
# BC847BPNH

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

4 May 2021 Product data sheet

## 1. General description

NPN/PNP general-purpose double transistor in a very small SOT363 (SC-88) Surface-Mounted Device (SMD) plastic package.

NPN/NPN complement: BC847BSH

PNP/PNP complement: BC857BSH

## 2. Features and benefits

- Low collector capacitance
- Low collector-emitter saturation voltage
- Closely matched current gain
- Reduces number of components and board space
- No mutual interference between the transistors
- High-temperature applications up to 175 °C

## 3. Applications

- General-purpose switching and amplification

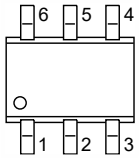
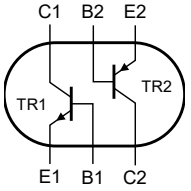
## 4. Quick reference data

**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 |
| $h_{FE}$ | DC current gain | $V_{CE}$ = 5 V; $I_C$ = 2 mA; $T_{amb}$ = 25 °C | | 200 | 300 | 450 | |

# 5. Pinning information

**Table 2. Pinning information**

| Pin | Symbol | Description | Simplified outline | Graphic symbol |
|---|---|---|---|---|
| 1 | E1 | emitter TR1 |  TSSOP6 (SOT363) |  sym139 |
| 2 | B1 | base TR1 | | |
| 3 | C2 | collector TR2 | | |
| 4 | E2 | emitter TR2 | | |
| 5 | B2 | base TR2 | | |
| 6 | C1 | collector TR1 | | |

# 6. Ordering information

**Table 3. Ordering information**

| Type number | Package | | |
|---|---|---|---|
| | Name | Description | Version |
| BC847BPNH | TSSOP6 | plastic, surface-mounted package; 6 leads; 0.65 mm pitch; 2.1 mm x 1.25 mm x 0.95 mm body | SOT363 |

# 7. Marking

**Table 4. Marking codes**

| Type number | Marking code[1] |
|---|---|
| BC847BPNH | 7E% |

[1] % = placeholder for manufacturing site code

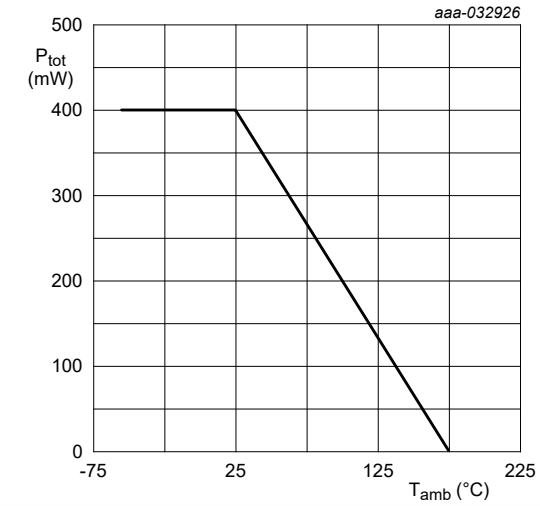
# 8. Limiting values

**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 | | - | 7 | 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 | | | - | 200 | mA |
| $P_{tot}$ | total power dissipation | $T_{amb} \leq 25$ °C | [1] | - | 270 | mW |
| **Per device** | | | | | | |
| $P_{tot}$ | total power dissipation | $T_{amb} \leq 25$ °C | [1] | - | 400 | mW |
| $T_j$ | junction temperature | | | - | 175 | °C |
| $T_{amb}$ | ambient temperature | | | -55 | 175 | °C |
| $T_{stg}$ | storage temperature | | | -65 | 175 | °C |

