



BC54PA-Q series

45 V, 1 A NPN medium power transistors

Rev. 1 — 2 May 2022

Product data sheet

1. General description

NPN medium power transistor in an ultra thin SOT1061 leadless 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
- Qualified according to AEC-Q101 and recommended for use in automotive applications

3. Applications

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

4. Quick reference data

Table 1. Quick reference data

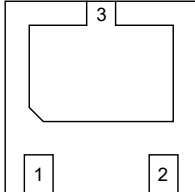
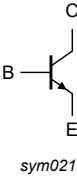
$T_{amb} = 25\text{ °C}$ unless otherwise specified.

Symbol	Parameter	Conditions	Min	Typ	Max	Unit	
V_{CEO}	collector-emitter voltage	open base	-	-	45	V	
I_C	collector current		-	-	1	A	
I_{CM}	peak collector current	single pulse; $t_p \leq 1\text{ ms}$	-	-	2	A	
h_{FE}	DC current gain						
	BC54PA-Q	$V_{CE} = 2\text{ V}; I_C = 150\text{ mA}$	[1]	63	-	250	
	BC54-10PA-Q		[1]	63	-	160	
	BC54-16PA-Q		[1]	100	-	250	

[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
BC54PA-Q	-	plastic thermal enhanced ultra thin small outline package; no leads; 3 terminals; body 2 x 2 x 0.65 mm	SOT1061
BC54-10PA-Q			
BC54-16PA-Q			

