

BC847 series

45 V, 100 mA NPN general-purpose transistors

Rev. 9 — 23 September 2014

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 ^[1]	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
- AEC-Q101 qualified

1.3 Applications

- General-purpose switching and amplification



1.4 Quick reference data

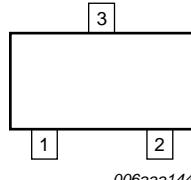
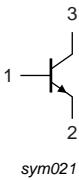
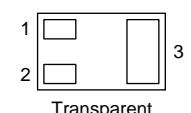
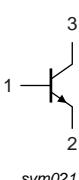
Table 2. Quick reference data

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	$V_{CE} = 5 \text{ V}; I_C = 2 \text{ mA}$	[1]	110	-	800
	h_{FE} group A			110	180	220
	h_{FE} group B			200	290	450
	h_{FE} group C			420	520	800

[1] $T_{amb} = 25 \text{ }^{\circ}\text{C}$ unless otherwise specified

2. Pinning information

Table 3. Pinning

Pin	Description	Simplified outline	Graphic symbol
SOT23, SOT323, SOT416			
1	base		
2	emitter		
3	collector	 006aaa144	 sym021
SOT883			
1	base		
2	emitter		
3	collector	 Transparent top view	 sym021

3. Ordering information

Table 4. Ordering information

Type number ^[1]	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 ^[1]	Type number	Marking code ^[1]
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; $t_p \leq 1 \text{ ms}$	-	200	mA
I_{BM}	peak base current	single pulse; $t_p \leq 1 \text{ ms}$	-	100	mA
P_{tot}	total power dissipation	$T_{amb} \leq 25 \text{ }^{\circ}\text{C}$	[1]		
	SOT23		-	250	mW
	SOT323		-	200	mW
	SOT416		-	150	mW
	SOT883		[2]	-	250
T_j	junction temperature		-	150	$^{\circ}\text{C}$
T_{amb}	ambient temperature		-65	+150	$^{\circ}\text{C}$
T_{stg}	storage temperature		-65	+150	$^{\circ}\text{C}$

[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]	-	-	K/W

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

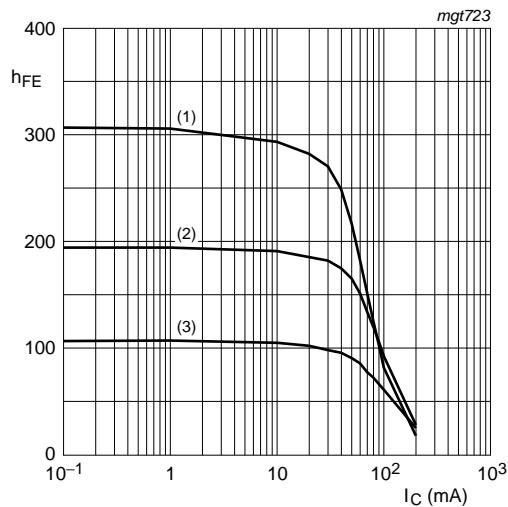
[2] Device mounted on an FR4 PCB with 60 μm copper strip line, standard footprint.

7. Characteristics

Table 8. Characteristics $T_{amb} = 25^\circ\text{C}$ unless otherwise specified.

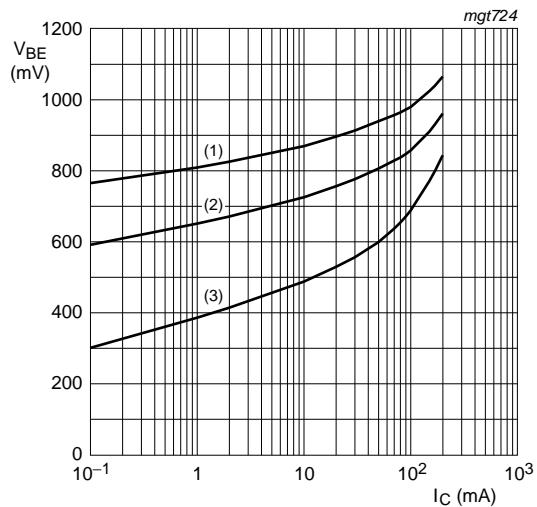
Symbol	Parameter	Conditions	Min	Typ	Max	Unit	
I_{CBO}	collector-base cut-off current	$V_{CB} = 30 \text{ V}; I_E = 0 \text{ A}$	-	-	15	nA	
		$V_{CB} = 30 \text{ V}; I_E = 0 \text{ A}; T_j = 150^\circ\text{C}$	-	-	5	μA	
I_{EBO}	emitter-base cut-off current	$V_{EB} = 5 \text{ V}; I_C = 0 \text{ A}$	-	-	100	nA	
h_{FE}	DC current gain	$V_{CE} = 5 \text{ V}; I_C = 10 \mu\text{A}$					
	h_{FE} group A		-	170	-		
	h_{FE} group B		-	280	-		
	h_{FE} group C		-	420	-		
	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	$I_C = 200 \mu\text{A}; V_{CE} = 5 \text{ V}; R_S = 2 \text{ k}\Omega; f = 1 \text{ kHz}; B = 200 \text{ Hz}$	-	2	10	dB	

