



BC846xQC-Q series

65 V, 100 mA NPN general-purpose transistor

Rev. 2 — 12 May 2021

Product data sheet

1. General description

NPN general-purpose transistor in an ultra small DFN1412D-3 (SOT8009) leadless Surface-Mounted Device (SMD) plastic package with side-wettable flanks.

Table 1. Product overview

| Type number | Package | | PNP complement: |
|-------------|----------|----------|-----------------|
| | Nexperia | JEDEC | |
| BC846AQC-Q | SOT8009 | MO-340CA | BC856AQC-Q |
| BC846BQC-Q | | | BC856BQC-Q |

2. Features and benefits

- High power dissipation capability
- High voltage (max. 65 V)
- Suitable for Automatic Optical Inspection (AOI) of solder joint
- Smaller footprint compared to conventional leaded SMD packages
- Low package height of 0.5 mm
- Qualified according to AEC-Q101 and recommended for use in automotive applications

3. Applications

- General-purpose switching and amplification
- Space restricted applications

4. Quick reference data

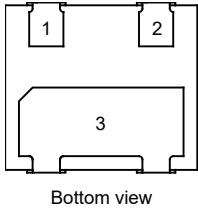
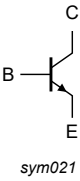
Table 2. Quick reference data

$T_{amb} = 25\text{ °C}$ unless otherwise specified.

| Symbol | Parameter | Conditions | Min | Typ | Max | Unit |
|-----------|---------------------------|--|-----|-----|-----|------|
| V_{CEO} | collector-emitter voltage | open base | - | - | 65 | V |
| I_C | collector current | | - | - | 100 | mA |
| I_{CM} | peak collector current | single pulse; $t_p \leq 1\text{ ms}$ | - | - | 200 | mA |
| h_{FE} | DC current gain | | | | | |
| | BC846AQC-Q | $V_{CE} = 5\text{ V}; I_C = 2\text{ mA}$ | 110 | - | 220 | |
| | BC846BQC-Q | | 200 | - | 450 | |

5. Pinning information

Table 3. Pinning

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

6. Ordering information

Table 4. Ordering information

| Type number | Package | | |
|-------------|------------|---|---------|
| | Name | Description | Version |
| BC846AQC-Q | DFN1412D-3 | plastic, leadless ultra small outline package with sidewettable flanks (SWF); 3 terminals; 0.8 mm pitch; 1.4 mm x 1.2 mm x 0.48 mm body | SOT8009 |
| BC846BQC-Q | | | |

7. Marking

Table 5. Marking

| Type number | Marking code |
|-------------|--------------|
| BC846AQC-Q | 9R |
| BC846BQC-Q | 9S |

8. Limiting values

Table 6. Limiting values

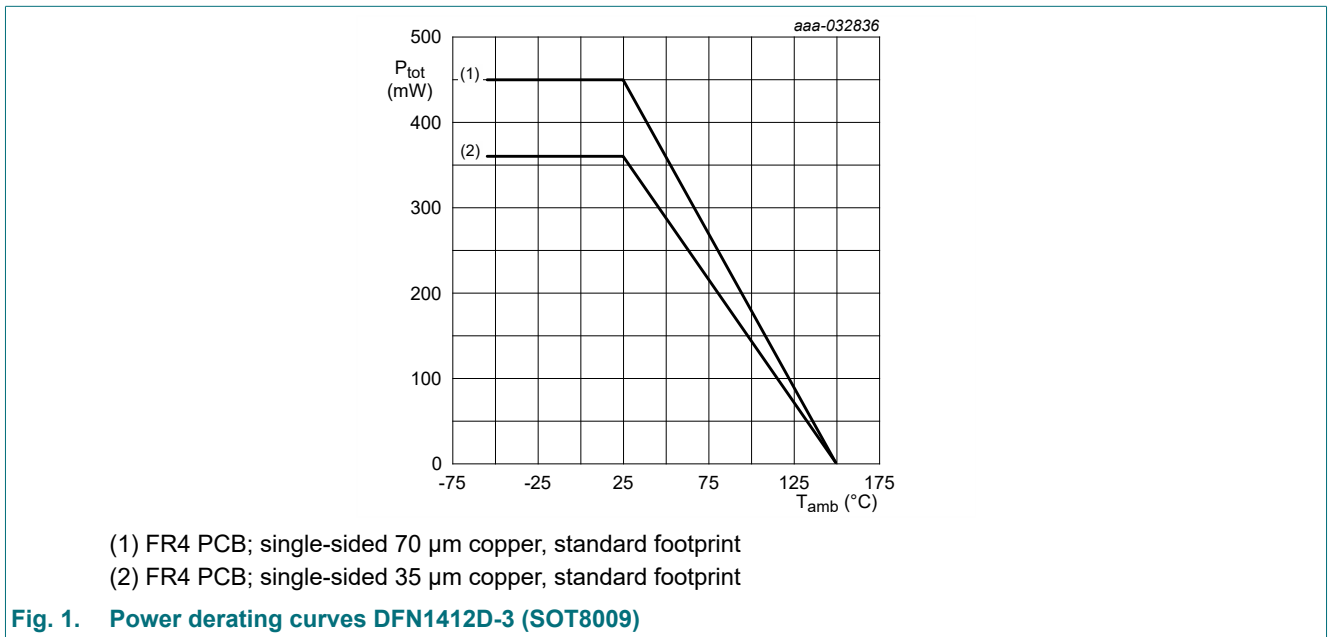
In accordance with the Absolute Maximum Rating System (IEC 60134).

