



# BC846BS

65 V, 100 mA NPN/NPN general-purpose transistor

1 July 2022

Product data sheet

## 1. General description

NPN/NPN general-purpose transistor pair in a very small SOT363 (SC-88) Surface-Mounted Device (SMD) plastic package.

## 2. Features and benefits

- Low collector capacitance
- Low collector-emitter saturation voltage
- Closely matched current gain
- Reduces number of components and board space
- No mutual interference between the transistors

## 3. Applications

- General-purpose switching and amplification

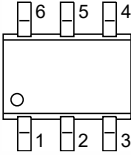
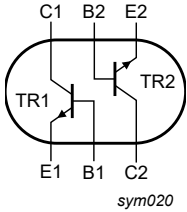
## 4. Quick reference data

Table 1. Quick reference data

| Symbol         | Parameter                 | Conditions                                                             | Min | Typ | Max | Unit |
|----------------|---------------------------|------------------------------------------------------------------------|-----|-----|-----|------|
| Per transistor |                           |                                                                        |     |     |     |      |
| $V_{CE0}$      | collector-emitter voltage | open base                                                              | -   | -   | 65  | V    |
| $I_C$          | collector current         |                                                                        | -   | -   | 100 | mA   |
| $h_{FE}$       | DC current gain           | $V_{CE} = 5\text{ V}$ ; $I_C = 2\text{ mA}$ ; $T_{amb} = 25\text{ °C}$ | 200 | 300 | 450 |      |

5. Pinning information

Table 2. Pinning information

| Pin | Symbol | Description   | Simplified outline                                                                                   | Graphic symbol                                                                                |
|-----|--------|---------------|------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------|
| 1   | E1     | emitter TR1   | <br>TSSOP6 (SOT363) | <br>sym020 |
| 2   | B1     | base TR1      |                                                                                                      |                                                                                               |
| 3   | C2     | collector TR2 |                                                                                                      |                                                                                               |
| 4   | E2     | emitter TR2   |                                                                                                      |                                                                                               |
| 5   | B2     | base TR2      |                                                                                                      |                                                                                               |
| 6   | C1     | collector TR1 |                                                                                                      |                                                                                               |

6. Ordering information

Table 3. Ordering information

| Type number | Package |                                                                                           |         |
|-------------|---------|-------------------------------------------------------------------------------------------|---------|
|             | Name    | Description                                                                               | Version |
| BC846BS     | TSSOP6  | plastic, surface-mounted package; 6 leads; 0.65 mm pitch; 2.1 mm x 1.25 mm x 0.95 mm body | SOT363  |

7. Marking

Table 4. Marking codes

| Type number | Marking code[1] |
|-------------|-----------------|
| BC846BS     | %E5             |

