BC817; BC817W; BC337

45 V, 500 mA NPN general-purpose transistors

Rev. 05 — 21 January 2005 Product data sheet

1. Product profile

1.1 General description

NPN general-purpose transistors.

Table 1: Product overview

Type number	Package		PNP complement
	Philips	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

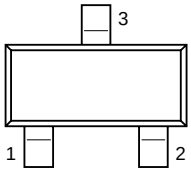
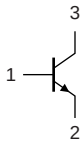
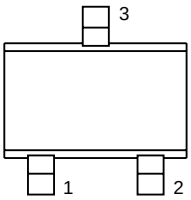
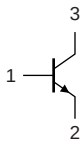
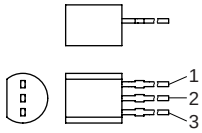
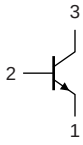
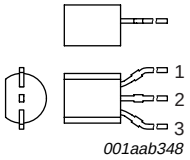
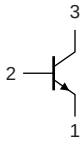
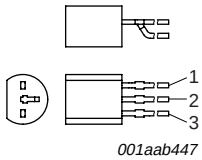
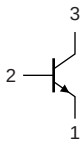
Symbol	Parameter	Conditions		Min	Typ	Max	Unit
V_{CEO}	collector-emitter voltage	open base; I_C = 10 mA		-	-	45	V
I_C	collector current (DC)			-	-	500	mA
I_{CM}	peak collector current			-	-	1	A
h_{FE}	DC current gain	I_C = 100 mA; V_{CE} = 1 V	[1]	-	-	-	
	BC817; BC817W; BC337			100	-	600	
	BC817-16; BC817-16W;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

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

PHILIPS

2. Pinning information

Table 3: Pinning

Pin	Description	Simplified outline	Symbol
SOT23			
1	base	 SOT23	 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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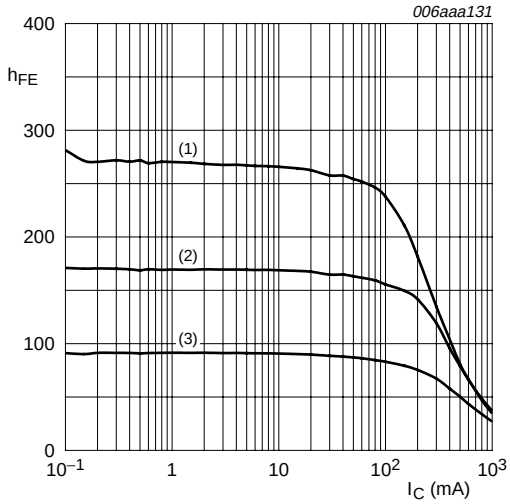


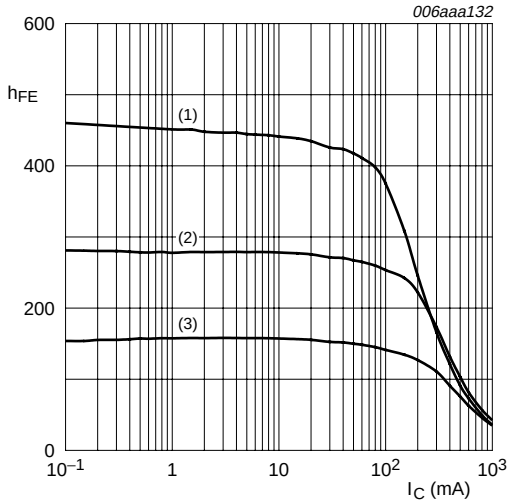
V_{CE} = 1 V.

(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.



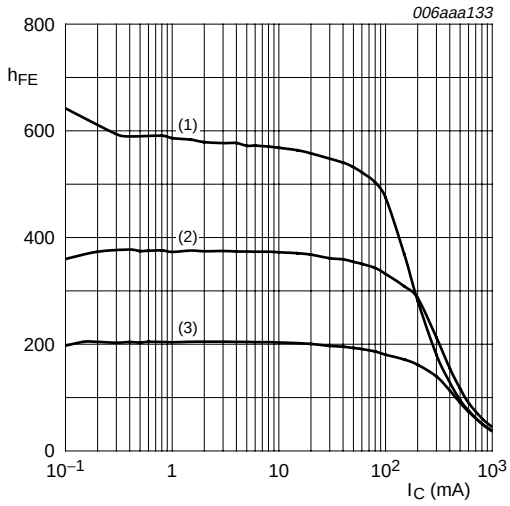
V_{CE} = 1 V.

