# BC817W series

## 45 V, 500 mA NPN general-purpose transistors

Rev. 7 — 11 June 2018 Product data sheet

## 1 Product profile

### 1.1 General description

NPN general-purpose transistors in a very small SOT323 (SC-70) Surface-Mounted Device (SMD) plastic package.

Table 1. Product overview

| Type number | Package | | | PNP complement |
|---|---|---|---|---|
| | Nexperia | JEDEC | JEITA | |
| BC817W | SOT323 | - | SC-70 | BC807W |
| BC817-16W | | | | BC807-16W |
| BC817-25W | | | | BC807-25W |
| BC817-40W | | | | BC807-40W |

### 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**

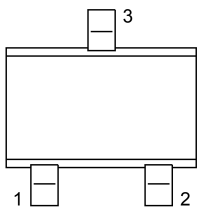
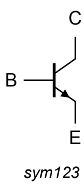
*$T_{amb}$ = 25 °C unless otherwise specified.*

| 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; $t_p \leq 1$ ms | | - | - | 1 | A |
| $h_{FE}$ | DC current gain | $V_{CE}$ = 1 V; $I_C$ = 100 mA | | | | | |
| | BC817W | | [1] | 100 | - | 600 | |
| | BC817-16W | | [1] | 100 | - | 250 | |
| | BC817-25W | | [1] | 160 | - | 400 | |
| | BC817-40W | | [1] | 250 | - | 600 | |

[1] pulsed; $t_p \leq 300$ μs; δ ≤ 0.02

## 2 Pinning information

**Table 3. Pinning**

| Pin | Symbol | Description | Simplified outline | Graphic symbol |
|---|---|---|---|---|
| **SOT323** | | | | |
| 1 | B | base |   |   |
| 2 | E | emitter | | |
| 3 | C | collector | | |

## 3 Ordering information

**Table 4. Ordering information**

| Type number | Package | | |
|---|---|---|---|
| | Name | Description | Version |
| BC817W | SC-70 | Plastic surface-mounted package; 3 leads | SOT323 |
| BC817-16W | | | |
| BC817-25W | | | |
| BC817-40W | | | |

# 4 Marking

**Table 5. Marking**

| Type number | | Marking code |
|---|---|---|
| BC817W | [1] | 6D% |
| BC817-16W | [1] | 6A% |
| BC817-25W | [1] | 6B% |
| BC817-40W | [1] | 6C% |

[1] % = placeholder for manufacturing site code

# 5 Limiting values

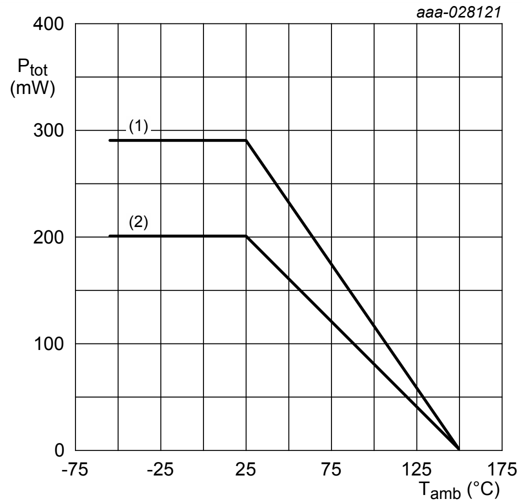
**Table 6. Limiting values**

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

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

| 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] | - | 200 | mW |
| | | | [3] [2] | - | 290 | 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 $cm^2$.




