

DATA SHEET

BF1101; BF1101R; BF1101WR N-channel dual-gate MOS-FETs

Product specification
Supersedes data of 1999 Feb 01

1999 May 14



N-channel dual-gate MOS-FETs

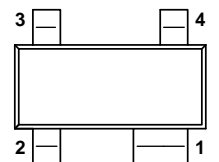
BF1101; BF1101R; BF1101WR

FEATURES

- Short channel transistor with high forward transfer admittance to input capacitance ratio
- Low noise gain controlled amplifier up to 1 GHz
- Partly internal self-biasing circuit to ensure good cross-modulation performance during AGC and good DC stabilization.

PINNING

PIN	DESCRIPTION
1	source
2	drain
3	gate 2
4	gate 1



Top view MSB035

BF1101R marking code: NCp.

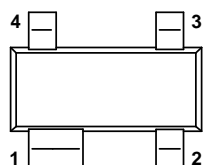
Fig.2 Simplified outline (SOT143R).

APPLICATIONS

- VHF and UHF applications with 3 to 7 V supply voltage, such as television tuners and professional communications equipment.

DESCRIPTION

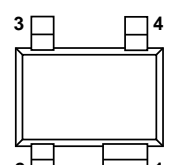
Enhancement type N-channel field-effect transistor with source and substrate interconnected. Integrated diodes between gates and source protect against excessive input voltage surges. The BF1101, BF1101R and BF1101WR are encapsulated in the SOT143B, SOT143R and SOT343R plastic packages respectively.



Top view MSB014

BF1101 marking code: NDp.

Fig.1 Simplified outline (SOT143B).



Top view MSB842

BF1101WR marking code: NC.

Fig.3 Simplified outline (SOT343R).

QUICK REFERENCE DATA

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
V_{DS}	drain-source voltage		–	–	7	V
I_D	drain current		–	–	30	mA
P_{tot}	total power dissipation		–	–	200	mW
$ y_{fs} $	forward transfer admittance		25	30	–	mS
C_{ig1-ss}	input capacitance at gate 1		–	2.2	2.7	pF
C_{rss}	reverse transfer capacitance	$f = 1 \text{ MHz}$	–	25	35	fF
F	noise figure	$f = 800 \text{ MHz}$	–	1.7	2.5	dB
X_{mod}	cross-modulation	input level for $k = 1\%$ at 40 dB AGC	100	–	–	dB μ V
T_j	operating junction temperature		–	–	150	°C

CAUTION

This product is supplied in anti-static packing to prevent damage caused by electrostatic discharge during transport and handling.

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LIMITING VALUES

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

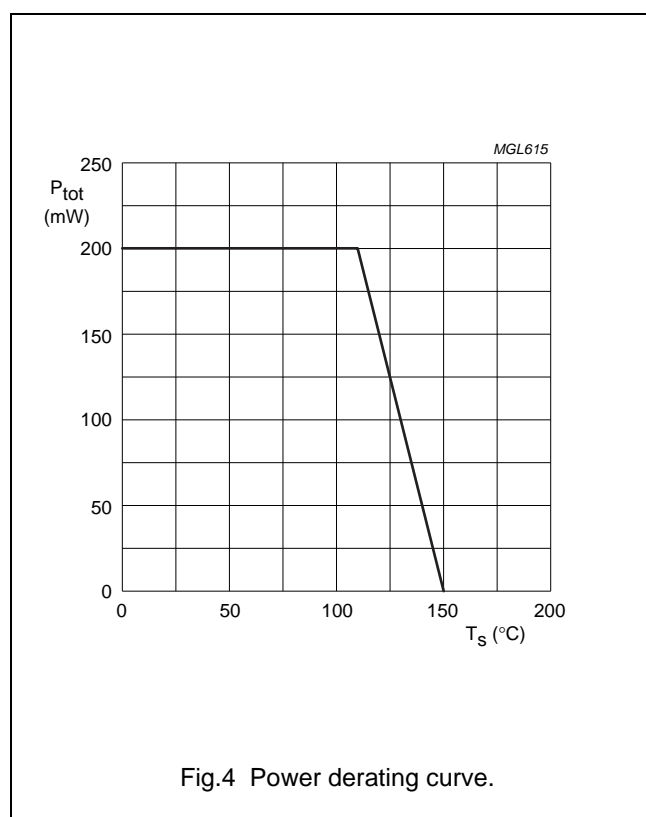
SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	UNIT
V_{DS}	drain-source voltage		–	7	V
I_D	drain current		–	30	mA
I_{G1}	gate 1 current		–	± 10	mA
I_{G2}	gate 2 current		–	± 10	mA
P_{tot}	total power dissipation	$T_s \leq 110\text{ }^{\circ}\text{C}$; note 1	–	200	mW
T_{stg}	storage temperature		–65	+150	$^{\circ}\text{C}$
T_j	operating junction temperature		–	+150	$^{\circ}\text{C}$

Note

1. T_s is the temperature of the soldering point of the source lead.

THERMAL CHARACTERISTICS

SYMBOL	PARAMETER	VALUE	UNIT
$R_{th\ j-s}$	thermal resistance from junction to soldering point	200	K/W



