

## Silicon N-channel dual-gate MOS-FETs

BF992; BF992R

## APPLICATIONS

- VHF applications such as VHF television tuners and FM tuners with 12 V supply voltage. The device is also suitable for use in professional communications equipment.

## DESCRIPTION

Depletion type field-effect transistor in a plastic micro-miniature SOT143 or SOT143R package with source and substrate interconnected.

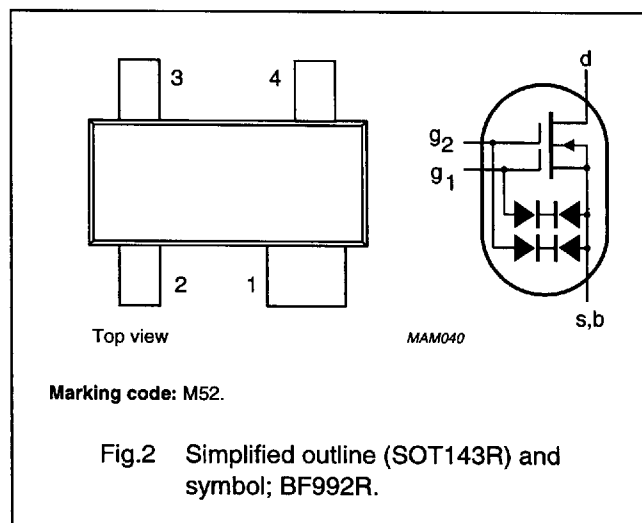
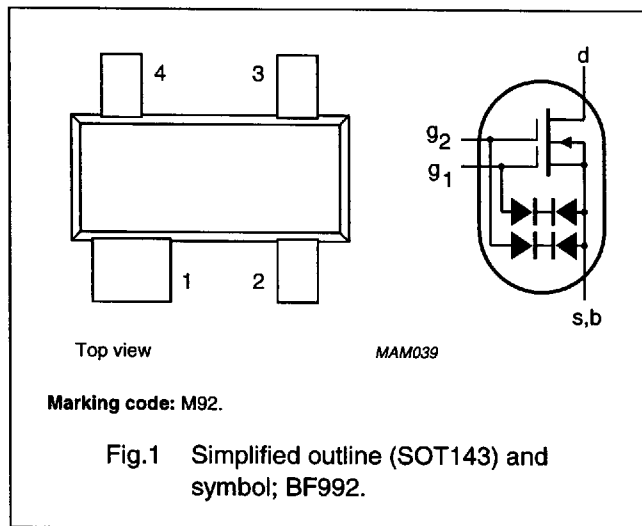
The transistors are protected against excessive input voltage surges by integrated back-to-back diodes between gates and source.

## CAUTION

The device is supplied in an antistatic package. The gate-source input must be protected against static discharge during transport or handling.

## PINNING

| PIN | SYMBOL         | DESCRIPTION |
|-----|----------------|-------------|
| 1   | s,b            | source      |
| 2   | d              | drain       |
| 3   | g <sub>2</sub> | gate 2      |
| 4   | g <sub>1</sub> | gate 1      |



