Freescale Semiconductor
Technical Data

Document Number: MRF6P18190H
Rev. 2, 12/2008

√RoHS

RF Power Field Effect Transistor

N-Channel Enhancement-Mode Lateral MOSFET

MRF6P18190HR6

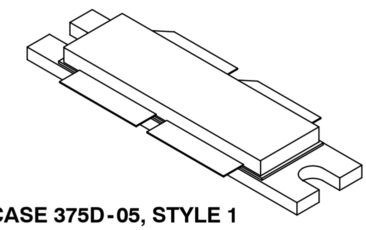
Designed for W-CDMA base station applications with frequencies from 1805 to 1880 MHz. Suitable for TDMA, CDMA and multicarrier amplifier applications. To be used in Class AB for PCN-PCS/cellular radio and WLL applications.

- Typical 2-Carrier W-CDMA Performance: V_{DD} = 28 Volts, I_{DQ} = 2000 mA, P_{out} = 44 Watts Avg., f = 1867 MHz, Channel Bandwidth = 3.84 MHz, PAR = 8.5 dB @ 0.01% Probability on CCDF.
  Power Gain — 15.9 dB
  Drain Efficiency — 27.5%
  IM3 @ 10 MHz Offset — -37 dBc in 3.84 MHz Channel Bandwidth
  ACPR @ 5 MHz Offset — -41 dBc in 3.84 MHz Channel Bandwidth
- Capable of Handling 10:1 VSWR, @ 28 Vdc, 1840 MHz, 190 Watts CW Output Power

Features

- Characterized with Series Equivalent Large-Signal Impedance Parameters
- Internally Matched for Ease of Use
- Qualified Up to a Maximum of 32 V_{DD} Operation
- Integrated ESD Protection
- Designed for Lower Memory Effects and Wide Instantaneous Bandwidth Applications
- RoHS Compliant
- In Tape and Reel. R6 Suffix = 150 Units per 56 mm, 13 inch Reel.

1805-1880 MHz, 44 W AVG., 28 V
2 x W-CDMA
LATERAL N-CHANNEL
RF POWER MOSFET



CASE 375D-05, STYLE 1
NI-1230

Table 1. Maximum Ratings

Rating	Symbol	Value	Unit
Drain-Source Voltage	V_{DSS}	-0.5, +68	Vdc
Gate-Source Voltage	V_{GS}	-0.5, +12	Vdc
Storage Temperature Range	T_{stg}	- 65 to +150	°C
Case Operating Temperature	T_C	150	°C
Operating Junction Temperature (1,2)	T_J	225	°C

Table 2. Thermal Characteristics

Characteristic	Symbol	Value (2,3)	Unit
Thermal Resistance, Junction to Case Case Temperature 80°C, 190 W CW Case Temperature 76°C, 44 W CW	$R_{\theta JC}$	 0.27 0.30	°C/W

1. Continuous use at maximum temperature will affect MTTF.
2. MTTF calculator available at http://www.freescale.com/rf. Select Software & Tools/Development Tools/Calculators to access MTTF calculators by product.
3. Refer to AN1955, *Thermal Measurement Methodology of RF Power Amplifiers.* Go to http://www.freescale.com/rf. Select Documentation/Application Notes - AN1955.

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Table 3. ESD Protection Characteristics

Test Methodology	Class
Human Body Model (per JESD22-A114)	1C (Minimum)
Machine Model (per EIA/JESD22-A115)	A (Minimum)
Charge Device Model (per JESD22-C101)	III (Minimum)

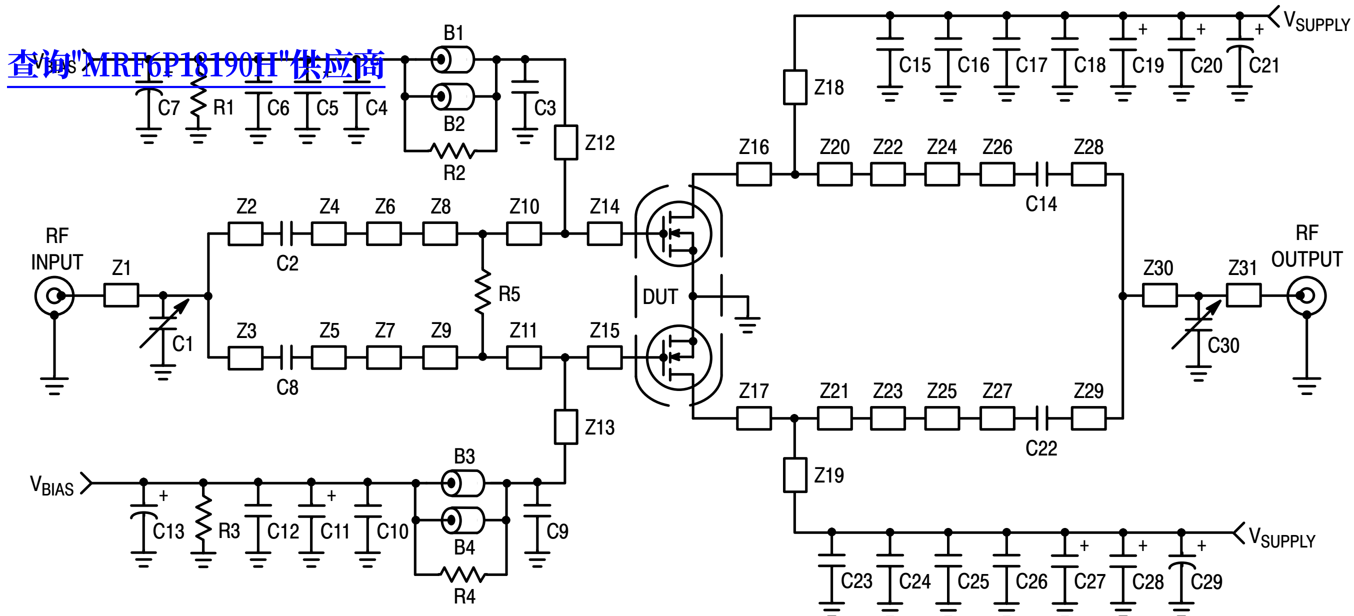
Table 4. Electrical Characteristics (T_C = 25°C unless otherwise noted)

