



# THE DATASHEET OF BC856S,115

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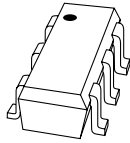
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Kind regards,

Team Nexperia



# BC856S

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

Rev. 02 — 19 February 2009

Product data sheet

## 1. Product profile

### 1.1 General description

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

### 1.2 Features

- 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

### 1.3 Applications

- General-purpose switching and amplification

### 1.4 Quick reference data

Table 1. Quick reference data

| Symbol                | Parameter                 | Conditions                                      | Min | Typ | Max  | Unit |
|-----------------------|---------------------------|-------------------------------------------------|-----|-----|------|------|
| <b>Per transistor</b> |                           |                                                 |     |     |      |      |
| $V_{CEO}$             | collector-emitter voltage | open base                                       | -   | -   | -65  | V    |
| $I_C$                 | collector current         |                                                 | -   | -   | -100 | mA   |
| $h_{FE}$              | DC current gain           | $V_{CE} = -5\text{ V};$<br>$I_C = -2\text{ mA}$ | 110 | -   | -    |      |

## 2. Pinning information

Table 2. Pinning

| Pin | Description   | Simplified outline | Graphic symbol |
|-----|---------------|--------------------|----------------|
| 1   | emitter TR1   |                    |                |
| 2   | base TR1      |                    |                |
| 3   | collector TR2 |                    |                |
| 4   | emitter TR2   |                    |                |
| 5   | base TR2      |                    |                |
| 6   | collector TR1 |                    |                |

sym018

### 3. Ordering information

Table 3. Ordering information

| Type number | Package |                                          |         |
|-------------|---------|------------------------------------------|---------|
|             | Name    | Description                              | Version |
| BC856S      | SC-88   | plastic surface-mounted package; 6 leads | SOT363  |

### 4. Marking

Table 4. Marking codes

| Type number | Marking code <sup>[1]</sup> |
|-------------|-----------------------------|
| BC856S      | 5F*                         |

- [1] \* = -: made in Hong Kong  
 \* = p: made in Hong Kong  
 \* = t: made in Malaysia  
 \* = W: made in China

