



# BC856; BC857; BC858

65 V, 100 mA PNP general-purpose transistors

Rev. 7 — 16 April 2018

Product data sheet

## 1 Product profile

### 1.1 General description

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

Table 1. Product overview

| Type number | Package  |          | NPN complement |
|-------------|----------|----------|----------------|
|             | Nexperia | JEDEC    |                |
| BC856       | SOT23    | TO-236AB | BC846          |
| BC856A      |          |          | BC846A         |
| BC856B      |          |          | BC846B         |
| BC857       |          |          | BC847          |
| BC857A      |          |          | BC847A         |
| BC857B      |          |          | BC847B         |
| BC857C      |          |          | BC847C         |
| BC858B      |          |          | BC848B         |

### 1.2 Features and benefits

- Low current (max. 100 mA)
- Low voltage (max. 65 V)
- AEC-Q101 qualified

### 1.3 Applications

- General-purpose switching and amplification

1.4 Quick reference data

Table 2. Quick reference data  
*T<sub>amb</sub> = 25 °C unless otherwise specified.*

| Symbol           | Parameter                 | Conditions                                     |  | Min | Typ | Max  | Unit |
|------------------|---------------------------|------------------------------------------------|--|-----|-----|------|------|
| V <sub>CEO</sub> | collector-emitter voltage | open base                                      |  |     |     |      |      |
|                  | BC856                     |                                                |  | -   | -   | -65  | V    |
|                  | BC857                     |                                                |  | -   | -   | -45  | V    |
|                  | BC858B                    |                                                |  | -   | -   | -30  | V    |
| I <sub>C</sub>   | collector current         |                                                |  | -   | -   | -100 | mA   |
| I <sub>CM</sub>  | peak collector current    |                                                |  | -   | -   | -200 | mA   |
| h <sub>FE</sub>  | DC current gain           | V <sub>CE</sub> = -5 V; I <sub>C</sub> = -2 mA |  |     |     |      |      |
|                  | BC856                     |                                                |  | 125 | -   | 475  | -    |
|                  | BC857                     |                                                |  | 125 | -   | 800  | -    |
|                  | BC856A; BC857A            |                                                |  | 125 | -   | 250  | -    |
|                  | BC856; BC857B; BC858B     |                                                |  | 220 | -   | 475  | -    |
|                  | BC857C                    |                                                |  | 420 | -   | 800  | -    |

2 Pinning information

Table 3. Pinning information

| Pin | Symbol | Description | Simplified outline                                                                   | Graphic symbol                                                                        |
|-----|--------|-------------|--------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|
| 1   | B      | base        |  |  |
| 2   | E      | emitter     |                                                                                      |                                                                                       |
| 3   | C      | collector   |                                                                                      |                                                                                       |

### 3 Ordering information

Table 4. Ordering information

| Type number | Package  |                                          |         |
|-------------|----------|------------------------------------------|---------|
|             | Name     | Description                              | Version |
| BC856       | TO-236AB | Plastic surface-mounted package; 3 leads | SOT23   |
| BC856A      |          |                                          |         |
| BC856B      |          |                                          |         |
| BC857       |          |                                          |         |
| BC857A      |          |                                          |         |
| BC857B      |          |                                          |         |
| BC857C      |          |                                          |         |
| BC858B      |          |                                          |         |

### 4 Marking

Table 5. Marking codes

| Type number | Marking code |
|-------------|--------------|
| BC856       | [1] 3D%      |
| BC856A      | [1] 3A%      |
| BC856B      | [1] 3B%      |
| BC857       | [1] 3H%      |
| BC857A      | [1] 3E%      |
| BC857B      | [1] 3F%      |
| BC857C      | [1] 3G%      |
| BC858B      | [1] 3K%      |

