



BC54xPAS series

45 V, 1 A NPN medium power transistors

27 April 2023

Product data sheet

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.

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
- AEC-Q101 qualified

3. Applications

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

4. Quick reference data

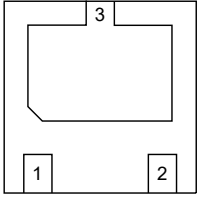
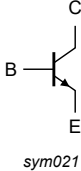
Table 1. Quick reference data

| 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 | | | | | | |
| | BC54PAS | $V_{CE} = 2$ V; $I_C = 150$ mA; $T_{amb} = 25$ °C | [1] | 63 | - | 250 | |
| | BC54-10PAS | | [1] | 63 | - | 160 | |
| | BC54-16PAS | | [1] | 100 | - | 250 | |

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

5. Pinning information

Table 2. Pinning information

| Pin | Symbol | Description | Simplified outline | Graphic symbol |
|-----|--------|-------------|---|---|
| 1 | B | base |  <p>Transparent top view DFN2020D-3 (SOT1061D)</p> |  <p>sym021</p> |
| 2 | E | emitter | | |
| 3 | C | collector | | |

6. Ordering information

Table 3. Ordering information

| Type number | Package | | |
|-------------|------------|--|----------|
| | Name | Description | Version |
| BC54PAS | 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 | SOT1061D |
| BC54-10PAS | | | |
| BC54-16PAS | | | |

7. Marking

Table 4. Marking codes

| Type number | Marking code |
|-------------|--------------|
| BC54PAS | CD |
| BC54-10PAS | CE |
| BC54-16PAS | CF |

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] | - | 1.10 | 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.

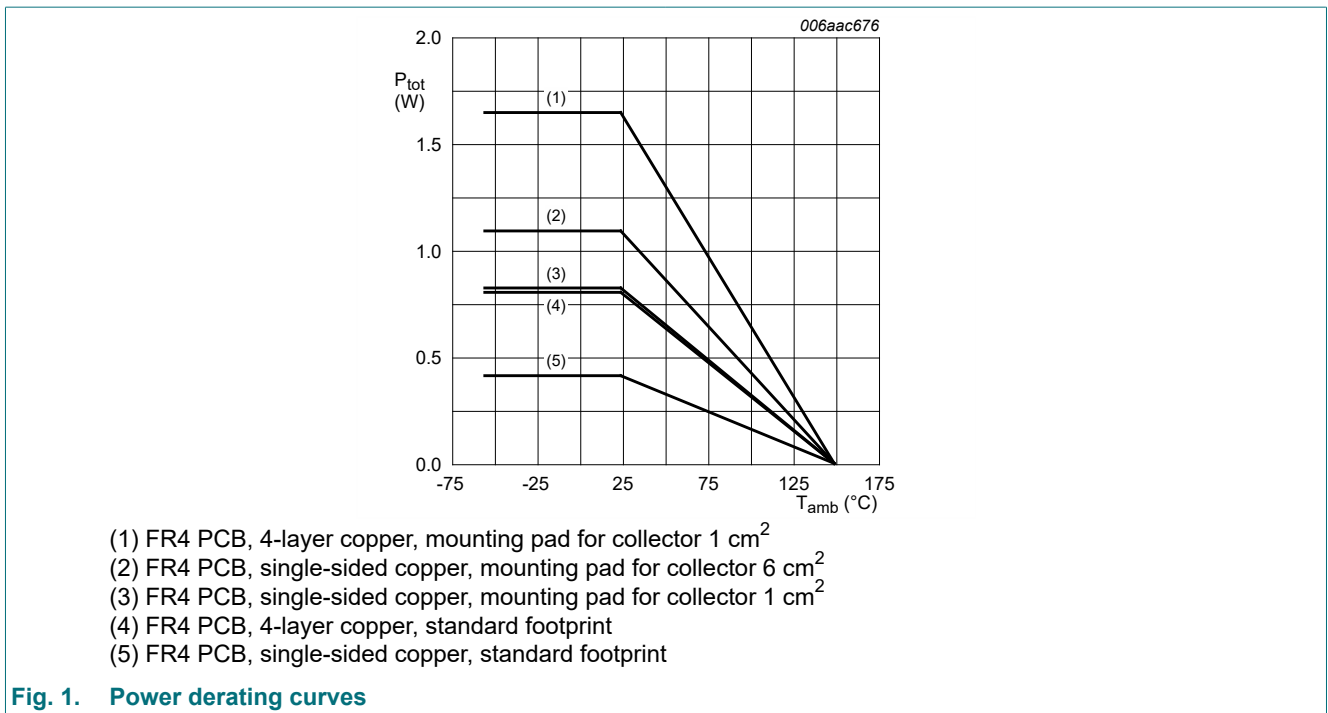


Fig. 1. Power derating curves

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 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.

