



# BC51PAS; BC52PAS; BC53PAS

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

Rev. 1 — 19 June 2015

Product data sheet

## 1. Product profile

### 1.1 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.

Table 1. Product overview

Type number <sup>[1]</sup>	Package		NPN complement
BC51PAS	DFN2020D-3	SOT1061D	BC54PAS
BC52PAS			BC55PAS
BC53PAS			BC56PAS

[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
- High-side switches
- Power management
- Amplifiers

### 1.4 Quick reference data

Table 2. 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				
	BC51PAS series		-	-	-45	V
	BC52PAS series		-	-	-60	V
	BC53PAS series		-	-	-80	V

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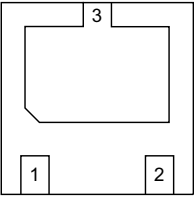
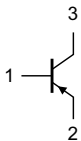
**Table 2. Quick reference data ...continued**  
 $T_{amb} = 25\text{ }^{\circ}\text{C}$  unless otherwise specified

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

[1] Pulse test:  $t_p \leq 300\text{ ms}$ ;  $\delta \leq 0.02$ .

## 2. Pinning information

**Table 3. Pinning**

Pin	Description	Simplified outline	Graphic symbol
1	base	 <p>Transparent top view</p>	 <p>sym013</p>
2	emitter		
3	collector		

## 3. Ordering information

**Table 4. Ordering information**

Type number <sup>[1]</sup>	Package		
	Name	Description	Version
BC51PAS series	DFN2020D-3	plastic thermal enhanced ultra thin small outline package; no leads; 3 terminals; body $2 \times 2 \times 0.65\text{ mm}$ .	SOT1061D
BC52PAS series			
BC53PAS series			

[1] Valid for all available selection groups.

## 4. Marking

Table 5. Marking codes

Type number	Marking code
BC51PAS	C4
BC51-10PAS	C5
BC51-16PAS	C6
BC52PAS	C7
BC52-10PAS	C8
BC52-16PAS	C9
BC53PAS	CA
BC53-10PAS	CB
BC53-16PAS	CC

## 5. Limiting values

Table 6. Limiting values

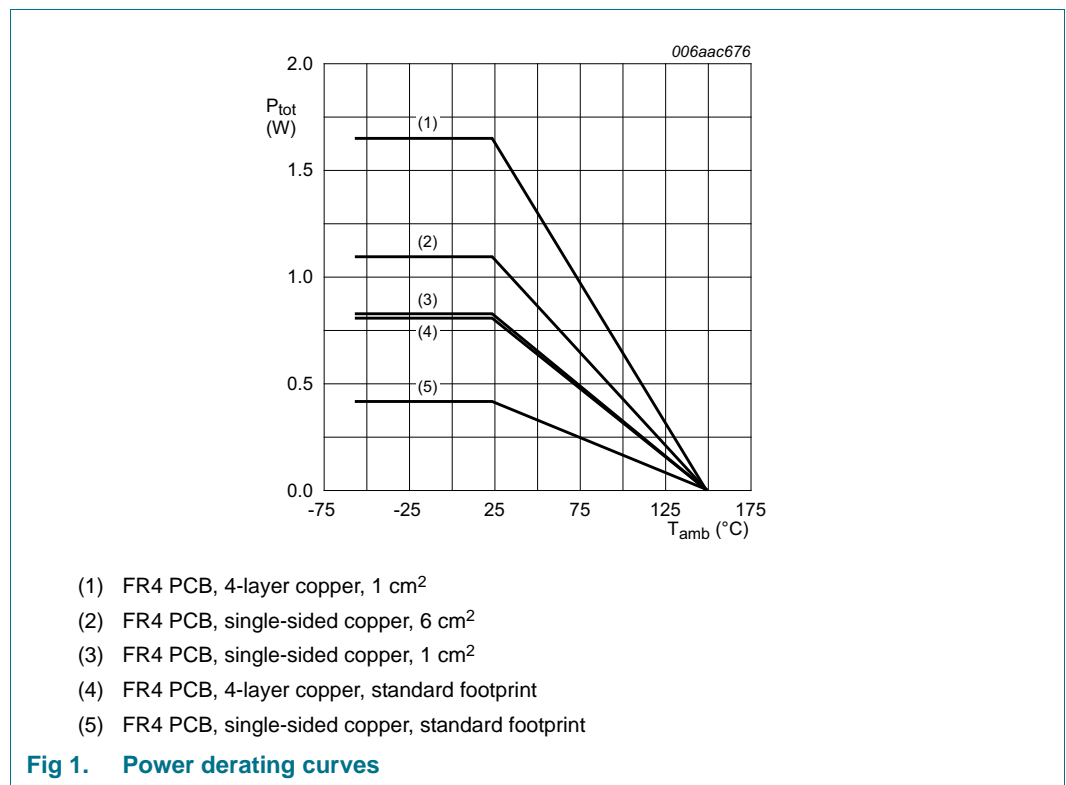
In accordance with the Absolute Maximum Rating System (IEC 60134).

