



BC846BS

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

Rev. 01 — 24 August 2009

Product data sheet

1. Product profile

1.1 General description

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

Table 1. Product overview

| Type number | Package | | PNP/PNP complement | NPN/PNP complement |
|-------------|---------|-------|--------------------|--------------------|
| | NXP | JEITA | | |
| BC846BS | SOT363 | SC-88 | BC856BS | 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 |
|-----------------------|---------------------------|--|-----|-----|-----|------|
| Per transistor | | | | | | |
| V_{CE0} | collector-emitter voltage | open base | - | - | 65 | V |
| I_C | collector current | | - | - | 100 | mA |
| h_{FE} | DC current gain | $V_{CE} = 5\text{ V}; I_C = 2\text{ mA}$ | 200 | 300 | 450 | |

2. Pinning information

Table 3. Pinning

| Pin | Description | Simplified outline | Graphic symbol |
|-----|---------------|--------------------|---|
| 1 | emitter TR1 | | <p style="text-align: center;">sym020</p> |
| 2 | base TR1 | | |
| 3 | collector TR2 | | |
| 4 | emitter TR2 | | |
| 5 | base TR2 | | |
| 6 | collector TR1 | | |

3. Ordering information

Table 4. Ordering information

| Type number | Package | | Version |
|-------------|---------|--|---------|
| | Name | Description | |
| BC846BS | SC-88 | plastic surface-mounted package; 6 leads | SOT363 |

4. Marking

Table 5. Marking codes

| Type number | Marking code ^[1] |
|-------------|-----------------------------|
| BC846BS | *E5 |

- [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).

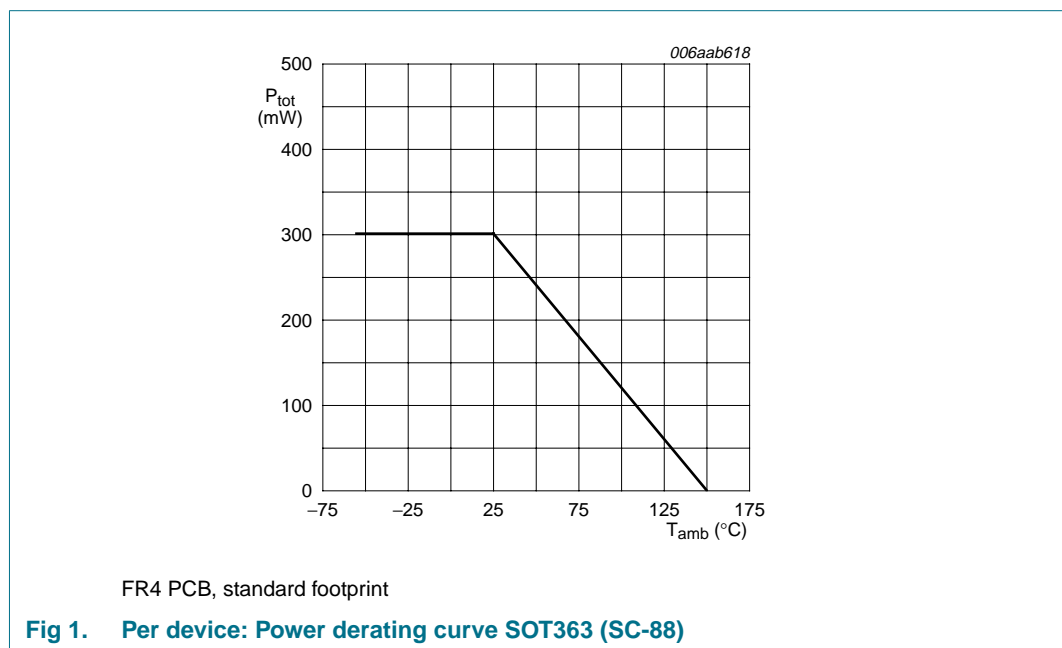
| Symbol | Parameter | Conditions | Min | Max | Unit |
|-----------------------|---------------------------|----------------------------------|-------|-----|------|
| Per transistor | | | | | |
| V_{CBO} | collector-base voltage | open emitter | - | 80 | V |
| V_{CEO} | collector-emitter voltage | open 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; $t_p \leq 1$ ms | - | 200 | mA |
| I_{BM} | peak base current | single pulse; $t_p \leq 1$ ms | - | 200 | mA |
| P_{tot} | total power dissipation | $T_{amb} \leq 25$ °C | [1] - | 200 | mW |

