



# 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    |

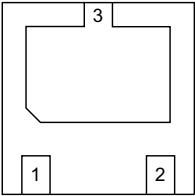
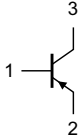
Table 2. Quick reference data ...continued  
*T<sub>amb</sub> = 25 °C unless otherwise specified*

| Symbol          | Parameter                     | Conditions                                           | Min | Typ | Max | Unit |
|-----------------|-------------------------------|------------------------------------------------------|-----|-----|-----|------|
| 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    |
| h <sub>FE</sub> | DC current gain               | V <sub>CE</sub> = -2 V; I <sub>C</sub> = -150 mA [1] | 63  | -   | 250 |      |
|                 | h <sub>FE</sub> selection -10 | V <sub>CE</sub> = -2 V; I <sub>C</sub> = -150 mA [1] | 63  | -   | 160 |      |
|                 | h <sub>FE</sub> selection -16 | V <sub>CE</sub> = -2 V; I <sub>C</sub> = -150 mA [1] | 100 | -   | 250 |      |

[1] Pulse test: t<sub>p</sub> ≤ 300 ms; δ ≤ 0.02.

2. Pinning information

Table 3. Pinning

| Pin | Description | Simplified outline                                                                                           | Graphic symbol                                                                                 |
|-----|-------------|--------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------|
| 1   | base        | <br>Transparent top view | <br>sym013 |
| 2   | emitter     |                                                                                                              |                                                                                                |
| 3   | collector   |                                                                                                              |                                                                                                |

3. Ordering information

Table 4. Ordering information

| Type number[1] | Package    |                                                                                                         |          |
|----------------|------------|---------------------------------------------------------------------------------------------------------|----------|
|                | Name       | Description                                                                                             | Version  |
| BC51PAS series | DFN2020D-3 | plastic thermal enhanced ultra thin small outline package; no leads; 3 terminals; body 2 × 2 × 0.65 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

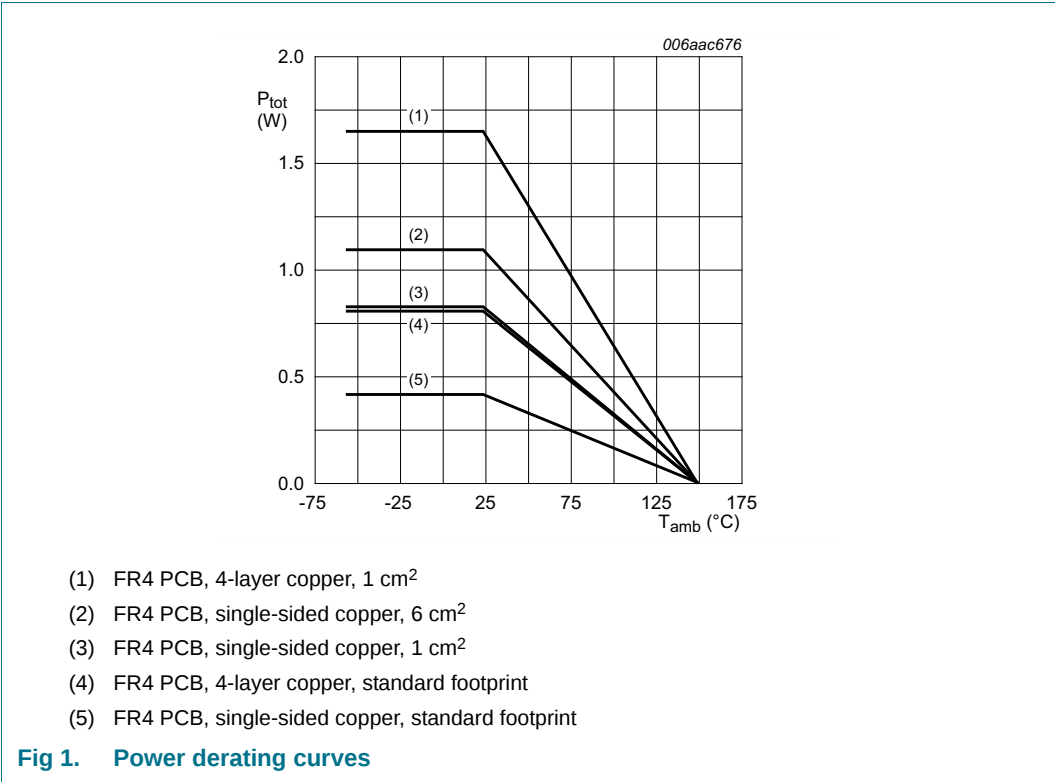
In accordance with the Absolute Maximum Rating System (IEC 60134).

