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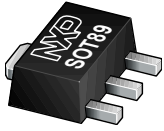
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Kind regards,

Team Nexperia



# PBHV8115X

150 V, 1 A NPN high-voltage low  $V_{CEsat}$  (BISS) transistor

9 December 2013

Product data sheet

## 1. General description

NPN high-voltage low  $V_{CEsat}$  Breakthrough In Small Signal (BISS) transistor in a SOT89 (SC-62) medium power and flat lead Surface-Mounted Device (SMD) plastic package.

PNP complement: PBHV9115X.

## 2. Features and benefits

- High voltage
- Low collector-emitter saturation voltage  $V_{CEsat}$
- High collector current capability  $I_C$  and  $I_{CM}$
- High collector current gain ( $h_{FE}$ ) at high  $I_C$
- AEC-Q101 qualified
- Medium power SMD plastic package

## 3. Applications

- LED driver for LED chain module
- LCD backlighting
- High Intensity Discharge (HID) front lighting
- Automotive motor management
- Hook switch for wired telecom
- Switch Mode Power Supply (SMPS)

## 4. Quick reference data

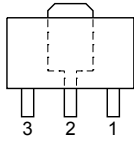
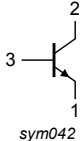
Table 1. Quick reference data

| Symbol    | Parameter                 | Conditions   | Min | Typ | Max | Unit |
|-----------|---------------------------|--|-----|-----|-----|------|
| $V_{CEO}$ | collector-emitter voltage | open base  | -   | -   | 150 | V    |
| $I_C$     | collector current         |  | -   | -   | 1   | A    |
| $h_{FE}$  | DC current gain           | $V_{CE} = 10\text{ V}; I_C = 50\text{ mA}; T_{amb} = 25\text{ °C}$ | 100 | 250 | -   |      |



## 5. Pinning information

Table 2. Pinning information

| Pin | Symbol | Description | Simplified outline  | Graphic symbol  |
|-----|--------|-------------|---|---|
| 1   | E      | emitter     |  <p style="text-align: center;"><b>SOT89</b></p> |  |
| 2   | C      | collector   |   |   |
| 3   | B      | base        |   |   |

## 6. Ordering information

Table 3. Ordering information

| Type number | Package |  |         |
|-------------|---------|--|---------|
|             | Name    | Description  | Version |
| PBHV8115X   | SOT89   | plastic surface-mounted package; die pad for good heat transfer; 3 leads | SOT89   |

## 7. Marking

Table 4. Marking codes

| Type number | Marking code |
|-------------|--------------|
| PBHV8115X   | %4F          |

