



BC847RAPN

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

14 September 2018

Product data sheet

1. General description

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

NPN/PNP complement: BC847RA

PNP/PNP complement: BC857RA

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

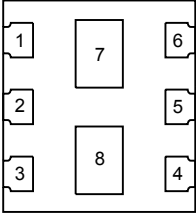
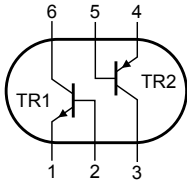
4. Quick reference data

Table 1. Quick reference data

| Symbol | Parameter | Conditions | Min | Typ | Max | Unit |
|---|---------------------------|---|-----|-----|-----|------|
| Per transistor; for the PNP transistor with negative polarity | | | | | | |
| 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>sym019</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 |
| BC847RAPN | 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 |
|-------------|--------------|
| BC847RAPN | A4 |

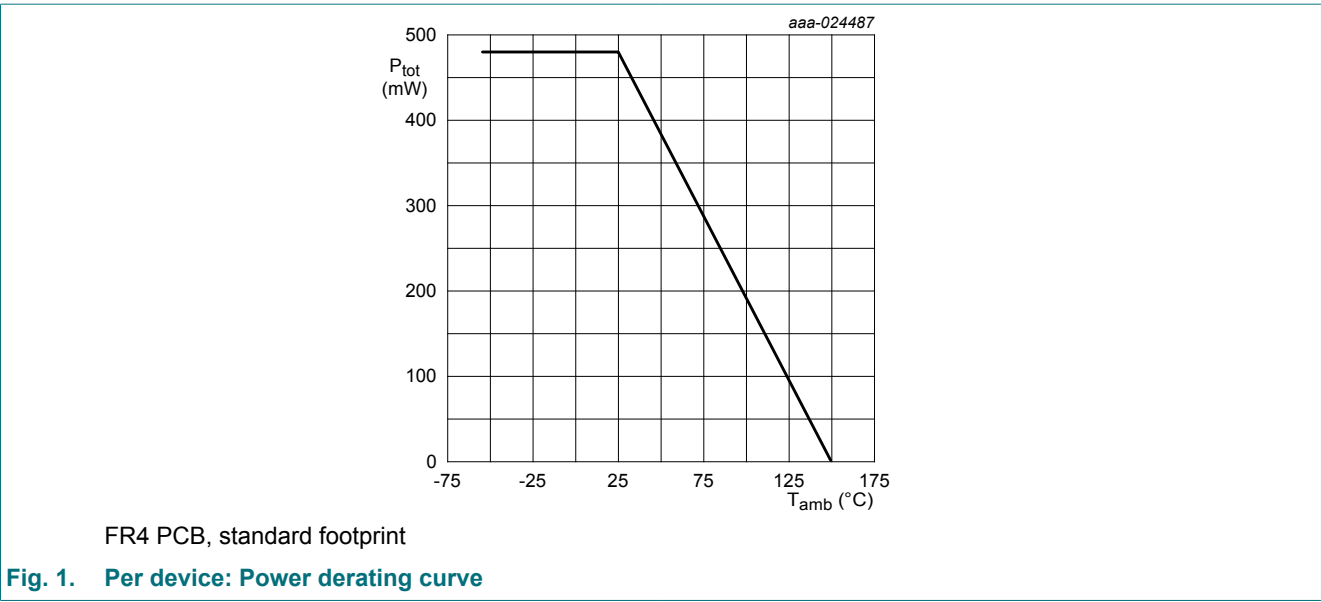
8. Limiting values

Table 5. Limiting values

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

| Symbol | Parameter | Conditions | | Min | Max | Unit |
|---|---------------------------|-------------------------------------|-----|-----|-----|------|
| Per transistor; for the PNP transistor with negative polarity | | | | | | |
| 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 ≤ 1 ms | | - | 200 | mA |
| I _{BM} | peak base current | | | - | 100 | mA |
| P _{tot} | total power dissipation | T _{amb} ≤ 25 °C | [1] | - | 325 | mW |
| Per device | | | | | | |
| P _{tot} | total power dissipation | T _{amb} ≤ 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.

