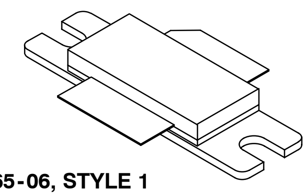
The RF MOSFET Line
RF Power Field Effect Transistors
N-Channel Enhancement-Mode Lateral MOSFETs

MRF21060R3
MRF21060SR3

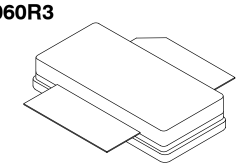
Designed for PCN and PCS base station applications with frequencies from 2.1 to 2.2 GHz. Suitable for W-CDMA, CDMA, TDMA, GSM and multicarrier amplifier applications.

- Typical W-CDMA Performance: 2140 MHz, 28 Volts
  5 MHz Offset @ 4.096 MHz BW, 15 DTCH
  - Output Power — 6.0 Watts
  - Power Gain — 12.5 dB
  - Drain Efficiency — 15%
- 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, @ 28 Vdc, 2.11 GHz, 60 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.

2170 MHz, 60 W, 28 V
LATERAL N-CHANNEL
RF POWER MOSFETs



CASE 465-06, STYLE 1
NI-780
MRF21060R3



CASE 465A-06, STYLE 1
NI-780S
MRF21060SR3

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	180 0.98	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	$R_{\theta JC}$	1.02	°C/W

ESD PROTECTION CHARACTERISTICS

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

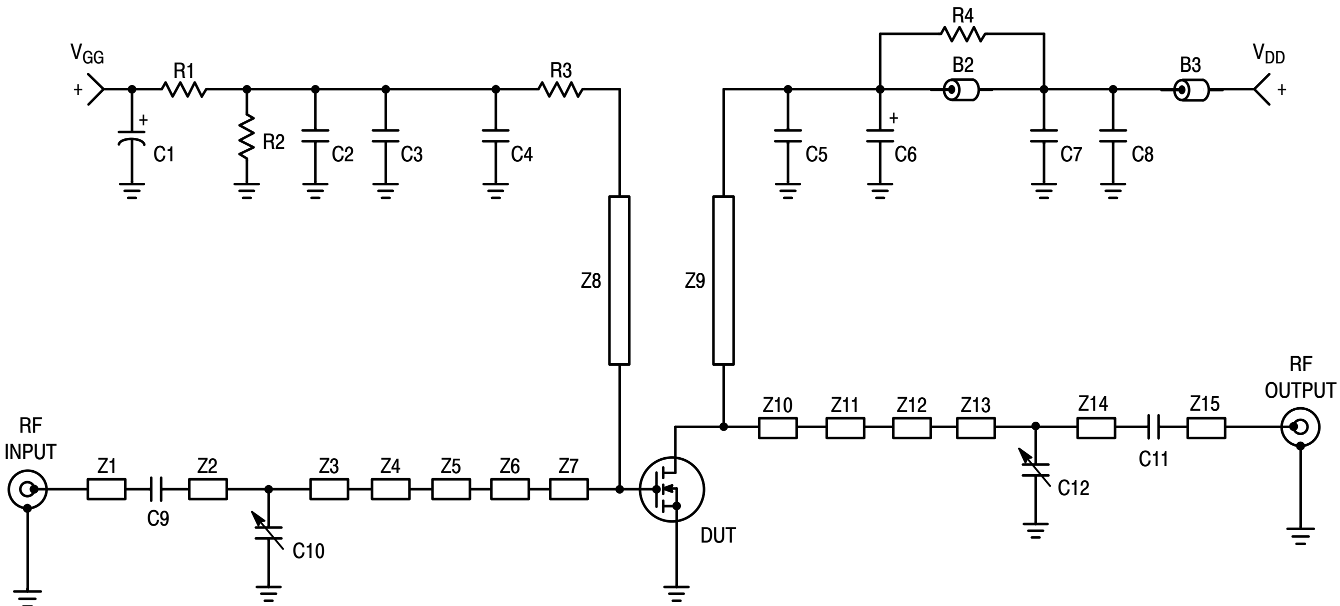
NOTE - **CAUTION** - MOS devices are susceptible to damage from electrostatic charge. Reasonable precautions in handling and packaging MOS devices should be observed.