[1] % = placeholder for manufacturing site code

## 8. Limiting values

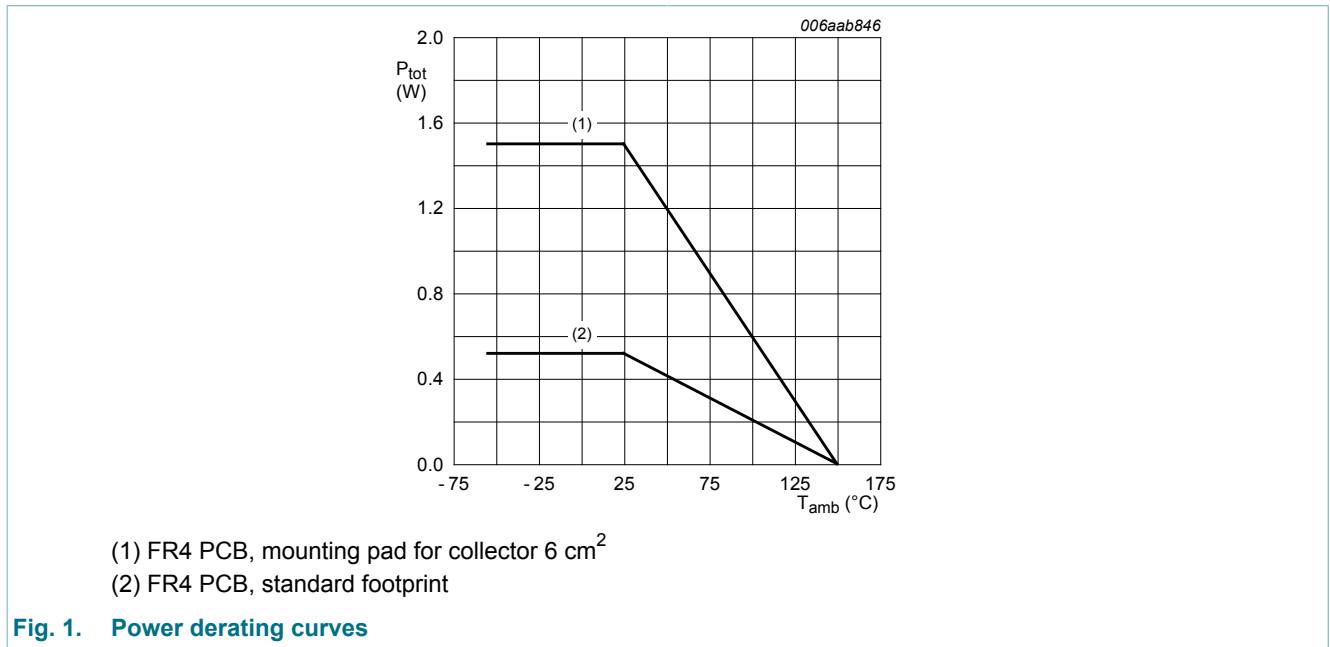
**Table 5. Limiting values**

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

| Symbol           | Parameter                 | Conditions                          |     | Min | Max  | Unit |
|------------------|---------------------------|-------------------------------------|-----|-----|------|------|
| V <sub>CBO</sub> | collector-base voltage    | open emitter                        |     | -   | 400  | V    |
| V <sub>CEO</sub> | collector-emitter voltage | open base                           |     | -   | 150  | V    |
| V <sub>EBO</sub> | emitter-base voltage      | open collector                      |     | -   | 6    | V    |
| I <sub>C</sub>   | collector current         |                                     |     | -   | 1    | A    |
| I <sub>CM</sub>  | peak collector current    | single pulse; t <sub>p</sub> ≤ 1 ms |     | -   | 2    | A    |
| I <sub>BM</sub>  | peak base current         |                                     |     | -   | 400  | mA   |
| P <sub>tot</sub> | total power dissipation   | T <sub>amb</sub> ≤ 25 °C            | [1] | -   | 0.52 | W    |
|                  |                           |                                     | [2] | -   | 1.5  | W    |
| T <sub>j</sub>   | junction temperature      |                                     |     | -   | 150  | °C   |
| T <sub>amb</sub> | ambient temperature       |                                     |     | -55 | 150  | °C   |
| T <sub>stg</sub> | storage temperature       |                                     |     | -65 | 150  | °C   |

[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 6 cm<sup>2</sup>.



### 9. Thermal characteristics

Table 6. Thermal characteristics

| Symbol                | Parameter  | Conditions  |     | Min | Typ | Max | Unit |
|-----------------------|--|-------------|-----|-----|-----|-----|------|
| R <sub>th(j-a)</sub>  | thermal resistance from junction to ambient      | in free air | [1] | -   | -   | 240 | K/W  |
|                       |  |             | [2] | -   | -   | 83  | K/W  |
| R <sub>th(j-sp)</sub> | thermal resistance from junction to solder point |             |     | -   | -   | 20  | 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 6 cm<sup>2</sup>.

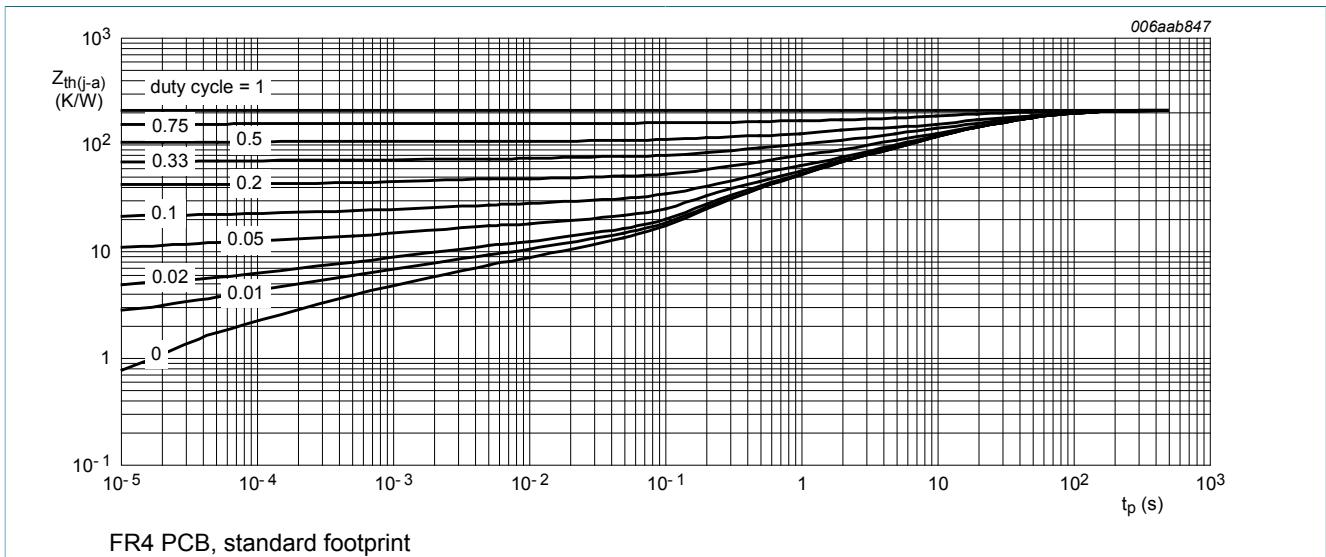


Fig. 2. Transient thermal impedance from junction to ambient as a function of pulse duration; typical values

