



# BC51XPAS-Q series

45 V, 1 A PNP medium power transistors

Rev. 1 — 18 October 2024

Product data sheet

## 1. General description

PNP 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.

## 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
- Two current gain selections
- Leadless very small SMD plastic package with medium power capability
- Suitable for Automatic Optical Inspection (AOI) of solder joint
- Qualified according to AEC-Q101 and recommended for use in automotive applications

## 3. Applications

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

## 4. Quick reference data

Table 1. Quick reference data

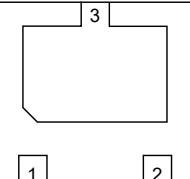
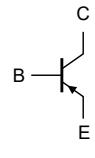
Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$V_{CEO}$	collector-emitter voltage	open base	-	-	-45	V
$I_C$	collector current		-	-	-1	A
$I_{CM}$	peak collector current	single pulse; $t_p \leq 1$ ms	-	-	-2	A
$h_{FE}$	DC current gain	$V_{CE} = -2$ V; $I_C = -150$ mA; $T_{amb} = 25$ °C	[1]	63	-	250
	BC51PAS-Q		[1]	63	-	160
	BC51-10PAS-Q		[1]	100	-	250
	BC51-16PAS-Q					

[1] pulsed;  $t_p \leq 300$  µs;  $\delta \leq 0.02$

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## 5. Pinning information

**Table 2. Pinning information**

Pin	Symbol	Description	Simplified outline	Graphic symbol
1	B	base	 Transparent top view	 sym013
2	E	emitter		
3	C	collector		

## 6. Ordering information

**Table 3. Ordering information**

Type number	Package		
	Name	Description	Version
<a href="#">BC51PAS-Q</a>	DFN2020D-3	plastic, leadless thermal enhanced ultra thin small outline package with side-wettable flanks (SWF); no leads; 3 terminals; 1.3 mm pitch; 2 mm x 2 mm x 0.65 mm body	<a href="#">SOT1061</a>
<a href="#">BC51-10PAS-Q</a>			
<a href="#">BC51-16PAS-Q</a>			

## 7. Marking

**Table 4. Marking codes**

Type number	Marking code
BC51PAS-Q	C4
BC51-10PAS-Q	C5
BC51-16PAS-Q	C6

## 8. 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		-	-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; $t_p \leq 1$ ms		-	-2	A
$I_B$	base current			-	-0.3	A
$P_{tot}$	total power dissipation	$T_{amb} \leq 25$ °C	[1]	-	0.42	W
			[2]	-	0.81	W
			[3]	-	0.83	W
			[4]	-	1.1	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

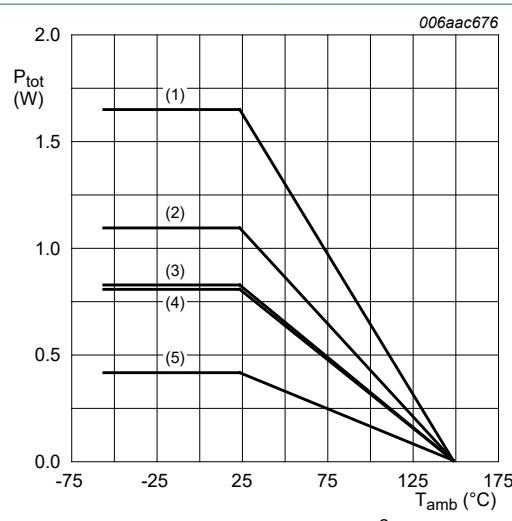
[1] Device mounted on an FR4 Printed-Circuit Board (PCB), single-sided copper, tin-plated and standard footprint.

[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<sup>2</sup>.

