MOTOROLA
SEMICONDUCTOR TECHNICAL DATA

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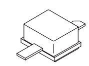
The RF Sub–Micron MOSFET Line
RF Power Field Effect Transistors
N–Channel Enhancement–Mode Lateral MOSFETs

MRF282SR1
MRF282ZR1

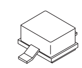
Designed for Class A and Class AB PCN and PCS base station applications with frequencies up to 2600 MHz. Suitable for FM, TDMA, CDMA, and multicarrier amplifier applications.

- 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°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	$R_{\theta JC}$	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 μAdc)	$V_{(BR)DSS}$	65	—	—	Vdc
Zero Gate Voltage Drain Current (V_{DS} = 28 Vdc, V_{GS} = 0)	I_{DSS}	—	—	1.0	μAdc
Gate–Source Leakage Current (V_{GS} = 20 Vdc, V_{DS} = 0)	I_{GSS}	—	—	1.0	μAdc

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

REV 12

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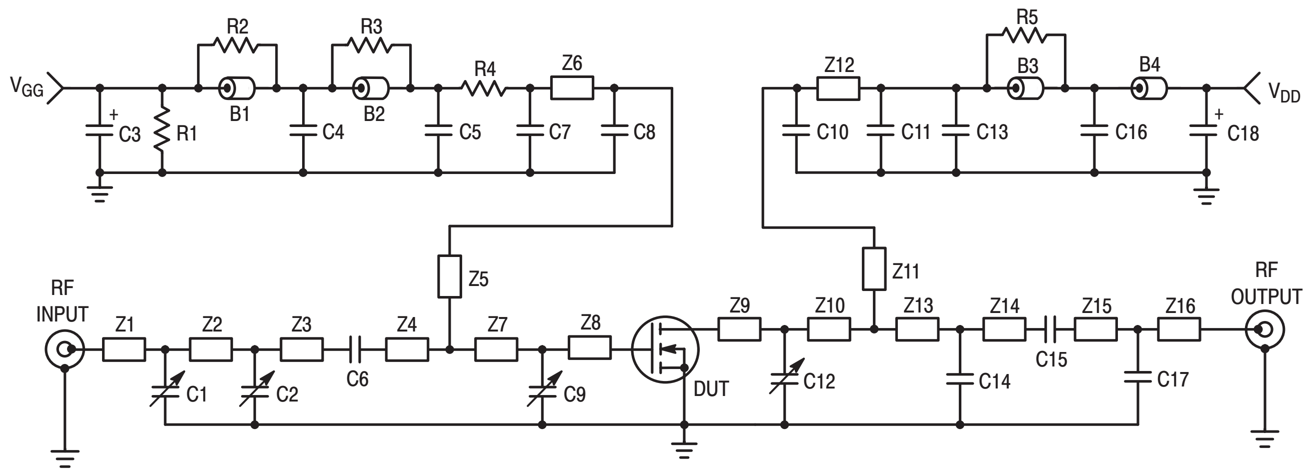
ELECTRICAL CHARACTERISTICS continued (T_C = 25°C unless otherwise noted)

