

# DIGITRON SEMICONDUCTORS

MFE140

DUAL GATE MOSFET FM AMPLIFIER

## MAXIMUM RATINGS

Rating	Symbol	Value	Unit
Drain-source voltage	$V_{DS}$	25	Vdc
Gate-source voltage	$V_{GS}$	$\pm 7.0$	Vdc
Drain current	$I_D$	30	mAdc
Gate current	$I_G$	10	mAdc
Total device dissipation @ $T_A = 25^\circ\text{C}$ Derate above $25^\circ\text{C}$	$P_D$	300	mW
Operating and storage temperature range	$T_J, T_{stg}$	-65 to 175	$^\circ\text{C}$

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

Characteristic	Symbol	Min	Typ	Max	Unit
<b>OFF CHARACTERISTICS</b>					
Drain source breakdown voltage ( $I_D = 10\mu\text{Adc}$ , $V_S = 0$ , $V_{G1} = -4.0\text{Vdc}$ , $V_{G2} = 4.0\text{Vdc}$ )	$V_{(BR)DSX}$	25	-	-	Vdc
Gate 1-source breakdown voltage ( $I_{G1} = \pm 10\mu\text{Adc}$ , $V_{G2S} = 0$ )	$V_{(BR)G1SO}$	$\pm 7.0$	-	$\pm 20$	Vdc
Gate 2-source breakdown voltage ( $I_{G2} = \pm 10\mu\text{Adc}$ , $V_{G2S} = 0$ )	$V_{(BR)G2SO}$	$\pm 7.0$	-	$\pm 20$	Vdc
Gate 1 leakage current ( $V_{G1S} = \pm 6.0\text{Vdc}$ , $V_{G2S} = 0$ , $V_{DS} = 0$ )	$I_{G1SS}$	-	-	20	nAdc
Gate 2 leakage current ( $V_{G2S} = \pm 6.0\text{Vdc}$ , $V_{G1S} = 0$ , $V_{DS} = 0$ )	$I_{G2SS}$	-	-	20	nAdc
Gate 1 to source cutoff voltage ( $V_{DS} = 15\text{Vdc}$ , $V_{G2S} = 4.0$ , $I_D = 200\mu\text{Adc}$ )	$V_{G1S(off)}$	-	-	-4.0	Vdc
Gate 2 to source cutoff voltage ( $V_{DS} = 15\text{Vdc}$ , $V_{G1S} = 0$ , $I_D = 200\mu\text{Adc}$ )	$V_{G2S(off)}$	-	-	-4.0	Vdc
<b>ON CHARACTERISTICS</b>					
Zero-gate voltage drain current ( $V_{DS} = 15\text{Vdc}$ , $V_{G2S} = 0$ , $V_{G1S} = 4.0\text{Vdc}$ )	$I_{DSS}$	3.0	10	30	mA
<b>SMALL SIGNAL CHARACTERISTICS</b>					
Forward transfer admittance (gate 1 connected to drain) ( $V_{DS} = 15\text{Vdc}$ , $V_{G2S} = 4.0\text{Vdc}$ , $I_D = 10\text{mAdc}$ , $f = 1.0\text{kHz}$ )	$ y_{fs} $	10	-	20	mmhs
Input capacitance ( $V_{DS} = 15\text{Vdc}$ , $V_{G2S} = 4.0\text{Vdc}$ , $I_D = I_{DSS}$ , $f = 1.0\text{MHz}$ )	$C_{iss}$	-	4.5	7.0	pF
Reverse transfer capacitance ( $V_{DS} = 15\text{Vdc}$ , $V_{G2S} = 4.0\text{Vdc}$ , $I_D = I_{DSS}$ , $f = 1.0\text{MHz}$ )	$C_{rss}$	-	0.023	0.05	pF
Output capacitance ( $V_{DS} = 15\text{Vdc}$ , $V_{G2S} = 4.0\text{Vdc}$ , $I_D = I_{DSS}$ , $f = 1.0\text{MHz}$ )	$C_{oss}$	-	2.5	4.0	pF
<b>FUNCTIONAL CHARACTERISTICS</b>					
Noise figure	NF	-	2.5	3.5	dB
Common source power gain	$G_{ps}$	20	23	-	dB
Level of unwanted signal for 1.0% cross modulation	-	-	45	-	mV
Common-source conversion power gain(Gate 1 or Gate 2 injection) (Signal frequency = 100MHz, local oscillator frequency = 110.7MHz)	$G_c$	15	18.5	-	dB
$\frac{1}{2}$ IF rejection	$\frac{1}{2} I_{FREJ}$	-	50	-	dB

