



# THE DATASHEET OF BAS21LLYL





# BC847xQB series

45 V, 100 mA NPN general-purpose transistor

Rev. 2 — 8 September 2021

Product data sheet

## 1. General description

NPN general-purpose transistor in an ultra small DFN1110D-3 (SOT8015) leadless Surface-Mounted Device (SMD) plastic package with side-wettable flanks.

Table 1. Product overview

Type number	Package		PNP complement:
	Nexperia	JEDEC	
BC847AQB	SOT8015	MO-340BA	BC857AQB
BC847BQB			BC857BQB
BC847CQB			BC857CQB

## 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

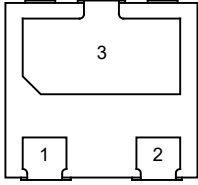
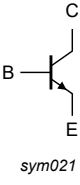
Table 2. Quick reference data

$T_{amb} = 25\text{ °C}$  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					
	BC847AQB	$V_{CE} = 5\text{ V}; I_C = 2\text{ mA}$	110	-	220	
	BC847BQB		200	-	450	
	BC847CQB		420	-	800	

## 5. Pinning information

Table 3. Pinning

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

## 6. Ordering information

Table 4. Ordering information

Type number	Package		Version
	Name	Description	
BC847AQB	DFN1110D-3	plastic leadless extremely thin small outline package with side-wettable flanks (SWF); 3 terminals; 0.65 mm pitch; body: 1.1 x 1.0 x 0.48 mm	SOT8015
BC847BQB			
BC847CQB			

## 7. Marking

Table 5. Marking

Type number	Marking code
BC847AQB	A2
BC847BQB	A3
BC847CQB	A4

## 8. Limiting values

**Table 6. Limiting values**

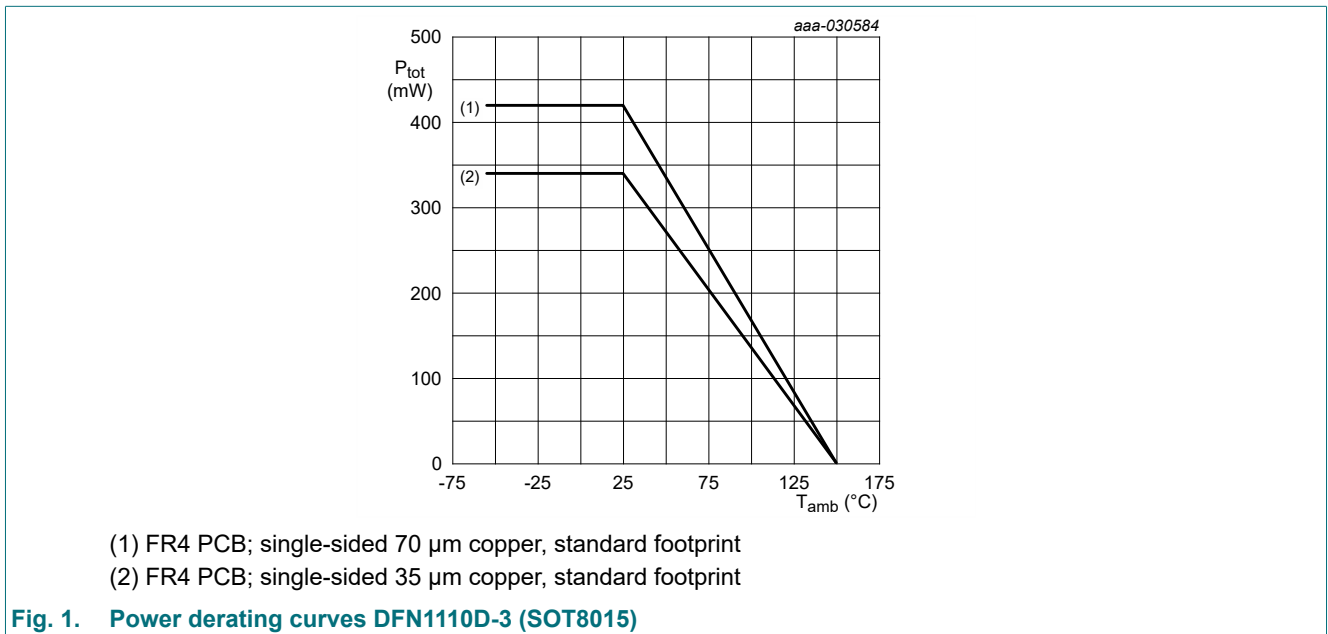
In accordance with the Absolute Maximum Rating System (IEC 60134).

