

# BCV61

## NPN general-purpose double transistors

Rev. 04 — 18 December 2009

Product data sheet

## 1. Product profile

### 1.1 General description

NPN general-purpose double transistors in a small SOT143B Surface-Mounted Device (SMD) plastic package.

Table 1. Product overview

| Type number | Package |       | PNP complement |
|-------------|---------|-------|----------------|
|             | NXP     | JEITA |                |
| BCV61       | SOT143B | -     | BCV62          |
| BCV61A      |         |       | BCV62A         |
| BCV61B      |         |       | BCV62B         |
| BCV61C      |         |       | BCV62C         |

### 1.2 Features

- Low current (max. 100 mA)
- Low voltage (max. 30 V)
- Matched pairs

### 1.3 Applications

- Applications with working point independent of temperature
- Current mirrors

## 2. Pinning information

Table 2. Pinning

| Pin | Description                        | Simplified outline | Graphic symbol |
|-----|------------------------------------|--------------------|----------------|
| 1   | collector TR2;<br>base TR1 and TR2 |                    |                |
| 2   | collector TR1                      |                    |                |
| 3   | emitter TR1                        |                    |                |
| 4   | emitter TR2                        |                    |                |

006aaa842

### 3. Ordering information

Table 3. Ordering information

| Type number | Package |                                          |         |
|-------------|---------|------------------------------------------|---------|
|             | Name    | Description                              | Version |
| BCV61       | -       | plastic surface-mounted package; 4 leads | SOT143B |
| BCV61A      |         |                                          |         |
| BCV61B      |         |                                          |         |
| BCV61C      |         |                                          |         |

### 4. Marking

Table 4. Marking codes

| Type number | Marking code <sup>[1]</sup> |
|-------------|-----------------------------|
| BCV61       | 1M*                         |
| BCV61A      | 1J*                         |
| BCV61B      | 1K*                         |
| BCV61C      | 1L*                         |

- [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 |
|-----------------------|---------------------------|----------------------|------------------|------|------|
| <b>Per transistor</b> |                           |                      |                  |      |      |
| $V_{CBO}$             | collector-base voltage    | open emitter         | -                | 30   | V    |
| $V_{CEO}$             | collector-emitter voltage | open base            | -                | 30   | V    |
| $V_{EBS}$             | emitter-base voltage      | $V_{CE} = 0$ V       | -                | 6    | V    |
| $I_C$                 | collector current         |                      | -                | 100  | mA   |
| $I_{CM}$              | peak collector current    |                      | -                | 200  | mA   |
| $I_{BM}$              | peak base current         |                      | -                | 200  | mA   |
| <b>Per device</b>     |                           |                      |                  |      |      |
| $P_{tot}$             | total power dissipation   | $T_{amb} \leq 25$ °C | <sup>[1]</sup> - | 250  | mW   |
| $T_j$                 | junction temperature      |                      | -                | 150  | °C   |
| $T_{amb}$             | ambient temperature       |                      | -65              | +150 | °C   |
| $T_{stg}$             | storage temperature       |                      | -65              | +150 | °C   |

- [1] Device mounted on an FR4 Printed-Circuit Board (PCB).

