

# DATA SHEET



## **BSR17A** NPN switching transistor

Product specification  
Supersedes data of September 1994  
File under Discrete Semiconductors, SC04

1997 Jun 02

# NPN switching transistor

# BSR17A

### FEATURES

- Low current (max. 100 mA)
- Low voltage (max. 40 V).

### APPLICATIONS

- Switching and linear amplification.

### DESCRIPTION

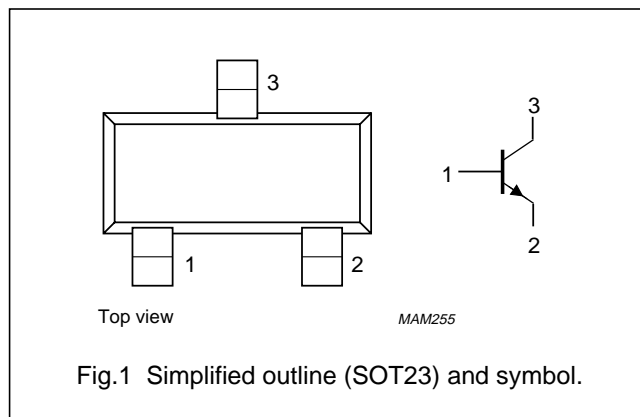
NPN switching transistor in a SOT23 plastic package.  
PNP complement: BSR18A.

### MARKING

| TYPE NUMBER | MARKING CODE |
|-------------|--------------|
| BSR17A      | U92          |

### PINNING

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



### QUICK REFERENCE DATA

| SYMBOL    | PARAMETER                 | CONDITIONS   | MIN. | MAX. | UNIT |
|-----------|---------------------------|--|------|------|------|
| $V_{CBO}$ | collector-base voltage    | open emitter   | –    | 60   | V    |
| $V_{CEO}$ | collector-emitter voltage | open base  | –    | 40   | V    |
| $I_C$     | collector current (DC)    |  | –    | 100  | mA   |
| $P_{tot}$ | total power dissipation   | $T_{amb} \leq 25\text{ °C}$  | –    | 250  | mW   |
| $h_{FE}$  | DC current gain           | $I_C = 10\text{ mA}; V_{CE} = 1\text{ V}$                                | 100  | 300  |      |
| $f_T$     | transition frequency      | $I_C = 10\text{ mA}; V_{CE} = 20\text{ V}; f = 100\text{ MHz}$           | 300  | –    | MHz  |
| $t_{off}$ | turn-off time             | $I_{Con} = 10\text{ mA}; I_{Bon} = 1\text{ mA}; I_{Boff} = -1\text{ mA}$ | –    | 240  | ns   |

## NPN switching transistor

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**LIMITING VALUES**

In accordance with the Absolute Maximum Rating System (IEC 134).

| SYMBOL           | PARAMETER                     | CONDITIONS               | MIN. | MAX. | UNIT |
|------------------|-------------------------------|--------------------------|------|------|------|
| V <sub>CBO</sub> | collector-base voltage        | open emitter             | –    | 60   | V    |
| V <sub>CEO</sub> | collector-emitter voltage     | open base                | –    | 40   | V    |
| V <sub>EBO</sub> | emitter-base voltage          | open collector           | –    | 6    | V    |
| I <sub>C</sub>   | collector current (DC)        |                          | –    | 100  | mA   |
| I <sub>CM</sub>  | peak collector current        |                          | –    | 200  | mA   |
| I <sub>BM</sub>  | peak base current             |                          | –    | 100  | mA   |
| P <sub>tot</sub> | total power dissipation       | T <sub>amb</sub> ≤ 25 °C | –    | 250  | mW   |
| T <sub>stg</sub> | storage temperature           |                          | –65  | +150 | °C   |
| T <sub>j</sub>   | junction temperature          |                          | –    | 150  | °C   |
| T <sub>amb</sub> | operating ambient temperature |                          | –65  | +150 | °C   |

