



# BC847xW-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 very small SOT323 (SC-70) Surface-Mounted Device (SMD) plastic package.

Table 1. Product overview

Type number[1]	Package		PNP complement
	Nexperia	JEITA	
BC847W-Q	SOT323	SC-70	BC857W-Q
BC847AW-Q			BC857AW-Q
BC847BW-Q			BC857BW-Q
BC847CW-Q			BC857CW-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

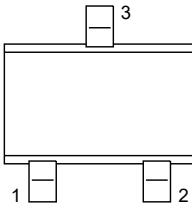
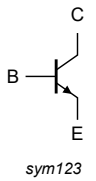
Table 2. Quick reference data

$T_{amb} = 25\text{ °C}$  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					
	BC847W-Q	$V_{CE} = 5\text{ V};$ $I_C = 2\text{ mA}$	110	-	800	
	BC847AW-Q		110	180	220	
	BC847BW-Q		200	290	450	
	BC847CW-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		
	Name	Description	Version
BC847W-Q	SC-70	plastic surface-mounted package; 3 leads	SOT323
BC847AW-Q			
BC847BW-Q			
BC847CW-Q			

## 7. Marking

Table 5. Marking codes

Type number		Marking code
BC847W-Q	[1]	1H%
BC847AW-Q	[1]	1E%
BC847BW-Q	[1]	1F%
BC847CW-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] -	200	mW
$T_j$	junction temperature		-	150	°C
$T_{amb}$	ambient temperature		-65	150	°C
$T_{stg}$	storage temperature		-65	150	°C

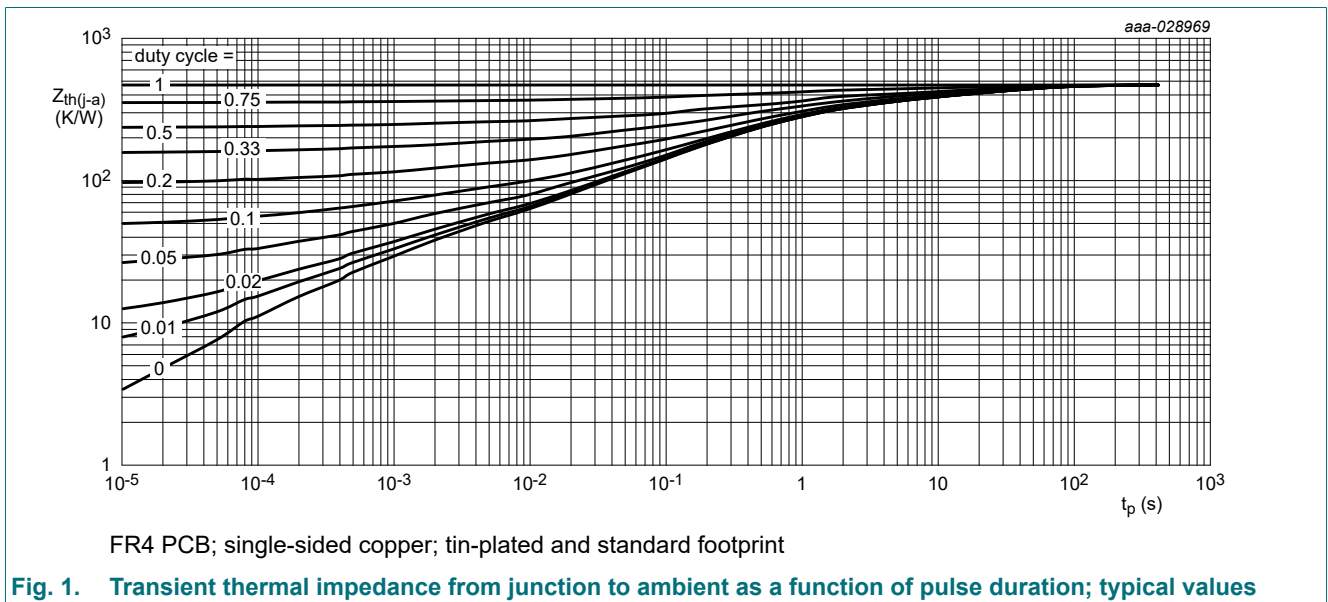
[1] Device mounted on an FR4 Printed-Circuit-Board (PCB); single-sided copper; tin-plated and standard footprint.

