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Tel: +86-755-8981 8866 Fax: +86-755-8427 6832

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Address: A1208, Overseas Decoration Building, #122 Zhenhua RD., Futian, Shenzhen, China





BC817 series

45 V, 500 mA NPN general-purpose transistors

Rev. 7 — 18 June 2018

Product data sheet

1 Product profile

1.1 General description

NPN general-purpose transistors in a small SOT23 Surface-Mounted Device (SMD) plastic package.

Table 1. Product overview

| Type number | Package | | | PNP complement |
|-------------|----------|----------|-------|----------------|
| | Nexperia | JEDEC | JEITA | |
| BC817 | SOT23 | TO-236AB | - | BC807 |
| BC817-16 | | | | BC807-16 |
| BC817-25 | | | | BC807-25 |
| BC817-40 | | | | BC807-40 |

1.2 Features and benefits

- High current
- Three current gain selections
- AEC-Q101 qualified

1.3 Applications

- General-purpose switching and amplification

1.4 Quick reference data

Table 2. Quick reference data

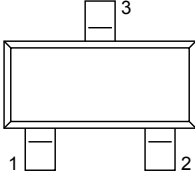
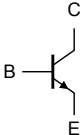
$T_{amb} = 25\text{ °C}$ unless otherwise specified.

| Symbol | Parameter | Conditions | | Min | Typ | Max | Unit |
|-----------|---------------------------|--|-----|-----|-----|-----|------|
| V_{CEO} | collector-emitter voltage | open base | | - | - | 45 | V |
| I_C | collector current | | | - | - | 500 | mA |
| I_{CM} | peak collector current | single pulse; $t_p \leq 1\text{ ms}$ | | - | - | 1 | A |
| h_{FE} | BC817 | $V_{CE} = 1\text{ V}; I_C = 100\text{ mA}$ | [1] | 100 | - | 600 | |
| | BC817-16 | | [1] | 100 | - | 250 | |
| | BC817-25 | | [1] | 160 | - | 400 | |
| | BC817-40 | | [1] | 250 | - | 600 | |

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

2 Pinning information

Table 3. Pinning

| Pin | Symbol | Description | Simplified outline | Graphic symbol |
|--------------|--------|-------------|--|---|
| SOT23 | | | | |
| 1 | B | base |  |  sym123 |
| 2 | E | emitter | | |
| 3 | C | collector | | |

3 Ordering information

Table 4. Ordering information

| Type number | Package | | Version |
|-------------|----------|--|---------|
| | Name | Description | |
| BC817 | TO-236AB | Plastic surface-mounted package; 3 leads | SOT23 |
| BC817-16 | | | |
| BC817-25 | | | |
| BC817-40 | | | |

4 Marking

Table 5. Marking

| Type number | Marking code |
|-------------|--------------------|
| BC817 | ^[1] 6D% |
| BC817-16 | ^[1] 6A% |
| BC817-25 | ^[1] 6B% |
| BC817-40 | ^[1] 6C% |

[1] % = placeholder for manufacturing site code

5 Limiting values

Table 6. Limiting values

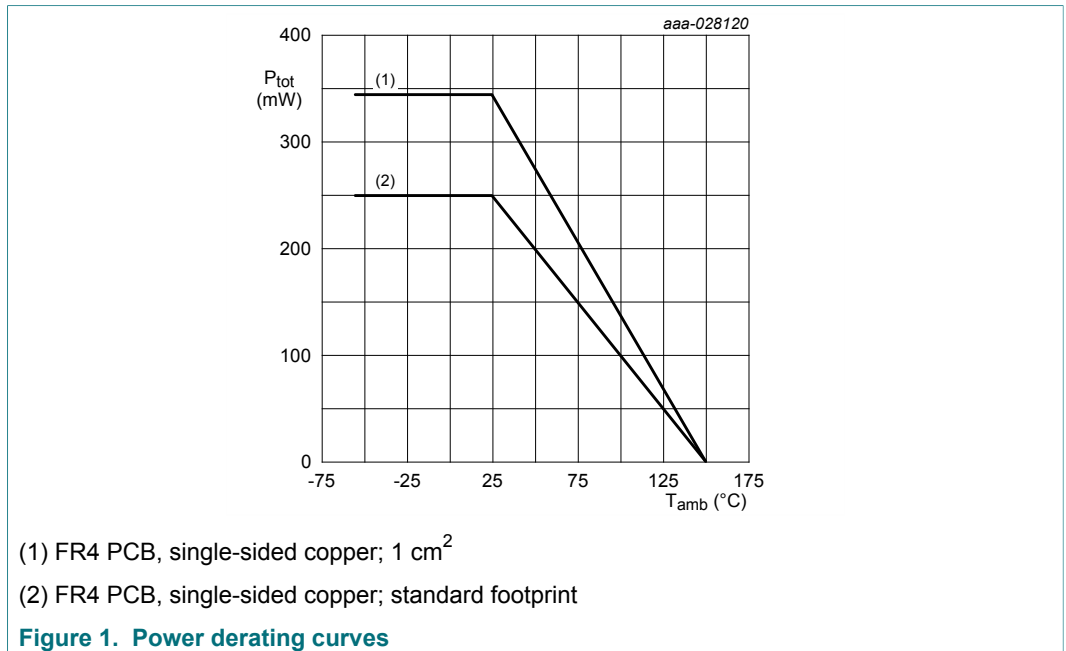
In accordance with the Absolute Maximum Rating System (IEC 60134).

| 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 | | - | 500 | mA | |
| I_{CM} | peak collector current | single pulse; $t_p \leq 1$ ms | - | 1 | A | |
| 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] ^[2] | - | 250 | mW |
| | | | ^[3] ^[2] | - | 345 | 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); single-sided copper; tin-plated and standard footprint.

