RF Power Field Effect Transistor

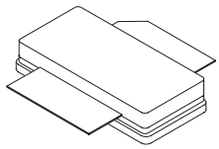
N–Channel Enhancement–Mode Lateral MOSFET

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 GSM1930 – 1990 MHz.

- GSM Performance, Full Frequency Band (1930 – 1990 MHz)
  Power Gain — 13 dB (Typ) @ 60 Watts CW
  Efficiency — 45% (Typ) @ 60 Watts CW
- 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 with Low Gold Plating Thickness on Leads. L Suffix Indicates 40μ″ Nominal.
- In Tape and Reel. R3 Suffix = 250 Units per 56 mm, 13 Inch Reel.

MRF18060BLSR3

1900–1990 MHz, 60 W, 26 V
LATERAL N–CHANNEL
RF POWER MOSFETs



CASE 465A–06, STYLE 1
NI–780S

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	180 1.03	W W/°C
Storage Temperature Range	T_{stg}	–65 to +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

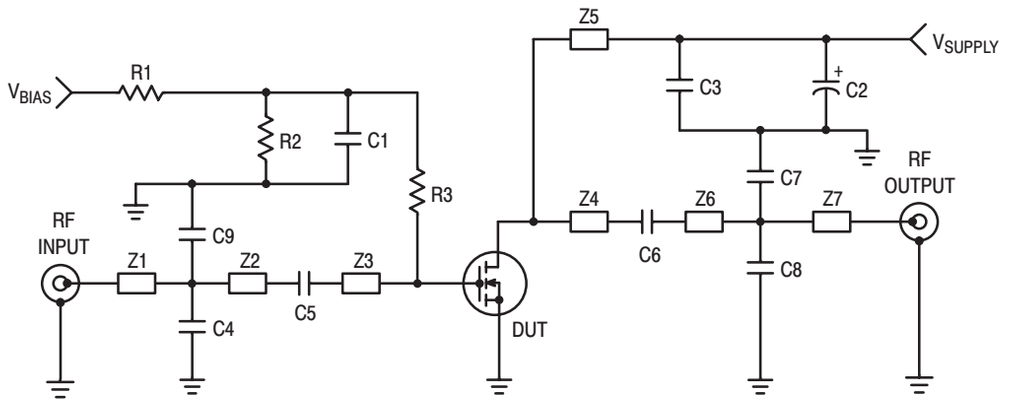
Test Conditions	Class
Human Body Model	2 (Minimum)
Machine Model	M3 (Minimum)

