

# BC847 series

45 V, 100 mA NPN general-purpose transistors

Rev. 12 — 24 October 2019

Product data sheet

## 1. Product profile

### 1.1. General description

NPN general-purpose transistors in a small SOT23 (TO-236AB), very small SOT323 (SC-70) or ultra small SOT883 (DFN1006-3) Surface-Mounted Device (SMD) plastic package.

Table 1. Product overview

Type number[1]	Package			PNP complement
	Nexperia	JEITA	JEDEC	
BC847	SOT23	-	TO-236AB	BC857
BC847A				BC857A
BC847B				BC857B
BC847C				BC857C
BC847W	SOT323	SC-70	-	BC857W
BC847AW				BC857AW
BC847BW				BC857BW
BC847CW				BC857CW
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

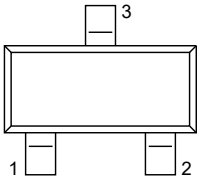
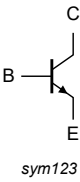
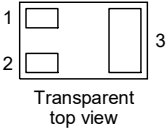
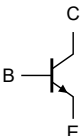
Table 2. Quick reference data

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

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 information

Pin	Symbol	Description	Simplified outline	Graphic symbol
SOT23; SOT323				
1	B	base		 sym123
2	E	emitter		
3	C	collector		
SOT883				
1	B	base		 sym123
2	E	emitter		
3	C	collector		

### 3. Ordering information

Table 4. Ordering information

Type number	Package		
	Name	Description	Version
BC847	TO-236AB	plastic surface-mounted package; 3 leads	SOT23
BC847A			
BC847B			
BC847C			
BC847W	SC-70		SOT323
BC847AW			
BC847BW			
BC847CW			
BC847AM	SC-101	leadless ultra small plastic package; 3 solder lands; body 1.0 x 0.6 x 0.5 mm	SOT 883
BC847BM			
BC847CM			

### 4. Marking

Table 5. Marking codes

Type number		Marking code
BC847	[1]	1H%
BC847A	[1]	1E%
BC847B	[1]	1F%
BC847C	[1]	1G%
BC847W	[1]	1H%
BC847AW	[1]	1E%
BC847BW	[1]	1F%
BC847CW	[1]	1G%
BC847AM		D4
BC847BM		D5
BC847CM		D6

[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				
	SOT23		[1]	-	250	mW
	SOT323		[1]	-	200	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 PCB with 60  $\mu$ m copper strip line, standard footprint.

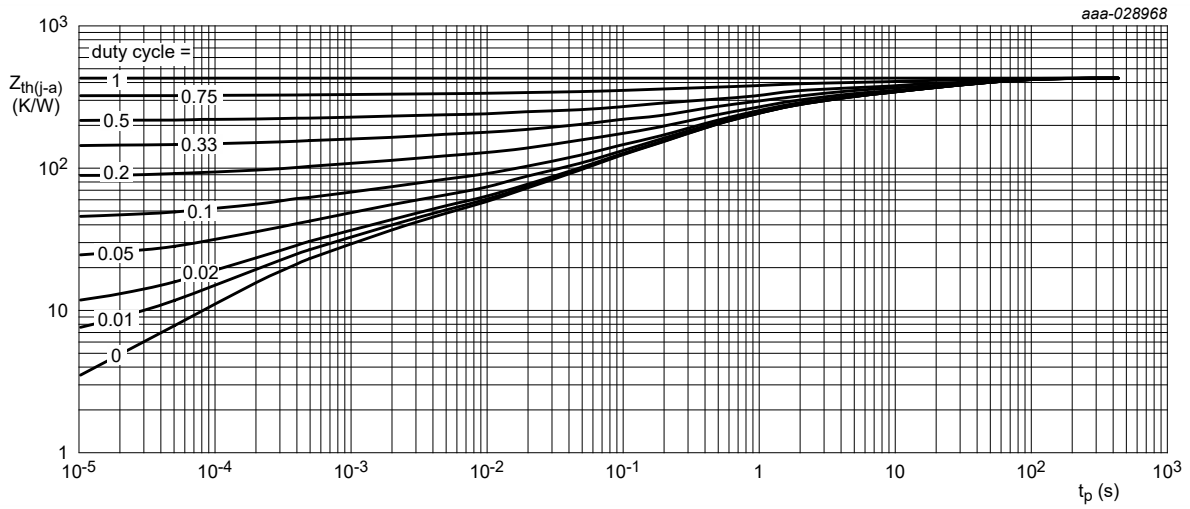
## 6. Thermal characteristics

**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
	SOT883		[2]	-	-	500	K/W

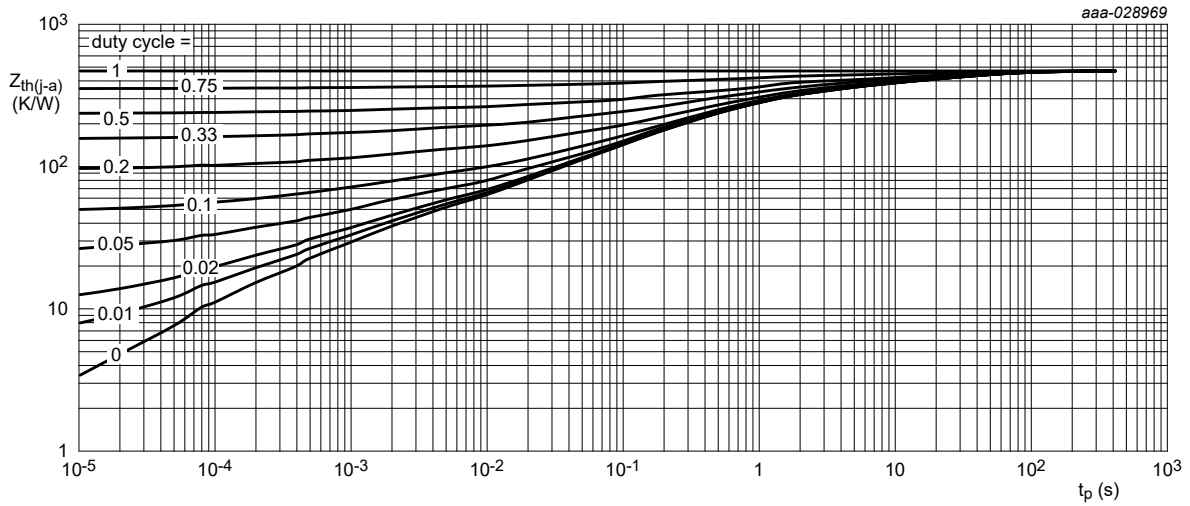
[1] Device mounted on an FR4 PCB; single-sided copper; tin-plated and standard footprint.

