

6367254 MOTOROLA SC (XSTRS/R F)

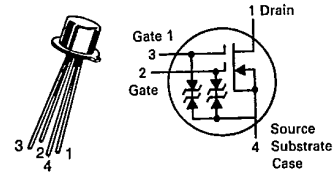
96D 82608 D  
T-31-25

**MAXIMUM RATINGS**

Rating	Symbol	Value	Unit
Drain-Source Voltage	V <sub>DS</sub>	25	Vdc
Drain-Gate Voltage	V <sub>DG1</sub> V <sub>DG2</sub>	30 30	Vdc
Drain Current	I <sub>D</sub>	50	mAdc
Gate Current	I <sub>G1</sub> I <sub>G2</sub>	±10 ±10	mAdc
Total Device Dissipation @ T <sub>A</sub> = 25°C Derate above 25°C	P <sub>D</sub>	360 2.4	mW mW/°C
Total Device Dissipation @ T <sub>C</sub> = 25°C Derate above 25°C	P <sub>D</sub>	1.2 8.0	Watt mW/°C
Lead Temperature	T <sub>L</sub>	300	°C
Junction Temperature Range	T <sub>J</sub>	-65 to +175	°C
Storage Channel Temperature Range	T <sub>stg</sub>	-65 to +175	°C

**3N201  
3N202  
3N203**

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



**DUAL-GATE MOSFET  
VHF AMPLIFIER**

**N-CHANNEL — DEPLETION**

Refer to MPF201 for additional graphs.

**ELECTRICAL CHARACTERISTICS (T<sub>A</sub> = 25°C unless otherwise noted.)**

Characteristic	Symbol	Min	Typ	Max	Unit
<b>OFF CHARACTERISTICS</b>					
Drain-Source Breakdown Voltage (I <sub>D</sub> = 10 μAdc, V <sub>S</sub> = 0, V <sub>G1S</sub> = V <sub>G2S</sub> = -5.0 Vdc)	V <sub>(BR)DSX</sub>	25	—	—	Vdc
Gate 1-Source Breakdown Voltage(1) (I <sub>G1</sub> = ±10 mAdc, V <sub>G2S</sub> = V <sub>DS</sub> = 0)	V <sub>(BR)G1SO</sub>	±6.0	±12	±30	Vdc
Gate 2-Source Breakdown Voltage(1) (I <sub>G2</sub> = ±10 mAdc, V <sub>G1S</sub> = V <sub>DS</sub> = 0)	V <sub>(BR)G2SO</sub>	±6.0	±12	±30	Vdc
Gate 1 Leakage Current (V <sub>G1S</sub> = ±5.0 Vdc, V <sub>G2S</sub> = V <sub>DS</sub> = 0) (V <sub>G1S</sub> = -5.0 Vdc, V <sub>G2S</sub> = V <sub>DS</sub> = 0, T <sub>A</sub> = 150°C)	I <sub>G1SS</sub>	—	±.040	±10	nAdc μAdc
Gate 2 Leakage Current (V <sub>G2S</sub> = ±5.0 Vdc, V <sub>G1S</sub> = V <sub>DS</sub> = 0) (V <sub>G2S</sub> = -5.0 Vdc, V <sub>G1S</sub> = V <sub>DS</sub> = 0, T <sub>A</sub> = 150°C)	I <sub>G2SS</sub>	—	±.050	±10	nAdc μAdc
Gate 1 to Source Cutoff Voltage (V <sub>DS</sub> = 15 Vdc, V <sub>G2S</sub> = 4.0 Vdc, I <sub>D</sub> = 20 μAdc)	V <sub>G1S(off)</sub>	-0.5	-1.5	-5.0	Vdc
Gate 2 to Source Cutoff Voltage (V <sub>DS</sub> = 15 Vdc, V <sub>G1S</sub> = 0, I <sub>D</sub> = 20 μAdc)	V <sub>G2S(off)</sub>	-0.2	-1.4	-5.0	Vdc
<b>ON CHARACTERISTICS</b>					
Zero-Gate-Voltage Drain Current(2) (V <sub>DS</sub> = 15 Vdc, V <sub>G1S</sub> = 0, V <sub>G2S</sub> = 4.0 Vdc)	I <sub>DSS</sub>	6.0 3.0	13 11	30 15	mAdc
<b>SMALL-SIGNAL CHARACTERISTICS</b>					
Forward Transfer Admittance(3) (V <sub>DS</sub> = 15 Vdc, V <sub>G2S</sub> = 4.0 Vdc, V <sub>G1S</sub> = 0, f = 1.0 kHz)	Y <sub>fs</sub>	8.0 7.0	12.8 12.5	20 15	mmhos
Input Capacitance (V <sub>DS</sub> = 15 Vdc, V <sub>G2S</sub> = 4.0 Vdc, I <sub>D</sub> = I <sub>DSS</sub> , f = 1.0 MHz)	C <sub>iss</sub>	—	3.3	—	pF
Reverse Transfer Capacitance (V <sub>DS</sub> = 15 Vdc, V <sub>G2S</sub> = 4.0 Vdc, I <sub>D</sub> = 10 mAdc, f = 1.0 MHz)	C <sub>rss</sub>	0.005	0.014	0.03	pF
Output Capacitance (V <sub>DS</sub> = 15 Vdc, V <sub>G2S</sub> = 4.0 Vdc, I <sub>D</sub> = I <sub>DSS</sub> , f = 1.0 MHz)	C <sub>oss</sub>	—	1.7	—	pF
<b>FUNCTIONAL CHARACTERISTICS</b>					
Noise Figure (V <sub>DD</sub> = 18 Vdc, V <sub>GG</sub> = 7.0 Vdc, f = 200 MHz) (Figure 1) (V <sub>DD</sub> = 18 Vdc, V <sub>GG</sub> = 6.0 Vdc, f = 45 MHz) (Figure 3)	NF	—	1.8 5.3	4.5 6.0	dB

