

DISCRETE SEMICONDUCTORS

DATA SHEET

BF908; BF908R **Dual-gate MOS-FETs**

Product specification
Supersedes data of April 1995
File under Discrete Semiconductors, SC07

1996 Jul 30

Dual-gate MOS-FETs

BF908; BF908R

FEATURES

- High forward transfer admittance
- Short channel transistor with high forward transfer admittance to input capacitance ratio
- Low noise gain controlled amplifier up to 1 GHz.

APPLICATIONS

- VHF and UHF applications with 12 V supply voltage, such as television tuners and professional communications equipment.

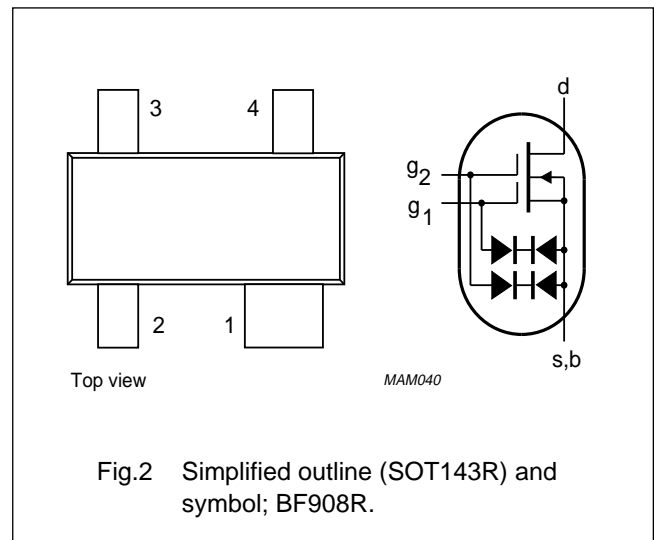
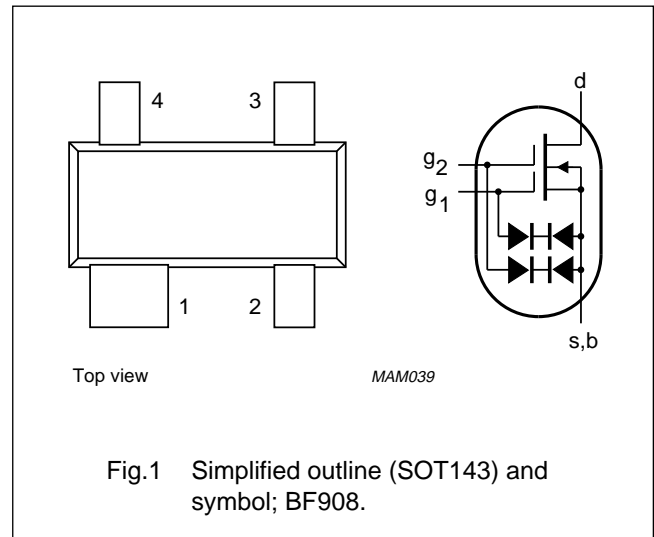
DESCRIPTION

Depletion type field-effect transistor in a plastic microminiature SOT143 or SOT143R package. 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 ₂ | gate 2 |
| 4 | g ₁ | gate 1 |



QUICK REFERENCE DATA

| SYMBOL | PARAMETER | CONDITIONS | MIN. | TYP. | MAX. | UNIT |
|--------------------|--------------------------------|-------------|------|------|------|------|
| V _{DS} | drain-source voltage | | – | – | 12 | V |
| I _D | drain current | | – | – | 40 | mA |
| P _{tot} | total power dissipation | | – | – | 200 | mW |
| T _j | operating junction temperature | | – | – | 150 | °C |
| y _{fs} | forward transfer admittance | | 36 | 43 | 50 | mS |
| C _{ig1-s} | input capacitance at gate 1 | | 2.4 | 3.1 | 4 | pF |
| C _{rs} | reverse transfer capacitance | f = 1 MHz | 20 | 30 | 45 | pF |
| F | noise figure | f = 800 MHz | – | 1.5 | 2.5 | dB |

