Freescale Semiconductor
Technical Data

Document Number: MRF18090A
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RoHS

RF Power Field Effect Transistor

N-Channel Enhancement-Mode Lateral MOSFET

MRF18090AR3

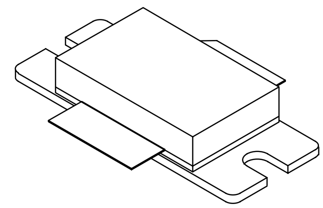
**1.80-1.88 GHz, 90 W, 26 V
LATERAL N-CHANNEL
RF POWER MOSFET**

Designed for GSM and GSM EDGE 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 GSM and GSM EDGE cellular radio applications.

- GSM and GSM EDGE Performances, Full Frequency Band
  Power Gain — 13.5 dB (Typ) @ 90 Watts CW
  Efficiency — 52% (Typ) @ 90 Watts CW
- Capable of Handling 10:1 VSWR, @ 26 Vdc, 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
- RoHS Compliant
- In Tape and Reel. R3 Suffix = 250 Units per 56 mm, 13 inch Reel.



**CASE 465B-03, STYLE 1
NI-880**

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

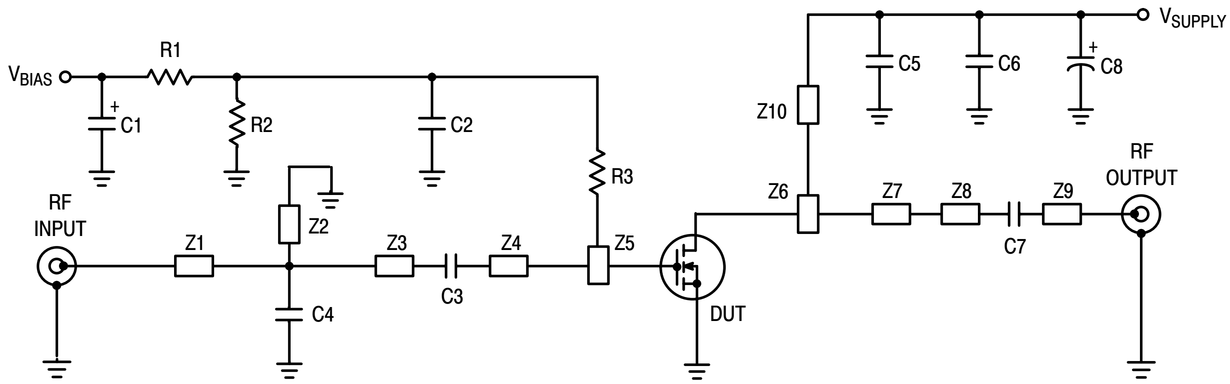
Table 3. ESD Protection Characteristics

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

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

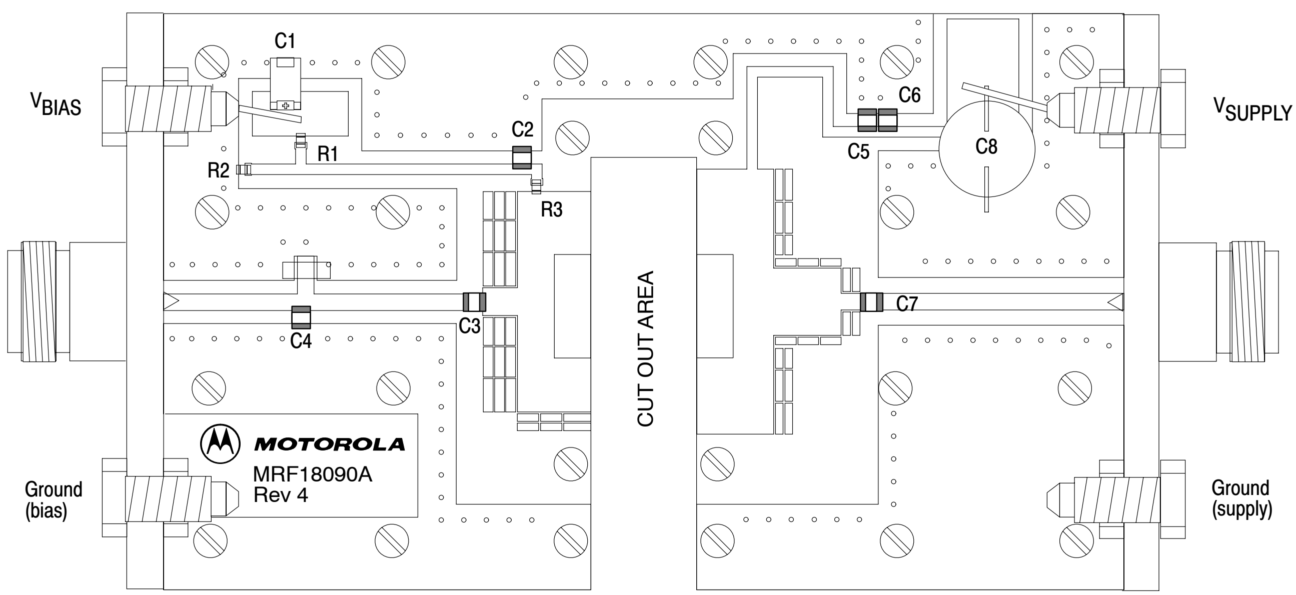
Characteristic	Symbol	Min	Typ	Max	Unit
Off Characteristics					
