

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

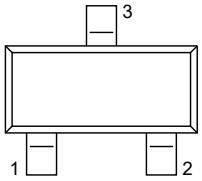
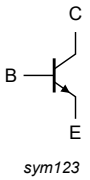
Table 2. Quick reference data

T_{amb} = 25 °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 V; I_C = 2 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	Descrition	Simlified 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
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

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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

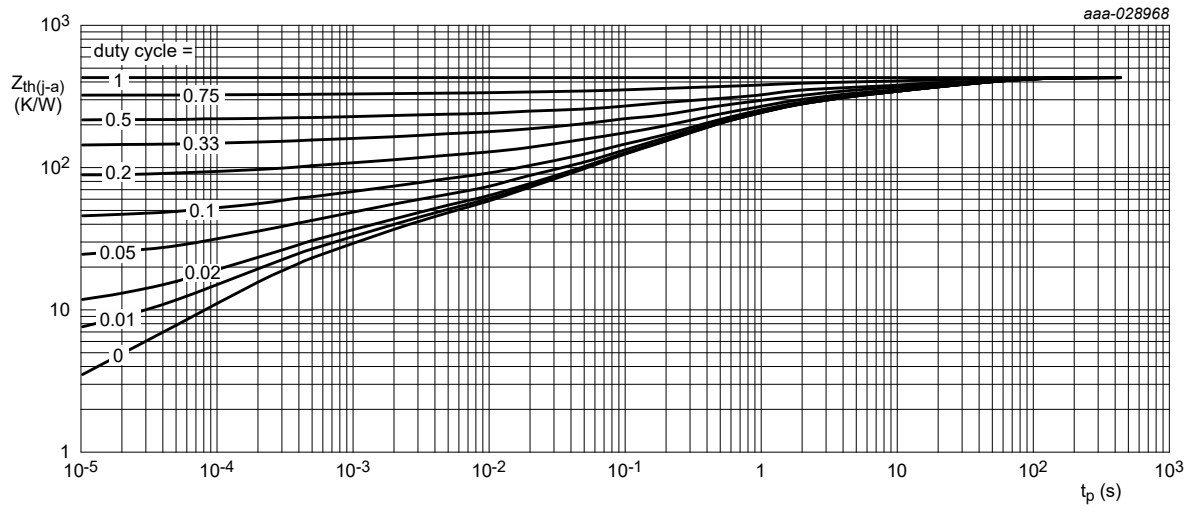
[1] Device mounted on an FR4 Printed-Circuit-Board (PCB); single-sided copper; tin-plated and standard footprint.

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.