## 6. Thermal characteristics

**Table 6. 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.

## 7. Characteristics

**Table 7. Characteristics**

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

| Symbol                | Parameter                            | Conditions                                                                                                                           | Min     | Typ | Max | Unit          |
|-----------------------|--------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------|---------|-----|-----|---------------|
| <b>Transistor TR1</b> |                                      |                                                                                                                                      |         |     |     |               |
| $I_{CBO}$             | collector-base cut-off current       | $V_{CB} = 30\text{ V};$<br>$I_E = 0\text{ A}$                                                                                        | -       | -   | 15  | nA            |
|                       |                                      | $V_{CB} = 30\text{ V};$<br>$I_E = 0\text{ A};$<br>$T_j = 150\text{ }^{\circ}\text{C}$                                                | -       | -   | 5   | $\mu\text{A}$ |
| $I_{EBO}$             | emitter-base cut-off current         | $V_{EB} = 5\text{ V};$<br>$I_C = 0\text{ A}$                                                                                         | -       | -   | 100 | nA            |
| $h_{FE}$              | DC current gain                      | $V_{CE} = 5\text{ V};$<br>$I_C = 100\text{ }\mu\text{A}$                                                                             | 100     | -   | -   |               |
|                       |                                      | $V_{CE} = 5\text{ V};$<br>$I_C = 2\text{ mA}$                                                                                        | 110     | -   | 800 |               |
| $V_{CEsat}$           | collector-emitter saturation voltage | $I_C = 10\text{ mA};$<br>$I_B = 0.5\text{ mA}$                                                                                       | -       | 90  | 250 | mV            |
|                       |                                      | $I_C = 100\text{ mA};$<br>$I_B = 5\text{ mA}$                                                                                        | -       | 200 | 600 | mV            |
| $V_{BEsat}$           | base-emitter saturation voltage      | $I_C = 10\text{ mA};$<br>$I_B = 0.5\text{ mA}$                                                                                       | [1] -   | 700 | -   | mV            |
|                       |                                      | $I_C = 100\text{ mA};$<br>$I_B = 5\text{ mA}$                                                                                        | [1] -   | 900 | -   | mV            |
| $V_{BE}$              | base-emitter voltage                 | $I_C = 2\text{ mA};$<br>$V_{CE} = 5\text{ V}$                                                                                        | [2] 580 | 660 | 700 | mV            |
|                       |                                      | $I_C = 10\text{ mA};$<br>$V_{CE} = 5\text{ V}$                                                                                       | [2] -   | -   | 770 | mV            |
| $f_T$                 | transition frequency                 | $V_{CE} = 5\text{ V};$<br>$I_C = 10\text{ mA};$<br>$f = 100\text{ MHz}$                                                              | 100     | -   | -   | MHz           |
| $C_c$                 | collector capacitance                | $V_{CB} = 10\text{ V};$<br>$I_E = I_C = 0\text{ A};$<br>$f = 1\text{ MHz}$                                                           | -       | 2.5 | -   | pF            |
| NF                    | noise figure                         | $V_{CE} = 5\text{ V};$<br>$I_C = 200\text{ }\mu\text{A};$<br>$R_S = 2\text{ k}\Omega;$<br>$f = 1\text{ kHz};$<br>$B = 200\text{ Hz}$ | -       | -   | 10  | dB            |

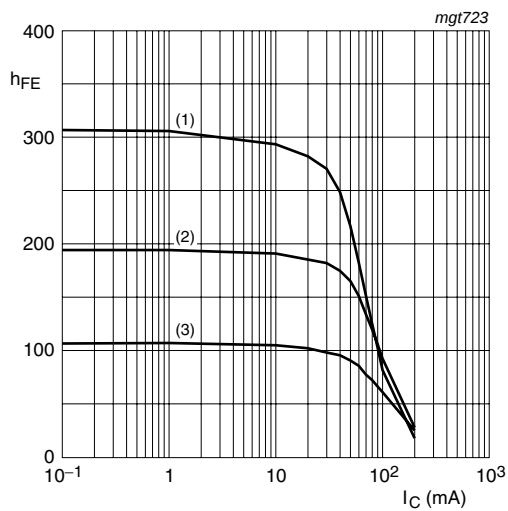
**Table 7. Characteristics ...continued**  
 $T_j = 25\text{ }^{\circ}\text{C}$  unless otherwise specified.

| Symbol                           | Parameter            | Conditions                                           | Min  | Typ | Max  | Unit |
|----------------------------------|----------------------|------------------------------------------------------|------|-----|------|------|
| Transistor TR2                   |                      |                                                      |      |     |      |      |
| V <sub>EBS</sub>                 | emitter-base voltage | V <sub>CB</sub> = 0 V;<br>I <sub>E</sub> = −250 mA   | -    | -   | −1.8 | V    |
|                                  |                      | V <sub>CB</sub> = 0 V;<br>I <sub>E</sub> = −10 μA    | −400 | -   | -    | mV   |
| h <sub>FE</sub>                  | DC current gain      | V <sub>CE</sub> = 5 V;<br>I <sub>C</sub> = 2 mA      |      |     |      |      |
|                                  | BCV61                |                                                      | 110  | -   | 800  |      |
|                                  | BCV61A               |                                                      | 110  | -   | 220  |      |
|                                  | BCV61B               |                                                      | 200  | -   | 450  |      |
|                                  | BCV61C               |                                                      | 420  | -   | 800  |      |
| Transistors TR1 and TR2          |                      |                                                      |      |     |      |      |
| I <sub>C1</sub> /I <sub>E2</sub> | current matching     | I <sub>E2</sub> = −0.5 mA;<br>V <sub>CE1</sub> = 5 V |      |     |      |      |
|                                  |                      | T <sub>amb</sub> ≤ 25 °C                             | 0.7  | -   | 1.3  |      |
|                                  |                      | T <sub>amb</sub> ≤ 150 °C                            | 0.7  | -   | 1.3  |      |
| I <sub>E2</sub>                  | emitter current 2    | V <sub>CE1</sub> = 5 V                               | [3]  | -   | −5   | mA   |

[1]  $V_{BEsat}$  decreases by about 1.7 mV/K with increasing temperature.

