Freescale Semiconductor
Technical Data

Document Number: MRF19030
Rev. 12, 5/2006

RF Power Field Effect Transistors

N-Channel Enhancement-Mode Lateral MOSFETs

MRF19030LR3
MRF19030LSR3

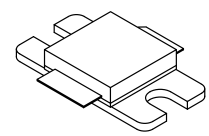
Designed for class AB PCN and PCS base station applications with frequencies from 1800 to 2000 MHz. Suitable for FM, TDMA, CDMA and multicarrier amplifier applications.

- CDMA Performance @ 1990 MHz, 26 Volts
  IS-95 CDMA Pilot, Sync, Paging, Traffic Codes 8 Thru 13
  885 kHz — -47 dBc in 30 kHz BW
  1.25 MHz — -55 dBc in 12.5 kHz BW
  2.25 MHz — -55 dBc in 1 MHz BW
  Output Power — 4.5 Watts Avg.
  Power Gain — 13.5 dB
  Efficiency — 17%
- Capable of Handling 10:1 VSWR, @ 26 Vdc, 1960 MHz, 30 Watts CW Output Power

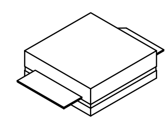
Features

- Internally Matched for Ease of Use
- High Gain, High Efficiency and High Linearity
- Integrated ESD Protection
- Designed for Maximum Gain and Insertion Phase Flatness
- Excellent Thermal Stability
- Characterized with Series Equivalent Large-Signal Impedance Parameters
- Low Gold Plating Thickness on Leads, 40μ″ Nominal.
- RoHS Compliant
- In Tape and Reel. R3 Suffix = 250 Units per 32 mm, 13 Inch Reel.

1930-1990 MHz, 30 W, 26 V
LATERAL N-CHANNEL
RF POWER MOSFETs



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



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

Table 1. Maximum Ratings

Rating	Symbol	Value	Unit
Drain-Source Voltage	V_{DSS}	-0.5, +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	W W/°C
Storage Temperature Range	T_{stg}	- 65 to +150	°C
Case Operating Temperature	T_C	150	°C
Operating Junction Temperature	T_J	200	°C

Table 2. Thermal Characteristics

Characteristic	Symbol	Value	Unit
Thermal Resistance, Junction to Case	$R_{\theta JC}$	2.1	°C/W

