

The RF MOSFET Line

RF Power Field Effect Transistors

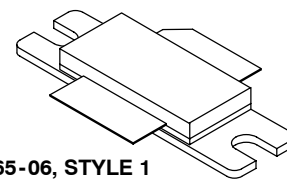
N-Channel Enhancement-Mode Lateral MOSFETs

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

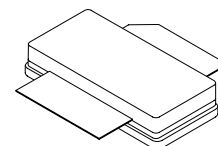
- Typical 2-Carrier N-CDMA Performance for $V_{DD} = 26$ Volts,
 $I_{DQ} = 850$ mA, $P_{out} = 18$ Watts Avg., $f_1 = 1960$ MHz, $f_2 = 1962.5$ MHz
IS-95 CDMA (Pilot, Sync, Paging, Traffic Codes 8 Through 13)
1.2288 MHz Channel Bandwidth Carrier. Adjacent Channels Measured
over a 30 kHz Bandwidth at $f_1 - 885$ 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 — 18 Watts Avg.
Power Gain — 13.0 dB
Efficiency — 23%
ACPR — -51 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 5:1 VSWR, @ 26 Vdc, 1.93 GHz, 90 Watts CW
Output Power
- Excellent Thermal Stability
- Characterized with Series Equivalent Large-Signal Impedance Parameters
- Available with Low Gold Plating Thickness on Leads. L Suffix Indicates
40 μ " Nominal.
- In Tape and Reel. R3 Suffix = 250 Units per 56 mm, 13 Inch Reel.

MRF19085R3
MRF19085LR3
MRF19085SR3
MRF19085LSR3

1990 MHz, 90 W, 26 V
LATERAL N-CHANNEL
RF POWER MOSFETs



CASE 465-06, STYLE 1
NI-780
MRF19085R3, MRF19085LR3



CASE 465A-06, STYLE 1
NI-780S
MRF19085SR3, MRF19085LSR3

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°C	P_D	273 1.56	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	Value (1)	Unit
Thermal Resistance, Junction to Case	$R_{\theta JC}$	0.79	$^\circ\text{C/W}$

ESD PROTECTION CHARACTERISTICS

Test Conditions	Class
Human Body Model	1 (Minimum)
Machine Model	M3 (Minimum)

(1) Refer to AN1955/D, *Thermal Measurement Methodology of RF Power Amplifiers*. Go to <http://www.motorola.com/semiconductors/rf>.
Select Documentation/Application Notes - AN1955.

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°C unless otherwise noted)

Characteristic	Symbol	Min	Typ	Max	Unit
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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 (DC)

Gate Threshold Voltage (V _{DS} = 10 Vdc, I _D = 200 μAdc)	V _{GS(th)}	2	—	4	Vdc
Gate Quiescent Voltage (V _{DS} = 26 Vdc, I _D = 850 mAdc)	V _{GS(Q)}	2.5	3.5	4.5	Vdc
Drain-Source On-Voltage (V _{GS} = 10 Vdc, I _D = 2 Adc)	V _{DS(on)}	—	0.18	0.210	Vdc
Forward Transconductance (V _{DS} = 10 Vdc, I _D = 2 Adc)	g _{fs}	—	6	—	S

DYNAMIC CHARACTERISTICS

Reverse Transfer Capacitance (1) (V _{DS} = 26 Vdc, V _{GS} = 0, f = 1.0 MHz)	C _{rss}	—	3.6	—	pF
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FUNCTIONAL TESTS (In Motorola Test Fixture, 50 ohm system) 2-Carrier N-CDMA, 1.2288 MHz Channel Bandwidth Carriers.
Peak/Avg. Ratio = 9.8 dB @ 0.01% Probability on CCDF.

Common-Source Amplifier Power Gain (V _{DD} = 26 Vdc, P _{out} = 18 W Avg., I _{DQ} = 850 mA, f ₁ = 1930 MHz, f ₂ = 1932.5 MHz and f ₁ = 1987.5 MHz, f ₂ = 1990 MHz)	G _{ps}	12	13	—	dB
Drain Efficiency (V _{DD} = 26 Vdc, P _{out} = 18 W Avg., I _{DQ} = 850 mA, f ₁ = 1930 MHz, f ₂ = 1932.5 MHz and f ₁ = 1987.5 MHz, f ₂ = 1990 MHz)	η	21	23	—	%
3rd Order Intermodulation Distortion (V _{DD} = 26 Vdc, P _{out} = 18 W Avg., I _{DQ} = 850 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)	IMD	—	-36.5	-35	dBc
Adjacent Channel Power Ratio (V _{DD} = 26 Vdc, P _{out} = 18 W Avg., I _{DQ} = 850 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	—	-51	-48	dBc
Input Return Loss (V _{DD} = 26 Vdc, P _{out} = 18 W Avg., I _{DQ} = 850 mA, f ₁ = 1930 MHz, f ₂ = 1932.5 MHz and f ₁ = 1987.5 MHz, f ₂ = 1990 MHz)	IRL	—	-12	-9	dB
Output Mismatch Stress (V _{DD} = 26 Vdc, P _{out} = 90 W CW, I _{DQ} = 850 mA, f = 1930 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 matched both on input and output.

