



BC56PA-Q series

80 V, 1 A NPN medium power transistors

Rev. 2 — 24 June 2022

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}
- Three 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
- Qualified according to AEC-Q101 and recommended for use in automotive applications

3. Applications

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

4. Quick reference data

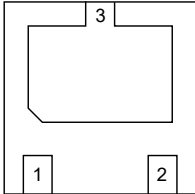
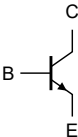
Table 1. Quick reference data
T_{amb} = 25 °C unless otherwise specified.

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
V _{CEO}	collector-emitter voltage	open base		-	-	80	V
I _C	collector current			-	-	1	A
I _{CM}	peak collector current	single pulse; t _p ≤ 1 ms		-	-	2	A
h _{FE}	DC current gain						
	BC56PA-Q	V _{CE} = 2 V; I _C = 150 mA	[1]	63	-	250	
	BC56-10PA-Q		[1]	63	-	160	
	BC56-16PA-Q		[1]	100	-	250	

[1] pulsed; t_p ≤ 300 µs; δ ≤ 0.02

5. Pinning information

Table 2. Pinning

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

6. Ordering information

Table 3. Ordering information

Type number	Package		
	Name	Description	Version
BC56PA-Q	DFN2020-3	plastic, thermal enhanced ultra thin small outline package; no leads; 3 Terminals; body 2 x 2 x 0.65 mm	SOT1061
BC56-10PA-Q			
BC56-16PA-Q			

7. Marking

Table 4. Marking

Type number	Marking code
BC56PA-Q	AZ
BC56-10PA-Q	BK
BC56-16PA-Q	BL

8. Limiting values

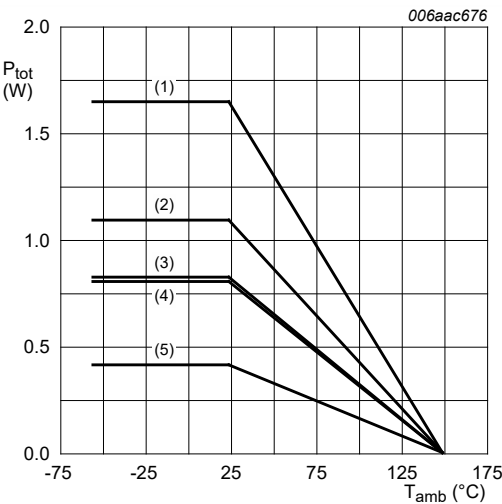
Table 5. Limiting values

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

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

Symbol	Parameter	Conditions	Min	Max	Unit
V_{CBO}	collector-base voltage	open emitter	-	100	V
V_{CEO}	collector-emitter voltage	open base	-	80	V
V_{EBO}	emitter-base voltage	open collector	-	5	V
I_C	collector current		-	1	A
I_{CM}	peak collector current	single pulse; $t_p \leq 1\text{ ms}$	-	2	A
I_B	base current		-	0.3	A
I_{BM}	peak base current	single pulse; $t_p \leq 1\text{ ms}$	-	0.3	A
P_{tot}	total power dissipation	$T_{amb} \leq 25\text{ }^{\circ}\text{C}$ [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	$^{\circ}\text{C}$
T_{amb}	ambient temperature		-55	150	$^{\circ}\text{C}$
T_{stg}	storage temperature		-65	150	$^{\circ}\text{C}$

- [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 cm².
- [3] Device mounted on an FR4 PCB; single-sided copper; tin-plated; mounting pad for collector 6 cm².
- [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 cm².



- (1) FR4 PCB, 4-layer copper, mounting pad for collector 1 cm²
- (2) FR4 PCB, single-sided copper, mounting pad for collector 6 cm²
- (3) FR4 PCB, single-sided copper, mounting pad for collector 1 cm²
- (4) FR4 PCB, 4-layer copper, standard footprint
- (5) FR4 PCB, single-sided copper, standard footprint

Fig. 1. Power derating curves SOT1061

9. Thermal characteristics

Table 6. Thermal characteristics

$T_{amb} = 25\text{ }^{\circ}\text{C}$ 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 cm².
[3] Device mounted on an FR4 PCB; single-sided copper; tin-plated; mounting pad for collector 6 cm².
[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 cm².

