# BC817KH-Q series

## 45 V, 500 mA NPN general-purpose transistors

Rev. 1 — 18 October 2023 Product data sheet

## 1. General description

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

**Table 1. Product overview**

| Type number | Package | | PNP complement: |
|---|---|---|---|
| | Nexperia | JEDEC | |
| BC817K-16H-Q | SOT23 | TO-236AB | BC807-16H-Q |
| BC817K-25H-Q | | | BC807-25H-Q |
| BC817K-40H-Q | | | BC807-40H-Q |

## 2. Features and benefits

- Three current gain selections
- High power dissipation capability
- High-temperature applications up to 175 °C
- Qualified according to AEC-Q101 and recommended for use in automotive applications

## 3. Applications

- General-purpose switching and amplification

## 4. Quick reference data

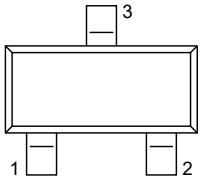
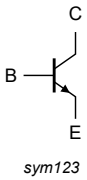
**Table 2. Quick reference data**

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

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

## 5. Pinning information

**Table 3. Pinning**

| Pin | Symbol | Description | Simplified outline | Graphic symbol |
|---|---|---|---|---|
| 1 | B | base |  SOT23 |  |
| 2 | E | emitter | | |
| 3 | C | collector | | |



## 6. Ordering information

**Table 4. Ordering information**

| Type number | Package | | |
|---|---|---|---|
| | Name | Description | Version |
| BC817K-16H-Q | SOT23 | plastic, surface-mounted package; 3 leads | SOT23 |
| BC817K-25H-Q | | | |
| BC817K-40H-Q | | | |

## 7. Marking

**Table 5. Marking**

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

[1] % = placeholder for manufacturing site code

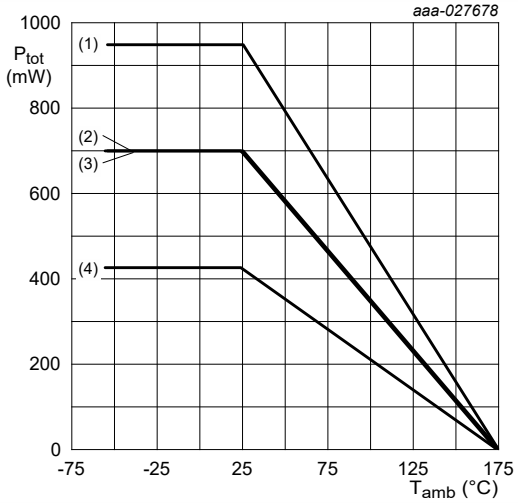
# 8. Limiting values

**Table 6. Limiting values**

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

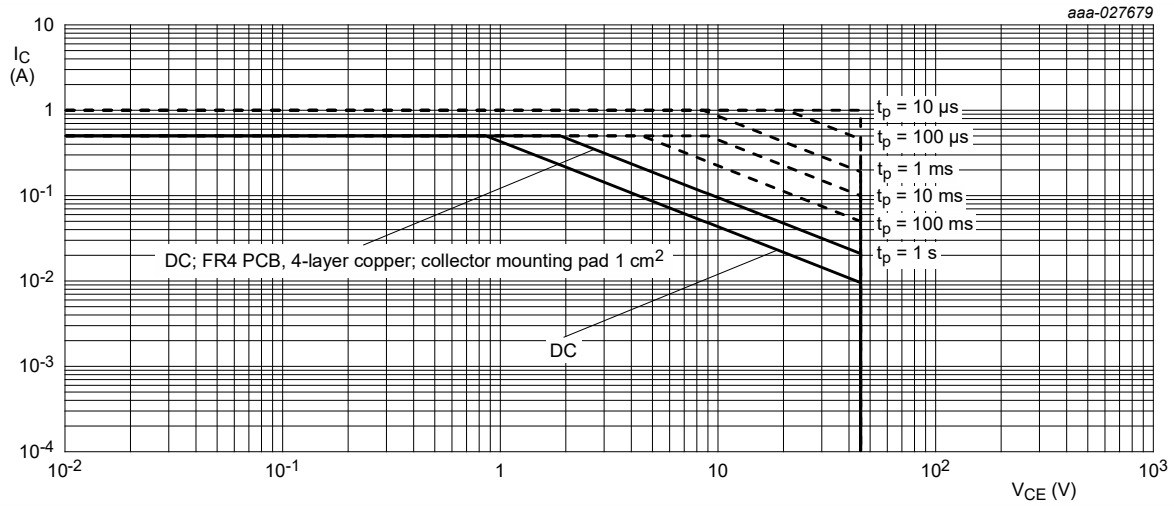
| Symbol | Parameter | Conditions | | Min | Max | Unit |
|---|---|---|---|---|---|---|
| $V_{CBO}$ | collector-base voltage | open emitter | | - | 50 | V |
| $V_{CEO}$ | collector-emitter voltage | open base | | - | 45 | V |
| $V_{EBO}$ | emitter-base voltage | open collector | | - | 7 | V |
| $I_C$ | 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] | - | 425 | mW |
| | | | [2] | - | 700 | mW |
| | | | [3] | - | 700 | mW |
| | | | [4] | - | 950 | mW |
| $T_j$ | junction temperature | | | - | 175 | °C |
| $T_{amb}$ | ambient temperature | | | -55 | 175 | °C |
| $T_{stg}$ | storage temperature | | | -65 | 175 | °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 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 $cm^2$.




(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

**Fig. 1. Power derating curves**




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

$T_{amb}$ = 25 °C

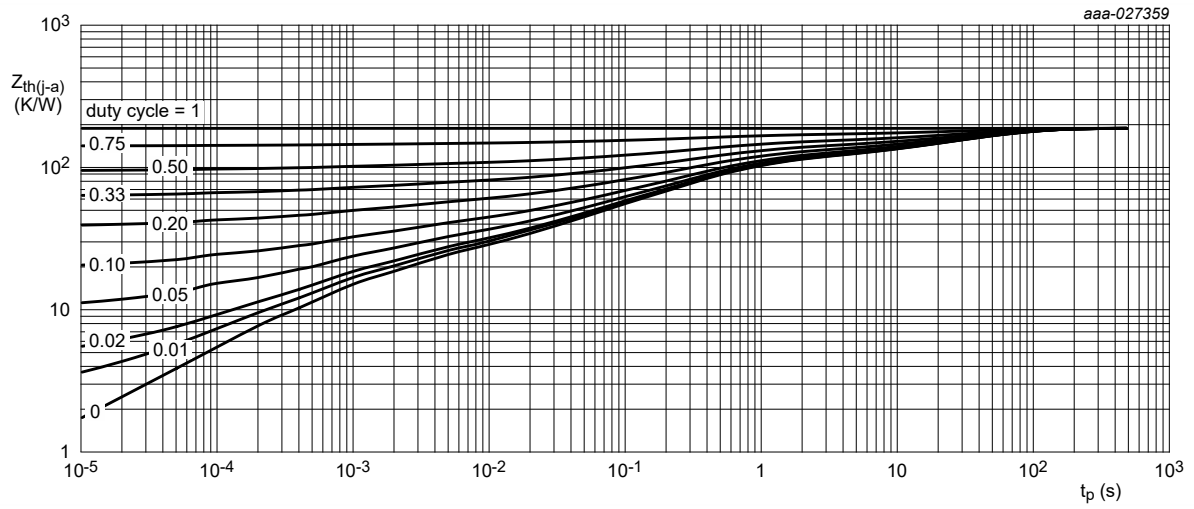
**Fig. 2. Safe operating area; junction to ambient; continous and peak collector currents as a funtion of collector-emitter voltage**

