

# BC847xQC series

45 V, 100 mA NPN general-purpose transistor

Rev. 1 — 4 January 2021

Product data sheet

## 1. General description

NPN general-purpose transistor in an ultra small DFN1412D-3 (SOT8009) leadless Surface-Mounted Device (SMD) plastic package with side-wettable flanks.

Table 1. Product overview

Type number	Package		PNP complement:
	Nexperia	JEDEC	
BC847AQC	SOT8009	MO-340CA	BC857AQC
BC847BQC			BC857BQC
BC847CQC			BC857CQC

## 2. Features and benefits

- High power dissipation capability
- Suitable for Automatic Optical Inspection (AOI) of solder joint
- Smaller footprint compared to conventional leaded SMD packages
- Low package height of 0.5 mm
- AEC-Q101 qualified

## 3. Applications

- General-purpose switching and amplification
- Space restricted applications

## 4. Quick reference data

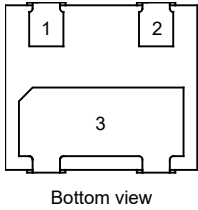
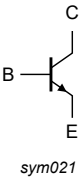
Table 2. Quick reference data

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

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$V_{CEO}$	collector-emitter voltage	open base	-	-	45	V
$I_C$	collector current		-	-	100	mA
$I_{CM}$	peak collector current	single pulse; $t_p \leq 1\text{ ms}$	-	-	200	mA
$h_{FE}$	DC current gain					
	BC847AQC	$V_{CE} = 5\text{ V}; I_C = 2\text{ mA}$	110	-	220	
	BC847BQC		200	-	450	
	BC847CQC		420	-	800	

## 5. Pinning information

Table 3. Pinning

Pin	Symbol	Description	Simplified outline	Graphic symbol
1	B	base	 <p>Bottom view</p>	 <p>sym021</p>
2	E	emitter		
3	C	collector		

## 6. Ordering information

Table 4. Ordering information

Type number	Package		
	Name	Description	Version
BC847AQC	DFN1412D-3	plastic, leadless ultra small outline package with sidewettable flanks (SWF); 3 terminals; 0.8 mm pitch; 1.4 mm x 1.2 mm x 0.48 mm body	SOT8009
BC847BQC			
BC847CQC			

## 7. Marking

Table 5. Marking

Type number	Marking code
BC847AQC	9C
BC847BQC	9D
BC847CQC	9E

## 8. Limiting values

**Table 6. Limiting values**

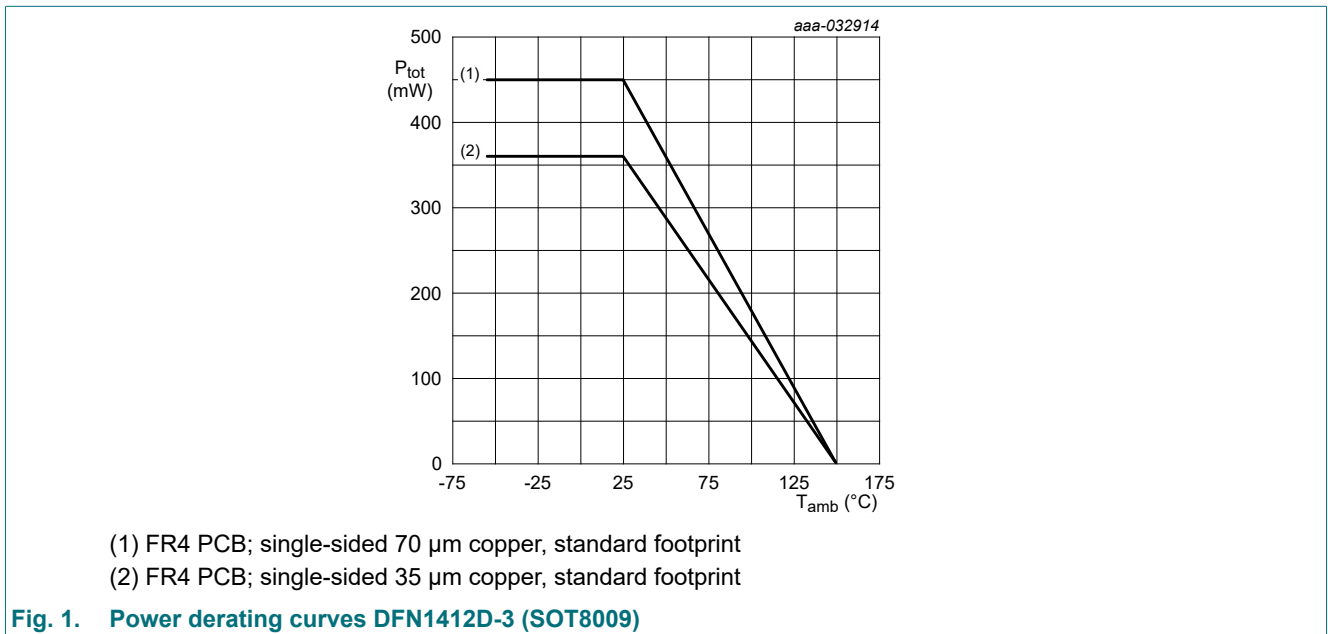
In accordance with the Absolute Maximum Rating System (IEC 60134).