Symbol	Parameter	Conditions	Min	Max	Unit
$V_{CBO}$	collector-base voltage	open emitter			
	BC51PAS series		-	-45	V
	BC52PAS series		-	-60	V
	BC53PAS series		-	-100	V
$V_{CEO}$	collector-emitter voltage	open base			
	BC51PAS series		-	-45	V
	BC52PAS series		-	-60	V
	BC53PAS series		-	-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 <sub>tot</sub>	total power dissipation	T <sub>amb</sub> ≤ 25 °C	[1]	-	0.42	W
			[2]	-	0.81	W
			[3]	-	0.83	W
			[4]	-	1.10	W
			[5]	-	1.65	W
T <sub>j</sub>	junction temperature		-	150	°C	
T <sub>amb</sub>	ambient temperature		-55	150	°C	
T <sub>stg</sub>	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>.

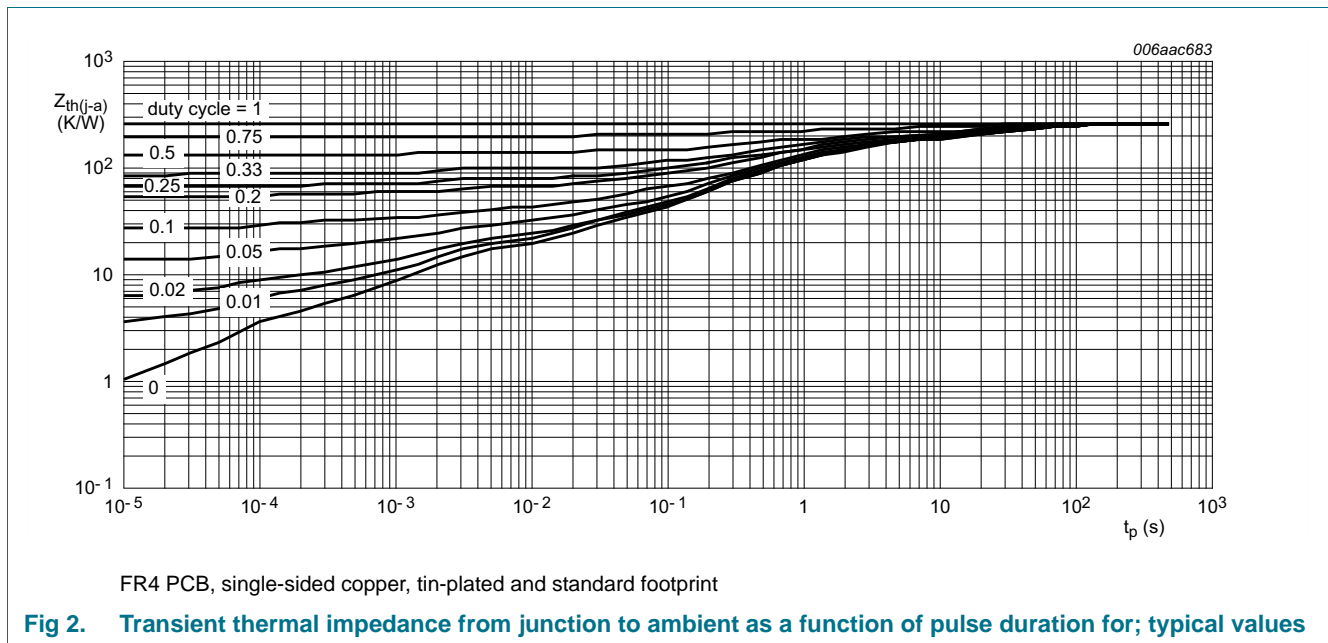


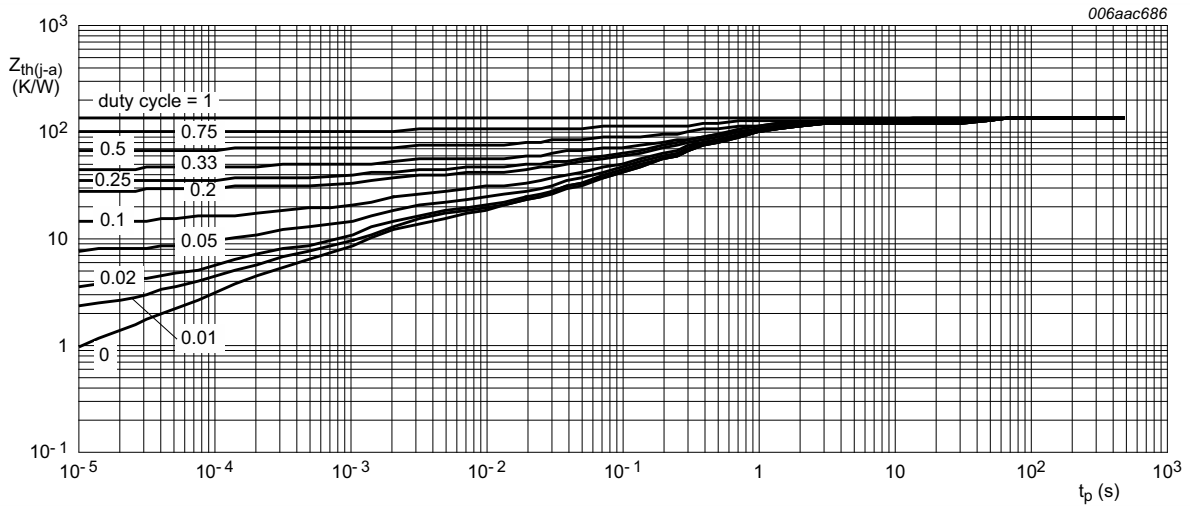
## 6. Thermal characteristics

**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

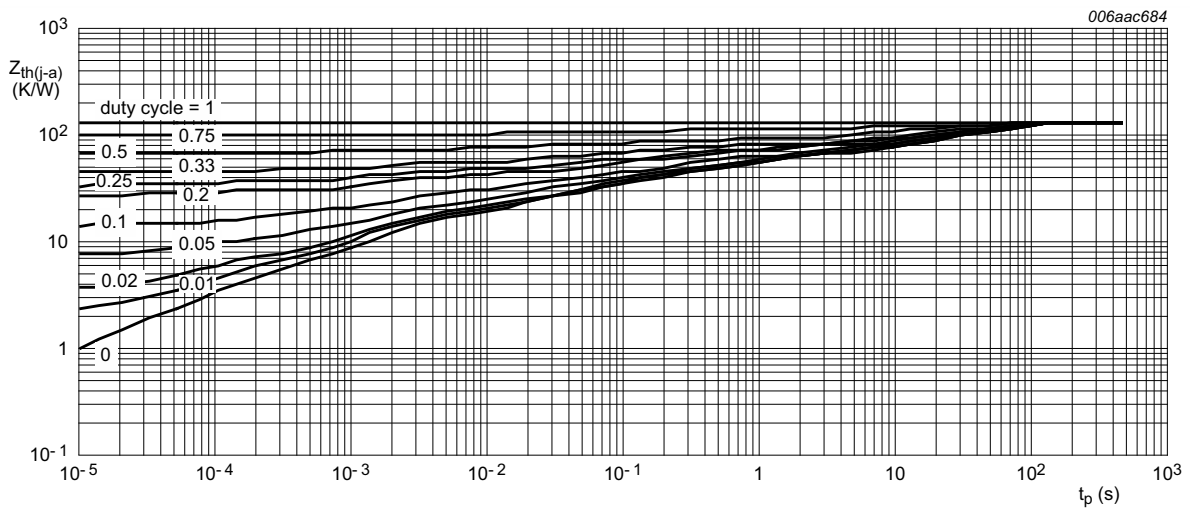
- [1] Device mounted on an FR4 Printed-Circuit Board (PCB), single-sided copper, tin-plated and standard footprint.
- [2] Device mounted on an FR4 PCB, 4-layer copper, tin-plated and standard footprint.
- [3] Device mounted on an FR4 PCB, single-sided copper, tin-plated and mounting pad for collector 1 cm<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>.