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STATIC CHARACTERISTICS

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

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	UNIT
$V_{(BR)DSS}$	drain-source breakdown voltage	$V_{G1-S} = V_{G2-S} = 0$; $I_D = 10\text{ }\mu\text{A}$	7	–	V
$V_{(BR)G1-SS}$	gate 1-source breakdown voltage	$V_{G2-S} = V_{DS} = 0$; $I_{G1-S} = 10\text{ mA}$	7	16	V
$V_{(BR)G2-SS}$	gate 2-source breakdown voltage	$V_{G1-S} = V_{DS} = 0$; $I_{G2-S} = 10\text{ mA}$	7	16	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	$V_{G2-S} = 4\text{ V}$; $V_{DS} = 5\text{ V}$; $I_D = 100\text{ }\mu\text{A}$	0.3	1.0	V
$V_{G2-S(th)}$	gate 2-source threshold voltage	$V_{G1-S} = 5\text{ V}$; $V_{DS} = 5\text{ V}$; $I_D = 100\text{ }\mu\text{A}$	0.3	1.2	V
I_{DSX}	drain-source current	$V_{G2-S} = 4\text{ V}$; $V_{DS} = 5\text{ V}$; $R_{G1} = 120\text{ k}\Omega$; note 1	8	16	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	$V_{G1-S} = V_{DS} = 0$; $V_{G2-S} = 4\text{ V}$	–	20	nA

Note

1. R_{G1} connects G_1 to $V_{GG} = 5\text{ V}$; see Fig.21.

DYNAMIC CHARACTERISTICS

Common source; $T_{amb} = 25\text{ }^{\circ}\text{C}$; $V_{G2-S} = 4\text{ V}$; $V_{DS} = 5\text{ V}$; $I_D = 12\text{ mA}$; unless otherwise specified.

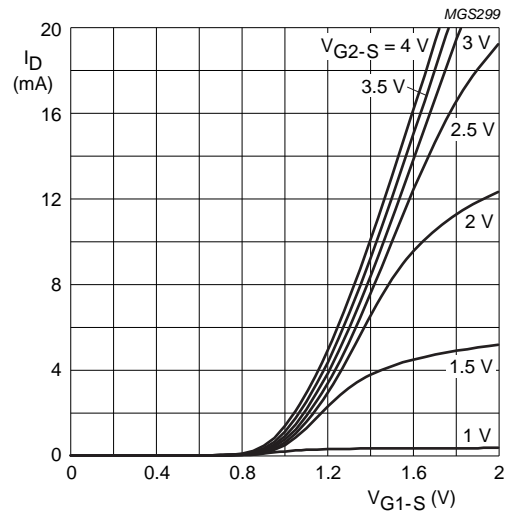
SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
$ y_{fs} $	forward transfer admittance	pulsed; $T_j = 25\text{ }^{\circ}\text{C}$	25	30	40	mS
C_{ig1-ss}	input capacitance at gate 1	$f = 1\text{ MHz}$	–	2.2	2.7	pF
C_{ig2-ss}	input capacitance at gate 2	$f = 1\text{ MHz}$	–	1.6	–	pF
C_{oss}	output capacitance	$f = 1\text{ MHz}$	–	1.2	–	pF
C_{rss}	reverse transfer capacitance	$f = 1\text{ MHz}$	–	25	35	fF
F	noise figure	$f = 800\text{ MHz}$; $Y_S = Y_{S\text{ opt}}$	–	1.7	2.5	dB
X_{mod}	cross-modulation	input level for $k = 1\%$ at 0 dB AGC; $f_w = 50\text{ MHz}$; $f_{unw} = 60\text{ MHz}$; note 1	85	–	–	dB μV
		input level for $k = 1\%$ at 40 dB AGC; $f_w = 50\text{ MHz}$; $f_{unw} = 60\text{ MHz}$; note 1	100	–	–	dB μV

Note

1. Measured in test circuit of Fig.21.

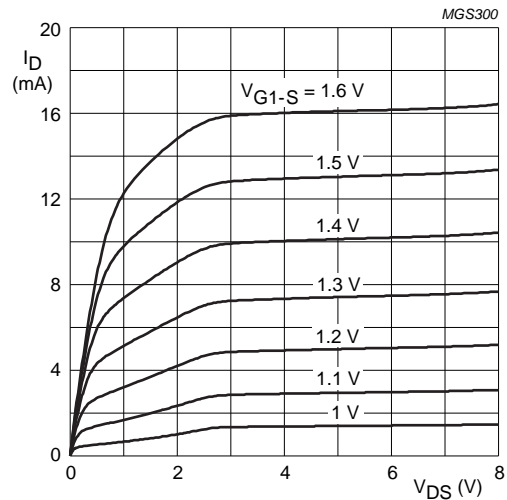
N-channel dual-gate MOS-FETs

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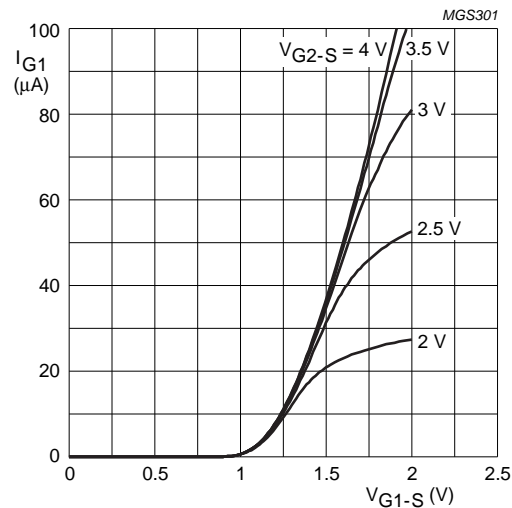
$V_{DS} = 5 \text{ V}$.
 $T_j = 25^\circ\text{C}$.

