

The RF Sub-Micron MOSFET Line

RF Power Field Effect Transistors

N-Channel Enhancement-Mode Lateral MOSFETs

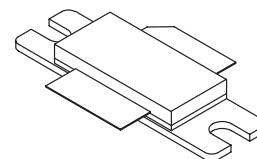
Designed for GSM 900 MHz frequency band, the high gain and broadband performance of these devices make them ideal for large-signal, common-source amplifier applications in 26 volt base station equipment.

- 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%
- Internally Matched, Controlled Q, for Ease of Use
- High Gain, High Efficiency and High Linearity
- Integrated ESD Protection
- Ease of Design for Gain and Insertion Phase Flatness
- Capable of Handling 5:1 VSWR, @ 26 Vdc, 921 MHz, 90 Watts CW Output Power
- Excellent Thermal Stability
- Characterized with Series Equivalent Large-Signal Impedance Parameters

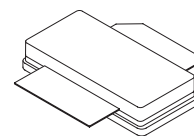
MRF9080

MRF9080S

**GSM 900 MHz FREQUENCY BAND,
75 W, 26 V
LATERAL N-CHANNEL
BROADBAND RF POWER MOSFETs**



**CASE 465-04, STYLE 1
(MRF9080)**



**CASE 465A-04, STYLE 1
(MRF9080S)**

MAXIMUM RATINGS

Rating	Symbol	Value	Unit
Drain-Source Voltage	V_{DS}	65	Vdc
Gate-Source Voltage	V_{GS}	+15, -0.5	Vdc
Total Device Dissipation @ $T_C = 25^\circ\text{C}$ Derate above 25°C	P_D	250 1.43	Watts W/ $^\circ\text{C}$
Storage Temperature Range	T_{stg}	-65 to +200	$^\circ\text{C}$
Operating Junction Temperature	T_J	200	$^\circ\text{C}$

ESD PROTECTION CHARACTERISTICS

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

THERMAL CHARACTERISTICS

Characteristic	Symbol	Max	Unit
Thermal Resistance, Junction to Case	$R_{\theta JC}$	0.7	$^\circ\text{C/W}$

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

Zero Gate Voltage Drain Leakage Current ($V_{DS} = 65\text{ Vdc}$, $V_{GS} = 0$)	I_{DSS}	—	—	10	μAdc
Zero Gate Voltage Drain Leakage Current ($V_{DS} = 26\text{ Vds}$, $V_{GS} = 0$)	I_{DSS}	—	—	1	μAdc
Gate–Source Leakage Current ($V_{GS} = 5\text{ Vdc}$, $V_{DS} = 0$)	I_{GSS}	—	—	1	μAdc

ON CHARACTERISTICS

Gate Threshold Voltage ($V_{DS} = 10\text{ Vdc}$, $I_D = 300\text{ }\mu\text{Adc}$)	$V_{GS(th)}$	2.0	—	4.0	Vdc
Gate Quiescent Voltage ($V_{DS} = 26\text{ Vdc}$, $I_D = 700\text{ mAdc}$)	$V_{GS(Q)}$	—	3.7	—	Vdc
Drain–Source On–Voltage ($V_{GS} = 10\text{ Vdc}$, $I_D = 2\text{ Adc}$)	$V_{DS(on)}$	—	0.19	0.4	Vdc
Forward Transconductance ($V_{DS} = 10\text{ Vdc}$, $I_D = 6\text{ Adc}$)	g_{fs}	—	8.0	—	S

DYNAMIC CHARACTERISTICS (1)

Output Capacitance ($V_{DS} = 26\text{ Vdc}$, $V_{GS} = 0$, $f = 1\text{ MHz}$)	C_{oss}	—	73	—	pF
Reverse Transfer Capacitance ($V_{DS} = 26\text{ Vdc}$, $V_{GS} = 0$, $f = 1\text{ MHz}$)	C_{rss}	—	2.9	—	pF

FUNCTIONAL TESTS (In Motorola Test Fixture) (2)

