# BC817; BC817W; BC337

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

Rev. 06 — 17 November 2009 Product data sheet

## 1. Product profile

### 1.1 General description

NPN general-purpose transistors.

**Table 1. Product overview**

| Type number | Package | | PNP complement |
|---|---|---|---|
| | NXP | JEITA | |
| BC817 | SOT23 | - | BC807 |
| BC817W | SOT323 | SC-70 | BC807W |
| BC337[1] | SOT54 (TO-92) | SC-43A | BC327 |

[1] Also available in SOT54A and SOT54 variant packages (see Section 2).

### 1.2 Features

- High current
- Low voltage

### 1.3 Applications

- General-purpose switching and amplification

### 1.4 Quick reference data

**Table 2. Quick reference data**

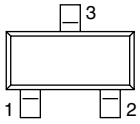
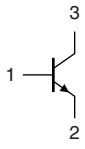
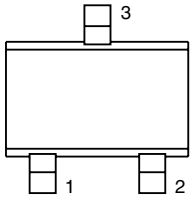
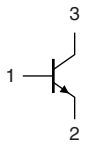
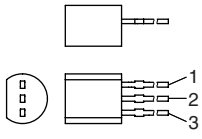
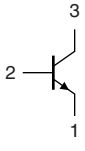
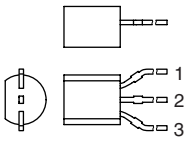
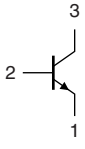
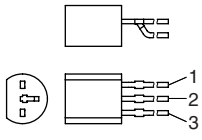
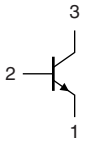
| Symbol | Parameter | Conditions | | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|---|
| $V_{CEO}$ | collector-emitter voltage | open base; $I_C$ = 10 mA | | - | - | 45 | V |
| $I_C$ | collector current (DC) | | | - | - | 500 | mA |
| $I_{CM}$ | peak collector current | | | - | - | 1 | A |
| $h_{FE}$ | DC current gain | $I_C$ = 100 mA; $V_{CE}$ = 1 V | [1] | - | - | - | |
| | BC817; BC817W; BC337 | | | 100 | - | 600 | |
| | BC817-16; BC817-16W; BC337-16 | | | 100 | - | 250 | |
| | BC817-25; BC817-25W; BC337-25 | | | 160 | - | 400 | |
| | BC817-40; BC817-40W; BC337-40 | | | 250 | - | 600 | |

[1] Pulse test: $t_p \leq 300\ \mu s$; $\delta \leq 0.02$.

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## 2. Pinning information

**Table 3. Pinning**

| Pin | Description | Simplified outline | Symbol |
|---|---|---|---|
| **SOT23** | | | |
| 1 | base |  |  sym021 |
| 2 | emitter | | |
| 3 | collector | | |
| **SOT323** | | | |
| 1 | base |  sot323_so |  sym021 |
| 2 | emitter | | |
| 3 | collector | | |
| **SOT54** | | | |
| 1 | emitter |  001aab347 |  sym026 |
| 2 | base | | |
| 3 | collector | | |
| **SOT54A** | | | |
| 1 | emitter |  001aab348 |  sym026 |
| 2 | base | | |
| 3 | collector | | |
| **SOT54 variant** | | | |
| 1 | emitter |  001aab447 |  sym026 |
| 2 | base | | |
| 3 | collector | | |



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## 3. Ordering information

**Table 4. Ordering information**

| Type number[1] | Package | | |
|---|---|---|---|
| | Name | Description | Version |
| BC817 | - | plastic surface mounted package; 3 leads | SOT23 |
| BC817W | SC-70 | plastic surface mounted package; 3 leads | SOT323 |
| BC337[2] | SC-43A | plastic single-ended leaded (through hole) package; 3 leads | SOT54 |

[1] Valid for all available selection groups.

[2] Also available in SOT54A and SOT54 variant packages (see Section 2 and Section 9).

## 4. Marking

**Table 5. Marking codes**

| Type number | Marking code[1] |
|---|---|
| BC817 | 6D* |
| BC817-16 | 6A* |
| BC817-25 | 6B* |
| BC817-40 | 6C* |
| BC817W | 6D* |
| BC817-16W | 6A* |
| BC817-25W | 6B* |
| BC817-40W | 6C* |
| BC337 | C337 |
| BC337-16 | C33716 |
| BC337-25 | C33725 |
| BC337-40 | C33740 |

[1] * = -: made in Hong Kong
* = p: made in Hong Kong
* = t: made in Malaysia
* = W: made in China


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## 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; $I_C$ = 10 mA | | - | 45 | V |
| $V_{EBO}$ | emitter-base voltage | open collector | | - | 5 | V |
| $I_C$ | collector current (DC) | | | - | 500 | mA |
| $I_{CM}$ | peak collector current | | | - | 1 | A |
| $I_{BM}$ | peak base current | | | - | 200 | mA |
| $P_{tot}$ | total power dissipation | | | | | |
| | BC817 | $T_{amb} \leq 25$ °C | [1][2] | - | 250 | mW |
| | BC817W | $T_{amb} \leq 25$ °C | [1][2] | - | 200 | mW |
| | BC337 | $T_{amb} \leq 25$ °C | [1][2] | - | 625 | mW |
| $T_{stg}$ | storage temperature | | | −65 | +150 | °C |
| $T_j$ | junction temperature | | | - | 150 | °C |
| $T_{amb}$ | ambient temperature | | | −65 | +150 | °C |

[1] Transistor mounted on an FR4 printed-circuit board, single-sided copper, tin-plated and standard footprint.

