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SEMICONDUCTOR TECHNICAL DATA

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MRF5S19130R3 and MRF5S19130SR3 replaced by MRF5S19130HR3 and MRF5S19130HSR3. “H” suffix indicates lower thermal resistance package.

The RF MOSFET Line

RF Power Field Effect Transistors

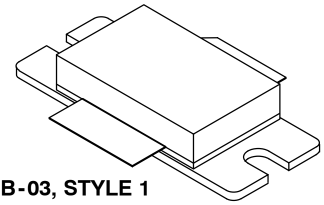
N-Channel Enhancement-Mode Lateral MOSFETs

MRF5S19130R3
MRF5S19130SR3

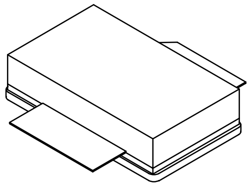
**1990 MHz, 26 W AVG.,
2 x N-CDMA, 28 V
LATERAL N-CHANNEL
RF POWER MOSFETs**

Designed for PCN and PCS base station applications at 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} = 28 Volts, I_{DQ} = 1200 mA, f1 = 1958.75 MHz, f2 = 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 f1 -885 kHz and f2 +885 kHz. Distortion Products Measured over 1.2288 MHz Bandwidth at f1 -2.5 MHz and f2 +2.5 MHz. Peak/Avg. = 9.8 dB @ 0.01% Probability on CCDF.
  - Output Power — 26 Watts Avg.
  - Power Gain — 13 dB
  - Efficiency — 25%
  - IM3 — -37 dBc
  - ACPR — -51 dB
- 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, f1 = 1960 MHz, 110 Watts CW Output Power
- Excellent Thermal Stability
- Characterized with Series Equivalent Large-Signal Impedance Parameters
- Qualified Up to a Maximum of 32 V Operation
- Available in Tape and Reel. R3 Suffix = 250 Units per 56 mm, 13 inch Reel.



**CASE 465B-03, STYLE 1
NI-880
MRF5S19130R3**



**CASE 465C-02, STYLE 1
NI-880S
MRF5S19130SR3**

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°C Derate above 25°C	P_D	324 1.85	Watts W/°C
Storage Temperature Range	T_{stg}	- 65 to +150	°C
Operating Junction Temperature	T_J	200	°C
CW Operation	CW	110	Watts

THERMAL CHARACTERISTICS

Characteristic	Symbol	Max	Unit
Thermal Resistance, Junction to Case Case Temperature 80°C, 110 W CW Case Temperature 80°C, 26 W CW	$R_{\theta JC}$	 0.54 0.60	°C/W

