



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 ^[1] | 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 |

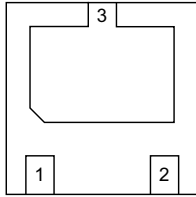
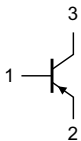
Table 2. Quick reference data ...continued
 $T_{amb} = 25\text{ }^{\circ}\text{C}$ unless otherwise specified

| 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 ^[1] | 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

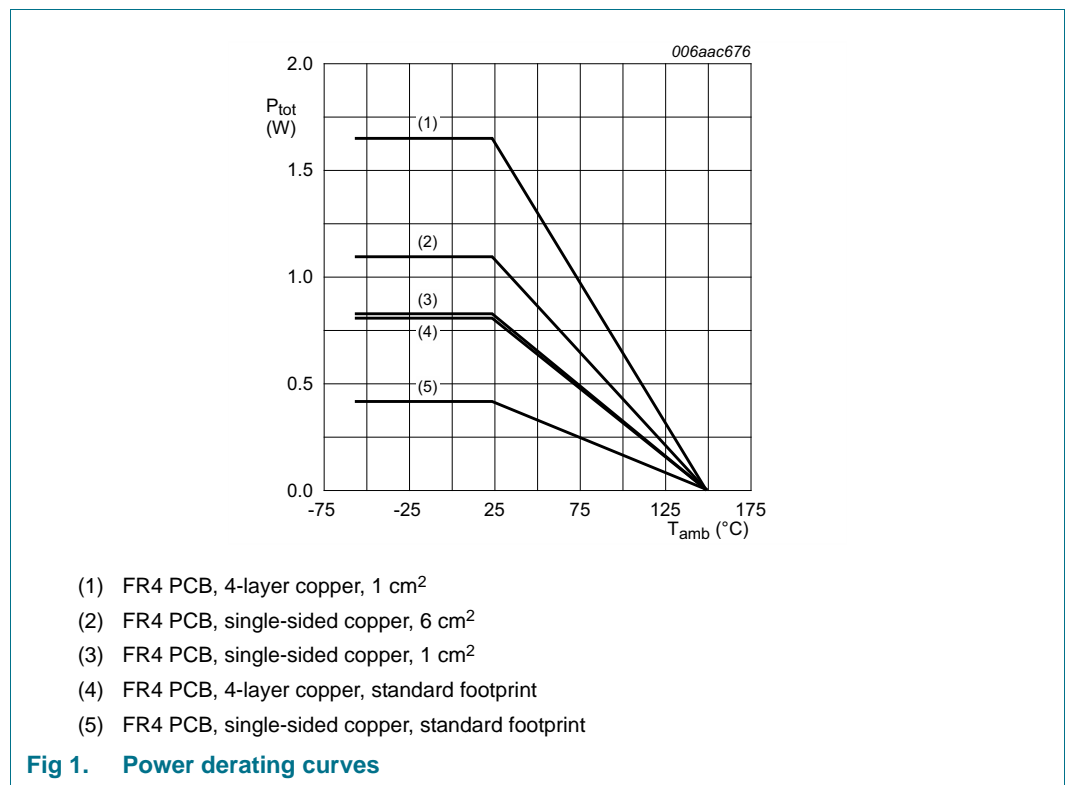
In accordance with the Absolute Maximum Rating System (IEC 60134).

| 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 ≤ 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 _{tot} | total power dissipation | T _{amb} ≤ 25 °C | [1] | - | 0.42 | W |
| | | | [2] | - | 0.81 | W |
| | | | [3] | - | 0.83 | W |
| | | | [4] | - | 1.10 | 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 cm².
- [4] Device mounted on an FR4 PCB, single-sided copper, tin-plated and mounting pad for collector 6 cm².
- [5] Device mounted on an FR4 PCB, 4-layer copper, tin-plated and mounting pad for collector 1 cm².

