DIGITRON™ Semiconductors

High-reliability discrete products
and engineering services since 1977

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} V_{DG2}	30	Vdc
Drain current	I_D	50	mAdc
Gate current	I_{G1} I_{G2}	±10	mAdc
Total device dissipation @ T_A = 25°C **Derate above 25°C**	P_D	360 2.4	mW mW/°C
Total device dissipation @ T_C = 25°C **Derate above 25°C**	P_D	1.2 8.0	W mW/°C
Lead temperature	T_L	300	°C
Junction temperature range	T_J	-65 to 175	°C
Storage temperature range	T_{stg}	-65 to 175	°C

ELECTRICAL CHARACTERISTICS (T_C = 25°C)

Characteristic		Symbol	Min	Typ	Max	Unit
OFF CHARACTERISTICS						
Drain-source breakdown voltage (I_D = 10μAdc, V_S = 0, V_{G1S} = V_{G2S} = -5.0Vdc)		$V_{(BR)DSX}$	25	-	-	Vdc
Gate 1-source breakdown voltage (1) (I_{G1} = ±10mAdc, V_{G2S} = V_{DS} = 0)		$V_{(BR)G1SO}$	±6.0	±12	±30	Vdc
Gate 2-source breakdown voltage (1) (I_{G2} = ±10mAdc, V_{G1S} = V_{DS} = 0)		$V_{(BR)G2SO}$	±6.0	±12	±30	Vdc
Gate 1 leakage current (V_{G1S} = ±5.0Vdc, V_{G2S} = VDS = 0) (V_{G1S} = -5.0Vdc, V_{G2S} = VDS = 0, T_A = 150°C)		I_{G1SS}	- -	±0.040 -	±10 -10	nAdc μAdc
Gate 2 leakage current (V_{G2S} = ±5.0Vdc, V_{G1S} = V_{DS} = 0) (V_{G2S} = -5.0Vdc, V_{G1S} = V_{DS} = 0, T_A = 150°C)		I_{G2SS}	- -	±0.050 -	±10 -10	nAdc μAdc
Gate 1 to source cutoff voltage (V_{DS} = 15Vdc, V_{G2S} = 4.0Vdc, I_D = 20μAdc)		$V_{G1S(off)}$	-0.5	-1.5	-5.0	Vdc
Gate 2 to source cutoff voltage (V_{DS} = 15Vdc, V_{G1S} = 0, I_D = 20μAdc)		$V_{G2S(off)}$	-0.2	-1.4	-5.0	Vdc
ON CHARACTERISTICS						
Zero-gate voltage drain current (2) (V_{DS} = 15Vdc, V_{G1S} = 0, V_{G2S} = 4.0Vdc)	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: ΔGps 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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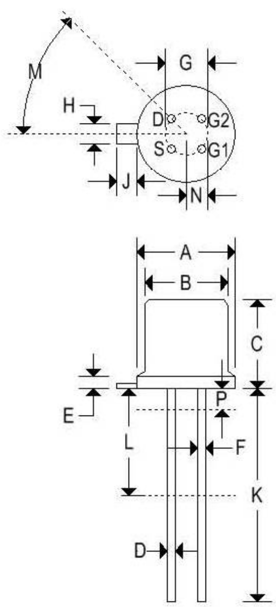
MECHANICAL CHARACTERISTICS

