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Kind regards,

Team Nexperia



# BC856BS

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

Rev. 01 — 11 August 2009

Product data sheet

## 1. Product profile

### 1.1 General description

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

Table 1. Product overview

| Type number | Package |       | NPN/PNP complement | NPN/PNP complement |
|-------------|---------|-------|--------------------|--------------------|
|             | NXP     | JEITA |                    |                    |
| BC856BS     | SOT363  | SC-88 | BC846BS            | BC846BPN           |

### 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
- AEC-Q101 qualified

### 1.3 Applications

- General-purpose switching and amplification

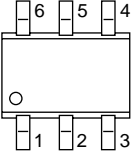
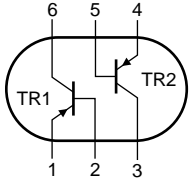
### 1.4 Quick reference data

Table 2. 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>$I_C = -2\text{ mA}$ | 200 | 290 | 450  |      |

## 2. Pinning information

**Table 3. 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 4. Ordering information**

| Type number | Package |                                          | Version |
|-------------|---------|------------------------------------------|---------|
|             | Name    | Description                              |         |
| BC856BS     | SC-88   | plastic surface-mounted package; 6 leads | SOT363  |

## 4. Marking

**Table 5. Marking codes**

| Type number | Marking code <sup>[1]</sup> |
|-------------|-----------------------------|
| BC856BS     | *E6                         |

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

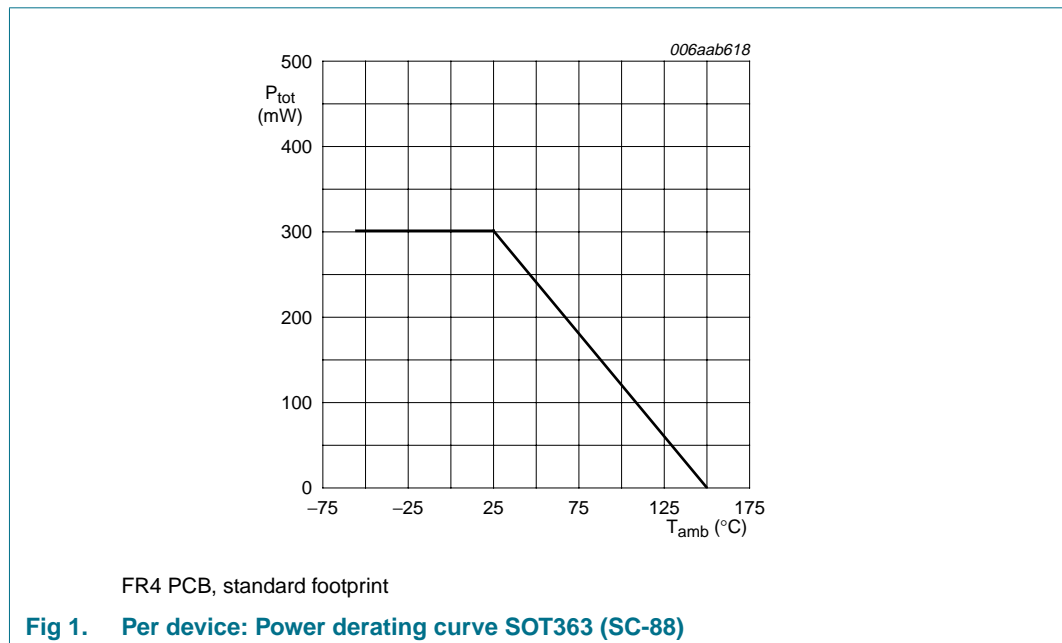
## 5. Limiting values

**Table 6. Limiting values**

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

| Symbol                | Parameter                 | Conditions                       | Min | Max  | Unit |
|-----------------------|---------------------------|----------------------------------|-----|------|------|
| <b>Per transistor</b> |                           |                                  |     |      |      |
| $V_{CBO}$             | collector-base voltage    | open emitter                     | -   | -80  | V    |
| $V_{CEO}$             | collector-emitter voltage | open base                        | -   | -65  | V    |
| $V_{EBO}$             | emitter-base voltage      | open collector                   | -   | -6   | V    |
| $I_C$                 | collector current         |                                  | -   | -100 | mA   |
| $I_{CM}$              | peak collector current    | single pulse;<br>$t_p \leq 1$ ms | -   | -200 | mA   |
| $I_{BM}$              | peak base current         | single pulse;<br>$t_p \leq 1$ ms | -   | -200 | mA   |
| $P_{tot}$             | total power dissipation   | $T_{amb} \leq 25$ °C             | [1] | 200  | mW   |
| <b>Per device</b>     |                           |                                  |     |      |      |
| $P_{tot}$             | total power dissipation   | $T_{amb} \leq 25$ °C             | [1] | 300  | mW   |
| $T_j$                 | 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.

