DATA SHEET

BF1201; BF1201R; BF1201WR
N-channel dual-gate PoLo MOS-FETs

Product specification
Supersedes data of 1999 Dec 01

2000 Mar 29

N-channel dual-gate PoLo MOS-FETs

BF1201; BF1201R; BF1201WR

FEATURES

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

APPLICATIONS

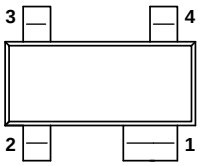
- VHF and UHF applications with 3 to 9 V supply voltage, such as digital and analogue television tuners and professional communications equipment.

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 BF1201, BF1201R and BF1201WR are encapsulated in the SOT143B, SOT143R and SOT343R plastic packages respectively.

PINNING

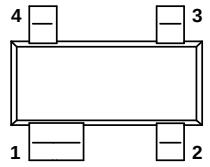
PIN	DESCRIPTION
1	source
2	drain
3	gate 2
4	gate 1



Top view MSB035

BF1201R marking code: LBp

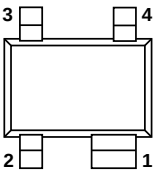
Fig.2 Simplified outline (SOT143R).



Top view MSB014

BF1201 marking code: LAp.

Fig.1 Simplified outline (SOT143B).



Top view MSB842

BF1201WR marking code: LA

Fig.3 Simplified outline (SOT343R).

QUICK REFERENCE DATA

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
V_{DS}	drain-source voltage		–	–	10	V
I_D	drain current		–	–	30	mA
P_{tot}	total power dissipation		–	–	200	mW
$\lvert y_{fs} \rvert$	forward transfer admittance		23	28	35	mS
$C_{ig1\text{-}ss}$	input capacitance at gate 1		–	2.6	3.1	pF
C_{rss}	reverse transfer capacitance	f = 1 MHz	–	15	30	fF
F	noise figure	f = 400 MHz	–	1	1.8	dB
X_{mod}	cross-modulation	input level for k = 1% at 40 dB AGC	105	–	–	dBμV
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.

LIMITING VALUES

In accordance with the Absolute Maximum Rating System (IEC 60134).

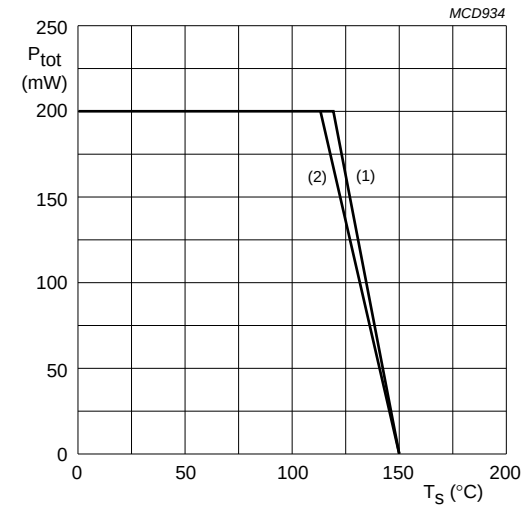
SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	UNIT
V_{DS}	drain-source voltage		–	10	V
I_D	drain current (DC)		–	30	mA
I_{G1}	gate 1 current		–	±10	mA
I_{G2}	gate 2 current		–	±10	mA
P_{tot}	total power dissipation				
	BF1201; BF1201R	$T_s \leq 113$ °C; note 1	–	200	mW
	BF1201WR	$T_s \leq 109$ °C; note 1	–	200	mW
T_{stg}	storage temperature		−65	+150	°C
T_j	operating junction temperature		–	150	°C

Note

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

THERMAL CHARACTERISTICS

SYMBOL	PARAMETER	VALUE	UNIT
$R_{th\ j\text{-}s}$	thermal resistance from junction to soldering point		
	BF1201; BF1201R	185	K/W
	BF1201WR	155	K/W



(1) BF1201WR.
(2) BF1201 and BF1201R.

Fig.4 Power derating curve.

