

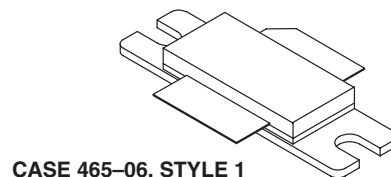
The RF MOSFET Line  
**RF Power Field Effect Transistors**  
N-Channel Enhancement-Mode Lateral MOSFETs

Designed for PCN and PCS base station applications with frequencies from 1.8 to 2.0 GHz. Suitable for FM, TDMA, CDMA and multicarrier amplifier applications. To be used in Class AB for PCN-PCS/cellular radio and WLL applications. Specified for GSM1805 – 1880 MHz.

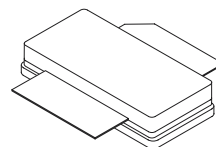
- Typical GSM Performance, Full Frequency Band (1805 – 1880 MHz)  
Power Gain — 13 dB (Typ) @ 60 Watts  
Efficiency — 45% (Typ) @ 60 Watts
- Internally Matched, Controlled Q, for Ease of Use
- High Gain, High Efficiency and High Linearity
- Integrated ESD Protection
- Designed for Maximum Gain and Insertion Phase Flatness
- Capable of Handling 10:1 VSWR, @ 26 Vdc, 60 Watts CW Output Power
- Excellent Thermal Stability
- Available in Tape and Reel. R3 Suffix = 250 Units per 56 mm, 13 Inch Reel.
- Available with Low Gold Plating Thickness on Leads. L Suffix Indicates 40µ" Nominal.

**MRF18060A**  
**MRF18060AR3**  
**MRF18060ALSR3**  
**MRF18060ASR3**

1.80 – 1.88 GHz, 60 W, 26 V  
LATERAL N-CHANNEL  
RF POWER MOSFETs



CASE 465-06, STYLE 1  
NI-780  
MRF18060A



CASE 465A-06, STYLE 1  
NI-780S  
MRF18060ALSR3, MRF18060ASR3

**MAXIMUM RATINGS**

Rating	Symbol	Value	Unit
Drain-Source Voltage	V <sub>DSS</sub>	65	Vdc
Gate-Source Voltage	V <sub>GS</sub>	-0.5, +15	Vdc
Total Device Dissipation @ T <sub>C</sub> ≥ 25°C Derate above 25°C	P <sub>D</sub>	180 1.03	Watts W/°C
Storage Temperature Range	T <sub>stg</sub>	-65 to +150	°C
Operating Junction Temperature	T <sub>J</sub>	200	°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 <sub>θJC</sub>	0.97	°C/W

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

**ELECTRICAL CHARACTERISTICS** ( $T_C = 25^\circ\text{C}$  unless otherwise noted)

Characteristic	Symbol	Min	Typ	Max	Unit
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**OFF CHARACTERISTICS**

Drain–Source Breakdown Voltage ( $V_{GS} = 0\text{ Vdc}$ , $I_D = 10\ \mu\text{Adc}$ )	$V_{(BR)DSS}$	65	—	—	Vdc
Zero Gate Voltage Drain Current ( $V_{DS} = 26\text{ Vdc}$ , $V_{GS} = 0\text{ Vdc}$ )	$I_{DSS}$	—	—	6	$\mu\text{Adc}$
Gate–Source Leakage Current ( $V_{GS} = 5\text{ Vdc}$ , $V_{DS} = 0\text{ Vdc}$ )	$I_{GSS}$	—	—	1	$\mu\text{Adc}$

**ON CHARACTERISTICS**

Gate Threshold Voltage ( $V_{DS} = 10\text{ Vdc}$ , $I_D = 300\ \mu\text{Adc}$ )	$V_{GS(th)}$	2	—	4	Vdc
Gate Quiescent Voltage ( $V_{DS} = 26\text{ Vdc}$ , $I_D = 500\text{ mAdc}$ )	$V_{GS(Q)}$	2.5	3.9	4.5	Vdc
Drain–Source On–Voltage ( $V_{GS} = 10\text{ Vdc}$ , $I_D = 2\text{ Adc}$ )	$V_{DS(on)}$	—	0.27	—	Vdc
Forward Transconductance ( $V_{DS} = 10\text{ Vdc}$ , $I_D = 2\text{ Adc}$ )	$g_{fs}$	—	4.7	—	S

