

BC846BW,135 Datasheet



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| | |
|------------------------------|--|
| DiGi Electronics Part Number | BC846BW,135-DG |
| Manufacturer | Nexperia USA Inc. |
| Manufacturer Product Number | BC846BW,135 |
| Description | TRANS NPN 65V 0.1A SOT323 |
| Detailed Description | Bipolar (BJT) Transistor NPN 65 V 100 mA 100MHz 200 mW Surface Mount SOT-323 |



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Purchase and inquiry

Manufacturer Product Number:

BC846BW,135

Series:

BC846xW

Transistor Type:

NPN

Voltage - Collector Emitter Breakdown (Max):

65 V

Current - Collector Cutoff (Max):

15nA (ICBO)

Power - Max:

200 mW

Operating Temperature:

150°C (TJ)

Package / Case:

SC-70, SOT-323

Base Product Number:

BC846

Manufacturer:

Nexperia USA Inc.

Product Status:

Active

Current - Collector (Ic) (Max):

100 mA

Vce Saturation (Max) @ Ib, Ic:

400mV @ 5mA, 100mA

DC Current Gain (hFE) (Min) @ Ic, Vce:

200 @ 2mA, 5V

Frequency - Transition:

100MHz

Mounting Type:

Surface Mount

Supplier Device Package:

SOT-323

Environmental & Export classification

RoHS Status:

ROHS3 Compliant

REACH Status:

REACH Unaffected

HTSUS:

8541.21.0075

Moisture Sensitivity Level (MSL):

1 (Unlimited)

ECCN:

EAR99



BC846xW series

65 V, 100 mA NPN general-purpose transistors

Rev. 12 — 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 | SOT323 | SC-70 | BC856W |
| BC846AW | | | BC856AW |
| BC846BW | | | BC856BW |

2. Features and benefits

- General-purpose transistors
- SMD plastic package
- Two different gain selections

3. Applications

- General-purpose switching and amplification

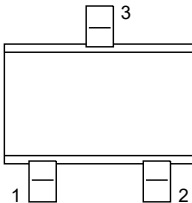
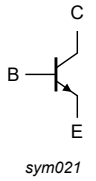
4. Quick reference data

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 |
| | DCcurrent gain | | | | | |
| h_{FE} | BC846W | $V_{CE} = 5\text{ V}; I_C = 2\text{ mA}$ | 110 | - | 450 | |
| | BC846AW | | 110 | 180 | 220 | |
| | BC846BW | | 200 | 290 | 450 | |

5. Pinning information

Table 3. Pinning

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

6. Ordering information

Table 4. Ordering information

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

7. Marking

Table 5. Marking

| Type number | Marking code[1] |
|-------------|-----------------|
| BC846W | 1D% |
| BC846AW | 1A% |
| BC846BW | 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.

