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

Datasheet.Live

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: $t_p \leq 300$ µs; $\delta = 0.02$.

2. Pinning information

Table 3. Pinning

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

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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

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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.

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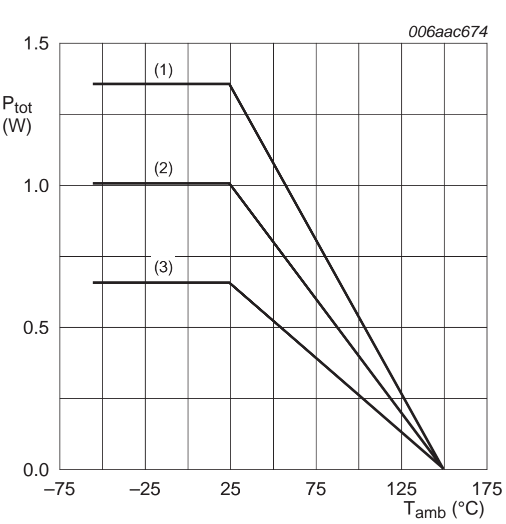
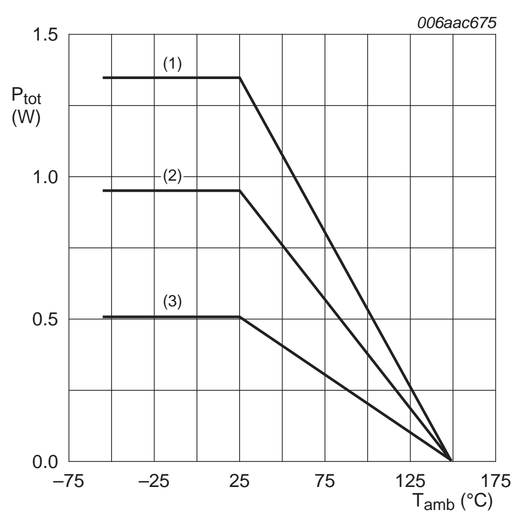


(1) FR4 PCB, mounting pad for collector 6 cm^2

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

(3) FR4 PCB, standard footprint

Fig 1. Power derating curves SOT223

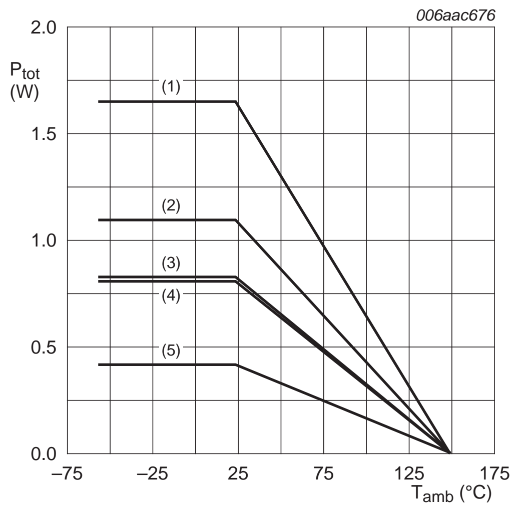


(1) FR4 PCB, mounting pad for collector 6 cm^2

(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

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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.

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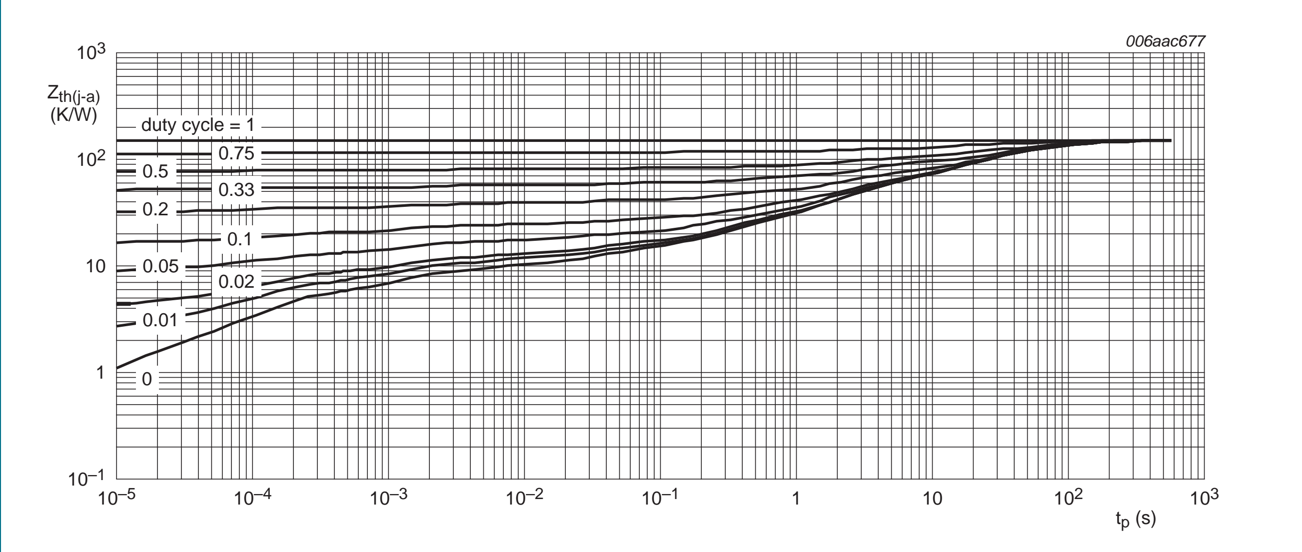
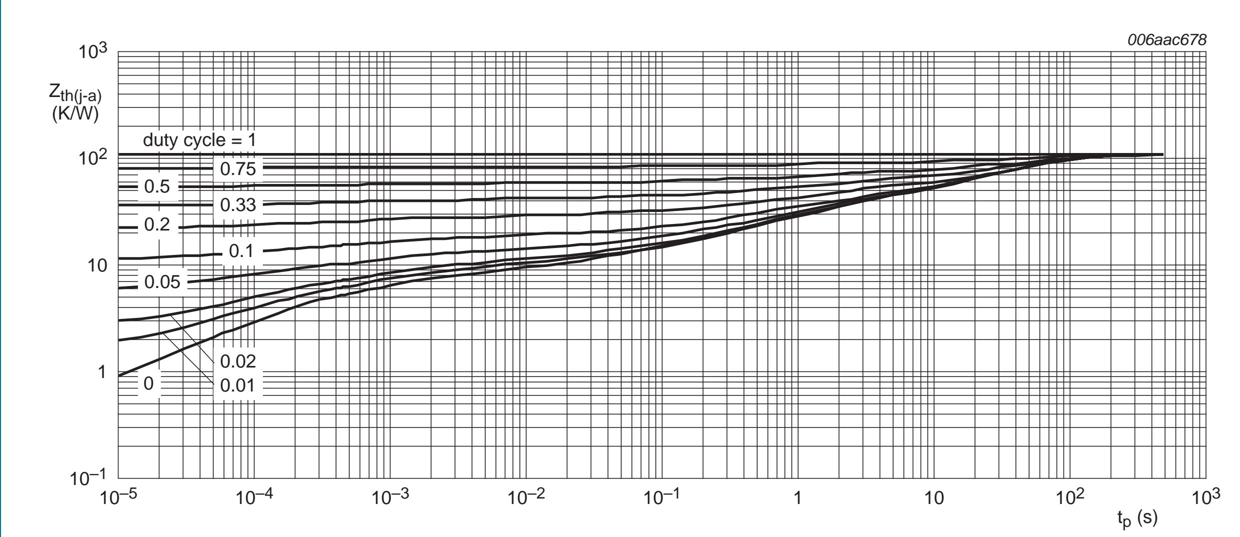