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

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



(1) FR4 PCB, 4-layer copper, mounting pad for collector 1 cm<sup>2</sup>

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

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

(4) FR4 PCB, 4-layer copper, standard footprint

(5) FR4 PCB, single-sided copper, standard footprint

**Fig. 1. Power derating curves**

## 9. Thermal characteristics

Table 6. Thermal characteristics

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]	-	-	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			-	-	20	K/W

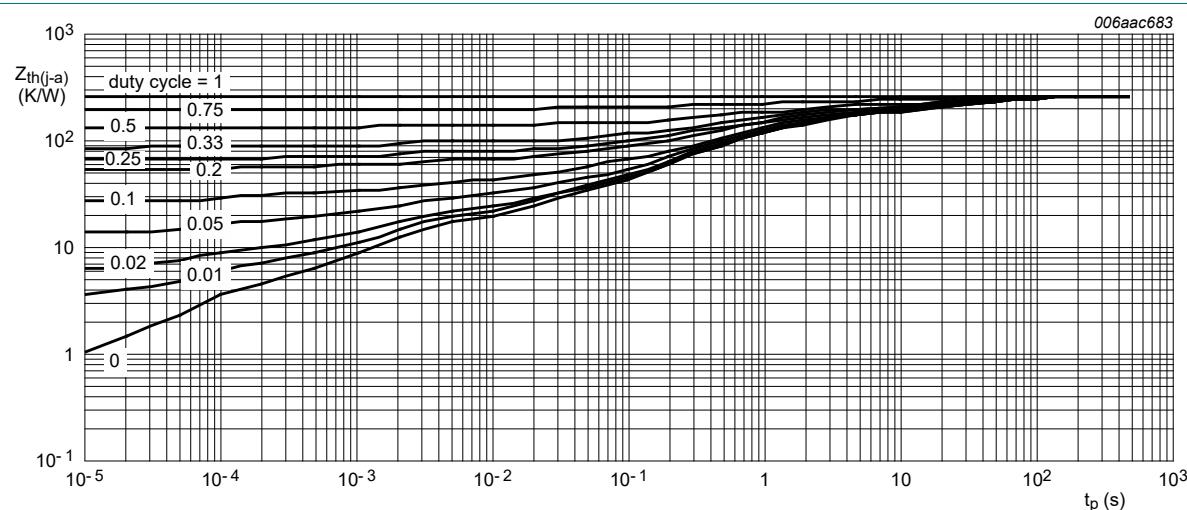
[1] Device mounted on an FR4 Printed-Circuit Board (PCB), single-sided copper, tin-plated and standard footprint.

[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<sup>2</sup>.

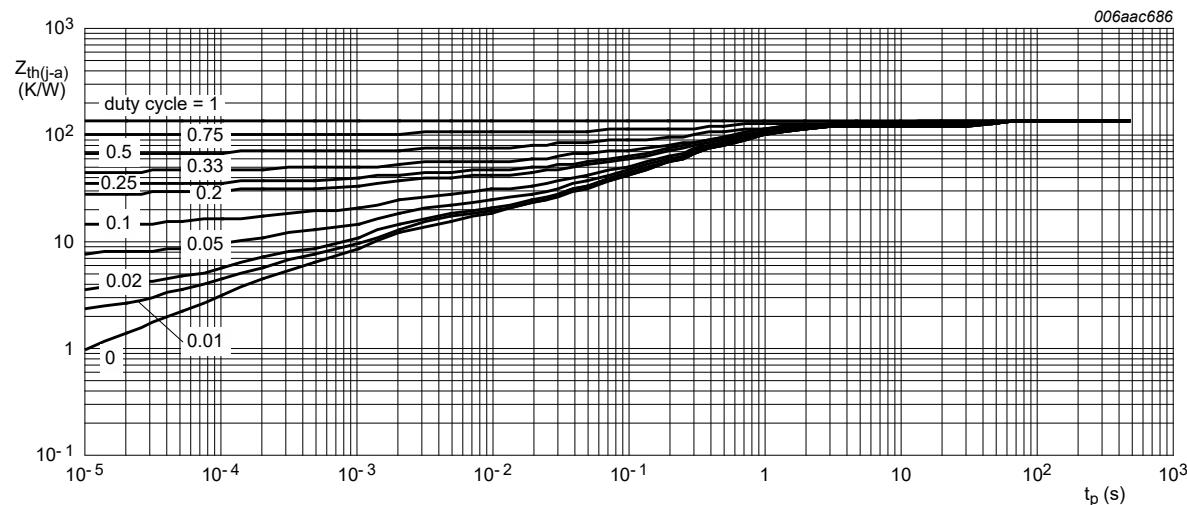
[4] Device mounted on an FR4 PCB, single-sided copper, tin-plated and mounting pad for collector 6 cm<sup>2</sup>.