**THERMAL CHARACTERISTICS**

| SYMBOL              | PARAMETER                                   | CONDITIONS | VALUE | UNIT |
|---------------------|---|------------|-------|------|
| R <sub>th j-a</sub> | thermal resistance from junction to ambient | note 1     | 500   | K/W  |

**Note**

1. Transistor mounted on an FR4 printed-circuit board.

## NPN switching transistor

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## CHARACTERISTICS

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

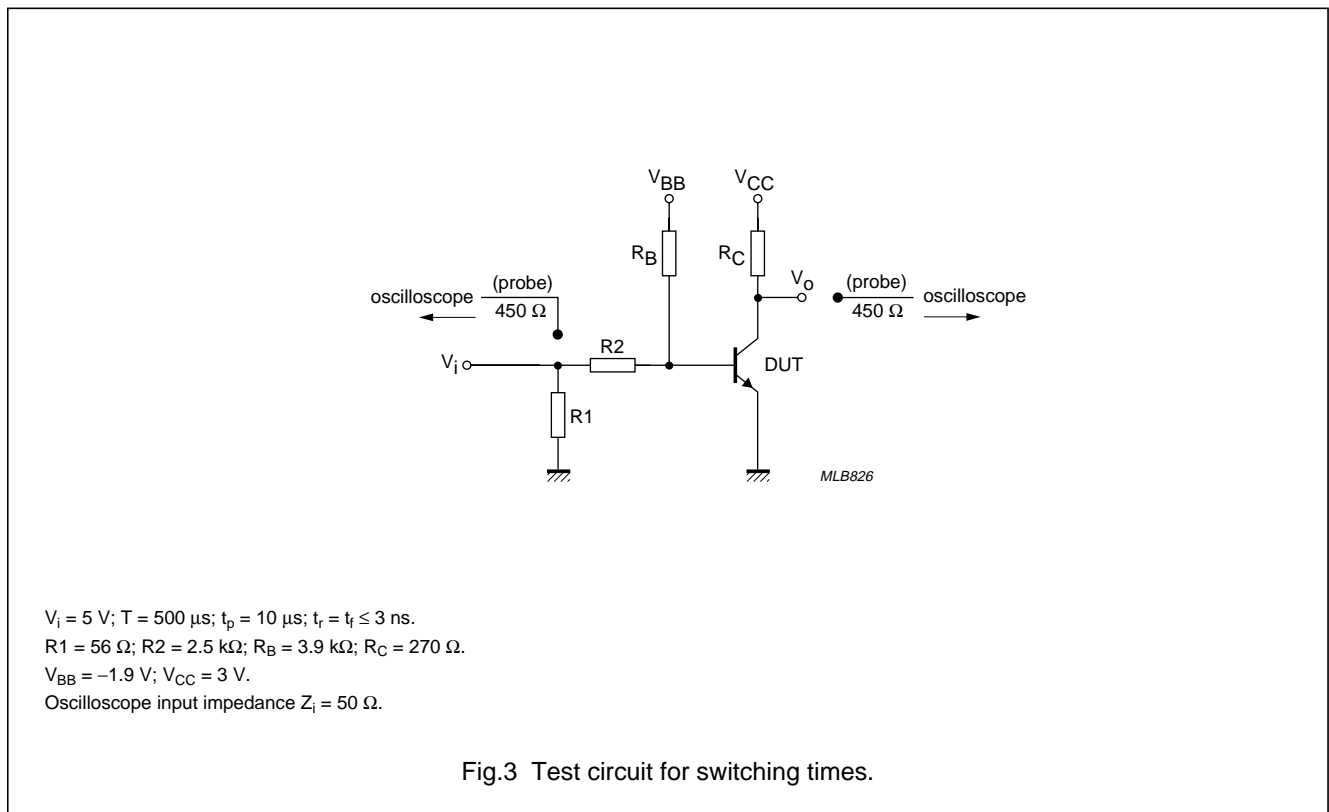
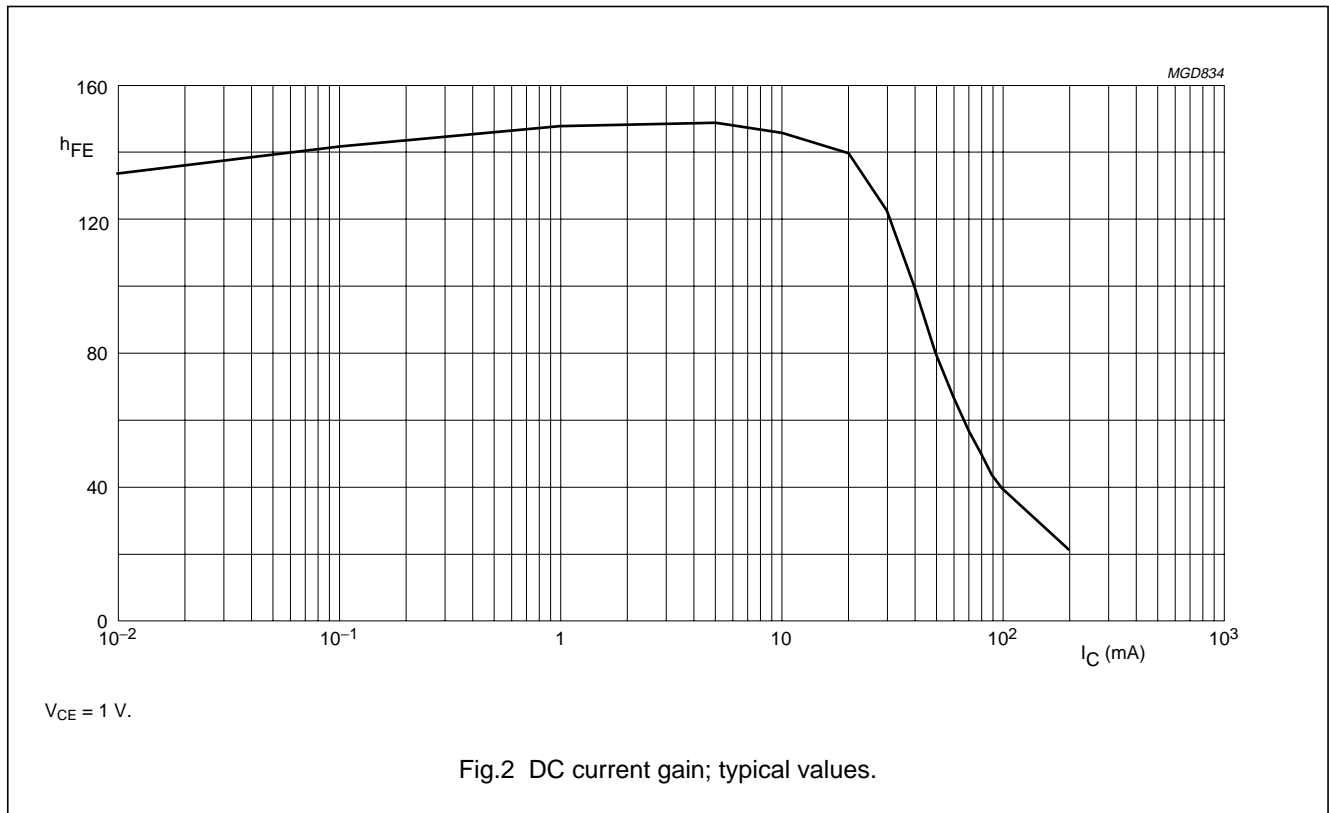
| SYMBOL   | PARAMETER                            | CONDITIONS  | MIN. | MAX. | UNIT          |
|--|--------------------------------------|---|------|------|---------------|
| $I_{CBO}$  | collector cut-off current            | $I_E = 0; V_{CB} = 30\text{ V}$   | –    | 50   | nA            |
|  |                                      | $I_E = 0; V_{CB} = 30\text{ V}; T_j = 150\text{ °C}$  | –    | 5    | $\mu\text{A}$ |
| $I_{EBO}$  | emitter cut-off current              | $I_C = 0; V_{EB} = 6\text{ V}$  | –    | 50   | nA            |
| $h_{FE}$   | DC current gain                      | $V_{CE} = 1\text{ V}$ ; note 1; see Fig.2   |      |      |               |
|  |                                      | $I_C = 0.1\text{ mA}$   | 60   | –    |               |
|  |                                      | $I_C = 1\text{ mA}$   | 80   | –    |               |
|  |                                      | $I_C = 10\text{ mA}$  | 100  | 300  |               |
|  |                                      | $I_C = 50\text{ mA}$  | 60   | –    |               |
