

# BF1100; BF1100R

## Dual-gate MOS-FETs

Rev. 02 — 13 November 2007

Product data sheet

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NXP Semiconductors



Dual-gate MOS-FETs

BF1100; BF1100R

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 SOT143 or SOT143R 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

Top view

MAM124

BF1100 marking code: %MY.

Fig.1 Simplified outline (SOT143) and symbol.

Top view

MAM125 - 1

BF1100R marking code: %MZ.

Fig.2 Simplified outline (SOT143R) and symbol.

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		–	–	200	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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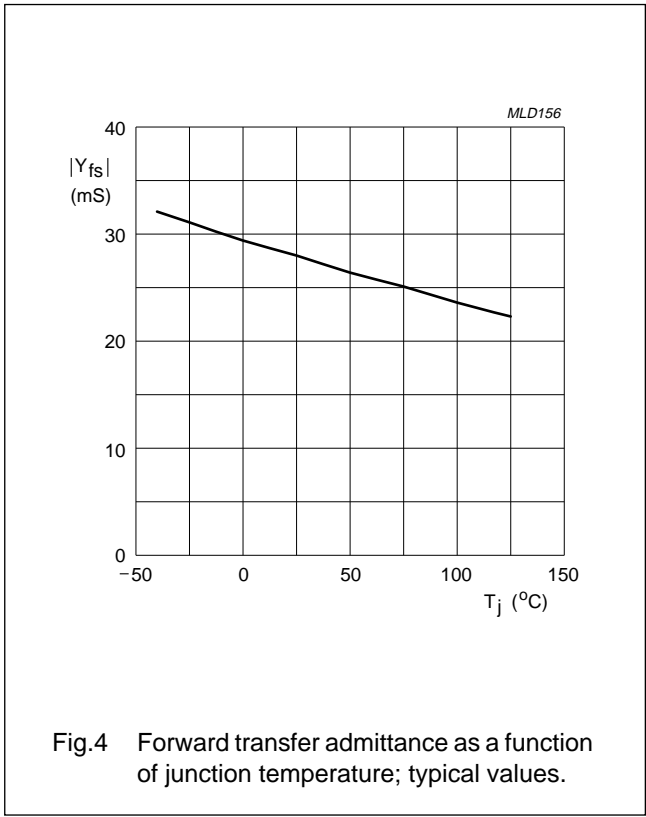
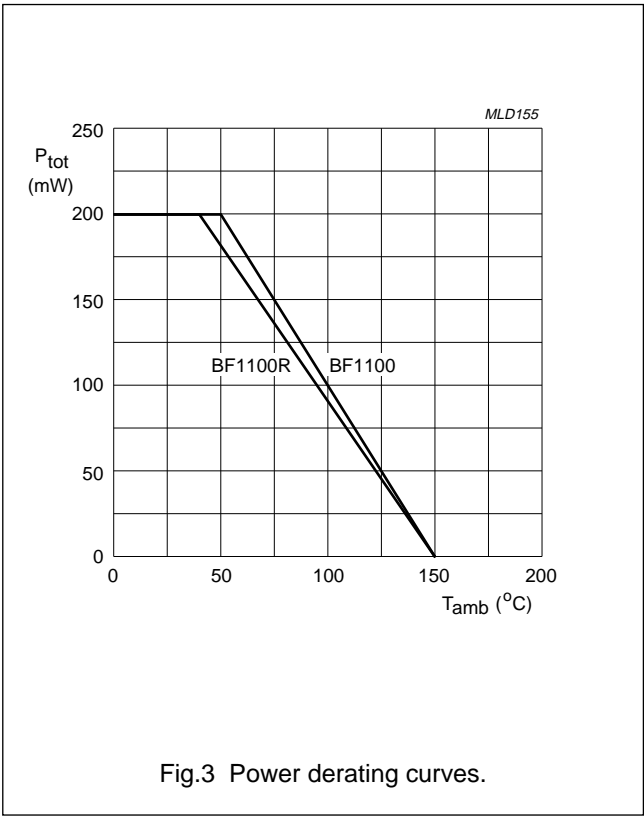
LIMITING VALUES

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.3			
	BF1100	up to $T_{amb} = 50\text{ }^{\circ}\text{C}$ ; note 1	–	200	mW
	BF1100R	up to $T_{amb} = 40\text{ }^{\circ}\text{C}$ ; note 1	–	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.



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## THERMAL CHARACTERISTICS

SYMBOL	PARAMETER	CONDITIONS	VALUE	UNIT
$R_{th\ j-a}$	thermal resistance from junction to ambient	note 1		
	BF1100		500	K/W
	BF1100R		550	K/W
$R_{th\ j-s}$	thermal resistance from junction to soldering point	note 2		
	BF1100	$T_s = 92\ ^\circ\text{C}$	290	K/W
	BF1100R	$T_s = 78\ ^\circ\text{C}$	360	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

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

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	UNIT
$V_{(BR)G1-SS}$	gate 1-source breakdown voltage	$V_{G2-S} = V_{DS} = 0$ ; $I_{G1-S} = 1\ \text{mA}$	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	$V_{G2-S} = 4\ \text{V}$ ; $V_{DS} = 9\ \text{V}$ ; $I_D = 20\ \mu\text{A}$	0.3	1	V
		$V_{G2-S} = 4\ \text{V}$ ; $V_{DS} = 12\ \text{V}$ ; $I_D = 20\ \mu\text{A}$	0.3	1	V
$V_{G2-S(th)}$	gate 2-source threshold voltage	$V_{G1-S} = 4\ \text{V}$ ; $V_{DS} = 9\ \text{V}$ ; $I_D = 20\ \mu\text{A}$	0.3	1.2	V
		$V_{G1-S} = 4\ \text{V}$ ; $V_{DS} = 12\ \text{V}$ ; $I_D = 20\ \mu\text{A}$	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.27.
2.  $R_{G1}$  connects gate 1 to  $V_{GG} = 12\ \text{V}$ ; see Fig.27.

