

# DATA SHEET

## **BF1100WR** Dual-gate MOS-FET

Product specification

1995 Apr 25



# Dual-gate MOS-FET

# BF1100WR

### FEATURES

- Specially designed for use at 9 to 12 V supply voltage
- Short channel transistor with high forward transfer admittance to input capacitance ratio
- Low noise gain controlled amplifier up to 1 GHz
- Superior cross-modulation performance during AGC.

### APPLICATIONS

- VHF and UHF applications such as television tuners and professional communications equipment.

### DESCRIPTION

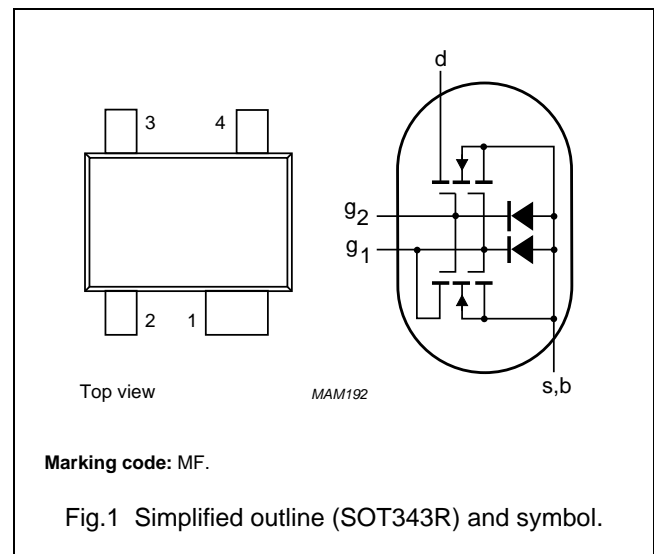
Enhancement type field-effect transistor in a plastic microminiature SOT343R package. The transistor consists of an amplifier MOS-FET with source and substrate interconnected and an internal bias circuit to ensure good cross-modulation performance during AGC.

### 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	MIN.	TYP.	MAX.	UNIT
V <sub>DS</sub>	drain-source voltage		–	–	14	V
I <sub>D</sub>	drain current		–	–	30	mA
P <sub>tot</sub>	total power dissipation		–	–	280	mW
T <sub>j</sub>	operating junction temperature		–	–	150	°C
y <sub>fs</sub>	forward transfer admittance		24	28	33	mS
C <sub>ig1-s</sub>	input capacitance at gate 1		–	2.2	2.6	pF
C <sub>rs</sub>	reverse transfer capacitance	f = 1 MHz	–	25	35	fF
F	noise figure	f = 800 MHz	–	2	–	dB

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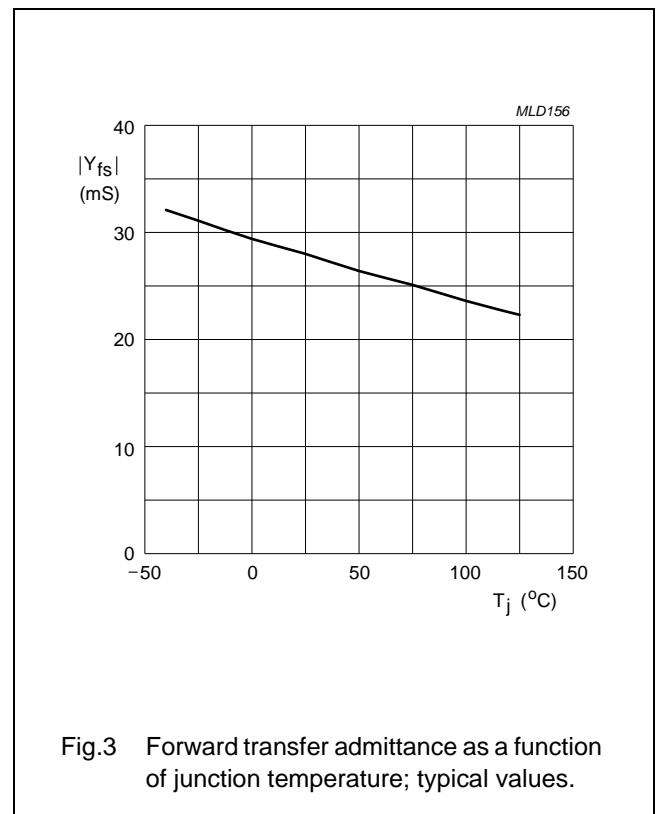
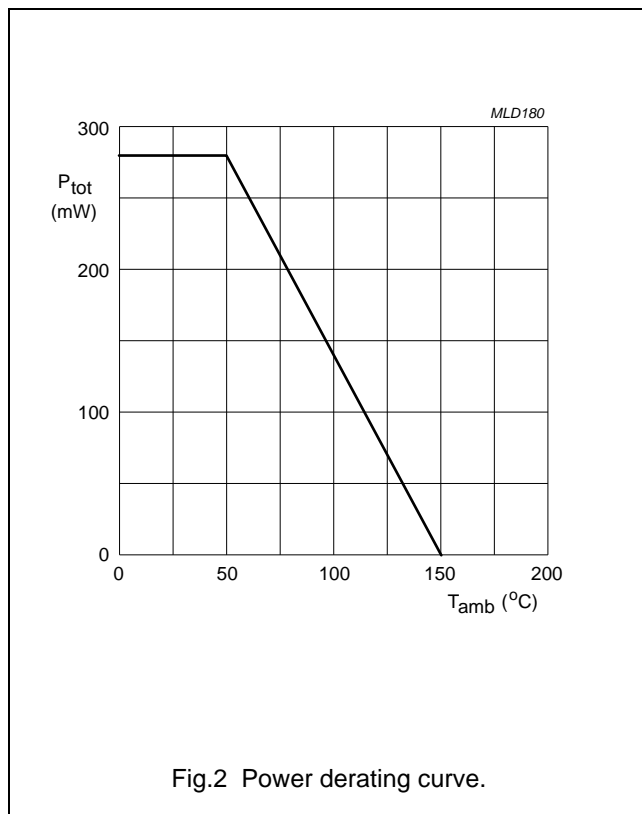
### LIMITING VALUES

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

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	UNIT
$V_{DS}$	drain-source voltage		–	14	V
$I_D$	drain current		–	30	mA
$I_{G1}$	gate 1 current		–	$\pm 10$	mA
$I_{G2}$	gate 2 current		–	$\pm 10$	mA
$P_{tot}$	total power dissipation	see Fig.2; up to $T_{amb} = 50\text{ }^\circ\text{C}$ ; note 1	–	280	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	$T_s = 91\text{ °C}$ ; note 2	210	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

