The RF MOSFET Line

RF Power Field Effect Transistors

N–Channel Enhancement Mode MOSFETs

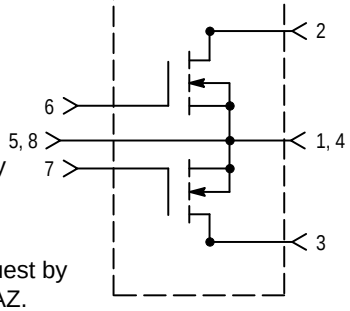
MRF177
MRF177M

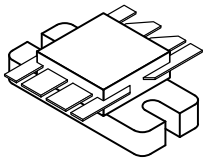
100 W, 28 V, 400 MHz
N–CHANNEL
BROADBAND
RF POWER MOSFETs

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.

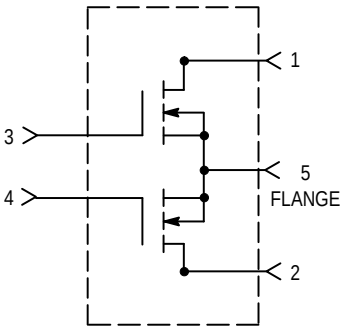
CASE 744A–01

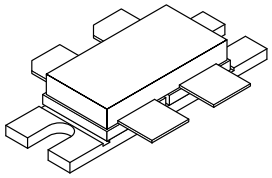




CASE 744A–01, STYLE 2
MRF177

CASE 390B–01





CASE 390B–01, STYLE 1
MRF177M

MAXIMUM RATINGS

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

THERMAL CHARACTERISTICS

Characteristic	Symbol	Max	Unit
Thermal Resistance, Junction–to–Case	$R_{\theta JC}$	0.65	°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°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:
1. Note each transistor chip measured separately
2. Both transistor chips operating in push–pull amplifier
3. RF functional specification is the same for MRF177 & MRF177M

