



# 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
	Nexperia	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; base TR1 and TR2		
2	collector TR1		
3	emitter TR1		
4	emitter TR2		

4  
3  
1  
2

4  
3  
TR2  
1  
2  
TR1

006aaa842

**nexperia**

### 3. Ordering information

**Table 3. Ordering information**

Type number	Package		Version
	Name	Description	
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	[1]	-	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**

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

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

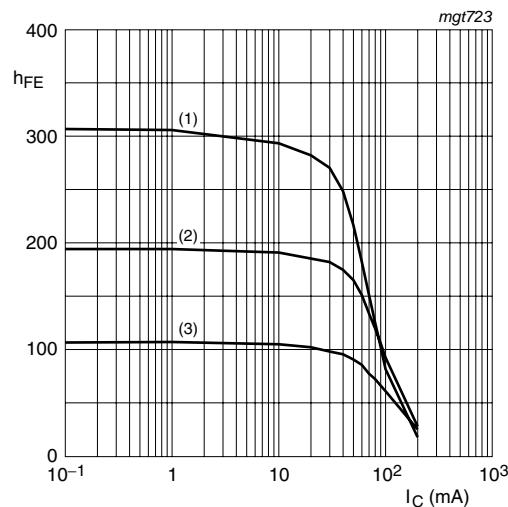
**Table 7. Characteristics ...continued**  
 $T_j = 25^\circ\text{C}$  unless otherwise specified.

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
<b>Transistor TR2</b>						
$V_{EBS}$	emitter-base voltage	$V_{CB} = 0\text{ V};$ $I_E = -250\text{ mA}$	-	-	-1.8	V
		$V_{CB} = 0\text{ V};$ $I_E = -10\text{ }\mu\text{A}$	-400	-	-	mV
$h_{FE}$	DC current gain	$V_{CE} = 5\text{ V};$ $I_C = 2\text{ mA}$				
	BCV61		110	-	800	
	BCV61A		110	-	220	
	BCV61B		200	-	450	
	BCV61C		420	-	800	
<b>Transistors TR1 and TR2</b>						
$I_{C1}/I_{E2}$	current matching	$I_{E2} = -0.5\text{ mA};$ $V_{CE1} = 5\text{ V}$				
		$T_{amb} \leq 25^\circ\text{C}$	0.7	-	1.3	
		$T_{amb} \leq 150^\circ\text{C}$	0.7	-	1.3	
$I_{E2}$	emitter current 2	$V_{CE1} = 5\text{ V}$	[3]	-	-5	mA

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

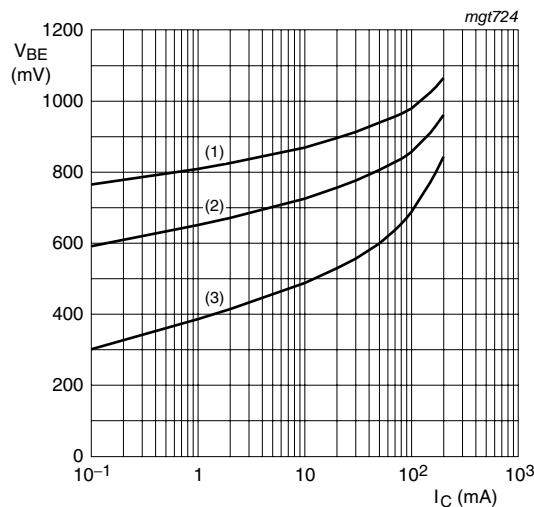
[2]  $V_{BE}$  decreases by about 2 mV/K with increasing temperature.

