

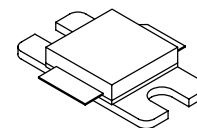
The RF MOSFET Line
RF Power Field Effect Transistors
N-Channel Enhancement-Mode Lateral MOSFETs

MRF19030LR3
MRF19030LSR3

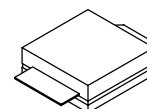
Designed for class AB PCN and PCS base station applications with frequencies from 1.8 to 2.0 GHz. Suitable for FM, TDMA, CDMA and multicarrier amplifier applications.

2.0 GHz, 30 W, 26 V
LATERAL N-CHANNEL
RF POWER MOSFETs

- CDMA Performance @ 1990 MHz, 26 Volts
 IS-97 CDMA Pilot, Sync, Paging, Traffic Codes 8 Thru 13
 885 kHz — -47 dBc @ 30 kHz BW
 1.25 MHz — -55 dBc @ 12.5 kHz BW
 2.25 MHz — -55 dBc @ 1 MHz BW
 Output Power — 4.5 Watts Avg.
 Power Gain — 13.5 dB
 Efficiency — 17%
- 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, 1.93 GHz, 30 Watts CW Output Power
- Excellent Thermal Stability
- Characterized with Series Equivalent Large-Signal Impedance Parameters
- Low Gold Plating Thickness on Leads, 40μ" Nominal.
- In Tape and Reel. R3 Suffix = 250 Units per 32 mm, 13 Inch Reel.



CASE 465E-04, STYLE 1
NI-400
MRF19030LR3



CASE 465F-04, STYLE 1
NI-400S
MRF19030LSR3

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°C Derate above 25°C	P _D	83.3 0.48	Watts W/°C
Storage Temperature Range	T _{stg}	- 65 to +150	°C
Operating Junction Temperature	T _J	200	°C

THERMAL CHARACTERISTICS

Characteristic	Symbol	Value	Unit
Thermal Resistance, Junction to Case	R _{θJC}	2.1	°C/W

ESD PROTECTION CHARACTERISTICS

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

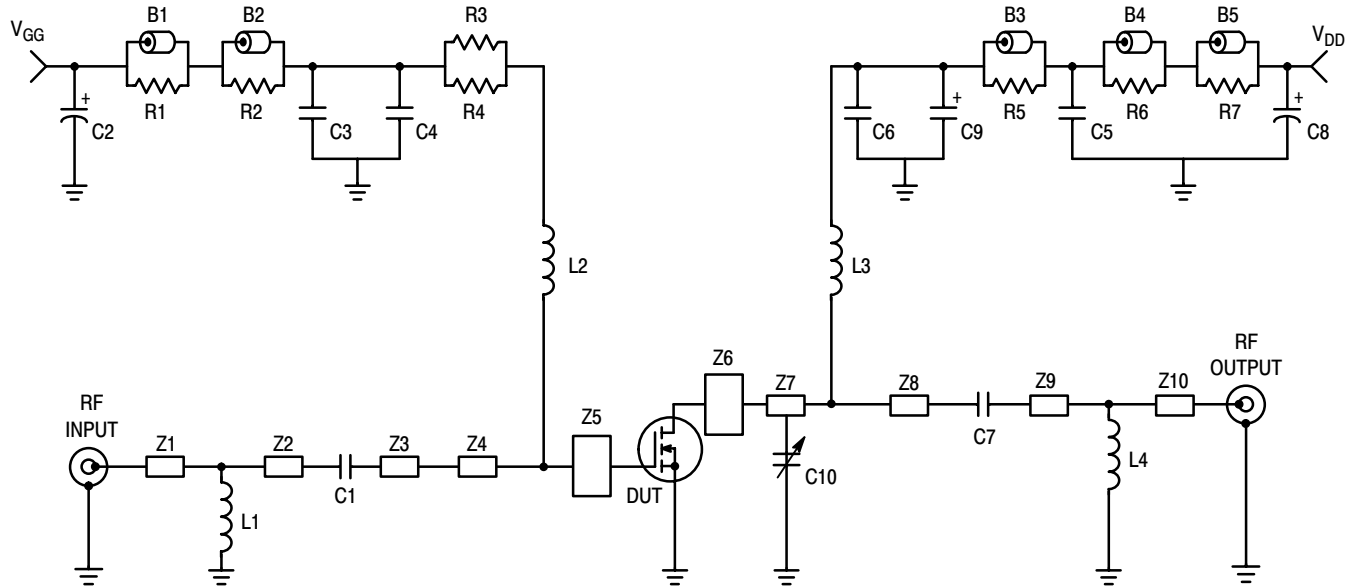
NOTE - CAUTION - MOS devices are susceptible to damage from electrostatic charge. Reasonable precautions in handling and packaging MOS devices should be observed.

