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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

1.4 Quick reference data

Table 2. Quick reference data

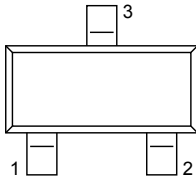
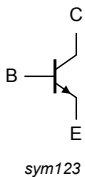
$T_{amb} = 25\text{ °C}$ unless otherwise specified.

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

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

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

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).

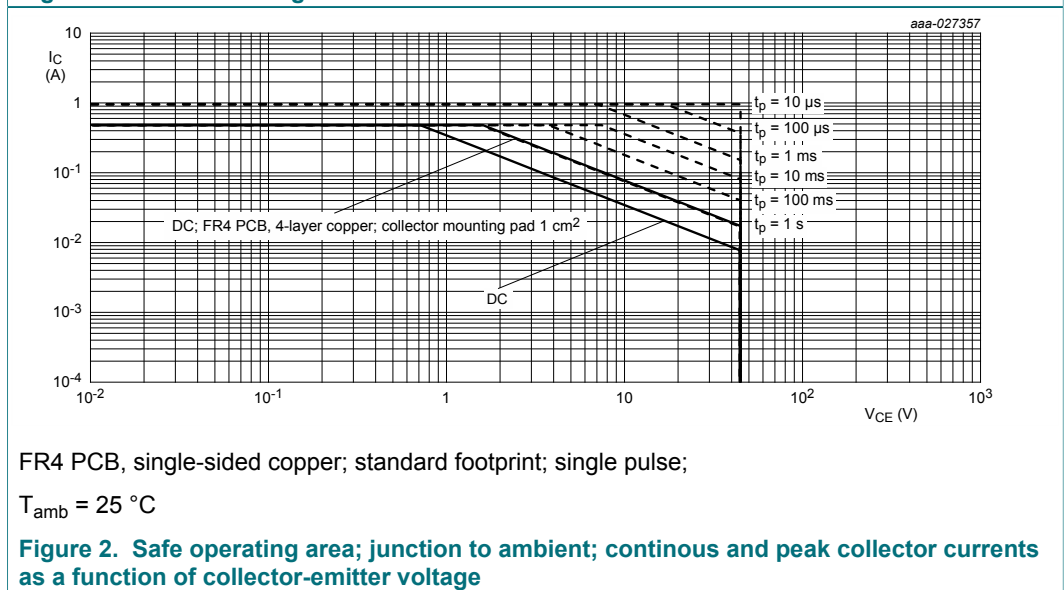
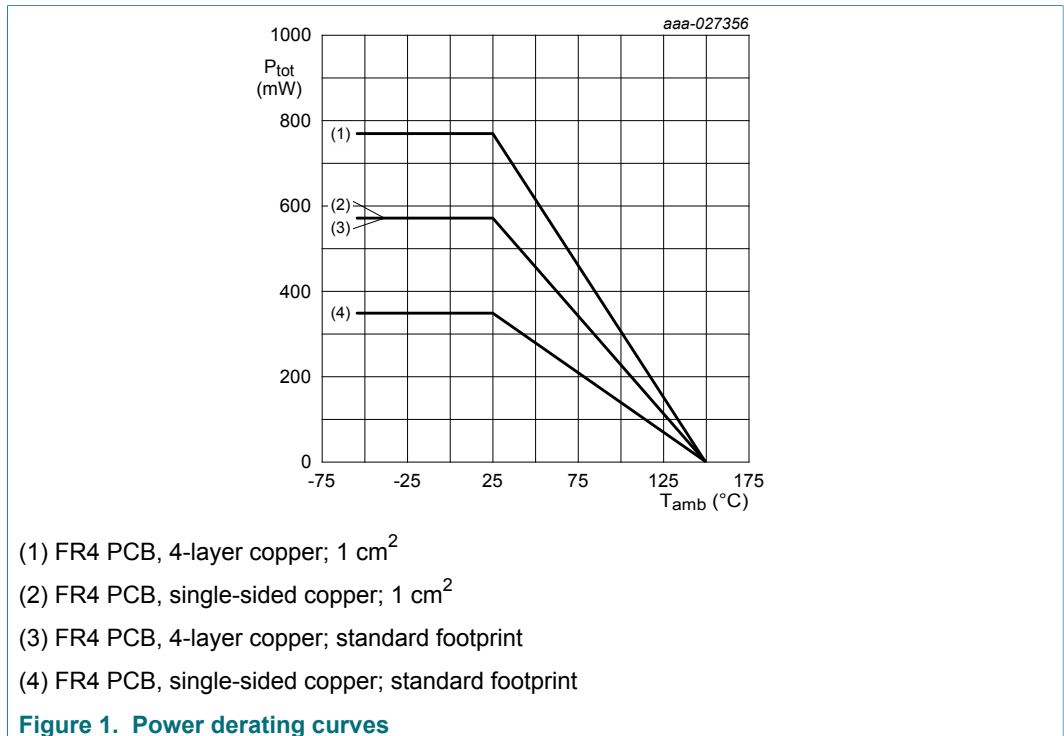
Symbol	Parameter	Conditions	Min	Max	Unit
V_{CBO}	collector-base voltage	open emitter	-	50	V
V_{CEO}	collector-emitter voltage	open base	-	45	V
V_{EBO}	emitter-base voltage	open collector	-	5	V
I_C	collector current		-	500	mA
I_{CM}	peak collector current	single pulse; $t_p \leq 1$ ms	-	1	A
I_{BM}	peak 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 cm².

[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 cm².

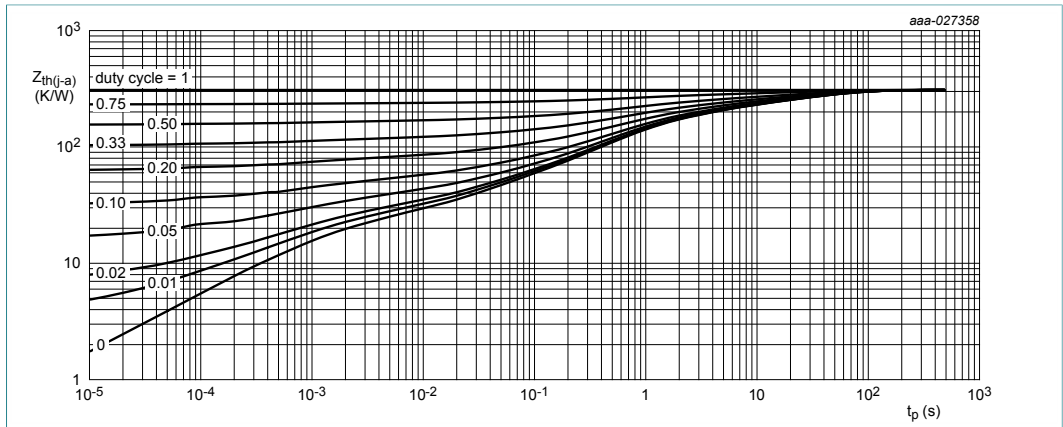


6 Thermal characteristics

Table 7. Thermal characteristics

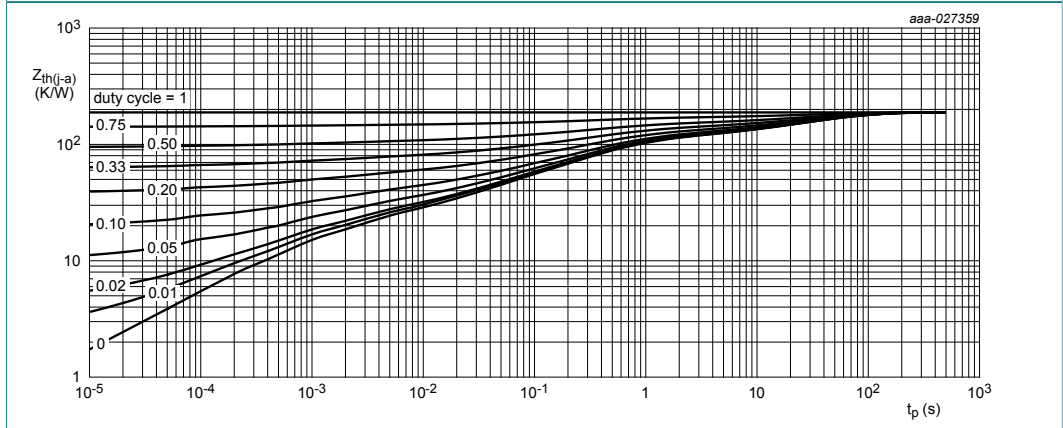
Symbol	Parameter	Conditions	Min	Typ	Max	Unit	
$R_{th(j-a)}$	thermal resistance from junction to ambient	in free air	[1]	-	-	358	K/W
			[2]	-	-	218	K/W
			[3]	-	-	218	K/W
			[4]	-	-	162	K/W
$R_{th(j-sp)}$	thermal resistance from junction to solder point		-	-	60	K/W	

- [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 cm².
- [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 cm².