[1] % = placeholder for manufacturing site code

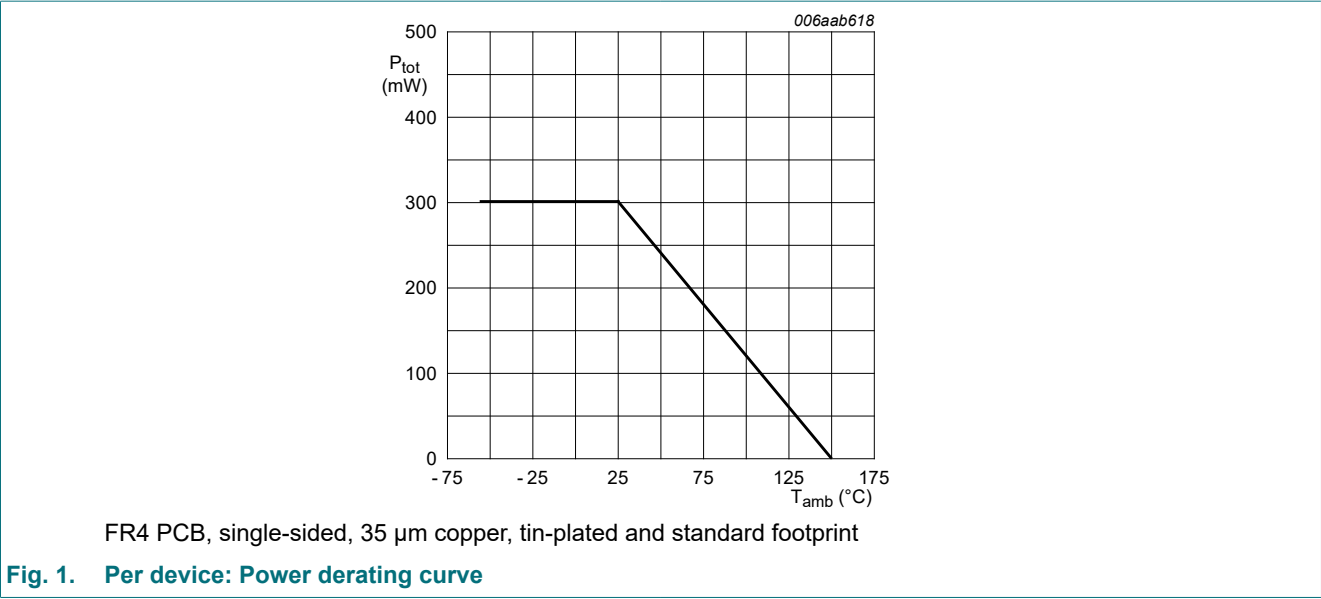
8. Limiting values

Table 5. Limiting values

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

| Symbol           | Parameter                 | Conditions                          |     | Min | Max | Unit |
|------------------|---------------------------|-------------------------------------|-----|-----|-----|------|
| Per transistor   |                           |                                     |     |     |     |      |
| V <sub>CBO</sub> | collector-base voltage    | open emitter                        |     | -   | 80  | V    |
| V <sub>CEO</sub> | collector-emitter voltage | open base                           |     | -   | 65  | V    |
| V <sub>EBO</sub> | emitter-base voltage      | open collector                      |     | -   | 6   | V    |
| I <sub>C</sub>   | collector current         |                                     |     | -   | 100 | mA   |
| I <sub>CM</sub>  | peak collector current    | single pulse; t <sub>p</sub> ≤ 1 ms |     | -   | 200 | mA   |
| I <sub>BM</sub>  | peak base current         |                                     |     | -   | 200 | mA   |
| P <sub>tot</sub> | total power dissipation   | T <sub>amb</sub> ≤ 25 °C            | [1] | -   | 200 | mW   |
| Per device       |                           |                                     |     |     |     |      |
| P <sub>tot</sub> | total power dissipation   | T <sub>amb</sub> ≤ 25 °C            | [1] | -   | 300 | mW   |
| 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 PCB, single-sided, 35 µm copper, tin-plated and standard footprint.

