

# 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 @ $T_A = 25^\circ\text{C}$ 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 ( $T_C = 25^\circ\text{C}$ )

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 $\mu\text{Adc}$

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### ELECTRICAL CHARACTERISTICS (T<sub>C</sub> = 25°C)

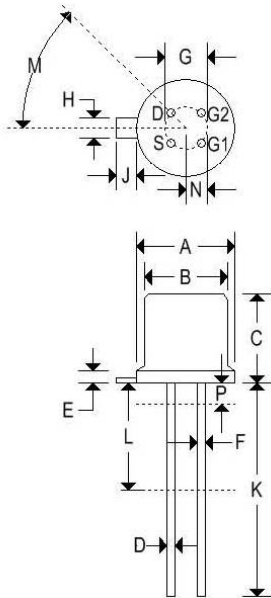
Characteristic	Symbol	Min	Typ	Max	Unit
<b>Gate 2 – terminal forward current</b> (V <sub>G2S</sub> = 6.0Vdc, V <sub>G1S</sub> = V <sub>DS</sub> = 0)	I <sub>G2SSF</sub>	-	-	20	nAdc
<b>Gate 2 – terminal reverse current</b> (V <sub>G2S</sub> = -6.0Vdc, V <sub>G1S</sub> = V <sub>DS</sub> = 0) (V <sub>G2S</sub> = -6.0Vdc, V <sub>G1S</sub> = V <sub>DS</sub> = 0, T <sub>A</sub> = 150°C)	I <sub>G2SSR</sub>	- -	- -	-20 -10	nAdc μAdc
<b>ON CHARACTERISTICS</b>					
<b>Gate 1 – zero voltage drain current</b> (V <sub>DS</sub> = 15Vdc, V <sub>G1S</sub> = 0, V <sub>G2S</sub> = 4.0Vdc)	I <sub>DSS</sub>	5.0	-	30	mAdc
<b>SMALL SIGNAL CHARACTERISTICS</b>					
<b>Forward transfer admittance</b> (V <sub>DS</sub> = 15Vdc, V <sub>G2S</sub> = 4.0Vdc, I <sub>D</sub> = 10mAdc, f = 1.0kHz)	Y <sub>fs</sub>	10	13	20	mmhos
<b>Input capacitance</b> (V <sub>DS</sub> = 15Vdc, V <sub>G2S</sub> = 4.0Vdc, I <sub>D</sub> ≥ 5.0mAdc, f = 1.0MHz)	C <sub>iss</sub>	-	4.5	7.0	pF
<b>Reverse transfer capacitance</b> (V <sub>DS</sub> = 15Vdc, V <sub>G2S</sub> = 4.0Vdc, I <sub>D</sub> ≥ 5.0mAdc, f = 1.0MHz)	C <sub>rss</sub>	0.005	0.023	0.030	pF
<b>Output capacitance</b> (V <sub>DS</sub> = 15Vdc, V <sub>G2S</sub> = 4.0Vdc, I <sub>D</sub> ≥ 5.0mAdc, f = 1.0MHz)	C <sub>oss</sub>	0.5	2.0	4.0	pF
<b>Common source noise figure</b> (V <sub>DS</sub> = 15Vdc, V <sub>G2S</sub> = 4.0Vdc, I <sub>D</sub> ≥ 10mAdc, f = 500MHz)	NF	-	4.5	6.0	dB
<b>Common source power gain</b> (V <sub>DS</sub> = 15Vdc, V <sub>G2S</sub> = 4.0Vdc, I <sub>D</sub> ≥ 10mAdc, f = 500MHz)	G <sub>ps</sub>	10	13	20	dB
<b>Bandwidth</b> (V <sub>DS</sub> = 15Vdc, V <sub>G2S</sub> = 4.0Vdc; I <sub>D</sub> = 10mAdc, f = 500MHz)	BW	7.0	-	17	MHz