FR4 PCB, standard footprint

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

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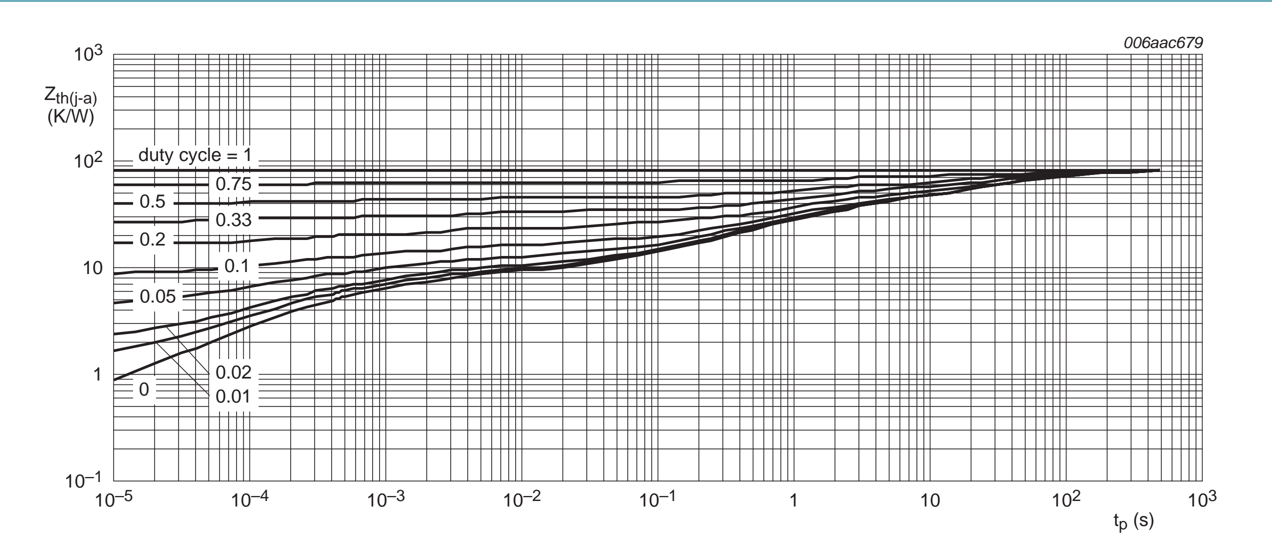
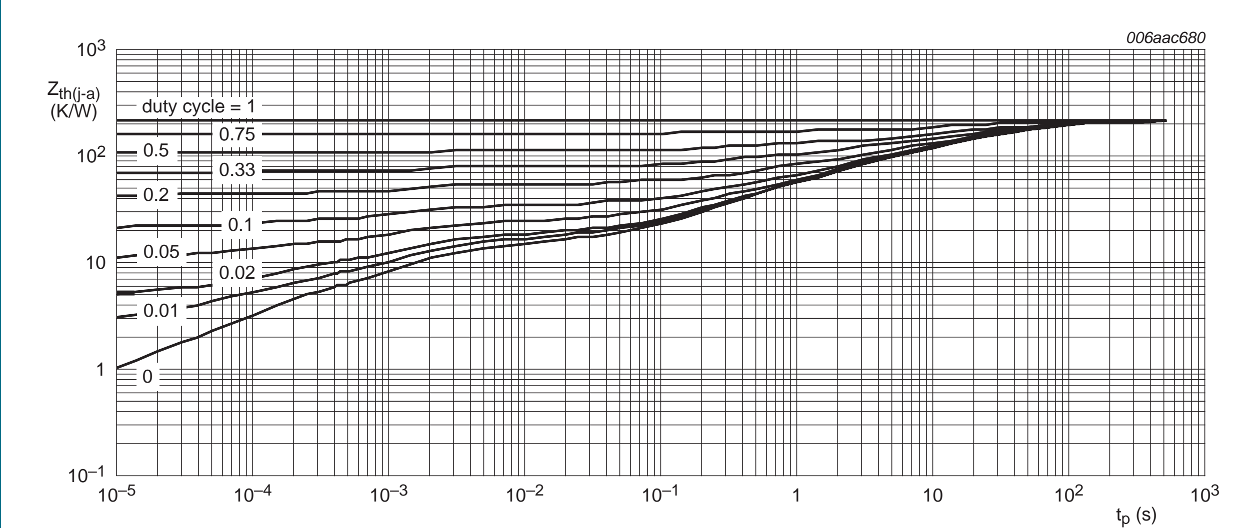


