

# BC847/BC547 series

45 V, 100 mA NPN general-purpose transistors

Rev. 06 — 19 May 2005

Product data sheet

## 1. Product profile

### 1.1 General description

NPN general-purpose transistors.

Table 1: Product overview

Type number <sup>[1]</sup>	Package		PNP complement
	Philips	JEITA	
BC847	SOT23	-	BC857
BC847W	SOT323	SC-70	BC857W
BC847T	SOT416	SC-75	BC857T
BC847AM	SOT883	SC-101	BC857AM
BC847BM	SOT883	SC-101	BC857BM
BC847CM	SOT883	SC-101	BC857CM
BC547 <sup>[2]</sup>	SOT54	SC-43A	BC557

[1] Valid for all available selection groups.

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

### 1.2 Features

- Low current
- Low voltage
- Three different gain selections

### 1.3 Applications

- General-purpose switching and amplification

### 1.4 Quick reference data

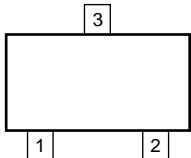
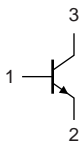
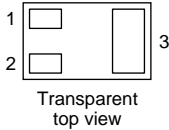
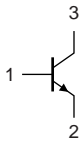
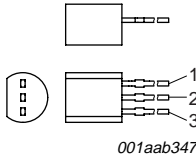
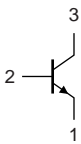
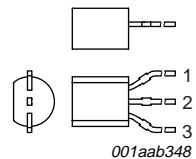
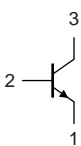
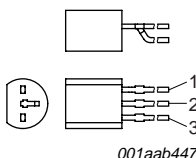
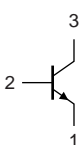
Table 2: Quick reference data

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$V_{CE0}$	collector-emitter voltage	open base	-	-	45	V
$I_C$	collector current (DC)		-	-	100	mA
$h_{FE}$	DC current gain	$V_{CE} = 5\text{ V};$ $I_C = 2\text{ mA}$	110	-	800	
	$h_{FE}$ group A		110	180	220	
	$h_{FE}$ group B		200	290	450	
	$h_{FE}$ group C		420	520	800	

**PHILIPS**

## 2. Pinning information

Table 3: Pinning

Pin	Description	Simplified outline	Symbol
<b>SOT23, SOT323, SOT416</b>			
1	base	 <p>006aaa144</p>	 <p>sym021</p>
2	emitter		
3	collector		
<b>SOT883</b>			
1	base	 <p>Transparent top view</p>	 <p>sym021</p>
2	emitter		
3	collector		
<b>SOT54</b>			
1	emitter	 <p>001aab347</p>	 <p>sym026</p>
2	base		
3	collector		
<b>SOT54A</b>			
1	emitter	 <p>001aab348</p>	 <p>sym026</p>
2	base		
3	collector		
<b>SOT54 variant</b>			
1	emitter	 <p>001aab447</p>	 <p>sym026</p>
2	base		
3	collector		

### 3. Ordering information

Table 4: Ordering information

Type number <sup>[1]</sup>	Package		
	Name	Description	Version
BC847	-	plastic surface mounted package; 3 leads	SOT23
BC847W	SC-70	plastic surface mounted package; 3 leads	SOT323
BC847T	SC-75	plastic surface mounted package; 3 leads	SOT416
BC847AM	SC-101	leadless ultra small plastic package; 3 solder lands; body 1.0 × 0.6 × 0.5 mm	SOT883
BC847BM			
BC847CM			
BC547 <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 SOT54 and SOT54 variant packages (see [Section 2](#) and [Section 9](#)).

### 4. Marking

Table 5: Marking codes

Type number	Marking code <sup>[1]</sup>	Type number	Marking code <sup>[1]</sup>
BC847	1H*	BC847AT	1E
BC847A	1E*	BC847BT	1F
BC847B	1F*	BC847CT	1G
BC847C	1G*	BC847AM	D4
BC847W	1H*	BC847BM	D5
BC847AW	1E*	BC847CM	D6
BC847BW	1F*	BC547	C547
BC847CW	1G*	BC547B	C547B
BC847T	1N	BC547C	C547C

[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	-	45	V
$V_{EBO}$	emitter-base voltage	open collector	-	6	V
$I_C$	collector current (DC)		-	100	mA
$I_{CM}$	peak collector current	single pulse; $t_p \leq 1$ ms	-	200	mA
$I_{BM}$	peak base current	single pulse; $t_p \leq 1$ ms	-	100	mA
$P_{tot}$	total power dissipation	$T_{amb} \leq 25$ °C			
	SOT23		[1] -	250	mW
	SOT323		[1] -	200	mW
	SOT416		[1] -	150	mW
	SOT883		[2] [3] -	250	mW
	SOT54		[1] -	500	mW
$T_{stg}$	storage temperature		-65	+150	°C
$T_j$	junction temperature		-	150	°C
$T_{amb}$	ambient temperature		-65	+150	°C

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

[2] Reflow soldering is the only recommended soldering method.

