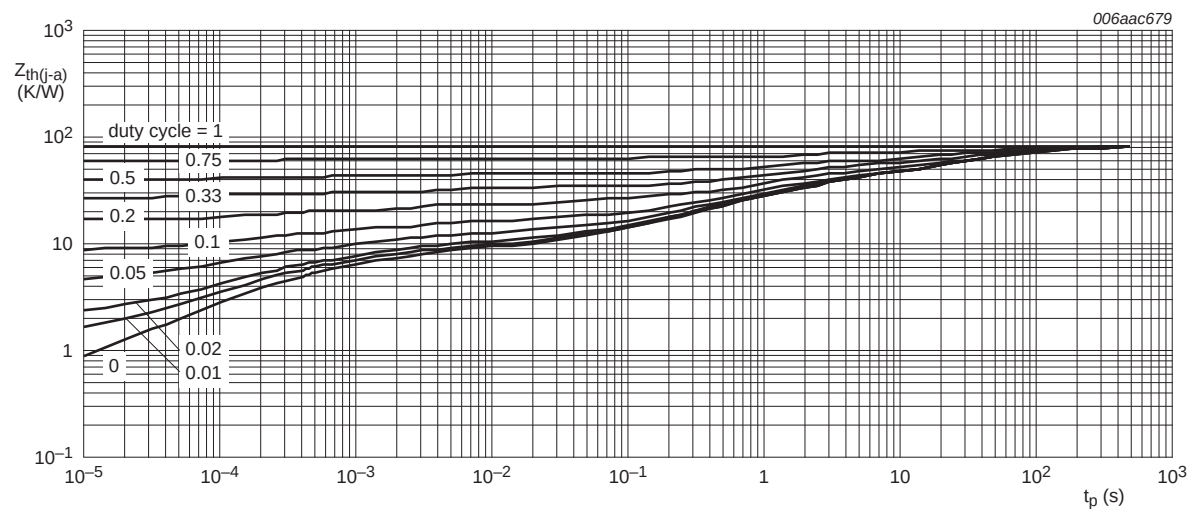
FR4 PCB, standard footprint

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



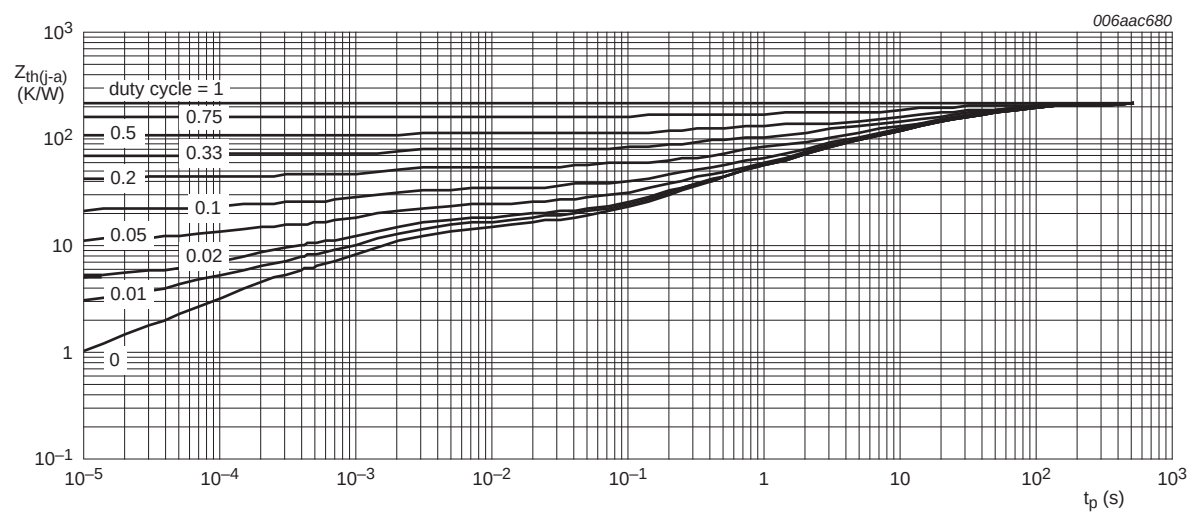
FR4 PCB, mounting pad for collector 1 cm²

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



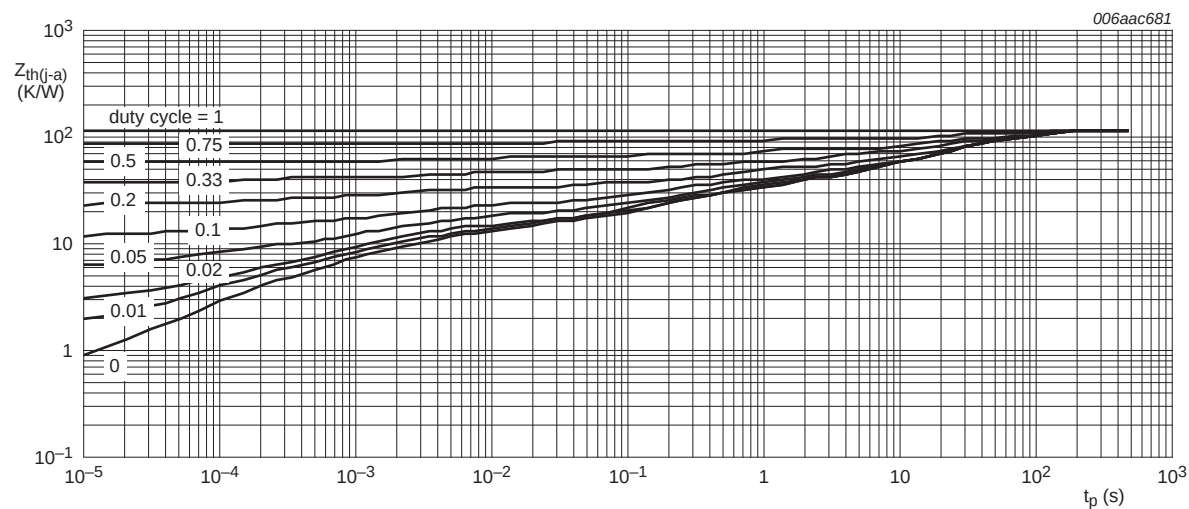
FR4 PCB, mounting pad for collector 6 cm²