FR4 PCB, mounting pad for collector 6 cm^2

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

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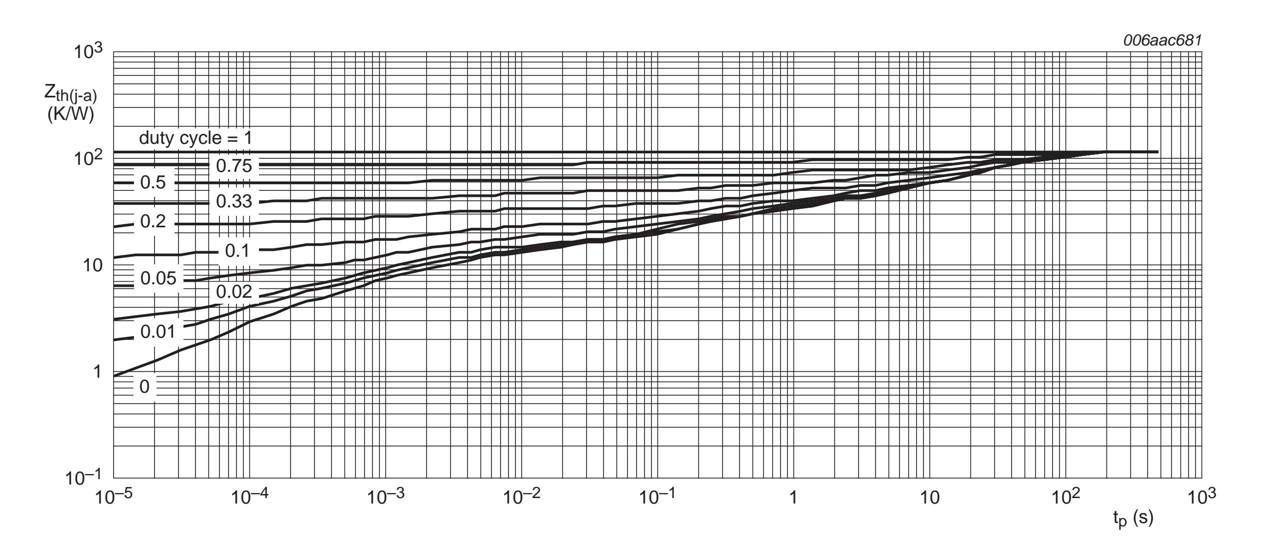
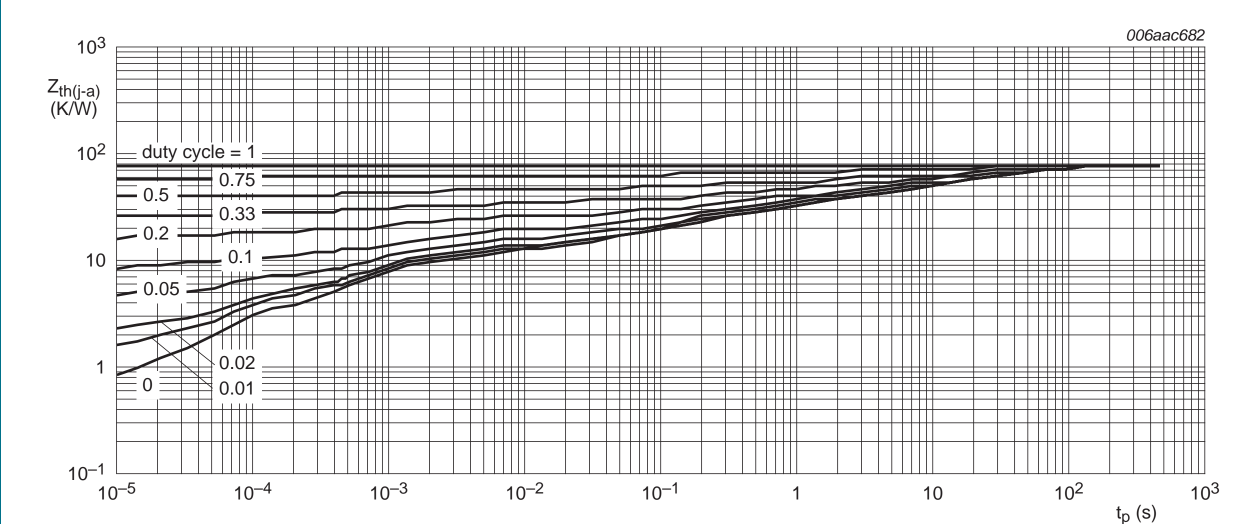


FR4 PCB, mounting pad for collector 1 cm^2

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

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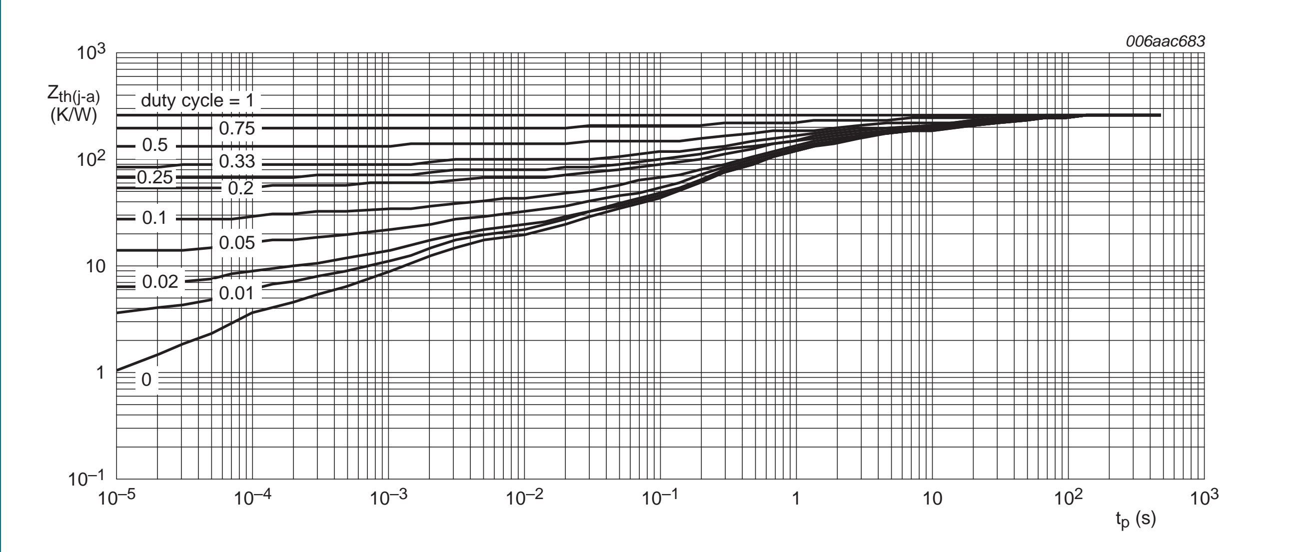
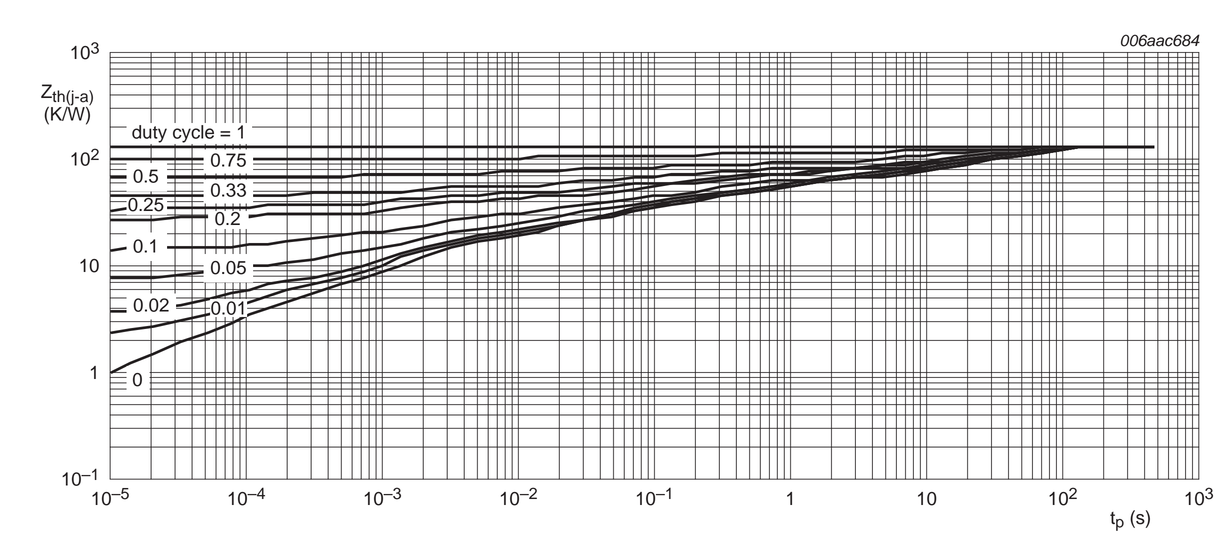


