

# 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 <sup>[1]</sup>	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

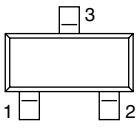
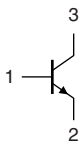
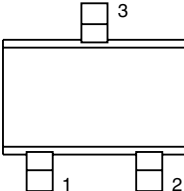
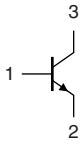
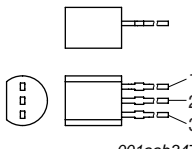
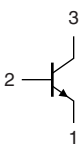
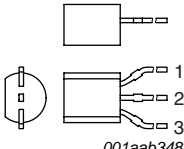
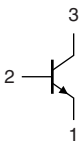
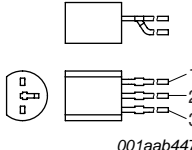
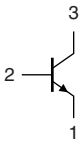
Table 2. Quick reference data

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$V_{CEO}$	collector-emitter voltage	open base; $I_C = 10 \text{ mA}$	-	-	45	V
$I_C$	collector current (DC)		-	-	500	mA
$I_{CM}$	peak collector current		-	-	1	A
$h_{FE}$	DC current gain	$I_C = 100 \text{ mA};$ $V_{CE} = 1 \text{ V}$	<sup>[1]</sup>	-	-	-
	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:  $t_p \leq 300 \mu\text{s}$ ;  $\delta \leq 0.02$ .

## 2. Pinning information

**Table 3. Pinning**

Pin	Description	Simplified outline	Symbol
<b>SOT23</b>			
1	base		 sym021
2	emitter		
3	collector		
<b>SOT323</b>			
1	base		 sym021
2	emitter		
3	collector		
<b>SOT54</b>			
1	emitter		 sym026
2	base		
3	collector		
<b>SOT54A</b>			
1	emitter		 sym026
2	base		
3	collector		
<b>SOT54 variant</b>			
1	emitter		 sym026
2	base		
3	collector		

### 3. Ordering information

**Table 4. Ordering information**

Type number <sup>[1]</sup>	Package		
	Name	Description	Version
BC817	-	plastic surface mounted package; 3 leads	SOT23
BC817W	SC-70	plastic surface mounted package; 3 leads	SOT323
BC337 <sup>[2]</sup>	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 <sup>[1]</sup>
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

## 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; $I_C = 10 \text{ mA}$	-	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	$T_{amb} \leq 25 \text{ °C}$	[1][2]	-	250	mW
	BC817W	$T_{amb} \leq 25 \text{ °C}$	[1][2]	-	200	mW
	BC337	$T_{amb} \leq 25 \text{ °C}$	[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	$T_{amb} \leq 25 \text{ °C}$	[1][2]	-	-	500	K/W
	BC817W	$T_{amb} \leq 25 \text{ °C}$	[1][2]	-	-	625	K/W
	BC337	$T_{amb} \leq 25 \text{ °C}$	[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.