**DYNAMIC CHARACTERISTICS**

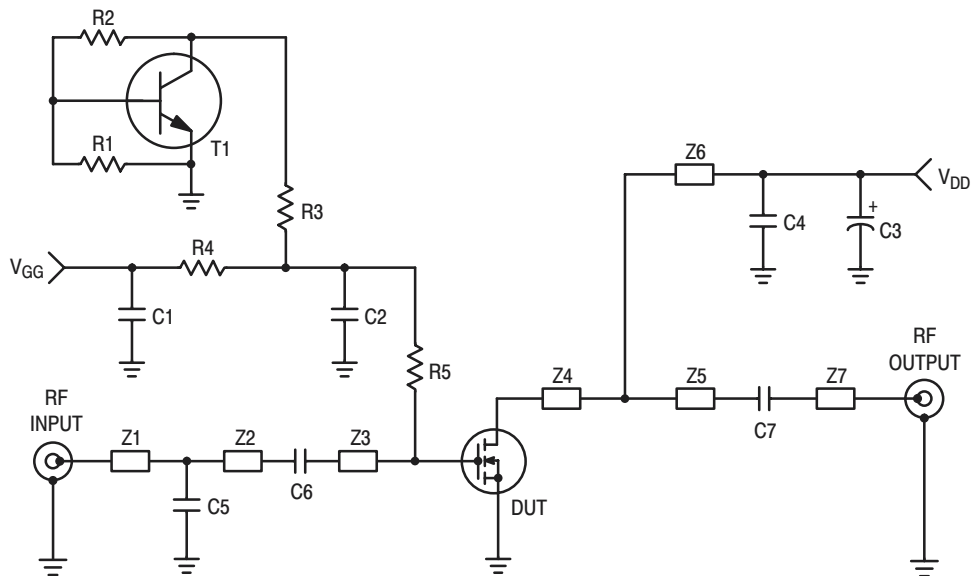
Input Capacitance (Including Input Matching Capacitor in Package) (1) ( $V_{DS} = 26\text{ Vdc} \pm 30\text{ mV(rms)ac}$ @ 1 MHz, $V_{GS} = 0\text{ Vdc}$ )	$C_{iss}$	—	160	—	pF
Output Capacitance (1) ( $V_{DS} = 26\text{ Vdc} \pm 30\text{ mV(rms)ac}$ @ 1 MHz, $V_{GS} = 0\text{ Vdc}$ )	$C_{oss}$	—	740	—	pF
Reverse Transfer Capacitance ( $V_{DS} = 26\text{ Vdc} \pm 30\text{ mV(rms)ac}$ @ 1 MHz, $V_{GS} = 0\text{ Vdc}$ )	$C_{rss}$	—	2.7	—	pF

**FUNCTIONAL TESTS** (In Motorola Test Fixture, 50 ohm system)

Common–Source Amplifier Power Gain @ 60 W (2) ( $V_{DD} = 26\text{ Vdc}$ , $I_{DQ} = 500\text{ mA}$ , $f = 1805 - 1880\text{ MHz}$ )	$G_{ps}$	11.5	13	—	dB
Drain Efficiency @ 60 W (2) ( $V_{DD} = 26\text{ Vdc}$ , $I_{DQ} = 500\text{ mA}$ , $f = 1805 - 1880\text{ MHz}$ )	$\eta$	43	45	—	%
Input Return Loss (2) ( $V_{DD} = 26\text{ Vdc}$ , $P_{out} = 60\text{ W CW}$ , $I_{DQ} = 500\text{ mA}$ , $f = 1805 - 1880\text{ MHz}$ )	IRL	—	—	-10	dB
Output Mismatch Stress ( $V_{DD} = 26\text{ Vdc}$ , $P_{out} = 60\text{ W CW}$ , $I_{DQ} = 500\text{ mA}$ VSWR = 10:1, All Phase Angles at Frequency of Tests)	$\Psi$	No Degradation In Output Power Before and After Test			

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

(2) To meet application requirements, Motorola test fixtures have been designed to cover the full GSM1800 band, ensuring batch–to–batch consistency.