## 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] -	-	625	K/W

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



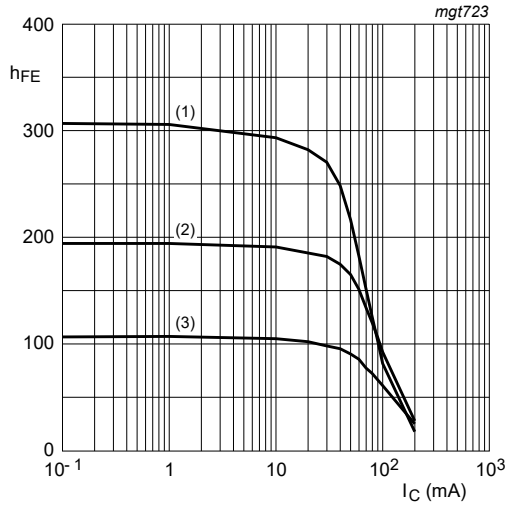
## 10. Characteristics

**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						
	BC847AW-Q	$V_{CE} = 5\ \text{V}$ ; $I_C = 10\ \mu\text{A}$	-	170	-		
	BC847BW-Q		-	280	-		
	BC847CW-Q		-	420	-		
	BC847W-Q	$V_{CE} = 5\ \text{V}$ ; $I_C = 2\ \text{mA}$	110	-	800		
	BC847AW-Q		110	180	220		
	BC847BW-Q		200	290	450		
	BC847CW-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	

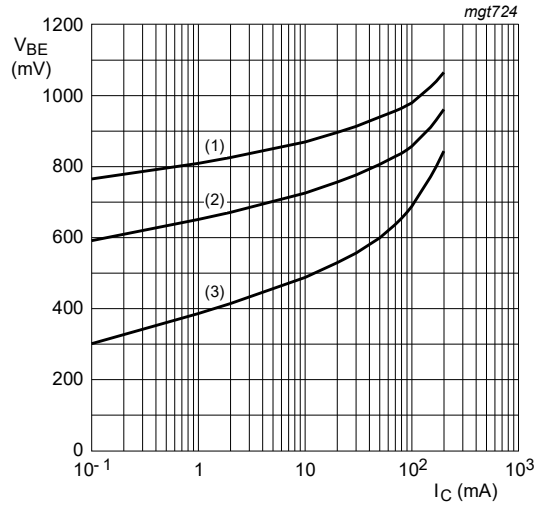
[1] pulsed;  $t_p \leq 300\ \mu\text{s}$ ;  $\delta \leq 0.02$

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



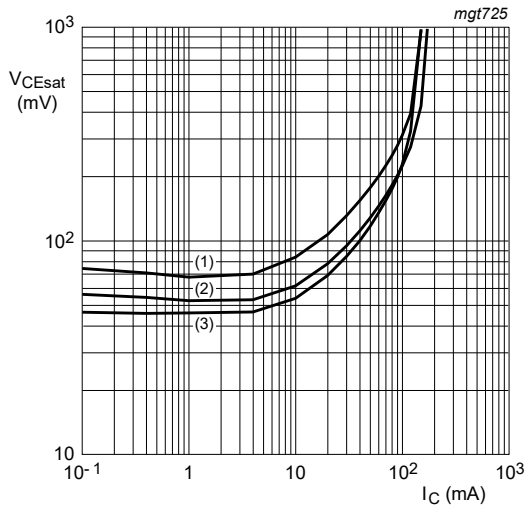
$V_{CE} = 5\text{ V}$   
 (1)  $T_{amb} = 150\text{ }^{\circ}\text{C}$   
 (2)  $T_{amb} = 25\text{ }^{\circ}\text{C}$   
 (3)  $T_{amb} = -55\text{ }^{\circ}\text{C}$

