

# 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

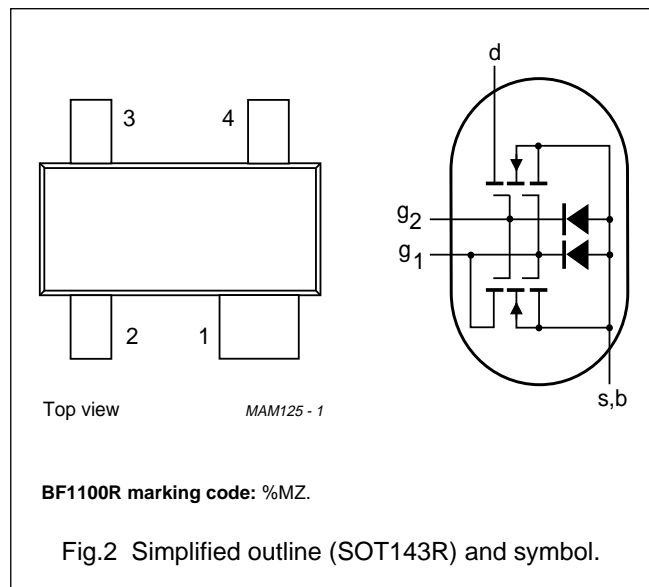
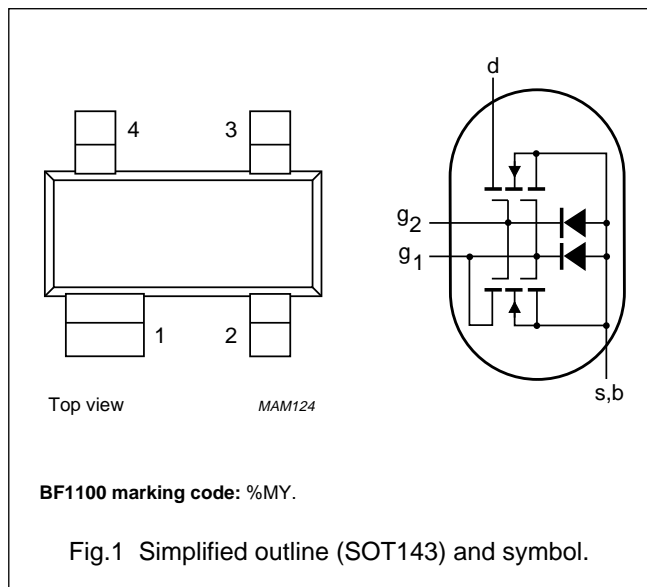
and substrate interconnected and an internal bias circuit to ensure good cross-modulation performance during AGC.

**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



### 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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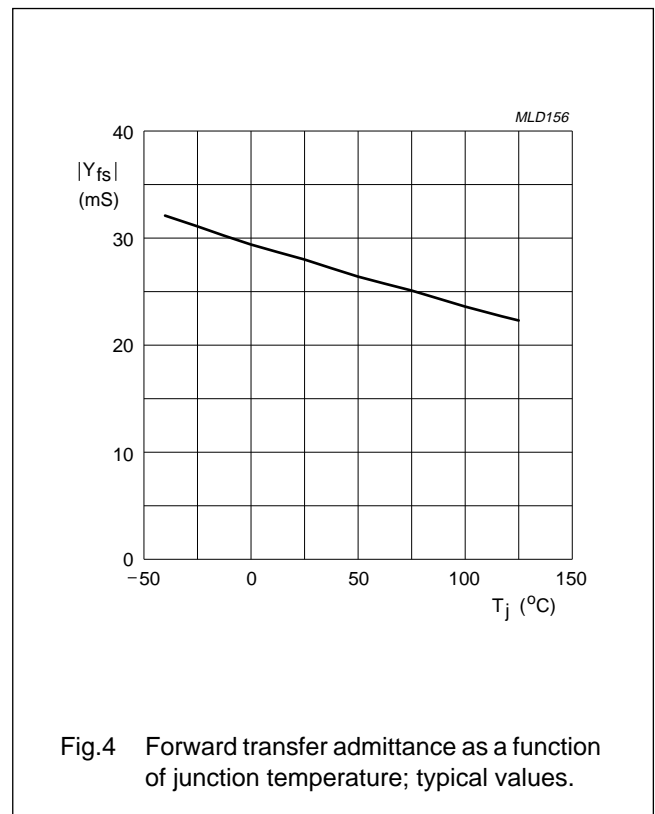
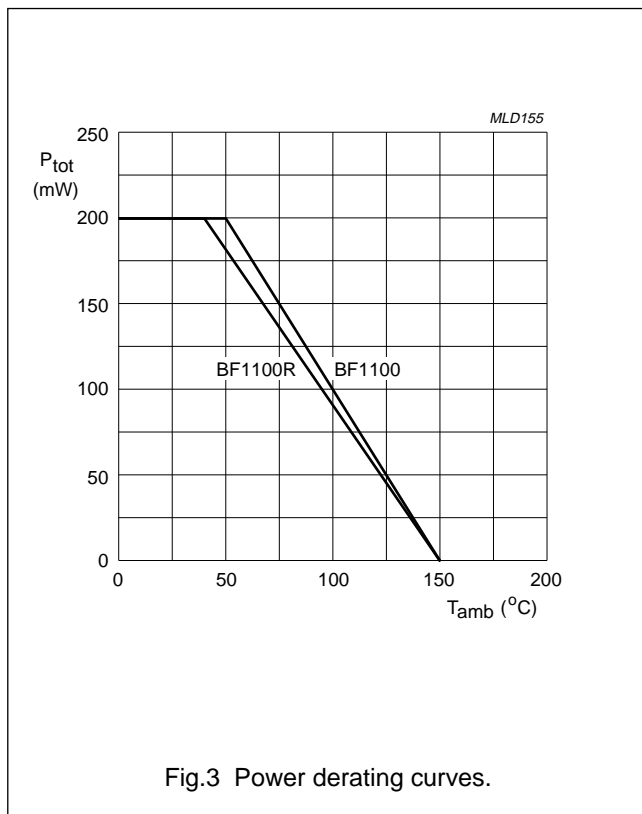
**LIMITING VALUES**

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	$T_s = 92\text{ °C}$	290	K/W
	BF1100R	$T_s = 78\text{ °C}$	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

$T_j = 25\text{ °C}$ ; 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.27.
2.  $R_{G1}$  connects gate 1 to  $V_{GG} = 12\text{ V}$ ; see Fig.27.