## 7. Characteristics

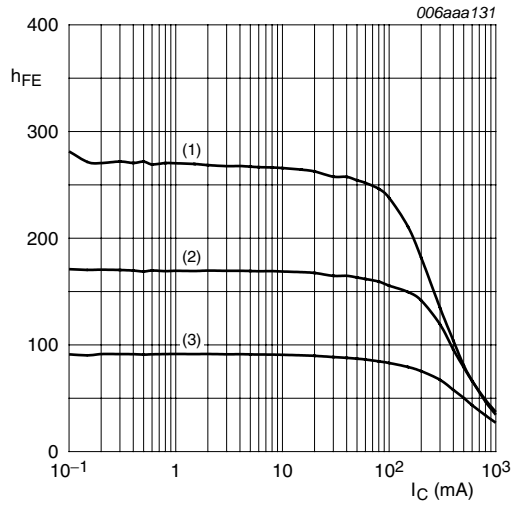
**Table 8. Characteristics**

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

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$I_{CBO}$	collector-base cut-off current	$I_E = 0\text{ A}; V_{CB} = 20\text{ V}$	-	-	100	nA
		$I_E = 0\text{ A}; V_{CB} = 20\text{ V};$ $T_j = 150\text{ °C}$	-	-	5	$\mu\text{A}$
$I_{EBO}$	emitter-base cut-off current	$I_C = 0\text{ A}; V_{EB} = 5\text{ V}$	-	-	100	nA
$h_{FE}$	DC current gain	$I_C = 100\text{ mA}; V_{CE} = 1\text{ V}$	[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	$I_C = 500\text{ mA}; V_{CE} = 1\text{ V}$	[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	$I_C = 500\text{ mA}; V_{CE} = 1\text{ V}$	[2] -	-	1.2	V
$C_c$	collector capacitance	$I_E = i_e = 0\text{ A}; V_{CB} = 10\text{ V};$ $f = 1\text{ MHz}$	-	3	-	pF
$f_T$	transition frequency	$I_C = 10\text{ mA}; V_{CE} = 5\text{ V};$ $f = 100\text{ MHz}$	100	-	-	MHz

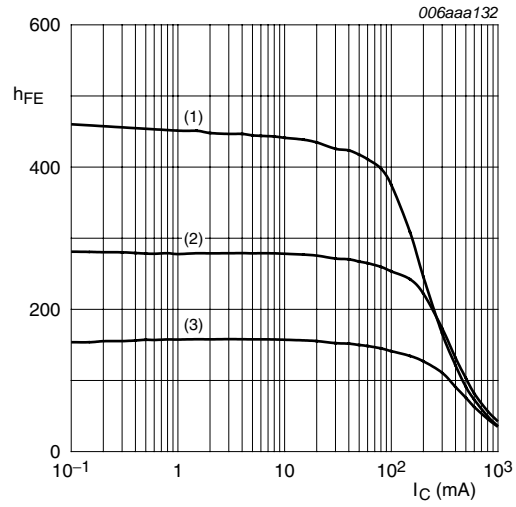
[1] Pulse test:  $t_p \leq 300\text{ }\mu\text{s}$ ;  $\delta \leq 0.02$ .

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



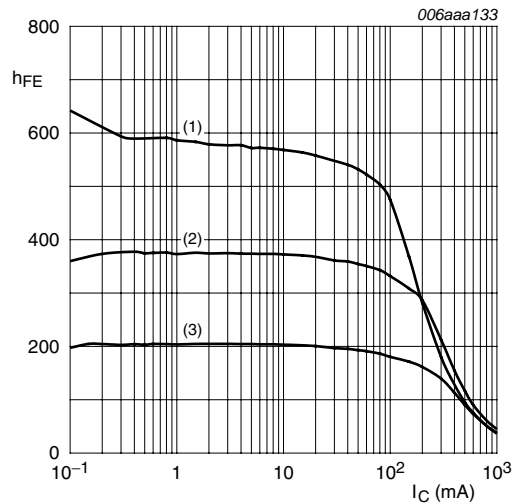
- $V_{CE} = 1\text{ V}$
- (1)  $T_{amb} = 150\text{ °C}$
  - (2)  $T_{amb} = 25\text{ °C}$
  - (3)  $T_{amb} = -55\text{ °C}$

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



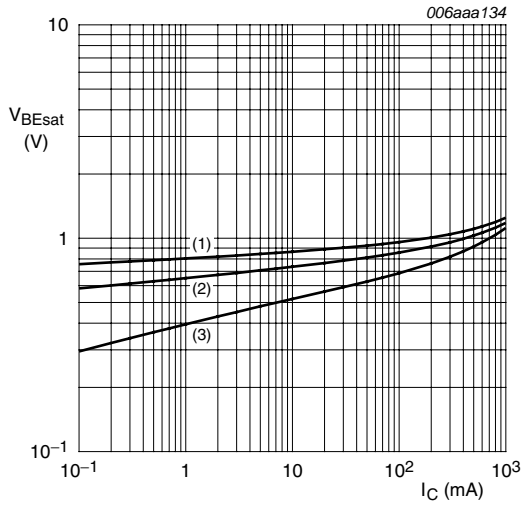
- $V_{CE} = 1\text{ V}$
- (1)  $T_{amb} = 150\text{ °C}$
  - (2)  $T_{amb} = 25\text{ °C}$
  - (3)  $T_{amb} = -55\text{ °C}$

