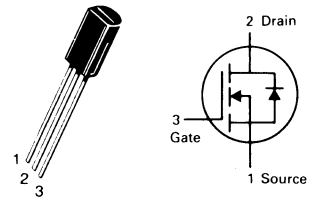
MPF89

CASE 29-03, STYLE 7
TO-92 (TO-226AE)



TMOS FET
TRANSISTOR
N-CHANNEL — ENHANCEMENT

MAXIMUM RATINGS

Rating	Symbol	Value	Unit
Drain-Source Voltage	V_{DSS}	200	Vdc
Gate-Source Voltage	V_{GS}	±20	Vdc
Drain Current — Continuous (1) — Pulsed (2)	I_D I_{DM}	400 800	mAdc
Total Power Dissipation @ T_A = 25°C Derate above 25°C	P_D	0.6 4.8	Watts mW/°C
Operating and Storage Temperature Range	T_J, T_{stg}	−55 to 150	°C
Thermal Resistance Junction to Ambient	θ_{JA}	208	°C/W

ELECTRICAL CHARACTERISTICS (T_A = 25°C unless otherwise noted.)

Characteristic	Symbol	Min	Typ	Max	Unit
OFF CHARACTERISTICS					
Drain-Source Breakdown Voltage (V_{GS} = 0, I_D = 0.5 mA)	$V_{(BR)DSS}$	200	—	—	Vdc
Zero Gate Voltage Drain Current (V_{DS} = 200 V, V_{GS} = 0)	I_{DSS}	—	0.1	60	μAdc
Gate-Body Leakage Current (V_{GS} = 20 V, V_{DS} = 0)	I_{GSS}	—	0.01	100	nAdc
ON CHARACTERISTICS*					
Gate Threshold Voltage (I_D = 1.0 mA, V_{DS} = V_{GS})	$V_{GS(th)}$	1.0	—	2.7	Vdc
Drain-Source On-Voltage (V_{GS} = 10 V) (I_D = 100 mA) (I_D = 300 mA) (I_D = 500 mA)	$V_{DS(on)}$	 — — —	 0.45 1.2 3.0	 0.6 1.8 —	Vdc
On-State Drain Current (V_{DS} = 25 V, V_{GS} = 10 V)	$I_{D(on)}$	500	700	—	mA
Static Drain-Source On-Resistance (V_{GS} = 10 Vdc) (I_D = 150 mA) (I_D = 300 mA) (I_D = 500 mA)	$r_{DS(on)}$	 — — —	 4.5 — 6.0	 6.0 6.0 —	Ohms
Forward Transconductance (V_{DS} = 25 V, I_D = 300 mA)	g_{fs}	140	400	—	mmhos
DYNAMIC CHARACTERISTICS					
Input Capacitance (V_{DS} = 25 V, V_{GS} = 0, f = 1.0 MHz)	C_{iss}	—	72	—	pF
Output Capacitance (V_{DS} = 25 V, V_{GS} = 0, f = 1.0 MHz)	C_{oss}	—	15	—	pF
Reverse Transfer Capacitance (V_{DS} = 25 V, V_{GS} = 0, f = 1.0 MHz)	C_{rss}	—	2.8	—	pF
SWITCHING CHARACTERISTICS*					
Turn-On Time (See Figure 1)	t_{on}	—	6.0	—	ns
Turn-Off Time (See Figure 1)	t_{off}	—	12	—	ns

(1) The Power Dissipation of the package may result in a lower continuous drain current.
(2) Pulse Width ≤ 300 μs, Duty Cycle ≤ 2.0%.

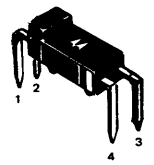
MPF120
MPF121
MPF122

N-CHANNEL DUAL-GATE
SILICON-NITRIDE PASSIVATED
MOS FIELD-EFFECT TRANSISTORS

. . . depletion mode (Type B) dual gate transistors designed for VHF amplifier and mixer applications. These types are specified as follows:

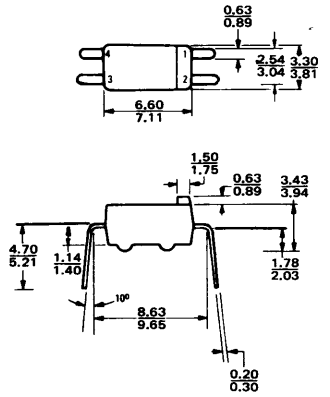
- MPF120 – RF Amplifier @ 105 MHz
  MPF121 – RF Amplifier @ 60 and 200 MHz
  MPF122 – Mixer @ 60 and 200 MHz
- Silicon Nitride Passivation for Excellent Long Term Stability
- Diode Protected Gates
- Low Cost Plastic Package

