Freescale Semiconductor
Technical Data

Document Number: MRF9080
Rev. 6, 5/2006

RoHS

RF Power Field Effect Transistors

N-Channel Enhancement-Mode Lateral MOSFETs

MRF9080LR3
MRF9080LSR3

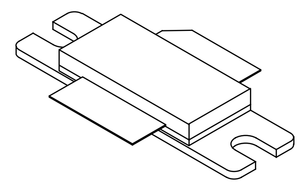
Designed for GSM 900 MHz frequency band, the high gain and broadband performance of these devices make them ideal for large-signal, common-source amplifier applications in 26 volt base station equipment.

- Typical Performance for GSM Frequencies, 921 to 960 MHz, 26 Volts
  Output Power @ P1db: 75 Watts
  Power Gain @ P1db: 18.5 dB
  Efficiency @ P1db: 55%
- Capable of Handling 5:1 VSWR, @ 26 Vdc, 921 MHz, 90 Watts CW Output Power

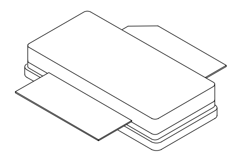
Features

- 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
- Available with Low Gold Plating Thickness on Leads. L Suffix Indicates 40μ″ Nominal.
- RoHS Compliant
- In Tape and Reel. R3 Suffix = 250 Units per 56 mm, 13 inch Reel.

921-960 MHz, 75 W, 26 V
LATERAL N-CHANNEL
RF POWER MOSFETs



CASE 465-06, STYLE 1
NI-780
MRF9080LR3



CASE 465A-06, STYLE 1
NI-780S
MRF9080LSR3

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	250 1.43	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	$R_{\theta JC}$	0.7	°C/W

Table 3. ESD Protection Characteristics

Test Conditions	Class
Human Body Model	1 (Minimum)
Machine Model	M1 (Minimum)

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

Characteristic	Symbol	Min	Typ	Max	Unit
Off Characteristics					
Zero Gate Voltage Drain Leakage Current (V_{DS} = 65 Vdc, V_{GS} = 0)	I_{DSS}	—	—	10	μAdc
Zero Gate Voltage Drain Leakage Current (V_{DS} = 26 Vds, V_{GS} = 0)	I_{DSS}	—	—	1	μAdc
Gate-Source Leakage Current (V_{GS} = 5 Vdc, V_{DS} = 0)	I_{GSS}	—	—	1	μAdc
On Characteristics					
Gate Threshold Voltage (V_{DS} = 10 Vdc, I_D = 300 μAdc)	$V_{GS(th)}$	2.0	—	4.0	Vdc
Gate Quiescent Voltage (V_{DS} = 26 Vdc, I_D = 700 mAdc)	$V_{GS(Q)}$	—	3.7	—	Vdc
Drain-Source On-Voltage (V_{GS} = 10 Vdc, I_D = 2 Adc)	$V_{DS(on)}$	—	0.19	0.4	Vdc
Forward Transconductance (V_{DS} = 10 Vdc, I_D = 6 Adc)	g_{fs}	—	8.0	—	S
Dynamic Characteristics (1)					
Output Capacitance (V_{DS} = 26 Vdc, V_{GS} = 0, f = 1 MHz)	C_{oss}	—	73	—	pF
Reverse Transfer Capacitance (V_{DS} = 26 Vdc, V_{GS} = 0, f = 1 MHz)	C_{rss}	—	2.9	—	pF
Functional Tests (In Freescale Test Fixture, 50 ohm system) (2)					
Power Output, 1 dB Compression Point (V_{DD} = 26 Vdc, I_{DQ} = 600 mA, f = 921 and 960 MHz)	P_{1dB}	68	75	—	W
Common-Source Amplifier Power Gain @ 70 W (Min) (V_{DD} = 26 Vdc, I_{DQ} = 600 mA, f = 921 and 960 MHz)	G_{ps}	17	18.5	20	dB
Drain Efficiency @ P_{out} = 70 W (V_{DD} = 26 Vdc, I_{DQ} = 600 mA, f = 921 and 960 MHz)	$\eta 1$	47	52	—	%
Drain Efficiency @ P1dB (V_{DD} = 26 Vdc, I_{DQ} = 600 mA, f = 921 and 960 MHz)	$\eta 2$	—	55	—	%
Input Return Loss (V_{DD} = 26 Vdc, P_{out} = 70 W, I_{DQ} = 600 mA, f = 921 and 960 MHz)	IRL	9.5	12.5	—	dB