(1) FR4 PCB, single-sided copper; 1 $cm^2$

(2) FR4 PCB, single-sided copper; standard footprint

**Figure 1. Power derating curves**

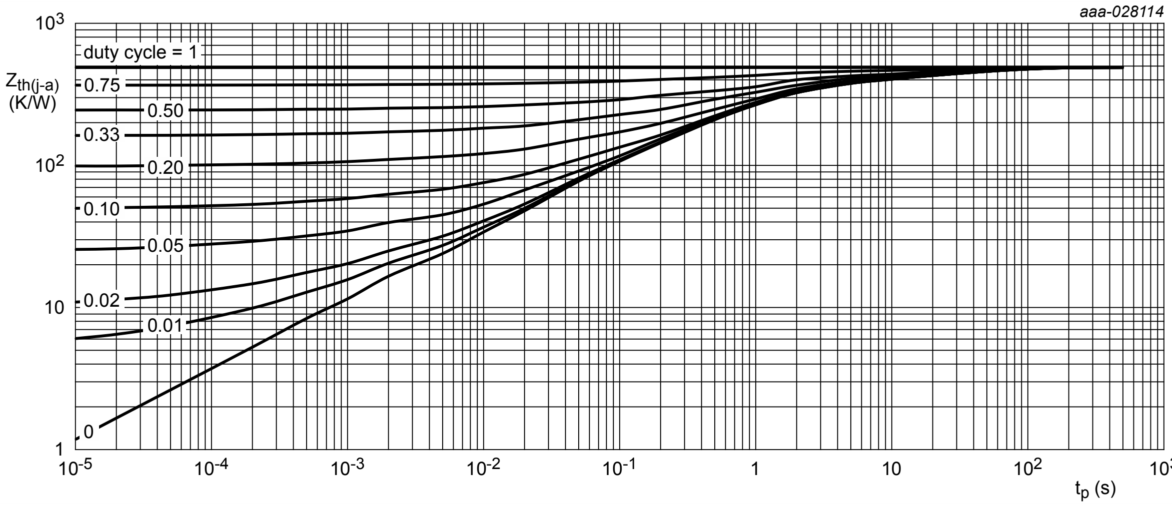
# 6 Thermal characteristics

**Table 7. Thermal characteristics**

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

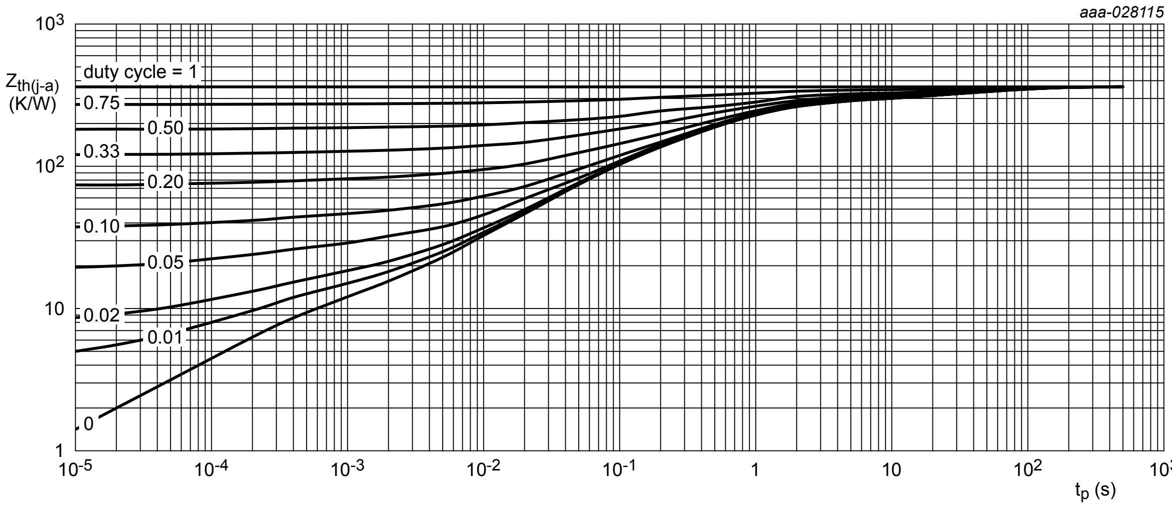
| Symbol | Parameter | Conditions | | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|---|
| $R_{th(j-a)}$ | thermal resistance from junction to ambient | in free air | [1] [2] | - | - | 625 | K/W |
| | | | [3] [2] | - | - | 431 | K/W |

[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 cm$^2$ .




