DIGITRON SEMICONDUCTORS

3N209-3N210 N-CHANNEL DUAL GATE MOS FIELD EFFECT TRANSISTORS

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_A = 25°C unless otherwise noted)

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
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

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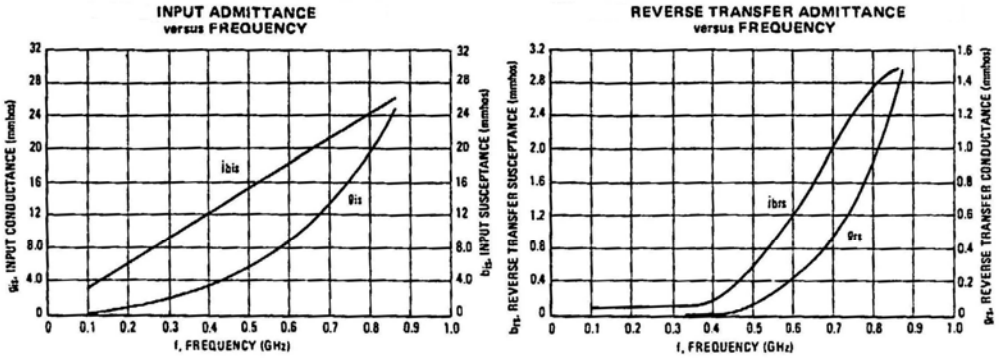
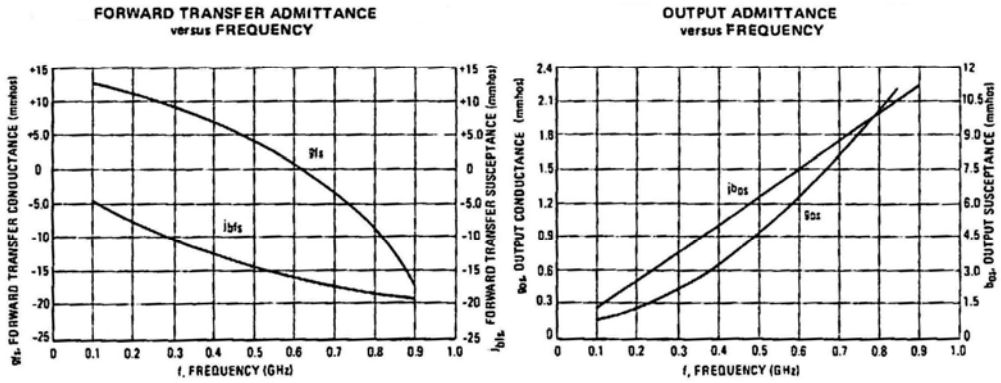
ELECTRICAL CHARACTERISTICS (T_A = 25°C unless otherwise noted)

Characteristic	Symbol	Min	Typ	Max	Unit
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