Fig.5 Transfer characteristics; typical values.



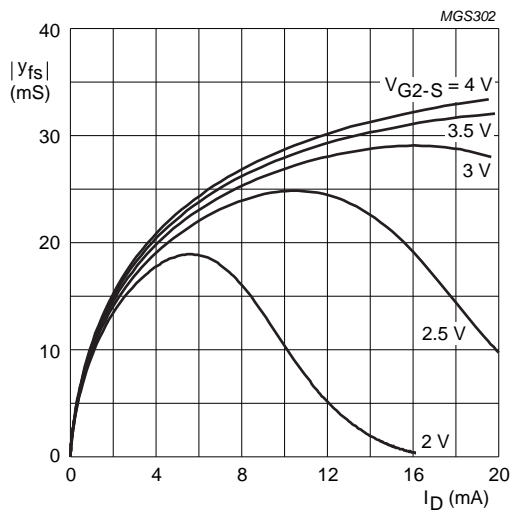
$V_{G2-S} = 4 \text{ V}$.
 $T_j = 25^\circ\text{C}$.

Fig.6 Output characteristics; typical values.



$V_{DS} = 5 \text{ V}$.
 $T_j = 25^\circ\text{C}$.

Fig.7 Gate 1 current as a function of gate 1 voltage; typical values.

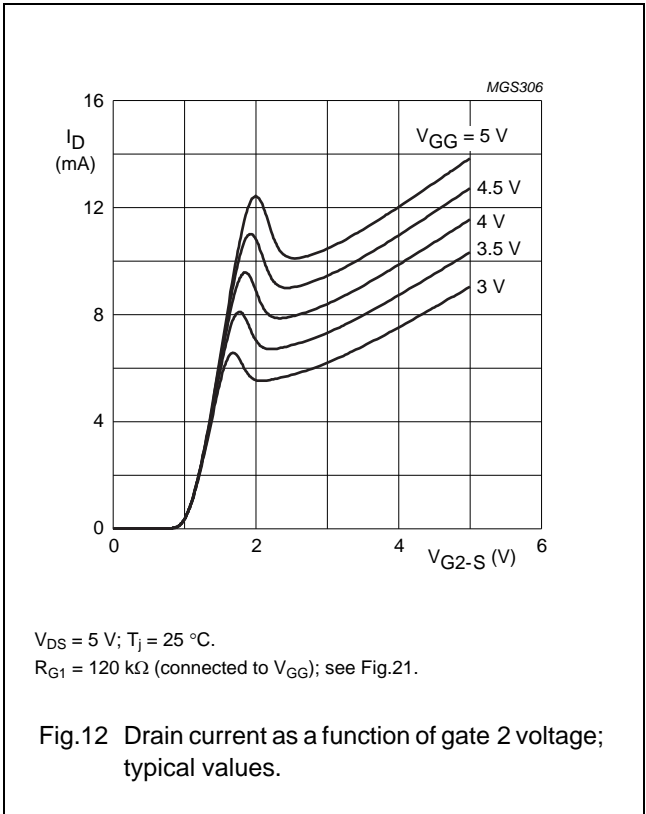
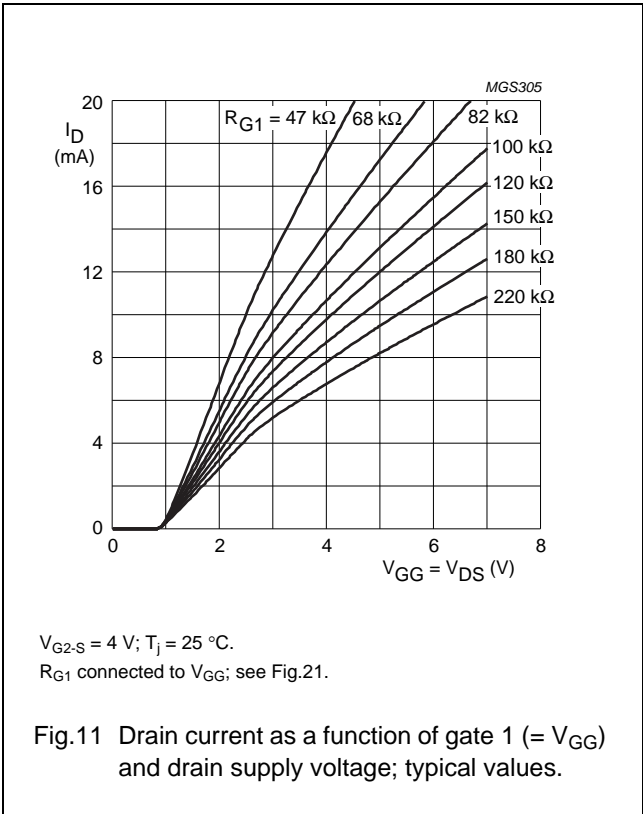
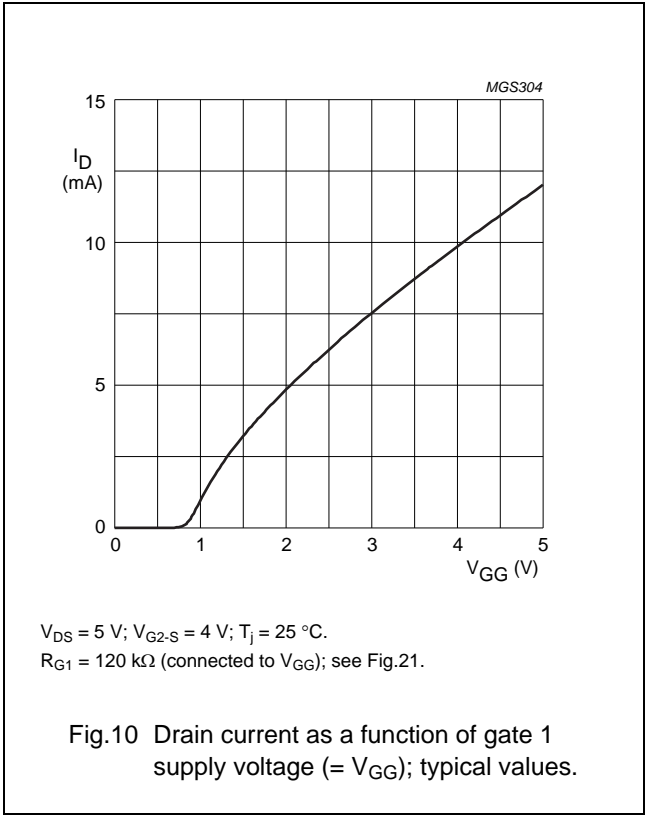
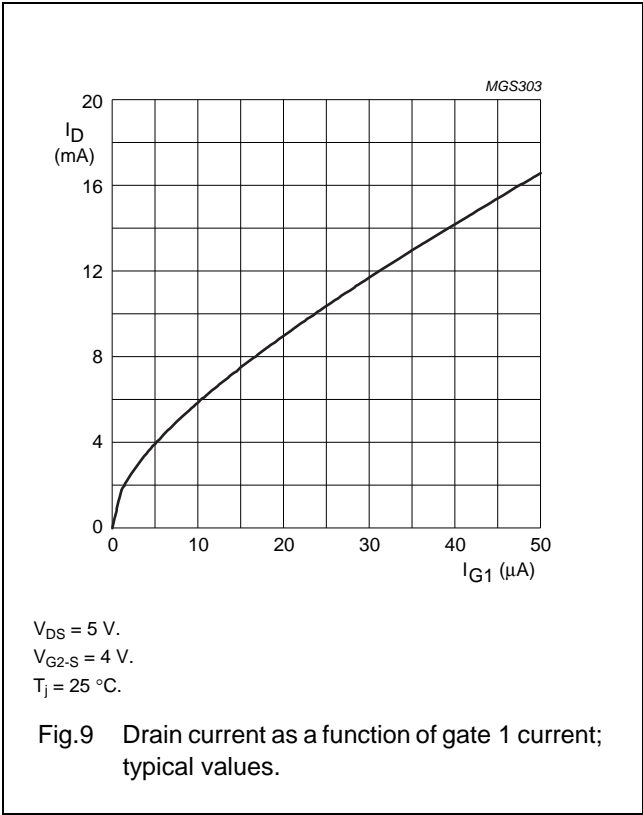