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ELECTRICAL CHARACTERISTICS — continued ($T_C = 25^\circ\text{C}$ unless otherwise noted)

Characteristic	Symbol	Min	Typ	Max	Unit
FUNCTIONAL TESTS (In Motorola Test Fixture)					
Two-Tone Common-Source Amplifier Power Gain ($V_{DD} = 26\text{ Vdc}$, $P_{out} = 90\text{ W PEP}$, $I_{DQ} = 850\text{ mA}$, $f = 1930\text{ MHz}$ and 1990 MHz , Tone Spacing = 100 kHz)	G_{ps}	—	13	—	dB
Two-Tone Drain Efficiency ($V_{DD} = 26\text{ Vdc}$, $P_{out} = 90\text{ W PEP}$, $I_{DQ} = 850\text{ mA}$, $f = 1930\text{ MHz}$ and 1990 MHz , Tone Spacing = 100 kHz)	η	—	36	—	%
3rd Order Intermodulation Distortion ($V_{DD} = 26\text{ Vdc}$, $P_{out} = 90\text{ W PEP}$, $I_{DQ} = 850\text{ mA}$, $f = 1930\text{ MHz}$ and 1990 MHz , Tone Spacing = 100 kHz)	IMD	—	-31	—	dBc
Input Return Loss ($V_{DD} = 26\text{ Vdc}$, $P_{out} = 90\text{ W PEP}$, $I_{DQ} = 850\text{ mA}$, $f = 1930\text{ MHz}$ and 1990 MHz , Tone Spacing = 100 kHz)	IRL	—	-12	—	dB
P_{out} , 1 dB Compression Point ($V_{DD} = 26\text{ Vdc}$, $I_{DQ} = 850\text{ mA}$, $f = 1990\text{ MHz}$)	P1dB	—	90	—	W

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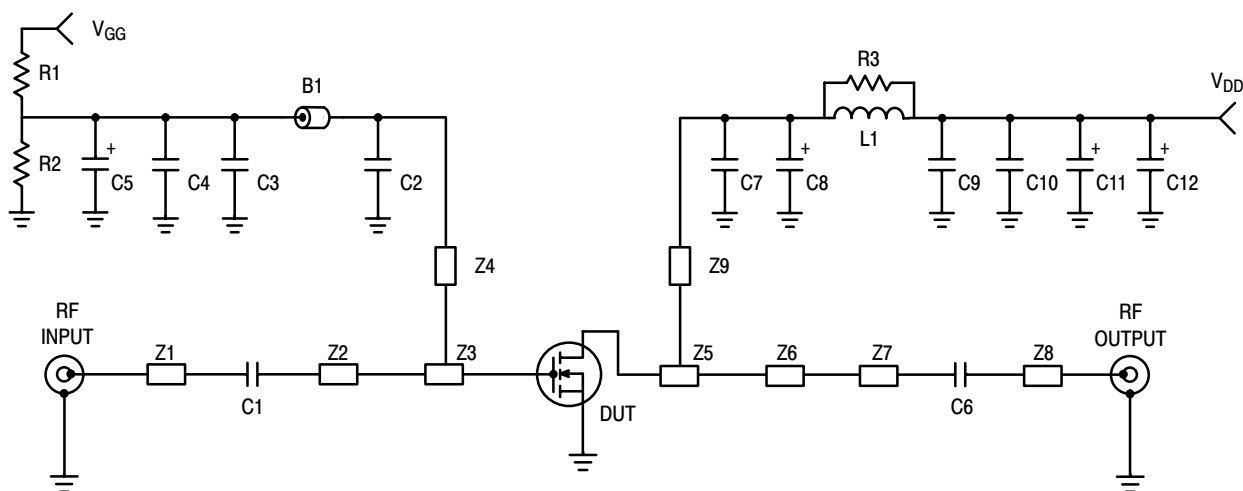