[1] Pulse test: $t_p \leq 300 \mu\text{s}; \delta = 0.02$.[2] V_{BE} decreases by approximately 2 mV/K with increasing temperature.



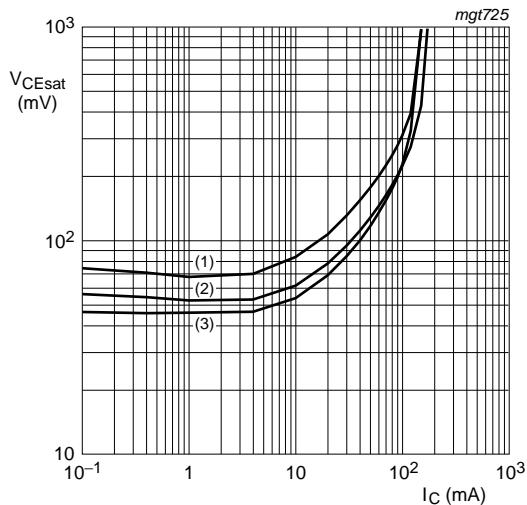
$V_{CE} = 5 \text{ V}$
(1) $T_{\text{amb}} = 150 \text{ }^{\circ}\text{C}$
(2) $T_{\text{amb}} = 25 \text{ }^{\circ}\text{C}$
(3) $T_{\text{amb}} = -55 \text{ }^{\circ}\text{C}$

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



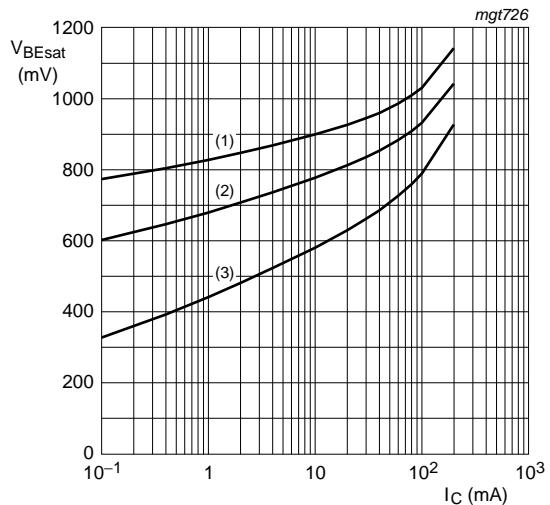
$V_{CE} = 5 \text{ V}$
(1) $T_{\text{amb}} = -55 \text{ }^{\circ}\text{C}$
(2) $T_{\text{amb}} = 25 \text{ }^{\circ}\text{C}$
(3) $T_{\text{amb}} = 150 \text{ }^{\circ}\text{C}$

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



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

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



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

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

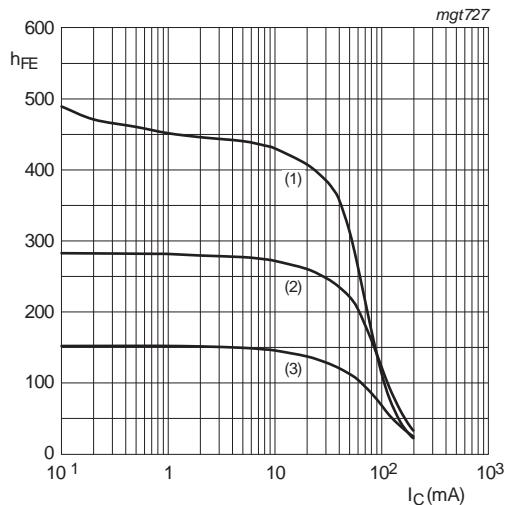


Fig 5. Group B: DC current gain as a function of collector current; typical values

