MFE120
MFE121
MFE122

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

DUAL-GATE MOSFET
VHF AMPLIFIER

N-CHANNEL — DEPLETION

MAXIMUM RATINGS

Rating	Symbol	Value	Unit
Drain-Source Voltage	V_{DS}	+25	Vdc
Drain Current	I_D	30	mAdc
Total Device Dissipation @ T_A = 25°C Derate above 25°C	P_D	300 1.7	mW mW/°C
Operating and Storage Junction Temperature Range	T_J, T_{stg}	−65 to +175	°C

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

Characteristic		Symbol	Min	Typ	Max	Unit
OFF CHARACTERISTICS						
Drain-Source Breakdown Voltage (I_D = 100 μAdc, V_S = 0, V_{G1S} = −4.0 V, V_{G2S} = + 4.0 V)		$V_{(BR)DSX}$	25	—	—	Vdc
Gate 1-Source Breakdown Voltage (I_{G1} = ±10 μAdc, V_{G2S} = 0)		$V_{(BR)G1SO}$	±7.0	—	±20	Vdc
Gate 2-Source Breakdown Voltage (I_{G2} = ±10 μAdc, V_{G2S} = 0)		$V_{(BR)G2SO}$	±7.0	—	±20	Vdc
Gate 1 Leakage Current (V_{G1S} = +6.0 Vdc, V_{G2S} = 0, V_{DS} = 0)		I_{G1SS}	—	—	20	nAdc
Gate 2 Leakage Current (V_{G2S} = +6.0 Vdc, V_{G1S} = 0, V_{DS} = 0)		I_{G2SS}	—	—	20	nAdc
Gate 1 to Source Cutoff Voltage (V_{DS} = 15 Vdc, V_{G2S} = 4.0 Vdc, I_D = 200 μAdc)		$V_{G1S(off)}$	—	—	−4.0	Vdc
Gate 2 to Source Cutoff Voltage (V_{DS} = 15 Vdc, V_{G1S} = 0, I_D = 200 μAdc)		$V_{G2S(off)}$	—	—	−4.0	Vdc
ON CHARACTERISTICS						
Zero-Gate-Voltage Drain Current (V_{DS} = 15 Vdc, V_{G1S} = 0, V_{G2S} = 4.0 Vdc)	MFE120 MFE121 MFE122	I_{DSS}	 2.0 5.0 2.0	 7.0 10 9.0	 18 30 20	mAdc
SMALL-SIGNAL CHARACTERISTICS						
Forward Transfer Admittance (Gate 1 to Drain) (V_{DS} = 15 Vdc, V_{G2S} = 4.0 Vdc, I_D = 10 mAdc, f = 1.0 kHz)	MFE120,22 MFE121	$\|Y_{fs}\|$	8000 10,000	— —	18,000 20,000	μmhos
Input Capacitance (V_{DS} = 15 Vdc, V_{G2S} = 4.0 Vdc, I_D = I_{DSS}, f = 1.0 MHz)	MFE120,22 MFE121	C_{iss}	— —	4.5 4.5	7.0 6.0	pF
Reverse Transfer Capacitance (V_{DS} = 15 Vdc, V_{G2S} = 4.0 Vdc, I_D = 6.0 mAdc, f = 1.0 MHz)		C_{rss}	—	0.023	—	pF
Output Capacitance (V_{DS} = 15 Vdc, V_{G2S} = 4.0 Vdc, I_D = I_{DSS}, f = 1.0 MHz)	MFE120,22 MFE121	C_{oss}	— —	2.5 2.5	4.0 3.5	pF

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

Characteristic		Symbol	Min	Typ	Max	Unit
FUNCTIONAL CHARACTERISTICS						
Noise Figure		NF				dB
(V_{DS} = 15 Vdc, V_{G2S} = 4.0 Vdc,						
I_D = 6.0 mAdc, Z_S is optimized for NF)						
(f = 105 MHz — Figure 1)	MFE120		—	2.9	5.0	
(f = 60 MHz — Figure 3)	MFE121		—	2.6	5.0	
(f = 200 MHz — Figure 3)	MFE121		—	2.6	5.0	
Common Source Power Gain		G_{ps}				dB
(V_{DS} = 15 Vdc, V_{G2S} = 4.0 Vdc,						
I_D = 6.0 mAdc, Z_S is optimized for NF)						
(f = 105 MHz — Figure 1)	MFE120		17	19.6	—	
(f = 60 MHz — Figure 3)	MFE121		20	27.8	—	
(f = 200 MHz — Figure 3)	MFE121		17	18.6	—	
Level of Unwanted Signal for 1.0% Cross Modulation (V_{DS} = 15 Vdc, V_{G2S} = 4.0 Vdc, I_D = 6.0 mAdc)		—	—	100	—	mV
Common-Source Conversion Power Gain (Gate 1 Injection, Figure 2)		G_c				dB
(V_{DS} = 15 Vdc, V_{G2S} = 4.0 Vdc, Local						
Oscillator Voltage = 925 mVrms)						
(Signal Frequency = 60 MHz, Local Oscillator Frequency = 104 MHz)	MFE122		15	16.5	—	
(Signal Frequency = 200 MHz, Local Oscillator Frequency = 244 MHz)	MFE122		12	13.3	—	

