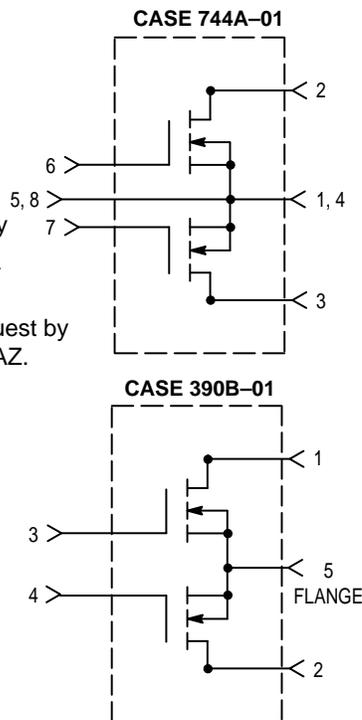


The RF MOSFET Line
RF Power
Field Effect Transistors
N-Channel Enhancement Mode MOSFETs

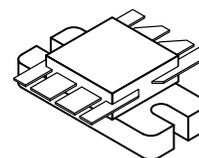
Designed for broadband commercial and military applications up to 400 MHz frequency range. Primarily used as drivers or output amplifiers in push-pull configurations. Can be used in manual gain control, ALC and modulation circuits.

- 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.

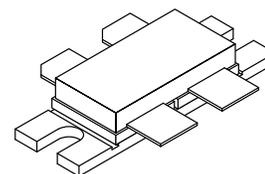


MRF177
MRF177M

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



CASE 744A-01, STYLE 2
MRF177



CASE 390B-01, STYLE 1
MRF177M

MAXIMUM RATINGS

Rating	Symbol	Value	Unit
Drain-Source Voltage	V_{DS}	65	Vdc
Drain-Gate Voltage ($R_{GS} = 1.0 M\Omega$)	V_{DGR}	65	Vdc
Gate-Source Voltage	V_{GS}	± 40	Vdc
Drain Current — Continuous	I_D	16	Adc
Total Device Dissipation @ $T_C = 25^\circ C$ (1) Derate above $25^\circ C$	P_D	270 1.54	Watts W/ $^\circ C$
Storage Temperature Range	T_{stg}	-65 to +150	$^\circ C$
Operating Temperature Range	T_J	200	$^\circ C$

THERMAL CHARACTERISTICS

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

NOTE:

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 (2)	Symbol	Min	Typ	Max	Unit
--------------------	--------	-----	-----	-----	------

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 (2)

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 (2)

Input Capacitance ($V_{DS} = 28$ V, $V_{GS} = 0$, $f = 1.0$ MHz)	C_{iss}	—	110	—	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 (Figures 7 & 8) (4)

Common Source Power Gain (3) ($V_{DD} = 28$ Vdc, $P_{out} = 100$ W, $f = 400$ MHz, $I_{DQ} = 200$ mA)	G_{PS}	10	12	—	dB
Drain Efficiency (3) ($V_{DD} = 28$ Vdc, $P_{out} = 100$ W, $f = 400$ MHz, $I_{DQ} = 200$ mA)	η	55	60	—	%
Electrical Ruggedness (3) ($V_{DD} = 28$ 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			

TYPICAL INPUT/OUTPUT DEVICE IMPEDANCES**MRF177**

Series Equivalent Input Impedance ($V_{DD} = 28$ V, $I_{DQ} = 200$ mA, $P_{out} = 100$ W, $f = 400$ MHz)	Z_{in}	—	$2.35 + j0.4$	—	Ohms
Series Equivalent Output Impedance ($V_{DD} = 28$ V, $I_{DQ} = 200$ mA, $P_{out} = 100$ W, $f = 400$ MHz)	Z_{out}	—	$3.2 - j1.38$	—	Ohms

MRF177M

Series Equivalent Input Impedance ($V_{DD} = 28$ V, $I_{DQ} = 200$ mA, $P_{out} = 100$ W, $f = 400$ MHz)	Z_{in}	—	$2.64 + j1.64$	—	Ohms
Series Equivalent Output Impedance ($V_{DD} = 28$ V, $I_{DQ} = 200$ mA, $P_{out} = 100$ W, $f = 400$ MHz)	Z_{out}	—	$3.15 + j0.05$	—	Ohms

NOTES:

- Note each transistor chip measured separately
- Both transistor chips operating in push–pull amplifier
- RF functional specification is the same for MRF177 & MRF177M

TYPICAL CHARACTERISTICS

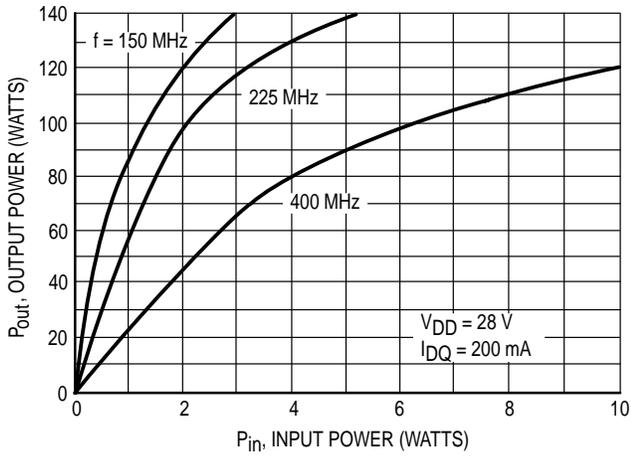


Figure 1. Output Power versus Input Power

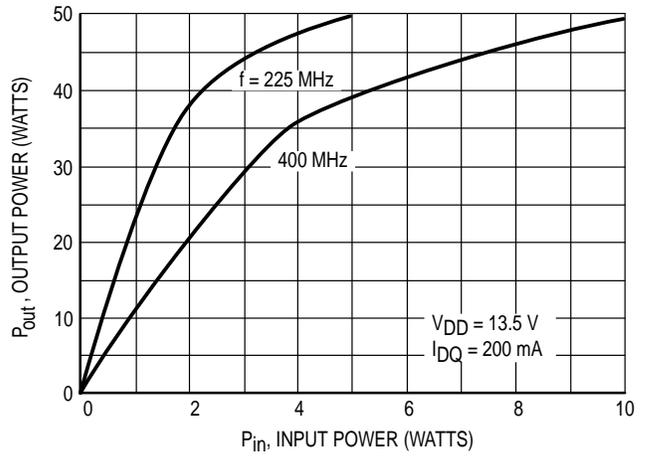


Figure 2. Output Power versus Input Power

