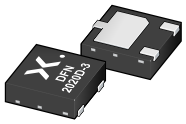

BC69PAS series

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; $\delta \leq 0.02$.

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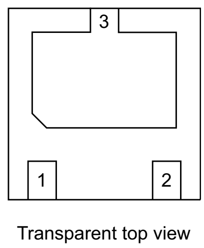
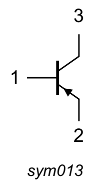
2. Pinning information

Table 2. Pinning

Pin	Description	Simplified outline	Graphic symbol
1	base		
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 × 2 × 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

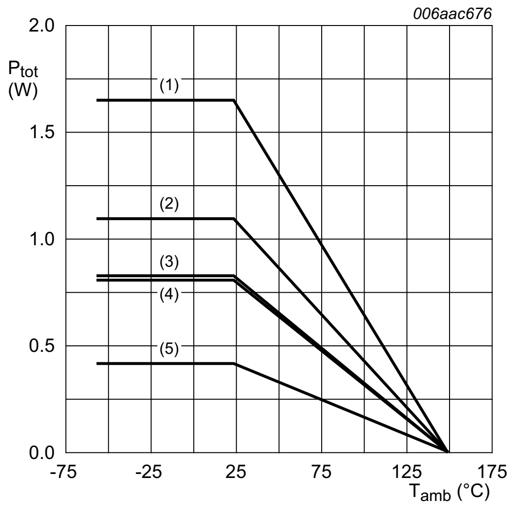
[1] Device mounted on an FR4 Printed-Circuit Board (PCB), single-sided copper, tin-plated and standard footprint.

[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

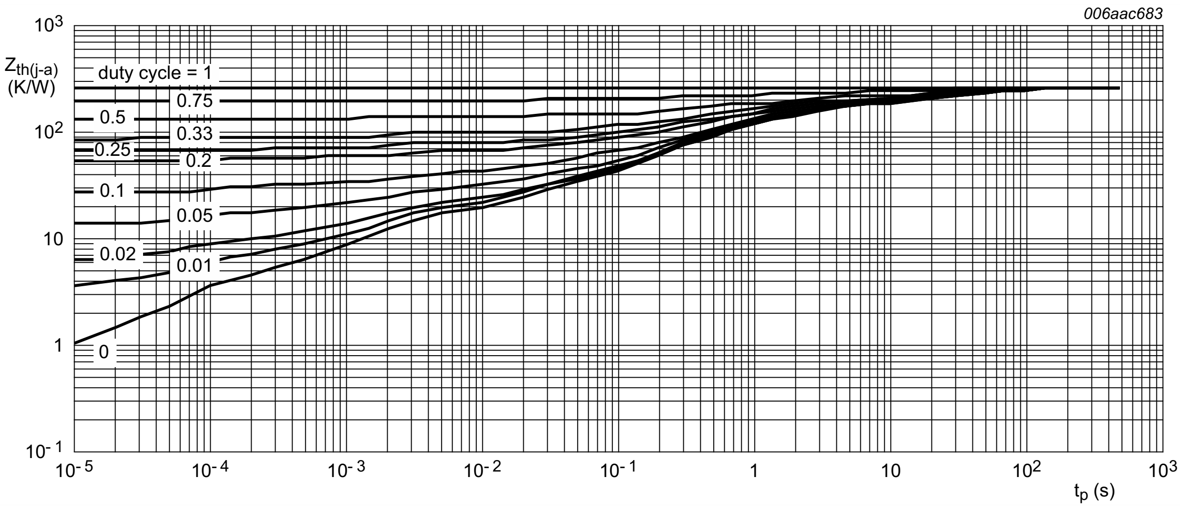
[1] Device mounted on an FR4 Printed-Circuit Board (PCB), single-sided copper, tin-plated and standard footprint.

[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.