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



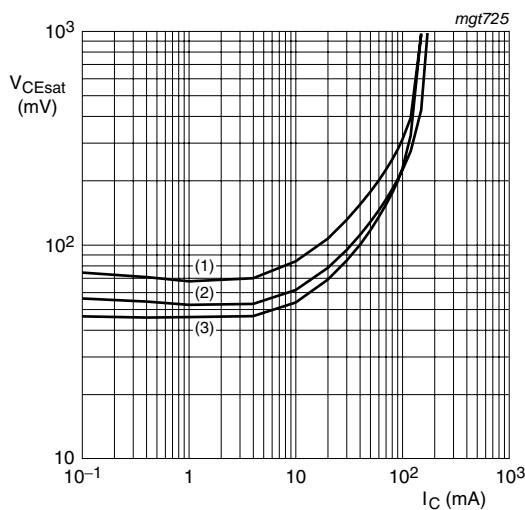
$V_{CE} = 5 \text{ V}$   
 (1)  $T_{amb} = 150 \text{ }^{\circ}\text{C}$   
 (2)  $T_{amb} = 25 \text{ }^{\circ}\text{C}$   
 (3)  $T_{amb} = -55 \text{ }^{\circ}\text{C}$

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



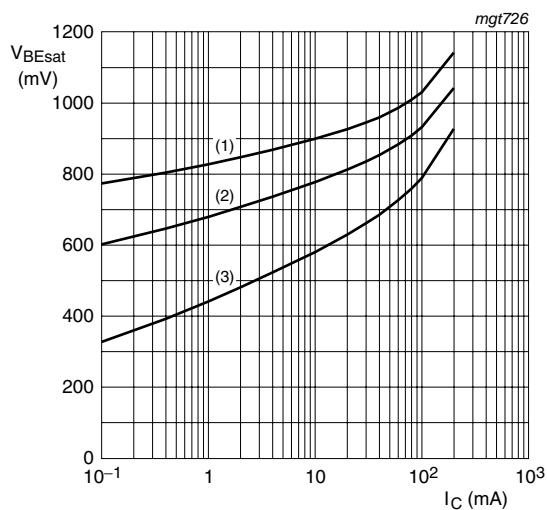
$V_{CE} = 5 \text{ V}$   
 (1)  $T_{amb} = -55 \text{ }^{\circ}\text{C}$   
 (2)  $T_{amb} = 25 \text{ }^{\circ}\text{C}$   
 (3)  $T_{amb} = 150 \text{ }^{\circ}\text{C}$

**Fig 2. BCV61A: Base-emitter voltage as a function of collector current; typical values**



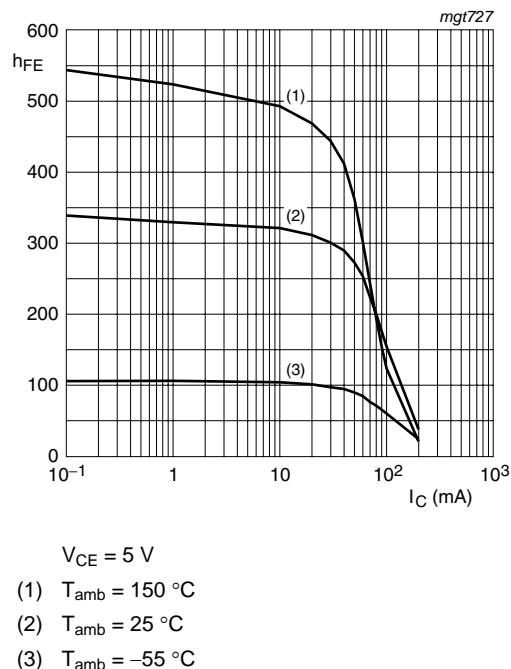
$I_C/I_B = 20$   
 (1)  $T_{amb} = 150 \text{ }^{\circ}\text{C}$   
 (2)  $T_{amb} = 25 \text{ }^{\circ}\text{C}$   
 (3)  $T_{amb} = -55 \text{ }^{\circ}\text{C}$