[2] Device mounted on an PCB with 60  $\mu$ m copper strip line, standard footprint.



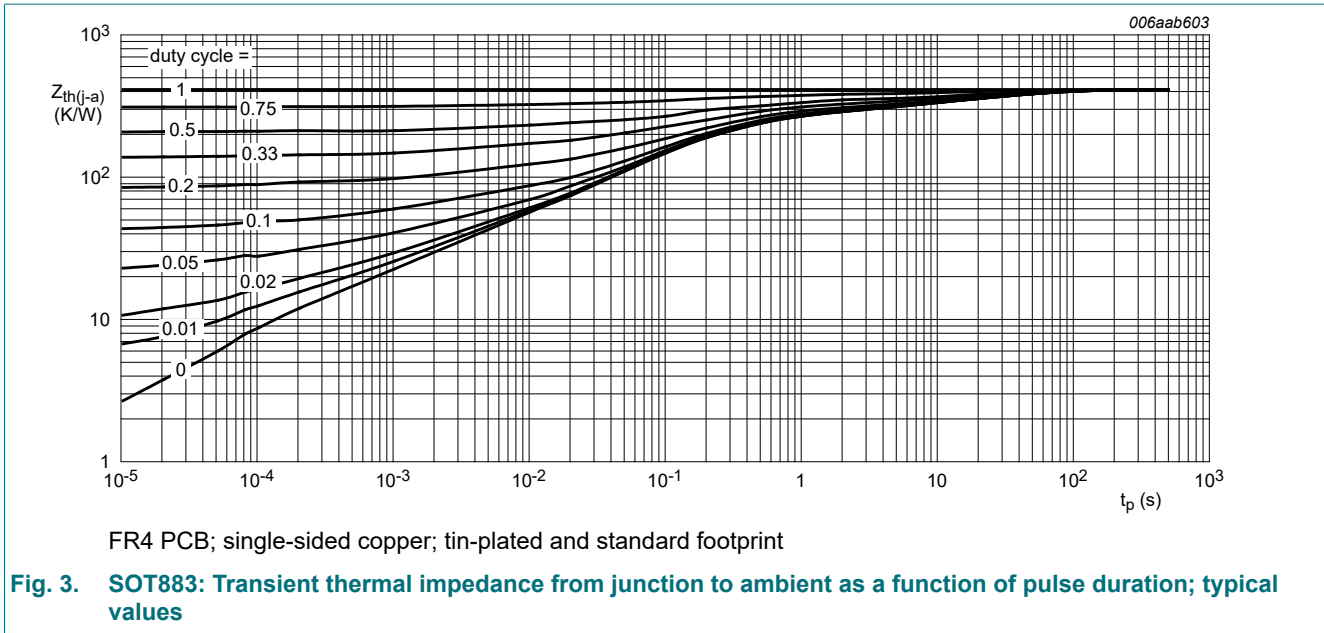
FR4 PCB; single-sided copper; tin-plated and standard footprint

**Fig. 1. SOT23: Transient thermal impedance from junction to ambient as a function of pulse duration; typical values**



FR4 PCB; single-sided copper; tin-plated and standard footprint

**Fig. 2. SOT323: Transient thermal impedance from junction to ambient as a function of pulse duration; typical values**



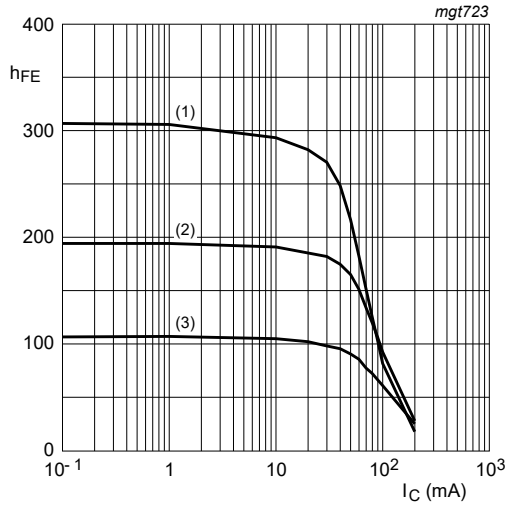
## 7. Characteristics

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

Symbol	Parameter	Conditions	Min	Typ	Max	Unit	
$V_{(BR)CBO}$	collector-base breakdown voltage	$I_C = 100\ \mu\text{A}$ ; $I_E = 0\ \text{A}$	50	-	-	V	
$V_{(BR)CES}$	collector-emitter breakdown voltage	$I_C = 2\ \text{mA}$ ; $V_{BE} = 0\ \text{V}$	45	-	-	V	
$V_{(BR)EBO}$	emitter-base breakdown voltage	$I_C = 0\ \text{A}$ ; $I_E = 100\ \mu\text{A}$	6	-	-	V	
$I_{CBO}$	collector-base cut-off current	$V_{CB} = 30\ \text{V}$ ; $I_E = 0\ \text{A}$	-	-	15	nA	
		$V_{CB} = 30\ \text{V}$ ; $I_E = 0\ \text{A}$ ; $T_j = 150\text{ °C}$	-	-	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	$V_{CE} = 5\ \text{V}$ ; $I_C = 10\ \mu\text{A}$					
	$h_{FE}$ 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	$V_{CE} = 5\ \text{V}$ ; $I_C = 2\ \text{mA}$	[2]	580	660	700	mV
		$V_{CE} = 5\ \text{V}$ ; $I_C = 10\ \text{mA}$		-	-	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	