$T_{amb} = 25\text{ °C}$  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]	-	340	mW
			[2]	-	420	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 PCB; single-sided 70  $\mu\text{m}$  copper; tin-plated and standard footprint.



## 9. Thermal characteristics

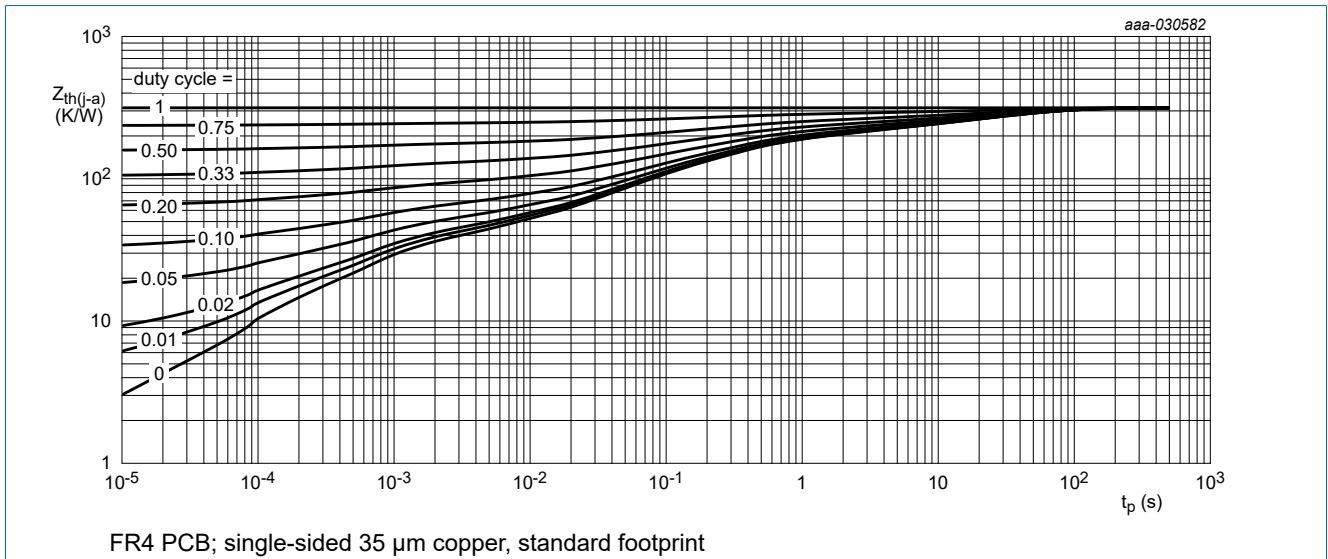
**Table 7. Thermal characteristics**

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

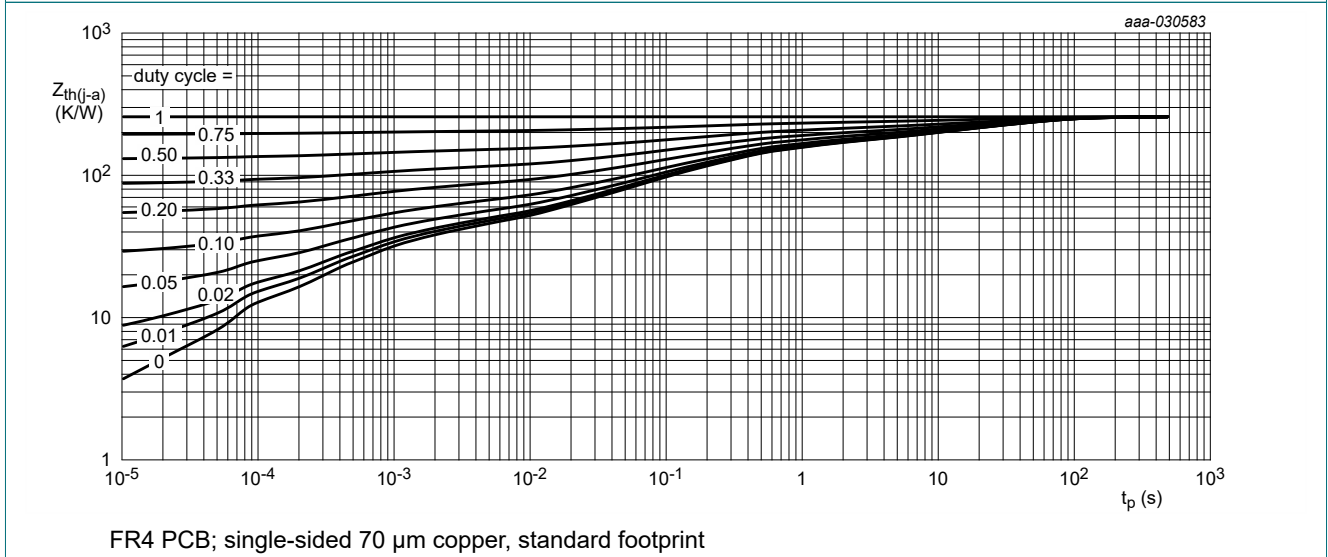
Symbol	Parameter	Conditions		Min	Typ	Max	Unit
$R_{th(j-a)}$	thermal resistance from junction to ambient	in free air	[1]	-	-	368	K/W
			[2]	-	-	298	K/W

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

