



# BCW68 series

45 V, 800 mA PNP general-purpose transistor

Rev. 1 — 21 April 2017

Product data sheet

## 1 General description

PNP general-purpose transistors in a small SOT23 (TO-236AB) Surface-Mounted Device (SMD) plastic package.

NPN complements: BCW66F/G/H

## 2 Features and benefits

- High current
- AEC-Q101 qualified

## 3 Applications

- General-purpose switching and amplification

## 4 Quick reference data

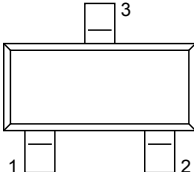
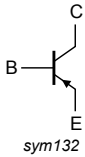
Table 1. Quick reference data

| Symbol    | Parameter                 | Conditions   | Min | Typ | Max  | Unit |
|-----------|---------------------------|--|-----|-----|------|------|
| $V_{CE0}$ | collector-emitter voltage | open base  | -   | -   | -45  | V    |
| $I_C$     | collector current         |  | -   | -   | -800 | mA   |
| $I_{CM}$  | peak collector current    | single pulse; $t_p \leq 1$ ms                                      | -   | -   | -1   | A    |
| $h_{FE}$  | DC current gain           | $V_{CE} = -1$ V; $I_C = -100$ mA; $T_{amb} = 25$ °C <sup>[1]</sup> |     |     |      |      |
|           | BCW68F                    |  | 100 | -   | 250  |      |
|           | BCW68G                    |  | 160 | -   | 400  |      |
|           | BCW68H                    |  | 250 | -   | 600  |      |

[1] pulsed:  $t_p \leq 300$   $\mu$ s,  $\delta \leq 0.02$

## 5 Pinning information

Table 2. Pinning

| Pin | Symbol | Description | Simplified outline   | Graphic symbol  |
|-----|--------|-------------|--|---|
| 1   | B      | base        |  | <br>sym132 |
| 2   | E      | emitter     |  |   |
| 3   | C      | collector   |  |   |

## 6 Ordering information

Table 3. Ordering information

| Type number | Package  |  | Version |
|-------------|----------|--|---------|
|             | Name     | Description                              |         |
| BCW68F      | TO-236AB | plastic surface-mounted package; 3 leads | SOT23   |
| BCW68G      |          |  |         |
| BCW68H      |          |  |         |

## 7 Marking

Table 4. Marking

| Type number | Marking code |
|-------------|--------------|
| BCW68F      | [1] ET%      |
| BCW68G      | [1] EU%      |
| BCW68H      | [1] EV%      |

