DIGITRON™ Semiconductors

High-reliability discrete products
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3N209-3N210

DUAL GATE MOSFET VHF AMPLIFIER

FEATURES

- Available as "HR" (high reliability) screened per MIL-PRF-19500, JANTX level. Add "HR" suffix to base part number.
- Available as non-RoHS (Sn/Pb plating), standard, and as RoHS by adding "-PBF" suffix.

MAXIMUM RATINGS

Rating	Symbol	Value		Unit
Drain – source voltage	V_{DS}	25		Vdc
Drain gate voltage	V_{DG1} V_{DG2}	30		Vdc
Gate current	I_{G1R} I_{G1F} I_{G2R} I_{G2F}	-10 10 -10 10		mAdc
Drain current – continuous	I_D	30		mAdc
Total power dissipation @ T_A = 25°C **Derate above 25°C**	P_D	3N209 300 1.71	3N210 350 2.80	mW mW/°C
Storage channel temperature range	T_{stg}	-65 to 200	-65 to 175	°C
Operating channel temperature	$T_{channel}$	200	150	°C
Lead temperature, 1/16" from seated surface for 10 s		260		°C

ELECTRICAL CHARACTERISTICS (T_C = 25°C)

Characteristic	Symbol	Min	Typ	Max	Unit
OFF CHARACTERISTICS					
Drain source breakdown voltage (I_D = 10µAdc, V_{G1S} = -4.0Vdc, V_{G2S} = 4.0Vdc)	$V_{(BR)DS}$	25	-	-	Vdc
Gate 1 – source forward breakdown voltage (I_{G1} = 10mAdc, V_{G2S} = V_{DS} = 0)	$V_{(BR)G1SSF}$	7.0	-	22	Vdc
Gate 1 – source reverse breakdown voltage (I_{G1} = -10mAdc, V_{G2S} = V_{DS} = 0)	$V_{(BR)G1SSR}$	7.0	-	-22	Vdc
Gate 2 – source forward breakdown voltage (I_{G2} = 10mAdc, V_{G1S} = V_{DS} = 0)	$V_{(BR)G2SSF}$	7.0	-	22	Vdc
Gate 2 – source reverse breakdown voltage (I_{G2} = -10mAdc, V_{G1S} = V_{DS} = 0)	$V_{(BR)G2SSR}$	-7.0	-	-22	Vdc
Gate 1 – source cutoff voltage (V_{DS} = 15Vdc, V_{G2S} = 4.0Vdc, I_D = 50µAdc)	$V_{G1S(off)}$	-0.1	-	-4.0	Vdc
Gate 2 – source cutoff voltage (V_{DS} = 15Vdc, V_{G1S} = 0Vdc, I_D = 50µAdc)	$V_{G2S(off)}$	-0.1	-	-4.0	Vdc
Gate 1 – terminal forward current (V_{G1S} = 6.0Vdc, V_{G2S} = V_{DS} = 0)	I_{G1SSF}	-	-	20	nAdc
Gate 1 – terminal reverse current (V_{G1S} = -6.0Vdc, V_{G2S} = V_{DS} = 0) (V_{G1S} = -6.0Vdc, V_{G2S} = V_{DS} = 0, T_A = 150°C)	I_{G1SSR}	- -	- -	-20 -10	nAdc µAdc

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ELECTRICAL CHARACTERISTICS (T_C = 25°C)