Figure 1. 1930 - 1990 MHz 2-Carrier N-CDMA Test Circuit Schematic

Table 1. 1930 - 1990 MHz 2-Carrier N-CDMA Test Circuit Component Designations and Values

Part	Description	Value, P/N or DWG	Manufacturer
B1	Short Ferrite Bead	2743019447	Fair Rite
C1	51 pF Chip Capacitor	100B510JCA500X	ATC
C2, C7	5.1 pF Chip Capacitors	100B5R1JCA500X	ATC
C3, C9	1000 pF Chip Capacitors	100B102JCA500X	ATC
C4, C10	0.1 μ F Chip Capacitors	CDR33BX104AKWS	Kemet
C5	0.1 μ F Tantalum Surface Mount Capacitor	T491C105M050	Kemet
C6	10 pF Chip Capacitor	100B100JCA500X	ATC
C8	10 μ F Tantalum Surface Mount Capacitor	T495X106K035AS4394	Kemet
C11, C12	22 μ F Tantalum Surface Mount Capacitors	T491X226K035AS4394	Kemet
L1	1 Turn, 20 AWG, 0.100" ID		Motorola
N1, N2	Type N Flange Mounts	3052-1648-10	Omni Spectra
R1	1.0 k Ω , 1/8 W Chip Resistor		
R2	220 k Ω , 1/8 W Chip Resistor		
R3	10 Ω , 1/8 W Chip Resistor		
Z1	Microstrip	0.750" x 0.0840"	
Z2	Microstrip	1.090" x 0.0840"	
Z3	Microstrip	0.400" x 1.400"	
Z4	Microstrip	0.520" x 0.050"	
Z5	Microstrip	0.540" x 1.133"	
Z6	Microstrip	0.400" x 0.140"	
Z7	Microstrip	0.555" x 0.0840"	
Z8	Microstrip	0.720" x 0.0840"	
Z9	Microstrip	0.560" x 0.070"	
Board	0.030" Glass Teflon [®]	GX-0300-55-22, $\epsilon_r = 2.55$	Keene
PCB	Etched Circuit Boards	MRF19085 Rev. 4	CMR