[1] % = placeholder for manufacturing site code

## 8 Limiting values

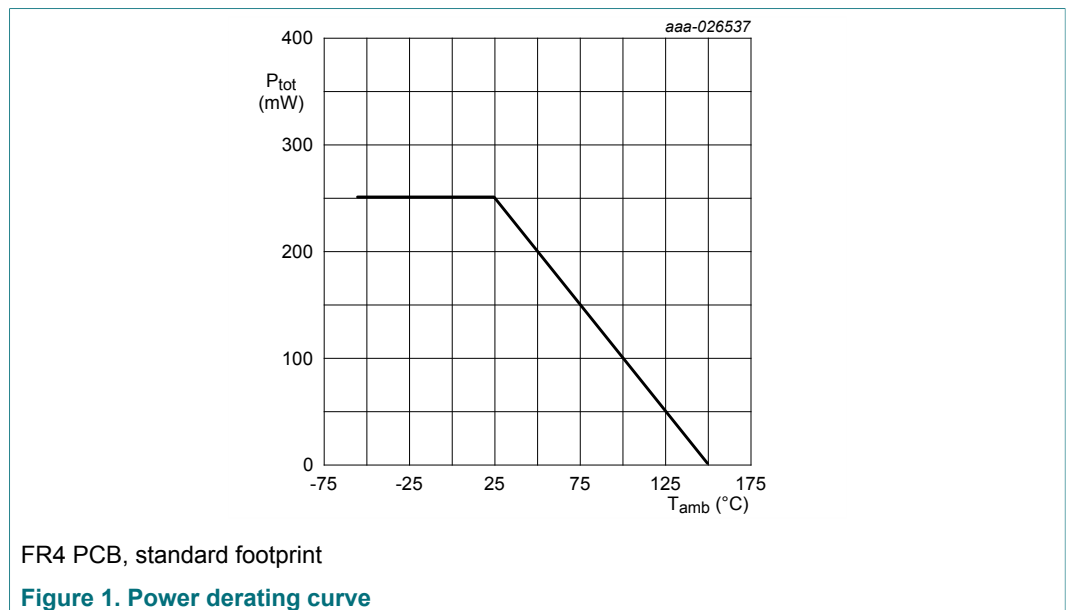
Table 5. Limiting values

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

| Symbol    | Parameter                 | Conditions                    | Min | Max  | Unit |
|-----------|---------------------------|-------------------------------|-----|------|------|
| $V_{CBO}$ | collector-base voltage    | open emitter                  | -   | -50  | V    |
| $V_{CEO}$ | collector-emitter voltage | open base                     | -   | -45  | V    |
| $V_{EBO}$ | emitter-base voltage      | open collector                | -   | -5   | V    |
| $I_C$     | collector current         |                               | -   | -800 | mA   |
| $I_{CM}$  | peak collector current    | single pulse; $t_p \leq 1$ ms | -   | -1   | A    |
| $I_B$     | base current              |                               | -   | -100 | mA   |

| Symbol    | Parameter               | Conditions                    | Min | Max  | Unit |
|-----------|-------------------------|-------------------------------|-----|------|------|
| $I_{BM}$  | peak base current       | single pulse; $t_p \leq 1$ ms | -   | -200 | mA   |
| $P_{tot}$ | total power dissipation | $T_{amb} \leq 25$ °C [1]      | -   | 250  | 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 chopper, tin-plated and standard footprint.

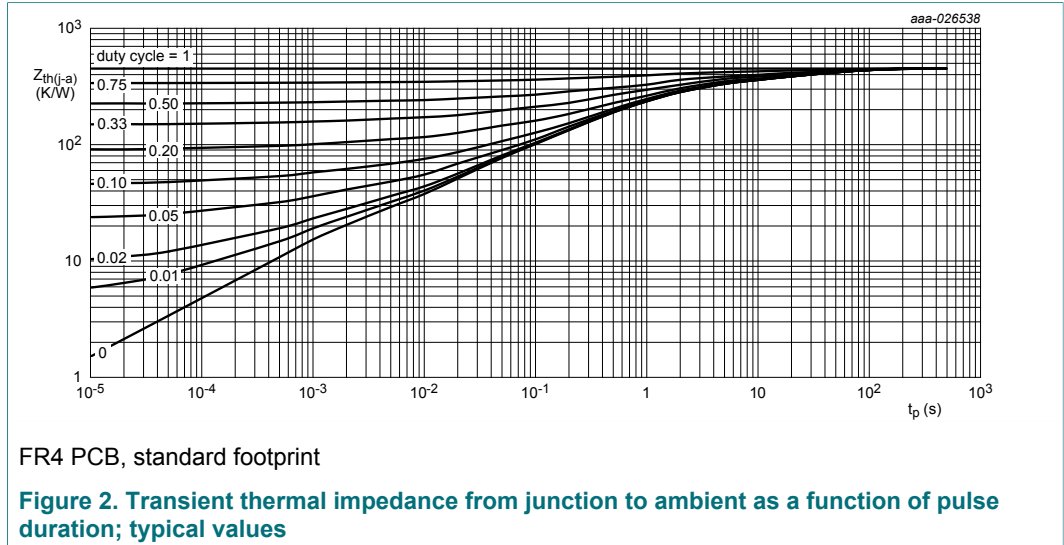


## 9 Thermal characteristics

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, single-sided copper, tin-plated and standard footprint.