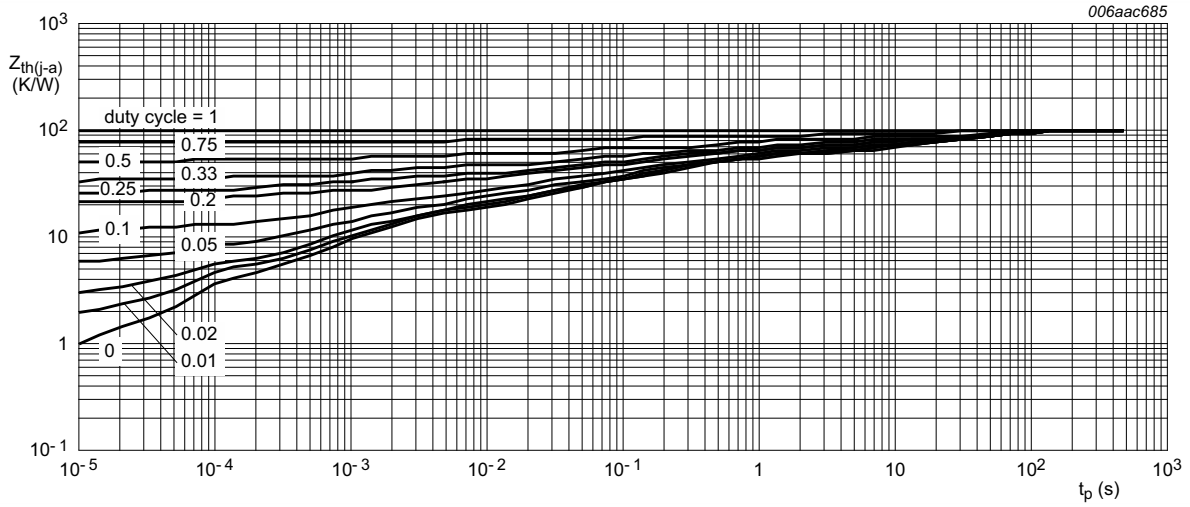
FR4 PCB, 4-layer copper, tin-plated and standard footprint.

