

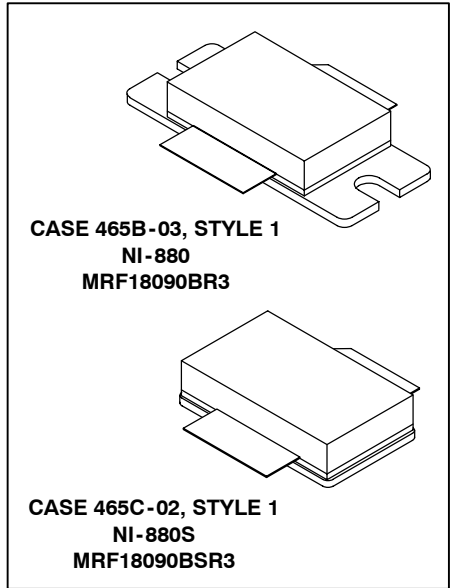
The RF MOSFET Line
RF Power Field Effect Transistors
 N-Channel Enhancement-Mode Lateral MOSFETs

MRF18090BR3
MRF18090BSR3

Designed for GSM and EDGE base station applications with frequencies from 1.9 to 2.0 GHz. Suitable for FM, TDMA, CDMA and multicarrier amplifier applications. To be used in class AB for GSM and EDGE cellular radio applications.

**1.90 - 1.99 GHz, 90 W, 26 V
 LATERAL N-CHANNEL
 RF POWER MOSFETS**

- GSM and EDGE Performances, Full Frequency Band
 Power Gain — 13.5 dB (Typ) @ 90 Watts (CW)
 Efficiency — 45% (Typ) @ 90 Watts (CW)
- Internally Matched, Controlled Q, for Ease of Use
- High Gain, High Efficiency and High Linearity
- Integrated ESD Protection
- Designed for Maximum Gain and Insertion Phase Flatness
- Capable of Handling 10:1 VSWR, @ 26 Vdc, 90 Watts (CW) Output Power
- Excellent Thermal Stability
- Characterized with Series Equivalent Large-Signal Impedance Parameters
- In Tape and Reel. R3 Suffix = 250 Units per 56 mm, 13 inch Reel.



MAXIMUM RATINGS

Rating	Symbol	Value	Unit
Drain-Source Voltage	V_{DSS}	65	Vdc
Gate-Source Voltage	V_{GS}	-0.5, +15	Vdc
Total Device Dissipation @ $T_C = 25^\circ\text{C}$ Derate above 25°C	P_D	250 1.43	Watts $\text{W}/^\circ\text{C}$
Storage Temperature Range	T_{stg}	- 65 to +150	$^\circ\text{C}$
Operating Junction Temperature	T_J	200	$^\circ\text{C}$

THERMAL CHARACTERISTICS

Characteristic	Symbol	Value	Unit
Thermal Resistance, Junction to Case	$R_{\theta JC}$	0.7	$^\circ\text{C}/\text{W}$

ESD PROTECTION CHARACTERISTICS

Test Conditions	Class
Human Body Model	2 (Minimum)
Machine Model	M3 (Minimum)

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

Freescale Semiconductor, Inc.

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

Characteristic	Symbol	Min	Typ	Max	Unit
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OFF CHARACTERISTICS

Drain-Source Breakdown Voltage (V _{GS} = 0 Vdc, I _D = 100 μAdc)	V _{(BR)DSS}	65	—	—	Vdc
Zero Gate Voltage Drain Current (V _{DS} = 26 Vdc, V _{GS} = 0 Vdc)	I _{DSS}	—	—	10	μAdc
Gate-Source Leakage Current (V _{GS} = 5 Vdc, V _{DS} = 0 Vdc)	I _{GSS}	—	—	1	μAdc

ON CHARACTERISTICS

Gate Quiescent Voltage (V _{DS} = 26 Vdc, I _D = 750 mAdc)	V _{GS(Q)}	2.5	3.7	4.5	Vdc
Drain-Source On-Voltage (V _{GS} = 10 Vdc, I _D = 1 Adc)	V _{DS(on)}	—	0.1	—	Vdc
Forward Transconductance (V _{DS} = 10 Vdc, I _D = 3 Adc)	g _{fs}	—	7.2	—	S

