

# ANTREX Electronics

Electronic Components Sourcing Information

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## Product Reference Information

**Part Number:** BC846A-QR

**Manufacturer:** Nexperia USA Inc.

**Package:** TO-236-3, SC-59, SOT-23-3

**Availability:** Please confirm with sales

### Product Page:

<https://antrexco.com/product/details/nexperia-usa-inc/bc846a-qr.html>

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### Note:

This PDF includes an ANTREX product reference cover page.

The original manufacturer datasheet follows from the next page.

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# BC846x-Q series

65 V, 100 mA NPN general-purpose transistors

Rev. 2 — 20 May 2022

Product data sheet

## 1. General description

NPN general-purpose transistors in a small SOT23 (TO236AB) Surface-Mounted Device (SMD) plastic package.

Table 1. Product overview

| Type number | Package  |          | PNP complement |
|-------------|----------|----------|----------------|
|             | Nexperia | JEDEC    |                |
| BC846-Q     | SOT23    | TO-236AB | BC856-Q        |
| BC846A-Q    |          |          | BC856A-Q       |
| BC846B-Q    |          |          | BC856B-Q       |

## 2. Features and benefits

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

## 3. Applications

- General-purpose switching and amplification

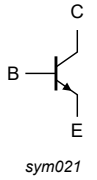
## 4. Quick reference data

Table 2. Quick reference data

| Symbol    | Parameter                 | Conditions                               | Min | Typ | Max | Unit |
|-----------|---------------------------|------------------------------------------|-----|-----|-----|------|
| $V_{CE0}$ | collector-emitter voltage | open base                                | -   | -   | 65  | V    |
| $I_C$     | collector current         |                                          | -   | -   | 100 | mA   |
|           | DC current gain           |                                          |     |     |     |      |
| $h_{FE}$  | BC846-Q                   | $V_{CE} = 5\text{ V}; I_C = 2\text{ mA}$ | 110 | -   | 450 |      |
|           | BC846A-Q                  |                                          | 110 | 180 | 220 |      |
|           | BC846B-Q                  |                                          | 200 | 290 | 450 |      |

## 5. Pinning information

Table 3. Pinning

| Pin | Symbol | Description | Simplified outline                                                                 | Graphic symbol                                                                                |
|-----|--------|-------------|------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------|
| 1   | B      | base        |  | <br>sym021 |
| 2   | E      | emitter     |                                                                                    |                                                                                               |
| 3   | C      | collector   |                                                                                    |                                                                                               |

## 6. Ordering information

Table 4. Ordering information

| Type number              | Package  |                                          |                       |
|--------------------------|----------|------------------------------------------|-----------------------|
|                          | Name     | Description                              | Version               |
| <a href="#">BC846-Q</a>  | TO-236AB | Plastic surface-mounted package; 3 leads | <a href="#">SOT23</a> |
| <a href="#">BC846A-Q</a> |          |                                          |                       |
| <a href="#">BC846B-Q</a> |          |                                          |                       |

## 7. Marking

Table 5. Marking

| Type number | Marking code[1] |
|-------------|-----------------|
| BC846-Q     | 1D%             |
| BC846A-Q    | 1A%             |
| BC846B-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 <sub>CBO</sub> | collector-base voltage    | open emitter                        | -   | 80  | V    |
| V <sub>CEO</sub> | collector-emitter voltage | open base                           | -   | 65  | V    |
| V <sub>EBO</sub> | emitter-base voltage      | open collector                      | -   | 6   | V    |
| I <sub>C</sub>   | collector current         |                                     | -   | 100 | mA   |
| I <sub>CM</sub>  | peak collector current    | single pulse; t <sub>p</sub> ≤ 1 ms | -   | 200 | mA   |
| I <sub>BM</sub>  | peak base current         | single pulse; t <sub>p</sub> ≤ 1 ms | -   | 200 | mA   |
| P <sub>tot</sub> | total power dissipation   | T <sub>amb</sub> ≤ 25 °C [1]        | -   | 250 | mW   |
| T <sub>j</sub>   | junction temperature      |                                     | -   | 150 | °C   |
| T <sub>amb</sub> | ambient temperature       |                                     | -65 | 150 | °C   |
| T <sub>stg</sub> | storage temperature       |                                     | -65 | 150 | °C   |