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



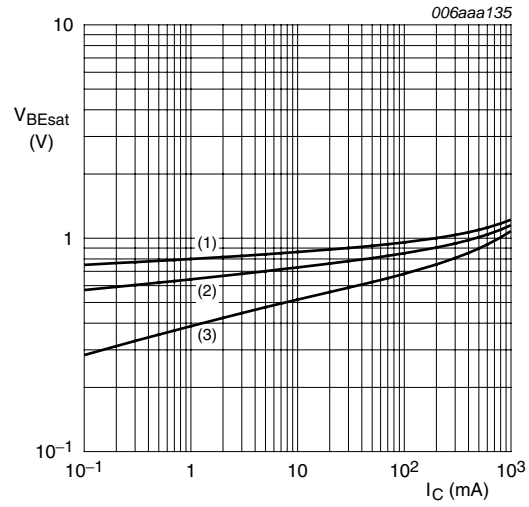
- $V_{CE} = 1\text{ V}$
- (1)  $T_{amb} = 150\text{ °C}$
  - (2)  $T_{amb} = 25\text{ °C}$
  - (3)  $T_{amb} = -55\text{ °C}$

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



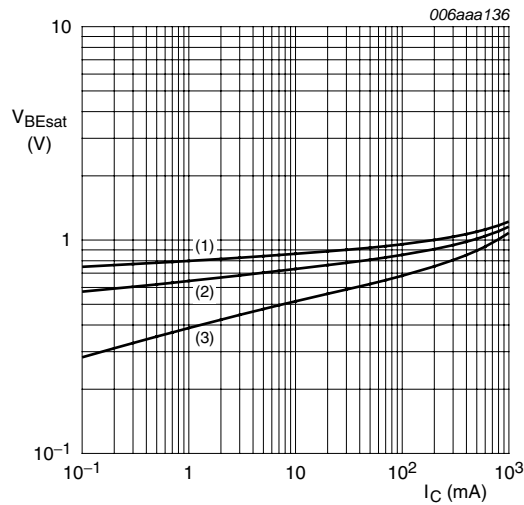
- $I_C/I_B = 10$
- (1)  $T_{amb} = -55\text{ }^\circ\text{C}$
  - (2)  $T_{amb} = 25\text{ }^\circ\text{C}$
  - (3)  $T_{amb} = 150\text{ }^\circ\text{C}$

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



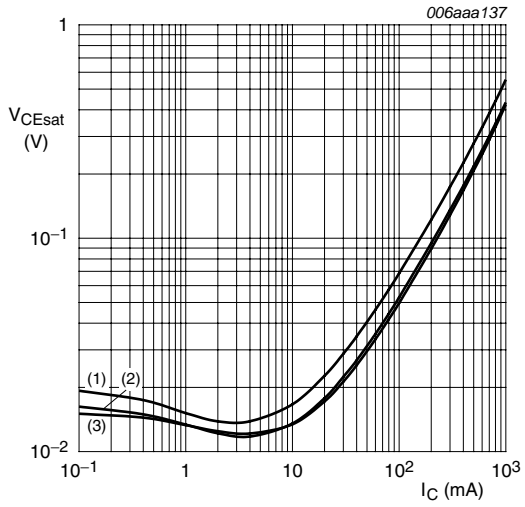
- $I_C/I_B = 10$
- (1)  $T_{amb} = -55\text{ }^\circ\text{C}$
  - (2)  $T_{amb} = 25\text{ }^\circ\text{C}$
  - (3)  $T_{amb} = 150\text{ }^\circ\text{C}$

