



# BC847x-Q series

45 V, 100 mA NPN general-purpose transistors

Rev. 2 — 24 June 2021

Product data sheet

## 1. General description

NPN general-purpose transistors in a small SOT23 (TO-236AB) Surface-Mounted Device (SMD) plastic package.

Table 1. Product overview

Type number[1]	Package		PNP complement
	Nexperia	JEDEC	
BC847-Q	SOT23	TO-236AB	BC857-Q
BC847A-Q			BC857A-Q
BC847B-Q			BC857B-Q
BC847C-Q			BC857C-Q

[1] Valid for all available selection groups.

## 2. Features and benefits

- General-purpose transistors
- SMD plastic packages
- Three different gain selections
- Qualified according to AEC-Q101 and recommended for use in automotive applications

## 3. Applications

- General-purpose switching and amplification

## 4. Quick reference data

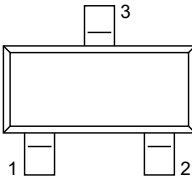
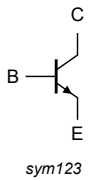
Table 2. Quick reference data

$T_{amb} = 25\text{ °C}$  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	$V_{CE} = 5\text{ V};$ $I_C = 2\text{ mA}$				
	BC847-Q		110	-	800	
	BC847A-Q		110	180	220	
	BC847B-Q		200	290	450	
	BC847C-Q		420	520	800	

## 5. Pinning information

Table 3. Pinning information

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

## 6. Ordering information

Table 4. Ordering information

Type number	Package		Version
	Name	Description	
BC847-Q	TO-236AB	plastic surface-mounted package; 3 leads	SOT23
BC847A-Q			
BC847B-Q			
BC847C-Q			

## 7. Marking

Table 5. Marking codes

Type number		Marking code
BC847-Q	[1]	1H%
BC847A-Q	[1]	1E%
BC847B-Q	[1]	1F%
BC847C-Q	[1]	1G%

[1] % = placeholder for manufacturing site code

## 8. 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] -	250	mW
$T_j$	junction temperature		-	150	°C
$T_{amb}$	ambient temperature		-65	150	°C
$T_{stg}$	storage temperature		-65	150	°C

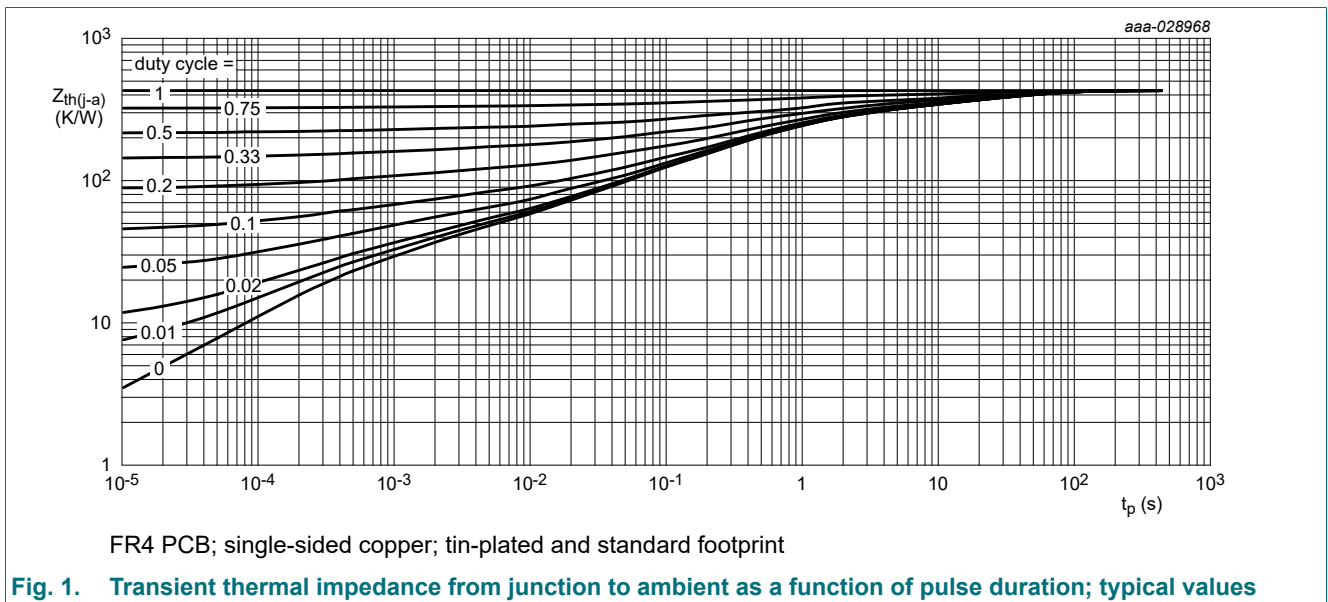
[1] Device mounted on an FR4 Printed-Circuit-Board (PCB); single-sided copper; tin-plated and standard footprint.