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



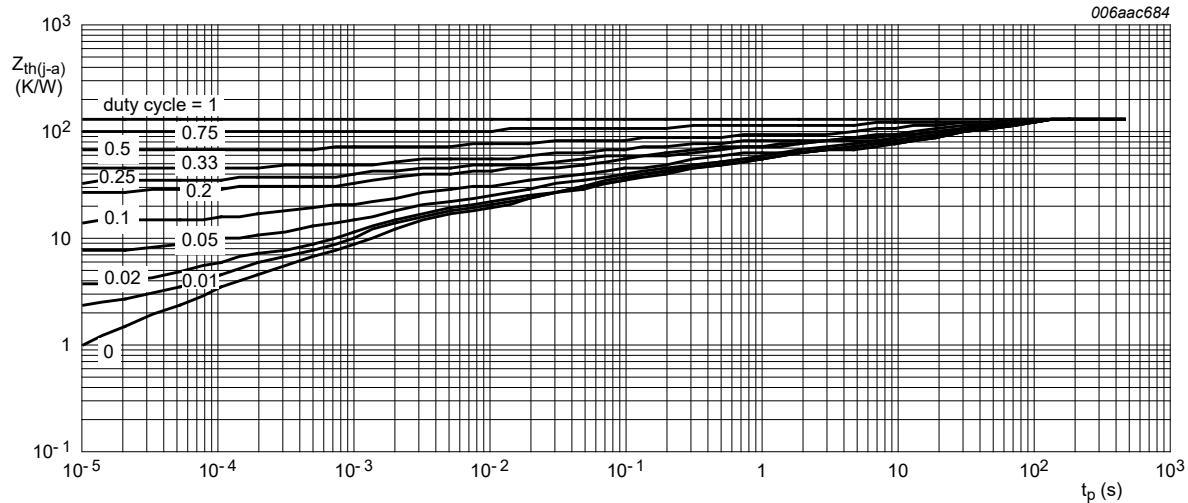
FR4 PCB, single-sided copper, standard footprint

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



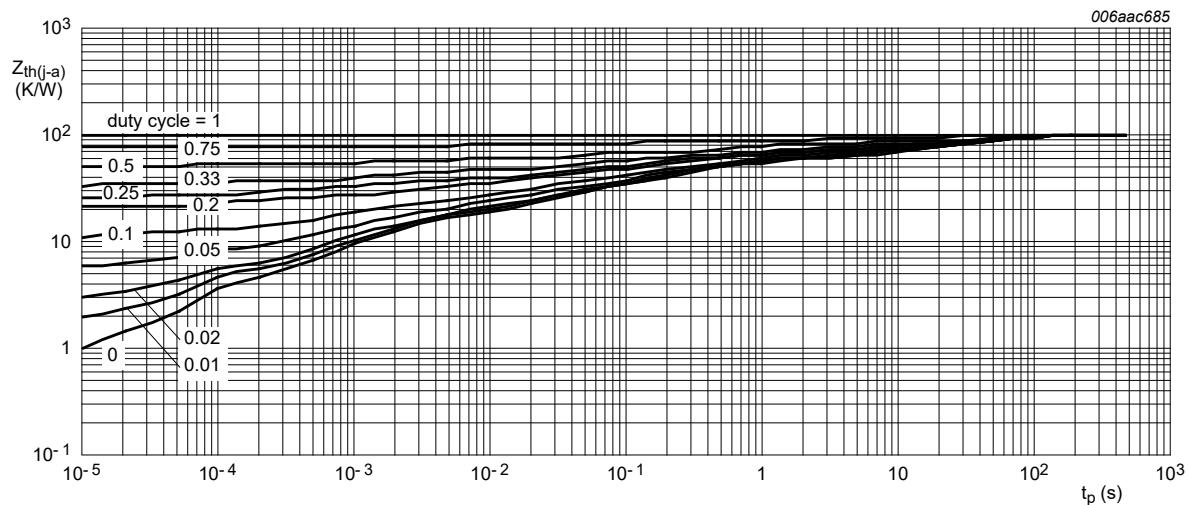
FR4 PCB, 4-layer copper, standard footprint

