BC69PAS series

20 V, 2 A PNP medium power transistors

Rev. 1 — 19 June 2015 **Product data sheet**

1. Product profile

1.1 General description

PNP medium power transistors in an ultra thin DFN2020D-3 (SOT1061D) leadless small Surface-Mounted Device (SMD) plastic package with medium power capability and visible and solderable side pads.

NPN complement: BC68PAS series

1.2 Features and benefits

- High collector current capability I_C and I_{CM}
- Reduced Printed-Circuit Board (PCB) area requirements
- Exposed heat sink for excellent thermal and electrical conductivity
- AEC-Q101 qualified
- Three current gain selections
- Leadless very small SMD plastic package with medium power capability
- Suitable for Automatic Optical Inspection (AOI) of solder joint

1.3 Applications

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

1.4 Quick reference data

Table 1. Quick reference data

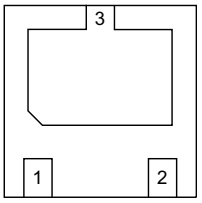
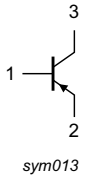
T_{amb} = 25 °C unless otherwise specified

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	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: $t_p \leq 300$ ms; $\delta \leq 0.02$.

2. Pinning information

Table 2. Pinning

Pin	Description	Simplified outline	Graphic symbol
1	base	 Transparent top view	 *sym013*
2	emitter		
3	collector		

3. Ordering information

Table 3. Ordering information

Type number	Package		
	Name	Description	Version
BC69PAS	DFN2020D-3	plastic thermal enhanced ultra thin small outline package; no leads; 3 terminals; body $2 \times 2 \times 0.65$ mm.	SOT1061D
BC69-16PAS			
BC69-25PAS			

4. Marking

Table 4. Marking codes

Type number	Marking code
BC69PAS	C1
BC69-16PAS	C2
BC69-25PAS	C3

5. 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	-	–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

Table 5. Limiting values *...continued*

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

Symbol	Parameter	Conditions		Min	Max	Unit
P_{tot}	total power dissipation	$T_{amb} \leq 25$ °C	[1]	-	420	mW
			[2]	-	830	mW
			[3]	-	1.1	W
			[4]	-	810	mW
			[5]	-	1.65	W
T_j	junction temperature			-	150	°C
T_{amb}	ambient temperature			–55	150	°C
T_{stg}	storage temperature			–65	150	°C

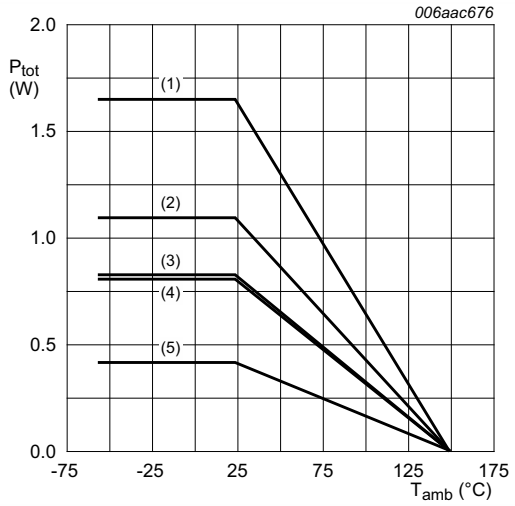
[1] Device mounted on an FR4 Printed-Circuit Board (PCB), single-sided copper, tin-plated and standard footprint.

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

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



(1) FR4 PCB, 4-layer copper, 1 cm^2

(2) FR4 PCB, single-sided copper, 6 cm^2

(3) FR4 PCB, single-sided copper, 1 cm^2

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

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

Fig 1. Power derating curves

6. Thermal characteristics

Table 6. Thermal characteristics

Symbol	Parameter	Conditions		Max	Unit
$R_{th(j-a)}$	thermal resistance from junction to ambient	in free air	[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	in free air		20	K/W

