

# BC847 series

45 V, 100 mA NPN general-purpose transistors

Rev. 8 — 20 August 2012

Product data sheet

## 1. Product profile

### 1.1 General description

NPN general-purpose transistors in Surface-Mounted Device (SMD) plastic packages.

Table 1. Product overview

Type number <sup>[1]</sup>	Package			PNP complement
	NXP	JEITA	JEDEC	
BC847	SOT23	-	TO-236AB	BC857
BC847A				BC857A
BC847B				BC857B
BC847C				BC857C
BC847W	SOT323	SC-70	-	BC857W
BC847AW				BC857AW
BC847BW				BC857BW
BC847CW				BC857CW
BC847T	SOT416	SC-75	-	BC857T
BC847AT				BC857AT
BC847BT				BC857BT
BC847CT				BC857CT
BC847AM	SOT883	SC-101	-	BC857AM
BC847BM				BC857BM
BC847CM				BC857CM

[1] Valid for all available selection groups.

### 1.2 Features and benefits

- General-purpose transistors
- SMD plastic packages
- Three different gain selections

### 1.3 Applications

- General-purpose switching and amplification



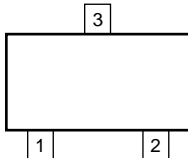
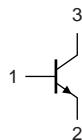
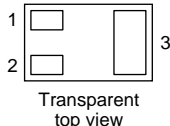
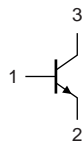
1.4 Quick reference data

Table 2. Quick reference data

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$V_{CEO}$	collector-emitter voltage	open base	-	-	45	V
$I_C$	collector current		-	-	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	

2. Pinning information

Table 3. Pinning

Pin	Description	Simplified outline	Graphic symbol
SOT23, SOT323, SOT416			
1	base	 006aaa144	 sym021
2	emitter		
3	collector		
SOT883			
1	base	 Transparent top view	 sym021
2	emitter		
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
BC847A			
BC847B			
BC847C			
BC847W	SC-70	plastic surface-mounted package; 3 leads	SOT323
BC847AW			
BC847BW			
BC847CW			
BC847T	SC-75	plastic surface-mounted package; 3 leads	SOT416
BC847AT			
BC847BT			
BC847CT			
BC847AM	SC-101	leadless ultra small plastic package; 3 solder lands; body 1.0 × 0.6 × 0.5 mm	SOT883
BC847BM			
BC847CM			

[1] Valid for all available selection groups.

### 4. Marking

Table 5. Marking codes

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

[1] \* = placeholder for manufacturing site code

## 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		-	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	[1]		
	SOT23		-	250	mW
	SOT323		-	200	mW
	SOT416		-	150	mW
	SOT883		[2]	250	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] 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	[1]			
	SOT23		-	-	500	K/W
	SOT323		-	-	625	K/W
	SOT416		-	-	833	K/W
	SOT883		[2]	-	500	K/W

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

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

## 7. Characteristics

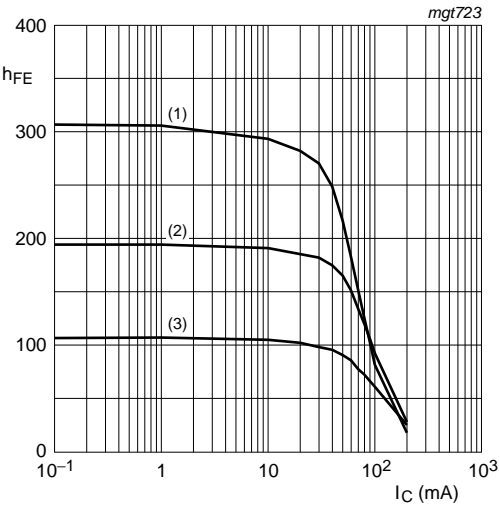
**Table 8. Characteristics**

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

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$I_{CBO}$	collector-base cut-off current	$V_{CB} = 30\text{ V}; I_E = 0\text{ A}$	-	-	15	nA
		$V_{CB} = 30\text{ V}; I_E = 0\text{ A}; T_j = 150\text{ }^{\circ}\text{C}$	-	-	5	$\mu\text{A}$
$I_{EBO}$	emitter-base cut-off current	$V_{EB} = 5\text{ V}; I_C = 0\text{ A}$	-	-	100	nA
$h_{FE}$	DC current gain	$V_{CE} = 5\text{ V}; I_C = 10\text{ }\mu\text{A}$				
	$h_{FE}$ group A		-	90	-	
	$h_{FE}$ group B		-	150	-	
	$h_{FE}$ group C		-	270	-	
	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	
$V_{CEsat}$	collector-emitter saturation voltage	$I_C = 10\text{ mA}; I_B = 0.5\text{ mA}$	-	90	200	mV
		$I_C = 100\text{ mA}; I_B = 5\text{ mA}$	[1] -	200	400	mV
$V_{BEsat}$	base-emitter saturation voltage	$I_C = 10\text{ mA}; I_B = 0.5\text{ mA}$	[2] -	700	-	mV
		$I_C = 100\text{ mA}; I_B = 5\text{ mA}$	[2] -	900	-	mV
$V_{BE}$	base-emitter voltage	$I_C = 2\text{ mA}; V_{CE} = 5\text{ V}$	[2] 580	660	700	mV
		$I_C = 10\text{ mA}; V_{CE} = 5\text{ V}$	-	-	770	mV
$f_T$	transition frequency	$V_{CE} = 5\text{ V}; I_C = 10\text{ mA}; f = 100\text{ MHz}$	100	-	-	MHz
$C_c$	collector capacitance	$V_{CB} = 10\text{ V}; I_E = i_e = 0\text{ A}; f = 1\text{ MHz}$	-	-	1.5	pF
$C_e$	emitter capacitance	$V_{EB} = 0.5\text{ V}; I_C = i_c = 0\text{ A}; f = 1\text{ MHz}$	-	11	-	pF
NF	noise figure	$I_C = 200\text{ }\mu\text{A}; V_{CE} = 5\text{ V}; R_S = 2\text{ k}\Omega; f = 1\text{ kHz}; B = 200\text{ Hz}$	-	2	10	dB

