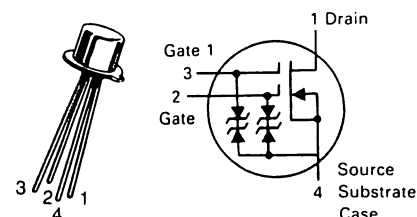


MAXIMUM RATINGS

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	50	mA _{dc}
Gate Current	I_{G1} I_{G2}	± 10 ± 10	mA _{dc}
Total Device Dissipation @ $T_A = 25^\circ\text{C}$ Derate above 25°C	P_D	360 2.4	mW mW/ $^\circ\text{C}$
Total Device Dissipation @ $T_C = 25^\circ\text{C}$ Derate above 25°C	P_D	1.2 8.0	Watt mW/ $^\circ\text{C}$
Lead Temperature	T_L	300	$^\circ\text{C}$
Junction Temperature Range	T_J	-65 to +175	$^\circ\text{C}$
Storage Channel Temperature Range	T_{stg}	-65 to +175	$^\circ\text{C}$

**3N201
3N202
3N203**

TO-72 (TO-206AF)



**DUAL-GATE MOSFET
VHF AMPLIFIER**

N-CHANNEL — DEPLETION

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

Characteristic	Symbol	Min	Typ	Max	Unit
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OFF CHARACTERISTICS

Drain-Source Breakdown Voltage ($I_D = 10 \mu\text{A}_{dc}$, $V_S = 0$, $V_{G1S} = V_{G2S} = -5.0 \text{ Vdc}$)	$V_{(BR)DSX}$	25	—	—	Vdc
Gate 1-Source Breakdown Voltage(1) ($I_{G1} = \pm 10 \text{ mA}_{dc}$, $V_{G2S} = V_{DS} = 0$)	$V_{(BR)G1SO}$	± 6.0	± 12	± 30	Vdc
Gate 2-Source Breakdown Voltage(1) ($I_{G2} = \pm 10 \text{ mA}_{dc}$, $V_{G1S} = V_{DS} = 0$)	$V_{(BR)G2SO}$	± 6.0	± 12	± 30	Vdc
Gate 1 Leakage Current ($V_{G1S} = \pm 5.0 \text{ Vdc}$, $V_{G2S} = V_{DS} = 0$) ($V_{G1S} = -5.0 \text{ Vdc}$, $V_{G2S} = V_{DS} = 0$, $T_A = 150^\circ\text{C}$)	I_{G1SS}	— —	$\pm .040$ —	± 10 -10	nA _{dc} μA_{dc}
Gate 2 Leakage Current ($V_{G2S} = \pm 5.0 \text{ Vdc}$, $V_{G1S} = V_{DS} = 0$) ($V_{G2S} = -5.0 \text{ Vdc}$, $V_{G1S} = V_{DS} = 0$, $T_A = 150^\circ\text{C}$)	I_{G2SS}	— —	$\pm .050$ —	± 10 -10	nA _{dc} μA_{dc}
Gate 1 to Source Cutoff Voltage ($V_{DS} = 15 \text{ Vdc}$, $V_{G2S} = 4.0 \text{ Vdc}$, $I_D = 20 \mu\text{A}_{dc}$)	$V_{G1S(off)}$	-0.5	-1.5	-5.0	Vdc
Gate 2 to Source Cutoff Voltage ($V_{DS} = 15 \text{ Vdc}$, $V_{G1S} = 0$, $I_D = 20 \mu\text{A}_{dc}$)	$V_{G2S(off)}$	-0.2	-1.4	-5.0	Vdc

ON CHARACTERISTICS

Zero-Gate-Voltage Drain Current(2) ($V_{DS} = 15 \text{ Vdc}$, $V_{G1S} = 0$, $V_{G2S} = 4.0 \text{ Vdc}$)	I_{DSS}	6.0 3.0	13 11	30 15	mA _{dc}
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SMALL-SIGNAL CHARACTERISTICS

