BC846xW-Q series

65 V, 100 mA NPN general-purpose transistors

Rev. 2 — 29 March 2023 Product data sheet

1. General description

NPN general-purpose transistors in a very small SOT323 (SC-70) Surface-Mounted Device (SMD) plastic package.

Table 1. Product overview

Type number	Package		PNP complement
	Nexperia	JEDEC	
BC846W-Q	SOT323	SC-70	BC856W-Q
BC846AW-Q			BC856AW-Q
BC846BW-Q			BC856BW-Q

2. Features and benefits

- General-purpose transistors
- SMD plastic package
- Two different gain selections
- Qualified according to AEC-Q101 and recommended for use in automotive applications

3. Applications

- General-purpose switching and amplification

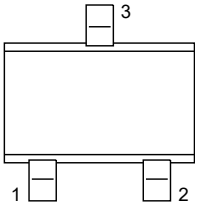
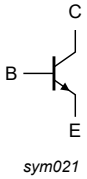
4. Quick reference data

Table 2. Quick reference data

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
V_{CEO}	collector-emitter voltage	open base		-	-	65	V
I_C	collector current			-	-	100	mA
	DCcurrent gain						
h_{FE}	BC846W-Q	V_{CE} = 5 V; I_C = 2 mA		110	-	450	
	BC846AW-Q			110	180	220	
	BC846BW-Q			200	290	450	

5. Pinning information

Table 3. Pinning

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

6. Ordering information

Table 4. Ordering information

Type number	Package		
	Name	Description	Version
BC846W-Q	SC-70	Plastic surface-mounted package; 3 leads	SOT323
BC846AW-Q			
BC846BW-Q			

7. Marking

Table 5. Marking

Type number	Marking code[1]
BC846W-Q	1D%
BC846AW-Q	1A%
BC846BW-Q	1B%

[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		-	80	V
V_{CEO}	collector-emitter voltage	open base		-	65	V
V_{EBO}	emitter-base voltage	open collector		-	6	V
I_C	collector current			-	100	mA
I_{CM}	peak collector current	single pulse; $t_p \leq 1$ ms		-	200	mA
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]	-	200	mW
T_j	junction temperature			-	150	°C
T_{amb}	ambient temperature			-65	150	°C
T_{stg}	storage temperature			-65	150	°C

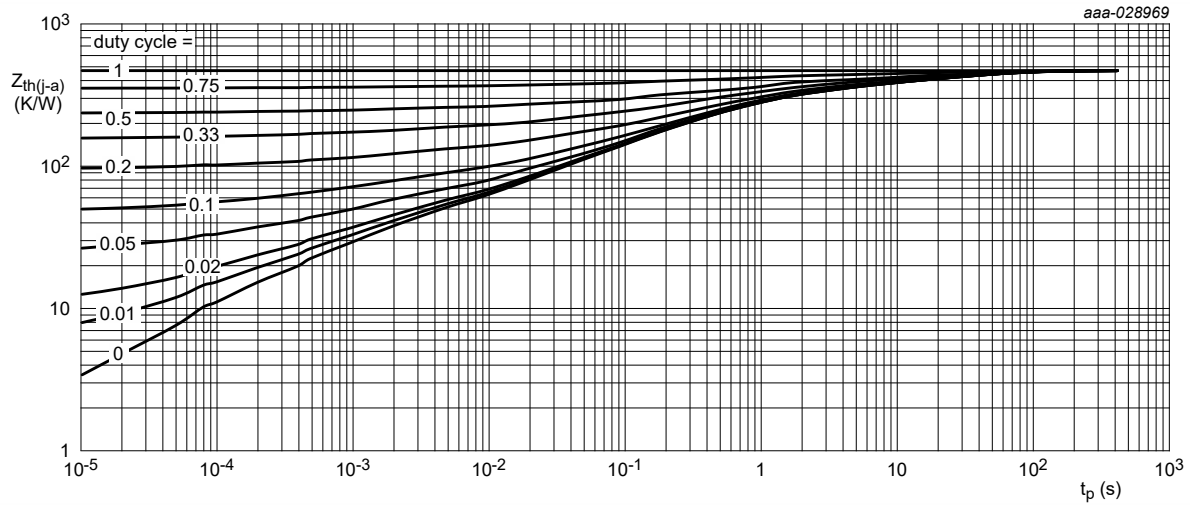
[1] Device mounted on an FR4 PCB, single-sided copper, tin-plated and standard footprint.