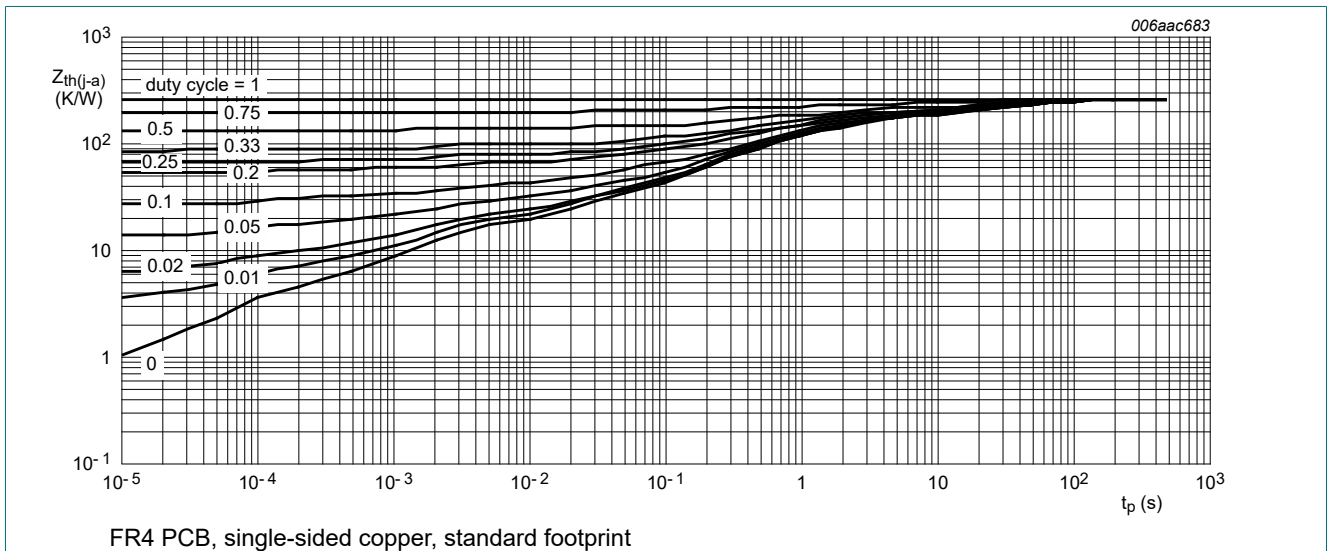


Fig. 2. Transient thermal impedance from junction to ambient as a function of pulse duration; typical values

