

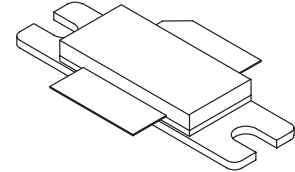
The RF MOSFET Line  
**RF Power Field Effect Transistors**  
N-Channel Enhancement-Mode Lateral MOSFETs

Designed for broadband commercial and industrial applications with frequencies up to 1.0 GHz. 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.

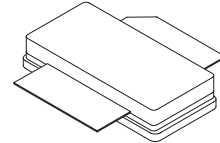
- Guaranteed Performance @ 880 MHz, 26 Volts  
Output Power — 85 Watts PEP  
Power Gain — 12 dB  
Efficiency — 30%  
Intermodulation Distortion — -28 dBc
- 100% Tested for Load Mismatch Stress at all Phase Angles with 5:1 VSWR @ 26 Vdc, 880 MHz, 85 Watts CW
- Excellent Thermal Stability
- Characterized with Series Equivalent Large-Signal Impedance Parameters
- Available in Tape and Reel. R3 Suffix = 250 Units per 56 mm, 13 Inch Reel.

**MRF187**  
**MRF187R3**  
**MRF187SR3**

**1.0 GHz, 85 W, 26 V**  
**LATERAL N-CHANNEL**  
**BROADBAND**  
**RF POWER MOSFETs**



**CASE 465-06, STYLE 1**  
**NI-780**  
**MRF187**



**CASE 465A-06, STYLE 1**  
**NI-780S**  
**MRF187SR3**

**MAXIMUM RATINGS**

Rating	Symbol	Value	Unit
Drain-Source Voltage	$V_{DSS}$	65	Vdc
Drain-Gate Voltage ( $R_{GS} = 1 \text{ M}\Omega$ )	$V_{DGR}$	65	Vdc
Gate-Source Voltage	$V_{GS}$	$\pm 20$	Vdc
Drain Current — Continuous	$I_D$	15	Adc
Total Device Dissipation @ $T_C \geq 25^\circ\text{C}$ Derate above $25^\circ\text{C}$	$P_D$	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	$^\circ\text{C}$

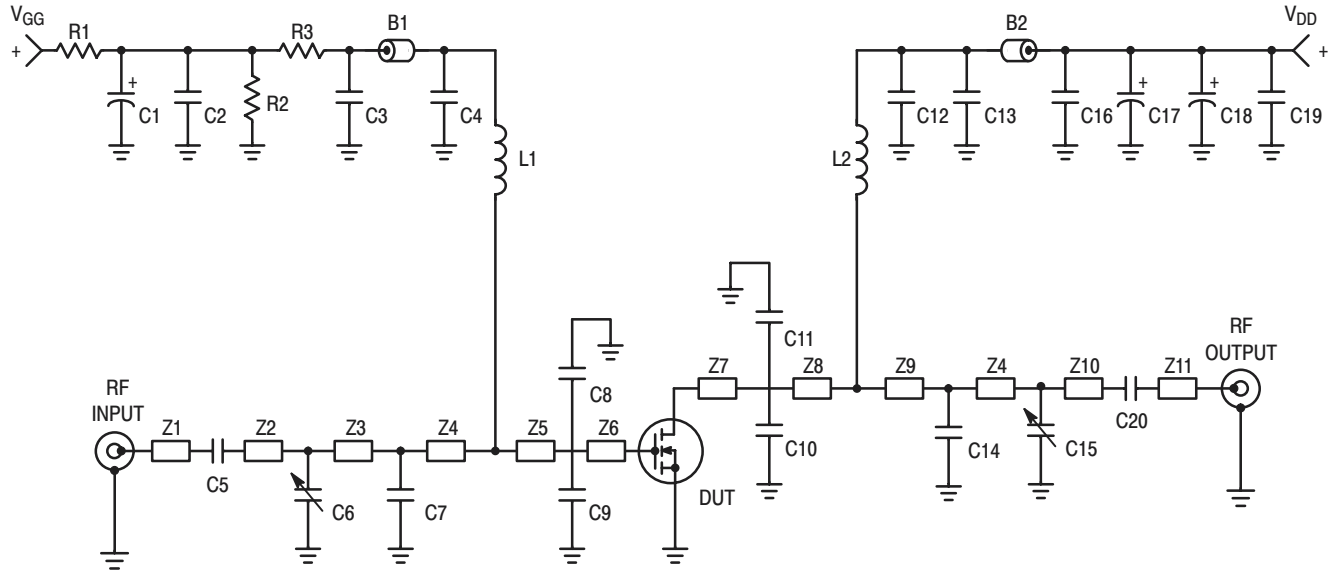
**THERMAL CHARACTERISTICS**

Characteristic	Symbol	Max	Unit
Thermal Resistance, Junction to Case	$R_{\theta JC}$	0.70	$^\circ\text{C/W}$

