



# BC816W series

80 V, 500 mA NPN general-purpose transistors

Rev. 2 — 27 November 2019

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	Package		PNP complement:
	Nexperia	JEITA	
BC816-16W	SOT323	SC-70	BC806-16W
BC816-25W			BC806-25W

## 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

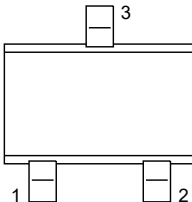
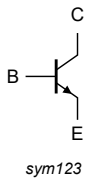
$T_{amb} = 25\text{ °C}$  unless otherwise specified.

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					
	BC816-16W	$V_{CE} = 1\text{ V}; I_C = 100\text{ mA}$	[1]	100	-	250
	BC816-25W		[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	 SC-70 (SOT323)	 sym123
2	E	emitter		
3	C	collector		

## 6. Ordering information

Table 4. Ordering information

Type number	Package		
	Name	Description	Version
BC816-16W	SC70	plastic surface-mounted package; 3 leads	SOT323
BC816-25W			

## 7. Marking

Table 5. Marking

Type number	Marking code [1]
BC816-16W	2L%
BC816-25W	2M%

[1] % = placeholder for manufacturing site code

## 8. Limiting values

**Table 6. Limiting values**

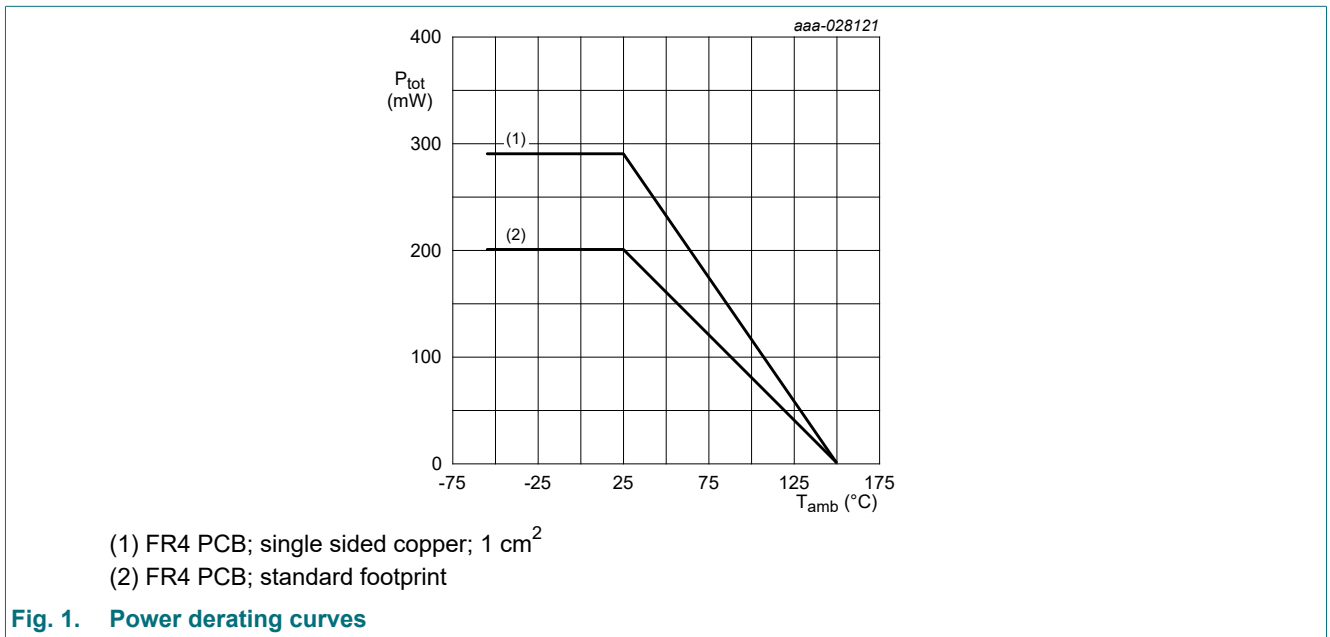
In accordance with the Absolute Maximum Rating System (IEC 60134).

$T_{amb} = 25\text{ °C}$  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]	-	200	mW
			[2]	-	290	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  $1\text{ cm}^2$ .