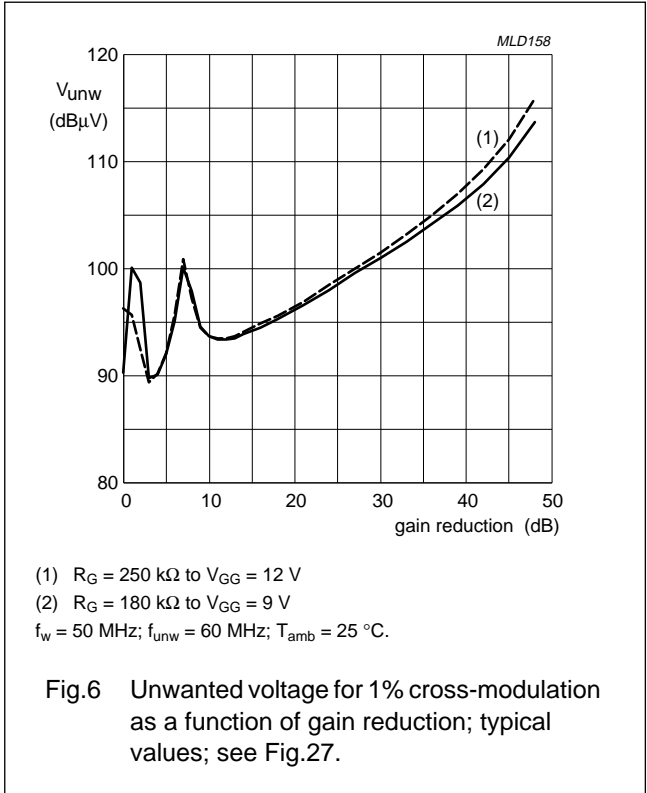
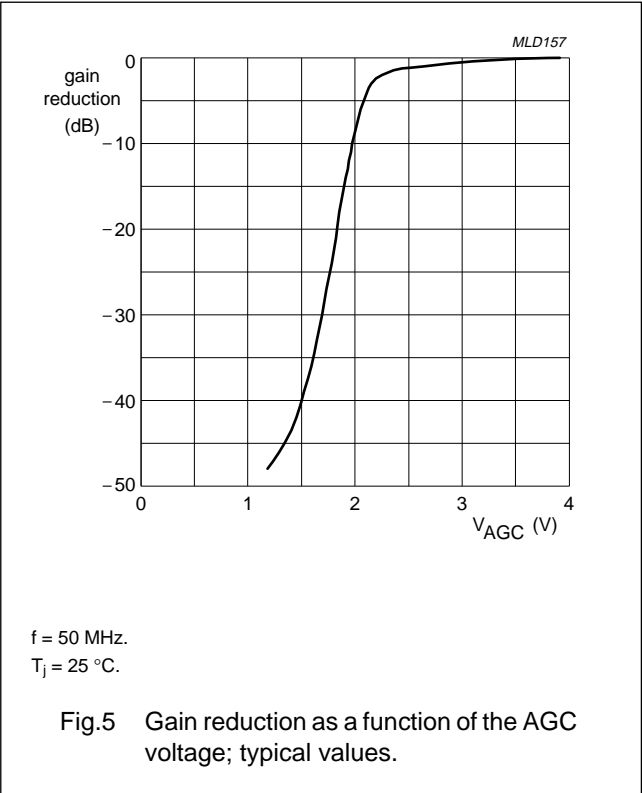
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DYNAMIC CHARACTERISTICS