Drain-Source Breakdown Voltage (V_{GS} = 0 Vdc, I_D = 100 μAdc)	$V_{(BR)DSS}$	65	—	—	Vdc
Zero Gate Voltage Drain Current (V_{DS} = 26 Vdc, V_{GS} = 0 Vdc)	I_{DSS}	—	—	10	μAdc
Gate-Source Leakage Current (V_{GS} = 5 Vdc, V_{DS} = 0 Vdc)	I_{GSS}	—	—	1	μAdc
On Characteristics					
Gate Quiescent Voltage (V_{DS} = 26 Vdc, I_D = 750 mAdc)	$V_{GS(Q)}$	2.5	3.7	4.5	Vdc
Drain-Source On-Voltage (V_{GS} = 10 Vdc, I_D = 1 Adc)	$V_{DS(on)}$	—	0.1	—	Vdc
Forward Transconductance (V_{DS} = 10 Vdc, I_D = 3 Adc)	g_{fs}	—	7.2	—	S
Dynamic Characteristics					
Reverse Transfer Capacitance (V_{DS} = 26 Vdc ± 30 mV(rms)ac @ 1 MHz, V_{GS} = 0 Vdc)	C_{rss}	—	4.2	—	pF
Functional Tests (In Freescale Test Fixture)					
Common-Source Amplifier Power Gain @ 90 W [(1)] (V_{DD} = 26 Vdc, I_{DQ} = 750 mA, f = 1805 - 1880 MHz)	G_{ps}	12.0	13.5	—	dB
Drain Efficiency @ 90 W [(1)] (V_{DD} = 26 Vdc, I_{DQ} = 750 mA, f = 1805 - 1880 MHz)	η	47	52	—	%
Input Return Loss [(1)] (V_{DD} = 26 Vdc, P_{out} = 90 W CW, I_{DQ} = 750 mA, f = 1805 - 1880 MHz)	IRL	—	—	-10	dB

1. To meet application requirements, Freescale test fixtures have been designed to cover the full GSM1800 band, ensuring batch-to-batch consistency.



