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Kind regards,

Team Nexperia



# BSS84

P-channel enhancement mode vertical DMOS transistor

Rev. 06 — 16 December 2008

Product data sheet

## 1. Product profile

### 1.1 General description

P-channel enhancement mode vertical Diffusion Metal-Oxide Semiconductor (DMOS) transistor in a small Surface-Mounted Device (SMD) plastic package.

Table 1. Product overview

| Type number <sup>[1]</sup> | Package |          |
|----------------------------|---------|----------|
|                            | NXP     | JEDEC    |
| BSS84                      | SOT23   | TO-236AB |
| BSS84/DG                   |         |          |

[1] /DG: halogen-free

### 1.2 Features

- Low threshold voltage
- High-speed switching
- Direct interface to CMOS and Transistor-Transistor Logic (TTL)
- No secondary breakdown

### 1.3 Applications

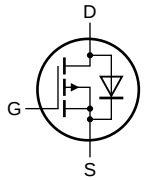
- Line current interrupter in telephone sets
- Relay, high-speed and line transformer drivers

### 1.4 Quick reference data

- $V_{DS} \leq -50 \text{ V}$
- $I_D \leq -130 \text{ mA}$
- $R_{DS(on)} \leq 10 \text{ } \Omega$
- $P_{tot} \leq 250 \text{ mW}$

2. Pinning information

Table 2. Pinning

| Pin | Symbol | Description | Simplified outline                                                                                      | Graphic symbol                                                                                   |
|-----|--------|-------------|---------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------|
| 1   | G      | gate        | <br>SOT23 (TO-236AB) | <br>001aaa025 |
| 2   | S      | source      |                                                                                                         |                                                                                                  |
| 3   | D      | drain       |                                                                                                         |                                                                                                  |

3. Ordering information

Table 3. Ordering information

| Type number <sup>[1]</sup> | Package  |                                          |         |
|----------------------------|----------|------------------------------------------|---------|
|                            | Name     | Description                              | Version |
| BSS84                      | TO-236AB | plastic surface-mounted package; 3 leads | SOT23   |
| BSS84/DG                   |          |                                          |         |

[1] /DG: halogen-free

4. Marking

Table 4. Marking codes

| Type number <sup>[1]</sup> | Marking code <sup>[2]</sup> |
|----------------------------|-----------------------------|
| BSS84                      | 13*                         |
| BSS84/DG                   | ZV*                         |

[1] /DG: halogen-free

[2] \* = -: 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               |
|-----------|-------------------------|--------------------------------------------------------------------------------------------------------|-----|----------|--------------------|
| $V_{DS}$  | drain-source voltage    | $25\text{ }^{\circ}\text{C} \leq T_j \leq 150\text{ }^{\circ}\text{C}$                                 | -   | -50      | V                  |
| $V_{GS}$  | gate-source voltage     |                                                                                                        | -   | $\pm 20$ | V                  |
| $I_D$     | drain current           | $T_{sp} = 25\text{ }^{\circ}\text{C}; V_{GS} = -10\text{ V};$<br>see <a href="#">Figure 1</a>          | -   | -130     | mA                 |
|           |                         | $T_{sp} = 100\text{ }^{\circ}\text{C};$<br>$V_{GS} = -10\text{ V}$                                     | -   | -75      | mA                 |
| $I_{DM}$  | peak drain current      | $T_{sp} = 25\text{ }^{\circ}\text{C}; t_p \leq 10\text{ }\mu\text{s};$<br>see <a href="#">Figure 1</a> | -   | -520     | mA                 |
| $P_{tot}$ | total power dissipation | $T_{sp} = 25\text{ }^{\circ}\text{C};$ see <a href="#">Figure 2</a> <a href="#">[1]</a>                | -   | 250      | mW                 |
| $T_{stg}$ | storage temperature     |                                                                                                        | -65 | +150     | $^{\circ}\text{C}$ |
| $T_j$     | junction temperature    |                                                                                                        | -65 | +150     | $^{\circ}\text{C}$ |

[1] Device mounted on a Printed-Circuit Board (PCB).