MOTOROLA SMALL-SIGNAL SEMICONDUCTORS

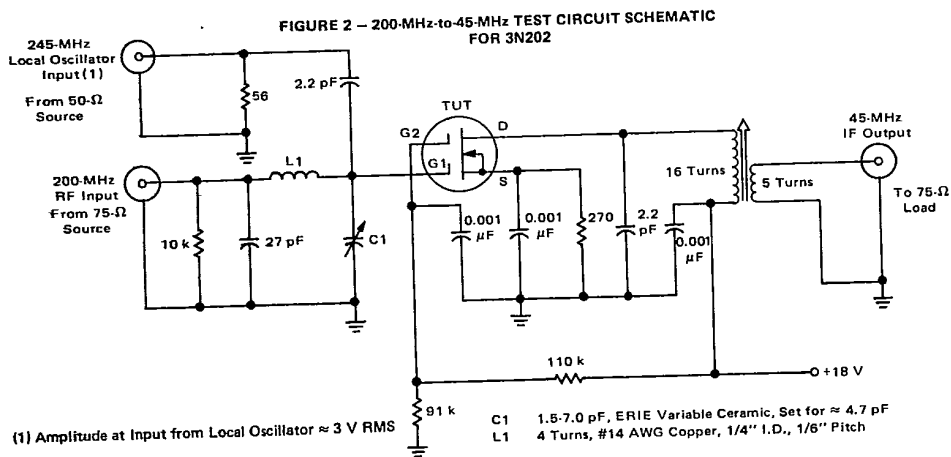
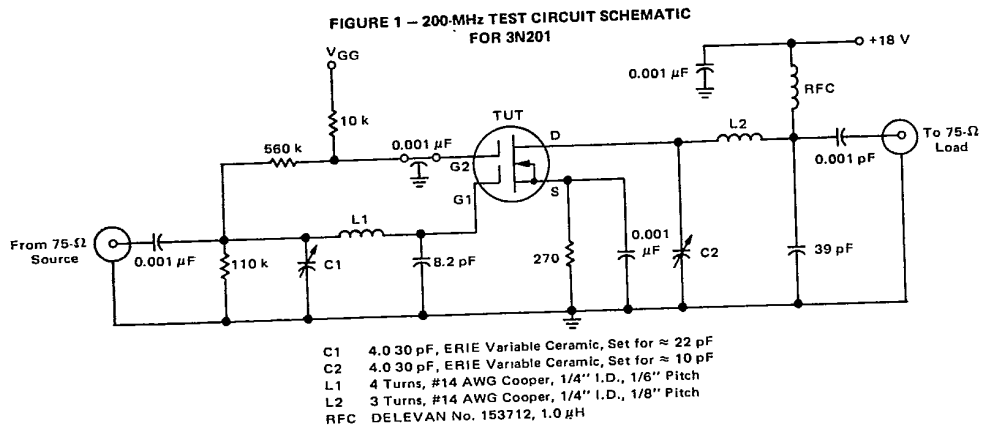
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 3N201, 3N202, 3N203

