BC54PAS; BC55PAS; BC56PAS

45V/60V/80V, 1A NPN medium power transistors

Rev. 1 — 11 November 2014 Product data sheet

1. Product profile

1.1 General description

NPN medium power transistor series encapsulated 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.

Table 1. Product overview

Type number[1]	Package		PNP complement
BC54PAS	DFN2020D-3	SOT1061D	BC51PAS
BC55PAS			BC52PAS
BC56PAS			BC53PAS

[1] Valid for all available selection groups.

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
- Low-side switches
- Power management
- 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				
	BC54PAS		-	-	45	V
	BC55PAS		-	-	60	V
	BC56PAS		-	-	80	V
I_C	collector current		-	-	1	A

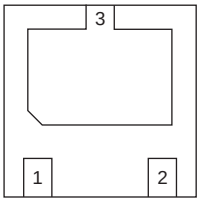
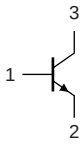
Table 2. Quick reference data *...continued*

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
I_{CM}	peak collector current	single pulse; $t_p \leq 1$ ms	-	-	2	A
h_{FE}	DC current gain	V_{CE} = 2 V; I_C = 150 mA [1]	63	-	250	
	h_{FE} selection -10	V_{CE} = 2 V; I_C = 150 mA [1]	63	-	160	
	h_{FE} selection -16	V_{CE} = 2 V; I_C = 150 mA [1]	100	-	250	

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

2. Pinning information

Table 3. Pinning

Pin	Description	Simplified outline	Graphic symbol
1	base	 Transparent top view	 *sym021*
2	emitter		
3	collector		

3. Ordering information

Table 4. Ordering information

Type number[1]	Package		
	Name	Description	Version
BC54PAS	DFN2020D-3	DFN2020D-3: plastic thermal enhanced ultra thin small outline package; no leads; 3 terminals; body 2 × 2 × 0.65 mm.	SOT1061D
BC55PAS			
BC56PAS			

[1] Valid for all available selection groups.

4. Marking

Table 5. Marking codes

Type number	Marking code
BC54PAS	CD
BC54-10PAS	CE
BC54-16-PAS	CF
BC55PAS	CG
BC55-10PAS	CH
BC55-16PAS	CJ
BC56PAS	CK
BC56-10PAS	CL
BC56-16PAS	CM

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			
	BC54PAS		-	45	V
	BC55PAS		-	60	V
	BC56PAS		-	100	V
V_{CEO}	collector-emitter voltage	open base			
	BC54PAS		-	45	V
	BC55PAS		-	60	V
	BC56PAS		-	80	V
V_{EBO}	emitter-base voltage	open collector	-	5	V
I_C	collector current		-	1	A
I_{CM}	peak collector current	single pulse; $t_p \leq 1$ ms	-	2	A
I_B	base current		-	0.3	A

Table 6. 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]	-	0.42	W
			[2]	-	0.81	W
			[3]	-	0.83	W
			[4]	-	1.10	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

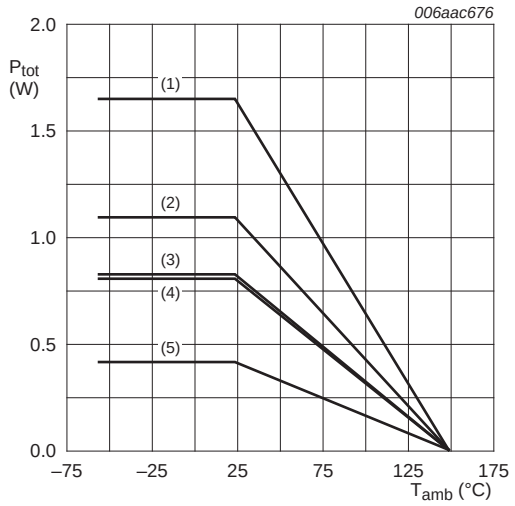
[1] Device mounted on an FR4 Printed-Circuit Board (PCB), single-sided copper, tin-plated and standard footprint.

