

MRF5S19100LR3 and MRF5S19100LSR3 replaced by MRF5S19100HR3 and MRF5S19100HSR3. "H" suffix indicates lower thermal resistance package.

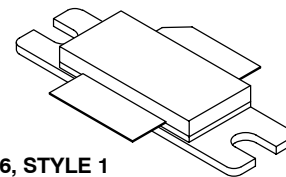
The RF MOSFET Line
RF Power Field Effect Transistors
N-Channel Enhancement-Mode Lateral MOSFETs

Designed for PCN and PCS base station applications with frequencies up to 1.9 to 2.0 GHz. Suitable for TDMA, CDMA and multicarrier amplifier applications.

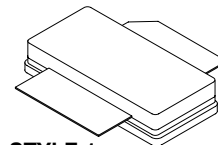
- Typical 2-Carrier N-CDMA Performance for $V_{DD} = 28$ Volts,
 $I_{DQ} = 1000$ mA, $f_1 = 1958.75$ MHz, $f_2 = 1961.25$ MHz
 IS-95 CDMA (Pilot, Sync, Paging, Traffic Codes 8 Through 13)
 1.2288 MHz Channel Bandwidth Carrier. Adjacent Channels Measured over a 30 kHz Bandwidth at $f_1 - 885$ kHz and $f_2 + 885$ kHz. Distortion Products Measured over 1.2288 MHz Bandwidth at $f_1 - 2.5$ MHz and $f_2 + 2.5$ MHz. Peak/Avg. = 9.8 dB @ 0.01% Probability on CCDF.
 Output Power — 22 Watts Avg.
 Power Gain — 13.9 dB
 Efficiency — 25.5%
 ACPR — -50.7 dB
 IM3 — -36.5 dBc
- 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, @ 28 Vdc, 1960 MHz, 100 Watts CW Output Power
- Excellent Thermal Stability
- Characterized with Series Equivalent Large-Signal Impedance Parameters
- Qualified Up to a Maximum of 32 V_{DD} Operation
- In Tape and Reel. R3 Suffix = 250 Units per 56 mm, 13 Inch Reel.
- Low Gold Plating Thickness on Leads. L Suffix Indicates 40 μ " Nominal.

MRF5S19100LR3
MRF5S19100LSR3

1990 MHz, 22 W AVG, 2 x N-CDMA
28 V LATERAL N-CHANNEL
RF POWER MOSFETs



CASE 465-06, STYLE 1
NI-780
MRF5S19100LR3



CASE 465A-06, STYLE 1
NI-780S
MRF5S19100LSR3

MAXIMUM RATINGS

Rating	Symbol	Value	Unit
Drain-Source Voltage	V_{DSS}	65	Vdc
Gate-Source Voltage	V_{GS}	-0.5, +15	Vdc
Total Device Dissipation @ $T_C = 25^\circ\text{C}$ Derate above 25 $^\circ\text{C}$	P_D	236 1.35	Watts W/ $^\circ\text{C}$
Storage Temperature Range	T_{stg}	- 65 to +150	$^\circ\text{C}$
Operating Junction Temperature	T_J	200	$^\circ\text{C}$

THERMAL CHARACTERISTICS

Characteristic	Symbol	Max	Unit
Thermal Resistance, Junction to Case Case Temperature 75 $^\circ\text{C}$, 100 W CW Case Temperature 70 $^\circ\text{C}$, 22 W CW	$R_{\theta JC}$	0.74 0.76	$^\circ\text{C}/\text{W}$

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

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ESD PROTECTION CHARACTERISTICS

Test Conditions	Class
Human Body Model	2 (Minimum)
Machine Model	M3 (Minimum)
Charge Device Model	C7 (Minimum)

ELECTRICAL CHARACTERISTICS (T_C = 25°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 Vdc, V _{GS} = 0 Vdc)	I _{DSS}	—	—	10	μA _{dc}
Zero Gate Voltage Drain Leakage Current (V _{DS} = 28 Vdc, V _{GS} = 0 Vdc)	I _{DSS}	—	—	1	μA _{dc}
Gate-Source Leakage Current (V _{GS} = 5 Vdc, V _{DS} = 0 Vdc)	I _{GSS}	—	—	1	μA _{dc}

ON CHARACTERISTICS (DC)