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

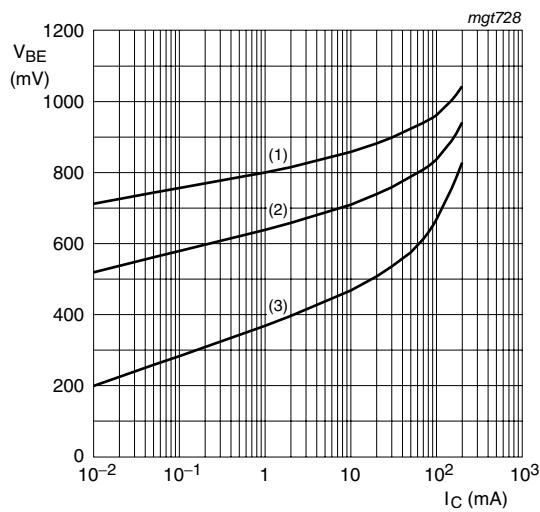


$I_C/I_B = 10$   
 (1)  $T_{amb} = -55 \text{ }^{\circ}\text{C}$   
 (2)  $T_{amb} = 25 \text{ }^{\circ}\text{C}$   
 (3)  $T_{amb} = 150 \text{ }^{\circ}\text{C}$

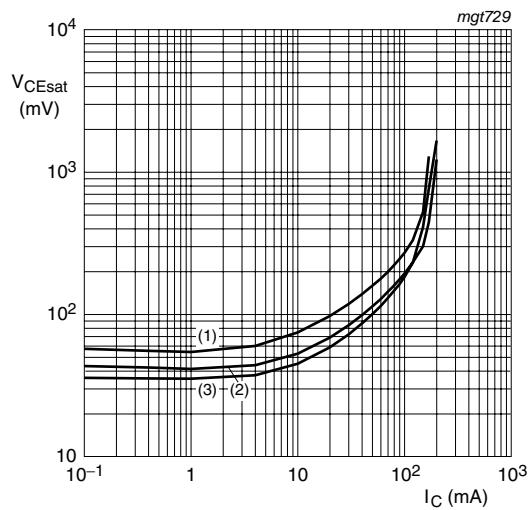
**Fig 4. BCV61A: Base-emitter saturation voltage as a function of collector current; typical values**



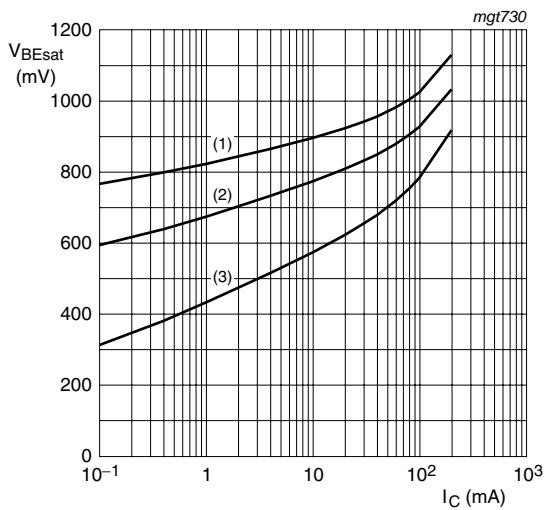
**Fig 5. BCV61B: DC current gain as a function of collector current; typical values**



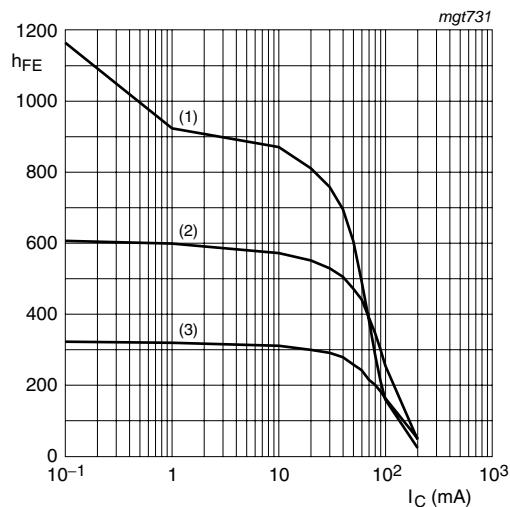
**Fig 6. BCV61B: Base-emitter voltage as a function of collector current; typical values**



