



**SOLID STATE INC.**

46 FARRAND STREET  
BLOOMFIELD, NEW JERSEY 07003

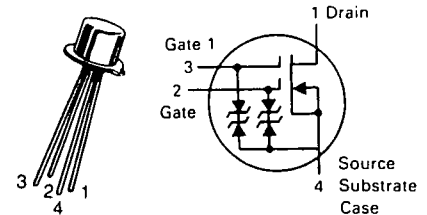
www.solidstateinc.com

**3N201  
3N202  
3N203**

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

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

**ON CHARACTERISTICS**

Zero-Gate-Voltage Drain Current(2) ( $V_{DS} = 15 \text{ Vdc}$ , $V_{G1S} = 0$ , $V_{G2S} = 4.0 \text{ Vdc}$ )	$I_{DSS}$	3N201,3N202 3N203	6.0 3.0	13 11	30 15	mAdc
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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} $	3N201,3N202 3N203	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 ( $V_{DS} = 15 \text{ Vdc}$ , $V_{G2S} = 4.0 \text{ Vdc}$ , $I_D = 10 \text{ mAdc}$ , $f = 1.0 \text{ MHz}$ )	$C_{rss}$		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	3N201 3N203	— —	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)	$G_{ps}$	15	20	25	dB
( $V_{DD} = 18\text{ Vdc}$ , $V_{GG} = 6.0\text{ Vdc}$ , $f = 45\text{ MHz}$ ) (Figure 3)	$G_{ps}$	20	25	30	
( $V_{DD} = 18\text{ Vdc}$ , $f_{LO} = 245\text{ MHz}$ , $f_{RF} = 200\text{ MHz}$ ) (Figure 2)	$G_{c(5)}$	15	19	25	
Bandwidth	BW				MHz
( $V_{DD} = 18\text{ Vdc}$ , $V_{GG} = 7.0\text{ Vdc}$ , $f = 200\text{ MHz}$ ) (Figure 1)		5.0	—	9.0	
( $V_{DD} = 18\text{ Vdc}$ , $f_{LO} = 245\text{ MHz}$ , $f_{RF} = 200\text{ MHz}$ ) (Figure 2)		4.5	—	7.5	
( $V_{DD} = 18\text{ Vdc}$ , $V_{GG} = 6.0\text{ Vdc}$ , $f = 45\text{ MHz}$ ) (Figure 3)		3.0	—	6.0	
Gain Control Gate-Supply Voltage(4)	$V_{GG(GC)}$				Vdc
( $V_{DD} = 18\text{ Vdc}$ , $\Delta G_{ps} = -30\text{ dB}$ , $f = 200\text{ MHz}$ ) (Figure 1)		0	-1.0	-3.0	
( $V_{DD} = 18\text{ Vdc}$ , $\Delta G_{ps} = -30\text{ dB}$ , $f = 45\text{ MHz}$ ) (Figure 3)		0	-0.6	-3.0	

(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.

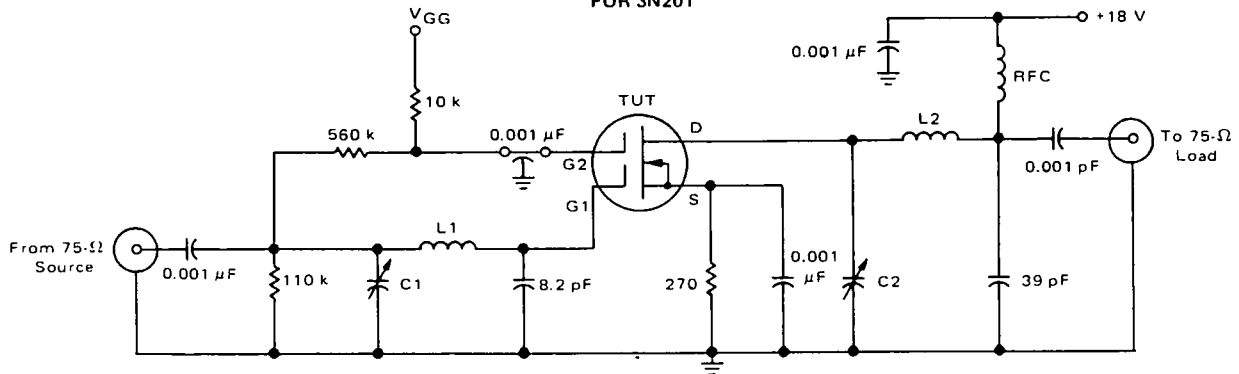
(2) Pulse Test: Pulse Width = 300  $\mu\text{s}$ , Duty Cycle  $\leq 2.0\%$ .