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FIGURE 1 – INPUT ADMITTANCE

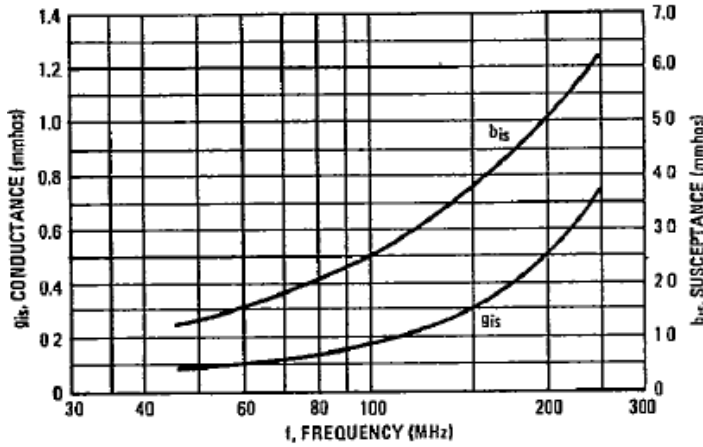


FIGURE 2 – REVERSE TRANSFER ADMITTANCE

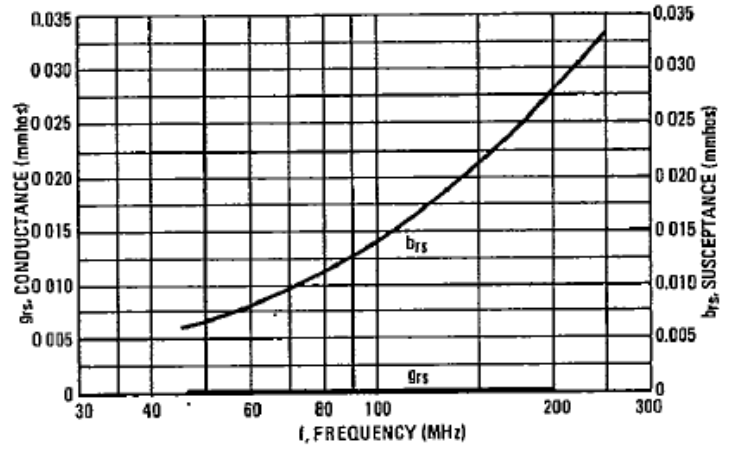


FIGURE 3 – FORWARD TRANSFER ADMITTANCE

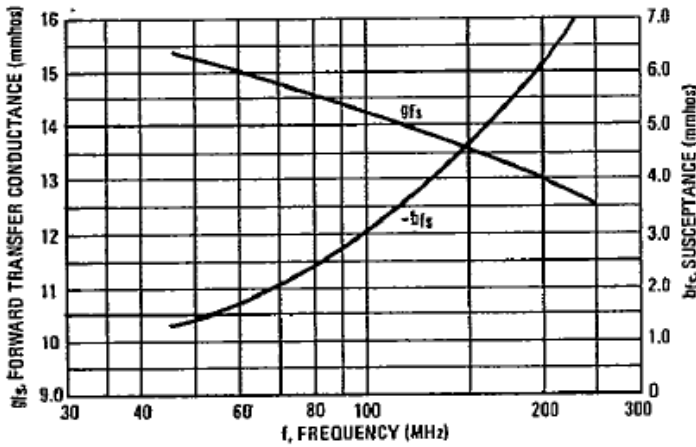
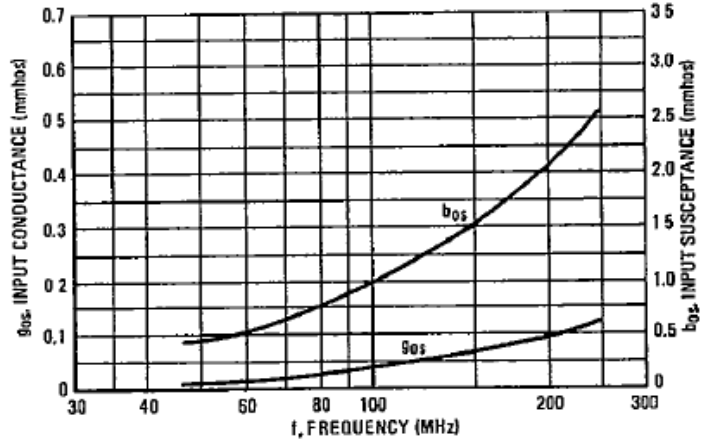


