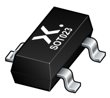


BC817K series

45 V, 500 mA NPN general-purpose transistors

Rev. 2 — 6 March 2018

Product data sheet

1 Product profile

1.1 General description

NPN general-purpose transistors in a small SOT23 (TO-236AB) Surface-Mounted Device (SMD) plastic package.

Table 1. Product overview

Type number	Package		PNP complement
	Nexperia	JEDEC	
BC817K-16	SOT23	TO-236AB	BC807K-16
BC817K-25			BC807K-25
BC817K-40			BC807K-40

1.2 Features and benefits

- Three current gain selections
- High power dissipation capability
- AEC-Q101 qualified

1.3 Applications

- General-purpose switching and amplification

nexperia

1.4 Quick reference data

Table 2. Quick reference data

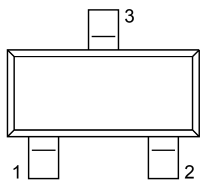
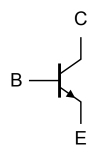
T_{amb} = 25 °C unless otherwise specified.

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
V_{CEO}	collector-emitter voltage	open base		-	-	45	V
I_C	collector current			-	-	500	mA
I_{CM}	peak collector current	single pulse; t_p ≤ 1 ms		-	-	1	A
h_{FE}	DC current gain	V_{CE} = 1 V; I_C = 100 mA					
	BC817K-16		[1]	100	-	250	-
	BC817K-25		[1]	160	-	400	-
	BC817K-40		[1]	250	-	600	-

[1] pulsed; t_p ≤ 300 µs; δ ≤ 0.02

2 Pinning information

Table 3. Pinning

Pin	Symbol	Description	Simplified outline	Graphic symbol
1	B	base		 sym123
2	E	emitter		
3	C	collector		

3 Ordering information

Table 4. Ordering information

Type number	Package		
	Name	Description	Version
BC817K-16	TO-236AB	Plastic surface-mounted package; 3 leads	SOT23
BC817K-25			
BC817K-40			

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4 Marking

Table 5. Marking

Type number		Marking code
BC817K-16	[1]	HD%
BC817K-25	[1]	HE%
BC817K-40	[1]	HF%

[1] % = placeholder for manufacturing site code

5 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		-	50	V
V_{CEO}	collector-emitter voltage	open base		-	45	V
V_{EBO}	emitter-base voltage	open collector		-	5	V
I_C	collector current			-	500	mA
I_{CM}	peak collector current	single pulse; $t_p \leq 1$ ms		-	1	A
I_{BM}	peak base current	single pulse; $t_p \leq 1$ ms		-	200	mA
P_{tot}	total power dissipation	$T_{amb} \leq 25$ °C	[1]	-	350	mW
			[2]	-	575	mW
			[3]	-	575	mW
			[4]	-	775	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 Printed-Circuit-Board (PCB); single-sided copper; tin-plated; mounting pad for collector 1 cm^2.
[3] Device mounted on an FR4 Printed-Circuit-Board (PCB); 4-layer copper; tin-plated and standard footprint.
[4] Device mounted on an FR4 Printed-Circuit-Board (PCB); 4-layer copper; tin-plated; mounting pad for collector 1 cm^2.

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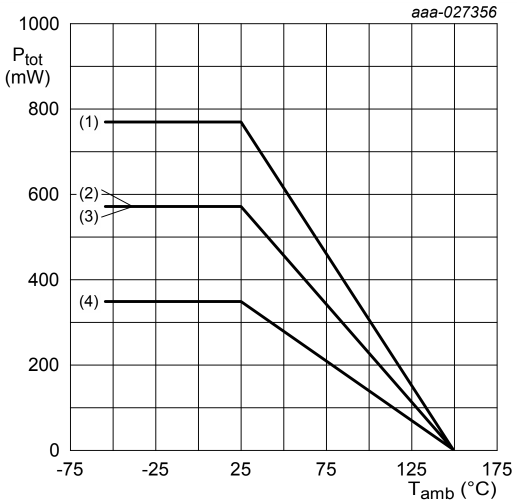


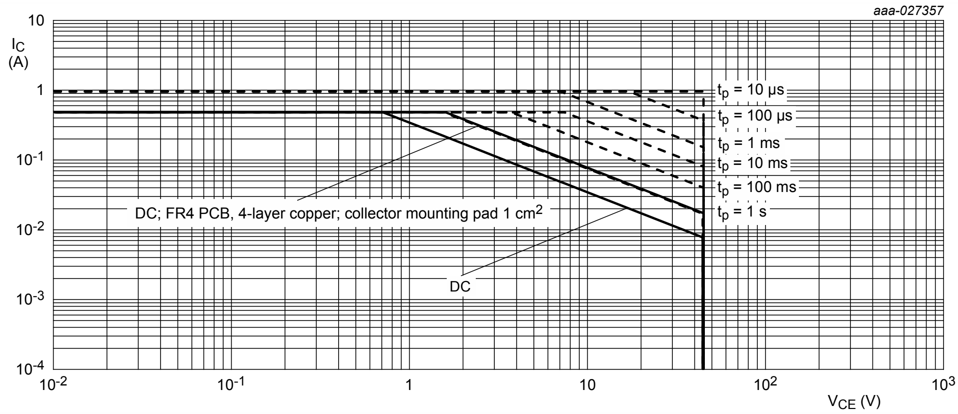
(1) FR4 PCB, 4-layer copper; 1 cm^2

(2) FR4 PCB, single-sided copper; 1 cm^2

(3) FR4 PCB, 4-layer copper; standard footprint

(4) FR4 PCB, single-sided copper; standard footprint

Figure 1. Power derating curves



FR4 PCB, single-sided copper; standard footprint; single pulse;

T_{amb} = 25 °C

Figure 2. Safe operating area; junction to ambient; continous and peak collector currents as a function of collector-emitter voltage

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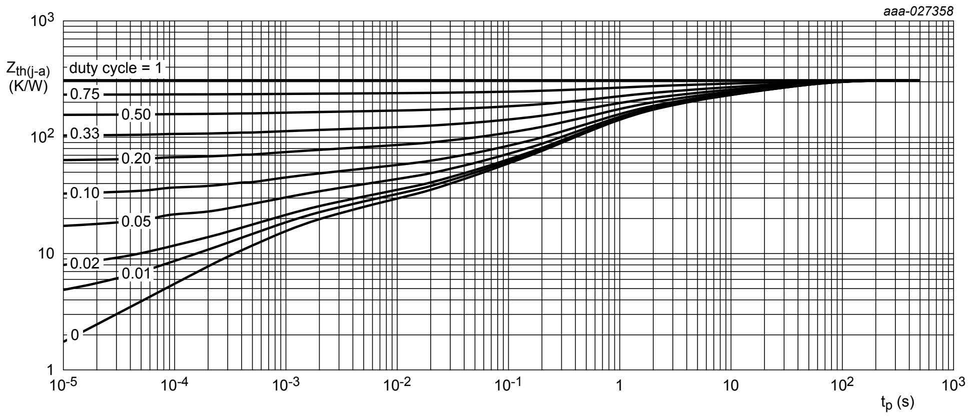
6 Thermal characteristics