TYPICAL CHARACTERISTICS

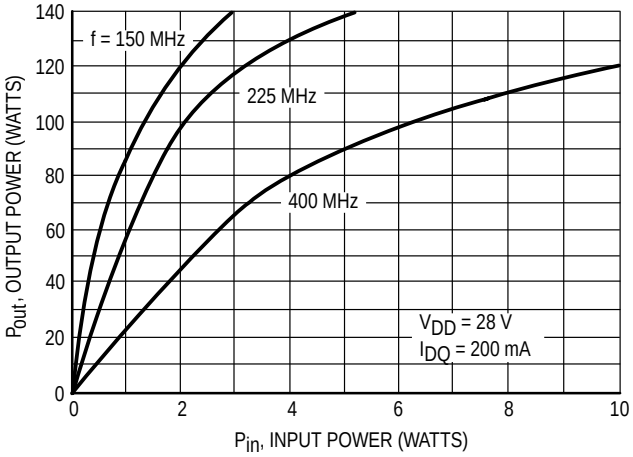


Figure 1. Output Power versus Input Power

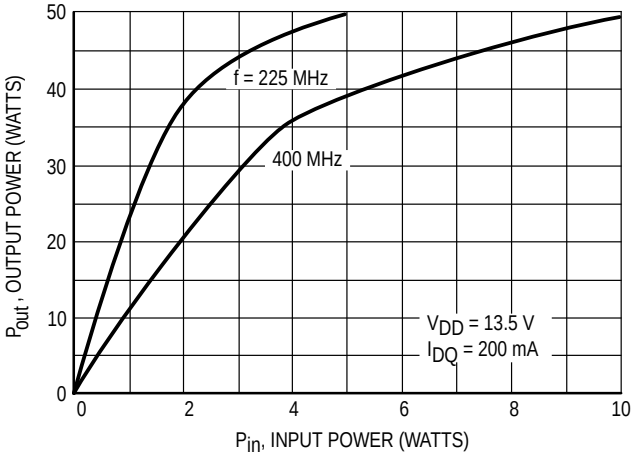


Figure 2. Output Power versus Input Power