[2] Valid for all available selection groups.

[3] Device mounted on an FR4 Printed-Circuit-Board (PCB); single-sided copper; tin-plated; mounting pad for collector 1 cm².



6 Thermal characteristics

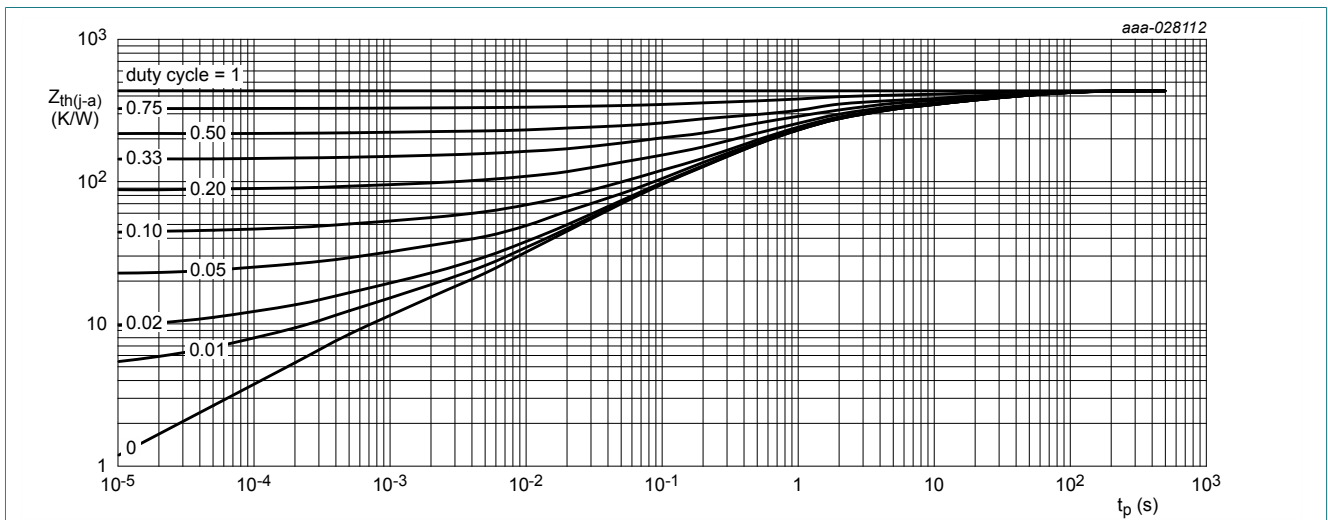
Table 7. Thermal characteristics

| Symbol | Parameter | Conditions | | Min | Typ | Max | Unit |
|---------------|---|-------------|---------|-----|-----|-----|------|
| $R_{th(j-a)}$ | thermal resistance from junction to ambient | in free air | [1] [2] | - | - | 500 | K/W |
| | | | [3] [2] | - | - | 362 | K/W |

[1] Device mounted on an FR4 Printed-Circuit-Board (PCB); single-sided copper; tin-plated and standard footprint.

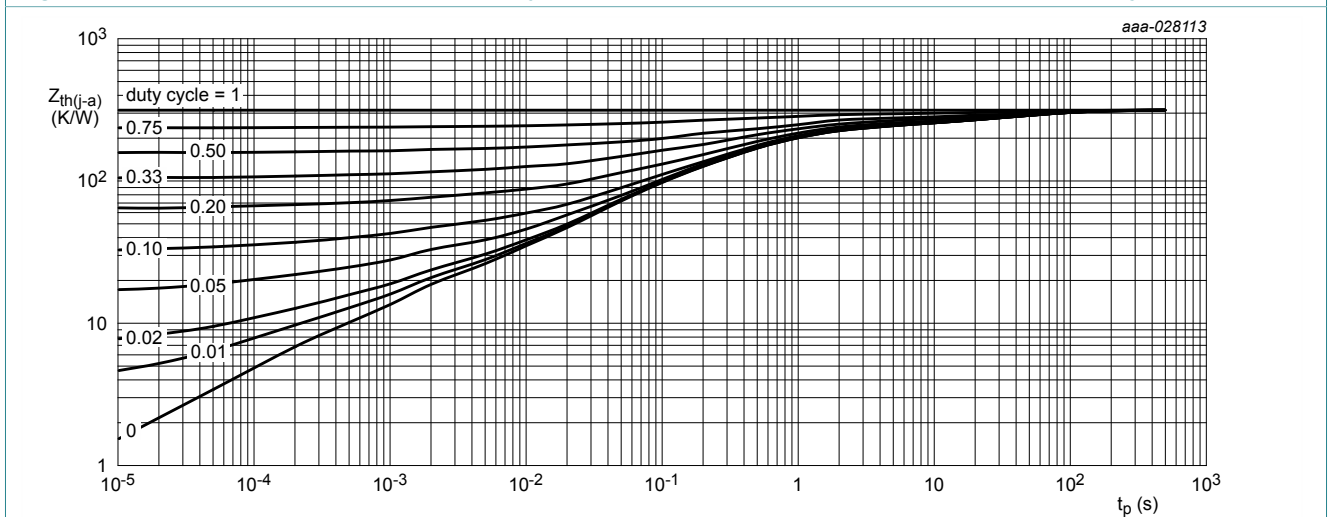
[2] Valid for all available selection groups.

