

The RF MOSFET Line

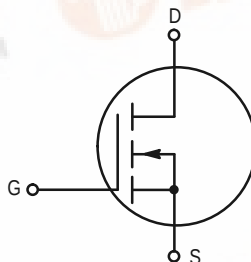
RF Power

Field Effect Transistors

N-Channel Enhancement Mode MOSFETs

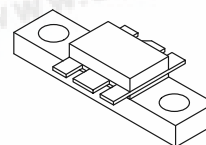
Designed primarily for wideband large-signal output and driver from 30–500 MHz.

- 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%
- 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.



MRF166C

20 W, 500 MHz
MOSFET
BROADBAND
RF POWER FETs



CASE 319-07, STYLE 3

MAXIMUM RATINGS

Rating	Symbol	Value	Unit
Drain–Gate Voltage	V_{DSS}	65	Vdc
Drain–Gate Voltage ($R_{GS} = 1.0$ M Ω)	V_{DGR}	65	Vdc
Gate–Source Voltage	V_{GS}	± 40	Adc
Drain Current — Continuous	I_D	4.0	Adc
Total Device Dissipation @ $T_C = 25^\circ\text{C}$ Derate Above 25°C	P_D	70 0.4	Watts W/ $^\circ\text{C}$
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	$R_{\theta JC}$	2.5	$^\circ\text{C/W}$

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

ON CHARACTERISTICS

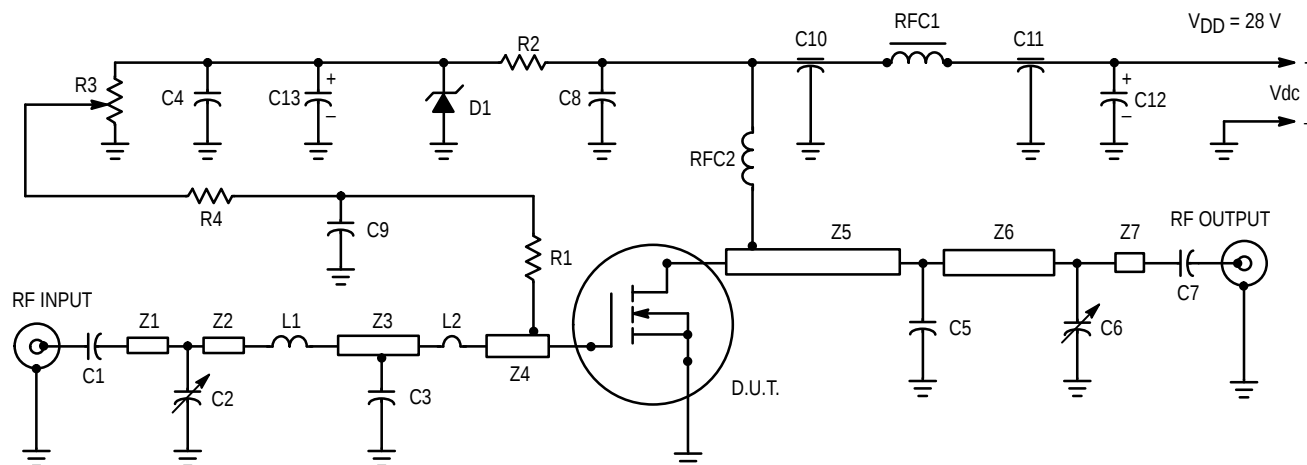
Gate Threshold Voltage ($V_{DS} = 10\text{ V}$, $I_D = 25\text{ mA}$)	$V_{GS(th)}$	1.0	3.0	6.0	V
Forward Transconductance ($V_{DS} = 10\text{ V}$, $I_D = 1.5\text{ A}$)	g_{fs}	600	800	—	mhos