FR4 PCB; single-sided copper; tin-plated; mounting pad for collector 1 cm$^2$

**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 cm$^2$

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

# 7 Characteristics

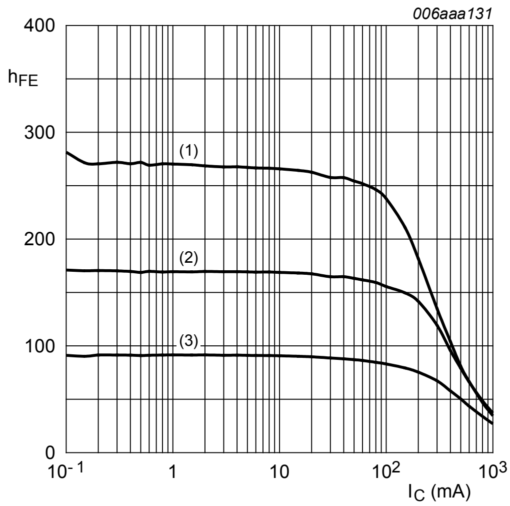
**Table 8. Characteristics**

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

| Symbol | Parameter | Conditions | | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|---|
| $V_{(BR)CBO}$ | collector-base breakdown voltage | $I_C$ = 100 μA; $I_E$ = 0 A | | 50 | - | - | V |
| $V_{(BR)CEO}$ | collector-emitter breakdown voltage | $I_C$ = 10 mA; $I_B$ = 0 A | | 45 | - | - | V |
| $V_{(BR)EBO}$ | emitter-base breakdown voltage | $I_E$ = 100 μA; $I_C$ = 0 A | | 5 | - | - | V |
| $I_{CBO}$ | collector-base cut-off current | $V_{CB}$ = 20 V; $I_E$ = 0 A | | - | - | 100 | nA |
| | | $V_{CB}$ = 20 V; $I_E$ = 0 A; $T_j$ = 150 °C | | - | - | 5 | μA |
| $I_{EBO}$ | emitter-base cut-off current | $V_{EB}$ = 5 V; $I_C$ = 0 A | | - | - | 100 | nA |
| $h_{FE}$ | DC current gain | | | | | | |
| | BC817W | $V_{CE}$ = 1 V; $I_C$ = 100 mA | [1] | 100 | - | 600 | |
| | BC817-16W | $V_{CE}$ = 1 V; $I_C$ = 100 mA | [1] | 100 | - | 250 | |
| | BC817-25W | $V_{CE}$ = 1 V; $I_C$ = 100 mA | [1] | 160 | - | 400 | |
| | BC817-40W | $V_{CE}$ = 1 V; $I_C$ = 100 mA | [1] | 250 | - | 600 | |
| $h_{FE}$ | DC current gain | $V_{CE}$ = 1 V; $I_C$ = 500 mA | [1] | 40 | - | - | |
| $V_{CEsat}$ | collector-emitter saturation voltage | $I_C$ = 500 mA; $I_B$ = 50 mA | [1] | - | - | 700 | mV |
| $V_{BE}$ | base-emitter voltage | $V_{CE}$ = 1 V; $I_C$ = 500 mA | [1] [2] | - | - | 1.2 | V |
| $f_T$ | transition frequency | $V_{CE}$ = 5 V; $I_C$ = 10 mA; f = 100 MHz | | 100 | - | - | MHz |
| $C_c$ | collector capacitance | $V_{CB}$ = 10 V; $I_E$ = $i_e$ = 0 A; f = 1 MHz | | - | 3 | - | pF |