[3] Device mounted on an FR4 Printed-Circuit-Board (PCB); single-sided copper; tin-plated; mounting pad for collector 1 cm².



FR4 PCB; single-sided copper; tin-plated and standard footprint

Figure 2. Transient thermal impedance from junction to ambient as a function of pulse duration; typical values



FR4 PCB; single-sided copper; tin-plated; mounting pad for collector 1 cm²

Figure 3. Transient thermal impedance from junction to ambient as a function of pulse duration; typical values

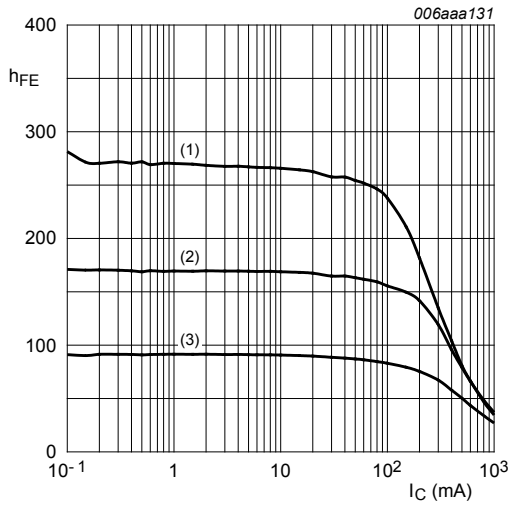
7 Characteristics

Table 8. Characteristics
 $T_{amb} = 25\text{ °C}$ unless otherwise specified.

| Symbol | Parameter | Conditions | Min | Typ | Max | Unit | |
|---------------|--------------------------------------|---|---------|-----|-----|---------------|-----|
| $V_{(BR)CBO}$ | collector-base breakdown voltage | $I_C = 100\ \mu\text{A}; I_E = 0\ \text{A}$ | 50 | - | - | V | |
| $V_{(BR)CEO}$ | collector-emitter breakdown voltage | $I_C = 10\ \text{mA}; I_B = 0\ \text{A}$ | 45 | - | - | V | |
| $V_{(BR)EBO}$ | emitter-base breakdown voltage | $I_E = 100\ \mu\text{A}; I_C = 0\ \text{A}$ | 5 | - | - | V | |
| I_{CBO} | collector-base cut-off current | $V_{CB} = 20\ \text{V}; I_E = 0\ \text{A}$ | - | - | 100 | nA | |
| | | $V_{CB} = 20\ \text{V}; I_E = 0\ \text{A}; T_j = 150\text{ °C}$ | - | - | 5 | μA | |
| I_{EBO} | emitter-base cut-off current | $V_{EB} = 5\ \text{V}; I_C = 0\ \text{A}$ | - | - | 100 | nA | |
| h_{FE} | DC current gain | | | | | | |
| | BC817 | $V_{CE} = 1\ \text{V}; I_C = 100\ \text{mA}$ | [1] | 100 | - | 600 | |
| | BC817-16 | $V_{CE} = 1\ \text{V}; I_C = 100\ \text{mA}$ | [1] | 100 | - | 250 | |
| | BC817-25 | $V_{CE} = 1\ \text{V}; I_C = 100\ \text{mA}$ | [1] | 160 | - | 400 | |
| | BC817-40 | $V_{CE} = 1\ \text{V}; I_C = 100\ \text{mA}$ | [1] | 250 | - | 600 | |
| h_{FE} | DC current gain | $V_{CE} = 1\ \text{V}; I_C = 500\ \text{mA}$ | [1] | 40 | - | - | |
| V_{CEsat} | collector-emitter saturation voltage | $I_C = 500\ \text{mA}; I_B = 50\ \text{mA}$ | [1] | - | - | 700 | mV |
| V_{BE} | base-emitter voltage | $V_{CE} = 1\ \text{V}; I_C = 500\ \text{mA}$ | [1] [2] | - | - | 1.2 | V |
| f_T | transition frequency | $V_{CE} = 5\ \text{V}; I_C = 10\ \text{mA}; f = 100\ \text{MHz}$ | | 100 | - | - | MHz |
| C_C | collector capacitance | $V_{CB} = 10\ \text{V}; I_E = I_e = 0\ \text{A}; f = 1\ \text{MHz}$ | | - | 3 | - | pF |