**Fig. 2. BC847AW-Q: DC current gain as a function of collector current; typical values**



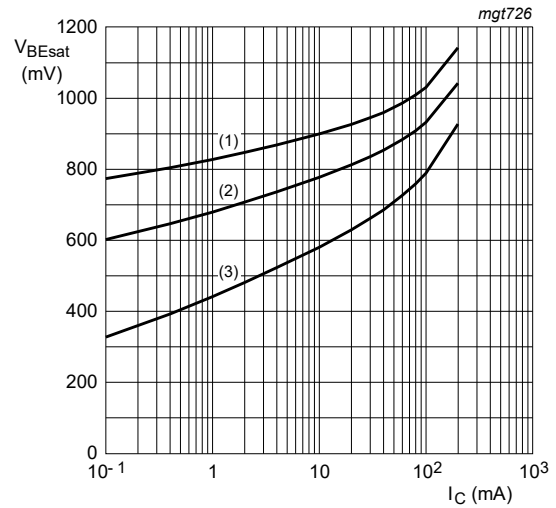
$V_{CE} = 5\text{ V}$   
 (1)  $T_{amb} = -55\text{ }^{\circ}\text{C}$   
 (2)  $T_{amb} = 25\text{ }^{\circ}\text{C}$   
 (3)  $T_{amb} = 150\text{ }^{\circ}\text{C}$

**Fig. 3. BC847AW-Q: Base-emitter voltage as a function of collector current; typical values**



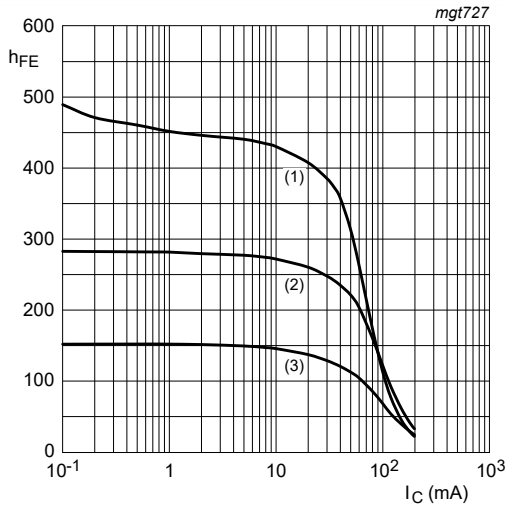
$I_C/I_B = 20$   
 (1)  $T_{amb} = 150\text{ }^{\circ}\text{C}$   
 (2)  $T_{amb} = 25\text{ }^{\circ}\text{C}$   
 (3)  $T_{amb} = -55\text{ }^{\circ}\text{C}$

**Fig. 4. BC847AW-Q: Collector-emitter saturation voltage as a function of collector current; typical values**



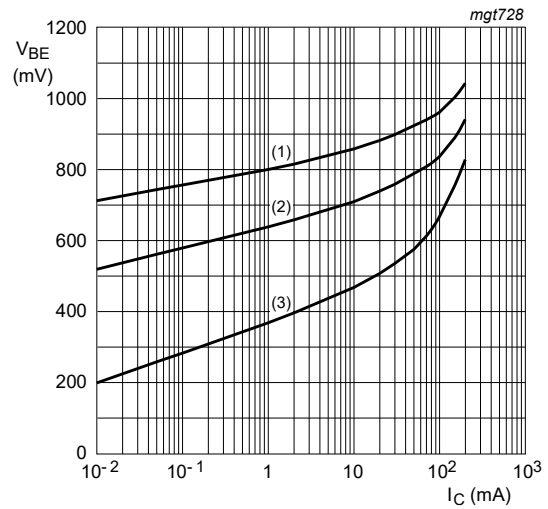
$I_C/I_B = 10$   
 (1)  $T_{amb} = -55\text{ }^{\circ}\text{C}$   
 (2)  $T_{amb} = 25\text{ }^{\circ}\text{C}$   
 (3)  $T_{amb} = 150\text{ }^{\circ}\text{C}$