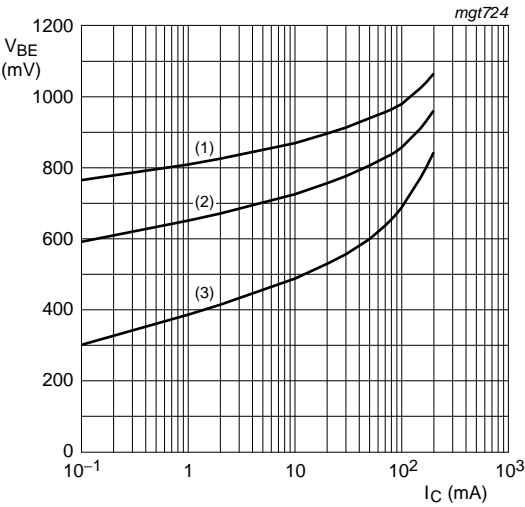
[1] Pulse test:  $t_p \leq 300\text{ }\mu\text{s}; \delta = 0.02$ .

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



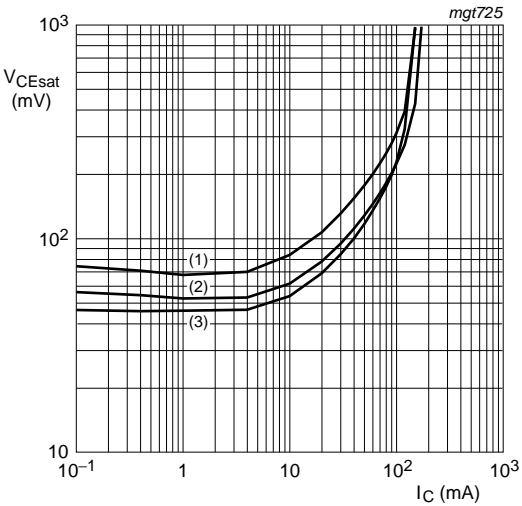
$V_{CE} = 5\text{ V}$   
(1)  $T_{amb} = 150^\circ\text{C}$   
(2)  $T_{amb} = 25^\circ\text{C}$   
(3)  $T_{amb} = -55^\circ\text{C}$

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



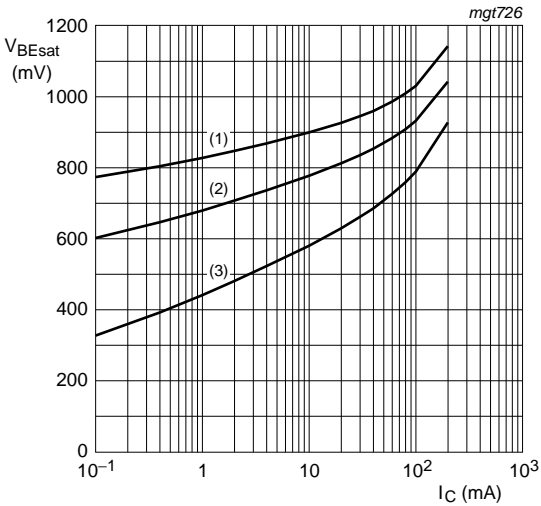
$V_{CE} = 5\text{ V}$   
(1)  $T_{amb} = -55^\circ\text{C}$   
(2)  $T_{amb} = 25^\circ\text{C}$   
(3)  $T_{amb} = 150^\circ\text{C}$

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



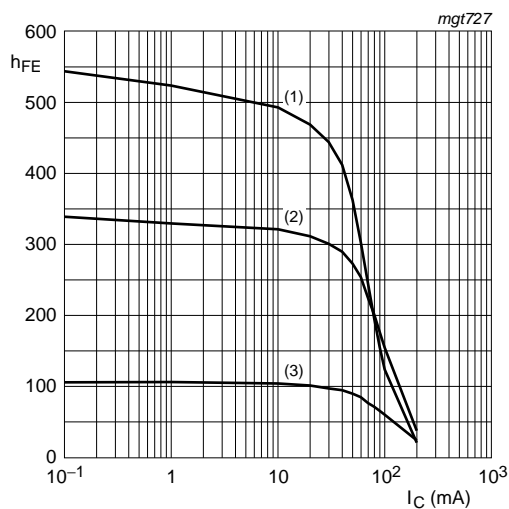
$I_C/I_B = 20$   
(1)  $T_{amb} = 150^\circ\text{C}$   
(2)  $T_{amb} = 25^\circ\text{C}$   
(3)  $T_{amb} = -55^\circ\text{C}$