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



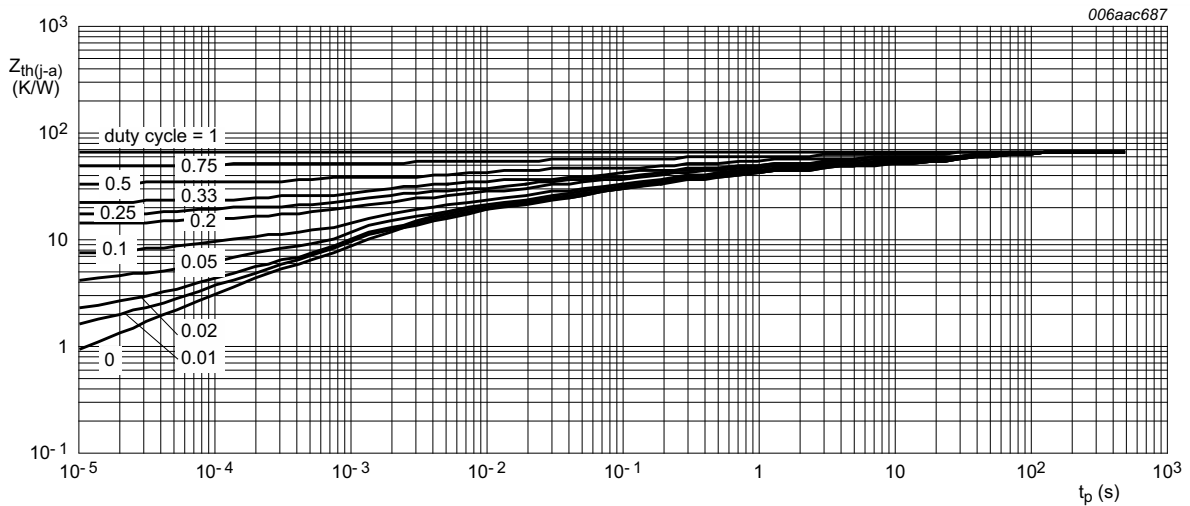
FR4 PCB, single-sided copper, tin-plated and mounting pad for collector 1 cm<sup>2</sup>

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



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

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



FR4 PCB, 4-layer copper, tin-plated and mounting pad for collector 1 cm<sup>2</sup>

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

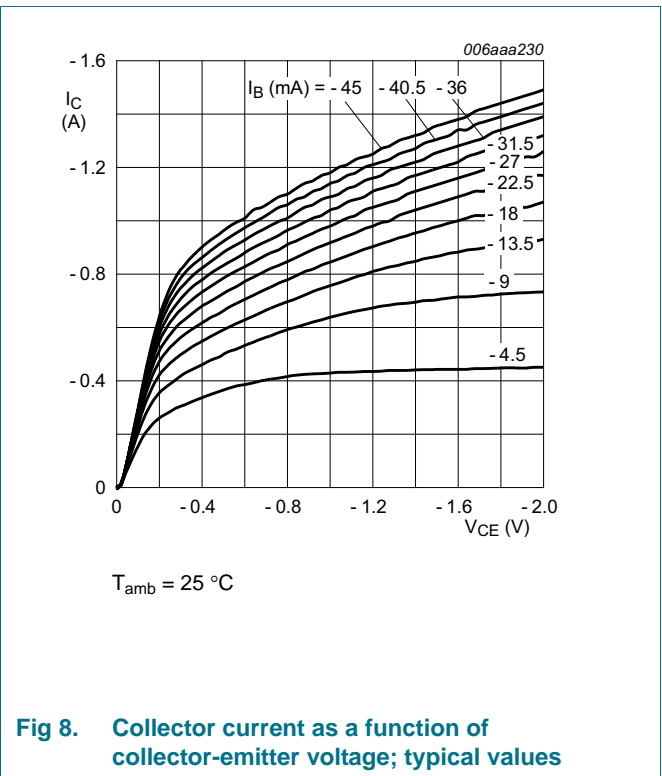
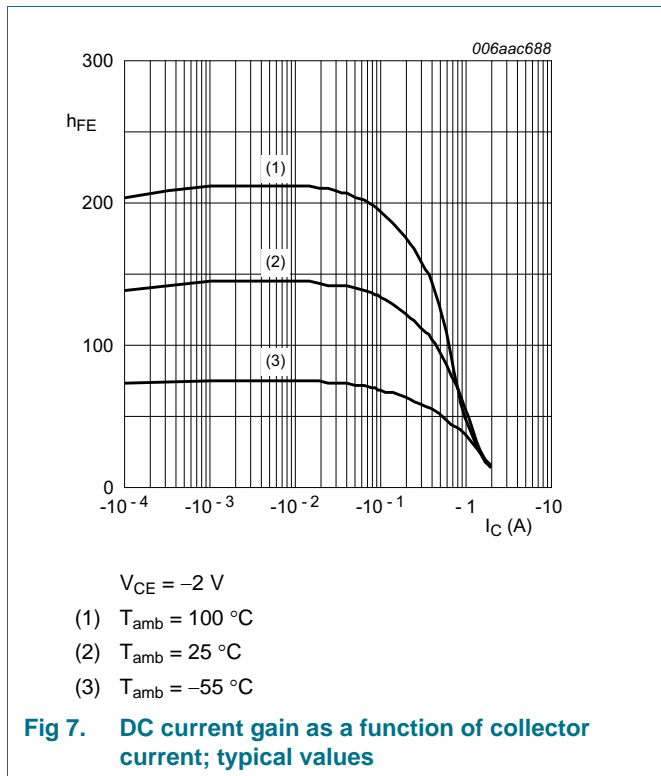
## 7. Characteristics

