



BC857RA

45 V, 100 mA PNP/PNP general-purpose double transistors

14 September 2018

Product data sheet

1. General description

PNP/PNP general-purpose double transistors in a leadless ultra small DFN1412-6 (SOT1268) Surface-Mounted Device (SMD) plastic package.

NPN/NPN complement: BC847RA

NPN/PNP complement: BC847RAPN

2. Features and benefits

- Reduces component count
- Reduces pick and place costs
- Low package height of 0.5 mm
- AEC-Q101 qualified

3. Applications

- General-purpose switching and amplification
- Mobile applications

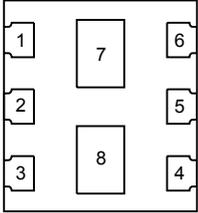
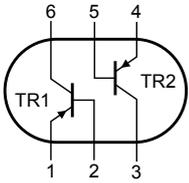
4. Quick reference data

Table 1. Quick reference data

| Symbol | Parameter | Conditions | Min | Typ | Max | Unit |
|-----------------------|---------------------------|---|-----|-----|------|------|
| Per transistor | | | | | | |
| V_{CEO} | collector-emitter voltage | open base | - | - | -45 | V |
| I_C | collector current | | - | - | -100 | mA |
| I_{CM} | peak collector current | single pulse; $t_p \leq 1$ ms | - | - | -200 | mA |
| h_{FE} | DC current gain | $V_{CE} = -5$ V; $I_C = -2$ mA; $T_{amb} = 25$ °C | 200 | - | 450 | |

5. Pinning information

Table 2. Pinning information

| Pin | Symbol | Description | Simplified outline | Graphic symbol |
|-----|--------|---------------|---|--|
| 1 | E1 | emitter TR1 |  <p>Transparent top view DFN1412-6 (SOT1268)</p> |  <p><i>sym018</i></p> |
| 2 | B1 | base TR1 | | |
| 3 | C2 | collector TR2 | | |
| 4 | E2 | emitter TR2 | | |
| 5 | B2 | base TR2 | | |
| 6 | C1 | collector TR1 | | |
| 7 | C1 | collector TR1 | | |
| 8 | C2 | collector TR2 | | |

6. Ordering information

Table 3. Ordering information

| Type number | Package | | |
|-------------|-----------|---|---------|
| | Name | Description | Version |
| BC857RA | DFN1412-6 | plastic thermal enhanced ultra thin small outline package; no leads; 6 terminals; body: 1.4 mm x 1.2 mm x 0.47 mm | SOT1268 |