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



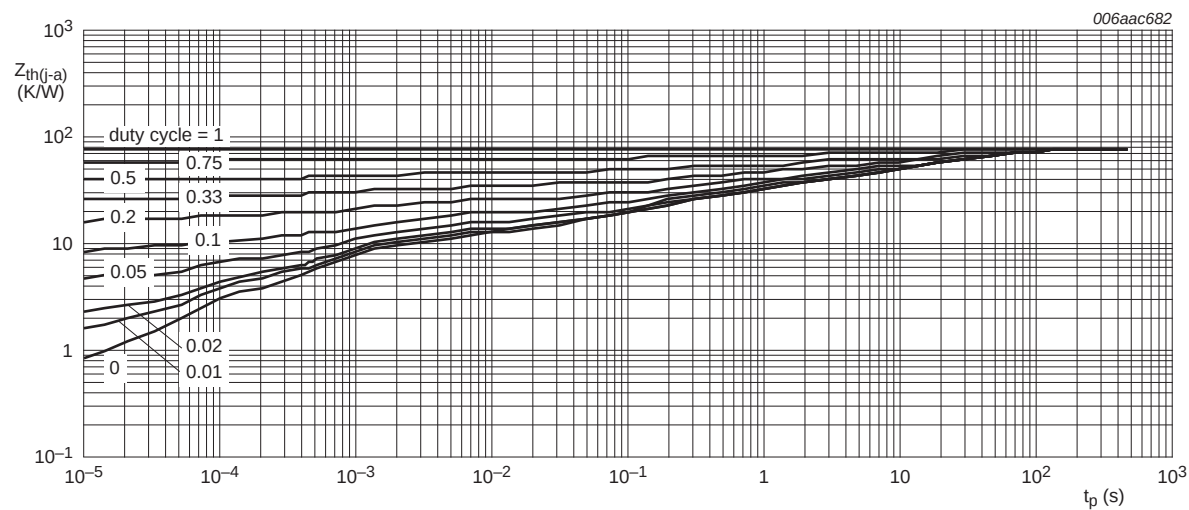
FR4 PCB, standard footprint

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



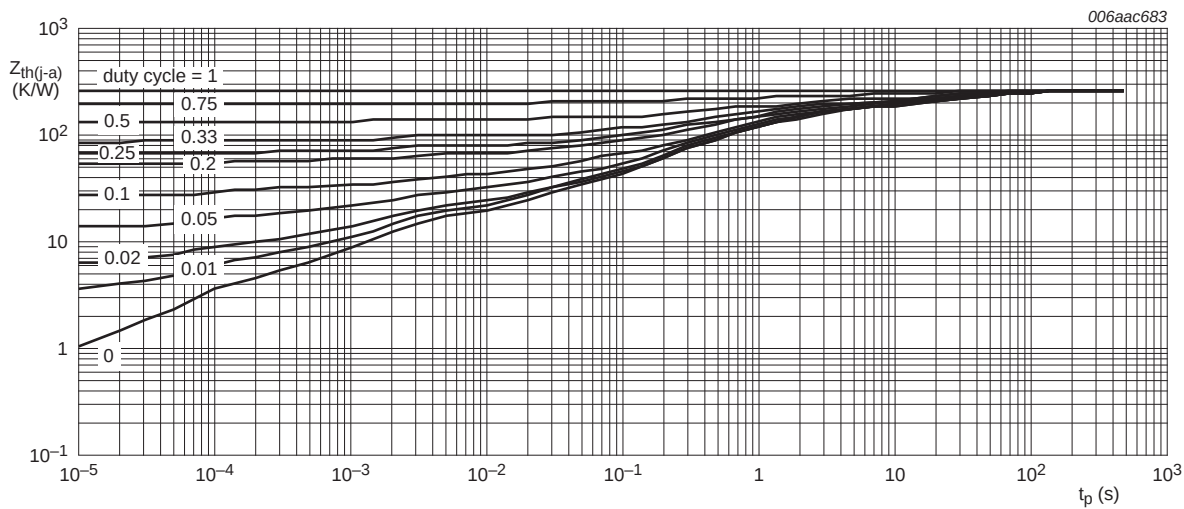
FR4 PCB, mounting pad for collector 1 cm²

