



# BC54PAS; BC55PAS; BC56PAS

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

Rev. 1 — 11 November 2014

Product data sheet

## 1. Product profile

### 1.1 General description

NPN 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		PNP complement
BC54PAS	DFN2020D-3	SOT1061D	BC51PAS
BC55PAS			BC52PAS
BC56PAS			BC53PAS

[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
- Low-side switches
- Power management
- Amplifiers

### 1.4 Quick reference data

Table 2. Quick reference data

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$V_{CEO}$	collector-emitter voltage	open base				
	BC54PAS		-	-	45	V
	BC55PAS		-	-	60	V
	BC56PAS		-	-	80	V
$I_C$	collector current		-	-	1	A



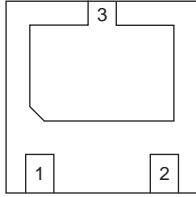
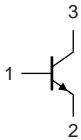
**Table 2. Quick reference data ...continued**

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$I_{CM}$	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 [1]	63	-	250	
	$h_{FE}$ selection -10	$V_{CE} = 2$ V; $I_C = 150$ mA [1]	63	-	160	
	$h_{FE}$ selection -16	$V_{CE} = 2$ V; $I_C = 150$ mA [1]	100	-	250	

[1] Pulse test:  $t_p \leq 300$   $\mu$ s;  $\delta \leq 0.02$

## 2. Pinning information

**Table 3. Pinning**

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

## 3. Ordering information

**Table 4. Ordering information**

Type number[1]	Package		Version
	Name	Description	
BC54PAS	DFN2020D-3	DFN2020D-3: plastic thermal enhanced ultra thin small outline package; no leads; 3 terminals; body 2 × 2 × 0.65 mm.	SOT1061D
BC55PAS			
BC56PAS			

[1] Valid for all available selection groups.

## 4. Marking

**Table 5. Marking codes**

Type number	Marking code
BC54PAS	CD
BC54-10PAS	CE
BC54-16-PAS	CF
BC55PAS	CG
BC55-10PAS	CH
BC55-16PAS	CJ
BC56PAS	CK
BC56-10PAS	CL
BC56-16PAS	CM

## 5. Limiting values

**Table 6. Limiting values**

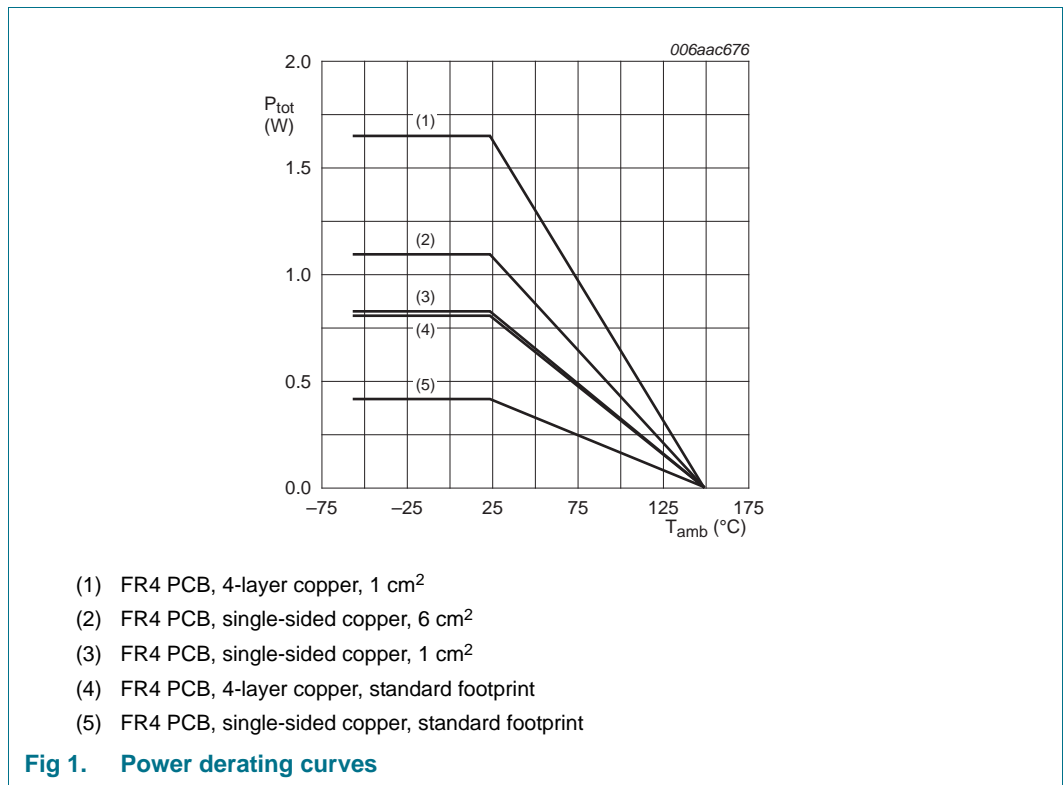
*In accordance with the Absolute Maximum Rating System (IEC 60134).*