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

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

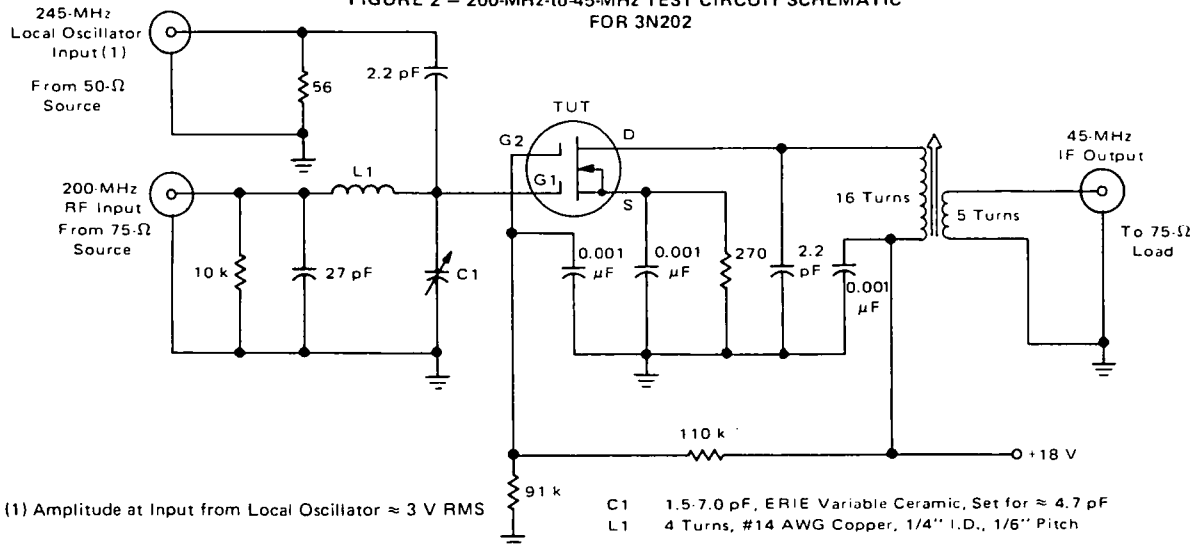
(5) Power Gain Conversion

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  $\mu\text{H}$

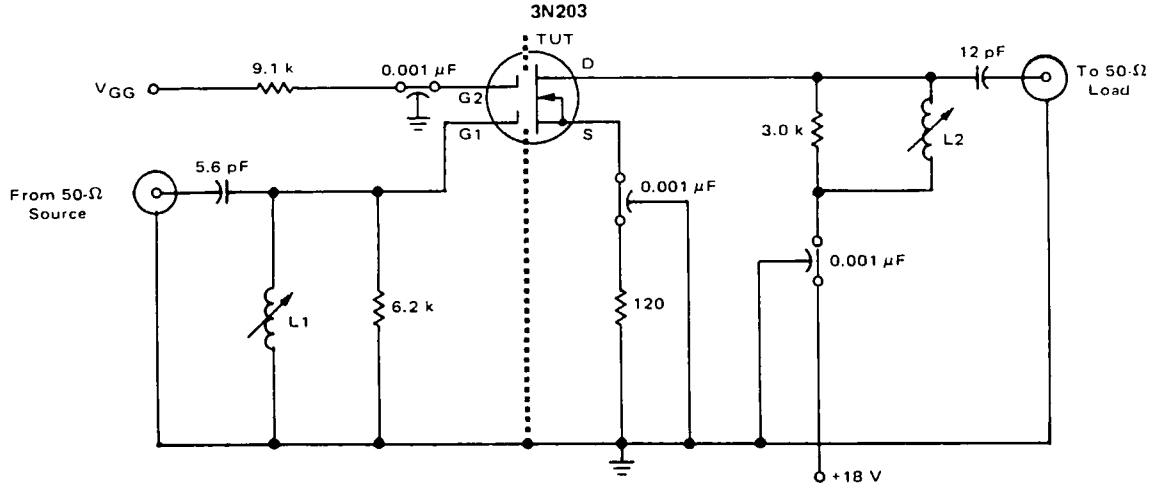
FIGURE 2 – 200-MHz-to-45-MHz TEST CIRCUIT SCHEMATIC FOR 3N202



(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

FIGURE 3 - 45-MHz TEST CIRCUIT SCHEMATIC



- L1 14 Turns, #30 AWG Copper, Close-Wound 7/32" OD form with ARNOLD ENGINEERING "J" Tuning Core
- L2 10 Turns, #30 AWG Copper, Close-Wound 7/32" OD form with ARNOLD ENGINEERING "J" Tuning Core

