



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

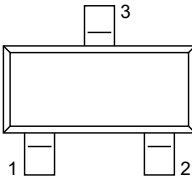
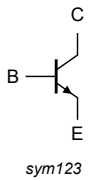
Table 2. Quick reference data

Symbol	Parameter	Conditions	Min	Typ	Max	Unit	
V_{CE0}	collector-emitter voltage	open base	-	-	45	V	
I_C	collector current	$T_{amb} = 25\text{ °C}$	-	-	500	mA	
I_{CM}	peak collector current	single pulse; $t_p \leq 1\text{ ms}$; $T_{amb} = 25\text{ °C}$	-	-	1	A	
h_{FE}	DC current gain						
	BC817K-16H-Q	$V_{CE} = 1\text{ V}$; $I_C = 100\text{ mA}$; $T_{amb} = 25\text{ °C}$	[1]	100	-	250	
	BC817K-25H-Q		[1]	160	-	400	
	BC817K-40H-Q		[1]	250	-	600	

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

5. Pinning information

Table 3. Pinning

Pin	Symbol	Description	Simplified outline	Graphic symbol
1	B	base	 SOT23	 sym123
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 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.

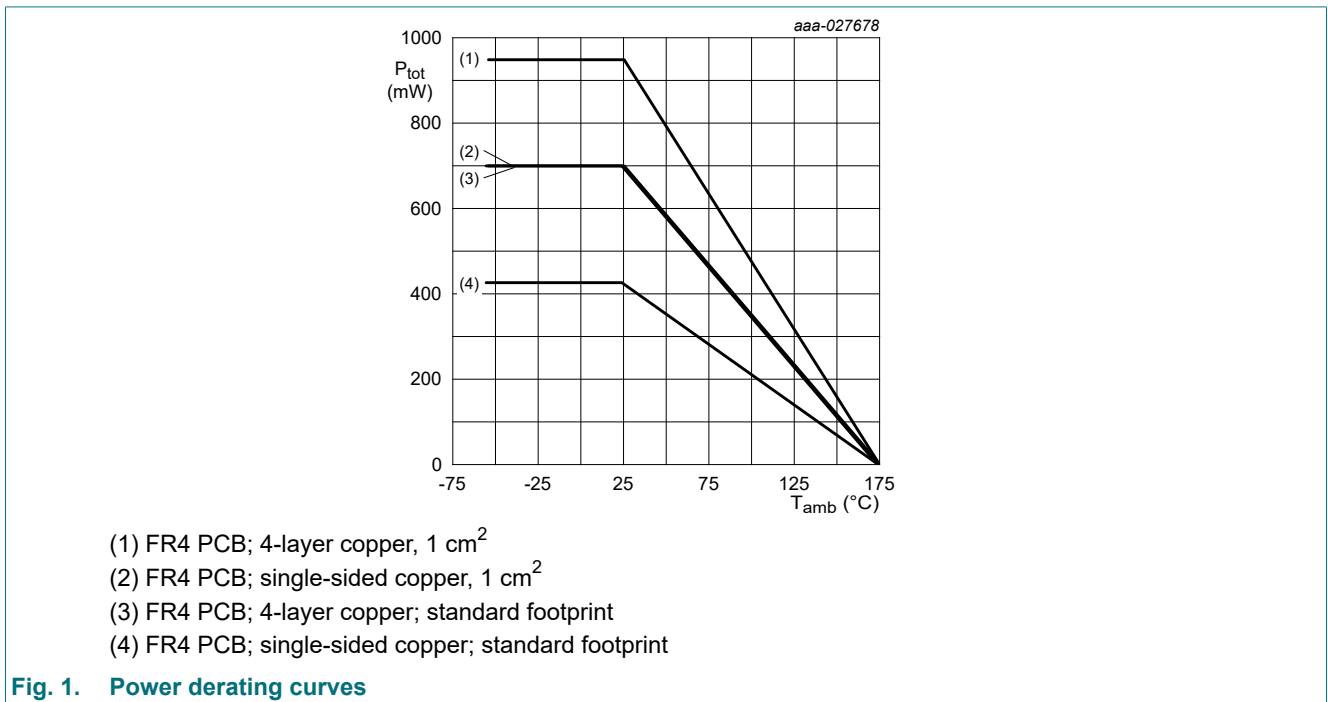
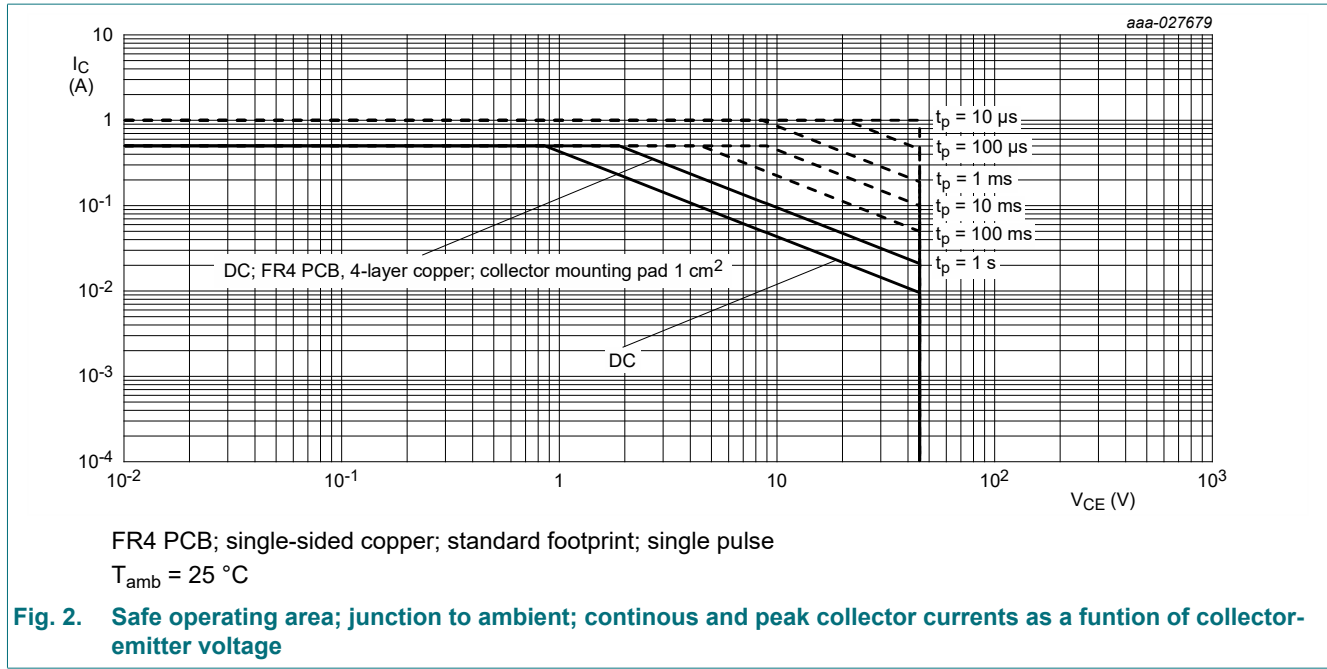


