

The RF MOSFET Line

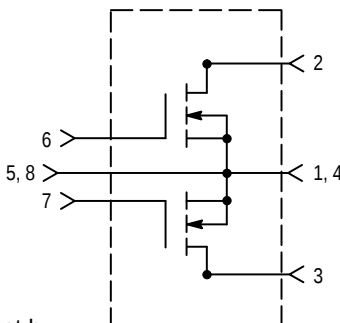
RF Power

Field Effect Transistors

N-Channel Enhancement Mode MOSFET

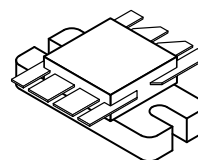
Designed for broadband commercial and military applications up to 400 MHz frequency range. Primarily used as a driver or output amplifier in push-pull configurations. Can be used in manual gain control, ALC and modulation circuits.

- Typical Performance at 400 MHz, 28 V:
Output Power — 100 W
Gain — 12 dB
Efficiency — 60%
- Low Thermal Resistance
- Low C_{rss} — 10 pF Typ @ $V_{DS} = 28$ Volts
- Ruggedness Tested at Rated Output Power
- Nitride Passivated Die for Enhanced Reliability
- Excellent Thermal Stability; Suited for Class A Operation
- Circuit board photomaster available upon request by contacting RF Tactical Marketing in Phoenix, AZ.



MRF177

100 W, 28 V, 400 MHz
N-CHANNEL
BROADBAND
RF POWER MOSFET



CASE 744A-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}	± 40	Vdc
Drain Current — Continuous	I_D	16	Adc
Total Device Dissipation @ $T_C = 25^\circ\text{C}$ (1) Derate above 25°C	P_D	270 1.54	Watts W/ $^\circ\text{C}$
Storage Temperature Range	T_{stg}	-65 to +150	$^\circ\text{C}$
Operating Temperature Range	T_J	200	$^\circ\text{C}$

THERMAL CHARACTERISTICS

Characteristic	Symbol	Max	Unit
Thermal Resistance, Junction-to-Case	$R_{\theta JC}$	0.65	$^\circ\text{C/W}$

(1) Total device dissipation rating applies only when the device is operated as an RF push-pull amplifier.

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 (1)	Symbol	Min	Typ	Max	Unit
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OFF CHARACTERISTICS

Drain–Source Breakdown Voltage ($V_{GS} = 0$, $I_D = 50$ mA)	$V_{(BR)DSS}$	65	—	—	Vdc
Zero Gate Voltage Drain Current ($V_{DS} = 28$ V, $V_{GS} = 0$)	I_{DSS}	—	—	2.0	mAdc
Gate–Source Leakage Current ($V_{GS} = 20$ V, $V_{DS} = 0$)	I_{GSS}	—	—	1.0	μAdc

ON CHARACTERISTICS (1)

Gate Threshold Voltage ($V_{DS} = 10$ V, $I_D = 50$ mA)	$V_{GS(th)}$	1.0	3.0	6.0	Vdc
Drain–Source On–Voltage ($V_{GS} = 10$ V, $I_D = 3.0$ A)	$V_{DS(on)}$	—	—	1.4	Vdc
Forward Transconductance ($V_{DS} = 10$ V, $I_D = 2.0$ A)	g_{fs}	1.8	2.2	—	mhos

DYNAMIC CHARACTERISTICS (1)

Input Capacitance ($V_{DS} = 28$ V, $V_{GS} = 0$, $f = 1.0$ MHz)	C_{iss}	—	100	—	pF
Output Capacitance ($V_{DS} = 28$ V, $V_{GS} = 0$, $f = 1.0$ MHz)	C_{oss}	—	105	—	pF
Reverse Transfer Capacitance ($V_{DS} = 28$ V, $V_{GS} = 0$, $f = 1.0$ MHz)	C_{rss}	—	10	—	pF

FUNCTIONAL CHARACTERISTICS (Figure 8) (2)

Common Source Power Gain ($V_{DD} = 28$ Vdc, $P_{out} = 100$ W, $f = 400$ MHz, $I_{DQ} = 200$ mA)	G_{PS}	10	12	—	dB
Drain Efficiency ($V_{DD} = 28$ Vdc, $P_{out} = 100$ W, $f = 400$ MHz, $I_{DQ} = 200$ mA)	η	55	60	—	%
Electrical Ruggedness ($V_{DD} = 28$ Vdc, $P_{out} = 100$ W, $f = 400$ MHz, $I_{DQ} = 200$ mA, Load VSWR = 30:1, All Phase Angles At Frequency of Test)	ψ	No Degradation in Output Power Before & After Test			