Characteristic	Symbol	Min	Typ	Max	Unit
Off Characteristics (1)					
Zero Gate Voltage Drain Leakage Current (V_{DS} = 68 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 (1) (V_{DS} = 10 Vdc, I_D = 250 μAdc)	$V_{GS(th)}$	1	2	3	Vdc
Gate Quiescent Voltage (3) (V_{DD} = 28 Vdc, I_D = 2000 mAdc, Measured in Functional Test)	$V_{GS(Q)}$	2	2.8	4	Vdc
Drain-Source On-Voltage (1) (V_{GS} = 10 Vdc, I_D = 2.2 Adc)	$V_{DS(on)}$	—	0.21	—	Vdc
Dynamic Characteristics (2,3)					
Reverse Transfer Capacitance (V_{DS} = 28 Vdc ± 30 mV(rms)ac @ 1 MHz, V_{GS} = 0 Vdc)	C_{rss}	—	1.5	—	pF

Functional Tests (3) (In Freescale Test Fixture, 50 ohm system) V_{DD} = 28 Vdc, I_{DQ} = 2000 mA, P_{out} = 44 W Avg., f = 1867 MHz, 2-Carrier W-CDMA, 3.84 MHz Channel Bandwidth Carriers. ACPR measured in 3.84 MHz Channel Bandwidth @ ±5 MHz Offset. IM3 measured in 3.84 MHz Bandwidth @ ±10 MHz Offset. PAR = 8.5 dB @ 0.01% Probability on CCDF.

Characteristic	Symbol	Min	Typ	Max	Unit
Power Gain	G_{ps}	14.5	15.9	17.5	dB
Drain Efficiency	η_D	25.5	27.5	—	%
Intermodulation Distortion	IM3	—	-37	-35	dBc
Adjacent Channel Power Ratio	ACPR	—	-41	-38	dBc
Input Return Loss	IRL	—	-12	-9	dB

1. Each side of device measured separately.
2. Part internally matched both on input and output.
3. Measurement made with device in push-pull configuration.



Z1	0.700″ x 0.067″ Microstrip	Z18, Z19	0.477″ x 0.136″ Microstrip
Z2	1.140″ x 0.114″ Microstrip	Z20, Z21	0.289″ x 0.856″ Microstrip
Z3	2.112″ x 0.067″ Microstrip	Z22, Z23	0.215″ x 0.385″ Microstrip
Z4, Z5	0.174″ x 0.067″ Microstrip	Z24, Z25	0.118″ x 0.259″ Microstrip
Z6, Z7	0.382″ x 0.250″ Microstrip	Z26, Z27	0.108″ x 0.067″ Microstrip
Z8, Z9	0.036″ x 0.764″ Microstrip	Z28	2.163″ x 0.067″ Microstrip
Z10, Z11	0.178″ x 0.764″ Microstrip	Z29	1.397″ x 0.114″ Microstrip
Z12, Z13	0.689″ x 0.073″ Microstrip	Z30	0.492″ x 0.067″ Microstrip
Z14, Z15	0.111″ x 0.764″ Microstrip	Z31	0.207″ x 0.067″ Microstrip
Z16, Z17	0.124″ x 0.856″ Microstrip	PCB	Taconic RF-35, 0.030″, ε_r = 3.5

