

# 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 @ $T_A = 25^\circ\text{C}$ Derate above $25^\circ\text{C}$	$P_D$	3N209	3N210	mW mW/ $^\circ\text{C}$
		300 1.71	350 2.80	
Storage channel temperature range	$T_{stg}$	-65 to 200	-65 to 175	$^\circ\text{C}$
Operating channel temperature	$T_{channel}$	200	150	$^\circ\text{C}$
Lead temperature, 1/16" from seated surface for 10 s		260		$^\circ\text{C}$

## ELECTRICAL CHARACTERISTICS ( $T_A = 25^\circ\text{C}$ unless otherwise noted)

Characteristic	Symbol	Min	Typ	Max	Unit
<b>OFF CHARACTERISTICS</b>					
Drain source breakdown voltage ( $I_D = 10\mu\text{Adc}$ , $V_{G1S} = -4.0\text{Vdc}$ , $V_{G2S} = 4.0\text{Vdc}$ )	$V_{(BR)DS}$	25	-	-	Vdc
Gate 1 – source forward breakdown voltage ( $I_{G1} = 10\text{mAdc}$ , $V_{G2S} = V_{DS} = 0$ )	$V_{(BR)G1SSF}$	7.0	-	22	Vdc
Gate 1 – source reverse breakdown voltage ( $I_{G1} = -10\text{mAdc}$ , $V_{G2S} = V_{DS} = 0$ )	$V_{(BR)G1SSR}$	7.0	-	-22	Vdc
Gate 2 – source forward breakdown voltage ( $I_{G2} = 10\text{mAdc}$ , $V_{G1S} = V_{DS} = 0$ )	$V_{(BR)G2SSF}$	7.0	-	22	Vdc
Gate 2 – source reverse breakdown voltage ( $I_{G2} = -10\text{mAdc}$ , $V_{G1S} = V_{DS} = 0$ )	$V_{(BR)G2SSR}$	-7.0	-	-22	Vdc
Gate 1 – source cutoff voltage ( $V_{DS} = 15\text{Vdc}$ , $V_{G2S} = 4.0\text{Vdc}$ , $I_D = 50\mu\text{Adc}$ )	$V_{G1S(off)}$	-0.1	-	-4.0	Vdc
Gate 2 – source cutoff voltage ( $V_{DS} = 15\text{Vdc}$ , $V_{G1S} = 0\text{Vdc}$ , $I_D = 50\mu\text{Adc}$ )	$V_{G2S(off)}$	-0.1	-	-4.0	Vdc
Gate 1 – terminal forward current ( $V_{G1S} = 6.0\text{Vdc}$ , $V_{G2S} = V_{DS} = 0$ )	$I_{G1SSF}$	-	-	20	nAdc
Gate 1 – terminal reverse current ( $V_{G1S} = -6.0\text{Vdc}$ , $V_{G2S} = V_{DS} = 0$ ) ( $V_{G1S} = -6.0\text{Vdc}$ , $V_{G2S} = V_{DS} = 0$ , $T_A = 150^\circ\text{C}$ )	$I_{G1SSR}$	- -	- -	-20 -10	nAdc $\mu\text{Adc}$
Gate 2 – terminal forward current ( $V_{G2S} = 6.0\text{Vdc}$ , $V_{G1S} = V_{DS} = 0$ )	$I_{G2SSF}$	-	-	20	nAdc
Gate 2 – terminal reverse current ( $V_{G2S} = -6.0\text{Vdc}$ , $V_{G1S} = V_{DS} = 0$ ) ( $V_{G2S} = -6.0\text{Vdc}$ , $V_{G1S} = V_{DS} = 0$ , $T_A = 150^\circ\text{C}$ )	$I_{G2SSR}$	- -	- -	-20 -10	nAdc $\mu\text{Adc}$
<b>ON CHARACTERISTICS</b>					
Gate 1 – zero voltage drain current ( $V_{DS} = 15\text{Vdc}$ , $V_{G1S} = 0$ , $V_{G2S} = 4.0\text{Vdc}$ )	$I_{DSS}$	5.0	-	30	mAdc

