

DATA SHEET

BF998WR

N-channel dual-gate MOS-FET

Product specification
File under Discrete Semiconductors, SC07

1995 Apr 25

Philips Semiconductors



PHILIPS

N-channel dual-gate MOS-FET

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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

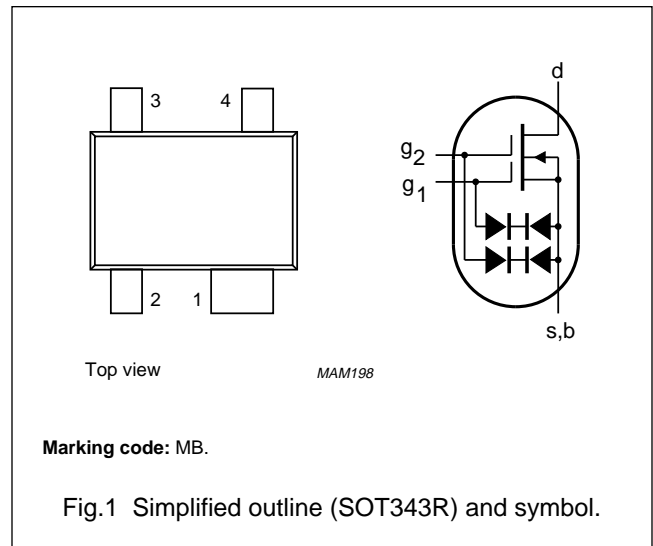
Depletion type field-effect transistor in a plastic microminiature SOT343R package with source and substrate interconnected. The transistor is protected against excessive input voltage surges by integrated back-to-back diodes between gates and source.

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		–	–	30	mA
P _{tot}	total power dissipation		–	–	300	mW
T _j	operating junction temperature		–	–	150	°C
y _{fs}	forward transfer admittance		–	24	–	mS
C _{ig1-s}	input capacitance at gate 1		–	2.1	–	pF
C _{rs}	reverse transfer capacitance	f = 1 MHz	–	25	–	fF
F	noise figure	f = 800 MHz	–	1	–	dB

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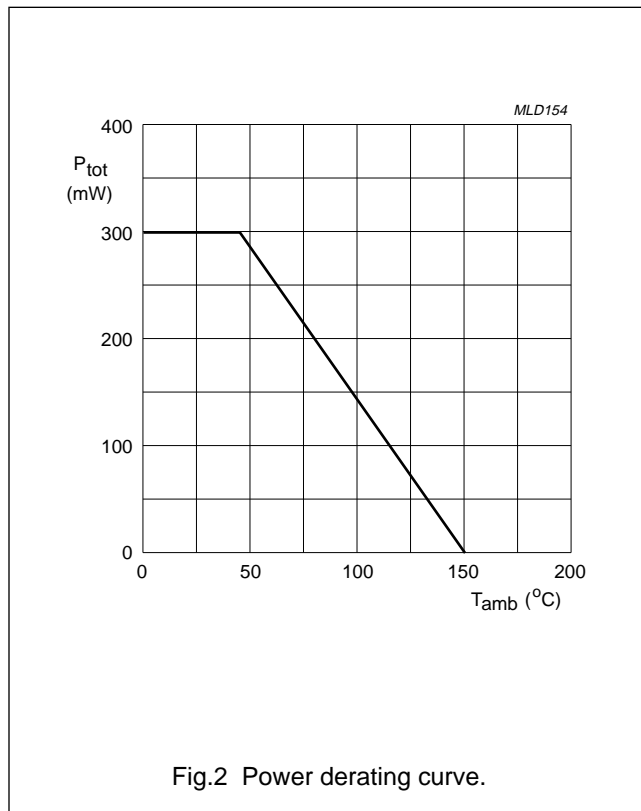
LIMITING VALUES

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
I_{G1}	gate 1 current		–	± 10	mA
I_{G2}	gate 2 current		–	± 10	mA
P_{tot}	total power dissipation	up to $T_{amb} = 45\text{ }^\circ\text{C}$; see Fig.2; note 1	–	300	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.



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THERMAL CHARACTERISTICS

SYMBOL	PARAMETER	CONDITIONS	VALUE	UNIT
$R_{th\ j-a}$	thermal resistance from junction to ambient	note 1	350	K/W
$R_{th\ j-s}$	thermal resistance from junction to soldering point	note 2; $T_s = 90\text{ }^\circ\text{C}$	200	K/W