Table 7. Thermal characteristics

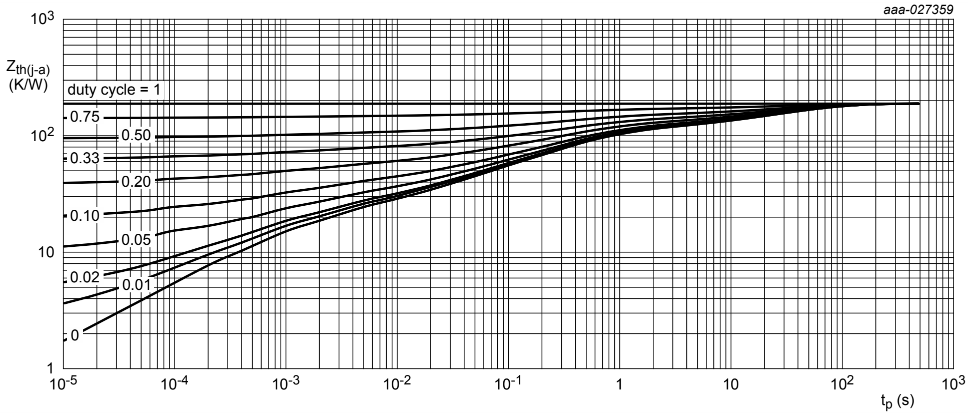
Symbol	Parameter	Conditions		Min	Typ	Max	Unit
$R_{th(j-a)}$	thermal resistance from junction to ambient	in free air	[1]	-	-	358	K/W
			[2]	-	-	218	K/W
			[3]	-	-	218	K/W
			[4]	-	-	162	K/W
$R_{th(j-sp)}$	thermal resistance from junction to solder point			-	-	60	K/W

[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^2.
[3] Device mounted on an FR4 PCB; 4-layer copper; tin-plated and standard footprint.
[4] Device mounted on an FR4 PCB; 4-layer copper; tin-plated; mounting pad for collector 1 cm^2.



FR4 PCB; single-sided copper; tin-plated and standard footprint

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



FR4 PCB; single-sided copper; tin-plated; mounting pad for collector 1 cm^2

Figure 4. Transient thermal impedance from junction to ambient as a function of pulse duration; typical values

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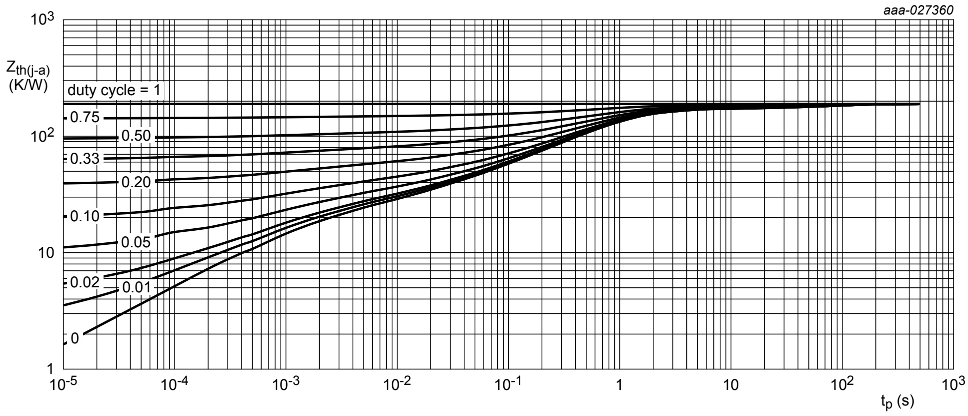
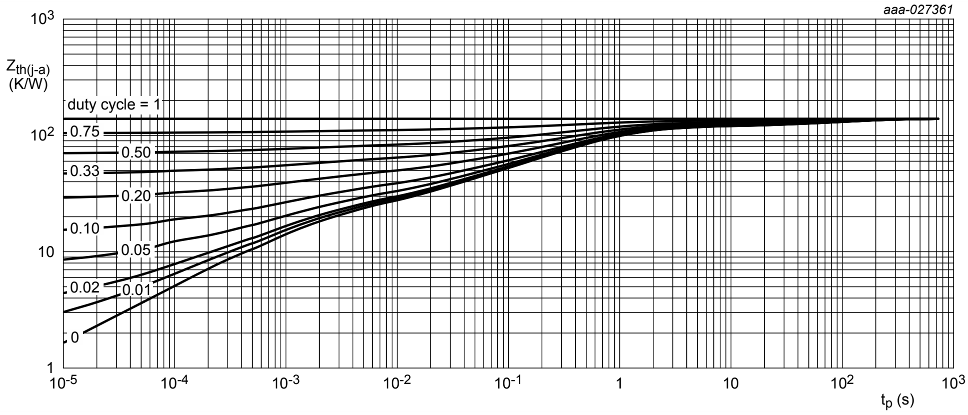


FR4 PCB; 4-layer copper; tin plated and standard footprint

Figure 5. Transient thermal impedance from junction to ambient as a function of pulse duration; typical values



FR4 PCB; 4-layer copper; tin plated; mounting pad for collector 1 cm^2

Figure 6. Transient thermal impedance from junction to ambient as a function of pulse duration; typical values

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7 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		50	-	-	V
$V_{(BR)CEO}$	collector-emitter breakdown voltage	I_C = 10 mA; I_B = 0 A		45	-	-	V
$V_{(BR)EBO}$	emitter-base breakdown voltage	I_E = 100 μA; I_C = 0 A		5	-	-	V
I_{CBO}	collector-base cut-off current	V_{CB} = 25 V; I_E = 0 A		-	-	100	nA
		V_{CB} = 25 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						
	BC817K-16	V_{CE} = 1 V; I_C = 100 mA	[1]	100	-	250	
	BC817K-25	V_{CE} = 1 V; I_C = 100 mA	[1]	160	-	400	
	BC817K-40	V_{CE} = 1 V; I_C = 100 mA	[1]	250	-	600	
	BC817K-16, -25, -40	V_{CE} = 1 V; I_C = 500 mA	[1]	40	-	-	
V_{CEsat}	collector-emitter saturation voltage	I_C = 500 mA; I_B = 50 mA	[1]	-	-	700	mV
V_{BEsat}	base-emitter saturation voltage	I_C = 500 mA; I_B = 50 mA	[1]	-	-	1.2	V
V_{BE}	base-emitter voltage	V_{CE} = 1 V; I_C = 500 mA	[1]	-	-	1.2	V
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_C = i_c = 0 A; f = 1 MHz					
	BC817K-16			-	44	-	pF
	BC817K-25			-	39	-	pF
	BC817K-40			-	39	-	pF

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

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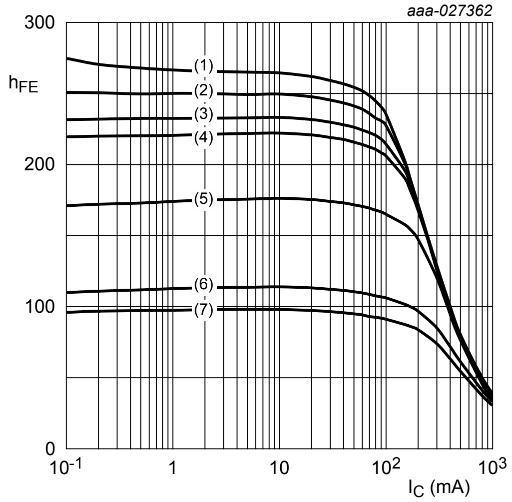