Symbol	Parameter	Conditions	Min	Max	Unit
V <sub>CBO</sub>	collector-base voltage	open emitter			
	BC54PAS		-	45	V
	BC55PAS		-	60	V
	BC56PAS		-	100	V
V <sub>CEO</sub>	collector-emitter voltage	open base			
	BC54PAS		-	45	V
	BC55PAS		-	60	V
	BC56PAS		-	80	V
V <sub>EBO</sub>	emitter-base voltage	open collector	-	5	V
I <sub>C</sub>	collector current		-	1	A
I <sub>CM</sub>	peak collector current	single pulse; t <sub>p</sub> ≤ 1 ms	-	2	A
I <sub>B</sub>	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>.

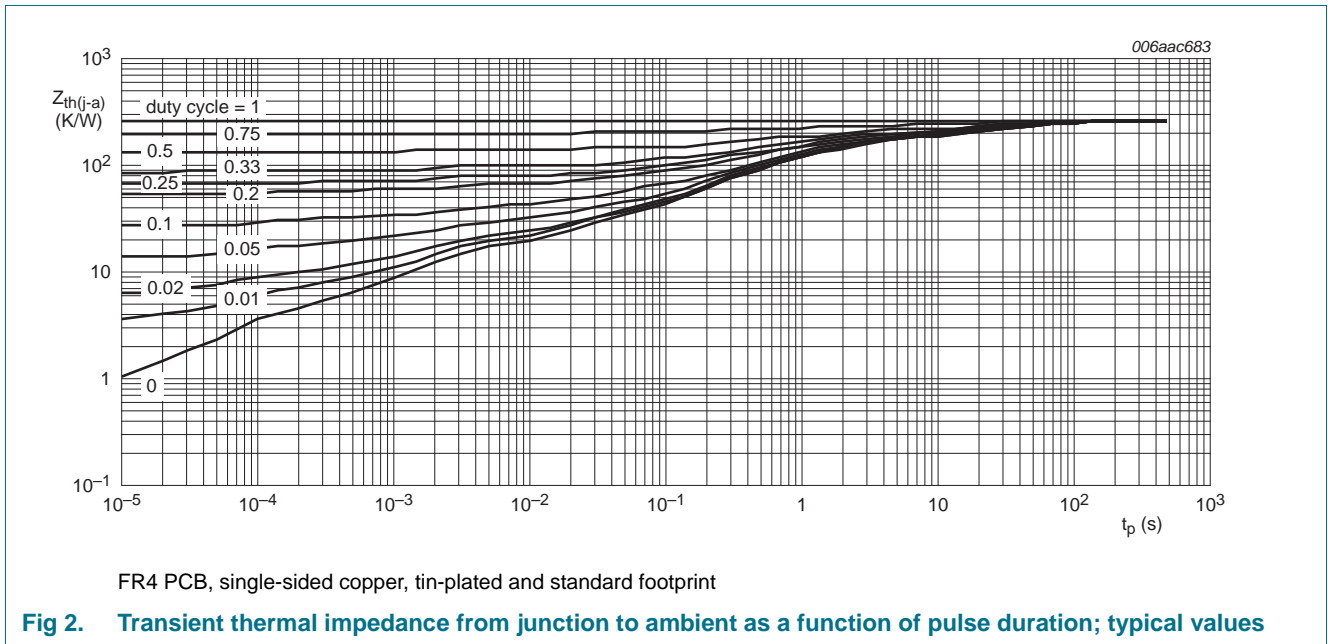