REV 6

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 = 10 μAdc)	$V_{(BR)DSS}$	65	—	—	Vdc
Zero Gate Voltage Drain Current (V_{DS} = 28 Vdc, V_{GS} = 0 Vdc)	I_{DSS}	—	—	6	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 = 300 μAdc)	$V_{GS(th)}$	2	—	4	Vdc
Gate Quiescent Voltage (V_{DS} = 28 Vdc, I_D = 500 mAdc)	$V_{GS(Q)}$	2.5	3.9	4.5	Vdc
Drain-Source On-Voltage (V_{GS} = 10 Vdc, I_D = 2 Adc)	$V_{DS(on)}$	—	0.27	—	Vdc
Forward Transconductance (V_{DS} = 10 Vdc, I_D = 2 Adc)	g_{fs}	—	4.7	—	S
DYNAMIC CHARACTERISTICS					
Reverse Transfer Capacitance (1) (V_{DS} = 28 Vdc, V_{GS} = 0, f = 1 MHz)	C_{rss}	—	2.7	—	pF
FUNCTIONAL TESTS (In Motorola Test Fixture, 50 ohm system)					
Two-Tone Common-Source Amplifier Power Gain (V_{DD} = 28 Vdc, P_{out} = 60 W PEP, I_{DQ} = 500 mA, f = 2110 MHz and 2170 MHz, Tone Spacing = 100 kHz)	G_{ps}	11	12.5	—	dB
Two-Tone Drain Efficiency (V_{DD} = 28 Vdc, P_{out} = 60 W PEP, I_{DQ} = 500 mA, f = 2110 MHz and 2170 MHz, Tone Spacing = 100 kHz)	η	31	34	—	%
3rd Order Intermodulation Distortion (V_{DD} = 28 Vdc, P_{out} = 60 W PEP, I_{DQ} = 500 mA, f = 2110 MHz and 2170 MHz, Tone Spacing = 100 kHz)	IMD	—	-30	-28	dBc
Input Return Loss (V_{DD} = 28 Vdc, P_{out} = 60 W PEP, I_{DQ} = 500 mA, f = 2110 MHz and 2170 MHz, Tone Spacing = 100 kHz)	IRL	—	-12	—	dB
P_{out}, 1 dB Compression Point (V_{DD} = 28 Vdc, P_{out} = 60 W CW, f = 2170 MHz)	P1dB	—	60	—	W
Output Mismatch Stress (V_{DD} = 28 Vdc, P_{out} = 60 W CW, I_{DQ} = 500 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.



B2 - B3	Ferrite Beads, Fair Rite #2743019447	Z3	0.180″ x 0.100″ Microstrip
C1	10 μF, 50 V Electrolytic Chip Capacitor, Panasonic #ECEV1HV100R	Z4	0.152″ x 0.293″ Microstrip
C2, C7	1000 pF Chip Capacitors, ATC #100B102JCA500X	Z5	0.216″ x 0.100″ Microstrip
C3, C8	0.10 μF Chip Capacitors, Kemet #CDR33BX104AKWS	Z6	0.114″ x 0.410″ Microstrip
C4, C5	4.7 pF Chip Capacitors, ATC #100B4R7JCA500X	Z7	0.626″ x 0.872″ Microstrip
C6	22 μF, 35 V Tantalum Surface Mount Chip Capacitor, Sprague	Z8	1.050″ x 0.050″ Microstrip
C9, C11	9.1 pF Chip Capacitors, ATC #100B9R1JCA500X	Z9	0.830″ x 0.050″ Microstrip
C10	0.8 pF - 8.0 pF Variable Capacitor, Johanson Gigatrim	Z10	0.596″ x 1.040″ Microstrip
C12	0.4 pF - 4.5 pF Variable Capacitor, Johanson Gigatrim	Z11	0.186″ x 0.315″ Microstrip
R1	1 kΩ, 1/4 W Fixed Film Chip Resistor, 0.08″ x 0.13″	Z12	0.097″ x 0.525″ Microstrip
R2	560 kΩ, 1/4 W Fixed Film Chip Resistor, 0.08″ x 0.13″	Z13	0.353″ x 0.138″ Microstrip
R3	10 Ω, 1/4 W Fixed Film Chip Resistor, 0.08″ x 0.13″	Z14	0.112″ x 0.080″ Microstrip
R4	10 Ω, 1/4 W Fixed Film Chip Resistor, 0.08″ x 0.13″	Z15	0.722″ x 0.080″ Microstrip
Z1	0.743″ x 0.080″ Microstrip	Board	0.030″ Glass Teflon®, Arlon GX-0300-55-22, 2 oz Cu
Z2	0.070″ x 0.100″ Microstrip		

