

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

MRF282SR1
MRF282ZR1

Designed for class A and class AB PCN and PCS base station applications at frequencies up to 2600 MHz. Suitable for FM, TDMA, CDMA, and multicarrier amplifier applications.

- Specified Two-Tone Performance @ 2000 MHz, 26 Volts
Output Power = 10 Watts PEP
Power Gain = 10.5 dB
Efficiency = 28%
Intermodulation Distortion = -31 dBc
- Specified Single-Tone Performance @ 2000 MHz, 26 Volts
Output Power = 10 Watts CW
Power Gain = 9.5 dB
Efficiency = 35%
- Capable of Handling 10:1 VSWR, @ 26 Vdc,
2000 MHz, 10 Watts CW Output Power
- Excellent Thermal Stability
- Characterized with Series Equivalent Large-Signal
Impedance Parameters
- Available in Tape and Reel. R1 Suffix = 500 Units per 12 mm, 7 inch Reel.
- LDMOS Models Available at
<http://www.motorola.com/semiconductors/rf/models/>

2000 MHz, 10 W, 26 V
LATERAL N-CHANNEL
BROADBAND
RF POWER MOSFETs



CASE 458B-02, STYLE 1
(MRF282SR1)



CASE 458C-02, STYLE 1
(MRF282ZR1)

MAXIMUM RATINGS

Rating	Symbol	Value	Unit
Drain-Source Voltage	V _{DSS}	65	Vdc
Gate-Source Voltage	V _{GS}	±20	Vdc
Total Device Dissipation @ T _C = 25°C Derate above 25°C	P _D	60 0.34	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 _{θJC}	4.2	°C/W

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

Characteristic	Symbol	Min	Typ	Max	Unit
----------------	--------	-----	-----	-----	------

OFF CHARACTERISTICS

Drain-Source Breakdown Voltage (V _{GS} = 0, I _D = 10 μA _{dc})	V _{(BR)DSS}	65	—	—	Vdc
Zero Gate Voltage Drain Current (V _{DS} = 28 Vdc, V _{GS} = 0)	I _{DSS}	—	—	1.0	μA _{dc}
Gate-Source Leakage Current (V _{GS} = 20 Vdc, V _{DS} = 0)	I _{GSS}	—	—	1.0	μA _{dc}

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

ELECTRICAL CHARACTERISTICS continued ($T_C = 25^\circ\text{C}$ unless otherwise noted)