Dual-gate MOS-FETs

BF908; BF908R

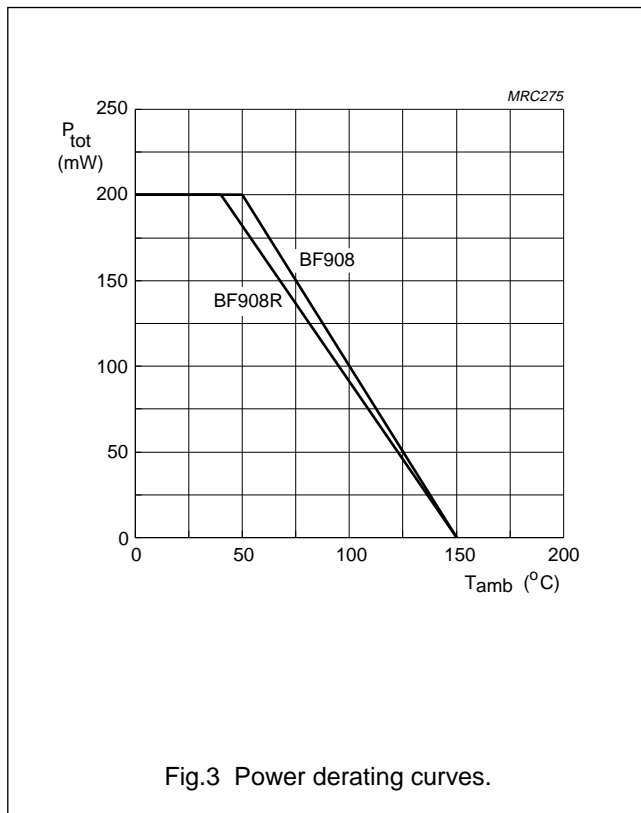
LIMITING VALUES

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

| SYMBOL | PARAMETER | CONDITIONS | MIN. | MAX. | UNIT |
|--------------|--------------------------------|--|------|------|------------------|
| V_{DS} | drain-source voltage | | – | 12 | 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 | see Fig.3; note 1 | | | |
| | BF908 | up to $T_{amb} = 50\text{ }^\circ\text{C}$ | – | 200 | mW |
| | BF908R | up to $T_{amb} = 40\text{ }^\circ\text{C}$ | – | 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 printed-circuit board.



Dual-gate MOS-FETs

BF908; BF908R

THERMAL CHARACTERISTICS

| SYMBOL | PARAMETER | CONDITIONS | VALUE | UNIT |
|---------------|---|------------|-------|------|
| $R_{th\ j-a}$ | thermal resistance from junction to ambient | note 1 | | |
| | BF908 | | 500 | K/W |
| | BF908R | | 550 | K/W |

Note

1. Device mounted on a printed-circuit board.

STATIC CHARACTERISTICS

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

| SYMBOL | PARAMETER | CONDITIONS | MIN. | TYP. | MAX. | UNIT |
|---------------------|---------------------------------|---|------|------|------|------|
| $\pm V_{(BR)G1-SS}$ | gate 1-source breakdown voltage | $V_{G2-S} = V_{DS} = 0$; $I_{G1-S} = 10\text{ mA}$ | 8 | – | 20 | V |
| $\pm V_{(BR)G2-SS}$ | gate 2-source breakdown voltage | $V_{G1-S} = V_{DS} = 0$; $I_{G2-S} = 10\text{ mA}$ | 8 | – | 20 | V |
| $-V_{(P)G1-S}$ | gate 1-source cut-off voltage | $V_{G2-S} = 4\text{ V}$; $V_{DS} = 8\text{ V}$; $I_D = 20\text{ }\mu\text{A}$ | – | – | 2 | V |
| $-V_{(P)G2-S}$ | gate 2-source cut-off voltage | $V_{G1-S} = 4\text{ V}$; $V_{DS} = 8\text{ V}$; $I_D = 20\text{ }\mu\text{A}$ | – | – | 1.5 | V |
| I_{DSS} | drain-source current | $V_{G2-S} = 4\text{ V}$; $V_{DS} = 8\text{ V}$; $V_{G1-S} = 0$ | 3 | 15 | 27 | mA |
| $\pm I_{G1-SS}$ | gate 1 cut-off current | $V_{G2-S} = V_{DS} = 0$; $V_{G1-S} = 5\text{ V}$ | – | – | 50 | nA |
| $\pm I_{G2-SS}$ | gate 2 cut-off current | $V_{G1-S} = V_{DS} = 0$; $V_{G2-S} = 5\text{ V}$ | – | – | 50 | nA |