[1] pulsed; $t_p$ ≤ 300 μs; δ ≤ 0.02

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



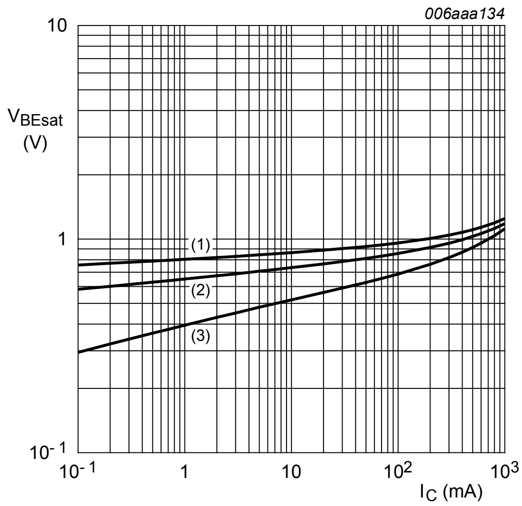

$V_{CE}$ = 1 V

(1) $T_{amb}$ = 150 °C

(2) $T_{amb}$ = 25 °C

(3) $T_{amb}$ = -55 °C

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



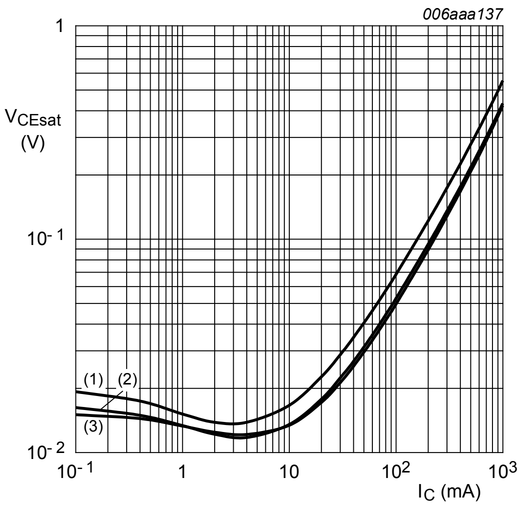

$I_C/I_B$ = 10

(1) $T_{amb}$ = -55 °C

(2) $T_{amb}$ = 25 °C

(3) $T_{amb}$ = 150 °C

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



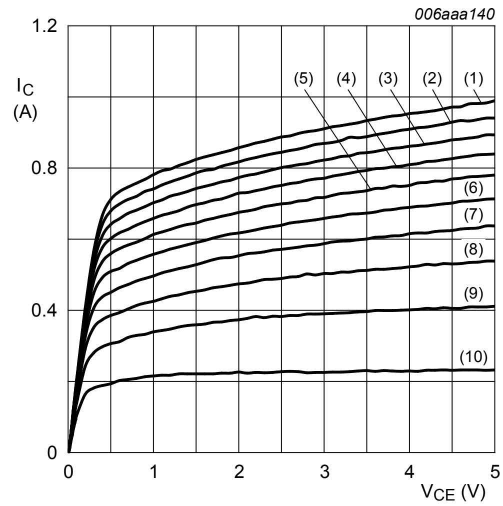

$I_C/I_B$ = 10

(1) $T_{amb}$ = 150 °C

(2) $T_{amb}$ = 25 °C

(3) $T_{amb}$ = -55 °C

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




$T_{amb}$ = 25 °C

(1) $I_B$ = 16.0 mA

(2) $I_B$ = 14.4 mA

(3) $I_B$ = 12.8 mA

(4) $I_B$ = 11.2 mA

(5) $I_B$ = 9.6 mA

(6) $I_B$ = 8.0 mA

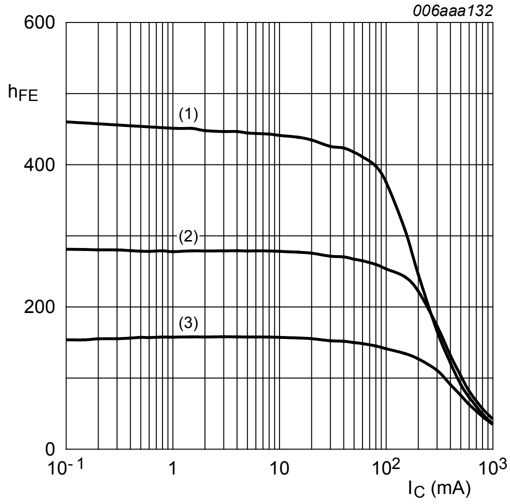
(7) $I_B$ = 6.4 mA

(8) $I_B$ = 4.8 mA

