



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

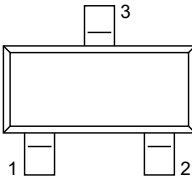
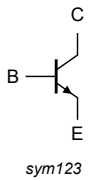
$T_{amb} = 25\text{ °C}$ unless otherwise specified.

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; $t_p \leq 1\text{ ms}$	-	-	1	A	
h_{FE}	DC current gain						
	BC816-16	$V_{CE} = 1\text{ V}; I_C = 100\text{ mA}$	[1]	100	-	250	
	BC816-25		[1]	160	-	400	

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

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

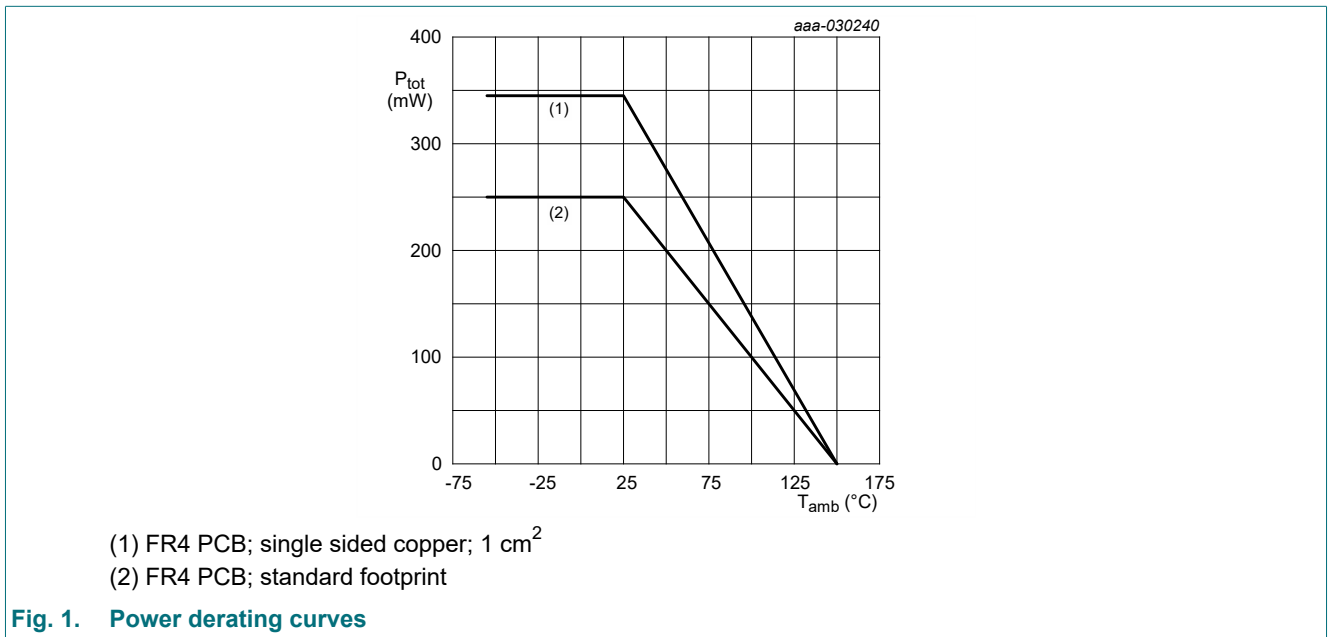
In accordance with the Absolute Maximum Rating System (IEC 60134).

$T_{amb} = 25\text{ °C}$ 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; $t_p \leq 1\text{ ms}$	-	1	A	
I_{BM}	peak base current	single pulse; $t_p \leq 1\text{ ms}$	-	200	mA	
P_{tot}	total power dissipation	$T_{amb} \leq 25\text{ °C}$	[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 cm².



9. Thermal characteristics

Table 7. Thermal characteristics

$T_{amb} = 25\text{ °C}$ 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 cm².

