

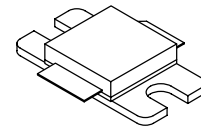
The RF MOSFET Line
RF Power Field Effect Transistors
N-Channel Enhancement-Mode Lateral MOSFETs

MRF21030LR3
MRF21030LSR3

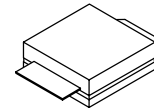
Designed for PCN and PCS base station applications with frequencies from 2.0 to 2.2 GHz. Suitable for FM, TDMA, CDMA and multicarrier amplifier applications. To be used in Class AB for PCN-PCS/cellular radio and WLL applications.

- Wideband CDMA Performance: -45 dB ACPR @ 4.096 MHz, 28 Volts
 Output Power — 3.5 Watts
 Power Gain — 14 dB
 Efficiency — 15%
- High Gain, High Efficiency and High Linearity
- Integrated ESD Protection
- Designed for Maximum Gain and Insertion Phase Flatness
- Capable of Handling 10:1 VSWR, @ 28 Vdc, 2.11 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.

2.2 GHz, 30 W, 28 V
LATERAL N-CHANNEL
RF POWER MOSFETs



CASE 465E-04, STYLE 1
NI-400
MRF21030LR3



CASE 465F-04, STYLE 1
NI-400S
MRF21030LSR3

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	83.3 0.48	Watts W/ $^\circ\text{C}$
Storage Temperature Range	T_{stg}	- 65 to +150	$^\circ\text{C}$
Operating Junction Temperature	T_J	200	$^\circ\text{C}$

ESD PROTECTION CHARACTERISTICS

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

THERMAL CHARACTERISTICS

Characteristic	Symbol	Max	Unit
Thermal Resistance, Junction to Case	$R_{\theta JC}$	2.1	$^\circ\text{C}/\text{W}$

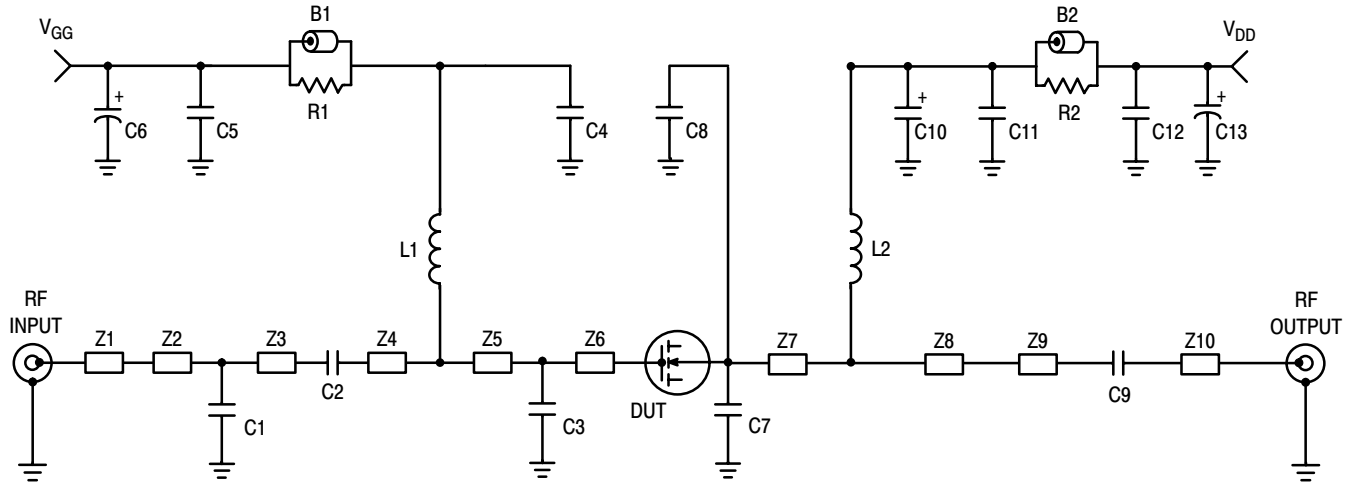
NOTE - CAUTION - MOS devices are susceptible to damage from electrostatic charge. Reasonable precautions in handling and packaging MOS devices should be observed.