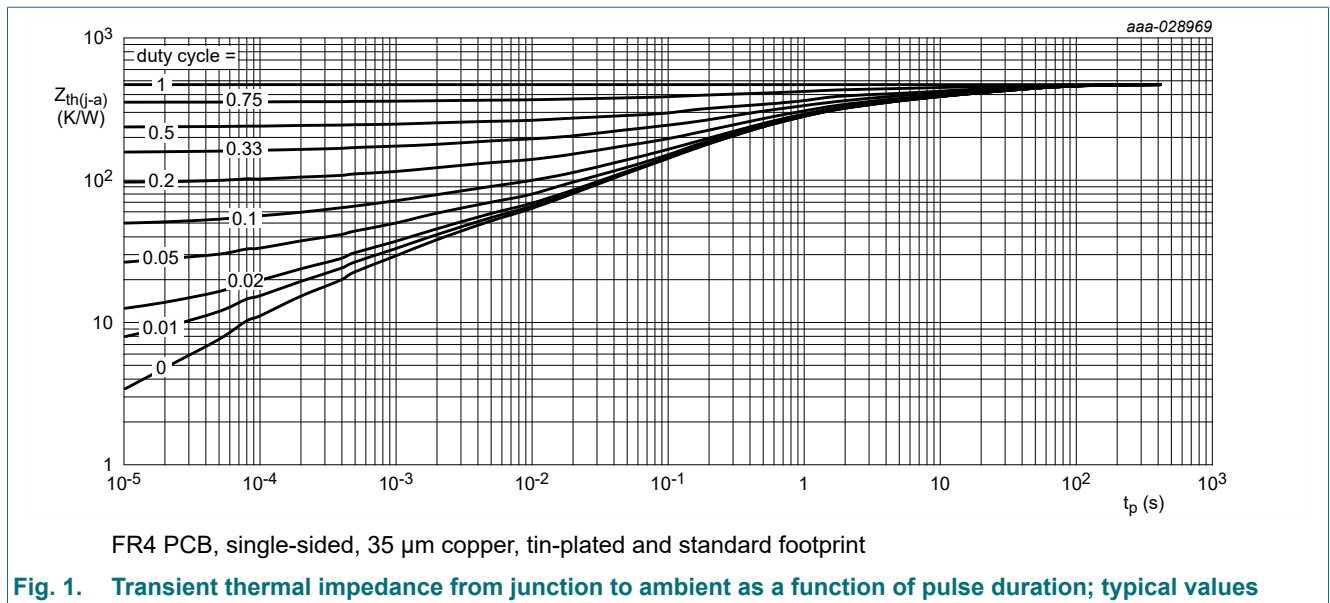
9. Thermal characteristics

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 μ m copper; tin-plated and standard footprint.

[2] Valid for all available selection groups.



10. Characteristics

Table 8. Characteristics

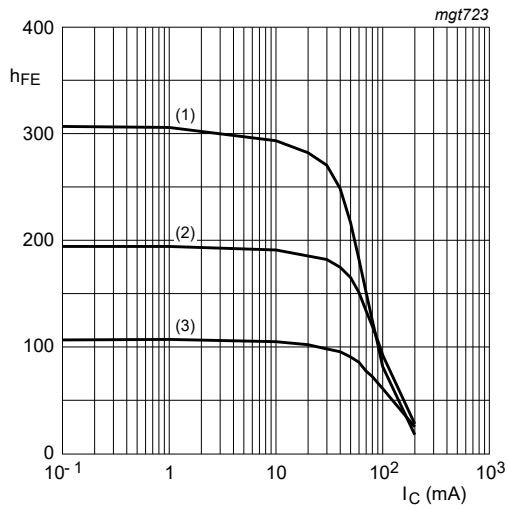
| Symbol | Parameter | Conditions | Min | Typ | Max | Unit | |
|---------------|--------------------------------------|--|-----|-----|-----|---------------|----|
| $V_{(BR)CBO}$ | collector-base breakdown voltage | $I_C = 100 \mu\text{A}; I_E = 0 \text{ A}; T_{\text{amb}} = 25 \text{ }^\circ\text{C}$ | 80 | - | - | V | |
| $V_{(BR)CEO}$ | collector-emitter breakdown voltage | $I_C = 10 \text{ mA}; I_E = 0 \text{ A}; T_{\text{amb}} = 25 \text{ }^\circ\text{C}$ | 65 | - | - | V | |
| $V_{(BR)EBO}$ | emitter-base breakdown voltage | $I_E = 100 \mu\text{A}; I_C = 0 \text{ A}; T_{\text{amb}} = 25 \text{ }^\circ\text{C}$ | 6 | - | - | V | |
| I_{CBO} | collector-base cut-off current | $V_{CB} = 30 \text{ V}; I_E = 0 \text{ A}; T_{\text{amb}} = 25 \text{ }^\circ\text{C}$ | - | - | 15 | nA | |
| | | $V_{CB} = 30 \text{ V}; I_E = 0 \text{ A}; T_j = 150 \text{ }^\circ\text{C}$ | - | - | 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 | | | | | | |
| | BC846AW | $V_{CE} = 5 \text{ V}; I_C = 10 \mu\text{A}; T_{\text{amb}} = 25 \text{ }^\circ\text{C}$ | - | 180 | - | | |
| | BC846BW | | - | 290 | - | | |
| | BC846W | $V_{CE} = 5 \text{ V}; I_C = 2 \text{ mA}; T_{\text{amb}} = 25 \text{ }^\circ\text{C}$ | 110 | - | 450 | | |
| | BC846AW | | 110 | 180 | 220 | | |
| | BC846BW | | 200 | 290 | 450 | | |
| V_{CEsat} | collector-emitter saturation voltage | $I_C = 10 \text{ mA}; I_B = 0.5 \text{ mA}; T_{\text{amb}} = 25 \text{ }^\circ\text{C}$ | - | 90 | 200 | mV | |
| | | $I_C = 100 \text{ mA}; I_B = 5 \text{ mA}; T_{\text{amb}} = 25 \text{ }^\circ\text{C}$ | [1] | - | 200 | 400 | mV |
| V_{BEsat} | base-emitter saturation voltage | $I_C = 10 \text{ mA}; I_B = 0.5 \text{ mA}; T_{\text{amb}} = 25 \text{ }^\circ\text{C}$ | [2] | - | 760 | - | mV |
| | | $I_C = 100 \text{ mA}; I_B = 5 \text{ mA}; T_{\text{amb}} = 25 \text{ }^\circ\text{C}$ | - | - | 900 | - | mV |
| V_{BE} | base-emitter voltage | $I_C = 2 \text{ mA}; V_{CE} = 5 \text{ V}; T_{\text{amb}} = 25 \text{ }^\circ\text{C}$ | [3] | 580 | 660 | 700 | mV |
| | | $I_C = 10 \text{ mA}; V_{CE} = 5 \text{ V}; T_{\text{amb}} = 25 \text{ }^\circ\text{C}$ | [4] | - | - | 770 | mV |
| 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 | $V_{CB} = 10 \text{ V}; I_E = i_e = 0 \text{ A}; f = 1 \text{ MHz}; T_{\text{amb}} = 25 \text{ }^\circ\text{C}$ | - | 2 | 3 | pF | |
| C_e | emitter capacitance | $V_{EB} = 0.5 \text{ V}; I_C = i_c = 0 \text{ A}; f = 1 \text{ MHz}; T_{\text{amb}} = 25 \text{ }^\circ\text{C}$ | - | 11 | - | pF | |
| NF | noise figure | $I_C = 200 \text{ } \mu\text{A}; V_{CE} = 5 \text{ V}; R_S = 2 \text{ k}\Omega; f = 1 \text{ kHz}; B = 200 \text{ Hz}; T_{\text{amb}} = 25 \text{ }^\circ\text{C}$ | - | 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.