Figure 1. MRF21060 Test Circuit Schematic

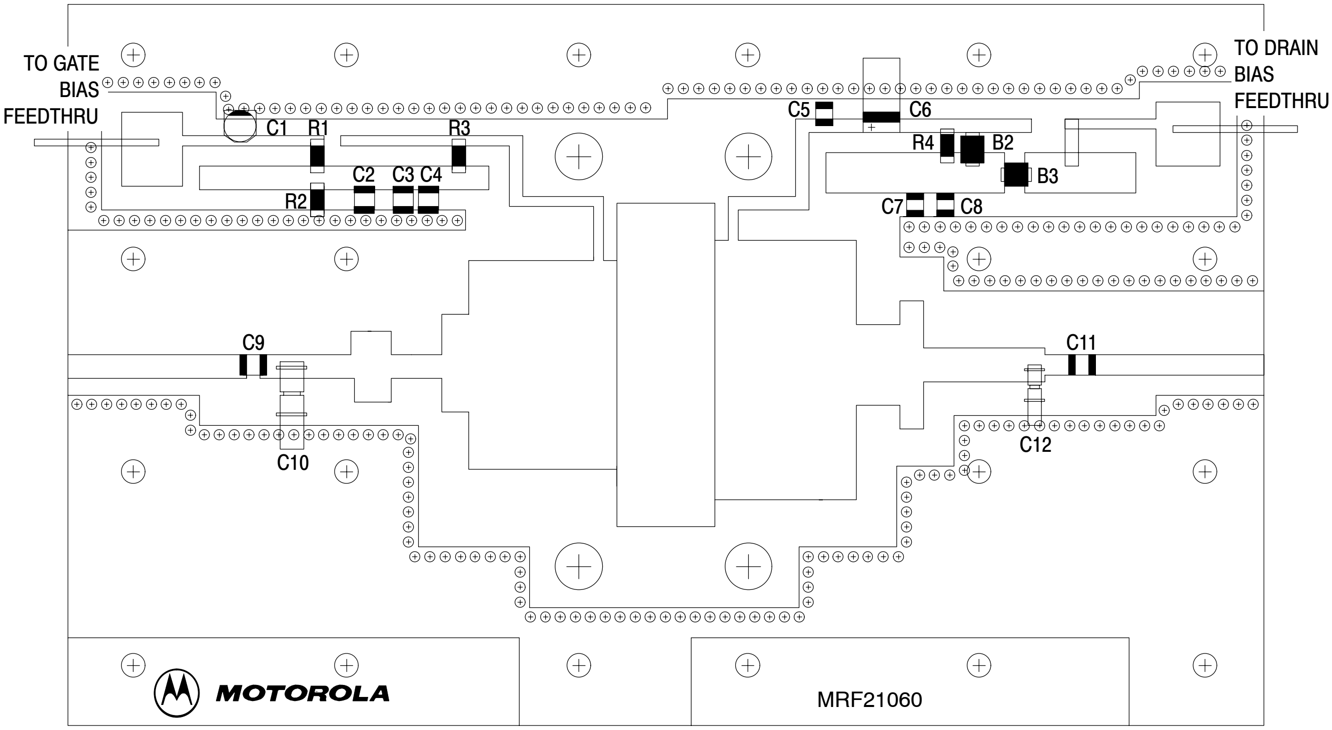


Figure 2. MRF21060 Test Circuit Component Layout

TYPICAL CHARACTERISTICS

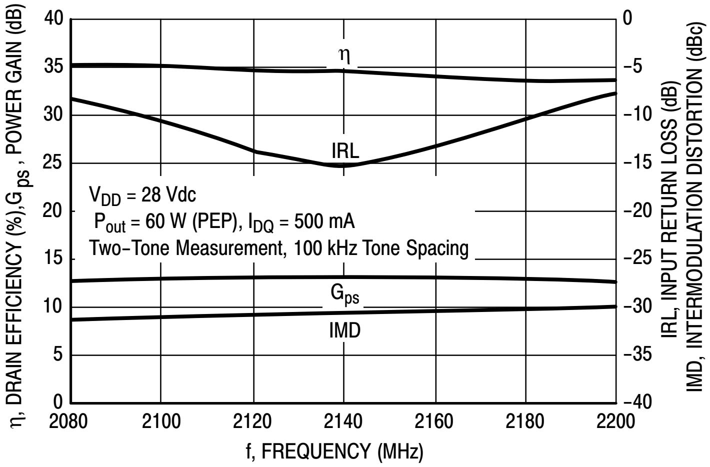


Figure 3. Class AB Broadband Circuit Performance