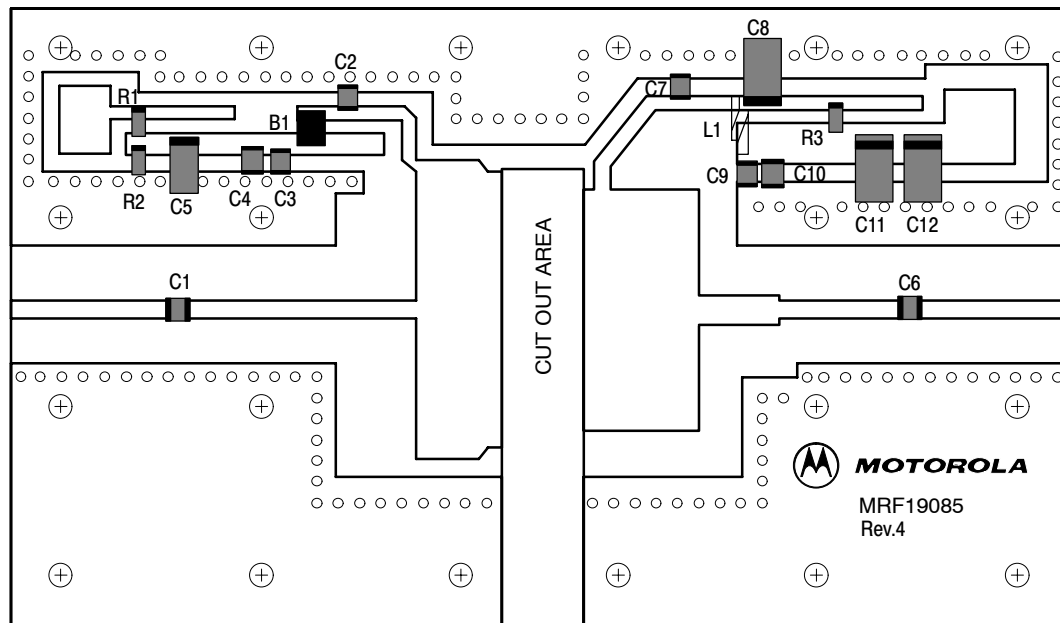


Figure 2. 1930 - 1990 MHz 2-Carrier N-CDMA Test Circuit Component Layout

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TYPICAL CHARACTERISTICS

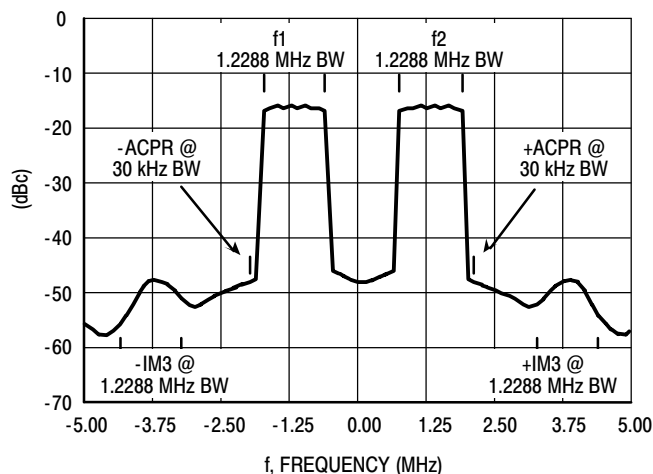


Figure 3. 2-Carrier N-CDMA Spectrum

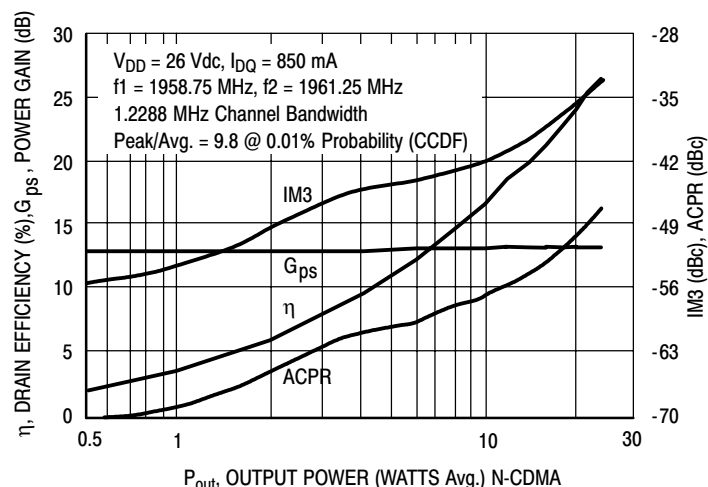


Figure 4. 2-Carrier N-CDMA ACPR, IM3, Power Gain and Drain Efficiency versus Output Power