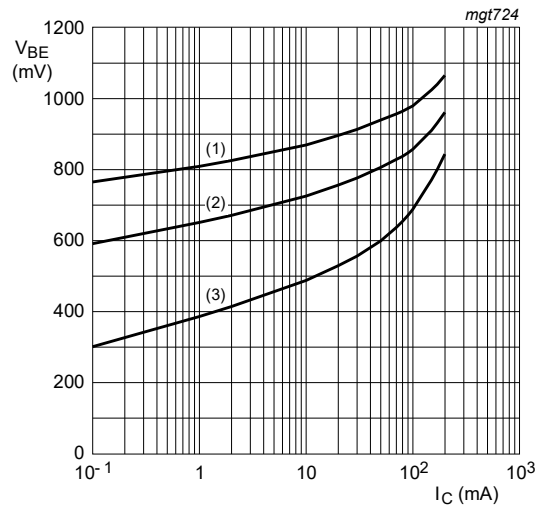
[3] V_{BE} decreases by about 2 mV/K with increasing temperature.

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



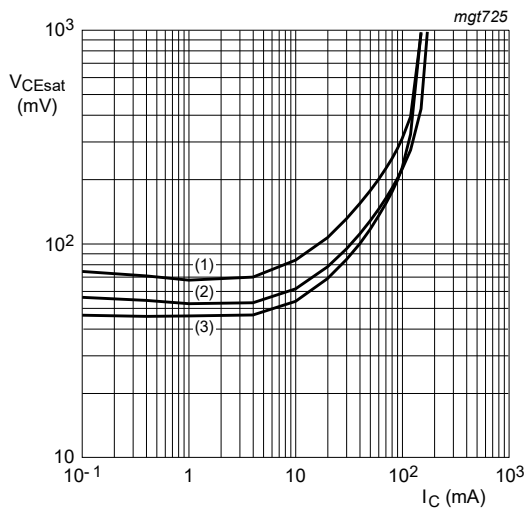
$V_{CE} = 5\text{ V}$
 (1) $T_{amb} = 150\text{ °C}$
 (2) $T_{amb} = 25\text{ °C}$
 (3) $T_{amb} = -55\text{ °C}$