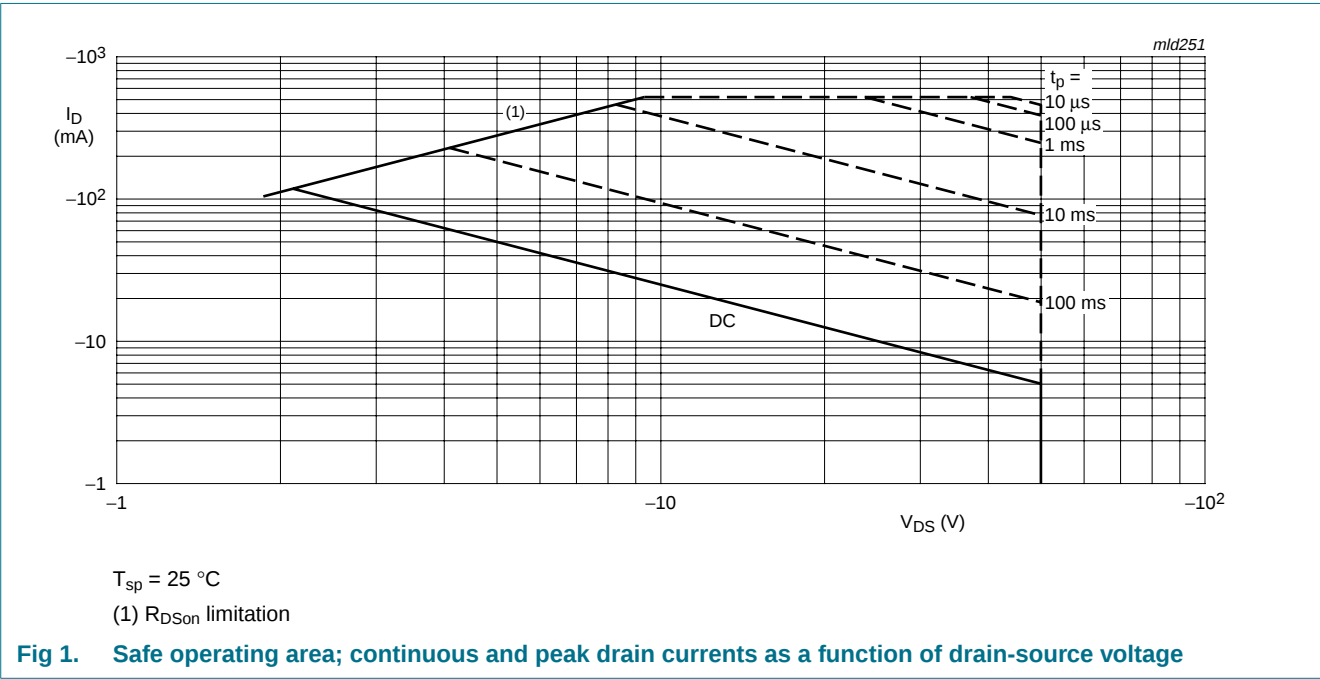


Fig 1. Safe operating area; continuous and peak drain currents as a function of drain-source voltage