| $V_{CEsat}$  | collector-emitter saturation voltage | $I_C = 10\text{ mA}; I_B = 1\text{ mA}$ ; note 1  | –    | 200  | mV            |
|  |                                      | $I_C = 50\text{ mA}; I_B = 5\text{ mA}$ ; note 1  | –    | 200  | mV            |
| $V_{BEsat}$  | base-emitter saturation voltage      | $I_C = 10\text{ mA}; I_B = 1\text{ mA}$ ; note 1  | 650  | 850  | mV            |
|  |                                      | $I_C = 50\text{ mA}; I_B = 5\text{ mA}$ ; note 1  | –    | 950  | mV            |
| $C_c$  | collector capacitance                | $I_E = i_e = 0; V_{CB} = 5\text{ V}; f = 1\text{ MHz}$  | –    | 4    | pF            |
| $C_e$  | emitter capacitance                  | $I_C = i_c = 0; V_{EB} = 500\text{ mV}; f = 1\text{ MHz}$   | –    | 8    | pF            |
| $f_T$  | transition frequency                 | $I_C = 10\text{ mA}; V_{CE} = 20\text{ V}; f = 100\text{ MHz}$  | 300  | –    | MHz           |
| F  | noise figure                         | $I_C = 100\text{ }\mu\text{A}; V_{CE} = 5\text{ V}; R_S = 1\text{ k}\Omega;$<br>$f = 10\text{ Hz to }15.7\text{ kHz}$ | –    | 5    | dB            |
| <b>Switching times (between 10% and 90% levels); see Fig.3</b> |                                      |   |      |      |               |
| $t_{on}$   | turn-on time                         | $I_{Con} = 10\text{ mA}; I_{Bon} = 1\text{ mA}; I_{Boff} = -1\text{ mA}$  | –    | 65   | ns            |
| $t_d$  | delay time                           |   | –    | 35   | ns            |
| $t_r$  | rise time                            |   | –    | 35   | ns            |