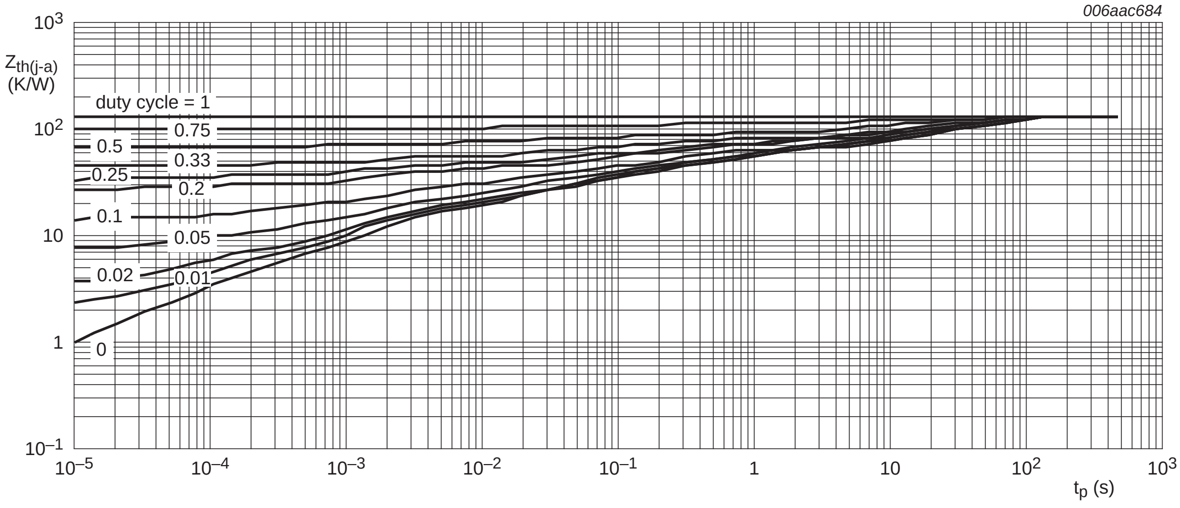
[4] Device mounted on an FR4 PCB, 4-layer copper, tin-plated and standard footprint.

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



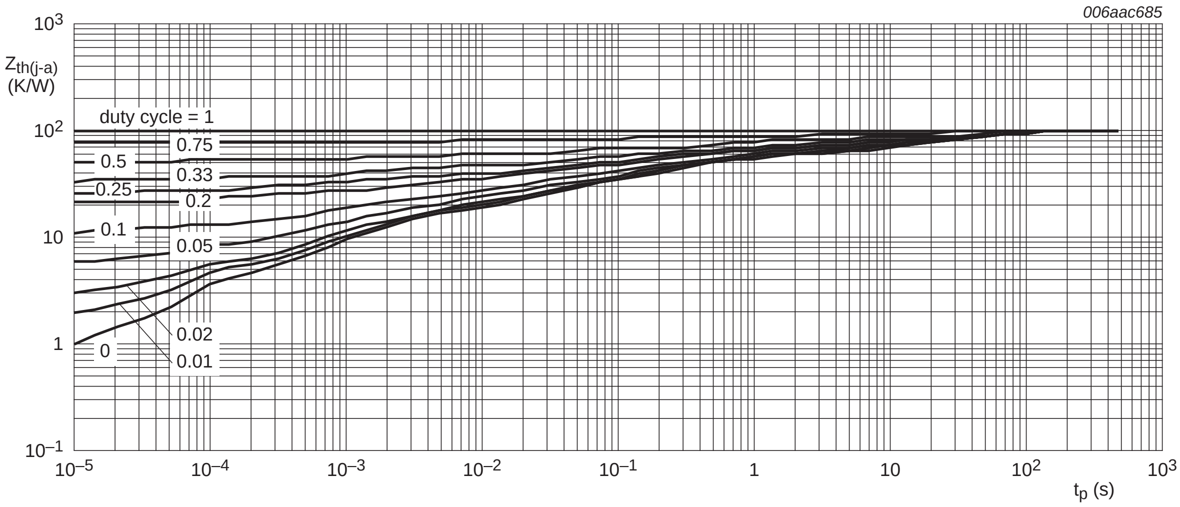
FR4 PCB, single-sided copper, tin-plated and standard footprint

