

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 with 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.

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



CASE 458B-03, STYLE 1
(NI-200S)
(MRF282SR1)



CASE 458C-03, STYLE 1
(NI-200Z)
(MRF282ZR1)

MAXIMUM RATINGS

Rating	Symbol	Value	Unit
Drain-Source Voltage	V_{DSS}	65	Vdc
Gate-Source Voltage	V_{GS}	± 20	Vdc
Total Device Dissipation @ $T_C = 25^\circ\text{C}$ Derate above 25°C	P_D	60 0.34	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	$R_{\theta JC}$	4.2	$^\circ\text{C/W}$

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

Characteristic	Symbol	Min	Typ	Max	Unit
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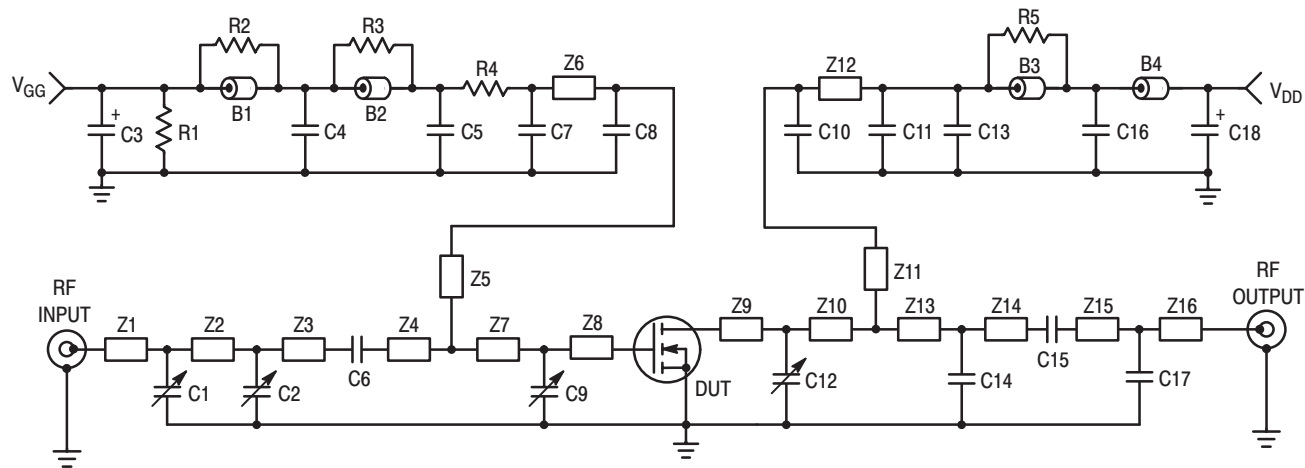
OFF CHARACTERISTICS

Drain-Source Breakdown Voltage ($V_{GS} = 0, I_D = 10 \mu\text{A}$)	$V_{(BR)DSS}$	65	—	—	Vdc
Zero Gate Voltage Drain Current ($V_{DS} = 28 \text{ Vdc}, V_{GS} = 0$)	I_{DSS}	—	—	1.0	μA
Gate-Source Leakage Current ($V_{GS} = 20 \text{ Vdc}, V_{DS} = 0$)	I_{GSS}	—	—	1.0	μA

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 ($V_{DS} = 26\text{ Vdc}$, $I_D = 75\text{ mAdc}$)	$V_{GS(q)}$	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	—	–14	–9	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	—	–14	–9	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			



Z1	0.491" x 0.080" Microstrip	Z11	0.636" x 0.055" Microstrip
Z2	0.253" x 0.080" Microstrip	Z12	0.303" x 0.055" Microstrip
Z3	0.632" x 0.080" Microstrip	Z13	0.463" x 0.080" Microstrip
Z4	0.567" x 0.080" Microstrip	Z14	0.105" x 0.080" Microstrip
Z5	1.139" x 0.055" Microstrip	Z15	0.452" ± 0.085" x 0.080" Microstrip
Z6	0.236" x 0.055" Microstrip	Z16	0.910" ± 0.085" x 0.080" Microstrip
Z7	0.180" x 0.325" Microstrip	Raw Board	0.030" Glass Teflon®, 2 oz Copper,
Z8	0.301" x 0.325" Microstrip	Material	3" x 5" Dimensions,
Z9	0.439" x 0.325" Microstrip		Arlon GX0300-55-22, ε _r = 2.55
Z10	0.055" x 0.325" Microstrip		