[1] % = placeholder for manufacturing site code

## 5 Limiting values

**Table 6. Limiting values**

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

| Symbol           | Parameter                 | Conditions               |     | Min | Max  | Unit |
|------------------|---------------------------|--------------------------|-----|-----|------|------|
| V <sub>CBO</sub> | collector-base voltage    | open emitter             |     |     |      |      |
|                  | BC856                     |                          |     | -   | -80  | V    |
|                  | BC857                     |                          |     | -   | -50  | V    |
|                  | BC858B                    |                          |     | -   | -30  | V    |
| V <sub>CEO</sub> | collector-emitter voltage | open base                |     |     |      |      |
|                  | BC856                     |                          |     | -   | -65  | V    |
|                  | BC857                     |                          |     | -   | -45  | V    |
|                  | BC858B                    |                          |     | -   | -30  | V    |
| V <sub>EBO</sub> | emitter-base voltage      | open collector           |     | -   | -5   | V    |
| I <sub>C</sub>   | collector current         |                          |     | -   | -100 | mA   |
| I <sub>CM</sub>  | peak collector current    |                          |     | -   | -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] | -   | 250  | mW   |
| T <sub>j</sub>   | junction temperature      |                          |     | -   | 150  | °C   |
| T <sub>amb</sub> | ambient temperature       |                          |     | -65 | 150  | °C   |
| T <sub>stg</sub> | storage temperature       |                          |     | -65 | 150  | °C   |

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

## 6 Thermal characteristics

**Table 7. Thermal characteristics**

| Symbol               | Parameter                                   | Conditions  |     | Min | Typ | Max | Unit |
|----------------------|---------------------------------------------|-------------|-----|-----|-----|-----|------|
| R <sub>th(j-a)</sub> | 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.