Forward Transfer Admittance(3) ($V_{DS} = 15 \text{ Vdc}$, $V_{G2S} = 4.0 \text{ Vdc}$, $V_{G1S} = 0$, $f = 1.0 \text{ kHz}$)	$ Y_{fs} $	8.0 7.0	12.8 12.5	20 15	mmhos
Input Capacitance ($V_{DS} = 15 \text{ Vdc}$, $V_{G2S} = 4.0 \text{ Vdc}$, $I_D = I_{DSS}$, $f = 1.0 \text{ MHz}$)	C_{iss}	—	3.3	—	pF
Reverse Transfer Capacitance ($V_{DS} = 15 \text{ Vdc}$, $V_{G2S} = 4.0 \text{ Vdc}$, $I_D = 10 \text{ mA}_{dc}$, $f = 1.0 \text{ MHz}$)	C_{rss}	0.005	0.014	0.03	pF
Output Capacitance ($V_{DS} = 15 \text{ Vdc}$, $V_{G2S} = 4.0 \text{ Vdc}$, $I_D = I_{DSS}$, $f = 1.0 \text{ MHz}$)	C_{oss}	—	1.7	—	pF

FUNCTIONAL CHARACTERISTICS

Noise Figure ($V_{DD} = 18 \text{ Vdc}$, $V_{GG} = 7.0 \text{ Vdc}$, $f = 200 \text{ MHz}$) (Figure 1) ($V_{DD} = 18 \text{ Vdc}$, $V_{GG} = 6.0 \text{ Vdc}$, $f = 45 \text{ MHz}$) (Figure 3)	NF	— —	1.8 5.3	4.5 6.0	dB
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3N201, 3N202, 3N203

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

Characteristic	Symbol	Min	Typ	Max	Unit
Common Source Power Gain ($V_{DD} = 18\text{ Vdc}$, $V_{GG} = 7.0\text{ Vdc}$, $f = 200\text{ MHz}$) (Figure 1) ($V_{DD} = 18\text{ Vdc}$, $V_{GG} = 6.0\text{ Vdc}$, $f = 45\text{ MHz}$) (Figure 3) ($V_{DD} = 18\text{ Vdc}$, $f_{LO} = 245\text{ MHz}$, $f_{RF} = 200\text{ MHz}$) (Figure 2)	G_{ps} $G_c(5)$	15 20 15	20 25 19	25 30 25	dB
Bandwidth ($V_{DD} = 18\text{ Vdc}$, $V_{GG} = 7.0\text{ Vdc}$, $f = 200\text{ MHz}$) (Figure 1) ($V_{DD} = 18\text{ Vdc}$, $f_{LO} = 245\text{ MHz}$, $f_{RF} = 200\text{ MHz}$) (Figure 2) ($V_{DD} = 18\text{ Vdc}$, $V_{GG} = 6.0\text{ Vdc}$, $f = 45\text{ MHz}$) (Figure 3)	BW	5.0 4.5 3.0	— — —	9.0 7.5 6.0	MHz
Gain Control Gate-Supply Voltage(4) ($V_{DD} = 18\text{ Vdc}$, $\Delta G_{ps} = -30\text{ dB}$, $f = 200\text{ MHz}$) (Figure 1) ($V_{DD} = 18\text{ Vdc}$, $\Delta G_{ps} = -30\text{ dB}$, $f = 45\text{ MHz}$) (Figure 3)	$V_{GG}(GC)$	0 0	-1.0 -0.6	-3.0 -3.0	Vdc

(1) 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.

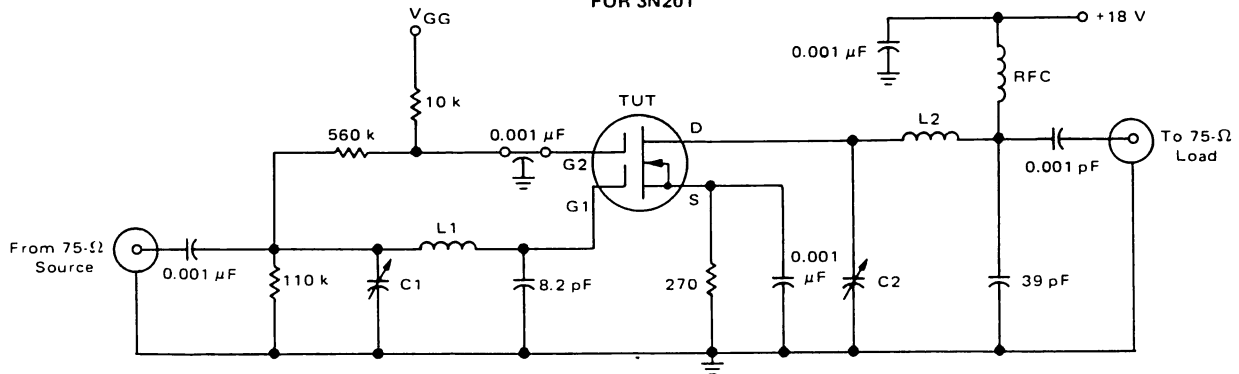
(2) Pulse Test: Pulse Width = $300\text{ }\mu\text{s}$, Duty Cycle $\leq 2.0\%$.