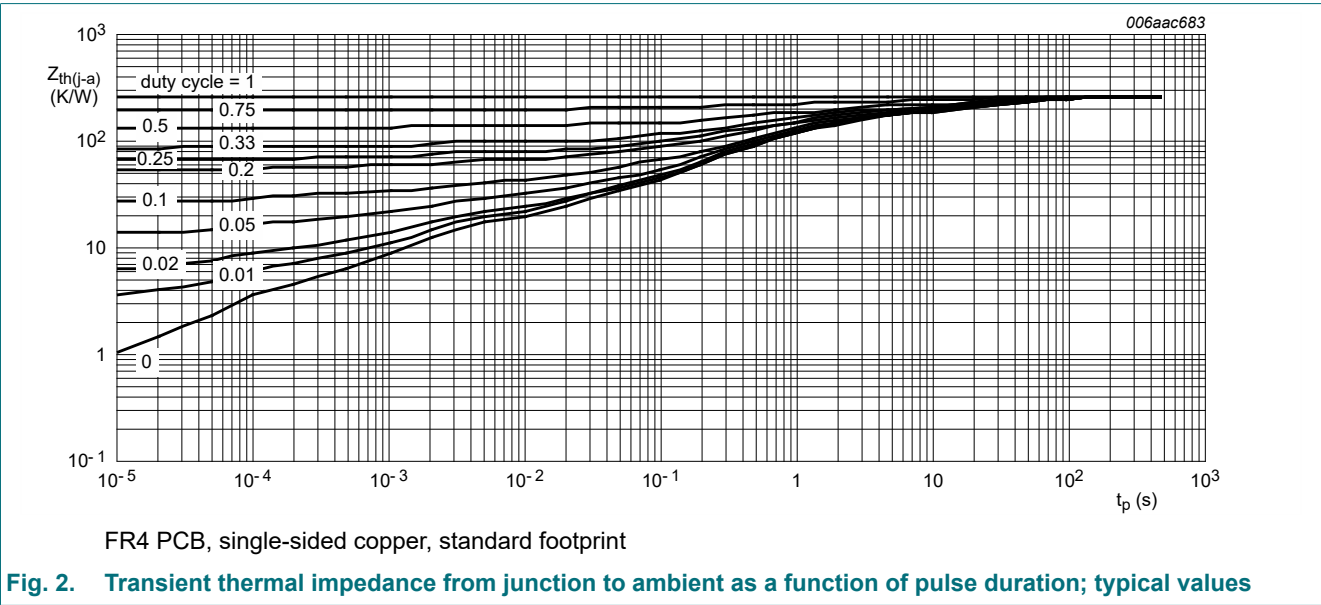
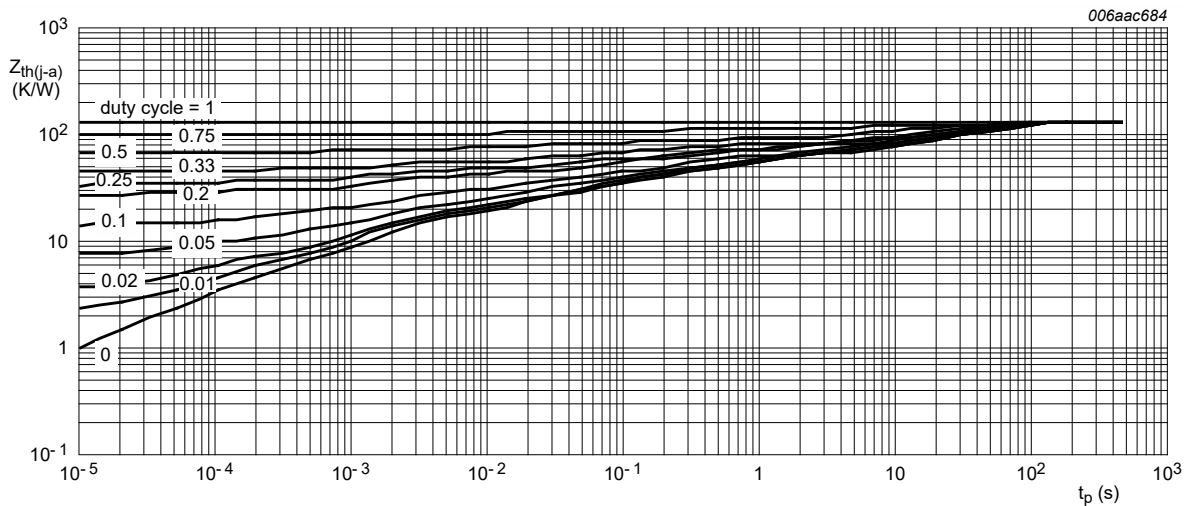
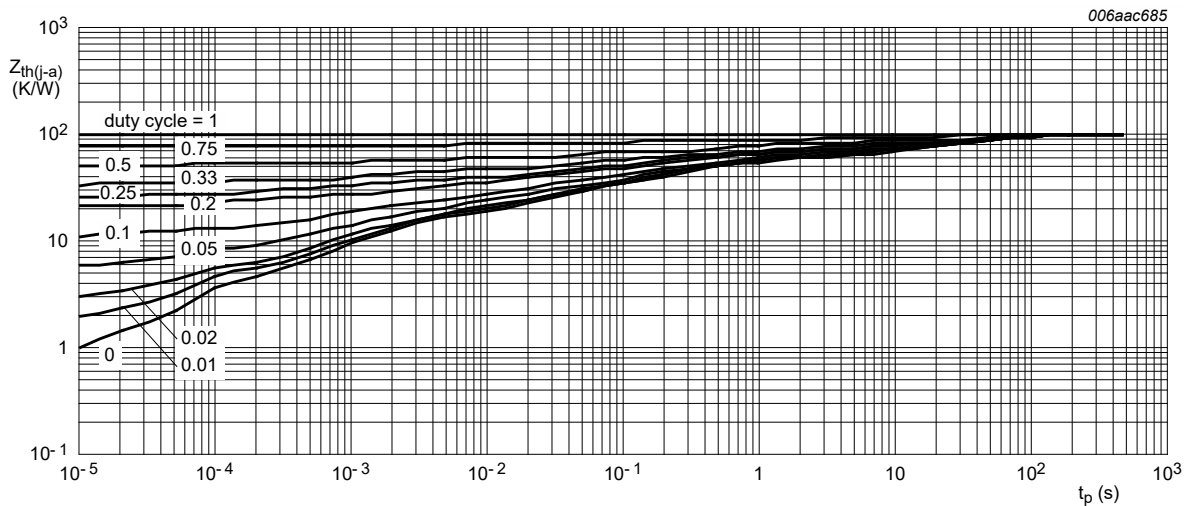