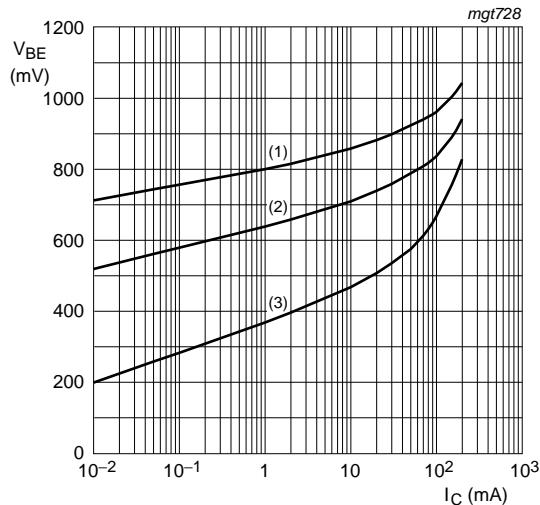


Fig 6. Group B: Base-emitter voltage as a function of collector current; typical values

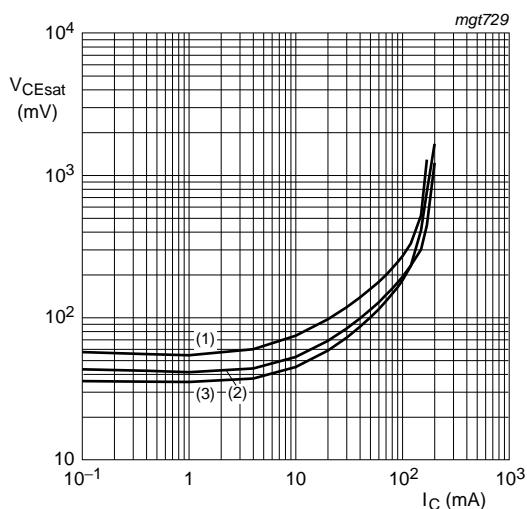


Fig 7. Group B: Collector-emitter saturation voltage as a function of collector current; typical values

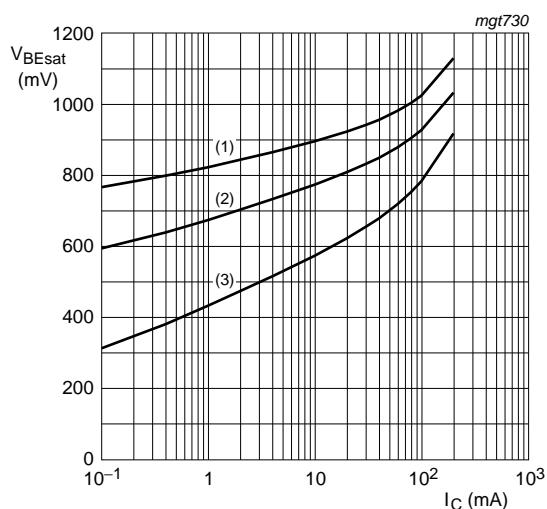
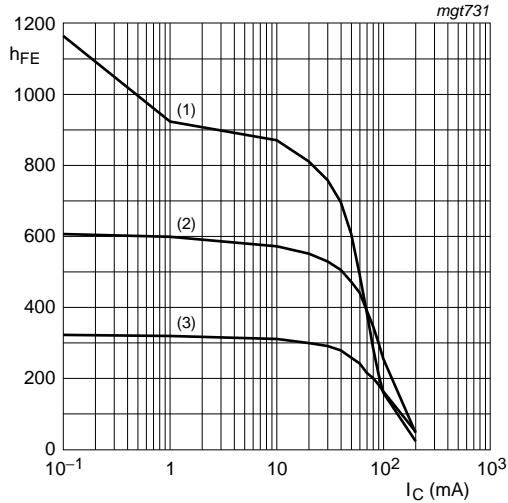
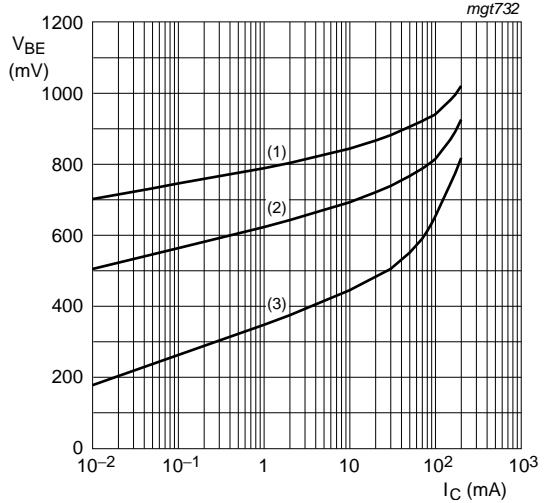


Fig 8. Group B: Base-emitter saturation voltage as a function of collector current; typical values