Notes

1. Device mounted on a printed-circuit board.
2. T_s is the temperature at the soldering point of the source lead.

STATIC CHARACTERISTICS

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

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	UNIT
$V_{(BR)G1-SS}$	gate 1-source breakdown voltage	$V_{G2-S} = V_{DS} = 0$; $I_{G1-S} = 10\text{ mA}$	6	20	V
$V_{(BR)G2-SS}$	gate 2-source breakdown voltage	$V_{G1-S} = V_{DS} = 0$; $I_{G2-S} = 10\text{ mA}$	6	20	V
$V_{(P)G1-S}$	gate 1-source cut-off voltage	$V_{G2-S} = 4\text{ V}$; $V_{DS} = 8\text{ V}$; $I_D = 20\text{ }\mu\text{A}$	–	–2.5	V
$V_{(P)G2-S}$	gate 2-source cut-off voltage	$V_{G1-S} = 0$; $V_{DS} = 8\text{ V}$; $I_D = 20\text{ }\mu\text{A}$	–	–2	V
I_{DSS}	drain-source current	$V_{G2-S} = 4\text{ V}$; $V_{DS} = 8\text{ V}$; $V_{G1-S} = 0$	2	18	mA
I_{G1-SS}	gate 1 cut-off current	$V_{G2-S} = V_{DS} = 0$; $V_{G1-S} = 5\text{ V}$	–	50	nA
I_{G2-SS}	gate 2 cut-off current	$V_{G1-S} = V_{DS} = 0$; $V_{G2-S} = 5\text{ V}$	–	50	nA

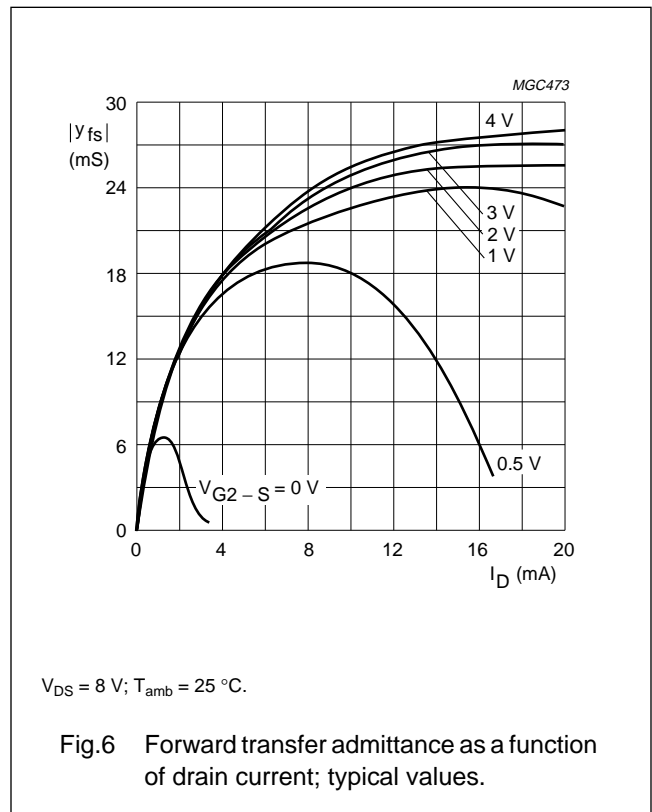
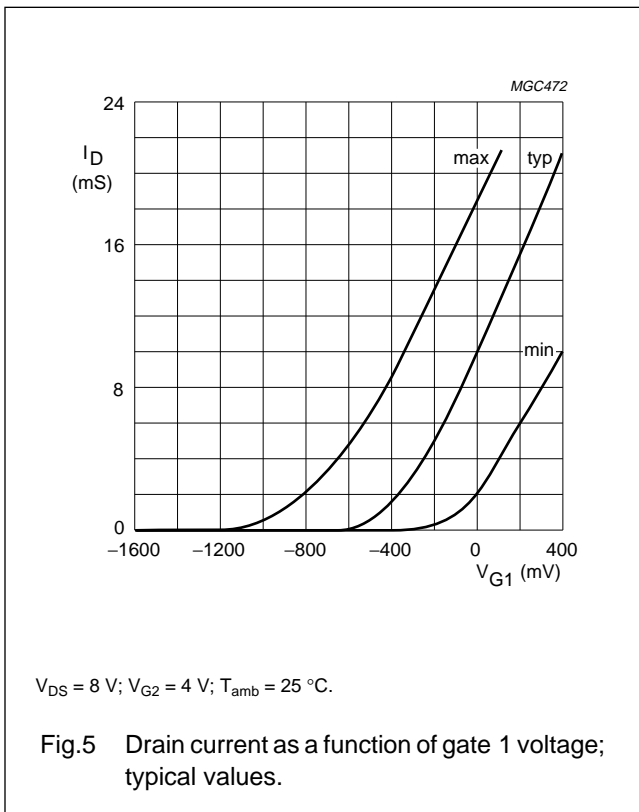
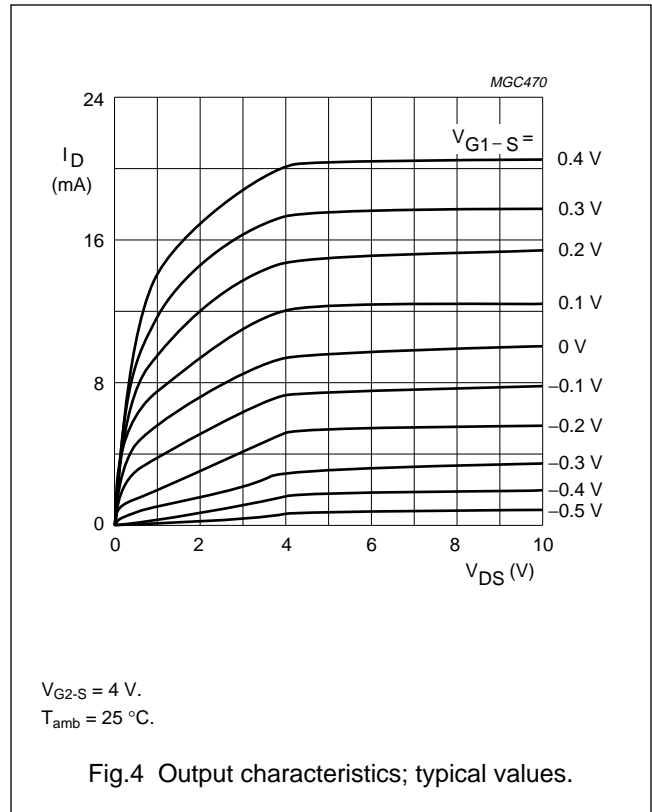
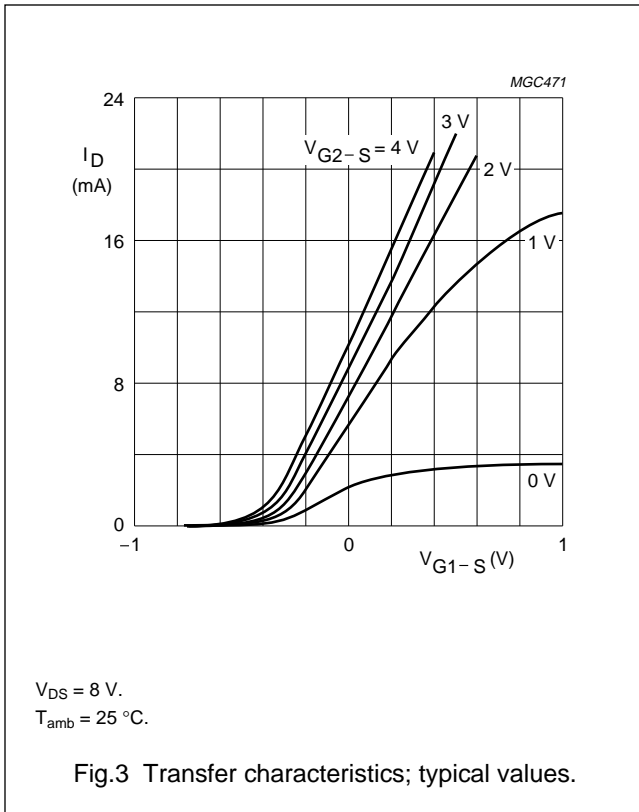
DYNAMIC CHARACTERISTICS