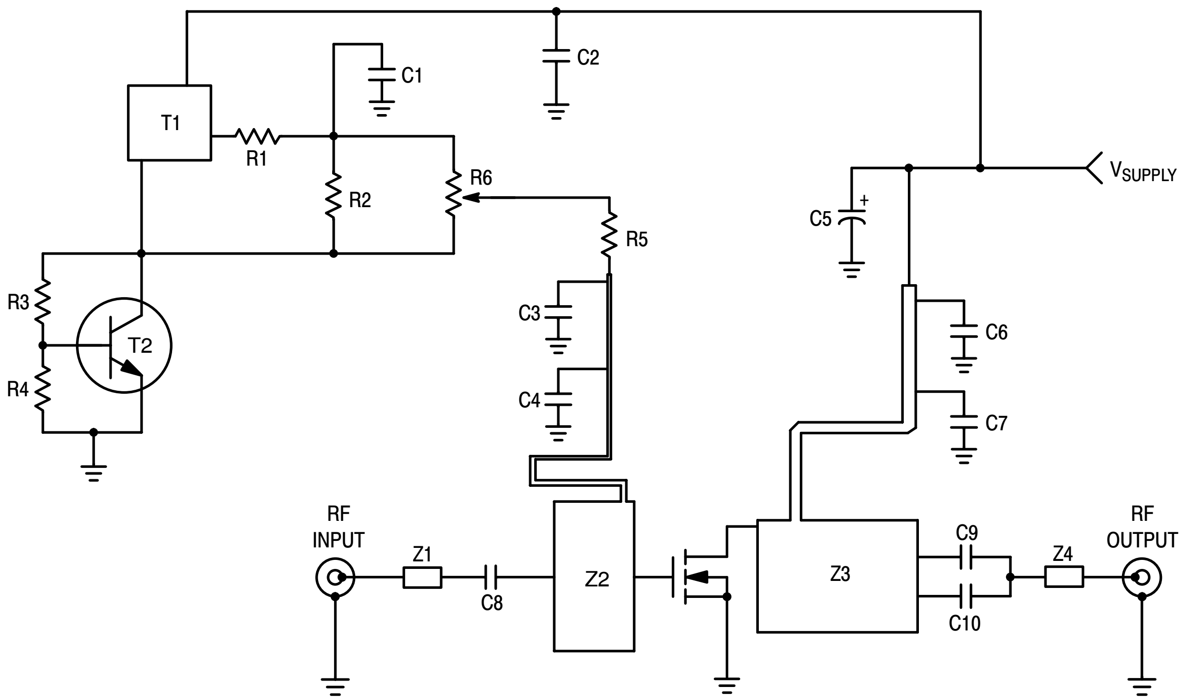
C1	10 μF, 35 V Tantalum Capacitor, Vishay-Sprague #293D106X9035D
C2, C3	10 pF, 100B Chip Capacitor , ATC #100B100GW
C4	3.3 pF, 100B Chip Capacitor, ATC #100B3R3BW
C5, C6	6.8 pF, 100B Chip Capacitors, ATC #100B6R8CW
C7	12 pF, 100B Chip Capacitors, ATC #100B120GW
C8	220 μF, 63 V Electrolytic Capacitor, Philips #13668221
R1, R2	10 kΩ, 1/8 W Chip Resistors (0805)
R3	1.0 kΩ, 1/8 W Chip Resistor (0805)
Z1	0.697″ x 0.087″ Microstrip
Z2	0.087″ x 0.197″ Microstrip
Z3	0.819″ x 0.087″ Microstrip
Z4	0.181″ x 0.144″ Microstrip
Z5	0.383″ x 1.148″ Microstrip
Z6	0.400″ x 1.380″ Microstrip
Z7	0.351″ x 0.351″ Microstrip
Z8	0.126″ x 0.087″ Microstrip
Z9	1.280″ x 0.087″ Microstrip
Z10	≈1.275″ x 0.055″ Microstrip
PCB	Taconic TLX8-0300, 0.030″, $\varepsilon_r = 2.55$

Figure 1. MRF18090A 1.80 - 1.88 GHz 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. MRF18090A 1.80 - 1.88 GHz Test Fixture Component Layout