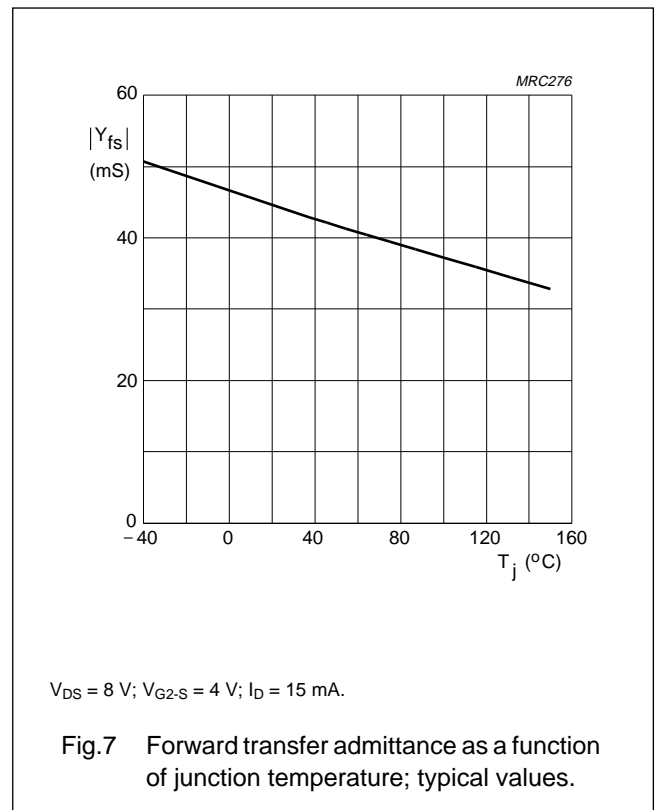
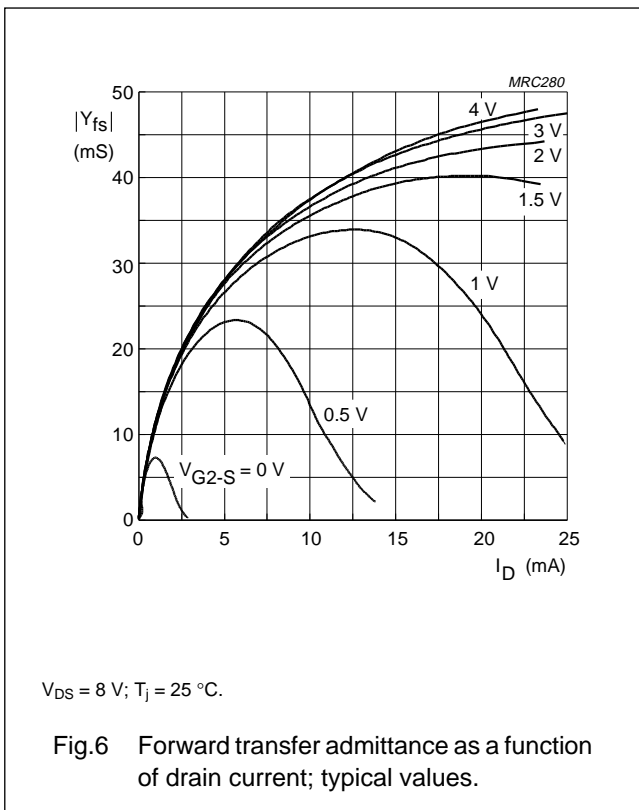
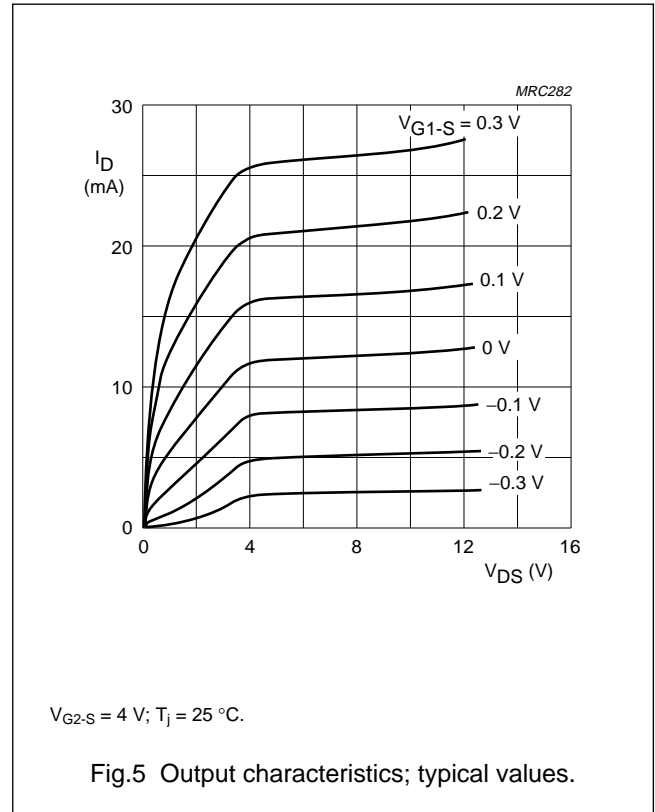
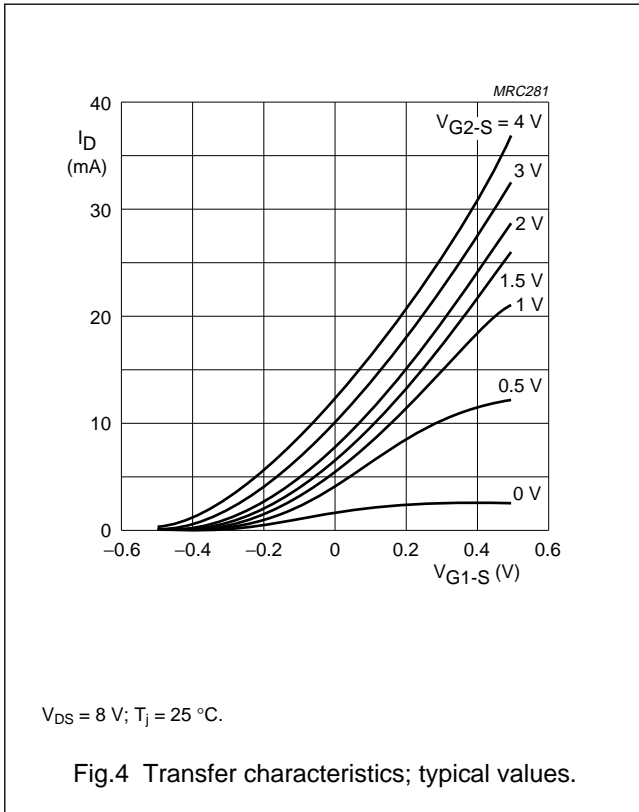
DYNAMIC CHARACTERISTICS