Figure 1. 1.93 – 2.0 GHz Broadband Test Circuit Schematic

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

Designators	Description
B1, B4	Surface Mount Ferrite Beads, 0.120" x 0.333" x 0.100", Fair Rite #2743019446
B2, B3	Surface Mount Ferrite Beads, 0.120" x 0.170" x 0.100", Fair Rite #2743029446
C1, C2, C9	0.8–8.0 pF Variable Capacitors, Johanson Gigatrim #27291SL
C3	10 μF, 35 V Tantalum Surface Mount Chip Capacitor, Kemet #T495X106K035AS4394
C4, C5, C13, C16	0.1 μF Chip Capacitors, Kemet #CDR33BX104AKWS
C6	200 pF Chip Capacitor, B Case, ATC #100B201JCA500X
C7	18 pF Chip Capacitor, B Case, ATC #100B180KP500X
C8	39 pF Chip Capacitor, B Case, ATC #100B390JCA500X
C10	27 pF Chip Capacitor, B Case, ATC #100B270JCA500X
C11	1.2 pF Chip Capacitor, B Case, ATC #100B1R2CCA500X
C12	0.6–4.5 pF Variable Capacitor, Johanson Gigatrim #27271SL
C14	0.5 pF Chip Capacitor, B Case, ATC #100B0R5BCA500X
C15	15 pF Chip Capacitor, B Case, ATC #100B150JCA500X
C17	0.1 pF Chip Capacitor, B Case, ATC #100B0R1BCA500X
C18	22 μF, 35 V Tantalum Surface Mount Chip Capacitor, Kemet #T491X226K035AS4394
R1	560 kΩ, 1/4 W Chip Resistor, 0.08" x 0.13"
R2, R5	12 Ω, 1/4 W Chip Resistors, 0.08" x 0.13", Garrett Instruments #RM73B2B120JT
R3, R4	91 Ω, 1/4 W Chip Resistors, 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®