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



**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**

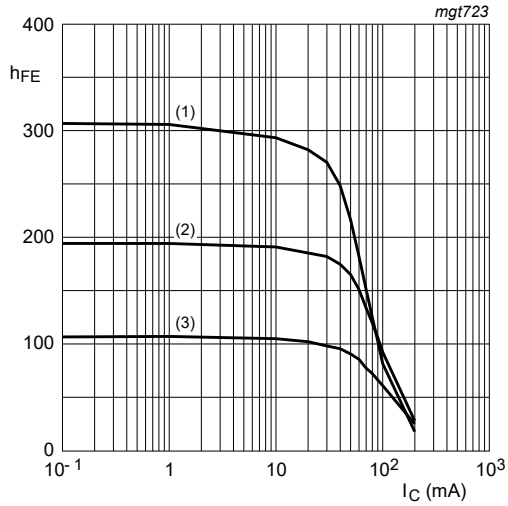
## 10. Characteristics

**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	$I_C = 100\ \mu\text{A}; I_E = 0\ \text{A}$	50	-	-	V
$V_{(BR)CES}$	collector-emitter peak voltage	$I_C = 2\ \text{mA}; I_E = 0\ \text{A}$	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					
	BC847AQB	$V_{CE} = 5\ \text{V}; I_C = 2\ \text{mA}$	110	-	220	
	BC847BQB		200	-	450	
	BC847CQB		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

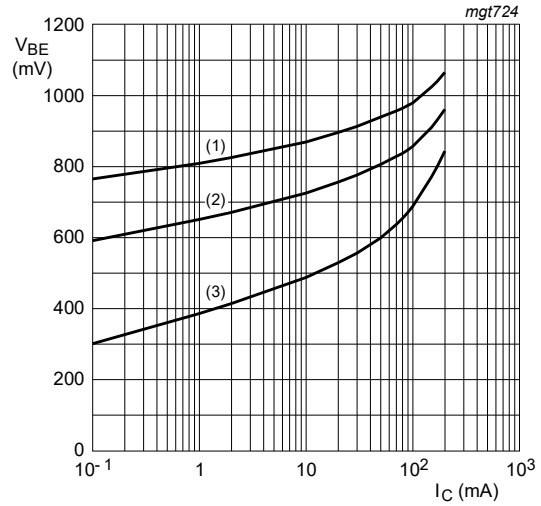
[1] pulsed;  $t_p \leq 300\ \mu\text{s}$ ;  $\delta \leq 0.02$

