



# BC817-Q series

45 V, 500 mA NPN general-purpose transistors

Rev. 1 — 8 June 2021

Product data sheet

## 1. General description

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

Table 1. Product overview

Type number	Package			PNP complement
	Nexperia	JEDEC	JEITA	
BC817-Q	SOT23	TO-236AB	-	BC807-Q
BC817-16-Q				BC807-16-Q
BC817-25-Q				BC807-25-Q
BC817-40-Q				BC807-40-Q

## 2. Features and benefits

- High current
- Three current 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

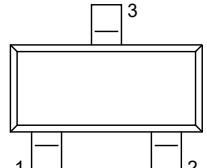
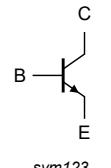
Table 2. Quick reference data

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$V_{CEO}$	collector-emitter voltage	open base; $T_{amb} = 25 \text{ }^{\circ}\text{C}$	-	-	45	V
$I_C$	collector current	$T_{amb} = 25 \text{ }^{\circ}\text{C}$	-	-	500	mA
$I_{CM}$	peak collector current	single pulse; $t_p \leq 1 \text{ ms}$ ; $T_{amb} = 25 \text{ }^{\circ}\text{C}$	-	-	1	A
$h_{FE}$	DC current gain	$V_{CE} = 1 \text{ V}$ ; $I_C = 100 \text{ mA}$ $T_{amb} = 25 \text{ }^{\circ}\text{C}$	[1]	100	-	600
	BC817-Q		[1]	100	-	250
	BC817-16-Q		[1]	160	-	400
	BC817-25-Q		[1]	250	-	600
	BC817-40-Q					

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

## 5. Pinning information

Table 3. Pinning

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

## 6. Ordering information

Table 4. Ordering information

Type number	Package		
	Name	Description	Version
BC817-Q	TO-236AB	Plastic surface-mounted package; 3 leads	SOT23
BC817-16-Q			
BC817-25-Q			
BC817-40-Q			

## 7. Marking

Table 5. Marking

Type number	Marking code <sup>[1]</sup>
BC817-Q	6D%
BC817-16-Q	6A%
BC817-25-Q	6B%
BC817-40-Q	6C%

[1] % = placeholder for manufacturing site code

## 8. Limiting values

**Table 6. Limiting values**

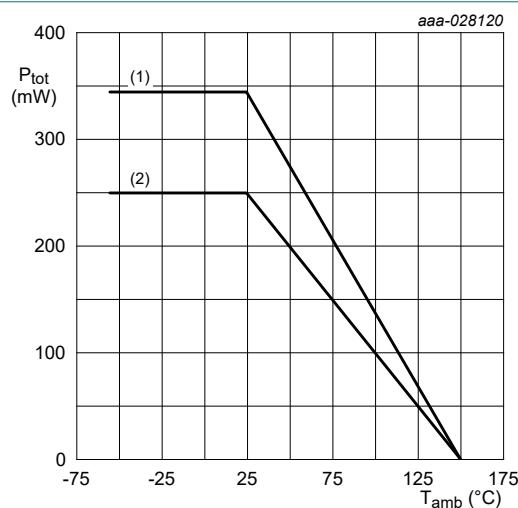
*In accordance with the Absolute Maximum Rating System (IEC 60134).*

Symbol	Parameter	Conditions	Min	Max	Unit
$V_{CBO}$	collector-base voltage	open emitter; $T_{amb} = 25^\circ\text{C}$	-	50	V
$V_{CEO}$	collector-emitter voltage	open base; $T_{amb} = 25^\circ\text{C}$	-	45	V
$V_{EBO}$	emitter-base voltage	open collector; $T_{amb} = 25^\circ\text{C}$	-	5	V
$I_C$	collector current	$T_{amb} = 25^\circ\text{C}$	-	500	mA
$I_{CM}$	peak collector current	single pulse; $t_p \leq 1\text{ ms}$ ; $T_{amb} = 25^\circ\text{C}$	-	1	A
$I_{BM}$	peak base current	single pulse; $t_p \leq 1\text{ ms}$ ; $T_{amb} = 25^\circ\text{C}$	-	200	mA
$P_{tot}$	total power dissipation	$T_{amb} \leq 25^\circ\text{C}$	[1] [2]	-	250 mW
			[3] [2]	-	345 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 PCB, single-sided copper, tin-plated and standard footprint.