7. Marking

Table 4. Marking

Type number	Marking code
BC54PA-Q	AT
BC54-10PA-Q	BF
BC54-16PA-Q	BG

8. Limiting values

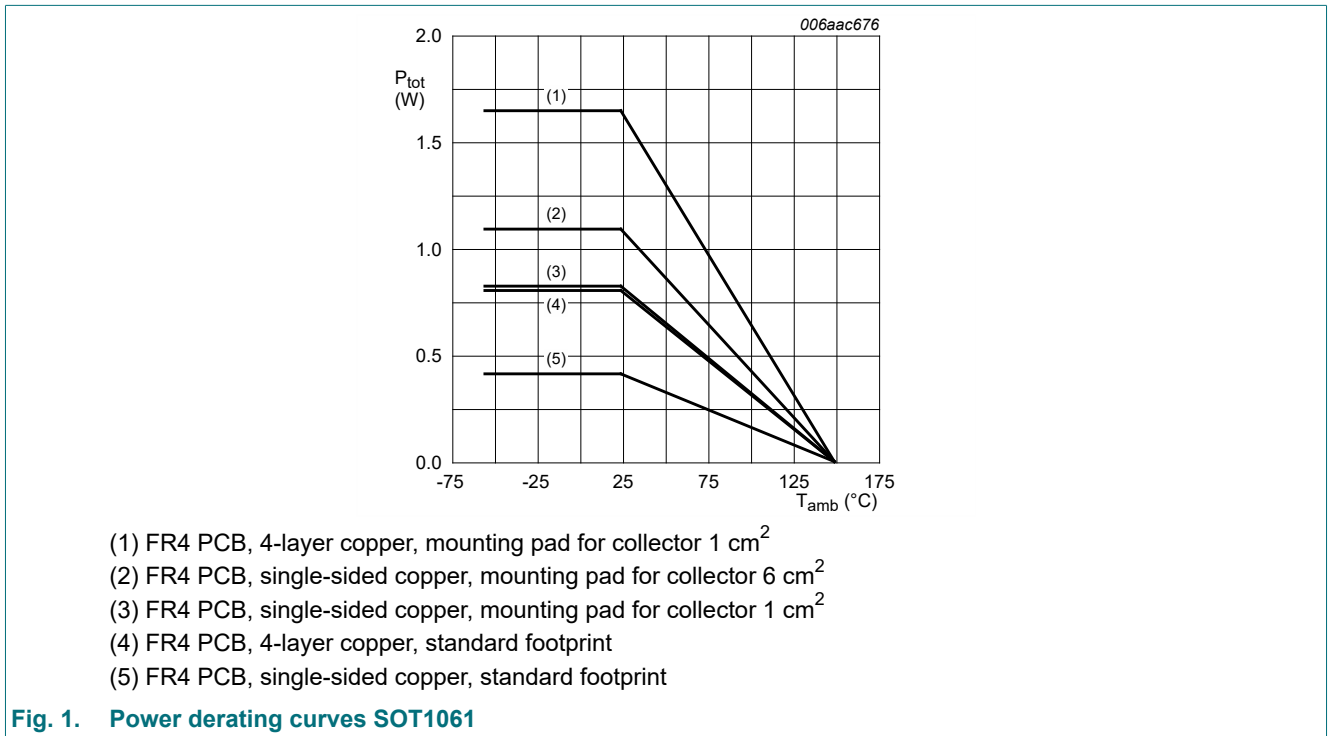
Table 5. Limiting values

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	-	45	V
V_{CEO}	collector-emitter voltage	open base	-	45	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	$T_{amb} \leq 25\text{ °C}$	[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 cm^2 .
- [3] Device mounted on an FR4 PCB; single-sided copper; tin-plated; 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, mounting pad for collector 1 cm^2 .



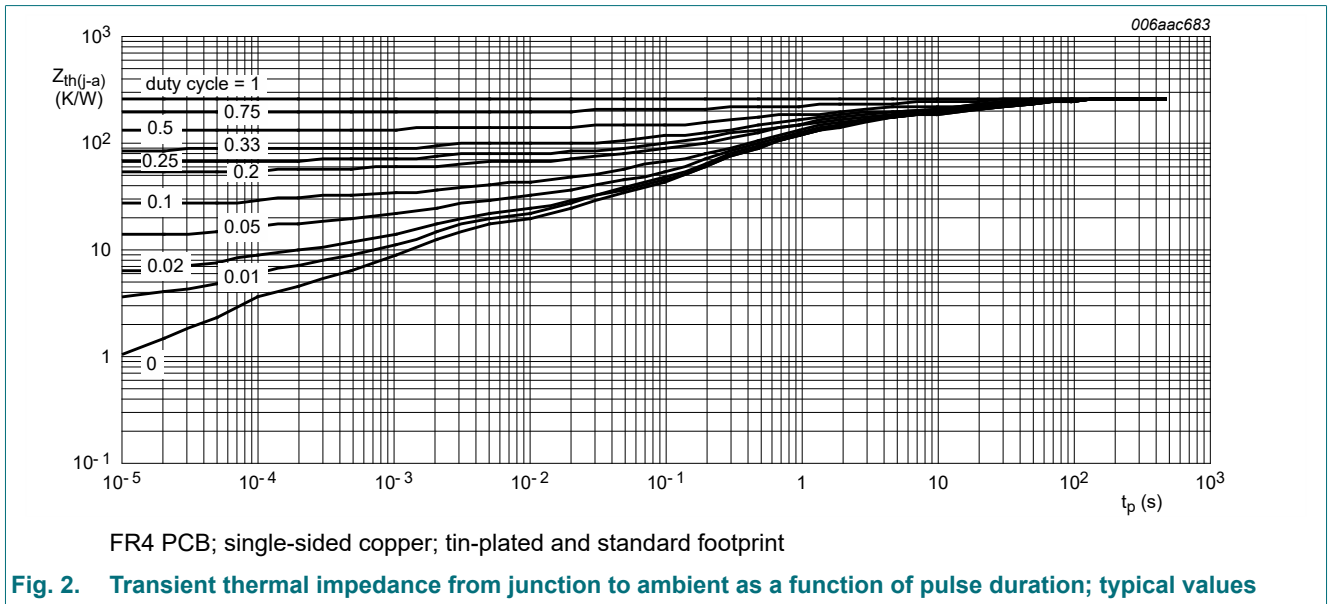
9. Thermal characteristics

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]	-	-	289	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.