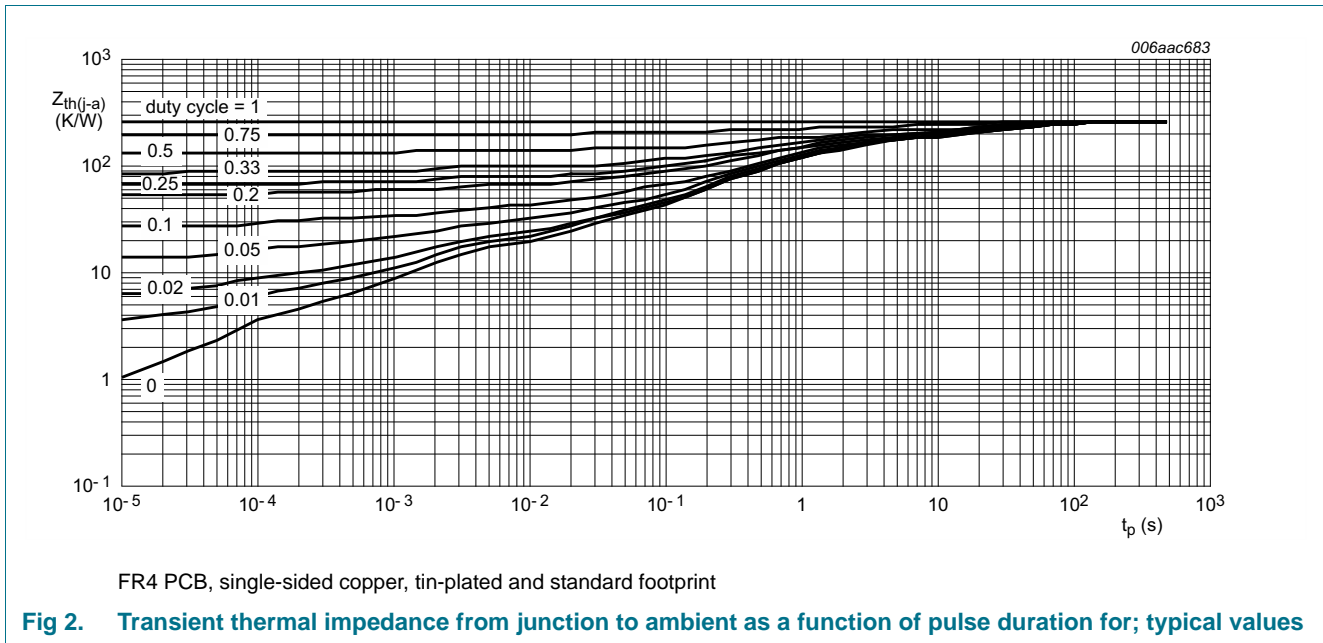


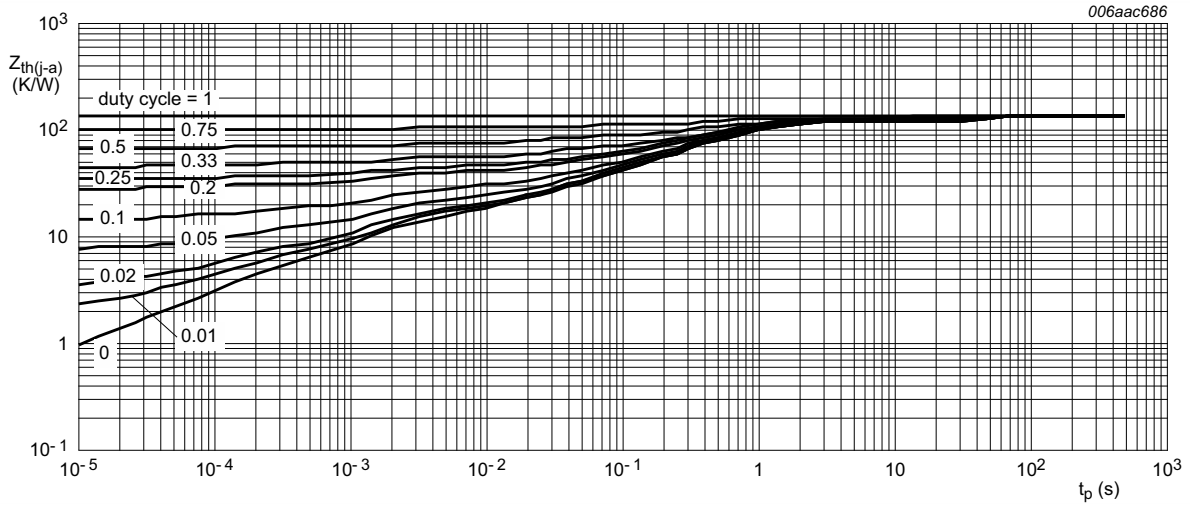
6. Thermal characteristics

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 |

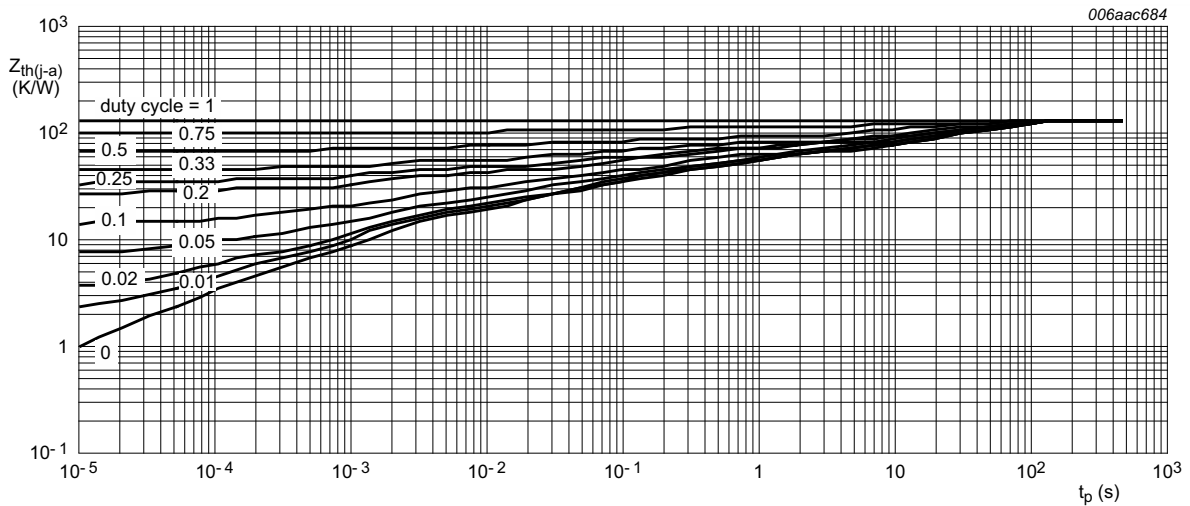
- [1] Device mounted on an FR4 Printed-Circuit Board (PCB), single-sided copper, tin-plated and standard footprint.
- [2] Device mounted on an FR4 PCB, 4-layer copper, tin-plated and standard footprint.
- [3] Device mounted on an FR4 PCB, single-sided copper, tin-plated and mounting pad for collector 1 cm².
- [4] Device mounted on an FR4 PCB, single-sided copper, tin-plated and mounting pad for collector 6 cm².
- [5] Device mounted on an FR4 PCB, 4-layer copper, tin-plated and mounting pad for collector 1 cm².





