

RF Power Field Effect Transistors

N-Channel Enhancement-Mode Lateral MOSFETs

Designed for PCN and PCS base station applications with frequencies from 1800 to 2000 MHz. 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 GSM 1805 - 1880 MHz.

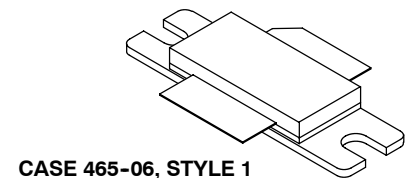
- Typical GSM Performance, Full Frequency Band (1805 - 1880 MHz)
Power Gain — 13 dB @ 60 Watts
Efficiency — 45% @ 60 Watts
- Capable of Handling 10:1 VSWR, @ 26 Vdc, 1840 MHz, 60 Watts CW Output Power

Features

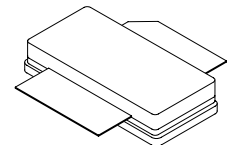
- Internally Matched for Ease of Use
- High Gain, High Efficiency and High Linearity
- Integrated ESD Protection
- Designed for Maximum Gain and Insertion Phase Flatness
- Excellent Thermal Stability
- Available with Low Gold Plating Thickness on Leads. L Suffix Indicates 40μ" Nominal.
- RoHS Compliant
- In Tape and Reel. R3 Suffix = 250 Units per 56 mm, 13 Inch Reel.

MRF18060ALR3
MRF18060ALSR3

1805-1880 MHz, 60 W, 26 V
LATERAL N-CHANNEL
RF POWER MOSFETs



CASE 465-06, STYLE 1
NI-780
MRF18060ALR3



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

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 @ $T_C \geq 25^\circ\text{C}$ Derate above 25°C	P_D	180 1.03	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	$R_{\theta JC}$	0.97	°C/W

Table 3. ESD Protection Characteristics

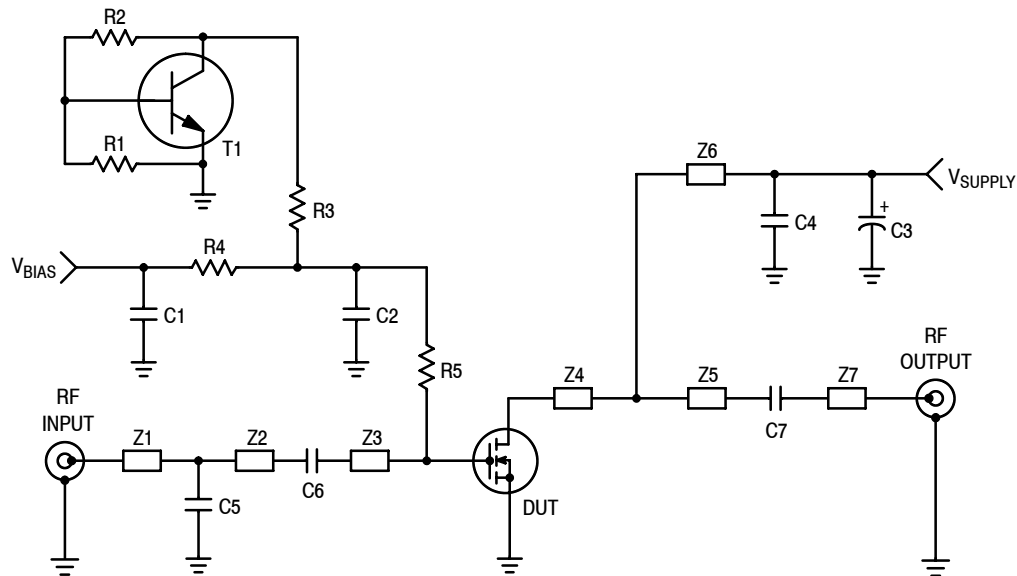
Test Conditions	Class
Human Body Model	2 (Minimum)
Machine Model	M3 (Minimum)

Table 4. Electrical Characteristics ($T_C = 25^\circ\text{C}$ unless otherwise noted)