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



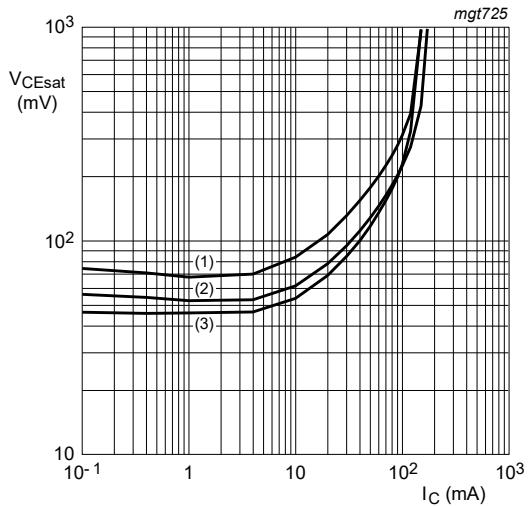
$V_{CE} = 5\text{ V}$   
 (1)  $T_{amb} = 150\text{ }^{\circ}\text{C}$   
 (2)  $T_{amb} = 25\text{ }^{\circ}\text{C}$   
 (3)  $T_{amb} = -55\text{ }^{\circ}\text{C}$

**Fig. 4. BC847AQB: DC current gain as a function of collector current; typical values**



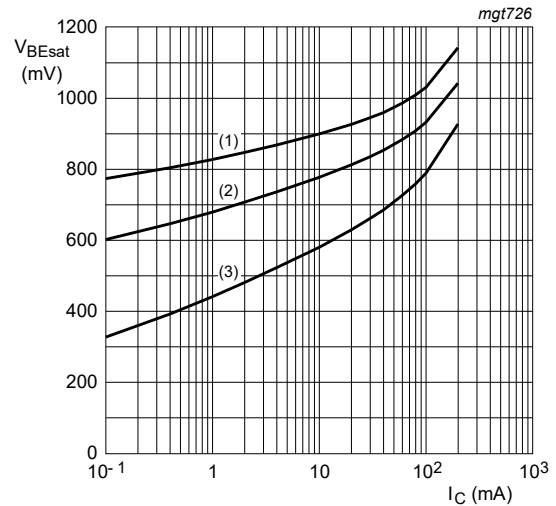
$V_{CE} = 5\text{ V}$   
 (1)  $T_{amb} = -55\text{ }^{\circ}\text{C}$   
 (2)  $T_{amb} = 25\text{ }^{\circ}\text{C}$   
 (3)  $T_{amb} = 150\text{ }^{\circ}\text{C}$

**Fig. 5. BC847AQB: Base-emitter voltage as a function of collector current; typical values**



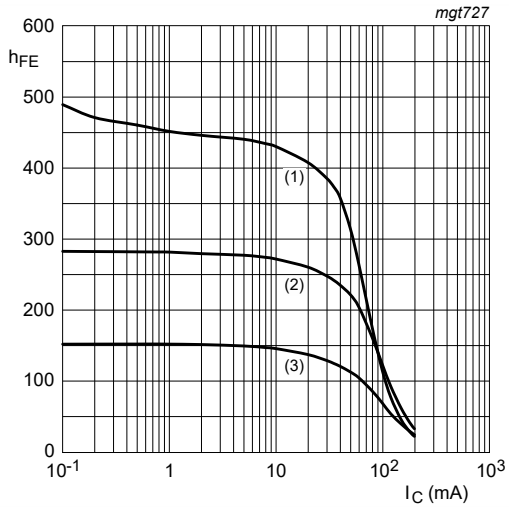
$I_C / I_B = 20$   
 (1)  $T_{amb} = 150\text{ }^{\circ}\text{C}$   
 (2)  $T_{amb} = 25\text{ }^{\circ}\text{C}$   
 (3)  $T_{amb} = -55\text{ }^{\circ}\text{C}$

**Fig. 6. BC847AQB: Collector-emitter saturation voltage as a function of collector current; typical values**



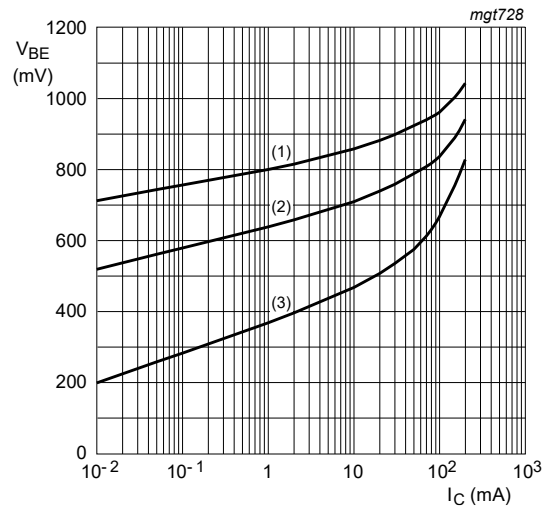
$I_C / I_B = 10$   
 (1)  $T_{amb} = -55\text{ }^{\circ}\text{C}$   
 (2)  $T_{amb} = 25\text{ }^{\circ}\text{C}$   
 (3)  $T_{amb} = 150\text{ }^{\circ}\text{C}$

