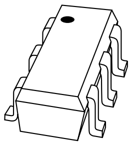


# BC847BPN

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

Rev. 04 — 18 February 2009 | Product data sheet

## 1. Product profile

### 1.1 General description

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

### 1.2 Features

- 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

### 1.3 Applications

- General-purpose switching and amplification

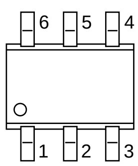
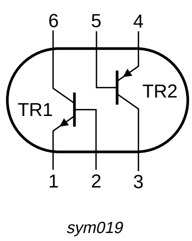
### 1.4 Quick reference data

**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 | 200 | - | 450 | |

## 2. Pinning information

**Table 2. Pinning**

| Pin | Description | Simplified outline | Graphic symbol |
|---|---|---|---|
| 1 | emitter TR1 |  |  |
| 2 | base TR1 | | |
| 3 | collector TR2 | | |
| 4 | emitter TR2 | | |
| 5 | base TR2 | | |
| 6 | collector TR1 | | |

## 3. Ordering information

**Table 3. Ordering information**

| Type number | Package | | |
|---|---|---|---|
| | Name | Description | Version |
| BC847BPN | SC-88 | plastic surface-mounted package; 6 leads | SOT363 |

## 4. Marking

**Table 4. Marking codes**

| Type number | Marking code[1] |
|---|---|
| BC847BPN | 13* |

[1] * = -: made in Hong Kong
* = p: made in Hong Kong
* = t: made in Malaysia
* = W: made in China

## 5. Limiting values

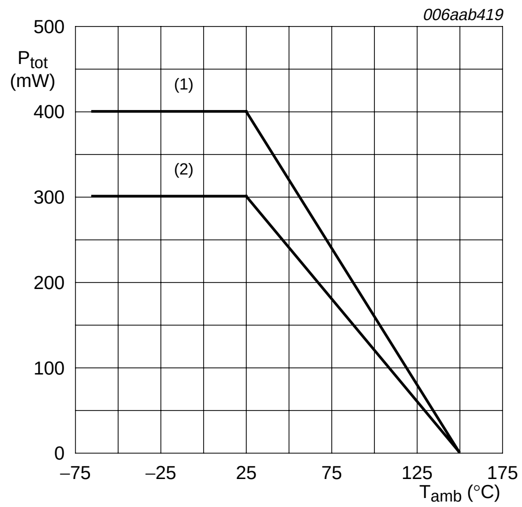
**Table 5. Limiting values**

*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 | | - | 5 | 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] | - | 220 | mW |
| | | | [2] | - | 250 | mW |
| **Per device** | | | | | | |
| $P_{tot}$ | total power dissipation | $T_{amb} \leq 25$ °C | [1] | - | 300 | mW |
| | | | [2] | - | 400 | 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 Printed-Circuit Board (PCB), single-sided copper, tin-plated and standard footprint.

[2] Device mounted on an FR4 PCB, single-sided copper, tin-plated, mounting pad for collector 1 $cm^2$.