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




FR4 PCB, single-sided, 35 µm copper, tin-plated and standard footprint

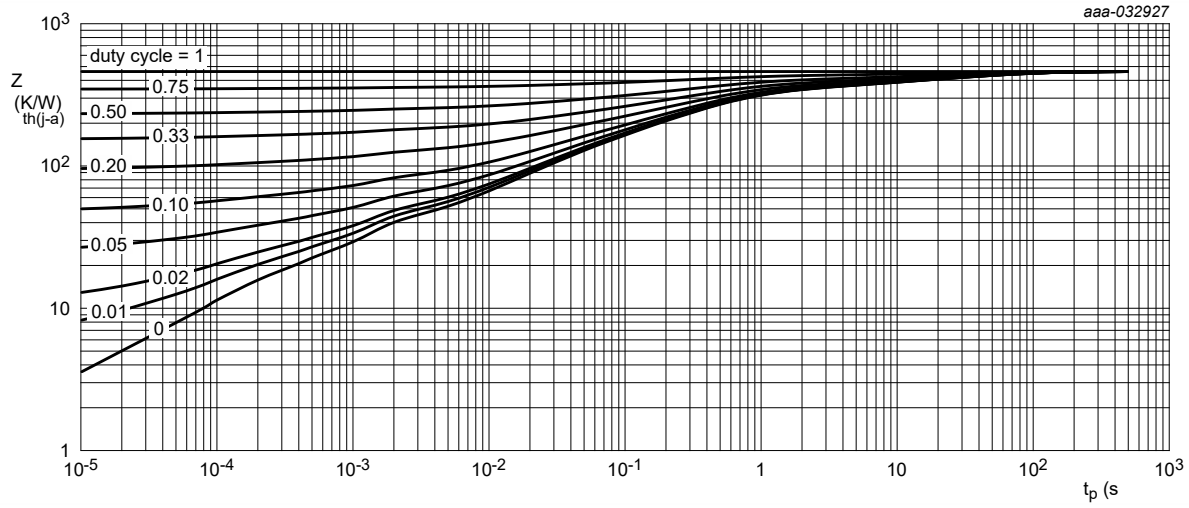
**Fig. 1. Per device: Power derating curve**

## 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] | - | - | 556 | K/W |
| $R_{th(j-sp)}$ | thermal resistance from junction to solder point | | | - | - | 170 | K/W |
| **Per device** | | | | | | | |
| $R_{th(j-a)}$ | thermal resistance from junction to ambient | in free air | [1] | - | - | 375 | K/W |

[1] Device mounted on an FR4 PCB, single-sided, 35 µm copper, tin-plated and standard footprint.




FR4 PCB, single-sided, 35 µm copper, tin-plated and standard footprint

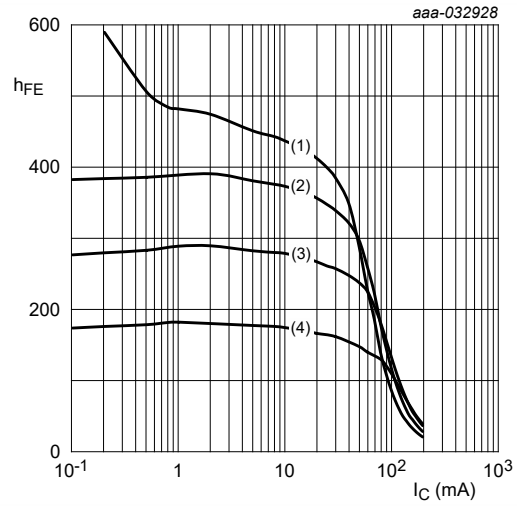
**Fig. 2. Per transistor: Transient thermal impedance from junction to ambient as a function of pulse duration; typical values**