Characteristic	Symbol	Min	Typ	Max	Unit
Off Characteristics					
Drain-Source Breakdown Voltage ($V_{GS} = 0\text{ Vdc}$, $I_D = 10\text{ }\mu\text{Adc}$)	$V_{(BR)DSS}$	65	—	—	Vdc
Zero Gate Voltage Drain Current ($V_{DS} = 26\text{ Vdc}$, $V_{GS} = 0\text{ Vdc}$)	I_{DSS}	—	—	6	μAdc
Gate-Source Leakage Current ($V_{GS} = 5\text{ Vdc}$, $V_{DS} = 0\text{ Vdc}$)	I_{GSS}	—	—	1	μAdc
On Characteristics					
Gate Threshold Voltage ($V_{DS} = 10\text{ Vdc}$, $I_D = 300\text{ }\mu\text{Adc}$)	$V_{GS(th)}$	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
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 Freescale 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⁾ ($V_{DD} = 26\text{ Vdc}$, $I_{DQ} = 500\text{ mA}$, $f = 1805 - 1880\text{ MHz}$)	η	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

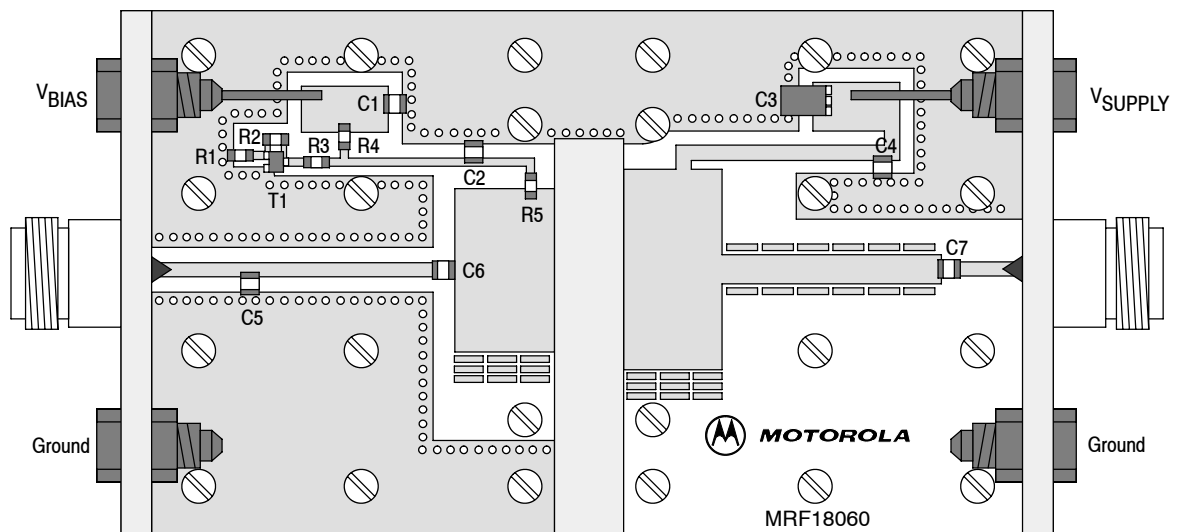
1. Part is internally matched both on input and output.

2. To meet application requirements, Freescale 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 μ 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 Ω Chip Resistors (0805)	Z6	1.15" x 0.09" Microstrip
R2, R4	2.7 k Ω Chip Resistors (0805)	Z7	0.37" x 0.09" Microstrip
R5	1.1 k Ω Chip Resistor (0805)		
T1	BC847 Transistor SOT-23		