Gate Threshold Voltage (V _{DS} = 10 Vdc, I _D = 240 μA _{dc})	V _{GS(th)}	—	2.7	—	Vdc
Gate Quiescent Voltage (V _{DS} = 28 Vdc, I _D = 1000 mA _{dc})	V _{GS(Q)}	—	3.7	—	Vdc
Drain-Source On-Voltage (V _{GS} = 10 Vdc, I _D = 2.4 A _{dc})	V _{DS(on)}	—	0.26	—	Vdc
Forward Transconductance (V _{DS} = 10 Vdc, I _D = 2.4 A _{dc})	g _{fs}	—	6.3	—	S

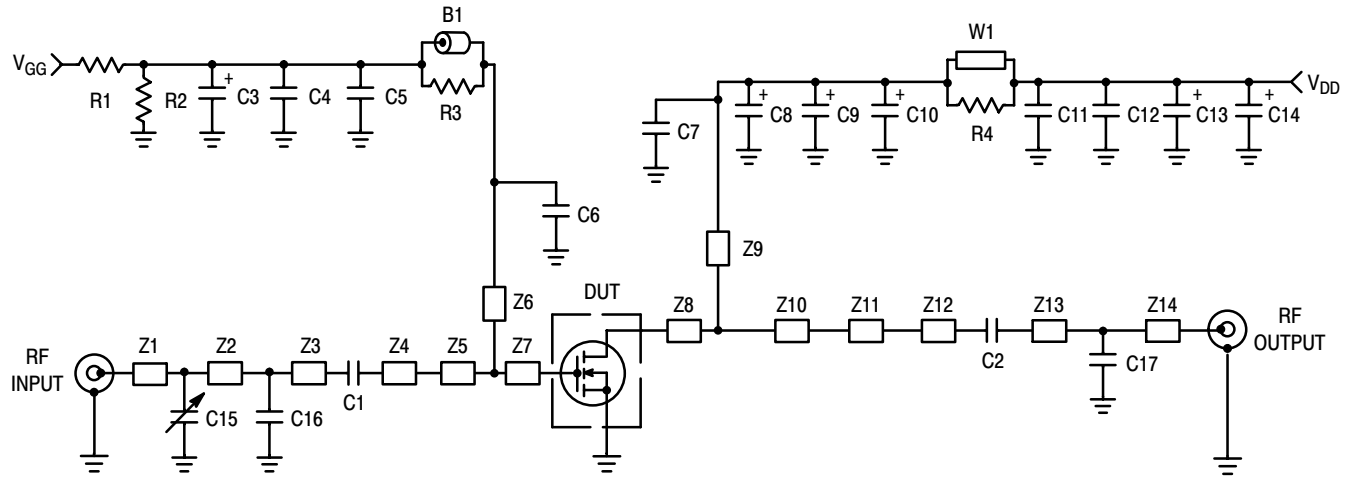
DYNAMIC CHARACTERISTICS

Reverse Transfer Capacitance (1) (V _{DS} = 28 Vdc, V _{GS} = 0, f = 1.0 MHz)	C _{r_{ss}}	—	2.2	—	pF
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FUNCTIONAL TESTS (In Motorola Test Fixture, 50 ohm system) 2-Carrier N-CDMA, 1.2288 MHz Channel Bandwidth Carriers. ACPR measured in 30 kHz Bandwidth and IM3 measured in 1.2288 MHz Bandwidth. Peak/Avg. Ratio = 9.8 dB @ 0.01% Probability on CCDF.

Power Gain (V _{DD} = 28 Vdc, P _{out} = 22 W Avg., I _{DQ} = 1000 mA, f ₁ = 1930 MHz, f ₂ = 1932.5 MHz and f ₁ = 1987.5 MHz, f ₂ = 1990 MHz)	G _{ps}	12.5	13.9	—	dB
Drain Efficiency (V _{DD} = 28 Vdc, P _{out} = 22 W Avg., I _{DQ} = 1000 mA, f ₁ = 1930 MHz, f ₂ = 1932.5 MHz and f ₁ = 1987.5 MHz, f ₂ = 1990 MHz)	η	24	25.5	—	%
Third Order Intermodulation Distortion (V _{DD} = 28 Vdc, P _{out} = 22 W Avg., I _{DQ} = 1000 mA, f ₁ = 1930 MHz, f ₂ = 1932.5 MHz and f ₁ = 1987.5 MHz, f ₂ = 1990 MHz); IM3 measured over 1.2288 MHz bandwidth @ f ₁ -2.5 MHz and f ₂ = +2.5 MHz)	IM3	—	-36.5	-35	dBc
Adjacent Channel Power Ratio (V _{DD} = 28 Vdc, P _{out} = 22 W Avg., I _{DQ} = 1000 mA, f ₁ = 1930 MHz, f ₂ = 1932.5 MHz and f ₁ = 1987.5 MHz, f ₂ = 1990 MHz); ACPR measured over 30 kHz bandwidth @ f ₁ -885 MHz and f ₂ = +885 MHz)	ACPR	—	-50.7	-48	dBc
Input Return Loss (V _{DD} = 28 Vdc, P _{out} = 22 W Avg., I _{DQ} = 1000 mA, f ₁ = 1930 MHz, f ₂ = 1932.5 MHz and f ₁ = 1987.5 MHz, f ₂ = 1990 MHz)	IRL	—	-13	-9	dB