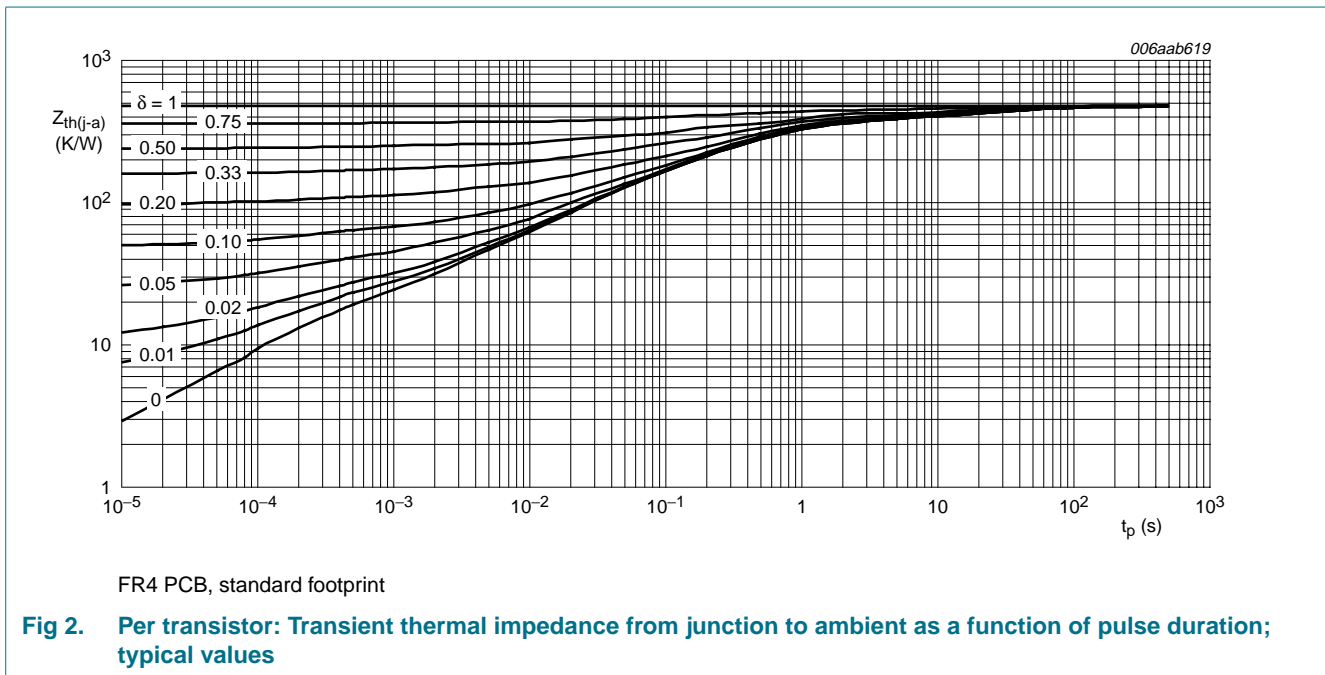


## 6. Thermal characteristics

Table 7. Thermal characteristics

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

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

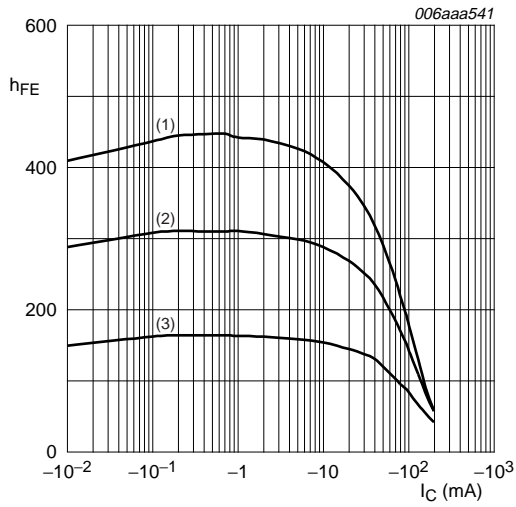


## 7. Characteristics

**Table 8. Characteristics**

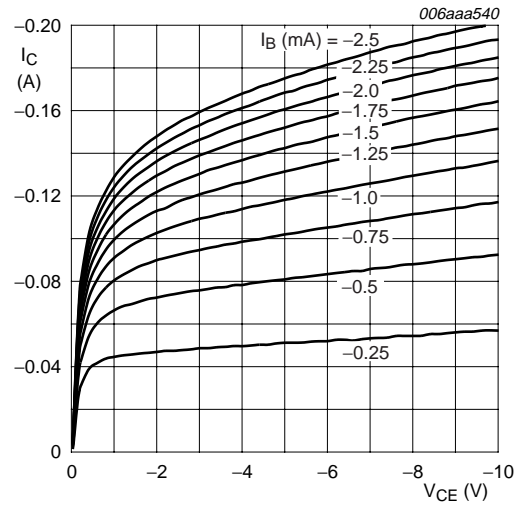
$T_{amb} = 25\text{ }^{\circ}\text{C}$  unless otherwise specified.

| Symbol                | Parameter                            | Conditions                                                                                                          | Min  | Typ  | Max  | Unit          |
|-----------------------|--------------------------------------|---------------------------------------------------------------------------------------------------------------------|------|------|------|---------------|
| <b>Per transistor</b> |                                      |                                                                                                                     |      |      |      |               |
| $I_{CBO}$             | collector-base cut-off current       | $V_{CB} = -50\text{ V}; I_E = 0\text{ A}$                                                                           | -    | -    | -15  | nA            |
|                       |                                      | $V_{CB} = -30\text{ V}; I_E = 0\text{ A};$<br>$T_j = 150\text{ }^{\circ}\text{C}$                                   | -    | -    | -5   | $\mu\text{A}$ |
|                       |                                      |                                                                                                                     |      |      |      |               |
| $I_{EBO}$             | emitter-base cut-off current         | $V_{EB} = -6\text{ V}; I_C = 0\text{ A}$                                                                            | -    | -    | -100 | nA            |
| $h_{FE}$              | DC current gain                      | $V_{CE} = -5\text{ V}$                                                                                              |      |      |      |               |
|                       |                                      | $I_C = -10\text{ }\mu\text{A}$                                                                                      | -    | 270  | -    |               |
|                       |                                      | $I_C = -2\text{ mA}$                                                                                                | 200  | 290  | 450  |               |