Figure 1. MRF6P18190H Test Circuit Schematic

Table 5. MRF6P18190H Test Circuit Component Designations and Values

Part	Description	Part Number	Manufacturer
B1, B2, B3, B4	Short RF Beads	2743019447	Fair-Rite
C1	0.6-4.5 pF Variable Capacitor	27271SL	Johanson Components
C2, C8, C14, C22	5.6 pF Chip Capacitors	ATC100B5R6CT500XT	ATC
C3, C9	7.5 pF Chip Capacitors	ATC100B7R5CT500XT	ATC
C4, C10, C18, C26	1K pF Chip Capacitors	ATC100B102JT50XT	ATC
C5, C11	1 μF, 50 V Tantalum Capacitors	T491C105K050AT	Kemet
C6, C12, C17, C25	0.1 μF Chip Capacitors	CDR33BX104AKTS	Kemet
C7, C13	100 μF, 50 V Electrolytic Capacitors, Radial	EEEFK1H101P	Panasonic
C15, C23	6.8 pF Chip Capacitors	ATC100B6R8GT500XT	ATC
C16, C24	0.56 μF Chip Capacitors	C1825C564J5RAC	Kemet
C19, C20, C27, C28	22 μF, 35 V Tantalum Capacitors	T491X226K035AT	Kemet
C21, C29	470 μF, 63 V Electrolytic Capacitors, Radial	477KXM063M	Illinois Capacitor
C30	0.4-2.5 pF Variable Capacitor	27283PC	Johanson Components
R1, R3	1 kΩ, 1/4 W Chip Resistors	CRCW12061001FKEA	Vishay
R2, R4	12 Ω, 1/4 W Chip Resistors	CRCW120612R0FKEA	Vishay
R5	560 Ω, 1/4 W Chip Resistor	CRCW12065600FKEA	Vishay

