



# BC68PA series

20 V, 2 A NPN medium power transistors

Rev. 9 — 1 July 2023

Product data sheet

## 1. General description

NPN medium power transistor in a SOT1061 (DFN2020-3) leadless very small Surface-Mounted Device (SMD) plastic package.

## 2. Features and benefits

- High collector current capability  $I_C$  and  $I_{CM}$
- Two current gain selections
- High power dissipation capability
- Exposed heatsink for excellent thermal and electrical conductivity
- Leadless very small SMD plastic package with medium power capability

## 3. Applications

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

## 4. Quick reference data

Table 1. Quick reference data

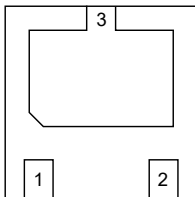
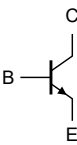
$T_{amb} = 25\text{ °C}$  unless otherwise specified.

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; $t_p \leq 1\text{ ms}$	-	-	3	A	
$h_{FE}$	DC current gain						
	BC68PA	$V_{CE} = 1\text{ V}; I_C = 500\text{ mA}$	[1]	85	-	375	
	BC68-25PA		[1]	160	-	375	

[1] pulsed;  $t_p \leq 300\text{ }\mu\text{s}$ ;  $\delta \leq 0.02$

## 5. Pinning information

Table 2. Pinning

Pin	Symbol	Description	Simplified outline	Graphic symbol
1	B	base	 <p>Transparent top view</p>	 <p>sym021</p>
2	E	emitter		
3	C	collector		

## 6. Ordering information

Table 3. Ordering information

Type number	Package		
	Name	Description	Version
<a href="#">BC68PA</a>	DFN2020-3	plastic, thermal enhanced ultra thin small outline package; no leads; 3 terminals; body: 2 x 2 x 0.65 mm	<a href="#">SOT1061</a>
<a href="#">BC68-25PA</a>			