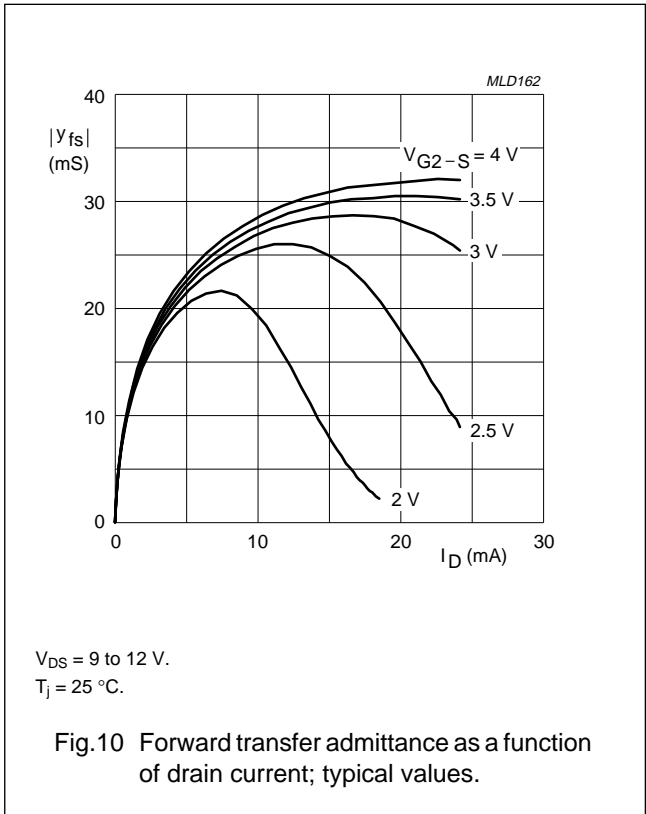
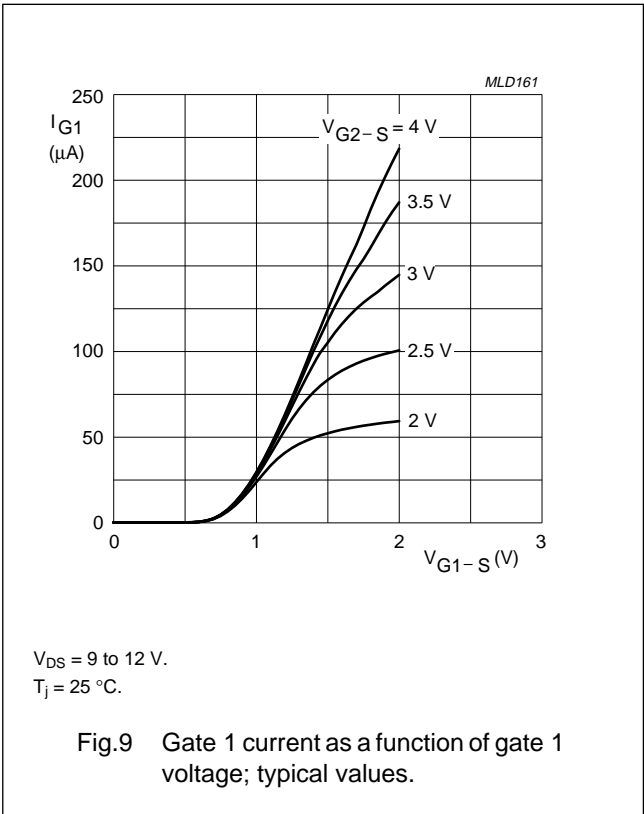
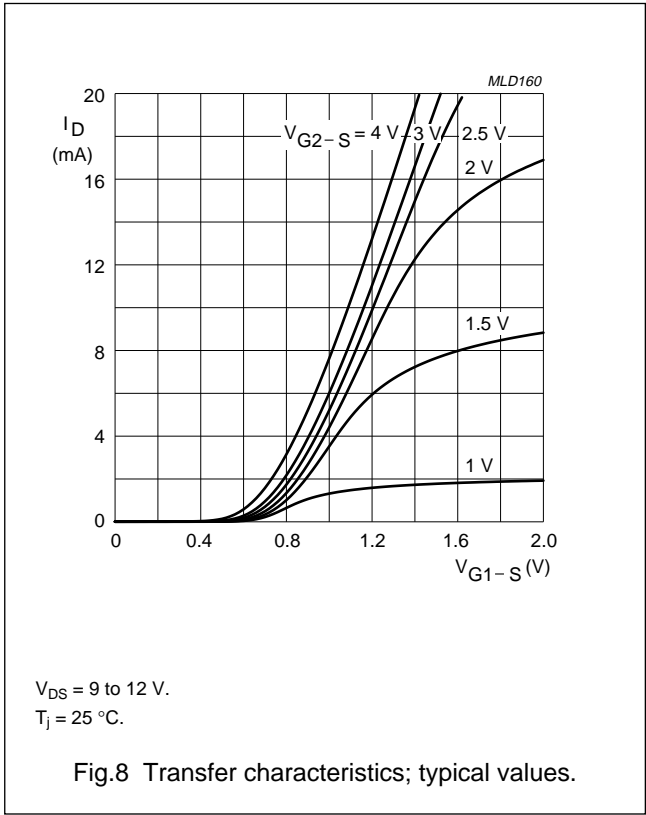
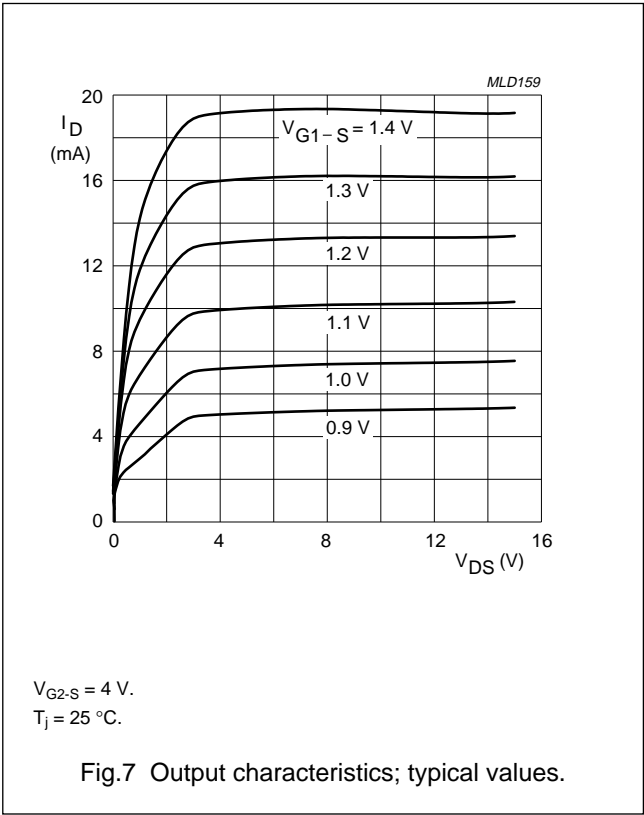
Common source;  $T_{amb} = 25\text{ }^{\circ}\text{C}$ ;  $V_{G2-S} = 4\text{ V}$ ;  $I_D = 10\text{ mA}$ ; unless otherwise specified.