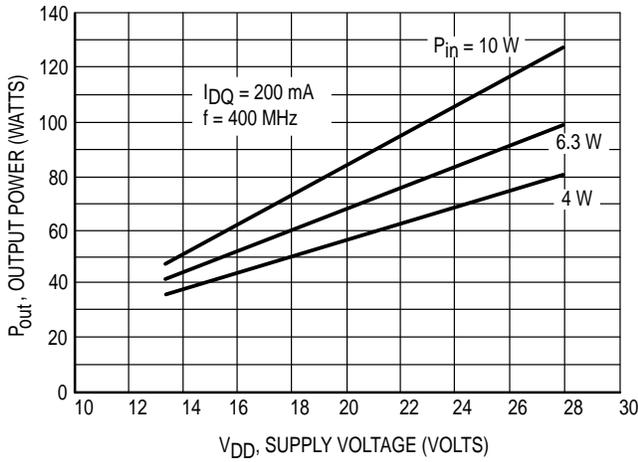


Figure 3. Output Power versus Supply Voltage

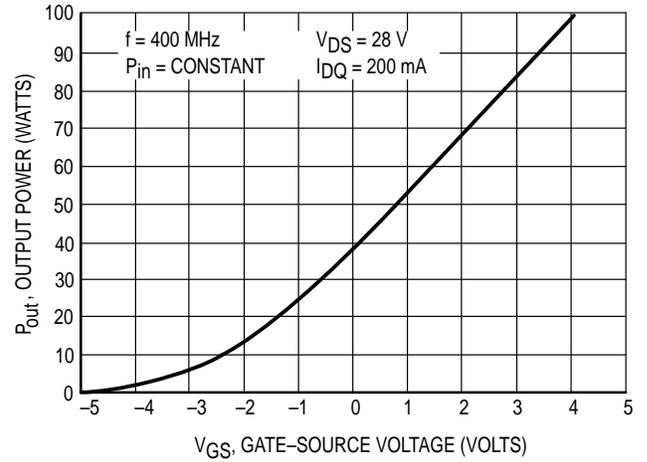


Figure 4. Output Power versus Gate Voltage

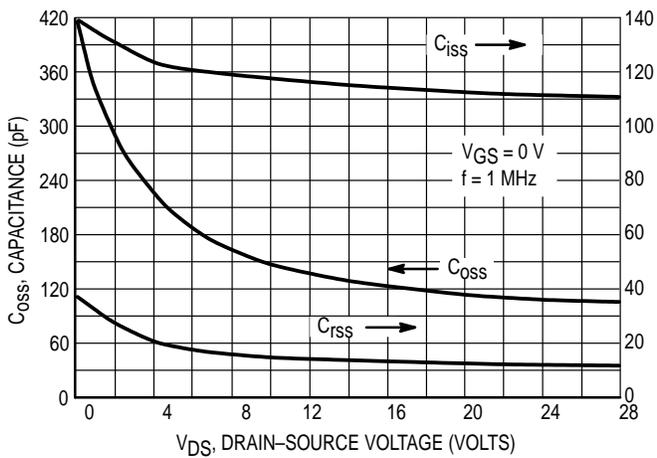


Figure 5. Capacitance versus Drain Voltage

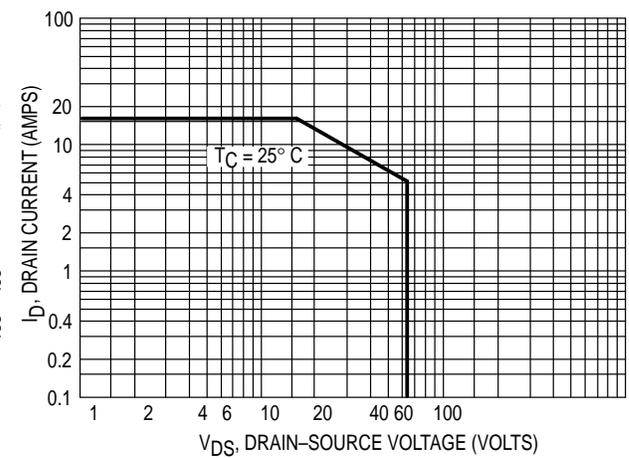
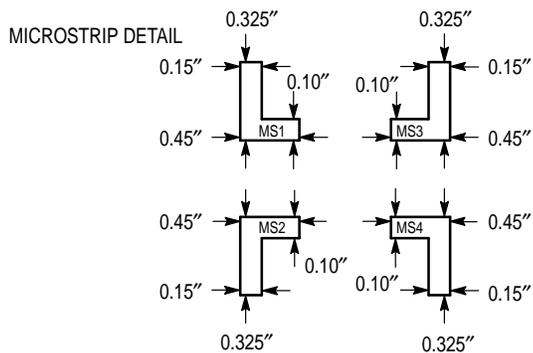
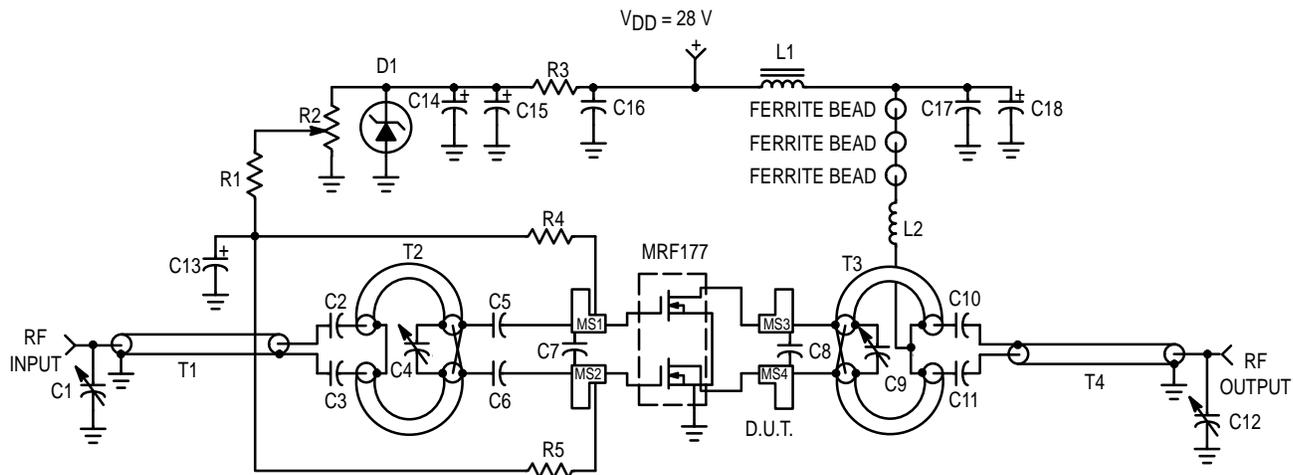