TYPICAL CHARACTERISTICS

FIGURE 4 - DRAIN CURRENT versus DRAIN TO SOURCE VOLTAGE

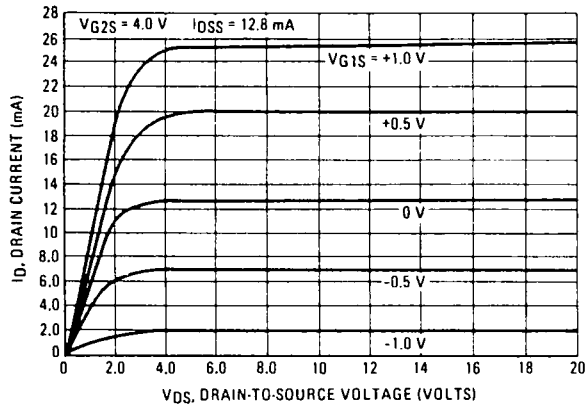


FIGURE 5 - DRAIN CURRENT versus GATE-ONE to SOURCE VOLTAGE

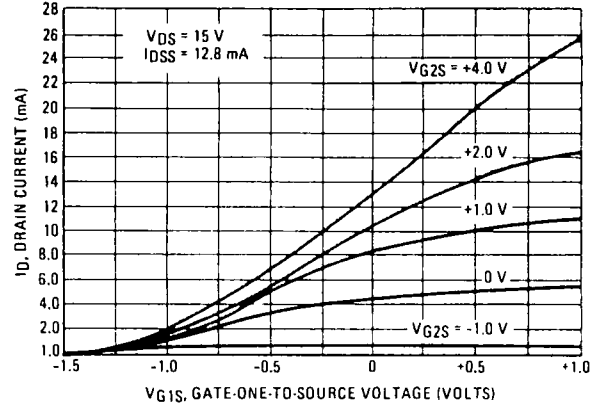


FIGURE 6 - SMALL-SIGNAL COMMON-SOURCE GATE-ONE FORWARD TRANSFER ADMITTANCE versus DRAIN CURRENT

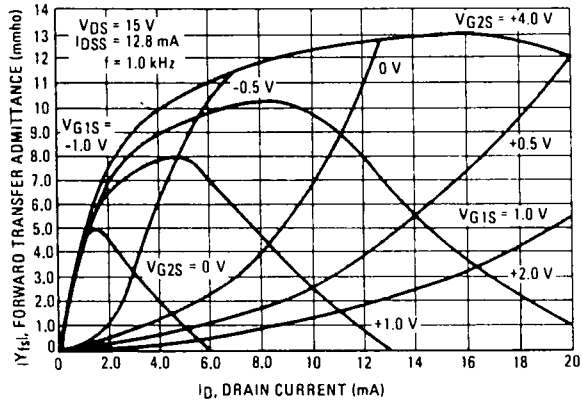