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	[1] [2]	-	-	625	K/W

[1] Device mounted on an FR4 Printed-Circuit-Board (PCB); single-sided; 35 µm copper; tin-plated and standard footprint.
[2] Valid for all available selection groups.



FR4 PCB, single-sided, 35 µm copper, tin-plated and standard footprint

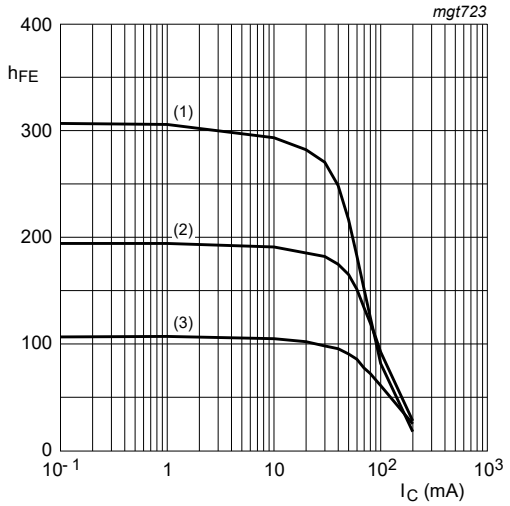
Fig. 1. Transient thermal impedance from junction to ambient as a function of pulse duration; typical values

10. Characteristics

Table 8. Characteristics

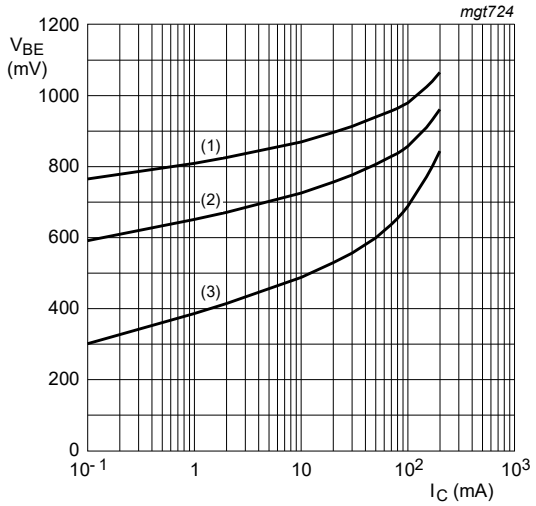
Symbol	Parameter	Conditions		Min	Typ	Max	Unit
$V_{(BR)CBO}$	collector-base breakdown voltage	I_C = 100 µA; I_E = 0 A; T_{amb} = 25 °C		80	-	-	V
$V_{(BR)CEO}$	collector-emitter breakdown voltage	I_C = 10 mA; I_E = 0 A; T_{amb} = 25 °C		65	-	-	V
$V_{(BR)EBO}$	emitter-base breakdown voltage	I_E = 100 µA; I_C = 0 A; T_{amb} = 25 °C		6	-	-	V
I_{CBO}	collector-base cut-off current	V_{CB} = 30 V; I_E = 0 A; T_{amb} = 25 °C		-	-	15	nA
		V_{CB} = 30 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						
	BC846AW-Q	V_{CE} = 5 V; I_C = 10 µA; T_{amb} = 25 °C		-	180	-	
	BC846BW -Q			-	290	-	
	BC846W-Q	V_{CE} = 5 V; I_C = 2 mA; T_{amb} = 25 °C		110	-	450	
	BC846AW-Q			110	180	220	
	BC846BW-Q			200	290	450	
V_{CEsat}	collector-emitter saturation voltage	I_C =10 mA; I_B = 0.5 mA; T_{amb} = 25 °C		-	90	200	mV
		I_C =100 mA; I_B = 5 mA; T_{amb} = 25 °C	[1]	-	200	400	mV
V_{BEsat}	base-emitter saturation voltage	I_C =10 mA; I_B = 0.5 mA; T_{amb} = 25 °C	[2]	-	760	-	mV
		I_C =100 mA; I_B = 5 mA; T_{amb} = 25 °C		-	900	-	mV
V_{BE}	base-emitter voltage	I_C = 2 mA; V_{CE} = 5 V; T_{amb} = 25 °C	[3]	580	660	700	mV
		I_C = 10 mA; V_{CE} = 5 V; T_{amb} = 25 °C	[3]	-	-	770	mV
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		-	2	3	pF
C_e	emitter capacitance	V_{EB} = 0.5 V; I_C = i_c = 0 A; f = 1 MHz; T_{amb} = 25 °C		-	11	-	pF
NF	noise figure	I_C = 200 A; V_{CE} = 5 V; R_S = 2 kΩ; f = 1 kHz; B = 200 Hz; T_{amb} = 25 °C		-	2	10	dB

