



# BC53PA series

80 V, 1 A PNP medium power transistors

Rev. 10 — 4 August 2023

Product data sheet

## 1. General description

PNP medium power transistors in an ultra thin SOT1061 leadless small Surface-Mounted Device (SMD) plastic package.

## 2. Features and benefits

- High current
- Three current gain selections
- High power dissipation capability
- Exposed heatsink for excellent thermal and electrical conductivity
- Leadless very small SMD plastic package with medium power capability
- AEC-Q101 qualified

## 3. Applications

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

## 4. Quick reference data

Table 1. Quick reference data

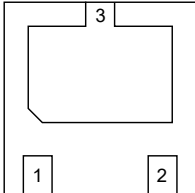
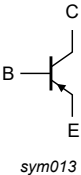
$T_{amb} = 25\text{ °C}$  unless otherwise specified.

| Symbol    | Parameter                 | Conditions                                                                  |     | Min | Typ | Max | Unit |
|-----------|---------------------------|-----------------------------------------------------------------------------|-----|-----|-----|-----|------|
| $V_{CEO}$ | collector-emitter voltage | open base                                                                   |     | -   | -   | -80 | V    |
| $I_C$     | collector current         |                                                                             |     | -   | -   | -1  | A    |
| $I_{CM}$  | peak collector current    | single pulse; $t_p \leq 1\text{ ms}$                                        |     | -   | -   | -2  | A    |
| $h_{FE}$  | DC current gain           |                                                                             |     |     |     |     |      |
|           | BC53PA                    | $V_{CE} = -2\text{ V}$ ; $I_C = -150\text{ mA}$<br>$T_{amb} = 25\text{ °C}$ | [1] | 63  | -   | 250 |      |
|           | BC53-10PA                 |                                                                             | [1] | 63  | -   | 160 |      |
|           | BC53-16PA                 |                                                                             | [1] | 100 | -   | 250 |      |

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

5. Pinning information

Table 2. Pinning

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

6. Ordering information

Table 3. Ordering information

| Type number               | Package |                                                                                                                         |                         |
|---------------------------|---------|-------------------------------------------------------------------------------------------------------------------------|-------------------------|
|                           | Name    | Description                                                                                                             | Version                 |
| <a href="#">BC53PA</a>    | -       | plastic, leadless thermal enhanced ultra thin small outline package ; no leads; 3 terminals; 2 mm x 2 mm x 0.65 mm body | <a href="#">SOT1061</a> |
| <a href="#">BC53-10PA</a> |         |                                                                                                                         |                         |
| <a href="#">BC53-16PA</a> |         |                                                                                                                         |                         |

7. Marking

Table 4. Marking

| Type number | Marking code |
|-------------|--------------|
| BC53PA      | BV           |
| BC53-10PA   | BW           |
| BC53-16PA   | BX           |