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



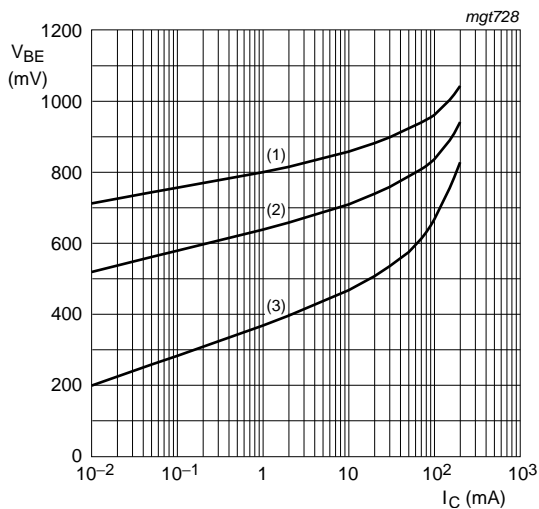
$I_C/I_B = 10$   
(1)  $T_{amb} = -55^\circ\text{C}$   
(2)  $T_{amb} = 25^\circ\text{C}$   
(3)  $T_{amb} = 150^\circ\text{C}$

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



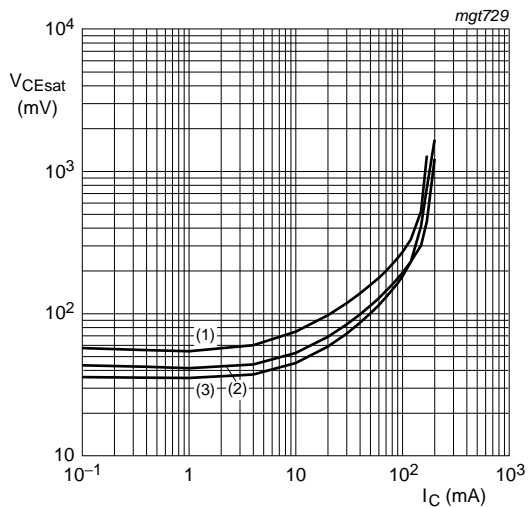
$V_{CE} = 5\text{ V}$   
(1)  $T_{amb} = 150\text{ }^{\circ}\text{C}$   
(2)  $T_{amb} = 25\text{ }^{\circ}\text{C}$   
(3)  $T_{amb} = -55\text{ }^{\circ}\text{C}$

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



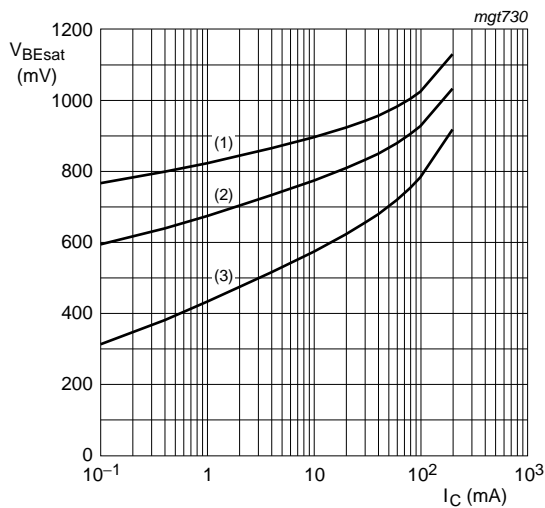
$V_{CE} = 5\text{ V}$   
(1)  $T_{amb} = -55\text{ }^{\circ}\text{C}$   
(2)  $T_{amb} = 25\text{ }^{\circ}\text{C}$   
(3)  $T_{amb} = 150\text{ }^{\circ}\text{C}$

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



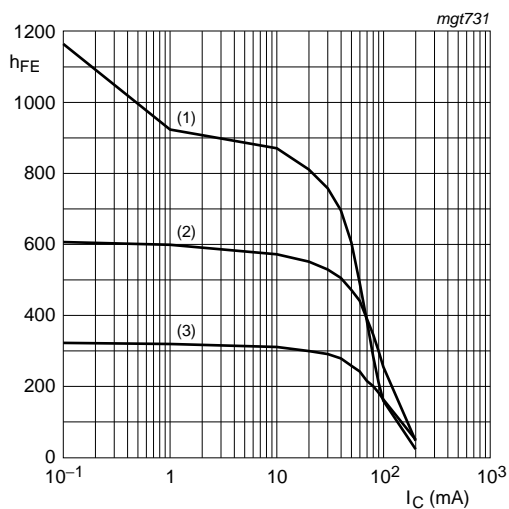
$I_C/I_B = 20$   
(1)  $T_{amb} = 150\text{ }^{\circ}\text{C}$   
(2)  $T_{amb} = 25\text{ }^{\circ}\text{C}$   
(3)  $T_{amb} = -55\text{ }^{\circ}\text{C}$