$T_{amb} = 25\text{ °C}$ unless otherwise specified.

| 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; $t_p \leq 1\text{ ms}$ | - | 200 | mA | |
| I_{BM} | peak base current | single pulse; $t_p \leq 1\text{ ms}$ | - | 100 | mA | |
| P_{tot} | total power dissipation | $T_{amb} \leq 25\text{ °C}$ | [1] | - | 360 | mW |
| | | | [2] | - | 450 | mW |
| T_j | junction temperature | | - | 150 | °C | |
| T_{amb} | ambient temperature | | -55 | 150 | °C | |
| T_{stg} | storage temperature | | -65 | 150 | °C | |

[1] Device mounted on an FR4 Printed-Circuit-Board (PCB); single-sided 35 μm copper; tin-plated and standard footprint.

[2] Device mounted on an FR4 Printed-Circuit-Board (PCB); single-sided 70 μm copper; tin-plated and standard footprint.



9. Thermal characteristics

Table 7. Thermal characteristics

$T_{amb} = 25\text{ °C}$ unless otherwise specified.

| Symbol | Parameter | Conditions | | Min | Typ | Max | Unit |
|---------------|---|-------------|-----|-----|-----|-----|------|
| $R_{th(j-a)}$ | thermal resistance from junction to ambient | in free air | [1] | - | - | 348 | K/W |
| | | | [2] | - | - | 278 | K/W |

[1] Device mounted on an FR4 Printed-Circuit-Board (PCB); single-sided 35 μm copper; tin-plated and standard footprint.

[2] Device mounted on an FR4 Printed-Circuit-Board (PCB); single-sided 70 μm copper; tin-plated and standard footprint.

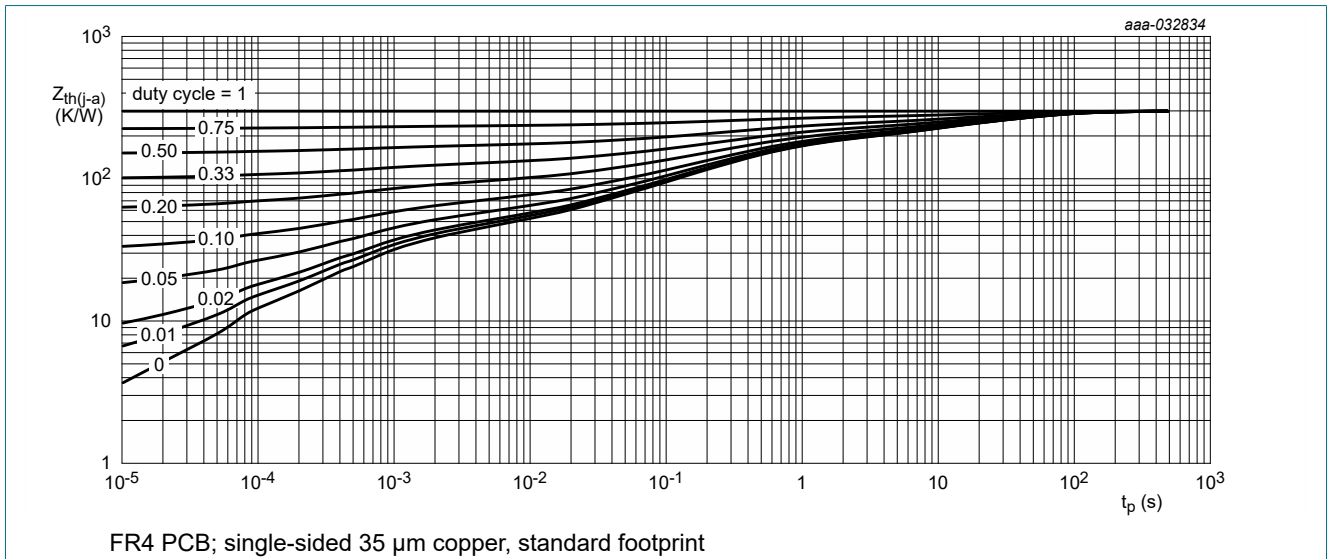


Fig. 2. Transient thermal impedance from junction to ambient as a function of pulse duration; typical values