| 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>.

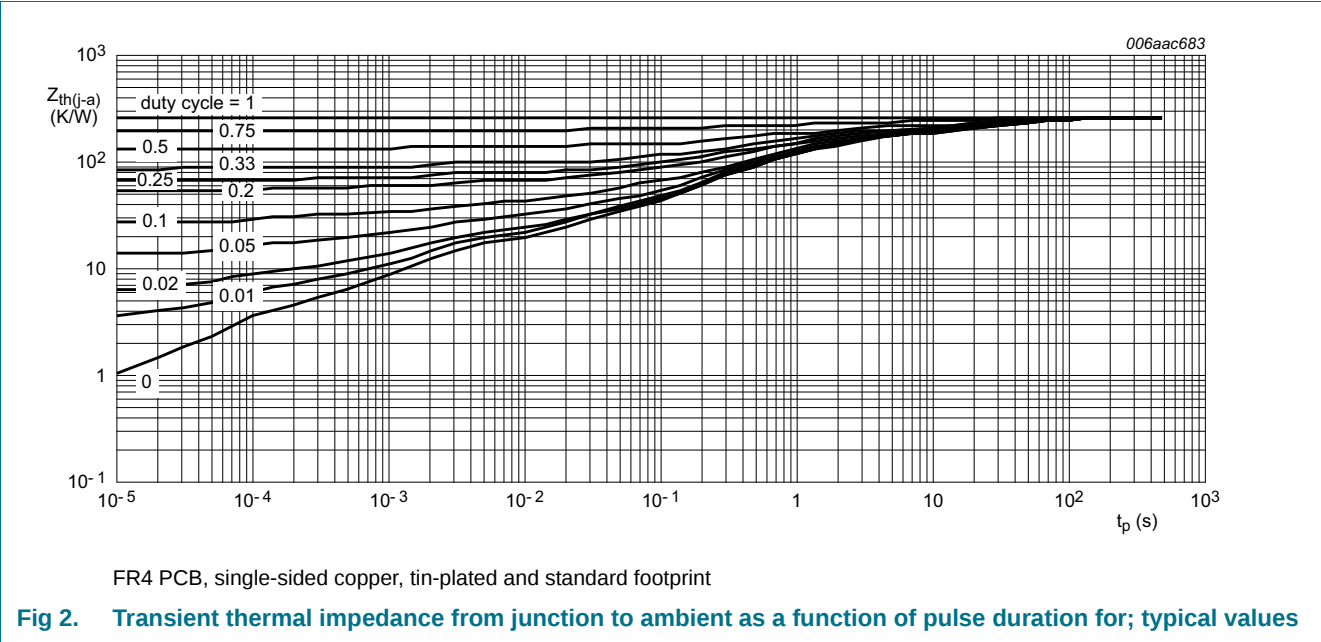


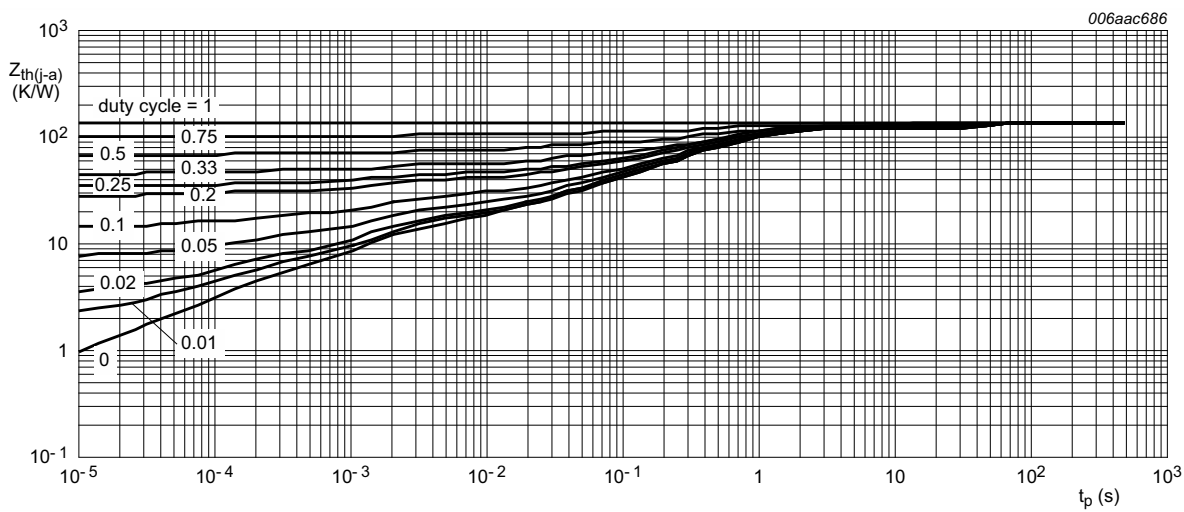
6. Thermal characteristics

Table 7. Thermal characteristics

| Symbol                | Parameter                                        | Conditions  | Max                     | Unit |
|-----------------------|--------------------------------------------------|-------------|-------------------------|------|
| R <sub>th(j-a)</sub>  | thermal resistance from junction to ambient      | in free air | <a href="#">[1]</a> 298 | K/W  |
|                       |                                                  |             | <a href="#">[2]</a> 154 | K/W  |
|                       |                                                  |             | <a href="#">[3]</a> 151 | K/W  |