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



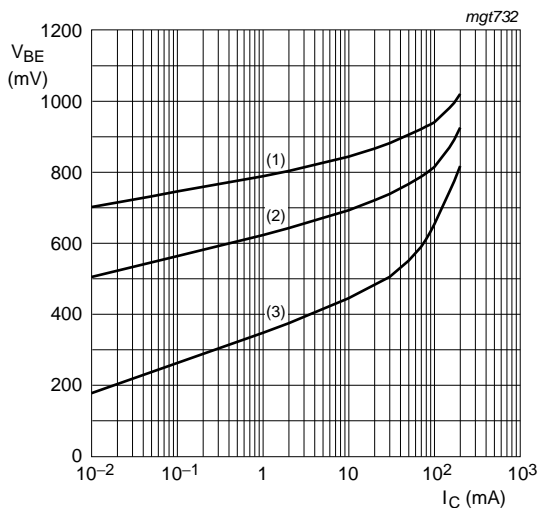
$I_C/I_B = 10$   
(1)  $T_{amb} = -55\text{ }^{\circ}\text{C}$   
(2)  $T_{amb} = 25\text{ }^{\circ}\text{C}$   
(3)  $T_{amb} = 150\text{ }^{\circ}\text{C}$

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



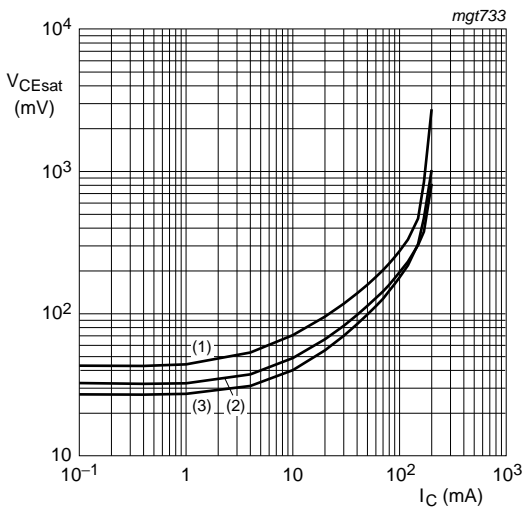
- $V_{CE} = 5\text{ V}$
- (1)  $T_{amb} = 150\text{ }^{\circ}\text{C}$
  - (2)  $T_{amb} = 25\text{ }^{\circ}\text{C}$
  - (3)  $T_{amb} = -55\text{ }^{\circ}\text{C}$

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



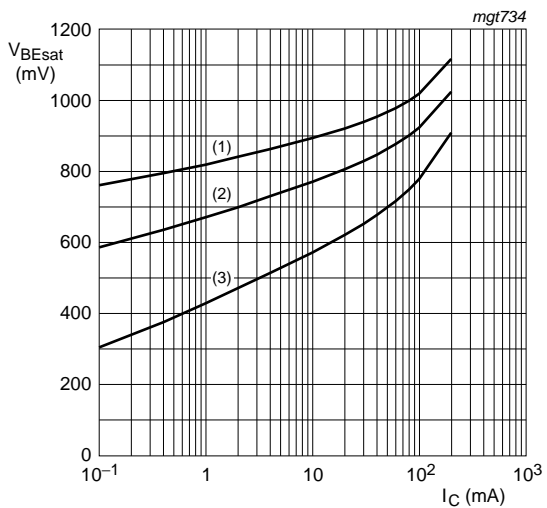
- $V_{CE} = 5\text{ V}$
- (1)  $T_{amb} = -55\text{ }^{\circ}\text{C}$
  - (2)  $T_{amb} = 25\text{ }^{\circ}\text{C}$
  - (3)  $T_{amb} = 150\text{ }^{\circ}\text{C}$

Fig 10. Group 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. Group C: Collector-emitter saturation voltage as a function of collector current; typical values