8. Limiting values

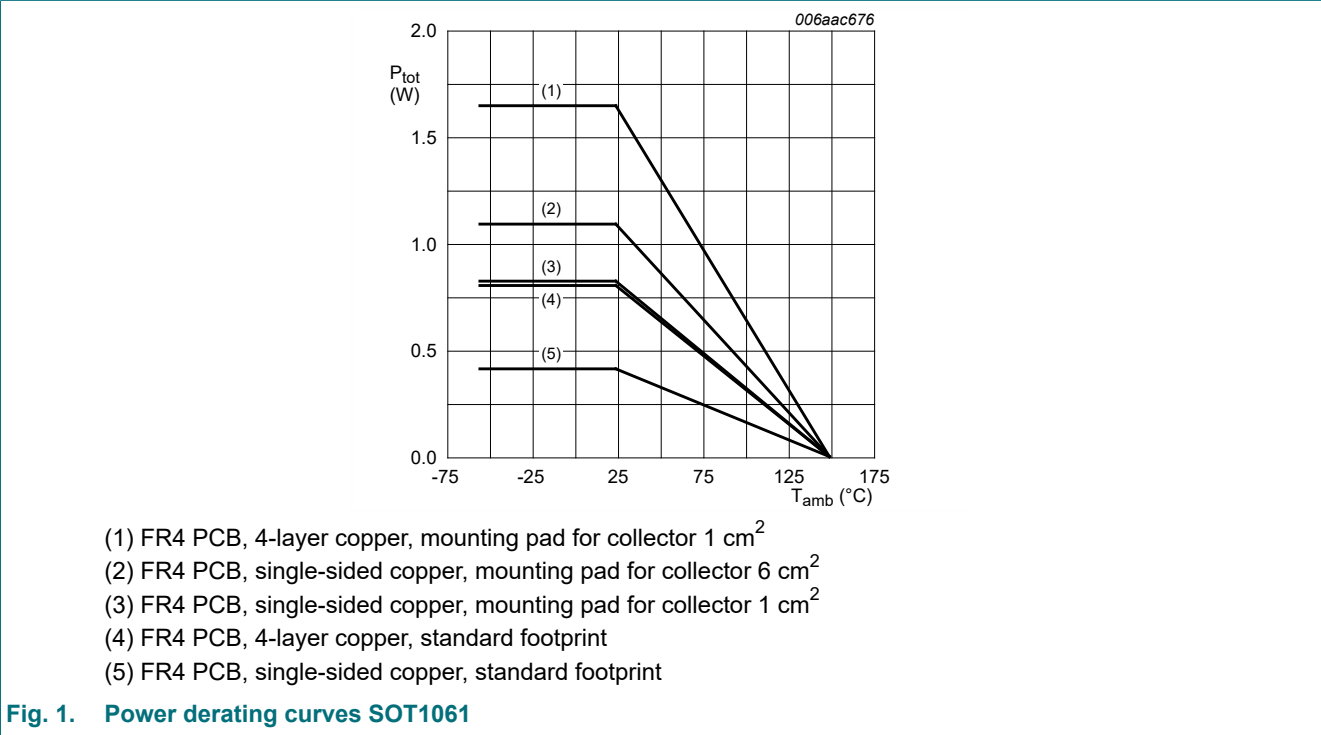
Table 5. Limiting values

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

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

| Symbol    | Parameter                 | Conditions                           | Min | Max  | Unit |
|-----------|---------------------------|--------------------------------------|-----|------|------|
| $V_{CBO}$ | collector-base voltage    | open emitter                         | -   | -100 | V    |
| $V_{CEO}$ | collector-emitter voltage | open base                            | -   | -80  | V    |
| $V_{EBO}$ | emitter-base voltage      | open collector                       | -   | -5   | V    |
| $I_C$     | collector current         |                                      | -   | -1   | A    |
| $I_{CM}$  | peak collector current    | single pulse; $t_p \leq 1\text{ ms}$ | -   | -2   | A    |
| $I_B$     | base current              |                                      | -   | -0.3 | A    |
| $I_{BM}$  | peak base current         | single pulse; $t_p \leq 1\text{ ms}$ | -   | -0.3 | A    |
| $P_{tot}$ | total power dissipation   | $T_{amb} \leq 25\text{ °C}$ [1]      | -   | 0.42 | W    |
|           |                           | [2]                                  | -   | 0.83 | W    |
|           |                           | [3]                                  | -   | 1.10 | W    |
|           |                           | [4]                                  | -   | 0.81 | 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; single-sided copper; tin-plated; mounting pad for collector 1 cm<sup>2</sup>.  
[3] Device mounted on an FR4 PCB; single-sided copper; tin-plated; mounting pad for collector 6 cm<sup>2</sup>.  
[4] Device mounted on an FR4 PCB, 4-layer copper, tin-plated and standard footprint.  
[5] Device mounted on an FR4 PCB, 4-layer copper, tin-plated, mounting pad for collector 1 cm<sup>2</sup>.