1. Part is internally input matched.
2. To meet application requirements, Freescale test fixtures are designed to cover full GSM 900 band ensuring batch to batch consistency

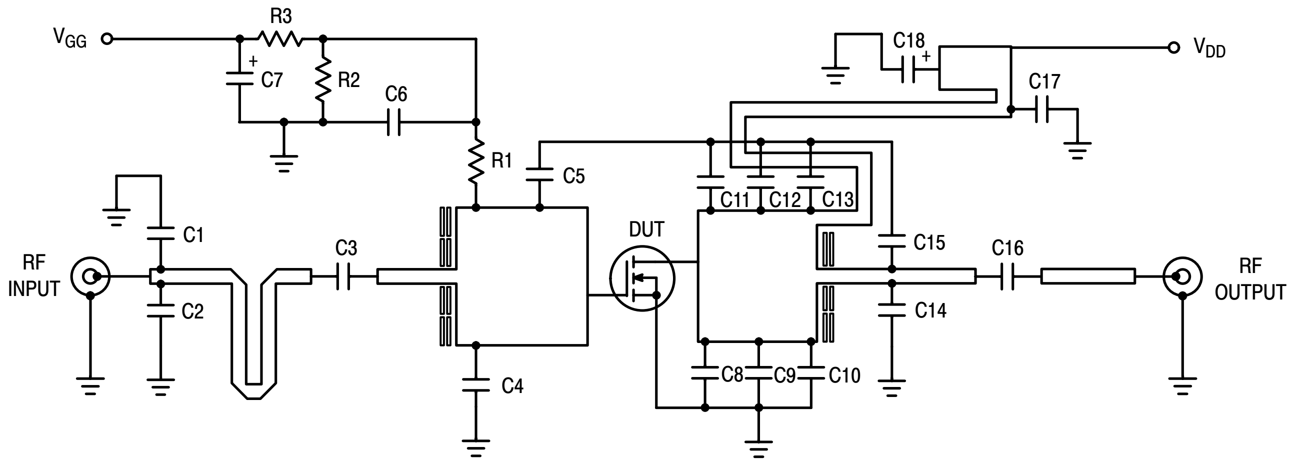
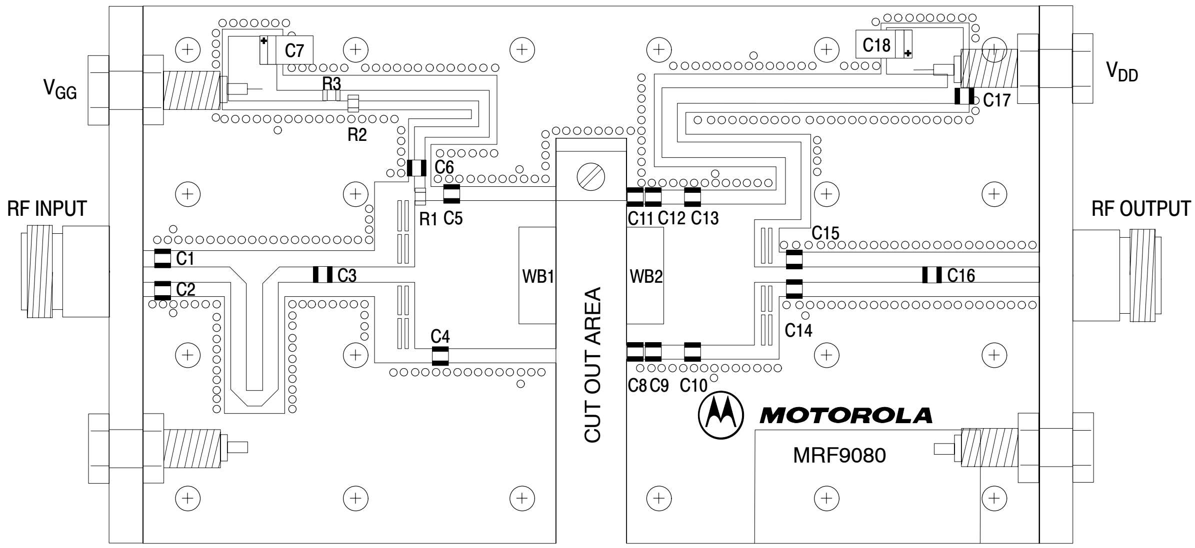