(1) FR4 PCB, mounting pad for collector 1 cm²

(2) FR4 PCB, standard footprint

**Fig 1. Per device: Power derating curves SOT363 (SC-88)**

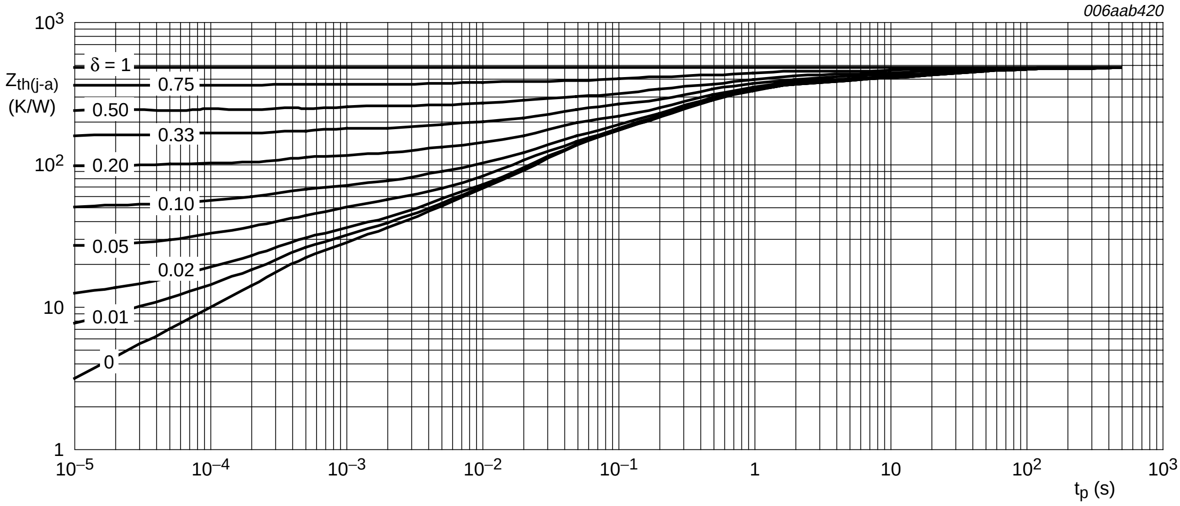
## 6. Thermal characteristics

**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] | - | - | 568 | K/W |
| | | | [2] | - | - | 500 | K/W |
| $R_{th(j-sp)}$ | thermal resistance from junction to solder point | | | - | - | 230 | K/W |
| **Per device** | | | | | | | |
| $R_{th(j-a)}$ | thermal resistance from junction to ambient | in free air | [1] | - | - | 416 | K/W |
| | | | [2] | - | - | 313 | K/W |

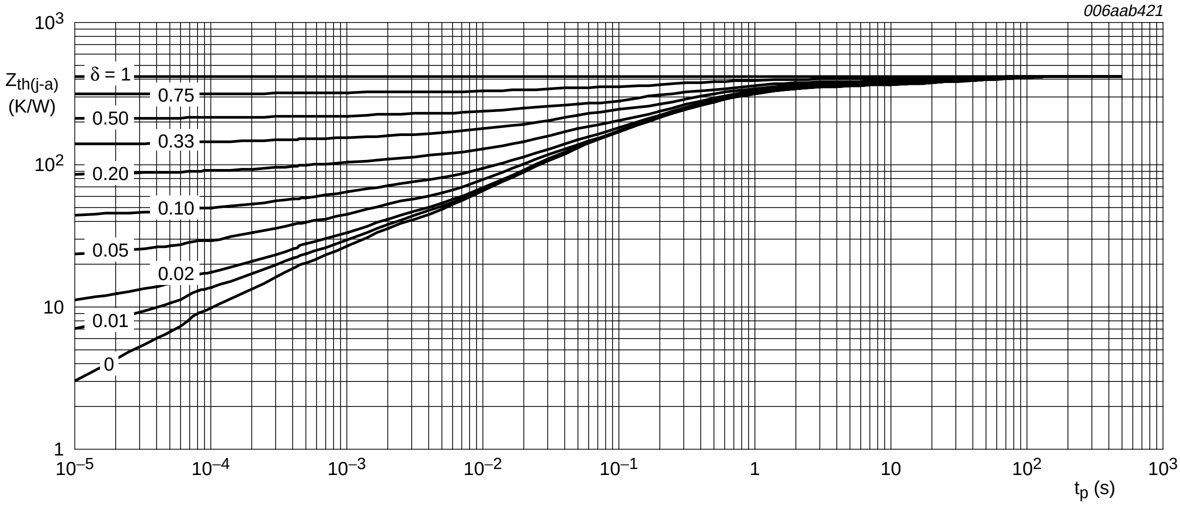
[1] Device mounted on an FR4 PCB, single-sided copper, tin-plated and standard footprint.

[2] Device mounted on an FR4 PCB, single-sided copper, tin-plated, mounting pad for collector 1 cm².