V_{CE} = 1 V

(1) T_{amb} = 150 °C

(2) T_{amb} = 125 °C

(3) T_{amb} = 100 °C

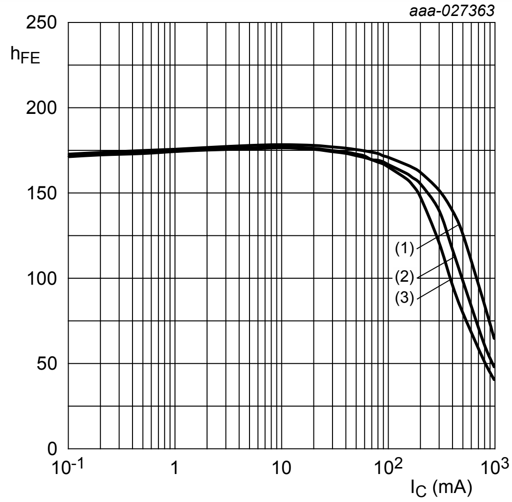
(4) T_{amb} = 85 °C

(5) T_{amb} = 25 °C

(6) T_{amb} = -40 °C

(7) T_{amb} = -55 °C

Figure 7. BC817K-16: DC current gain as a function of collector current; typical values



T_{amb} = 25 °C

(1) V_{CE} = 5 V

(2) V_{CE} = 2 V

(3) V_{CE} = 1 V

Figure 8. BC817K-16: DC current gain as a function of collector current; typical values

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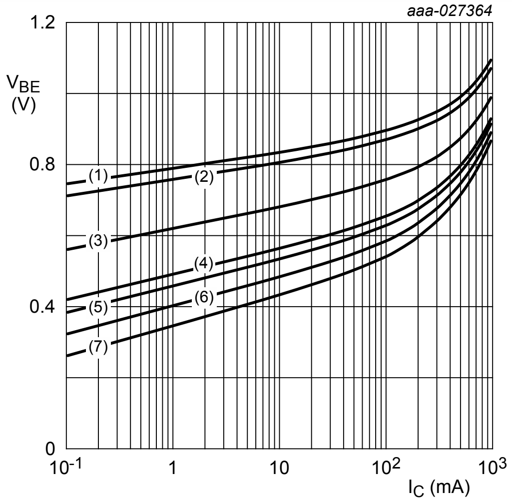


V_{CE} = 1 V

(1) T_{amb} = -55 °C

(2) T_{amb} = -40°C

(3) T_{amb} = 25 °C

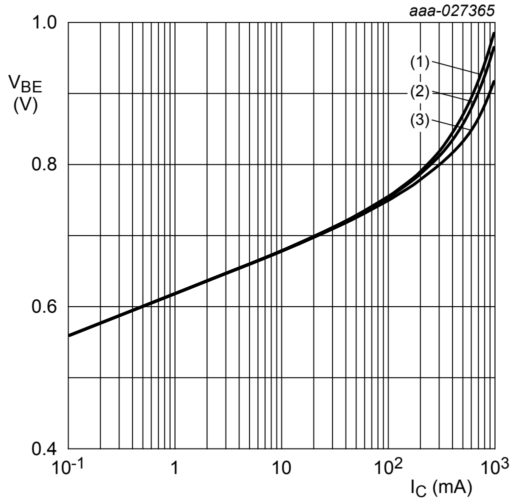
(4) T_{amb} = 85 °C

(5) T_{amb} = 100 °C

(6) T_{amb} = 125 °C

(7) T_{amb} = 150 °C

Figure 9. BC817K-16: Base-emitter voltage as a function of collector current; typical values



T_{amb} = 25 °C

(1) V_{CE} = 1 V

(2) V_{CE} = 2 V

(3) V_{CE} = 5 V

Figure 10. BC817K-16: Base-emitter voltage as a function of collector current; typical values

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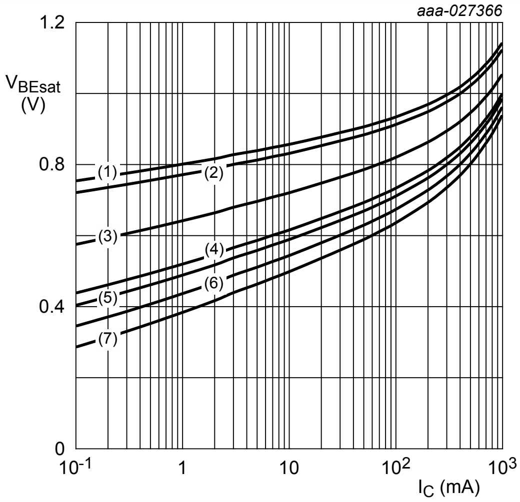


I_C/I_B = 10

(1) T_{amb} = -55 °C

(2) T_{amb} = -40°C

(3) T_{amb} = 25 °C

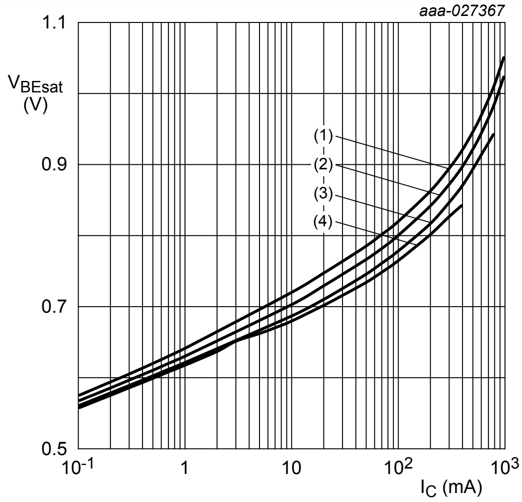
(4) T_{amb} = 85 °C

(5) T_{amb} = 100 °C

(6) T_{amb} = 125 °C

(7) T_{amb} = 150 °C

Figure 11. BC817K-16: Base-emitter saturation voltage as a function of collector current; typical values



T_{amb} = 25 °C

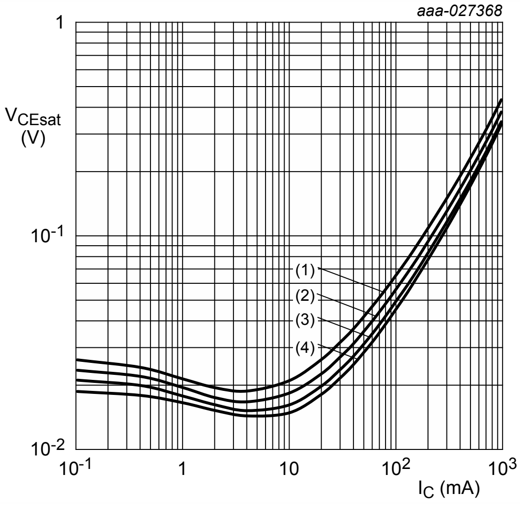
(1) I_C/I_B = 10

(2) I_C/I_B = 20

(3) I_C/I_B = 50

(4) I_C/I_B = 100

Figure 12. BC817K-16: Base-emitter saturation voltage as a function of collector current; typical values



I_C/I_B = 10

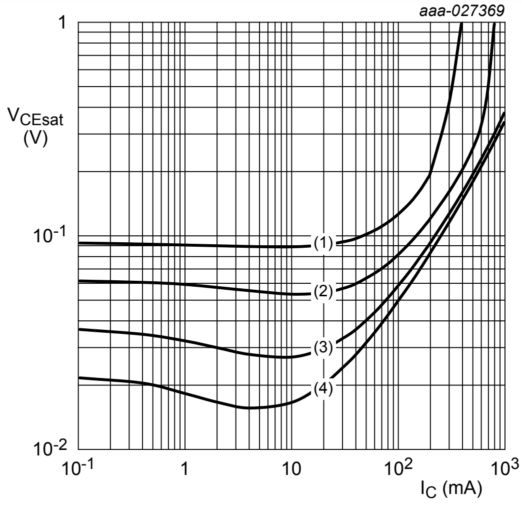
(1) T_{amb} = 150 °C

(2) T_{amb} = 85 °C

(3) T_{amb} = 25 °C

(4) T_{amb} = -40 °C

Figure 13. BC817K-16: Collector-emitter saturation voltage as a function of collector current; typical values