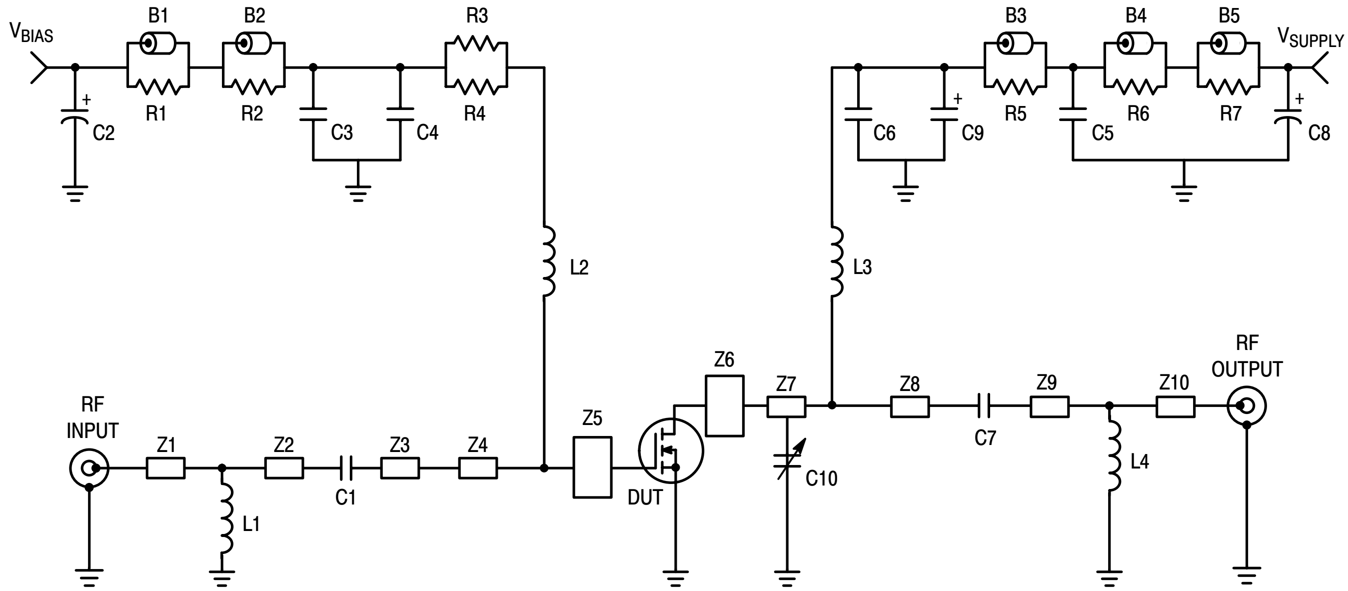
Table 3. ESD Protection Characteristics

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

Table 4. Electrical Characteristics (T_C = 25°C unless otherwise noted)

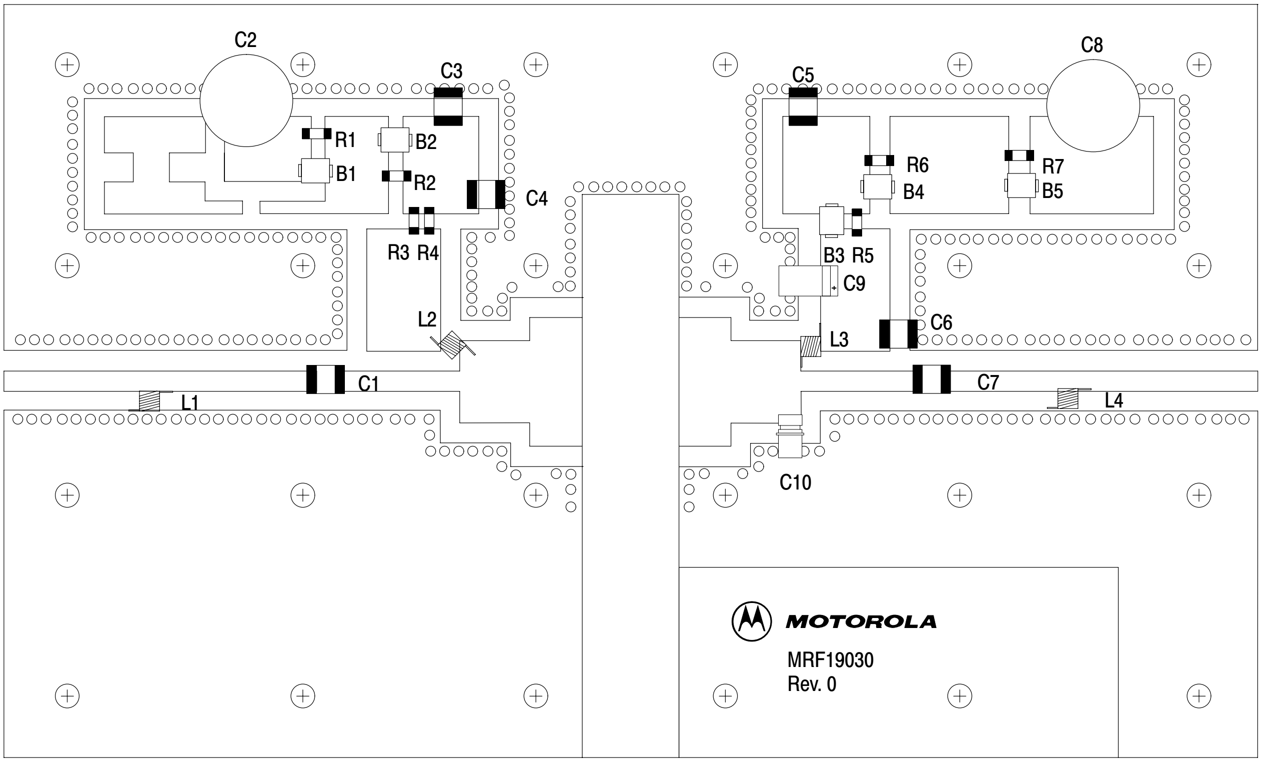
Characteristic	Symbol	Min	Typ	Max	Unit
Off Characteristics					
Drain-Source Breakdown Voltage (V_{GS} = 0 Vdc, I_D = 20 μA)	$V_{(BR)DSS}$	65	—	—	Vdc
Zero Gate Voltage Drain Current (V_{DS} = 28 Vdc, V_{GS} = 0 Vdc)	I_{DSS}	—	—	1	μAdc
Gate-Source Leakage Current (V_{GS} = 5 Vdc, V_{DS} = 0 Vdc)	I_{GSS}	—	—	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 Freescale 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, f1 = 1960.0 MHz, f2 = 1960.1 MHz)	G_{ps}	—	13	—	dB
Two-Tone Drain Efficiency (V_{DD} = 26 Vdc, P_{out} = 30 W PEP, I_{DQ} = 300 mA, f1 = 1960.0 MHz, f2 = 1960.1 MHz)	η	—	36	—	%