|                       |                                                  |             | <a href="#">[4]</a> 114 | K/W  |
|                       |                                                  |             | <a href="#">[5]</a> 76  | K/W  |
| R <sub>th(j-sp)</sub> | thermal resistance from junction to solder point | in free air | 20                      | K/W  |

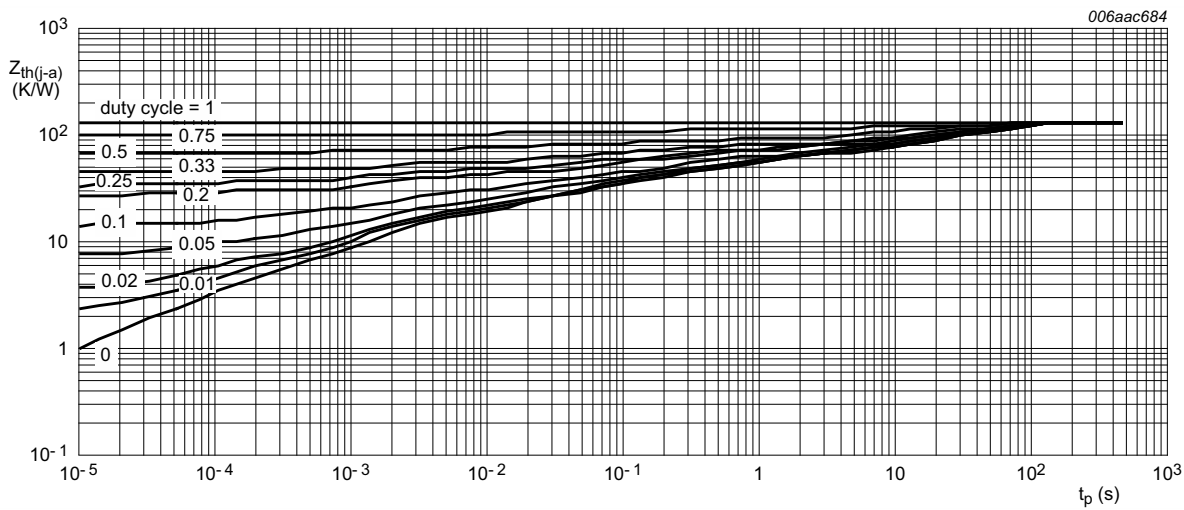
- [1] Device mounted on an FR4 Printed-Circuit Board (PCB), single-sided copper, tin-plated and standard footprint.
- [2] Device mounted on an FR4 PCB, 4-layer copper, tin-plated and standard footprint.
- [3] Device mounted on an FR4 PCB, single-sided copper, tin-plated and mounting pad for collector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