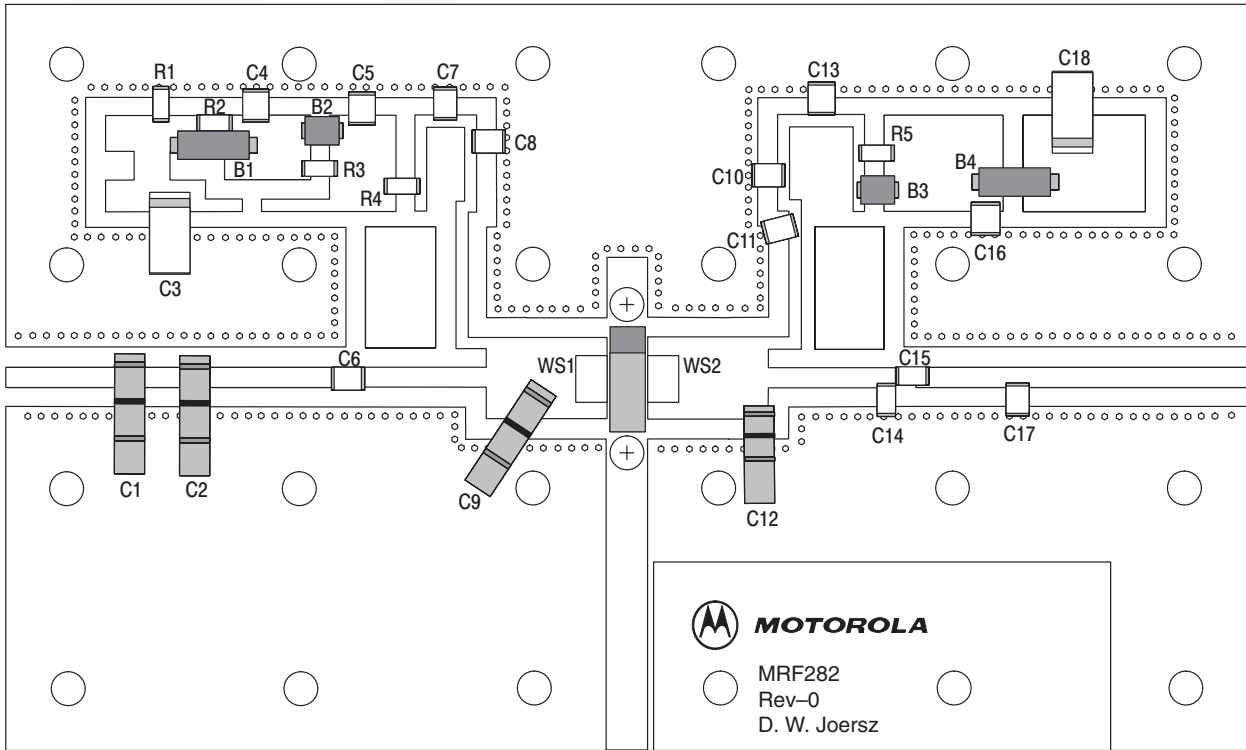


Figure 2. 1.93–2.0 GHz Broadband Test Circuit Component Layout

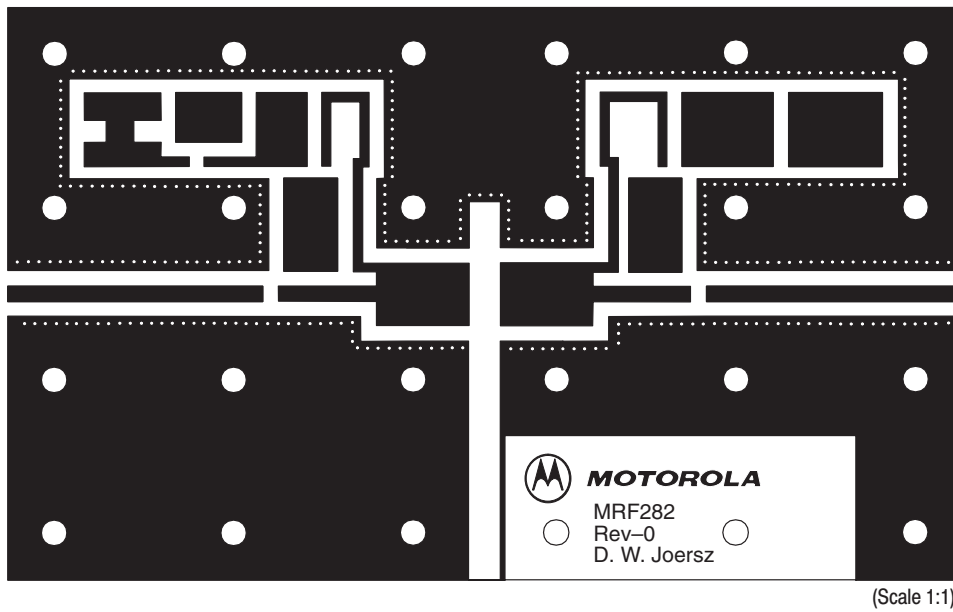
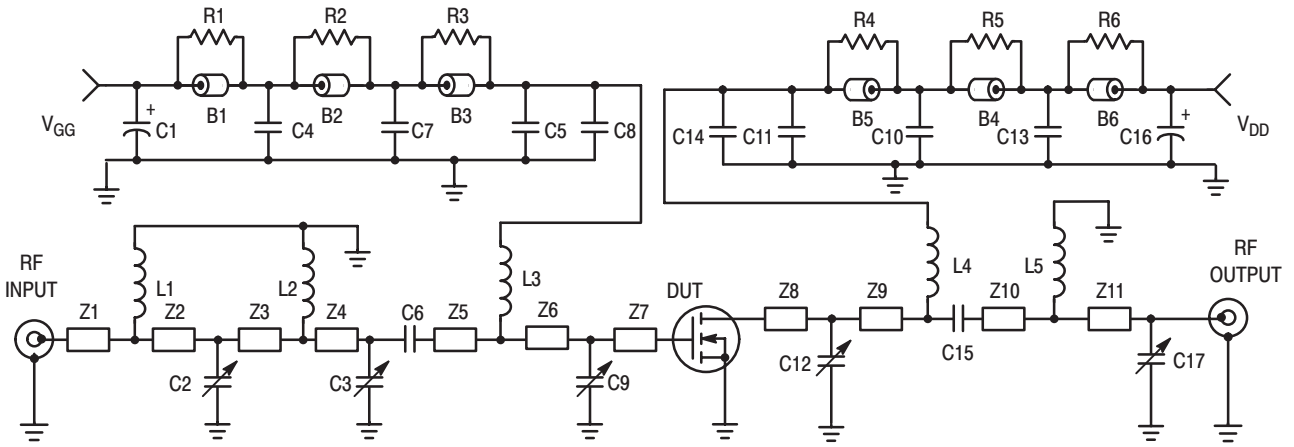