### 5. Limiting values

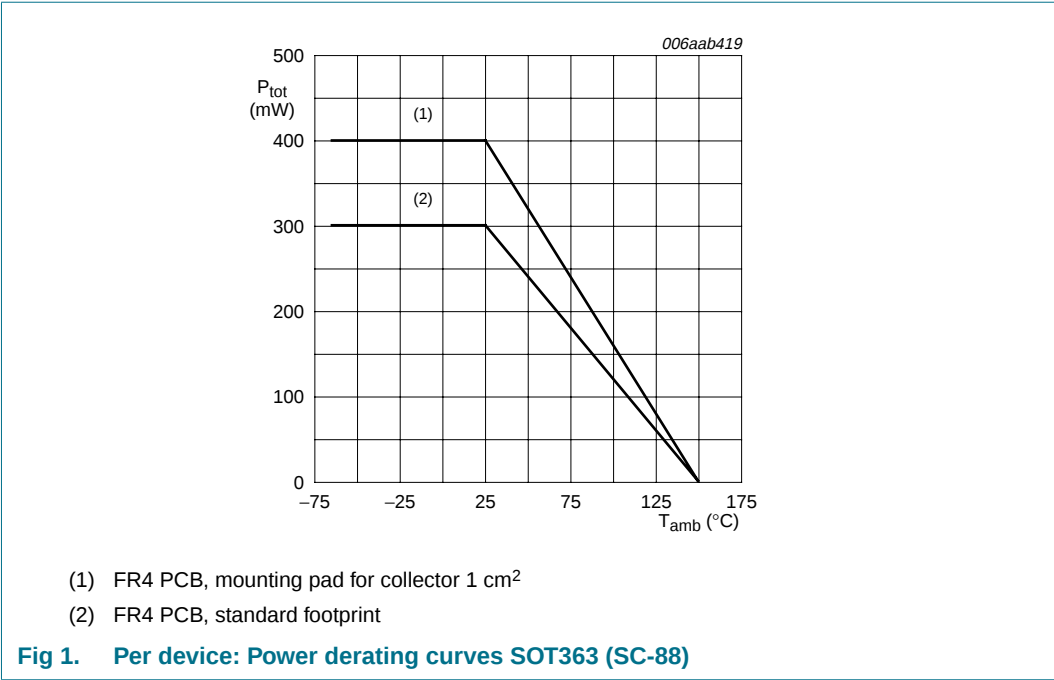
Table 5. Limiting values

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           | -                     | −5   | V    |
| I <sub>C</sub>   | collector current         |                          | -                     | −100 | mA   |
| P <sub>tot</sub> | total power dissipation   | T <sub>amb</sub> ≤ 25 °C | <a href="#">[1]</a> - | 220  | mW   |
|                  |                           |                          | <a href="#">[2]</a> - | 250  | mW   |
| Per device       |                           |                          |                       |      |      |
| P <sub>tot</sub> | total power dissipation   | T <sub>amb</sub> ≤ 25 °C | <a href="#">[1]</a> - | 300  | mW   |
|                  |                           |                          | <a href="#">[2]</a> - | 400  | 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.

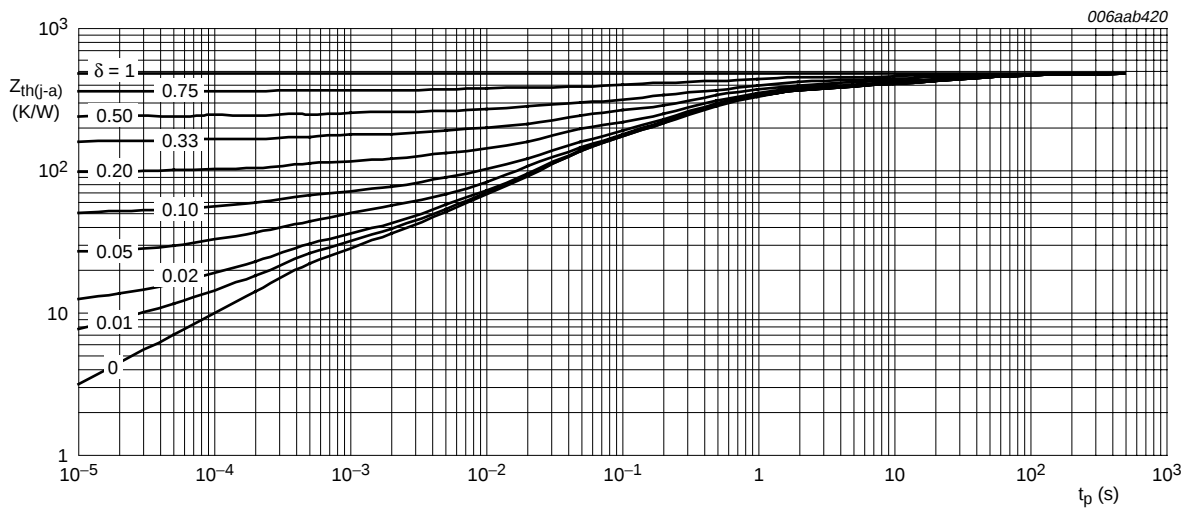
[2] Device mounted on an FR4 PCB, single-sided copper, tin-plated, mounting pad for collector 1 cm<sup>2</sup>.