Fig. 1. Power derating curves



9. Thermal characteristics

Table 7. Thermal characteristics

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

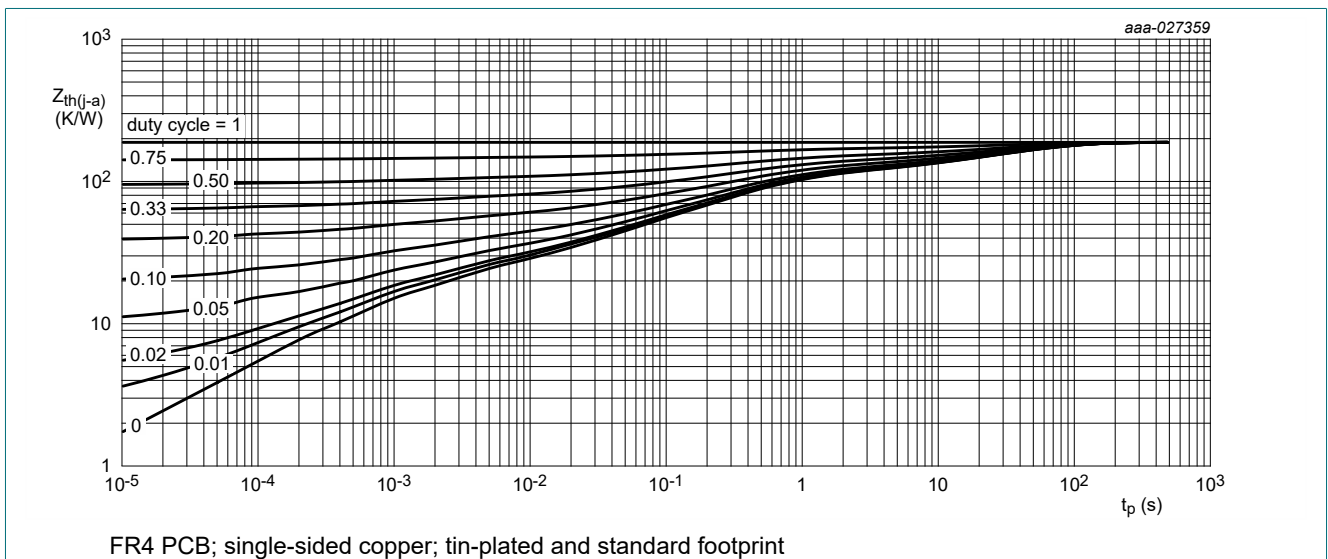


Fig. 3. Transient thermal impedance from junction to ambient as a function of pulse duration; typical values

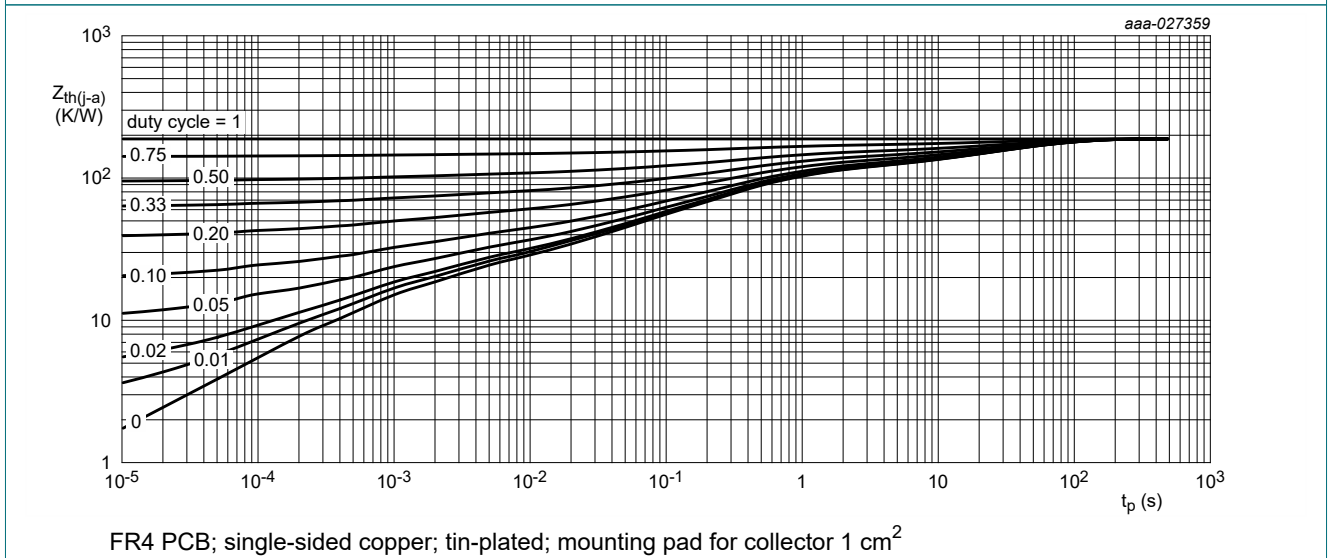
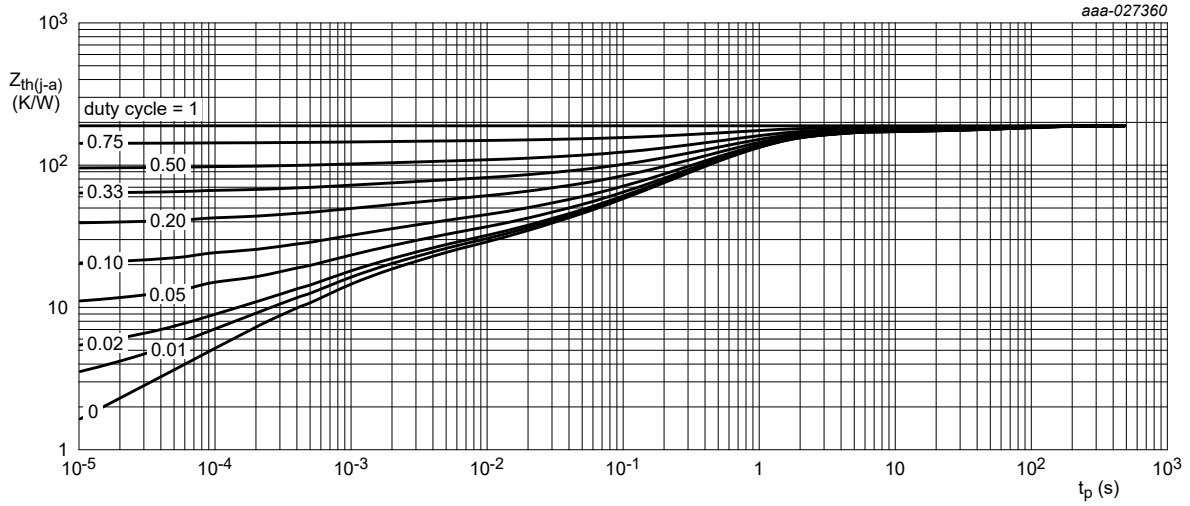
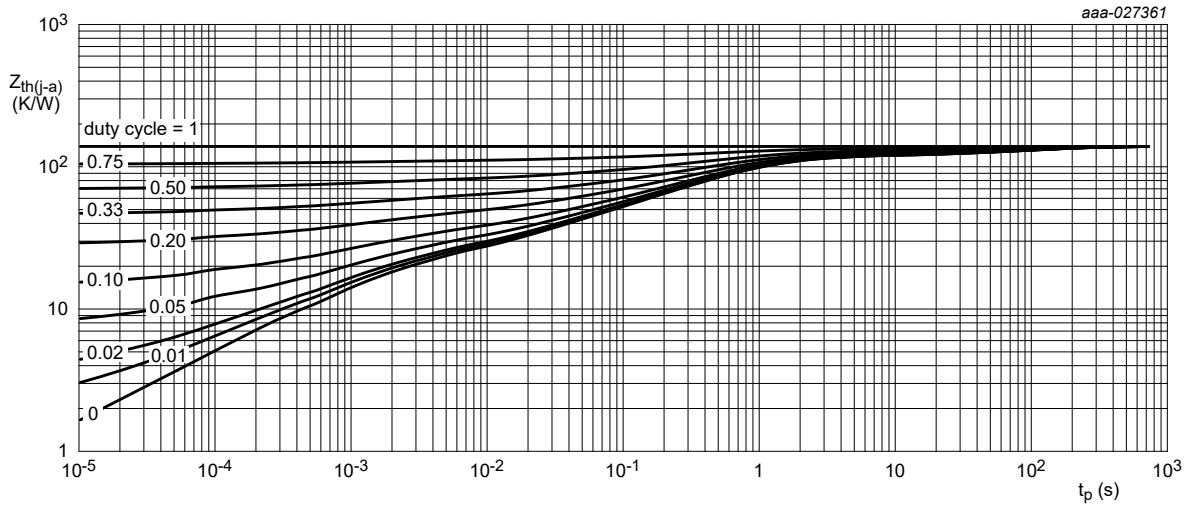