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
<b>OFF CHARACTERISTICS</b>					
Drain–Source Breakdown Voltage ( $V_{GS} = 0\text{ Vdc}$ , $I_D = 50\ \mu\text{Adc}$ )	$V_{(BR)DSS}$	65	—	—	Vdc
Zero Gate Voltage Drain Leakage Current ( $V_{DS} = 26\text{ Vdc}$ , $V_{GS} = 0\text{ Vdc}$ )	$I_{DSS}$	—	—	1	$\mu\text{Adc}$
Gate–Source Leakage Current ( $V_{GS} = 20\text{ Vdc}$ , $V_{DS} = 0\text{ Vdc}$ )	$I_{GSS}$	—	—	1	$\mu\text{Adc}$
<b>ON CHARACTERISTICS</b>					
Gate Quiescent Voltage ( $V_{DS} = 26\text{ Vdc}$ , $I_D = 550\text{ mAdc}$ )	$V_{GS(Q)}$	3	—	5	Vdc
Drain–Source On–Voltage ( $V_{GS} = 10\text{ Vdc}$ , $I_D = 3\text{ Adc}$ )	$V_{DS(on)}$	—	0.40	0.55	Vdc
Forward Transconductance ( $V_{DS} = 10\text{ Vdc}$ , $I_D = 5\text{ Adc}$ )	$g_{fs}$	—	2	—	S
<b>DYNAMIC CHARACTERISTICS</b>					
Input Capacitance (Includes Internal Input MOSCap) ( $V_{DS} = 26\text{ Vdc}$ , $V_{GS} = 0$ , $f = 1\text{ MHz}$ )	$C_{iss}$	—	295	—	pF
Output Capacitance ( $V_{DS} = 26\text{ Vdc}$ , $V_{GS} = 0$ , $f = 1\text{ MHz}$ )	$C_{oss}$	—	85	—	pF
Reverse Transfer Capacitance ( $V_{DS} = 26\text{ Vdc}$ , $V_{GS} = 0$ , $f = 1\text{ MHz}$ )	$C_{rss}$	—	10	—	pF
<b>FUNCTIONAL TESTS</b> (In Motorola Test Fixture, 50 ohm system)					
Two–Tone Common–Source Amplifier Power Gain ( $V_{DD} = 26\text{ Vdc}$ , $P_{out} = 85\text{ W PEP}$ , $I_{DQ} = 550\text{ mA}$ , $f_1 = 880.0\text{ MHz}$ , $f_2 = 880.1\text{ MHz}$ )	$G_{ps}$	12	13	—	dB
Two–Tone Drain Efficiency ( $V_{DD} = 26\text{ Vdc}$ , $P_{out} = 85\text{ W PEP}$ , $I_{DQ} = 550\text{ mA}$ , $f_1 = 880.0\text{ MHz}$ , $f_2 = 880.1\text{ MHz}$ )	$\eta_D$	30	33	—	%
3rd Order Intermodulation Distortion ( $V_{DD} = 26\text{ Vdc}$ , $P_{out} = 85\text{ W PEP}$ , $I_{DQ} = 550\text{ mA}$ , $f_1 = 880.0\text{ MHz}$ , $f_2 = 880.1\text{ MHz}$ )	IMD	—	–31	–28	dBc
Input Return Loss ( $V_{DD} = 26\text{ Vdc}$ , $P_{out} = 85\text{ W PEP}$ , $I_{DQ} = 550\text{ mA}$ , $f_1 = 880.0\text{ MHz}$ , $f_2 = 880.1\text{ MHz}$ )	IRL	9	15	—	dB
Two–Tone Common–Source Amplifier Power Gain ( $V_{DD} = 26\text{ Vdc}$ , $P_{out} = 85\text{ W PEP}$ , $I_{DQ} = 550\text{ mA}$ , $f_1 = 865.0\text{ MHz}$ , $f_2 = 865.1\text{ MHz}$ and $f_1 = 895.0\text{ MHz}$ , $f_2 = 895.1\text{ MHz}$ )	$G_{ps}$	—	13	—	dB
Two–Tone Drain Efficiency ( $V_{DD} = 26\text{ Vdc}$ , $P_{out} = 85\text{ W PEP}$ , $I_{DQ} = 550\text{ mA}$ , $f_1 = 865.0\text{ MHz}$ , $f_2 = 865.1\text{ MHz}$ and $f_1 = 895.0\text{ MHz}$ , $f_2 = 895.1\text{ MHz}$ )	$\eta_D$	—	33	—	%
3rd Order Intermodulation Distortion ( $V_{DD} = 26\text{ Vdc}$ , $P_{out} = 85\text{ W PEP}$ , $I_{DQ} = 550\text{ mA}$ , $f_1 = 865.0\text{ MHz}$ , $f_2 = 865.1\text{ MHz}$ and $f_1 = 895.0\text{ MHz}$ , $f_2 = 895.1\text{ MHz}$ )	IMD	—	–31	—	dBc
Input Return Loss ( $V_{DD} = 26\text{ Vdc}$ , $P_{out} = 85\text{ W PEP}$ , $I_{DQ} = 550\text{ mA}$ , $f_1 = 865.0\text{ MHz}$ , $f_2 = 865.1\text{ MHz}$ and $f_1 = 895.0\text{ MHz}$ , $f_2 = 895.1\text{ MHz}$ )	IRL	—	12	—	dB
Output Mismatch Stress ( $V_{DD} = 26\text{ Vdc}$ , $P_{out} = 85\text{ W CW}$ , $I_{DQ} = 550\text{ mA}$ , $f = 880\text{ MHz}$ , $V_{SWR} = 5:1$ , All Phase Angles at Frequency of Tests)	$\Psi$	No Degradation In Output Power Before and After Test			