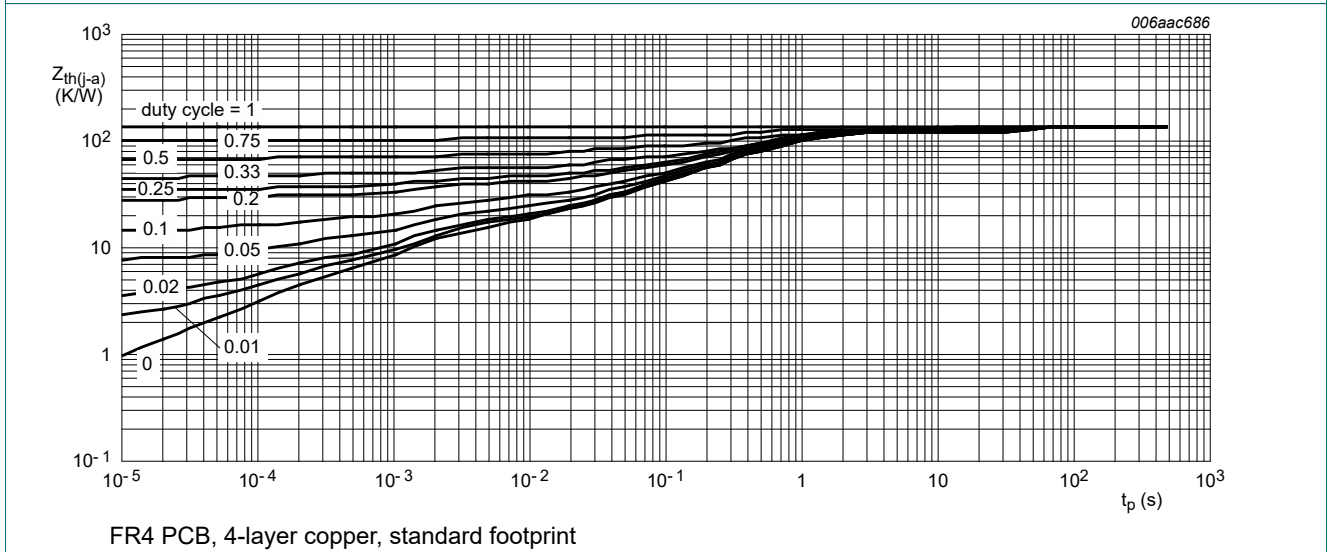
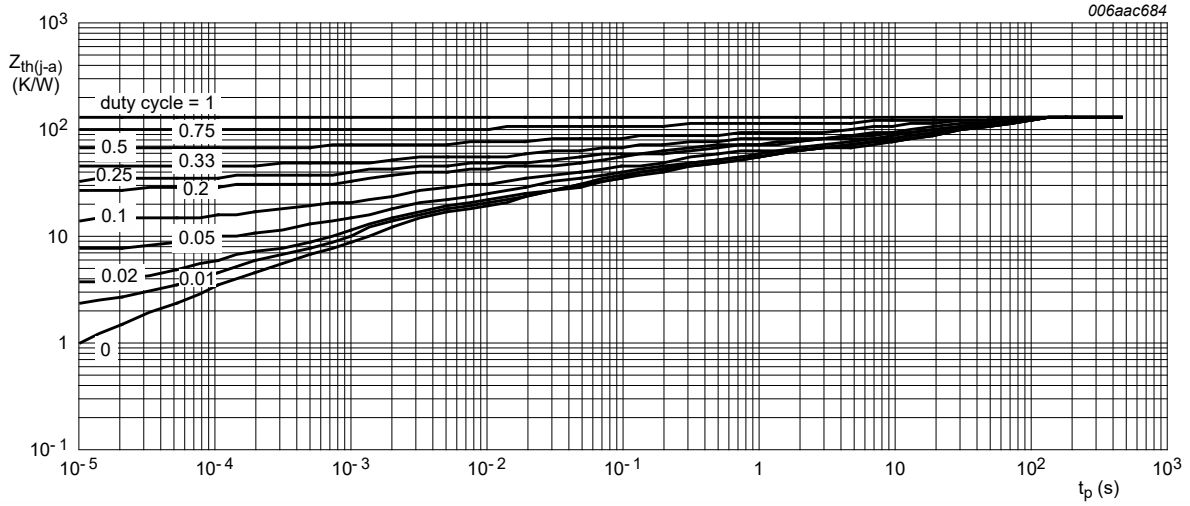
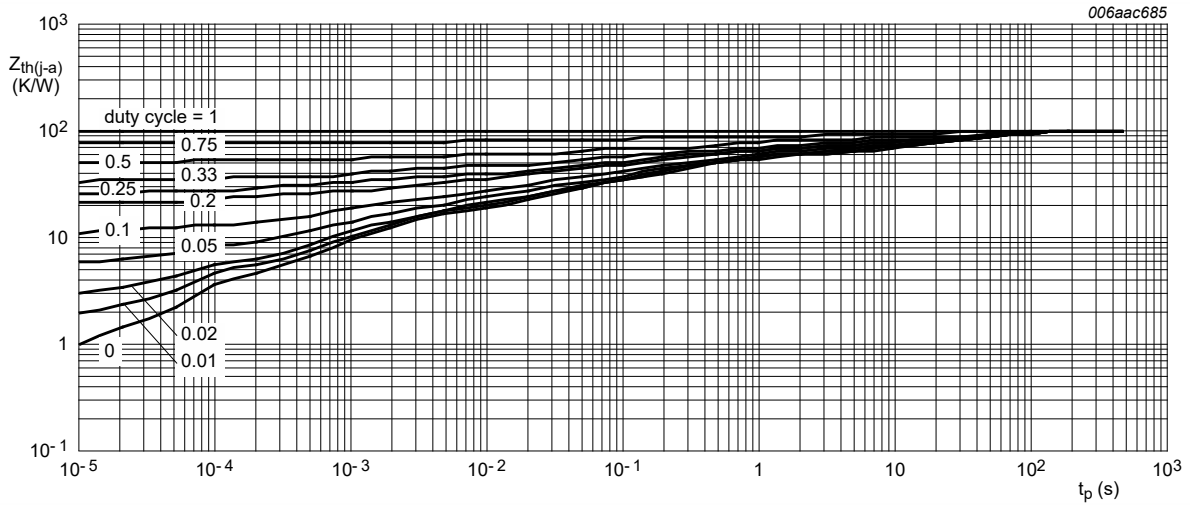