# 10. Characteristics

**Table 7. Characteristics**

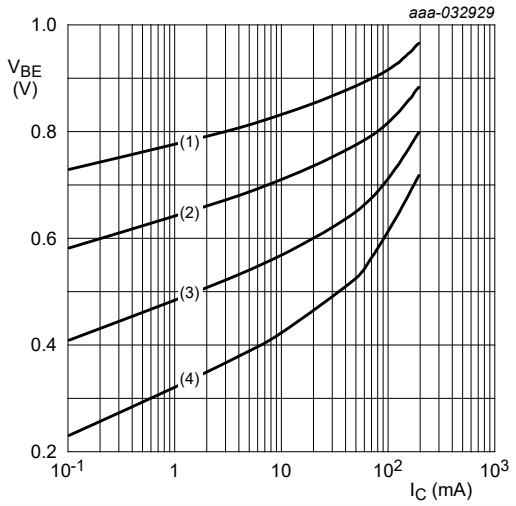
| Symbol | Parameter | Conditions | | Min | Typ | Max | Unit |
|---|---|---|---|---|---|---|---|
| **Per transistor; for the PNP transistor with negative polarity** | | | | | | | |
| $V_{(BR)CBO}$ | collector-base breakdown voltage | $I_C$ = 100 µA; $I_E$ = 0 A; $T_{amb}$ = 25 °C | | 50 | - | - | V |
| $V_{(BR)CEO}$ | collector-emitter breakdown voltage | $I_C$ = 2 mA; $I_B$ = 0 A; $T_{amb}$ = 25 °C | | 45 | - | - | V |
| $V_{(BR)EBO}$ | emitter-base breakdown voltage | $I_C$ = 0 A; $I_E$ = 100 µA; $T_{amb}$ = 25 °C | | 7 | - | - | V |
| $I_{CBO}$ | collector-base cut-off current | $V_{CB}$ = 30 V; $I_E$ = 0 A; $T_{amb}$ = 25 °C | | - | - | 15 | nA |
| | | $V_{CB}$ = 30 V; $I_E$ = 0 A; $T_j$ = 150 °C | | - | - | 5 | µA |
| $I_{EBO}$ | emitter-base cut-off current | $V_{EB}$ = 7 V; $I_C$ = 0 A; $T_{amb}$ = 25 °C | | - | - | 100 | nA |
| $h_{FE}$ | DC current gain | $V_{CE}$ = 5 V; $I_C$ = 2 mA; $T_{amb}$ = 25 °C | | 200 | 300 | 450 | |
| $V_{CEsat}$ | collector-emitter saturation voltage | $I_C$ = 10 mA; $I_B$ = 0.5 mA; $T_{amb}$ = 25 °C | | - | 50 | 100 | mV |
| | | $I_C$ = 100 mA; $I_B$ = 5 mA; pulsed; $t_p \leq$ 300 µs; $\delta \leq$ 0.02; $T_{amb}$ = 25 °C | | - | 200 | 300 | mV |
| $V_{BEsat}$ | base-emitter saturation voltage | $I_C$ = 10 mA; $I_B$ = 0.5 mA; $T_{amb}$ = 25 °C | [1] | - | 750 | 850 | mV |
| | | $I_C$ = 100 mA; $I_B$ = 5 mA; $T_{amb}$ = 25 °C | | - | 875 | - | mV |
| $V_{BE}$ | base-emitter voltage | $V_{CE}$ = 5 V; $I_C$ = 2 mA; $T_{amb}$ = 25 °C | [2] | 600 | 655 | 700 | mV |
| | | $V_{CE}$ = 5 V; $I_C$ = 10 mA; $T_{amb}$ = 25 °C | [2] | - | 705 | 770 | mV |
| $f_T$ | transition frequency | $V_{CE}$ = 5 V; $I_C$ = 10 mA; f = 100 MHz; $T_{amb}$ = 25 °C | | 100 | - | - | MHz |
| NF | noise figure | $V_{CE}$ = 5 V; $I_C$ = 0.2 mA; $R_S$ = 2 kΩ; f = 10 Hz to 15.7 kHz; $T_{amb}$ = 25 °C | | - | 1.7 | - | dB |
| **TR1 (NPN)** | | | | | | | |
| $C_c$ | collector capacitance | $V_{CB}$ = 10 V; $I_E$ = 0 A; $i_e$ = 0 A; f = 1 MHz; $T_{amb}$ = 25 °C | | - | 1.2 | - | pF |
| $C_e$ | emitter capacitance | $V_{EB}$ = 0.5 V; $I_C$ = 0 A; $i_c$ = 0 A; f = 1 MHz; $T_{amb}$ = 25 °C | | - | 11 | - | pF |
| NF | noise figure | $V_{CE}$ = 5 V; $I_C$ = 0.2 mA; $R_S$ = 2 kΩ; f = 1 kHz; B = 200 Hz; $T_{amb}$ = 25 °C | | - | 3.1 | - | dB |
| **TR2 (PNP)** | | | | | | | |
| $C_c$ | collector capacitance | $V_{CB}$ = -10 V; $I_E$ = 0 A; $i_e$ = 0 A; f = 1 MHz; $T_{amb}$ = 25 °C | | - | 1.8 | - | pF |
| $C_e$ | emitter capacitance | $V_{EB}$ = -0.5 V; $I_C$ = 0 A; $i_c$ = 0 A; f = 1 MHz; $T_{amb}$ = 25 °C | | - | 8.5 | - | pF |
| NF | noise figure | $V_{CE}$ = -5 V; $I_C$ = -0.2 mA; $R_S$ = 2 kΩ; f = 1 kHz; B = 200 Hz; $T_{amb}$ = 25 °C | | - | 3.3 | - | dB |