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

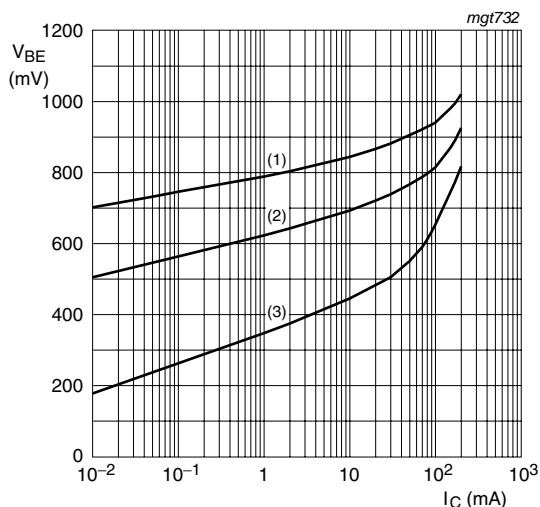


**Fig 8. BCV61B: Base-emitter saturation voltage as a function of collector current; typical values**



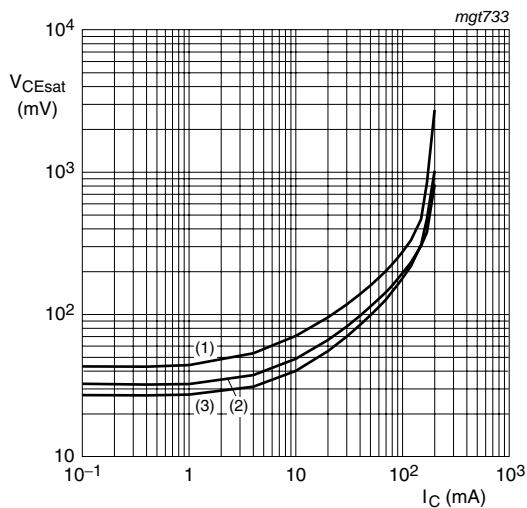
$V_{CE} = 5 \text{ V}$   
 (1)  $T_{amb} = 150 \text{ }^{\circ}\text{C}$   
 (2)  $T_{amb} = 25 \text{ }^{\circ}\text{C}$   
 (3)  $T_{amb} = -55 \text{ }^{\circ}\text{C}$

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



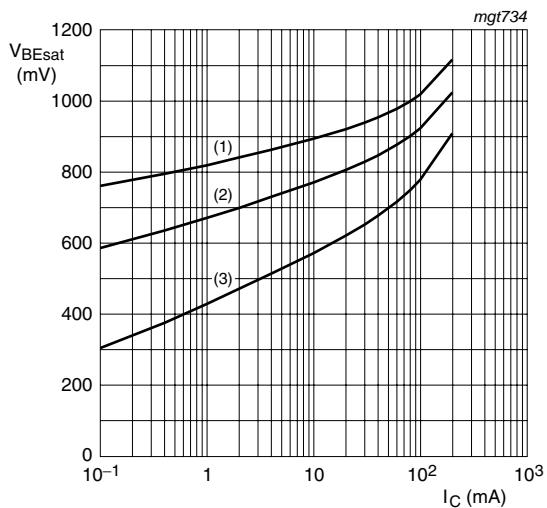
$V_{CE} = 5 \text{ V}$   
 (1)  $T_{amb} = -55 \text{ }^{\circ}\text{C}$   
 (2)  $T_{amb} = 25 \text{ }^{\circ}\text{C}$   
 (3)  $T_{amb} = 150 \text{ }^{\circ}\text{C}$

