

3N201-3N203

DUAL GATE MOSFET VHF AMPLIFIER

FEATURES

- Available as "HR" (high reliability) screened per MIL-PRF-19500, JANTX level. Add "HR" suffix to base part number.
- Available as non-RoHS (Sn/Pb plating), standard, and as RoHS by adding "-PBF" suffix.

MAXIMUM RATINGS

Rating	Symbol	Value	Unit
Drain-source voltage	V_{DS}	25	Vdc
Drain-gate voltage	V_{DG1}	30	Vdc
	V_{DG2}		
Drain current	I_D	50	mAdc
Gate current	I_{G1}	±10	mAdc
	I_{G2}		
Total device dissipation @ $T_A = 25^\circ\text{C}$ Derate above 25°C	P_D	360	mW
		2.4	mW/ $^\circ\text{C}$
Total device dissipation @ $T_C = 25^\circ\text{C}$ Derate above 25°C	P_D	1.2	W
		8.0	mW/ $^\circ\text{C}$
Lead temperature	T_L	300	$^\circ\text{C}$
Junction temperature range	T_J	-65 to 175	$^\circ\text{C}$
Storage temperature range	T_{stg}	-65 to 175	$^\circ\text{C}$

ELECTRICAL CHARACTERISTICS ($T_C = 25^\circ\text{C}$)

Characteristic		Symbol	Min	Typ	Max	Unit
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⁾ ($I_{G1} = \pm 10\text{mAdc}$, $V_{G2S} = V_{DS} = 0$)		$V_{(BR)G1SO}$	± 6.0	± 12	± 30	Vdc
Gate 2-source breakdown voltage ⁽¹⁾ ($I_{G2} = \pm 10\text{mAdc}$, $V_{G1S} = V_{DS} = 0$)		$V_{(BR)G2SO}$	± 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}	- -	± 0.040 -	± 10 -10	nAdc μAdc
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}	- -	± 0.050 -	± 10 -10	nAdc μAdc
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⁾ ($V_{DS} = 15\text{Vdc}$, $V_{G1S} = 0$, $V_{G2S} = 4.0\text{Vdc}$)	3N201, 3N202 3N203	I_{DSS}	6.0 3.0	13 11	30 15	mAdc

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ELECTRICAL CHARACTERISTICS (T_C = 25°C)

Characteristic		Symbol	Min	Typ	Max	Unit
SMALL SIGNAL CHARACTERISTICS						
Forward transfer admittance ⁽³⁾ (V _{DS} = 15Vdc, V _{G2S} = 4.0Vdc, V _{G1S} = 0, f = 1.0kHz)	3N201, 3N202 3N203	Y _{fs}	8.0 7.0	12.8 12.5	20 15	mmhos
Input capacitance (V _{DS} = 15Vdc, V _{G2S} = 4.0Vdc, I _D = I _{DSS} , f = 1.0MHz)		C _{iss}	-	3.3	-	pF
Reverse transfer capacitance (V _{DS} = 15Vdc, V _{G2S} = 4.0Vdc, I _D = 10mAdc, f = 1.0MHz)		C _{rss}	0.005	0.014	0.03	pF
Output capacitance (V _{DS} = 15Vdc, V _{G2S} = 4.0Vdc, I _D = I _{DSS} , f = 1.0MHz)		C _{oss}	-	1.7	-	pF
FUNCTIONAL CHARACTERISTICS						
Noise figure (V _{DD} = 18Vdc, V _{GG} = 7.0Vdc, f = 200MHz) (V _{DD} = 18Vdc, V _{GG} = 6.0Vdc, f = 45MHz)	3N201 3N203	NF	- -	1.8 5.3	4.5 6.0	dB
Common source power gain (V _{DD} = 18Vdc, V _{GG} = 7.0Vdc, f = 200MHz) (V _{DD} = 18Vdc, V _{GG} = 6.0Vdc, f = 45MHz) (V _{DD} = 18Vdc, f _{LO} = 245MHz, f _{RF} = 200MHz)	3N201 3N203 3N202	G _{ps} G _c (5)	15 20 15	20 25 19	25 30 25	dB
Bandwidth (V _{DD} = 18Vdc, V _{GG} = 7.0Vdc, f = 200MHz) (V _{DD} = 18Vdc, f _{LO} = 245MHz, f _{RF} = 200MHz) (V _{DD} = 18Vdc, V _{GG} = 6.0Vdc, f = 45MHz)	3N201 3N202 3N203	B _w	5.0 4.5 3.0	- - -	9.0 7.5 6.0	MHz
Gain control gate-supply voltage ⁽⁴⁾ (V _{DD} = 18Vdc, ΔG _{ps} = -30dB, f = 200MHz) (V _{DD} = 18Vdc, ΔG _{ps} = -30dB, f = 45MHz)	3N201 3N203	V _{GG(GC)}	0 0	-1.0 -0.6	-3.0 -3.0	Vdc