Freescale Semiconductor, Inc.

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

Characteristic	Symbol	Min	Typ	Max	Unit
OFF CHARACTERISTICS					
Drain-Source Breakdown Voltage (V _{GS} = 0 Vdc, I _D = 20 μA)	V _{(BR)DSS}	65	—	—	Vdc
Zero Gate Voltage Drain Current (V _{DS} = 28 Vdc, V _{GS} = 0 Vdc)	I _{DSS}	—	—	1	μAdc
Gate-Source Leakage Current (V _{GS} = 5 Vdc, V _{DS} = 0 Vdc)	I _{GSS}	—	—	1	μAdc
ON CHARACTERISTICS					
Gate Threshold Voltage (V _{DS} = 10 Vdc, I _D = 100 μAdc)	V _{GS(th)}	2	3	4	Vdc
Gate Quiescent Voltage (V _{DS} = 28 Vdc, I _D = 300 mA)	V _{GS(Q)}	2	3.3	4.5	Vdc
Drain-Source On-Voltage (V _{GS} = 10 Vdc, I _D = 1 Adc)	V _{DS(on)}	—	0.29	0.4	Vdc
Forward Transconductance (V _{DS} = 10 Vdc, I _D = 1 Adc)	g _{fs}	—	2	—	S
DYNAMIC CHARACTERISTICS					
Input Capacitance (Including Input Matching Capacitor in Package) (1) (V _{DS} = 26 Vdc, V _{GS} = 0, f = 1 MHz)	C _{iss}	—	98.5	—	pF
Output Capacitance (1) (V _{DS} = 26 Vdc, V _{GS} = 0, f = 1 MHz)	C _{oss}	—	37	—	pF
Reverse Transfer Capacitance (V _{DS} = 26 Vdc, V _{GS} = 0, f = 1 MHz)	C _{rss}	—	1.3	—	pF
FUNCTIONAL TESTS (In Motorola Test Fixture, 50 ohm system)					
Two-Tone Common-Source Amplifier Power Gain (V _{DD} = 26 Vdc, P _{out} = 30 W PEP, I _{DQ} = 300 mA, f ₁ = 1960.0 MHz, f ₂ = 1960.1 MHz)	G _{ps}	—	13	—	dB
Two-Tone Drain Efficiency (V _{DD} = 26 Vdc, P _{out} = 30 W PEP, I _{DQ} = 300 mA, f ₁ = 1960.0 MHz, f ₂ = 1960.1 MHz)	η	—	36	—	%
3rd Order Intermodulation Distortion (V _{DD} = 26 Vdc, P _{out} = 30 W PEP, I _{DQ} = 300 mA, f ₁ = 1960.0 MHz, f ₂ = 1960.1 MHz)	IMD	—	-31	—	dBc
Input Return Loss (V _{DD} = 26 Vdc, P _{out} = 30 W PEP, I _{DQ} = 300 mA, f ₁ = 1960.0 MHz, f ₂ = 1960.1 MHz)	IRL	—	-13	—	dB
Two-Tone Common-Source Amplifier Power Gain (V _{DD} = 26 Vdc, P _{out} = 30 W PEP, I _{DQ} = 300 mA, f ₁ = 1930.0 MHz, f ₂ = 1930.1 MHz and f ₁ = 1990.0 MHz, f ₂ = 1990.1 MHz)	G _{ps}	12	13	—	dB
Two-Tone Drain Efficiency (V _{DD} = 26 Vdc, P _{out} = 30 W PEP, I _{DQ} = 300 mA, f ₁ = 1930.0 MHz, f ₂ = 1930.1 MHz and f ₁ = 1990.0 MHz, f ₂ = 1990.1 MHz)	η	33	36	—	%
3rd Order Intermodulation Distortion (V _{DD} = 26 Vdc, P _{out} = 30 W PEP, I _{DQ} = 300 mA, f ₁ = 1930.0 MHz, f ₂ = 1930.1 MHz and f ₁ = 1990.0 MHz, f ₂ = 1990.1 MHz)	IMD	—	-31	-28	dBc
Input Return Loss (V _{DD} = 26 Vdc, P _{out} = 30 W PEP, I _{DQ} = 300 mA, f ₁ = 1930.0 MHz, f ₂ = 1930.1 MHz and f ₁ = 1990.0 MHz, f ₂ = 1990.1 MHz)	IRL	—	-13	-9	dB
Output Mismatch Stress (V _{DD} = 26 Vdc, P _{out} = 30 W CW, I _{DQ} = 300 mA, f = 1930 MHz, VSWR = 10:1, All Phase Angles at Frequency of Tests)	Ψ	No Degradation In Output Power Before and After Test			