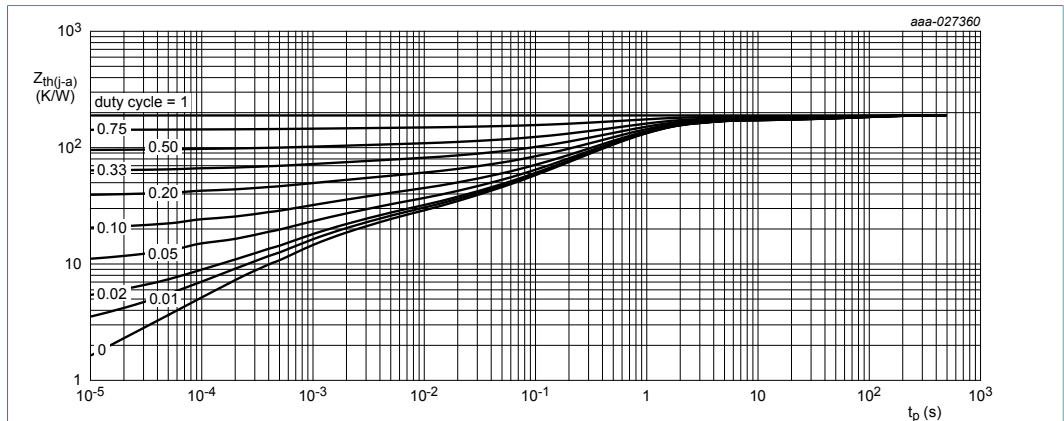
FR4 PCB; single-sided copper; tin-plated and standard footprint

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



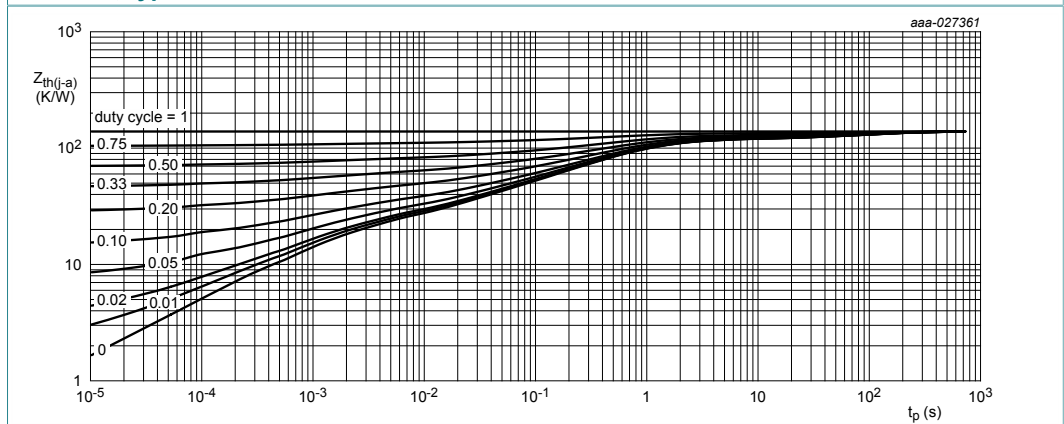
FR4 PCB; single-sided copper; tin-plated; mounting pad for collector 1 cm²

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



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 cm²

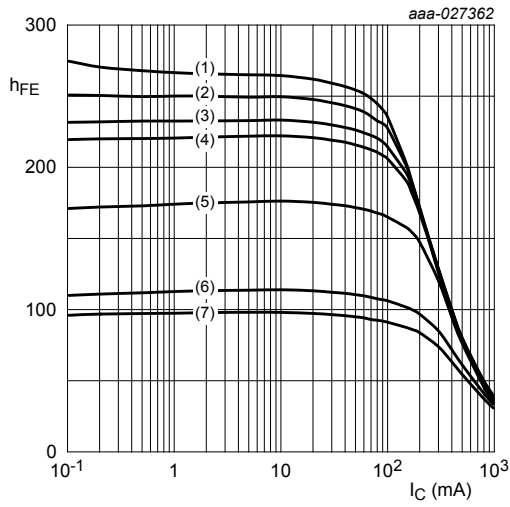
Figure 6. Transient thermal impedance from junction to ambient as a function of pulse duration; typical values

7 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	$I_C = 10\ \text{mA}; I_B = 0\ \text{A}$	45	-	-	V	
$V_{(BR)EBO}$	emitter-base breakdown voltage	$I_E = 100\ \mu\text{A}; I_C = 0\ \text{A}$	5	-	-	V	
I_{CBO}	collector-base cut-off current	$V_{CB} = 25\ \text{V}; I_E = 0\ \text{A}$	-	-	100	nA	
		$V_{CB} = 25\ \text{V}; I_E = 0\ \text{A}; T_j = 150\ \text{°C}$	-	-	5	μA	
I_{EBO}	emitter-base cut-off current	$V_{EB} = 5\ \text{V}; I_C = 0\ \text{A}$	-	-	100	nA	
h_{FE}	DC current gain						
	BC817K-16	$V_{CE} = 1\ \text{V}; I_C = 100\ \text{mA}$	[1]	100	-	250	
	BC817K-25	$V_{CE} = 1\ \text{V}; I_C = 100\ \text{mA}$	[1]	160	-	400	
	BC817K-40	$V_{CE} = 1\ \text{V}; I_C = 100\ \text{mA}$	[1]	250	-	600	
	BC817K-16, -25, -40	$V_{CE} = 1\ \text{V}; I_C = 500\ \text{mA}$	[1]	40	-	-	
V_{CEsat}	collector-emitter saturation voltage	$I_C = 500\ \text{mA}; I_B = 50\ \text{mA}$	[1]	-	-	700 mV	
V_{BEsat}	base-emitter saturation voltage	$I_C = 500\ \text{mA}; I_B = 50\ \text{mA}$	[1]	-	-	1.2 V	
V_{BE}	base-emitter voltage	$V_{CE} = 1\ \text{V}; I_C = 500\ \text{mA}$	[1]	-	-	1.2 V	
f_T	transition frequency	$V_{CE} = 5\ \text{V}; I_C = 10\ \text{mA}; f = 100\ \text{MHz}$	100	-	-	MHz	
C_c	collector capacitance	$V_{CB} = 10\ \text{V}; I_E = i_e = 0\ \text{A}; f = 1\ \text{MHz}$	-	3	-	pF	
C_e	emitter capacitance	$V_{EB} = 0.5\ \text{V}; I_C = i_c = 0\ \text{A}; f = 1\ \text{MHz}$					
	BC817K-16		-	44	-	pF	
	BC817K-25		-	39	-	pF	
	BC817K-40		-	39	-	pF	

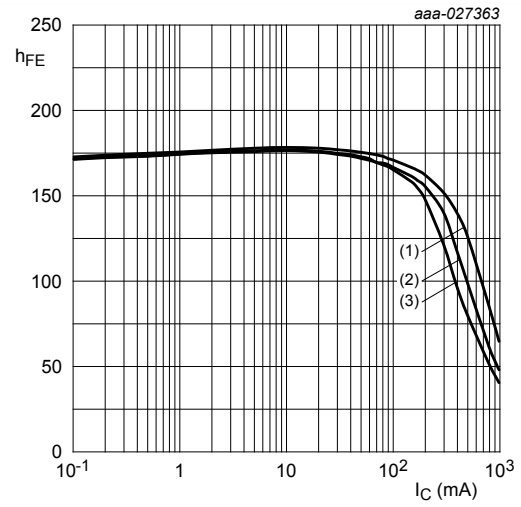
 [1] pulsed; $t_p \leq 300\ \mu\text{s}$; $\delta \leq 0.02$