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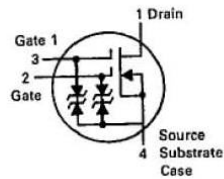
## DUAL GATE MOSFET VHF AMPLIFIER

### MECHANICAL CHARACTERISTICS

<b>Case:</b>	TO-72
<b>Marking:</b>	Body painted, alpha-numeric
<b>Pin out:</b>	See below



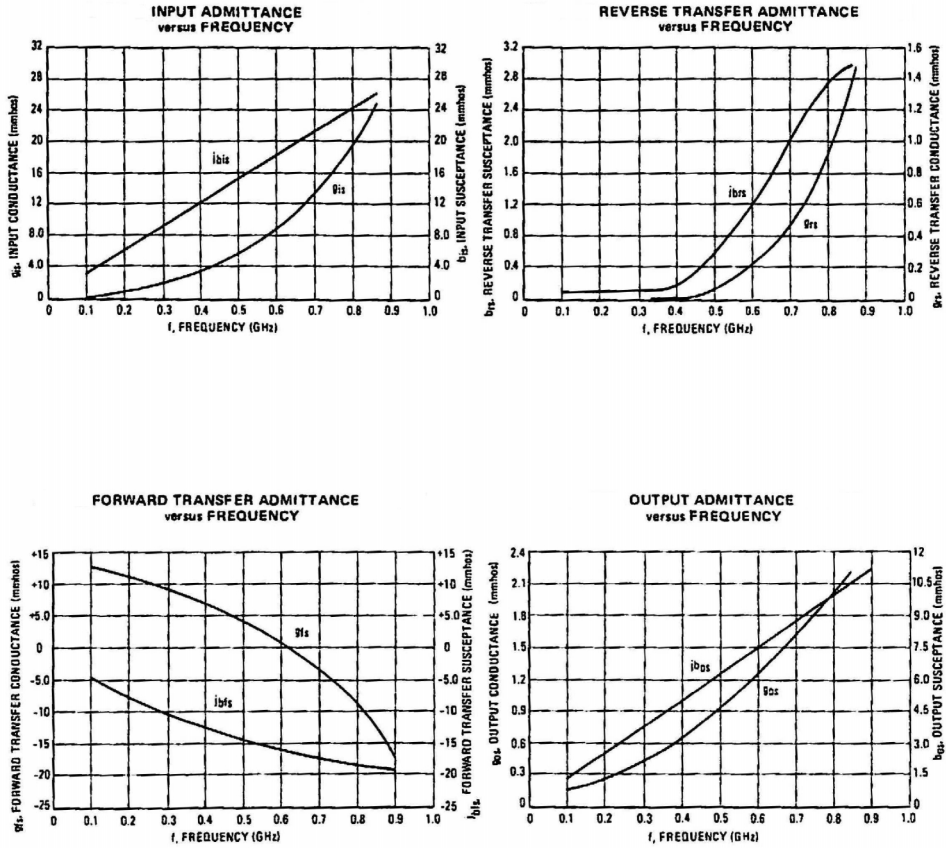
	TO-72			
	Inches		Millimeters	
	Min	Max	Min	Max
A	-	0.230	-	5.840
B	-	0.195	-	4.950
C	-	0.210	-	5.330
D	-	0.021	-	0.530
E	-	0.030	-	0.760
F	-	0.019	-	0.480
G	0.100 BSC		2.540 BSC	
H	-	0.046	-	1.170
J	-	0.048	-	1.220
K	0.500	-	12.700	-
L	0.250	-	-	6.350
M	45° BSC		45° BSC	
N	0.050 BDC		1.270 BSC	
P	-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