# 9. Thermal characteristics

**Table 7. Thermal characteristics**

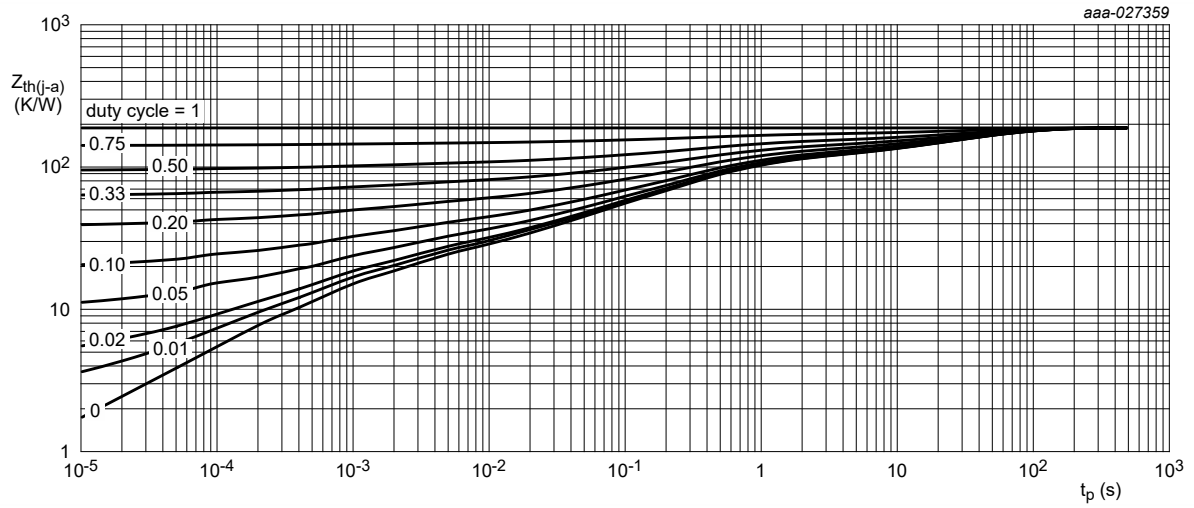
| Symbol | Parameter | Conditions | | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|---|
| $R_{th(j-a)}$ | thermal resistance from junction to ambient | in free air; $T_{amb}$ = 25 °C | [1] | - | - | 353 | K/W |
| | | | [2] | - | - | 215 | K/W |
| | | | [3] | - | - | 215 | K/W |
| | | | [4] | - | - | 158 | 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 $cm^2$.



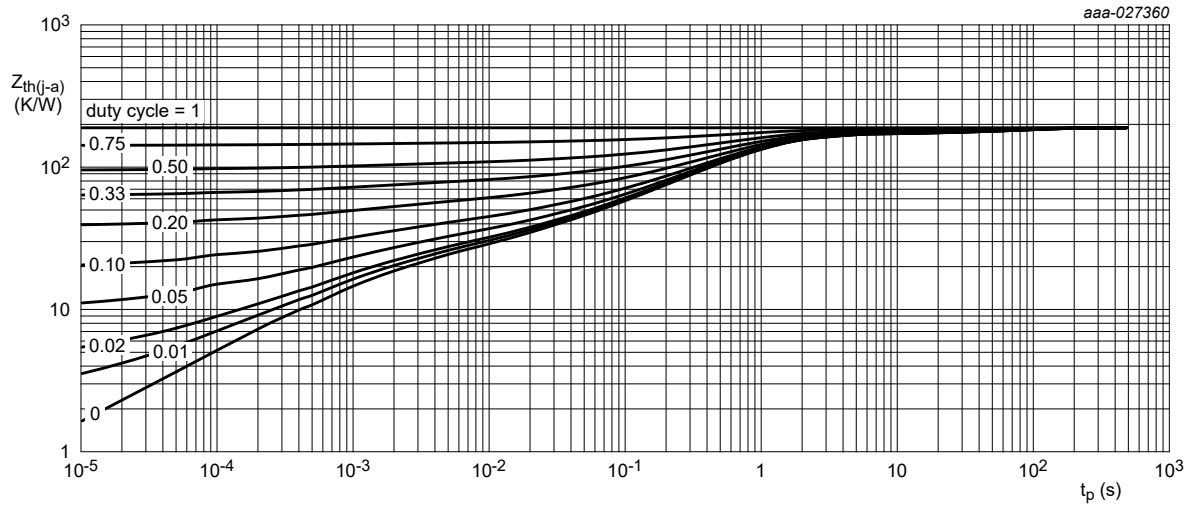

FR4 PCB; single-sided copper; tin-plated and standard footprint

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



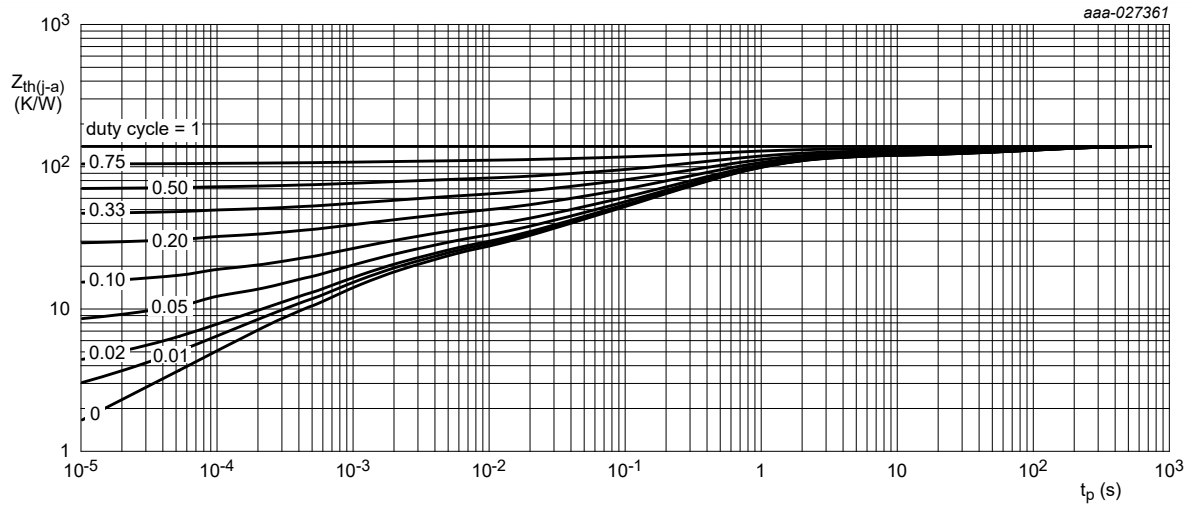

FR4 PCB; single-sided copper; tin-plated; mounting pad for collector 1 $cm^2$

**Fig. 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

**Fig. 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 $cm^2$

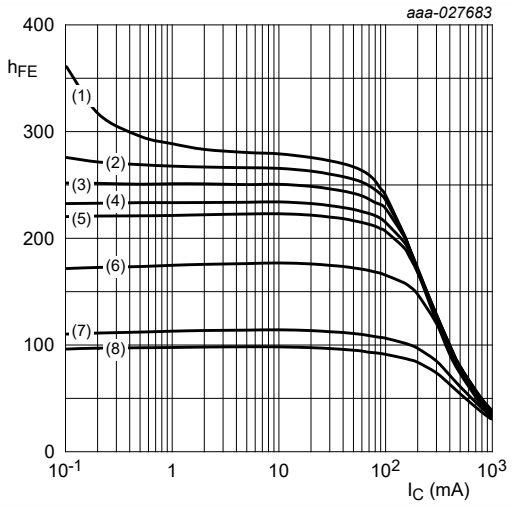
**Fig. 6. Transient thermal impedance from junction to ambient as a function of pulse duration; typical values**