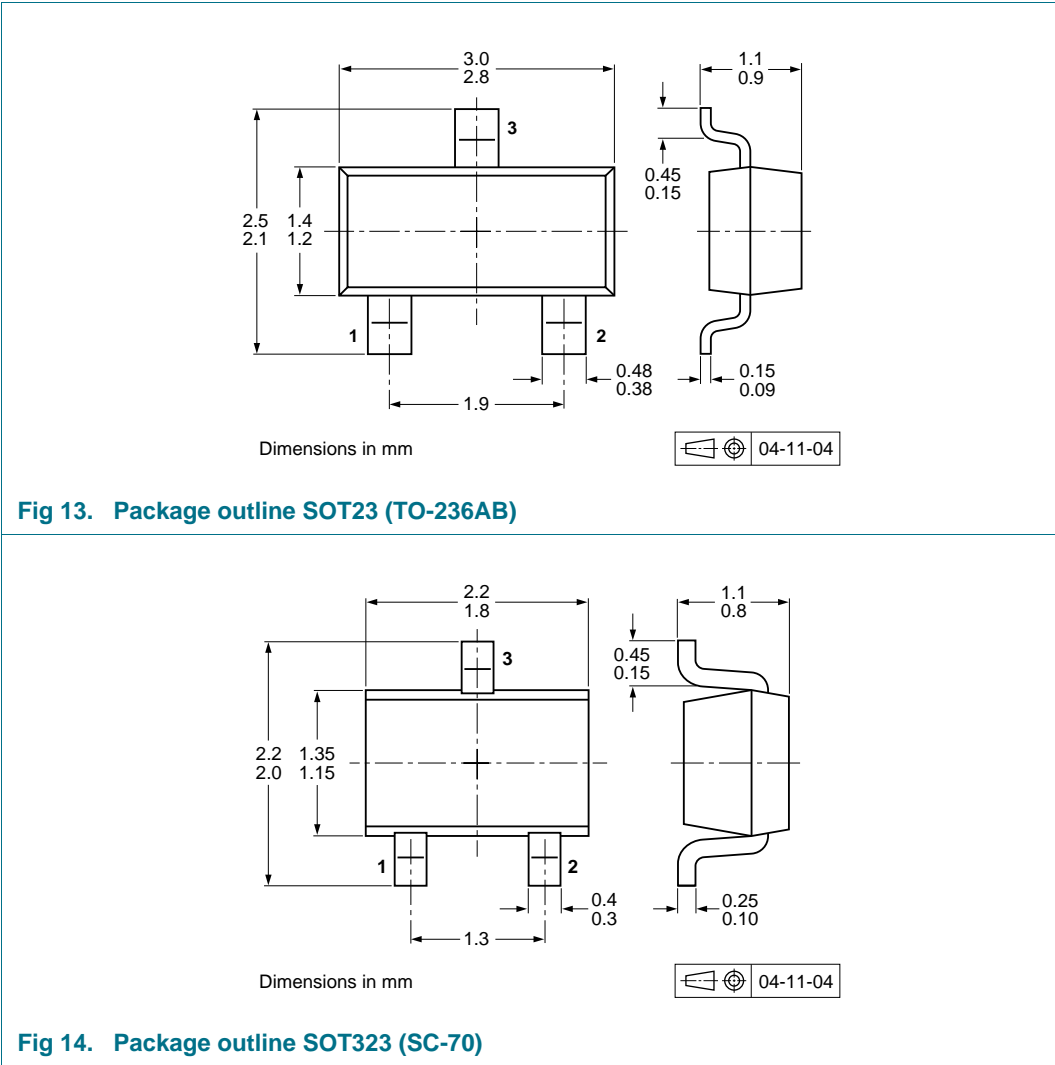


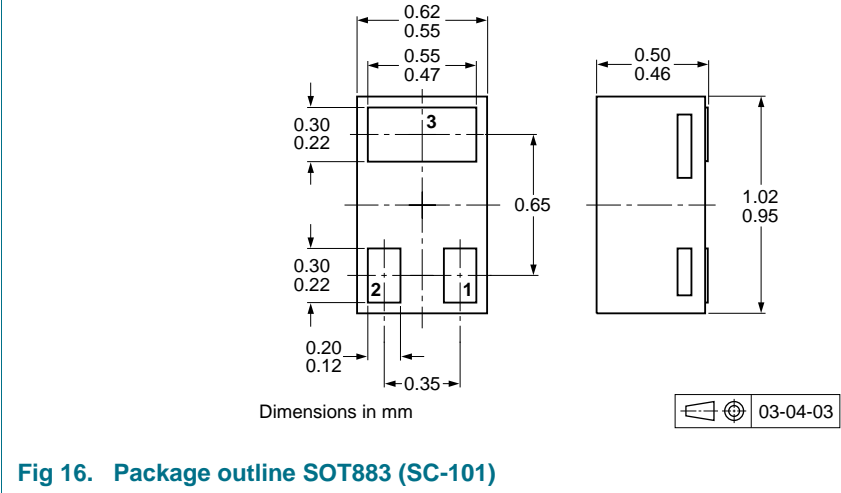
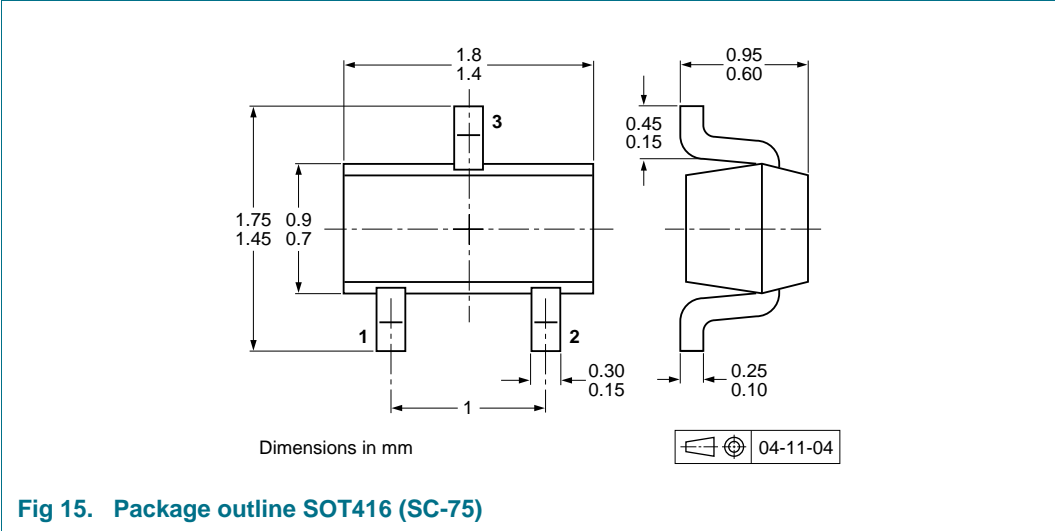
- $I_C/I_B = 10$
- (1)  $T_{amb} = -55\text{ }^{\circ}\text{C}$
  - (2)  $T_{amb} = 25\text{ }^{\circ}\text{C}$
  - (3)  $T_{amb} = 150\text{ }^{\circ}\text{C}$