(1) Part is internally matched both on input and output.



B1 - B5	Short Ferrite Beads	Z3	0.080" x 0.480" Microstrip
C1, C7	10 pF Chip Capacitors, B Case	Z4	0.325" x 0.280" Microstrip
C2, C8	470 μ F, 35 V Electrolytic Capacitors	Z5	0.510" x 0.200" Microstrip
C3, C5	0.1 μ F Chip Capacitors, B Case	Z6	0.510" x 0.200" Microstrip
C4, C6	5.1 pF Chip Capacitors, B Case	Z7	0.325" x 0.280" Microstrip
C9	22 μ F Tantalum Chip Capacitor	Z8	0.080" x 0.480" Microstrip
C10	0.4 - 2.5 pF Variable Capacitor, Johanson Gigatrim	Z9	0.080" x 0.530" Microstrip
L1 - L4	12.5 nH Inductors	Z10	0.080" x 0.671" Microstrip
R1 - R7	12 Ω Chip Resistors (0805)	Substrate	0.030" x 3.00" x 5.00" Glass Teflon [®] , Arlon
Z1	0.080" x 0.595" Microstrip		
Z2	0.080" x 0.600" Microstrip		

Figure 1. MRF19030LR3(LSR3) Test Circuit Schematic

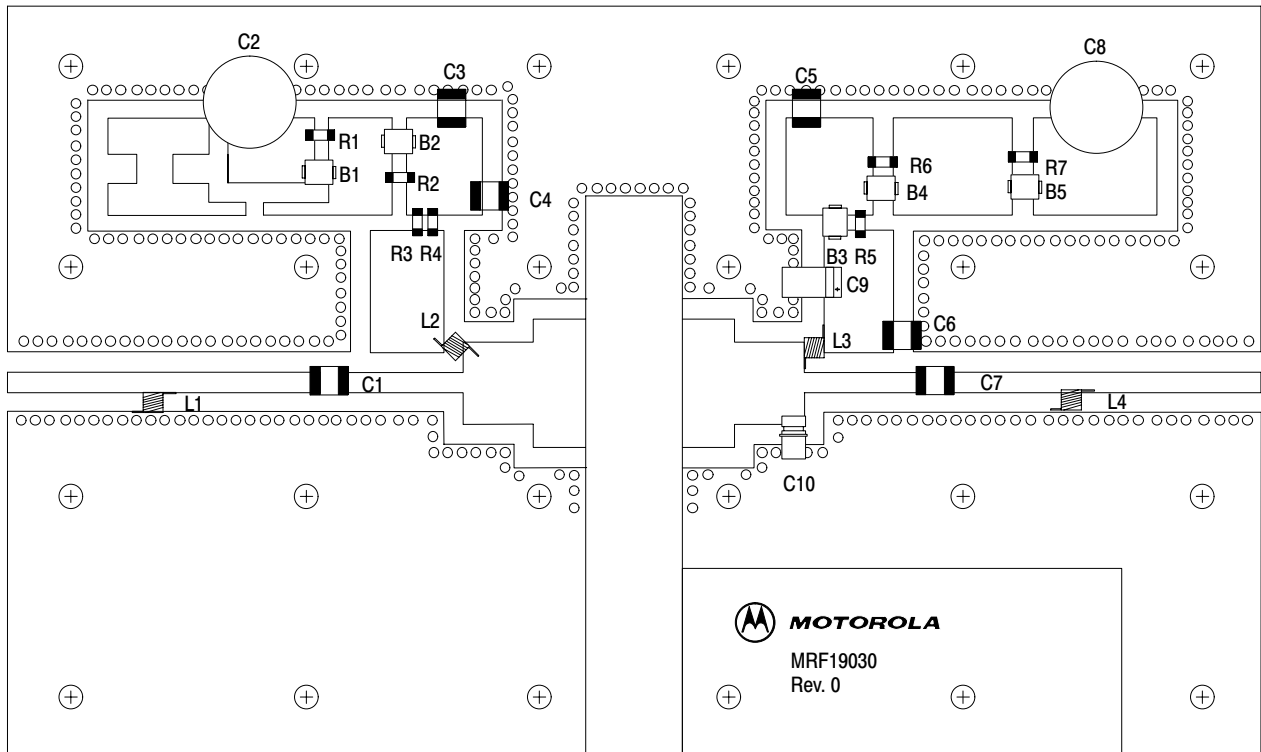


Figure 2. MRF19030LR3(LSR3) Test Circuit Component Layout

TYPICAL CHARACTERISTICS

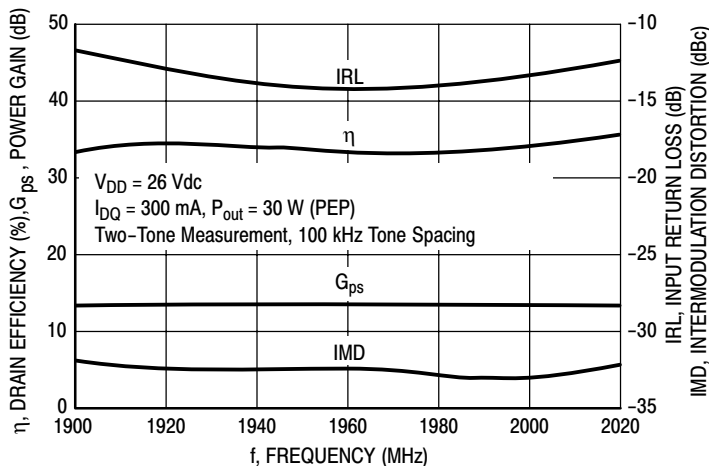


Figure 3. Class AB Broadband Circuit Performance

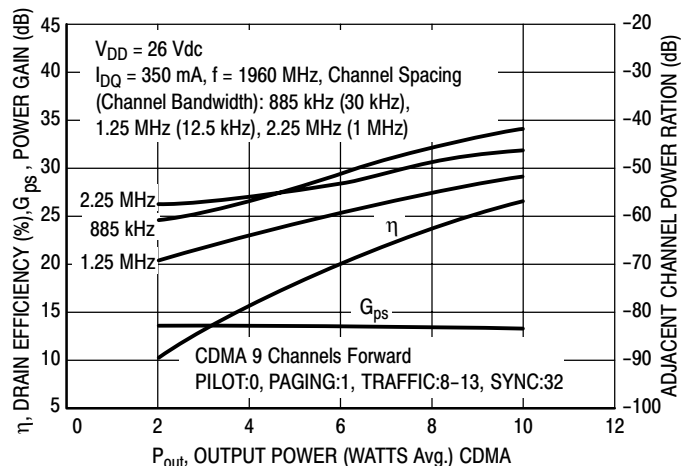


Figure 4. CDMA ACPR, Power Gain and Drain Efficiency versus Output Power