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



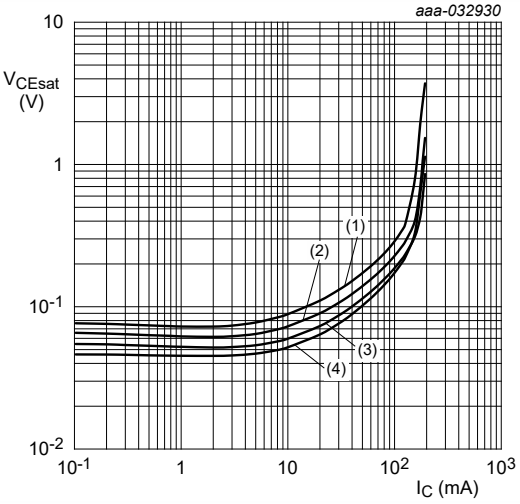

$V_{CE}$ = 5 V
(1) $T_{amb}$ = 175 °C
(2) $T_{amb}$ = 150 °C
(3) $T_{amb}$ = 25 °C
(4) $T_{amb}$ = -40 °C

**Fig. 3. TR1 (NPN): DC current gain as a function of collector current; typical values**



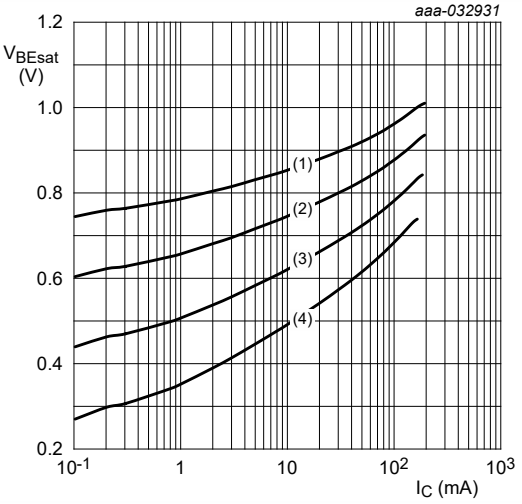

$V_{CE}$ = 5 V
(1) $T_{amb}$ = -40 °C
(2) $T_{amb}$ = 25 °C
(3) $T_{amb}$ = 100 °C
(4) $T_{amb}$ = 175°C

**Fig. 4. TR1 (NPN): Base-emitter voltage as a function of collector current; typical values**



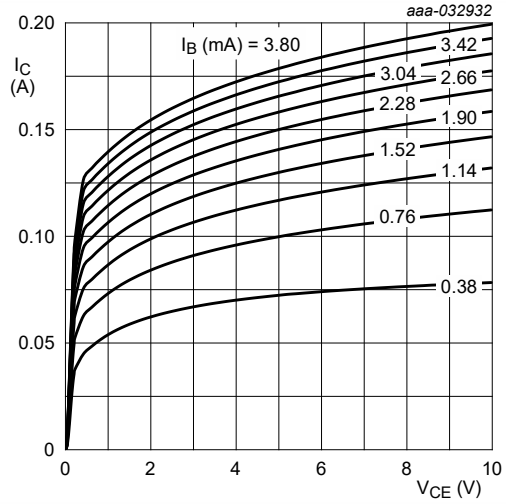

$I_C/I_B$ = 20
(1) $T_{amb}$ = 175 °C
(2) $T_{amb}$ = 100 °C
(3) $T_{amb}$ = 25 °C
(4) $T_{amb}$ = -40 °C