7. Marking

Table 4. Marking codes

| Type number | Marking code |
|-------------|--------------|
| BC857RA | A6 |

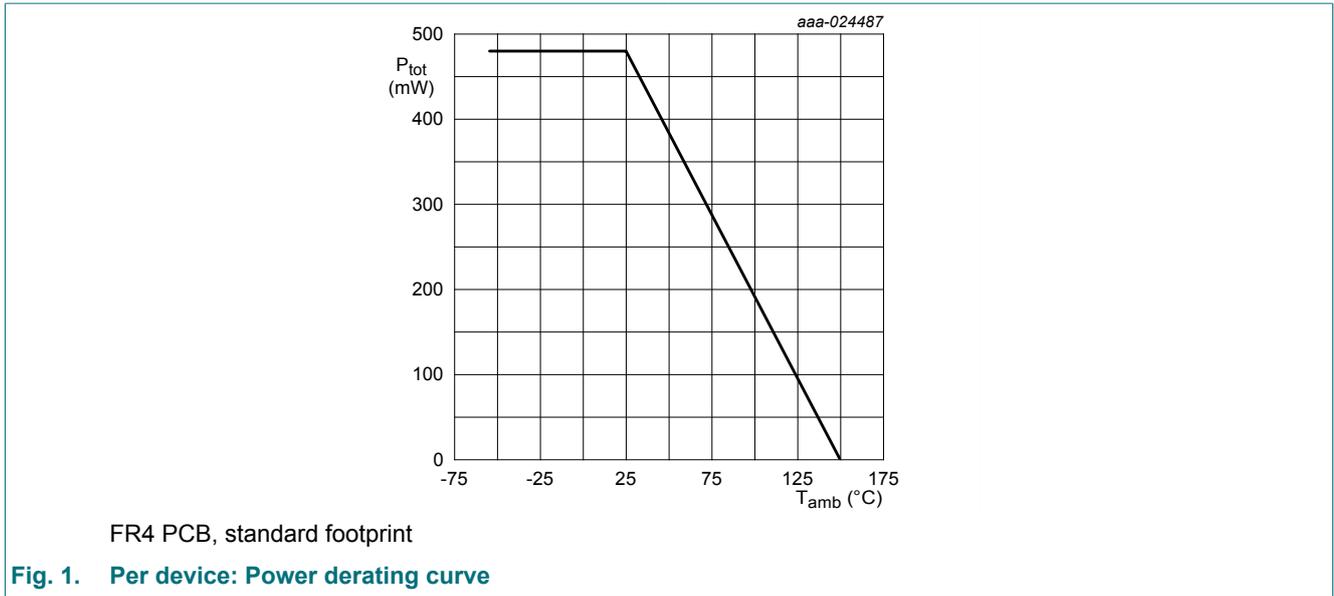
8. Limiting values

Table 5. Limiting values

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

| Symbol | Parameter | Conditions | | Min | Max | Unit |
|-----------------------|---------------------------|-------------------------------|-----|-----|------|------|
| Per transistor | | | | | | |
| V_{CBO} | collector-base voltage | open emitter | | - | -50 | V |
| V_{CEO} | collector-emitter voltage | open base | | - | -45 | 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 | | | - | -100 | mA |
| P_{tot} | total power dissipation | $T_{amb} \leq 25$ °C | [1] | - | 325 | mW |
| Per device | | | | | | |
| P_{tot} | total power dissipation | $T_{amb} \leq 25$ °C | [1] | - | 480 | 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 copper, tin-plated and standard footprint.