[2] Valid for all available selection groups.

## 6. Thermal characteristics

**Table 7. Thermal characteristics**

| Symbol | Parameter | Conditions | | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|---|
| $R_{th(j-a)}$ | thermal resistance from junction to ambient | | | | | | |
| | BC817 | $T_{amb} \leq 25$ °C | [1][2] | - | - | 500 | K/W |
| | BC817W | $T_{amb} \leq 25$ °C | [1][2] | - | - | 625 | K/W |
| | BC337 | $T_{amb} \leq 25$ °C | [1][2] | - | - | 200 | K/W |

[1] Transistor mounted on an FR4 printed-circuit board, single-sided copper, tin-plated and standard footprint.

[2] Valid for all available selection groups.



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## 7. Characteristics

**Table 8. Characteristics**

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

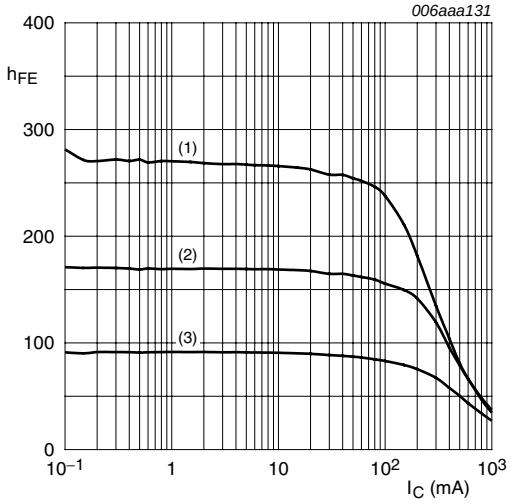
| Symbol | Parameter | Conditions | | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|---|
| $I_{CBO}$ | collector-base cut-off current | $I_E$ = 0 A; $V_{CB}$ = 20 V | | - | - | 100 | nA |
| | | $I_E$ = 0 A; $V_{CB}$ = 20 V; $T_j$ = 150 °C | | - | - | 5 | μA |
| $I_{EBO}$ | emitter-base cut-off current | $I_C$ = 0 A; $V_{EB}$ = 5 V | | - | - | 100 | nA |
| $h_{FE}$ | DC current gain | $I_C$ = 100 mA; $V_{CE}$ = 1 V | [1] | | | | |
| | BC817; BC817W; BC337 | | | 100 | - | 600 | |
| | BC817-16; BC817-16W; BC337-16 | | | 100 | - | 250 | |
| | BC817-25; BC817-25W; BC337-25 | | | 160 | - | 400 | |
| | BC817-40; BC817-40W; BC337-40 | | | 250 | - | 600 | |
| $h_{FE}$ | DC current gain | $I_C$ = 500 mA; $V_{CE}$ = 1 V | [1] | 40 | - | - | |
| $V_{CEsat}$ | collector-emitter saturation voltage | $I_C$ = 500 mA; $I_B$ = 50 mA | [1] | - | - | 700 | mV |
| $V_{BE}$ | base-emitter voltage | $I_C$ = 500 mA; $V_{CE}$ = 1 V | [2] | - | - | 1.2 | V |
| $C_c$ | collector capacitance | $I_E$ = $i_e$ = 0 A; $V_{CB}$ = 10 V; f = 1 MHz | | - | 3 | - | pF |
| $f_T$ | transition frequency | $I_C$ = 10 mA; $V_{CE}$ = 5 V; f = 100 MHz | | 100 | - | - | MHz |

[1] Pulse test: $t_p \leq 300$ μs; $\delta \leq 0.02$.

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



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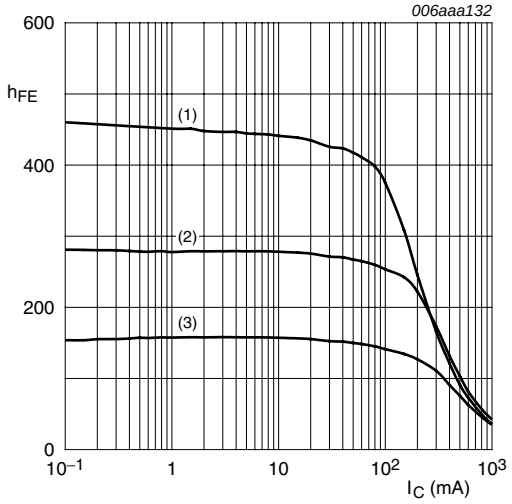