FR4 PCB, standard footprint

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




FR4 PCB, mounting pad for collector 1 $cm^2$

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

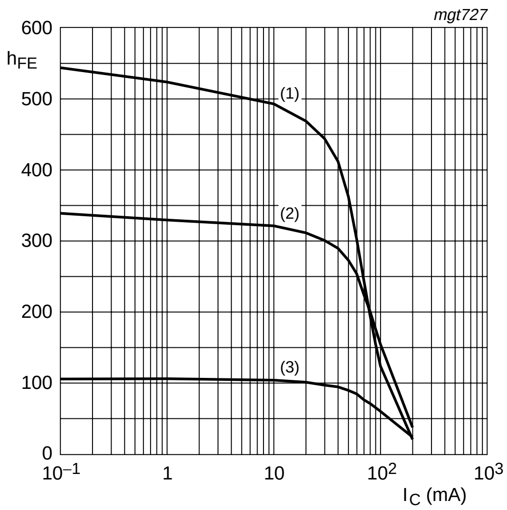
## 7. Characteristics

**Table 7. Characteristics**

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

| 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 V; $I_E$ = 0 A | | - | - | 15 | nA |
| | | $V_{CB}$ = 30 V; $I_E$ = 0 A; $T_j$ = 150 °C | | - | - | 5 | µA |
| $I_{EBO}$ | emitter-base cut-off current | $V_{EB}$ = 5 V; $I_C$ = 0 A | | - | - | 100 | nA |
| $h_{FE}$ | DC current gain | $V_{CE}$ = 5 V; $I_C$ = 2 mA | | 200 | - | 450 | |
| $V_{CEsat}$ | collector-emitter saturation voltage | $I_C$ = 10 mA; $I_B$ = 0.5 mA | | - | - | 100 | mV |
| | | $I_C$ = 100 mA; $I_B$ = 5 mA | [1] | - | - | 300 | mV |
| $V_{BEsat}$ | base-emitter saturation voltage | $I_C$ = 10 mA; $I_B$ = 0.5 mA | | - | 755 | - | mV |
| $V_{BE}$ | base-emitter voltage | $I_C$ = 2 mA; $V_{CE}$ = 5 V | | | | | |
| | TR1 (NPN) | | | 580 | 655 | 700 | mV |
| | TR2 (PNP) | | | 600 | 655 | 750 | mV |
| $C_c$ | collector capacitance | $I_E$ = $i_e$ = 0 A; $V_{CB}$ = 10 V; f = 1 MHz | | | | | |
| | TR1 (NPN) | | | - | - | 1.5 | pF |
| | TR2 (PNP) | | | - | - | 2.2 | pF |
| $C_e$ | emitter capacitance | $I_C$ = $i_c$ = 0 A; $V_{EB}$ = 0.5 V; f = 1 MHz | | | | | |
| | TR1 (NPN) | | | - | 11 | - | pF |
| | TR2 (PNP) | | | - | 10 | - | pF |
| $f_T$ | transition frequency | $I_C$ = 10 mA; $V_{CE}$ = 5 V; f = 100 MHz | | 100 | - | - | MHz |

[1] Pulse test: $t_p \leq 300$ µs; $\delta \leq 0.02$.