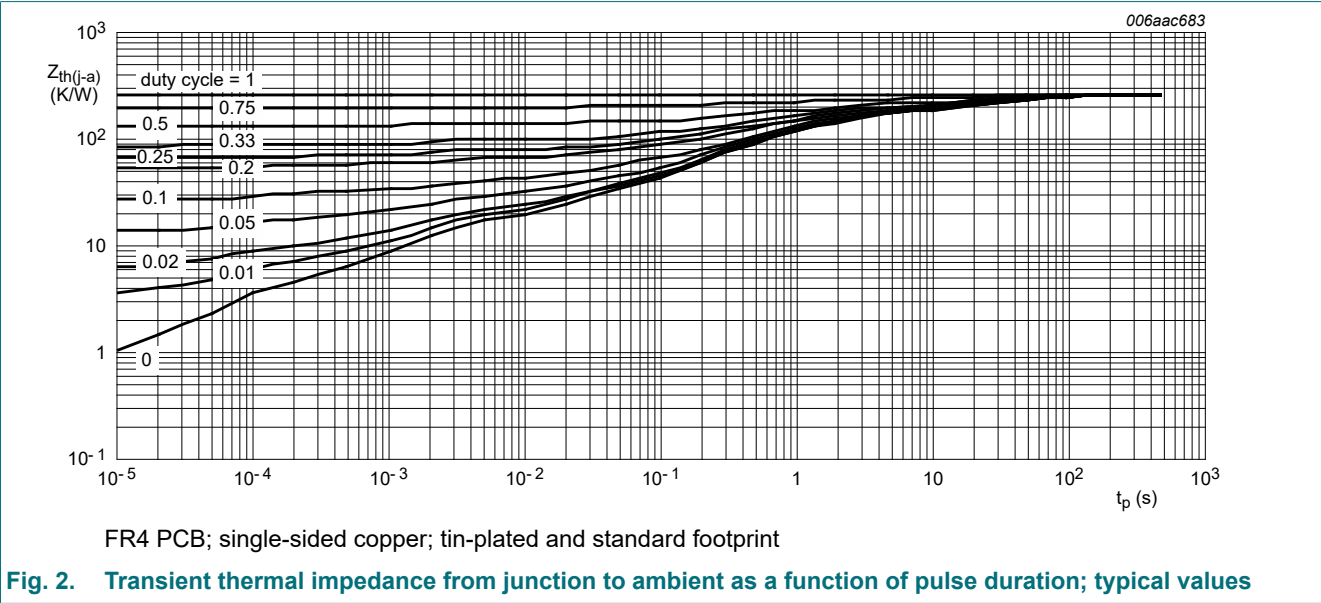
9. Thermal characteristics

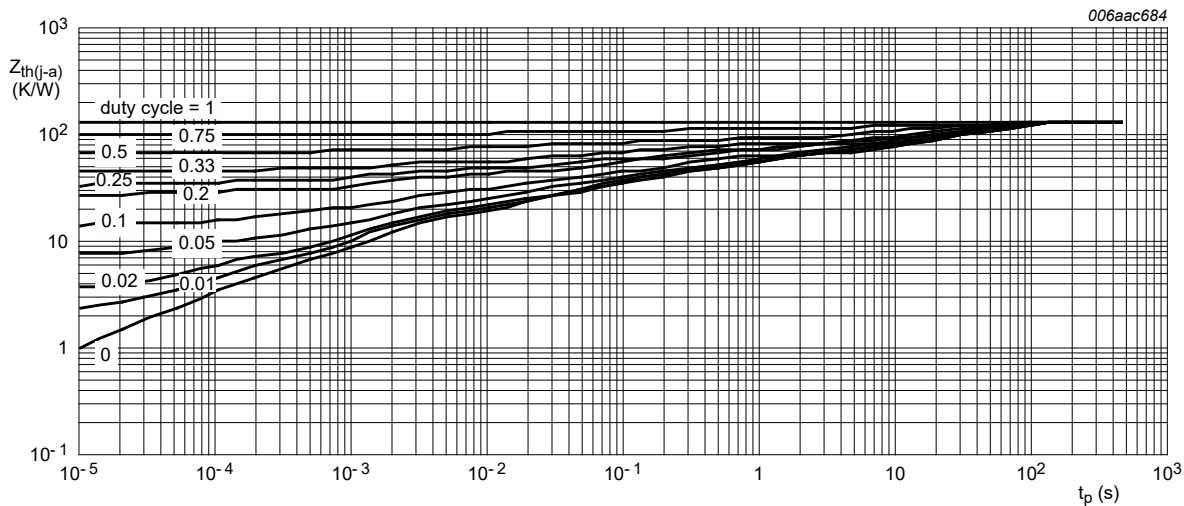
Table 6. Thermal characteristics

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

| 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] | -   | -   | 151 | K/W  |
|               |                                                  |             | [3] | -   | -   | 114 | K/W  |
|               |                                                  |             | [4] | -   | -   | 154 | K/W  |
|               |                                                  |             | [5] | -   | -   | 76  | K/W  |
| $R_{(j-sp)}$  | thermal resistance from junction to solder point |             |     | -   | -   | 20  | K/W  |