Common source; $T_{amb} = 25\text{ °C}$; $V_{DS} = 8\text{ V}$; $V_{G2-S} = 4\text{ V}$; $I_D = 15\text{ mA}$; unless otherwise specified.

| SYMBOL | PARAMETER | CONDITIONS | MIN. | TYP. | MAX. | UNIT |
|-------------|------------------------------|---|------|------|------|------|
| $ y_{fs} $ | forward transfer admittance | pulsed; $T_j = 25\text{ °C}$; $f = 1\text{ MHz}$ | 36 | 43 | 50 | mS |
| C_{ig1-s} | input capacitance at gate 1 | $f = 1\text{ MHz}$ | 2.4 | 3.1 | 4 | pF |
| C_{ig2-s} | input capacitance at gate 2 | $f = 1\text{ MHz}$ | 1.2 | 1.8 | 2.5 | pF |
| C_{os} | output capacitance | $f = 1\text{ MHz}$ | 1.2 | 1.7 | 2.2 | pF |
| C_{rs} | reverse transfer capacitance | $f = 1\text{ MHz}$ | 20 | 30 | 45 | fF |
| F | noise figure | $f = 200\text{ MHz}$; $G_S = 2\text{ mS}$; $B_S = B_{Sopt}$ | – | 0.6 | 1.2 | dB |
| | | $f = 800\text{ MHz}$; $G_S = G_{Sopt}$; $B_S = B_{Sopt}$ | – | 1.5 | 2.5 | dB |