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

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	UNIT
$V_{(BR)G1-SS}$	gate 1-source breakdown voltage	$V_{G2-S} = V_{DS} = 0$ ; $I_{G1-S} = 1\text{ mA}$	13.2	20	V
$V_{(BR)G2-SS}$	gate 2-source breakdown voltage	$V_{G1-S} = V_{DS} = 0$ ; $I_{G2-S} = 1\text{ mA}$	13.2	20	V
$V_{(F)S-G1}$	forward source-gate 1 voltage	$V_{G2-S} = V_{DS} = 0$ ; $I_{S-G1} = 10\text{ mA}$	0.5	1.5	V
$V_{(F)S-G2}$	forward source-gate 2 voltage	$V_{G1-S} = V_{DS} = 0$ ; $I_{S-G2} = 10\text{ mA}$	0.5	1.5	V
$V_{G1-S(th)}$	gate 1-source threshold voltage	$V_{G2-S} = 4\text{ V}$ ; $V_{DS} = 9\text{ V}$ ; $I_D = 20\text{ }\mu\text{A}$	0.3	1	V
		$V_{G2-S} = 4\text{ V}$ ; $V_{DS} = 12\text{ V}$ ; $I_D = 20\text{ }\mu\text{A}$	0.3	1	V
$V_{G2-S(th)}$	gate 2-source threshold voltage	$V_{G1-S} = 4\text{ V}$ ; $V_{DS} = 9\text{ V}$ ; $I_D = 20\text{ }\mu\text{A}$	0.3	1.2	V
		$V_{G1-S} = 4\text{ V}$ ; $V_{DS} = 12\text{ V}$ ; $I_D = 20\text{ }\mu\text{A}$	0.3	1.2	V
$I_{DSX}$	drain-source current	$V_{G2-S} = 4\text{ V}$ ; $V_{DS} = 9\text{ V}$ ; $R_{G1} = 180\text{ k}\Omega$ ; note 1	8	13	mA
		$V_{G2-S} = 4\text{ V}$ ; $V_{DS} = 12\text{ V}$ ; $R_{G1} = 250\text{ k}\Omega$ ; note 2	8	13	mA
$I_{G1-SS}$	gate 1 cut-off current	$V_{G2-S} = V_{DS} = 0$ ; $V_{G1-S} = 12\text{ V}$	–	50	nA
$I_{G2-SS}$	gate 2 cut-off current	$V_{G1-S} = V_{DS} = 0$ ; $V_{G2-S} = 12\text{ V}$	–	50	nA

## Notes

1.  $R_{G1}$  connects gate 1 to  $V_{GG} = 9\text{ V}$ ; see Fig.26.
2.  $R_{G1}$  connects gate 1 to  $V_{GG} = 12\text{ V}$ ; see Fig.26.

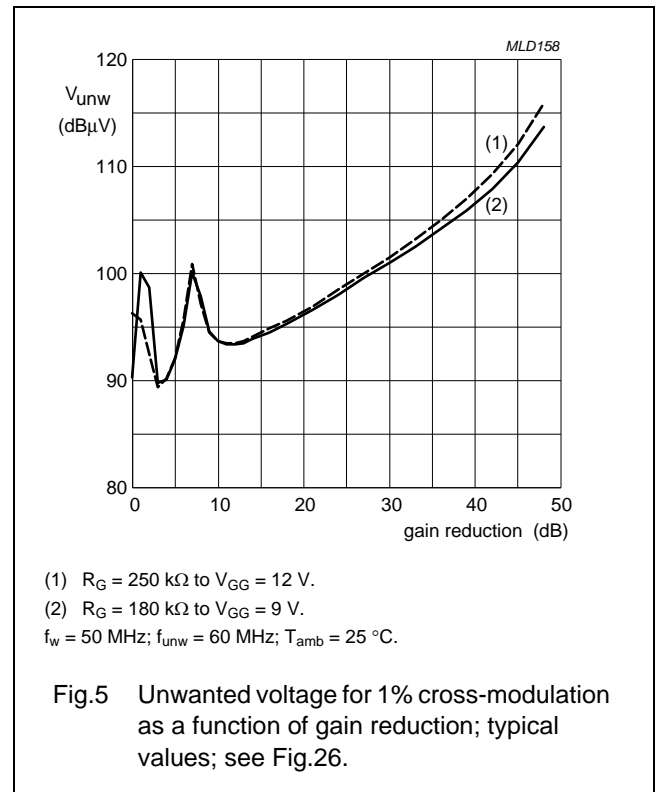
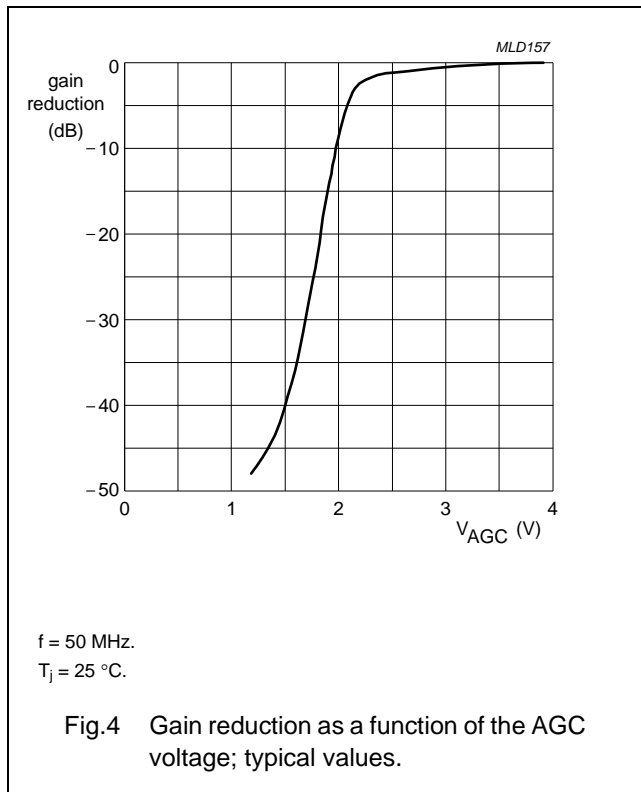
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**DYNAMIC CHARACTERISTICS**