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 = 250 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} = 28 Vdc, V _{GS} = 0, f = 1 MHz)	C _{iss}	—	98.5	—	pF
Output Capacitance (1) (V _{DS} = 28 Vdc, V _{GS} = 0, f = 1 MHz)	C _{oss}	—	37	—	pF
Reverse Transfer Capacitance (V _{DS} = 28 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} = 28 Vdc, P _{out} = 30 W PEP, I _{DQ} = 250 mA, f ₁ = 2140.0 MHz, f ₂ = 2140.1 MHz)	G _{ps}	—	13	—	dB
Two-Tone Drain Efficiency (V _{DD} = 28 Vdc, P _{out} = 30 W PEP, I _{DQ} = 250 mA, f ₁ = 2140.0 MHz, f ₂ = 2140.1 MHz)	η	—	33	—	%
3rd Order Intermodulation Distortion (V _{DD} = 28 Vdc, P _{out} = 30 W PEP, I _{DQ} = 250 mA, f ₁ = 2140.0 MHz, f ₂ = 2140.1 MHz)	IMD	—	-30	—	dBc
Input Return Loss (V _{DD} = 28 Vdc, P _{out} = 30 W PEP, I _{DQ} = 250 mA, f ₁ = 2140.0 MHz, f ₂ = 2140.1 MHz)	IRL	—	-13	—	dB
Two-Tone Common-Source Amplifier Power Gain (V _{DD} = 28 Vdc, P _{out} = 30 W PEP, I _{DQ} = 250 mA, f ₁ = 2110.0 MHz, f ₂ = 2110.1 MHz and f ₁ = 2170.0 MHz, f ₂ = 2170.1 MHz)	G _{ps}	12	13	—	dB
Two-Tone Drain Efficiency (V _{DD} = 28 Vdc, P _{out} = 30 W PEP, I _{DQ} = 250 mA, f ₁ = 2110.0 MHz, f ₂ = 2110.1 MHz and f ₁ = 2170.0 MHz, f ₂ = 2170.1 MHz)	η	31	33	—	%
3rd Order Intermodulation Distortion (V _{DD} = 28 Vdc, P _{out} = 30 W PEP, I _{DQ} = 250 mA, f ₁ = 2110.0 MHz, f ₂ = 2110.1 MHz and f ₁ = 2170.0 MHz, f ₂ = 2170.1 MHz)	IMD	—	-30	-27.5	dBc
Input Return Loss (V _{DD} = 28 Vdc, P _{out} = 30 W PEP, I _{DQ} = 250 mA, f ₁ = 2110.0 MHz, f ₂ = 2110.1 MHz and f ₁ = 2170.0 MHz, f ₂ = 2170.1 MHz)	IRL	—	-13	-9	dB
Output Mismatch Stress (V _{DD} = 28 Vdc, P _{out} = 30 W CW, I _{DQ} = 250 mA, f = 2110 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, B2	Short Ferrite Beads	Z1	0.153" x 0.087" Microstrip
C1	1 pF Chip Capacitor	Z2	0.509" x 0.156" Microstrip
C2	4.7 pF Chip Capacitor	Z3	0.572" x 0.087" Microstrip
C3	0.5 pF Chip Capacitor	Z4	0.509" x 0.232" Microstrip
C4	3.9 pF Chip Capacitor	Z5	0.277" x 0.143" Microstrip
C5, C12	0.1 μ F Chip Capacitors	Z6	0.200" x 0.305" Microstrip
C6, C13	470 μ F, 63 V Electrolytic Chip Capacitors	Z7	0.200" x 0.511" Microstrip
C7, C8	0.3 pF Chip Capacitors	Z8	0.510" x 0.328" Microstrip
C9	3.6 pF Chip Capacitor	Z9	0.608" x 0.081" Microstrip
C10	22 μ F Tantalum Chip Capacitor	PCB	Taconic TLX8, 30 mils, $\epsilon_r = 2.55$
C11	5.1 pF Chip Capacitor		
L1, L2	12.5 nH Inductors		
R1, R2	12 Ω Chip Resistors (1206)		