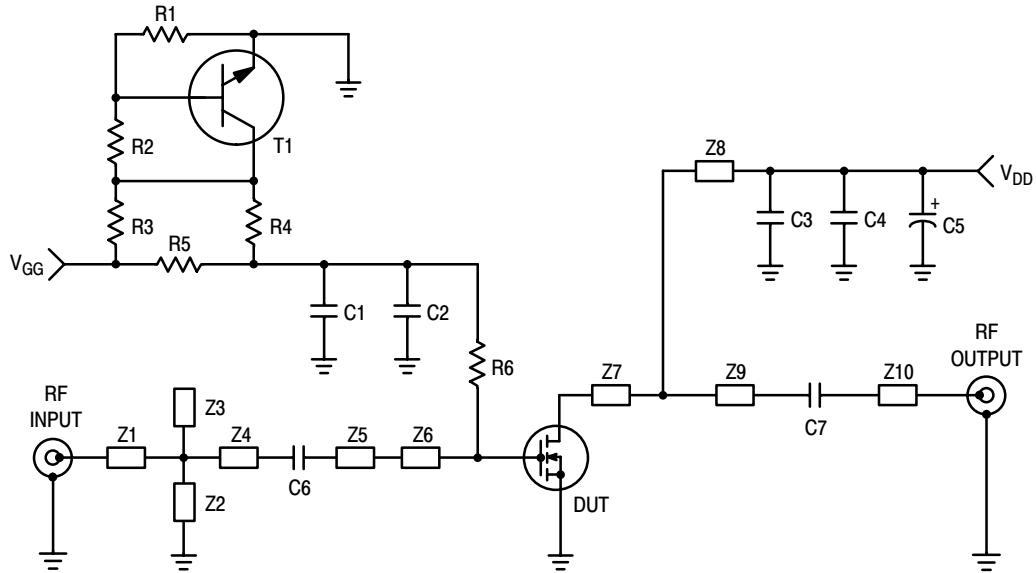
DYNAMIC CHARACTERISTICS

Reverse Transfer Capacitance (V _{DS} = 26 Vdc ± 30 mV(rms)ac @ 1 MHz, V _{GS} = 0 Vdc)	C _{rss}	—	4.2	—	pF
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FUNCTIONAL TESTS (In Motorola Test Fixture)

Common-Source Amplifier Power Gain @ 90 W (1) (V _{DD} = 26 Vdc, I _{DQ} = 750 mA, f = 1930 - 1990 MHz)	G _{ps}	12	13.5	—	dB
Drain Efficiency @ 90 W (1) (V _{DD} = 26 Vdc, I _{DQ} = 750 mA, f = 1930 - 1990 MHz)	η	40	45	—	%
Input Return Loss (1) (V _{DD} = 26 Vdc, P _{out} = 90 W CW, I _{DQ} = 750 mA, f = 1930 - 1990 MHz)	IRL	—	—	- 10	dB
Output Mismatch Stress (V _{DD} = 26 Vdc, P _{out} = 90 W CW, I _{DQ} = 750 mA VSWR = 10:1, All Phase Angles at Frequency of Tests)	Ψ	No Degradation In Output Power Before and After Test			

(1) To meet application requirements, Motorola test fixtures have been designed to cover the full GSM1900 band, ensuring batch-to-batch consistency.



C1	1.0 μ F Chip Capacitor (0805)	Z2	Printed Inductance
C2	1.0 nF Chip Capacitor (0805)	Z3	Printed Inductance (Butterfly)
C3, C4	6.8 pF, 100B Chip Capacitors	Z4	0.70" x 0.09" Microstrip
C5	220 μ F, 50 V Electrolytic Capacitor	Z5	0.36" x 0.09" Microstrip
C6, C7	12 pF, 100B Chip Capacitors	Z6	0.21" x 1.25" Microstrip
R1	2.2 k Ω Chip Resistor (0805)	Z7	0.45" x 1.18" Microstrip
R2, R3, R6	1.0 k Ω Chip Resistors (0805)	Z8	1.37" x 0.05" Microstrip
R4	10 k Ω Chip Resistor (0805)	Z9	0.39" x 0.09" Microstrip
R5	6.8 k Ω Chip Resistor (0805)	Z10	1.25" x 0.09" Microstrip
T1	BC847 SOT-23	PCB	Teflon [®] Glass
Z1	0.85" x 0.09" Microstrip		