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

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

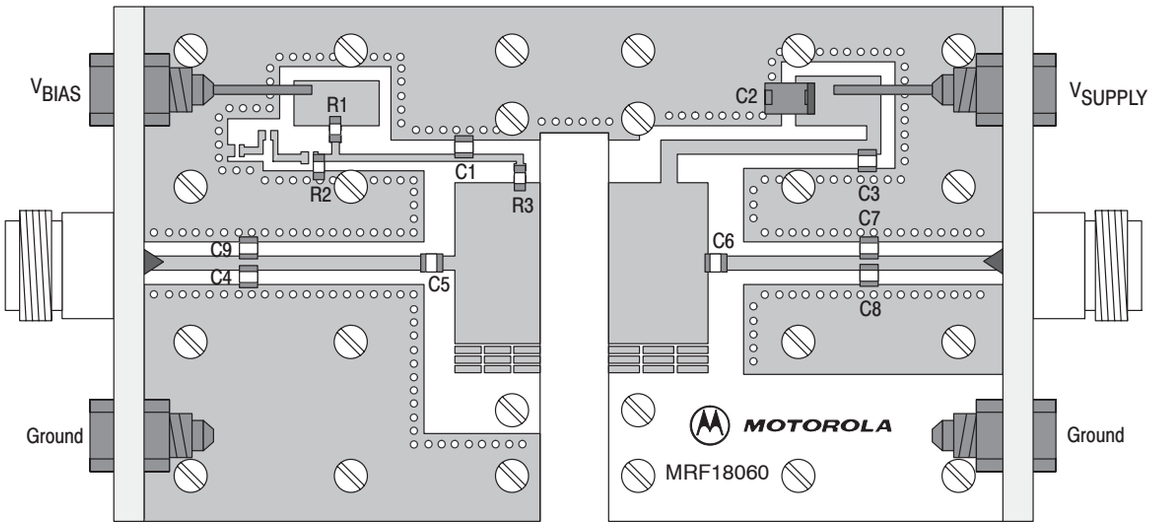
Characteristic	Symbol	Min	Typ	Max	Unit
Off Characteristics					
Drain−Source Breakdown Voltage (V_{GS} = 0 Vdc, I_D = 10 μAdc)	$V_{(BR)DSS}$	65	—	—	Vdc
Zero Gate Voltage Drain Current (V_{DS} = 26 Vdc, V_{GS} = 0 Vdc)	I_{DSS}	—	—	6	μAdc
Gate−Source Leakage Current (V_{GS} = 5 Vdc, V_{DS} = 0 Vdc)	I_{GSS}	—	—	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} = 26 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					
Input Capacitance (Including Input Matching Capacitor in Package) (1) (V_{DS} = 26 Vdc ± 30 mV(rms)ac @ 1 MHz, V_{GS} = 0 Vdc)	C_{iss}	—	160	—	pF
Output Capacitance (1) (V_{DS} = 26 Vdc ± 30 mV(rms)ac @ 1 MHz, V_{GS} = 0 Vdc)	C_{oss}	—	740	—	pF
Reverse Transfer Capacitance (V_{DS} = 26 Vdc ± 30 mV(rms)ac @ 1 MHz, V_{GS} = 0 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 Vdc, I_{DQ} = 500 mA, f = 1930 − 1990 MHz)	G_{ps}	11.5	13	—	dB
Drain Efficiency @ 60 W (2) (V_{DD} = 26 Vdc, I_{DQ} = 500 mA, f = 1930 − 1990 MHz)	η	40	45	—	%
Input Return Loss (2) (V_{DD} = 26 Vdc, P_{out} = 60 W CW, I_{DQ} = 500 mA, f = 1930 − 1990 MHz)	IRL	—	—	−10	dB
Output Mismatch Stress (V_{DD} = 26 Vdc, P_{out} = 60 W CW, I_{DQ} = 500 mA 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.
2. To meet application requirements, Freescale test fixtures have been designed to cover the full GSM1900 band, ensuring batch−to−batch consistency.



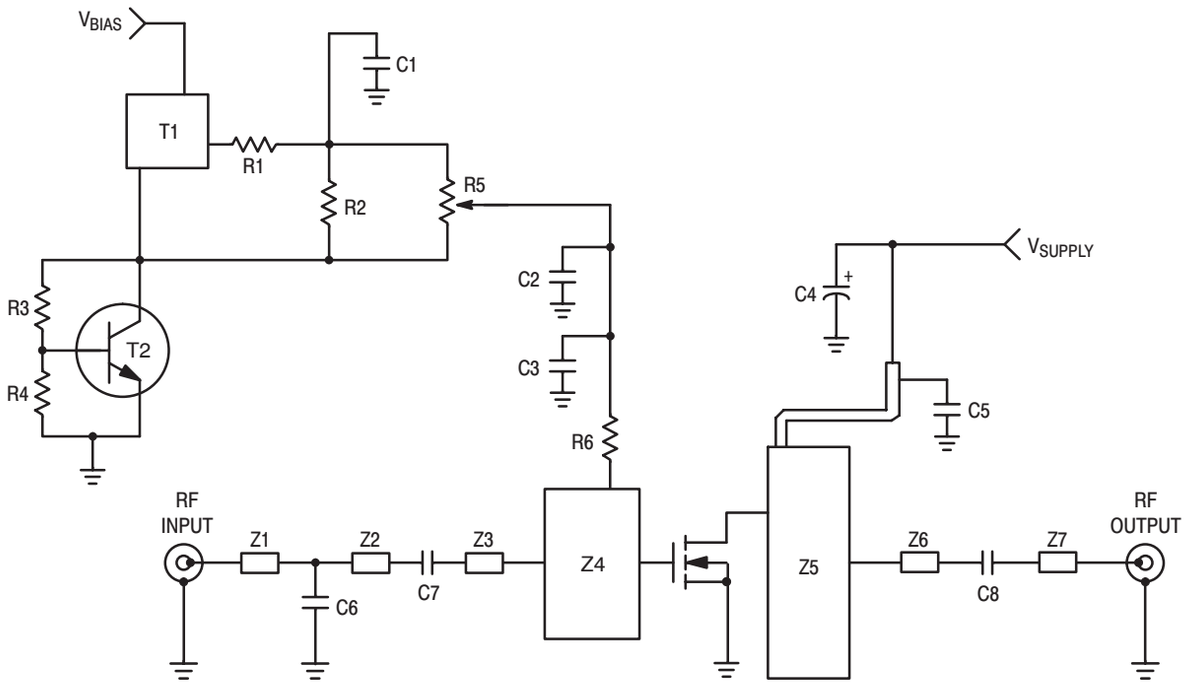
C1, C3	10 pF, 100B Chip Capacitors	Z1	0.60″ x 0.09″ Microstrip
C2	10 μF, 35 V Electrolytic Tantalum Capacitor	Z2	1.00″ x 0.09″ Microstrip
C4, C8	1.2 pF, 100B Chip Capacitors	Z3	0.51″ x 0.94″ Microstrip
C5	1.0 pF, 100B Chip Capacitor	Z4	0.59″ x 0.98″ Microstrip
C6	2.2 pF, 100B Chip Capacitor	Z5	0.79″ x 0.09″ Microstrip
C7, C9	0.3 pF, 100B Chip Capacitors	Z6	1.38″ x 0.09″ Microstrip
R1, R2	10 kΩ Chip Resistors (0805)	Z7	0.79″ x 0.09″ Microstrip
R3	1.0 kΩ Chip Resistor (0805)	PCB	Teflon® Glass