Figure 1. MRF21030LR3(LSR3) Test Circuit Schematic

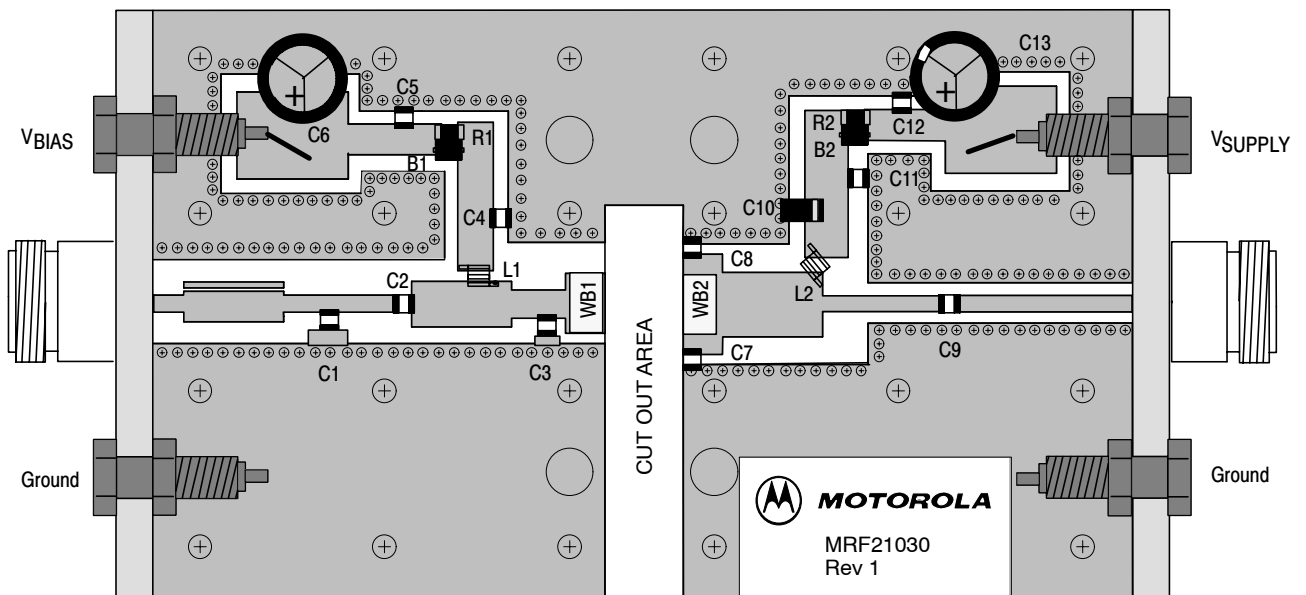


Figure 2. MRF21030LR3(LSR3) Test Circuit Component Layout

TYPICAL CHARACTERISTICS

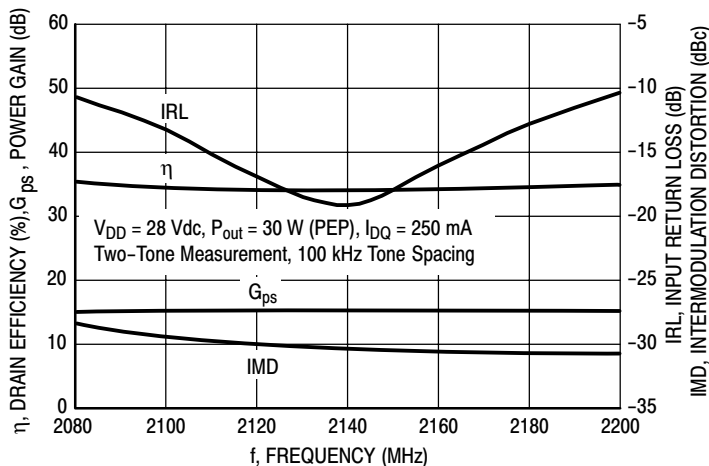


Figure 3. Class AB Broadband Circuit Performance