Table 6. Limiting values ...continued

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

| Symbol | Parameter | Conditions | Min | Max | Unit |
|-------------------|-------------------------|-----------------------------|-------|------|------|
| Per device | | | | | |
| P_{tot} | total power dissipation | $T_{amb} \leq 25\text{ °C}$ | [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 |
|-----------------------|--|-------------|-------|-----|-----|------|
| 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 copper, tin-plated and standard footprint.

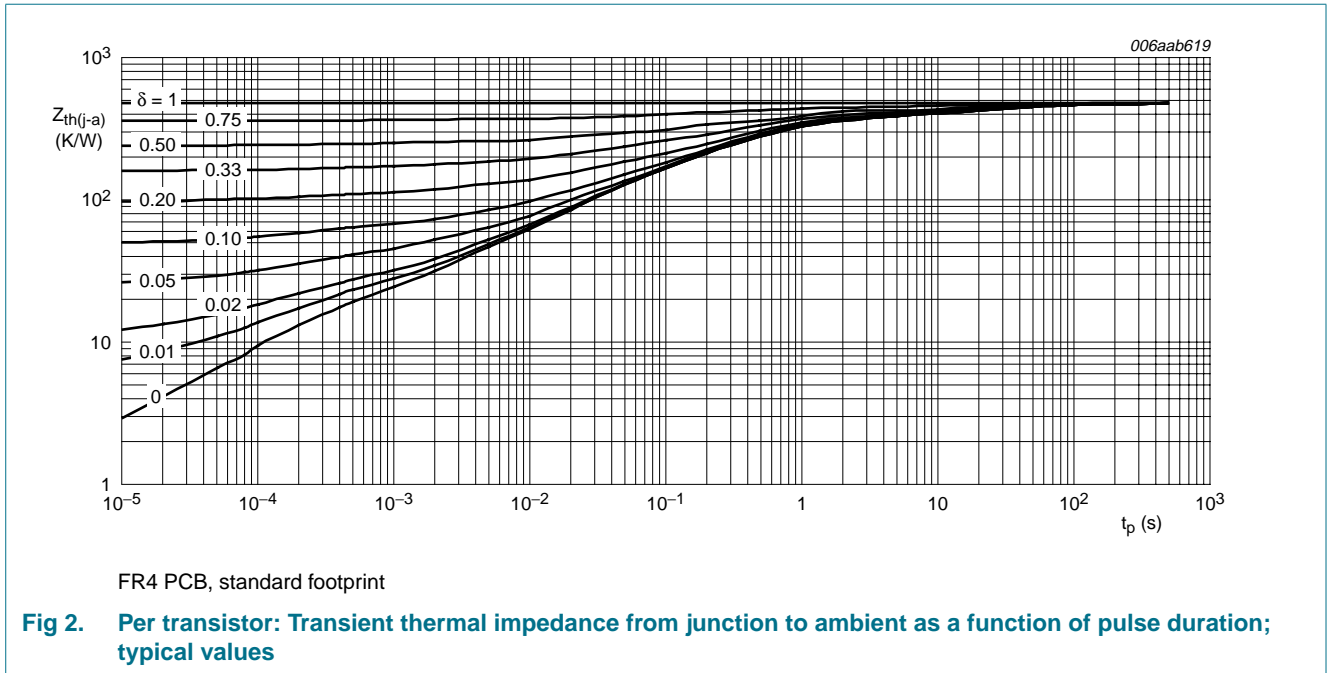


Fig 2. Per transistor: Transient thermal impedance from junction to ambient as a function of pulse duration; typical values