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



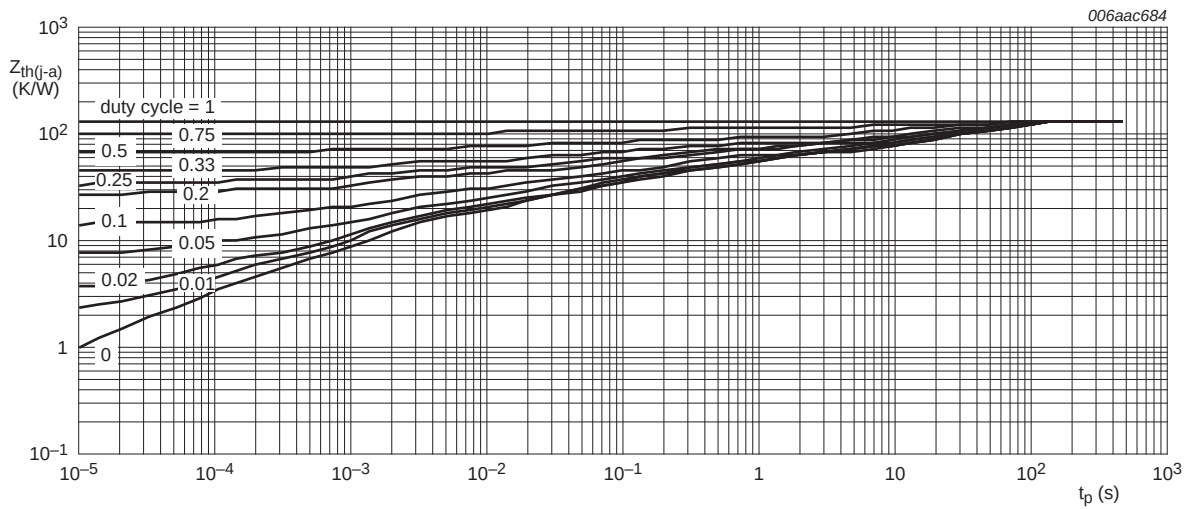
FR4 PCB, mounting pad for collector 6 cm²

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



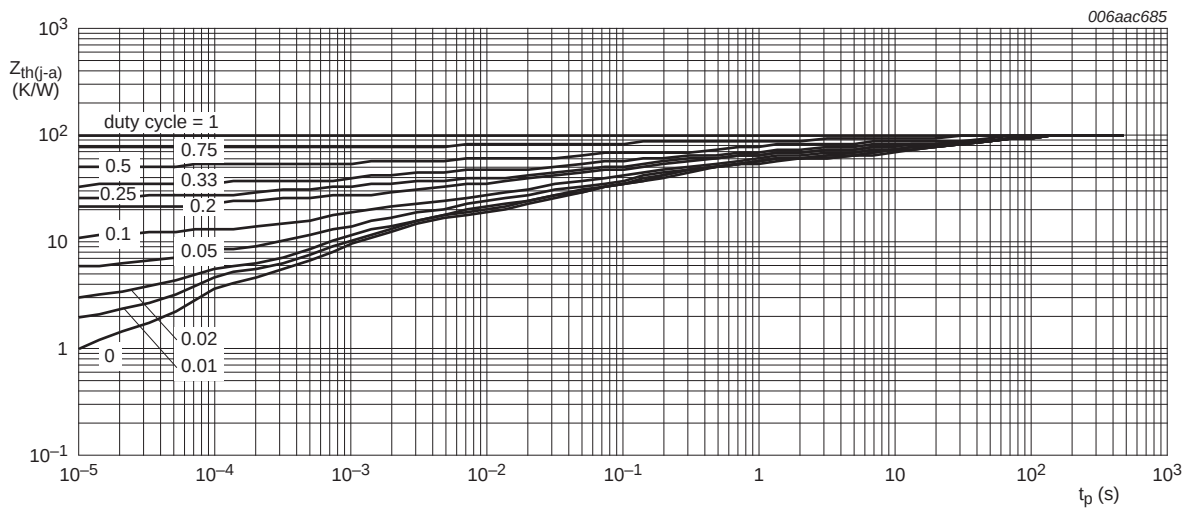
FR4 PCB, single-sided copper, standard footprint

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



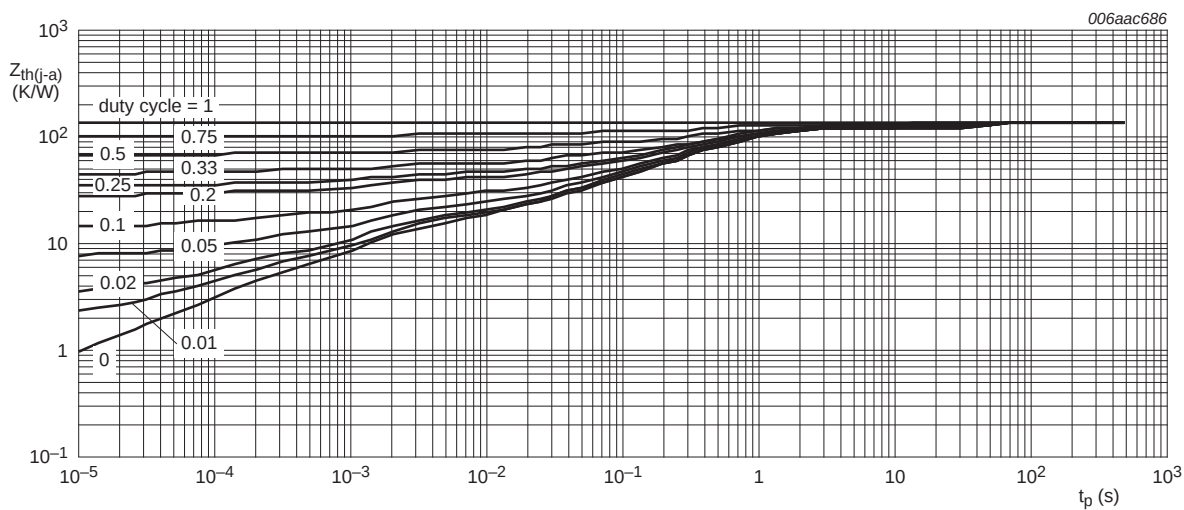
FR4 PCB, single-sided copper, mounting pad for collector 1 cm²