[2] Valid for all available selection groups.

[3] Device mounted on an FR4 PCB, single-sided copper, tin-plated; mounting pad for collector 1 cm<sup>2</sup>.



(1) FFR4 PCB, single-sided copper; 1 cm<sup>2</sup>

(2) FR4 PCB, single-sided copper; standard footprint

**Fig. 1. Power derating curves**

## 9. Thermal characteristics

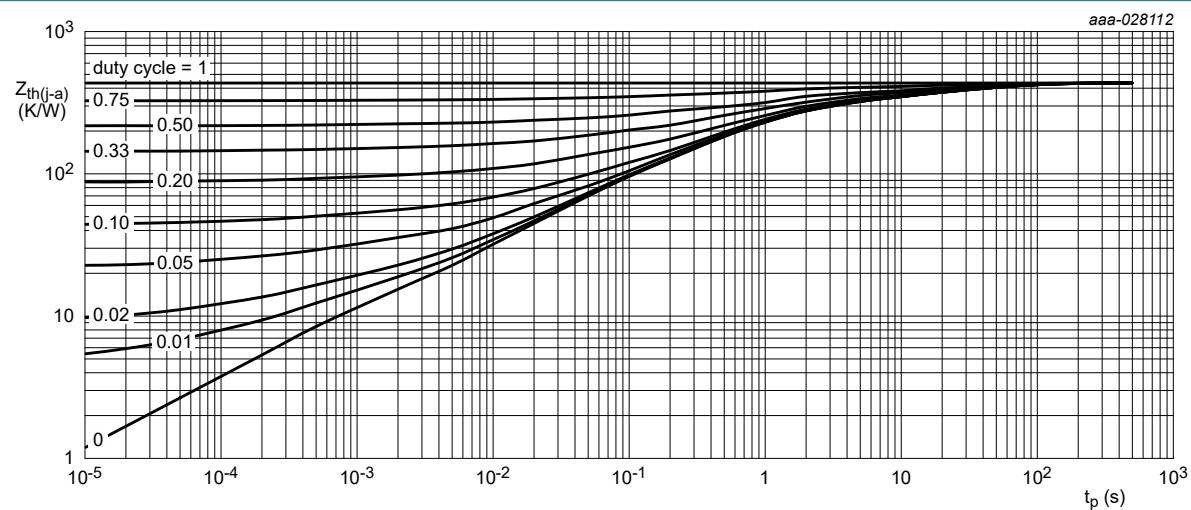
Table 7. Thermal characteristics

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
$R_{th(j-a)}$	thermal resistance from junction to ambient	in free air	[1]	-	-	500	K/W
			[2]	-	-	362	K/W
			[3]	-	-	362	K/W
			[2]	-	-	362	K/W

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

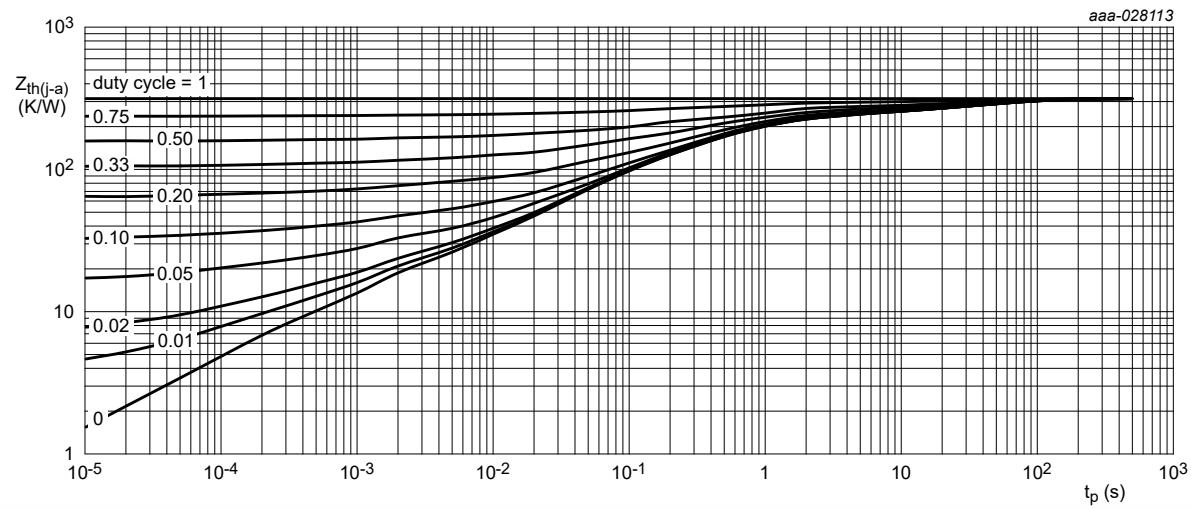
[2] Valid for all available selection groups.