Characteristic	Symbol	Min	Typ	Max	Unit
ON CHARACTERISTICS					
Gate Threshold Voltage ($V_{DS} = 10\text{ Vdc}$, $I_D = 50\ \mu\text{Adc}$)	$V_{GS(th)}$	2.0	3.0	4.0	Vdc
Drain–Source On–Voltage ($V_{GS} = 10\text{ Vdc}$, $I_D = 0.5\text{ Adc}$)	$V_{DS(on)}$	—	0.4	0.6	Vdc
Gate Quiescent Voltage ($V_{DS} = 26\text{ Vdc}$, $I_D = 75\text{ mA}$)	$V_{GS(q)}$	3.0	4.0	5.0	Vdc
DYNAMIC CHARACTERISTICS					
Input Capacitance ($V_{DS} = 26\text{ Vdc}$, $V_{GS} = 0$, $f = 1.0\text{ MHz}$)	C_{iss}	—	15	—	pF
Output Capacitance ($V_{DS} = 26\text{ Vdc}$, $V_{GS} = 0$, $f = 1.0\text{ MHz}$)	C_{oss}	—	8.0	—	pF
Reverse Transfer Capacitance ($V_{DS} = 26\text{ Vdc}$, $V_{GS} = 0$, $f = 1.0\text{ MHz}$)	C_{rss}	—	0.45	—	pF
FUNCTIONAL TESTS (In Motorola Test Fixture)					
Common–Source Power Gain ($V_{DD} = 26\text{ Vdc}$, $P_{out} = 10\text{ W PEP}$, $I_{DQ} = 75\text{ mA}$, $f_1 = 2000.0\text{ MHz}$, $f_2 = 2000.1\text{ MHz}$)	G_{ps}	10.5	11.5	—	dB
Drain Efficiency ($V_{DD} = 26\text{ Vdc}$, $P_{out} = 10\text{ W PEP}$, $I_{DQ} = 75\text{ mA}$, $f_1 = 2000.0\text{ MHz}$, $f_2 = 2000.1\text{ MHz}$)	η	28	—	—	%
Intermodulation Distortion ($V_{DD} = 26\text{ Vdc}$, $P_{out} = 10\text{ W PEP}$, $I_{DQ} = 75\text{ mA}$, $f_1 = 2000.0\text{ MHz}$, $f_2 = 2000.1\text{ MHz}$)	IMD	—	–31	–28	dBc
Input Return Loss ($V_{DD} = 26\text{ Vdc}$, $P_{out} = 10\text{ W PEP}$, $I_{DQ} = 75\text{ mA}$, $f_1 = 2000.0\text{ MHz}$, $f_2 = 2000.1\text{ MHz}$)	IRL	9	14	—	dB
Common–Source Power Gain ($V_{DD} = 26\text{ Vdc}$, $P_{out} = 10\text{ W PEP}$, $I_{DQ} = 75\text{ mA}$, $f_1 = 1930.0\text{ MHz}$, $f_2 = 1930.1\text{ MHz}$)	G_{ps}	10.5	11.5	—	dB
Drain Efficiency ($V_{DD} = 26\text{ Vdc}$, $P_{out} = 10\text{ W PEP}$, $I_{DQ} = 75\text{ mA}$, $f_1 = 1930.0\text{ MHz}$, $f_2 = 1930.1\text{ MHz}$)	η	28	—	—	%
Intermodulation Distortion ($V_{DD} = 26\text{ Vdc}$, $P_{out} = 10\text{ W PEP}$, $I_{DQ} = 75\text{ mA}$, $f_1 = 1930.0\text{ MHz}$, $f_2 = 1930.1\text{ MHz}$)	IMD	—	–31	–28	dBc
Input Return Loss ($V_{DD} = 26\text{ Vdc}$, $P_{out} = 10\text{ W PEP}$, $I_{DQ} = 75\text{ mA}$, $f_1 = 1930.0\text{ MHz}$, $f_2 = 1930.1\text{ MHz}$)	IRL	9	14	—	dB
Common–Source Power Gain ($V_{DD} = 26\text{ Vdc}$, $P_{out} = 10\text{ W CW}$, $I_{DQ} = 75\text{ mA}$, $f = 2000.0\text{ MHz}$)	G_{ps}	9.5	11.5	—	dB
Drain Efficiency ($V_{DD} = 26\text{ Vdc}$, $P_{out} = 10\text{ W CW}$, $I_{DQ} = 75\text{ mA}$, $f = 2000.0\text{ MHz}$)	η	35	40	—	%
Output Mismatch Stress ($V_{DD} = 26\text{ Vdc}$, $P_{out} = 10\text{ W CW}$, $I_{DQ} = 75\text{ mA}$, $f_1 = 2000.0\text{ MHz}$, $f_2 = 2000.1\text{ MHz}$, Load VSWR = 10:1, All Phase Angles at Frequency of Test)	Ψ	No Degradation In Output Power			