## 7. Marking

Table 4. Marking

Type number	Marking code
BC68PA	AR
BC68-25PA	AS

## 8. Limiting values

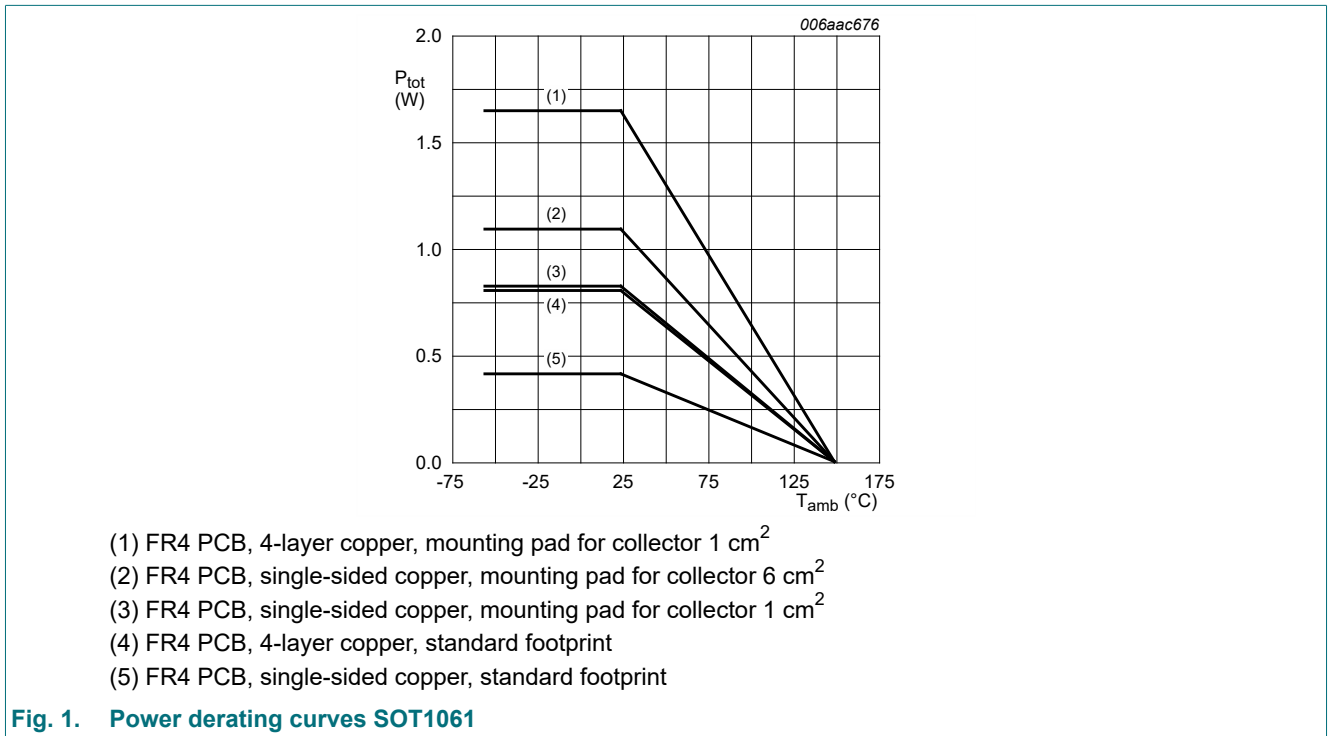
**Table 5. Limiting values**

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

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

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; $t_p \leq 1\text{ ms}$	-	3	A
$I_B$	base current		-	0.4	A
$I_{BM}$	peak base current	single pulse; $t_p \leq 1\text{ ms}$	-	0.4	A
$P_{tot}$	total power dissipation	$T_{amb} \leq 25\text{ °C}$	[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  $1\text{ cm}^2$ .
- [3] Device mounted on an FR4 PCB; single-sided copper; tin-plated; mounting pad for collector  $6\text{ cm}^2$ .
- [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  $1\text{ cm}^2$ .