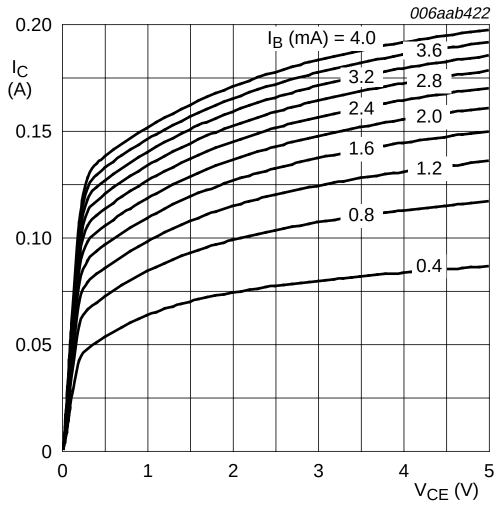

$V_{CE}$ = 5 V

(1) $T_{amb}$ = 150 °C

(2) $T_{amb}$ = 25 °C

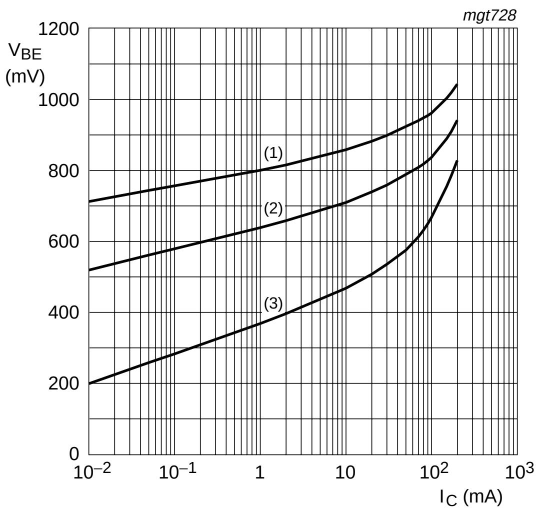
(3) $T_{amb}$ = −55 °C

**Fig 4. TR1 (NPN): DC current gain as a function of collector current; typical values**




$T_{amb}$ = 25 °C

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



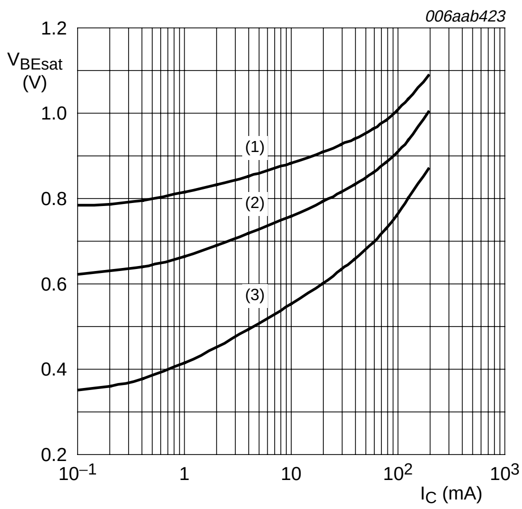

$V_{CE}$ = 5 V

(1) $T_{amb}$ = −55 °C

(2) $T_{amb}$ = 25 °C

(3) $T_{amb}$ = 150 °C

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



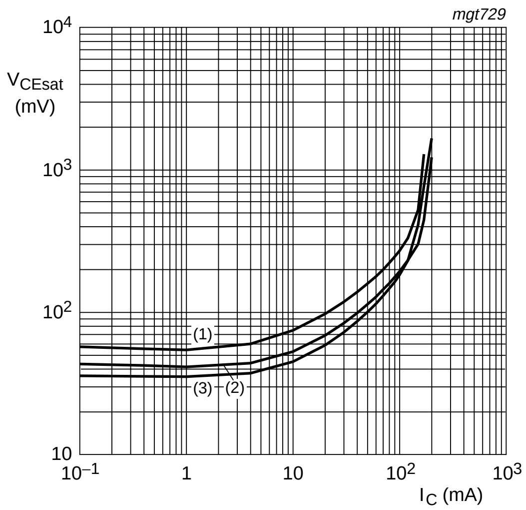

$I_C/I_B$ = 20

(1) $T_{amb}$ = −55 °C

(2) $T_{amb}$ = 25 °C

(3) $T_{amb}$ = 150 °C

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



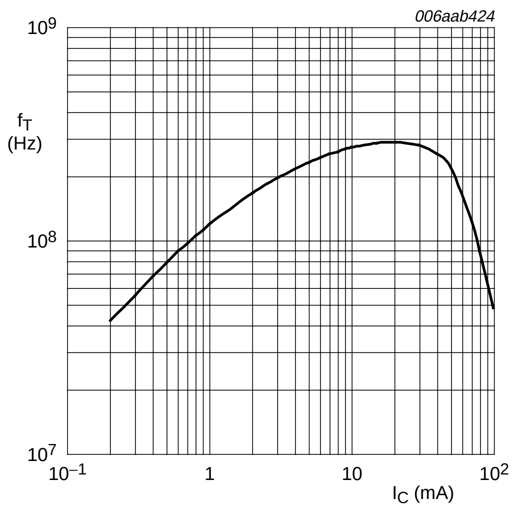

$I_C/I_B = 20$

(1) $T_{amb} = 150$ °C

(2) $T_{amb} = 25$ °C

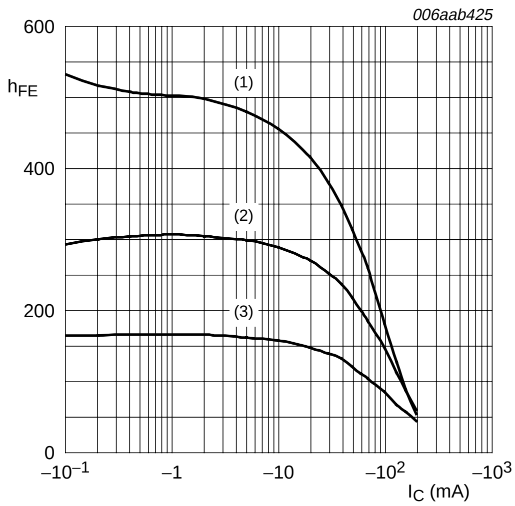
(3) $T_{amb} = -55$ °C