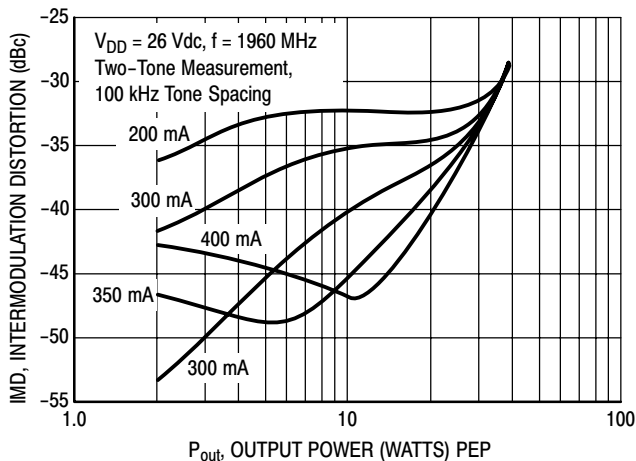


Figure 5. Intermodulation Distortion versus Output Power

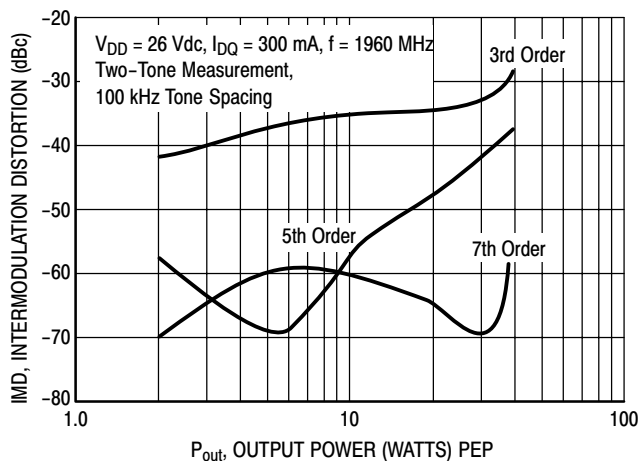


Figure 6. Intermodulation Distortion Products versus Output Power

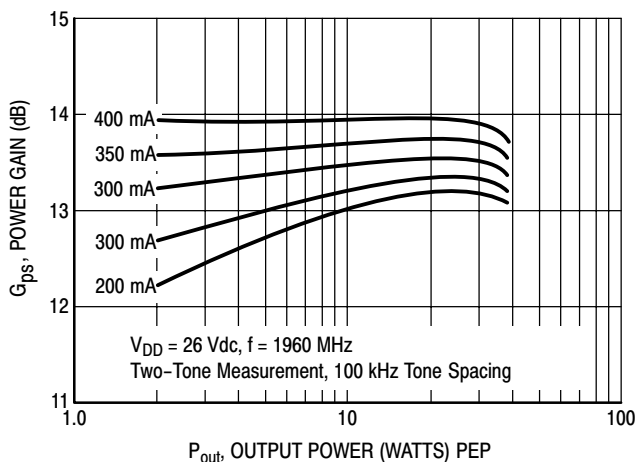


Figure 7. Power Gain versus Output Power

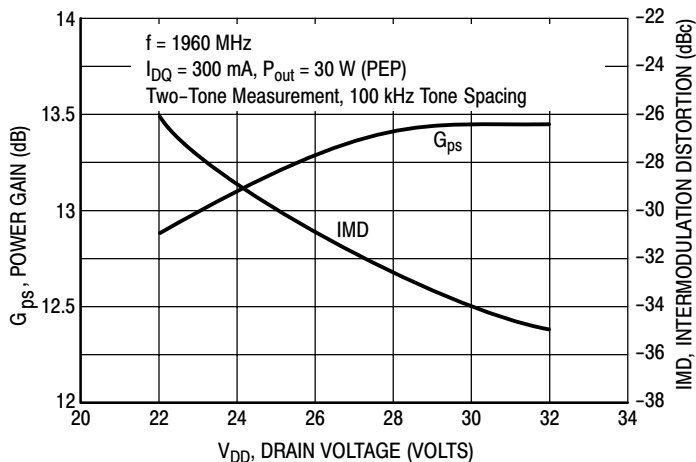
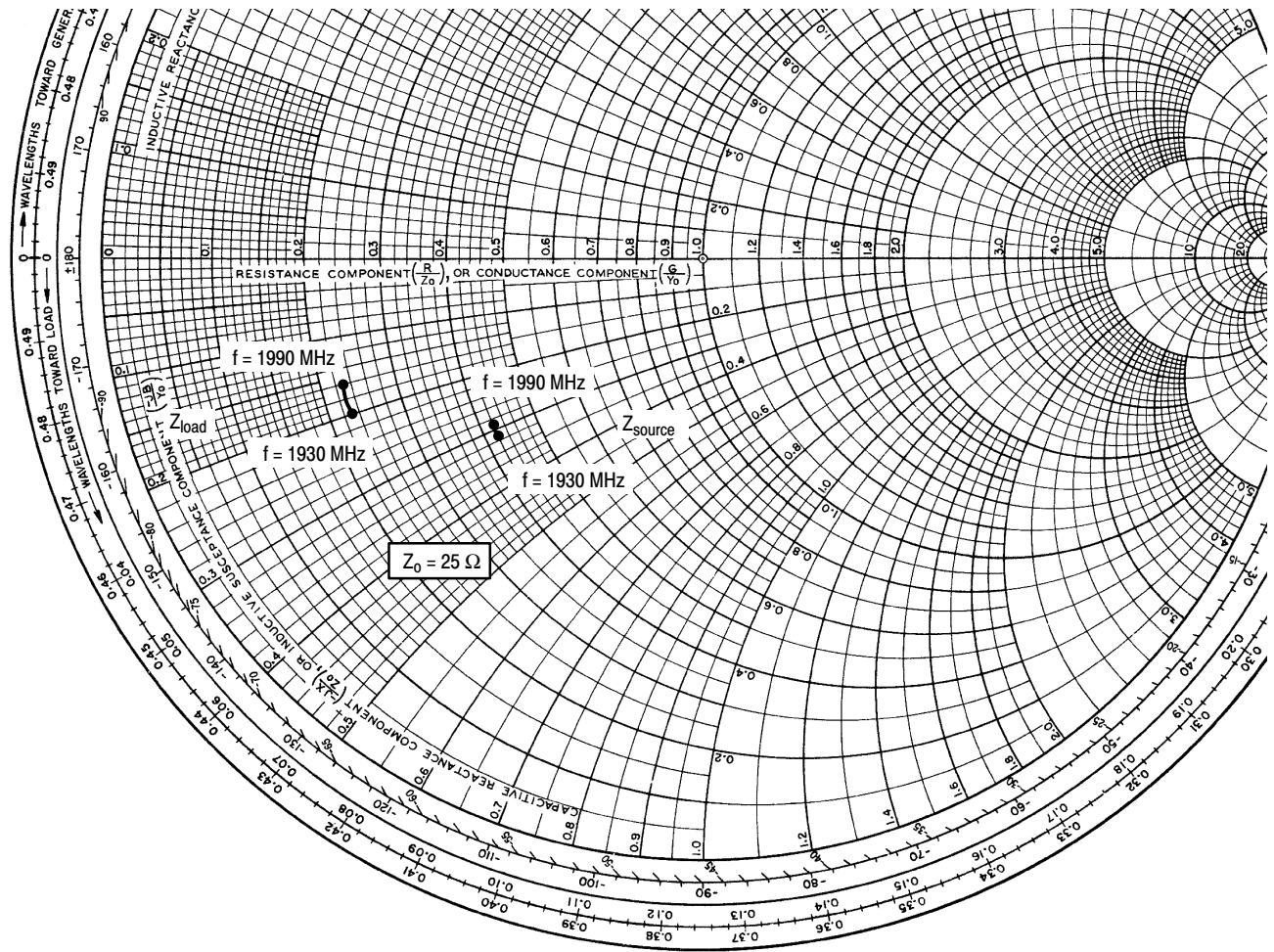