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



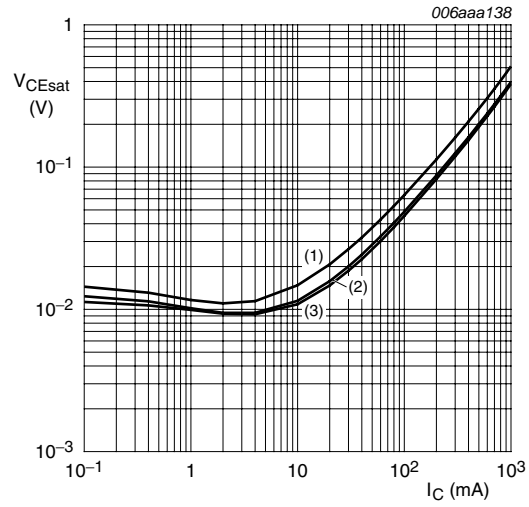
- $I_C/I_B = 10$
- (1)  $T_{amb} = -55\text{ }^\circ\text{C}$
  - (2)  $T_{amb} = 25\text{ }^\circ\text{C}$
  - (3)  $T_{amb} = 150\text{ }^\circ\text{C}$

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



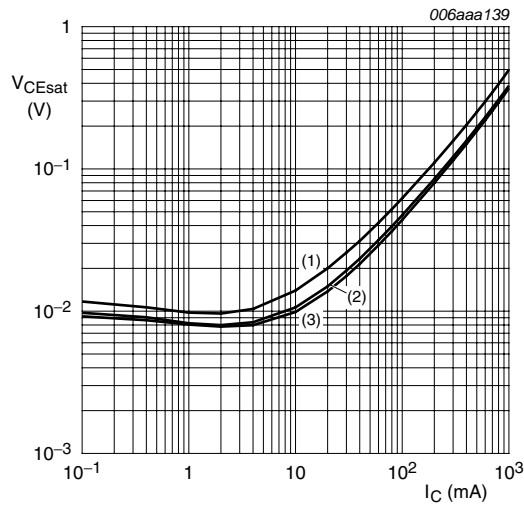
- $I_C/I_B = 10$
- (1)  $T_{amb} = 150\text{ °C}$
  - (2)  $T_{amb} = 25\text{ °C}$
  - (3)  $T_{amb} = -55\text{ °C}$

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



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

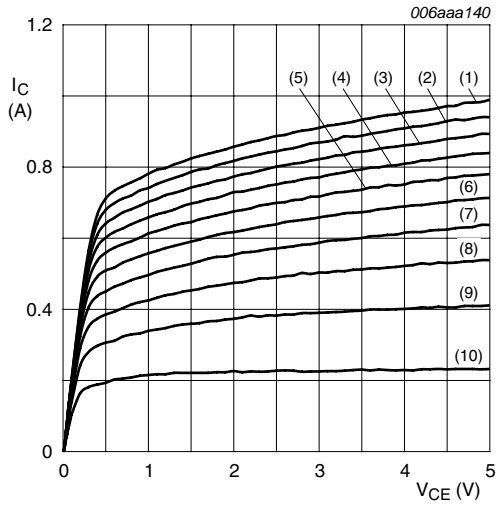
**Fig 8. Selection -25: Collector-emitter saturation voltage as a function of collector current; typical values**



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

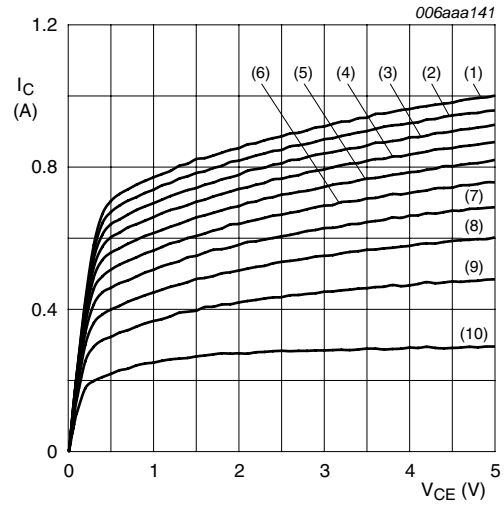
**Fig 9. Selection -40: Collector-emitter saturation voltage as a function of collector current; typical values**