Figure 1. 1805 - 1880 MHz Test Fixture Schematic



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

Figure 2. 1805 - 1880 MHz Test Fixture Component Layout

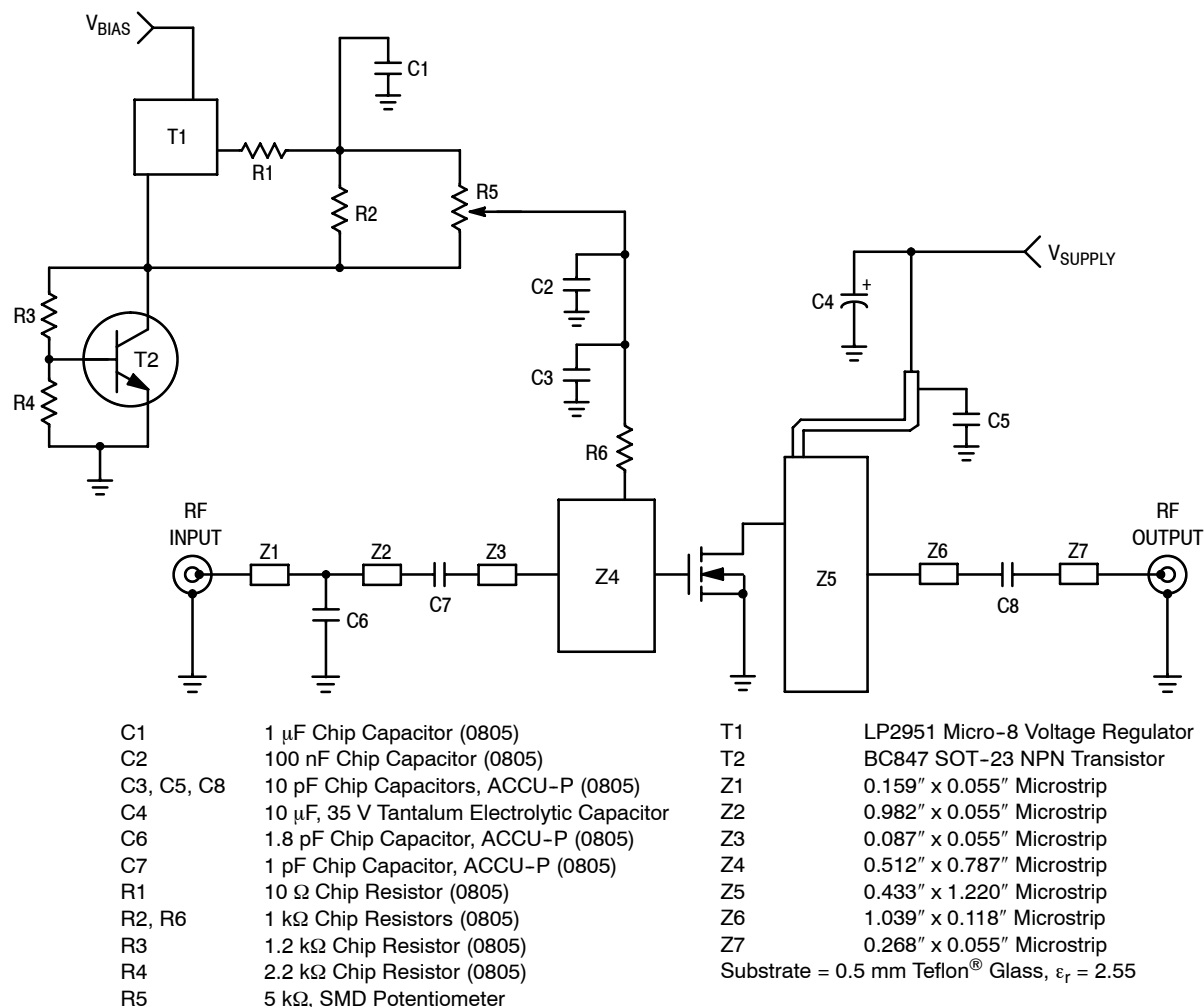
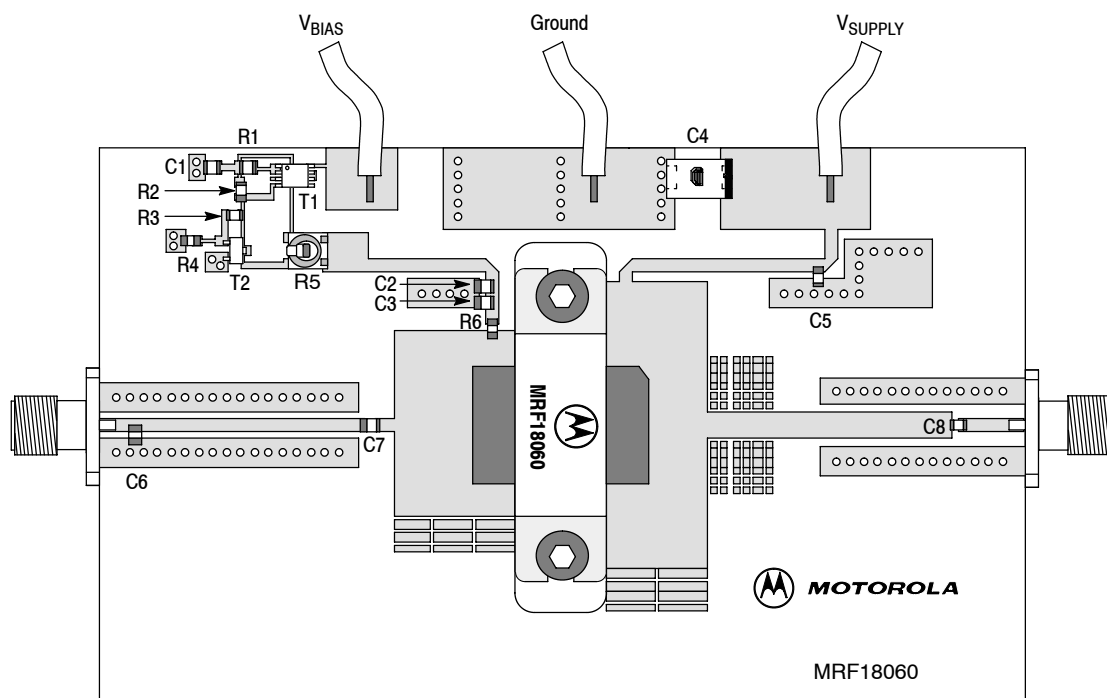