$V_{DS} = 5 \text{ V}$.
 $T_j = 25^\circ\text{C}$.

Fig.8 Forward transfer admittance as a function of drain current; typical values.

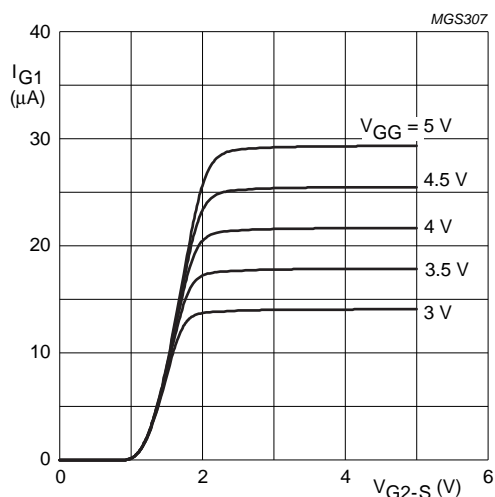
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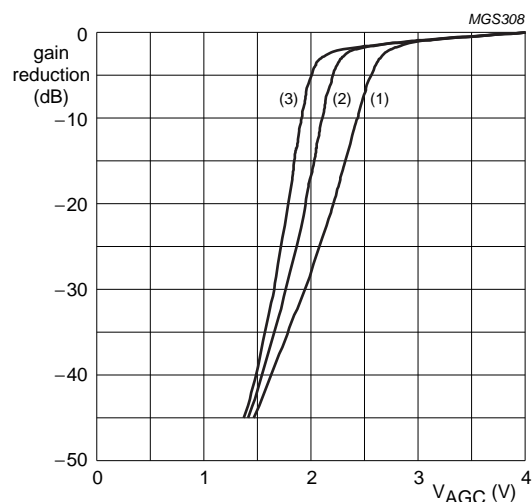
N-channel dual-gate MOS-FETs