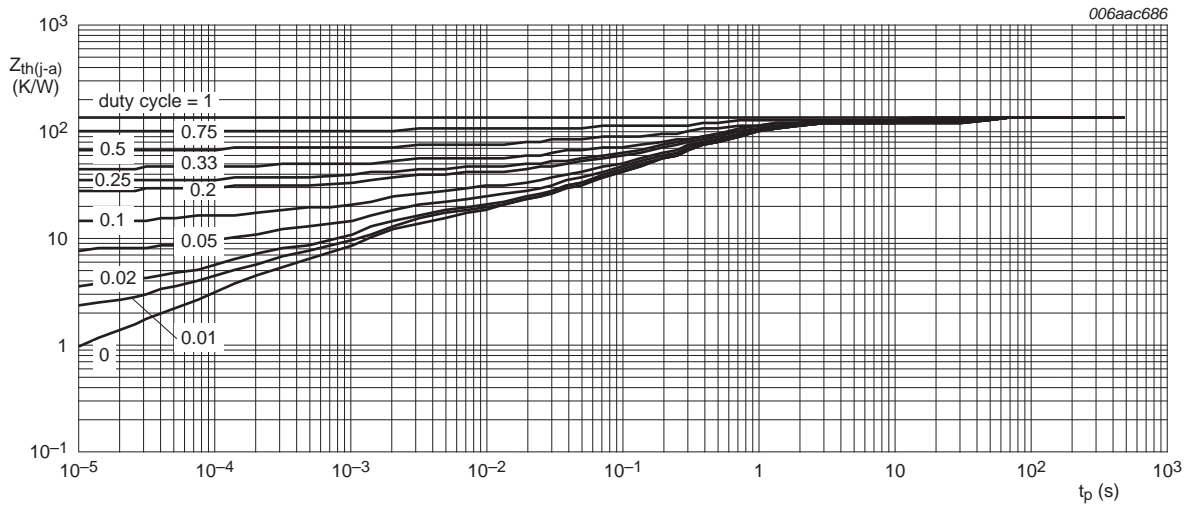
**6. Thermal characteristics**

**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

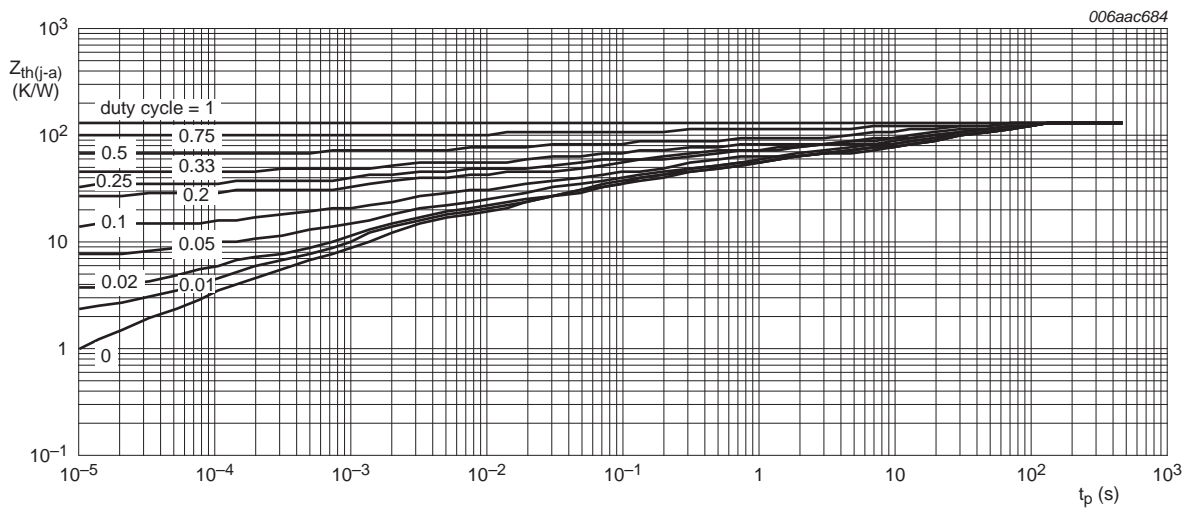
- [1] Device mounted on an FR4 Printed-Circuit Board (PCB), single-sided copper, tin-plated and standard footprint.
- [2] Device mounted on an FR4 PCB, 4-layer copper, tin-plated and standard footprint.
- [3] Device mounted on an FR4 PCB, single-sided copper, tin-plated and mounting pad for collector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