C1	100 nF Chip Capacitor (1203)	Z1	0.47" x 0.09" Microstrip
C2, C4, C7	10 pF Chip Capacitors	Z2	1.16" x 0.09" Microstrip
C3	10 $\mu$ F, 35 V Electrolytic Tantalum Capacitor	Z3	0.57" x 0.95" Microstrip
C5	1.2 pF Chip Capacitor	Z4	0.59" x 1.18" Microstrip
C6	1.0 pF Chip Capacitor	Z5	1.26" x 0.15" Microstrip
R1, R3	2.2 k $\Omega$ Chip Resistors (0805)	Z6	1.15" x 0.09" Microstrip
R2, R4	2.7 k $\Omega$ Chip Resistors (0805)	Z7	0.37" x 0.09" Microstrip
R5	1.1 k $\Omega$ Chip Resistor (0805)		
T1	BC847 Transistor SOT-23		

Figure 1. 1805 – 1880 MHz Test Fixture Schematic

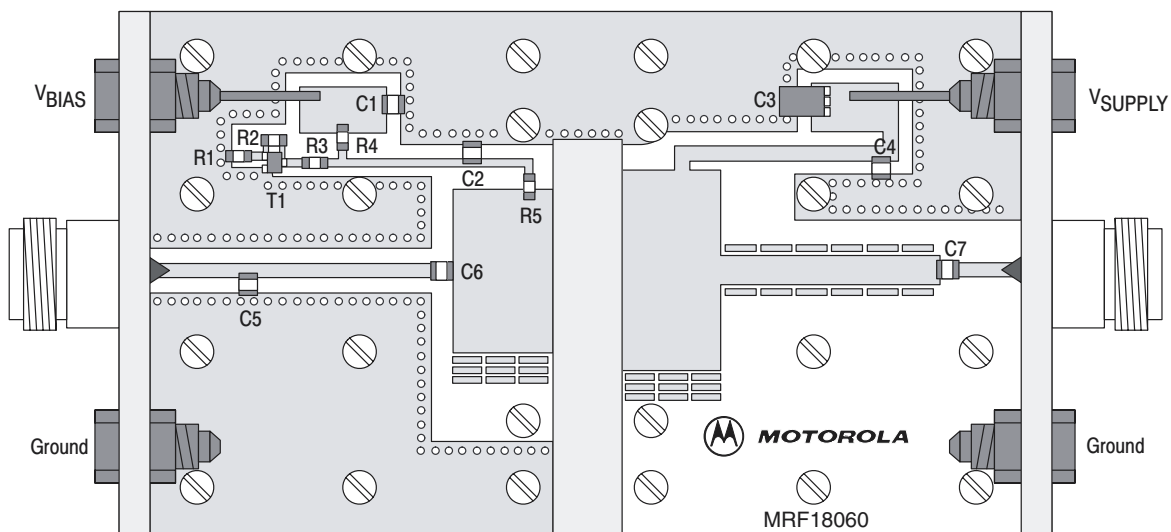
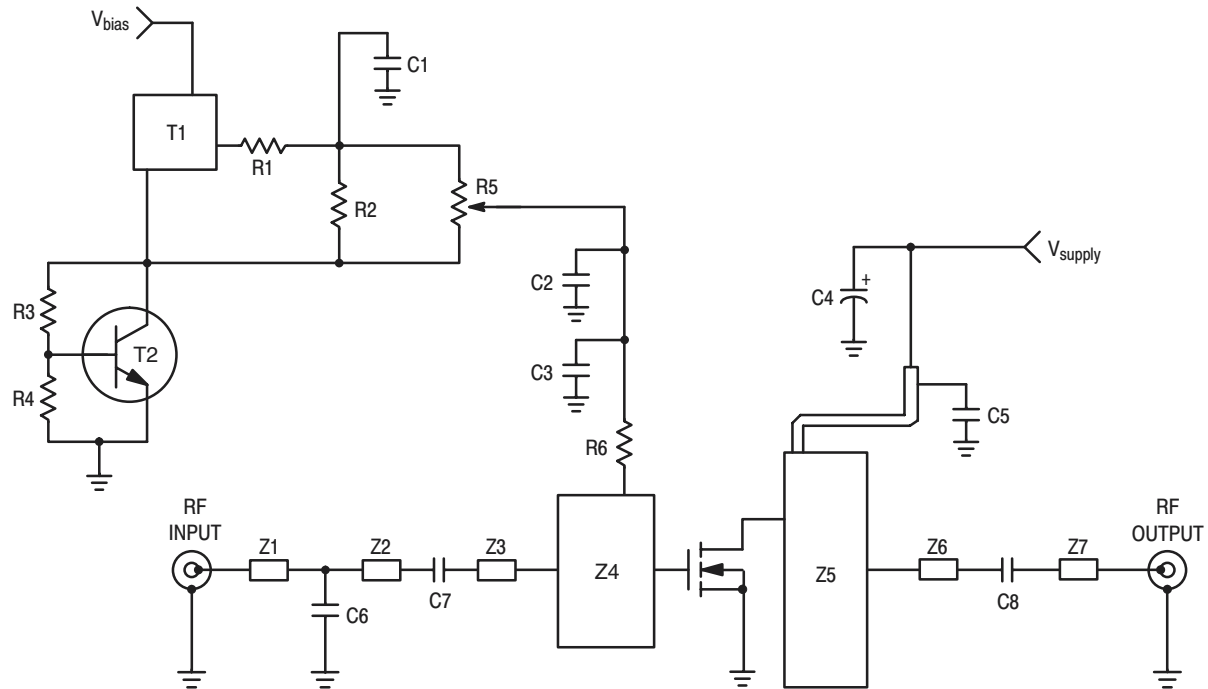