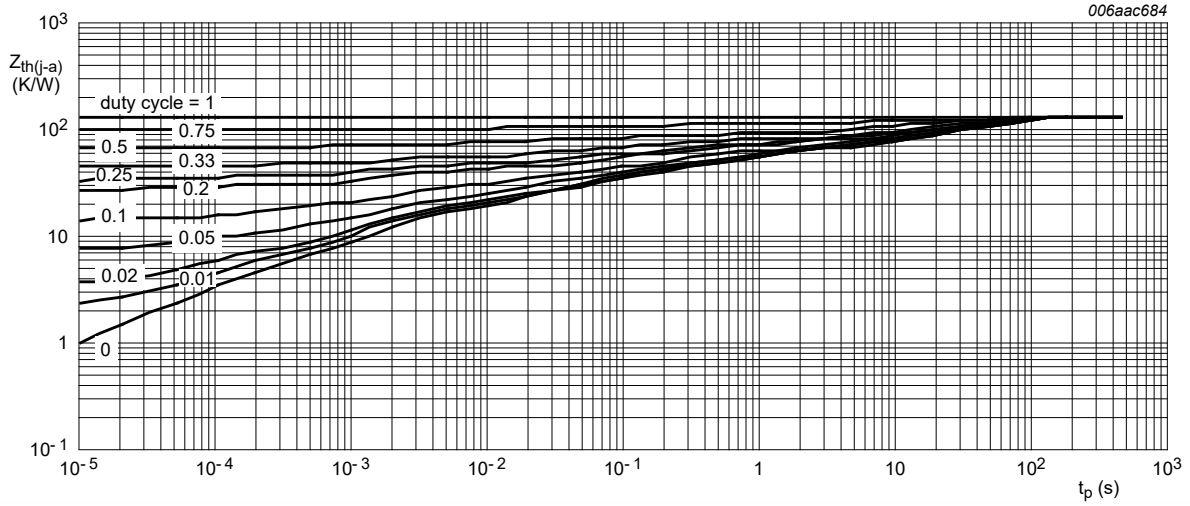


Fig. 3. Transient thermal impedance from junction to ambient as a function of pulse duration; typical values

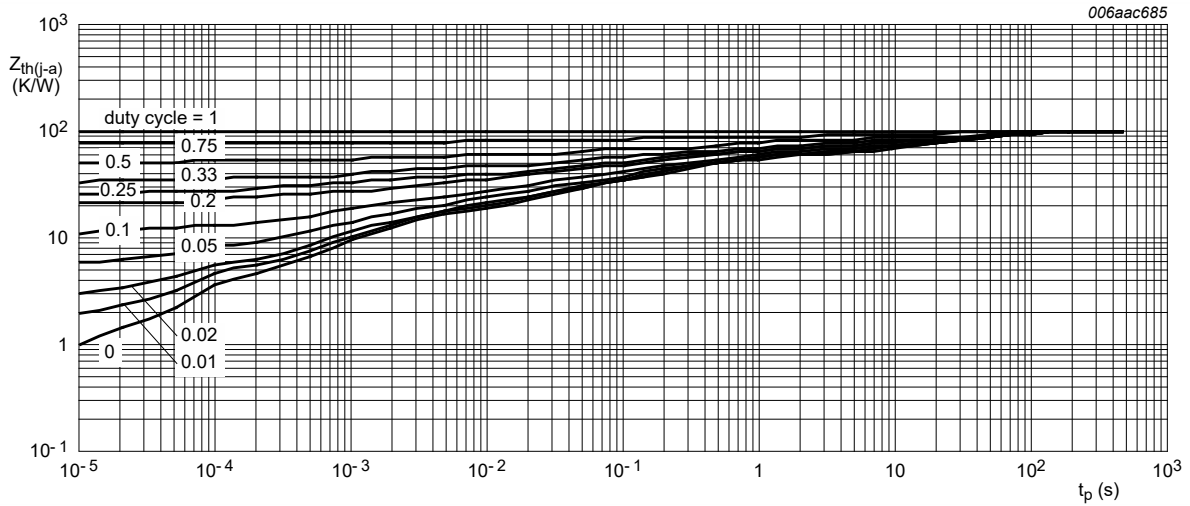


Fig. 4. Transient thermal impedance from junction to ambient as a function of pulse duration; typical values