B1 – B2	Ferrite Bead, Fair Rite, 2743019447	L1, L2	5 Turns, #24 AWG, 0.059" OD
C1	10 $\mu$ F, 50 V, Electrolytic Capacitor, ECEV1HV100R Panasonic	R1	12 $\Omega$ , 1/4 Watt Carbon
C2, C16	0.10 $\mu$ F, B Case Chip Capacitors, CDR33BX104AKWS, Kemet	R2	4.7 M $\Omega$ , 1/4 Watt Carbon
C3	20000 pF, B Case Chip Capacitor, 200B203MCA50X, ATC	R3	16 k $\Omega$ , 1/4 Watt Carbon
C4, C13	100 pF, B Case Chip Capacitors, 100B101JCA500X, ATC	Z1, Z11	0.150" x 0.220" Microstrip
C5, C20	47 pF, B Case Chip Capacitors, 100B470JCA500X, ATC	Z2, Z10	0.410" x 0.220" Microstrip
C6, C15	0.8 – 8.0 pF, Variable Capacitors, Johanson Gigatrim	Z3	0.160" x 0.630" Microstrip
C7	4.7 pF, B Case Chip Capacitor, 100B4R7JCA500X, ATC	Z4	0.160" x 0.630" Microstrip
C8, C9	10 pF, B Case Chip Capacitors, 100B100JCA500X, ATC	Z5	0.098" x 0.630" Microstrip
C10, C11	16 pF, B Case Chip Capacitors, 100B160JCA500X, ATC	Z6	0.098" x 0.630" Microstrip
C12	43 pF, B Case Chip Capacitor, 100B430JCA500X, ATC	Z7	0.210" x 0.220" Microstrip
C14	7.5 pF, B Case Chip Capacitor, 100B7R5JCA500X, ATC	Z8	0.050" x 0.220" Microstrip
C17, C18, C19	10 $\mu$ F, 35 V, Electrolytic Capacitors, SMT, Kemet		