## 10. Characteristics

**Table 8. Characteristics**

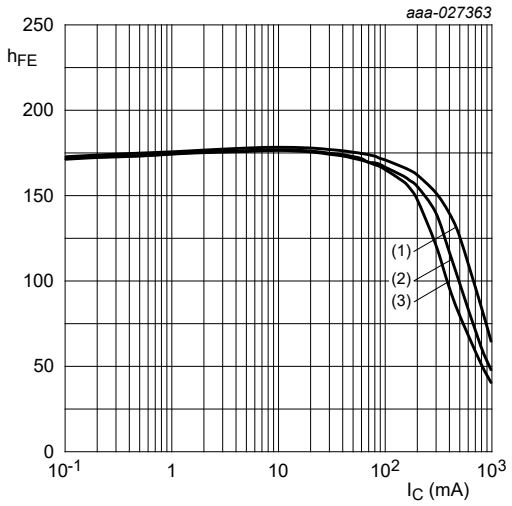
| Symbol | Parameter | Conditions | | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|---|
| $V_{(BR)CBO}$ | collector-base breakdown voltage | $I_C$ = 100 µA; $I_E$ = 0 A; $T_{amb}$ = 25 °C | | 50 | - | | V |
| $V_{(BR)CEO}$ | collector-emitter breakdown voltage | $I_C$ = 10 mA; $I_B$ = 0 A; $T_{amb}$ = 25 °C | | 45 | - | | V |
| $V_{(BR)EBO}$ | emitter-base breakdown voltage | $I_E$ = 100 µA; $I_C$ = 0 A; $T_{amb}$ = 25 °C | | 7 | - | | V |
| $I_{CBO}$ | collector-base cut-off current | $V_{CB}$ = 25 V; $I_E$ = 0 A; $T_{amb}$ = 25 °C | | - | - | 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; $T_{amb}$ = 25 °C | | - | - | 100 | nA |
| $h_{FE}$ | DC current gain | | | | | | |
| | BC817K-16H-Q | $V_{CE}$ = 1 V; $I_C$ = 100 mA; $T_{amb}$ = 25 °C | [1] | 100 | - | 250 | |
| | BC817K-25H-Q | | [1] | 160 | - | 400 | |
| | BC817K-40H-Q | | [1] | 250 | - | 600 | |
| | BC817K-16H-Q<br>BC817K-25H-Q<br>BC817K-40H-Q | $V_{CE}$ = 1 V; $I_C$ = 500 mA; $T_{amb}$ = 25 °C | [1] | 40 | - | - | |
| $V_{CEsat}$ | collector-emitter saturation voltage | $I_C$ = 500 mA; $I_B$ = 50 mA; $T_{amb}$ = 25 °C | [1] | - | - | 700 | mV |
| $V_{BEsat}$ | base-emitter saturation voltage | $I_C$ = 500 mA; $I_B$ = 50 mA; $T_{amb}$ = 25 °C | [1] | - | - | 1.2 | V |
| $V_{BE}$ | base-emitter voltage | $V_{CE}$ = 1 V; $I_C$ = 500 mA; $T_{amb}$ = 25 °C | [1] | - | - | 1.2 | V |
| $f_T$ | transition frequency | $V_{CE}$ = 5 V; $I_C$ = 10 mA; f = 100 MHz; $T_{amb}$ = 25 °C | | 100 | - | - | MHz |
| $C_c$ | collector capacitance | $V_{CB}$ = 10 V; $I_E$ = $i_e$ = 0 A; f = 1 MHz; $T_{amb}$ = 25 °C | | - | 3 | - | pF |
| $C_e$ | emitter capacitance | $V_{EB}$ = 0.5 V; $I_C$ = $i_c$ = 0 A; f = 1 MHz; $T_{amb}$ = 25 °C | | | | | |
| | BC817K-16H-Q | | | - | 44 | - | pF |
| | BC817K-25H-Q | | | - | 39 | - | pF |
| | BC817K-40H-Q | | | - | 39 | - | pF |

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



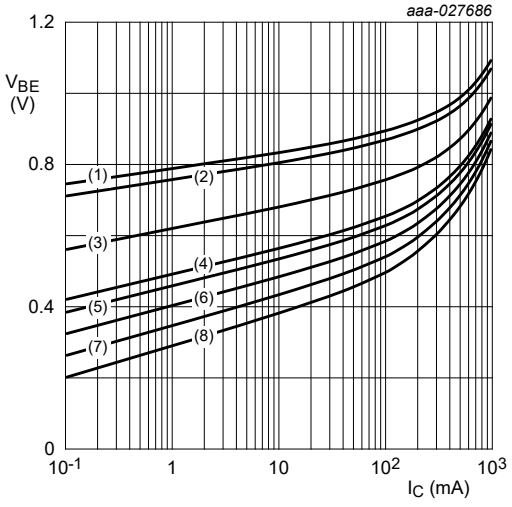

$V_{CE}$ = 1 V
(1) $T_{amb}$ = 175 °C
(2) $T_{amb}$ = 150 °C
(3) $T_{amb}$ = 125 °C
(4) $T_{amb}$ = 100 °C
(5) $T_{amb}$ = 85 °C
(6) $T_{amb}$ = 25 °C
(7) $T_{amb}$ = -40 °C
(8) $T_{amb}$ = -55 °C

**Fig. 7. BC817K-16H-Q: DC current gain as a function of collector current; typical values**



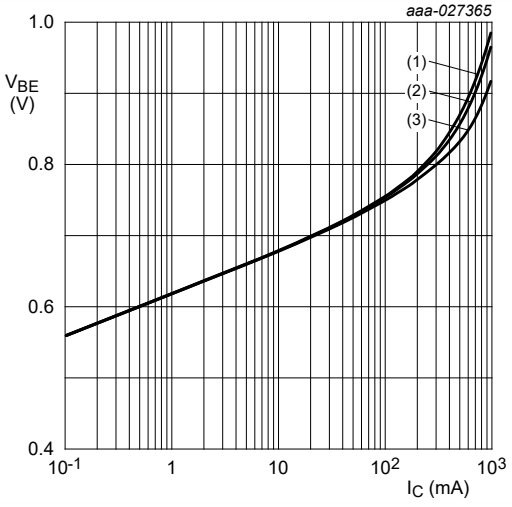

$T_{amb}$ = 25 °C
(1) $V_{CE}$ = 5 V
(2) $V_{CE}$ = 2 V
(3) $V_{CE}$ = 1 V

**Fig. 8. BC817K-16H-Q: DC current gain as a function of collector current; typical values**



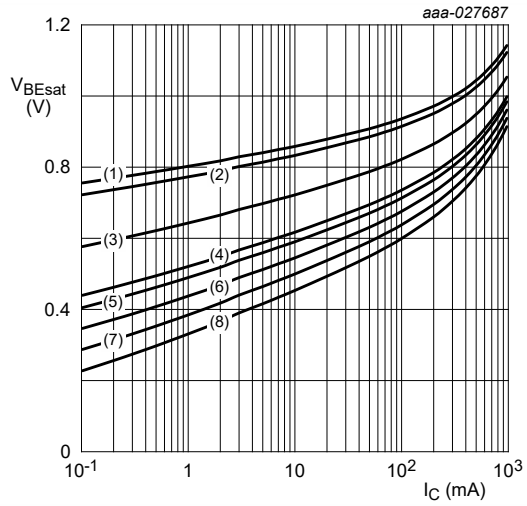

$V_{CE}$ = 1 V
(1) $T_{amb}$ = -55 °C
(2) $T_{amb}$ = -40 °C
(3) $T_{amb}$ = 25 °C
(4) $T_{amb}$ = 85 °C
(5) $T_{amb}$ = 100 °C
(6) $T_{amb}$ = 125 °C
(7) $T_{amb}$ = 150 °C
(8) $T_{amb}$ = 175 °C