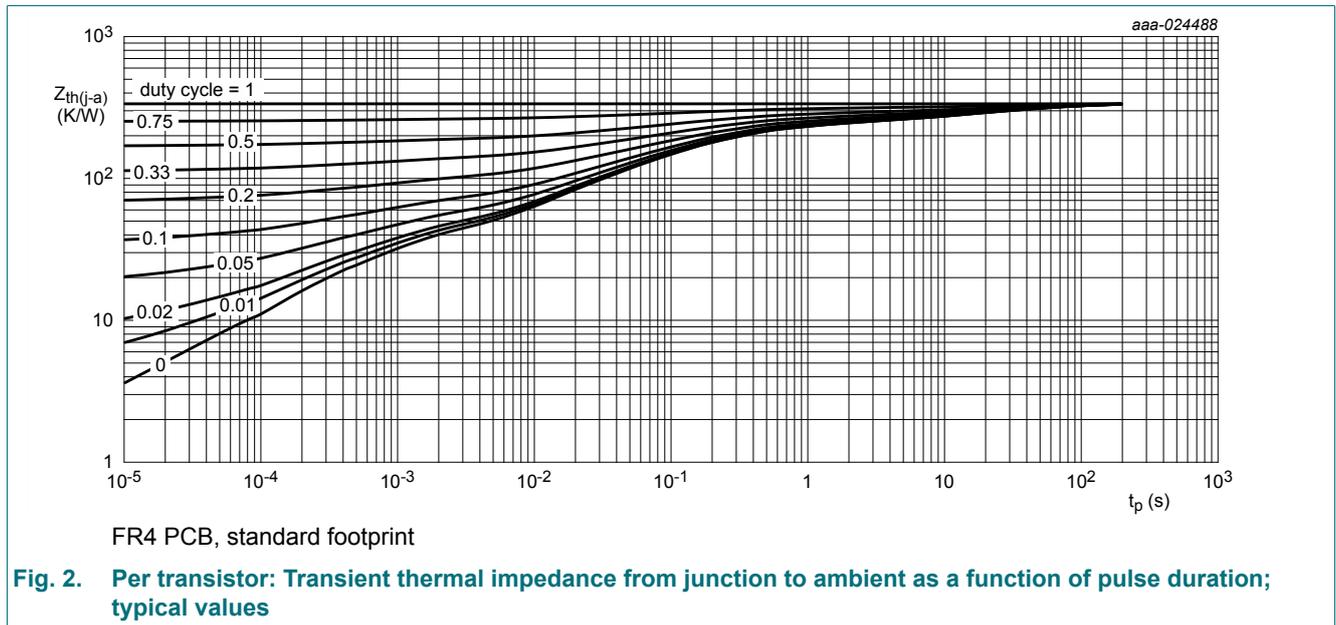


9. Thermal characteristics

Table 6. Thermal characteristics

| Symbol | Parameter | Conditions | Min | Typ | Max | Unit |
|-----------------------|---|-------------|-----|-----|-----|------|
| Per transistor | | | | | | |
| $R_{th(j-a)}$ | thermal resistance from junction to ambient | in free air | [1] | - | 385 | K/W |
| Per device | | | | | | |
| $R_{th(j-a)}$ | thermal resistance from junction to ambient | in free air | [1] | - | 261 | K/W |

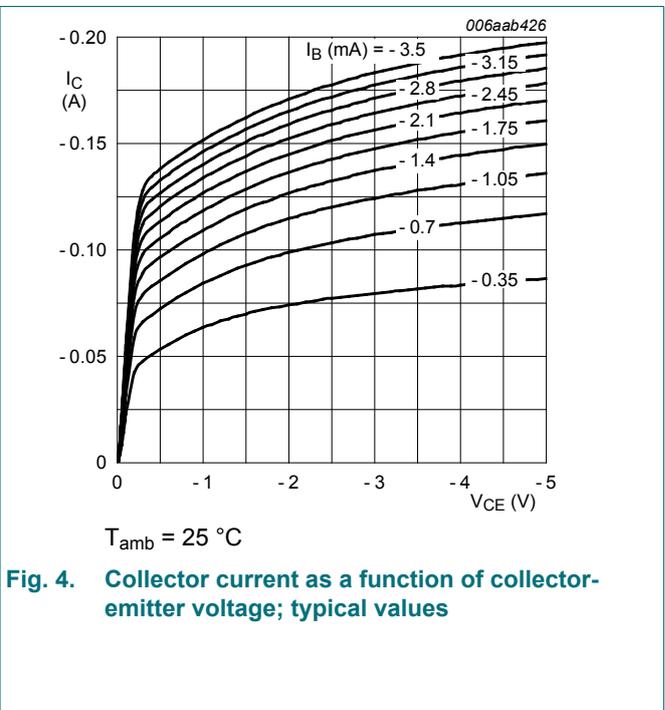
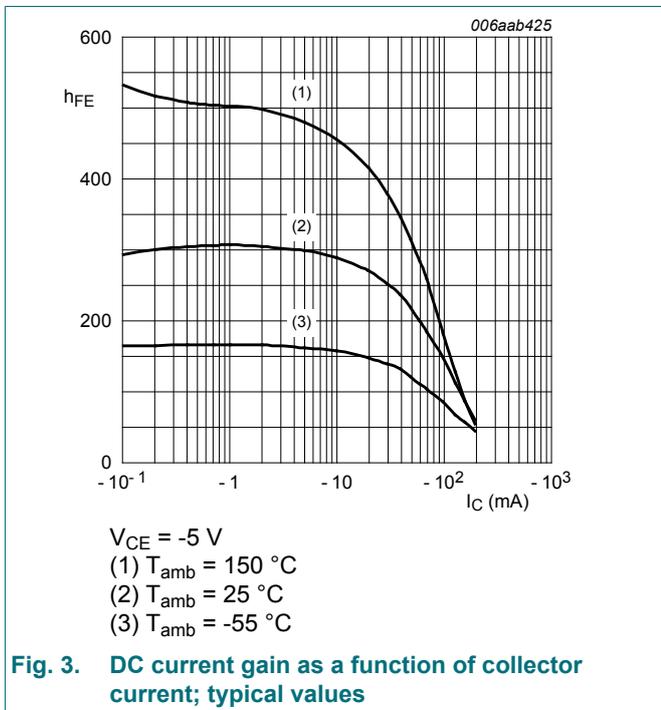
[1] Device mounted on an FR4 PCB, single-sided copper, tin-plated and standard footprint.