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



Z1, Z3	0.140" x 0.080" Microstrip	Z9	0.590" x 0.071" Microstrip
Z2	0.450" x 0.080" Microstrip	Z10	0.450" x 1.133" Microstrip
Z4	0.525" x 0.080" Microstrip	Z11	0.450" x 0.141" Microstrip
Z5	0.636" x 0.141" Microstrip	Z12	0.490" x 0.080" Microstrip
Z6	0.650" x 0.050" Microstrip	Z13	0.085" x 0.080" Microstrip
Z7	0.320" x 1.299" Microstrip	Z14	1.124" x 0.080" Microstrip
Z8	0.091" x 1.133" Microstrip	PCB	Arlon GX-0300-55-22, 0.030", $\epsilon_r = 2.55$

Figure 1. MRF5S19100LR3(LSR3) Test Circuit Schematic

Table 1. MRF5S19100LR3(LSR3) Test Circuit Component Designations and Values

Part	Description	Value, P/N or DWG	Manufacturer
B1	Short RF Bead	95F786	Newark
C1	22 pF Chip Capacitor, B Case	100B220CP 500X	ATC
C2	10 pF Chip Capacitor, B Case	100B100CP 500X	ATC
C3	1 μ F, 50 V Tantalum Capacitor	T494C105(1)050AS	Kemet
C4, C12	0.1 μ F Chip Capacitors, B Case	CDR33BX104AKWS	Kemet
C5, C11	1K pF Chip Capacitors, B Case	100B102JP 500X	ATC
C6	2.7 pF Chip Capacitor, B Case	100B2R7BP 500X	ATC
C7	4.3 pF Chip Capacitor, B Case	100B4R3JP 500X	ATC
C8	10 μ F, 35 V Tantalum Capacitor	T494D106(1)035AS	Kemet
C9, C10, C13, C14	22 μ F, 35 V Tantalum Capacitors	T494X226(1)035AS	Kemet
C15	0.6 – 4.5 Gigatrim Variable Capacitor	44F3358	Newark
C16	2.2 pF Chip Capacitor, B Case	100B2R2BP 500X	ATC
C17*	0.3 pF Chip Capacitor, B Case	100B0R3BP 500X	ATC
R1	1 k Ω Chip Resistor	D5534M07B1K00R	Newark
R2	560 k Ω Chip Resistor	CR1206 564JT	Newark
R3, R4	12 Ω Chip Resistors	RM73B2B120JT	Garrett Electronics
W1	1 turn 14 gauge wire		

* Need for part will vary from fixture to fixture.