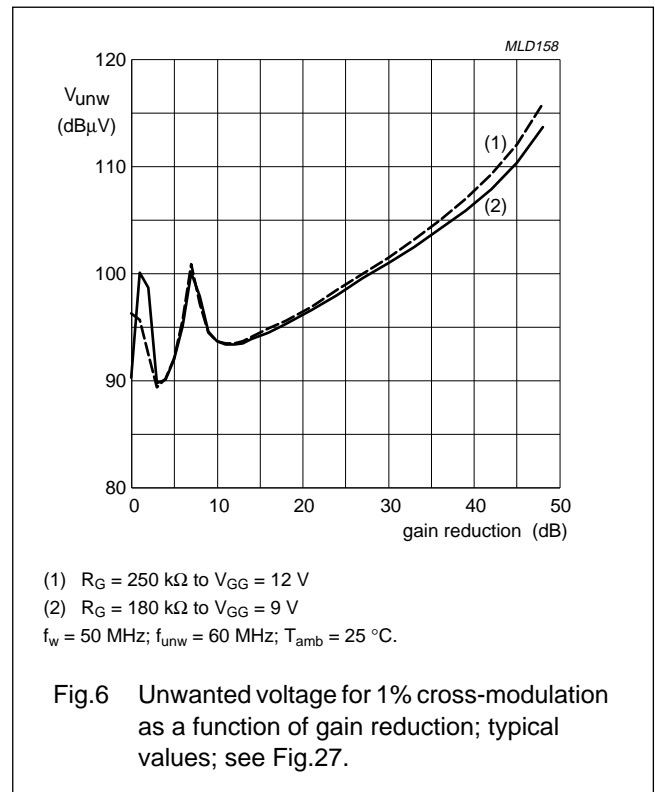
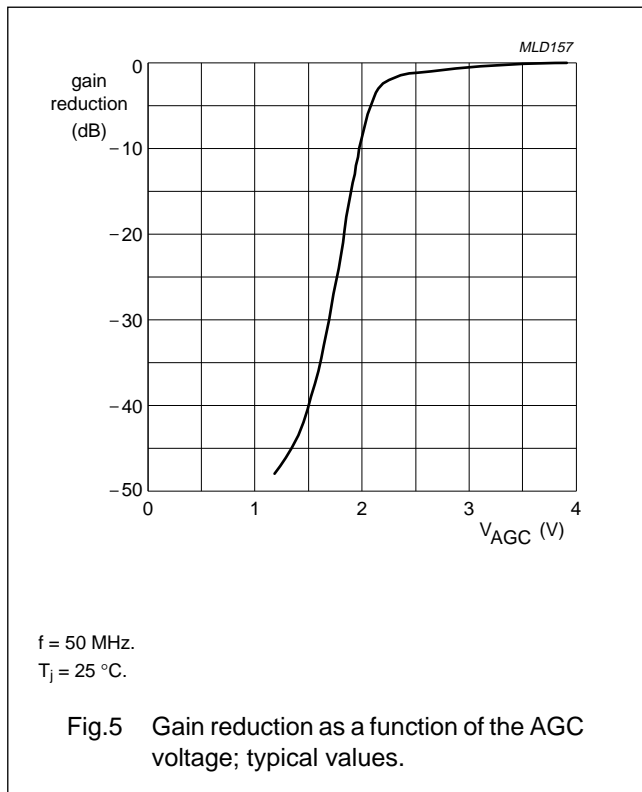
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**DYNAMIC CHARACTERISTICS**

