



# 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

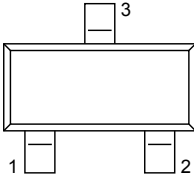
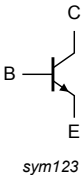
Table 2. Quick reference data  
*T<sub>amb</sub> = 25 °C unless otherwise specified.*

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
V <sub>CEO</sub>	collector-emitter voltage	open base		-	-	45	V
I <sub>C</sub>	collector current			-	-	500	mA
I <sub>CM</sub>	peak collector current	single pulse; t <sub>p</sub> ≤ 1 ms		-	-	1	A
h <sub>FE</sub>	DC current gain	V <sub>CE</sub> = 1 V; I <sub>C</sub> = 100 mA					
	BC817K-16		[1]	100	-	250	-
	BC817K-25		[1]	160	-	400	-
	BC817K-40		[1]	250	-	600	-

[1] pulsed; t<sub>p</sub> ≤ 300 µs; δ ≤ 0.02

2 Pinning information

Table 3. Pinning

Pin	Symbol	Description	Simplified outline	Graphic symbol
1	B	base		
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			

## 4 Marking

Table 5. Marking

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

[1] % = placeholder for manufacturing site code

## 5 Limiting values

Table 6. Limiting values

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

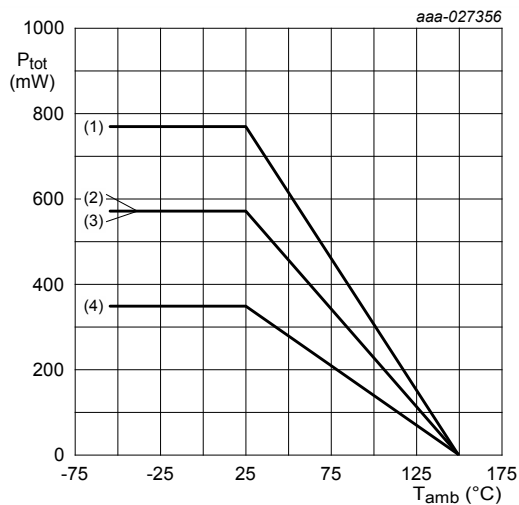
Symbol	Parameter	Conditions	Min	Max	Unit
$V_{CBO}$	collector-base voltage	open emitter	-	50	V
$V_{CEO}$	collector-emitter voltage	open base	-	45	V
$V_{EBO}$	emitter-base voltage	open collector	-	5	V
$I_C$	collector current		-	500	mA
$I_{CM}$	peak collector current	single pulse; $t_p \leq 1$ ms	-	1	A
$I_{BM}$	peak base current	single pulse; $t_p \leq 1$ ms	-	200	mA
$P_{tot}$	total power dissipation	$T_{amb} \leq 25$ °C <sup>[1]</sup>	-	350	mW
		<sup>[2]</sup>	-	575	mW
		<sup>[3]</sup>	-	575	mW
		<sup>[4]</sup>	-	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<sup>2</sup>.

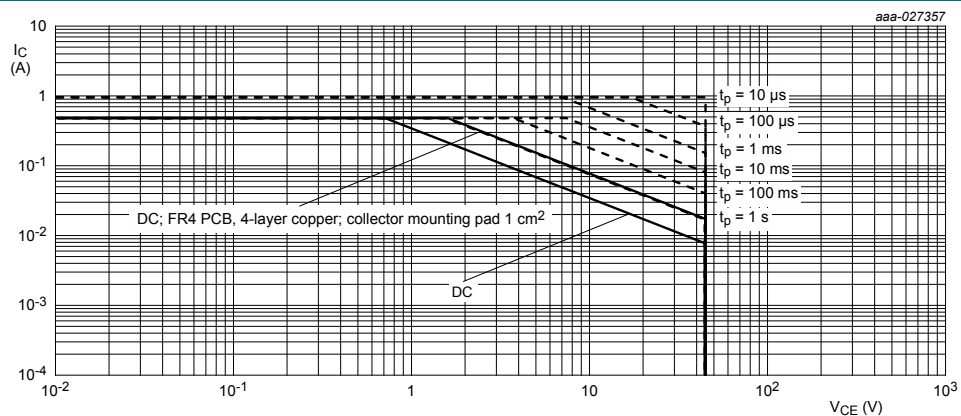
[3] Device mounted on an FR4 Printed-Circuit-Board (PCB); 4-layer copper; tin-plated and standard footprint.

[4] Device mounted on an FR4 Printed-Circuit-Board (PCB); 4-layer copper; tin-plated; mounting pad for collector 1 cm<sup>2</sup>.



- (1) FR4 PCB, 4-layer copper; 1 cm<sup>2</sup>  
 (2) FR4 PCB, single-sided copper; 1 cm<sup>2</sup>  
 (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;

$T_{amb} = 25\text{ °C}$

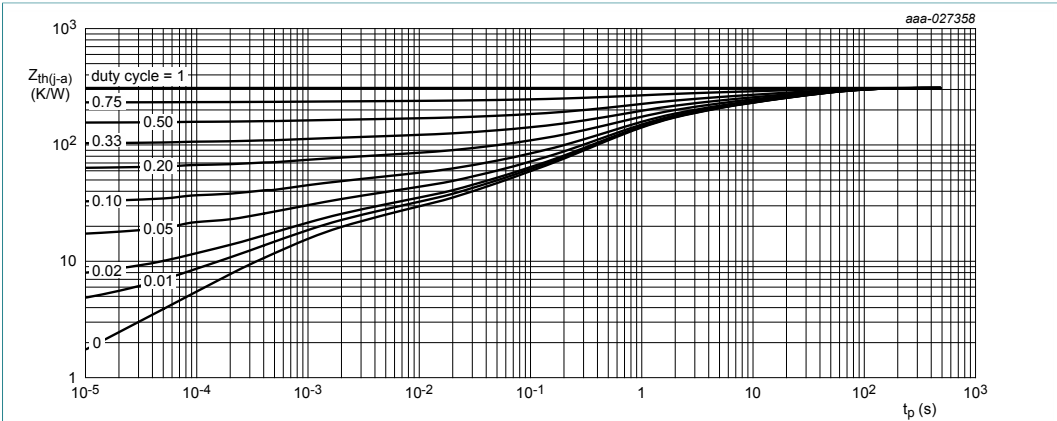
**Figure 2. Safe operating area; junction to ambient; continuous and peak collector currents as a function of collector-emitter voltage**

6 Thermal characteristics

Table 7. Thermal characteristics

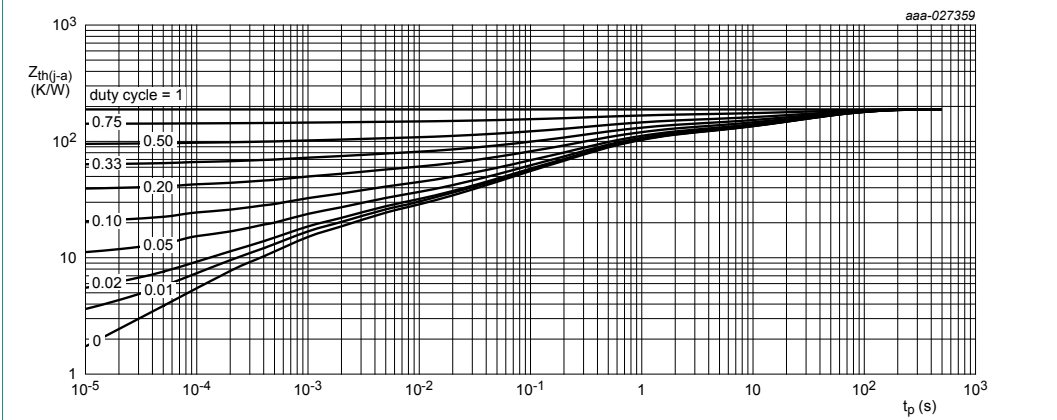
Symbol	Parameter	Conditions		Min	Typ	Max	Unit
$R_{th(j-a)}$	thermal resistance from junction to ambient	in free air	[1]	-	-	358	K/W
			[2]	-	-	218	K/W
			[3]	-	-	218	K/W
			[4]	-	-	162	K/W
$R_{th(j-sp)}$	thermal resistance from junction to solder point			-	-	60	K/W

[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<sup>2</sup>.  
[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<sup>2</sup>.