$V_{CE} = 1 \text{ V}$

- (1) $T_{amb} = 150 \text{ }^\circ\text{C}$
- (2) $T_{amb} = 125 \text{ }^\circ\text{C}$
- (3) $T_{amb} = 100 \text{ }^\circ\text{C}$
- (4) $T_{amb} = 85 \text{ }^\circ\text{C}$
- (5) $T_{amb} = 25 \text{ }^\circ\text{C}$
- (6) $T_{amb} = -40 \text{ }^\circ\text{C}$
- (7) $T_{amb} = -55 \text{ }^\circ\text{C}$

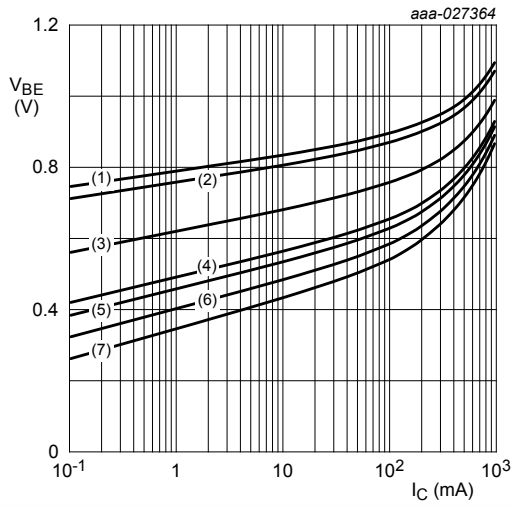
Figure 7. BC817K-16: DC current gain as a function of collector current; typical values



$T_{amb} = 25 \text{ }^\circ\text{C}$

- (1) $V_{CE} = 5 \text{ V}$
- (2) $V_{CE} = 2 \text{ V}$
- (3) $V_{CE} = 1 \text{ V}$

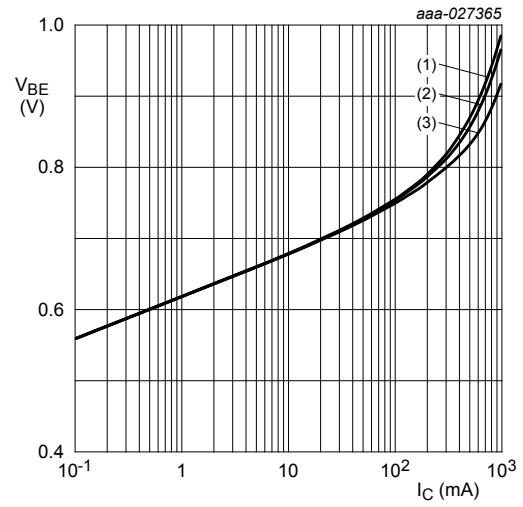
Figure 8. BC817K-16: DC current gain as a function of collector current; typical values



$V_{CE} = 1 \text{ V}$

- (1) $T_{amb} = -55 \text{ }^\circ\text{C}$
- (2) $T_{amb} = -40 \text{ }^\circ\text{C}$
- (3) $T_{amb} = 25 \text{ }^\circ\text{C}$
- (4) $T_{amb} = 85 \text{ }^\circ\text{C}$
- (5) $T_{amb} = 100 \text{ }^\circ\text{C}$
- (6) $T_{amb} = 125 \text{ }^\circ\text{C}$
- (7) $T_{amb} = 150 \text{ }^\circ\text{C}$

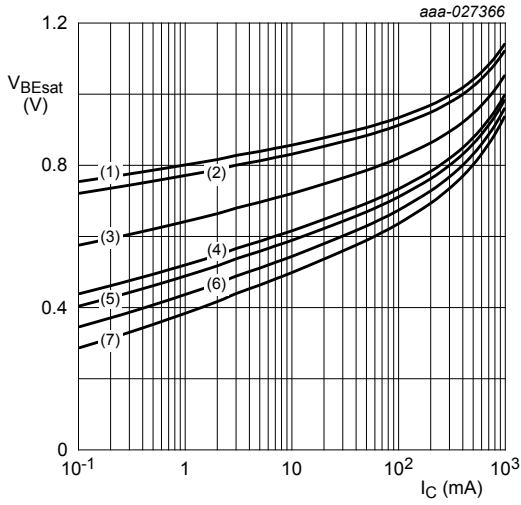
Figure 9. BC817K-16: Base-emitter voltage as a function of collector current; typical values



$T_{amb} = 25 \text{ }^\circ\text{C}$

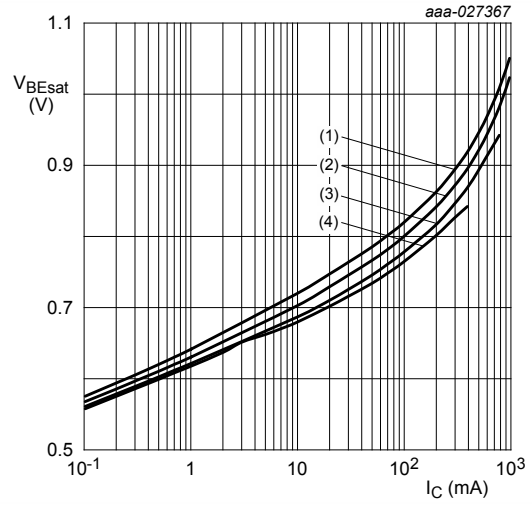
- (1) $V_{CE} = 1 \text{ V}$
- (2) $V_{CE} = 2 \text{ V}$
- (3) $V_{CE} = 5 \text{ V}$

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



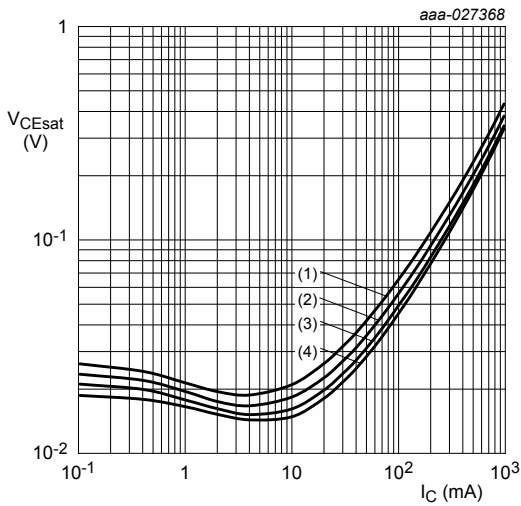
- $I_C/I_B = 10$
- (1) $T_{amb} = -55\text{ }^\circ\text{C}$
 - (2) $T_{amb} = -40\text{ }^\circ\text{C}$
 - (3) $T_{amb} = 25\text{ }^\circ\text{C}$
 - (4) $T_{amb} = 85\text{ }^\circ\text{C}$
 - (5) $T_{amb} = 100\text{ }^\circ\text{C}$
 - (6) $T_{amb} = 125\text{ }^\circ\text{C}$
 - (7) $T_{amb} =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

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



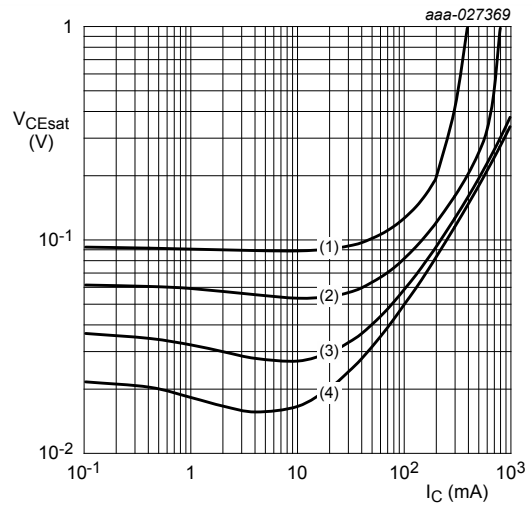
- $T_{amb} = 25\text{ }^\circ\text{C}$
- (1) $I_C/I_B = 10$
 - (2) $I_C/I_B = 20$
 - (3) $I_C/I_B = 50$
 - (4) $I_C/I_B = 100$

