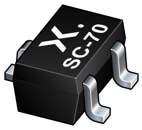


BC846xW-Q series

65 V, 500 mA NPN general-purpose transistors

Rev. 1 — 16 July 2021 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

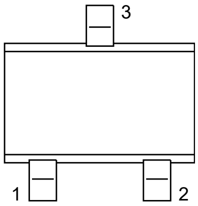
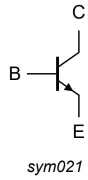
Table 2. Quick reference data

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	

nexperia

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

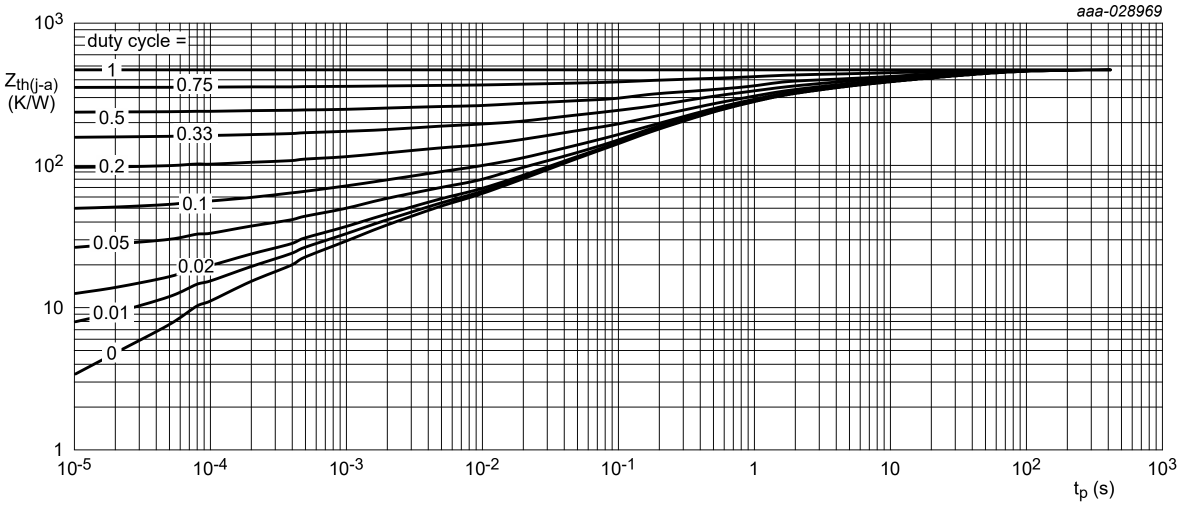
[1] Device mounted on an FR4 PCB, single-sided copper, tin-plated and standard footprint.

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

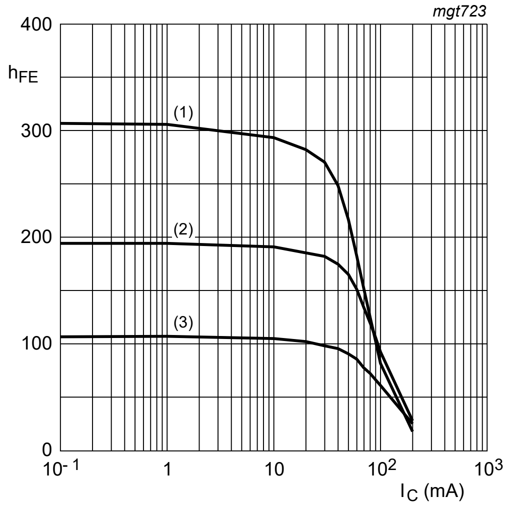
Fig. 1. Transient thermal impedance from junction to ambient as a function of pulse duration; typical values

