

The RF MOSFET Line

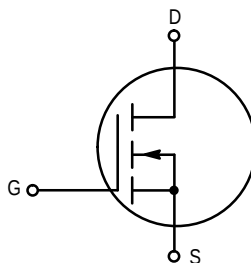
RF Power

Field Effect Transistors

N-Channel Enhancement Mode MOSFETs

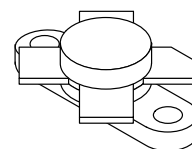
Designed primarily for wideband large-signal output and driver from 30–500 MHz.

- 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%
- 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.

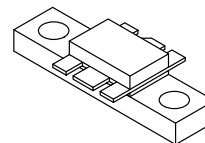


MRF166
MRF166C

20 W, 500 MHz
MOSFET
BROADBAND
RF POWER FETs



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 ($R_{GS} = 1.0$ 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	$^\circ\text{C}$

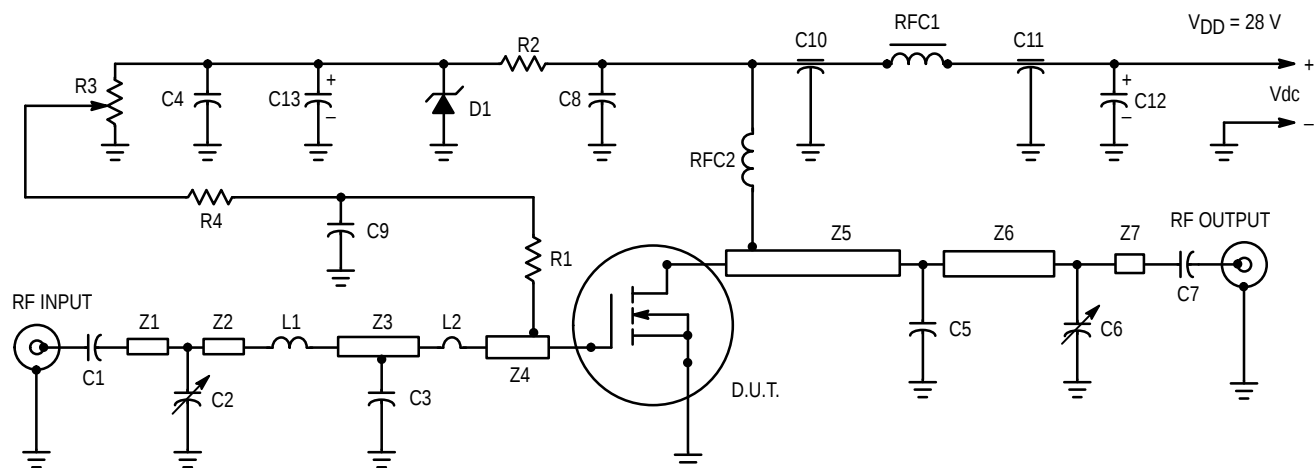
THERMAL CHARACTERISTICS

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

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
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
MRF166C					
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			
MRF166					
Common Source Power Gain ($V_{DD} = 28\text{ V}$, $P_{out} = 20\text{ W}$, $f = 150\text{ MHz}$, $I_{DQ} = 25\text{ mA}$)	G_{ps}	15	19	—	dB
Drain Efficiency ($V_{DD} = 28\text{ V}$, $P_{out} = 20\text{ W}$, $f = 150\text{ MHz}$, $I_{DQ} = 25\text{ mA}$)	η	55	65	—	%
Electrical Ruggedness ($V_{DD} = 28\text{ V}$, $P_{out} = 20\text{ W}$, $f = 150\text{ MHz}$, $I_{DQ} = 25\text{ mA}$, Load VSWR 30:1 at All Phase Angles)	ψ	No Degradation in Output Power			
Series Equivalent Input Impedance ($V_{DD} = 28\text{ V}$, $P_{out} = 20\text{ W}$, $f = 150\text{ MHz}$, $I_{DQ} = 25\text{ mA}$)	Z_{in}	—	3.99 – j12.2	—	Ohms
Series Equivalent Output Impedance ($V_{DD} = 28\text{ V}$, $P_{out} = 20\text{ W}$, $f = 150\text{ MHz}$, $I_{DQ} = 25\text{ mA}$)	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 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