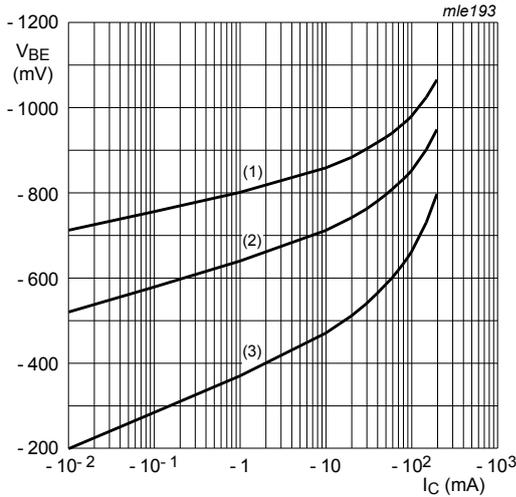


10. Characteristics

Table 7. Characteristics

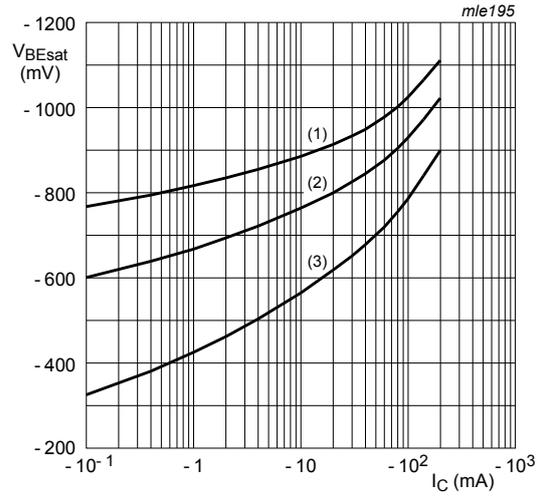
| Symbol | Parameter | Conditions | Min | Typ | Max | Unit |
|-----------------------|--------------------------------------|---|------|------|------|---------------|
| Per transistor | | | | | | |
| I_{CBO} | collector-base cut-off current | $V_{CB} = -30\text{ V}; I_E = 0\text{ A}; T_{amb} = 25\text{ }^\circ\text{C}$ | - | - | -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 | $V_{EB} = -5\text{ V}; I_C = 0\text{ A}; T_{amb} = 25\text{ }^\circ\text{C}$ | - | - | -100 | nA |
| h_{FE} | DC current gain | $V_{CE} = -5\text{ V}; I_C = -2\text{ mA}; T_{amb} = 25\text{ }^\circ\text{C}$ | 200 | - | 450 | |
| V_{CEsat} | collector-emitter saturation voltage | $I_C = -10\text{ mA}; I_B = -0.5\text{ mA}; T_{amb} = 25\text{ }^\circ\text{C}$ | - | - | -100 | mV |
| | | $I_C = -100\text{ mA}; I_B = -5\text{ mA}; T_{amb} = 25\text{ }^\circ\text{C}$ | - | - | -300 | mV |
| V_{BEsat} | base-emitter saturation voltage | $I_C = -10\text{ mA}; I_B = -0.5\text{ mA}; T_{amb} = 25\text{ }^\circ\text{C}$ | - | -760 | - | mV |
| | | $I_C = -100\text{ mA}; I_B = -5\text{ mA}; T_{amb} = 25\text{ }^\circ\text{C}$ | - | -900 | - | mV |
| V_{BE} | base-emitter voltage | $V_{CE} = -5\text{ V}; I_C = -2\text{ mA}; T_{amb} = 25\text{ }^\circ\text{C}$ | -600 | -660 | -725 | mV |
| | | $V_{CE} = -5\text{ V}; I_C = -10\text{ mA}; T_{amb} = 25\text{ }^\circ\text{C}$ | - | -710 | -820 | mV |
| C_c | collector capacitance | $V_{CB} = -10\text{ V}; I_E = 0\text{ A}; i_e = 0\text{ A}; f = 1\text{ MHz}; T_{amb} = 25\text{ }^\circ\text{C}$ | - | - | 4 | pF |
| C_e | emitter capacitance | $V_{EB} = -0.5\text{ V}; I_C = 0\text{ A}; i_c = 0\text{ A}; f = 1\text{ MHz}; T_{amb} = 25\text{ }^\circ\text{C}$ | - | 10 | - | pF |
| f_T | transition frequency | $V_{CE} = -5\text{ V}; I_C = -10\text{ mA}; f = 100\text{ MHz}; T_{amb} = 25\text{ }^\circ\text{C}$ | 100 | - | - | MHz |
| NF | noise figure | $V_{CE} = -5\text{ V}; I_C = -0.2\text{ mA}; R_S = 2\text{ k}\Omega; f = 1\text{ kHz}; B = 200\text{ Hz}; T_{amb} = 25\text{ }^\circ\text{C}$ | - | - | 10 | dB |