**Fig. 1. Power derating curves SOT1061**

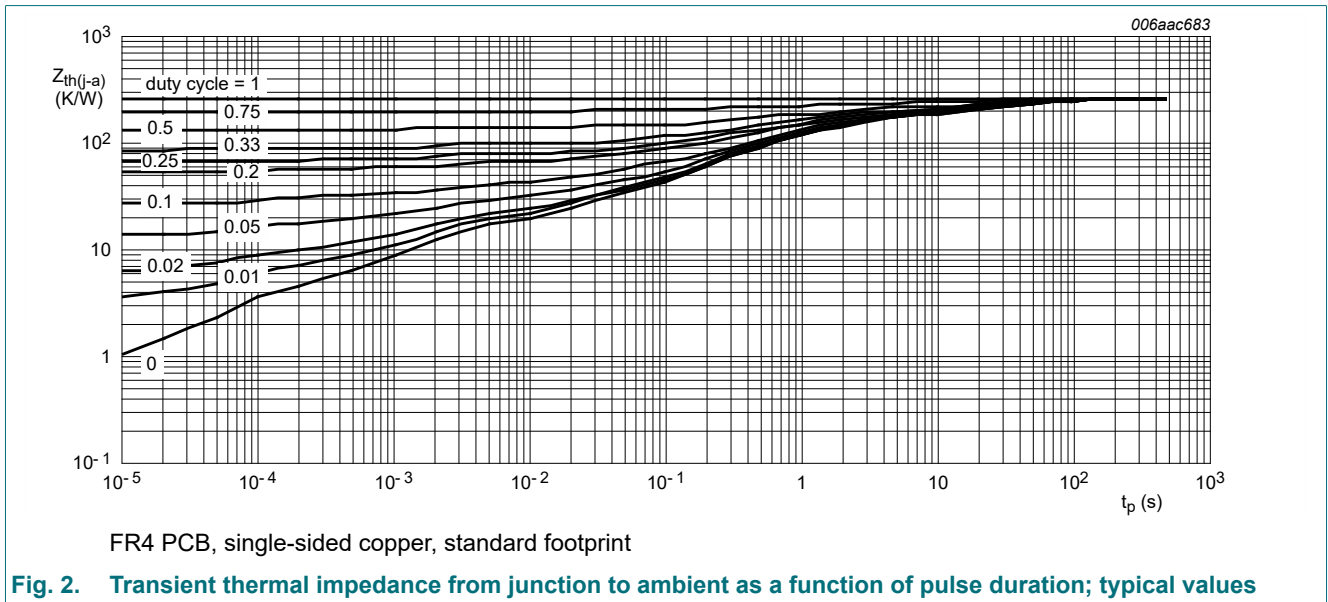
## 9. Thermal characteristics

**Table 6. Thermal characteristics**

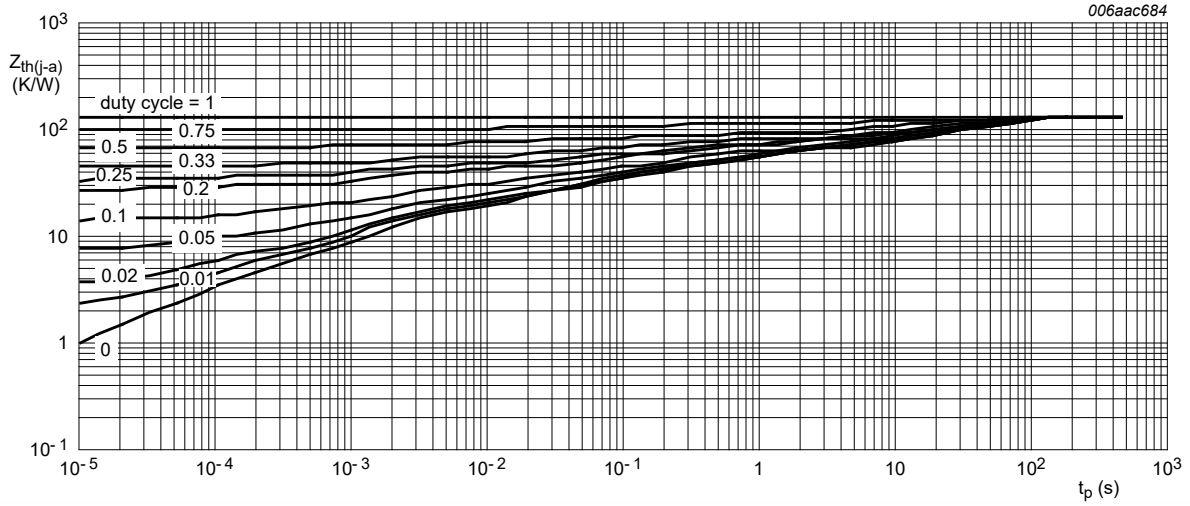
$T_{amb} = 25\text{ °C}$  unless otherwise specified.

Symbol	Parameter	Conditions		Min	Typ	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
$R_{(j-sp)}$	thermal resistance from junction to solder point			-	-	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<sup>2</sup>.
- [3] Device mounted on an FR4 PCB; single-sided copper; tin-plated; mounting pad for collector 6 cm<sup>2</sup>.
- [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<sup>2</sup>.

