MAXIMUM RATINGS

Rating	Symbol	Value		Unit
Drain-Source Voltage	V_{DS}	25		Vdc
Drain-Gate Voltage	V_{DG1} V_{DG2}	30 30		Vdc
Drain Current	I_D	30		mAdc
Gate Current	I_{G1R} I_{G1F} I_{G2R} I_{G2F}	−10 10 −10 10		mAdc
		3N209	MPF209	
Total Device Dissipation @ T_A = 25°C Derate above 25°C	P_D	300 1.71	— —	mW mW/°C
Total Device Dissipation @ T_C = 25°C Derate above 25°C	P_D		300 2.4	mW mW/°C
Lead Temperature, 1/16″ From Seated Surface for 10 seconds	T_L	260	200	°C
Storage Channel Temperature Range	T_{stg}	−65 to +175	−65 to +150	°C
Operating Channel Temperature	$T_{channel}$	175	150	°C

3N209
MPF209

3N209
CASE 20-03, STYLE 9
TO-72 (TO-206AF)

MPF209
CASE 317-01, STYLE 1

DUAL-GATE
MOSFET
UHF COMMUNICATIONS

N-CHANNEL — DEPLETION

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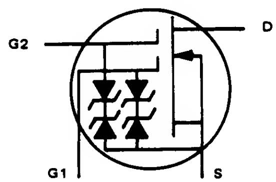
ELECTRICAL CHARACTERISTICS (T_A = 25°C unless otherwise noted.)

Characteristic	Symbol	Min	Typ	Max	Unit
OFF CHARACTERISTICS					
Drain-Source Breakdown Voltage (I_D = 10 μAdc, V_{G1S} = −4.0 Vdc, V_{G2S} = 4.0 Vdc)	$V_{(BR)DSX}$	25	—	—	Vdc
Gate 1 — Source Forward Breakdown Voltage (I_{G1} = 10 mAdc, V_{G2S} = V_{DS} = 0)	$V_{(BR)G1SSF}$	7.0	—	22	Vdc
Gate 1 — Source Reverse Breakdown Voltage (I_{G1} = −10 mAdc, V_{G2S} = V_{DS} = 0)	$V_{(BR)G1SSR}$	−7.0	—	−22	Vdc
Gate 2 — Source Forward Breakdown Voltage (I_{G2} = 10 mAdc, V_{G1S} = V_{DS} = 0)	$V_{(BR)G2SSF}$	7.0	—	22	Vdc
Gate 2 — Source Reverse Breakdown Voltage (I_{G2} = −10 mAdc, V_{G1S} = V_{DS} = 0)	$V_{(BR)G2SSR}$	−7.0	—	−22	Vdc
Gate 1 — Terminal Forward Current (V_{G1S} = 6.0 Vdc, V_{G2S} = V_{DS} = 0)	I_{G1SSF}	—	—	20	nAdc
Gate 1 — Terminal Reverse Current (V_{G1S} = −6.0 Vdc, V_{G2S} = V_{DS} = 0) (V_{G1S} = −6.0 Vdc, V_{G2S} = V_{DS} = 0, T_A = 150°C)	I_{G1SSR}	— —	— —	−20 −10	nAdc μAdc
Gate 2 — Terminal Forward Current (V_{G2S} = 6.0 Vdc, V_{G1S} = V_{DS} = 0)	I_{G2SSF}	—	—	20	nAdc
Gate 2 — Terminal Reverse Current (V_{G2S} = −6.0 Vdc, V_{G1S} = V_{DS} = 0) (V_{G2S} = −6.0 Vdc, 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} = 15 Vdc, V_{G1S} = 0, V_{G2S} = 4.0 Vdc)	I_{DSS}	5.0	—	30	mAdc
SMALL-SIGNAL CHARACTERISTICS					
Forward Transfer Admittance (V_{DS} = 15 Vdc, V_{G2S} = 4.0 Vdc, I_D = 10 mAdc, f = 1.0 kHz)	$\lvert y_{fs} \rvert$	10	13	20	mmhos
Input Capacitance (V_{DS} = 15 Vdc, V_{G2S} = 4.0 Vdc, I_D ≥ 5.0 mAdc, f = 1.0 MHz)	C_{iss}	—	3.3	7.0	pF
Reverse Transfer Capacitance (V_{DS} = 15 Vdc, V_{G2S} = 4.0 Vdc, I_D ≥ 5.0 mAdc, f = 1.0 MHz)	C_{rss}	0.005	0.023	0.03	pF
Output Capacitance (V_{DS} = 15 Vdc, V_{G2S} = 4.0 Vdc, I_D ≥ 5.0 mAdc, f = 1.0 MHz)	C_{oss}	0.5	2.0	4.0	pF