Fig. 4. Transient thermal impedance from junction to ambient as a function of pulse duration; typical values



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 cm²

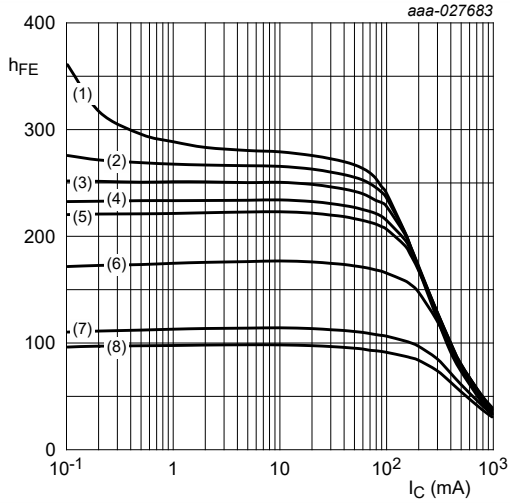
Fig. 6. Transient thermal impedance from junction to ambient as a function of pulse duration; typical values

10. Characteristics

Table 8. Characteristics

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

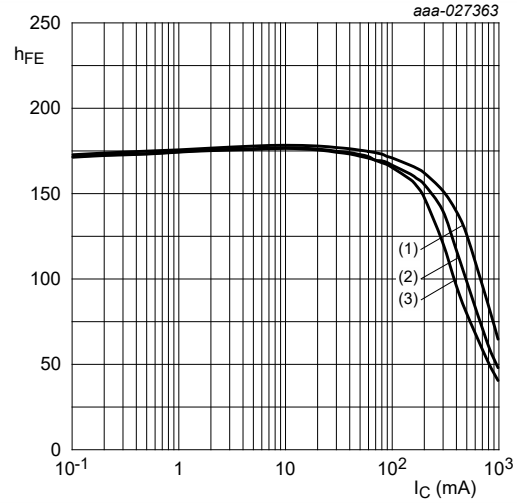
[1] pulsed; $t_p \leq 300 \mu\text{s}$; $\delta \leq 0.02$



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

- (1) $T_{amb} = 175 \text{ }^\circ\text{C}$
- (2) $T_{amb} = 150 \text{ }^\circ\text{C}$
- (3) $T_{amb} = 125 \text{ }^\circ\text{C}$
- (4) $T_{amb} = 100 \text{ }^\circ\text{C}$
- (5) $T_{amb} = 85 \text{ }^\circ\text{C}$
- (6) $T_{amb} = 25 \text{ }^\circ\text{C}$
- (7) $T_{amb} = -40 \text{ }^\circ\text{C}$
- (8) $T_{amb} = -55 \text{ }^\circ\text{C}$

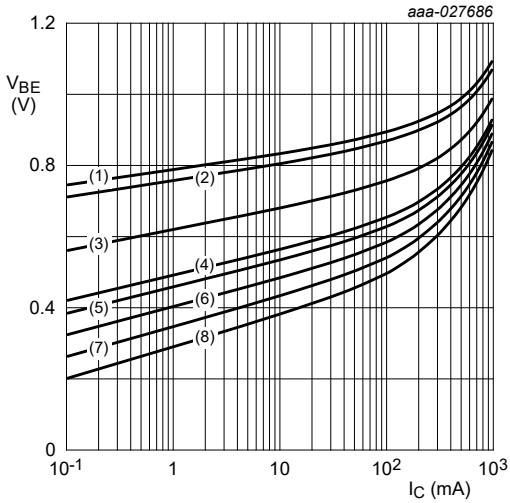
Fig. 7. BC817K-16H-Q: DC current gain as a function of collector current; typical values



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

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

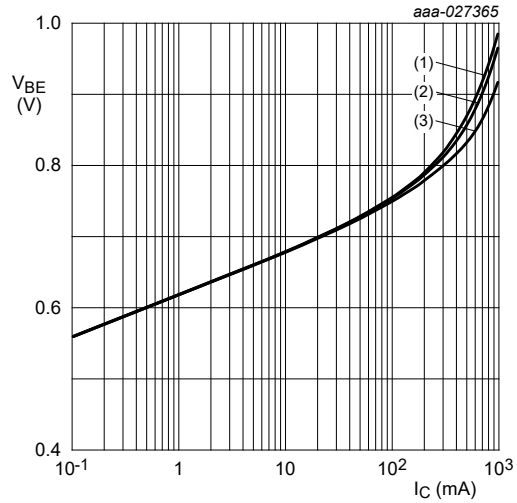
Fig. 8. BC817K-16H-Q: DC current gain as a function of collector current; typical values



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

- (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) $T_{amb} = 150 \text{ }^\circ\text{C}$
- (8) $T_{amb} = 175 \text{ }^\circ\text{C}$

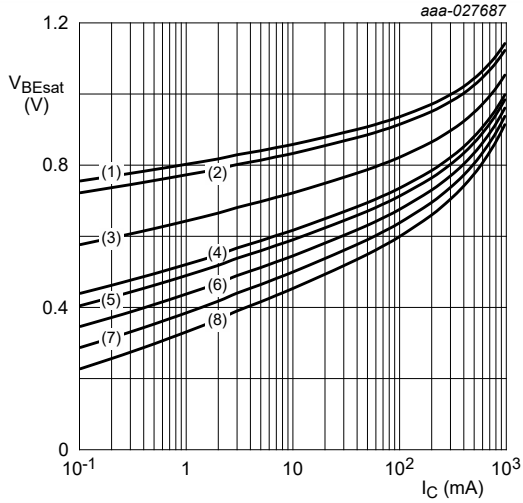
Fig. 9. BC817K-16H-Q: Base-emitter voltage as a function of collector current; typical values



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

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

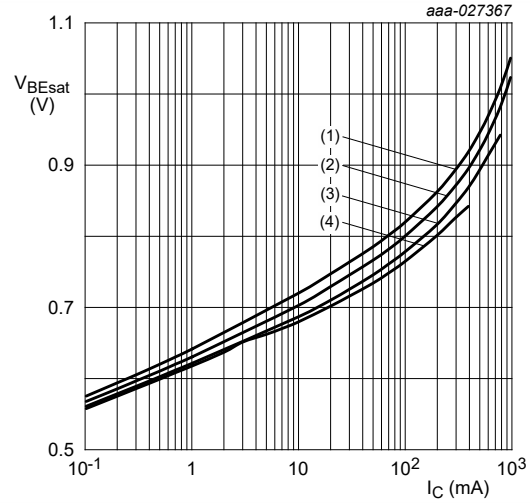
Fig. 10. BC817K-16H-Q: Base-emitter voltage as a function of collector current; typical values



$I_C/I_B = 10$

- (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) $T_{amb} = 150\text{ °C}$
- (8) $T_{amb} = 175\text{ °C}$

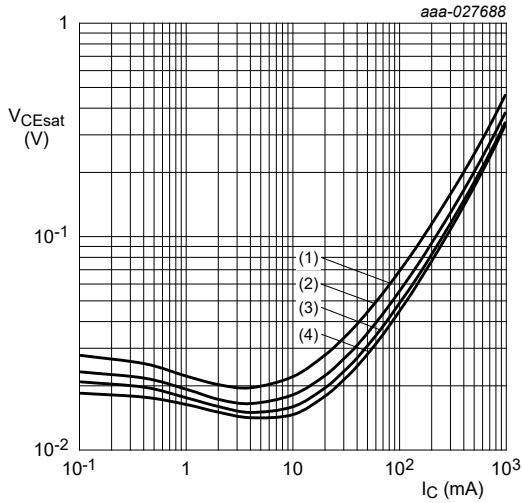
Fig. 11. BC817K-16H-Q: Base-emitter saturation voltage as a function of collector current; typical values



