BC846xQC series

65 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	
BC846AQC	SOT8009	MO-340CA	BC856AQC
BC846BQC			BC856BQC

2. Features and benefits

- High power dissipation capability
- High voltage (max. 65 V)
- 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

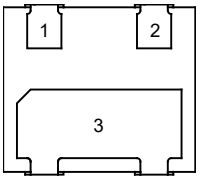
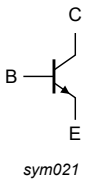
Table 2. Quick reference data

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

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
V_{CEO}	collector-emitter voltage	open base	-	-	65	V
I_C	collector current		-	-	100	mA
I_{CM}	peak collector current	single pulse; $t_p \leq 1$ ms	-	-	200	mA
h_{FE}	DC current gain					
	BC846AQC	V_{CE} = 5 V; I_C = 2 mA	110	-	220	
	BC846BQC		200	-	450	

5. Pinning information

Table 3. Pinning

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

6. Ordering information

Table 4. Ordering information

Type number	Package		
	Name	Description	Version
BC846AQC	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
BC846BQC			

7. Marking

Table 5. Marking

Type number	Marking code
BC846AQC	9R
BC846BQC	9S

8. Limiting values

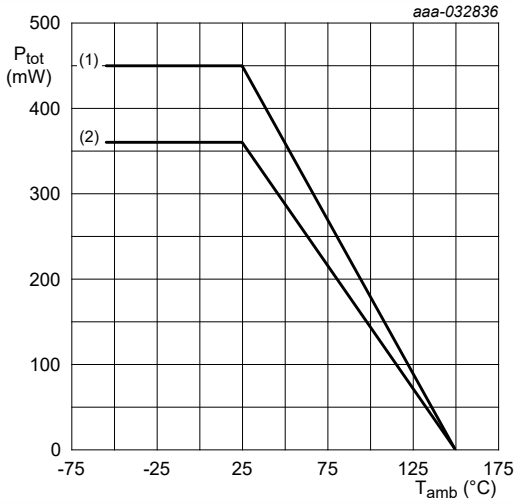
Table 6. Limiting values

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		-	65	V
V_{EBO}	emitter-base voltage	open collector		-	6	V
I_C	collector current			-	100	mA
I_{CM}	peak collector current	single pulse; $t_p \leq 1$ ms		-	200	mA
I_{BM}	peak base current	single pulse; $t_p \leq 1$ ms		-	100	mA
P_{tot}	total power dissipation	$T_{amb} \leq 25$ °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 µm copper; tin-plated and standard footprint.
[2] Device mounted on an FR4 Printed-Circuit-Board (PCB); single-sided 70 µm copper; tin-plated and standard footprint.



(1) FR4 PCB; single-sided 70 µm copper, standard footprint
(2) FR4 PCB; single-sided 35 µm copper, standard footprint

Fig. 1. Power derating curves DFN1412D-3 (SOT8009)

