U308
U309
U310

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

JFET
VHF/UHF AMPLIFIER

N-CHANNEL — DEPLETION

MAXIMUM RATINGS

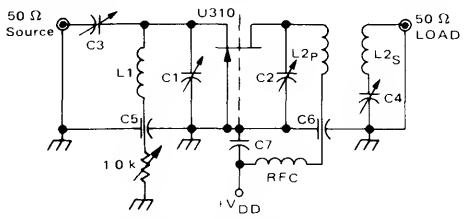
Rating	Symbol	Value	Unit
Drain-Source Voltage	V_{DS}	25	Vdc
Gate-Source Voltage	V_{GS}	25	Vdc
Gate Current	I_G	20	mAdc
Total Device Dissipation @ T_A = 25°C Derate above 25°C	P_D	500 4.0	mW mW/°C
Operating and Storage Junction Temperature Range	T_J, T_{stg}	−65 to +150	°C

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

Characteristic		Symbol	Min	Typ	Max	Unit
OFF CHARACTERISTICS						
Gate-Source Breakdown Voltage (I_G = 1.0 μA, V_{DS} = 0)		$V_{(BR)GSS}$	−25	—	—	V
Gate Reverse Current		I_{GSS}				
(V_{GS} = −15 V)			—	—	−150	pA
(V_{GS} = 0, T_A = 125°C)			—	—	−150	nA
Gate Source Cutoff Voltage (V_{DS} = 10 V, I_D = 1.0 nA)		$V_{GS(off)}$				V
	U308		−1.0	—	−6.0	
	U309		−1.0	—	−4.0	
	U310		−2.5	—	−6.0	
ON CHARACTERISTICS						
Zero-Gate-Voltage Drain Current(1) (V_{DS} = 10 V, V_{GS} = 0)		I_{DSS}				mA
	U308		12	—	60	
	U309		12	—	30	
	U310		24	—	60	
Gate-Source Forward Voltage (I_G = 10 mA, V_{DS} = 0)		$V_{GS(f)}$	—	—	1.0	V
SWITCHING CHARACTERISTICS						
Common-Gate Forward Transconductance(1) (V_{DS} = 10 V, I_D = 10 mA, f = 1.0 kHz)		g_{fg}				mmhos
	U308		10	—	20	
	U309		10	—	20	
	U310		10	—	18	
Common-Gate Output Conductance (V_{DS} = 10 V, I_D = 10 mA, f = 1.0 kHz)		g_{og}	—	150	—	μmhos
Drain-Gate Capacitance (V_{GS} = −10 V, V_{DS} = 10 V, f = 1.0 MHz)		C_{gd}	—	—	2.5	pF
Gate-Source Capacitance (V_{GS} = −10 V, V_{DS} = 10 V, f = 1.0 MHz)		C_{gs}	—	—	5.0	pF
Equivalent Short-Circuit Input Noise Voltage (V_{DS} = 10 V, I_D = 10 mA, f = 100 Hz)		$\bar{e}_n$	—	10	—	$nV\sqrt{Hz}$

(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).
$L2_P$ = One Turn #16 Cu, 1/4" I.D. (Air Core).
$L2_S$ = One Turn #16 Cu, 1/4" I.D. (Air Core).