C1, C3	1 μF Chip Capacitors (0805)	R5	10 kΩ Chip Resistor (0603)
C2	0.1 μF Chip Capacitor (0805)	R6	5 kΩ, SMD Potentiometer
C4	1 nF Chip Capacitor (0805)	T1	LP2951 Micro-8 Voltage Regulator
C5	220 μF, 50 V Electrolytic Capacitor	T2	BC847 SOT-23 NPN Transistor
C6, C7	8.2 pF, 100A Chip Capacitors	Z1	0.210″ x 0.055″ Microstrip
C8, C9, C10	22 pF, 100A Chip Capacitors	Z2	0.419″ x 0.787″ Microstrip
R1	10 Ω Chip Resistor (0805)	Z3	0.836″ x 0.512″ Microstrip
R2, R3	1 kΩ Chip Resistors (0805)	Z4	0.164″ x 0.055″ Microstrip
R4	2.2 kΩ Chip Resistor (0805)	Substrate = 0.5 mm Teflon® Glass	

Figure 3. 1.80 - 1.88 GHz Demo Board Schematic

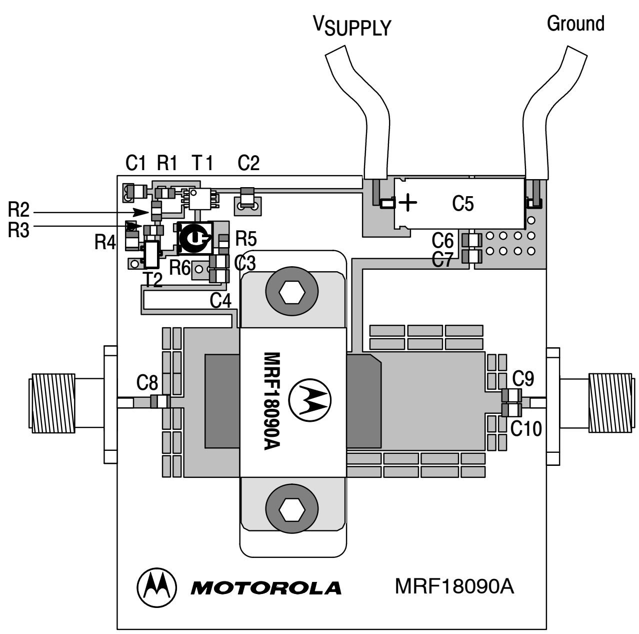


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Figure 4. 1.80 - 1.88 GHz Demo Board Component Layout