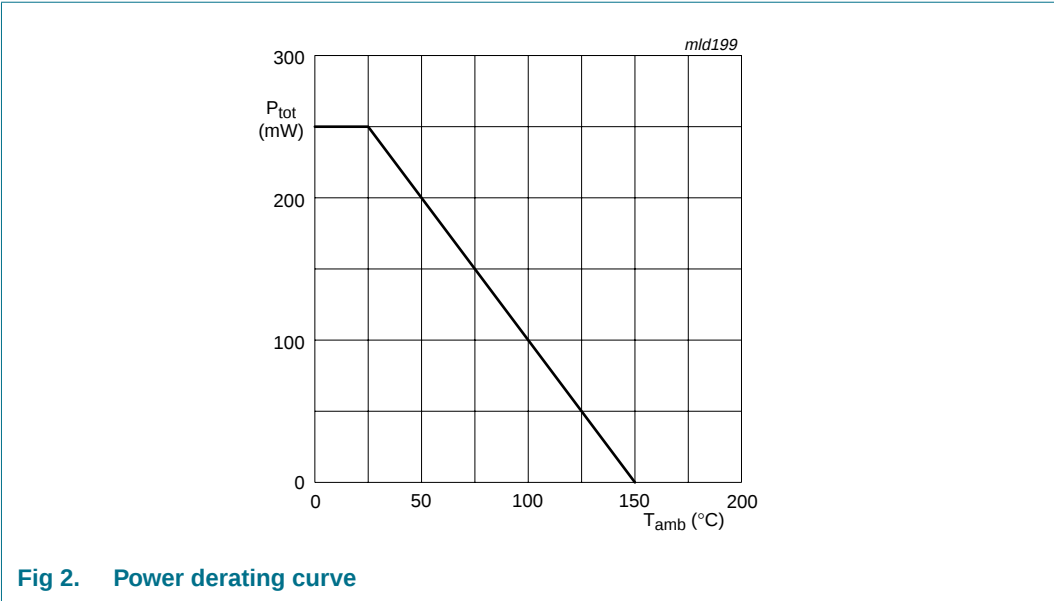


Fig 2. Power derating curve

6. Thermal characteristics

Table 6. Thermal characteristics

| Symbol        | Parameter                                   | Conditions                   | Min | Typ | Max | Unit |
|---------------|---------------------------------------------|------------------------------|-----|-----|-----|------|
| $R_{th(j-a)}$ | thermal resistance from junction to ambient | see <a href="#">Figure 3</a> | [1] | -   | 500 | K/W  |

[1] Mounted on a PCB, vertical in still air.