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



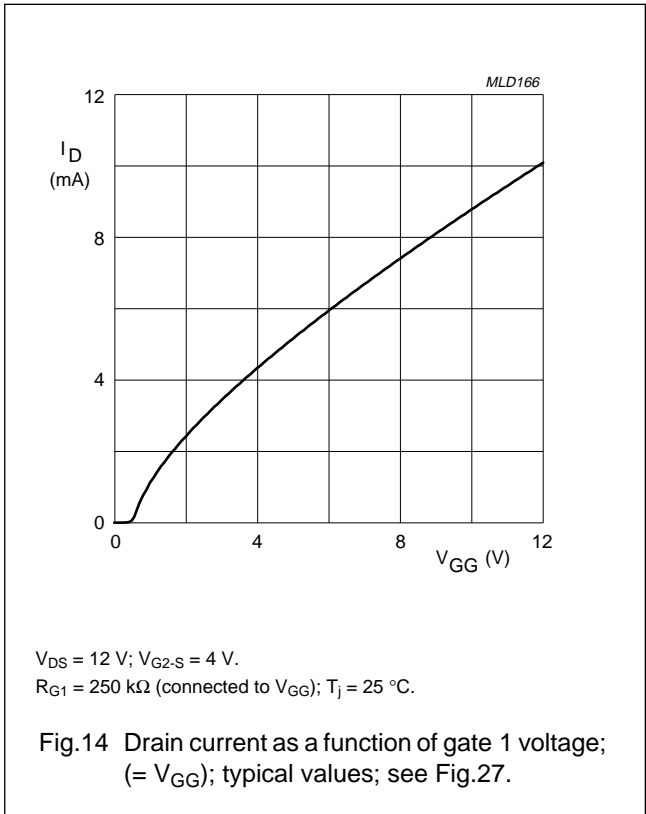
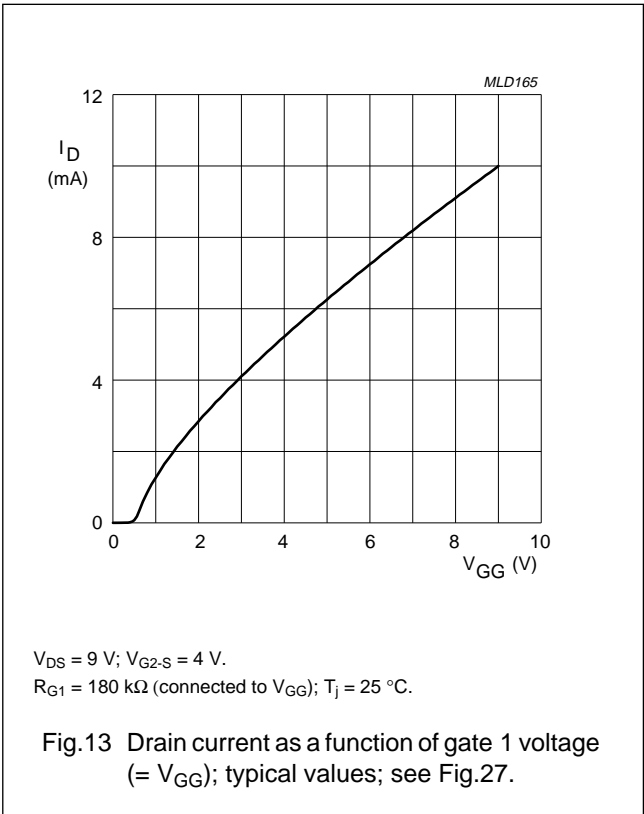
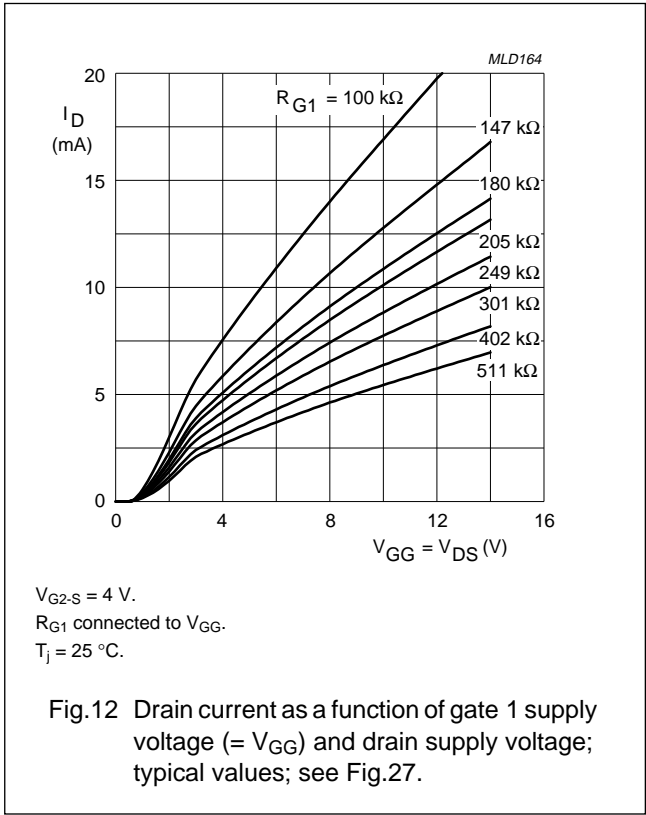
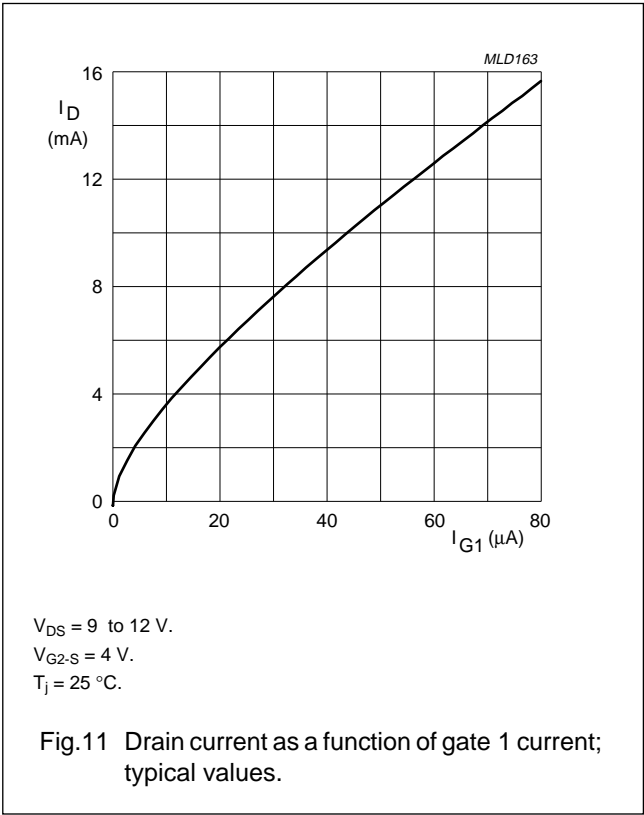
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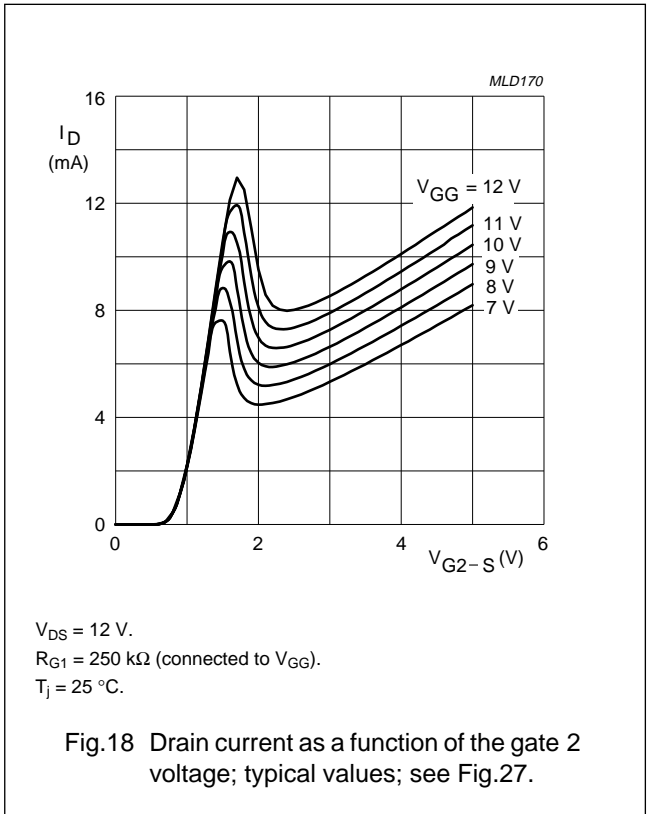
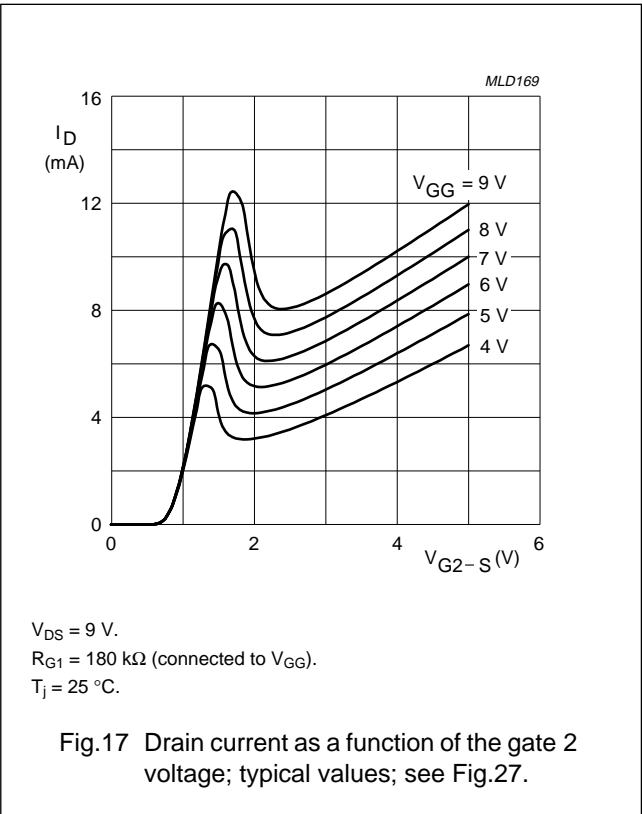