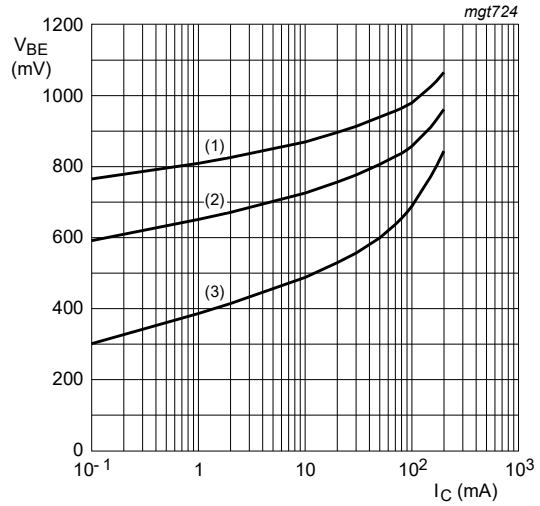
[1] pulsed;  $t_p \leq 300\ \mu\text{s}$ ;  $\delta \leq 0.02$

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



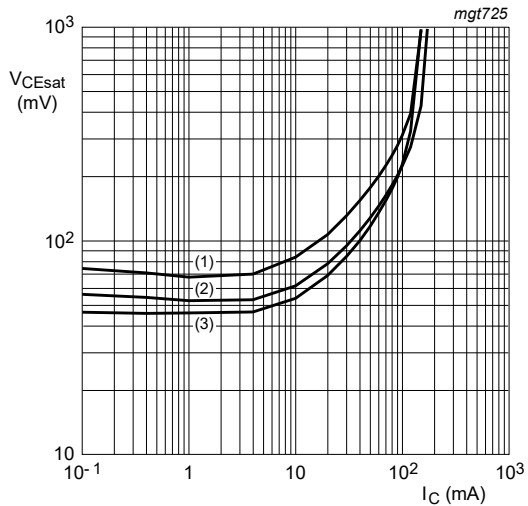
$V_{CE} = 5\text{ V}$   
 (1)  $T_{amb} = 150\text{ °C}$   
 (2)  $T_{amb} = 25\text{ °C}$   
 (3)  $T_{amb} = -55\text{ °C}$

**Fig. 4. Group A: DC current gain as a function of collector current; typical values**



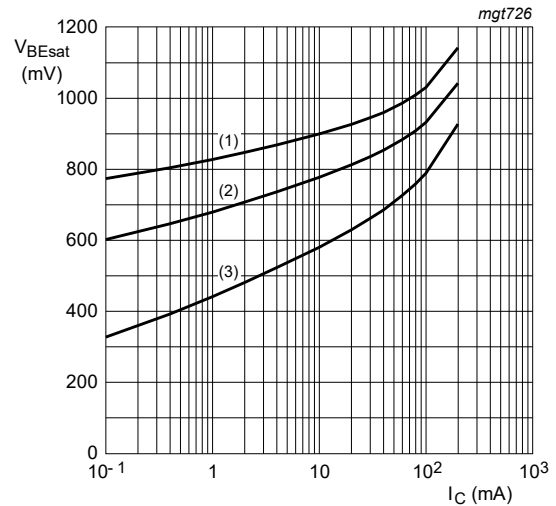
$V_{CE} = 5\text{ V}$   
 (1)  $T_{amb} = -55\text{ °C}$   
 (2)  $T_{amb} = 25\text{ °C}$   
 (3)  $T_{amb} = 150\text{ °C}$

**Fig. 5. Group A: Base-emitter voltage as a function of collector current; typical values**



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

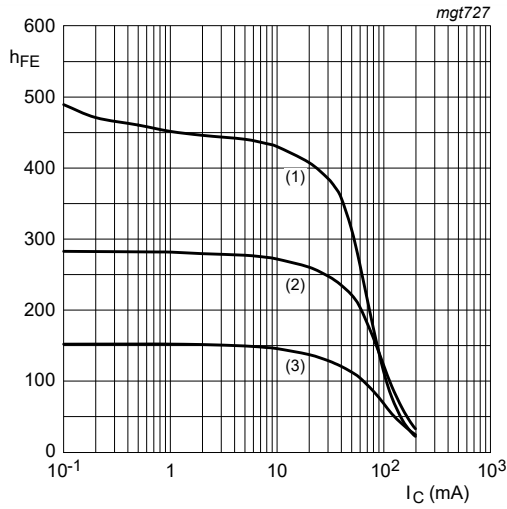
**Fig. 6. Group A: Collector-emitter saturation voltage as a function of collector current; typical values**



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

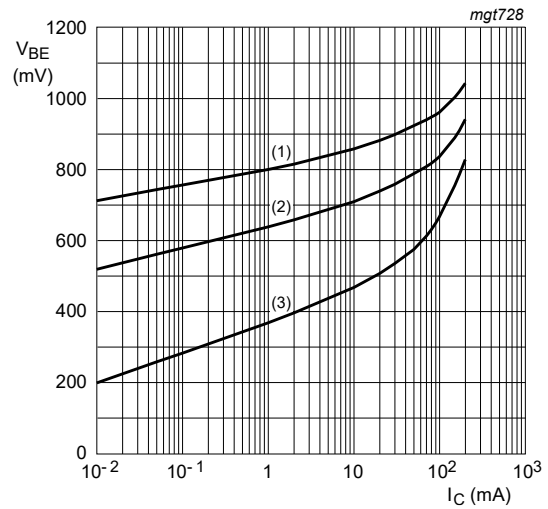
**Fig. 7. Group A: Base-emitter saturation voltage as a function of collector current; typical values**