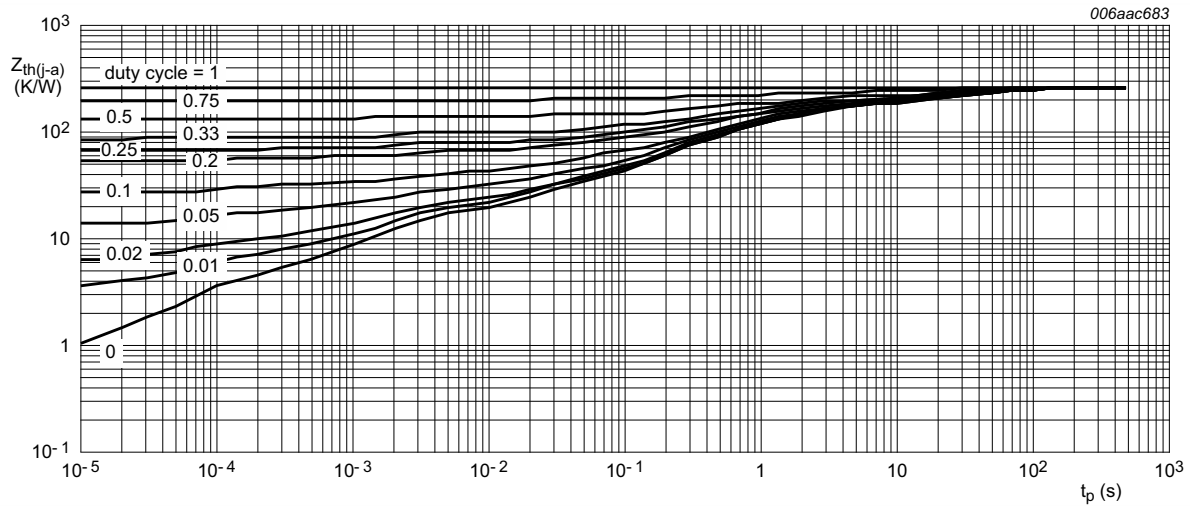
[1] Device mounted on an FR4 Printed-Circuit Board (PCB), single-sided copper, tin-plated and standard footprint.

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

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

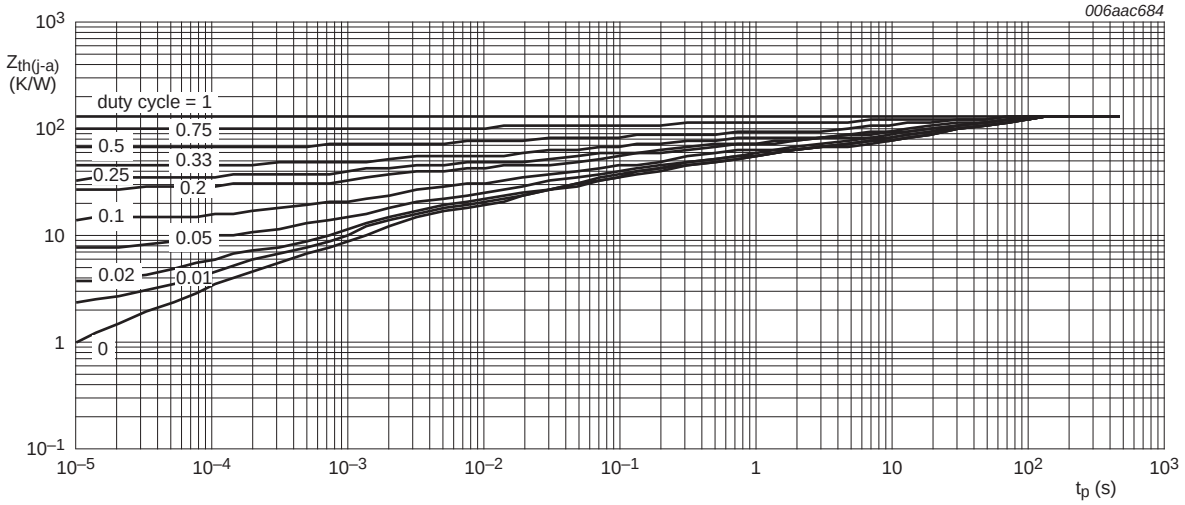
[4] Device mounted on an FR4 PCB, 4-layer copper, tin-plated and standard footprint.