## 9. Thermal characteristics

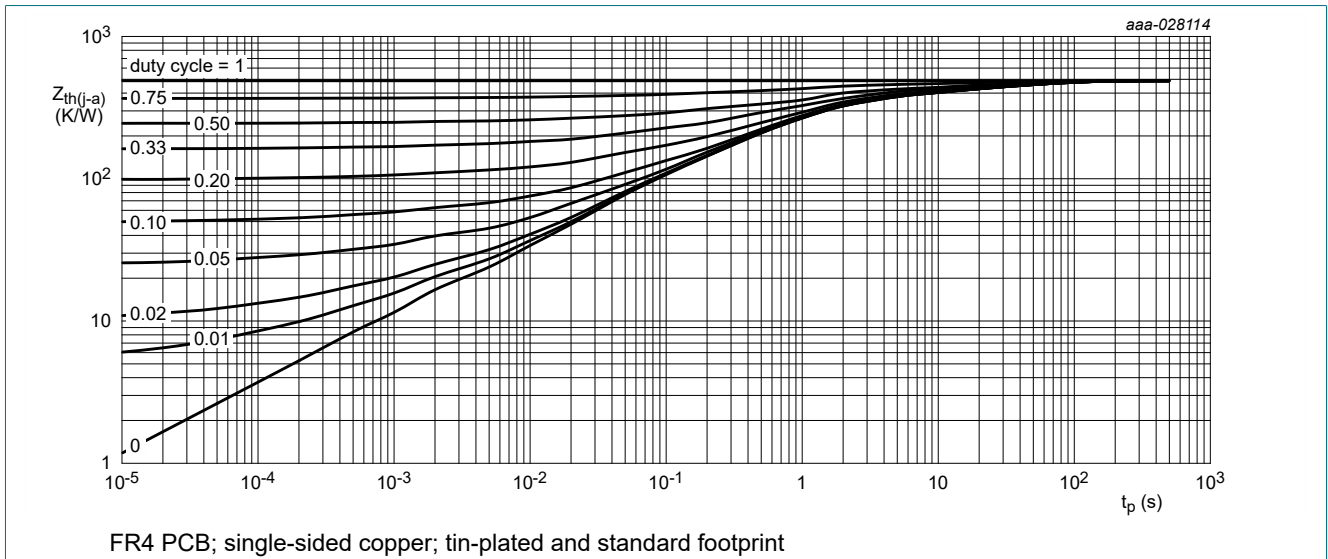
**Table 7. Thermal characteristics**

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

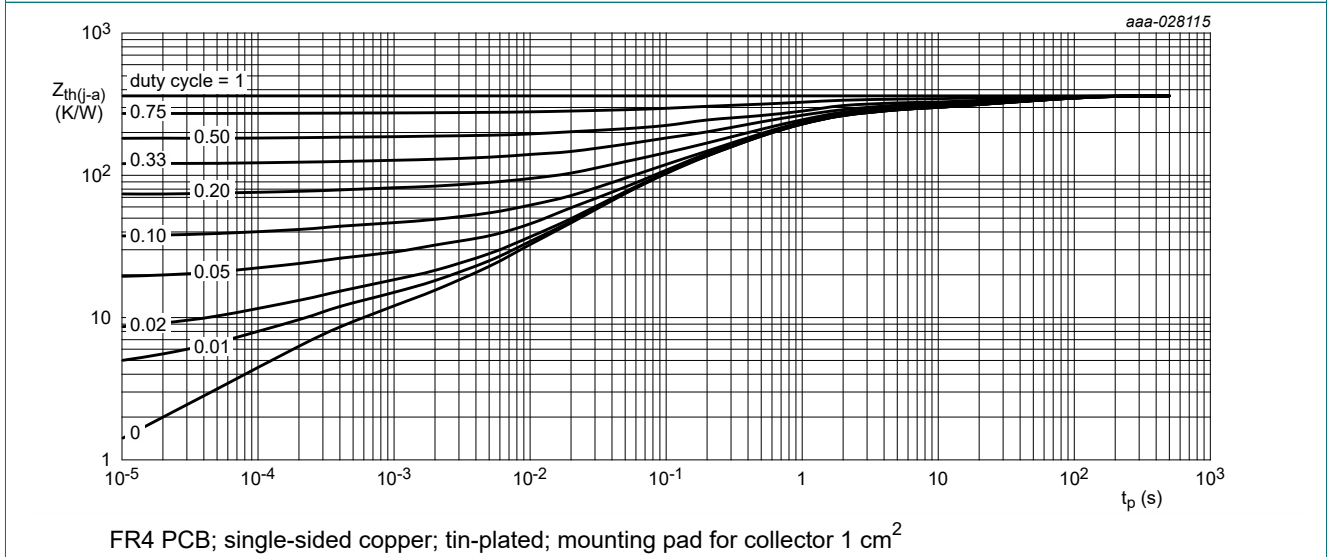
Symbol	Parameter	Conditions		Min	Typ	Max	Unit
$R_{th(j-a)}$	thermal resistance from junction to ambient	in free air	[1]	-	-	625	K/W
			[2]	-	-	431	K/W

[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<sup>2</sup>.