**Fig. 5. BC847AW-Q: Base-emitter saturation voltage as a function of collector current; typical values**



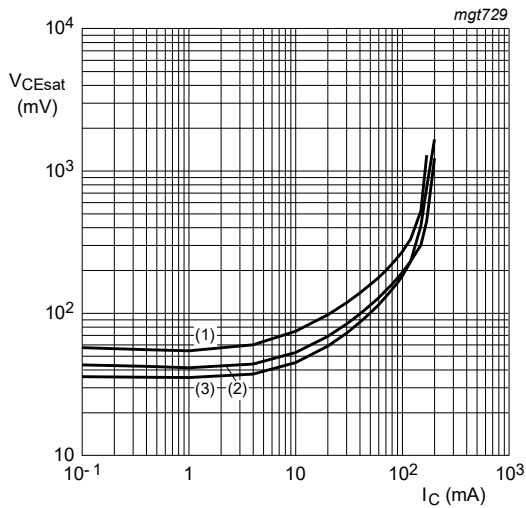
$V_{CE} = 5\text{ V}$   
 (1)  $T_{amb} = 150\text{ °C}$   
 (2)  $T_{amb} = 25\text{ °C}$   
 (3)  $T_{amb} = -55\text{ °C}$

Fig. 6. BC847BW-Q: DC current gain as a function of collector current; typical values



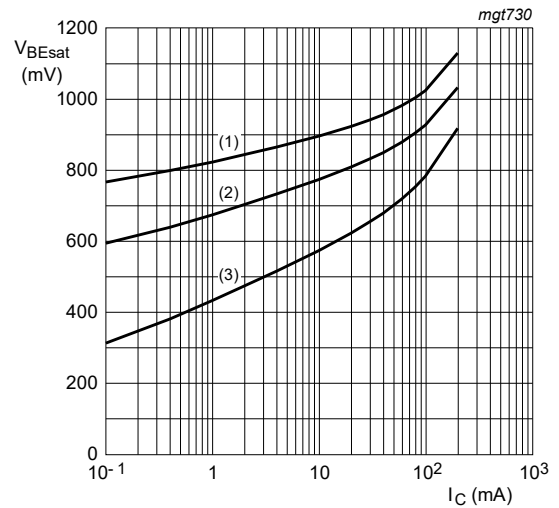
$V_{CE} = 5\text{ V}$   
 (1)  $T_{amb} = -55\text{ °C}$   
 (2)  $T_{amb} = 25\text{ °C}$   
 (3)  $T_{amb} = 150\text{ °C}$

Fig. 7. BC847BW-Q: Base-emitter voltage as a function of collector current; typical values



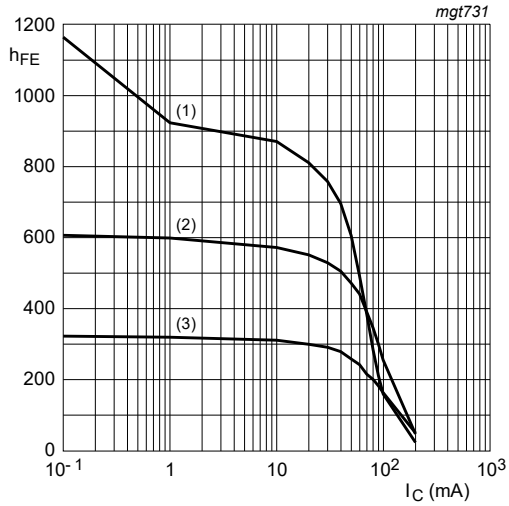
$I_C/I_B = 20$   
 (1)  $T_{amb} = 150\text{ °C}$   
 (2)  $T_{amb} = 25\text{ °C}$   
 (3)  $T_{amb} = -55\text{ °C}$

