

# DATA SHEET



## **BSR40; BSR41; BSR42; BSR43** NPN medium power transistors

Product data sheet  
Supersedes data of 1999 Apr 28

2004 Dec 13

# NPN medium power transistors

**BSR40; BSR41;  
BSR42; BSR43**

### FEATURES

- High current (max. 1 A)
- Low voltage (max. 80 V).

### APPLICATIONS

- Thick and thin-film circuits
- Telephony and general industrial applications.

### DESCRIPTION

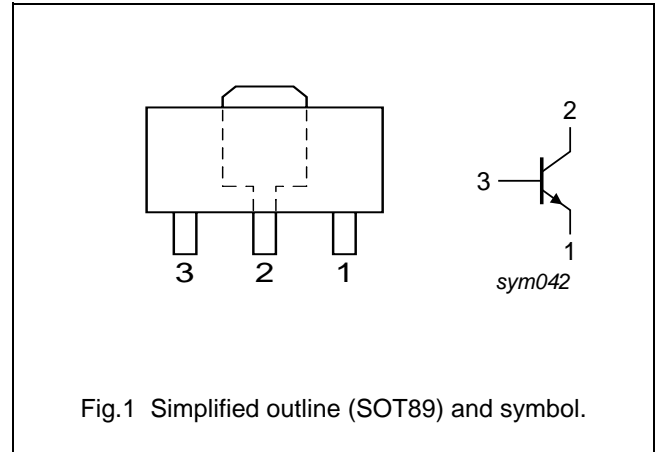
NPN medium power transistor in a SOT89 plastic package. PNP complements: BSR30; BSR31 and BSR33.

### MARKING

| TYPE NUMBER | MARKING CODE | TYPE NUMBER | MARKING CODE |
|-------------|--------------|-------------|--------------|
| BSR40       | AR1          | BSR42       | AR3          |
| BSR41       | AR2          | BSR43       | AR4          |

### PINNING

| PIN | DESCRIPTION |
|-----|-------------|
| 1   | emitter     |
| 2   | collector   |
| 3   | base        |



### ORDERING INFORMATION

| TYPE NUMBER | PACKAGE |  |         |
|-------------|---------|--|---------|
|             | NAME    | DESCRIPTION  | VERSION |
| BSR40       | SC-62   | plastic surface mounted package; collector pad for good heat transfer; 3 leads | SOT89   |
| BSR41       |         |  |         |
| BSR42       |         |  |         |
| BSR43       |         |  |         |

## NPN medium power transistors

BSR40; BSR41; BSR42;  
BSR43**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                     |      |      |      |
|                  | BSR40; BSR41              |                                  | –    | 70   | V    |
|                  | BSR42; BSR43              |                                  | –    | 90   | V    |
| V <sub>CEO</sub> | collector-emitter voltage | open base                        |      |      |      |
|                  | BSR40; BSR41              |                                  | –    | 60   | V    |
|                  | BSR42; BSR43              |                                  | –    | 80   | V    |
| V <sub>EBO</sub> | emitter-base voltage      | open collector                   | –    | 5    | V    |
| I <sub>C</sub>   | collector current (DC)    |                                  | –    | 1    | A    |
| I <sub>CM</sub>  | peak collector current    |                                  | –    | 2    | A    |
| I <sub>BM</sub>  | peak base current         |                                  | –    | 0.2  | A    |
| P <sub>tot</sub> | total power dissipation   | T <sub>amb</sub> ≤ 25 °C; note 1 | –    | 1.35 | W    |
| T <sub>stg</sub> | storage temperature       |                                  | –65  | +150 | °C   |
| T <sub>j</sub>   | junction temperature      |                                  | –    | 150  | °C   |
| T <sub>amb</sub> | ambient temperature       |                                  | –65  | +150 | °C   |

**Note**

- Device mounted on a printed-circuit board, single-sided copper, tin-plated, mounting pad for collector 6 cm<sup>2</sup>.  
For other mounting conditions, see *“Thermal considerations for SOT89 in the General Part of associated Handbook”*.