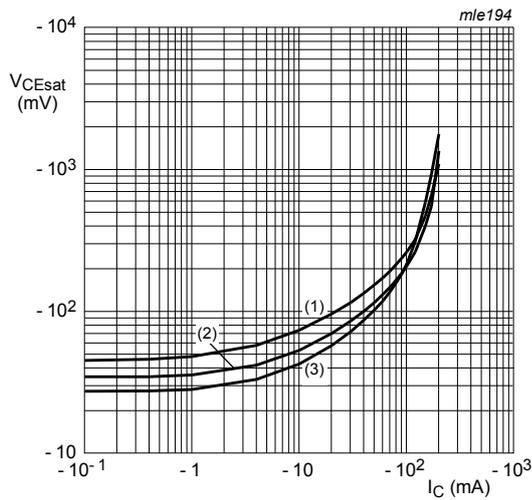
$V_{CE} = -5 \text{ V}$
 (1) $T_{amb} = -55 \text{ }^\circ\text{C}$
 (2) $T_{amb} = 25 \text{ }^\circ\text{C}$
 (3) $T_{amb} = 150 \text{ }^\circ\text{C}$

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



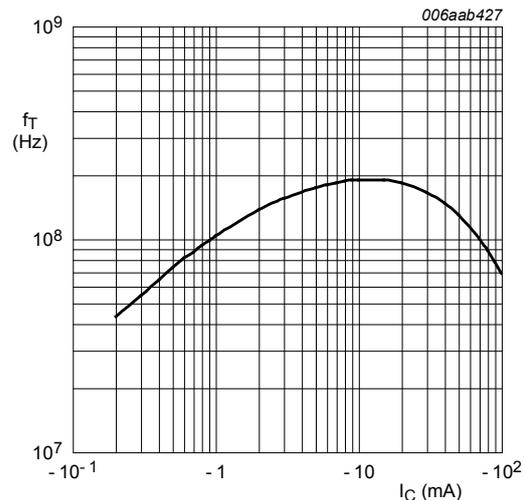
$I_C/I_B = 20$
 (1) $T_{amb} = -55 \text{ }^\circ\text{C}$
 (2) $T_{amb} = 25 \text{ }^\circ\text{C}$
 (3) $T_{amb} = 150 \text{ }^\circ\text{C}$

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



$T_{amb} = 25 \text{ }^\circ\text{C};$
 $V_{CE} = -5 \text{ V};$
 $f = 100 \text{ MHz}$

Fig. 8. Transition frequency 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

DFN1412-6: plastic thermal enhanced ultra thin small outline package; no leads;
6 terminals; body: 1.4 x 1.2 x 0.47 mm