(9) $I_B$ = 3.2 mA

(10) $I_B$ = 1.6 mA

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



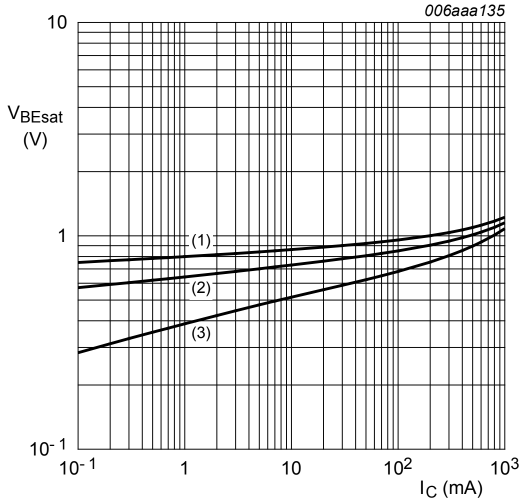

$V_{CE}$ = 1 V

(1) $T_{amb}$ = 150 °C

(2) $T_{amb}$ = 25 °C

(3) $T_{amb}$ = -55 °C

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



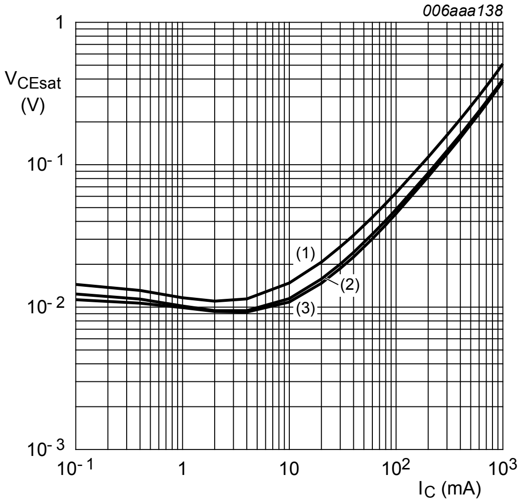

$I_C/I_B$ = 10

(1) $T_{amb}$ = -55 °C

(2) $T_{amb}$ = 25 °C

(3) $T_{amb}$ = 150 °C

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



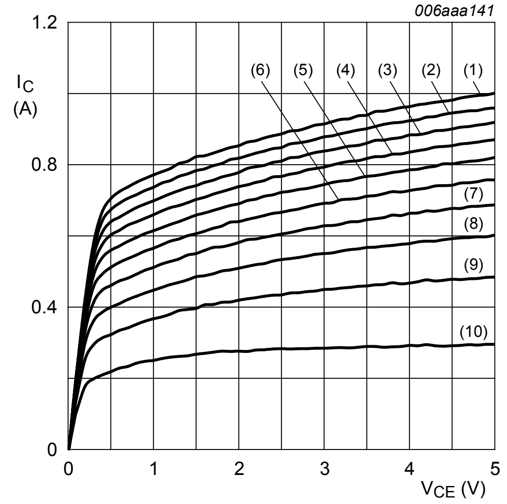

$I_C/I_B$ = 10

(1) $T_{amb}$ = 150 °C

(2) $T_{amb}$ = 25 °C

(3) $T_{amb}$ = -55 °C

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




$T_{amb}$ = 25 °C

(1) $I_B$ = 13.0 mA

(2) $I_B$ = 11.7 mA

(3) $I_B$ = 10.4 mA

(4) $I_B$ = 9.1 mA

(5) $I_B$ = 7.8 mA

(6) $I_B$ = 6.5 mA

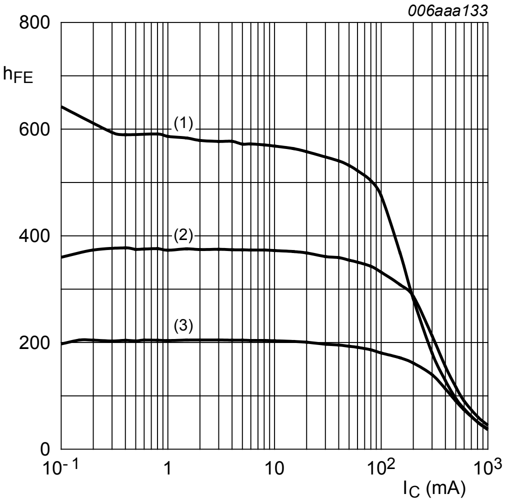
(7) $I_B$ = 5.2 mA

(8) $I_B$ = 3.9 mA

