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# DATA SHEET

## **BF998; BF998R** Silicon N-channel dual-gate MOS-FETs

Product specification  
Supersedes data of April 1991

1996 Aug 01



# Silicon N-channel dual-gate MOS-FETs

# BF998; BF998R

### FEATURES

- 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 SOT143B 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**

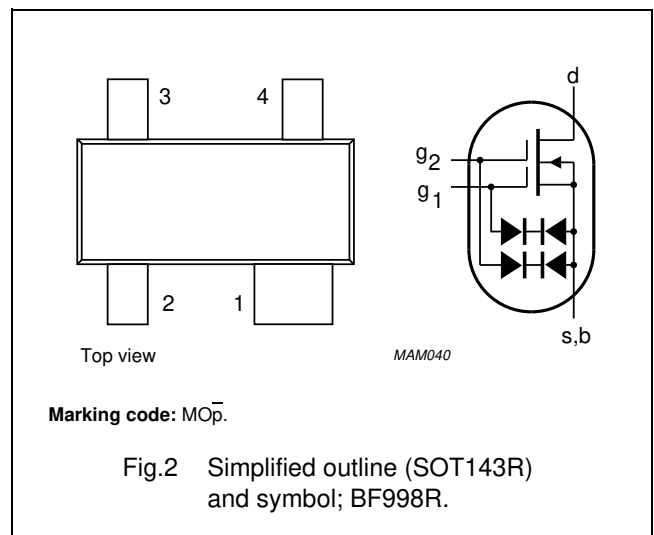
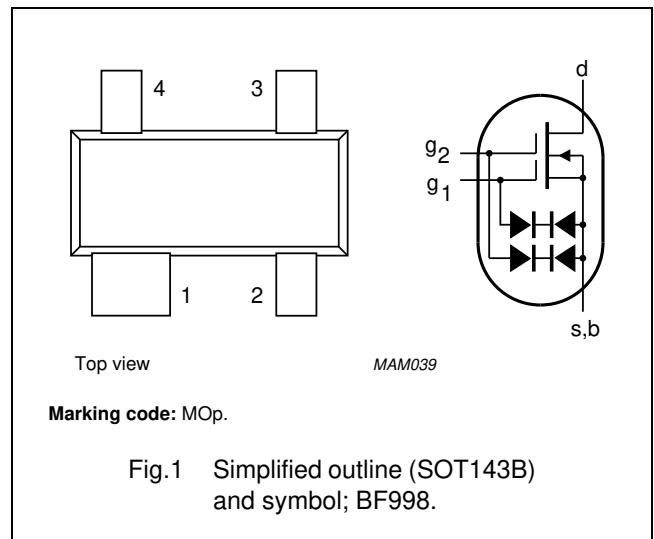
The device is supplied in an antistatic package. The gate-source input must be protected against static discharge during transport or handling.

### 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 <sub>DS</sub>	drain-source voltage		–	12	V
I <sub>D</sub>	drain current		–	30	mA
P <sub>tot</sub>	total power dissipation		–	200	mW
y <sub>fs</sub>	forward transfer admittance		24	–	mS
C <sub>ig1-s</sub>	input capacitance at gate 1		2.1	–	pF
C <sub>rs</sub>	reverse transfer capacitance	f = 1 MHz	25	–	fF
F	noise figure	f = 800 MHz	1	–	dB
T <sub>j</sub>	operating junction temperature		–	150	°C



Silicon N-channel dual-gate MOS-FETs

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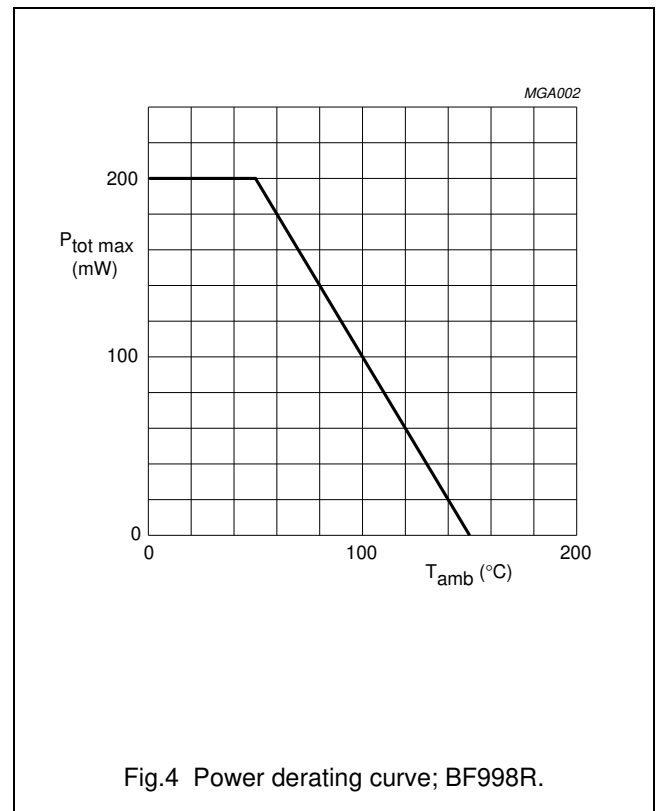
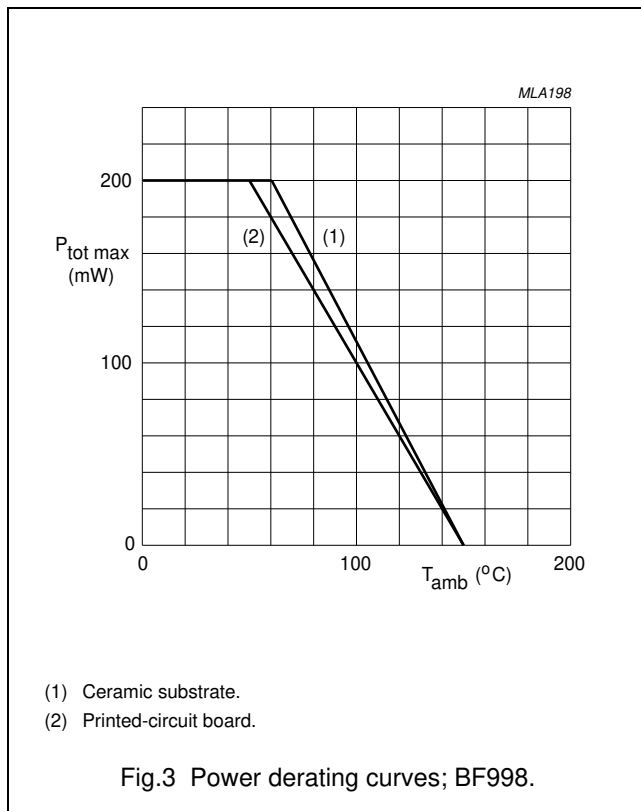
**LIMITING VALUES**