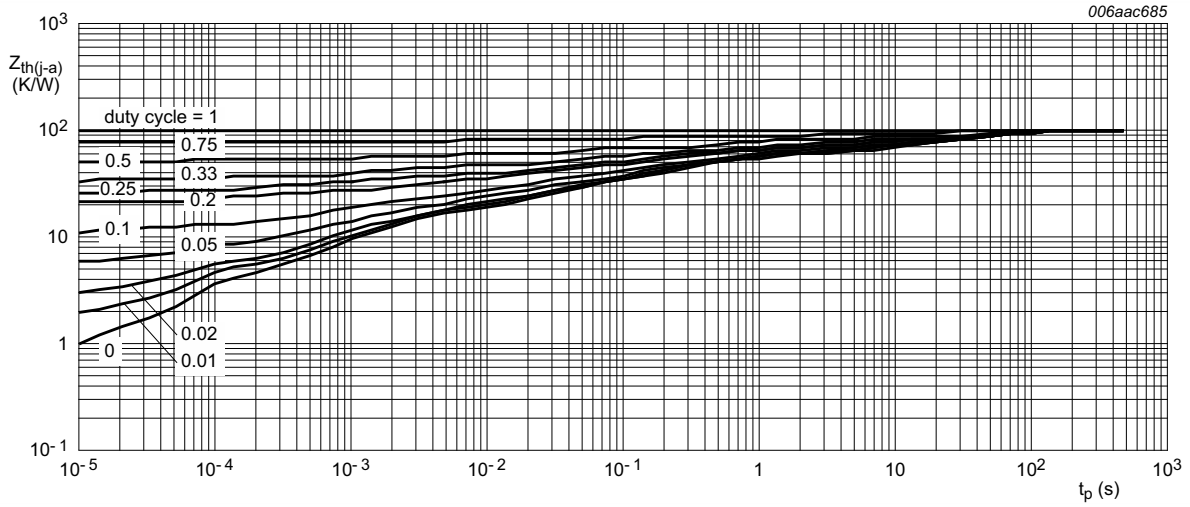
FR4 PCB, 4-layer copper, tin-plated and standard footprint.

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



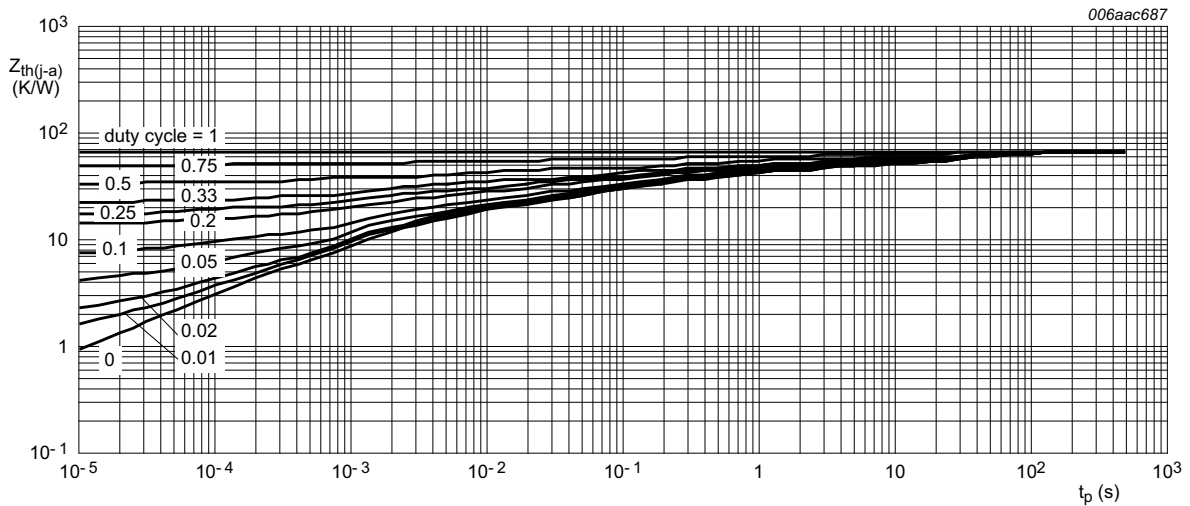
FR4 PCB, single-sided copper, tin-plated and mounting pad for collector 1 cm²