Characteristic	Symbol	Min	Typ	Max	Unit
Gate 2 – terminal forward current (V_{G2S} = 6.0Vdc, V_{G1S} = V_{DS} = 0)	I_{G2SSF}	-	-	20	nAdc
Gate 2 – terminal reverse current (V_{G2S} = -6.0Vdc, V_{G1S} = V_{DS} = 0) (V_{G2S} = -6.0vdc, V_{G1S} = V_{DS} = 0, T_A = 150°C)	I_{G2SSR}	- -	- -	-20 -10	nAdc µAdc
ON CHARACTERISTICS					
Gate 1 – zero voltage drain current (V_{DS} = 15Vdc, V_{G1S} = 0, V_{G2S} = 4.0Vdc)	I_{DSS}	5.0	-	30	mAdc
SMALL SIGNAL CHARACTERISTICS					
Forward transfer admittance (V_{DS} = 15Vdc, V_{G2S} = 4.0Vdc, I_D = 10mAdc, f = 1.0kHz)	y_{fs}	10	13	20	mmhos
Input capacitance (V_{DS} = 15Vdc, V_{G2S} = 4.0Vdc, I_D ≥ 5.0mAdc, f = 1.0MHz)	C_{iss}	-	4.5	7.0	pF
Reverse transfer capacitance (V_{DS} = 15Vdc, V_{G2S} = 4.0Vdc, I_D ≥ 5.0mAdc, f = 1.0MHz)	C_{rss}	0.005	0.023	0.030	pF
Output capacitance (V_{DS} = 15Vdc, V_{G2S} = 4.0Vdc, I_D ≥ 5.0mAdc, f = 1.0MHz)	C_{oss}	0.5	2.0	4.0	pF
Common source noise figure (V_{DS} = 15Vdc, V_{G2S} = 4.0Vdc, I_D ≥ 10mAdc, f = 500MHz)	NF	-	4.5	6.0	dB
Common source power gain (V_{DS} = 15Vdc, V_{G2S} = 4.0Vdc, I_D ≥ 10mAdc, f = 500MHz)	G_{ps}	10	13	20	dB
Bandwidth (V_{DS} = 15Vdc, V_{G2S} = 4.0Vdc; I_D = 10mAdc, f = 500MHz)	BW	7.0	-	17	MHz

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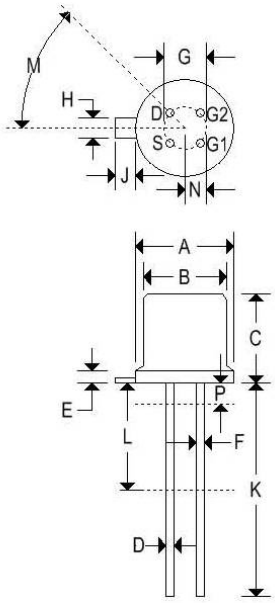
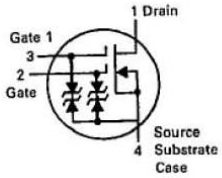
MECHANICAL CHARACTERISTICS

Case:	TO-72
Marking:	Body painted, alpha-numeric
Pin out:	See below



	TO-72			
	Inches		Millimeters	
	Min	Max	Min	Max
A	-	0.230	-	5.840
B	-	0.195	-	4.950
C	-	0.210	-	5.330
D	-	0.021	-	0.530
E	-	0.030	-	0.760
F	-	0.019	-	0.480
G	0.100 BSC		2.540 BSC	
H	-	0.046	-	1.170
J	-	0.048	-	1.220
K	0.500	-	12.700	-
L	0.250	-	-	6.350
M	45° BSC		45° BSC	
N	0.050 BDC		1.270 BSC	
P	-	0.050	-	1.270



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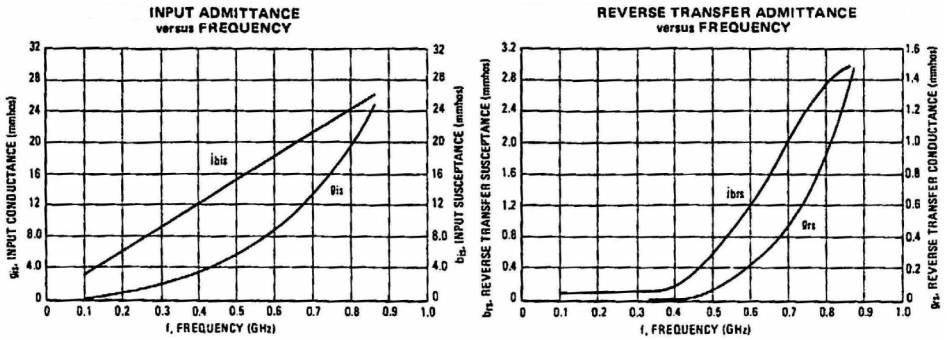
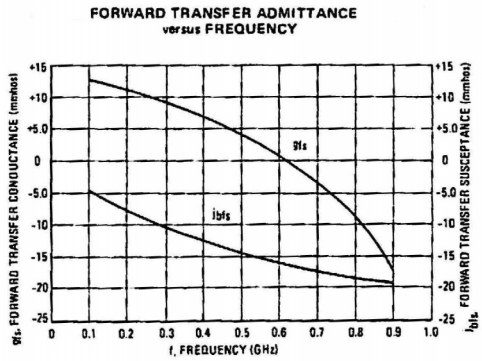
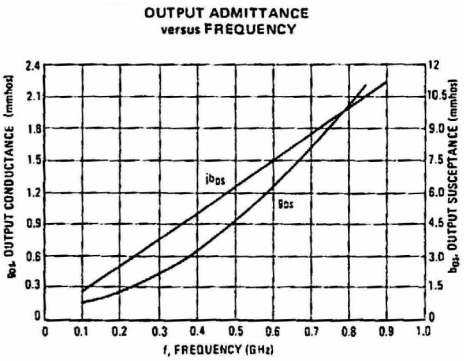
TYPICAL COMMON-SOURCE ADMITTANCE PARAMETERS
(V_{DS} = 15 Vdc, V_{GS2} = 4.0 Vdc, I_D = 10 mAdc)