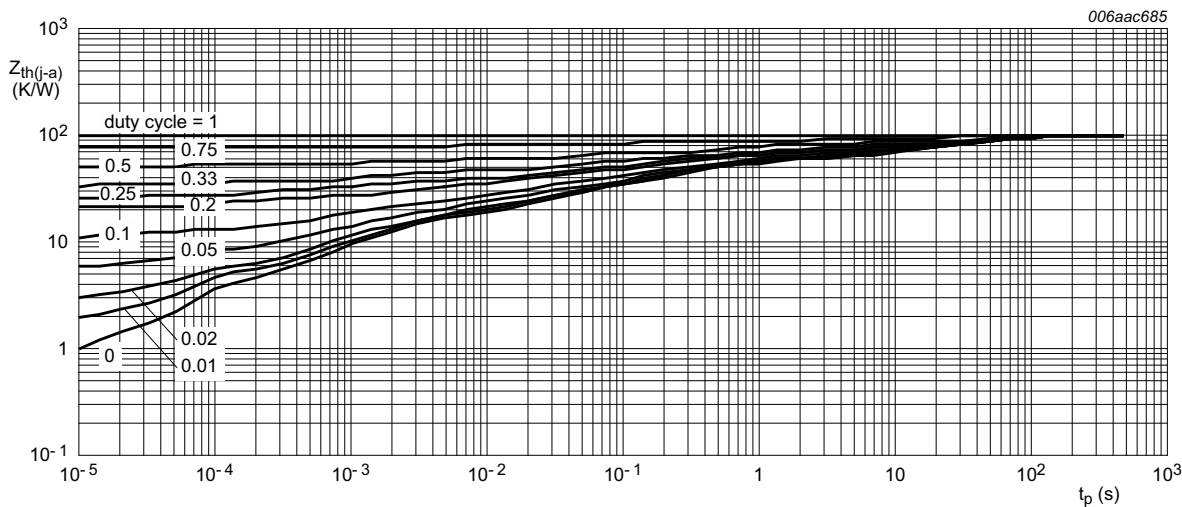
FR4 PCB, 4-layer copper, tin-plated and standard footprint.