[3] Device mounted on an FR4 PCB, single-sided copper, tin-plated; mounting pad for collector 1 cm<sup>2</sup>.



FR4 PCB, single-sided, tin-plated and standard footprint

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



FR4 PCB, single-sided copper, tin-plated; mounting pad for collector 1 cm<sup>2</sup>.

Fig. 3. Transient thermal impedance from junction to ambient as a function of pulse duration; typical values

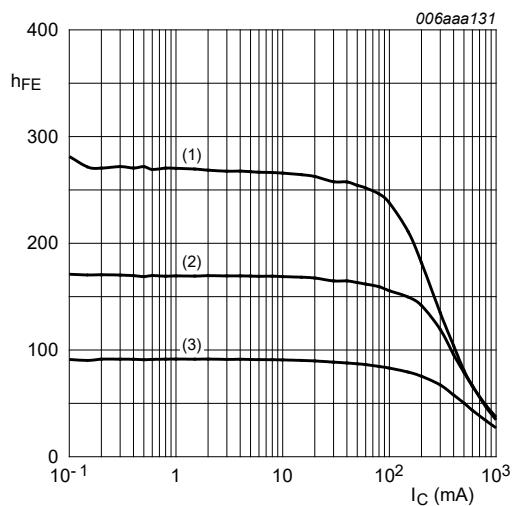
## 10. Characteristics

Table 8. Characteristics

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$V_{(BR)CBO}$	collector-base breakdown voltage	$I_C = 100 \mu A; I_E = 0 A; T_{amb} = 25^\circ C$	50	-	-	V
$V_{(BR)CEO}$	collector-emitter breakdown voltage	$I_C = 10 mA; I_E = 0 A; T_{amb} = 25^\circ C$	45	-	-	V
$V_{(BR)EBO}$	emitter-base breakdown voltage	$I_E = 100 \mu A; I_C = 0 A; T_{amb} = 25^\circ C$	5	-	-	V
$I_{CBO}$	collector-base cut-off current	$V_{CB} = 20 V; I_E = 0 A; T_{amb} = 25^\circ C$	-	-	100	nA
		$V_{CB} = 20 V; I_E = 0 A; T_j = 150^\circ C$	-	-	5	μA
$I_{EBO}$	emitter-base cut-off current	$V_{EB} = 5 V; I_C = 0 A; T_{amb} = 25^\circ C$	-	-	100	nA
$h_{FE}$	DC current gain	$V_{CE} = 1 V; I_C = 100 mA; T_{amb} = 25^\circ C$	[1]	100	-	600
	BC817-Q			100	-	250
	BC817-16-Q			160	-	400
	BC817-25-Q			250	-	600
	BC817-40-Q			40	-	-
$h_{FE}$	DC current gain	$V_{CE} = 1 V; I_C = 500 mA; T_{amb} = 25^\circ C$	[1]	-	-	-
$V_{CEsat}$	collector-emitter saturation voltage	$I_C = 500 mA; I_B = 50 mA; T_{amb} = 25^\circ C$	[1]	-	700	mV
$V_{BE}$	base-emitter voltage	$V_{CE} = 1 V; I_C = 500 mA; T_{amb} = 25^\circ C$	[1] [2]	-	1.2	V
$f_T$	transition frequency	$V_{CE} = 5 V; I_C = 10 mA; f = 100 MHz; T_{amb} = 25^\circ C$	100	-	-	MHz
$C_c$	collector capacitance	$V_{CB} = 10 V; I_E = i_e = 0 A; f = 1 MHz; T_{amb} = 25^\circ C$	-	3	-	pF