Figure 1. 1.93 - 1.99 MHz Test Fixture Schematic

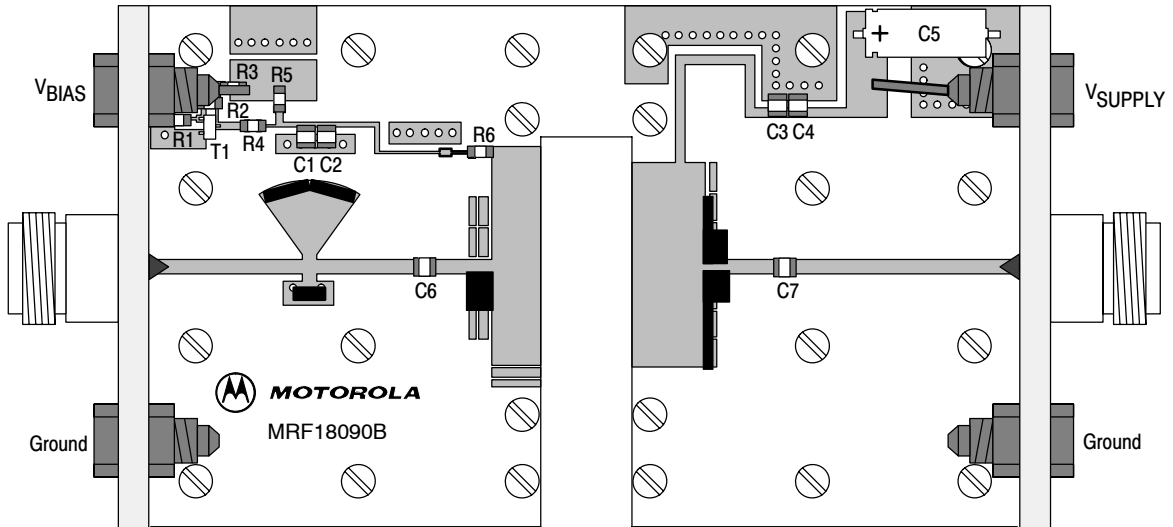
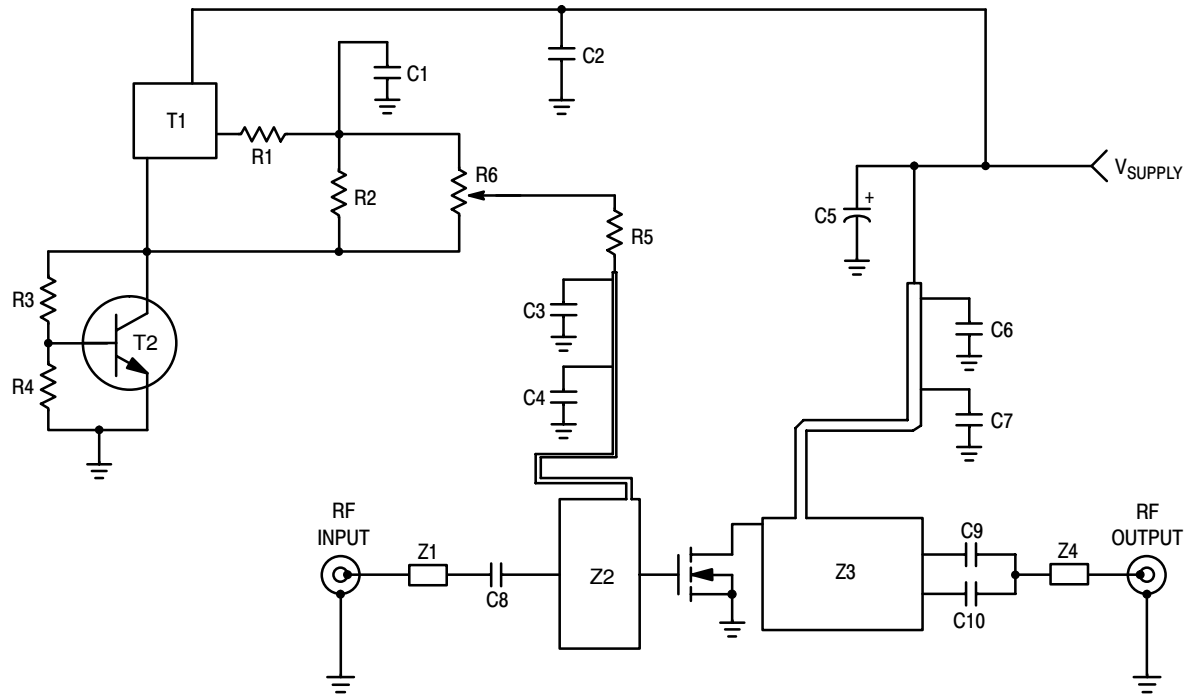