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



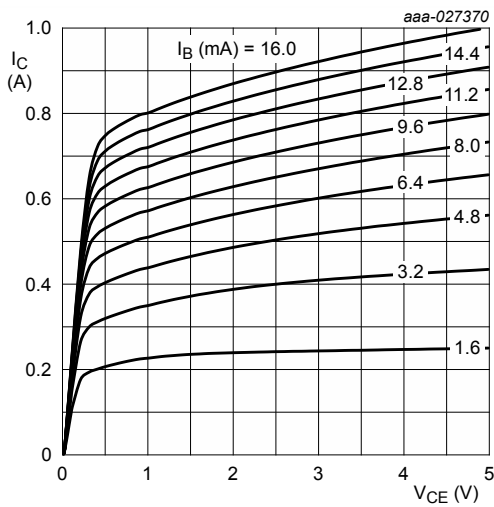
- $I_C/I_B = 10$
- (1) $T_{amb} = 150\text{ }^\circ\text{C}$
 - (2) $T_{amb} = 85\text{ }^\circ\text{C}$
 - (3) $T_{amb} = 25\text{ }^\circ\text{C}$
 - (4) $T_{amb} = -40\text{ }^\circ\text{C}$

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



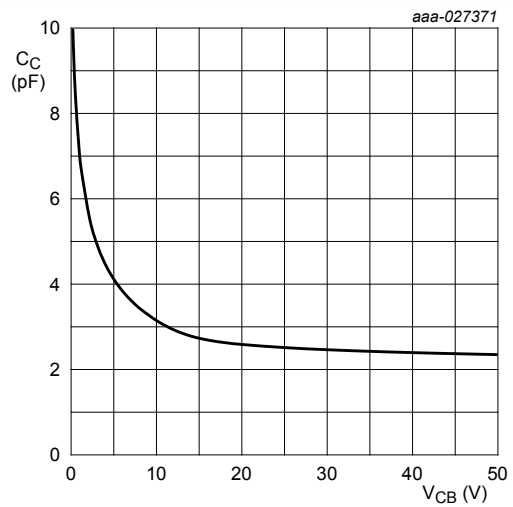
- $T_{amb} = 25\text{ }^\circ\text{C}$
- (1) $I_C/I_B = 100$
 - (2) $I_C/I_B = 50$
 - (3) $I_C/I_B = 20$
 - (4) $I_C/I_B = 10$

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



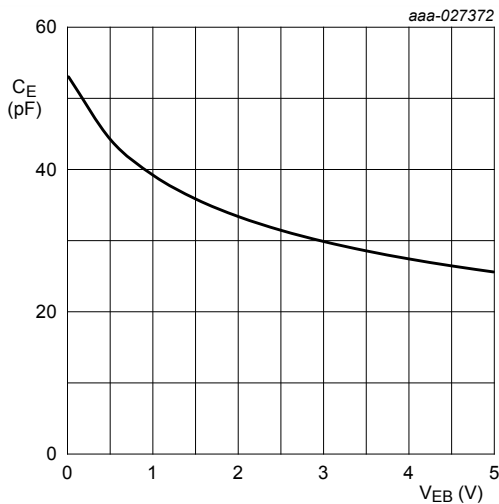
$T_{amb} = 25^\circ C$

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



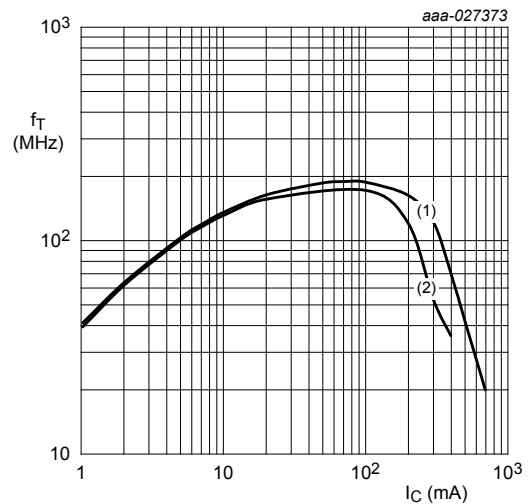
$f = 1$ MHz; $T_{amb} = 25^\circ C$

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



$f = 1$ MHz; $T_{amb} = 25^\circ C$

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

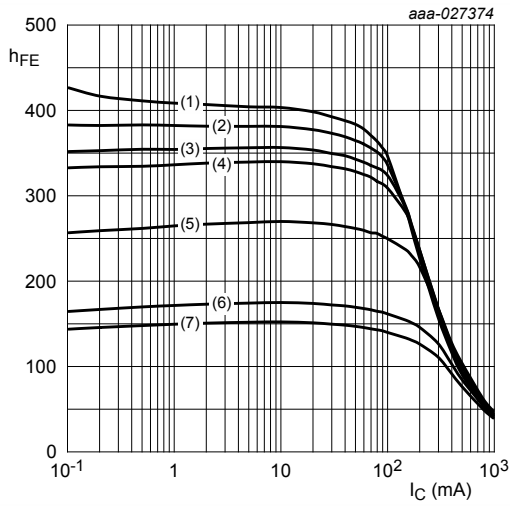


$f = 100$ MHz; $T_{amb} = 25^\circ C$

(1) $V_{CE} = 5$ V

(2) $V_{CE} = 1$ V

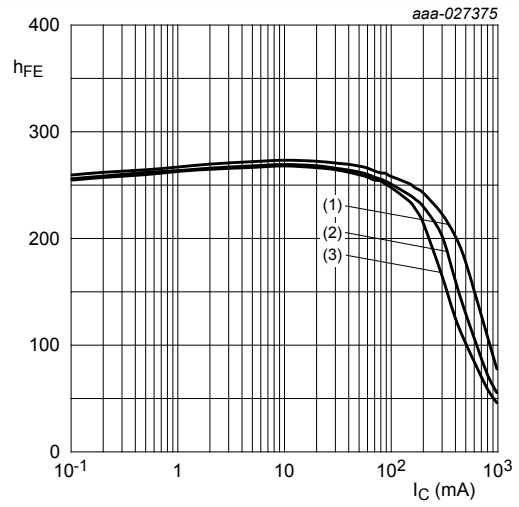
Figure 18. BC817K-16: Transition frequency as a function of collector current voltage; typical values



$V_{CE} = 1 \text{ V}$

- (1) $T_{amb} = 150 \text{ }^\circ\text{C}$
- (2) $T_{amb} = 125 \text{ }^\circ\text{C}$
- (3) $T_{amb} = 100 \text{ }^\circ\text{C}$
- (4) $T_{amb} = 85 \text{ }^\circ\text{C}$
- (5) $T_{amb} = 25 \text{ }^\circ\text{C}$
- (6) $T_{amb} = -40 \text{ }^\circ\text{C}$
- (7) $T_{amb} = -55 \text{ }^\circ\text{C}$

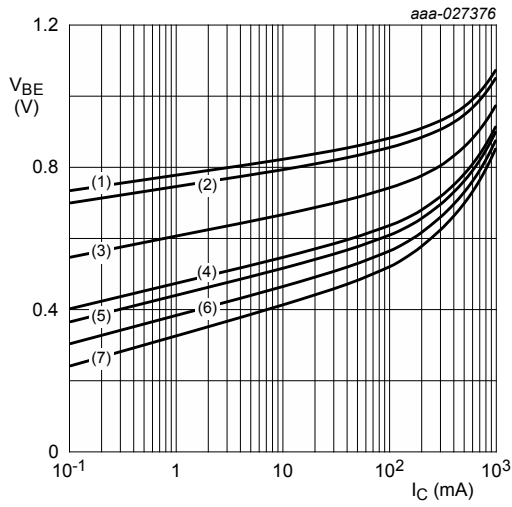
Figure 19. BC817K-25: DC current gain as a function of collector current; typical values



$T_{amb} = 25 \text{ }^\circ\text{C}$

- (1) $V_{CE} = 5 \text{ V}$
- (2) $V_{CE} = 2 \text{ V}$
- (3) $V_{CE} = 1 \text{ V}$