6. Thermal characteristics

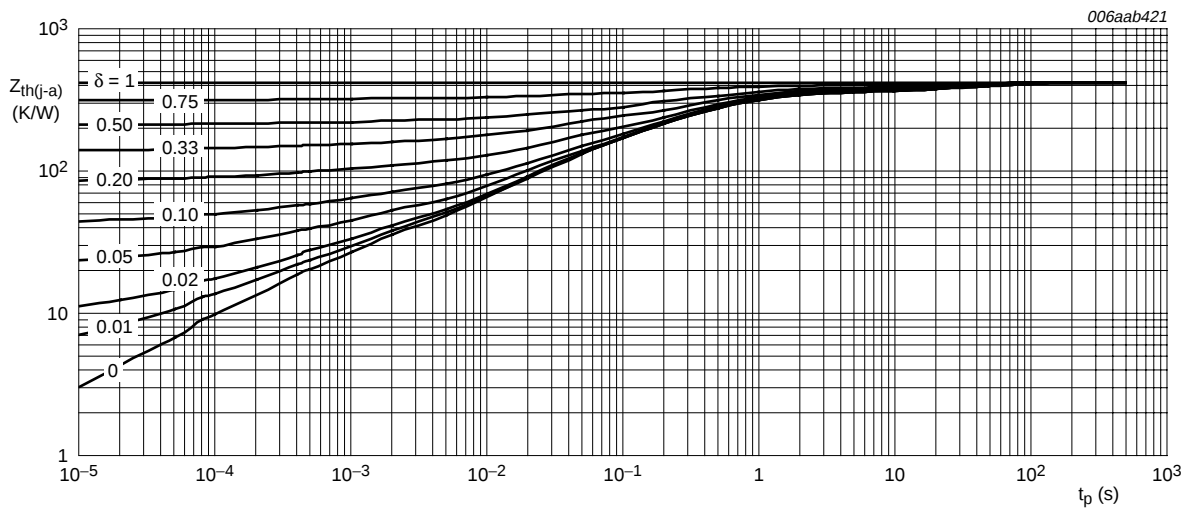
| Table 6. Thermal characteristics |                                                  |             |     |     |     |      |
|----------------------------------|--------------------------------------------------|-------------|-----|-----|-----|------|
| Symbol                           | Parameter                                        | Conditions  | Min | Typ | Max | Unit |
| Per transistor                   |                                                  |             |     |     |     |      |
| R <sub>th(j-a)</sub>             | thermal resistance from junction to ambient      | in free air | [1] | -   | 568 | K/W  |
|                                  |                                                  |             | [2] | -   | 500 | K/W  |
| R <sub>th(j-sp)</sub>            | thermal resistance from junction to solder point |             | -   | -   | 230 | K/W  |
| Per device                       |                                                  |             |     |     |     |      |
| R <sub>th(j-a)</sub>             | thermal resistance from junction to ambient      | in free air | [1] | -   | 416 | K/W  |
|                                  |                                                  |             | [2] | -   | 313 | 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>.