Figure 1. MRF187 Schematic

## TYPICAL CHARACTERISTICS

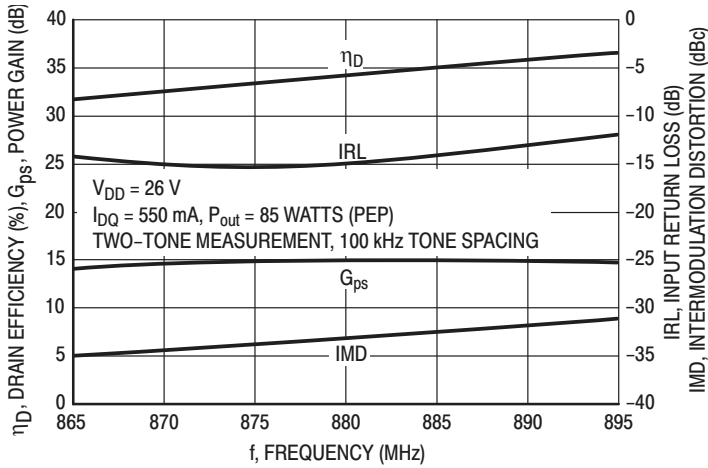


Figure 2. Class AB Broadband Circuit Performance

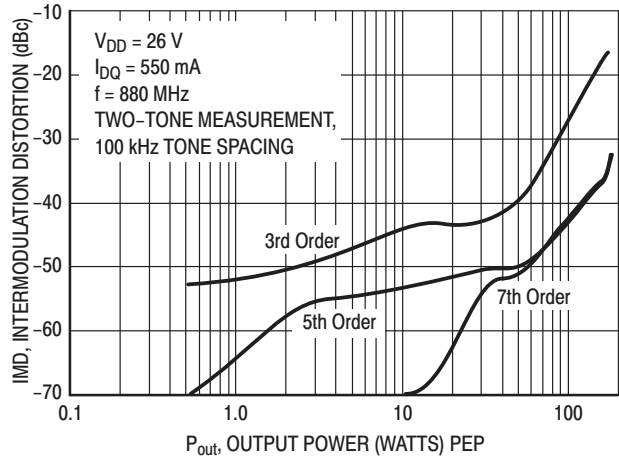


Figure 3. Intermodulation Distortion Products versus Output Power

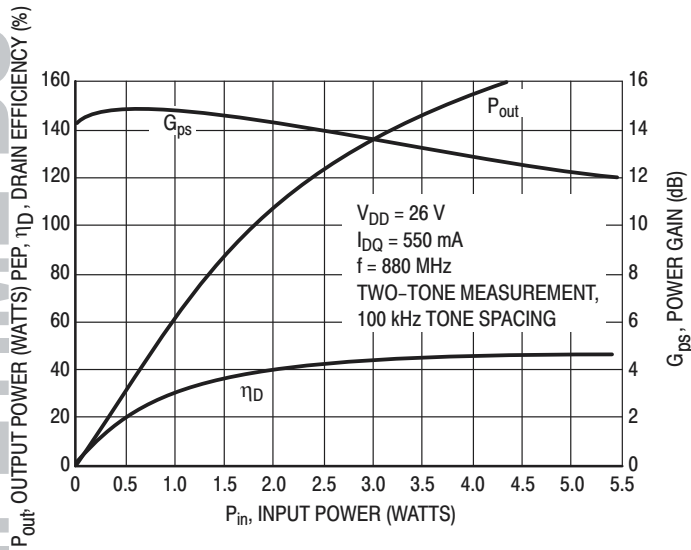


Figure 4. Class AB Parameters versus Input Power

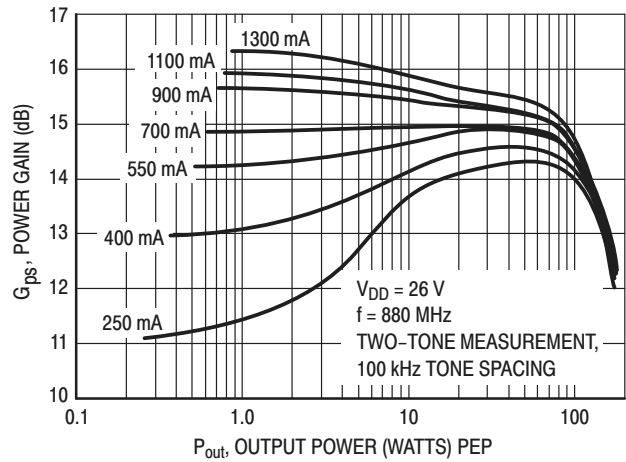


Figure 5. Power Gain versus Output Power