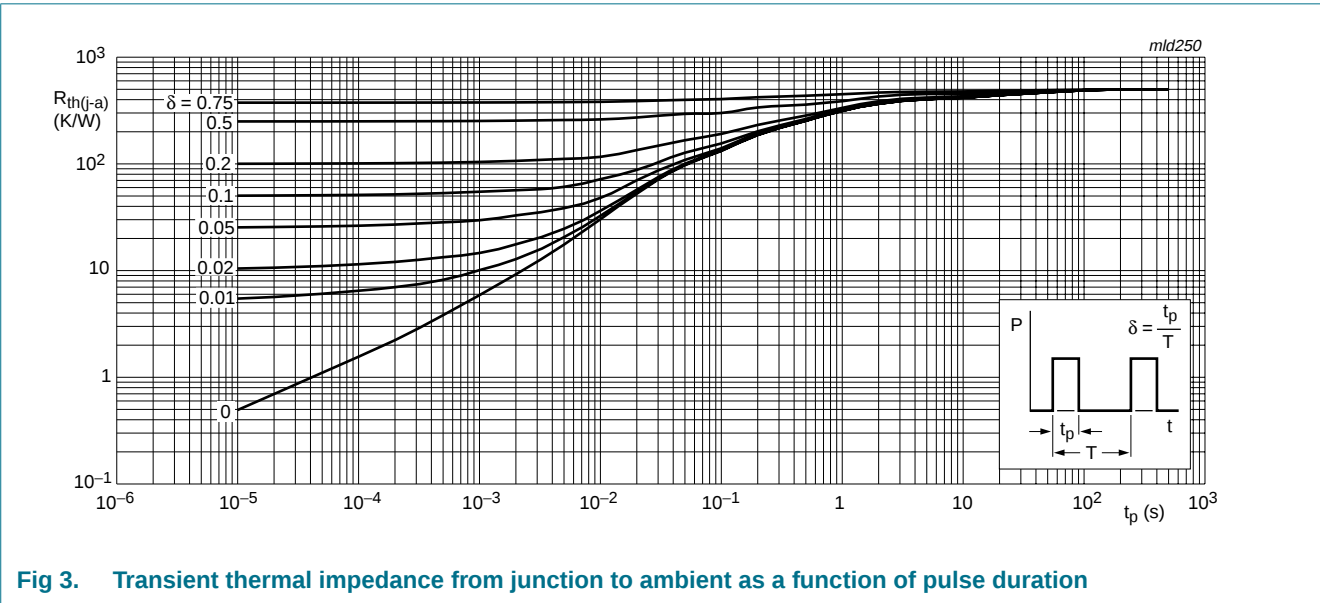


Fig 3. Transient thermal impedance from junction to ambient as a function of pulse duration

## 7. Characteristics

**Table 7. Characteristics**

$T_j = 25\text{ }^{\circ}\text{C}$  unless otherwise specified.

| Symbol                         | Parameter                        | Conditions                                                                                                                                                 | Min  | Typ | Max  | Unit          |
|--------------------------------|----------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------|------|-----|------|---------------|
| <b>Static characteristics</b>  |                                  |                                                                                                                                                            |      |     |      |               |
| $V_{(BR)DSS}$                  | drain-source breakdown voltage   | $I_D = -10\text{ }\mu\text{A}$ ; $V_{GS} = 0\text{ V}$                                                                                                     | -50  | -   | -    | V             |
| $V_{GS(th)}$                   | gate-source threshold voltage    | $I_D = -1\text{ mA}$ ; $V_{DS} = V_{GS}$ ;<br>see <a href="#">Figure 8</a>                                                                                 |      |     |      |               |
|                                |                                  | $T_j = 25\text{ }^{\circ}\text{C}$                                                                                                                         | -0.8 | -   | -2   | V             |
|                                |                                  | $T_j = -55\text{ }^{\circ}\text{C}$                                                                                                                        | -    | -   | -1.8 | V             |
| $I_{DSS}$                      | drain leakage current            | $V_{DS} = -40\text{ V}$ ; $V_{GS} = 0\text{ V}$                                                                                                            |      |     |      |               |
|                                |                                  | $T_j = 25\text{ }^{\circ}\text{C}$                                                                                                                         | -    | -   | -100 | nA            |
|                                |                                  | $V_{DS} = -50\text{ V}$ ; $V_{GS} = 0\text{ V}$                                                                                                            |      |     |      |               |
|                                |                                  | $T_j = 25\text{ }^{\circ}\text{C}$                                                                                                                         | -    | -   | -10  | $\mu\text{A}$ |