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

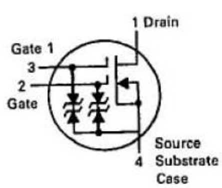


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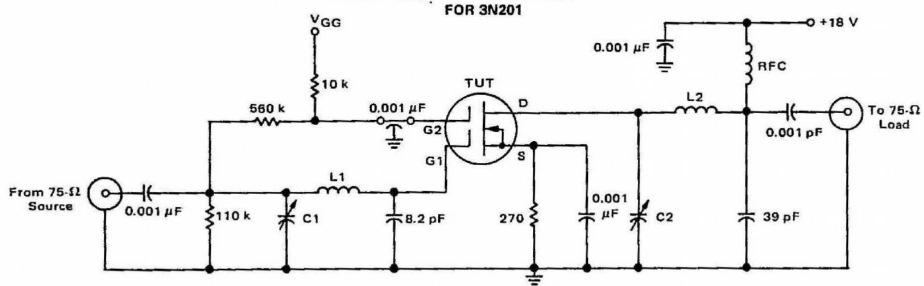
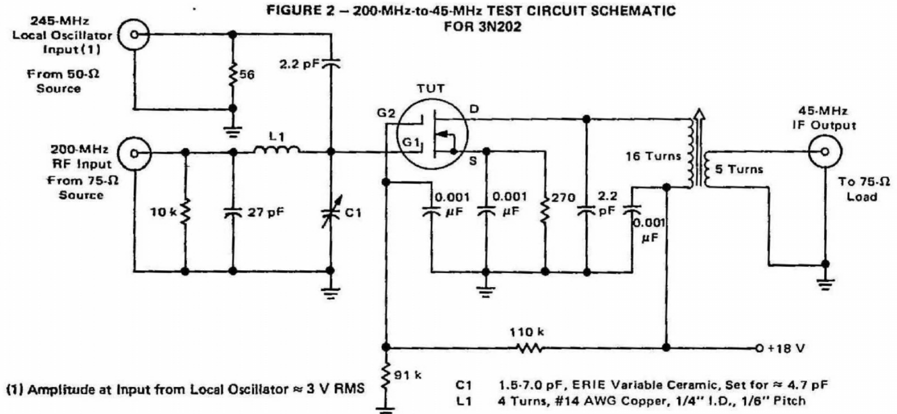
FIGURE 1 — 200-MHz TEST CIRCUIT SCHEMATIC FOR 3N201



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., 1/6" Pitch
L2	3 Turns, #14 AWG Cooper, 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 ≈ 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., 1/6" Pitch