(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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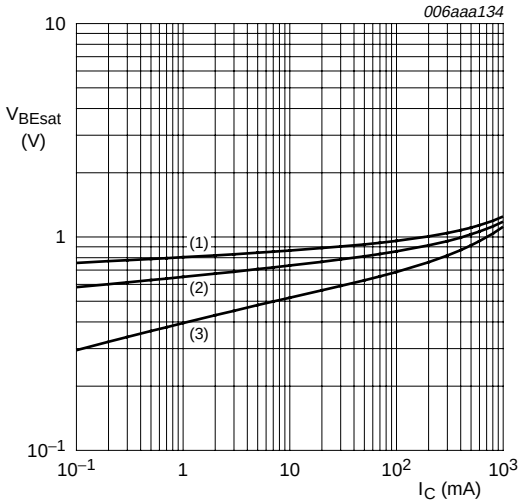


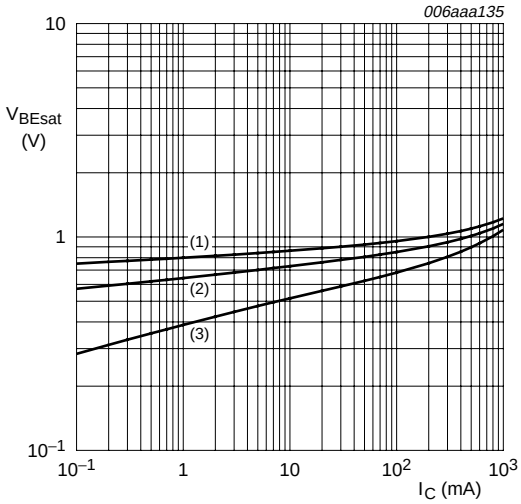
I_C/I_B = 10.

(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.



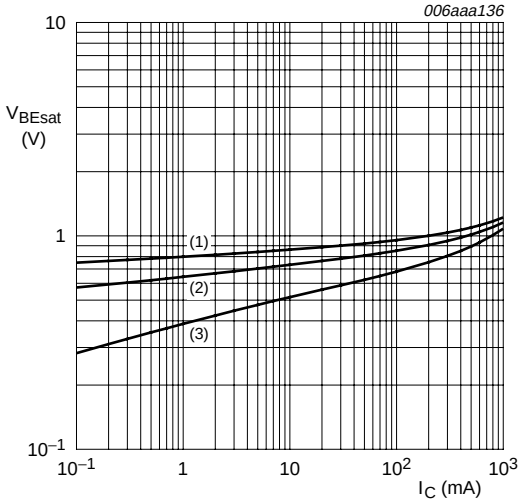
I_C/I_B = 10.

(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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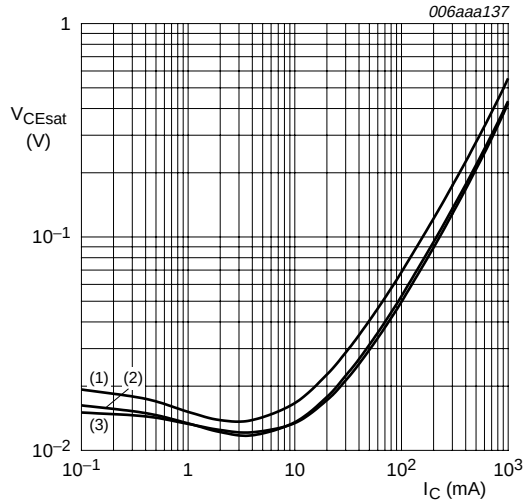