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



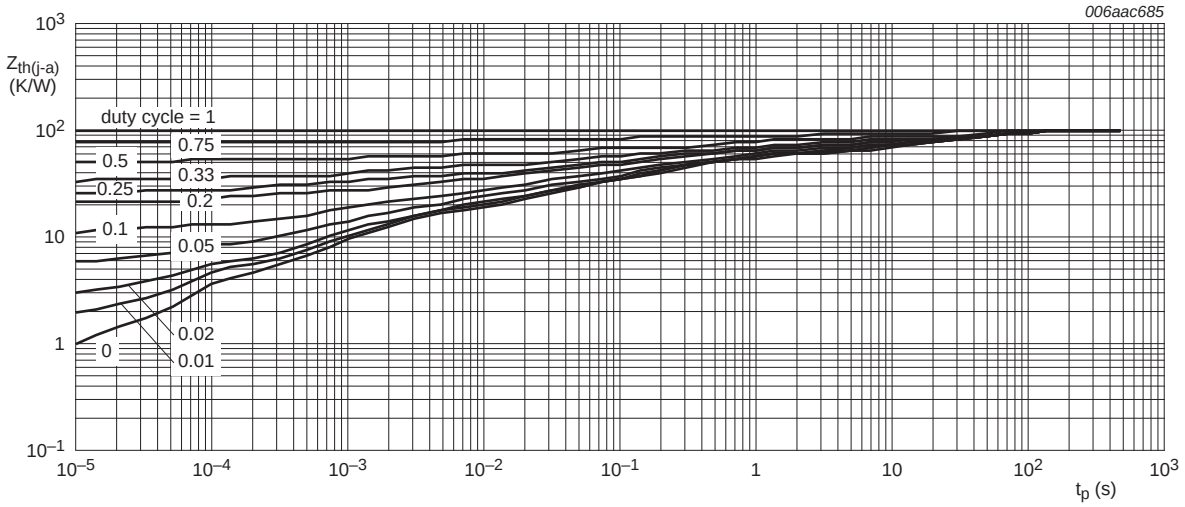
FR4 PCB, single-sided copper, tin-plated and standard footprint

Fig 2. Transient thermal impedance from junction to ambient as a function of pulse duration for; typical values



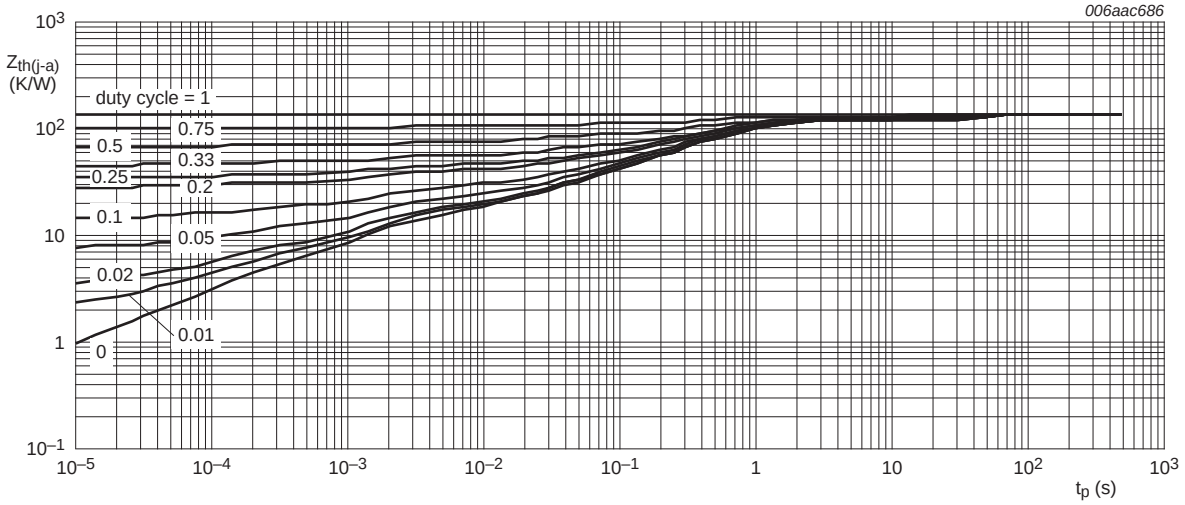
FR4 PCB, single-sided copper, tin-plated and mounting pad for collector 1 cm^2