**Fig. 5. TR1 (NPN): Collector-emitter saturation voltage as a function of collector current; typical values**



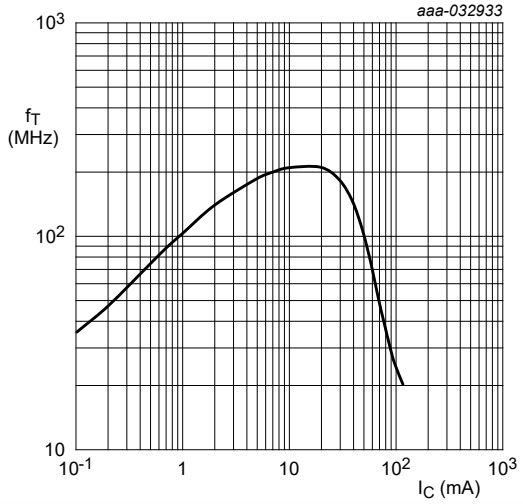

$I_C/I_B$ = 20
(1) $T_{amb}$ = -40 °C
(2) $T_{amb}$ = 25 °C
(3) $T_{amb}$ = 100 °C
(4) $T_{amb}$ = 175 °C

**Fig. 6. TR1 (NPN): Base-emitter saturation voltage as a function of collector current; typical values**



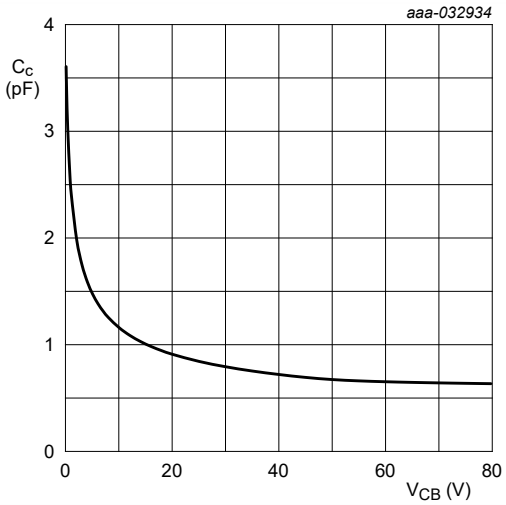

$T_{amb}$ = 25 °C

**Fig. 7. TR1 (NPN): Collector current as a function of collector-emitter voltage; typical values**



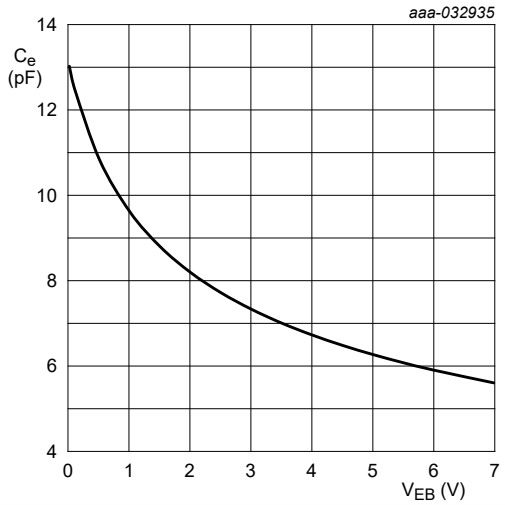

f = 100 MHz
$T_{amb}$ = 25 °C
$V_{CE}$ = 5 V

**Fig. 8. TR1 (NPN): Transition frequency as a function of collector current; typical values**



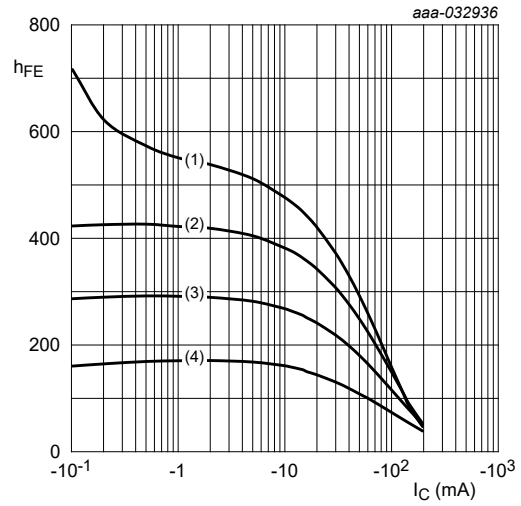

f = 1 MHz
$T_{amb}$ = 25 °C