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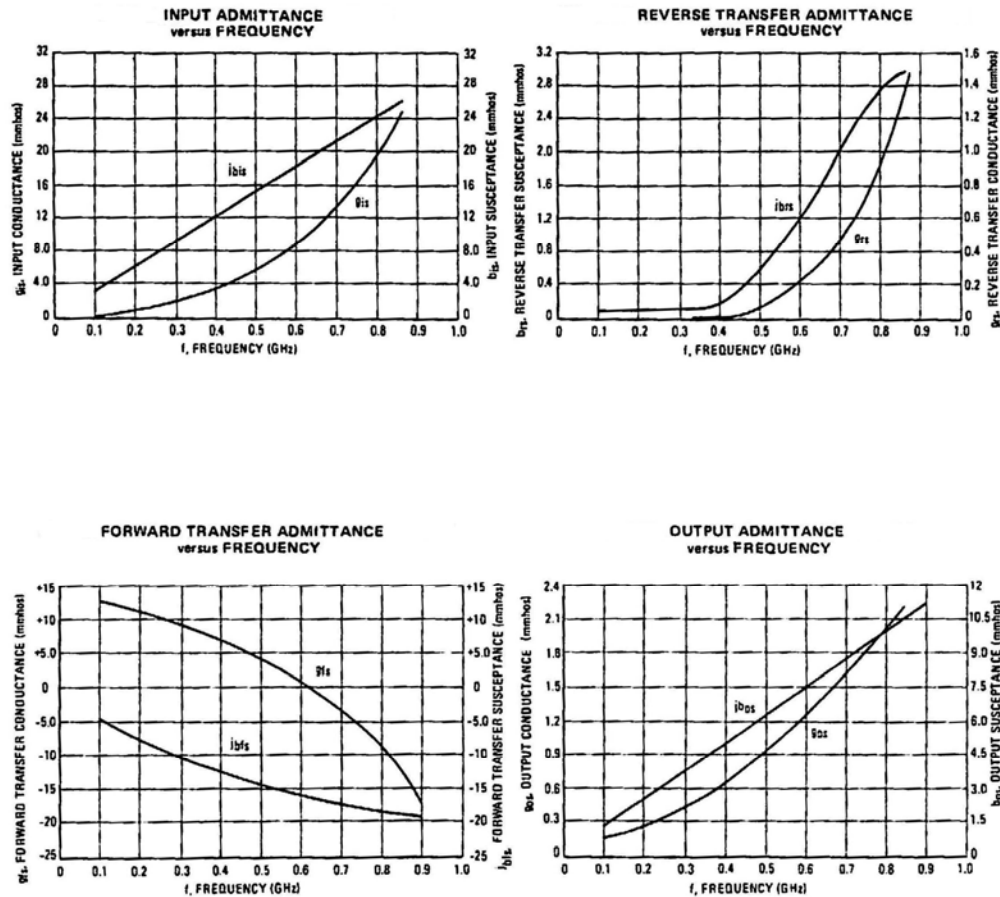
N-CANNEL DUAL GATE MOS FIELD EFFECT TRANSISTORS

**ELECTRICAL CHARACTERISTICS** ( $T_A = 25^\circ\text{C}$  unless otherwise noted)

Characteristic	Symbol	Min	Typ	Max	Unit
<b>SMALL SIGNAL CHARACTERISTICS</b>					
<b>Forward transfer admittance</b> ( $V_{DS} = 15\text{Vdc}$ , $V_{GS2} = 4.0\text{Vdc}$ , $I_D = 10\text{mAdc}$ , $f = 1.0\text{kHz}$ )	$Y_{fs}$	10	13	20	mmhos
<b>Input capacitance</b> ( $V_{DS} = 15\text{Vdc}$ , $V_{GS2} = 4.0\text{Vdc}$ , $I_D \geq 5.0\text{mAdc}$ , $f = 1.0\text{MHz}$ )	$C_{iss}$	-	4.5	7.0	pF
<b>Reverse transfer capacitance</b> ( $V_{DS} = 15\text{Vdc}$ , $V_{GS2} = 4.0\text{Vdc}$ , $I_D \geq 5.0\text{mAdc}$ , $f = 1.0\text{MHz}$ )	$C_{rss}$	0.005	0.023	0.030	pF
<b>Output capacitance</b> ( $V_{DS} = 15\text{Vdc}$ , $V_{GS2} = 4.0\text{Vdc}$ , $I_D \geq 5.0\text{mAdc}$ , $f = 1.0\text{MHz}$ )	$C_{oss}$	0.5	2.0	4.0	pF
<b>Common source noise figure</b> ( $V_{DS} = 15\text{Vdc}$ , $V_{GS2} = 4.0\text{Vdc}$ , $I_D \geq 10\text{mAdc}$ , $f = 500\text{MHz}$ )	NF	-	4.5	6.0	dB
<b>Common source power gain</b> ( $V_{DS} = 15\text{Vdc}$ , $V_{GS2} = 4.0\text{Vdc}$ , $I_D \geq 10\text{mAdc}$ , $f = 500\text{MHz}$ )	$G_{ps}$	10	13	20	dB
<b>Bandwidth</b> ( $V_{DS} = 15\text{Vdc}$ , $V_{GS2} = 4.0\text{Vdc}$ ; $I_D = 10\text{mAdc}$ , $f = 500\text{MHz}$ )	BW	7.0	-	17	MHz