**Fig. 9. BC817K-16H-Q: Base-emitter voltage as a function of collector current; typical values**



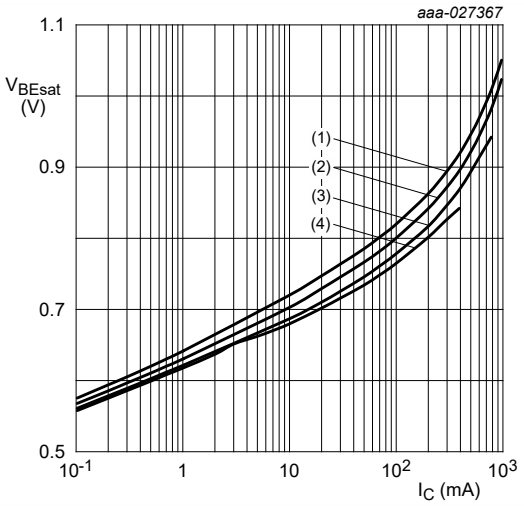

$T_{amb}$ = 25 °C
(1) $V_{CE}$ = 1 V
(2) $V_{CE}$ = 2 V
(3) $V_{CE}$ = 5 V

**Fig. 10. BC817K-16H-Q: Base-emitter voltage as a function of collector current; typical values**



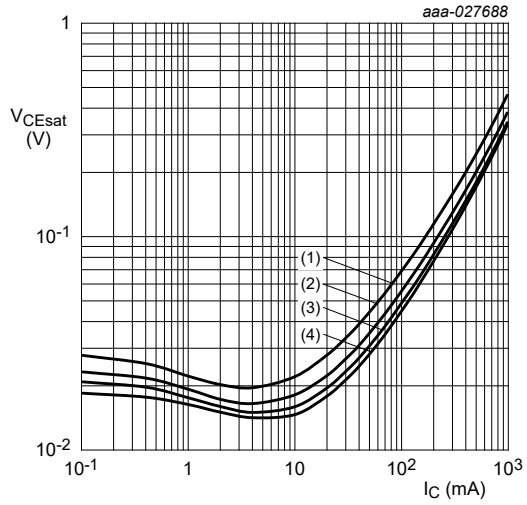

IC/IB = 10
(1) $T_{amb}$ = -55 °C
(2) $T_{amb}$ = -40 °C
(3) $T_{amb}$ = 25 °C
(4) $T_{amb}$ = 85 °C
(5) $T_{amb}$ = 100 °C
(6) $T_{amb}$ = 125 °C
(7) $T_{amb}$ = 150 °C
(8) $T_{amb}$ = 175 °C

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



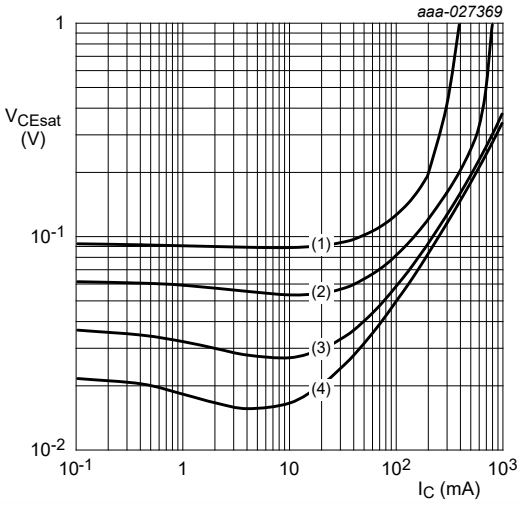

$T_{amb}$ = 25 °C
(1) IC/IB = 10
(2) IC/IB = 20
(3) IC/IB = 50
(4) IC/IB = 100

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



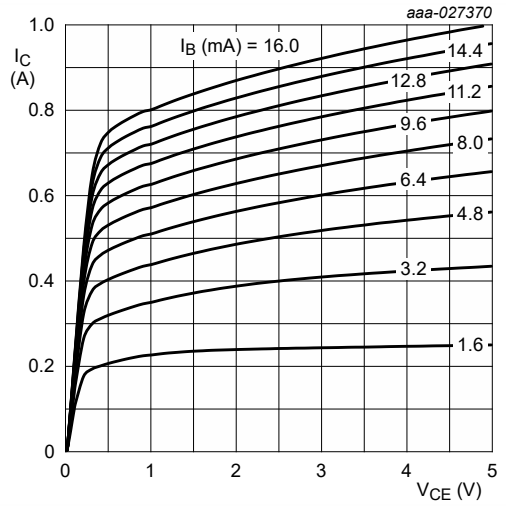

$I_C/I_B$ = 10
(1) $T_{amb}$ = 175 °C
(2) $T_{amb}$ = 85 °C
(3) $T_{amb}$ = 25 °C
(4) $T_{amb}$ = -40 °C

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



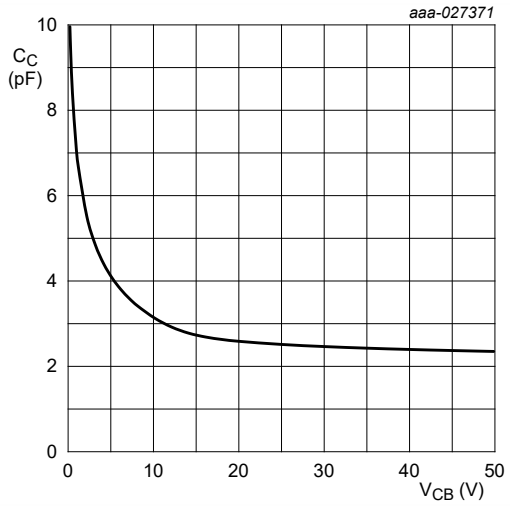

$T_{amb}$ = 25 °C
(1) IC/IB = 100
(2) IC/IB = 50
(3) IC/IB = 20
(4) IC/IB = 10

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




$T_{amb}$ = 25 °C

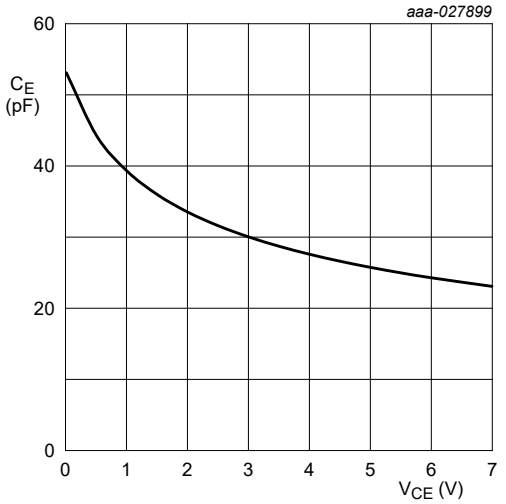
**Fig. 15. BC817K-16H-Q: Collector current as a function of collector-emitter voltage; typical values**




f = 1 MHz

$T_{amb}$ = 25 °C

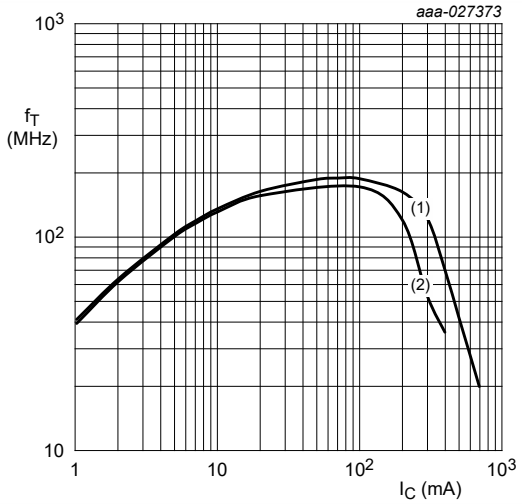
**Fig. 16. BC817K-16H-Q: Collector capacitance as a function of collector-base voltage; typical values**