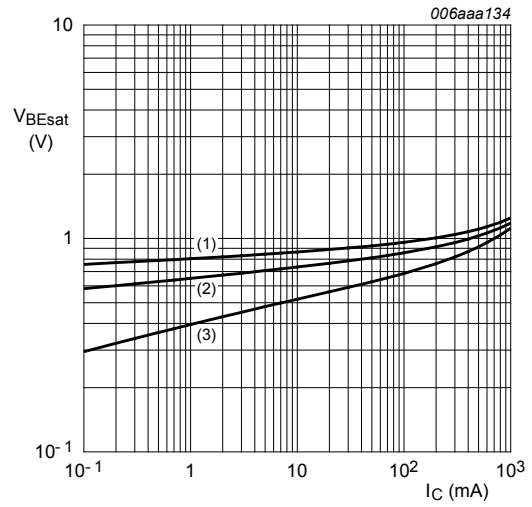
[1] pulsed; $t_p \leq 300\ \mu\text{s}$; $\delta \leq 0.02$

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



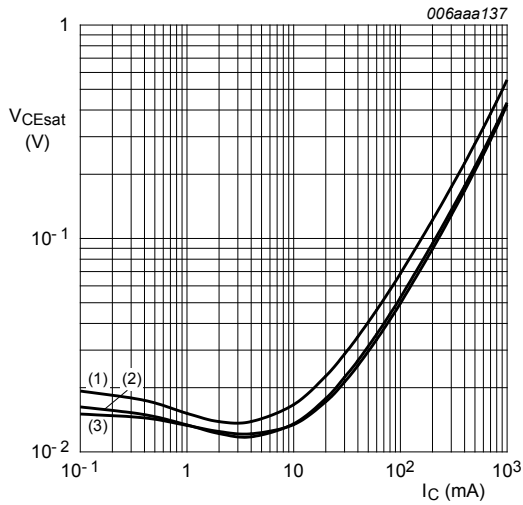
$V_{CE} = -1 \text{ V}$
 (1) $T_{amb} = 150 \text{ }^\circ\text{C}$
 (2) $T_{amb} = 25 \text{ }^\circ\text{C}$
 (3) $T_{amb} = -55 \text{ }^\circ\text{C}$

Figure 4. BC817-16: DC current gain as a function of collector current; typical values



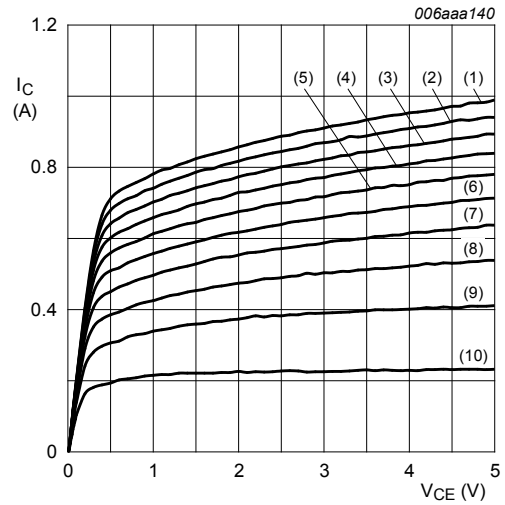
$I_C/I_B = 10$
 (1) $T_{amb} = -55 \text{ }^\circ\text{C}$
 (2) $T_{amb} = 25 \text{ }^\circ\text{C}$
 (3) $T_{amb} = 150 \text{ }^\circ\text{C}$

Figure 5. BC817-16: Base-emitter saturation voltage as a function of collector current; typical values



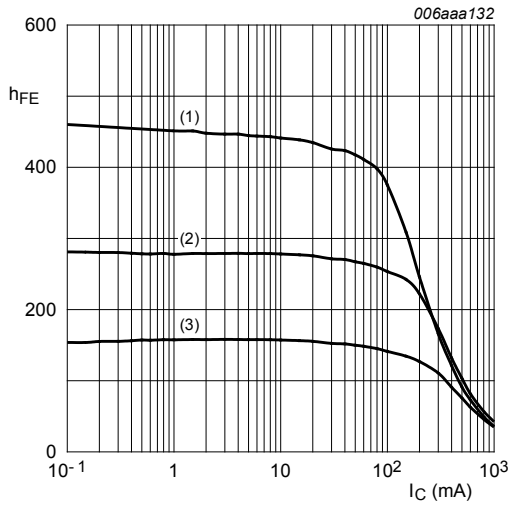
$I_C/I_B = 10$
 (1) $T_{amb} = 150 \text{ }^\circ\text{C}$
 (2) $T_{amb} = 25 \text{ }^\circ\text{C}$
 (3) $T_{amb} = -55 \text{ }^\circ\text{C}$

Figure 6. BC817-16: Collector-emitter saturation voltage as a function of collector current; typical values