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

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

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

[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 7. 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]	154	K/W
			[3]	151	K/W
			[4]	114	K/W
			[5]	76	K/W
$R_{th(j-sp)}$	thermal resistance from junction to solder point	in free air		20	K/W

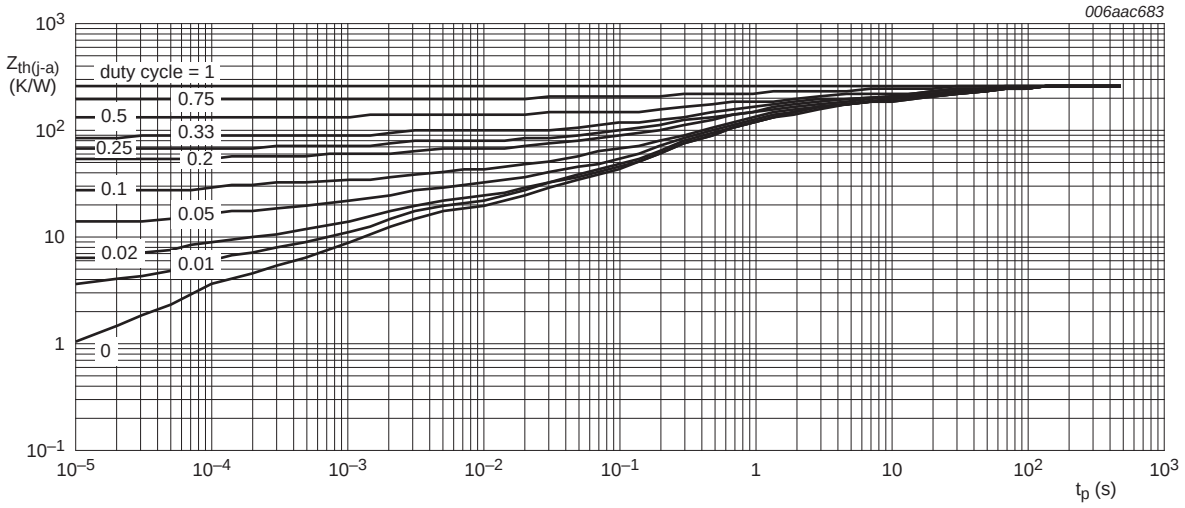
[1] Device mounted on an FR4 Printed-Circuit Board (PCB), single-sided copper, tin-plated and standard footprint.

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

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

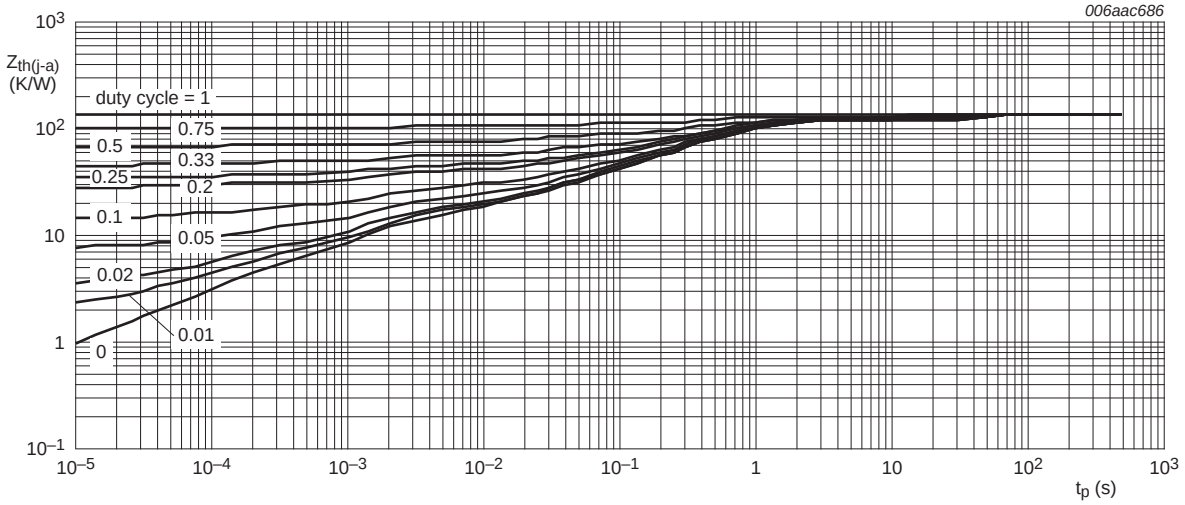
[4] Device mounted on an FR4 PCB, single-sided copper, tin-plated and mounting pad for collector 6 cm^2.