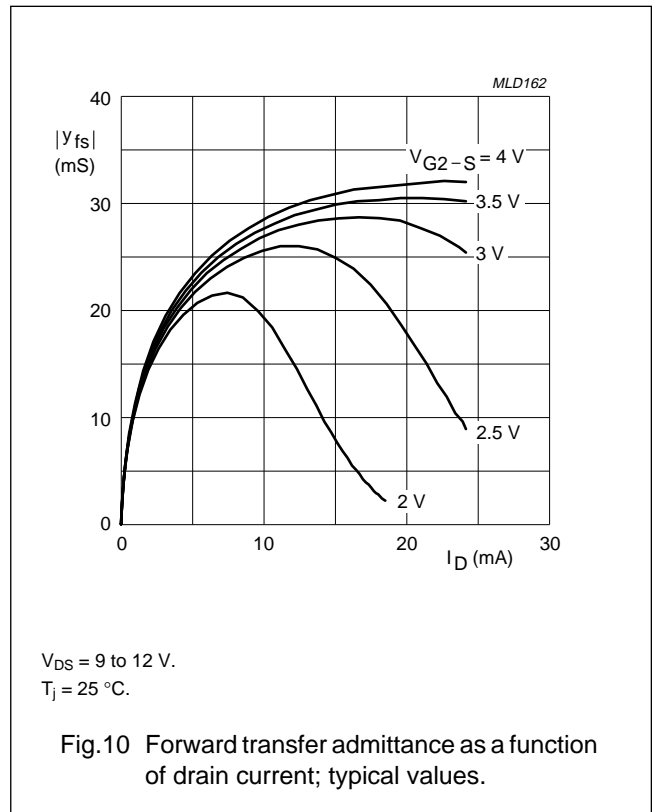
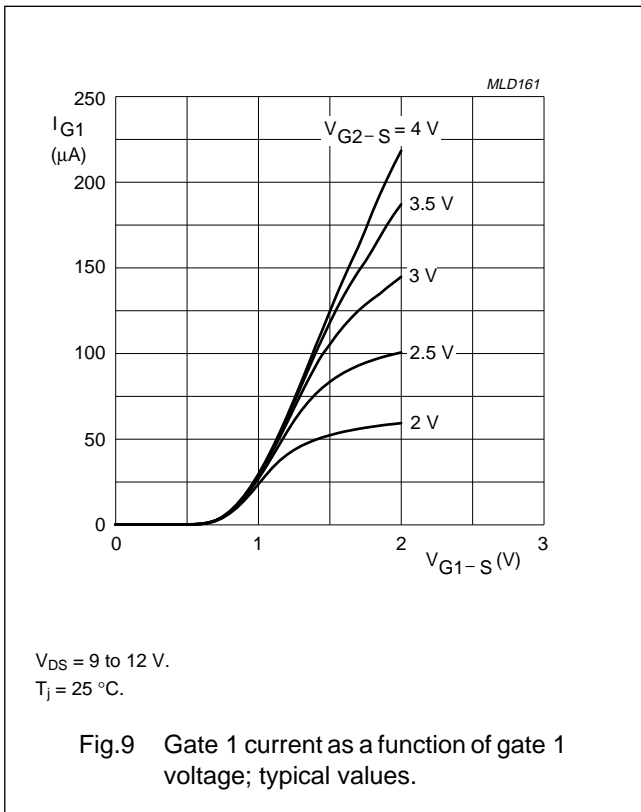
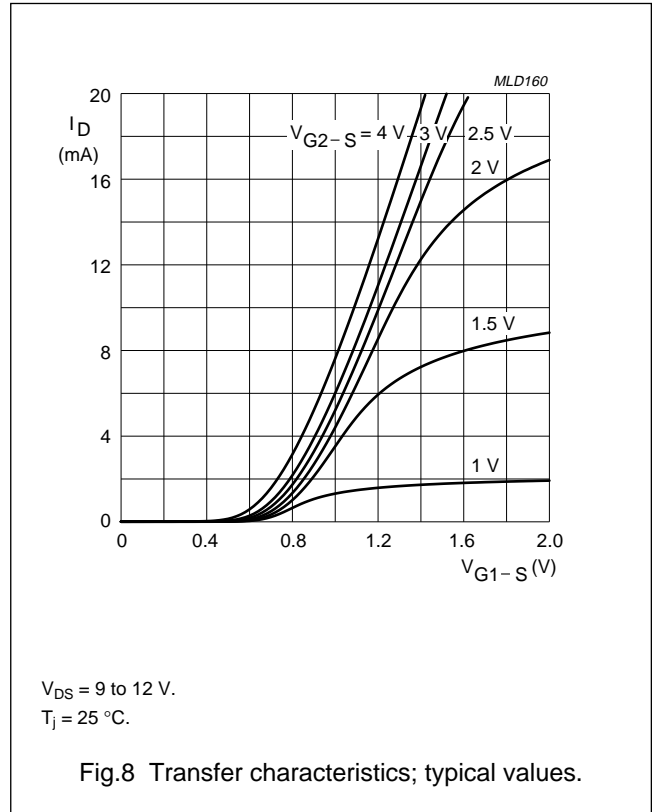
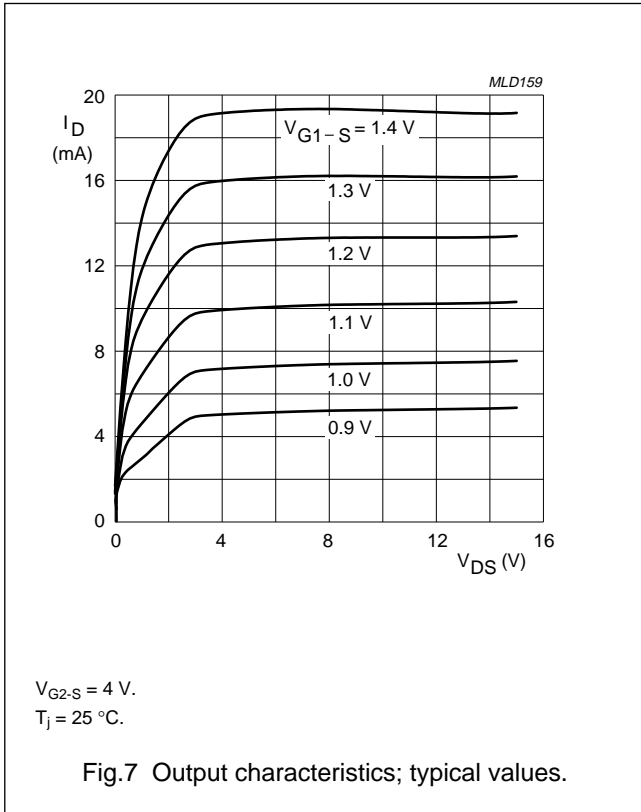
Common source;  $T_{amb} = 25\text{ }^{\circ}\text{C}$ ;  $V_{G2-S} = 4\text{ V}$ ;  $I_D = 10\text{ mA}$ ; unless otherwise specified.

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
$ y_{fs} $	forward transfer admittance	pulsed; $T_j = 25\text{ }^{\circ}\text{C}$ $V_{DS} = 9\text{ V}$	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