## 10 Electrical characteristics

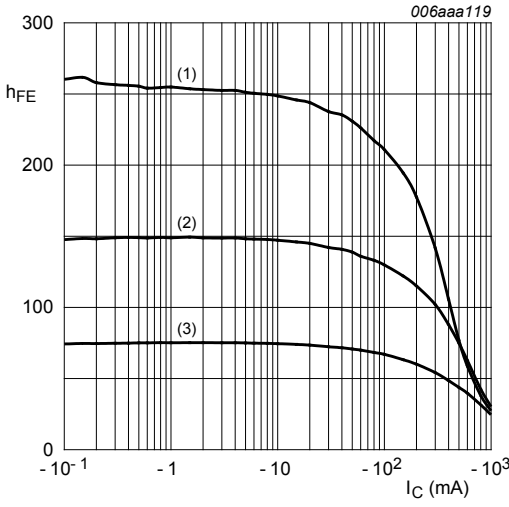
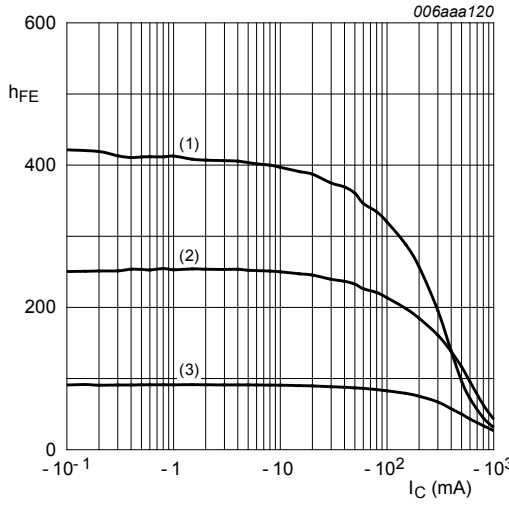
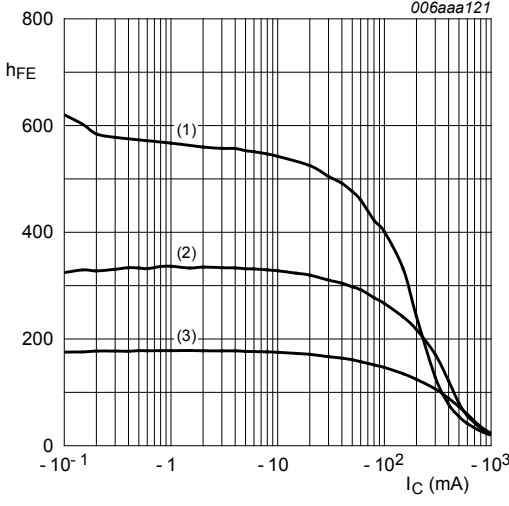
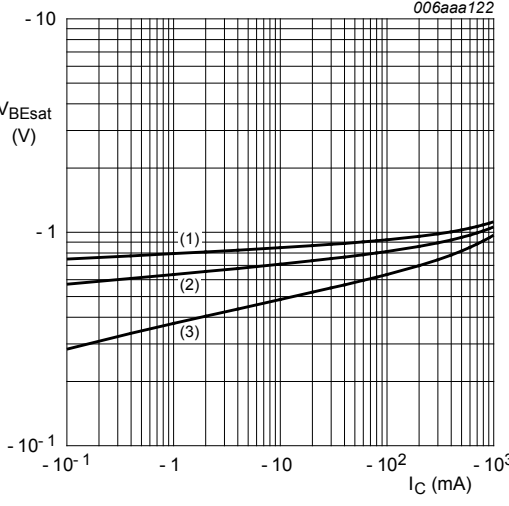
Table 7. Electrical characteristics

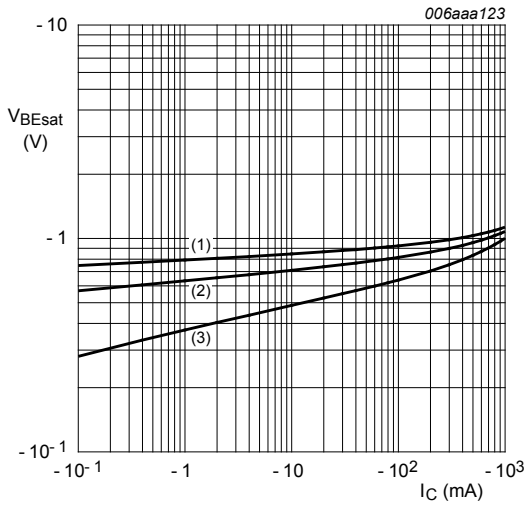
$T_{amb} = 25\text{ °C}$  unless otherwise specified.