TYPICAL CHARACTERISTICS

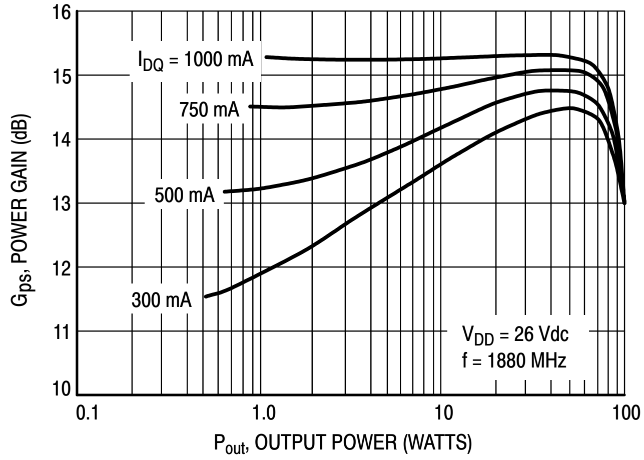


Figure 5. Power Gain versus Output Power

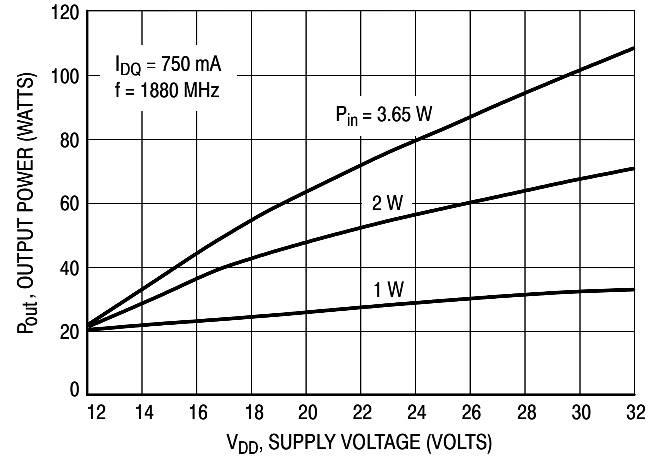


Figure 6. Output Power versus Supply Voltage

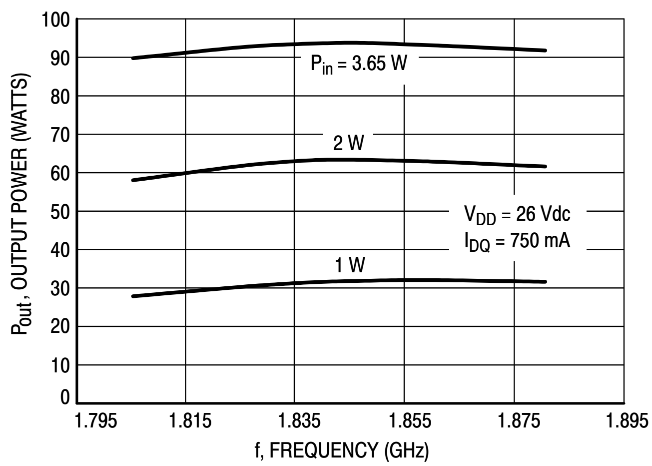


Figure 7. Output Power versus Frequency

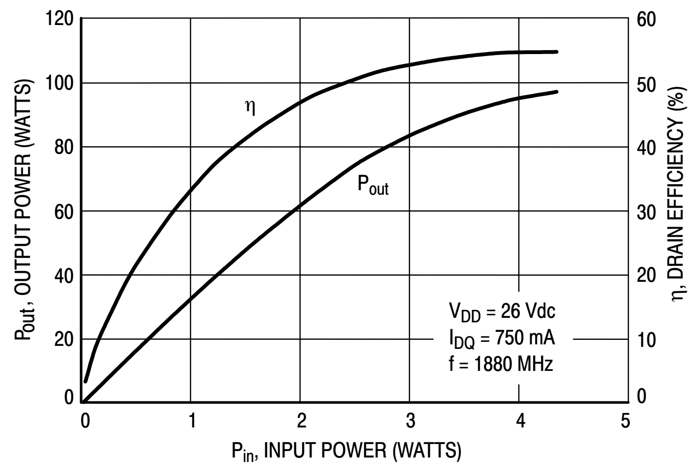


Figure 8. Output Power and Efficiency versus Input Power