Power Output, 1 dB Compression Point ($V_{DD} = 26\text{ Vdc}$, $I_{DQ} = 600\text{ mA}$, $f = 921\text{ and }960\text{ MHz}$)	P_{1dB}	68	75	—	W
Common–Source Amplifier Power Gain @ 70 W (Min) ($V_{DD} = 26\text{ Vdc}$, $I_{DQ} = 600\text{ mA}$, $f = 921\text{ and }960\text{ MHz}$)	G_{ps}	17	18.5	20	dB
Drain Efficiency @ $P_{out} = 70\text{ W}$ ($V_{DD} = 26\text{ Vdc}$, $I_{DQ} = 600\text{ mA}$, $f = 921\text{ and }960\text{ MHz}$)	η_1	47	52	—	%
Drain Efficiency @ P_{1dB} ($V_{DD} = 26\text{ Vdc}$, $I_{DQ} = 600\text{ mA}$, $f = 921\text{ and }960\text{ MHz}$)	η_2	—	55	—	%
Input Return Loss ($V_{DD} = 26\text{ Vdc}$, $P_{out} = 70\text{ W}$, $I_{DQ} = 600\text{ mA}$, $f = 921\text{ and }960\text{ MHz}$)	IRL	9.5	12.5	—	dB
Output Mismatch Stress ($V_{DD} = 26\text{ Vdc}$, $P_{out} = 90\text{ W CW}$, $I_{DQ} = 600\text{ mA}$, $f = 921\text{ MHz}$, $VSWR = 5:1$, All Phase Angles at Frequency of Tests)	Ψ	No Degradation In Output Power Before and After Test			

(1) Part is internally input matched.

(2) To meet application requirements, Motorola test fixtures are designed to cover full GSM 900 band ensuring batch to batch consistency

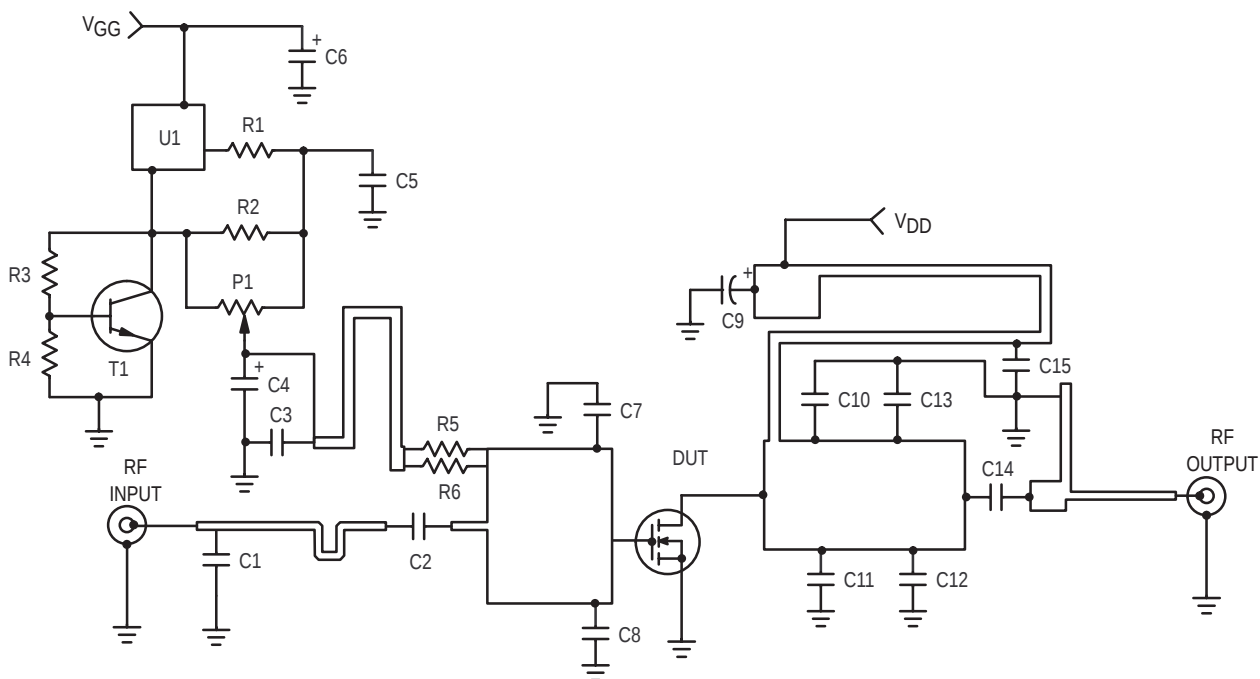


Figure 1. Broadband GSM 900 Optimized Demo Board Schematic

Table 1. Broadband GSM 900 Optimized Demo Board Component Designations and Values

