



BC817QC series

45 V, 500 mA NPN general-purpose transistors

Rev. 2 — 28 October 2020

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
	Name	JEDEC	Version	
BC817-16QC	DFN1412D-3	MO-340CA	SOT8009	BC807-16QC
BC817-25QC				BC807-25QC
BC817-40QC				BC807-40QC

2. Features and benefits

- High power dissipation capability
- High current
- Three current gain selections
- 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

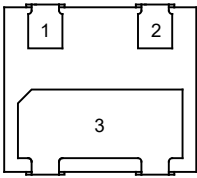
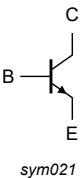
Table 2. Quick reference data

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
V_{CEO}	collector-emitter voltage	open base; $T_{amb} = 25\text{ °C}$		-	-	45	V
I_C	collector current	$T_{amb} = 25\text{ °C}$		-	-	500	mA
I_{CM}	peak collector current	single pulse; $t_p \leq 1\text{ ms}$; $T_{amb} = 25\text{ °C}$		-	-	1	A
h_{FE}	DC current gain						
	BC817-16QC	$V_{CE} = 1\text{ V}$; $I_C = 100\text{ mA}$ $T_{amb} = 25\text{ °C}$	[1]	100	-	250	
	BC817-25QC		[1]	160	-	400	
	BC817-40QC		[1]	250	-	600	

[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	 Bottom view DFN1412D-3 (SOT8009)	 sym021
2	E	emitter		
3	C	collector		

6. Ordering information

Table 4. Ordering information

Type number	Package		
	Name	Description	Version
BC817-16QC	DFN1412D-3	DFN1412D-3: plastic thermal enhanced ultra thin small outline package; no leads; 3 terminals; body: 1.4 x 1.2 x 0.5 mm	SOT8009 (MO-340CA)
BC817-25QC			
BC817-40QC			

7. Marking

Table 5. Marking

Type number	Marking code
BC817-16QC	9M
BC817-25QC	9N
BC817-40QC	9P

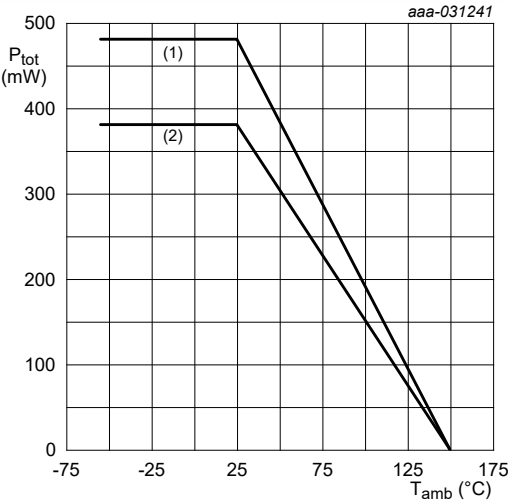
8. Limiting values

Table 6. Limiting values

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

Symbol	Parameter	Conditions	Min	Max	Unit
V _{CBO}	collector-base voltage	open emitter; T _{amb} = 25 °C	-	50	V
V _{CEO}	collector-emitter voltage	open base; T _{amb} = 25 °C	-	45	V
V _{EBO}	emitter-base voltage	open collector; T _{amb} = 25 °C	-	5	V
I _C	collector current	T _{amb} = 25 °C	-	500	mA
I _{CM}	peak collector current	single pulse; t _p ≤ 1 ms; T _{amb} = 25 °C	-	1	A
I _{BM}	peak base current	single pulse; t _p ≤ 1 ms; T _{amb} = 25 °C	-	200	mA
P _{tot}	total power dissipation	T _{amb} ≤ 25 °C	[1]	380	mW
			[2]	480	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 PCB, single-sided 35 µm copper, tin-plated and standard footprint.
[2] Device mounted on an FR4 PCB, single-sided 70 µm copper, tin-plated and standard footprint.



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

Fig. 1. Power derating curves for SOT8009

9. Thermal characteristics

Table 7. Thermal characteristics

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
$R_{th(j-a)}$	thermal resistance from junction to ambient	in free air; $T_{amb} = 25\text{ °C}$	[1]	-	-	329	K/W
			[2]	-	-	261	K/W

- [1] Device mounted on an FR4 PCB, single-sided 35 μm copper, tin-plated and standard footprint.
[2] Device mounted on an FR4 PCB, single-sided 70 μm copper, tin-plated and standard footprint.