**TYPICAL COMMON-SOURCE ADMITTANCE PARAMETERS**

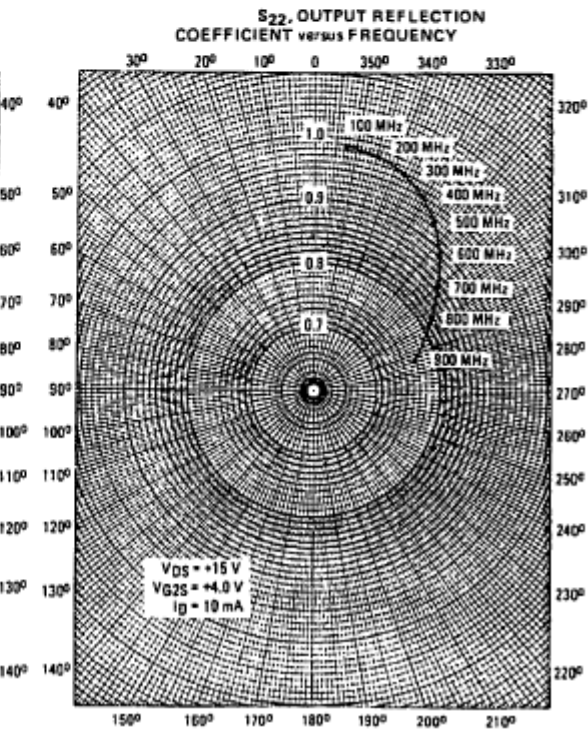
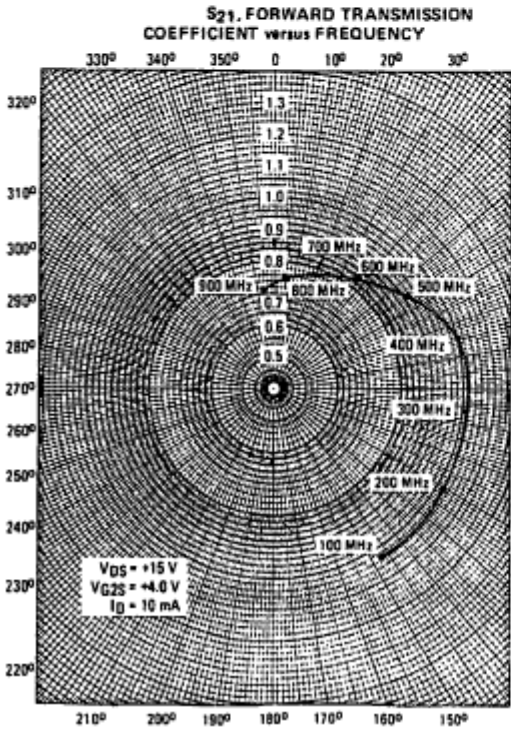
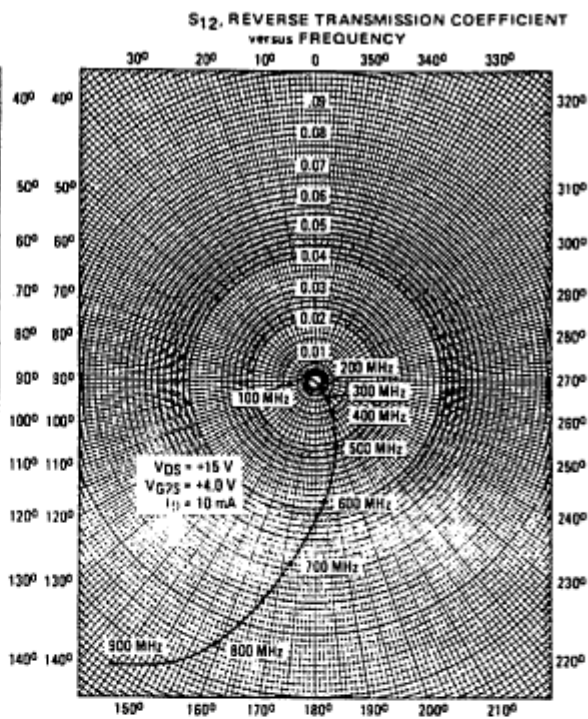
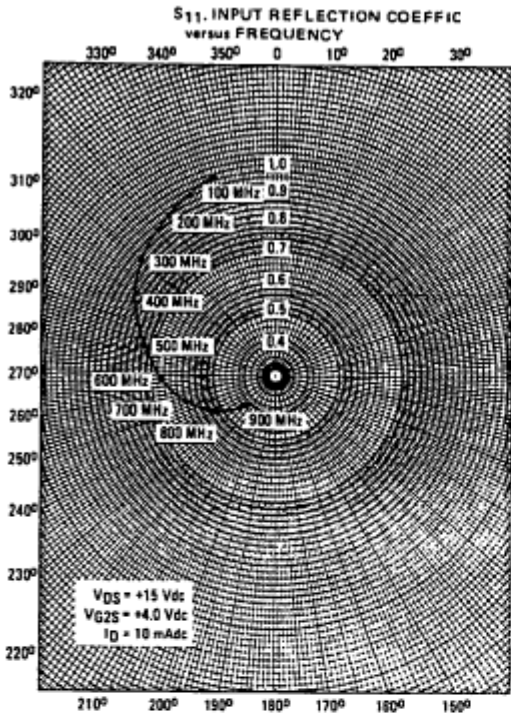
( $V_{DS} = 15\text{ Vdc}$ ,  $V_{GS2} = 4.0\text{ Vdc}$ ,  $I_D = 10\text{ mAdc}$ )