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



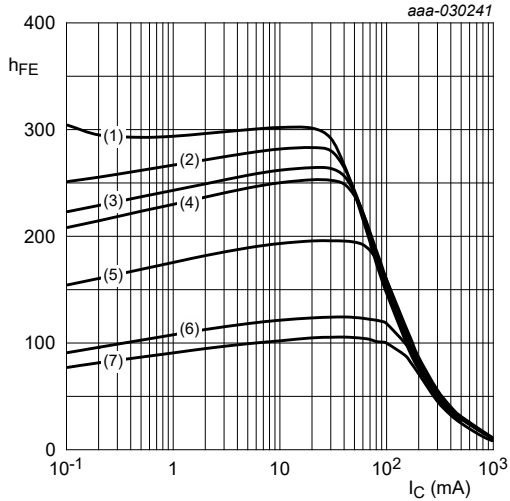
**Fig. 3. Transient thermal impedance from junction to ambient as a function of pulse duration; typical values**

## 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	$\mu\text{A}$	
$I_{EBO}$	emitter-base cut-off current	$V_{EB} = 5.6\ \text{V}; I_C = 0\ \text{A}$	-	-	100	nA	
$h_{FE}$	DC current gain						
	BC816-16W	$V_{CE} = 1\ \text{V}; I_C = 100\ \text{mA}$	[1]	100	-	250	
	BC816-25W	$V_{CE} = 1\ \text{V}; I_C = 100\ \text{mA}$	[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

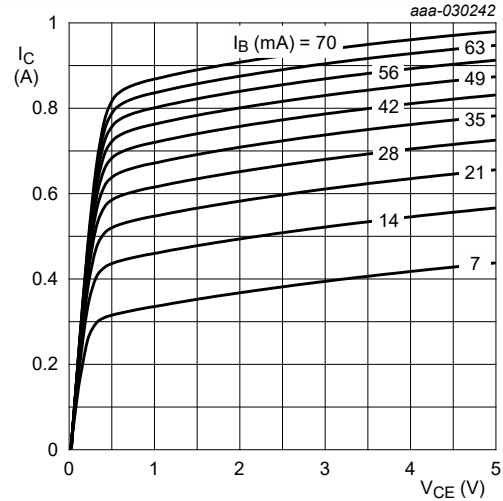
[1] pulsed;  $t_p \leq 300\ \mu\text{s}$ ;  $\delta \leq 0.02$



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

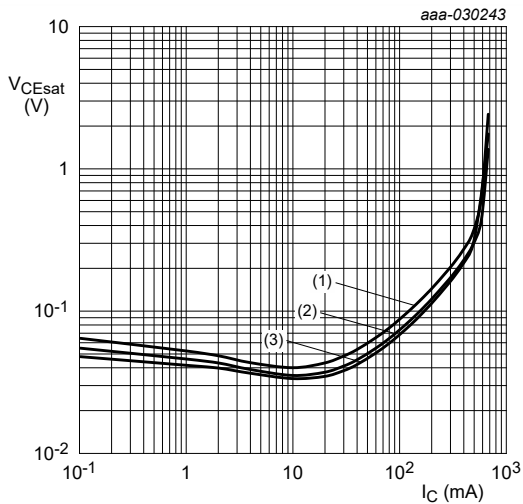
- (1)  $T_{amb} = 150\text{ °C}$
- (2)  $T_{amb} = 125\text{ °C}$
- (3)  $T_{amb} = 100\text{ °C}$
- (4)  $T_{amb} = 85\text{ °C}$
- (5)  $T_{amb} = 25\text{ °C}$
- (6)  $T_{amb} = -40\text{ °C}$
- (7)  $T_{amb} = -55\text{ °C}$