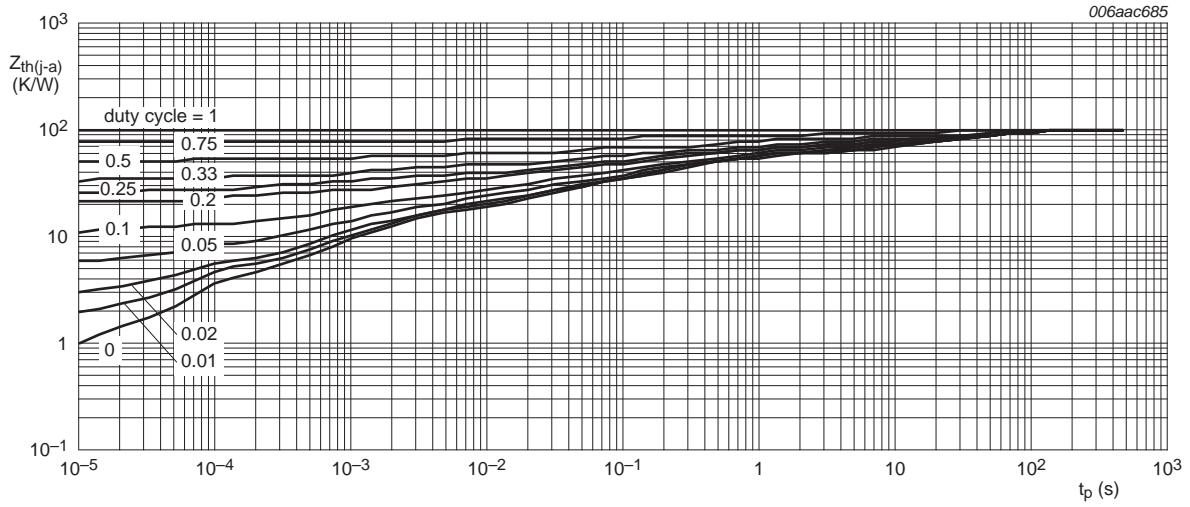
FR4 PCB, 4-layer copper, tin-plated and standard footprint

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



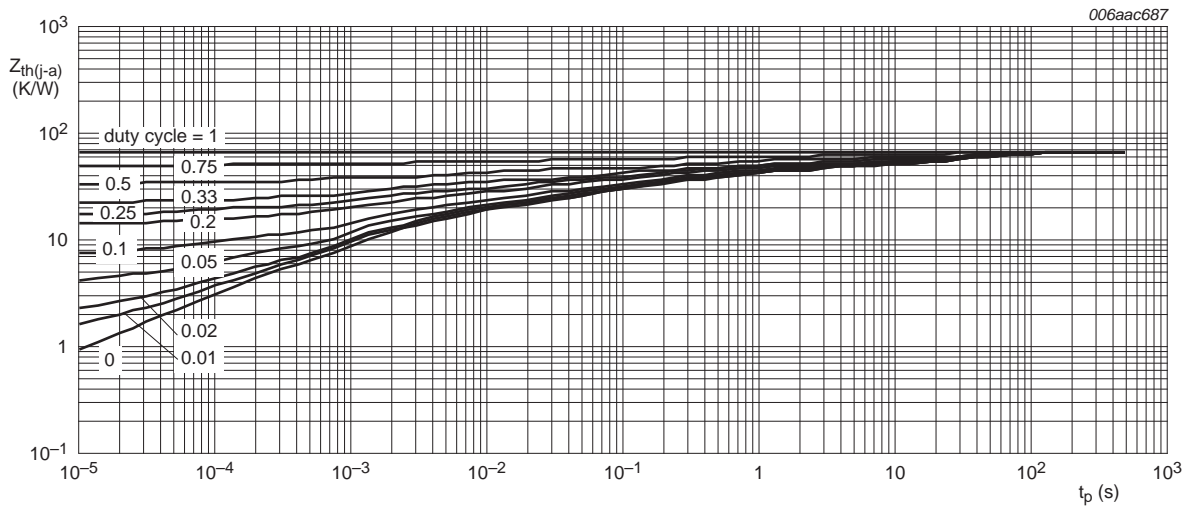
FR4 PCB, single-sided copper, tin-plated and mounting pad for collector 1 cm<sup>2</sup>