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

REV 1

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digital dna™

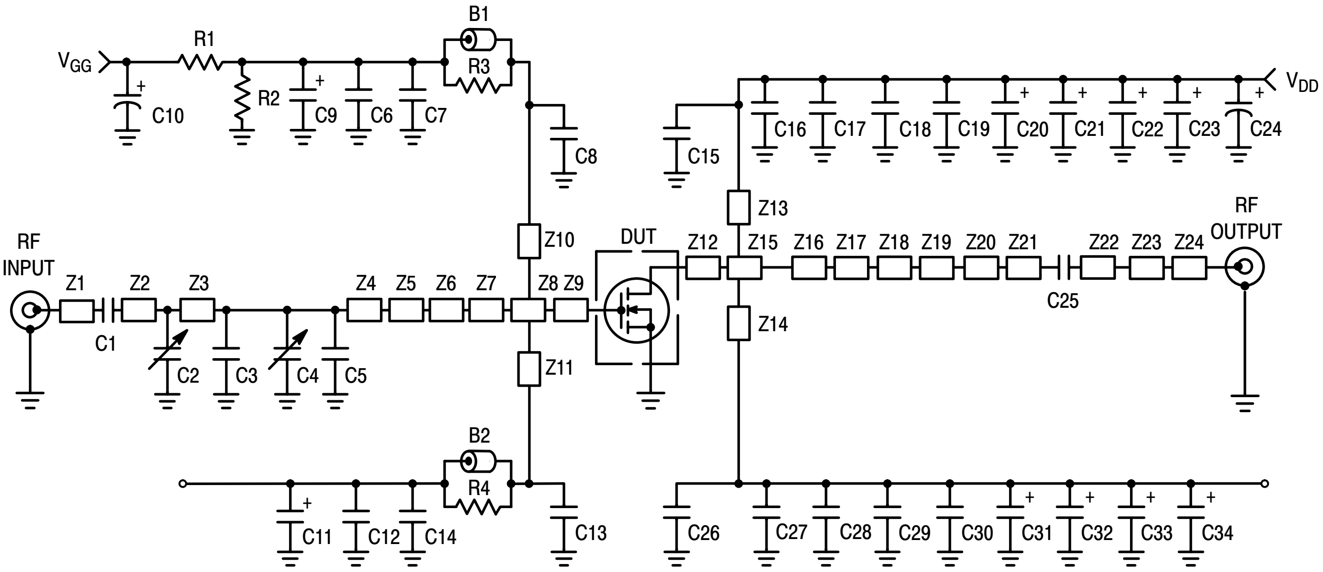
ESD PROTECTION CHARACTERISTICS

Test Conditions	Class
Human Body Model	2 (Minimum)
Machine Model	M4 (Minimum)
Charge Device Model	C7 (Minimum)

ELECTRICAL CHARACTERISTICS (T_C = 25°C unless otherwise noted)

Characteristic	Symbol	Min	Typ	Max	Unit
OFF CHARACTERISTICS					
Zero Gate Voltage Drain Leakage Current (V_{DS} = 65 Vdc, V_{GS} = 0 Vdc)	I_{DSS}	—	—	10	µAdc
Zero Gate Voltage Drain Leakage Current (V_{DS} = 28 Vdc, V_{GS} = 0 Vdc)	I_{DSS}	—	—	1	µAdc
Gate-Source Leakage Current (V_{GS} = 5 Vdc, V_{DS} = 0 Vdc)	I_{GSS}	—	—	1	µAdc
ON CHARACTERISTICS					
Gate Threshold Voltage (V_{DS} = 10 Vdc, I_D = 200 µAdc)	$V_{GS(th)}$	2.5	2.8	3.5	Vdc
Gate Quiescent Voltage (V_{DS} = 28 Vdc, I_D = 1200 mAdc)	$V_{GS(Q)}$	—	3.8	—	Vdc
Drain-Source On-Voltage (V_{GS} = 10 Vdc, I_D = 3 Adc)	$V_{DS(on)}$	—	0.26	—	Vdc
Forward Transconductance (V_{DS} = 10 Vdc, I_D = 3 Adc)	g_{fs}	—	7.5	—	S
DYNAMIC CHARACTERISTICS					
Reverse Transfer Capacitance (1) (V_{DS} = 28 Vdc ± 30 mV(rms)ac @ 1 MHz, V_{GS} = 0 Vdc)	C_{rss}	—	2.7	—	pF
FUNCTIONAL TESTS (In Motorola Test Fixture, 50 ohm system) 2-Carrier N-CDMA, 1.2288 MHz Channel Bandwidth Carriers. Peak/Avg = 9.8 dB @ 0.01% Probability on CCDF.					
Common-Source Amplifier Power Gain (V_{DD} = 28 Vdc, P_{out} = 26 W Avg, I_{DQ} = 1200 mA, f1 = 1930 MHz, f2 = 1932.5 MHz and f1 = 1987.5 MHz, f2 = 1990 MHz)	G_{ps}	12	13	—	dB
Drain Efficiency (V_{DD} = 28 Vdc, P_{out} = 26 W Avg, I_{DQ} = 1200 mA, f1 = 1930 MHz, f2 = 1932.5 MHz and f1 = 1987.5 MHz, f2 = 1990 MHz)	η	23	25	—	%
Third Order Intermodulation Distortion (V_{DD} = 28 Vdc, P_{out} = 26 W Avg, I_{DQ} = 1200 mA, f1 = 1930 MHz, f2 = 1932.5 MHz and f1 = 1987.5 MHz, f2 = 1990 MHz; IM3 measured over 1.2288 MHz Bandwidth at f1 -2.5 MHz and f2 +2.5 MHz referenced to carrier channel power.)	IM3	—	-37	-35	dBc
Adjacent Channel Power Ratio (V_{DD} = 28 Vdc, P_{out} = 26 W Avg, I_{DQ} = 1200 mA, f1 = 1930 MHz, f2 = 1932.5 MHz and f1 = 1987.5 MHz, f2 = 1990 MHz; ACPR measured over 30 kHz Bandwidth at f1 -885 kHz and f2 +885 kHz)	ACPR	—	-51	-48	dBc
Input Return Loss (V_{DD} = 28 Vdc, P_{out} = 26 W Avg, I_{DQ} = 1200 mA, f1 = 1930 MHz, f2 = 1932.5 MHz and f1 = 1987.5 MHz, f2 = 1990 MHz)	IRL	—	-15	-9	dB