(3) This parameter must be measured with bias voltages applied for less than 5 seconds to avoid overheating.

(4) ΔG_{ps} is defined as the change in G_{ps} from the value at $V_{GG} = 7.0\text{ volts}$ (3N201) and $V_{GG} = 6.0\text{ volts}$ (3N203).

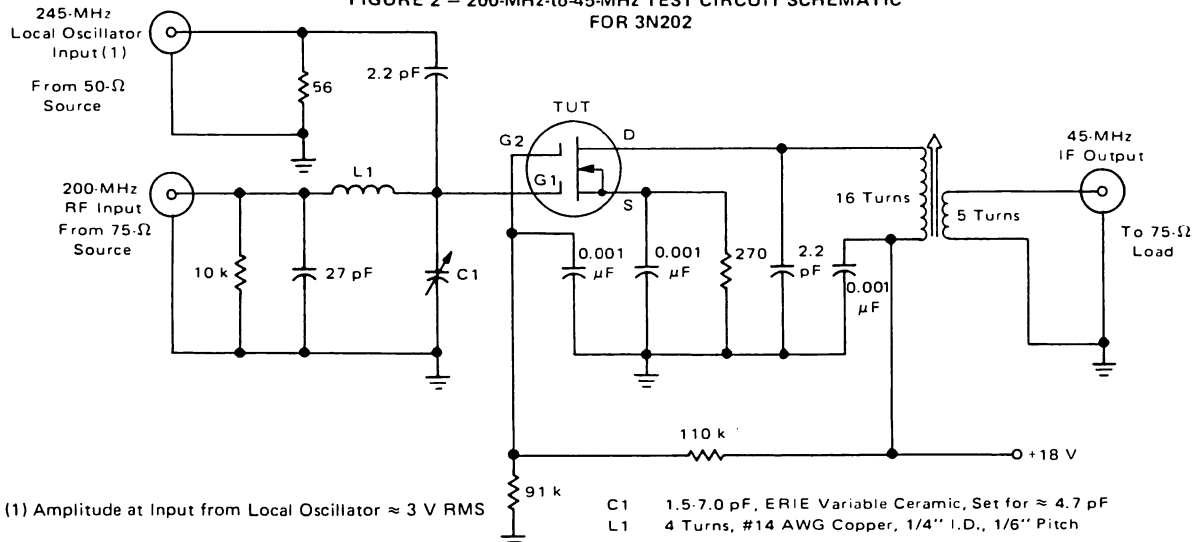
(5) Power Gain Conversion

FIGURE 1 – 200-MHz TEST CIRCUIT SCHEMATIC
FOR 3N201



- C1 4.0-30 pF, ERIE Variable Ceramic, Set for $\approx 22\text{ pF}$
- C2 4.0-30 pF, ERIE Variable Ceramic, Set for $\approx 10\text{ pF}$
- L1 4 Turns, #14 AWG Copper, 1/4" I.D., 1/6" Pitch
- L2 3 Turns, #14 AWG Copper, 1/4" I.D., 1/8" Pitch
- RFC DELEVAN No. 153712, 1.0 μH