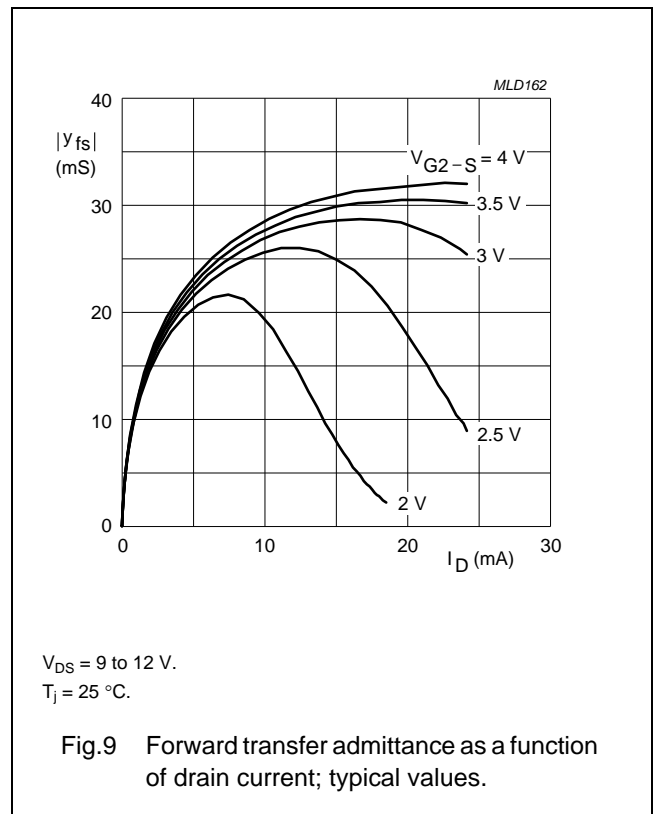
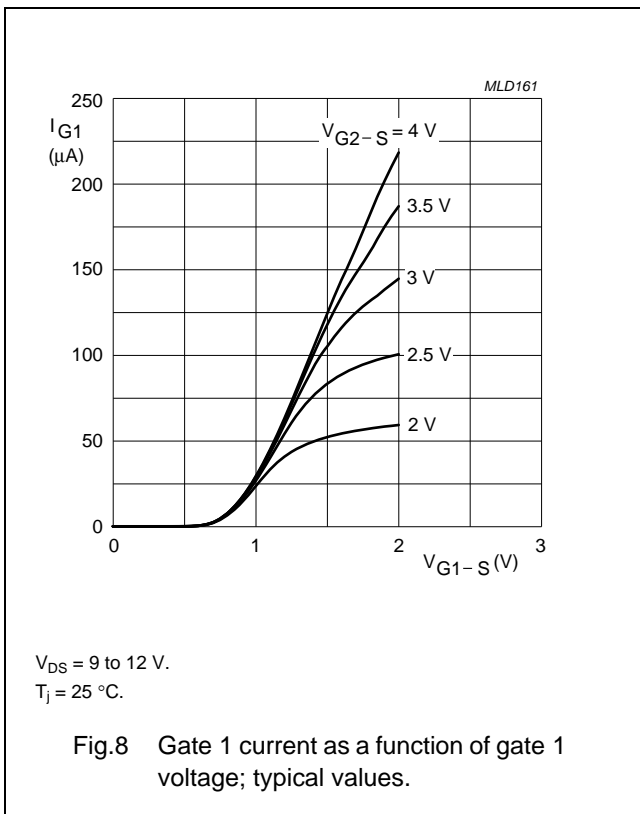
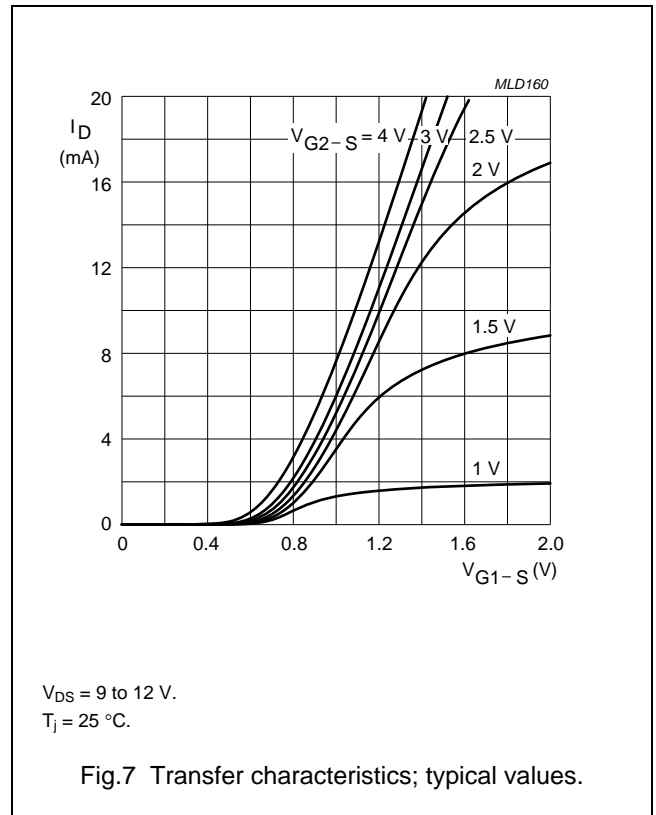
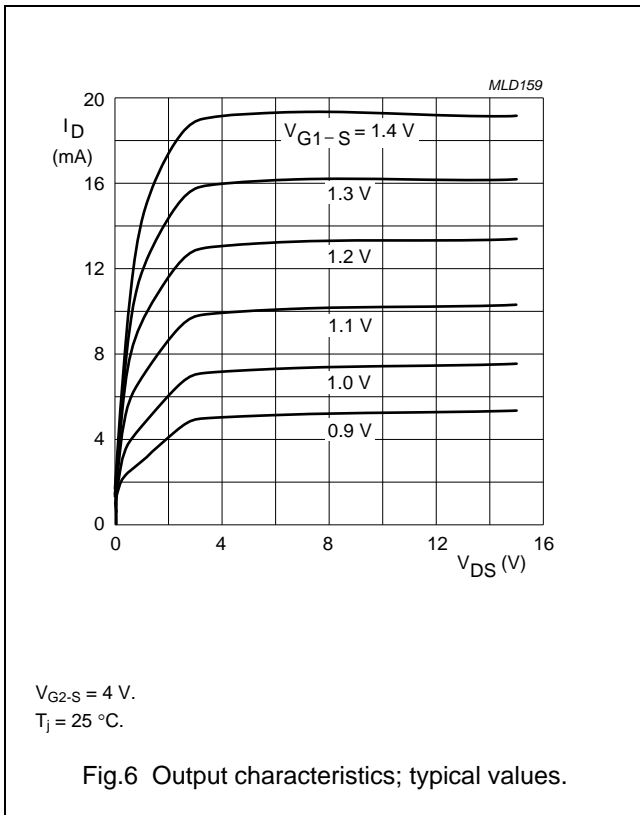
Common source;  $T_{amb} = 25\text{ }^{\circ}\text{C}$ ;  $V_{G2-S} = 4\text{ V}$ ;  $I_D = 10\text{ mA}$ ; unless otherwise specified.

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
$ y_{fs} $	forward transfer admittance	pulsed; $T_j = 25\text{ }^{\circ}\text{C}$ $V_{DS} = 9\text{ V}$	24	28	33	mS
		$V_{DS} = 12\text{ V}$	24	28	33	mS
$C_{ig1-s}$	input capacitance at gate 1	$f = 1\text{ MHz}$ $V_{DS} = 9\text{ V}$	–	2.2	2.6	pF
		$V_{DS} = 12\text{ V}$	–	2.2	2.6	pF
$C_{ig2-s}$	input capacitance at gate 2	$f = 1\text{ MHz}$ $V_{DS} = 9\text{ V}$	–	1.6	–	pF
		$V_{DS} = 12\text{ V}$	–	1.4	–	pF
$C_{os}$	drain-source capacitance	$f = 1\text{ MHz}$ $V_{DS} = 9\text{ V}$	–	1.4	1.8	pF
		$V_{DS} = 12\text{ V}$	–	1.1	1.5	pF
$C_{rs}$	reverse transfer capacitance	$f = 1\text{ MHz}$ $V_{DS} = 9\text{ V}$	–	25	35	fF
		$V_{DS} = 12\text{ V}$	–	25	35	fF
F	noise figure	$f = 800\text{ MHz}$ ; $G_S = G_{Sopt}$ ; $B_S = B_{Sopt}$ $V_{DS} = 9\text{ V}$	–	2	2.8	dB
		$V_{DS} = 12\text{ V}$	–	2	2.8	dB