SOT1268

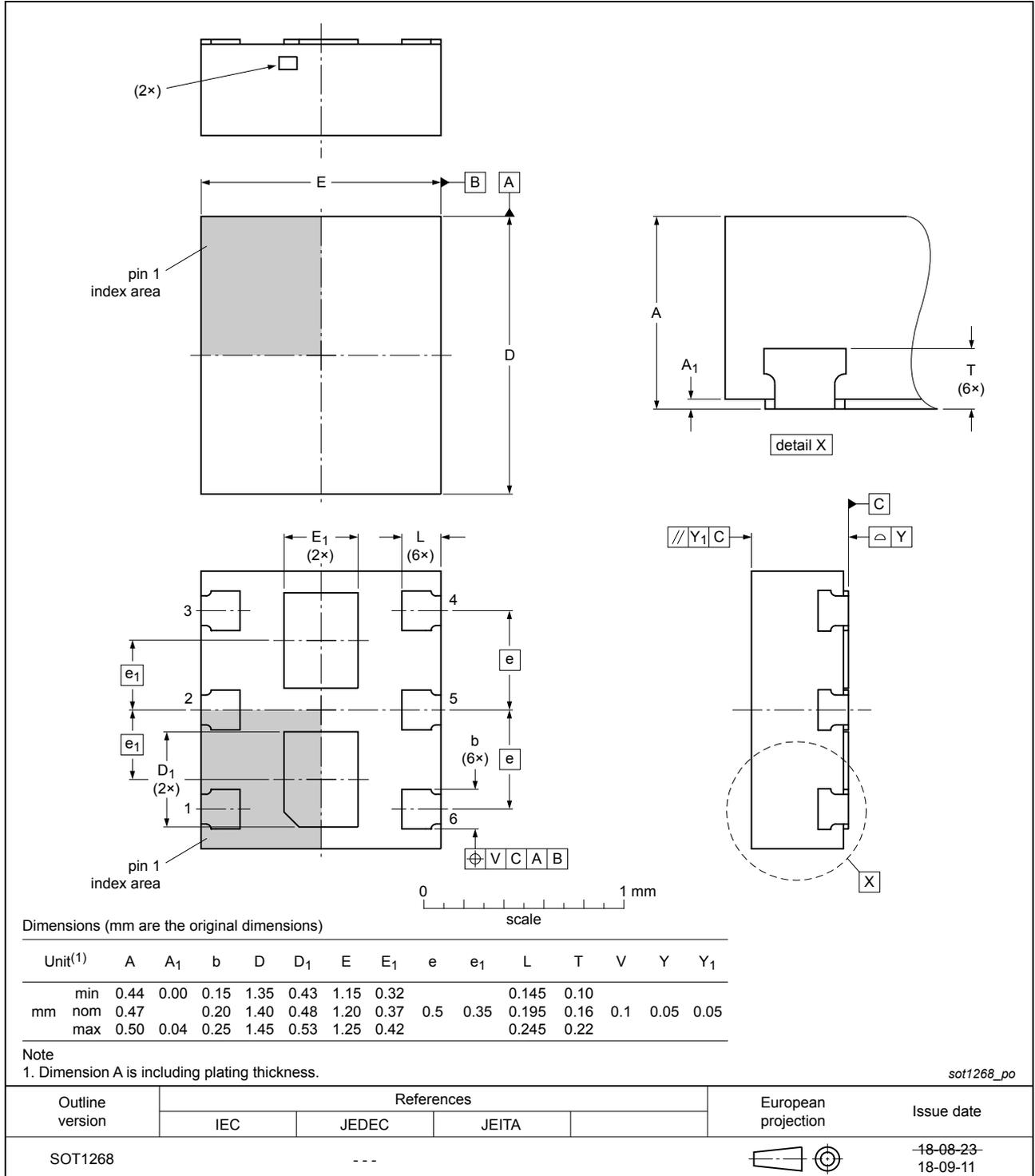


Fig. 9. Package outline DFN1412-6 (SOT1268)