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

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

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10. Characteristics

Table 8. Characteristics

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

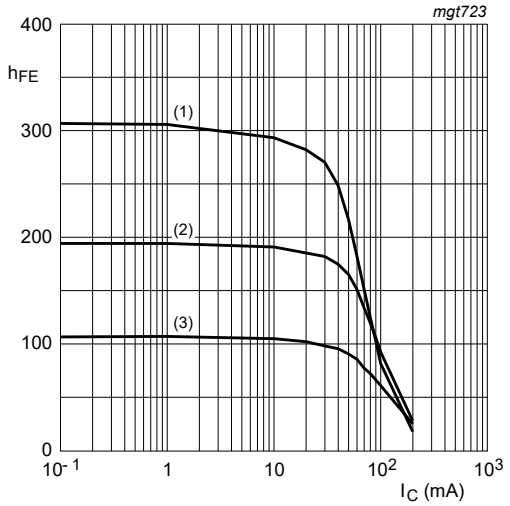
Symbol	Parameter	Conditions		Min	Typ	Max	Unit
$V_{(BR)CBO}$	collector-base breakdown voltage	I_C = 100 µA; I_E = 0 A		50	-	-	V
$V_{(BR)CES}$	collector-emitter breakdown voltage	I_C = 2 mA; V_{BE} = 0 A		45	-	-	V
$V_{(BR)EBO}$	emitter-base breakdown voltage	I_C = 0 A; I_E = 100 µA		6	-	-	V
I_{CBO}	collector-base cut-off current	V_{CB} = 30 V; I_E = 0 A		-	-	15	nA
		V_{CB} = 30 V; I_E = 0 A; T_j = 150 °C		-	-	5	µA
I_{EBO}	emitter-base cut-off current	V_{EB} = 5 V; I_C = 0 A		-	-	100	nA
h_{FE}	DC current gain						
	BC847A-Q	V_{CE} = 5 V; I_C = 10 µA		-	170	-	
	BC847B-Q			-	280	-	
	BC847C-Q			-	420	-	
	BC847-Q	V_{CE} = 5 V; I_C = 2 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 mA; I_B = 0.5 mA		-	90	200	mV
		I_C = 100 mA; I_B = 5 mA	[1]	-	200	400	mV
V_{BEsat}	base-emitter saturation voltage	I_C = 10 mA; I_B = 0.5 mA	[2]	-	700	-	mV
		I_C = 100 mA; I_B = 5 mA	[2]	-	900	-	mV
V_{BE}	base-emitter voltage	V_{CE} = 5 V; I_C = 2 mA	[2]	580	660	700	mV
		V_{CE} = 5 V; I_C = 10 mA		-	-	770	mV
f_T	transition frequency	V_{CE} = 5 V; I_C = 10 mA; f = 100 MHz		100	-	-	MHz
C_c	collector capacitance	V_{CB} = 10 V; I_E = i_e = 0 A; f = 1 MHz		-	-	1.5	pF
C_e	emitter capacitance	V_{EB} = 0.5 V; I_C = i_c = 0 A; f = 1 MHz		-	11	-	pF
NF	noise figure	I_C = 200 µA; V_{CE} = 5 V; R_S = 2 kΩ; f = 1 kHz; B = 200Hz		-	2	10	dB

[1] pulsed; $t_p \leq 300$ µs; $\delta \leq 0.02$

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

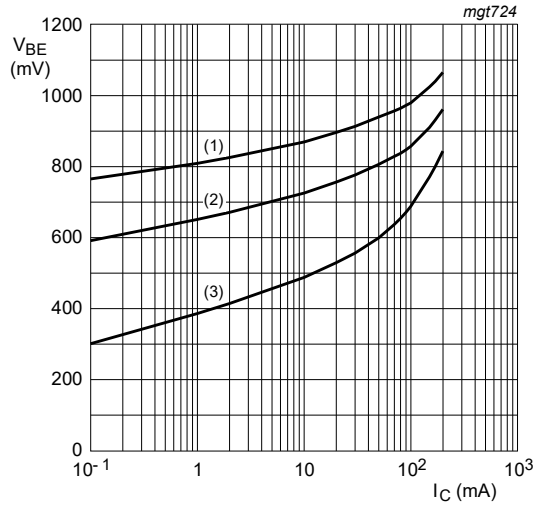
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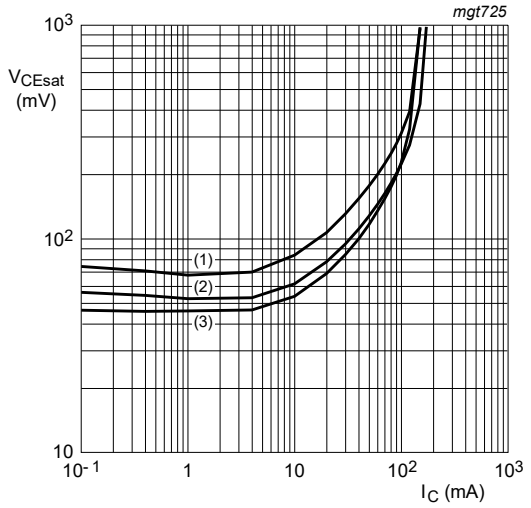
V_{CE} = 5 V
(1) T_{amb} = 150 °C
(2) T_{amb} = 25 °C
(3) T_{amb} = -55 °C