FIGURE 7 - SMALL-SIGNAL COMMON-SOURCE GATE-ONE FORWARD TRANSFER ADMITTANCE versus GATE-ONE to SOURCE VOLTAGE

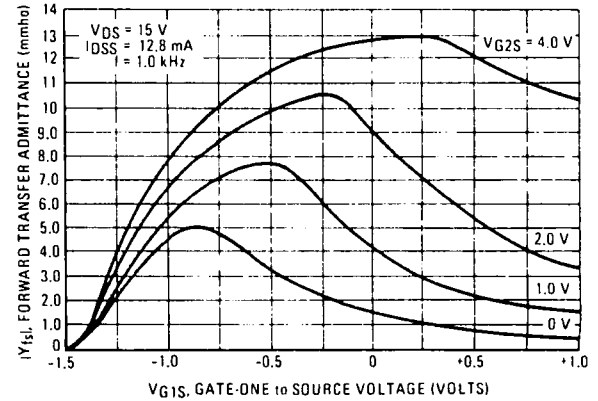


FIGURE 8 – SMALL-SIGNAL COMMON-SOURCE GATE-ONE FORWARD TRANSFER ADMITTANCE versus GATE-TWO to SOURCE VOLTAGE

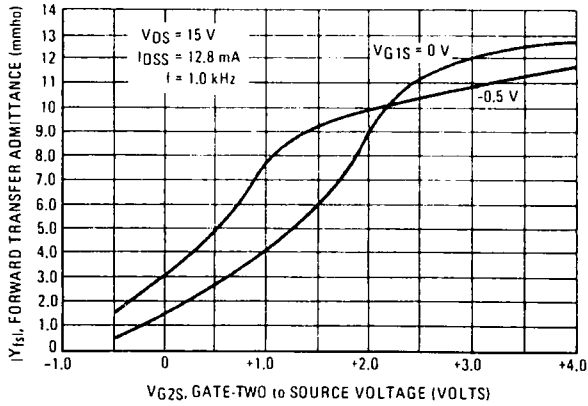
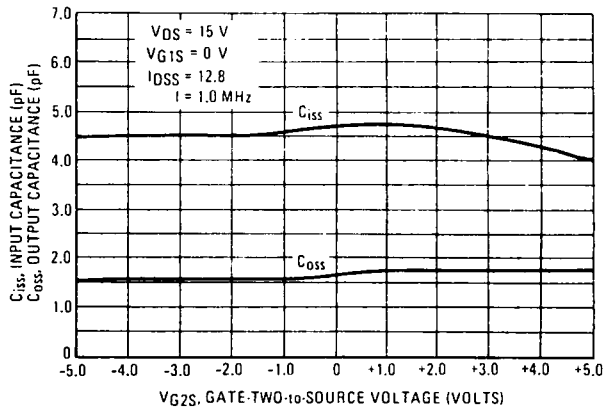