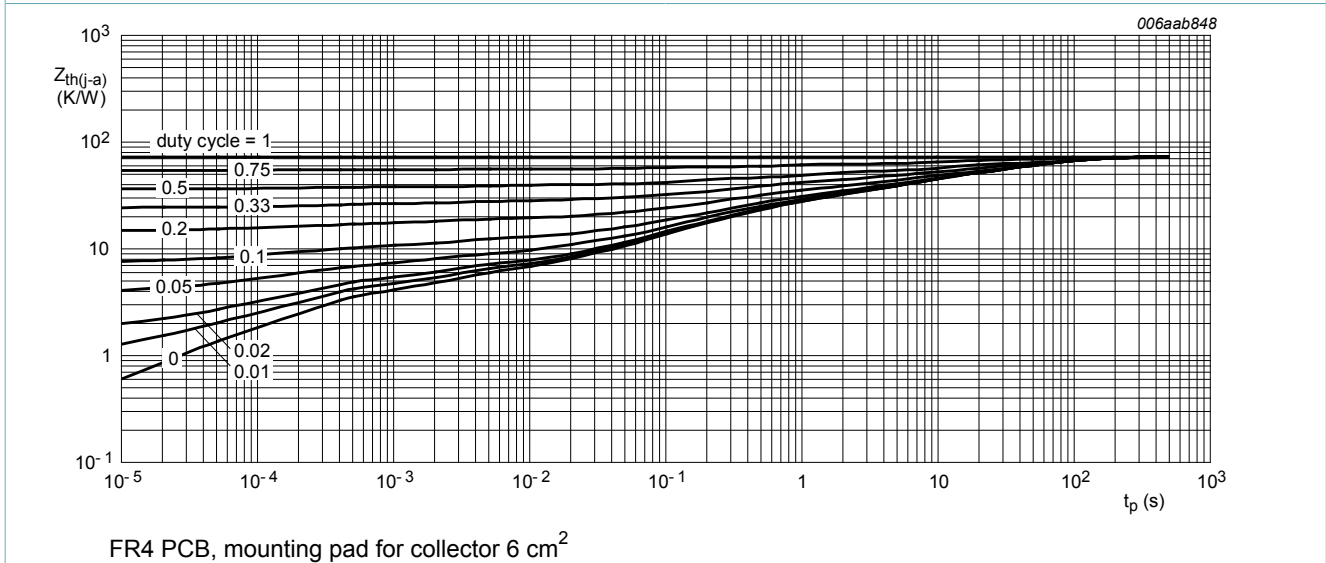


Fig. 3. Transient thermal impedance from junction to ambient as a function of pulse duration; typical values

## 10. Characteristics

Table 7. Characteristics

| Symbol             | Parameter                            | Conditions   | Min  | Typ  | Max | Unit |
|--------------------|--------------------------------------|--|--|------|-----|------|
| I <sub>CBO</sub>   | collector-base cut-off current       | V <sub>CB</sub> = 120 V; I <sub>E</sub> = 0 A; T <sub>amb</sub> = 25 °C  | -  | -    | 100 | nA   |
|                    |                                      | V <sub>CB</sub> = 120 V; I <sub>E</sub> = 0 A; T <sub>J</sub> = 150 °C   | -  | -    | 10  | μA   |
| I <sub>CES</sub>   | collector-emitter cut-off current    | V <sub>CE</sub> = 120 V; V <sub>BE</sub> = 0 V; T <sub>amb</sub> = 25 °C   | -  | -    | 100 | nA   |
| I <sub>EBO</sub>   | emitter-base cut-off current         | V <sub>EB</sub> = 4 V; I <sub>C</sub> = 0 A; T <sub>amb</sub> = 25 °C  | -  | -    | 100 | nA   |
| h <sub>FE</sub>    | DC current gain                      | V <sub>CE</sub> = 10 V; I <sub>C</sub> = 50 mA; T <sub>amb</sub> = 25 °C   | 100  | 250  | -   |      |
|                    |                                      | V <sub>CE</sub> = 10 V; I <sub>C</sub> = 100 mA; pulsed;<br>t <sub>p</sub> ≤ 300 μs; δ ≤ 0.02; T <sub>amb</sub> = 25 °C          | 100  | 250  | -   |      |
|                    |                                      | V <sub>CE</sub> = 10 V; I <sub>C</sub> = 0.5 A; pulsed;<br>t <sub>p</sub> ≤ 300 μs; δ ≤ 0.02; T <sub>amb</sub> = 25 °C           | 50   | 160  | -   |      |
|                    |                                      | V <sub>CE</sub> = 10 V; I <sub>C</sub> = 1 A; t <sub>p</sub> ≤ 300 μs;<br>δ ≤ 0.02; T <sub>amb</sub> = 25 °C                     | 10   | 30   | -   |      |
| V <sub>CEsat</sub> | collector-emitter saturation voltage | I <sub>C</sub> = 100 mA; I <sub>B</sub> = 20 mA; T <sub>amb</sub> = 25 °C  | -  | 33   | 50  | mV   |
|                    |                                      | I <sub>C</sub> = 100 mA; I <sub>B</sub> = 10 mA; T <sub>amb</sub> = 25 °C  | -  | 40   | 60  | mV   |
|                    |                                      | I <sub>C</sub> = 1 A; I <sub>B</sub> = 0.2 A; pulsed; t <sub>p</sub> ≤ 300 μs;<br>δ ≤ 0.02; T <sub>amb</sub> = 25 °C             | -  | 225  | 350 | mV   |
| V <sub>BEsat</sub> | base-emitter saturation voltage      | I <sub>C</sub> = 1 A; I <sub>B</sub> = 200 mA; pulsed;<br>t <sub>p</sub> ≤ 300 μs; δ ≤ 0.02; T <sub>amb</sub> = 25 °C            | -  | 1.1  | 1.2 | V    |
| t <sub>d</sub>     | delay time                           | V <sub>CC</sub> = 6 V; I <sub>C</sub> = 0.5 A; I <sub>Bon</sub> = 0.1 A;<br>I <sub>Boff</sub> = -0.1 A; T <sub>amb</sub> = 25 °C | -  | 7    | -   | ns   |
| t <sub>r</sub>     | rise time                            |  | -  | 565  | -   | ns   |
| t <sub>on</sub>    | turn-on time                         |  | -  | 572  | -   | ns   |
| t <sub>s</sub>     | storage time                         |  | -  | 1530 | -   | ns   |
| t <sub>f</sub>     | fall time                            |  | -  | 700  | -   | ns   |
| t <sub>off</sub>   | turn-off time                        |  | -  | 2230 | -   | ns   |
| f <sub>T</sub>     | transition frequency                 |  | V <sub>CE</sub> = 10 V; I <sub>C</sub> = 10 mA; f = 100 MHz;<br>T <sub>amb</sub> = 25 °C | -    | 30  | -    |
| C <sub>c</sub>     | collector capacitance                | V <sub>CB</sub> = 20 V; I <sub>E</sub> = 0 A; i <sub>e</sub> = 0 A;<br>f = 1 MHz; T <sub>amb</sub> = 25 °C                       | -  | 5.7  | -   | pF   |
| C <sub>e</sub>     | emitter capacitance                  | V <sub>EB</sub> = 0.5 V; I <sub>C</sub> = 0 A; i <sub>c</sub> = 0 A;<br>f = 1 MHz; T <sub>amb</sub> = 25 °C                      | -  | 150  | -   | pF   |