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



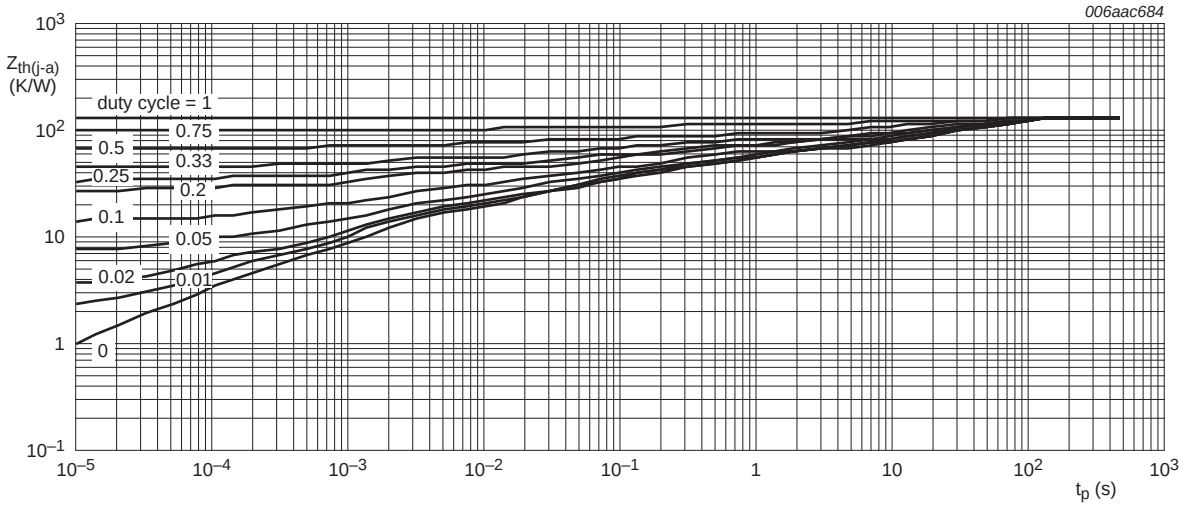
FR4 PCB, single-sided copper, tin-plated and standard footprint

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



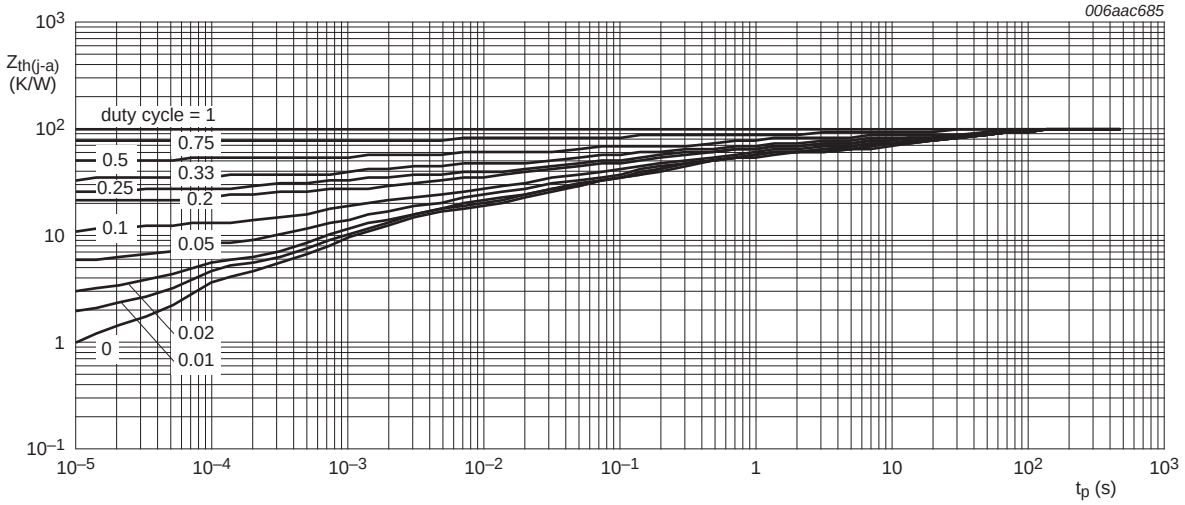
FR4 PCB, 4-layer copper, tin-plated and standard footprint