$V_{CE}$ = 1 V

(1) $T_{amb}$ = 150 °C

(2) $T_{amb}$ = 25 °C

(3) $T_{amb}$ = −55 °C

**Fig 1. Selection -16: DC current gain as a function of collector current; typical values**



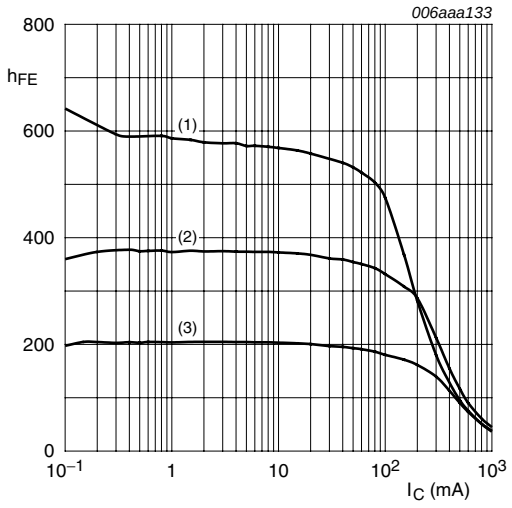

$V_{CE}$ = 1 V

(1) $T_{amb}$ = 150 °C

(2) $T_{amb}$ = 25 °C

(3) $T_{amb}$ = −55 °C

**Fig 2. Selection -25: DC current gain as a function of collector current; typical values**




$V_{CE}$ = 1 V

(1) $T_{amb}$ = 150 °C

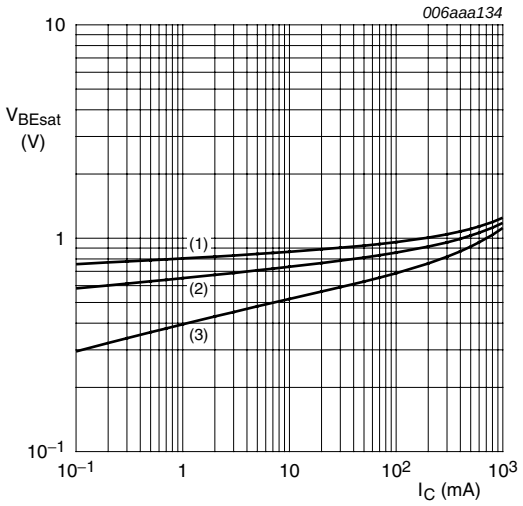
(2) $T_{amb}$ = 25 °C

(3) $T_{amb}$ = −55 °C

**Fig 3. Selection -40: DC current gain as a function of collector current; typical values**



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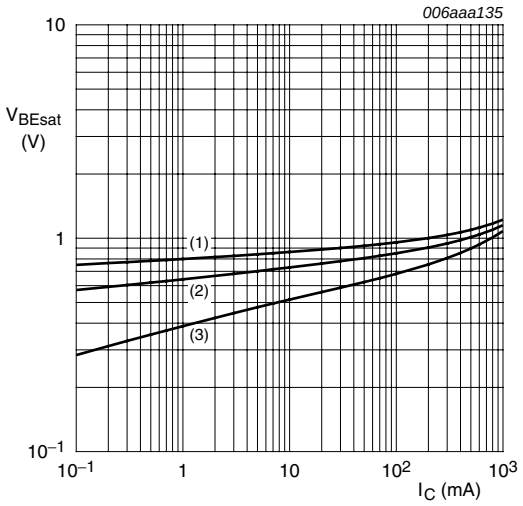

$I_C/I_B$ = 10

(1) $T_{amb}$ = −55 °C

(2) $T_{amb}$ = 25 °C

(3) $T_{amb}$ = 150 °C

**Fig 4. Selection -16: Base-emitter saturation voltage as a function of collector current; typical values**



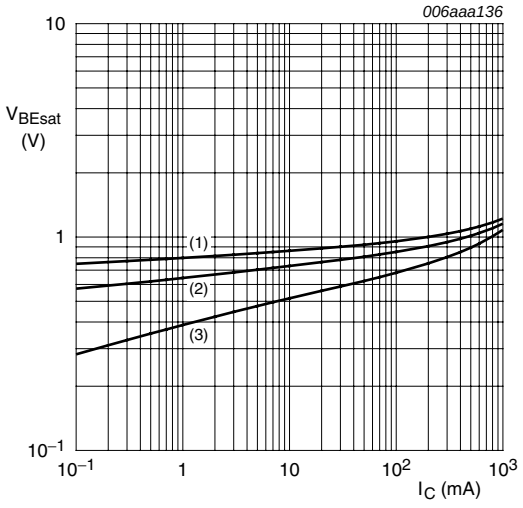

$I_C/I_B$ = 10

(1) $T_{amb}$ = −55 °C

(2) $T_{amb}$ = 25 °C

(3) $T_{amb}$ = 150 °C

**Fig 5. Selection -25: Base-emitter saturation voltage as a function of collector current; typical values**




$I_C/I_B$ = 10

(1) $T_{amb}$ = −55 °C

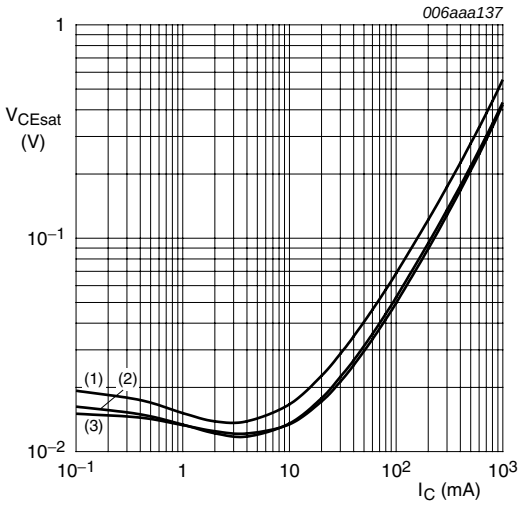
(2) $T_{amb}$ = 25 °C

(3) $T_{amb}$ = 150 °C

**Fig 6. Selection -40: Base-emitter saturation voltage as a function of collector current; typical values**



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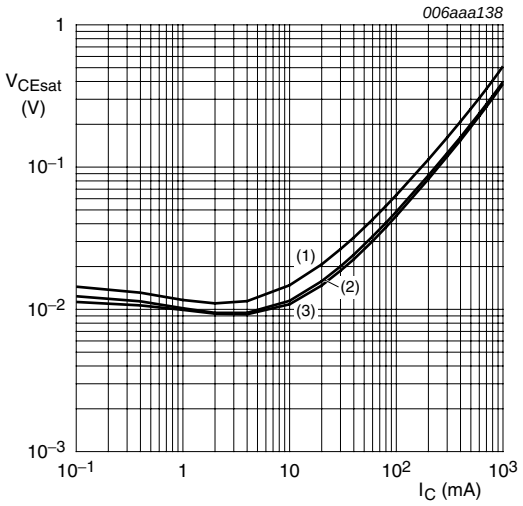