**Fig. 7. BC847AQB: Base-emitter saturation voltage as a function of collector current; typical values**



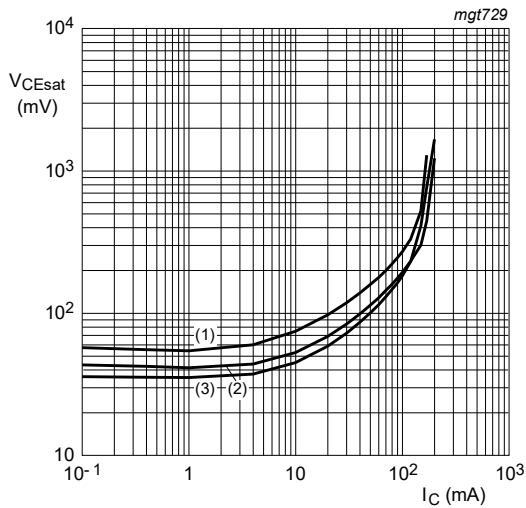
$V_{CE} = 5\text{ V}$   
 (1)  $T_{amb} = 150\text{ }^\circ\text{C}$   
 (2)  $T_{amb} = 25\text{ }^\circ\text{C}$   
 (3)  $T_{amb} = -55\text{ }^\circ\text{C}$

Fig. 8. BC847BQB: DC current gain as a function of collector current; typical values



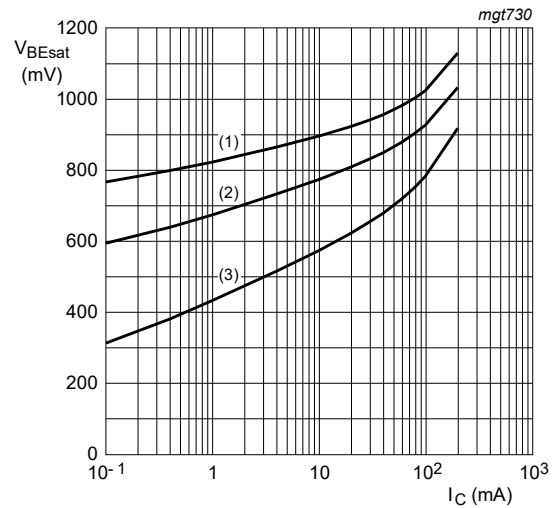
$V_{CE} = 5\text{ V}$   
 (1)  $T_{amb} = -55\text{ }^\circ\text{C}$   
 (2)  $T_{amb} = 25\text{ }^\circ\text{C}$   
 (3)  $T_{amb} = 150\text{ }^\circ\text{C}$

Fig. 9. BC847BQB: 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. 10. BC847BQB: 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. 11. BC847BQB: Base-emitter saturation voltage as a function of collector current; typical values