## 9. 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] -	-	500	K/W

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



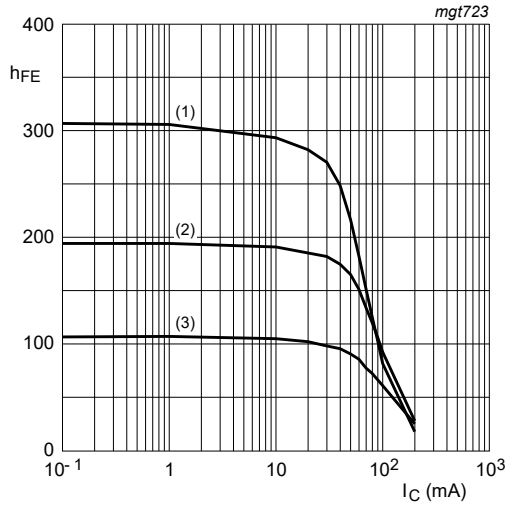
## 10. Characteristics

**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						
	BC847A-Q	$V_{CE} = 5\ \text{V}$ ; $I_C = 10\ \mu\text{A}$	-	170	-		
	BC847B-Q		-	280	-		
	BC847C-Q		-	420	-		
	BC847-Q	$V_{CE} = 5\ \text{V}$ ; $I_C = 2\ \text{mA}$	110	-	800		
	BC847A-Q		110	180	220		
	BC847B-Q		200	290	450		
	BC847C-Q		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	

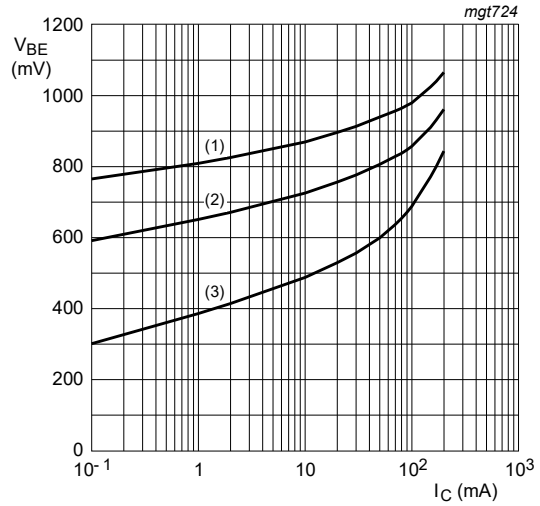
[1] pulsed;  $t_p \leq 300\ \mu\text{s}$ ;  $\delta \leq 0.02$

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



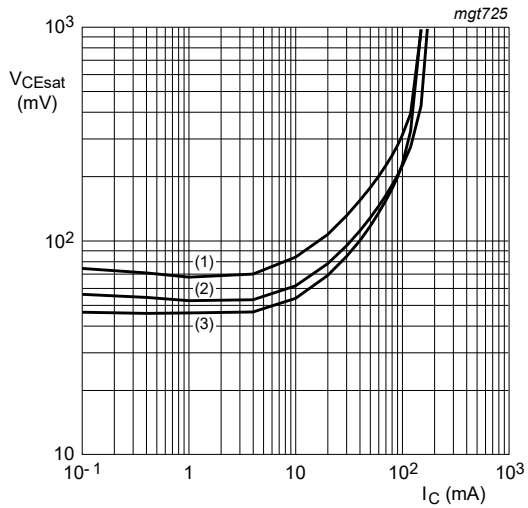
$V_{CE} = 5\text{ V}$   
 (1)  $T_{amb} = 150\text{ }^{\circ}\text{C}$   
 (2)  $T_{amb} = 25\text{ }^{\circ}\text{C}$   
 (3)  $T_{amb} = -55\text{ }^{\circ}\text{C}$