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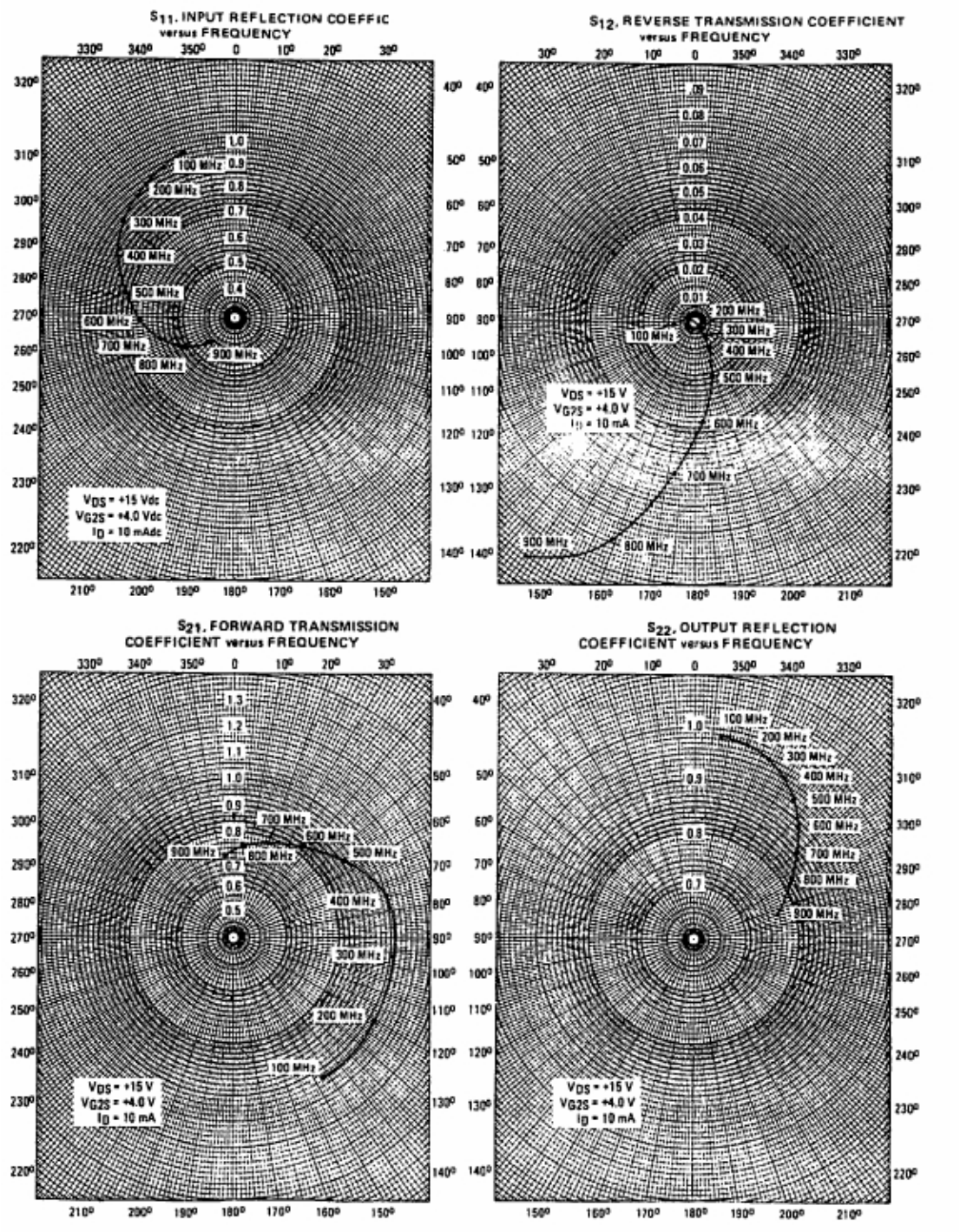