FIGURE 2 – 200-MHz-to-45-MHz TEST CIRCUIT SCHEMATIC
FOR 3N202

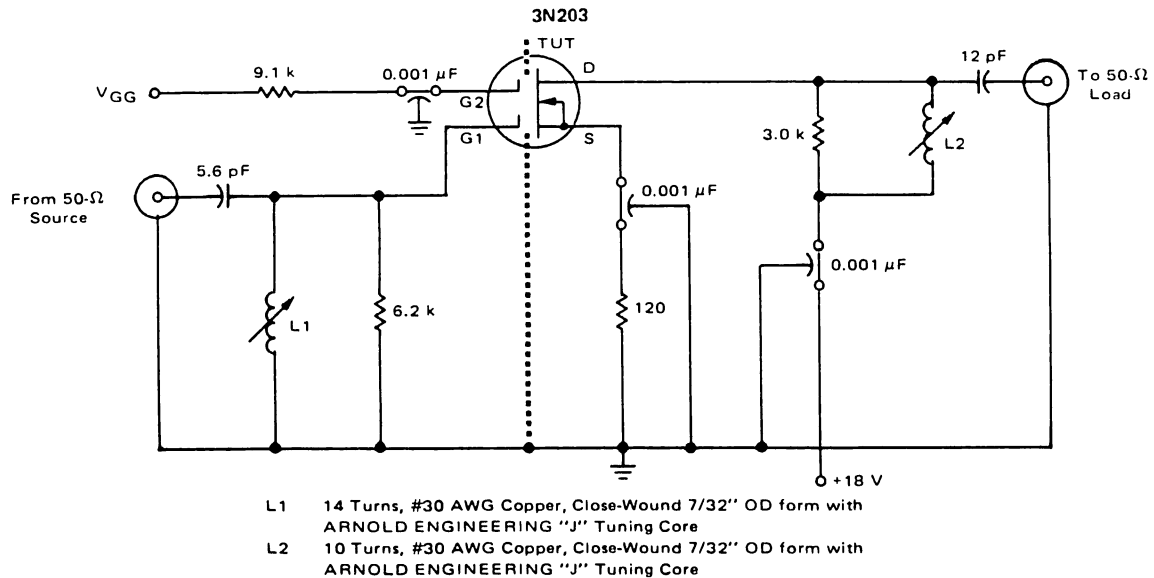


(1) Amplitude at Input from Local Oscillator $\approx 3\text{ V RMS}$

- C1 1.5-7.0 pF, ERIE Variable Ceramic, Set for $\approx 4.7\text{ pF}$
- L1 4 Turns, #14 AWG Copper, 1/4" I.D., 1/6" Pitch