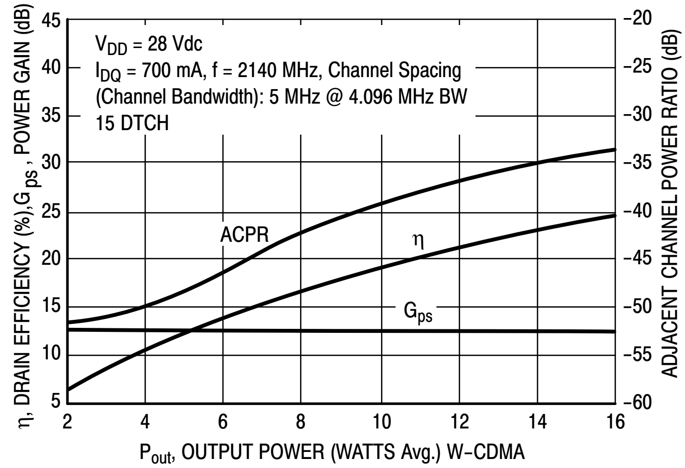


Figure 4. W-CDMA ACPR, Power Gain and Drain Efficiency versus Output Power

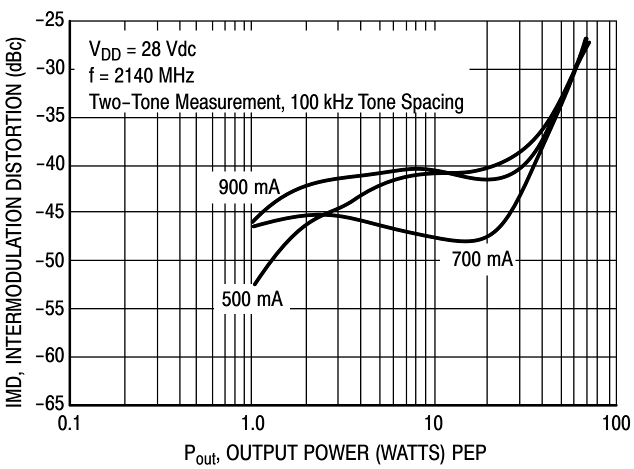


Figure 5. Intermodulation Distortion versus Output Power

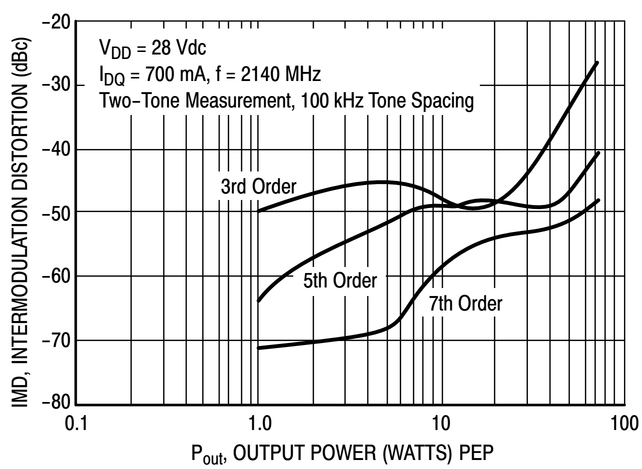