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

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	UNIT
$V_{DS}$	drain-source voltage		-	12	V
$I_D$	drain current		-	30	mA
$\pm I_{G1}$	gate 1 current		-	10	mA
$\pm I_{G2}$	gate 2 current		-	10	mA
$P_{tot}$	total power dissipation; BF998	up to $T_{amb} = 60\text{ }^\circ\text{C}$ ; see Fig.3; note 1	-	200	mW
		up to $T_{amb} = 50\text{ }^\circ\text{C}$ ; see Fig.3; note 2	-	200	mW
$P_{tot}$	total power dissipation; BF998R	up to $T_{amb} = 50\text{ }^\circ\text{C}$ ; see Fig.4; note 1	-	200	mW
$T_{stg}$	storage temperature		-65	+150	$^\circ\text{C}$
$T_j$	operating junction temperature		-	150	$^\circ\text{C}$

**Notes**

1. Device mounted on a ceramic substrate, 8 mm × 10 mm × 0.7 mm.
2. Device mounted on a printed-circuit board.



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## THERMAL CHARACTERISTICS

SYMBOL	PARAMETER	CONDITIONS	VALUE	UNIT
$R_{th\ j-a}$	thermal resistance from junction to ambient in free air; BF998	note 1	460	K/W
		note 2	500	K/W
$R_{th\ j-a}$	thermal resistance from junction to ambient in free air; BF998R	note 1	500	K/W

## Notes

1. Device mounted on a ceramic substrate, 8 mm × 10 mm × 0.7 mm.
2. Device mounted on a printed-circuit board.

## STATIC CHARACTERISTICS

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

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	UNIT
$\pm V_{(BR)G1-SS}$	gate 1-source breakdown voltage	$V_{G2-S} = V_{DS} = 0$ ; $I_{G1-SS} = \pm 10\text{ mA}$	6	20	V
$\pm V_{(BR)G2-SS}$	gate 2-source breakdown voltage	$V_{G1-S} = V_{DS} = 0$ ; $I_{G2-SS} = \pm 10\text{ mA}$	6	20	V
$-V_{(P)G1-S}$	gate 1-source cut-off voltage	$V_{G2-S} = 4\text{ V}$ ; $V_{DS} = 8\text{ V}$ ; $I_D = 20\text{ }\mu\text{A}$	–	2.0	V
$-V_{(P)G2-S}$	gate 2-source cut-off voltage	$V_{G1-S} = 0$ ; $V_{DS} = 8\text{ V}$ ; $I_D = 20\text{ }\mu\text{A}$	–	1.5	V
$I_{DSS}$	drain-source current	$V_{G2-S} = 4\text{ V}$ ; $V_{DS} = 8\text{ V}$ ; $V_{G1-S} = 0$ ; note 1	2	18	mA
$\pm I_{G1-SS}$	gate 1 cut-off current	$V_{G2-S} = V_{DS} = 0$ ; $V_{G1-S} = \pm 5\text{ V}$	–	50	nA
$\pm I_{G2-SS}$	gate 2 cut-off current	$V_{G1-S} = V_{DS} = 0$ ; $V_{G2-S} = \pm 5\text{ V}$	–	50	nA

