MPF211
MPF212
MPF213

CASE 317-01, STYLE 1

DUAL-GATE MOSFET
VHF AMPLIFIER

N-CHANNEL — DEPLETION

MAXIMUM RATINGS

Rating	Symbol	MPF211 MPF212	MPF213	Unit
Drain-Source Voltage	V_{DS}	27	35	Vdc
Drain-Gate Voltage	V_{DG1} V_{DG2}	35 35	40 40	Vdc
Drain Current — Continuous	I_D	50		mAdc
Gate Current	I_{G1} I_{G2}	±10 ±10		mAdc
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	1.2 8.0		Watt mW/°C
Lead Temperature, 1/16″ From Seated Surface for 10 Seconds	T_L	260		°C
Junction Temperature Range	T_J	−65 to +150		°C
Storage Channel Temperature Range	T_{stg}	−65 to +150		°C

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

Characteristic		Symbol	Min	Max	Unit
OFF CHARACTERISTICS					
Drain-Source Breakdown Voltage (V_{G1S} = V_{G2S} = −4.0 Vdc, I_D = 10 μAdc)	MPF211,212 MPF213	$V_{(BR)DSX}$	25 30	— —	Vdc
Instantaneous Drain-Source Breakdown Voltage(1) (V_{G1S} = V_{G2S} = −4.0 Vdc, I_D = 10 μAdc)	MPF211,212 MPF213	$V_{(BR)DSX}$	27 35	— —	Vdc
Gate 1-Source Breakdown Voltage(2) (V_{G2S} = V_{DS} = 0, I_{G1} = ±10 mAdc)		$V_{(BR)G1SO}$	±6.0	—	Vdc
Gate 2-Source Breakdown Voltage(2) (V_{G1S} = V_{DS} = 0, I_{G2} = ±10 mAdc)		$V_{(BR)G2SO}$	±6.0	—	Vdc
Gate 1 Leakage Current (V_{G1S} = ±5.0 Vdc, V_{G2S} = V_{DS} = 0) (V_{G1S} = −5.0 Vdc, V_{G2S} = V_{DS} = 0, T_A = 150°C)		I_{G1SS}	±0.04(Typ) —	±100 −100	nAdc μAdc
Gate 2 Leakage Current (V_{G2S} = ±5.0 Vdc, V_{G1S} = V_{DS} = 0) (V_{G2S} = −5.0 Vdc, V_{G1S} = V_{DS} = 0, T_A = 150°C)		I_{G2SS}	±0.04(Typ) —	±100 −100	nAdc μAdc
Gate 1 to Source Cutoff Voltage (V_{DS} = 15 Vdc, V_{G2S} = 4.0 Vdc, I_D = 2.0 μAdc)	MPF211,213 MPF212	$V_{G1S(off)}$	−0.5 −0.5	−5.5 −4.0	Vdc
Gate 2 to Source Cutoff Voltage (V_{DS} = 15 Vdc, V_{G1S} = 0, I_D = 20 μAdc)	MPF211 MPF212,213	$V_{G2S(off)}$	−0.2 −0.2	−2.5 −4.0	Vdc
ON CHARACTERISTICS					
Zero-Gate-Voltage Drain Current(3) (V_{DS} = 15 Vdc, V_{G1S} = 0, V_{G2S} = 4.0 Vdc)		I_{DSS}	6.0	4.0	mAdc
SMALL-SIGNAL CHARACTERISTICS					
Forward Transfer Admittance(4) (V_{DS} = 15 Vdc, V_{G2S} = 4.0 Vdc, V_{G1S} = 0, f = 1.0 kHz)	MPF211,212 MPF213	$\|Y_{fs}\|$	17 15	40 35	mmhos
Reverse Transfer Capacitance (V_{DS} = 15 Vdc, V_{G2S} = 4.0 Vdc, I_D = 10 mAdc, f = 1.0 MHz)		C_{rss}	0.005	0.05	pF
FUNCTIONAL CHARACTERISTICS					
Noise Figure (V_{DD} = 18 Vdc, V_{GG} = 7.0 Vdc, f = 200 MHz) (Figure 1) (V_{DD} = 24 Vdc, V_{GG} = 6.0 Vdc, f = 45 MHz) (Figure 2)	MPF211 MPF211,213	NF	— —	4.0 4.5	dB