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



Z1	0.200″ x 0.085″ Microstrip	Z13, Z14	1.125″ x 0.068″ Microstrip
Z2	0.170″ x 0.085″ Microstrip	Z15	0.071″ x 1.080″ Microstrip
Z3	0.480″ x 0.085″ Microstrip	Z16	0.060″ x 1.080″ Microstrip
Z4	0.926″ x 0.085″ Microstrip	Z17	0.290″ x 1.080″ Microstrip
Z5	0.590″ x 0.085″ Microstrip	Z18	1.075″ x 0.825″ x 0.125″ Taper
Z6	0.519″ x 0.955″ x 0.160″ Taper	Z19	0.635″ x 0.120″ Microstrip
Z7	0.022″ x 0.955″ Microstrip	Z20	0.185″ x 0.096″ Microstrip
Z8	0.046″ x 0.955″ Microstrip	Z21	0.414″ x 0.084″ Microstrip
Z9	0.080″ x 0.955″ Microstrip	Z22	0.040″ x 0.084″ Microstrip
Z10, Z11	1.280″ x 0.046″ Microstrip	Z23	0.199″ x 0.057″ Microstrip
Z12	0.053″ x 1.080″ Microstrip	PCB	Arlon GX0300-55-22, 0.03″, ε_r = 2.55

Figure 1. MRF5S19130R3(SR3) Test Circuit Schematic

Table 1. MRF5S19130R3(SR3) Test Circuit Component Designations and Values

Part	Description	Value, P/N or DWG	Manufacturer
B1, B2	Short RF Bead	95F786	Newark
C1	0.8 pF Chip Capacitor, B Case	100B0R8BP 500X	ATC
C2, C4	0.6 – 4.5 pF Gigatrim Variable Capacitors	44F3358	Newark
C3	2.2 pF Chip Capacitor, B Case	100B2R2BP 500X	ATC
C5	1.7 pF Chip Capacitor, B Case	100B1R7BP 500X	ATC
C8, C13	9.1 pF Chip Capacitors, B Case	100B9R1CP 500X	ATC
C9, C11	1 μF, 25 V Tantalum Capacitors	92F1845	Newark
C10	47 μF, 50 V Electrolytic Capacitor	51F2913	Newark
C6, C14, C17, C18, C19, C28, C29, C30	0.1 μF Chip Capacitors, B Case	CDR33BX104AKWS	Kemet
C7, C12, C16, C27	1000 pF Chip Capacitors, B Case	100B102JP 500X	ATC
C15, C26	8.2 pF Chip Capacitors, B Case	100B8R2CP 500X	ATC
C20, C21, C22, C23, C31, C32, C33, C34	22 μF, 35 V Tantalum Capacitors	92F1853	Newark
C24	470 μF, 63 V Electrolytic Capacitor	95F4579	Newark
C25	6.2 pF Chip Capacitor, B Case	100B6R2CP 500X	ATC
R1	1 kΩ Chip Resistor	D5534M07B1K00R	Newark
R2	560 kΩ Chip Resistor	CR1206 564JT	Newark
R3, R4	12 Ω Chip Resistors	RM73B2B120JT	Garrett Electtonics