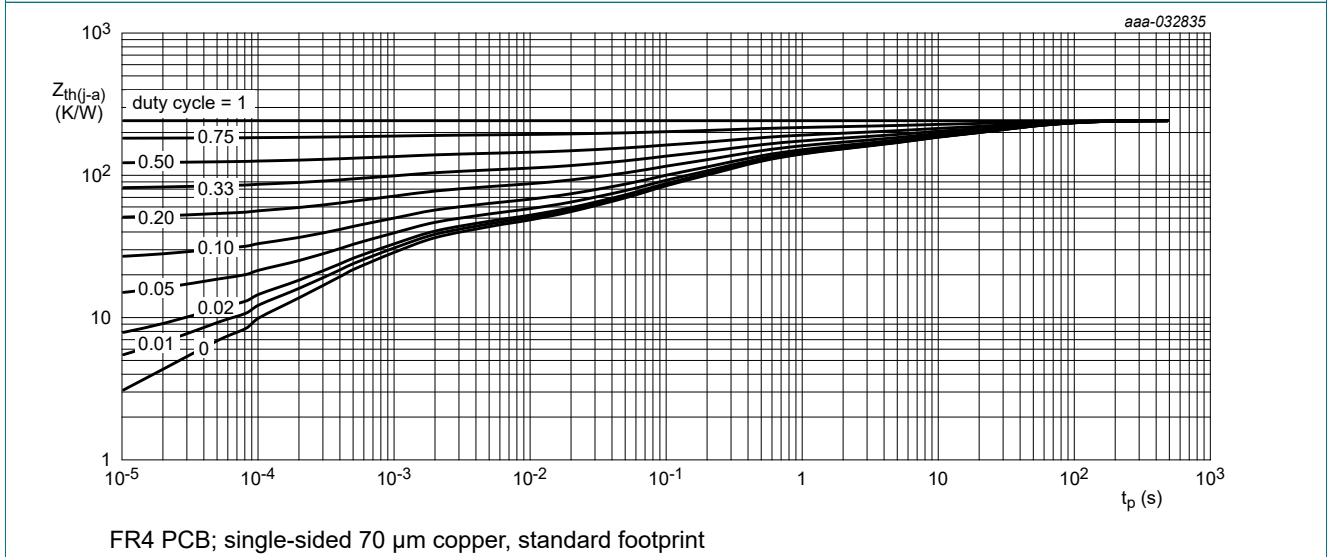


Fig. 3. Transient thermal impedance from junction to ambient as a function of pulse duration; typical values

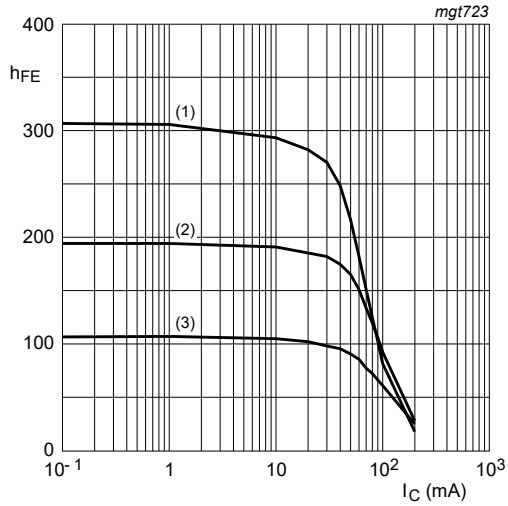
10. Characteristics

Table 8. Characteristics
 $T_{amb} = 25\text{ °C}$ unless otherwise specified.