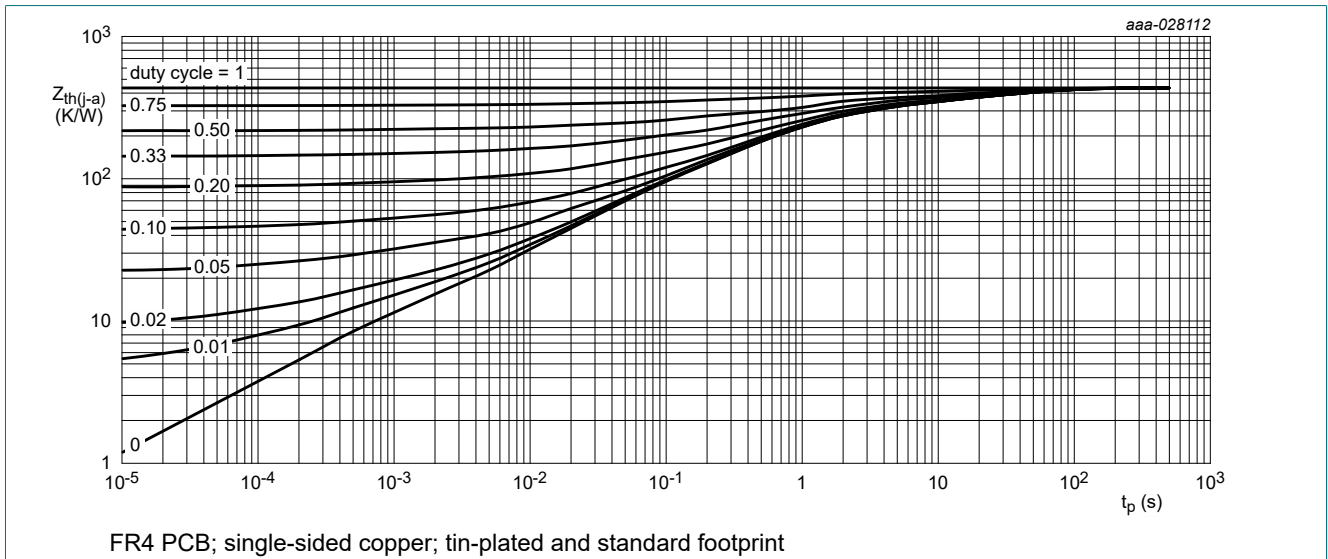


Fig. 2. Transient thermal impedance from junction to ambient as a function of pulse duration; typical values