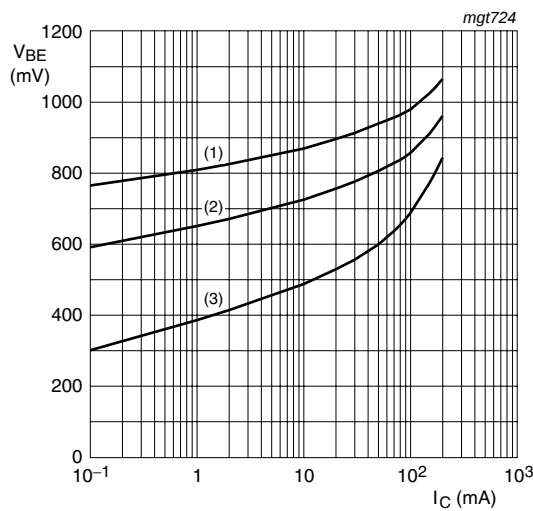
[2]  $V_{BE}$  decreases by about 2 mV/K with increasing temperature.

[3] Device, without emitter resistors, mounted on an FR4 PCB.



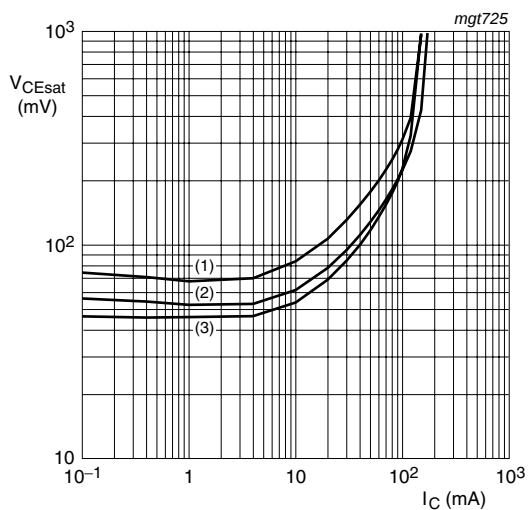
- $V_{CE} = 5\text{ V}$
- (1)  $T_{amb} = 150\text{ }^{\circ}\text{C}$
  - (2)  $T_{amb} = 25\text{ }^{\circ}\text{C}$
  - (3)  $T_{amb} = -55\text{ }^{\circ}\text{C}$

Fig 1. BCV61A: DC current gain as a function of collector current; typical values



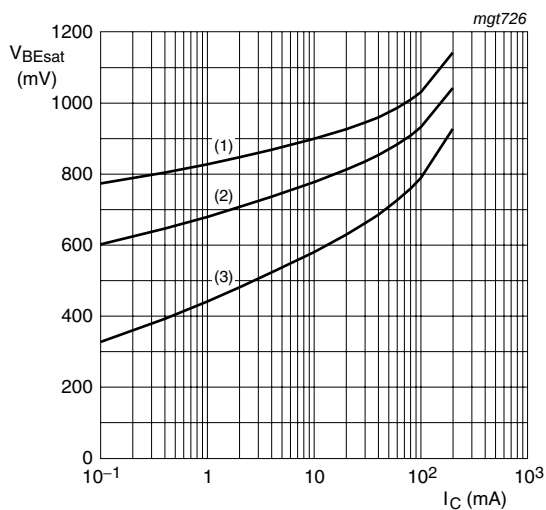
- $V_{CE} = 5\text{ V}$
- (1)  $T_{amb} = -55\text{ }^{\circ}\text{C}$
  - (2)  $T_{amb} = 25\text{ }^{\circ}\text{C}$
  - (3)  $T_{amb} = 150\text{ }^{\circ}\text{C}$

Fig 2. BCV61A: 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)  $T_{amb} = -55\text{ }^{\circ}\text{C}$

Fig 3. BCV61A: Collector-emitter saturation voltage as a function of collector current; typical values



- $I_C/I_B = 10$
- (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 4. BCV61A: Base-emitter saturation voltage as a function of collector current; typical values