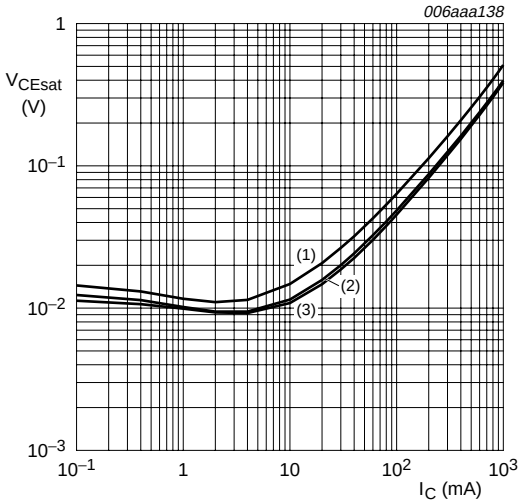
I_C/I_B = 10.

(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.



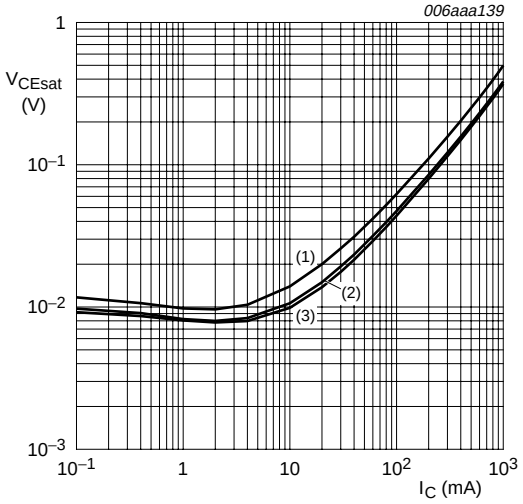
I_C/I_B = 10.

(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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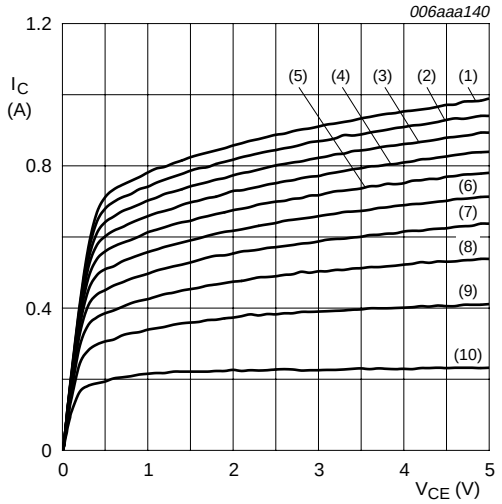
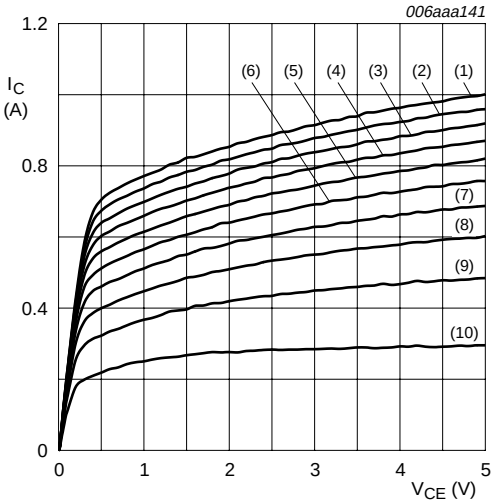


T_{amb} = 25 °C.

(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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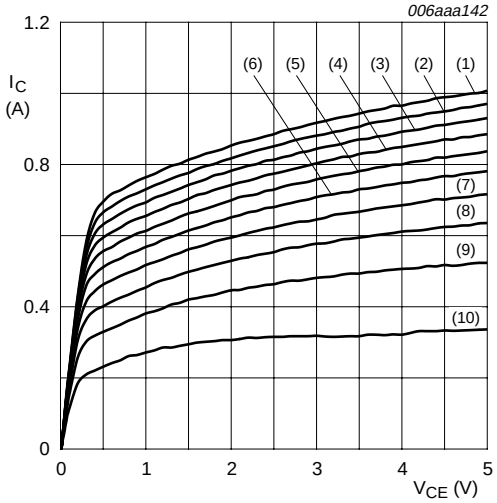

T_{amb} = 25 °C.