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TYPICAL CHARACTERISTICS

FIGURE 4 – DRAIN CURRENT versus DRAIN to SOURCE VOLTAGE

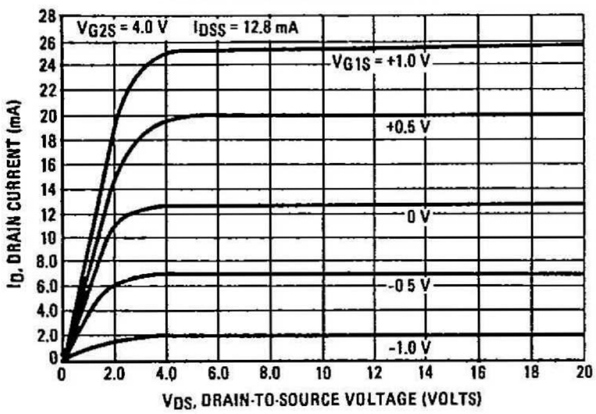


FIGURE 5 – DRAIN CURRENT versus GATE-ONE to SOURCE VOLTAGE

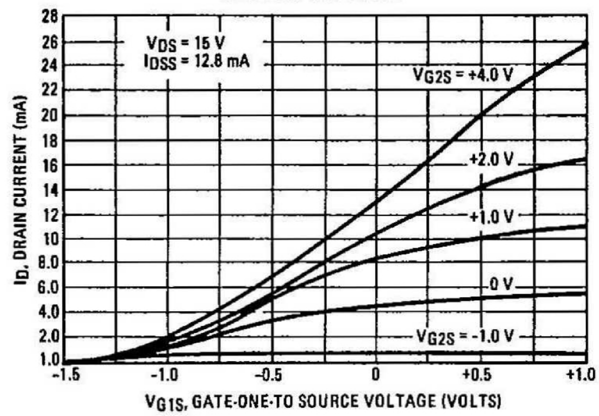


FIGURE 6 – SMALL-SIGNAL COMMON-SOURCE GATE-ONE FORWARD TRANSFER ADMITTANCE versus DRAIN CURRENT

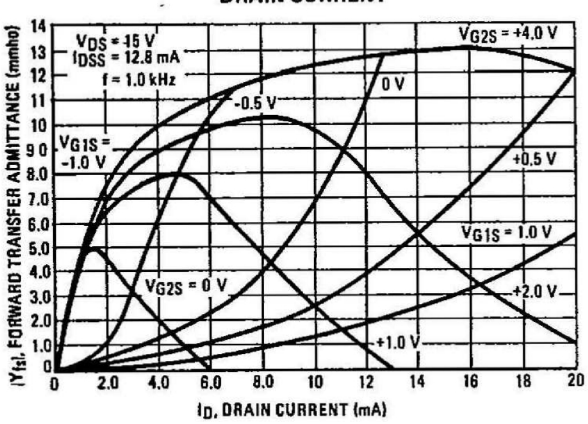


FIGURE 7 – SMALL-SIGNAL COMMON-SOURCE GATE-ONE FORWARD TRANSFER ADMITTANCE versus GATE-ONE to SOURCE VOLTAGE

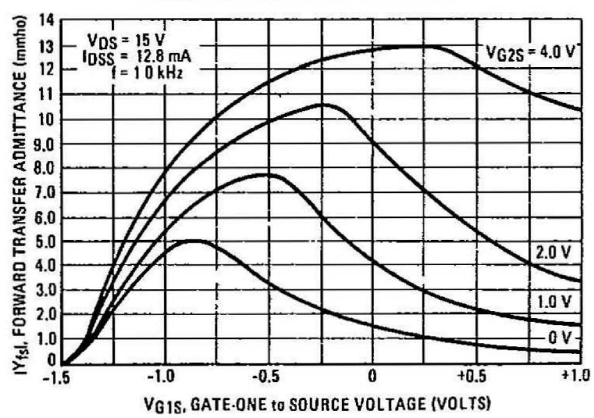


FIGURE 8 – SMALL-SIGNAL COMMON-SOURCE GATE-ONE FORWARD TRANSFER ADMITTANCE versus GATE-TWO to SOURCE VOLTAGE

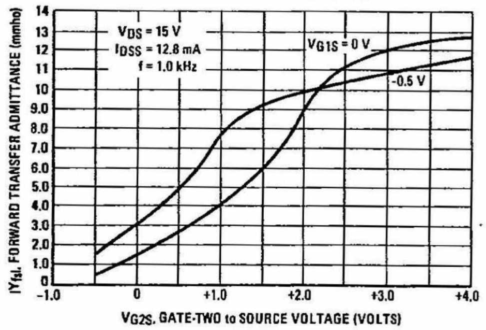
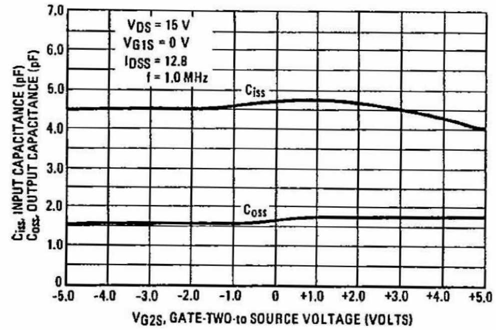