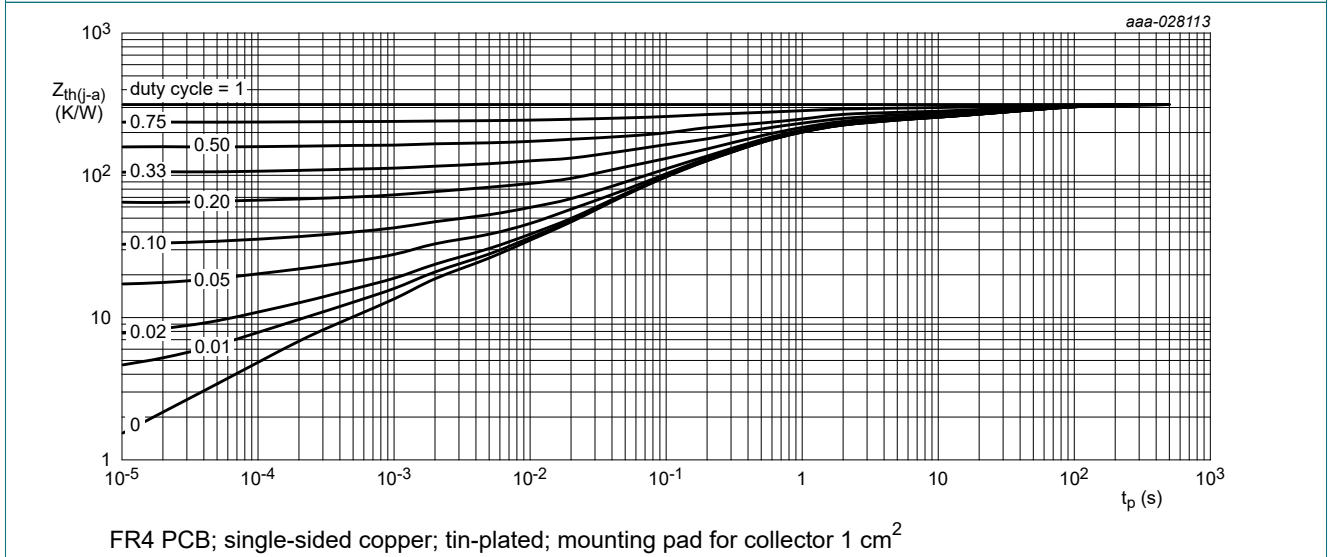


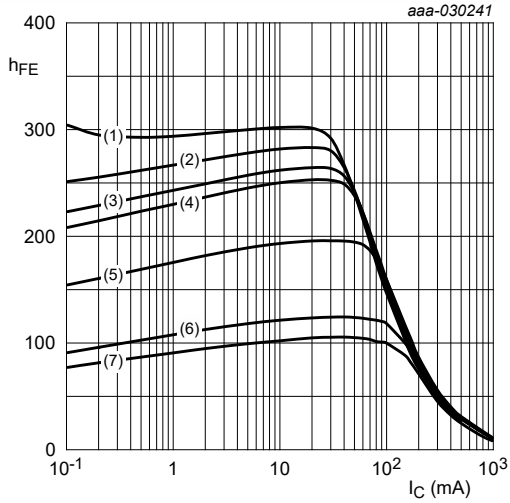
Fig. 3. Transient thermal impedance from junction to ambient as a function of pulse duration; typical values

10. Characteristics

Table 8. Characteristics
 $T_{amb} = 25\text{ °C}$ unless otherwise specified.

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

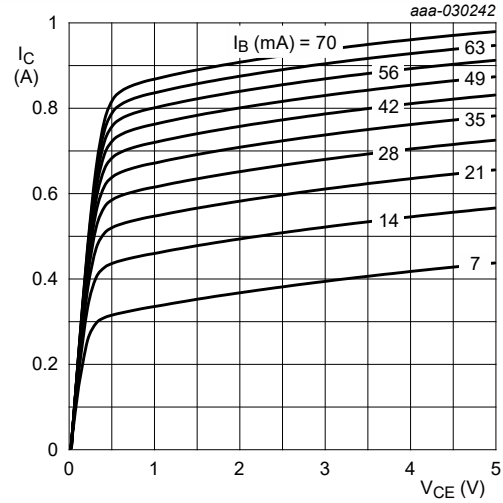
[1] pulsed; $t_p \leq 300\ \mu\text{s}$; $\delta \leq 0.02$



$V_{CE} = 1\text{ V}$

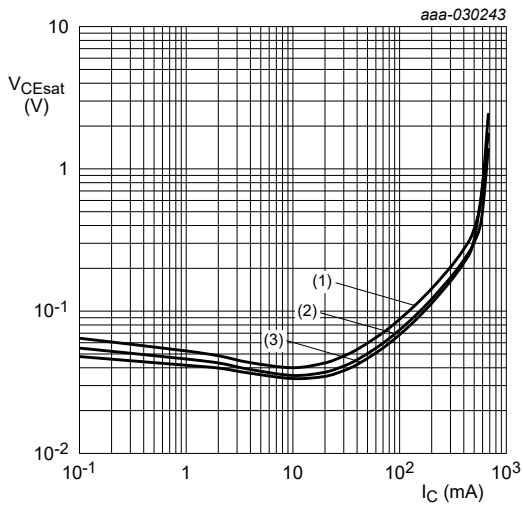
- (1) $T_{amb} = 150\text{ °C}$
- (2) $T_{amb} = 125\text{ °C}$
- (3) $T_{amb} = 100\text{ °C}$
- (4) $T_{amb} = 85\text{ °C}$
- (5) $T_{amb} = 25\text{ °C}$
- (6) $T_{amb} = -40\text{ °C}$
- (7) $T_{amb} = -55\text{ °C}$