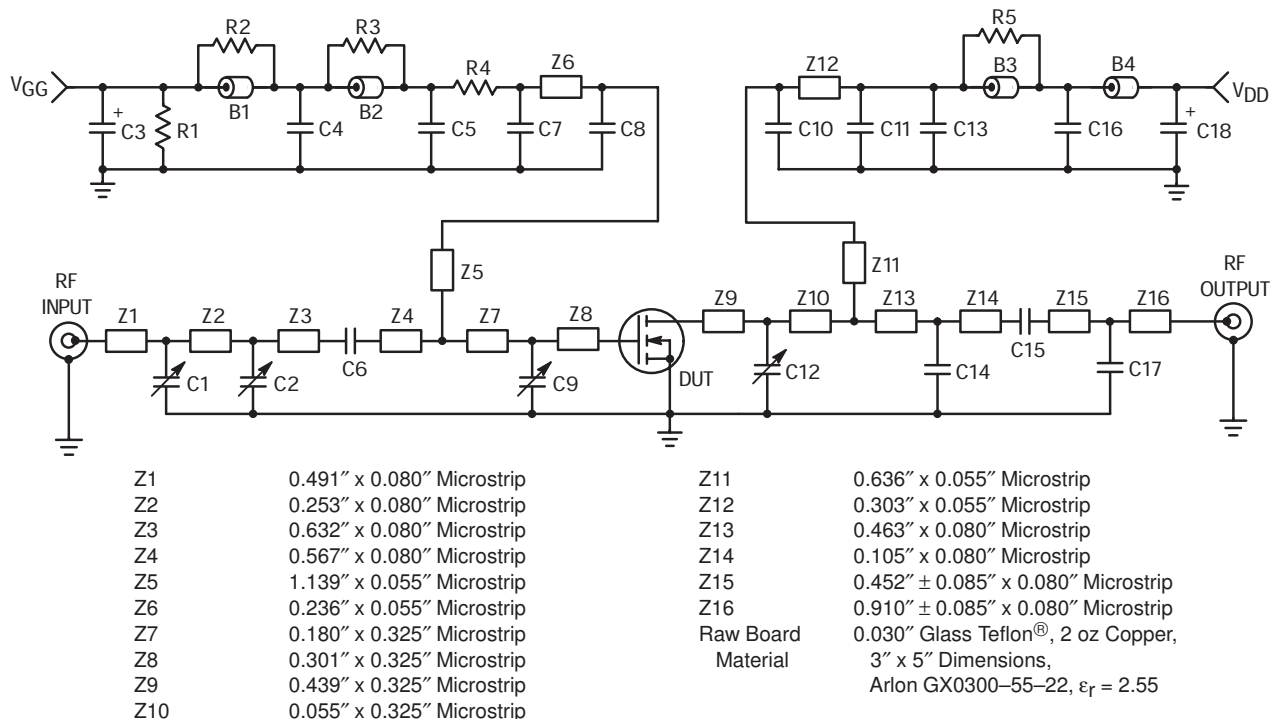


Figure 1. 1.93 – 2.0 GHz Broadband Test Circuit Schematic

Table 1. 1.93 – 2.0 GHz Broadband Component Designations and Values

Designators	Description
B1, B4	0.120" x 0.333" x 0.100", Surface Mount Ferrite Beads, Fair Rite # 2743019446
B2, B3	0.120" x 0.170" x 0.100", Surface Mount Ferrite Beads, Fair Rite # 2743029446
C1, C2, C9	0.8–8.0 pF Gigatrim Variable Capacitors, Johanson # 27291SL
C3	10 μ F, 35 V Tantalum Surface Mount Chip Capacitor, Kemet # T495X106K035AS4394
C4, C5, C13, C16	0.1 μ F Chip Capacitor, Kemet # CDR33BX104AKWS
C6	200 pF, B Case RF Chip Capacitors, ATC # 100B201JCA500X
C7	18 pF, B Case RF Chip Capacitors, ATC # 100B180KP500X
C8	39 pF, B Case RF Chip Capacitors, ATC # 100B390JCA500X
C10	27 pF, B Case RF Chip Capacitors, ATC # 100B270JCA500X
C11	1.2 pF, B Case RF Chip Capacitors, ATC # 100B1R2CCA500X
C12	0.6–4.5 pF, Gigatrim Variable Capacitor, Johanson # 27271SL
C14	0.5 pF, B Case RF Chip Capacitors, ATC # 100B0R5BCA500X
C15	15 pF, B Case RF Chip Capacitors, ATC # 100B150JCA500X
C17	0.1 pF, B Case RF Chip Capacitors, ATC # 100B0R1BCA500X
C18	22 μ F, 35 V Tantalum Surface Mount Chip Capacitor, Kemet # T491X226K035AS4394
R1	560 k Ω , 1/4 W Chip Resistor 0.08" x 0.13"
R2, R5	12 Ω , 1/4 W Chip Resistor 0.08" x 0.13", Garrett Instruments # RM73B2B120JT
R3, R4	91 Ω , 1/4 W Chip Resistor 0.08" x 0.13", Garrett Instruments # RM73B2B910JT
WS1, WS2	Beryllium Copper Wear Blocks 0.010" x 0.235" x 0.135" NOM
	Brass Banana Jack and Nut
	Red Banana Jack and Nut
	Green Banana Jack and Nut
	Type "N" Jack Connectors, Omni-Spectra # 3052-1648-10
	4-40 Ph Head Screws, 0.125" Long
	4-40 Ph Head Screws, 0.188" Long
	4-40 Ph Head Screws, 0.312" Long
	4-40 Ph Rec. Hd. Screws, 0.438" Long
RF Circuit Board	3" x 5" Copper Clad PCB, Glass Teflon®