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



8. Package outline





## 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 <sup>[2]</sup>	Package	Description	Packing quantity		
			3000	5000	10000
BC847	SOT23	4 mm pitch, 8 mm tape and reel	-215	-	-235
BC847A					
BC847B					
BC847C					
BC847W	SOT323	4 mm pitch, 8 mm tape and reel	-115	-	-135
BC847AW					
BC847BW					
BC847CW					
BC847T	SOT416	4 mm pitch, 8 mm tape and reel	-115	-	-135
BC847AT					
BC847BT					
BC847CT					
BC847AM	SOT883	2 mm pitch, 8 mm tape and reel	-	-	-315
BC847BM					
BC847CM					

[1] For further information and the availability of packing methods, see [Section 13](#).

[2] Valid for all available selection groups.

10. Soldering

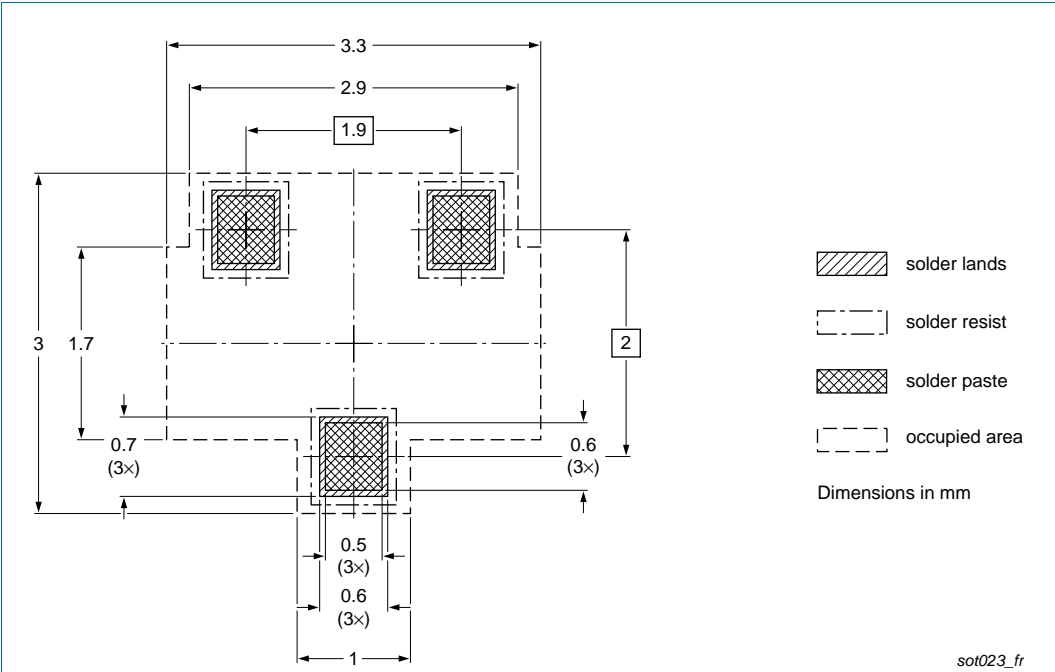


Fig 17. Reflow soldering footprint SOT23 (TO-236AB)