| Symbol      | Parameter                            | Conditions  | Min     | Typ | Max   | Unit          |
|-------------|--------------------------------------|---|---------|-----|-------|---------------|
| $I_{CBO}$   | collector-base cut-off current       | $V_{CB} = -40\text{ V}; I_E = 0\text{ A}$                         | -       | -   | -20   | nA            |
|             |                                      | $V_{CB} = -40\text{ V}; I_E = 0\text{ A}; T_J = 150\text{ °C}$    | -       | -   | -5    | $\mu\text{A}$ |
| $I_{EBO}$   | emitter-base cut-off current         | $V_{EB} = -5\text{ V}; I_C = 0\text{ A}$                          | -       | -   | -20   | nA            |
| $h_{FE}$    | DC current gain                      |   |         |     |       |               |
|             | BCW68F/G/H                           | $V_{CE} = -1\text{ V}; I_C = -100\text{ }\mu\text{A}$             | 100     | -   | -     |               |
|             | BCW68F/G/H                           | $V_{CE} = -1\text{ V}; I_C = -1\text{ mA}$                        | 100     | -   | -     |               |
|             | BCW68F/G/H                           | $V_{CE} = -1\text{ V}; I_C = -10\text{ mA}$                       | 100     | -   | -     |               |
|             | BCW68F                               | $V_{CE} = -1\text{ V}; I_C = -100\text{ mA}$                      | [1] 100 | -   | 250   |               |
|             | BCW68G                               |   | 160     | -   | 400   |               |
|             | BCW68H                               |   | 250     | -   | 600   |               |
|             | BCW68F                               | $V_{CE} = -2\text{ V}; I_C = -500\text{ mA}$                      | [1] 35  | -   | -     |               |
|             | BCW68G                               |   | 60      | -   | -     |               |
| BCW68H      | 100                                  |   | -       | -   |       |               |
| $V_{CEsat}$ | collector-emitter saturation voltage | $I_C = -100\text{ mA}; I_B = -10\text{ mA}$                       | [1] -   | -   | -350  | mV            |
|             |                                      | $I_C = -500\text{ mA}; I_B = -50\text{ mA}$                       | [1] -   | -   | -450  | mV            |
| $V_{BEsat}$ | base-emitter saturation voltage      | $I_C = -100\text{ mA}; I_B = -10\text{ mA}$                       | [1] -   | -   | -1.25 | V             |
|             |                                      | $I_C = -500\text{ mA}; I_B = -50\text{ mA}$                       | [1] -   | -   | -1.25 | V             |
| $f_T$       | transition frequency                 | $V_{CE} = -5\text{ V}; I_C = -10\text{ mA}; f = 100\text{ MHz}$   | 80      | -   | -     | MHz           |
| $C_c$       | collector capacitance                | $V_{CB} = -10\text{ V}; I_E = I_e = 0\text{ A}; f = 1\text{ MHz}$ | -       | 5   | -     | pF            |

[1] pulsed;  $t_p \leq 300\text{ }\mu\text{s}$ ;  $\delta \leq 0.02$

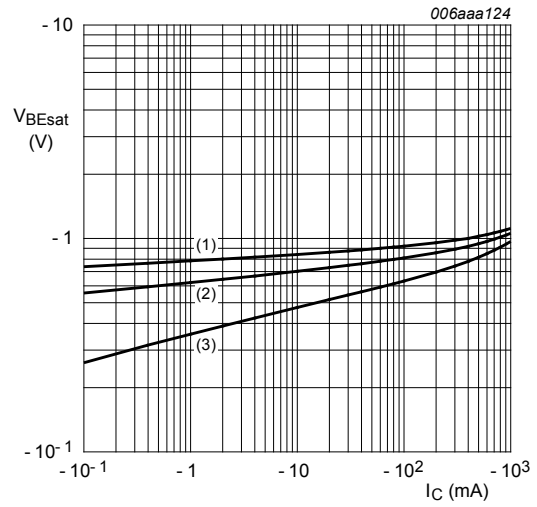
Table 8.

|  |   |
|--|---|
|  <p><math>V_{CE} = -1\text{ V}</math><br/>         (1) <math>T_{amb} = 150\text{ °C}</math><br/>         (2) <math>T_{amb} = 25\text{ °C}</math><br/>         (3) <math>T_{amb} = -55\text{ °C}</math></p> <p><b>Figure 3. BCW68F: DC current gain as a function of collector current; typical values</b></p>   |  <p><math>V_{CE} = -1\text{ V}</math><br/>         (1) <math>T_{amb} = 150\text{ °C}</math><br/>         (2) <math>T_{amb} = 25\text{ °C}</math><br/>         (3) <math>T_{amb} = -55\text{ °C}</math></p> <p><b>Figure 4. BCW68G: DC current gain as a function of collector current; typical values</b></p>           |
|  <p><math>V_{CE} = -1\text{ V}</math><br/>         (1) <math>T_{amb} = 150\text{ °C}</math><br/>         (2) <math>T_{amb} = 25\text{ °C}</math><br/>         (3) <math>T_{amb} = -55\text{ °C}</math></p> <p><b>Figure 5. BCW68H: DC current gain as a function of collector current; typical values</b></p> |  <p><math>I_C/I_B = 10</math><br/>         (1) <math>T_{amb} = -55\text{ °C}</math><br/>         (2) <math>T_{amb} = 25\text{ °C}</math><br/>         (3) <math>T_{amb} = 150\text{ °C}</math></p> <p><b>Figure 6. BCW68F: Base-emitter saturation voltage as a function of collector current; typical values</b></p> |



