BC816 series

80 V, 500 mA NPN general-purpose transistors

Rev. 2 — 5 November 2019 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	Package		PNP complement:
	Nexperia	JEDEC	
BC816-16	SOT23	TO-236AB	BC806-16
BC816-25	SOT23	TO-236AB	BC806-25

2. Features and benefits

- High current
- High voltage
- Two current gain selections
- AEC-Q101 qualified

3. Applications

- General-purpose switching and amplification
- 48 V automotive board net

4. Quick reference data

Table 2. Quick reference data

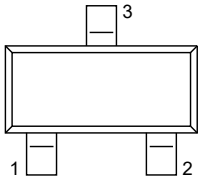
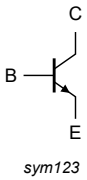
T_{amb} = 25 °C unless otherwise specified.

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
V_{CEO}	collector-emitter voltage	open base		-	-	80	V
I_C	collector current			-	-	500	mA
I_{CM}	peak collector current	single pulse; $t_p \leq 1$ ms		-	-	1	A
h_{FE}	DC current gain						
	BC816-16	V_{CE} = 1 V; I_C = 100 mA	[1]	100	-	250	
	BC816-25		[1]	160	-	400	

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

5. Pinning information

Table 3. Pinning

Pin	Symbol	Description	Simplified outline	Graphic symbol
1	B	base	 TO-236AB (SOT23)	 sym123
2	E	emitter		
3	C	collector		

6. Ordering information

Table 4. Ordering information

Type number	Package		
	Name	Description	Version
BC816-16	TO-236AB	plastic surface-mounted package; 3 leads	SOT23
BC816-25			

7. Marking

Table 5. Marking

Type number	Marking code [1]
BC816-16	%GT
BC816-25	%GU

[1] % = placeholder for manufacturing site code

8. Limiting values

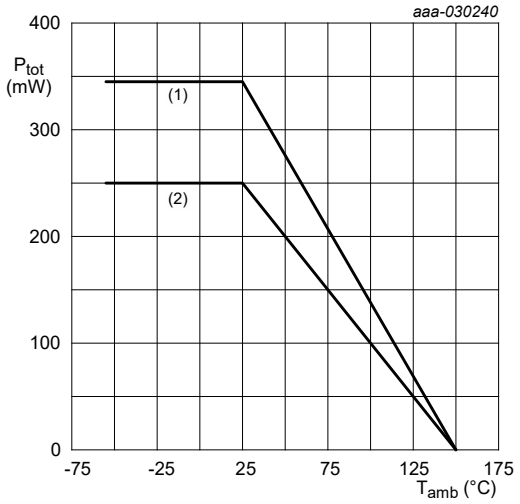
Table 6. Limiting values

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

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

Symbol	Parameter	Conditions		Min	Max	Unit
V_{CBO}	collector-base voltage	open emitter		-	80	V
V_{CEO}	collector-emitter voltage	open base		-	80	V
V_{EBO}	emitter-base voltage	open collector		-	7	V
I_C	collector current			-	500	mA
I_{CM}	peak collector current	single pulse; $t_p \leq 1$ ms		-	1	A
I_{BM}	peak base current	single pulse; $t_p \leq 1$ ms		-	200	mA
P_{tot}	total power dissipation	$T_{amb} \leq 25$ °C	[1]	-	250	mW
			[2]	-	345	mW
T_j	junction temperature			-	150	°C
T_{amb}	ambient temperature			-55	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 FR4 PCB; single-sided copper; tin-plated; mounting pad for collector 1 cm^2.