**THERMAL CHARACTERISTICS**

| SYMBOL               | PARAMETER   | CONDITIONS | VALUE | UNIT |
|----------------------|---|------------|-------|------|
| R <sub>th(j-a)</sub> | thermal resistance from junction to ambient         | note 1     | 93    | K/W  |
| R <sub>th(j-s)</sub> | thermal resistance from junction to soldering point |            | 13    | K/W  |

**Note**

- Device mounted on a printed-circuit board, single-sided copper, tin-plated, mounting pad for collector 6 cm<sup>2</sup>.  
For other mounting conditions, see *“Thermal considerations for SOT89 in the General Part of associated Handbook”*.

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BSR43**CHARACTERISTICS**T<sub>amb</sub> = 25 °C unless otherwise specified.

| SYMBOL  | PARAMETER                                       | CONDITIONS   | MIN.      | MAX.       | UNIT |
|---|---|--|-----------|------------|------|
| I <sub>CBO</sub>                                    | collector-base cut-off current                  | I <sub>E</sub> = 0 A; V <sub>CB</sub> = 60 V                                     | –         | 100        | nA   |
|   |   | I <sub>E</sub> = 0 A; V <sub>CB</sub> = 60 V; T <sub>j</sub> = 150 °C            | –         | 50         | μA   |
| I <sub>EBO</sub>                                    | emitter-base cut-off current                    | I <sub>C</sub> = 0 A; V <sub>EB</sub> = 5 V                                      | –         | 100        | nA   |
| h <sub>FE</sub>                                     | DC current gain<br>BSR40; BSR42<br>BSR41; BSR43 | I <sub>C</sub> = 100 μA; V <sub>CE</sub> = 5 V; note 1                           | 10<br>30  | –<br>–     |      |
|   | DC current gain<br>BSR40; BSR42<br>BSR41; BSR43 | I <sub>C</sub> = 100 mA; V <sub>CE</sub> = 5 V; note 1                           | 40<br>100 | 120<br>300 |      |
|   | DC current gain<br>BSR40; BSR42<br>BSR41; BSR43 | I <sub>C</sub> = 500 mA; V <sub>CE</sub> = 5 V; note 1                           | 30<br>50  | –<br>–     |      |
| V <sub>CEsat</sub>                                  | collector-emitter saturation voltage            | I <sub>C</sub> = 150 mA; I <sub>B</sub> = 15 mA; note 1                          | –         | 250        | mV   |
|   |   | I <sub>C</sub> = 500 mA; I <sub>B</sub> = 50 mA; note 1                          | –         | 500        | mV   |
| V <sub>BEsat</sub>                                  | base-emitter saturation voltage                 | I <sub>C</sub> = 150 mA; I <sub>B</sub> = 15 mA; note 1                          | –         | 1          | V    |
|   |   | I <sub>C</sub> = 500 mA; I <sub>B</sub> = 50 mA; note 1                          | –         | 1.2        | V    |
| C <sub>c</sub>                                      | collector capacitance                           | I <sub>E</sub> = i <sub>e</sub> = 0 A; V <sub>CB</sub> = 10 V; f = 1 MHz         | –         | 12         | pF   |
| C <sub>e</sub>                                      | emitter capacitance                             | I <sub>C</sub> = i <sub>c</sub> = 0 A; V <sub>EB</sub> = 0.5 V; f = 1 MHz        | –         | 90         | pF   |
| f <sub>T</sub>                                      | transition frequency                            | I <sub>C</sub> = 50 mA; V <sub>CE</sub> = 10 V; f = 100 MHz                      | 100       | –          | MHz  |
| <b>Switching times (between 10% and 90% levels)</b> |   |  |           |            |      |
| t <sub>on</sub>                                     | turn-on time                                    | I <sub>Con</sub> = 100 mA; I <sub>Bon</sub> = 5 mA;<br>I <sub>Boff</sub> = –5 mA | –         | 250        | ns   |
| t <sub>off</sub>                                    | turn-off time                                   |  | –         | 1          | μs   |