7. Characteristics

Table 8. Characteristics

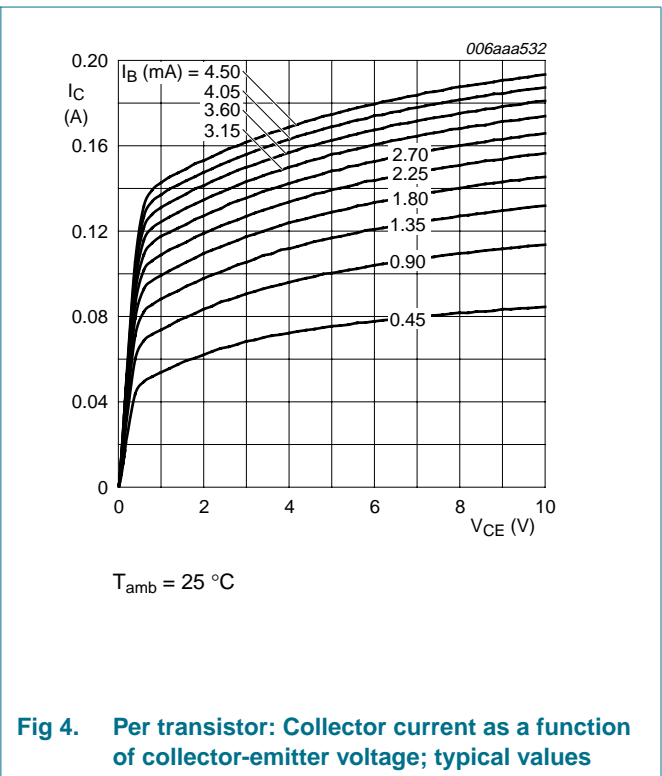
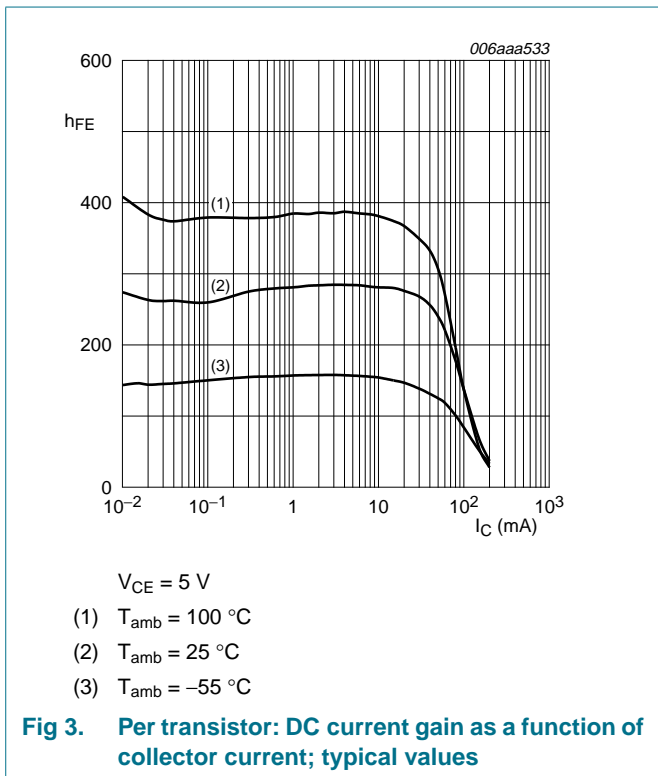
$T_{amb} = 25\text{ }^{\circ}\text{C}$ unless otherwise specified.