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



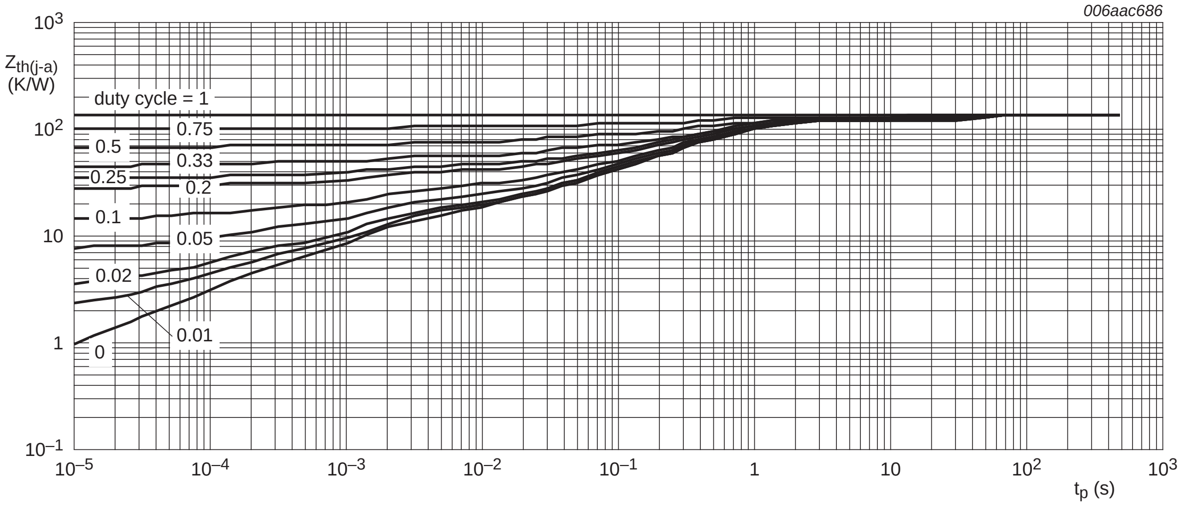
FR4 PCB, single-sided copper, tin-plated and mounting pad for collector 1 cm²

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



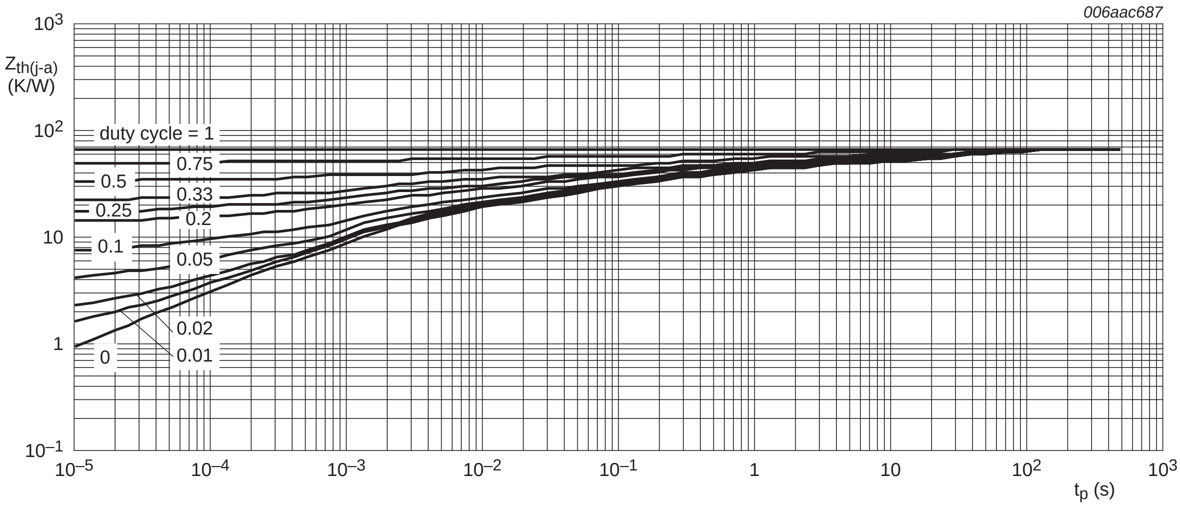
FR4 PCB, single-sided copper, tin-plated and mounting pad for collector 6 cm²