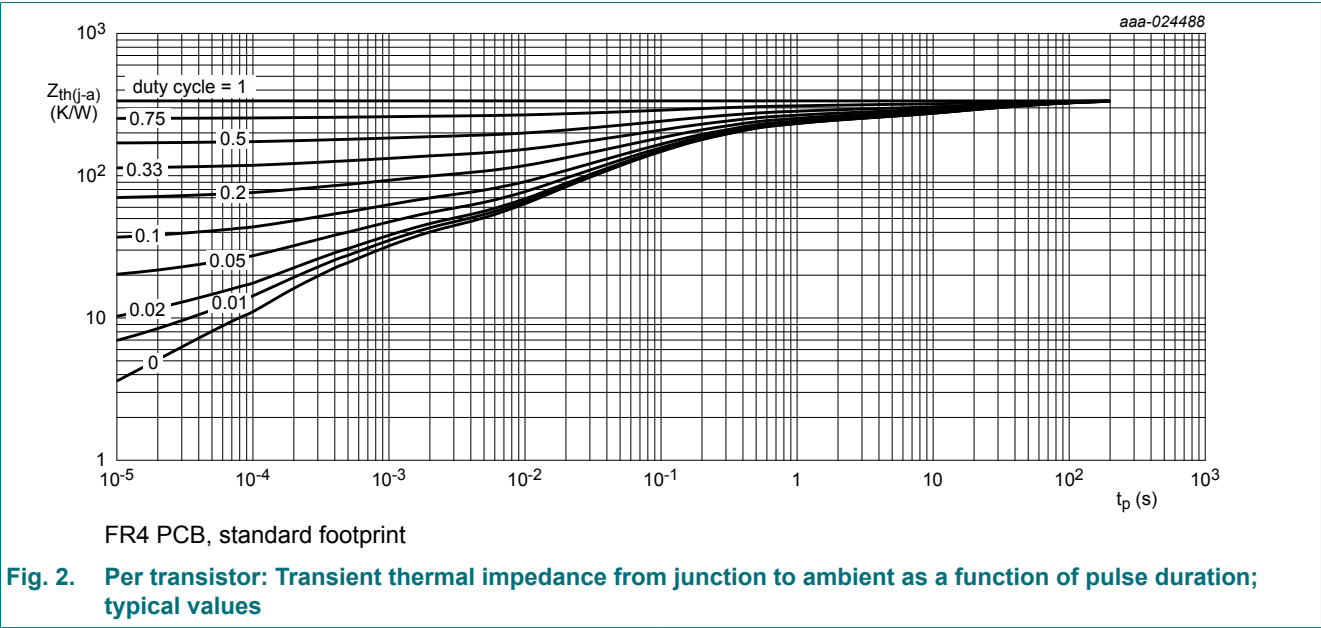


9. Thermal characteristics

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 |

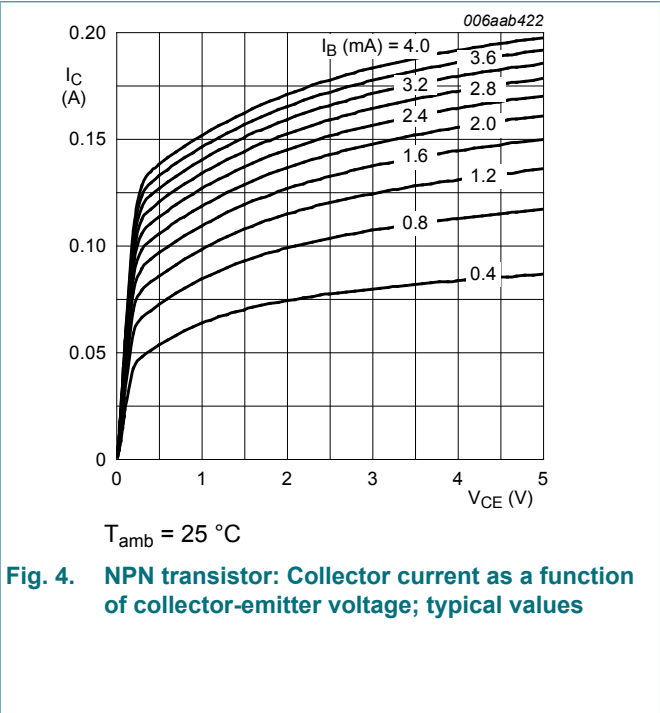
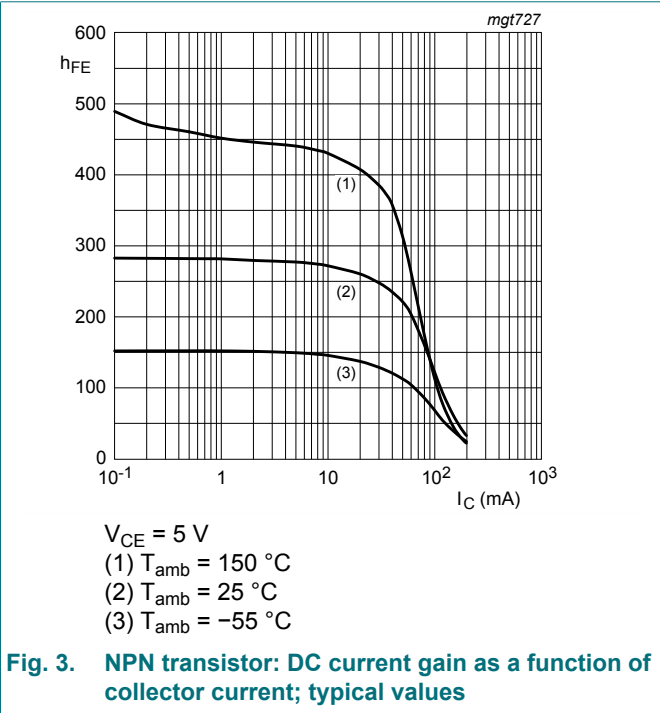
[1] Device mounted on an FR4 PCB, single-sided copper, tin-plated and standard footprint.



10. Characteristics

Table 7. Characteristics

| Symbol | Parameter | Conditions | Min | Typ | Max | Unit |
|---|--------------------------------------|--|-----|-----|-----|---------------|
| Per transistor; for the PNP transistor with negative polarity | | | | | | |
