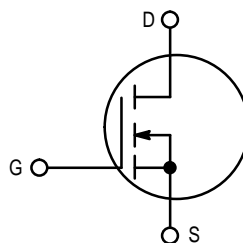


The RF TMOS® Line  
**Power Field Effect Transistor**  
N-Channel Enhancement Mode

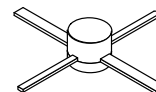
Designed for wideband large-signal amplifier and oscillator applications to 500 MHz.

- Guaranteed 28 Volt, 400 MHz Performance  
Output Power = 2.0 Watts  
Minimum Gain = 16 dB  
Efficiency = 55% (Typical)
- Grounded Source Package for High Gain and Excellent Heat Dissipation (MRF158R)
- Facilitates Manual Gain Control, ALC and Modulation Techniques
- 100% Tested for Load Mismatch at All Phase Angles with 30:1 VSWR
- Excellent Thermal Stability, Ideally Suited for Class A Operation
- Circuit board photomaster available upon request by contacting RF Tactical Marketing in Phoenix, AZ.



**MRF158**

2.0 W, to 500 MHz  
TMOS  
BROADBAND  
RF POWER FET



CASE 305A-01, STYLE 2

**MAXIMUM RATINGS**

Rating	Symbol	Value	Unit
Drain-Source Voltage	$V_{DSS}$	65	Vdc
Drain-Gate Voltage ( $R_{GS} = 1.0 \text{ M}\Omega$ )	$V_{DGR}$	65	Vdc
Gate-Source Voltage	$V_{GS}$	$\pm 40$	Vdc
Drain Current — Continuous	$I_D$	0.5	Adc
Total Device Dissipation @ $T_C = 25^\circ\text{C}$ Derate above $25^\circ\text{C}$	$P_D$	8.0 45	Watts mW/ $^\circ\text{C}$
Storage Temperature Range	$T_{stg}$	-65 to +150	$^\circ\text{C}$
Operating Junction Temperature	$T_J$	200	$^\circ\text{C}$

**THERMAL CHARACTERISTICS**

Characteristic	Symbol	Max	Unit
Thermal Resistance, Junction to Case	$R_{\theta JC}$	13.2	$^\circ\text{C}/\text{W}$

NOTE — **CAUTION** — MOS devices are susceptible to damage from electrostatic charge. Reasonable precautions in handling and packaging MOS devices should be observed.

**ELECTRICAL CHARACTERISTICS** ( $T_C = 25^\circ\text{C}$  unless otherwise noted.)

Characteristic	Symbol	Min	Typ	Max	Unit
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**OFF CHARACTERISTICS**

Drain–Source Breakdown Voltage ( $V_{GS} = 0$ , $I_D = 5.0$ mA)	$V_{(BR)DSS}$	65	—	—	Vdc
Zero Gate Voltage Drain Current ( $V_{DS} = 28$ V, $V_{GS} = 0$ )	$I_{DSS}$	—	—	0.5	mAdc
Gate–Source Leakage Current ( $V_{GS} = 40$ V, $V_{DS} = 0$ )	$I_{GSS}$	—	—	1.0	$\mu\text{Adc}$