| Symbol | Parameter | Conditions | Min | Typ | Max | Unit |
|---------------|--------------------------------------|--|-----|-----|-----|---------------|
| $V_{(BR)CBO}$ | collector-base breakdown voltage | $I_C = 100\ \mu\text{A}; I_E = 0\ \text{A}$ | 80 | - | - | V |
| $V_{(BR)CEO}$ | collector-emitter breakdown voltage | $I_C = 2\ \text{mA}; I_B = 0\ \text{A}$ | 65 | - | - | V |
| $V_{(BR)EBO}$ | emitter-base breakdown voltage | $I_E = 100\ \mu\text{A}; I_C = 0\ \text{A}$ | 6 | - | - | V |
| I_{CBO} | collector-base cut-off current | $V_{CB} = 30\ \text{V}; I_E = 0\ \text{A}$ | - | - | 15 | nA |
| | | $V_{CB} = 30\ \text{V}; I_E = 0\ \text{A}; T_j = 150\text{ °C}$ | - | - | 5 | μA |
| I_{EBO} | emitter-base cut-off current | $V_{EB} = 5\ \text{V}; I_C = 0\ \text{A}$ | - | - | 100 | nA |
| h_{FE} | DC current gain | | | | | |
| | BC846AQC-Q | $V_{CE} = 5\ \text{V}; I_C = 2\ \text{mA}$ | 110 | - | 220 | |
| | BC846BQC-Q | | 200 | - | 450 | |
| V_{CEsat} | collector-emitter saturation voltage | $I_C = 10\ \text{mA}; I_B = 0.5\ \text{mA}$ | - | - | 200 | mV |
| | | $I_C = 100\ \text{mA}; I_B = 5\ \text{mA}$ [1] | - | - | 400 | mV |
| V_{BE} | base-emitter voltage | $V_{CE} = 5\ \text{V}; I_C = 2\ \text{mA}$ [2] | 580 | - | 700 | mV |
| | | $V_{CE} = 5\ \text{V}; I_C = 10\ \text{mA}$ [2] | - | - | 770 | mV |
| V_{BEsat} | base-emitter saturation voltage | $I_C = 10\ \text{mA}; I_B = 0.5\ \text{mA}$ | - | 760 | - | mV |
| | | $I_C = 100\ \text{mA}; I_B = 5\ \text{mA}$ [1] | - | 900 | - | mV |
| f_T | transition frequency | $V_{CE} = 5\ \text{V}; I_C = 10\ \text{mA}; f = 100\ \text{MHz}$ | 100 | - | - | MHz |
| C_c | collector capacitance | $V_{CB} = 10\ \text{V}; I_E = I_e = 0\ \text{A}; f = 1\ \text{MHz}$ | - | - | 3 | pF |
| C_e | emitter capacitance | $V_{EB} = 0.5\ \text{V}; I_E = I_e = 0\ \text{A}; f = 1\ \text{MHz}$ | - | 11 | - | pF |
| NF | noise figure | $V_{CE} = 5\ \text{V}; I_C = 200\ \mu\text{A}; R_S = 2\ \text{k}\Omega; f = 1\ \text{kHz}; B = 200\ \text{Hz}$ | - | - | 10 | dB |

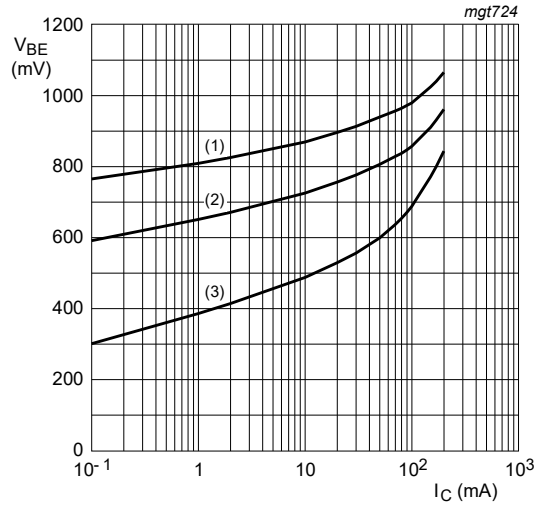
[1] pulsed; $t_p \leq 300\ \mu\text{s}$; $\delta \leq 0.02$

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



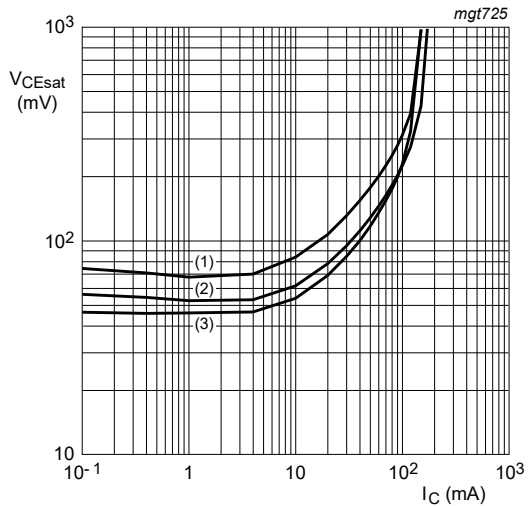
$V_{CE} = 5\text{ V}$
 (1) $T_{amb} = 150\text{ °C}$
 (2) $T_{amb} = 25\text{ °C}$
 (3) $T_{amb} = -55\text{ °C}$

Fig. 4. BC846AQC-Q: DC current gain as a function of collector current; typical values



