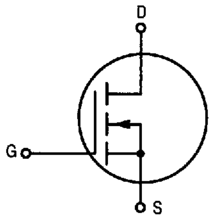
The RF MOSFET Line
RF Power Field Effect Transistors
N-Channel Enhancement Mode MOSFETs

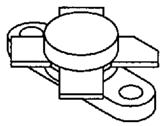
MRF166
MRF166C

20 W, 500 MHz
MOSFET
BROADBAND
RF POWER FETs

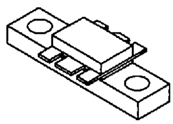
Designed primarily for wideband large-signal output and driver from 30–500 MHz.

- Low C_{rss} — 4.5 pF @ V_{DS} = 28 V
- MRF166C — Typical Performance at 400 MHz, 28 Vdc
  Output Power = 20 W
  Gain = 17 dB
  Efficiency = 55%
- Optional 4-Lead Flange Package (MRF166)
- Replacement for Industry Standards such as MRF136, DV2820, BLF244, SD1902, and ST1001
- 100% Tested for Load Mismatch at all Phase Angles with 30:1 VSWR
- Facilitates Manual Gain Control, ALC and Modulation Techniques
- Excellent Thermal Stability, Ideally Suited for Class A Operation
- Circuit board photomaster available upon request by contacting RF Tactical Marketing in Phoenix, AZ.





CASE 211-07, STYLE 2



CASE 319-07, STYLE 3

MAXIMUM RATINGS

Rating	Symbol	Value	Unit
Drain-Gate Voltage	V_{DSS}	65	Vdc
Drain-Gate Voltage (R_{GS} = 1.0 MΩ)	V_{DGR}	65	Vdc
Gate-Source Voltage	V_{GS}	±40	Adc
Drain Current — Continuous	I_D	4.0	Adc
Total Device Dissipation @ T_C = 25°C Derate Above 25°C	P_D	70 0.4	Watts W/°C
Storage Temperature Range	T_{stg}	−65 to 150	°C
Operating Junction Temperature	T_J	200	°C

THERMAL CHARACTERISTICS

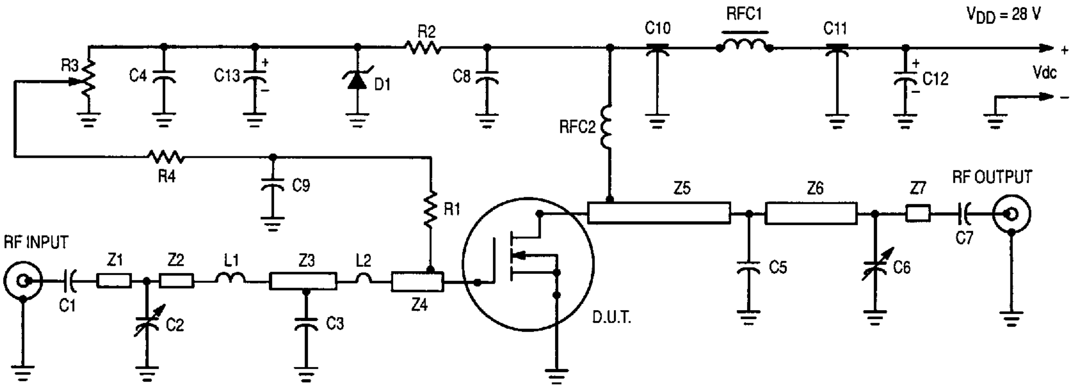
Characteristic	Symbol	Max	Unit
Thermal Resistance, Junction to Case	$R_{\theta JC}$	2.5	°C/W