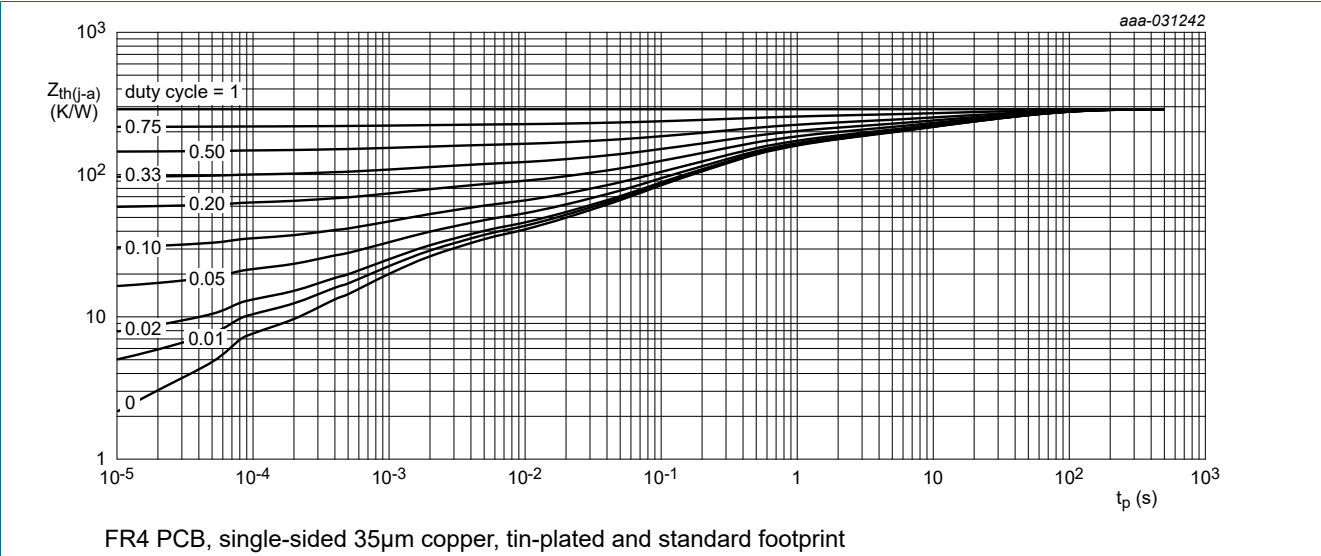


Fig. 2. Transient thermal impedance from junction to ambient as a function of pulse duration; typical values