Dual-gate MOS-FETs

BF908; BF908R



Dual-gate MOS-FETs

BF908; BF908R

Table 1 Scattering parameters

| f (MHz) | S ₁₁ | | S ₂₁ | | S ₁₂ | | S ₂₂ | |
|--|----------------------|----------------|----------------------|----------------|----------------------|----------------|----------------------|----------------|
| | MAGNITUDE (ratio) | ANGLE (deg) | MAGNITUDE (ratio) | ANGLE (deg) | MAGNITUDE (ratio) | ANGLE (deg) | MAGNITUDE (ratio) | ANGLE (deg) |
| V_{DS} = 8 V; V_{G2-S} = 4 V; I_D = 10 mA; T_{amb} = 25 °C. | | | | | | | | |
| 50 | 0.998 | -5.1 | 3.537 | 173.5 | 0.001 | 98.2 | 0.996 | -2.4 |
| 100 | 0.994 | -10.4 | 3.502 | 167.7 | 0.001 | 88.8 | 0.994 | -4.9 |
| 200 | 0.979 | -20.8 | 3.450 | 154.9 | 0.003 | 74.6 | 0.987 | -9.5 |
| 300 | 0.962 | -30.3 | 3.318 | 143.7 | 0.004 | 69.5 | 0.983 | -13.9 |
| 400 | 0.939 | -40.1 | 3.234 | 131.9 | 0.005 | 65.6 | 0.980 | -18.5 |
| 500 | 0.914 | -49.1 | 3.093 | 120.7 | 0.006 | 64.4 | 0.974 | -22.8 |
| 600 | 0.892 | -57.1 | 2.912 | 111.1 | 0.005 | 63.1 | 0.969 | -27.0 |
| 700 | 0.865 | -64.4 | 2.774 | 101.0 | 0.005 | 65.2 | 0.966 | -31.2 |
| 800 | 0.837 | -71.6 | 2.616 | 91.4 | 0.004 | 70.8 | 0.965 | -35.4 |
| 900 | 0.811 | -78.1 | 2.479 | 81.9 | 0.004 | 87.4 | 0.965 | -39.4 |
| 1000 | 0.785 | -84.5 | 3.329 | 72.5 | 0.003 | 108.0 | 0.966 | -43.7 |
| V_{DS} = 8 V; V_{G2-S} = 4 V; I_D = 15 mA; T_{amb} = 25 °C. | | | | | | | | |
| 50 | 0.998 | -5.3 | 3.983 | 173.4 | 0.001 | 95.5 | 0.994 | -2.4 |
| 100 | 0.994 | -10.9 | 3.943 | 167.5 | 0.001 | 93.6 | 0.991 | -5.0 |
| 200 | 0.976 | -21.6 | 3.878 | 154.7 | 0.003 | 74.3 | 0.984 | -9.7 |
| 300 | 0.957 | -31.7 | 3.722 | 143.3 | 0.004 | 70.0 | 0.979 | -14.2 |
| 400 | 0.934 | -41.7 | 3.614 | 131.6 | 0.005 | 63.5 | 0.975 | -18.8 |
| 500 | 0.907 | -51.1 | 3.446 | 120.4 | 0.006 | 62.2 | 0.969 | -23.2 |
| 600 | 0.885 | -59.1 | 3.240 | 110.9 | 0.005 | 59.6 | 0.964 | -27.4 |
| 700 | 0.851 | -66.8 | 3.072 | 100.9 | 0.005 | 64.8 | 0.961 | -31.6 |
| 800 | 0.826 | -73.9 | 2.891 | 91.3 | 0.004 | 67.8 | 0.959 | -35.9 |
| 900 | 0.797 | -80.7 | 2.733 | 81.9 | 0.004 | 85.0 | 0.958 | -40.0 |
| 1000 | 0.773 | -87.0 | 2.569 | 72.8 | 0.004 | 102.9 | 0.958 | -44.2 |