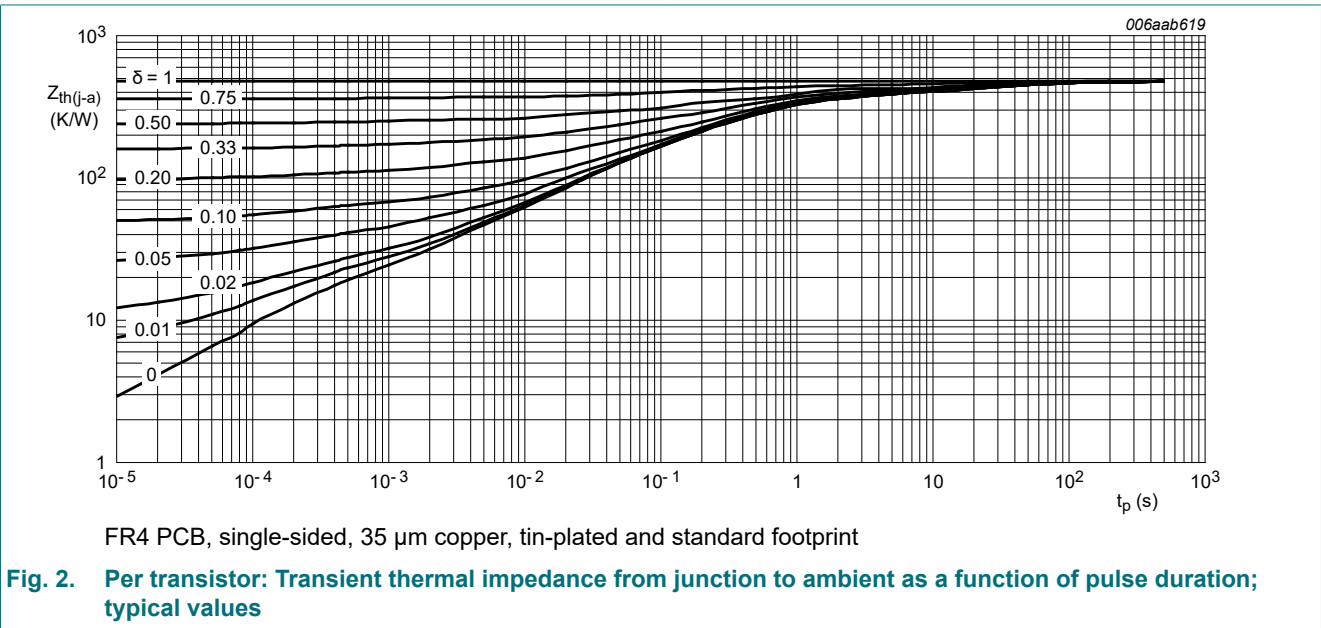


9. Thermal characteristics

Table 6. Thermal characteristics

| Symbol         | Parameter                                        | Conditions  |     | Min | Typ | Max | Unit |
|----------------|--------------------------------------------------|-------------|-----|-----|-----|-----|------|
| Per transistor |                                                  |             |     |     |     |     |      |
| $R_{th(j-a)}$  | thermal resistance from junction to ambient      | in free air | [1] | -   | -   | 625 | K/W  |
| $R_{th(j-sp)}$ | thermal resistance from junction to solder point |             |     | -   | -   | 230 | K/W  |
| Per device     |                                                  |             |     |     |     |     |      |
| $R_{th(j-a)}$  | thermal resistance from junction to ambient      | in free air | [1] | -   | -   | 416 | K/W  |

[1] Device mounted on an FR4 PCB, single-sided, 35 µm copper, tin-plated and standard footprint.