FR4 PCB, single-sided copper, standard footprint

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

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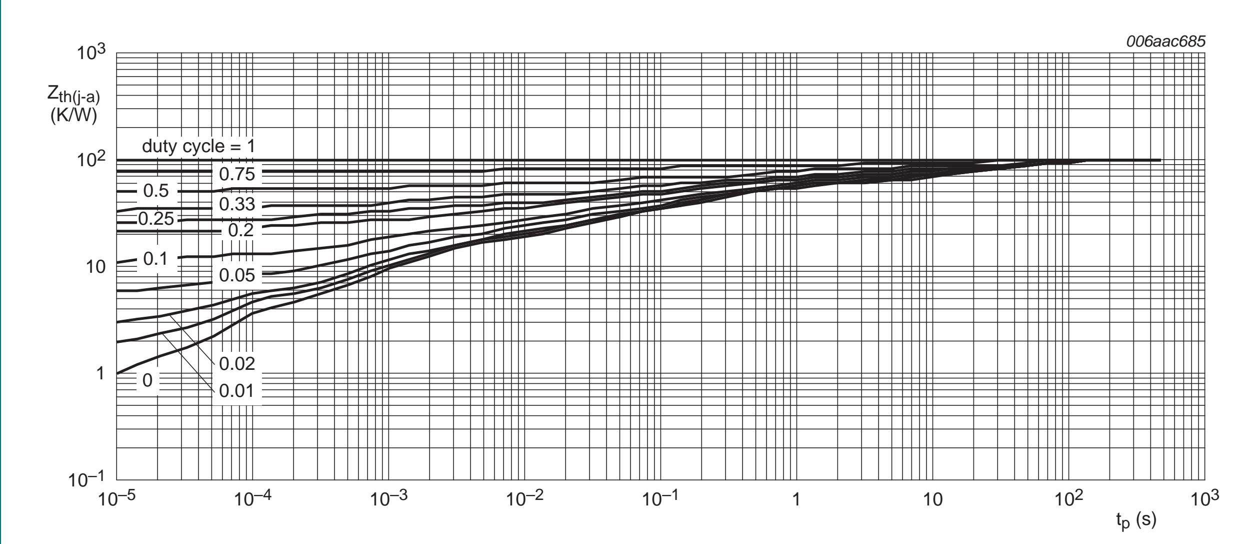
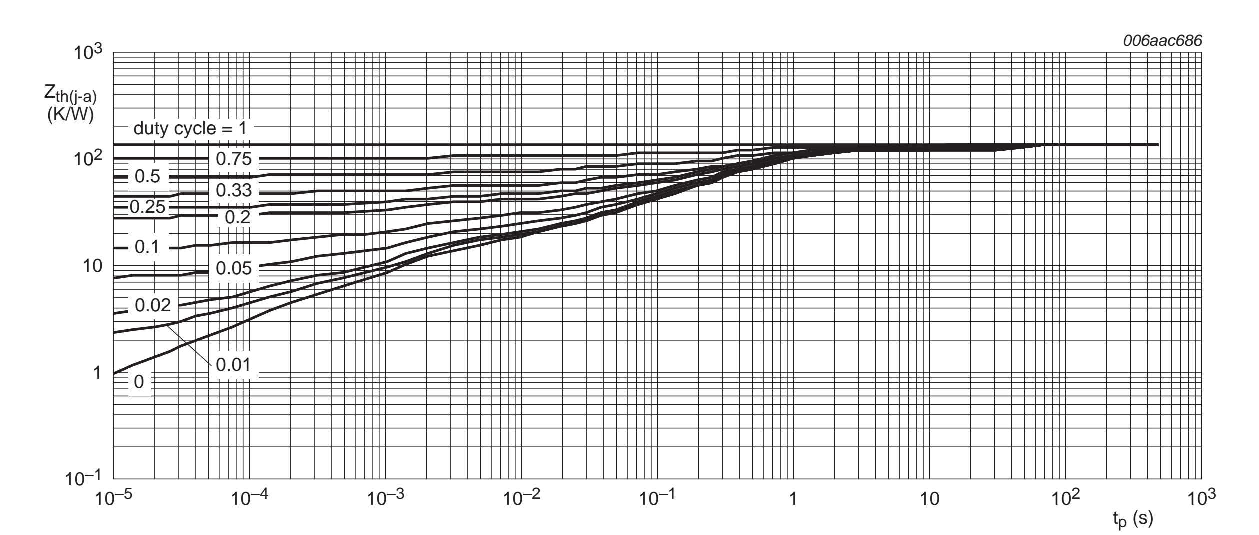