N–CHANNEL
DUAL GATE
MOS FIELD–EFFECT
TRANSISTORS
Type B



MAXIMUM RATINGS

Rating	Symbol	Value	Unit
Drain-Source Voltage	V_{DS}	+25	Vdc
Drain Current	I_D	30	mAdc
Total Device Dissipation @ $T_A = 25^oC$ (Package Limitation)	P_D	500	mW
Derate above 25^oC		5.0	$mW/^oC$
Operating and Storage Junction Temperature Range	T_J, T_{stg}	−65 to +175	^oC



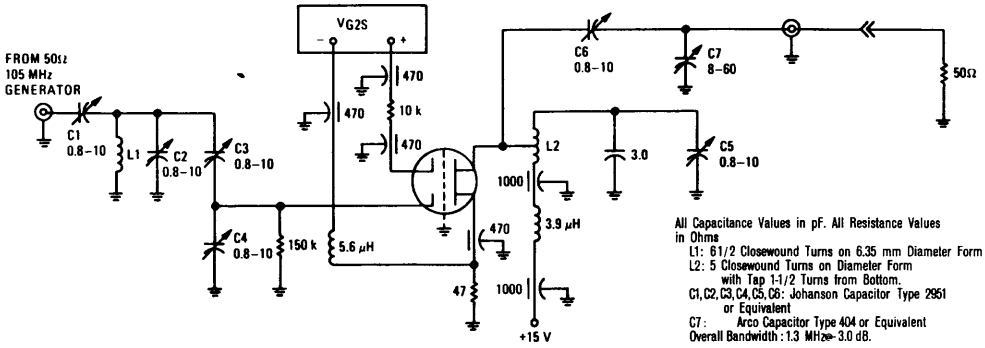
CASE 259-01
PLASTIC

Dimensions in millimeters

ELECTRICAL CHARACTERISTICS (T_A 25°C unless otherwise noted) Substrate Connected to Source