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

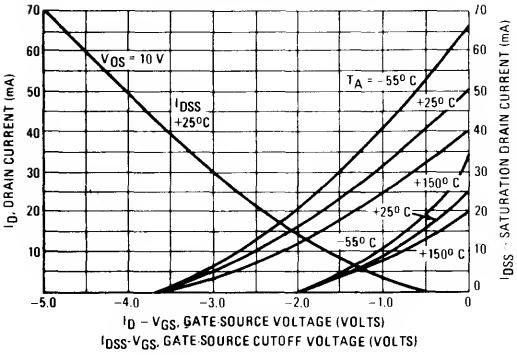


FIGURE 3 – FORWARD TRANSCONDUCTANCE versus GATE-SOURCE VOLTAGE

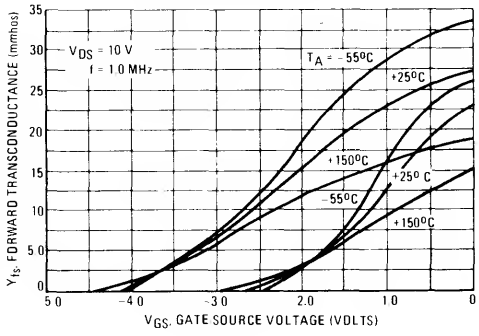


FIGURE 4 – COMMON-SOURCE OUTPUT ADMITTANCE and FORWARD TRANSCONDUCTANCE versus DRAIN CURRENT

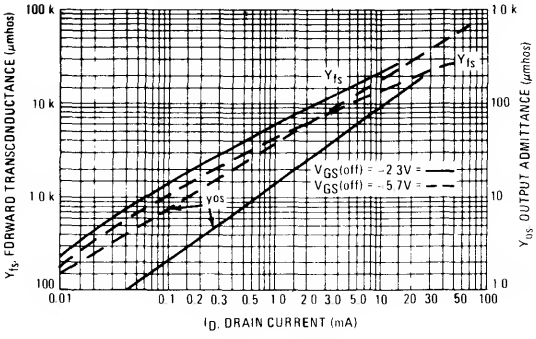


FIGURE 5 – ON RESISTANCE and JUNCTION CAPACITANCE versus GATE-SOURCE VOLTAGE

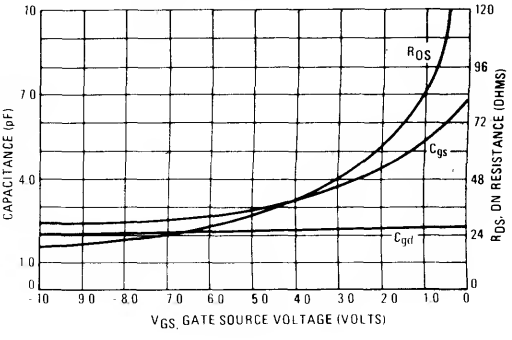


FIGURE 6 – COMMON-GATE Y PARAMETER MAGNITUDE versus FREQUENCY

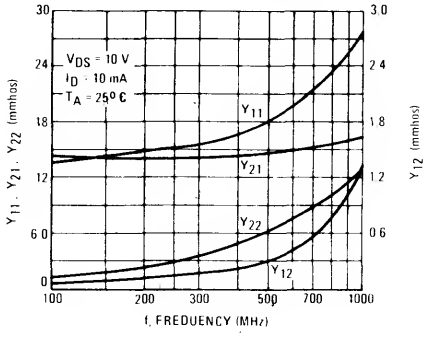


FIGURE 7 – COMMON-GATE S PARAMETER MAGNITUDE versus FREQUENCY

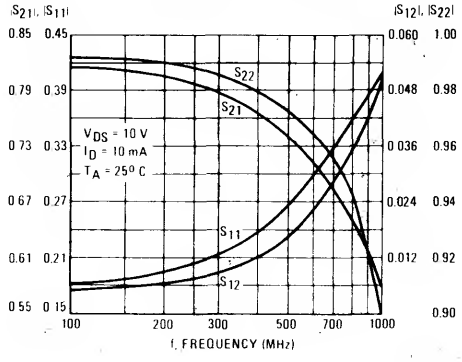


FIGURE 8 – COMMON-GATE Y PARAMETER PHASE-ANGLE versus FREQUENCY

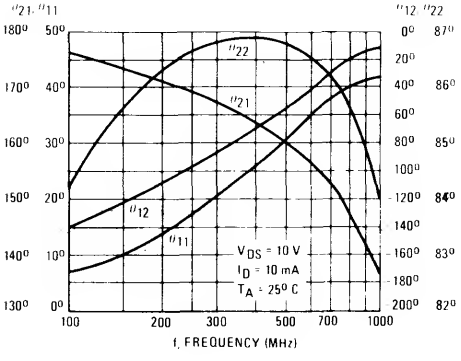


FIGURE 9 – S PARAMETER PHASE-ANGLE versus FREQUENCY

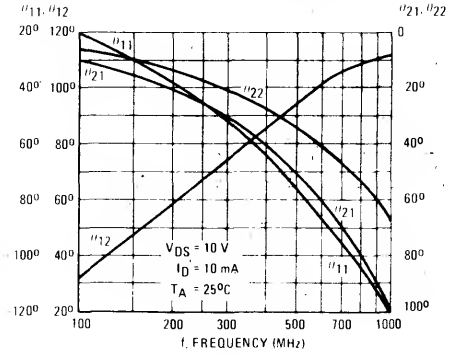


FIGURE 10 – NOISE FIGURE and POWER GAIN versus DRAIN CURRENT