Figure 2. 1.93 - 1.99 GHz Test Fixture Component Layout



- | | | | |
|-------------|--|----|--|
| C1, C3 | 1 μ F Chip Capacitors (0805) | R5 | 10 k Ω Chip Resistor (0603) |
| C2 | 0.1 μ F Chip Capacitor (0805) | R6 | 5 k Ω , SMD Potentiometer |
| C4 | 1 nF Chip Capacitor (0805) | T1 | LP2951 Micro-8 Voltage Regulator |
| C5 | 220 μ F, 50 V Electrolytic Capacitor | T2 | BC847 SOT-23 NPN Transistor |
| C6, C7 | 8.2 pF, 100A Chip Capacitors | Z1 | 0.491" x 0.110" Microstrip |
| C8, C9, C10 | 22 pF, 100A Chip Capacitors | Z2 | 0.756" x 1.260" Microstrip |
| R1 | 10 Ω Chip Resistor (0805) | Z3 | 1.433" x 1.260" Microstrip |
| R2, R3 | 1 k Ω Chip Resistors (0805) | Z4 | 0.567" x 0.110" Microstrip |
| R4 | 2.2 k Ω Chip Resistor (0805) | | Substrate = 0.5 mm Teflon [®] Glass |

Figure 3. 1.93 - 1.99 GHz Demo Board Schematic

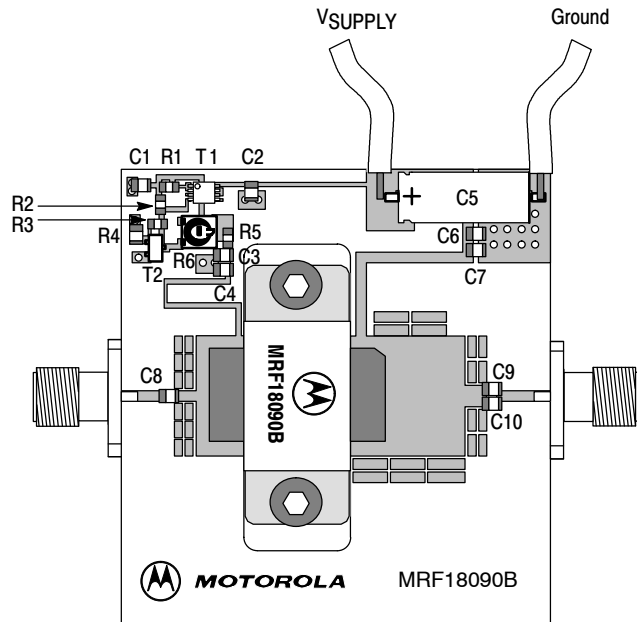


Figure 4. 1.93 - 1.99 GHz Demo Board Component Layout