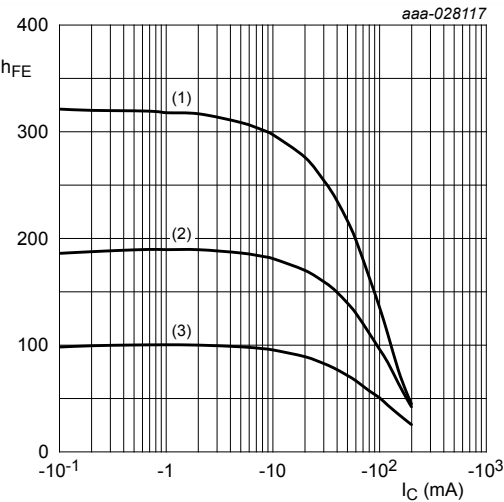
## 7 Characteristics

**Table 8. Characteristics**

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

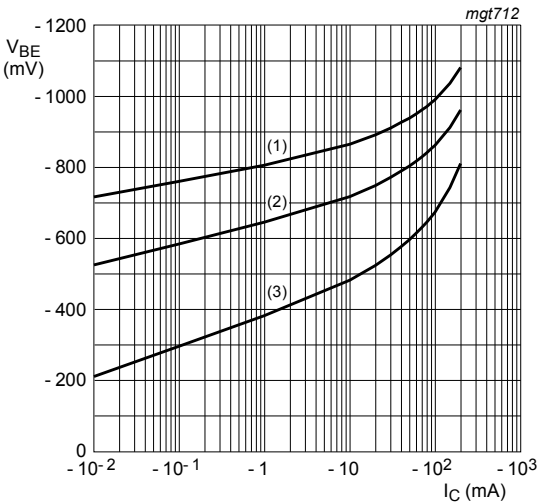
| Symbol      | Parameter                            | Conditions                                                                                                         | Min  | Typ  | Max  | Unit          |
|-------------|--------------------------------------|--------------------------------------------------------------------------------------------------------------------|------|------|------|---------------|
| $I_{CBO}$   | collector-base cut-off current       | $V_{CB} = -30\text{ V}; I_E = 0$                                                                                   | -    | -1   | -15  | nA            |
|             |                                      | $V_{CB} = -30\text{ V}; I_E = 0; T_J = 150\text{ °C}$                                                              | -    | -    | -4   | $\mu\text{A}$ |
| $I_{EBO}$   | emitter-base cut-off current         | $V_{EB} = -5\text{ V}; I_C = 0$                                                                                    | -    | -    | -100 | nA            |
| $h_{FE}$    | DC current gain                      |                                                                                                                    |      |      |      |               |
|             | BC856                                | $V_{CE} = -5\text{ V}; I_C = -2\text{ mA}$                                                                         | 125  | -    | 475  |               |
|             | BC857                                |                                                                                                                    | 125  | -    | 800  |               |
|             | BC856A; BC857A                       |                                                                                                                    | 125  | -    | 250  |               |
|             | BC856B; BC857B;<br>BC858B            |                                                                                                                    | 220  | -    | 475  |               |
|             | BC857C                               |                                                                                                                    | 420  | -    | 800  |               |
| $V_{CEsat}$ | collector-emitter saturation voltage | $I_C = -10\text{ mA}; I_B = -0.5\text{ mA}$                                                                        | -    | -75  | -300 | mV            |
|             |                                      | $I_C = -100\text{ mA}; I_B = -5\text{ mA}$ [1]                                                                     | -    | -250 | -650 | mV            |
| $V_{BEsat}$ | base-emitter saturation voltage      | $I_C = -10\text{ mA}; I_B = -0.5\text{ mA}$                                                                        | -    | -700 | -    | mV            |
|             |                                      | $I_C = -100\text{ mA}; I_B = -5\text{ mA}$ [1]                                                                     | -    | -850 | -    | mV            |
| $V_{BE}$    | base-emitter voltage                 | $V_{CE} = -5\text{ V}; I_C = -2\text{ mA}$                                                                         | -600 | -650 | -750 | mV            |
|             |                                      | $V_{CE} = -5\text{ V}; I_C = -10\text{ mA}$                                                                        | -    | -    | -820 | mV            |
| $f_T$       | transition frequency                 | $V_{CE} = -5\text{ V}; I_C = -10\text{ mA}; f = 100\text{ MHz}$                                                    | 100  | -    | -    | MHz           |
| $C_c$       | collector capacitance                | $V_{CB} = -10\text{ V}; I_E = I_B = 0\text{ A}; f = 1\text{ MHz}$                                                  | -    | 4.5  | -    | pF            |
| F           | noise figure                         | $I_C = -200\text{ }\mu\text{A}; V_{CE} = -5\text{ V}; R_S = 2\text{ k}\Omega; f = 1\text{ kHz}; B = 200\text{ Hz}$ | -    | 2    | 10   | dB            |

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



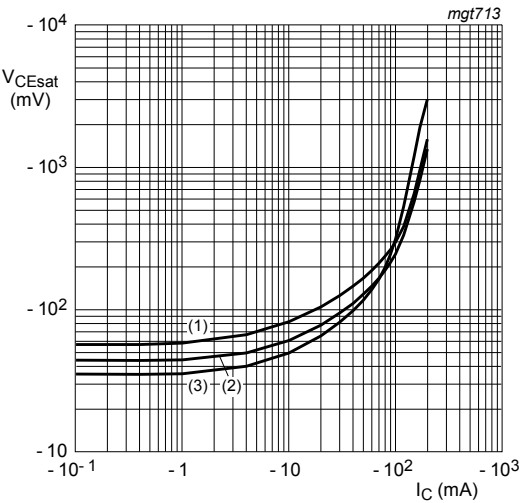
$V_{CE} = -5\text{ V}$   
(1)  $T_{amb} = 150\text{ }^{\circ}\text{C}$   
(2)  $T_{amb} = 25\text{ }^{\circ}\text{C}$   
(3)  $T_{amb} = -55\text{ }^{\circ}\text{C}$

Figure 1. BC856A; BC857A: DC current gain as a function of collector current; typical values