FIGURE 4 – OUTPUT ADMITTANCE



FORWARD TRANSFER ADMITTANCE  
( $V_{DS} = 15$  Vdc,  $f = 1.0$  kHz)

FIGURE 5 – GATE 1

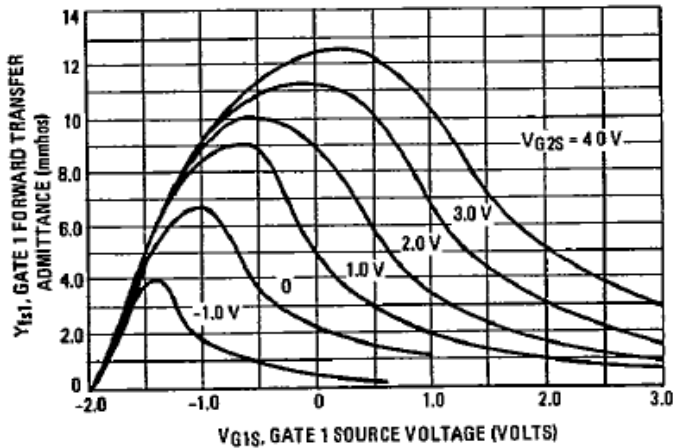
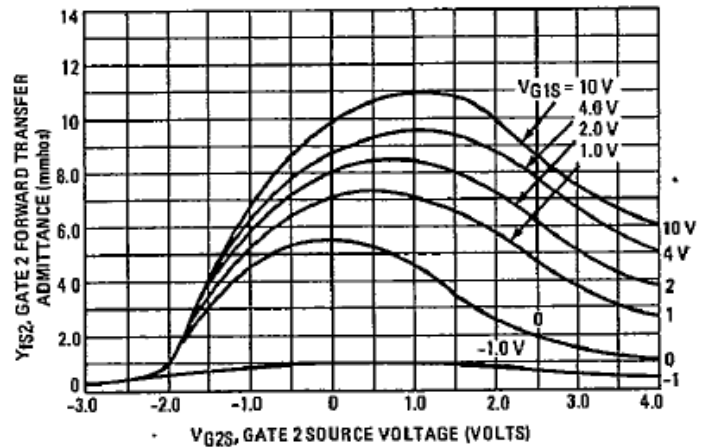