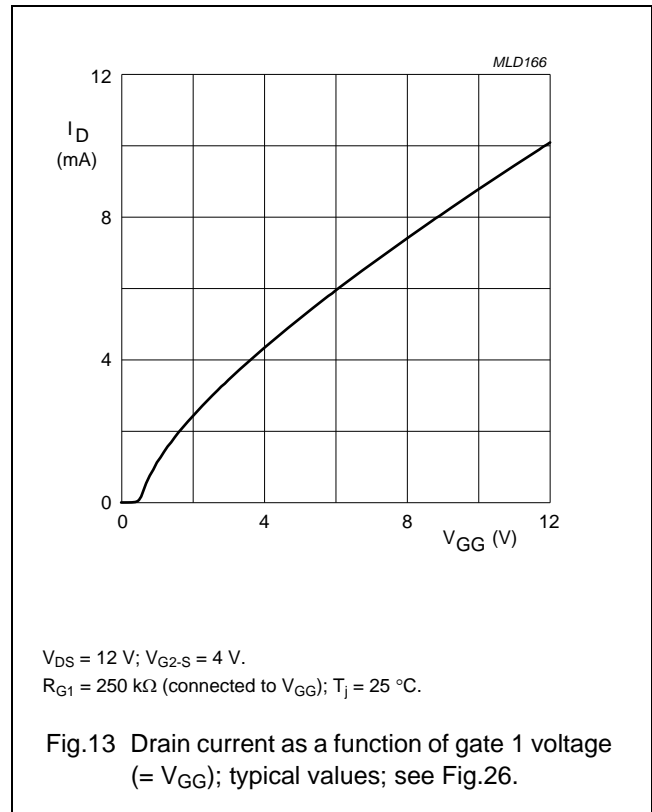
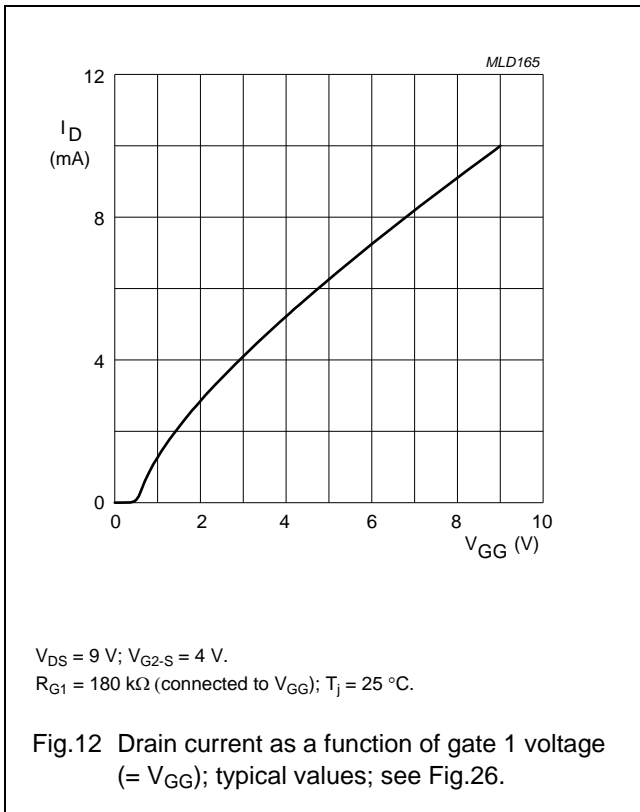
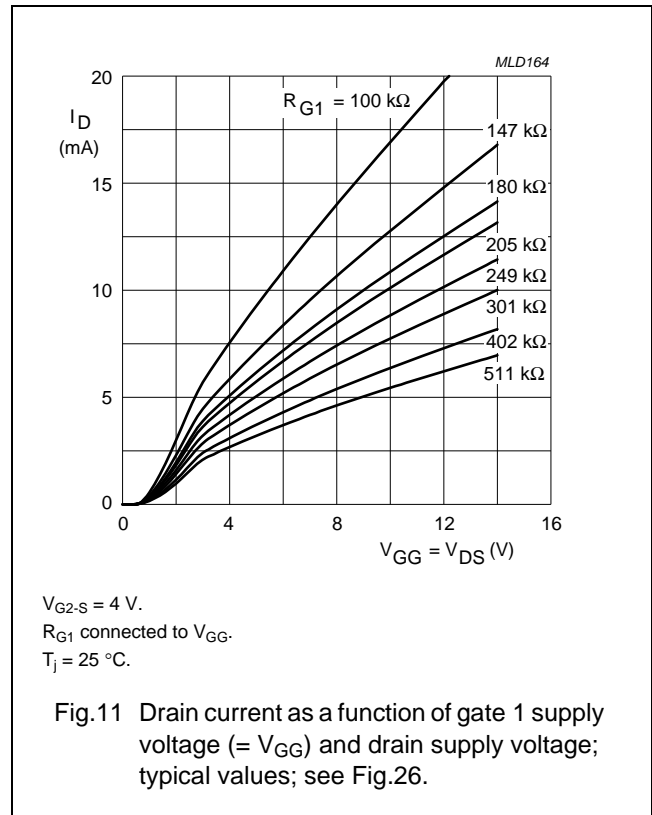
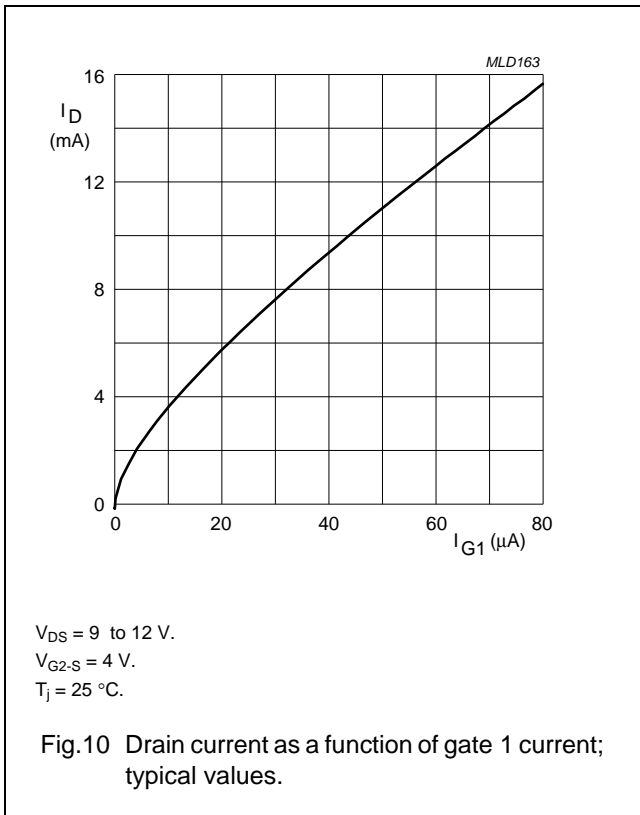
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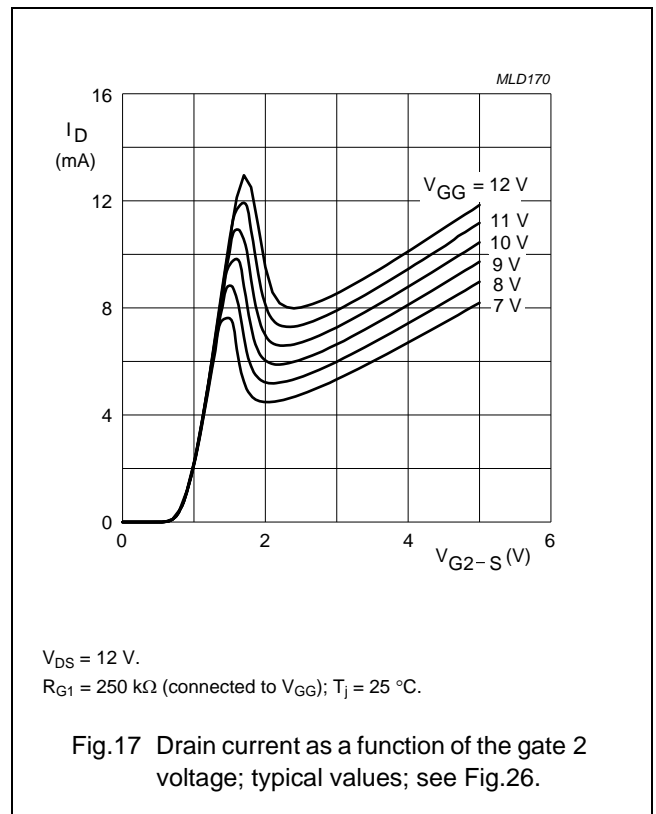
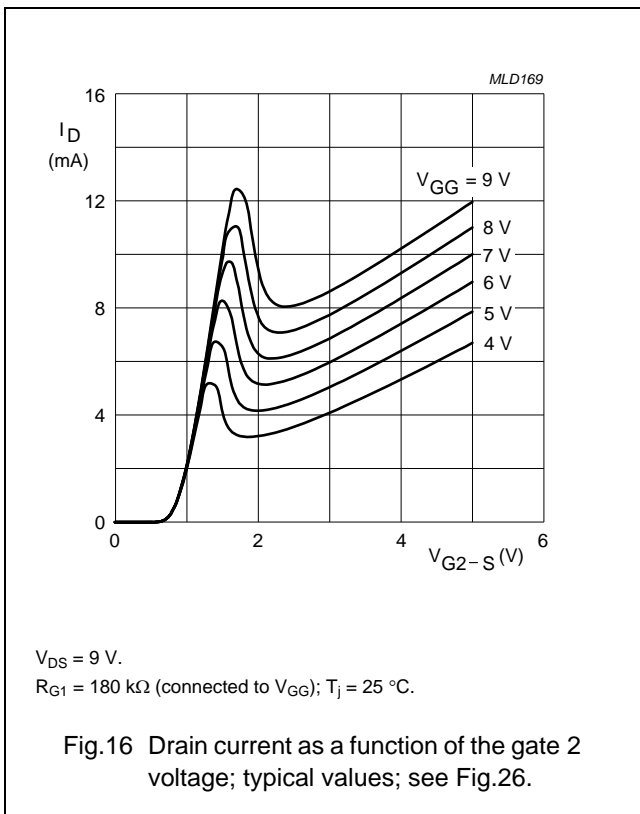
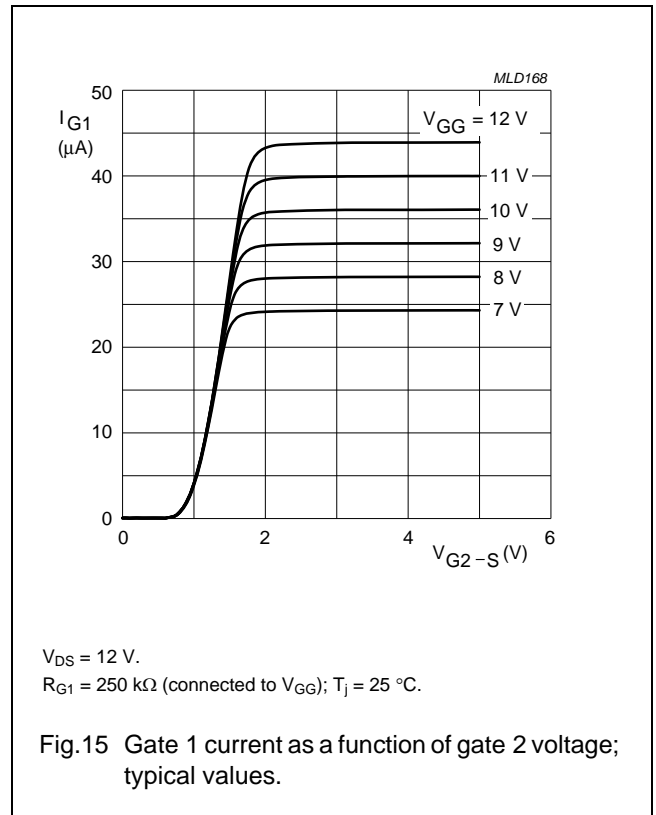
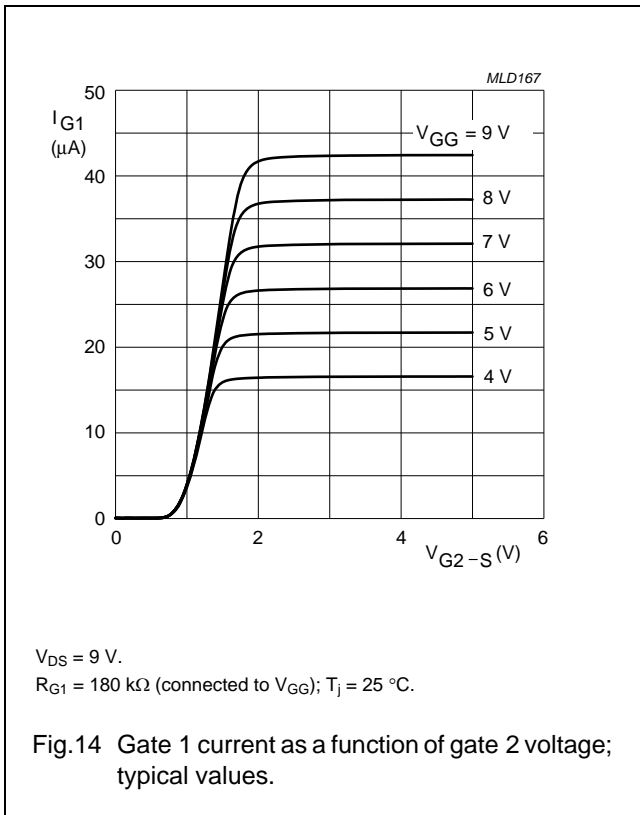