10. Characteristics

Table 8. Characteristics

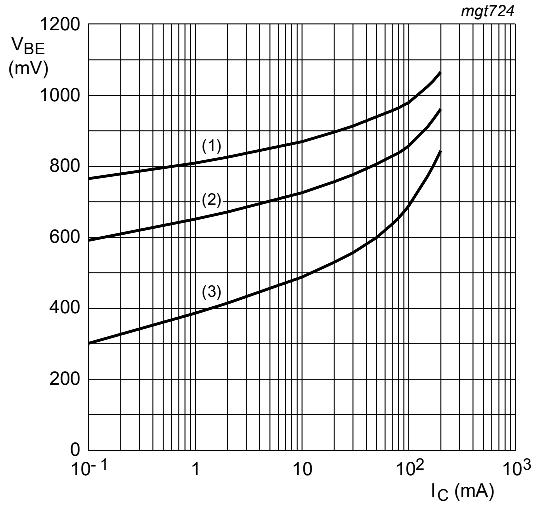
Symbol	Parameter	Conditions		Min	Typ	Max	Unit
$V_{(BR)CBO}$	collector-base breakdown voltage	I_C = 100 μA; I_E = 0 A; T_{amb} = 25 °C		80	-	-	V
$V_{(BR)CEO}$	collector-emitter breakdown voltage	I_C = 10 mA; I_E = 0 A; T_{amb} = 25 °C		65	-	-	V
$V_{(BR)EBO}$	emitter-base breakdown voltage	I_E = 100 μA; 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 ≤ 300 μs; δ ≤ 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.



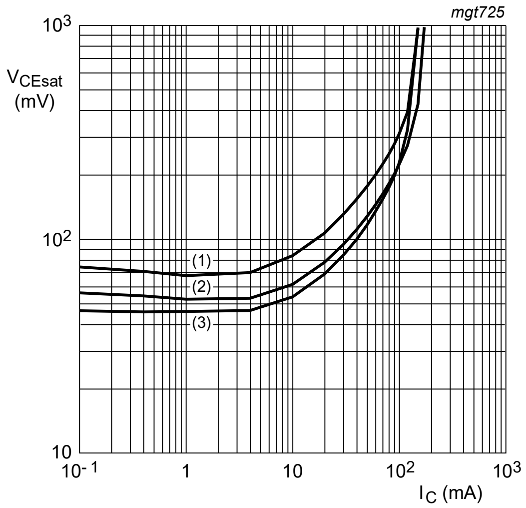
V_{CE} = 5 V
(1) T_{amb} = 150 °C
(2) T_{amb} = 25 °C
(3) T_{amb} = -55 °C

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



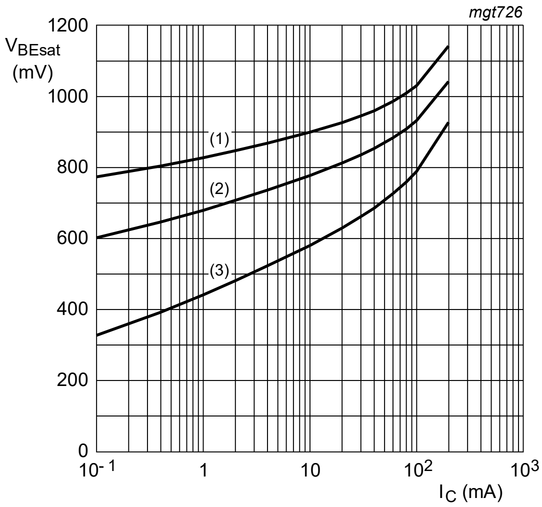
V_{CE} = 5 V
(1) T_{amb} = -55 °C
(2) T_{amb} = 25 °C
(3) T_{amb} = 150 °C

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



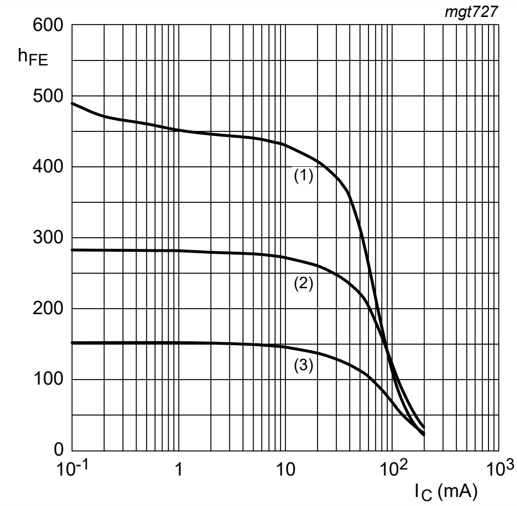
IC/IB = 20
(1) T_{amb} = 150 °C
(2) T_{amb} = 25 °C
(3) T_{amb} = -55 °C