T_{amb} = 25 °C

(1) I_C/I_B = 100

(2) I_C/I_B = 50

(3) I_C/I_B = 20

(4) I_C/I_B = 10

Figure 14. BC817K-16: Collector-emitter saturation voltage as a function of collector current; typical values

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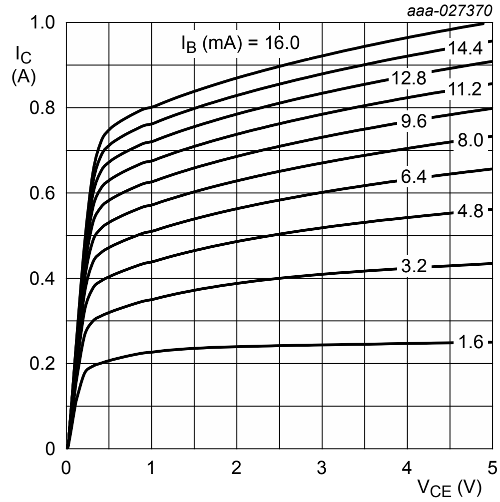
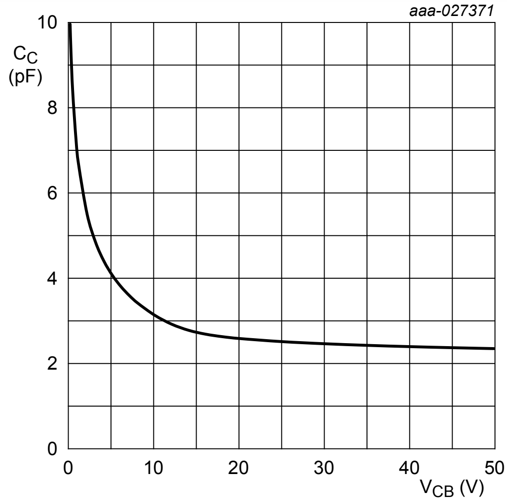


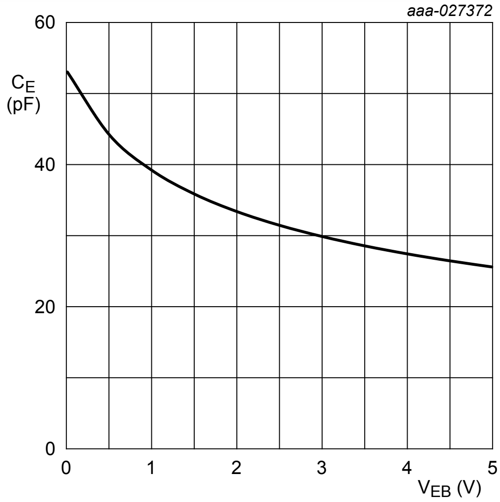
T_{amb} = 25 °C

Figure 15. BC817K-16: Collector current as a function of collector-emitter voltage; typical values



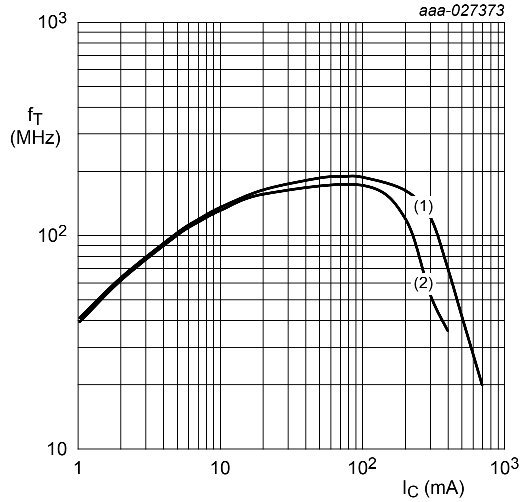
f = 1 MHz; T_{amb} = 25 °C

Figure 16. BC817K-16: Collector capacitance as a function of collector-base voltage; typical values



f = 1 MHz; T_{amb} = 25 °C

Figure 17. BC817K-16: Emitter capacitance as a function of emitter-base voltage; typical values



f = 100 MHz; T_{amb} = 25 °C

(1) V_{CE} = 5 V

(2) V_{CE} = 1 V

Figure 18. BC817K-16: Transition frequency as a function of collector current voltage; typical values

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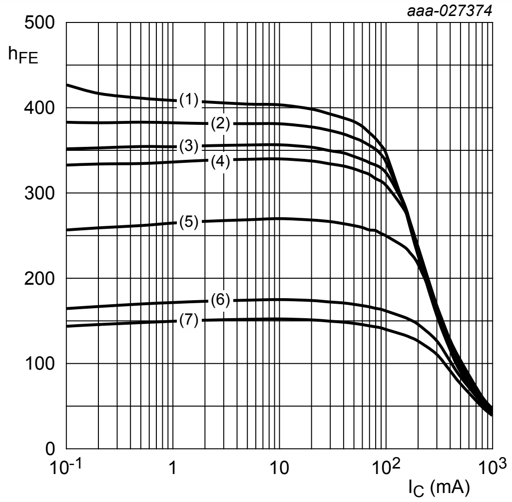


V_{CE} = 1 V

(1) T_{amb} = 150 °C

(2) T_{amb} = 125 °C

(3) T_{amb} = 100 °C

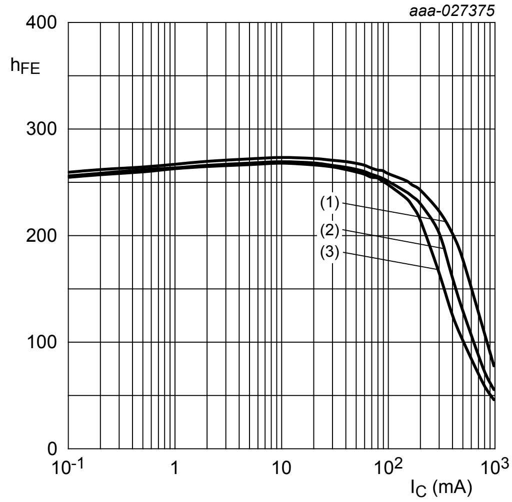
(4) T_{amb} = 85 °C

(5) T_{amb} = 25 °C

(6) T_{amb} = -40 °C

(7) T_{amb} = -55 °C

Figure 19. BC817K-25: DC current gain as a function of collector current; typical values



T_{amb} = 25 °C

(1) V_{CE} = 5 V

(2) V_{CE} = 2 V

(3) V_{CE} = 1 V

Figure 20. BC817K-25: DC current gain as a function of collector current; typical values