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



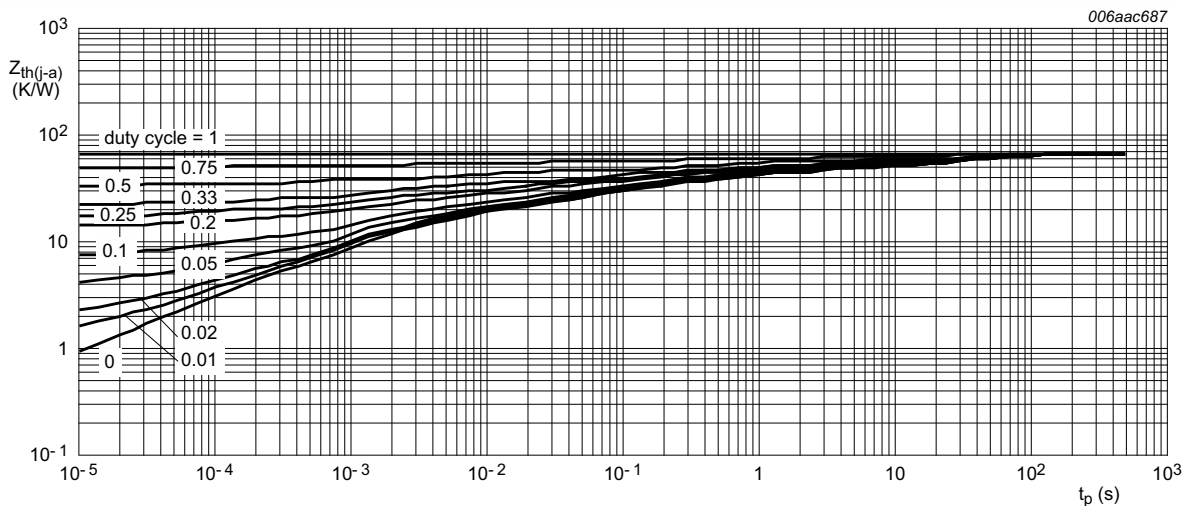
FR4 PCB, single-sided copper, tin-plated and mounting pad for collector 1 cm<sup>2</sup>

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>

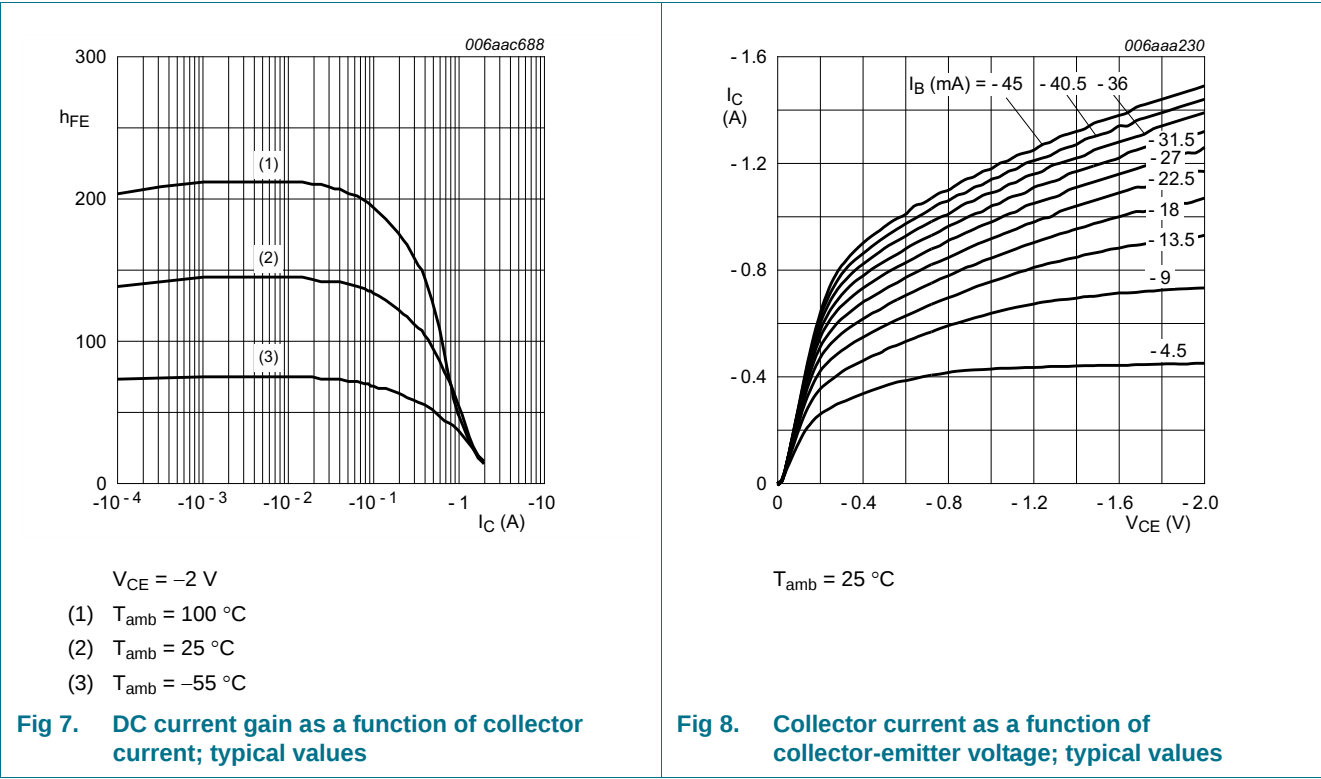
Fig 6. Transient thermal impedance from junction to ambient as a function of pulse duration for; typical values