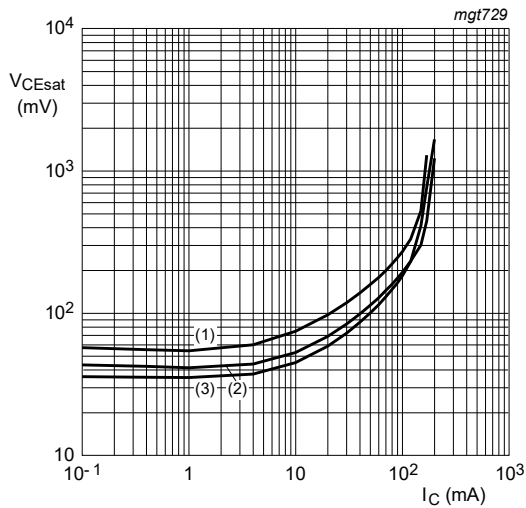
$V_{CE} = 5\text{ V}$   
 (1)  $T_{amb} = 150\text{ °C}$   
 (2)  $T_{amb} = 25\text{ °C}$   
 (3)  $T_{amb} = -55\text{ °C}$

Fig. 8. Group B: DC current gain as a function of collector current; typical values



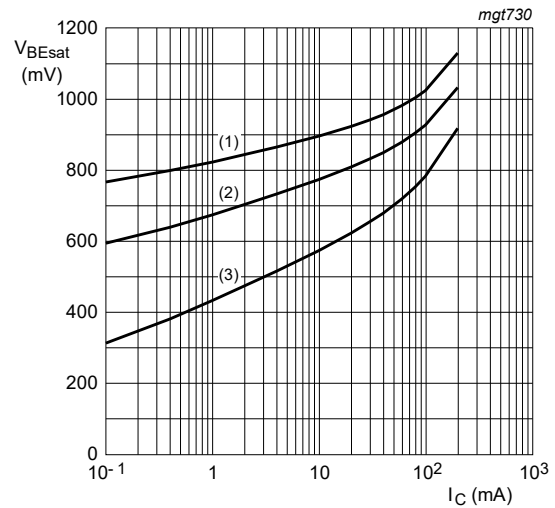
$V_{CE} = 5\text{ V}$   
 (1)  $T_{amb} = -55\text{ °C}$   
 (2)  $T_{amb} = 25\text{ °C}$   
 (3)  $T_{amb} = 150\text{ °C}$

Fig. 9. Group B: Base-emitter voltage as a function of collector current; typical values



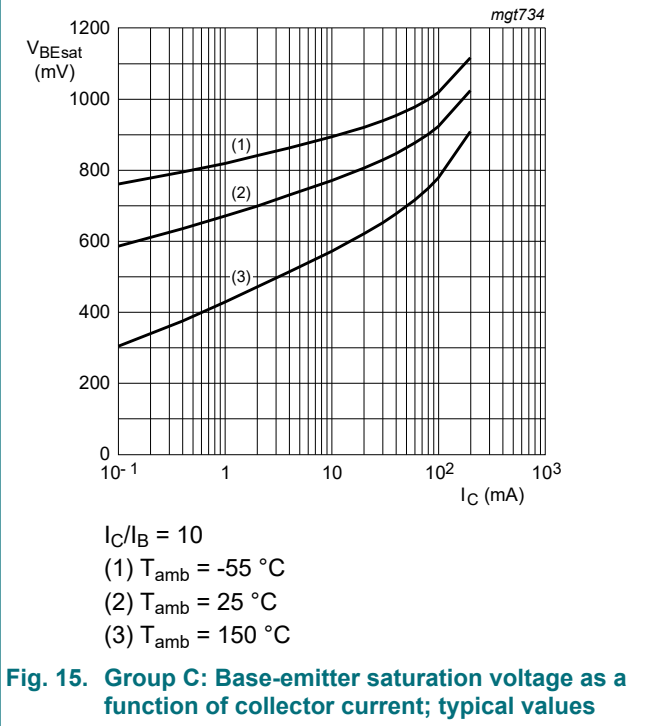
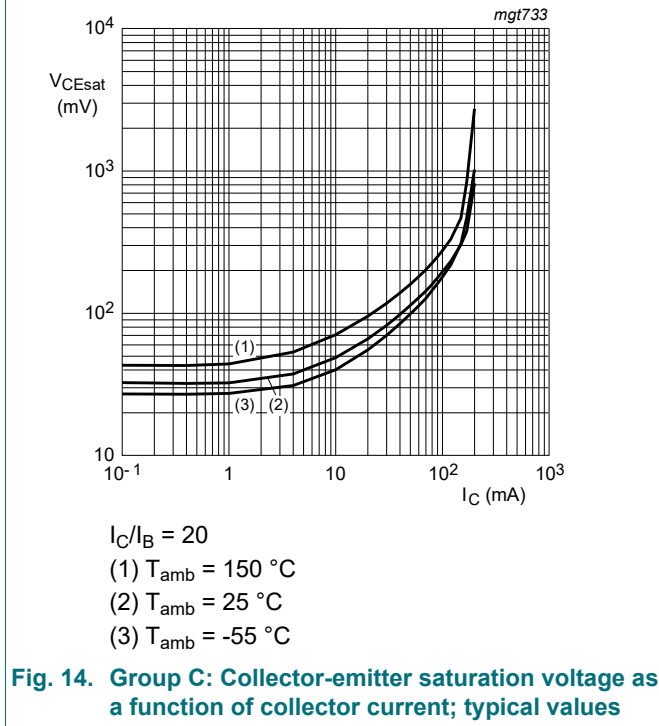
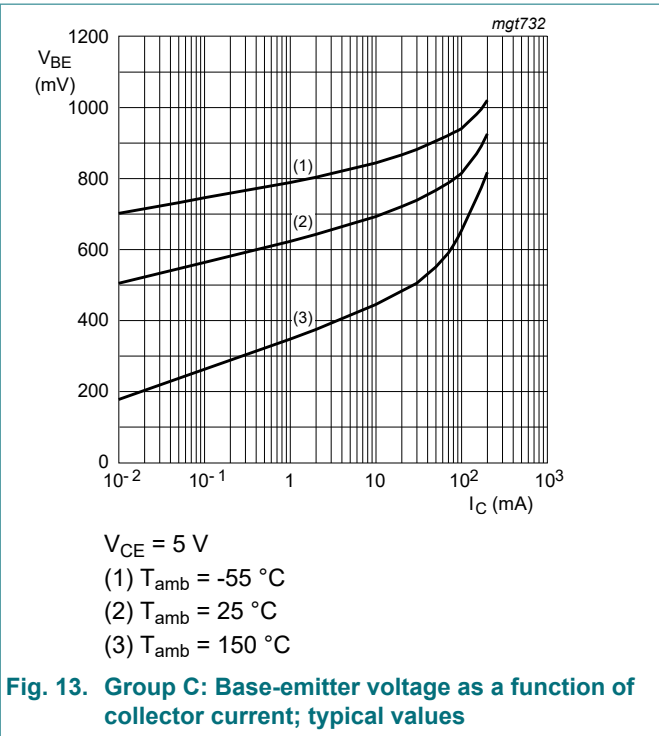
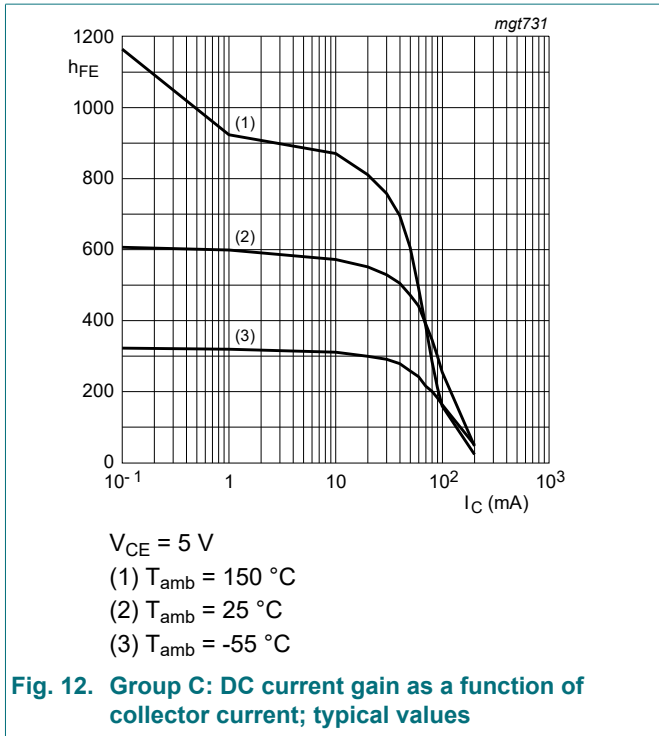
$I_C/I_B = 20$   
 (1)  $T_{amb} = 150\text{ °C}$   
 (2)  $T_{amb} = 25\text{ °C}$   
 (3)  $T_{amb} = -55\text{ °C}$