Figure 1. Broadband GSM 900 Test Circuit Schematic

Table 5. Broadband GSM 900 Test Circuit Component Designations and Values

Part	Description	Part Number	Manufacturer
C1	4.7 pF Chip Capacitor	100B4R7BW	ATC
C2	2.7 pF Chip Capacitor	100B2R7BW	ATC
C3	1.5 pF Chip Capacitor	100B1R5BW	ATC
C4, C5, C9, C10, C12, C13	5.6 pF Chip Capacitors	100B5R6CW	ATC
C6, C16, C17	22 pF Chip Capacitors	100B220GW	ATC
C7, C18	10 μF, 35 V Tantalum Chip Capacitors	293D106X9035D2T	Sprague-Vishay
C8, C11	10 pF Chip Capacitors	100B100JW	ATC
C14	0.8 pF Chip Capacitor	100B0R8BW	ATC
C15	8.2 pF Chip Capacitor	100B8R2GW	ATC
R1, R2, R3	1.0 kΩ, 1/8 W Chip Resistors (0805)		
WB1, WB2	Beryllium Copper Wear Blocks	0.004″ x 0.210″ x 0.520″	
Raw PCB Material	30 mil Glass Teflon®, ε_r = 2.55	TLX8-0300	Taconic
PCB	Etched Circuit Board	C-GY-00-001-02	Cibel



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. Broadband GSM 900 Test Circuit Component Layout

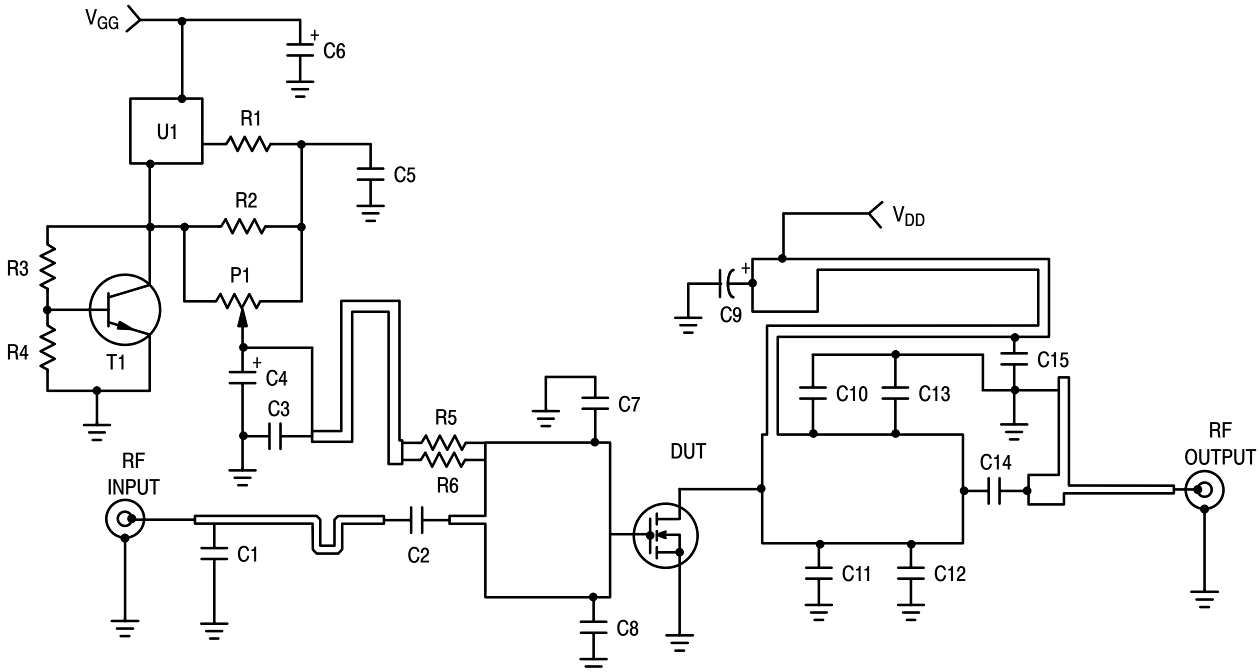


Figure 3. Broadband GSM 900 Optimized Demo Board Schematic

Table 6. Broadband GSM 900 Optimized Demo Board Component Designations and Values

