

# DATA SHEET

**BF994S**

**N-channel dual-gate MOS-FET**

Product specification  
File under Discrete Semiconductors, SC07

July 1993

# N-channel dual-gate MOS-FET

# BF994S

### FEATURES

- Protected against excessive input voltage surges by integrated back-to-back diodes between gates and source.

### APPLICATIONS

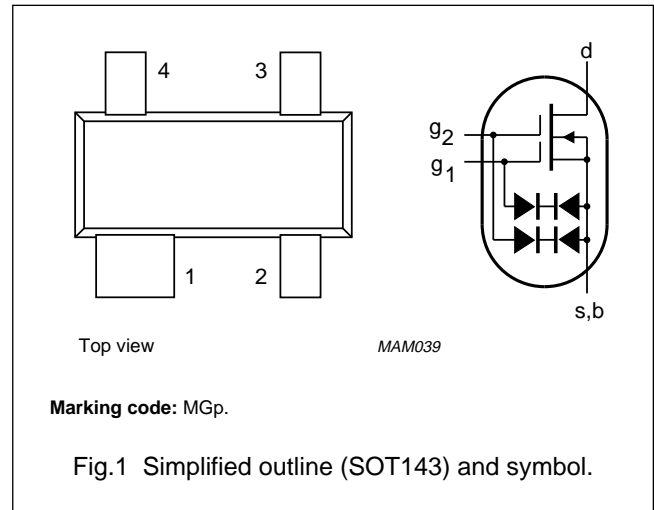
- VHF applications such as:
  - VHF television tuners
  - Professional communication equipment.

### 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

### DESCRIPTION

Depletion type field-effect transistor in a plastic SOT143 microminiature package with interconnected source and substrate.



### QUICK REFERENCE DATA

SYMBOL	PARAMETER	CONDITIONS	TYP.	MAX.	UNIT
V <sub>DS</sub>	drain-source voltage		–	20	V
I <sub>D</sub>	drain current		–	30	mA
P <sub>tot</sub>	total power dissipation	up to T <sub>amb</sub> = 60 °C	–	200	mW
T <sub>j</sub>	junction temperature		–	150	°C
Y <sub>fs</sub>	transfer admittance	f = 1 kHz; I <sub>D</sub> = 10 mA; V <sub>DS</sub> = 15 V; V <sub>G2-S</sub> = 4 V	18	–	mS
C <sub>ig1-s</sub>	input capacitance at gate 1	f = 1 MHz; I <sub>D</sub> = 10 mA; V <sub>DS</sub> = 15 V; V <sub>G2-S</sub> = 4 V	2.5	3	pF
C <sub>rs</sub>	feedback capacitance	f = 1 MHz; I <sub>D</sub> = 10 mA; V <sub>DS</sub> = 15 V; V <sub>G2-S</sub> = 4 V	25	–	fF
F	noise figure	f = 200 MHz; G <sub>S</sub> = 2 mS; B <sub>S</sub> = B <sub>Sopt</sub> ; I <sub>D</sub> = 10 mA; V <sub>DS</sub> = 15 V; V <sub>G2-S</sub> = 4 V	1	–	dB

# N-channel dual-gate MOS-FET

BF994S

## LIMITING VALUES

In according 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 (DC)		–	30	mA
$I_{D(AV)}$	average drain current		–	30	mA
$I_{G1-S}$	gate 1-source current		–	$\pm 10$	mA
$I_{G2-S}$	gate 2-source current		–	$\pm 10$	mA
$P_{tot}$	total power dissipation	up to $T_{amb} = 60\text{ }^\circ\text{C}$ ; note 1	–	200	mW
$T_{stg}$	storage temperature range		–65	+150	$^\circ\text{C}$
$T_j$	junction temperature		–	150	$^\circ\text{C}$