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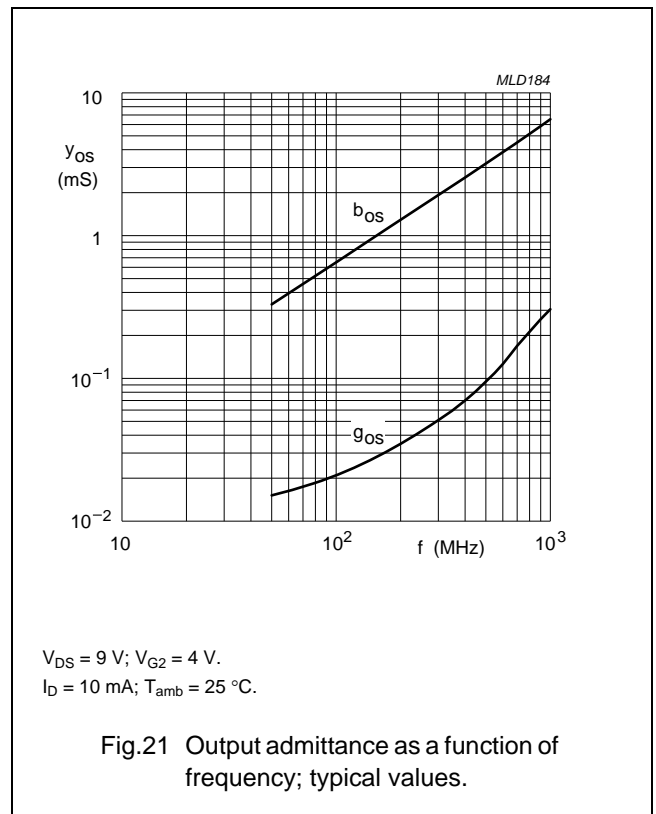
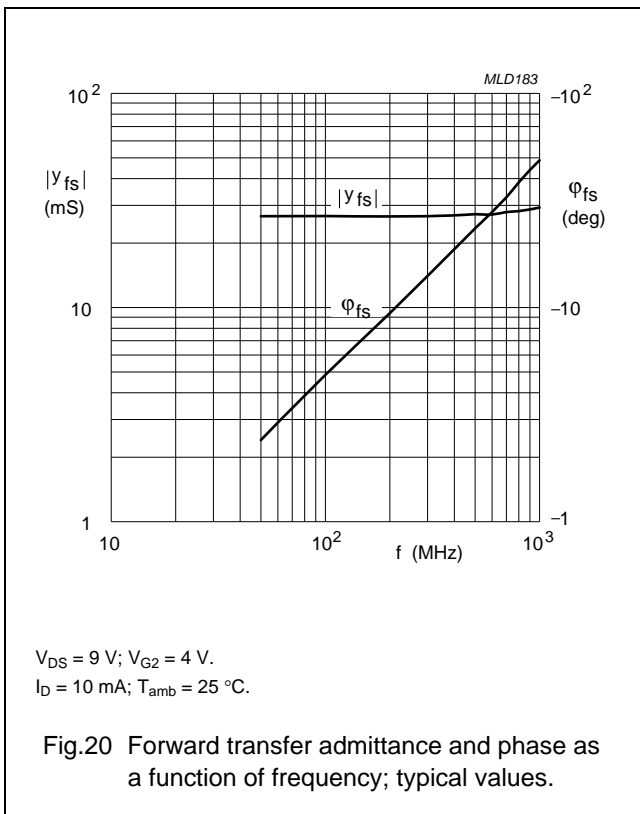
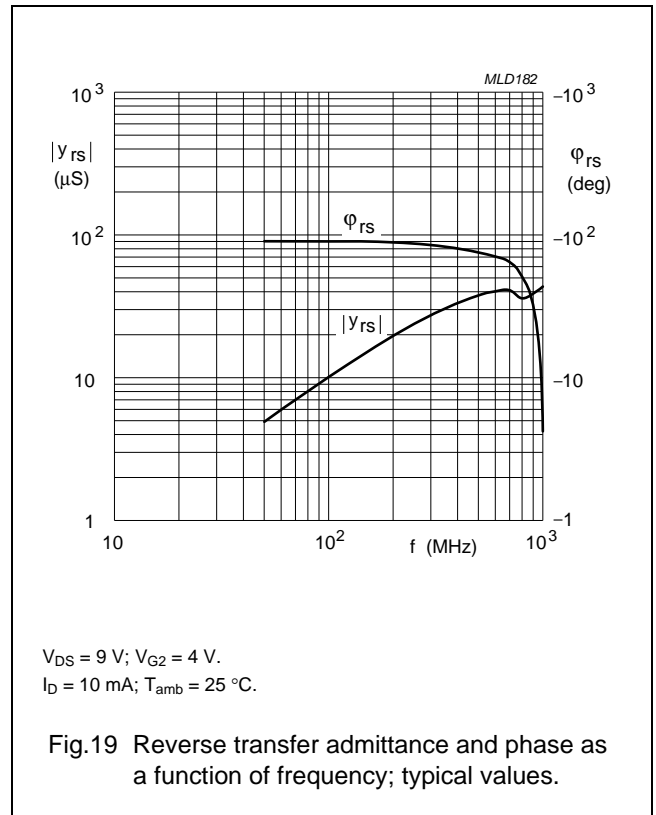
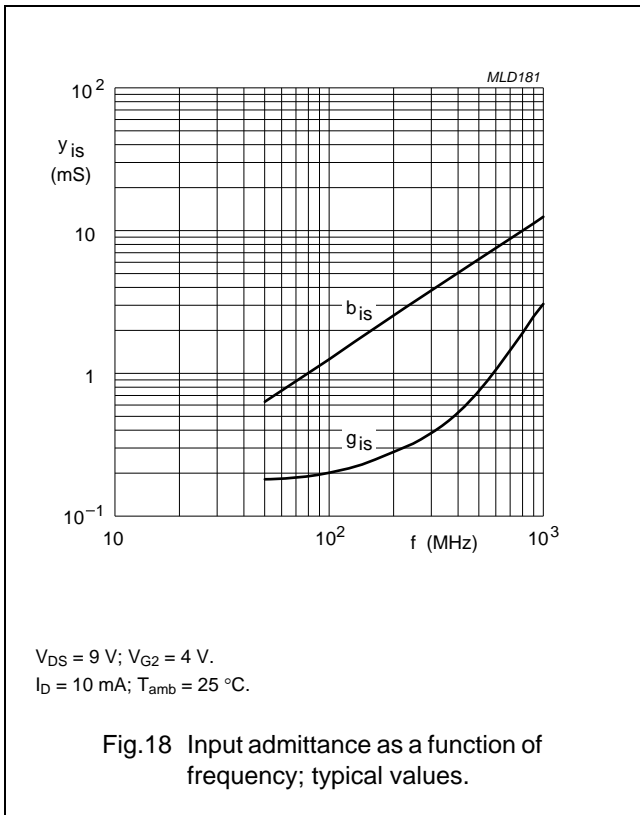
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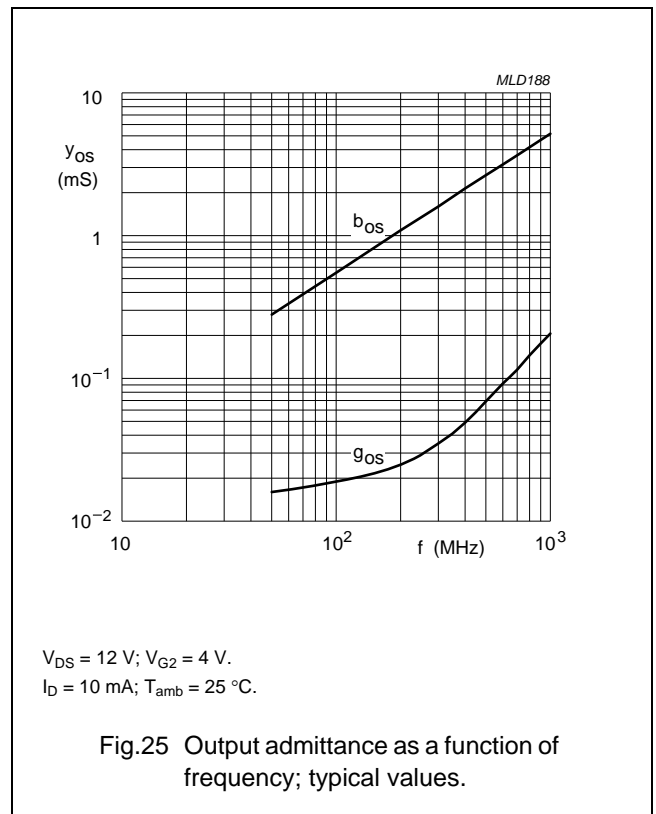
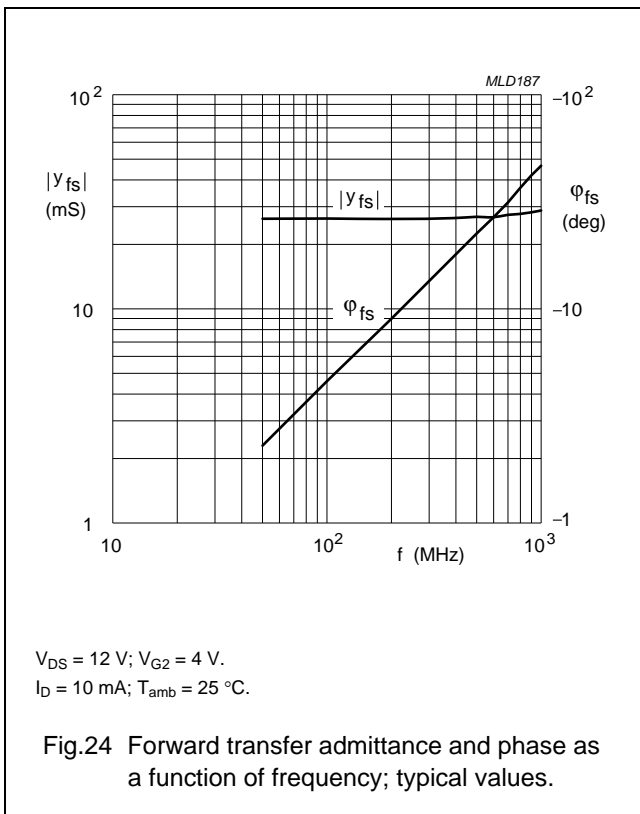