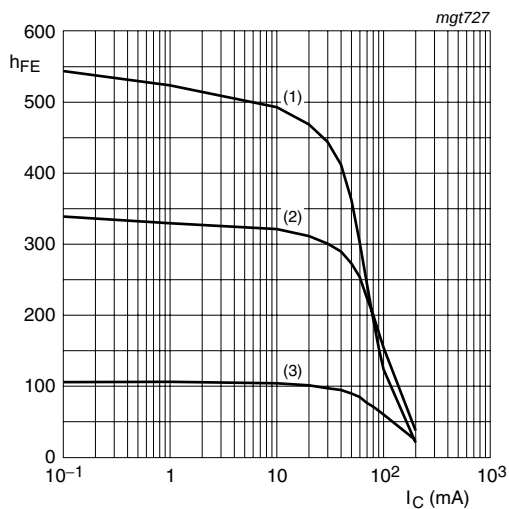


Fig 5. BCV61B: DC current gain as a function of collector current; typical values

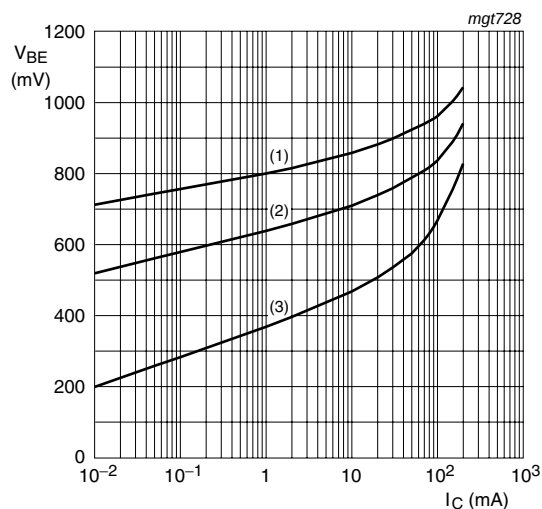


Fig 6. BCV61B: Base-emitter voltage as a function of collector current; typical values

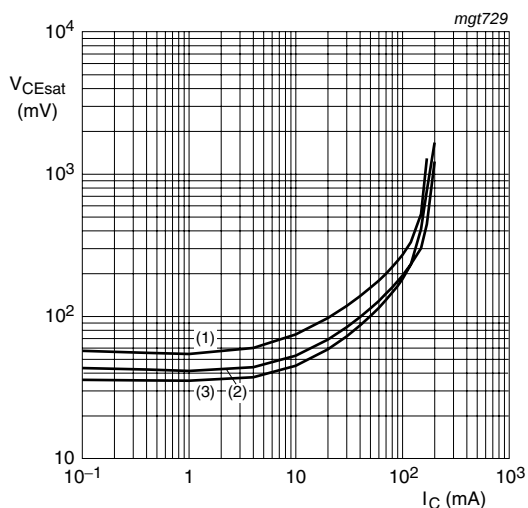


Fig 7. BCV61B: Collector-emitter saturation voltage as a function of collector current; typical values

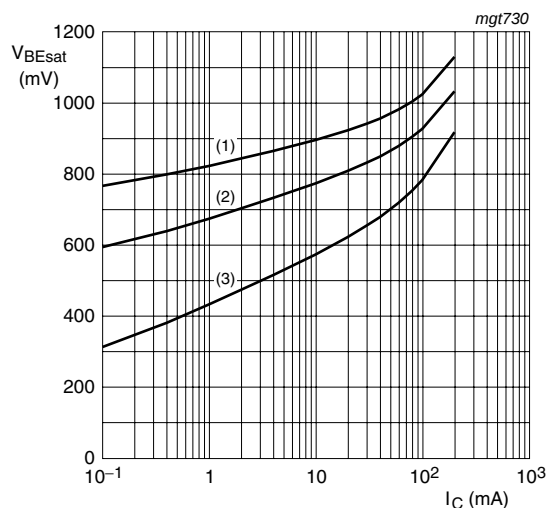
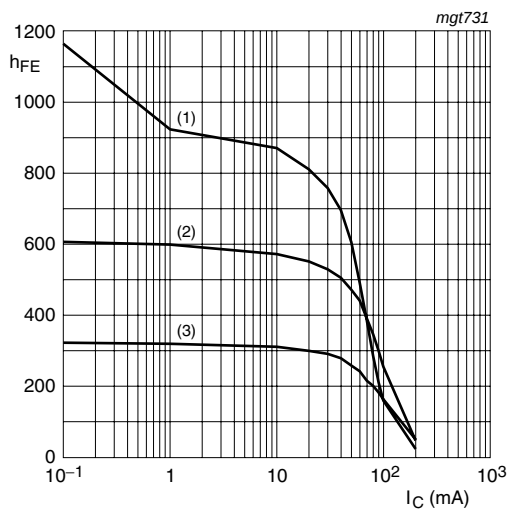
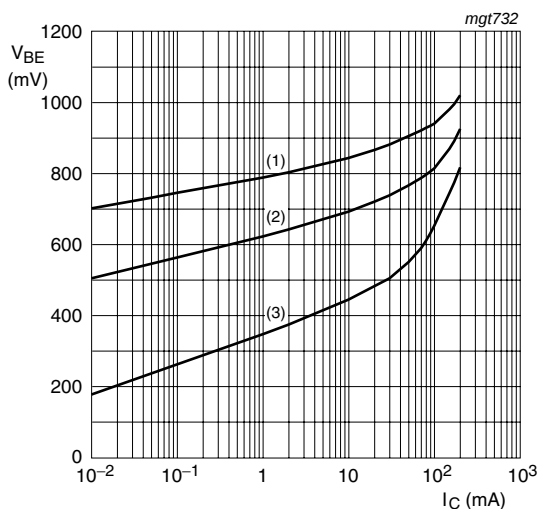