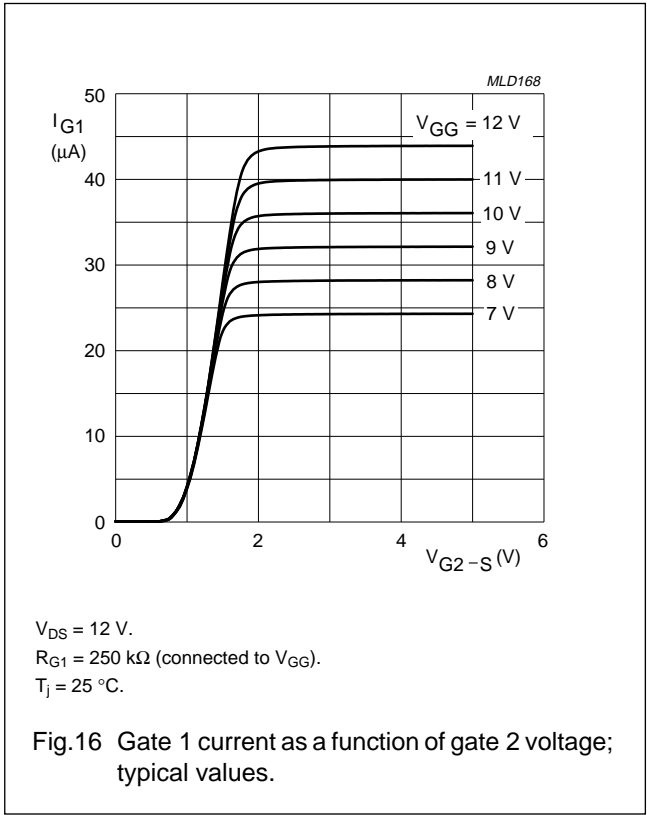
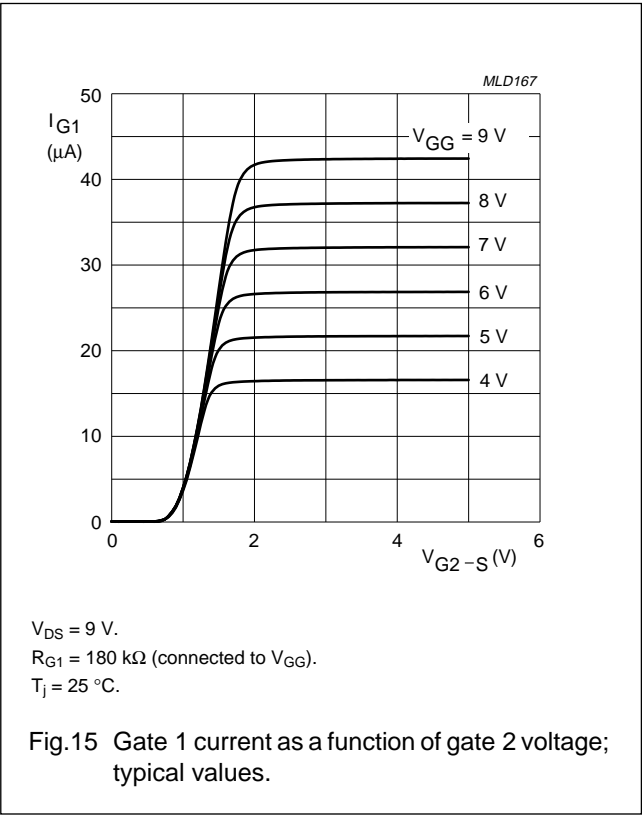
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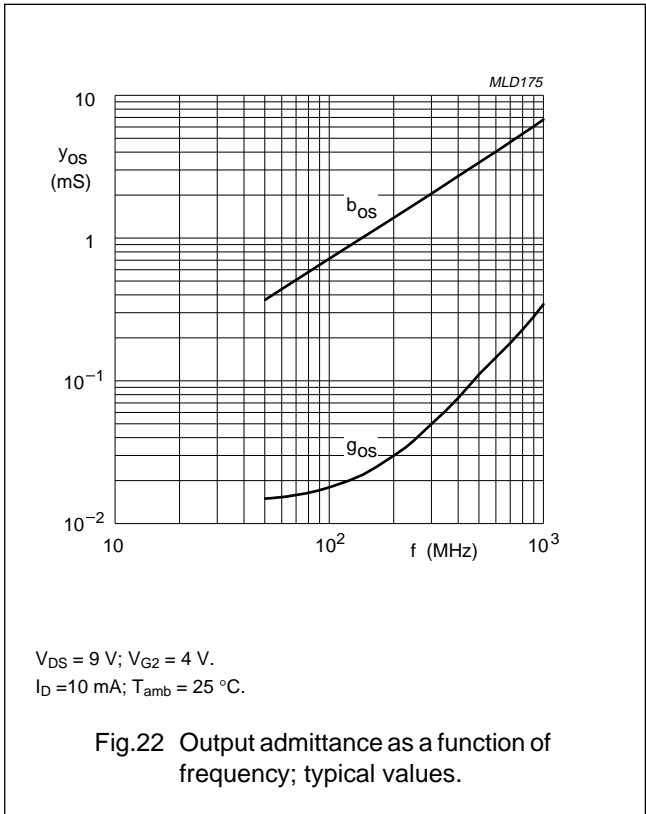
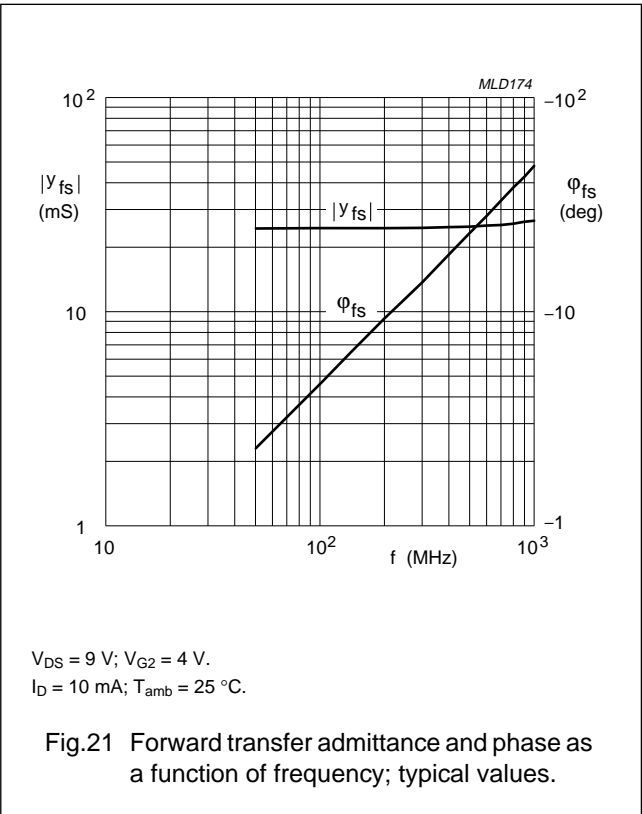
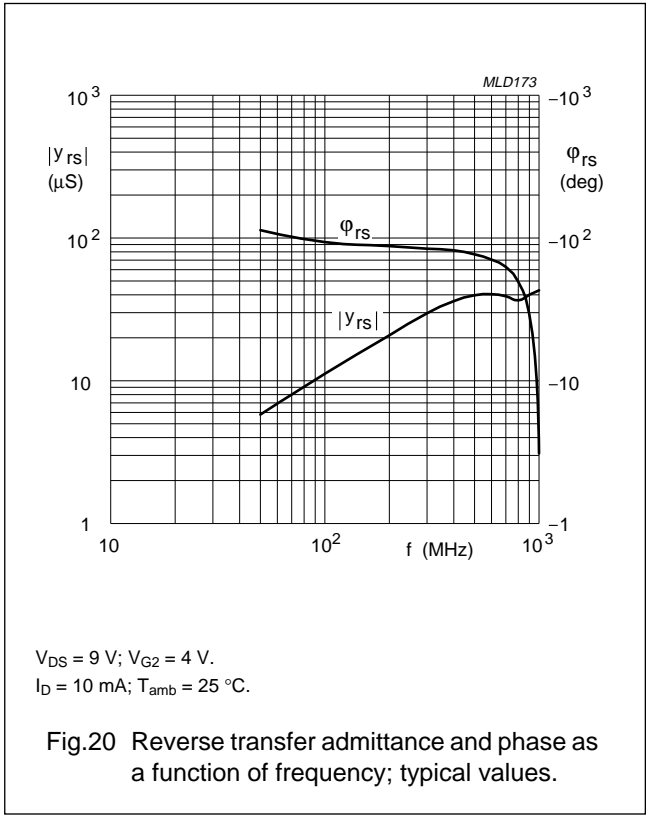
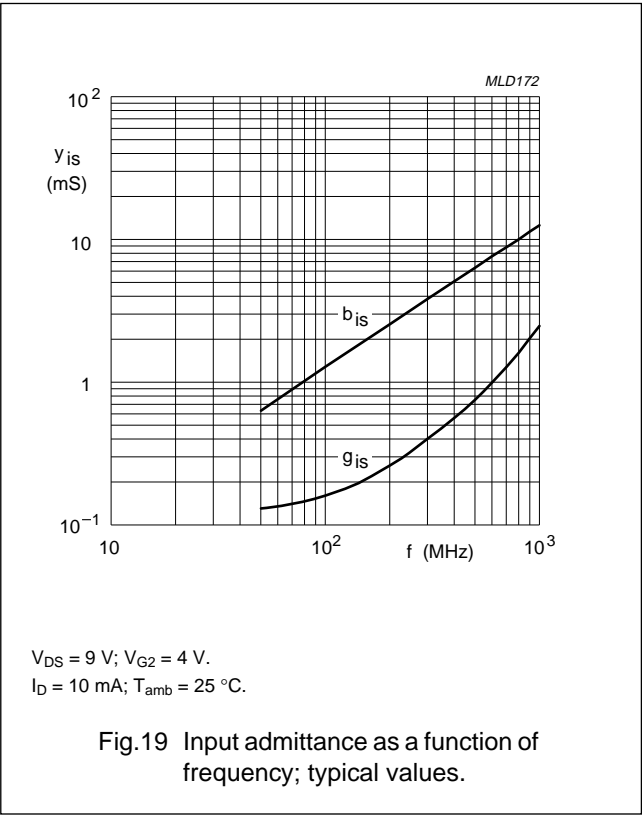