**Note**

1. Pulse test: t<sub>p</sub> ≤ 300 μs; δ ≤ 0.01.

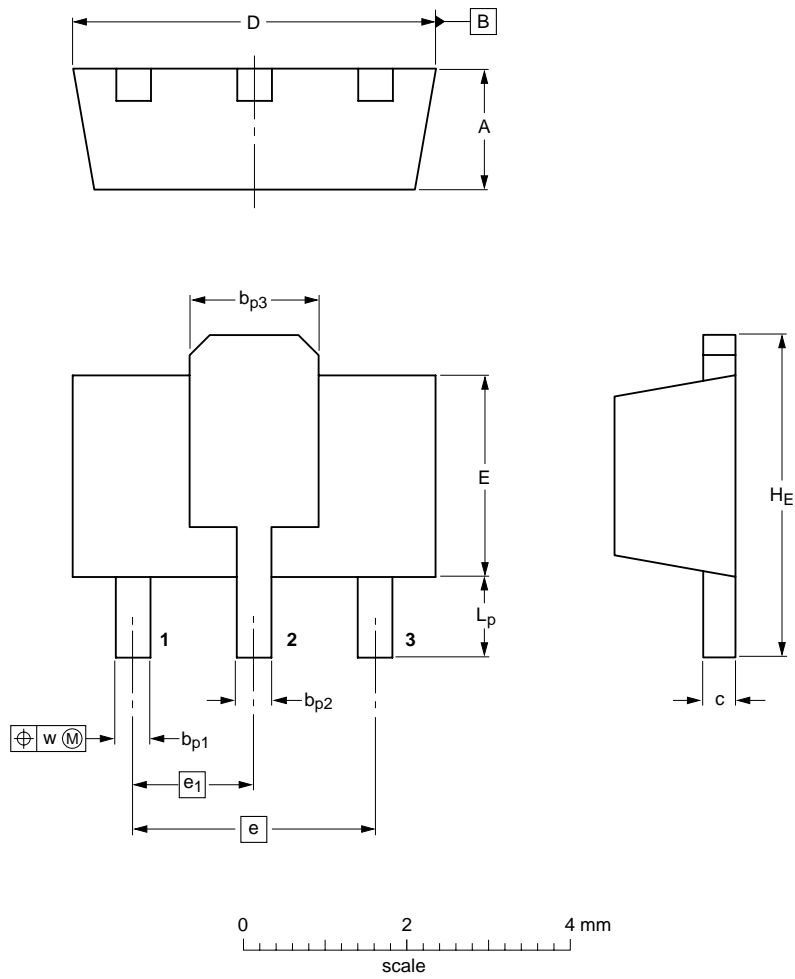
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PACKAGE OUTLINE

Plastic surface-mounted package; collector pad for good heat transfer; 3 leads

SOT89



DIMENSIONS (mm are the original dimensions)

| UNIT | A          | b <sub>p1</sub> | b <sub>p2</sub> | b <sub>p3</sub> | c            | D          | E          | e   | e <sub>1</sub> | H <sub>E</sub> | L <sub>p</sub> | w    |
|------|------------|-----------------|-----------------|-----------------|--------------|------------|------------|-----|----------------|----------------|----------------|------|
| mm   | 1.6<br>1.4 | 0.48<br>0.35    | 0.53<br>0.40    | 1.8<br>1.4      | 0.44<br>0.23 | 4.6<br>4.4 | 2.6<br>2.4 | 3.0 | 1.5            | 4.25<br>3.75   | 1.2<br>0.8     | 0.13 |

| OUTLINE VERSION | REFERENCES |        |       | EUROPEAN PROJECTION | ISSUE DATE           |
|-----------------|------------|--------|-------|---------------------|----------------------|
|                 | IEC        | JEDEC  | JEITA |                     |                      |
| SOT89           |            | TO-243 | SC-62 |                     | 04-08-03<br>06-03-16 |

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DATA SHEET STATUS

| DOCUMENT STATUS <sup>(1)</sup> | PRODUCT STATUS <sup>(2)</sup> | DEFINITION  |
|--------------------------------|-------------------------------|---|
| Objective data sheet           | Development                   | This document contains data from the objective specification for product development. |
| Preliminary data sheet         | Qualification                 | This document contains data from the preliminary specification.                       |
| Product data sheet             | Production                    | This document contains the product specification.                                     |

Notes

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# ***NXP Semiconductors***

## **Customer notification**

This data sheet was changed to reflect the new company name NXP Semiconductors, including new legal definitions and disclaimers. No changes were made to the technical content, except for package outline drawings which were updated to the latest version.

## **Contact information**

For additional information please visit: <http://www.nxp.com>

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