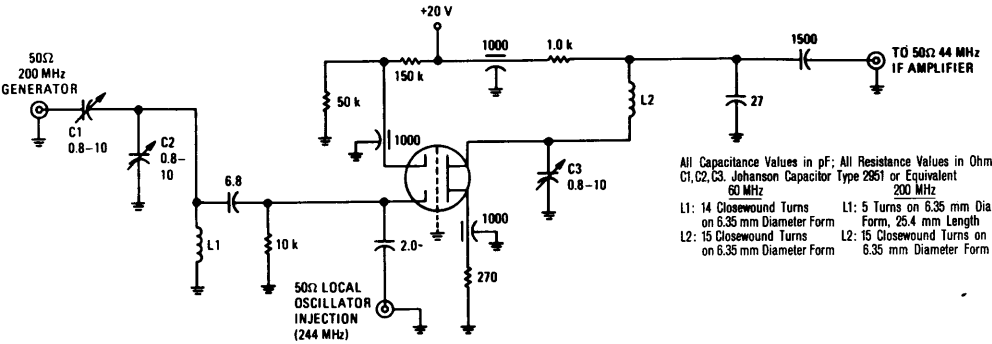
Characteristic		Symbol	Min	Typ	Max	Unit
OFF CHARACTERISTICS						
Drain-Source Breakdown Voltage (I_D = 10 μAdc, V_S = 0, V_{G1} = V_{G2} = −4.0 Vdc)		$V_{(BR)DSX}$	25	–	–	Vdc
Gate 1 – Source Breakdown Voltage (I_{G1} = ±10 μAdc, V_{G2S} = 0)		$V_{(BR)G1SO}$	±7.0	–	±20	Vdc
Gate 2 – Source Breakdown Voltage (I_{G2} = ±10 μAdc, V_{G2S} = 0)		$V_{(BR)G2SO}$	±7.0	–	±20	Vdc
Gate 1 to Source Cutoff Voltage (V_{DS} = 15 Vdc, V_{G2S} = 4.0 Vdc, I_D = 200 μAdc)		$V_{G1S(off)}$	–	–	−4.0	Vdc
Gate 2 to Source Cutoff Voltage (V_{DS} = 15 Vdc, V_{G1S} = 0, I_D = 200 μAdc)		$V_{G2S(off)}$	–	–	−4.0	Vdc
Gate 1 Reverse Leakage Current (V_{G1S} = +6.0 Vdc, V_{G2S} = 0, V_{DS} = 0)		I_{G1SS}	–	–	20	nAdc
Gate 2 Reverse Leakage Current (V_{G2S} = +6.0 Vdc, V_{G1S} = 0, V_{DS} = 0)		I_{G2SS}	–	–	20	nAdc
ON CHARACTERISTICS						
Zero-Gate Voltage Drain Current (V_{DS} = 15 Vdc, V_{G1S} = 0, V_{G2S} = 4.0 Vdc)	MPF120	I_{DSS}	2.0	7.0	18	mAdc
	MPF121		5.0	10	30	
	MPF122		2.0	9.0	20	
SMALL-SIGNAL CHARACTERISTICS						
Forward Transadmittance (Gate 1 to Drain) (V_{DS} = 15 Vdc, V_{G2S} = 4.0 Vdc, I_D = 10 mAdc, f = 1.0 kHz)	MPF120, 22	Y_{fs}	8000	–	18,000	μmhos
	MPF121		10,000	–	20,000	
Input Capacitance (V_{DS} = 15 Vdc, V_{G2S} = 4.0 Vdc, I_D = I_{DSS}, f = 1.0 MHz)	MPF120, 22	C_{iss}	–	4.5	7.0	pF
	MPF121		–	4.5	6.0	
Output Capacitance (V_{DS} = 15 Vdc, V_{G2S} = 4.0 Vdc, I_D = I_{DSS}, f = 1.0 MHz)	MPF120, 22	C_{oss}	–	2.5	4.0	pF
	MPF121		–	2.5	3.5	
Reverse Transfer Capacitance (V_{DS} = 15 Vdc, V_{G2S} = 4.0 Vdc, I_D = 6.0 mAdc, f = 1.0 MHz)		C_{rss}	–	0.023	–	pF
Common-Source Noise Figure (V_{DS} = 15 Vdc, V_{G2S} = 4.0 Vdc, I_D = 6.0 mAdc, Z_S is optimized for NF)		NF				dB
(f = 105 MHz – Figure 1)	MPF120		–	2.9	5.0	
(f = 60 MHz – Figure 2)	MPF121		–	2.6	5.0	
(f = 200 MHz – Figure 2)	MPF121		–	2.6	5.0	
Common-Source Power Gain (V_{DS} = 15 Vdc, V_{G2S} = 4.0 Vdc, I_D = 6.0 mAdc, Z_S is optimized for NF)		G_{ps}				dB
(f = 105 MHz – Figure 1)	MPF120		17	19.6	–	
(f = 60 MHz – Figure 2)	MPF121		20	27.8	–	
(f = 200 MHz – Figure 2)	MPF121		17	18.6	–	
Level of Unwanted Signal for 1.0% Cross Modulation (V_{DS} = 15 Vdc, V_{G2S} = 4.0 Vdc, I_D = 6.0 mAdc)		–	–	100	–	mV
Common-Source Conversion Power Gain (Gate 1 Injection, Figure 3) (V_{DS} = 15 Vdc, V_{G2S} = 4.0 Vdc, Local Oscillator Voltage = 925 mVrms)		G_c				dB
(Signal Frequency = 60 MHz, Local Oscillator Frequency = 104 MHz)	MPF122		15	16.5	–	
(Signal Frequency = 200 MHz, Local Oscillator Frequency = 244 MHz)	MPF122		12	13.3	–	

FIGURE 1 – 105 MHz TEST CIRCUIT



All Capacitance Values in pF. All Resistance Values in Ohms
L1: 6 1/2 Closewound Turns on 6.35 mm Diameter Form
L2: 5 Closewound Turns on Diameter Form with Tap 1-1/2 Turns from Bottom.
C1, C2, C3, C4, C5, C6: Johanson Capacitor Type 2951 or Equivalent
C7: Arco Capacitor Type 404 or Equivalent
Overall Bandwidth : 1.3 MHz@ 3.0 dB.

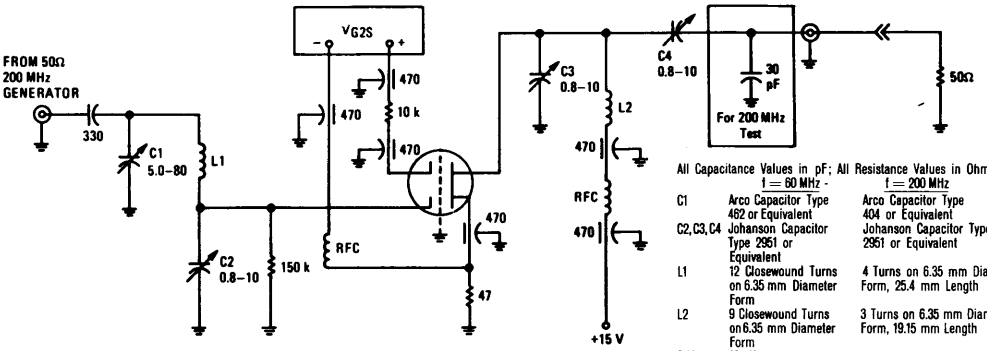
FIGURE 2 – 60 AND 200 MHz TEST CIRCUIT



All Capacitance Values in pF; All Resistance Values in Ohms.
C1, C2, C3. Johanson Capacitor Type 2951 or Equivalent