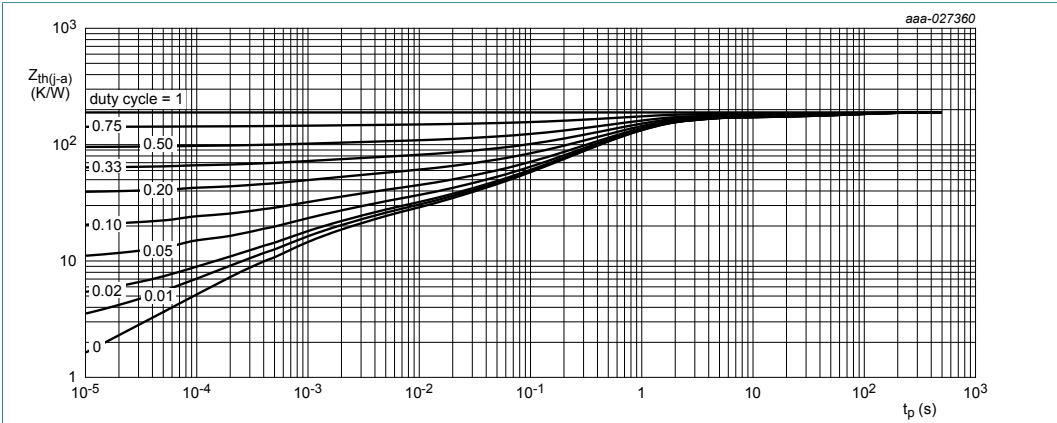
FR4 PCB; single-sided copper; tin-plated and standard footprint

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



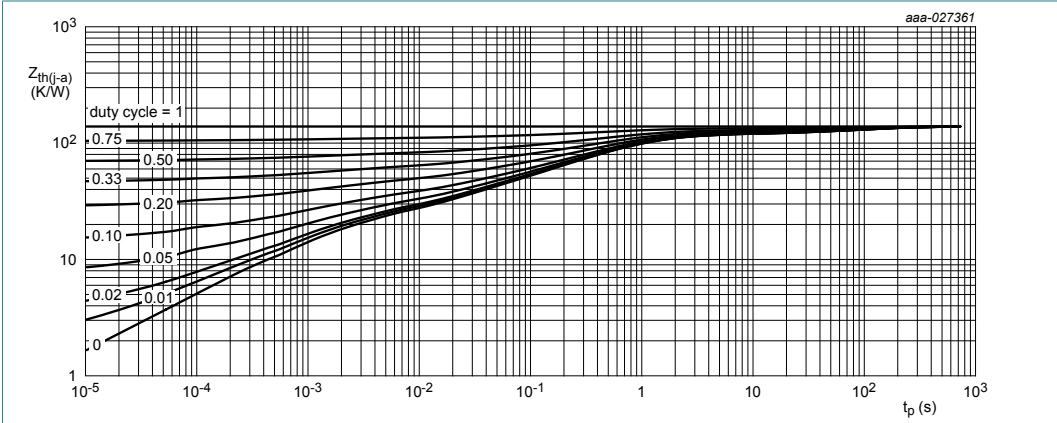
FR4 PCB; single-sided copper; tin-plated; mounting pad for collector 1 cm<sup>2</sup>

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 cm<sup>2</sup>

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

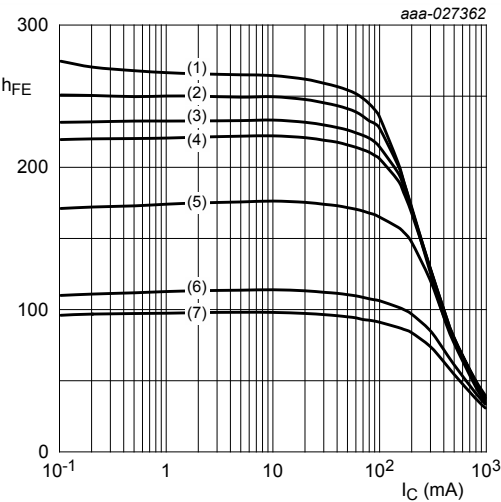
## 7 Characteristics

**Table 8. Characteristics**

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

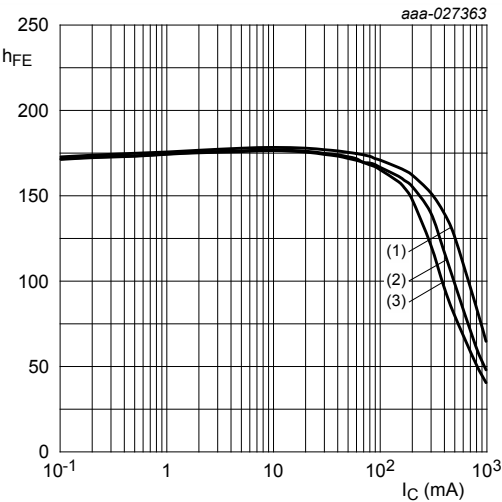
Symbol	Parameter	Conditions		Min	Typ	Max	Unit
$V_{(BR)CBO}$	collector-base breakdown voltage	$I_C = 100\text{ }\mu\text{A}$ ; $I_E = 0\text{ A}$		50	-	-	V
$V_{(BR)CEO}$	collector-emitter breakdown voltage	$I_C = 10\text{ mA}$ ; $I_B = 0\text{ A}$		45	-	-	V
$V_{(BR)EBO}$	emitter-base breakdown voltage	$I_E = 100\text{ }\mu\text{A}$ ; $I_C = 0\text{ A}$		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	$\mu\text{A}$
$I_{EBO}$	emitter-base cut-off current	$V_{EB} = 5\text{ V}$ ; $I_C = 0\text{ A}$		-	-	100	nA
$h_{FE}$	DC current gain						
	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;  $t_p \leq 300\text{ }\mu\text{s}$ ;  $\delta \leq 0.02$