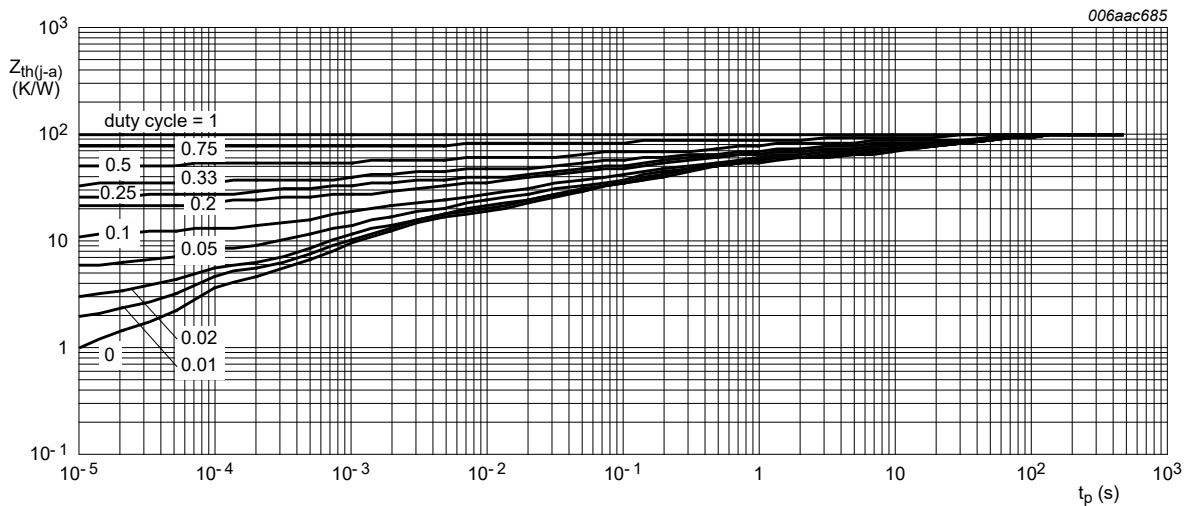
- [1] Device mounted on an FR4 PCB; single-sided copper; tin-plated and standard footprint.  
[2] Device mounted on an FR4 PCB; single-sided copper; tin-plated; mounting pad for collector 1 cm<sup>2</sup>.  
[3] Device mounted on an FR4 PCB; single-sided copper; tin-plated; mounting pad for collector 6 cm<sup>2</sup>.  
[4] Device mounted on an FR4 PCB, 4-layer copper, tin-plated and standard footprint.  
[5] Device mounted on an FR4 PCB, 4-layer copper, tin-plated, mounting pad for collector 1 cm<sup>2</sup>.





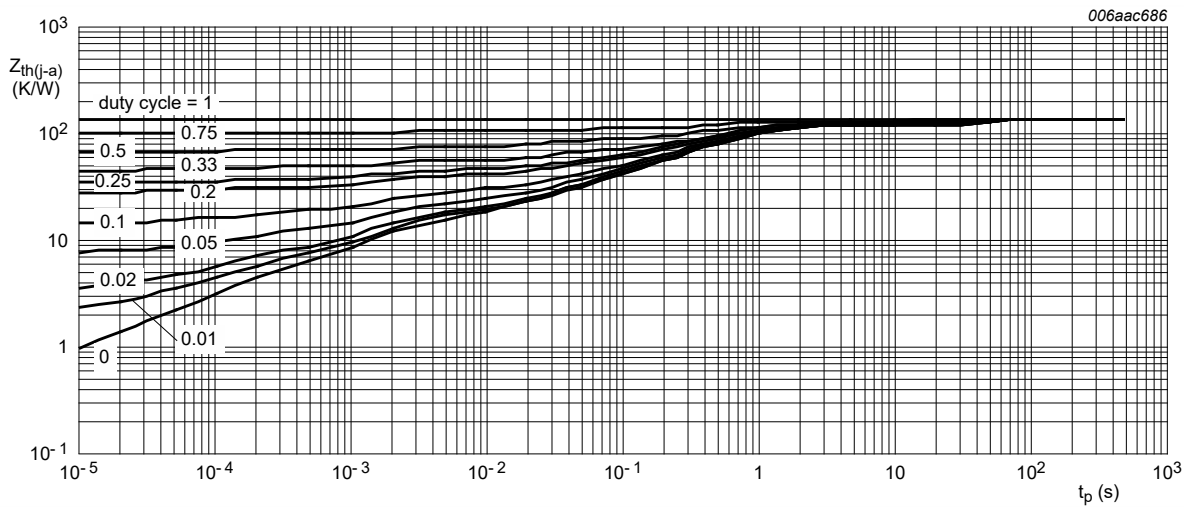
FR4 PCB; single-sided copper; tin-plated; mounting pad for collector 1 cm<sup>2</sup>