$I_C/I_B$ = 10

(1) $T_{amb}$ = 150 °C

(2) $T_{amb}$ = 25 °C

(3) $T_{amb}$ = −55 °C

**Fig 7. Selection -16: Collector-emitter saturation voltage as a function of collector current; typical values**



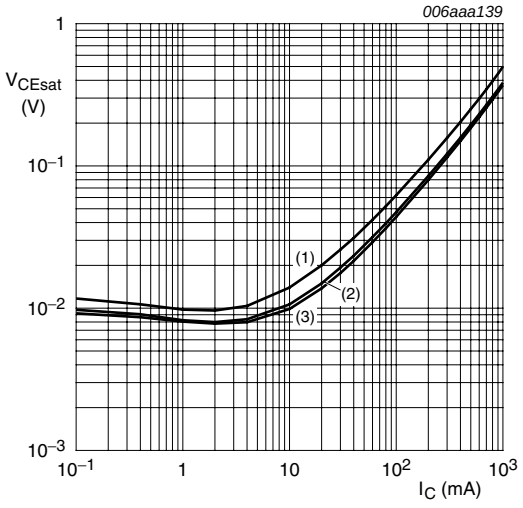

$I_C/I_B$ = 10

(1) $T_{amb}$ = 150 °C

(2) $T_{amb}$ = 25 °C

(3) $T_{amb}$ = −55 °C

**Fig 8. Selection -25: Collector-emitter saturation voltage as a function of collector current; typical values**




$I_C/I_B$ = 10

(1) $T_{amb}$ = 150 °C

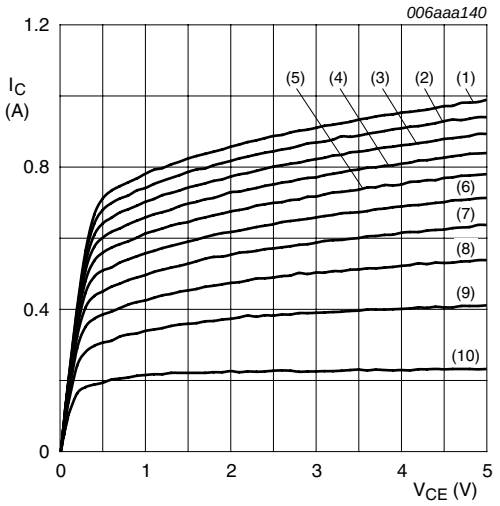
(2) $T_{amb}$ = 25 °C

(3) $T_{amb}$ = −55 °C

**Fig 9. Selection -40: Collector-emitter saturation voltage as a function of collector current; typical values**



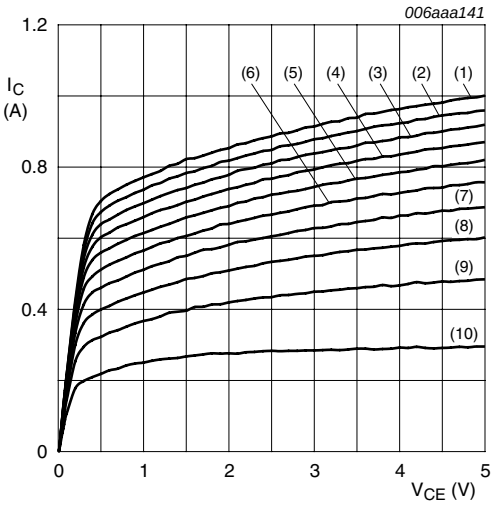
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$T_{amb}$ = 25 °C

(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

**Fig 10. Selection -16: Collector current as a function of collector-emitter voltage; typical values**

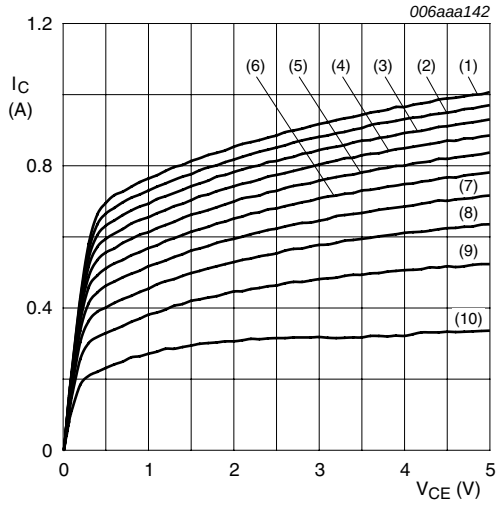



$T_{amb}$ = 25 °C

(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

**Fig 11. Selection -25: Collector current as a function of collector-emitter voltage; typical values**


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$T_{amb}$ = 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