**Fig. 9. TR1 (NPN): Collector capacitance as a function of collector-base voltage; typical values**



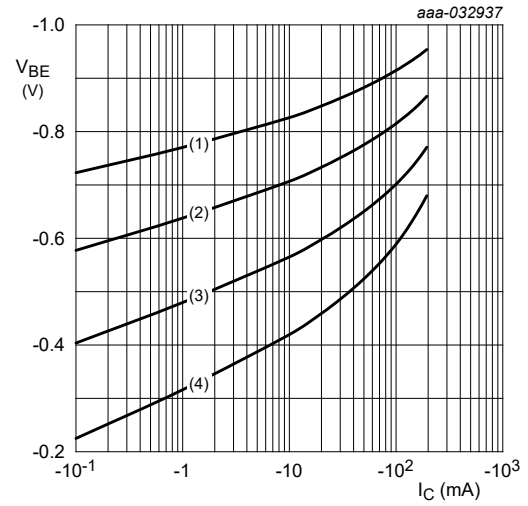

f = 1 MHz
$T_{amb}$ = 25 °C

**Fig. 10. TR1 (NPN): Emitter capacitance as a function of emitter-base voltage; typical values**



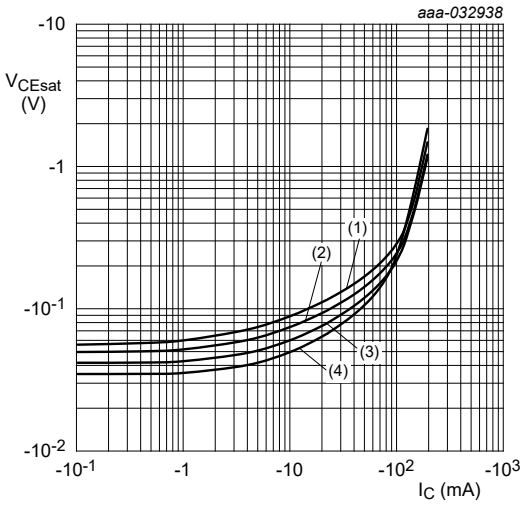

$V_{CE}$ = -5 V
(1) $T_{amb}$ = 175 °C
(2) $T_{amb}$ = 100 °C
(3) $T_{amb}$ = 25 °C
(4) $T_{amb}$ = -40 °C

**Fig. 11. TR2 (PNP): DC current gain as a function of collector current; typical values**



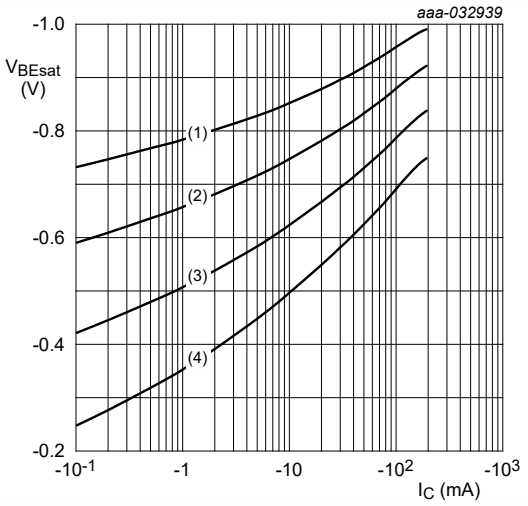

$V_{CE}$ = -5 V
(1) $T_{amb}$ = -40 °C
(2) $T_{amb}$ = 25 °C
(3) $T_{amb}$ = 100 °C
(4) $T_{amb}$ = 175 °C

**Fig. 12. TR2 (PNP): Base-emitter voltage as a function of collector current; typical value**



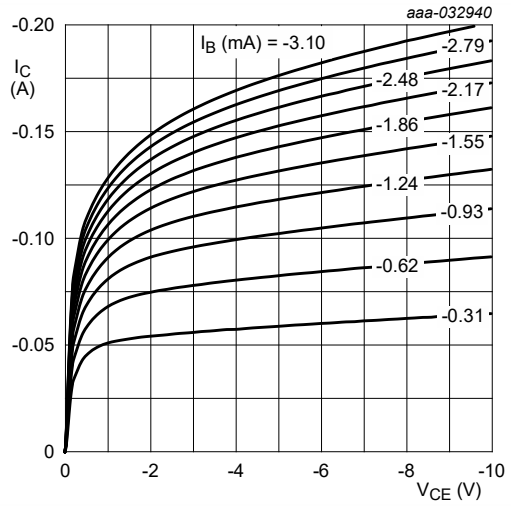

$I_C/I_B$ = 20
(1) $T_{amb}$ = 175 °C
(2) $T_{amb}$ = 100 °C
(3) $T_{amb}$ = 25 °C
(4) $T_{amb}$ = -40 °C