Note 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.

Note 2: Pulse test: pulse width = 300μs. Duty cycle ≤ 2.0%.

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

Note 4: ΔG_{ps} is defined as the change from the value at V_{GG} = 7.0V and V_{GG} = 6.0V.

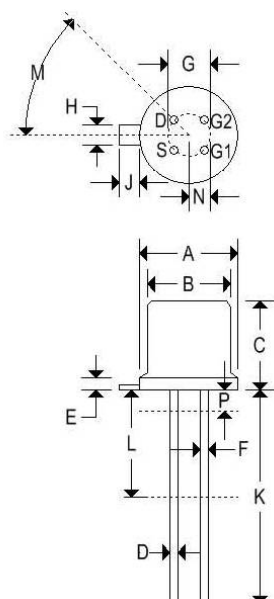
Note 5: Power gain conversion.

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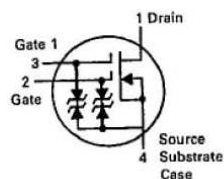
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MECHANICAL CHARACTERISTICS

Case:	TO-72
Marking:	Body painted, alpha-numeric
Pin out:	See below



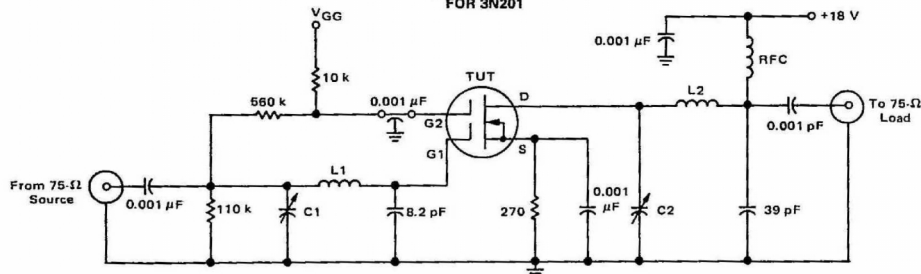
	TO-72			
	Inches		Millimeters	
	Min	Max	Min	Max
A	-	0.230	-	5.840
B	-	0.195	-	4.950
C	-	0.210	-	5.330
D	-	0.021	-	0.530
E	-	0.030	-	0.760
F	-	0.019	-	0.480
G	0.100 BSC		2.540 BSC	
H	-	0.046	-	1.170
J	-	0.048	-	1.220
K	0.500	-	12.700	-
L	0.250	-	-	6.350
M	45° BSC		45° BSC	
N	0.050 BDC		1.270 BSC	
P	-	0.050	-	1.270



