



# BC847x series

45 V, 100 mA NPN general-purpose transistors

Rev. 13 — 1 July 2022

Product data sheet

## 1. General description

NPN general-purpose transistors in a small SOT23 (TO-236AB) Surface-Mounted Device (SMD) plastic package.

Table 1. Product overview

| Type number[1] | Package  |       |          | PNP complement |
|----------------|----------|-------|----------|----------------|
|                | Nexperia | JEITA | JEDEC    |                |
| BC847          | SOT23    | -     | TO-236AB | BC857          |
| BC847A         |          |       |          | BC857A         |
| BC847B         |          |       |          | BC857B         |
| BC847C         |          |       |          | BC857C         |

[1] Valid for all available selection groups.

## 2. Features and benefits

- General-purpose transistors
- SMD plastic packages
- Three different gain selections

## 3. Applications

- General-purpose switching and amplification

## 4. Quick reference data

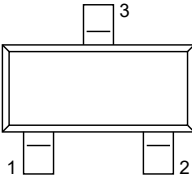
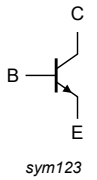
Table 2. Quick reference data

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

| Symbol    | Parameter                 | Conditions                                    | Min | Typ | Max | Unit |
|-----------|---------------------------|-----------------------------------------------|-----|-----|-----|------|
| $V_{CEO}$ | collector-emitter voltage | open base                                     | -   | -   | 45  | V    |
| $I_C$     | collector current         |                                               | -   | -   | 100 | mA   |
| $h_{FE}$  | DC current gain           |                                               |     |     |     |      |
|           | BC847                     | $V_{CE} = 5\text{ V};$<br>$I_C = 2\text{ mA}$ | 110 | -   | 800 |      |
|           | BC847A                    |                                               | 110 | 180 | 220 |      |
|           | BC847B                    |                                               | 200 | 290 | 450 |      |
|           | BC847C                    |                                               | 420 | 520 | 800 |      |

5. Pinning information

Table 3. Pinning information

| Pin | Symbol | Description | Simlified outline                                                                  | Graphic symbol                                                                                |
|-----|--------|-------------|------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------|
| 1   | B      | base        |  | <br>sym123 |
| 2   | E      | emitter     |                                                                                    |                                                                                               |
| 3   | C      | collector   |                                                                                    |                                                                                               |

6. Ordering information

Table 4. Ordering information

| Type number            | Package  |                                          |                       |
|------------------------|----------|------------------------------------------|-----------------------|
|                        | Name     | Description                              | Version               |
| <a href="#">BC847</a>  | TO-236AB | plastic surface-mounted package; 3 leads | <a href="#">SOT23</a> |
| <a href="#">BC847A</a> |          |                                          |                       |
| <a href="#">BC847B</a> |          |                                          |                       |
| <a href="#">BC847C</a> |          |                                          |                       |

7. Marking

Table 5. Marking codes

| Type number |     | Marking code |
|-------------|-----|--------------|
| BC847       | [1] | 1H%          |
| BC847A      | [1] | 1E%          |
| BC847B      | [1] | 1F%          |
| BC847C      | [1] | 1G%          |

[1] % = placeholder for manufacturing site code

8. 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                              | -     | 50  | V                  |
| $V_{CEO}$ | collector-emitter voltage | open base                                 | -     | 45  | V                  |
| $V_{EBO}$ | emitter-base voltage      | open collector                            | -     | 6   | V                  |
| $I_C$     | collector current         |                                           | -     | 100 | mA                 |
| $I_{CM}$  | peak collector current    | single pulse; $t_p \leq 1\text{ ms}$      | -     | 200 | mA                 |
| $I_{BM}$  | peak base current         | single pulse; $t_p \leq 1\text{ ms}$      | -     | 100 | mA                 |
| $P_{tot}$ | total power dissipation   | $T_{amb} \leq 25\text{ }^{\circ}\text{C}$ | [1] - | 250 | mW                 |
| $T_j$     | junction temperature      |                                           | -     | 150 | $^{\circ}\text{C}$ |
| $T_{amb}$ | ambient temperature       |                                           | -65   | 150 | $^{\circ}\text{C}$ |
| $T_{stg}$ | storage temperature       |                                           | -65   | 150 | $^{\circ}\text{C}$ |