STATIC CHARACTERISTICS

T_j = 25 °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 μA	10	–	V
$V_{(BR)G1-SS}$	gate 1-source breakdown voltage	$V_{G2-S} = V_{DS} = 0$; I_{G1-S} = 10 mA	6	–	V
$V_{(BR)G2-SS}$	gate 2-source breakdown voltage	$V_{G1-S} = V_{DS} = 0$; I_{G2-S} = 10 mA	6	–	V
$V_{(F)S-G1}$	forward source-gate 1 voltage	$V_{G2-S} = V_{DS} = 0$; I_{S-G1} = 10 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 mA	0.5	1.5	V
$V_{G1-S(th)}$	gate 1-source threshold voltage	V_{G2-S} = 4 V; V_{DS} = 5 V; I_D = 100 μA	0.3	1.0	V
$V_{G2-S(th)}$	gate 2-source threshold voltage	$V_{G1-S} = V_{DS}$ = 5 V; I_D = 100 μA	0.3	1.2	V
I_{DSX}	drain-source current	V_{G2-S} = 4 V; V_{DS} = 5 V; R_{G1} = 62 kΩ; note 1	11	19	mA
I_{G1-SS}	gate 1 cut-off current	$V_{G2-S} = V_{DS} = 0$; V_{G1-S} = 5 V	–	50	nA
I_{G2-SS}	gate 2 cut-off current	$V_{G1-S} = V_{DS} = 0$; V_{G2-S} = 4 V	–	20	nA

Note

1. R_{G1} connects G_1 to V_{GG} = 5 V.

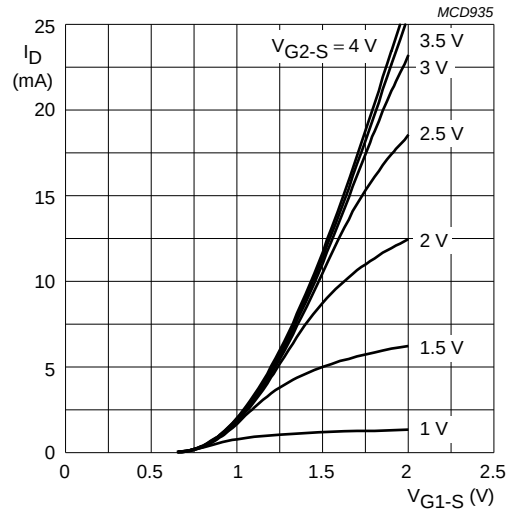
DYNAMIC CHARACTERISTICS

Common source; T_{amb} = 25 °C; V_{G2-S} = 4 V; V_{DS} = 5 V; I_D = 15 mA; unless otherwise specified.

SYMBOL	PARAMETER	CONDITIONS	MIN.	TYP.	MAX.	UNIT
$\lvert y_{fs} \rvert$	forward transfer admittance	pulsed; T_j = 25 °C	23	28	35	mS
C_{ig1-ss}	input capacitance at gate 1	f = 1 MHz	–	2.6	3.1	pF
C_{ig2-ss}	input capacitance at gate 2	f = 1 MHz	–	1.1	–	pF
C_{oss}	output capacitance	f = 1 MHz	–	0.9	–	pF
C_{rss}	reverse transfer capacitance	f = 1 MHz	–	15	30	fF
F	noise figure	f = 10.7 MHz; G_S = 20 mS; B_S = 0	–	5	7	dB
		f = 400 MHz; $Y_S = Y_{S\ opt}$	–	1	1.8	dB
		f = 800 MHz; $Y_S = Y_{S\ opt}$	–	1.9	2.5	dB
G_{tr}	power gain	f = 200 MHz; G_S = 2 mS; $B_S = B_{S\ opt}$; G_L = 0.5 mS; $B_L = B_{L\ opt}$;	–	33.5	–	dB
		f = 400 MHz; G_S = 2 mS; $B_S = B_{S\ opt}$; G_L = 1 mS; $B_L = B_{L\ opt}$;	–	29	–	dB
		f = 800 MHz; G_S = 3.3 mS; $B_S = B_{S\ opt}$; G_L = 1 mS; $B_L = B_{L\ opt}$;	–	24	–	dB
X_{mod}	cross-modulation	input level for k = 1%; f_w = 50 MHz; f_{unw} = 60 MHz; note 1				
		at 0 dB AGC	90	–	–	dBμV
		at 10 dB AGC	–	95	–	dBμV
		at 40 dB AGC	105	–	–	dBμV