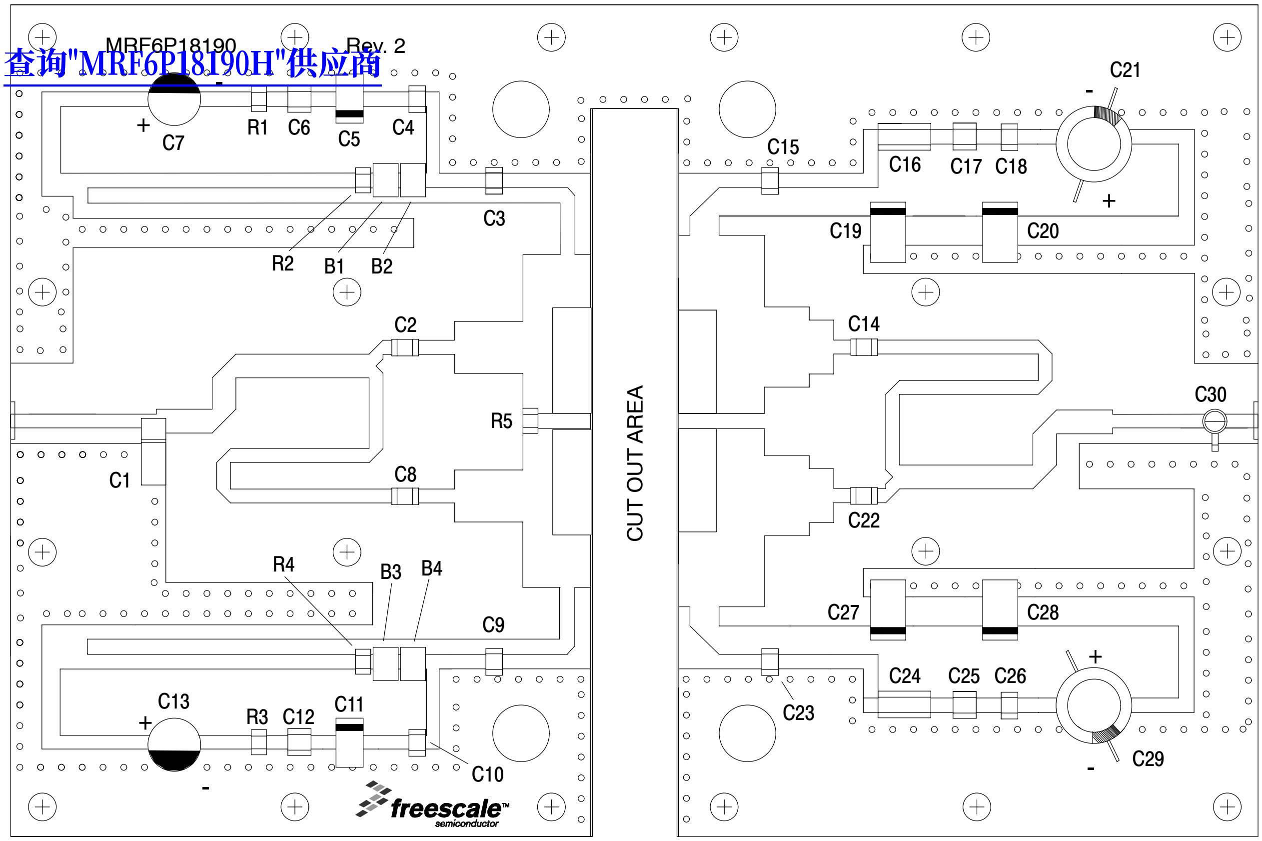


Figure 2. MRF6P18190H Test Circuit Component Layout

查询"MRF6P18190H"供应商

TYPICAL CHARACTERISTICS

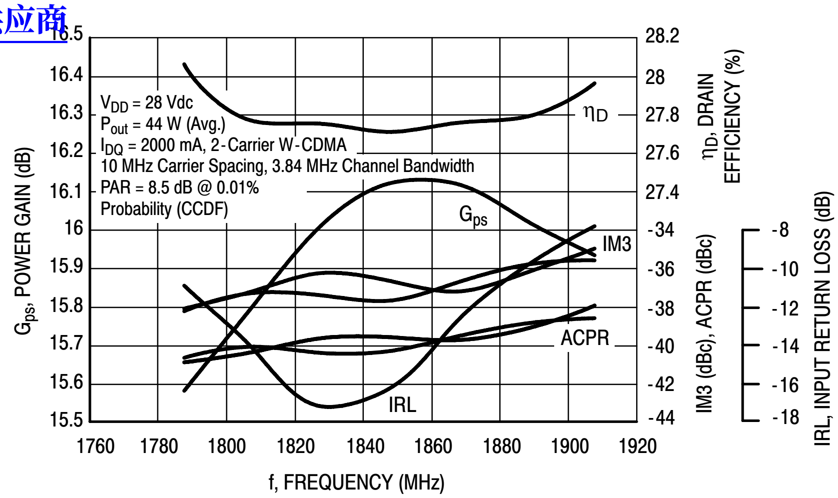


Figure 3. 2-Carrier W-CDMA Broadband Performance @ P_{out} = 44 Watts

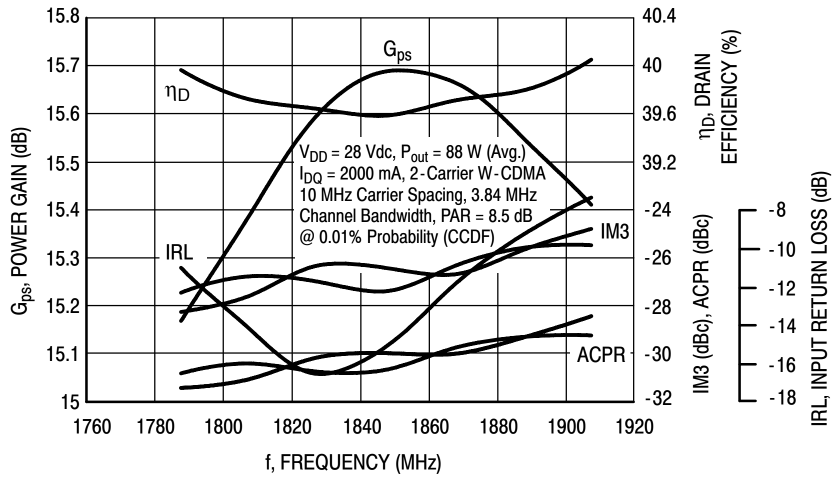


Figure 4. 2-Carrier W-CDMA Broadband Performance @ P_{out} = 88 Watts

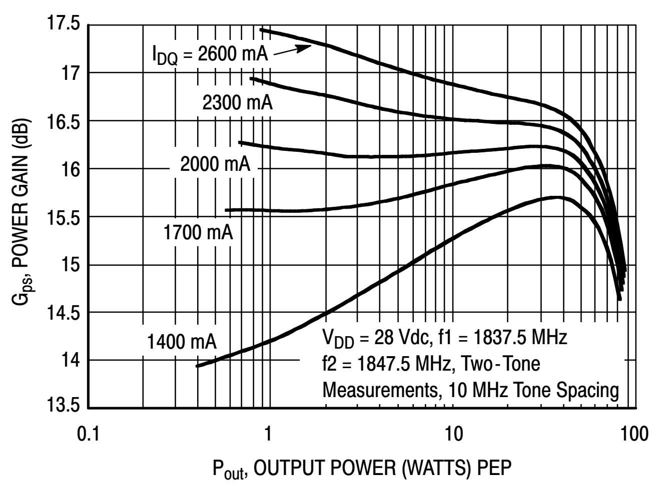


Figure 5. Two-Tone Power Gain versus Output Power