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

REV 6

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

Characteristic	Symbol	Min	Typ	Max	Unit
OFF CHARACTERISTICS					
Drain-Source Breakdown Voltage (V_{GS} = 0 V, I_D = 5.0 mA)	$V_{(BR)DSS}$	65	—	—	V
Zero Gate Voltage Drain Current (V_{DS} = 28 V, V_{GS} = 0 V)	I_{DSS}	—	—	1.0	mA
Gate-Source Leakage Current (V_{GS} = 40 V, V_{DS} = 0 V)	I_{GSS}	—	—	1.0	μA
ON CHARACTERISTICS					
Gate Threshold Voltage (V_{DS} = 10 V, I_D = 25 mA)	$V_{GS(th)}$	1.0	3.0	6.0	V
Forward Transconductance (V_{DS} = 10 V, I_D = 1.5 A)	g_{fs}	600	800	—	mhos
DYNAMIC CHARACTERISTICS					
Input Capacitance (V_{DS} = 28 V, V_{GS} = 0 V, f = 1.0 MHz)	C_{iss}	—	30	—	pF
Output Capacitance (V_{DS} = 28 V, V_{GS} = 0 V, f = 1.0 MHz)	C_{oss}	—	35	—	pF
Reverse Transfer Capacitance (V_{DS} = 28 V, V_{GS} = 0 V, f = 1.0 MHz)	C_{rss}	—	4.5	—	pF
FUNCTIONAL CHARACTERISTICS					
Noise Figure (V_{DD} = 28 V, f = 30 MHz, I_{DQ} = 50 mA)	NF	—	2.5	—	dB
MRF166C					
Common Source Power Gain (V_{DD} = 28 V, P_{out} = 20 W, f = 400 MHz, I_{DQ} = 100 mA)	G_{ps}	14	17	—	dB
Drain Efficiency (V_{DD} = 28 V, P_{out} = 20 W, f = 400 MHz, I_{DQ} = 100 mA)	η	50	55	—	%
Electrical Ruggedness (V_{DD} = 28 V, P_{out} = 20 W, f = 400 MHz, I_{DQ} = 100 mA, Load VSWR 30:1 at All Phase Angles)	ψ	No Degradation in Output Power			
MRF166					
Common Source Power Gain (V_{DD} = 28 V, P_{out} = 20 W, f = 150 MHz, I_{DQ} = 25 mA)	G_{ps}	15	19	—	dB
Drain Efficiency (V_{DD} = 28 V, P_{out} = 20 W, f = 150 MHz, I_{DQ} = 25 mA)	η	55	65	—	%
Electrical Ruggedness (V_{DD} = 28 V, P_{out} = 20 W, f = 150 MHz, I_{DQ} = 25 mA, Load VSWR 30:1 at All Phase Angles)	ψ	No Degradation in Output Power			
Series Equivalent Input Impedance (V_{DD} = 28 V, P_{out} = 20 W, f = 150 MHz, I_{DQ} = 25 mA)	Z_{in}	—	3.99 – j12.2	—	Ohms
Series Equivalent Output Impedance (V_{DD} = 28 V, P_{out} = 20 W, f = 150 MHz, I_{DQ} = 25 mA)	Z_{out}	—	14.15 – j6.51	—	Ohms

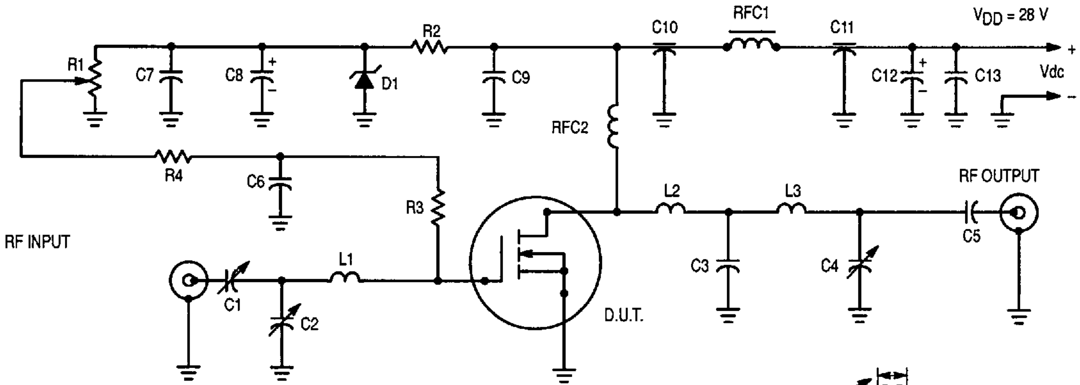


C1, C7 — 270 pF Chip Capacitor
C2, C6 — Johanson Trimmer Capacitor, 2–20 pF
C3 — 21 pF Mini Unelco
C4, C8, C9 — 0.01 μF
C5 — 18 pF Mini Unelco
C10, C11 — 680 pF Feed Through
C12, C13 — 50 μF, 50 V
D1 — 1N5925A Motorola Zener

Board Material — Teflon fiberglass
2 oz. Copper clad both sides, ε_r = 2.55
0.060″ Dielectric Thickness