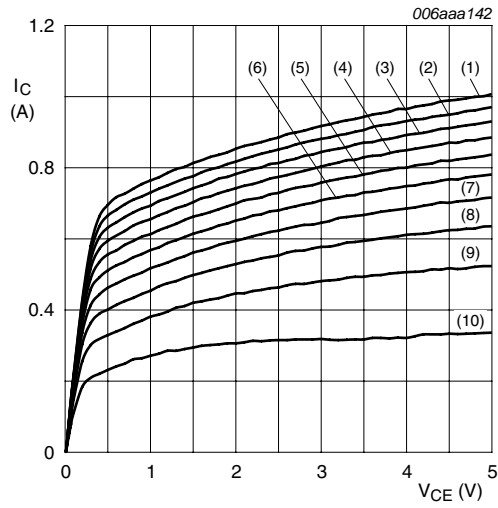
- $T_{amb} = 25\text{ }^\circ\text{C}$
- (1)  $I_B = 16.0\text{ mA}$
  - (2)  $I_B = 14.4\text{ mA}$
  - (3)  $I_B = 12.8\text{ mA}$
  - (4)  $I_B = 11.2\text{ mA}$
  - (5)  $I_B = 9.6\text{ mA}$
  - (6)  $I_B = 8.0\text{ mA}$
  - (7)  $I_B = 6.4\text{ mA}$
  - (8)  $I_B = 4.8\text{ mA}$
  - (9)  $I_B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

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



- $T_{amb} = 25\text{ }^\circ\text{C}$
- (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)  $I_B = 1.3\text{ mA}$

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



$T_{amb} = 25\text{ }^{\circ}\text{C}$

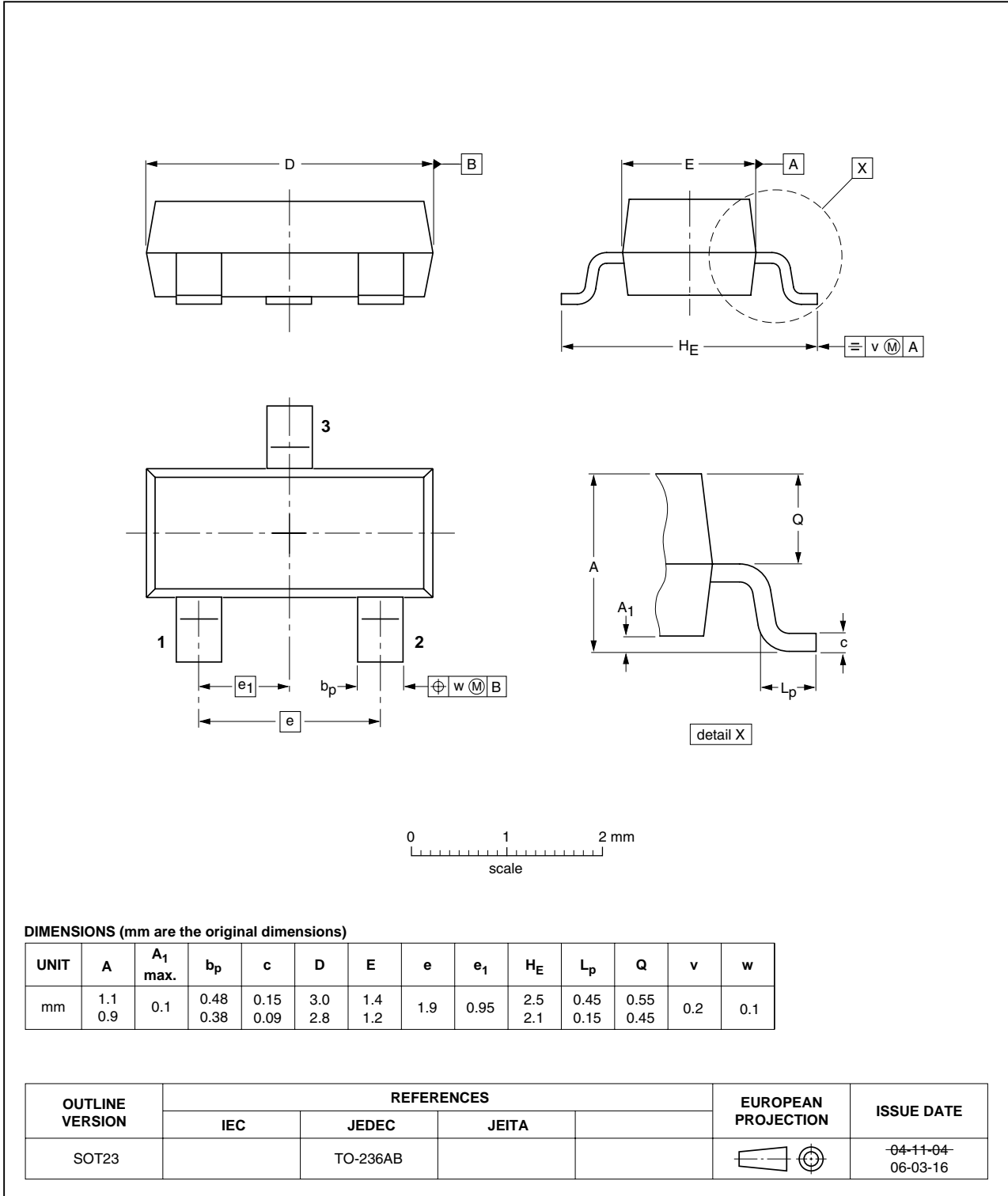
- (1)  $I_B = 12.0\text{ mA}$
- (2)  $I_B = 10.8\text{ mA}$
- (3)  $I_B = 9.6\text{ mA}$
- (4)  $I_B = 8.4\text{ mA}$
- (5)  $I_B = 7.2\text{ mA}$
- (6)  $I_B = 6.0\text{ mA}$
- (7)  $I_B = 4.8\text{ mA}$
- (8)  $I_B = 3.6\text{ mA}$
- (9)  $I_B = 2.4\text{ mA}$
- (10)  $I_B = 1.2\text{ mA}$