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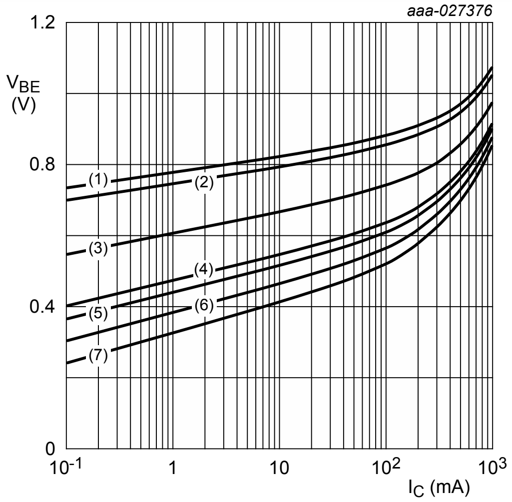


V_{CE} = 1 V

(1) T_{amb} = -55 °C

(2) T_{amb} = -40°C

(3) T_{amb} = 25 °C

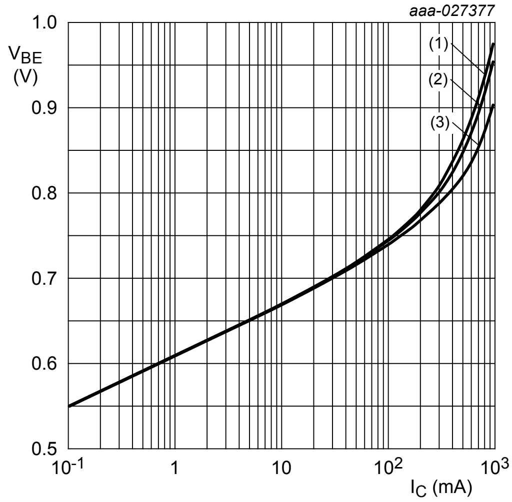
(4) T_{amb} = 85 °C

(5) T_{amb} = 100 °C

(6) T_{amb} = 125 °C

(7) T_{amb} = 150 °C

Figure 21. BC817K-25: Base-emitter voltage as a function of collector current; typical values



T_{amb} = 25 °C

(1) V_{CE} = 1 V

(2) V_{CE} = 2 V

(3) V_{CE} = 5 V

Figure 22. BC817K-25: Base-emitter voltage as a function of collector current; typical values

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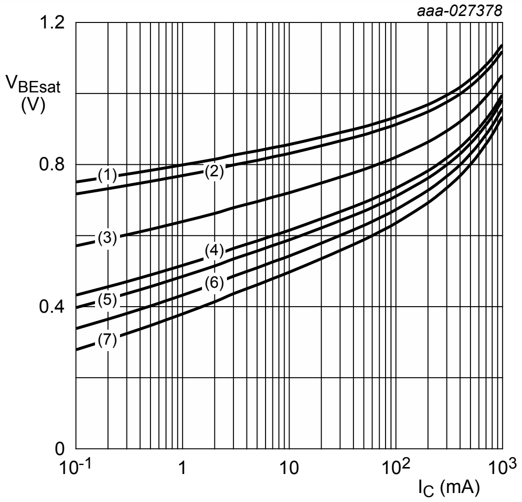
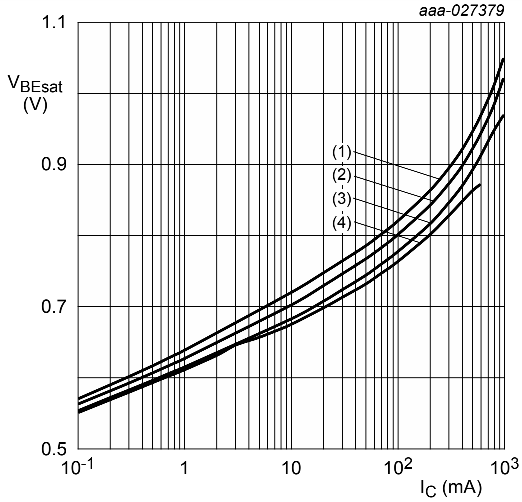


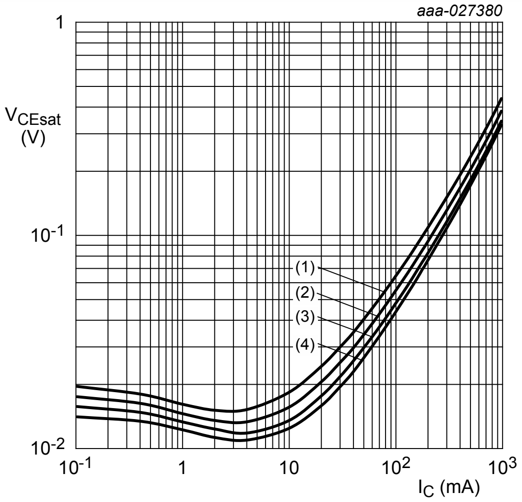
I_C/I_B = 10
(1) T_{amb} = -55 °C
(2) T_{amb} = -40°C
(3) T_{amb} = 25 °C
(4) T_{amb} = 85 °C
(5) T_{amb} = 100 °C
(6) T_{amb} = 125 °C
(7) T_{amb} = 150 °C

Figure 23. BC817K-25: Base-emitter saturation voltage as a function of collector current; typical values



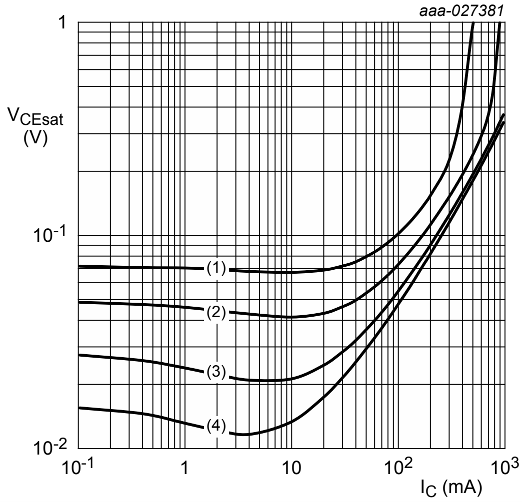
T_{amb} = 25 °C
(1) I_C/I_B = 10
(2) I_C/I_B = 20
(3) I_C/I_B = 50
(4) I_C/I_B = 100

Figure 24. BC817K-25: Base-emitter saturation voltage as a function of collector current; typical values



I_C/I_B = 10
(1) T_{amb} = 150 °C
(2) T_{amb} = 85 °C
(3) T_{amb} = 25 °C
(4) T_{amb} = -40 °C

Figure 25. BC817K-25: Collector-emitter saturation voltage as a function of collector current; typical values



T_{amb} = 25 °C
(1) I_C/I_B = 100
(2) I_C/I_B = 50
(3) I_C/I_B = 20
(4) I_C/I_B = 10

Figure 26. BC817K-25: Collector-emitter saturation voltage as a function of collector current; typical values

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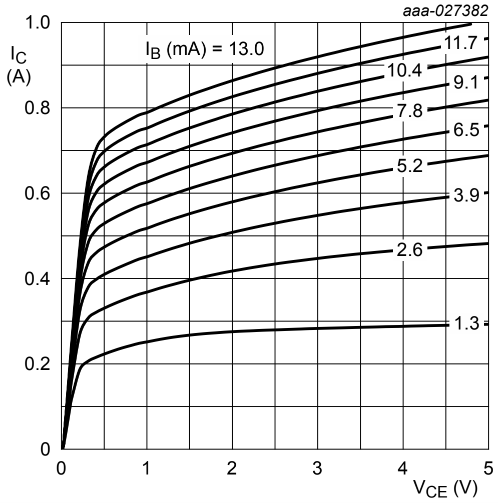
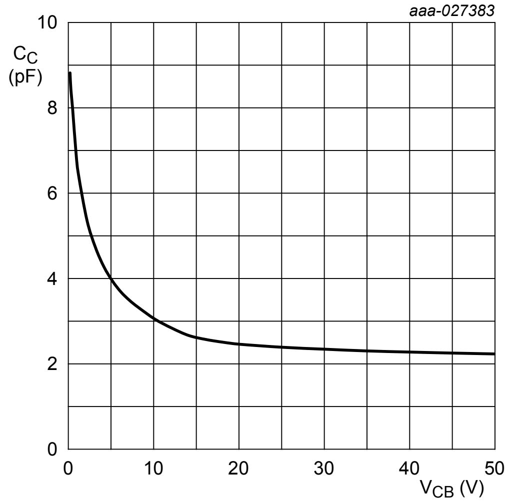