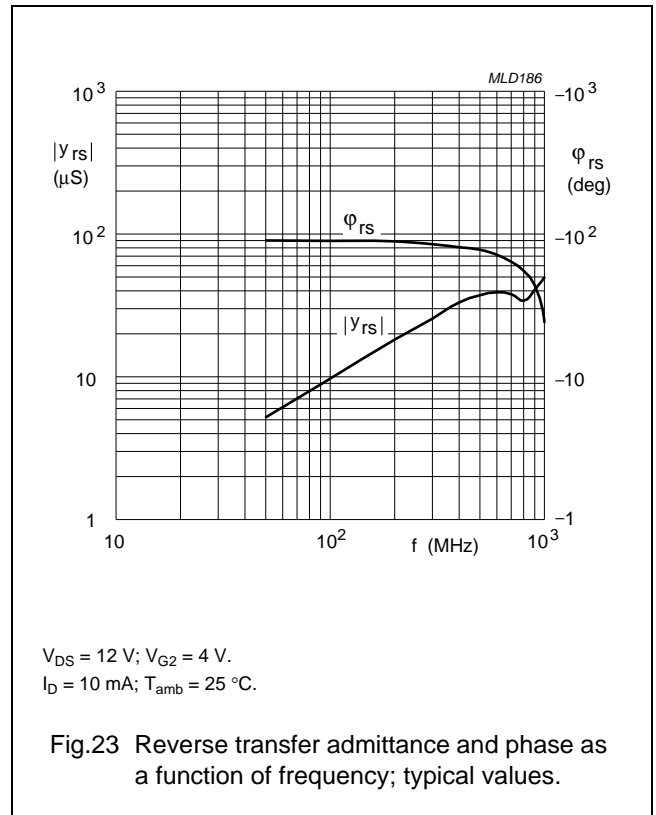
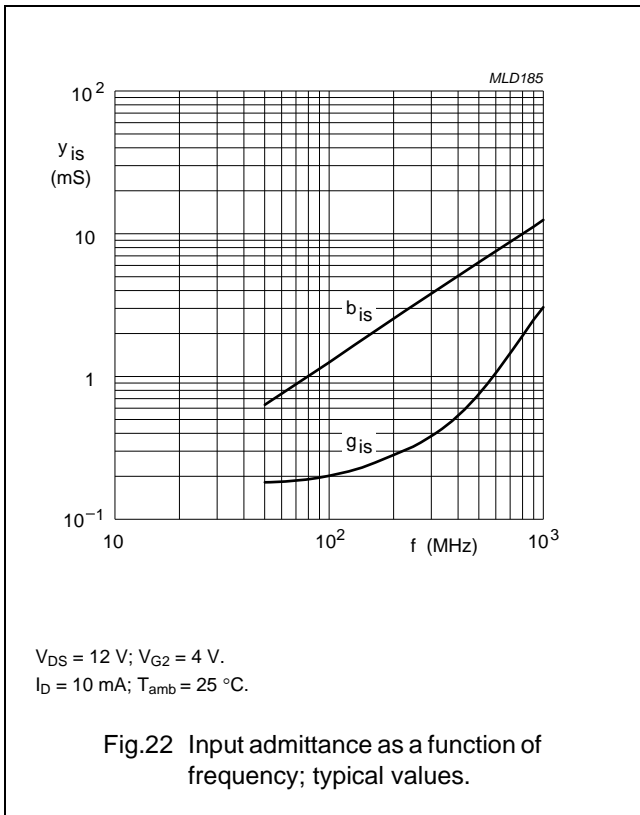
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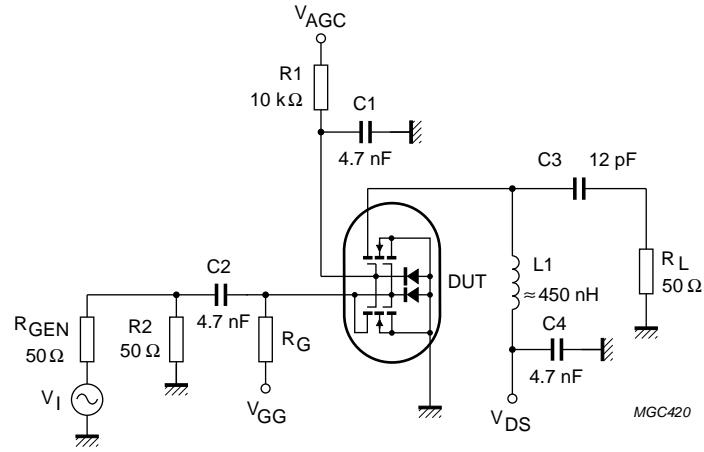
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For  $V_{GG} = V_{DS} = 9\text{ V}$ ,  $R_G = 180\text{ k}\Omega$ .  
For  $V_{GG} = V_{DS} = 12\text{ V}$ ,  $R_G = 250\text{ k}\Omega$ .