| 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 | $V_{EB} = 0.5\text{ V}; I_C = 0\text{ A}; i_c = 0\text{ A}; f = 1\text{ MHz}; T_{amb} = 25\text{ }^{\circ}\text{C}$ | - | 11 | - | pF |
| | | $V_{EB} = -0.5\text{ V}; I_C = 0\text{ mA}; i_c = 0\text{ mA}; f = 1\text{ MHz}; T_{amb} = 25\text{ }^{\circ}\text{C}$ | - | 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 | $V_{CE} = 5\text{ V}; I_C = 0.2\text{ mA}; R_S = 2\text{ k}\Omega; f = 1\text{ MHz}; T_{amb} = 25\text{ }^{\circ}\text{C}$ | - | - | 10 | dB |



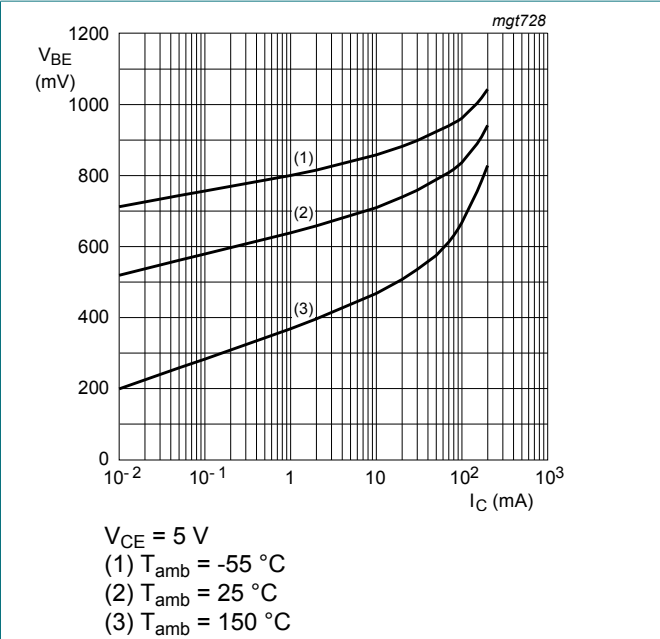


Fig. 5. NPN transistor: Base-emitter voltage as a function of collector current; typical values