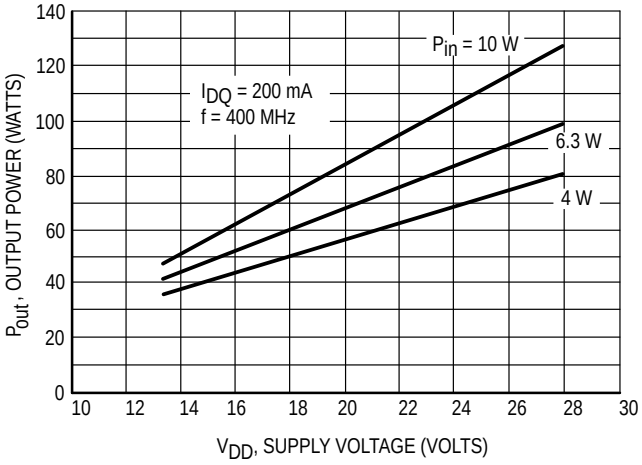


Figure 3. Output Power versus Supply Voltage

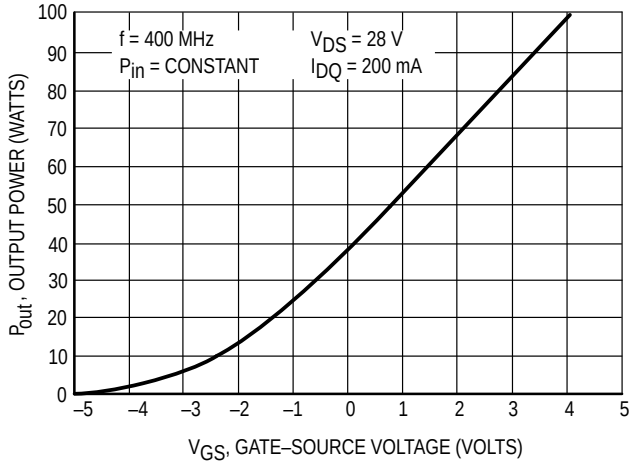


Figure 4. Output Power versus Gate Voltage