| $I_{GSS}$                      | gate leakage current             | $T_j = 125\text{ }^{\circ}\text{C}$                                                                                                                        | -    | -   | -60  | $\mu\text{A}$ |
|                                |                                  | $V_{GS} = +20\text{ V}$ ; $V_{DS} = 0\text{ V}$                                                                                                            | -    | -   | 100  | nA            |
|                                |                                  | $V_{GS} = -20\text{ V}$ ; $V_{DS} = 0\text{ V}$                                                                                                            | -    | -   | 100  | nA            |
| $R_{DS(on)}$                   | drain-source on-state resistance | $V_{GS} = -10\text{ V}$ ;<br>$I_D = -130\text{ mA}$ ;<br>see <a href="#">Figure 5</a> and <a href="#">7</a>                                                | -    | 6   | 10   | $\Omega$      |
| <b>Dynamic characteristics</b> |                                  |                                                                                                                                                            |      |     |      |               |
| $ Y_{fs} $                     | transfer admittance              | $V_{DS} = -25\text{ V}$ ;<br>$I_D = -130\text{ mA}$                                                                                                        | 50   | -   | -    | mS            |
| $C_{iss}$                      | input capacitance                | $V_{GS} = 0\text{ V}$ ; $V_{DS} = -25\text{ V}$ ;<br>$f = 1\text{ MHz}$ ; see <a href="#">Figure 9</a>                                                     | -    | 25  | 45   | pF            |
| $C_{oss}$                      | output capacitance               |                                                                                                                                                            | -    | 15  | 25   | pF            |
| $C_{rss}$                      | reverse transfer capacitance     |                                                                                                                                                            | -    | 3.5 | 12   | pF            |
| $t_{on}$                       | turn-on time                     | $V_{DS} = -40\text{ V}$ ; $V_{GS} = 0\text{ V}$<br>to $-10\text{ V}$ ; $I_D = -200\text{ mA}$ ;<br>see <a href="#">Figure 10</a> and <a href="#">11</a>    | -    | 3   | -    | ns            |
| $t_{off}$                      | turn-off time                    | $V_{DS} = -40\text{ V}$ ;<br>$V_{GS} = -10\text{ V}$ to $0\text{ V}$ ;<br>$I_D = -200\text{ mA}$ ;<br>see <a href="#">Figure 10</a> and <a href="#">11</a> | -    | 7   | -    | ns            |