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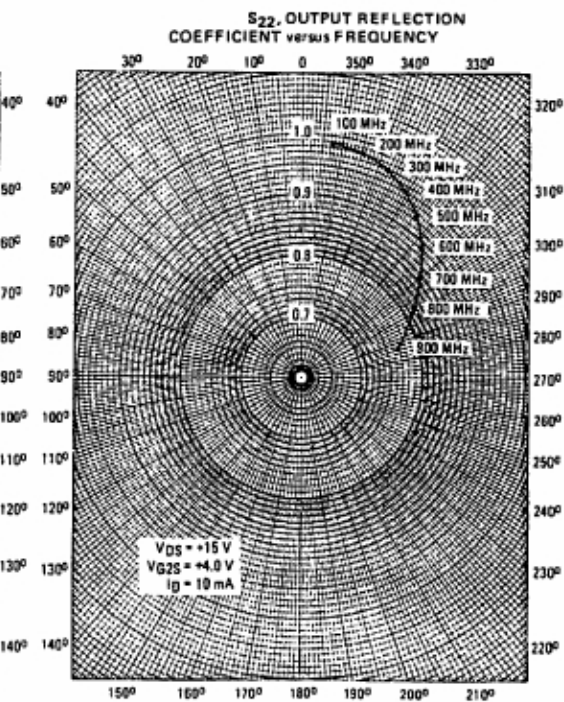
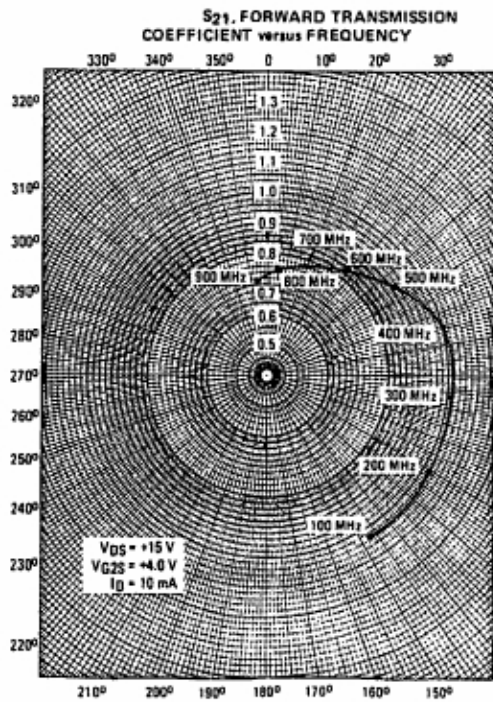
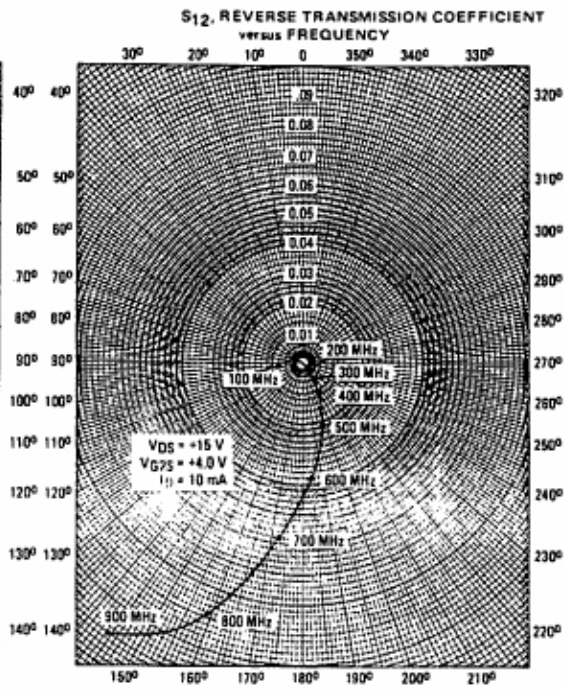
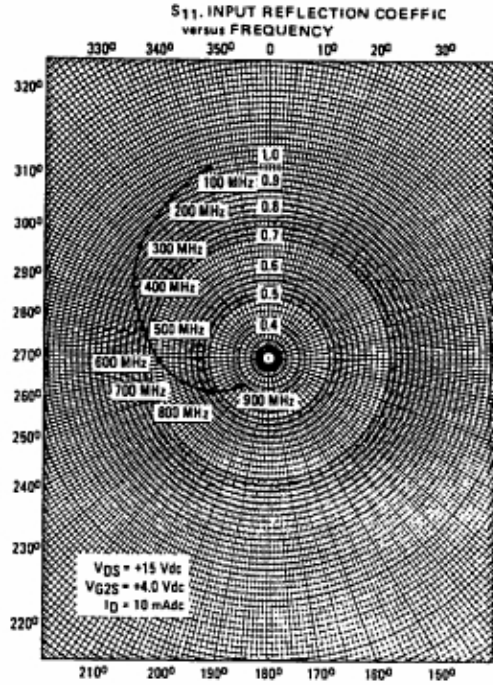
**TYPICAL COMMON-SOURCE ADMITTANCE PARAMETERS**  
( $V_{DS} = 15$  Vdc,  $V_{GS2} = 4.0$  Vdc,  $I_D = 10$  mAdc)