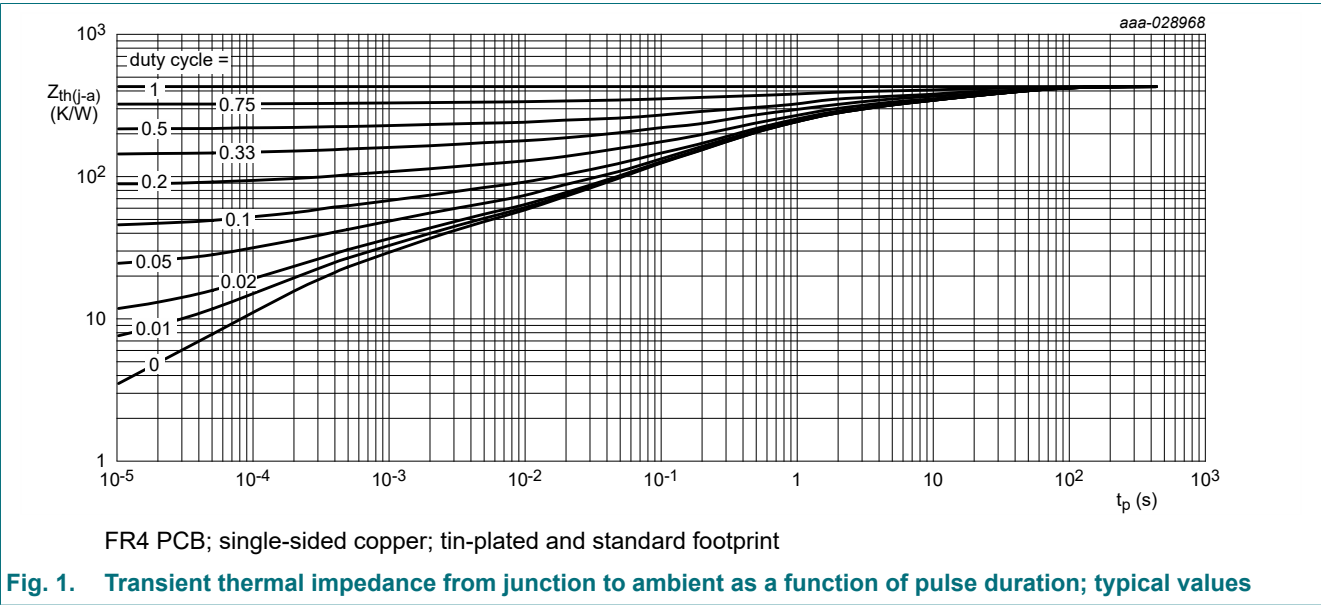
[1] Device mounted on an FR4 Printed-Circuit-Board (PCB); single-sided copper; tin-plated and standard footprint.

9. Thermal characteristics

Table 7. Thermal characteristics

| Symbol        | Parameter                                   | Conditions  | Min   | Typ | Max | Unit |
|---------------|---------------------------------------------|-------------|-------|-----|-----|------|
| $R_{th(j-a)}$ | thermal resistance from junction to ambient | in free air | [1] - | -   | 500 | K/W  |