(1) Note each transistor chip measured separately

(2) Both transistor chips operating in push–pull amplifier

TYPICAL CHARACTERISTICS

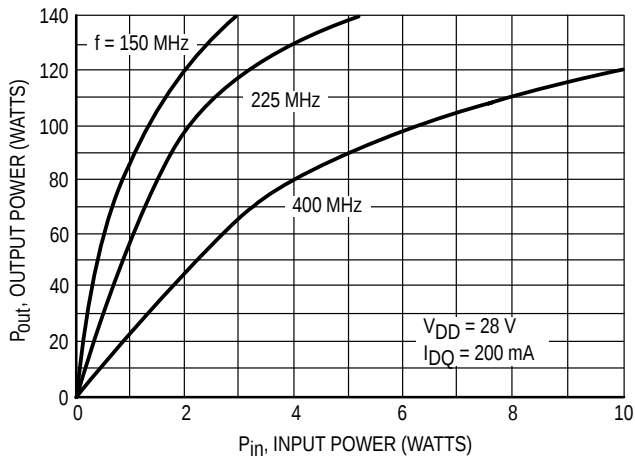


Figure 1. Output Power versus Input Power

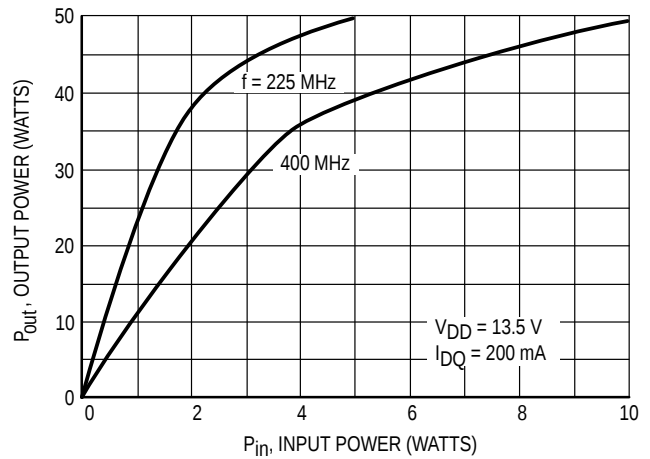


Figure 2. Output Power versus Input Power