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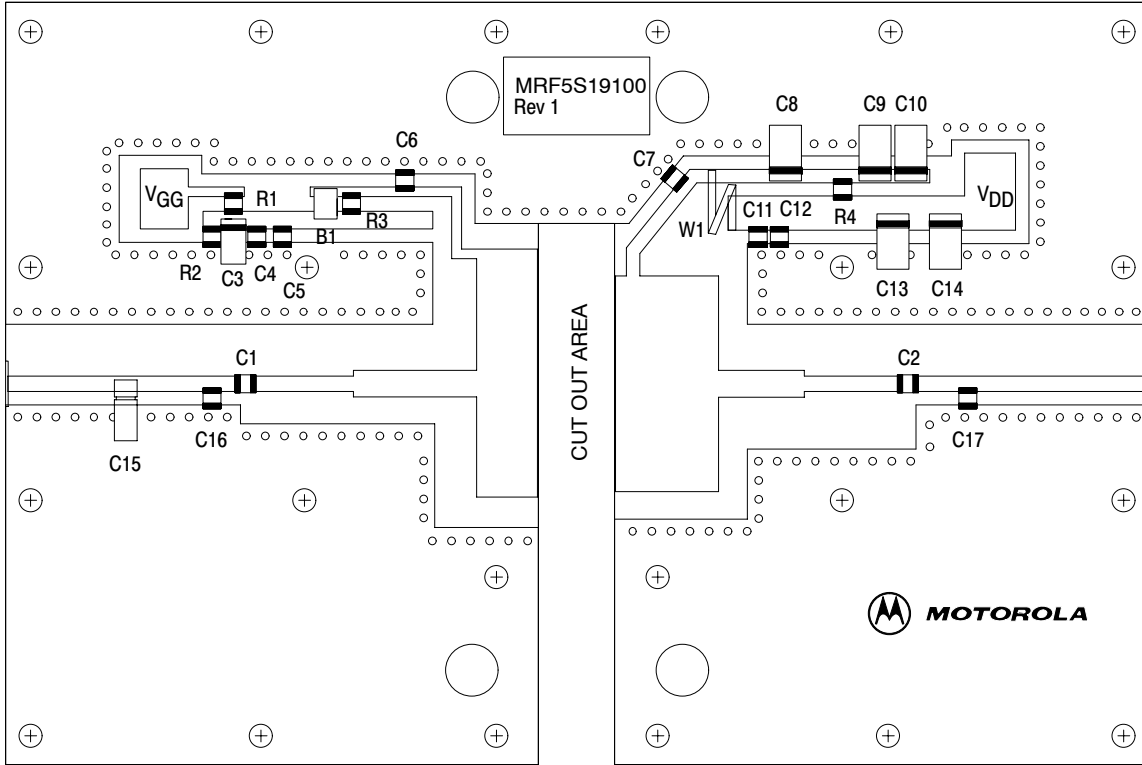