**Fig. 2. BC847A-Q: DC current gain as a function of collector current; typical values**



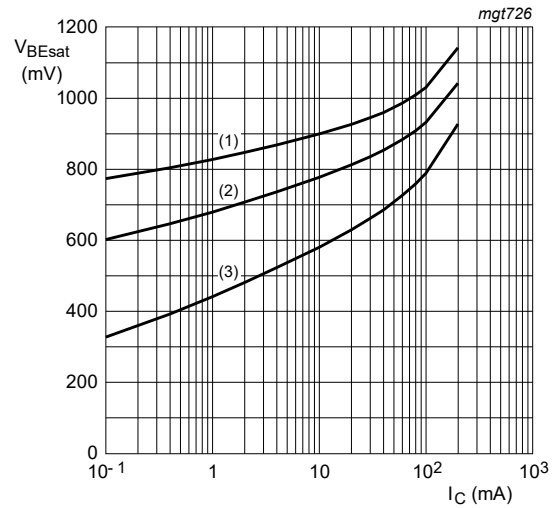
$V_{CE} = 5\text{ V}$   
 (1)  $T_{amb} = -55\text{ }^{\circ}\text{C}$   
 (2)  $T_{amb} = 25\text{ }^{\circ}\text{C}$   
 (3)  $T_{amb} = 150\text{ }^{\circ}\text{C}$

**Fig. 3. BC847A-Q: Base-emitter voltage as a function of collector current; typical values**



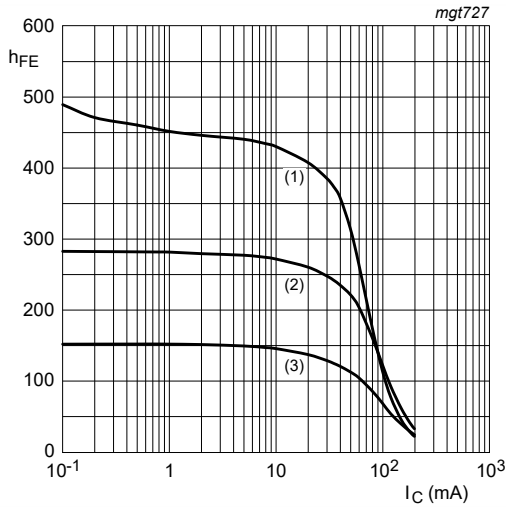
$I_C/I_B = 20$   
 (1)  $T_{amb} = 150\text{ }^{\circ}\text{C}$   
 (2)  $T_{amb} = 25\text{ }^{\circ}\text{C}$   
 (3)  $T_{amb} = -55\text{ }^{\circ}\text{C}$

**Fig. 4. BC847A-Q: Collector-emitter saturation voltage as a function of collector current; typical values**



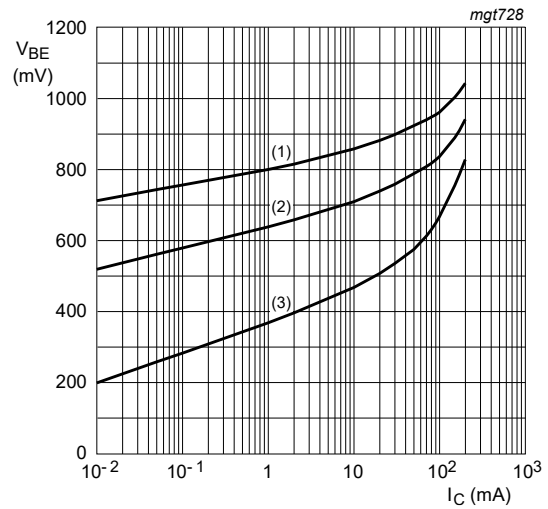
$I_C/I_B = 10$   
 (1)  $T_{amb} = -55\text{ }^{\circ}\text{C}$   
 (2)  $T_{amb} = 25\text{ }^{\circ}\text{C}$   
 (3)  $T_{amb} = 150\text{ }^{\circ}\text{C}$