3N201, 3N202, 3N203

FIGURE 3 — 45-MHz TEST CIRCUIT SCHEMATIC



TYPICAL CHARACTERISTICS

FIGURE 4 — DRAIN CURRENT versus DRAIN to SOURCE VOLTAGE

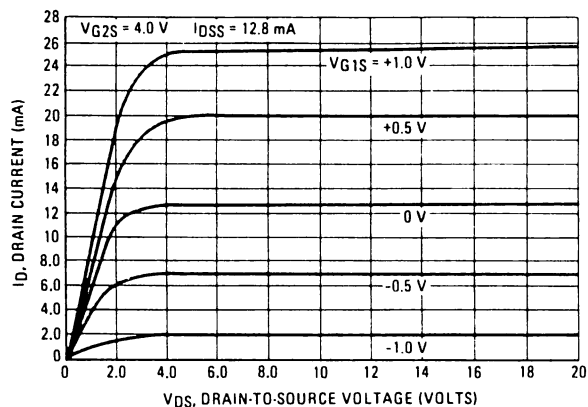


FIGURE 5 — DRAIN CURRENT versus GATE-ONE to SOURCE VOLTAGE

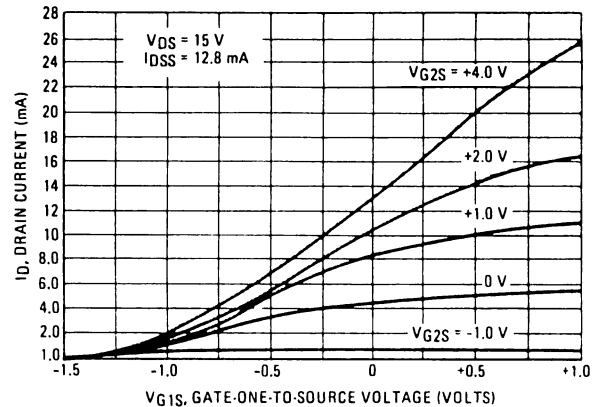


FIGURE 6 — SMALL-SIGNAL COMMON-SOURCE GATE-ONE FORWARD TRANSFER ADMITTANCE versus DRAIN CURRENT

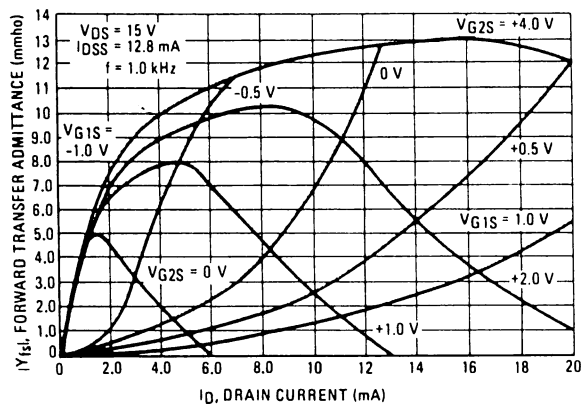


FIGURE 7 — SMALL-SIGNAL COMMON-SOURCE GATE-ONE FORWARD TRANSFER ADMITTANCE versus GATE-ONE to SOURCE VOLTAGE

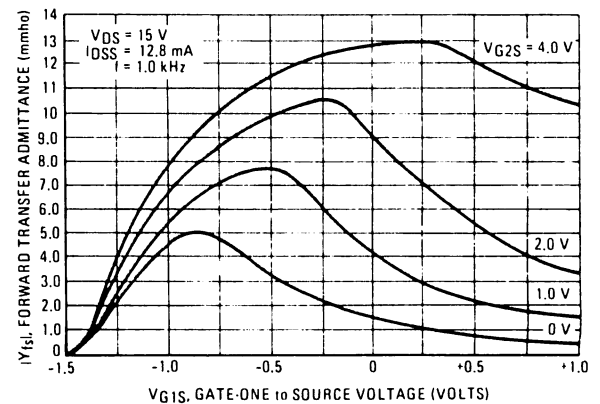


FIGURE 8 – SMALL-SIGNAL COMMON-SOURCE GATE-ONE
FORWARD TRANSFER ADMITTANCE versus
GATE-TWO to SOURCE VOLTAGE

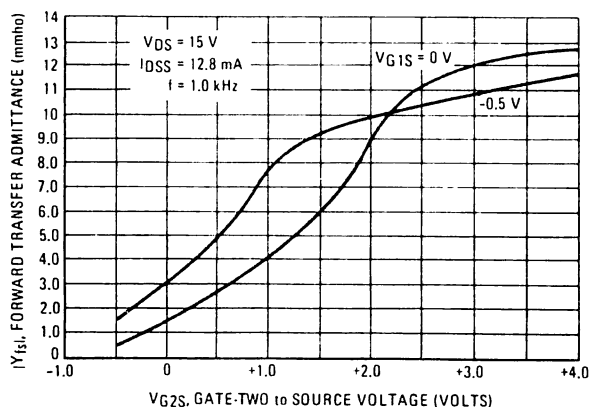
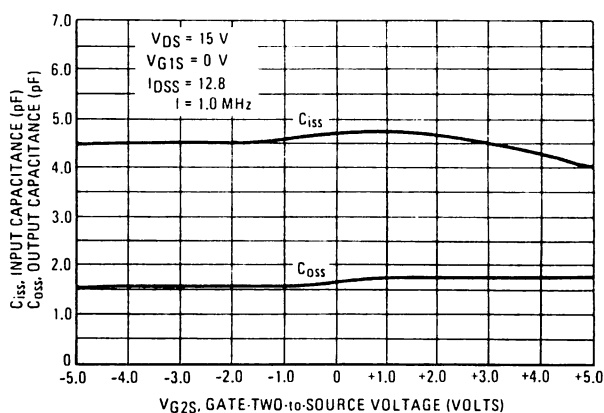