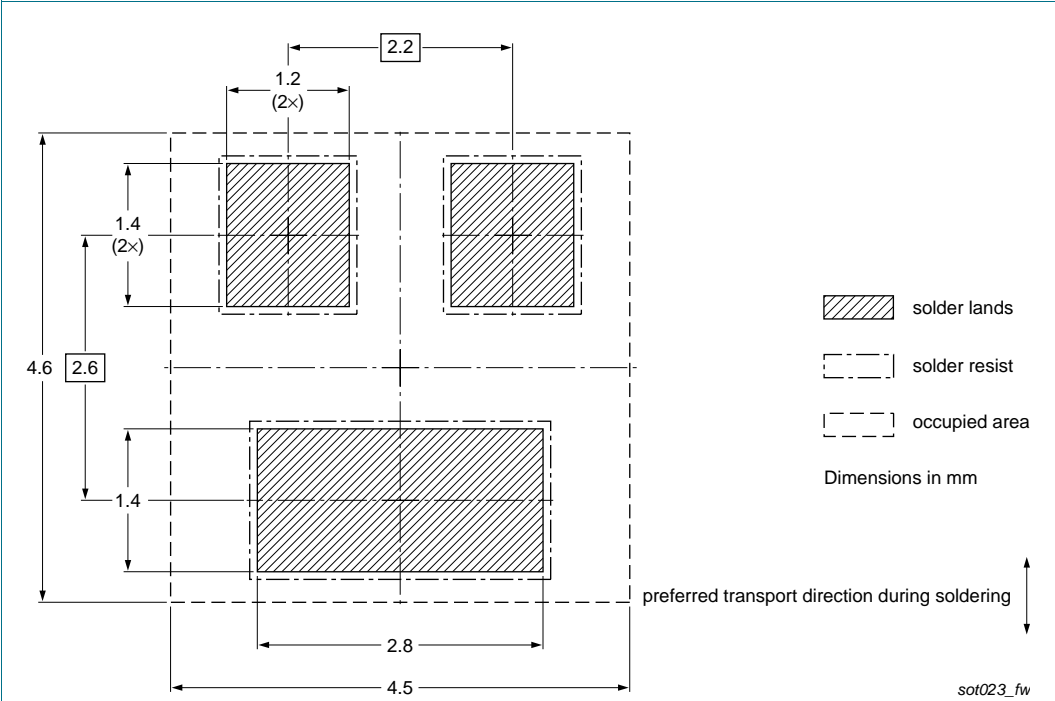


Fig 18. Wave soldering footprint SOT23 (TO-236AB)

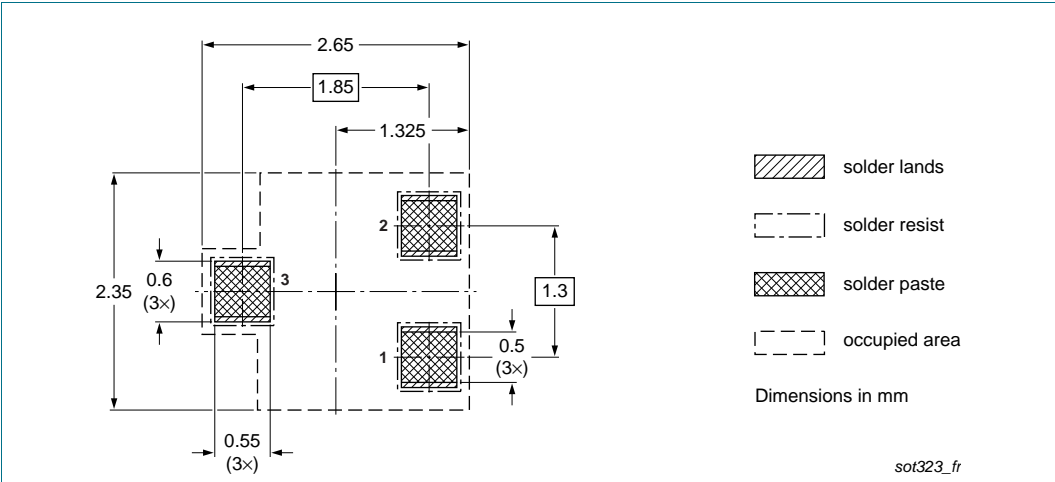


Fig 19. Reflow soldering footprint SOT323 (SC-70)

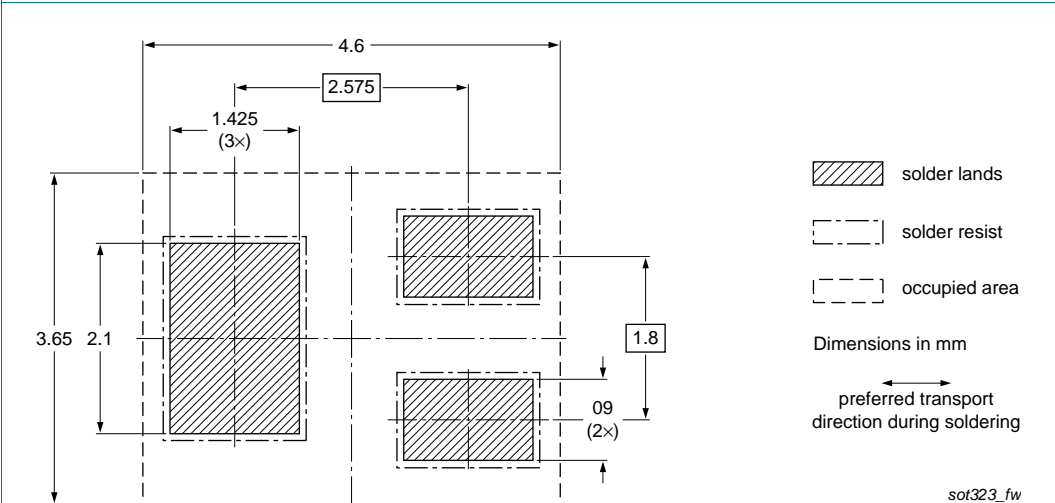


Fig 20. Wave soldering footprint SOT323 (SC-70)