Figure 2. MRF5S19100LR3(LSR3) Test Circuit Component Layout

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TYPICAL CHARACTERISTICS

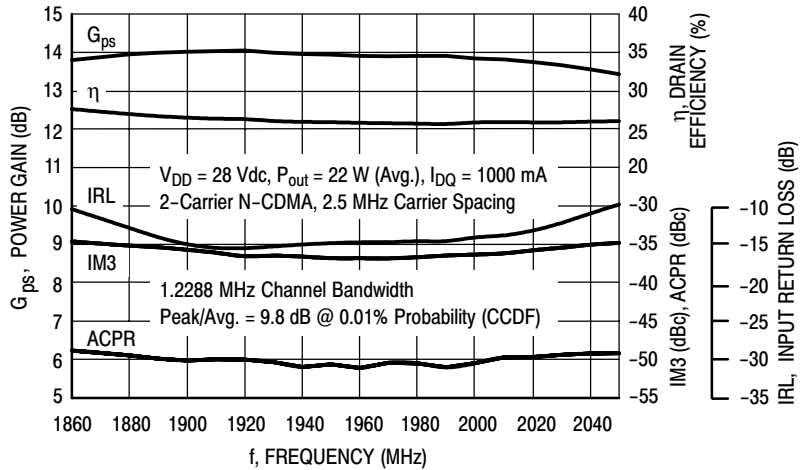


Figure 3. 2-Carrier N-CDMA Broadband Performance

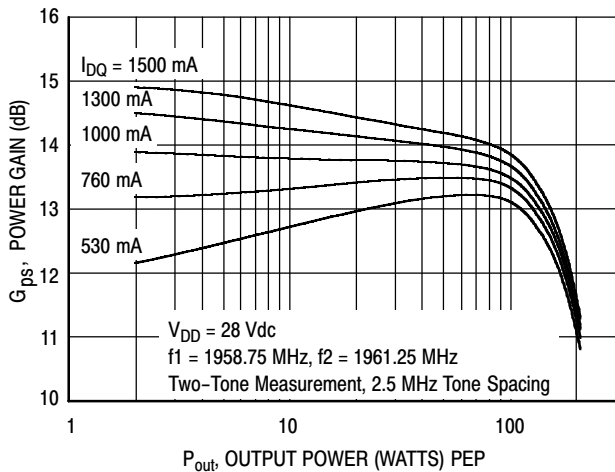


Figure 4. Two-Tone Power Gain versus Output Power

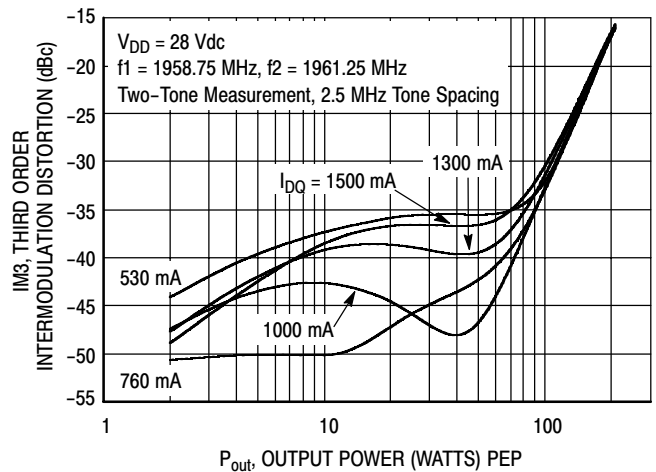


Figure 5. Third Order Intermodulation Distortion versus Output Power

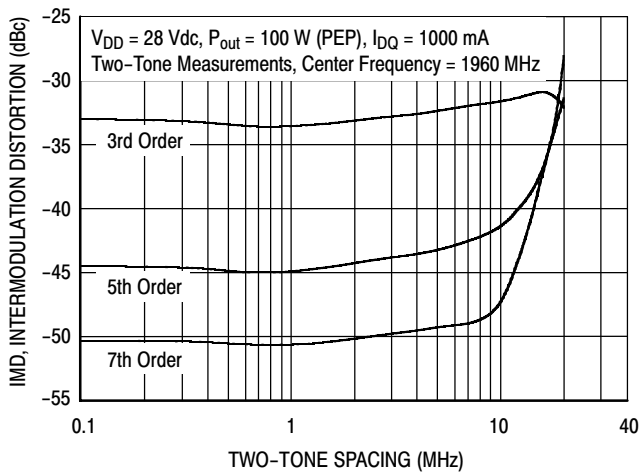


Figure 6. Intermodulation Distortion Products versus Tone Spacing

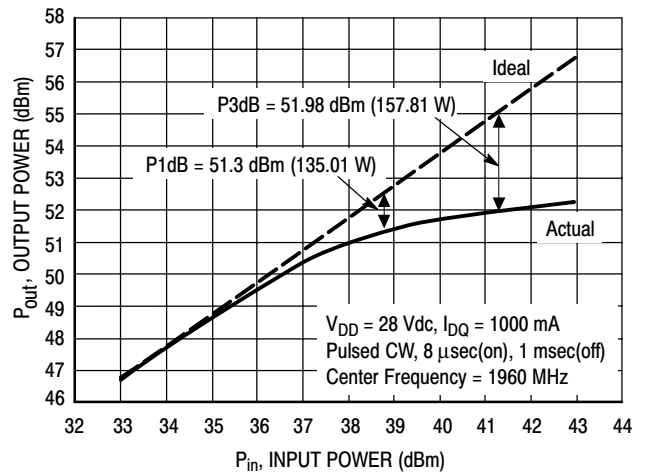


Figure 7. Pulse CW Output Power versus Input Power

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TYPICAL CHARACTERISTICS

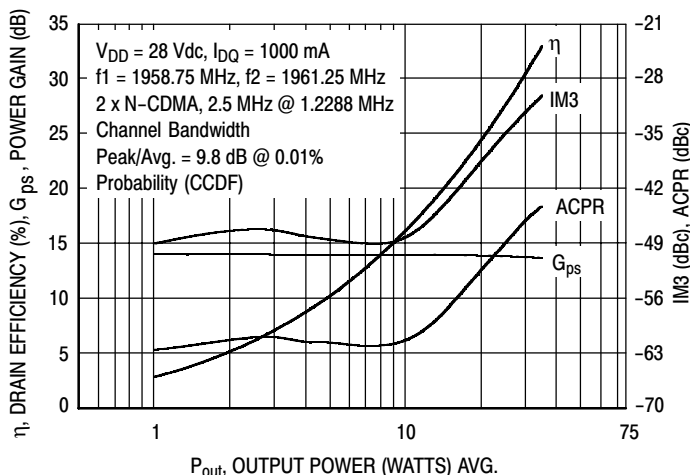


Figure 8. 2-Carrier N-CDMA ACPR, IM3, Power Gain and Drain Efficiency versus Output Power