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



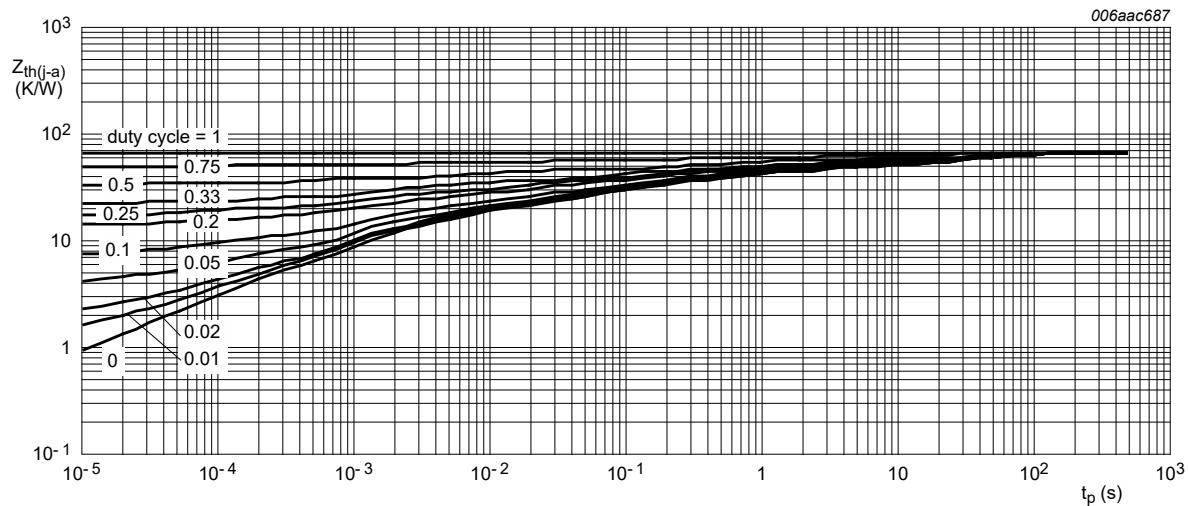
FR4 PCB, single-sided copper, mounting pad for collector  $1 \text{ cm}^2$