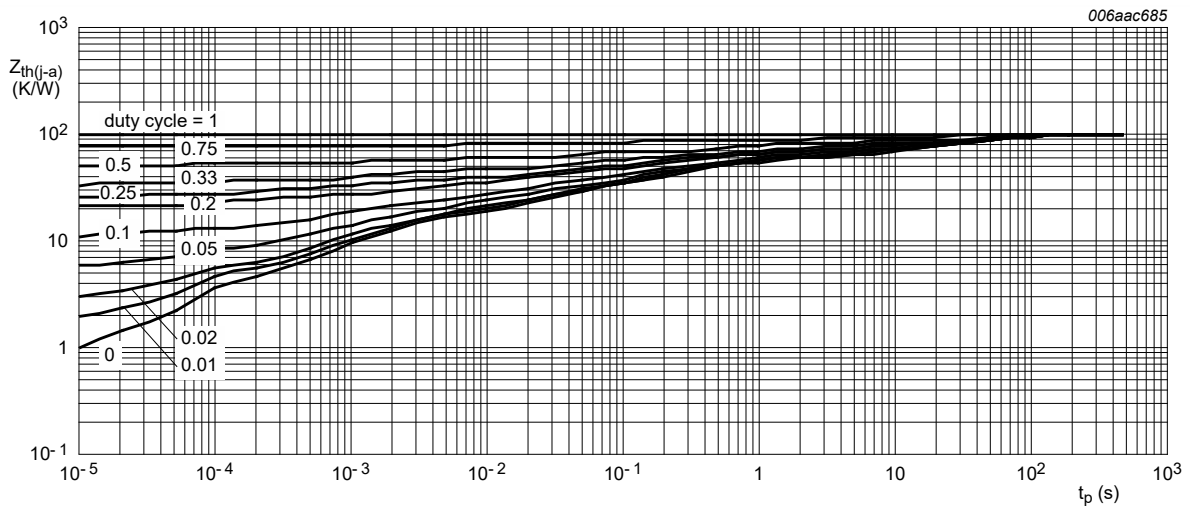


**Fig. 2. Transient thermal impedance from junction to ambient as a function of pulse duration; typical values**



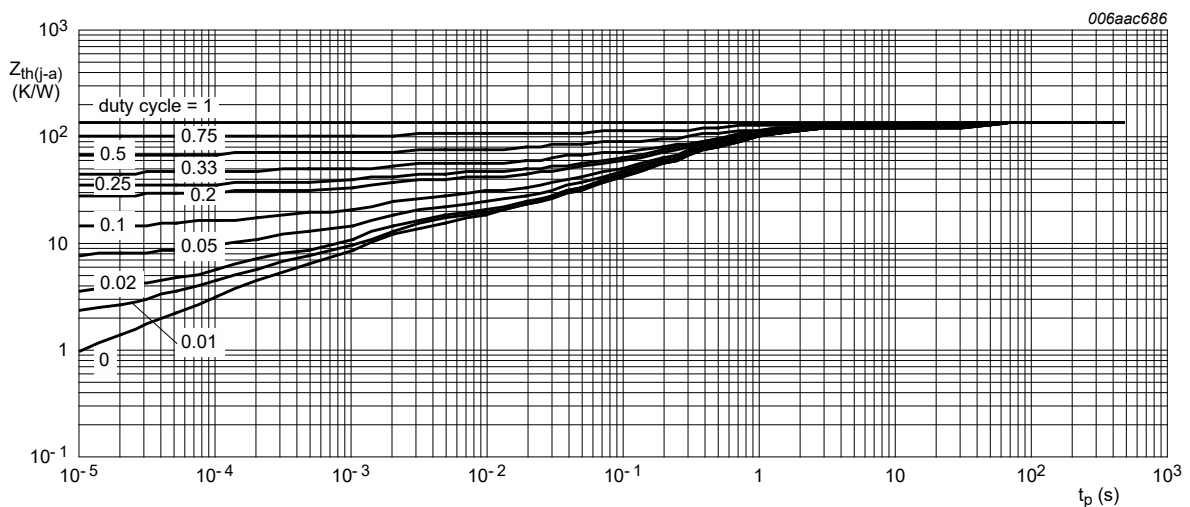
FR4 PCB, single-sided copper, mounting pad for collector 1 cm<sup>2</sup>