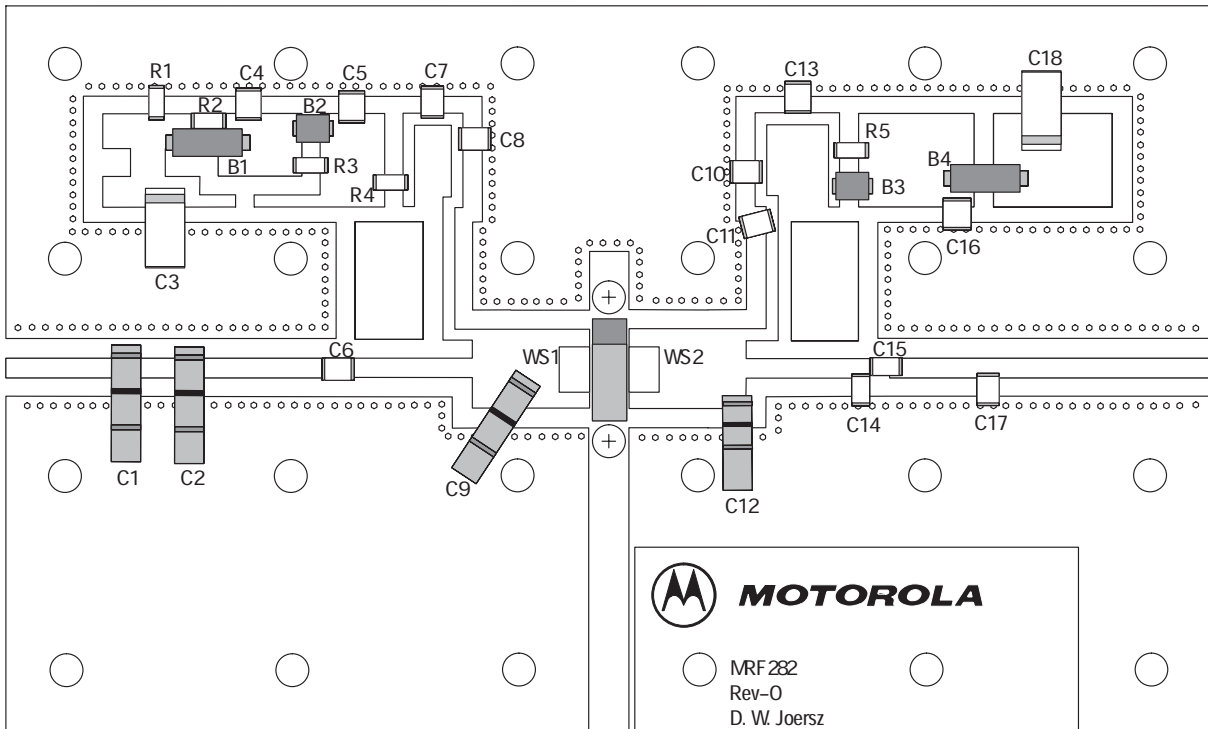
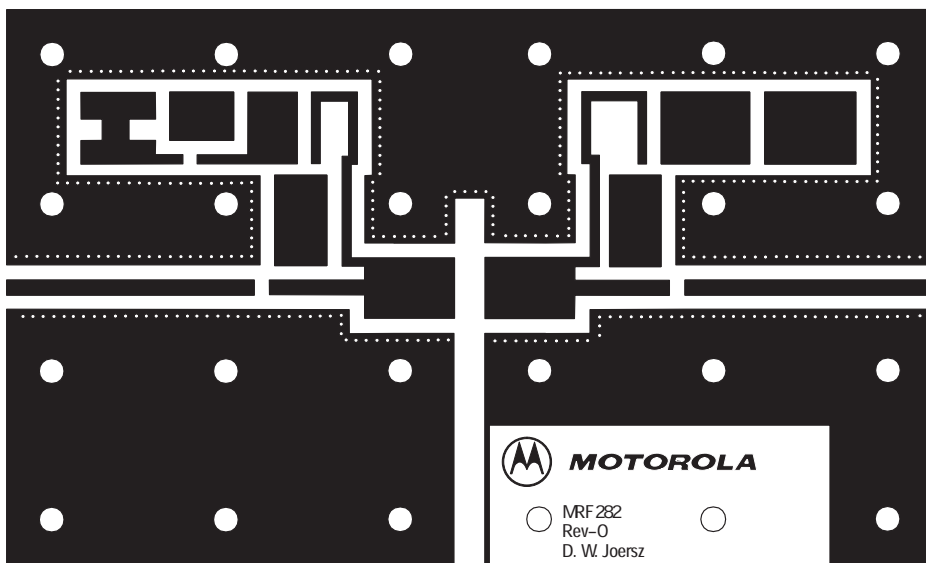