FIGURE 6 – GATE 2



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FIGURE 7 – POWER GAIN

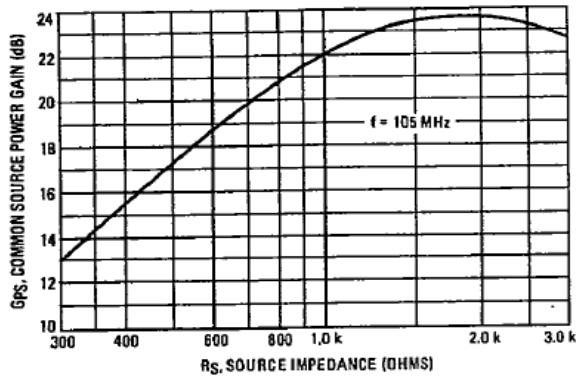


FIGURE 8 – NOISE FIGURE

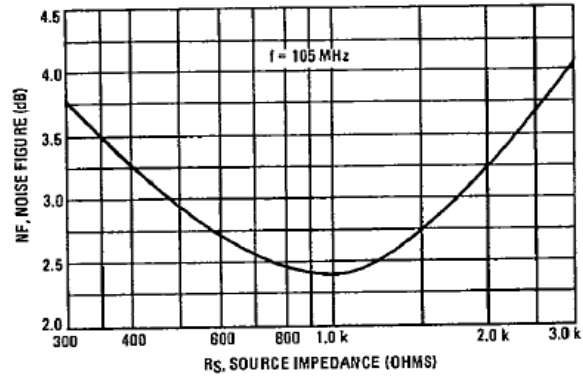


FIGURE 9 – GAIN REDUCTION

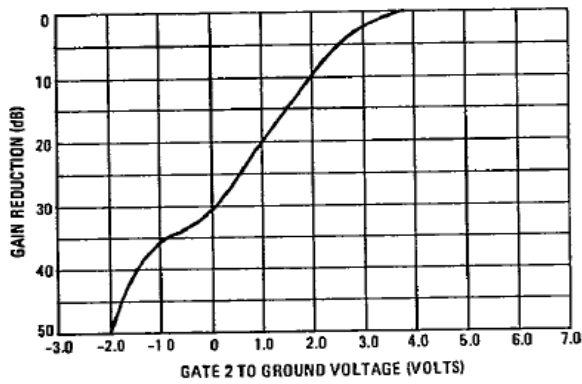


FIGURE 10 – CROSS MODULATION

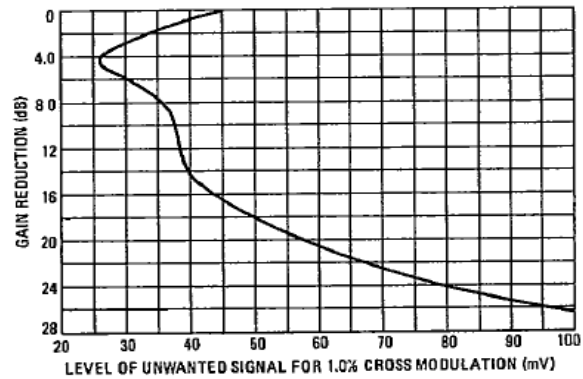
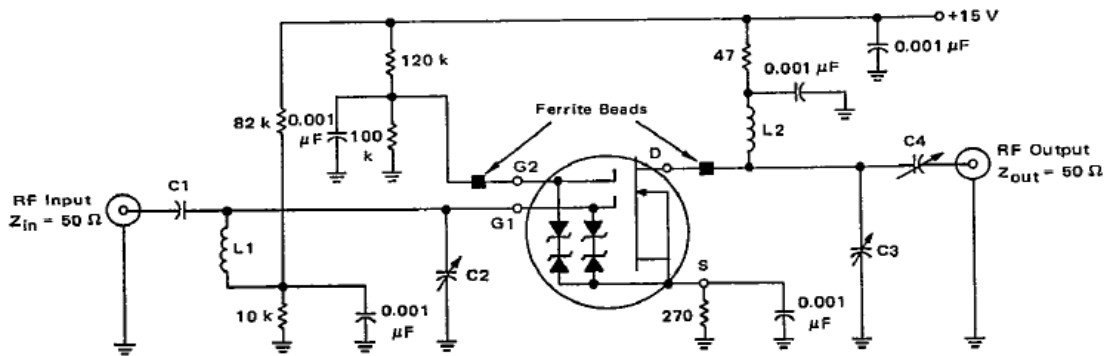


FIGURE 11 – 105 MHz POWER GAIN AND NOISE FIGURE TEST CIRCUIT



The following component values are for a stern stability factor = 2.0.  
 L1, L2 126 nH PAUL SMITH CO. SK-138-1  
 4-½ Turns (yellow)  
 C1 Nominal 7.0 pF Adjusted for source impedance of approximately 1000 Ω, JOHANSON JMC2951

C2 Nominal 4.0 pF ARCO 402  
 C3 Nominal 13.73 pF ARCO 403  
 C4 Nominal 4.36 pF JOHANSON JMC2951  
 All Decoupling Capacitors are Ceramic Discs.