## Note

1. Measured under pulse condition.

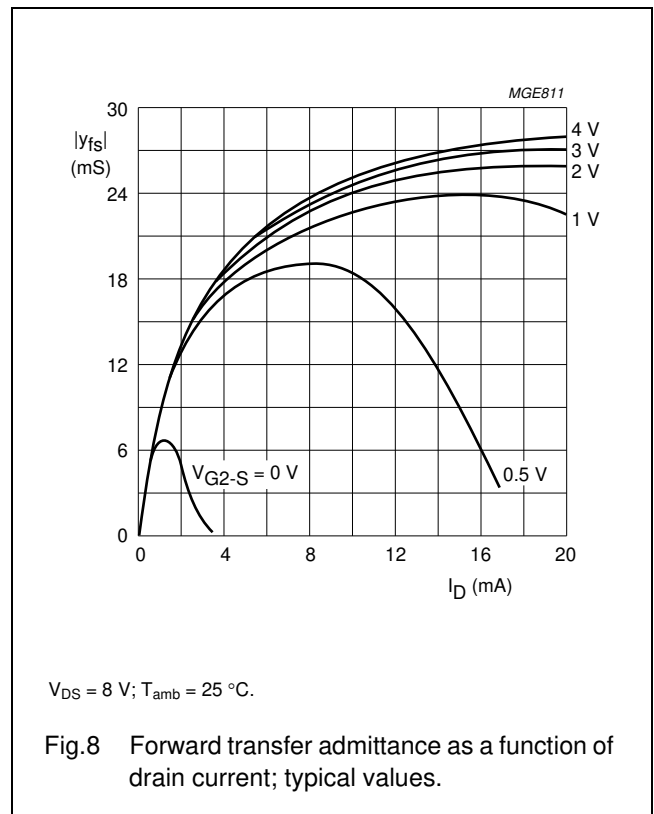
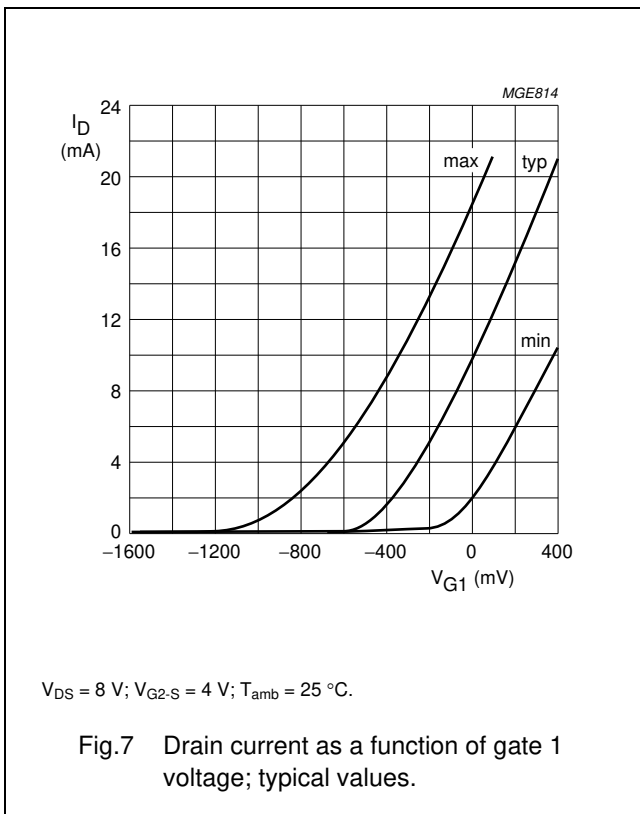
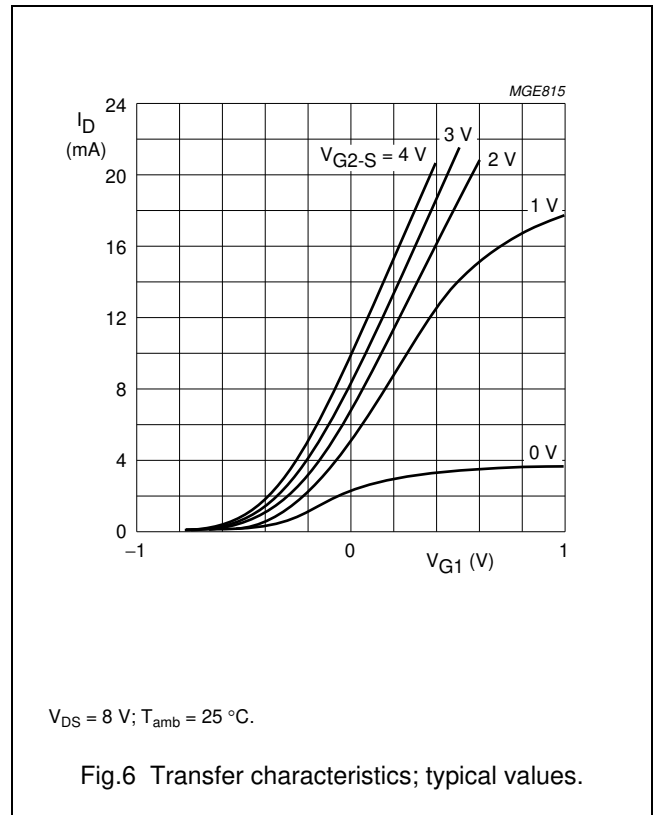
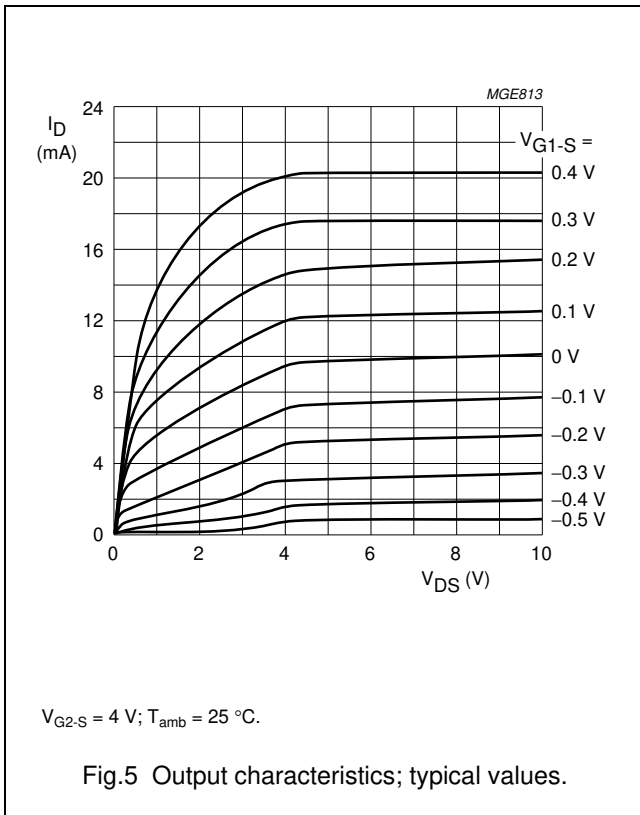
## DYNAMIC CHARACTERISTICS

Common source;  $T_{amb} = 25\text{ °C}$ ;  $V_{DS} = 8\text{ V}$ ;  $V_{G2-S} = 4\text{ V}$ ;  $I_D = 10\text{ mA}$ .

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
$ y_{fs} $	forward transfer admittance	$f = 1\text{ kHz}$	21	24	–	mS
$C_{ig1-s}$	input capacitance at gate 1	$f = 1\text{ MHz}$	–	2.1	2.5	pF
$C_{ig2-s}$	input capacitance at gate 2	$f = 1\text{ MHz}$	–	1.2	–	pF
$C_{os}$	output capacitance	$f = 1\text{ MHz}$	–	1.05	–	pF
$C_{rs}$	reverse transfer capacitance	$f = 1\text{ MHz}$	–	25	–	fF
F	noise figure	$f = 200\text{ MHz}$ ; $G_S = 2\text{ mS}$ ; $B_S = B_{Sopt}$	–	0.6	–	dB
		$f = 800\text{ MHz}$ ; $G_S = 3.3\text{ mS}$ ; $B_S = B_{Sopt}$	–	1.0	–	dB