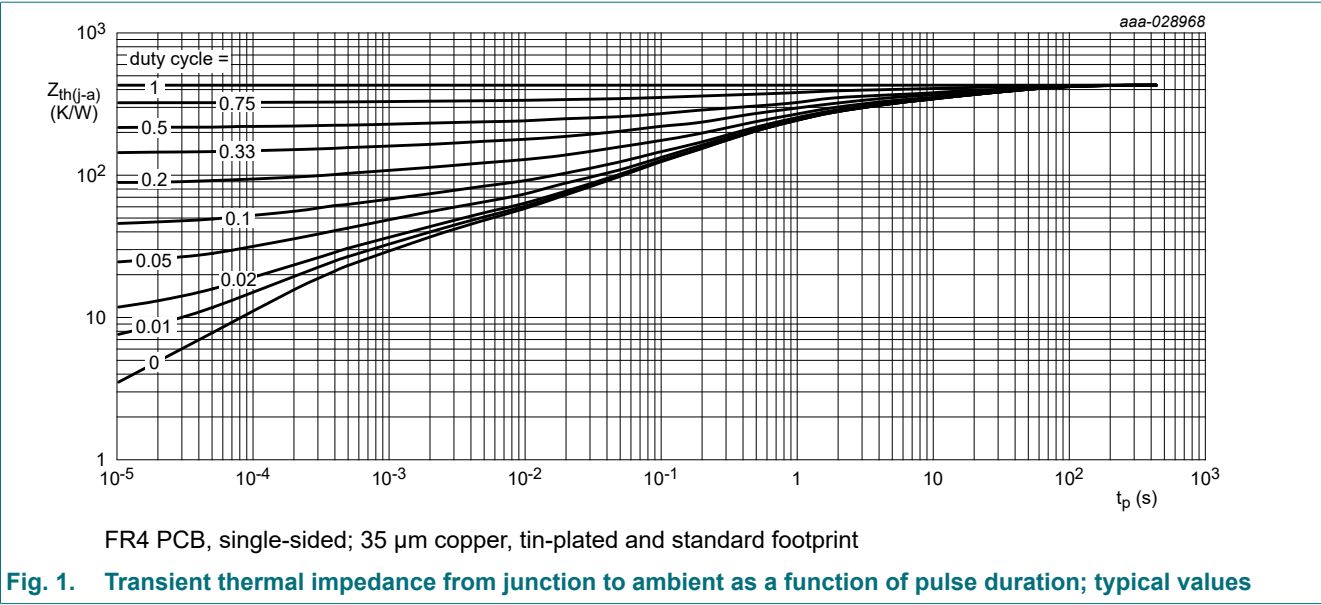
[1] Device mounted on an FR4 PCB, single-sided copper, tin-plated and standard footprint.

9. Thermal characteristics

Table 7. Thermal characteristics

| Symbol               | Parameter                                   | Conditions             | Min | Typ | Max | Unit |
|----------------------|---------------------------------------------|------------------------|-----|-----|-----|------|
| R <sub>th(j-a)</sub> | thermal resistance from junction to ambient | in free air [1]<br>[2] | -   | -   | 500 | 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.