**Fig 8. TR1 (NPN): Collector-emitter saturation voltage as a function of collector current; typical values**




$V_{CE} = 5$ V; f = 1 MHz; $T_{amb} = 25$ °C

**Fig 9. TR1 (NPN): Transition frequency as a function of collector current; typical values**



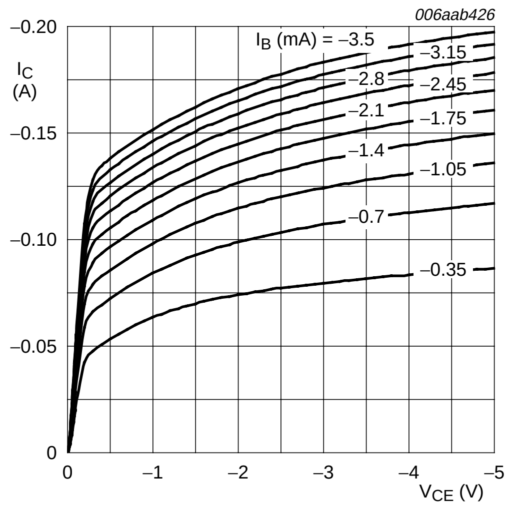

$V_{CE}$ = −5 V

(1) $T_{amb}$ = 150 °C

(2) $T_{amb}$ = 25 °C

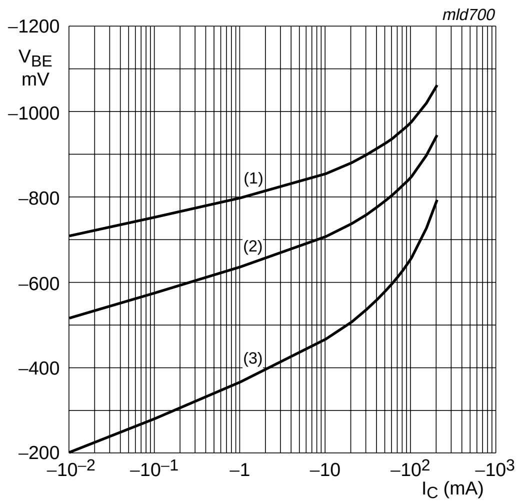
(3) $T_{amb}$ = −55 °C

**Fig 10. TR2 (PNP): DC current gain as a function of collector current; typical values**




$T_{amb}$ = 25 °C

**Fig 11. TR2 (PNP): Collector current as a function of collector-emitter voltage; typical values**



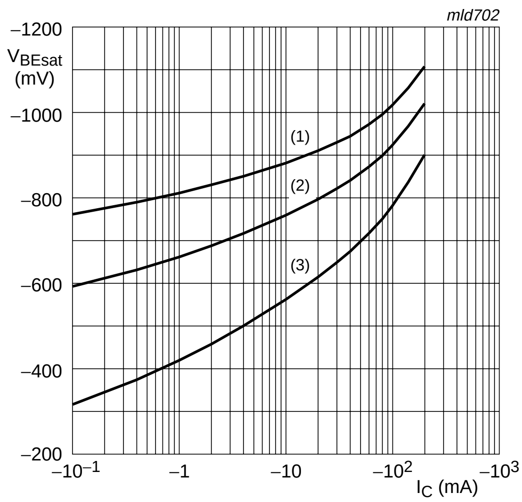

$V_{CE}$ = −5 V

(1) $T_{amb}$ = −55 °C

(2) $T_{amb}$ = 25 °C

(3) $T_{amb}$ = 150 °C

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



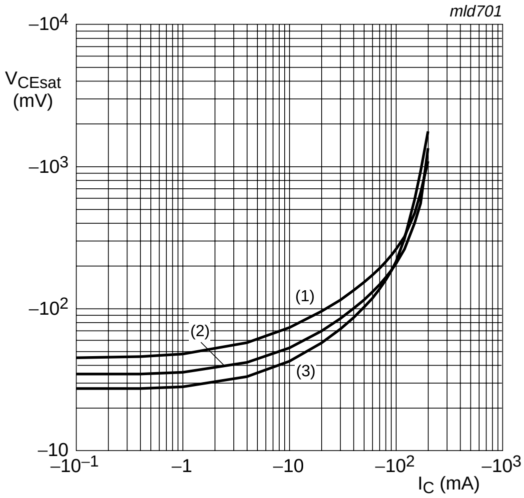

$I_C/I_B$ = 20

(1) $T_{amb}$ = −55 °C

(2) $T_{amb}$ = 25 °C

(3) $T_{amb}$ = 150 °C

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