Fig. 2. Transient thermal impedance from junction to ambient as a function of pulse duration; typical values



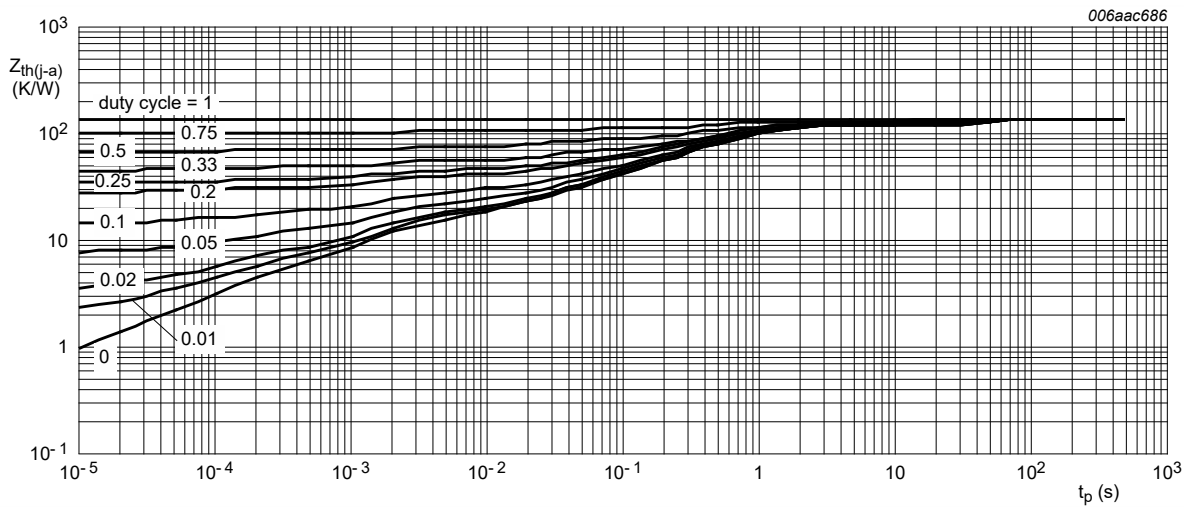
FR4 PCB, single-sided copper, mounting pad for collector 1 cm²