**Fig. 5. BC847A-Q: Base-emitter saturation voltage as a function of collector current; typical values**



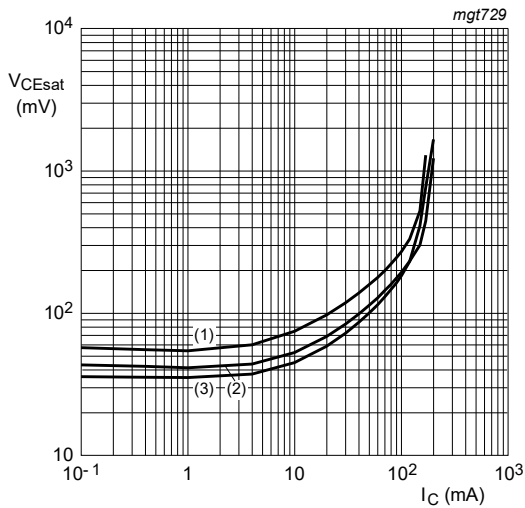
$V_{CE} = 5\text{ V}$   
 (1)  $T_{amb} = 150\text{ °C}$   
 (2)  $T_{amb} = 25\text{ °C}$   
 (3)  $T_{amb} = -55\text{ °C}$

Fig. 6. BC847B-Q: DC current gain as a function of collector current; typical values



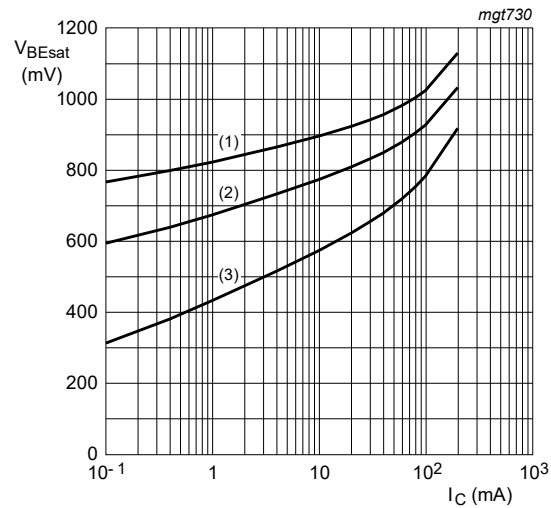
$V_{CE} = 5\text{ V}$   
 (1)  $T_{amb} = -55\text{ °C}$   
 (2)  $T_{amb} = 25\text{ °C}$   
 (3)  $T_{amb} = 150\text{ °C}$

Fig. 7. BC847B-Q: Base-emitter voltage as a function of collector current; typical values



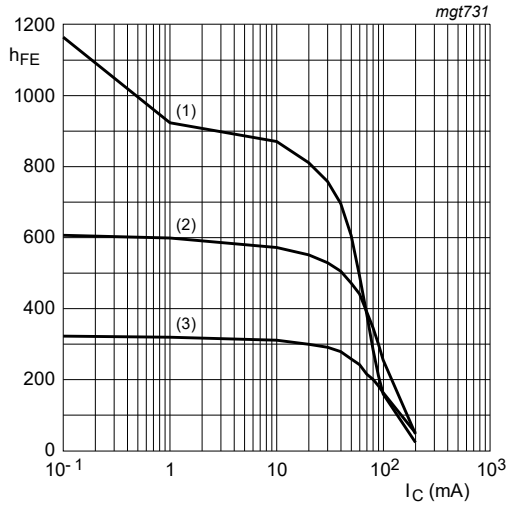
$I_C/I_B = 20$   
 (1)  $T_{amb} = 150\text{ °C}$   
 (2)  $T_{amb} = 25\text{ °C}$   
 (3)  $T_{amb} = -55\text{ °C}$

Fig. 8. BC847B-Q: Collector-emitter saturation voltage as a function of collector current; typical values