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



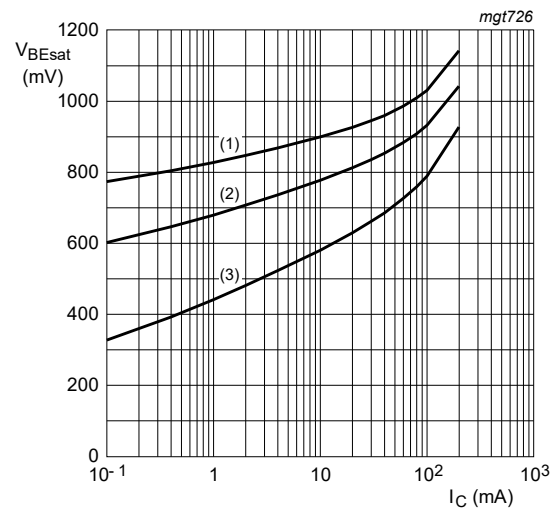
$V_{CE} = 5\text{ V}$
 (1) $T_{amb} = -55\text{ °C}$
 (2) $T_{amb} = 25\text{ °C}$
 (3) $T_{amb} = 150\text{ °C}$

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



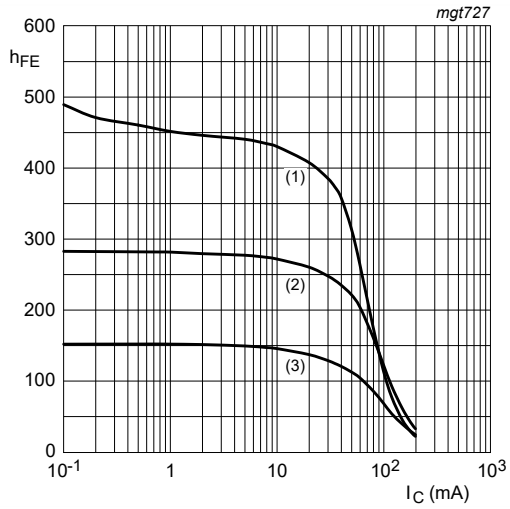
$I_C/I_B = 20$
 (1) $T_{amb} = 150\text{ °C}$
 (2) $T_{amb} = 25\text{ °C}$
 (3) $T_{amb} = -55\text{ °C}$

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



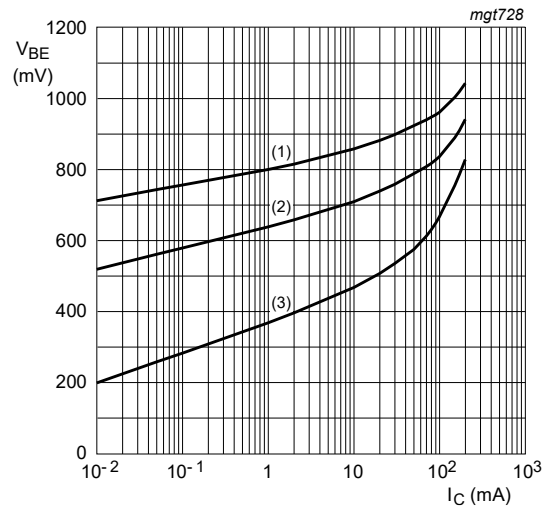
$I_C/I_B = 10$
 (1) $T_{amb} = -55\text{ °C}$
 (2) $T_{amb} = 25\text{ °C}$
 (3) $T_{amb} = 150\text{ °C}$

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



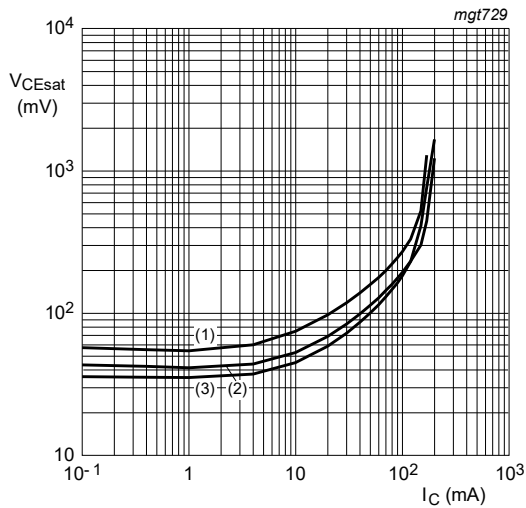
$V_{CE} = 5\text{ V}$
 (1) $T_{amb} = 150\text{ }^{\circ}\text{C}$
 (2) $T_{amb} = 25\text{ }^{\circ}\text{C}$
 (3) $T_{amb} = -55\text{ }^{\circ}\text{C}$