Fig 8. BCV61B: Base-emitter saturation voltage as a function of collector current; typical values



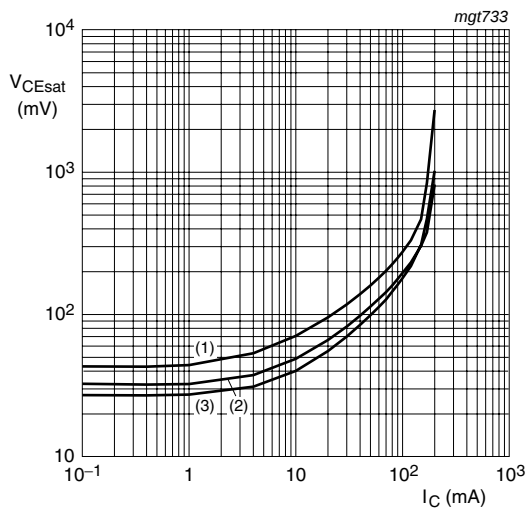
$V_{CE} = 5\text{ V}$   
(1)  $T_{amb} = 150\text{ }^{\circ}\text{C}$   
(2)  $T_{amb} = 25\text{ }^{\circ}\text{C}$   
(3)  $T_{amb} = -55\text{ }^{\circ}\text{C}$

Fig 9. BCV61C: DC current gain as a function of collector current; typical values



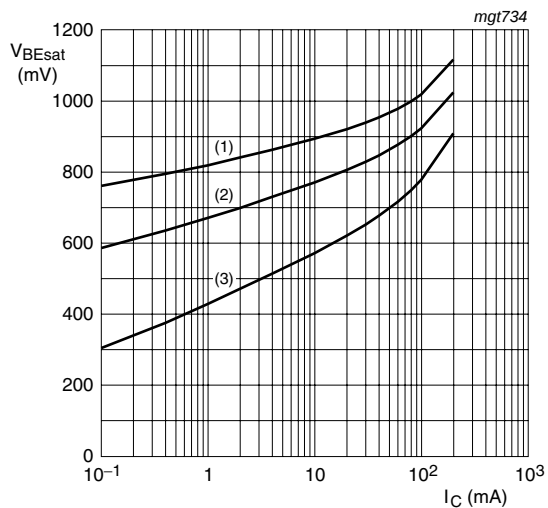
$V_{CE} = 5\text{ V}$   
(1)  $T_{amb} = -55\text{ }^{\circ}\text{C}$   
(2)  $T_{amb} = 25\text{ }^{\circ}\text{C}$   
(3)  $T_{amb} = 150\text{ }^{\circ}\text{C}$

Fig 10. BCV61C: Base-emitter voltage as a function of collector current; typical values