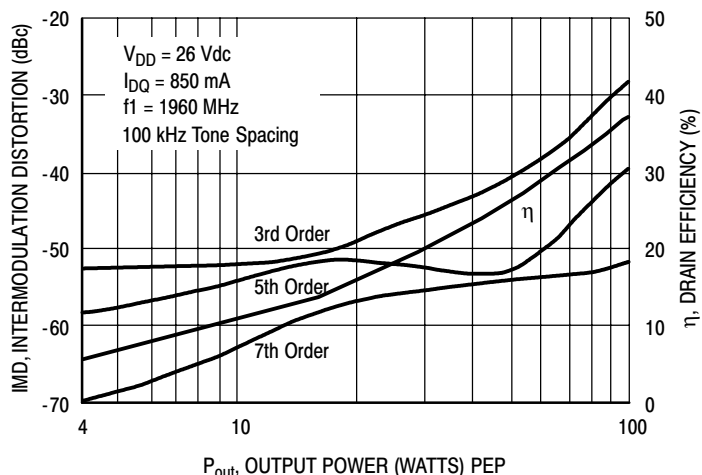


Figure 5. Intermodulation Distortion Products versus Output Power

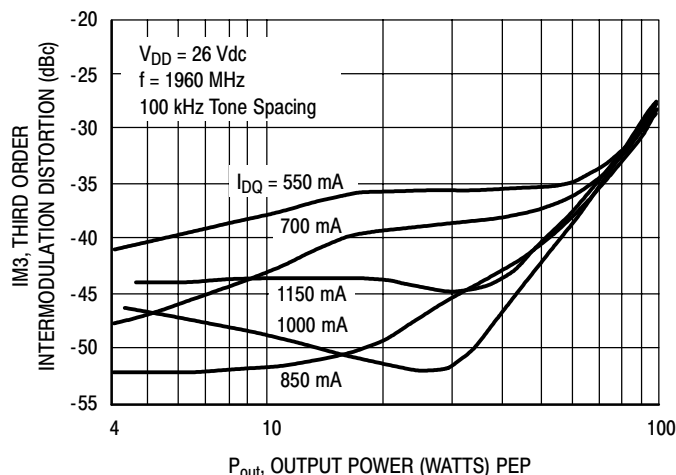


Figure 6. Third Order Intermodulation Distortion versus Output Power and IDQ

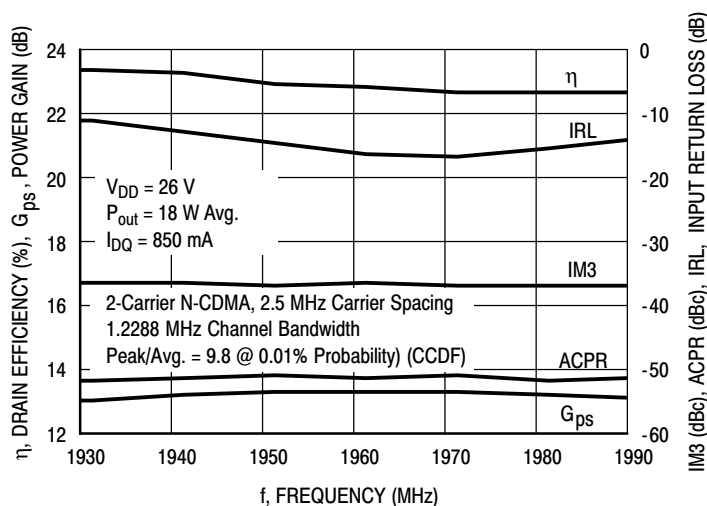


Figure 7. 2-Carrier N-CDMA Broadband Performance

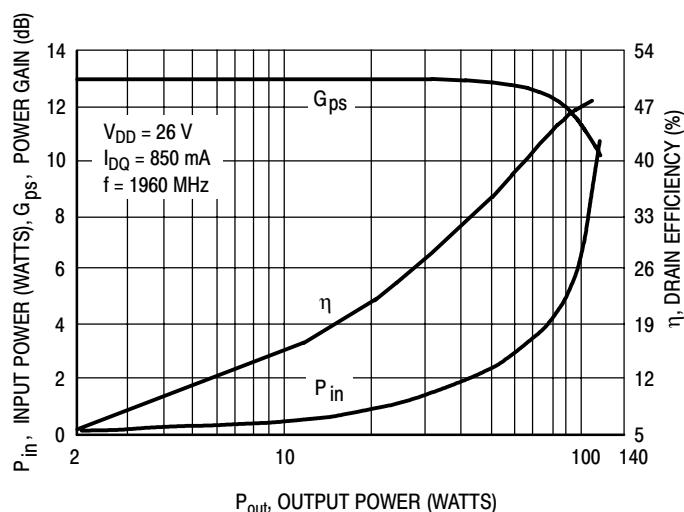


Figure 8. CW Performance

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TYPICAL CHARACTERISTICS

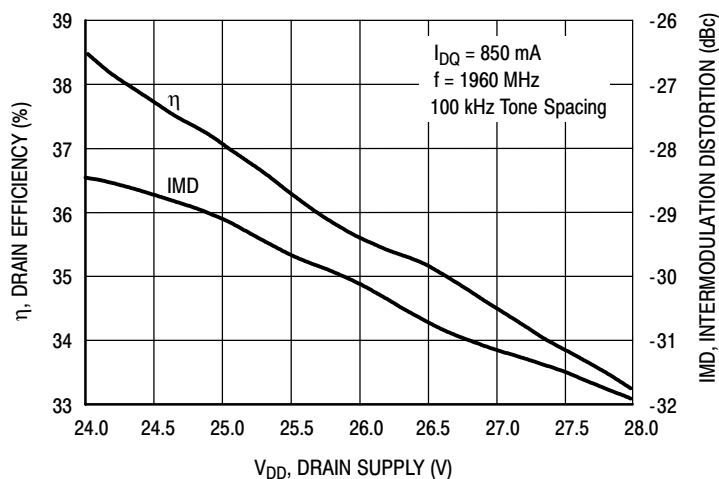


Figure 9. Two-Tone Intermodulation Distortion and Drain Efficiency versus Drain Supply