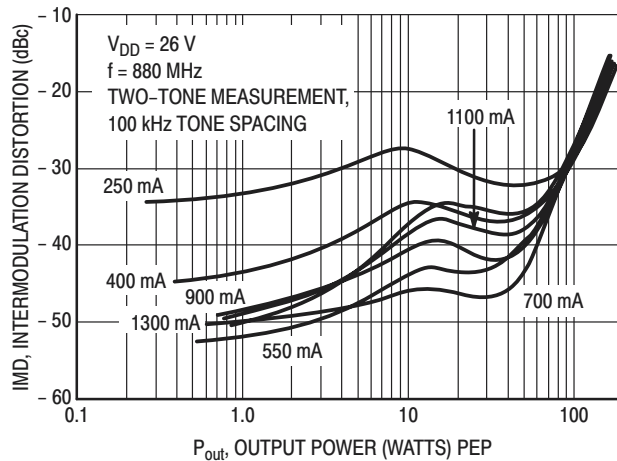
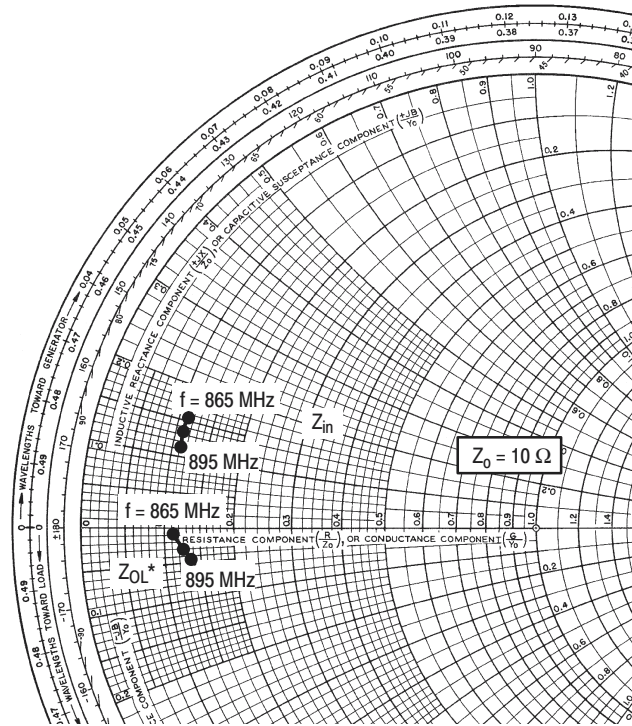


Figure 6. Intermodulation Distortion versus Output Power

LIFETIME BUY

LAST SHIP 31JAN05  
LAST ORDER 31JUL04



$V_{CC} = 26\text{ V}$ ,  $I_{DQ} = 550\text{ mA}$ ,  $P_{out} = 85\text{ W PEP}$

f MHz	$Z_{in}$ $\Omega$	$Z_{OL}^*$ $\Omega$
865	$1.04 + j1.51$	$1.13 - j0.091$
880	$1.03 + j1.39$	$1.20 - j0.176$
895	$1.03 + j1.29$	$1.28 - j0.242$