| $V_{CEsat}$           | collector-emitter saturation voltage | $I_C = -10\text{ mA};$<br>$I_B = -0.5\text{ mA}$                                                                    | -    | -55  | -100 | mV            |
|                       |                                      | $I_C = -100\text{ mA}; I_B = -5\text{ mA}$                                                                          | -    | -200 | -300 | mV            |
| $V_{BEsat}$           | base-emitter saturation voltage      | $I_C = -10\text{ mA};$<br>$I_B = -0.5\text{ mA}$                                                                    | -    | -755 | -850 | mV            |
|                       |                                      | $I_C = -100\text{ mA}; I_B = -5\text{ mA}$                                                                          | -    | -900 | -    | mV            |
| $V_{BE}$              | base-emitter voltage                 | $V_{CE} = -5\text{ V}$                                                                                              |      |      |      |               |
|                       |                                      | $I_C = -2\text{ mA}$                                                                                                | -600 | -650 | -750 | mV            |
|                       |                                      | $I_C = -10\text{ mA}$                                                                                               | -    | -    | -820 | mV            |
| $C_c$                 | collector capacitance                | $V_{CB} = -10\text{ V}; I_E = i_e = 0\text{ A};$<br>$f = 1\text{ MHz}$                                              | -    | 2.3  | -    | pF            |
| $C_e$                 | emitter capacitance                  | $V_{EB} = -0.5\text{ V};$<br>$I_C = i_c = 0\text{ A}; f = 1\text{ MHz}$                                             | -    | 10   | -    | pF            |
| $f_T$                 | transition frequency                 | $V_{CE} = -5\text{ V}; I_C = -10\text{ mA};$<br>$f = 100\text{ MHz}$                                                | 100  | -    | -    | MHz           |
| NF                    | noise figure                         | $V_{CE} = -5\text{ V}; I_C = -0.2\text{ mA};$<br>$R_S = 2\text{ k}\Omega;$<br>$f = 10\text{ Hz to }15.7\text{ kHz}$ | -    | 1.6  | -    | dB            |
|                       |                                      | $V_{CE} = -5\text{ V}; I_C = -0.2\text{ mA};$<br>$R_S = 2\text{ k}\Omega; f = 1\text{ kHz};$<br>$B = 200\text{ Hz}$ | -    | 2.9  | -    | dB            |