$T_{amb} = 25\text{ °C}$

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

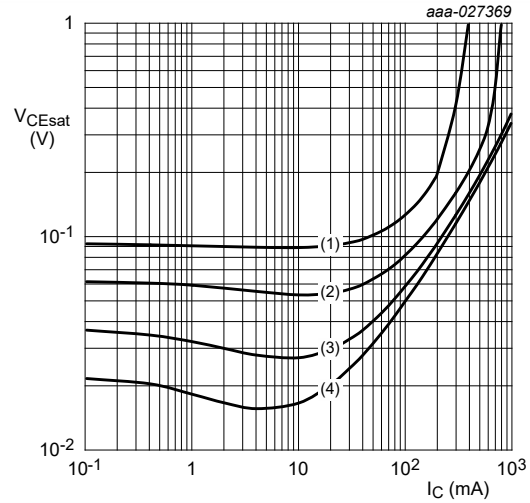
Fig. 12. BC817K-16H-Q: Base-emitter saturation voltage as a function of collector current; typical values



$I_C/I_B = 10$

- (1) $T_{amb} = 175\text{ °C}$
- (2) $T_{amb} = 85\text{ °C}$
- (3) $T_{amb} = 25\text{ °C}$
- (4) $T_{amb} = -40\text{ °C}$

Fig. 13. BC817K-16H-Q: 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) $I_C/I_B = 10$

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

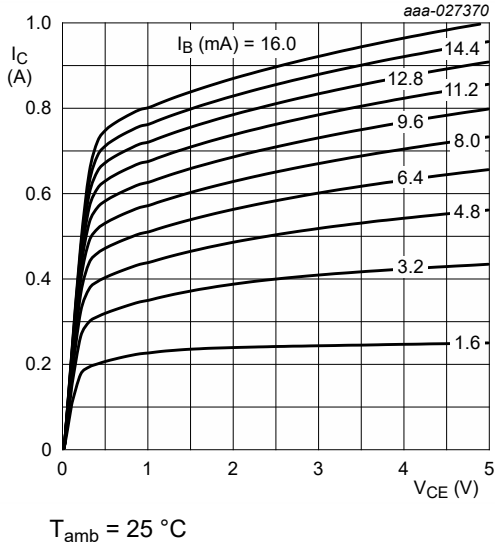


Fig. 15. BC817K-16H-Q: Collector current as a function of collector-emitter voltage; typical values

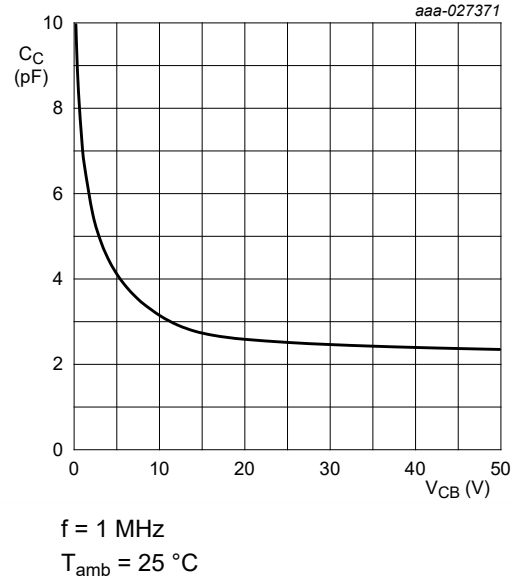


Fig. 16. BC817K-16H-Q: Collector capacitance as a function of collector-base voltage; typical values

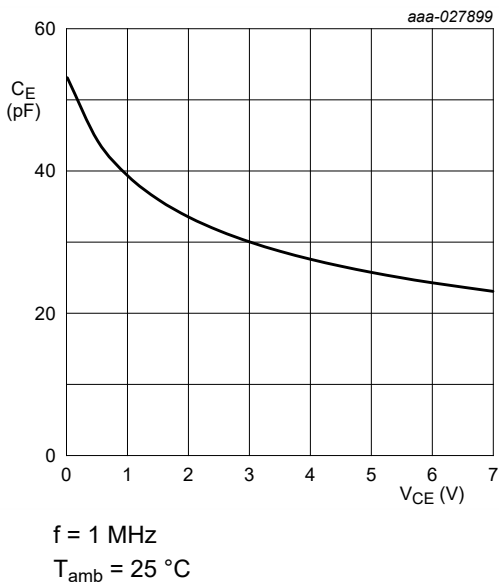


Fig. 17. BC817K-16H-Q: Emitter capacitance as a function of emitter-base voltage; typical values

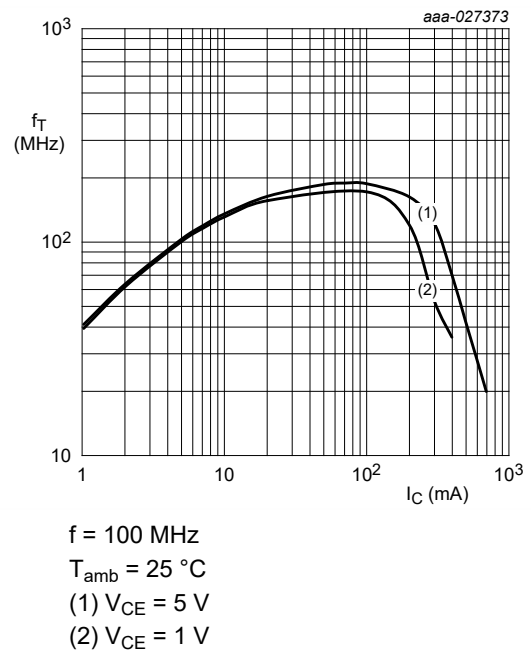
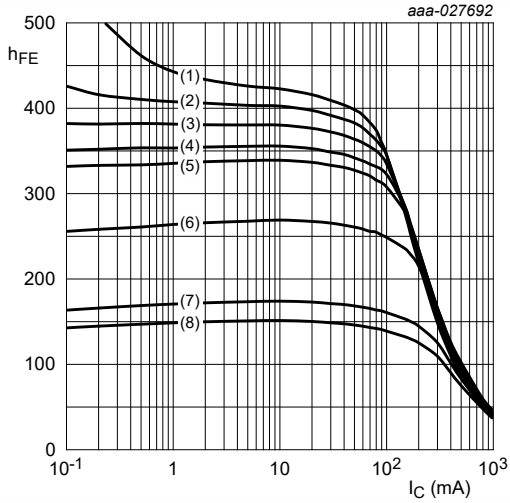


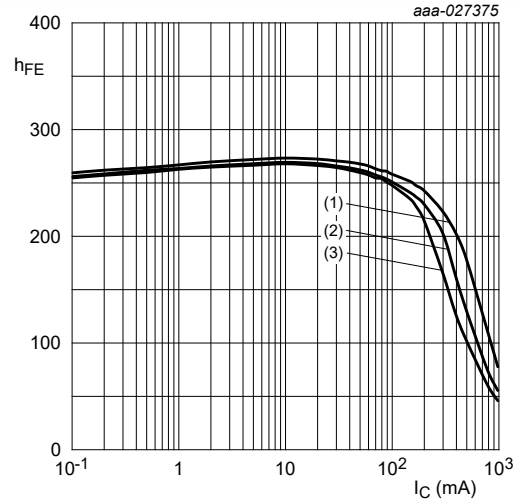
Fig. 18. BC817K-16H-Q: Transition frequency as a function of collector current; typical values



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

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

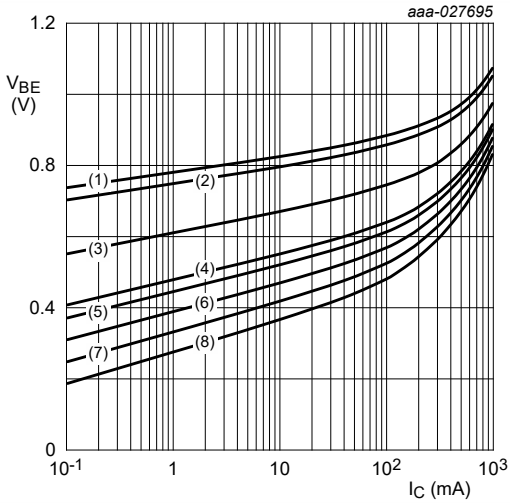
Fig. 19. BC817K-25H-Q: DC current gain as a function of collector current; typical values