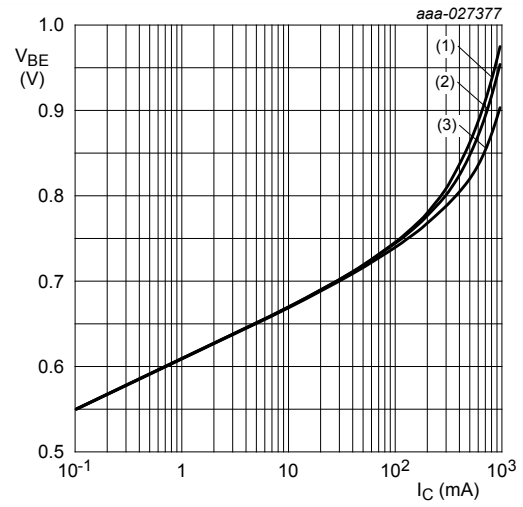
Figure 20. BC817K-25: DC current gain as a function of collector current; typical values



$V_{CE} = 1 \text{ V}$

- (1) $T_{amb} = -55 \text{ }^\circ\text{C}$
- (2) $T_{amb} = -40 \text{ }^\circ\text{C}$
- (3) $T_{amb} = 25 \text{ }^\circ\text{C}$
- (4) $T_{amb} = 85 \text{ }^\circ\text{C}$
- (5) $T_{amb} = 100 \text{ }^\circ\text{C}$
- (6) $T_{amb} = 125 \text{ }^\circ\text{C}$
- (7) $T_{amb} = 150 \text{ }^\circ\text{C}$

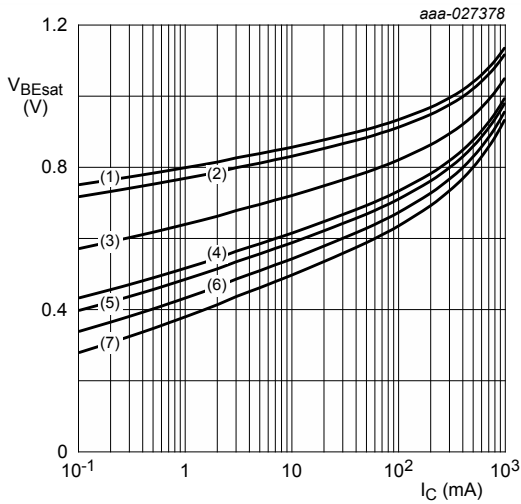
Figure 21. BC817K-25: Base-emitter voltage as a function of collector current; typical values



$T_{amb} = 25 \text{ }^\circ\text{C}$

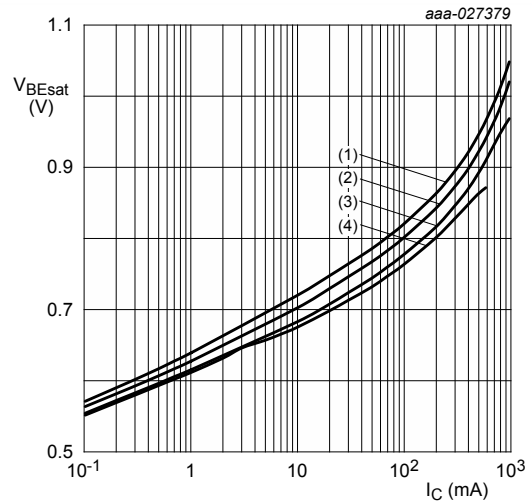
- (1) $V_{CE} = 1 \text{ V}$
- (2) $V_{CE} = 2 \text{ V}$
- (3) $V_{CE} = 5 \text{ V}$

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



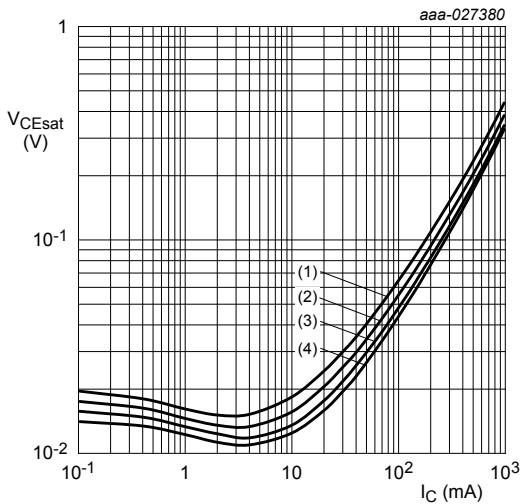
- $I_C/I_B = 10$
- (1) $T_{amb} = -55\text{ °C}$
 - (2) $T_{amb} = -40\text{ °C}$
 - (3) $T_{amb} = 25\text{ °C}$
 - (4) $T_{amb} = 85\text{ °C}$
 - (5) $T_{amb} = 100\text{ °C}$
 - (6) $T_{amb} = 125\text{ °C}$
 - (7) $T_{amb} = 150\text{ °C}$

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



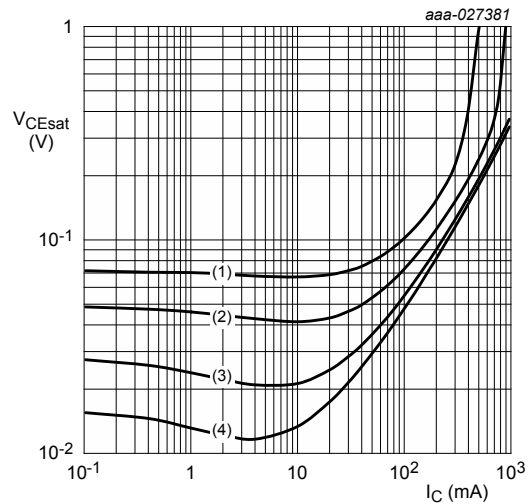
- $T_{amb} = 25\text{ °C}$
- (1) $I_C/I_B = 10$
 - (2) $I_C/I_B = 20$
 - (3) $I_C/I_B = 50$
 - (4) $I_C/I_B = 100$

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



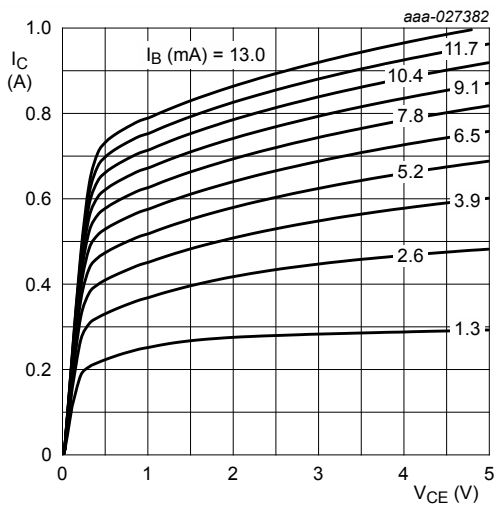
- $I_C/I_B = 10$
- (1) $T_{amb} = 150\text{ °C}$
 - (2) $T_{amb} = 85\text{ °C}$
 - (3) $T_{amb} = 25\text{ °C}$
 - (4) $T_{amb} = -40\text{ °C}$

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



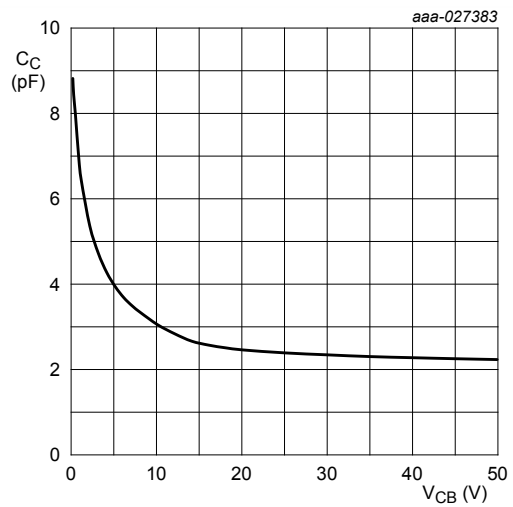
- $T_{amb} = 25\text{ °C}$
- (1) $I_C/I_B = 100$
 - (2) $I_C/I_B = 50$
 - (3) $I_C/I_B = 20$
 - (4) $I_C/I_B = 10$