## THERMAL CHARACTERISTICS

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

### Note to the Limiting values and the Thermal characteristics

1. Device mounted on a ceramic substrate of  $8 \times 10 \times 0.7\text{ mm}$ .

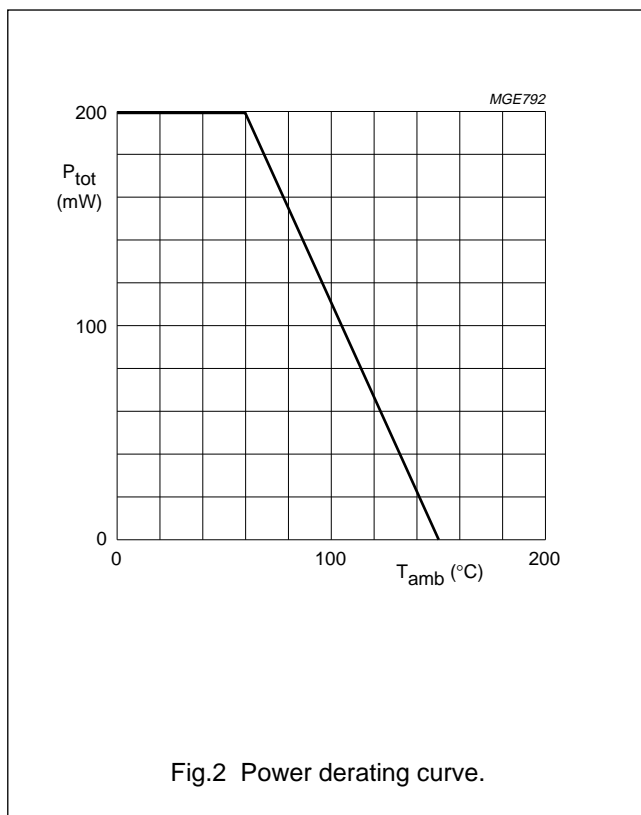


Fig.2 Power derating curve.

## N-channel dual-gate MOS-FET

BF994S

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

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	UNIT
$I_{G1-SS}$	gate 1 cut-off currents	$V_{G1-S} = \pm 5\text{ V}$ ; $V_{G2-S} = V_{DS} = 0$	–	$\pm 50$	nA
$I_{G2-SS}$	gate 2 cut-off currents	$V_{G2-S} = \pm 5\text{ V}$ ; $V_{G1-S} = V_{DS} = 0$	–	$\pm 50$	nA
$V_{(BR)G1-SS}$	gate 1-source breakdown voltage	$I_{G1-SS} = \pm 10\text{ mA}$ ; $V_{G2-S} = V_{DS} = 0$	$\pm 6$	$\pm 20$	V
$V_{(BR)G2-SS}$	gate 2-source breakdown voltage	$I_{G2-SS} = \pm 10\text{ mA}$ ; $V_{G1-S} = V_{DS} = 0$	$\pm 6$	$\pm 20$	V
$I_{DSS}$	drain-source cut-off voltage	$V_{DS} = 15\text{ V}$ ; $V_{G1-S} = 0$ ; $V_{G2-S} = 4\text{ V}$	4	20	mA
$V_{(P)G1-S}$	gate 1-source cut-off voltage	$I_D = 20\text{ }\mu\text{A}$ ; $V_{DS} = 15\text{ V}$ ; $V_{G2-S} = 4\text{ V}$	–	–2.5	V
$V_{(P)G2-S}$	gate 2-source cut-off voltage	$I_D = 20\text{ }\mu\text{A}$ ; $V_{DS} = 15\text{ V}$ ; $V_{G1-S} = 0$	–	–2	V