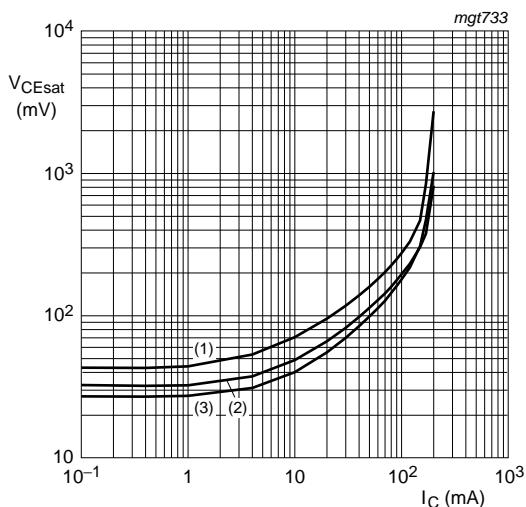
$V_{CE} = 5 \text{ V}$
(1) $T_{\text{amb}} = 150 \text{ }^{\circ}\text{C}$
(2) $T_{\text{amb}} = 25 \text{ }^{\circ}\text{C}$
(3) $T_{\text{amb}} = -55 \text{ }^{\circ}\text{C}$

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



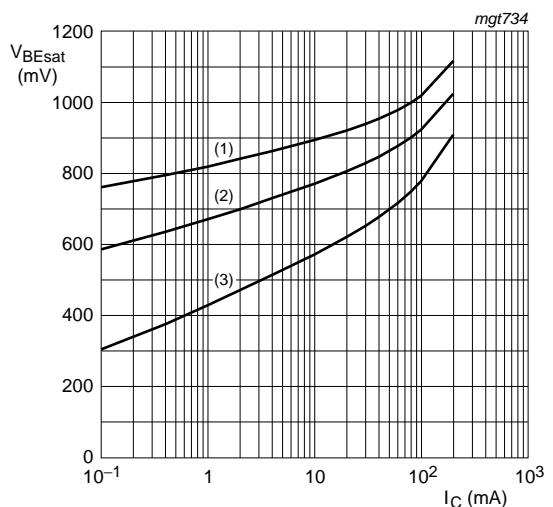
$V_{CE} = 5 \text{ V}$
(1) $T_{\text{amb}} = -55 \text{ }^{\circ}\text{C}$
(2) $T_{\text{amb}} = 25 \text{ }^{\circ}\text{C}$
(3) $T_{\text{amb}} = 150 \text{ }^{\circ}\text{C}$

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



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

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



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

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

8. Test information

8.1 Quality information

This product has been qualified in accordance with the Automotive Electronics Council (AEC) standard Q101 - *Stress test qualification for discrete semiconductors*, and is suitable for use in automotive applications.

9. Package outline

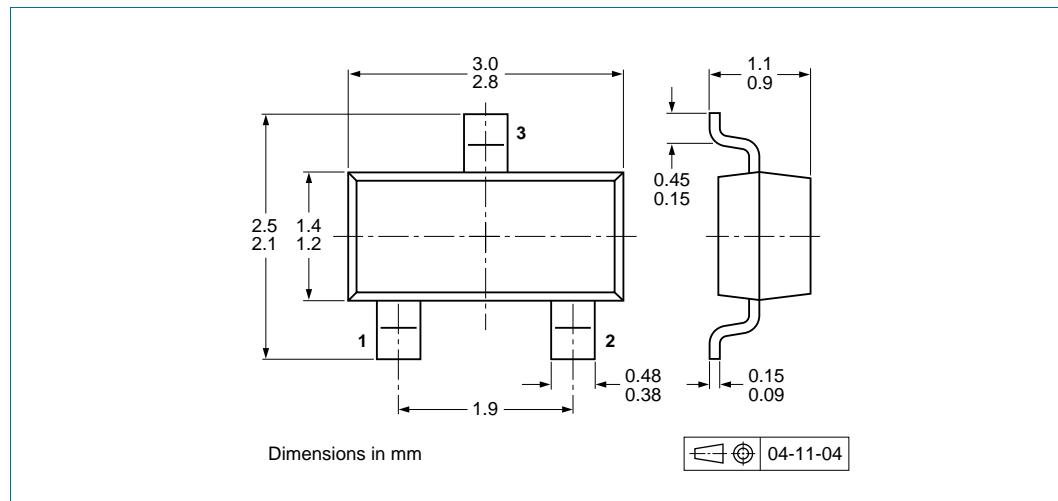


Fig 13. Package outline SOT23 (TO-236AB)