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



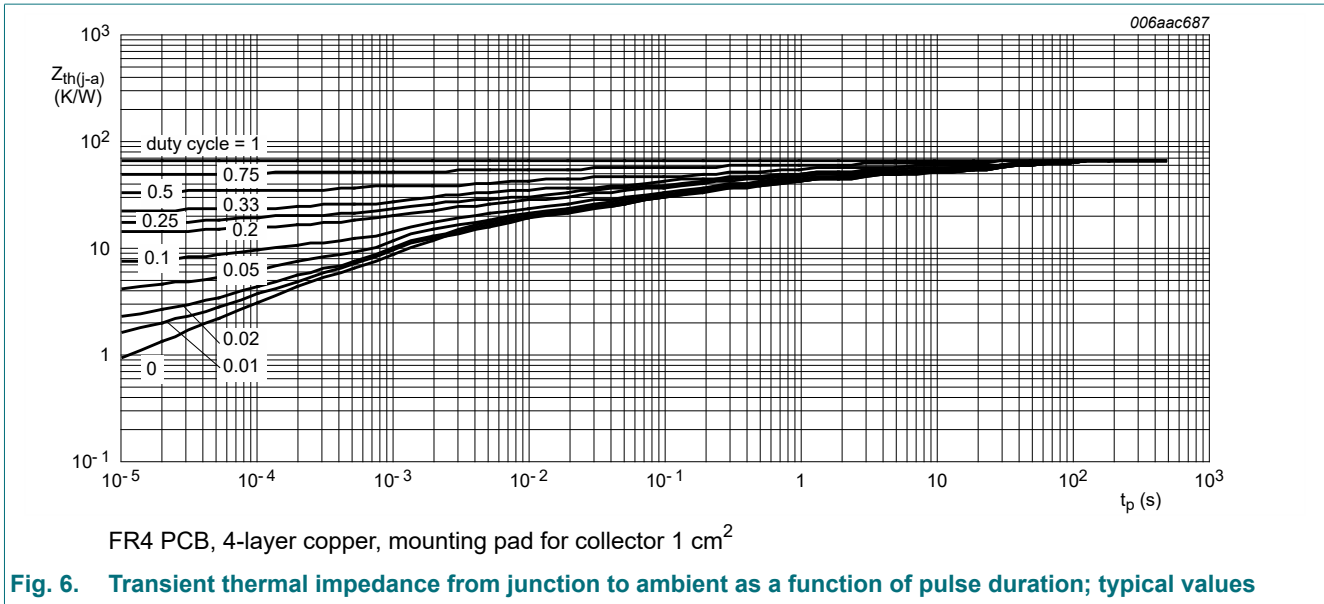
FR4 PCB, single-sided copper, mounting pad for collector 6 cm<sup>2</sup>

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



FR4 PCB, 4-layer copper, standard footprint

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



## 10. Characteristics

**Table 7. Characteristics**
 $T_{amb} = 25\text{ °C}$  unless otherwise specified.

Symbol	Parameter	Conditions	Min	Typ	Max	Unit	
$V_{(BR)CBO}$	collector-base breakdown voltage	$I_C = 100\ \mu\text{A}; I_E = 0\ \text{A}$	32	-	-	V	
$V_{(BR)CEO}$	collector-emitter breakdown voltage	$I_C = 10\ \text{mA}; I_B = 0\ \text{A}$	20	-	-	V	
$V_{(BR)EBO}$	emitter-base breakdown voltage	$I_E = 100\ \mu\text{A}; I_C = 0\ \text{A}$	5	-	-	V	
$I_{CBO}$	collector-base cut-off current	$V_{CB} = 25\ \text{V}; I_E = 0\ \text{A}$	-	-	100	nA	
		$V_{CB} = 25\ \text{V}; I_E = 0\ \text{A}; T_j = 150\text{ °C}$	-	-	10	$\mu\text{A}$	
$I_{EBO}$	emitter-base cut-off current	$V_{EB} = 5\ \text{V}; I_C = 0\ \text{A}$	-	-	100	nA	
$h_{FE}$	DC current gain						
	BC68PA	$V_{CE} = 10\ \text{V}; I_C = 5\ \text{mA}$	[1]	50	-	-	
		$V_{CE} = 1\ \text{V}; I_C = 500\ \text{mA}$	[1]	85	-	375	
		$V_{CE} = 1\ \text{V}; I_C = 1\ \text{A}$	[1]	60	-	-	
		$V_{CE} = 1\ \text{V}; I_C = 2\ \text{A}$	[1]	40	-	-	
	BC68-25PA	$V_{CE} = 10\ \text{V}; I_C = 5\ \text{mA}$	[1]	50	-	-	
		$V_{CE} = 1\ \text{V}; I_C = 500\ \text{mA}$	[1]	160	-	375	
		$V_{CE} = 1\ \text{V}; I_C = 1\ \text{A}$	[1]	60	-	-	
$V_{CE} = 1\ \text{V}; I_C = 2\ \text{A}$		[1]	40	-	-		
$V_{CEsat}$	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	$V_{CB} = 10\ \text{V}; I_E = i_e = 0\ \text{A}; f = 1\ \text{MHz}$	-	22	-	pF	
$f_T$	transition frequency	$V_{CE} = 5\ \text{V}; I_C = 50\ \text{mA}; f = 100\ \text{MHz}$	40	170	-	MHz	