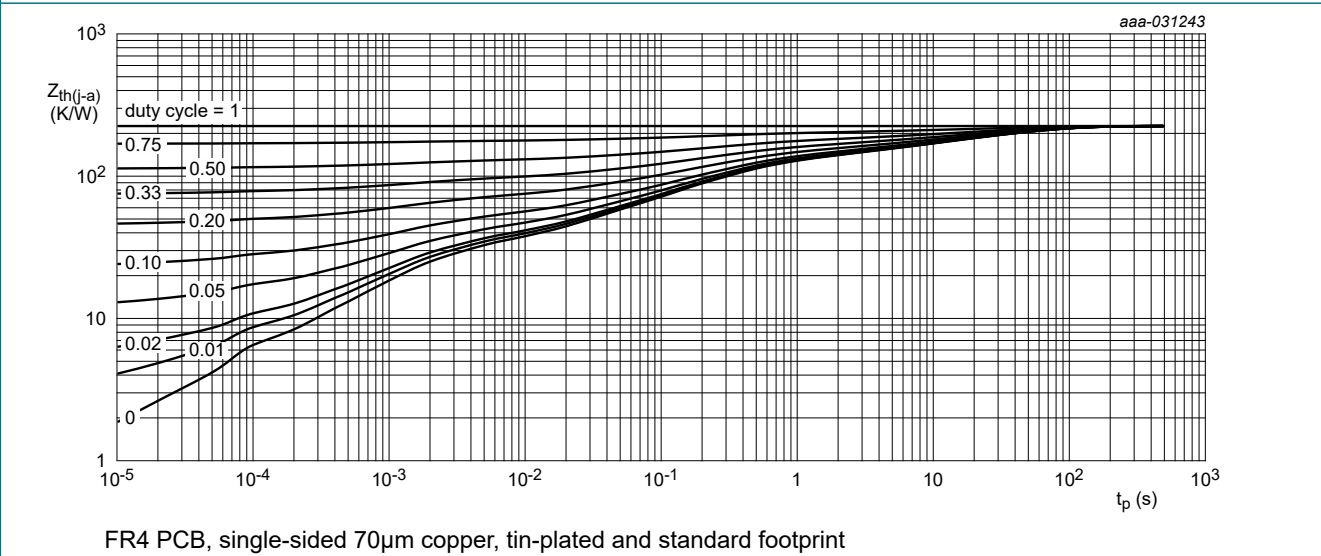


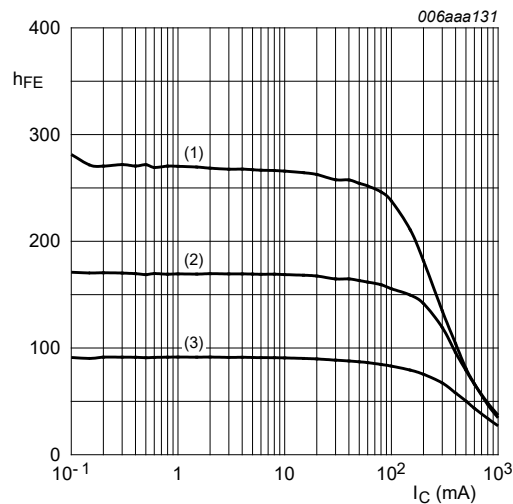
Fig. 3. Transient thermal impedance from junction to ambient as a function of pulse duration; typical values

10. Characteristics

Table 8. Characteristics

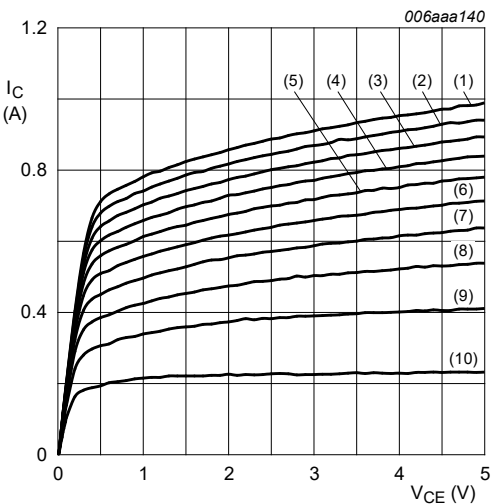
Symbol	Parameter	Conditions		Min	Typ	Max	Unit
$V_{(BR)CBO}$	collector-base breakdown voltage	$I_C = 100\ \mu\text{A}$; $I_E = 0\ \text{A}$; $T_{\text{amb}} = 25\ ^\circ\text{C}$		50	-		V
$V_{(BR)CEO}$	collector-emitter breakdown voltage	$I_C = 10\ \text{mA}$; $I_E = 0\ \text{A}$; $T_{\text{amb}} = 25\ ^\circ\text{C}$		45	-		V
$V_{(BR)EBO}$	emitter-base breakdown voltage	$I_E = 100\ \mu\text{A}$; $I_C = 0\ \text{A}$; $T_{\text{amb}} = 25\ ^\circ\text{C}$		5	-		V
I_{CBO}	collector-base cut-off current	$V_{CB} = 20\ \text{V}$; $I_E = 0\ \text{A}$; $T_{\text{amb}} = 25\ ^\circ\text{C}$		-	-	100	nA
		$V_{CB} = 20\ \text{V}$; $I_E = 0\ \text{A}$; $T_J = 150\ ^\circ\text{C}$		-	-	5	μA
I_{EBO}	emitter-base cut-off current	$V_{EB} = 5\ \text{V}$; $I_C = 0\ \text{A}$; $T_{\text{amb}} = 25\ ^\circ\text{C}$		-	-	100	nA
h_{FE}	DC current gain						
	BC817-16QC	$V_{CE} = 1\ \text{V}$; $I_C = 100\ \text{mA}$; $T_{\text{amb}} = 25\ ^\circ\text{C}$	[1]	100	-	250	
	BC817-25QC	$V_{CE} = 1\ \text{V}$; $I_C = 100\ \text{mA}$; $T_{\text{amb}} = 25\ ^\circ\text{C}$	[1]	160	-	400	
	BC817-40QC	$V_{CE} = 1\ \text{V}$; $I_C = 100\ \text{mA}$; $T_{\text{amb}} = 25\ ^\circ\text{C}$	[1]	250	-	600	
		$V_{CE} = 1\ \text{V}$; $I_C = 500\ \text{mA}$; $T_{\text{amb}} = 25\ ^\circ\text{C}$		40	-	-	
V_{CEsat}	collector-emitter saturation voltage	$I_C = 500\ \text{mA}$; $I_B = 50\ \text{mA}$; $T_{\text{amb}} = 25\ ^\circ\text{C}$	[1]	-	-	700	mV
V_{BE}	base-emitter voltage	$V_{CE} = 1\ \text{V}$; $I_C = 500\ \text{mA}$; $T_{\text{amb}} = 25\ ^\circ\text{C}$	[1]	-	-	1.2	V
f_T	transition frequency	$V_{CE} = 5\ \text{V}$; $I_C = 10\ \text{mA}$; $f = 100\ \text{MHz}$; $T_{\text{amb}} = 25\ ^\circ\text{C}$		100	-	-	MHz
C_C	collector capacitance	$V_{CB} = 10\ \text{V}$; $I_E = i_e = 0\ \text{A}$; $f = 1\ \text{MHz}$; $T_{\text{amb}} = 25\ ^\circ\text{C}$		-	3	-	pF