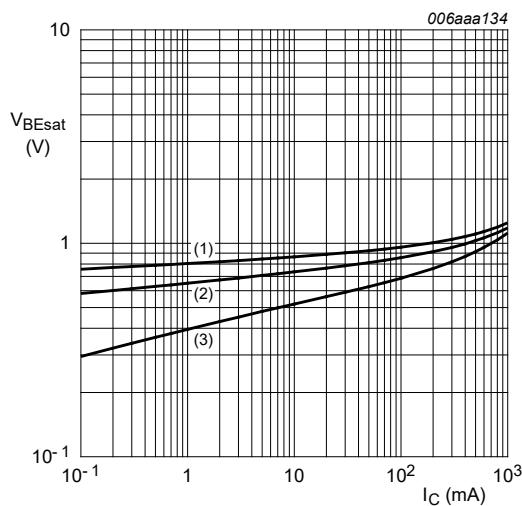
[1] pulsed;  $t_p \leq 300 \mu s$ ;  $\delta \leq 0.02$

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



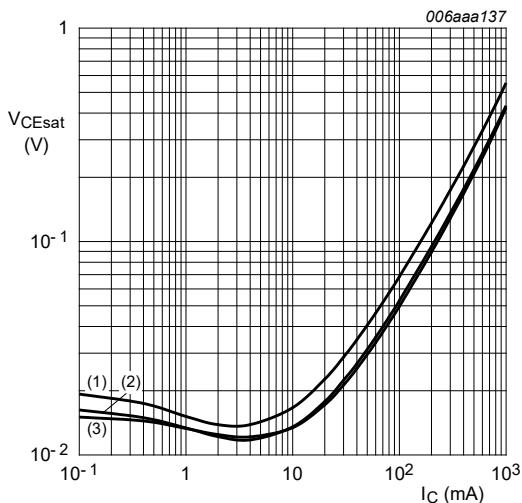
$V_{CE} = 1 \text{ V}$   
 (1)  $T_{amb} = 150 \text{ }^{\circ}\text{C}$   
 (2)  $T_{amb} = 25 \text{ }^{\circ}\text{C}$   
 (3)  $T_{amb} = -55 \text{ }^{\circ}\text{C}$

**Fig. 4. BC817-16-Q: DC current gain as a function of collector current; typical values**



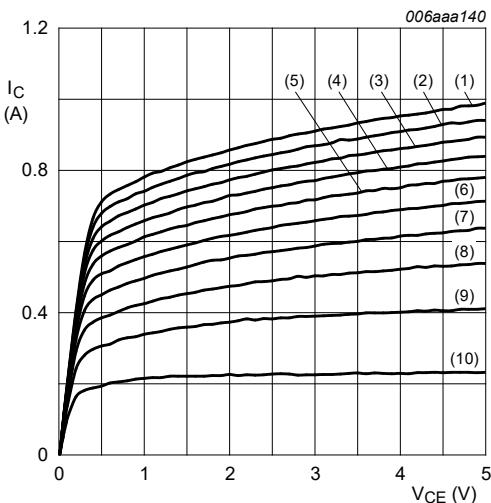
$IC/IB = 10$   
 (1)  $T_{amb} = -55 \text{ }^{\circ}\text{C}$   
 (2)  $T_{amb} = 25 \text{ }^{\circ}\text{C}$   
 (3)  $T_{amb} = 150 \text{ }^{\circ}\text{C}$

**Fig. 5. BC817-16-Q: Base-emitter saturation voltage as a function of collector current; typical values**



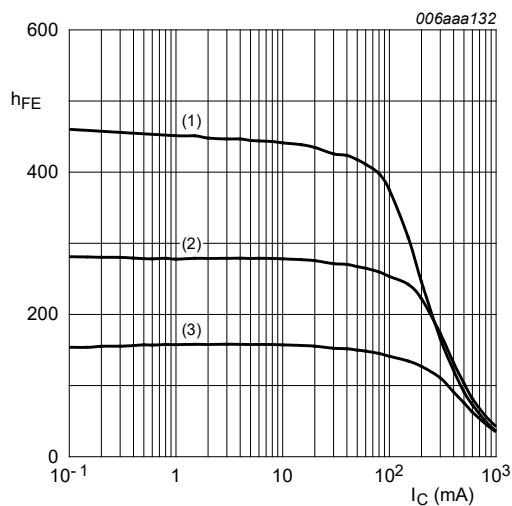
$IC/IB = 10$   
 (1)  $T_{amb} = 150 \text{ }^{\circ}\text{C}$   
 (2)  $T_{amb} = 25 \text{ }^{\circ}\text{C}$   
 (3)  $T_{amb} = -55 \text{ }^{\circ}\text{C}$