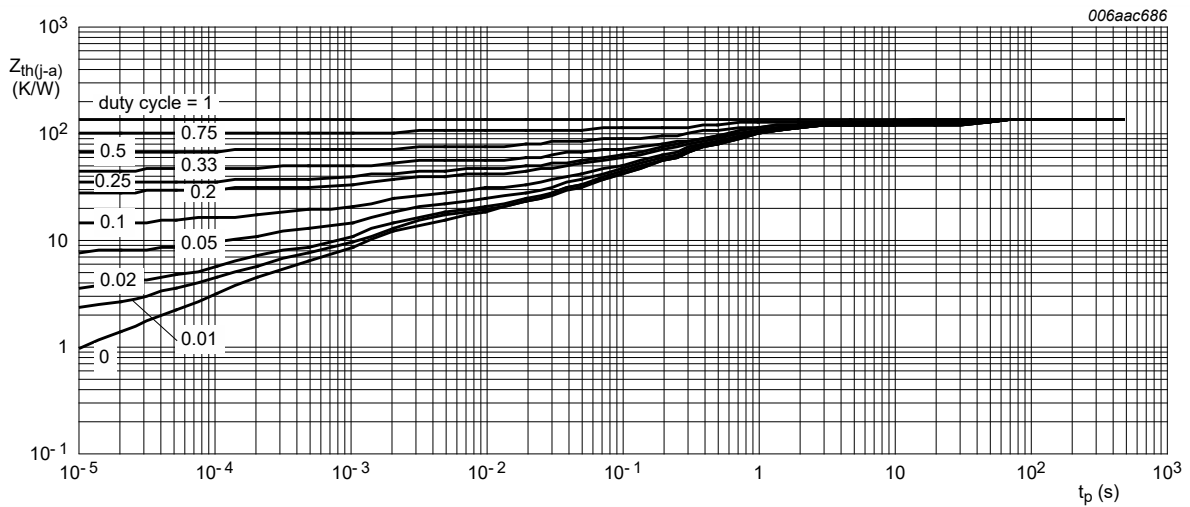
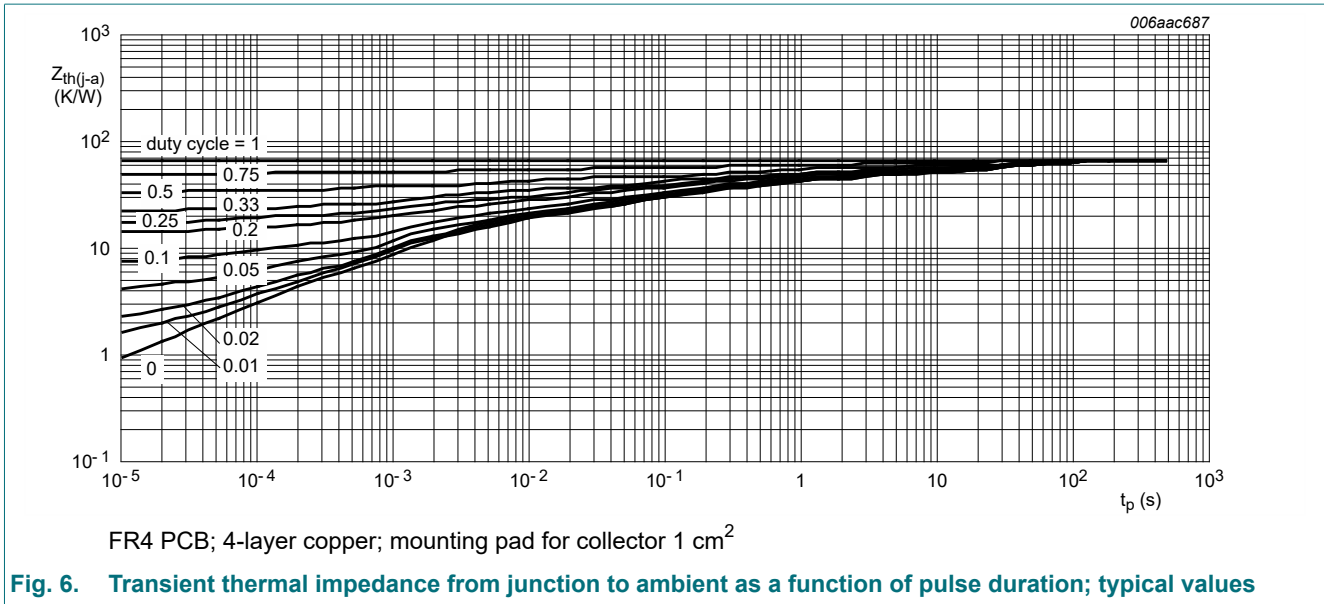