BF1101; BF1101R; BF1101WR



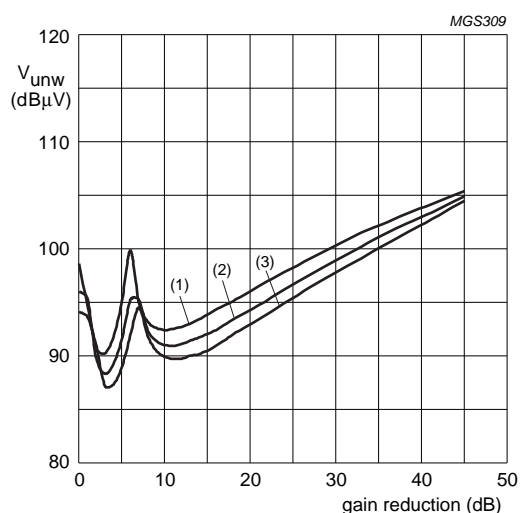
$V_{DS} = 5$ V; $T_j = 25$ °C.
 $R_{G1} = 120$ k Ω (connected to V_{G1}); see Fig.21.

Fig.13 Gate 1 current as a function of gate 2 voltage; typical values.



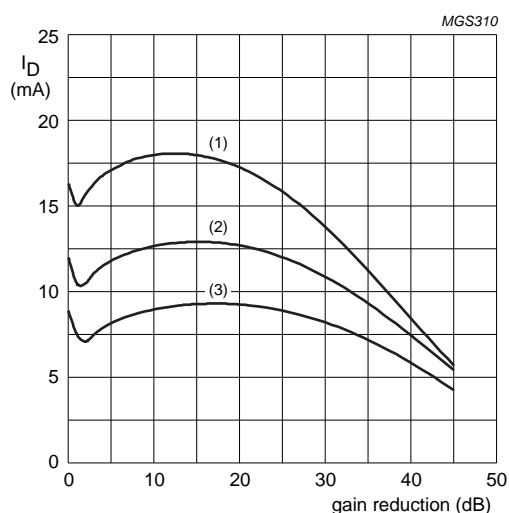
$V_{DS} = 5$ V; $V_{GG} = 5$ V; $f = 50$ MHz; $T_{amb} = 25$ °C.
 (1) $R_{G1} = 68$ k Ω . (2) $R_{G1} = 120$ k Ω . (3) $R_{G1} = 180$ k Ω .

Fig.14 Typical gain reduction as a function of the AGC voltage; see Fig.21.



$V_{DS} = 5$ V; $V_{GG} = 5$ V; $f = 50$ MHz; $f_{unw} = 60$ MHz; $T_{amb} = 25$ °C.
 (1) $R_{G1} = 68$ k Ω . (2) $R_{G1} = 120$ k Ω . (3) $R_{G1} = 180$ k Ω .

Fig.15 Unwanted voltage for 1% cross-modulation as a function of gain reduction; typical values; see Fig.21.

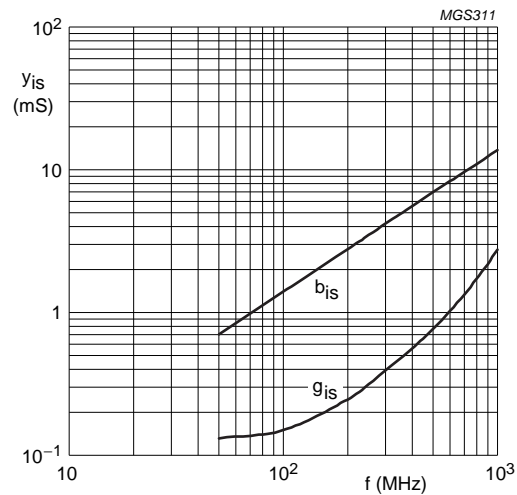


$V_{DS} = 5$ V; $V_{GG} = 5$ V; $f = 50$ MHz; $T_{amb} = 25$ °C.
 (1) $R_{G1} = 68$ k Ω . (2) $R_{G1} = 120$ k Ω . (3) $R_{G1} = 180$ k Ω .

Fig.16 Drain current as a function of gain reduction; typical values; see Fig.21.

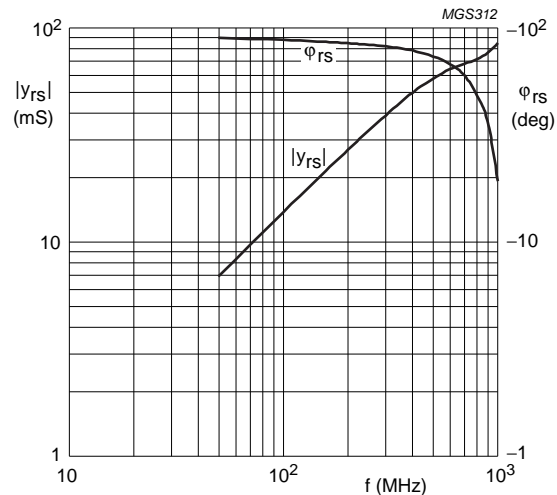
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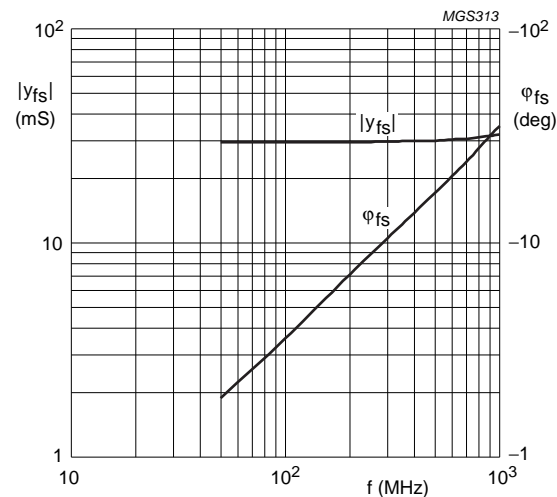
$V_{DS} = 5\text{ V}$; $V_{G2} = 4\text{ V}$.
 $I_D = 12\text{ mA}$; $T_{amb} = 25\text{ }^{\circ}\text{C}$.