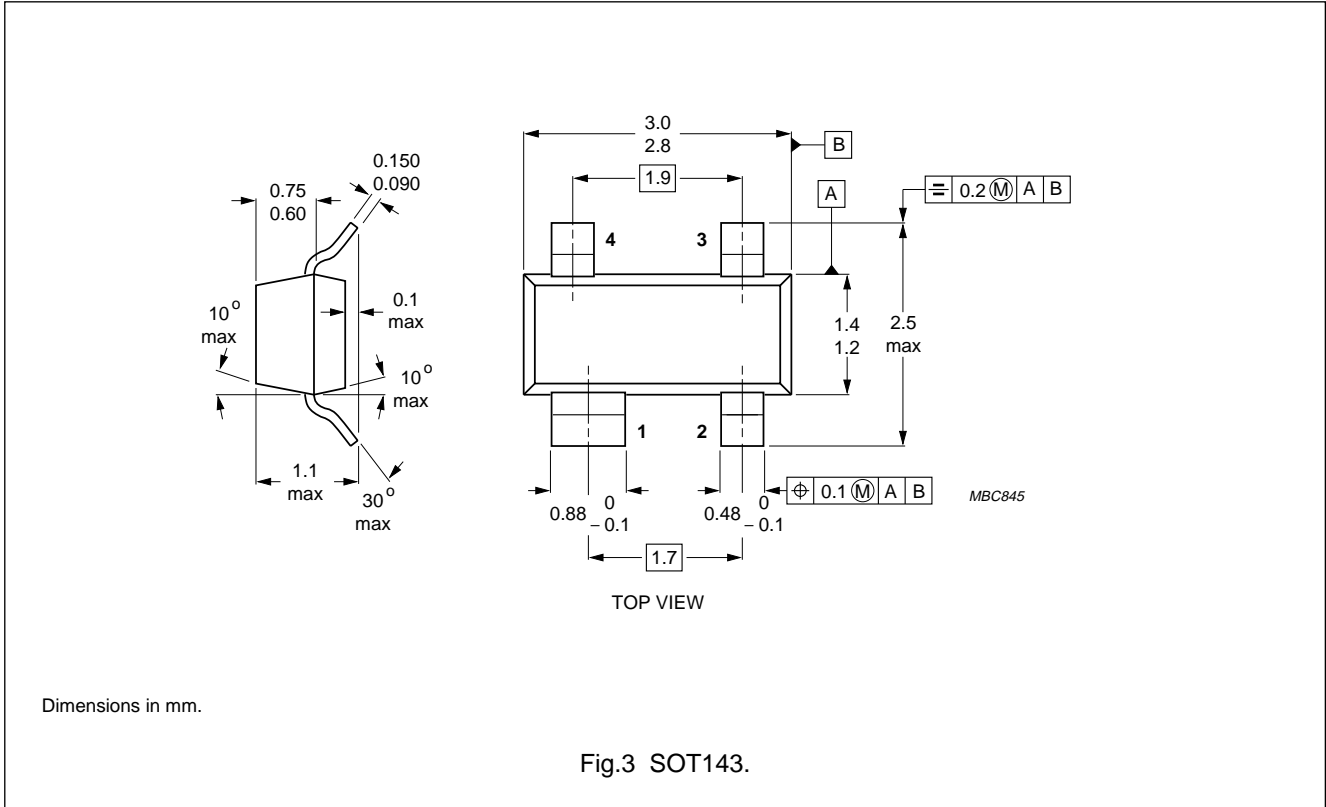
**DYNAMIC CHARACTERISTICS**Measuring conditions (common source):  $I_D = 10\text{ mA}$ ;  $V_{DS} = 15\text{ V}$ ;  $V_{G2-S} = 4\text{ V}$ ;  $T_{amb} = 25\text{ °C}$ .

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
$ Y_{fs} $	transfer admittance	$f = 1\text{ kHz}$	15	18	–	mS
$C_{ig1-s}$	input capacitance at gate 1	$f = 1\text{ MHz}$	–	2.5	3	pF
$C_{ig2-s}$	input capacitance at gate 2	$f = 1\text{ MHz}$	–	1.2	–	pF
$C_{rs}$	feedback capacitance	$f = 1\text{ MHz}$	–	25	–	fF
$C_{os}$	output capacitance	$f = 1\text{ MHz}$	–	1	–	pF
F	noise figure	$f = 200\text{ MHz}$ ; $G_S = 2\text{ mS}$ ; $B_S = B_{Sopt}$	–	1	–	dB
$G_p$	power gain	$f = 200\text{ MHz}$ ; $G_S = 2\text{ mS}$ ; $B_S = B_{Sopt}$ ; $G_L = 0.5\text{ mS}$ ; $B_L = B_{Lopt}$	–	25	–	dB

N-channel dual-gate MOS-FET

BF994S

PACKAGE OUTLINE



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.	

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.