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



$T_{amb} = 25\text{ °C}$

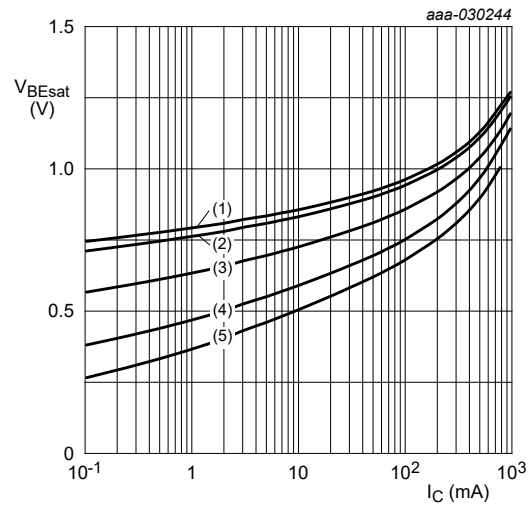
Fig. 5. BC816-16: Collector current as a function of collector-emitter voltage; typical values



$I_C/I_B = 20$

- (1) $T_{amb} = 100\text{ °C}$
- (2) $T_{amb} = 25\text{ °C}$
- (3) $T_{amb} = -40\text{ °C}$

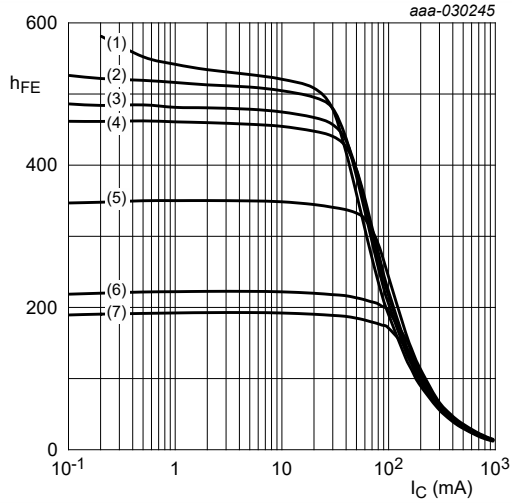
Fig. 6. BC816-16: Collector-emitter saturation voltage as a function of collector current; typical values



$I_C/I_B = 10$

- (1) $T_{amb} = -55\text{ °C}$
- (2) $T_{amb} = -40\text{ °C}$
- (3) $T_{amb} = 25\text{ °C}$
- (4) $T_{amb} = 100\text{ °C}$
- (5) $T_{amb} = 150\text{ °C}$

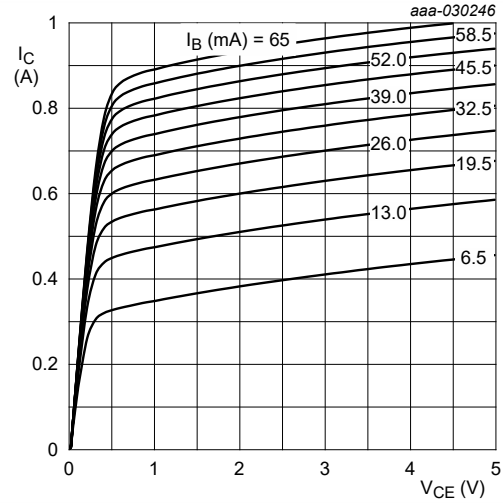
Fig. 7. BC816-16: Base-emitter saturation voltage as a function of collector current; typical values