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



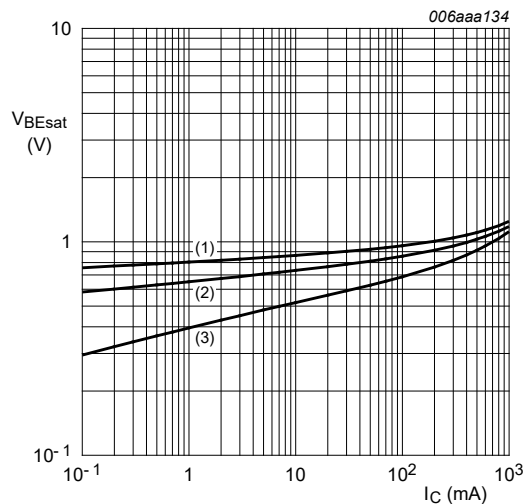
$V_{CE} = 1\text{ V}$
(1) $T_{amb} = 150\text{ }^{\circ}\text{C}$
(2) $T_{amb} = 25\text{ }^{\circ}\text{C}$
(3) $T_{amb} = -55\text{ }^{\circ}\text{C}$

Fig. 4. BC817-16QC: DC current gain as a function of collector current; typical values



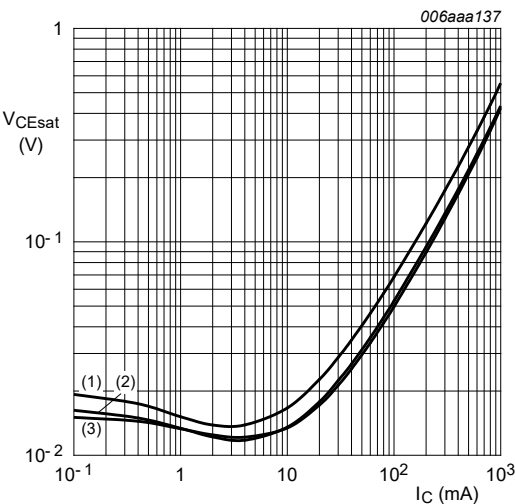
$T_{amb} = 25\text{ }^{\circ}\text{C}$
(1) $I_B = 16.0\text{ mA}$
(2) $I_B = 14.4\text{ mA}$
(3) $I_B = 12.8\text{ mA}$
(4) $I_B = 11.2\text{ mA}$
(5) $I_B = 9.6\text{ mA}$
(6) $I_B = 8.0\text{ mA}$
(7) $I_B = 6.4\text{ mA}$
(8) $I_B = 4.8\text{ mA}$
(9) $I_B = 3.2\text{ mA}$
(10) $I_B = 1.6\text{ mA}$

Fig. 5. BC817-16QC: Collector current as a function of collector-emitter voltage; typical values



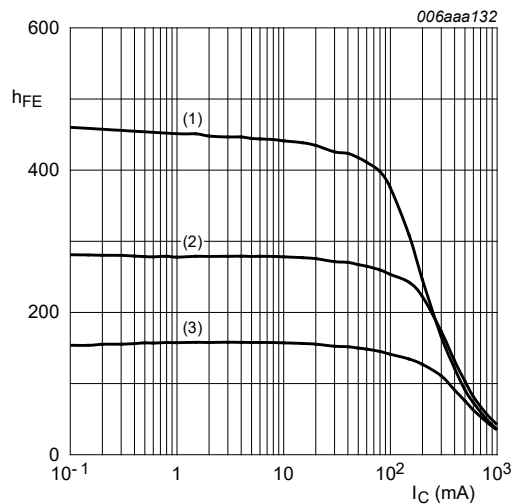
$I_C/I_B = 10$
(1) $T_{amb} = -55\text{ }^{\circ}\text{C}$
(2) $T_{amb} = 25\text{ }^{\circ}\text{C}$
(3) $T_{amb} = 150\text{ }^{\circ}\text{C}$