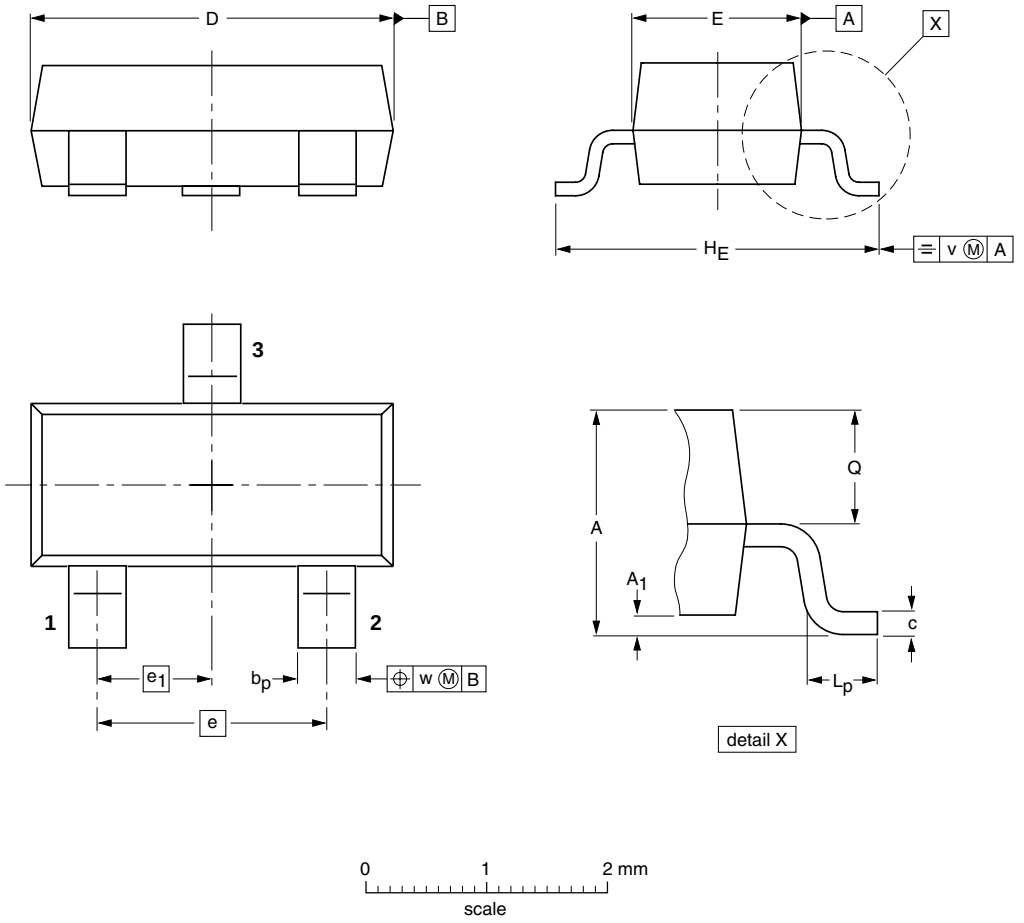
**Fig 12. Selection -40: Collector current as a function of collector-emitter voltage; typical values**



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## 8. Package outline

**Plastic surface-mounted package; 3 leads** **SOT23**




**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>0.9 | 0.1 | 0.48<br>0.38 | 0.15<br>0.09 | 3.0<br>2.8 | 1.4<br>1.2 | 1.9 | 0.95 | 2.5<br>2.1 | 0.45<br>0.15 | 0.55<br>0.45 | 0.2 | 0.1 |

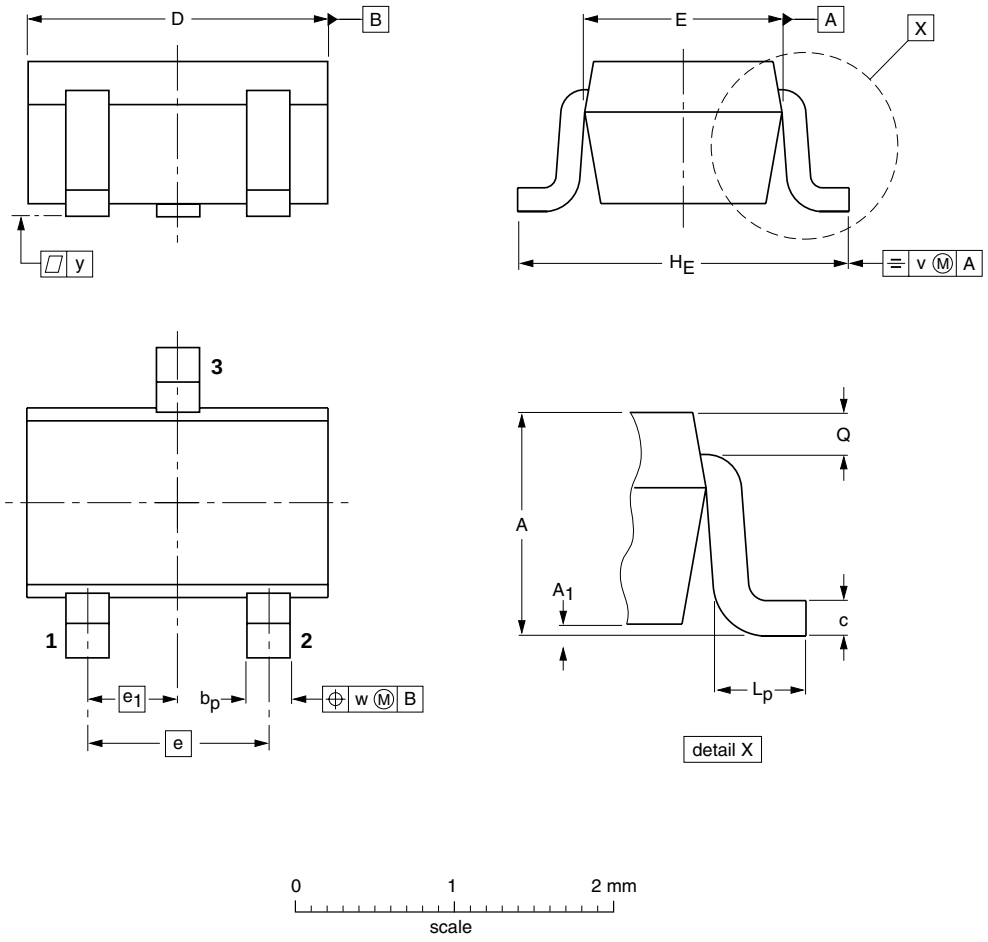
| OUTLINE VERSION | REFERENCES | | | | EUROPEAN PROJECTION | ISSUE DATE |
|---|---|---|---|---|---|---|
| | IEC | JEDEC | JEITA | | | |
| SOT23 | | TO-236AB | | | | ~~04-11-04~~<br>06-03-16 |