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



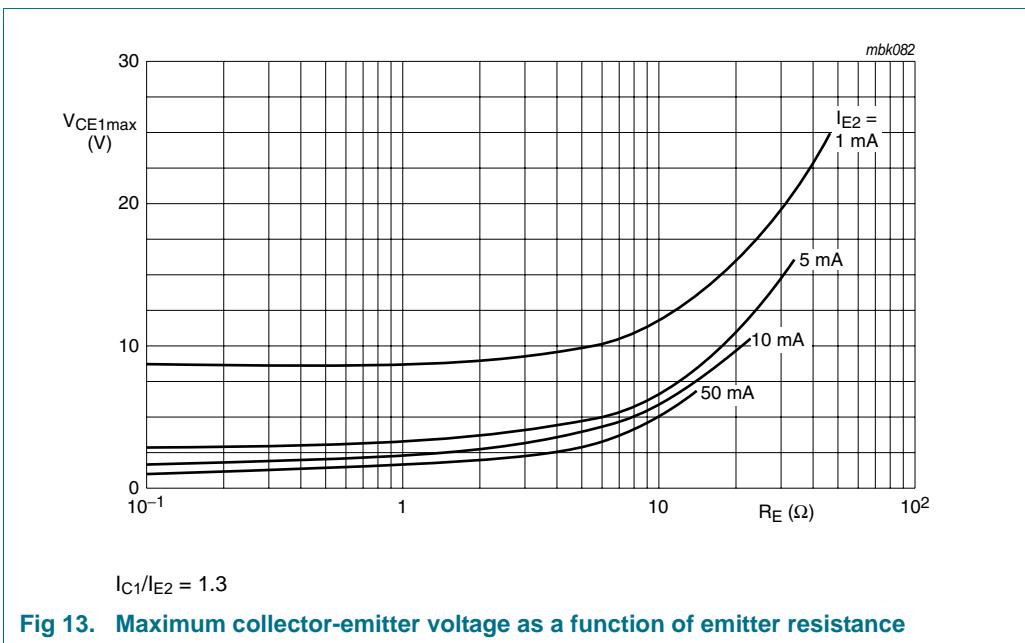
$I_C/I_B = 20$   
 (1)  $T_{amb} = 150 \text{ }^{\circ}\text{C}$   
 (2)  $T_{amb} = 25 \text{ }^{\circ}\text{C}$   
 (3)  $T_{amb} = -55 \text{ }^{\circ}\text{C}$