(1) FR4 PCB; single sided copper; 1 cm^2
(2) FR4 PCB; standard footprint

Fig. 1. Power derating curves

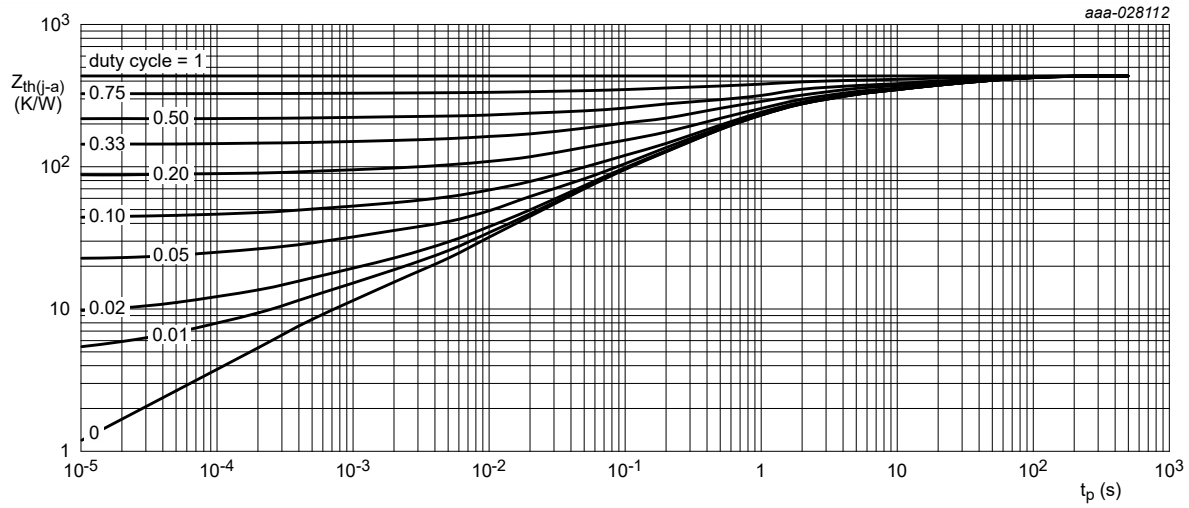
9. Thermal characteristics

Table 7. Thermal characteristics

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

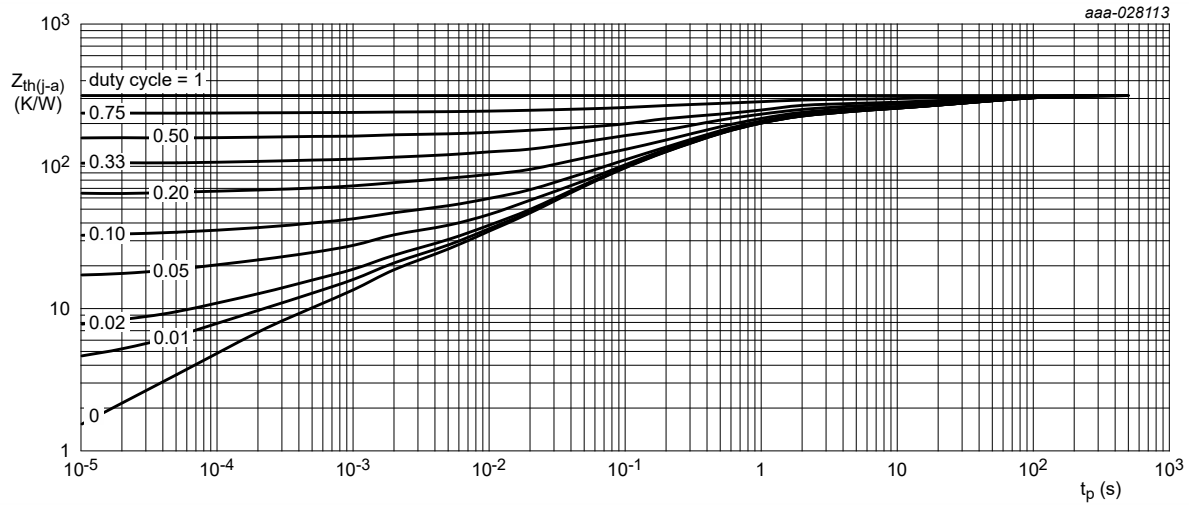
Symbol	Parameter	Conditions		Min	Typ	Max	Unit
$R_{th(j-a)}$	thermal resistance from junction to ambient	in free air	[1]	-	-	500	K/W
			[2]	-	-	363	K/W

[1] Device mounted on an FR4 PCB; single-sided copper; tin-plated and standard footprint.
[2] Device mounted on an FR4 PCB; single-sided copper; tin-plated; mounting pad for collector 1 cm^2.