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





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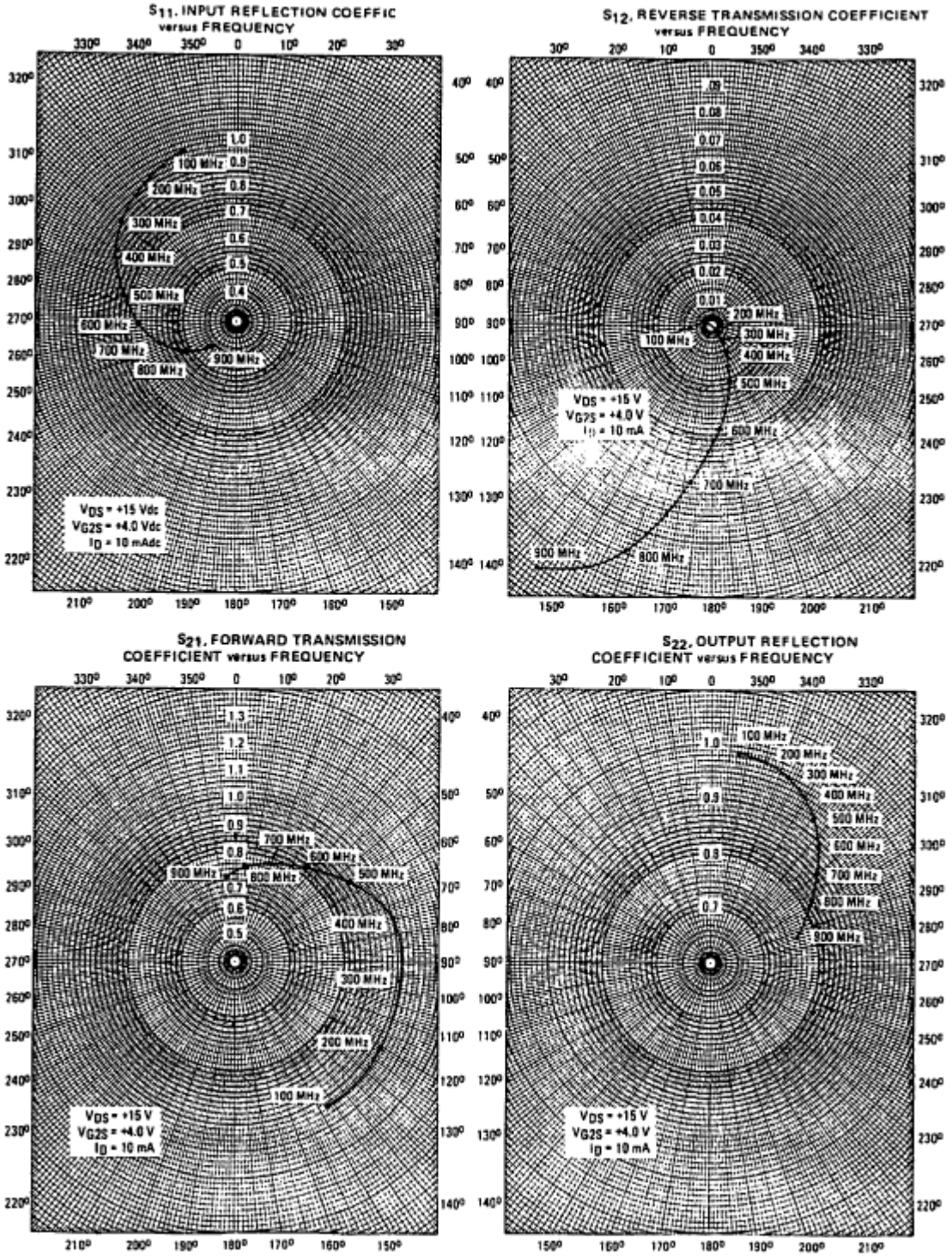

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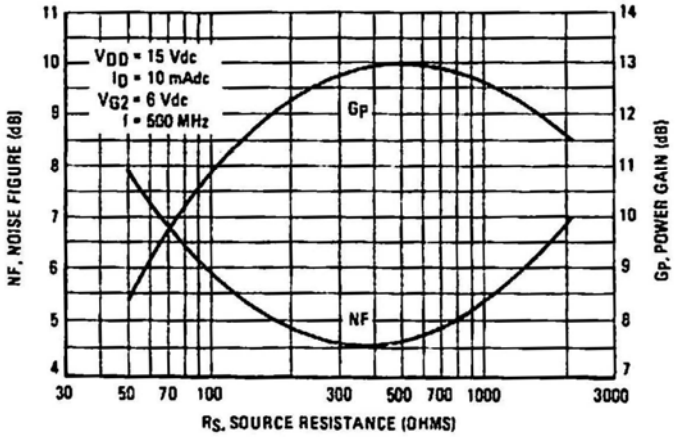
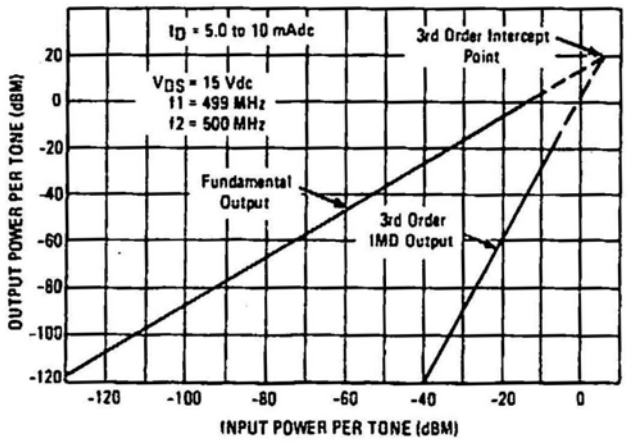
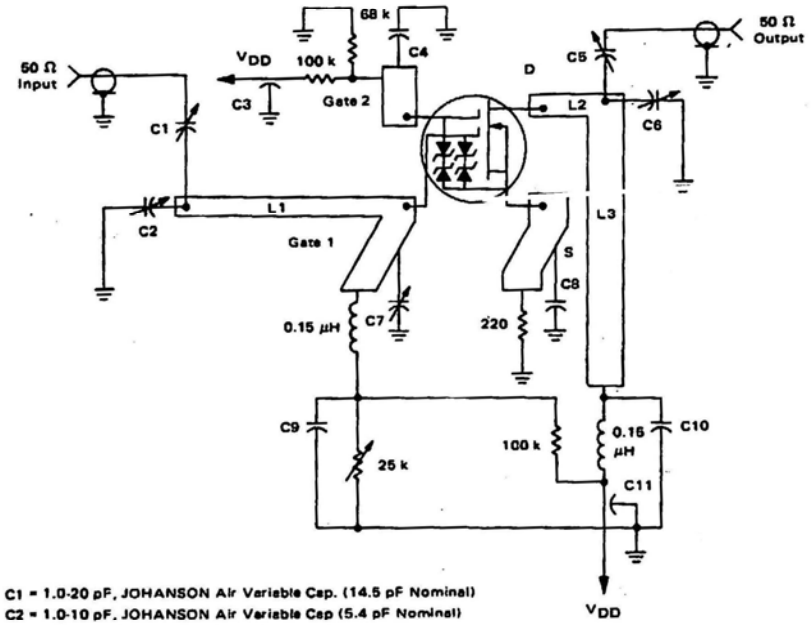
POWER GAIN AND NOISE FIGURE versus SOURCE RESISTANCE