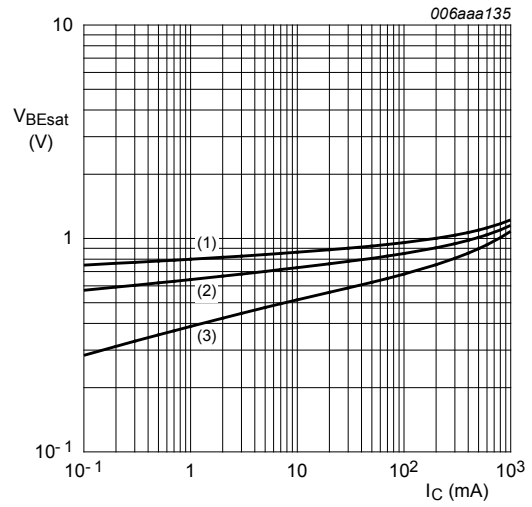
$T_{amb} = 25 \text{ }^\circ\text{C}$
 (1) $I_B = -16.0 \text{ mA}$
 (2) $I_B = -14.4 \text{ mA}$
 (3) $I_B = -12.8 \text{ mA}$
 (4) $I_B = -11.2 \text{ mA}$
 (5) $I_B = -9.6 \text{ mA}$
 (6) $I_B = -8.0 \text{ mA}$
 (7) $I_B = -6.4 \text{ mA}$
 (8) $I_B = -4.8 \text{ mA}$
 (9) $I_B = -3.2 \text{ mA}$
 (10) $I_B = -1.6 \text{ mA}$

Figure 7. BC817-16: Collector current as a function of collector-emitter voltage; typical values



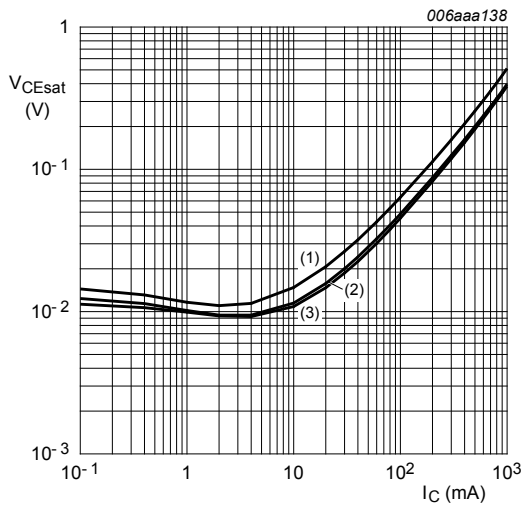
$V_{CE} = 1\text{ V}$
 (1) $T_{amb} = 150\text{ °C}$
 (2) $T_{amb} = 25\text{ °C}$
 (3) $T_{amb} = -55\text{ °C}$

Figure 8. BC817-25: DC current gain as a function of collector current; typical values



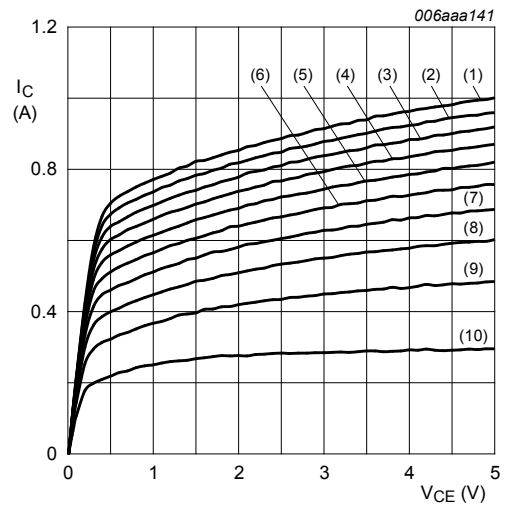
$I_C/I_B = 10$
 (1) $T_{amb} = -55\text{ °C}$
 (2) $T_{amb} = 25\text{ °C}$
 (3) $T_{amb} = 150\text{ °C}$

Figure 9. BC817-25: Base-emitter saturation voltage as a function of collector current; typical values



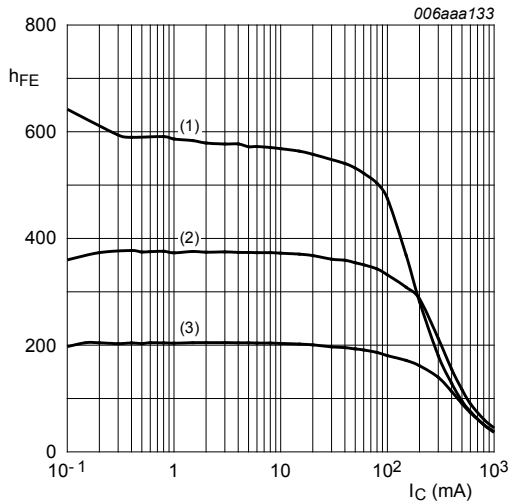
$I_C/I_B = 10$
 (1) $T_{amb} = 150\text{ °C}$
 (2) $T_{amb} = 25\text{ °C}$
 (3) $T_{amb} = -55\text{ °C}$