Fig. 8. BC847BW-Q: Collector-emitter saturation voltage as a function of collector current; typical values



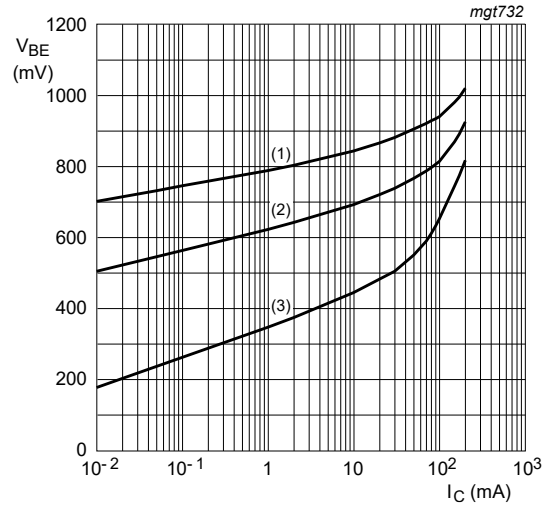
$I_C/I_B = 10$   
 (1)  $T_{amb} = -55\text{ °C}$   
 (2)  $T_{amb} = 25\text{ °C}$   
 (3)  $T_{amb} = 150\text{ °C}$

Fig. 9. BC847BW-Q: Base-emitter saturation voltage as a function of collector current; typical values



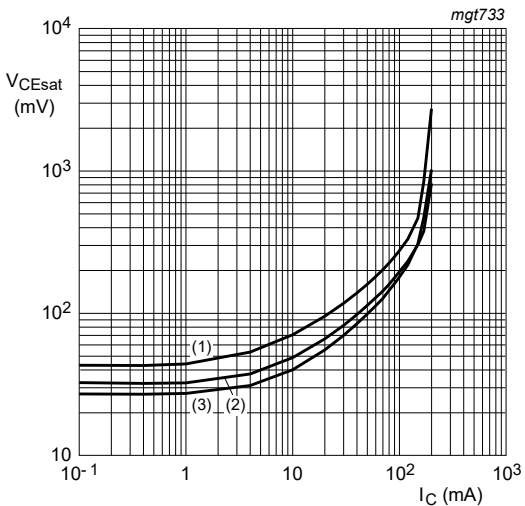
$V_{CE} = 5\text{ V}$   
 (1)  $T_{amb} = 150\text{ °C}$   
 (2)  $T_{amb} = 25\text{ °C}$   
 (3)  $T_{amb} = -55\text{ °C}$

**Fig. 10. BC847CW-Q: DC current gain as a function of collector current; typical values**



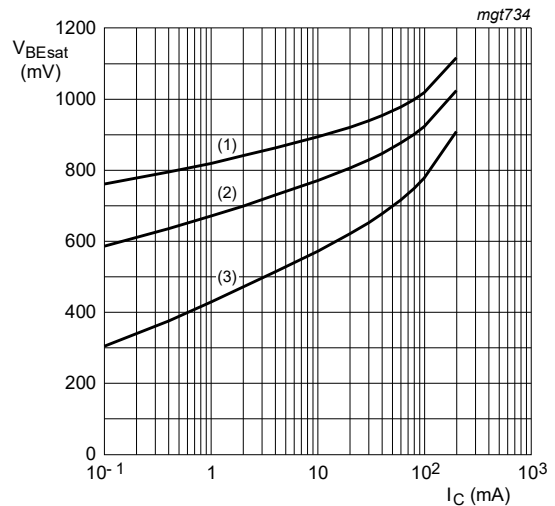
$V_{CE} = 5\text{ V}$   
 (1)  $T_{amb} = -55\text{ °C}$   
 (2)  $T_{amb} = 25\text{ °C}$   
 (3)  $T_{amb} = 150\text{ °C}$