$V_{CE} = 1\text{ V}$

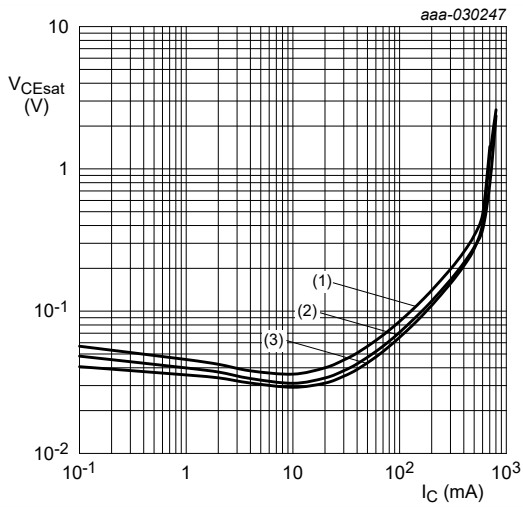
- (1) $T_{amb} = 150\text{ °C}$
- (2) $T_{amb} = 125\text{ °C}$
- (3) $T_{amb} = 100\text{ °C}$
- (4) $T_{amb} = 85\text{ °C}$
- (5) $T_{amb} = 25\text{ °C}$
- (6) $T_{amb} = -40\text{ °C}$
- (7) $T_{amb} = -55\text{ °C}$

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



$T_{amb} = 25\text{ °C}$

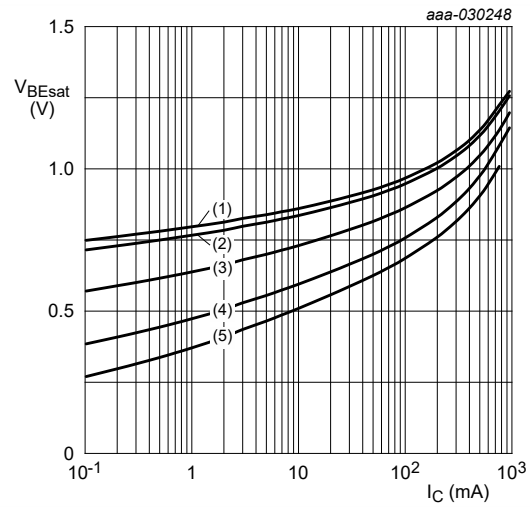
Fig. 9. BC816-25: Collector current as a function of collector-emitter voltage; typical values



$I_C/I_B = 20$

- (1) $T_{amb} = 100\text{ °C}$
- (2) $T_{amb} = 25\text{ °C}$
- (3) $T_{amb} = -40\text{ °C}$

Fig. 10. BC816-25: Collector-emitter saturation voltage as a function of collector current; typical values



$I_C/I_B = 10$

- (1) $T_{amb} = -55\text{ °C}$
- (2) $T_{amb} = -40\text{ °C}$
- (3) $T_{amb} = 25\text{ °C}$
- (4) $T_{amb} = 100\text{ °C}$
- (5) $T_{amb} = 150\text{ °C}$