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

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

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

Figure 7. Series Equivalent Input and Output Impedance

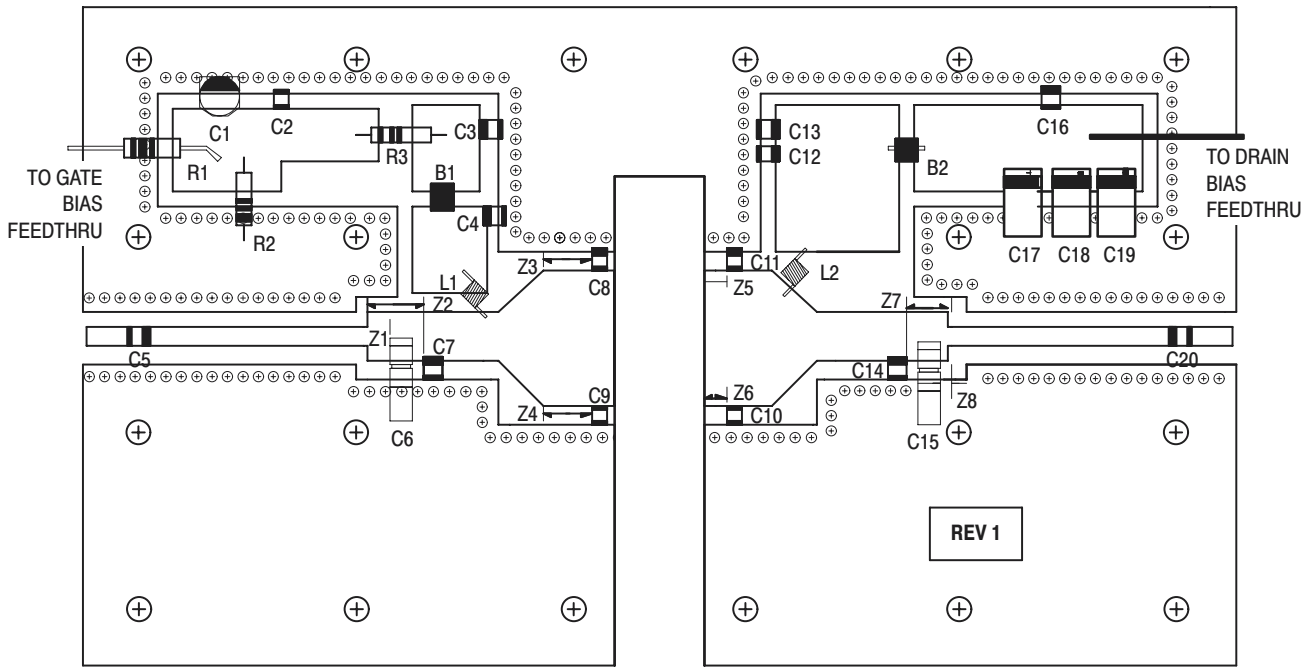
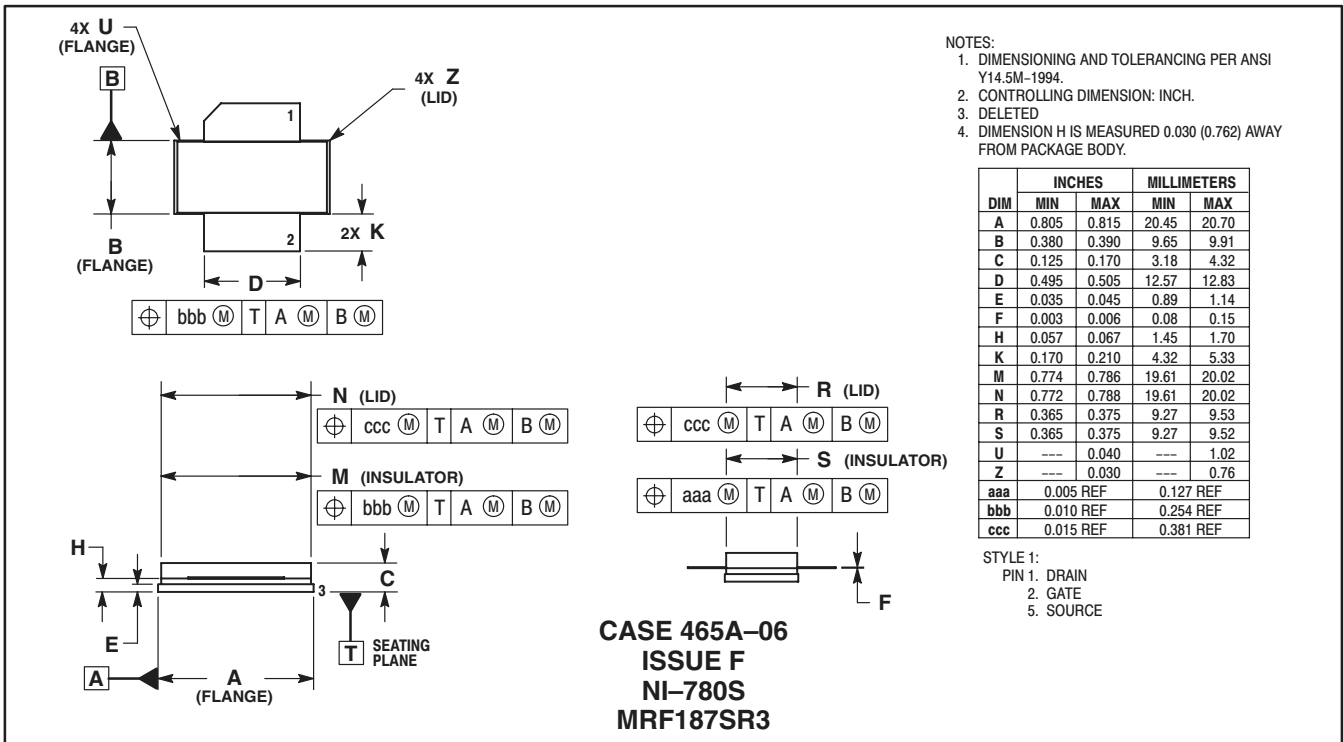
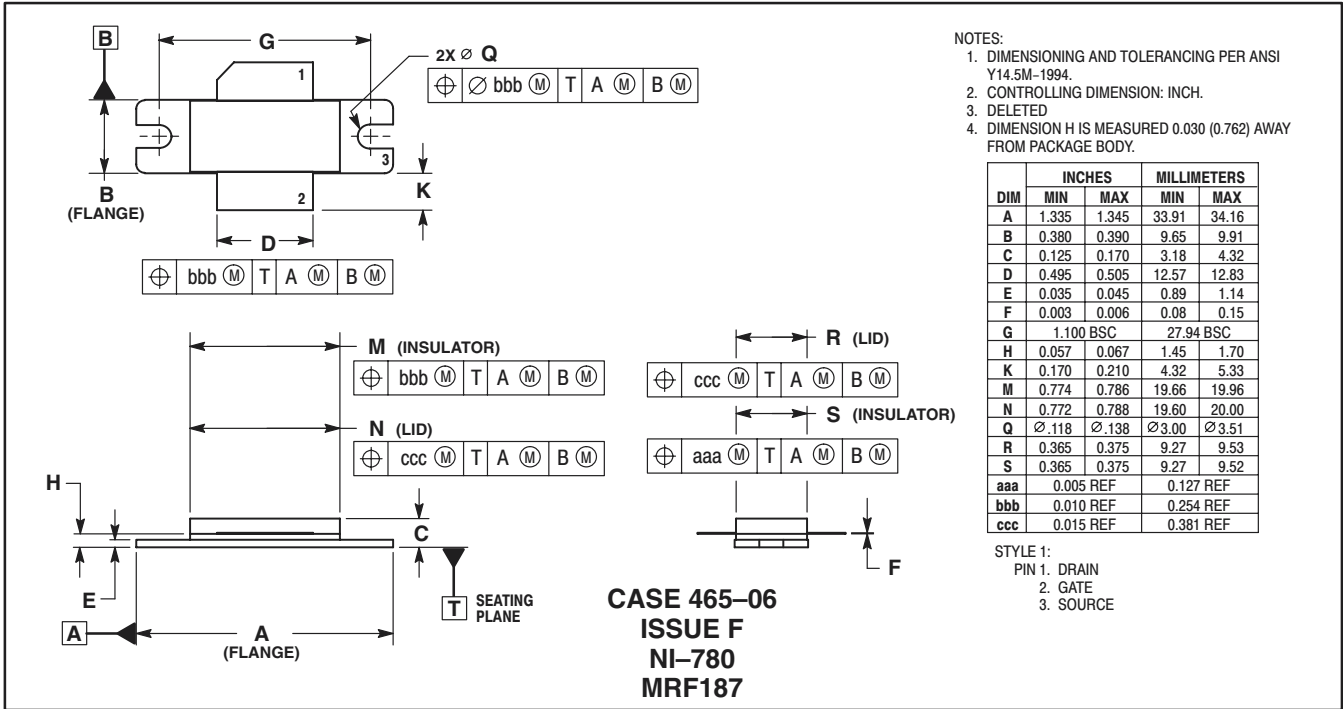


Figure 8. MRF187 Populated PC Board Layout Diagram

## PACKAGE DIMENSIONS



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