Figure 3. 1800 - 2000 MHz Demo Board Schematic



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

Figure 4. 1800 - 2000 MHz Demo Board Component Layout

TYPICAL CHARACTERISTICS (DATA TAKEN USING WIDEBAND DEMONSTRATION BOARD)

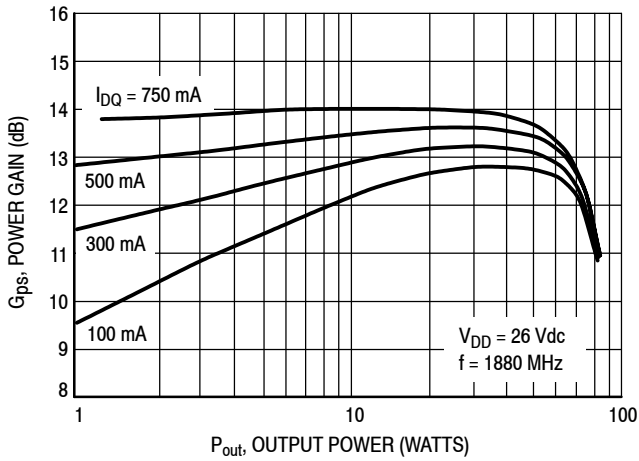


Figure 5. Power Gain versus Output Power

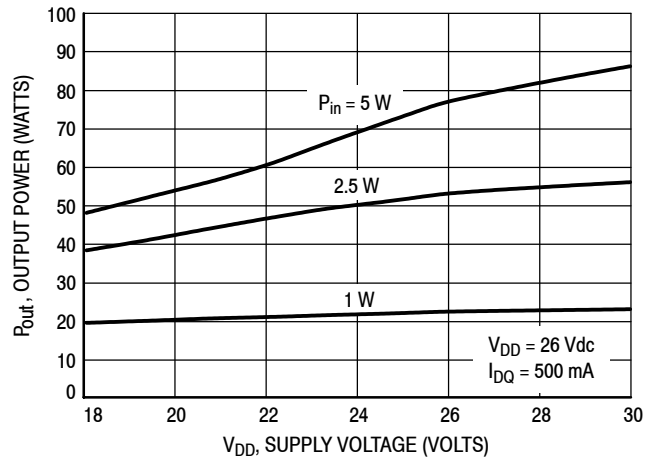


Figure 6. Output Power versus Supply Voltage

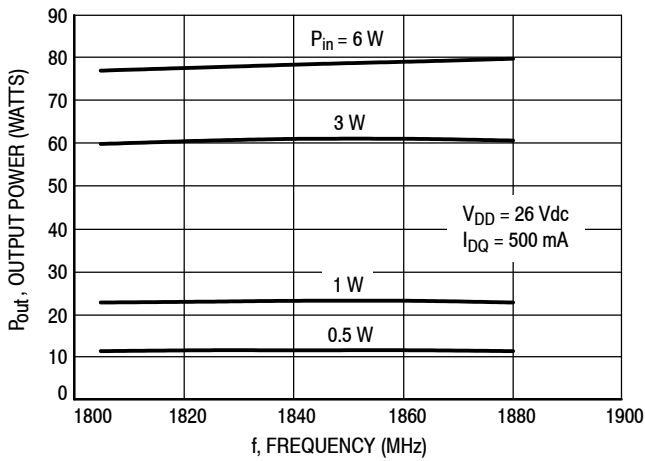


Figure 7. Output Power versus Frequency

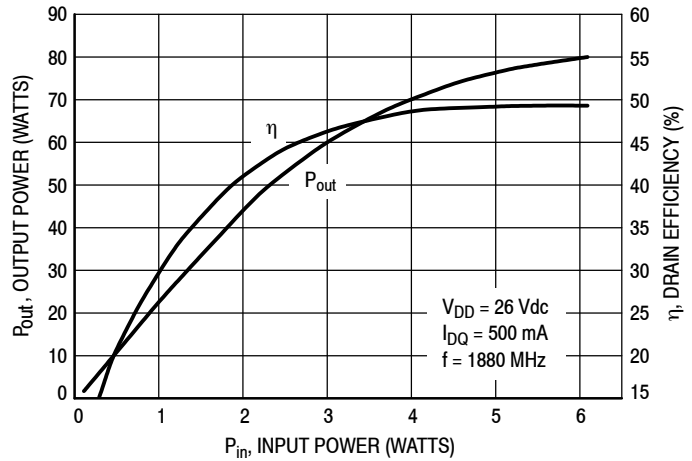


Figure 8. Output Power and Efficiency versus Input Power

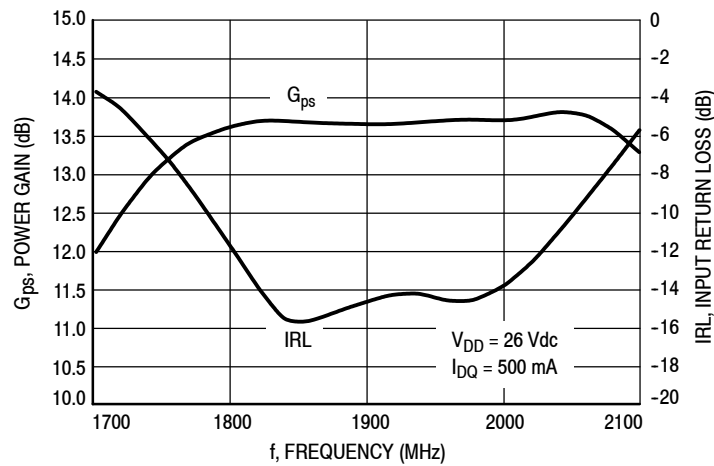