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



$T_{amb} = 25\text{ °C}$

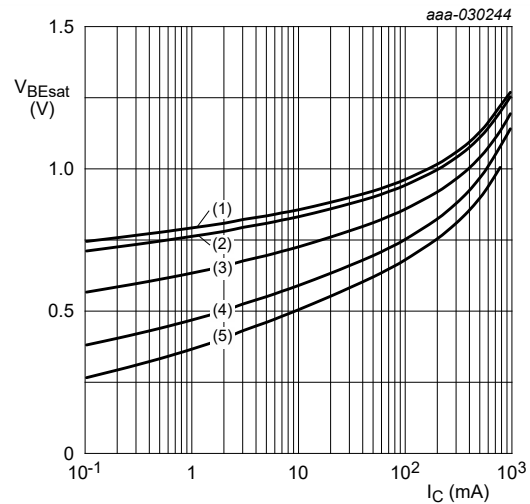
Fig. 5. BC816-16W: Collector current as a function of collector-emitter voltage; typical values



$I_C/I_B = 20$

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

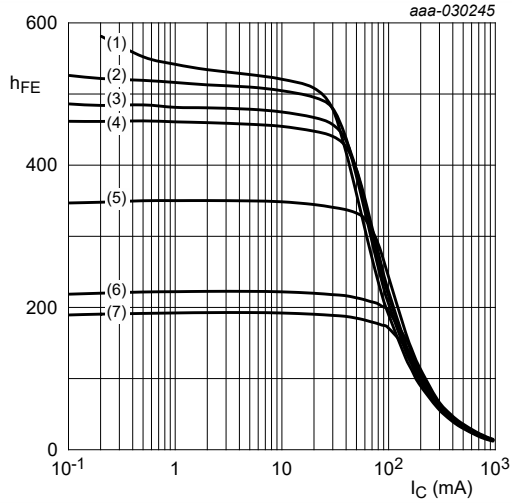
Fig. 6. BC816-16W: Collector-emitter saturation voltage as a function of collector current; typical values



$I_C/I_B = 10$

- (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)  $T_{amb} = 150\text{ °C}$

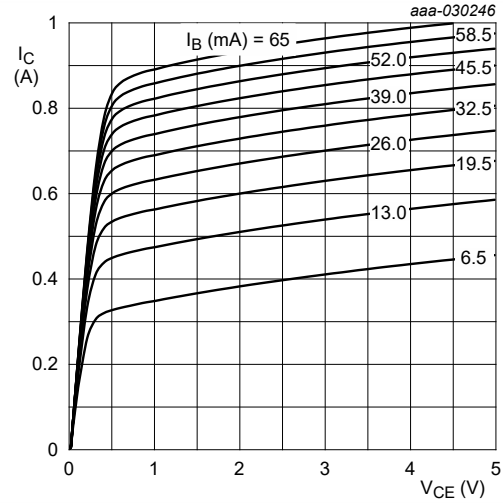
Fig. 7. BC816-16W: Base-emitter saturation voltage as a function of collector current; typical values



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

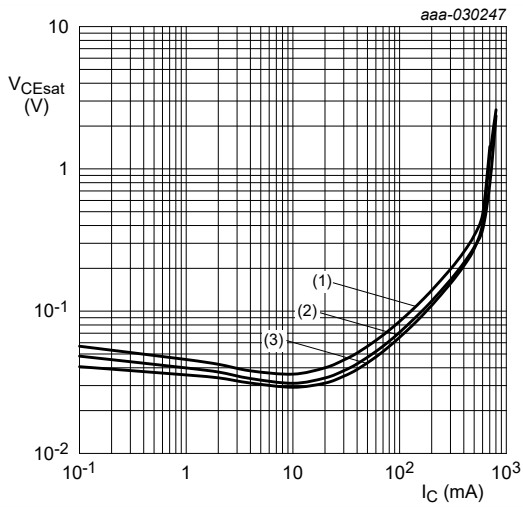
- (1)  $T_{amb} = 150\text{ }^{\circ}\text{C}$
- (2)  $T_{amb} = 125\text{ }^{\circ}\text{C}$
- (3)  $T_{amb} = 100\text{ }^{\circ}\text{C}$
- (4)  $T_{amb} = 85\text{ }^{\circ}\text{C}$
- (5)  $T_{amb} = 25\text{ }^{\circ}\text{C}$
- (6)  $T_{amb} = -40\text{ }^{\circ}\text{C}$
- (7)  $T_{amb} = -55\text{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