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

Symbol	Parameter	Conditions	Min	Max	Unit	
$V_{CBO}$	collector-base voltage	open emitter	-	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; $t_p \leq 1\text{ ms}$	-	200	mA	
$I_{BM}$	peak base current	single pulse; $t_p \leq 1\text{ ms}$	-	100	mA	
$P_{tot}$	total power dissipation	$T_{amb} \leq 25\text{ °C}$	[1]	-	360	mW
			[2]	-	450	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 35  $\mu\text{m}$  copper; tin-plated and standard footprint.

[2] Device mounted on an FR4 Printed-Circuit-Board (PCB); single-sided 70  $\mu\text{m}$  copper; tin-plated and standard footprint.



## 9. Thermal characteristics

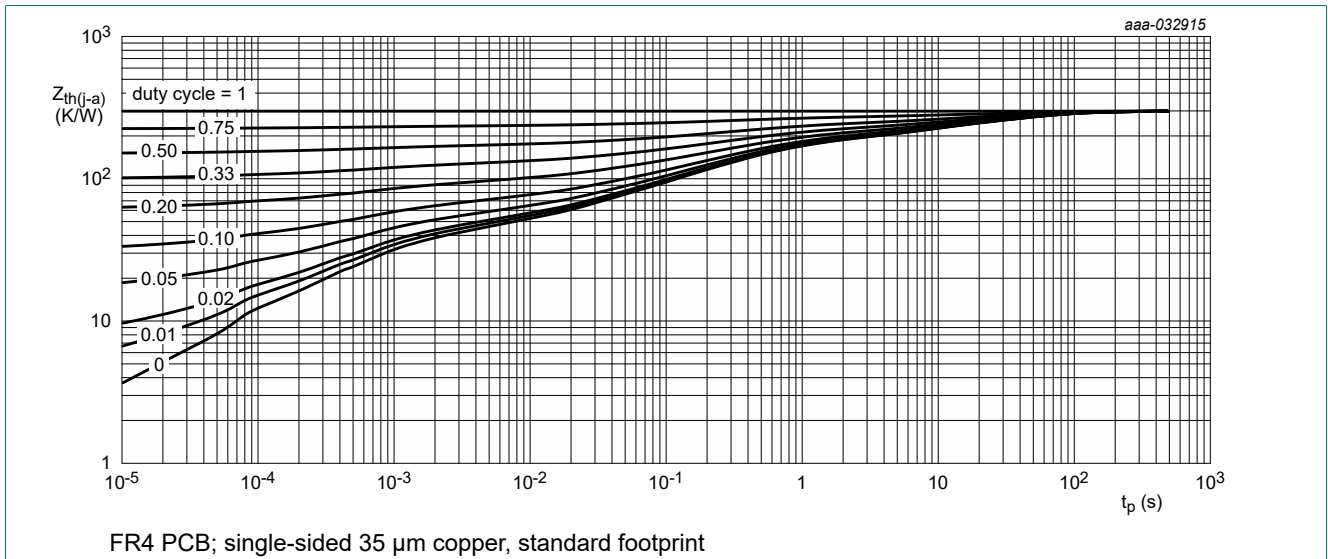
**Table 7. Thermal characteristics**

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

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
$R_{th(j-a)}$	thermal resistance from junction to ambient	in free air	[1]	-	-	348	K/W
			[2]	-	-	278	K/W

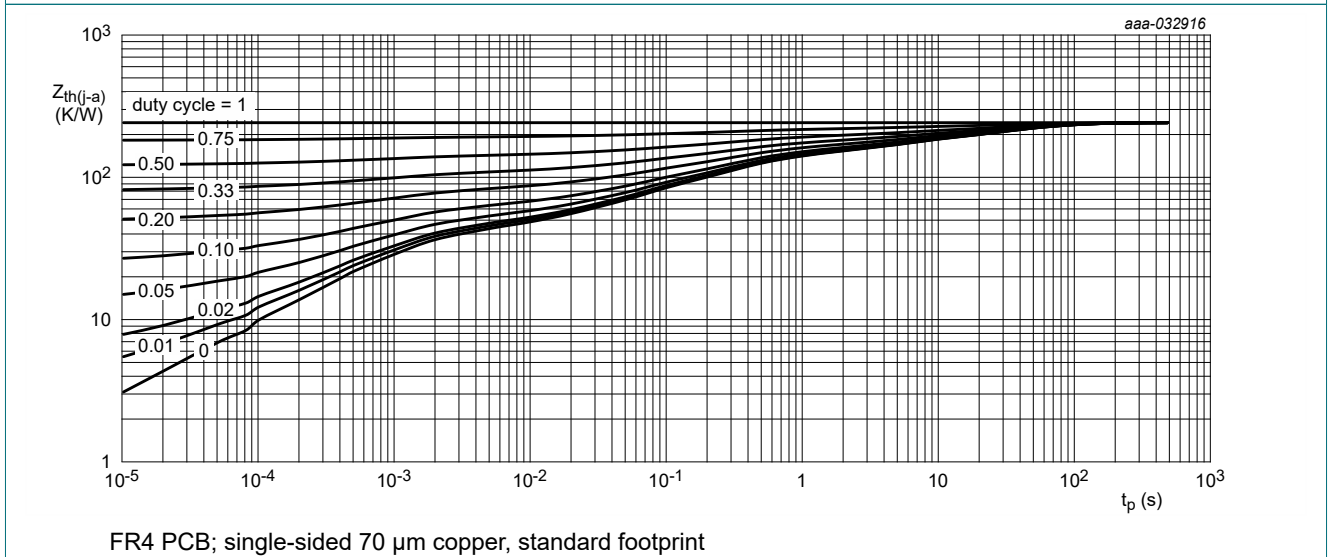
[1] Device mounted on an FR4 Printed-Circuit-Board (PCB); single-sided 35  $\mu\text{m}$  copper; tin-plated and standard footprint.