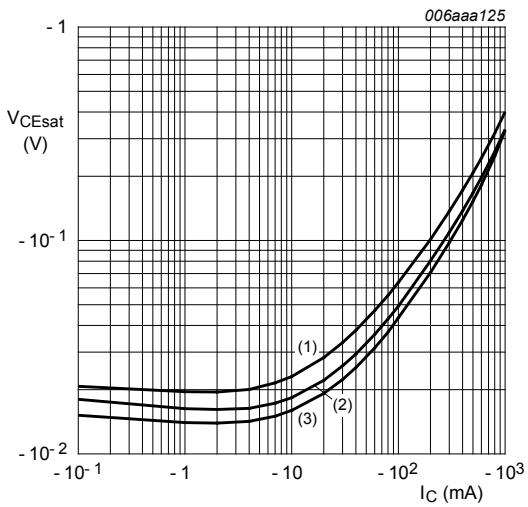
$I_C/I_B = 10$   
 (1)  $T_{amb} = -55\text{ °C}$   
 (2)  $T_{amb} = 25\text{ °C}$   
 (3)  $T_{amb} = 150\text{ °C}$

**Figure 7. BCW68G: Base-emitter saturation voltage as a function of collector current; typical values**



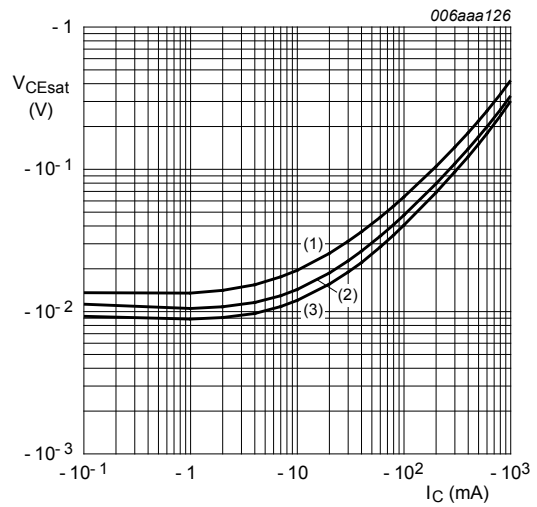
$I_C/I_B = 10$   
 (1)  $T_{amb} = -55\text{ °C}$   
 (2)  $T_{amb} = 25\text{ °C}$   
 (3)  $T_{amb} = 150\text{ °C}$

**Figure 8. BCW68H: Base-emitter saturation voltage as a function of collector current; typical values**



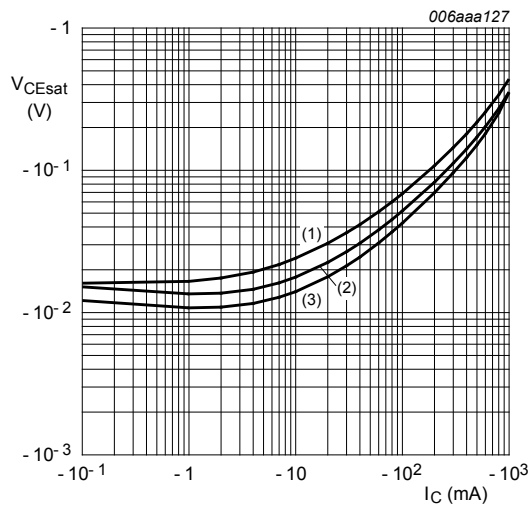
$I_C/I_B = 10$   
 (1)  $T_{amb} = 150\text{ °C}$   
 (2)  $T_{amb} = 25\text{ °C}$   
 (3)  $T_{amb} = -55\text{ °C}$

**Figure 9. BCW68F: Collector-emitter saturation voltage as a function of collector current; typical values**



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

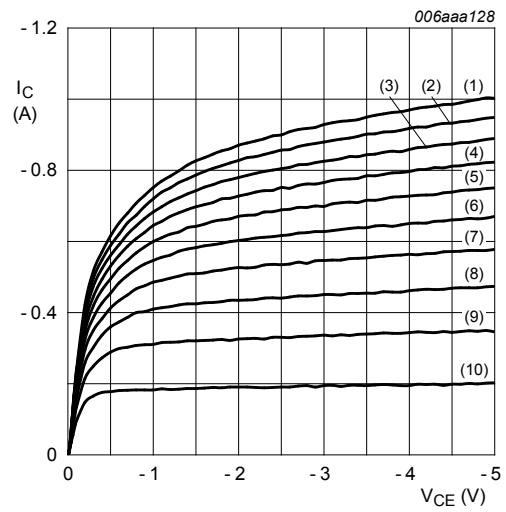
**Figure 10. BCW68G: Collector-emitter saturation voltage as a function of collector current; typical values**



$I_C/I_B = 10$

- (1)  $T_{amb} = 150\text{ °C}$
- (2)  $T_{amb} = 25\text{ °C}$
- (3)  $T_{amb} = -55\text{ °C}$