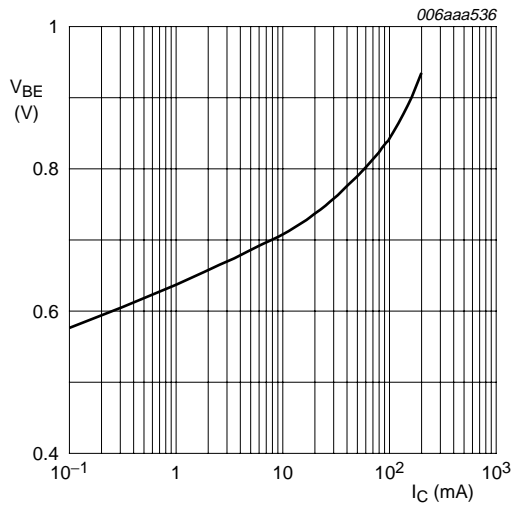
| Symbol | Parameter | Conditions | Min | Typ | Max | Unit |
|-----------------------|--------------------------------------|---|-----|------|-----|---------------|
| Per transistor | | | | | | |
| I_{CBO} | collector-base cut-off current | $V_{CB} = 50\text{ V}; I_E = 0\text{ A}$ | - | - | 15 | nA |
| | | $V_{CB} = 30\text{ V}; I_E = 0\text{ A}; T_j = 150\text{ }^{\circ}\text{C}$ | - | - | 5 | μA |
| I_{EBO} | emitter-base cut-off current | $V_{EB} = 6\text{ V}; I_C = 0\text{ A}$ | - | - | 100 | nA |
| h_{FE} | DC current gain | $V_{CE} = 5\text{ V}$ | | | | |
| | | $I_C = 10\text{ }\mu\text{A}$ | - | 280 | - | |
| | | $I_C = 2\text{ mA}$ | 200 | 300 | 450 | |
| V_{CEsat} | collector-emitter saturation voltage | $I_C = 10\text{ mA}; I_B = 0.5\text{ mA}$ | - | 55 | 100 | mV |
| | | $I_C = 100\text{ mA}; I_B = 5\text{ mA}$ | - | 200 | 300 | mV |
| V_{BEsat} | base-emitter saturation voltage | $I_C = 10\text{ mA}; I_B = 0.5\text{ mA}$ | - | 755 | 850 | mV |
| | | $I_C = 100\text{ mA}; I_B = 5\text{ mA}$ | - | 1000 | - | mV |
| V_{BE} | base-emitter voltage | $V_{CE} = 5\text{ V}$ | | | | |
| | | $I_C = 2\text{ mA}$ | 580 | 650 | 700 | mV |
| | | $I_C = 10\text{ mA}$ | - | - | 770 | mV |

Table 8. Characteristics ...continued

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

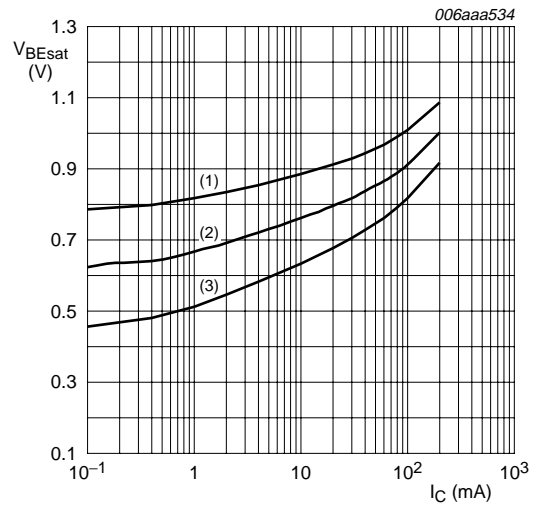
| Symbol | Parameter | Conditions | Min | Typ | Max | Unit |
|--------|-----------------------|---|-----|-----|-----|------|
| C_c | collector capacitance | $V_{CB} = 10\text{ V}; I_E = i_e = 0\text{ A};$ $f = 1\text{ MHz}$ | - | 1.9 | - | pF |
| C_e | emitter capacitance | $V_{EB} = 0.5\text{ V}; I_C = i_c = 0\text{ A};$ $f = 1\text{ MHz}$ | - | 11 | - | pF |
| f_T | transition frequency | $V_{CE} = 5\text{ V}; I_C = 10\text{ mA};$ $f = 100\text{ MHz}$ | 100 | - | - | MHz |
| NF | noise figure | $V_{CE} = 5\text{ V}; I_C = 0.2\text{ mA};$ $R_S = 2\text{ k}\Omega;$ $f = 10\text{ Hz to }15.7\text{ kHz}$ | - | 1.9 | - | dB |
| | | $V_{CE} = 5\text{ V}; I_C = 0.2\text{ mA};$ $R_S = 2\text{ k}\Omega; f = 1\text{ kHz};$ $B = 200\text{ Hz}$ | - | 3.1 | - | dB |