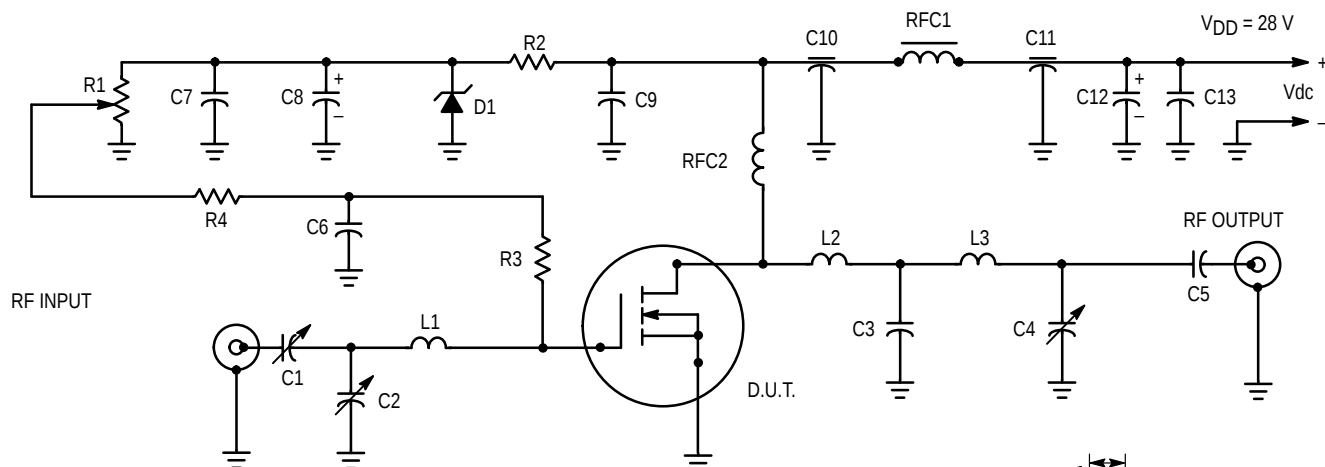
Z4 — Microstrip Line 0.150" wide, 0.450" long

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



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 μ F

C8, C12 — 50 μ F, 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 k Ω , 10 Turn Bourns