Fig. 6. BC817-16QC: Base-emitter saturation voltage as a function of collector current; typical values



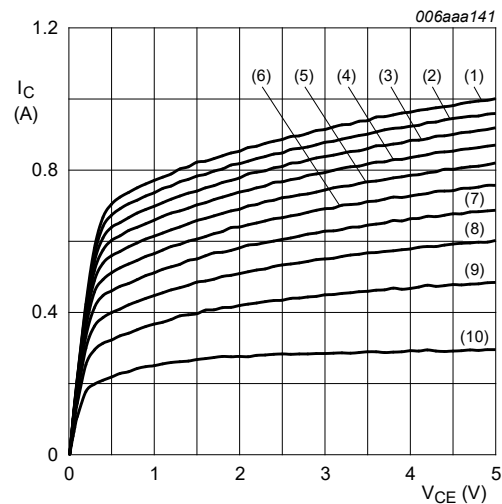
$I_C/I_B = 10$
(1) $T_{amb} = 150\text{ }^{\circ}\text{C}$
(2) $T_{amb} = 25\text{ }^{\circ}\text{C}$
(3) $T_{amb} = -55\text{ }^{\circ}\text{C}$

Fig. 7. BC817-16QC: Collector-emitter saturation voltage as a function of collector current; typical values



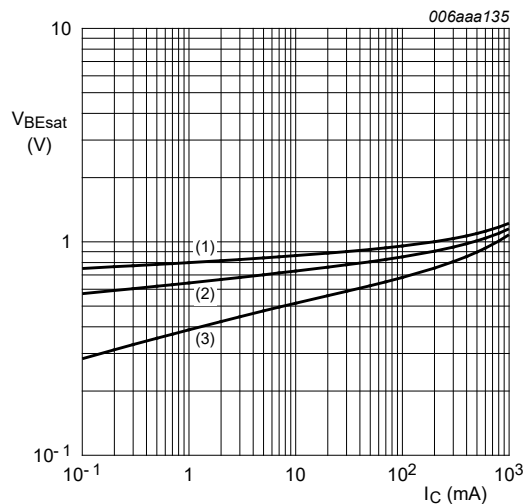
$V_{CE} = 1\text{ V}$
(1) $T_{amb} = 150^\circ\text{C}$
(2) $T_{amb} = 25^\circ\text{C}$
(3) $T_{amb} = -55^\circ\text{C}$

Fig. 8. BC817-25QC: DC current gain as a function of collector current; typical values



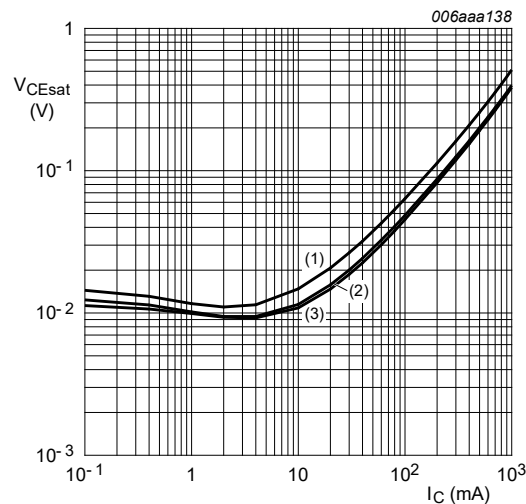
$T_{amb} = 25^\circ\text{C}$
(1) $I_B = 13.0\text{ mA}$
(2) $I_B = 11.7\text{ mA}$
(3) $I_B = 10.4\text{ mA}$
(4) $I_B = 9.1\text{ mA}$
(5) $I_B = 7.8\text{ mA}$
(6) $I_B = 6.5\text{ mA}$
(7) $I_B = 5.2\text{ mA}$
(8) $I_B = 3.9\text{ mA}$
(9) $I_B = 2.6\text{ mA}$
(10) $I_B = 1.3\text{ mA}$

Fig. 9. BC817-25QC: Collector current as a function of collector-emitter voltage; typical values



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

Fig. 10. BC817-25QC: Base-emitter saturation voltage as a function of collector current; typical values



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

Fig. 11. BC817-25QC: Collector-emitter saturation voltage as a function of collector current; typical values