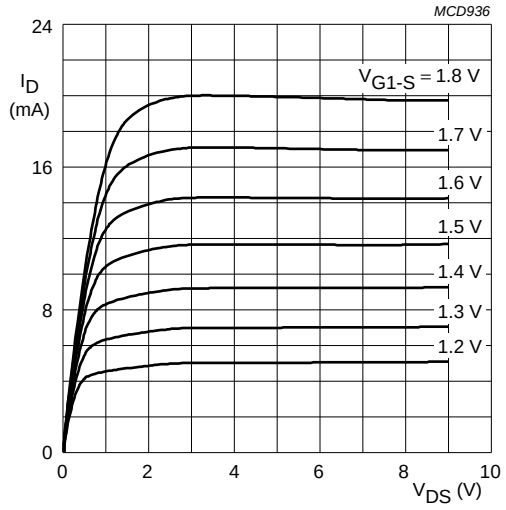
Note

1. Measured in Fig.21 test circuit.



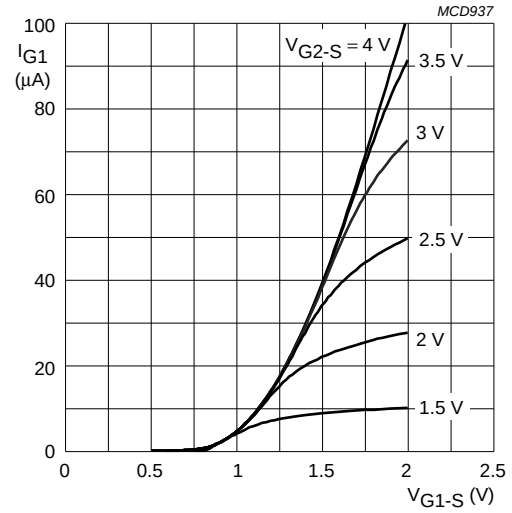
V_{DS} = 5 V.
T_j = 25 °C.

Fig.5 Transfer characteristics; typical values.



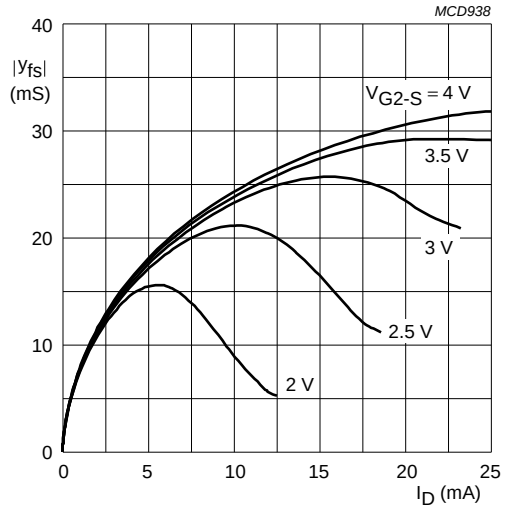
V_{G2-S} = 4 V.
T_j = 25 °C.

Fig.6 Output characteristics; typical values.



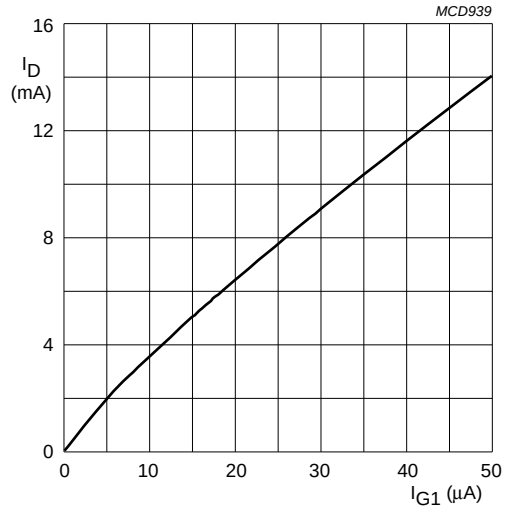
V_{DS} = 5 V.
T_j = 25 °C.

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



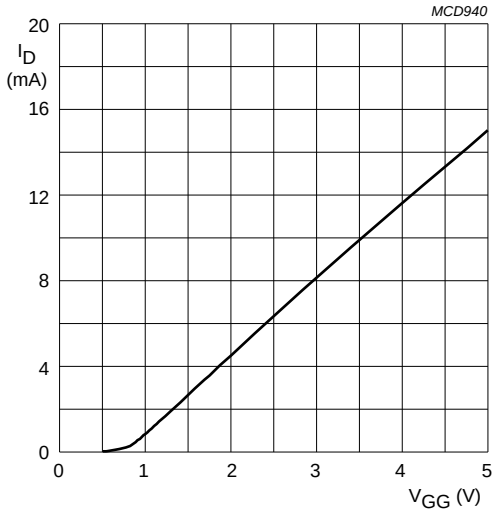
V_{DS} = 5 V.
T_j = 25 °C.

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



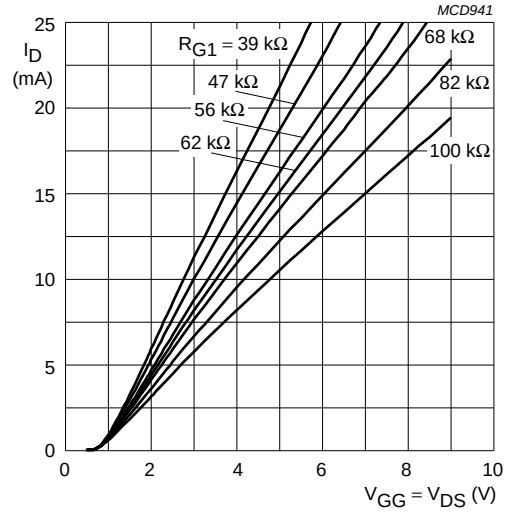
V_{DS} = 5 V; $V_{G2\text{-}S}$ = 4 V.
T_j = 25 °C.