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



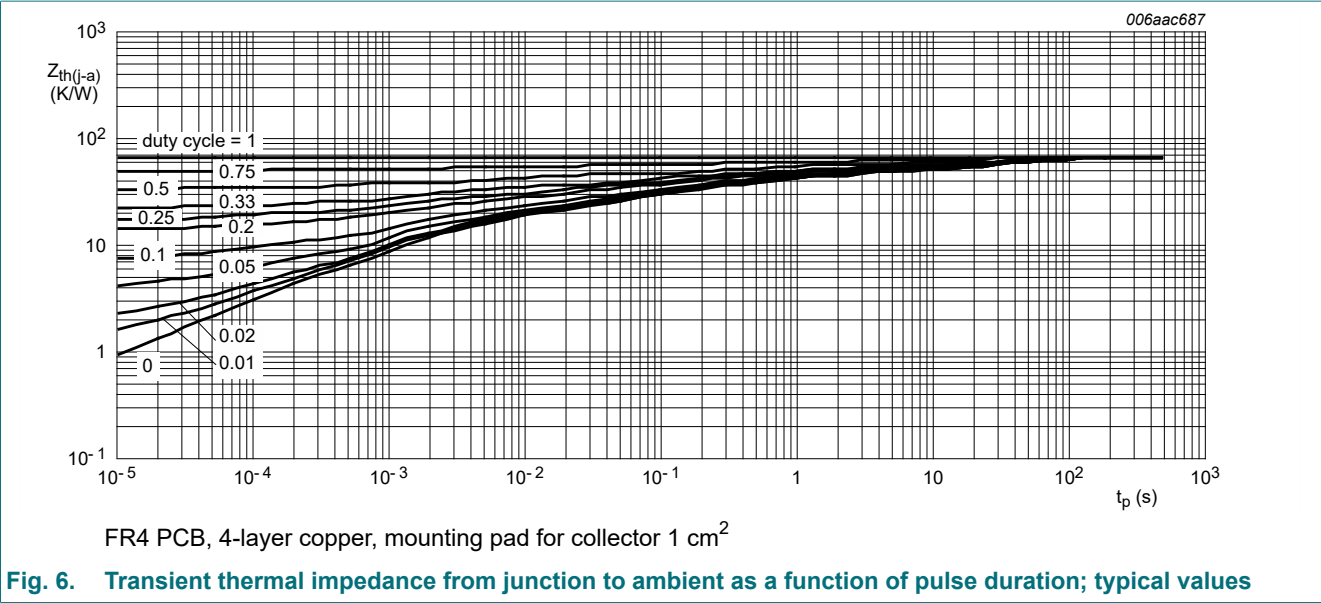
FR4 PCB, single-sided copper, mounting pad for collector 6 cm²