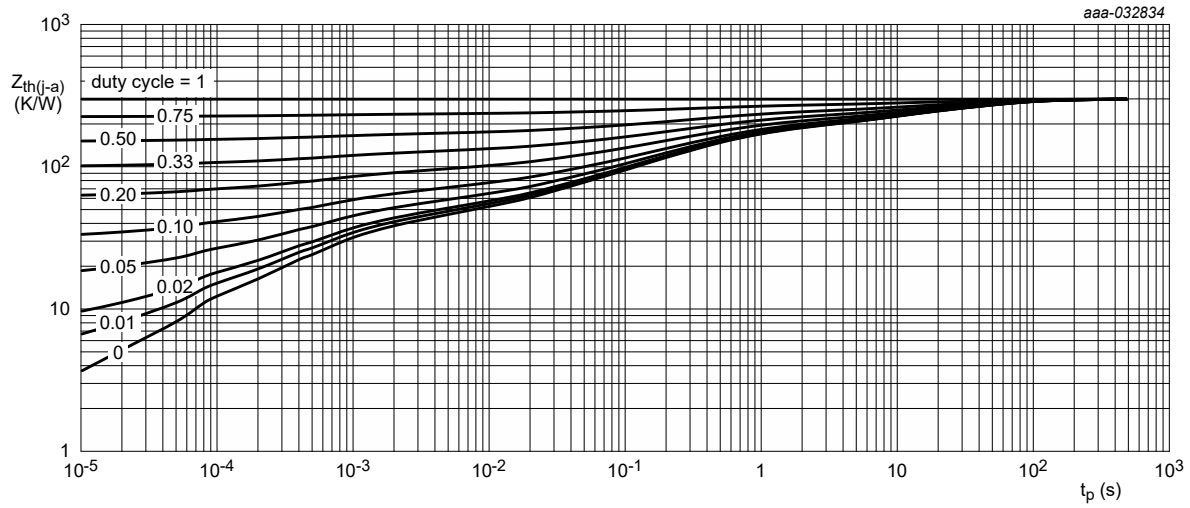
9. Thermal characteristics

Table 7. Thermal characteristics

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

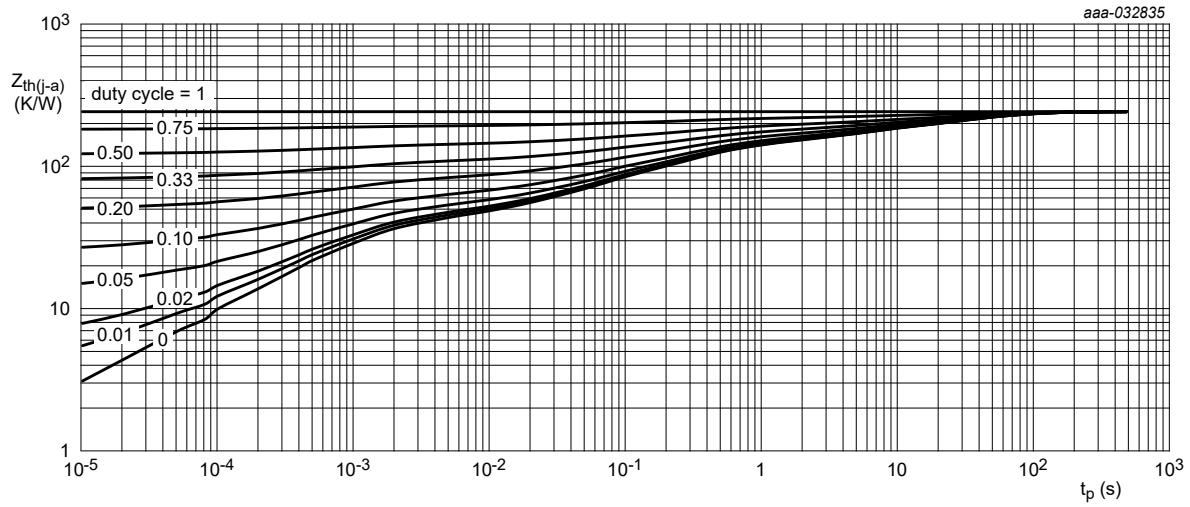
Symbol	Parameter	Conditions		Min	Typ	Max	Unit
$R_{th(j-a)}$	thermal resistance from junction to ambient	in free air	[1]	-	-	348	K/W
			[2]	-	-	278	K/W

[1] Device mounted on an FR4 Printed-Circuit-Board (PCB); single-sided 35 µm copper; tin-plated and standard footprint.
[2] Device mounted on an FR4 Printed-Circuit-Board (PCB); single-sided 70 µm copper; tin-plated and standard footprint.