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**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)	3N201	15	20	25	dB
	3N203	20	25	30	
	3N202	15	19	25	
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)	3N201	5.0	—	9.0	MHz
	3N202	4.5	—	7.5	
	3N203	3.0	—	6.0	
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)	3N201	0	-1.0	-3.0	Vdc
	3N203	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  $V_{GG} = 7.0\text{ volts}$  (3N201) and  $V_{GG} = 6.0\text{ volts}$  (3N203).
- (5) Power Gain Conversion



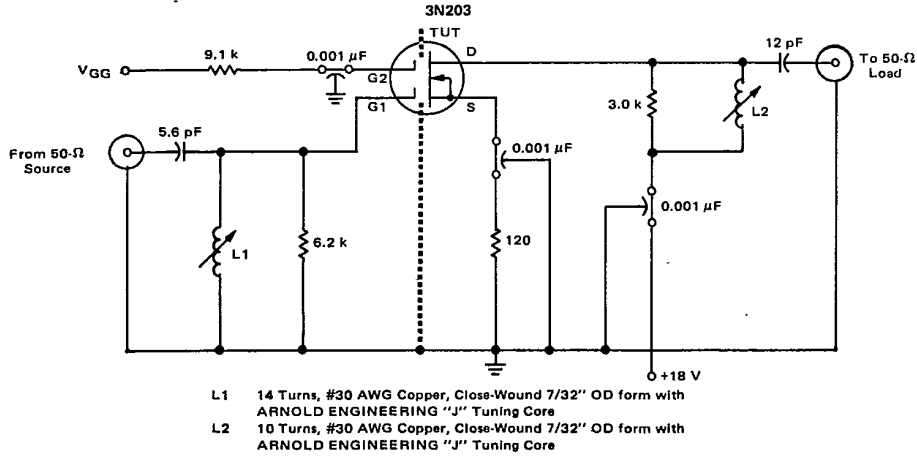
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FIGURE 3 - 45-MHz TEST CIRCUIT SCHEMATIC