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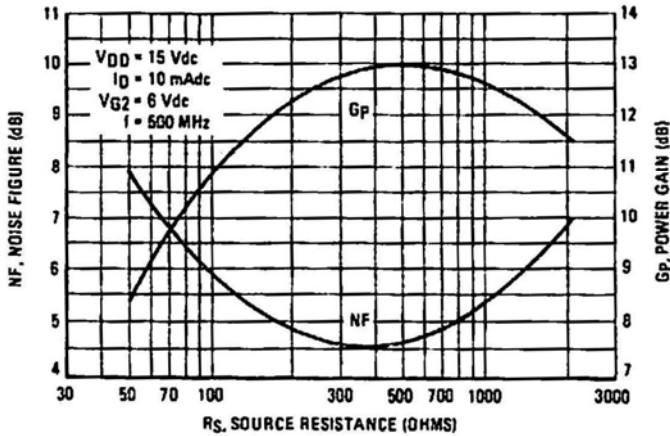


# DIGITRON SEMICONDUCTORS

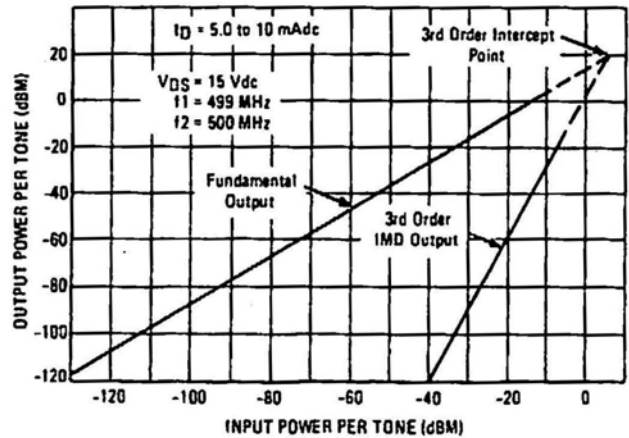
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N-CHANNEL DUAL GATE MOS FIELD EFFECT TRANSISTORS