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" $\epsilon_R = 2.55$

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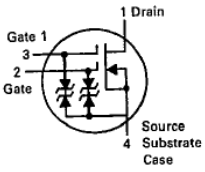
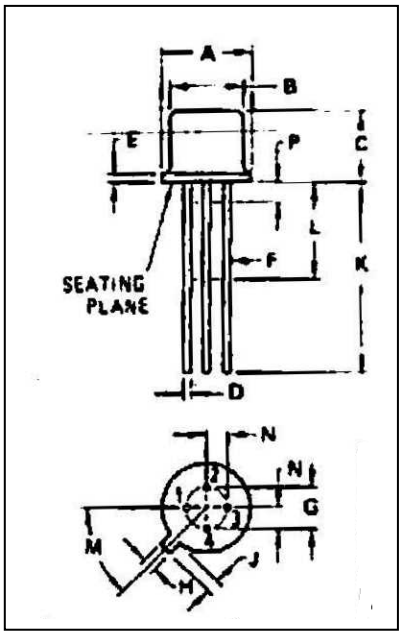
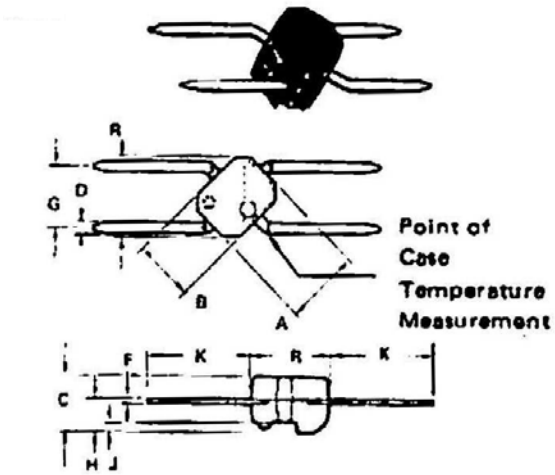


TO-72



Dim	Inches		Millimeters	
	Min	Max	Min	Max
A	0.209	0.230	5.310	5.840
B	0.178	0.195	4.520	4.950
C	0.170	0.210	4.320	5.330
D	0.016	0.0210	0.410	0.530
E	-	0.030	-	0.0760
F	0.016	0.0419	0.410	0.480
G	0.100 BSC		2.540 BSC	
H	0.036	0.046	0.910	1.170
J	0.028	0.048	0.710	1.220
K	0.500	-	12.700	-
L	0.250	-	6.350	-
M	45°BSC			
N	0.050 BSC		1.270 BSC	
P	-	0.050	-	1.270

3N209



Dim	Inches		Millimeters	
	Min	Max	Min	Max
A	0.195	0.205	4.950	5.210
B	0.155	0.165	3.940	4.190
C	0.105	0.115	2.670	2.920
D	0.025	0.035	0.640	0.890
F	0.008	0.012	0.200	0.300
G	0.106 BSC		4.060 BSC	
H	0.062	0.072	1.570	1.830
J	0.020	0.030	0.510	0.760
K	0.250	0.300	6.350	7.620
R	0.205	0.215	5.210	5.460

3N210

Available Non-RoHS (standard) or RoHS compliant (add PBF suffix).
Available as "HR" (high reliability) screened per MIL-PRF-19500, JANTX level. Add

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