FR4 PCB; single-sided 35 µm 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 µm copper, standard footprint

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

10. Characteristics

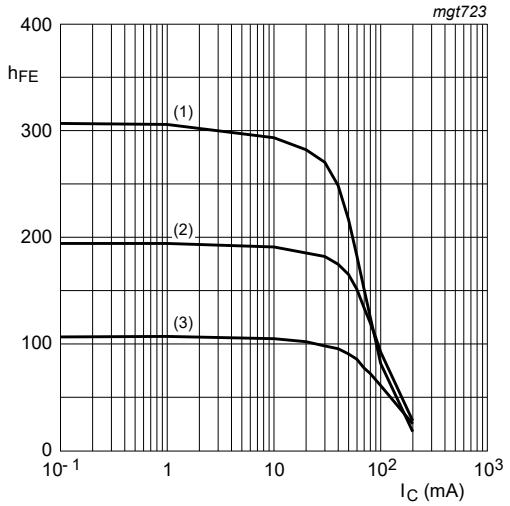
Table 8. Characteristics

T_{amb} = 25 °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_B = 0 A	65	-	-	V
$V_{(BR)EBO}$	emitter-base breakdown voltage	I_E = 100 µA; I_C = 0 A	6	-	-	V
I_{CBO}	collector-base cut-off current	V_{CB} = 30 V; I_E = 0 A	-	-	15	nA
		V_{CB} = 30 V; I_E = 0 A; T_j = 150 °C	-	-	5	µA
I_{EBO}	emitter-base cut-off current	V_{EB} = 5 V; I_C = 0 A	-	-	100	nA
h_{FE}	DC current gain					
	BC846AQC	V_{CE} = 5 V; I_C = 2 mA	110	-	220	
	BC846BQC		200	-	450	
V_{CEsat}	collector-emitter saturation voltage	I_C = 10 mA; I_B = 0.5 mA	-	-	200	mV
		I_C = 100 mA; I_B = 5 mA [1]	-	-	400	mV
V_{BE}	base-emitter voltage	V_{CE} = 5 V ; I_C = 2 mA [2]	580	-	700	mV
		V_{CE} = 5 V ; I_C = 10 mA [2]	-	-	770	mV
V_{BEsat}	base-emitter saturation voltage	I_C = 10 mA ; I_B = 0.5 mA	-	760	-	mV
		I_C = 100 mA ; I_B = 5 mA [1]	-	900	-	mV
f_T	transition frequency	V_{CE} = 5 V; I_C = 10 mA; f = 100 MHz	100	-	-	MHz
C_c	collector capacitance	V_{CB} = 10 V; I_E = i_e = 0 A; f = 1 MHz	-	-	3	pF
C_e	emitter capacitance	V_{EB} = 0.5 V; I_E = i_e = 0 A; f = 1 MHz	-	11	-	pF
NF	noise figure	V_{CE} = 5 V; I_C = 200µA; R_S = 2 kΩ; f = 1 kHz; B = 200 Hz	-	-	10	dB

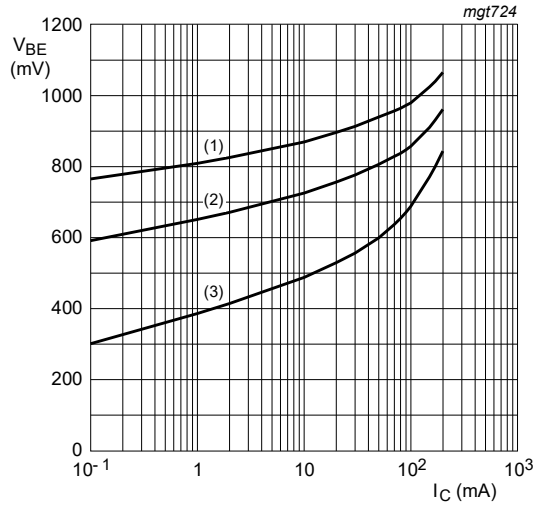
[1] pulsed; $t_p \leq 300$ µs; $\delta \leq 0.02$