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



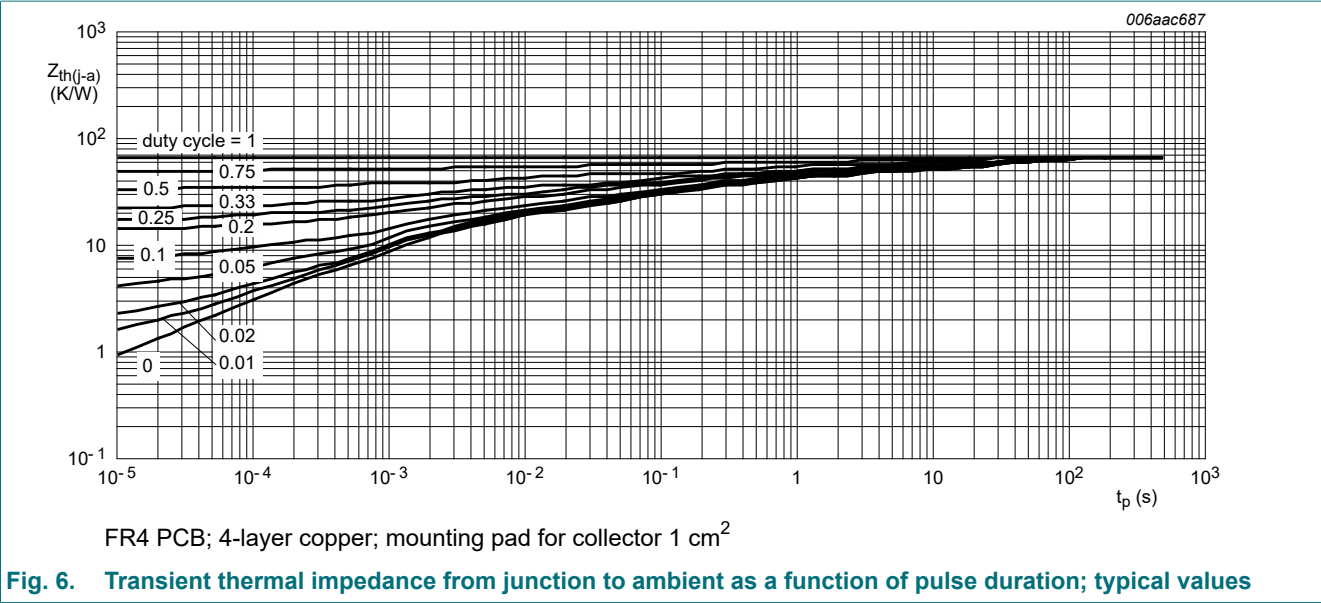
FR4 PCB; single-sided copper; tin-plated; mounting pad for collector 6 cm<sup>2</sup>