Figure 1. 1930 – 1990 MHz Test Fixture Schematic



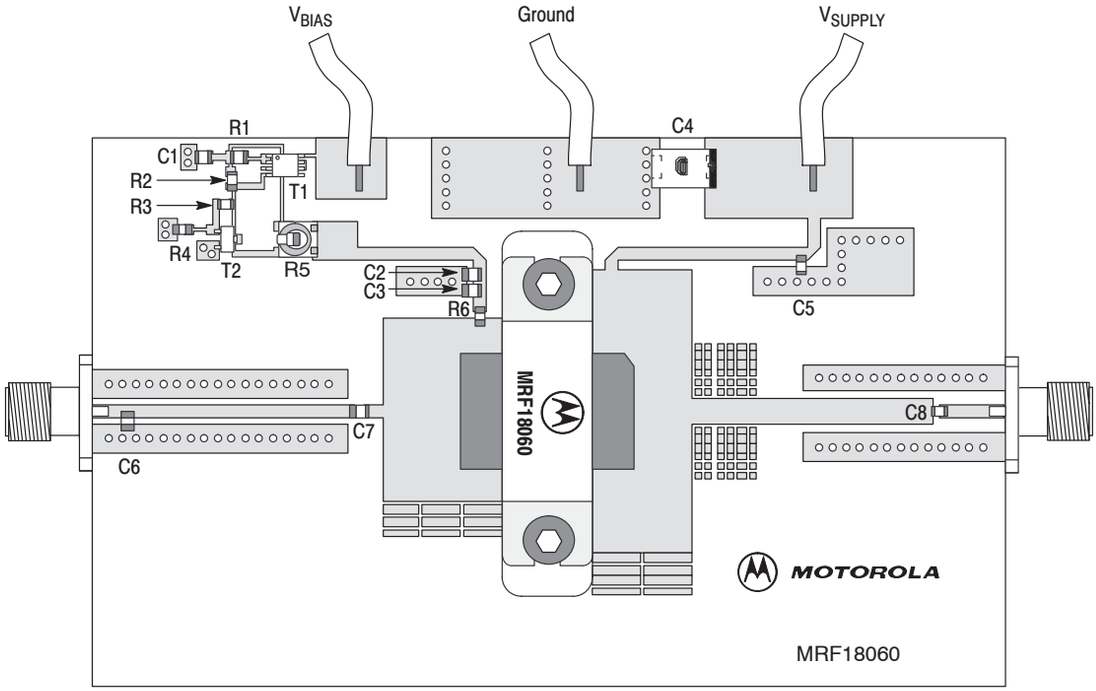
Freescale has begun the transition of marking Printed Circuit Boards (PCBs) with the Freescale Semiconductor signature/logo. PCBs may have either Motorola or Freescale markings during the transition period. These changes will have no impact on form, fit or function of the current product.