Fig. 3. Transient thermal impedance from junction to ambient as a function of pulse duration; typical values



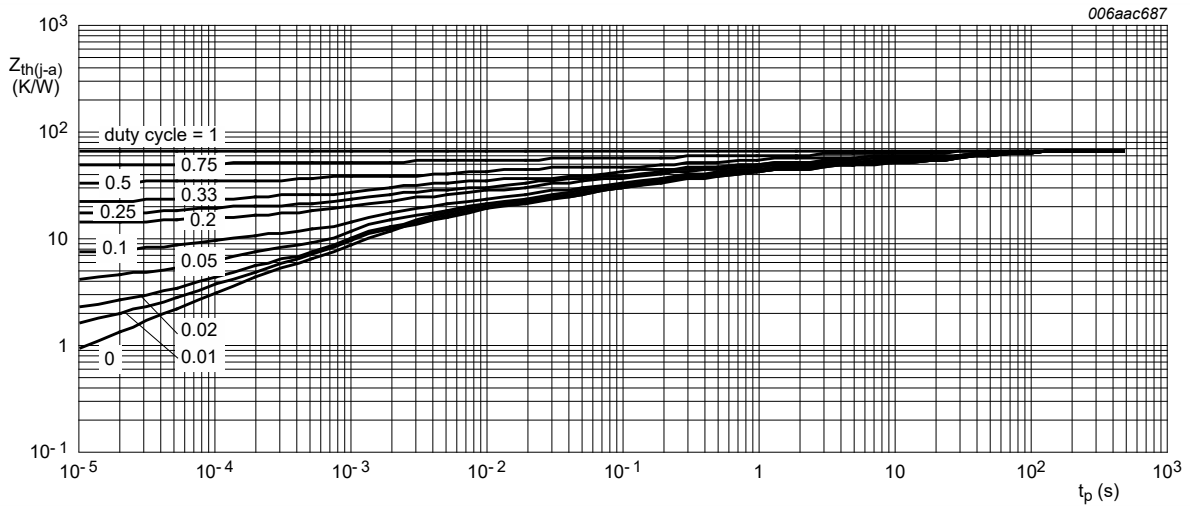
FR4 PCB, single-sided copper, mounting pad for collector 1 cm²