[3] Device mounted on an FR4 PCB with 60 µm copper strip line, standard footprint.

## 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				
	SOT23		[1] -	-	500	K/W
	SOT323		[1] -	-	625	K/W
	SOT416		[1] -	-	833	K/W
	SOT883		[2] [3] -	-	500	K/W
	SOT54		[1] -	-	250	K/W

[1] Device mounted on an FR4 PCB, single-sided copper, tin-plated and standard footprint.

[2] Reflow soldering is the only recommended soldering method.

[3] Device mounted on an FR4 PCB with 60 µm copper strip line, standard footprint.

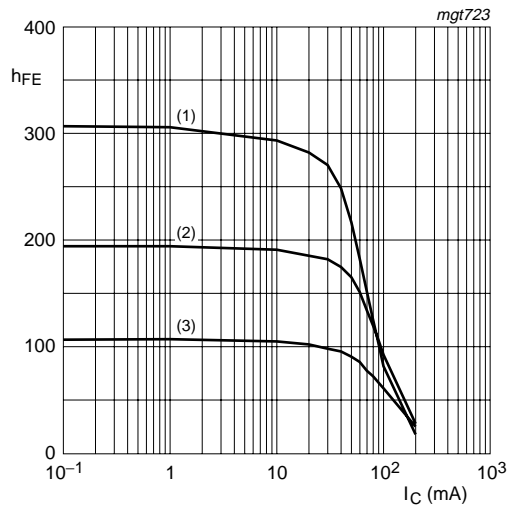
## 7. Characteristics

**Table 8: Characteristics**
*T<sub>amb</sub> = 25 °C unless otherwise specified.*

Symbol	Parameter	Conditions	Min	Typ	Max	Unit	
I <sub>CBO</sub>	collector-base cut-off current	V <sub>CB</sub> = 30 V; I <sub>E</sub> = 0 A	-	-	15	nA	
		V <sub>CB</sub> = 30 V; I <sub>E</sub> = 0 A; T <sub>j</sub> = 150 °C	-	-	5	μA	
I <sub>EBO</sub>	emitter-base cut-off current	V <sub>EB</sub> = 5 V; I <sub>E</sub> = 0 A	-	-	100	nA	
h <sub>FE</sub>	DC current gain						
	h <sub>FE</sub> group A	V <sub>CE</sub> = 5 V; I <sub>C</sub> = 10 μA	-	90	-		
	h <sub>FE</sub> group B	V <sub>CE</sub> = 5 V; I <sub>C</sub> = 10 μA	-	150	-		
	h <sub>FE</sub> group C	V <sub>CE</sub> = 5 V; I <sub>C</sub> = 10 μA	-	270	-		
	DC current gain	V <sub>CE</sub> = 5 V; I <sub>C</sub> = 2 mA	110	-	800		
	h <sub>FE</sub> group A	V <sub>CE</sub> = 5 V; I <sub>C</sub> = 2 mA	110	180	220		
	h <sub>FE</sub> group B	V <sub>CE</sub> = 5 V; I <sub>C</sub> = 2 mA	200	290	450		
h <sub>FE</sub> group C	V <sub>CE</sub> = 5 V; I <sub>C</sub> = 2 mA	420	520	800			
V <sub>CEsat</sub>	collector-emitter saturation voltage	I <sub>C</sub> = 10 mA; I <sub>B</sub> = 0.5 mA	-	90	200	mV	
		I <sub>C</sub> = 100 mA; I <sub>B</sub> = 5 mA	[1]	200	400	mV	
V <sub>BEsat</sub>	base-emitter saturation voltage	I <sub>C</sub> = 10 mA; I <sub>B</sub> = 0.5 mA	[2]	700	-	mV	
		I <sub>C</sub> = 100 mA; I <sub>B</sub> = 5 mA	[2]	900	-	mV	
V <sub>BE</sub>	base-emitter voltage	I <sub>C</sub> = 2 mA; V <sub>CE</sub> = 5 V	[2]	580	660	700	mV
		I <sub>C</sub> = 10 mA; V <sub>CE</sub> = 5 V	-	-	770	mV	
C <sub>C</sub>	collector capacitance	I <sub>E</sub> = i <sub>e</sub> = 0 A; V <sub>CB</sub> = 10 V; f = 1 MHz	-	-	1.5	pF	
C <sub>e</sub>	emitter capacitance	I <sub>C</sub> = i <sub>c</sub> = 0 A; V <sub>EB</sub> = 0.5 V; f = 1 MHz	-	11	-	pF	
f <sub>T</sub>	transition frequency	I <sub>C</sub> = 10 mA; V <sub>CE</sub> = 5 V; f = 100 MHz	100	-	-	MHz	
F	noise figure	I <sub>C</sub> = 200 μA; V <sub>CE</sub> = 5 V; R <sub>S</sub> = 2 kΩ; f = 1 kHz; B = 200 Hz	-	2	10	dB	