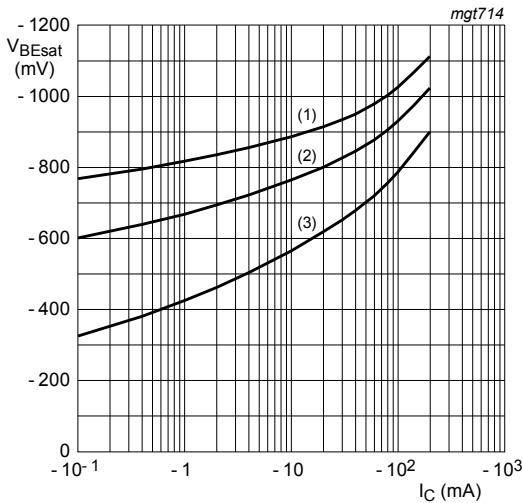
$V_{CE} = -5\text{ V}$   
(1)  $T_{amb} = -55\text{ }^{\circ}\text{C}$   
(2)  $T_{amb} = 25\text{ }^{\circ}\text{C}$   
(3)  $T_{amb} = 150\text{ }^{\circ}\text{C}$

Figure 2. BC856A; BC857A: Base-emitter voltage as a function of collector current; typical values



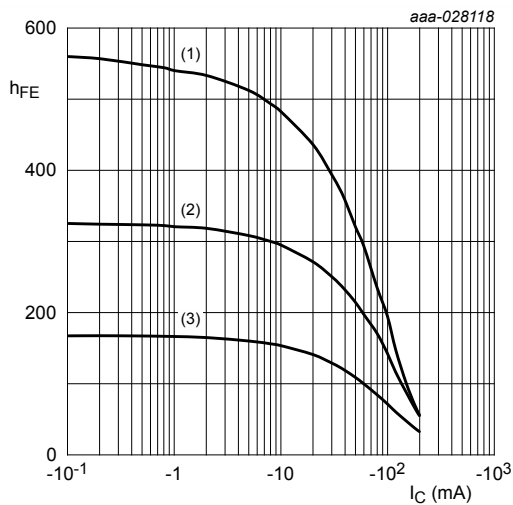
$I_C/I_B = 20$   
(1)  $T_{amb} = 150\text{ }^{\circ}\text{C}$   
(2)  $T_{amb} = 25\text{ }^{\circ}\text{C}$   
(3)  $T_{amb} = -55\text{ }^{\circ}\text{C}$

Figure 3. BC856A; BC857A: Collector-emitter saturation voltage as a function of collector current; typical values



$I_C/I_B = 20$   
(1)  $T_{amb} = -55\text{ }^{\circ}\text{C}$   
(2)  $T_{amb} = 25\text{ }^{\circ}\text{C}$   
(3)  $T_{amb} = 150\text{ }^{\circ}\text{C}$

Figure 4. BC856A; BC857A: Base-emitter saturation voltage as a function of collector current; typical values