3rd Order Intermodulation Distortion (V_{DD} = 26 Vdc, P_{out} = 30 W PEP, I_{DQ} = 300 mA, f1 = 1960.0 MHz, f2 = 1960.1 MHz)	IMD	—	-31	—	dBc
Input Return Loss (V_{DD} = 26 Vdc, P_{out} = 30 W PEP, I_{DQ} = 300 mA, f1 = 1960.0 MHz, f2 = 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, f1 = 1930.0 MHz, f2 = 1930.1 MHz and f1 = 1990.0 MHz, f2 = 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, f1 = 1930.0 MHz, f2 = 1930.1 MHz and f1 = 1990.0 MHz, f2 = 1990.1 MHz)	η	33	36	—	%
3rd Order Intermodulation Distortion (V_{DD} = 26 Vdc, P_{out} = 30 W PEP, I_{DQ} = 300 mA, f1 = 1930.0 MHz, f2 = 1930.1 MHz and f1 = 1990.0 MHz, f2 = 1990.1 MHz)	IMD	—	-31	-28	dBc
Input Return Loss (V_{DD} = 26 Vdc, P_{out} = 30 W PEP, I_{DQ} = 300 mA, f1 = 1930.0 MHz, f2 = 1930.1 MHz and f1 = 1990.0 MHz, f2 = 1990.1 MHz)	IRL	—	-13	-9	dB

