

# RF Power Field Effect Transistors

## N-Channel Enhancement-Mode Lateral MOSFETs

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

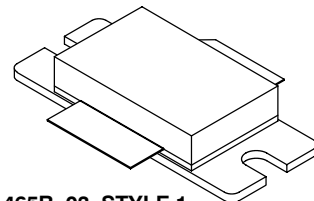
- Typical Single-Carrier W-CDMA Performance:  $V_{DD} = 28$  Volts,  $I_{DQ} = 1400$  mA,  $P_{out} = 50$  Watts Avg.,  $f = 1807.5$  MHz, IQ Magnitude Clipping, Channel Bandwidth = 3.84 MHz, Input Signal PAR = 7.5 dB @ 0.01% Probability on CCDF.  
Power Gain — 17.5 dB  
Drain Efficiency — 31%  
Device Output Signal PAR — 6.2 dB @ 0.01% Probability on CCDF  
ACPR @ 5 MHz Offset — -37 dBc in 3.84 MHz Channel Bandwidth
- Capable of Handling 5:1 VSWR, @ 32 Vdc, 1840 MHz, 170 Watts CW Output Power
- $P_{out}$  @ 1 dB Compression Point  $\approx 170$  Watts CW

### Features

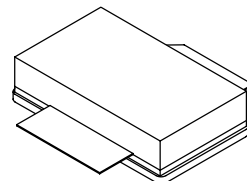
- 100% PAR Tested for Guaranteed Output Power Capability
- Characterized with Series Equivalent Large-Signal Impedance Parameters
- Internally Matched for Ease of Use
- Integrated ESD Protection
- Greater Negative Gate-Source Voltage Range for Improved Class C Operation
- Designed for Digital Predistortion Error Correction Systems
- RoHS Compliant
- In Tape and Reel. R3 Suffix = 250 Units, 56 mm Tape Width, 13 inch Reel. For R5 Tape and Reel option, see p. 17.

**MRF7S18170HR3**  
**MRF7S18170HSR3**

**1805-1880 MHz, 50 W AVG., 28 V**  
**SINGLE W-CDMA**  
**LATERAL N-CHANNEL**  
**RF POWER MOSFETs**



**CASE 465B-03, STYLE 1**  
**NI-880**  
**MRF7S18170HR3**



**CASE 465C-02, STYLE 1**  
**NI-880S**  
**MRF7S18170HSR3**

**Table 1. Maximum Ratings**

| Rating                               | Symbol    | Value       | Unit |
|--------------------------------------|-----------|-------------|------|
| Drain-Source Voltage                 | $V_{DSS}$ | -0.5, +65   | Vdc  |
| Gate-Source Voltage                  | $V_{GS}$  | -6.0, +10   | Vdc  |
| Operating Voltage                    | $V_{DD}$  | 32, +0      | 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 | $R_{\theta JC}$ |             | °C/W |
| Case Temperature 84°C, 170 W CW      |                 | 0.27        |      |
| Case Temperature 79°C, 50 W CW       |                 | 0.30        |      |

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.

**Table 3. ESD Protection Characteristics**

| Test Methodology                      | Class        |
|---------------------------------------|--------------|
| Human Body Model (per JESD22-A114)    | IA (Minimum) |
| Machine Model (per EIA/JESD22-A115)   | B (Minimum)  |
| Charge Device Model (per JESD22-C101) | IV (Minimum) |

**Table 4. Electrical Characteristics** ( $T_A = 25^\circ\text{C}$  unless otherwise noted)

| Characteristic | Symbol | Min | Typ | Max | Unit |
|----------------|--------|-----|-----|-----|------|
|----------------|--------|-----|-----|-----|------|

**Off Characteristics**

|                                                                                                   |           |   |   |    |                 |
|---------------------------------------------------------------------------------------------------|-----------|---|---|----|-----------------|
| Zero Gate Voltage Drain Leakage Current<br>( $V_{DS} = 65\text{ Vdc}$ , $V_{GS} = 0\text{ Vdc}$ ) | $I_{DSS}$ | — | — | 10 | $\mu\text{Adc}$ |
| Zero Gate Voltage Drain Leakage Current<br>( $V_{DS} = 28\text{ Vdc}$ , $V_{GS} = 0\text{ Vdc}$ ) | $I_{DSS}$ | — | — | 1  | $\mu\text{Adc}$ |
| Gate-Source Leakage Current<br>( $V_{GS} = 5\text{ Vdc}$ , $V_{DS} = 0\text{ Vdc}$ )              | $I_{GSS}$ | — | — | 1  | $\mu\text{Adc}$ |