FR4 PCB, standard footprint

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



FR4 PCB, mounting pad for collector 1 cm<sup>2</sup>

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

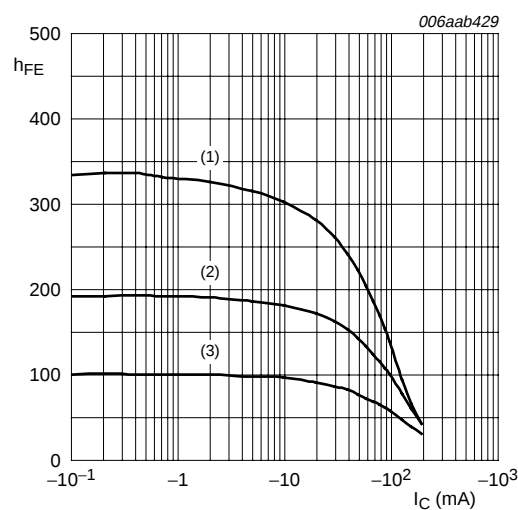
## 7. Characteristics

**Table 7. Characteristics**

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

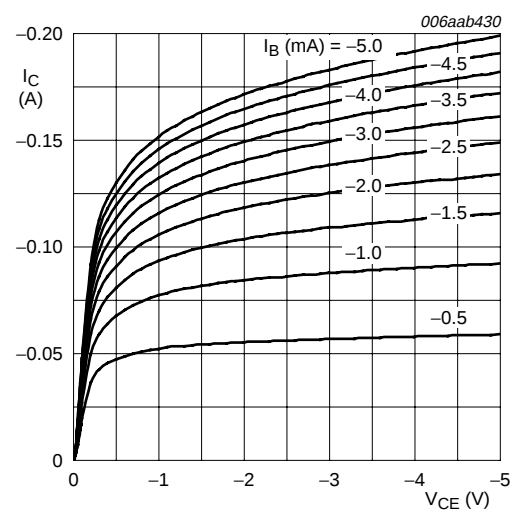
| Symbol                | Parameter                            | Conditions                                                                   | Min  | Typ  | Max  | Unit          |
|-----------------------|--------------------------------------|------------------------------------------------------------------------------|------|------|------|---------------|
| <b>Per transistor</b> |                                      |                                                                              |      |      |      |               |
| $I_{CBO}$             | collector-base cut-off current       | $V_{CB} = -30\text{ V}; I_E = 0\text{ A}$                                    | -    | -    | -15  | nA            |
|                       |                                      | $V_{CB} = -30\text{ V}; I_E = 0\text{ A}; T_j = 150\text{ }^{\circ}\text{C}$ | -    | -    | -5   | $\mu\text{A}$ |
| $I_{EBO}$             | emitter-base cut-off current         | $V_{EB} = -5\text{ V}; I_C = 0\text{ A}$                                     | -    | -    | -100 | nA            |
| $h_{FE}$              | DC current gain                      | $V_{CE} = -5\text{ V}; I_C = -2\text{ mA}$                                   | 110  | -    | -    |               |
| $V_{CEsat}$           | collector-emitter saturation voltage | $I_C = -10\text{ mA}; I_B = -0.5\text{ mA}$                                  | -    | -    | -100 | mV            |
|                       |                                      | $I_C = -100\text{ mA}; I_B = -5\text{ mA}$ <a href="#">[1]</a>               | -    | -    | -300 | mV            |
| $V_{BEsat}$           | base-emitter saturation voltage      | $I_C = -10\text{ mA}; I_B = -0.5\text{ mA}$                                  | -    | 700  | -    | mV            |
| $V_{BE}$              | base-emitter voltage                 | $I_C = -2\text{ mA}; V_{CE} = -5\text{ V}$                                   | -600 | -650 | -750 | mV            |
|                       |                                      | $I_C = -10\text{ mA}; V_{CE} = -5\text{ V}$                                  | -    | -    | -820 | mV            |
| $C_c$                 | collector capacitance                | $I_E = I_e = 0\text{ A}; V_{CB} = -10\text{ V}; f = 1\text{ MHz}$            | -    | -    | 2.5  | pF            |
| $f_T$                 | transition frequency                 | $I_C = -10\text{ mA}; V_{CE} = -5\text{ V}; f = 100\text{ MHz}$              | 100  | -    | -    | MHz           |

[1] Pulse test:  $t_p \leq 300\text{ }\mu\text{s}$ ;  $\delta \leq 0.02$ .



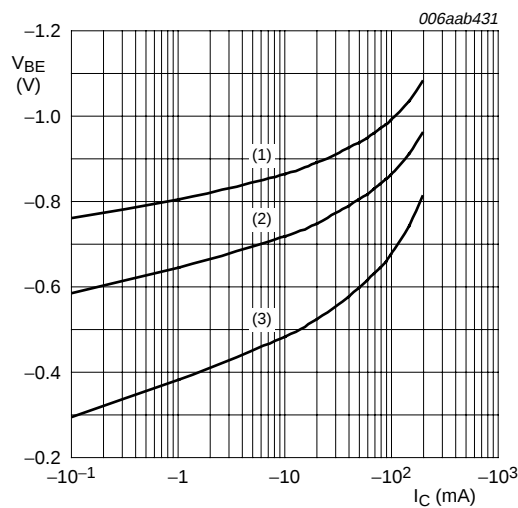
- $V_{CE} = -5\text{ V}$
- (1)  $T_{amb} = 150\text{ }^{\circ}\text{C}$
  - (2)  $T_{amb} = 25\text{ }^{\circ}\text{C}$
  - (3)  $T_{amb} = -55\text{ }^{\circ}\text{C}$

Fig 4. Per transistor: DC current gain as a function of collector current; typical values