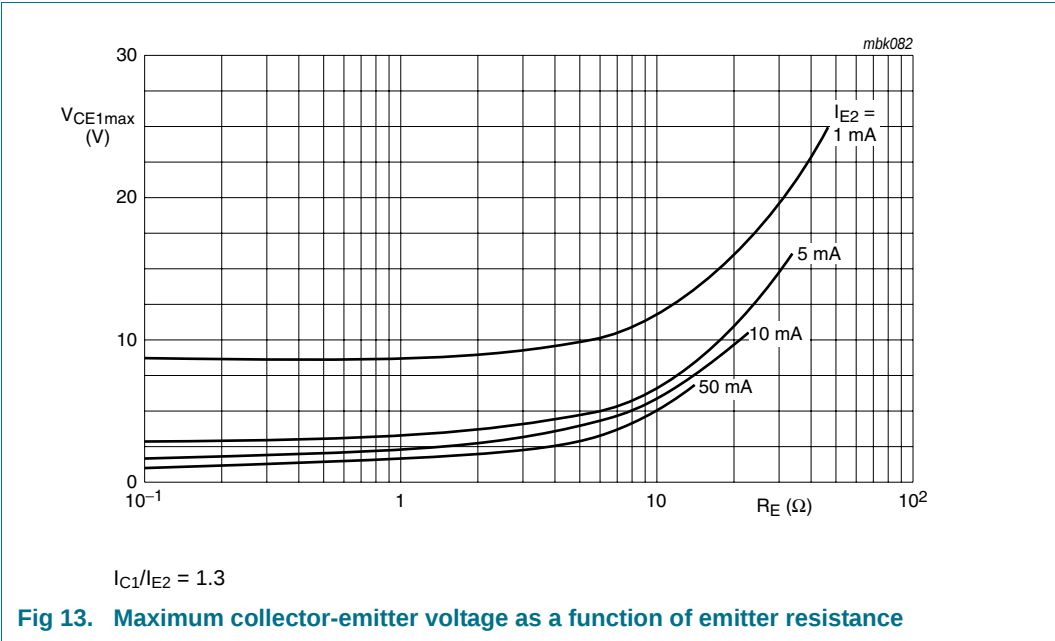
$I_C/I_B = 20$   
(1)  $T_{amb} = 150\text{ }^{\circ}\text{C}$   
(2)  $T_{amb} = 25\text{ }^{\circ}\text{C}$   
(3)  $T_{amb} = -55\text{ }^{\circ}\text{C}$

Fig 11. BCV61C: Collector-emitter saturation voltage as a function of collector current; typical values

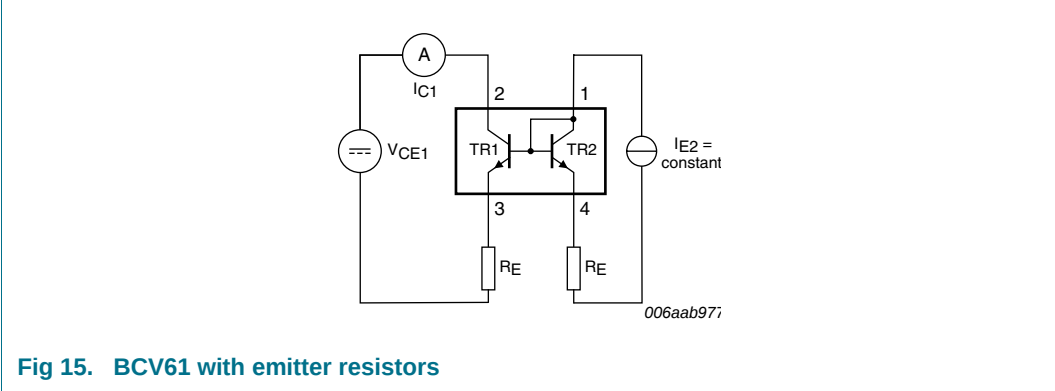
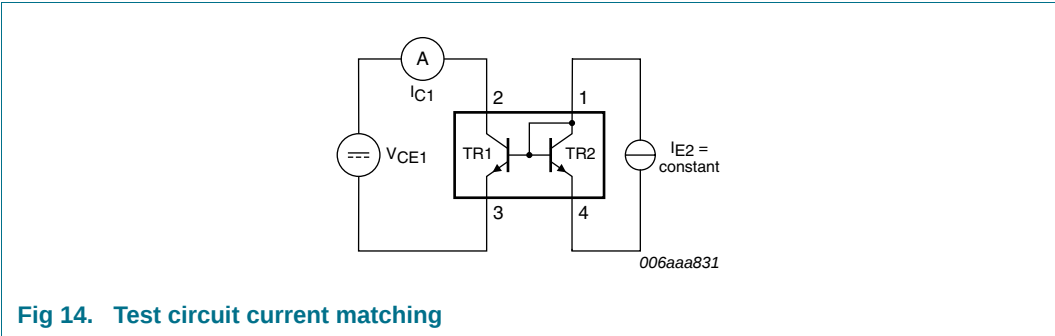


$I_C/I_B = 10$   
(1)  $T_{amb} = -55\text{ }^{\circ}\text{C}$   
(2)  $T_{amb} = 25\text{ }^{\circ}\text{C}$   
(3)  $T_{amb} = 150\text{ }^{\circ}\text{C}$