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

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
$V_{(BR)CBO}$	collector-base breakdown voltage	$I_C = 100\text{ }\mu\text{A}$; $I_E = 0\text{ A}$		100	-	-	V
$V_{(BR)CEO}$	collector-emitter breakdown voltage	$I_C = 2\text{ mA}$; $I_B = 0\text{ A}$		80	-	-	V
$V_{(BR)EBO}$	emitter-base breakdown voltage	$I_E = 100\text{ }\mu\text{A}$; $I_C = 0\text{ A}$		5	-	-	V
I_{CBO}	collector-base cut-off current	$V_{CB} = 30\text{ V}$; $I_E = 0\text{ A}$		-	-	100	nA
		$V_{CB} = 30\text{ V}$; $I_E = 0\text{ A}$; $T_J = 150\text{ }^{\circ}\text{C}$		-	-	10	μA
I_{EBO}	emitter-base cut-off current	$V_{EB} = 5\text{ V}$; $I_C = 0\text{ A}$		-	-	100	nA
h_{FE}	DC current gain						
	BC56PA-Q	$V_{CE} = 2\text{ V}$; $I_C = 5\text{ mA}$	[1]	63	-	-	
		$V_{CE} = 2\text{ V}$; $I_C = 150\text{ mA}$	[1]	63	-	250	
		$V_{CE} = 2\text{ V}$; $I_C = 500\text{ mA}$	[1]	40	-	-	
	BC56-10PA-Q	$V_{CE} = 2\text{ V}$; $I_C = 5\text{ mA}$	[1]	63	-	-	
		$V_{CE} = 2\text{ V}$; $I_C = 150\text{ mA}$	[1]	63	-	160	
		$V_{CE} = 2\text{ V}$; $I_C = 500\text{ mA}$	[1]	40	-	-	
	BC56-16PA-Q	$V_{CE} = 2\text{ V}$; $I_C = 5\text{ mA}$	[1]	63	-	-	
		$V_{CE} = 2\text{ V}$; $I_C = 150\text{ mA}$		100	-	250	
		$V_{CE} = 2\text{ V}$; $I_C = 500\text{ mA}$		40	-	-	
V_{CEsat}	collector-emitter saturation voltage	$I_C = 500\text{ mA}$; $I_B = 50\text{ mA}$	[1]	-	-	500	mV
V_{BE}	base-emitter voltage	$V_{CE} = 2\text{ V}$; $I_C = 500\text{ mA}$	[1]	-	-	1	V
C_c	collector capacitance	$V_{CB} = 10\text{ V}$; $I_E = i_e = 0\text{ A}$; $f = 1\text{ MHz}$		-	6	-	pF
f_T	transition frequency	$V_{CE} = 5\text{ V}$; $I_C = 50\text{ mA}$; $f = 100\text{ MHz}$		100	180	-	MHz

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

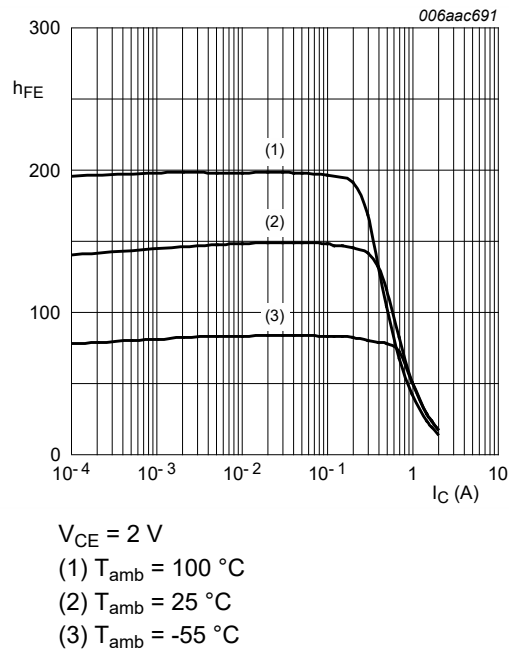


Fig. 7. DC current gain as a function of collector current; typical values

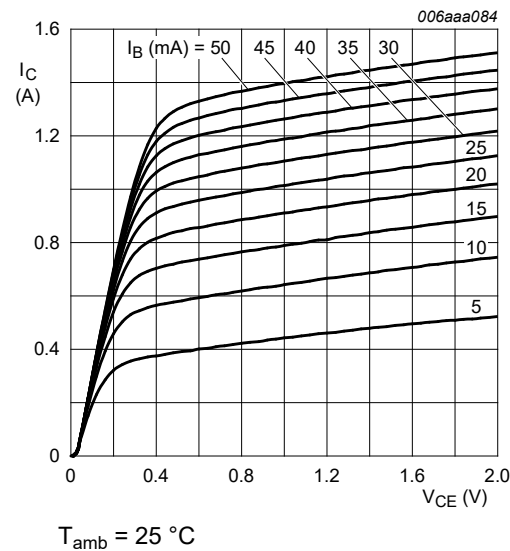


Fig. 8. Collector current as a function of collector-emitter voltage; typical values