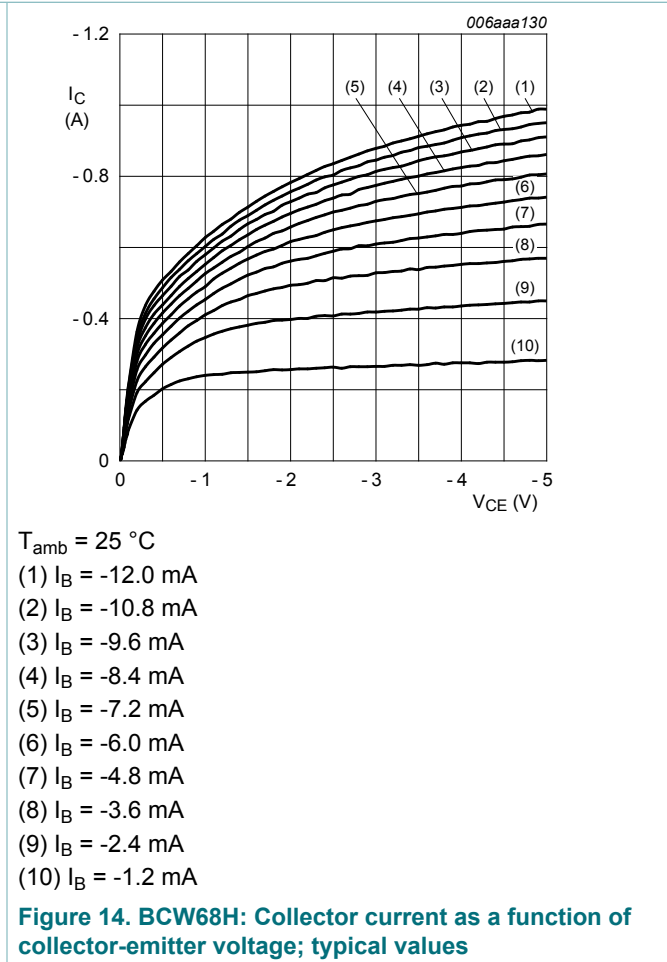
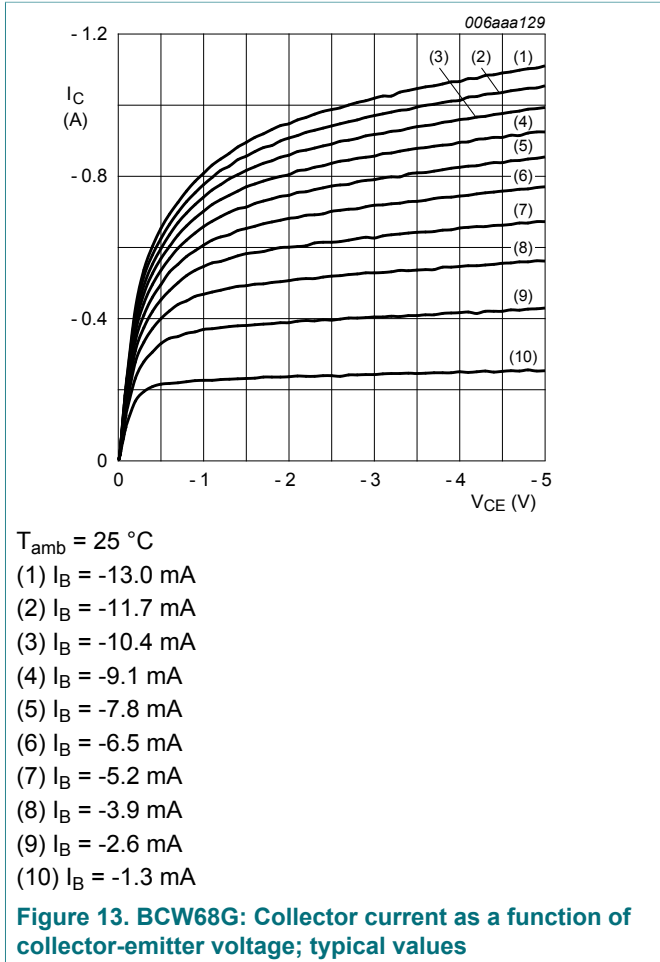
**Figure 11. BCW68H: Collector-emitter saturation voltage as a function of collector current; typical values**



$T_{amb} = 25\text{ °C}$

- (1)  $I_B = -16.0\text{ mA}$
- (2)  $I_B = -14.4\text{ mA}$
- (3)  $I_B = -12.8\text{ mA}$
- (4)  $I_B = -11.2\text{ mA}$
- (5)  $I_B = -9.6\text{ mA}$
- (6)  $I_B = -8.0\text{ mA}$
- (7)  $I_B = -6.4\text{ mA}$
- (8)  $I_B = -4.8\text{ mA}$
- (9)  $I_B = -3.2\text{ mA}$
- (10)  $I_B = -1.6\text{ mA}$