**Fig. 13. TR2 (PNP): Collector-emitter saturation voltage as a function of collector current; typical values**



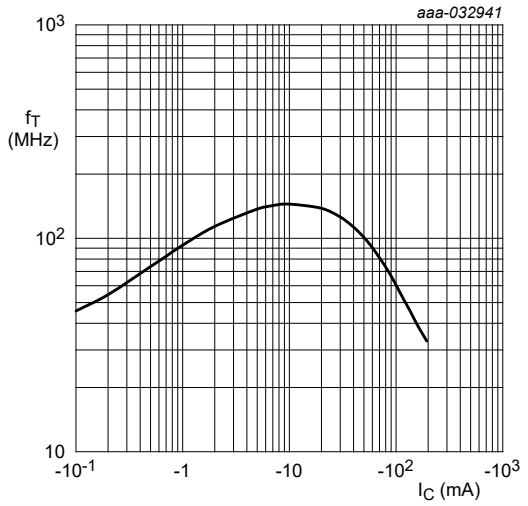

$I_C/I_B$ = 20
(1) $T_{amb}$ = -40 °C
(2) $T_{amb}$ = 25 °C
(3) $T_{amb}$ = 100 °C
(4) $T_{amb}$ = 175 °C

**Fig. 14. TR2 (PNP): Base-emitter saturation voltage as a function of collector current; typical values**



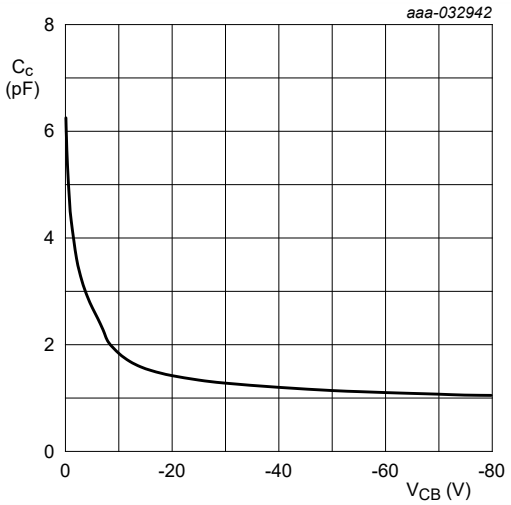

$T_{amb}$ = 25 °C

**Fig. 15. TR2 (PNP): Collector current as a function of collector-emitter voltage; typical values**



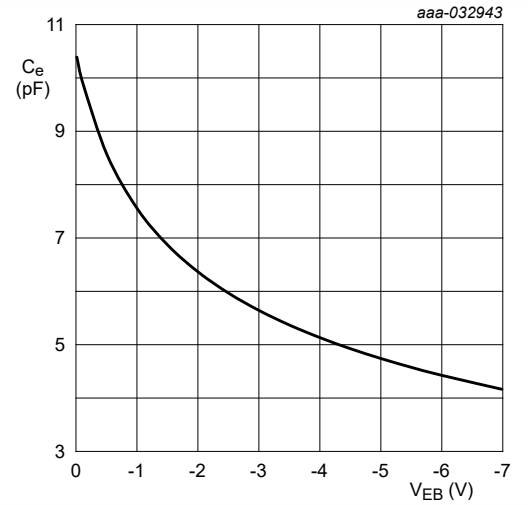

f = 100 MHz
$T_{amb}$ = 25 °C
$V_{CE}$ = -5 V

**Fig. 16. TR2 (PNP): Transition frequency as a function of collector current; typical values**




f = 1 MHz
$T_{amb}$ = 25 °C

**Fig. 17. TR2 (PNP): Collector capacitance as a function of collector-base voltage; typical values**




f = 1 MHz
$T_{amb}$ = 25 °C