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 cm²

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 cm²

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

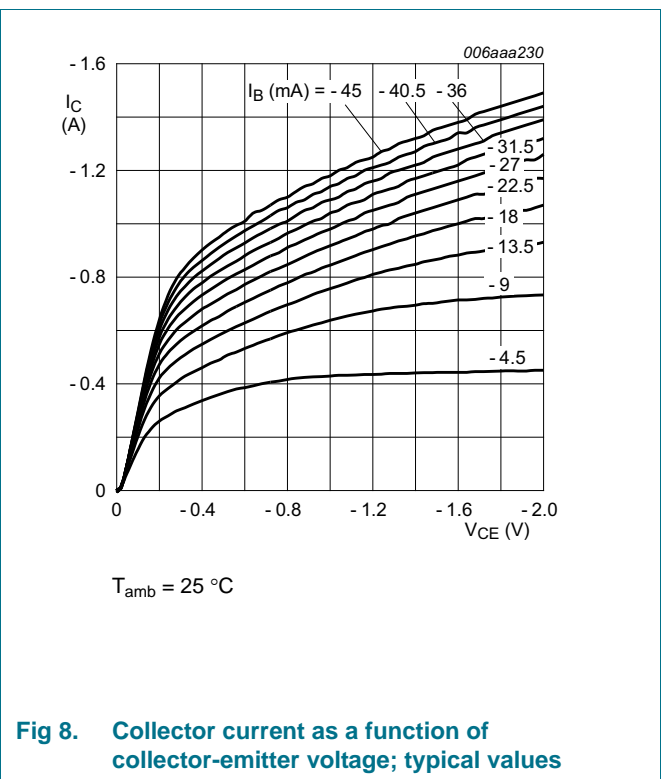
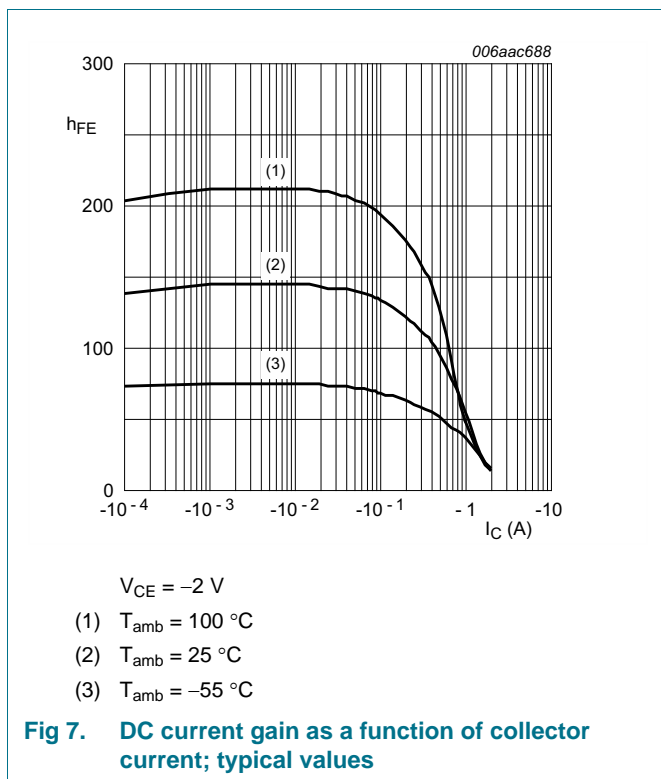
7. Characteristics

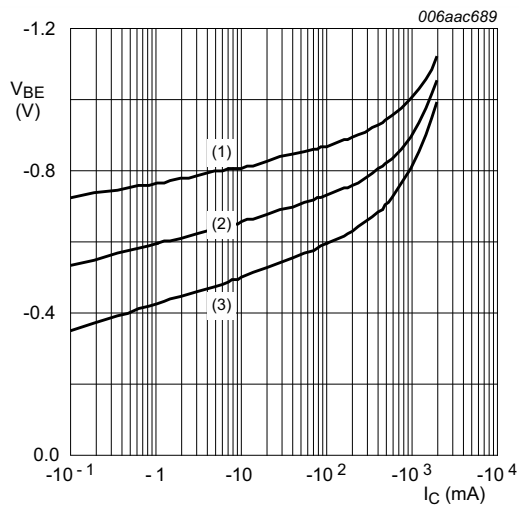
Table 8. Characteristics

$T_{amb} = 25\text{ °C}$ 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 | 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 | $V_{CE} = -2\text{ V}; I_C = -5\text{ mA}$ | 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: $t_p \leq 300\text{ ms}; \delta \leq 0.02$.