FR4 PCB; single-sided copper; 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^2

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

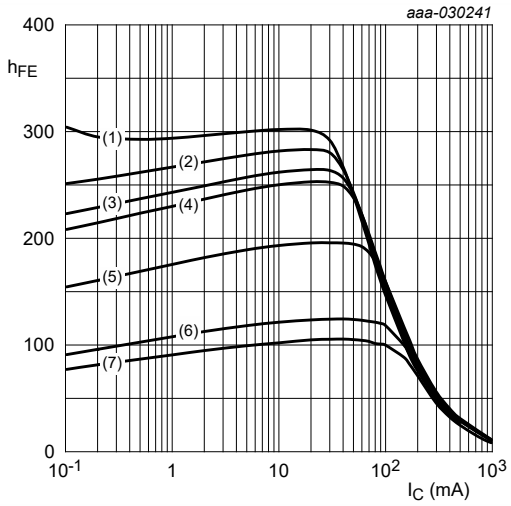
10. Characteristics

Table 8. Characteristics

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

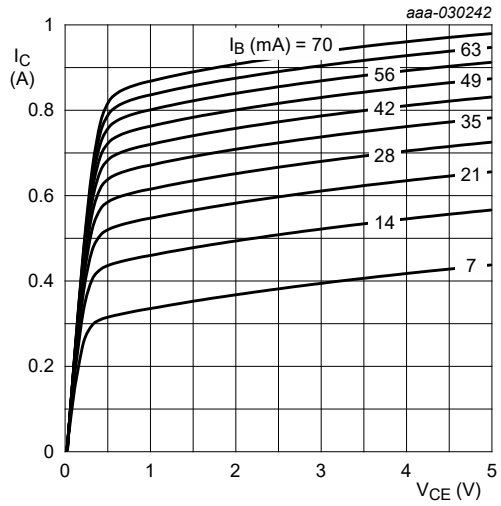
Symbol	Parameter	Conditions		Min	Typ	Max	Unit
$V_{(BR)CBO}$	collector-base breakdown voltage	I_C = 100 µA; I_E = 0 A		80	-		V
$V_{(BR)CEO}$	collector-emitter breakdown voltage	I_C = 2 mA; I_E = 0 A		80	-		V
$V_{(BR)EBO}$	emitter-base breakdown voltage	I_E = 100 µA; I_C = 0 A		7	-		V
I_{CBO}	collector-base cut-off current	V_{CB} = 64 V; I_E = 0 A		-	-	100	nA
		V_{CB} = 64 V; I_E = 0 A; T_j = 150 °C		-	-	5	µA
I_{EBO}	emitter-base cut-off current	V_{EB} = 5.6 V; I_C = 0 A		-	-	100	nA
h_{FE}	DC current gain						
	BC816-16	V_{CE} = 1 V; I_C = 100 mA	[1]	100	-	250	
	BC816-25	V_{CE} = 1 V; I_C = 100 mA	[1]	160	-	400	
		V_{CE} = 2 V; I_C = 500 mA	[1]	30	-	-	
V_{CEsat}	collector-emitter saturation voltage	I_C = 100 mA; I_B = 10 mA	[1]	-	-	-150	mV
		I_C = 500 mA; I_B = 50 mA	[1]	-	-	400	mV
V_{BE}	base-emitter voltage	V_{CE} = 1 V; I_C = 500 mA	[1]	-	-	1.2	V
f_T	transition frequency	V_{CE} = 5 V; I_C = 50 mA; f = 100 MHz		100	-	-	MHz
C_c	collector capacitance	V_{CB} = 10 V; I_E = i_e = 0 A; f = 1 MHz		-	2	-	pF

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



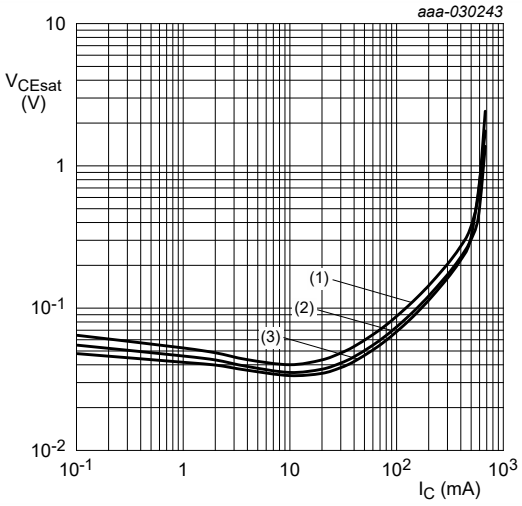
V_{CE} = 1 V
(1) T_{amb} = 150 °C
(2) T_{amb} = 125 °C
(3) T_{amb} = 100 °C
(4) T_{amb} = 85 °C
(5) T_{amb} = 25 °C
(6) T_{amb} = -40 °C
(7) T_{amb} = -55 °C