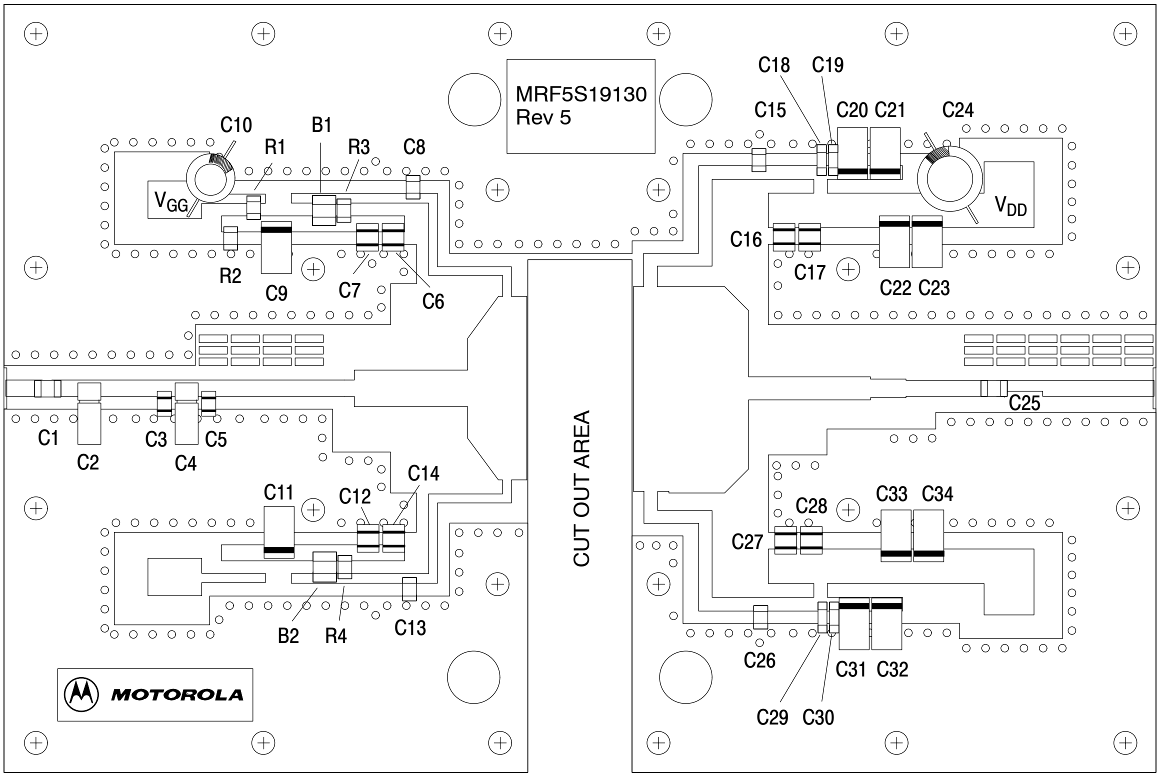


Figure 2. MRF5S19130R3(SR3) Test Circuit Component Layout

TYPICAL CHARACTERISTICS

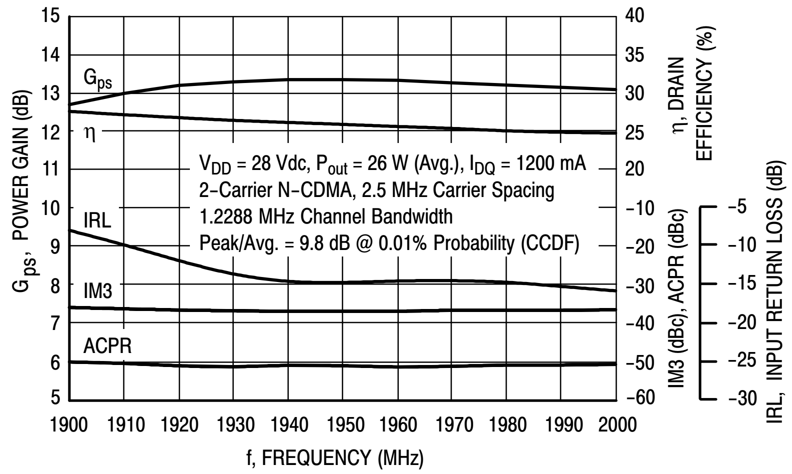


Figure 3. 2-Carrier N-CDMA Broadband Performance