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

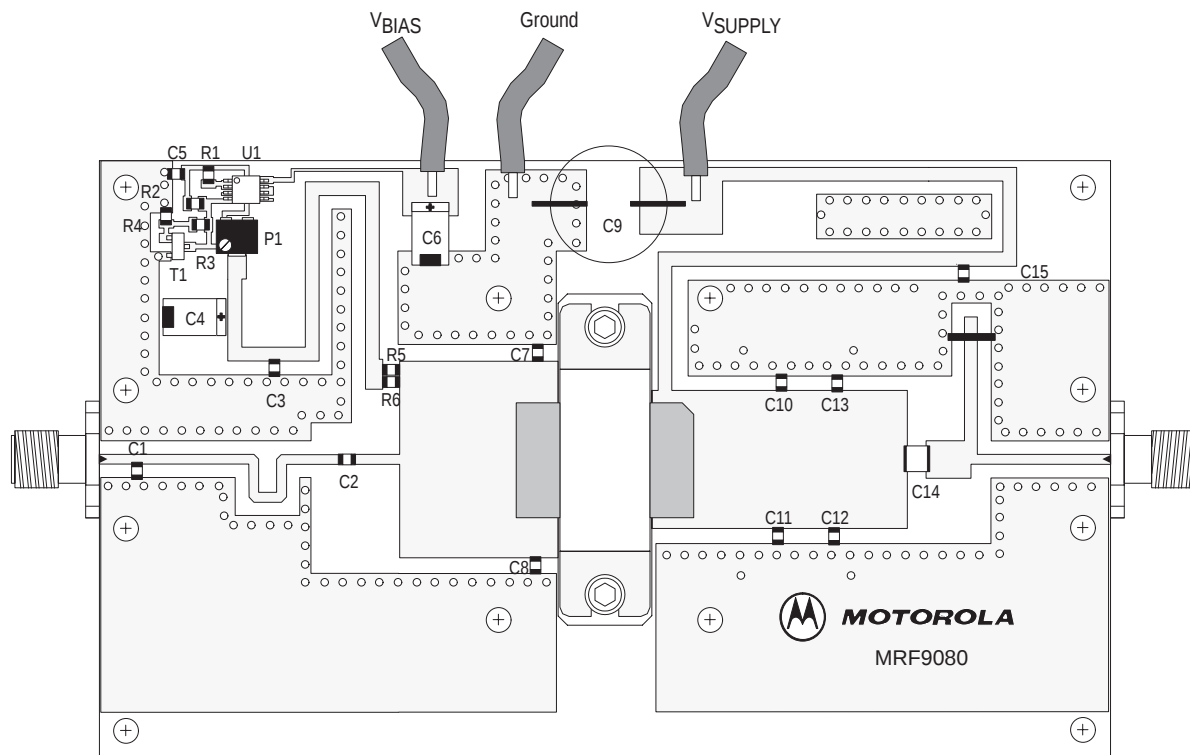


Figure 2. Broadband GSM 900 Optimized Demo Board Component Layout

TYPICAL CHARACTERISTICS **(IN MOTOROLA BROADBAND GSM 900 OPTIMIZED DEMO BOARD)**

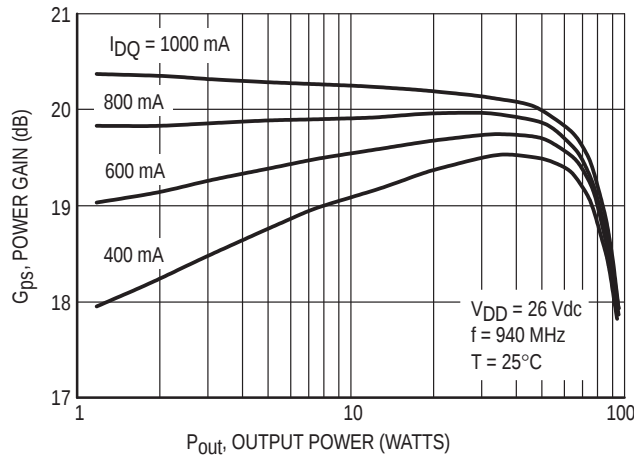


Figure 3. Power Gain versus Output Power

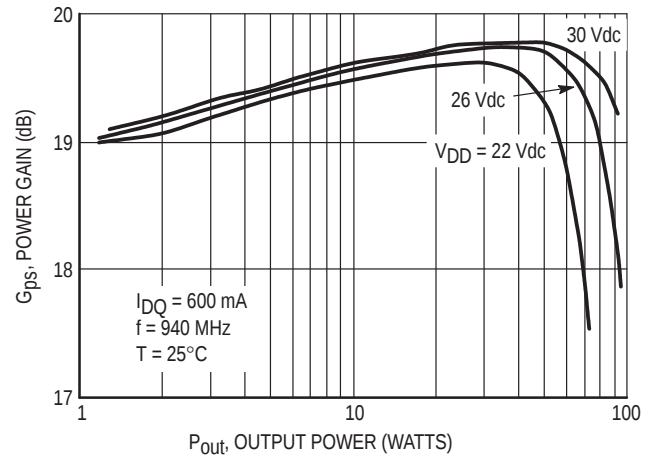