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 cm²

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 cm²

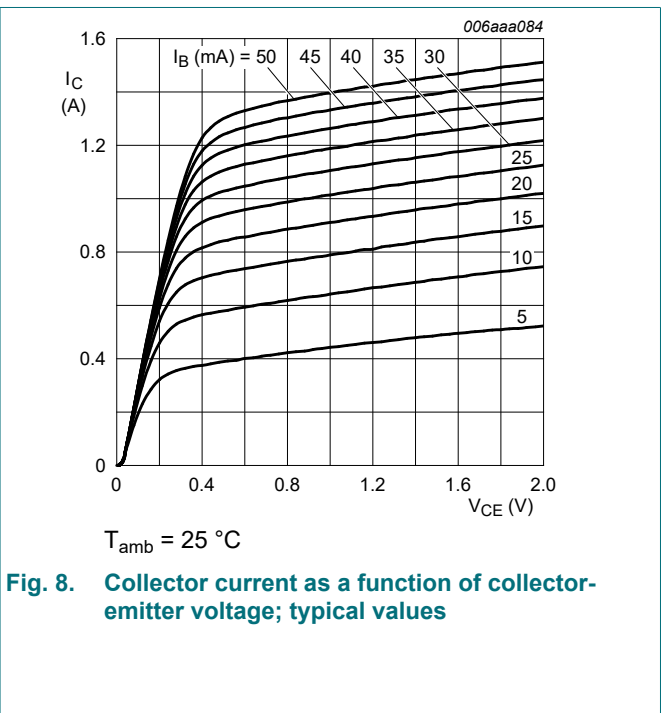
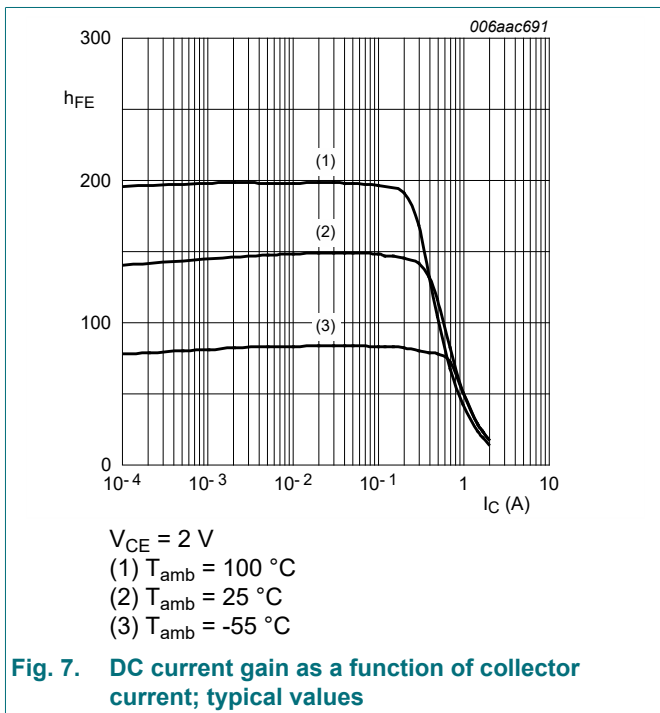
Fig. 6. Transient thermal impedance from junction to ambient as a function of pulse duration; typical values

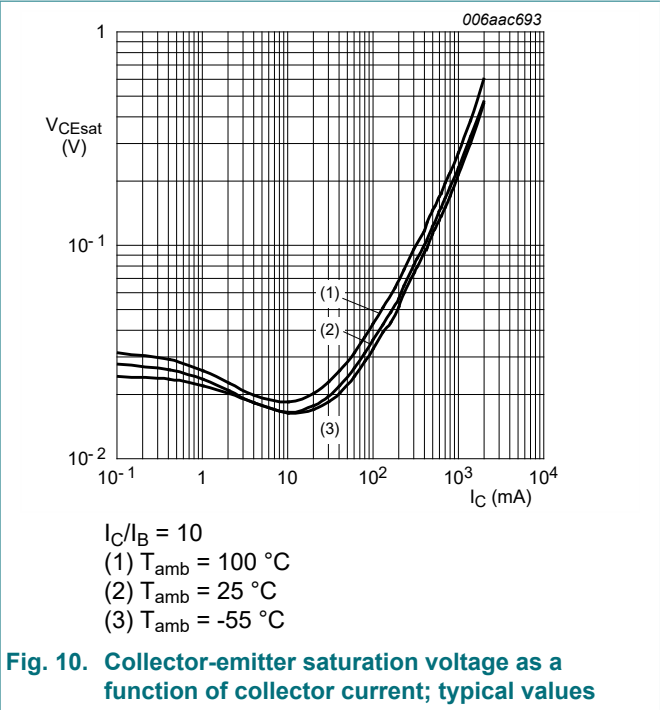
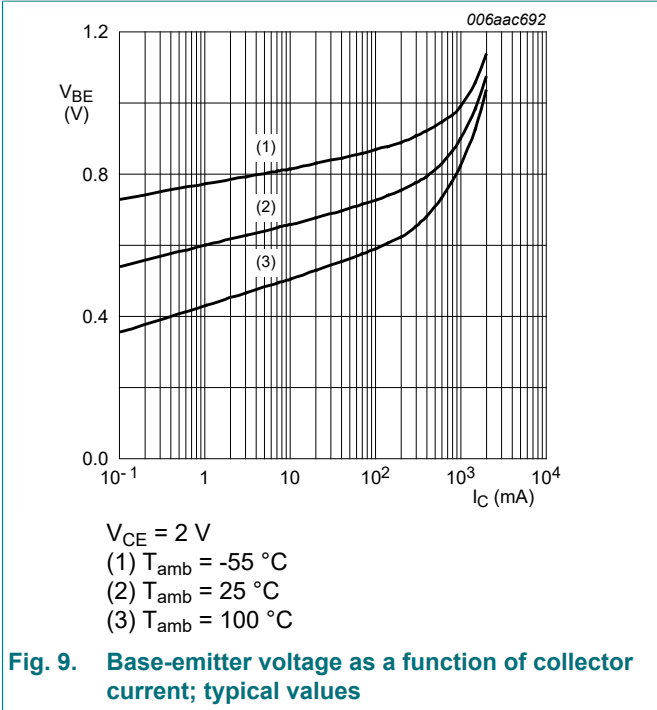
10. Characteristics