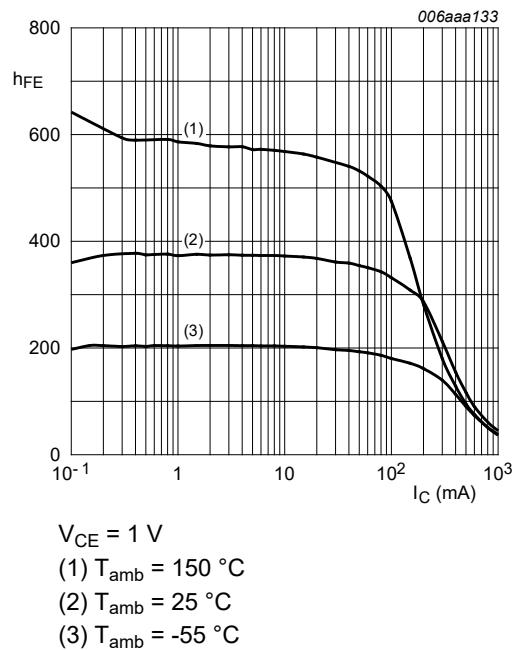


Fig. 12. BC817-40QC: DC current gain as a function of collector current; typical values

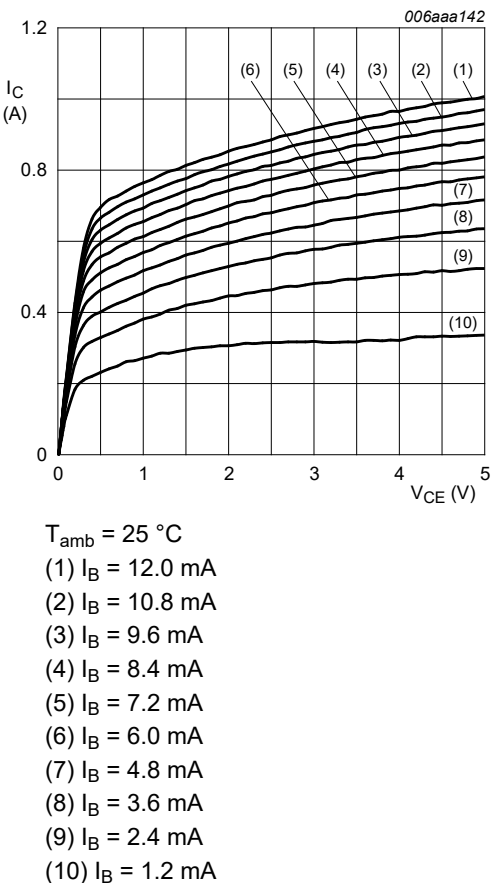


Fig. 13. BC817-40QC: Transition frequency as a function of collector current; typical values

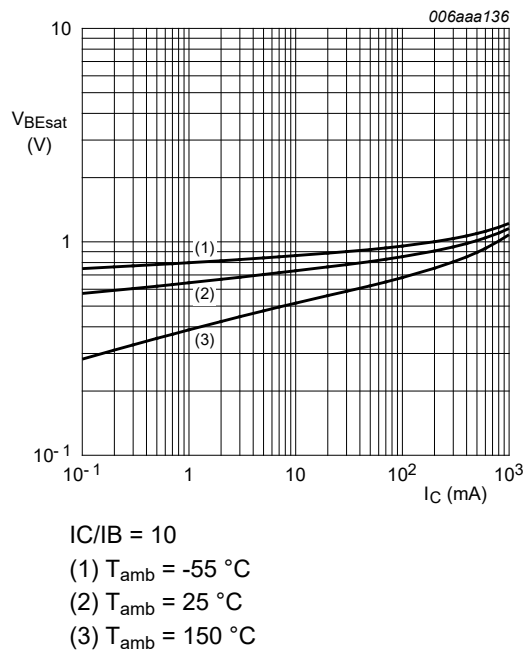


Fig. 14. BC817-40QC: Base-emitter saturation voltage as a function of collector current; typical values