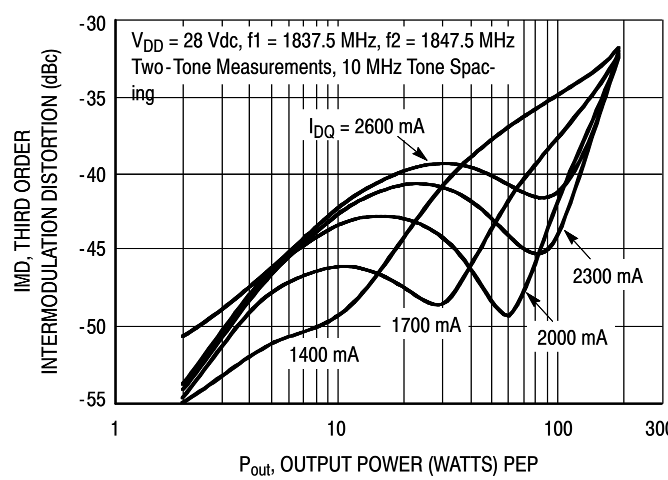


Figure 6. Third Order Intermodulation Distortion versus Output Power

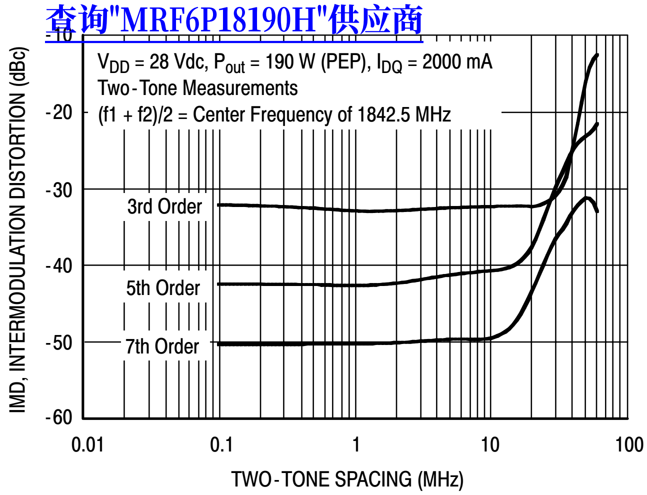


Figure 7. Intermodulation Distortion Products versus Tone Spacing

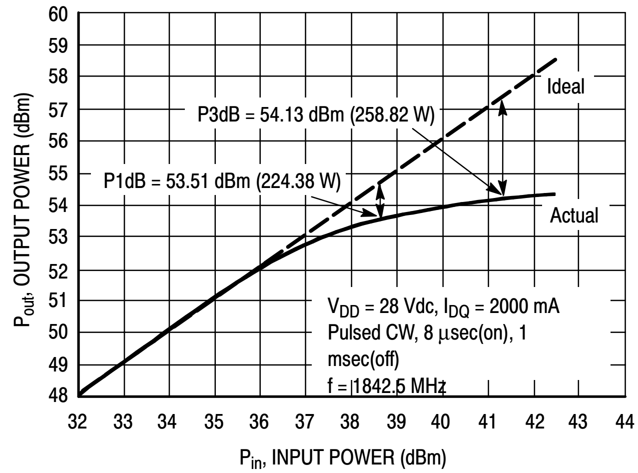


Figure 8. Pulsed CW Output Power versus Input Power

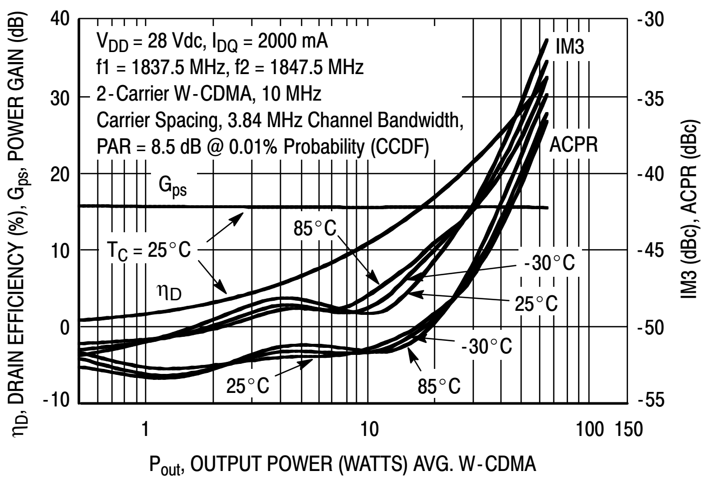


Figure 9. 2-Carrier W-CDMA ACPR, IM3, Power Gain and Drain Efficiency versus Output Power