[2] Device mounted on an FR4 Printed-Circuit-Board (PCB); single-sided 70  $\mu\text{m}$  copper; tin-plated and standard footprint.



FR4 PCB; single-sided 35  $\mu\text{m}$  copper, standard footprint

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



FR4 PCB; single-sided 70  $\mu\text{m}$  copper, standard footprint

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

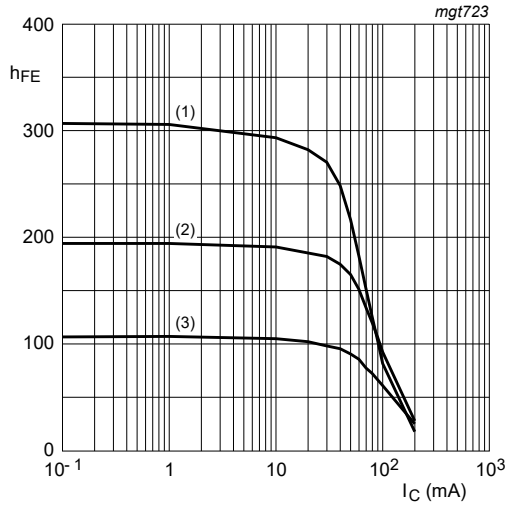
## 10. Characteristics

**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	$I_C = 100\ \mu\text{A}; I_E = 0\ \text{A}$	50	-	-	V
$V_{(BR)CEO}$	collector-emitter breakdown voltage	$I_C = 2\ \text{mA}; I_B = 0\ \text{A}$	45	-	-	V
$V_{(BR)EBO}$	emitter-base breakdown voltage	$I_E = 100\ \mu\text{A}; I_C = 0\ \text{A}$	6	-	-	V
$I_{CBO}$	collector-base cut-off current	$V_{CB} = 30\ \text{V}; I_E = 0\ \text{A}$	-	-	15	nA
		$V_{CB} = 30\ \text{V}; I_E = 0\ \text{A}; T_j = 150\text{ °C}$	-	-	5	$\mu\text{A}$
$I_{EBO}$	emitter-base cut-off current	$V_{EB} = 5\ \text{V}; I_C = 0\ \text{A}$	-	-	100	nA
$h_{FE}$	DC current gain					
	BC847AQC	$V_{CE} = 5\ \text{V}; I_C = 2\ \text{mA}$	110	-	220	
	BC847BQC		200	-	450	
	BC847CQC		420	-	800	
$V_{CEsat}$	collector-emitter saturation voltage	$I_C = 10\ \text{mA}; I_B = 0.5\ \text{mA}$	-	-	200	mV
		$I_C = 100\ \text{mA}; I_B = 5\ \text{mA}$ [1]	-	-	400	mV
$V_{BE}$	base-emitter voltage	$V_{CE} = 5\ \text{V}; I_C = 2\ \text{mA}$ [2]	580	-	700	mV
		$V_{CE} = 5\ \text{V}; I_C = 10\ \text{mA}$ [2]	-	-	770	mV
$V_{BEsat}$	base-emitter saturation voltage	$I_C = 10\ \text{mA}; I_B = 0.5\ \text{mA}$	-	760	-	mV
		$I_C = 100\ \text{mA}; I_B = 5\ \text{mA}$ [1]	-	900	-	mV
$f_T$	transition frequency	$V_{CE} = 5\ \text{V}; I_C = 10\ \text{mA}; f = 100\ \text{MHz}$	100	-	-	MHz
$C_c$	collector capacitance	$V_{CB} = 10\ \text{V}; I_E = i_e = 0\ \text{A}; f = 1\ \text{MHz}$	-	-	1.5	pF
$C_e$	emitter capacitance	$V_{EB} = 0.5\ \text{V}; I_E = i_e = 0\ \text{A}; f = 1\ \text{MHz}$	-	11	-	pF
NF	noise figure	$V_{CE} = 5\ \text{V}; I_C = 200\ \mu\text{A}; R_S = 2\ \text{k}\Omega; f = 1\ \text{kHz}; B = 200\ \text{Hz}$	-	-	10	dB