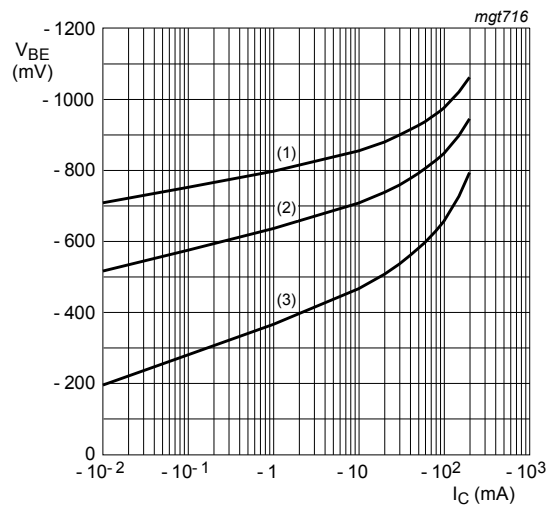
$V_{CE} = -5 \text{ V}$

(1)  $T_{amb} = 150 \text{ }^{\circ}\text{C}$

(2)  $T_{amb} = 25 \text{ }^{\circ}\text{C}$

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

**Figure 5. BC856B; BC857B; BC858B: DC current gain as a function of collector current; typical values**



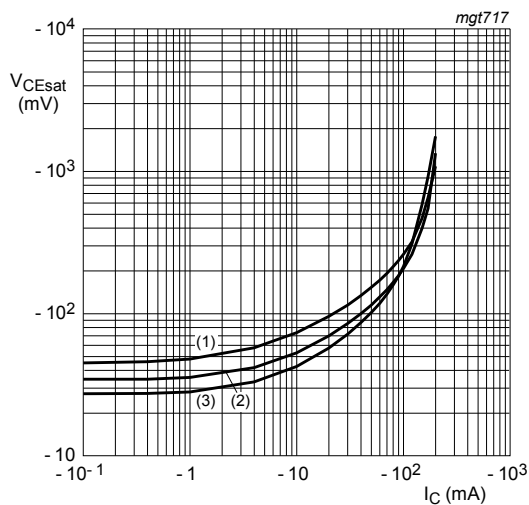
$V_{CE} = -5 \text{ V}$

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

(2)  $T_{amb} = 25 \text{ }^{\circ}\text{C}$

(3)  $T_{amb} = 150 \text{ }^{\circ}\text{C}$

**Figure 6. BC856B; BC857B; BC858B: Base-emitter voltage as a function of collector current; typical values**



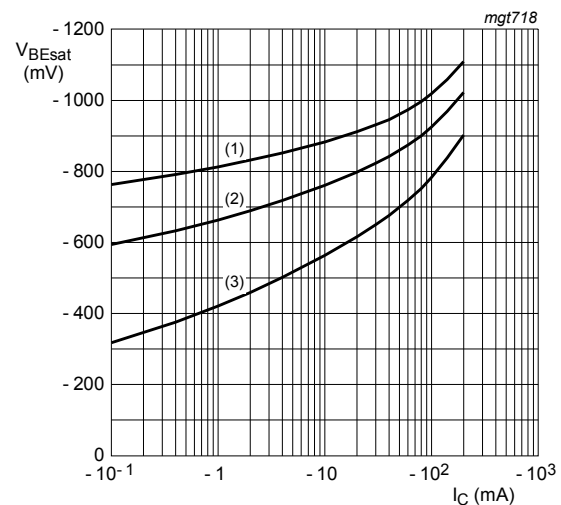
$I_C/I_B = 20$

(1)  $T_{amb} = 150 \text{ }^{\circ}\text{C}$

(2)  $T_{amb} = 25 \text{ }^{\circ}\text{C}$

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

**Figure 7. BC856B; BC857B; BC858B: Collector-emitter saturation voltage as a function of collector current; typical values**