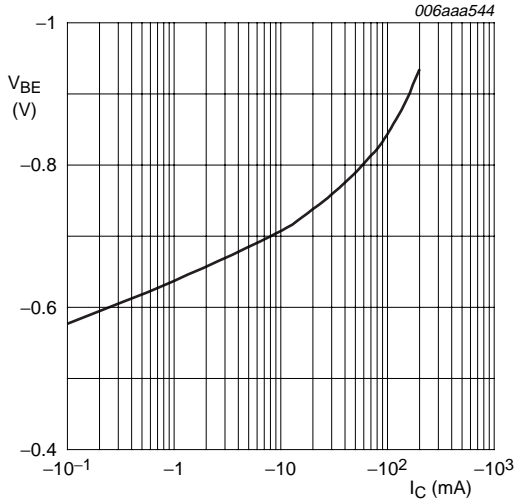
$V_{CE} = -5\text{ V}$   
 (1)  $T_{amb} = 100\text{ °C}$   
 (2)  $T_{amb} = 25\text{ °C}$   
 (3)  $T_{amb} = -55\text{ °C}$

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



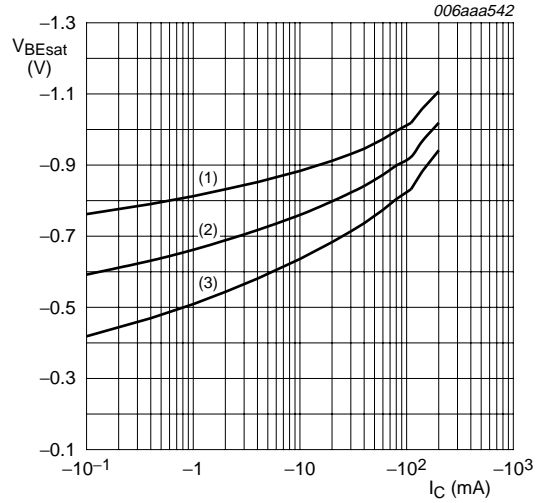
$T_{amb} = 25\text{ °C}$

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



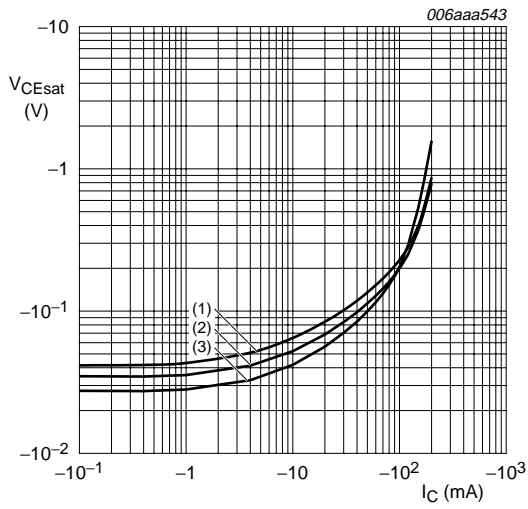
$V_{CE} = -5\text{ V}; T_{amb} = 25\text{ °C}$

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



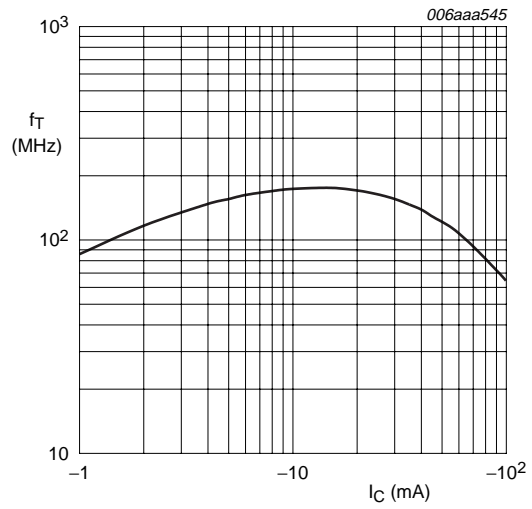
$I_C/I_B = 20$   
 (1)  $T_{amb} = -55\text{ °C}$   
 (2)  $T_{amb} = 25\text{ °C}$   
 (3)  $T_{amb} = 100\text{ °C}$