Fig.17 Input admittance as a function of frequency; typical values.



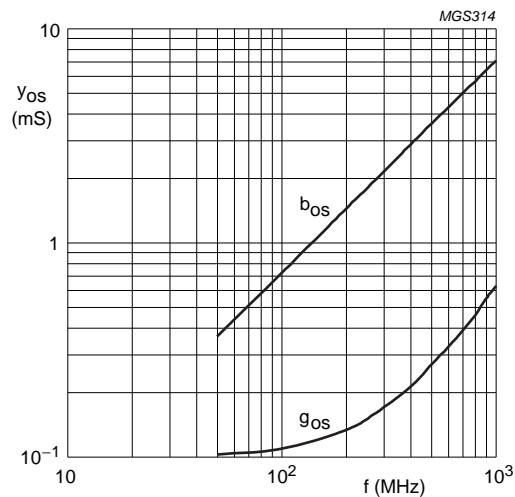
$V_{DS} = 5\text{ V}$; $V_{G2} = 4\text{ V}$.
 $I_D = 12\text{ mA}$; $T_{amb} = 25\text{ }^{\circ}\text{C}$.

Fig.18 Reverse transfer admittance and phase as a function of frequency; typical values.



$V_{DS} = 5\text{ V}$; $V_{G2} = 4\text{ V}$.
 $I_D = 12\text{ mA}$; $T_{amb} = 25\text{ }^{\circ}\text{C}$.

Fig.19 Forward transfer admittance and phase as a function of frequency; typical values.



$V_{DS} = 5\text{ V}$; $V_{G2} = 4\text{ V}$.
 $I_D = 12\text{ mA}$; $T_{amb} = 25\text{ }^{\circ}\text{C}$.

Fig.20 Output admittance as a function of frequency; typical values.

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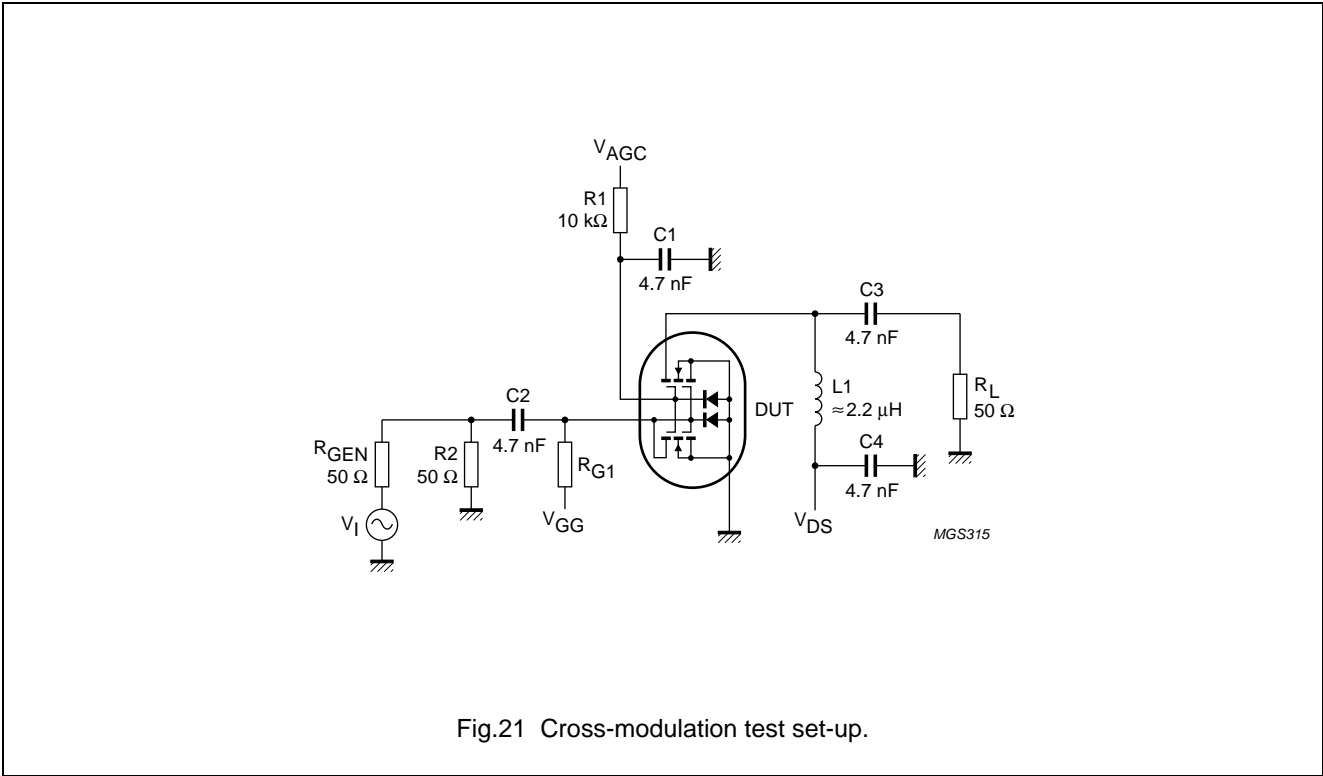