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



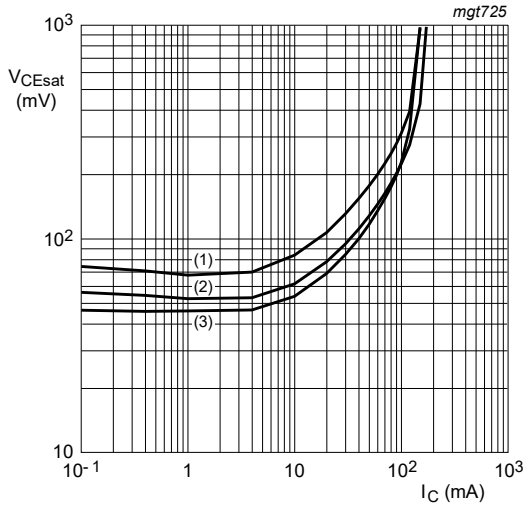
V_{CE} = 5 V
(1) T_{amb} = 150 °C
(2) T_{amb} = 25 °C
(3) T_{amb} = -55 °C

Fig. 4. BC846AQC: DC current gain as a function of collector current; typical values



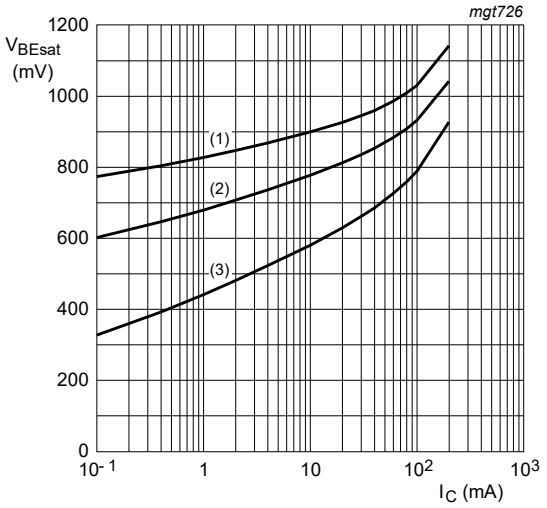
V_{CE} = 5 V
(1) T_{amb} = -55 °C
(2) T_{amb} = 25 °C
(3) T_{amb} = 150 °C

Fig. 5. BC846AQC: Base-emitter voltage as a function of collector current; typical values



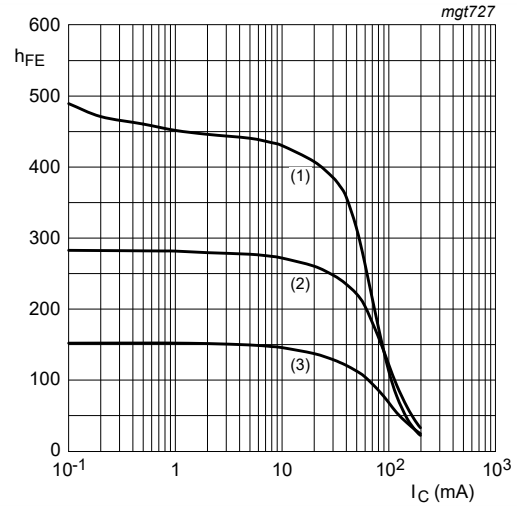
I_C / I_B = 20
(1) T_{amb} = 150 °C
(2) T_{amb} = 25 °C
(3) T_{amb} = -55 °C

Fig. 6. BC846AQC: Collector-emitter saturation voltage as a function of collector current; typical values



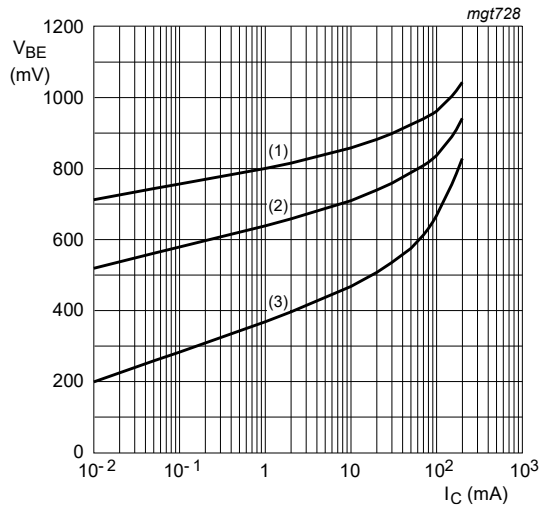
I_C / I_B = 10
(1) T_{amb} = -55 °C
(2) T_{amb} = 25 °C
(3) T_{amb} = 150 °C