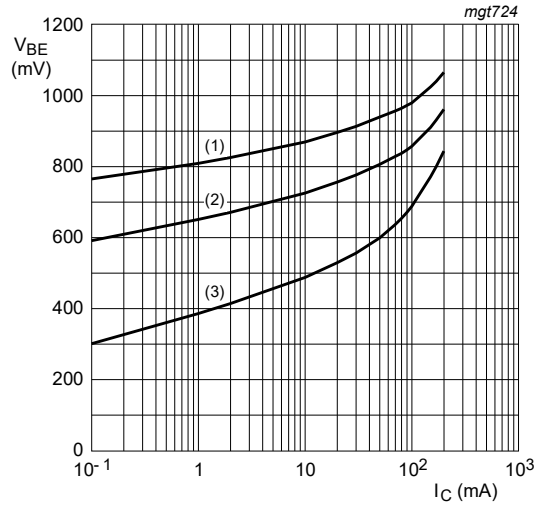
[1] pulsed;  $t_p \leq 300\ \mu\text{s}$ ;  $\delta \leq 0.02$

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



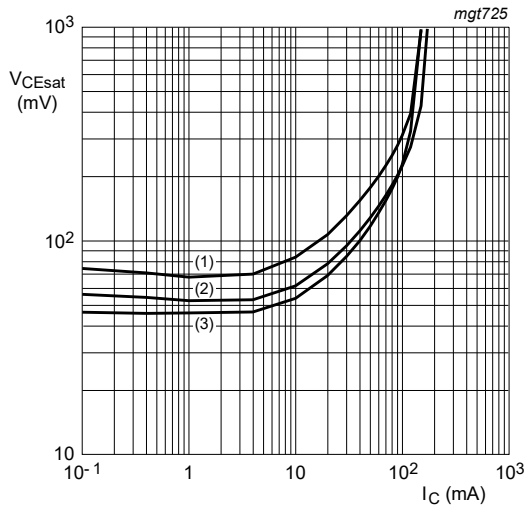
$V_{CE} = 5\text{ V}$   
 (1)  $T_{amb} = 150\text{ }^{\circ}\text{C}$   
 (2)  $T_{amb} = 25\text{ }^{\circ}\text{C}$   
 (3)  $T_{amb} = -55\text{ }^{\circ}\text{C}$

**Fig. 4. BC847AQC: DC current gain as a function of collector current; typical values**



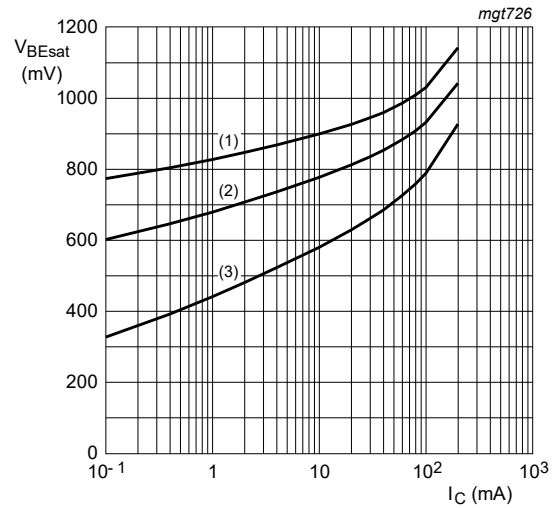
$V_{CE} = 5\text{ V}$   
 (1)  $T_{amb} = -55\text{ }^{\circ}\text{C}$   
 (2)  $T_{amb} = 25\text{ }^{\circ}\text{C}$   
 (3)  $T_{amb} = 150\text{ }^{\circ}\text{C}$

**Fig. 5. BC847AQC: Base-emitter voltage as a function of collector current; typical values**



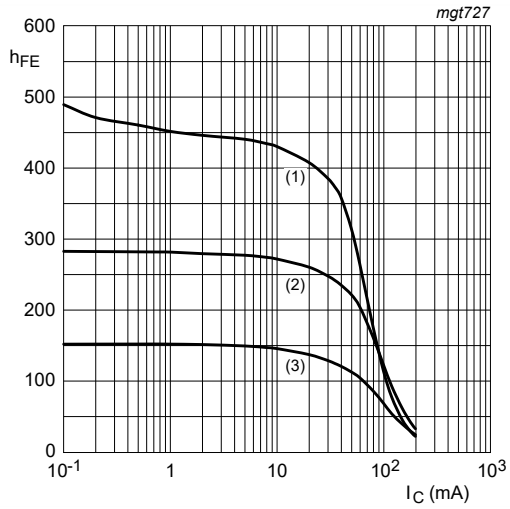
$I_C / I_B = 20$   
 (1)  $T_{amb} = 150\text{ }^{\circ}\text{C}$   
 (2)  $T_{amb} = 25\text{ }^{\circ}\text{C}$   
 (3)  $T_{amb} = -55\text{ }^{\circ}\text{C}$