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



## 10. Characteristics

**Table 8. Characteristics**

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

| Symbol               | Parameter                            | Conditions                                                                                  |     | Min | Typ | Max | Unit |
|----------------------|--------------------------------------|---------------------------------------------------------------------------------------------|-----|-----|-----|-----|------|
| V <sub>(BR)CBO</sub> | collector-base breakdown voltage     | I <sub>C</sub> = 100 μA; I <sub>E</sub> = 0 A                                               |     | 50  | -   | -   | V    |
| V <sub>(BR)CES</sub> | collector-emitter breakdown voltage  | I <sub>C</sub> = 2 mA; V <sub>BE</sub> = 0 A                                                |     | 45  | -   | -   | V    |
| V <sub>(BR)EBO</sub> | emitter-base breakdown voltage       | I <sub>C</sub> = 0 A; I <sub>E</sub> = 100 μA                                               |     | 6   | -   | -   | V    |
| I <sub>CBO</sub>     | collector-base cut-off current       | V <sub>CB</sub> = 30 V; I <sub>E</sub> = 0 A                                                |     | -   | -   | 15  | nA   |
|                      |                                      | V <sub>CB</sub> = 30 V; I <sub>E</sub> = 0 A; T <sub>J</sub> = 150 °C                       |     | -   | -   | 5   | 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                      |                                                                                             |     |     |     |     |      |
|                      | BC847A                               | V <sub>CE</sub> = 5 V; I <sub>C</sub> = 10 μA                                               |     | -   | 170 | -   |      |
|                      | BC847B                               |                                                                                             |     | -   | 280 | -   |      |
|                      | BC847C                               |                                                                                             |     | -   | 420 | -   |      |
|                      | BC847                                | V <sub>CE</sub> = 5 V; I <sub>C</sub> = 2 mA                                                |     | 110 | -   | 800 |      |
|                      | BC847A                               |                                                                                             |     | 110 | 180 | 220 |      |
|                      | BC847B                               |                                                                                             |     | 200 | 290 | 450 |      |
|                      | BC847C                               |                                                                                             |     | 420 | 520 | 800 |      |
| V <sub>CEsat</sub>   | collector-emitter saturation voltage | I <sub>C</sub> = 10 mA; I <sub>B</sub> = 0.5 mA                                             |     | -   | 90  | 200 | mV   |
|                      |                                      | I <sub>C</sub> = 100 mA; I <sub>B</sub> = 5 mA                                              | [1] | -   | 200 | 400 | mV   |
| V <sub>BEsat</sub>   | base-emitter saturation voltage      | I <sub>C</sub> = 10 mA; I <sub>B</sub> = 0.5 mA                                             | [2] | -   | 700 | -   | mV   |
|                      |                                      | I <sub>C</sub> = 100 mA; I <sub>B</sub> = 5 mA                                              | [2] | -   | 900 | -   | mV   |
| V <sub>BE</sub>      | base-emitter voltage                 | V <sub>CE</sub> = 5 V; I <sub>C</sub> = 2 mA                                                | [2] | 580 | 660 | 700 | mV   |
|                      |                                      | V <sub>CE</sub> = 5 V; I <sub>C</sub> = 10 mA                                               |     | -   | -   | 770 | mV   |
| f <sub>T</sub>       | transition frequency                 | V <sub>CE</sub> = 5 V; I <sub>C</sub> = 10 mA; f = 100 MHz                                  |     | 100 | -   | -   | MHz  |
| 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                    |     | -   | -   | 1.5 | pF   |
| C <sub>e</sub>       | emitter capacitance                  | V <sub>EB</sub> = 0.5 V; I <sub>C</sub> = i <sub>c</sub> = 0 A; f = 1 MHz                   |     | -   | 11  | -   | pF   |
| NF                   | noise figure                         | I <sub>C</sub> = 200 μA; V <sub>CE</sub> = 5 V; R <sub>S</sub> = 2 kΩ; f = 1 kHz; B = 200Hz |     | -   | 2   | 10  | dB   |

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

[2]  $V_{BE}$  decreases by approximately 2 mV/K with increasing temperature

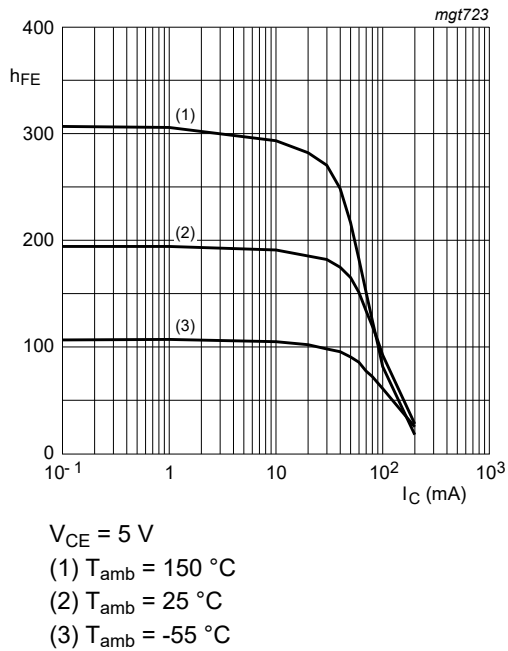


Fig. 2. BC847A: DC current gain as a function of collector current; typical values

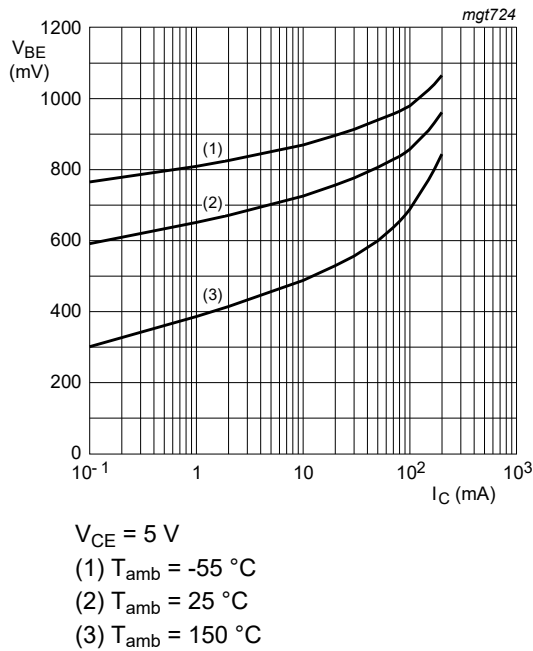


Fig. 3. BC847A: Base-emitter voltage as a function of collector current; typical values