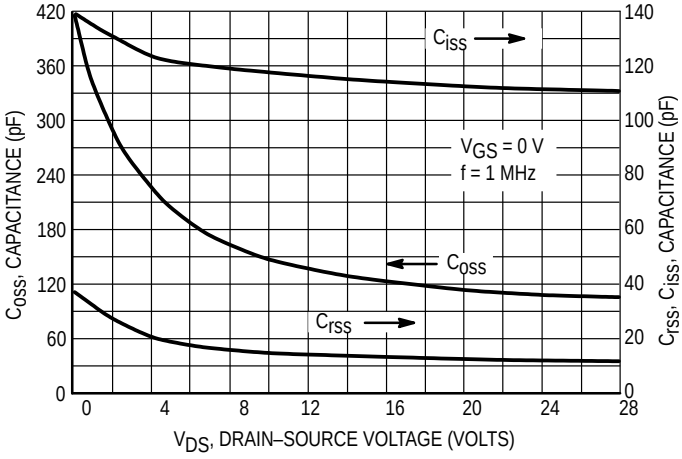


Figure 5. Capacitance versus Drain Voltage

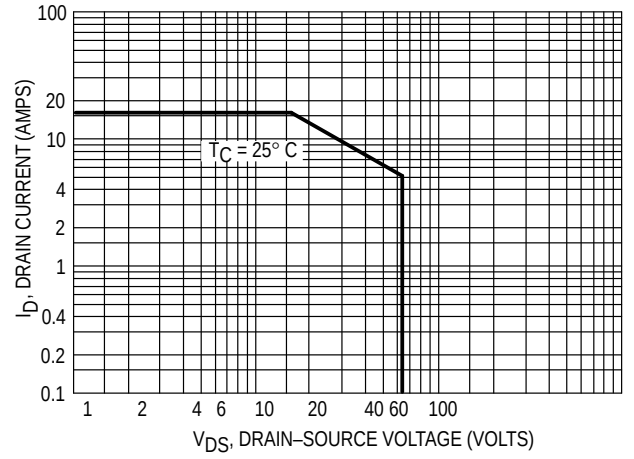
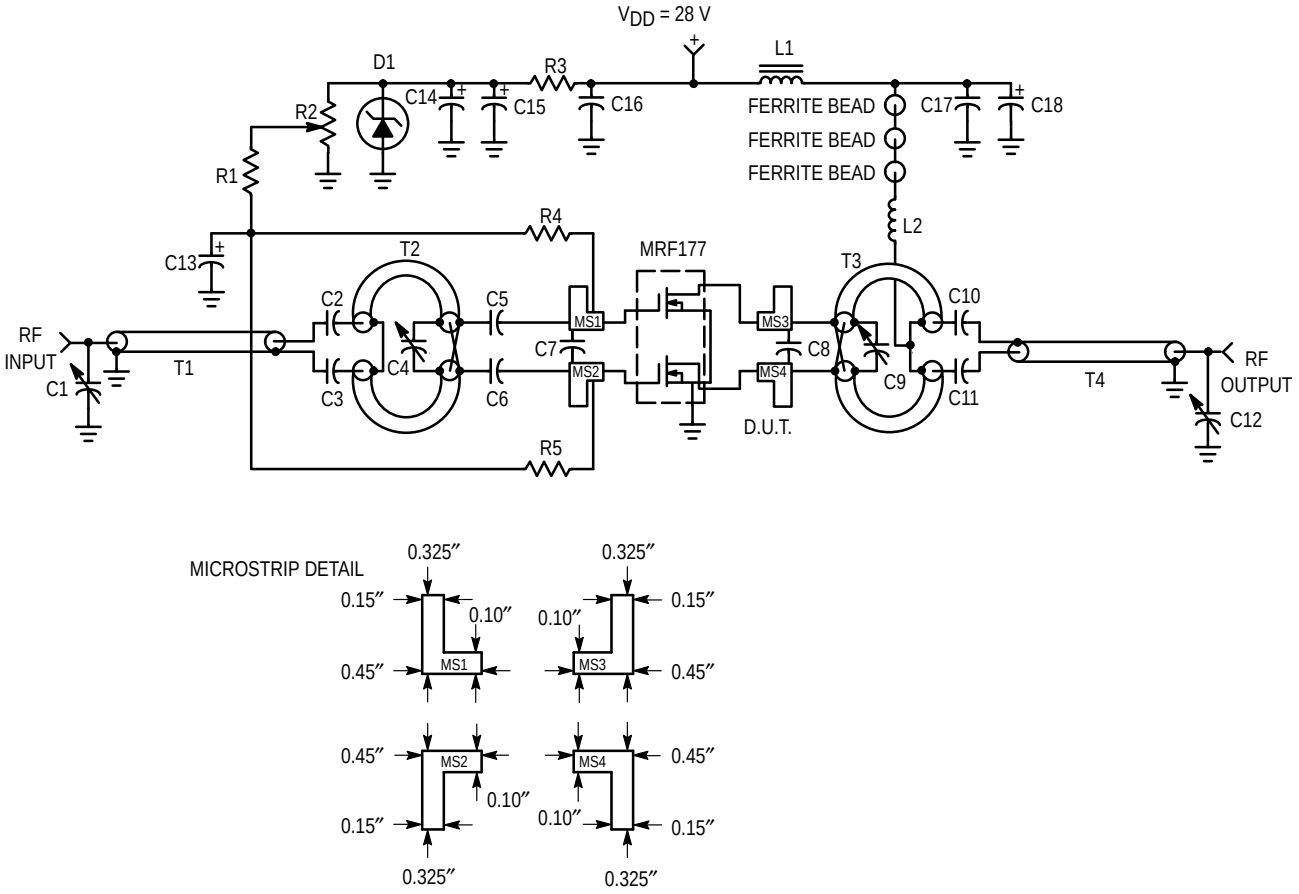
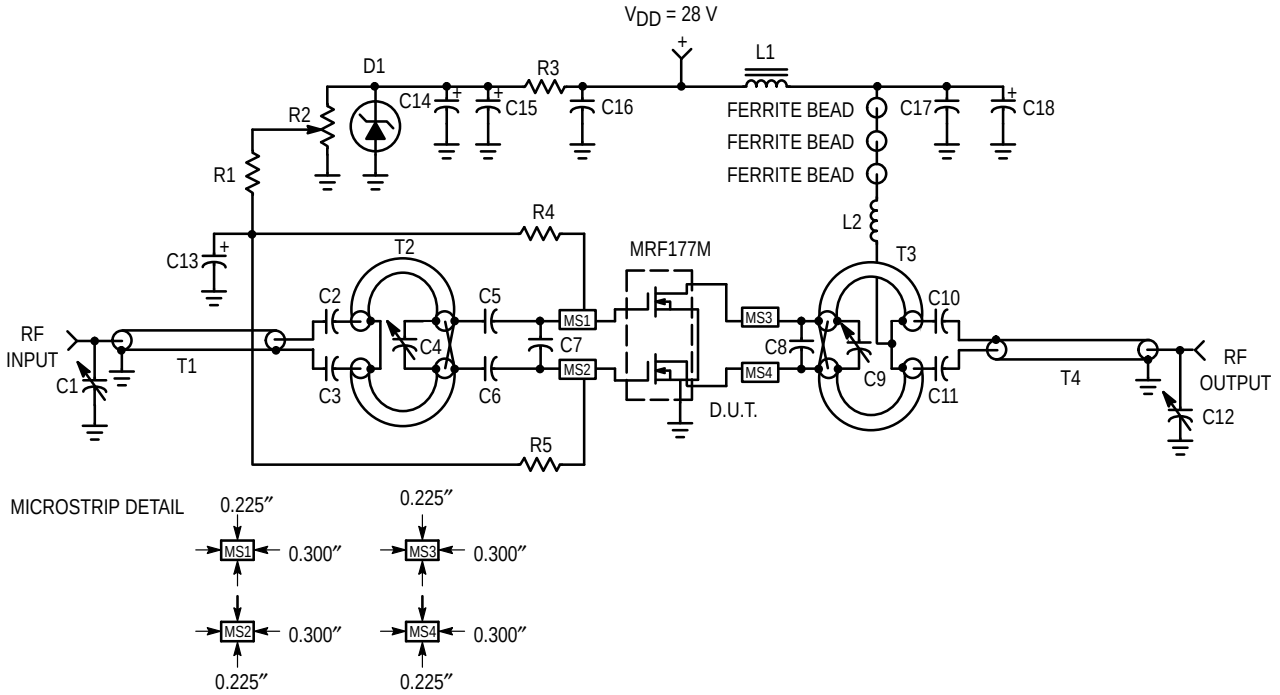