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



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

Fig. 11. Group B: 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

Table 9. Package outline

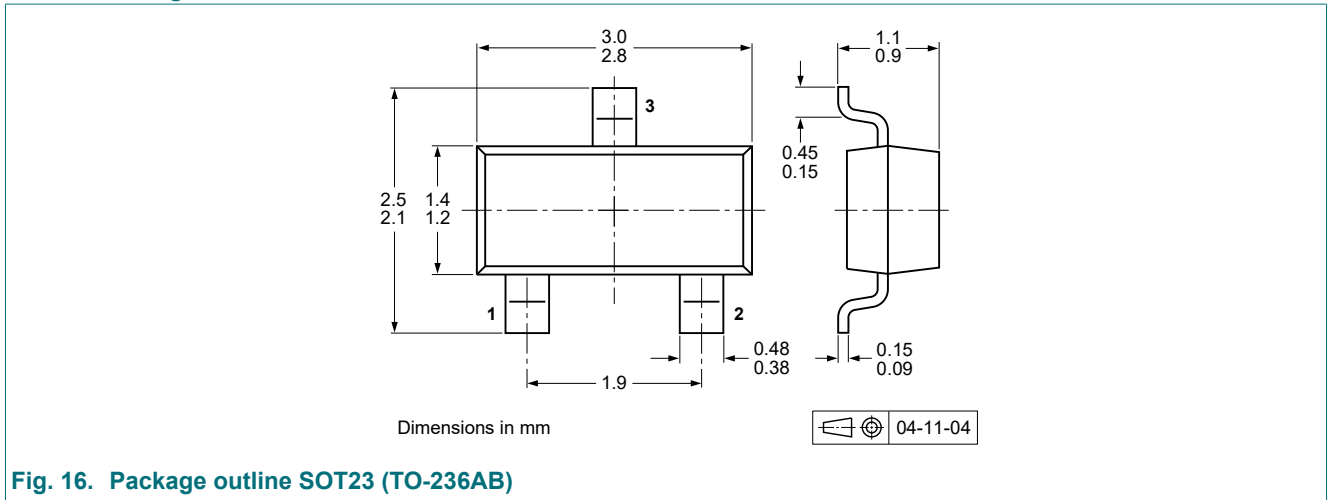


Fig. 16. Package outline SOT23 (TO-236AB)

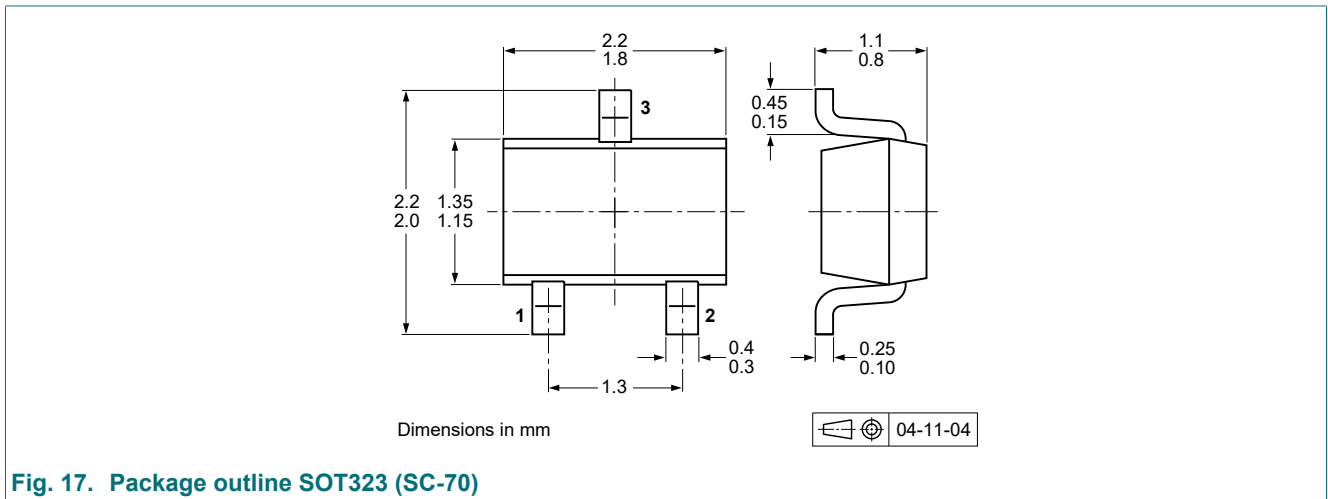


Fig. 17. Package outline SOT323 (SC-70)