(9) $I_B$ = 2.6 mA

(10) $I_B$ = 1.3 mA

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



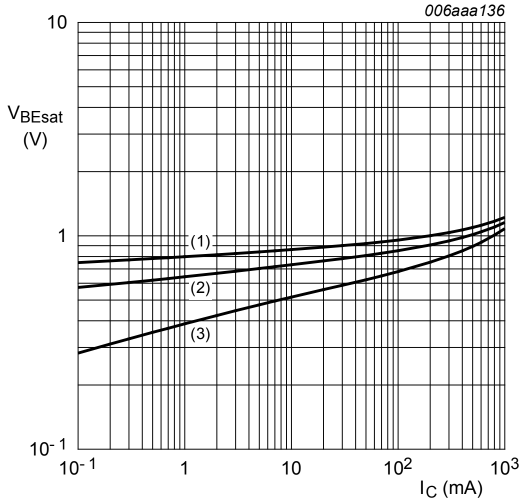

$V_{CE}$ = 1 V

(1) $T_{amb}$ = 150 °C

(2) $T_{amb}$ = 25 °C

(3) $T_{amb}$ = -55 °C

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



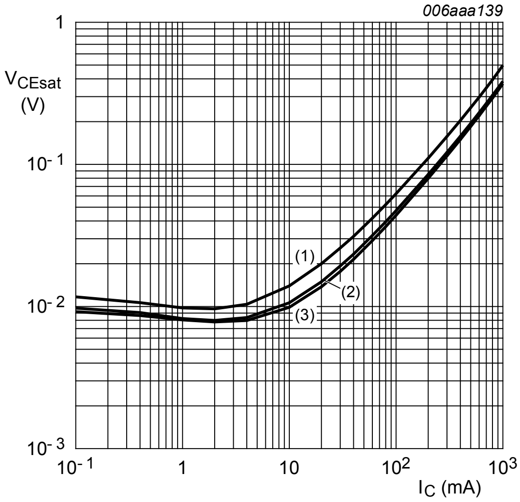

$I_C/I_B$ = 10

(1) $T_{amb}$ = -55 °C

(2) $T_{amb}$ = 25 °C

(3) $T_{amb}$ = 150 °C

**Figure 13. BC817-40W: Base-emitter saturation voltage as a function of collector current; typical values**



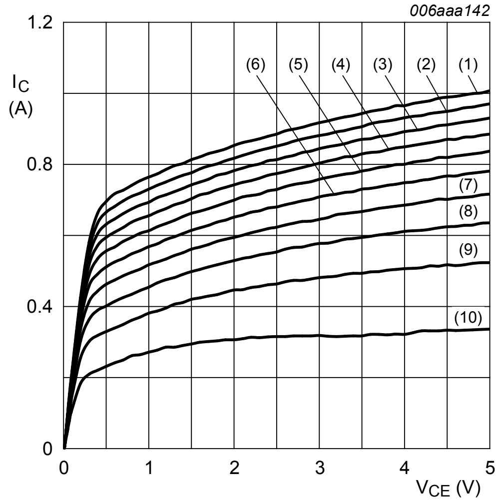

$I_C/I_B$ = 10

(1) $T_{amb}$ = 150 °C

(2) $T_{amb}$ = 25 °C

(3) $T_{amb}$ = -55 °C

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




$T_{amb}$ = 25 °C

(1) $I_B$ = 12.0 mA

(2) $I_B$ = 10.8 mA

(3) $I_B$ = 9.6 mA

(4) $I_B$ = 8.4 mA

(5) $I_B$ = 7.2 mA

(6) $I_B$ = 6.0 mA

(7) $I_B$ = 4.8 mA

(8) $I_B$ = 3.6 mA