Fig. 7. BC846AQC: Base-emitter saturation voltage as a function of collector current; typical values



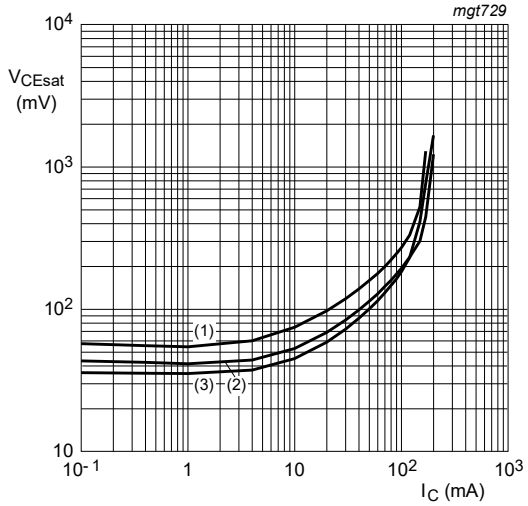
V_{CE} = 5 V
(1) T_{amb} = 150 °C
(2) T_{amb} = 25 °C
(3) T_{amb} = -55 °C

Fig. 8. BC846BQC: DC current gain as a function of collector current; typical values



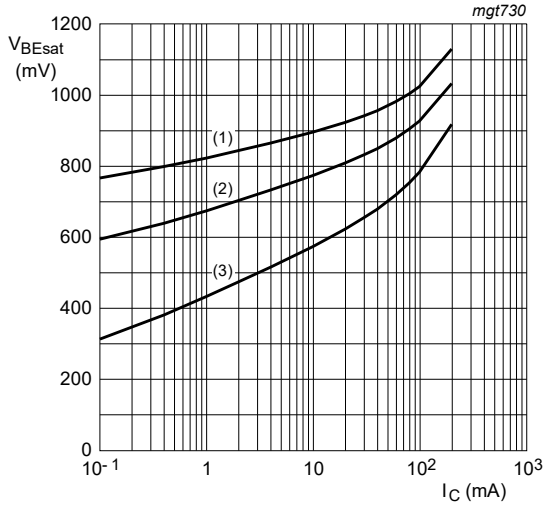
V_{CE} = 5 V
(1) T_{amb} = -55 °C
(2) T_{amb} = 25 °C
(3) T_{amb} = 150 °C

Fig. 9. BC846BQC: Base-emitter voltage as a function of collector current; typical values



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

Fig. 10. BC846BQC: 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} = 25 °C
(3) T_{amb} = 150 °C

Fig. 11. BC846BQC: Base-emitter saturation voltage as a function of collector current; typical values