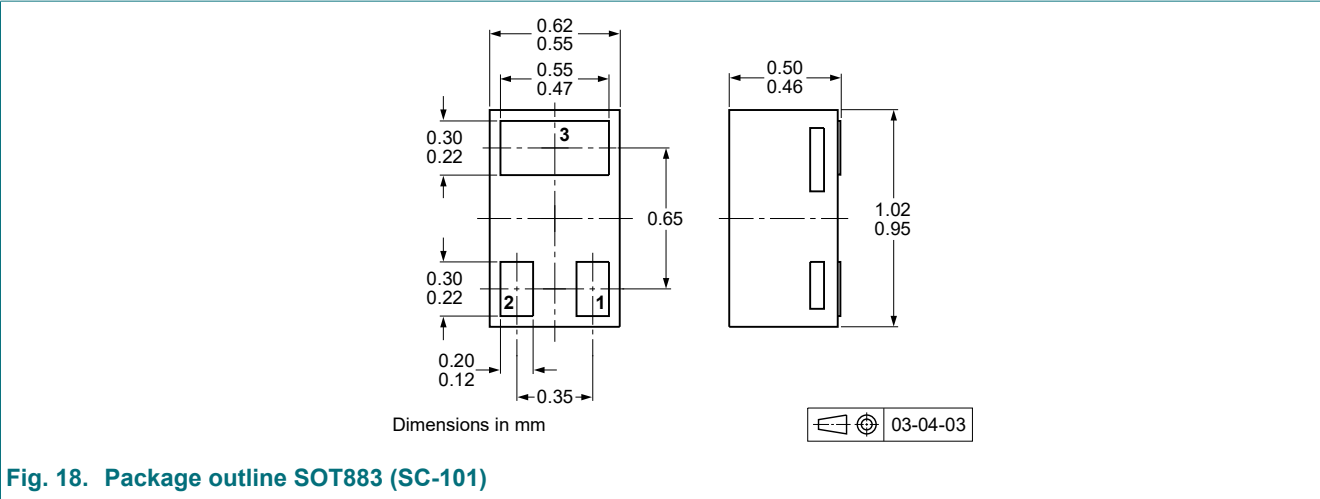


Fig. 18. Package outline SOT883 (SC-101)

## 10. Soldering

Table 10. Soldering

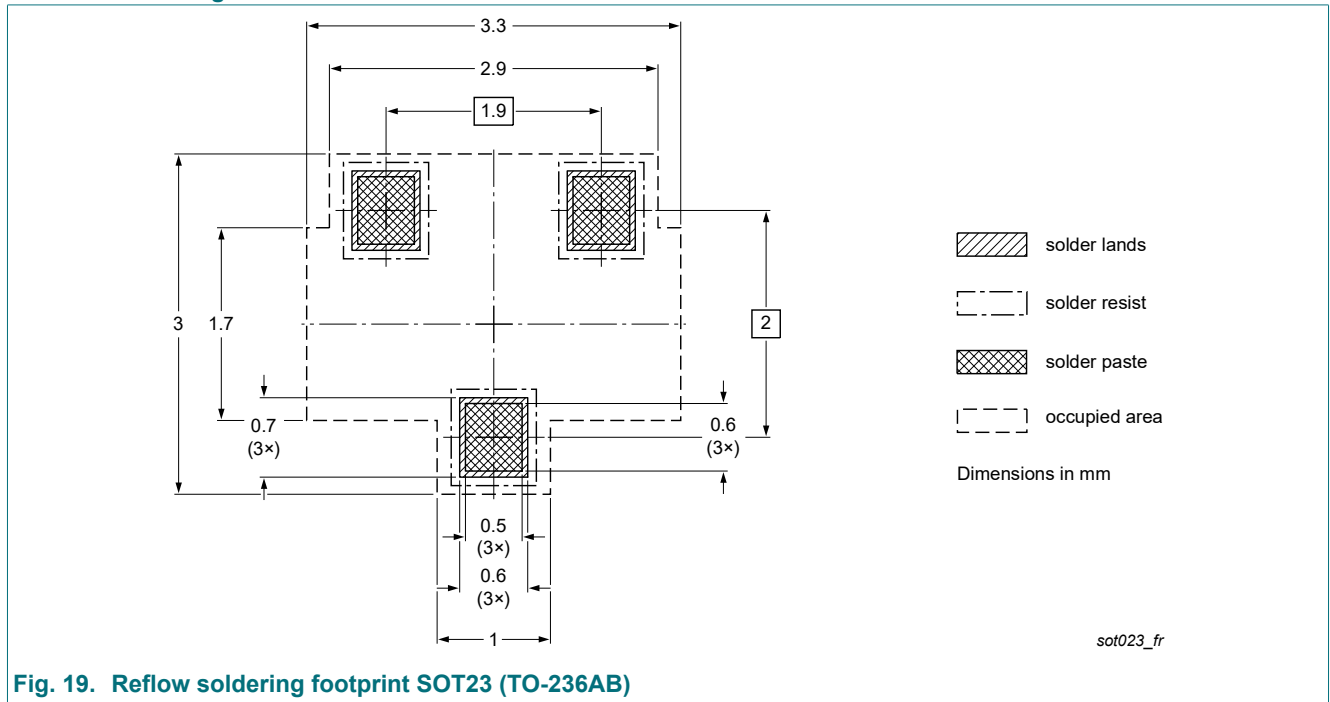


Fig. 19. Reflow soldering footprint SOT23 (TO-236AB)