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

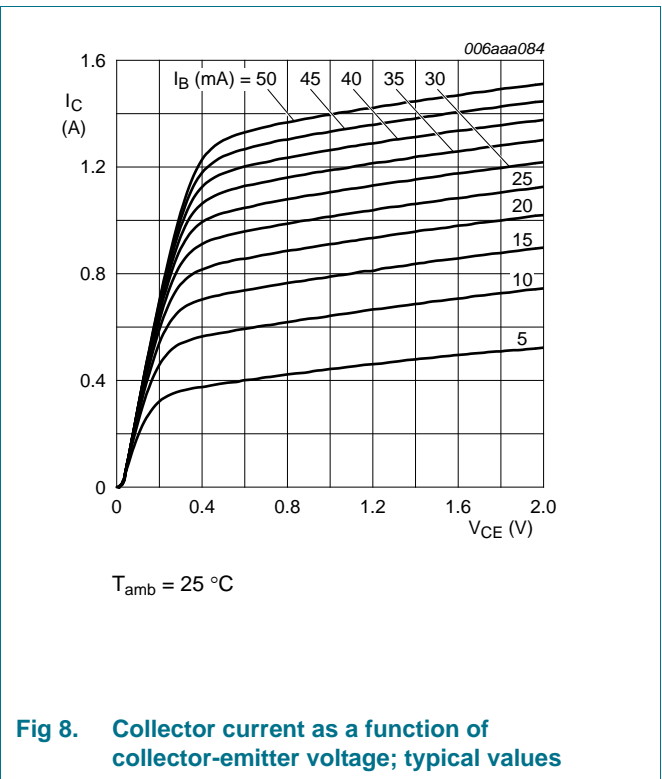
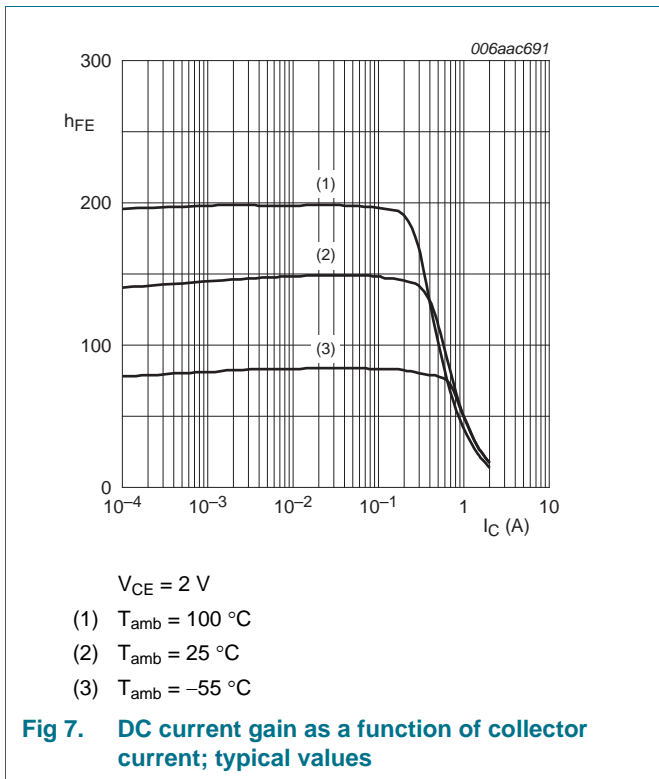
**7. Characteristics**