Figure 2. 1805 – 1880 MHz Test Fixture Component Layout



C1	1 $\mu$ F Chip Capacitor (0805)	T1	LP2951 Micro-8 Voltage Regulator
C2	100 nF Chip Capacitor (0805)	T2	BC847 SOT-23 NPN Transistor
C3, C5, C8	10 pF Chip Capacitors, ACCU-P (0805)	Z1	0.159" x 0.055" Microstrip
C4	10 $\mu$ F, 35 V Tantalum Electrolytic Capacitor	Z2	0.982" x 0.055" Microstrip
C6	1.8 pF Chip Capacitor, ACCU-P (0805)	Z3	0.087" x 0.055" Microstrip
C7	1 pF Chip Capacitor, ACCU-P (0805)	Z4	0.512" x 0.787" Microstrip
R1	10 $\Omega$ Chip Resistor (0805)	Z5	0.433" x 1.220" Microstrip
R2, R6	1 k $\Omega$ Chip Resistors (0805)	Z6	1.039" x 0.118" Microstrip
R3	1.2 k $\Omega$ Chip Resistor (0805)	Z7	0.268" x 0.055" Microstrip
R4	2.2 k $\Omega$ Chip Resistor (0805)		Substrate = 0.5 mm Teflon <sup>®</sup> Glass, $\epsilon_r = 2.55$
R5	5 k $\Omega$ , SMD Potentiometer		

Figure 3. 1800 – 2000 MHz Demo Board Schematic

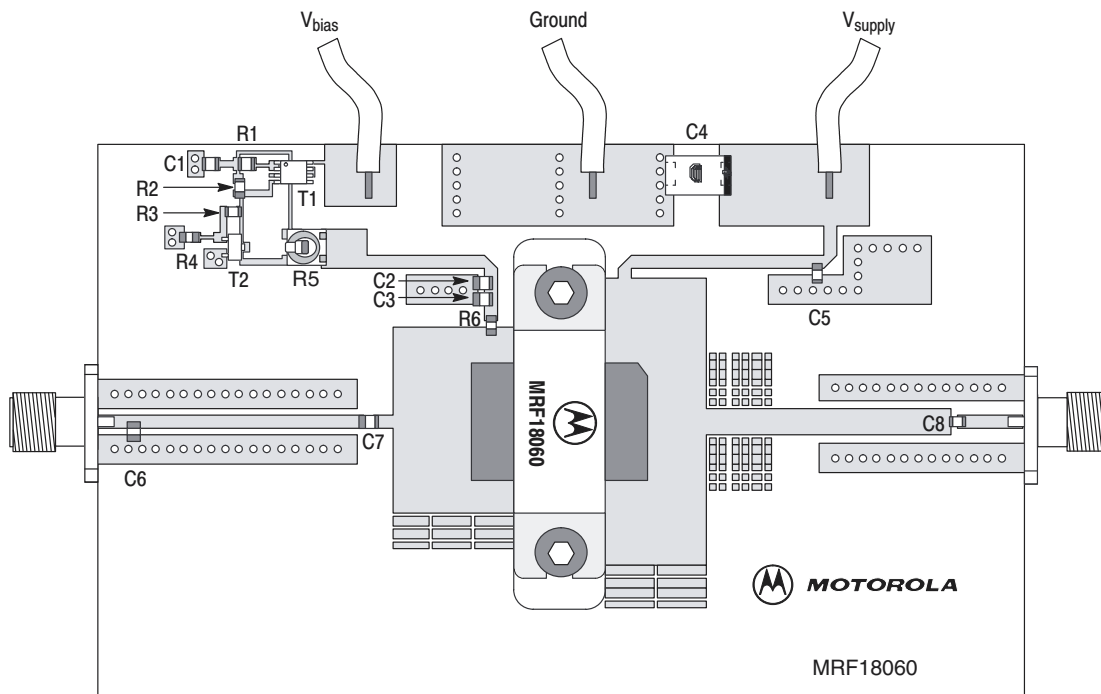


Figure 4. 1800 – 2000 MHz Demo Board Component Layout

TYPICAL CHARACTERISTICS (DATA TAKEN USING WIDEBAND DEMONSTRATION BOARD)