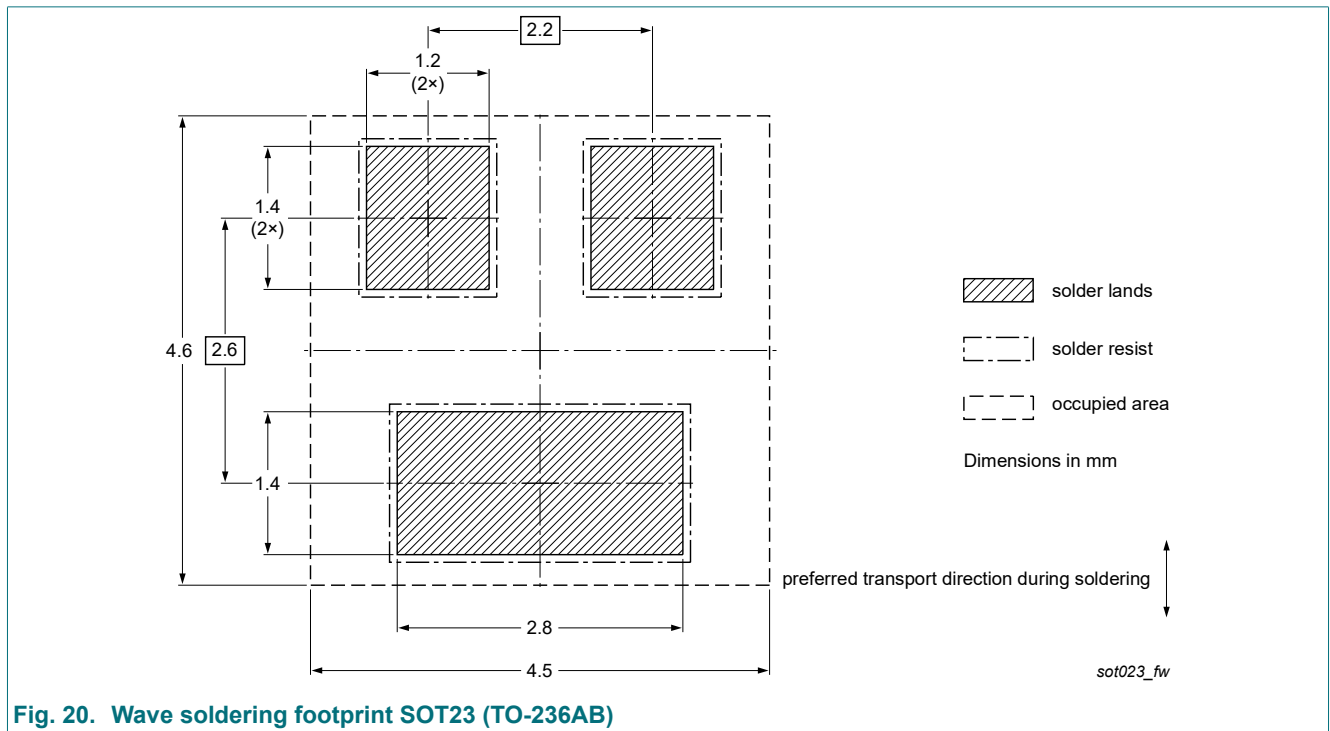


Fig. 20. Wave soldering footprint SOT23 (TO-236AB)

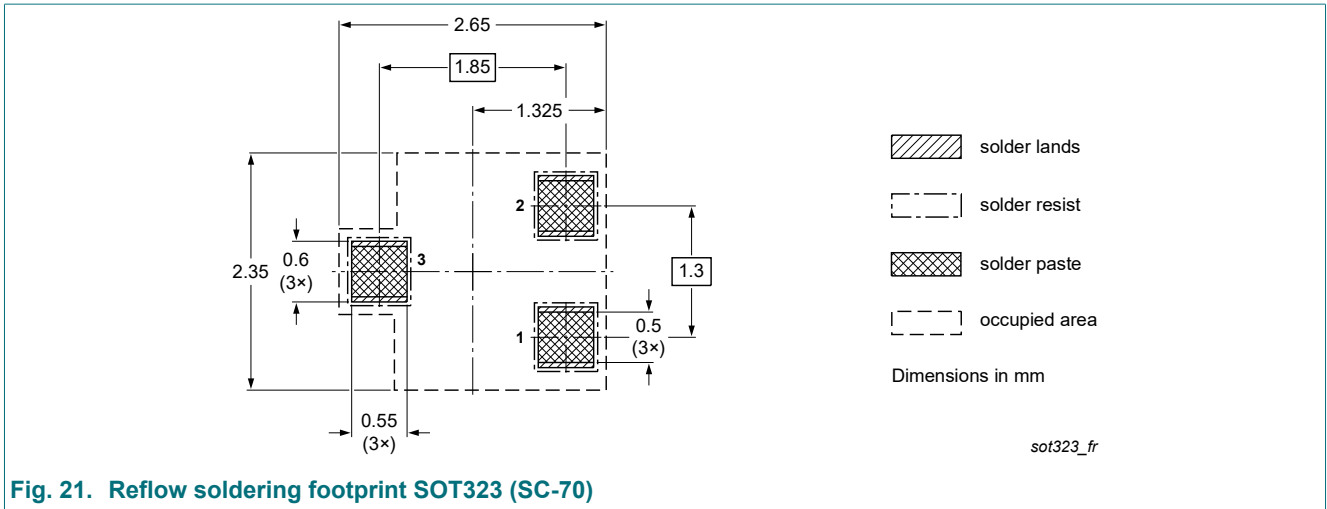


Fig. 21. Reflow soldering footprint SOT323 (SC-70)