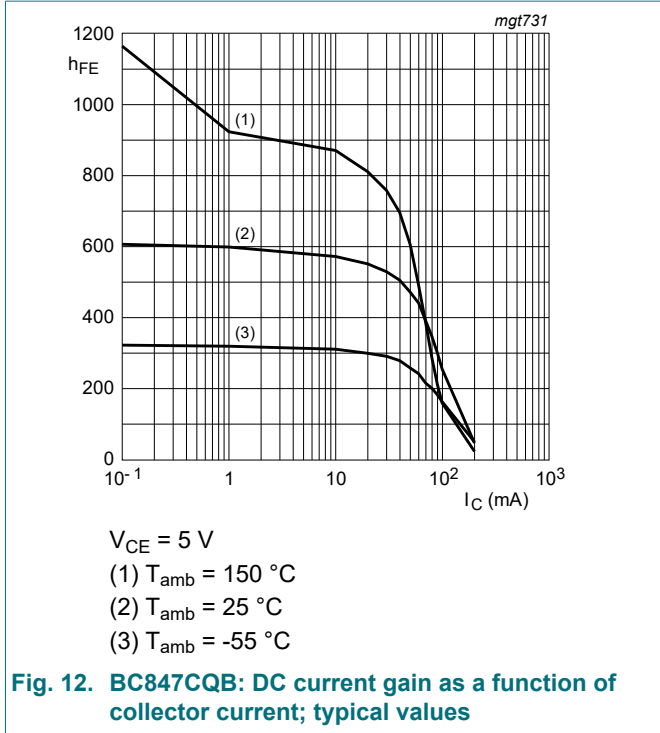


Fig. 12. BC847CQB: DC current gain as a function of collector current; typical values

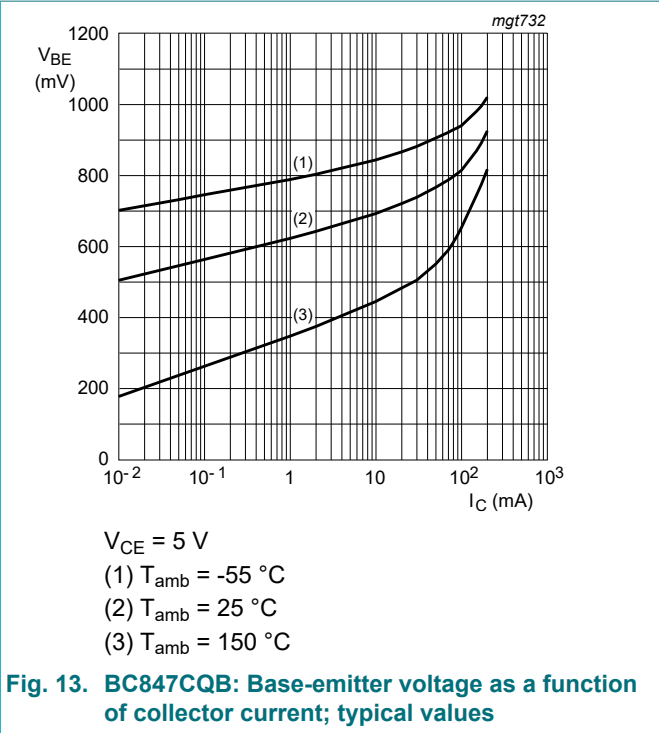


Fig. 13. BC847CQB: Base-emitter voltage as a function of collector current; typical values

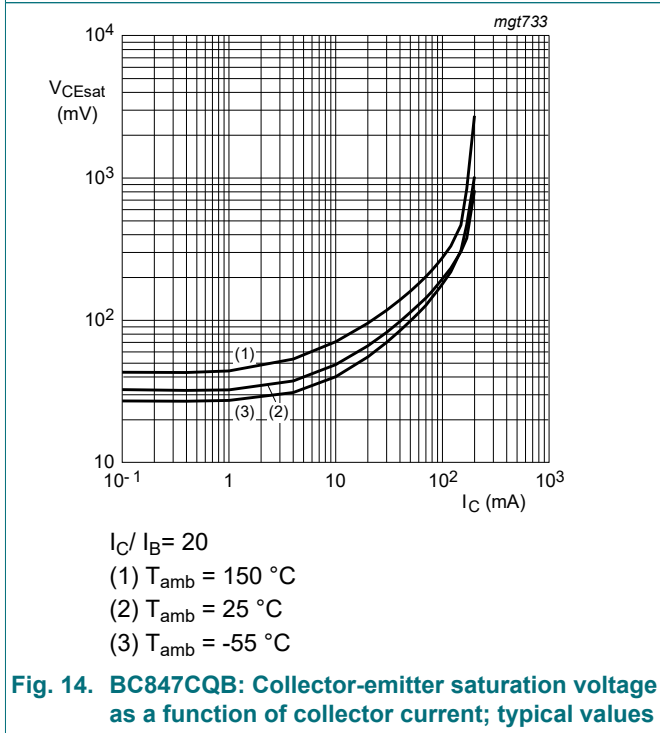


Fig. 14. BC847CQB: Collector-emitter saturation voltage as a function of collector current; typical values