## 10. Characteristics

Table 7. Characteristics

| Symbol                | Parameter                            | Conditions                                                                                                                                                         |  | Min | Typ  | Max | Unit          |
|-----------------------|--------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|-----|------|-----|---------------|
| <b>Per transistor</b> |                                      |                                                                                                                                                                    |  |     |      |     |               |
| $V_{(BR)CBO}$         | collector-base breakdown voltage     | $I_C = 100\ \mu\text{A}$ ; $I_E = 0\ \text{A}$ ; $T_{\text{amb}} = 25\ ^\circ\text{C}$                                                                             |  | 80  | -    | -   | V             |
| $V_{(BR)CEO}$         | collector-emitter breakdown voltage  | $I_C = 2\ \text{mA}$ ; $I_B = 0\ \text{A}$ ; $T_{\text{amb}} = 25\ ^\circ\text{C}$                                                                                 |  | 65  | -    | -   | V             |
| $V_{(BR)EBO}$         | emitter-base breakdown voltage       | $I_C = 0\ \text{A}$ ; $I_E = 100\ \mu\text{A}$ ; $T_{\text{amb}} = 25\ ^\circ\text{C}$                                                                             |  | 6   | -    | -   | V             |
| $I_{CBO}$             | collector-base cut-off current       | $V_{CB} = 50\ \text{V}$ ; $I_E = 0\ \text{A}$ ; $T_{\text{amb}} = 25\ ^\circ\text{C}$                                                                              |  | -   | -    | 15  | nA            |
|                       |                                      | $V_{CB} = 30\ \text{V}$ ; $I_E = 0\ \text{A}$ ; $T_j = 150\ ^\circ\text{C}$                                                                                        |  | -   | -    | 5   | $\mu\text{A}$ |
| $I_{EBO}$             | emitter-base cut-off current         | $V_{EB} = 6\ \text{V}$ ; $I_C = 0\ \text{A}$ ; $T_{\text{amb}} = 25\ ^\circ\text{C}$                                                                               |  | -   | -    | 100 | nA            |
| $h_{FE}$              | DC current gain                      | $V_{CE} = 5\ \text{V}$ ; $I_C = 10\ \mu\text{A}$ ; $T_{\text{amb}} = 25\ ^\circ\text{C}$                                                                           |  | -   | 280  | -   |               |
|                       |                                      | $V_{CE} = 5\ \text{V}$ ; $I_C = 2\ \text{mA}$ ; $T_{\text{amb}} = 25\ ^\circ\text{C}$                                                                              |  | 200 | 300  | 450 |               |
| $V_{CEsat}$           | collector-emitter saturation voltage | $I_C = 10\ \text{mA}$ ; $I_B = 0.5\ \text{mA}$ ; $T_{\text{amb}} = 25\ ^\circ\text{C}$                                                                             |  | -   | 55   | 100 | mV            |
|                       |                                      | $I_C = 100\ \text{mA}$ ; $I_B = 5\ \text{mA}$ ; $T_{\text{amb}} = 25\ ^\circ\text{C}$                                                                              |  | -   | 200  | 300 | mV            |
| $V_{BEsat}$           | base-emitter saturation voltage      | $I_C = 10\ \text{mA}$ ; $I_B = 0.5\ \text{mA}$ ; $T_{\text{amb}} = 25\ ^\circ\text{C}$                                                                             |  | -   | 755  | 850 | mV            |
|                       |                                      | $I_C = 100\ \text{mA}$ ; $I_B = 5\ \text{mA}$ ; $T_{\text{amb}} = 25\ ^\circ\text{C}$                                                                              |  | -   | 1000 | -   | mV            |
| $V_{BE}$              | base-emitter voltage                 | $V_{CE} = 5\ \text{V}$ ; $I_C = 2\ \text{mA}$ ; $T_{\text{amb}} = 25\ ^\circ\text{C}$                                                                              |  | 580 | 650  | 700 | mV            |
|                       |                                      | $V_{CE} = 5\ \text{V}$ ; $I_C = 10\ \text{mA}$ ; $T_{\text{amb}} = 25\ ^\circ\text{C}$                                                                             |  | -   | -    | 770 | mV            |
| $C_c$                 | collector capacitance                | $V_{CB} = 10\ \text{V}$ ; $I_E = 0\ \text{A}$ ; $i_e = 0\ \text{A}$ ; $f = 1\ \text{MHz}$ ; $T_{\text{amb}} = 25\ ^\circ\text{C}$                                  |  | -   | 1.9  | -   | pF            |
| $C_e$                 | emitter capacitance                  | $V_{EB} = 0.5\ \text{V}$ ; $I_C = 0\ \text{A}$ ; $i_c = 0\ \text{A}$ ; $f = 1\ \text{MHz}$ ; $T_{\text{amb}} = 25\ ^\circ\text{C}$                                 |  | -   | 11   | -   | pF            |
| $f_T$                 | transition frequency                 | $V_{CE} = 5\ \text{V}$ ; $I_C = 10\ \text{mA}$ ; $f = 100\ \text{MHz}$ ; $T_{\text{amb}} = 25\ ^\circ\text{C}$                                                     |  | 100 | -    | -   | MHz           |
| NF                    | noise figure                         | $V_{CE} = 5\ \text{V}$ ; $I_C = 0.2\ \text{mA}$ ; $R_S = 2\ \text{k}\Omega$ ; $10\ \text{Hz} \leq f \leq 15700\ \text{Hz}$ ; $T_{\text{amb}} = 25\ ^\circ\text{C}$ |  | -   | 1.9  | -   | dB            |
|                       |                                      | $V_{CE} = 5\ \text{V}$ ; $I_C = 0.2\ \text{mA}$ ; $R_S = 2\ \text{k}\Omega$ ; $f = 1\ \text{kHz}$ ; $B = 200\ \text{Hz}$ ; $T_{\text{amb}} = 25\ ^\circ\text{C}$   |  | -   | 3.1  | -   | dB            |