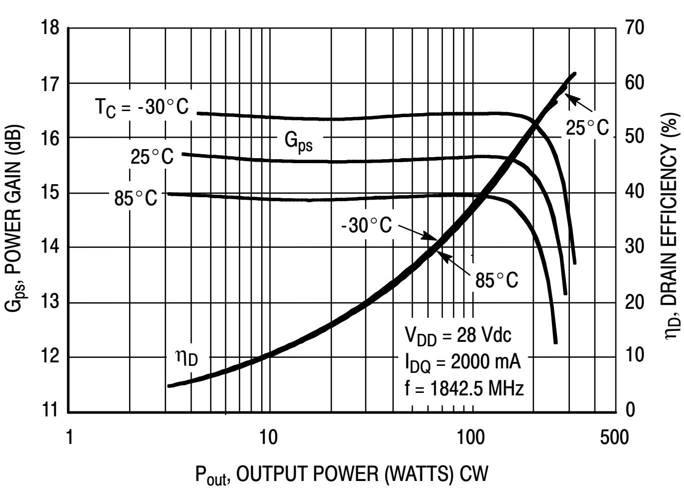


Figure 10. Power Gain and Drain Efficiency versus CW Output Power

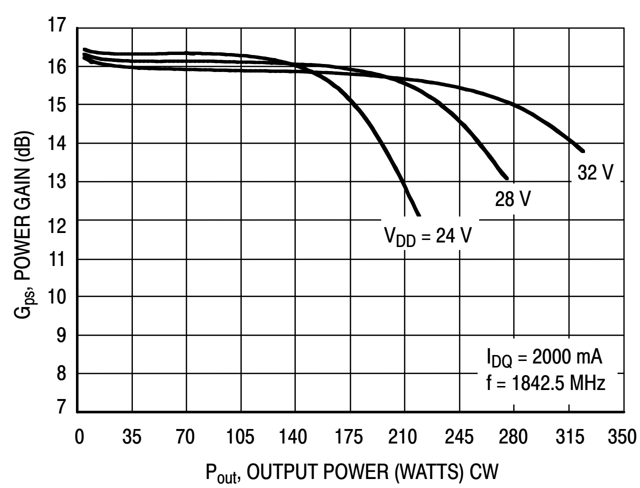
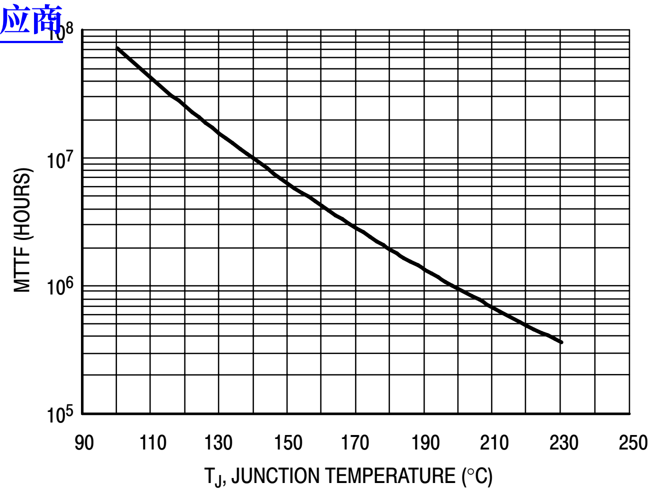


Figure 11. Power Gain versus Output Power

TYPICAL CHARACTERISTICS



This above graph displays calculated MTTF in hours when the device is operated at V_{DD} = 28 Vdc, P_{out} = 44 W Avg., and η_D = 27.5%.

MTTF calculator available at http://www.freescale.com/rf. Select Software & Tools/Development Tools/Calculators to access MTTF calculators by product.

Figure 12. MTTF versus Junction Temperature

W-CDMA TEST SIGNAL

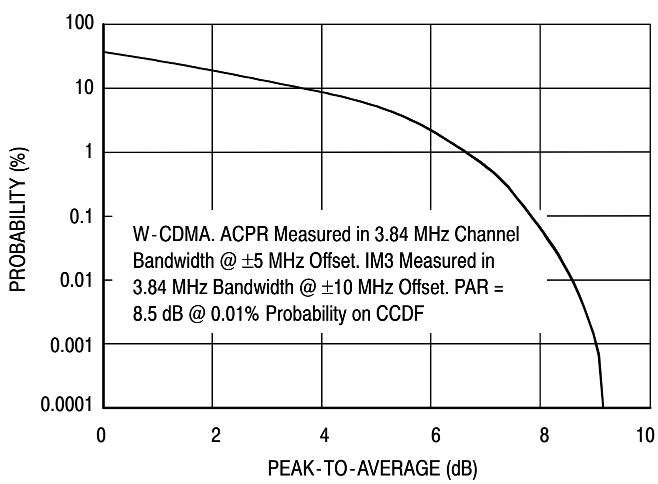


Figure 13. CCDF W-CDMA 3GPP, Test Model 1, 64 DPCH, 67% Clipping, Single-Carrier Test Signal

