

U308 U309 U310

CASE 27-02, STYLE 4
TO-52 (TO-206AC)

JFET
VHF/UHF AMPLIFIER
N-CHANNEL — DEPLETION

MAXIMUM RATINGS

Rating	Symbol	Value	Unit
Drain-Source Voltage	V_{DS}	25	Vdc
Gate-Source Voltage	V_{GS}	25	Vdc
Gate Current	I_G	20	mAdc
Total Device Dissipation @ $T_A = 25^\circ\text{C}$ Derate above 25°C	P_D	500 4.0	mW mW/ $^\circ\text{C}$
Operating and Storage Junction Temperature Range	T_J, T_{stg}	-65 to +150	$^\circ\text{C}$

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

Characteristic	Symbol	Min	Typ	Max	Unit
OFF CHARACTERISTICS					
Gate-Source Breakdown Voltage ($I_G = 1.0 \mu\text{A}, V_{DS} = 0$)	$V_{(BR)GSS}$	-25	—	—	V
Gate Reverse Current ($V_{GS} = -15 \text{ V}$) ($V_{DS} = 0, T_A = 125^\circ\text{C}$)	I_{GSS}	—	—	-150 -150	pA nA
Gate Source Cutoff Voltage ($V_{DS} = 10 \text{ V}, I_D = 1.0 \text{ nA}$)	$V_{GS(off)}$	-1.0 -1.0 -2.5	— — —	-6.0 -4.0 -6.0	V
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ON CHARACTERISTICS

Zero-Gate-Voltage Drain Current(1) ($V_{DS} = 10 \text{ V}, V_{GS} = 0$)	I_{DSS}	12 12 24	— — —	60 30 60	mA
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Gate-Source Forward Voltage ($I_G = 10 \text{ mA}, V_{DS} = 0$)	$V_{GS(f)}$	—	—	1.0	V

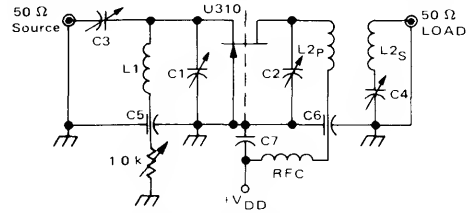
SWITCHING CHARACTERISTICS

Common-Gate Forward Transconductance(1) ($V_{DS} = 10 \text{ V}, I_D = 10 \text{ mA}, f = 1.0 \text{ kHz}$)	g_{fg}	10 10 10	— — —	20 20 18	mmhos
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Common-Gate Output Conductance ($V_{DS} = 10 \text{ V}, I_D = 10 \text{ mA}, f = 1.0 \text{ kHz}$)	g_{og}	—	150	—	μmhos
Drain-Gate Capacitance ($V_{GS} = -10 \text{ V}, V_{DS} = 10 \text{ V}, f = 1.0 \text{ MHz}$)	C_{gd}	—	—	2.5	pF
Gate-Source Capacitance ($V_{GS} = -10 \text{ V}, V_{DS} = 10 \text{ V}, f = 1.0 \text{ MHz}$)	C_{gs}	—	—	5.0	pF
Equivalent Short-Circuit Input Noise Voltage ($V_{DS} = 10 \text{ V}, I_D = 10 \text{ mA}, f = 100 \text{ Hz}$)	\bar{e}_n	—	10	—	$\text{nV}/\sqrt{\text{Hz}}$

(1) Pulse test duration = 2.0 ms.

(2) See Figures 10 and 11 for Noise Figure and Power Gain information.

FIGURE 1 — 450 MHz COMMON-GATE AMPLIFIER TEST CIRCUIT



C1 = C2 = 0.8 - 10 pF JFD #MVM010W
 C3 = C4 = 8.35 pF Erie #539 002D
 C5 = C6 = 5000 pF Erie (2443 000)
 C7 = 1000 pF, Allen Bradley #FA5C.
 RFC = 0.33 μH Miller #9230 30.
 L1 = One Turn #16 Cu, 1/4" I.D. (Air Core)
 L2P = One Turn #16 Cu, 1/4" I.D. (Air Core).
 L2S = One Turn #16 Cu, 1/4" I.D. (Air Core).