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



FR4 PCB, single-sided copper, mounting pad for collector  $6 \text{ cm}^2$

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



FR4 PCB, 4-layer copper, mounting pad for collector  $1 \text{ cm}^2$

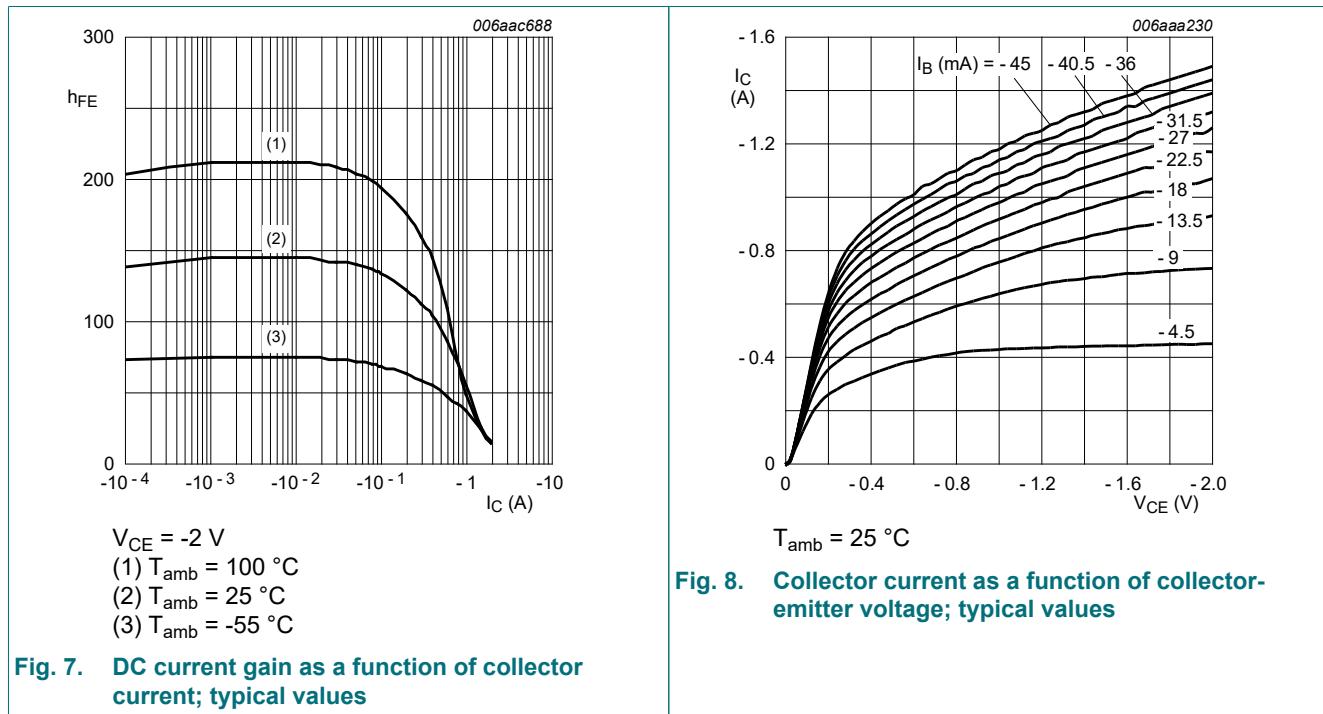
Fig. 6. Transient thermal impedance from junction to ambient as a function of pulse duration; typical values