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

Characteristic		Symbol	Min	Max	Unit
Common Source Power Gain		G_{ps}			dB
(V_{DD} = 18 Vdc, V_{GG} = 7.0 Vdc, f = 200 MHz) (Figure 1)	MPF211		24	35	
(V_{DD} = 24 Vdc, V_{GG} = 6.0 Vdc, f = 45 MHz) (Figure 2)	MPF211		29	37	
(V_{DD} = 24 Vdc, V_{GG} = 6.0 Vdc, f = 45 MHz) (Figure 2)	MPF213		27	35	
(V_{DD} = 18 Vdc, f_{LO} = 245 MHz, f_{RE} = 200 MHz) (Figure 3)	MPF212	G_c(6)	21	38	
Bandwidth		BW			MHz
(V_{DD} = 18 Vdc, V_{GG} = 7.0 Vdc, f = 200 MHz) (Figure 1)	MPF211		5.0	12	
(V_{DD} = 18 Vdc, f_{LO} = 245 MHz, f_{RE} = 200 MHz) (Figure 3)	MPF212		4.0	7.0	
(V_{DD} = 24 Vdc, V_{GG} = 6.0 Vdc, f = 45 MHz) (Figure 2)	MPF211,213		3.5	6.0	
Gain Control Gate-Supply Voltage(5)		$V_{GG(GC)}$			Vdc
(V_{DD} = 18 Vdc, ΔG_{ps} = −30 dB, f = 200 MHz) (Figure 1)	MPF211		—	−2.0	
(V_{DD} = 24 Vdc, ΔG_{ps} = −30 dB, f = 45 MHz) (Figure 2)	MPF211,213		—	±1.0	

(1) Measured after five seconds of applied voltage.
(2) All gate breakdown voltages are measured while the device is conducting rated gate current. This ensures that the gate voltage limiting network is functioning properly.
(3) Pulse Test: Pulse Width = 300 μs, Duty Cycle ≤ 2.0%.
(4) This parameter must be measured with bias voltages applied for less than 5 seconds to avoid overheating. The signal is applied to Gate 1 with Gate 2 at ac ground.
(5) ΔG_{ps} is defined as the change in G_{ps} from the value at V_{GG} = 7.0 Volts (MPF211) and V_{GG} = 6.0 Volts (MPF213).
(6) Power Gain Conversion. Amplitude at input from local oscillator is adjusted for maximum G_c.

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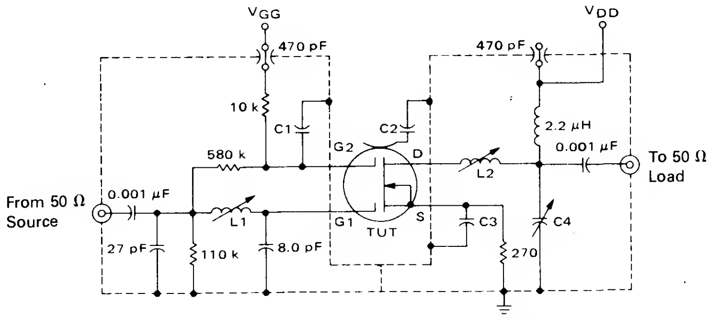
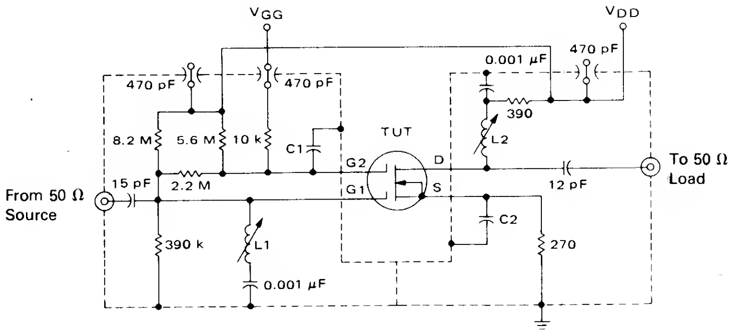
FIGURE 1 — 200 MHz POWER GAIN, GAIN CONTROL VOLTAGE, AND NOISE FIGURE TEST CIRCUIT