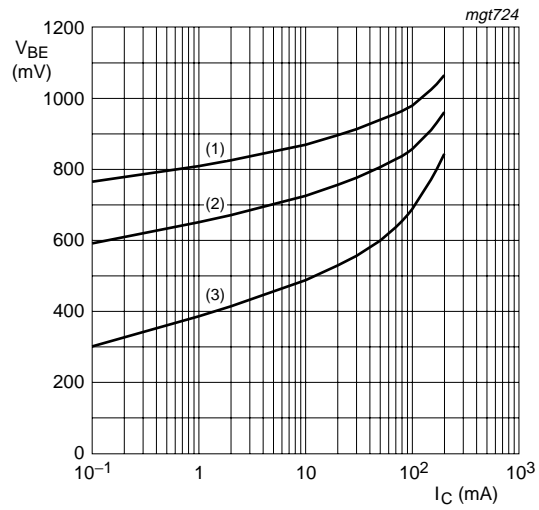
[1] Pulse test: t<sub>p</sub> ≤ 300 μs; δ ≤ 0.02.

[2] V<sub>BE</sub> decreases by approximately 2 mV/K with increasing temperature.



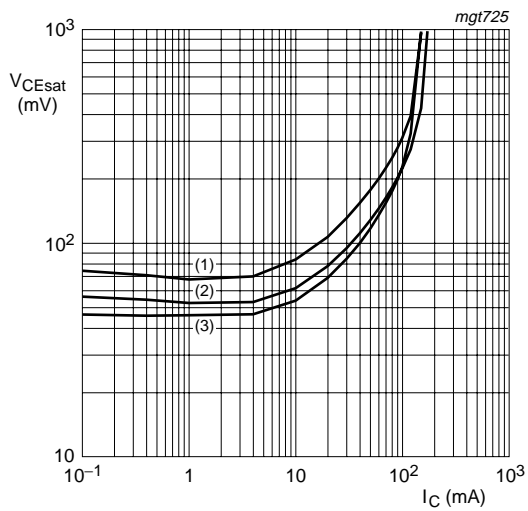
$V_{CE} = 5 \text{ V}$   
 (1)  $T_{amb} = 150 \text{ }^\circ\text{C}$   
 (2)  $T_{amb} = 25 \text{ }^\circ\text{C}$   
 (3)  $T_{amb} = -55 \text{ }^\circ\text{C}$

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



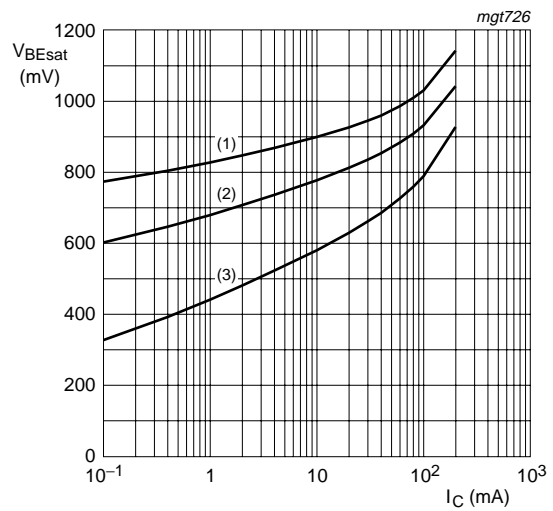
$V_{CE} = 5 \text{ V}$   
 (1)  $T_{amb} = -55 \text{ }^\circ\text{C}$   
 (2)  $T_{amb} = 25 \text{ }^\circ\text{C}$   
 (3)  $T_{amb} = 150 \text{ }^\circ\text{C}$