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



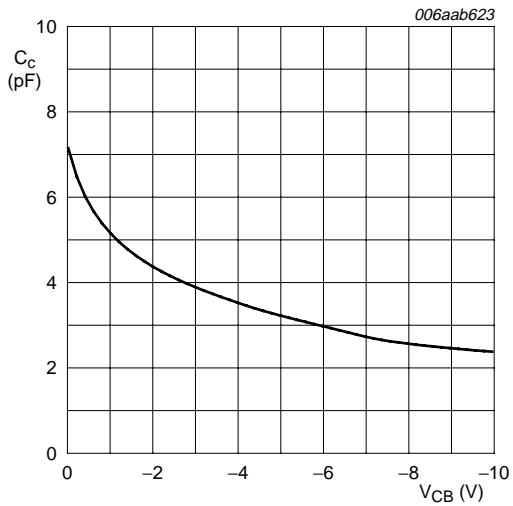
$I_C/I_B = 20$   
 (1)  $T_{amb} = 100\text{ }^\circ\text{C}$   
 (2)  $T_{amb} = 25\text{ }^\circ\text{C}$   
 (3)  $T_{amb} = -55\text{ }^\circ\text{C}$

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



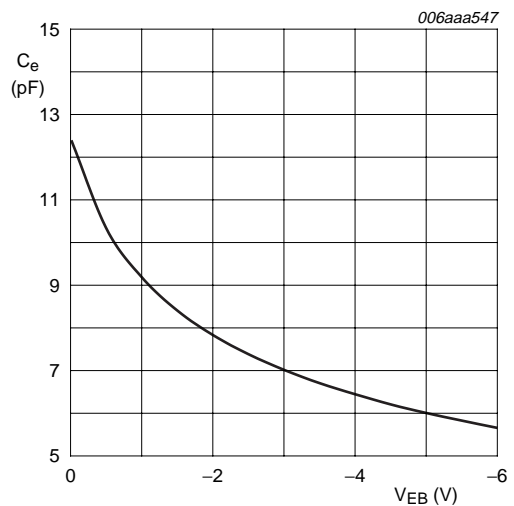
$V_{CE} = -5\text{ V}; T_{amb} = 25\text{ }^\circ\text{C}$