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



$T_{amb} = 25\text{ }^{\circ}\text{C}$

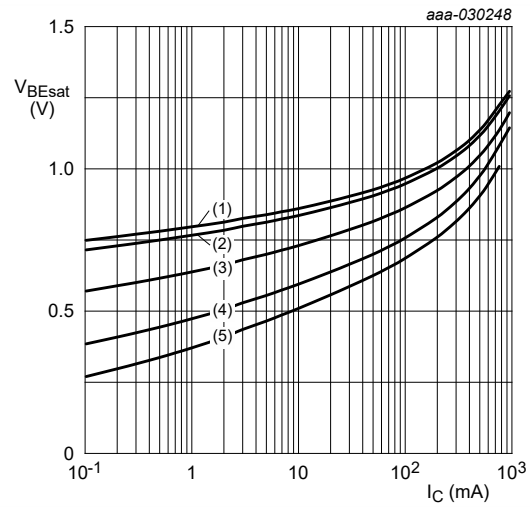
Fig. 9. BC816-25W: Collector current as a function of collector-emitter voltage; typical values



$I_C/I_B = 20$

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

Fig. 10. BC816-25W: 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)  $T_{amb} = -40\text{ }^{\circ}\text{C}$
- (3)  $T_{amb} = 25\text{ }^{\circ}\text{C}$
- (4)  $T_{amb} = 100\text{ }^{\circ}\text{C}$
- (5)  $T_{amb} = 150\text{ }^{\circ}\text{C}$

Fig. 11. BC816-25W: 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

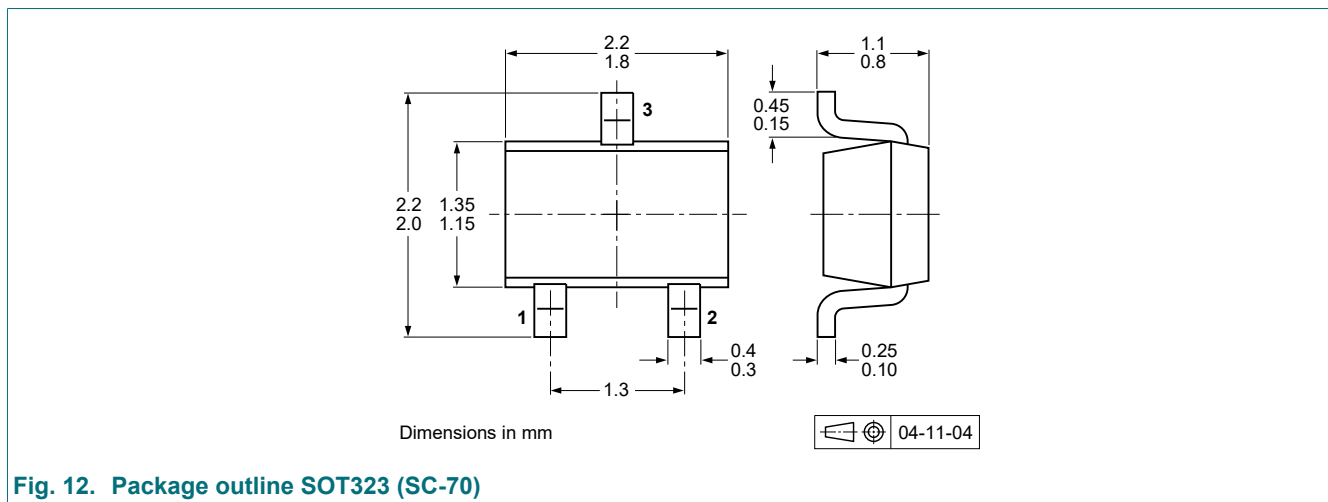


Fig. 12. Package outline SOT323 (SC-70)