Fig.26 Cross-modulation test circuit.

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**Table 1** Scattering parameters:  $V_{DS} = 9\text{ V}$ ;  $V_{G2-S} = 4\text{ V}$ ;  $I_D = 10\text{ mA}$

f (MHz)	S <sub>11</sub>		S <sub>21</sub>		S <sub>12</sub>		S <sub>22</sub>	
	MAGNITUDE (ratio)	ANGLE (deg)	MAGNITUDE (ratio)	ANGLE (deg)	MAGNITUDE (ratio)	ANGLE (deg)	MAGNITUDE (ratio)	ANGLE (deg)
50	0.985	-3.9	2.618	175.1	0.001	137.9	1.000	-1.9
100	0.981	-7.3	2.602	170.5	0.001	80.4	0.999	-4.0
200	0.975	-14.4	2.577	160.7	0.002	74.0	0.995	-7.6
300	0.965	-21.6	2.555	151.6	0.002	79.3	0.994	-11.3
400	0.947	-28.3	2.513	141.8	0.003	80.5	0.992	-15.0
500	0.927	-34.9	2.449	133.4	0.003	82.8	0.988	-18.5
600	0.913	-41.7	2.339	124.6	0.003	78.9	0.984	-22.0
700	0.890	-47.9	2.361	115.4	0.003	80.6	0.982	-25.3
800	0.869	-54.0	2.302	106.4	0.003	93.9	0.979	-28.8
900	0.845	-59.7	2.228	97.6	0.003	104.8	0.976	-32.1
1000	0.823	-65.4	2.167	89.6	0.003	129.3	0.974	-35.5