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

Characteristic	Symbol	Min	Typ	Max	Unit
FUNCTIONAL CHARACTERISTICS					
Noise Figure (V_{DS} = 15 Vdc, V_{G2S} = 4.0 Vdc, I_D = 10 mAdc, f = 500 MHz)	NF	—	4.0	6.0	dB
Common Source Power Gain (Figure 12) (V_{DS} = 15 Vdc, V_{G2S} = 4.0 Vdc, I_D = 10 mAdc, f = 500 MHz)	G_{ps}	10	13	20	dB
*Bandwidth (V_{DS} = 15 Vdc, V_{G2S} = 4.0 Vdc, I_D = 10 mAdc, f = 500 MHz)	BW	7.0	—	17	MHz

FIGURE 1 — MOS FET CIRCUIT SCHEMATIC



TYPICAL SCATTERING PARAMETERS

FIGURE 2 — S_{11}, INPUT REFLECTION COEFFICIENT versus FREQUENCY

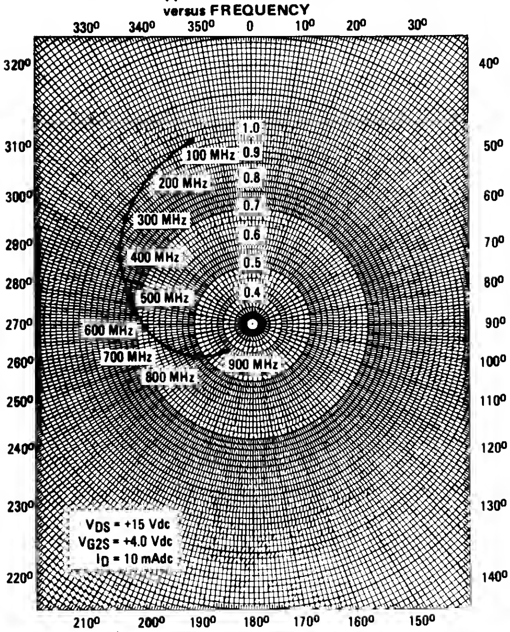


FIGURE 3 — S_{12}, REVERSE TRANSMISSION COEFFICIENT versus FREQUENCY

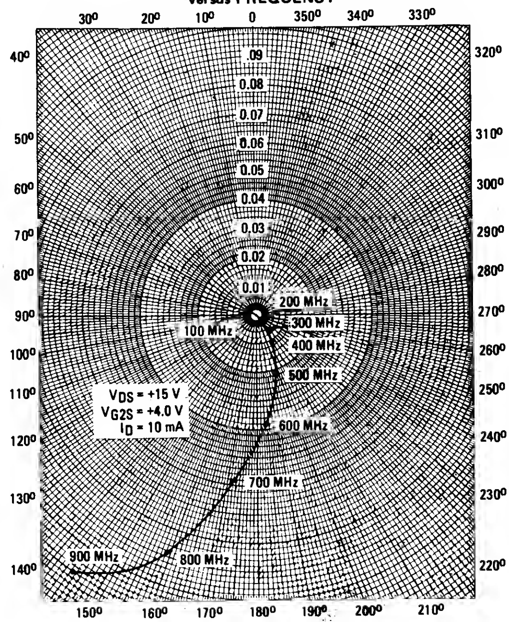


FIGURE 4 – S_{21}, FORWARD TRANSMISSION COEFFICIENT versus FREQUENCY

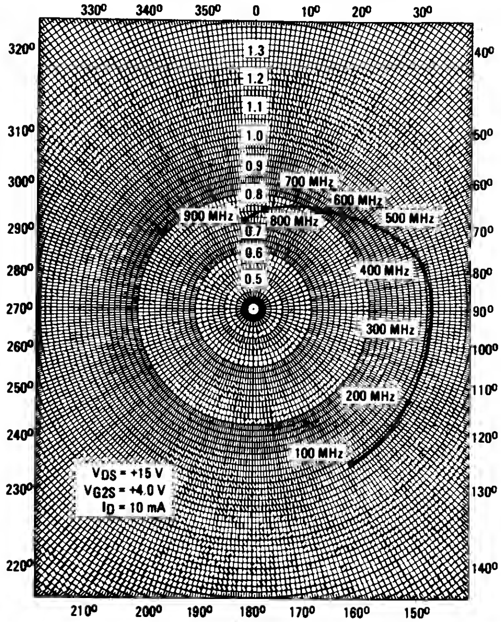
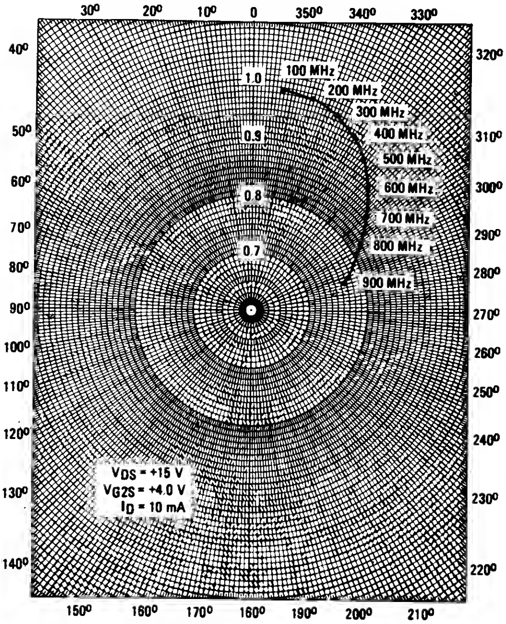