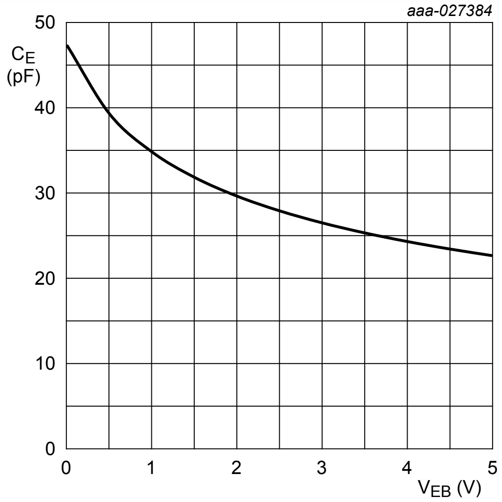
T_{amb} = 25 °C

Figure 27. BC817K-25: Collector current as a function of collector-emitter voltage; typical values



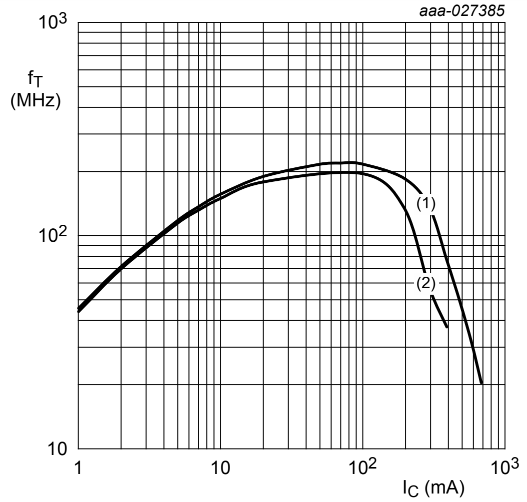
f = 1 MHz; T_{amb} = 25 °C

Figure 28. BC817K-25: Collector capacitance as a function of collector-base voltage; typical values



f = 1 MHz; T_{amb} = 25 °C

Figure 29. BC817K-25: Emitter capacitance as a function of emitter-base voltage; typical values



f = 100 MHz; T_{amb} = 25 °C

(1) V_{CE} = 5 V

(2) V_{CE} = 1 V

Figure 30. BC817K-25: Transition frequency as a function of collector current voltage; typical values

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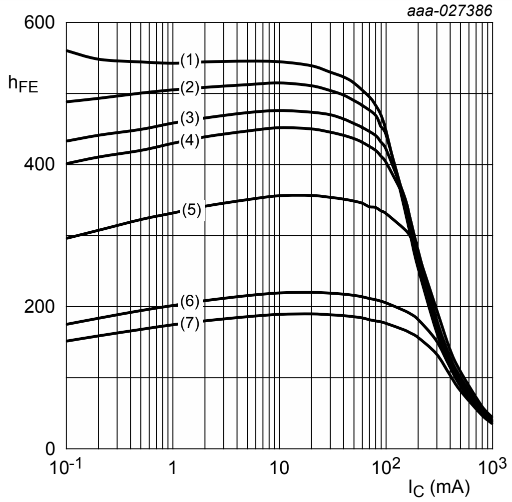


V_{CE} = 1 V

(1) T_{amb} = 150 °C

(2) T_{amb} = 125 °C

(3) T_{amb} = 100 °C

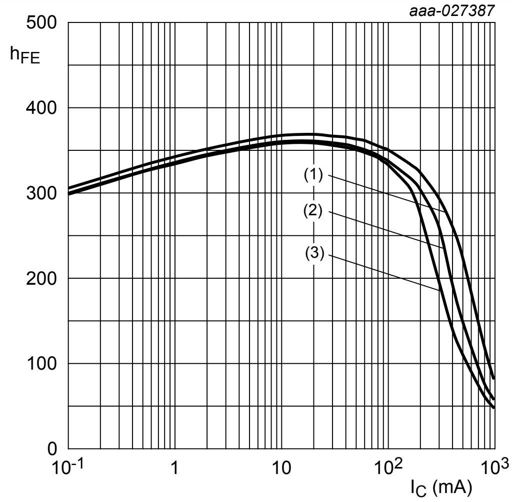
(4) T_{amb} = 85 °C

(5) T_{amb} = 25 °C

(6) T_{amb} = -40 °C

(7) T_{amb} = -55 °C

Figure 31. BC817K-40: DC current gain as a function of collector current; typical values



T_{amb} = 25 °C

(1) V_{CE} = 5 V

(2) V_{CE} = 2 V

(3) V_{CE} = 1 V

Figure 32. BC817K-40: DC current gain as a function of collector current; typical values

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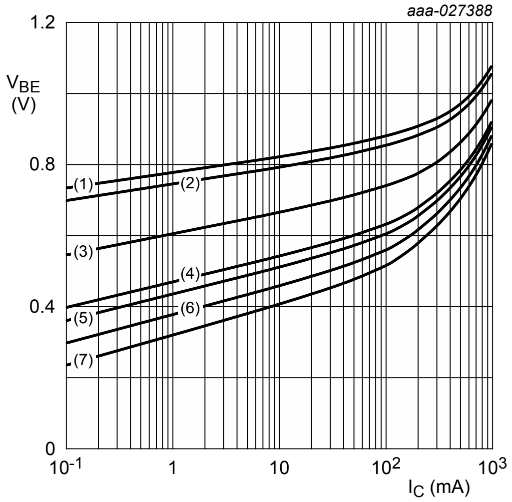


V_{CE} = 1 V

(1) T_{amb} = -55 °C

(2) T_{amb} = -40°C

(3) T_{amb} = 25 °C

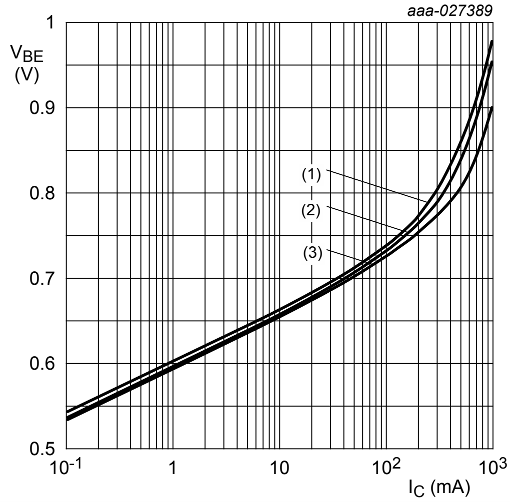
(4) T_{amb} = 85 °C

(5) T_{amb} = 100 °C

(6) T_{amb} = 125 °C

(7) T_{amb} = 150 °C

Figure 33. BC817K-40: Base-emitter voltage as a function of collector current; typical values