R2 — 1.8 k Ω 1/4 Watt

R3 — 120 Ω 1/2 Watt

R4 — 10 k Ω 1/4 Watt

Board Material — 0.062" G10, 2 oz Cu Clad Double Sided

Figure 2. MRF166 150 MHz Test Circuit

TYPICAL CHARACTERISTICS

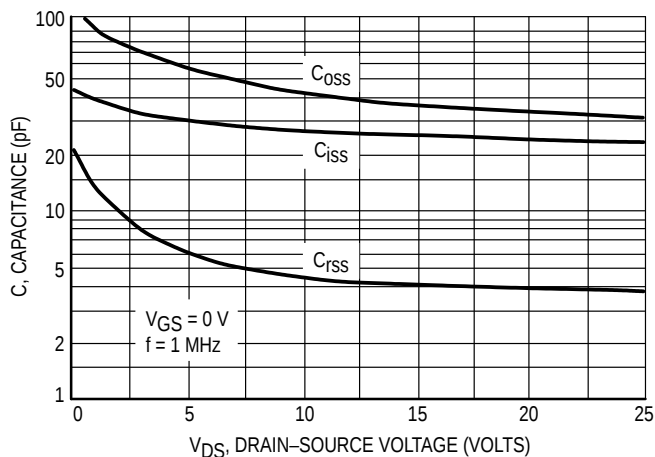


Figure 3. Capacitance versus Drain-Source Voltage

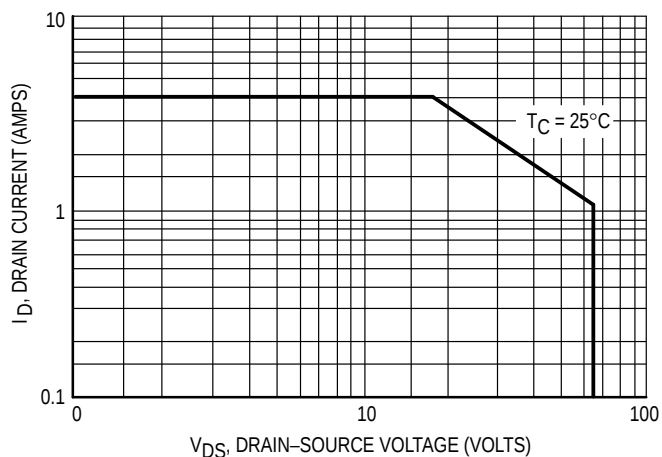


Figure 4. DC Safe Operating Area

MRF166

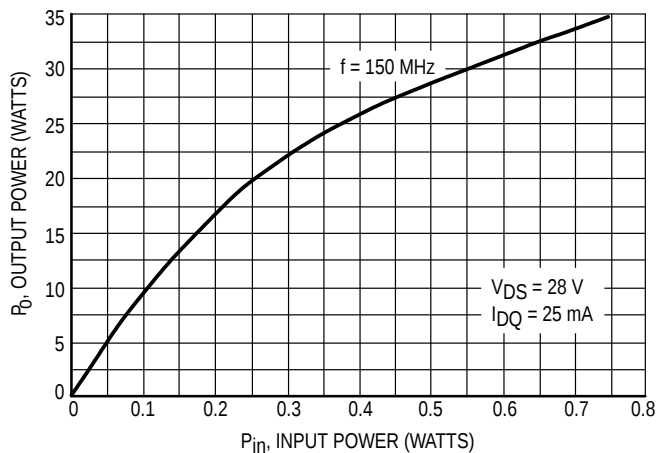


Figure 5. Output Power versus Input Power

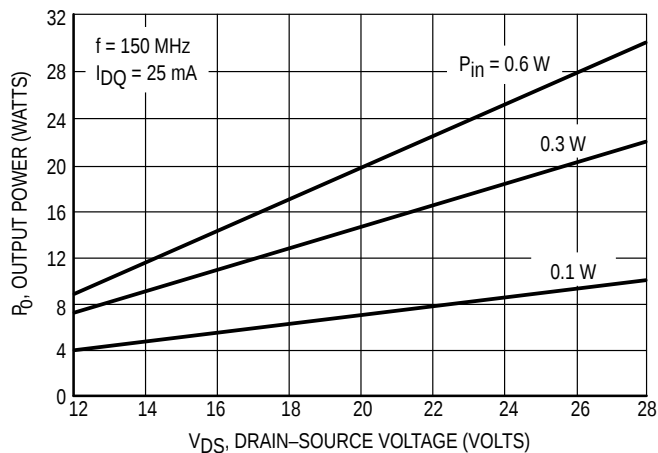


Figure 6. Output Power versus Voltage

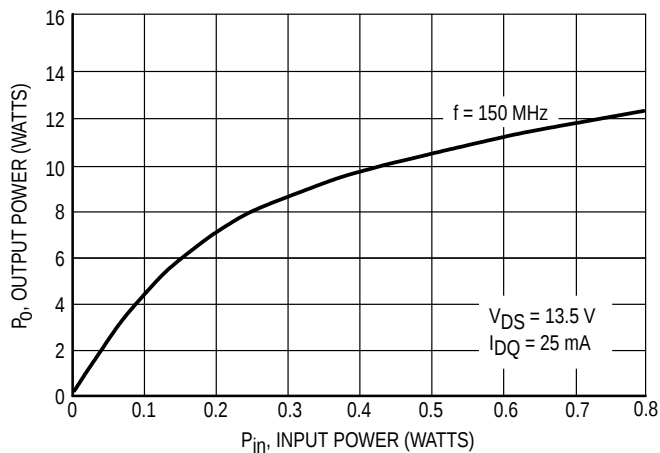