FIGURE 9 – SMALL-SIGNAL COMMON-SOURCE GATE-ONE INPUT AND OUTPUT CAPACITANCE versus GATE-TWO-to-SOURCE VOLTAGE



TYPICAL CHARACTERISTICS

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

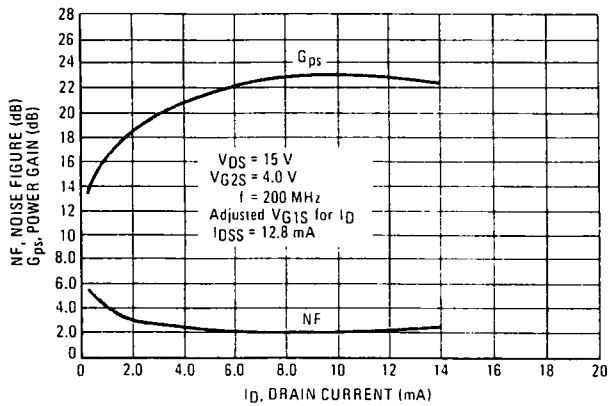


FIGURE 11 – COMMON-SOURCE POWER GAIN AND SPOT NOISE FIGURE versus GAIN CONTROL GATE-SUPPLY VOLTAGE – 3N201

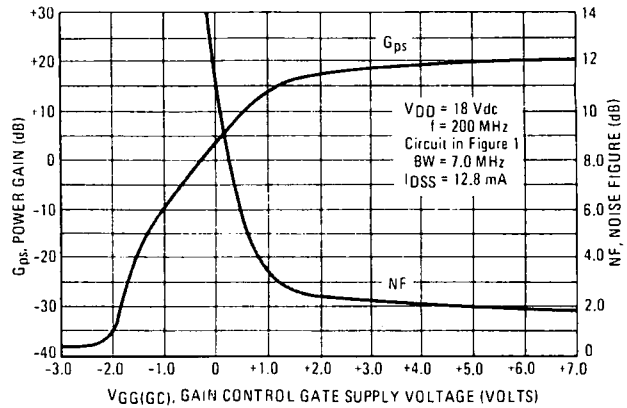


FIGURE 12 – COMMON-SOURCE POWER GAIN versus DRAIN SUPPLY CURRENT – 3N201

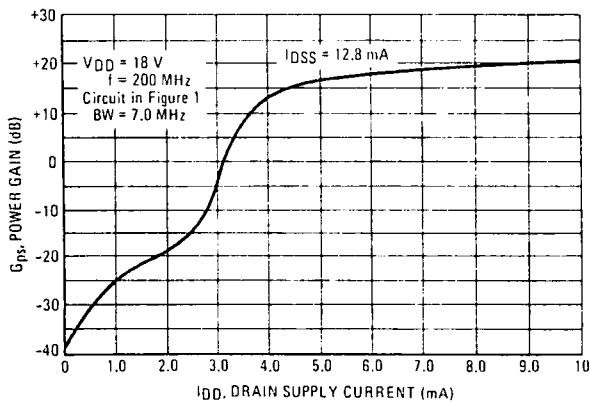


FIGURE 13 – SMALL-SIGNAL COMMON-SOURCE CONVERSION POWER GAIN versus LOCAL OSCILLATOR INPUT VOLTAGE – 3N202

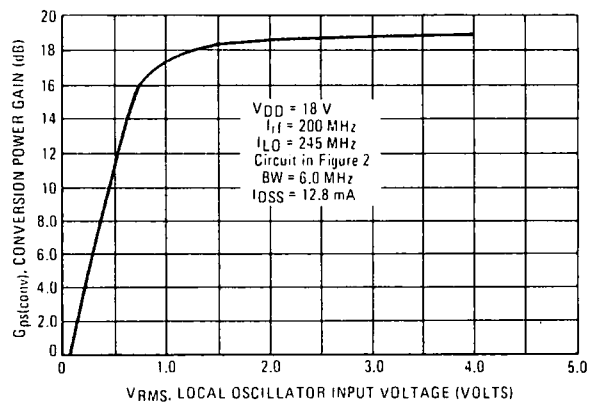
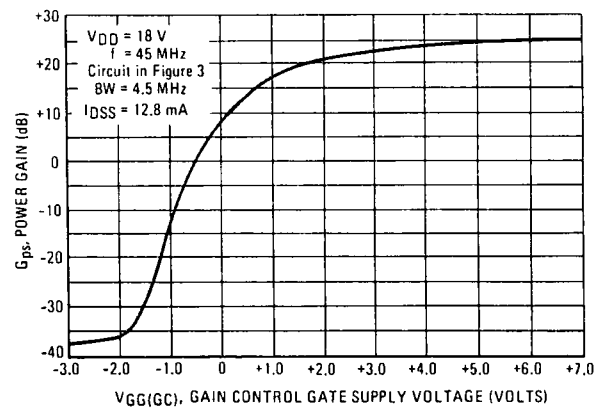