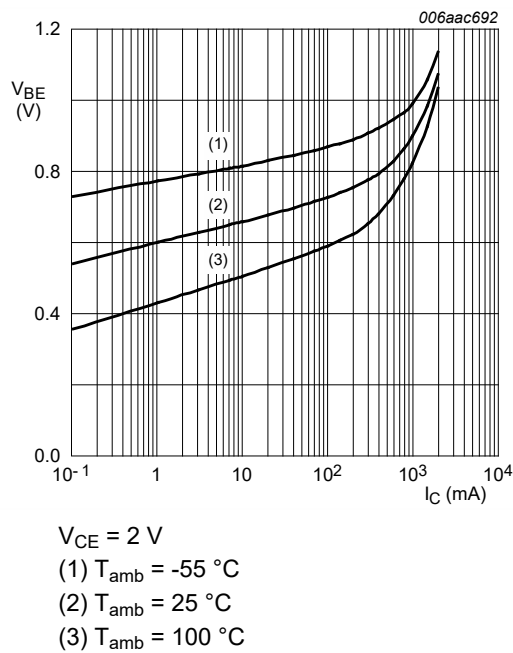


Fig. 9. Base-emitter voltage as a function of collector current; typical values

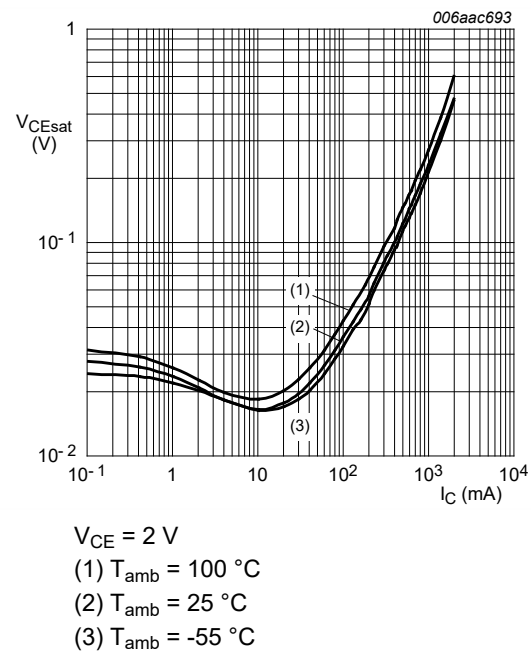


Fig. 10. Collector-emitter saturation voltage as a function of collector current; typical values

11. Test information

11.1. 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.

12. Package outline

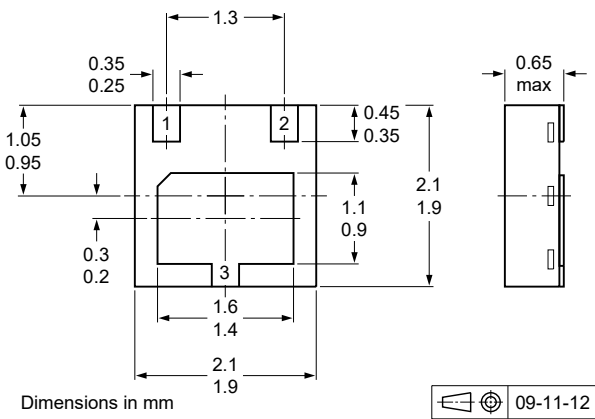


Fig. 11. Package outline SOT1061 (DFN2020-3)