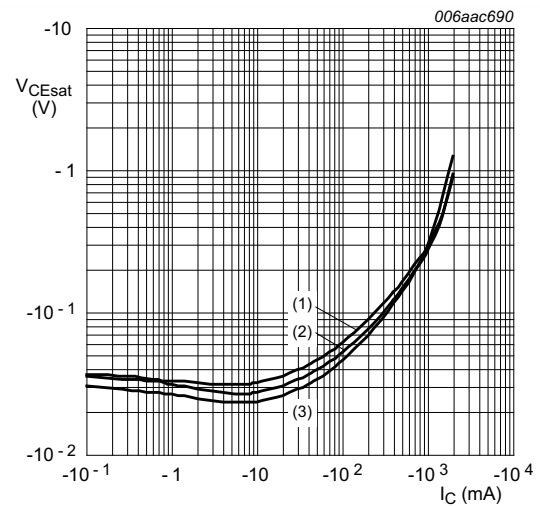




$$V_{CE} = -2 \text{ V}$$

- (1) $T_{amb} = -55 \text{ }^{\circ}\text{C}$
- (2) $T_{amb} = 25 \text{ }^{\circ}\text{C}$
- (3) $T_{amb} = 100 \text{ }^{\circ}\text{C}$

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



$$I_C/I_B = 10$$

- (1) $T_{amb} = 100 \text{ }^{\circ}\text{C}$
- (2) $T_{amb} = 25 \text{ }^{\circ}\text{C}$
- (3) $T_{amb} = -55 \text{ }^{\circ}\text{C}$