Fig.9 Drain current as a function of gate 1 current; typical values.



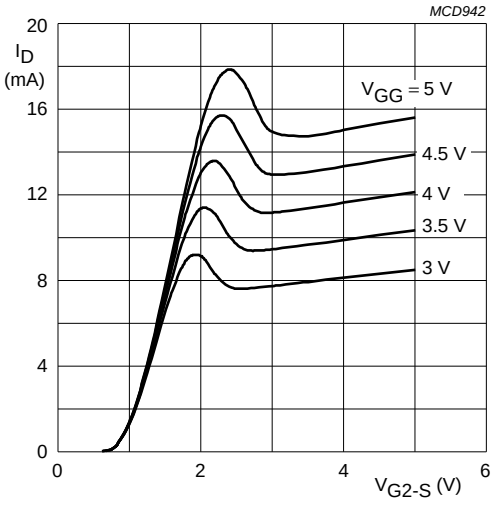
V_{DS} = 5 V; $V_{G2\text{-}S}$ = 4 V; T_j = 25 °C.
R_{G1} = 62 kΩ (connected to V_{GG}); see Fig.21.

Fig.10 Drain current as a function of gate 1 supply voltage (= V_{GG}); typical values.



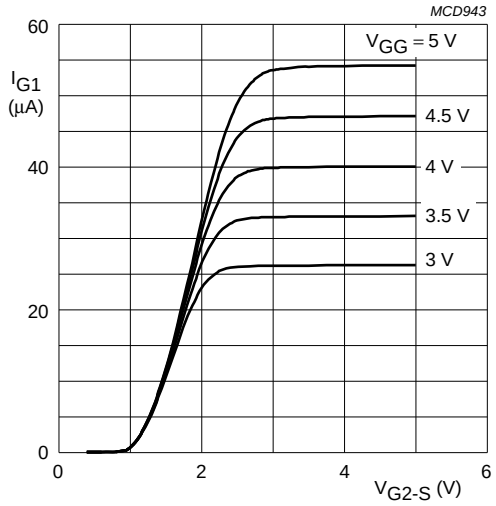
$V_{G2\text{-}S}$ = 4 V; T_j = 25 °C.
R_{G1} connected to V_{GG}; see Fig.21.

Fig.11 Drain current as a function of gate 1 (= V_{GG}) and drain supply voltage; typical values.



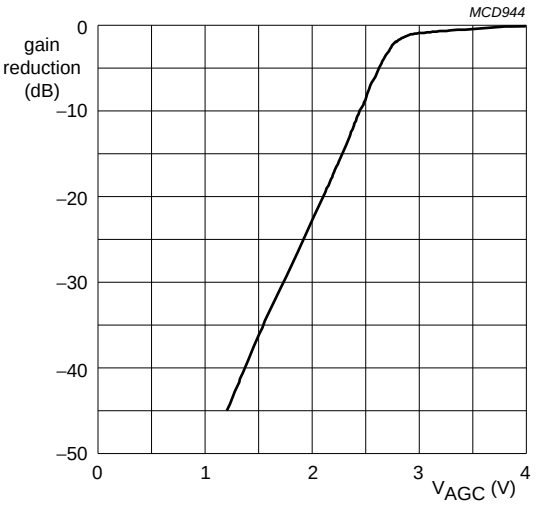
V_{DS} = 5 V; T_j = 25 °C.
R_{G1} = 62 kΩ (connected to V_{GG}); see Fig.21.

Fig.12 Drain current as a function of gate 2 voltage; typical values.



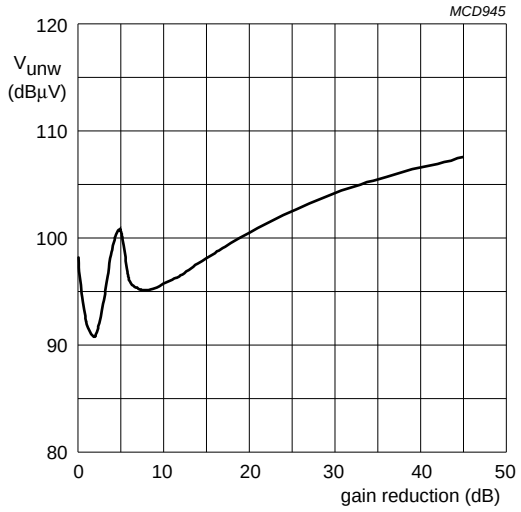
V_{DS} = 5 V; T_j = 25 °C.
R_{G1} = 62 kΩ (connected to V_{GG}); see Fig.21.