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FIGURE 12 – CONVERSION GAIN

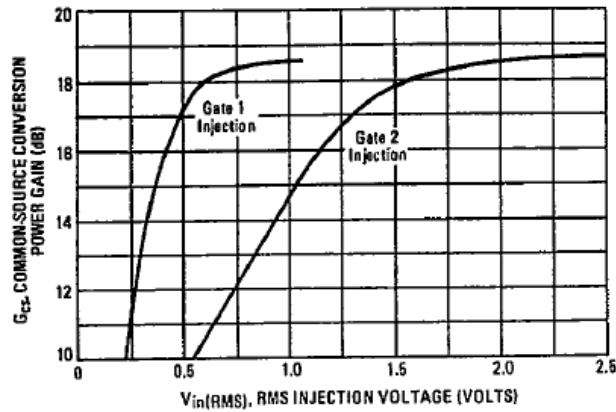
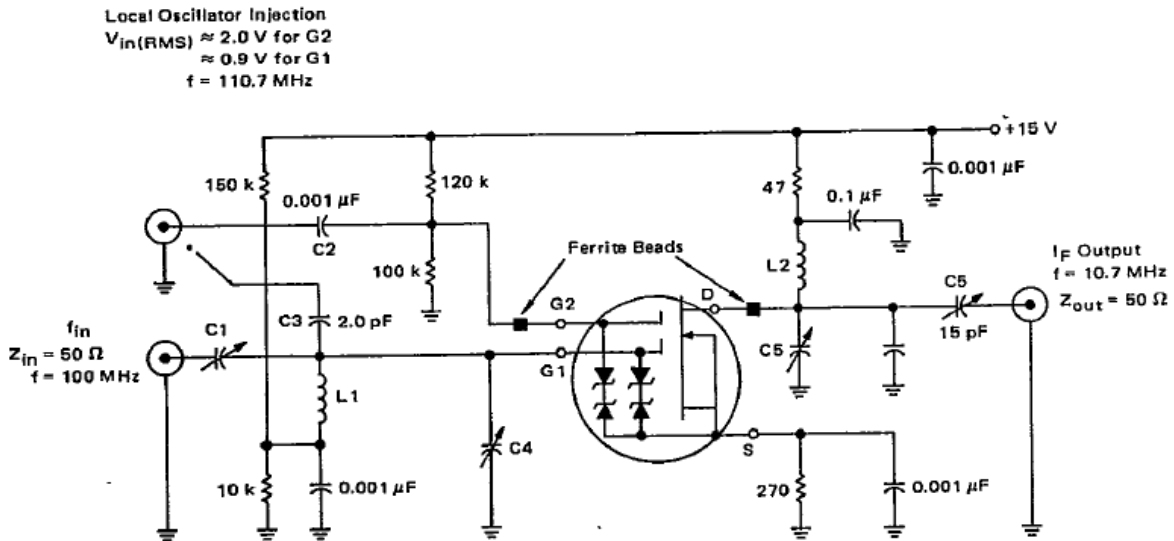


FIGURE 13 – CONVERSION GAIN TEST CIRCUIT



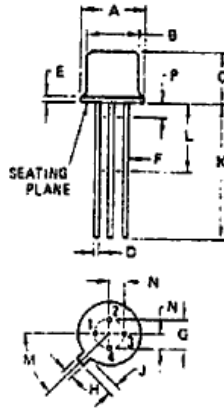
- L1 126 nH PAUL SMITH CO. SK-138-1  
4-1/2 Turns (yellow)
- L2 2.73  $\mu$ H High Unloaded  $\Omega$
- C1 JOHANSON JMC2951
- C4,C5,C6 ARCO 402

\*For G1 injection, C2 is changed to bypass G2 to ground and C3 is added to connect G1 to the injection input.

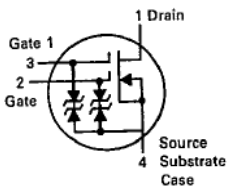
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Dim	Inches		Millimeters	
	Min	Max	Min	Max
A	-	0.230	-	5.840
B	-	0.195	-	4.950
C	-	0.210	-	5.330
D	-	0.021	-	0.530
E	-	0.030	-	0.760
F	-	0.019	-	0.480
G	0.100 BSC		2.540 BSC	
H	-	0.046	-	1.170
J	-	0.0480	-	1.220
K	0.500	-	12.700	-
L	0.250	-	6.350	-
M	45°C BSC		45°C BSC	
N	0.050 BSC		1.270 BSC	
P	-	0.050	-	1.270



Available Non-RoHS (standard) or RoHS compliant (add PBF suffix).

Available as "HR" (high reliability) screened per MIL-PRF-19500, JANTX level. Add "HR" suffix to base part number.