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



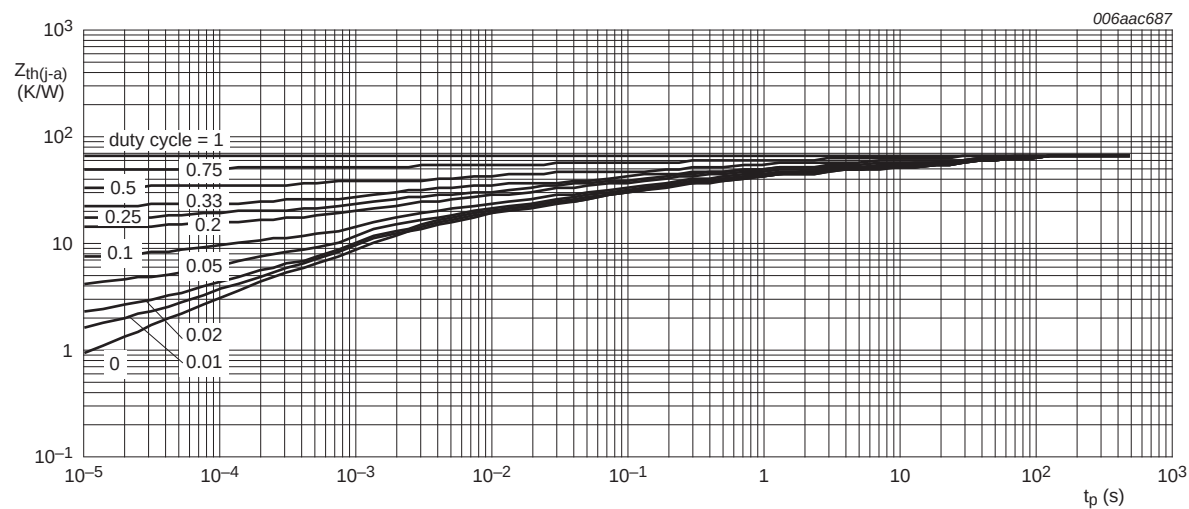
FR4 PCB, single-sided copper, mounting pad for collector 6 cm²

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 cm²

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

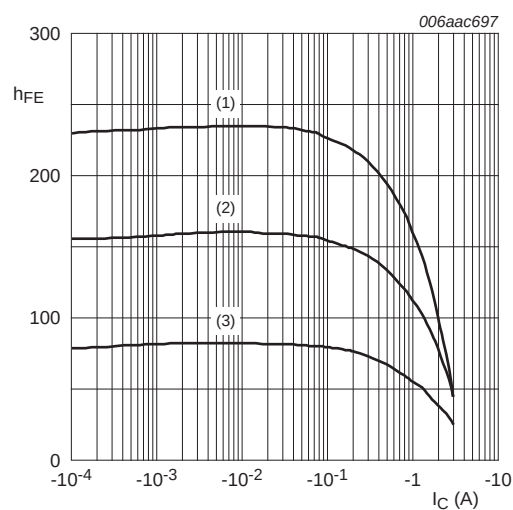
7. Characteristics

Table 8. Characteristics

$T_{amb} = 25\text{ }^{\circ}\text{C}$ unless otherwise specified.

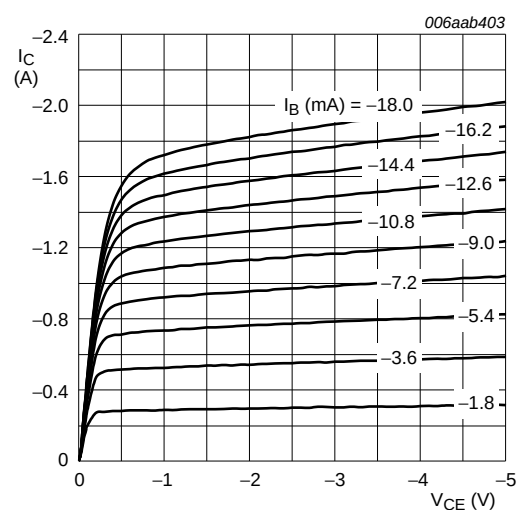
Symbol	Parameter	Conditions	Min	Typ	Max	Unit
I_{CBO}	collector-base cut-off current	$V_{CB} = -25\text{ V}; I_E = 0\text{ A}$	-	-	-100	nA
		$V_{CB} = -25\text{ V}; I_E = 0\text{ A}; T_j = 150\text{ }^{\circ}\text{C}$	-	-	-10	μA
I_{EBO}	emitter-base cut-off current	$V_{EB} = -5\text{ V}; I_C = 0\text{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

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



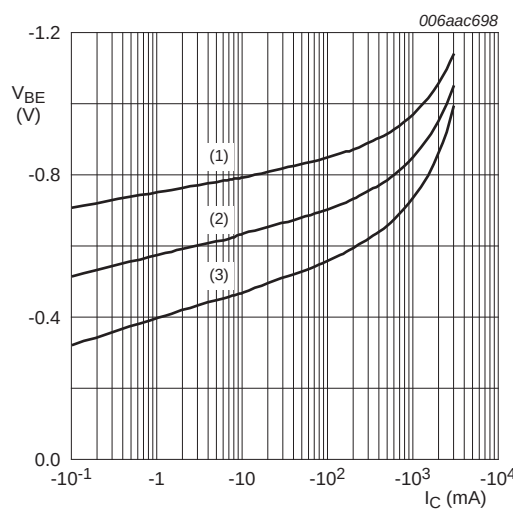
- $V_{CE} = -1\text{ V}$
- (1) $T_{amb} = 100\text{ }^{\circ}\text{C}$
 - (2) $T_{amb} = 25\text{ }^{\circ}\text{C}$
 - (3) $T_{amb} = -55\text{ }^{\circ}\text{C}$