**Fig. 6. BC817-16-Q: Collector-emitter saturation voltage as a function of collector current; typical values**



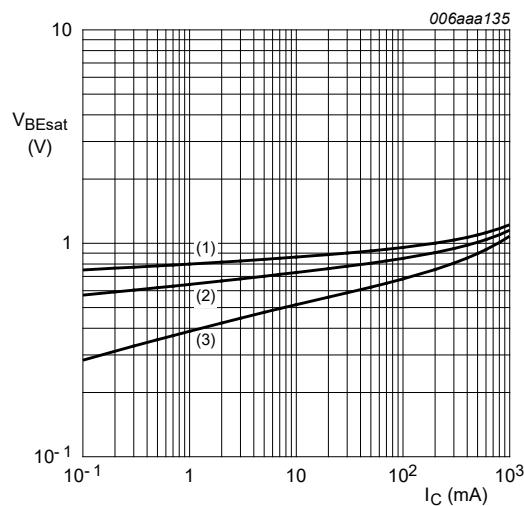
$T_{amb} = 25 \text{ }^{\circ}\text{C}$   
 (1)  $I_B = 16.0 \text{ mA}$   
 (2)  $I_B = 14.4 \text{ mA}$   
 (3)  $I_B = 12.8 \text{ mA}$   
 (4)  $I_B = 11.2 \text{ mA}$   
 (5)  $I_B = 9.6 \text{ mA}$   
 (6)  $I_B = 8.0 \text{ mA}$   
 (7)  $I_B = 6.4 \text{ mA}$   
 (8)  $I_B = 4.8 \text{ mA}$   
 (9)  $I_B = 3.2 \text{ mA}$   
 (10)  $I_B = 1.6 \text{ mA}$

**Fig. 7. BC817-16-Q: Collector current as a function of collector-emitter voltage; typical values**



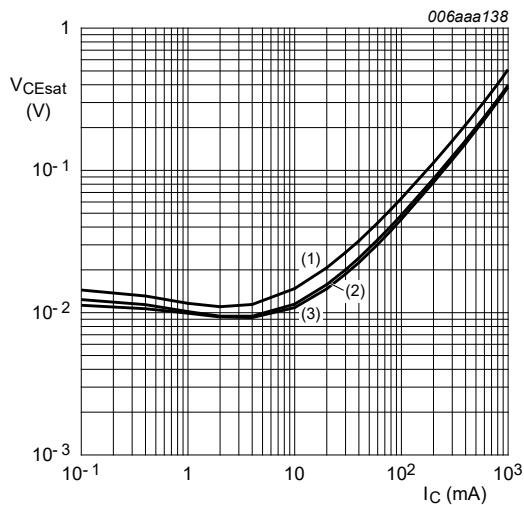
$V_{CE} = 1 \text{ V}$   
 (1)  $T_{amb} = 150 \text{ }^{\circ}\text{C}$   
 (2)  $T_{amb} = 25 \text{ }^{\circ}\text{C}$   
 (3)  $T_{amb} = -55 \text{ }^{\circ}\text{C}$

**Fig. 8. BC817-25-Q: DC current gain as a function of collector current; typical values**



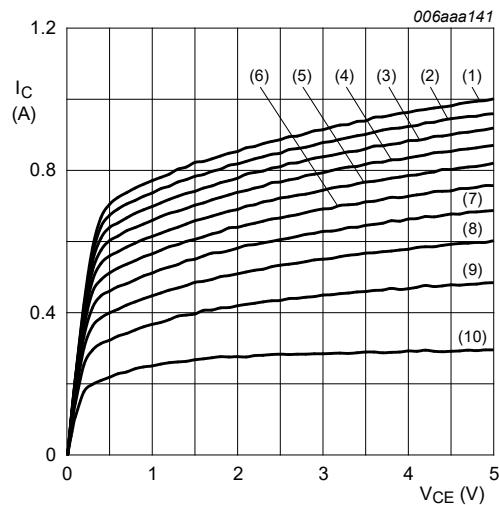
$IC/IB = 10$   
 (1)  $T_{amb} = -55 \text{ }^{\circ}\text{C}$   
 (2)  $T_{amb} = 25 \text{ }^{\circ}\text{C}$   
 (3)  $T_{amb} = 150 \text{ }^{\circ}\text{C}$