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



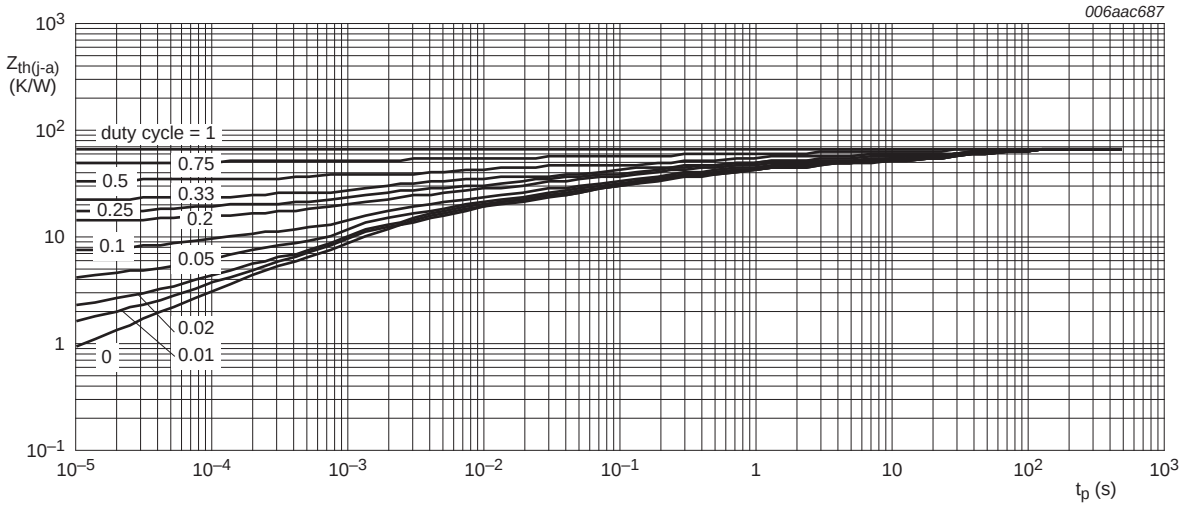
FR4 PCB, single-sided copper, tin-plated and mounting pad for collector 1 cm^2

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



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

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

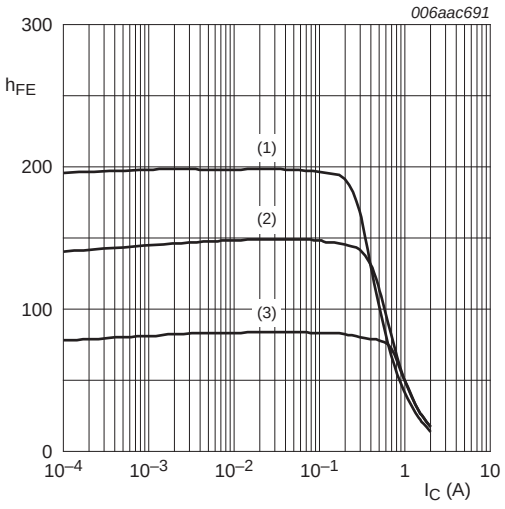
7. Characteristics

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} = 30 V; I_E = 0 A		-	-	100	nA
		V_{CB} = 30 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} = 2 V; I_C = 5 mA		63	-	-	
		V_{CE} = 2 V; I_C = 150 mA	[1]	63	-	250	
		V_{CE} = 2 V; I_C = 500 mA	[1]	40	-	-	
	h_{FE} selection -10	V_{CE} = 2 V; I_C = 150 mA	[1]	63	-	160	
	h_{FE} selection -16	V_{CE} = 2 V; I_C = 150 mA	[1]	100	-	250	
V_{CEsat}	collector-emitter saturation voltage	I_C = 500 mA; I_B = 50 mA	[1]	-	-	500	mV
V_{BE}	base-emitter voltage	V_{CE} = 2 V; I_C = 500 mA	[1]	-	-	1	V
C_c	collector capacitance	V_{CB} = 10 V; I_E = i_e = 0 A; f = 1 MHz		-	6	-	pF
f_T	transition frequency	V_{CE} = 5 V; I_C = 50 mA; f = 100 MHz		100	180	-	MHz