Figure 6. DC Safe Operating Area



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 UNCASED 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

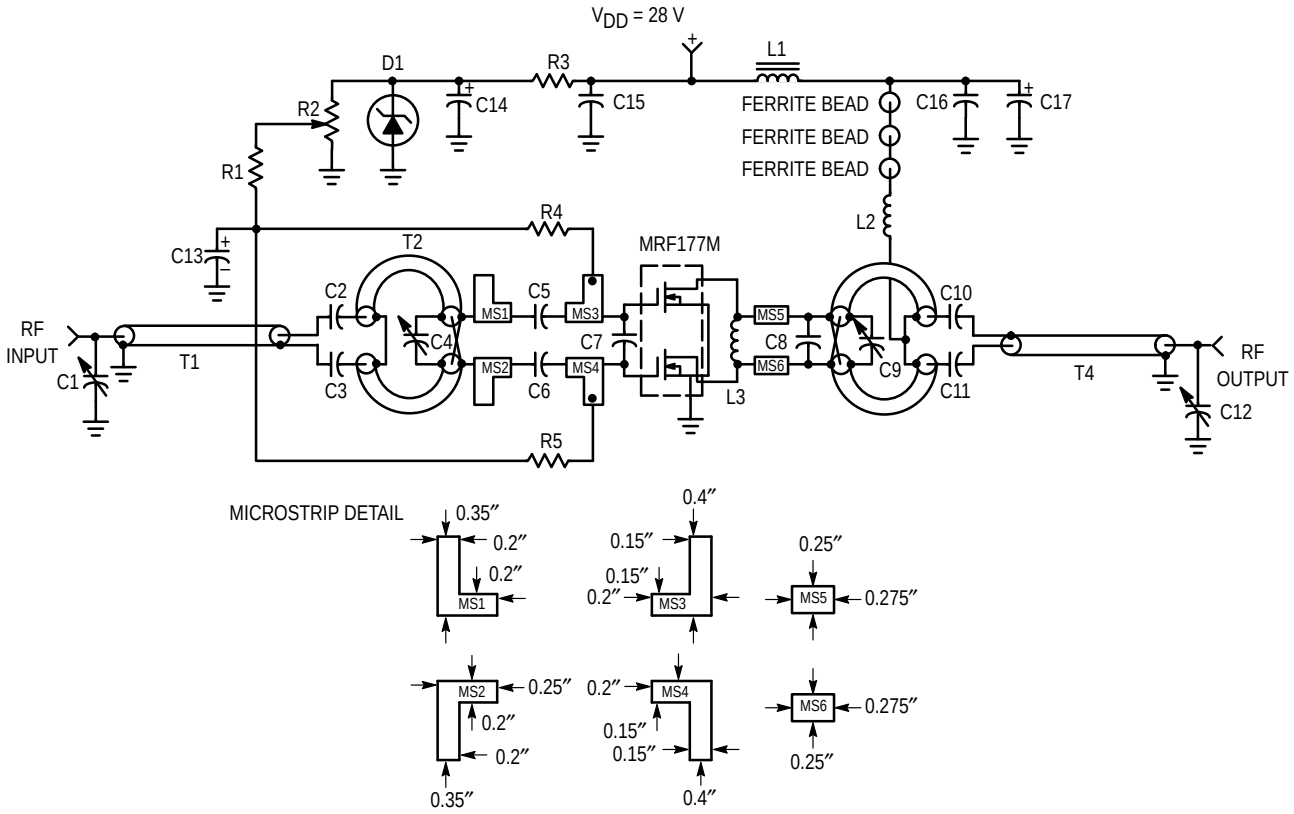
Figure 7. Test Circuit Electrical Schematic — MRF177



C1, C12	1–10 pF JOHANSON OR EQUIVALENT
C2, C3, C5, C6, C10, C11	270 pF ATC 100 MIL CHIP CAP
C4, C9	1–20 pF
C7	36 pF CHIP CAP
C8	10 pF CHIP CAP
C13, C14	0.1 μFD @ 50 Vdc
C15, C18	10 μFD @ 50 Vdc
C16	500 pF BUTTON
C17	1000 pF UNCASED MICA

D1	1N5347B, 20 Vdc MOTOROLA ZENER
L1	1–TURN NO. 18, 0.25″, 2–HOLE FERRITE BEAD
L2	8–1/2 TURNS NO. 18, CLOSE WOUND .375″ DIA.
R1, R4, R5	10 kΩ @ 1/2 W RESISTOR
R2	10 kΩ, 10 TURN RESISTOR
R3	2.0 kΩ @ 1/2 W RESISTOR
T1	1–1/2 T, 50 Ω COAX, .034″ DIA. ON DUAL 0.5″ FERRITE CORE
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, ε_r = 2.55