13. Soldering

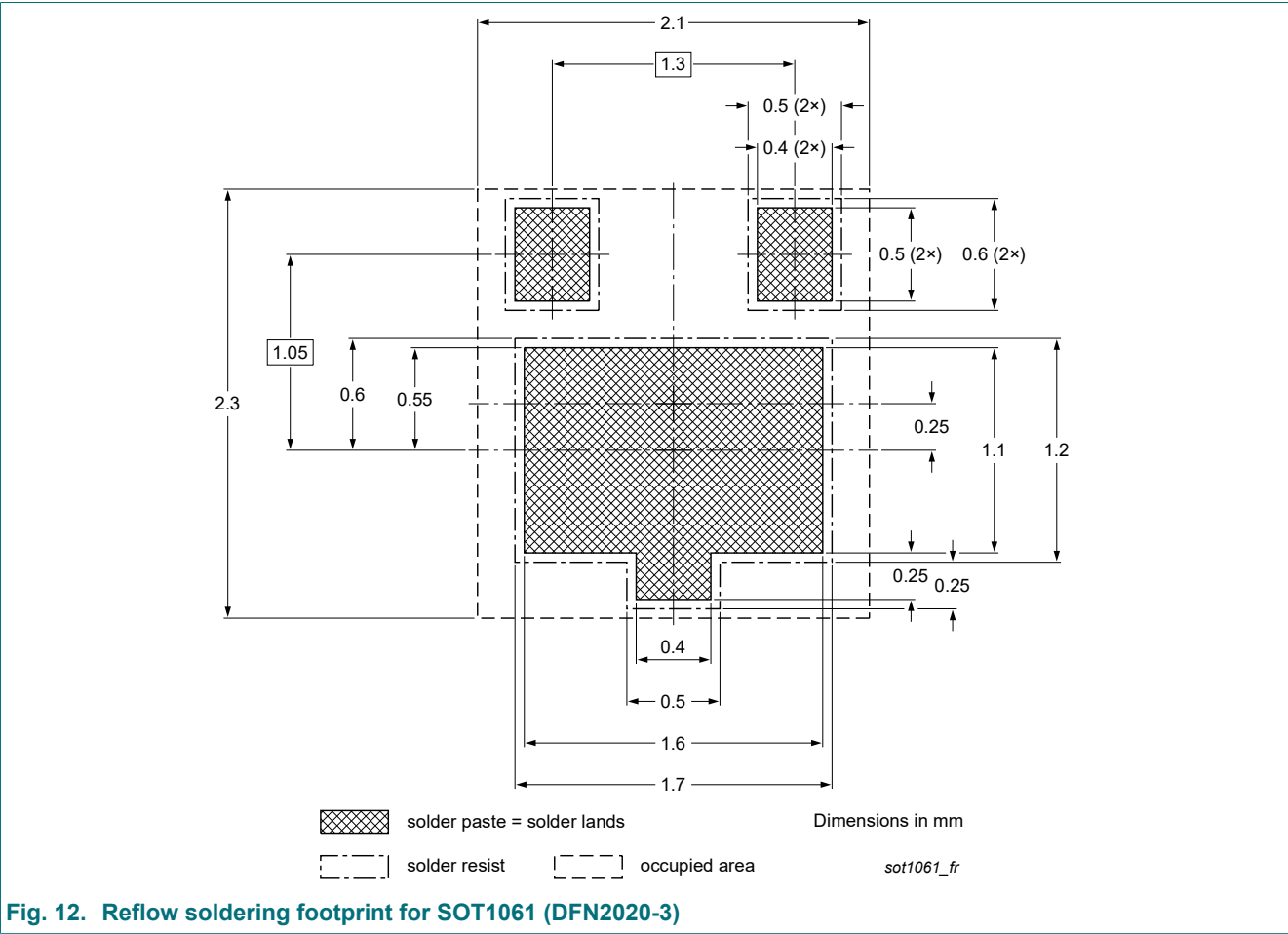


Fig. 12. Reflow soldering footprint for SOT1061 (DFN2020-3)

14. Revision history

Table 8. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
BC56PA-Q_SER v.2	20220624	Product data sheet	-	BC56PA-Q_SER v.1
Modifications:	• Characteristics at $V_{(BR)CEO}$: Conditions corrected			
BC56PA-Q_SER v.1	20220119	Product data sheet	-	-

15. 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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- [2] The term 'short data sheet' is explained in section "Definitions".
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For sales office addresses, please send an email to: salesaddresses@nexperia.com

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