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



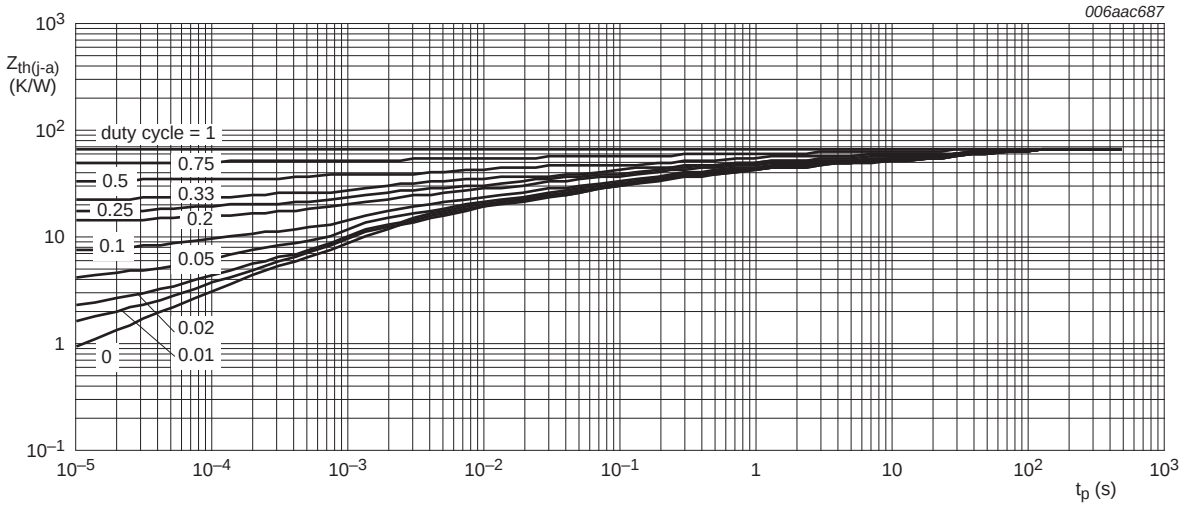
FR4 PCB, single-sided copper, tin-plated and mounting pad for collector 6 cm^2

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



FR4 PCB, 4-layer copper, tin-plated and standard footprint

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



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

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

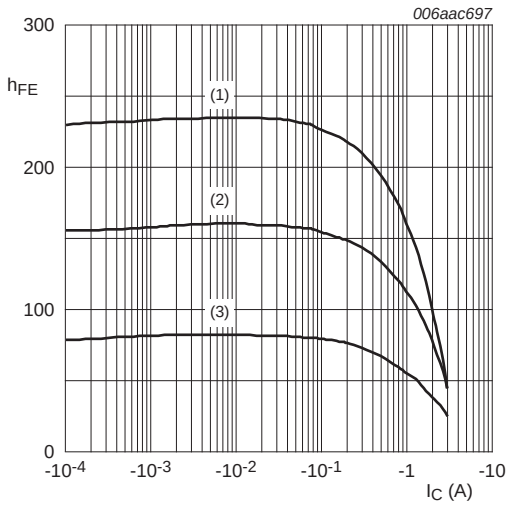
7. Characteristics

Table 7. 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	-	-	
		V_{CE} = –1 V; I_C = –500 mA [1]	85	-	375	
		V_{CE} = –1 V; I_C = –1 A [1]	60	-	-	
		V_{CE} = –1 V; I_C = –2 A [1]	40	-	-	
	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	
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	I_C = –5 mA; V_{CE} = –10 V [1]	-	-	–0.7	V
		I_C = –1 A; V_{CE} = –1 V [1]	-	-	–1	V
f_T	transition frequency	V_{CE} = –5 V; I_C = –50 mA; f = 100 MHz	40	140	-	MHz
C_c	collector capacitance	V_{CB} = –10 V; I_E = i_e = 0 A; f = 1 MHz	-	28	-	pF