$V_{CE} = 1$  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

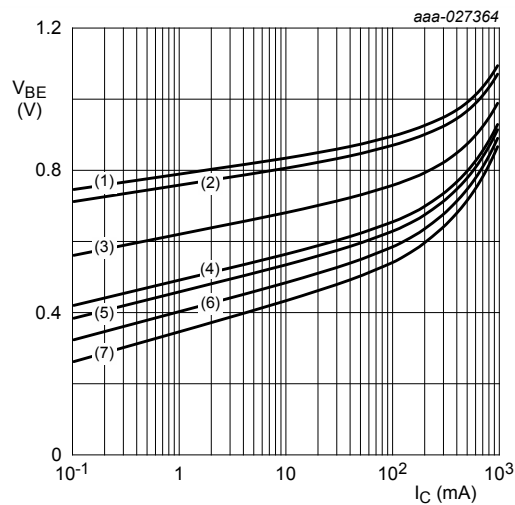
Figure 7. BC817K-16: DC current gain as a function of collector current; typical values



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

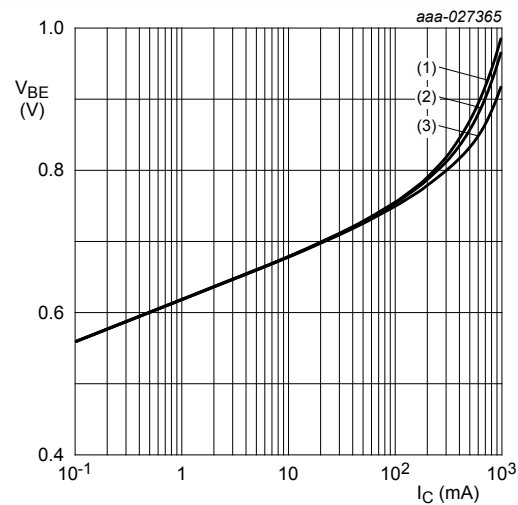
Figure 8. BC817K-16: DC current gain as a function of collector current; typical values





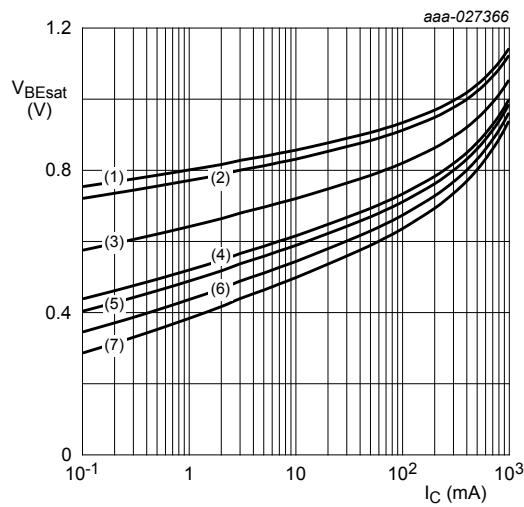
- $V_{CE} = 1$  V
- (1)  $T_{amb} = -55$  °C
  - (2)  $T_{amb} = -40$  °C
  - (3)  $T_{amb} = 25$  °C
  - (4)  $T_{amb} = 85$  °C
  - (5)  $T_{amb} = 100$  °C
  - (6)  $T_{amb} = 125$  °C
  - (7)  $T_{amb} = 150$  °C

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

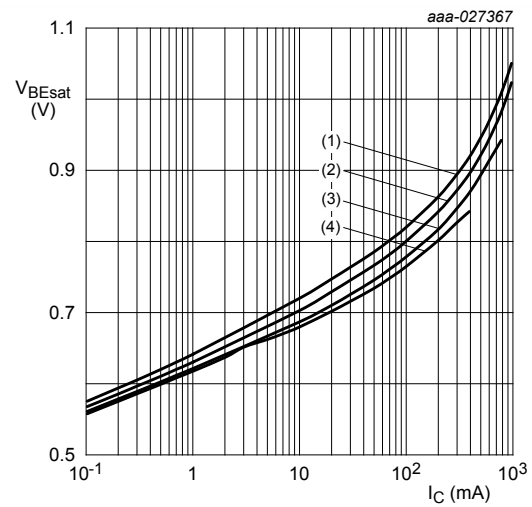
Figure 10. BC817K-16: Base-emitter voltage as a function of collector current; typical values



$I_C/I_B = 10$

- (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)  $T_{amb} = 150\text{ °C}$

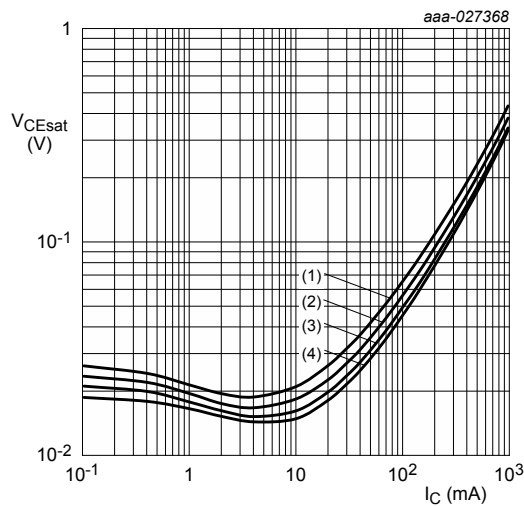
**Figure 11. BC817K-16: Base-emitter saturation voltage as a function of collector current; typical values**



$T_{amb} = 25\text{ °C}$

- (1)  $I_C/I_B = 10$
- (2)  $I_C/I_B = 20$
- (3)  $I_C/I_B = 50$
- (4)  $I_C/I_B = 100$

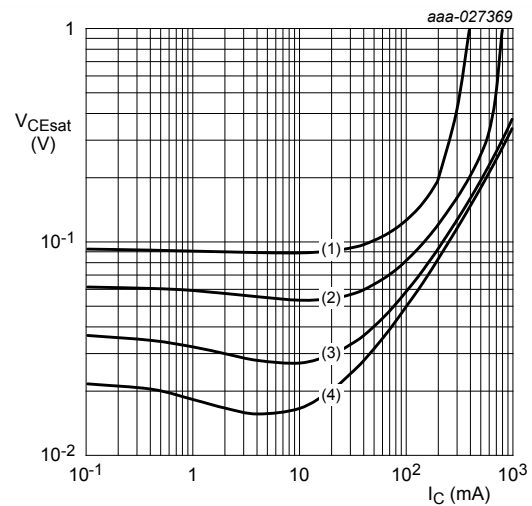
**Figure 12. BC817K-16: Base-emitter saturation voltage as a function of collector current; typical values**



$I_C/I_B = 10$

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

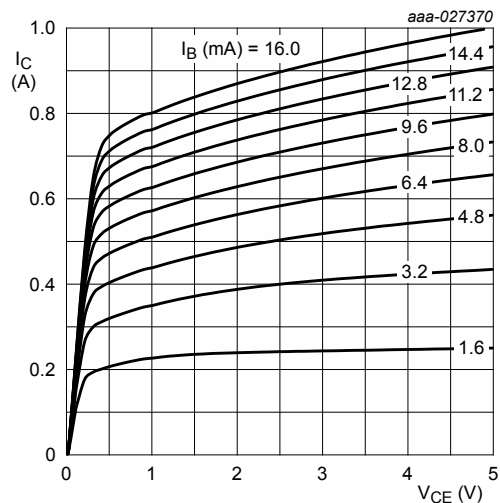
**Figure 13. BC817K-16: Collector-emitter saturation voltage as a function of collector current; typical values**