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



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

Figure 1. MRF19030LR3(SR3) Test Circuit Schematic



Freescale has begun the transition of marking Printed Circuit Boards (PCBs) with the Freescale Semiconductor signature/logo. PCBs may have either Motorola or Freescale markings during the transition period. These changes will have no impact on form, fit or function of the current product.

Figure 2. MRF19030LR3(SR3) Test Circuit Component Layout

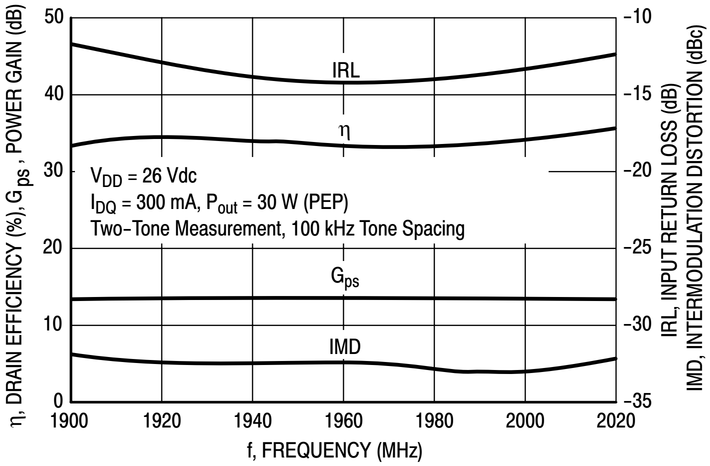


Figure 3. Class AB Broadband Circuit Performance

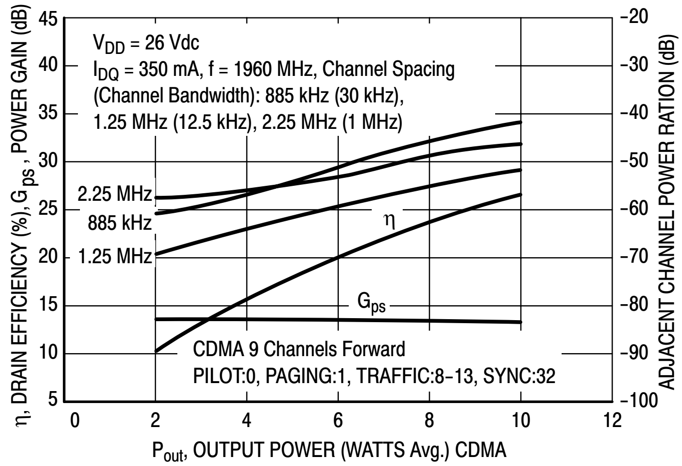