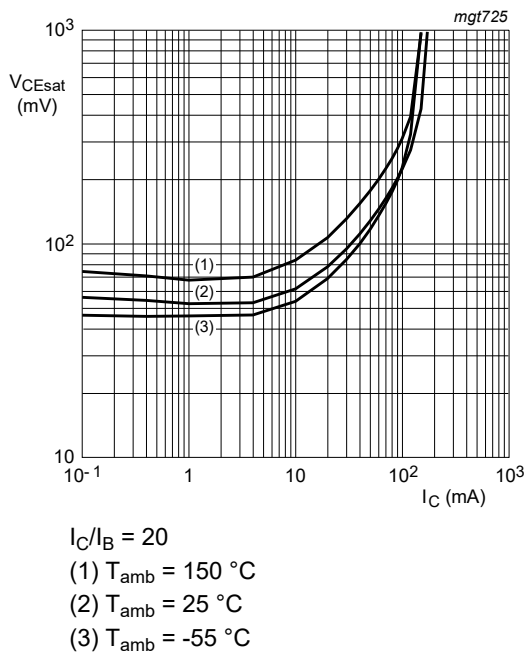


Fig. 4. BC847A: Collector-emitter saturation voltage as a function of collector current; typical values

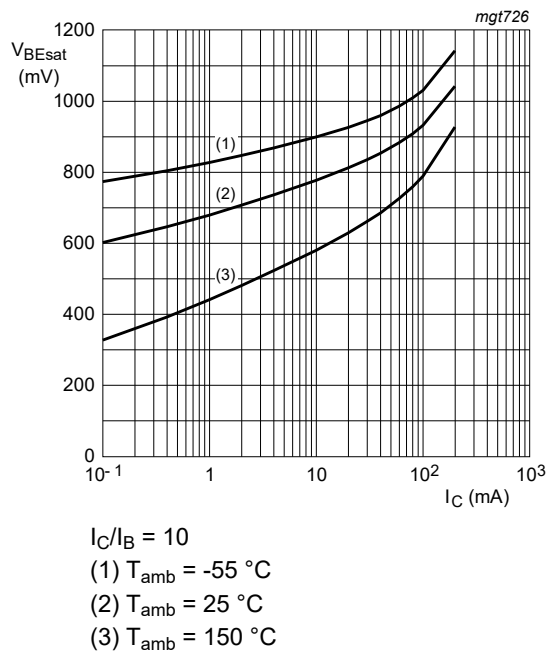


Fig. 5. BC847A: Base-emitter saturation voltage as a function of collector current; typical values

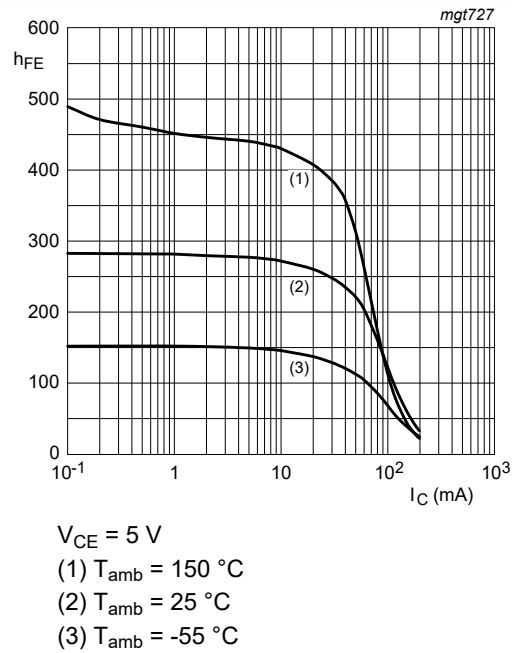


Fig. 6. BC847B: DC current gain as a function of collector current; typical values

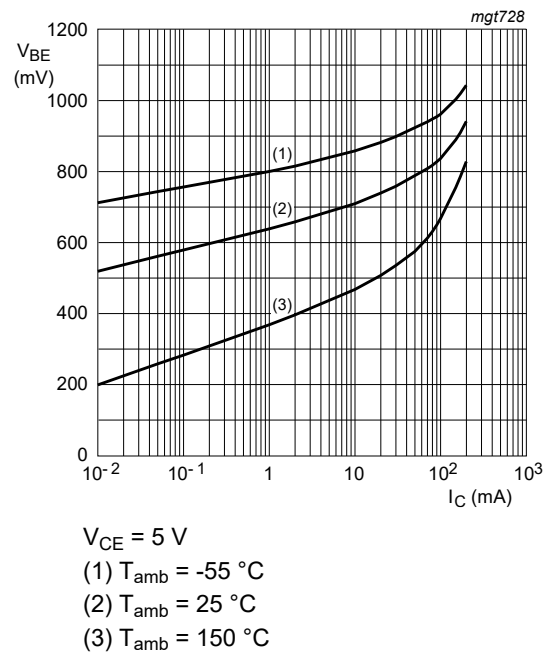


Fig. 7. BC847B: Base-emitter voltage as a function of collector current; typical values