**Fig. 6. BC847AQC: Collector-emitter saturation voltage as a function of collector current; typical values**



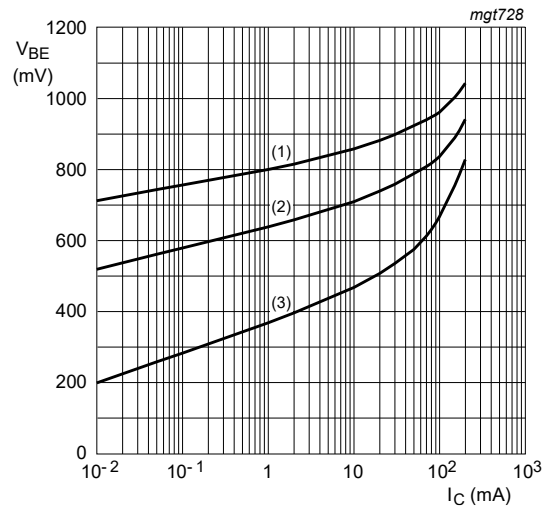
$I_C / I_B = 10$   
 (1)  $T_{amb} = -55\text{ }^{\circ}\text{C}$   
 (2)  $T_{amb} = 25\text{ }^{\circ}\text{C}$   
 (3)  $T_{amb} = 150\text{ }^{\circ}\text{C}$

**Fig. 7. BC847AQC: Base-emitter saturation voltage as a function of collector current; typical values**



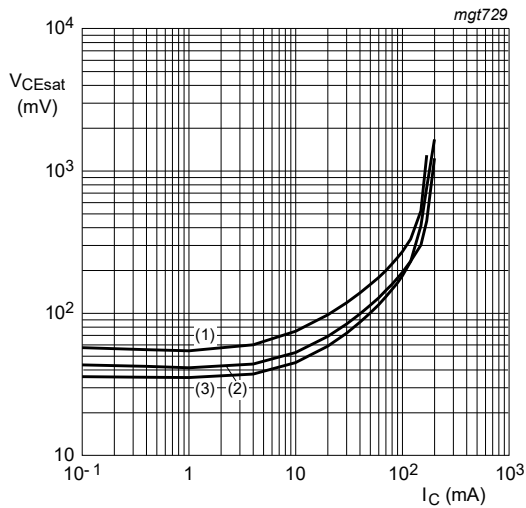
$V_{CE} = 5\text{ V}$   
 (1)  $T_{amb} = 150\text{ °C}$   
 (2)  $T_{amb} = 25\text{ °C}$   
 (3)  $T_{amb} = -55\text{ °C}$

Fig. 8. BC847BQC: DC current gain as a function of collector current; typical values



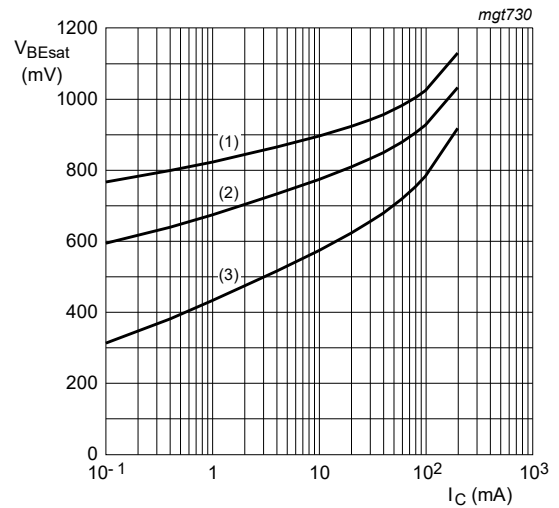
$V_{CE} = 5\text{ V}$   
 (1)  $T_{amb} = -55\text{ °C}$   
 (2)  $T_{amb} = 25\text{ °C}$   
 (3)  $T_{amb} = 150\text{ °C}$

Fig. 9. BC847BQC: Base-emitter voltage as a function of collector current; typical values



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

Fig. 10. BC847BQC: Collector-emitter saturation voltage as a function of collector current; typical values



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

Fig. 11. BC847BQC: Base-emitter saturation voltage as a function of collector current; typical values

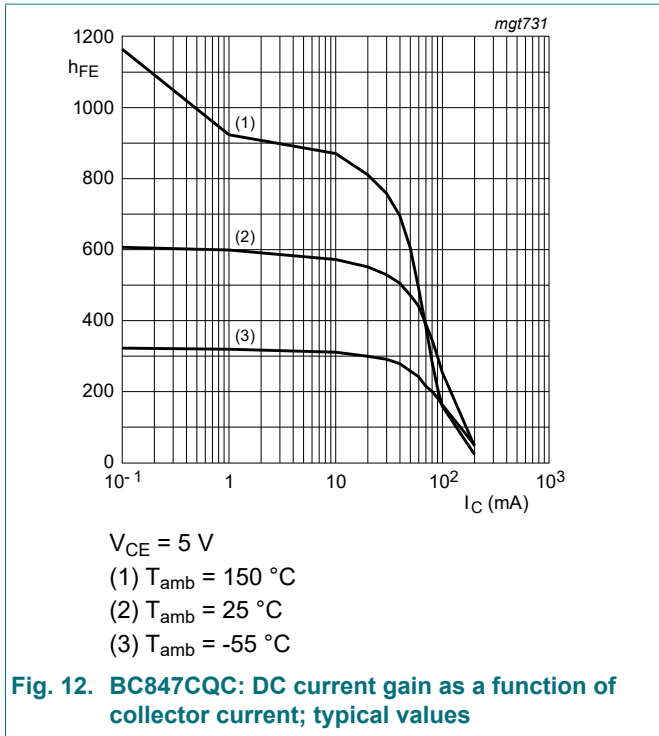


Fig. 12. BC847CQC: DC current gain as a function of collector current; typical values