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



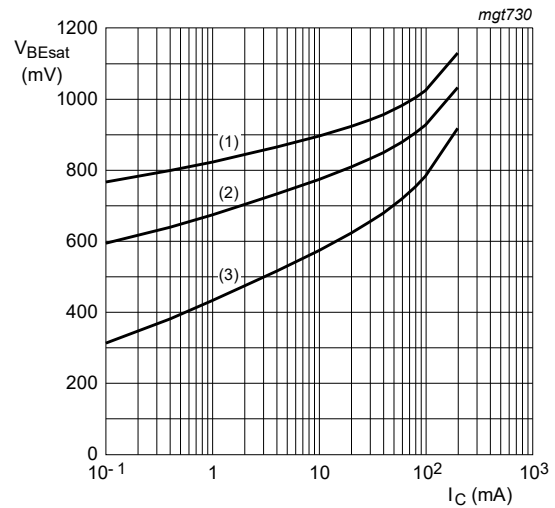
$V_{CE} = 5\text{ V}$
 (1) $T_{amb} = -55\text{ }^{\circ}\text{C}$
 (2) $T_{amb} = 25\text{ }^{\circ}\text{C}$
 (3) $T_{amb} = 150\text{ }^{\circ}\text{C}$

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



$I_C/I_B = 20$
 (1) $T_{amb} = 150\text{ }^{\circ}\text{C}$
 (2) $T_{amb} = 25\text{ }^{\circ}\text{C}$
 (3) $T_{amb} = -55\text{ }^{\circ}\text{C}$

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



$I_C/I_B = 10$
 (1) $T_{amb} = -55\text{ }^{\circ}\text{C}$
 (2) $T_{amb} = 25\text{ }^{\circ}\text{C}$
 (3) $T_{amb} = 150\text{ }^{\circ}\text{C}$

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

11. Package outline

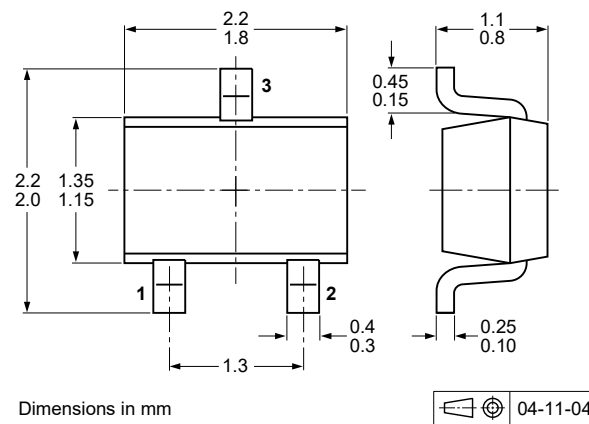


Fig. 10. Package outline SOT323 (SC-70)