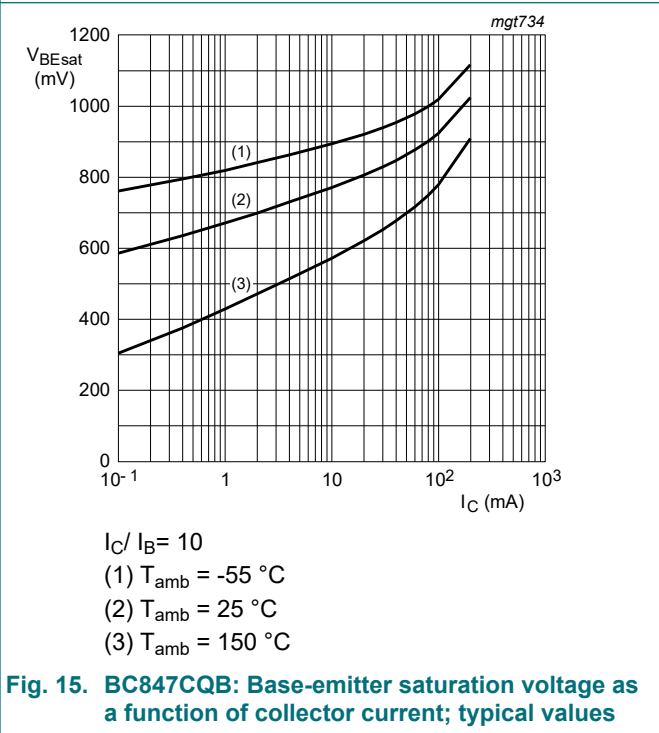


Fig. 15. BC847CQB: Base-emitter saturation voltage as a function of collector current; typical values

## 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

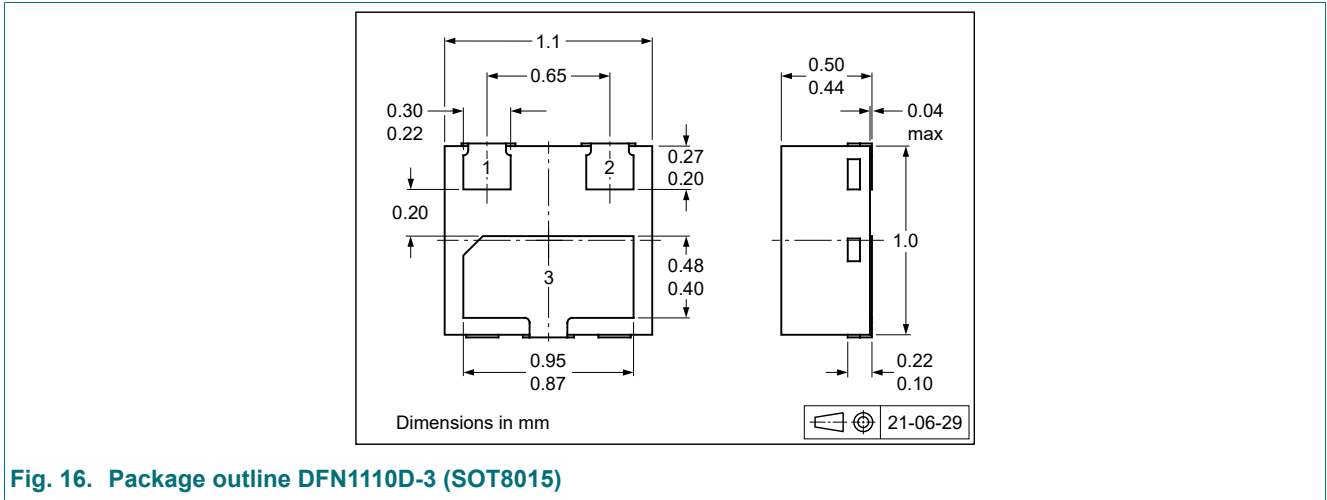


Fig. 16. Package outline DFN1110D-3 (SOT8015)