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



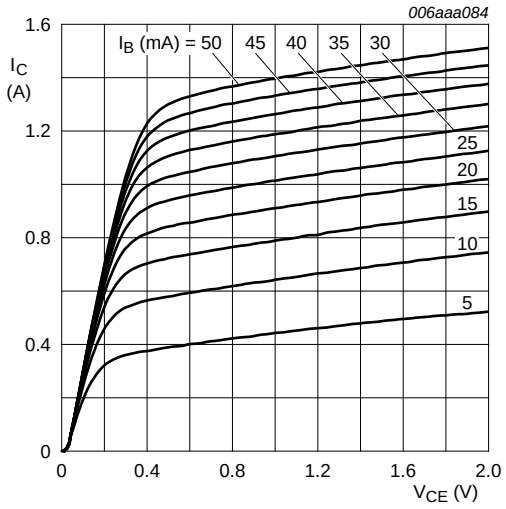
V_{CE} = 2 V

(1) T_{amb} = 100 °C

(2) T_{amb} = 25 °C

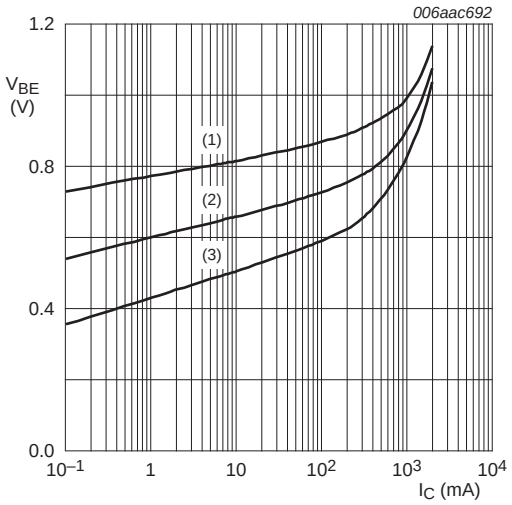
(3) T_{amb} = −55 °C

Fig 7. DC current gain as a function of collector current; typical values



T_{amb} = 25 °C

Fig 8. Collector current as a function of collector-emitter voltage; typical values



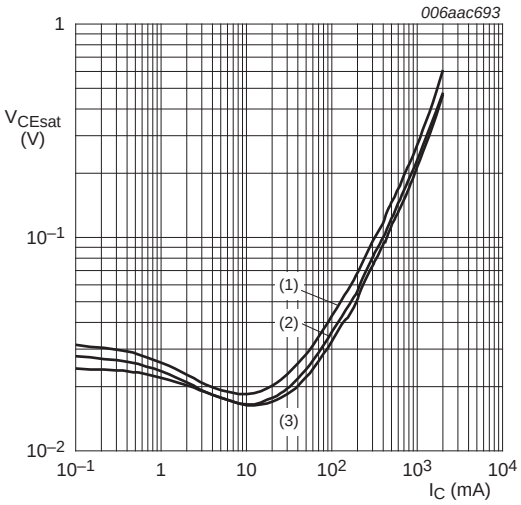
V_{CE} = 2 V

(1) T_{amb} = −55 °C

(2) T_{amb} = 25 °C

(3) T_{amb} = 100 °C

Fig 9. 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. 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

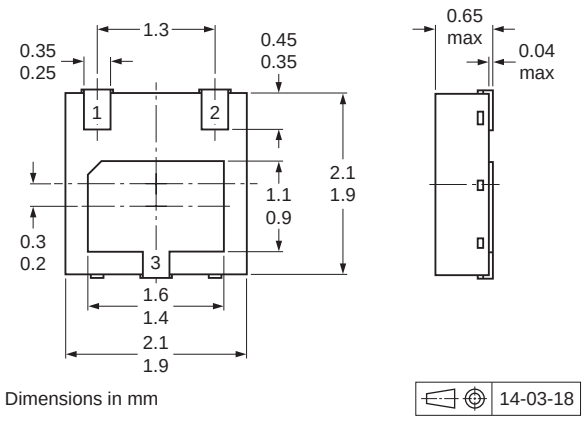


Fig 11. Package outline DFN2020D-3 (SOT1061D)