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

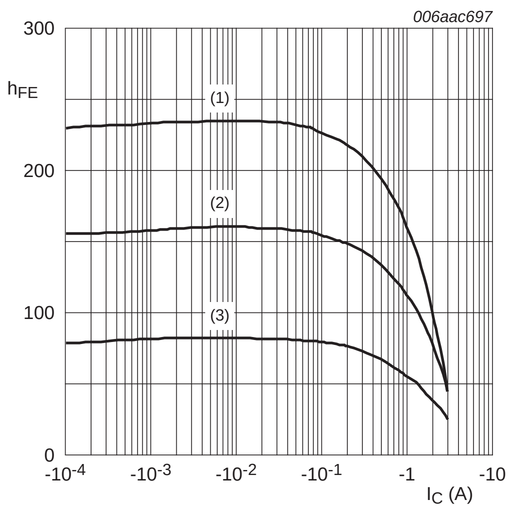
7. Characteristics

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



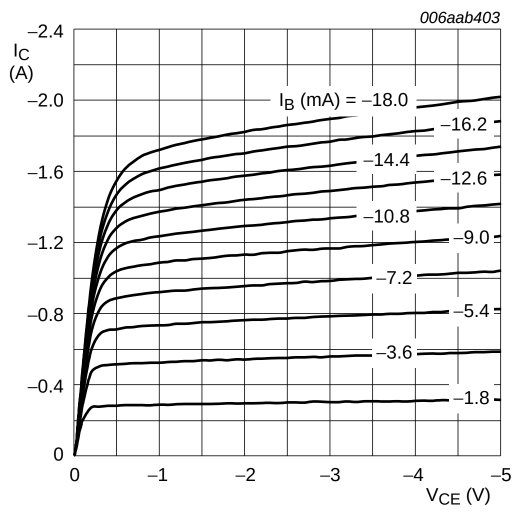
V_{CE} = –1 V

(1) T_{amb} = 100 °C

(2) T_{amb} = 25 °C

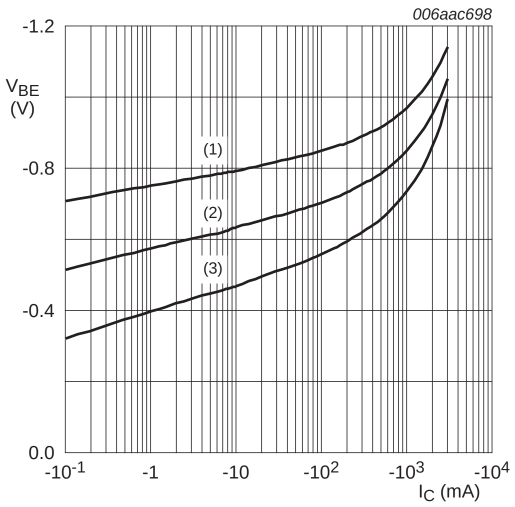
(3) T_{amb} = –55 °C

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



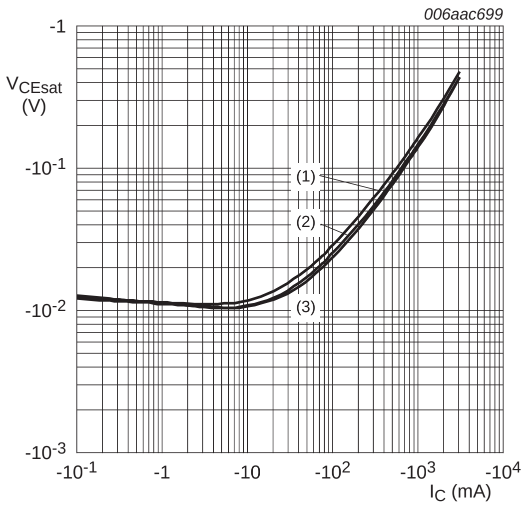
$V_{CE} = -1$ V

(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