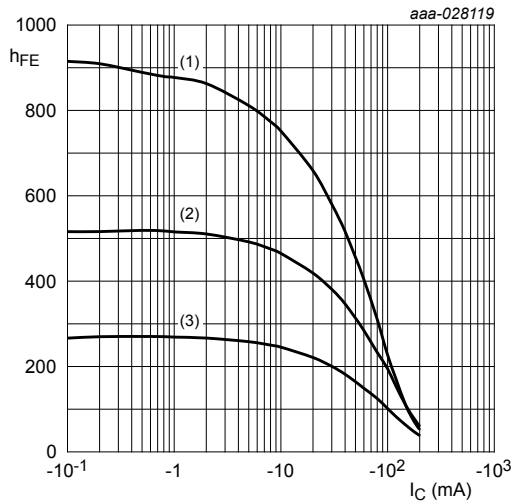
$I_C/I_B = 20$

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

(2)  $T_{amb} = 25 \text{ }^{\circ}\text{C}$

(3)  $T_{amb} = 150 \text{ }^{\circ}\text{C}$

**Figure 8. BC856B; BC857B; BC858B: Base-emitter saturation voltage as a function of collector current; typical values**



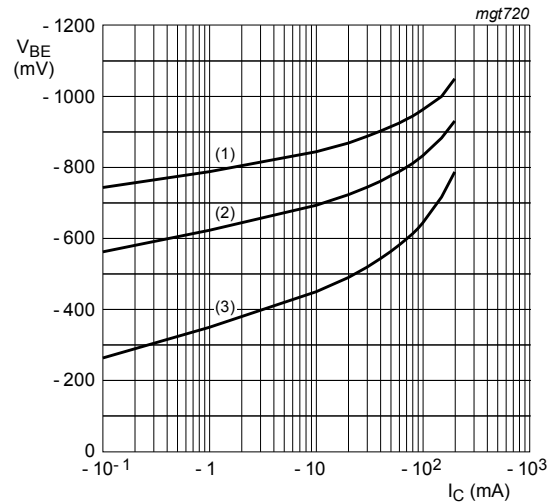
$V_{CE} = -5 \text{ V}$

(1)  $T_{amb} = 150 \text{ }^{\circ}\text{C}$

(2)  $T_{amb} = 25 \text{ }^{\circ}\text{C}$

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

**Figure 9. BC857C: DC current gain as a function of collector current; typical values**



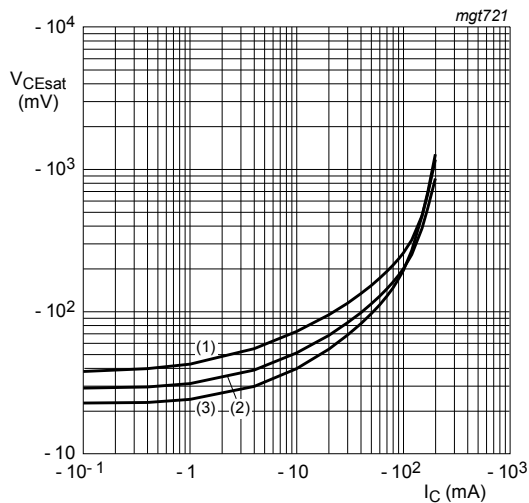
$V_{CE} = -5 \text{ V}$

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

(2)  $T_{amb} = 25 \text{ }^{\circ}\text{C}$