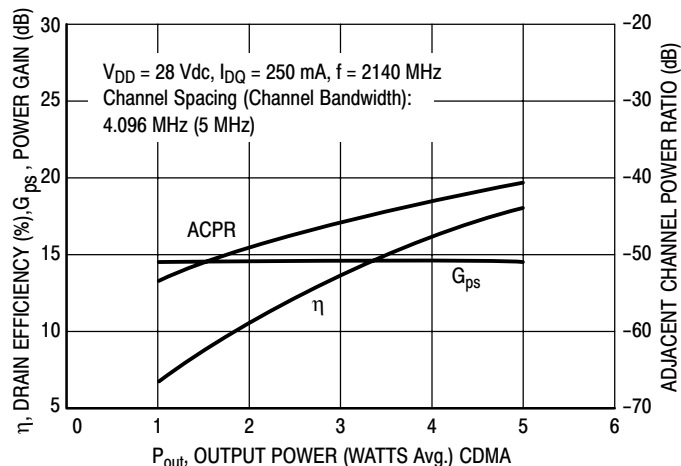


Figure 4. CDMA ACPR, Power Gain and Drain Efficiency versus Output Power

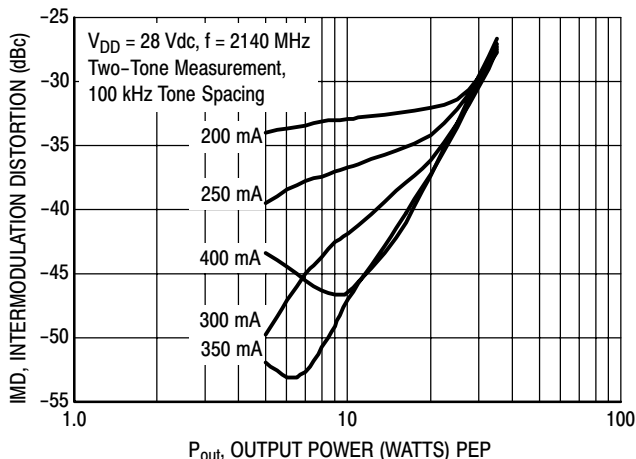


Figure 5. Intermodulation Distortion versus Output Power

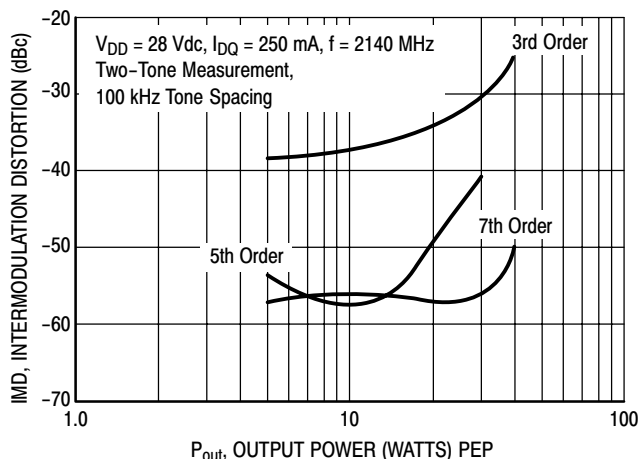