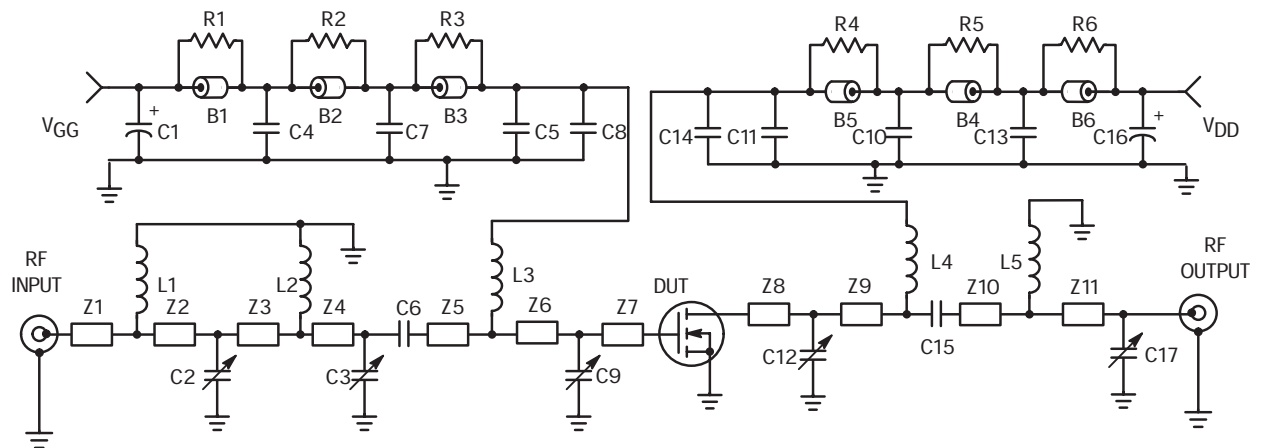