**Table 8. Characteristics**

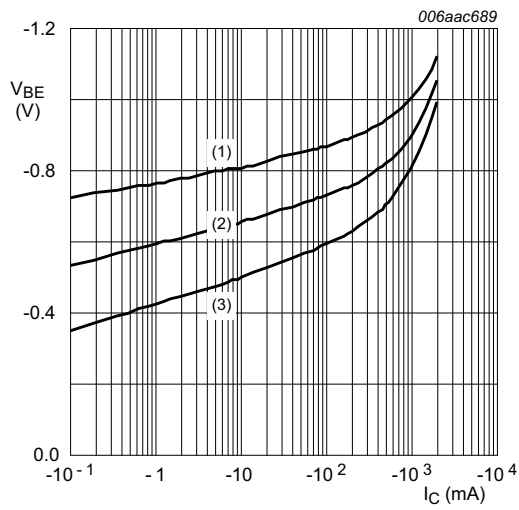
$T_{amb} = 25\text{ °C}$  unless otherwise specified

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$I_{CBO}$	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	$\mu\text{A}$
$I_{EBO}$	emitter-base cut-off current	$V_{EB} = -5\text{ V}; I_C = 0\text{ A}$	-	-	-100	nA
$h_{FE}$	DC current gain	$V_{CE} = -2\text{ V}; I_C = -5\text{ mA}$	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	-	-	
	$h_{FE}$ selection -10	$V_{CE} = -2\text{ V}; I_C = -150\text{ mA}$	[1] 63	-	160	
	$h_{FE}$ selection -16	$V_{CE} = -2\text{ V}; I_C = -150\text{ mA}$	[1] 100	-	250	
$V_{CEsat}$	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	$V_{CB} = -10\text{ V}; I_E = i_e = 0\text{ A}; f = 1\text{ MHz}$	-	15	-	pF
$f_T$	transition frequency	$V_{CE} = -5\text{ V}; I_C = -50\text{ mA}; f = 100\text{ MHz}$	-	145	-	MHz

[1] Pulse test:  $t_p \leq 300\text{ ms}; \delta \leq 0.02$ .



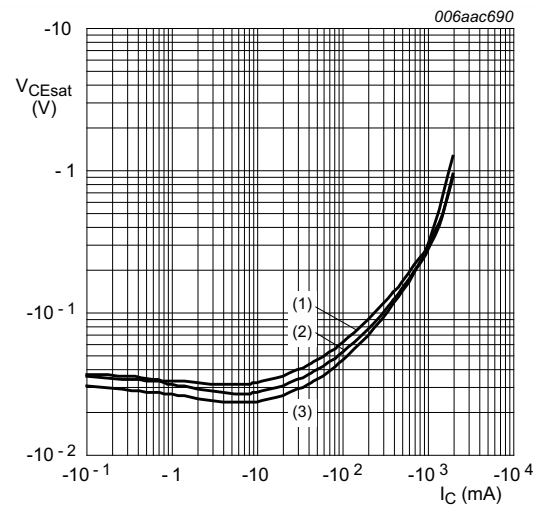




$V_{CE} = -2 \text{ V}$

- (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)  $T_{amb} = -55 \text{ °C}$