[1] Pulse test: $t_p \leq 300$ ms; $\delta \leq 0.02$



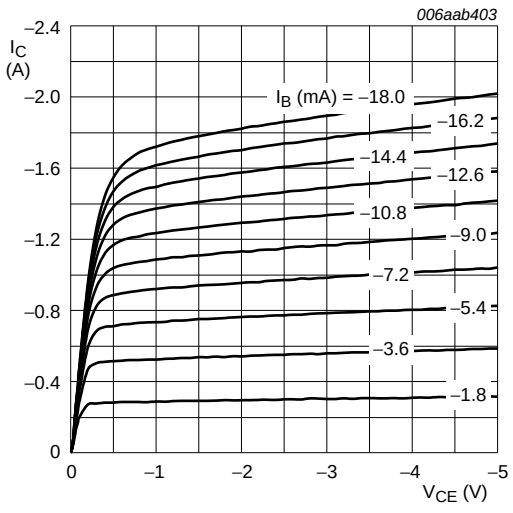
V_{CE} = –1 V

(1) T_{amb} = 100 °C

(2) T_{amb} = 25 °C

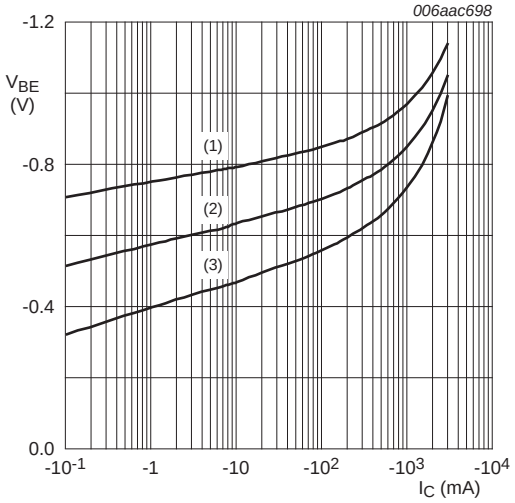
(3) T_{amb} = –55 °C

Fig 7. h_{FE} selection -16: DC current gain as a function of collector current; typical values



T_{amb} = 25 °C

Fig 8. h_{FE} selection -16: Collector current as a function of collector-emitter voltage; typical values



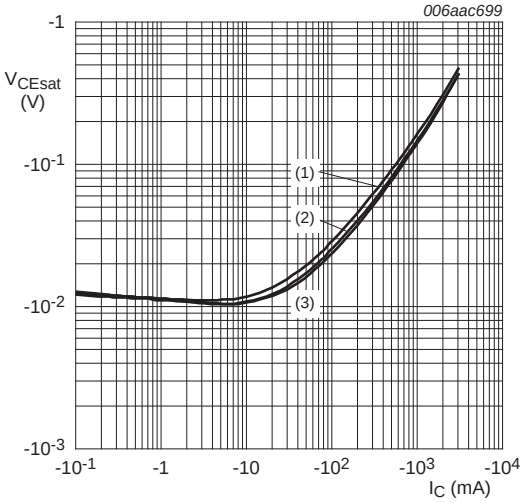
V_{CE} = –1 V

(1) T_{amb} = –55 °C

(2) T_{amb} = 25 °C

(3) T_{amb} = 100 °C

Fig 9. h_{FE} selection -16: Base-emitter voltage as a function of collector current; typical values



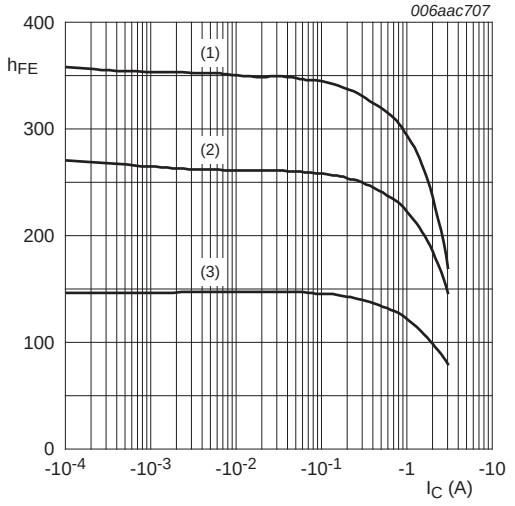
I_C/I_B = 10

(1) T_{amb} = 100 °C

(2) T_{amb} = 25 °C

(3) T_{amb} = –55 °C

Fig 10. h_{FE} selection -16: Collector-emitter saturation voltage as a function of collector current; typical values