## 10. Characteristics

Table 8. Characteristics

| Symbol               | Parameter                            | Conditions                                                                                                            |     | Min | Typ | Max | Unit |
|----------------------|--------------------------------------|-----------------------------------------------------------------------------------------------------------------------|-----|-----|-----|-----|------|
| V <sub>(BR)CBO</sub> | collector-base breakdown voltage     | I <sub>C</sub> = 100 μA; I <sub>E</sub> = 0 A; T <sub>amb</sub> = 25 °C                                               |     | 80  | -   | -   | V    |
| V <sub>(BR)CEO</sub> | collector-emitter breakdown voltage  | I <sub>C</sub> = 10 mA; I <sub>E</sub> = 0 A; T <sub>amb</sub> = 25 °C                                                |     | 65  | -   | -   | V    |
| V <sub>(BR)EBO</sub> | emitter-base breakdown voltage       | I <sub>E</sub> = 100 μA; I <sub>C</sub> = 0 A; T <sub>amb</sub> = 25 °C                                               |     | 6   | -   | -   | V    |
| I <sub>CBO</sub>     | collector-base cut-off current       | V <sub>CB</sub> = 30 V; I <sub>E</sub> = 0 A; T <sub>amb</sub> = 25 °C                                                |     | -   | -   | 15  | nA   |
|                      |                                      | V <sub>CB</sub> = 30 V; I <sub>E</sub> = 0 A; T <sub>j</sub> = 150 °C                                                 |     | -   | -   | 5   | μA   |
| I <sub>EBO</sub>     | emitter-base cut-off current         | V <sub>EB</sub> = 5 V; I <sub>C</sub> = 0 A; T <sub>amb</sub> = 25 °C                                                 |     | -   | -   | 100 | nA   |
| h <sub>FE</sub>      | DC current gain                      |                                                                                                                       |     |     |     |     |      |
|                      | BC846A-Q                             | V <sub>CE</sub> = 5 V; I <sub>C</sub> = 10 μA; T <sub>amb</sub> = 25 °C                                               |     | -   | 180 | -   |      |
|                      | BC846B-Q                             |                                                                                                                       |     | -   | 290 | -   |      |
|                      | BC846-Q                              | V <sub>CE</sub> = 5 V; I <sub>C</sub> = 2 mA; T <sub>amb</sub> = 25 °C                                                |     | 110 | -   | 450 |      |
|                      | BC846A-Q                             |                                                                                                                       |     | 110 | 180 | 220 |      |
|                      | BC846B-Q                             |                                                                                                                       |     | 200 | 290 | 450 |      |
| V <sub>CEsat</sub>   | collector-emitter saturation voltage | I <sub>C</sub> =10 mA; I <sub>B</sub> = 0.5 mA; T <sub>amb</sub> = 25 °C                                              |     | -   | 90  | 200 | mV   |
|                      |                                      | I <sub>C</sub> =100 mA; I <sub>B</sub> = 5 mA; T <sub>amb</sub> = 25 °C                                               | [1] | -   | 200 | 400 | mV   |
| V <sub>BEsat</sub>   | base-emitter saturation voltage      | I <sub>C</sub> =10 mA; I <sub>B</sub> = 0.5 mA; T <sub>amb</sub> = 25 °C                                              | [2] | -   | 760 | -   | mV   |
|                      |                                      | I <sub>C</sub> =100 mA; I <sub>B</sub> = 5 mA; T <sub>amb</sub> = 25 °C                                               |     | -   | 900 | -   | mV   |
| V <sub>BE</sub>      | base-emitter voltage                 | I <sub>C</sub> = 2 mA; V <sub>CE</sub> = 5 V; T <sub>amb</sub> = 25 °C                                                | [3] | 580 | 660 | 700 | mV   |
|                      |                                      | I <sub>C</sub> = 10 mA; V <sub>CE</sub> = 5 V; T <sub>amb</sub> = 25 °C                                               | [3] | -   | -   | 770 | mV   |
| f <sub>T</sub>       | transition frequency                 | V <sub>CE</sub> = 5 V; I <sub>C</sub> = 10 mA; f = 100 MHz; T <sub>amb</sub> = 25 °C                                  |     | 100 | -   | -   | MHz  |
| C <sub>c</sub>       | collector capacitance                | V <sub>CB</sub> = 10 V; I <sub>E</sub> = i <sub>e</sub> = 0 A; f = 1 MHz; T <sub>amb</sub> = 25 °C                    |     | -   | 2   | 3   | pF   |
| C <sub>e</sub>       | emitter capacitance                  | V <sub>EB</sub> = 0.5 V; I <sub>C</sub> = i <sub>c</sub> = 0 A; f = 1 MHz; T <sub>amb</sub> = 25 °C                   |     | -   | 11  | -   | pF   |
| NF                   | noise figure                         | I <sub>C</sub> = 200 A; V <sub>CE</sub> = 5 V; R <sub>S</sub> = 2 kΩ; f = 1 kHz; B = 200 Hz; T <sub>amb</sub> = 25 °C |     | -   | 2   | 10  | dB   |

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

[2]  $V_{BEsat}$  decreases by approximately 1.7 mV/K with increasing temperature.

[3]  $V_{BE}$  decreases by about 2 mV/K with increasing temperature.