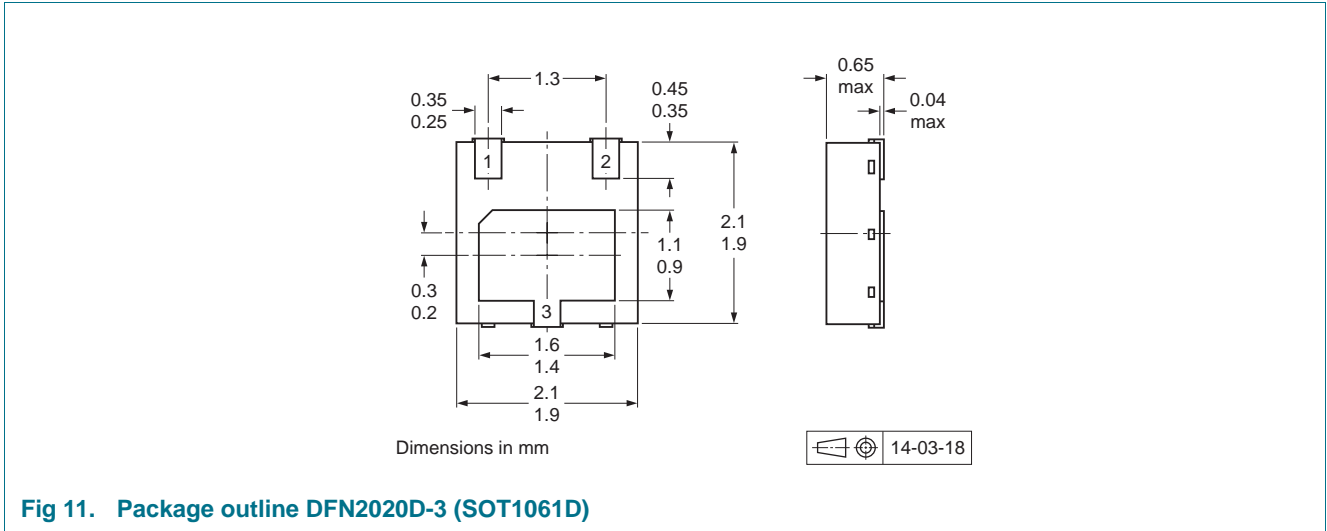
**Fig 10. Collector-emitter saturation voltage as a function of collector current; typical values**