### 13. Soldering

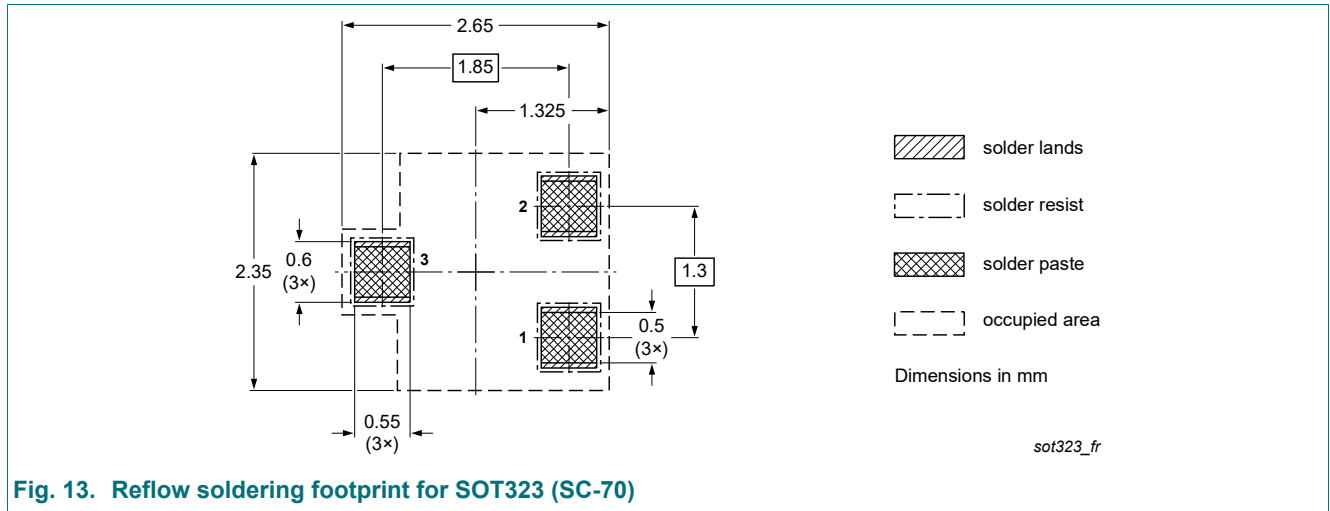


Fig. 13. Reflow soldering footprint for SOT323 (SC-70)

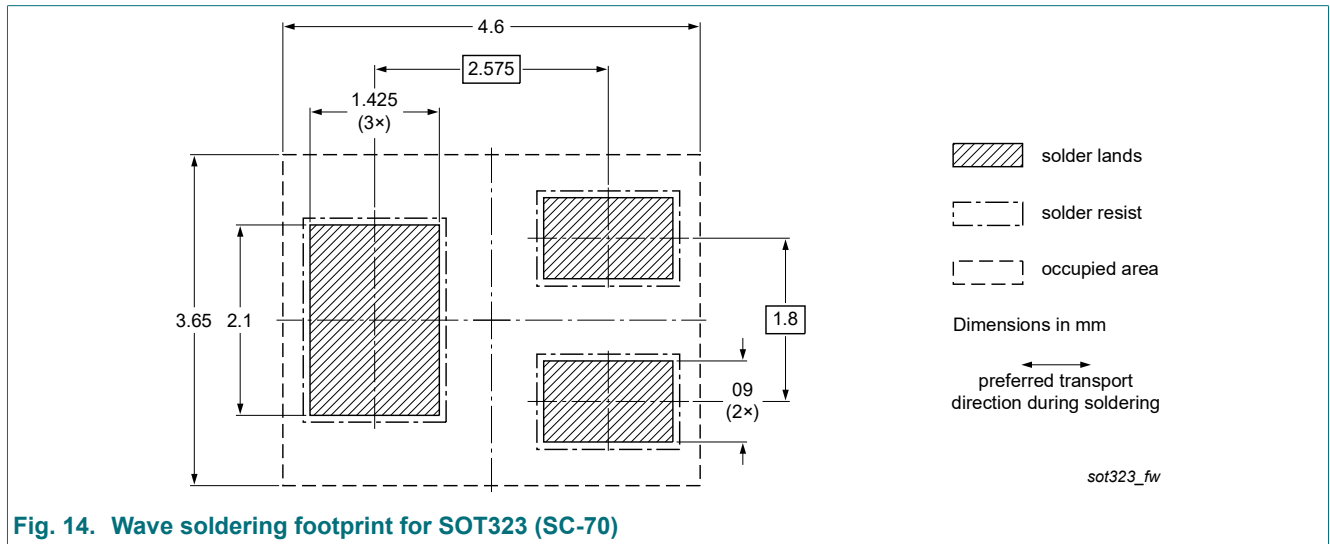


Fig. 14. Wave soldering footprint for SOT323 (SC-70)

## 14. Revision history

**Table 9. Revision history**

Data sheet ID	Release date	Data sheet status	Change notice	Supersedes
BC816W_SER v.2	20191127	Product data sheet	-	BC816W_SER v.1
Modifications:	• Product status changed			
BC816W_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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