**Fig 2. Selection A: Base-emitter voltage as a function of collector current; typical values**



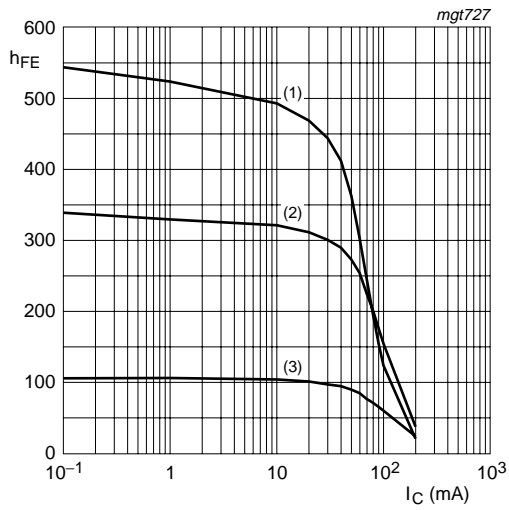
$I_C/I_B = 20$   
 (1)  $T_{amb} = 150 \text{ }^\circ\text{C}$   
 (2)  $T_{amb} = 25 \text{ }^\circ\text{C}$   
 (3)  $T_{amb} = -55 \text{ }^\circ\text{C}$

**Fig 3. Selection A: Collector-emitter saturation voltage as a function of collector current; typical values**



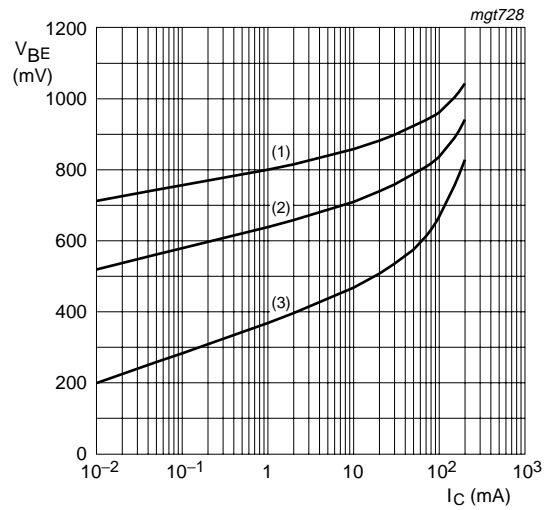
$I_C/I_B = 10$   
 (1)  $T_{amb} = -55 \text{ }^\circ\text{C}$   
 (2)  $T_{amb} = 25 \text{ }^\circ\text{C}$   
 (3)  $T_{amb} = 150 \text{ }^\circ\text{C}$

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



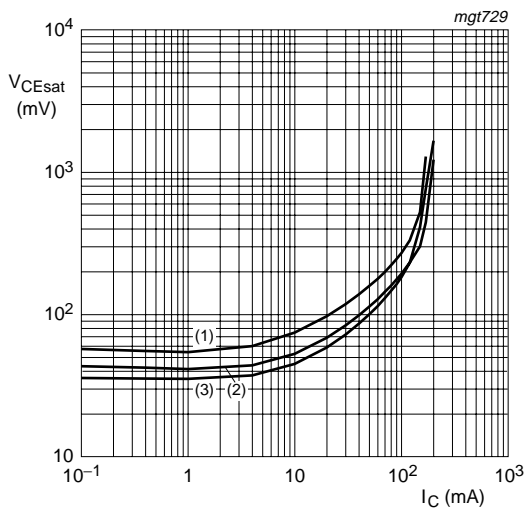
$V_{CE} = 5 \text{ V}$   
 (1)  $T_{amb} = 150 \text{ }^\circ\text{C}$   
 (2)  $T_{amb} = 25 \text{ }^\circ\text{C}$   
 (3)  $T_{amb} = -55 \text{ }^\circ\text{C}$