Characteristic	Symbol	Min	Typ	Max	Unit
ON CHARACTERISTICS					
Gate Threshold Voltage (V_{DS} = 10 Vdc, I_D = 50 μAdc)	$V_{GS(th)}$	2.0	3.0	4.0	Vdc
Drain–Source On–Voltage (V_{GS} = 10 Vdc, I_D = 0.5 Adc)	$V_{DS(on)}$	—	0.4	0.6	Vdc
Gate Quiescent Voltage (V_{DS} = 26 Vdc, I_D = 75 mAdc)	$V_{GS(q)}$	3.0	4.0	5.0	Vdc
DYNAMIC CHARACTERISTICS					
Input Capacitance (V_{DS} = 26 Vdc, V_{GS} = 0, f = 1.0 MHz)	C_{iss}	—	15	—	pF
Output Capacitance (V_{DS} = 26 Vdc, V_{GS} = 0, f = 1.0 MHz)	C_{oss}	—	8.0	—	pF
Reverse Transfer Capacitance (V_{DS} = 26 Vdc, V_{GS} = 0, f = 1.0 MHz)	C_{rss}	—	0.45	—	pF
FUNCTIONAL TESTS (In Motorola Test Fixture)					
Common–Source Power Gain (V_{DD} = 26 Vdc, P_{out} = 10 W PEP, I_{DQ} = 75 mA, f1 = 2000.0 MHz, f2 = 2000.1 MHz)	G_{ps}	10.5	11.5	—	dB
Drain Efficiency (V_{DD} = 26 Vdc, P_{out} = 10 W PEP, I_{DQ} = 75 mA, f1 = 2000.0 MHz, f2 = 2000.1 MHz)	η	28	—	—	%
Intermodulation Distortion (V_{DD} = 26 Vdc, P_{out} = 10 W PEP, I_{DQ} = 75 mA, f1 = 2000.0 MHz, f2 = 2000.1 MHz)	IMD	—	–31	–28	dBc
Input Return Loss (V_{DD} = 26 Vdc, P_{out} = 10 W PEP, I_{DQ} = 75 mA, f1 = 2000.0 MHz, f2 = 2000.1 MHz)	IRL	—	–14	–9	dB
Common–Source Power Gain (V_{DD} = 26 Vdc, P_{out} = 10 W PEP, I_{DQ} = 75 mA, f1 = 1930.0 MHz, f2 = 1930.1 MHz)	G_{ps}	10.5	11.5	—	dB
Drain Efficiency (V_{DD} = 26 Vdc, P_{out} = 10 W PEP, I_{DQ} = 75 mA, f1 = 1930.0 MHz, f2 = 1930.1 MHz)	η	28	—	—	%
Intermodulation Distortion (V_{DD} = 26 Vdc, P_{out} = 10 W PEP, I_{DQ} = 75 mA, f1 = 1930.0 MHz, f2 = 1930.1 MHz)	IMD	—	–31	–28	dBc
Input Return Loss (V_{DD} = 26 Vdc, P_{out} = 10 W PEP, I_{DQ} = 75 mA, f1 = 1930.0 MHz, f2 = 1930.1 MHz)	IRL	—	–14	–9	dB
Common–Source Power Gain (V_{DD} = 26 Vdc, P_{out} = 10 W CW, I_{DQ} = 75 mA, f = 2000.0 MHz)	G_{ps}	9.5	11.5	—	dB
Drain Efficiency (V_{DD} = 26 Vdc, P_{out} = 10 W CW, I_{DQ} = 75 mA, f = 2000.0 MHz)	η	35	40	—	%
Output Mismatch Stress (V_{DD} = 26 Vdc, P_{out} = 10 W CW, I_{DQ} = 75 mA, f1 = 2000.0 MHz, f2 = 2000.1 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 Material	0.030″ Glass Teflon®, 2 oz Copper, 3″ x 5″ Dimensions, Arlon GX0300–55–22, ε_r = 2.55
Z8	0.301″ x 0.325″ Microstrip		
Z9	0.439″ x 0.325″ Microstrip		
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®