(3)  $T_{amb} = 150 \text{ }^{\circ}\text{C}$

**Figure 10. BC857C: Base-emitter voltage as a function of collector current; typical values**



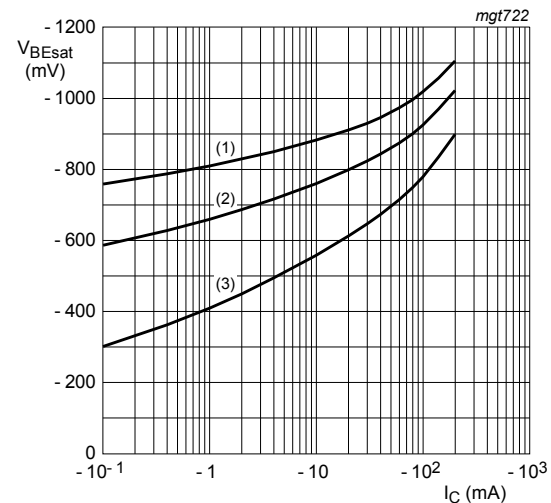
$I_C/I_B = 20$

(1)  $T_{amb} = 150 \text{ }^{\circ}\text{C}$

(2)  $T_{amb} = 25 \text{ }^{\circ}\text{C}$

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

**Figure 11. BC857C: Collector-emitter saturation voltage as a function of collector current; typical values**



$I_C/I_B = 20$

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

(2)  $T_{amb} = 25 \text{ }^{\circ}\text{C}$

(3)  $T_{amb} = 150 \text{ }^{\circ}\text{C}$

**Figure 12. BC857C: Base-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.

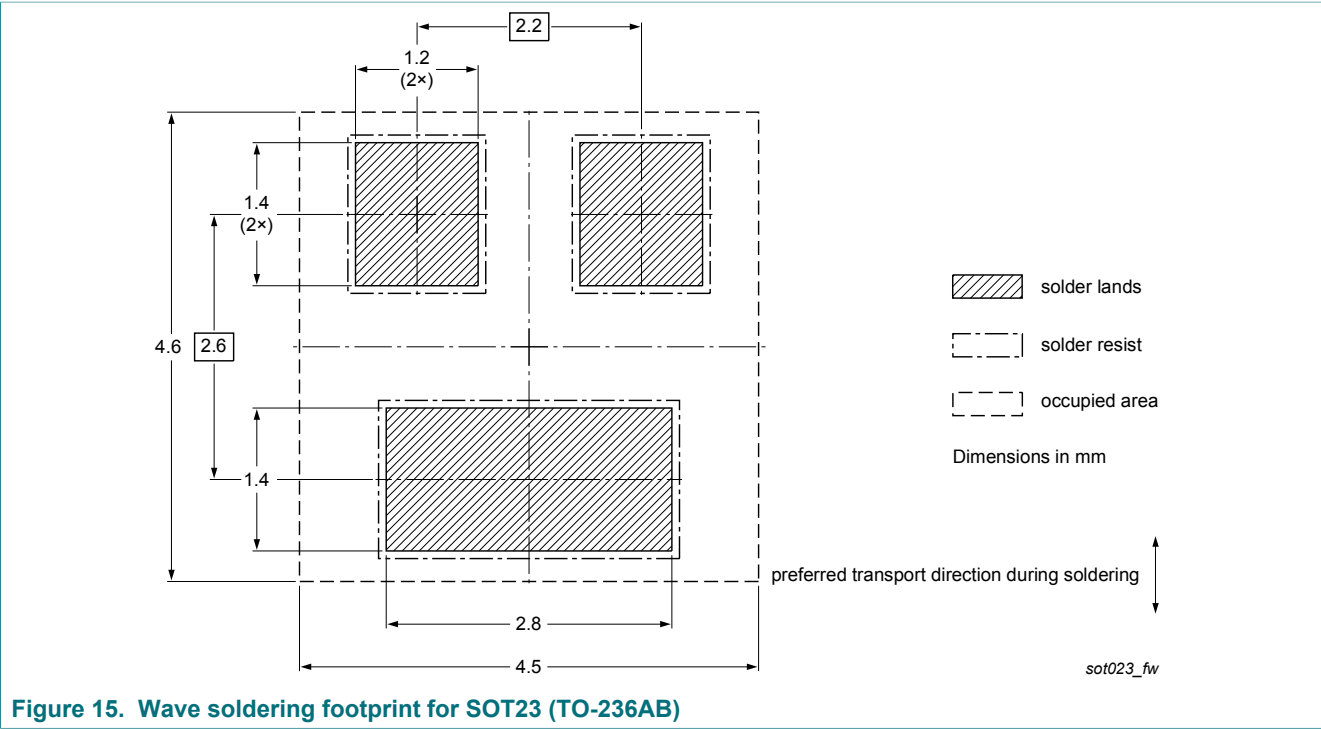
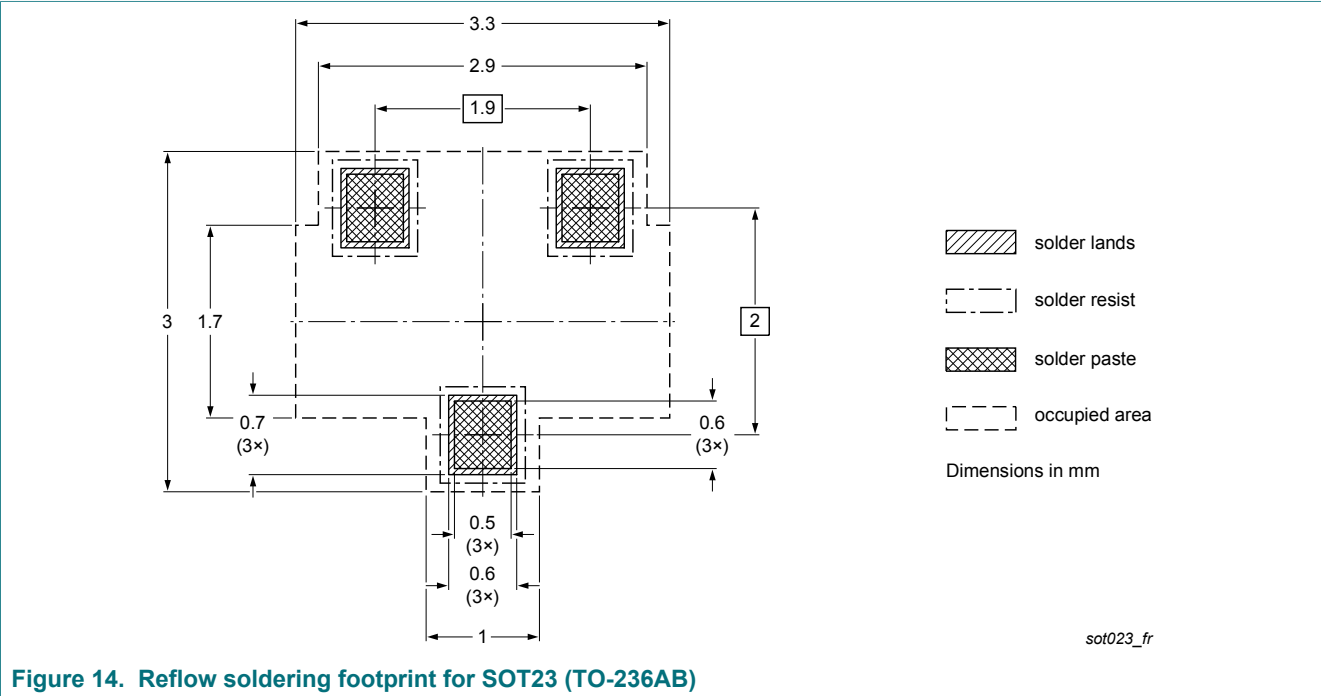
9 Package outline