Figure 8. Test Fixture Electrical Schematic — MRF177M

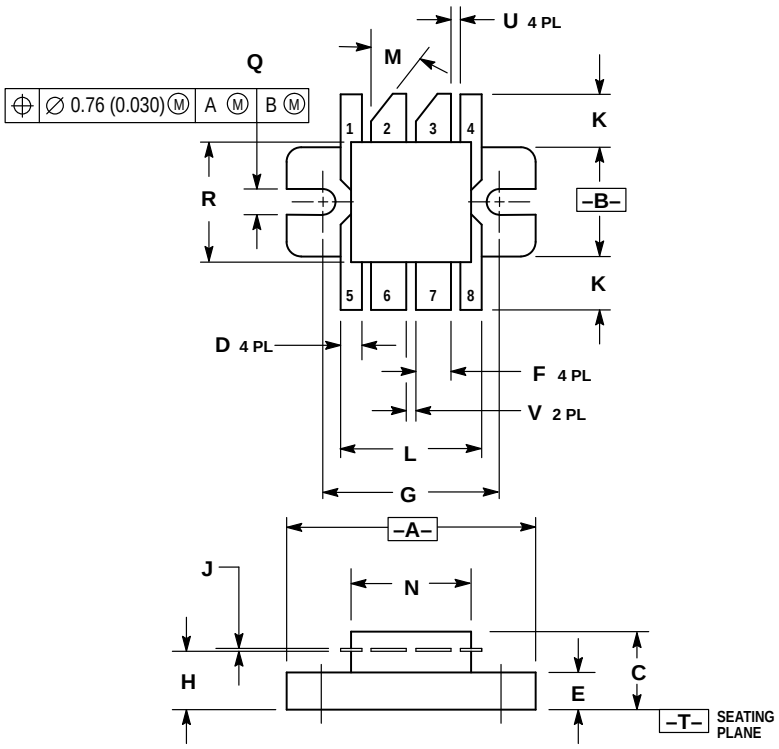


C1, C12	1–10 pF JOHANSON OR EQUIVALENT
C2, C3, C5, C6, C10, C11	270 pF ATC 100 MIL CHIP CAP
C4, C9	1–20 pF
C7	43 pF CHIP CAP
C8	10 pF CHIP CAP
C13, C14	0.1 μFD @ 50 Vdc
C15	500 pF BUTTON
C16	1000 pF UNCASED MICA
C17	10 μFD @ 50 Vdc

D1	1N5347B, 20 Vdc MOTOROLA ZENER
L1	1–TURN NO. 18, 0.25″, 2–HOLE FERRITE BEAD
L2	8–1/2 TURNS NO. 18, CLOSE WOUND .375″ DIA.
L3	4–TURNS NO. 22, 1/8″ DIA., 0.25″ LONG
R1, R4, R5	10 kΩ @ 1/2 W RESISTOR
R2	10 kΩ, 10 TURN RESISTOR
R3	2.0 kΩ @ 1/2 W RESISTOR
T1	1–1/2 T, 50 Ω COAX, .034″ DIA. ON DUAL 0.5″ FERRITE CORE
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, ε_r = 2.55

Figure 9. Broadband Amplifier Schematic — MRF177M

PACKAGE DIMENSIONS

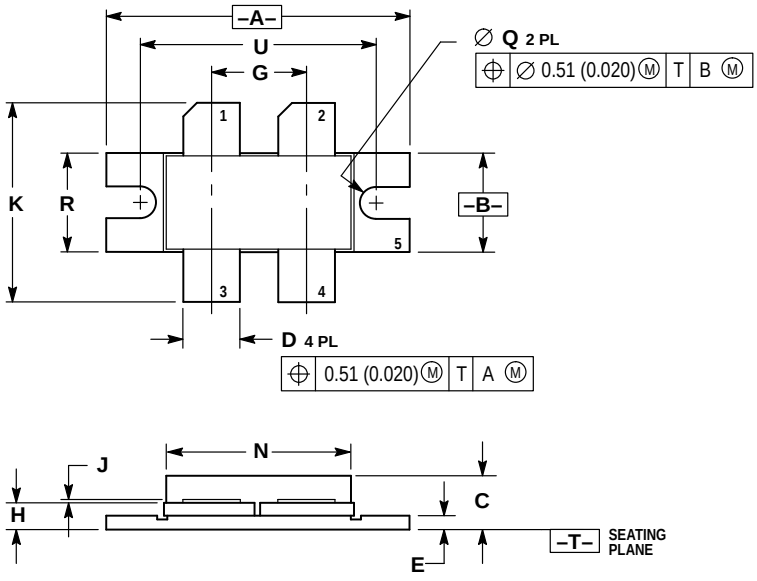


NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.

	MILLIMETERS		INCHES	
DIM	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
MRF177



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

	INCHES		MILLIMETERS	
DIM	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

CASE 390B–01
ISSUE O
MRF177M

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