	60 MHz	200 MHz
L1	14 Closewound Turns on 6.35 mm Diameter Form	5 Turns on 6.35 mm Diameter Form, 25.4 mm Length
L2	15 Closewound Turns on 6.35 mm Diameter Form	15 Closewound Turns on 6.35 mm Diameter Form

FIGURE 3 – 60 AND 200 MHz CONVERSION POWER GAIN



All Capacitance Values in pF; All Resistance Values in Ohms.

	f = 60 MHz	f = 200 MHz
C1	Arco Capacitor Type 462 or Equivalent	Arco Capacitor Type 404 or Equivalent
C2, C3, C4	Johanson Capacitor Type 2951 or Equivalent	Johanson Capacitor Type 2951 or Equivalent
L1	12 Closewound Turns on 6.35 mm Diameter Form	4 Turns on 6.35 mm Diameter Form, 25.4 mm Length
L2	9 Closewound Turns on 6.35 mm Diameter Form	3 Turns on 6.35 mm Diameter Form, 19.15 mm Length
RFC	10 μH	1.0 μH
Overall Bandwidth	6.0 MHz -3.0 dB	6.5 MHz@ 3.0 dB

COMMON-SOURCE ADMITTANCE PARAMETERS
(V_{DS} = 15 Vdc, V_{G2S} = 4.0 Vdc, I_D = 6.0 mAdc)

FIGURE 4 – INPUT ADMITTANCE

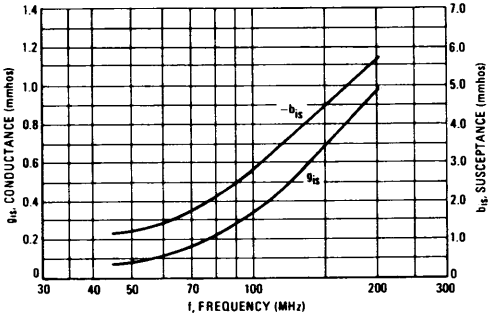


FIGURE 5 – REVERSE TRANSFER ADMITTANCE

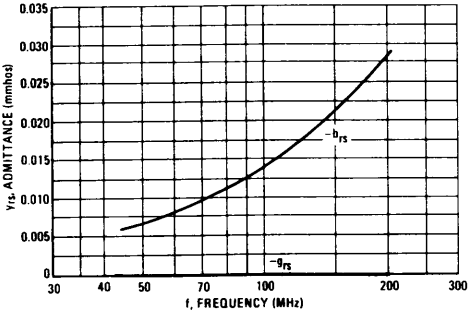


FIGURE 6 – FORWARD TRANSFER ADMITTANCE

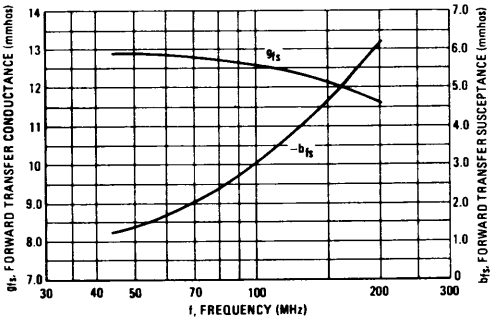


FIGURE 7 – OUTPUT ADMITTANCE

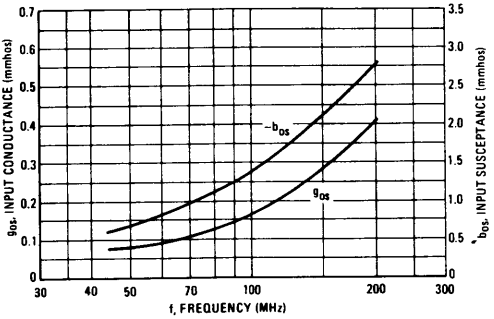


FIGURE 8 – GAIN REDUCTION

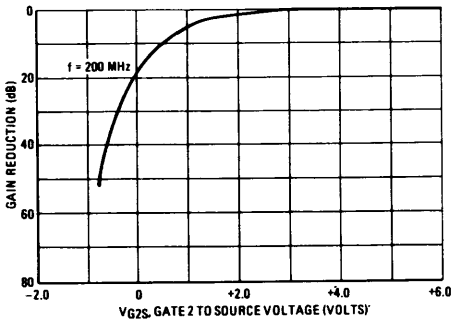


FIGURE 9 – CONVERSION POWER GAIN