**Table 8. Characteristics**

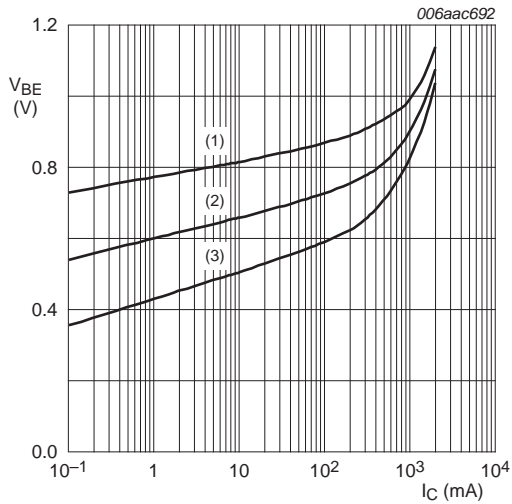
$T_{amb} = 25\text{ }^{\circ}\text{C}$  unless otherwise specified

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
		$V_{CB} = 30\text{ V}; I_E = 0\text{ A}; T_J = 150\text{ }^{\circ}\text{C}$	-	-	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	$V_{CB} = 10\text{ V}; I_E = i_e = 0\text{ A}; f = 1\text{ MHz}$	-	6	-	pF
$f_T$	transition frequency	$V_{CE} = 5\text{ V}; I_C = 50\text{ mA}; f = 100\text{ MHz}$	100	180	-	MHz

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

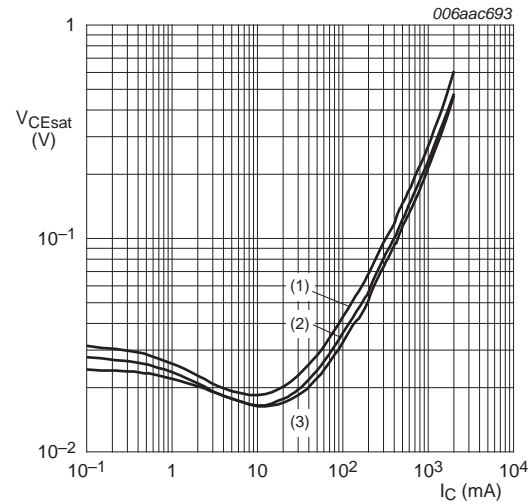






$V_{CE} = 2\text{ V}$   
 (1)  $T_{amb} = -55\text{ °C}$   
 (2)  $T_{amb} = 25\text{ °C}$   
 (3)  $T_{amb} = 100\text{ °C}$

**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)  $T_{amb} = -55\text{ °C}$

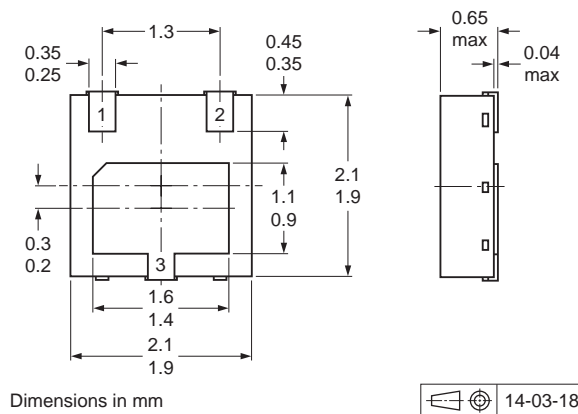
**Fig 10. Collector-emitter saturation voltage as a function of collector current; typical values**