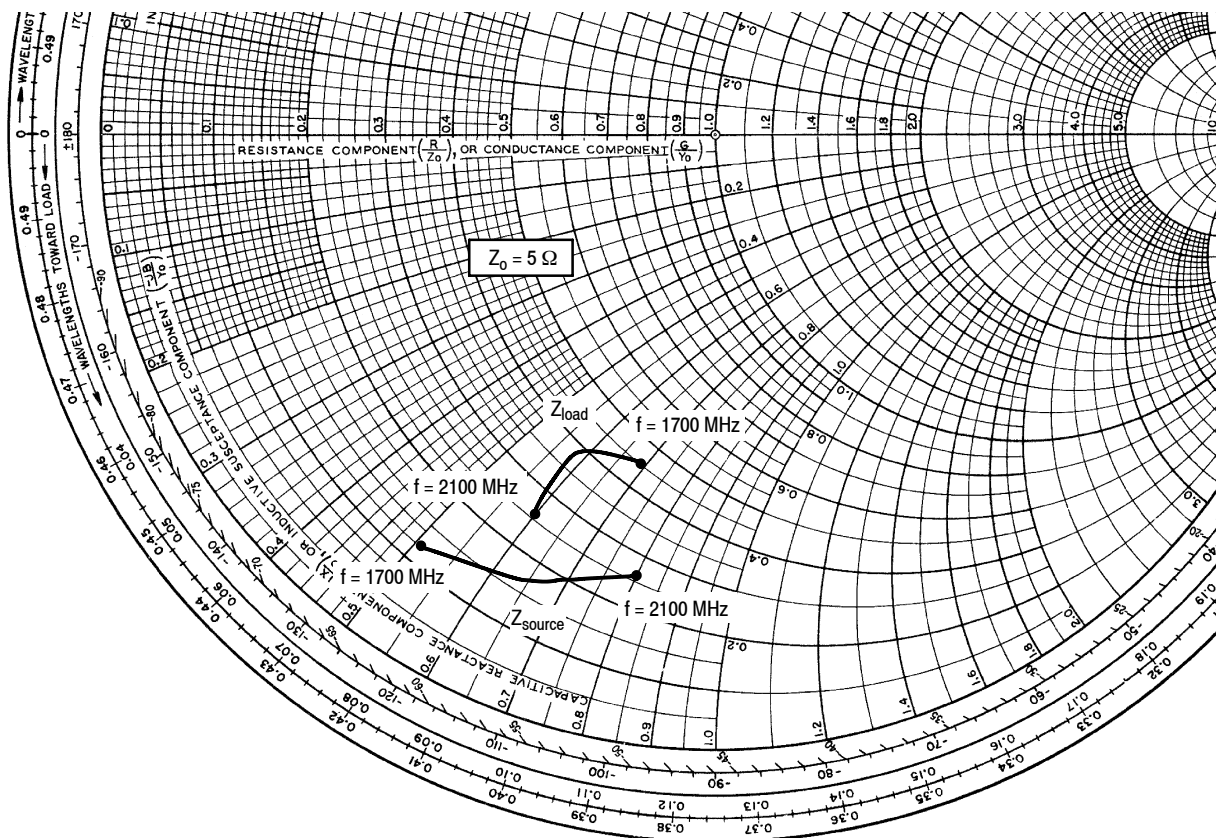


Figure 9. Wideband Gain and IRL (at Small Signal)



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

f MHz	Z_{source} Ω	Z_{load} Ω
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_{source} = Test circuit impedance as measured from gate to ground.

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

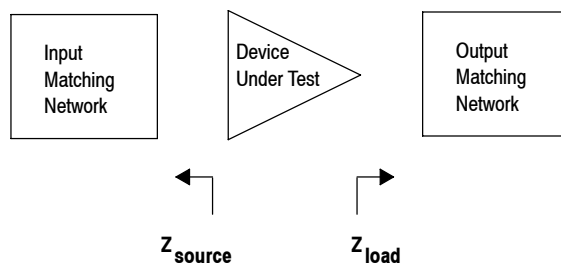


Figure 10. Series Equivalent Source and Load Impedance

NOTES

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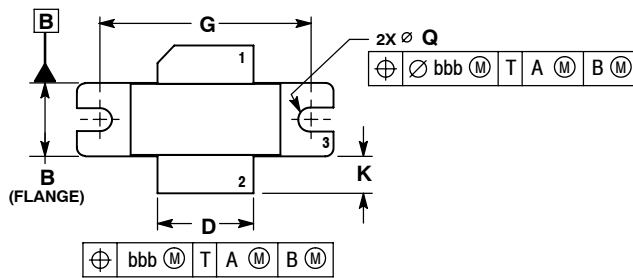
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PACKAGE DIMENSIONS