[1] pulsed; $t_p \leq 300$ µs; $\delta \leq 0.02$
[2] V_{BE}sat decreases by approximately 1.7 mV/K with increasing temperature.
[3] V_{BE} decreases by about 2 mV/K with increasing temperature.



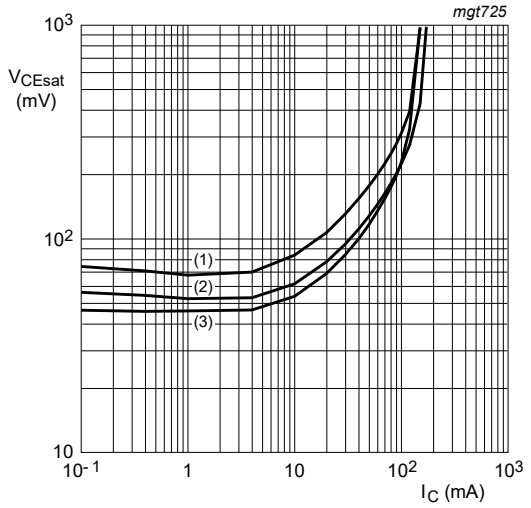
V_{CE} = 5 V
(1) T_{amb} = 150 °C
(2) T_{amb} = 25 °C
(3) T_{amb} = -55 °C

Fig. 2. Group A: DC current gain as a function of collector current; typical values



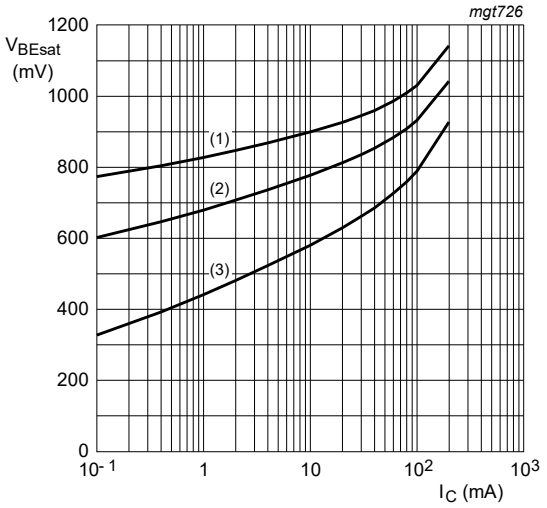
V_{CE} = 5 V
(1) T_{amb} = -55 °C
(2) T_{amb} = 25 °C
(3) T_{amb} = 150 °C

Fig. 3. Group A: Base-emitter voltage as a function of collector current; typical values



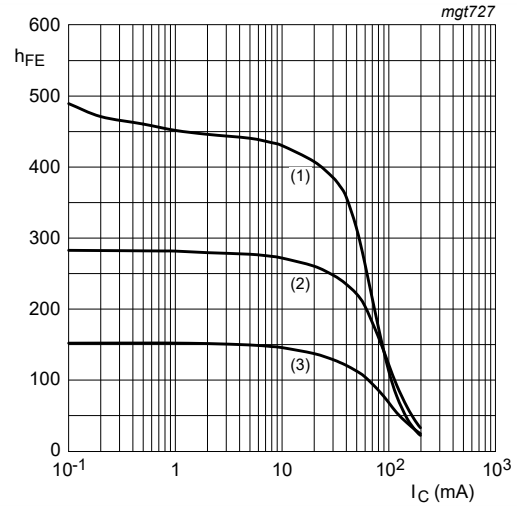
IC/IB = 20
(1) T_{amb} = 150 °C
(2) T_{amb} = 25 °C
(3) T_{amb} = -55 °C