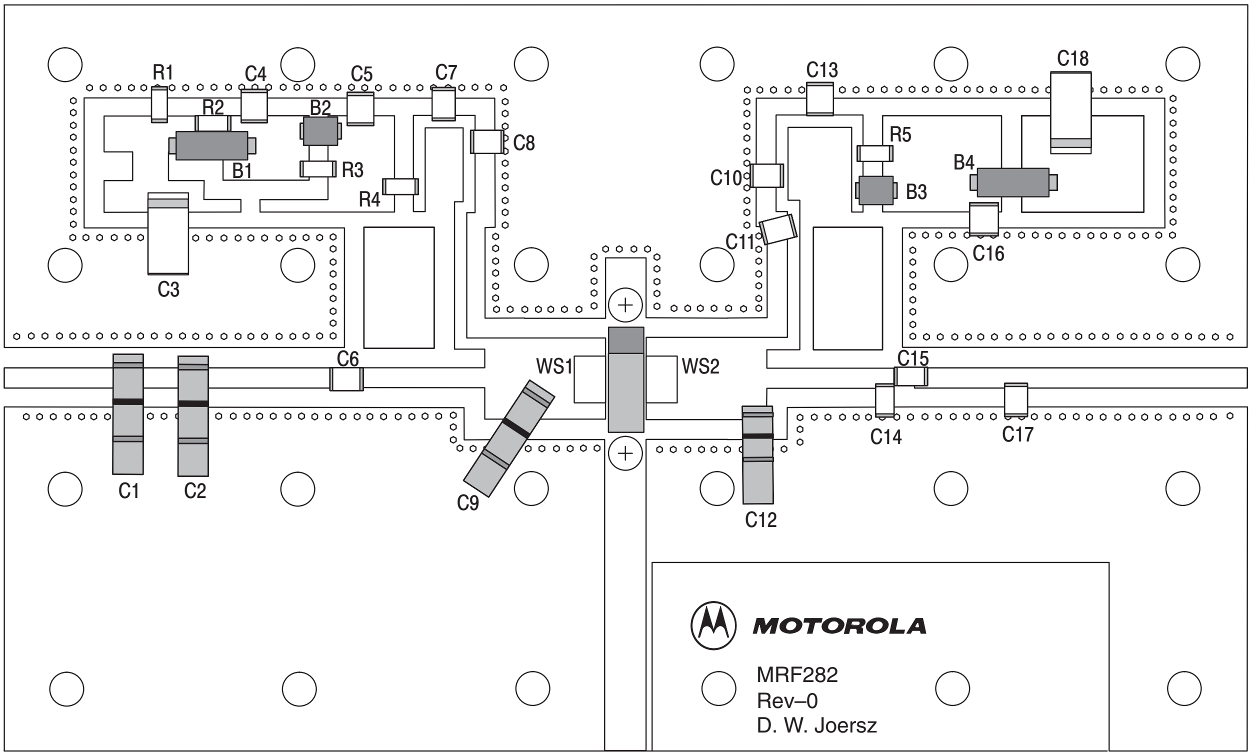
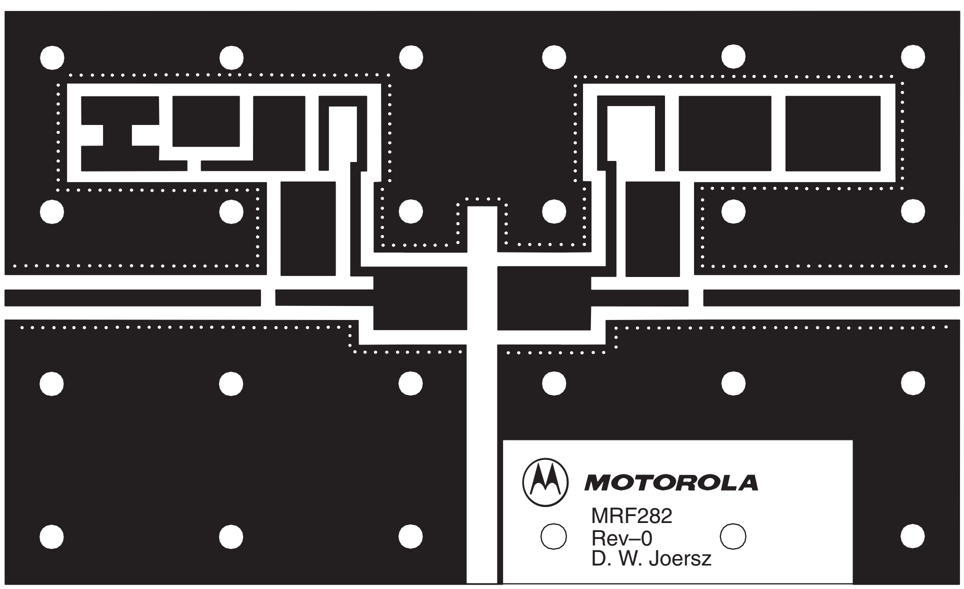