FIGURE 5 – S_{22}, OUTPUT REFLECTION COEFFICIENT versus FREQUENCY



TYPICAL COMMON-SOURCE ADMITTANCE PARAMETERS

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

FIGURE 6 – Y_{11}, INPUT ADMITTANCE versus FREQUENCY

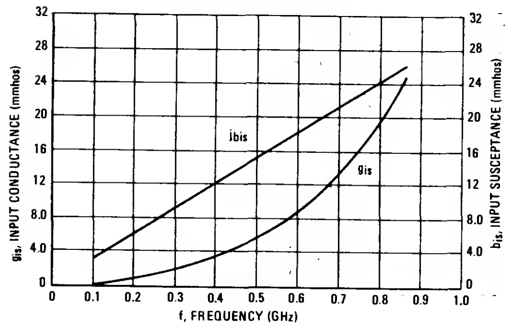


FIGURE 7 – Y_{12}, REVERSE TRANSFER ADMITTANCE versus FREQUENCY

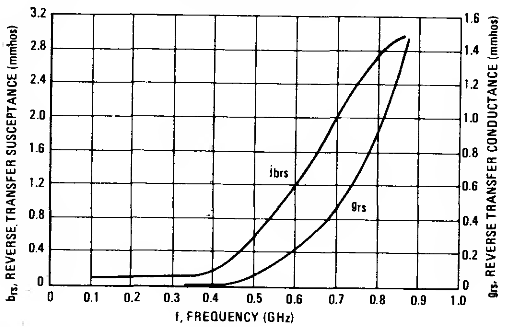


FIGURE 8 – Y_{21}, FORWARD TRANSFER ADMITTANCE versus FREQUENCY

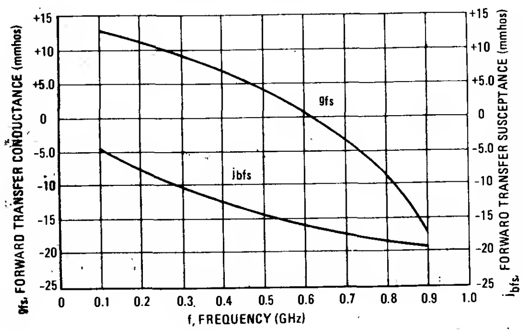


FIGURE 9 – Y_{22}, OUTPUT ADMITTANCE versus FREQUENCY

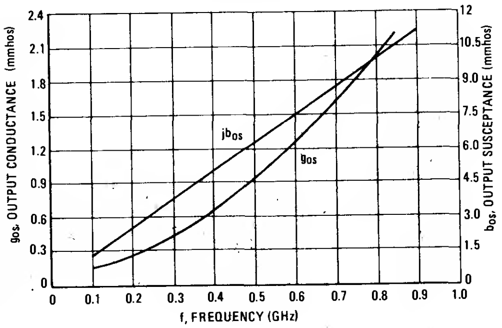
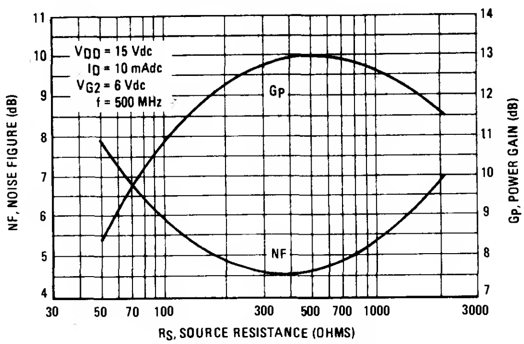


FIGURE 10 – POWER GAIN AND NOISE FIGURE versus SOURCE RESISTANCE
(See Schematic Figure 12)



The Test Circuit shown in Figure 12 was used to generate Power Gain and Noise Figure as a function of Source Resistance curves.