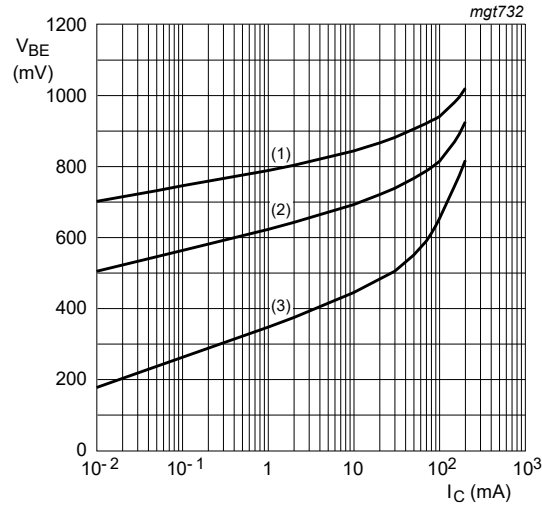
$I_C/I_B = 10$   
 (1)  $T_{amb} = -55\text{ °C}$   
 (2)  $T_{amb} = 25\text{ °C}$   
 (3)  $T_{amb} = 150\text{ °C}$

Fig. 9. BC847B-Q: Base-emitter saturation voltage as a function of collector current; typical values



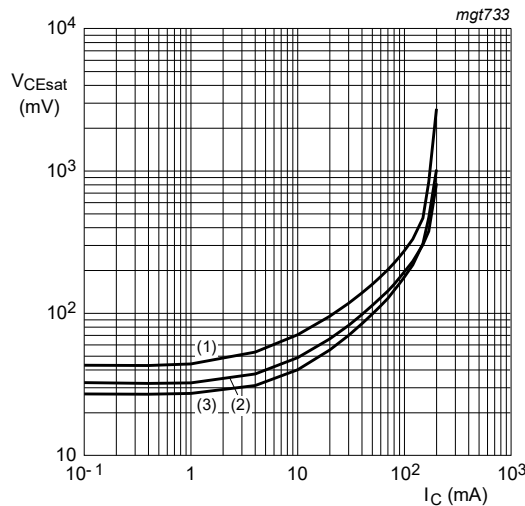
$V_{CE} = 5\text{ V}$   
 (1)  $T_{amb} = 150\text{ }^{\circ}\text{C}$   
 (2)  $T_{amb} = 25\text{ }^{\circ}\text{C}$   
 (3)  $T_{amb} = -55\text{ }^{\circ}\text{C}$

**Fig. 10. BC847C-Q: DC current gain as a function of collector current; typical values**



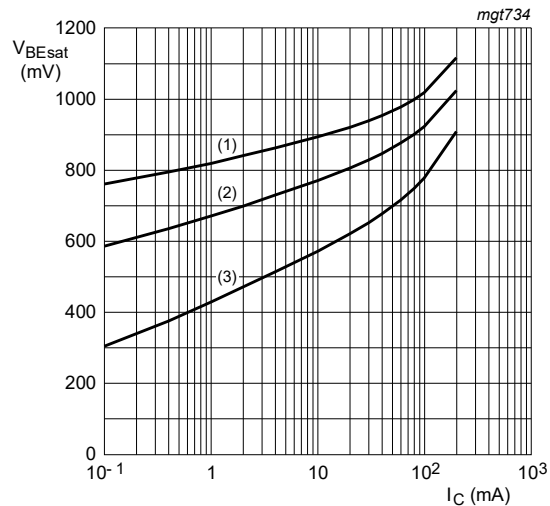
$V_{CE} = 5\text{ V}$   
 (1)  $T_{amb} = -55\text{ }^{\circ}\text{C}$   
 (2)  $T_{amb} = 25\text{ }^{\circ}\text{C}$   
 (3)  $T_{amb} = 150\text{ }^{\circ}\text{C}$

**Fig. 11. BC847C-Q: 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. 12. BC847C-Q: 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. 13. BC847C-Q: Base-emitter saturation voltage as a function of collector current; typical values**