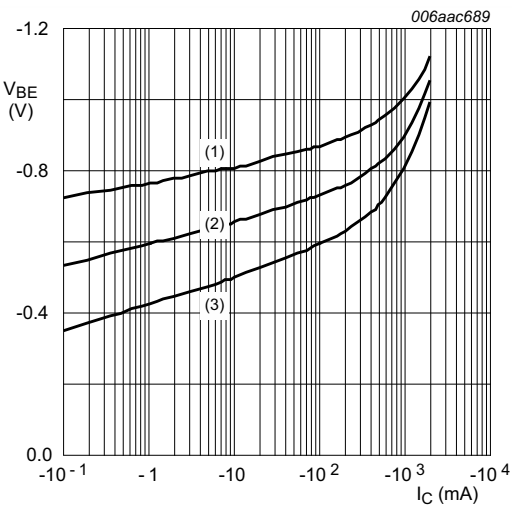
7. Characteristics

Table 8. Characteristics  
*T<sub>amb</sub> = 25 °C unless otherwise specified*

| Symbol             | Parameter                            | Conditions                                                                | Min     | Typ | Max  | Unit |
|--------------------|--------------------------------------|---------------------------------------------------------------------------|---------|-----|------|------|
| I <sub>CBO</sub>   | collector-base cut-off current       | V <sub>CB</sub> = -30 V; I <sub>E</sub> = 0 A                             | -       | -   | -100 | nA   |
|                    |                                      | V <sub>CB</sub> = -30 V; I <sub>E</sub> = 0 A; T <sub>J</sub> = 150 °C    | -       | -   | -10  | μA   |
| I <sub>EBO</sub>   | emitter-base cut-off current         | V <sub>EB</sub> = -5 V; I <sub>C</sub> = 0 A                              | -       | -   | -100 | nA   |
| h <sub>FE</sub>    | DC current gain                      | V <sub>CE</sub> = -2 V; I <sub>C</sub> = -5 mA                            | 63      | -   | -    |      |
|                    |                                      | V <sub>CE</sub> = -2 V; I <sub>C</sub> = -150 mA                          | [1] 63  | -   | 250  |      |
|                    |                                      | V <sub>CE</sub> = -2 V; I <sub>C</sub> = -500 mA                          | [1] 40  | -   | -    |      |
|                    | h <sub>FE</sub> selection -10        | V <sub>CE</sub> = -2 V; I <sub>C</sub> = -150 mA                          | [1] 63  | -   | 160  |      |
|                    | h <sub>FE</sub> selection -16        | V <sub>CE</sub> = -2 V; I <sub>C</sub> = -150 mA                          | [1] 100 | -   | 250  |      |
| V <sub>CEsat</sub> | collector-emitter saturation voltage | I <sub>C</sub> = -500 mA; I <sub>B</sub> = -50 mA                         | [1] -   | -   | -500 | mV   |
| V <sub>BE</sub>    | base-emitter voltage                 | V <sub>CE</sub> = -2 V; I <sub>C</sub> = -500 mA                          | [1] -   | -   | -1   | V    |
| C <sub>c</sub>     | collector capacitance                | V <sub>CB</sub> = -10 V; I <sub>E</sub> = i <sub>e</sub> = 0 A; f = 1 MHz | -       | 15  | -    | pF   |
| f <sub>T</sub>     | transition frequency                 | V <sub>CE</sub> = -5 V; I <sub>C</sub> = -50 mA; f = 100 MHz              | -       | 145 | -    | MHz  |