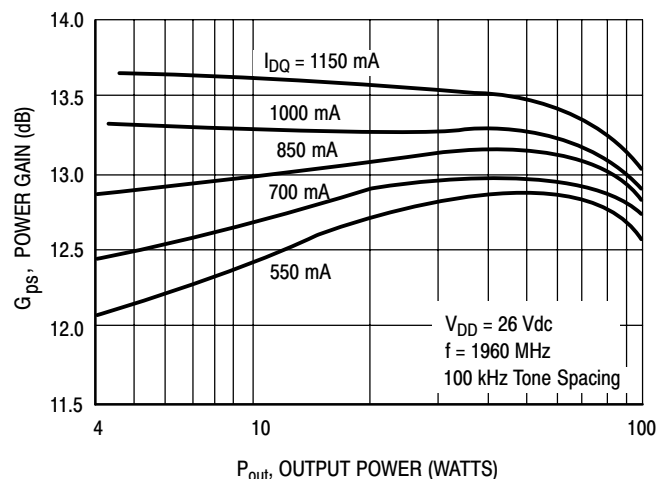


Figure 10. Two-Tone Power Gain versus Output Power

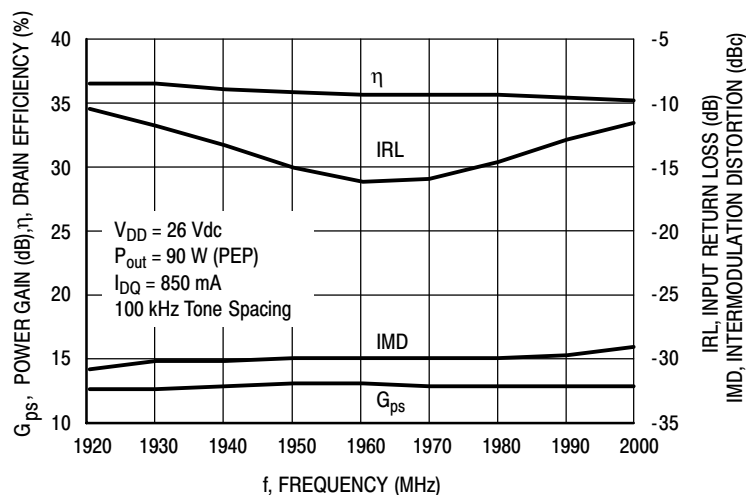
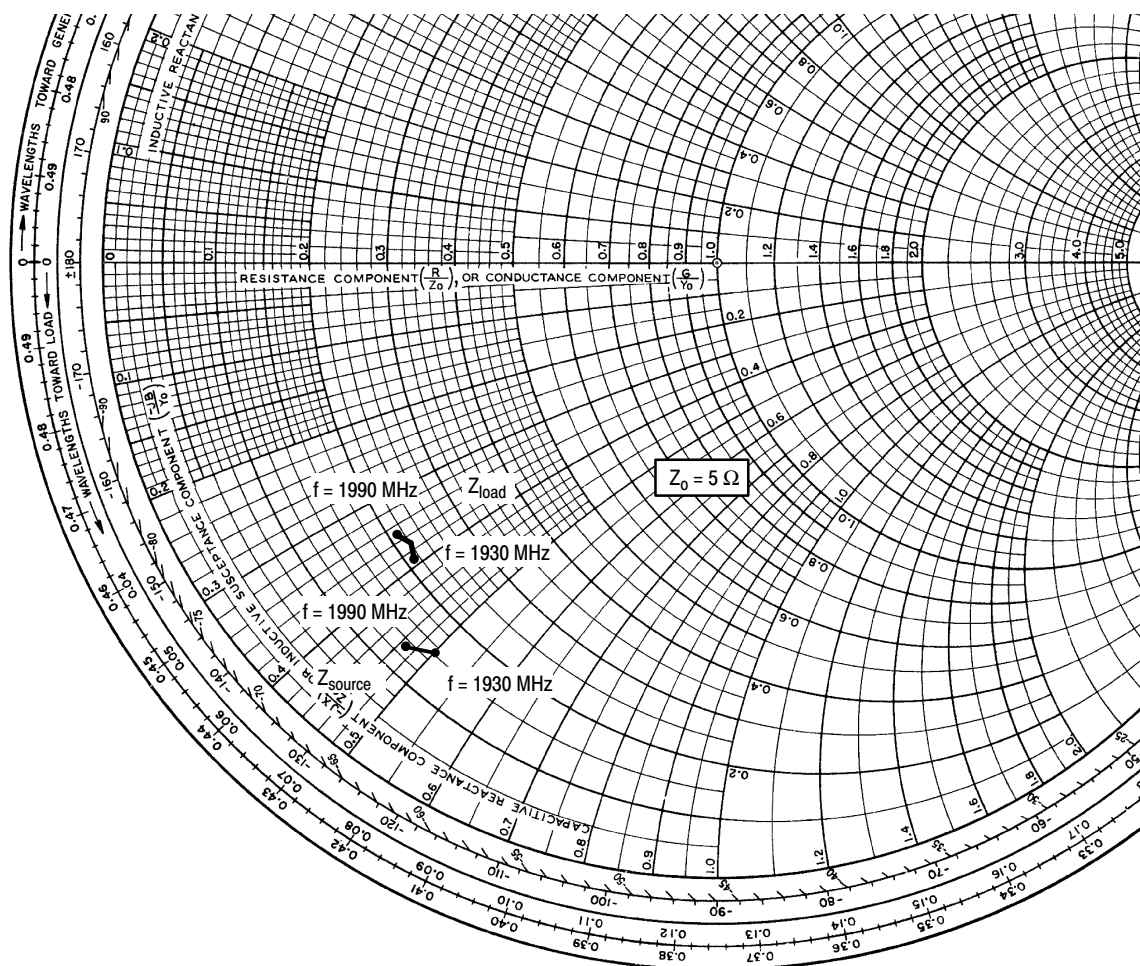