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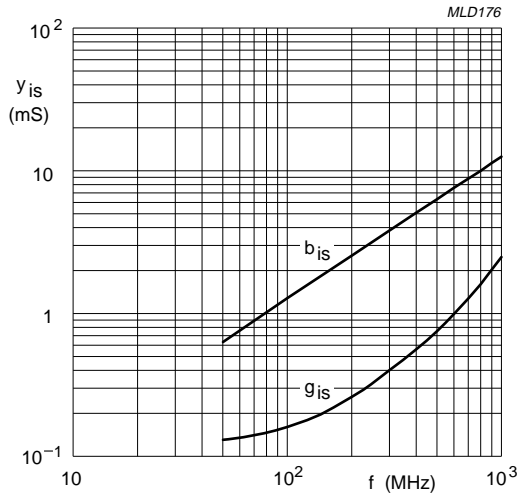
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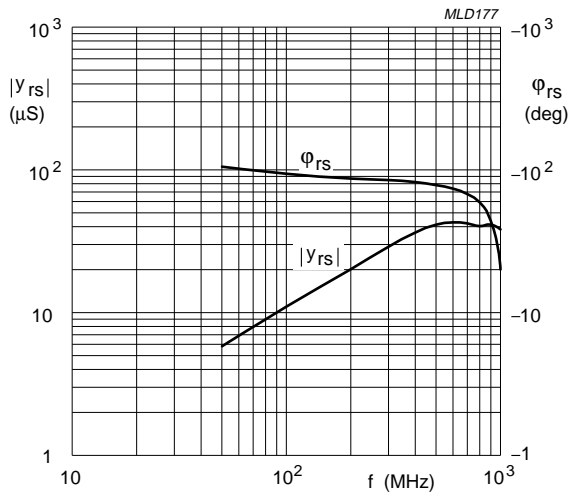
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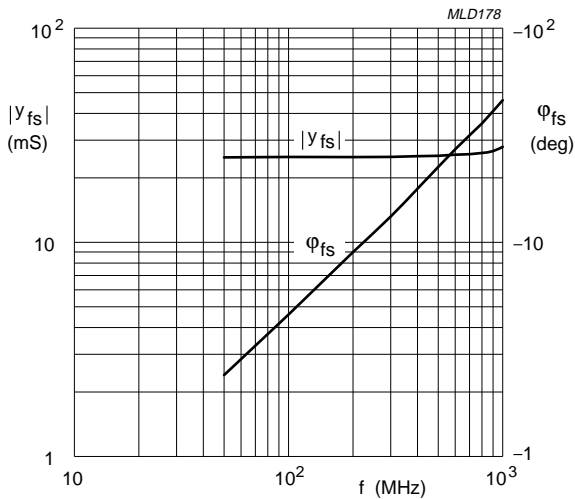
$V_{DS} = 12\text{ V}; V_{G2} = 4\text{ V}.$   
 $I_D = 10\text{ mA}; T_{amb} = 25\text{ }^{\circ}\text{C}.$