**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

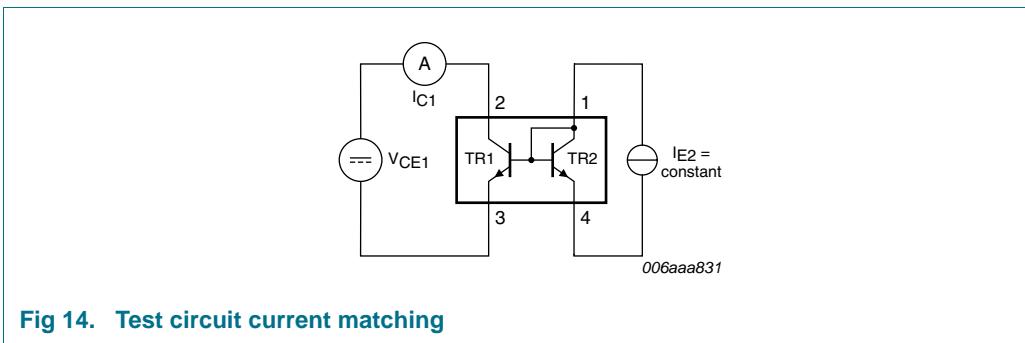


Fig 14. Test circuit current matching

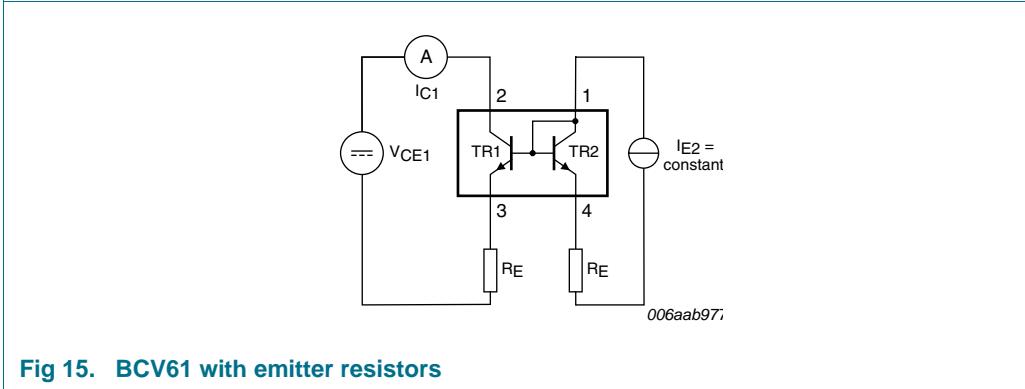


Fig 15. BCV61 with emitter resistors

## 9. Package outline

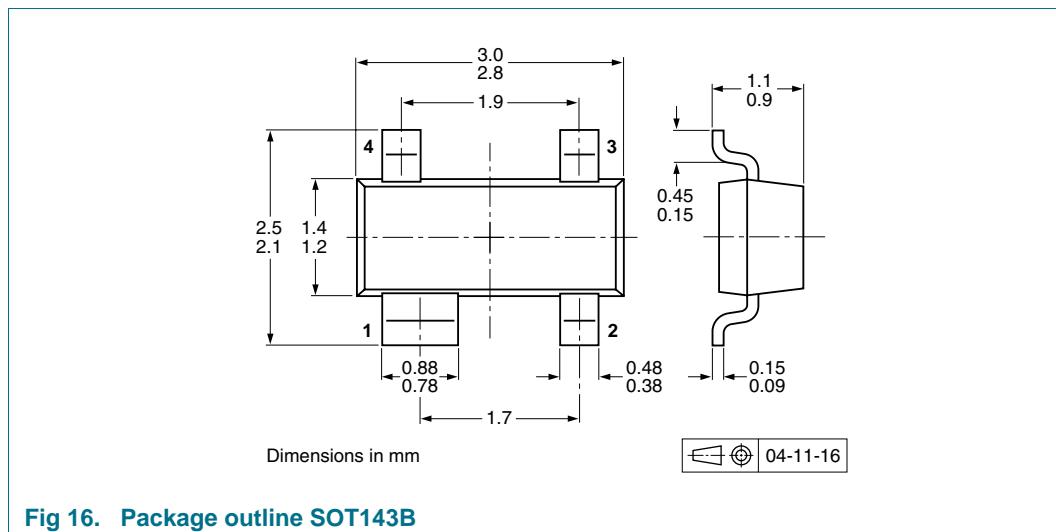


Fig 16. Package outline SOT143B

## 10. Packing information

Please refer to packing information on [www.nexperia.com](http://www.nexperia.com).