**On Characteristics**

|                                                                                                                            |              |     |      |     |     |
|----------------------------------------------------------------------------------------------------------------------------|--------------|-----|------|-----|-----|
| Gate Threshold Voltage<br>( $V_{DS} = 10\text{ Vdc}$ , $I_D = 372\text{ }\mu\text{Adc}$ )                                  | $V_{GS(th)}$ | 1.2 | 2    | 2.7 | Vdc |
| Gate Quiescent Voltage<br>( $V_{DS} = 28\text{ Vdc}$ , $I_D = 1400\text{ mAdc}$ )                                          | $V_{GS(Q)}$  | —   | 2.7  | —   | Vdc |
| Fixture Gate Quiescent Voltage (1)<br>( $V_{DD} = 28\text{ Vdc}$ , $I_D = 1400\text{ mAdc}$ , Measured in Functional Test) | $V_{GG(Q)}$  | 4   | 5.4  | 7.6 | Vdc |
| Drain-Source On-Voltage<br>( $V_{GS} = 10\text{ Vdc}$ , $I_D = 3.72\text{ Adc}$ )                                          | $V_{DS(on)}$ | 0.1 | 0.15 | 0.3 | Vdc |

**Dynamic Characteristics (2)**

|                                                                                                                       |           |   |      |   |    |
|-----------------------------------------------------------------------------------------------------------------------|-----------|---|------|---|----|
| Reverse Transfer Capacitance<br>( $V_{DS} = 28\text{ Vdc} \pm 30\text{ mV(rms)ac}$ @ 1 MHz, $V_{GS} = 0\text{ Vdc}$ ) | $C_{rss}$ | — | 0.87 | — | pF |
| Output Capacitance<br>( $V_{DS} = 28\text{ Vdc} \pm 30\text{ mV(rms)ac}$ @ 1 MHz, $V_{GS} = 0\text{ Vdc}$ )           | $C_{oss}$ | — | 703  | — | pF |

**Functional Tests** (In Freescale Test Fixture, 50 ohm system)  $V_{DD} = 28\text{ Vdc}$ ,  $I_{DQ} = 1400\text{ mA}$ ,  $P_{out} = 50\text{ W Avg.}$ ,  $f = 1807.5\text{ MHz}$ , Single-Carrier W-CDMA, IQ Magnitude Clipping, PAR = 7.5 dB @ 0.01% Probability on CCDF. ACPR measured in 3.84 MHz Channel Bandwidth @  $\pm 5\text{ MHz}$  Offset.