[1] pulsed;  $t_p \leq 300\ \mu\text{s}$ ;  $\delta \leq 0.02$

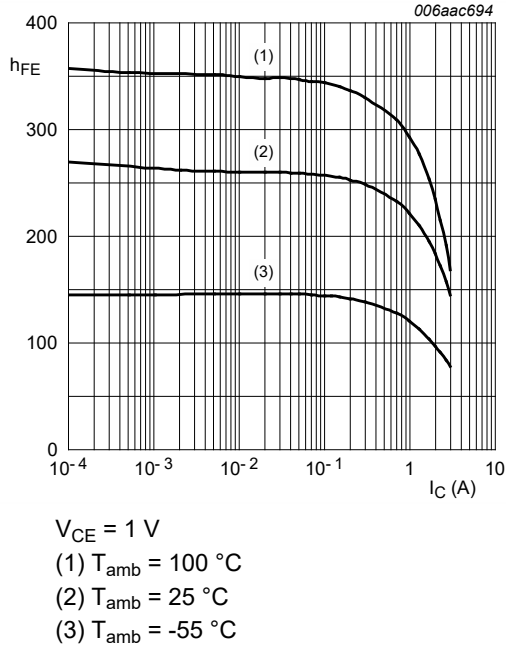


Fig. 7. DC current gain as a function of collector current; typical values

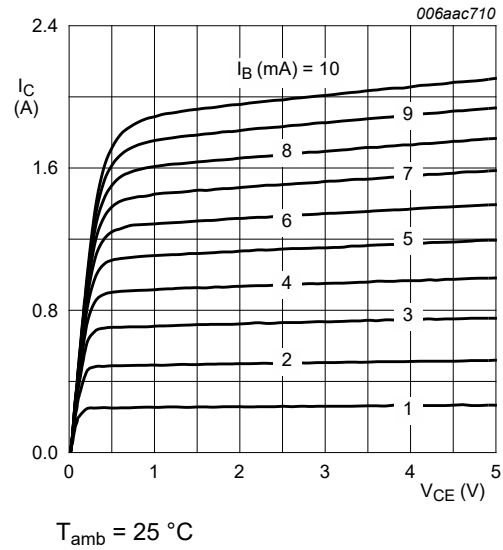


Fig. 8. Collector current as a function of collector-emitter voltage; typical values