$T_{amb} = 25\text{ °C}$

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

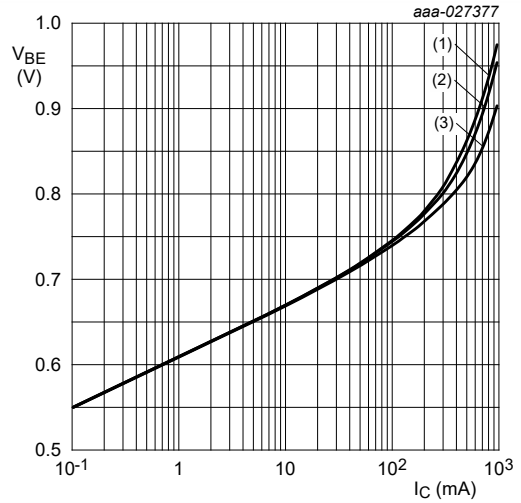
Fig. 20. BC817K-25H-Q: DC current gain as a function of collector current; typical values



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

- (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) $T_{amb} = 150\text{ °C}$
- (8) $T_{amb} = 175\text{ °C}$

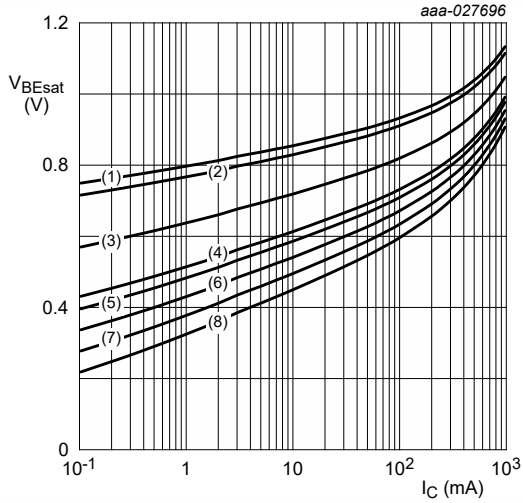
Fig. 21. BC817K-25H-Q: Base-emitter voltage as a function of collector current; typical values



$T_{amb} = 25\text{ °C}$

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

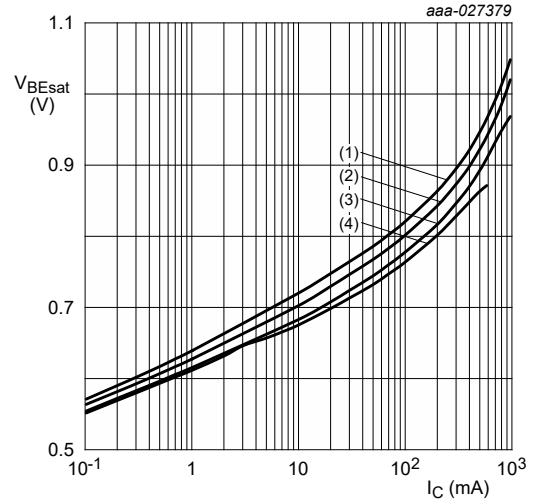
Fig. 22. BC817K-25H-Q: Base-emitter voltage as a function of collector current; typical values



$I_C/I_B = 10$

- (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) $T_{amb} = 150\text{ }^\circ\text{C}$
- (8) $T_{amb} = 175\text{ }^\circ\text{C}$

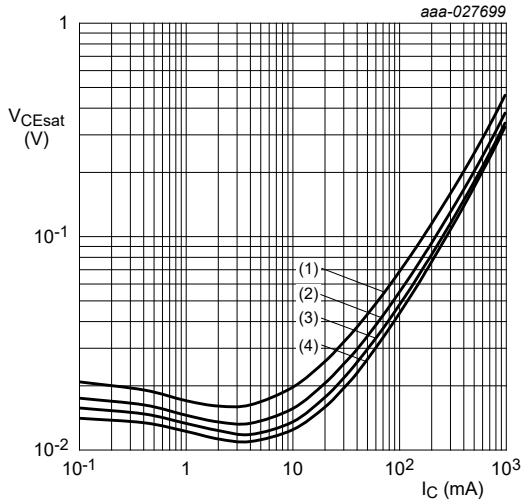
Fig. 23. BC817K-25H-Q: Base-emitter saturation voltage as a function of collector current; typical values



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

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

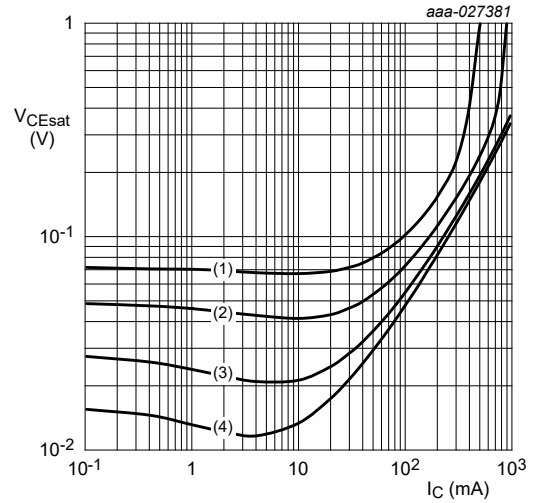
Fig. 24. BC817K-25H-Q: Base-emitter saturation voltage as a function of collector current; typical values



$I_C/I_B = 10$

- (1) $T_{amb} = 175\text{ }^\circ\text{C}$
- (2) $T_{amb} = 85\text{ }^\circ\text{C}$
- (3) $T_{amb} = 25\text{ }^\circ\text{C}$
- (4) $T_{amb} = -40\text{ }^\circ\text{C}$

Fig. 25. BC817K-25H-Q: 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) $I_C/I_B = 10$

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

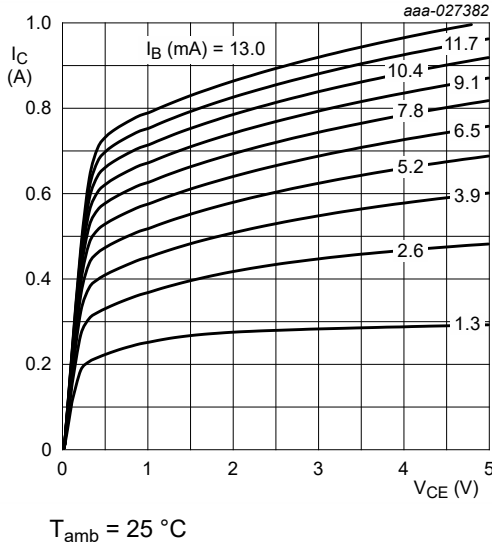


Fig. 27. BC817K-25H-Q: Collector current as a function of collector-emitter voltage; typical values

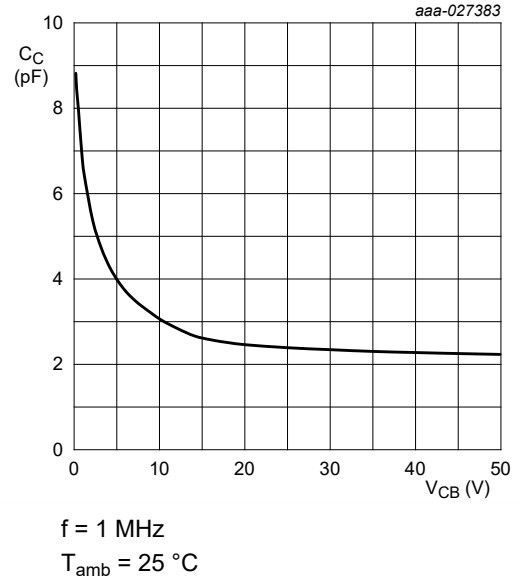


Fig. 28. BC817K-25H-Q: Collector capacitance as a function of collector-base voltage; typical values