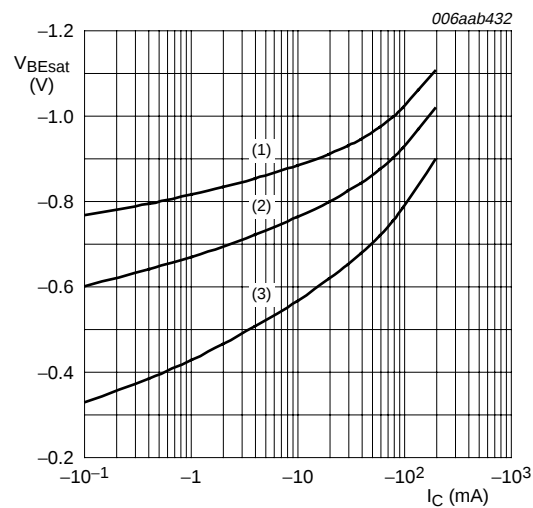
$T_{amb} = 25\text{ }^{\circ}\text{C}$

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



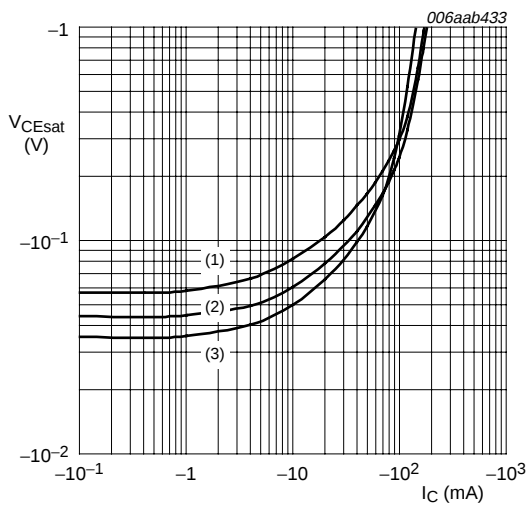
- $V_{CE} = -5\text{ V}$
- (1)  $T_{amb} = -55\text{ }^{\circ}\text{C}$
  - (2)  $T_{amb} = 25\text{ }^{\circ}\text{C}$
  - (3)  $T_{amb} = 150\text{ }^{\circ}\text{C}$

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



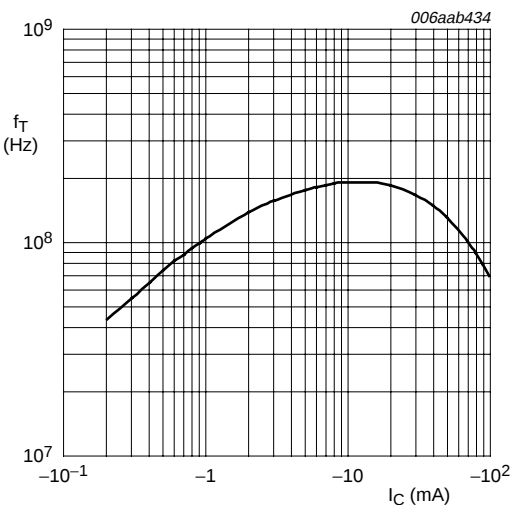
- $I_C/I_B = 20$
- (1)  $T_{amb} = -55\text{ }^{\circ}\text{C}$
  - (2)  $T_{amb} = 25\text{ }^{\circ}\text{C}$
  - (3)  $T_{amb} = 150\text{ }^{\circ}\text{C}$

Fig 7. Per transistor: Base-emitter saturation 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)  $T_{amb} = -55\text{ }^{\circ}\text{C}$