Figure 6. DC Safe Operating Area



- | | | | |
|--------------------------|--------------------------------|------------|---|
| 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 kΩ @ 1/2 W RESISTOR |
| C8 | 10 pF CHIP CAP | R2 | 10 kΩ, 10 TURN RESISTOR |
| C13, C14 | 0.1 μFD @ 50 Vdc | R3 | 2.0 kΩ @ 1/2 W RESISTOR |
| C15, C18 | 10 μFD @ 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 | .0625", Cu-Clad, Teflon Fiberglass, ε _r = 2.55 |

Figure 7. Test Circuit Electrical Schematic — MRF177

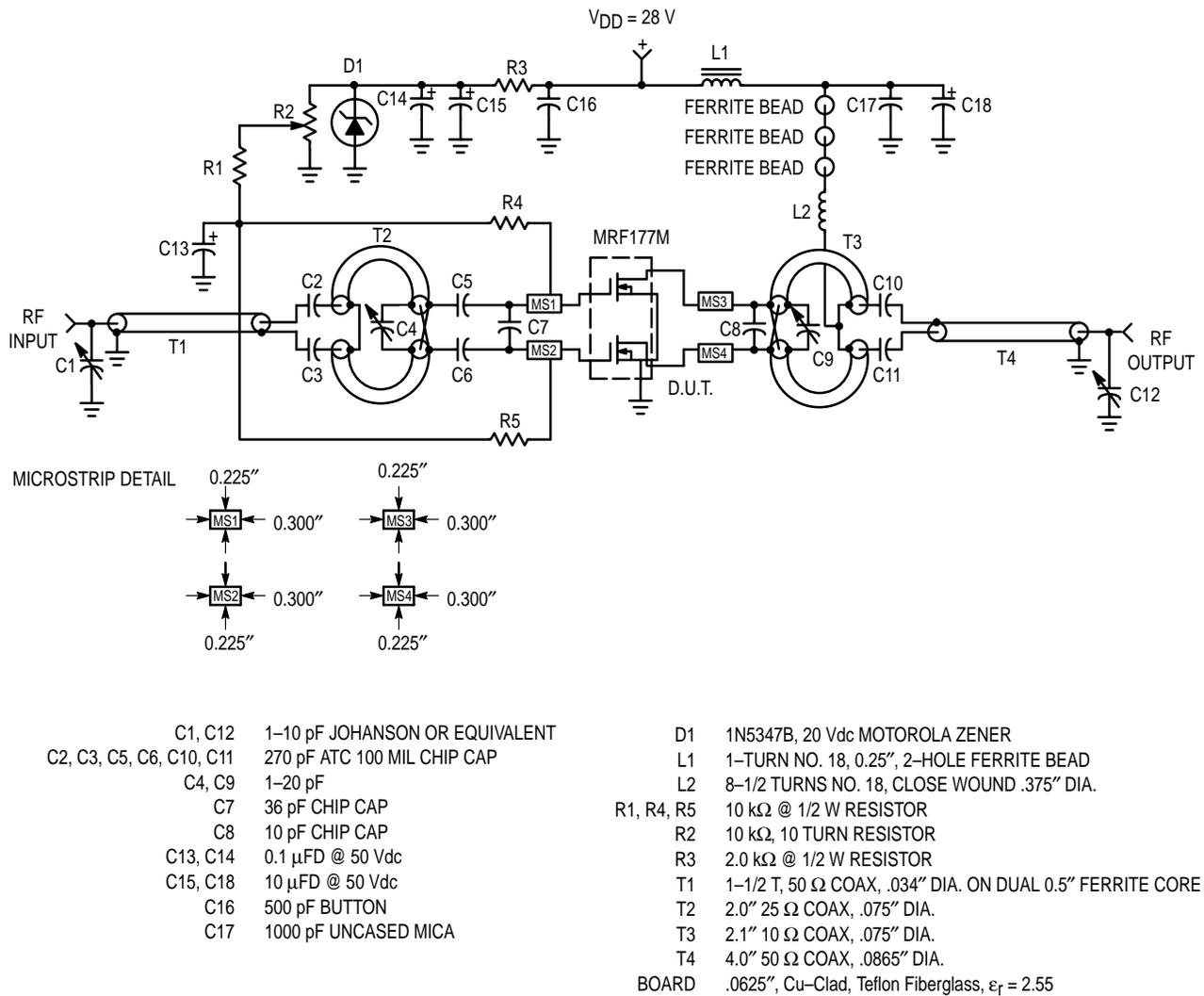
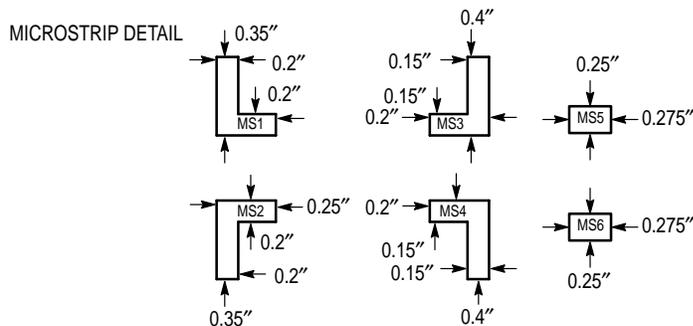
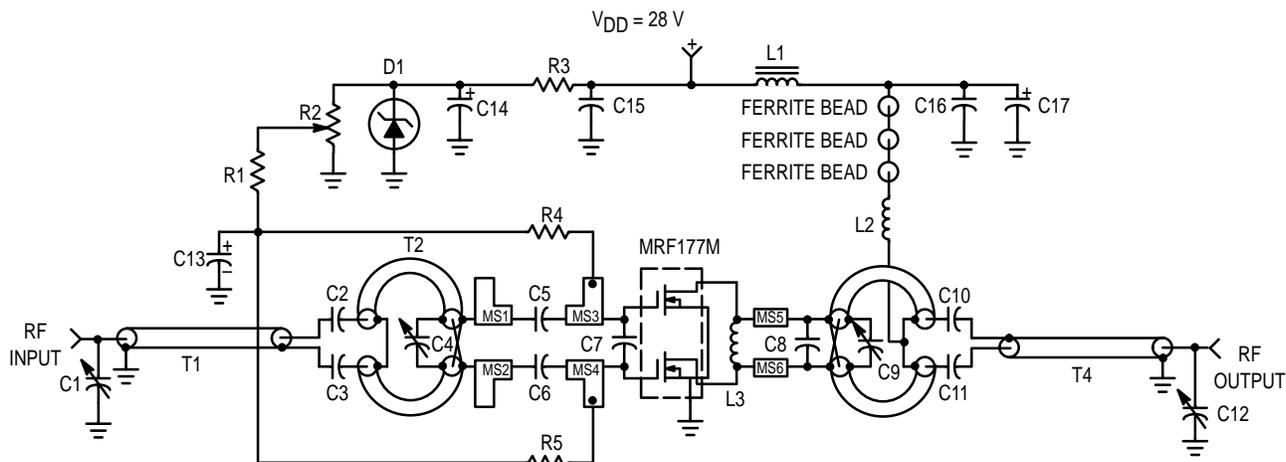