**Fig. 9. BC817-25-Q: Base-emitter saturation voltage as a function of collector current; typical values**



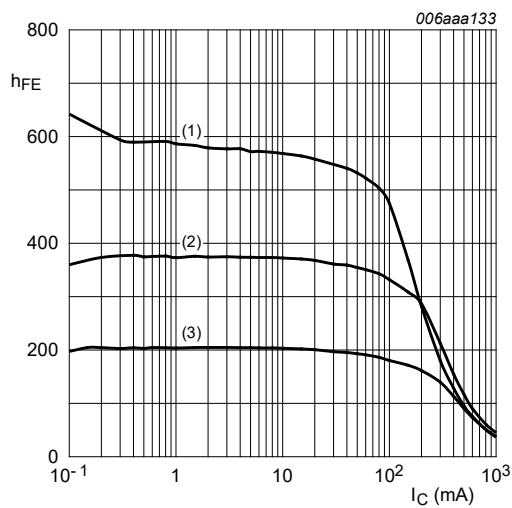
$IC/IB = 10$   
 (1)  $T_{amb} = 150 \text{ }^{\circ}\text{C}$   
 (2)  $T_{amb} = 25 \text{ }^{\circ}\text{C}$   
 (3)  $T_{amb} = -55 \text{ }^{\circ}\text{C}$

**Fig. 10. BC817-25-Q: Collector-emitter saturation voltage as a function of collector current; typical values**



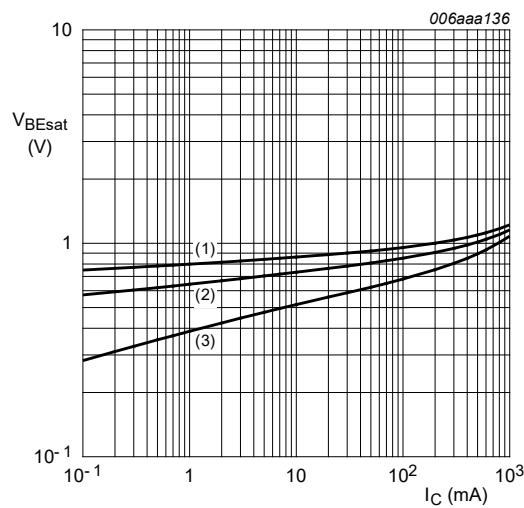
$T_{amb} = 25 \text{ }^{\circ}\text{C}$   
 (1)  $I_B = 13.0 \text{ mA}$   
 (2)  $I_B = 11.7 \text{ mA}$   
 (3)  $I_B = 10.4 \text{ mA}$   
 (4)  $I_B = 9.1 \text{ mA}$   
 (5)  $I_B = 7.8 \text{ mA}$   
 (6)  $I_B = 6.5 \text{ mA}$   
 (7)  $I_B = 5.2 \text{ mA}$   
 (8)  $I_B = 3.9 \text{ mA}$   
 (9)  $I_B = 2.6 \text{ mA}$   
 (10)  $I_B = 1.3 \text{ mA}$

**Fig. 11. BC817-25-Q: Collector current as a function of collector-emitter voltage; typical values**



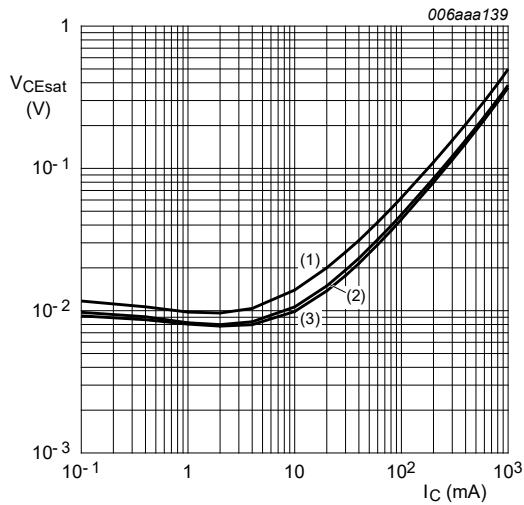
$V_{CE} = 1 \text{ V}$   
 (1)  $T_{amb} = 150 \text{ }^{\circ}\text{C}$   
 (2)  $T_{amb} = 25 \text{ }^{\circ}\text{C}$   
 (3)  $T_{amb} = -55 \text{ }^{\circ}\text{C}$