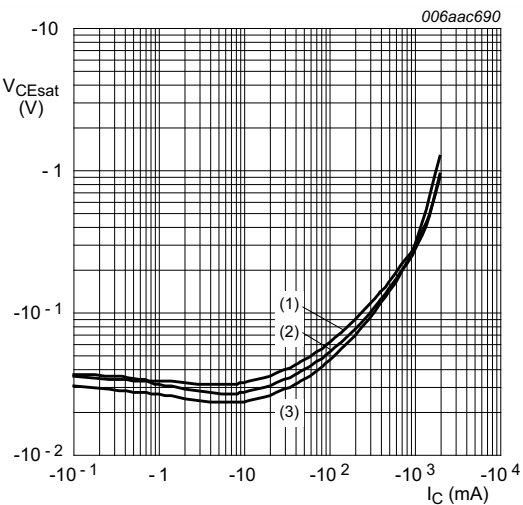
[1] Pulse test: t<sub>p</sub> ≤ 300 ms; δ ≤ 0.02.





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

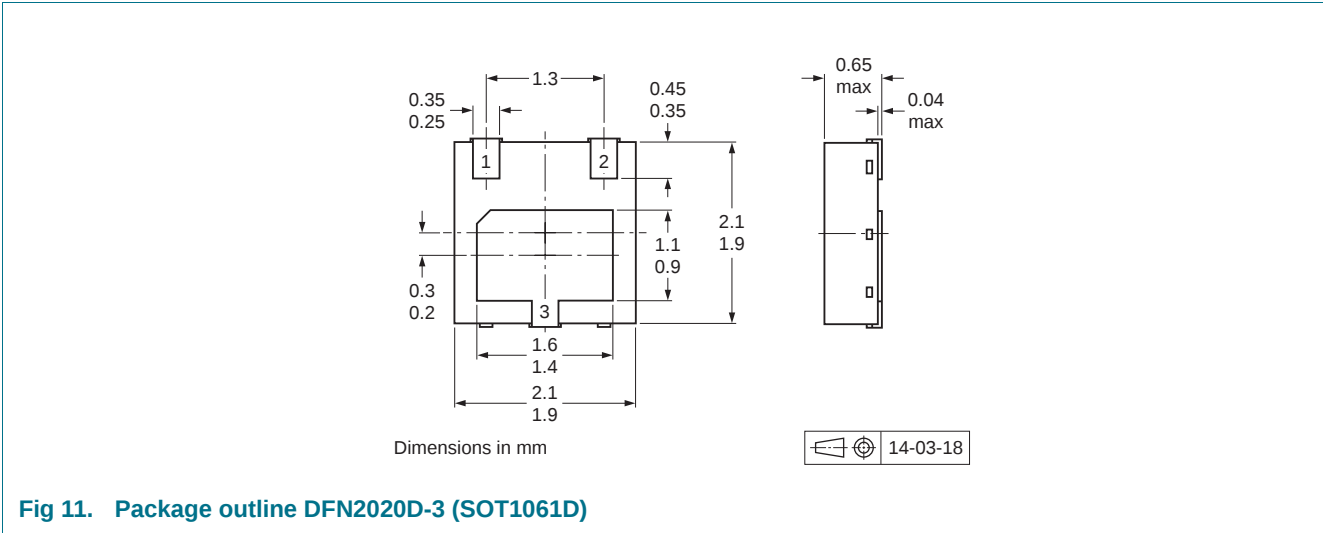
Fig 10. Collector-emitter saturation voltage as a function of collector current; typical values