Fig. 5. Transient thermal impedance from junction to ambient as a function of pulse duration; typical values

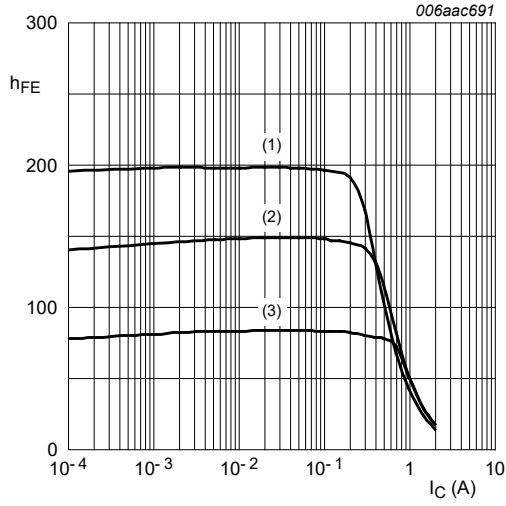


10. Characteristics

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

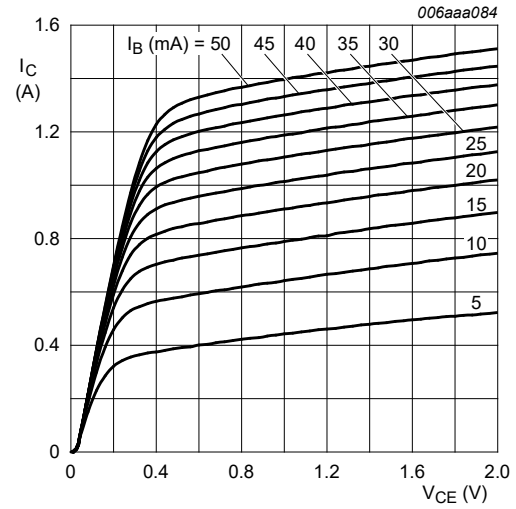
Symbol	Parameter	Conditions	Min	Typ	Max	Unit	
$V_{(BR)CBO}$	collector-base breakdown voltage	$I_C = 100\text{ }\mu\text{A}; I_E = 0\text{ A}$	45	-	-	V	
$V_{(BR)CEO}$	collector-emitter breakdown voltage	$I_C = 2\text{ mA}; I_B = 0\text{ A}$	45	-	-	V	
$V_{(BR)EBO}$	emitter-base breakdown voltage	$I_E = 100\text{ }\mu\text{A}; I_C = 0\text{ A}$	5	-	-	V	
I_{CBO}	collector-base cut-off current	$V_{CB} = 30\text{ V}; I_E = 0\text{ A}$	-	-	100	nA	
		$V_{CB} = 30\text{ V}; I_E = 0\text{ A}; T_J = 150\text{ °C}$	-	-	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						
	BC54PA-Q	$V_{CE} = 2\text{ V}; I_C = 5\text{ mA}$	[1]	63	-	-	
		$V_{CE} = 2\text{ V}; I_C = 150\text{ mA}$		63	-	250	
		$V_{CE} = 2\text{ V}; I_C = 500\text{ mA}$		40	-	-	
	BC54-10PA-Q	$V_{CE} = 2\text{ V}; I_C = 5\text{ mA}$	[1]	63	-	-	
		$V_{CE} = 2\text{ V}; I_C = 150\text{ mA}$		63	-	160	
		$V_{CE} = 2\text{ V}; I_C = 500\text{ mA}$		40	-	-	
	BC54-16PA-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]	-	0.5	V	
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; $t_p \leq 300\text{ }\mu\text{s}$; $\delta \leq 0.02$