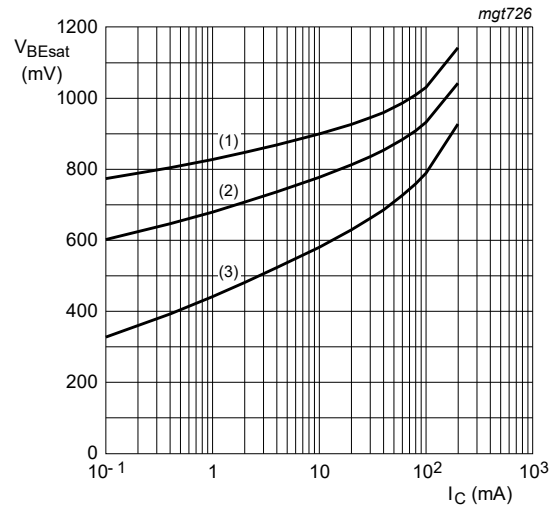
$V_{CE} = 5\text{ V}$
 (1) $T_{amb} = -55\text{ °C}$
 (2) $T_{amb} = 25\text{ °C}$
 (3) $T_{amb} = 150\text{ °C}$

Fig. 5. BC846AQC-Q: Base-emitter voltage as a function of collector current; typical values



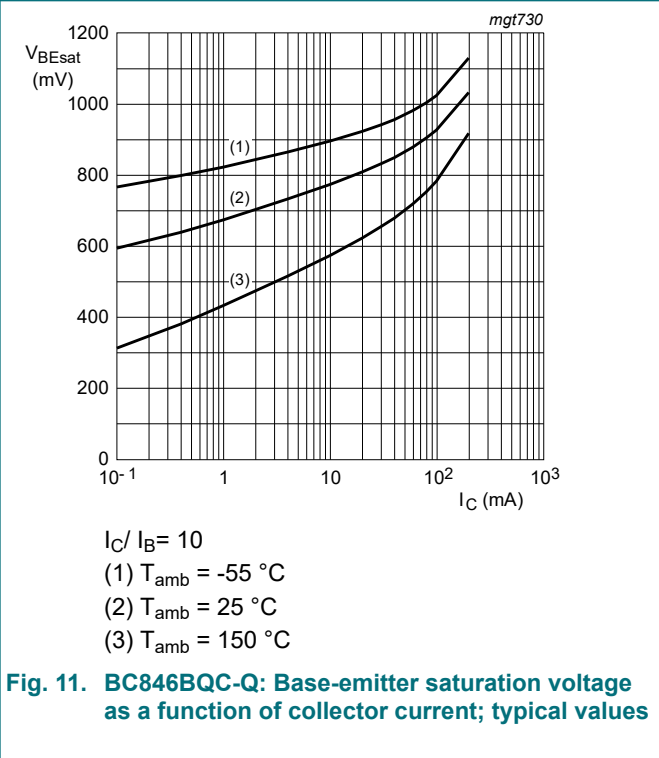
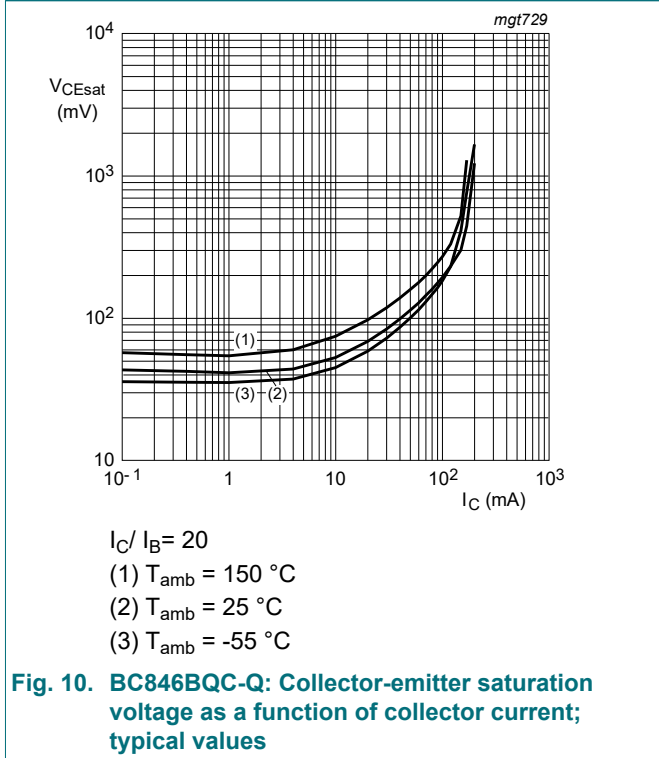
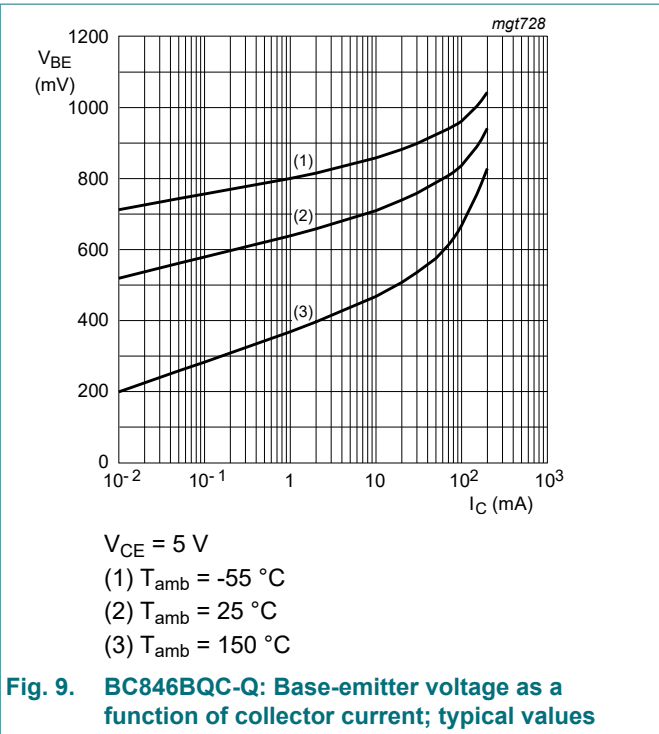
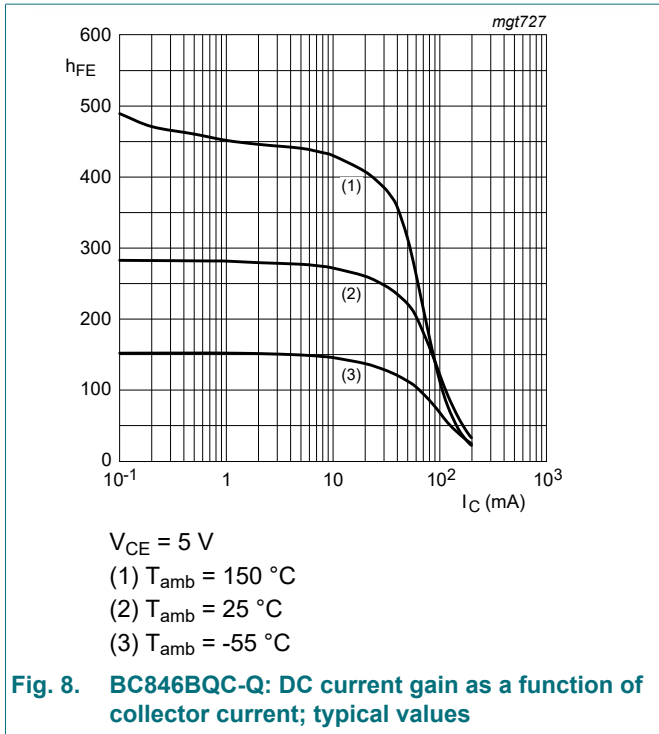
$I_C / I_B = 20$
 (1) $T_{amb} = 150\text{ °C}$
 (2) $T_{amb} = 25\text{ °C}$
 (3) $T_{amb} = -55\text{ °C}$