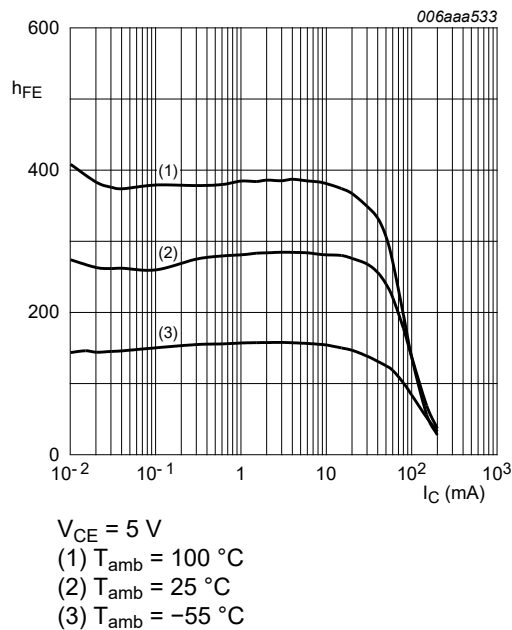


Fig. 3. Per transistor: DC current gain as a function of collector current; typical values

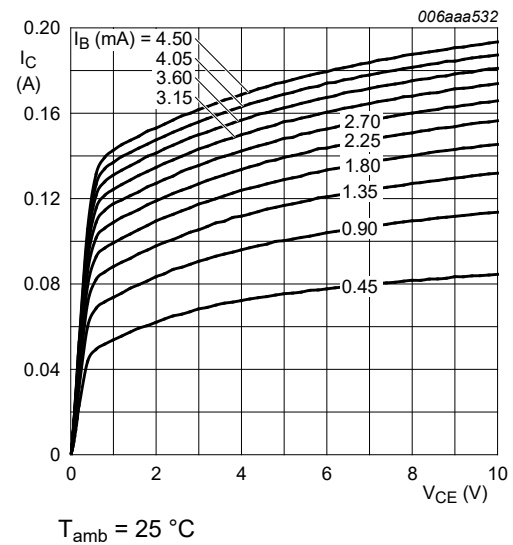


Fig. 4. Per transistor: Collector current as a function of collector-emitter voltage; typical values

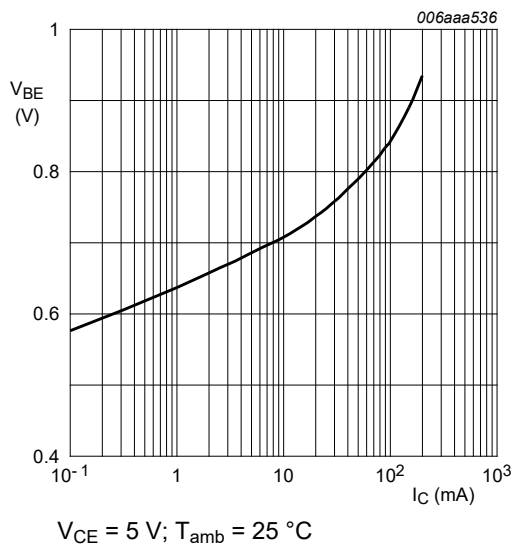


Fig. 5. Per transistor: Base-emitter voltage as a function of collector current; typical values

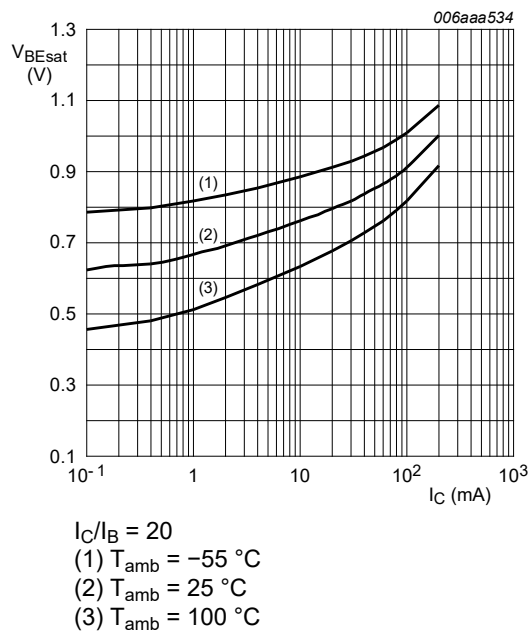


Fig. 6. Per transistor: Base-emitter saturation voltage as a function of collector current; typical values