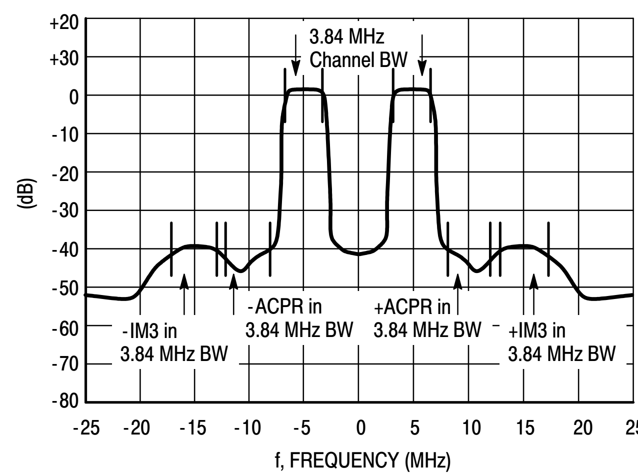
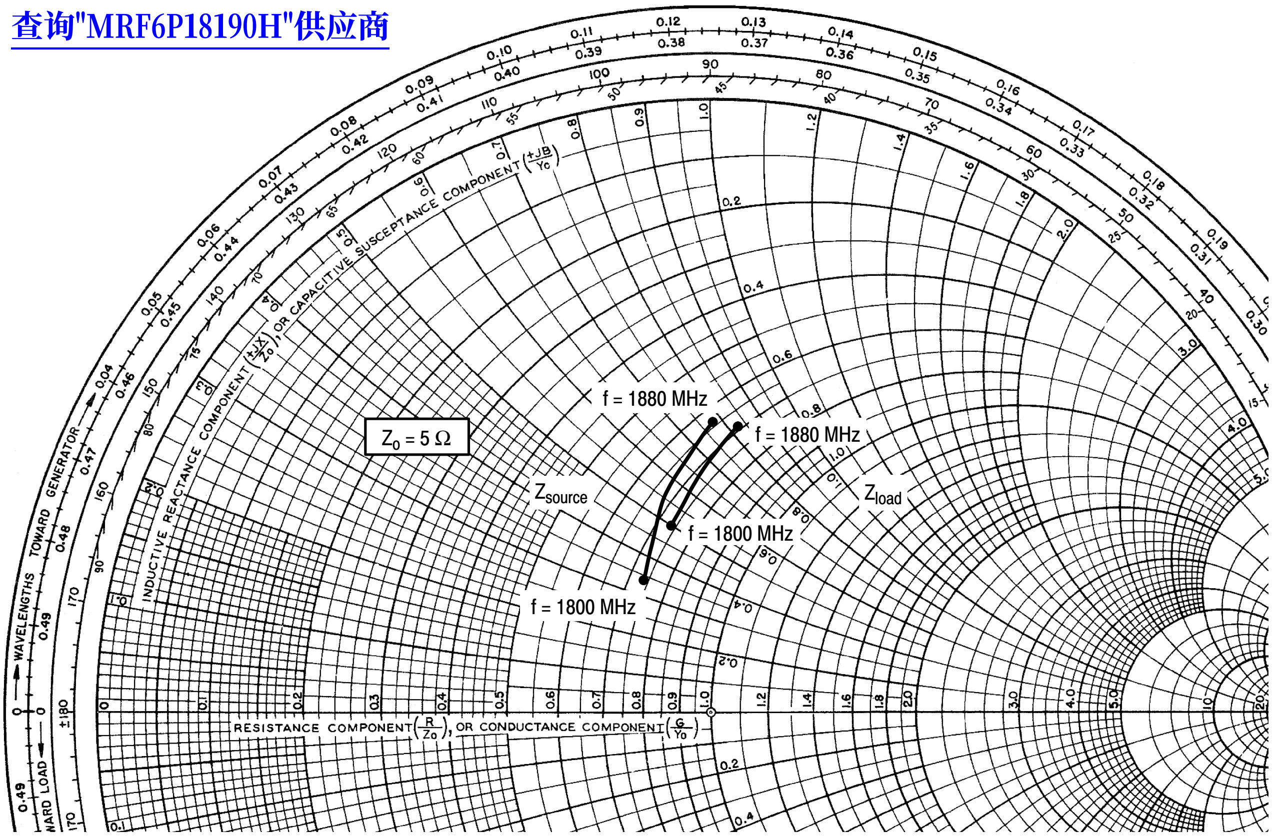


Figure 14. 2-Carrier W-CDMA Spectrum



V_{DD} = 28 Vdc, I_{DQ} = 2000 mA, P_{out} = 44 W Avg.

f MHz	Z_{source} Ω	Z_{load} Ω
1800	3.70 + j1.71	3.70 + j2.49
1840	3.40 + j2.75	3.55 + j3.29
1880	3.19 + j3.88	3.45 + j4.12