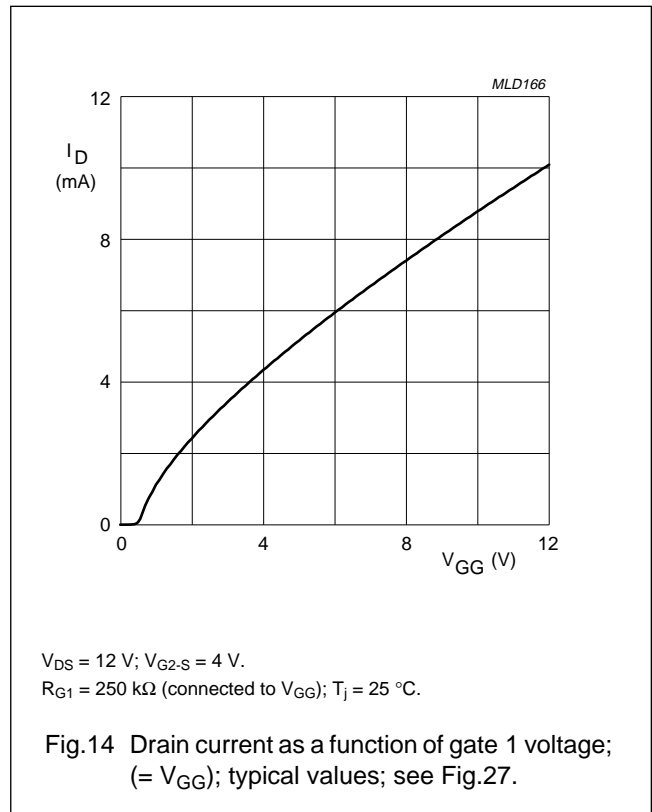
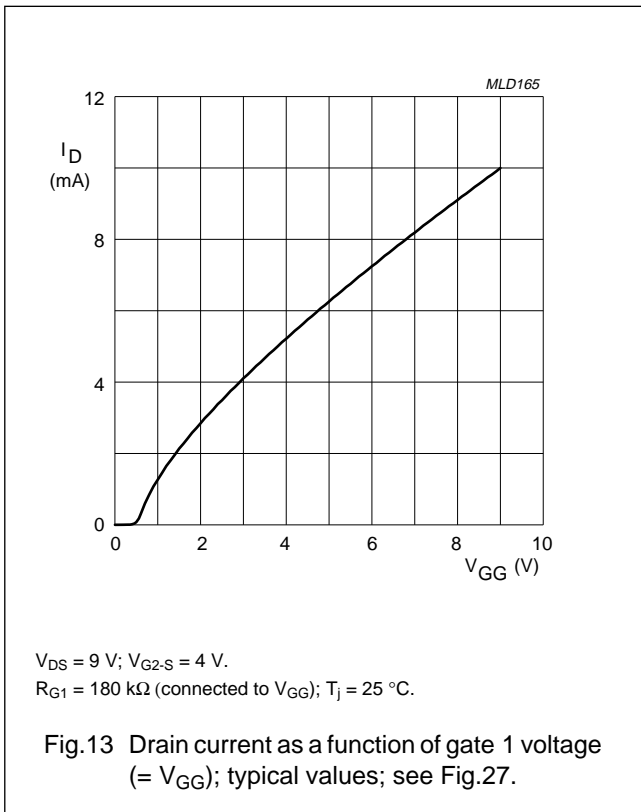
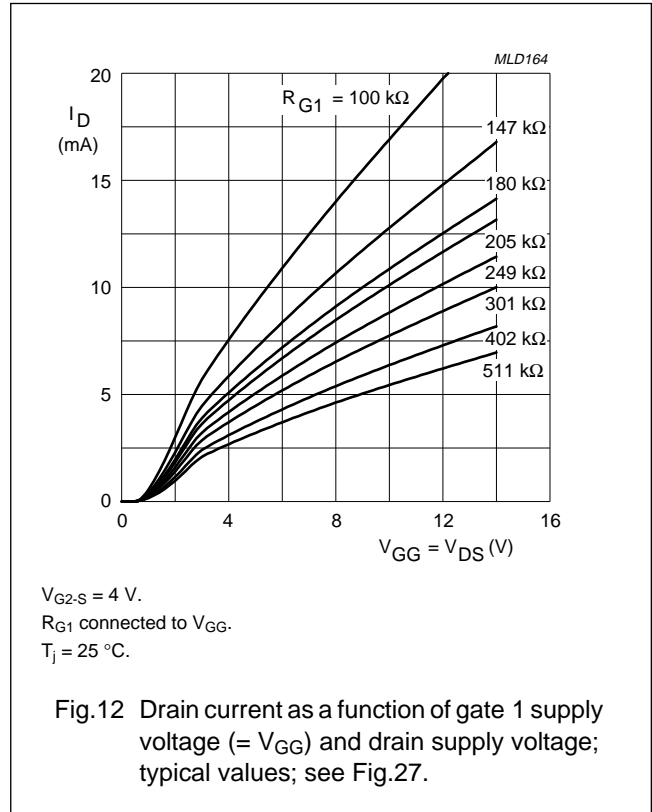
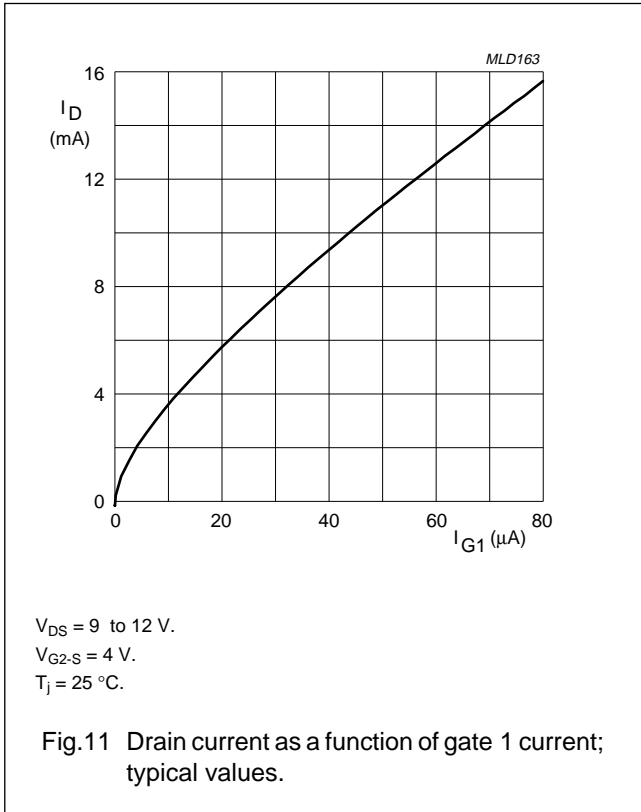
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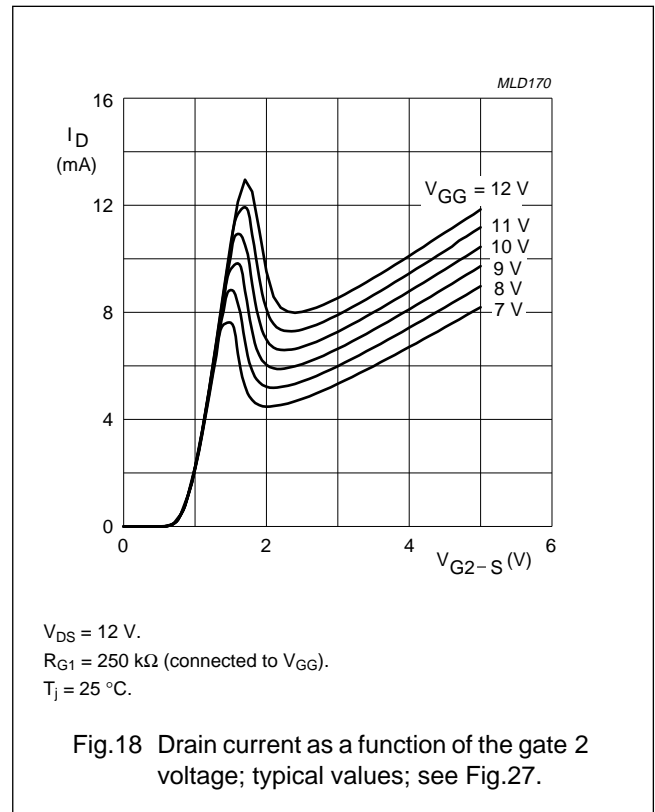