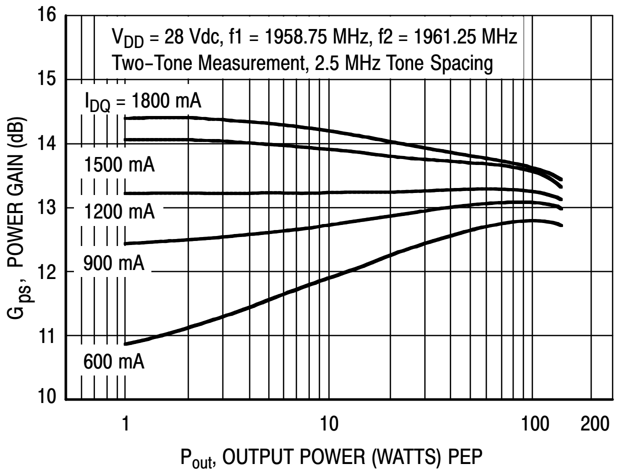


Figure 4. Two-Tone Power Gain versus Output Power

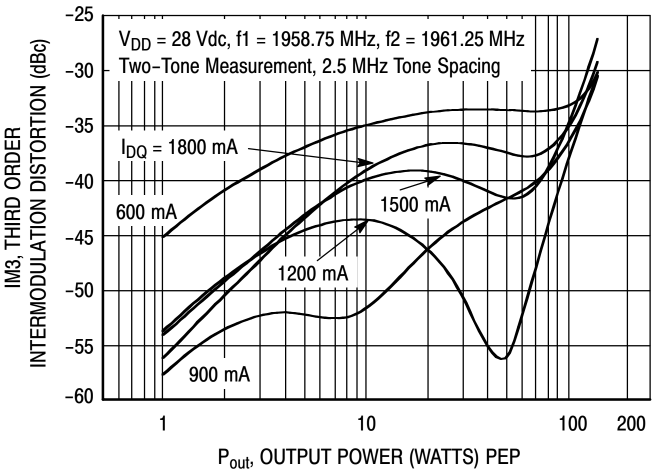


Figure 5. Third Order Intermodulation Distortion versus Output Power

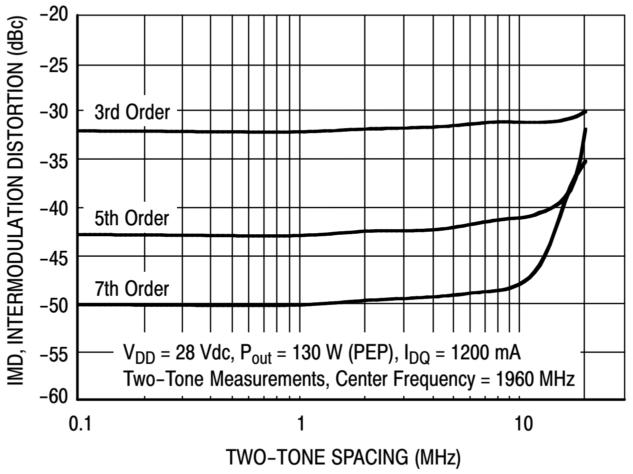