FR4 PCB, single-sided copper, mounting pad for collector 6 cm^2

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

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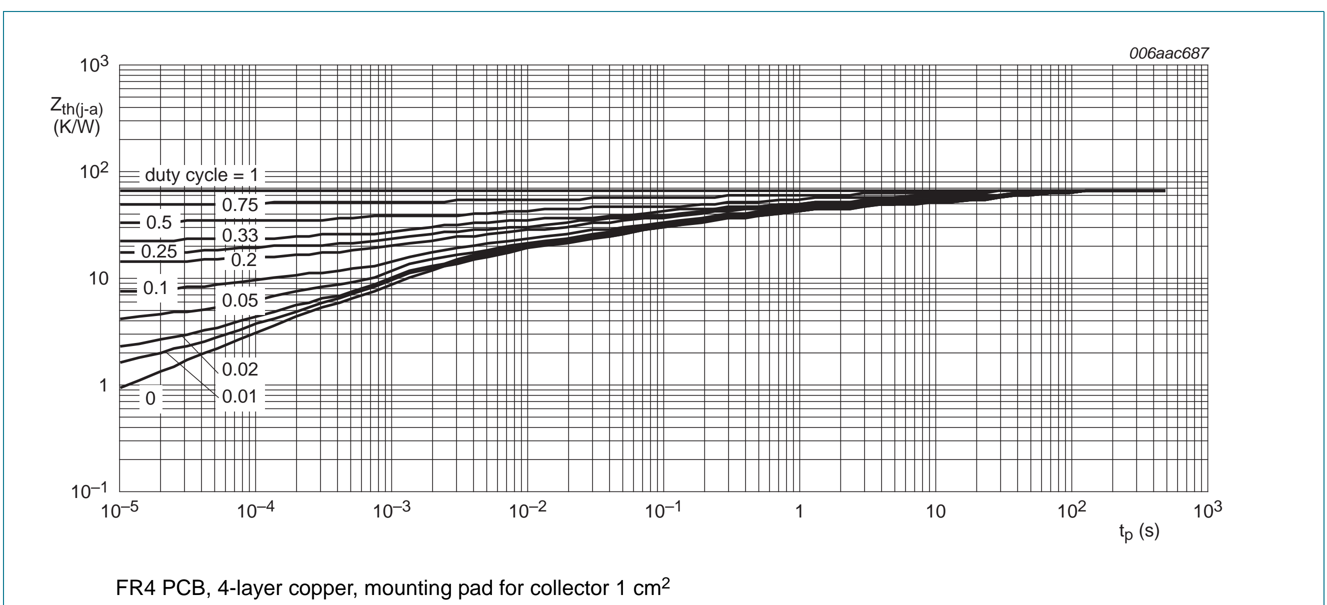

FR4 PCB, 4-layer copper, mounting pad for collector 1 cm^2

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

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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; $\delta = 0.02$.

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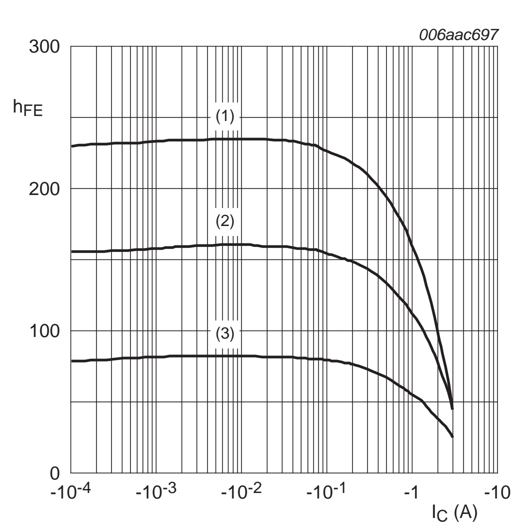


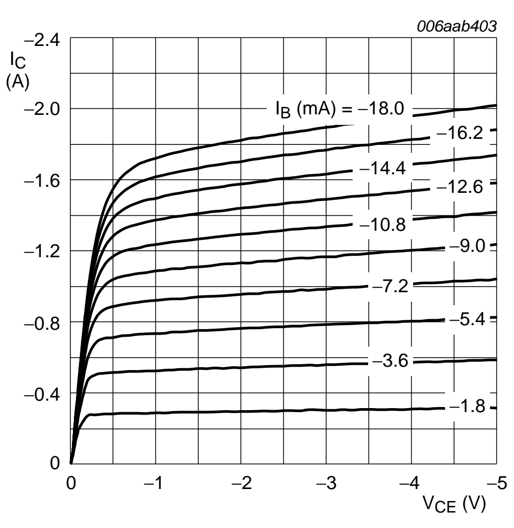
V_{CE} = −1 V

(1) T_{amb} = 100 °C

(2) T_{amb} = 25 °C

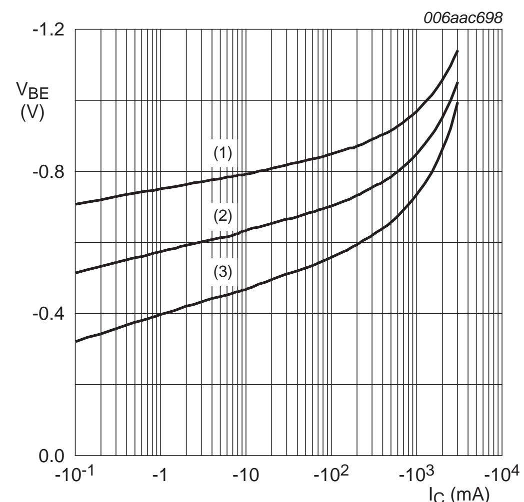
(3) T_{amb} = −55 °C

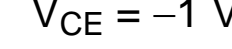
Fig 15. h_{FE} **selection -16: DC current gain as a function of collector current; typical values**



T_{amb} = 25 °C

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





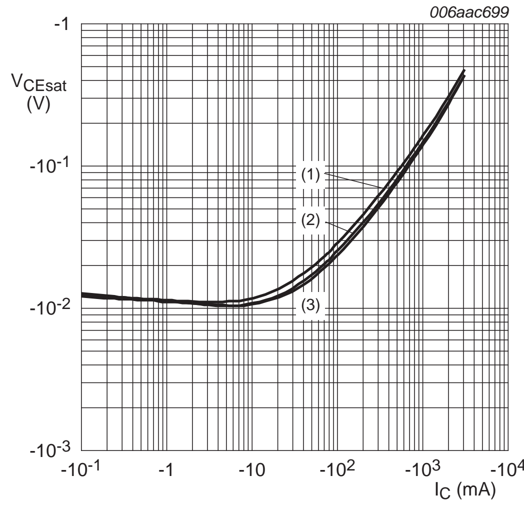
V_{CE} = −1 V

(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**

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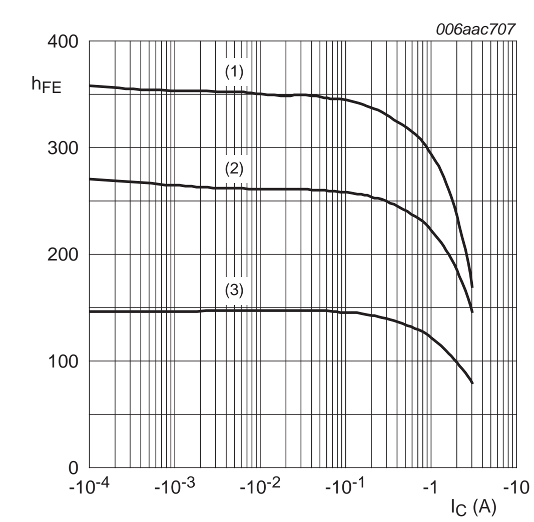