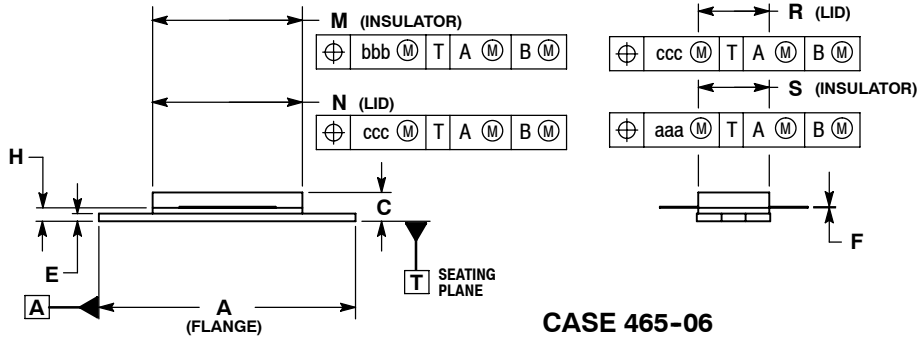
NOTES:

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.

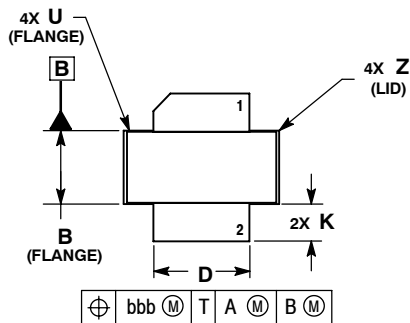
DIM	INCHES		MILLIMETERS	
	MIN	MAX	MIN	MAX
A	1.335	1.345	33.91	34.16
B	0.380	0.390	9.65	9.91
C	0.125	0.170	3.18	4.32
D	0.495	0.505	12.57	12.83
E	0.035	0.045	0.89	1.14
F	0.003	0.006	0.08	0.15
G	1.100	BSC	27.94	BSC
H	0.057	0.067	1.45	1.70
K	0.170	0.210	4.32	5.33
M	0.774	0.786	19.66	19.96
N	0.772	0.788	19.60	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
- GATE
- SOURCE



**CASE 465-06
ISSUE G
NI-780
MRF18060ALR3**



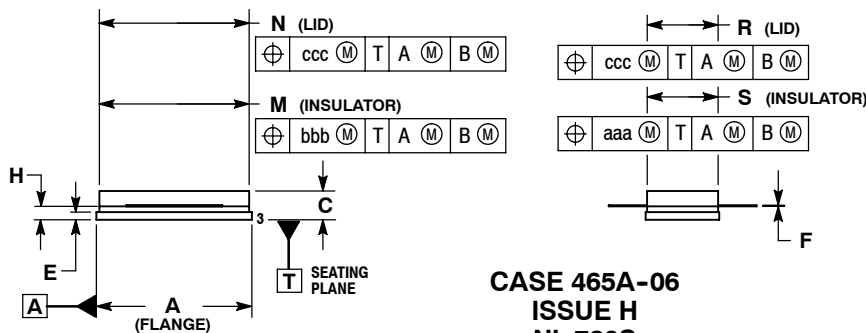
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3. DELETED
4. DIMENSION H IS MEASURED 0.030 (0.762) AWAY FROM PACKAGE BODY.

DIM	INCHES		MILLIMETERS	
	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
- GATE
- SOURCE



**CASE 465A-06
ISSUE H
NI-780S
MRF18060ALSR3**

MRF18060ALR3 MRF18060ALSR3

REVISION HISTORY

The following table summarizes revisions to this document.

Revision	Date	Description
9	Dec. 2010	MRF18060A Rev. 9 data sheet archived. Data sheet split due to change in part life cycle. See MRF18060A-1 Rev. 10 for MRF18060ALSR3 and MRF18060A-2 Rev. 11 for MRF18030ALR3.

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