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



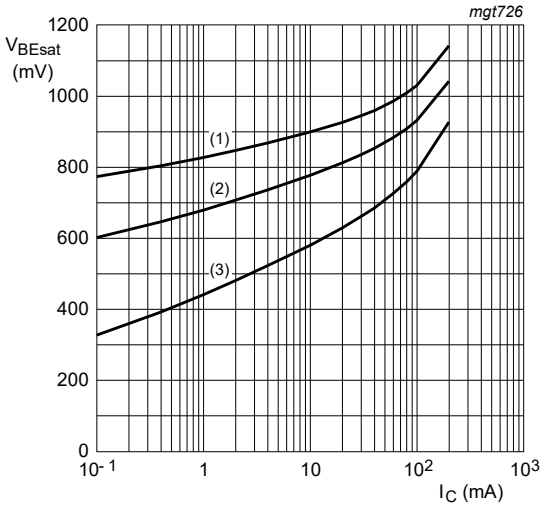
V_{CE} = 5 V
(1) T_{amb} = -55 °C
(2) T_{amb} = 25 °C
(3) T_{amb} = 150 °C

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



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

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

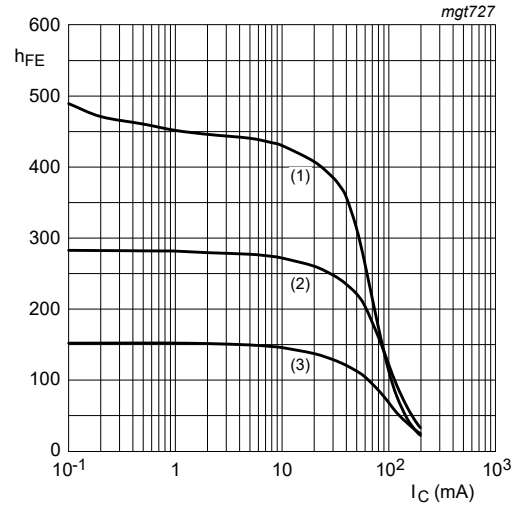


I_C/I_B = 10
(1) T_{amb} = -55 °C
(2) T_{amb} = 25 °C
(3) T_{amb} = 150 °C

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

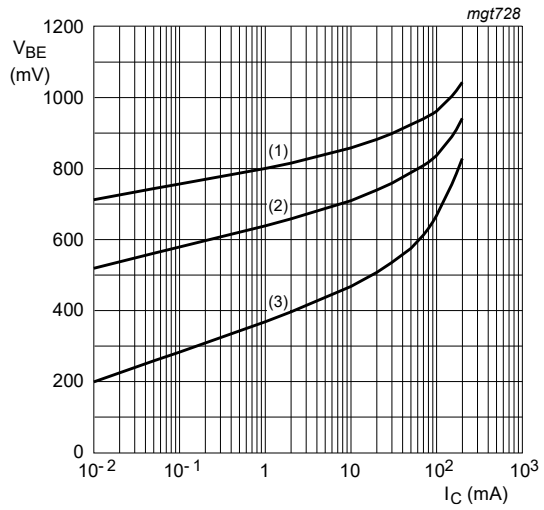
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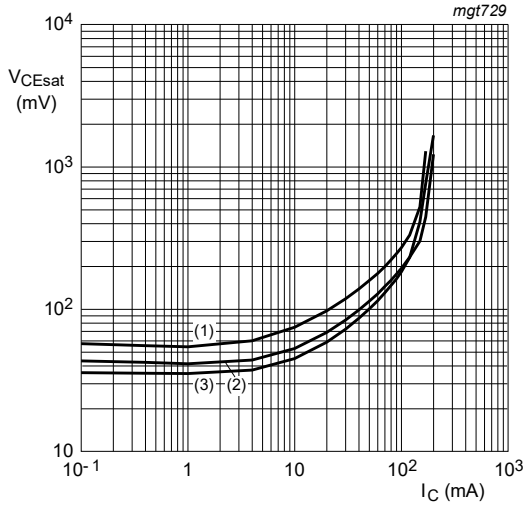
V_{CE} = 5 V
(1) T_{amb} = 150 °C
(2) T_{amb} = 25 °C
(3) T_{amb} = -55 °C