FIGURE 11 – THIRD ORDER INTERMODULATION DISTORTION
(See Schematic Figure 12)

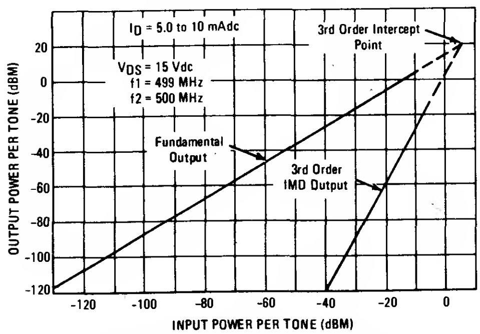
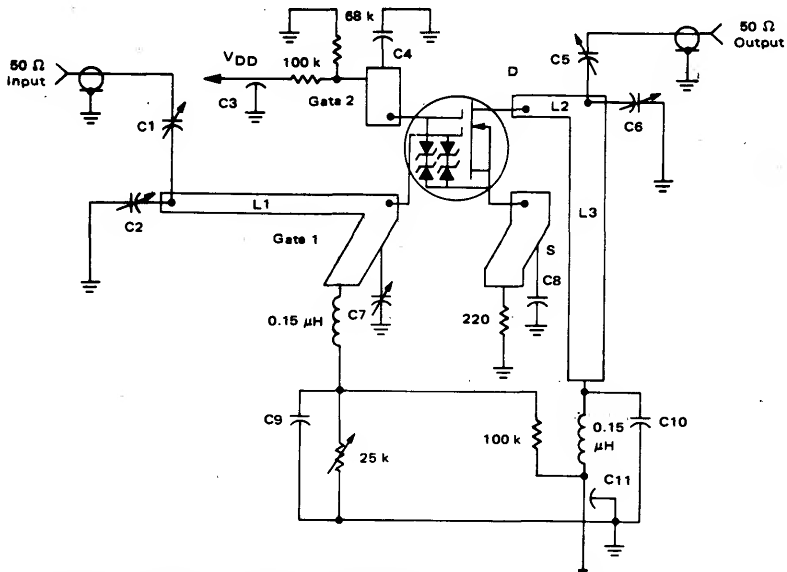


Figure 11 shows the typical third order intermodulation distortion (IMD) performance of the 3N209 and 3N210 at 500 MHz.

Both fundamental output and third order IMD output characteristics are plotted. The curves have been extrapolated to show the third order intermodulation output intercept point.

The performance is typical for I_D between 5.0 mAdc and 10 mAdc. The test circuit shown in Figure 12 was used to generate the IMD Data.

FIGURE 12 – 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

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