## QUICK REFERENCE DATA

| SYMBOL      | PARAMETER                      | CONDITIONS                                                                                               | TYP. | MAX. | UNIT               |
|-------------|--------------------------------|----------------------------------------------------------------------------------------------------------|------|------|--------------------|
| $V_{DS}$    | drain-source voltage (DC)      |                                                                                                          | —    | 20   | V                  |
| $I_D$       | drain current (DC)             |                                                                                                          | —    | 40   | mA                 |
| $P_{tot}$   | total power dissipation        | $T_{amb} = 60\text{ }^{\circ}\text{C}$                                                                   | —    | 200  | mW                 |
| $ Y_{fs} $  | forward transfer admittance    | $f = 1\text{ kHz}; I_D = 15\text{ mA}; V_{DS} = 10\text{ V}; V_{G2-S} = 4\text{ V}$                      | 25   | —    | mS                 |
| $C_{ig1-s}$ | input capacitance at gate 1    | $f = 1\text{ MHz}; I_D = 15\text{ mA}; V_{DS} = 10\text{ V}; V_{G2-S} = 4\text{ V}$                      | 4    | —    | pF                 |
| $C_{rs}$    | reverse transfer capacitance   | $f = 1\text{ MHz}; I_D = 15\text{ mA}; V_{DS} = 10\text{ V}; V_{G2-S} = 4\text{ V}$                      | 30   | —    | fF                 |
| F           | noise figure                   | $G_S = 2\text{ mS}; I_D = 15\text{ mA}; V_{DS} = 10\text{ V}; V_{G2-S} = 4\text{ V}; f = 200\text{ MHz}$ | 1.2  | —    | dB                 |
| $T_j$       | operating junction temperature |                                                                                                          | —    | 150  | $^{\circ}\text{C}$ |

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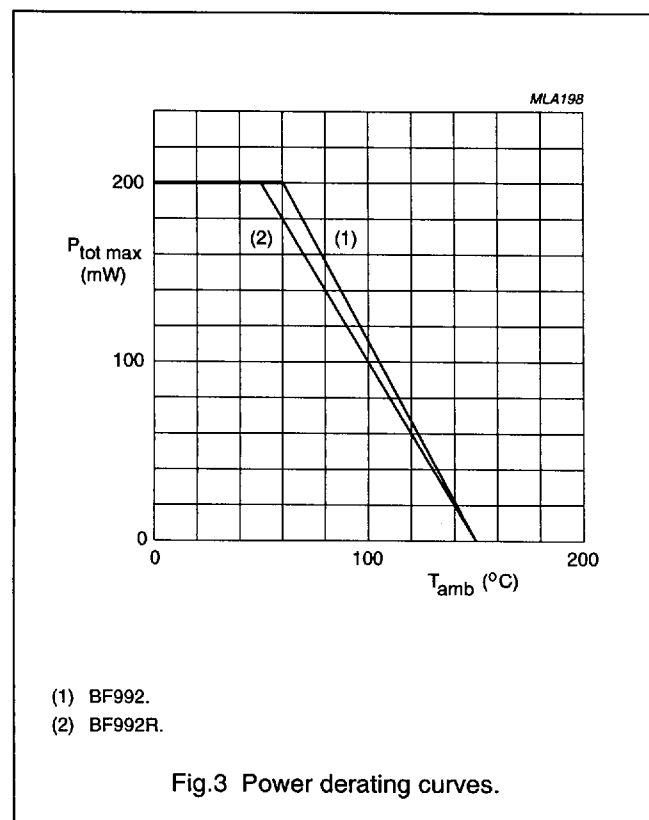
## LIMITING VALUES

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

| SYMBOL       | PARAMETER                      | CONDITIONS                                                       | MIN. | MAX. | UNIT               |
|--------------|--------------------------------|------------------------------------------------------------------|------|------|--------------------|
| $V_{DS}$     | drain-source voltage           |                                                                  | –    | 20   | V                  |
| $I_D$        | drain current                  |                                                                  | –    | 40   | mA                 |
| $\pm I_{G1}$ | gate 1 current                 |                                                                  | –    | 10   | mA                 |
| $\pm I_{G2}$ | gate 2 current                 |                                                                  | –    | 10   | mA                 |
| $P_{tot}$    | total power dissipation        | up to $T_{amb} = 60\text{ }^{\circ}\text{C}$ ; see Fig.3; note 1 | –    | 200  | mW                 |
| $T_{stg}$    | storage temperature            |                                                                  | –65  | +150 | $^{\circ}\text{C}$ |
| $T_j$        | operating junction temperature |                                                                  | –    | 150  | $^{\circ}\text{C}$ |