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



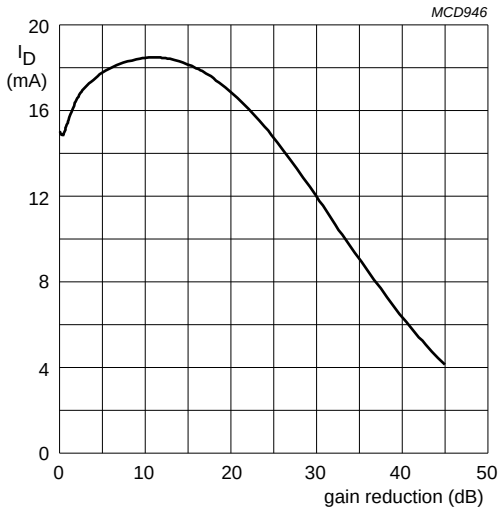
V_{DS} = 5 V; V_{GG} = 5 V; R_{G1} = 62 kΩ;
f = 50 MHz; T_{amb} = 25 °C.

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



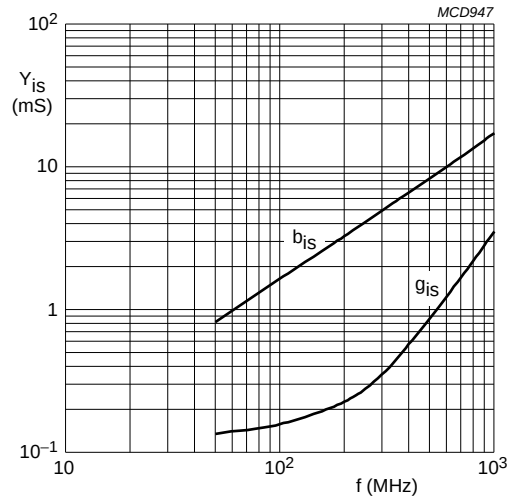
V_{DS} = 5 V; V_{GG} = 5 V; R_{G1} = 62 kΩ; f = 50 MHz;
f_{unw} = 60 MHz; T_{amb} = 25 °C.

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



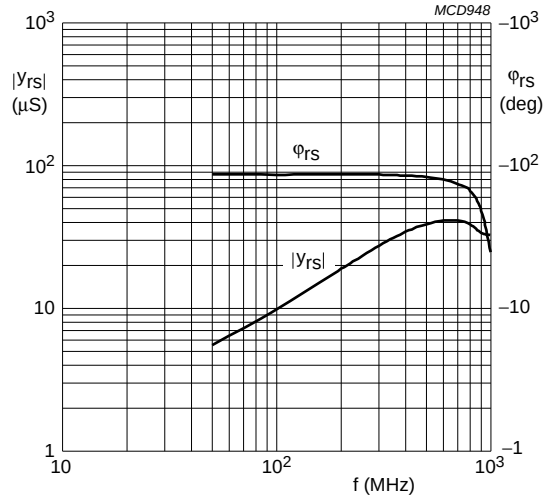
V_{DS} = 5 V; V_{GG} = 5 V; R_{G1} = 62 kΩ;
f = 50 MHz; T_{amb} = 25 °C.

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



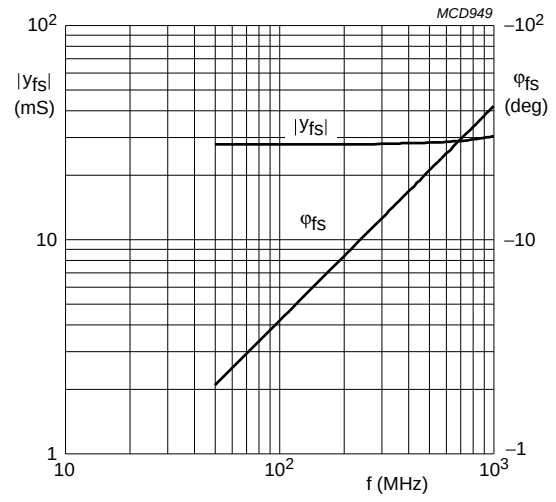
V_{DS} = 5 V; V_{G2} = 4 V.
I_D = 15 mA; T_{amb} = 25 °C.