Figure 3. MRF282 Test Circuit Photomaster
(Reduced 18% in printed data book, DL110/D)



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 Test Circuit Component Designations and Values

Designators	Description
B1, B2, B3, B4, B5, B6	Surface Mount Ferrite Beads, 0.120" x 0.170" x 0.100", Fair Rite #2743029446
C1, C16	470 μ F, 63 V Electrolytic Capacitors, Mallory #SME63UB471M12X25L
C2, C9, C12, C17	0.6–4.5 pF Variable Capacitors, Johanson Gigatrim #27271SL
C3	0.8–8.0 pF Variable Capacitor, Johanson Gigatrim #27291SL
C4, C13	0.1 μ F Chip Capacitors, Kemet #CDR33BX104AKWS
C5, C14	100 pF Chip Capacitors, B Case, ATC #100B101JCA500X
C6, C8, C11, C15	12 pF Chip Capacitors, B Case, ATC #100B120JCA500X
C7, C10	1000 pF Chip Capacitors, B Case, 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 Resistors, Garrett Instruments #RM73B2B120JT
R4, R5, R6	0.08" x 0.13" Resistors, Garrett Instruments #RM73B2B120JT
W1, W2	Beryllium Copper 0.010" x 0.110" x 0.210"

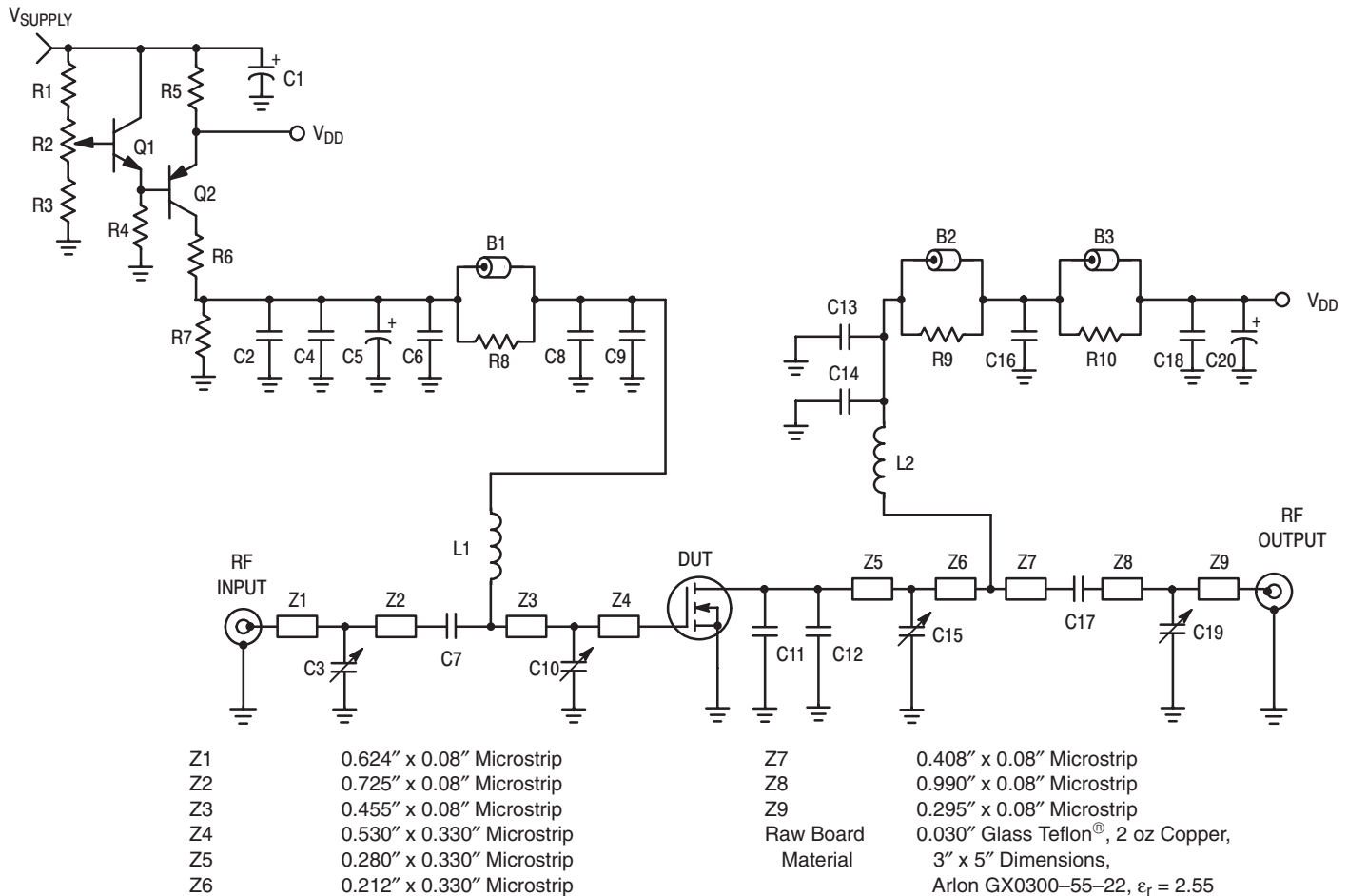
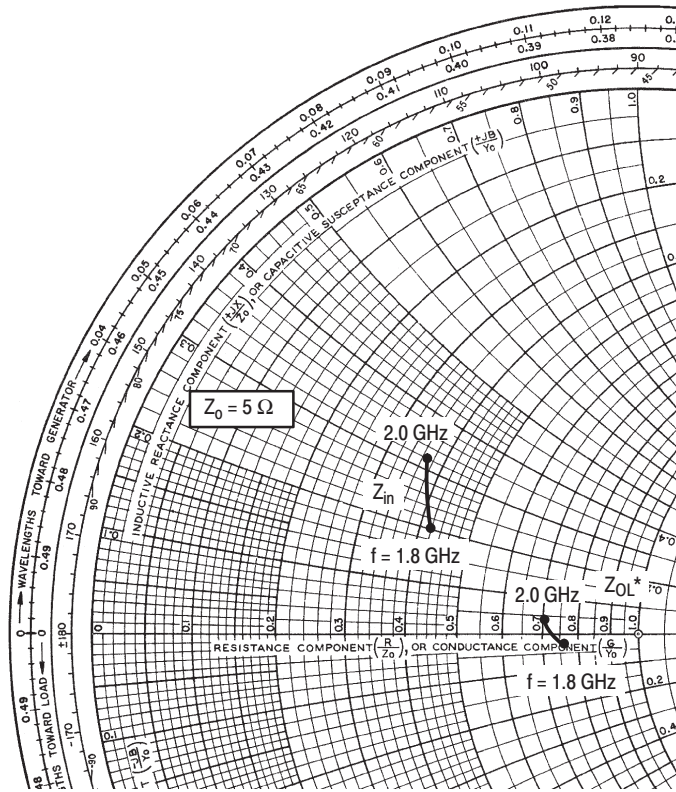