(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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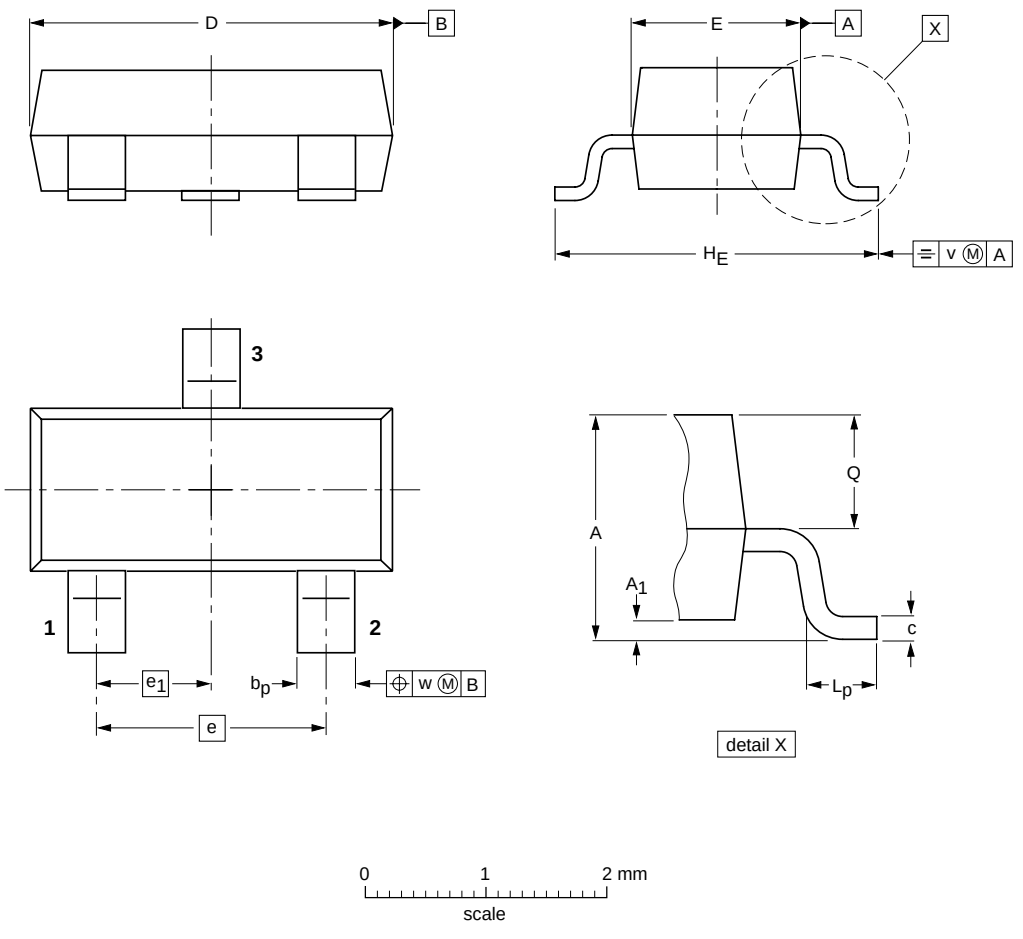
8. Package outline

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 0.9	0.1	0.48 0.38	0.15 0.09	3.0 2.8	1.4 1.2	1.9	0.95	2.5 2.1	0.45 0.15	0.55 0.45	0.2	0.1

OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	JEITA			
SOT23		TO-236AB				~~99-09-13~~ 04-11-04