L1 — #18 AWG, 2 Turns, 0.25″ ID 0.15″ Wide
L2 — #18 AWG Hairpin 0.7″ long, bend into hairpin
RFC1 — Ferroxcube VK200-19/4B
RFC2 — 18 Turns #18 AWG Enameled, 0.3″ ID
R1 — 220 Ω 1/2 Watt
R2 — 1.8 kΩ 1/4 Watt
R3 — 10 kΩ, 10 Turns Bourns
R4 — 10 k 1/4 Watt
Z1 — Microstrip Line 0.150″ wide, 0.420″ long
Z2 — Microstrip Line 0.150″ wide, 0.350″ long
Z3 — Microstrip Line 0.150″ wide, 0.350″ long
Z4 — Microstrip Line 0.150″ wide, 0.450″ long
Z5 — Microstrip Line 0.150″ wide, 1.1″ long
Z6 — Microstrip Line 0.150″ wide, 0.650″ long
Z7 — Microstrip Line 0.150″ wide, 0.200″ long

Figure 1. MRF166C 400 MHz Test Circuit



C1, C2 — 406 ARCO
C3 — 39 pF ATC 100 Mil Chip Cap
C4 — 403 ARCO
C5 — 470 pF ATC 100 Mil Chip Cap
C6, C7, C9, C13 — 0.01 μF
C8, C12 — 50 μF, 50 V
C10, C11 — 680 pF Feed Through
D1 — 1N5925A Motorola Zener

L1 — #20 AWG 2 Turns, 0.235″ ID, 0.10″ OD
L2 — #18 AWG 2 Turns, 0.225″ ID, 0.22″ OD
L3 — #18 AWG 2 Turns, 0.325″ ID, 0.13″ OD
RFC1 — Ferroxcube VK200-19/4B
RFC2 — 18 Turns #18 AWG Enameled, 0.3″ ID
R1 — 10 kΩ, 10 Turn Bourns
R2 — 1.8 kΩ 1/4 Watt
R3 — 120 Ω 1/2 Watt
R4 — 10 kΩ 1/4 Watt
Board Material — 0.062″ G10, 2 oz Cu Clad Double Sided