**Figure 12. BCW68F: Collector current as a function of collector-emitter voltage; typical values**



## 11 Test information

### 11.1 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.



## 12 Package outline

Table 9. Package outline

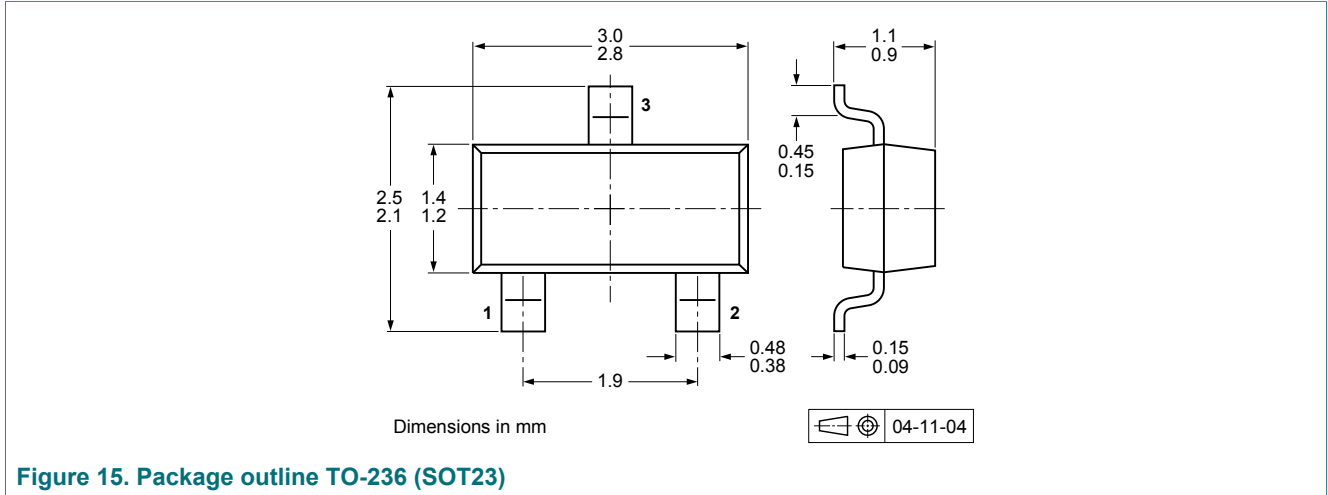


Figure 15. Package outline TO-236 (SOT23)