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

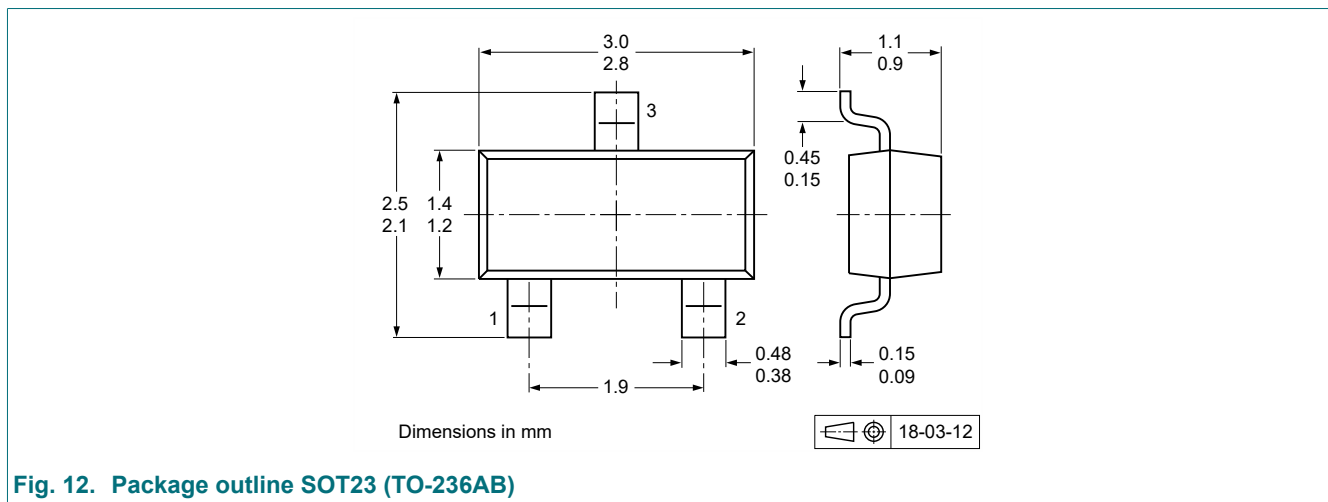


Fig. 12. Package outline SOT23 (TO-236AB)

13. Soldering

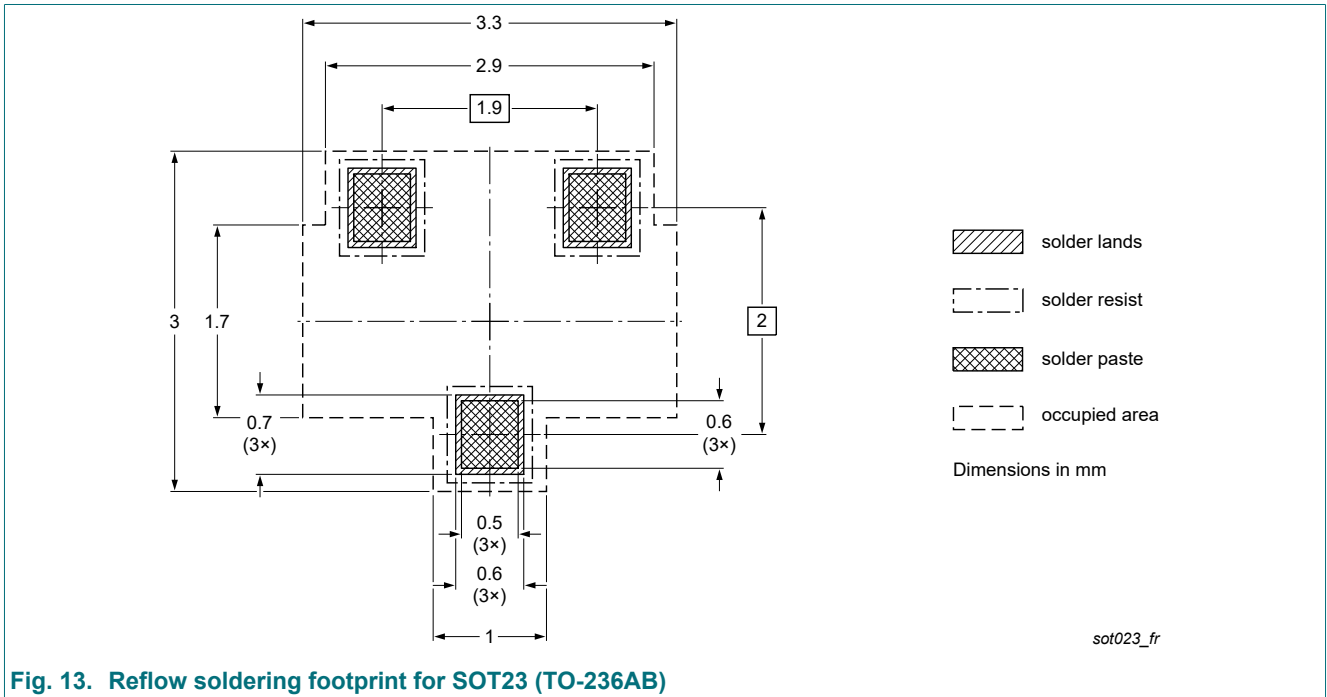


Fig. 13. Reflow soldering footprint for SOT23 (TO-236AB)