Figure 5. Class A Broadband Test Circuit Schematic

Table 3. Class A Broadband Test Circuit Component Designations and Values

Designators	Description
B1, B2, B3	Ferrite Beads, Ferroxcube #56-590-65-3B
C1, C20	470 μ F, 63 V Electrolytic Capacitors, Mallory #SME63V471M12X25L
C2	0.01 μ F Chip Capacitor, B Case, ATC #100B103JCA50X
C3, C10, C15	0.6-4.5 pF Variable Capacitors, Johanson #27271SL
C4, C16	0.02 μ F Chip Capacitors, B Case, ATC #100B203JCA50X
C5	100 μ F, 50 V Electrolytic Capacitor, Mallory #SME50VB101M12X256
C6, C7, C9, C14, C17	12 pF Chip Capacitors, B Case, ATC #100B120JCA500X
C8, C13	51 pF Chip Capacitors, B Case, ATC #100B510JCA500X
C11, C12	0.3 pF Chip Capacitors, B Case, 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 , 1/4 W Axial Resistor
R2	1.0 k Ω , 1/2 W Potentiometer, Bourns
R3	13 k Ω , 1/4 W Axial Resistor
R4, R6, R7	390 Ω , 1/8 W Chip Resistors, Garrett Instruments #RM73B2B391JT
R5	1.0 Ω , 10 W 1% Resistor, Dale #RE65G1R00
R8, R9, R10	12 Ω , 1/8 W Chip Resistors, Garrett Instruments #RM73B2B120JT
Input/Output	Type N Flange Mount RF55-22 Connectors, Omni-Spectra



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

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.