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



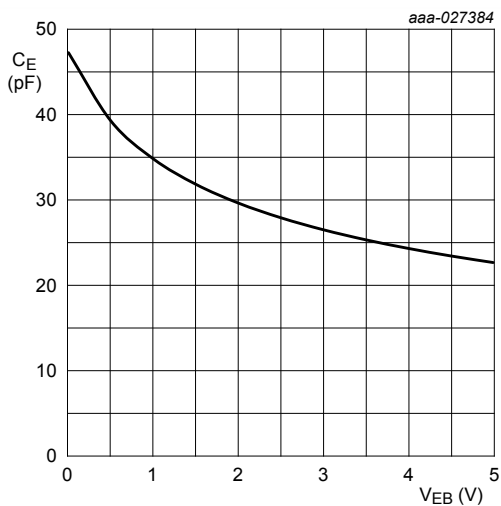
$T_{amb} = 25\text{ }^\circ\text{C}$

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



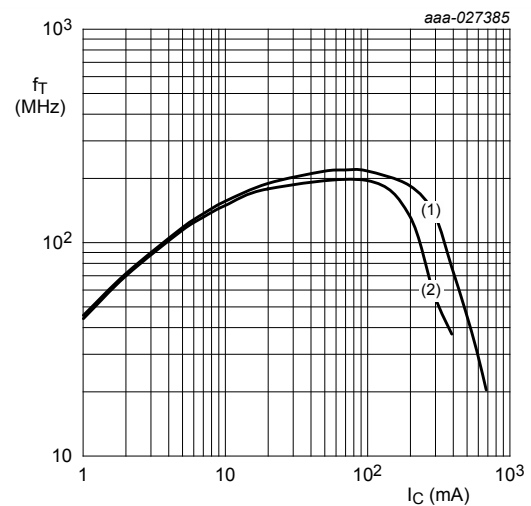
$f = 1\text{ MHz}$; $T_{amb} = 25\text{ }^\circ\text{C}$

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



$f = 1\text{ MHz}$; $T_{amb} = 25\text{ }^\circ\text{C}$

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

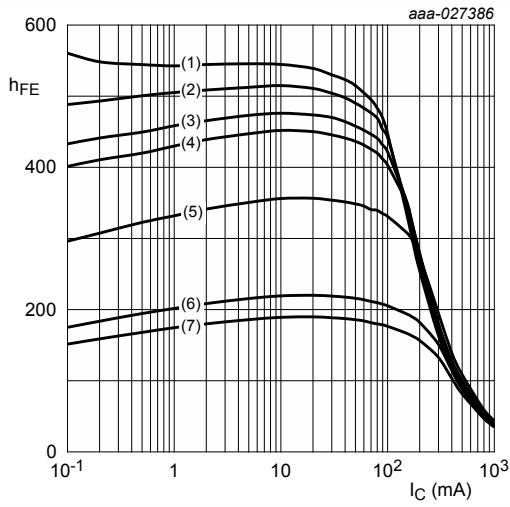


$f = 100\text{ MHz}$; $T_{amb} = 25\text{ }^\circ\text{C}$

(1) $V_{CE} = 5\text{ V}$

(2) $V_{CE} = 1\text{ V}$

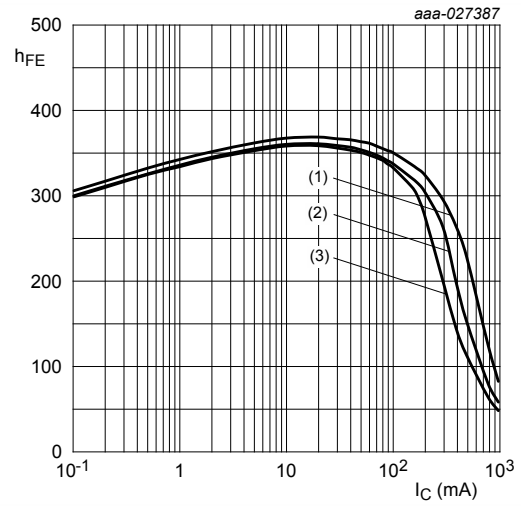
Figure 30. BC817K-25: Transition frequency as a function of collector current voltage; typical values



$V_{CE} = 1 \text{ V}$

- (1) $T_{amb} = 150 \text{ }^\circ\text{C}$
- (2) $T_{amb} = 125 \text{ }^\circ\text{C}$
- (3) $T_{amb} = 100 \text{ }^\circ\text{C}$
- (4) $T_{amb} = 85 \text{ }^\circ\text{C}$
- (5) $T_{amb} = 25 \text{ }^\circ\text{C}$
- (6) $T_{amb} = -40 \text{ }^\circ\text{C}$
- (7) $T_{amb} = -55 \text{ }^\circ\text{C}$

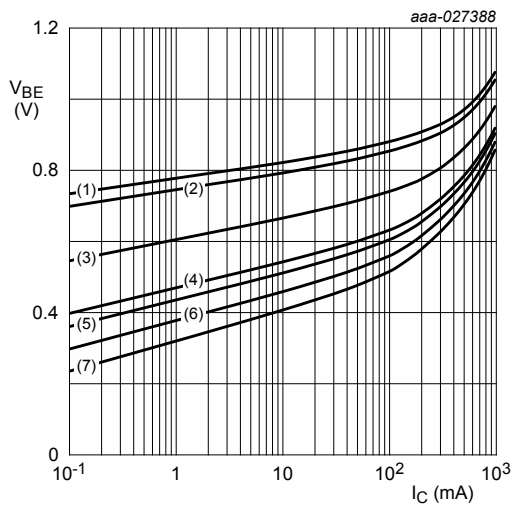
Figure 31. BC817K-40: DC current gain as a function of collector current; typical values



$T_{amb} = 25 \text{ }^\circ\text{C}$

- (1) $V_{CE} = 5 \text{ V}$
- (2) $V_{CE} = 2 \text{ V}$
- (3) $V_{CE} = 1 \text{ V}$

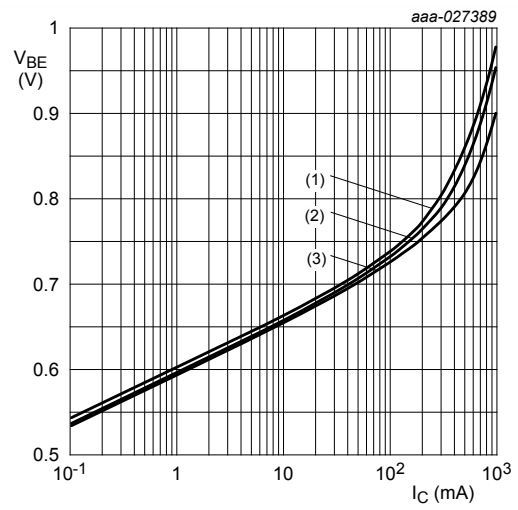
Figure 32. BC817K-40: DC current gain as a function of collector current; typical values



$V_{CE} = 1\text{ V}$

- (1) $T_{amb} = -55\text{ °C}$
- (2) $T_{amb} = -40\text{ °C}$
- (3) $T_{amb} = 25\text{ °C}$
- (4) $T_{amb} = 85\text{ °C}$
- (5) $T_{amb} = 100\text{ °C}$
- (6) $T_{amb} = 125\text{ °C}$
- (7) $T_{amb} = 150\text{ °C}$

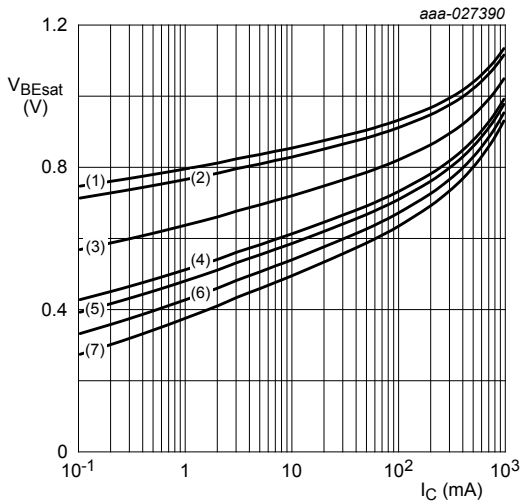
Figure 33. BC817K-40: Base-emitter voltage as a function of collector current; typical values