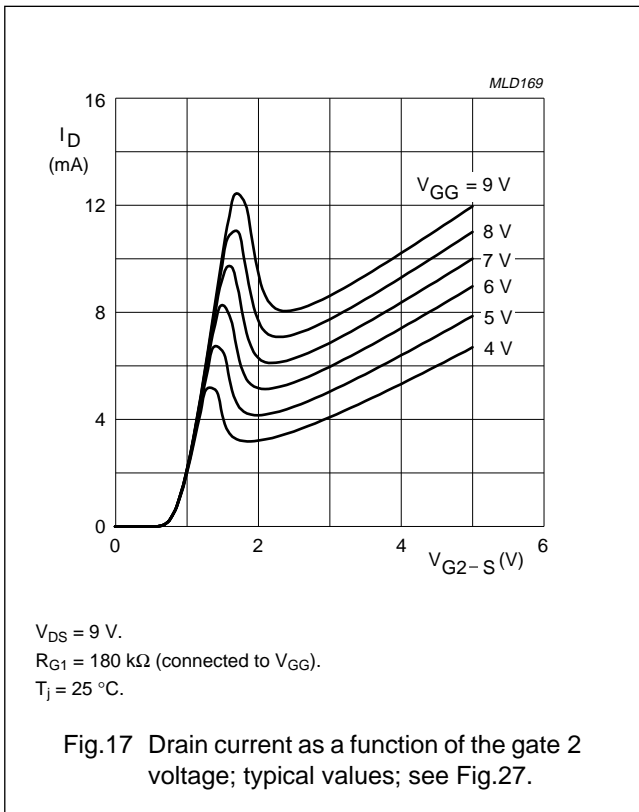
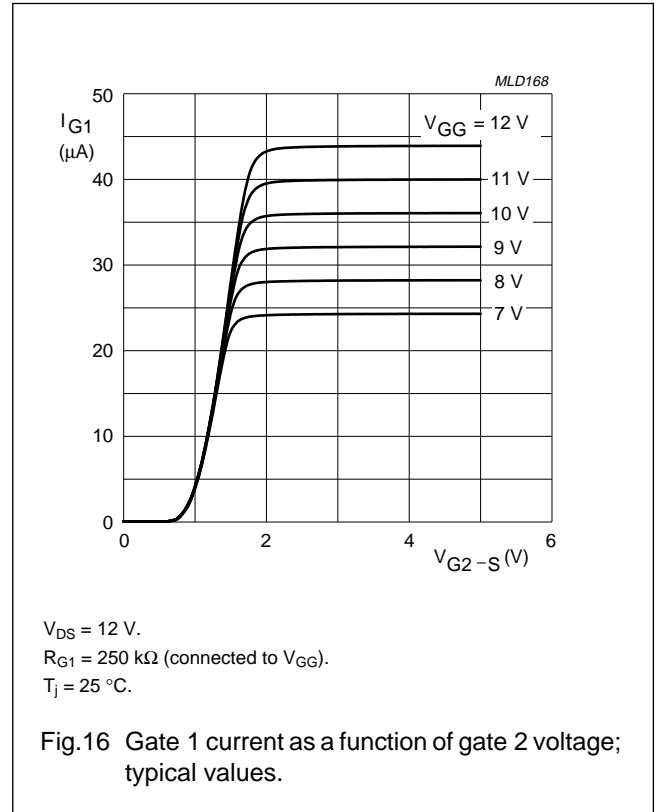
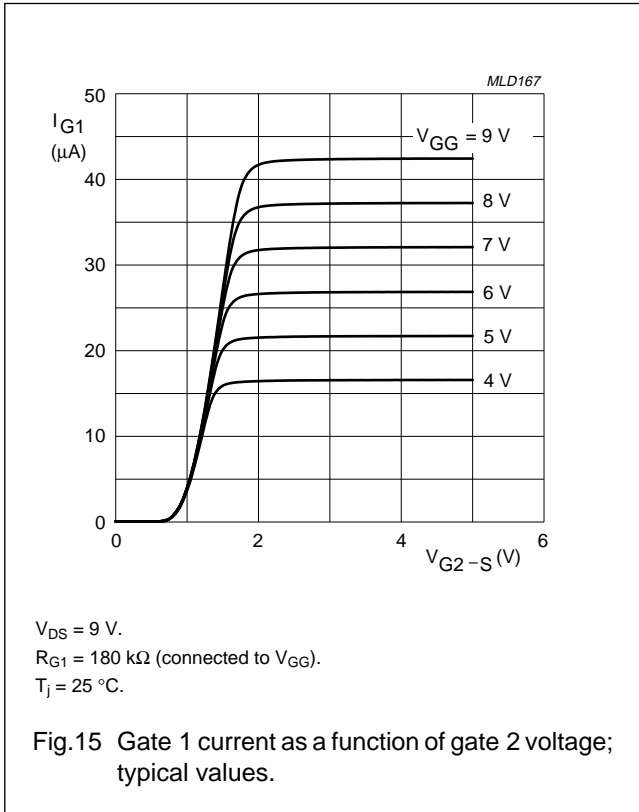
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Dual-gate MOS-FETs