DYNAMIC CHARACTERISTICS

Input Capacitance ($V_{DS} = 28\text{ V}$, $V_{GS} = 0\text{ V}$, $f = 1.0\text{ MHz}$)	C_{iss}	—	30	—	pF
Output Capacitance ($V_{DS} = 28\text{ V}$, $V_{GS} = 0\text{ V}$, $f = 1.0\text{ MHz}$)	C_{oss}	—	35	—	pF
Reverse Transfer Capacitance ($V_{DS} = 28\text{ V}$, $V_{GS} = 0\text{ V}$, $f = 1.0\text{ MHz}$)	C_{rss}	—	4.5	—	pF

FUNCTIONAL CHARACTERISTICS

Noise Figure ($V_{DD} = 28\text{ V}$, $f = 30\text{ MHz}$, $I_{DQ} = 50\text{ mA}$)	NF	—	2.5	—	dB
Common Source Power Gain ($V_{DD} = 28\text{ V}$, $P_{out} = 20\text{ W}$, $f = 400\text{ MHz}$, $I_{DQ} = 100\text{ mA}$)	G_{ps}	14	17	—	dB
Drain Efficiency ($V_{DD} = 28\text{ V}$, $P_{out} = 20\text{ W}$, $f = 400\text{ MHz}$, $I_{DQ} = 100\text{ mA}$)	η	50	55	—	%
Electrical Ruggedness ($V_{DD} = 28\text{ V}$, $P_{out} = 20\text{ W}$, $f = 400\text{ MHz}$, $I_{DQ} = 100\text{ mA}$, Load VSWR 30:1 at All Phase Angles)	ψ	No Degradation in Output Power			



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

Board Material — Teflon fiberglass
 2 oz. Copper clad both sides, $\epsilon_r = 2.55$
 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 k Ω 1/4 Watt
 R3 — 10 k Ω , 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