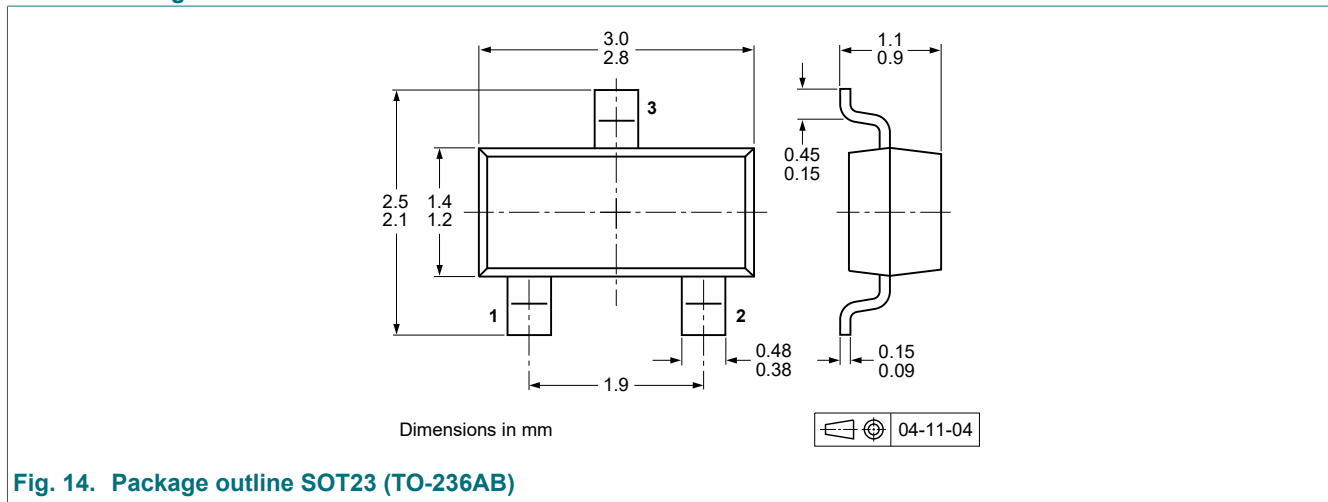
## 11. Test information

### 11.1. 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.

## 12. Package outline

Table 9. Package outline





### 13. Soldering

Table 10. Soldering

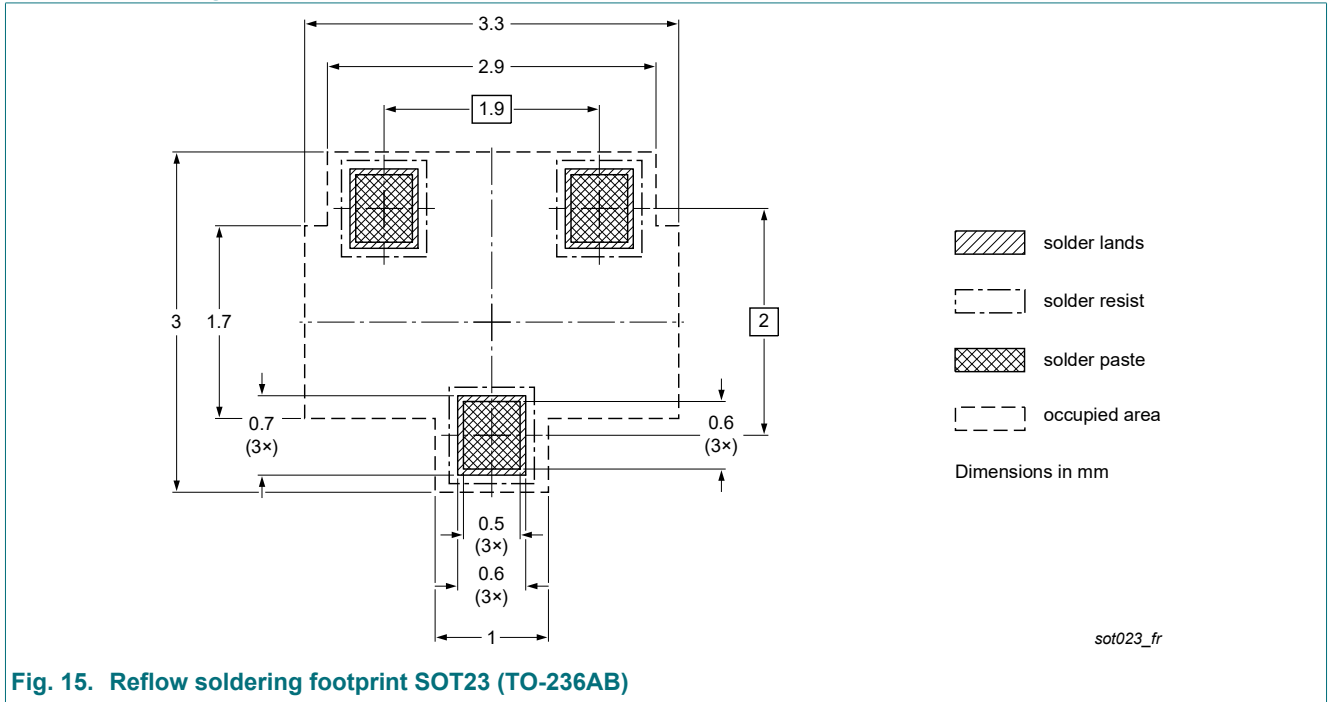


Fig. 15. Reflow soldering footprint SOT23 (TO-236AB)