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



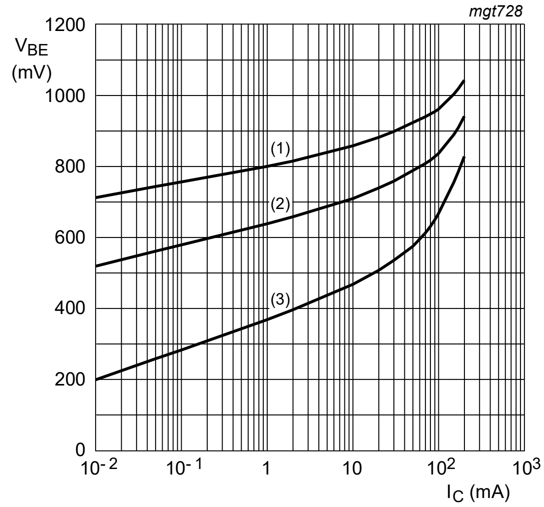
IC/IB = 10
(1) T_{amb} = -55 °C
(2) T_{amb} = 25 °C
(3) T_{amb} = 150 °C

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



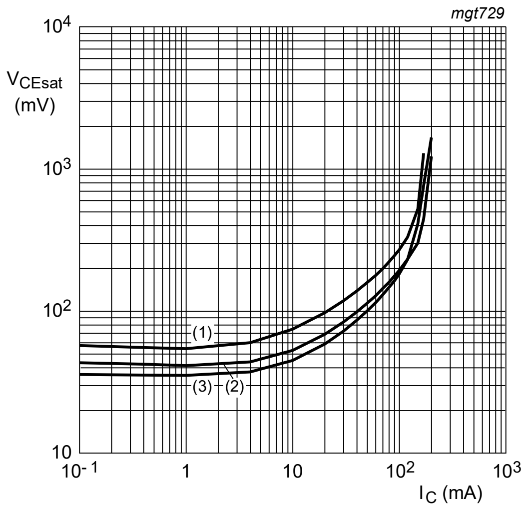
V_{CE} = 5 V
(1) T_{amb} = 150 °C
(2) T_{amb} = 25 °C
(3) T_{amb} = -55 °C

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



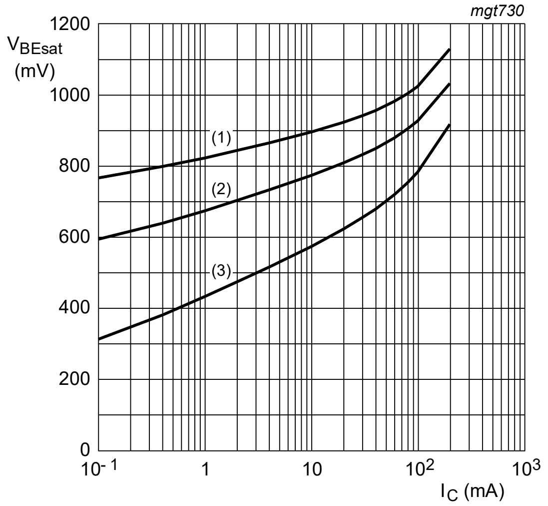
V_{CE} = 5 V
(1) T_{amb} = -55 °C
(2) T_{amb} = 25 °C
(3) T_{amb} = 150 °C