Figure 2. 1.93-2.0 GHz Broadband Test Circuit Component Layout



(Scale 1:1)

Figure 3. MRF282 Test Circuit Photomaster
(Reduced 18% in printed data book, DL110/D)



Z1	0.122" x 0.08" Microstrip	Z8	0.414" x 0.330" Microstrip
Z2	0.650" x 0.08" Microstrip	Z9	0.392" x 0.08" Microstrip
Z3	0.160" x 0.08" Microstrip	Z10	0.070" x 0.08" Microstrip
Z4	0.030" x 0.08" Microstrip	Z11	1.110" x 0.08" Microstrip
Z5	0.045" x 0.08" Microstrip	Raw Board	0.030" Glass Teflon [®] , 2 oz Copper,
Z6	0.291" x 0.08" Microstrip	Material	3" x 5" Dimensions,
Z7	0.483" x 0.330" Microstrip		Arlon GX0300-55-22, $\epsilon_r = 2.55$

Figure 4. 1.81 – 1.88 GHz Broadband Test Circuit Schematic

Table 2. 1.81 – 1.88 GHz Broadband Component Designations and Values

Designators	Description
B1, B2, B3, B4, B5, B6	0.120" x 0.170" x 0.100", Surface Mount Ferrite Beads, Fair Rite # 2743029446
C1, C16	470 μ F, 63 V, Electrolytic Capacitor, Mallory # SME63UB471M12X25L
C2, C9, C12, C17	0.6–4.5 pF, Variable Capacitor, Johanson Gigatrim # 27271SL
C3	0.8–8.0 pF, Variable Capacitor, Johanson Gigatrim # 27291SL
C4, C13	0.1 μ F, Chip Capacitor, Kemet # CDR33BX104AKWS
C5, C14	100 pF, B Case Chip Capacitor, ATC # 100B101JCA500X
C6, C8, C11, C15	12 pF, B Case Chip Capacitor, ATC # 100B120JCA500X
C7, C10	1000 pF, B Case Chip Capacitor, ATC # 100B102JCA50X
L1	3 Turns, 27 AWG, 0.087" OD, 0.050" ID, 0.053" Long, 6.0 nH
L2	5 Turns, 27 AWG, 0.087" OD, 0.050" ID, 0.091" Long, 15 nH
L3, L4	9 Turns, 26 AWG, 0.080" OD, 0.046" ID, 0.170" Long, 30.8 nH
L5	4 Turns, 27 AWG, 0.087" OD, 0.050" ID, 0.078" Long, 10 nH
R1, R2, R3	12 Ω , 1/8 W Fixed Film Chip Resistor. Garrett Instruments # RM73B2B120JT
R4, R5, R6	0.08" x 0.13". Garrett Instruments # RM73B2B120JT
W1, W2	Beryllium Copper 0.010" x 0.110" x 0.210"