Fig. 4. BC816-16: DC current gain as a function of collector current; typical values



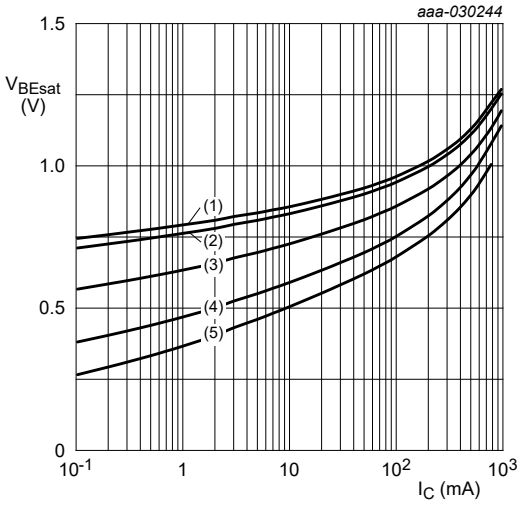
T_{amb} = 25 °C

Fig. 5. BC816-16: Collector current as a function of collector-emitter voltage; typical values



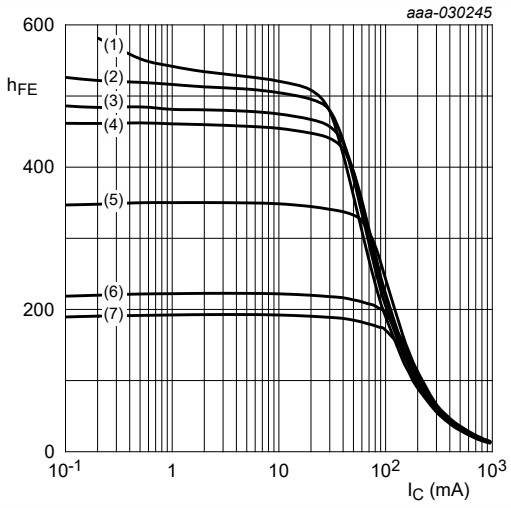
I_C/I_B = 20
(1) T_{amb} = 100 °C
(2) T_{amb} = 25 °C
(3) T_{amb} = -40 °C

Fig. 6. BC816-16: Collector-emitter saturation voltage as a function of collector current; typical values



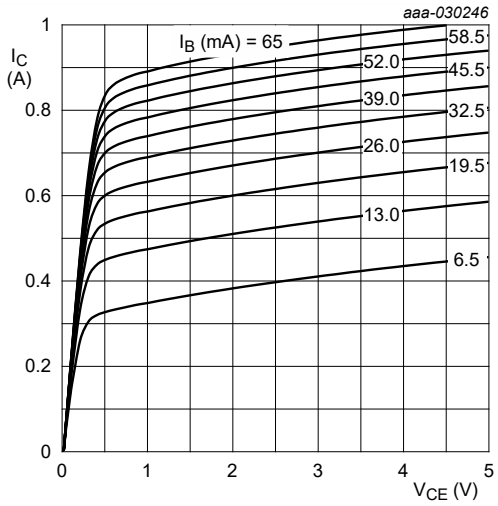
I_C/I_B = 10
(1) T_{amb} = -55 °C
(2) T_{amb} = -40 °C
(3) T_{amb} = 25 °C
(4) T_{amb} = 100 °C
(5) T_{amb} = 150 °C

Fig. 7. BC816-16: Base-emitter saturation voltage as a function of collector current; typical values