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



$f = 1\text{ MHz}; T_{amb} = 25\text{ }^\circ\text{C}$

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



$f = 1\text{ MHz}; T_{amb} = 25\text{ }^\circ\text{C}$

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

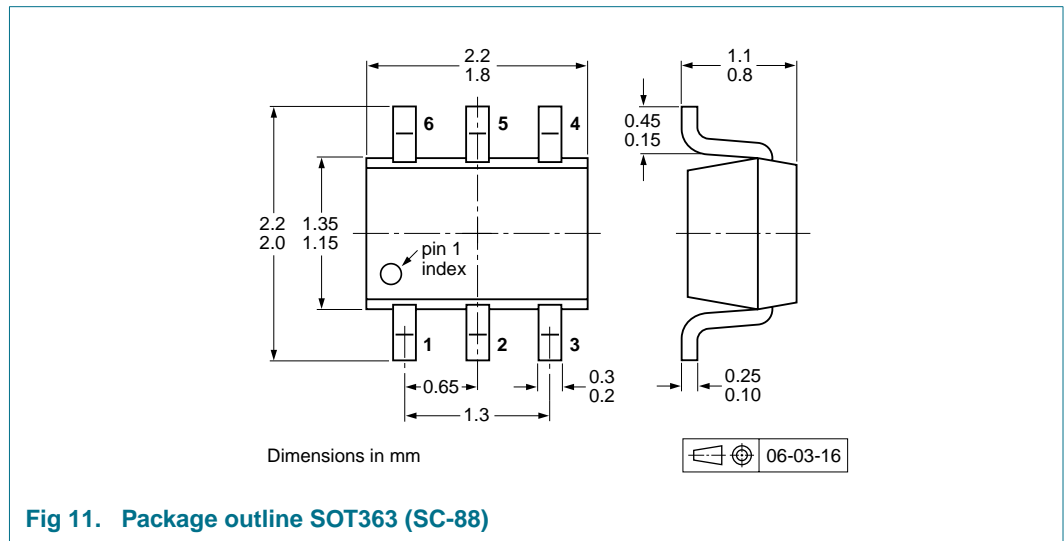


## 8. Test information

### 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



## 10. Packing information

**Table 9. Packing methods**

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

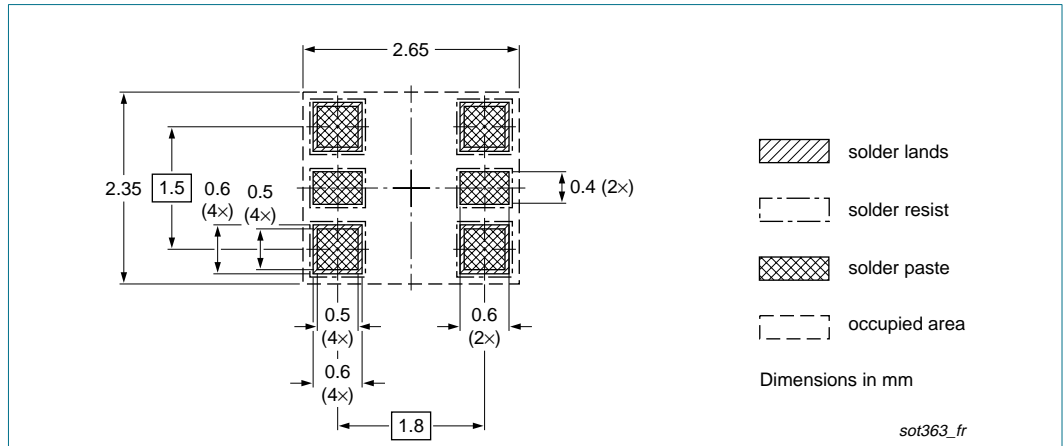
| Type number | Package | Description                        | Packing quantity |       |
|-------------|---------|------------------------------------|------------------|-------|
|             |         |                                    | 3000             | 10000 |
| BC856BS     | SOT363  | 4 mm pitch, 8 mm tape and reel; T1 | [2] -115         | -135  |
|             |         | 4 mm pitch, 8 mm tape and reel; T2 | [3] -125         | -165  |

[1] For further information and the availability of packing methods, see [Section 14](#).

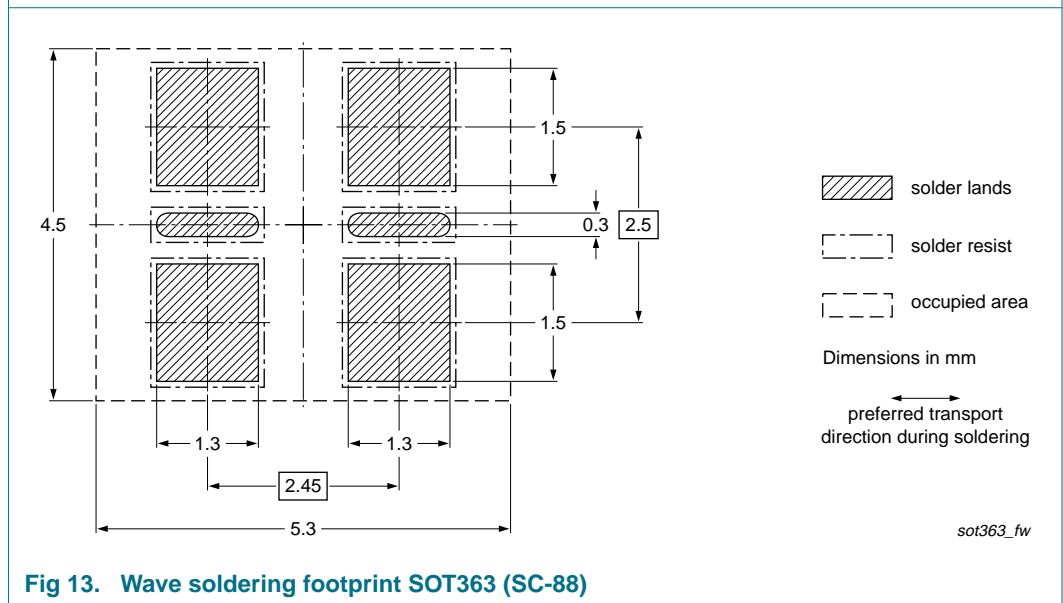
[2] T1: normal taping

[3] T2: reverse taping

## 11. Soldering



**Fig 12. Reflow soldering footprint SOT363 (SC-88)**



**Fig 13. Wave soldering footprint SOT363 (SC-88)**

## 12. Revision history

Table 10. Revision history

| Document ID | Release date | Data sheet status  | Change notice | Supersedes |
|-------------|--------------|--------------------|---------------|------------|
| BC856BS_1   | 20090811     | Product data sheet | -             | -          |

## 13. Legal information

### 13.1 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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