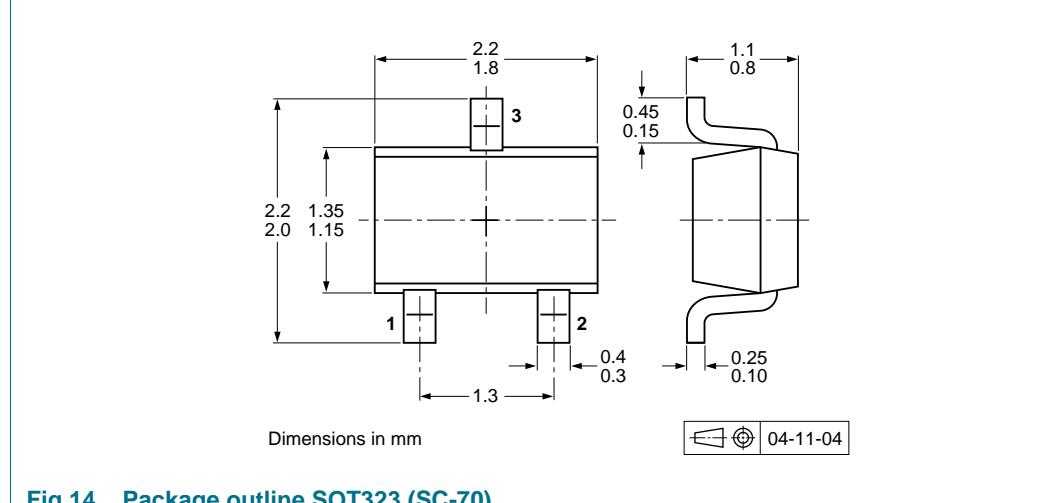


Fig 14. Package outline SOT323 (SC-70)

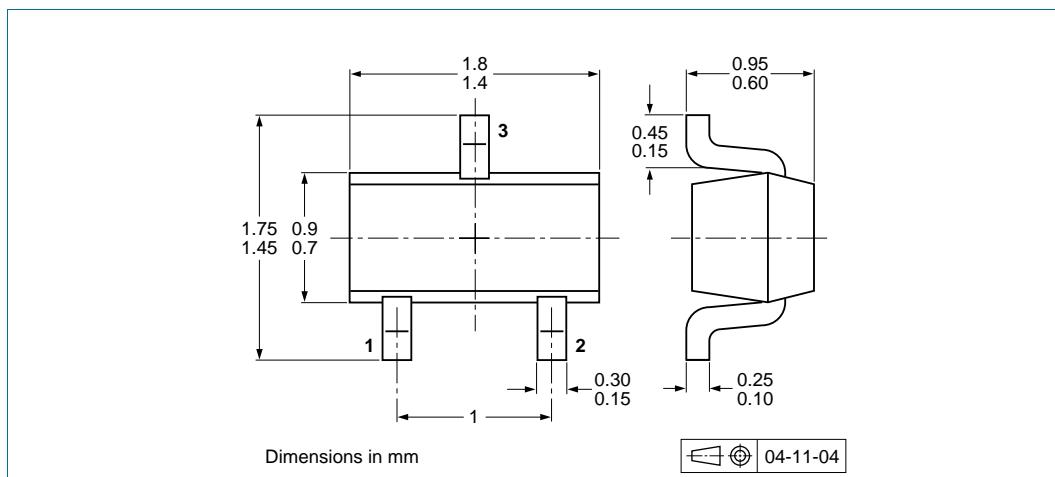


Fig 15. Package outline SOT416 (SC-75)

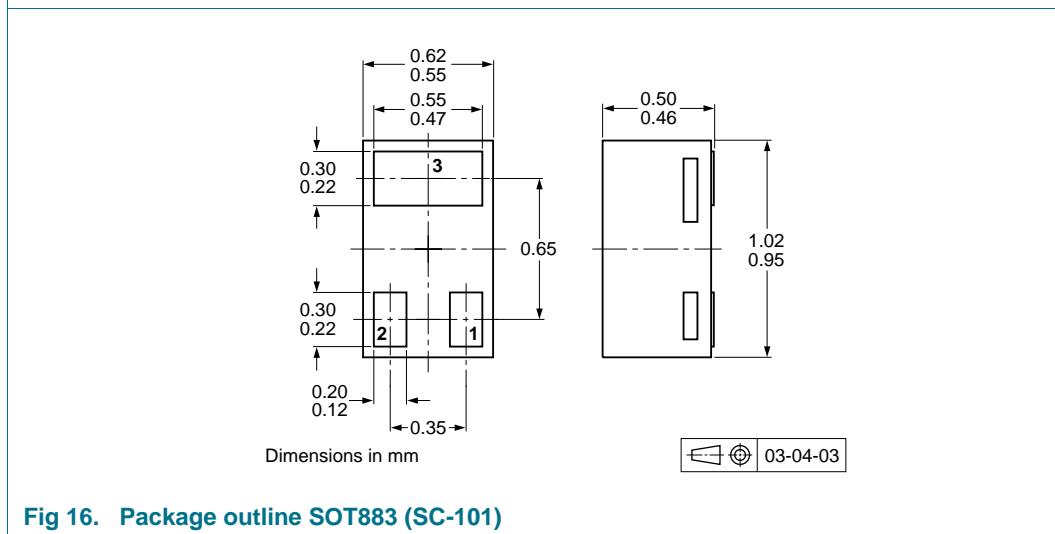


Fig 16. Package outline SOT883 (SC-101)