**Fig 13. Package outline SOT23 (TO-236AB)**



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**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 |

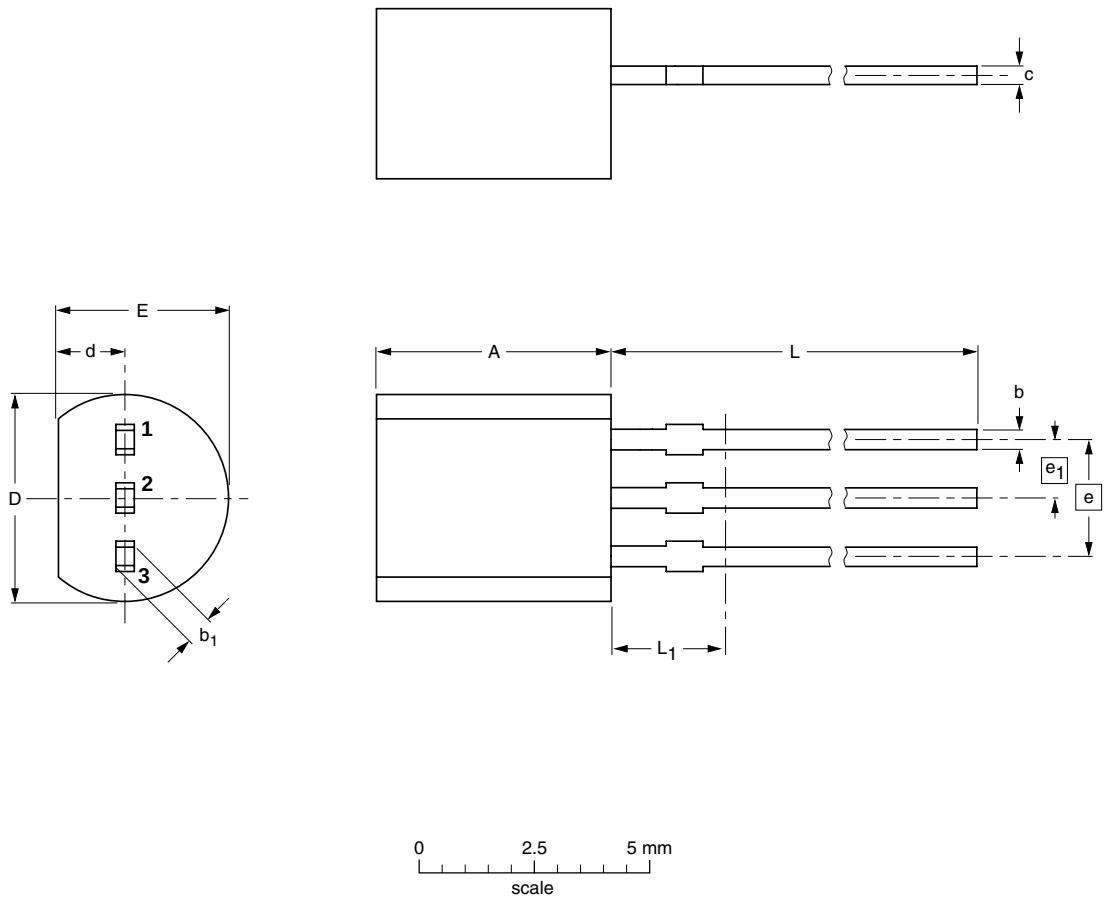
| OUTLINE VERSION | REFERENCES | | | | EUROPEAN PROJECTION | ISSUE DATE |
|---|---|---|---|---|---|---|
| | IEC | JEDEC | JEITA | | | |
| SOT323 | | | SC-70 | | | ~~04-11-04~~<br>06-03-16 |

**Fig 14. Package outline SOT323 (SC-70)**



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**Plastic single-ended leaded (through hole) package; 3 leads** **SOT54**




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

| UNIT | A | b | $b_1$ | c | D | d | E | e | $e_1$ | L | $L_1$(1) max. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| mm | 5.2<br>5.0 | 0.48<br>0.40 | 0.66<br>0.55 | 0.45<br>0.38 | 4.8<br>4.4 | 1.7<br>1.4 | 4.2<br>3.6 | 2.54 | 1.27 | 14.5<br>12.7 | 2.5 |