## Note

1. Device mounted on a ceramic substrate, 8 mm × 10 mm × 0.7 mm.



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## THERMAL CHARACTERISTICS

| SYMBOL        | PARAMETER                                               | CONDITIONS | VALUE | UNIT |
|---------------|---------------------------------------------------------|------------|-------|------|
| $R_{th\ j-a}$ | thermal resistance from junction to ambient in free air | note 1     |       |      |
|               | BF992                                                   |            | 460   | K/W  |
|               | BF992R                                                  |            | 500   | K/W  |

## Note

1. Device mounted on a ceramic substrate, 8 mm × 10 mm × 0.7 mm.

## STATIC CHARACTERISTICS

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

| SYMBOL              | PARAMETER                       | CONDITIONS                                                                   | MIN. | MAX. | UNIT |
|---------------------|---------------------------------|------------------------------------------------------------------------------|------|------|------|
| $\pm V_{(BR)G1-SS}$ | gate 1-source breakdown voltage | $V_{G2-S} = V_{DS} = 0$ ; $I_{G1-SS} = \pm 10\ \text{mA}$                    | 8    | 20   | V    |
| $\pm V_{(BR)G2-SS}$ | gate 2-source breakdown voltage | $V_{G1-S} = V_{DS} = 0$ ; $I_{G2-SS} = \pm 10\ \text{mA}$                    | 8    | 20   | V    |
| $-V_{(P)G1-S}$      | gate 1-source cut-off voltage   | $V_{G2-S} = 4\ \text{V}$ ; $V_{DS} = 10\ \text{V}$ ; $I_D = 20\ \mu\text{A}$ | 0.2  | 1.3  | V    |
| $-V_{(P)G2-S}$      | gate 2-source cut-off voltage   | $V_{G1-S} = 0$ ; $V_{DS} = 10\ \text{V}$ ; $I_D = 20\ \mu\text{A}$           | 0.2  | 1.1  | V    |
| $\pm I_{G1-SS}$     | gate 1 cut-off current          | $V_{G2-S} = V_{DS} = 0$ ; $V_{G1-S} = \pm 7\ \text{V}$                       | –    | 25   | nA   |
| $\pm I_{G2-SS}$     | gate 2 cut-off current          | $V_{G1-S} = V_{DS} = 0$ ; $V_{G2-S} = \pm 7\ \text{V}$                       | –    | 25   | nA   |

## DYNAMIC CHARACTERISTICS

Common source;  $T_{amb} = 25\ ^\circ\text{C}$ ;  $V_{DS} = 10\ \text{V}$ ;  $V_{G2-S} = 4\ \text{V}$ ;  $I_D = 15\ \text{mA}$ ; unless otherwise specified.

| SYMBOL      | PARAMETER                    | CONDITIONS                                   | MIN. | TYP. | MAX. | UNIT |
|-------------|------------------------------|----------------------------------------------|------|------|------|------|
| $ y_{fs} $  | forward transfer admittance  |                                              | 20   | 25   | –    | mS   |
| $C_{ig1-s}$ | input capacitance at gate 1  | $f = 1\ \text{MHz}$                          | –    | 4    | –    | pF   |
| $C_{ig2-s}$ | input capacitance at gate 2  | $f = 1\ \text{MHz}$                          | –    | 1.7  | –    | pF   |
| $C_{os}$    | output capacitance           | $f = 1\ \text{MHz}$                          | –    | 2    | –    | pF   |
| $C_{rs}$    | reverse transfer capacitance | $f = 1\ \text{MHz}$                          | –    | 30   | 40   | fF   |
| F           | noise figure                 | $f = 200\ \text{MHz}$ ; $G_S = 2\ \text{mS}$ | –    | 1.2  | –    | dB   |