Figure 6. Intermodulation Distortion Products versus Tone Spacing

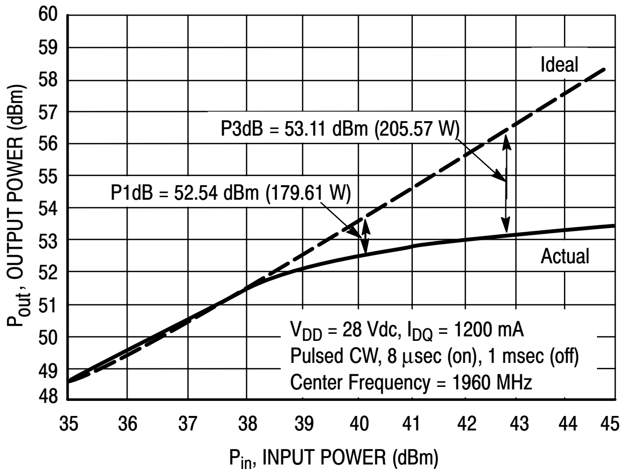


Figure 7. Pulse CW Output Power versus Input Power

TYPICAL CHARACTERISTICS

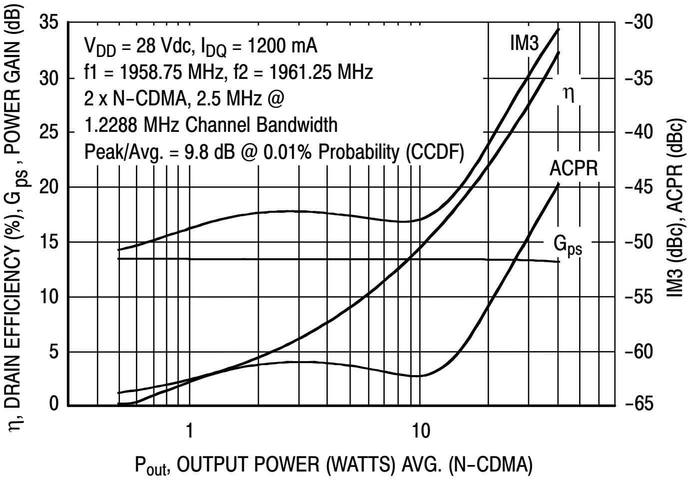