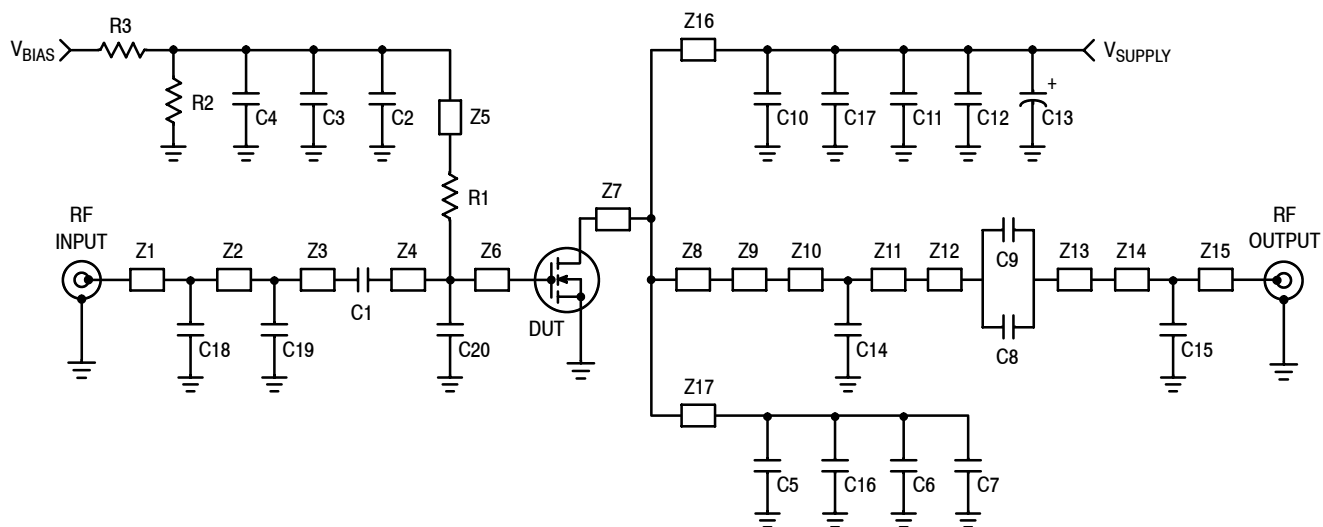
|                                                                                             |          |            |            |        |     |
|---------------------------------------------------------------------------------------------|----------|------------|------------|--------|-----|
| Power Gain                                                                                  | $G_{ps}$ | 16         | 17.5       | 19     | dB  |
| Drain Efficiency                                                                            | $\eta_D$ | 29         | 31         | —      | %   |
| Output Peak-to-Average Ratio @ 0.01% Probability on CCDF<br>MRF7S18170HR3<br>MRF7S18170HSR3 | PAR      | 5.8<br>5.7 | 6.2<br>6.2 | —<br>— | dB  |
| Adjacent Channel Power Ratio                                                                | ACPR     | —          | -37        | -35    | dBc |
| Input Return Loss                                                                           | IRL      | —          | -15        | -9     | dB  |

1.  $V_{GG} = 2 \times V_{GS(Q)}$ . Parameter measured on Freescale Test Fixture, due to resistive divider network on the board. Refer to Test Circuit schematic.
2. Part internally matched both on input and output.

(continued)

**Table 4. Electrical Characteristics** ( $T_A = 25^\circ\text{C}$  unless otherwise noted) (continued)

| Characteristic                                                                                                                                                                                                  | Symbol           | Min | Typ   | Max | Unit  |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------|-----|-------|-----|-------|
| <b>Typical Performances</b> (In Freescale Test Fixture, 50 ohm system) $V_{DD} = 28\text{ Vdc}$ , $I_{DQ} = 1400\text{ mA}$ , 1805–1880 MHz Bandwidth                                                           |                  |     |       |     |       |
| Video Bandwidth @ 170 W PEP $P_{out}$ where $IM3 = -30\text{ dBc}$<br>(Tone Spacing from 100 kHz to VBW)<br>$\Delta IMD3 = IMD3 @ \text{VBW frequency} - IMD3 @ 100\text{ kHz} < 1\text{ dBc}$ (both sidebands) | VBW              | —   | 25    | —   | MHz   |
| Gain Flatness in 75 MHz Bandwidth @ $P_{out} = 50\text{ W Avg.}$                                                                                                                                                | $G_F$            | —   | 0.4   | —   | dB    |
| Average Deviation from Linear Phase in 75 MHz Bandwidth<br>@ $P_{out} = 170\text{ W CW}$                                                                                                                        | $\Phi$           | —   | 2.5   | —   | °     |
| Average Group Delay @ $P_{out} = 170\text{ W CW}$ , $f = 1840\text{ MHz}$                                                                                                                                       | Delay            | —   | 4.2   | —   | ns    |
| Part-to-Part Insertion Phase Variation @ $P_{out} = 170\text{ W CW}$ ,<br>$f = 1840\text{ MHz}$ , Six Sigma Window                                                                                              | $\Delta\Phi$     | —   | 15    | —   | °     |
| Gain Variation over Temperature<br>( $-30^\circ\text{C}$ to $+85^\circ\text{C}$ )                                                                                                                               | $\Delta G$       | —   | 0.015 | —   | dB/°C |
| Output Power Variation over Temperature<br>( $-30^\circ\text{C}$ to $+85^\circ\text{C}$ )                                                                                                                       | $\Delta P_{1dB}$ | —   | 0.01  | —   | dB/°C |