T_{amb} = 25 °C

(1) V_{CE} = 1 V

(2) V_{CE} = 2 V

(3) V_{CE} = 5 V

Figure 34. BC817K-40: Base-emitter voltage as a function of collector current; typical values

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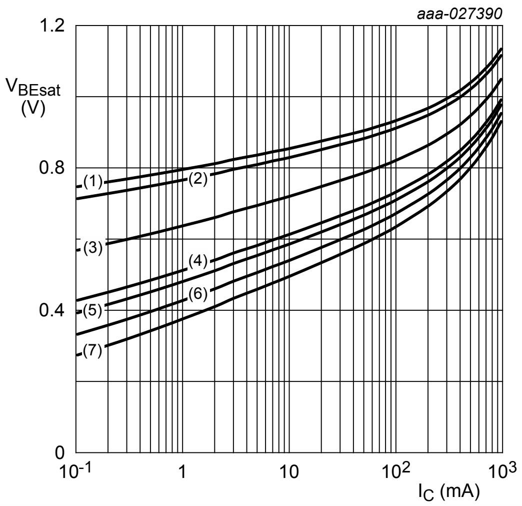


I_C/I_B = 10

(1) T_{amb} = -55 °C

(2) T_{amb} = -40°C

(3) T_{amb} = 25 °C

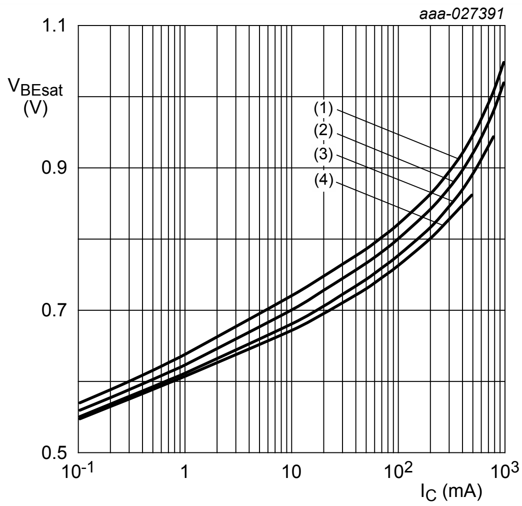
(4) T_{amb} = 85 °C

(5) T_{amb} = 100 °C

(6) T_{amb} = 125 °C

(7) T_{amb} = 150 °C

Figure 35. BC817K-40: Base-emitter saturation voltage as a function of collector current; typical values



T_{amb} = 25 °C

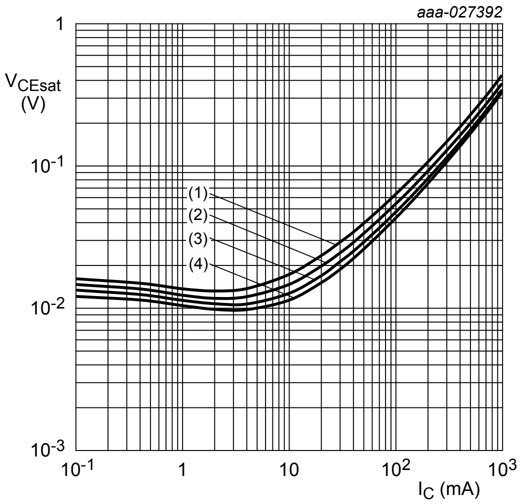
(1) I_C/I_B = 10

(2) I_C/I_B = 20

(3) I_C/I_B = 50

(4) I_C/I_B = 100

Figure 36. BC817K-40: Base-emitter saturation voltage as a function of collector current; typical values



I_C/I_B = 10

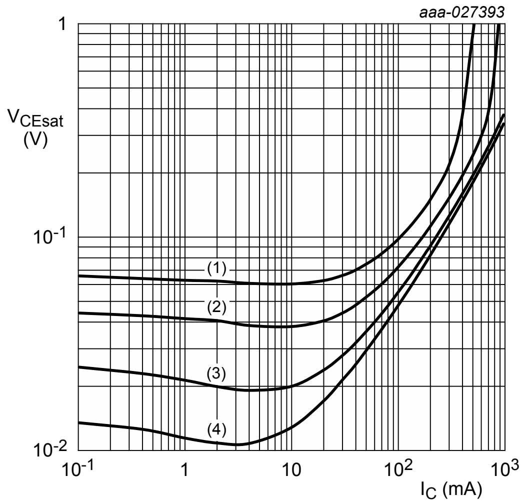
(1) T_{amb} = 150 °C

(2) T_{amb} = 85 °C

(3) T_{amb} = 25 °C

(4) T_{amb} = -40 °C

Figure 37. BC817K-40: Collector-emitter saturation voltage as a function of collector current; typical values



T_{amb} = 25 °C

(1) I_C/I_B = 100

(2) I_C/I_B = 50

(3) I_C/I_B = 20

(4) I_C/I_B = 10

Figure 38. BC817K-40: Collector-emitter saturation voltage as a function of collector current; typical values

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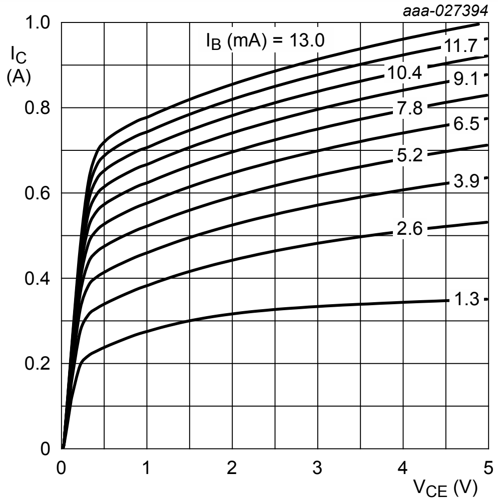
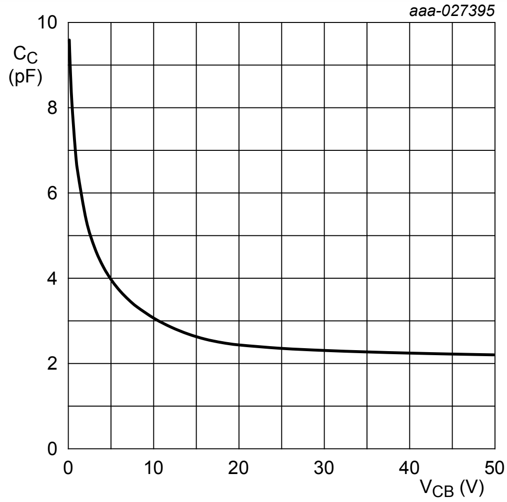


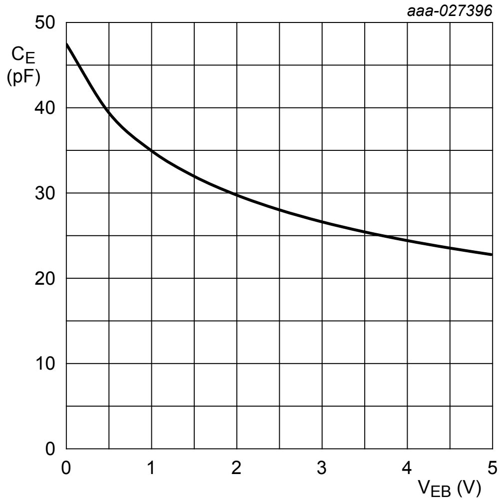
T_{amb} = 25 °C

Figure 39. BC817K-40: Collector current as a function of collector-emitter voltage; typical values