Figure 8. 2-Carrier N-CDMA ACPR, IM3, Power Gain and Drain Efficiency versus Output Power

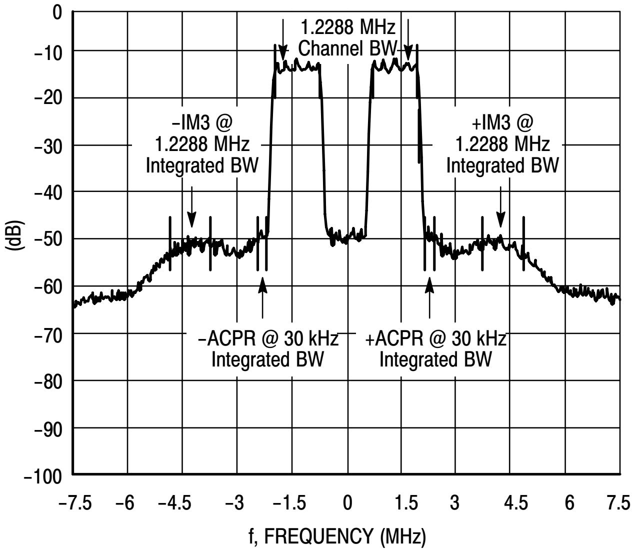
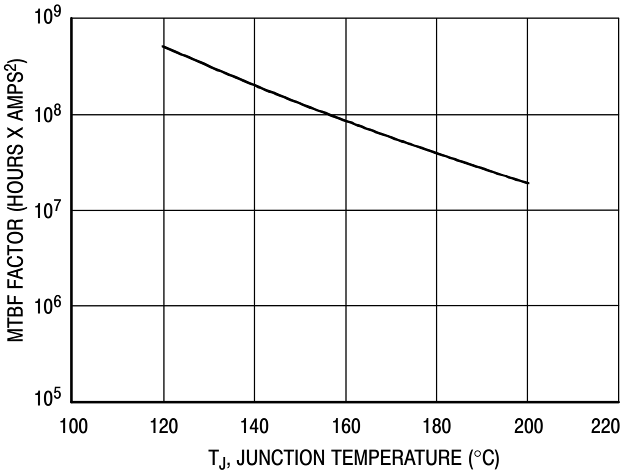
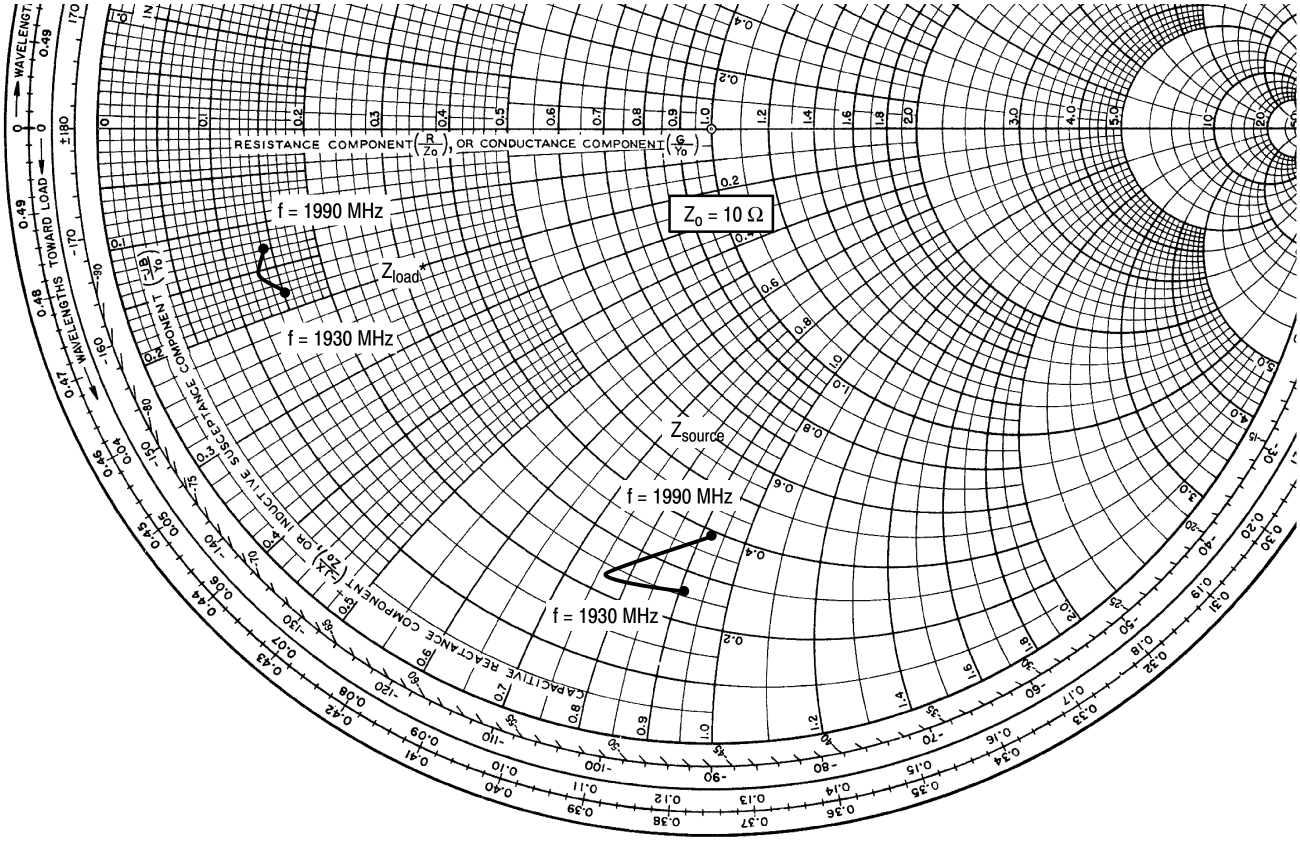