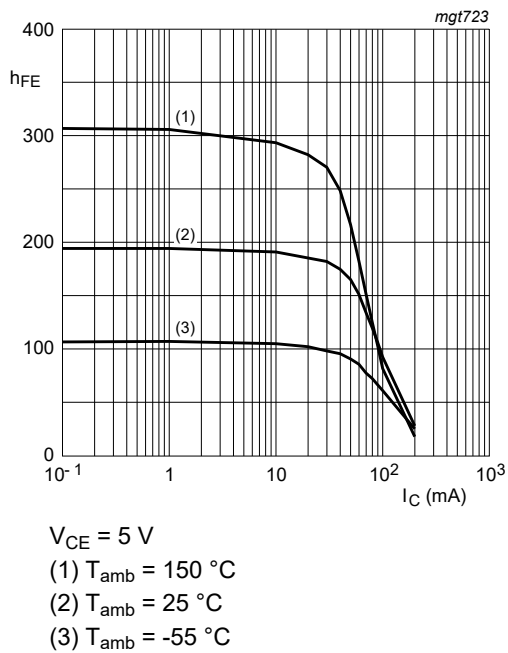


Fig. 2. Group A: DC current gain as a function of collector current; typical values



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

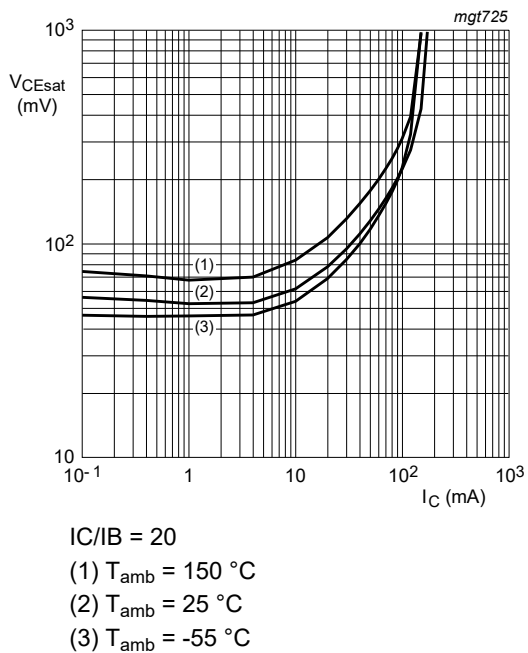


Fig. 4. Group A: Collector-emitter saturation voltage as a function of collector current; typical values

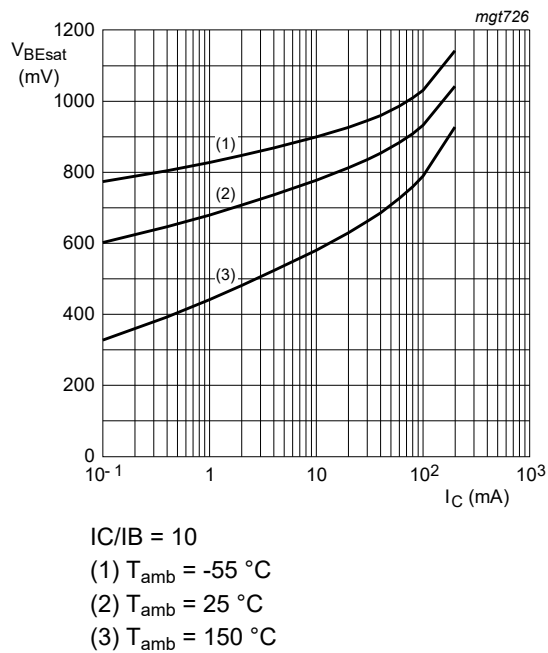


Fig. 5. Group A: Base-emitter saturation voltage as a function of collector current; typical values