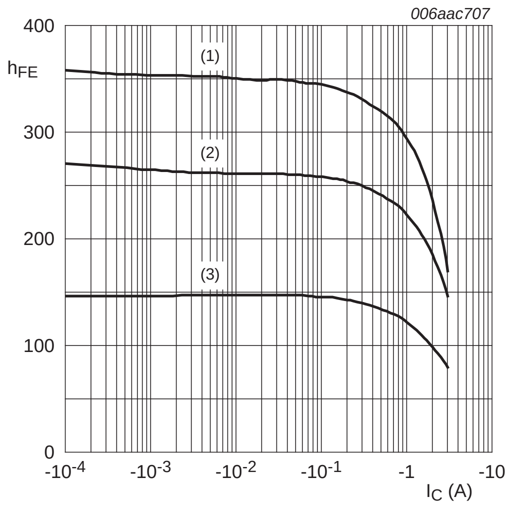
$I_C/I_B = 10$

(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



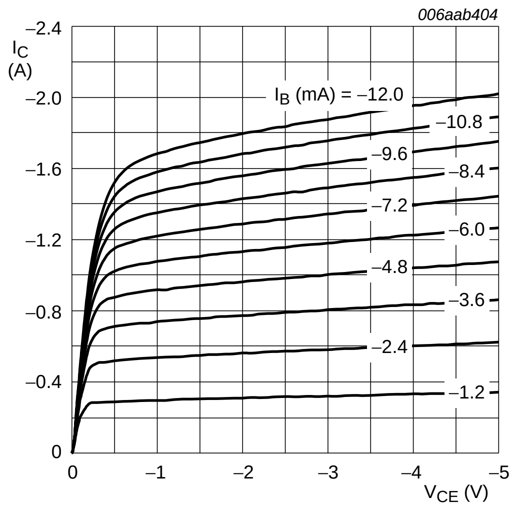
$V_{CE} = -1$ V

(1) $T_{amb} = 100$ °C

(2) $T_{amb} = 25$ °C

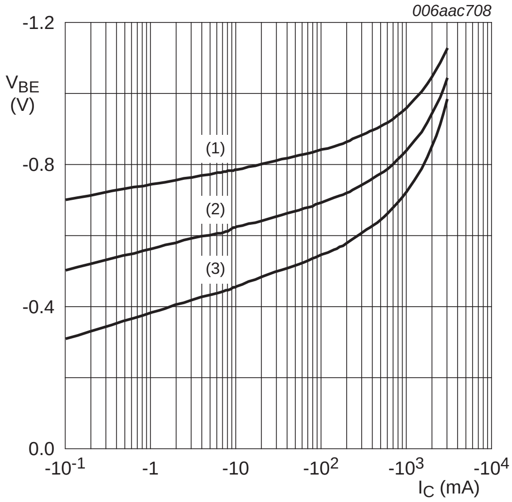
(3) $T_{amb} = -55$ °C

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



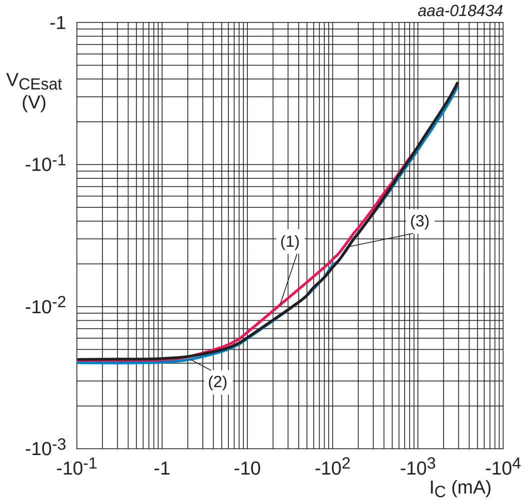
$V_{CE} = -1$ V

(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

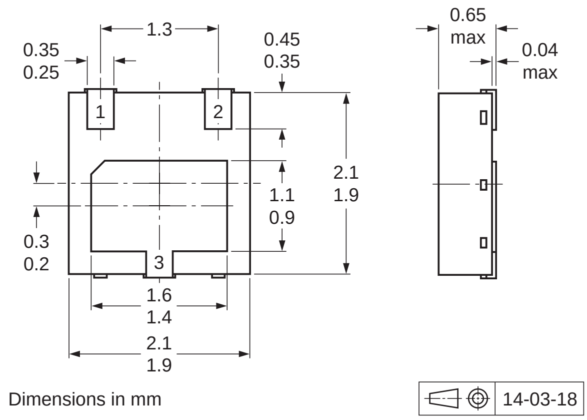


Fig 15. Package outline DFN2020D-3 (SOT1061D)