FIGURE 9 – SMALL-SIGNAL COMMON-SOURCE GATE-ONE INPUT AND OUTPUT CAPACITANCE versus GATE-TWO-to-SOURCE VOLTAGE



TYPICAL CHARACTERISTICS

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

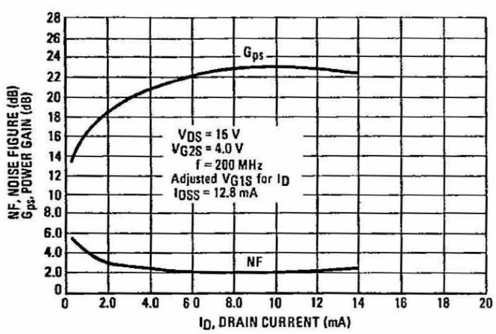


FIGURE 11 – COMMON-SOURCE POWER GAIN AND SPOT NOISE FIGURE versus GAIN CONTROL GATE-SUPPLY VOLTAGE – 3N201

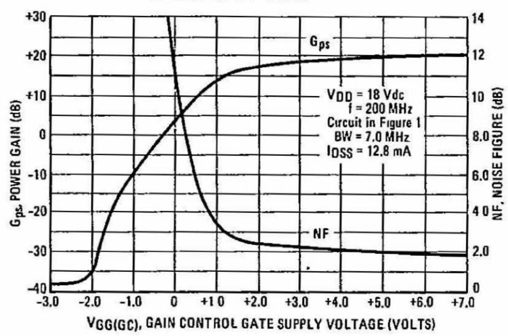


FIGURE 12 – COMMON-SOURCE POWER GAIN versus DRAIN SUPPLY CURRENT – 3N201

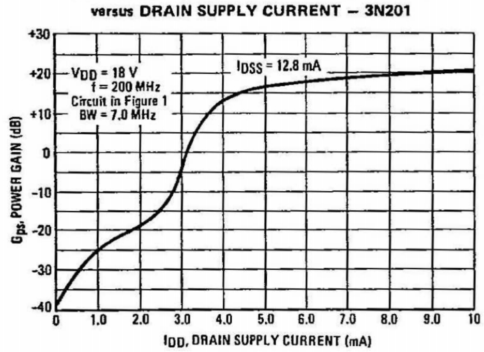


FIGURE 13 – SMALL-SIGNAL COMMON-SOURCE CONVERSION POWER GAIN versus LOCAL OSCILLATOR INPUT VOLTAGE – 3N202

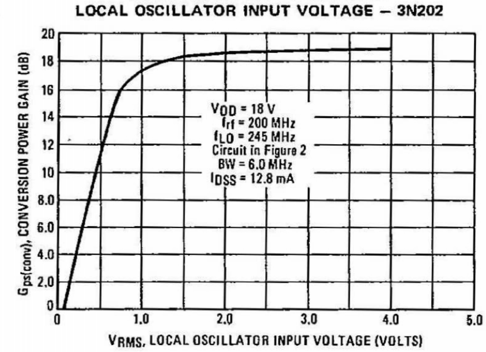
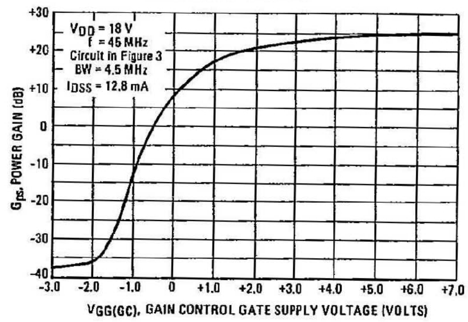


FIGURE 14 – SMALL-SIGNAL COMMON SOURCE INSERTION POWER GAIN versus GAIN CONTROL GATE-SUPPLY VOLTAGE – 3N203



TYPICAL CHARACTERISTICS

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

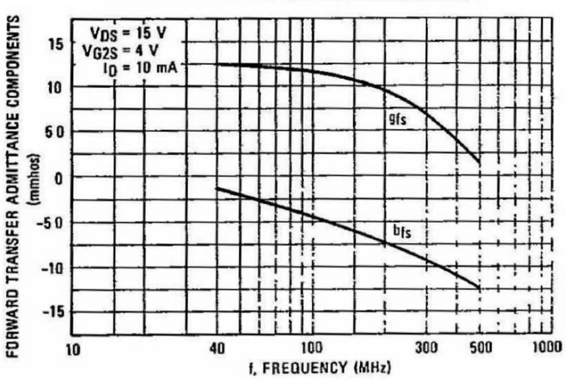


FIGURE 16 – SMALL-SIGNAL GATE ONE INPUT ADMITTANCE versus FREQUENCY

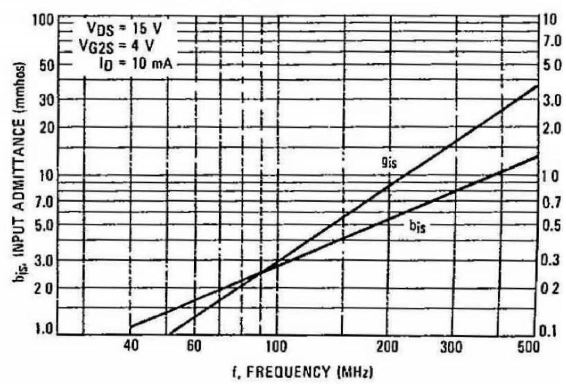


FIGURE 17 – SMALL-SIGNAL GATE ONE OUTPUT ADMITTANCE versus FREQUENCY