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



FR4 PCB; 4-layer copper, standard footprint

Fig. 5. 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       | $V_{CB} = -30\text{ V}$ ; $I_E = 0\text{ A}$<br>$T_{amb} = 25\text{ °C}$                            |     | -   | -   | -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         | $V_{EB} = -5\text{ V}$ ; $I_C = 0\text{ A}$<br>$T_{amb} = 25\text{ °C}$                             |     | -   | -   | -100 | nA   |
| $h_{FE}$    | DC current gain                      |                                                                                                     |     |     |     |      |      |
|             | BC53PA                               | $V_{CE} = -2\text{ V}$ ; $I_C = -5\text{ mA}$<br>$T_{amb} = 25\text{ °C}$                           | [1] | 63  | -   | -    |      |
|             |                                      | $V_{CE} = -2\text{ V}$ ; $I_C = -150\text{ mA}$<br>$T_{amb} = 25\text{ °C}$                         |     | 63  | -   | 250  |      |
|             |                                      | $V_{CE} = -2\text{ V}$ ; $I_C = -500\text{ mA}$<br>$T_{amb} = 25\text{ °C}$                         |     | 40  | -   | -    |      |
|             | BC53-10PA                            | $V_{CE} = -2\text{ V}$ ; $I_C = -5\text{ mA}$<br>$T_{amb} = 25\text{ °C}$                           | [1] | 63  | -   | -    |      |
|             |                                      | $V_{CE} = -2\text{ V}$ ; $I_C = -150\text{ mA}$<br>$T_{amb} = 25\text{ °C}$                         |     | 63  | -   | 160  |      |
|             |                                      | $V_{CE} = -2\text{ V}$ ; $I_C = -500\text{ mA}$<br>$T_{amb} = 25\text{ °C}$                         |     | 40  | -   | -    |      |
|             | BC53-16PA                            | $V_{CE} = -2\text{ V}$ ; $I_C = -5\text{ mA}$<br>$T_{amb} = 25\text{ °C}$                           | [1] | 63  | -   | -    |      |
|             |                                      | $V_{CE} = -2\text{ V}$ ; $I_C = -150\text{ mA}$<br>$T_{amb} = 25\text{ °C}$                         |     | 100 | -   | 250  |      |
|             |                                      | $V_{CE} = -2\text{ V}$ ; $I_C = -500\text{ mA}$<br>$T_{amb} = 25\text{ °C}$                         |     | 40  | -   | -    |      |
| $V_{CEsat}$ | collector-emitter saturation voltage | $I_C = -500\text{ mA}$ ; $I_B = -50\text{ mA}$<br>$T_{amb} = 25\text{ °C}$                          | [1] | -   | -   | -0.5 | V    |
| $V_{BE}$    | base-emitter voltage                 | $V_{CE} = -2\text{ V}$ ; $I_C = -500\text{ mA}$<br>$T_{amb} = 25\text{ °C}$                         | [1] | -   | -   | -1   | V    |
| $C_c$       | collector capacitance                | $V_{CB} = -10\text{ V}$ ; $I_E = I_C = 0\text{ A}$ ; $f = 1\text{ MHz}$<br>$T_{amb} = 25\text{ °C}$ |     | -   | 15  | -    | pF   |
| $f_T$       | transition frequency                 | $V_{CE} = -5\text{ V}$ ; $I_C = -50\text{ mA}$ ; $f = 100\text{ MHz}$<br>$T_{amb} = 25\text{ °C}$   |     | -   | 145 | -    | MHz  |

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

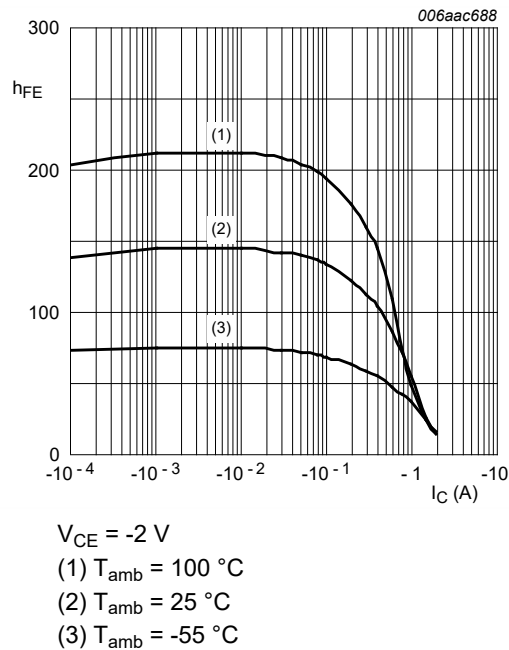


Fig. 7. DC current gain as a function of collector current; typical values

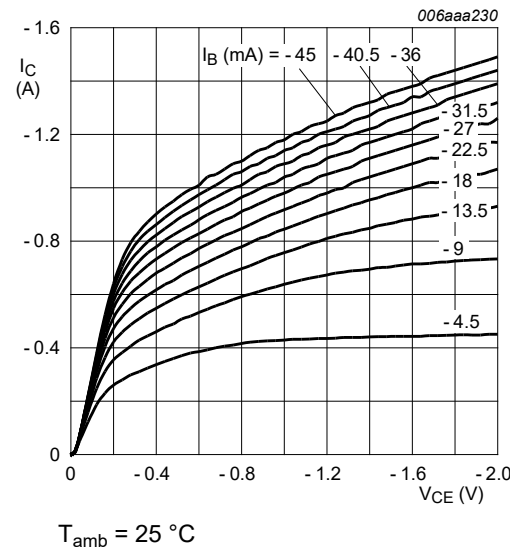


Fig. 8. Collector current as a function of collector-emitter voltage; typical values