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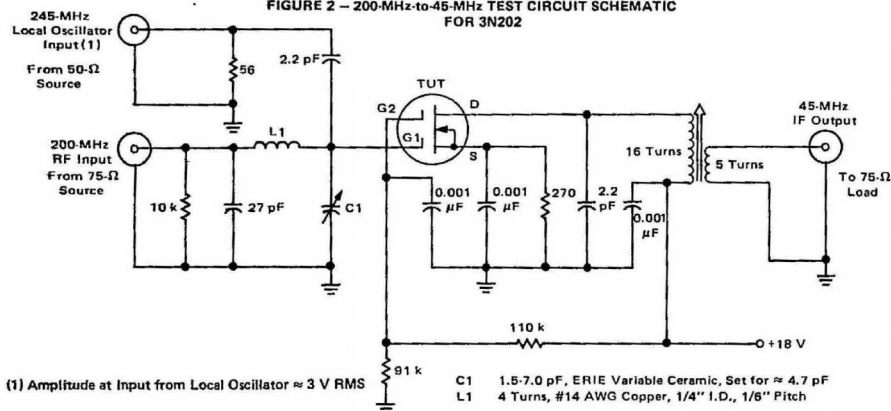
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FIGURE 1 – 200-MHz TEST CIRCUIT SCHEMATIC
FOR 3N201



- C1 4.0 30 pF, ERIE Variable Ceramic, Set for ≈ 22 pF
C2 4.0 30 pF, ERIE Variable Ceramic, Set for ≈ 10 pF
L1 4 Turns, #14 AWG Cooper, 1/4" I.D., 1/8" Pitch
L2 3 Turns, #14 AWG Cooper, 1/4" I.D., 1/8" Pitch
RFC DELEVAN No. 153712, 1.0 μ H

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



(1) Amplitude at Input from Local Oscillator ≈ 3 V RMS

- C1 1.5-7.0 pF, ERIE Variable Ceramic, Set for ≈ 4.7 pF
L1 4 Turns, #14 AWG Copper, 1/4" I.D., 1/8" Pitch