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

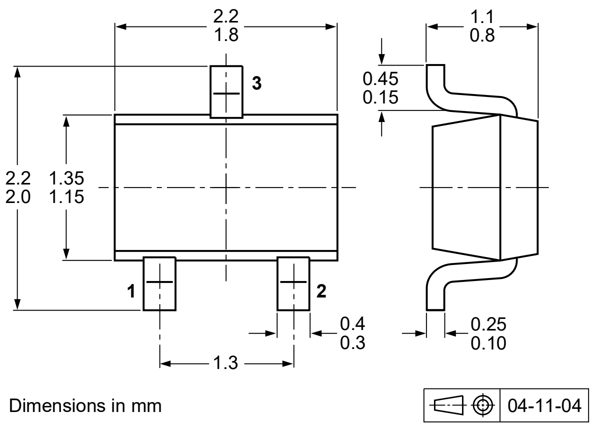


Fig. 10. Package outline SOT323 (SC-70)

13. Soldering

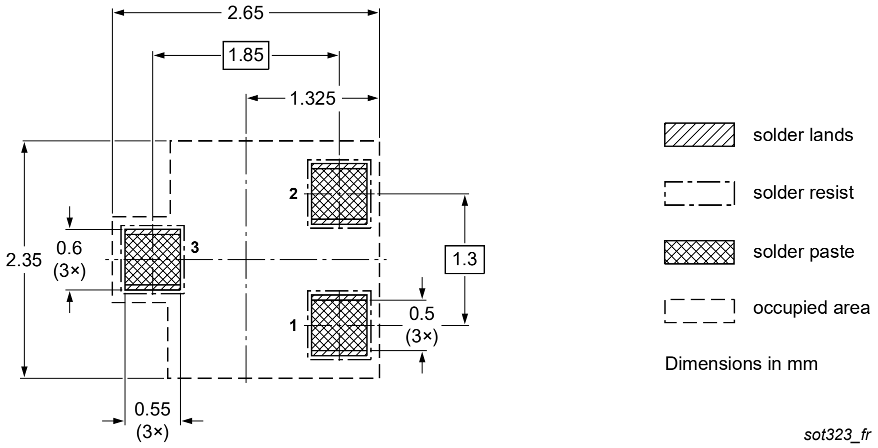


Fig. 11. Reflow soldering footprint for SOT323 (SC-70)

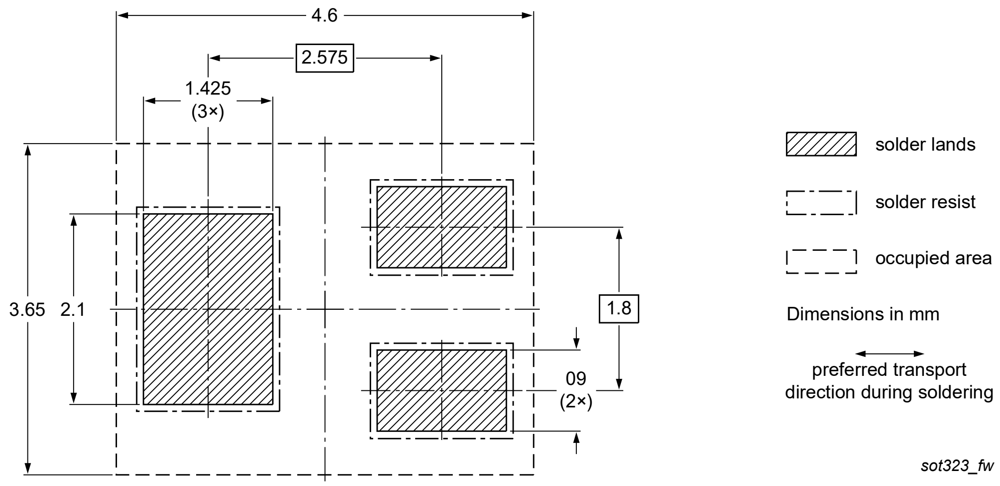


Fig. 12. Wave soldering footprint for SOT323 (SC-70)

14. Revision history

Table 9. Revision history

Data sheet ID	Release date	Data sheet status	Change notice	Supersedes
BC846XW-Q_SER v.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".
[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: 16 July 2021