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



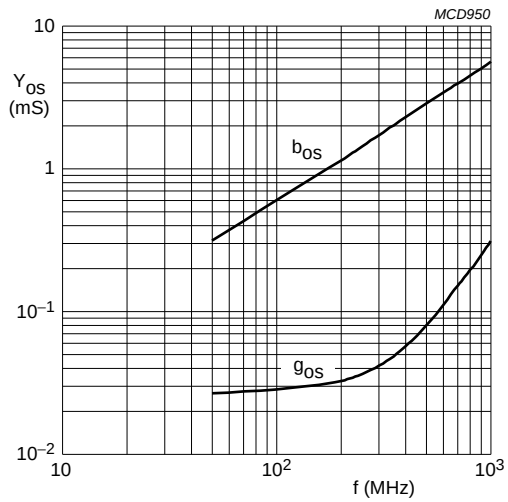
V_{DS} = 5 V; V_{G2} = 4 V.
I_D = 15 mA; T_{amb} = 25 °C.

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



V_{DS} = 5 V; V_{G2} = 4 V.
I_D = 15 mA; T_{amb} = 25 °C.

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



V_{DS} = 5 V; V_{G2} = 4 V.
I_D = 15 mA; T_{amb} = 25 °C.

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

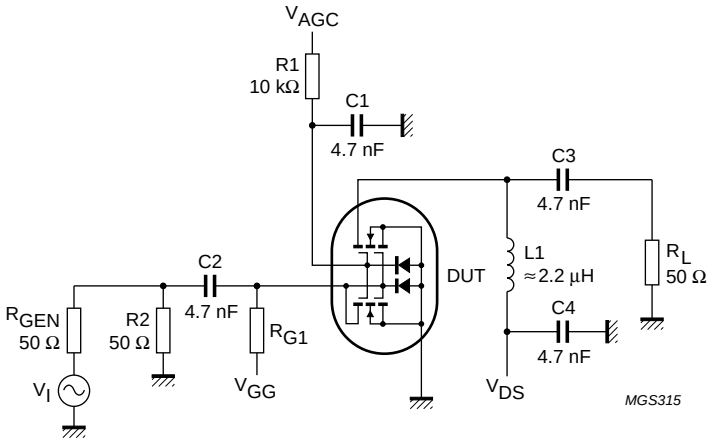


Fig.21 Cross-modulation test set-up.

Table 1 Scattering parameters: V_{DS} = 5 V; $V_{G2\text{-}S}$ = 4 V; I_D = 15 mA; T_{amb} = 25 °C