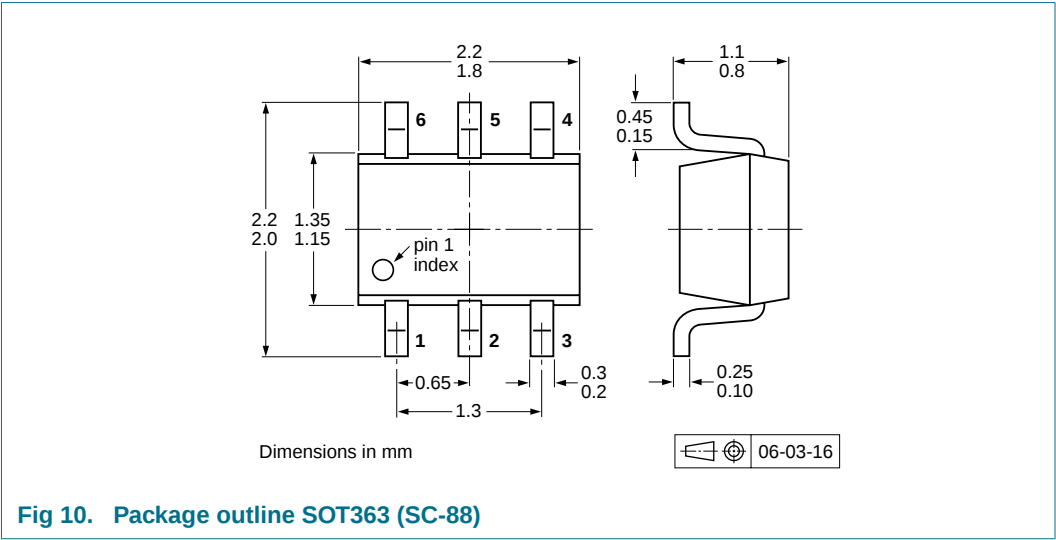
**Fig 8.** Per transistor: Collector-emitter saturation voltage as a function of collector current; typical values



$V_{CE} = -5\text{ V}$ ;  $f = 1\text{ MHz}$ ;  $T_{amb} = 25\text{ }^{\circ}\text{C}$

**Fig 9.** Per transistor: Transition frequency as a function of collector current; typical values

8. Package outline



9. Packing information

Table 8. Packing methods

The indicated -xxx are the last three digits of the 12NC ordering code.<sup>[1]</sup>

| Type number | Package | Description                        | Packing quantity    |       |
|-------------|---------|------------------------------------|---------------------|-------|
|             |         |                                    | 3000                | 10000 |
| BC856S      | SOT363  | 4 mm pitch, 8 mm tape and reel; T1 | <sup>[2]</sup> -115 | -135  |
|             |         | 4 mm pitch, 8 mm tape and reel; T2 | <sup>[3]</sup> -125 | -165  |

[1]

For further information and the availability of packing methods, see [Section 13](#).