**Fig. 12. BC817-40-Q: DC current gain as a function of collector current; typical values**



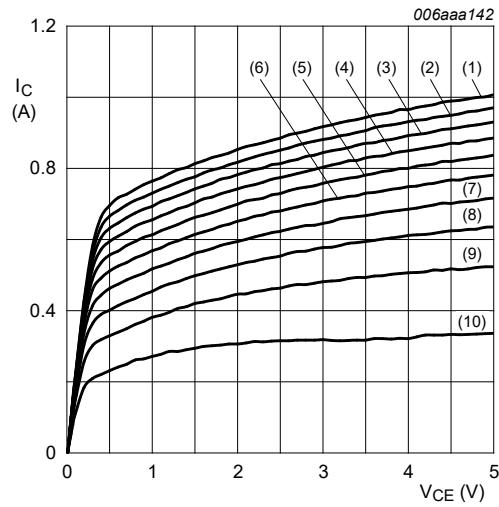
$IC/IB = 10$   
 (1)  $T_{amb} = -55 \text{ }^{\circ}\text{C}$   
 (2)  $T_{amb} = 25 \text{ }^{\circ}\text{C}$   
 (3)  $T_{amb} = 150 \text{ }^{\circ}\text{C}$

**Fig. 13. BC817-40-Q: Base-emitter saturation voltage as a function of collector current; typical values**



$IC/IB = 10$   
 (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. 14. BC817-40-Q: Collector-emitter saturation voltage as a function of collector current; typical values**



$T_{amb} = 25 \text{ }^{\circ}\text{C}$   
 (1)  $I_B = 12.0 \text{ mA}$   
 (2)  $I_B = 10.8 \text{ mA}$   
 (3)  $I_B = 9.6 \text{ mA}$   
 (4)  $I_B = 8.4 \text{ mA}$   
 (5)  $I_B = 7.2 \text{ mA}$   
 (6)  $I_B = 6.0 \text{ mA}$   
 (7)  $I_B = 4.8 \text{ mA}$   
 (8)  $I_B = 3.6 \text{ mA}$   
 (9)  $I_B = 2.4 \text{ mA}$   
 (10)  $I_B = 1.2 \text{ mA}$

**Fig. 15. BC817-40-Q: Collector current as a function of collector-emitter voltage; 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

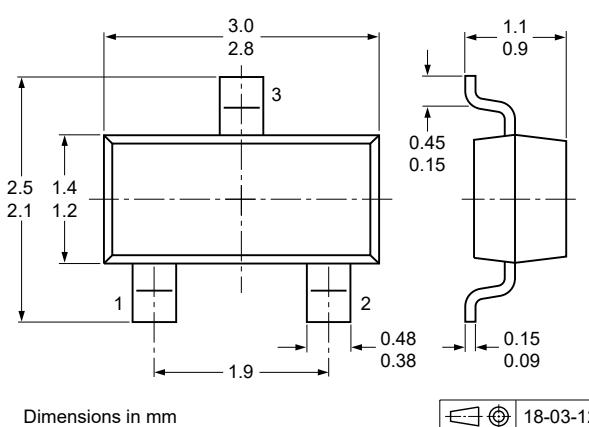
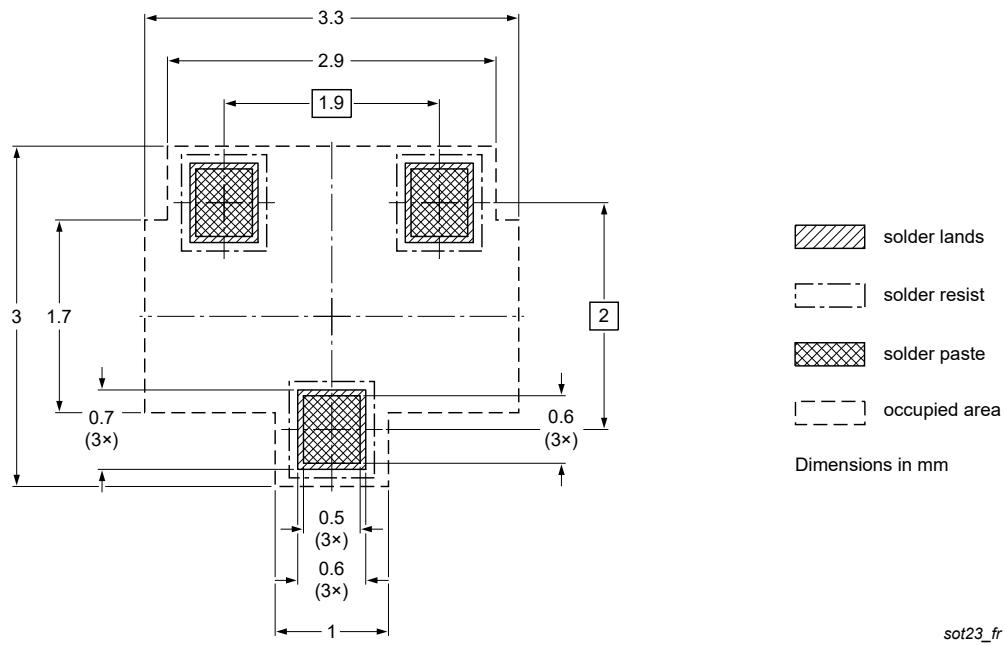