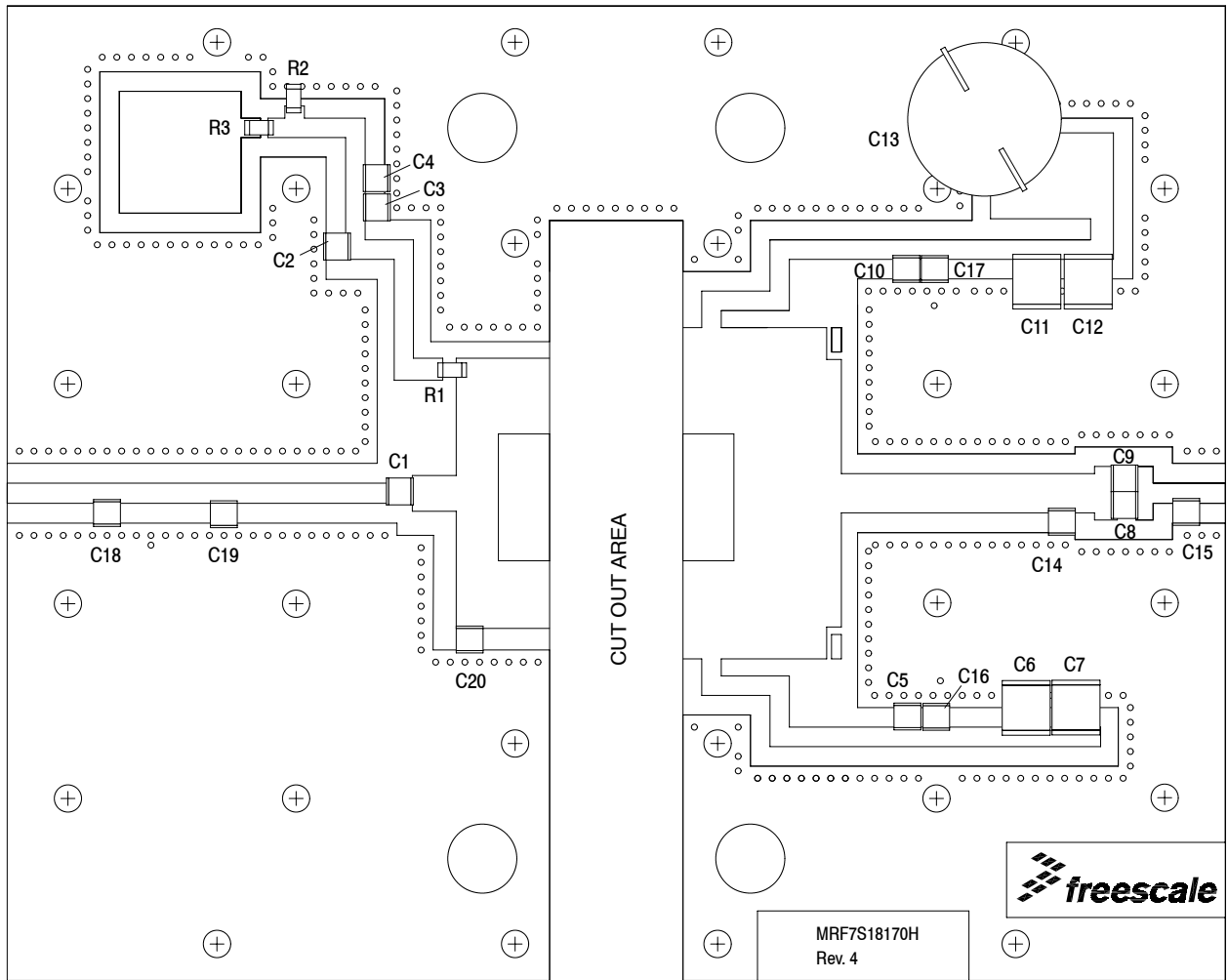


|                       |                            |          |                                                |
|-----------------------|----------------------------|----------|------------------------------------------------|
| Z1                    | 0.410" x 0.083" Microstrip | Z10*     | 0.900" x 0.161" Microstrip                     |
| Z2*                   | 0.480" x 0.083" Microstrip | Z11*     | 0.140" x 0.161" Microstrip                     |
| Z3*                   | 0.710" x 0.083" Microstrip | Z12      | 0.094" x 0.220" Microstrip                     |
| Z4                    | 0.180" x 0.147" Microstrip | Z13      | 0.070" x 0.220" Microstrip                     |
| Z5                    | 0.850" x 0.091" Microstrip | Z14*     | 0.140" x 0.083" Microstrip                     |
| Z6                    | 0.383" x 1.109" Microstrip | Z15*     | 0.160" x 0.083" Microstrip                     |
| Z7                    | 0.120" x 1.360" Microstrip | Z16, Z17 | 1.120" x 0.080" Microstrip                     |
| Z8                    | 0.480" x 1.360" Microstrip | PCB      | Taconic TLX8-0300, 0.030", $\epsilon_r = 2.55$ |
| Z9                    | 0.060" x 1.098" Microstrip |          |                                                |
| * Variable for tuning |                            |          |                                                |

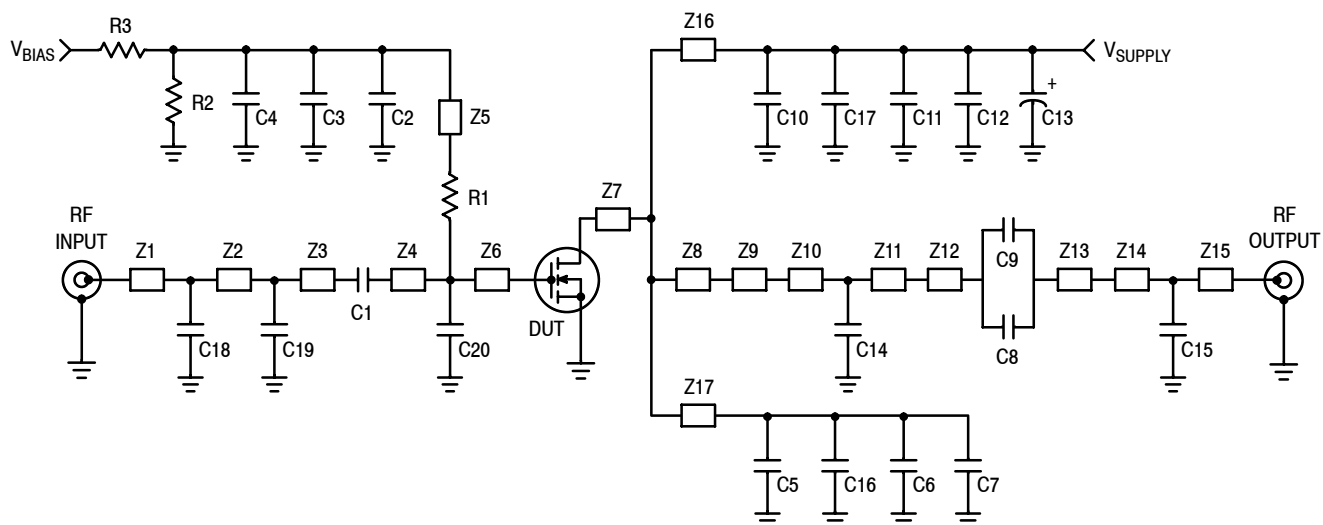
**Figure 1. MRF7S18170HR3 Test Circuit Schematic — NI-880**

**Table 5. MRF7S18170HR3 Test Circuit Component Designations and Values — NI-880**

| Part             | Description                                      | Part Number       | Manufacturer       |