$V_{CE} = 5$ V; $T_{amb} = 25$ °C

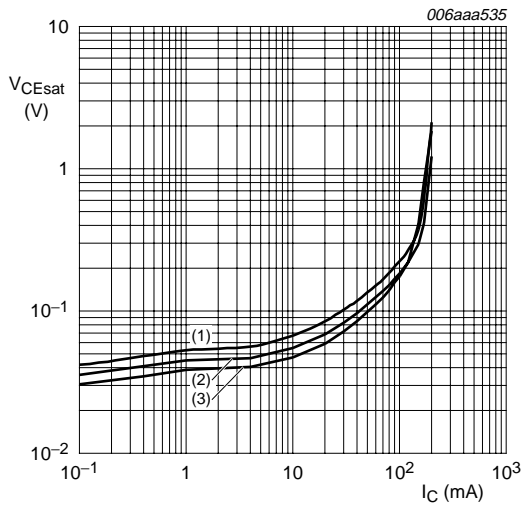
Fig 5. Per transistor: Base-emitter voltage as a function of collector current; typical values



$I_C/I_B = 20$

- (1) $T_{amb} = -55$ °C
- (2) $T_{amb} = 25$ °C
- (3) $T_{amb} = 100$ °C

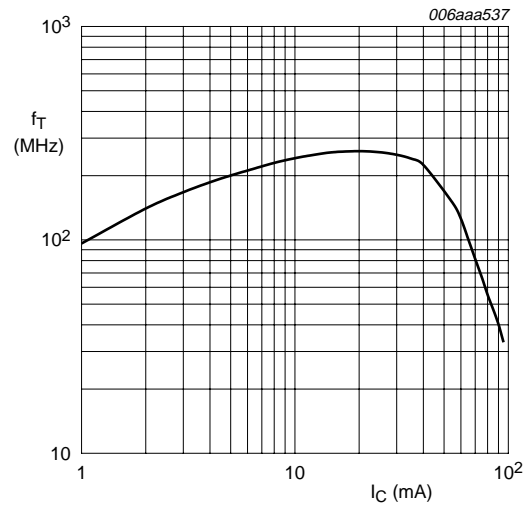
Fig 6. Per transistor: Base-emitter saturation voltage as a function of collector current; typical values



$I_C/I_B = 20$

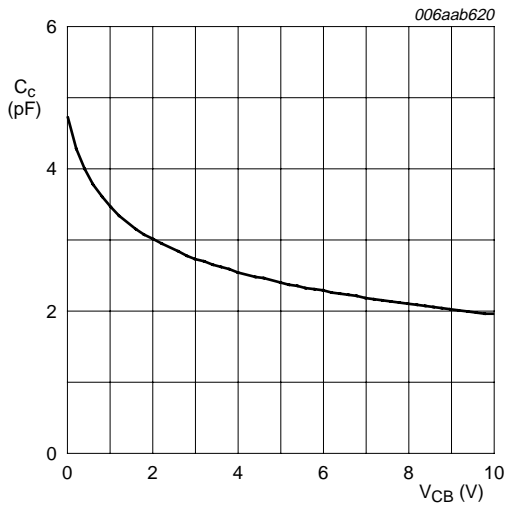
- (1) $T_{amb} = 100$ °C
- (2) $T_{amb} = 25$ °C
- (3) $T_{amb} = -55$ °C