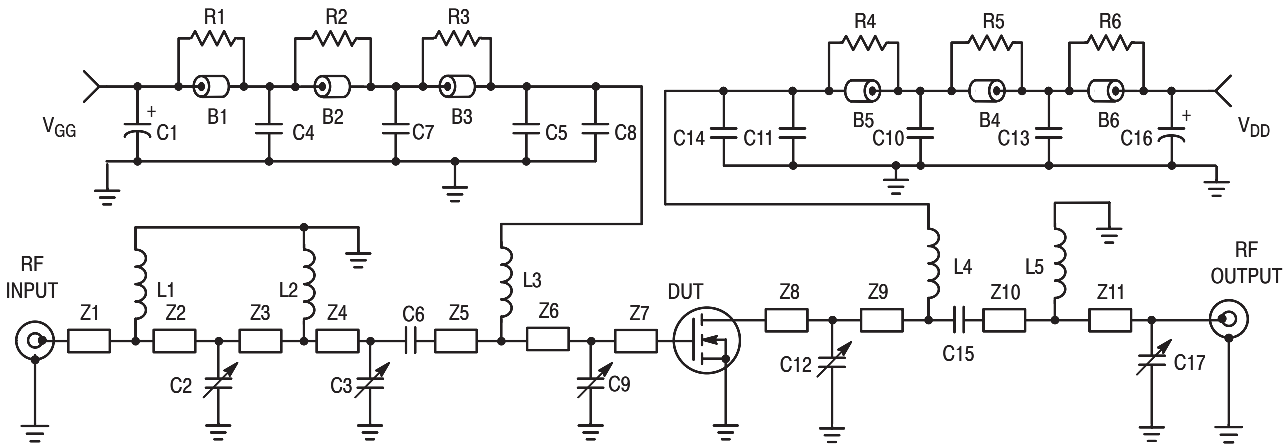