## 11. Soldering

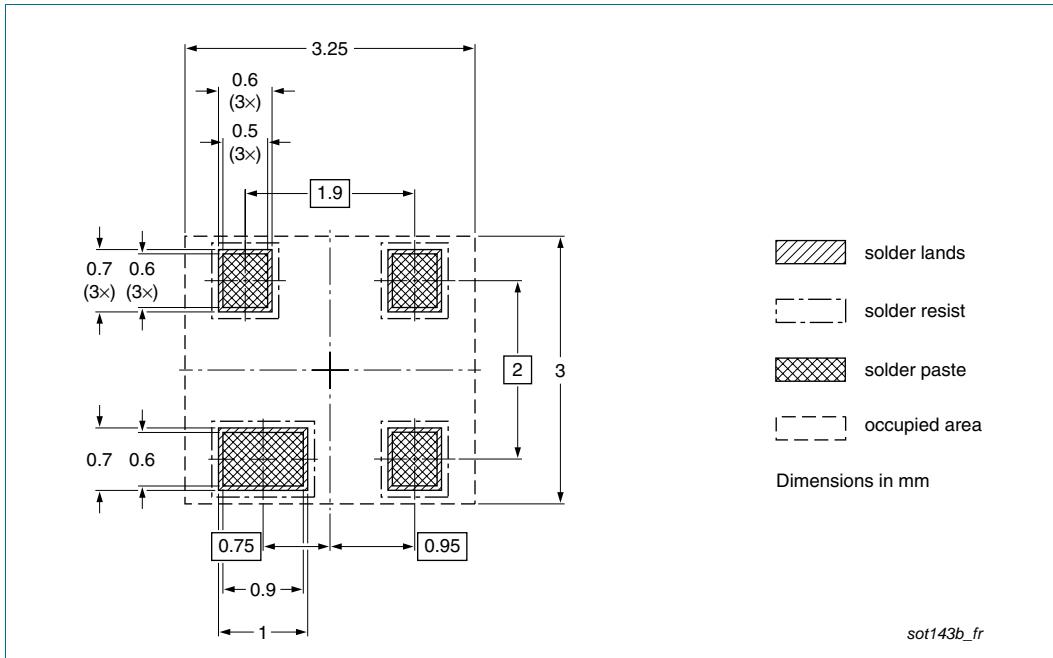


Fig 17. Reflow soldering footprint SOT143B

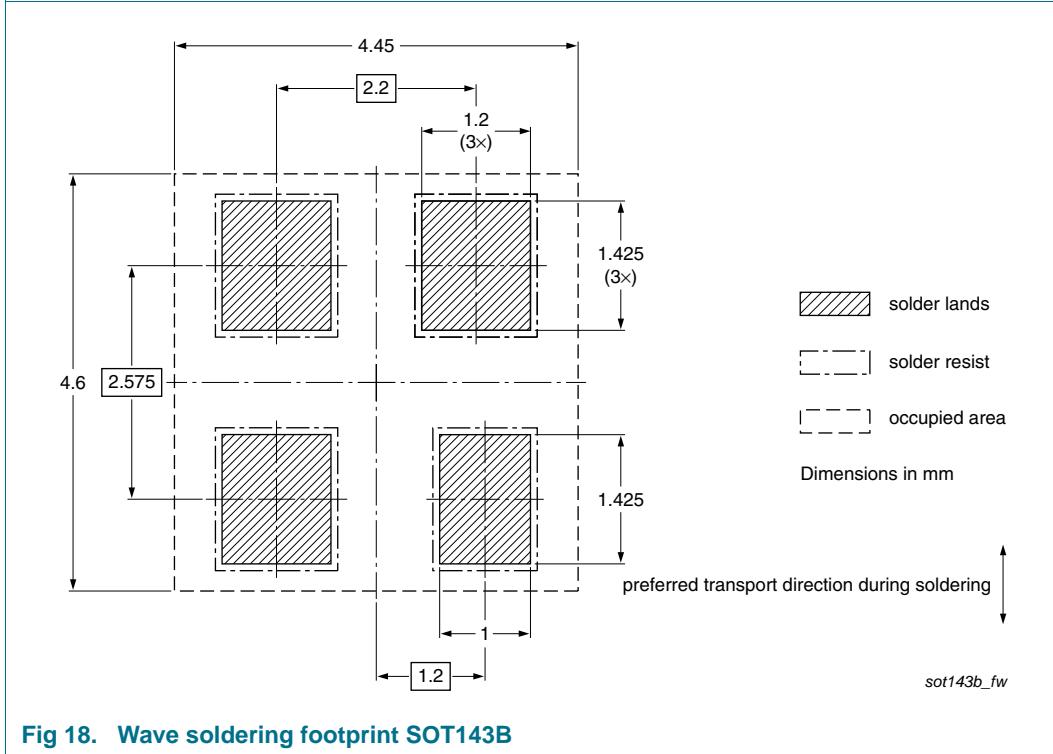


Fig 18. Wave soldering footprint SOT143B

## 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, 2, 3, 4, 5, 6, 7, 8, 9, 10, 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.nexperia.com>.

### 13.2 Definitions

**Draft** — The document is a draft version only. The content is still under internal review and subject to formal approval, which may result in modifications or additions. Nexperia does not give any representations or warranties as to the accuracy or completeness of information included herein and shall have no liability for the consequences of use of such information.