f = 1 MHz

$T_{amb}$ = 25 °C

**Fig. 17. BC817K-16H-Q: Emitter capacitance as a function of emitter-base voltage; typical values**



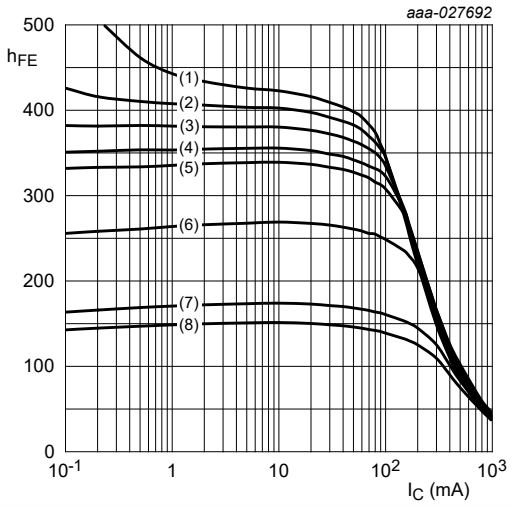

f = 100 MHz

$T_{amb}$ = 25 °C

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

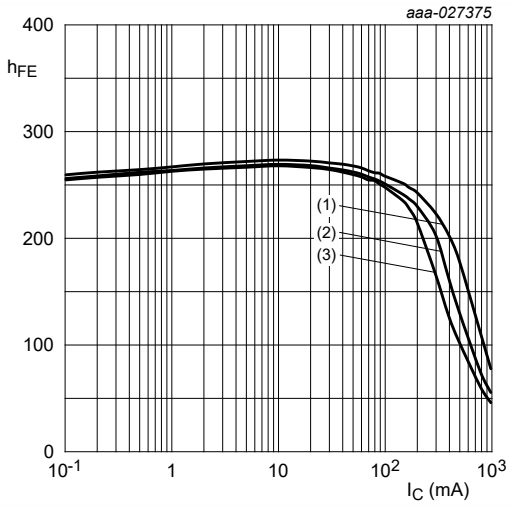
(2) $V_{CE}$ = 1 V

**Fig. 18. BC817K-16H-Q: Transition frequency as a function of collector current; typical values**



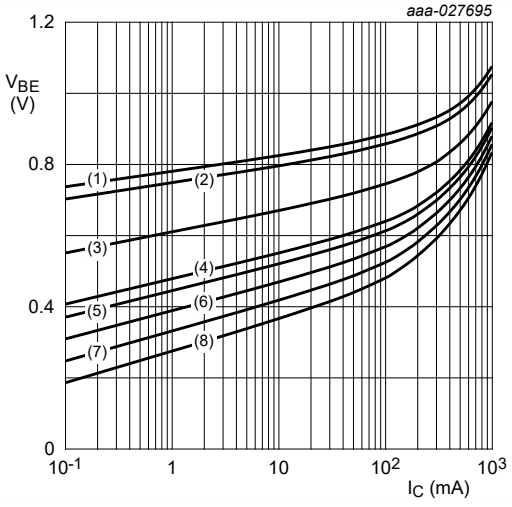

$V_{CE}$ = 1 V
(1) $T_{amb}$ = 175 °C
(2) $T_{amb}$ = 150 °C
(3) $T_{amb}$ = 125 °C
(4) $T_{amb}$ = 100 °C
(5) $T_{amb}$ = 85 °C
(6) $T_{amb}$ = 25 °C
(7) $T_{amb}$ = -40 °C
(8) $T_{amb}$ = -55 °C

**Fig. 19. BC817K-25H-Q: DC current gain as a function of collector current; typical values**



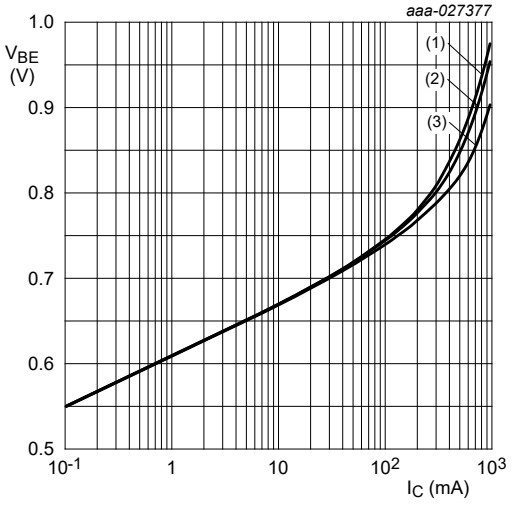

$T_{amb}$ = 25 °C
(1) $V_{CE}$ = 5 V
(2) $V_{CE}$ = 2 V
(3) $V_{CE}$ = 1 V

**Fig. 20. BC817K-25H-Q: DC current gain as a function of collector current; typical values**



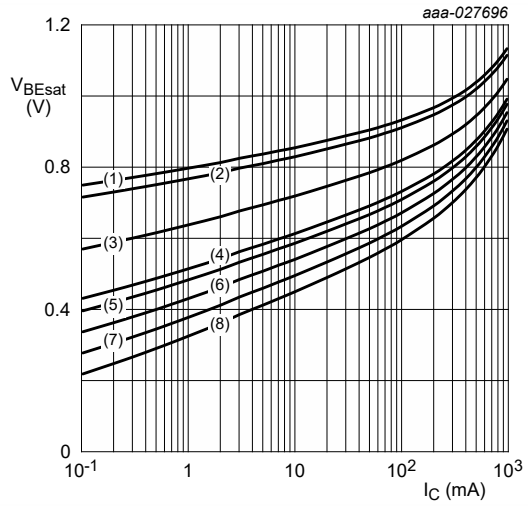

$V_{CE}$ = 1 V
(1) $T_{amb}$ = -55 °C
(2) $T_{amb}$ = -40 °C
(3) $T_{amb}$ = 25 °C
(4) $T_{amb}$ = 85 °C
(5) $T_{amb}$ = 100 °C
(6) $T_{amb}$ = 125 °C
(7) $T_{amb}$ = 150 °C
(8) $T_{amb}$ = 175 °C

**Fig. 21. BC817K-25H-Q: Base-emitter voltage as a function of collector current; typical values**



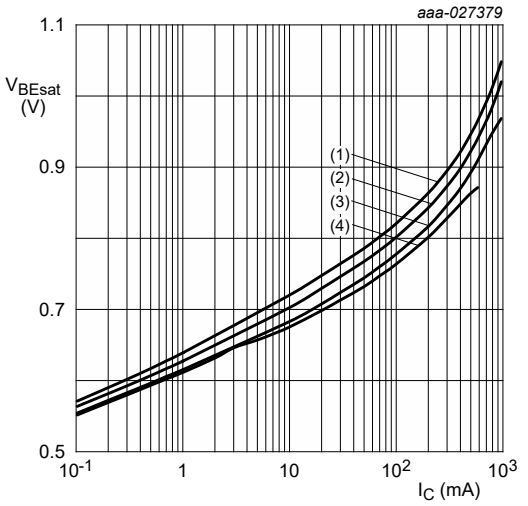

$T_{amb}$ = 25 °C
(1) $V_{CE}$ = 1 V
(2) $V_{CE}$ = 2 V
(3) $V_{CE}$ = 5 V

**Fig. 22. BC817K-25H-Q: Base-emitter voltage as a function of collector current; typical values**



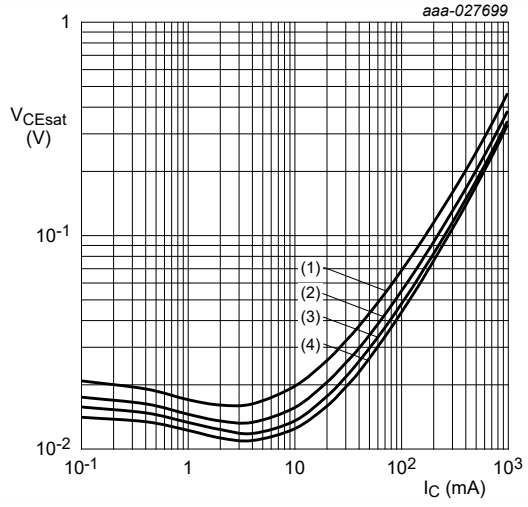

IC/IB = 10
(1) $T_{amb}$ = -55 °C
(2) $T_{amb}$ = -40 °C
(3) $T_{amb}$ = 25 °C
(4) $T_{amb}$ = 85 °C
(5) $T_{amb}$ = 100 °C
(6) $T_{amb}$ = 125 °C
(7) $T_{amb}$ = 150 °C
(8) $T_{amb}$ = 175 °C