## 8. Test information

### 8.1 Quality information

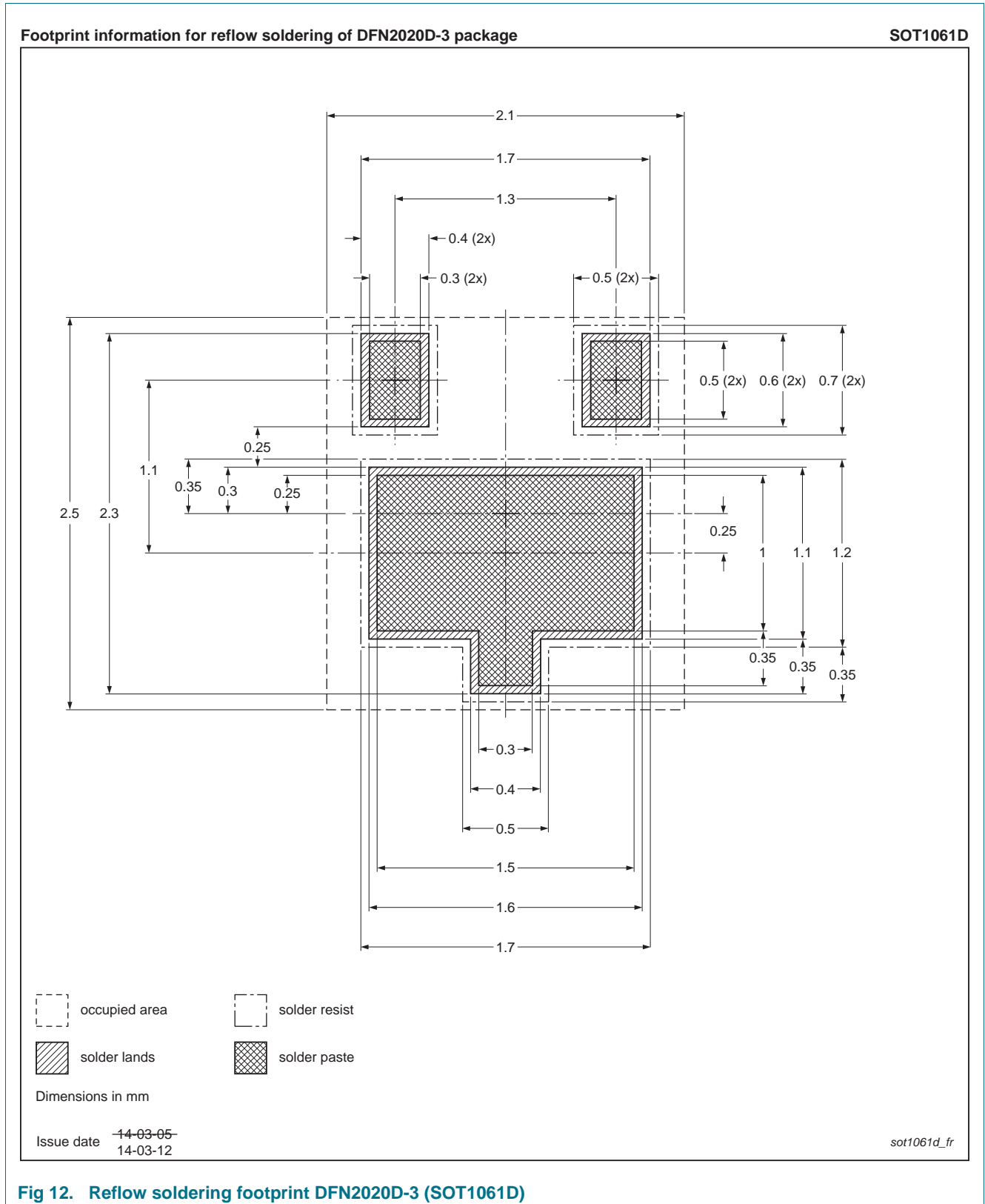
This product has been qualified in accordance with the Automotive Electronics Council (AEC) standard Q101 - *Stress test qualification for discrete semiconductors*, and is suitable for use in automotive applications.

## 9. Package outline



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

## 10. Soldering



## 11. Revision history

Table 9. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
BC51_52_53PAS_SER v.1	20150619	Product data sheet	-	-

## 12. Legal information

### 12.1 Data sheet status

Document status <sup>[1][2]</sup>	Product status <sup>[3]</sup>	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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## 14. Contents

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<b>1</b>	<b>Product profile</b> . . . . .	<b>1</b>
1.1	General description . . . . .	1
1.2	Features and benefits . . . . .	1
1.3	Applications . . . . .	1
1.4	Quick reference data . . . . .	1
<b>2</b>	<b>Pinning information</b> . . . . .	<b>2</b>
<b>3</b>	<b>Ordering information</b> . . . . .	<b>2</b>
<b>4</b>	<b>Marking</b> . . . . .	<b>3</b>
<b>5</b>	<b>Limiting values</b> . . . . .	<b>3</b>
<b>6</b>	<b>Thermal characteristics</b> . . . . .	<b>5</b>
<b>7</b>	<b>Characteristics</b> . . . . .	<b>8</b>
<b>8</b>	<b>Test information</b> . . . . .	<b>9</b>
8.1	Quality information . . . . .	9
<b>9</b>	<b>Package outline</b> . . . . .	<b>10</b>
<b>10</b>	<b>Soldering</b> . . . . .	<b>11</b>
<b>11</b>	<b>Revision history</b> . . . . .	<b>12</b>
<b>12</b>	<b>Legal information</b> . . . . .	<b>13</b>
12.1	Data sheet status . . . . .	13
12.2	Definitions . . . . .	13
12.3	Disclaimers . . . . .	13
12.4	Trademarks . . . . .	14
<b>13</b>	<b>Contact information</b> . . . . .	<b>14</b>
<b>14</b>	<b>Contents</b> . . . . .	<b>15</b>