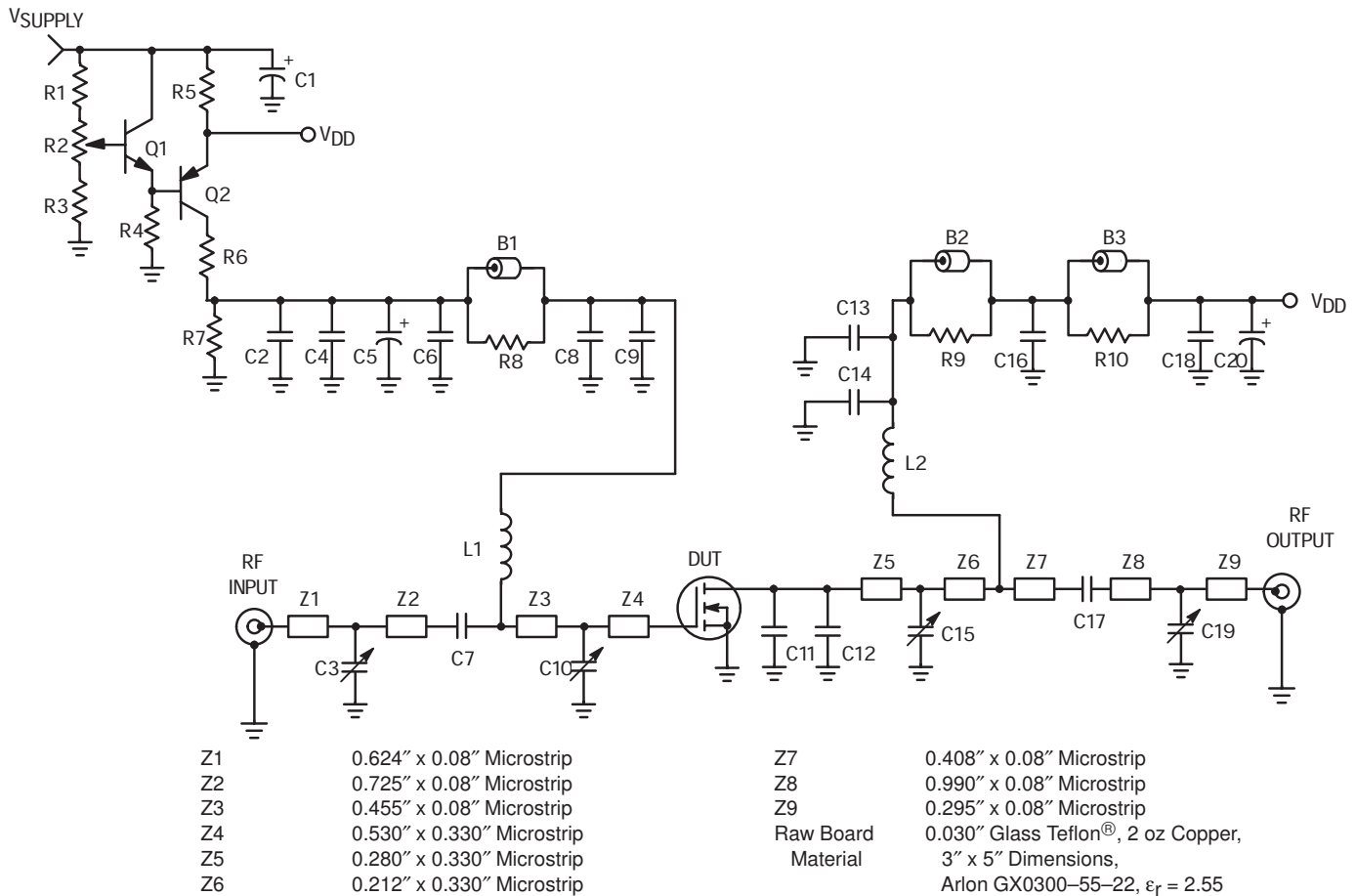
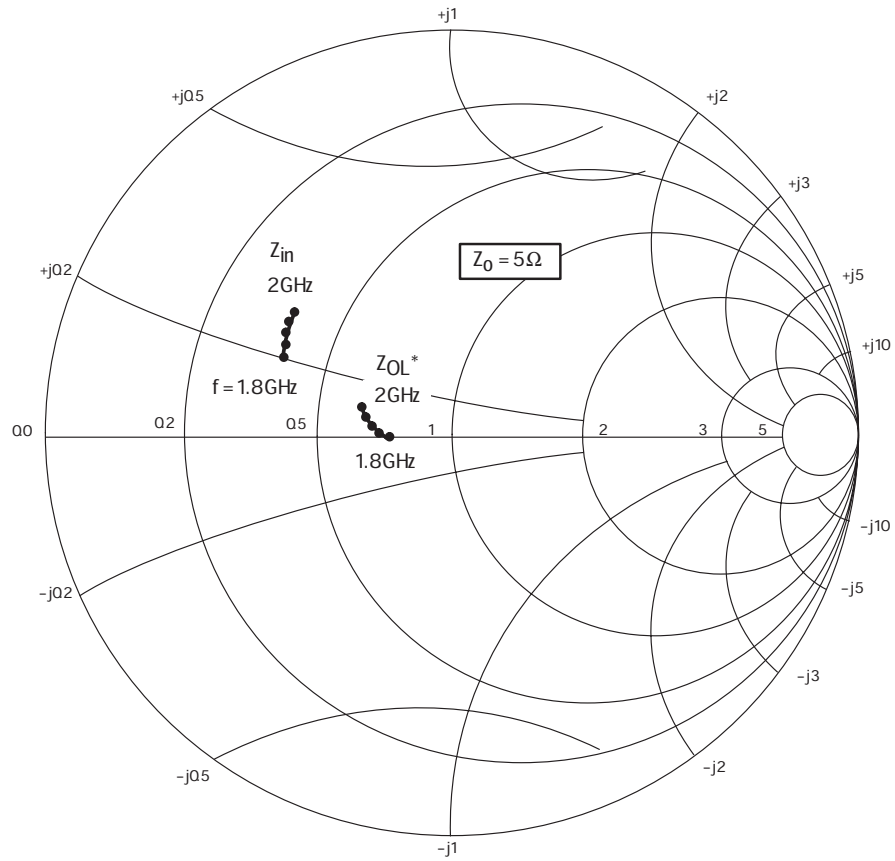