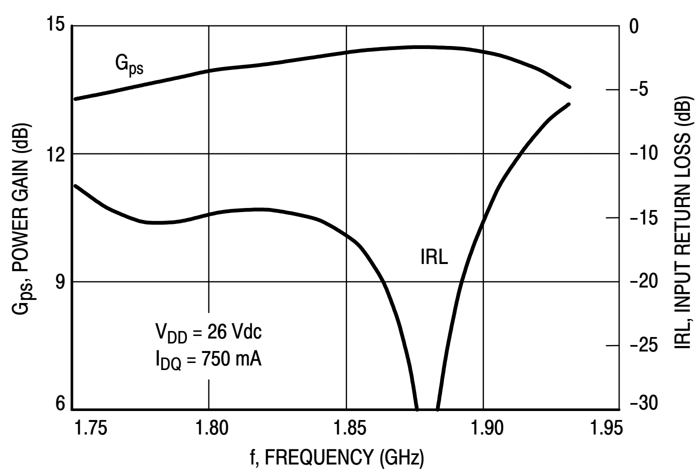
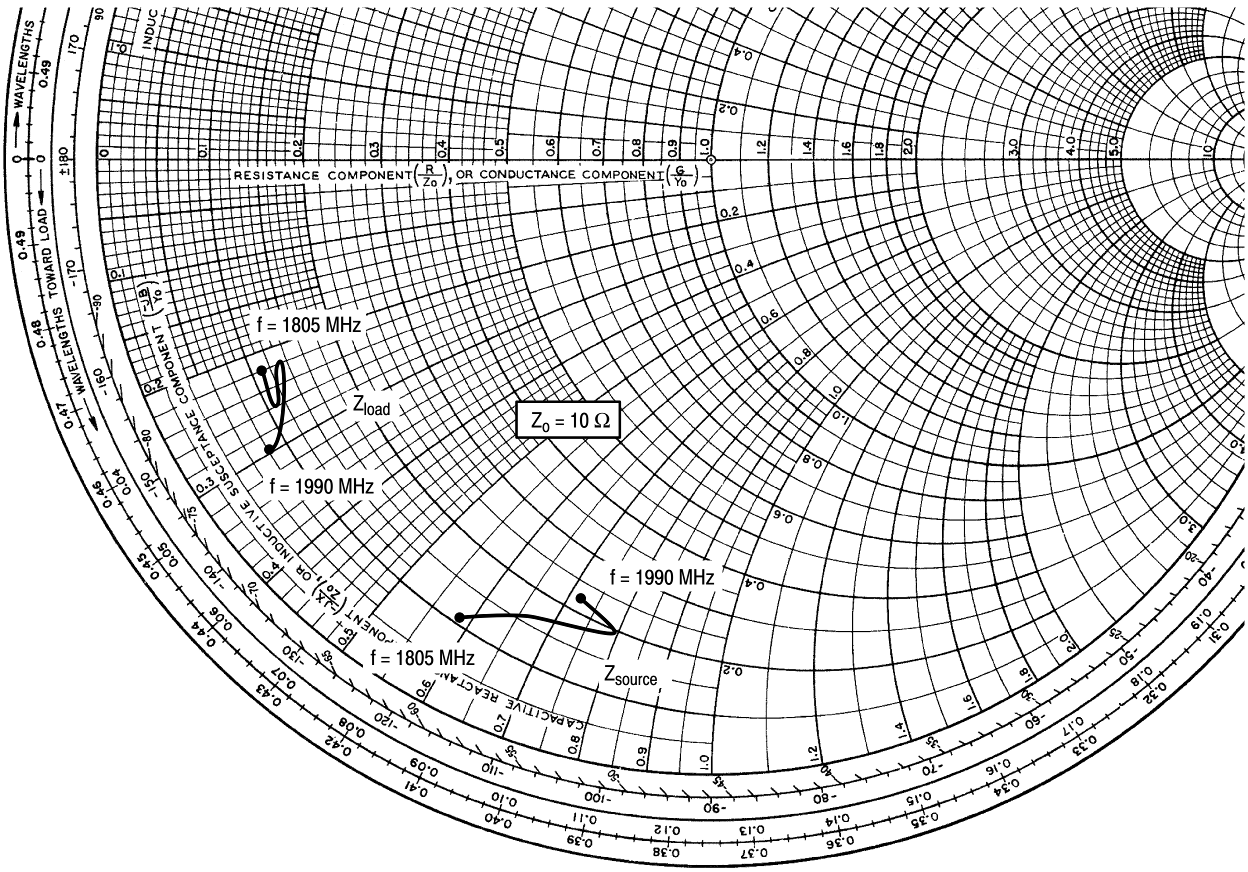


Figure 9. Wideband Gain and IRL (at Small Signal)



V_{DD} = 26 V, I_{DQ} = 750 mA, P_{out} = 90 Watts (CW)

f MHz	Z_{source} Ω	Z_{load} Ω
1805	1.10 - j5.85	1.15 - j2.16
1880	1.56 - j6.75	1.13 - j2.60
1930	2.05 - j8.00	1.30 - j2.23
1990	2.30 - j7.30	0.82 - j2.90