FIGURE 9 – SMALL-SIGNAL COMMON-SOURCE GATE-ONE
INPUT AND OUTPUT CAPACITANCE versus
GATE-TWO to SOURCE VOLTAGE



TYPICAL CHARACTERISTICS

FIGURE 10 – COMMON-SOURCE POWER GAIN AND
SPOT NOISE FIGURE versus DRAIN CURRENT

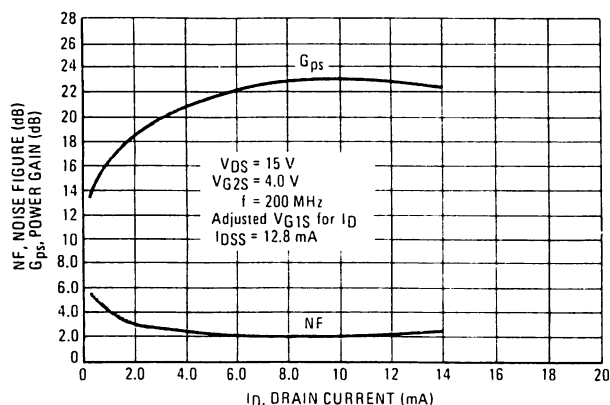


FIGURE 11 – COMMON-SOURCE POWER GAIN AND
SPOT NOISE FIGURE versus GAIN CONTROL
GATE-SUPPLY VOLTAGE – 3N201

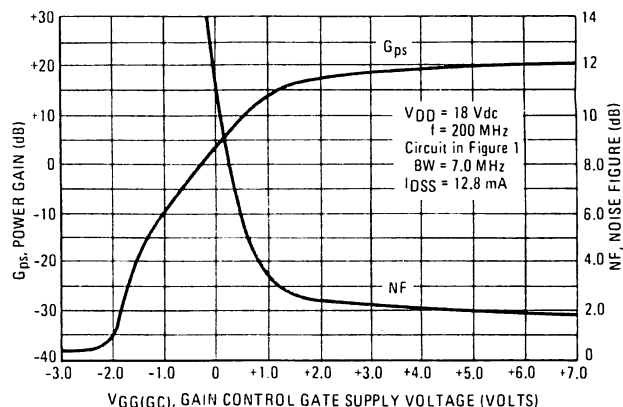


FIGURE 12 – COMMON-SOURCE POWER GAIN
versus DRAIN SUPPLY CURRENT – 3N201

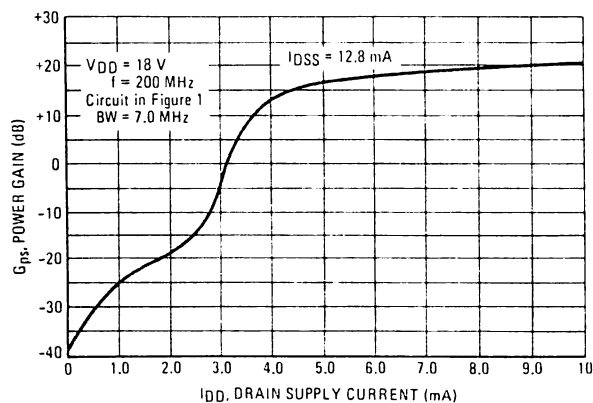


FIGURE 13 – SMALL-SIGNAL COMMON-SOURCE
CONVERSION POWER GAIN versus
LOCAL OSCILLATOR INPUT VOLTAGE – 3N202

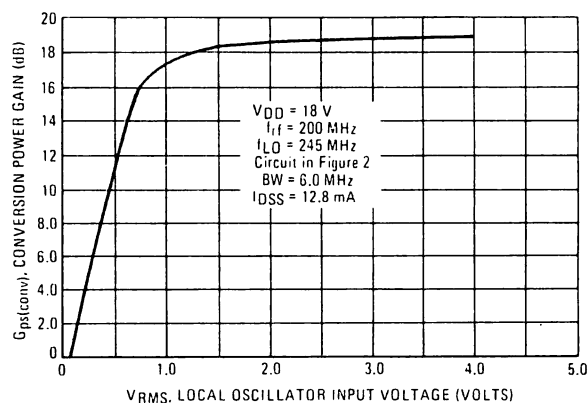
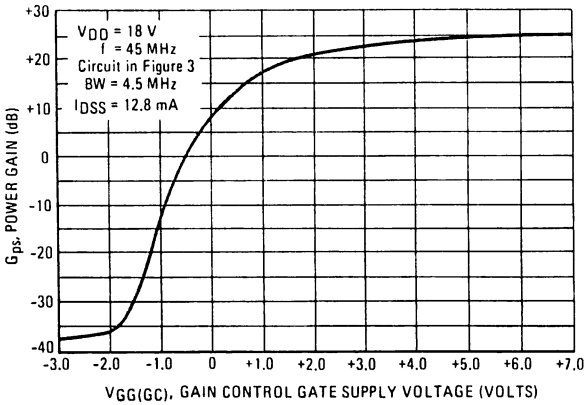