|------------------|--------------------------------------------------|-------------------|--------------------|
| C1               | 0.8 pF Chip Capacitor                            | ATC100B0R8BT500XT | ATC                |
| C2, C8, C9       | 6.8 pF Chip Capacitors                           | ATC100B6R8BT500XT | ATC                |
| C3               | 100 pF Chip Capacitor                            | ATC100B101JT500XT | ATC                |
| C4               | 100 nF Chip Capacitor                            | ATC100B104JT500XT | ATC                |
| C5, C10          | 5.6 pF Chip Capacitors                           | ATC100B5R6BT500XT | ATC                |
| C6, C7, C11, C12 | 10 $\mu$ F Chip Capacitors                       | C5750X5R1H106MT   | TDK                |
| C13              | 470 $\mu$ F, 63 V Electrolytic Capacitor, Radial | 477KXM063M        | Illinois Capacitor |
| C14              | 0.5 pF Chip Capacitor                            | ATC100B0R5BT500XT | ATC                |
| C15, C20         | 0.2 pF Chip Capacitors                           | ATC100B0R2BT500XT | ATC                |
| C16, C17         | 4.7 pF Chip Capacitors                           | ATC100B4R7BT500XT | ATC                |
| C18              | 2 pF Chip Capacitor                              | ATC100B2R0BT500XT | ATC                |
| C19              | 0.3 pF Chip Capacitor                            | ATC100B0R3BT500XT | ATC                |
| R1               | 10 $\Omega$ , 1/4 W Chip Resistor                | CRCW120610R0FKEA  | Vishay             |
| R2, R3           | 10 k $\Omega$ , 1/4 W Chip Resistors             | CRCW12061002FKEA  | Vishay             |