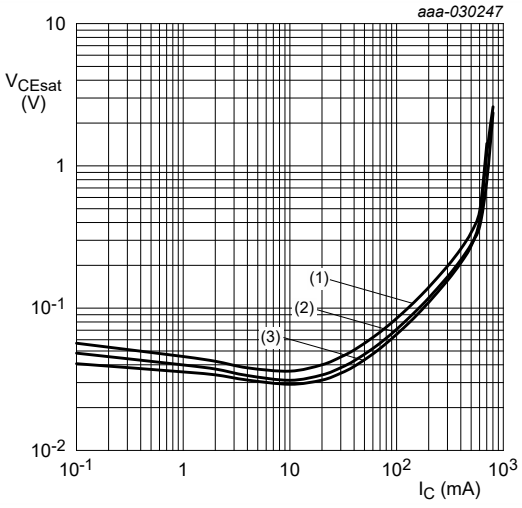
V_{CE} = 1 V
(1) T_{amb} = 150 °C
(2) T_{amb} = 125 °C
(3) T_{amb} = 100 °C
(4) T_{amb} = 85 °C
(5) T_{amb} = 25 °C
(6) T_{amb} = -40 °C
(7) T_{amb} = -55 °C

Fig. 8. BC816-25: DC current gain as a function of collector current; typical values



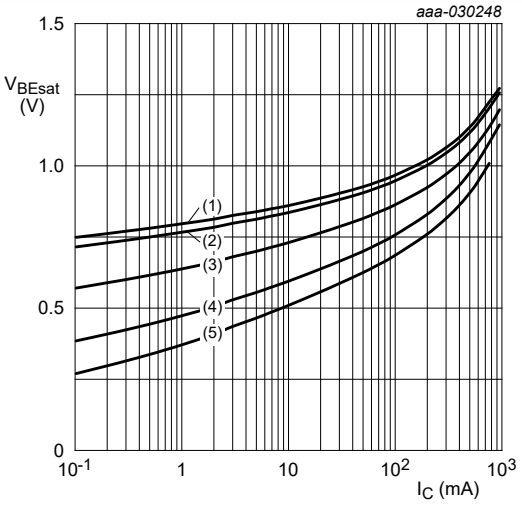
T_{amb} = 25 °C

Fig. 9. BC816-25: Collector current as a function of collector-emitter voltage; typical values



I_C/I_B = 20
(1) T_{amb} = 100 °C
(2) T_{amb} = 25 °C
(3) T_{amb} = -40 °C

Fig. 10. BC816-25: 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} = -40 °C
(3) T_{amb} = 25 °C
(4) T_{amb} = 100 °C
(5) T_{amb} = 150 °C

Fig. 11. BC816-25: 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

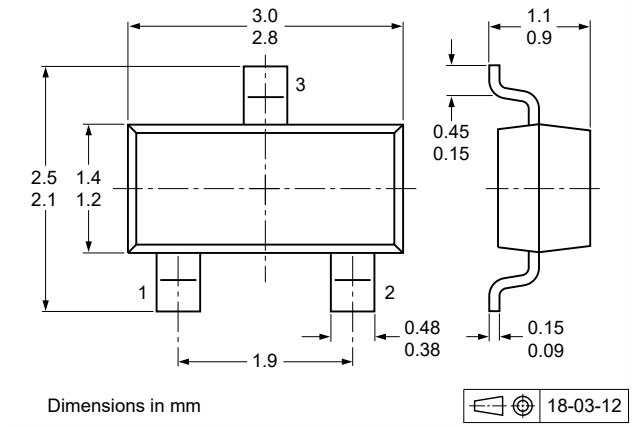


Fig. 12. Package outline SOT23 (TO-236AB)