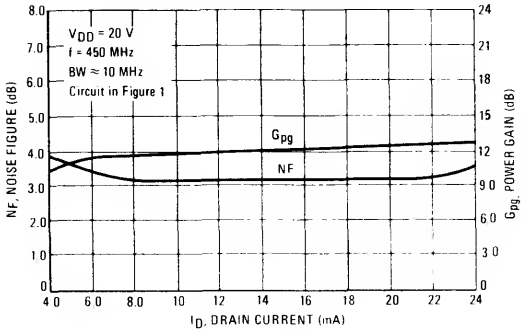


FIGURE 11 – NOISE FIGURE and POWER GAIN versus FREQUENCY

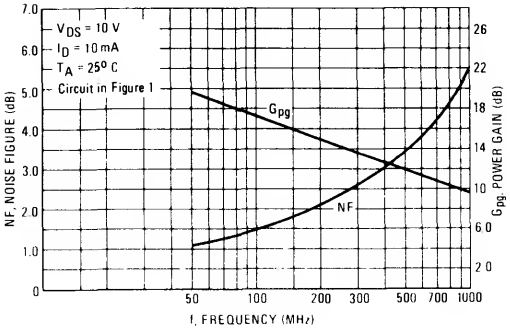
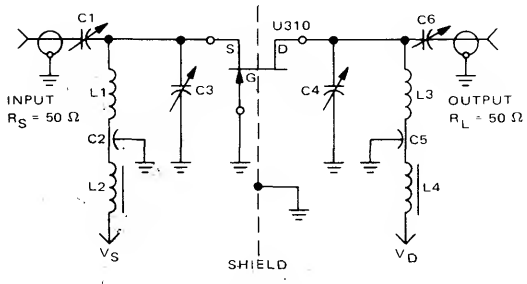


FIGURE 12 – 450 MHz IMD EVALUATION AMPLIFIER



B_W (3dB) – 36 5 MHz
I_D – 10 mAdc
V_{DS} 20 Vdc
Device case grounded
IM test tones – f1 – 449.5 MHz, f2 = 450.5 MHz

C1 = 1 10 pf Johanson Air variable trimmer.
C2, C5 = 100 pf feed thru button capacitor
C3, C4, C6 = 0.5-6 pf Johanson Air variable trimmer.

L1 = 1/8" x 1/32" x 1 5/8" copper bar
L2, L4 = Ferroxcube Vk200 choke.
L3 = 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 C4 and C6 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 C4, C6 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.

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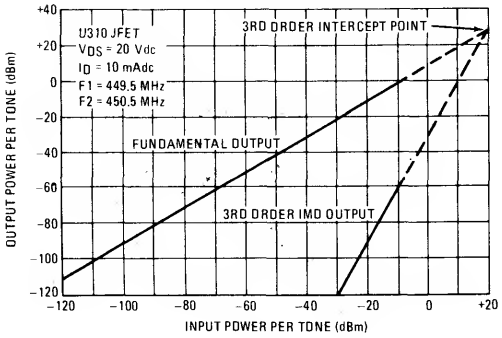
FIGURE 13 – TWO TONE 3RD ORDER INTERCEPT POINT



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.