TYPICAL CHARACTERISTICS

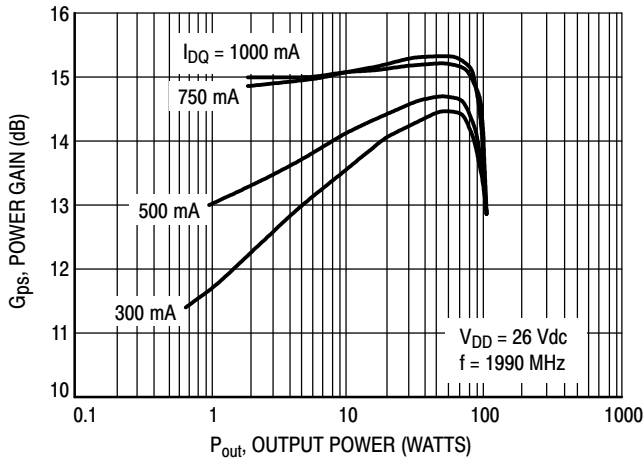


Figure 5. Power Gain versus Output Power

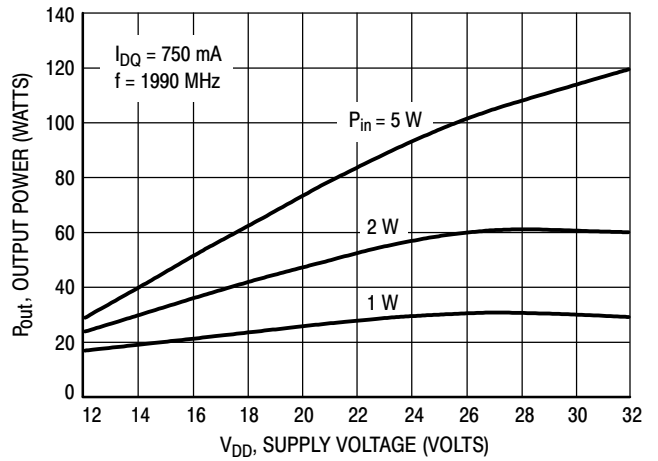


Figure 6. Output Power versus Supply Voltage

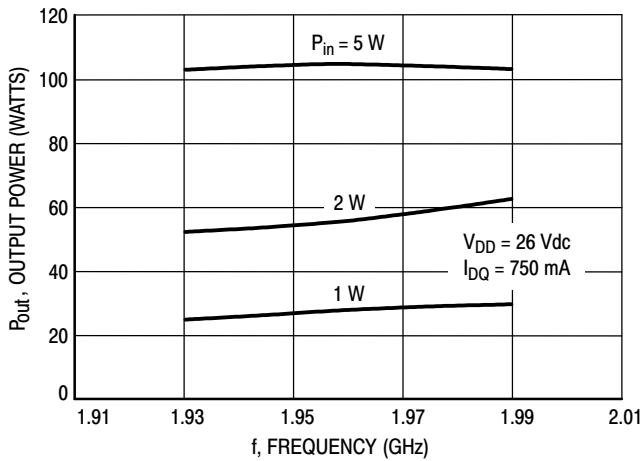


Figure 7. Output Power versus Frequency

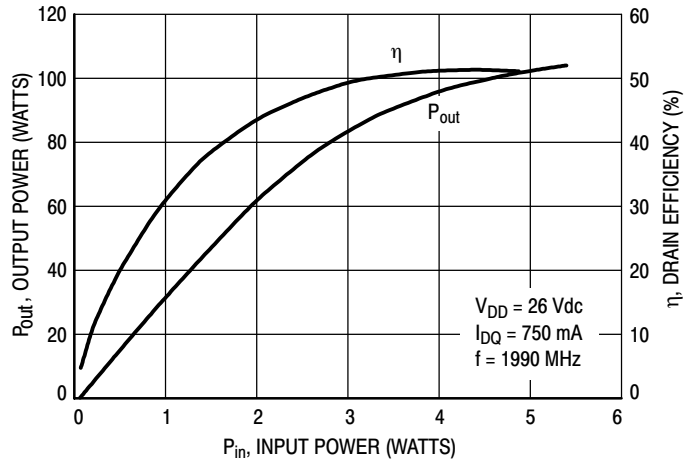


Figure 8. Output Power and Efficiency versus Input Power

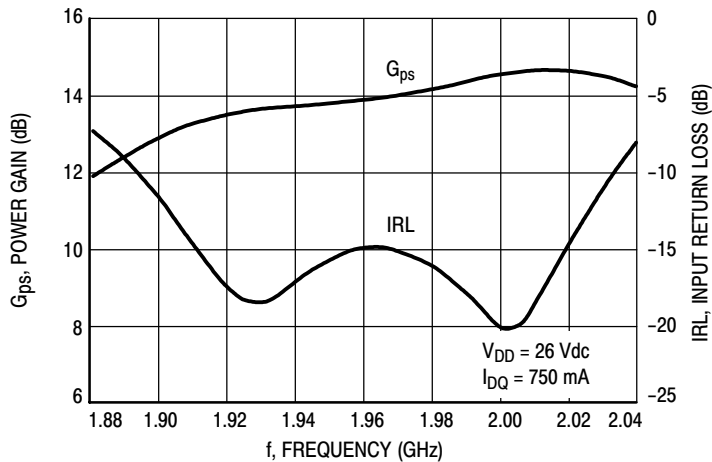
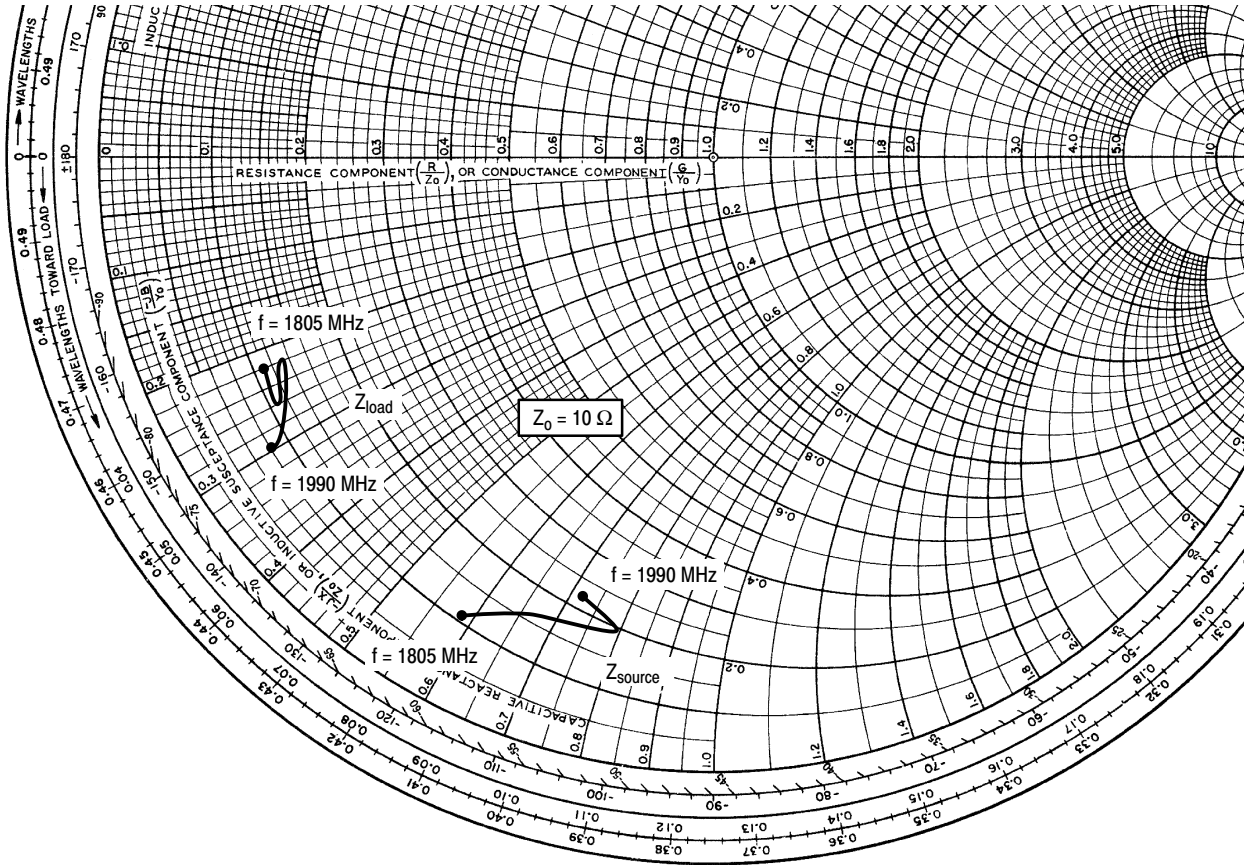