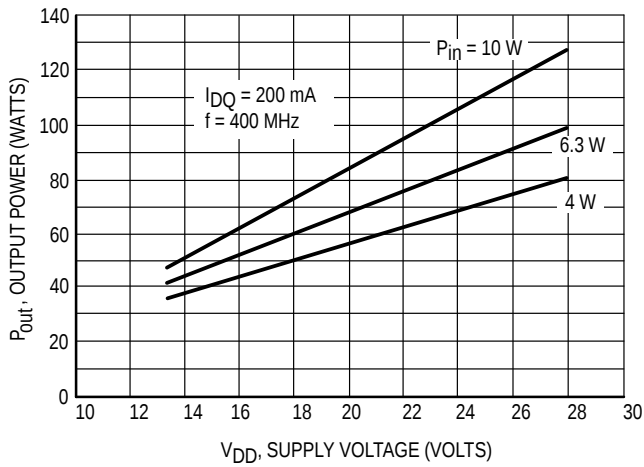


Figure 3. Output Power versus Supply Voltage

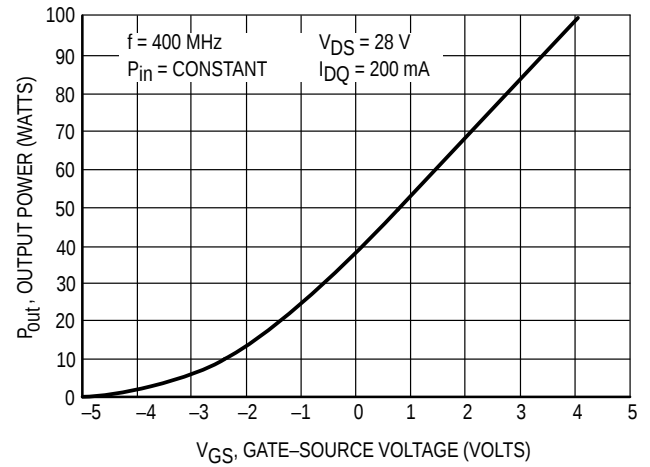


Figure 4. Output Power versus Gate Voltage

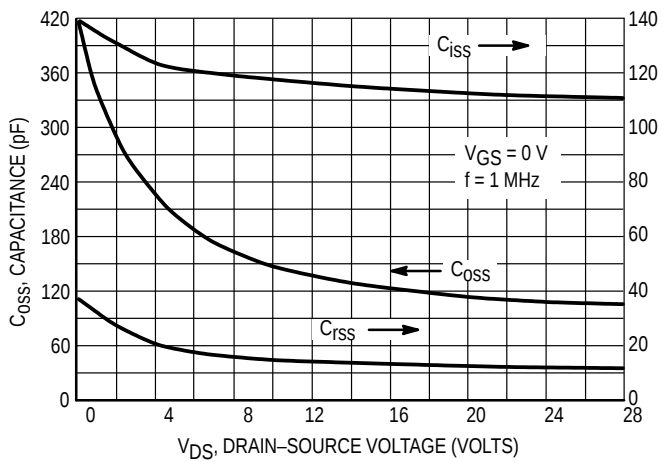


Figure 5. Capacitance versus Drain Voltage

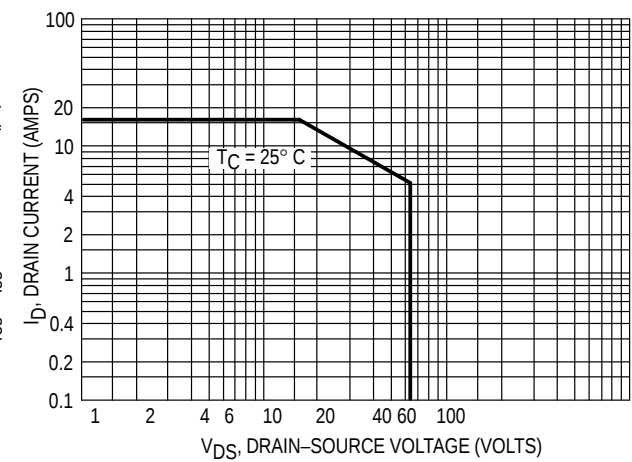
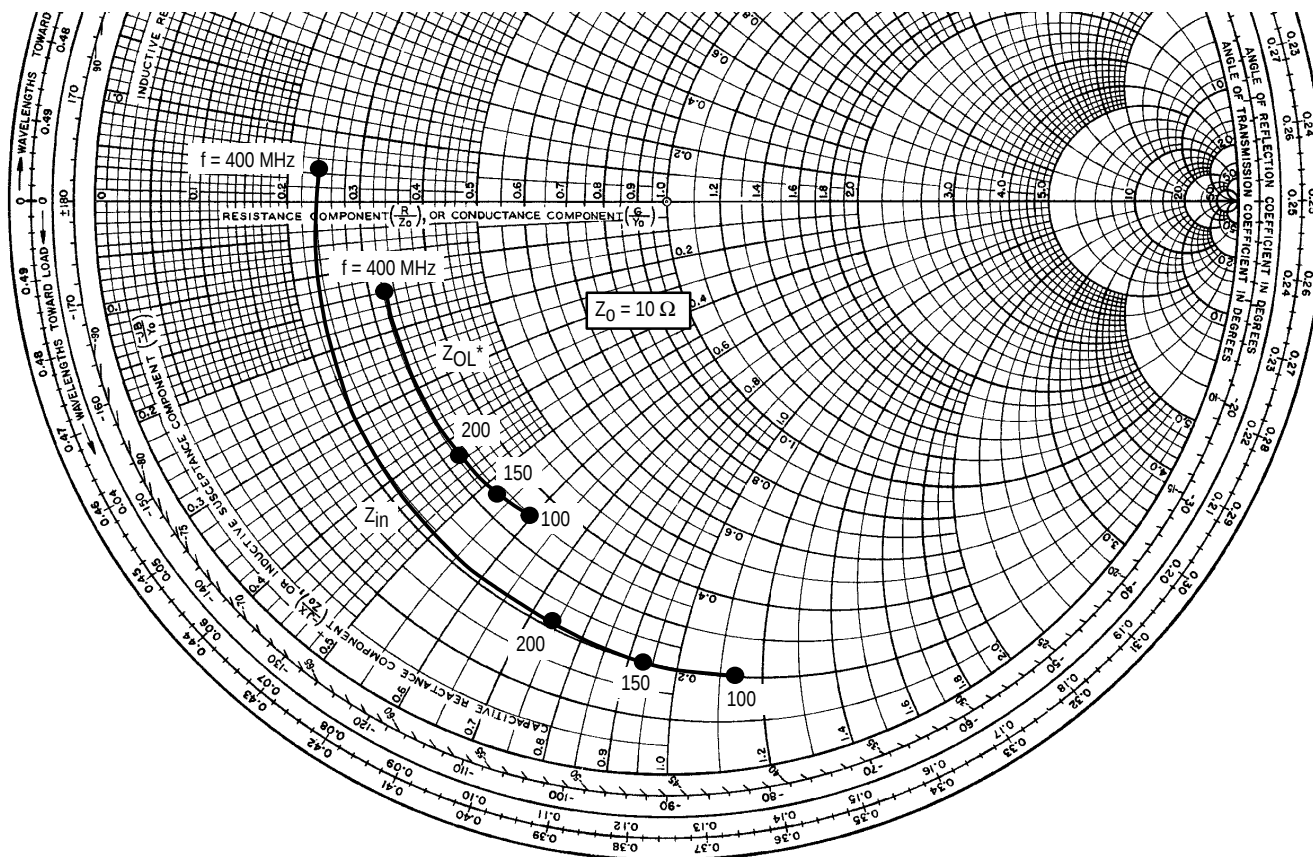