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TYPICAL CHARACTERISTICS

FIGURE 4 - DRAIN CURRENT versus DRAIN to SOURCE VOLTAGE

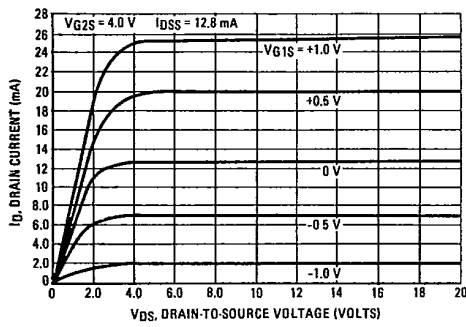


FIGURE 5 - DRAIN CURRENT versus GATE-ONE to SOURCE VOLTAGE

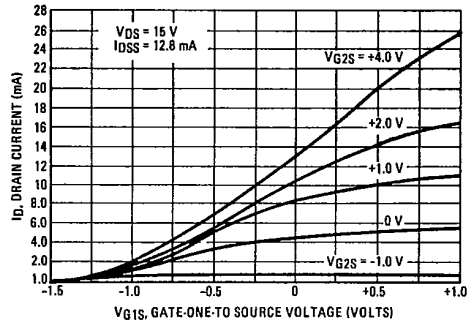


FIGURE 6 - SMALL-SIGNAL COMMON-SOURCE GATE-ONE FORWARD TRANSFER ADMITTANCE versus DRAIN CURRENT

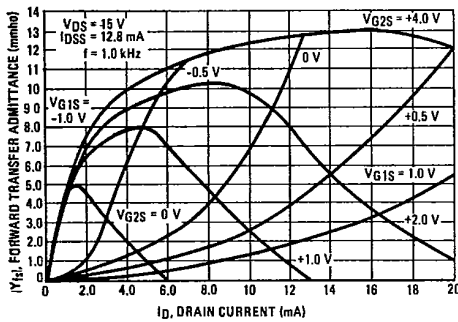
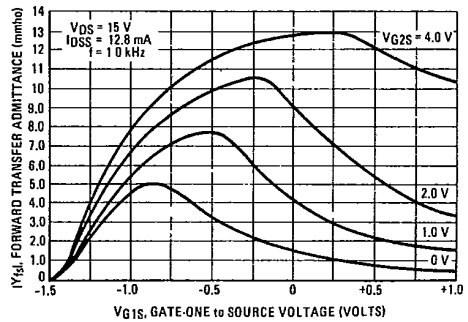


FIGURE 7 - SMALL-SIGNAL COMMON-SOURCE GATE-ONE FORWARD TRANSFER ADMITTANCE versus GATE-ONE to SOURCE VOLTAGE



MOTOROLA SMALL-SIGNAL SEMICONDUCTORS

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

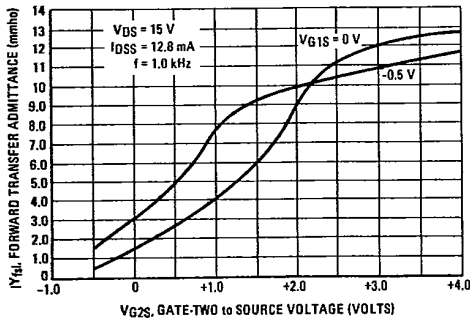
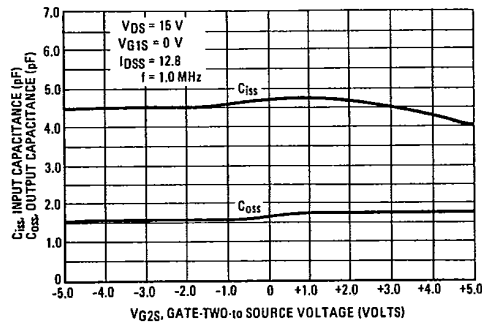