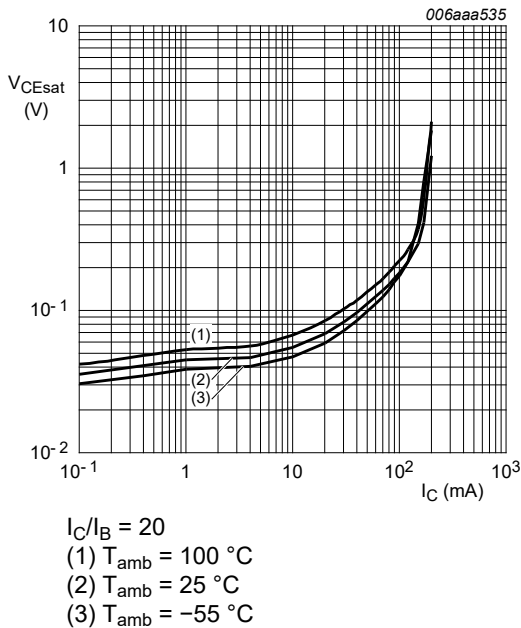


Fig. 7. Per transistor: Collector-emitter saturation voltage as a function of collector current; typical values

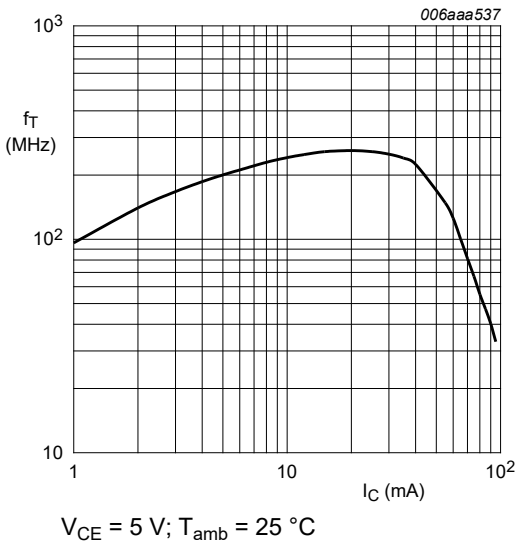


Fig. 8. Per transistor: Transition frequency as a function of collector current; typical values

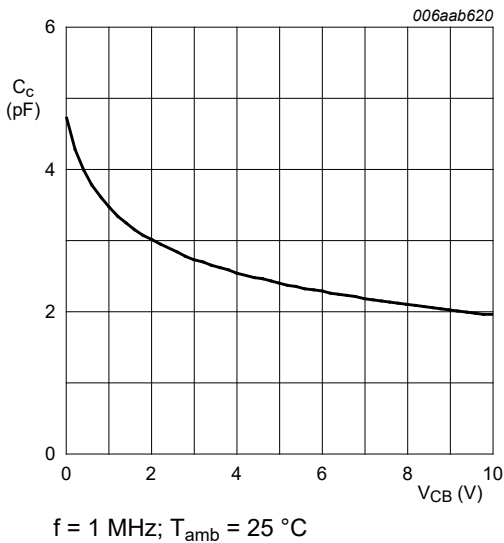


Fig. 9. Per transistor: Collector capacitance as a function of collector-base voltage; typical values