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



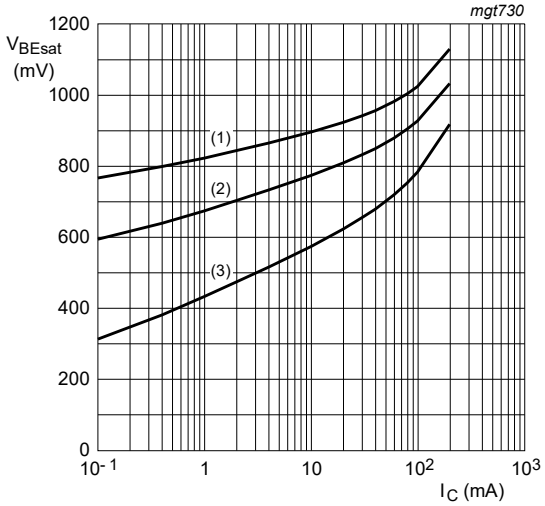
V_{CE} = 5 V
(1) T_{amb} = -55 °C
(2) T_{amb} = 25 °C
(3) T_{amb} = 150 °C

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



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

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

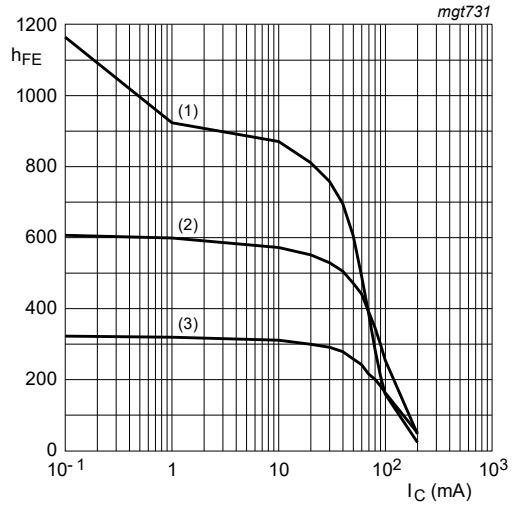


I_C/I_B = 10
(1) T_{amb} = -55 °C
(2) T_{amb} = 25 °C
(3) T_{amb} = 150 °C

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

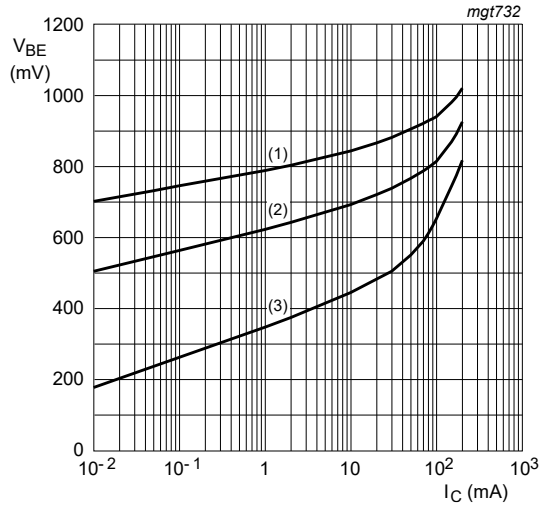
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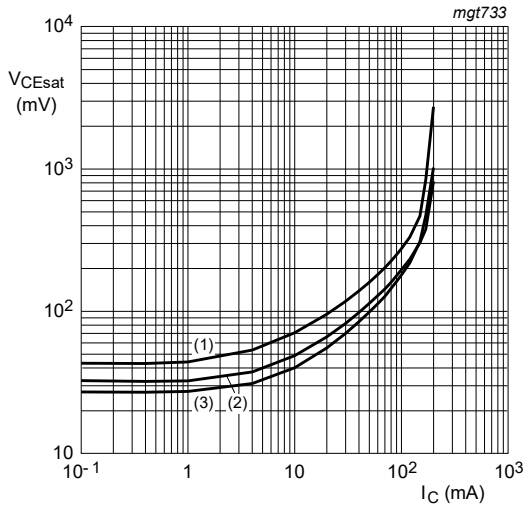
V_{CE} = 5 V
(1) T_{amb} = 150 °C
(2) T_{amb} = 25 °C
(3) T_{amb} = -55 °C