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

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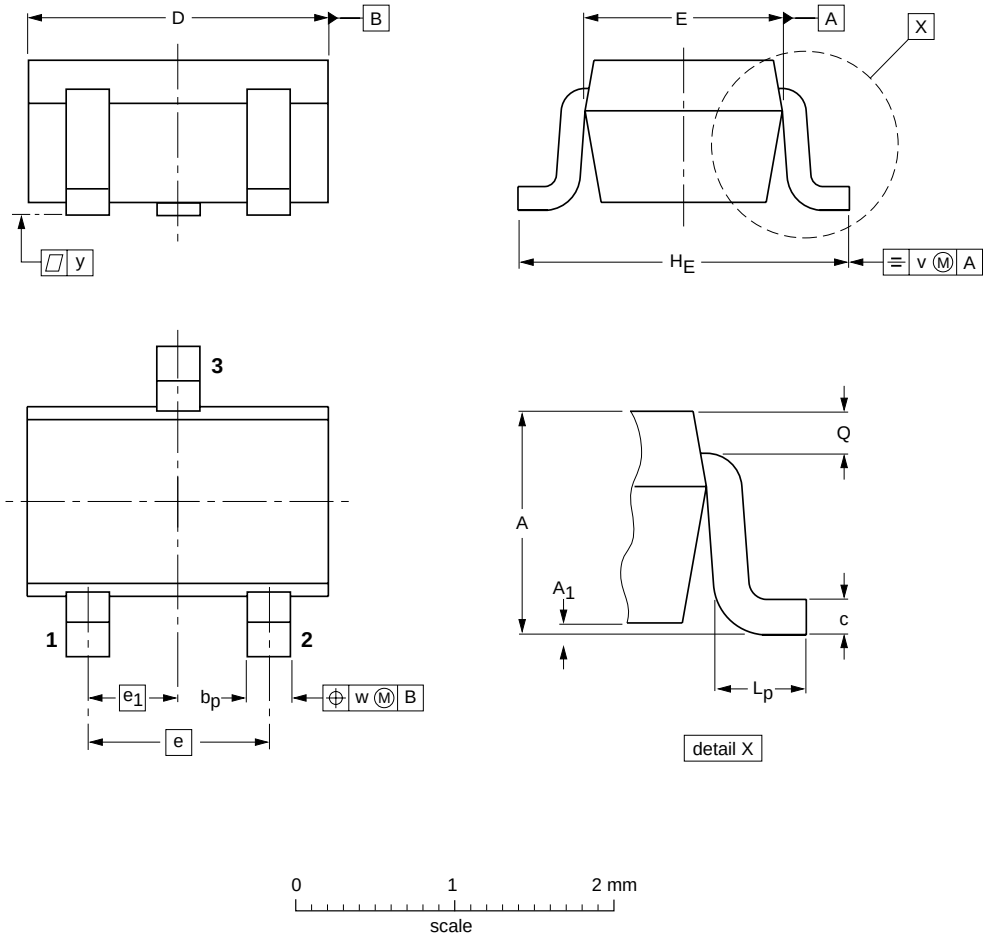
Plastic surface mounted package; 3 leads **SOT323**



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 0.8	0.1	0.4 0.3	0.25 0.10	2.2 1.8	1.35 1.15	1.3	0.65	2.2 2.0	0.45 0.15	0.23 0.13	0.2	0.2

OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	JEITA			
SOT323			SC-70			~~97-02-28~~ 04-11-04