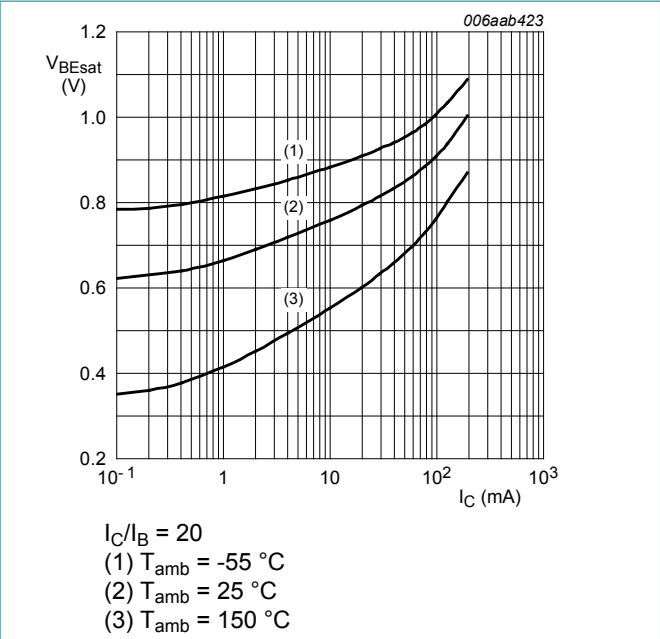


Fig. 6. NPN transistor: Base-emitter saturation voltage as a function of collector current; typical values

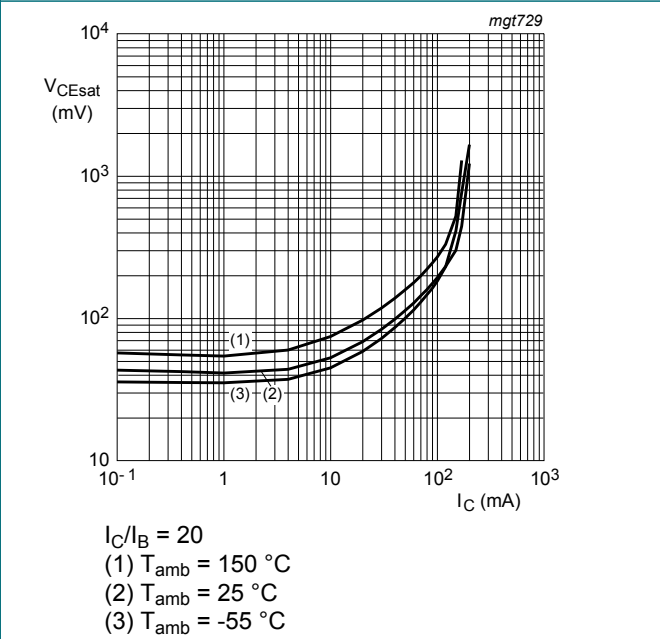


Fig. 7. NPN transistor: Collector-emitter saturation voltage as a function of collector current; typical values

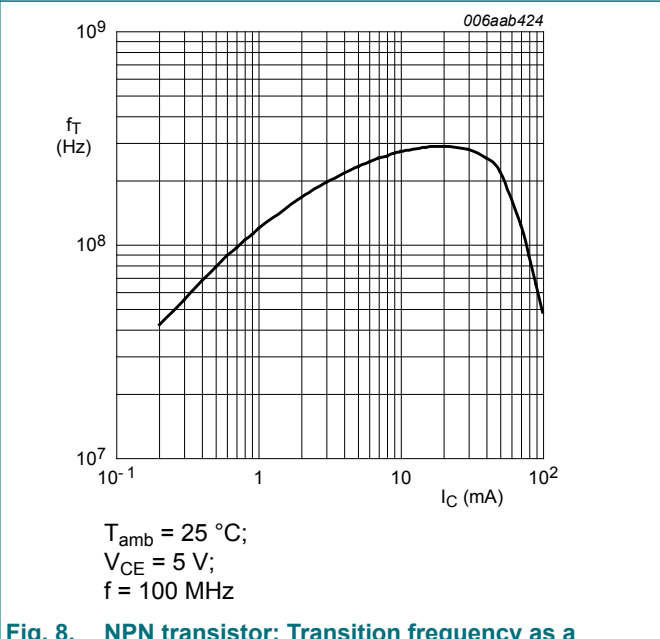


Fig. 8. NPN transistor: Transition frequency as a function of collector current; typical values