Part	Description	Part Number	Manufacturer
C1	4.7 pF Chip Capacitor, ACCU-P (0805)	#08051J3R9CBT	AVX
C2	3.9 pF Chip Capacitor, ACCU-P (0805)	#08051J3R9CBT	AVX
C3, C15	22 pF Chip Capacitors, ACCU-P (0805)	#08051J221	AVX
C4, C6	22 μF, 35 V Tantalum Chip Capacitors	#T491X226K035AS4394	Kemet
C5	1.0 μF Chip Capacitor, ACCU-P (0805)	#08053G105ZATEA	AVX
C7, C8	5.6 pF Chip Capacitors, ACCU-P (0805)	#08051J5R18CBT	AVX
C9	220 μF, 63 V Electrolytic Capacitor		
C10, C11	3.3 pF Chip Capacitors, ACCU-P (0805)	#08051J8R2CBT	AVX
C12, C13	2.2 pF Chip Capacitors, ACCU-P (0805)	#08051J2R2CBT	AVX
C14	4.7 pF Chip Capacitor	#100B	ATC
P1	5.0 kΩ Potentiometer CMS Cermet Multi-turn	#3224W	Bourns
R1	10 Ω, 1/8 W Chip Resistor (0805)		
R2	1.0 kΩ, 1/8 W Chip Resistor (0805)		
R3	1.2 kΩ, 1/8 W Chip Resistor (0805)		
R4	2.2 kΩ, 1/8 W Chip Resistor (0805)		
R5, R6	1.0 kΩ, 1/8 W Chip Resistors (0805)		
T1	Bipolar NPN Transistor, SOT-23	#BC847ALT1	ON Semiconductor
U1	Voltage Regulator, Micro-8	#LP2951ACDM-5.0R2	ON Semiconductor
	RF Connectors, Type SMA	#R125510001	Radial
	Substrate = Taconic RF35, Thickness 0.5 mm		