Figure 4. Power Gain versus Output Power

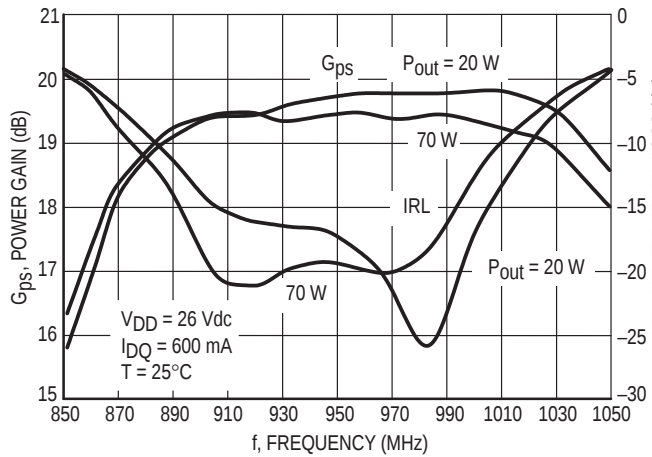


Figure 5. Power Gain and Input Return Loss versus Frequency

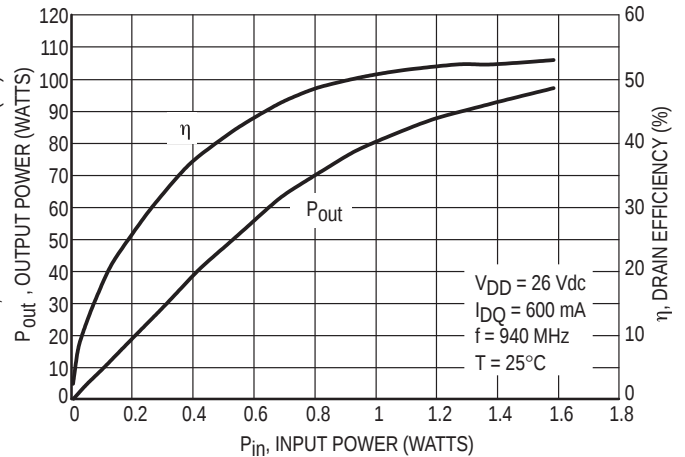


Figure 6. Output Power and Efficiency versus Input Power

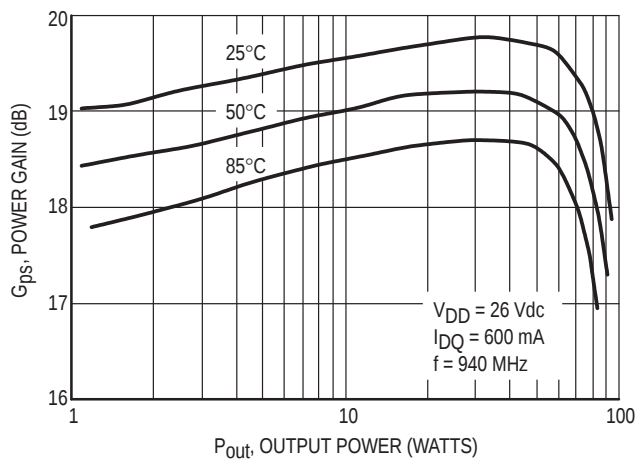


Figure 7. Power Gain versus Output Power

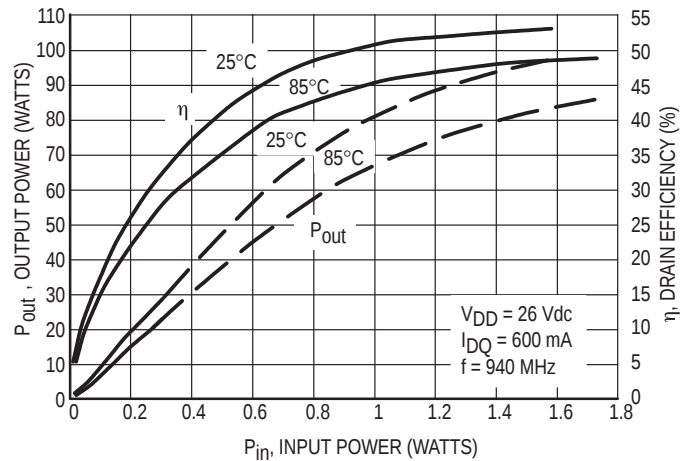
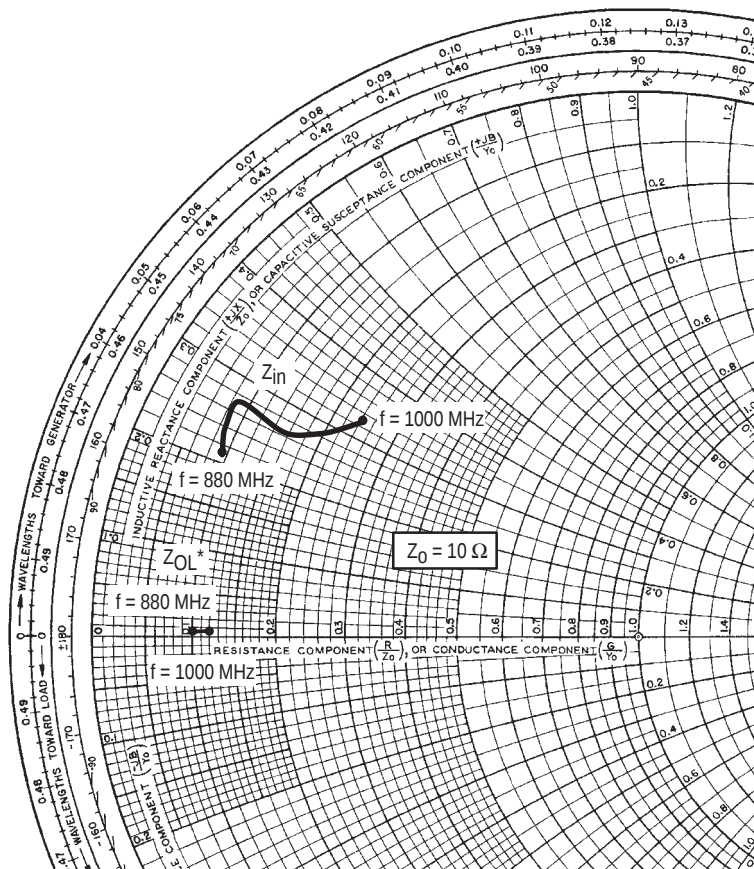


Figure 8. Output Power and Efficiency versus Input Power



$V_{DD} = 26 \text{ V}$, $I_{DQ} = 600 \text{ mA}$, $P_{out} = 90 \text{ W (CW)}$

f MHz	Z_{in} Ω	Z_{OL}^* 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_{in} = Complex conjugate of source impedance.

Z_{OL}^* = Complex conjugate of the optimum load impedance at a given output power, voltage, bias current and frequency.