13. Soldering

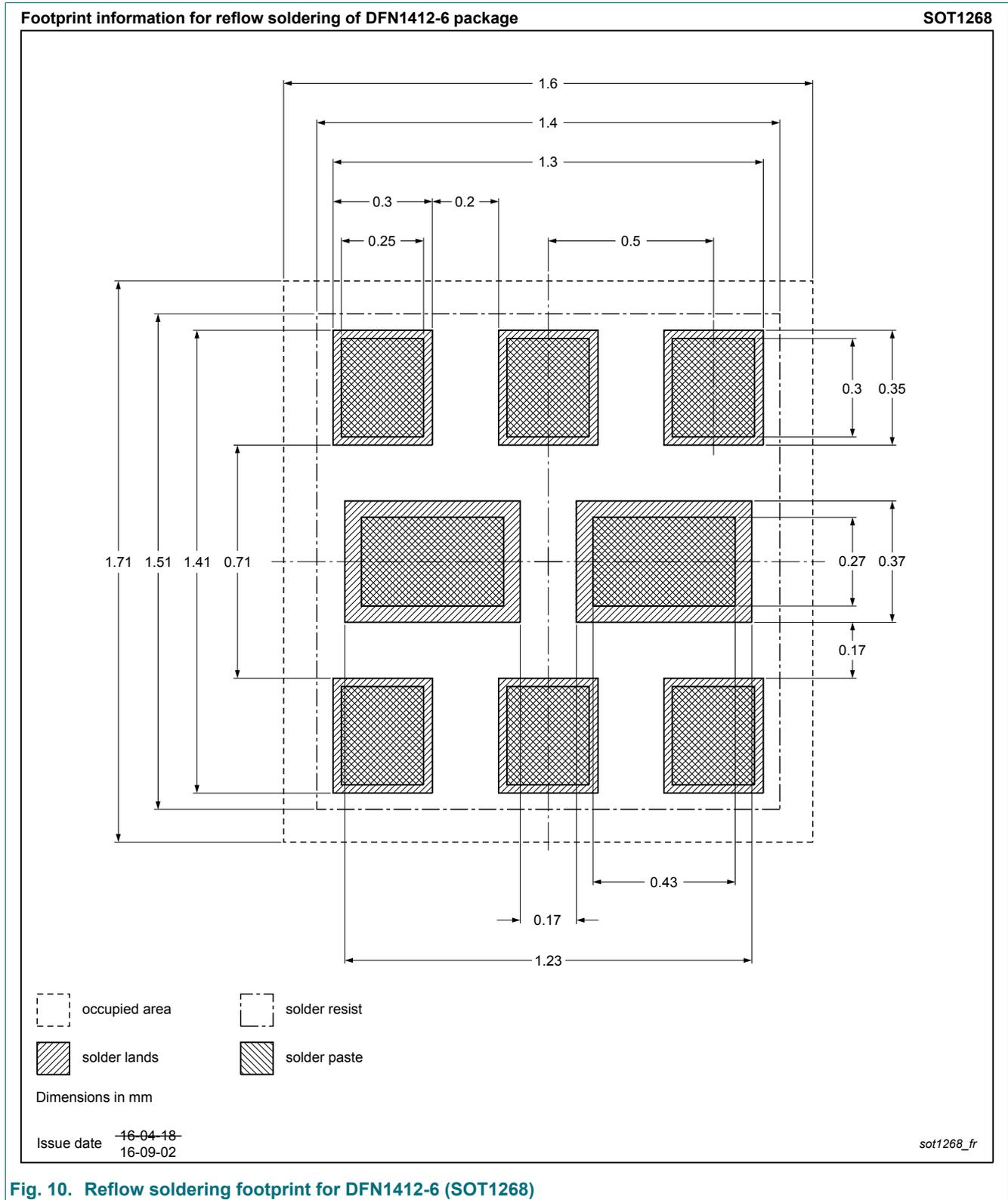


Fig. 10. Reflow soldering footprint for DFN1412-6 (SOT1268)

14. Revision history

Table 8. Revision history

| Data sheet ID | Release date | Data sheet status | Change notice | Supersedes |
|----------------|---|--------------------|---------------|-------------|
| BC857RA v.2 | 20180914 | Product data sheet | - | BC857RA v.1 |
| Modifications: | • Package outline drawing updated: Unit T added | | | |
| BC857RA v.1 | 20170607 | 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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