**Fig 5. Selection B: DC current gain as a function of collector current; typical values**



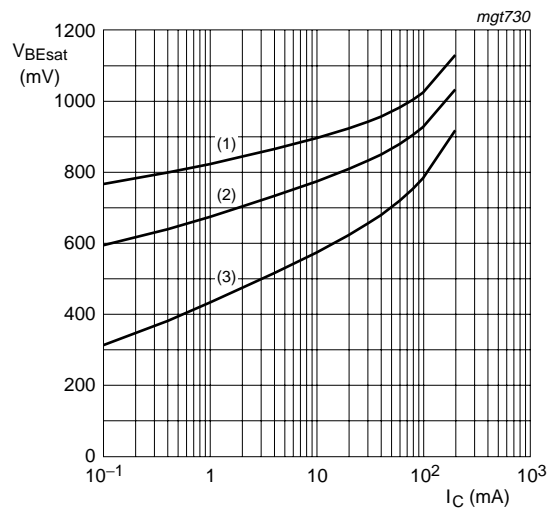
$V_{CE} = 5 \text{ V}$   
 (1)  $T_{amb} = -55 \text{ }^\circ\text{C}$   
 (2)  $T_{amb} = 25 \text{ }^\circ\text{C}$   
 (3)  $T_{amb} = 150 \text{ }^\circ\text{C}$

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



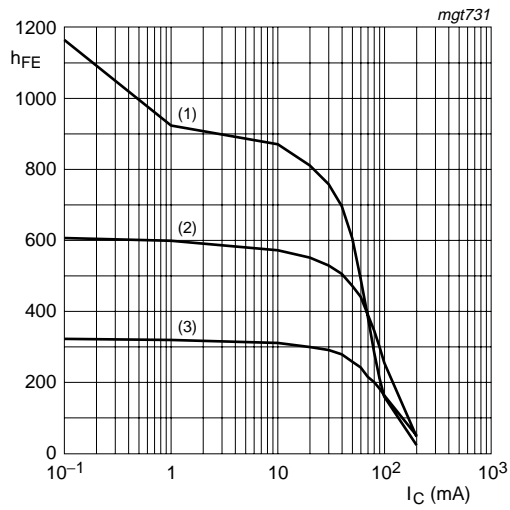
$I_C/I_B = 20$   
 (1)  $T_{amb} = 150 \text{ }^\circ\text{C}$   
 (2)  $T_{amb} = 25 \text{ }^\circ\text{C}$   
 (3)  $T_{amb} = -55 \text{ }^\circ\text{C}$

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



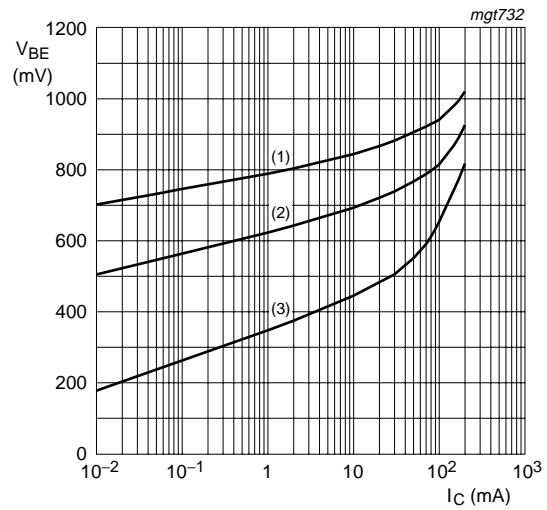
$I_C/I_B = 10$   
 (1)  $T_{amb} = -55 \text{ }^\circ\text{C}$   
 (2)  $T_{amb} = 25 \text{ }^\circ\text{C}$   
 (3)  $T_{amb} = 150 \text{ }^\circ\text{C}$

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



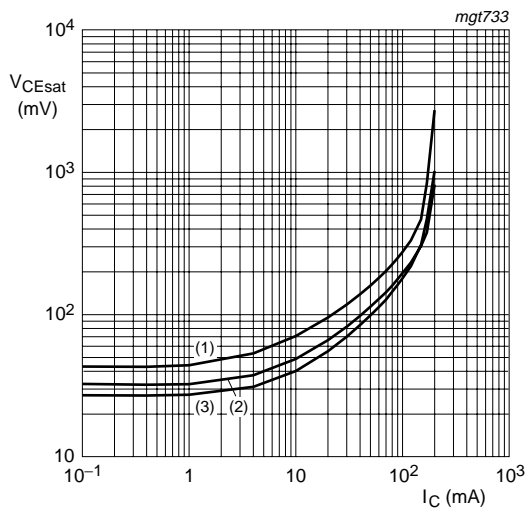
$V_{CE} = 5 \text{ V}$   
 (1)  $T_{amb} = 150 \text{ }^\circ\text{C}$   
 (2)  $T_{amb} = 25 \text{ }^\circ\text{C}$   
 (3)  $T_{amb} = -55 \text{ }^\circ\text{C}$