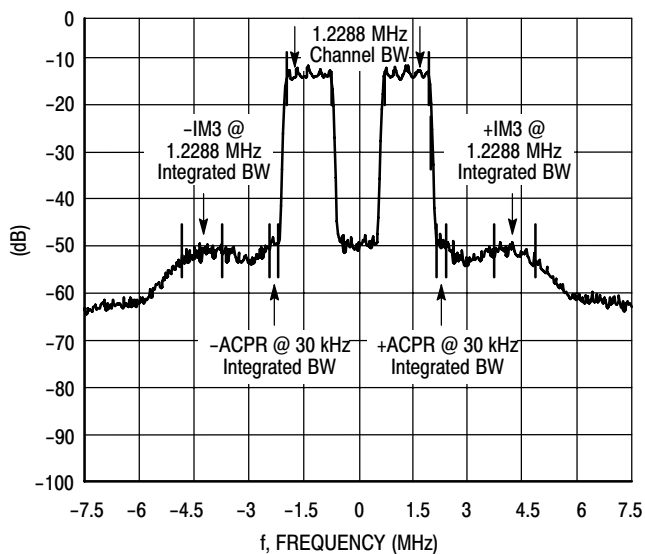
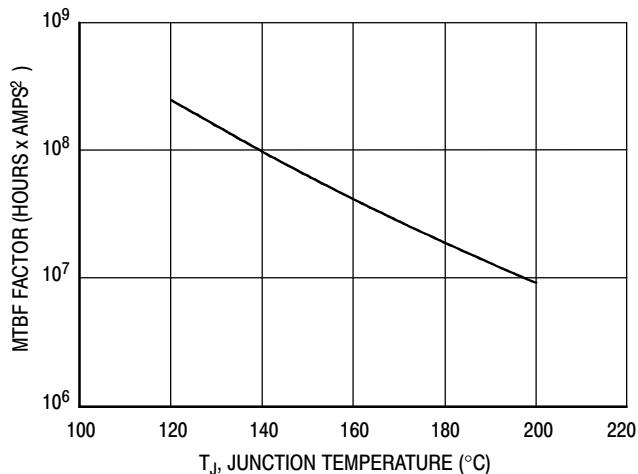
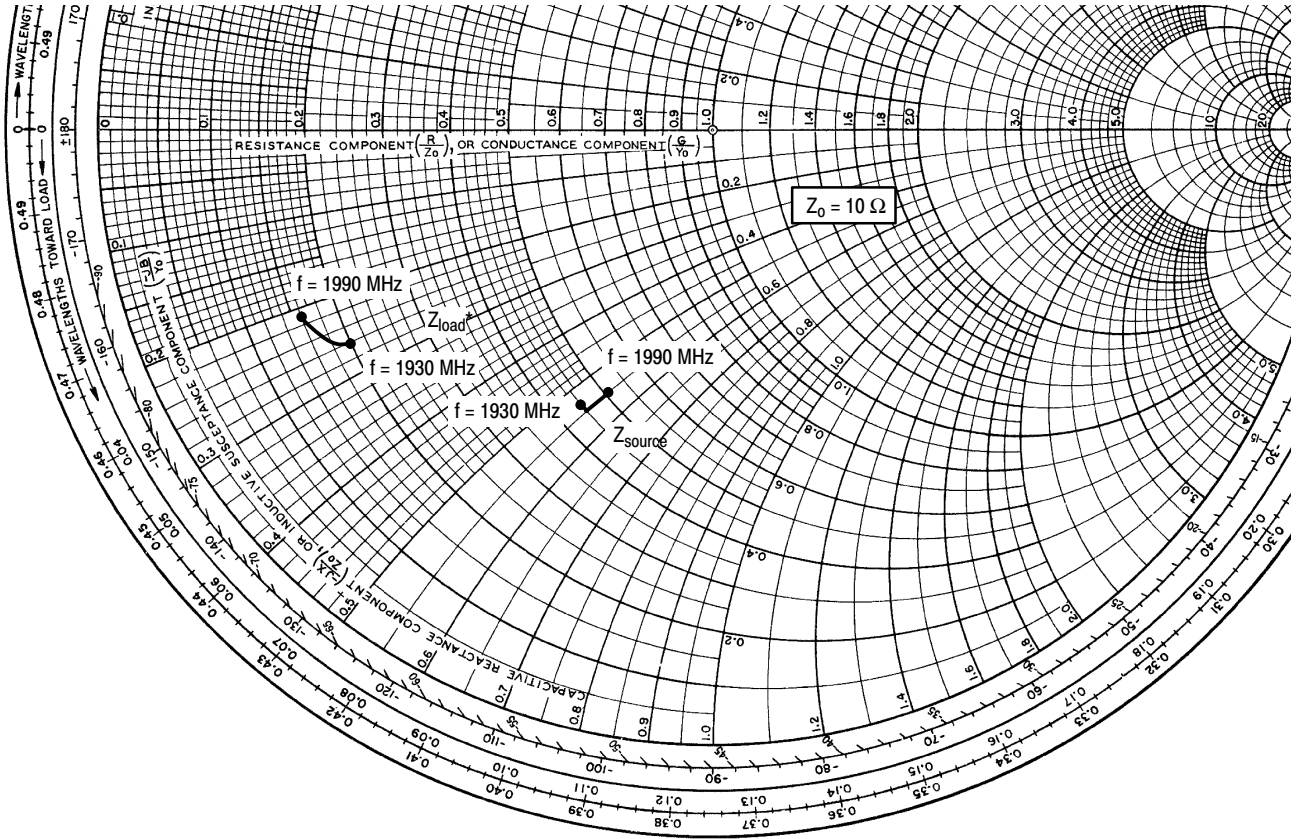