FIGURE 2 — DRAIN CURRENT and TRANSFER CHARACTERISTICS versus GATE-SOURCE VOLTAGE

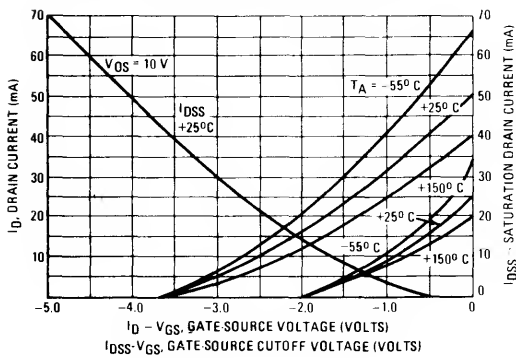


FIGURE 3 — FORWARD TRANSCONDUCTANCE versus GATE-SOURCE VOLTAGE

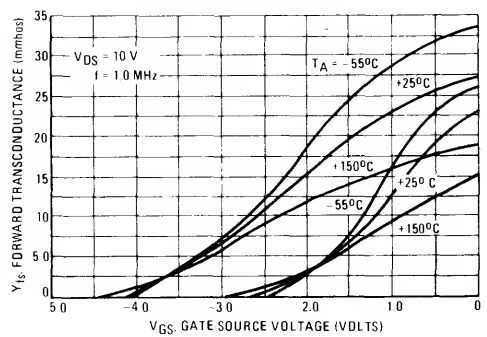


FIGURE 4 — COMMON-SOURCE OUTPUT ADMITTANCE and FORWARD TRANSCONDUCTANCE versus DRAIN CURRENT

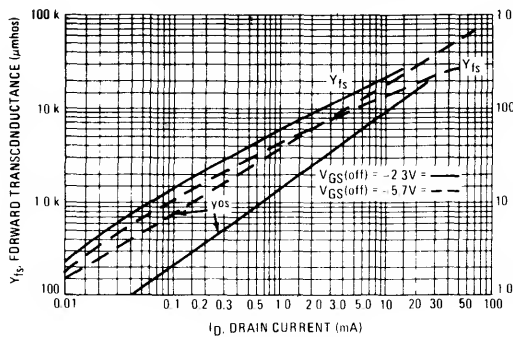


FIGURE 5 — ON RESISTANCE and JUNCTION CAPACITANCE versus GATE-SOURCE VOLTAGE

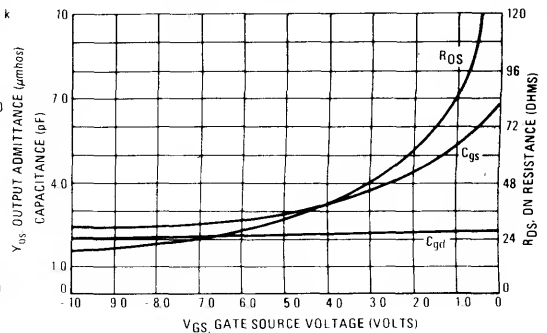


FIGURE 6 – COMMON-GATE Y PARAMETER
MAGNITUDE versus FREQUENCY

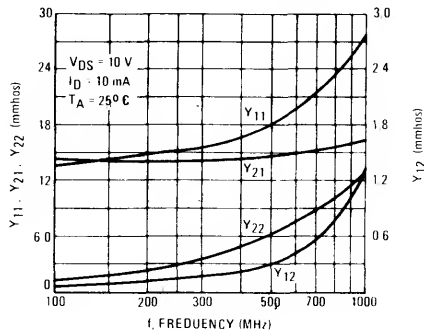


FIGURE 7 – COMMON-GATE S PARAMETER
MAGNITUDE versus FREQUENCY

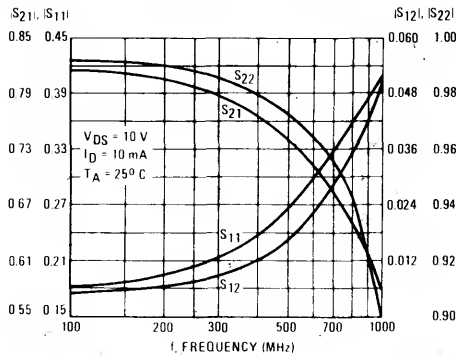


FIGURE 8 – COMMON-GATE Y PARAMETER
PHASE-ANGLE versus FREQUENCY

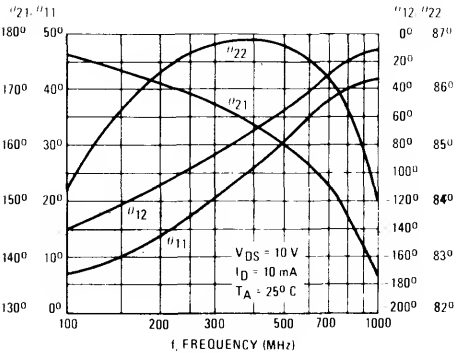


FIGURE 9 – S PARAMETER PHASE-ANGLE
versus FREQUENCY

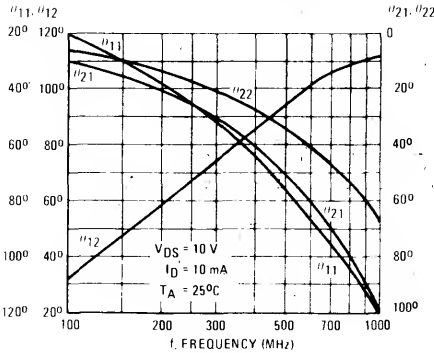


FIGURE 10 – NOISE FIGURE and
POWER GAIN versus DRAIN CURRENT

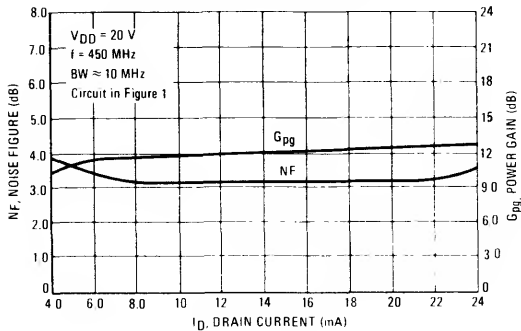


FIGURE 11 – NOISE FIGURE and
POWER GAIN versus FREQUENCY

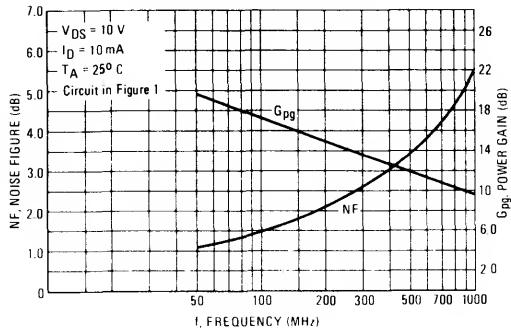
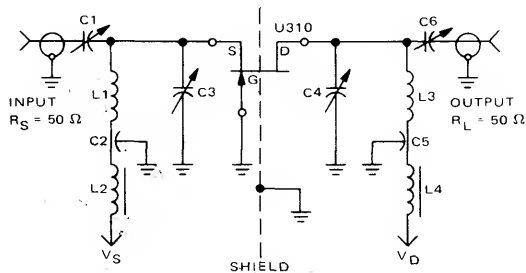


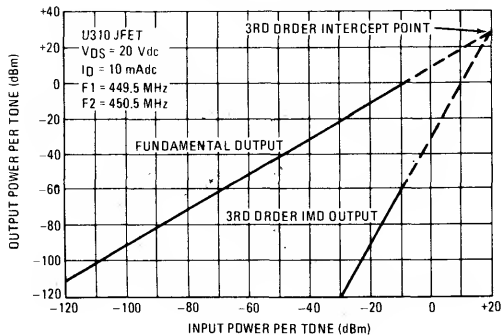
FIGURE 12 – 450 MHz IMD EVALUATION AMPLIFIER



BW (3dB) - 36.5 MHz