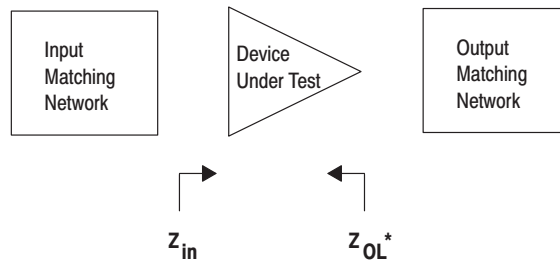


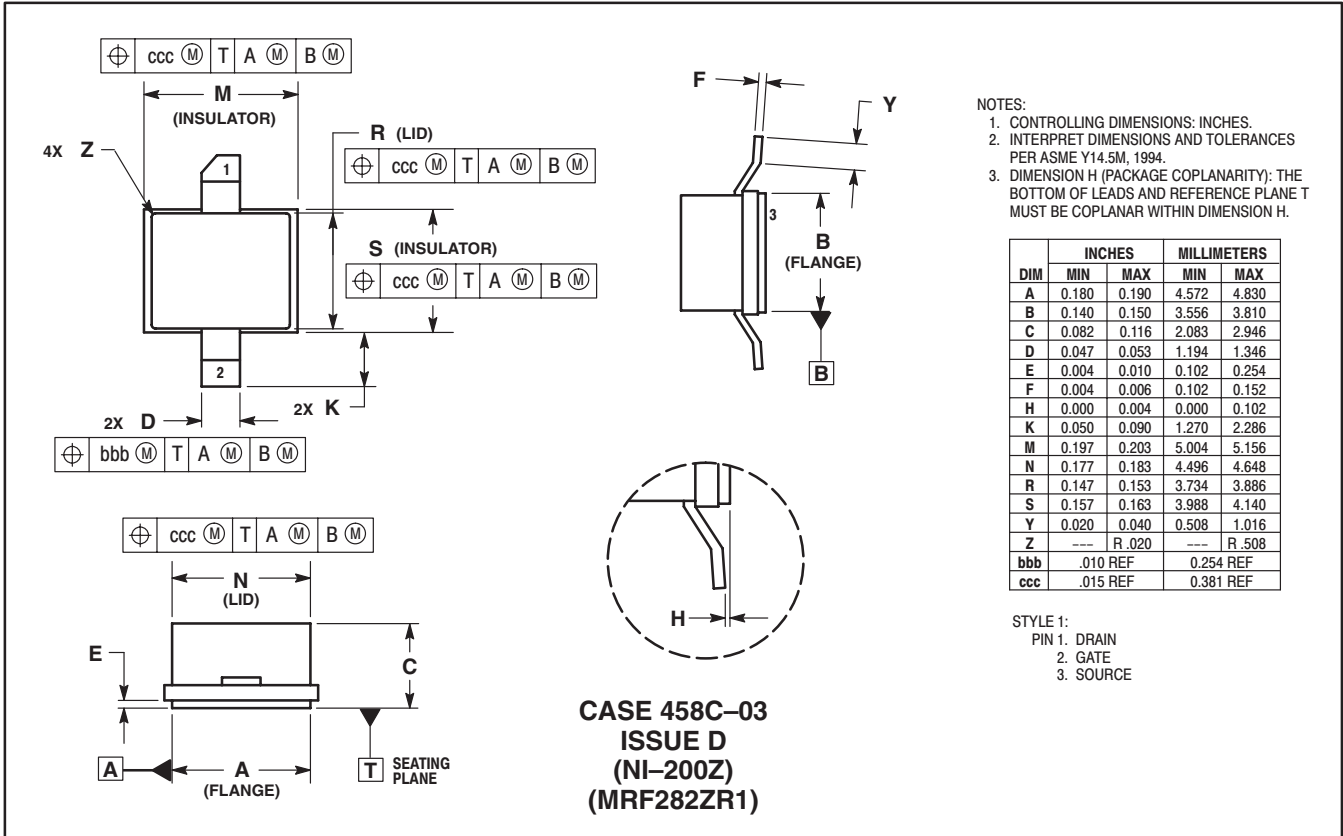
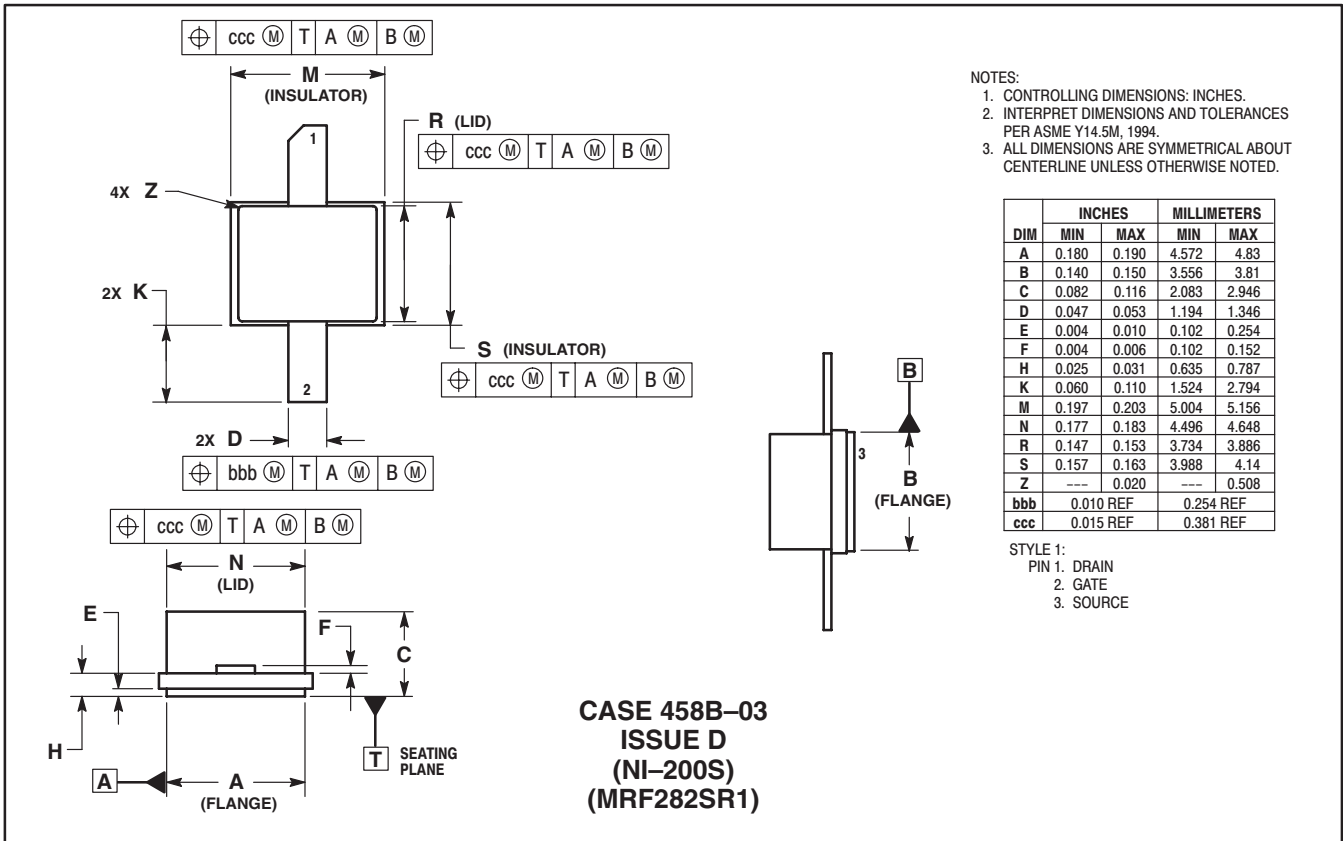
Figure 6. Series Equivalent Input and Output Impedance


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PACKAGE DIMENSIONS



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How to reach us:

USA/EUROPE/Locations Not Listed: Motorola Literature Distribution; P.O. Box 5405, Denver, Colorado 80217. 1-303-675-2140 or 1-800-441-2447

JAPAN: Motorola Japan Ltd.; SPS, Technical Information Center, 3-20-1, Minami-Azabu. Minato-ku, Tokyo 106-8573 Japan. 81-3-3440-3569

ASIA/PACIFIC: Motorola Semiconductors H.K. Ltd.; Silicon Harbour Centre, 2 Dai King Street, Tai Po Industrial Estate, Tai Po, N.T., Hong Kong. 852-26668334

Technical Information Center: 1-800-521-6274

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