**Fig. 18. TR2 (PNP): Emitter capacitance as a function of emitter-base voltage; typical values**

## 11. Package outline

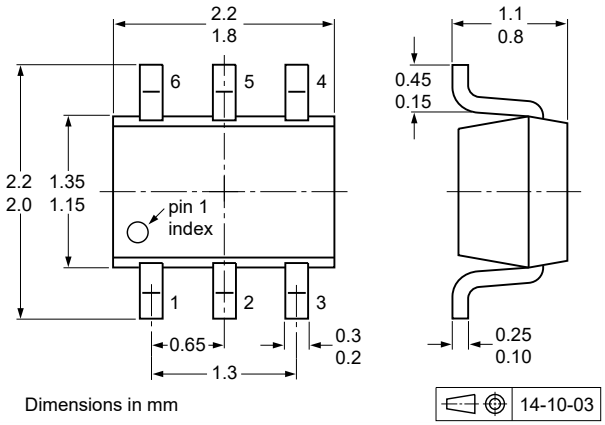



**Fig. 19. Package outline TSSOP6 (SOT363)**

## 12. Soldering

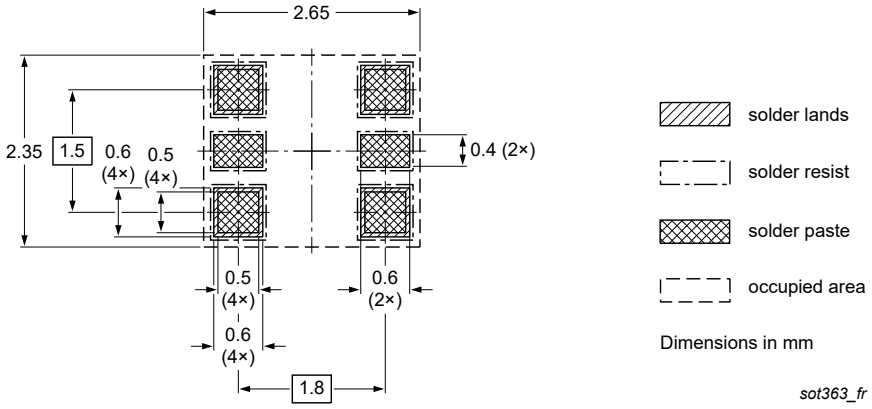



**Fig. 20. Reflow soldering footprint for TSSOP6 (SOT363)**

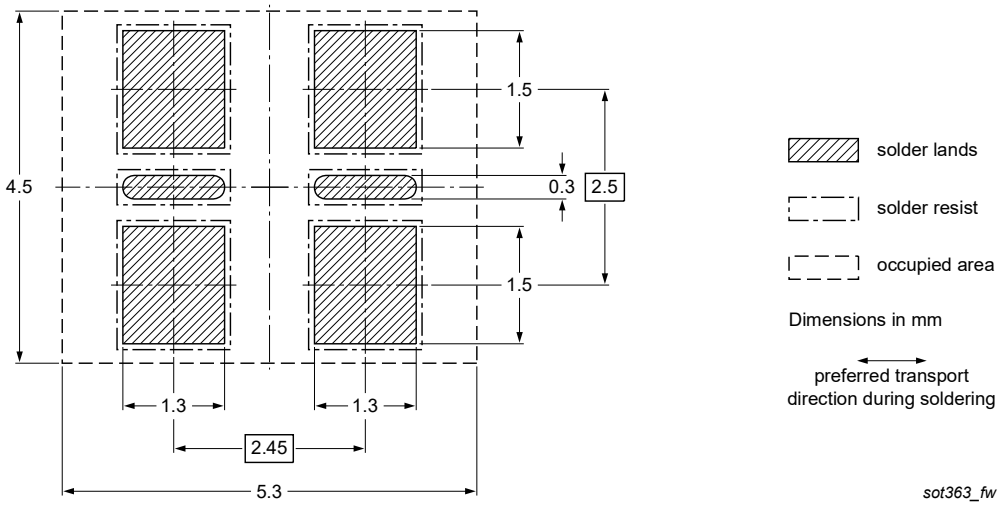



**Fig. 21. Wave soldering footprint for TSSOP6 (SOT363)**

# 13. Revision history

**Table 8. Revision history**

| Data sheet ID | Release date | Data sheet status | Change notice | Supersedes |
|---|---|---|---|---|
| BC847BPNH v.1 | 20210504 | 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. |

[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".
[3] The product status of device(s) described in this document may have changed since this document was published and may differ in case of multiple devices. The latest product status information is available on the internet at https://www.nexperia.com.

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