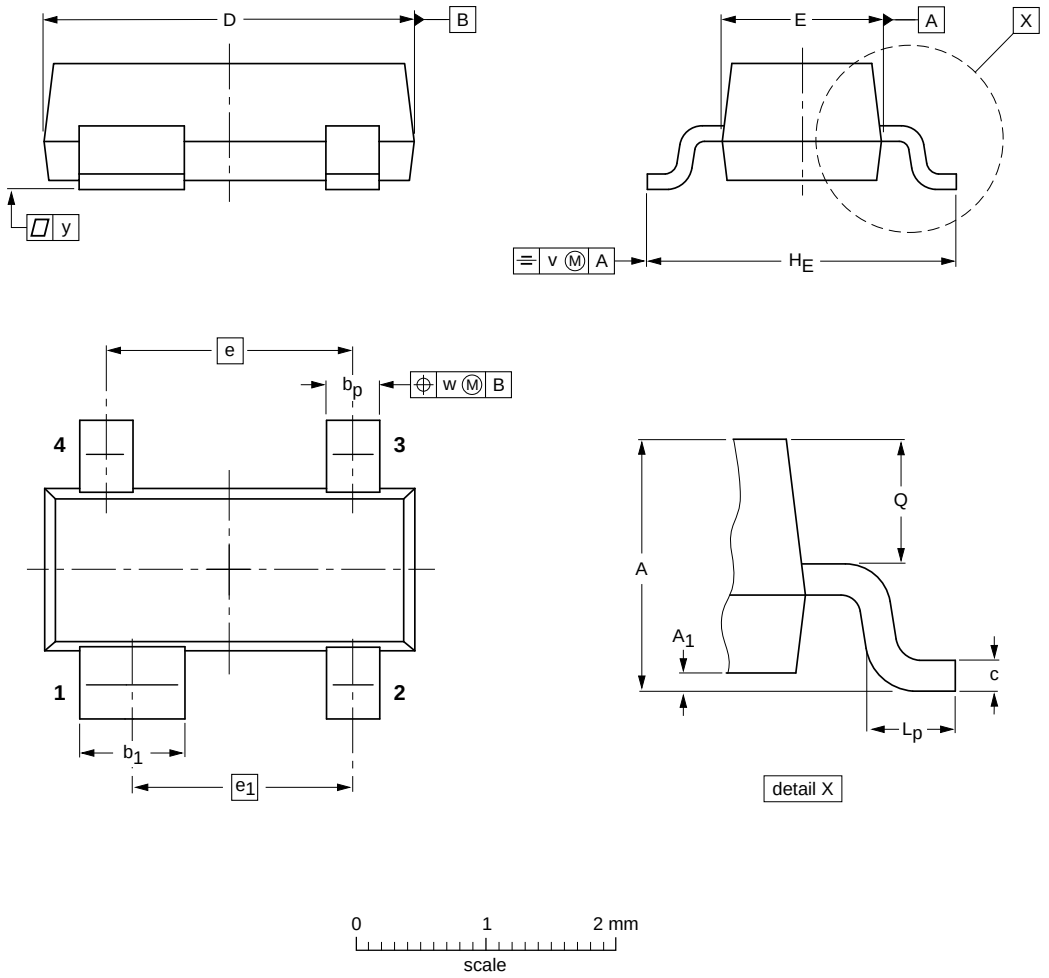
f (MHz)	s_{11}		s_{21}		s_{12}		s_{22}	
	MAGNITUDE (ratio)	ANGLE (deg)	MAGNITUDE (ratio)	ANGLE (deg)	MAGNITUDE (ratio)	ANGLE (deg)	MAGNITUDE (ratio)	ANGLE (deg)
50	0.987	−4.72	2.775	174.6	0.0006	88.8	0.997	−1.84
100	0.985	−9.39	2.774	169.5	0.0010	86.7	0.997	−3.37
200	0.978	−18.59	2.731	159.1	0.0019	79.7	0.996	−6.72
300	0.976	−27.74	2.671	148.8	0.0026	74.2	0.994	−10.02
400	0.949	−36.59	2.599	138.8	0.0032	69.9	0.992	−13.33
500	0.928	−45.08	2.501	129.1	0.0035	65.9	0.989	−16.55
600	0.905	−53.26	2.400	119.8	0.0035	64.6	0.986	−19.64
700	0.882	−61.07	2.297	110.9	0.0033	65.7	0.982	−22.63
800	0.860	−68.48	2.199	102.4	0.0029	69.1	0.979	−25.54
900	0.838	−75.55	2.096	94.2	0.0024	83.3	0.975	−28.44
1000	0.818	−82.23	1.997	86.3	0.0021	103.8	0.971	−31.42

Table 2 Noise data: V_{DS} = 5 V; $V_{G2\text{-}S}$ = 4 V; I_D = 15 mA; T_{amb} = 25 °C

f (MHz)	F_{min} (dB)	Γ_{opt}		R_n (Ω)
		(ratio)	(deg)	
400	1	0.825	38.93	50
800	1.9	0.753	70.65	38.75