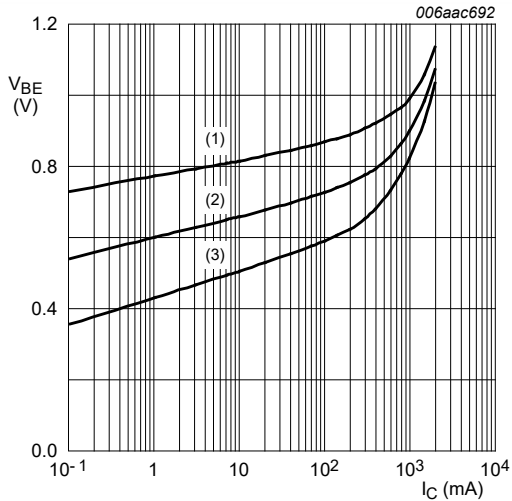
$V_{CE} = 2\text{ V}$
 (1) $T_{amb} = 100\text{ °C}$
 (2) $T_{amb} = 25\text{ °C}$
 (3) $T_{amb} = -55\text{ °C}$

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



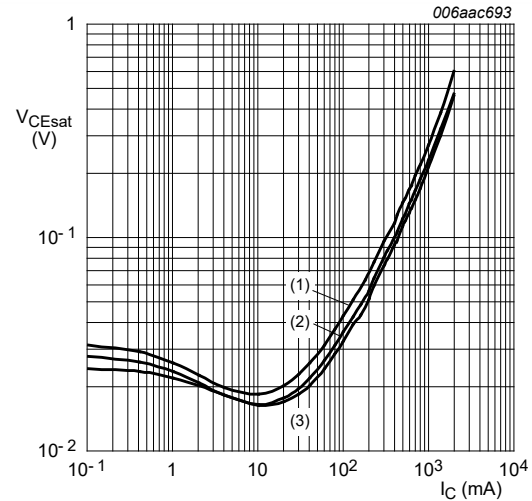
$T_{amb} = 25\text{ °C}$

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



$V_{CE} = 2\text{ V}$
 (1) $T_{amb} = -55\text{ °C}$
 (2) $T_{amb} = 25\text{ °C}$
 (3) $T_{amb} = 100\text{ °C}$

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



$I_C/I_B = 10$
 (1) $T_{amb} = 100\text{ °C}$
 (2) $T_{amb} = 25\text{ °C}$
 (3) $T_{amb} = -55\text{ °C}$