Rev. 20120705

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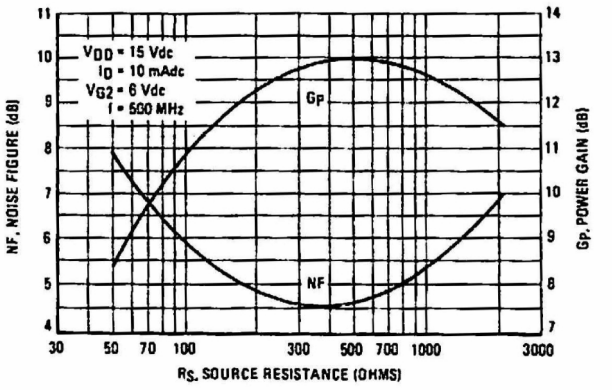
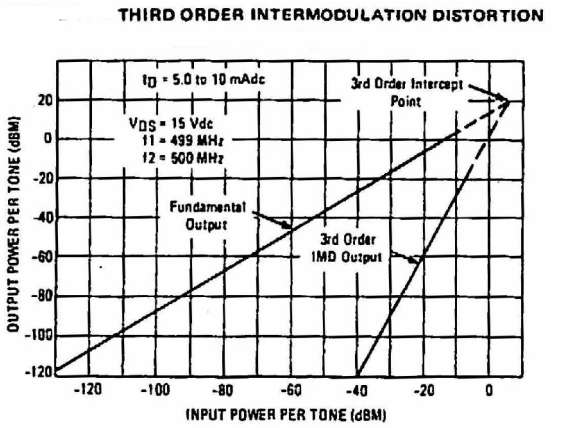
DUAL GATE MOSFET VHF AMPLIFIER

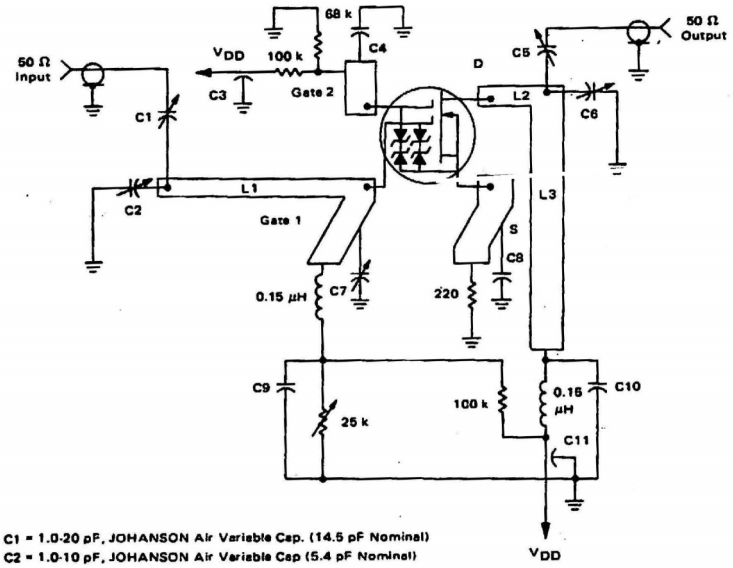
POWER GAIN AND NOISE FIGURE versus SOURCE RESISTANCE



THIRD ORDER INTERMODULATION DISTORTION



TEST CIRCUIT FOR POWER GAIN, NOISE FIGURE AND THIRD ORDER INTERMODULATION DISTORTION



C1 = 1.0-20 pF, JOHANSON Air Variable Cap. (14.5 pF Nominal)
C2 = 1.0-10 pF, JOHANSON Air Variable Cap (5.4 pF Nominal)
C3, C11 = 470 pF, Low Inductance Feedthru Cap.
C4, C8, C9, C10 = 250 pF, Low Inductance, UNDERWOOD Cap. (J-101)
C5 = 0.4-6.0 pF, JOHANSON Air Variable Cap. (0.92 pF Nominal)
C6 = 1.0-10 pF, JOHANSON Air Variable Cap. (5.9 pF Nominal)
C7 = 1.0-10 pF, JOHANSON Air Variable Cap (3.0 pF Nominal)
L1 = 2.52 x 0.1 inches
L2 = 0.4 x 0.1 inches
L3 = 1.23 x 0.2 inches
} On 2 sided glass Teflon®, 1 oz. copper clad, 1/16"
ϵ_R = 2.55