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



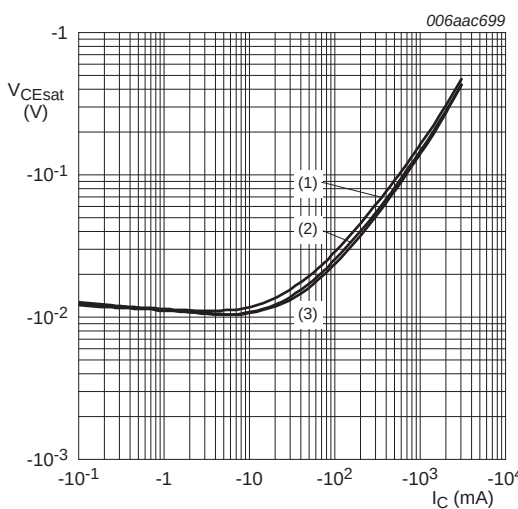
$T_{amb} = 25\text{ }^{\circ}\text{C}$

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



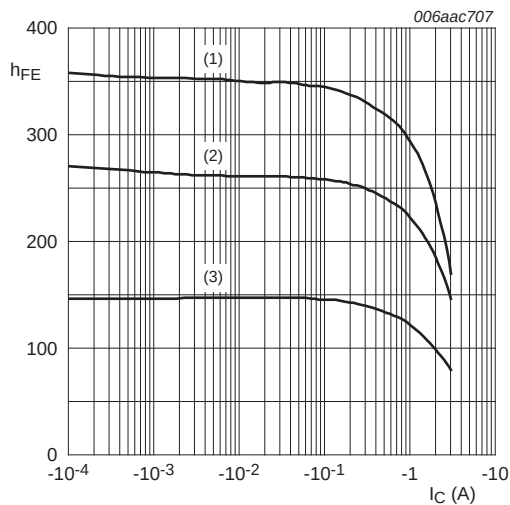
- $V_{CE} = -1\text{ V}$
- (1) $T_{amb} = -55\text{ }^{\circ}\text{C}$
 - (2) $T_{amb} = 25\text{ }^{\circ}\text{C}$
 - (3) $T_{amb} = 100\text{ }^{\circ}\text{C}$

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



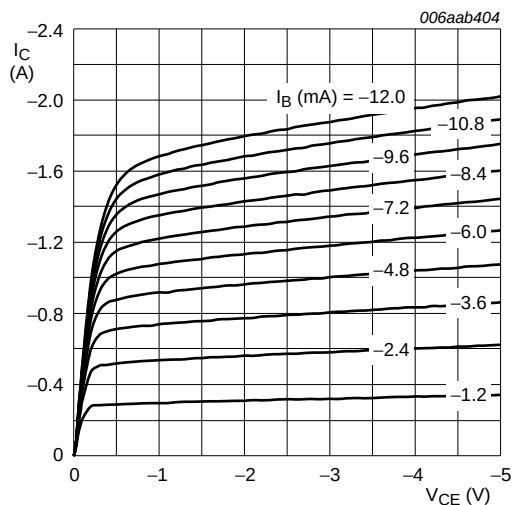
- $I_C/I_B = 10$
- (1) $T_{amb} = 100\text{ }^{\circ}\text{C}$
 - (2) $T_{amb} = 25\text{ }^{\circ}\text{C}$
 - (3) $T_{amb} = -55\text{ }^{\circ}\text{C}$

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



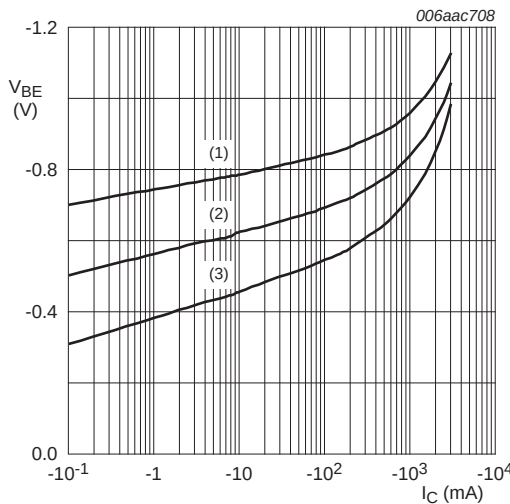
- $V_{CE} = -1\text{ V}$
- (1) $T_{amb} = 100\text{ °C}$
 - (2) $T_{amb} = 25\text{ °C}$
 - (3) $T_{amb} = -55\text{ °C}$