Figure 10. BC817-25: Collector-emitter saturation voltage as a function of collector current; typical values



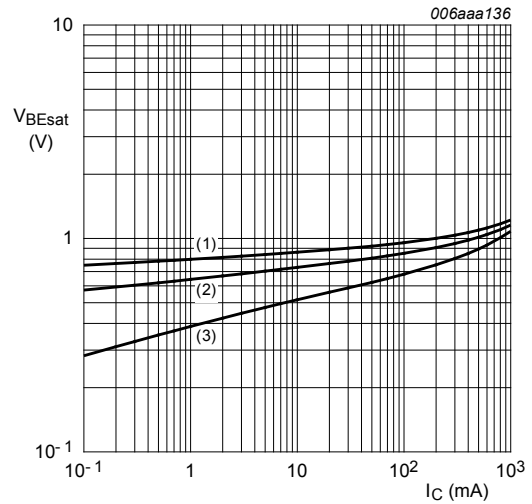
$T_{amb} = 25\text{ °C}$
 (1) $I_B = 13.0\text{ mA}$
 (2) $I_B = 11.7\text{ mA}$
 (3) $I_B = 10.4\text{ mA}$
 (4) $I_B = 9.1\text{ mA}$
 (5) $I_B = 7.8\text{ mA}$
 (6) $I_B = 6.5\text{ mA}$
 (7) $I_B = 5.2\text{ mA}$
 (8) $I_B = 3.9\text{ mA}$
 (9) $I_B = 2.6\text{ mA}$
 (10) $I_B = 1.3\text{ mA}$

Figure 11. BC817-25: Collector current as a function of collector-emitter voltage; typical values



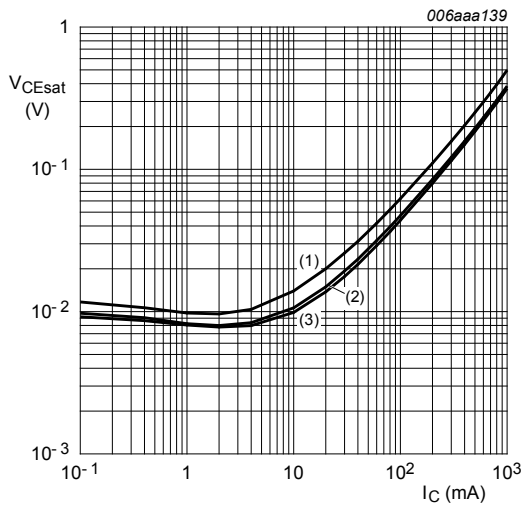
$V_{CE} = 1\text{ V}$
 (1) $T_{amb} = 150\text{ °C}$
 (2) $T_{amb} = 25\text{ °C}$
 (3) $T_{amb} = -55\text{ °C}$

Figure 12. BC817-40: DC current gain as a function of collector current; typical values



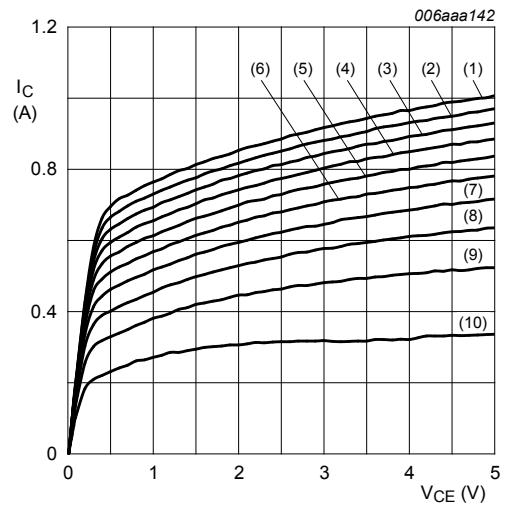
$I_C/I_B = 10$
 (1) $T_{amb} = -55\text{ °C}$
 (2) $T_{amb} = 25\text{ °C}$
 (3) $T_{amb} = 150\text{ °C}$

Figure 13. BC817-40: 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 14. BC817-40: Collector-emitter saturation voltage as a function of collector current; typical values



$T_{amb} = 25\text{ °C}$
 (1) $I_B = 12.0\text{ mA}$
 (2) $I_B = 10.8\text{ mA}$
 (3) $I_B = 9.6\text{ mA}$
 (4) $I_B = 8.4\text{ mA}$
 (5) $I_B = 7.2\text{ mA}$
 (6) $I_B = 6.0\text{ mA}$
 (7) $I_B = 4.8\text{ mA}$
 (8) $I_B = 3.6\text{ mA}$
 (9) $I_B = 2.4\text{ mA}$
 (10) $I_B = 1.2\text{ mA}$

Figure 15. BC817-40: Collector current as a function of collector-emitter 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