**ON CHARACTERISTICS**

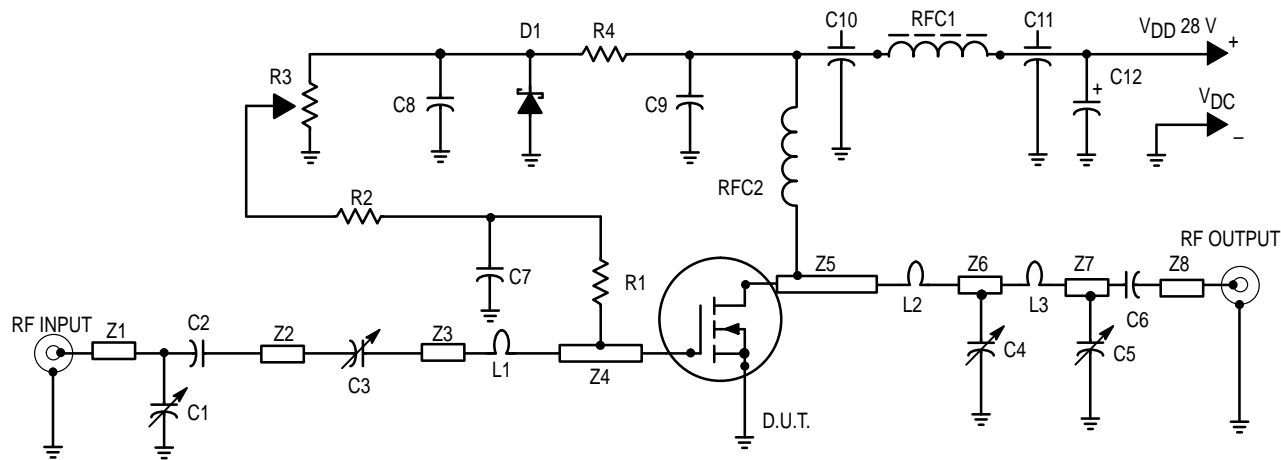
Gate Threshold Voltage ( $I_D = 10$ mA, $V_{DS} = 10$ V)	$V_{GS(th)}$	1.0	4.0	6.0	Vdc
Forward Transconductance ( $V_{DS} = 10$ V, $I_D = 100$ mA)	$g_{fs}$	50	85	—	mmhos

**DYNAMIC CHARACTERISTICS**

Input Capacitance ( $V_{DS} = 28$ V, $V_{GS} = 0$ , $f = 1.0$ MHz)	$C_{iss}$	—	3.0	—	pF
Output Capacitance ( $V_{DS} = 28$ V, $V_{GS} = 0$ , $f = 1.0$ MHz)	$C_{oss}$	—	4.2	—	pF
Reverse Transfer Capacitance ( $V_{DS} = 28$ V, $V_{GS} = 0$ , $f = 1.0$ MHz)	$C_{rss}$	—	0.45	—	pF

**FUNCTIONAL CHARACTERISTICS** (Figure 1)

Common Source Power Gain ( $V_{DD} = 28$ Vdc, $P_{out} = 2.0$ W, $f = 400$ MHz, $I_{DQ} = 100$ mA)	$G_{ps}$	16	20	—	dB
Drain Efficiency (Figure 1) ( $V_{DD} = 28$ Vdc, $P_{out} = 2.0$ W, $f = 400$ MHz, $I_{DQ} = 100$ mA)	$\eta$	45	55	—	%
Electrical Ruggedness (Figure 1) ( $V_{DD} = 28$ Vdc, $P_{out} = 2.0$ W, $f = 400$ MHz, $I_{DQ} = 100$ mA, VSWR 30:1 at all Phase Angles)	$\psi$	No Degradation in Output Power			
Series Equivalent Input Impedance ( $V_{DD} = 28$ V, $P_{out} = 2.0$ W, $f = 400$ MHz, $I_{DQ} = 100$ mA)	$Z_{in}$	—	$8.8 - j27.37$	—	Ohms
Series Equivalent Output Impedance ( $V_{DD} = 28$ V, $P_{out} = 2.0$ W, $f = 400$ MHz, $I_{DQ} = 100$ mA)	$Z_{out}$	—	$16.96 - j62$	—	Ohms



- C1, C4, C5 — Johanson Trimmer Capacitor, 2–20 pF
- C2, C6 — 270 pF Chip Capacitor
- C3 — Arco 404
- C7, C8, C9 — 0.1  $\mu$ F
- C10, C11 — 680 pF Feed Through
- C12 — 50  $\mu$ F, 50 V
- D1 — 1N5925A Motorola Zener
- L1 — #18 AWG, Hairpin 0.825" long, bend into hairpin
- L2 — #18 AWG, Hairpin 0.875" long, bend into hairpin
- L3 — #18 AWG, Hairpin 0.965" long, bend into hairpin
- Board Material — 0.062", Teflon Fiberglass, 2 oz., Copper clad both sides,  $\epsilon_r = 2.55$