10. Soldering

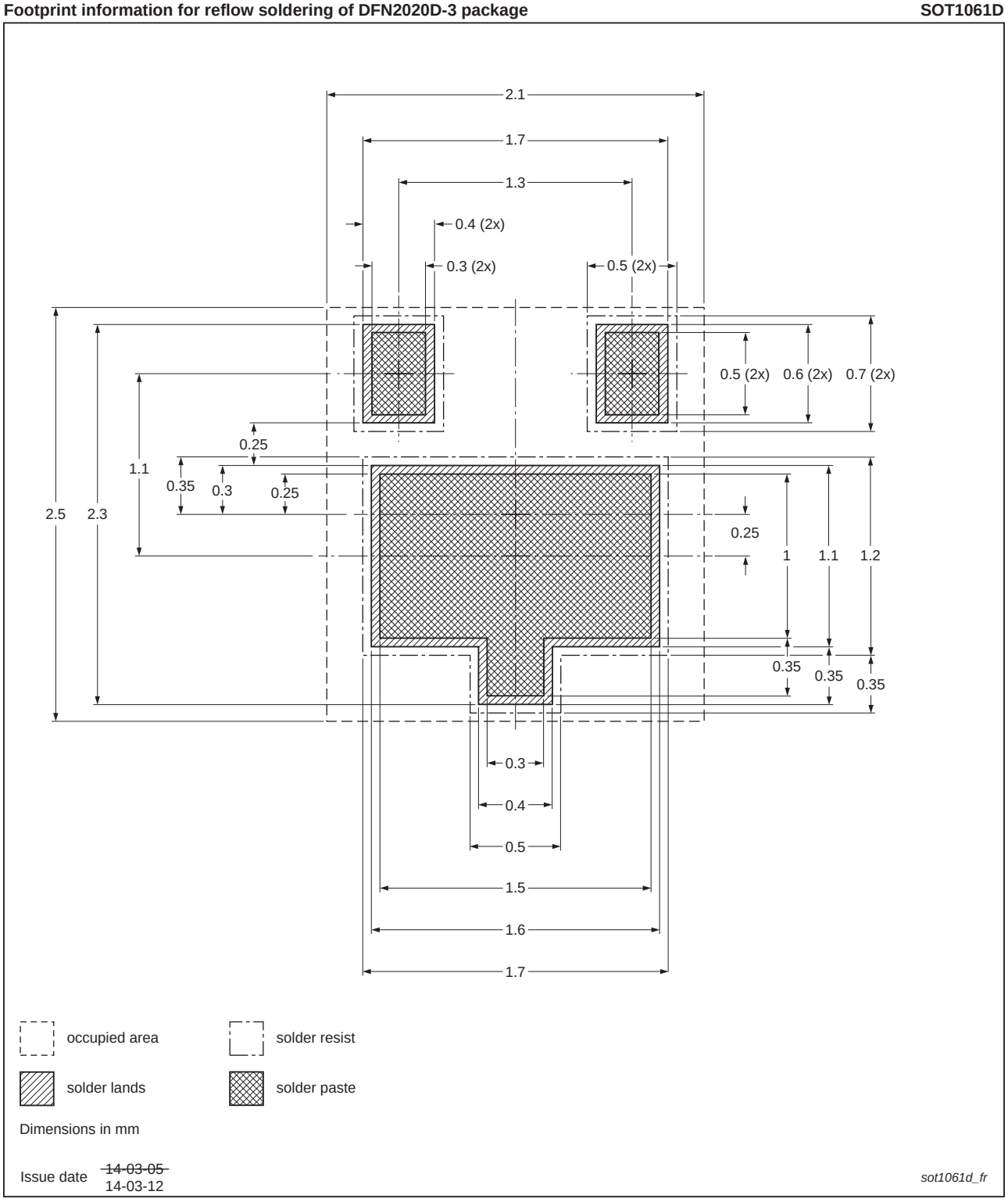


Fig 12. Reflow soldering footprint DFN2020D-3 (SOT1061D)

11. Revision history

Table 9. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
BC54_55_56PAS_SER v.1	20141111	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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14. Contents

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