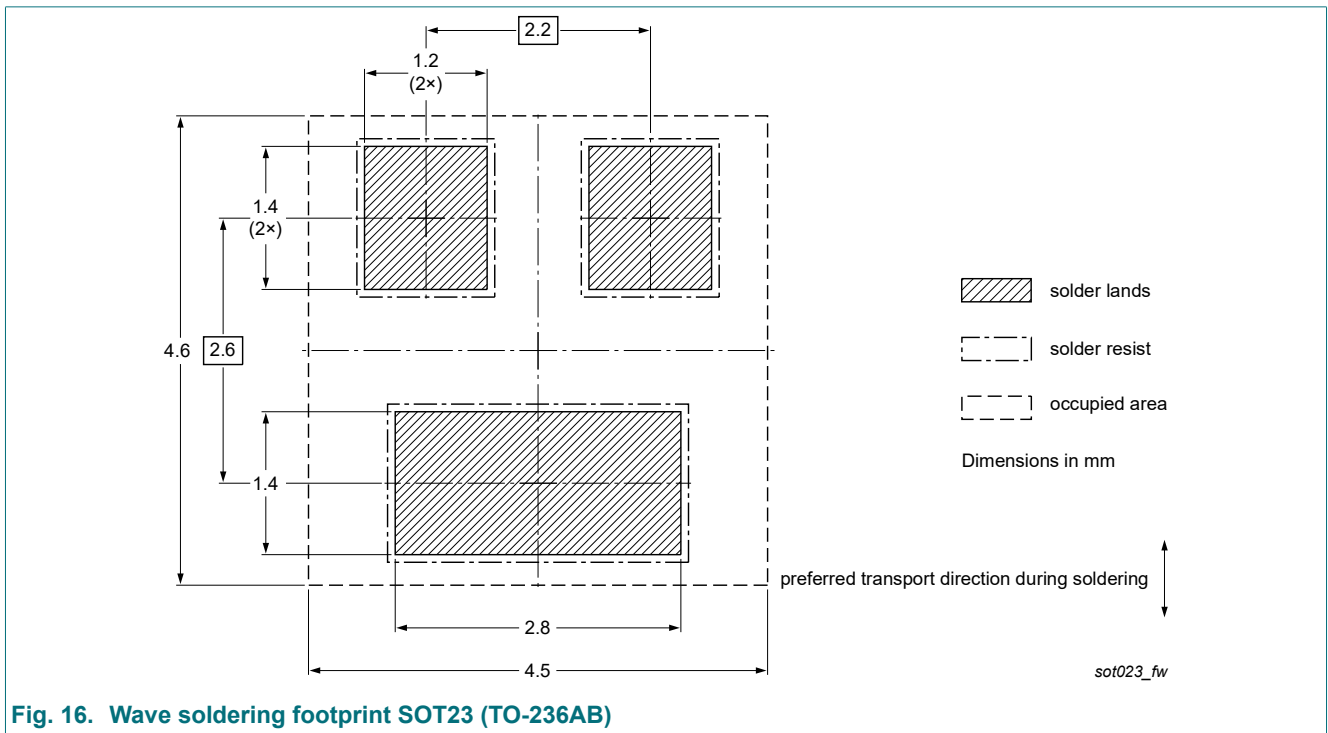


Fig. 16. Wave soldering footprint SOT23 (TO-236AB)

## 14. Revision history

Table 11. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
BC847x-Q_SER v.2	20210624	Product data sheet	-	BC847-Q_SER v.1
Modifications:	• Series data sheet reduced to 3 data sheets per package			
BC847-Q_SER v.1	20210617	Product data sheet	-	-

## 15. 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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