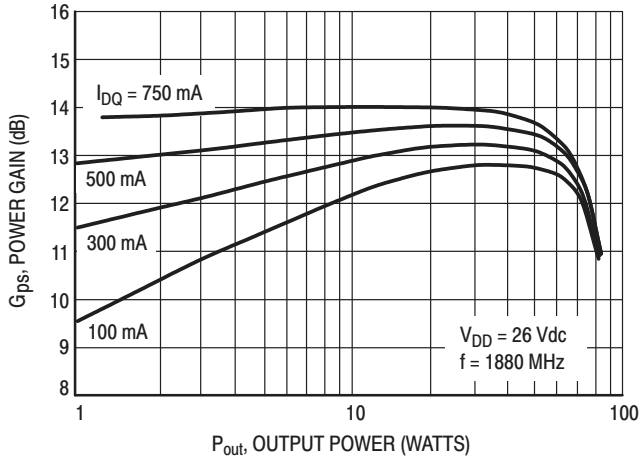


Figure 5. Power Gain versus Output Power

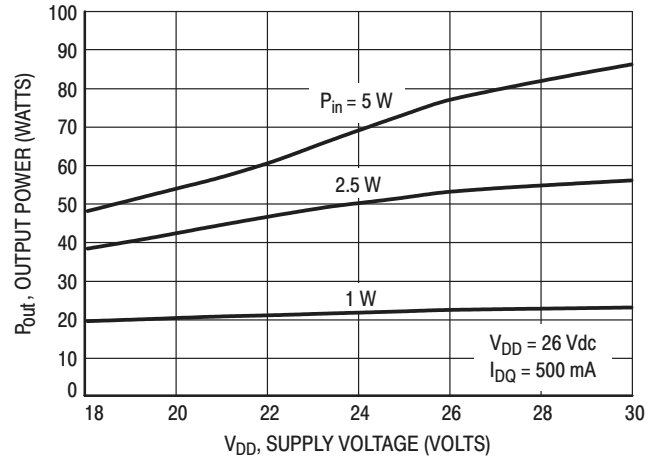


Figure 6. Output Power versus Supply Voltage

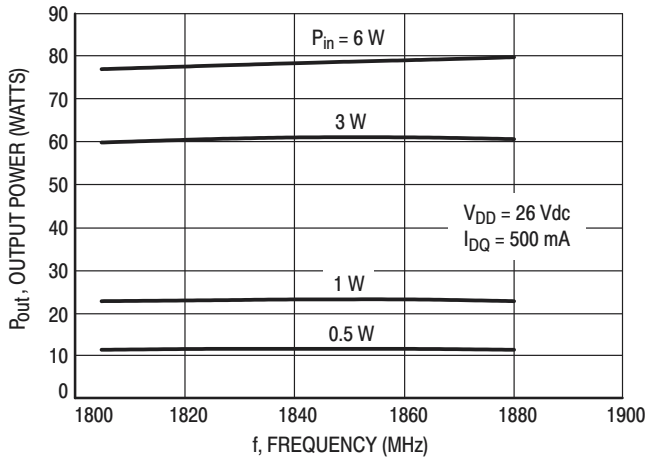