Figure 4. CDMA ACPR, Power Gain and Drain Efficiency versus Output Power

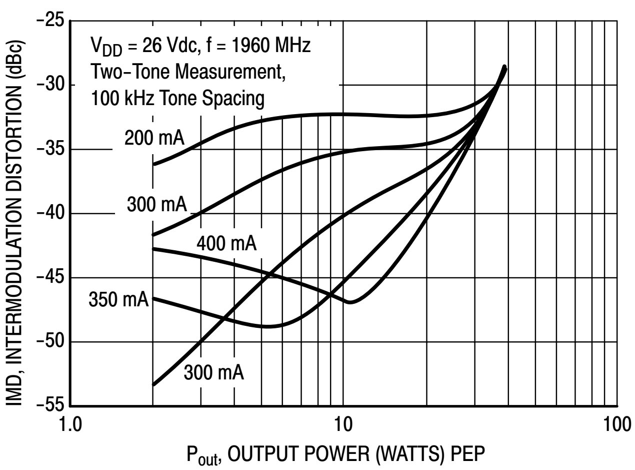


Figure 5. Intermodulation Distortion versus Output Power

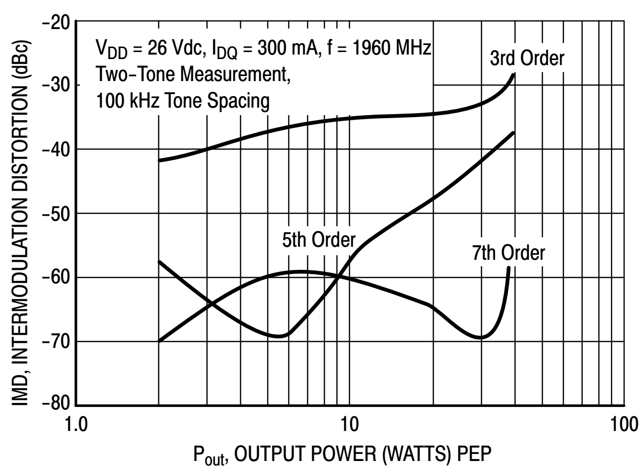


Figure 6. Intermodulation Distortion Products versus Output Power

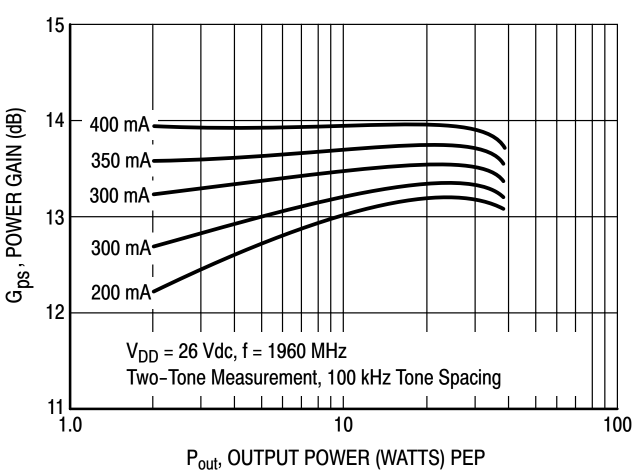


Figure 7. Power Gain versus Output Power

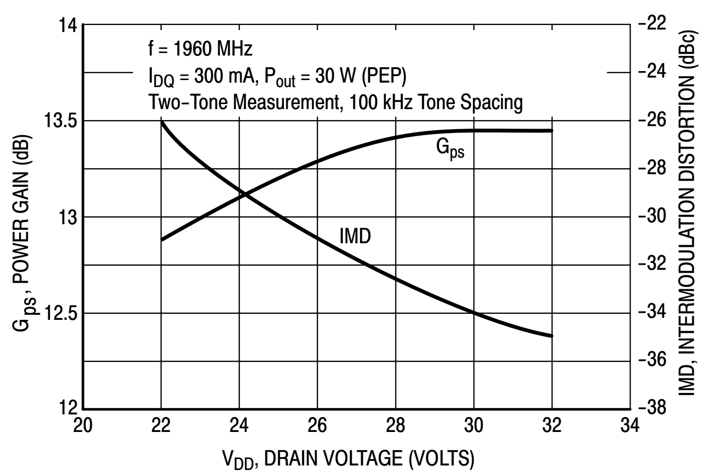
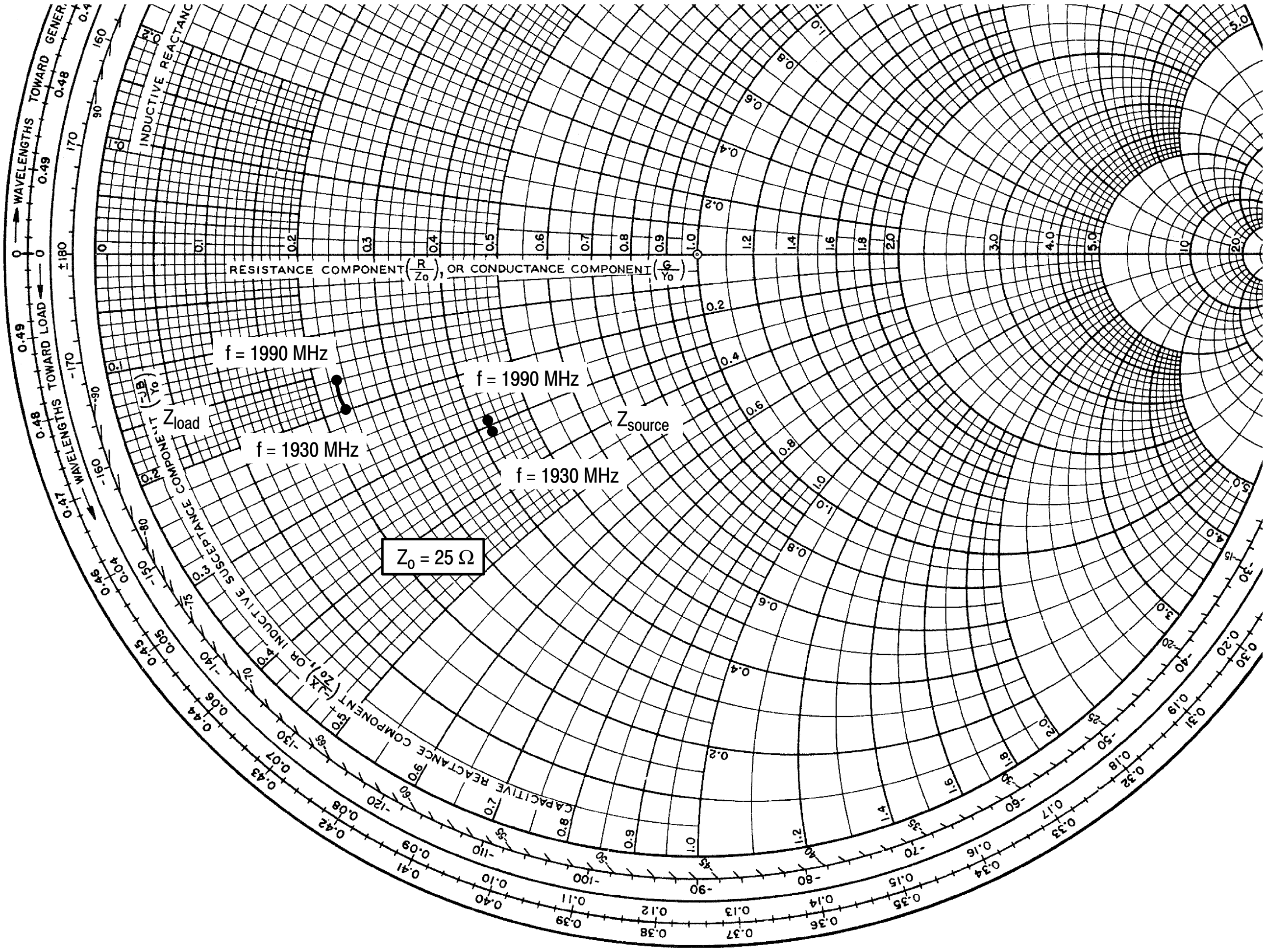


Figure 8. Power Gain and Intermodulation Distortion versus Supply Voltage



V_{DD} = 26 V, I_{DQ} = 300 mA, P_{out} = 30 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.