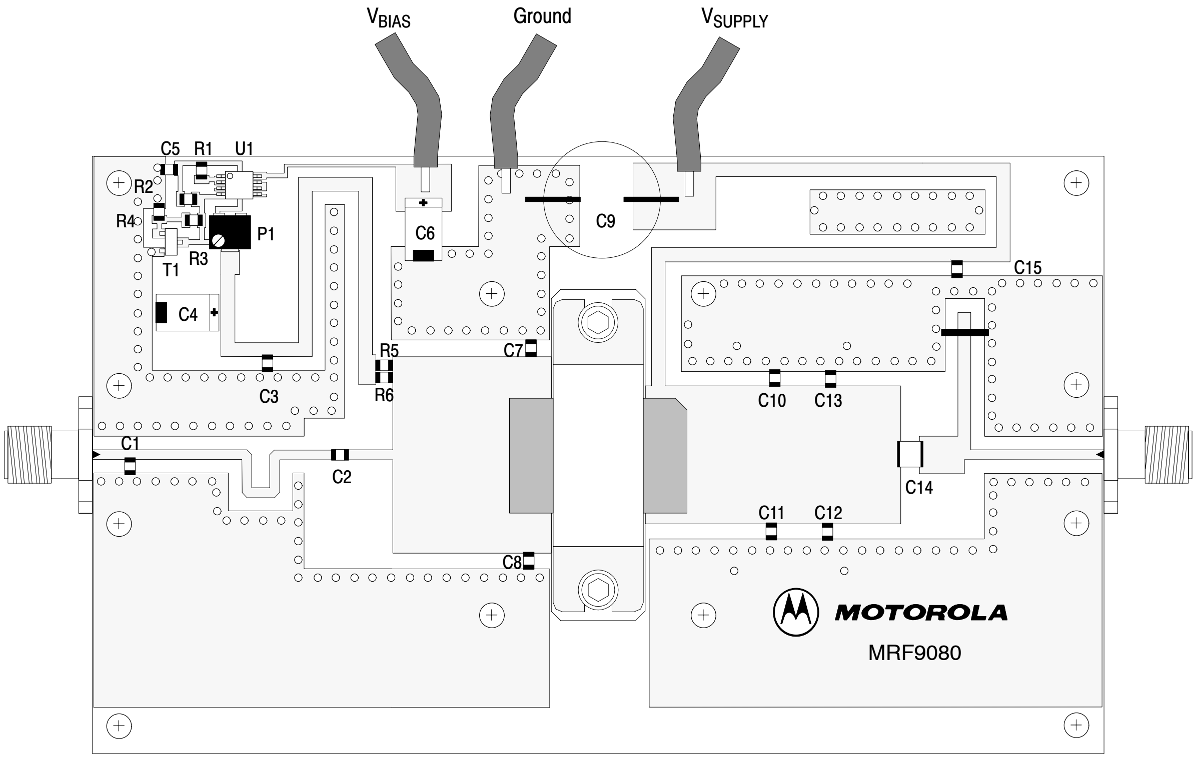


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Figure 4. Broadband GSM 900 Optimized Demo Board Component Layout

TYPICAL CHARACTERISTICS
(IN FREESCALE BROADBAND GSM 900 OPTIMIZED DEMO BOARD)