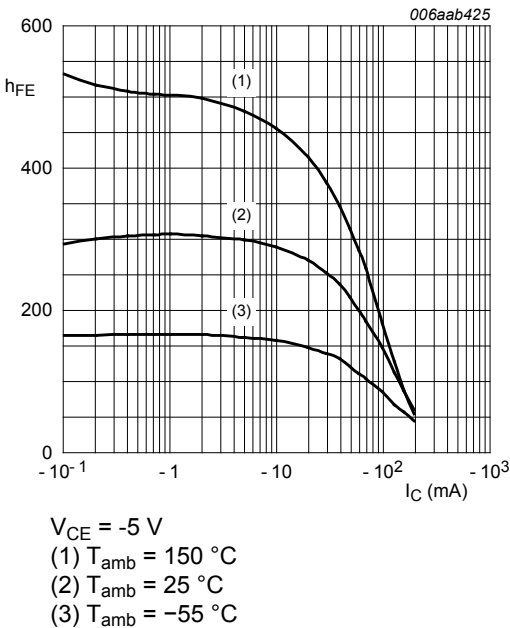


Fig. 9. PNP transistor: DC current gain as a function of collector current; typical values

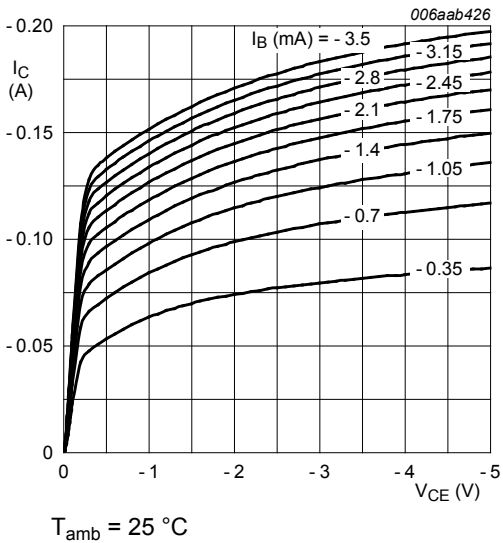


Fig. 10. PNP transistor: Collector current as a function of collector-emitter voltage; typical values

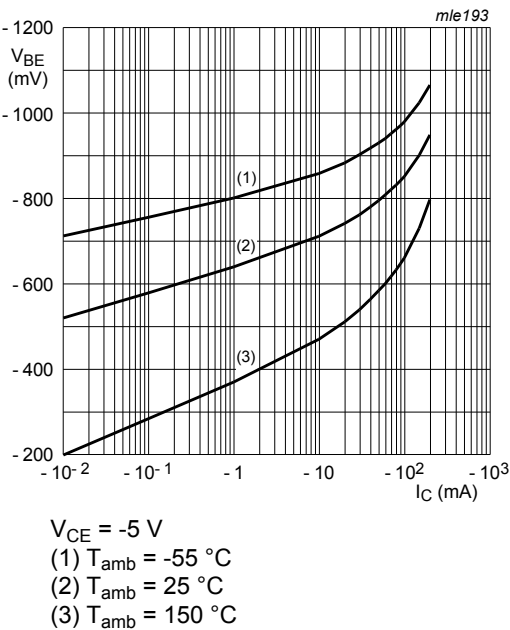


Fig. 11. PNP transistor: Base-emitter voltage as a function of collector current; typical values