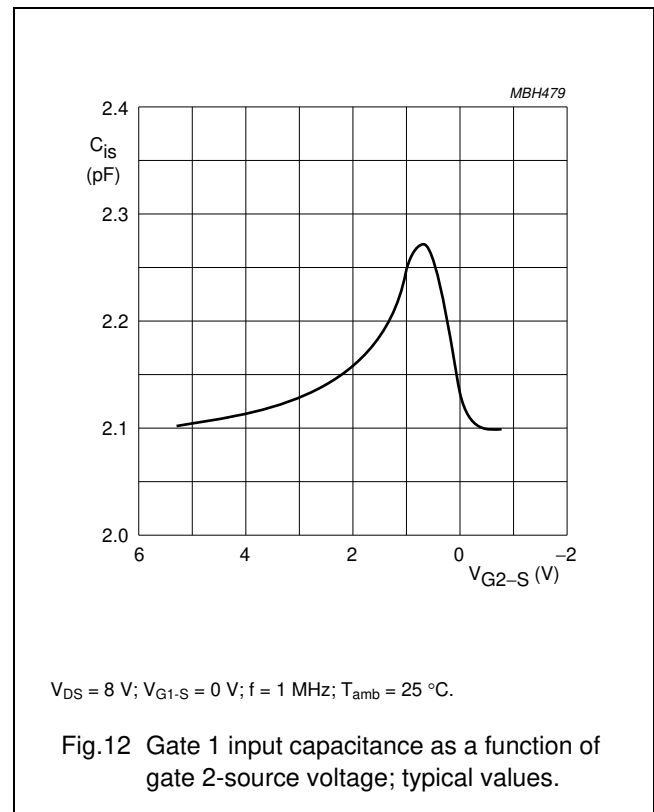
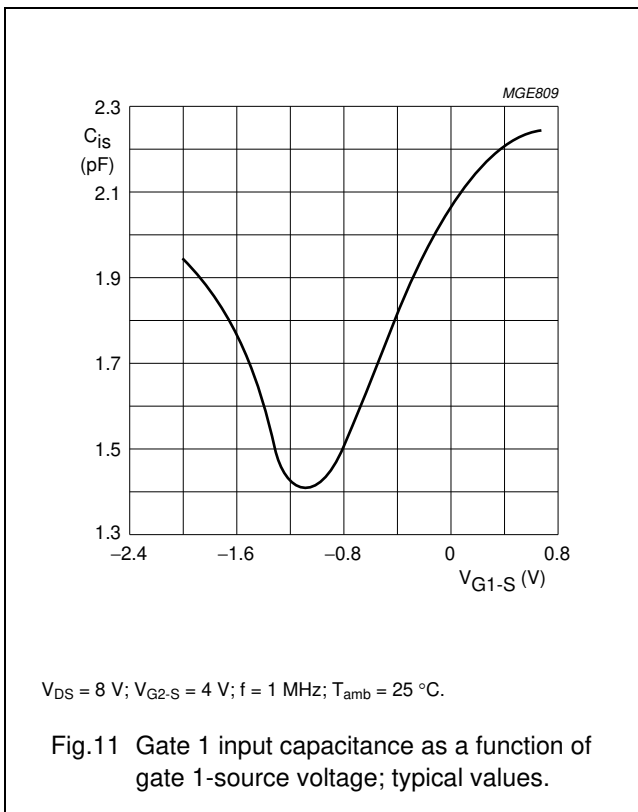
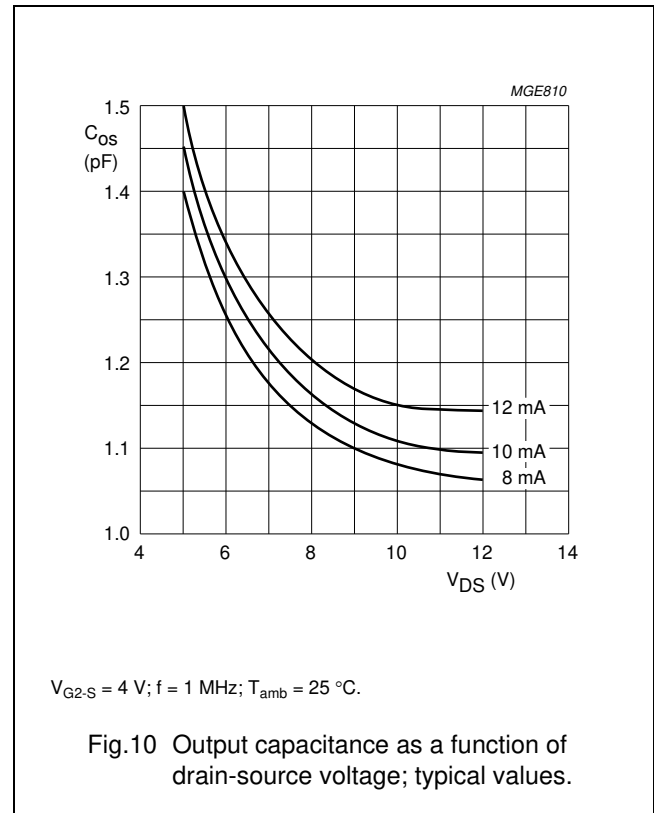
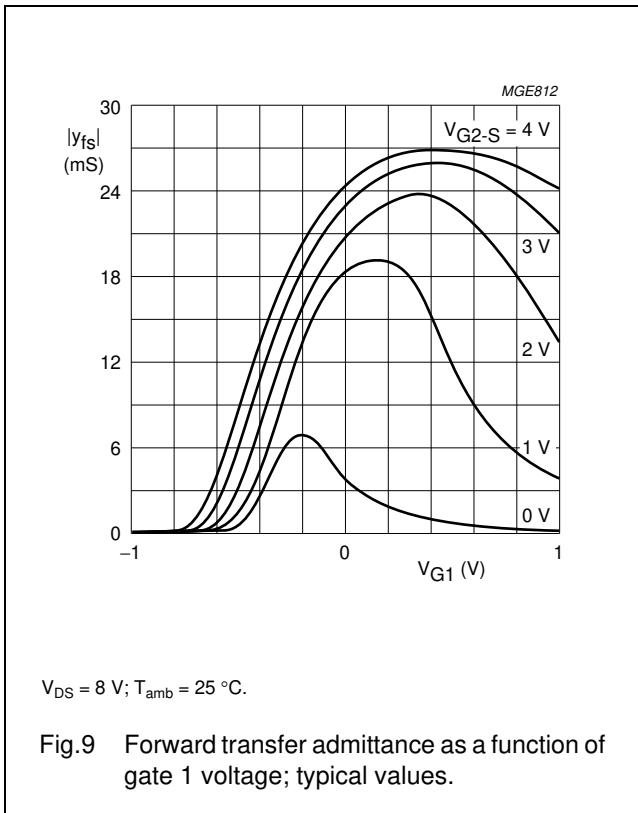
Silicon N-channel dual-gate MOS-FETs