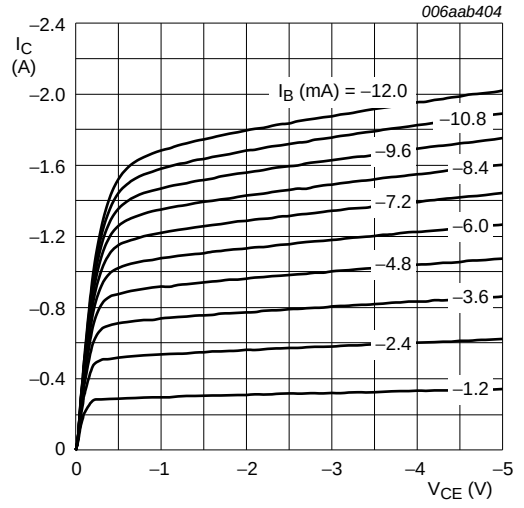
V_{CE} = –1 V

(1) T_{amb} = 100 °C

(2) T_{amb} = 25 °C

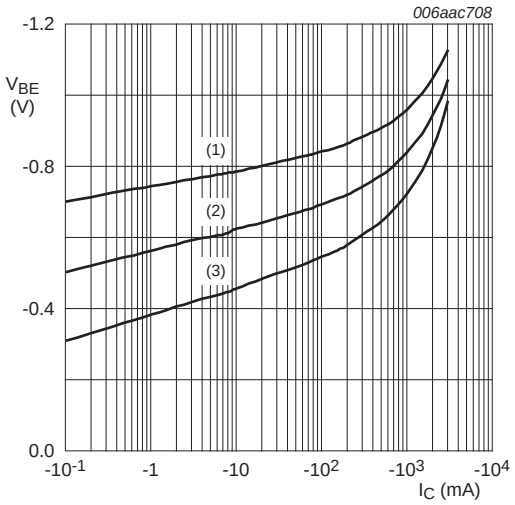
(3) T_{amb} = –55 °C

Fig 11. h_{FE} selection -25: DC current gain as a function of collector current; typical values



T_{amb} = 25 °C

Fig 12. h_{FE} selection -25: Collector current as a function of collector-emitter voltage; typical values



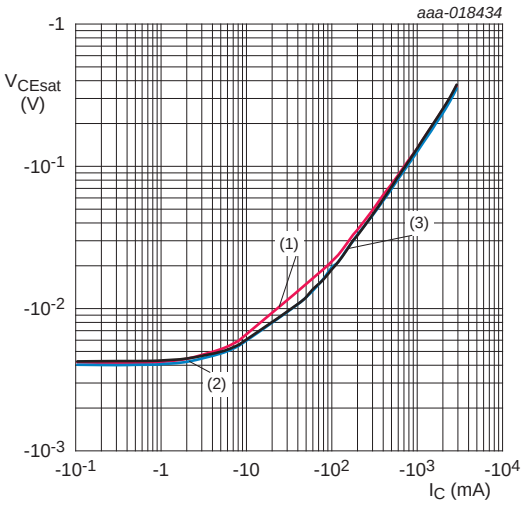
V_{CE} = −1 V

(1) T_{amb} = −55 °C

(2) T_{amb} = 25 °C

(3) T_{amb} = 100 °C

Fig 13. 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 14. 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

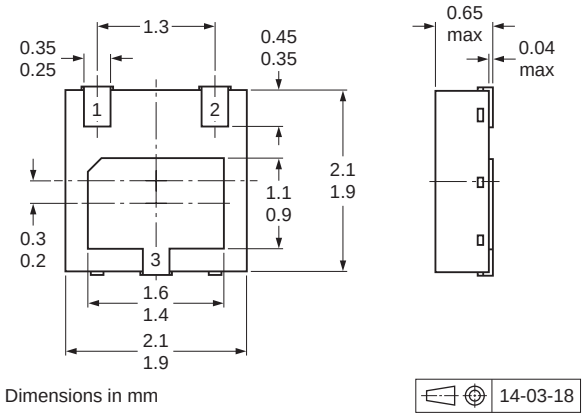


Fig 15. Package outline DFN2020D-3 (SOT1061D)