$T_{amb} = 25\text{ °C}$

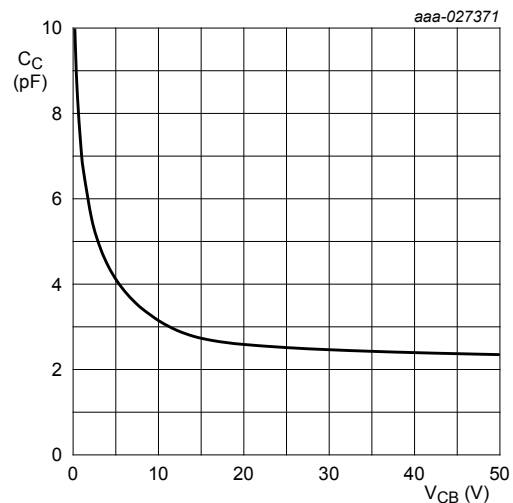
- (1)  $I_C/I_B = 100$
- (2)  $I_C/I_B = 50$
- (3)  $I_C/I_B = 20$
- (4)  $I_C/I_B = 10$

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



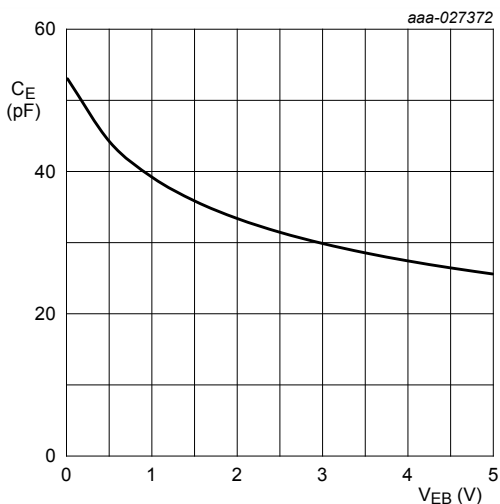
$T_{amb} = 25\text{ }^{\circ}\text{C}$

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



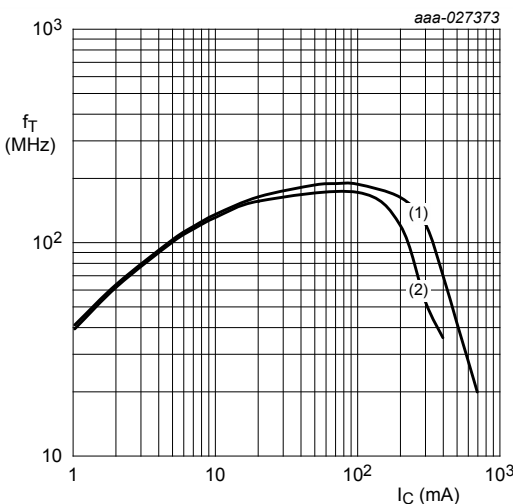
$f = 1\text{ MHz}$ ;  $T_{amb} = 25\text{ }^{\circ}\text{C}$

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



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

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

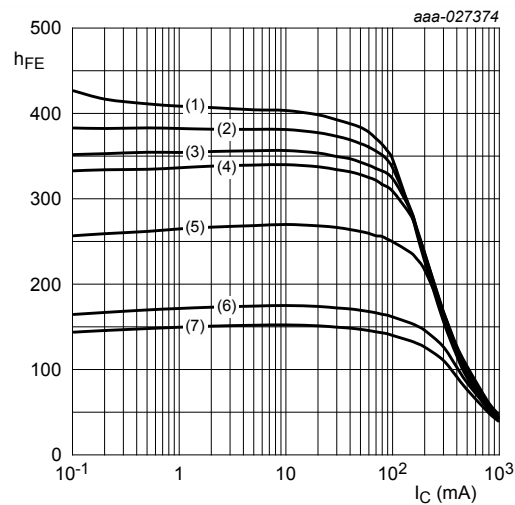


$f = 100\text{ MHz}$ ;  $T_{amb} = 25\text{ }^{\circ}\text{C}$

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

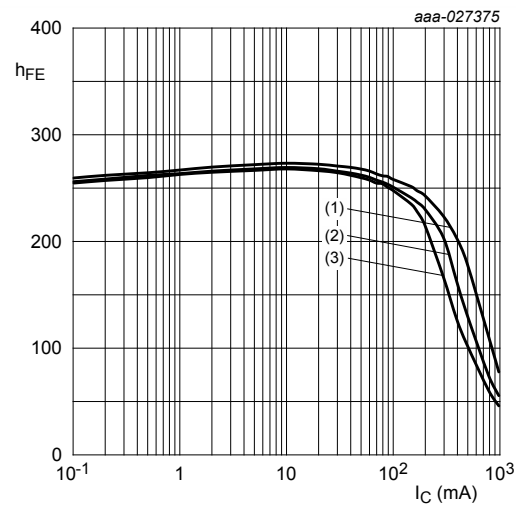
(2)  $V_{CE} = 1\text{ V}$

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



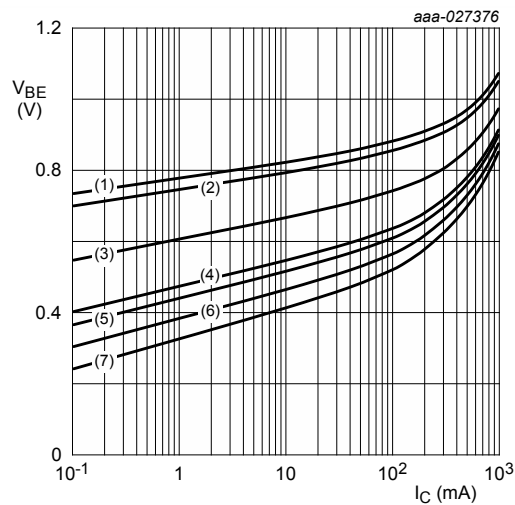
- $V_{CE} = 1$  V
- (1)  $T_{amb} = 150$  °C
  - (2)  $T_{amb} = 125$  °C
  - (3)  $T_{amb} = 100$  °C
  - (4)  $T_{amb} = 85$  °C
  - (5)  $T_{amb} = 25$  °C
  - (6)  $T_{amb} = -40$  °C
  - (7)  $T_{amb} = -55$  °C

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



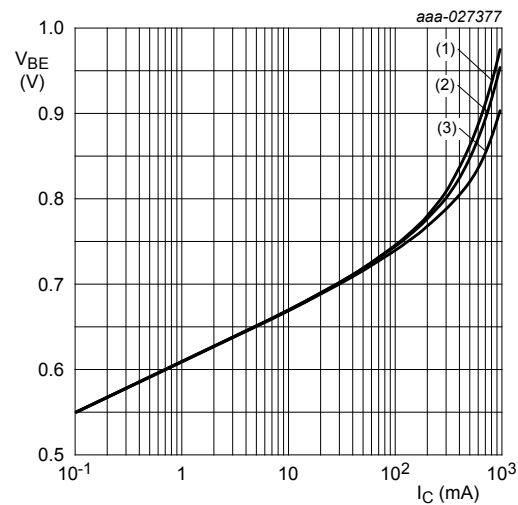
- $T_{amb} = 25$  °C
- (1)  $V_{CE} = 5$  V
  - (2)  $V_{CE} = 2$  V
  - (3)  $V_{CE} = 1$  V