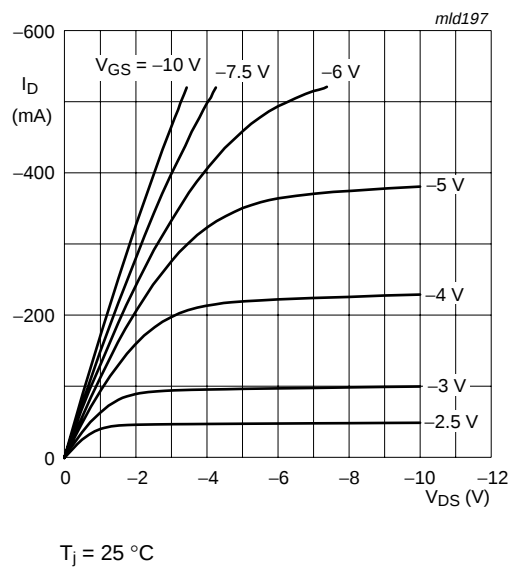


Fig 4. Output characteristics: drain current as a function of drain-source voltage; typical values

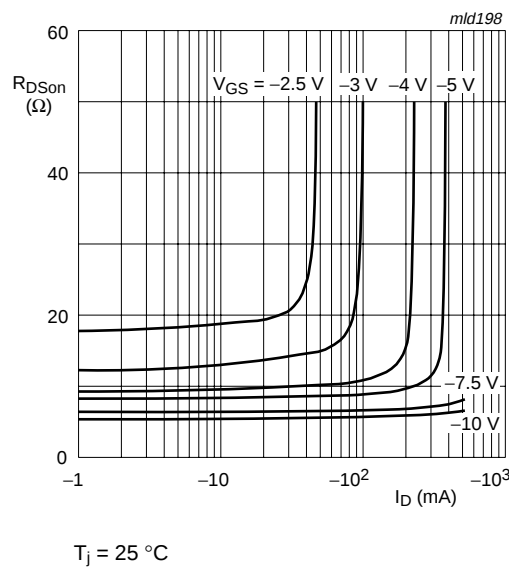


Fig 5. Drain-source on-state resistance as a function of drain current; typical values

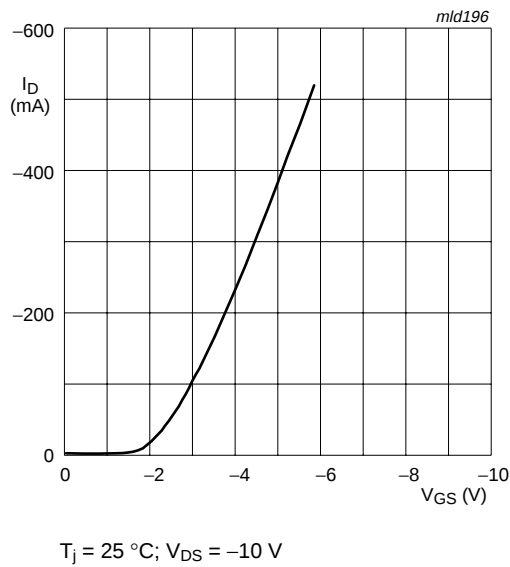


Fig 6. Transfer characteristics: drain current as a function of gate-source voltage; typical values