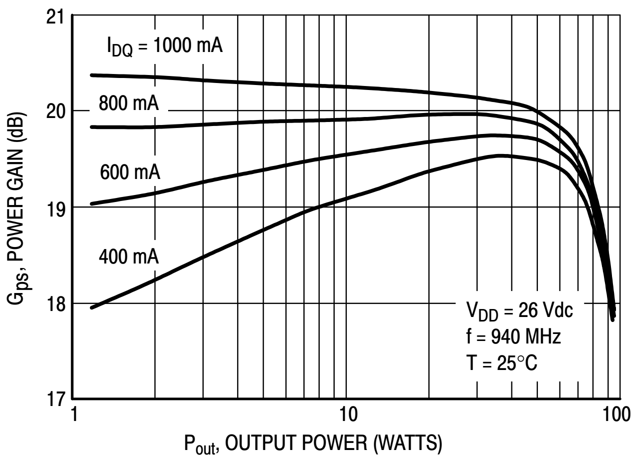


Figure 5. Power Gain versus Output Power

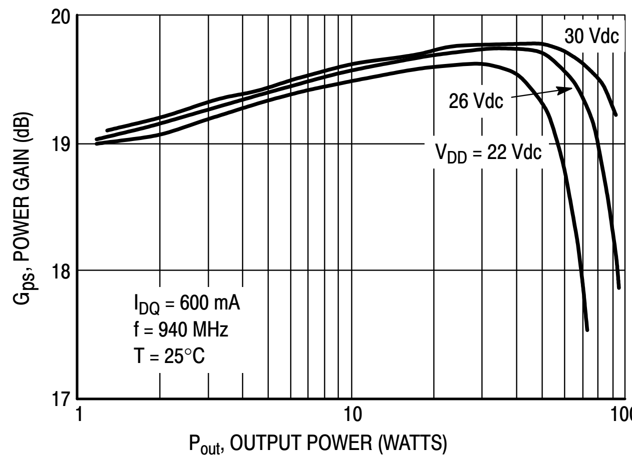


Figure 6. Power Gain versus Output Power

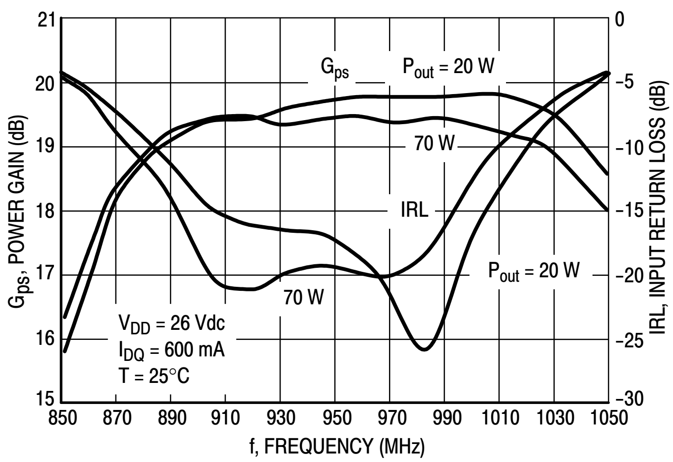


Figure 7. Power Gain and Input Return Loss versus Frequency

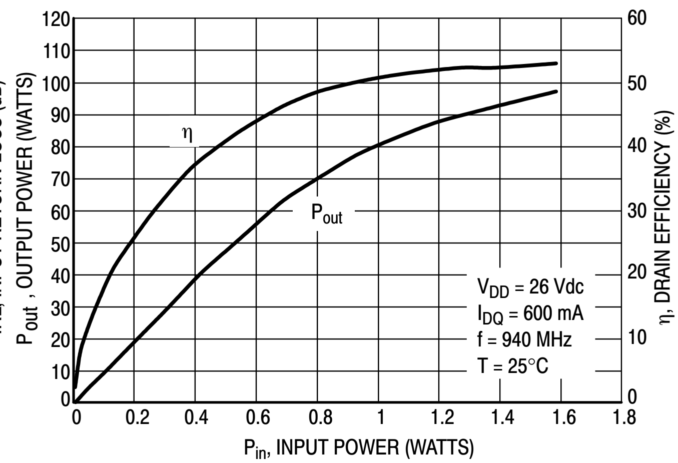


Figure 8. Output Power and Efficiency versus Input Power

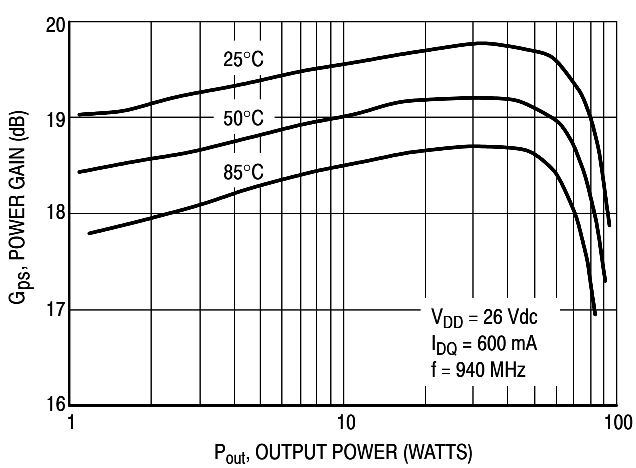