### 13. Soldering

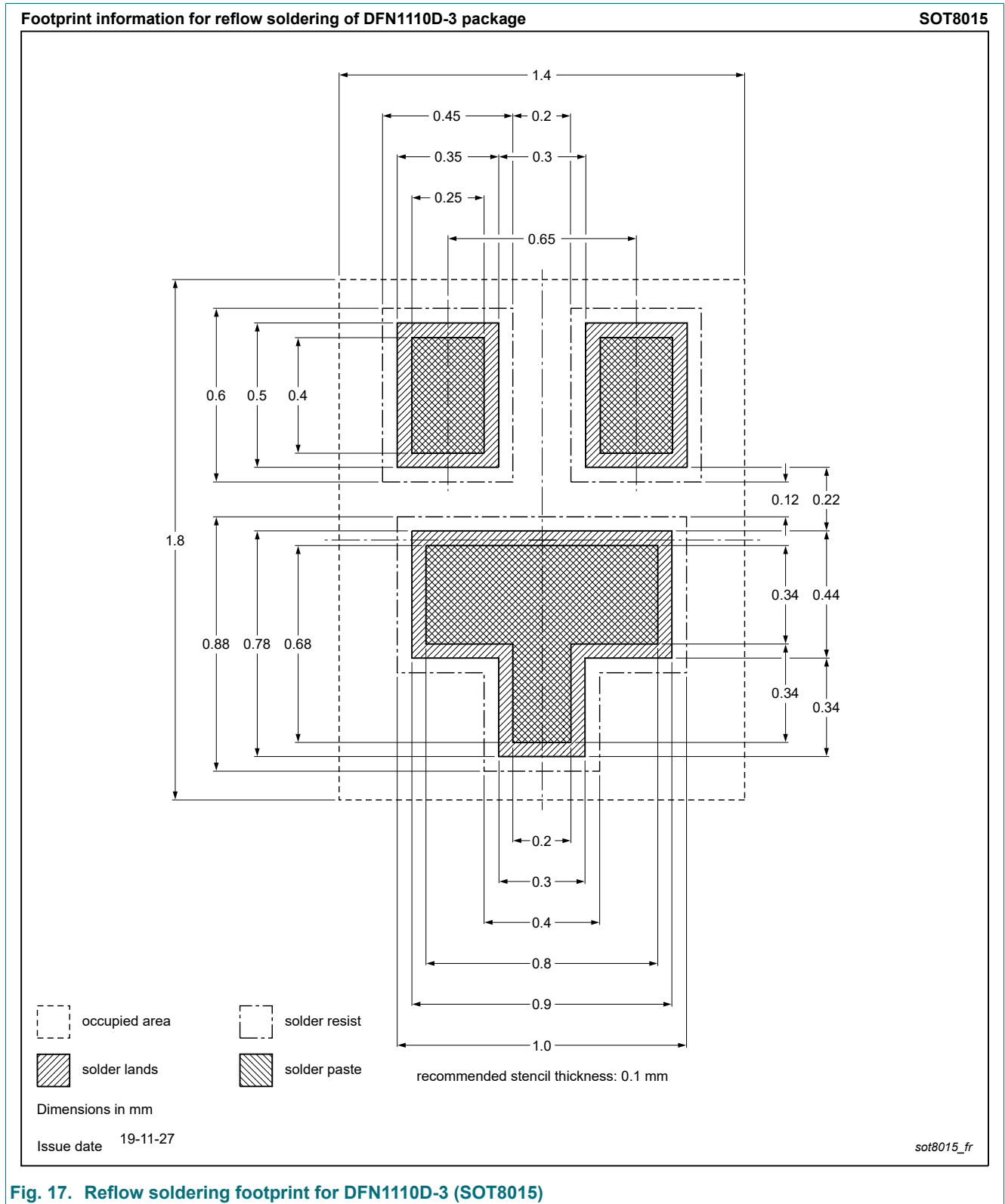


Fig. 17. Reflow soldering footprint for DFN1110D-3 (SOT8015)

## 14. Revision history

**Table 9. Revision history**

Data sheet ID	Release date	Data sheet status	Change notice	Supersedes
BC847XQB_SER v.2	20210908	Product data sheet	-	BC847XQB_SER v.1
Modifications:	<ul style="list-style-type: none"><li>• Pinning: Simplified outline replaced</li><li>• Characteristics: Conditions corrected at <math>C_e</math></li><li>• Package outline: Drawing replaced by minimized version</li></ul>			
BC847XQB_SER v.1	20200124	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.
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Date of release: 8 September 2021

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