**Fig. 11. BC847CW-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. 12. BC847CW-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. 13. BC847CW-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

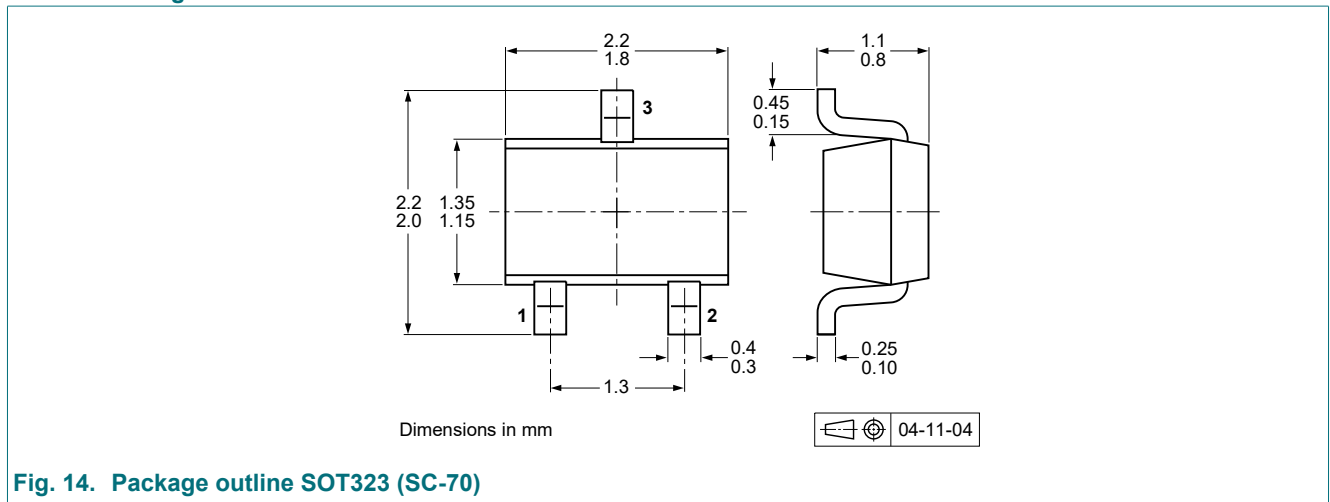


Fig. 14. Package outline SOT323 (SC-70)