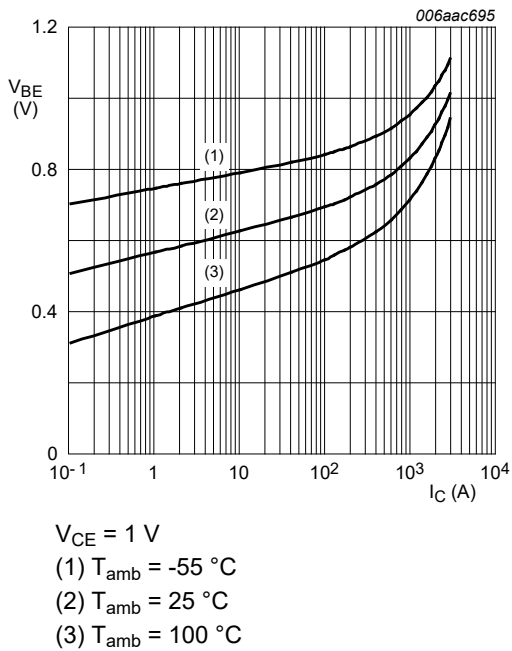


Fig. 9. Base-emitter voltage as a function of collector current; typical values

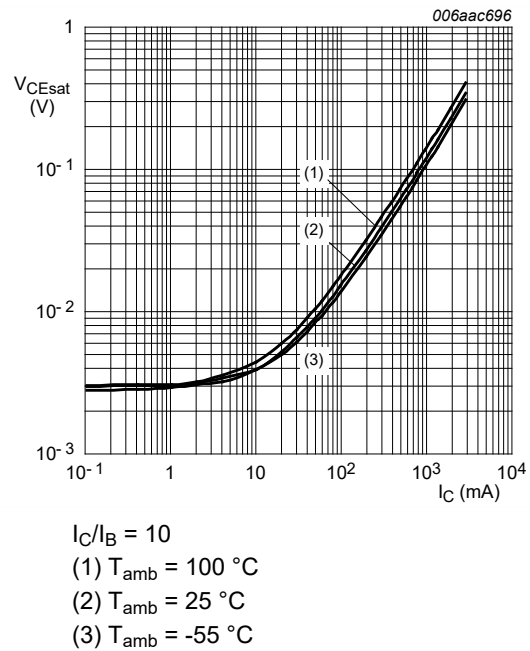
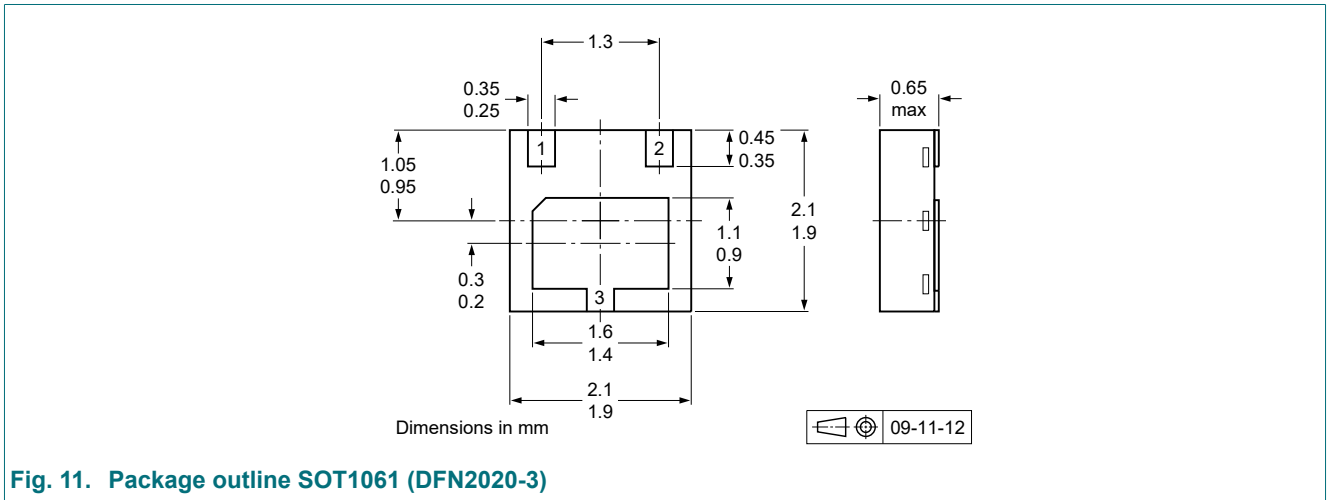


Fig. 10. Collector-emitter saturation voltage as a function of collector current; typical values