## 13 Soldering

Table 10. Soldering

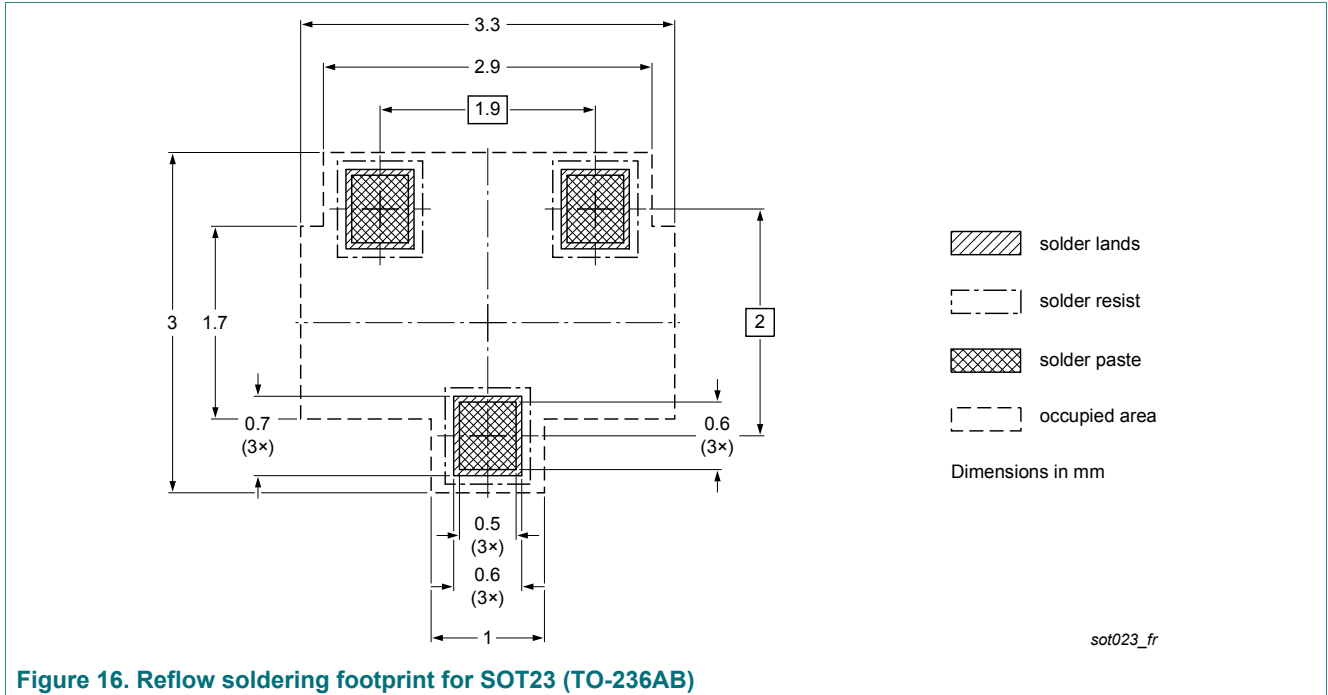
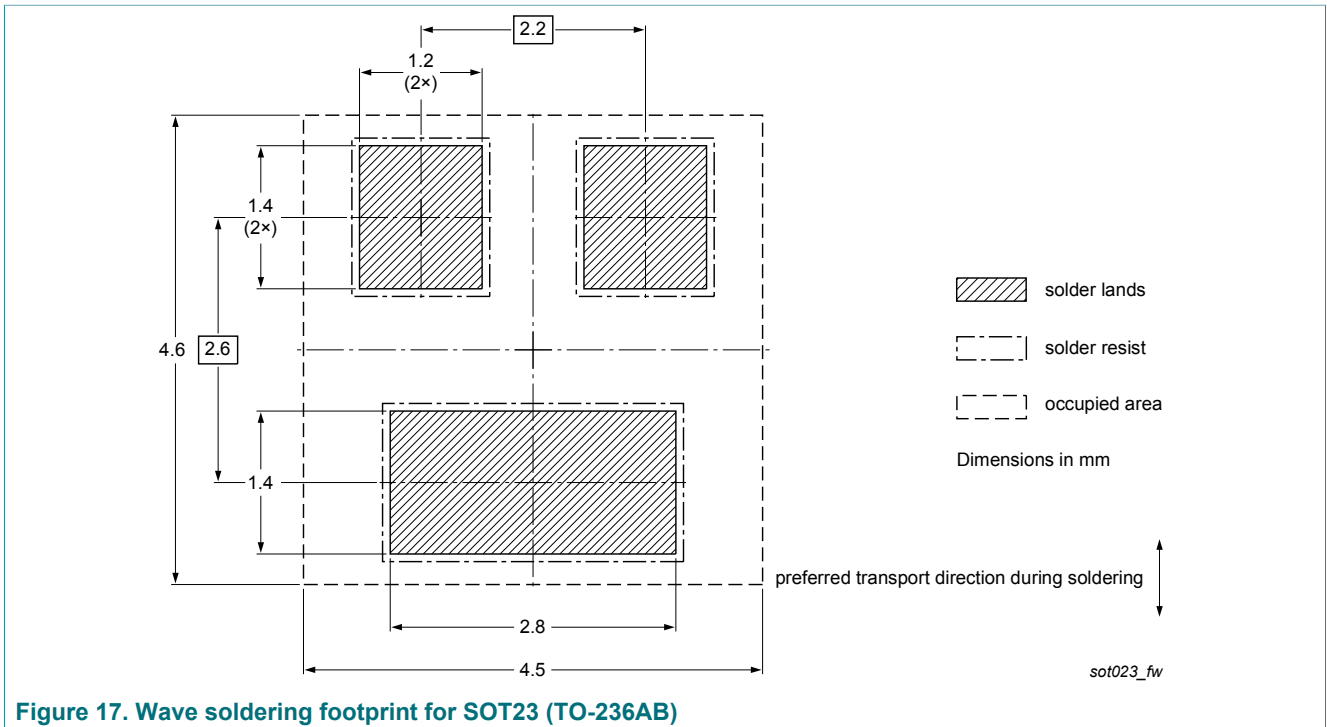


Figure 16. Reflow soldering footprint for SOT23 (TO-236AB)



## 14 Revision history

Table 11. Revision history

| Document ID    | Release date | Data sheet status  | Change notice | Supersedes |
|----------------|--------------|--------------------|---------------|------------|
| BCW68X_SER v.1 | 20170421     | Product data sheet | -             | -          |

## 15 Legal information

### 15.1 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>.

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