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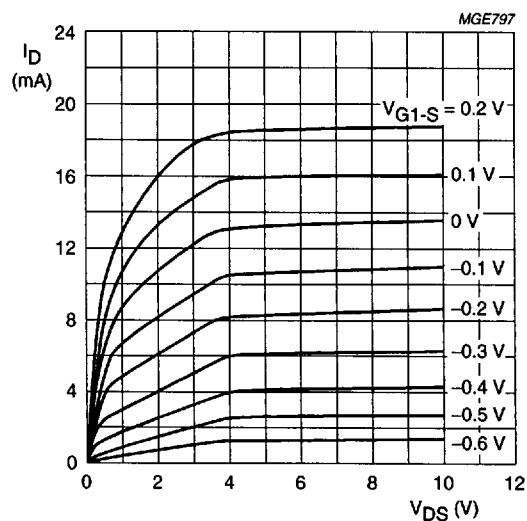
 $V_{G2-S} = 4 \text{ V}; T_j = 25^\circ\text{C}.$ 

Fig.4 Output characteristics; typical values.

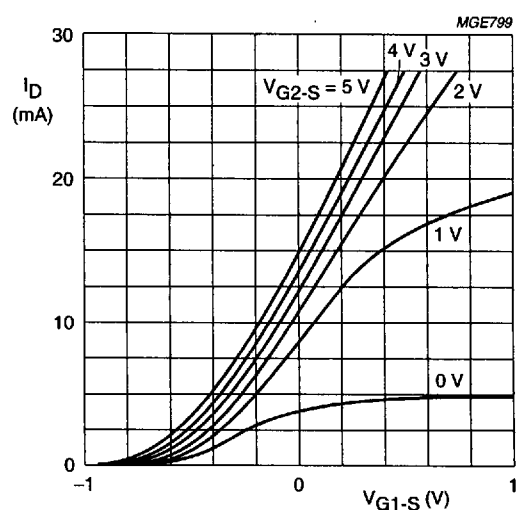
 $V_{DS} = 10 \text{ V}; T_j = 25^\circ\text{C}.$ 

Fig.5 Transfer characteristics; typical values.

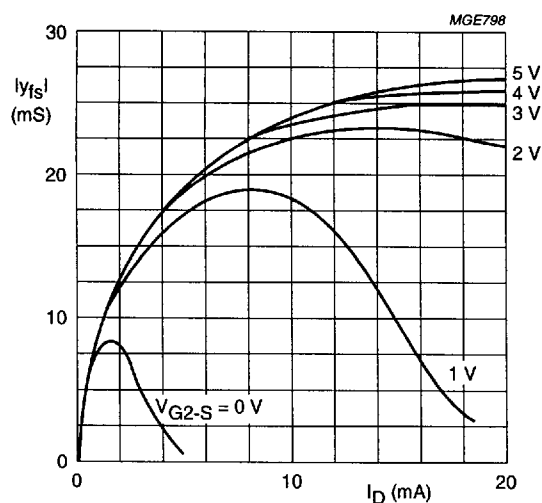
 $V_{DS} = 10 \text{ V}; T_j = 25^\circ\text{C}.$ 

Fig.6 Forward transfer admittance as a function of drain current; typical values.

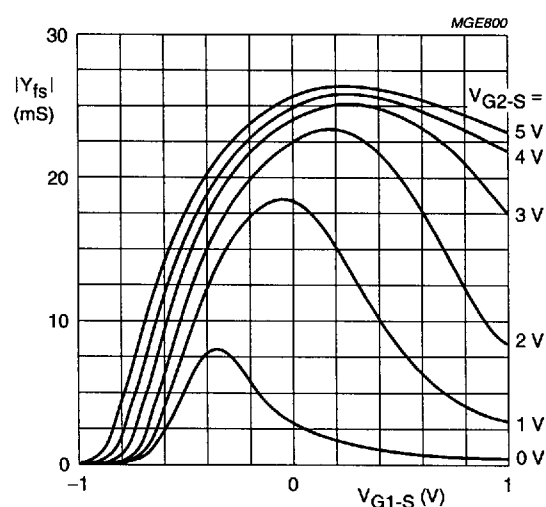
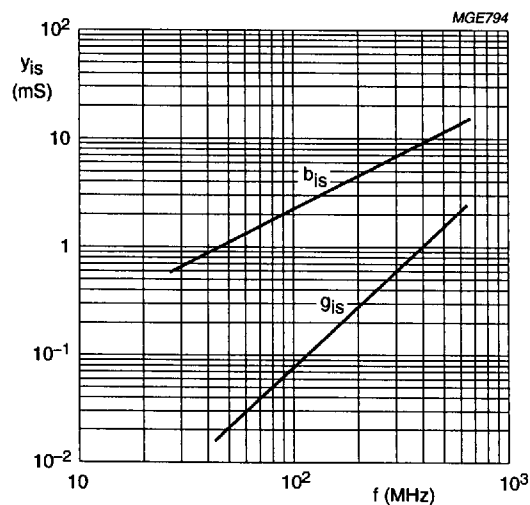
 $V_{DS} = 10 \text{ V}; T_j = 25^\circ\text{C}.$ 