**Figure 2. MRF7S18170HR3 Test Circuit Component Layout — NI-880**

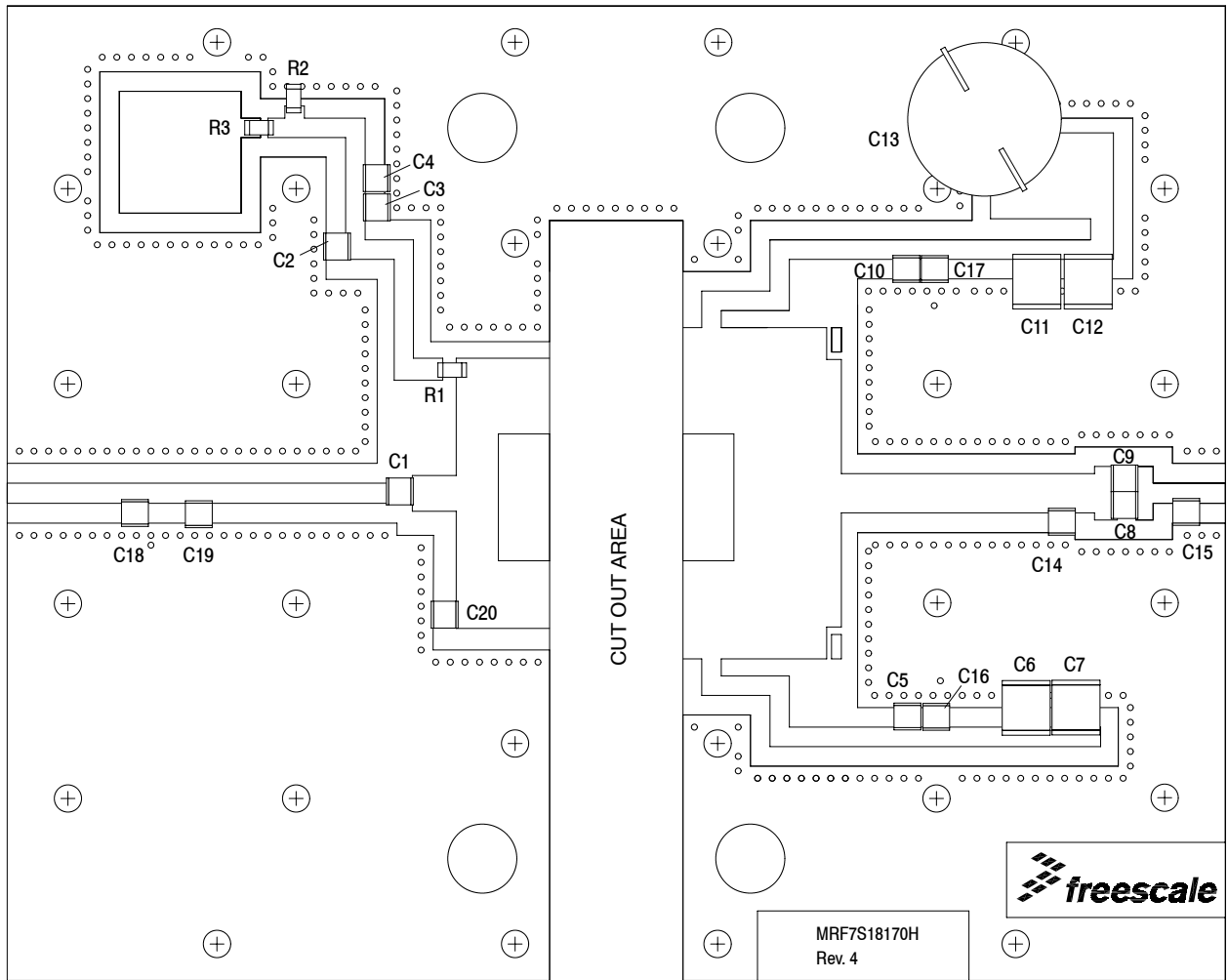


|                       |                            |          |                                                |
|-----------------------|----------------------------|----------|------------------------------------------------|
| Z1*                   | 0.500" x 0.083" Microstrip | Z10*     | 0.900" x 0.161" Microstrip                     |
| Z2*                   | 0.290" x 0.083" Microstrip | Z11*     | 0.140" x 0.161" Microstrip                     |
| Z3*                   | 0.810" x 0.083" Microstrip | Z12      | 0.094" x 0.220" Microstrip                     |
| Z4                    | 0.180" x 0.147" Microstrip | Z13      | 0.070" x 0.220" Microstrip                     |
| Z5                    | 0.850" x 0.091" Microstrip | Z14*     | 0.140" x 0.083" Microstrip                     |
| Z6                    | 0.383" x 1.109" Microstrip | Z15*     | 0.160" x 0.083" Microstrip                     |
| Z7                    | 0.117" x 1.360" Microstrip | Z16, Z17 | 1.120" x 0.080" Microstrip                     |
| Z8                    | 0.480" x 1.360" Microstrip | PCB      | Taconic TLX8-0300, 0.030", $\epsilon_r = 2.55$ |
| Z9                    | 0.060" x 1.098" Microstrip |          |                                                |