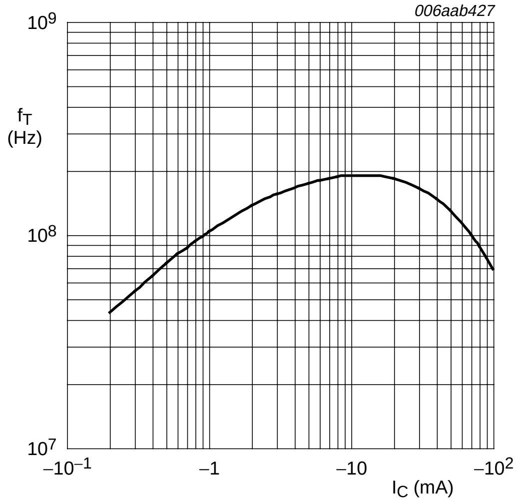

$I_C/I_B = 20$

(1) $T_{amb} = 150$ °C

(2) $T_{amb} = 25$ °C

(3) $T_{amb} = -55$ °C

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




$V_{CE} = -5$ V; f = 1 MHz; $T_{amb} = 25$ °C

**Fig 15. TR2 (PNP): Transition frequency as a function of collector current; typical values**

## 8. Package outline

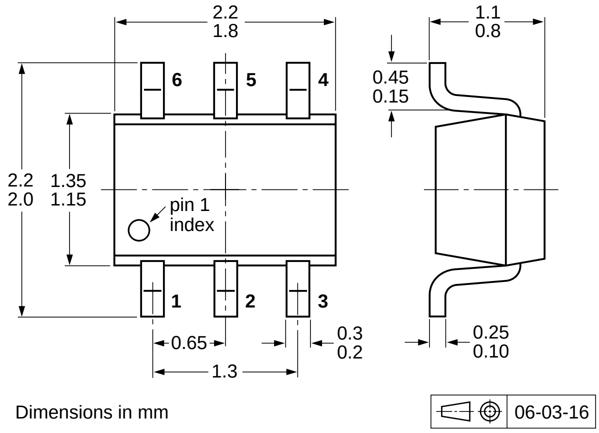



**Fig 16. Package outline SOT363 (SC-88)**

## 9. Packing information

**Table 8. Packing methods**

*The indicated -xxx are the last three digits of the 12NC ordering code.*[1]

| Type number | Package | Description | Packing quantity | |
|---|---|---|---|---|
| | | | **3000** | **10000** |
| BC847BPN | SOT363 | 4 mm pitch, 8 mm tape and reel; T1 [2] | -115 | -135 |
| | | 4 mm pitch, 8 mm tape and reel; T2 [3] | -125 | -165 |

[1] For further information and the availability of packing methods, see Section 13.