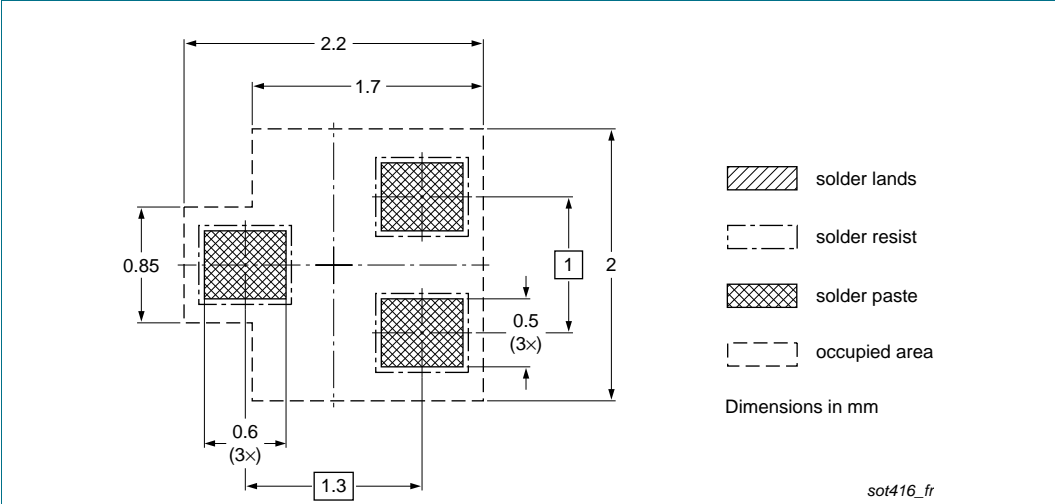


Fig 21. Reflow soldering footprint SOT416 (SC-75)

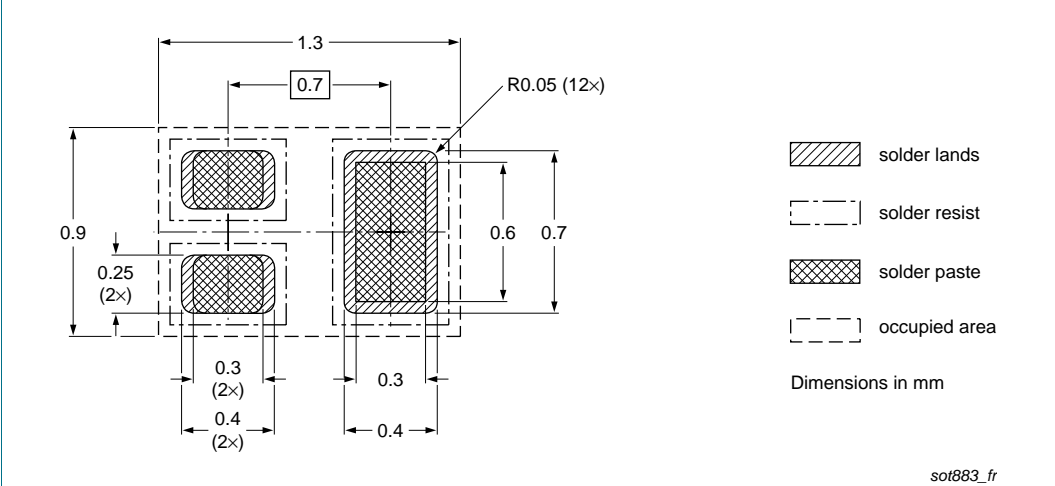


Fig 22. Reflow soldering footprint SOT883 (SC-101)

## 11. Revision history

**Table 10. Revision history**

Document ID	Release date	Data sheet status	Change notice	Supersedes
BC847_SER v.8	20120820	Product data sheet	-	BC847_BC547_SER v.7
Modifications:	<ul style="list-style-type: none"><li>Type numbers removed: BC847B/DG, BC847BW/DG, BC847AT/DG, BC857, BC857B and BC857C</li><li><a href="#">Section 12 "Legal information"</a>: updated</li></ul>			
BC847_BC547_SER v.7	20081210	Product data sheet	-	BC847_BC547_SER v.6
BC847_BC547_SER v.6	20050519	Product data sheet	-	-

## 12. Legal information

### 12.1 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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In the event that customer uses the product for design-in and use in automotive applications to automotive specifications and standards, customer (a) shall use the product without NXP Semiconductors' warranty of the product for such automotive applications, use and specifications, and (b) whenever customer uses the product for automotive applications beyond NXP Semiconductors' specifications such use shall be solely at customer's own risk, and (c) customer fully indemnifies NXP Semiconductors for any liability, damages or failed product claims resulting from customer design and use of the product for automotive applications beyond NXP Semiconductors' standard warranty and NXP Semiconductors' product specifications.

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## 13. Contact information

For more information, please visit: <http://www.nxp.com>

For sales office addresses, please send an email to: [salesaddresses@nxp.com](mailto:salesaddresses@nxp.com)

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Please be aware that important notices concerning this document and the product(s) described herein, have been included in section 'Legal information'.

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