Table 1 Scattering parameters: $V_{DS} = 5\text{ V}$; $V_{G2-S} = 4\text{ V}$; $I_D = 12\text{ mA}$; $T_{amb} = 25\text{ }^{\circ}\text{C}$

f (MHz)	S ₁₁		S ₂₁		S ₁₂		S ₂₂	
	MAGNITUDE (ratio)	ANGLE (deg)	MAGNITUDE (ratio)	ANGLE (deg)	MAGNITUDE (ratio)	ANGLE (deg)	MAGNITUDE (ratio)	ANGLE (deg)
50	0.987	−4.1	2.922	175.0	0.001	87.6	0.990	−2.2
100	0.985	−8.1	2.908	170.3	0.001	86.1	0.989	−4.3
200	0.976	−16.1	2.875	160.8	0.003	83.3	0.985	−8.5
300	0.963	−23.9	2.820	157.6	0.004	80.4	0.982	−12.6
400	0.949	−31.6	2.762	142.6	0.005	78.2	0.977	−16.8
500	0.933	−38.8	2.665	134.1	0.005	77.8	0.972	−20.8
600	0.916	−45.7	2.591	125.7	0.005	78.9	0.967	−24.7
700	0.897	−52.2	2.498	117.7	0.006	81.8	0.961	−28.5
800	0.877	−58.4	2.410	109.6	0.005	89.1	0.957	−32.2
900	0.856	−64.5	2.318	101.6	0.006	97.1	0.950	−35.8
1000	0.832	−70.3	2.214	94.2	0.006	110.4	0.946	−39.6

Table 2 Noise data: $V_{DS} = 5\text{ V}$; $V_{G2-S} = 4\text{ V}$; $I_D = 12\text{ mA}$; $T_{amb} = 25\text{ }^{\circ}\text{C}$

f (MHz)	F _{min} (dB)	Γ _{opt}		R _n (Ω)
		(ratio)	(deg)	
800	1.5	0.715	58.3	37.85

N-channel dual-gate MOS-FETs

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PACKAGE OUTLINES

Plastic surface-mounted package; 4 leads

SOT143B

Technical drawing of the SOT143B package showing top, side, and lead detail views with dimensions A, A1, bp, b1, c, D, E, e, e1, HE, Lp, Q, v, w, y.

0 1 2 mm
scale

DIMENSIONS (mm are the original dimensions)

UNIT	A	A1 max	bp	b1	c	D	E	e	e1	HE	Lp	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

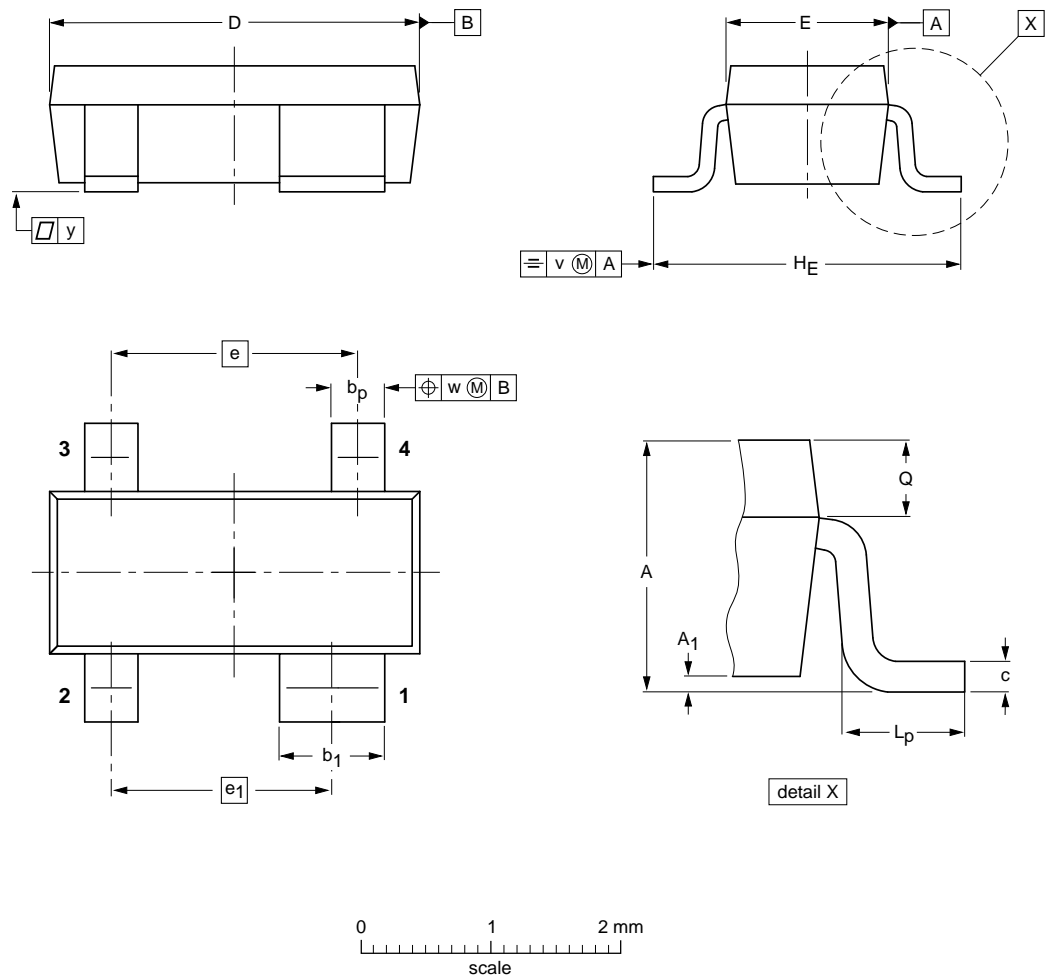
OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	JEITA			
SOT143B						04-11-16 06-03-16