**Table 2** Noise data:  $V_{DS} = 9\text{ V}$ ;  $V_{G2-S} = 4\text{ V}$ ;  $I_D = 10\text{ mA}$

f (MHz)	F <sub>min</sub> (dB)	Γ <sub>opt</sub>		r <sub>n</sub>
		(ratio)	(deg)	
800	2.00	0.67	43.9	0.89

**Table 3** Scattering parameters:  $V_{DS} = 12\text{ V}$ ;  $V_{G2-S} = 4\text{ V}$ ;  $I_D = 10\text{ mA}$

f (MHz)	S <sub>11</sub>		S <sub>21</sub>		S <sub>12</sub>		S <sub>22</sub>	
	MAGNITUDE (ratio)	ANGLE (deg)	MAGNITUDE (ratio)	ANGLE (deg)	MAGNITUDE (ratio)	ANGLE (deg)	MAGNITUDE (ratio)	ANGLE (deg)
50	0.985	-3.7	2.576	175.3	0.000	125.0	1.000	-1.6
100	0.980	-7.4	2.563	170.9	0.001	111.2	1.000	-3.3
200	0.973	-14.6	2.541	161.6	0.002	83.0	0.997	-6.4
300	0.962	-21.5	2.519	152.9	0.002	85.2	0.996	-9.3
400	0.946	-28.5	2.479	143.5	0.003	79.4	0.995	-12.4
500	0.929	-35.0	2.419	135.5	0.003	78.2	0.991	-15.3
600	0.912	-41.6	2.373	127.2	0.003	80.0	0.989	-18.1
700	0.895	-47.8	2.336	118.7	0.003	83.4	0.987	-20.9
800	0.868	-53.8	2.284	110.0	0.003	91.3	0.985	-23.7
900	0.845	-59.8	2.213	101.6	0.003	95.9	0.983	-26.5
1000	0.823	-65.7	2.160	94.1	0.003	112.2	0.981	-29.3

**Table 4** Noise data:  $V_{DS} = 12\text{ V}$ ;  $V_{G2-S} = 4\text{ V}$ ;  $I_D = 10\text{ mA}$

f (MHz)	F <sub>min</sub> (dB)	Γ <sub>opt</sub>		r <sub>n</sub>
		(ratio)	(deg)	
800	2.00	0.66	43.3	0.97

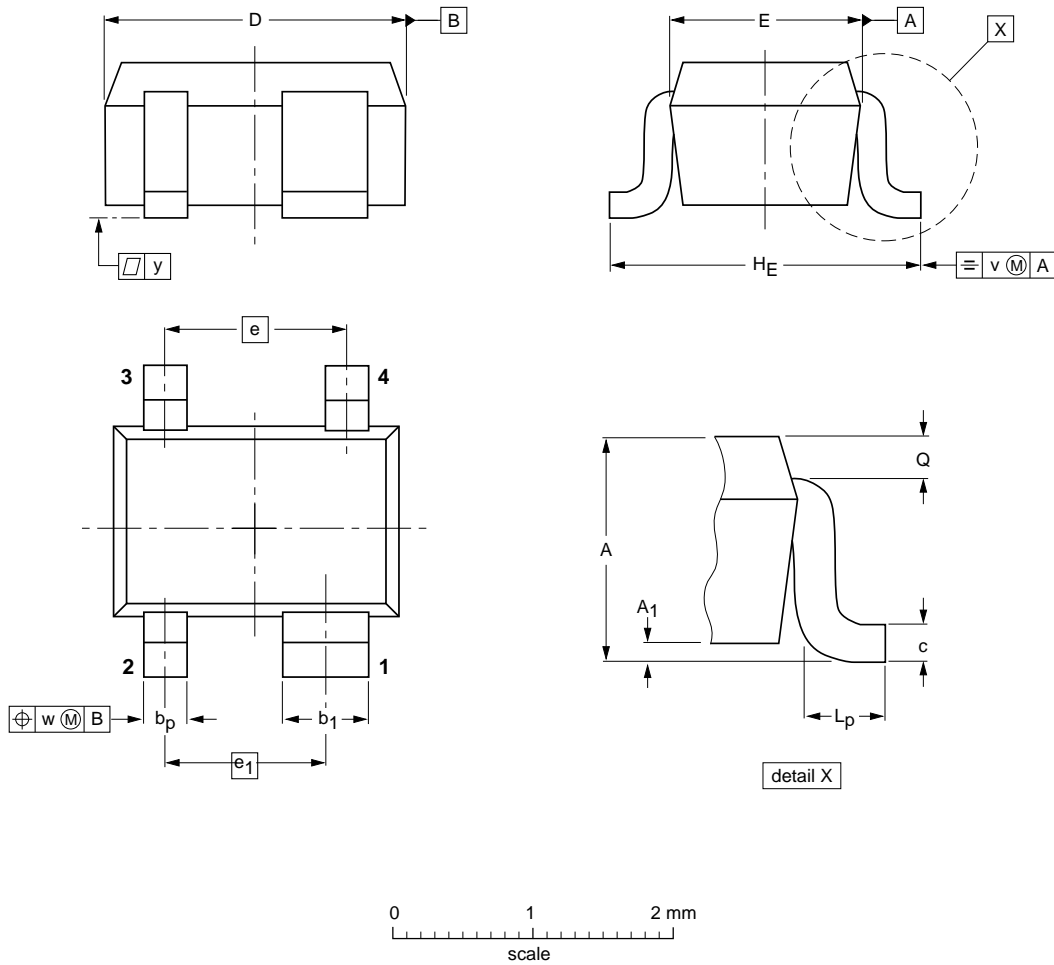
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PACKAGE OUTLINE

Plastic surface-mounted package; reverse pinning; 4 leads

SOT343R



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 0.8	0.1	0.4 0.3	0.7 0.5	0.25 0.10	2.2 1.8	1.35 1.15	1.3	1.15	2.2 2.0	0.45 0.15	0.23 0.13	0.2	0.2	0.1

OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	EIAJ			
SOT343R						97-05-21 06-03-16

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## 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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This data sheet was changed to reflect the new company name NXP Semiconductors, including new legal definitions and disclaimers. No changes were made to the technical content, except for package outline drawings which were updated to the latest version.

## **Contact information**

For additional information please visit: <http://www.nxp.com>

For sales offices addresses send e-mail to: [salesaddresses@nxp.com](mailto:salesaddresses@nxp.com)

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