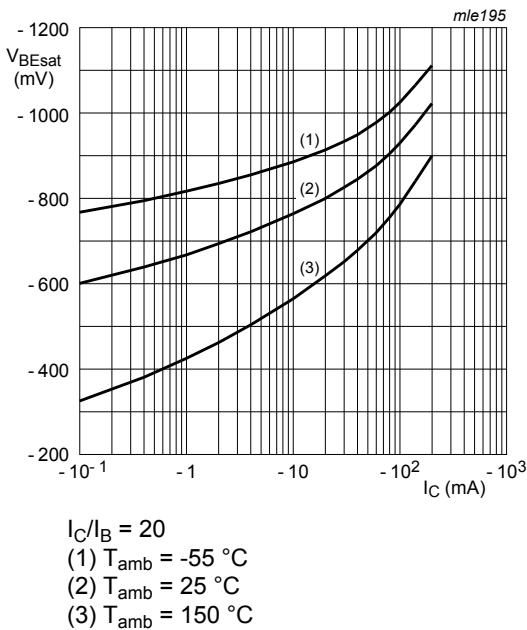
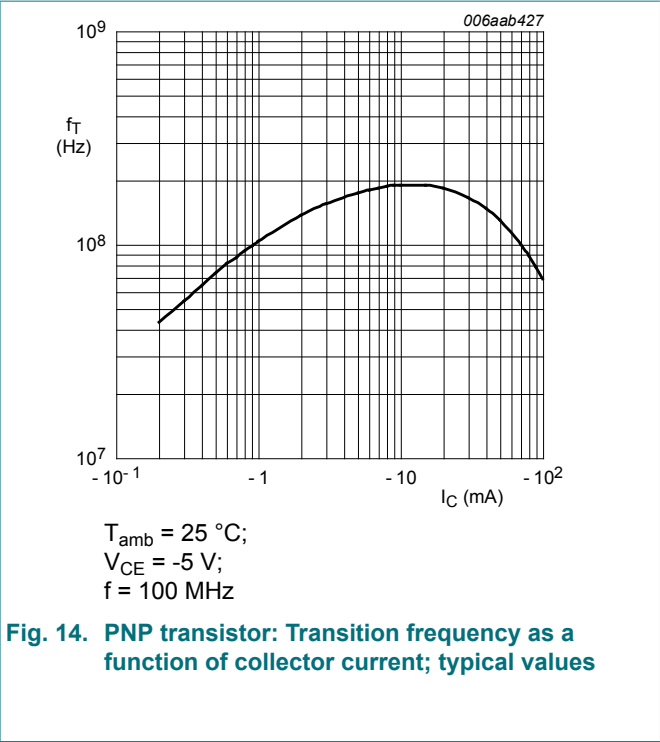
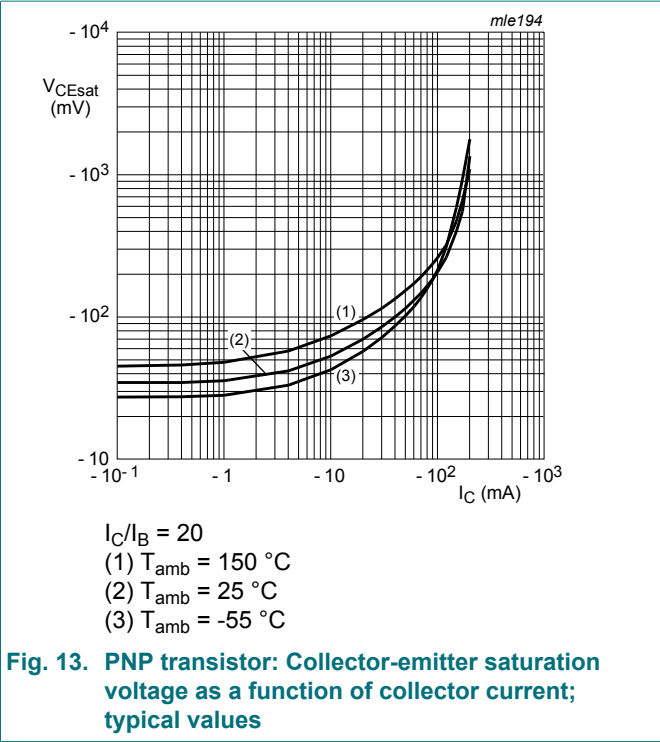


Fig. 12. PNP transistor: Base-emitter saturation voltage as a function of collector current; typical values