Figure 9. 2-Carrier N-CDMA Spectrum



This above graph displays calculated MTBF in hours x ampere² drain current. Life tests at elevated temperatures have correlated to better than $\pm 10\%$ of the theoretical prediction for metal failure. Divide MTBF factor by I_D^2 for MTBF in a particular application.

Figure 10. MTBF Factor versus Junction Temperature



$V_{DD} = 28\text{ V}$, $I_{DQ} = 1000\text{ mA}$, $P_{out} = 22\text{ W Avg.}$

f MHz	Z_{source} Ω	Z_{load} Ω
1930	4.45 - j5.32	1.98 - j2.58
1960	4.53 - j5.40	1.83 - j2.55
1990	5.12 - j5.45	1.60 - j2.15

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

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

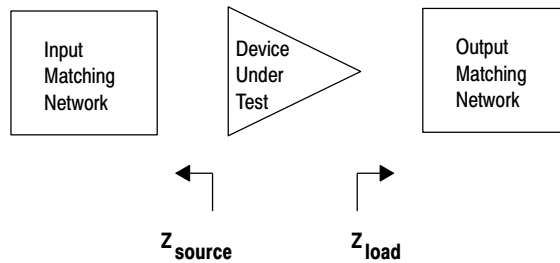


Figure 11. Series Equivalent Input and Output Impedance

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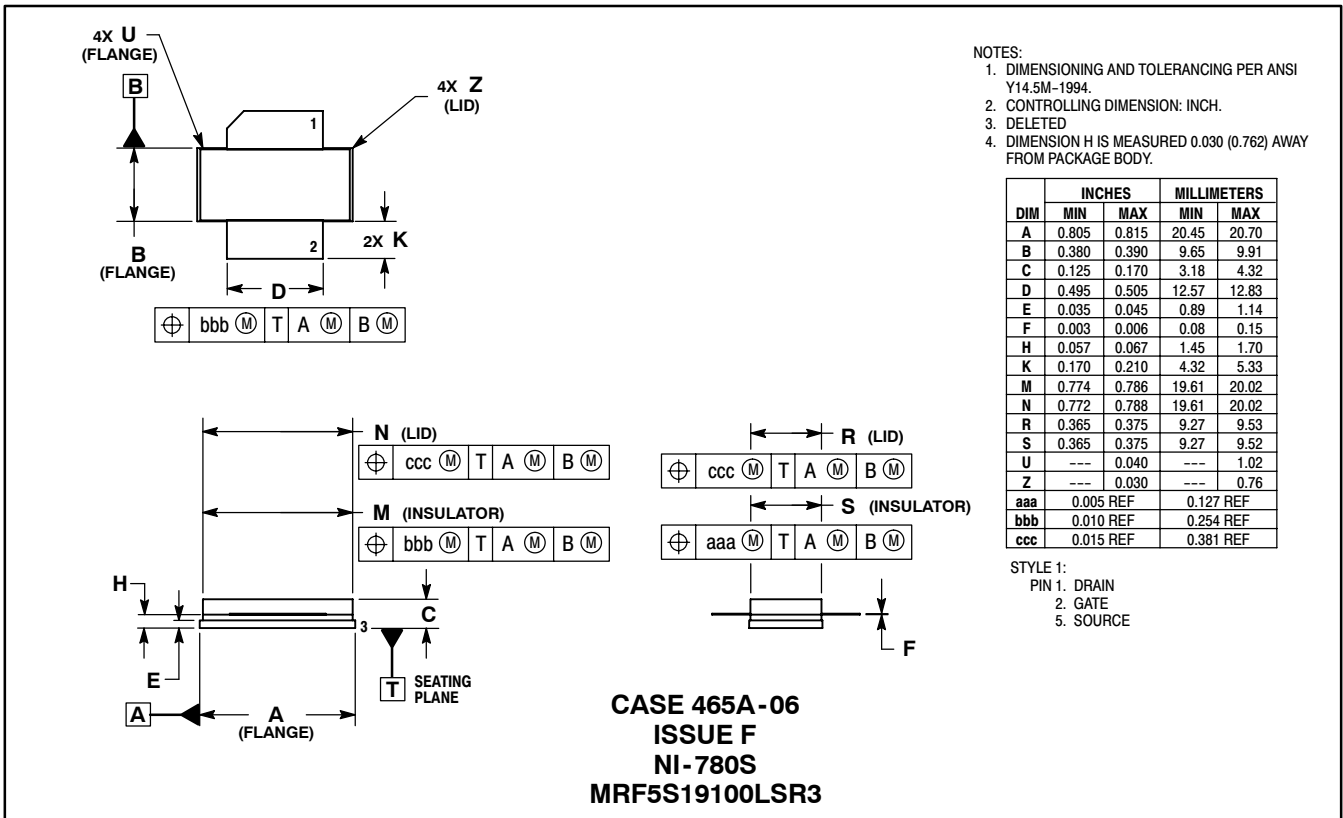
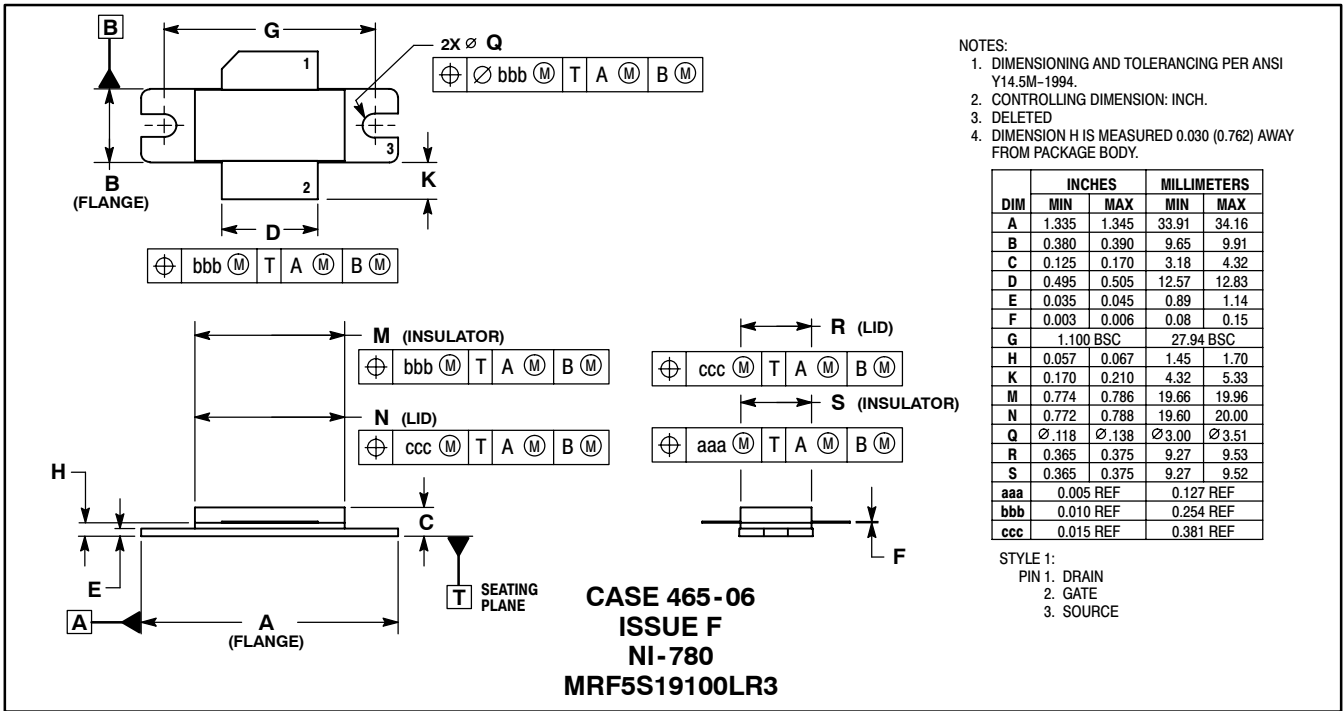
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