**Short data sheet** — A short data sheet is an extract from a full data sheet with the same product type number(s) and title. A short data sheet is intended for quick reference only and should not be relied upon to contain detailed and full information. For detailed and full information see the relevant full data sheet, which is available on request via the local Nexperia sales office. In case of any inconsistency or conflict with the short data sheet, the full data sheet shall prevail.

### 13.3 Disclaimers

**General** — Information in this document is believed to be accurate and reliable. However, Nexperia does not give any representations or warranties, expressed or implied, as to the accuracy or completeness of such information and shall have no liability for the consequences of use of such information.

**Right to make changes** — Nexperia reserves the right to make changes to information published in this document, including without limitation specifications and product descriptions, at any time and without notice. This document supersedes and replaces all information supplied prior to the publication hereof.

**Suitability for use** — Nexperia products are not designed, authorized or warranted to be suitable for use in medical, military, aircraft, space or life support equipment, nor in applications where failure or malfunction of an Nexperia product can reasonably be expected to result in personal injury, death or severe property or environmental

damage. Nexperia accepts no liability for inclusion and/or use of Nexperia products in such equipment or applications and therefore such inclusion and/or use is at the customer's own risk.

**Applications** — Applications that are described herein for any of these products are for illustrative purposes only. Nexperia makes no representation or warranty that such applications will be suitable for the specified use without further testing or modification.

**Limiting values** — Stress above one or more limiting values (as defined in the Absolute Maximum Ratings System of IEC 60134) may cause permanent damage to the device. Limiting values are stress ratings only and operation of the device at these or any other conditions above those given in the Characteristics sections of this document is not implied. Exposure to limiting values for extended periods may affect device reliability.

**Terms and conditions of sale** — Nexperia products are sold subject to the general terms and conditions of commercial sale, as published at <http://www.nexperia.com/profile/terms>, including those pertaining to warranty, intellectual property rights infringement and limitation of liability, unless explicitly otherwise agreed to in writing by Nexperia. In case of any inconsistency or conflict between information in this document and such terms and conditions, the latter will prevail.

**No offer to sell or license** — Nothing in this document may be interpreted or construed as an offer to sell products that is open for acceptance or the grant, conveyance or implication of any license under any copyrights, patents or other industrial or intellectual property rights.

**Export control** — This document as well as the item(s) described herein may be subject to export control regulations. Export might require a prior authorization from national authorities.

**Quick reference data** — The Quick reference data is an extract of the product data given in the Limiting values and Characteristics sections of this document, and as such is not complete, exhaustive or legally binding.

### 13.4 Trademarks

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

## 14. Contents

---

<b>1</b>	<b>Product profile</b>	<b>1</b>
1.1	General description	1
1.2	Features	1
1.3	Applications	1
<b>2</b>	<b>Pinning information</b>	<b>1</b>
<b>3</b>	<b>Ordering information</b>	<b>2</b>
<b>4</b>	<b>Marking</b>	<b>2</b>
<b>5</b>	<b>Limiting values</b>	<b>2</b>
<b>6</b>	<b>Thermal characteristics</b>	<b>3</b>
<b>7</b>	<b>Characteristics</b>	<b>3</b>
<b>8</b>	<b>Test information</b>	<b>8</b>
<b>9</b>	<b>Package outline</b>	<b>9</b>
<b>10</b>	<b>Packing information</b>	<b>9</b>
<b>11</b>	<b>Soldering</b>	<b>10</b>
<b>12</b>	<b>Revision history</b>	<b>11</b>
<b>13</b>	<b>Legal information</b>	<b>12</b>
13.1	Data sheet status	12
13.2	Definitions	12
13.3	Disclaimers	12
13.4	Trademarks	12
<b>14</b>	<b>Contents</b>	<b>13</b>

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

© Nexperia B.V. 2009.

All rights reserved.

For more information, please visit: <http://www.nexperia.com>  
For sales office addresses, please send an email to:  
[salesaddresses@nexperia.com](mailto:salesaddresses@nexperia.com)

Date of release: 18 December 2009  
Document identifier: BCV61