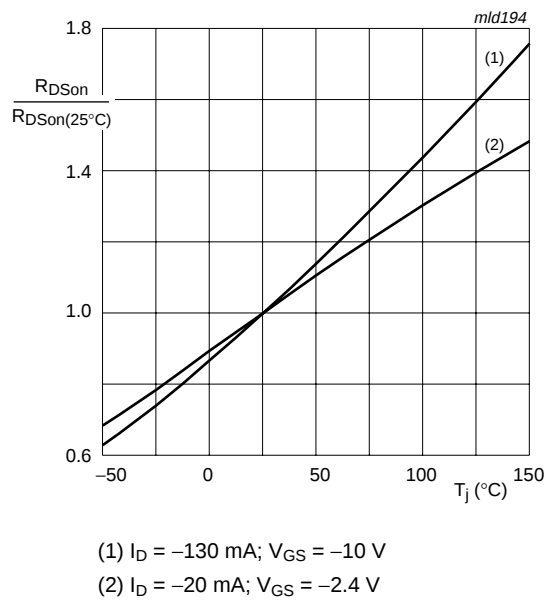
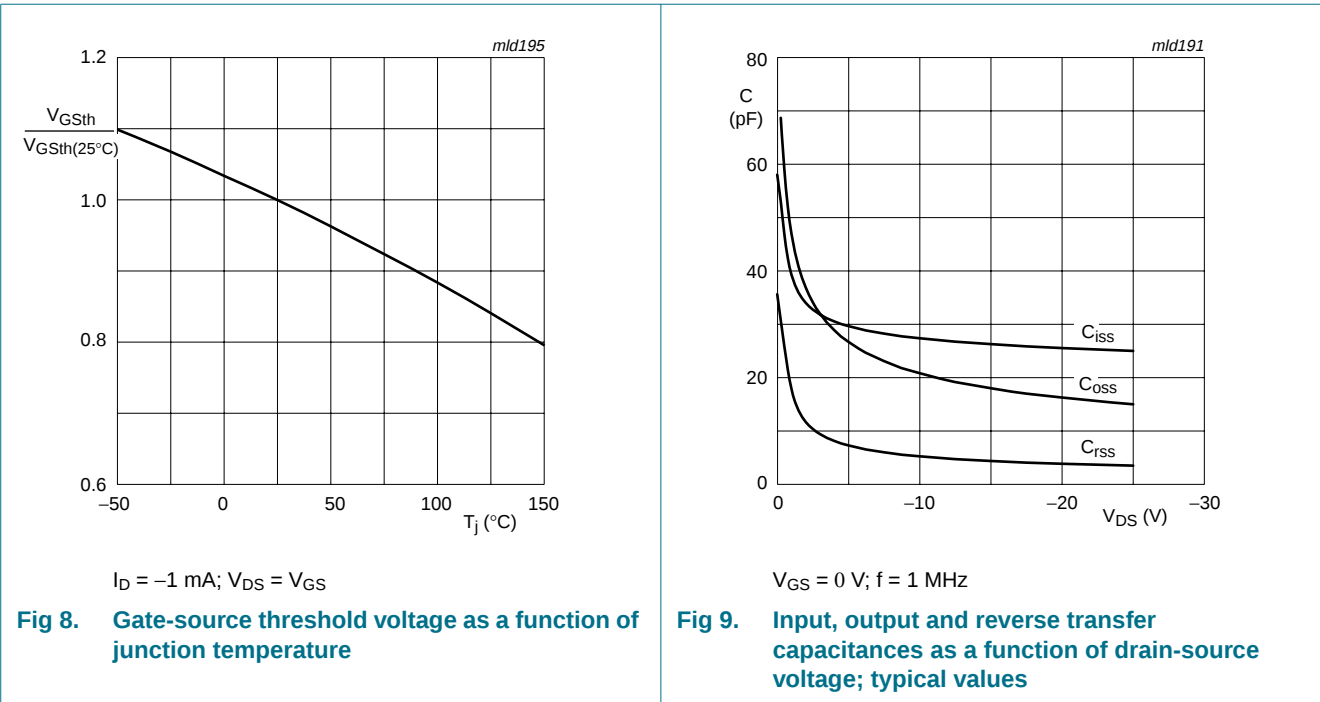
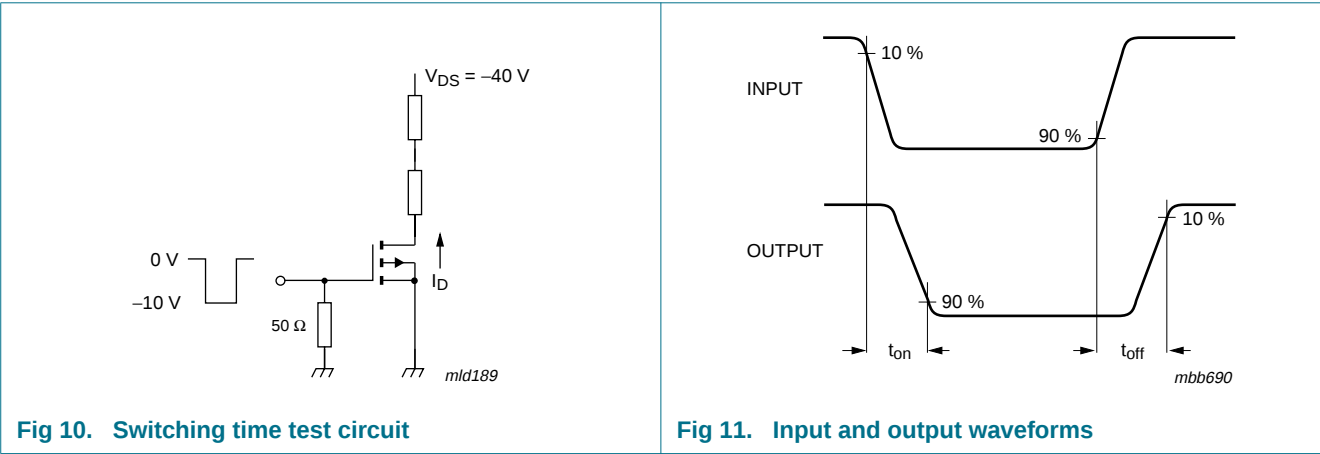