10. Soldering

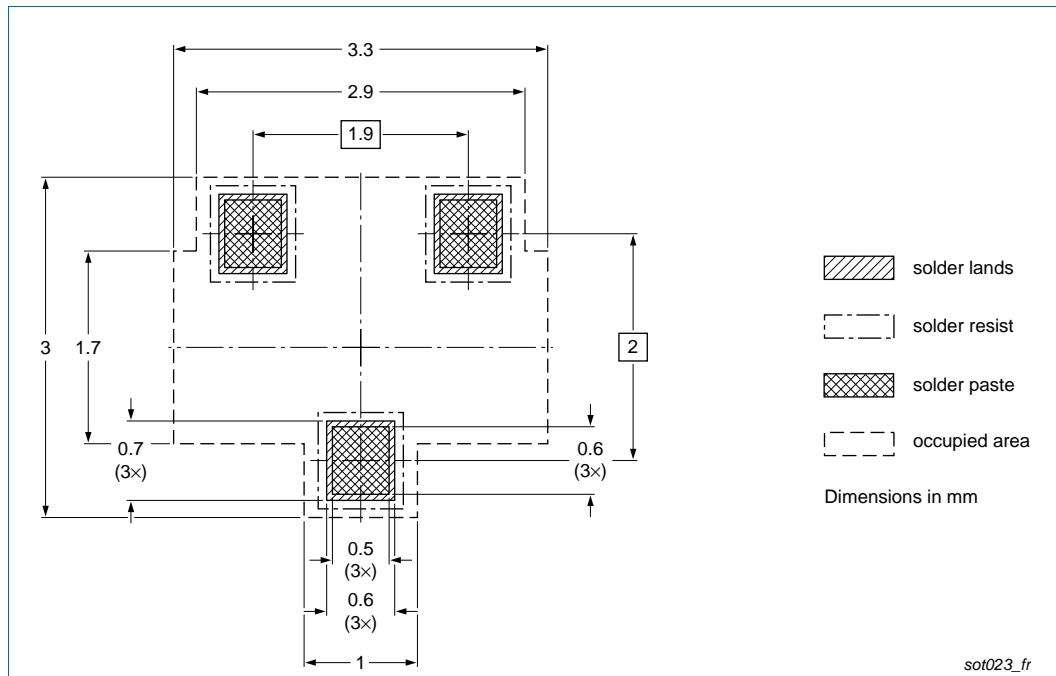


Fig 17. Reflow soldering footprint SOT23 (TO-236AB)