(9) $I_B$ = 2.4 mA

(10) $I_B$ = 1.2 mA

**Figure 15. BC817-40W: Collector current as a function of collector-emitter voltage; typical values**

# 8 Test information

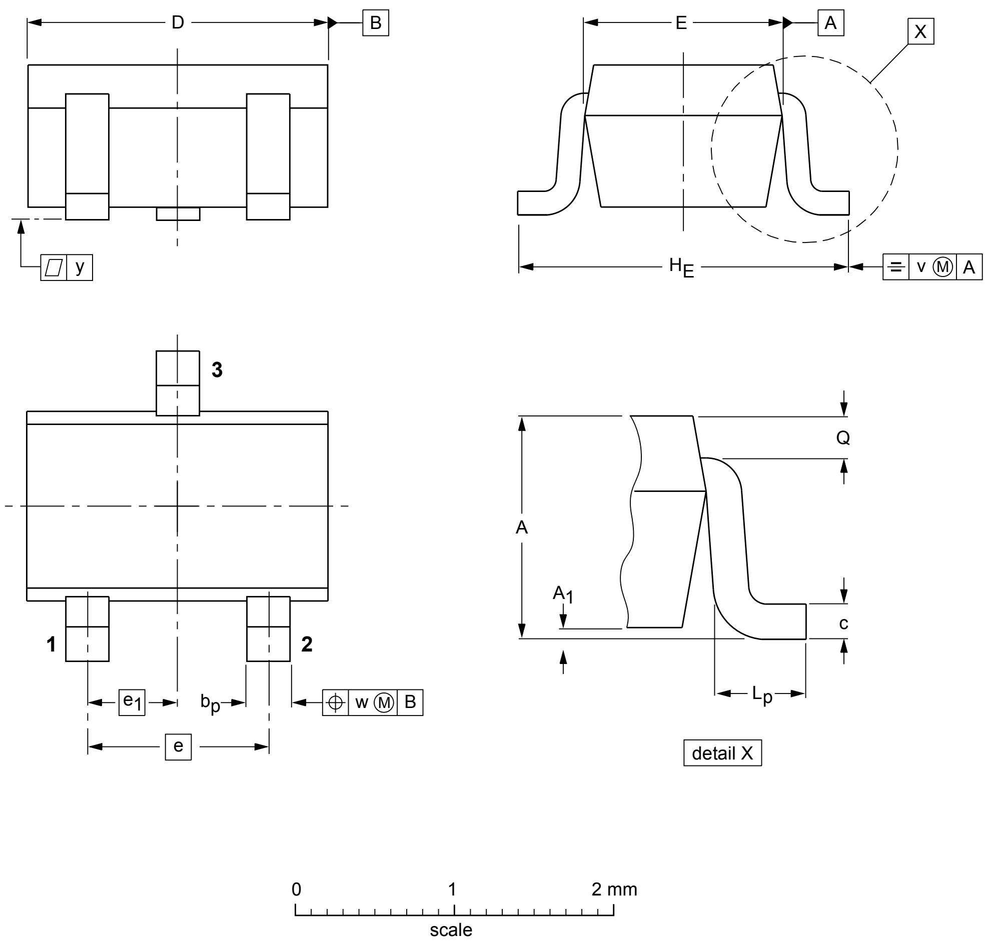
## 8.1 Quality information

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**

**Plastic surface-mounted package; 3 leads** **SOT323**




**DIMENSIONS (mm are the original dimensions)**

| UNIT | A | $A_1$ max | $b_p$ | c | D | E | e | $e_1$ | $H_E$ | $L_p$ | Q | v | w |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| mm | 1.1<br>0.8 | 0.1 | 0.4<br>0.3 | 0.25<br>0.10 | 2.2<br>1.8 | 1.35<br>1.15 | 1.3 | 0.65 | 2.2<br>2.0 | 0.45<br>0.15 | 0.23<br>0.13 | 0.2 | 0.2 |

| OUTLINE VERSION | REFERENCES | | | | EUROPEAN PROJECTION | ISSUE DATE |
|---|---|---|---|---|---|---|
| | IEC | JEDEC | JEITA | | | |
| SOT323 | | | SC-70 | | | ~~04-11-04~~<br>06-03-16 |