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

**8. Package outline**

Plastic surface-mounted package; 3 leads

SOT23



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

Plastic surface-mounted package; 3 leads

SOT323

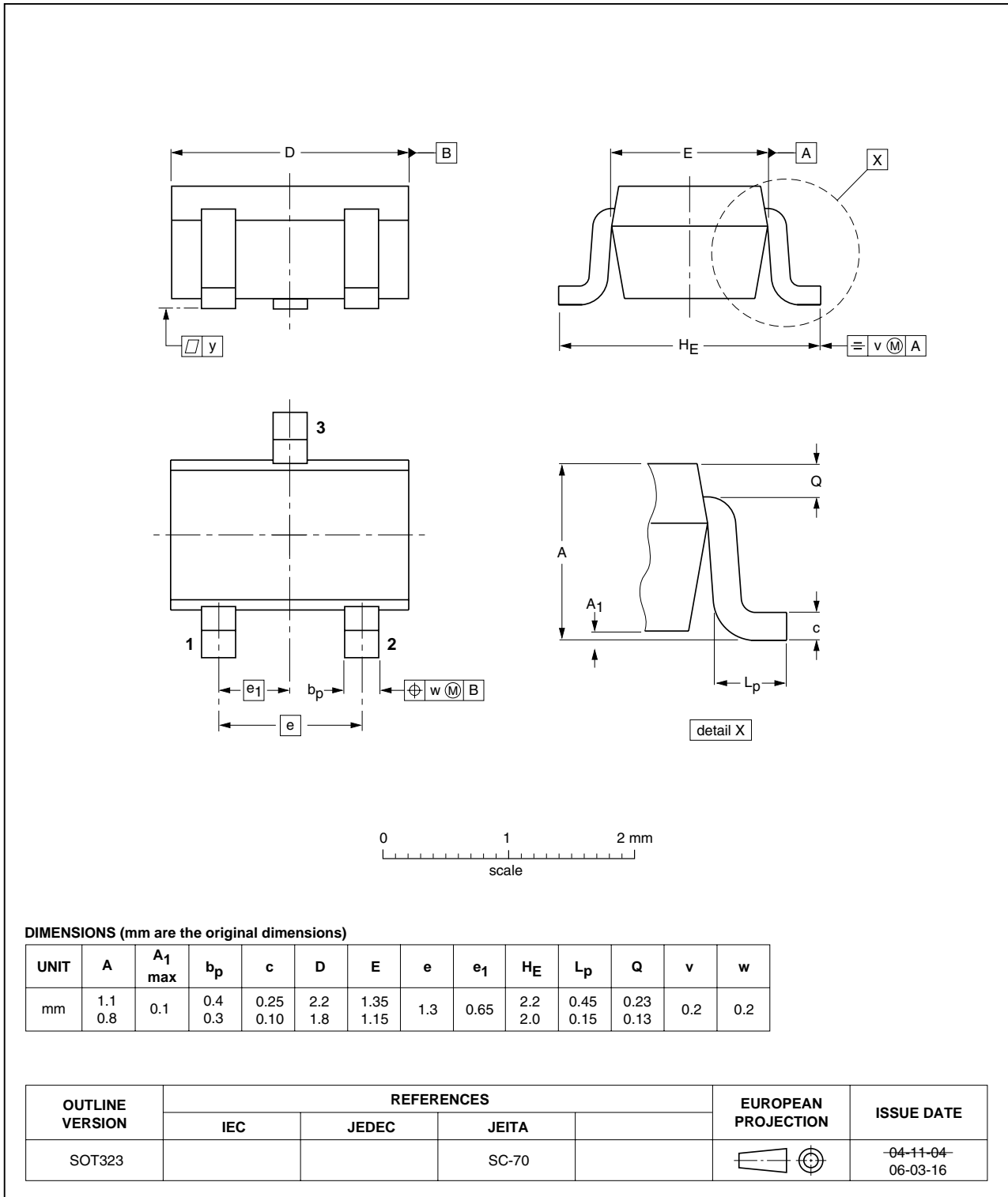


Fig 14. Package outline SOT323 (SC-70)