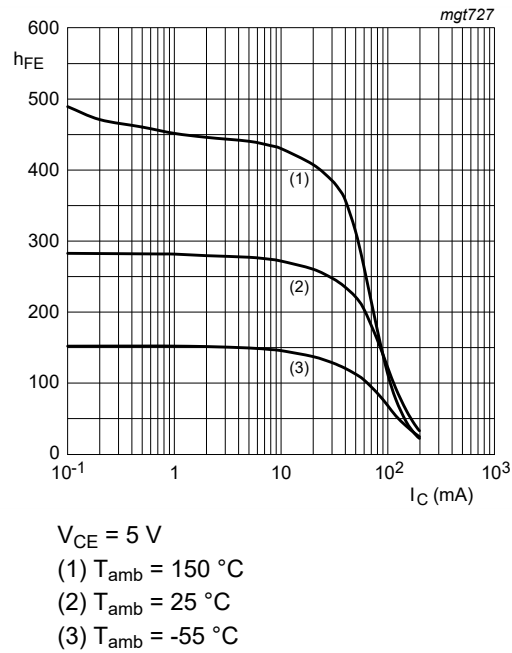


Fig. 6. Group B: DC current gain as a function of collector current; typical values

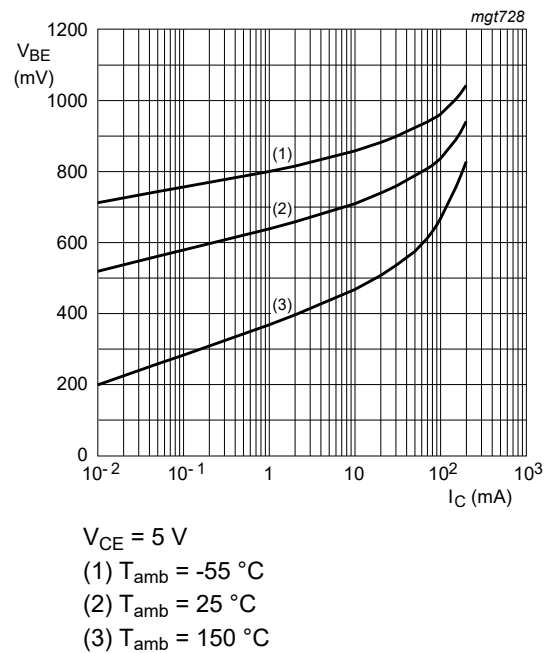


Fig. 7. Group B: Base-emitter voltage as a function of collector current; typical values

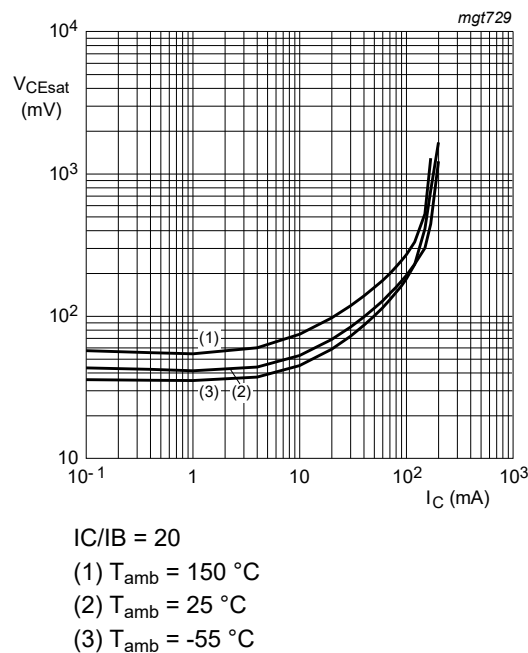


Fig. 8. Group B: Collector-emitter saturation voltage as a function of collector current; typical values

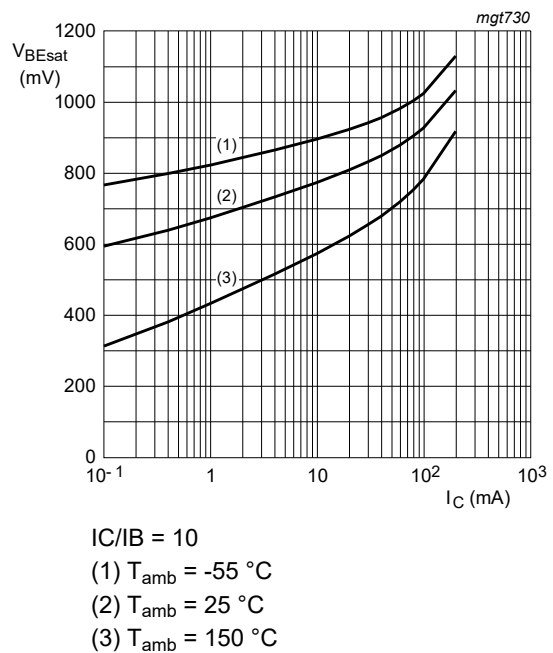


Fig. 9. Group B: Base-emitter saturation voltage as a function of collector current; typical values