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

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
$ y_{fs} $	forward transfer admittance	pulsed; $T_j = 25\text{ }^\circ\text{C}$	22	25	–	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}	drain-source 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	–	dB

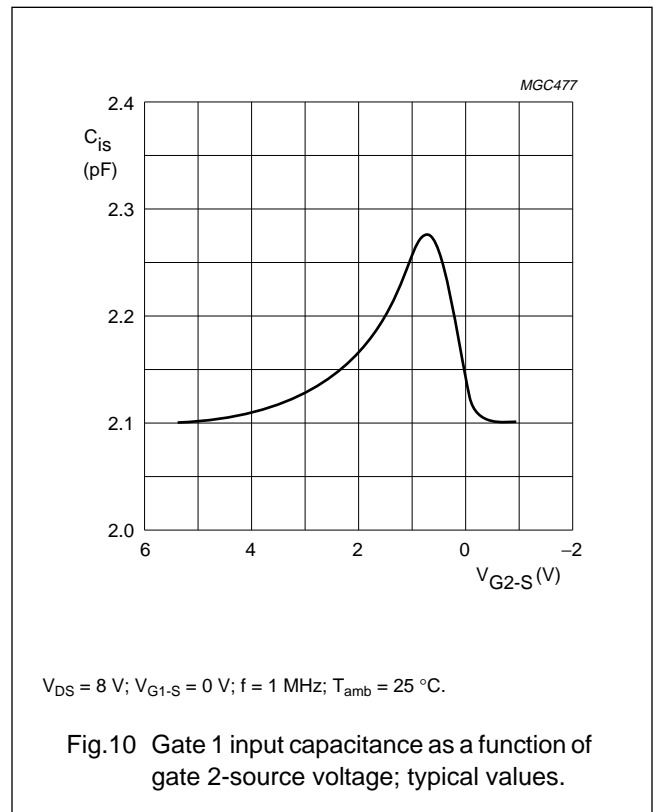
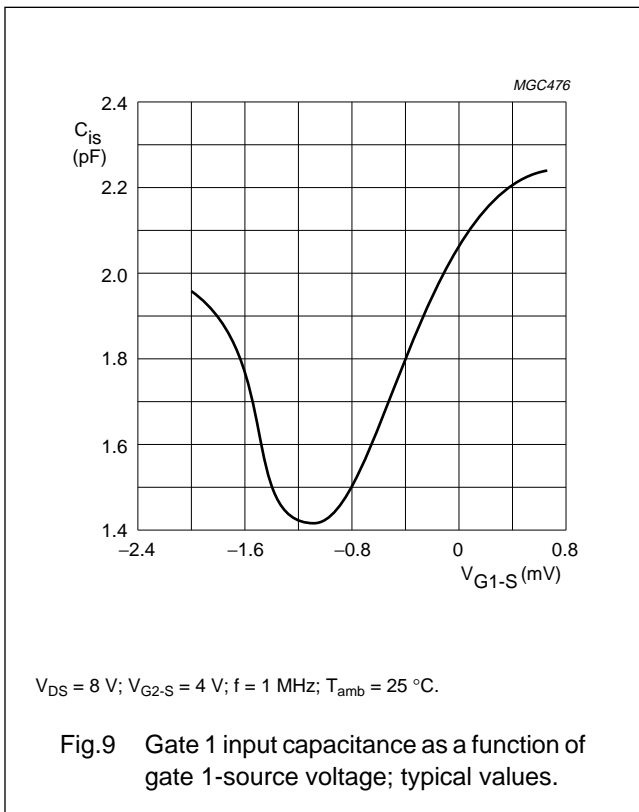
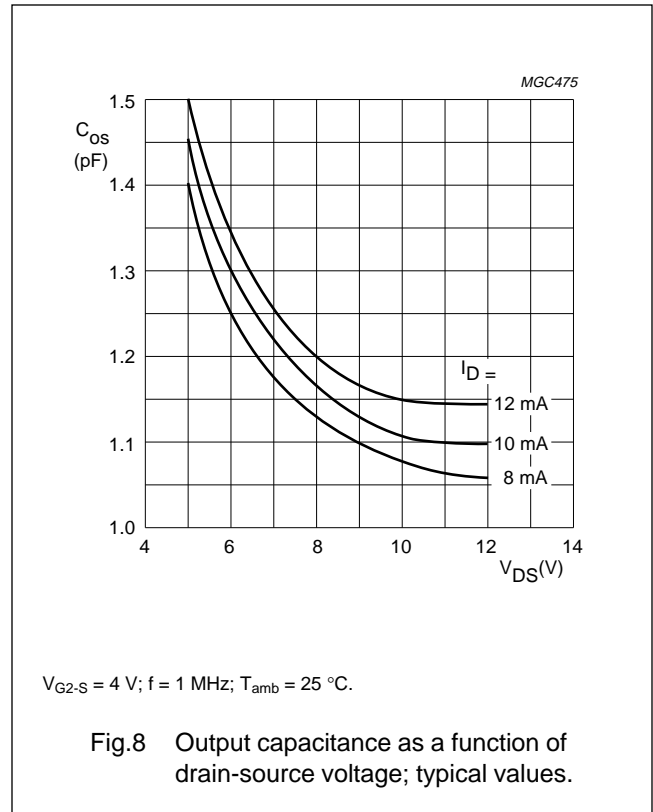
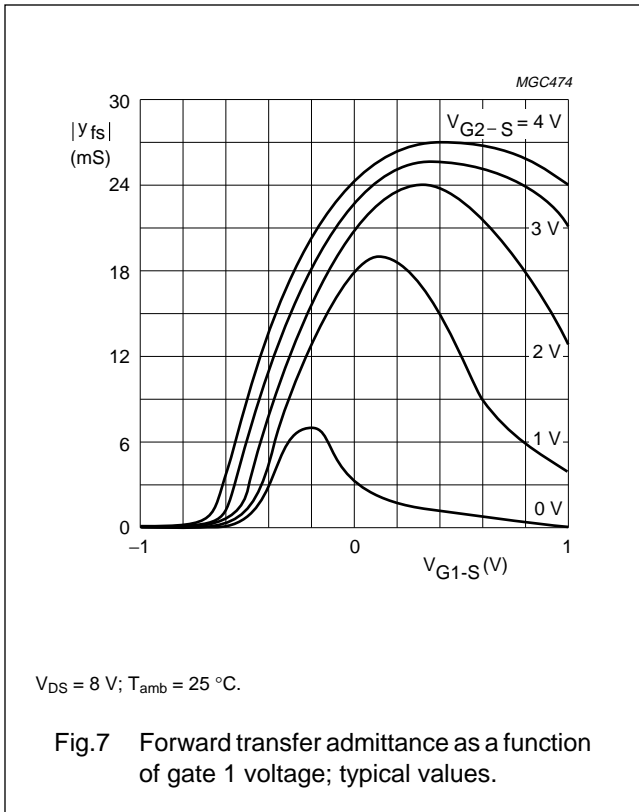
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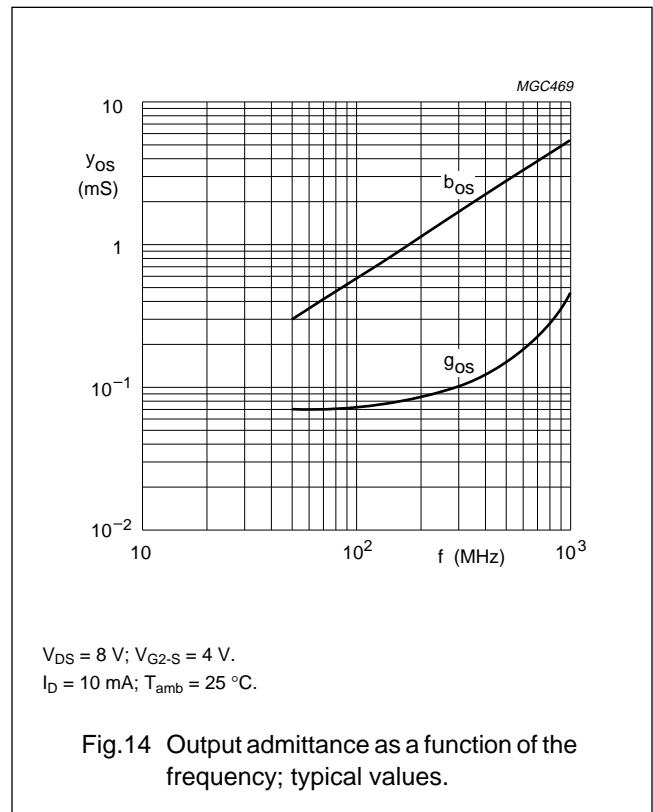
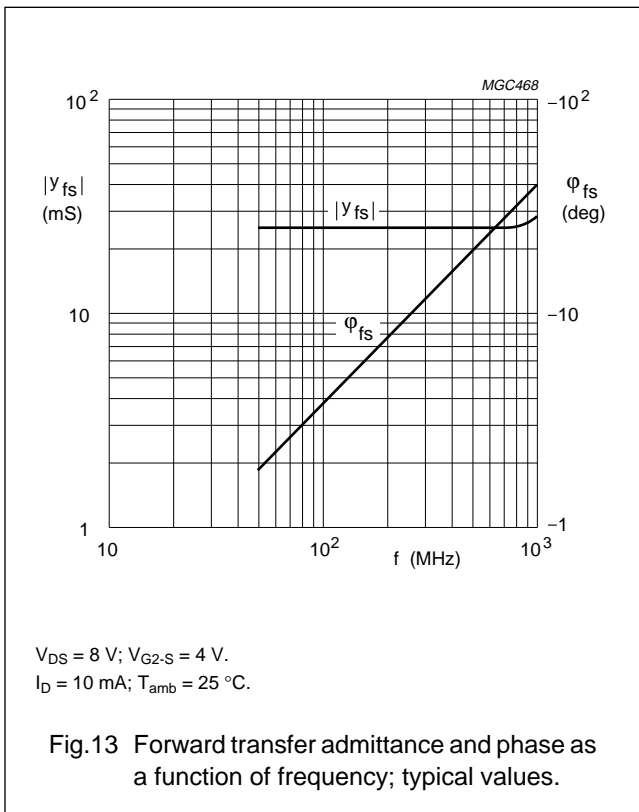