Figure 9. Power Gain versus Output Power

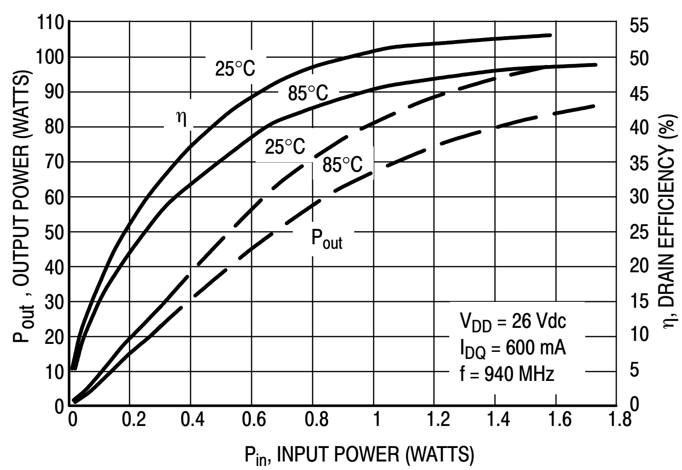
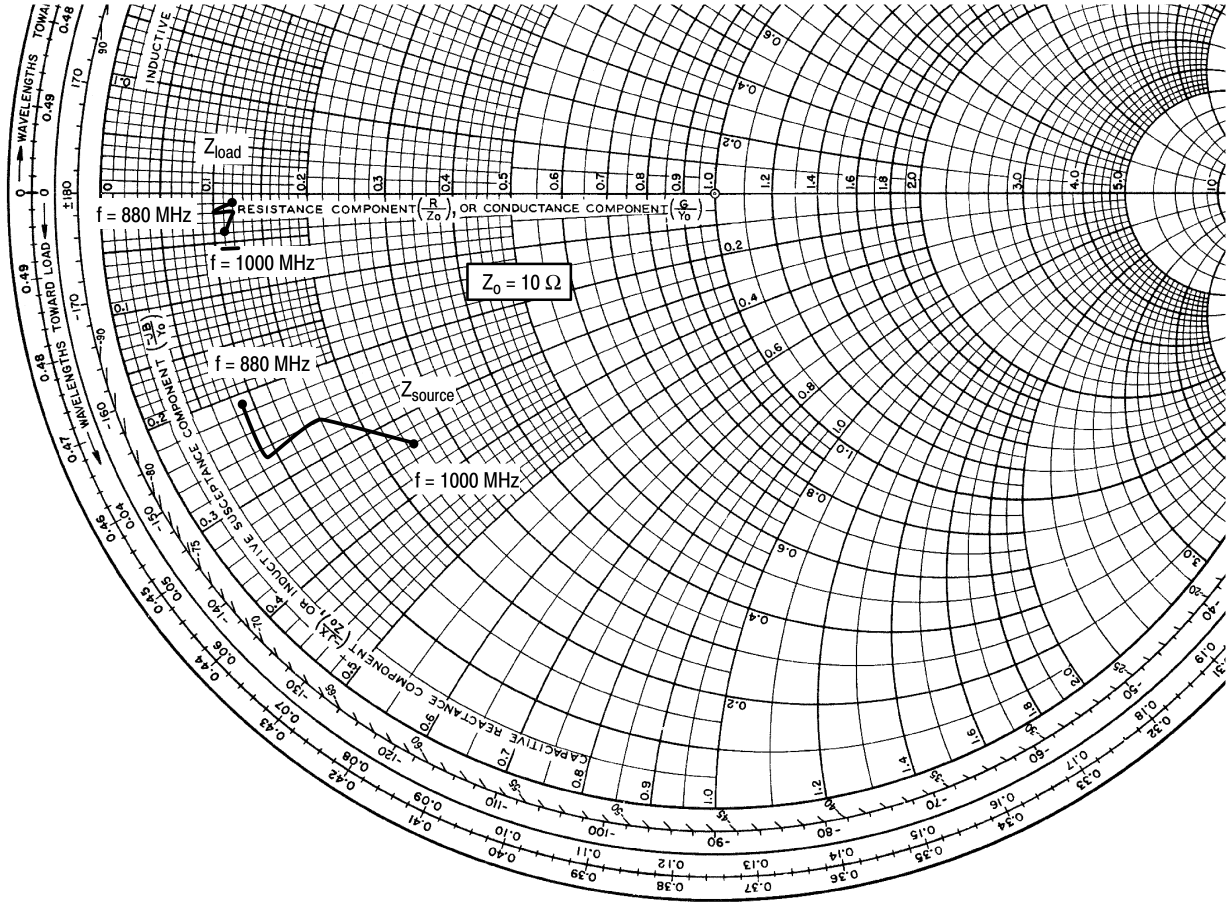


Figure 10. Output Power and Efficiency versus Input Power



V_{DD} = 26 V, I_{DQ} = 600 mA, P_{out} = 90 W CW

f MHz	Z_{source} Ω	Z_{load} Ω
880	0.91 - j2.11	1.22 - j0.12
920	0.88 - j2.65	1.00 - j0.16
960	1.6 - j2.61	1.22 - j0.22
1000	2.45 - j3.38	1.14 - j0.41