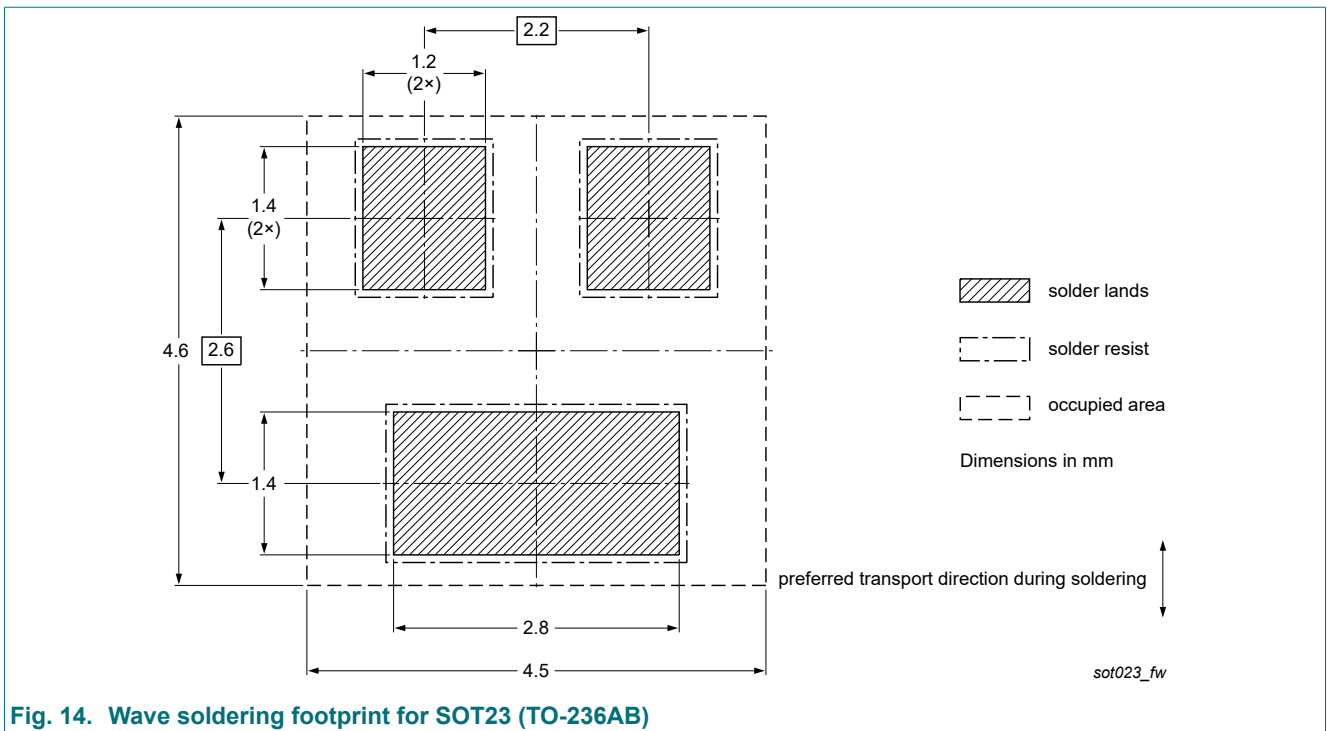


Fig. 14. Wave soldering footprint for SOT23 (TO-236AB)

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".
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