- R1 — 91  $\Omega$  1/2 Watt
- R2 — 10 k $\Omega$  1/2 Watt
- R3 — 10 k $\Omega$ , 10 Turns Bourns
- R4 — 1.8 k 1.4 Watt
- RFC1 — Ferroxcube VK200–19/4B
- RFC2 — 10 Turns #20 AWG Enameled, 0.250" ID
- Z1 — Microstrip Line 0.150" wide, 0.420" long
- Z2 — Microstrip Line 0.150" wide, 0.420" long
- Z3 — Microstrip Line 0.150" wide, 0.475" long
- Z4 — Microstrip Line 0.150" wide, 0.825" long
- Z5 — Microstrip Line 0.150" wide, 0.750" long
- Z6 — Microstrip Line 0.150" wide, 0.500" long
- Z7 — Microstrip Line 0.150" wide, 0.500" long
- Z8 — Microstrip Line 0.150" wide, 0.450" long

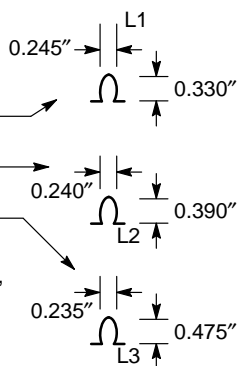
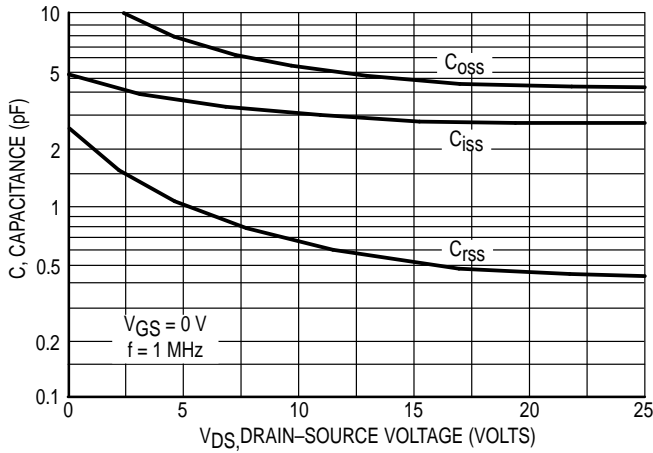
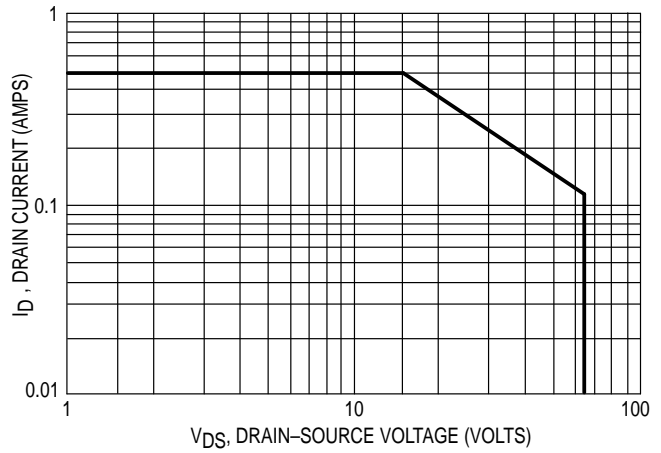