## 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

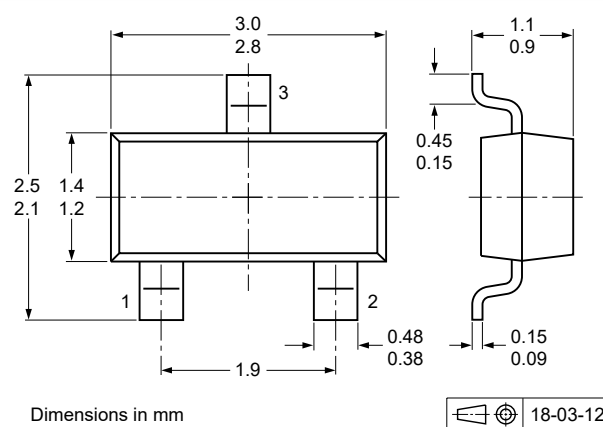
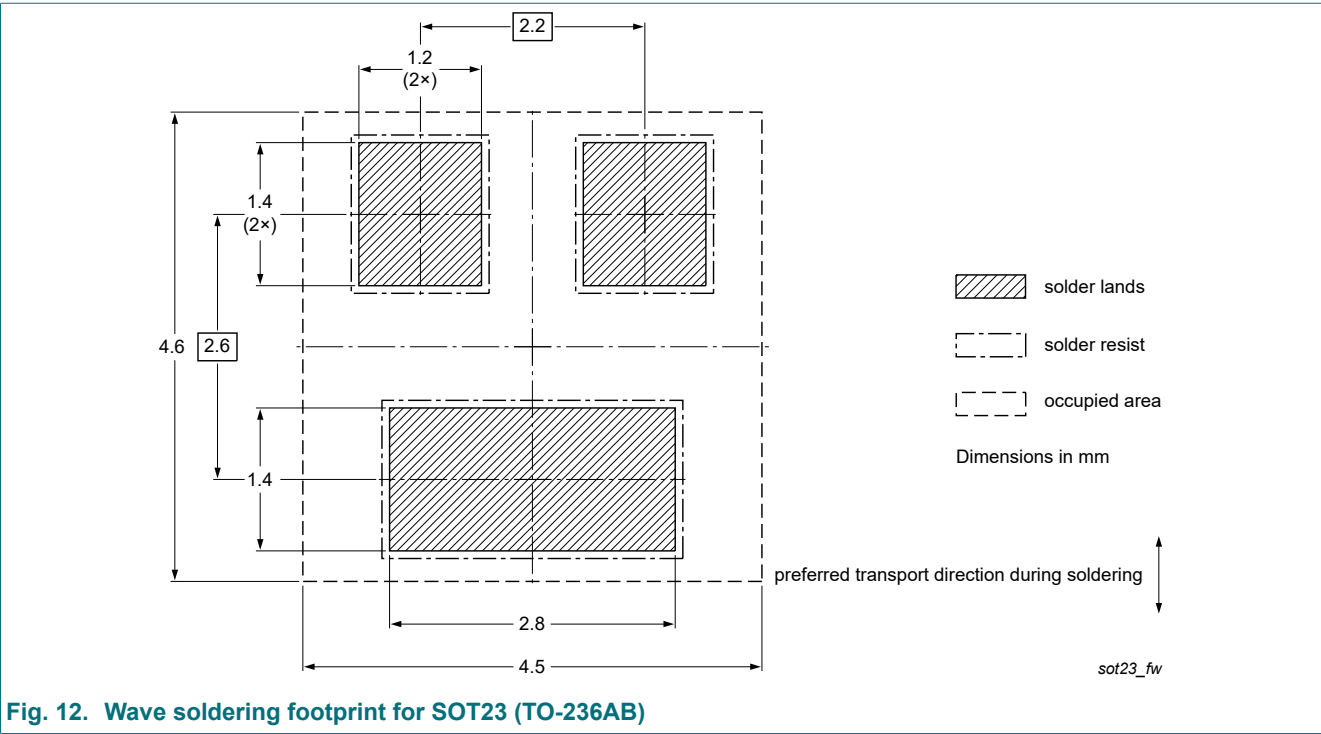
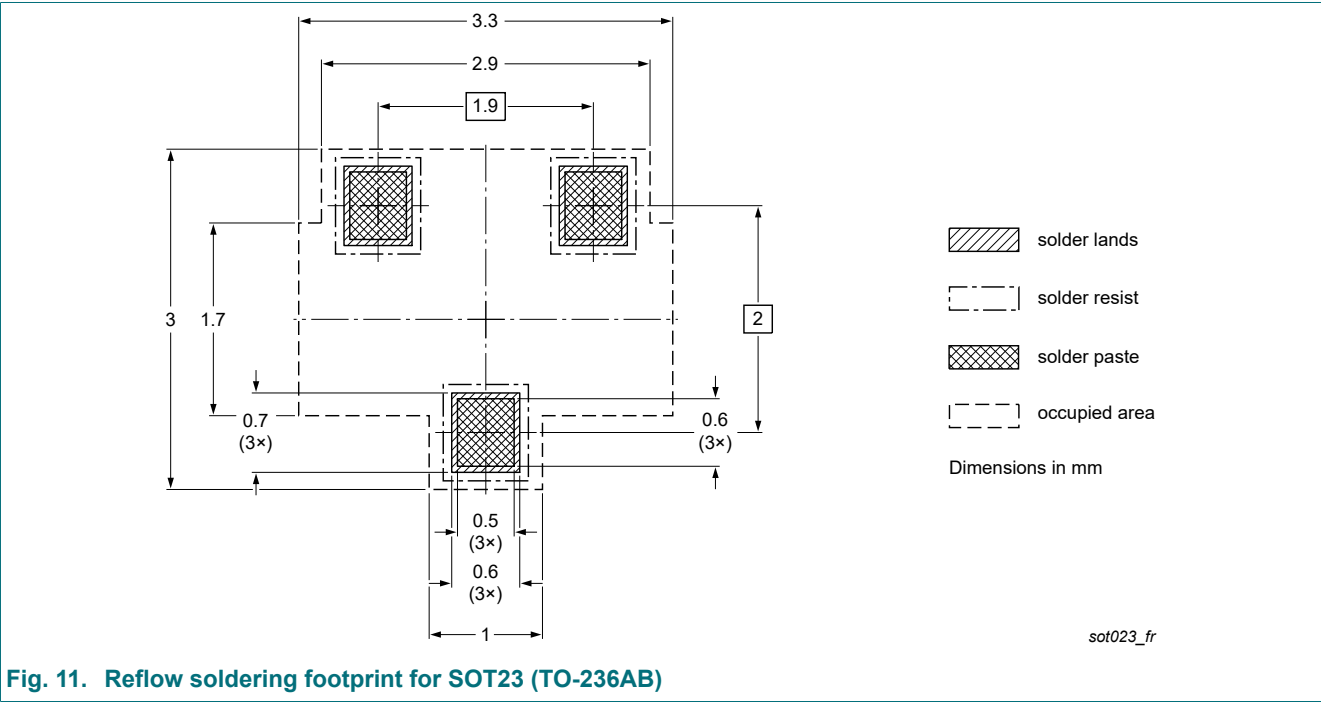


Fig. 10. Package outline SOT23 (TO-236AB)

13. Soldering



## 14. Revision history

**Table 9. Revision history**

| Data sheet ID    | Release date                                                                                  | Data sheet status  | Change notice | Supersedes       |
|------------------|-----------------------------------------------------------------------------------------------|--------------------|---------------|------------------|
| BC846X-Q_SER v.2 | 20220520                                                                                      | Product data sheet | -             | BC846X-Q_SER v.1 |
| Modifications:   | <ul style="list-style-type: none"><li>Alternative title: 500 mA corrected to 100 mA</li></ul> |                    |               |                  |
| BC846X-Q_SER v.1 | 20210716                                                                                      | Product data sheet | -             | -                |

## 15. Legal information

### Data sheet status

| Document status<br>[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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For sales office addresses, please send an email to: [salesaddresses@nexperia.com](mailto:salesaddresses@nexperia.com)

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