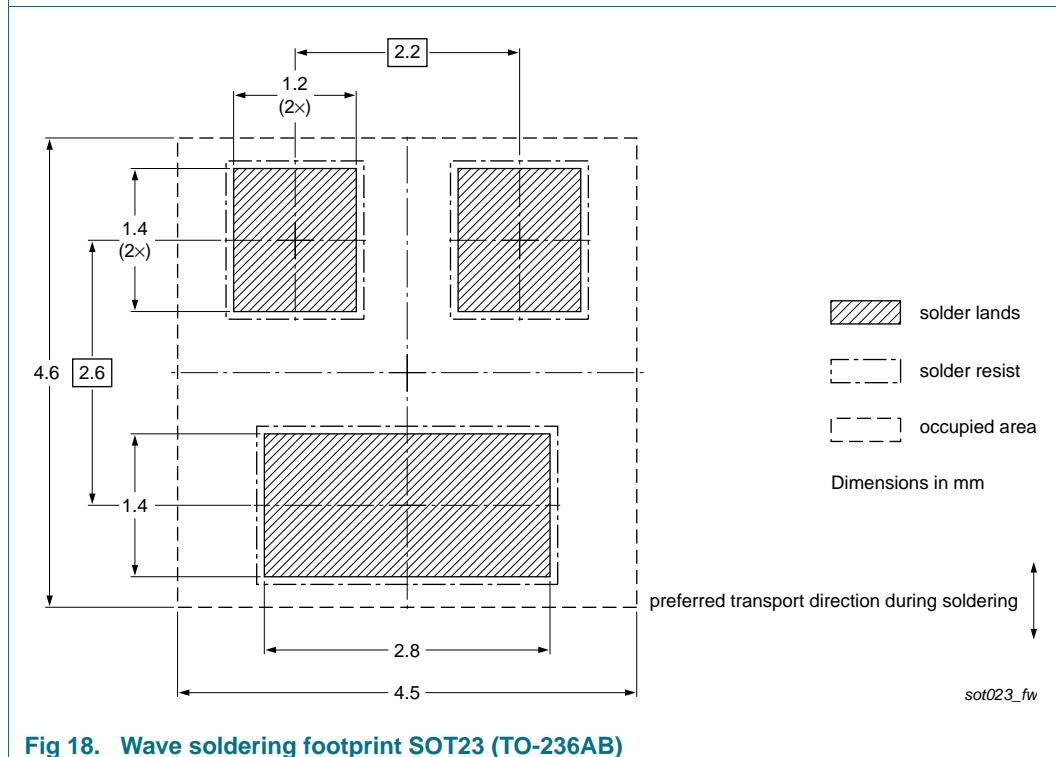


Fig 18. Wave soldering footprint SOT23 (TO-236AB)

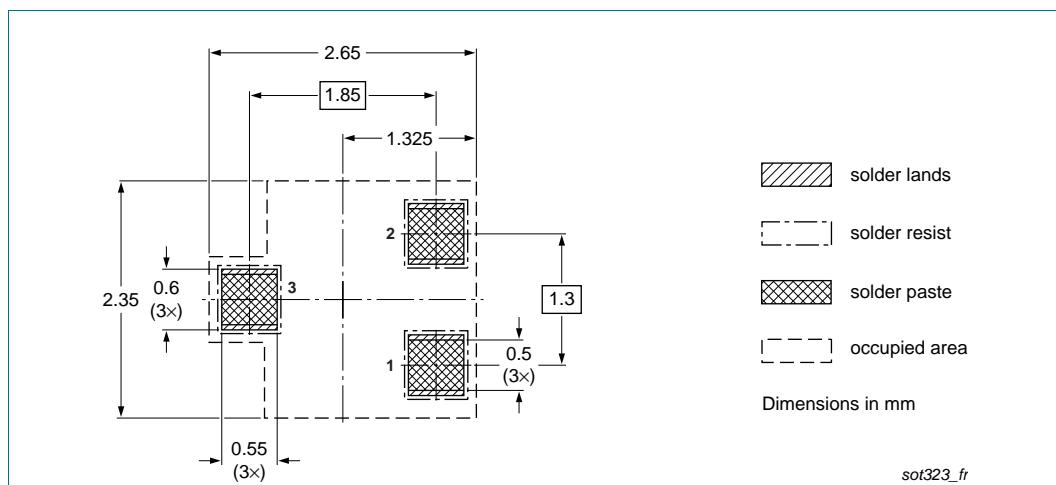


Fig 19. Reflow soldering footprint SOT323 (SC-70)

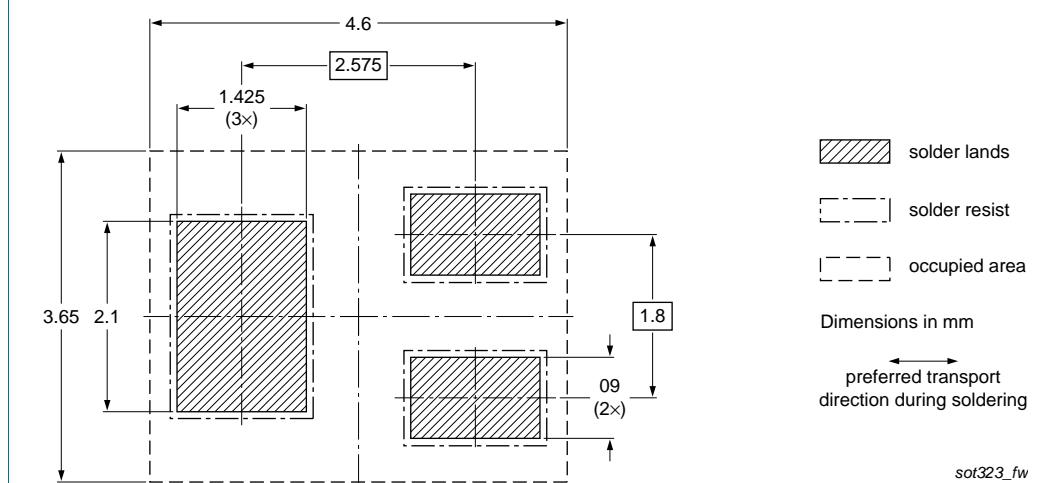


Fig 20. Wave soldering footprint SOT323 (SC-70)