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



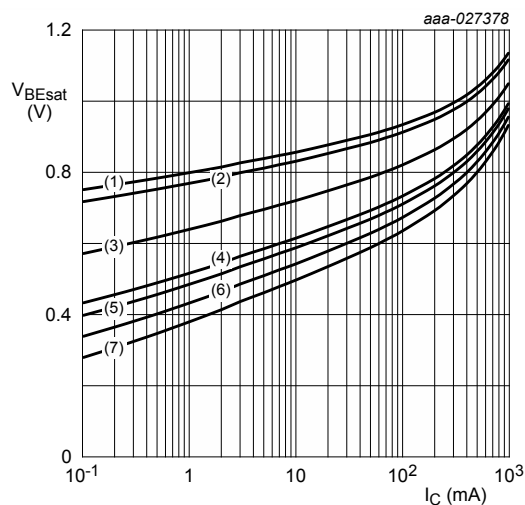
- $V_{CE} = 1$  V
- (1)  $T_{amb} = -55$  °C
  - (2)  $T_{amb} = -40$  °C
  - (3)  $T_{amb} = 25$  °C
  - (4)  $T_{amb} = 85$  °C
  - (5)  $T_{amb} = 100$  °C
  - (6)  $T_{amb} = 125$  °C
  - (7)  $T_{amb} = 150$  °C

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

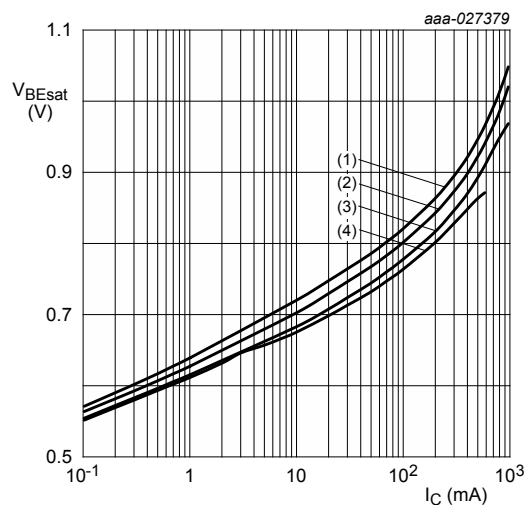
Figure 22. BC817K-25: Base-emitter voltage as a function of collector current; typical values



$I_C/I_B = 10$

- (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)  $T_{amb} = 150\text{ °C}$

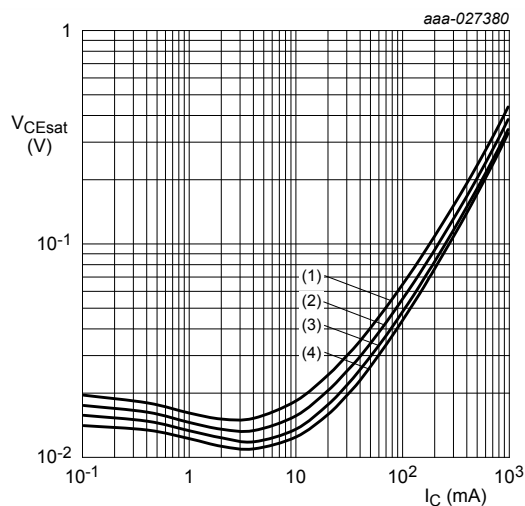
**Figure 23. BC817K-25: Base-emitter saturation voltage as a function of collector current; typical values**



$T_{amb} = 25\text{ °C}$

- (1)  $I_C/I_B = 10$
- (2)  $I_C/I_B = 20$
- (3)  $I_C/I_B = 50$
- (4)  $I_C/I_B = 100$

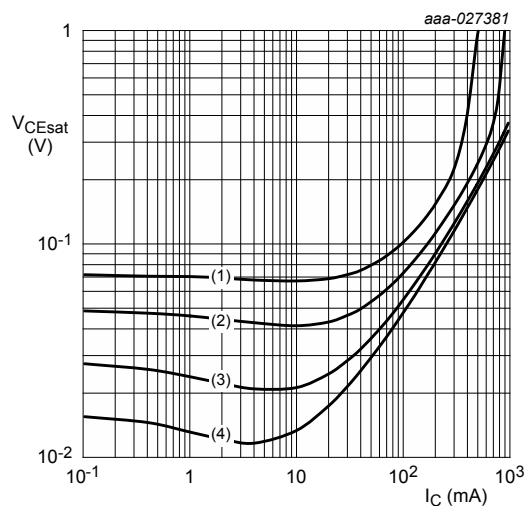
**Figure 24. BC817K-25: Base-emitter saturation voltage as a function of collector current; typical values**



$I_C/I_B = 10$

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

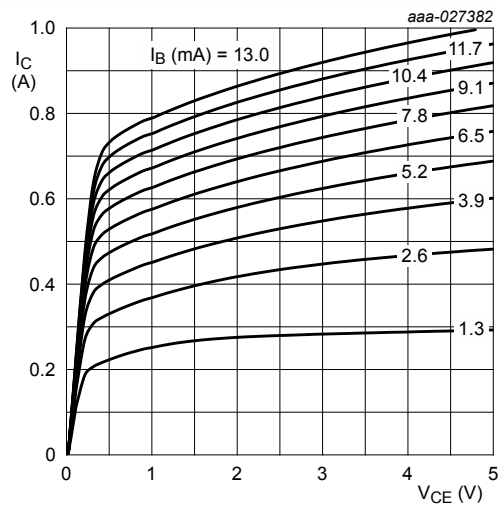
**Figure 25. BC817K-25: Collector-emitter saturation voltage as a function of collector current; typical values**



$T_{amb} = 25\text{ °C}$

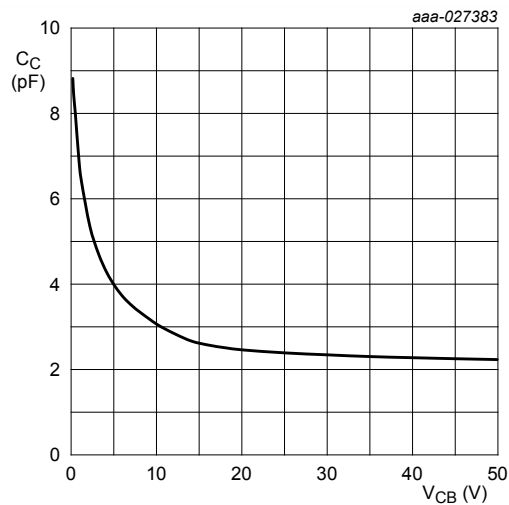
- (1)  $I_C/I_B = 100$
- (2)  $I_C/I_B = 50$
- (3)  $I_C/I_B = 20$
- (4)  $I_C/I_B = 10$