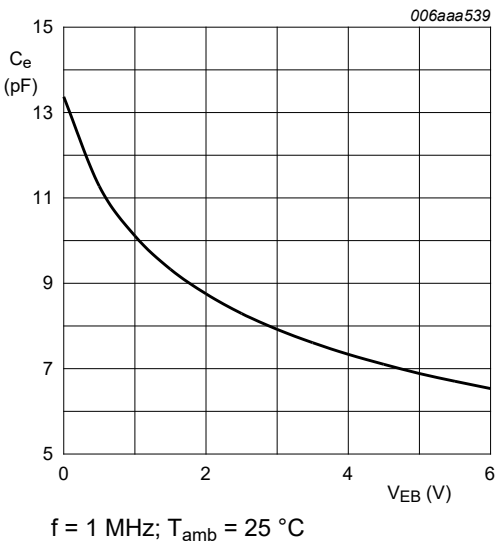


Fig. 10. Per transistor: Emitter capacitance as a function of emitter-base voltage; typical values

11. Package outline

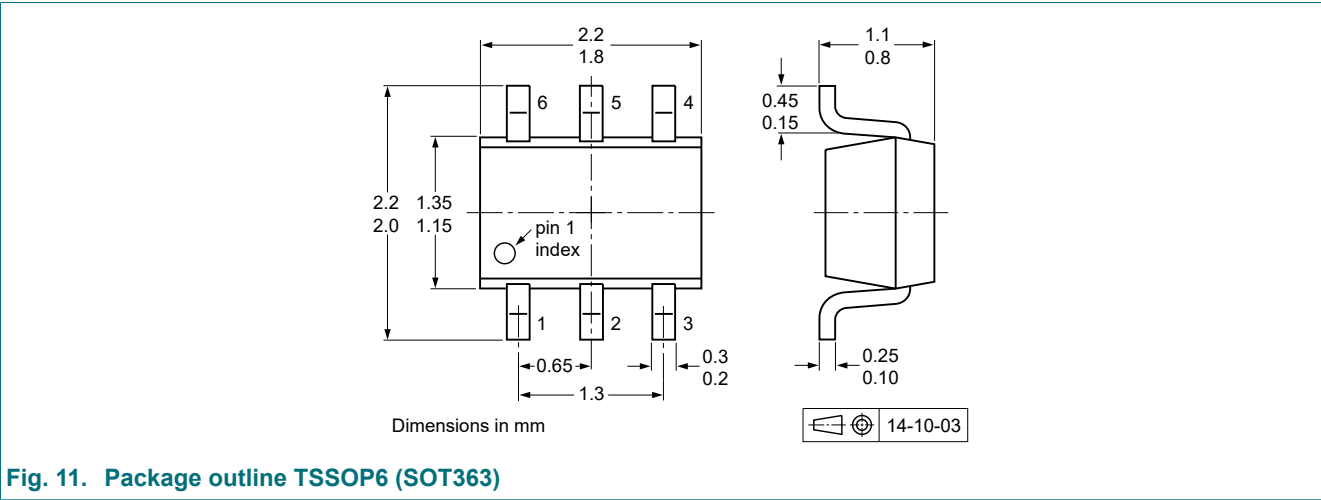


Fig. 11. Package outline TSSOP6 (SOT363)