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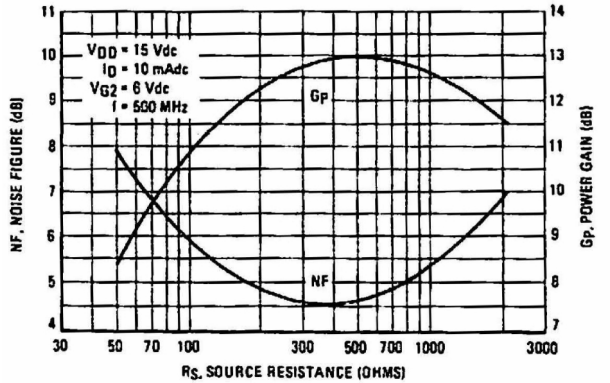


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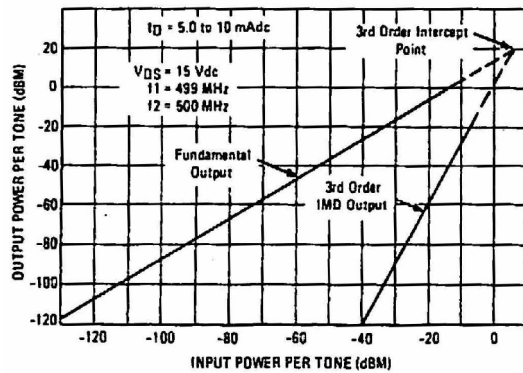
## DUAL GATE MOSFET VHF AMPLIFIER

High-reliability discrete products  
and engineering services since 1977

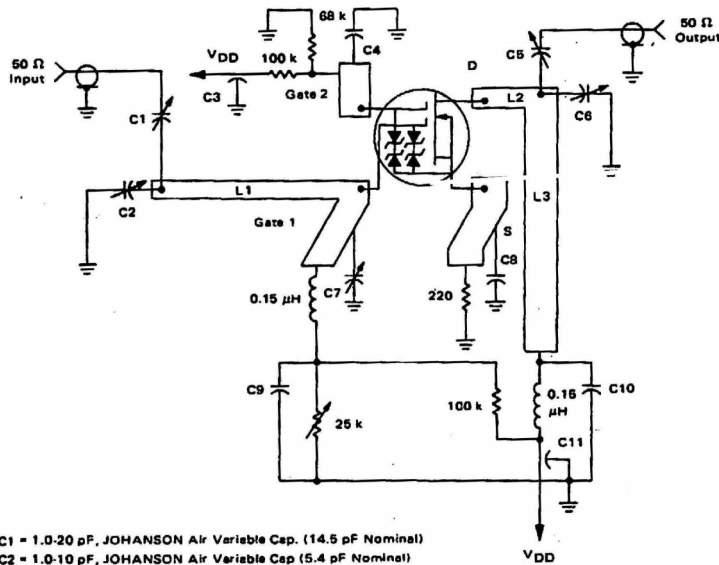
POWER GAIN AND NOISE FIGURE versus SOURCE RESISTANCE



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 }