Figure 7. Output Power versus Frequency

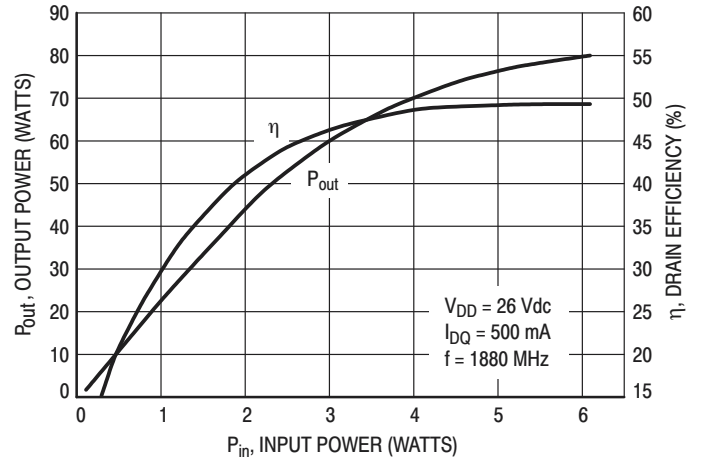


Figure 8. Output Power and Efficiency versus Input Power

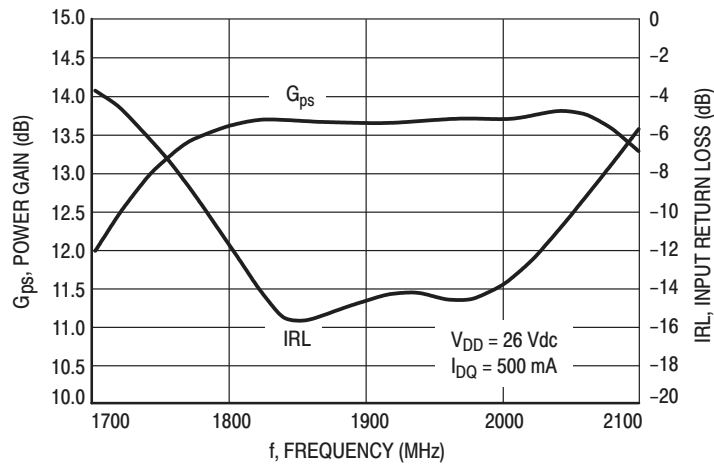
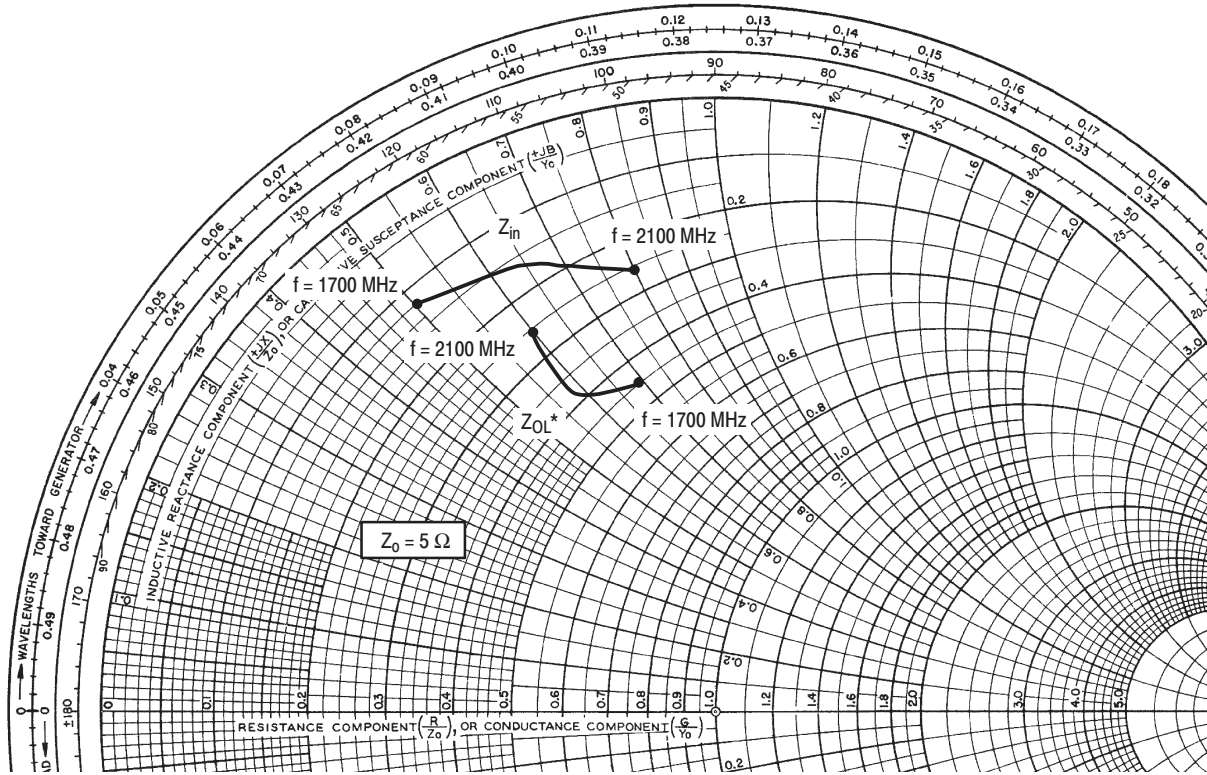