Fig. 6. BC846AQC-Q: 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. 7. BC846AQC-Q: Base-emitter saturation voltage as a function of collector current; typical values



11. Test information

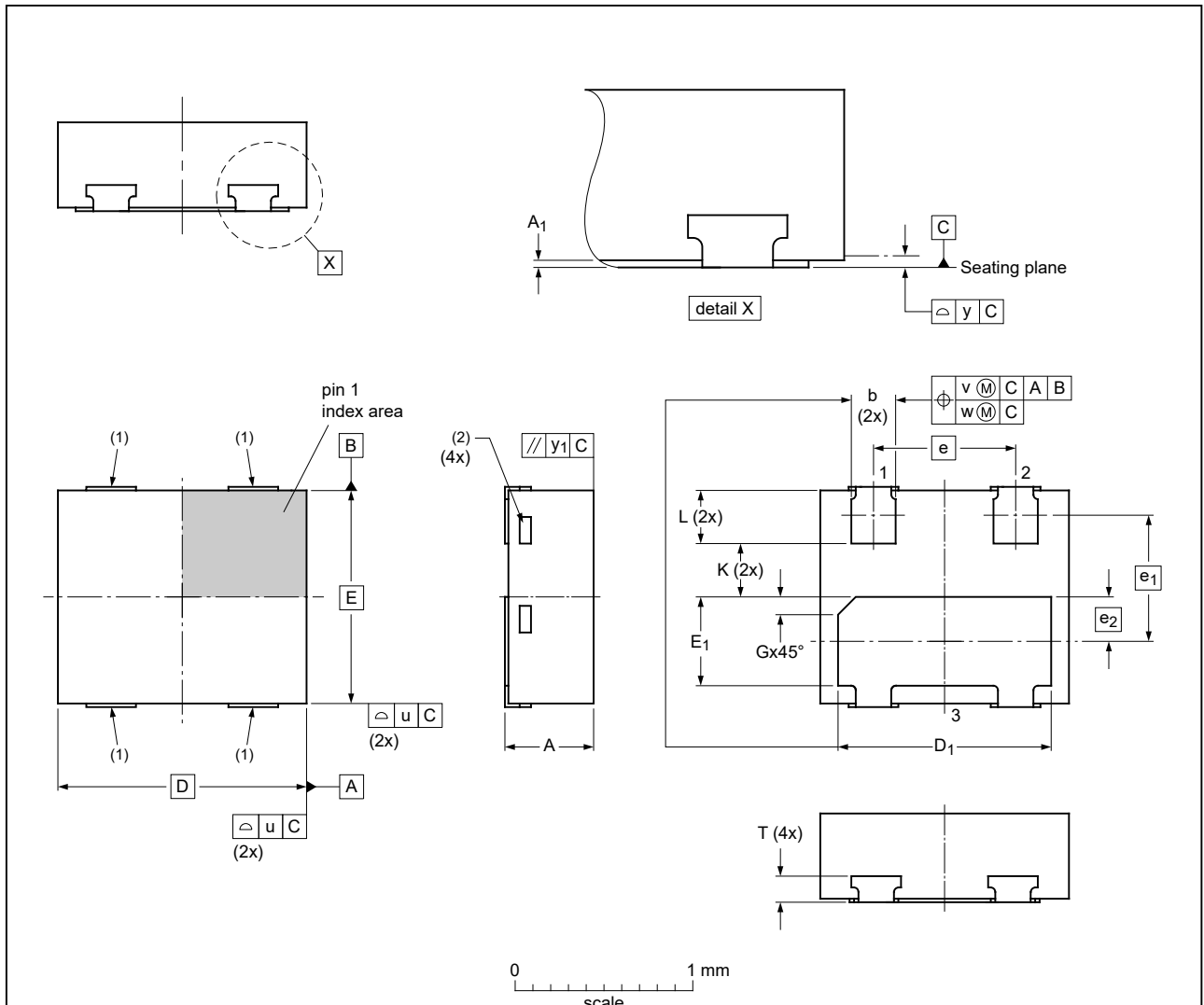
Quality information

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

DFN1412D-3: plastic, leadless extremely thin small outline package with side-wettable flanks (SWF); 3 terminals; 0.8 mm pitch; 1.4 mm x 1.2 mm x 0.48 mm body

SOT8009



Dimensions (mm are the original dimensions)

| Unit | A | A ₁ | b | D | D ₁ | E | E ₁ | e | e ₁ | e ₂ | G | K | L | T | u | v | w | y | y ₁ |
|------|------|----------------|------|------|----------------|-----|----------------|-----|----------------|----------------|-------|------|------|------|------|-----|------|------|----------------|
| max | 0.50 | 0.04 | 0.30 | 1.25 | 0.55 | | | | | | | | 0.35 | 0.22 | | | | | |
| nom | 0.47 | | 0.25 | 1.4 | 1.20 | 1.2 | 0.50 | 0.8 | 0.71 | 0.26 | 0.09 | | 0.30 | 0.16 | 0.05 | 0.1 | 0.05 | 0.05 | 0.05 |
| min | 0.44 | | 0.22 | 1.17 | 0.47 | | | | | | (ref) | 0.25 | 0.27 | 0.10 | | | | | |

Note

- Side Wettable Flank, protrusion max. 0.02 mm.
 - Visible depend upon used manufacturing technology.
- Dimension A and T are including plating thickness.

sot8009_po

| Outline version | References | | | | European projection | Issue date |
|-----------------|------------|----------|-------|--|---------------------|----------------------|
| | IEC | JEDEC | JEITA | | | |
| SOT8009 | | MO-340CA | | | | 19-12-04 19-12-06 |

Fig. 12. Package outline DFN1412D-3 (SOT8009)