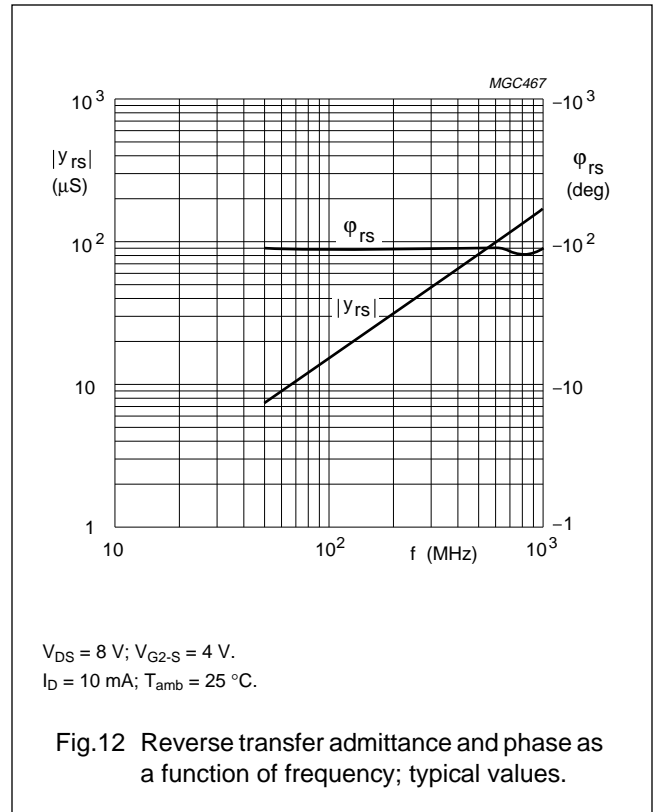
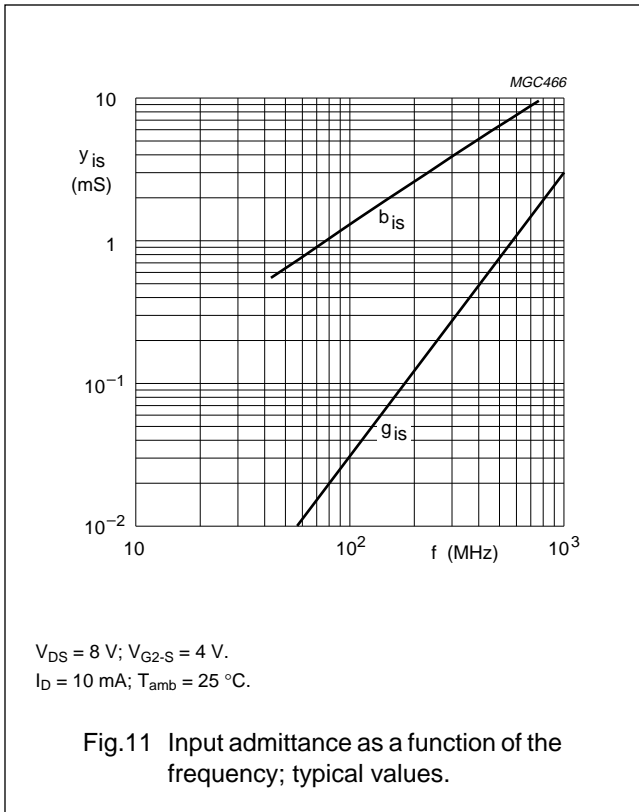
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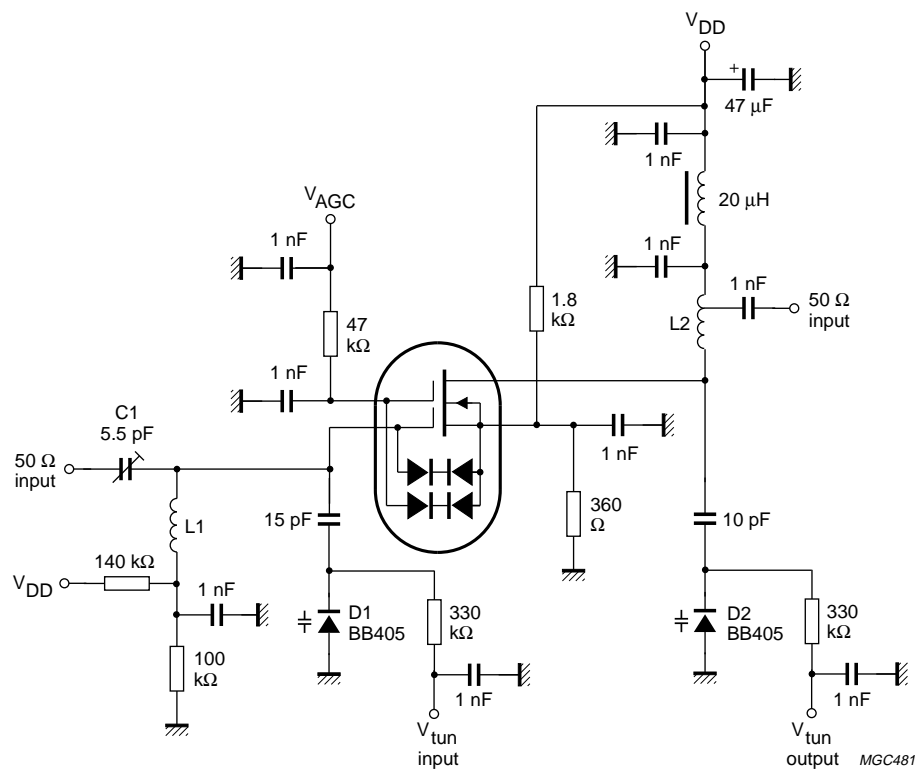
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$V_{DD} = 12 \text{ V}$; $G_S = 2 \text{ mS}$; $G_L = 0.5 \text{ mS}$.