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



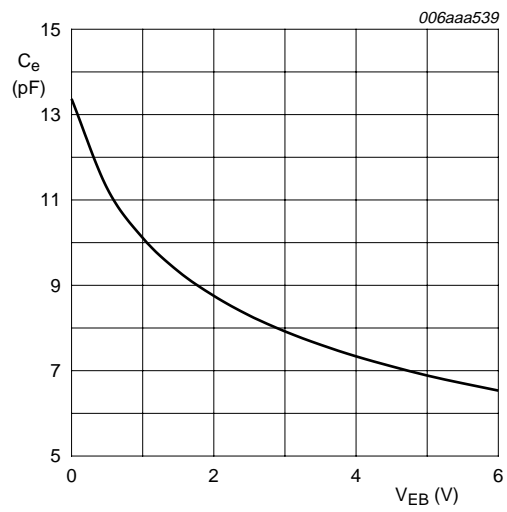
$V_{CE} = 5$ V; $T_{amb} = 25$ °C

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



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

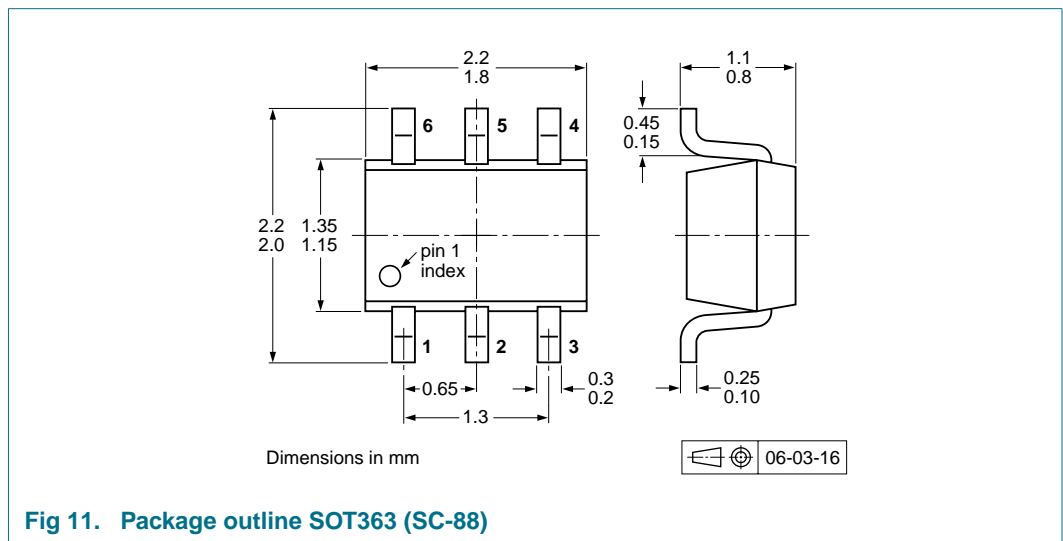
Fig 10. Per transistor: Emitter capacitance as a function of emitter-base voltage; typical values

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.^[1]

| Type number | Package | Description | Packing quantity | |
|-------------|---------|------------------------------------|---------------------|-------|
| | | | 3000 | 10000 |
| BC846BS | 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