## 8. Test information

### 8.1 Quality information

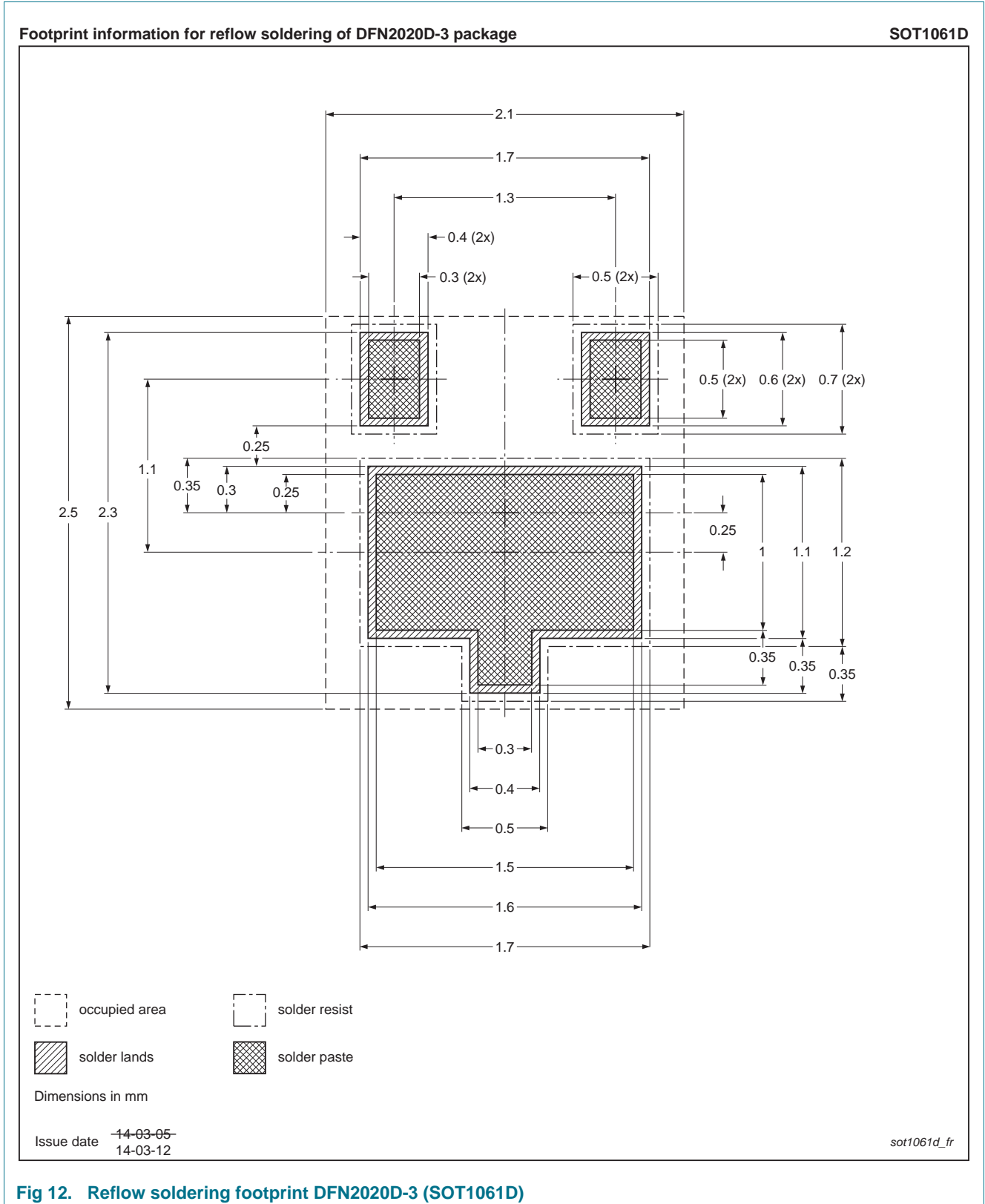
This product has been qualified in accordance with the Automotive Electronics Council (AEC) standard Q101 - *Stress test qualification for discrete semiconductors*, and is suitable for use in automotive applications.

## 9. Package outline



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

**10. Soldering**



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

## 11. Revision history

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**Table 9.** Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
BC54_55_56PAS_SER v.1	20141111	Product data sheet	-	-

## 12. Legal information

### 12.1 Data sheet status

Document status <sup>[1][2]</sup>	Product status <sup>[3]</sup>	Definition
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