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



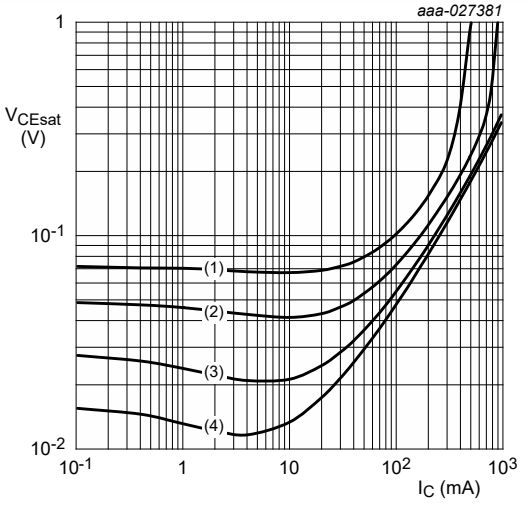

$T_{amb}$ = 25 °C
(1) IC/IB = 10
(2) IC/IB = 20
(3) IC/IB = 50
(4) IC/IB = 100

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



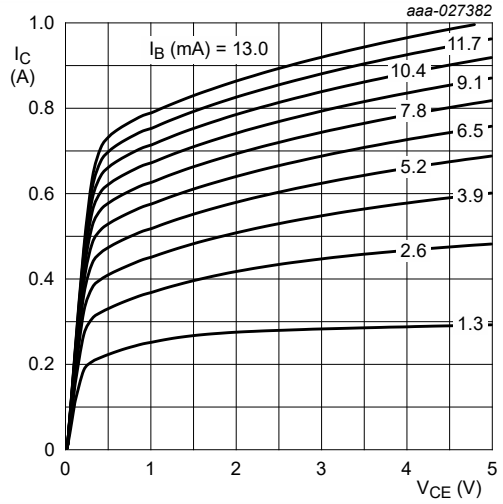

$I_C/I_B$ = 10
(1) $T_{amb}$ = 175 °C
(2) $T_{amb}$ = 85 °C
(3) $T_{amb}$ = 25 °C
(4) $T_{amb}$ = -40 °C

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



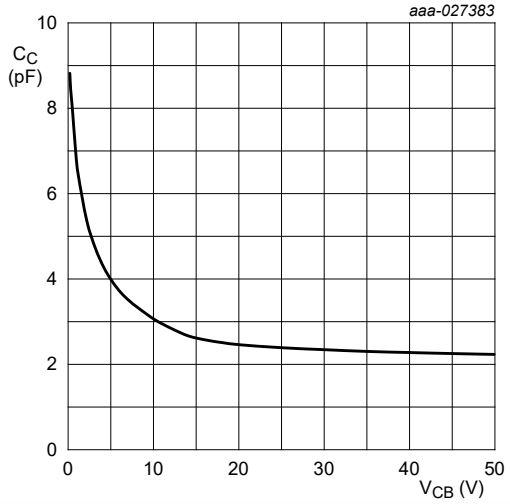

$T_{amb}$ = 25 °C
(1) IC/IB = 100
(2) IC/IB = 50
(3) IC/IB = 20
(4) IC/IB = 10

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




$T_{amb}$ = 25 °C

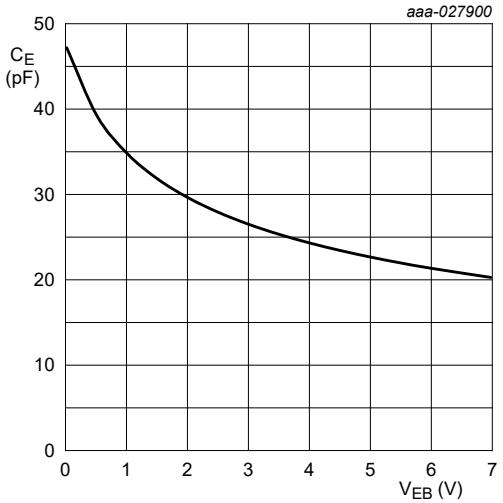
**Fig. 27. BC817K-25H-Q: Collector current as a function of collector-emitter voltage; typical values**




f = 1 MHz

$T_{amb}$ = 25 °C

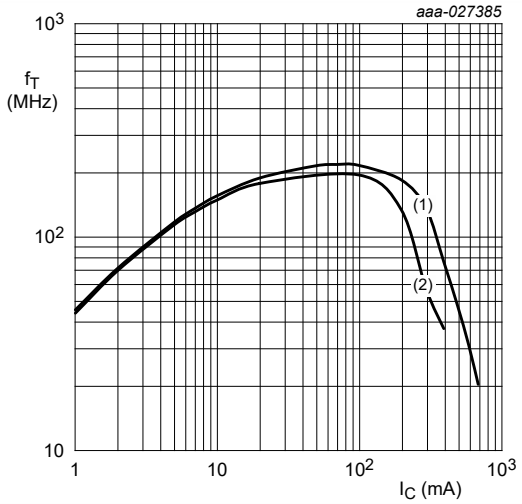
**Fig. 28. BC817K-25H-Q: Collector capacitance as a function of collector-base voltage; typical values**




f = 1 MHz

$T_{amb}$ = 25 °C

**Fig. 29. BC817K-25H-Q: Emitter capacitance as a function of emitter-base voltage; typical values**



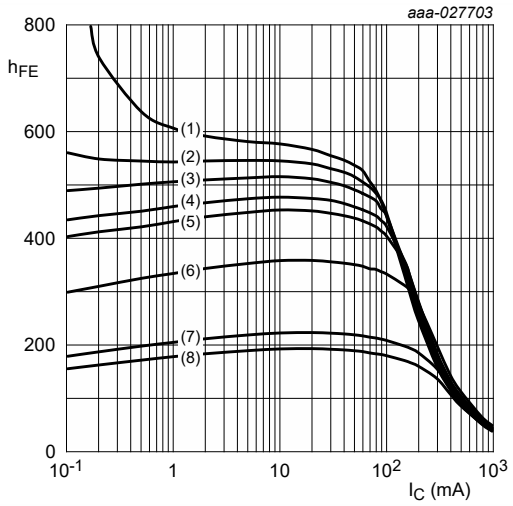

f = 100 MHz

$T_{amb}$ = 25 °C

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

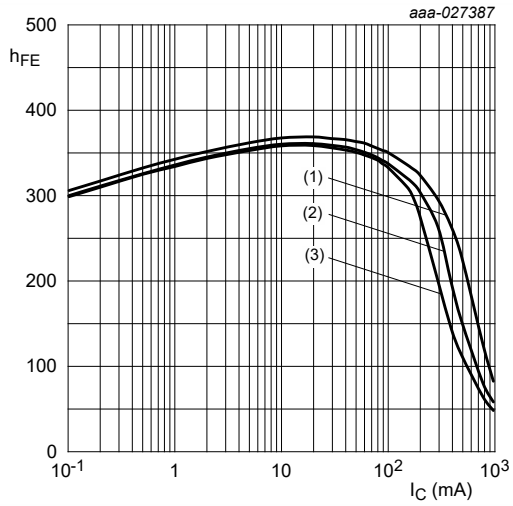
(2) $V_{CE}$ = 1 V

**Fig. 30. BC817K-25H-Q: Transition frequency as a function of collector current; typical values**



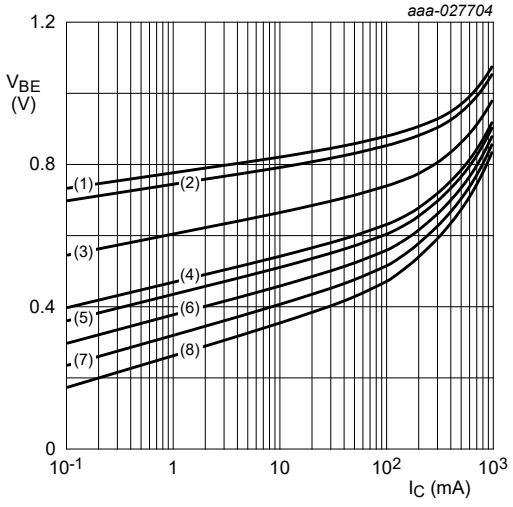

$V_{CE}$ = 1 V
(1) $T_{amb}$ = 175 °C
(2) $T_{amb}$ = 150 °C
(3) $T_{amb}$ = 125 °C
(4) $T_{amb}$ = 100 °C
(5) $T_{amb}$ = 85 °C
(6) $T_{amb}$ = 25 °C
(7) $T_{amb}$ = -40 °C
(8) $T_{amb}$ = -55 °C