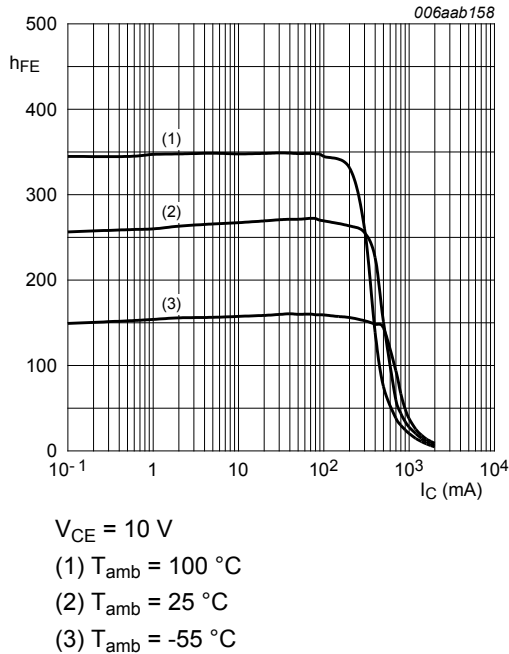


Fig. 4. DC current gain as a function of collector current; typical values

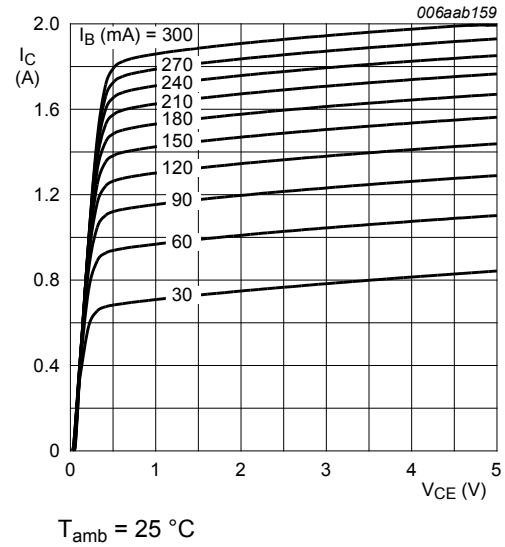


Fig. 5. Collector current as a function of collector-emitter voltage; typical values

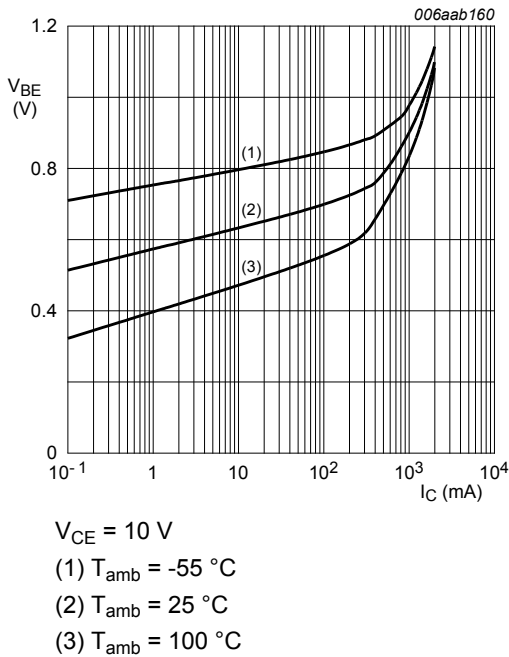


Fig. 6. Base-emitter voltage as a function of collector current; typical values

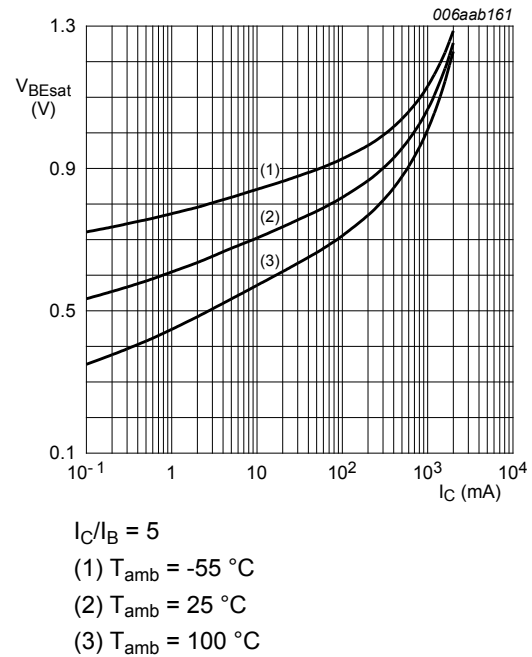
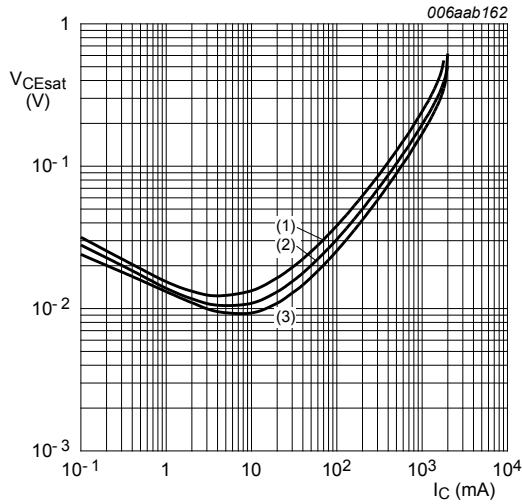
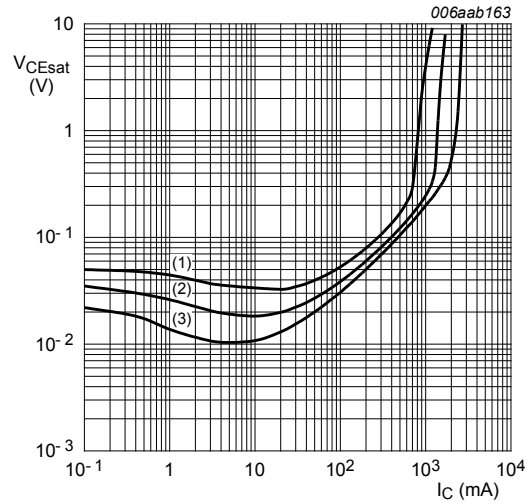