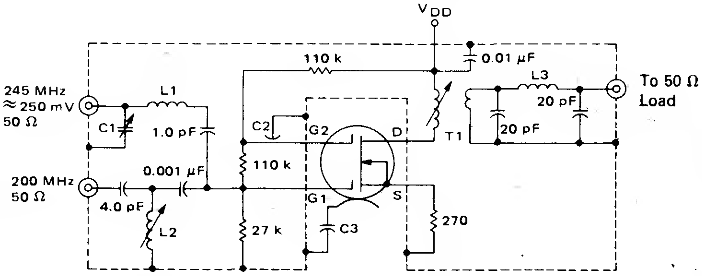
C1, C2 & C3: Leadless disc ceramic, 0.001 μF
C4: Arco 462, 5-80 pF, or equivalent
L1: 3 Turns #18, 3/16″ diameter aluminum slug
L2: 8 Turns #20, 3/16″ diameter aluminum slug

FIGURE 2 — 45-MHz POWER GAIN AND NOISE FIGURE TEST CIRCUIT



C1: Leadless disc ceramic, 0.001 μF
C2: Leadless disc ceramic, 0.01 μF
L1: 8 Turns #28, 5/32″ diameter form, type "J" slug
L2: 9 Turns #28, 5/32″ diameter form, type "J" slug

FIGURE 3 — 200-MHz-to-45-MHz CIRCUIT FOR CONVERSION POWER GAIN



L1: 7 Turns #34, 1/4" diameter aluminum slug
L2: 5-1/2 Turns #20, 1/4" diameter aluminum slug
L3: 7 Turns #24, 1/4" diameter air core

C1: Arco type 462, 5-80 pF
C2: 0.001 μF leadless disc
C3: 0.01 μF leadless disc

T1: Pri: 25 Turns #30, close wound on 1/4" diameter form, type "J" slug
Sec: 4 Turns #30, centered over primary

TYPICAL CHARACTERISTICS

FIGURE 4 — DRAIN CURRENT versus DRAIN-TO-SOURCE VOLTAGE

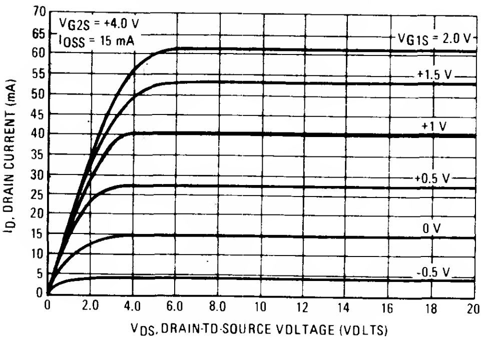
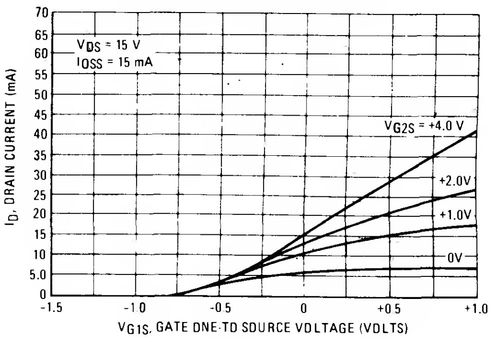