12. Soldering

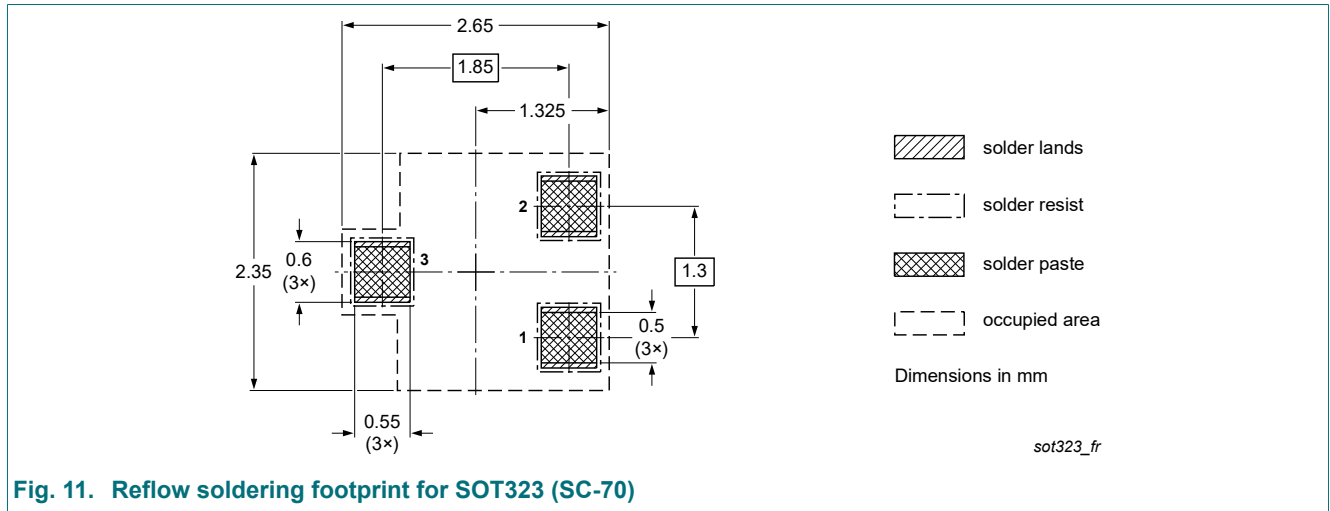


Fig. 11. Reflow soldering footprint for SOT323 (SC-70)

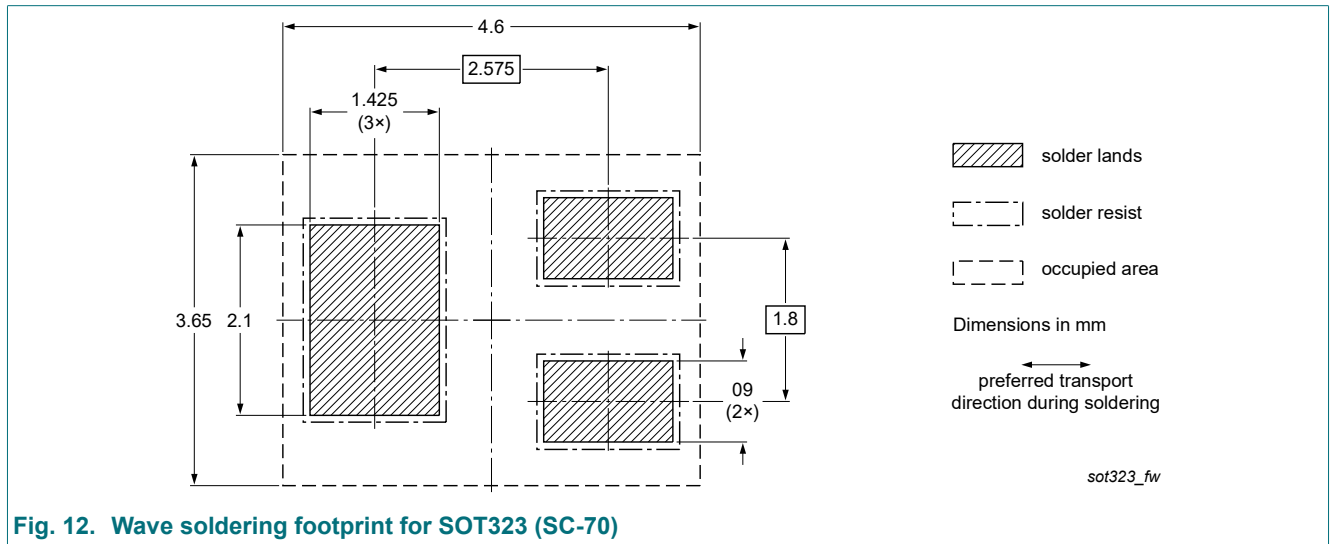


Fig. 12. Wave soldering footprint for SOT323 (SC-70)

13. Revision history

Table 9. Revision history

| Data sheet ID | Release date | Data sheet status | Change notice | Supersedes |
|---------------------|--|--------------------|---------------|---------------------|
| BC846XW_SER v.12 | 20230329 | Product data sheet | - | BC846_SER v.11 |
| Modifications: | <ul style="list-style-type: none"> Subtitle of the data sheet corrected to 100 mA | | | |
| BC846XW_SER v.11 | 20220701 | Product data sheet | - | BC846_SER v.10 |
| BC846_SER v.9 | 20120925 | Product data sheet | - | BC846_SER v.8 |
| BC846_SER v.8 | 20120424 | Product data sheet | - | BC846_BC546_SER v.7 |
| BC846_BC546_SER v.7 | 20091117 | Product data sheet | - | BC846_BC546_SER v.6 |
| BC846_BC546_SER v.6 | 20060207 | Product data sheet | - | - |

14. 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. |

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- [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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