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

SOT54



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

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

SOT54A

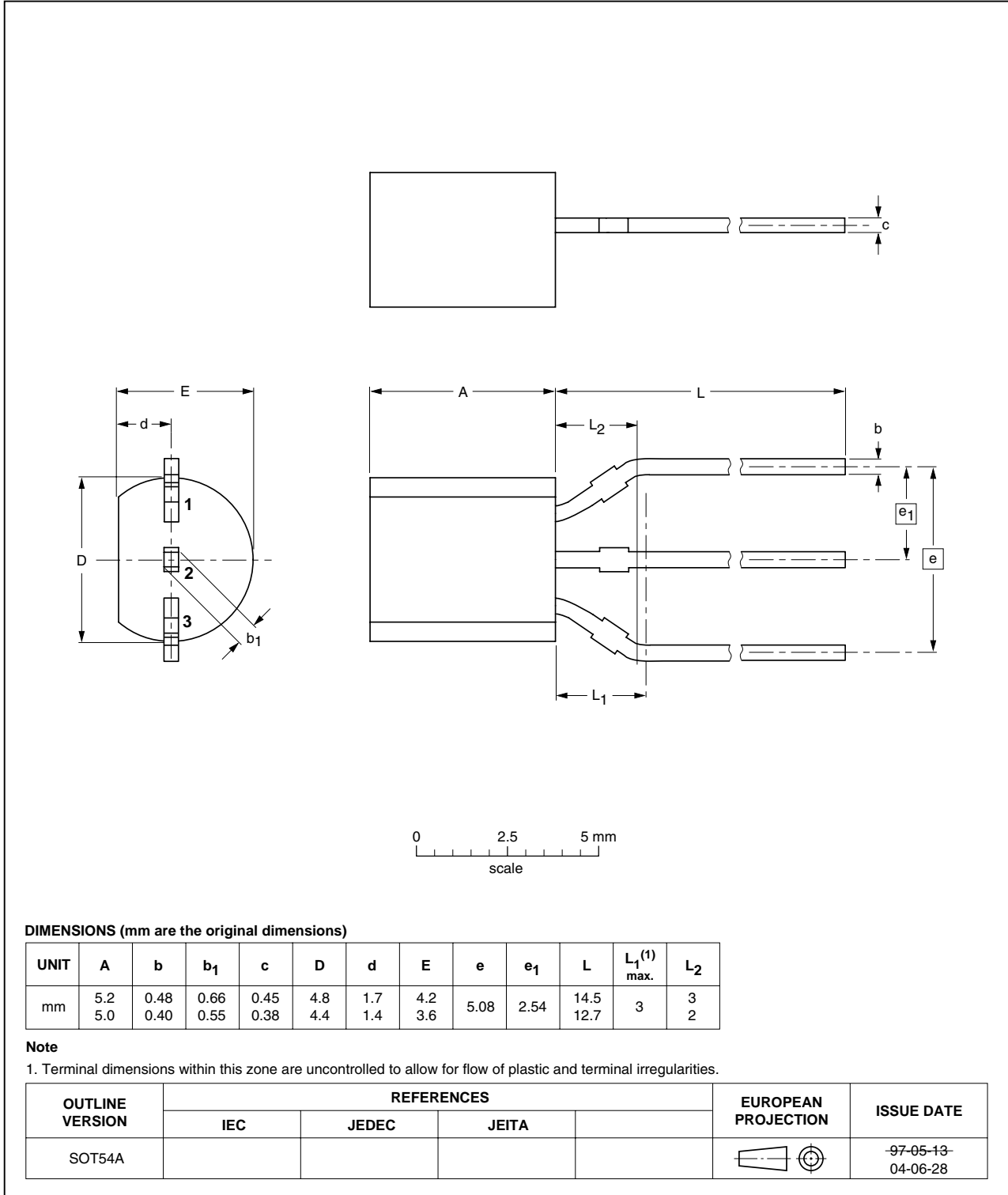


Fig 16. Package outline SOT54A

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

SOT54 variant



Fig 17. Package outline SOT54 variant

## 9. Packing information

**Table 9. Packing methods**

The indicated -xxx are the last three digits of the 12NC ordering code.<sup>[1]</sup>

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](#).



## 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:		<ul style="list-style-type: none"> <li>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.</li> <li><a href="#">Table 3 "Pinning"</a>: updated</li> <li><a href="#">Figure 13 "Package outline SOT23 (TO-236AB)"</a>: updated</li> <li><a href="#">Figure 14 "Package outline SOT323 (SC-70)"</a>: updated</li> </ul>		
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

## 11. Legal information

### 11.1 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.nxp.com>.

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## 13. Contents