$L1 = 45 \text{ nH}$; 4 turns 0.8 mm copper wire, internal diameter 4 mm.

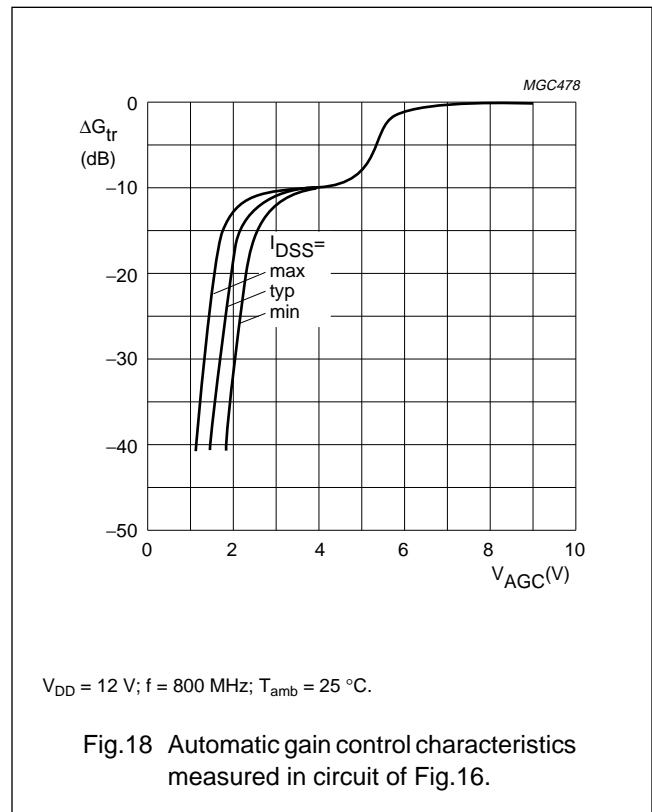
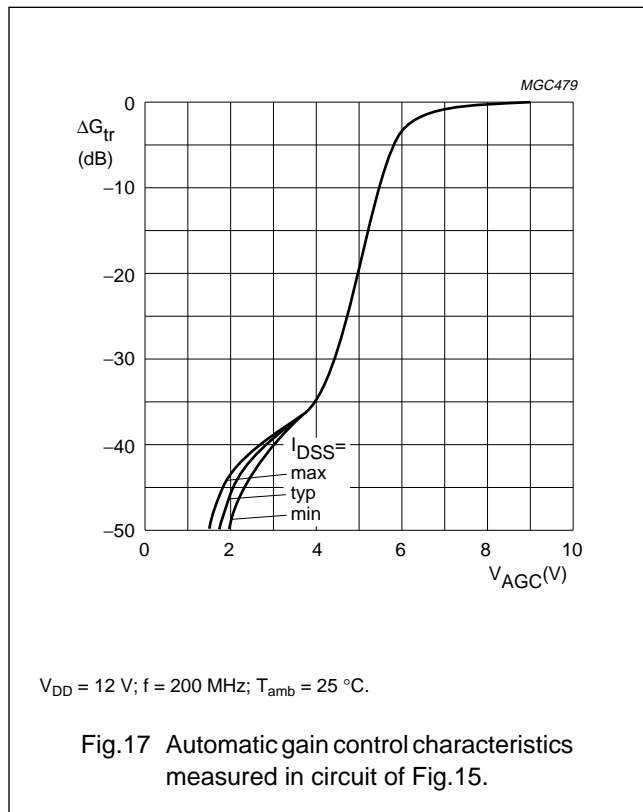
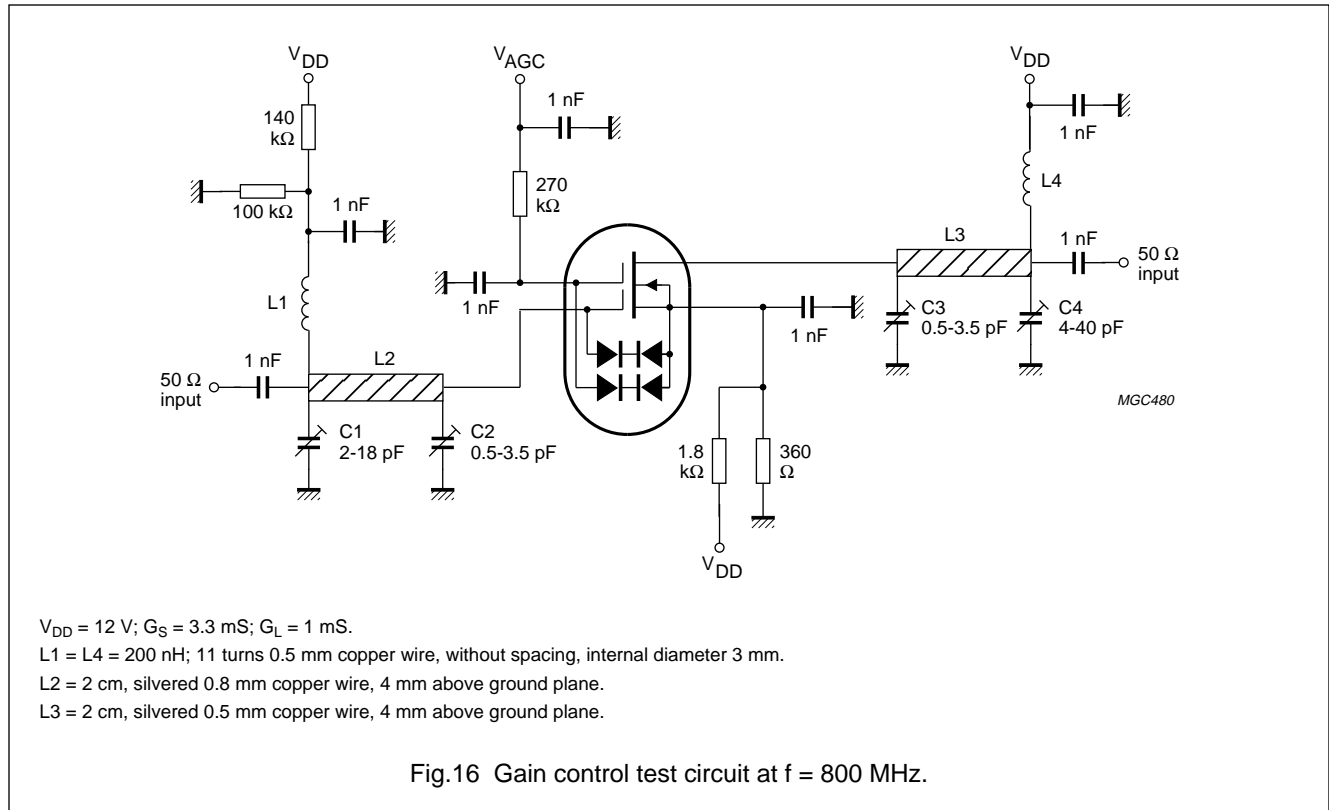
$L2 = 160 \text{ nH}$; 3 turns 0.8 mm copper wire, internal diameter 8 mm.