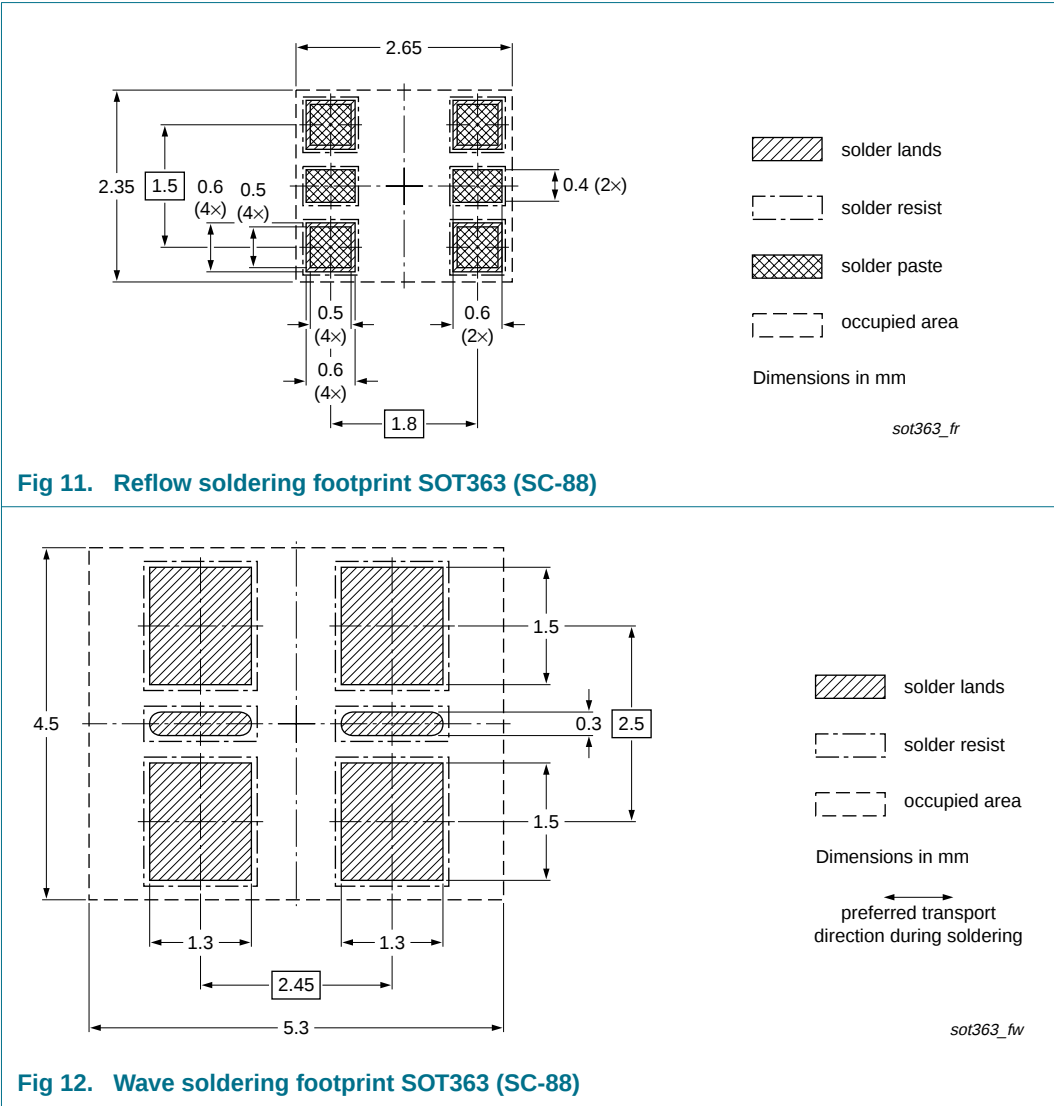
[2]

T1: normal taping

[3]

T2: reverse taping

10. Soldering



## 11. Revision history

**Table 9.** Revision history

| Document ID    | Release date                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | Data sheet status     | Change notice | Supersedes |
|----------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------|---------------|------------|
| BC856S_2       | 20090219                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | Product data sheet    | -             | BC856S_1   |
| Modifications: | <ul style="list-style-type: none"><li>• The format of this data sheet has been redesigned to comply with the new identity guidelines of NXP Semiconductors.</li><li>• Legal texts have been adapted to the new company name where appropriate.</li><li>• <a href="#">Section 1.2 "Features"</a>: adapted</li><li>• <a href="#">Section 4 "Marking"</a>: updated</li><li>• <a href="#">Section 7 "Characteristics"</a>: enhanced</li><li>• <a href="#">Section 9 "Packing information"</a>: added</li><li>• <a href="#">Section 10 "Soldering"</a>: added</li><li>• <a href="#">Section 12 "Legal information"</a>: updated</li></ul> |                       |               |            |
| BC856S_1       | 19990824                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | Product specification | -             | -          |

## 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".

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14. Contents

1 Product profile ..... 1

1.1 General description..... 1

1.2 Features ..... 1

1.3 Applications ..... 1

1.4 Quick reference data..... 1

2 Pinning information..... 1

3 Ordering information..... 2

4 Marking..... 2

5 Limiting values..... 2

6 Thermal characteristics..... 3

7 Characteristics..... 5

8 Package outline ..... 8

9 Packing information..... 8

10 Soldering ..... 9

11 Revision history..... 10

12 Legal information..... 11

12.1 Data sheet status ..... 11

12.2 Definitions..... 11

12.3 Disclaimers..... 11

12.4 Trademarks..... 11

13 Contact information..... 11

14 Contents ..... 12



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