N-channel dual-gate MOS-FETs

BF1101; BF1101R; BF1101WR

Plastic surface-mounted package; reverse pinning; 4 leads

SOT143R



DIMENSIONS (mm are the original dimensions)

UNIT	A	A ₁ max	b _p	b ₁	c	D	E	e	e ₁	H _E	L _p	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	0.55 0.25	0.45 0.25	0.2	0.1	0.1

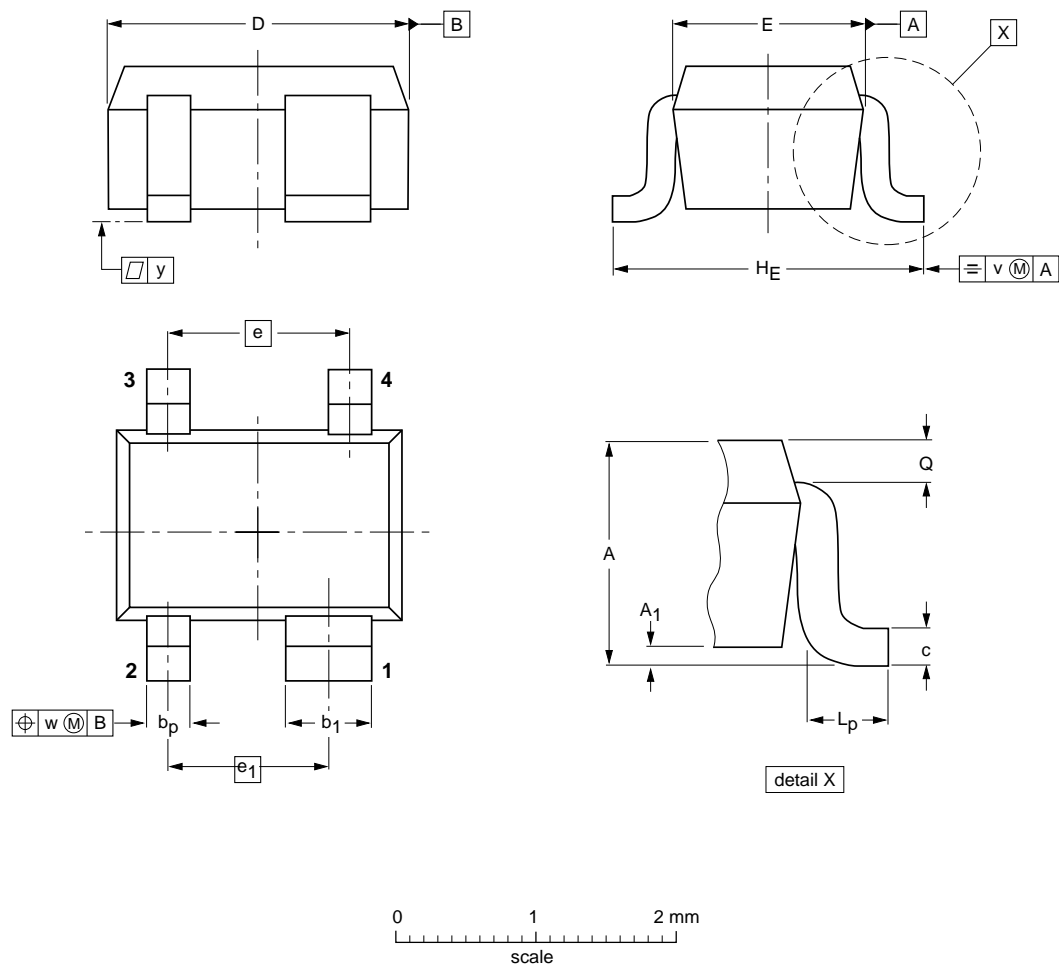
OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	JEITA			
SOT143R			SC-61AA			04-11-16 06-03-16

N-channel dual-gate MOS-FETs

BF1101; BF1101R; BF1101WR

Plastic surface-mounted package; reverse pinning; 4 leads

SOT343R



DIMENSIONS (mm are the original dimensions)

UNIT	A	A ₁ max	b _p	b ₁	c	D	E	e	e ₁	H _E	L _p	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

N-channel dual-gate MOS-FETs

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DATA SHEET STATUS

DOCUMENT STATUS ⁽¹⁾	PRODUCT STATUS ⁽²⁾	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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1. Please consult the most recently issued document before initiating or completing a design.
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NXP Semiconductors

provides High Performance Mixed Signal and Standard Product solutions that leverage its leading RF, Analog, Power Management, Interface, Security and Digital Processing expertise

Customer notification

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>

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