Fig 7. Normalized drain-source on-state resistance factor as a function of junction temperature



8. Test information



9. Package outline

Plastic surface-mounted package; 3 leads

SOT23

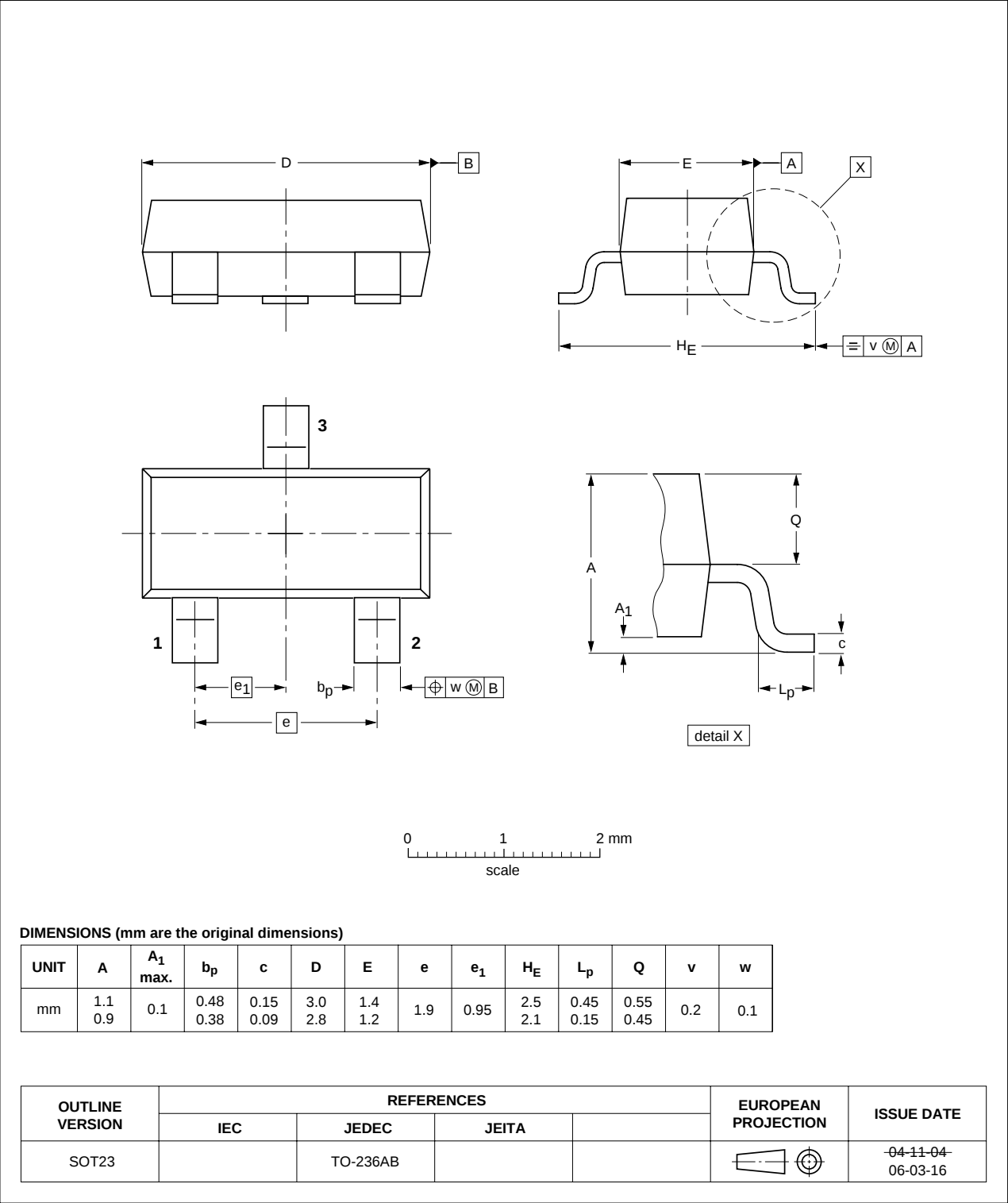


Fig 12. Package outline SOT23 (TO-236AB)

## 10. Revision history

Table 8. Revision history

| Document ID    | Release date                                                                     | Data sheet status     | Change notice | Supersedes |
|----------------|----------------------------------------------------------------------------------|-----------------------|---------------|------------|
| BSS84_6        | 20081216                                                                         | Product data sheet    | -             | BSS84_5    |
| Modifications: | • <a href="#">Table 5 “Limiting values”</a> : $P_{tot}$ figure reference updated |                       |               |            |
| BSS84_5        | 20081209                                                                         | Product data sheet    | -             | BSS84_4    |
| BSS84_4        | 20070717                                                                         | Product data sheet    | -             | BSS84_3    |
| BSS84_3        | 20030804                                                                         | Product specification | -             | BSS84_2    |
| BSS84_2        | 19970618                                                                         | Product specification | -             | BSS84_1    |
| BSS84_1        | 19950407                                                                         | Product specification | -             | -          |

## 11. Legal information

### 11.1 Data sheet status

| Document status <sup>[1][2]</sup> | Product status <sup>[3]</sup> | 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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