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

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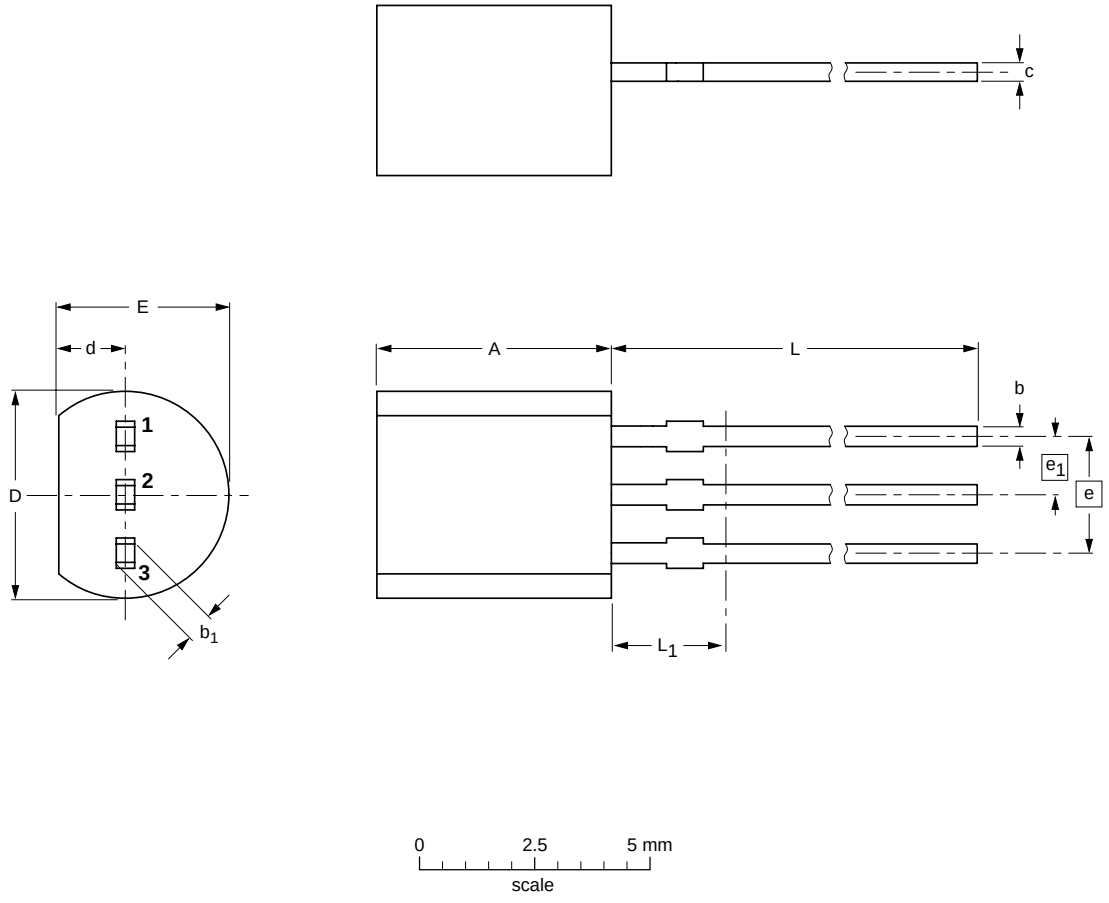
Plastic single-ended leaded (through hole) package; 3 leads **SOT54**



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 5.0	0.48 0.40	0.66 0.55	0.45 0.38	4.8 4.4	1.7 1.4	4.2 3.6	2.54	1.27	14.5 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~~ 04-11-16