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

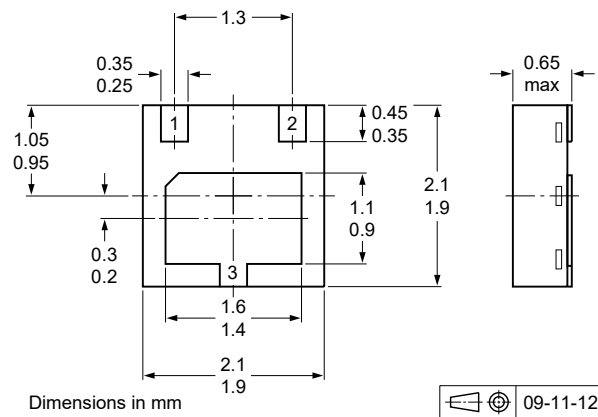


Fig. 11. Package outline SOT1061

13. Soldering

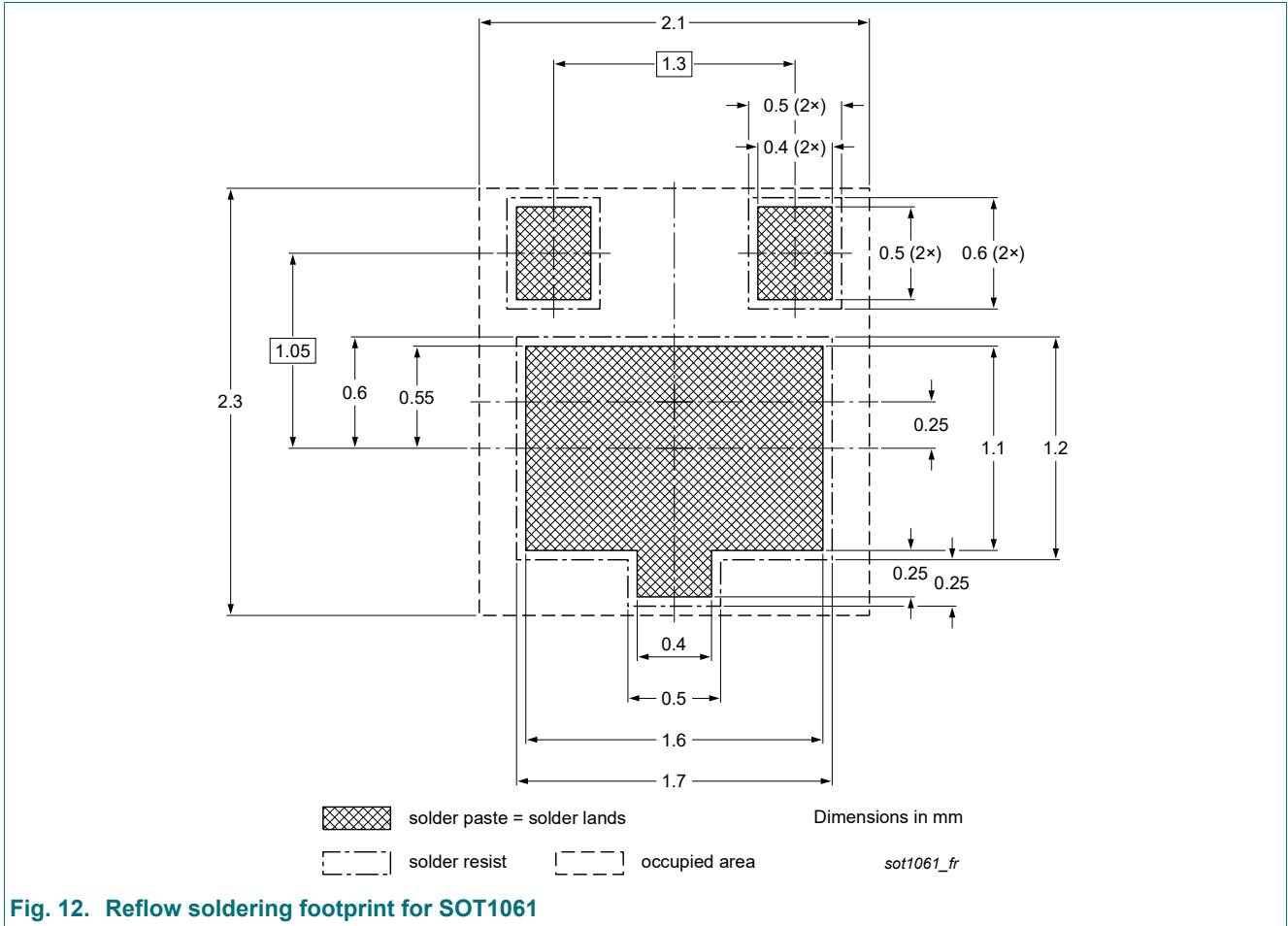


Fig. 12. Reflow soldering footprint for SOT1061

14. Revision history

Table 8. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
BC54PA-Q_SER v.1	20220502	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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