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

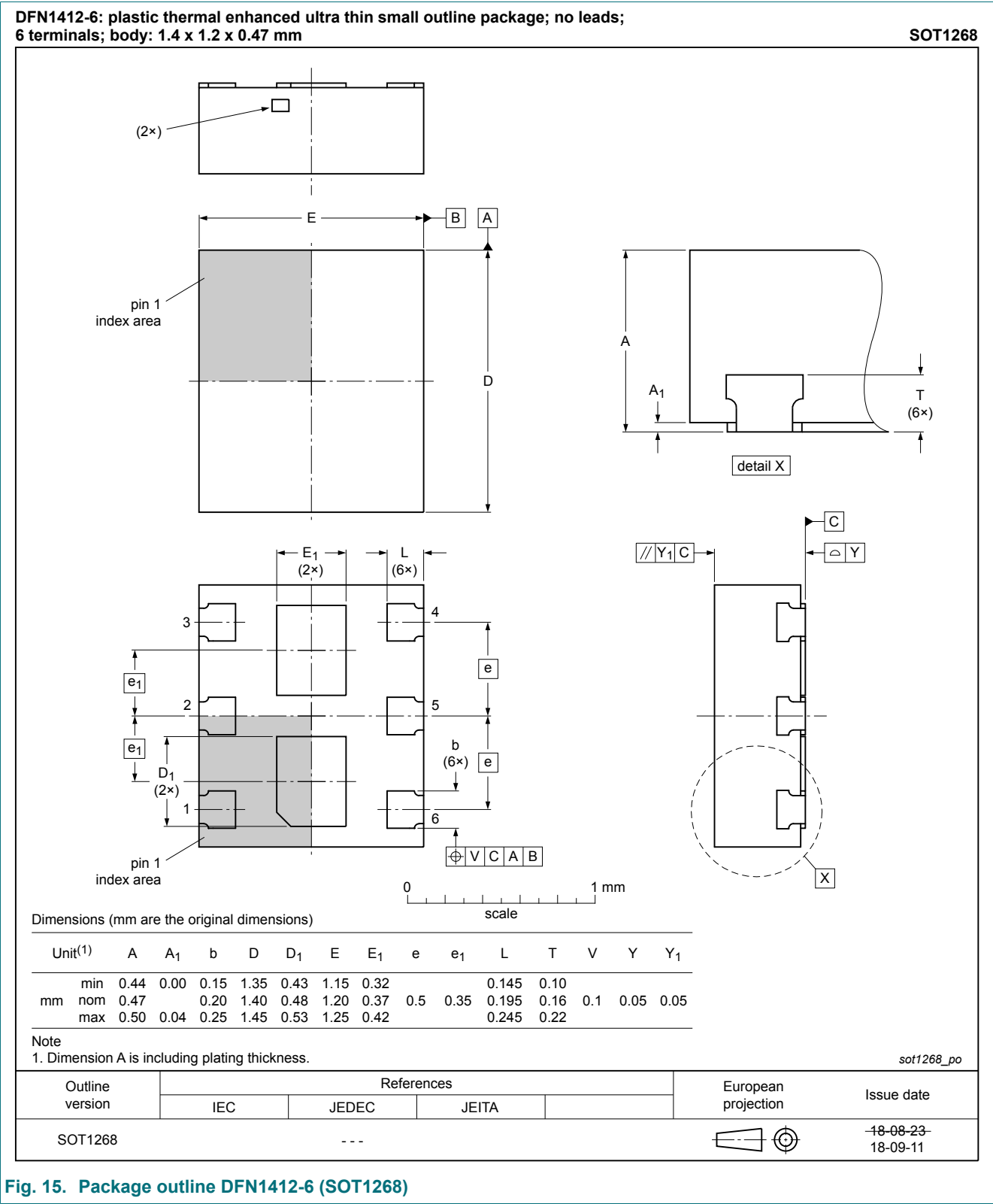


Fig. 15. Package outline DFN1412-6 (SOT1268)