Figure 2. 1930 – 1990 MHz Test Fixture Component Layout



C1	1 μF 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 μF, 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 Ω Chip Resistor (0805)	Z5	0.433″ x 1.220″ Microstrip
R2, R6	1 kΩ Chip Resistors (0805)	Z6	1.039″ x 0.118″ Microstrip
R3	1.2 kΩ Chip Resistor (0805)	Z7	0.268″ x 0.055″ Microstrip
R4	2.2 kΩ Chip Resistor (0805)	Substrate = 0.5 mm Teflon® Glass, ε_r = 2.55	
R5	5 kΩ, SMD Potentiometer		

Figure 3. 1800 − 2000 MHz Demo Board Schematic



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 4. 1800 – 2000 MHz Demo Board Component Layout

TYPICAL CHARACTERISTICS (DATA TAKEN USING WIDEBAND DEMONSTRATION BOARD)

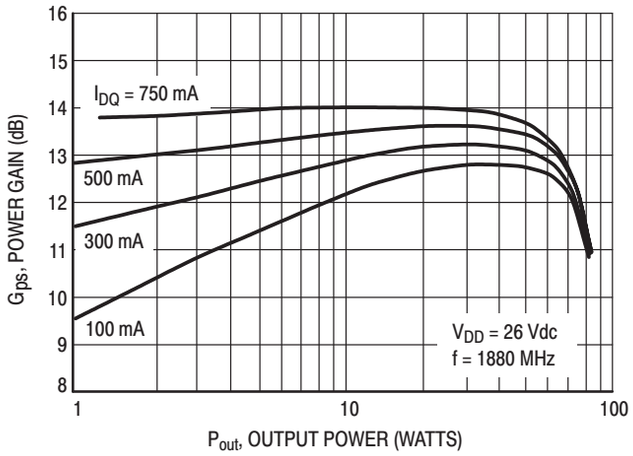


Figure 5. Power Gain versus Output Power

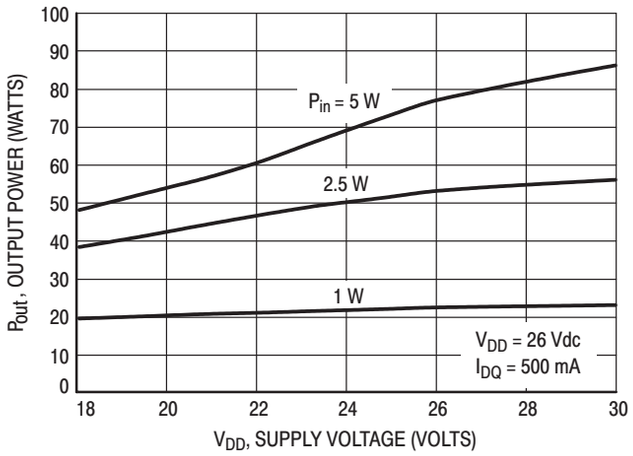


Figure 6. Output Power versus Supply Voltage

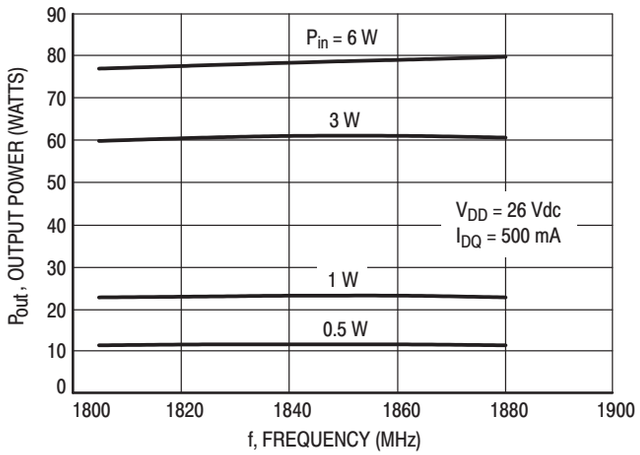


Figure 7. Output Power versus Frequency

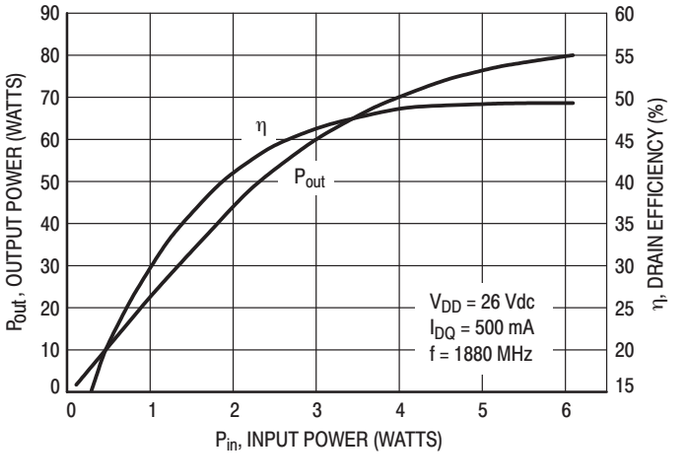


Figure 8. Output Power and Efficiency versus Input Power

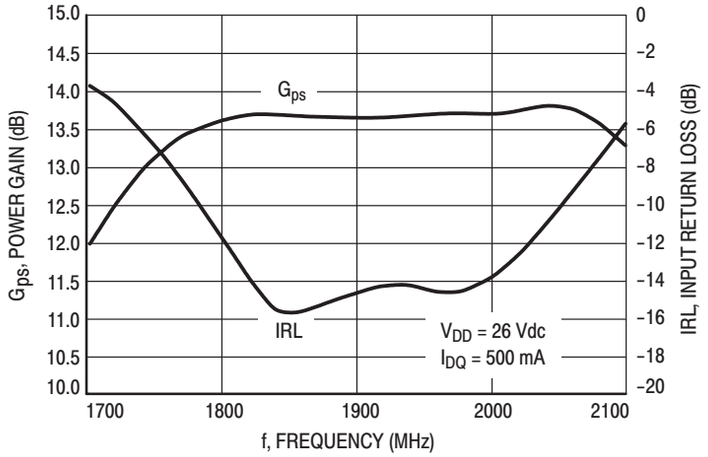
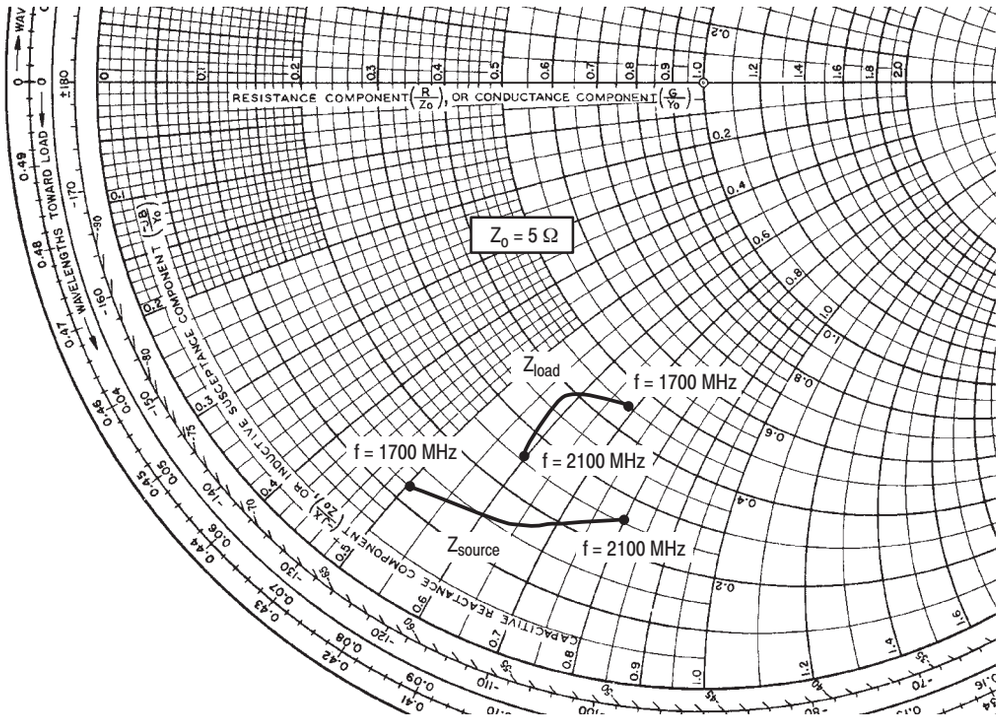


Figure 9. Wideband Gain and IRL (at Small Signal)



V_{DD} = 26 V, I_{DQ} = 500 mA, P_{out} = 60 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.