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 | | | | | | |
| | BC54PAS | $V_{CE} = 2\text{ V}; I_C = 5\text{ mA}; T_{amb} = 25\text{ }^\circ\text{C}$ | 63 | - | - | | |
| | BC54-10PAS | | 63 | - | - | | |
| | BC54-16PAS | | 63 | - | - | | |
| | BC54PAS | $V_{CE} = 2\text{ V}; I_C = 150\text{ mA}; T_{amb} = 25\text{ }^\circ\text{C}$ | [1] | 63 | - | 250 | |
| | BC54-10PAS | | [1] | 63 | - | 160 | |
| | BC54-16PAS | | [1] | 100 | - | 250 | |
| | BC54PAS | $V_{CE} = 2\text{ V}; I_C = 500\text{ mA}; T_{amb} = 25\text{ }^\circ\text{C}$ | [1] | 40 | - | - | |
| | BC54-10PAS | | [1] | 40 | - | - | |
| BC54-16PAS | [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 | $V_{CB} = 10\text{ V}; i_e = 0\text{ A}; f = 1\text{ MHz}; T_{amb} = 25\text{ }^\circ\text{C}$ | - | 6 | - | pF | |
| f_T | transition frequency | $V_{CE} = 5\text{ V}; I_C = 50\text{ mA}; f = 100\text{ MHz}; T_{amb} = 25\text{ }^\circ\text{C}$ | 100 | 180 | - | MHz | |