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

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

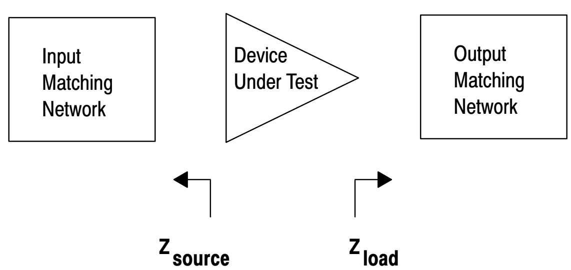
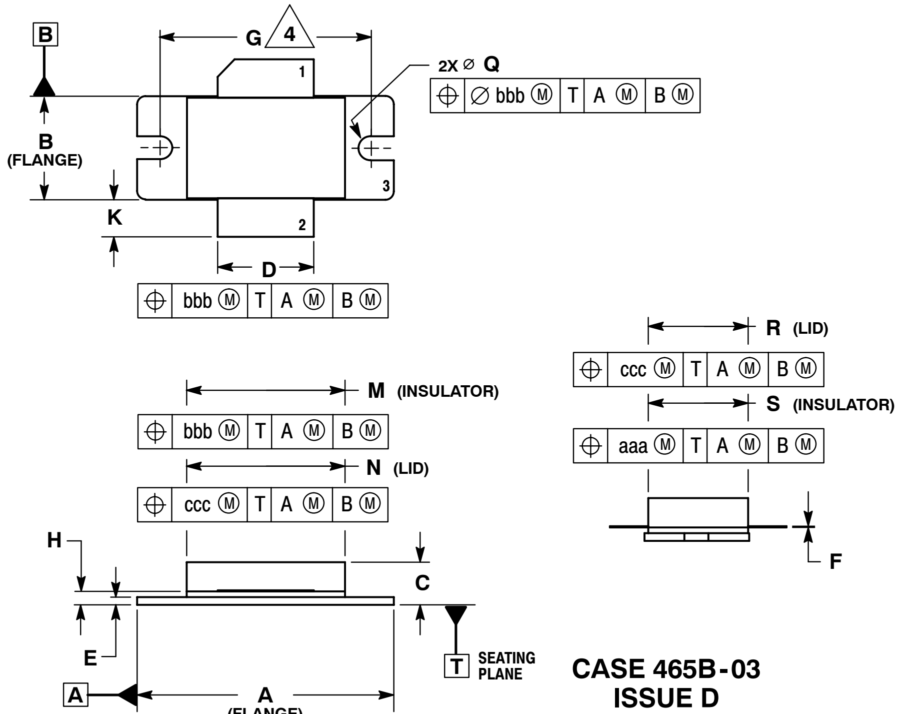


Figure 10. Large Signal Source and Load Impedance

PACKAGE DIMENSIONS



CASE 465B-03
ISSUE D
NI-880

NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M-1994.
2. CONTROLLING DIMENSION: INCH.
3. DIMENSION H IS MEASURED 0.030 (0.762) AWAY FROM PACKAGE BODY.
4. RECOMMENDED BOLT CENTER DIMENSION OF 1.16 (29.57) BASED ON M3 SCREW.

	INCHES		MILLIMETERS	
DIM	MIN	MAX	MIN	MAX
A	1.335	1.345	33.91	34.16
B	0.535	0.545	13.6	13.8
C	0.147	0.200	3.73	5.08
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	0.175	0.205	4.44	5.21
M	0.872	0.888	22.15	22.55
N	0.871	0.889	19.30	22.60
Q	⌀.118	⌀.138	⌀3.00	⌀3.51
R	0.515	0.525	13.10	13.30
S	0.515	0.525	13.10	13.30
aaa	0.007 REF		0.178 REF	
bbb	0.010 REF		0.254 REF	
ccc	0.015 REF		0.381 REF	

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

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