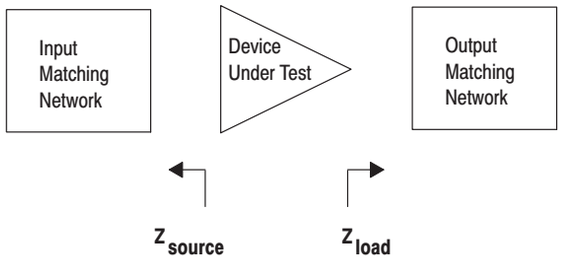


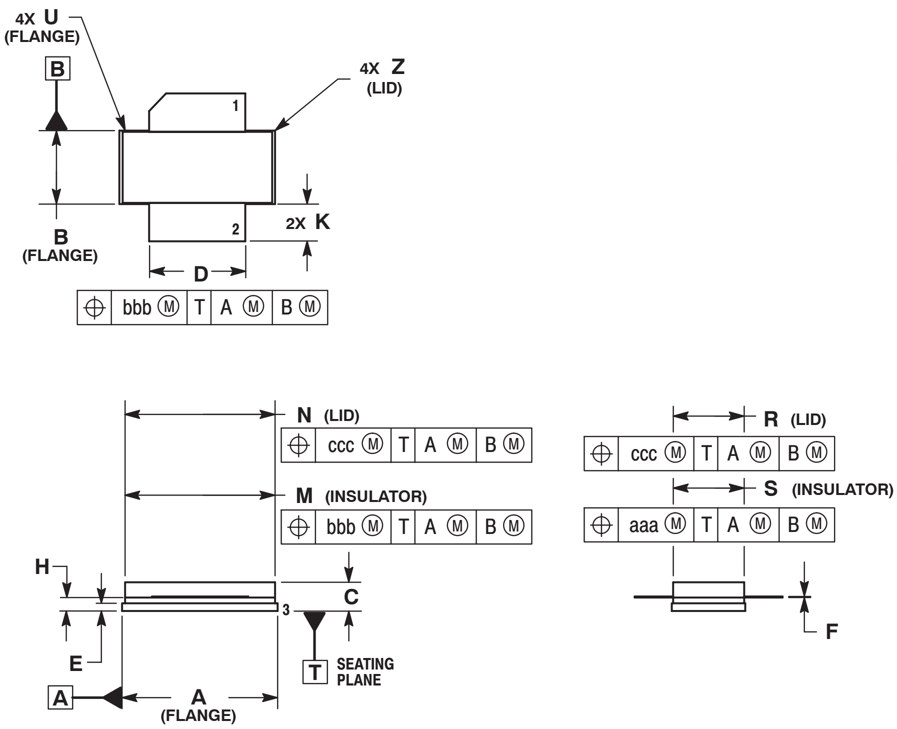
Figure 10. Series Equivalent Source and Load Impedance

NOTES

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	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 F
NI−780S

How to Reach Us:

Home Page:
www.freescale.com

E–mail:
support@freescale.com

USA/Europe or Locations Not Listed:
Freescale Semiconductor
Technical Information Center, CH370
1300 N. Alma School Road
Chandler, Arizona 85224
+1–800–521–6274 or +1–480–768–2130
support@freescale.com

Europe, Middle East, and Africa:
Freescale Halbleiter Deutschland GmbH
Technical Information Center
Schatzbogen 7
81829 Muenchen, Germany
+44 1296 380 456 (English)
+46 8 52200080 (English)
+49 89 92103 559 (German)
+33 1 69 35 48 48 (French)
support@freescale.com

Japan:
Freescale Semiconductor Japan Ltd.
Headquarters
ARCO Tower 15F
1–8–1, Shimo–Meguro, Meguro–ku,
Tokyo 153–0064
Japan
0120 191014 or +81 3 5437 9125
support.japan@freescale.com

Asia/Pacific:
Freescale Semiconductor Hong Kong Ltd.
Technical Information Center
2 Dai King Street
Tai Po Industrial Estate
Tai Po, N.T., Hong Kong
+800 2666 8080
support.asia@freescale.com

For Literature Requests Only:
Freescale Semiconductor Literature Distribution Center
P.O. Box 5405
Denver, Colorado 80217
1–800–441–2447 or 303–675–2140
Fax: 303–675–2150
LDCForFreescaleSemiconductor@hibbertgroup.com

Document Number: MRF18060B
Rev. 6, 1/2005