Figure 7. Output Power versus Input Power

MRF166C

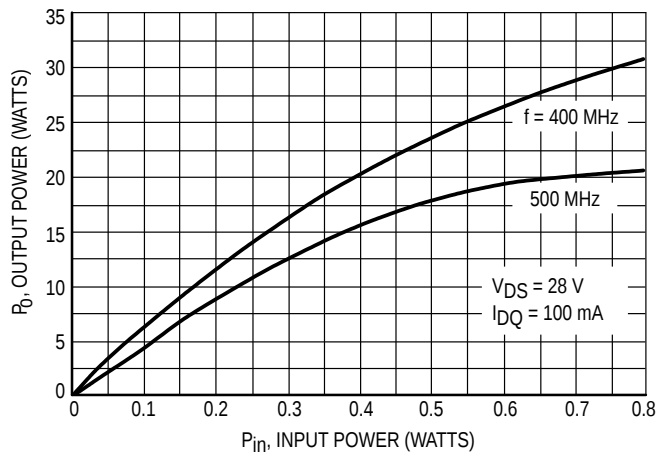


Figure 8. Output Power versus Input Power

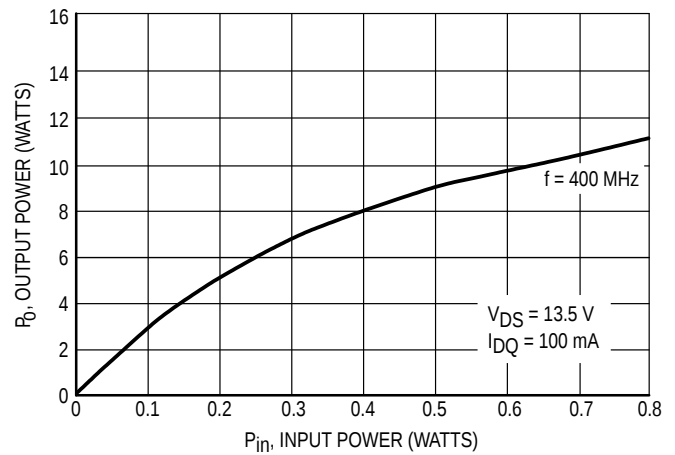


Figure 9. Output Power versus Input Power

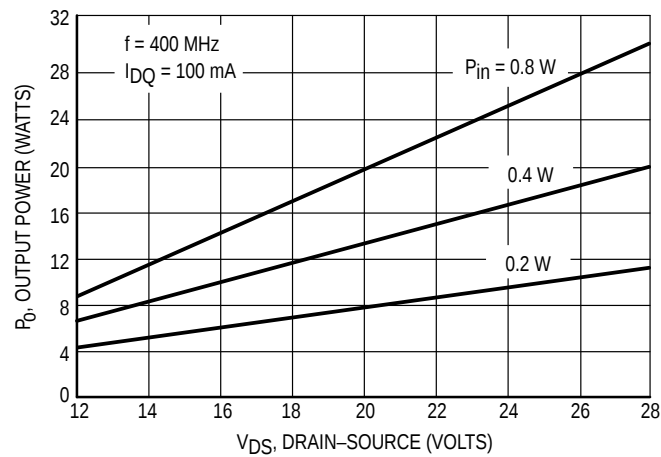


Figure 10. Output Power versus Voltage

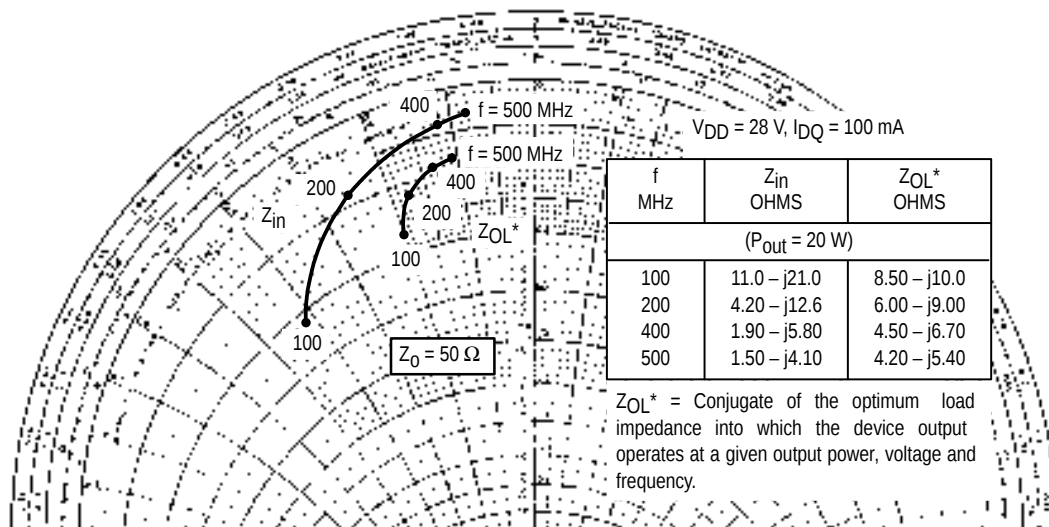
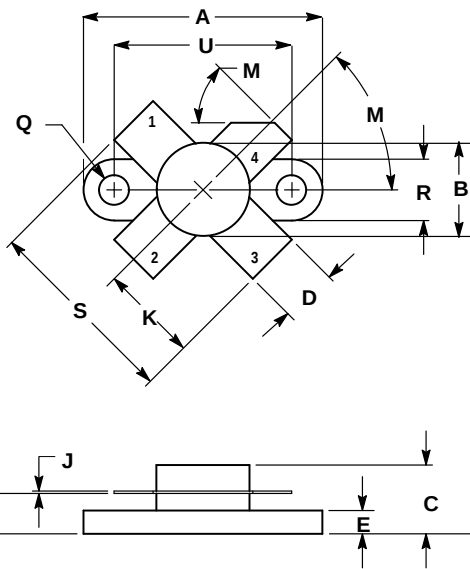


Figure 11. Series Equivalent Input and Output Impedance

PACKAGE DIMENSIONS

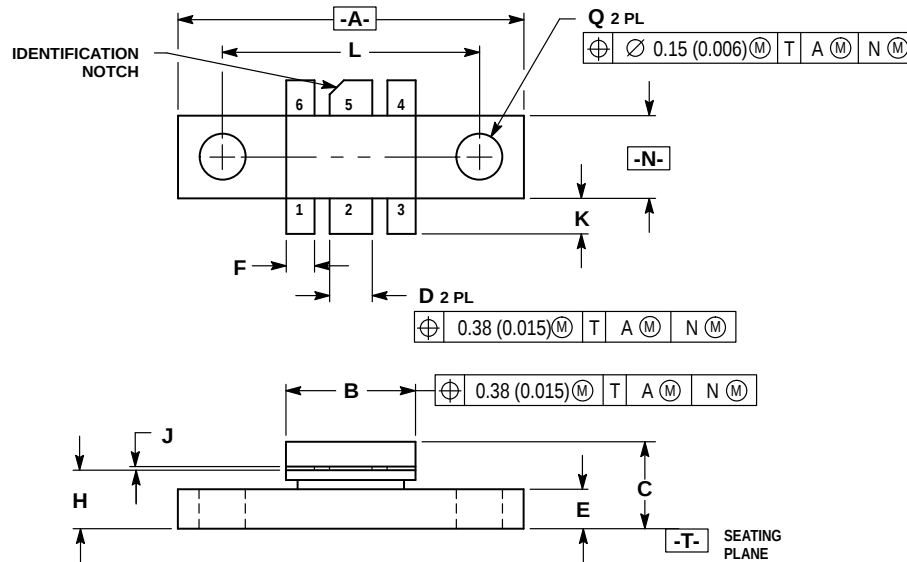


- NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
 2. CONTROLLING DIMENSION: INCH.

DIM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	0.960	0.990	24.39	25.14
B	0.370	0.390	9.40	9.90
C	0.229	0.281	5.82	7.13
D	0.215	0.235	5.47	5.96
E	0.085	0.105	2.16	2.66
H	0.150	0.108	3.81	4.57
J	0.004	0.006	0.11	0.15
K	0.395	0.405	10.04	10.28
M	40°	50°	40°	50°
Q	0.113	0.130	2.88	3.30
R	0.245	0.255	6.23	6.47
S	0.790	0.810	20.07	20.57
U	0.720	0.730	18.29	18.54

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

**CASE 211-07
ISSUE N**



- 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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MRF166/D