$T_{amb} = 25\text{ °C}$

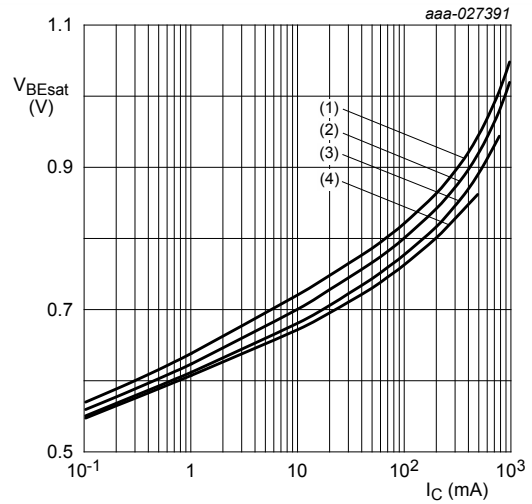
- (1) $V_{CE} = 1\text{ V}$
- (2) $V_{CE} = 2\text{ V}$
- (3) $V_{CE} = 5\text{ V}$

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



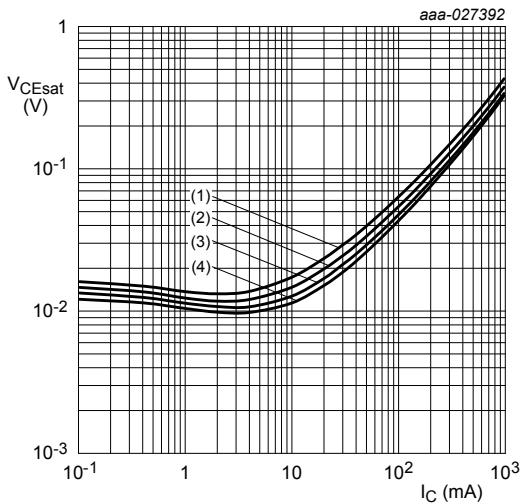
- $I_C/I_B = 10$
- (1) $T_{amb} = -55\text{ }^\circ\text{C}$
 - (2) $T_{amb} = -40\text{ }^\circ\text{C}$
 - (3) $T_{amb} = 25\text{ }^\circ\text{C}$
 - (4) $T_{amb} = 85\text{ }^\circ\text{C}$
 - (5) $T_{amb} = 100\text{ }^\circ\text{C}$
 - (6) $T_{amb} = 125\text{ }^\circ\text{C}$
 - (7) $T_{amb} =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

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



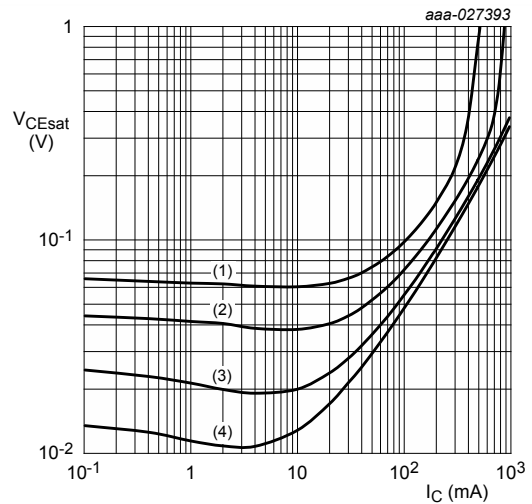
- $T_{amb} = 25\text{ }^\circ\text{C}$
- (1) $I_C/I_B = 10$
 - (2) $I_C/I_B = 20$
 - (3) $I_C/I_B = 50$
 - (4) $I_C/I_B = 100$

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



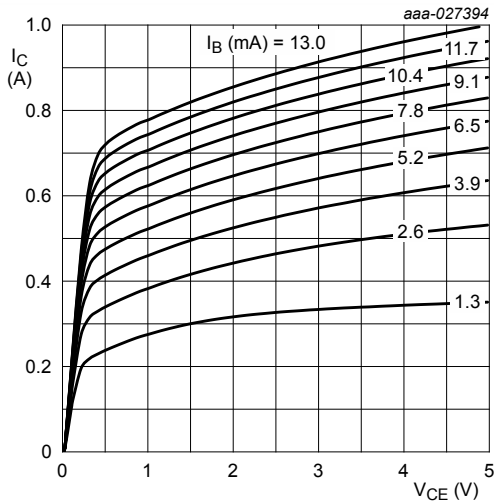
- $I_C/I_B = 10$
- (1) $T_{amb} = 150\text{ }^\circ\text{C}$
 - (2) $T_{amb} = 85\text{ }^\circ\text{C}$
 - (3) $T_{amb} = 25\text{ }^\circ\text{C}$
 - (4) $T_{amb} = -40\text{ }^\circ\text{C}$

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



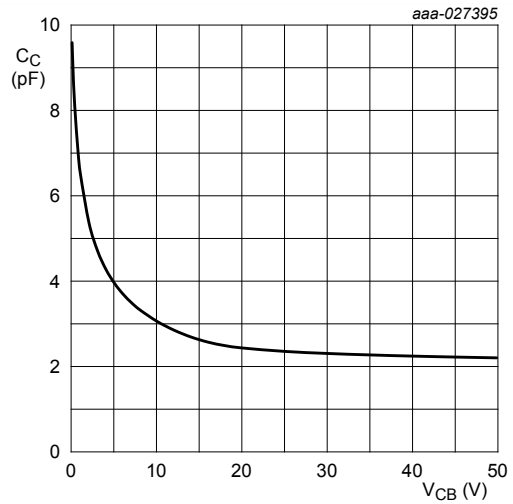
- $T_{amb} = 25\text{ }^\circ\text{C}$
- (1) $I_C/I_B = 100$
 - (2) $I_C/I_B = 50$
 - (3) $I_C/I_B = 20$
 - (4) $I_C/I_B = 10$

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



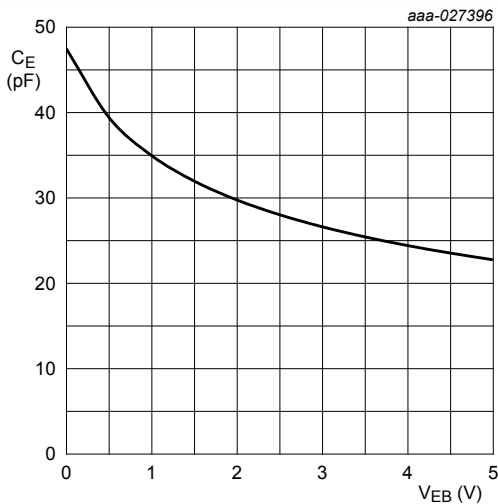
$T_{amb} = 25^\circ C$

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



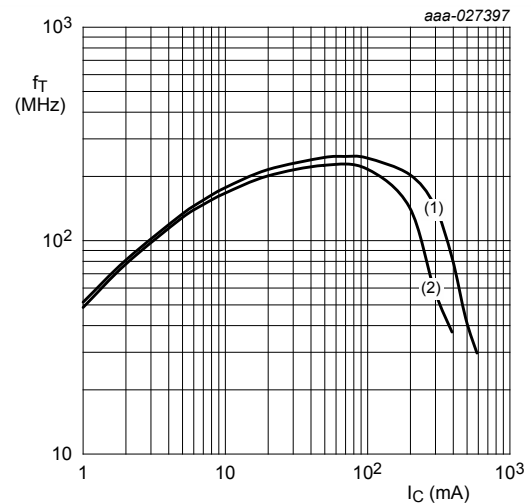
$f = 1$ MHz; $T_{amb} = 25^\circ C$

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



$f = 1$ MHz; $T_{amb} = 25^\circ C$

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



$f = 100$ MHz; $T_{amb} = 25^\circ C$

(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.