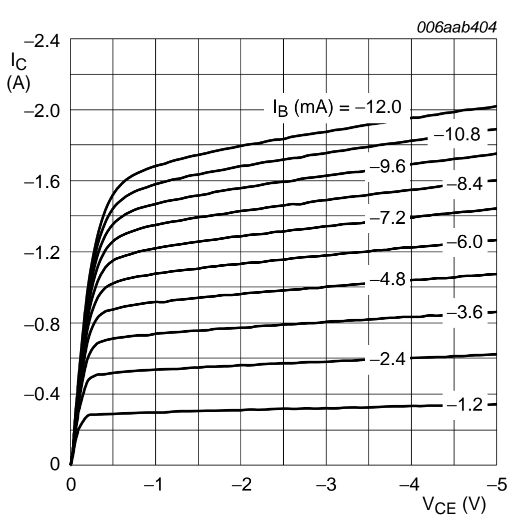
V_{CE} = −1 V

(1) T_{amb} = 100 °C

(2) T_{amb} = 25 °C

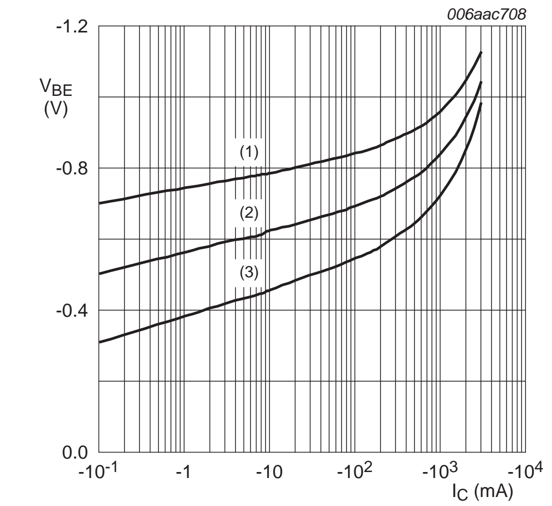
(3) T_{amb} = −55 °C

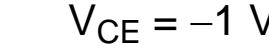
Fig 19. h_{FE} selection -25: DC current gain as a function of collector current; typical values



T_{amb} = 25 °C

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





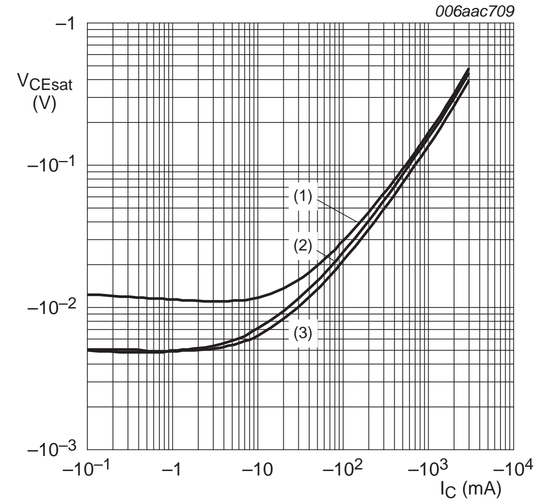
V_{CE} = −1 V

(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

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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

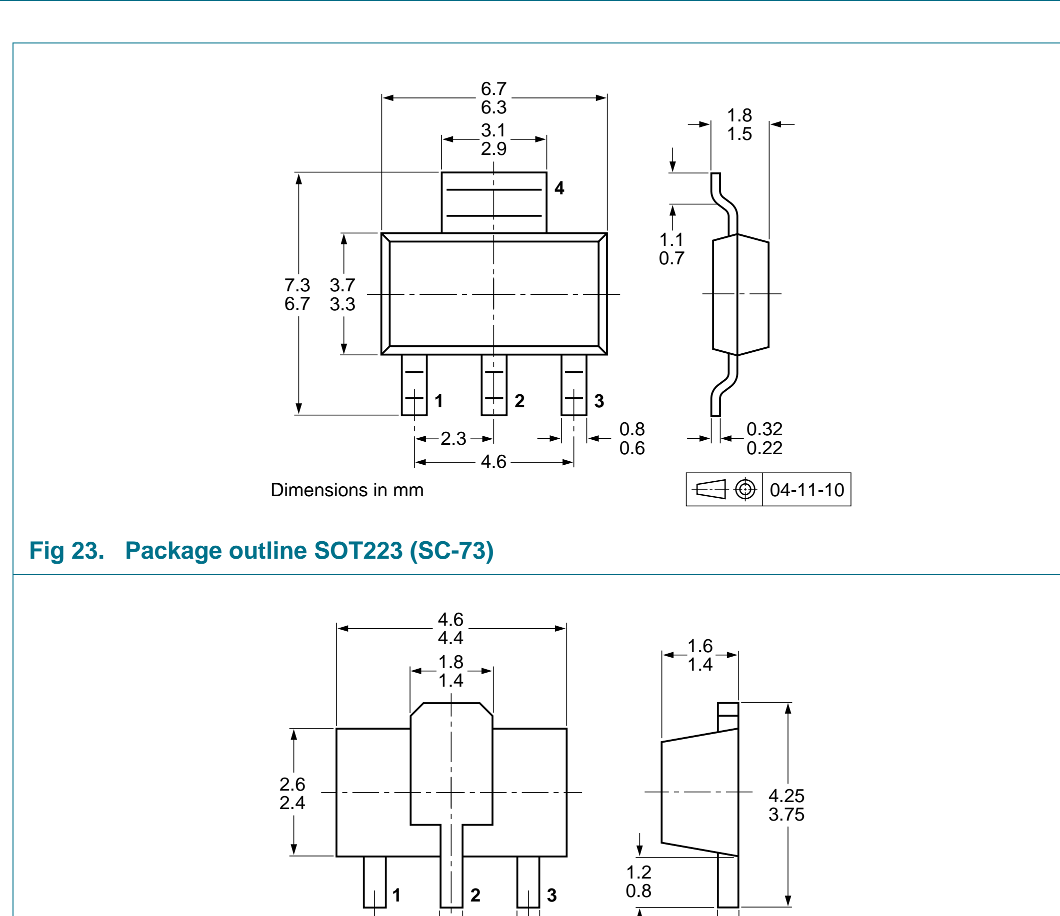

Fig 23. Package outline SOT223 (SC-73)