10. Soldering

Footprint information for reflow soldering of DFN2020D-3 package **SOT1061D**

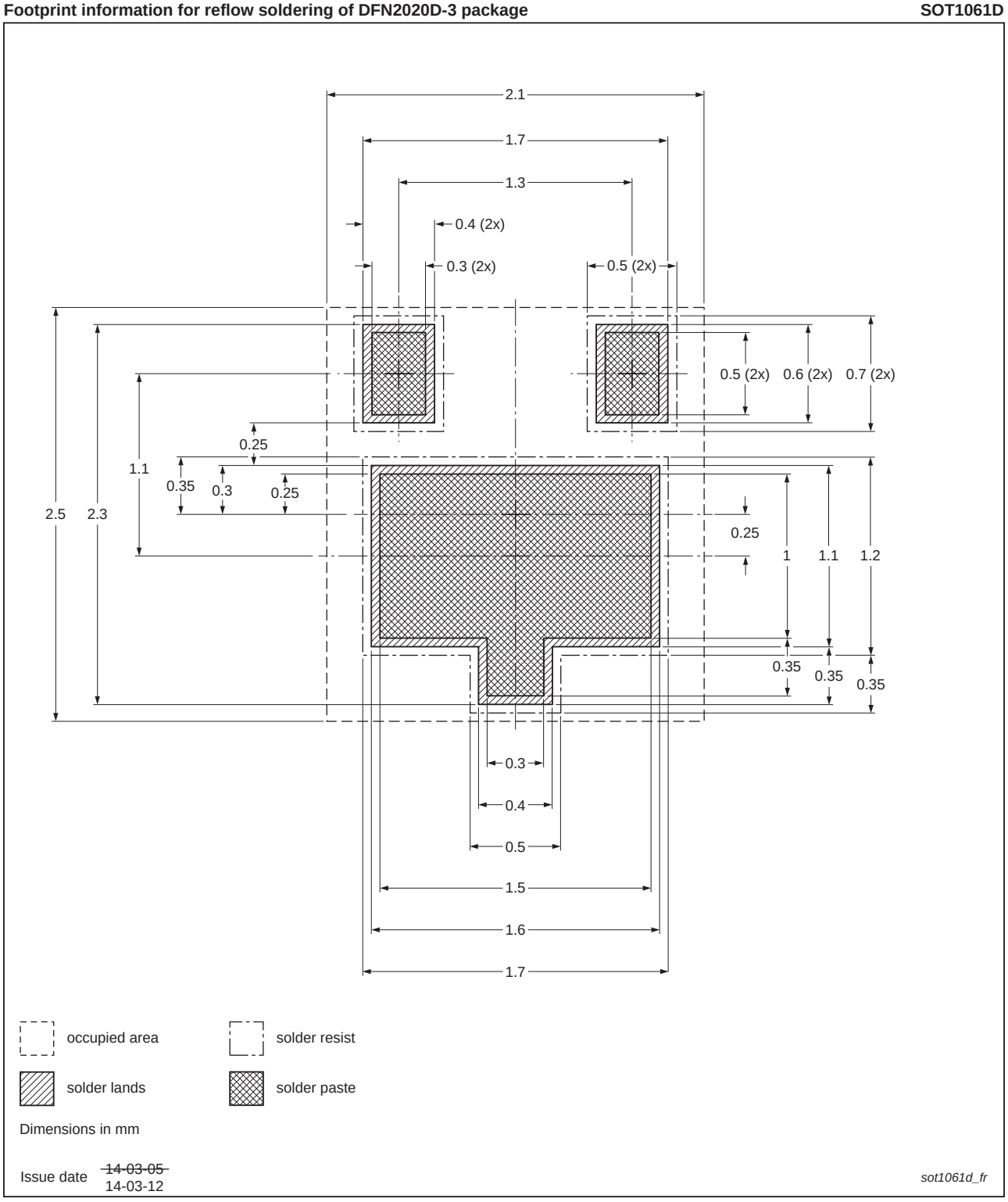


Fig 16. Reflow soldering footprint DFN2020D-3 (SOT1061D)

11. Revision history

Table 8. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
BC69PAS_SER v.1	20150619	Product data sheet	-	-

12. Legal information

12.1 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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13. Contents

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