Figure 6. DC Safe Operating Area

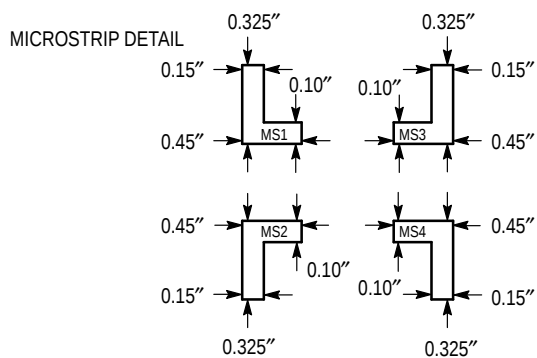
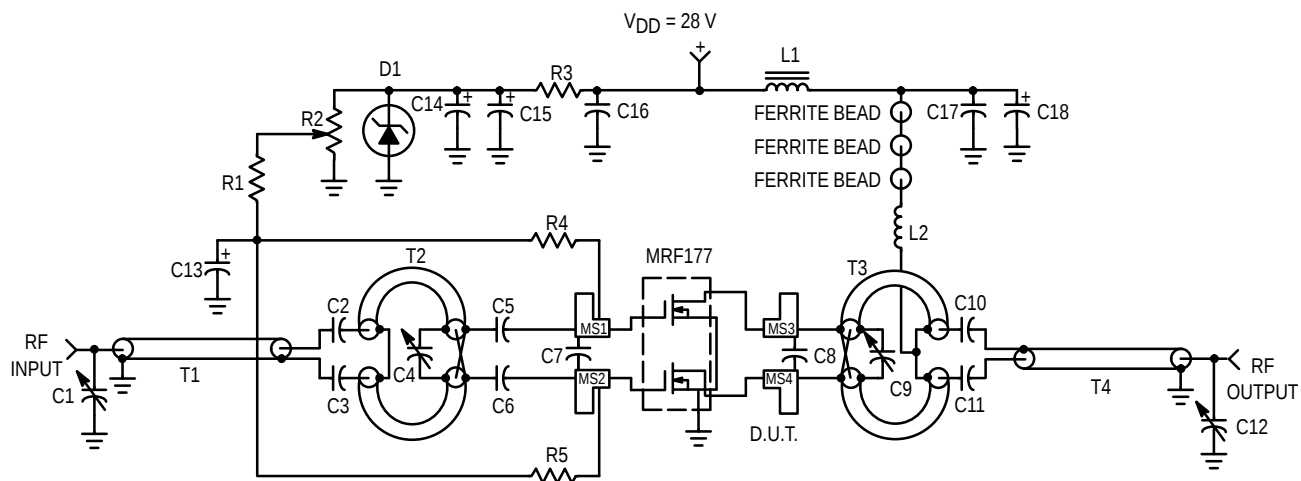


NOTE: Input and Output Impedance values given are measured gate-to-gate and drain-to-drain respectively.

$V_{DD} = 28\text{ V}$ $I_{DQ} = 200\text{ mA}$ $P_{out} = 100\text{ W}$		
f (MHz)	Z_{in} Ohms	Z_{OL}^* Ohms
100	$2.0 - j11.5$	$3.5 - j6$
150	$2.05 - j9.45$	$3.35 - j5.34$
200	$2.1 - j7.5$	$3.3 - j4.4$
400	$2.35 + j0.4$	$3.2 - j1.38$

Z_{OL}^* : Conjugate of optimum load impedance into which the device operates at a given output power, voltage, current and frequency.