Figure 6. Intermodulation Distortion Products versus Output Power

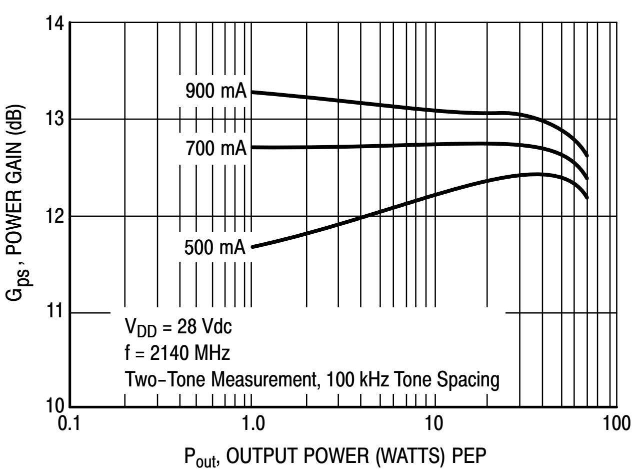


Figure 7. Power Gain versus Output Power

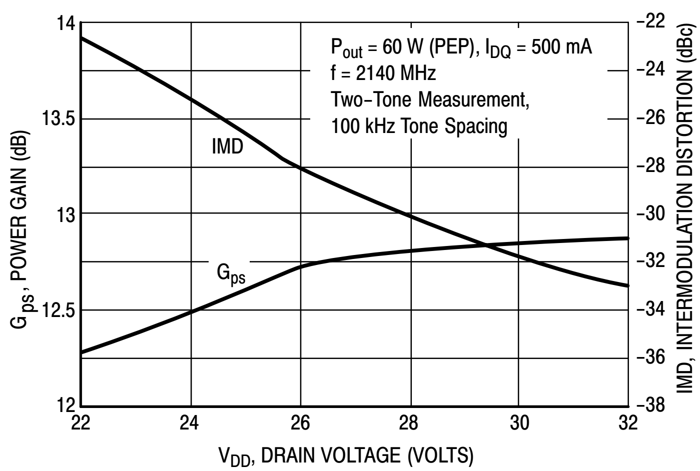
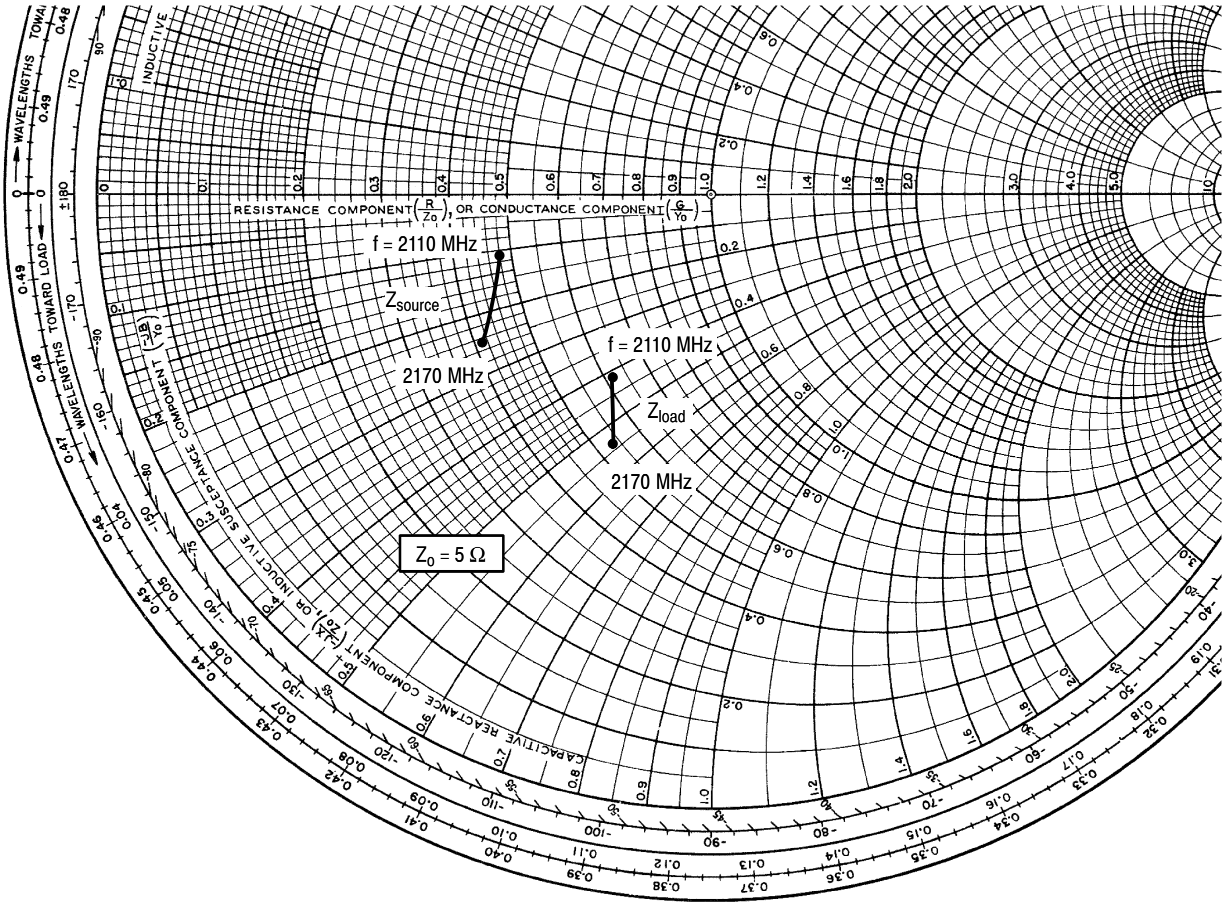