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

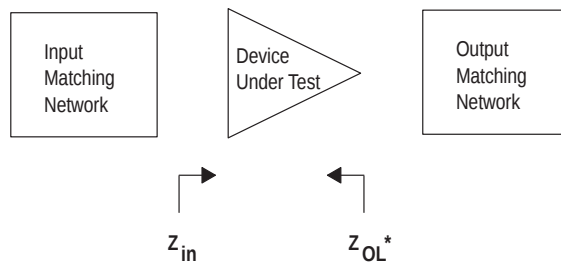
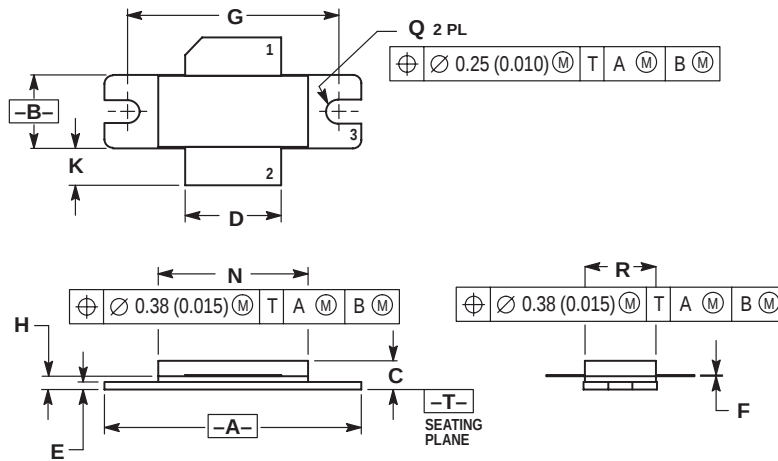


Figure 9. Series Equivalent Input and Output Impedance

PACKAGE DIMENSIONS



NOTES:

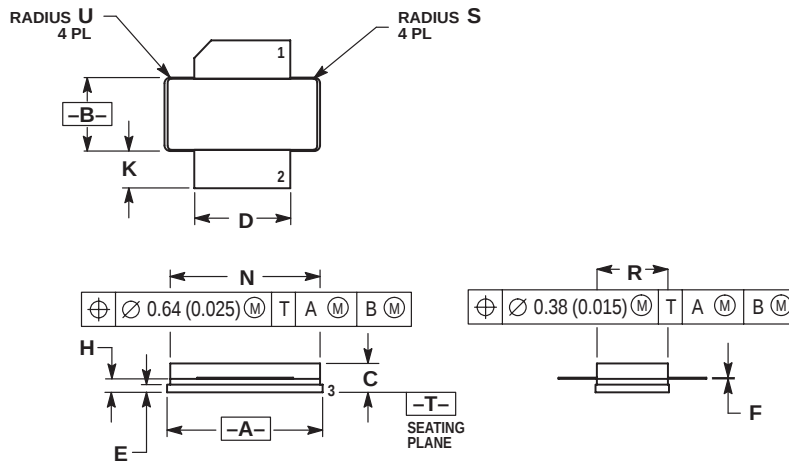
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.
3. DIMENSION H IS MEASURED 0.030" AWAY FROM FLANGE.

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	0.055	0.065	1.40	1.65
K	0.170	0.210	4.32	5.33
N	0.772	0.788	19.60	20.00
Q	0.118	0.138	3.00	3.51
R	0.365	0.375	9.27	9.53

STYLE 1:

- PIN 1. DRAIN
- GATE
- SOURCE

**CASE 465-04
ISSUE D
(MRF9080)**



NOTES:

1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: INCH.
3. DIMENSION H IS MEASURED 0.030" AWAY FROM FLANGE.

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	0.055	0.065	1.40	1.65
K	0.170	0.210	4.32	5.33
N	0.775	0.785	19.69	19.94
R	0.365	0.375	9.27	9.53
S	0.020	REF	0.51	REF
U	0.030	REF	0.76	REF

STYLE 1:

- PIN 1. DRAIN
- GATE
- SOURCE

**CASE 465A-04
ISSUE D
(MRF9080S)**

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USA/EUROPE/Locations Not Listed: Motorola Literature Distribution; P.O. Box 5405, Denver, Colorado 80217. 1-303-675-2140 or 1-800-441-2447

JAPAN: Motorola Japan Ltd.; SPS, Technical Information Center, 3-20-1, Minami-Azabu. Minato-ku, Tokyo 106-8573 Japan. 81-3-3440-3569

ASIA/PACIFIC: Motorola Semiconductors H.K. Ltd.; Silicon Harbour Centre, 2 Dai King Street, Tai Po Industrial Estate, Tai Po, N.T., Hong Kong. 852-26668334

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