<b>1</b>	<b>Product profile</b> . . . . .	<b>1</b>
1.1	General description . . . . .	1
1.2	Features . . . . .	1
1.3	Applications . . . . .	1
1.4	Quick reference data . . . . .	1
<b>2</b>	<b>Pinning information</b> . . . . .	<b>2</b>
<b>3</b>	<b>Ordering information</b> . . . . .	<b>3</b>
<b>4</b>	<b>Marking</b> . . . . .	<b>3</b>
<b>5</b>	<b>Limiting values</b> . . . . .	<b>4</b>
<b>6</b>	<b>Thermal characteristics</b> . . . . .	<b>4</b>
<b>7</b>	<b>Characteristics</b> . . . . .	<b>5</b>
<b>8</b>	<b>Package outline</b> . . . . .	<b>11</b>
<b>9</b>	<b>Packing information</b> . . . . .	<b>16</b>
<b>10</b>	<b>Revision history</b> . . . . .	<b>17</b>
<b>11</b>	<b>Legal information</b> . . . . .	<b>18</b>
11.1	Data sheet status . . . . .	18
11.2	Definitions . . . . .	18
11.3	Disclaimers . . . . .	18
11.4	Trademarks . . . . .	18
<b>12</b>	<b>Contact information</b> . . . . .	<b>18</b>
<b>13</b>	<b>Contents</b> . . . . .	<b>19</b>

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Date of release: 17 November 2009

Document identifier: BC817\_BC817W\_BC337\_6