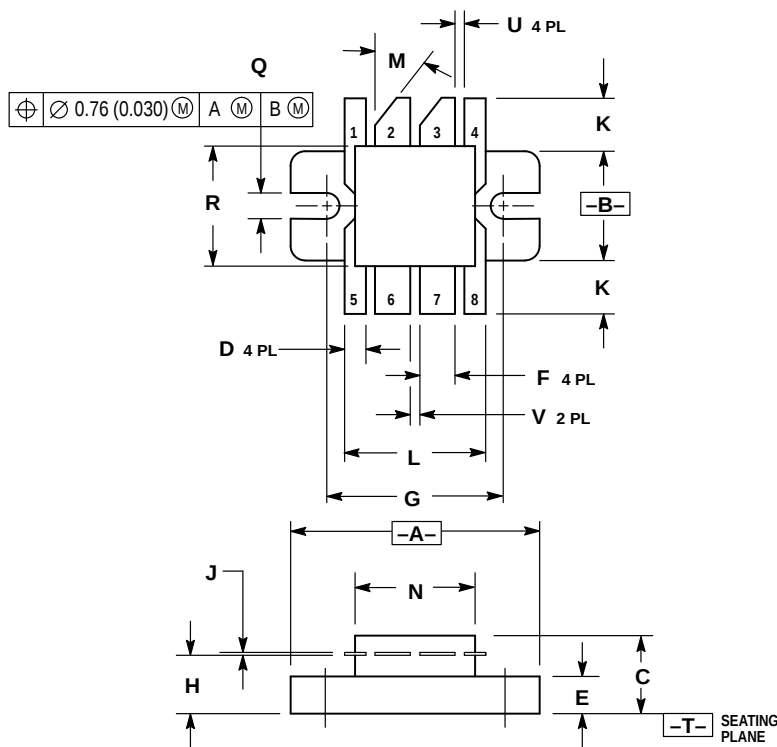
Figure 7. Impedance or Admittance Coordinates



C1, C12	1–10 pF JOHANSON OR EQUIVALENT	D1	1N5347B, 20 Vdc
C2, C3, C5, C6, C10, C11	270 pF ATC 100 MIL CHIP CAP	L1	1–TURN NO. 18, 0.25", 2–HOLE FERRITE BEAD
C4, C9	1–20 pF	L2	8–1/2 TURNS NO. 18, CLOSE WOUND .375" DIA.
C7	36 pF CHIP CAP	R1, R4, R5	10 k Ω @ 1/2 W RESISTOR
C8	10 pF CHIP CAP	R2	10 k Ω , 10 TURN RESISTOR
C13, C14	0.1 μ FD @ 50 Vdc	R3	2.0 k Ω @ 1/2 W RESISTOR
C15, C18	10 μ FD @ 50 Vdc	T1	1–1/2 T, 50 Ω COAX, .034" DIA. ON DUAL 0.5" FERRITE CORE
C16	500 pF BUTTON	T2	2.0" 25 Ω COAX, .075" DIA.
C17	1000 pF UNCASSED MICA	T3	2.1" 10 Ω COAX, .075" DIA.
		T4	4.0" 50 Ω COAX, .0865" DIA.
		BOARD	Dielectric Thickness = 0.060" 2oz Copper, Cu–Clad, Teflon Fiberglass, $\epsilon_r = 2.55$

Figure 8. Test Circuit Electrical Schematic

PACKAGE DIMENSIONS



NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.

DIM	MILLIMETERS		INCHES	
	MIN	MAX	MIN	MAX
A	22.60	23.11	0.890	0.910
B	9.52	10.03	0.375	0.395
C	6.65	7.16	0.262	0.282
D	1.60	1.95	0.063	0.077
E	2.94	3.40	0.116	0.134
F	2.87	3.22	0.113	0.127
G	16.51	BSC	0.650	BSC
H	4.01	4.36	0.158	0.172
J	0.07	0.15	0.003	0.006
K	4.34	4.90	0.171	0.193
L	12.45	12.95	0.490	0.510
M	45°	NOM	45°	NOM
N	1.051	11.02	0.414	0.434
Q	3.04	3.35	0.120	0.132
R	9.90	10.41	0.390	0.410
U	1.02	1.27	0.040	0.050
V	0.64	0.89	0.025	0.035

STYLE 2:
PIN 1. SOURCE (COMMON)
2. DRAIN
3. DRAIN
4. SOURCE (COMMON)
5. SOURCE (COMMON)
6. GATE
7. GATE
8. SOURCE (COMMON)

**CASE 744A-01
ISSUE C**

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