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



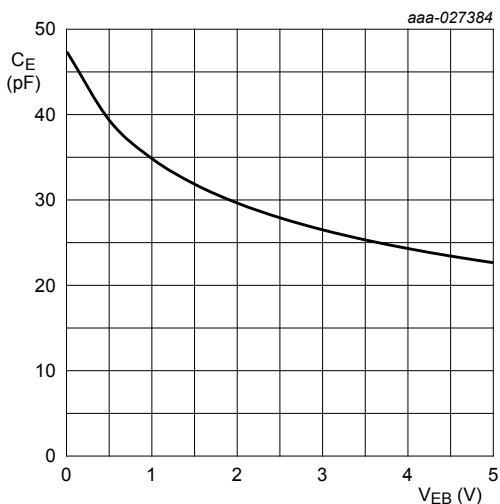
$T_{amb} = 25\text{ }^{\circ}\text{C}$

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



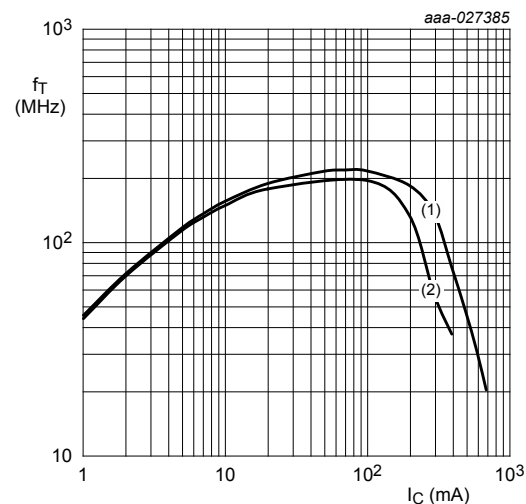
$f = 1\text{ MHz}$ ;  $T_{amb} = 25\text{ }^{\circ}\text{C}$

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

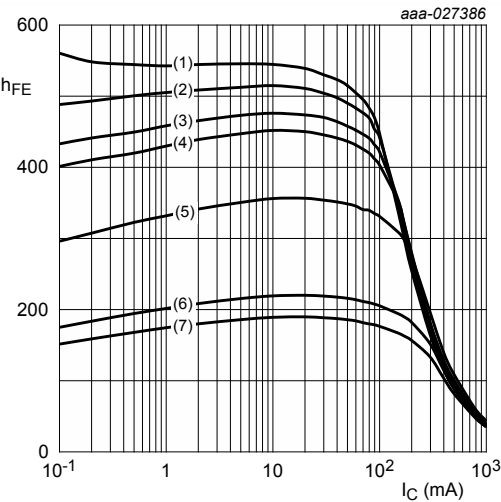


$f = 100\text{ MHz}$ ;  $T_{amb} = 25\text{ }^{\circ}\text{C}$

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

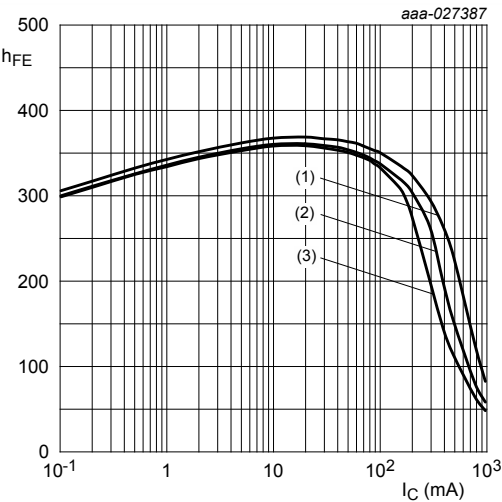
(2)  $V_{CE} = 1\text{ V}$

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



$V_{CE} = 1$  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

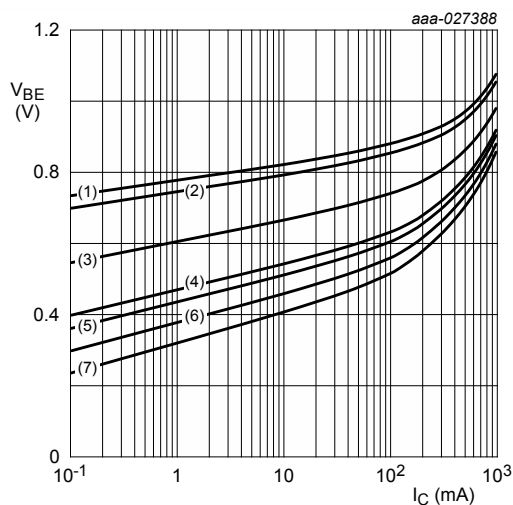
Figure 31. BC817K-40: DC current gain as a function of collector current; typical values



$T_{amb} = 25$  °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





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

(1)  $T_{amb} = -55 \text{ }^{\circ}\text{C}$

(2)  $T_{amb} = -40 \text{ }^{\circ}\text{C}$

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

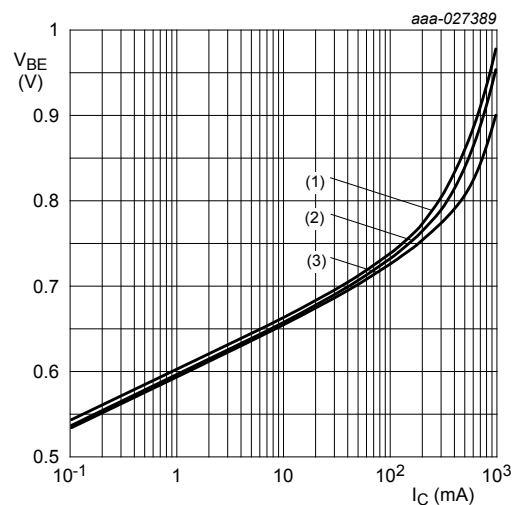
(4)  $T_{amb} = 85 \text{ }^{\circ}\text{C}$

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



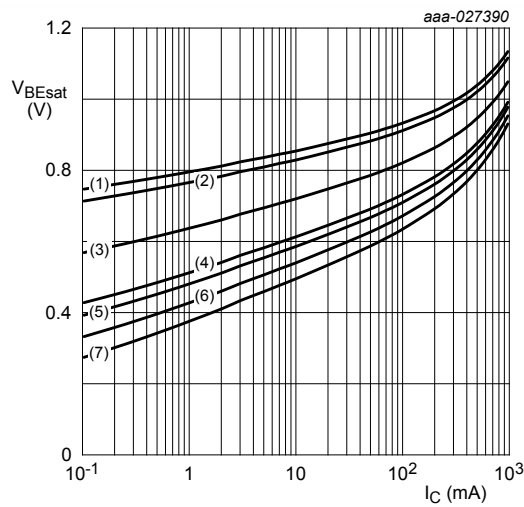
$T_{amb} = 25 \text{ }^{\circ}\text{C}$

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

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

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

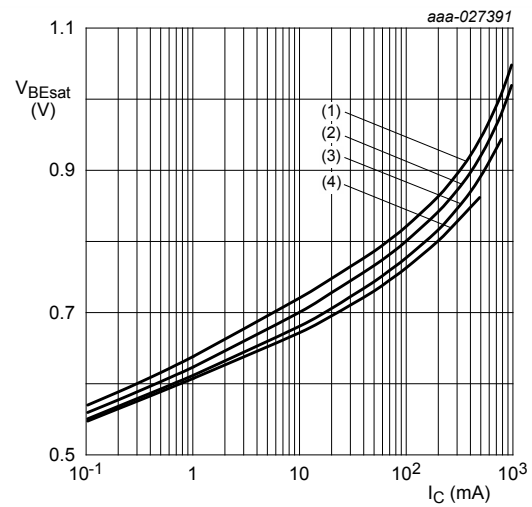
**Figure 34. BC817K-40: Base-emitter voltage as a function of collector current; typical values**



$$I_C/I_B = 10$$

- (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)  $T_{amb} = 150\text{ °C}$