Figure 9. Wideband Gain and IRL (at Small Signal)



$V_{DD} = 26\text{ V}$, $I_{DQ} = 750\text{ mA}$, $P_{out} = 90\text{ Watts (CW)}$

f MHz	Z_{source} Ω	Z_{load} Ω
1805	1.10 - j5.85	1.15 - j2.16
1880	1.56 - j6.75	1.13 - j2.60
1930	2.05 - j8.00	1.30 - j2.23
1990	2.30 - j7.30	0.82 - j2.90

Z_{source} = Test circuit impedance as measured from gate to ground.

Z_{load} = Test circuit impedance as measured from drain to ground.

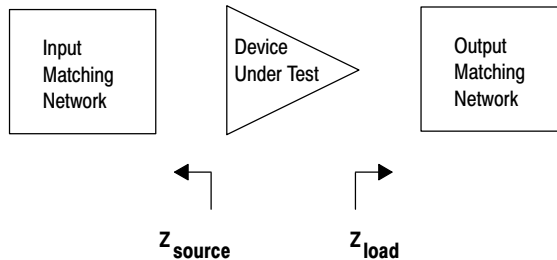


Figure 10. Large Signal Input and Output Impedance

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PACKAGE DIMENSIONS

NOTES:

1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M-1994.
2. CONTROLLING DIMENSION: INCH.
3. DIMENSION H IS MEASURED 0.030 (0.762) AWAY FROM PACKAGE BODY.
4. RECOMMENDED BOLT CENTER DIMENSION OF 1.16 (29.57) BASED ON M3 SCREW.

DIM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	1.335	1.345	33.91	34.16
B	0.535	0.545	13.6	13.8
C	0.147	0.200	3.73	5.08
D	0.495	0.505	12.57	12.83
E	0.035	0.045	0.89	1.14
F	0.003	0.006	0.08	0.15
G	1.100 BSC		27.94 BSC	
H	0.057	0.067	1.45	1.70
K	0.175	0.205	4.44	5.21
M	0.872	0.888	22.15	22.55
N	0.871	0.889	19.30	22.60
Q	∅.118	∅.138	∅3.00	∅3.51
R	0.515	0.525	13.10	13.30
S	0.515	0.525	13.10	13.30
aaa	0.007 REF		0.178 REF	
bbb	0.010 REF		0.254 REF	
ccc	0.015 REF		0.381 REF	

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

**CASE 465B-03
 ISSUE C
 NI-880
 MRF18090BR3**

NOTES:

1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M-1994.
2. CONTROLLING DIMENSION: INCH.
3. DIMENSION H IS MEASURED 0.030 (0.762) AWAY FROM PACKAGE BODY.

DIM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	0.905	0.915	22.99	23.24
B	0.535	0.545	13.60	13.80
C	0.147	0.200	3.73	5.08
D	0.495	0.505	12.57	12.83
E	0.035	0.045	0.89	1.14
F	0.003	0.006	0.08	0.15
H	0.057	0.067	1.45	1.70
K	0.170	0.210	4.32	5.33
M	0.872	0.888	22.15	22.55
N	0.871	0.889	19.30	22.60
R	0.515	0.525	13.10	13.30
S	0.515	0.525	13.10	13.30
aaa	0.007 REF		0.178 REF	
bbb	0.010 REF		0.254 REF	
ccc	0.015 REF		0.381 REF	

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

**CASE 465C-02
 ISSUE A
 NI-880S
 MRF18090BSR3**

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