Figure 1. 400 MHz Test Circuit

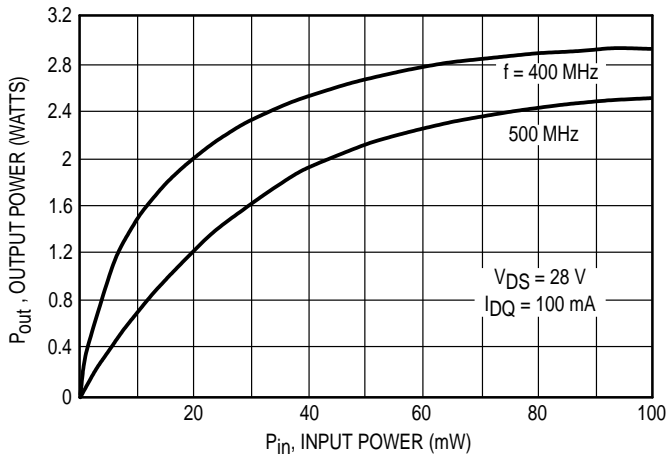
## TYPICAL CHARACTERISTICS



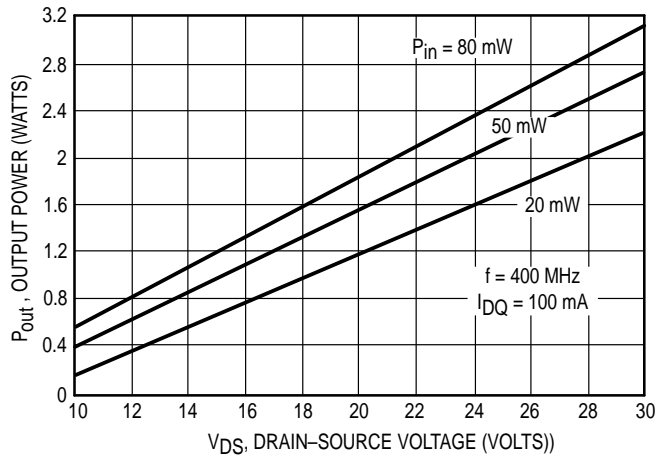
**Figure 2. Capacitance versus Drain-Source Voltage**



**Figure 3. DC Safe Operating Area**



**Figure 4. Output Power versus Input Power**

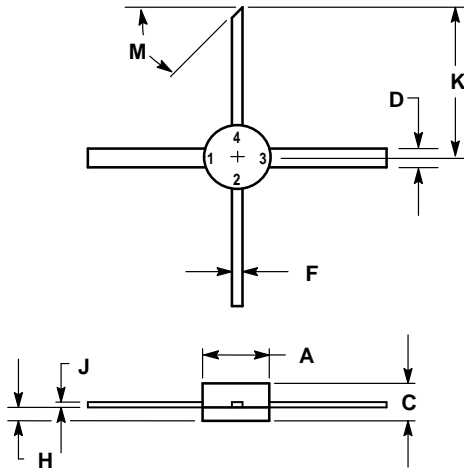


**Figure 5. Output Power versus Voltage**

**Table 1. Typical Common Emitter S-Parameters**

V <sub>DS</sub> (Volts)	I <sub>D</sub> (mA)	f (MHz)	S <sub>11</sub>		S <sub>21</sub>		S <sub>12</sub>		S <sub>22</sub>	
			S <sub>11</sub>	∠φ	S <sub>21</sub>	∠φ	S <sub>12</sub>	∠φ	S <sub>22</sub>	∠φ
28	100	5	1.00	-2.0	3.84	-179	0.003	73	0.97	-2.0
		10	1.00	-2.0	3.81	179	0.004	83	0.97	-2.0
		30	1.00	-7.0	3.74	174	0.011	81	0.97	-6.0
		50	1.00	-11	3.72	170	0.018	78	0.96	-9.0
		100	0.98	-21	3.62	159	0.034	70	0.95	-19
		200	0.93	-41	3.28	137	0.061	52	0.90	-35
		300	0.88	-58	2.88	120	0.077	39	0.86	-50
		400	0.83	-75	2.57	104	0.088	27	0.81	-63
		500	0.79	-87	2.24	91	0.090	17	0.78	-74
		600	0.75	-99	1.94	78	0.084	8.0	0.75	-84
		700	0.73	-110	1.72	68	0.077	2.0	0.75	-93
		800	0.72	-120	1.52	58	0.067	-3.0	0.75	-99
900	0.71	-130	1.35	48	0.055	-6.0	0.74	-108		
1000	0.71	-139	1.18	40	0.043	-4.0	0.73	-114		

## PACKAGE DIMENSIONS



**NOTES:**


1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.

DIM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	0.200	0.220	5.08	5.59
C	0.095	0.130	2.41	3.30
D	0.055	0.065	1.40	1.65
F	0.025	0.035	0.64	0.89
H	0.040	0.050	1.02	1.27
J	0.003	0.007	0.08	0.18
K	0.435	—	11.05	—
M	45 °REF		45 °REF	

**STYLE 2:**

- PIN 1. SOURCE
2. GATE
3. SOURCE
4. DRAIN

**CASE 305A-01  
ISSUE A**

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MRF158/D