Table 9. Package outline



10 Soldering

Table 10. Soldering



## 11 Revision history

**Table 11. Revision history**

| Document ID           | Release date                                                                                                                                                                                                                                                                                                                                                                                                                                         | Data sheet status  | Change notice | Supersedes            |
|-----------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------|---------------|-----------------------|
| BC856_BC857_BC858 v.7 | 20180416                                                                                                                                                                                                                                                                                                                                                                                                                                             | Product data sheet | -             | BC856_BC857_BC858 v.6 |
| Modifications:        | <ul style="list-style-type: none"><li>• The products are AEC-Q101 qualified.</li><li>• The format of this data sheet has been redesigned to comply with the identity guidelines of Nexperia.</li><li>• Legal texts have been adapted to the new company name where appropriate.</li><li>• General description, pinning information, ordering information, marking and characteristics are corrected.</li><li>• Quick reference data added.</li></ul> |                    |               |                       |
| BC856_BC857_BC858 v.6 | 20040106                                                                                                                                                                                                                                                                                                                                                                                                                                             | Product data sheet | -             | BC856_BC857_BC858 v.5 |

## 12 Legal information

### 12.1 Data sheet status

| Document status <sup>[1][2]</sup> | Product status <sup>[3]</sup> | 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".

[3] The product status of device(s) described in this document may have changed since this document was published and may differ in case of multiple devices. The latest product status information is available on the Internet at URL <http://www.nexperia.com>.

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## 12.4 Trademarks

Notice: All referenced brands, product names, service names and trademarks are the property of their respective owners.

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Please be aware that important notices concerning this document and the product(s) described herein, have been included in section 'Legal information'.