Fig.7 Forward transfer admittance as a function of gate 1-source voltage; typical values.

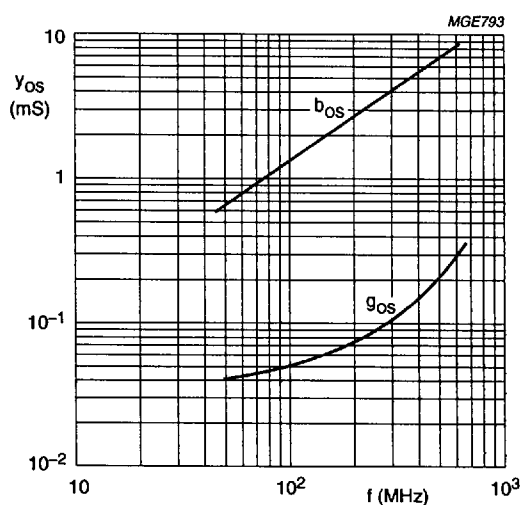
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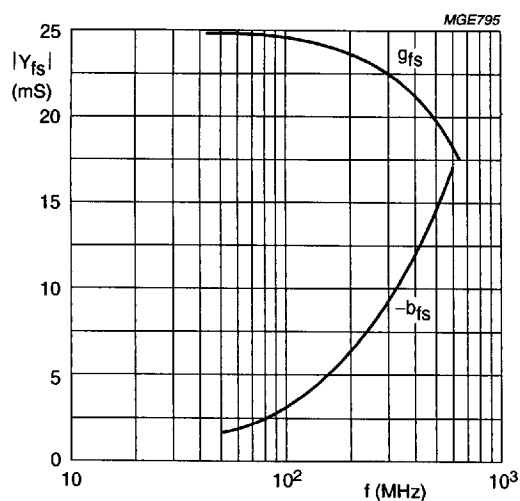
$V_{DS} = 10 \text{ V}$ ;  $V_{G2-S} = 4 \text{ V}$ ;  $I_D = 15 \text{ mA}$ ;  $T_{amb} = 25^\circ\text{C}$ .

Fig.8 Input admittance as a function of frequency; typical values.



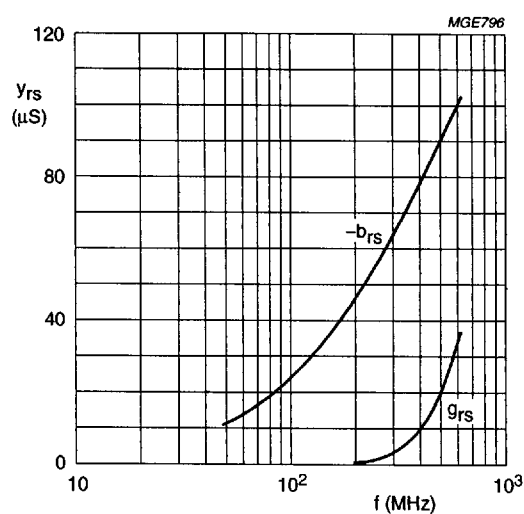
$V_{DS} = 10 \text{ V}$ ;  $V_{G2-S} = 4 \text{ V}$ ;  $I_D = 15 \text{ mA}$ ;  $T_{amb} = 25^\circ\text{C}$ .