BF998; BF998R



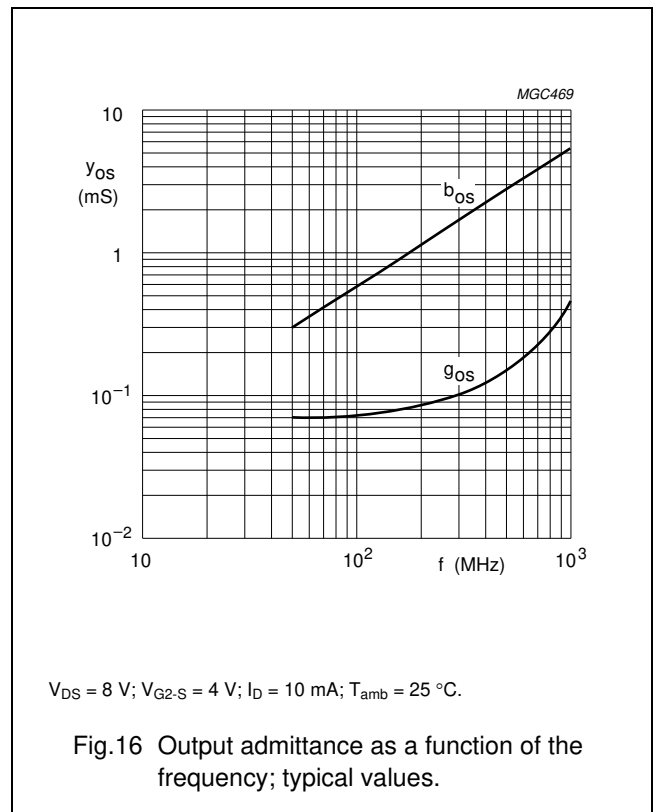
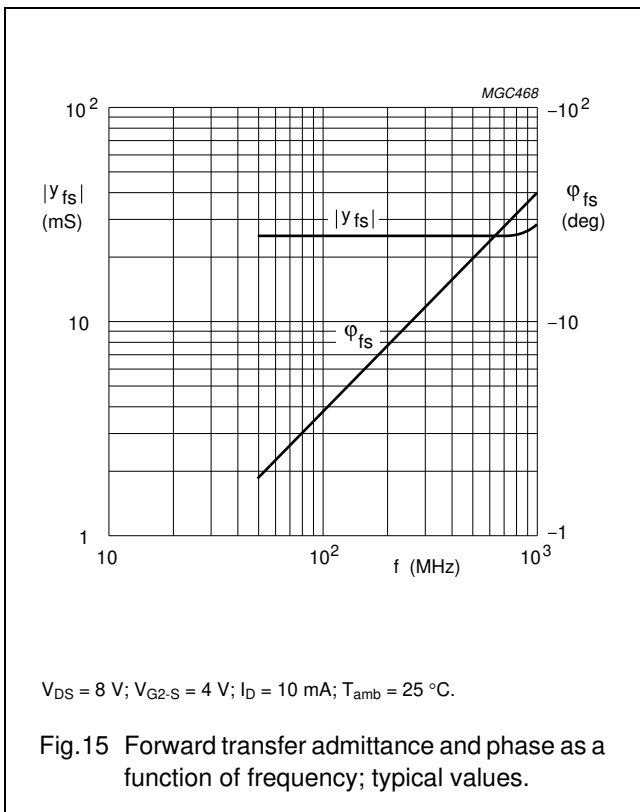
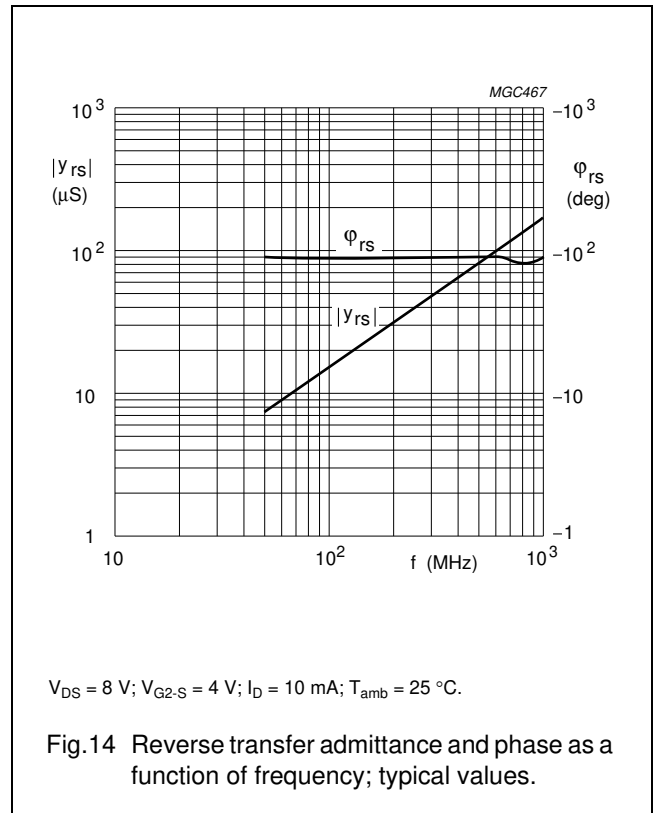
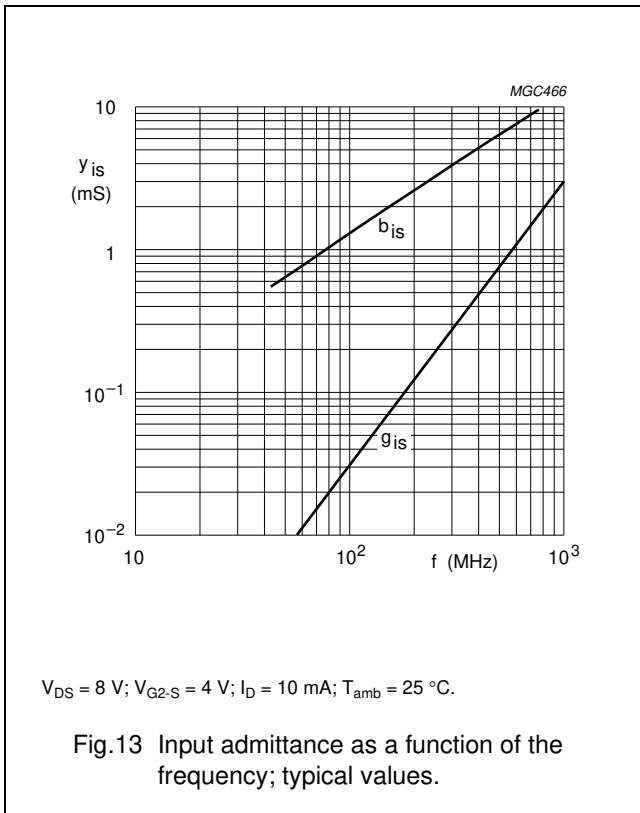
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Silicon N-channel dual-gate MOS-FETs