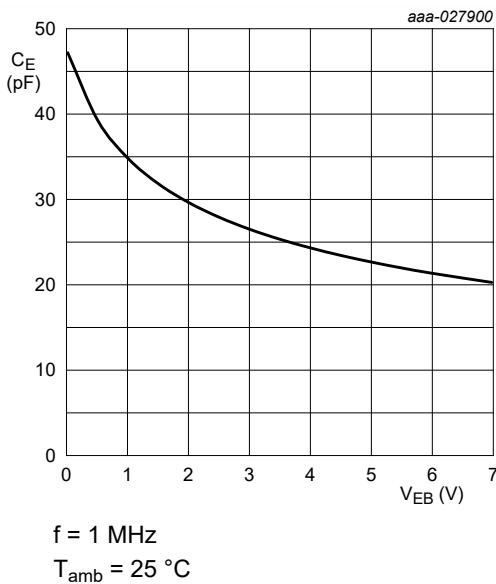


Fig. 29. BC817K-25H-Q: Emitter capacitance as a function of emitter-base voltage; typical values

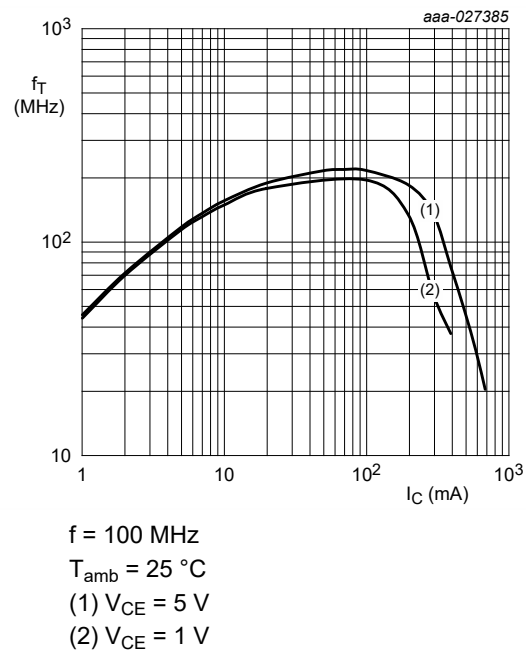
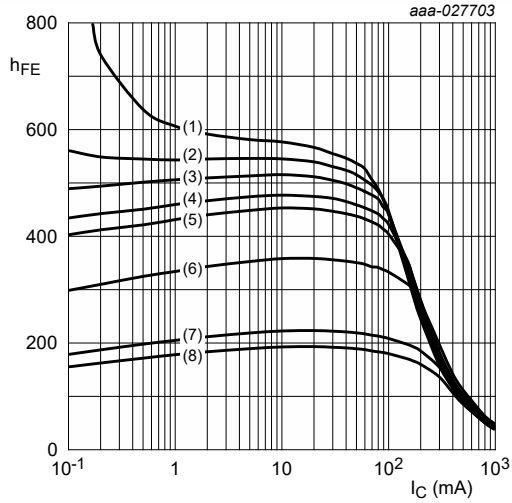


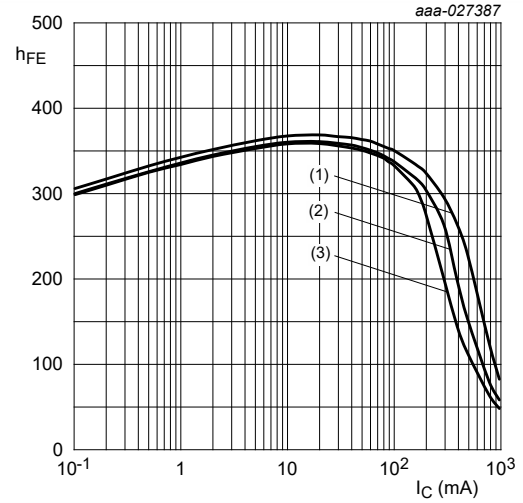
Fig. 30. BC817K-25H-Q: Transition frequency as a function of collector current; typical values



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

- (1) $T_{amb} = 175\text{ }^{\circ}\text{C}$
- (2) $T_{amb} = 150\text{ }^{\circ}\text{C}$
- (3) $T_{amb} = 125\text{ }^{\circ}\text{C}$
- (4) $T_{amb} = 100\text{ }^{\circ}\text{C}$
- (5) $T_{amb} = 85\text{ }^{\circ}\text{C}$
- (6) $T_{amb} = 25\text{ }^{\circ}\text{C}$
- (7) $T_{amb} = -40\text{ }^{\circ}\text{C}$
- (8) $T_{amb} = -55\text{ }^{\circ}\text{C}$

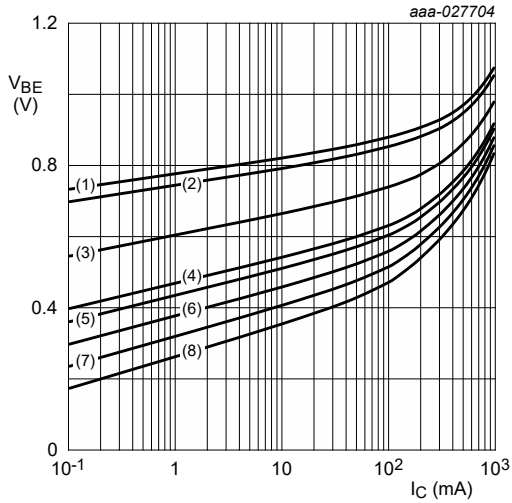
Fig. 31. BC817K-40H-Q: DC current gain as a function of collector current; typical values



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

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

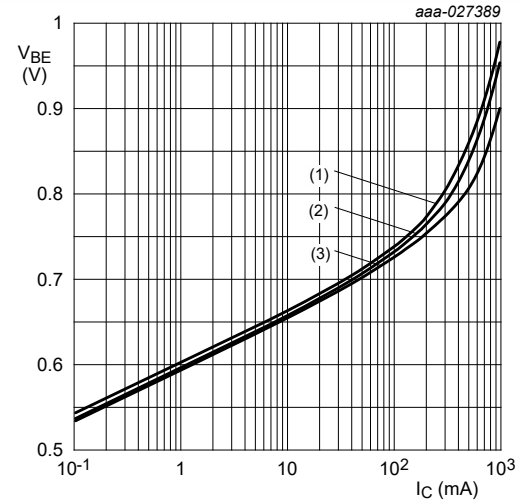
Fig. 32. BC817K-40H-Q: DC current gain as a function of collector current; typical values



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

- (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) $T_{amb} = 150\text{ }^{\circ}\text{C}$
- (8) $T_{amb} = 175\text{ }^{\circ}\text{C}$

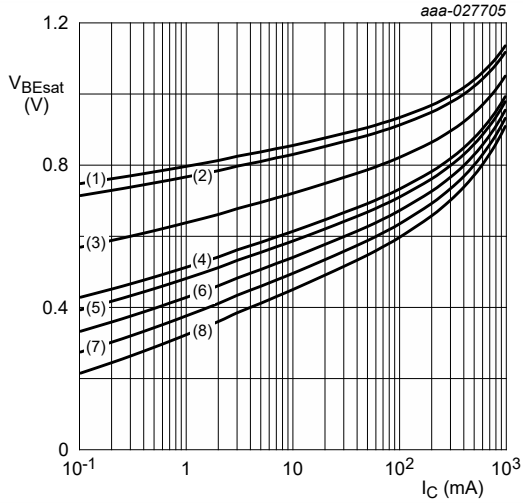
Fig. 33. BC817K-40H-Q: Base-emitter voltage as a function of collector current; typical values



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

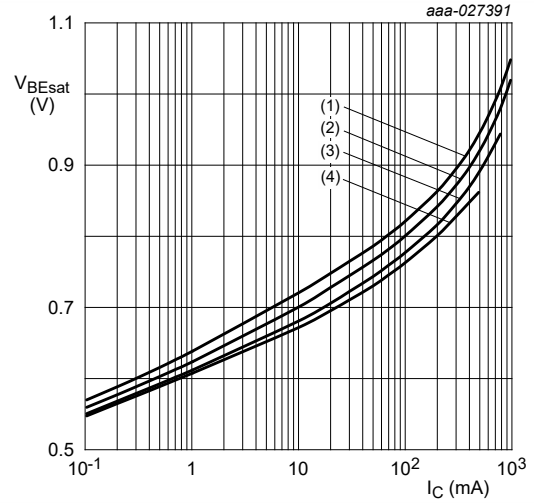
- (1) $V_{CE} = 1\text{ V}$
- (2) $V_{CE} = 2\text{ V}$
- (3) $V_{CE} = 5\text{ V}$