**Fig. 31. BC817K-40H-Q: DC current gain as a function of collector current; typical values**



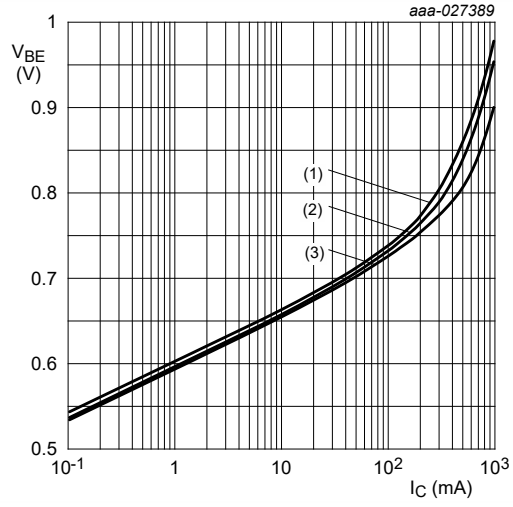

$T_{amb}$ = 25 °C
(1) $V_{CE}$ = 5 V
(2) $V_{CE}$ = 2 V
(3) $V_{CE}$ = 1 V

**Fig. 32. BC817K-40H-Q: DC current gain as a function of collector current; typical values**



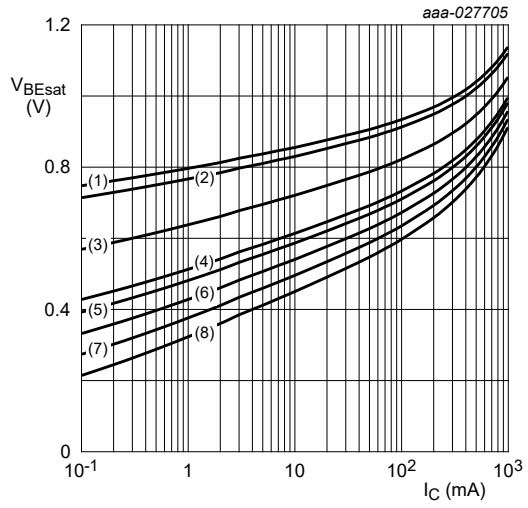

$V_{CE}$ = 1 V
(1) $T_{amb}$ = -55 °C
(2) $T_{amb}$ = -40 °C
(3) $T_{amb}$ = 25 °C
(4) $T_{amb}$ = 85 °C
(5) $T_{amb}$ = 100 °C
(6) $T_{amb}$ = 125 °C
(7) $T_{amb}$ = 150 °C
(8) $T_{amb}$ = 175 °C

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



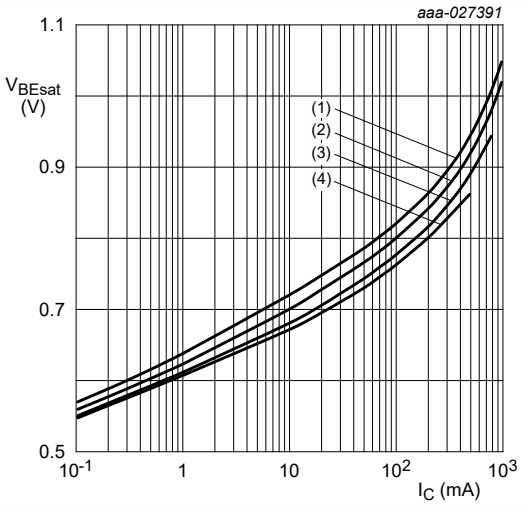

$T_{amb}$ = 25 °C
(1) $V_{CE}$ = 1 V
(2) $V_{CE}$ = 2 V
(3) $V_{CE}$ = 5 V

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



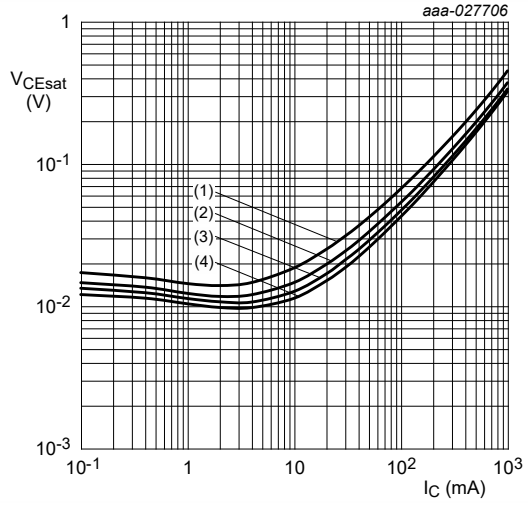

IC/IB = 10
(1) $T_{amb}$ = -55 °C
(2) $T_{amb}$ = -40 °C
(3) $T_{amb}$ = 25 °C
(4) $T_{amb}$ = 85 °C
(5) $T_{amb}$ = 100 °C
(6) $T_{amb}$ = 125 °C
(7) $T_{amb}$ = 150 °C
(8) $T_{amb}$ = 175 °C

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



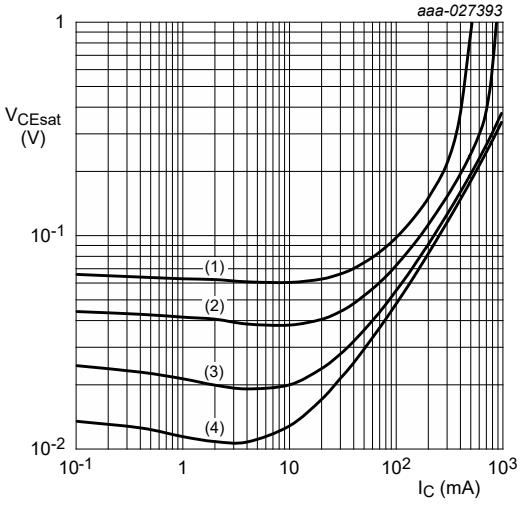

$T_{amb}$ = 25 °C
(1) IC/IB = 10
(2) IC/IB = 20
(3) IC/IB = 50
(4) IC/IB = 100

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



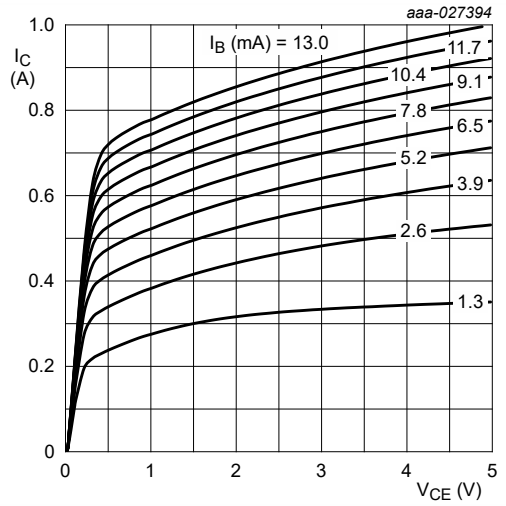

$I_C/I_B$ = 10
(1) $T_{amb}$ = 175 °C
(2) $T_{amb}$ = 85 °C
(3) $T_{amb}$ = 25 °C
(4) $T_{amb}$ = -40 °C