Tapped at approximately half a turn from the cold side, to adjust $G_L = 0.5 \text{ mS}$. $C1$ adjusted for $G_S = 2 \text{ mS}$.

Fig.15 Gain control testcircuit at $f = 200 \text{ MHz}$.

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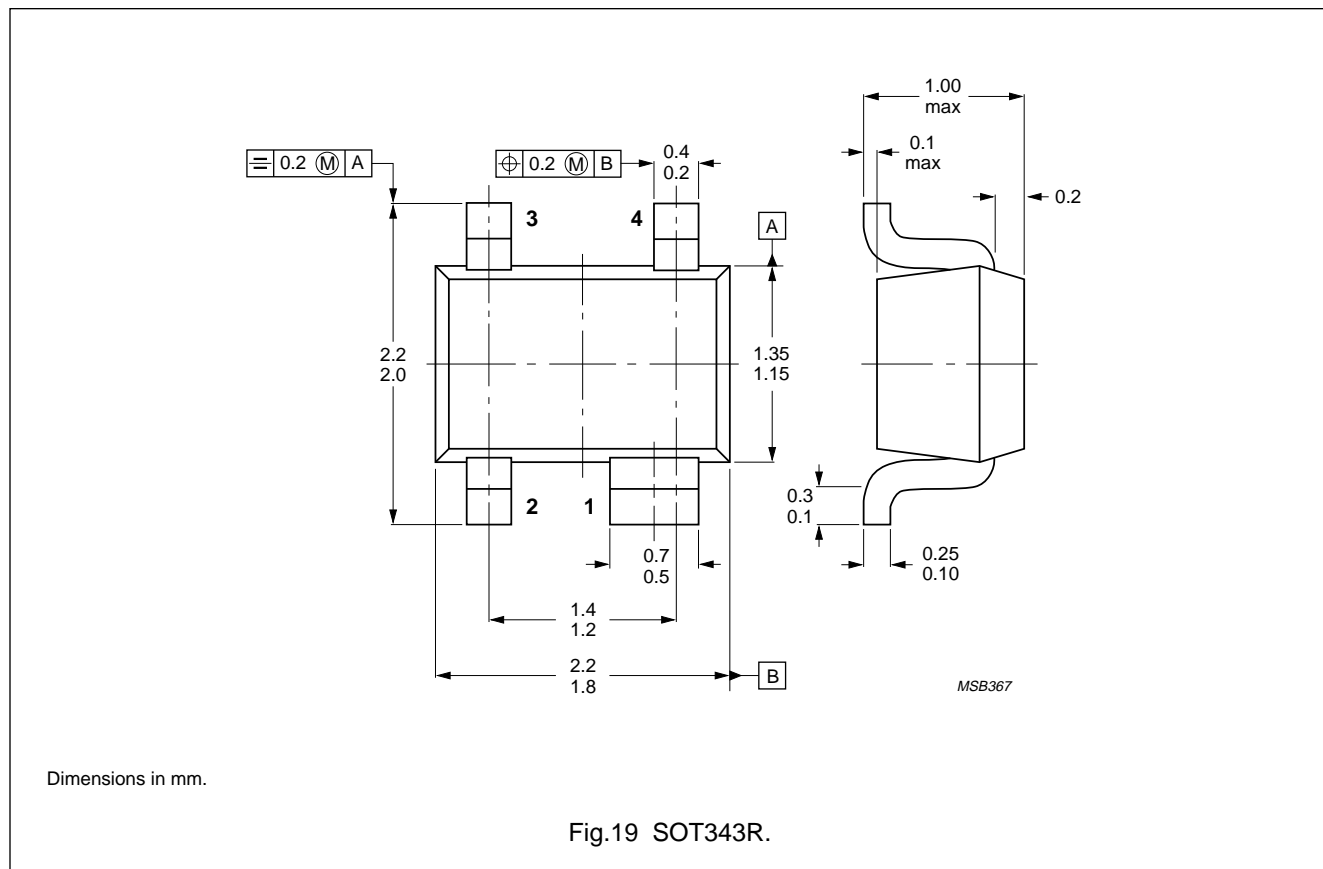
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PACKAGE OUTLINE



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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.	

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