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TYPICAL CHARACTERISTICS

FIGURE 4 – DRAIN CURRENT versus DRAIN to SOURCE VOLTAGE

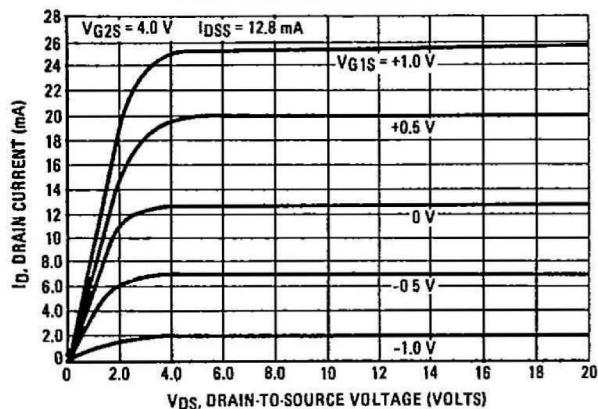


FIGURE 5 – DRAIN CURRENT versus GATE-ONE to SOURCE VOLTAGE

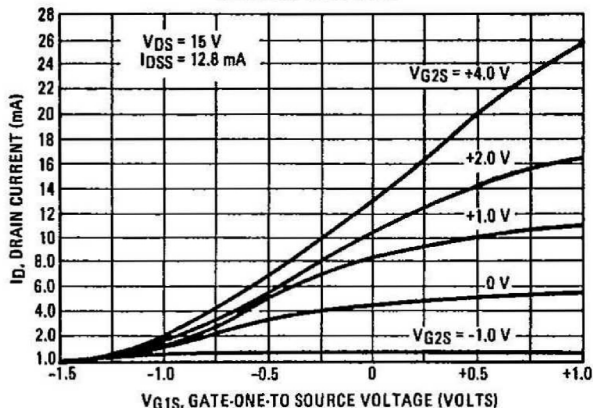


FIGURE 6 – SMALL-SIGNAL COMMON-SOURCE GATE-ONE FORWARD TRANSFER ADMITTANCE versus DRAIN CURRENT

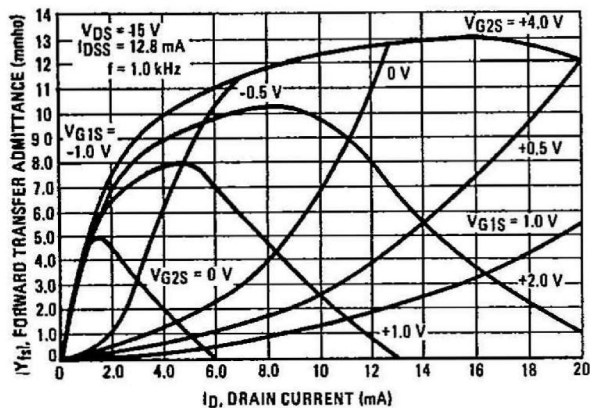
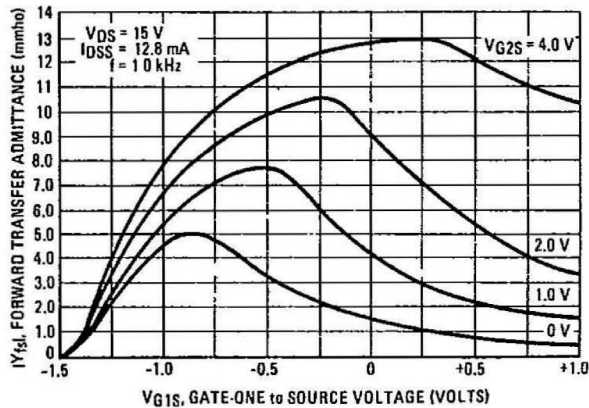


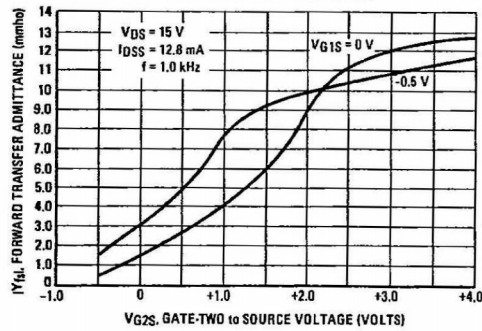
FIGURE 7 – SMALL-SIGNAL COMMON-SOURCE GATE-ONE FORWARD TRANSFER ADMITTANCE versus GATE-ONE to SOURCE VOLTAGE



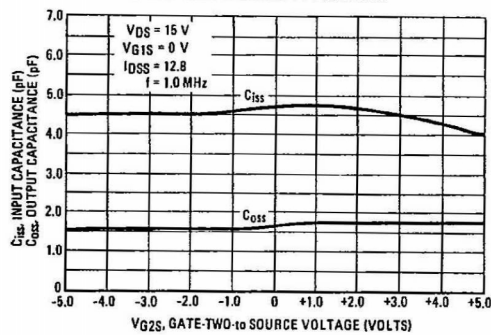
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**FIGURE 8 – SMALL-SIGNAL COMMON-SOURCE GATE-ONE
FORWARD TRANSFER ADMITTANCE versus
GATE-TWO to SOURCE VOLTAGE**