Figure 9. Wideband Gain and IRL (at Small Signal)



$V_{DD} = 26\text{ V}$ ,  $I_{DQ} = 500\text{ mA}$ ,  $P_{out} = 60\text{ W CW}$

f MHz	$Z_{in}$ $\Omega$	$Z_{OL}^*$ $\Omega$
1700	$0.60 + j2.53$	$2.27 + j3.44$
1800	$0.80 + j3.20$	$2.05 + j3.05$
1900	$0.92 + j3.42$	$1.90 + j2.90$
2000	$1.07 + j3.59$	$1.64 + j2.88$
2100	$1.31 + j4.00$	$1.29 + j2.99$

$Z_{in}$  = Complex conjugate of the source impedance.

$Z_{OL}^*$  = Complex conjugate of the optimum load at a given voltage, P1dB, gain, efficiency, bias current and frequency.

Note:  $Z_{OL}^*$  was chosen based on tradeoffs between gain, output power, and drain efficiency.

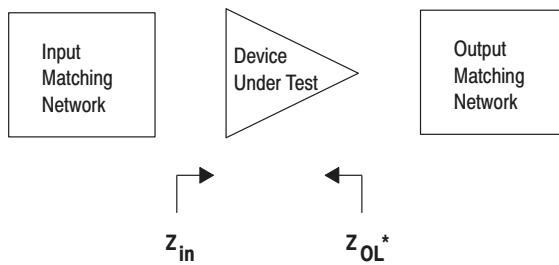
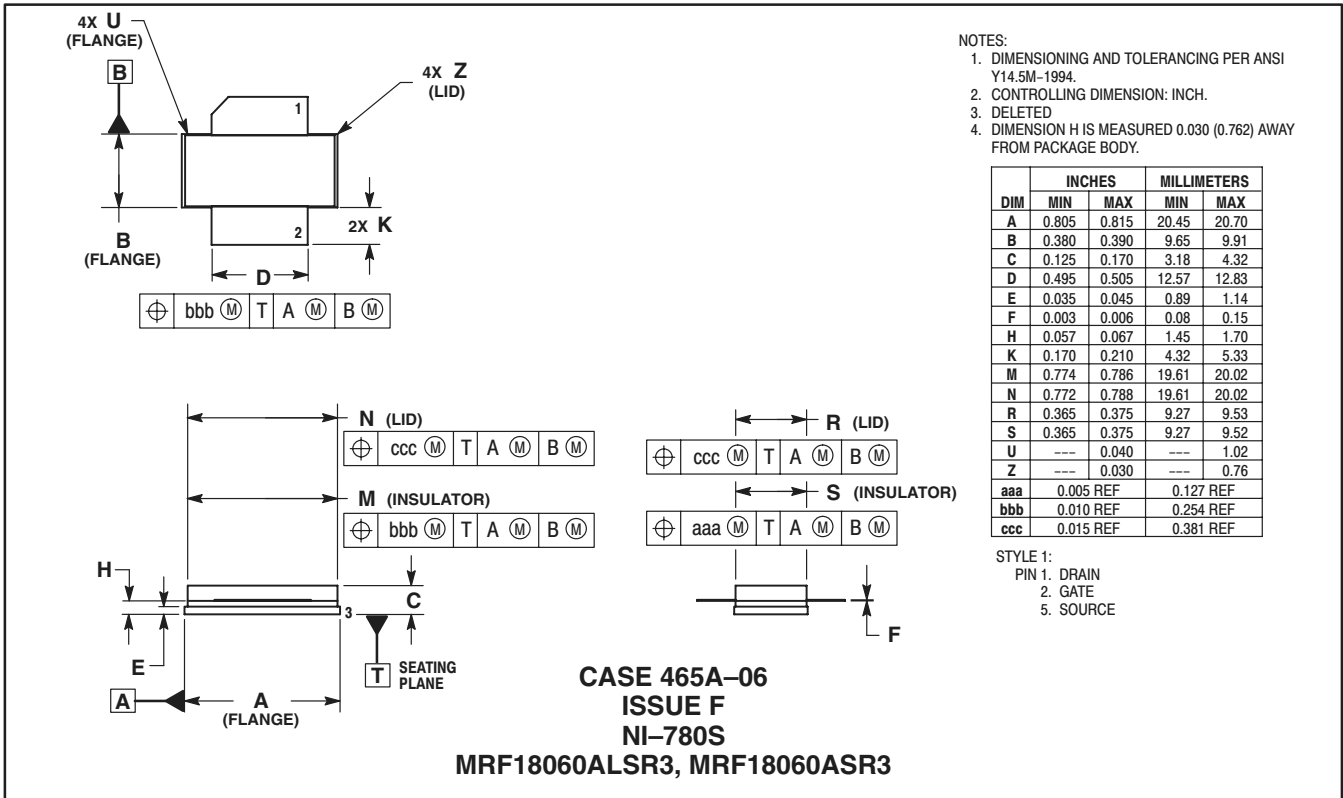
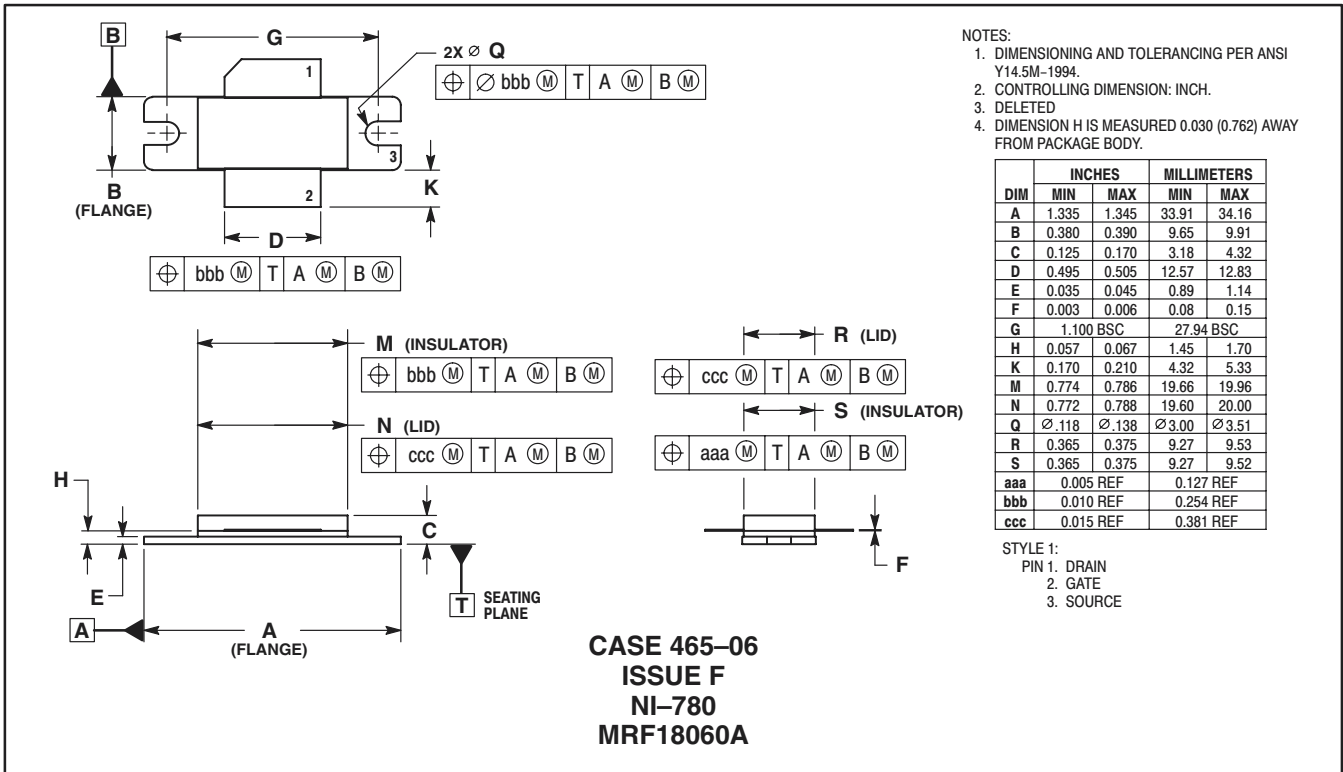



Figure 10. Series Equivalent Input and Output Impedance

## PACKAGE DIMENSIONS



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