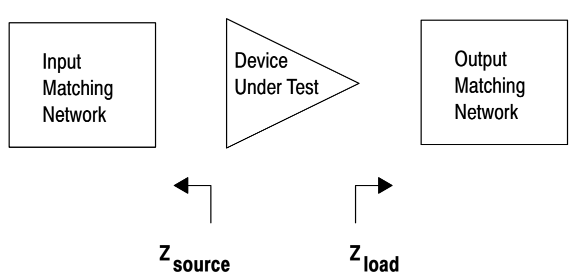
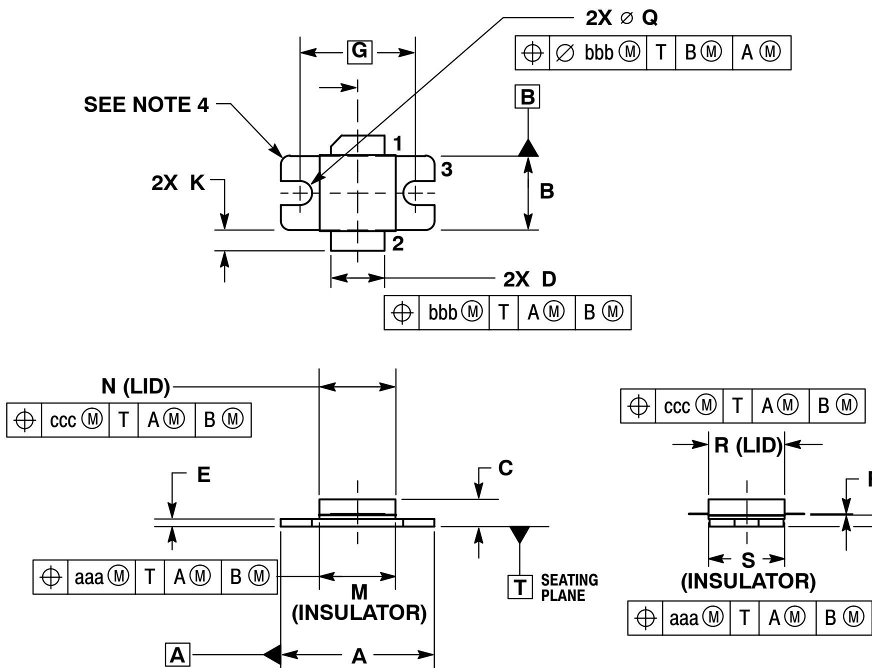


Figure 9. Series Equivalent Source and Load Impedance

PACKAGE DIMENSIONS

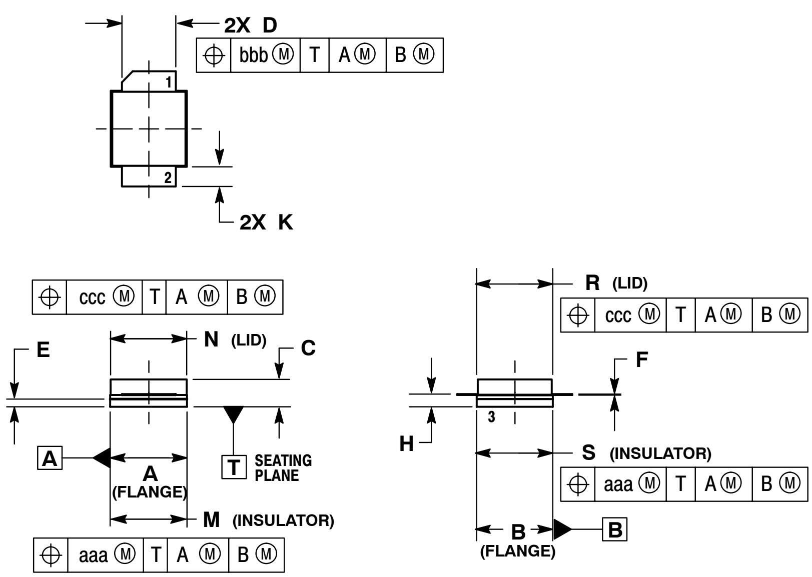


NOTES:
1. CONTROLLING DIMENSION: INCH.
2. INTERPRET DIMENSIONS AND TOLERANCES PER ASME Y14.5M, 1994.
3. DIMENSION H IS MEASURED 0.030 (0.762) AWAY FROM PACKAGE BODY.
4. INFORMATION ONLY: CORNER BREAK (4X) TO BE .060±.005 (1.52±0.13) RADIUS OR .06±.005 (1.52±0.13) x 45° CHAMFER.

	INCHES		MILLIMETERS	
DIM	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	∅ .120	∅ .130	∅ 3.05	∅ 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	

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

CASE 465E-04
ISSUE F
NI-400
MRF19030LR3



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	INCHES		MILLIMETERS	
DIM	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	

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

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

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Document Number: MRF19030
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