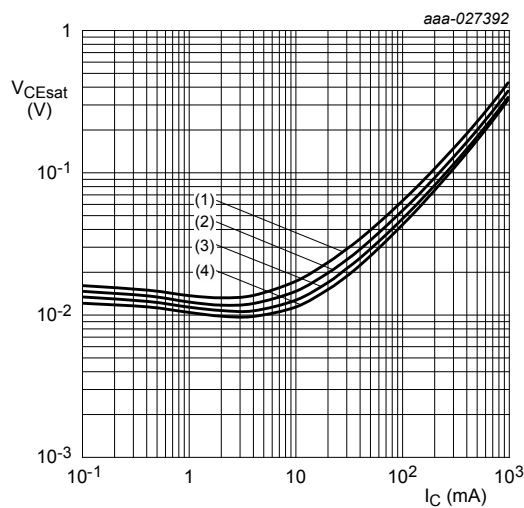
**Figure 35. BC817K-40: Base-emitter saturation voltage as a function of collector current; typical values**



$$T_{amb} = 25\text{ °C}$$

- (1)  $I_C/I_B = 10$
- (2)  $I_C/I_B = 20$
- (3)  $I_C/I_B = 50$
- (4)  $I_C/I_B = 100$

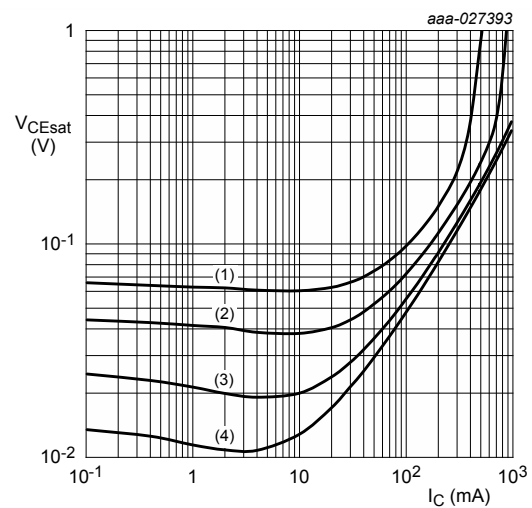
**Figure 36. BC817K-40: Base-emitter saturation voltage as a function of collector current; typical values**



$$I_C/I_B = 10$$

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

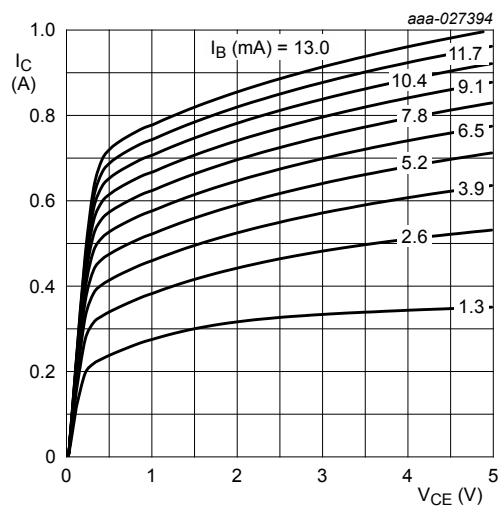
**Figure 37. BC817K-40: Collector-emitter saturation voltage as a function of collector current; typical values**



$$T_{amb} = 25\text{ °C}$$

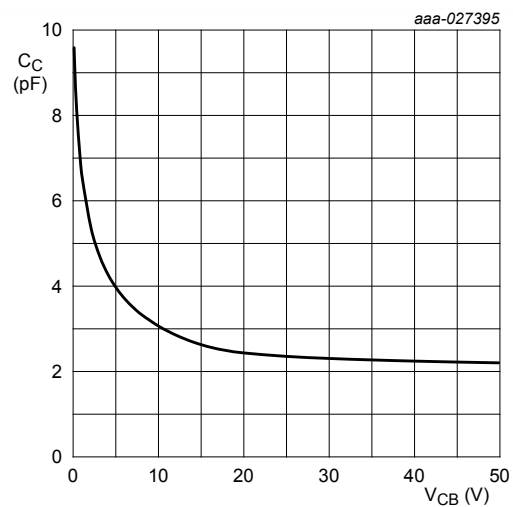
- (1)  $I_C/I_B = 100$
- (2)  $I_C/I_B = 50$
- (3)  $I_C/I_B = 20$
- (4)  $I_C/I_B = 10$

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



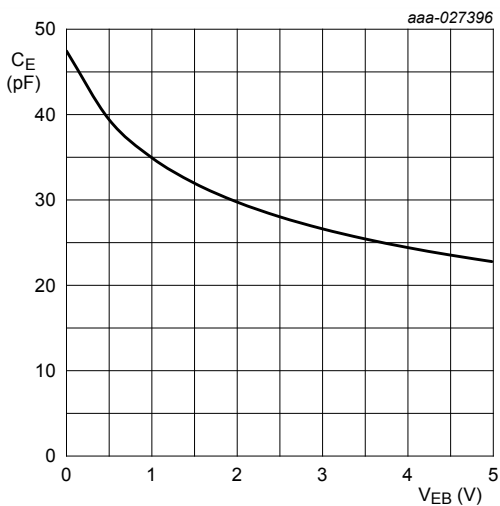
$T_{amb} = 25\text{ }^{\circ}\text{C}$

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



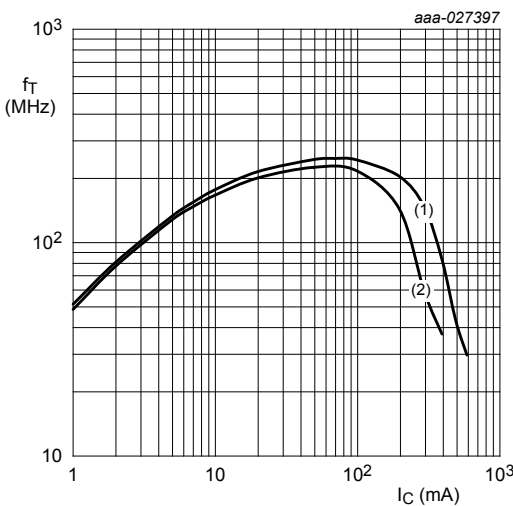
$f = 1\text{ MHz}$ ;  $T_{amb} = 25\text{ }^{\circ}\text{C}$

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



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

Figure 41. BC817K-40: 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 42. BC817K-40: Transition frequency as a function of collector current voltage; typical values