**Note**

1. Terminal dimensions within this zone are uncontrolled to allow for flow of plastic and terminal irregularities.

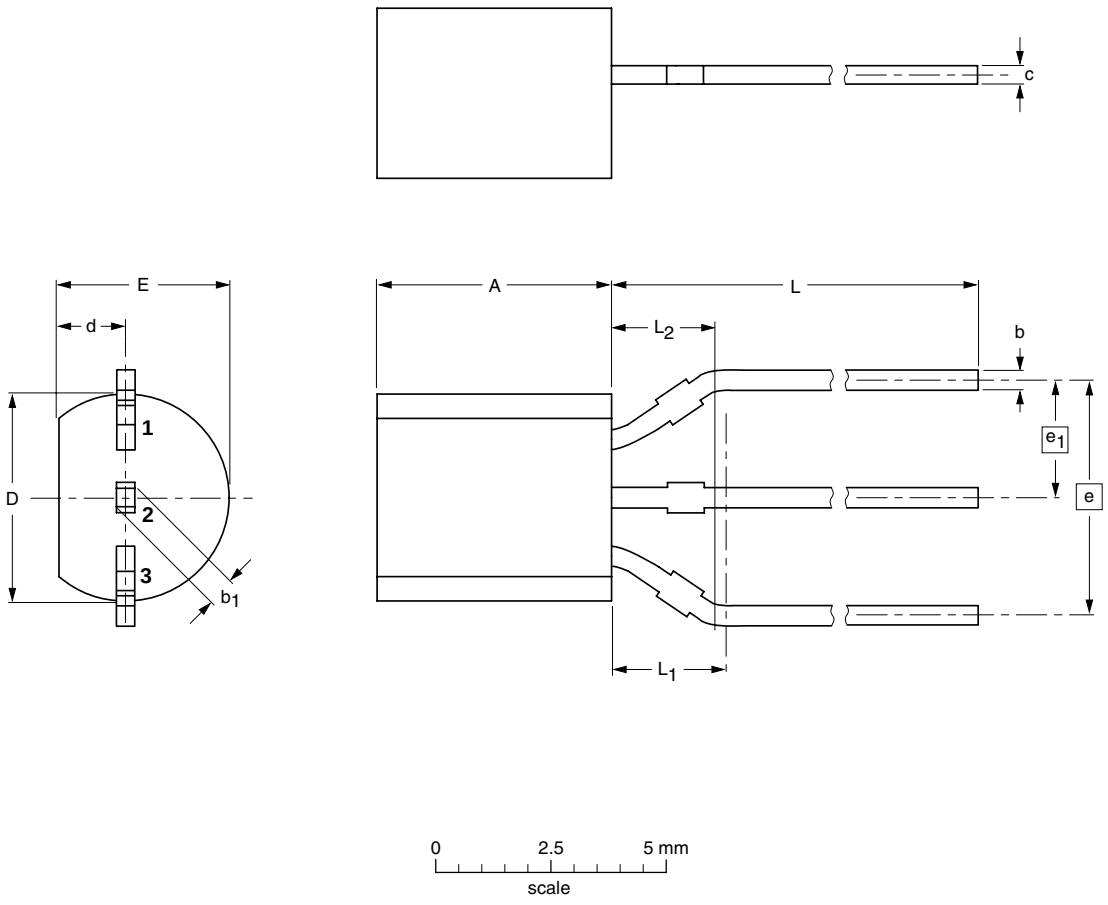
| OUTLINE VERSION | REFERENCES | | | | EUROPEAN PROJECTION | ISSUE DATE |
|---|---|---|---|---|---|---|
| | IEC | JEDEC | JEITA | | | |
| SOT54 | | TO-92 | SC-43A | | | ~~04-06-28~~<br>04-11-16 |

**Fig 15. Package outline SOT54 (SC-43A/TO-92)**



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**Plastic single-ended leaded (through hole) package; 3 leads (wide pitch)** **SOT54A**




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

| UNIT | A | b | $b_1$ | c | D | d | E | e | $e_1$ | L | $L_1$ (1) max. | $L_2$ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| mm | 5.2<br>5.0 | 0.48<br>0.40 | 0.66<br>0.55 | 0.45<br>0.38 | 4.8<br>4.4 | 1.7<br>1.4 | 4.2<br>3.6 | 5.08 | 2.54 | 14.5<br>12.7 | 3 | 3<br>2 |