Fig. 7. Base-emitter saturation voltage as a function of collector current; typical values



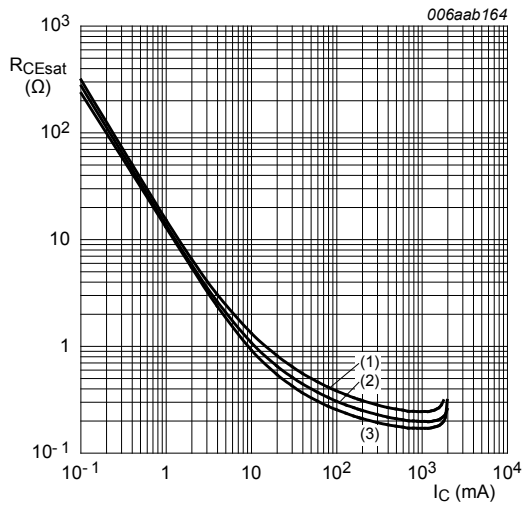
$I_C/I_B = 5$   
 (1)  $T_{amb} = 100\text{ }^\circ\text{C}$   
 (2)  $T_{amb} = 25\text{ }^\circ\text{C}$   
 (3)  $T_{amb} = -55\text{ }^\circ\text{C}$

**Fig. 8. Collector-emitter saturation voltage as a function of collector current; typical values**



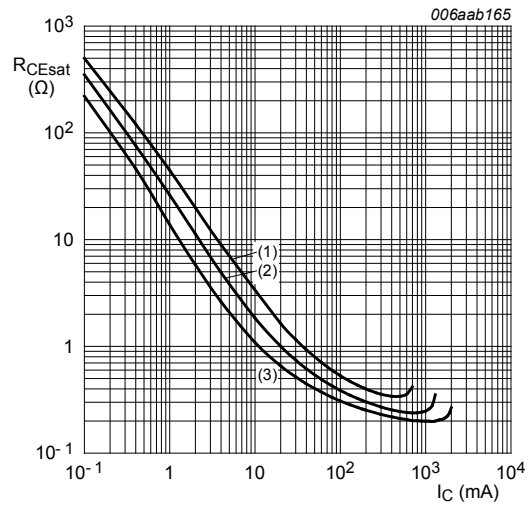
$T_{amb} = 25\text{ }^\circ\text{C}$   
 (1)  $I_C/I_B = 20$   
 (2)  $I_C/I_B = 10$   
 (3)  $I_C/I_B = 5$

**Fig. 9. Collector-emitter saturation voltage as a function of collector current; typical values**



$I_C/I_B = 5$   
 (1)  $T_{amb} = 100\text{ }^\circ\text{C}$   
 (2)  $T_{amb} = 25\text{ }^\circ\text{C}$   
 (3)  $T_{amb} = -55\text{ }^\circ\text{C}$

**Fig. 10. Collector-emitter saturation resistance as a function of collector current; typical values**



$T_{amb} = 25\text{ }^\circ\text{C}$   
 (1)  $I_C/I_B = 20$   
 (2)  $I_C/I_B = 10$   
 (3)  $I_C/I_B = 5$