### 13. Soldering

Table 10. Soldering

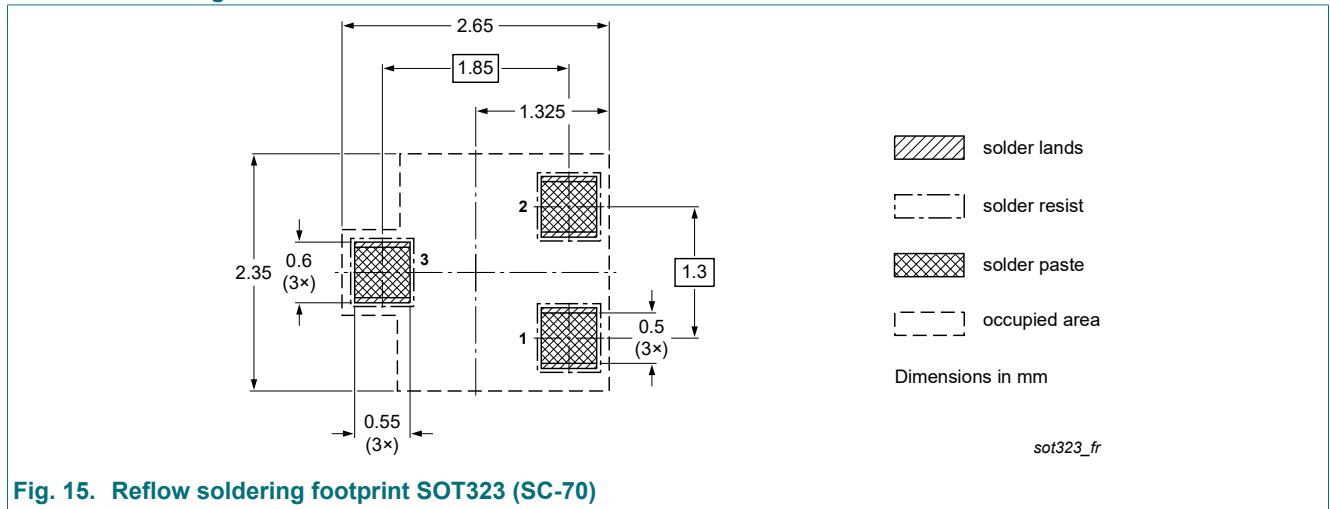


Fig. 15. Reflow soldering footprint SOT323 (SC-70)

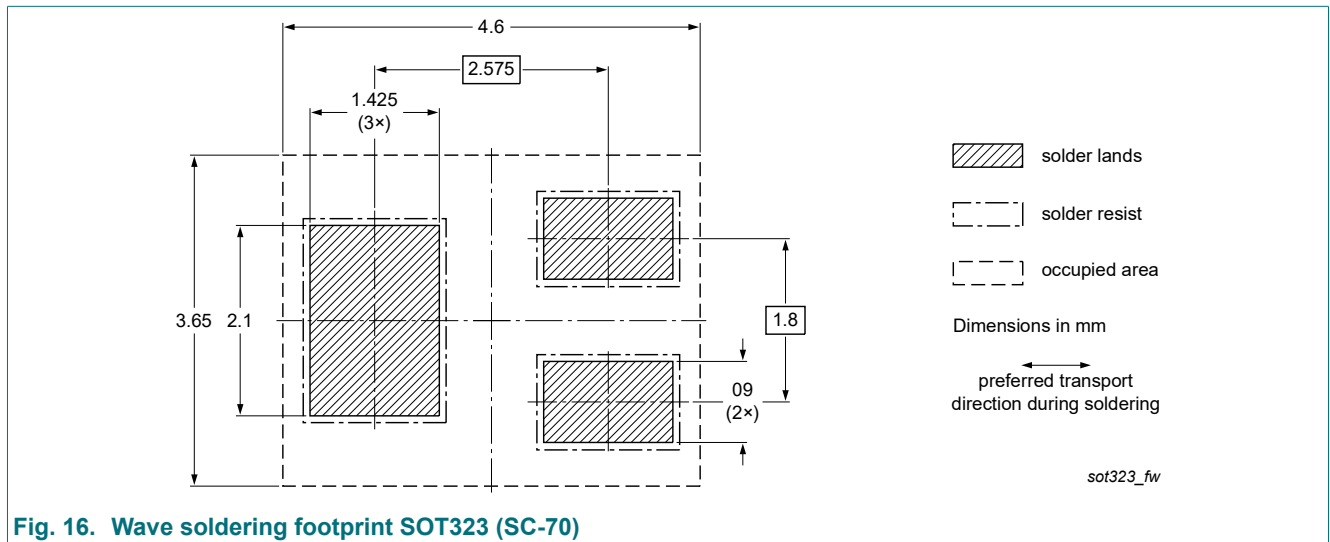


Fig. 16. Wave soldering footprint SOT323 (SC-70)

## 14. Revision history

Table 11. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
BC847XW-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.

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- [2] The term 'short data sheet' is explained in section "Definitions".
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