**Fig 9. Selection C: DC current gain as a function of collector current; typical values**



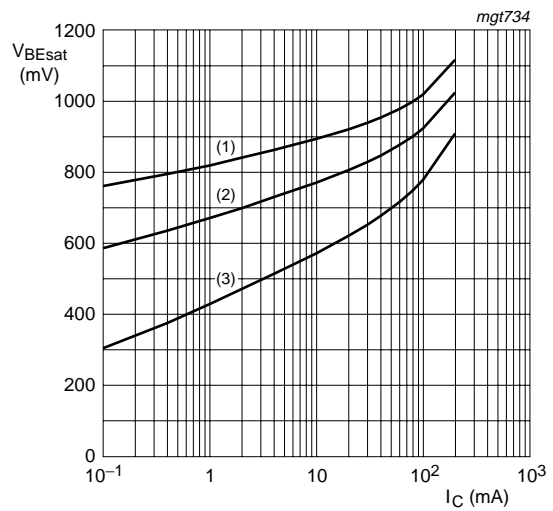
$V_{CE} = 5 \text{ V}$   
 (1)  $T_{amb} = -55 \text{ }^\circ\text{C}$   
 (2)  $T_{amb} = 25 \text{ }^\circ\text{C}$   
 (3)  $T_{amb} = 150 \text{ }^\circ\text{C}$

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



$I_C/I_B = 20$   
 (1)  $T_{amb} = 150 \text{ }^\circ\text{C}$   
 (2)  $T_{amb} = 25 \text{ }^\circ\text{C}$   
 (3)  $T_{amb} = -55 \text{ }^\circ\text{C}$

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

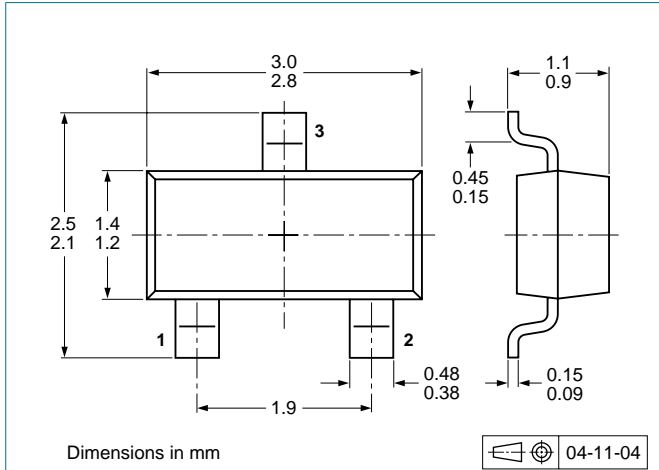


$I_C/I_B = 10$   
 (1)  $T_{amb} = -55 \text{ }^\circ\text{C}$   
 (2)  $T_{amb} = 25 \text{ }^\circ\text{C}$   
 (3)  $T_{amb} = 150 \text{ }^\circ\text{C}$

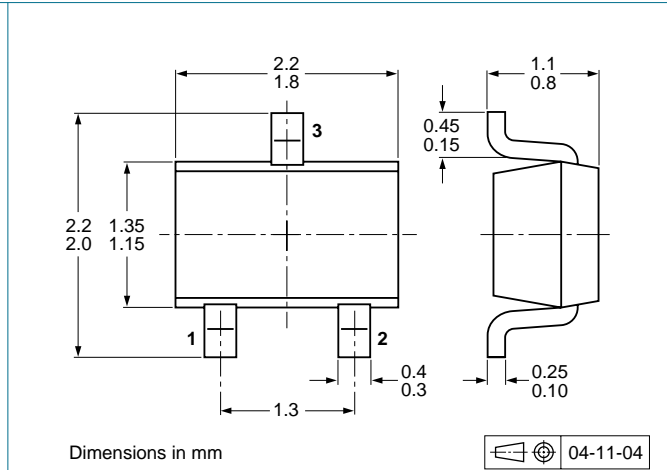
**Fig 12. Selection C: Base-emitter saturation voltage as a function of collector current; typical values**