13. Soldering

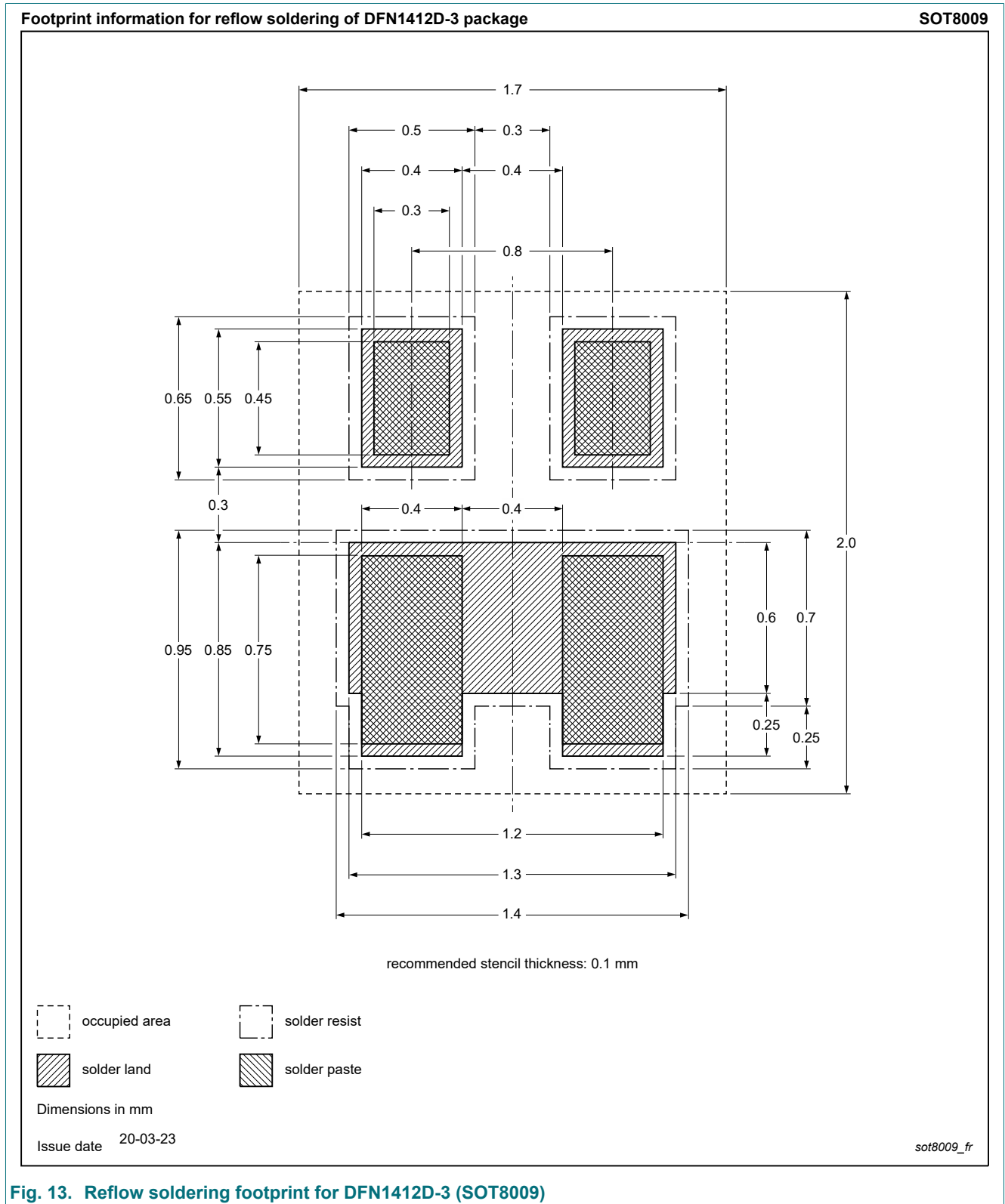


Fig. 13. Reflow soldering footprint for DFN1412D-3 (SOT8009)

14. Revision history

Table 9. Revision history

| Document ID | Release date | Data sheet status | Change notice | Supersedes |
|--------------------|---|--------------------|---------------|--------------------|
| BC846xQC-Q_SER v.2 | 20210512 | Product data sheet | - | BC846xQC-Q_SER v.1 |
| Modifications: | • Features and benefits: added recommendation for automotive applications | | | |
| BC846xQC-Q_SER v.1 | 20210304 | 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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Contents

| | |
|---------------------------------|----|
| 1. General description..... | 1 |
| 2. Features and benefits..... | 1 |
| 3. Applications..... | 1 |
| 4. Quick reference data..... | 1 |
| 5. Pinning information..... | 2 |
| 6. Ordering information..... | 2 |
| 7. Marking..... | 2 |
| 8. Limiting values..... | 3 |
| 9. Thermal characteristics..... | 4 |
| 10. Characteristics..... | 5 |
| 11. Test information..... | 7 |
| 12. Package outline..... | 8 |
| 13. Soldering..... | 9 |
| 14. Revision history..... | 10 |
| 15. Legal information..... | 11 |

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