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



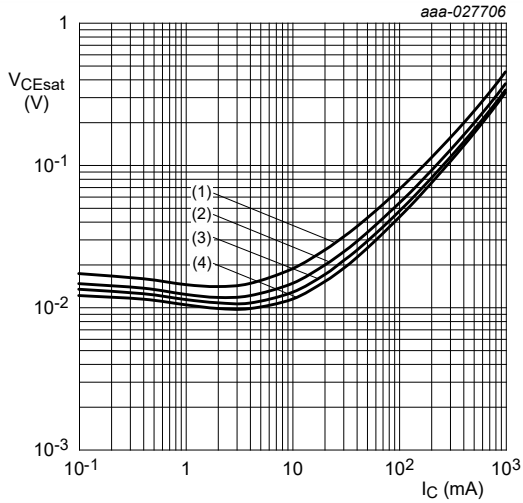
- $I_C/I_B = 10$
- (1) $T_{amb} = -55\text{ °C}$
 - (2) $T_{amb} = -40\text{ °C}$
 - (3) $T_{amb} = 25\text{ °C}$
 - (4) $T_{amb} = 85\text{ °C}$
 - (5) $T_{amb} = 100\text{ °C}$
 - (6) $T_{amb} = 125\text{ °C}$
 - (7) $T_{amb} = 150\text{ °C}$
 - (8) $T_{amb} = 175\text{ °C}$

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



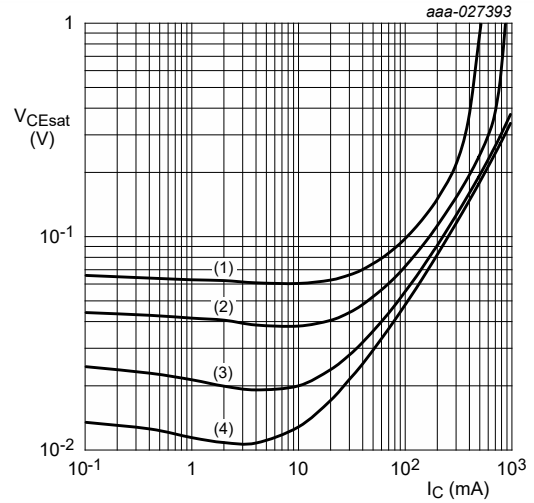
- $T_{amb} = 25\text{ °C}$
- (1) $I_C/I_B = 10$
 - (2) $I_C/I_B = 20$
 - (3) $I_C/I_B = 50$
 - (4) $I_C/I_B = 100$

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



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

Fig. 37. BC817K-40H-Q: 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) $I_C/I_B = 10$

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

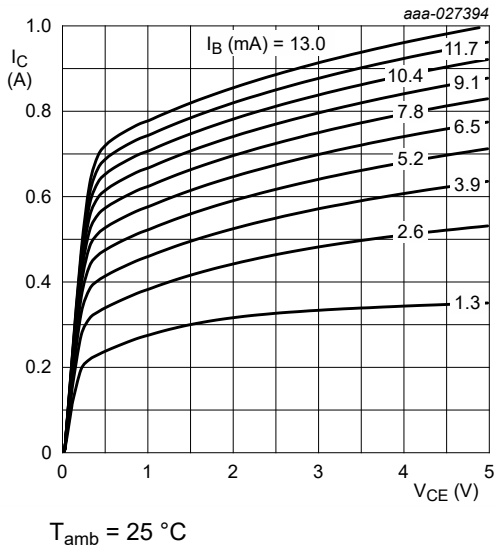


Fig. 39. BC817K-40H-Q: Collector current as a function of collector-emitter voltage; typical values

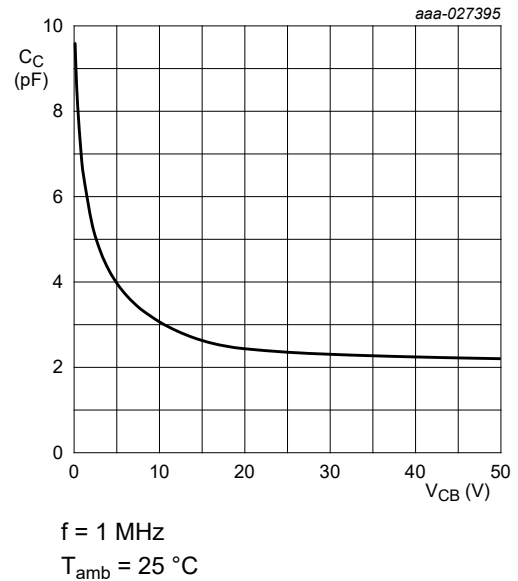


Fig. 40. BC817K-40H-Q: Collector capacitance as a function of collector-base voltage; typical values

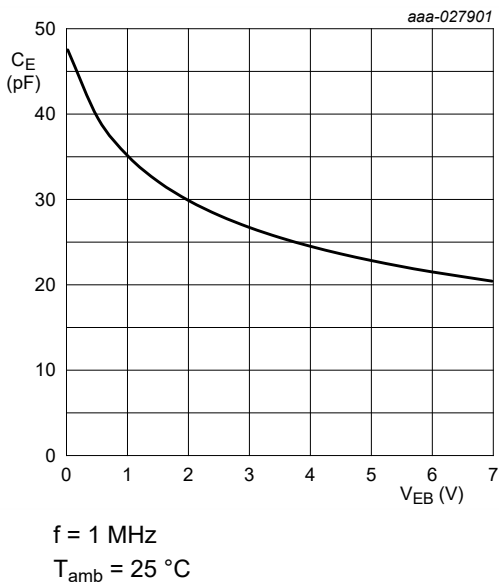


Fig. 41. BC817K-40H-Q: Emitter capacitance as a function of emitter-base voltage; typical values