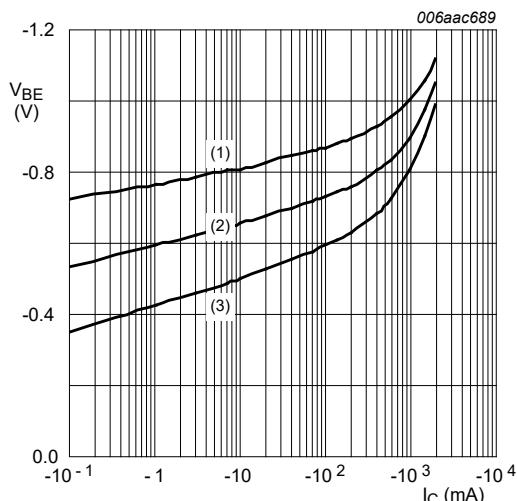
## 10. Characteristics

Table 7. Characteristics

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
$I_{CBO}$	collector-base cut-off current (emitter open)	$V_{CB} = -30 \text{ V}$ ; $I_E = 0 \text{ A}$ ; $T_{amb} = 25 \text{ }^\circ\text{C}$		-	-	-100	nA
		$V_{CB} = -30 \text{ V}$ ; $I_E = 0 \text{ A}$ ; $T_{amb} = 150 \text{ }^\circ\text{C}$		-	-	-10	μA
$I_{EBO}$	emitter-base cut-off current (collector open)	$V_{EB} = -5 \text{ V}$ ; $I_C = 0 \text{ A}$ ; $T_{amb} = 25 \text{ }^\circ\text{C}$		-	-	-100	nA
$h_{FE}$	DC current gain						
	BC51PAS-Q	$V_{CE} = -2 \text{ V}$ ; $I_C = -5 \text{ mA}$ ; $T_{amb} = 25 \text{ }^\circ\text{C}$		63	-	-	
	BC51-10PAS-Q			63	-	-	
	BC51-16PAS-Q			63	-	-	
	BC51PAS-Q	$V_{CE} = -2 \text{ V}$ ; $I_C = -150 \text{ mA}$ ; $T_{amb} = 25 \text{ }^\circ\text{C}$	[1]	63	-	250	
	BC51-10PAS-Q		[1]	63	-	160	
	BC51-16PAS-Q		[1]	100	-	250	
	BC51PAS-Q	$V_{CE} = -2 \text{ V}$ ; $I_C = -500 \text{ mA}$ ; $T_{amb} = 25 \text{ }^\circ\text{C}$	[1]	40	-	-	
	BC51-10PAS-Q		[1]	40	-	-	
	BC51-16PAS-Q		[1]	40	-	-	
$V_{CEsat}$	collector-emitter saturation voltage	$I_C = -500 \text{ mA}$ ; $I_B = -50 \text{ mA}$ ; $T_{amb} = 25 \text{ }^\circ\text{C}$	[1]	-	-	-500	mV
$V_{BE}$	base-emitter voltage	$V_{CE} = -2 \text{ V}$ ; $I_C = -500 \text{ mA}$ ; $T_{amb} = 25 \text{ }^\circ\text{C}$	[1]	-	-	-1	V
$C_c$	collector capacitance	$V_{CB} = -10 \text{ V}$ ; $i_e = 0 \text{ A}$ ; $f = 1 \text{ MHz}$ ; $T_{amb} = 25 \text{ }^\circ\text{C}$		-	15	-	pF
$f_T$	transition frequency	$V_{CE} = -5 \text{ V}$ ; $I_C = -50 \text{ mA}$ ; $f = 100 \text{ MHz}$ ; $T_{amb} = 25 \text{ }^\circ\text{C}$		-	145	-	MHz

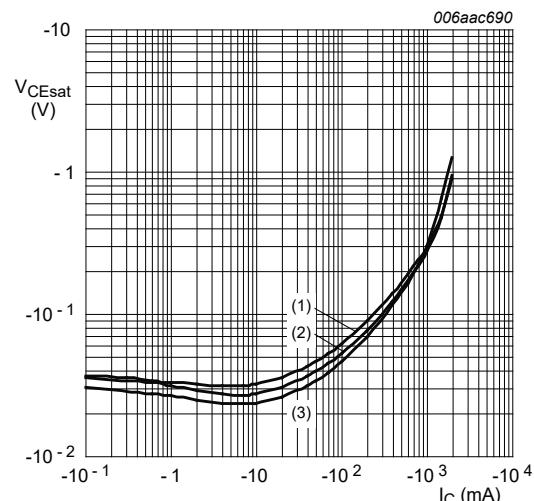
[1] pulsed;  $t_p \leq 300 \text{ } \mu\text{s}$ ;  $\delta \leq 0.02$