Figure 8. Power Gain and Intermodulation Distortion versus Supply Voltage



$V_{DD} = 26\text{ V}$, $I_{DQ} = 300\text{ mA}$, $P_{out} = 30\text{ W PEP}$

f MHz	Z_{source} Ω	Z_{load} Ω
1930	$10.57 - j7.69$	$5.81 - j5.01$
1960	$10.54 - j7.43$	$5.84 - j4.67$
1990	$10.47 - j7.21$	$5.84 - j4.35$

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

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

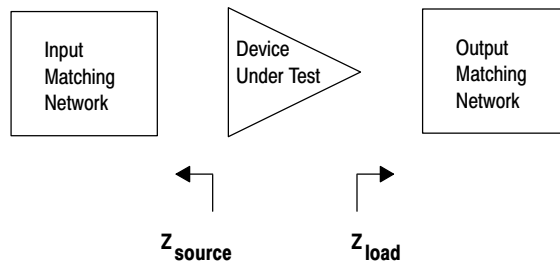


Figure 9. Series Equivalent Source and Load Impedance

NOTES

Freescale Semiconductor, Inc.

PACKAGE DIMENSIONS

2X Ø Q
 $\oplus \ominus$ bbb (M) T B (M) A (M)

2X K

2X D
 $\oplus \ominus$ bbb (M) T A (M) B (M)

N (LID)
 $\oplus \ominus$ ccc (M) T A (M) B (M)

ccc (M) T A (M) B (M)

aaa (M) T A (M) B (M)

T SEATING PLANE

M (INSULATOR)

R (LID)
 $\oplus \ominus$ ccc (M) T A (M) B (M)

(INSULATOR)
 $\oplus \ominus$ aaa (M) T A (M) B (M)

aaa (M) T A (M) B (M)

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

DIM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	.795	.805	20.19	20.44
B	.380	.390	9.65	9.9
C	.125	.163	3.17	4.14
D	.275	.285	6.98	7.24
E	.035	.045	0.89	1.14
F	.004	.006	0.10	0.15
G	.600 BSC		15.24 BSC	
H	.057	.067	1.45	1.7
K	.092	.122	2.33	3.1
M	.395	.405	10	10.3
N	.395	.405	10	10.3
Q	\varnothing .120	\varnothing .130	\varnothing 3.05	\varnothing 3.3
R	.395	.405	10	10.3
S	.395	.405	10	10.3
aaa	.005 BSC		0.127 BSC	
bbb	.010 BSC		0.254 BSC	
ccc	.015 BSC		0.381 BSC	

CASE 465E-04
ISSUE E
NI-400
MRF19030LR3

2X D
 $\oplus \ominus$ bbb (M) T A (M) B (M)

2X K

ccc (M) T A (M) B (M)

aaa (M) T A (M) B (M)

T SEATING PLANE

A (FLANGE)

M (INSULATOR)

N (LID)
 $\oplus \ominus$ ccc (M) T A (M) B (M)

R (LID)
 $\oplus \ominus$ ccc (M) T A (M) B (M)

(INSULATOR)
 $\oplus \ominus$ aaa (M) T A (M) B (M)

aaa (M) T A (M) B (M)

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

DIM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	.395	.405	10.03	10.29
B	.395	.405	10.03	10.29
C	.125	.163	3.18	4.14
D	.275	.285	6.98	7.24
E	.035	.045	0.89	1.14
F	.004	.006	0.10	0.15
H	.057	.067	1.45	1.70
K	.092	.122	2.34	3.10
M	.395	.405	10.03	10.29
N	.395	.405	10.03	10.29
R	.395	.405	10.03	10.29
S	.395	.405	10.03	10.29
aaa	.005 REF		0.127 REF	
bbb	.010 REF		0.254 REF	
ccc	.015 REF		0.38 REF	

CASE 465F-04
ISSUE C
NI-400S
MRF19030LSR3

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MRF19030/D