6

FIGURE 1 – 105 MHz TEST CIRCUIT

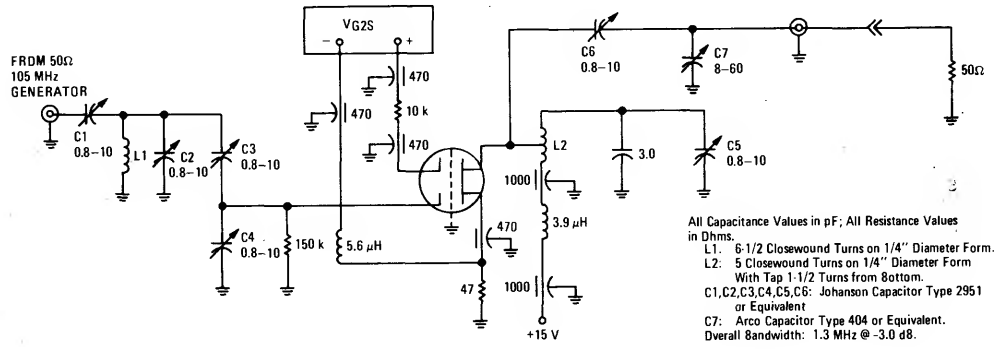


FIGURE 2 – 60 AND 200 MHz TEST CIRCUIT

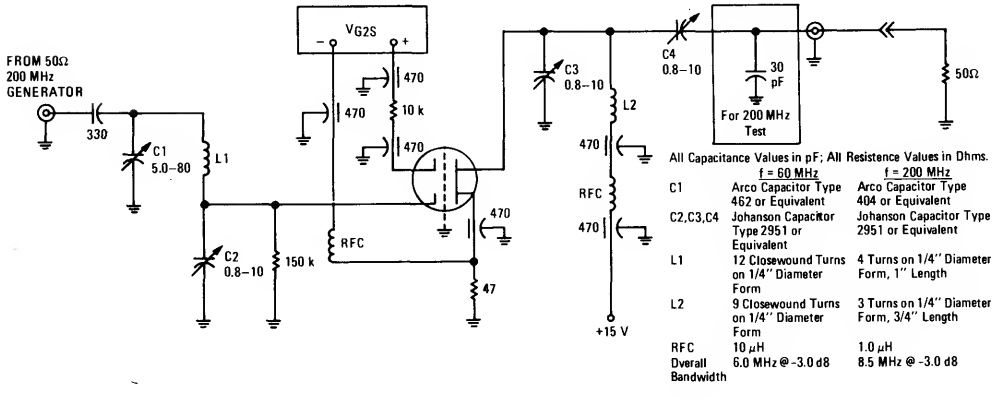
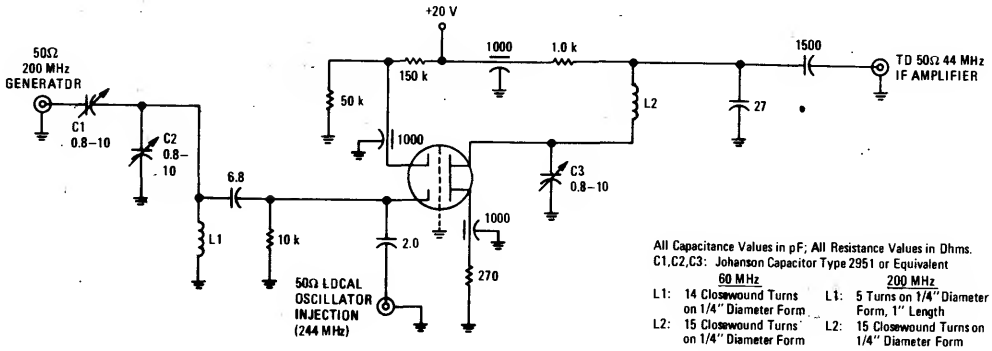