10. Soldering

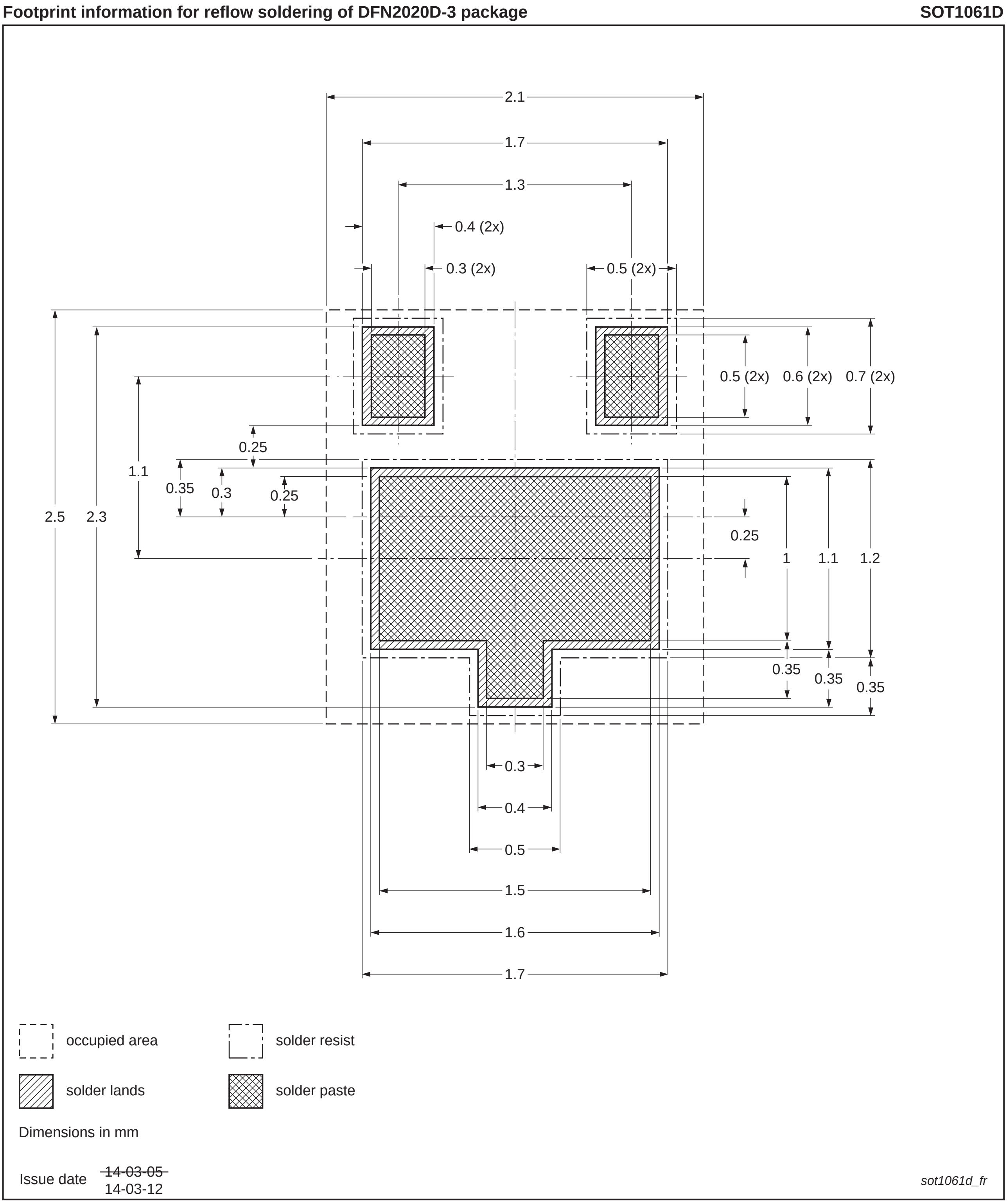


Fig 16. Reflow soldering footprint DFN2020D-3 (SOT1061D)

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”.

[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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