Table 9. Package outline

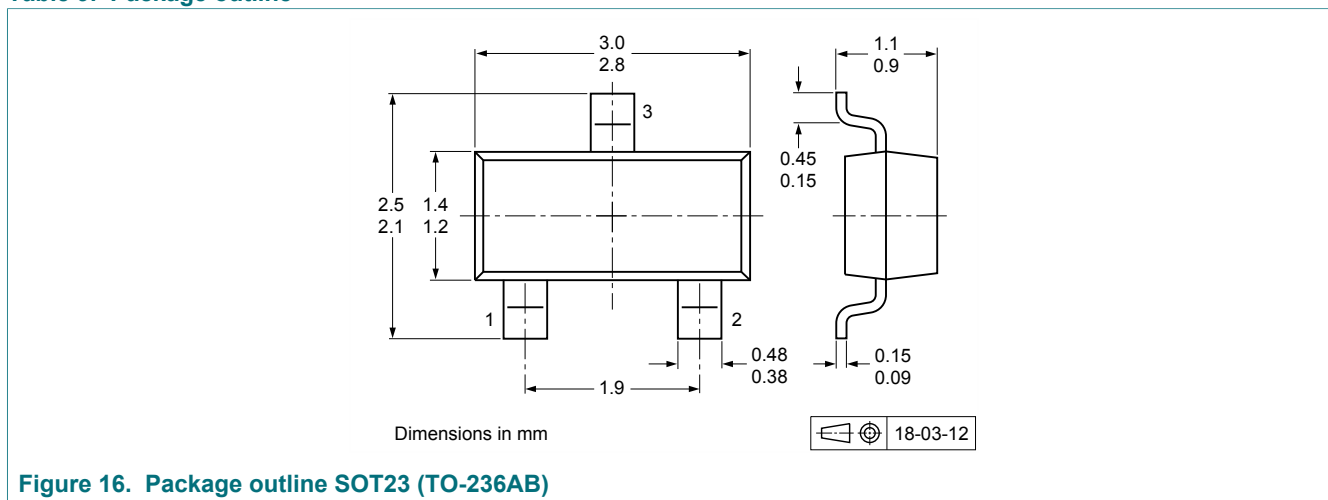
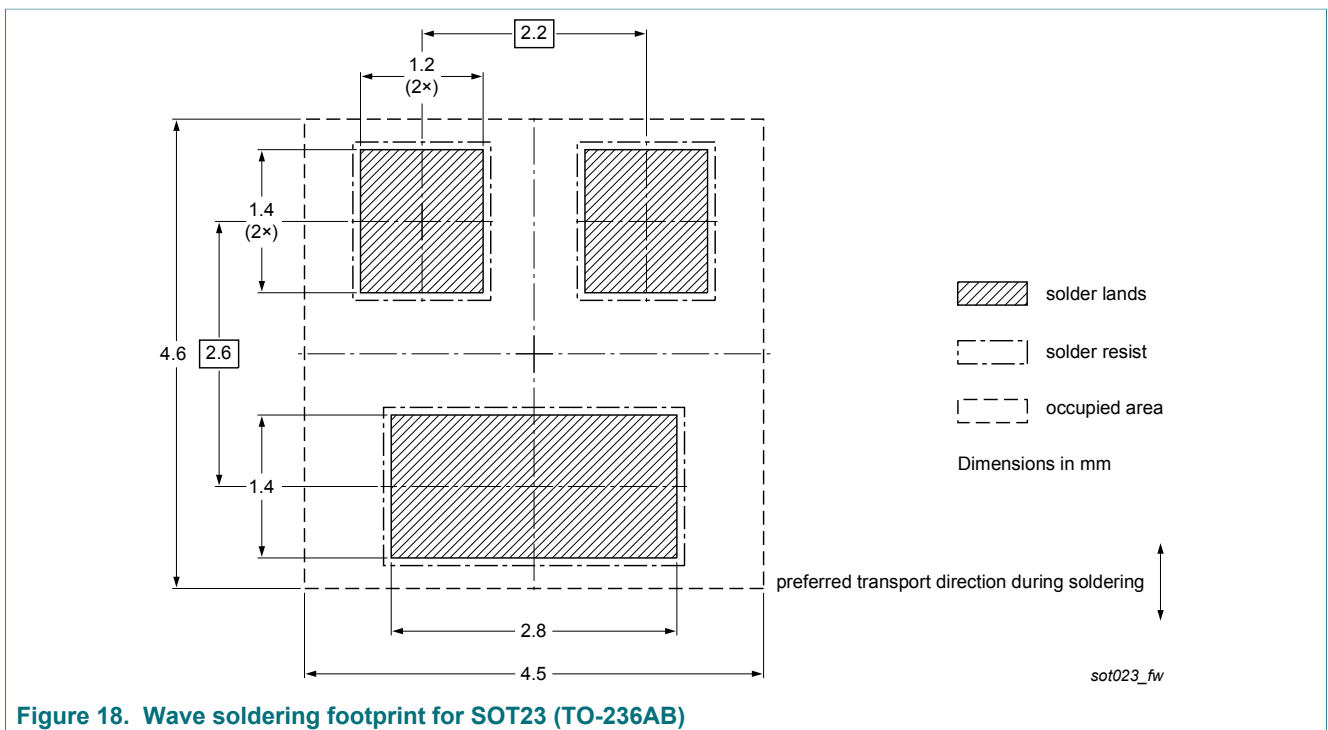
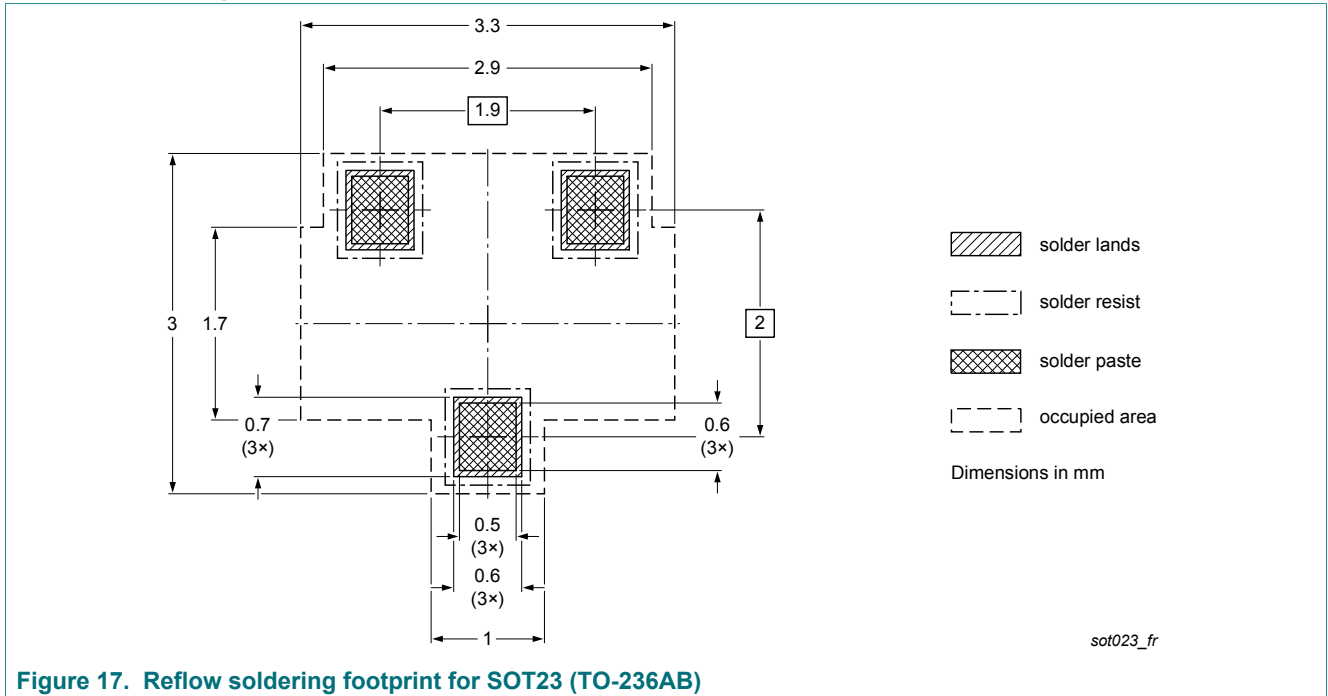