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



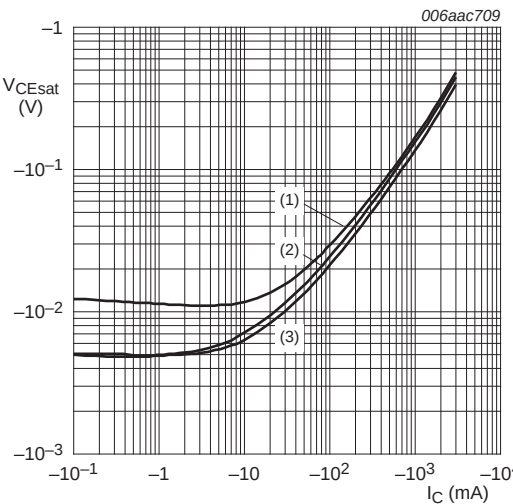
$T_{amb} = 25\text{ °C}$

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



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

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



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

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

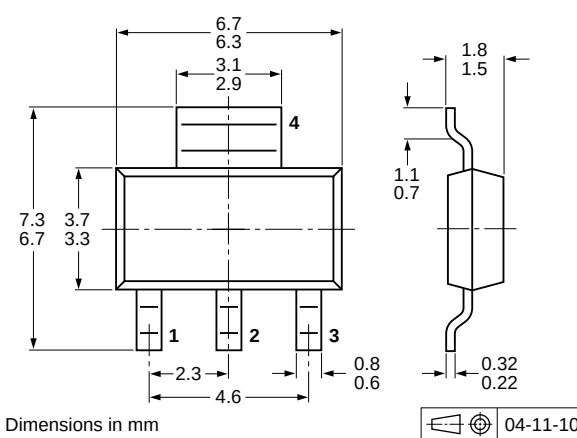


Fig 23. Package outline SOT223 (SC-73)

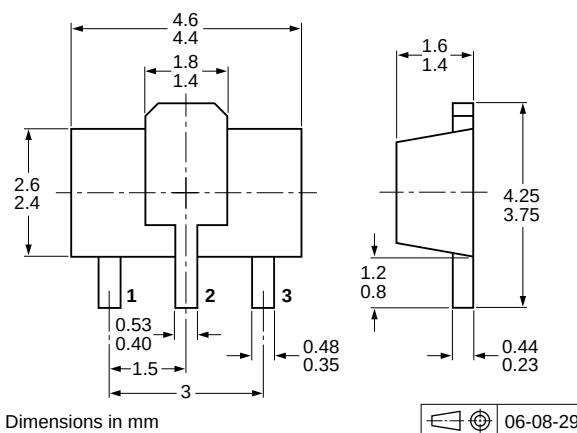
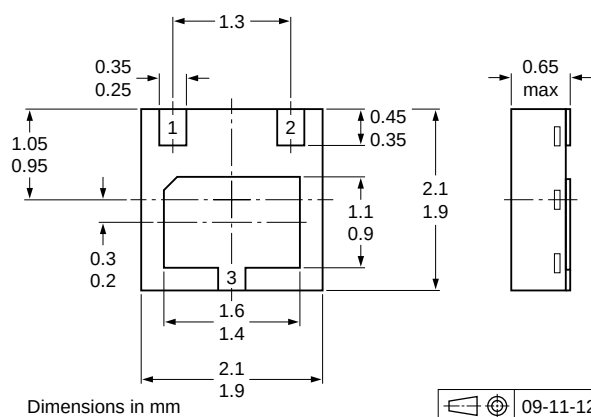


Fig 24. Package outline SOT89 (SC-62/TO-243)

**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	-

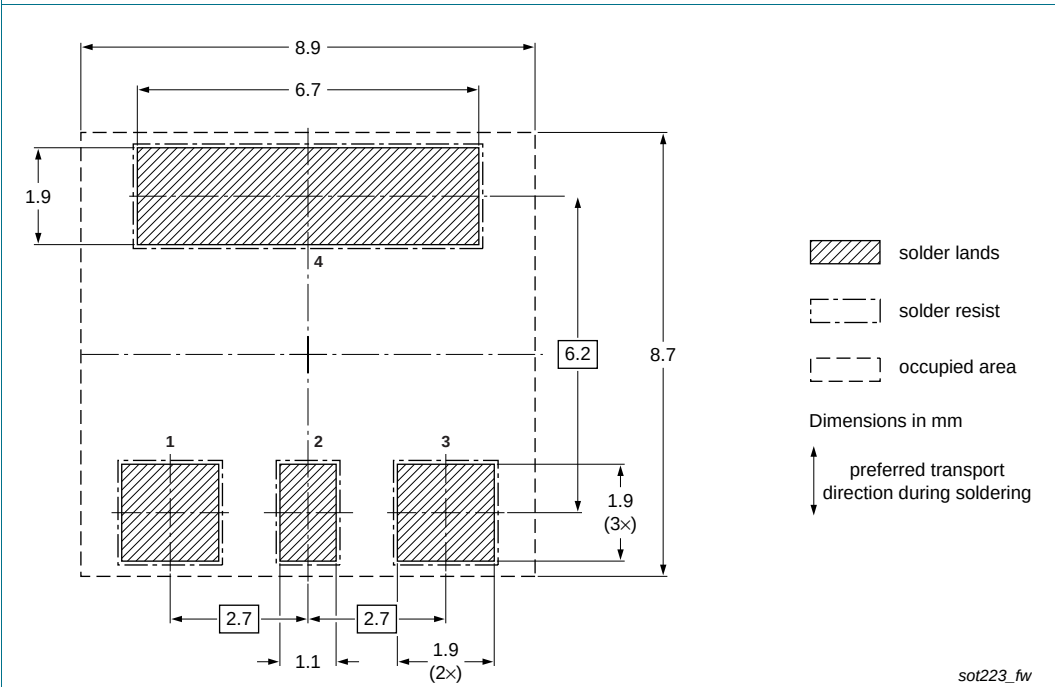
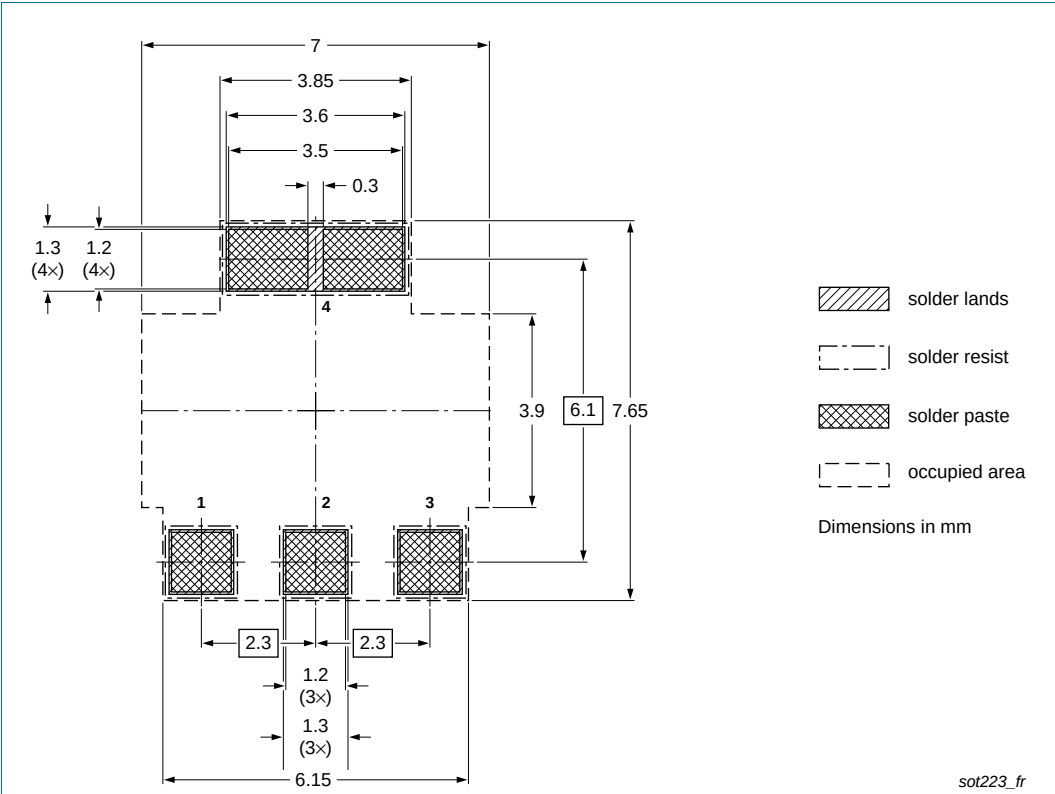
[1] For further information and the availability of packing methods, see [Section 14](#).