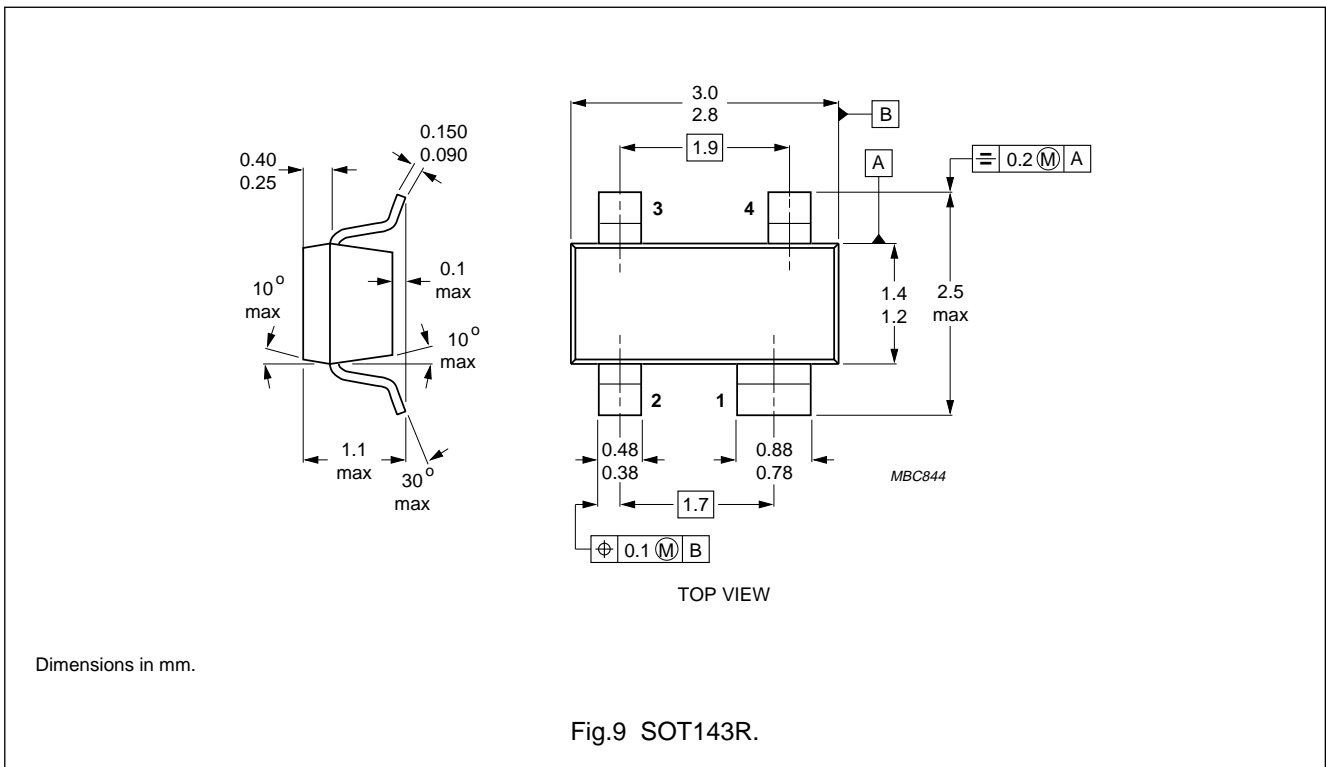
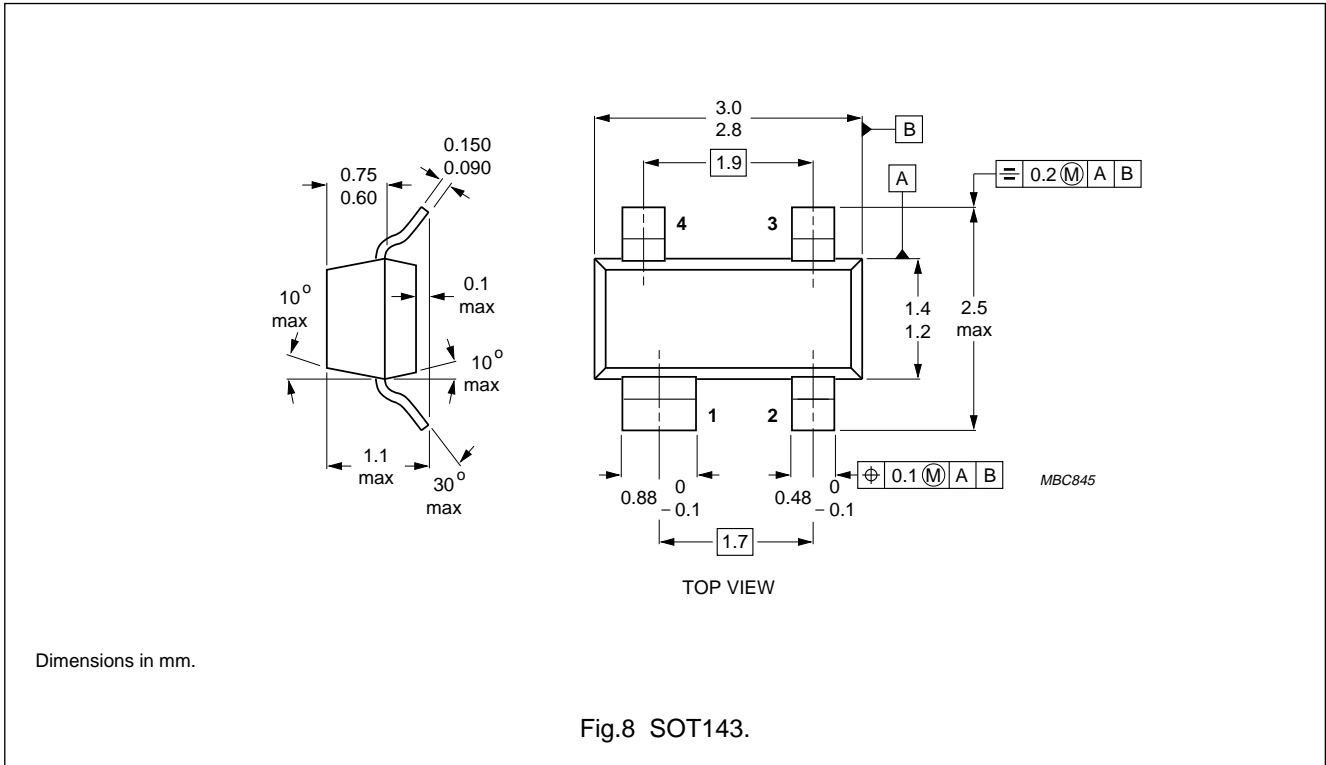
Table 2 Noise data

| f (MHz) | F _{min} (dB) | Γ _{opt} | | r _n |
|--|--------------------------|------------------|-------|----------------|
| | | (ratio) | (deg) | |
| V_{DS} = 8 V; V_{G2-S} = 4 V; I_D = 10 mA; T_{amb} = 25 °C. | | | | |
| 800 | 1.50 | 0.720 | 56.7 | 0.580 |
| V_{DS} = 8 V; V_{G2-S} = 4 V; I_D = 15 mA; T_{amb} = 25 °C. | | | | |
| 800 | 1.50 | 0.700 | 59.2 | 0.520 |

Dual-gate MOS-FETs

BF908; BF908R

PACKAGE OUTLINES



Dual-gate MOS-FETs

BF908; BF908R

DEFINITIONS

| | |
|---|---|
| Data Sheet Status | |
| 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. |
| Limiting values | |
| 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. | |
| Application information | |
| Where application information is given, it is advisory and does not form part of the specification. | |

LIFE SUPPORT APPLICATIONS

These products are not designed for use in life support appliances, devices, or systems where malfunction of these products can reasonably be expected to result in personal injury. Philips customers using or selling these products for use in such applications do so at their own risk and agree to fully indemnify Philips for any damages resulting from such improper use or sale.