## 11. Package outline



## 12. Soldering

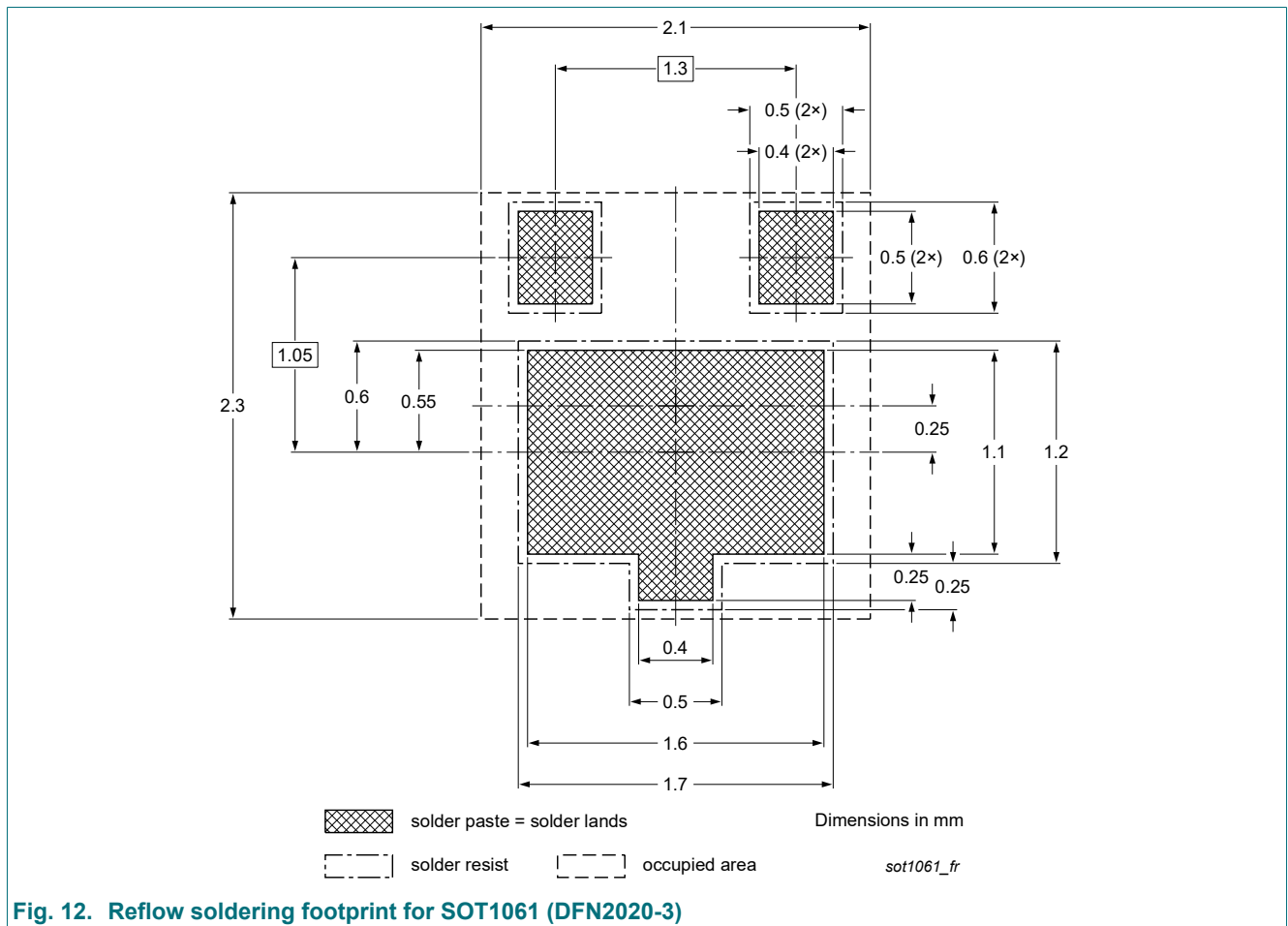


Fig. 12. Reflow soldering footprint for SOT1061 (DFN2020-3)

## 13. Revision history

Table 8. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
BC68PA_SER v.9	20230701	Product data sheet	-	BCP68_BC868_BC68PA v.8
Modifications:	<ul style="list-style-type: none"> <li>Family data sheet splitted to 3 data sheets.</li> <li>Section "Packing information" removed.</li> <li>Product(s) changed to non-automotive qualification. Please refer to nexperia.com for automotive (-Q) product alternative(s).</li> </ul>			
BCP68_BC868_BC68PA v.8	20111018	Product data sheet		BC868 v.7
BC868 v.7	20041108	Product specification	-	BC868 v.6
BC868 v.6	20031202	Product specification	-	BC868 v.5
BC868 v.5	19990408	Product specification	-	BC868 v.4
BC868 v.4	19980716	Product specification	-	BC868_CNV v.3
BC868_CNV v.3	19970319	Product specification	-	BC868_CNV v.2
BC868_CNV v.2	19970307	Product specification	-	
BCP68 v.4	20031125	Product specification	-	BCP68 v.3
BCP68 v.3	19990408	Product specification	-	BCP68_CNV v.2
BCP68_CNV v.2	19970409	Product specification	-	-

## 14. Legal information

### 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.

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Date of release: 1 July 2023

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