 I_D - 10 mAdc
 V_{DS} 20 Vdc
 Device case grounded
 IM test tones - f_1 = 449.5 MHz, f_2 = 450.5 MHz
 C_1 = 1.10 pF Johanson Air variable trimmer.
 C_2, C_5 = 100 pF feed thru button capacitor
 C_3, C_4, C_6 = 0.5-6 pF Johanson Air variable trimmer.
 L_1 = 1/8" x 1/32" x 1.5/8" copper bar
 L_2, L_4 = Ferroxcube V4200 choke.
 L_3 = 1/8" x 1/32" x 1.7/8" copper bar.

Amplifier power gain and IMD products are a function of the load impedance. For the amplifier design shown above with C_4 and C_6 adjusted to reflect a load to the drain resulting in a nominal power gain of 9 dB, the 3rd order intercept point (IP) value is 29 dBm. Adjusting C_4, C_6 to provide larger load values will result in higher gain, smaller bandwidth and lower IP values. For example, a nominal gain of 13 dB can be achieved with an intercept point of 19 dBm.

FIGURE 13 – TWO TONE 3RD ORDER INTERCEPT POINT



Example of intercept point plot use:
 Assume two in-band signals of -20 dBm at the amplifier input. They will result in a 3rd order IMD signal at the output of -90 dBm. Also, each signal level at the output will be -11 dBm, showing an amplifier gain of 9.0 dB and an intermodulation ratio (IMR) capability of 79 dB. The gain and IMR values apply only for signal levels below compression.