Fig. 16. Package outline SOT23 (TO-236AB)

## 13. Soldering



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

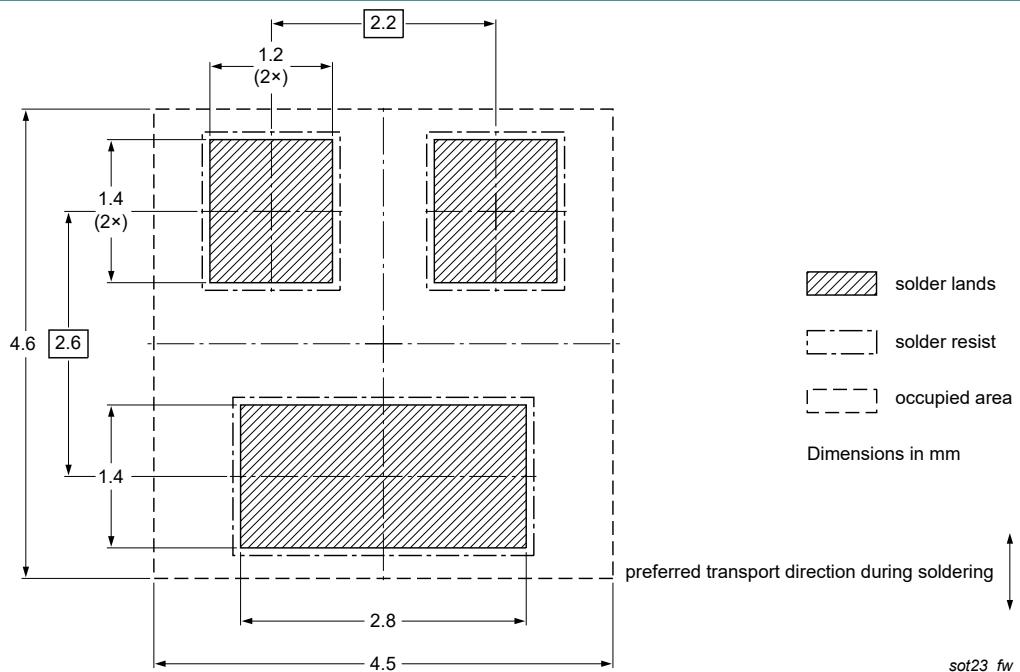


Fig. 18. Wave soldering footprint for SOT23 (TO-236AB)

## 14. Revision history

**Table 9. Revision history**

Data sheet ID	Release date	Data sheet status	Change notice	Supersedes
BC817-Q_SER v.1	20210608	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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## Contents

1. General description.....	1
2. Features and benefits.....	1
3. Applications.....	1
4. Quick reference data.....	1
5. Pinning information.....	2
6. Ordering information.....	2
7. Marking.....	2
8. Limiting values.....	3
9. Thermal characteristics.....	4
10. Characteristics.....	5
11. Test information.....	9
11.1. Quality information.....	9
12. Package outline.....	9
13. Soldering.....	10
14. Revision history.....	11
15. Legal information.....	12

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