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



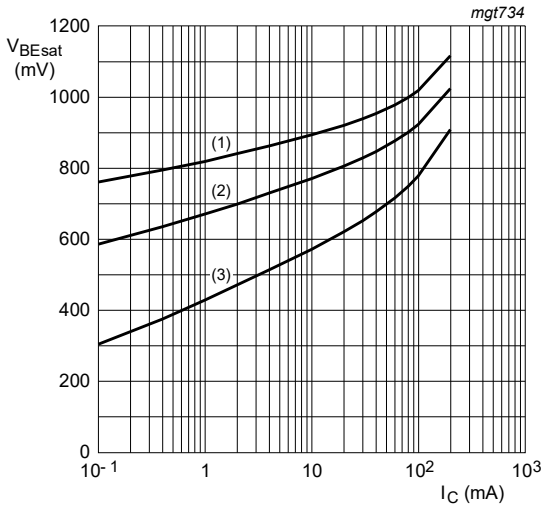
V_{CE} = 5 V
(1) T_{amb} = -55 °C
(2) T_{amb} = 25 °C
(3) T_{amb} = 150 °C

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



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

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

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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

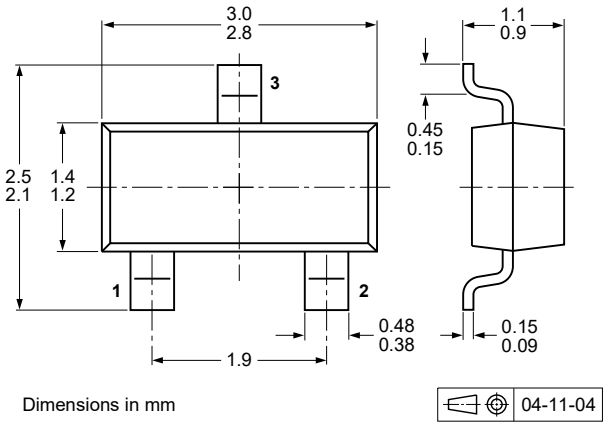


Fig. 14. Package outline SOT23 (TO-236AB)