FIGURE 5 — DRAIN CURRENT versus GATE ONE-TO-SOURCE VOLTAGE



SMALL-SIGNAL COMMON-SOURCE PARAMETER — GATE ONE

FIGURE 6 — FORWARD TRANSFER ADMITTANCE versus GATE TWO-TO-SOURCE VOLTAGE

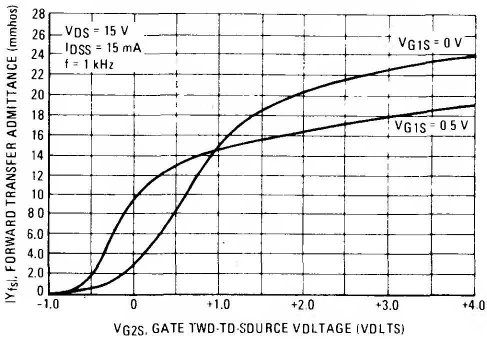


FIGURE 7 — FORWARD TRANSFER ADMITTANCE versus GATE ONE-TO-SOURCE VOLTAGE

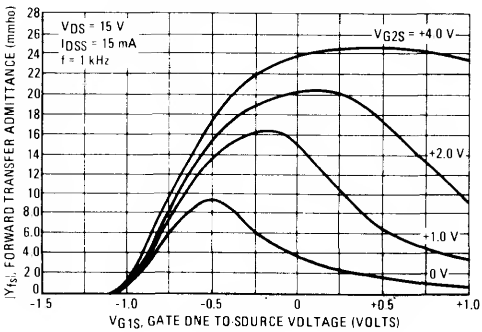


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FIGURE 8 — FORWARD TRANSFER ADMITTANCE versus DRAIN CURRENT

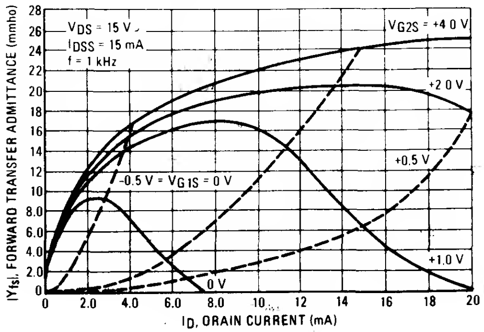

FIGURE 9 — INPUT AND OUTPUT CAPACITANCE versus GATE TWO-TO-SOURCE VOLTAGE

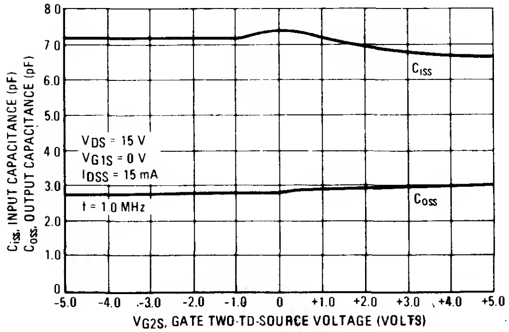

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FIGURE 10 — SMALL-SIGNAL GATE ONE INPUT ADMITTANCE versus FREQUENCY