13. Soldering

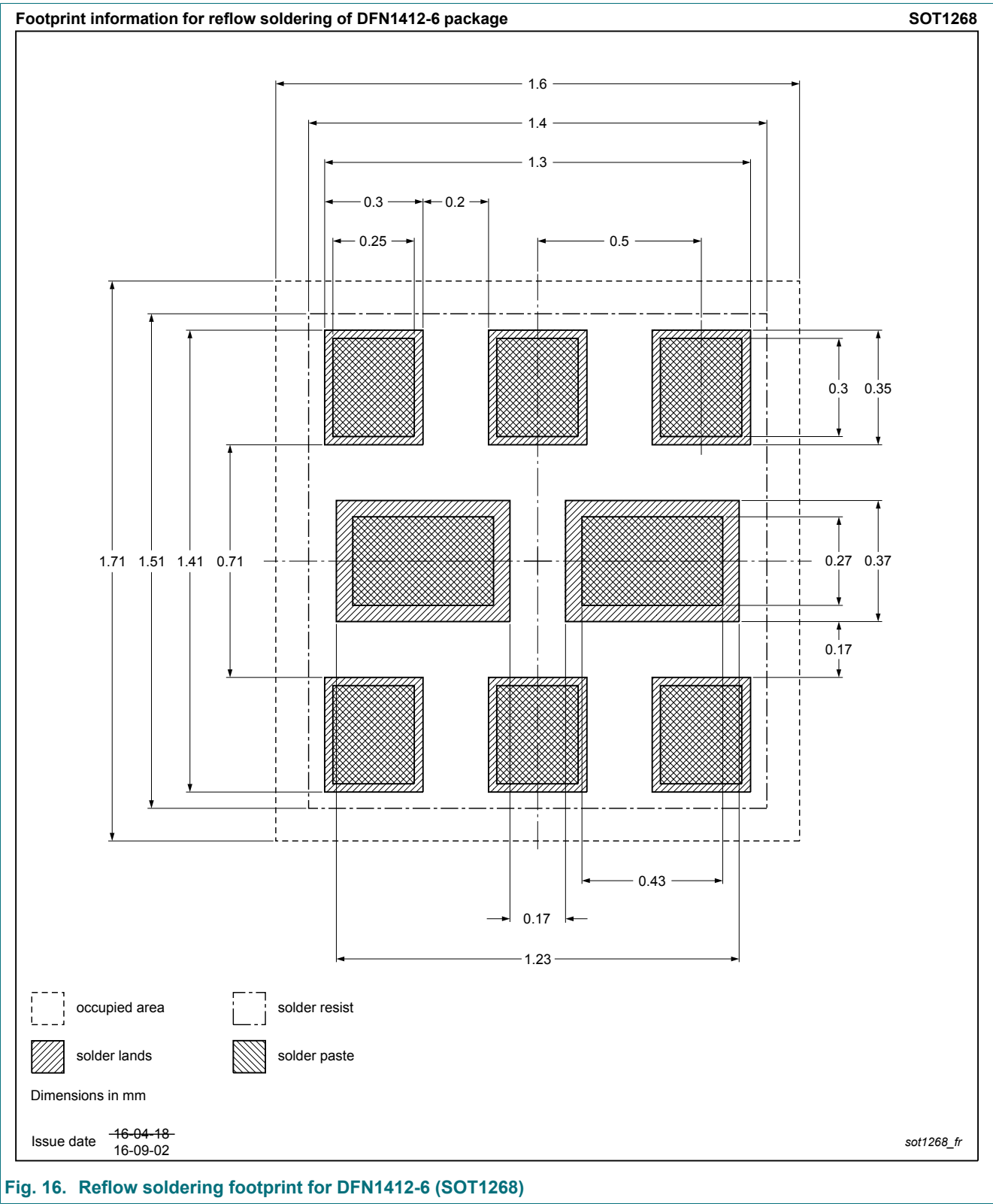


Fig. 16. Reflow soldering footprint for DFN1412-6 (SOT1268)

14. Revision history

Table 8. Revision history

| Data sheet ID | Release date | Data sheet status | Change notice | Supersedes |
|----------------|---|--------------------|---------------|---------------|
| BC847RAPN v.2 | 20180914 | Product data sheet | - | BC847RAPN v.1 |
| Modifications: | • Package outline drawing updated: Unit T added | | | |
| BC847RAPN 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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