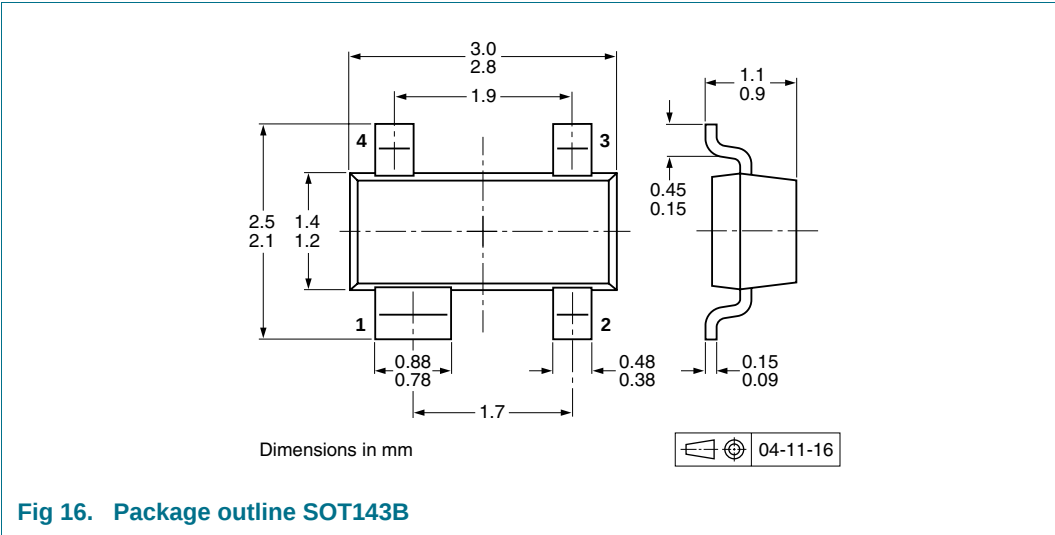
Fig 12. BCV61C: Base-emitter saturation voltage as a function of collector current; typical values