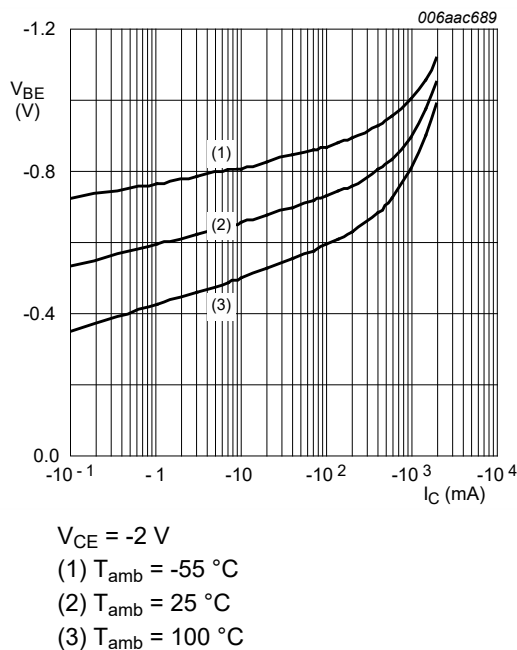


Fig. 9. Base-emitter voltage as a function of collector current; typical values

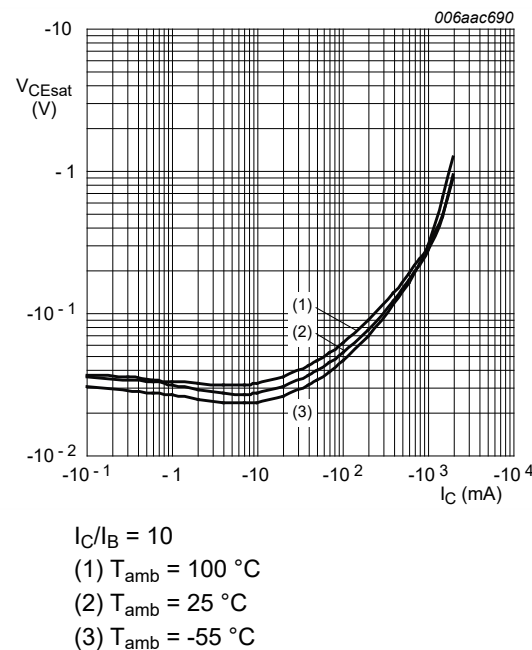


Fig. 10. Collector-emitter saturation voltage as a function of collector current; typical values



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

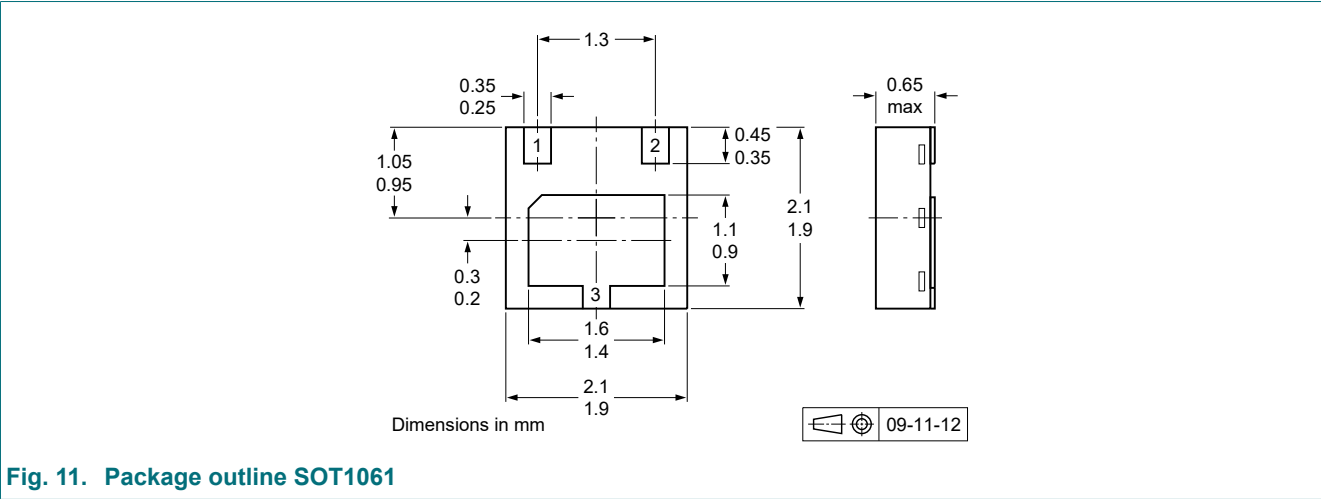
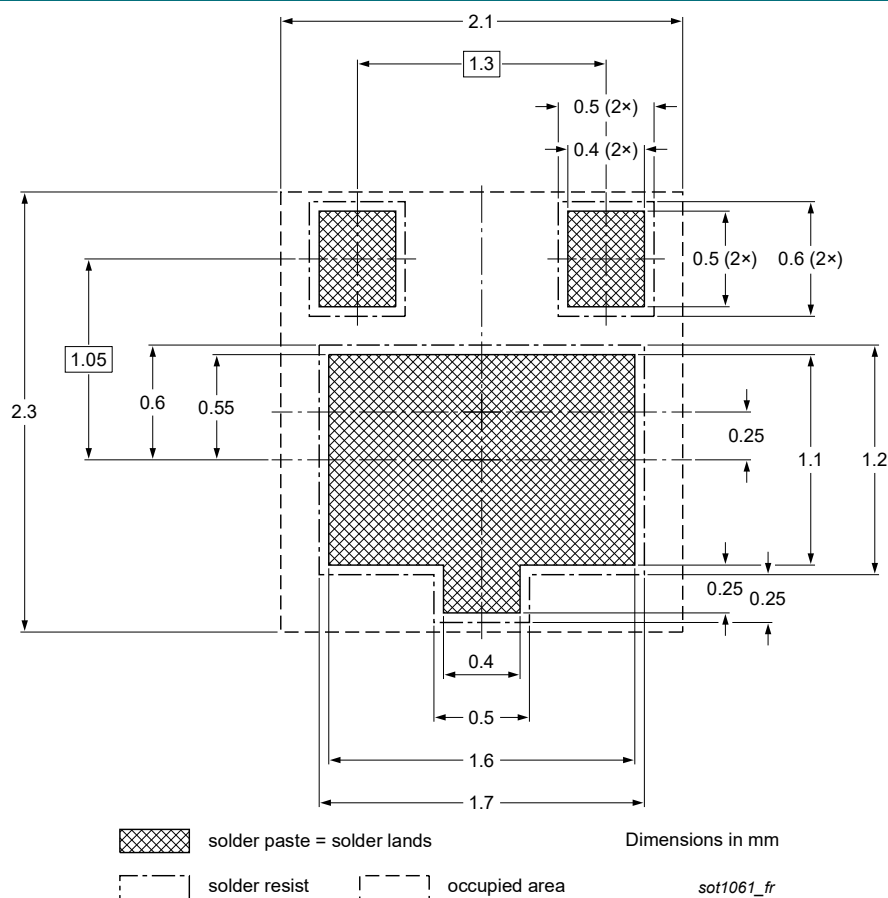