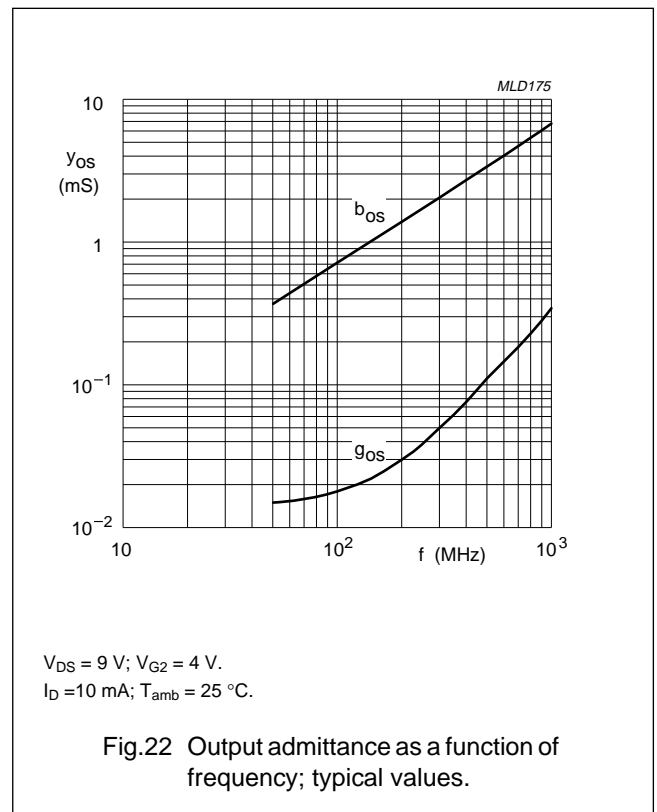
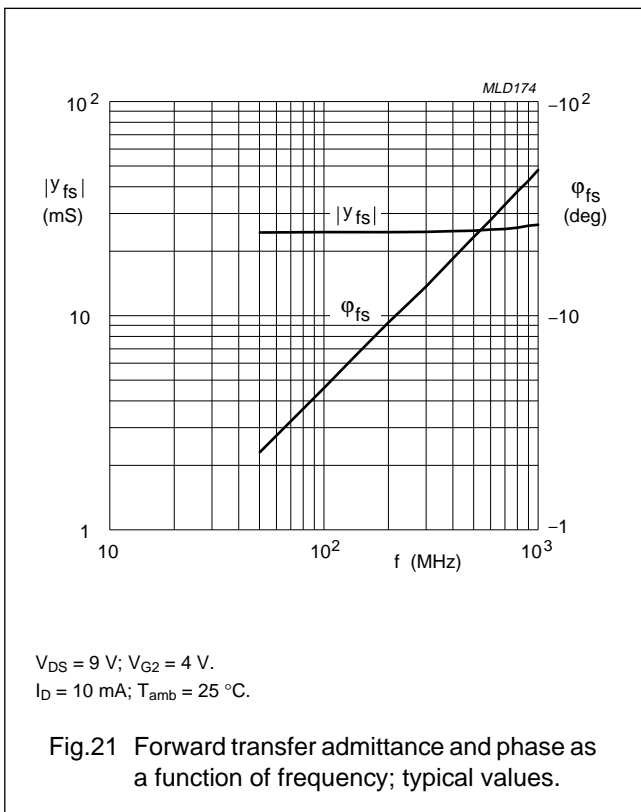
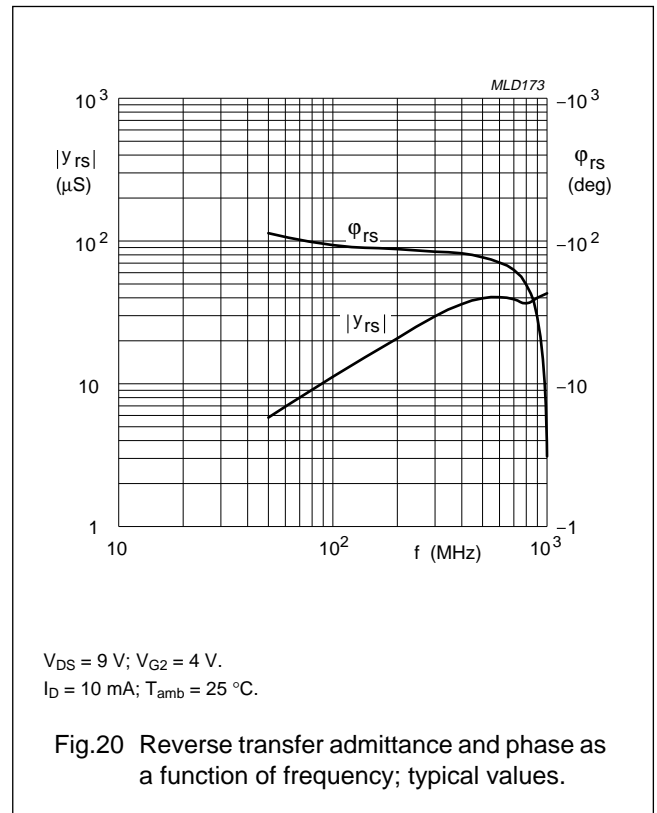
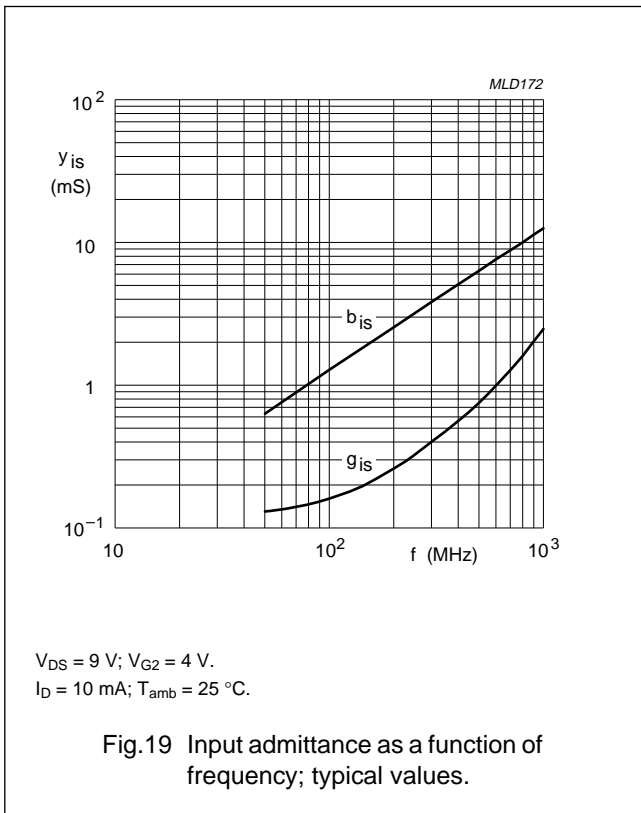
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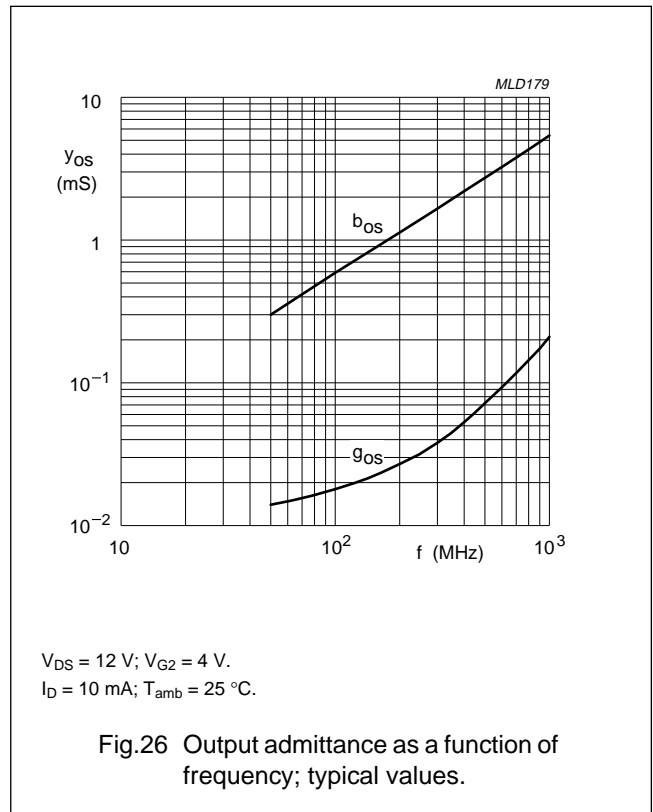
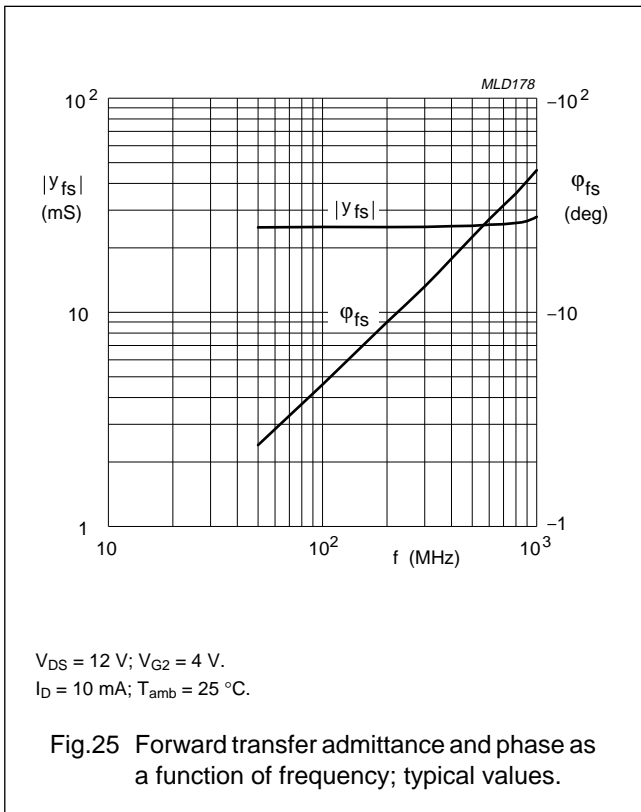
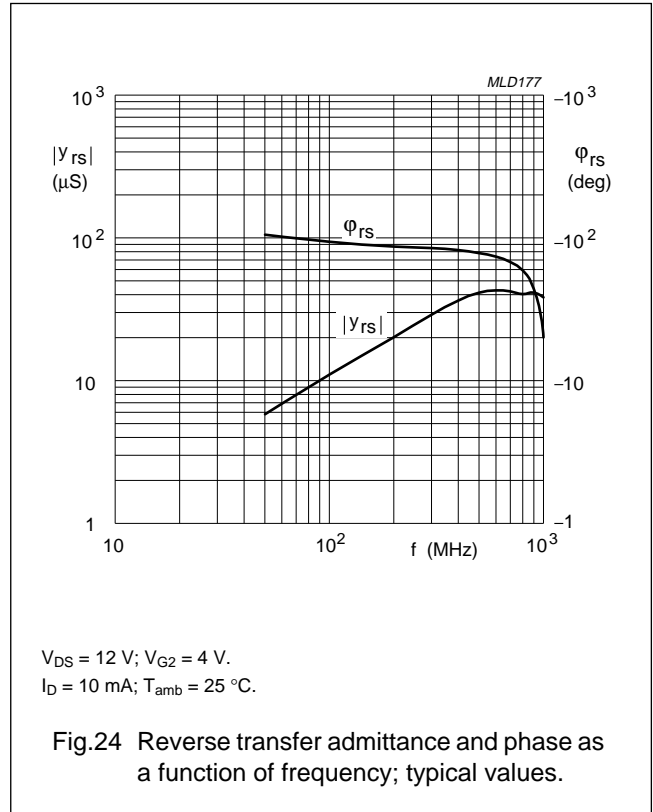