Figure 16. Package outline SOT23 (TO-236AB)

10 Soldering

Table 10. Soldering



11 Revision history

Table 11. Revision history

| Document ID | Release date | Data sheet status | Change notice | Supersedes |
|------------------------|---|-----------------------|----------------------------------|--|
| BC817 v.7 | 20180618 | Product data sheet | - | BC817_BC817W_BC337 v.6 |
| Modifications: | <ul style="list-style-type: none"> • The format of this data sheet has been redesigned to comply with the identity guidelines of Nexperia. • Legal texts have been adapted to the new company name where appropriate. • Removed basic types: BC327 and BC807W (separate data sheet). • Added Fig 1. Power derating curves in section "Limiting values" and the thermal graphs as Fig 2. and Fig 3. in section "Thermal characteristics". • Graphs in section "Characteristics" are sorted in new order. • Added sections 8 "Test information" and 9 "Soldering". • Removed Section "Packing information" • AEC-Q101 qualified | | | |
| BC817_BC817W_BC337 v.6 | 20091117 | Product data sheet | - | BC817_BC817W_BC337 v.5 |
| BC817_BC817W_BC337 v.5 | 20050221 | Product data sheet | CPCN200302007F CPCN200405006F | BC817 v.4; BC817W_SER v.4; BC337 v.3 |
| BC817 v.4 | 20040116 | Product Specification | - | BC817 v.3 |
| BC817W_SER v.4 | 20040225 | Product Specification | - | BC817W_SER v.3 |
| BC337 v.3 | 19990415 | Product Specification | - | BC337_338_CNV v.2 |

12 Legal information

12.1 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. |
| 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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Translations — A non-English (translated) version of a document is for reference only. The English version shall prevail in case of any discrepancy between the translated and English versions.

12.4 Trademarks

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

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

For sales office addresses, please send an email to: salesaddresses@nexperia.com

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