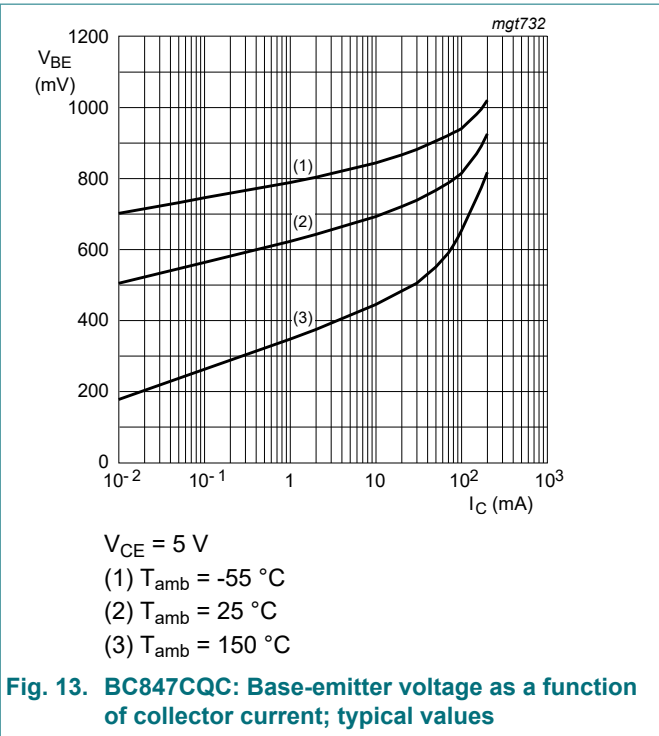


Fig. 13. BC847CQC: Base-emitter voltage as a function of collector current; typical values

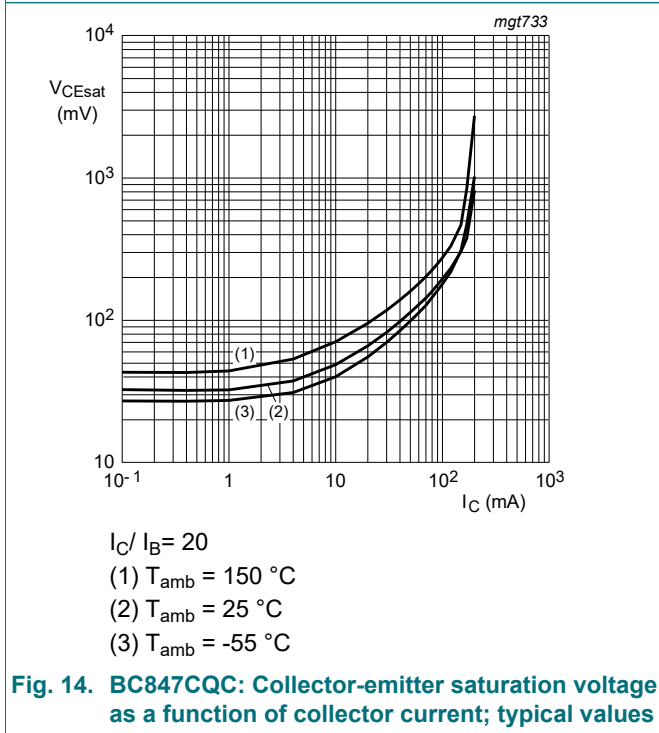


Fig. 14. BC847CQC: Collector-emitter saturation voltage as a function of collector current; typical values

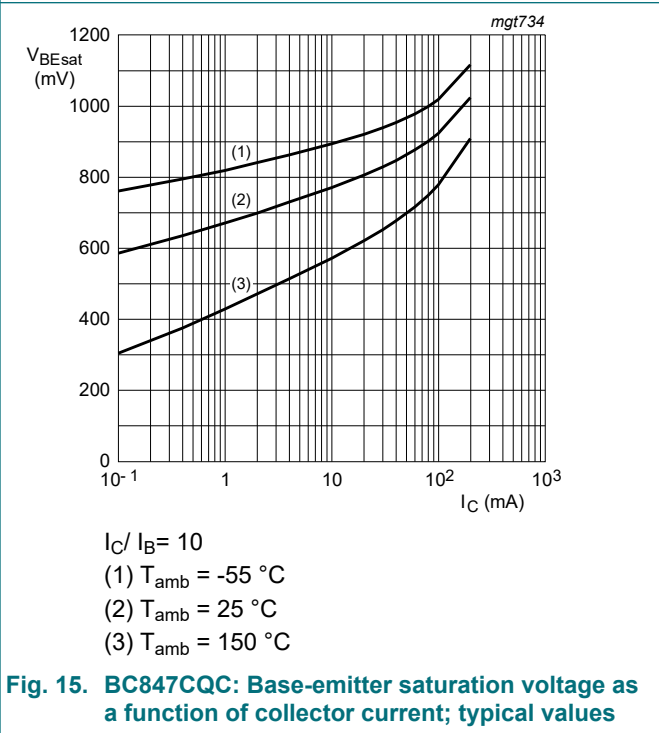


Fig. 15. BC847CQC: Base-emitter saturation voltage as a function of collector current; typical values