[2] Valid for all available selection groups.

[3] T1: normal taping

[4] T3: 90° rotated taping

11. Soldering



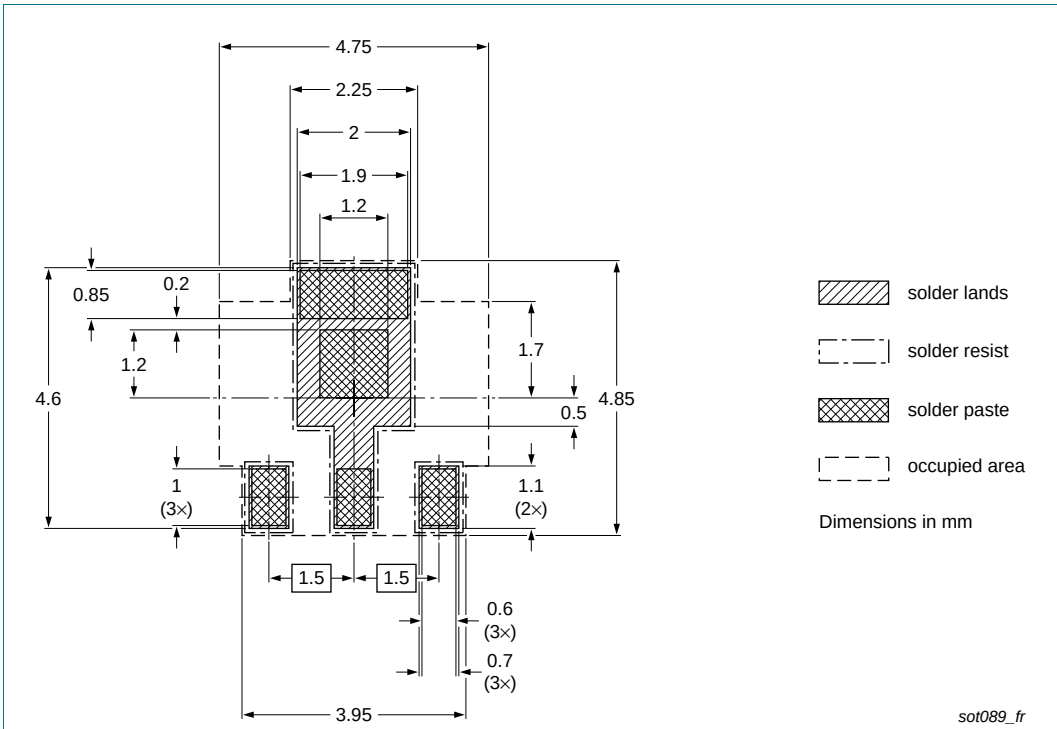


Fig 28. Reflow soldering footprint SOT89 (SC-62/TO-243)