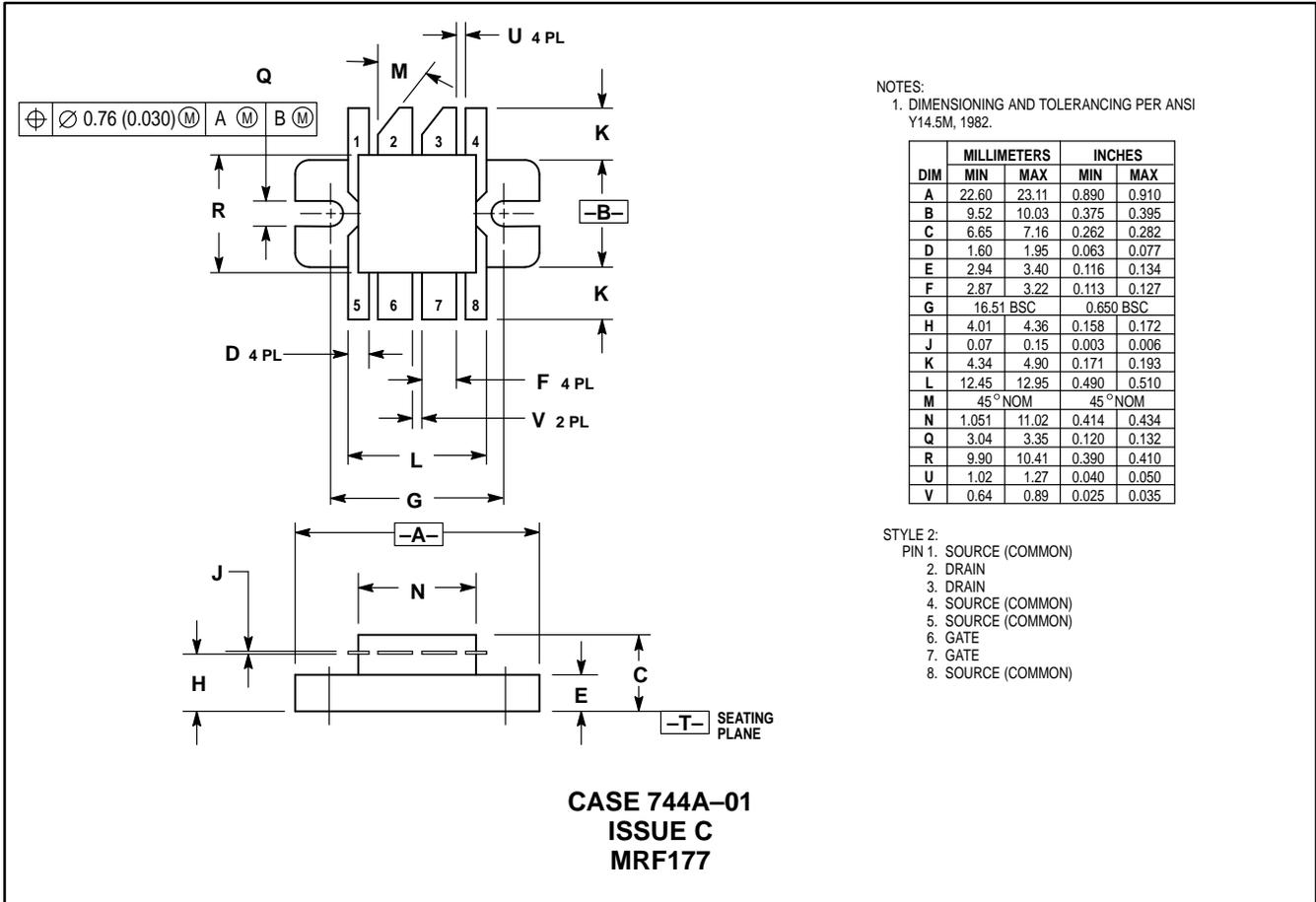
Figure 8. Test Fixture Electrical Schematic — MRF177M



- | | | | |
|--------------------------|--------------------------------|------------|---|
| C1, C12 | 1–10 pF JOHANSON OR EQUIVALENT | D1 | 1N5347B, 20 Vdc MOTOROLA ZENER |
| 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 | 43 pF CHIP CAP | L3 | 4–TURNS NO. 22, 1/8" DIA., .25" LONG |
| C8 | 10 pF CHIP CAP | R1, R4, R5 | 10 k Ω @ 1/2 W RESISTOR |
| C13, C14 | 0.1 μ FD @ 50 Vdc | R2 | 10 k Ω , 10 TURN RESISTOR |
| C15 | 500 pF BUTTON | R3 | 2.0 k Ω @ 1/2 W RESISTOR |
| C16 | 1000 pF UNCASSED MICA | T1 | 1–1/2 T, 50 Ω COAX, .034" DIA. ON DUAL 0.5" FERRITE CORE |
| C17 | 10 μ FD @ 50 Vdc | T2 | 2.0" 25 Ω COAX, .075" DIA. |
| | | T3 | 2.1" 10 Ω COAX, .075" DIA. |
| | | T4 | 4.0" 50 Ω COAX, .0865" DIA. |
| | | BOARD | .0625", Cu–Clad, Teflon Fiberglass, $\epsilon_r = 2.55$ |