PACKAGE OUTLINES

Plastic surface-mounted package; 4 leads **SOT143B**

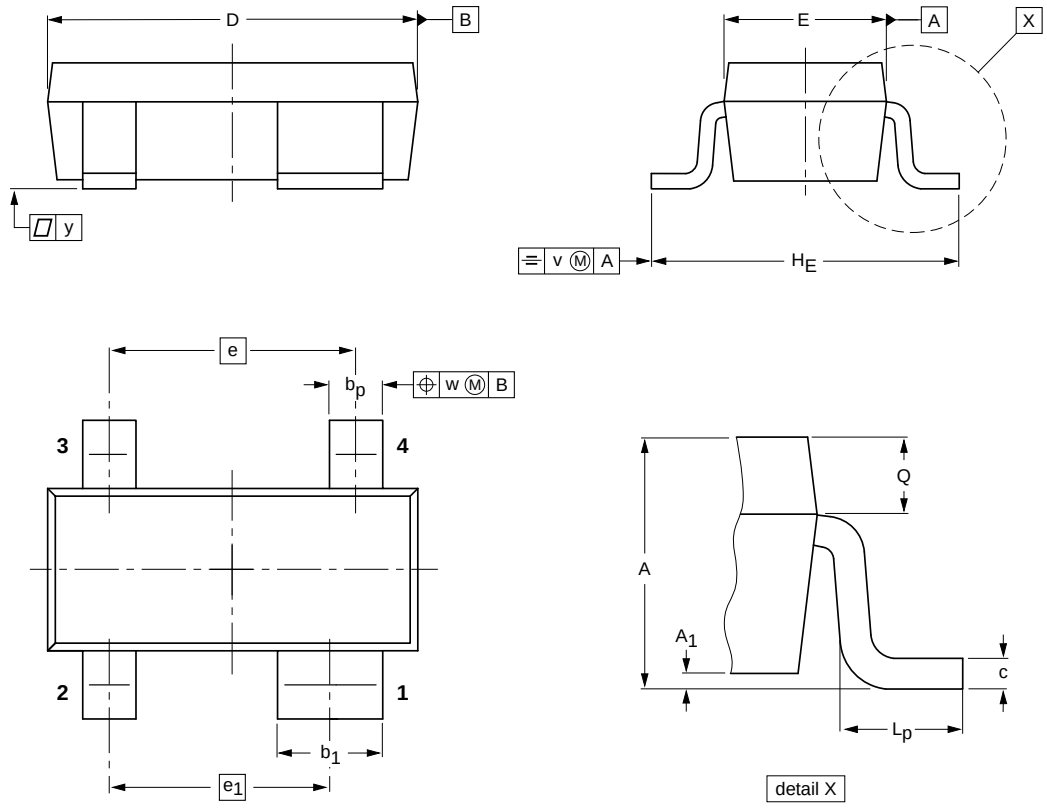


DIMENSIONS (mm are the original dimensions)

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	0.45 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

Plastic surface-mounted package; reverse pinning; 4 leads **SOT143R**

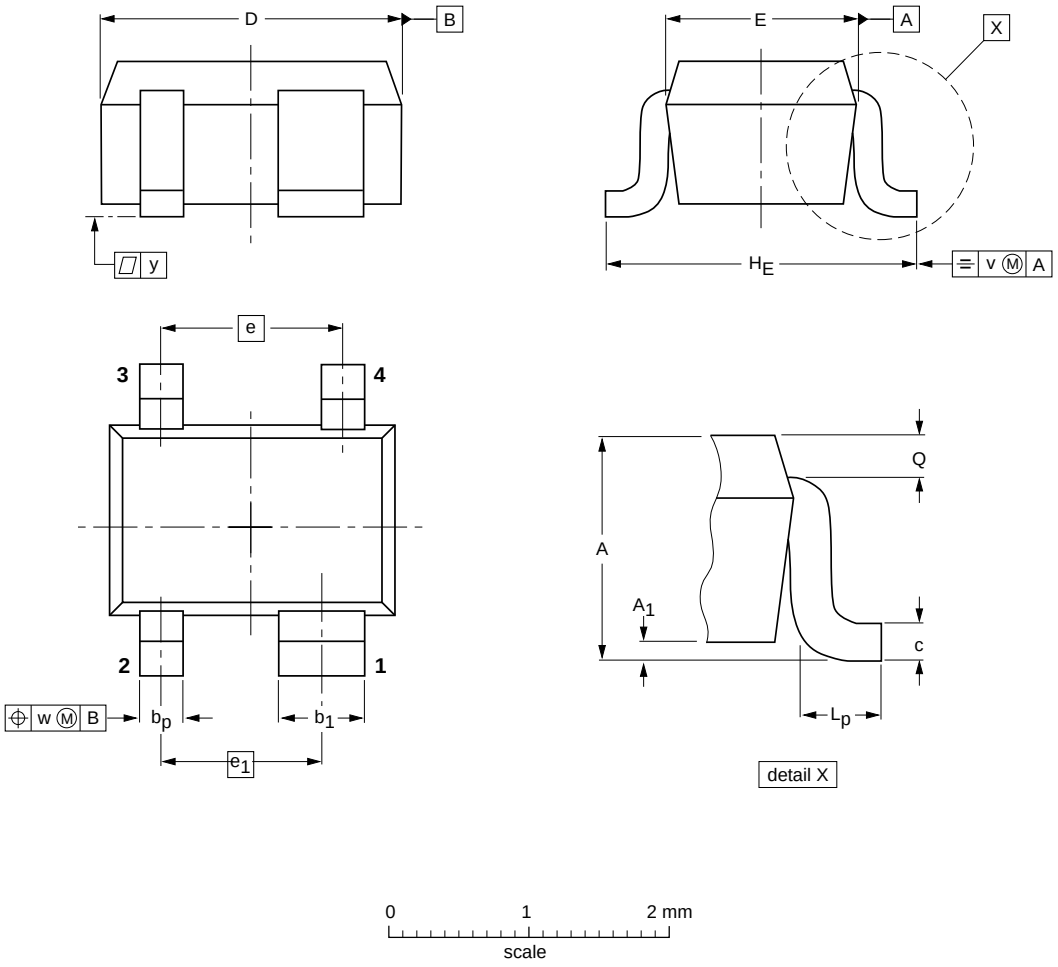


DIMENSIONS (mm are the original dimensions)

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

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

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.

Notes

1. Please consult the most recently issued document before initiating or completing a design.
2. 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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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.

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