**Figure 16. Package outline SOT323 (SC70)**

## 10 Soldering

**Table 10. Soldering**

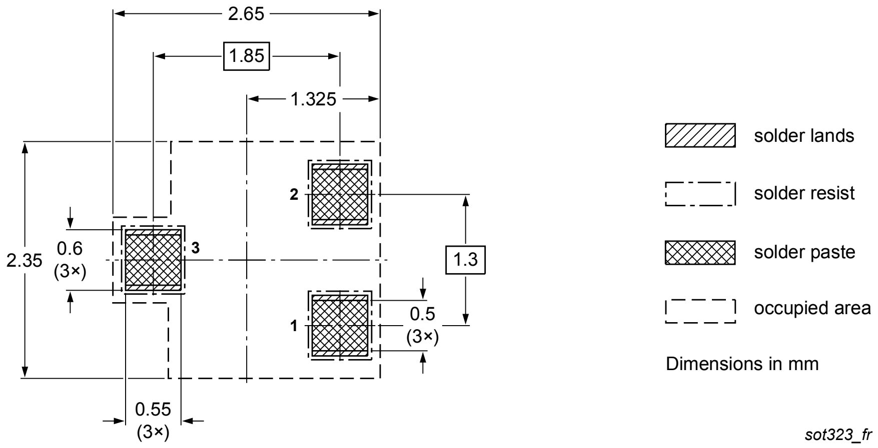



**Figure 17. Reflow soldering footprint for SOT323 (SC-70)**

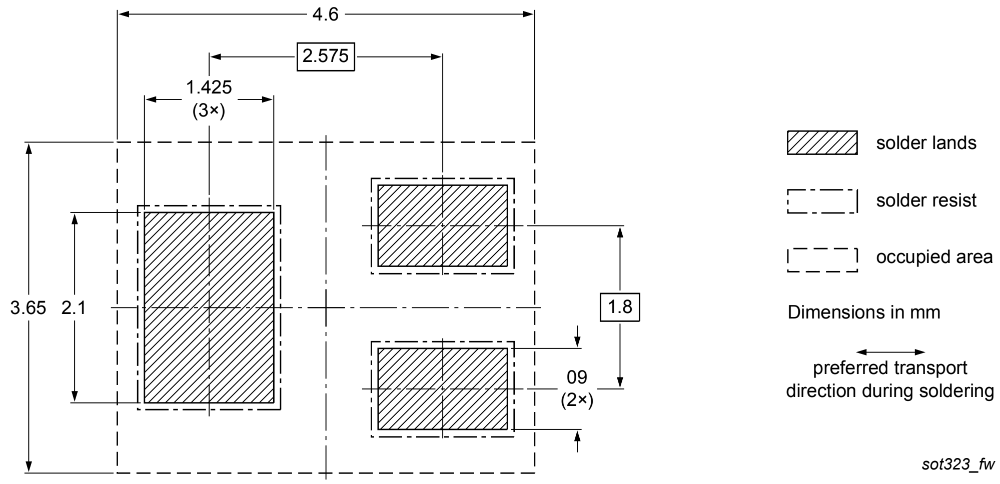



**Figure 18. Wave soldering footprint for SOT323 (SC-70)**

## 11 Revision history

**Table 11. Revision history**

| Document ID | Release date | Data sheet status | Change notice | Supersedes |
|---|---|---|---|---|
| BC817W_SER v.7 | 20180611 | Product data sheet | - | BC817_BC817W_BC337 v.6 |
| Modifications: | • The format of this data sheet has been redesigned to comply with the identity guidelines of Nexperia.<br>• Legal texts have been adapted to the new company name where appropriate.<br>• Removed basic types: BC327 and BC807W (separate data sheet).<br>• Added Fig 1. Power derating curves in section "Limiting values" and the thermal graphs as Fig 2. and Fig 3. in section "Thermal characteristics".<br>• Graphs in section "Characteristics" are sorted in new order.<br>• Added sections 8 "Test information" and 9 "Soldering".<br>• Removed Section "Packing information"<br>• 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<br>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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