## 11. Test information

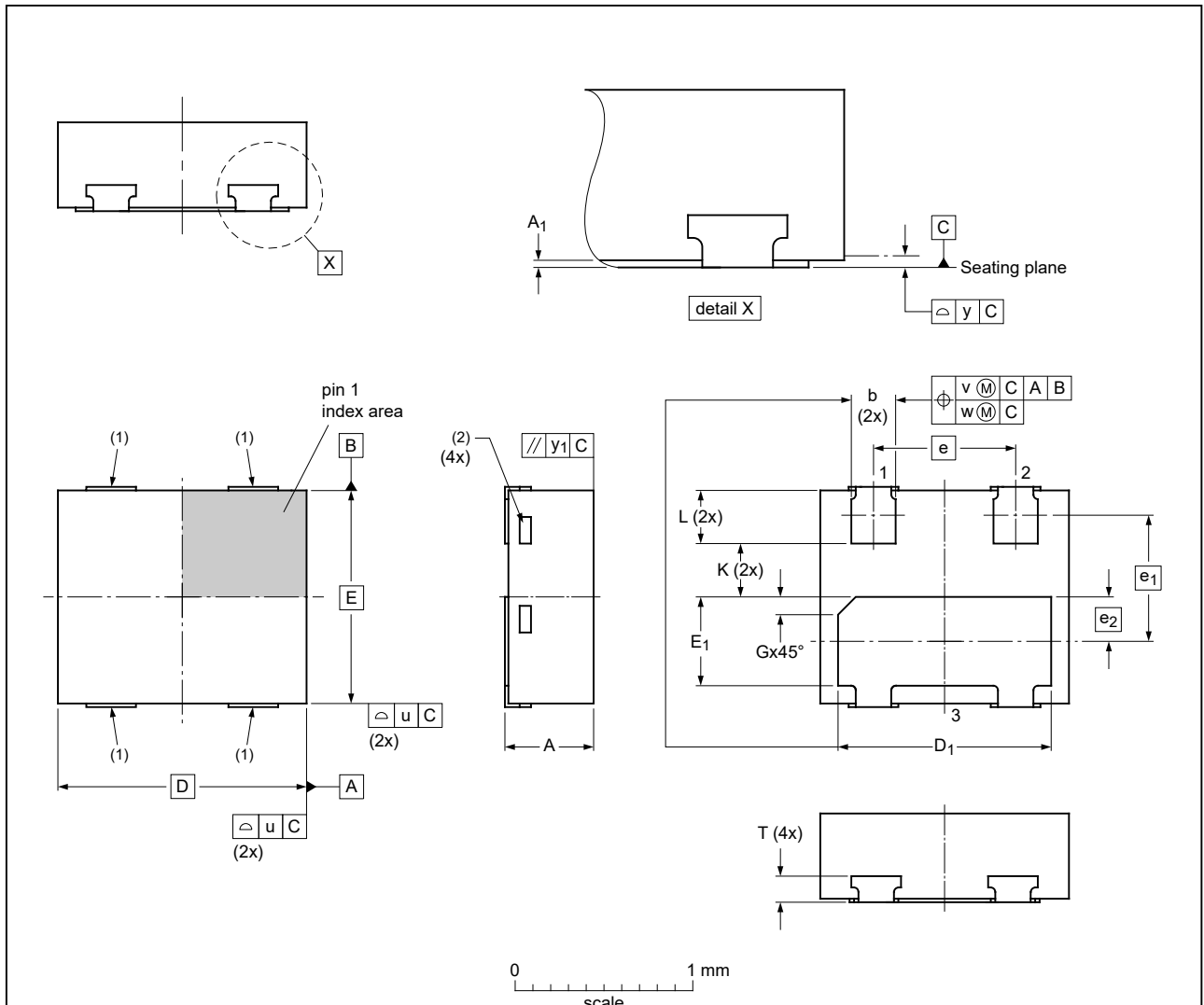
### Quality information

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

DFN1412D-3: plastic, leadless extremely thin small outline package with side-wettable flanks (SWF); 3 terminals; 0.8 mm pitch; 1.4 mm x 1.2 mm x 0.48 mm body

SOT8009



Dimensions (mm are the original dimensions)