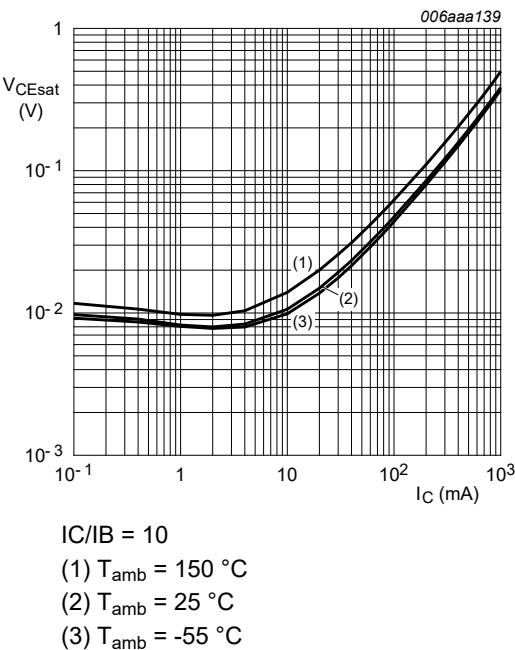


Fig. 15. BC817-40QC: Collector-emitter saturation voltage as a function of collector current; typical values

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

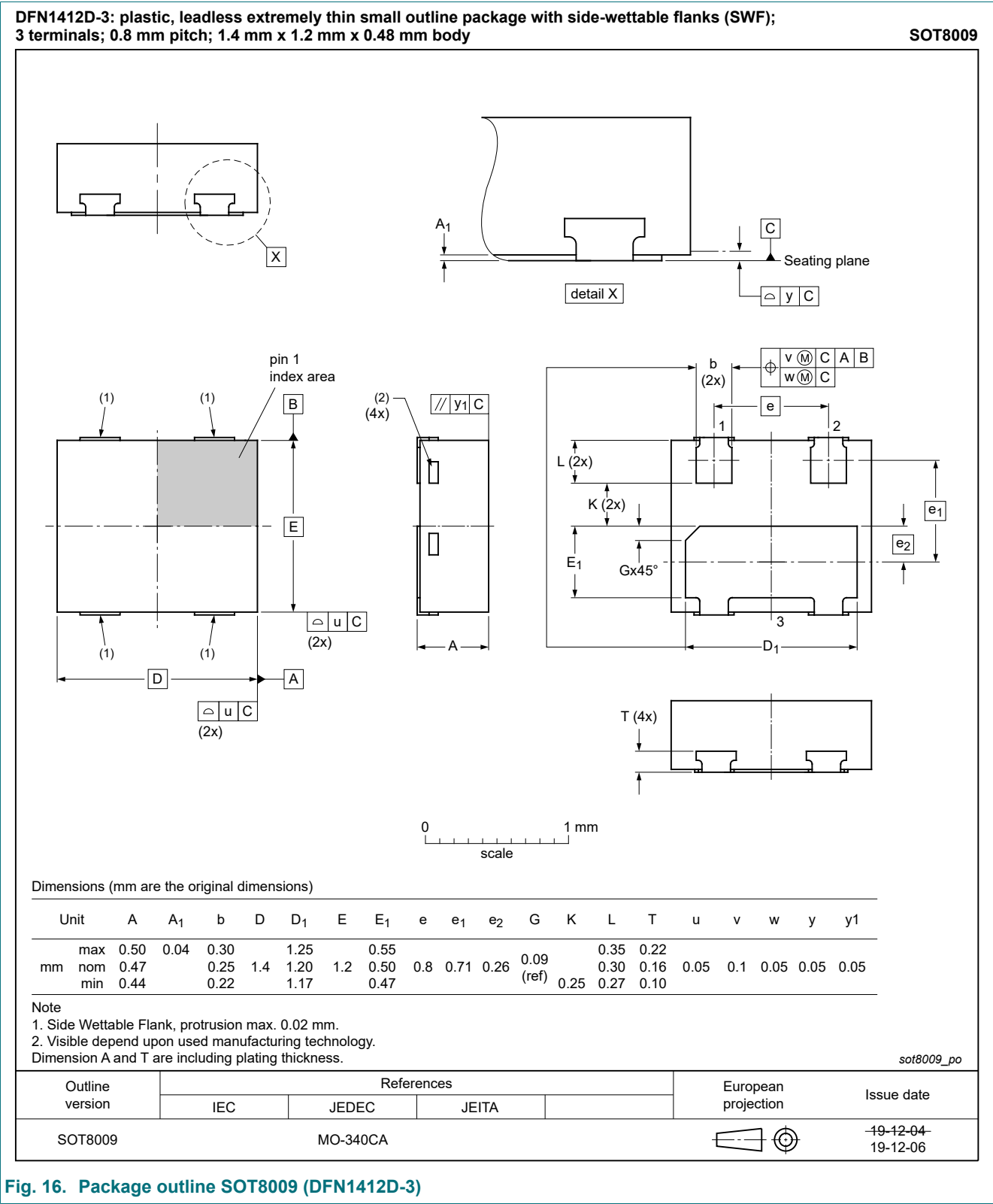


Fig. 16. Package outline SOT8009 (DFN1412D-3)