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

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

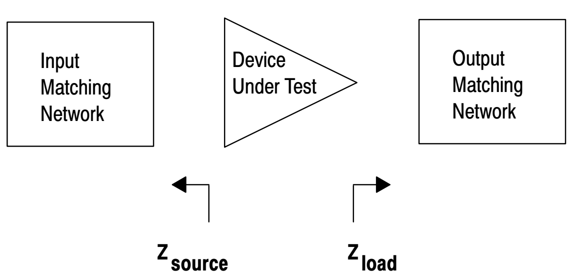
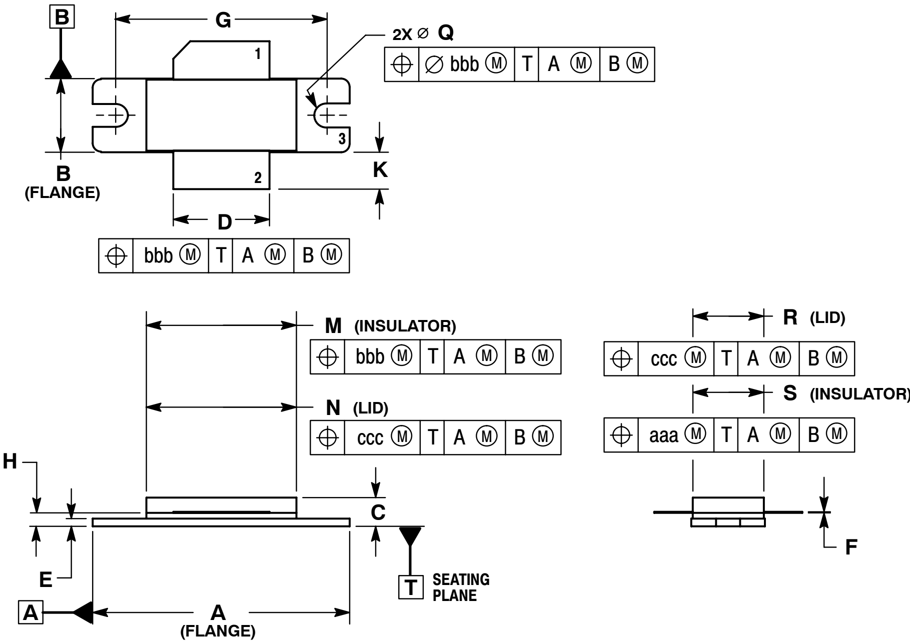


Figure 11. Series Equivalent Source and Load Impedance

NOTES

NOTES

PACKAGE DIMENSIONS

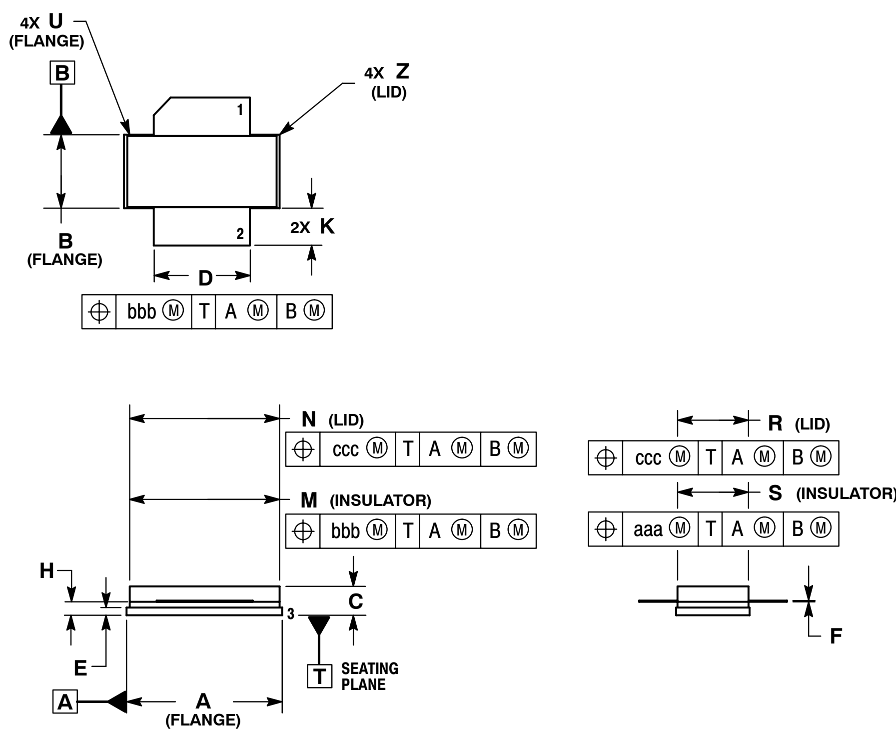


NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M-1994.
2. CONTROLLING DIMENSION: INCH.
3. DELETED
4. DIMENSION H IS MEASURED 0.030 (0.762) AWAY FROM PACKAGE BODY.

	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	∅.118	∅.138	∅3.00	∅3.51
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 465-06
ISSUE G
NI-780
MRF9080LR3



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	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

CASE 465A-06
ISSUE H
NI-780S
MRF9080LSR3

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