Figure 8. Power Gain and Intermodulation Distortion versus Supply Voltage



V_{DD} = 28 V, I_{DQ} = 500 mA, P_{out} = 60 W PEP

f MHz	Z_{source} Ω	Z_{load} Ω
2110	2.40 - j0.55	3.07 - j2.05
2140	2.26 - j0.87	2.89 - j2.38
2170	2.08 - j1.23	2.66 - j2.71

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

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

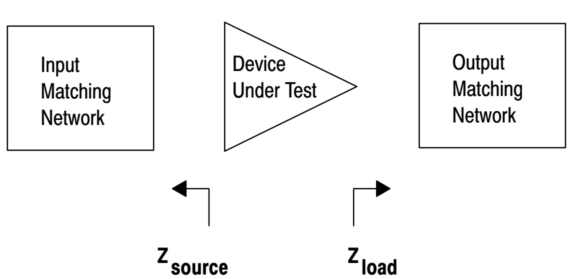
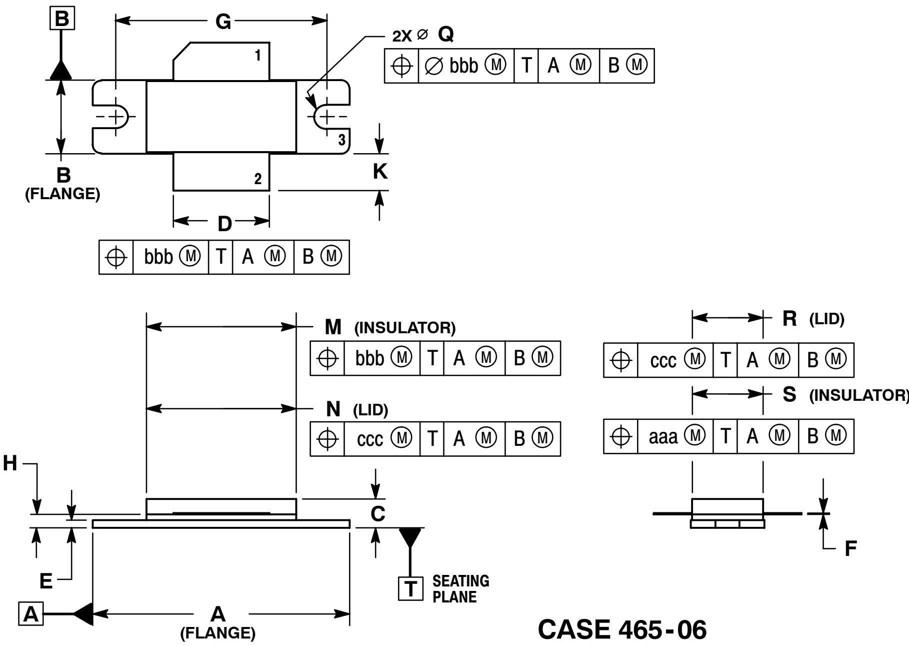