Figure 2. 1.93–2.0 GHz Broadband Test Circuit Component Layout



(Scale 1:1)

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

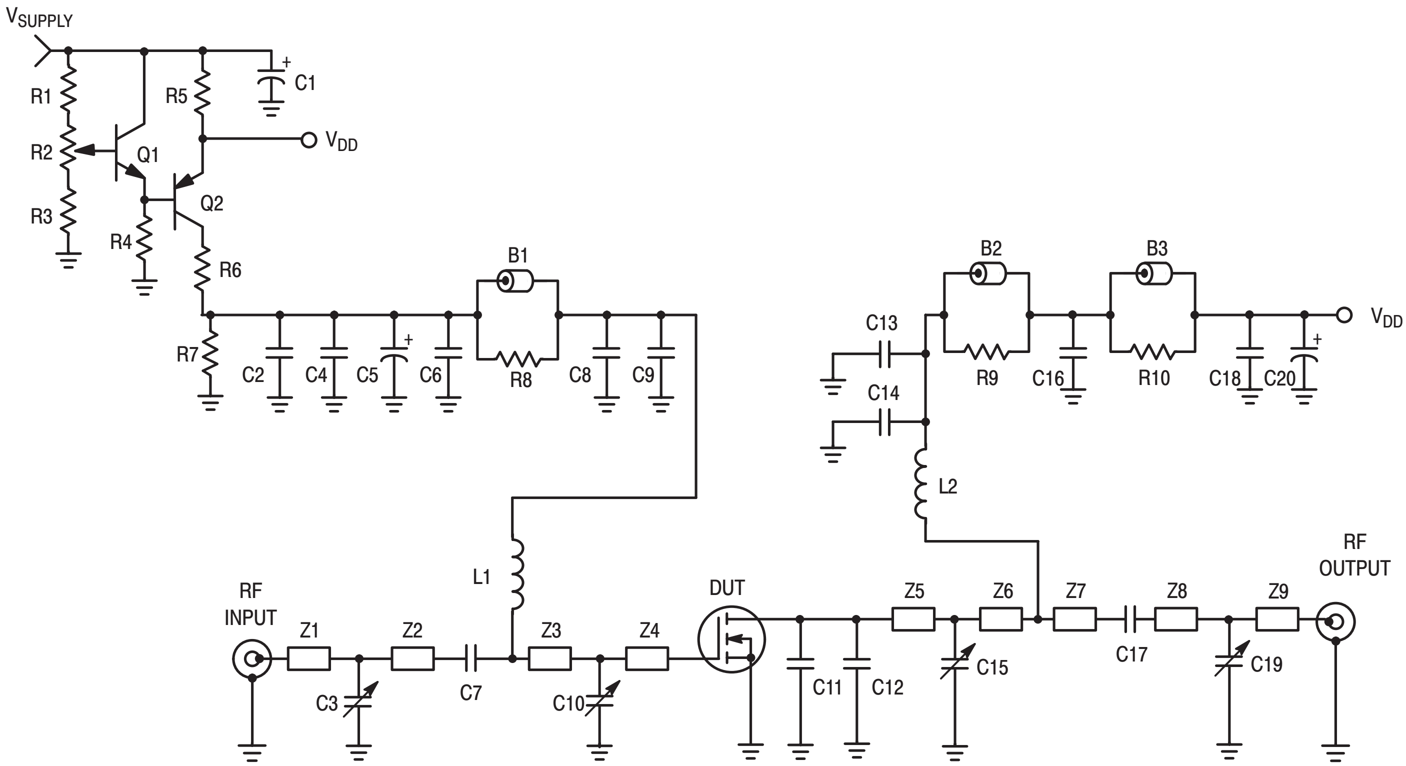


Z1	0.122″ x 0.08″ Microstrip	Z8	0.414″ x 0.330″ Microstrip
Z2	0.650″ x 0.08″ Microstrip	Z9	0.392″ x 0.08″ Microstrip
Z3	0.160″ x 0.08″ Microstrip	Z10	0.070″ x 0.08″ Microstrip
Z4	0.030″ x 0.08″ Microstrip	Z11	1.110″ x 0.08″ Microstrip
Z5	0.045″ x 0.08″ Microstrip	Raw Board Material	0.030″ Glass Teflon®,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

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 μF, 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 μF 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″