Figure 6. Intermodulation Distortion Products versus Output Power

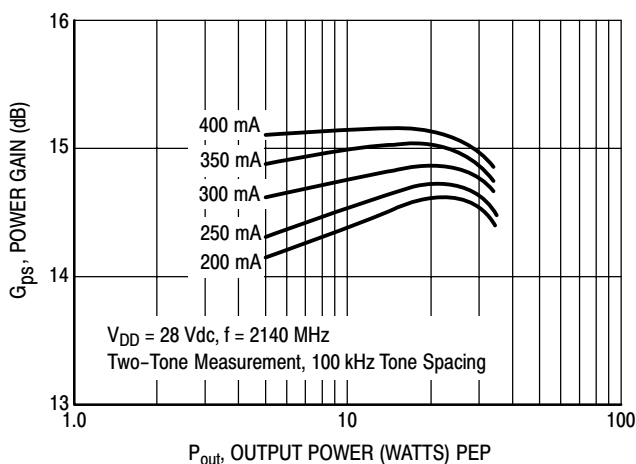


Figure 7. Power Gain versus Output Power

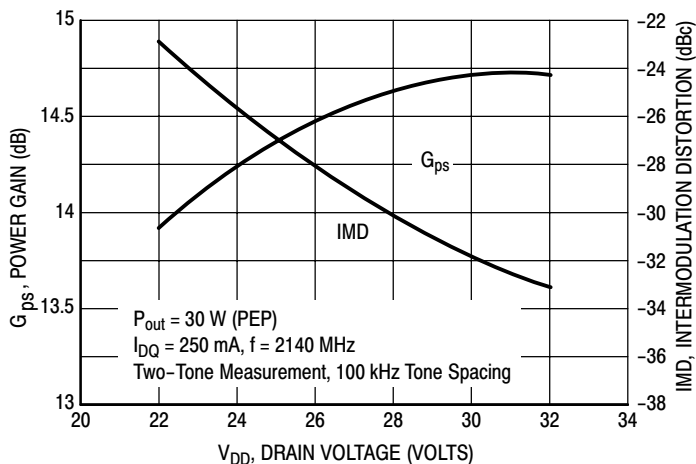
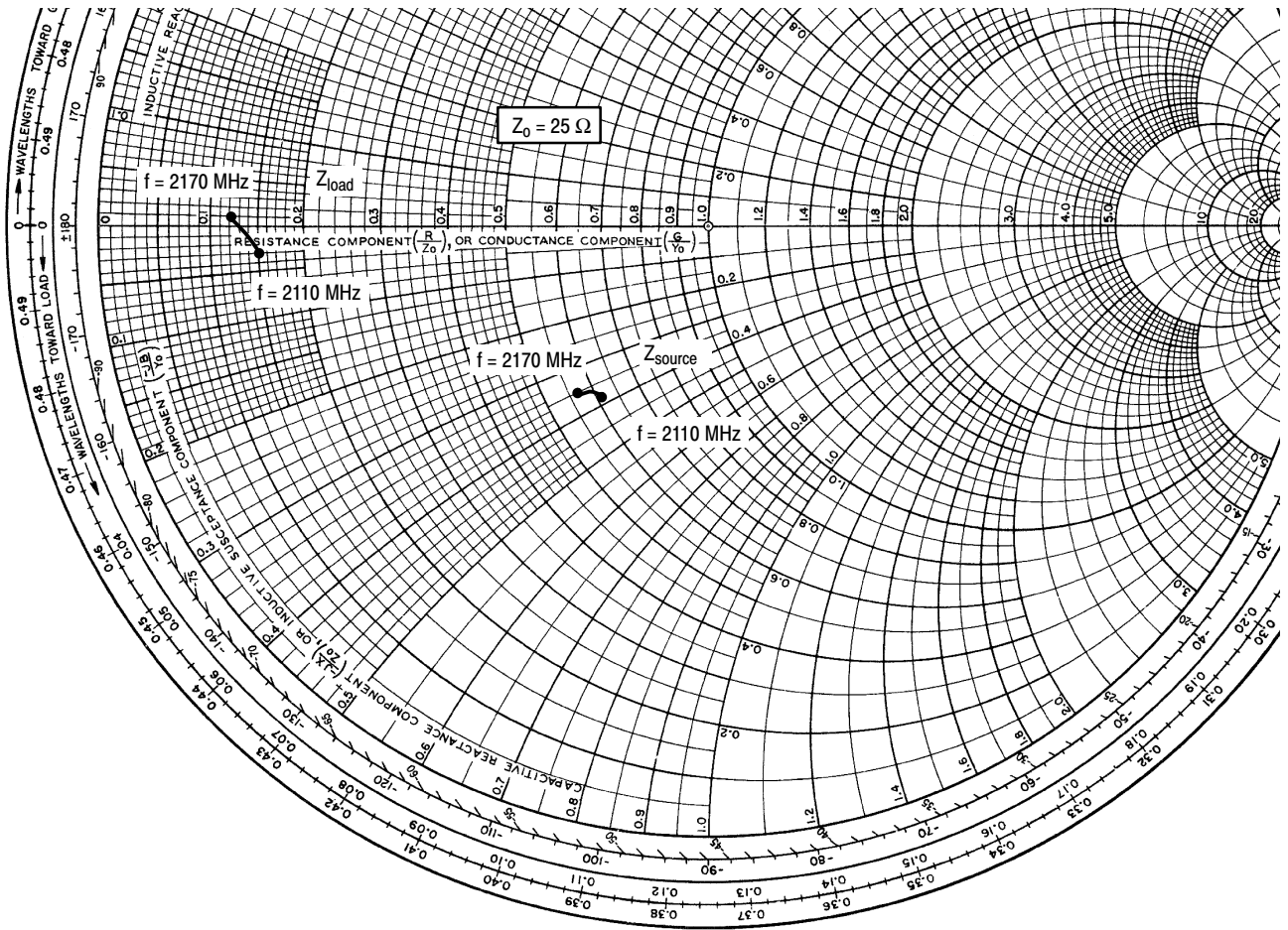