Figure 9. 2-Carrier N-CDMA Spectrum



This above graph displays calculated MTBF in hours x ampere^2 drain current. Life tests at elevated temperatures have correlated to better than ±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 V, I_{DQ} = 1.2 A, P_{out} = 26 W (2–Carrier N–CDMA)

f MHz	Z_{source} Ω	Z_{load} Ω
1930	2.57 - j9.1	1.48 - j1.8
1960	2.35 - j7.6	1.28 - j1.5
1990	3.86 - j9.2	1.42 - j1.3

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

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

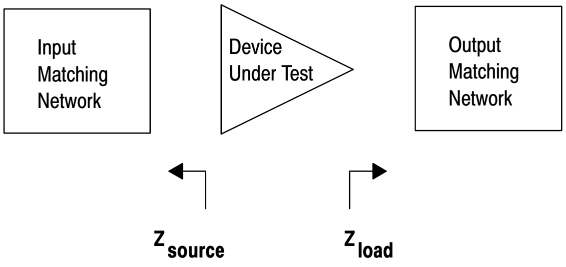


Figure 11. Series Equivalent Source and Load Impedance

NOTES

NOTES

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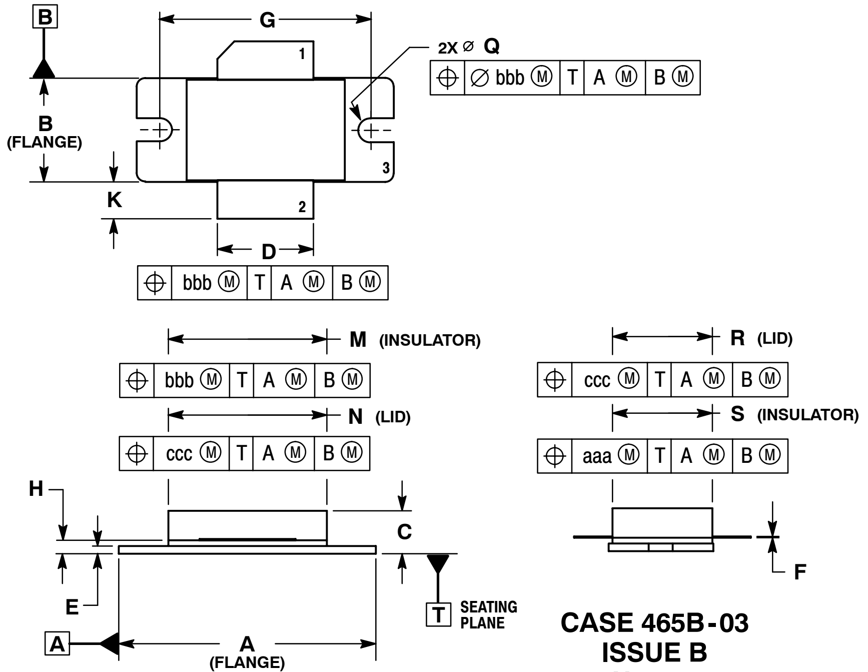
PACKAGE DIMENSIONS

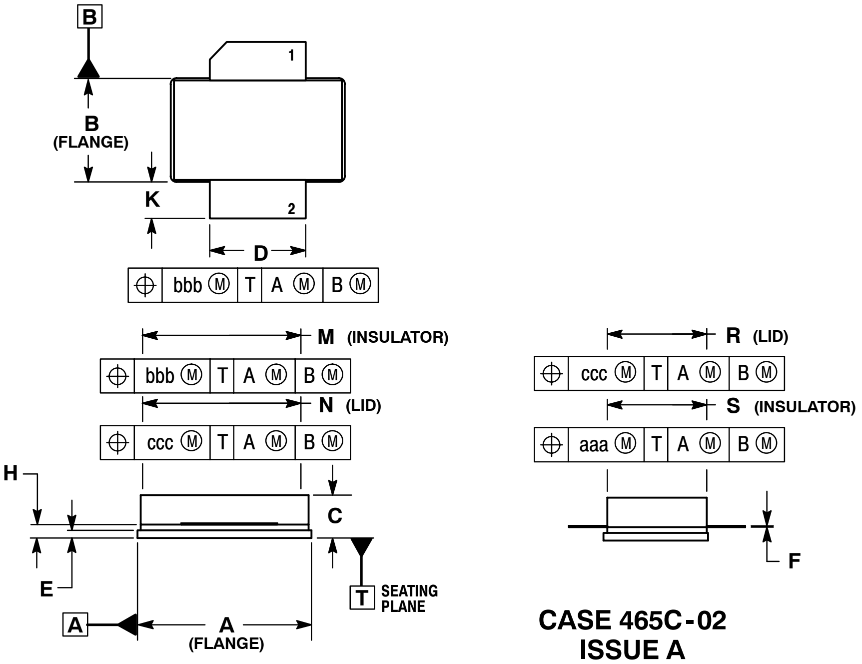


CASE 465B-03
ISSUE B
NI-880
MRF5S19130R3

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. DELETED

	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	0.170	0.210	4.32	5.33
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



CASE 465C-02
ISSUE A
NI-880S
MRF5S19130SR3

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.

	INCHES		MILLIMETERS	
DIM	MIN	MAX	MIN	MAX
A	0.905	0.915	22.99	23.24
B	0.535	0.545	13.60	13.80
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
H	0.057	0.067	1.45	1.70
K	0.170	0.210	4.32	5.33
M	0.872	0.888	22.15	22.55
N	0.871	0.889	19.30	22.60
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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Freescale Semiconductor, Inc.

ARCHIVE INFORMATION

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