Figure 2. MRF166 150 MHz Test Circuit

TYPICAL CHARACTERISTICS

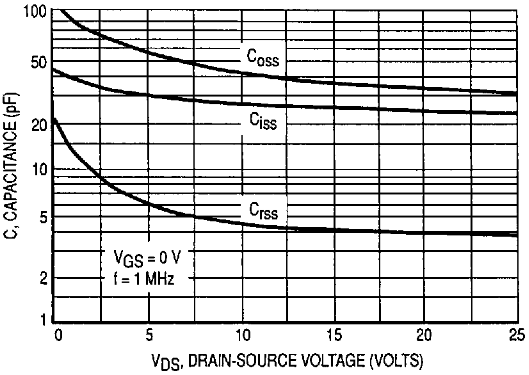


Figure 3. Capacitance versus Drain-Source Voltage

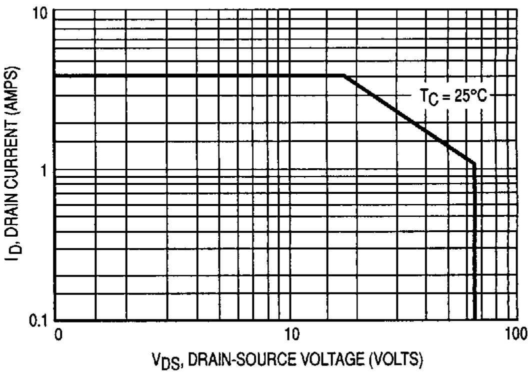


Figure 4. DC Safe Operating Area

MRF166

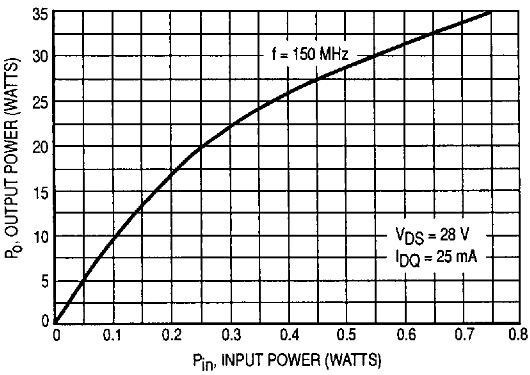


Figure 5. Output Power versus Input Power

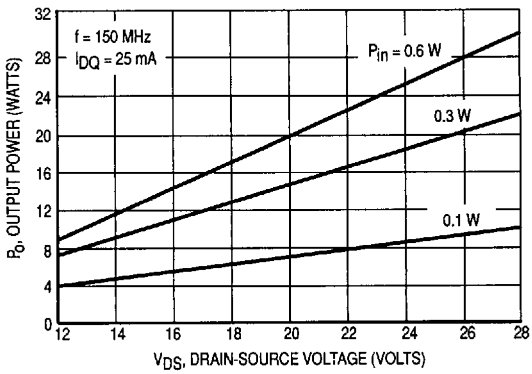


Figure 6. Output Power versus Voltage

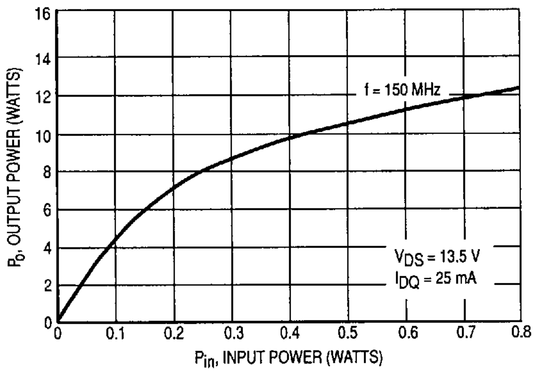


Figure 7. Output Power versus Input Power

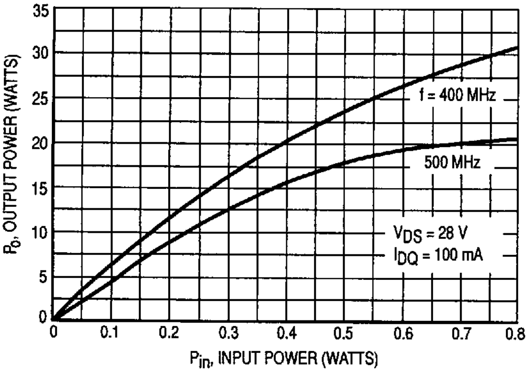


Figure 8. Output Power versus Input Power

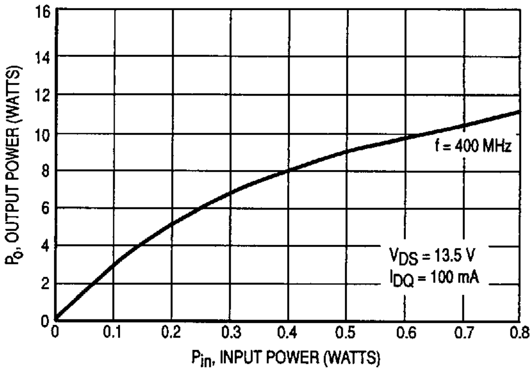


Figure 9. Output Power versus Input Power

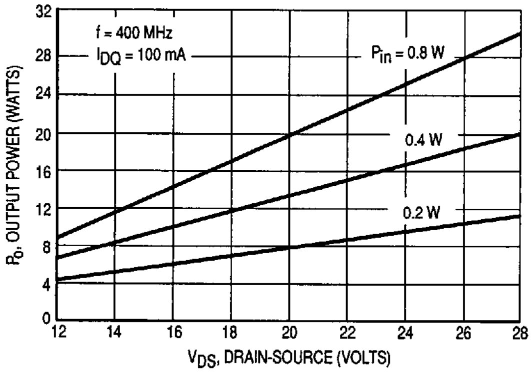
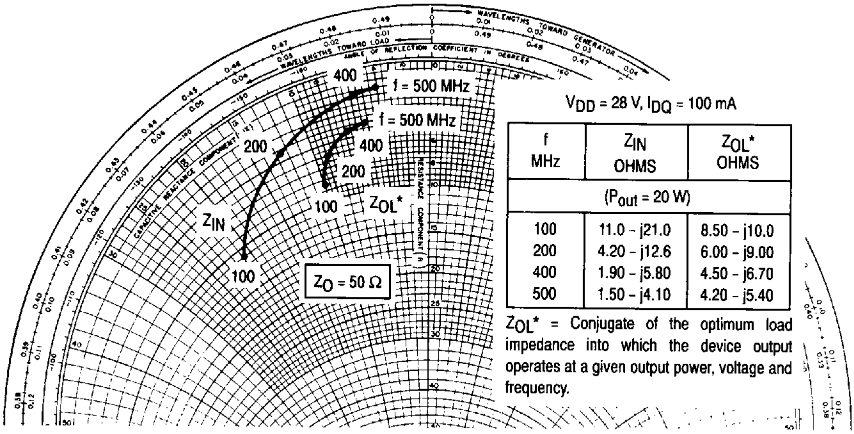


Figure 10. Output Power versus Voltage



V_{DD} = 28 V, I_{DQ} = 100 mA

f MHz	Z_{IN} OHMS	Z_{OL}* OHMS
(P_{out} = 20 W)		
100	11.0 - j21.0	8.50 - j10.0
200	4.20 - j12.6	6.00 - j9.00
400	1.90 - j5.80	4.50 - j6.70
500	1.50 - j4.10	4.20 - j5.40

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

Figure 11. Series Equivalent Input and Output Impedance