FIGURE 14 – SMALL-SIGNAL COMMON SOURCE  
INSERTION POWER GAIN versus GAIN CONTROL  
GATE-SUPPLY VOLTAGE – 3N203



TYPICAL CHARACTERISTICS

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

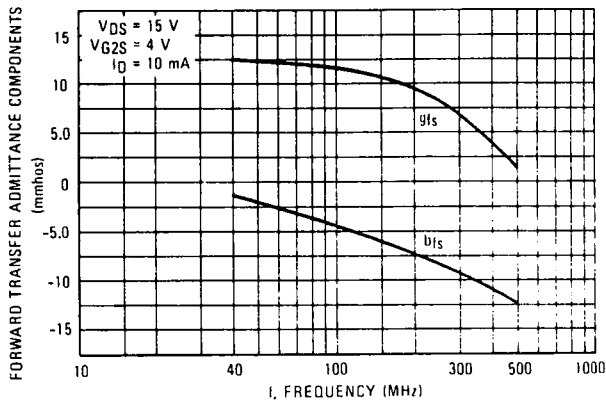


FIGURE 16 – SMALL-SIGNAL GATE ONE INPUT  
ADMITTANCE versus FREQUENCY

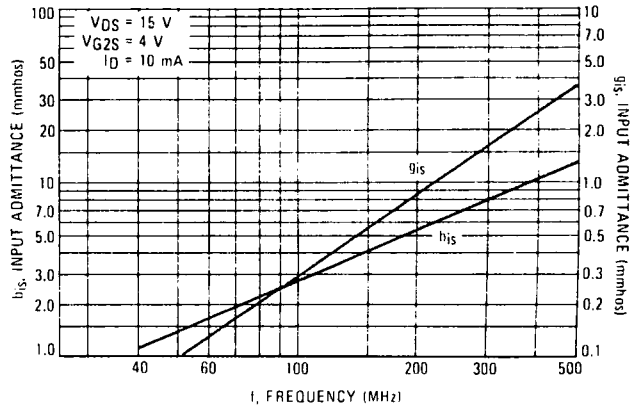
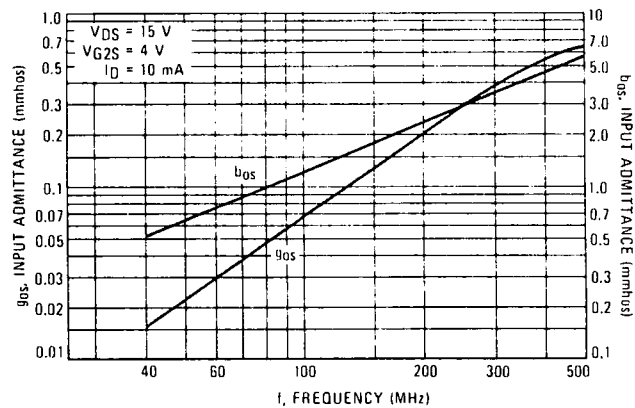


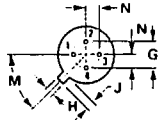
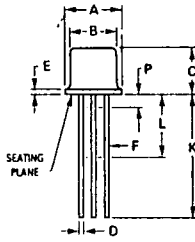
FIGURE 17 – SMALL-SIGNAL GATE ONE OUTPUT  
ADMITTANCE versus FREQUENCY



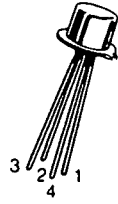
# Package Outline Dimensions

Dimensions are in inches unless otherwise noted.

## TO-206AF (TO-72) METAL



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



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

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	5.32	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	0.035	0.046
J	0.71	1.22	0.028	0.048
K	17.70	—	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.