8. Test information



9. Package outline



10. Packing information

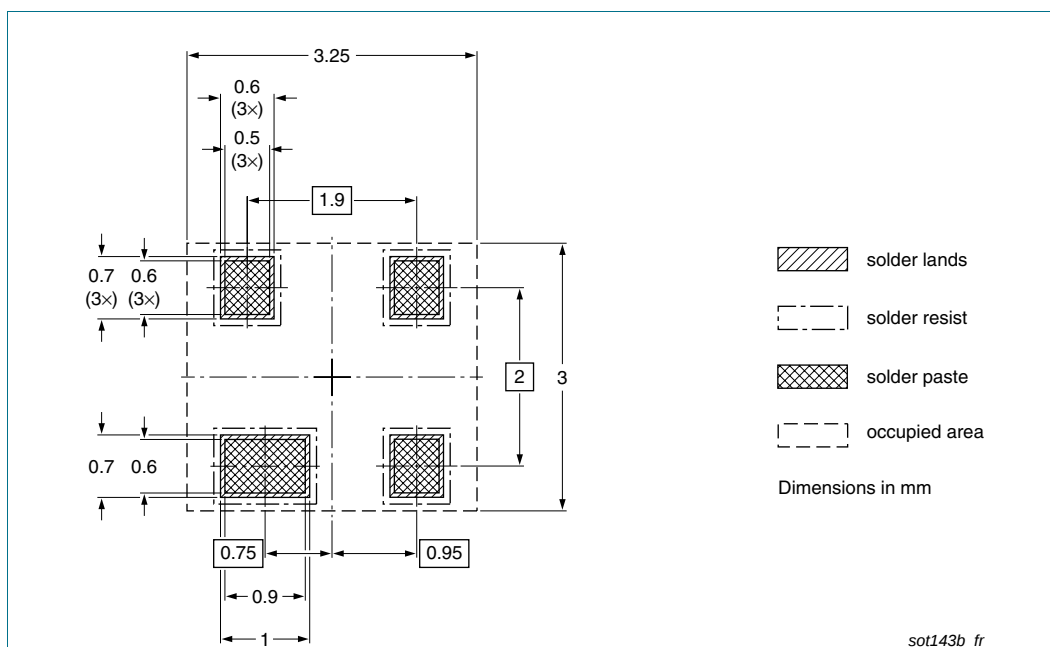
Table 8. Packing methods

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

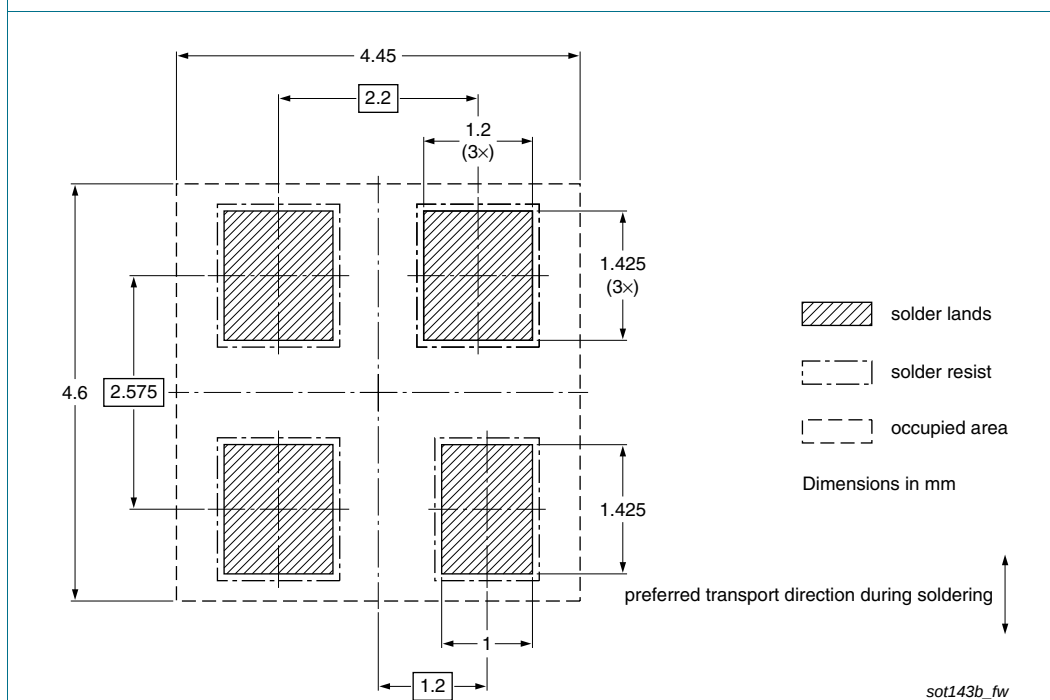
| Type number | Package | Description                    | Packing quantity |       |
|-------------|---------|--------------------------------|------------------|-------|
|             |         |                                | 3000             | 10000 |
| BCV61       | SOT143B | 4 mm pitch, 8 mm tape and reel | -215             | -235  |
| BCV61A      |         |                                |                  |       |
| BCV61B      |         |                                |                  |       |
| BCV61C      |         |                                |                  |       |

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

## 11. Soldering



**Fig 17. Reflow soldering footprint SOT143B**



**Fig 18. Wave soldering footprint SOT143B**

## 12. Revision history

Table 9. Revision history

| Document ID    | Release date                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | Data sheet status     | Change notice | Supersedes  |
|----------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------|---------------|-------------|
| BCV61_4        | 20091218                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Product data sheet    | -             | BCV61_3     |
| 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 3 "Ordering information"</a>: added</li><li>• <a href="#">Section 4 "Marking"</a>: updated</li><li>• <a href="#">Figure 1</a>, <a href="#">2</a>, <a href="#">3</a>, <a href="#">4</a>, <a href="#">5</a>, <a href="#">6</a>, <a href="#">7</a>, <a href="#">8</a>, <a href="#">9</a>, <a href="#">10</a>, <a href="#">11</a> and <a href="#">12</a>: added</li><li>• <a href="#">Section 8 "Test information"</a>: added</li><li>• <a href="#">Figure 16</a>: superseded by minimized package outline drawing</li><li>• <a href="#">Section 10 "Packing information"</a>: added</li><li>• <a href="#">Section 11 "Soldering"</a>: added</li><li>• <a href="#">Section 13 "Legal information"</a>: updated</li></ul> |                       |               |             |
| BCV61_3        | 19990408                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Product specification | -             | BCV61_CNV_2 |
| BCV61_CNV_2    | 19970616                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Product specification | -             | -           |

## 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".

[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.nxp.com>.

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## 14. Contact information

For more information, please visit: <http://www.nxp.com>

For sales office addresses, please send an email to: [salesaddresses@nxp.com](mailto:salesaddresses@nxp.com)

15. Contents

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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'.

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Сотрудничество с глобальными дистрибьюторами электронных компонентов, предоставляет возможность заказывать и получать с международных складов практически любой перечень компонентов в оптимальные для Вас сроки.

На всех этапах разработки и производства наши партнеры могут получить квалифицированную поддержку опытных инженеров.

Система менеджмента качества компании отвечает требованиям в соответствии с ГОСТ Р ИСО 9001, ГОСТ РВ 0015-002 и ЭС РД 009

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