[2] T1: normal taping

[3] T2: reverse taping

## 10. Soldering

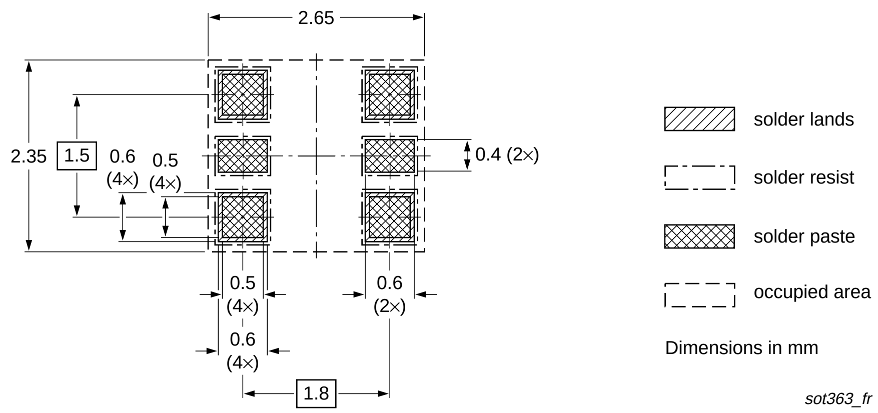



**Fig 17. Reflow soldering footprint SOT363 (SC-88)**

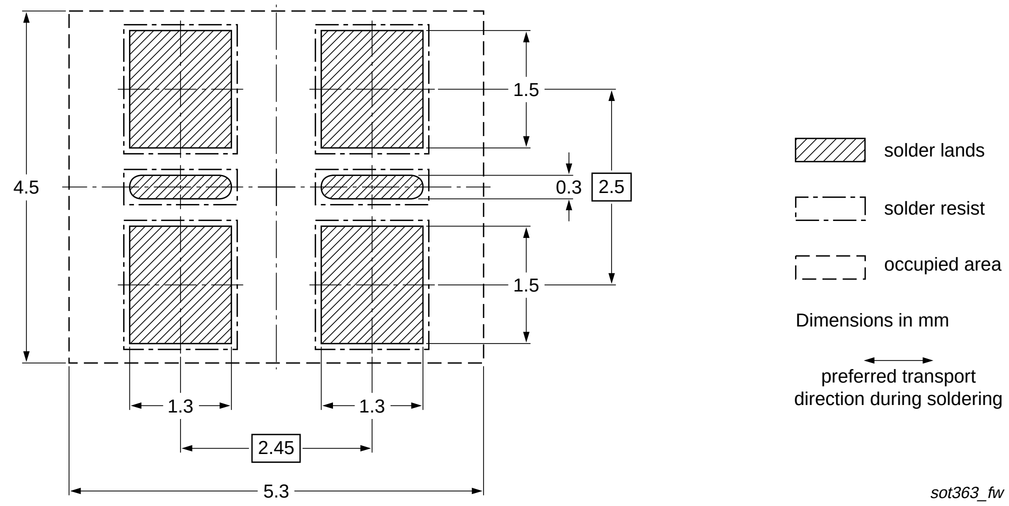



**Fig 18. Wave soldering footprint SOT363 (SC-88)**

## 11. Revision history

**Table 9. Revision history**

| Document ID | Release date | Data sheet status | Change notice | Supersedes |
|---|---|---|---|---|
| BC847BPN_4 | 20090218 | Product data sheet | - | BC847BPN_3 |
| Modifications: | • The format of this data sheet has been redesigned to comply with the new identity guidelines of NXP Semiconductors.<br>• Legal texts have been adapted to the new company name where appropriate.<br>• Section 4 “Marking”: updated<br>• Section 7 “Characteristics”: enhanced<br>• Section 9 “Packing information”: added<br>• Section 10 “Soldering”: added<br>• Section 12 “Legal information”: updated | | | |
| BC847BPN_3 | 20011026 | Product specification | - | BC847BPN_2 |
| BC847BPN_2 | 19990426 | Preliminary specification | - | BC847BPN_1 |
| BC847BPN_1 | 19970709 | Preliminary specification | - | - |

# 12. Legal information

## 12.1 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 URL http://www.nxp.com.

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# 13. Contact information

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## 14. Contents





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**Document identifier: BC847BPN_4**