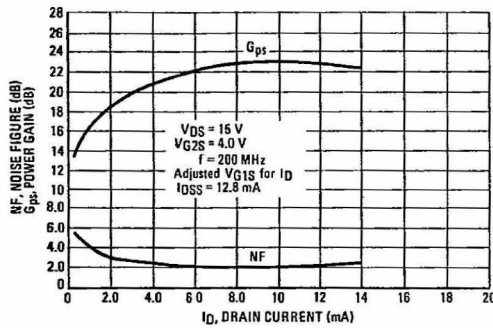


**FIGURE 9 – SMALL-SIGNAL COMMON-SOURCE GATE-ONE
INPUT AND OUTPUT CAPACITANCE versus
GATE-TWO to SOURCE VOLTAGE**

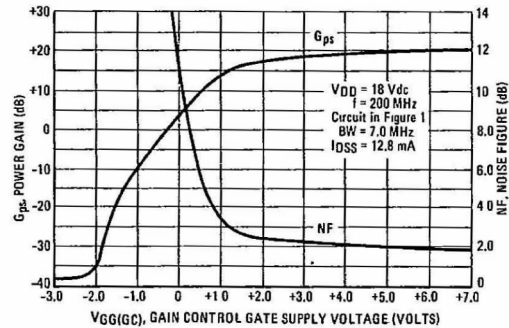


TYPICAL CHARACTERISTICS

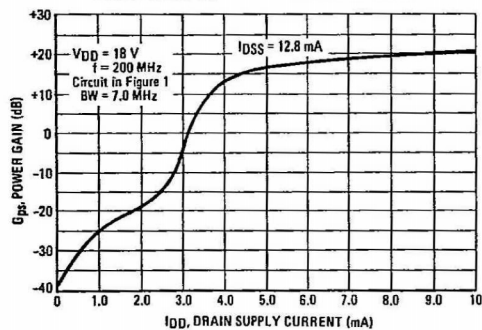
**FIGURE 10 – COMMON-SOURCE POWER GAIN AND
SPOT NOISE FIGURE versus DRAIN CURRENT**



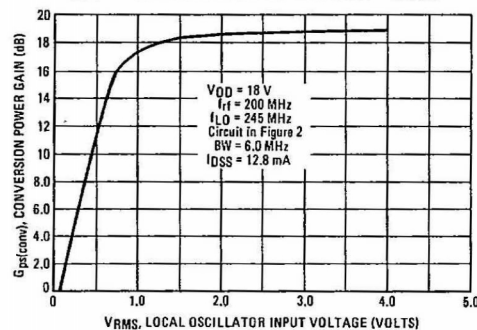
**FIGURE 11 – COMMON-SOURCE POWER GAIN AND
SPOT NOISE FIGURE versus GAIN CONTROL
GATE-SUPPLY VOLTAGE – 3N201**



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



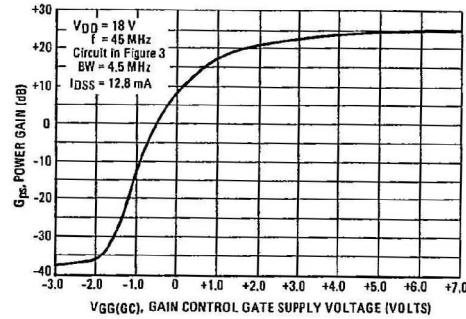
**FIGURE 13 – SMALL-SIGNAL COMMON-SOURCE
CONVERSION POWER GAIN versus
LOCAL OSCILLATOR INPUT VOLTAGE – 3N202**



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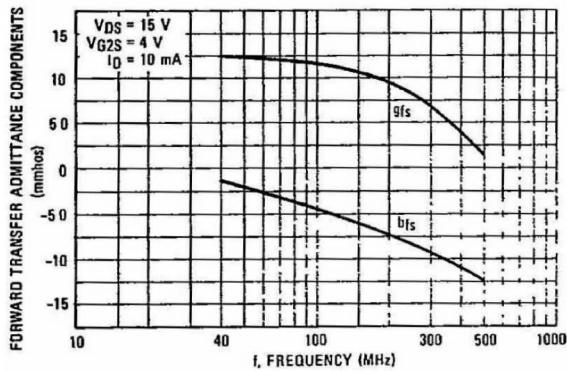
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**FIGURE 14 – SMALL-SIGNAL COMMON SOURCE
INSERTION POWER GAIN versus GAIN CONTROL
GATE-SUPPLY VOLTAGE – 3N203**

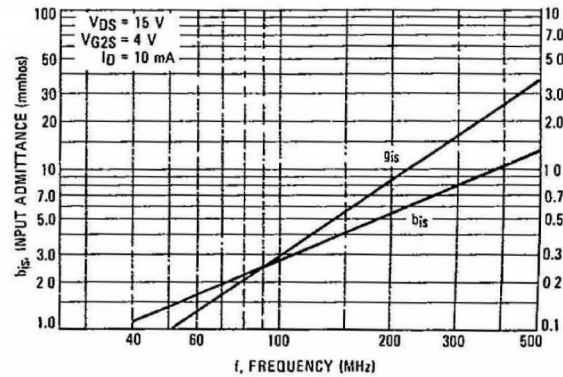


TYPICAL CHARACTERISTICS

**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**