Figure 9. Series Equivalent Source and Load Impedance

PACKAGE DIMENSIONS

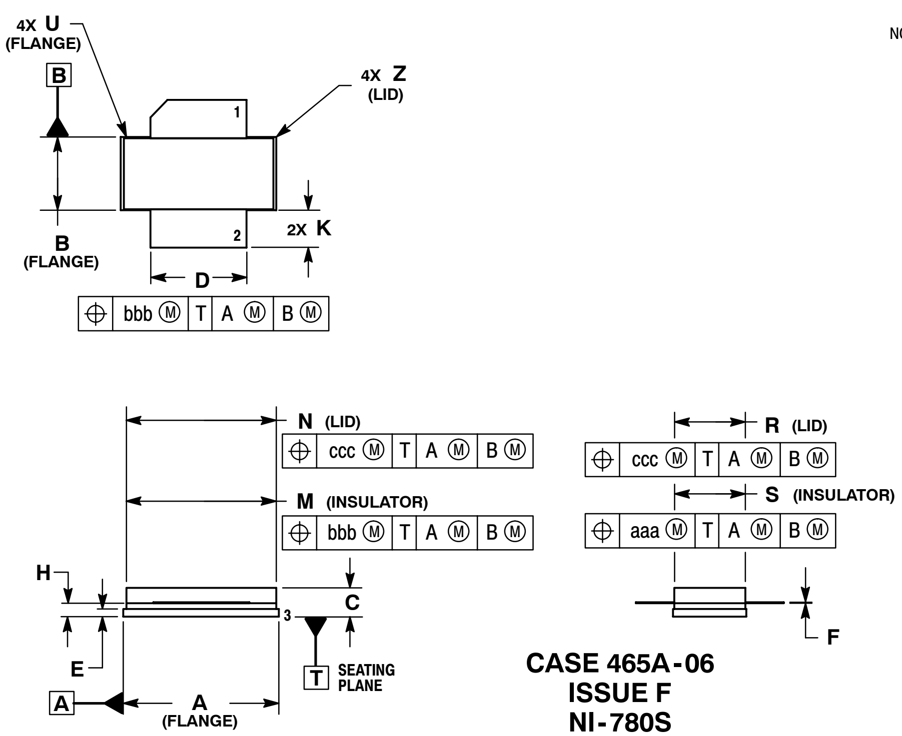


CASE 465-06
ISSUE F
NI-780
MRF21060R3

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

	INCHES		MILLIMETERS	
DIM	MIN	MAX	MIN	MAX
A	1.335	1.345	33.91	34.16
B	0.380	0.390	9.65	9.91
C	0.125	0.170	3.18	4.32
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	0.170	0.210	4.32	5.33
M	0.774	0.786	19.66	19.96
N	0.772	0.788	19.60	20.00
Q	Ø.118	Ø.138	Ø3.00	Ø3.51
R	0.365	0.375	9.27	9.53
S	0.365	0.375	9.27	9.52
aaa	0.005 REF		0.127 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 465A-06
ISSUE F
NI-780S
MRF21060SR3

NOTES:
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3. DELETED
4. DIMENSION H IS MEASURED 0.030 (0.762) AWAY FROM PACKAGE BODY.

	INCHES		MILLIMETERS	
DIM	MIN	MAX	MIN	MAX
A	0.805	0.815	20.45	20.70
B	0.380	0.390	9.65	9.91
C	0.125	0.170	3.18	4.32
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	0.774	0.786	19.61	20.02
N	0.772	0.788	19.61	20.02
R	0.365	0.375	9.27	9.53
S	0.365	0.375	9.27	9.52
U	---	0.040	---	1.02
Z	---	0.030	---	0.76
aaa	0.005 REF		0.127 REF	
bbb	0.010 REF		0.254 REF	
ccc	0.015 REF		0.381 REF	

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

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