FIGURE 14 – SMALL-SIGNAL COMMON SOURCE
INSERTION POWER GAIN versus GAIN CONTROL
GATE-SUPPLY VOLTAGE – 3N203



TYPICAL CHARACTERISTICS

FIGURE 15 – SMALL-SIGNAL GATE ONE FORWARD
TRANSFER ADMITTANCE versus FREQUENCY

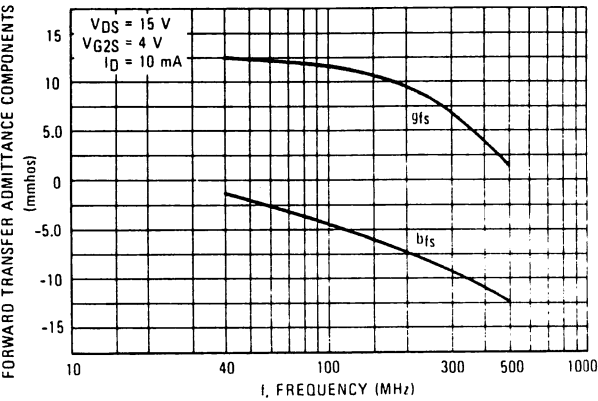


FIGURE 16 – SMALL-SIGNAL GATE ONE INPUT
ADMITTANCE versus FREQUENCY

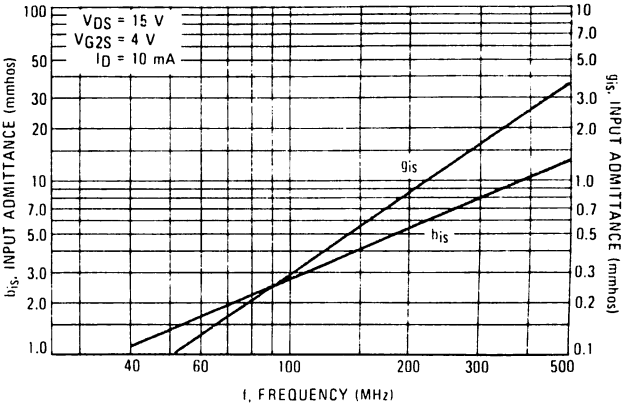
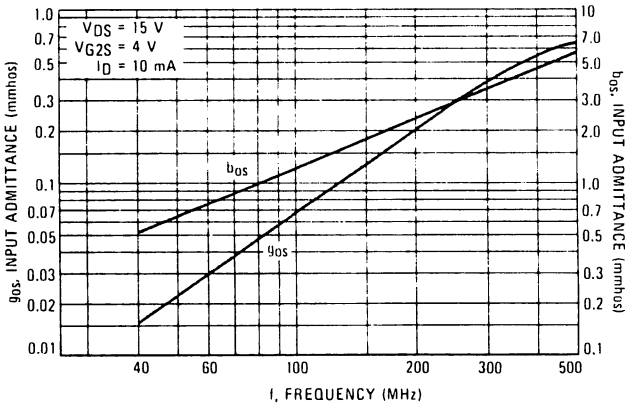


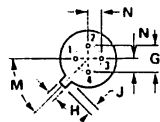
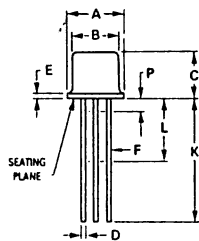
FIGURE 17 – SMALL-SIGNAL GATE ONE OUTPUT
ADMITTANCE versus FREQUENCY



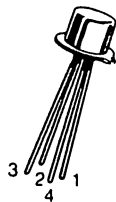
Package Outline Dimensions

Dimensions are in inches unless otherwise noted.

TO-206AF (TO-72) METAL



NOTE: ALL RULES AND NOTES ASSOCIATED WITH TO-72 OUTLINE SHALL APPLY.



DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	5.31	5.84	0.209	0.230
B	4.52	4.95	0.178	0.195
C	4.32	5.33	0.170	0.210
D	0.41	0.53	0.016	0.021
E	—	0.76	—	0.030
F	0.41	0.48	0.016	0.019
G	2.54 BSC		0.100 BSC	
H	0.91	1.17	0.036	0.046
J	0.71	1.22	0.028	0.048
K	12.70	—	0.500	—
L	6.35	—	0.250	—
M	45° BSC		45° BSC	
N	1.27 BSC		0.050 BSC	
P	—	1.27	—	0.050

All JEDEC dimensions and notes apply.



PIN 1, DRAIN
2, GATE 2
3, GATE 1
4, SOURCE,
SUBSTRATE
AND CASE