Fig. 4. Group A: Collector-emitter saturation voltage as a function of collector current; typical values



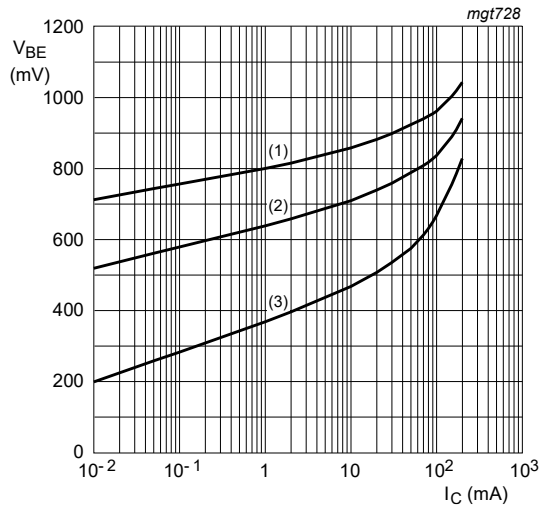
IC/IB = 10
(1) T_{amb} = -55 °C
(2) T_{amb} = 25 °C
(3) T_{amb} = 150 °C

Fig. 5. Group A: Base-emitter saturation voltage as a function of collector current; typical values



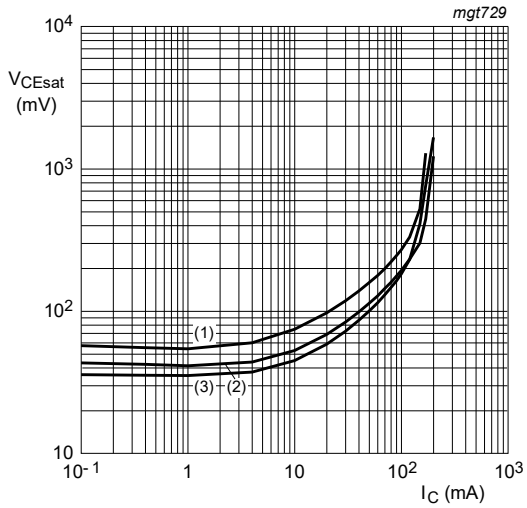
V_{CE} = 5 V
(1) T_{amb} = 150 °C
(2) T_{amb} = 25 °C
(3) T_{amb} = -55 °C

Fig. 6. Group B: DC current gain as a function of collector current; typical values



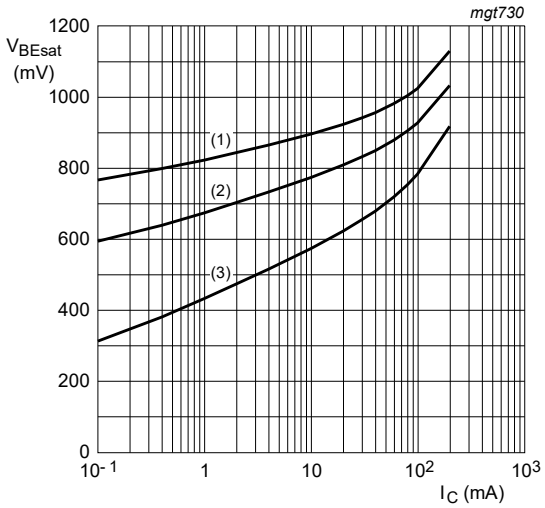
V_{CE} = 5 V
(1) T_{amb} = -55 °C
(2) T_{amb} = 25 °C
(3) T_{amb} = 150 °C

Fig. 7. Group B: Base-emitter voltage as a function of collector current; typical values



IC/IB = 20
(1) T_{amb} = 150 °C
(2) T_{amb} = 25 °C
(3) T_{amb} = -55 °C

Fig. 8. Group B: Collector-emitter saturation voltage as a function of collector current; typical values



IC/IB = 10
(1) T_{amb} = -55 °C
(2) T_{amb} = 25 °C
(3) T_{amb} = 150 °C

Fig. 9. Group B: Base-emitter saturation voltage 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