Figure 9. Broadband Amplifier Schematic — MRF177M

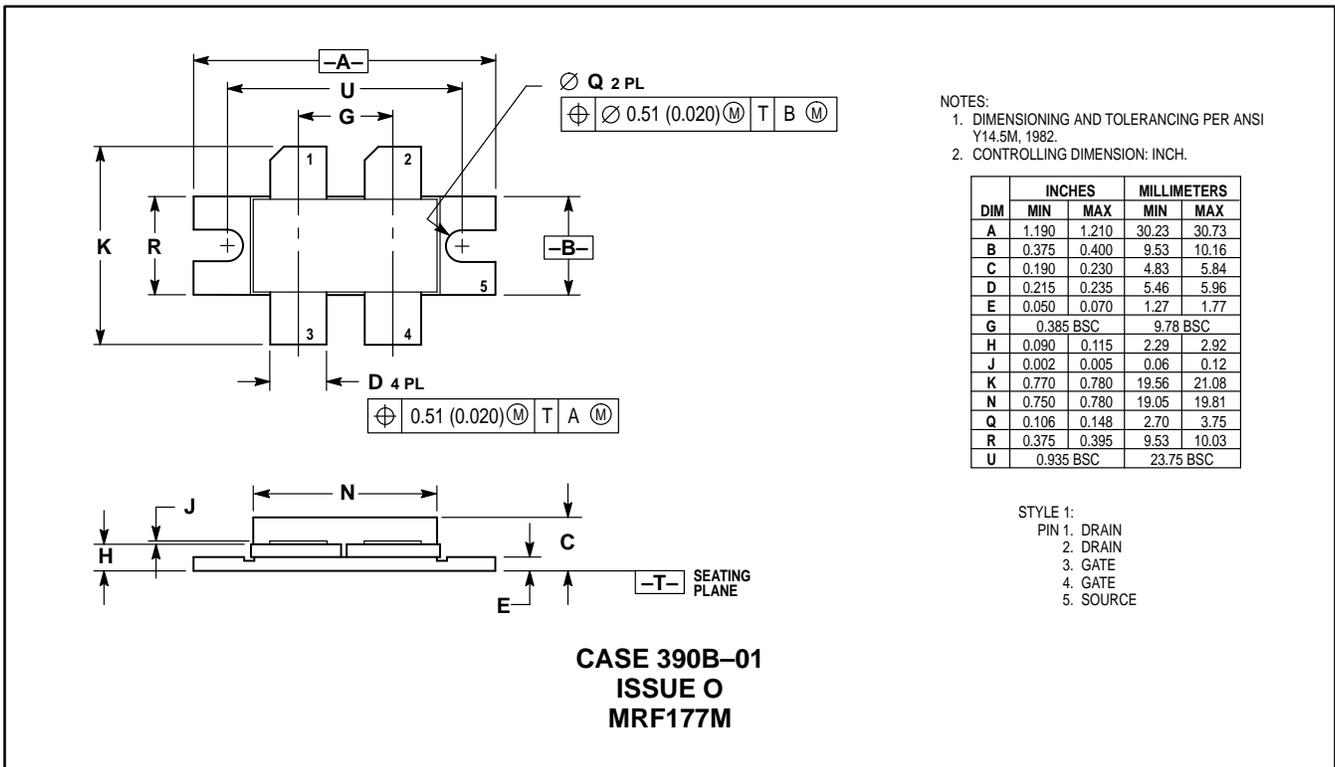
PACKAGE DIMENSIONS



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)



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

DIM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	1.190	1.210	30.23	30.73
B	0.375	0.400	9.53	10.16
C	0.190	0.230	4.83	5.84
D	0.215	0.235	5.46	5.96
E	0.050	0.070	1.27	1.77
G	0.385 BSC		9.78 BSC	
H	0.090	0.115	2.29	2.92
J	0.002	0.005	0.06	0.12
K	0.770	0.780	19.56	21.08
N	0.750	0.780	19.05	19.81
Q	0.106	0.148	2.70	3.75
R	0.375	0.395	9.53	10.03
U	0.935 BSC		23.75 BSC	

STYLE 1:
PIN 1: DRAIN
2: DRAIN
3: GATE
4: GATE
5: SOURCE

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MRF177/D