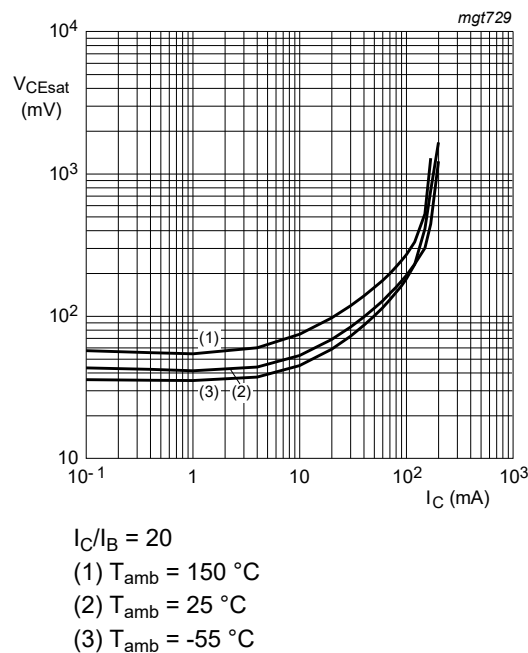


Fig. 8. BC847B: Collector-emitter saturation voltage as a function of collector current; typical values

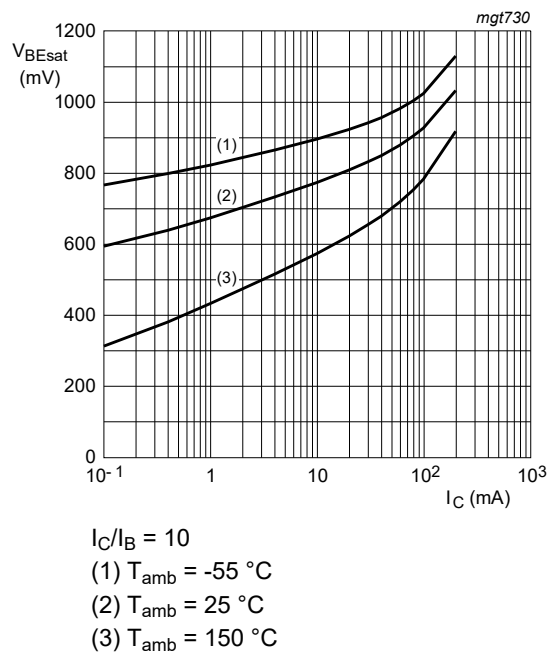


Fig. 9. BC847B: Base-emitter saturation voltage as a function of collector current; typical values

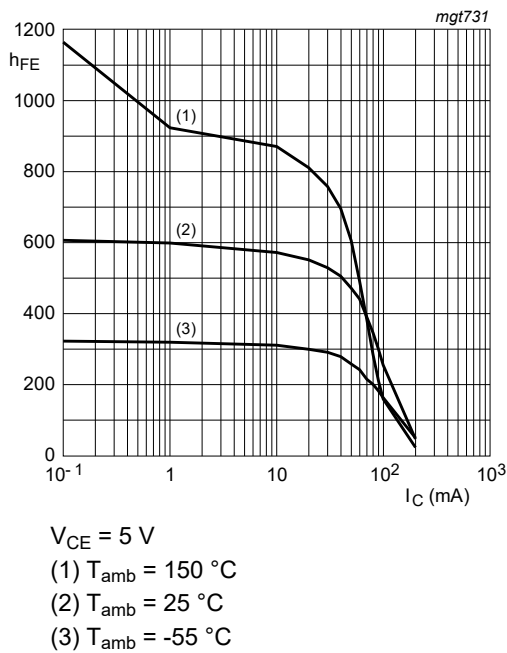


Fig. 10. BC847C: DC current gain as a function of collector current; typical values