9 Package outline

Table 9. Package outline

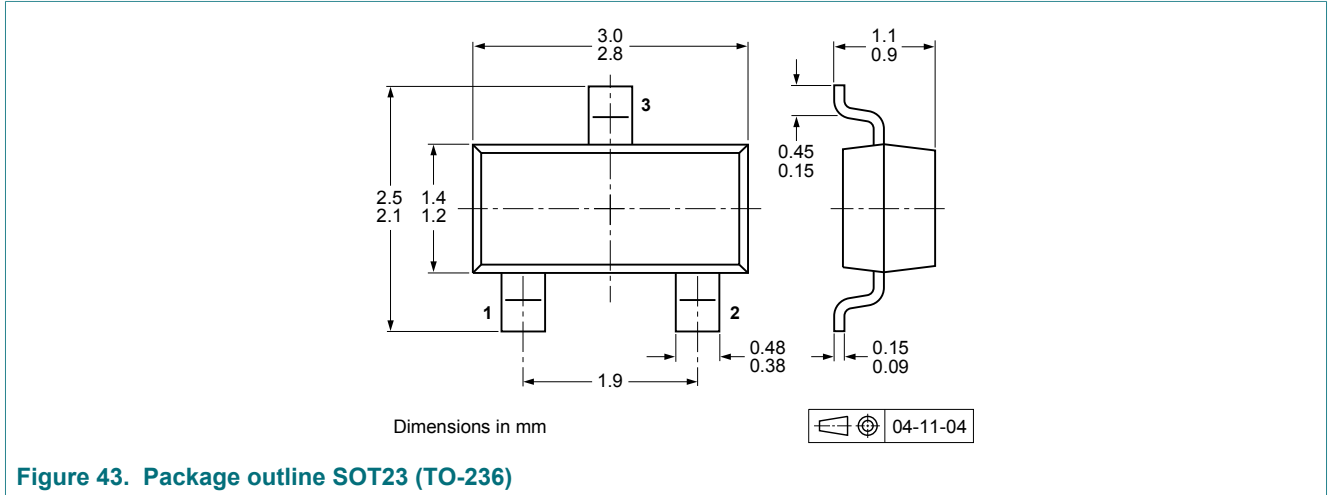


Figure 43. Package outline SOT23 (TO-236)

10 Soldering

Table 10. Soldering

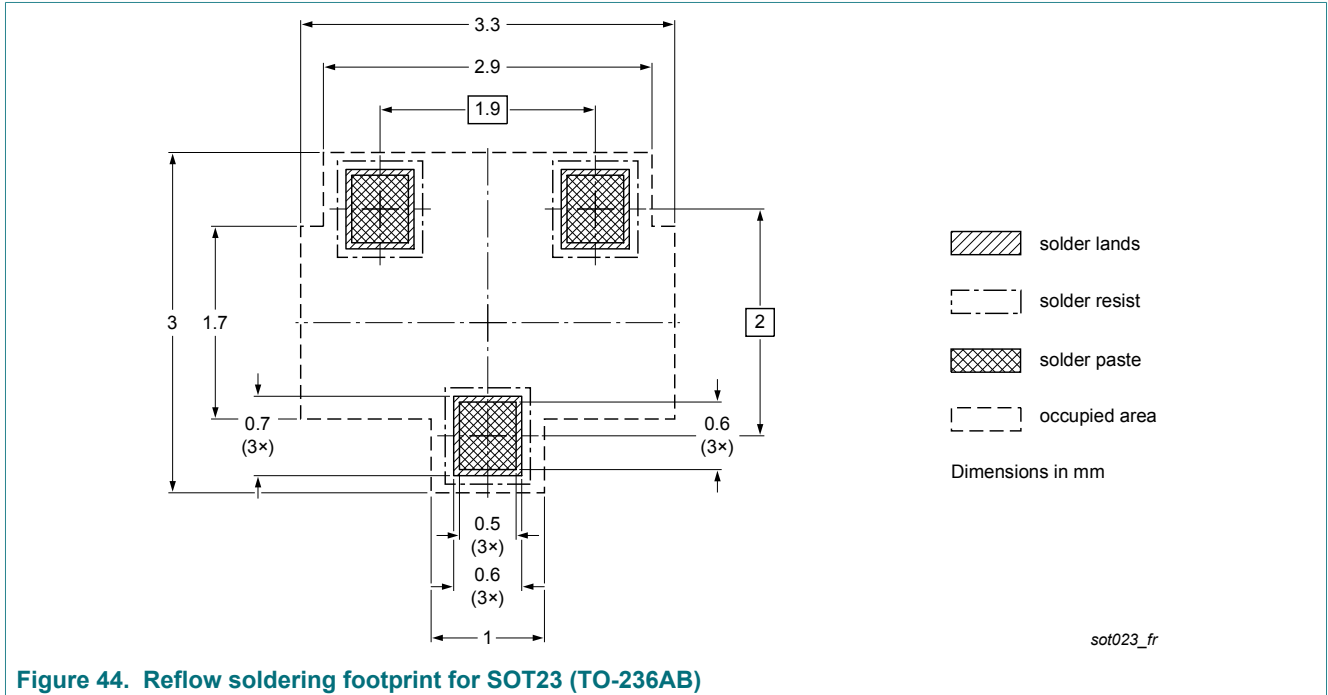
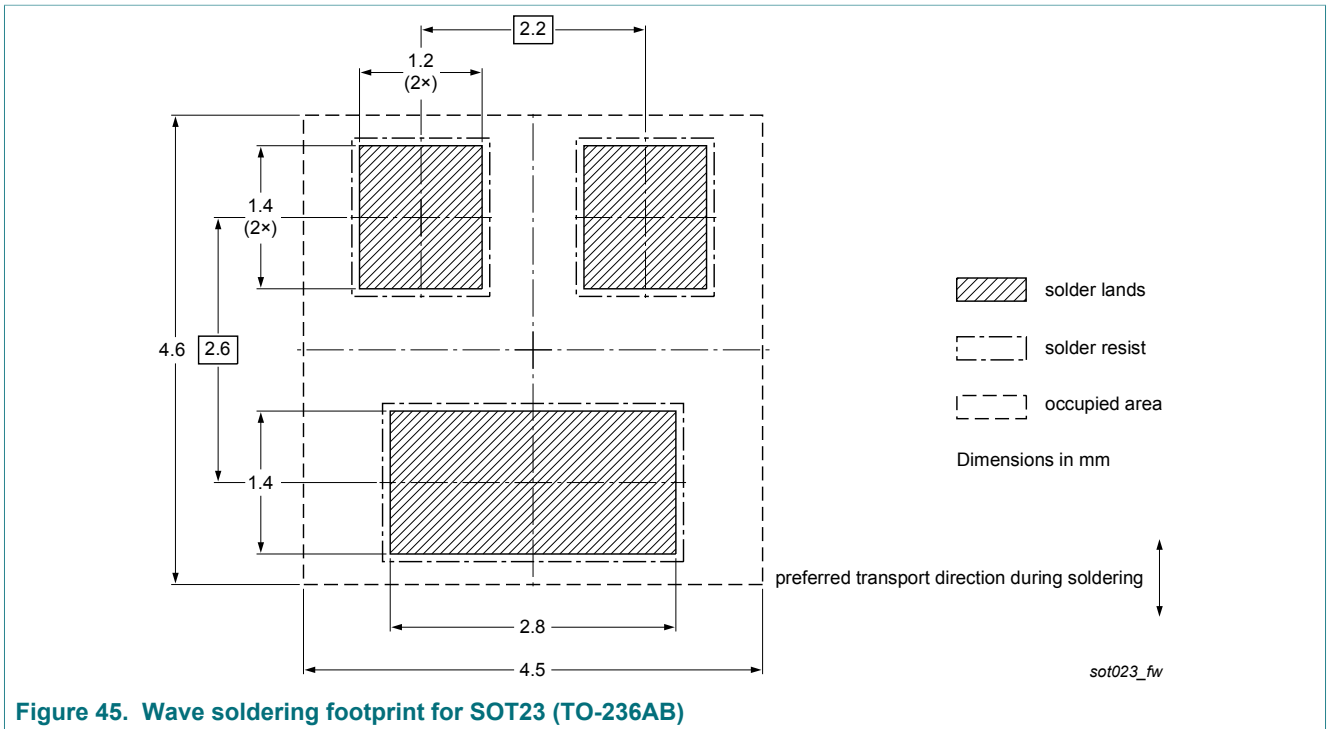


Figure 44. Reflow soldering footprint for SOT23 (TO-236AB)



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			-

12 Legal information

12.1 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".

[3] The product status of device(s) described in this document may have changed since this document was published and may differ in case of multiple devices. The latest product status information is available on the Internet at URL <http://www.nexperia.com>.

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