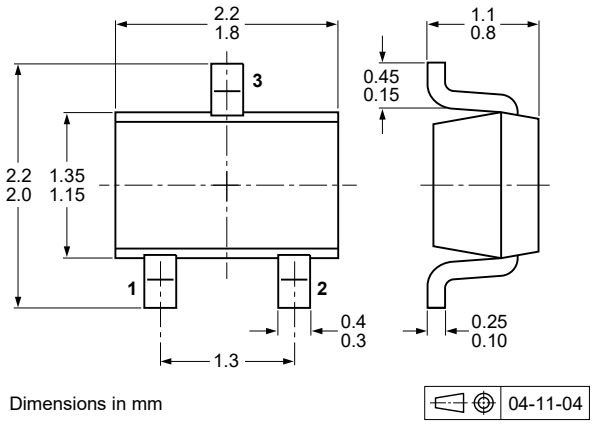


Fig. 10. Package outline SOT323 (SC-70)

13. Soldering

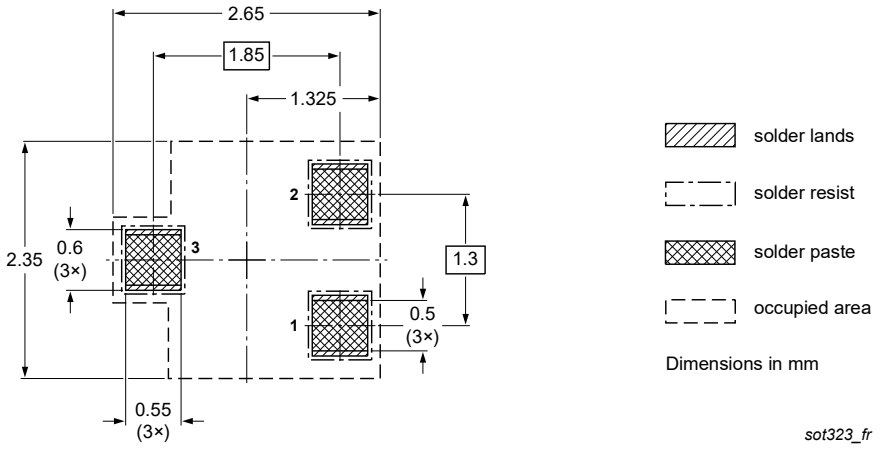


Fig. 11. Reflow soldering footprint for SOT323 (SC-70)

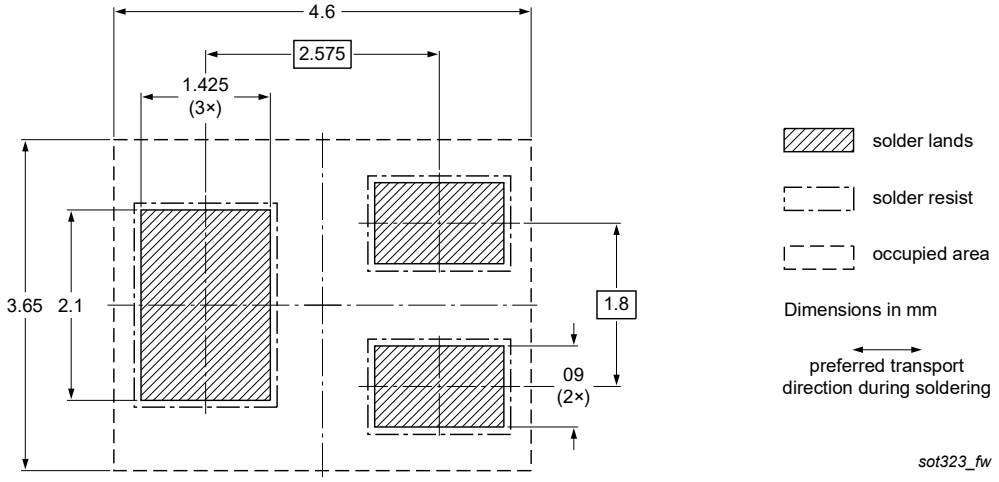


Fig. 12. Wave soldering footprint for SOT323 (SC-70)

14. Revision history

Table 9. Revision history

Data sheet ID	Release date	Data sheet status	Change notice	Supersedes
BC846XW-Q_SER v.2	20230329	Product data sheet	-	BC846XW-Q_SER v.1
Modifications:	• Subtitle of the data sheet corrected to 100 mA			
BC846XW-Q_SER v.1	20210716	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".
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Date of release: 29 March 2023

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