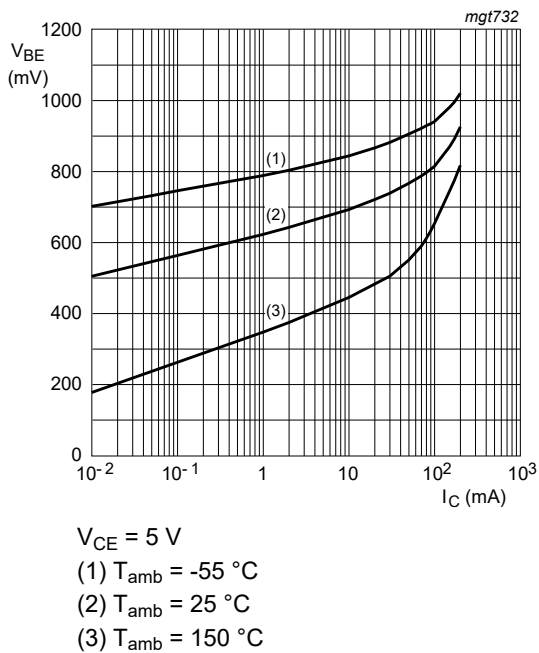


Fig. 11. BC847C: Base-emitter voltage as a function of collector current; typical values

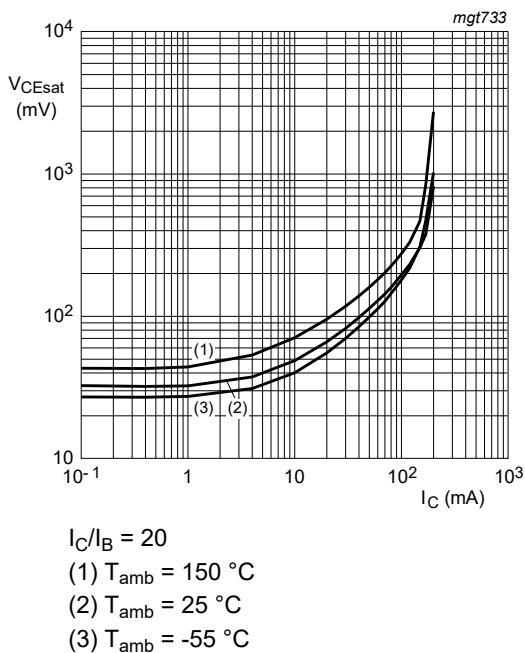


Fig. 12. BC847C: Collector-emitter saturation voltage as a function of collector current; typical values

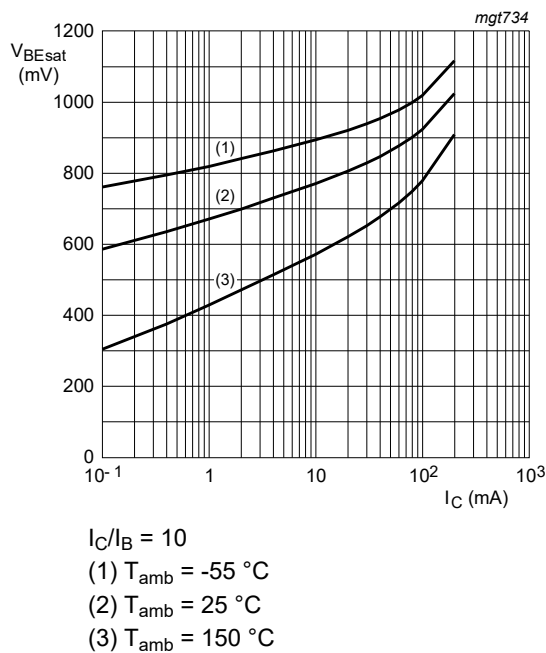
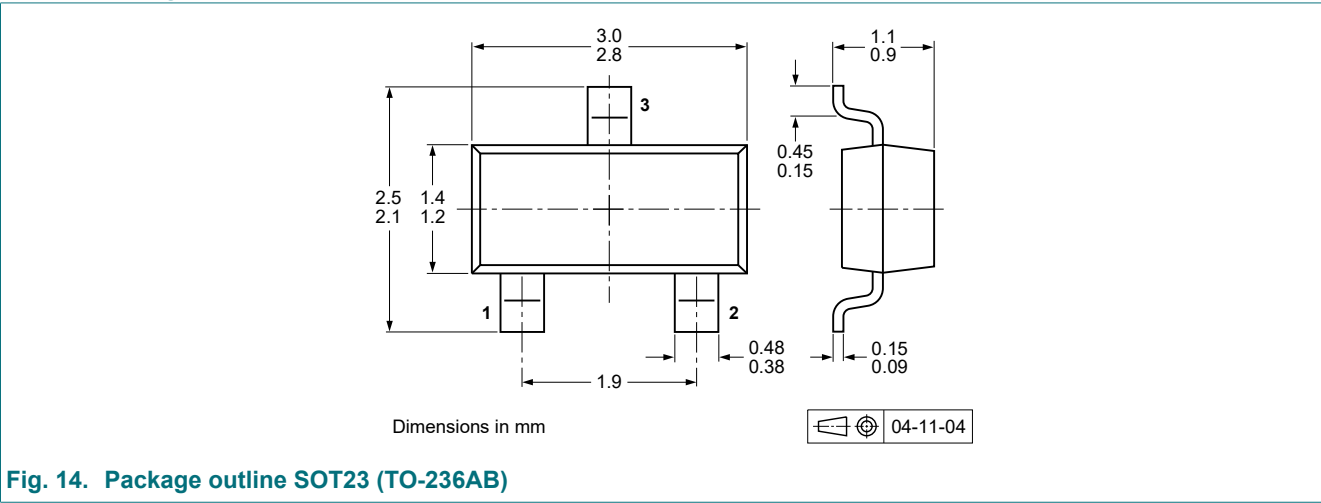