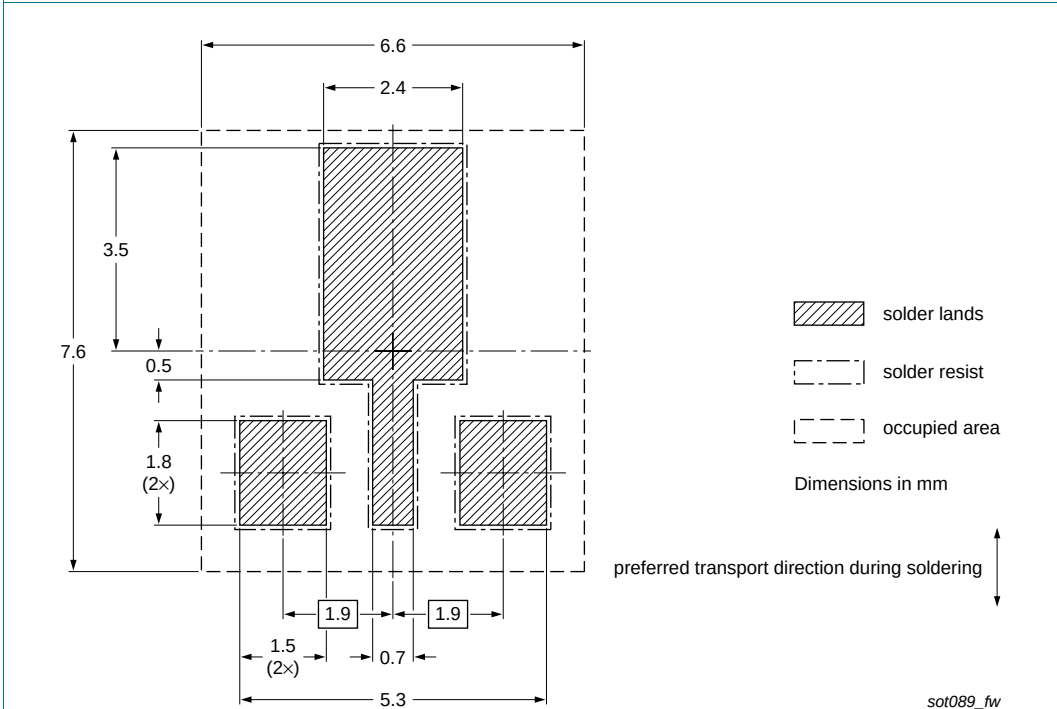
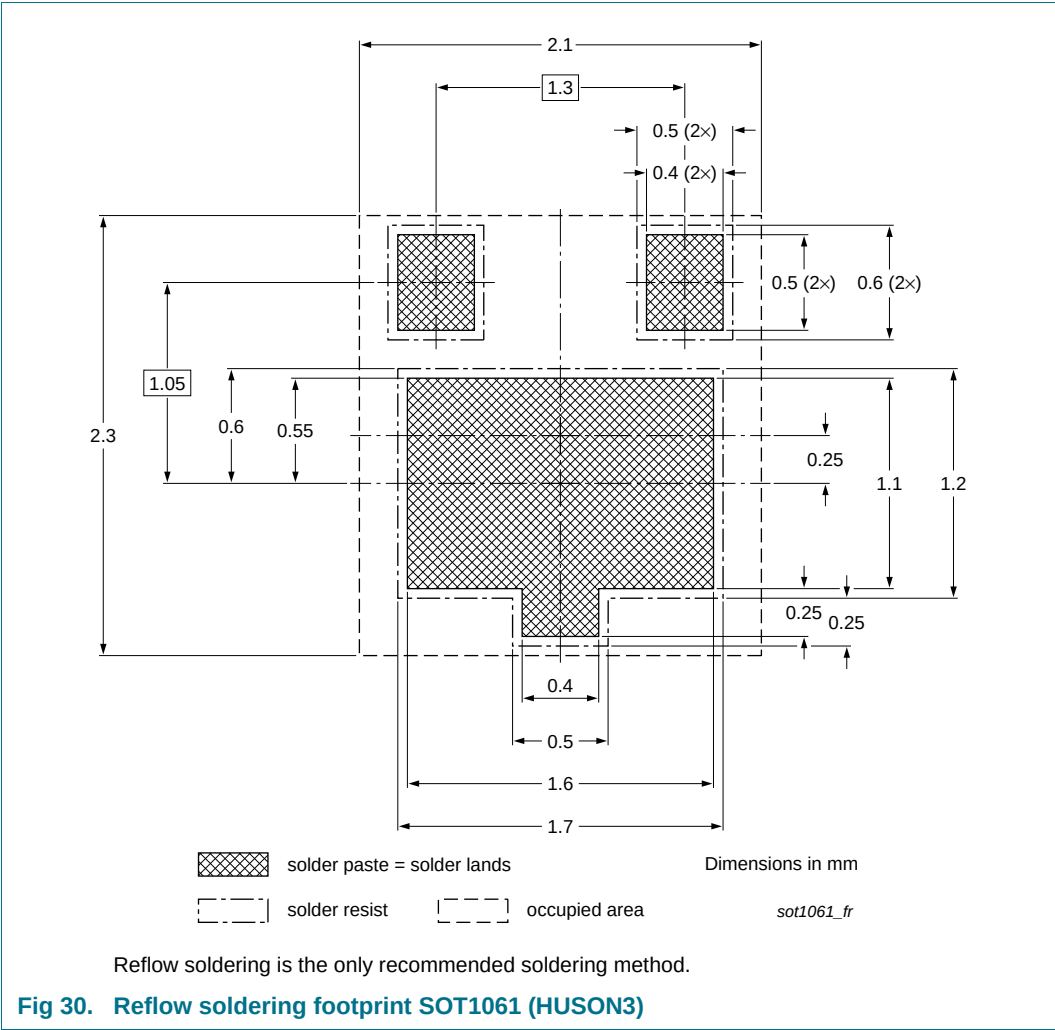


Fig 29. Wave soldering footprint SOT89 (SC-62/TO-243)



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".

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