Fig.9 Output admittance as a function of frequency; typical values.



$V_{DS} = 10 \text{ V}$ ;  $V_{G2-S} = 4 \text{ V}$ ;  $I_D = 15 \text{ mA}$ ;  $T_{amb} = 25^\circ\text{C}$ .

Fig.10 Forward transfer admittance as a function of frequency; typical values.



$V_{DS} = 10 \text{ V}$ ;  $V_{G2-S} = 4 \text{ V}$ ;  $I_D = 15 \text{ mA}$ ;  $T_{amb} = 25^\circ\text{C}$ .

Fig.11 Reverse transfer admittance as a function of frequency; typical values.

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## PACKAGE OUTLINES

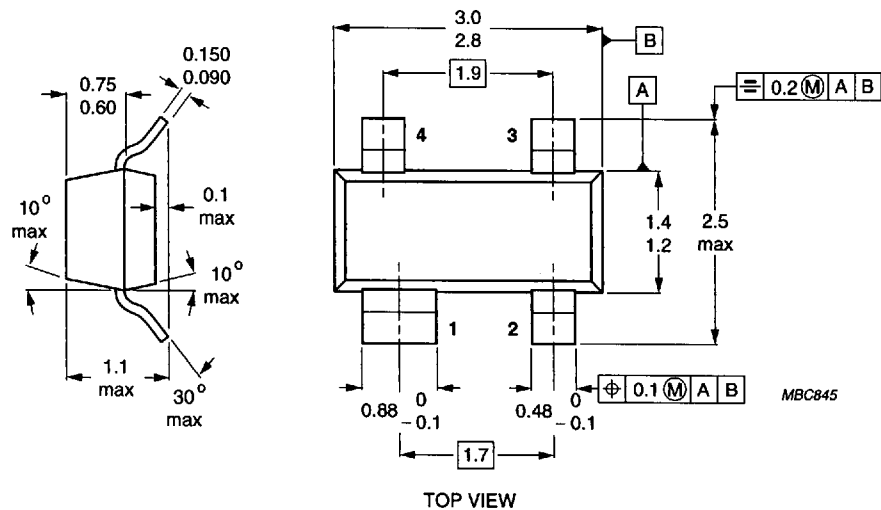


Fig.12 SOT143.

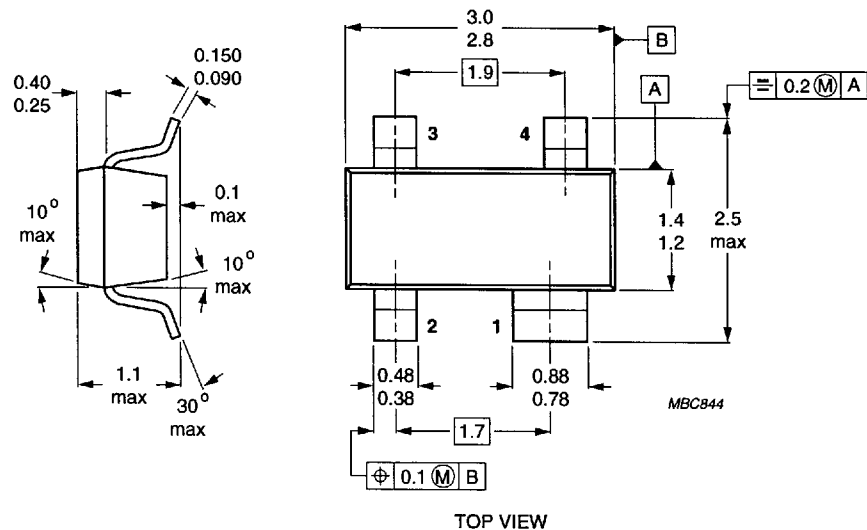


Fig.13 SOT143R.