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

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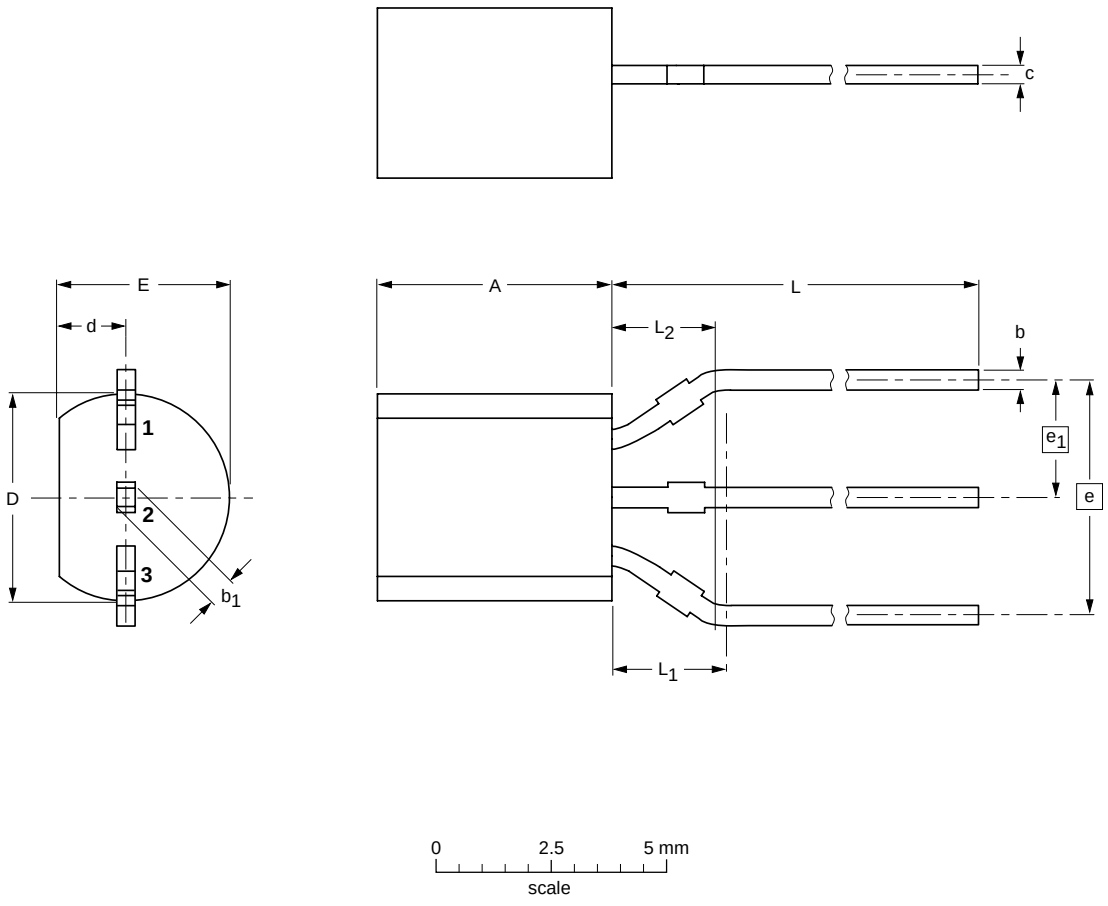
Plastic single-ended leaded (through hole) package; 3 leads (wide pitch) **SOT54A**



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 5.0	0.48 0.40	0.66 0.55	0.45 0.38	4.8 4.4	1.7 1.4	4.2 3.6	5.08	2.54	14.5 12.7	3	3 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~~ 04-06-28

Fig 16. Package outline SOT54A.

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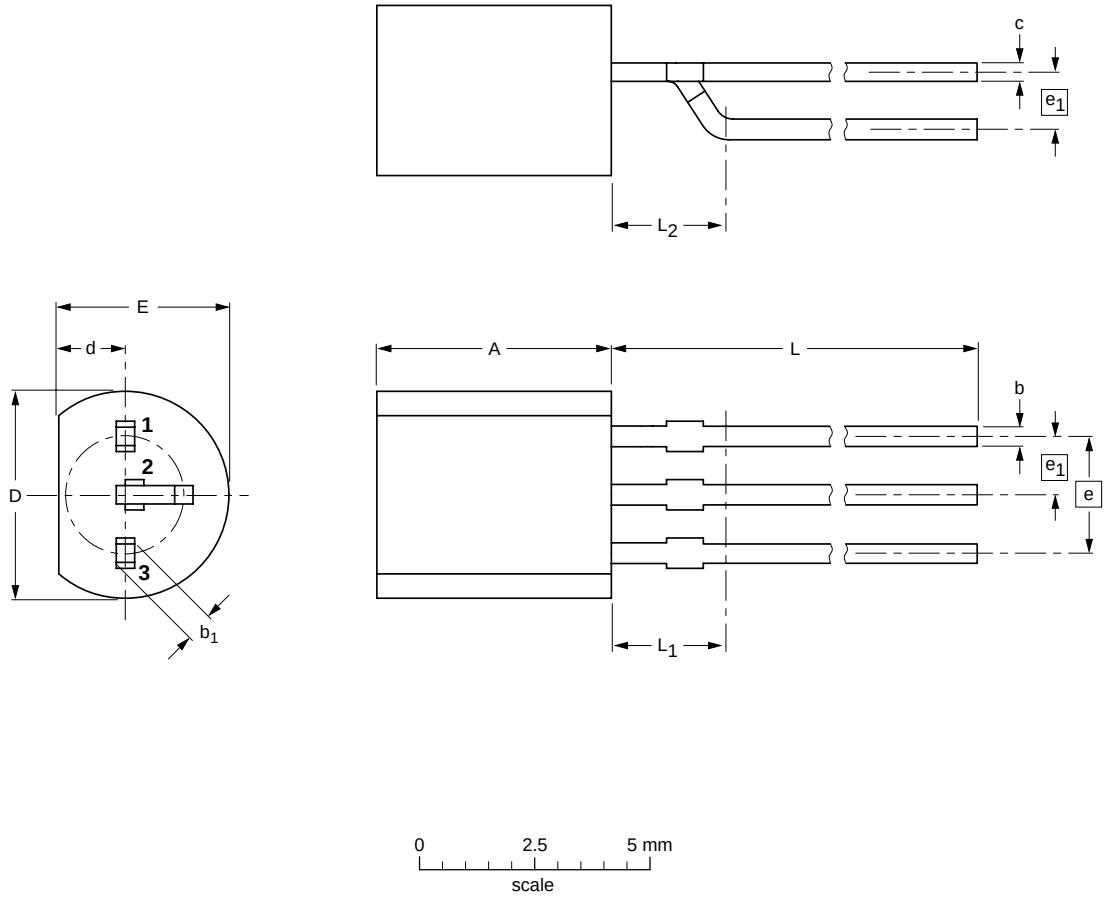
Plastic single-ended leaded (through hole) package; 3 leads (on-circle) **SOT54 variant**