Fig. 13. BC847C: Base-emitter saturation voltage as a function of collector current; typical values

11. Package outline

Table 9. Package outline



12. Soldering

Table 10. Soldering

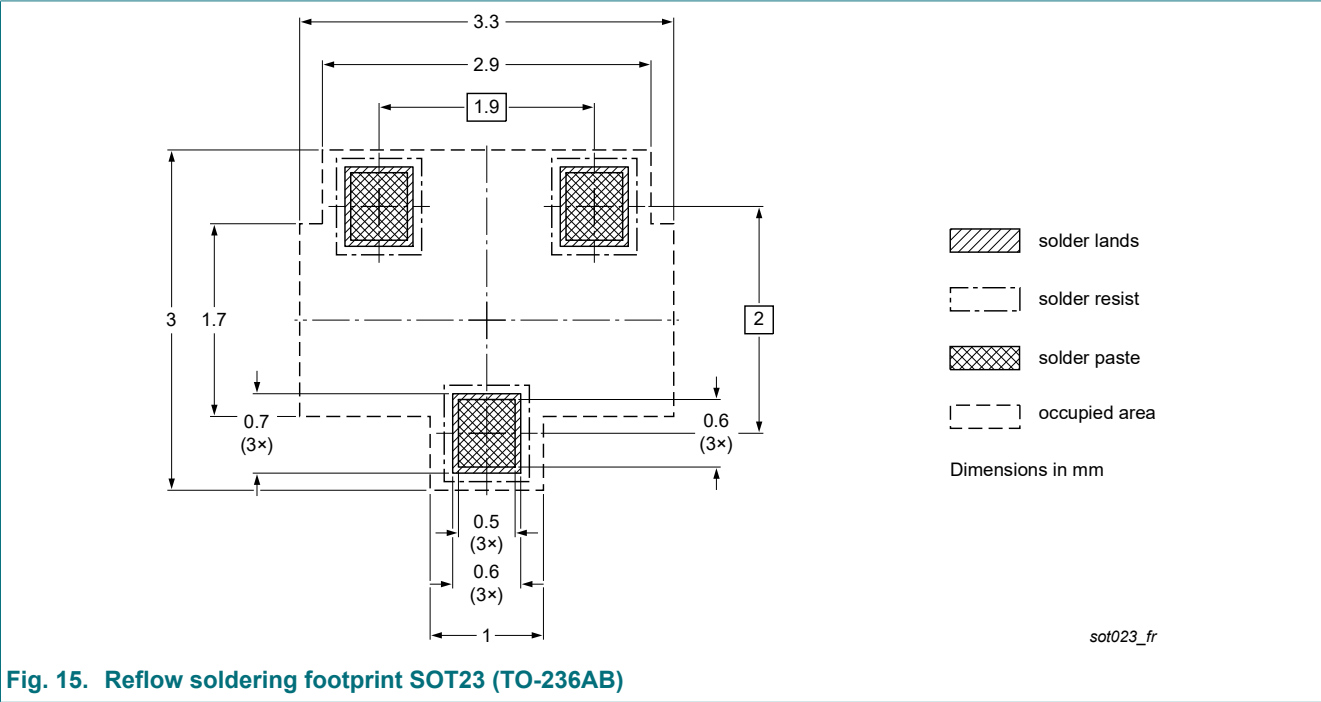


Fig. 15. Reflow soldering footprint SOT23 (TO-236AB)