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



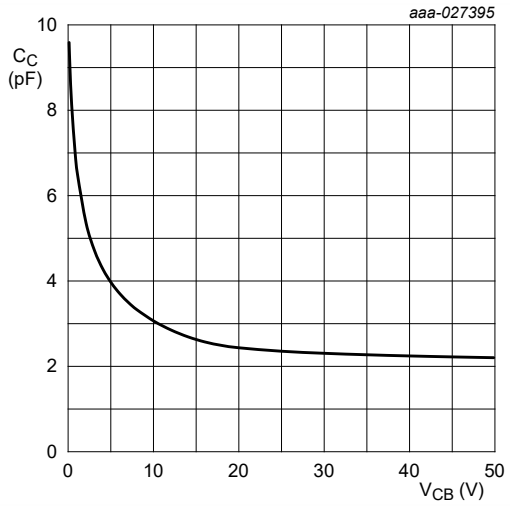

$T_{amb}$ = 25 °C
(1) IC/IB = 100
(2) IC/IB = 50
(3) IC/IB = 20
(4) IC/IB = 10

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




$T_{amb}$ = 25 °C

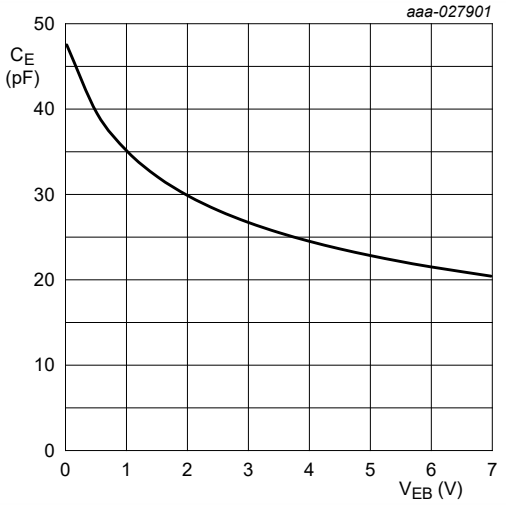
**Fig. 39. BC817K-40H-Q: Collector current as a function of collector-emitter voltage; typical values**




f = 1 MHz

$T_{amb}$ = 25 °C

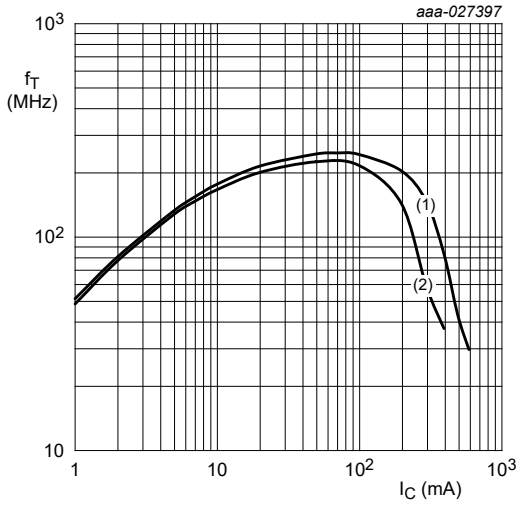
**Fig. 40. BC817K-40H-Q: Collector capacitance as a function of collector-base voltage; typical values**




f = 1 MHz

$T_{amb}$ = 25 °C

**Fig. 41. BC817K-40H-Q: 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

**Fig. 42. BC817K-40H-Q: Transition frequency 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

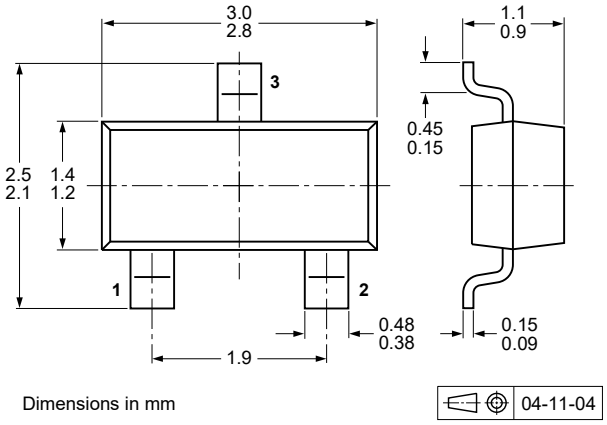



**Fig. 43. Package outline SOT23**

## 13. Soldering

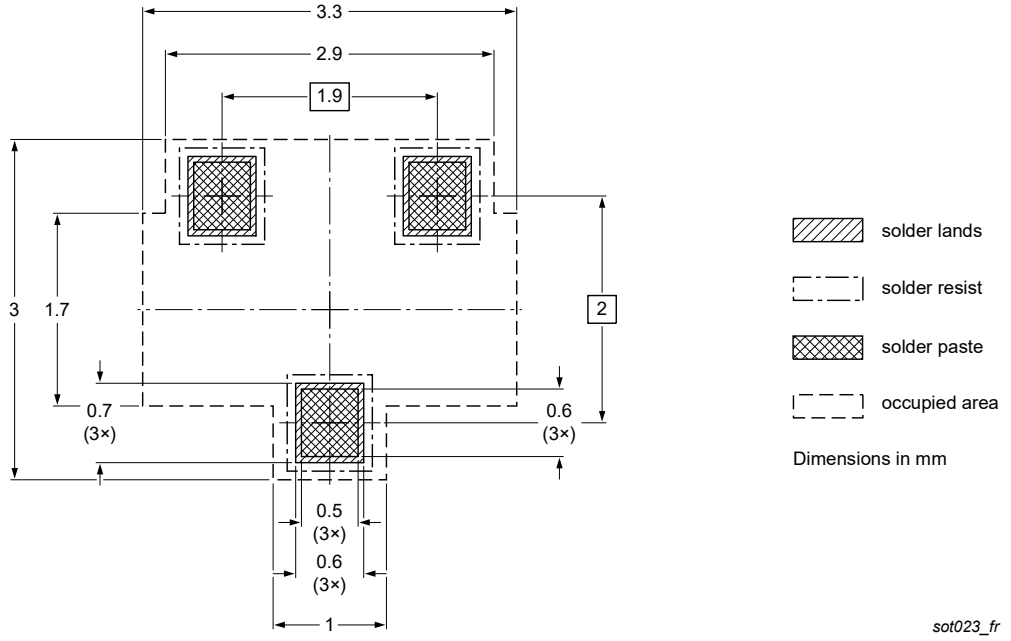



**Fig. 44. Reflow soldering footprint for SOT23**

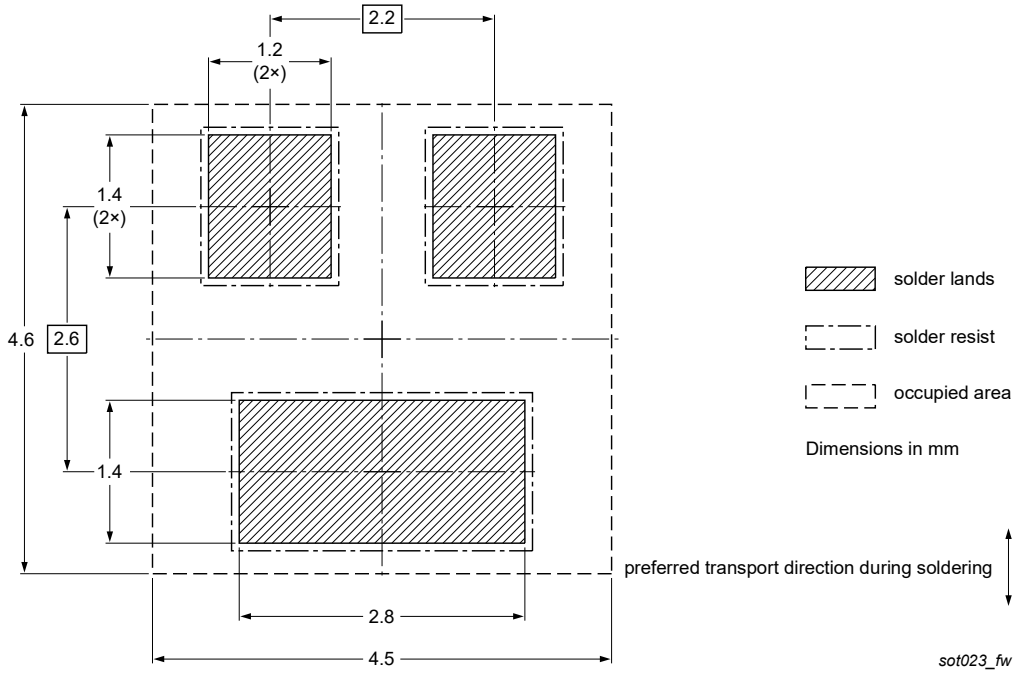



**Fig. 45. Wave soldering footprint for SOT23**

# 14. Revision history

**Table 9. Revision history**

| Data sheet ID | Release date | Data sheet status | Change notice | Supersedes |
|---|---|---|---|---|
| BC817KH-Q_SER v.1 | 20231018 | 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".
[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 https://www.nexperia.com.

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**Date of release: 18 October 2023**

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