**Note**

1. Terminal dimensions within this zone are uncontrolled to allow for flow of plastic and terminal irregularities.

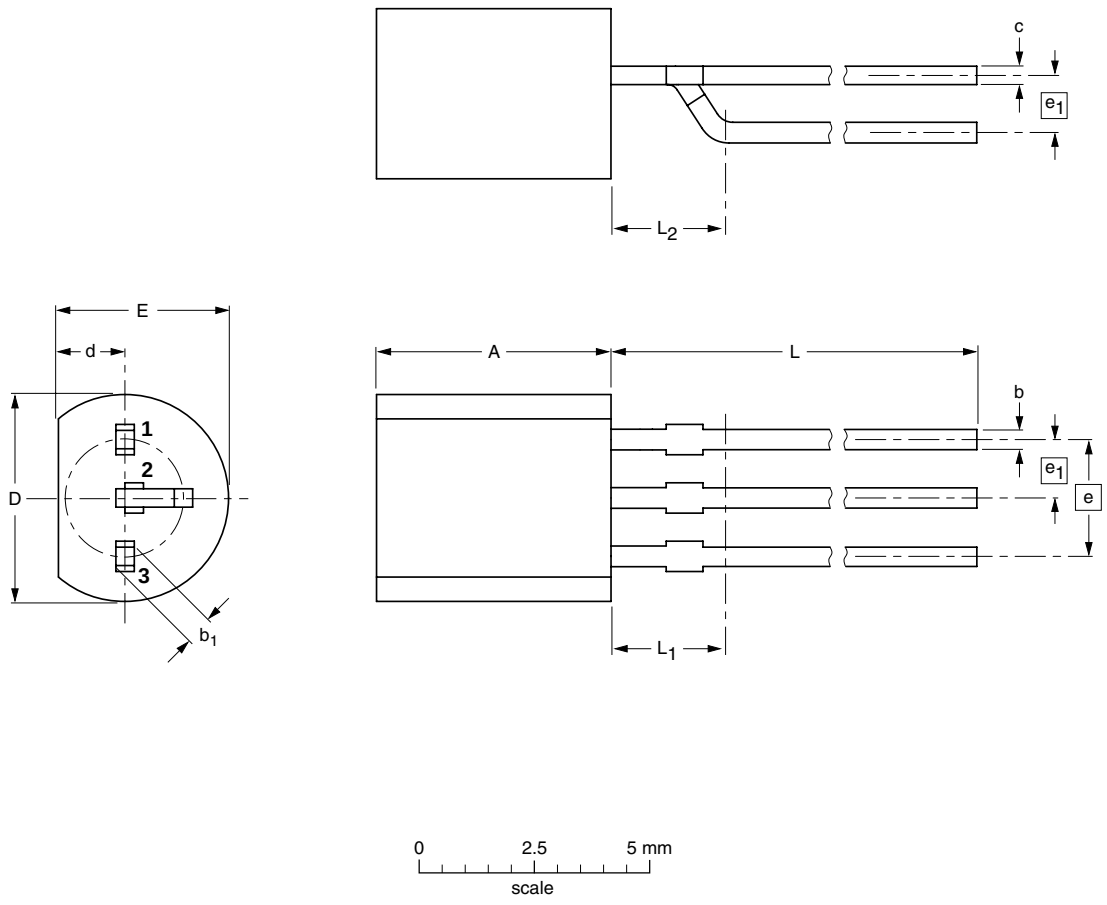
| OUTLINE VERSION | REFERENCES | | | | EUROPEAN PROJECTION | ISSUE DATE |
|---|---|---|---|---|---|---|
| | IEC | JEDEC | JEITA | | | |
| SOT54A | | | | | | ~~97-05-13~~<br>04-06-28 |

**Fig 16. Package outline SOT54A**



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**Plastic single-ended leaded (through hole) package; 3 leads (on-circle)** **SOT54 variant**




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

| UNIT | A | b | $b_1$ | c | D | d | E | e | $e_1$ | L | $L_1$ (1) max | $L_2$ max |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| mm | 5.2<br>5.0 | 0.48<br>0.40 | 0.66<br>0.55 | 0.45<br>0.38 | 4.8<br>4.4 | 1.7<br>1.4 | 4.2<br>3.6 | 2.54 | 1.27 | 14.5<br>12.7 | 2.5 | 2.5 |

**Note**

1. Terminal dimensions within this zone are uncontrolled to allow for flow of plastic and terminal irregularities.

| OUTLINE VERSION | REFERENCES | | | | EUROPEAN PROJECTION | ISSUE DATE |
|---|---|---|---|---|---|---|
| | IEC | JEDEC | JEITA | | | |
| SOT54 variant | | | | | | ~~04-06-28~~<br>05-01-10 |

**Fig 17. Package outline SOT54 variant**



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# 9. Packing information

**Table 9. Packing methods**

*The indicated -xxx are the last three digits of the 12NC ordering code.*[1]

| Type number | Package | Description | Packing quantity | | |
|---|---|---|---|---|---|
| | | | 3000 | 5000 | 10000 |
| BC817 | SOT23 | 4 mm pitch, 8 mm tape and reel | -215 | - | -235 |
| BC817W | SOT323 | 4 mm pitch, 8 mm tape and reel | -115 | - | -135 |
| BC337 | SOT54 | bulk, straight leads | - | -412 | - |
| BC337 | SOT54A | tape and reel, wide pitch | - | - | -116 |
| BC337 | SOT54A | tape ammopack, wide pitch | - | - | -126 |
| BC337 | SOT 54 variant | bulk, delta pinning (on-circle) | - | -112 | - |

[1] For further information and the availability of packing methods, see Section 12.



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## 10. Revision history

**Table 10. Revision history**

| Document ID | Release date | Data sheet status | Change notice | Supersedes |
|---|---|---|---|---|
| BC817_BC817W_BC337_6 | 20091117 | Product data sheet | - | BC817_BC817W_BC337_5 |
| Modifications: | • This data sheet was changed to reflect the new company name NXP Semiconductors, including new legal definitions and disclaimers. No changes were made to the technical content.<br>• Table 3 “Pinning”: updated<br>• Figure 13 “Package outline SOT23 (TO-236AB)”: updated<br>• Figure 14 “Package outline SOT323 (SC-70)”: updated | | | |
| BC817_BC817W_BC337_5 | 20050121 | Product data sheet | CPCN200302007F1 | BC817_4; BC817W_SER_4; BC337_3 |
| BC817_4 | 20040105 | Product specification | - | BC817_3 |
| BC817W_SER_4 | 20040225 | Product specification | - | BC817W_SER_3 |
| BC337_3 | 19990415 | Product specification | - | BC337_338_CNV_2 |


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# 11. Legal information

## 11.1 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.nxp.com.

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