Fig.23 Input admittance as a function of frequency; typical values.



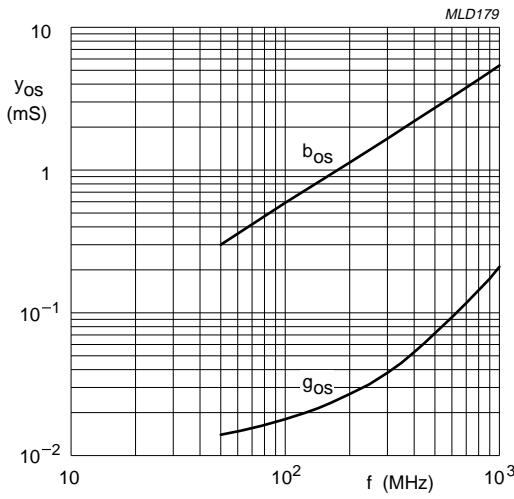
$V_{DS} = 12\text{ V}; V_{G2} = 4\text{ V}.$   
 $I_D = 10\text{ mA}; T_{amb} = 25\text{ }^{\circ}\text{C}.$

Fig.24 Reverse transfer admittance and phase as a function of frequency; typical values.



$V_{DS} = 12\text{ V}; V_{G2} = 4\text{ V}.$   
 $I_D = 10\text{ mA}; T_{amb} = 25\text{ }^{\circ}\text{C}.$

Fig.25 Forward transfer admittance and phase as a function of frequency; typical values.

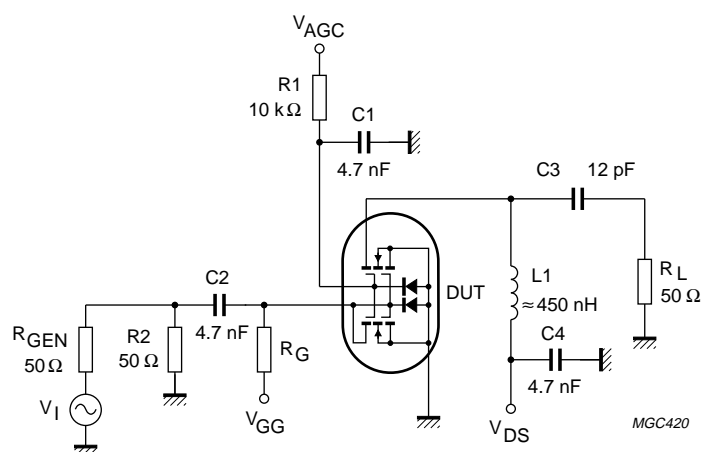


$V_{DS} = 12\text{ V}; V_{G2} = 4\text{ V}.$   
 $I_D = 10\text{ mA}; T_{amb} = 25\text{ }^{\circ}\text{C}.$

Fig.26 Output admittance as a function of frequency; typical values.

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

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

Fig.27 Cross-modulation test set-up.