13. Soldering

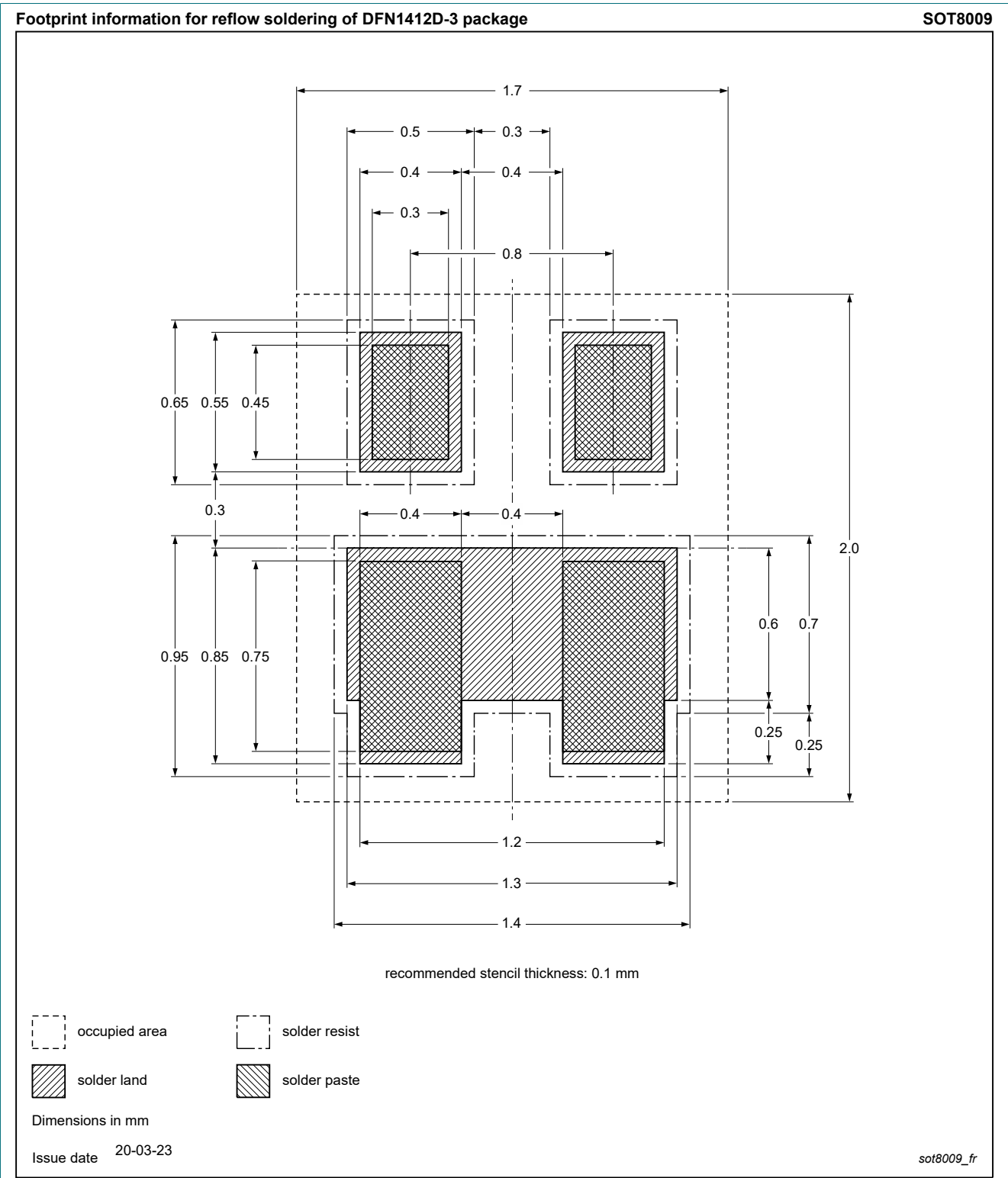


Fig. 17. Reflow soldering footprint for SOT8009 (DFN1412D-3)

14. Revision history

Table 9. Revision history

Data sheet ID	Release date	Data sheet status	Change notice	Supersedes
BC817QC_SER v.2	20201028	Product data sheet	-	BC817QC_SER v.1
Modifications:	• Thermal characteristics: $R_{th(j-sp)}$ removed			
BC817QC_SER v.1	20200512	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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