Unit	A	A <sub>1</sub>	b	D	D <sub>1</sub>	E	E <sub>1</sub>	e	e <sub>1</sub>	e <sub>2</sub>	G	K	L	T	u	v	w	y	y <sub>1</sub>
max	0.50	0.04	0.30	1.25	0.55								0.35	0.22					
nom	0.47		0.25	1.4	1.20	1.2	0.50	0.8	0.71	0.26	0.09		0.30	0.16	0.05	0.1	0.05	0.05	0.05
min	0.44		0.22	1.17	0.47						(ref)	0.25	0.27	0.10					

Note

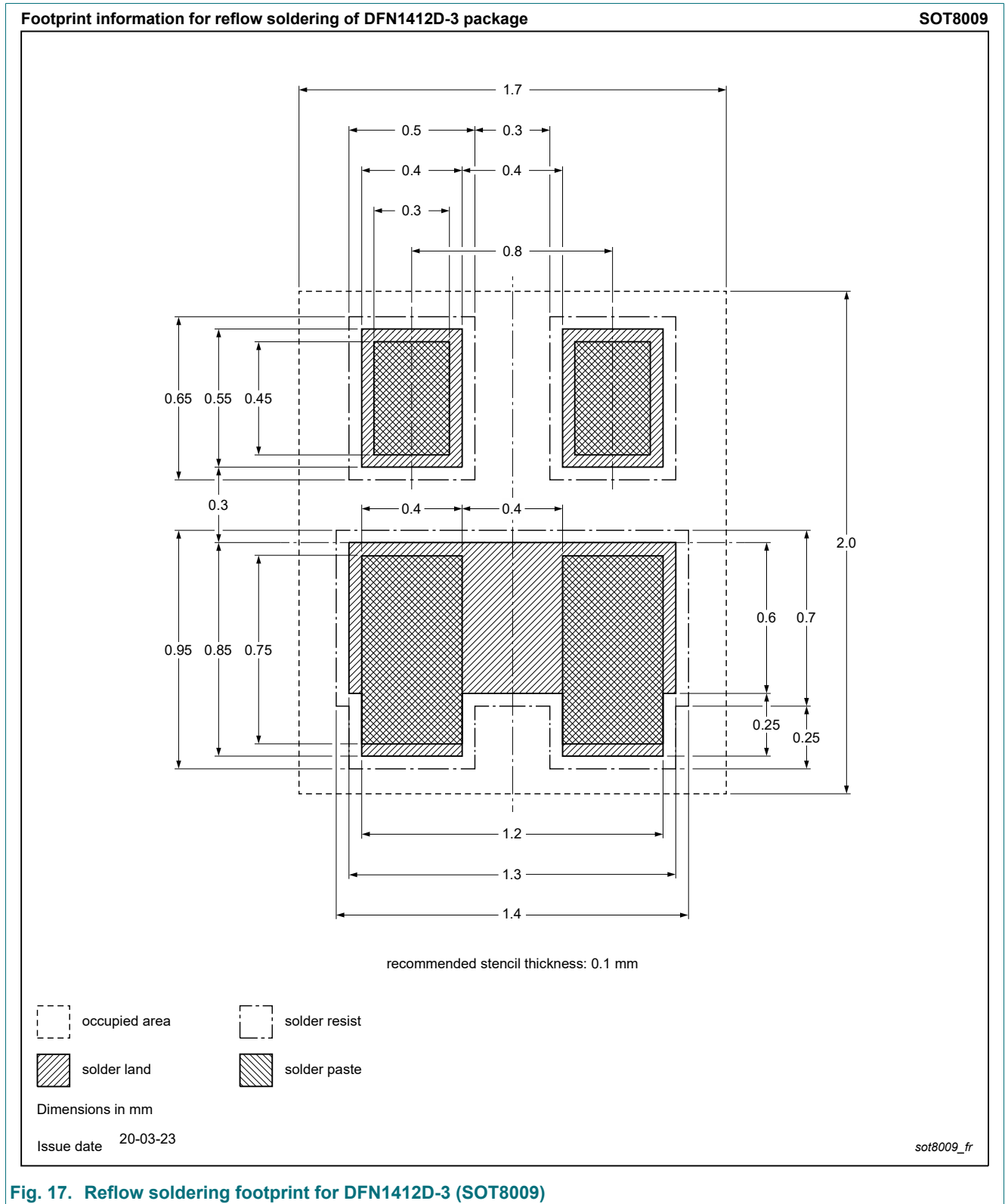
- 1. Side Wettable Flank, protrusion max. 0.02 mm.
  - 2. Visible depend upon used manufacturing technology.
- Dimension A and T are including plating thickness.

sot8009\_po

Outline version	References				European projection	Issue date
	IEC	JEDEC	JEITA			
SOT8009	MO-340CA					19-12-04 19-12-06

Fig. 16. Package outline DFN1412D-3 (SOT8009)

### 13. Soldering



**Fig. 17. Reflow soldering footprint for DFN1412D-3 (SOT8009)**

## 14. Revision history

**Table 9. Revision history**

Data sheet ID	Release date	Data sheet status	Change notice	Supersedes
BC847XQC_SER v.1	20210104	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".
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## Contents

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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.....	8
12. Package outline.....	9
13. Soldering.....	10
14. Revision history.....	11
15. Legal information.....	12

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Date of release: 4 January 2021

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