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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	0.986	-3.6	2.528	174.4	0.001	63.7	1.000	-2.0
100	0.983	-7.4	2.531	169.8	0.001	80.7	1.000	-4.2
200	0.974	-14.7	2.490	159.5	0.002	81.0	0.996	-8.1
300	0.960	-21.8	2.446	149.8	0.002	80.3	0.994	-11.9
400	0.953	-28.7	2.412	139.8	0.003	76.3	0.992	-15.7
500	0.933	-35.4	2.341	130.1	0.003	76.5	0.987	-19.4
600	0.915	-42.0	2.283	120.4	0.004	79.0	0.984	-23.0
700	0.895	-47.9	2.205	111.6	0.003	81.5	0.981	-26.7
800	0.880	-53.5	2.146	102.9	0.003	90.8	0.978	-30.3
900	0.864	-59.6	2.087	93.4	0.003	106.6	0.974	-33.9
1000	0.839	-65.0	1.998	84.4	0.003	135.4	0.971	-37.6

**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	0.986	-3.7	2.478	174.7	0.001	72.2	1.000	-1.6
100	0.984	-7.4	2.480	170.3	0.001	80.9	1.000	-3.5
200	0.974	-14.6	2.440	160.6	0.002	82.7	0.997	-6.6
300	0.960	-21.8	2.400	151.4	0.002	79.9	0.996	-9.7
400	0.953	-28.7	2.371	141.9	0.003	77.7	0.994	-12.8
500	0.933	-35.3	2.306	132.7	0.003	77.1	0.991	-15.8
600	0.915	-41.9	2.255	123.6	0.004	77.1	0.989	-18.7
700	0.894	-47.8	2.183	115.3	0.004	79.3	0.986	-21.7
800	0.879	-53.5	2.131	107.2	0.003	83.9	0.984	-24.6
900	0.863	-59.5	2.080	98.2	0.003	95.1	0.982	-27.5
1000	0.838	-65.0	1.999	89.7	0.003	115.8	0.980	-30.4

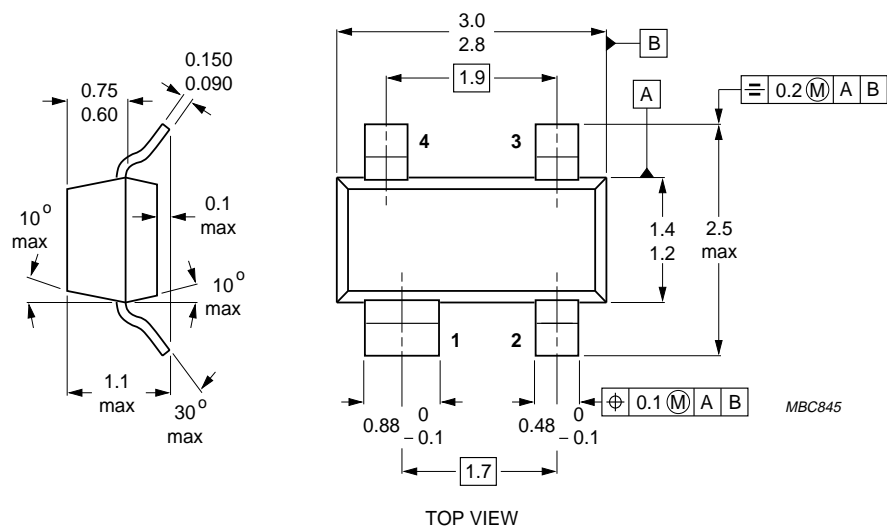
**Table 4** Noise data:  $V_{DS} = 12\text{ V}$ ;  $V_{G2-S} = 4\text{ V}$ ;  $I_D = 10\text{ mA}$ 

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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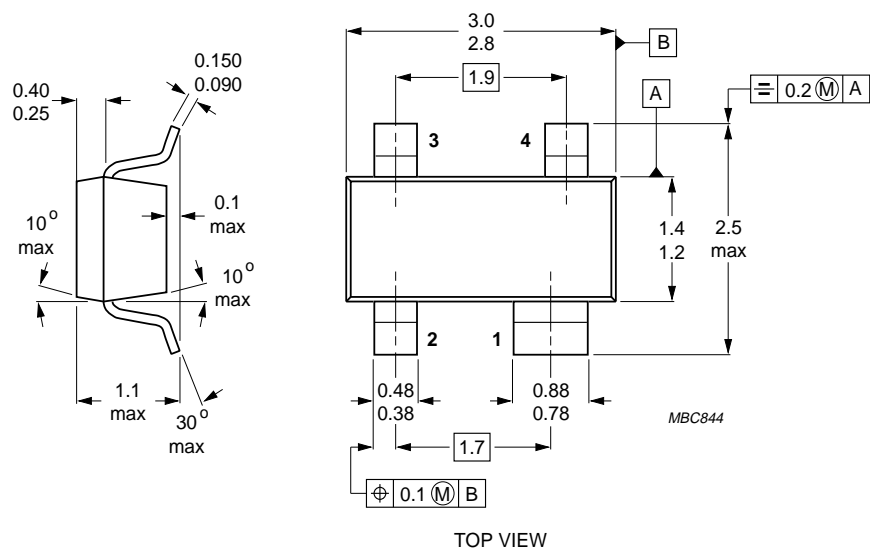
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## PACKAGE OUTLINES



Dimensions in mm.

Fig.28 SOT143.



Dimensions in mm.

Fig.29 SOT143R.

## Legal information

### Data sheet status

Document status <sup>[1][2]</sup>	Product status <sup>[3]</sup>	Definition
Objective [short] data sheet	Development	This document contains data from the objective specification for product development.
Preliminary [short] data sheet	Qualification	This document contains data from the preliminary specification.
Product [short] data sheet	Production	This document contains the product specification.

[1] Please consult the most recently issued document before initiating or completing a design.

[2] The term 'short data sheet' is explained in section "Definitions".

[3] The product status of device(s) described in this document may have changed since this document was published and may differ in case of multiple devices. The latest product status information is available on the Internet at URL <http://www.nxp.com>.

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## Revision history

### Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
BF1100_N_2	20071113	Product data sheet	-	BF1100_1
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BF1100_1	19950425	Product specification	-	-

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