TYPICAL CHARACTERISTICS

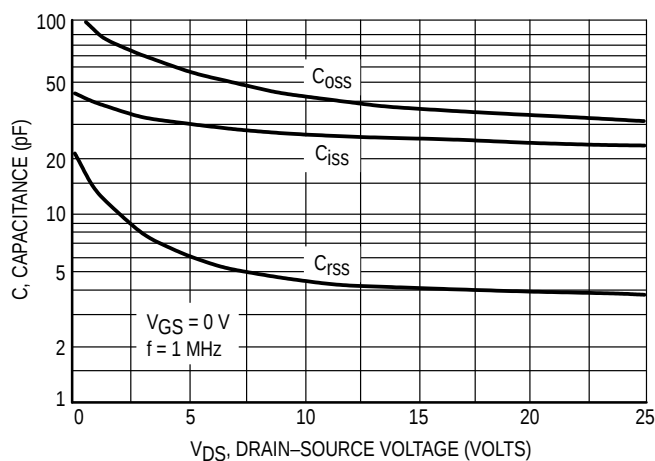


Figure 2. Capacitance versus Drain-Source Voltage

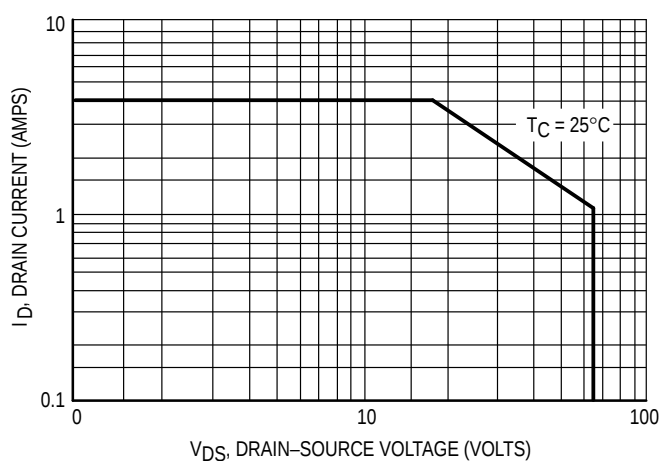


Figure 3. DC Safe Operating Area

TYPICAL CHARACTERISTICS

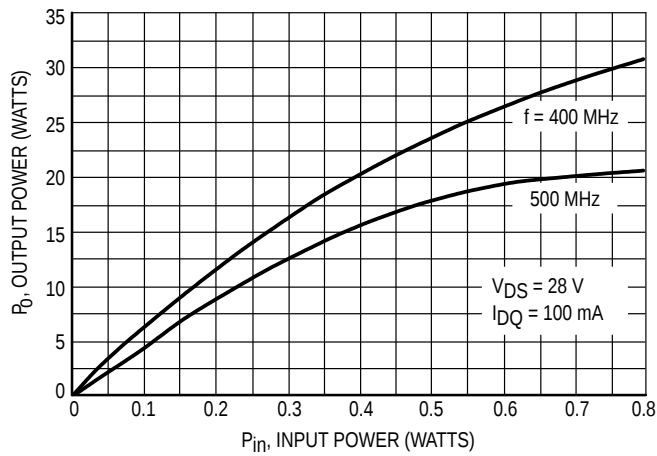


Figure 4. Output Power versus Input Power

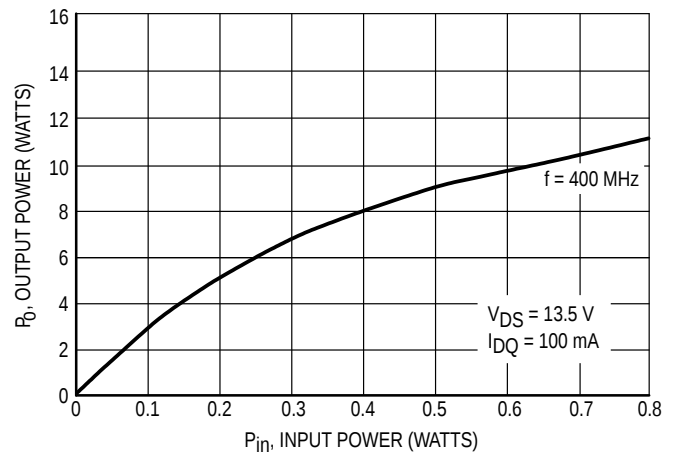


Figure 5. Output Power versus Input Power

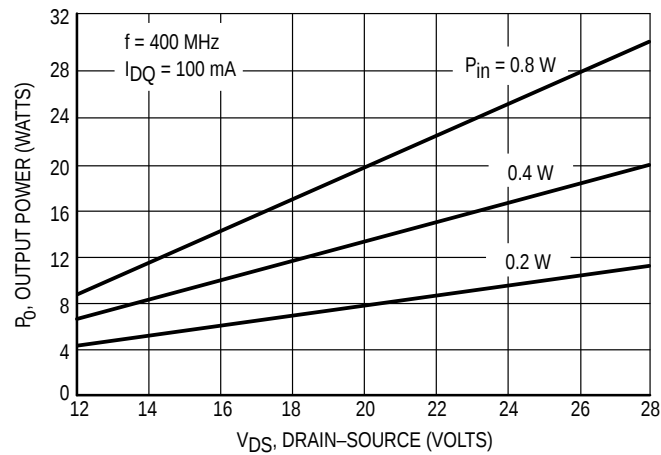


Figure 6. Output Power versus Voltage

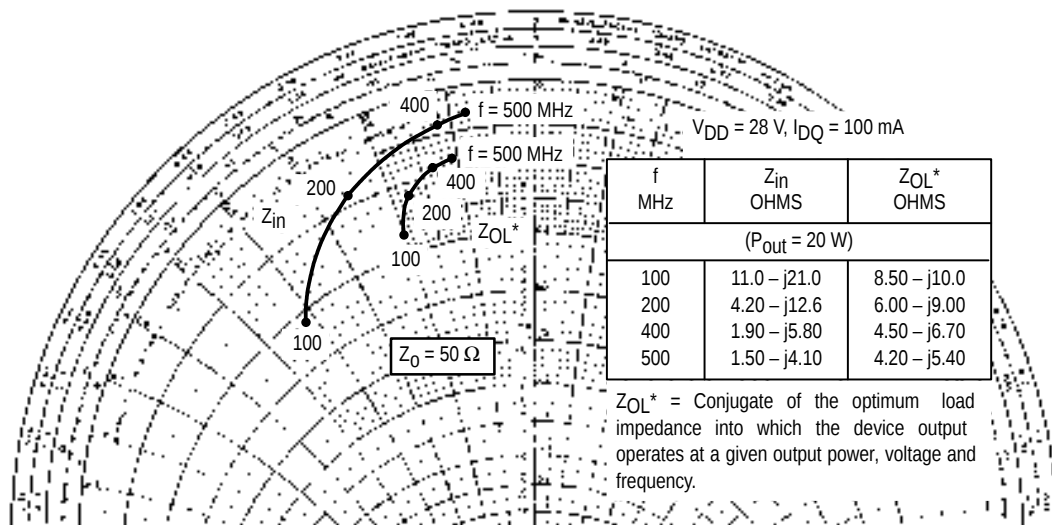
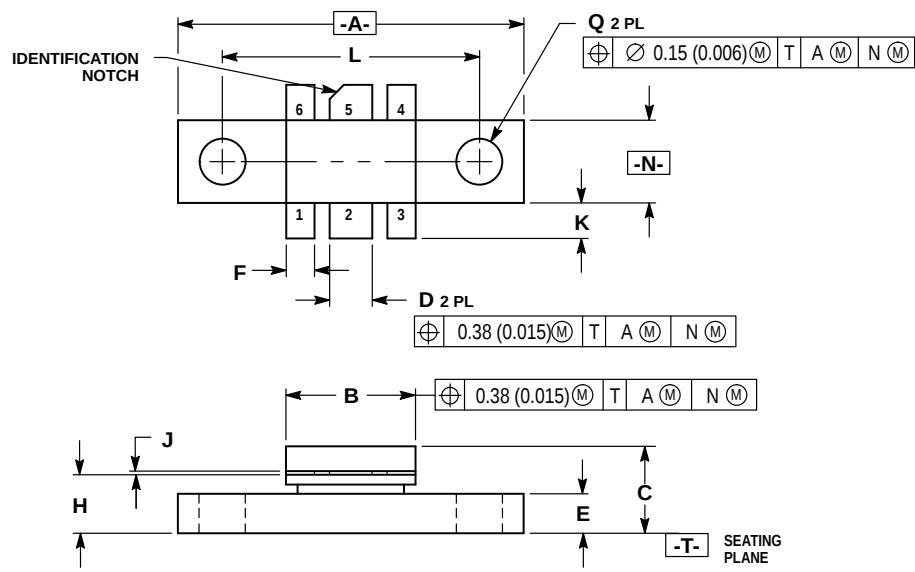


Figure 7. Series Equivalent Input and Output Impedance

PACKAGE DIMENSIONS



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

DIM	INCHES		MILLIMETER	
	MIN	MAX	MIN	MAX
A	0.965	0.985	24.52	25.01
B	0.355	0.375	9.02	9.52
C	0.230	0.260	5.85	6.60
D	0.115	0.125	2.93	3.17
E	0.102	0.114	2.59	2.90
F	0.075	0.085	1.91	2.15
H	0.160	0.170	4.07	4.31
J	0.004	0.006	0.11	0.15
K	0.090	0.110	2.29	2.79
L	0.725 BSC		18.42 BSC	
N	0.225	0.241	5.72	6.12
Q	0.125	0.135	3.18	3.42

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

CASE 319-07
ISSUE M

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