Figure 8. Power Gain and Intermodulation Distortion versus Supply Voltage



$V_{DD} = 28 \text{ V}$, $I_{DQ} = 250 \text{ mA}$, $P_{out} = 30 \text{ W PEP}$

f MHz	Z _{source} Ω	Z _{load} Ω
2110	15.3 - j9.4	3.7 - j0.78
2140	14.6 - j9.4	3.4 - j0.37
2170	14.3 - j8.8	3.0 + j0.13

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

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

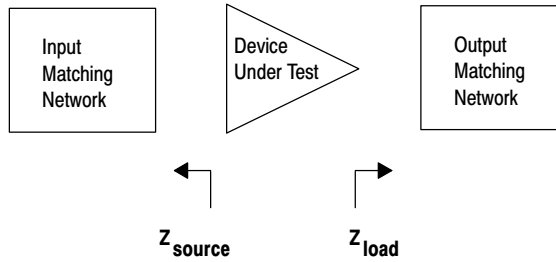
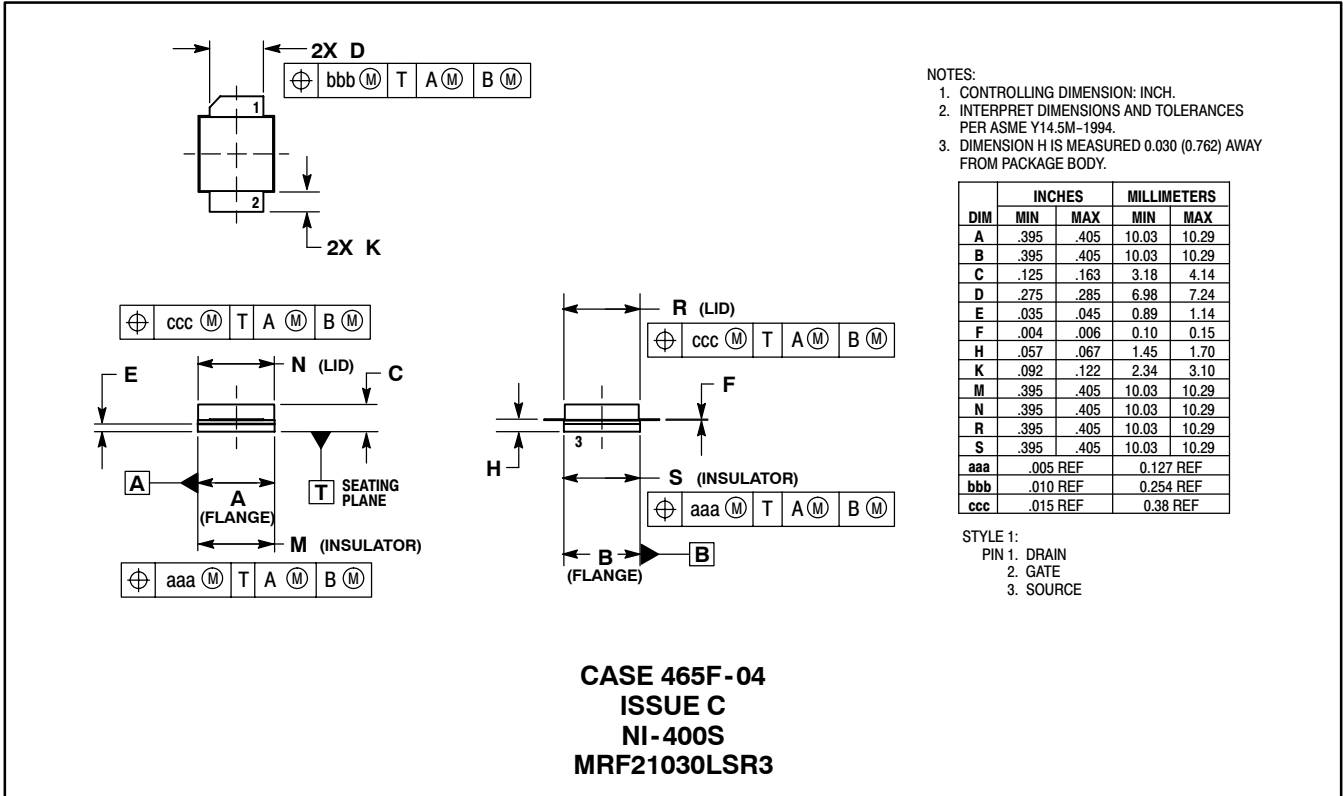
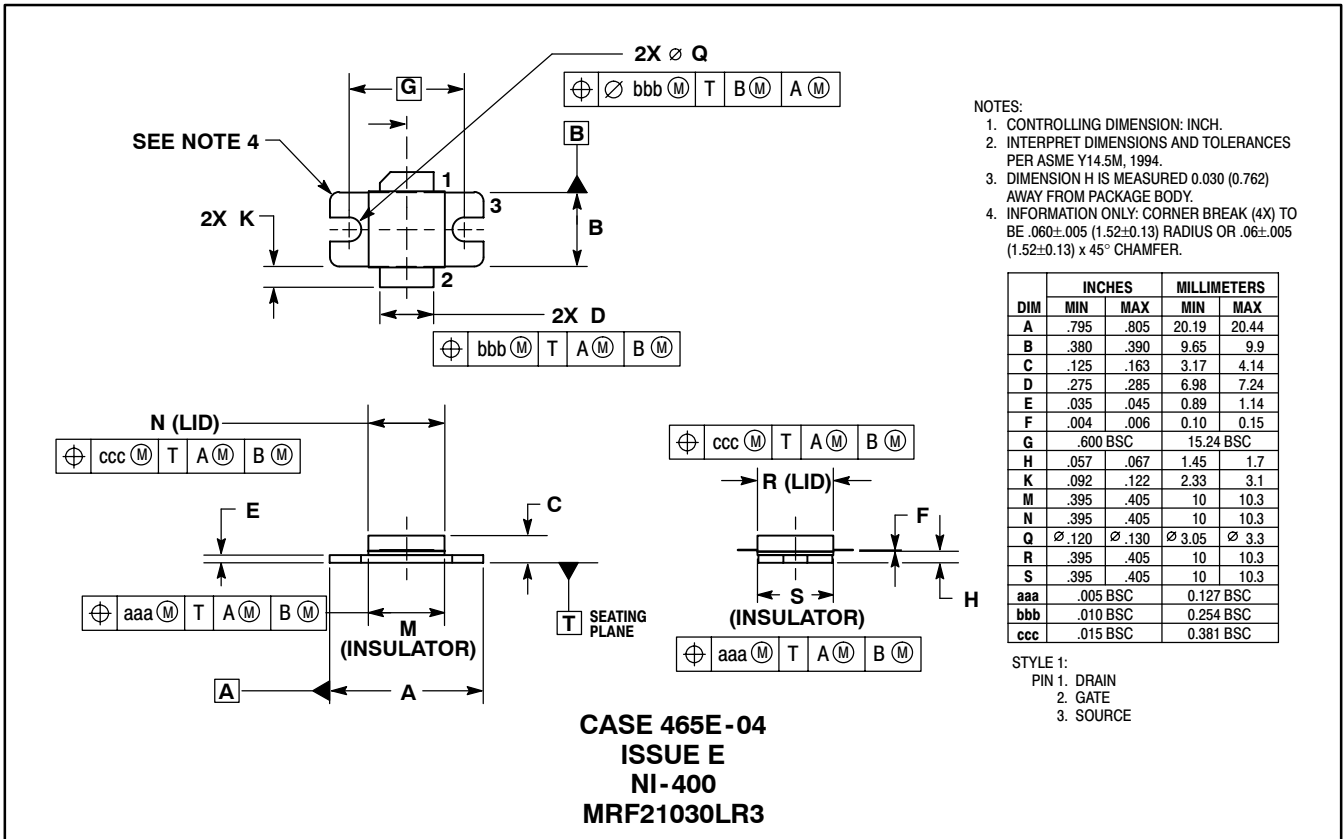


Figure 9. Series Equivalent Source and Load Impedance

NOTES

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PACKAGE DIMENSIONS



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