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

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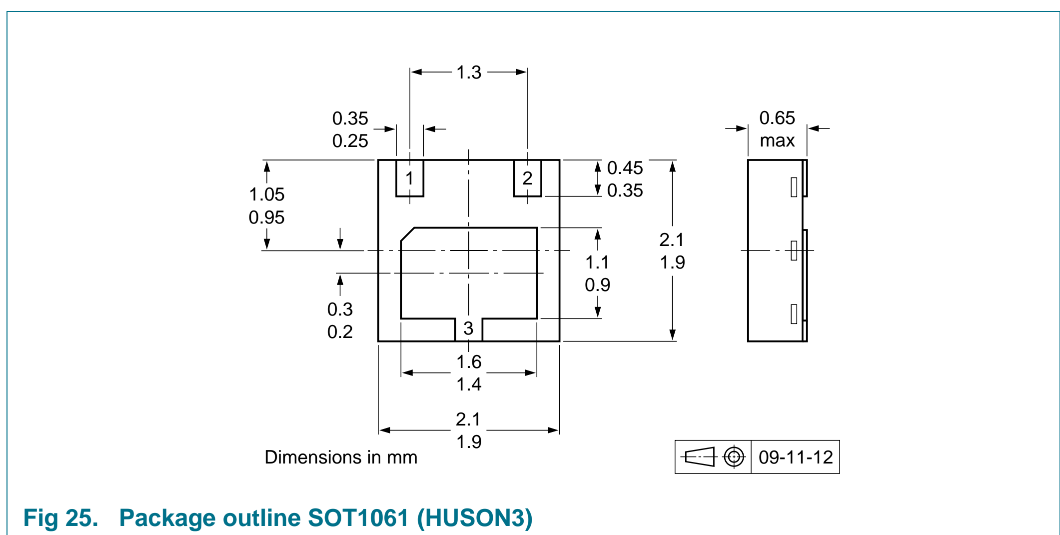

Fig 25. Package outline SOT1061 (HUSON3)

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

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11. Soldering

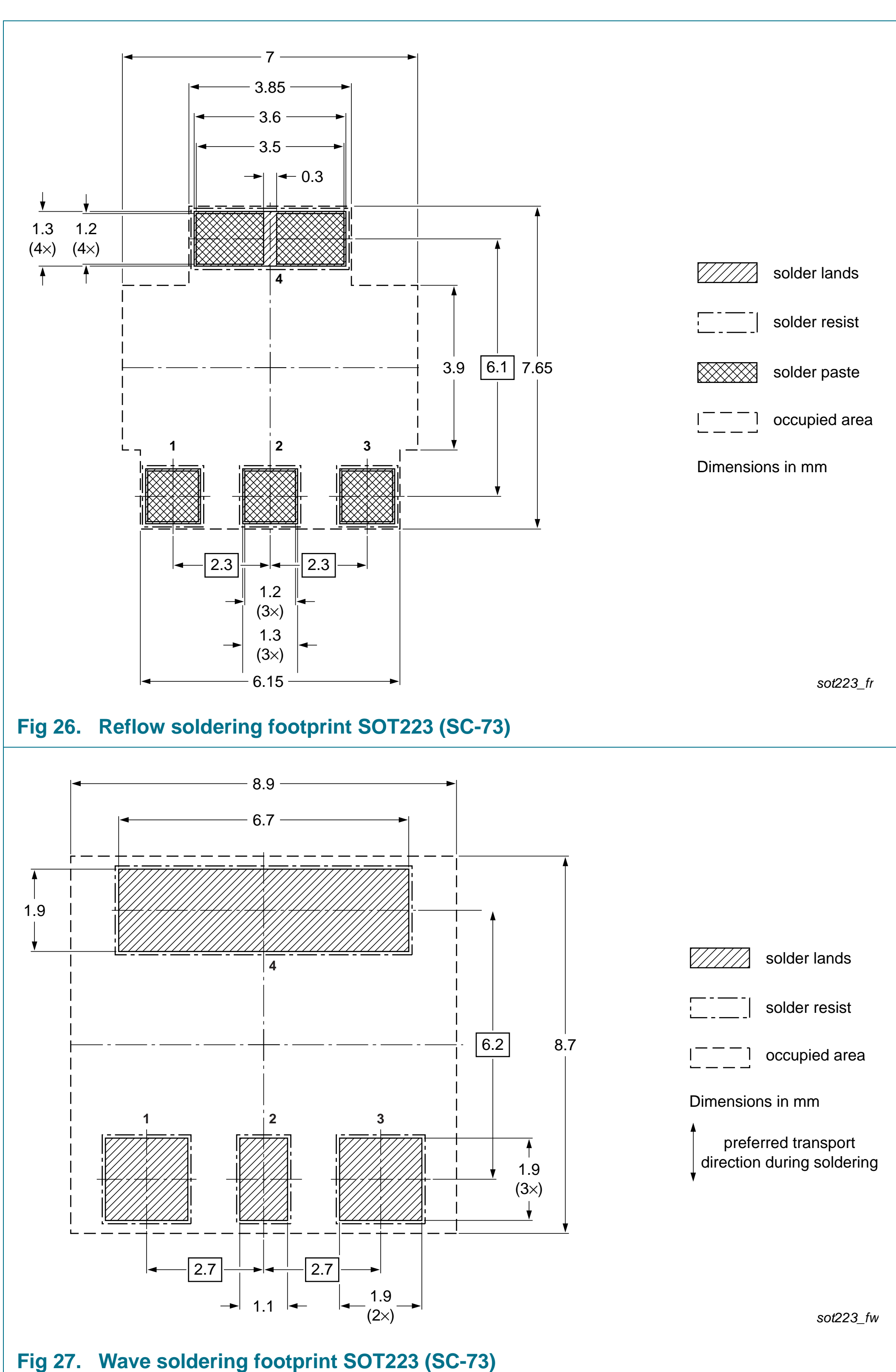

Fig 26. Reflow soldering footprint SOT223 (SC-73)