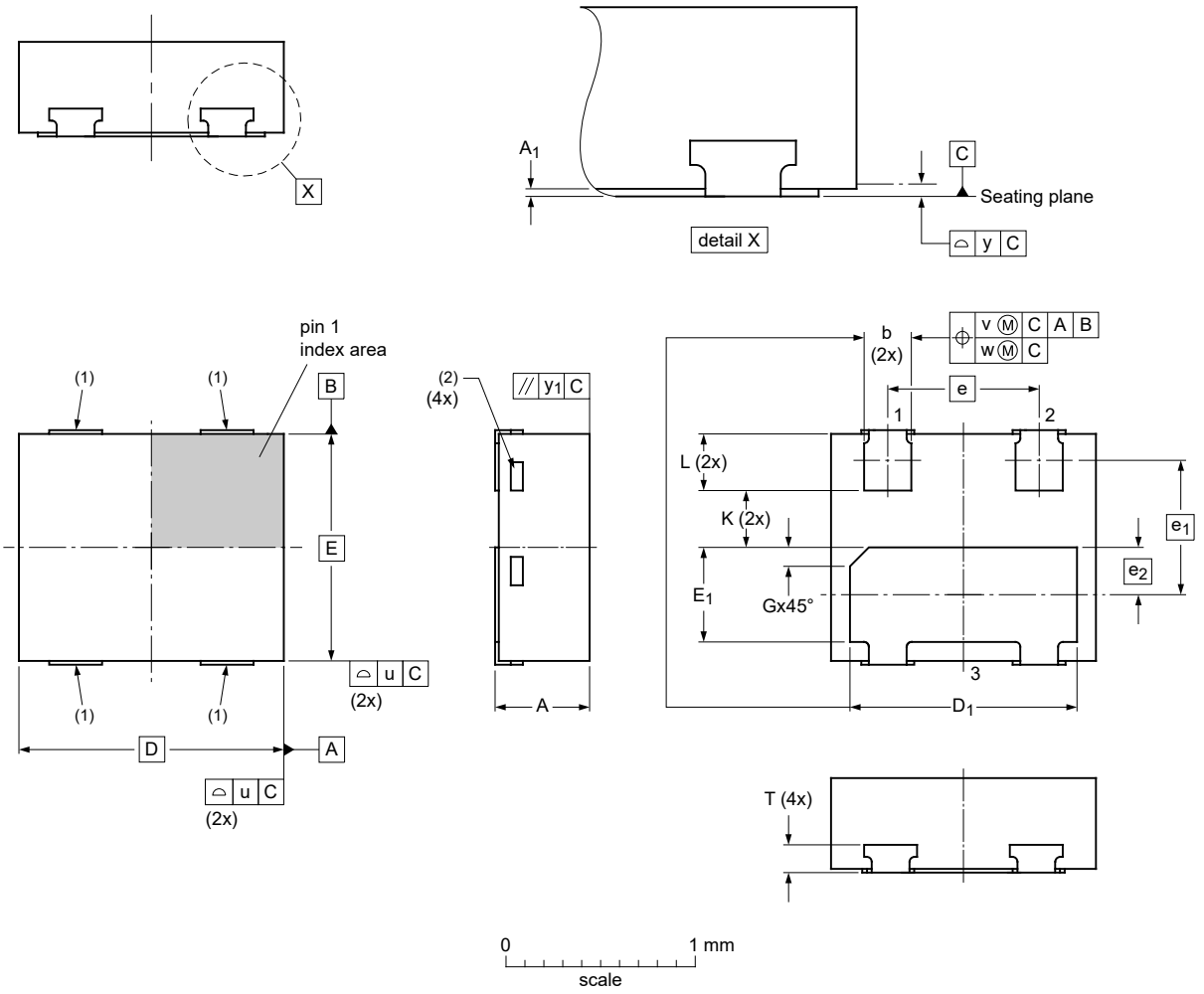
11. Test information

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_1	b	D	D_1	E	E_1	e	e_1	e_2	G	K	L	T	u	v	w	y	y1
	max	0.50	0.04	0.30		1.25		0.55						0.35	0.22					
mm	nom	0.47		0.25	1.4	1.20	1.2	0.50	0.8	0.71	0.26	0.09 (ref)		0.30	0.16	0.05	0.1	0.05	0.05	0.05
	min	0.44		0.22		1.17		0.47					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. 12. Package outline DFN1412D-3 (SOT8009)