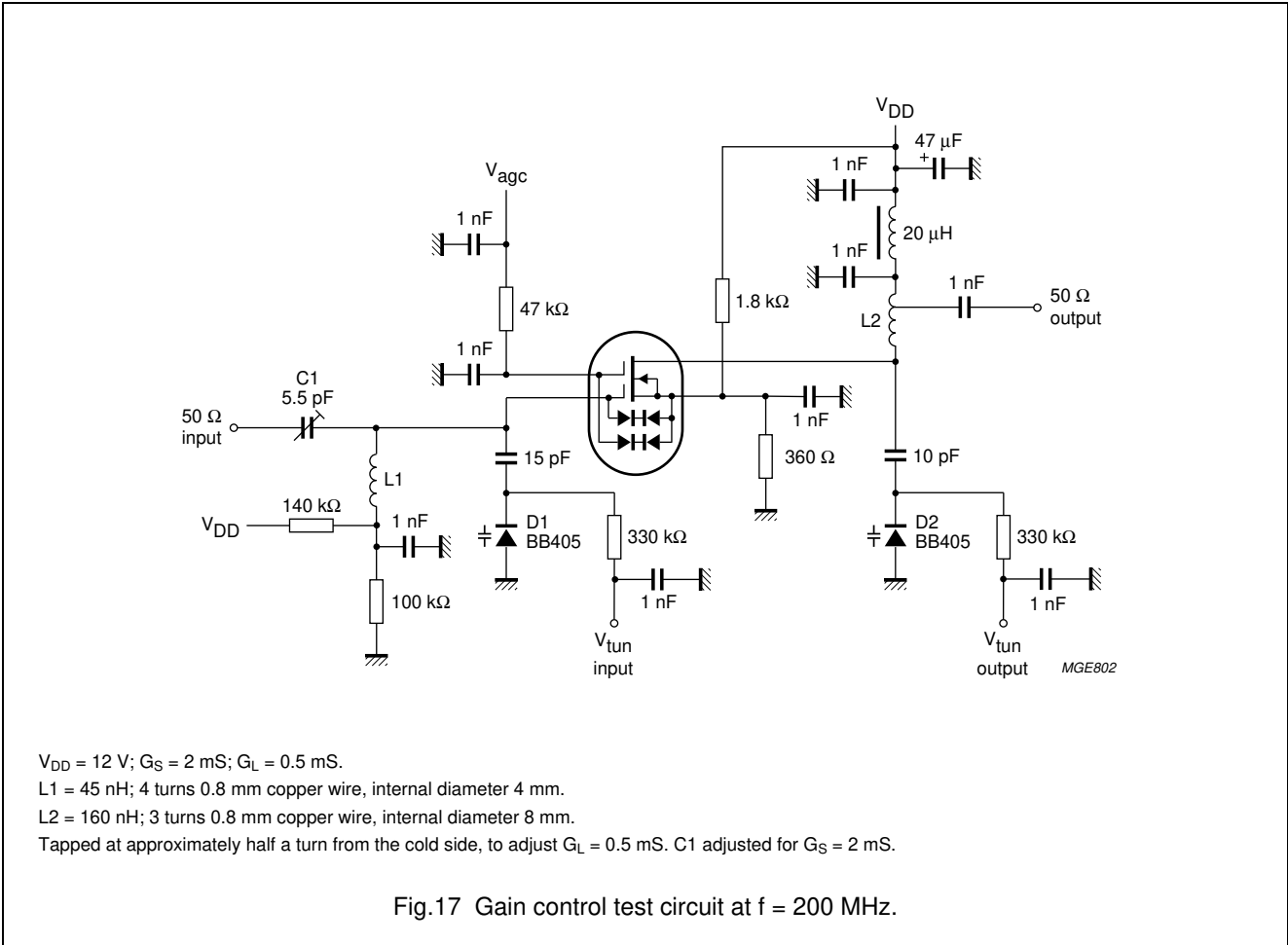
BF998; BF998R





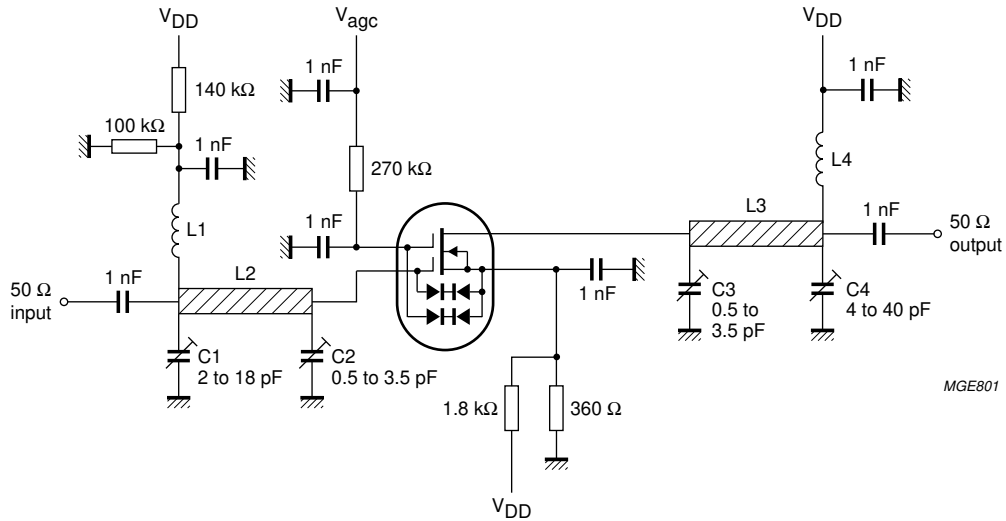
Silicon N-channel dual-gate MOS-FETs

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Silicon N-channel dual-gate MOS-FETs

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MGE801

$V_{DD} = 12\text{ V}$ ;  $G_S = 3.3\text{ mS}$ ;  $G_L = 1\text{ mS}$ .