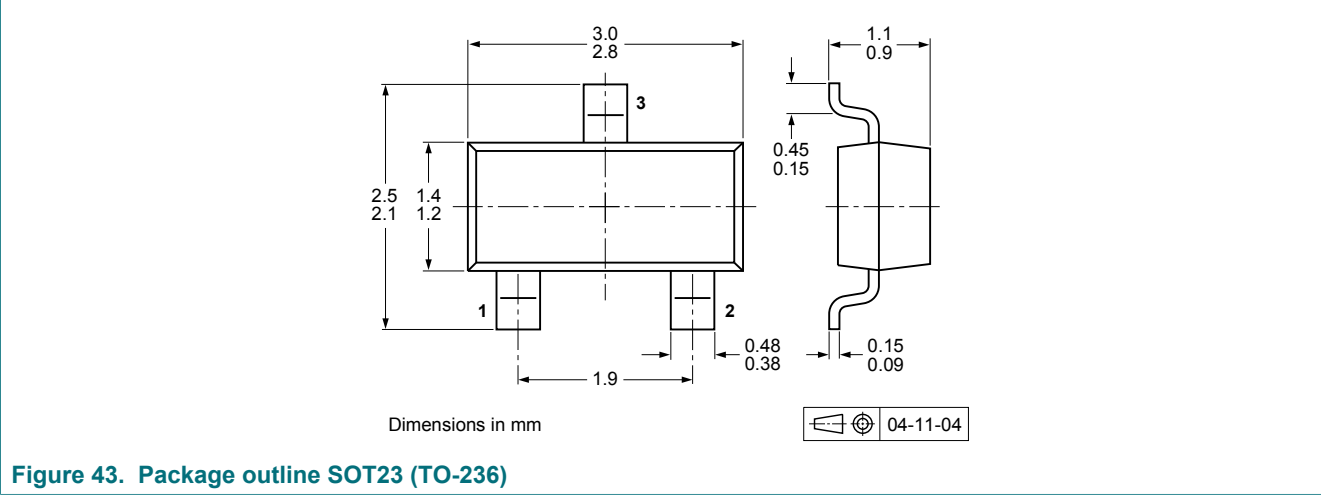
## 8 Test information

### 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.

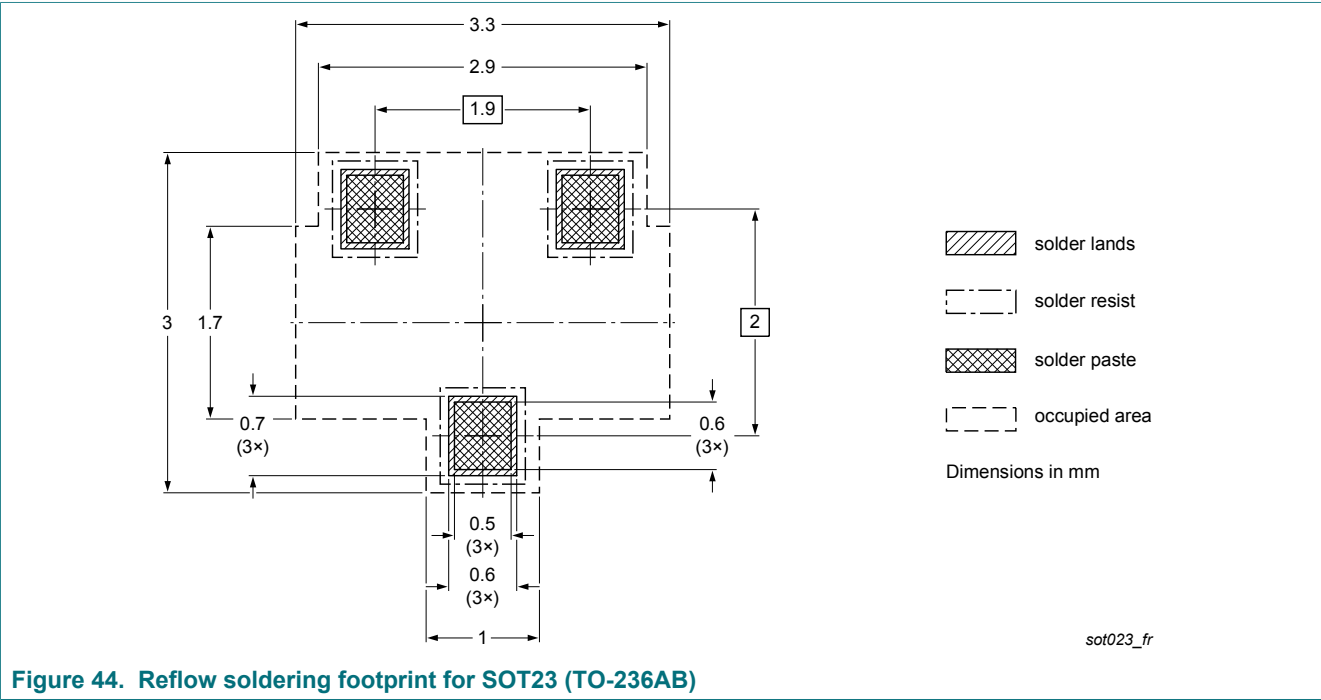
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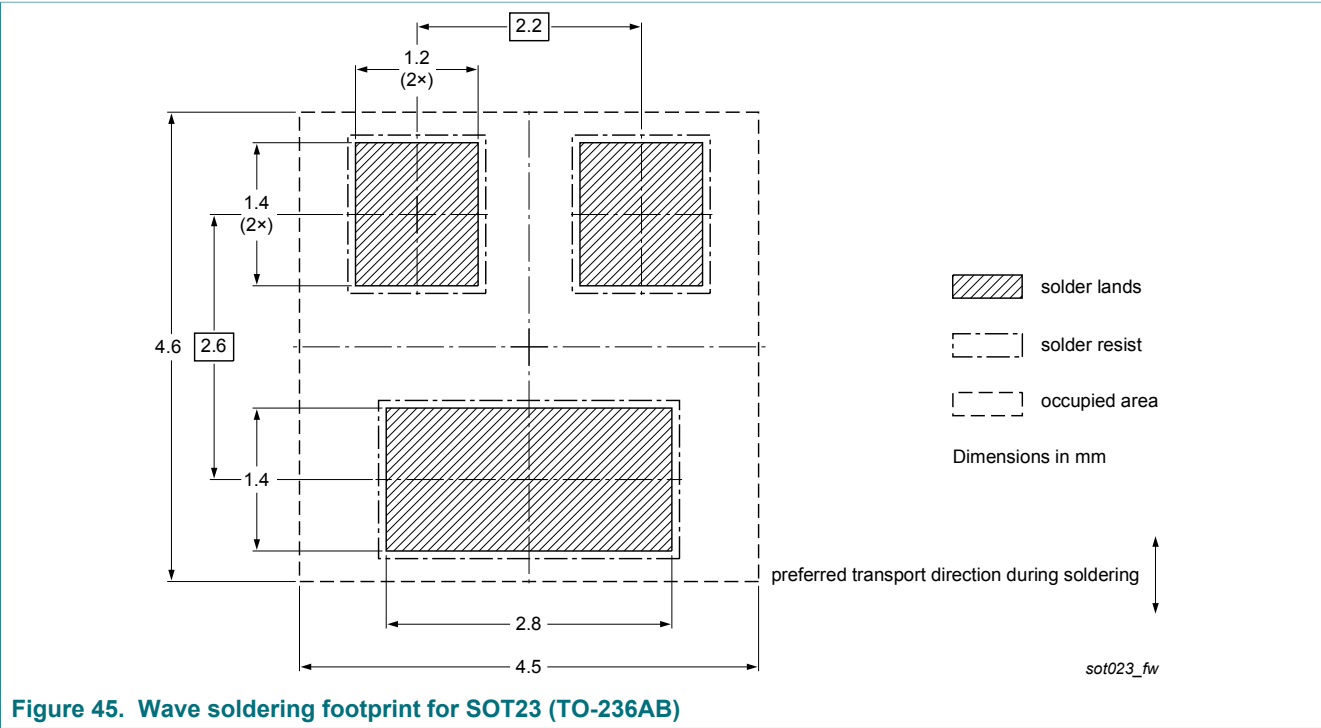
Table 9. Package outline



10 Soldering

Table 10. Soldering





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 <sup>[1][2]</sup>	Product status <sup>[3]</sup>	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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