Figure 11. Two-Tone Broadband Performance



$V_{DD} = 26 \text{ V}$, $I_{DQ} = 850 \text{ mA}$, $P_{\text{out}} = 18 \text{ W Avg.}$

f MHz	Z_{source} Ω	Z_{load} Ω
1930	$0.75 - j2.50$	$1.05 - j1.95$
1960	$0.70 - j2.40$	$1.10 - j1.85$
1990	$0.65 - j2.35$	$1.05 - j1.75$

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

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

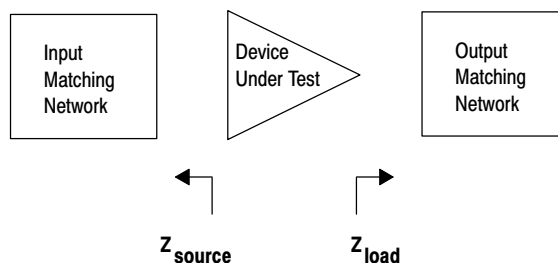


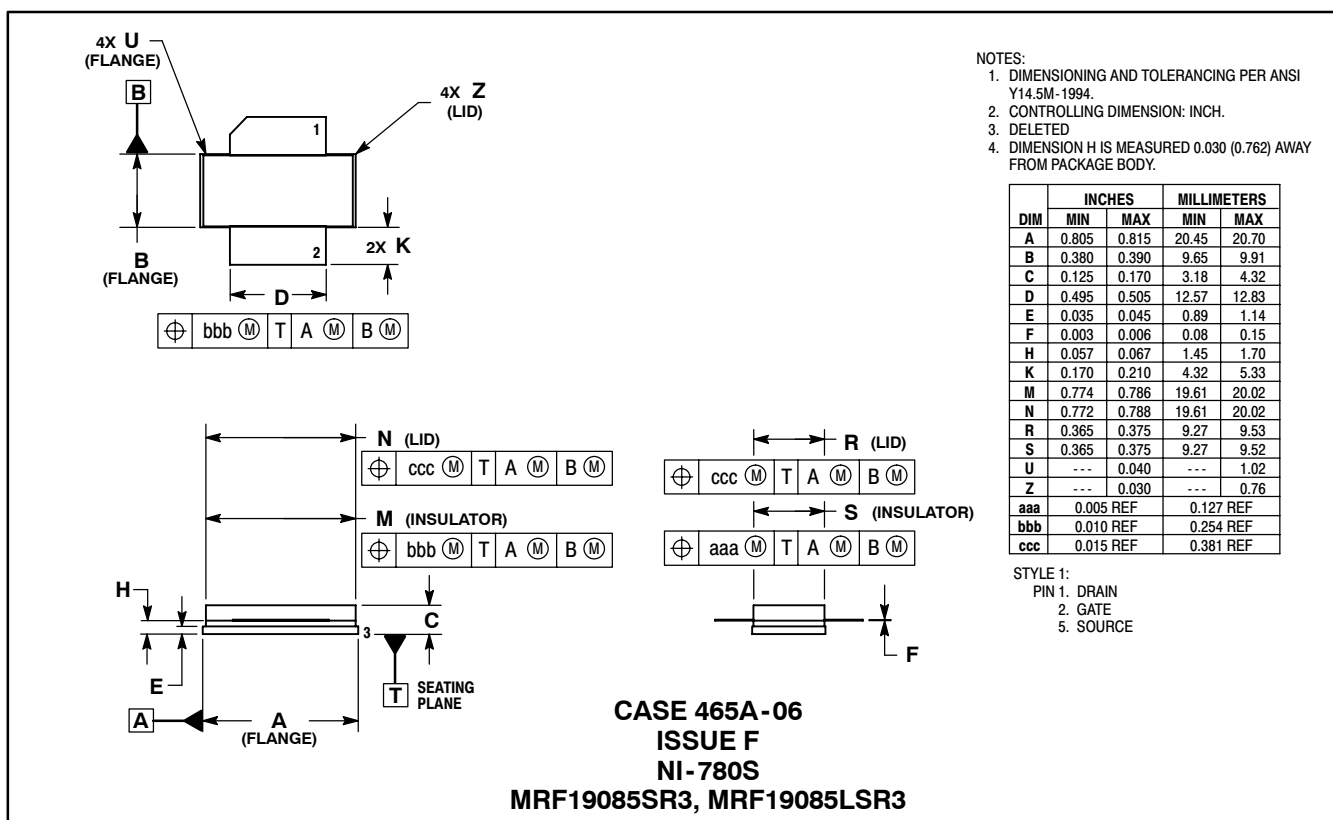
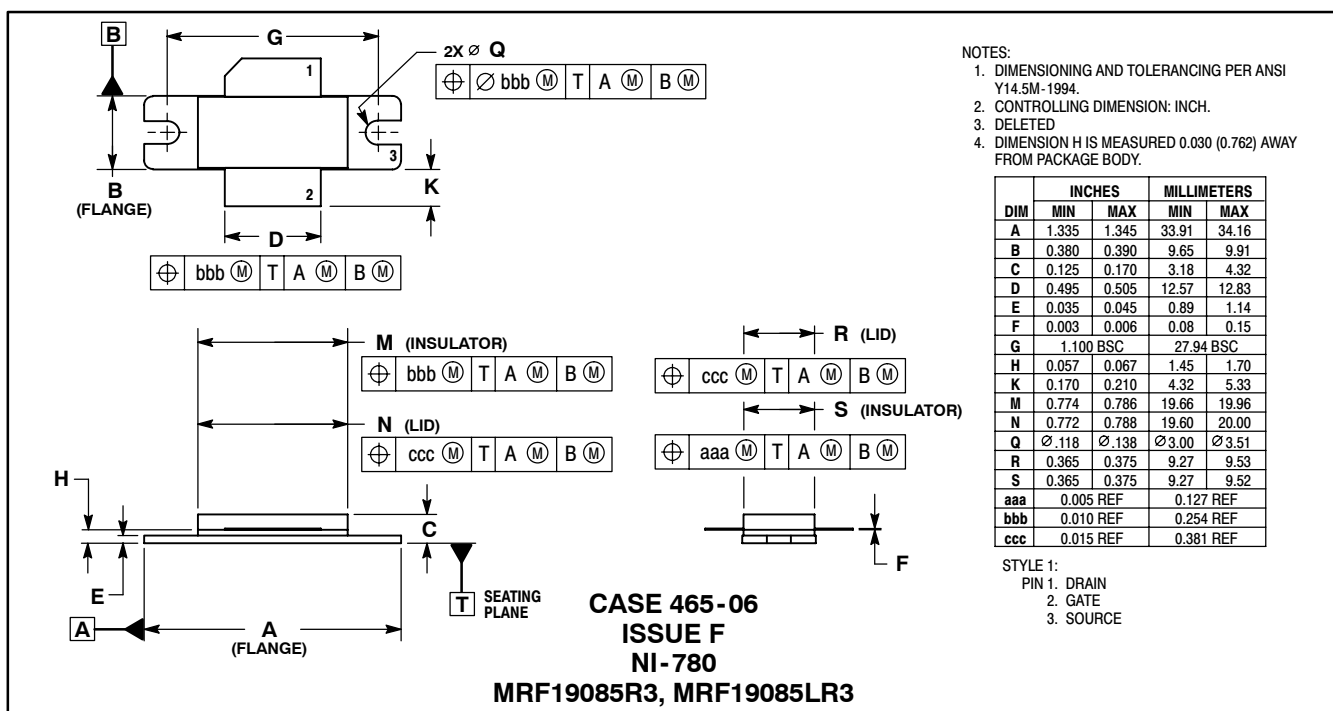
Figure 12. Series Equivalent Input and Output Impedance

NOTES

NOTES

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