$L_1 = L_4 = 200\text{ nH}$ ; 11 turns 0.5 mm copper wire, without spacing, internal diameter 3 mm.

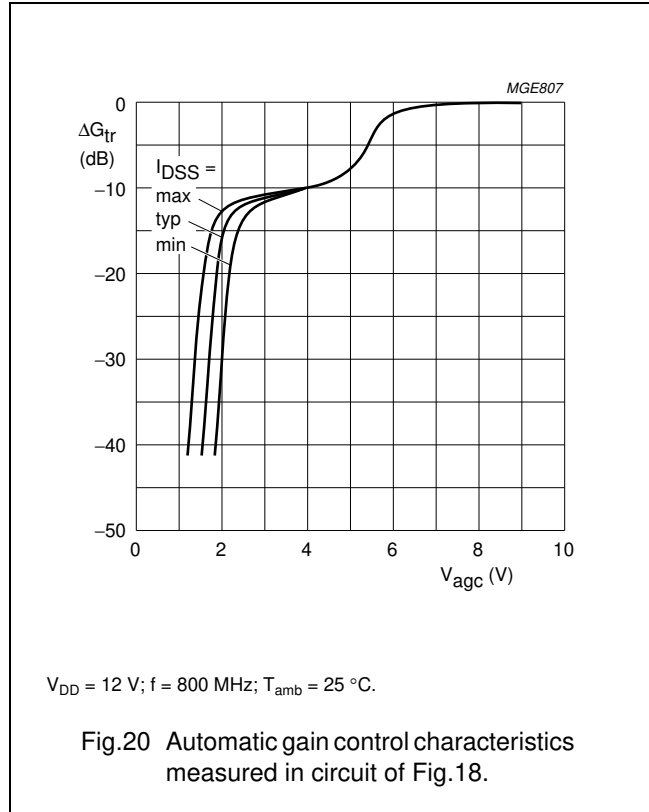
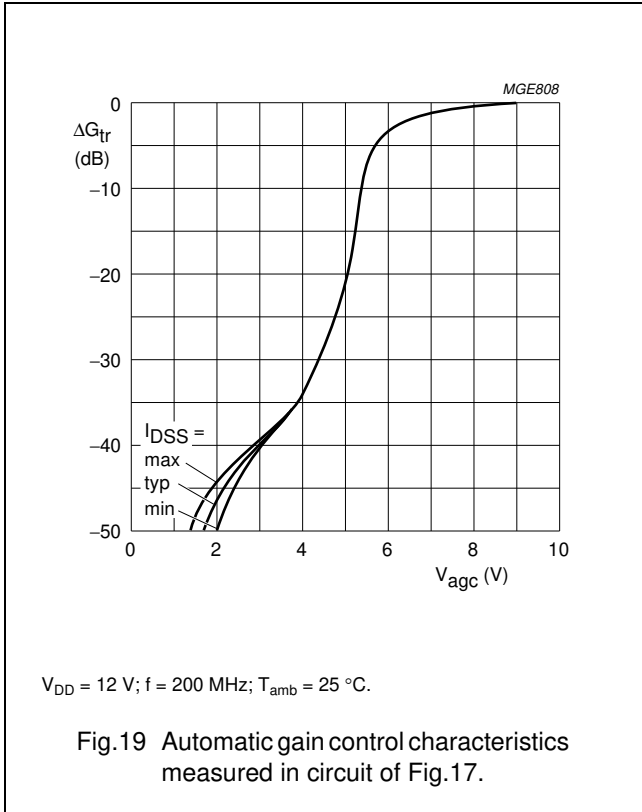
$L_2 = 2\text{ cm}$ , silvered 0.8 mm copper wire, 4 mm above ground plane.

$L_3 = 2\text{ cm}$ , silvered 0.5 mm copper wire, 4 mm above ground plane.

Fig.18 Gain control test circuit at  $f = 800\text{ MHz}$ .