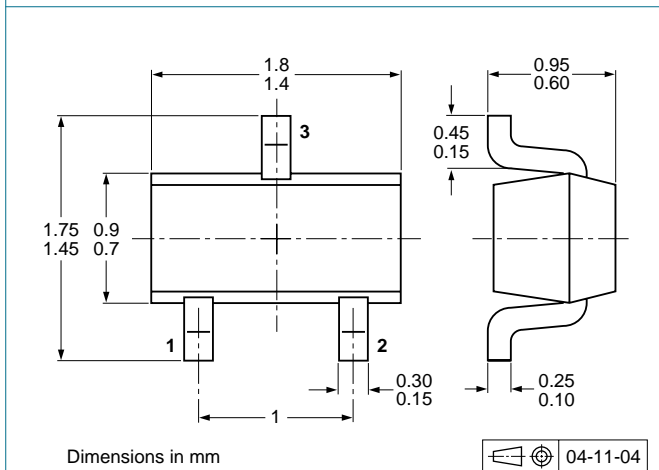
**8. Package outline**



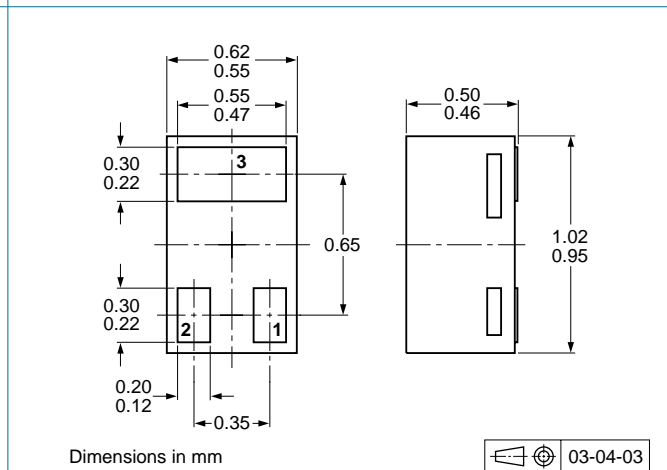
**Fig 13. Package outline SOT23 (TO-236AB)**



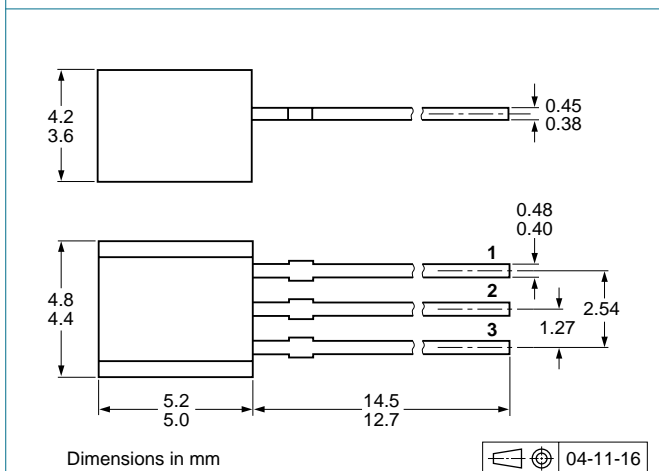
**Fig 14. Package outline SOT323 (SC-70)**



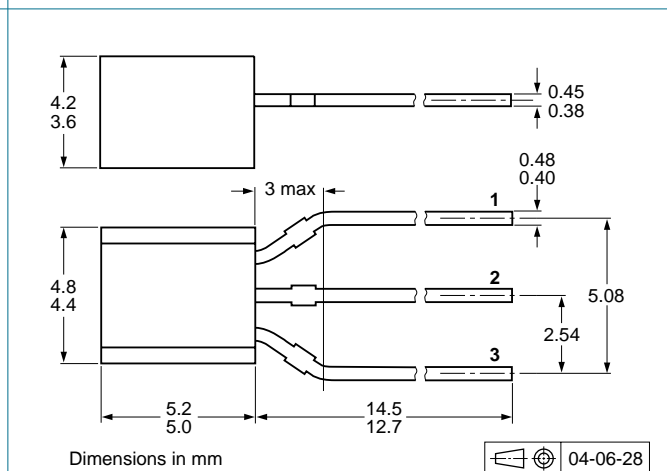
**Fig 15. Package outline SOT416 (SC-75)**