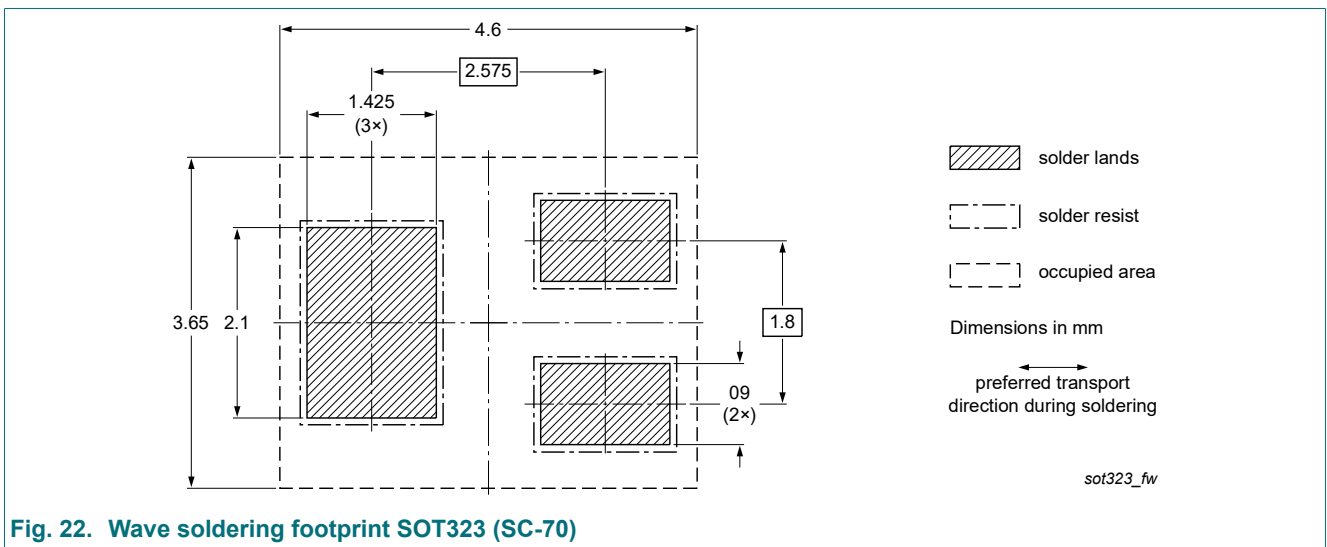


Fig. 22. Wave soldering footprint SOT323 (SC-70)

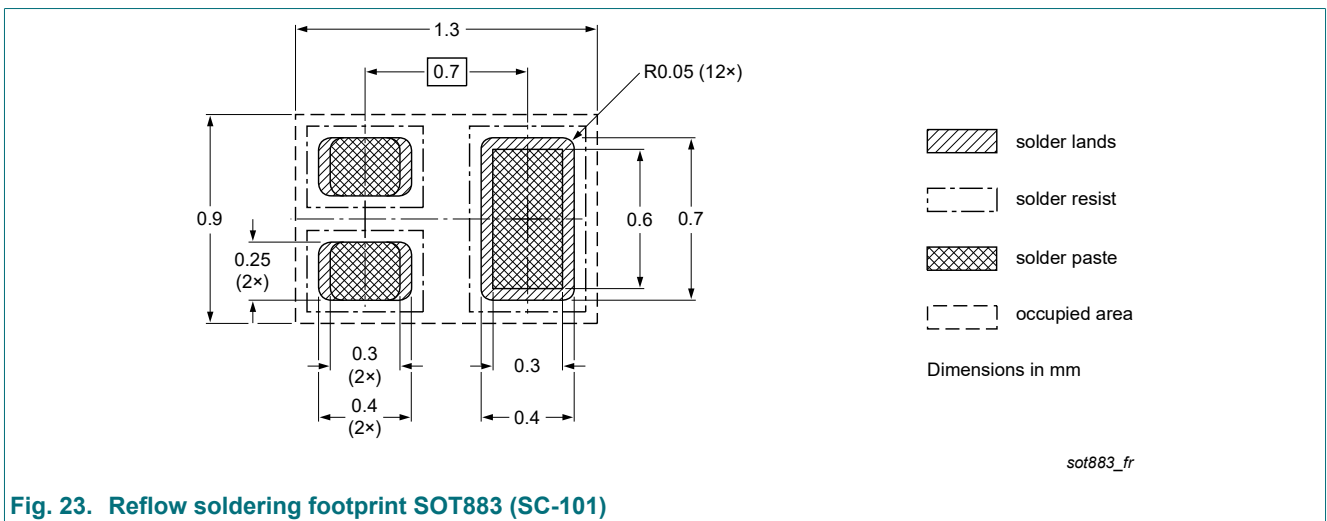


Fig. 23. Reflow soldering footprint SOT883 (SC-101)

## 11. Revision history

Table 11. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
BC847_SER v.12	20191024	Product data sheet	-	BC847_SER v.11
Modifications:	<ul style="list-style-type: none"> <li>Table 1: Header NPN complement corrected to PNP complement</li> </ul>			
BC847_SER v.11	20181205	Product data sheet	-	BC847_SER v.10
BC847_SER v.10	20180302	Product data sheet	-	BC847_SER v.9
BC847_SER v.9	20140923	Product data sheet	-	BC847_SER v.8
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	-	-

## 12. Legal information

### Data sheet status

Document status [1][2]	Product status [3]	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 <https://www.nexperia.com>.

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## Contents

<b>1. Product profile</b> .....	<b>1</b>
1.1. General description.....	1
1.2. Features and benefits.....	1
1.3. Applications.....	1
1.4. Quick reference data.....	2
<b>2. Pinning information</b> .....	<b>2</b>
<b>3. Ordering information</b> .....	<b>3</b>
<b>4. Marking</b> .....	<b>3</b>
<b>5. Limiting values</b> .....	<b>4</b>
<b>6. Thermal characteristics</b> .....	<b>4</b>
<b>7. Characteristics</b> .....	<b>7</b>
<b>8. Test information</b> .....	<b>11</b>
8.1. Quality information.....	11
<b>9. Package outline</b> .....	<b>11</b>
<b>10. Soldering</b> .....	<b>13</b>
<b>11. Revision history</b> .....	<b>15</b>
<b>12. Legal information</b> .....	<b>16</b>

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