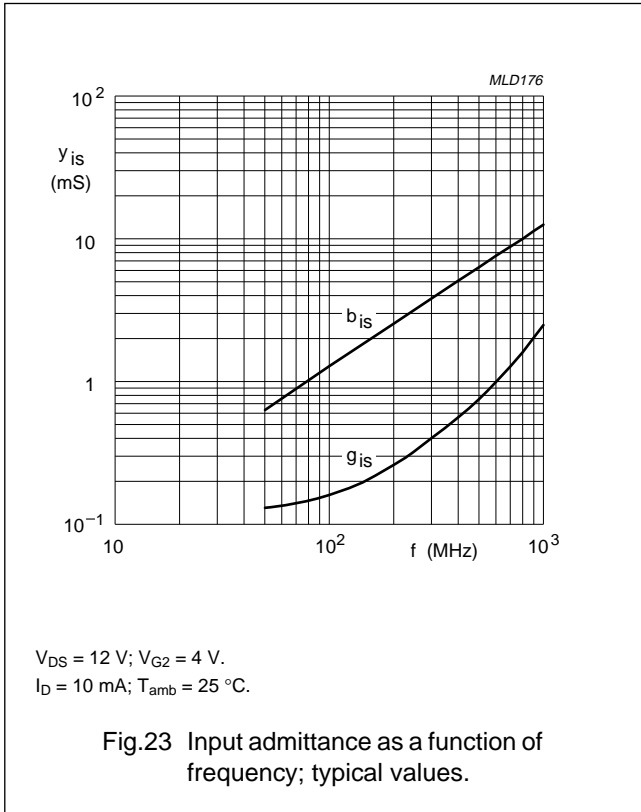
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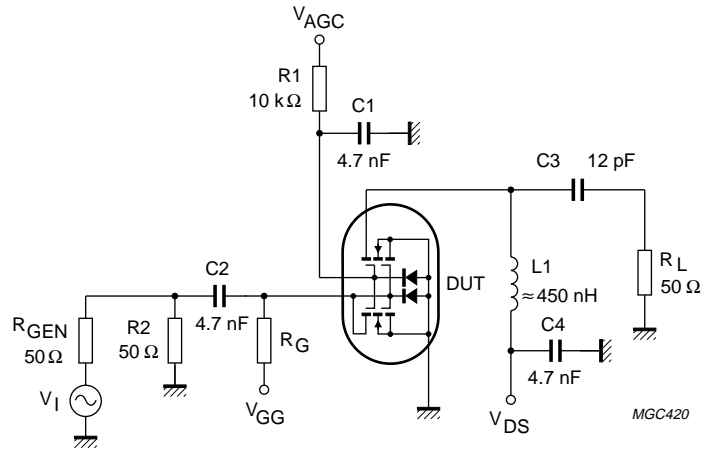
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For  $V_{GG} = V_{DS} = 9\text{ V}$ ,  $R_G = 180\text{ k}\Omega$ .  
 For  $V_{GG} = V_{DS} = 12\text{ V}$ ,  $R_G = 250\text{ k}\Omega$ .