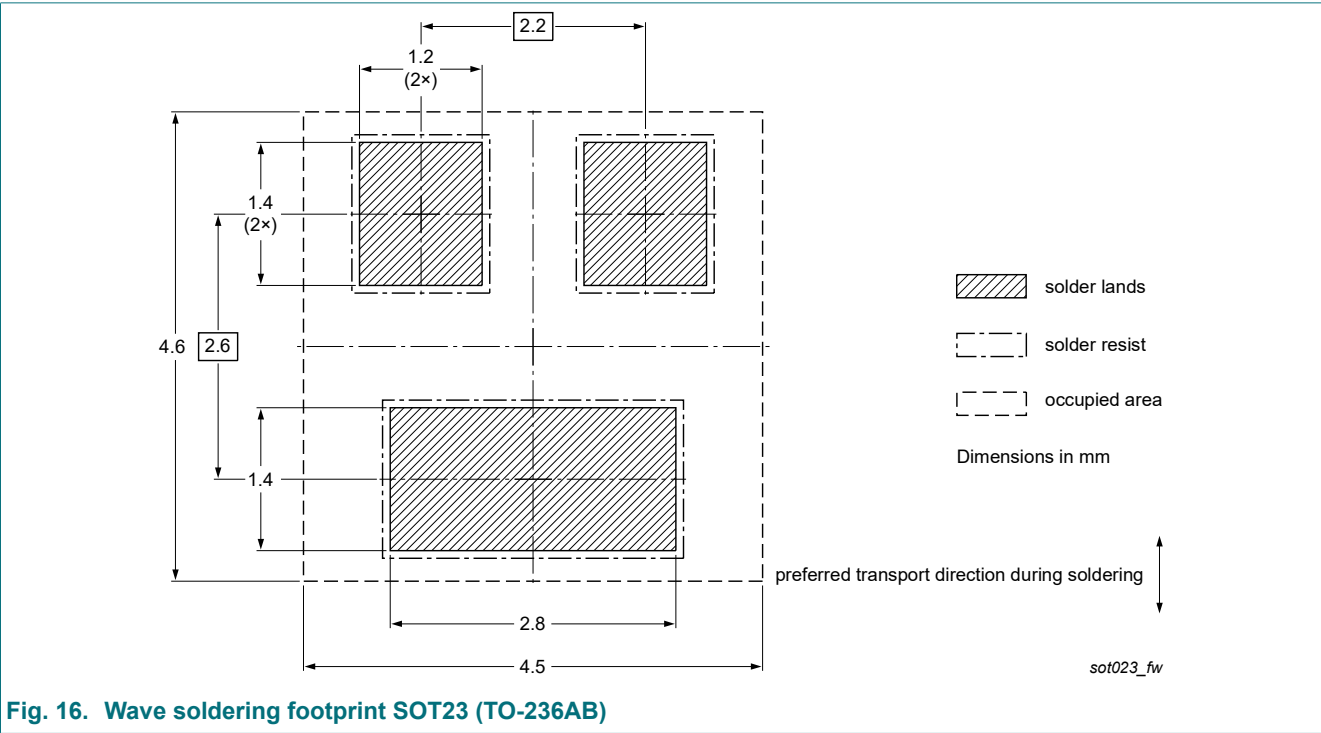


Fig. 16. Wave soldering footprint SOT23 (TO-236AB)

## 13. Revision history

Table 11. Revision history

| Document ID         | Release date                                                                                                                                                                                                                                                                       | Data sheet status  | Change notice | Supersedes          |
|---------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------|---------------|---------------------|
| BC847X_SER v.13     | 20220701                                                                                                                                                                                                                                                                           | Product data sheet | -             | BC847_SER v.12      |
| Modifications:      | <ul style="list-style-type: none"><li>Series data sheet reduced to 3 data sheets per package</li><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></ul> |                    |               |                     |
| BC847_SER v.12      | 20191024                                                                                                                                                                                                                                                                           | Product data sheet | -             | BC847_SER v.11      |
| BC847_SER v.11      | 20181205                                                                                                                                                                                                                                                                           | Product data sheet | -             | BC847_SER v.10      |
| BC847_SER v.10      | 20180302                                                                                                                                                                                                                                                                           | Product data sheet | -             | BC847_SER v.9       |
| BC847_SER v.9       | 20140923                                                                                                                                                                                                                                                                           | Product data sheet | -             | BC847_SER v.8       |
| BC847_SER v.8       | 20120820                                                                                                                                                                                                                                                                           | Product data sheet | -             | BC847_BC547_SER v.7 |
| BC847_BC547_SER v.7 | 20081210                                                                                                                                                                                                                                                                           | Product data sheet | -             | BC847_BC547_SER v.6 |
| BC847_BC547_SER v.6 | 20050519                                                                                                                                                                                                                                                                           | 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.
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