**Fig 16. Package outline SOT883 (SC-101)**



**Fig 17. Package outline SOT54 (SC-43A/TO-92)**



**Fig 18. Package outline SOT54A**

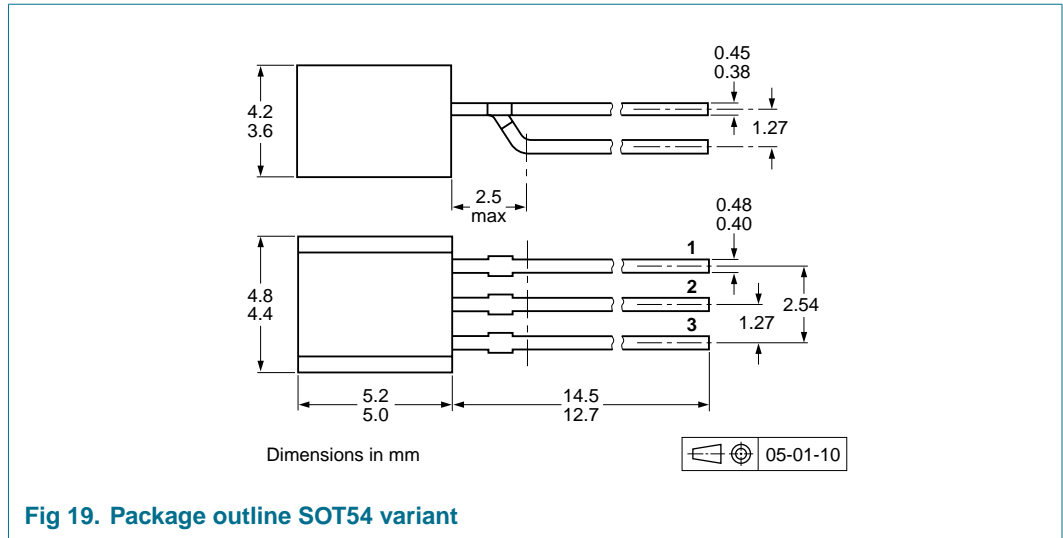


Fig 19. Package outline SOT54 variant

## 9. Packing information

**Table 9: Packing methods**

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

Type number [2]	Package	Description	Packing quantity		
			3000	5000	10000
BC847	SOT23	4 mm pitch, 8 mm tape and reel	-215	-	-235
BC847W	SOT323	4 mm pitch, 8 mm tape and reel	-115	-	-135
BC847T	SOT416	4 mm pitch, 8 mm tape and reel	-115	-	-135
BC847AM	SOT883	2 mm pitch, 8 mm tape and reel	-	-	-315
BC847BM					
BC847CM					
BC547	SOT54	bulk, straight leads	-	-412	-
	SOT54A	tape and reel, wide pitch	-	-	-116
		tape ammpack, wide pitch	-	-	-126
	SOT54 variant	bulk, delta pinning	-	-112	-

[1] For further information and the availability of packing methods, see [Section 15](#).

[2] Valid for all available selection groups.

## 10. Revision history

Table 10: Revision history

Document ID	Release date	Data sheet status	Change notice	Doc. number	Supersedes
BC847_BC547_SER_6	20050519	Product data sheet	-	9397 750 14609	BC846_BC847_ BC848_5, BC847M_SERIES_2, BC846T_847T_ SERIES_3, BC846W_BC847W_ BC848W_4, BC546_547_4
<p>Modifications:</p> <ul style="list-style-type: none"> <li>The format of this data sheet has been redesigned to comply with the new presentation and information standard of Philips Semiconductors.</li> <li>This data sheet is a type combination out of the previous data sheets BC846_BC847_BC848_5, BC847M_SERIES_2, BC846T_847T_SERIES_3, BC846W_BC847W_BC848W_4 and BC546_547_4.</li> </ul>					
BC846_BC847_BC848_5	20040206	Product specification	-	9397 750 12395	BC846_BC847_ BC848_4
BC847M_SERIES_2	20040310	Product specification	-	9397 750 12838	BC847M_SERIES_1
BC846T_847T_SERIES_3	20001115	Product specification	-	9397 750 07524	BC846T_847T_2
BC846W_BC847W_ BC848W_4	20020204	Product specification	-	9397 750 09166	BC846W_847W_3
BC546_547_4	20041125	Product specification	-	9397 750 13568	BC546_547_3

## 11. Data sheet status

Level	Data sheet status <sup>[1]</sup>	Product status <sup>[2] [3]</sup>	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.
II	Preliminary data	Qualification	This data sheet contains data from the preliminary specification. Supplementary data will be published at a later date. Philips Semiconductors reserves the right to change the specification without notice, in order to improve the design and supply the best possible product.
III	Product data	Production	This data sheet contains data from the product specification. Philips Semiconductors reserves the right to make changes at any time in order to improve the design, manufacturing and supply. Relevant changes will be communicated via a Customer Product/Process Change Notification (CPCN).

[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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## 15. Contact information

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