Fig.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

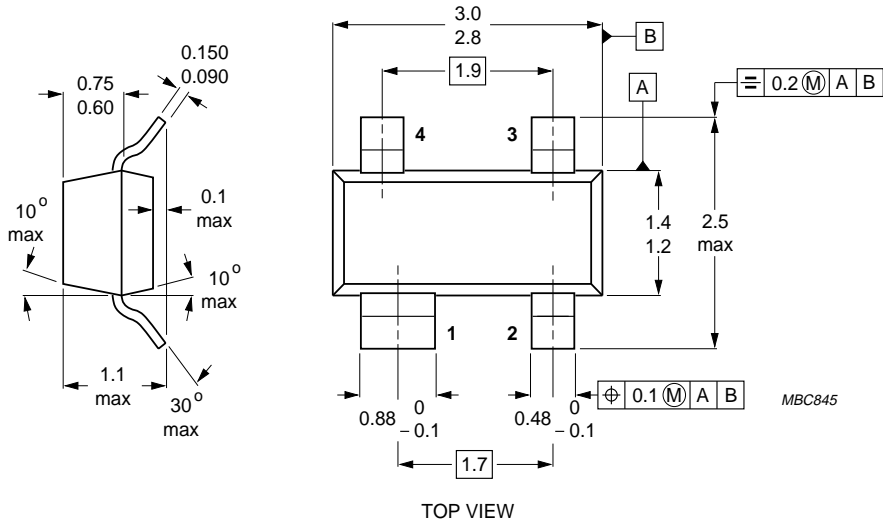
**Table 4** Noise data:  $V_{DS} = 12\text{ V}$ ;  $V_{G2-S} = 4\text{ V}$ ;  $I_D = 10\text{ mA}$

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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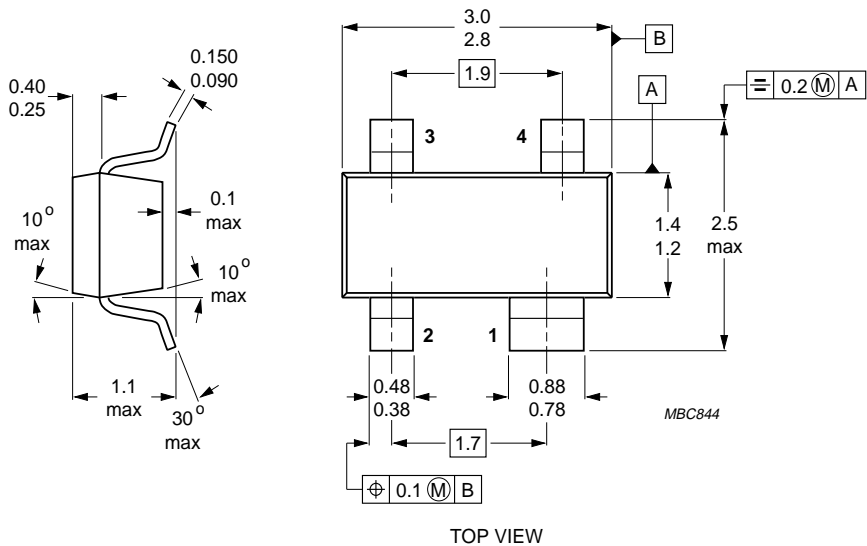
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## PACKAGE OUTLINES



Dimensions in mm.

Fig.28 SOT143.



Dimensions in mm.

Fig.29 SOT143R.

## Legal information

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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.
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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
Modifications:	• Fig. 1 and 2 on page 2; Figure note changed			
BF1100_1	19950425	Product specification	-	-

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