FIGURE 9 - SMALL-SIGNAL COMMON-SOURCE GATE-ONE INPUT AND OUTPUT CAPACITANCE versus GATE-TWO to SOURCE VOLTAGE



TYPICAL CHARACTERISTICS

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

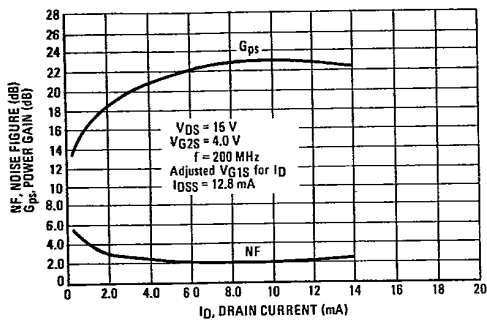


FIGURE 11 - COMMON-SOURCE POWER GAIN AND SPOT NOISE FIGURE versus GAIN CONTROL GATE-SUPPLY VOLTAGE - 3N201

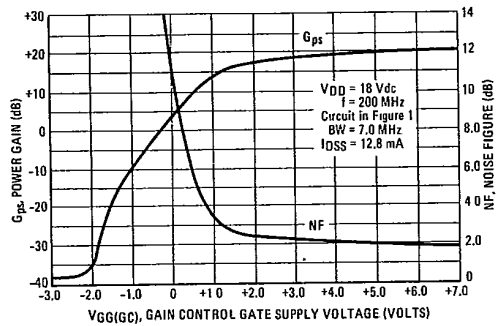


FIGURE 12 - COMMON-SOURCE POWER GAIN versus DRAIN SUPPLY CURRENT - 3N201

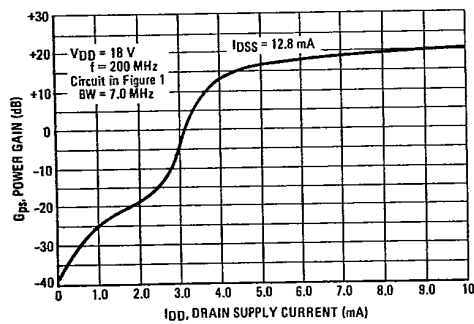
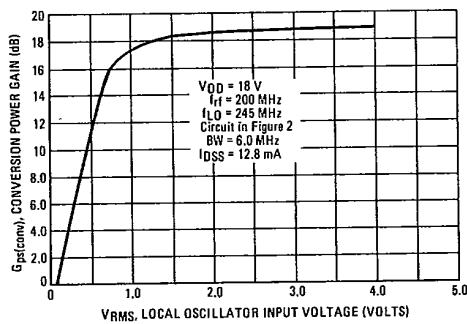


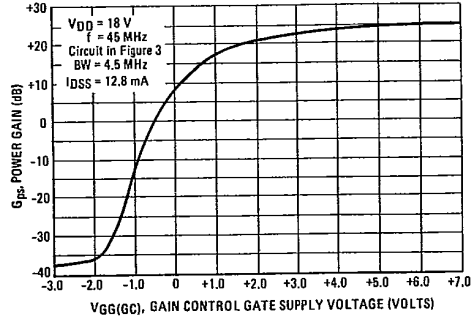
FIGURE 13 - SMALL-SIGNAL COMMON-SOURCE CONVERSION POWER GAIN versus LOCAL OSCILLATOR INPUT VOLTAGE - 3N202



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



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TYPICAL CHARACTERISTICS

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

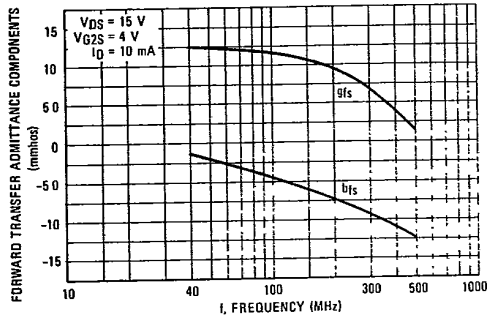


FIGURE 16 - SMALL-SIGNAL GATE ONE INPUT  
 ADMITTANCE versus FREQUENCY

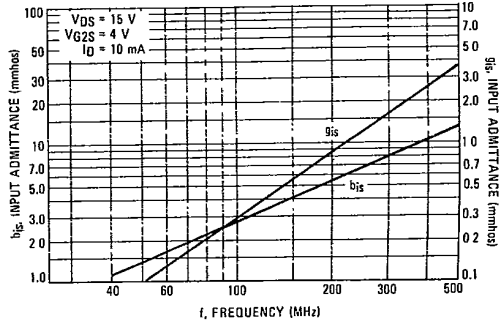
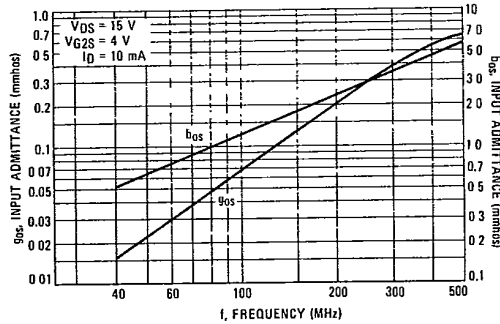


FIGURE 17 - SMALL-SIGNAL GATE ONE OUTPUT  
 ADMITTANCE versus FREQUENCY



MOTOROLA SMALL-SIGNAL SEMICONDUCTORS