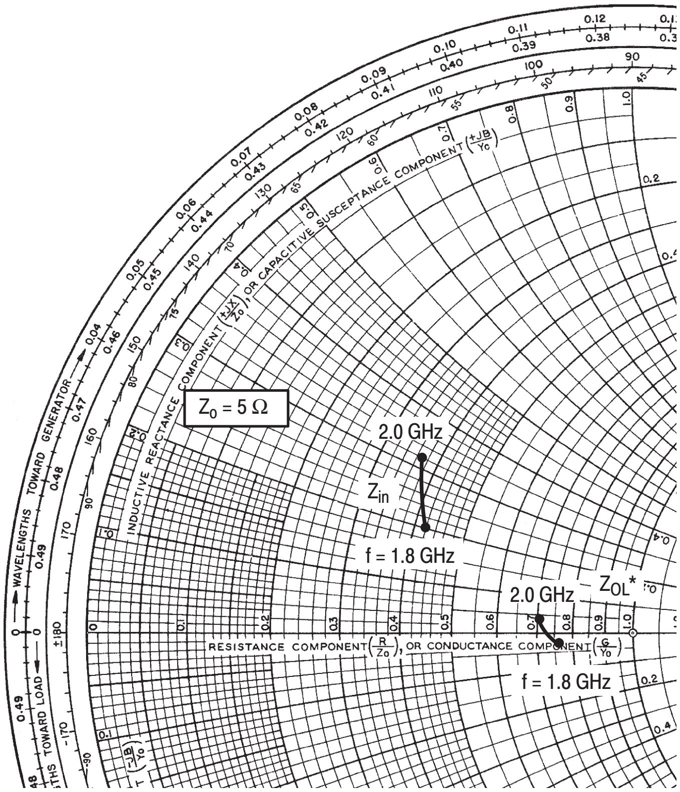


Z1	0.624″ x 0.08″ Microstrip	Z7	0.408″ x 0.08″ Microstrip
Z2	0.725″ x 0.08″ Microstrip	Z8	0.990″ x 0.08″ Microstrip
Z3	0.455″ x 0.08″ Microstrip	Z9	0.295″ x 0.08″ Microstrip
Z4	0.530″ x 0.330″ Microstrip	Raw Board Material	0.030″ Glass Teflon®, 2 oz Copper, 3″ x 5″ Dimensions, Arlon GX0300–55–22, ε_r = 2.55
Z5	0.280″ x 0.330″ Microstrip		
Z6	0.212″ x 0.330″ Microstrip		

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 µF, 63 V Electrolytic Capacitors, Mallory #SME63V471M12X25L
C2	0.01 µF Chip Capacitor, B Case, ATC #100B103JCA50X
C3, C10, C15	0.6–4.5 pF Variable Capacitors, Johanson #27271SL
C4, C16	0.02 µF Chip Capacitors, B Case, ATC #100B203JCA50X
C5	100 µF, 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 µF 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 kΩ, 1/2 W Potentiometer, Bourns
R3	13 kΩ, 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 V, I_{DQ} = 75 mA, P_{out} = 10 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.

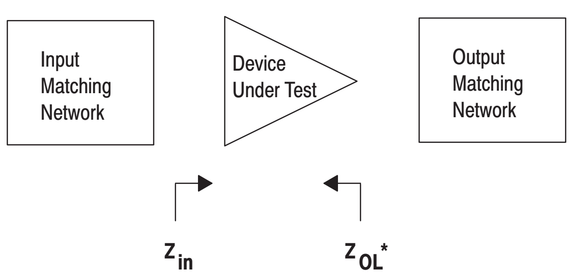


Figure 6. Series Equivalent Input and Output Impedence

NOTES

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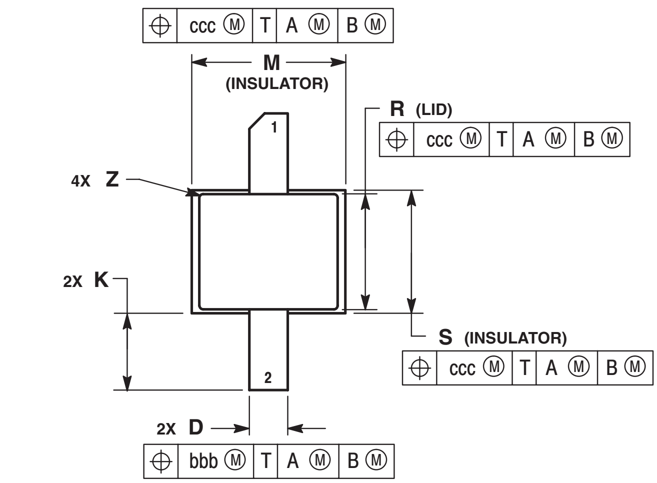
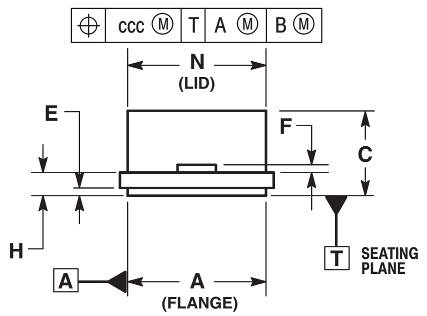
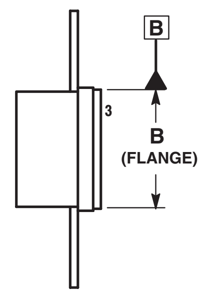