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

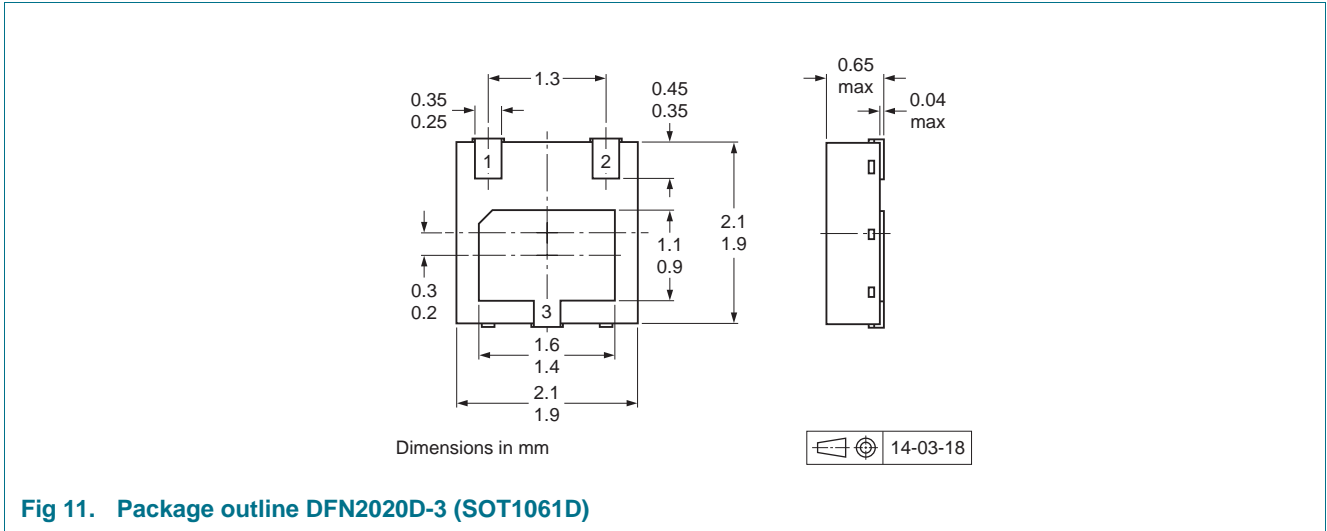
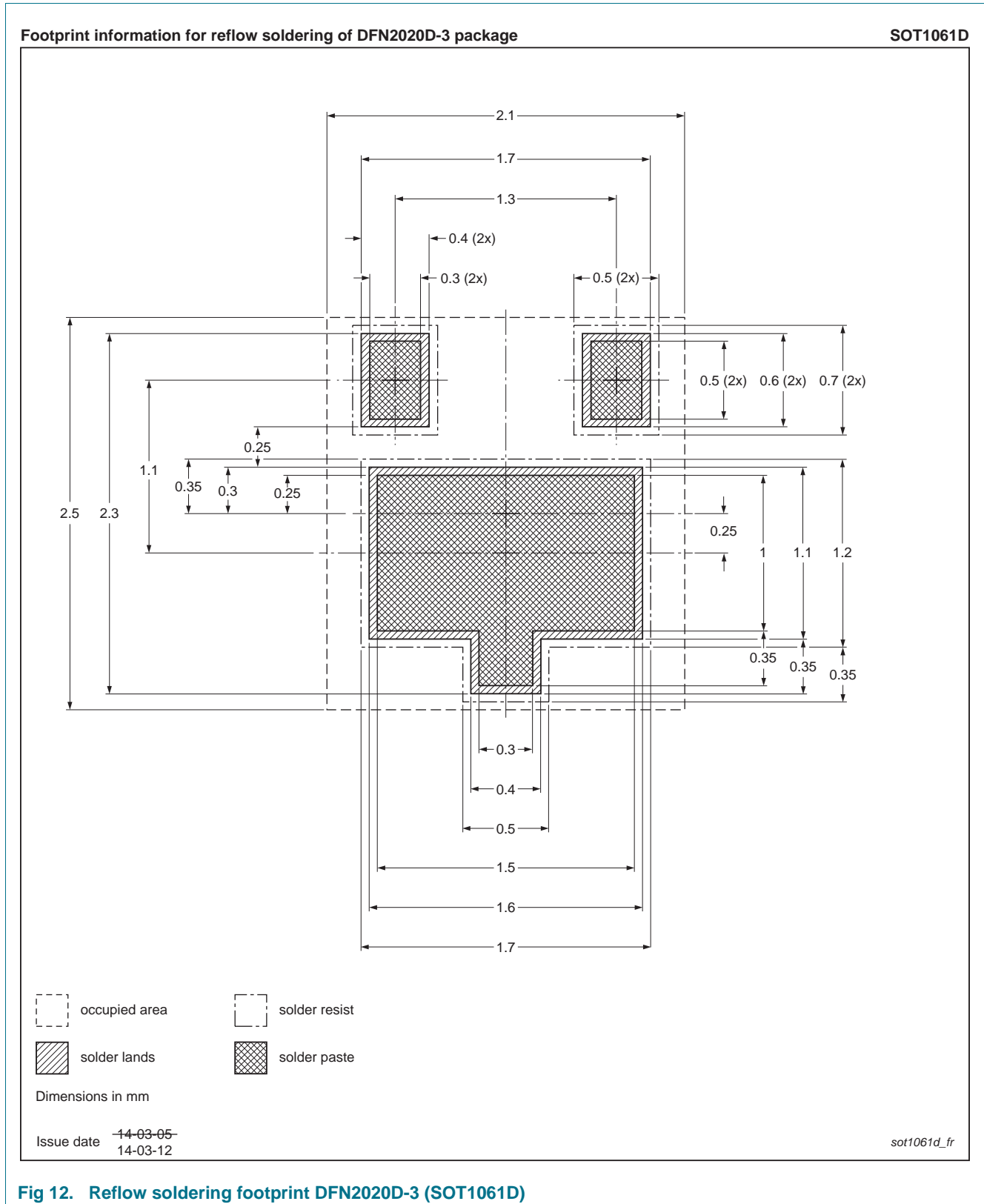


Fig 11. Package outline DFN2020D-3 (SOT1061D)

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 ^{[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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