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



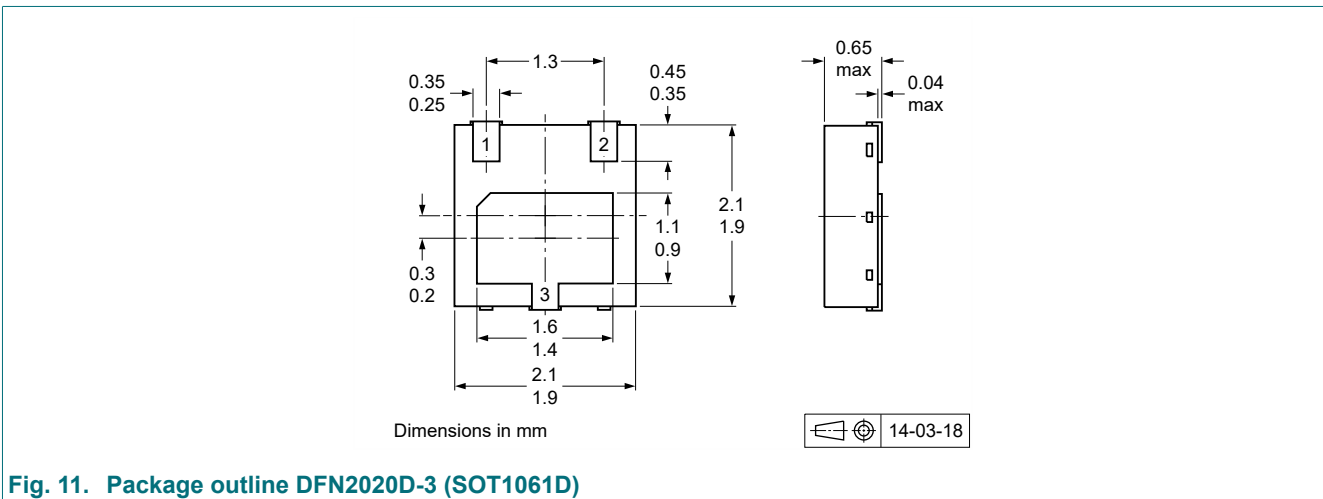


11. Test information

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



13. Soldering

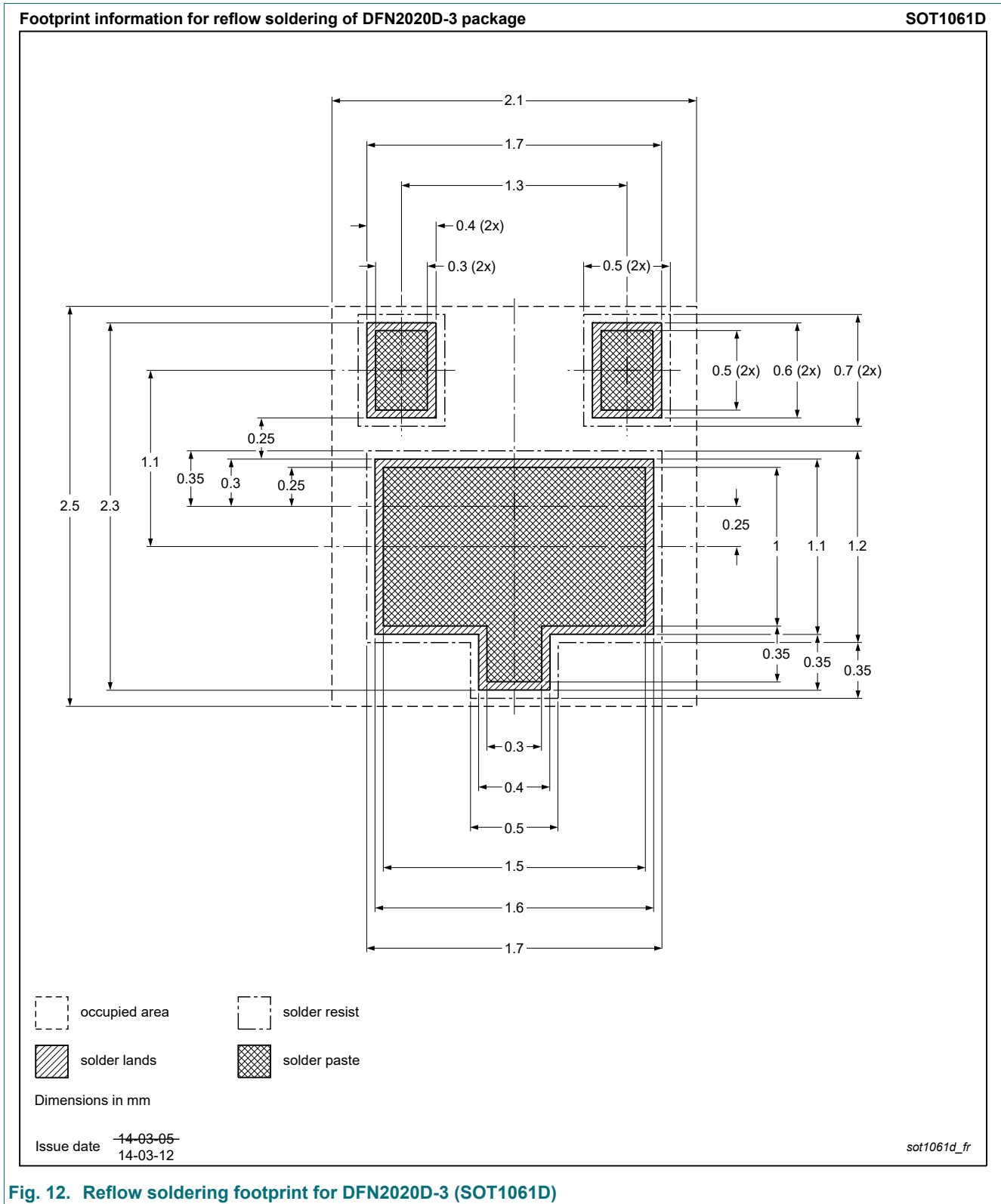


Fig. 12. Reflow soldering footprint for DFN2020D-3 (SOT1061D)

14. Revision history

Table 8. Revision history

| Data sheet ID | Release date | Data sheet status | Change notice | Supersedes |
|-----------------------|---|--------------------|---------------|-----------------------|
| BC54XPAS_SER v.2 | 20230427 | Product data sheet | - | BC54_55_56PAS_SER v.1 |
| Modifications: | • Family data sheet splitted to three data sheets | | | |
| BC54_55_56PAS_SER v.1 | 20141111 | 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. |

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