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13. Soldering

Table 10. Soldering

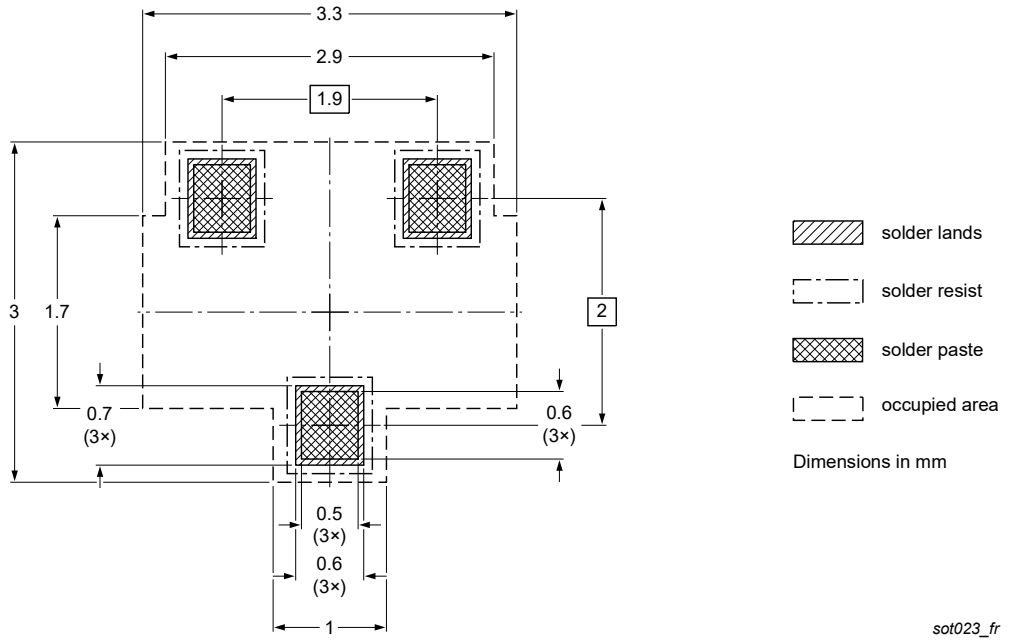


Fig. 15. Reflow soldering footprint SOT23 (TO-236AB)

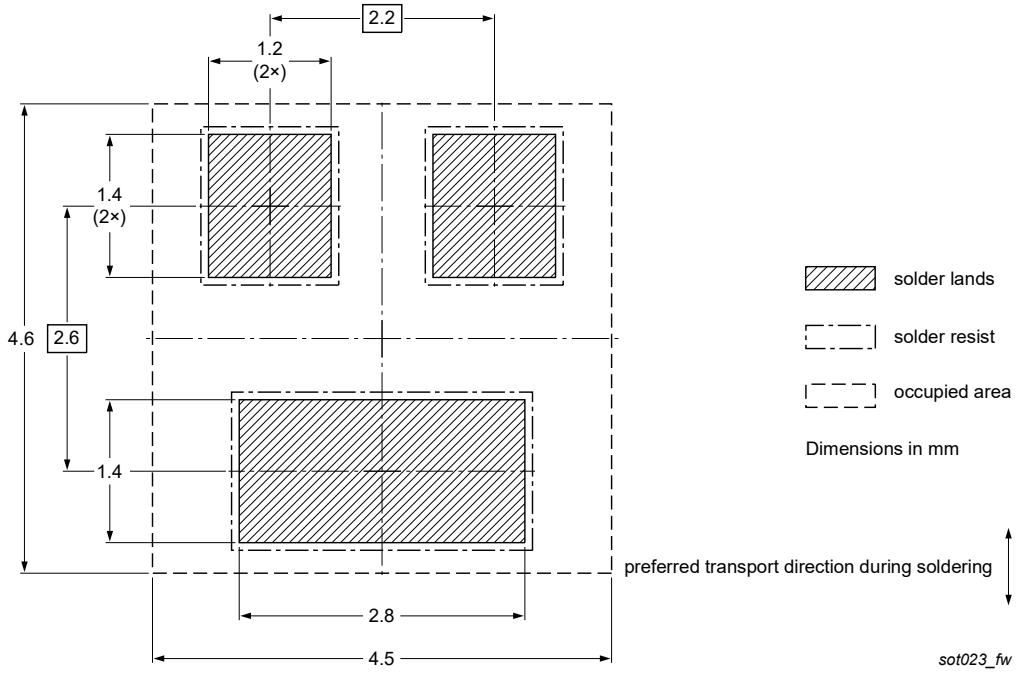


Fig. 16. Wave soldering footprint SOT23 (TO-236AB)

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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	-	-

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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".
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