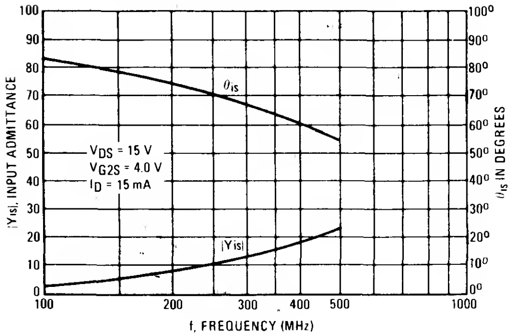

FIGURE 11 — SMALL-SIGNAL FORWARD TRANSFER ADMITTANCE versus FREQUENCY

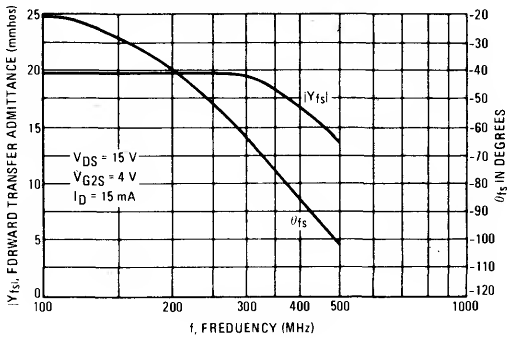

FIGURE 12 — SMALL-SIGNAL GATE ONE REVERSE TRANSFERS ADMITTANCE versus FREQUENCY

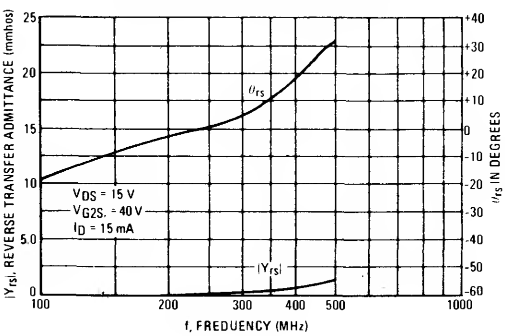

FIGURE 13 — SMALL-SIGNAL GATE ONE OUTPUT ADMITTANCE versus FREQUENCY

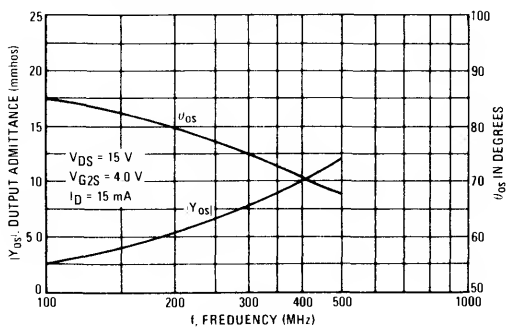

FIGURE 14 — RELATIVE SMALL-SIGNAL POWER GAIN versus GAIN CONTROL GATE SUPPLY VOLTAGE MPF211

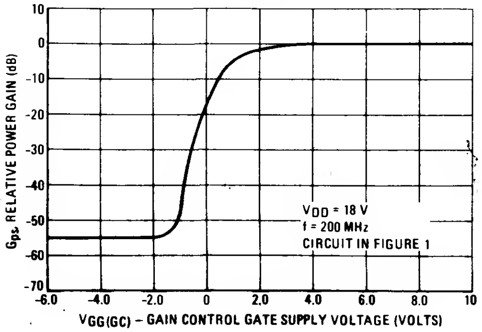

FIGURE 15 — COMMON SOURCE SPOT NOISE FIGURE versus GAIN CONTROL GATE SUPPLY VOLTAGE MPF211

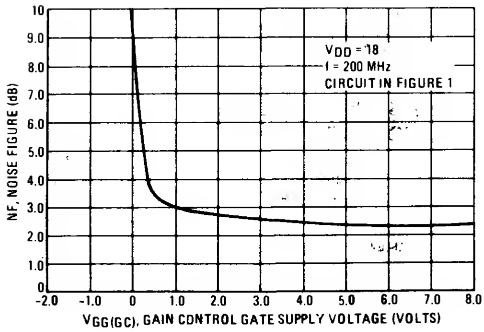

FIGURE 16 — SMALL-SIGNAL COMMON-SOURCE INSERTION POWER GAIN versus GAIN CONTROL GATE SUPPLY VOLTAGE MPF211, 213

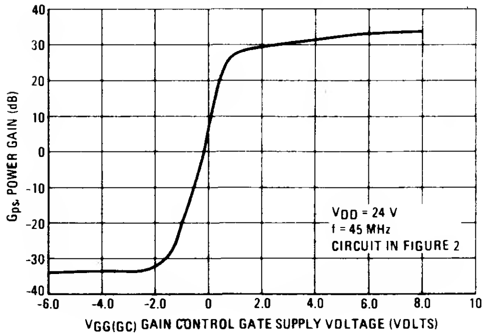

FIGURE 17 — OPTIMUM SPOT NOISE FIGURE versus FREQUENCY

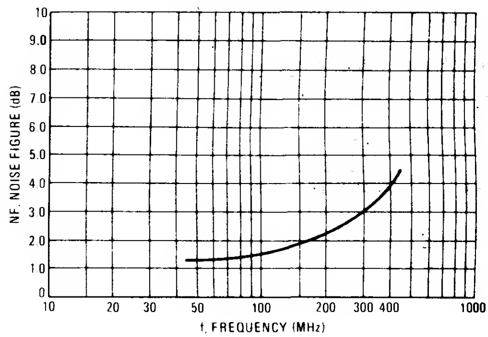

FIGURE 18 — INPUT/OUTPUT IMPEDANCE