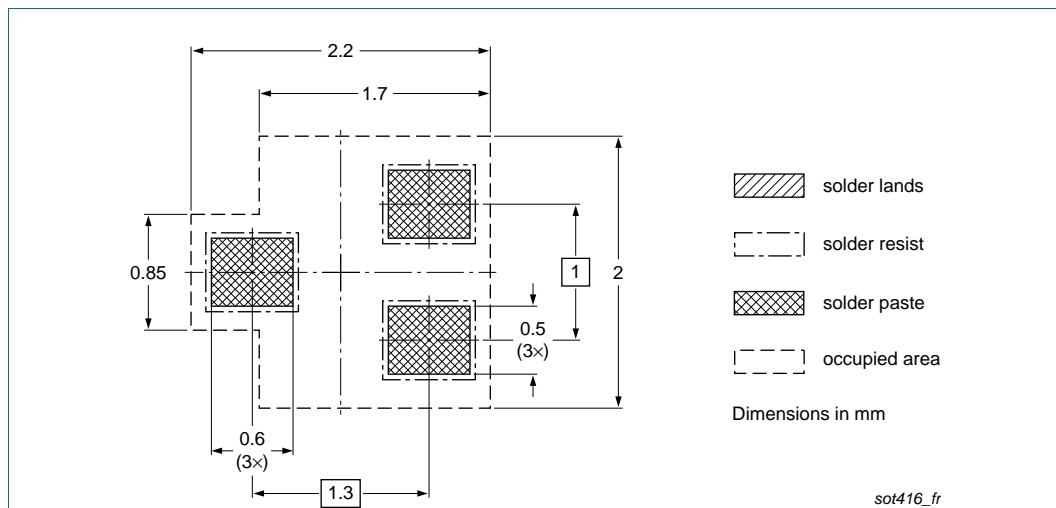


Fig 21. Reflow soldering footprint SOT416 (SC-75)

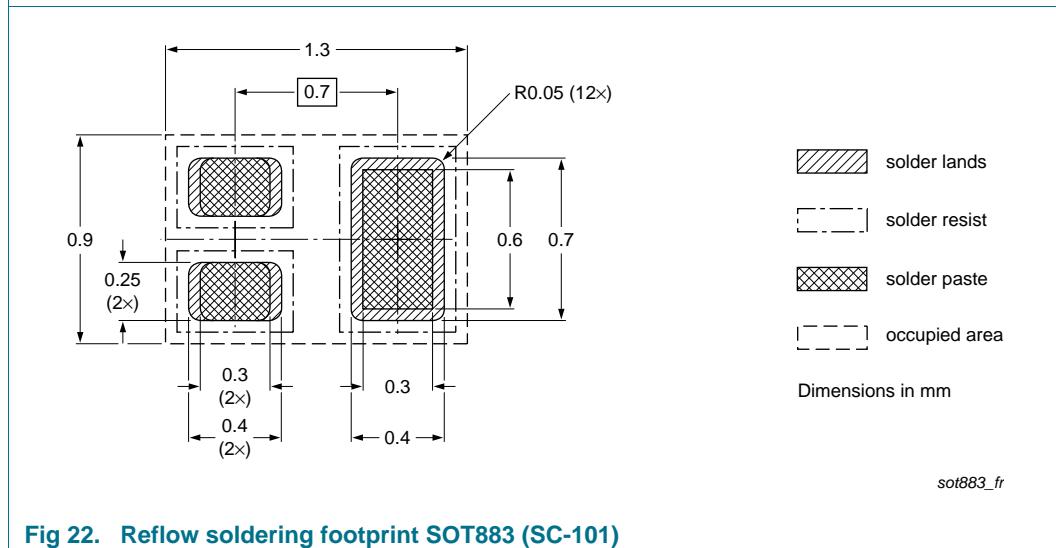


Fig 22. Reflow soldering footprint SOT883 (SC-101)

11. Revision history

Table 9. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
BC847_SER v.9	20140923	Product data sheet	-	BC847_SER v.8
Modifications:	<ul style="list-style-type: none">• Section 1.2 "Features and benefits": updated• Section 5 "Limiting values": updated• Figure 5: corrected• Section 8 "Test information": added• Section 12 "Legal information": updated			
BC847_SER v.8	20120820	Product data sheet	-	BC847_BC547_SER v.7
BC847_BC547_SER v.7	20081210	Product data sheet	-	BC847_BC547_SER v.6
BC847_BC547_SER v.6	20050519	Product data sheet	-	-