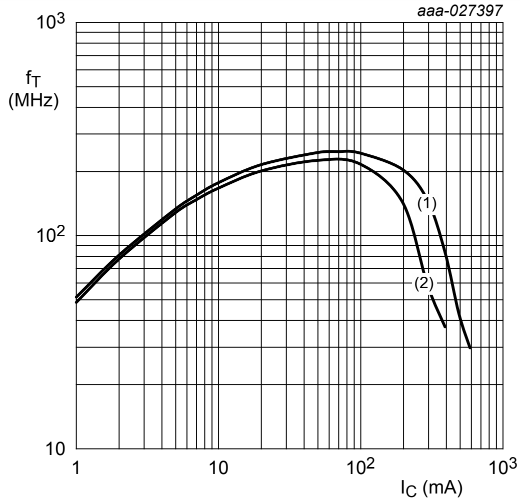
f = 1 MHz; T_{amb} = 25 °C

Figure 40. BC817K-40: Collector capacitance as a function of collector-base voltage; typical values



f = 1 MHz; T_{amb} = 25 °C

Figure 41. BC817K-40: Emitter capacitance as a function of emitter-base voltage; typical values



f = 100 MHz; T_{amb} = 25 °C

(1) V_{CE} = 5 V

(2) V_{CE} = 1 V

Figure 42. BC817K-40: Transition frequency as a function of collector current voltage; typical values

8 Test information

8.1 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.

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9 Package outline

Table 9. Package outline

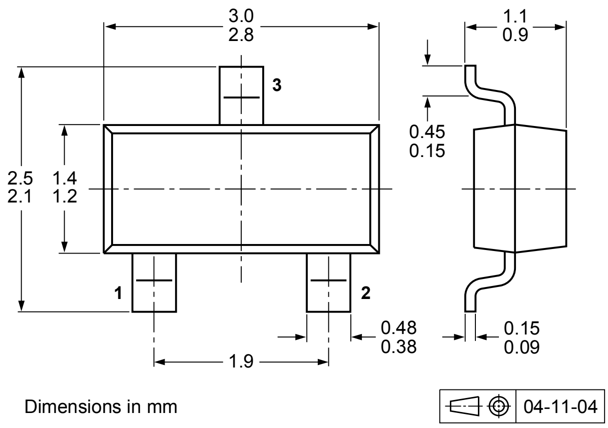

Figure 43. Package outline SOT23 (TO-236)

10 Soldering

Table 10. Soldering

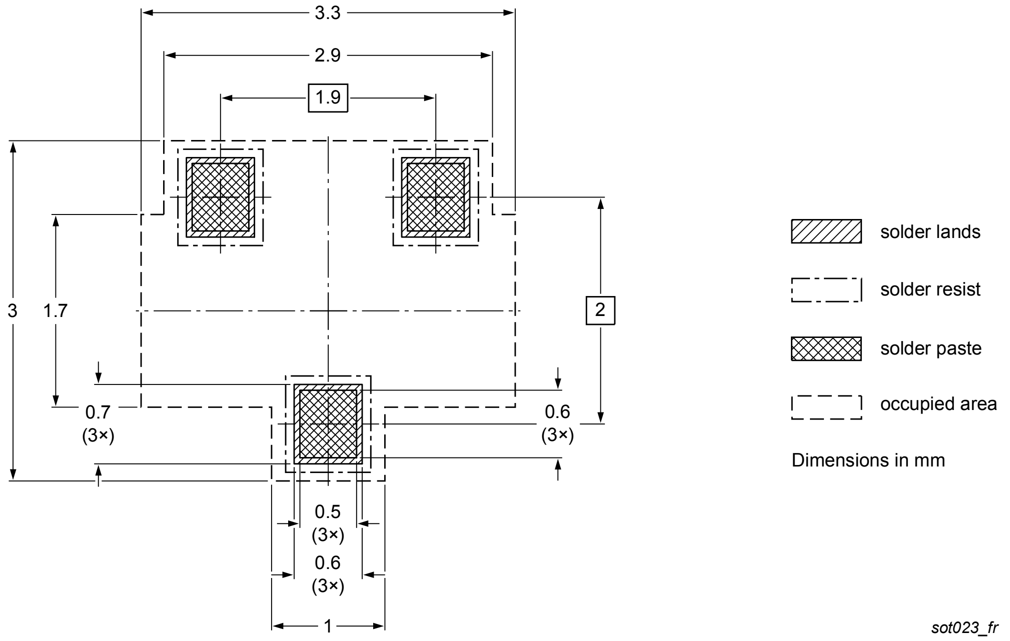

Figure 44. Reflow soldering footprint for SOT23 (TO-236AB)

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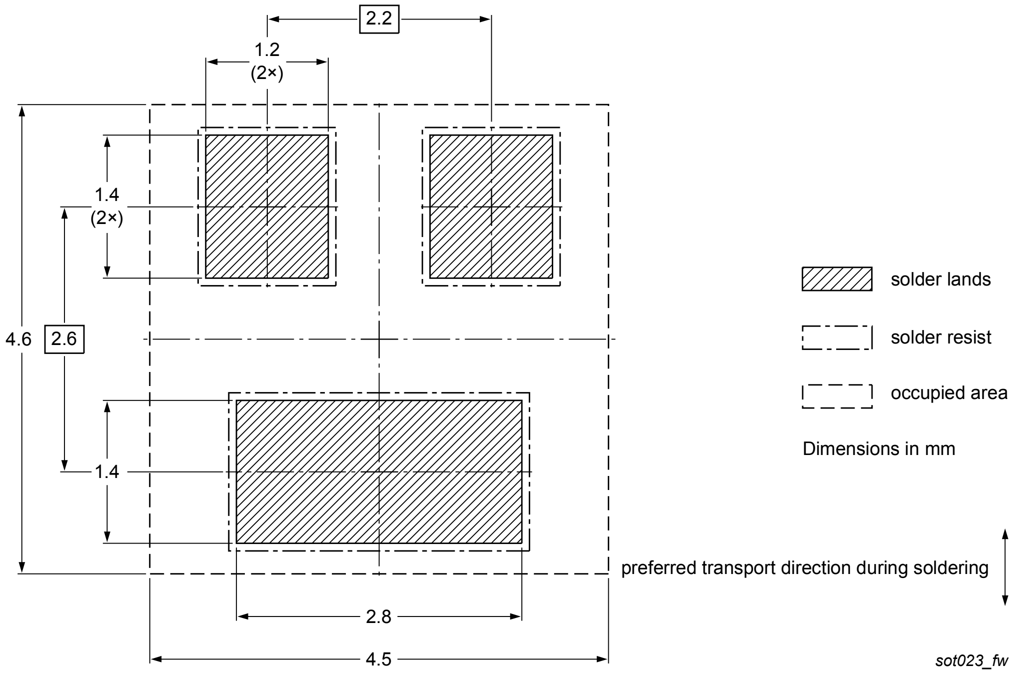

Figure 45. Wave soldering footprint for SOT23 (TO-236AB)

11 Revision history

Table 11. Revision history

Document ID	Release date	Data sheet status		Supersedes
BC817K_SER v.2	20180306	Product data sheet		BC817K_SER v.1
Modification:	• Characteristics: Figures are updated			
BC817K_SER v.1	20171108			-

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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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Document identifier: BC817K_SER

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