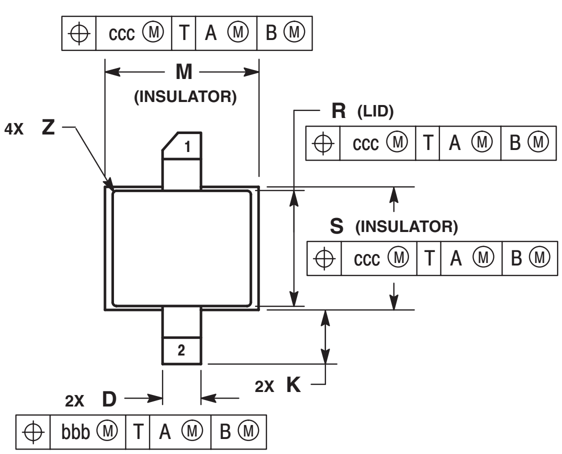


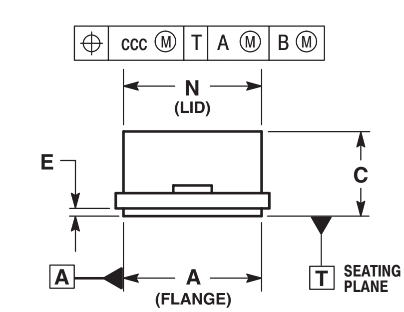
NOTES:
1. CONTROLLING DIMENSIONS: INCHES.
2. INTERPRET DIMENSIONS AND TOLERANCES PER ASME Y14.5M, 1994.
3. ALL DIMENSIONS ARE SYMMETRICAL ABOUT CENTERLINE UNLESS OTHERWISE NOTED.

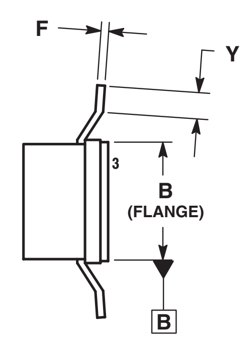
	INCHES		MILLIMETERS	
DIM	MIN	MAX	MIN	MAX
A	0.180	0.190	4.572	4.83
B	0.140	0.150	3.556	3.81
C	0.082	0.116	2.083	2.946
D	0.047	0.053	1.194	1.346
E	0.004	0.010	0.102	0.254
F	0.004	0.006	0.102	0.152
H	0.025	0.031	0.635	0.787
K	0.060	0.110	1.524	2.794
M	0.197	0.203	5.004	5.156
N	0.177	0.183	4.496	4.648
R	0.147	0.153	3.734	3.886
S	0.157	0.163	3.988	4.14
Z	---	0.020	---	0.508
bbb	0.010 REF		0.254 REF	
ccc	0.015 REF		0.381 REF	

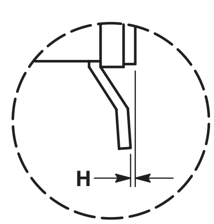
STYLE 1:
PIN 1. DRAIN
2. GATE
3. SOURCE

CASE 458B–03
ISSUE D
(NI–200S)
(MRF282SR1)









NOTES:
1. CONTROLLING DIMENSIONS: INCHES.
2. INTERPRET DIMENSIONS AND TOLERANCES PER ASME Y14.5M, 1994.
3. DIMENSION H (PACKAGE COPLANARITY): THE BOTTOM OF LEADS AND REFERENCE PLANE T MUST BE COPLANAR WITHIN DIMENSION H.

	INCHES		MILLIMETERS	
DIM	MIN	MAX	MIN	MAX
A	0.180	0.190	4.572	4.830
B	0.140	0.150	3.556	3.810
C	0.082	0.116	2.083	2.946
D	0.047	0.053	1.194	1.346
E	0.004	0.010	0.102	0.254
F	0.004	0.006	0.102	0.152
H	0.000	0.004	0.000	0.102
K	0.050	0.090	1.270	2.286
M	0.197	0.203	5.004	5.156
N	0.177	0.183	4.496	4.648
R	0.147	0.153	3.734	3.886
S	0.157	0.163	3.988	4.140
Y	0.020	0.040	0.508	1.016
Z	---	R .020	---	R .508
bbb	.010 REF		0.254 REF	
ccc	.015 REF		0.381 REF	

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

CASE 458C–03
ISSUE D
(NI–200Z)
(MRF282ZR1)

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