13. Soldering

Footprint information for reflow soldering of DFN1412D-3 package **SOT8009**

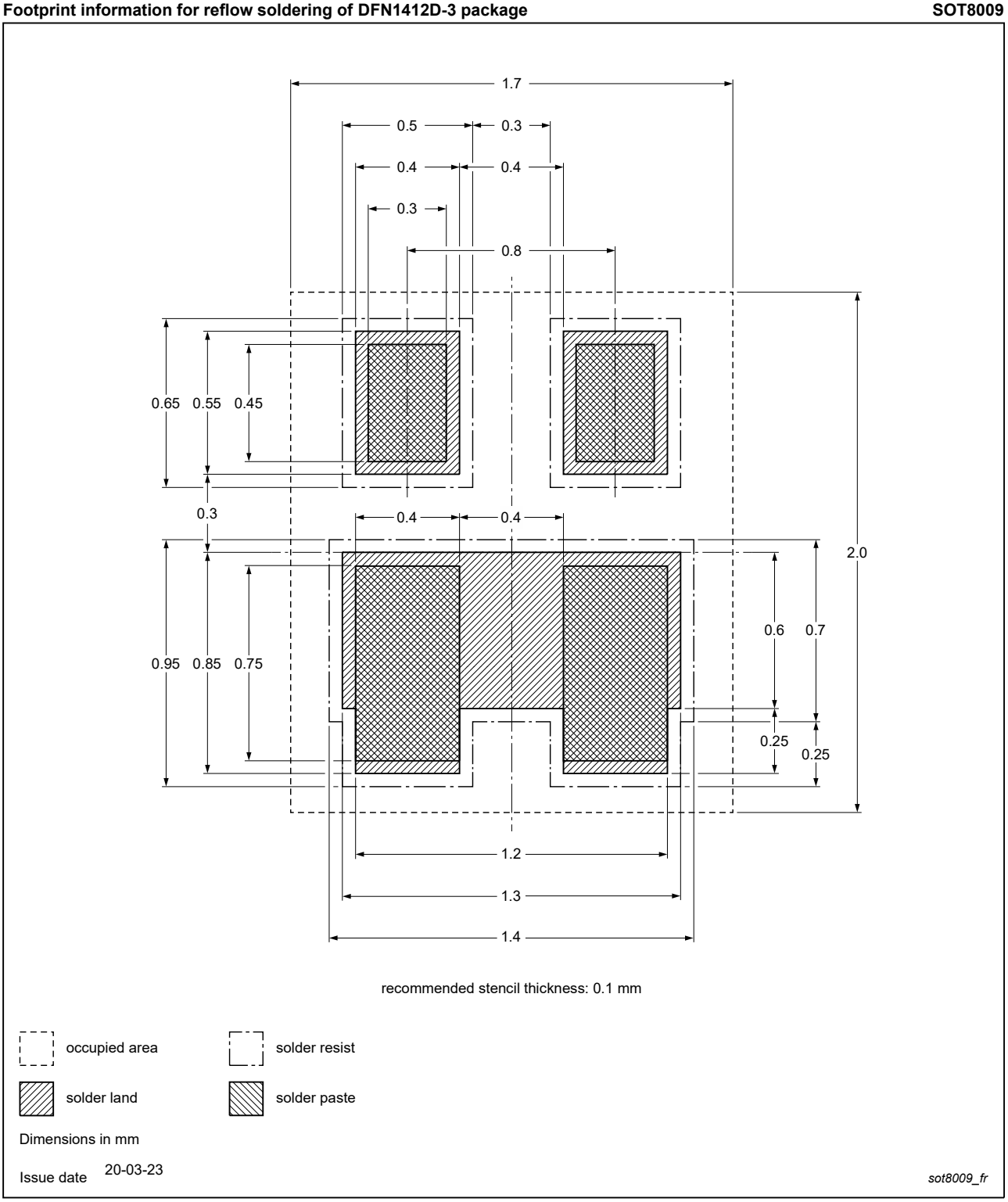


Fig. 13. Reflow soldering footprint for DFN1412D-3 (SOT8009)

14. Revision history

Table 9. Revision history

Data sheet ID	Release date	Data sheet status	Change notice	Supersedes
BC846XQC_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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