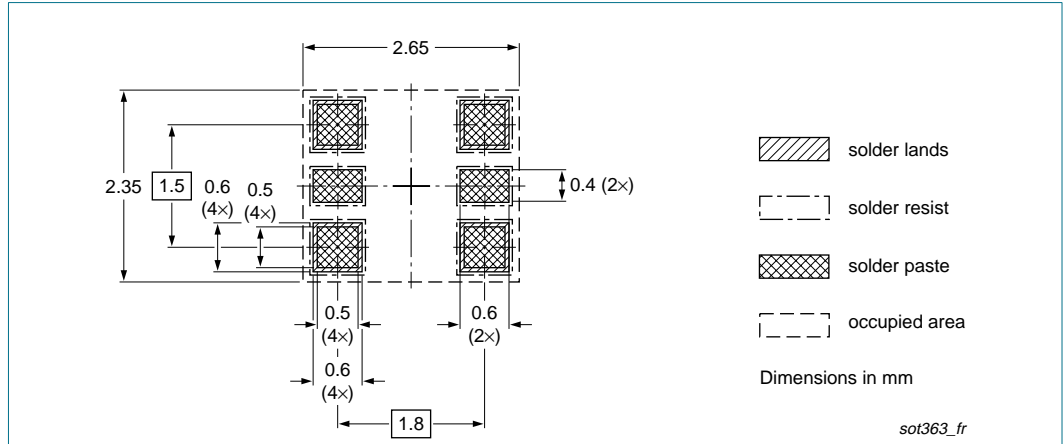


Fig 12. Reflow soldering footprint SOT363 (SC-88)

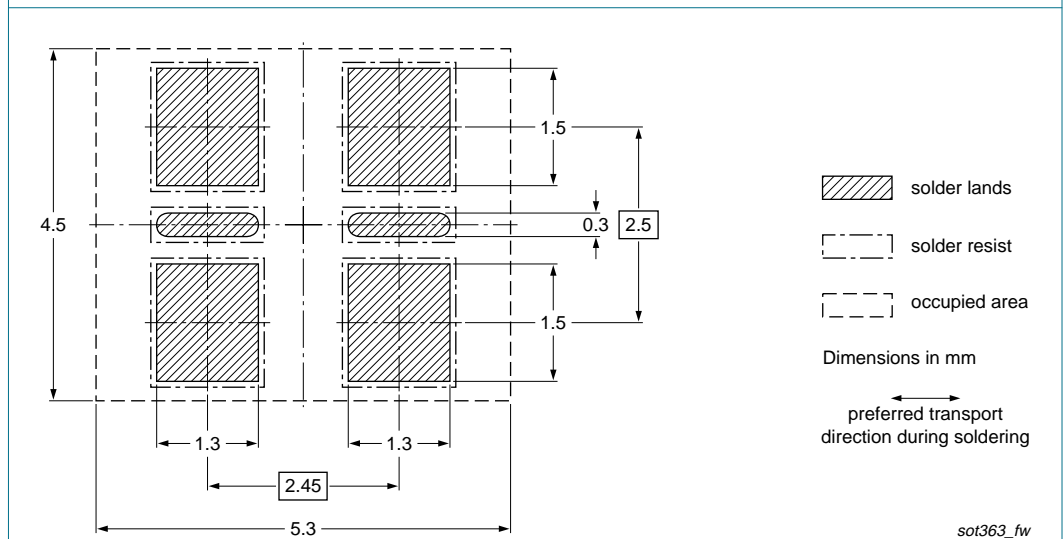


Fig 13. Wave soldering footprint SOT363 (SC-88)

12. Revision history

Table 10. Revision history

| Document ID | Release date | Data sheet status | Change notice | Supersedes |
|-------------|--------------|--------------------|---------------|------------|
| BC846BS_1 | 20090824 | Product data sheet | - | - |

13. Legal information

13.1 Data sheet status

| Document status ^{[1][2]} | Product status ^[3] | Definition |
|-----------------------------------|-------------------------------|---|
| Objective [short] data sheet | Development | This document contains data from the objective specification for product development. |
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[2] The term 'short data sheet' is explained in section "Definitions".

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