**Fig. 11. Collector-emitter saturation resistance as a function of collector current; typical values**



### 11. Test information

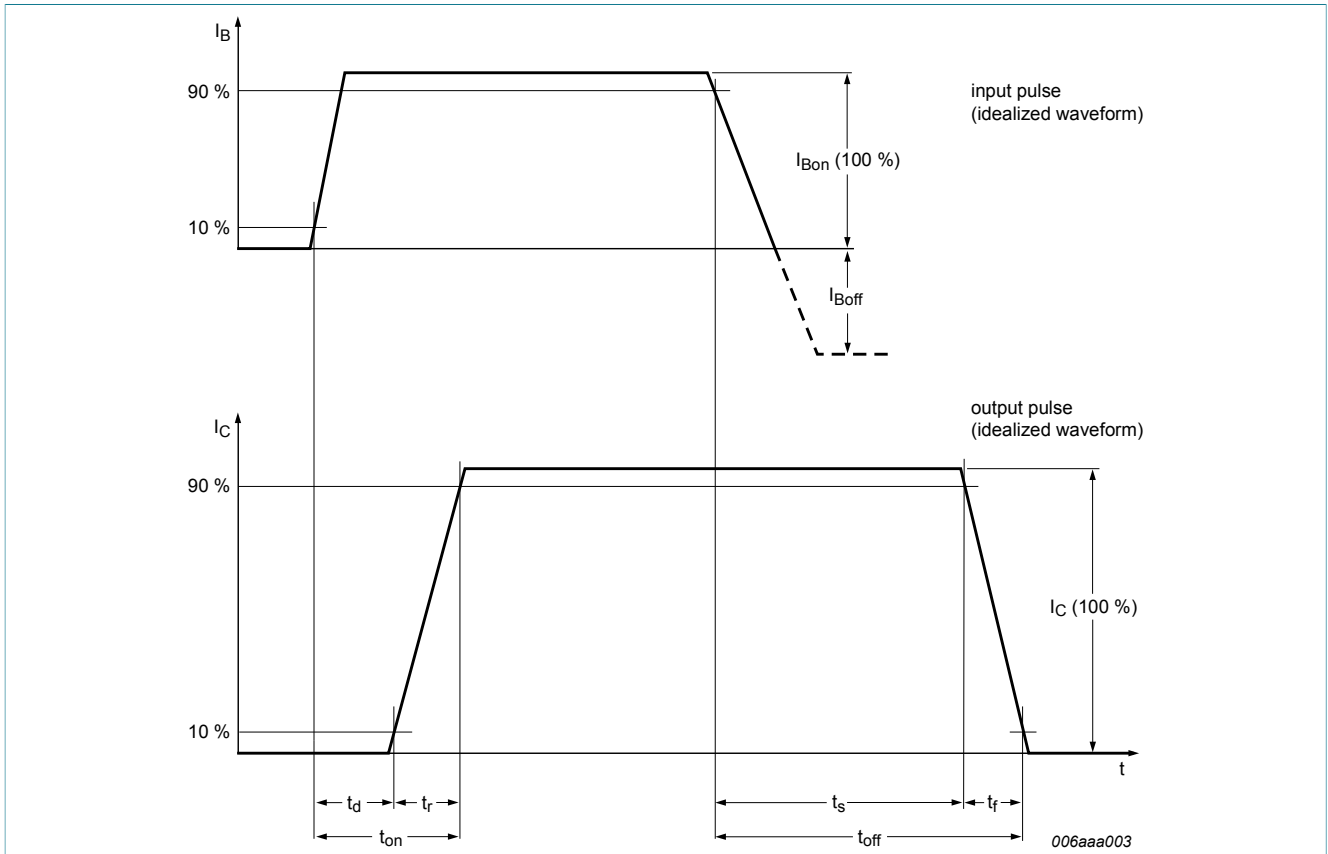


Fig. 12. BISS transistor switching time definition

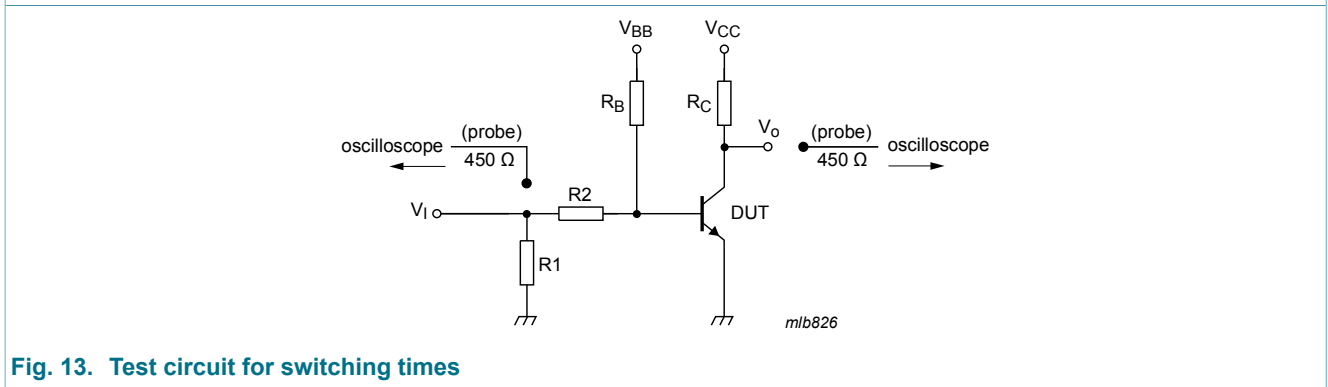


Fig. 13. Test circuit for switching times

#### 11.1 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

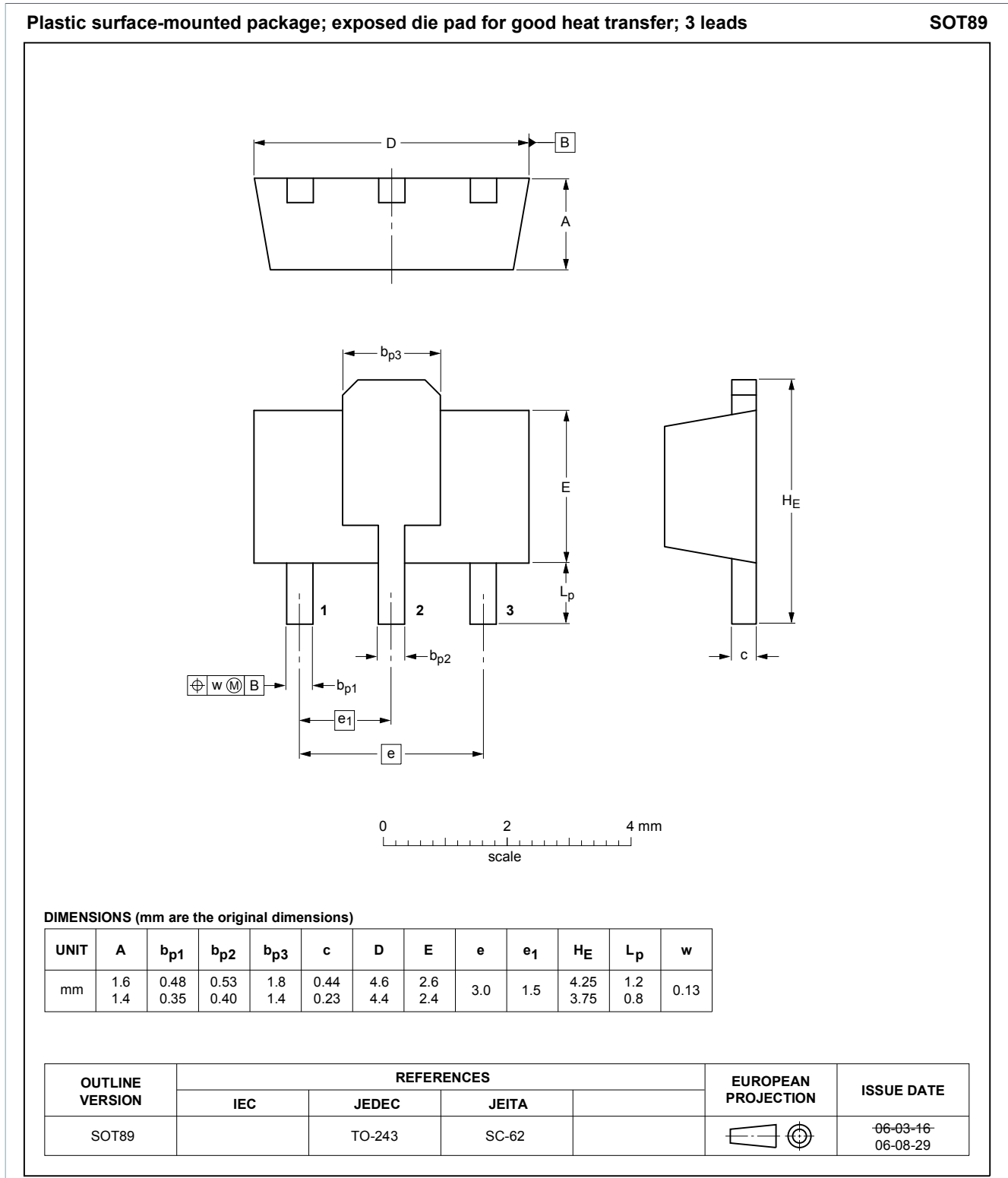


Fig. 14. Package outline SOT89

### 13. Soldering

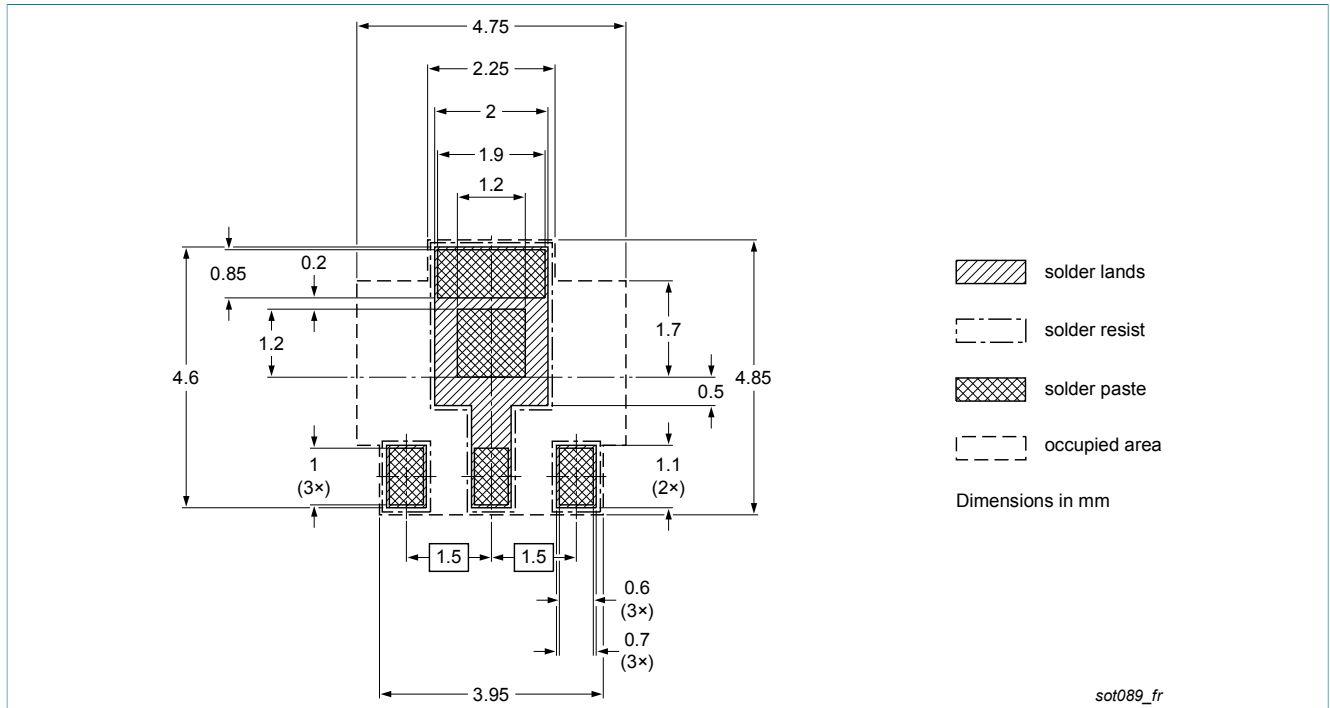


Fig. 15. Reflow soldering footprint for SOT89

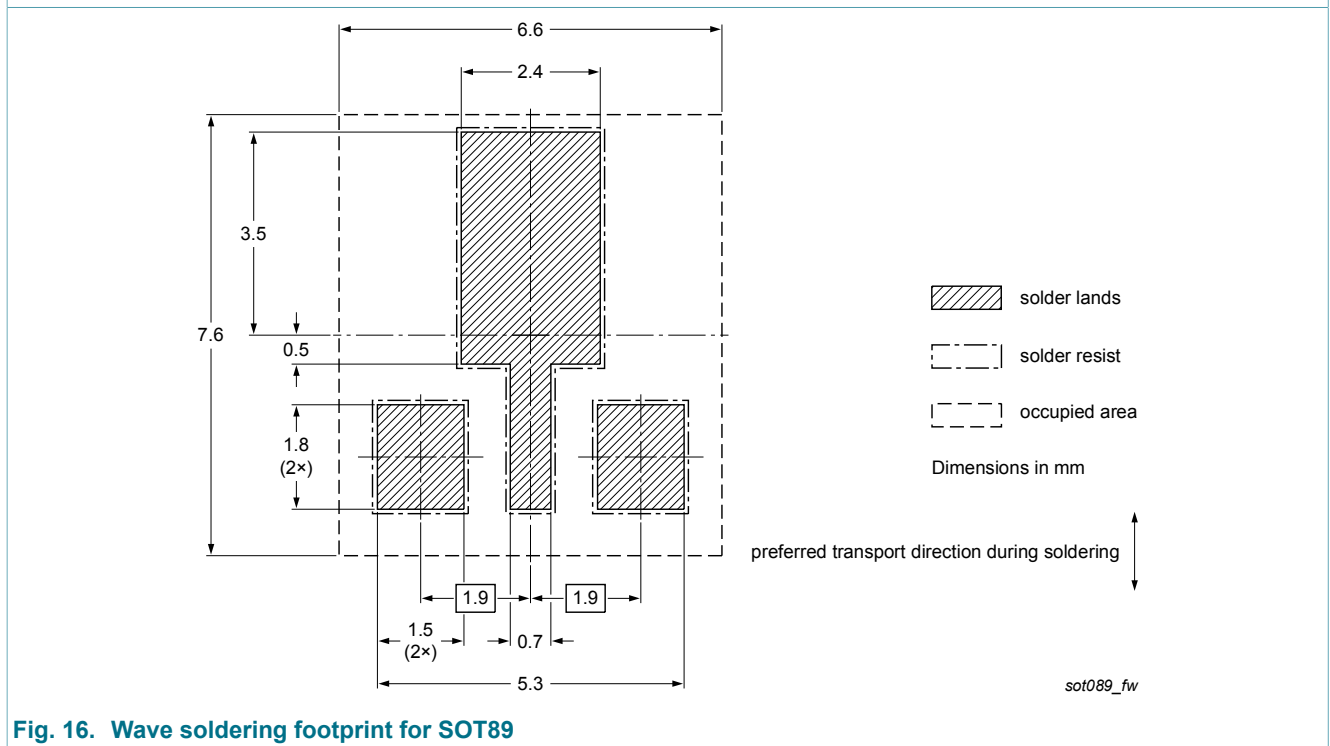


Fig. 16. Wave soldering footprint for SOT89

## 14. Revision history

Table 8. Revision history

| Data sheet ID | Release date | Data sheet status  | Change notice | Supersedes |
|---------------|--------------|--------------------|---------------|------------|
| PBHV8115X v.1 | 20131209     | Product data sheet | -             | -          |