$V_{CE} = -2$  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

## 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

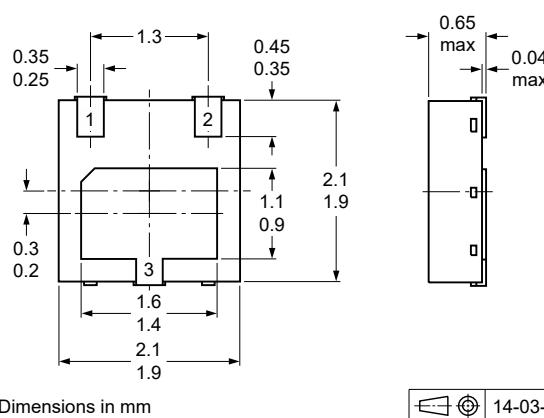
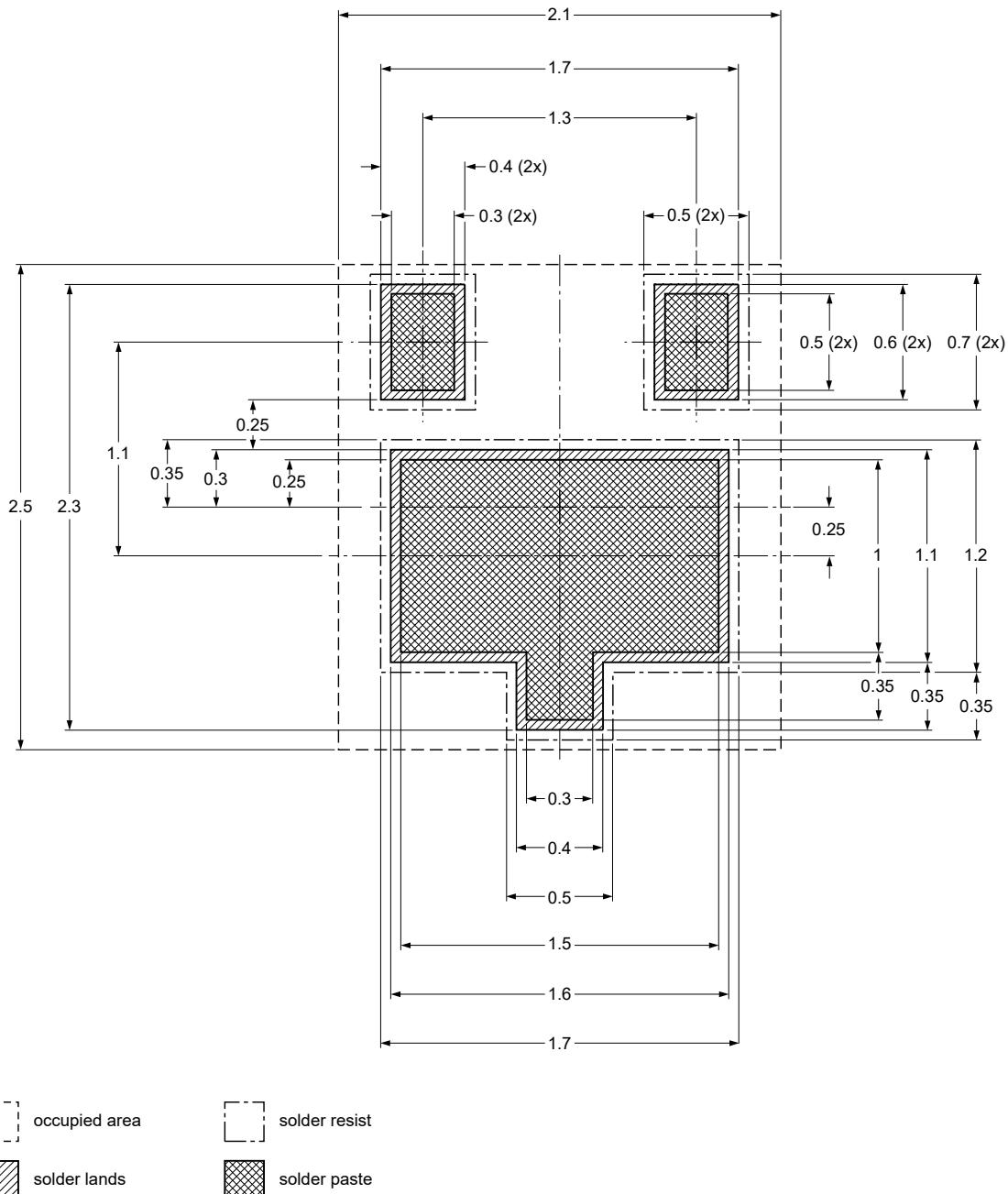


Fig. 11. Package outline DFN2020D-3 (SOT1061D)

## 13. Soldering

Footprint information for reflow soldering of DFN2020D-3 package

SOT1061D

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

## 14. Revision history

**Table 8. Revision history**

Data sheet ID	Release date	Data sheet status	Change notice	Supersedes
BC51XPAS-Q_SER v.1	20241018	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.

- [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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