Figure 5. Class A Test Circuit Schematic

Table 3. Class A Broadband Component Designations and Values

Designators	Description
B1, B2, B3	Ferrite Bead, Ferroxcube, 56-590-65-3B
C1, C20	470 μ F, 63 V, Electrolytic Capacitor, Mallory # SME63V471M12X25L
C2	0.01 μ F, B Case Chip Capacitor, ATC # 100B103JCA50X
C3, C10, C15	0.6-4.5 pF, Variable Capacitor, Johanson # 27271SL
C4, C16	0.02 μ F, B Case Chip Capacitor, ATC # 100B203JCA50X
C5	100 μ F, 50 V, Electrolytic Capacitor, Mallory # SME50VB101M12X256
C6, C7, C9, C14, C17	12 pF, B Case Chip Capacitor, ATC # 100B120JCA500X
C8, C13	51 pF, B Case Chip Capacitor, ATC # 100B510JCA500X
C11, C12	0.3 pF, B Case Chip Capacitor, ATC # 100B0R3CCA500X
C18	0.1 μ F, Chip Capacitor, Kemet # CDR33BX104AKWS
C19	0.4-2.5 pF, Variable Capacitor, Johanson # 27285
L1	8 Turns, 0.042" ID, 24 AWG, Enamel
L2	9 Turns, 0.046" ID, 26 AWG, Enamel
Q1	NPN, 15 W, Bipolar Transistor, MJD310
Q2	PNP, 15 W, Bipolar Transistor, MJD320
R1	200 Ω , Axial, 1/4 W Resistor
R2	1.0 k Ω , 1/2 W Potentiometer, Bourns
R3	13 k Ω , Axial, 1/4 W Resistor
R4, R6, R7	390 Ω , 1/8 W Chip Resistor, Garrett Instruments # RM73B2B391JT
R5	1.0 Ω , 10 W 1% Resistor, DALE # RE65G1R00
R8, R9, R10	12 Ω , 1/8 W Chip Resistor, Garrett Instruments # RM73B2B120JT
Input/Output	Type N Flange Mount RF55-22, Connectors, Omni-Spectra



$V_{DD} = 26V, I_{DQ} = 75mA, P_{out} = 10W (PEP)$

f MHz	Z_{in} Ω	Z_{OL}^* Ω
1800	$2.1 + j1.0$	$3.8 - j0.15$
1860	$2.05 + j1.15$	$3.77 - j0.13$
1900	$2.0 + j1.2$	$3.75 - j0.1$
1960	$1.9 + j1.4$	$3.65 + j0.1$
2000	$1.85 + j1.6$	$3.55 + j0.2$

Z_{in} = Complex conjugate of source impedance.

Z_{OL}^* = Complex conjugate of the optimum load impedance at given output power, voltage, IMD, bias current and frequency.

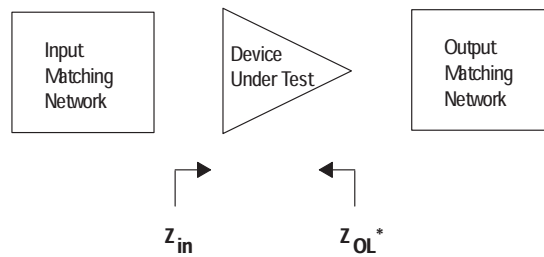


Figure 6. Series Equivalent Input and Output Impedance