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

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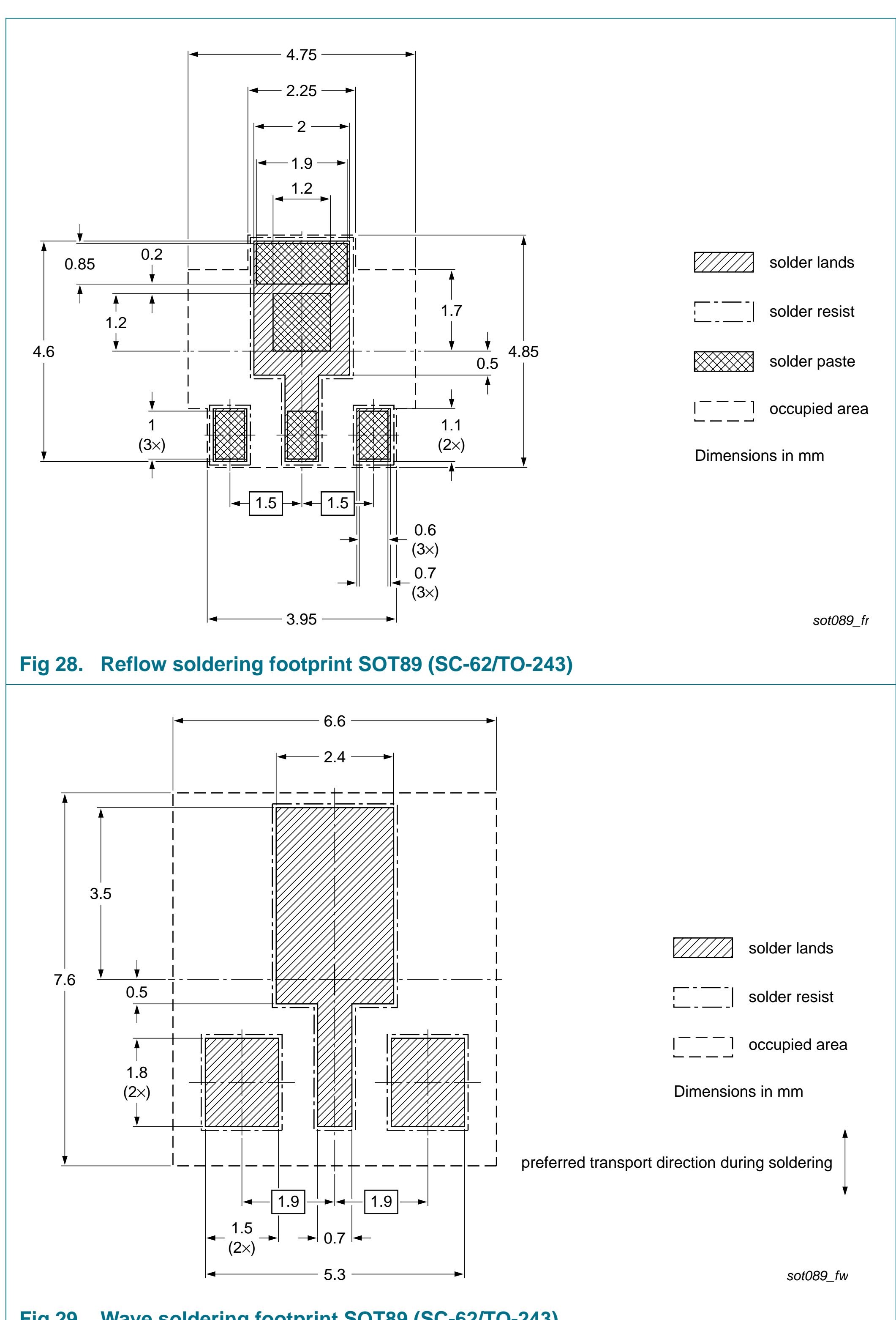

Fig 28. Reflow soldering footprint SOT89 (SC-62/TO-243)

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

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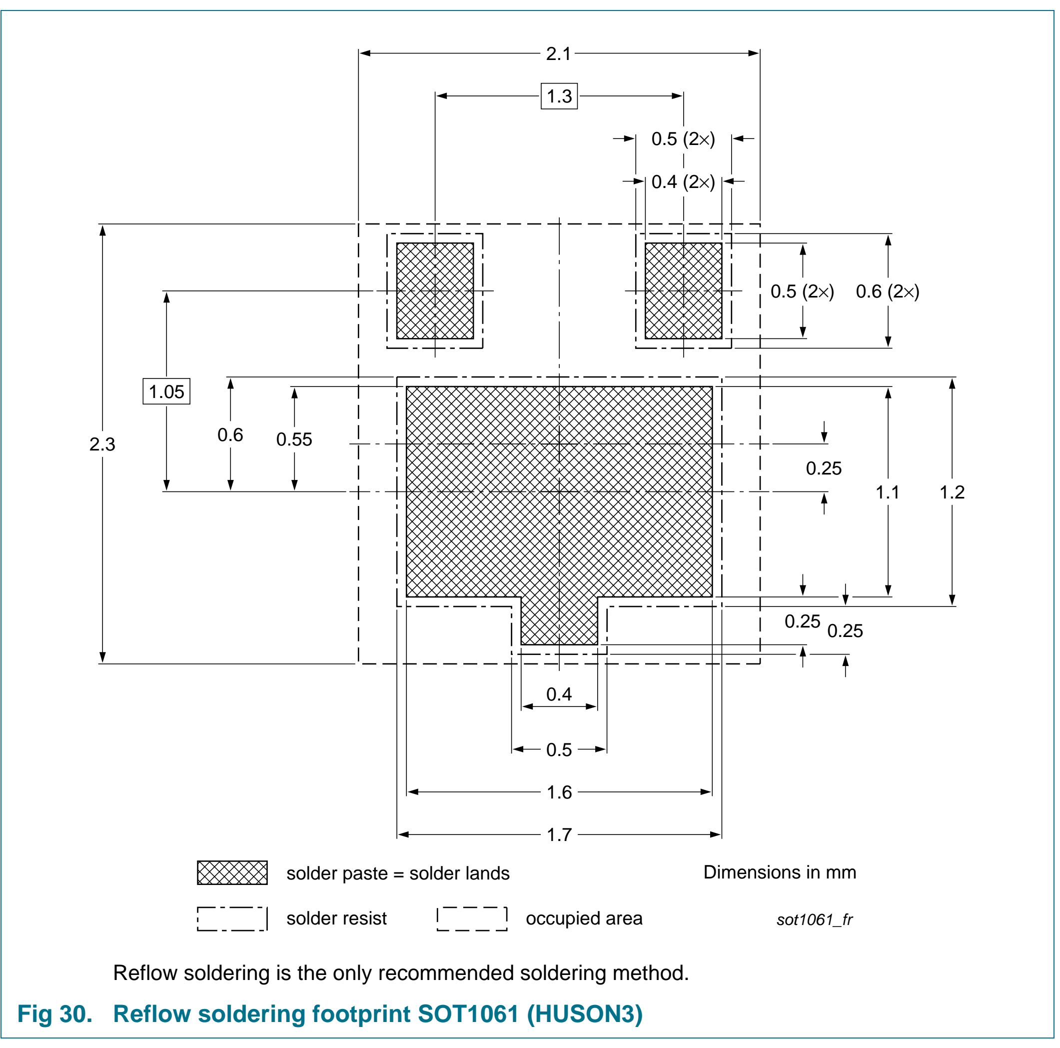

Reflow soldering is the only recommended soldering method.

Fig 30. Reflow soldering footprint SOT1061 (HUSON3)

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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
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BCP69_CNV_2	19970312	Product specification	-	-

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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.
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15. Contents

1 Product profile . . . 1
1.1 General description . . . 1
1.2 Features and benefits . . . 1
1.3 Applications . . . 1
1.4 Quick reference data . . . 1
2 Pinning information . . . 2
3 Ordering information . . . 3
4 Marking . . . 3
5 Limiting values . . . 4
6 Thermal characteristics . . . 6
7 Characteristics . . . 13
8 Test information . . . 16
8.1 Quality information . . . 16
9 Package outline . . . 16
10 Packing information . . . 17
11 Soldering . . . 18
12 Revision history . . . 21
13 Legal information . . . 22
13.1 Data sheet status . . . 22
13.2 Definitions . . . 22
13.3 Disclaimers . . . 22
13.4 Trademarks . . . 23
14 Contact information . . . 23
15 Contents . . . 24

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