FIGURE 3 – 60 AND 200 MHz CONVERSION POWER GAIN



All Capacitance Values in pF; All Resistance Values in Ohms.
C1,C2,C3: Johanson Capacitor Type 2951 or Equivalent

60 MHz	200 MHz
L1: 14 Closewound Turns on 1/4" Diameter Form	L1: 5 Turns on 1/4" Diameter Form, 1" Length
L2: 15 Closewound Turns on 1/4" Diameter Form	L2: 15 Closewound Turns on 1/4" Diameter Form

COMMON-SOURCE ADMITTANCE PARAMETERS
(V_{DS} = 15 Vdc, V_{G2S} = 4.0 Vdc, I_D = 6.0 mAdc)

6

FIGURE 4 – INPUT ADMITTANCE

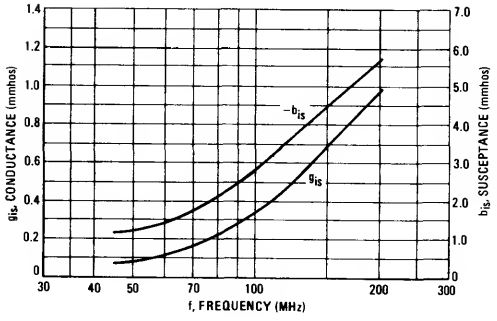


FIGURE 5 – REVERSE TRANSFER ADMITTANCE

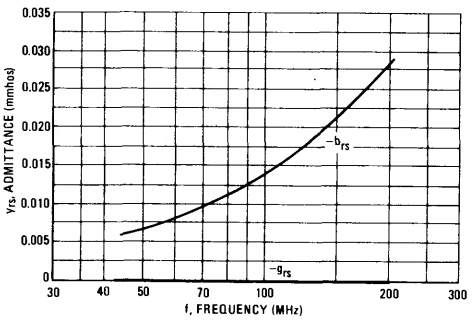


FIGURE 6 – FORWARD TRANSFER ADMITTANCE

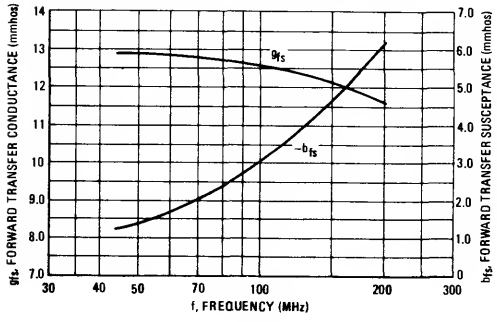


FIGURE 7 – OUTPUT ADMITTANCE

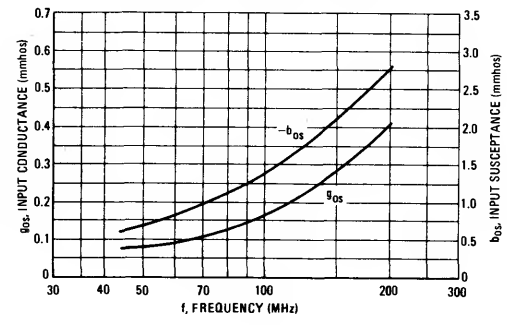


FIGURE 8 – GAIN REDUCTION

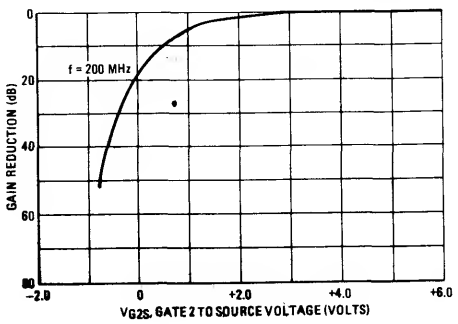
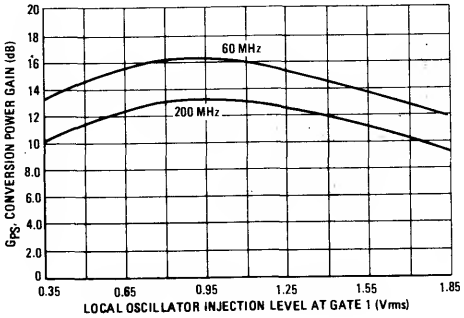


FIGURE 9 – CONVERSION POWER GAIN



6