Silicon N-channel dual-gate MOS-FETs

BF998; BF998R



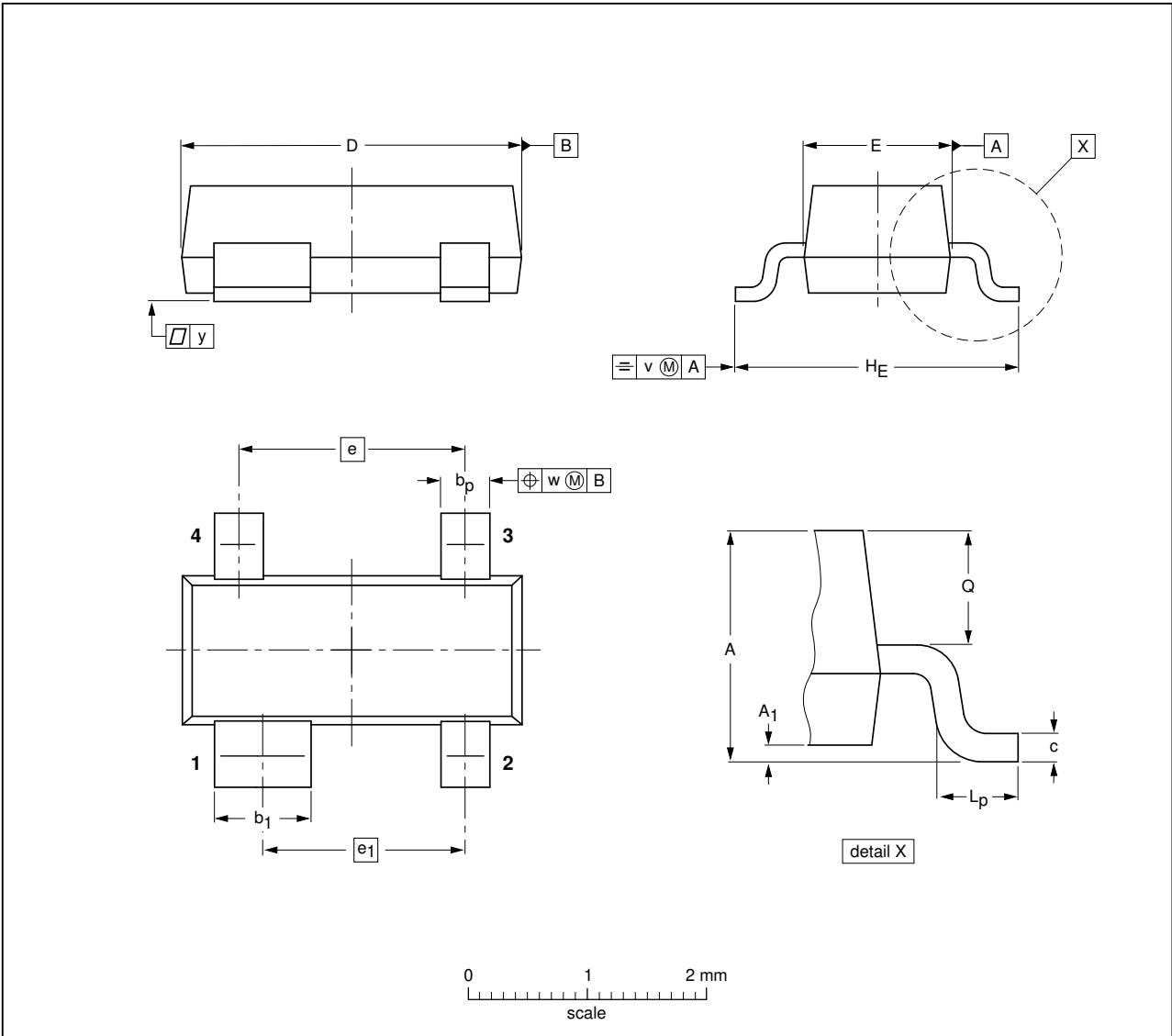
Silicon N-channel dual-gate MOS-FETs

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PACKAGE OUTLINES

Plastic surface-mounted package; 4 leads

SOT143B



DIMENSIONS (mm are the original dimensions)

UNIT	A	A <sub>1</sub> max	b <sub>p</sub>	b <sub>1</sub>	c	D	E	e	e <sub>1</sub>	H <sub>E</sub>	L <sub>p</sub>	Q	v	w	y
mm	1.1 0.9	0.1	0.48 0.38	0.88 0.78	0.15 0.09	3.0 2.8	1.4 1.2	1.9	1.7	2.5 2.1	0.45 0.15	0.55 0.45	0.2	0.1	0.1

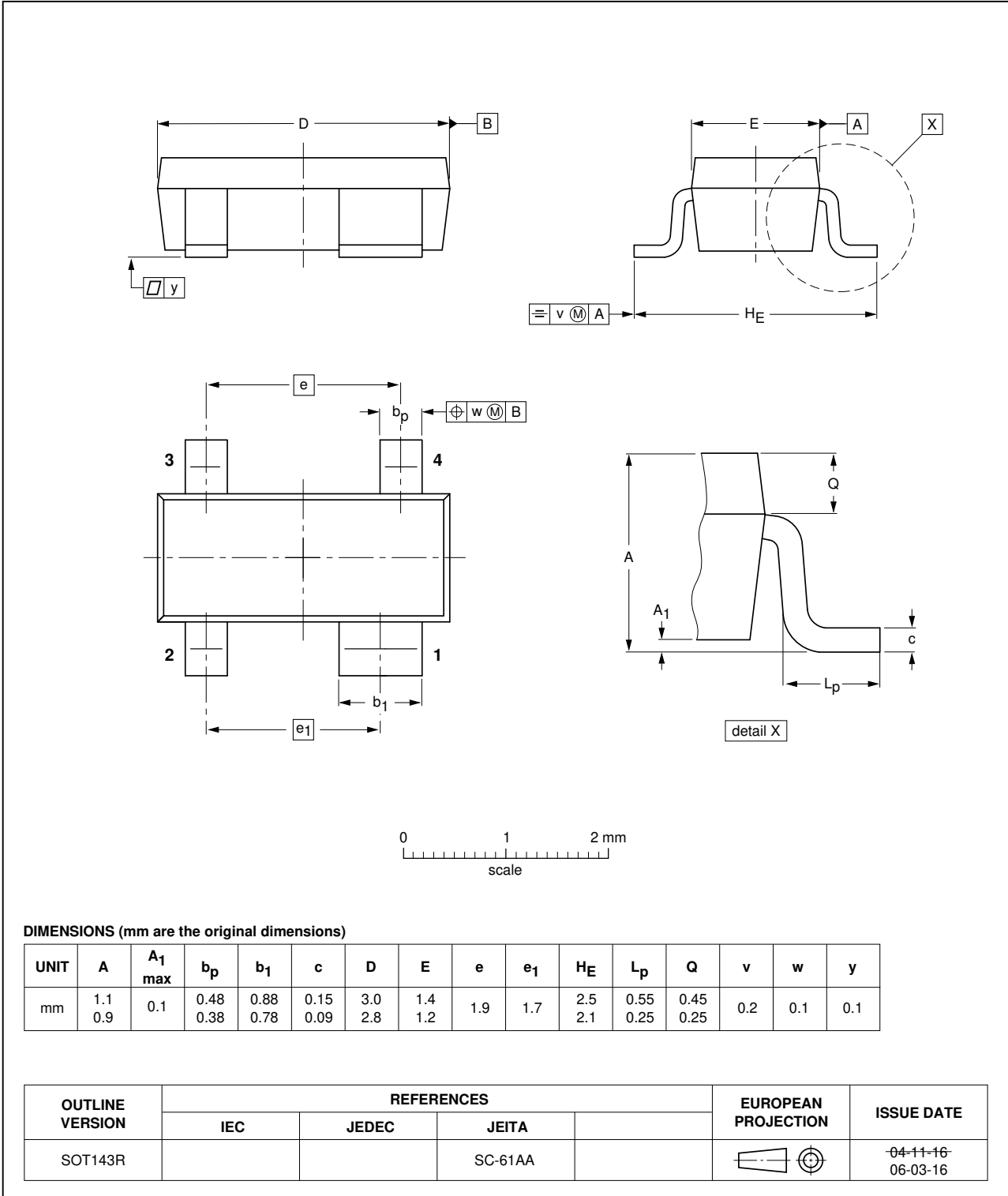
OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	JEITA			
SOT143B						04-11-16 06-03-16

Silicon N-channel dual-gate MOS-FETs

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Plastic surface-mounted package; reverse pinning; 4 leads

SOT143R



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

BF998; BF998R

## 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.

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

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## **Contact information**

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Printed in The Netherlands

R77/02/pp15

Date of release:1996 Aug 01