Fig. 11. Package outline SOT1061

## 13. Soldering



**Fig. 12. Reflow soldering footprint for SOT1061**

## 14. Revision history

Table 8. Revision history

| Document ID            | Release date                                                                                                                             | Data sheet status     | Change notice     | Supersedes                                              |
|------------------------|------------------------------------------------------------------------------------------------------------------------------------------|-----------------------|-------------------|---------------------------------------------------------|
| BC53PA_SER v.10        | 20230804                                                                                                                                 | Product data sheet    | -                 | BCP53_BCX53_BC53PA v.9                                  |
| Modifications:         | <ul style="list-style-type: none"> <li>Data sheet separated into 3 data sheets</li> <li>Section "Packing information" removed</li> </ul> |                       |                   |                                                         |
| BCP53_BCX53_BC53PA v.9 | 20220106                                                                                                                                 | Product data sheet    | -                 | BC640_BCP53_BCX53 v.8                                   |
| BC640_BCP53_BCX53 v.8  | 20111021                                                                                                                                 | Product data sheet    | -                 | BC640_BCP53_BCX53 v.7                                   |
| BC640_BCP53_BCX53 v.7  | 20070604                                                                                                                                 | Product data sheet    | -                 | BC640_BCP53_BCX53 v.6                                   |
| BC640_BCP53_BCX53 v.6  | 20050225                                                                                                                                 | Product data sheet    | CPCN200405<br>029 | BC636_638_640 v.5<br>BCP51_52_53 v.5<br>BCX51_52_53 v.4 |
| BC636_638_640 v.5      | 20011010                                                                                                                                 | Product specification | -                 | BCX51_52_53 v.5                                         |
| BCX51_52_53 v.5        | 20030206                                                                                                                                 | Product specification | -                 | BCX51_52_53 v.4                                         |
| BCX51_52_53 v.4        | 20011010                                                                                                                                 | Product specification | -                 | BCX54_55_56 v.3                                         |

## 15. Legal information

### Data sheet status

| Document status<br>[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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- [2] The term 'short data sheet' is explained in section "Definitions".
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Date of release: 4 August 2023

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