## 15. Legal information

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|--------------------------------|--------------------|---|
| Objective [short] data sheet   | Development        | This document contains data from the objective specification for product development. |
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Date of release: 9 December 2013

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Компания «Life Electronics» занимается поставками электронных компонентов импортного и отечественного производства от производителей и со складов крупных дистрибьюторов Европы, Америки и Азии.

С конца 2013 года компания активно расширяет линейку поставок компонентов по направлению коаксиальный кабель, кварцевые генераторы и конденсаторы (керамические, пленочные, электролитические), за счёт заключения дистрибьюторских договоров

Мы предлагаем:

- Конкурентоспособные цены и скидки постоянным клиентам.
- Специальные условия для постоянных клиентов.
- Подбор аналогов.
- Поставку компонентов в любых объемах, удовлетворяющих вашим потребностям.
- Приемлемые сроки поставки, возможна ускоренная поставка.
- Доставку товара в любую точку России и стран СНГ.
- Комплексную поставку.
- Работу по проектам и поставку образцов.
- Формирование склада под заказчика.
- Сертификаты соответствия на поставляемую продукцию (по желанию клиента).
- Тестирование поставляемой продукции.
- Поставку компонентов, требующих военную и космическую приемку.
- Входной контроль качества.
- Наличие сертификата ISO.

В составе нашей компании организован Конструкторский отдел, призванный помогать разработчикам, и инженерам.

Конструкторский отдел помогает осуществить:

- Регистрацию проекта у производителя компонентов.
- Техническую поддержку проекта.
- Защиту от снятия компонента с производства.
- Оценку стоимости проекта по компонентам.
- Изготовление тестовой платы монтаж и пусконаладочные работы.



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