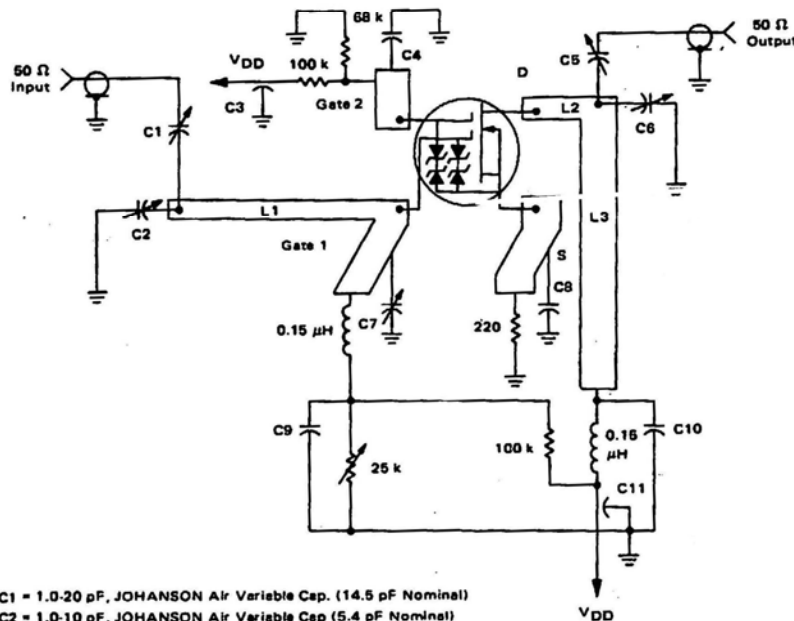
POWER GAIN AND NOISE FIGURE versus SOURCE RESISTANCE



THIRD ORDER INTERMODULATION DISTORTION



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

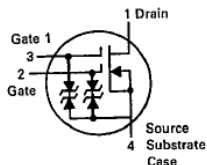


- C1 = 1.0-20 pF, JOHANSON Air Variable Cap. (14.5 pF Nominal)
- C2 = 1.0-10 pF, JOHANSON Air Variable Cap. (5.4 pF Nominal)
- C3, C11 = 470 pF, Low Inductance Feedthru Cap.
- C4, C8, C9, C10 = 250 pF, Low Inductance, UNDERWOOD Cap. (J-101)
- C5 = 0.4-6.0 pF, JOHANSON Air Variable Cap. (0.92 pF Nominal)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

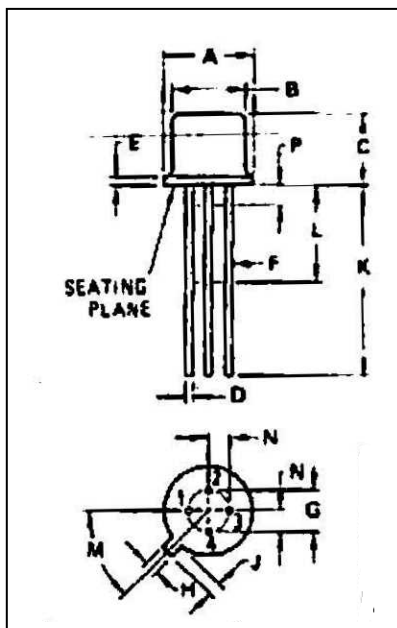
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N-CHANNEL DUAL GATE MOS FIELD EFFECT TRANSISTORS

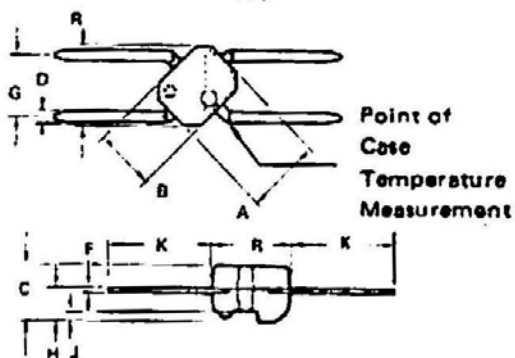


TO-72



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