13. Soldering

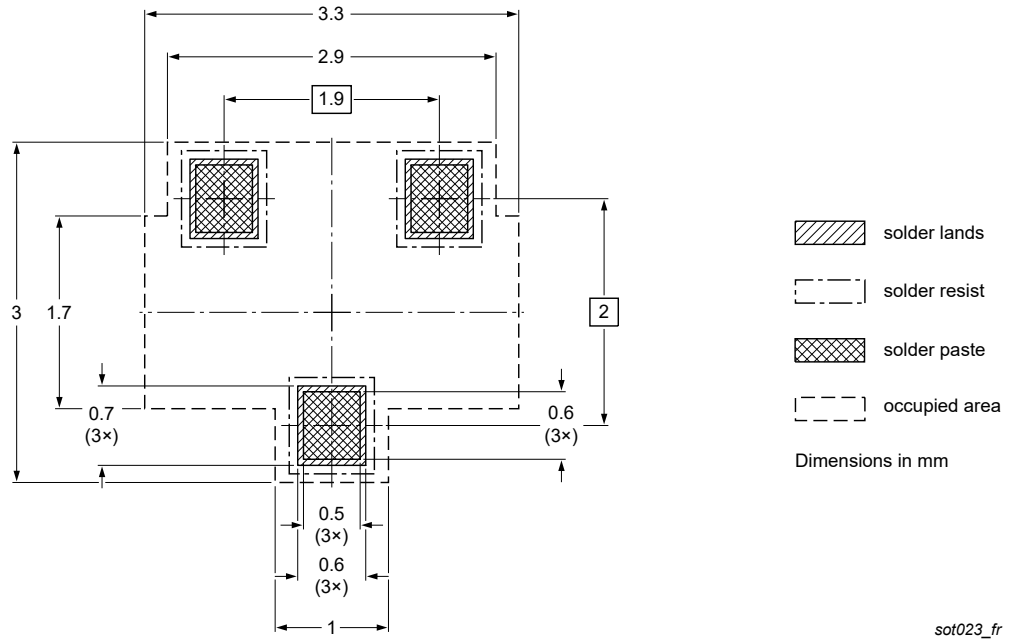


Fig. 13. Reflow soldering footprint for SOT23 (TO-236AB)

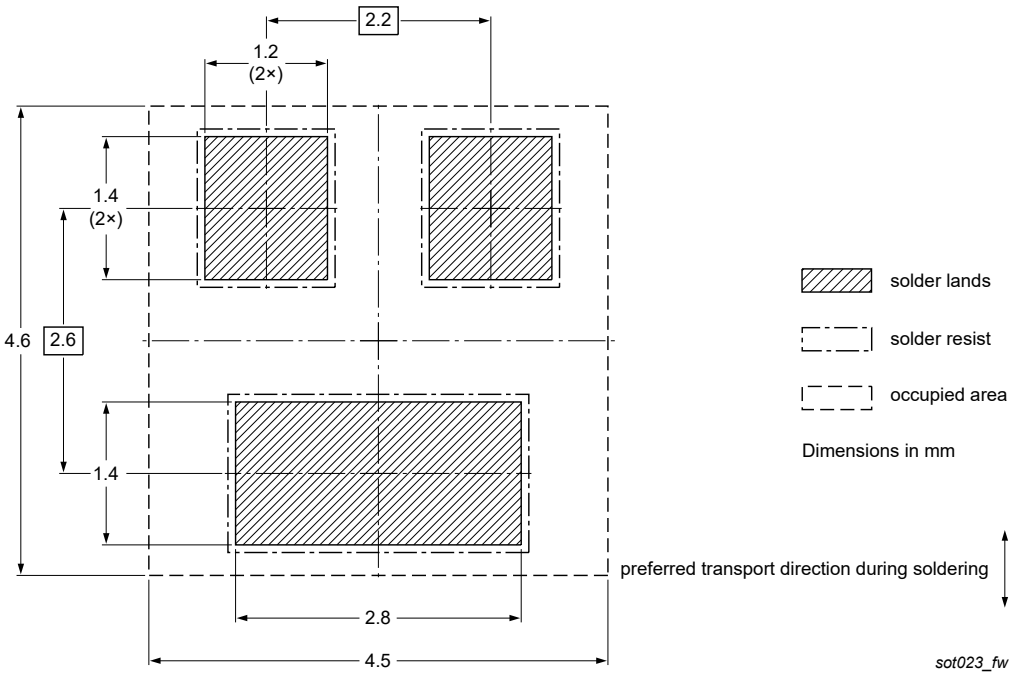


Fig. 14. Wave soldering footprint for SOT23 (TO-236AB)

14. Revision history

Table 9. Revision history

Data sheet ID	Release date	Data sheet status	Change notice	Supersedes
BC816_SER v.2	20191105	Product data sheet	-	BC816_SER v.1
Modifications:	• Product status changed			
BC816_SER v.1	20190904	Preliminary 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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