## 8. Test information

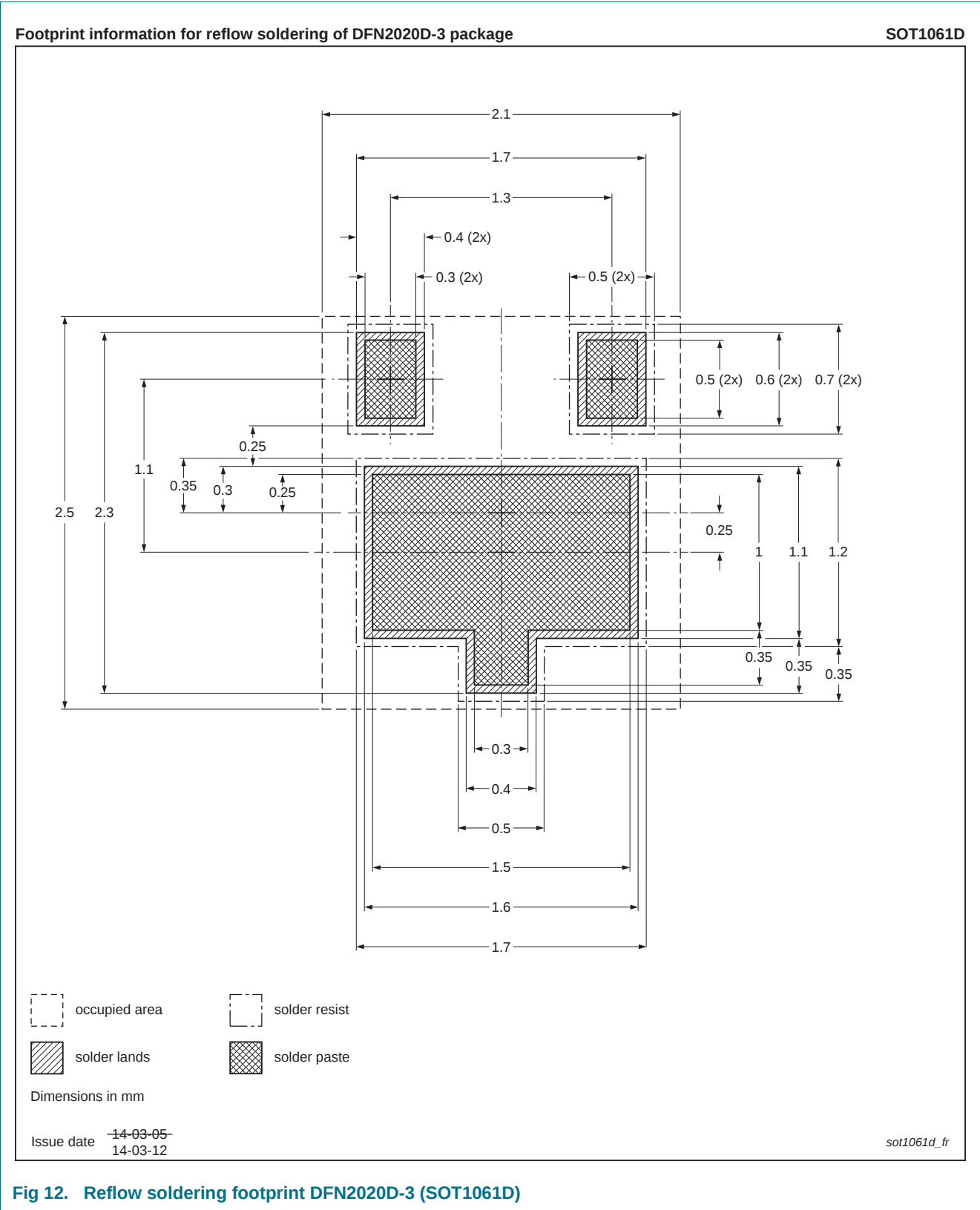
### 8.1 Quality information

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



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.                                     |

[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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