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 5.0	0.48 0.40	0.66 0.55	0.45 0.38	4.8 4.4	1.7 1.4	4.2 3.6	2.54	1.27	14.5 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~~ 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 14.

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10. Revision history

Table 10: Revision history

Document ID	Release date	Data sheet status	Change notice	Doc. number	Supersedes
BC817_BC817W_BC337_5	20050121	Product data sheet	CPCN200302007F1	9397 750 14022	BC817_4; BC817W_SER_4; BC337_3
Modifications:	• The format of the data sheet has been redesigned to comply with the new presentation and information standard of Philips Semiconductors. • This data sheet is a combination of the previous data sheets BC817_4, BC817W_SER_4 and BC337_3. • Table 1 and 2 added • Table 3 Discrete pinning for SOT54A and SOT54 variant added • Table 5 Marking codes for BC337, BC337-16, BC337-25 and BC337-40 added • Table 8 Typical value for C_c changed to 3 pF according to CPCN200302007F1 • Figure 1, 2 and 3 amended • Figure 4, 5, 6, 7, 8, 9, 10, 11 and 12 added • Figure 15 changed according to CPCN200405006F • Figure 16 and 17 added • Section 9 added				
BC817_4	20040105	Product specification	-	9397 750 12394	BC817_3
BC817W_SER_4	20040225	Product specification	-	9397 750 11944	BC817W_SER_3
BC337_3	19990415	Product specification	-	9397 750 05676	BC337_338_CNV_2

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11. Data sheet status

Level	Data sheet status [1]	Product status [2] [3]	Definition
I	Objective data	Development	This data sheet contains data from the objective specification for product development. Philips Semiconductors reserves the right to change the specification in any manner without notice.
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[1] Please consult the most recently issued data sheet before initiating or completing a design.

[2] The product status of the device(s) described in this data sheet may have changed since this data sheet was published. The latest information is available on the Internet at URL http://www.semiconductors.philips.com.

[3] For data sheets describing multiple type numbers, the highest-level product status determines the data sheet status.

12. Definitions

Short-form specification — The data in a short-form specification is extracted from a full data sheet with the same type number and title. For detailed information see the relevant data sheet or data handbook.

Limiting values definition — Limiting values given are in accordance with the Absolute Maximum Rating System (IEC 60134). Stress above one or more of the limiting values may cause permanent damage to the device. These are stress ratings only and operation of the device at these or at any other conditions above those given in the Characteristics sections of the specification is not implied. Exposure to limiting values for extended periods may affect device reliability.

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