| $t_{off}$  | turn-off time                        |   | –    | 240  | ns            |
| $t_s$  | storage time                         |   | –    | 200  | ns            |
| $t_f$  | fall time                            |   | –    | 50   | ns            |

## Note

1. Pulse test:  $t_p \leq 300\text{ }\mu\text{s}$ ;  $\delta \leq 0.02$ .

NPN switching transistor

BSR17A



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PACKAGE OUTLINE

Plastic surface mounted package; 3 leads

SOT23



## NPN switching transistor

BSR17A

**DEFINITIONS**

|   |   |
|---|---|
| <b>Data sheet status</b>  |   |
| Objective specification   | This data sheet contains target or goal specifications for product development.       |
| Preliminary specification   | This data sheet contains preliminary data; supplementary data may be published later. |
| Product specification   | This data sheet contains final product specifications.                                |
| <b>Limiting values</b>  |   |
| Limiting values given are in accordance with the Absolute Maximum Rating System (IEC 134). Stress above one or more of the limiting values may cause permanent damage to the device. These are stress ratings only and operation of the device at these or at any other conditions above those given in the Characteristics sections of the specification is not implied. Exposure to limiting values for extended periods may affect device reliability. |   |
| <b>Application information</b>  |   |
| Where application information is given, it is advisory and does not form part of the specification.   |   |

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