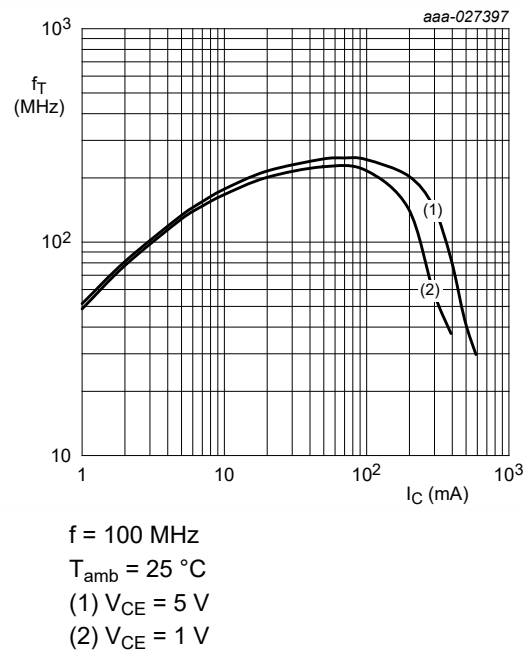


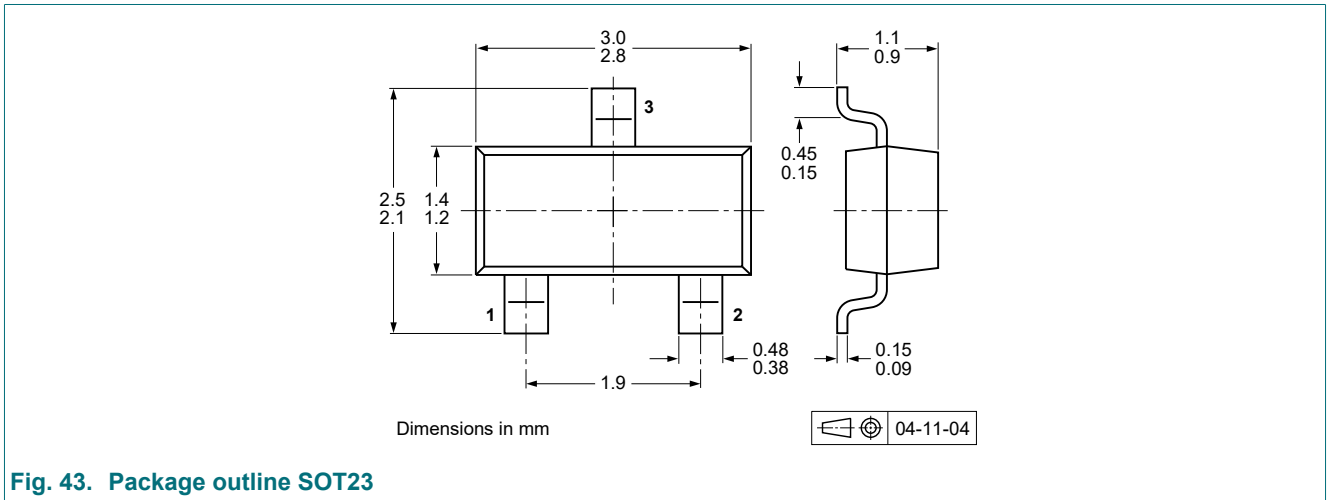
Fig. 42. BC817K-40H-Q: Transition frequency as a function of collector current; typical values

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



13. Soldering

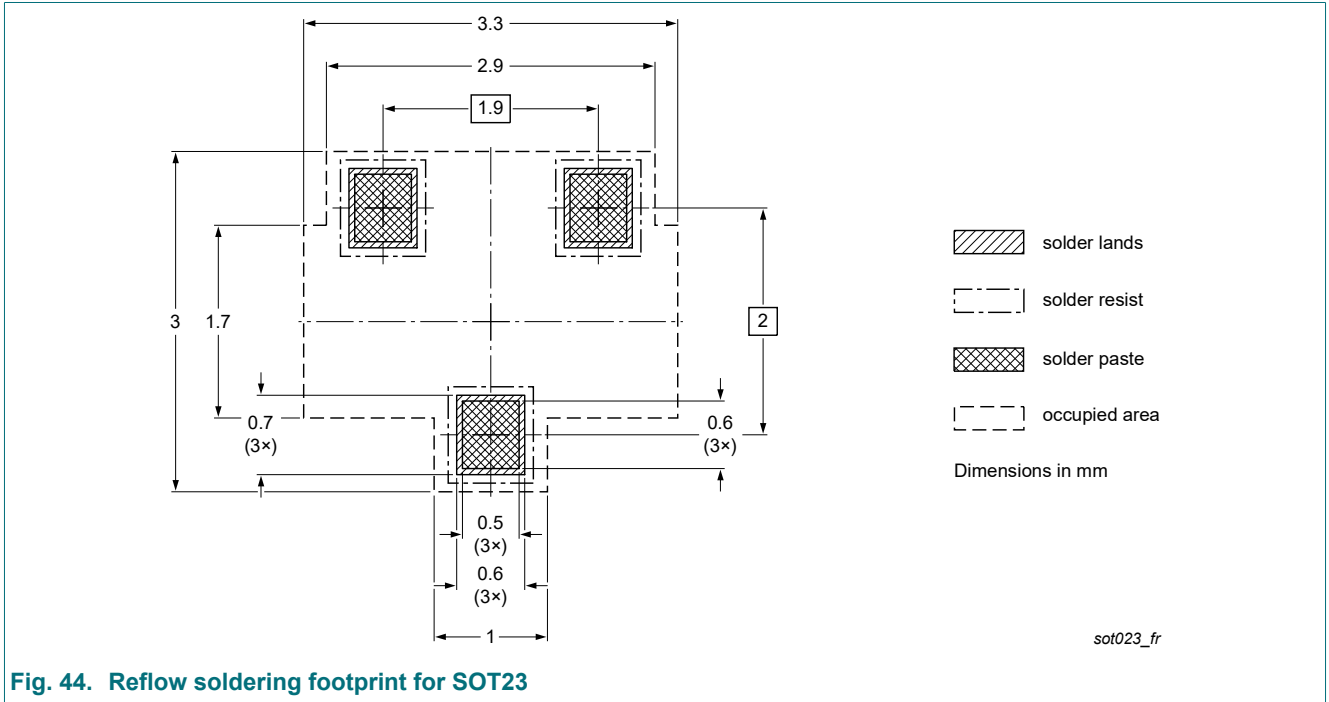


Fig. 44. Reflow soldering footprint for SOT23

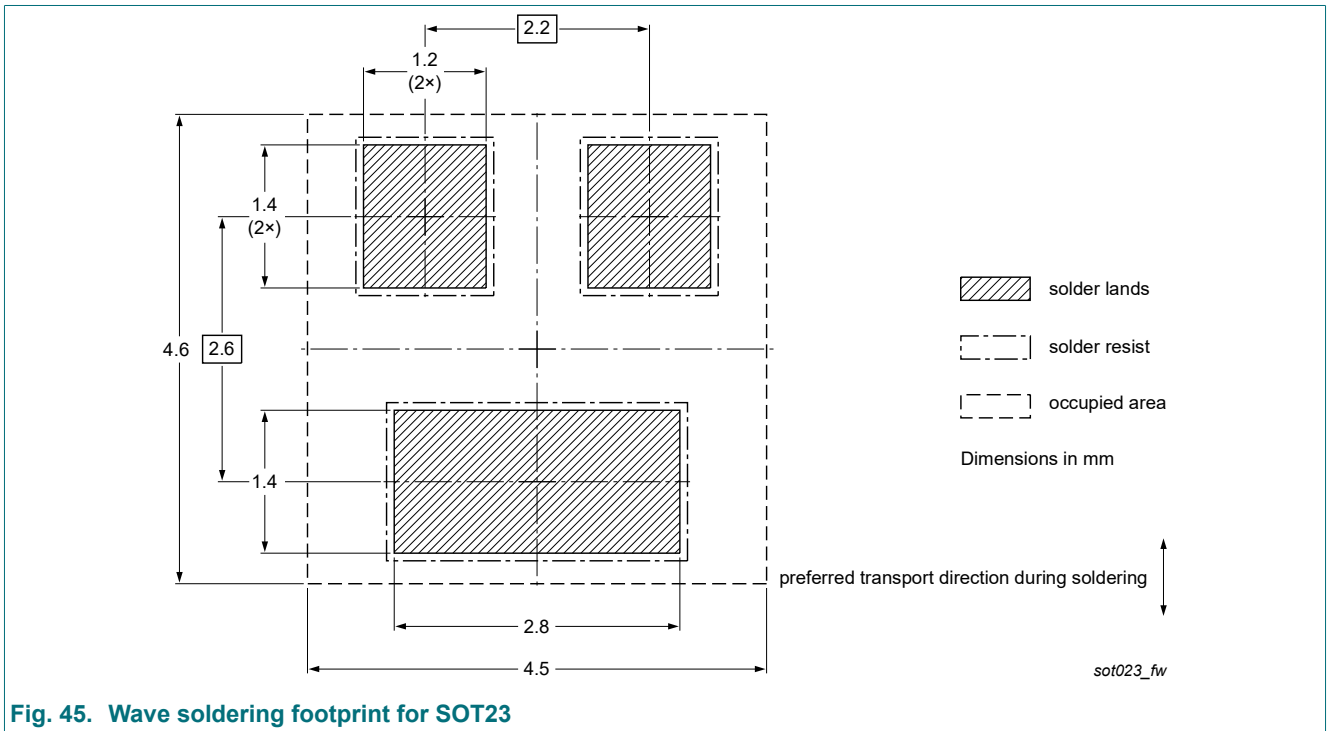


Fig. 45. Wave soldering footprint for SOT23

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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