12. Soldering

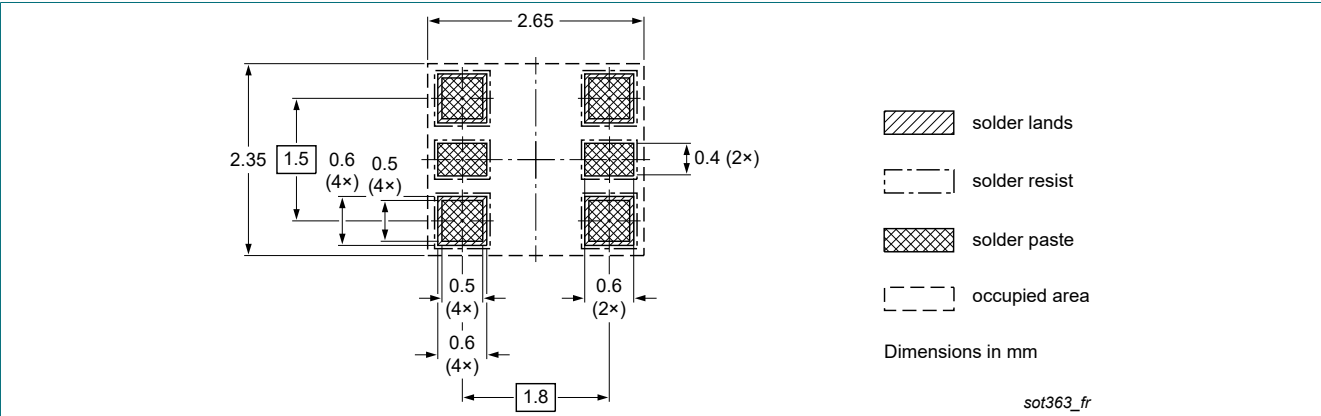


Fig. 12. Reflow soldering footprint for TSSOP6 (SOT363)

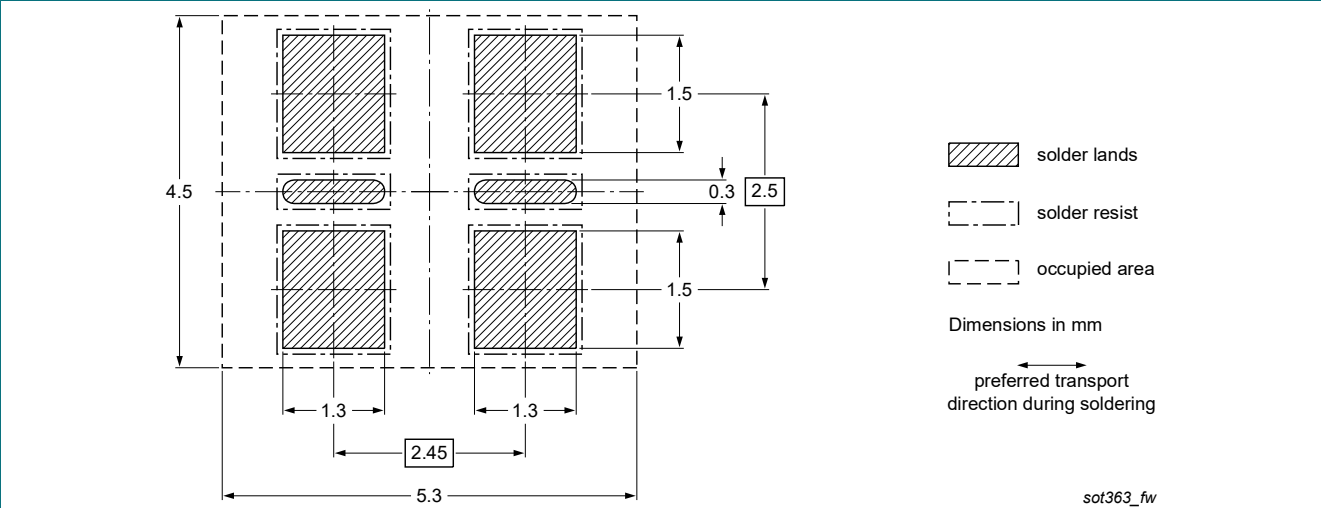


Fig. 13. Wave soldering footprint for TSSOP6 (SOT363)

## 13. Revision history

**Table 8. Revision history**

| Data sheet ID | Release date                                                                                                                                                                                                                                             | Data sheet status  | Change notice | Supersedes  |
|---------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------|---------------|-------------|
| BC846BS v.2   | 20220701                                                                                                                                                                                                                                                 | Product data sheet | -             | BC846BS v.1 |
| Modification: | <ul style="list-style-type: none"><li>Product(s) changed to non-automotive qualification. Please refer to <a href="https://www.nexperia.com">nexperia.com</a> for automotive (-Q) product alternative(s).</li><li>Packing information removed.</li></ul> |                    |               |             |
| BC846BS v.1   | 20090824                                                                                                                                                                                                                                                 | Product data sheet | -             | -           |

## 14. 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.                                     |

- [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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Date of release: 1 July 2022