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

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

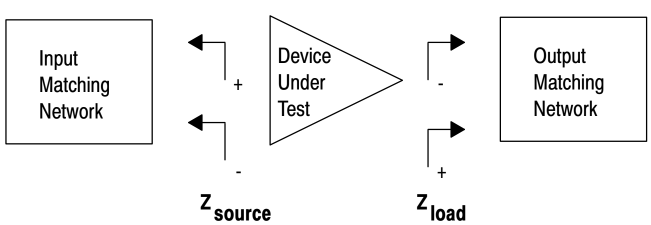
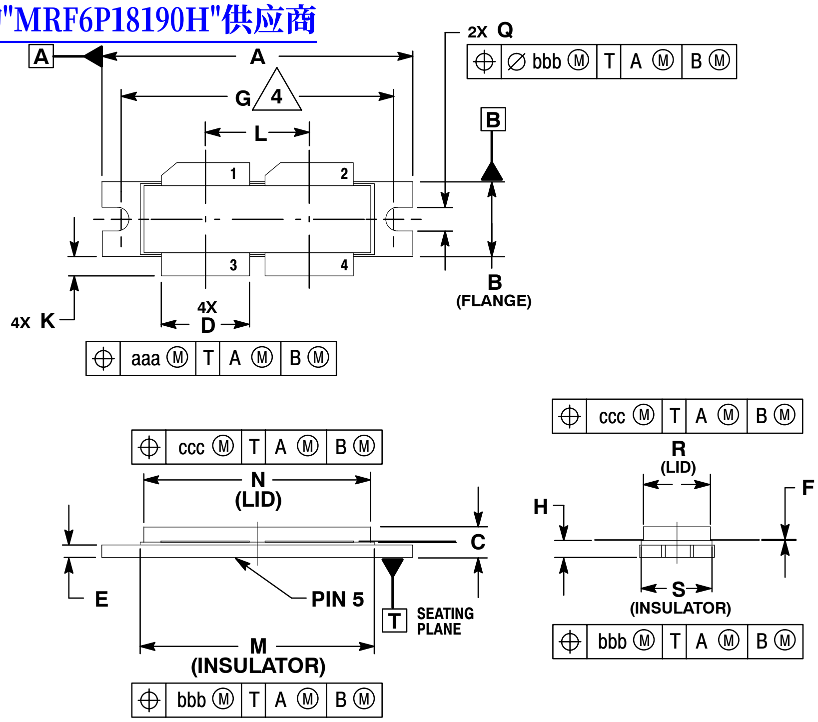


Figure 15. Series Equivalent Source and Load Impedance

PACKAGE DIMENSIONS



NOTES:
1. INTERPRET DIMENSIONS AND TOLERANCES PER ASME Y14.5M-1994.
2. CONTROLLING DIMENSION: INCH.
3. DIMENSION H IS MEASURED 0.030 (0.762) AWAY FROM PACKAGE BODY.
4. RECOMMENDED BOLT CENTER DIMENSION OF 1.52 (38.61) BASED ON M3 SCREW.

	INCHES		MILLIMETERS	
DIM	MIN	MAX	MIN	MAX
A	1.615	1.625	41.02	41.28
B	0.395	0.405	10.03	10.29
C	0.150	0.200	3.81	5.08
D	0.455	0.465	11.56	11.81
E	0.062	0.066	1.57	1.68
F	0.004	0.007	0.10	0.18
G	1.400 BSC		35.56 BSC	
H	0.082	0.090	2.08	2.29
K	0.117	0.137	2.97	3.48
L	0.540 BSC		13.72 BSC	
M	1.219	1.241	30.96	31.52
N	1.218	1.242	30.94	31.55
Q	0.120	0.130	3.05	3.30
R	0.355	0.365	9.01	9.27
S	0.365	0.375	9.27	9.53
aaa	0.013 REF		0.33 REF	
bbb	0.010 REF		0.25 REF	
ccc	0.020 REF		0.51 REF	

STYLE 1:
PIN 1. DRAIN
2. DRAIN
3. GATE
4. GATE
5. SOURCE

CASE 375D-05
ISSUE E
NI-1230

PRODUCT DOCUMENTATION

Refer to the following documents to aid your design process.

Application Notes

- AN1955: Thermal Measurement Methodology of RF Power Amplifiers

Engineering Bulletins

- EB212: Using Data Sheet Impedances for RF LDMOS Devices

REVISION HISTORY

The following table summarizes revisions to this document.

Revision	Date	Description
2	Dec. 2008	• Modified data sheet to reflect RF Test Reduction described in Product and Process Change Notification number, PCN13232, p. 1, 2 • Removed Lower Thermal Resistance and Low Gold Plating bullets from Features section as functionality is standard, p. 1 • Removed Total Device Dissipation from Max Ratings table as data was redundant (information already provided in Thermal Characteristics table), p. 1 • Operating Junction Temperature increased from 200° to 225°C in Maximum Ratings table and related "Continuous use of maximum temperature will affect MTTF" footnote added, p. 1 • Corrected V_{DS} to V_{DD} in the RF test condition voltage callout for $V_{GS(Q)}$, On Characteristics table, p. 2 • Removed Forward Transconductance from On Characteristics table as it no longer provided usable information, p. 2 • Updated Part Numbers in Table 5, Component Designations and Values, to latest RoHS compliant part numbers, p. 3 • Removed lower voltage test from Fig. 11, Power Gain versus Output Power, due to fixed tuned fixture limitations, p. 6 • Replaced Fig. 12, MTTF versus Junction Temperature with updated graph. Removed $Amps^2$ and listed operating characteristics and location of MTTF calculator for device, p. 7 • Updated Z_{source} and Z_{load} definitions, Fig. 15, Series Equivalent Source and Load Impedance, p. 8 • Added Product Documentation and Revision History, p. 10

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