| * Variable for tuning |                            |          |                                                |

**Figure 3. MRF7S18170HSR3 Test Circuit Schematic — NI-880S**

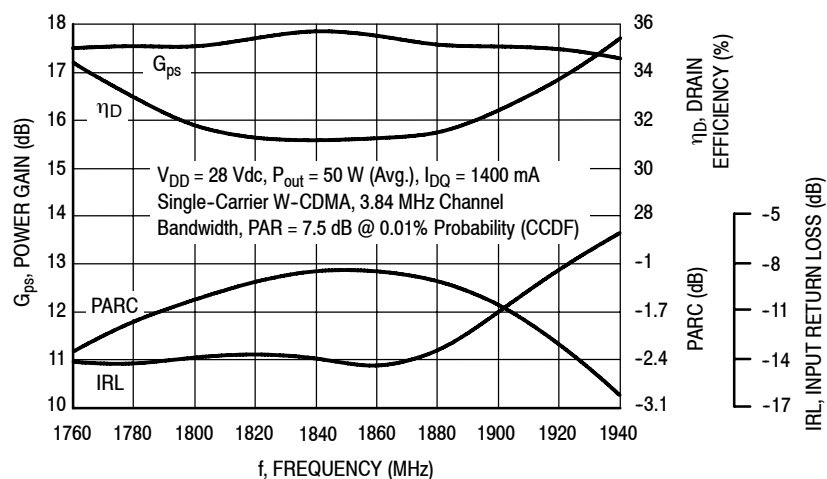
**Table 6. MRF7S18170HSR3 Test Circuit Component Designations and Values — NI-880S**

| Part             | Description                                      | Part Number       | Manufacturer       |
|------------------|--------------------------------------------------|-------------------|--------------------|
| C1               | 0.8 pF Chip Capacitor                            | ATC100B0R8BT500XT | ATC                |
| C2, C8, C9       | 6.8 pF Chip Capacitors                           | ATC100B6R8BT500XT | ATC                |
| C3               | 100 pF Chip Capacitor                            | ATC100B101JT500XT | ATC                |
| C4               | 100 nF Chip Capacitor                            | ATC100B104JT500XT | ATC                |
| C5, C10          | 5.6 pF Chip Capacitors                           | ATC100B5R6BT500XT | ATC                |
| C6, C7, C11, C12 | 10 $\mu$ F Chip Capacitors                       | C5750X5R1H106MT   | TDK                |
| C13              | 470 $\mu$ F, 63 V Electrolytic Capacitor, Radial | 477KXM063M        | Illinois Capacitor |
| C14              | 0.5 pF Chip Capacitor                            | ATC100B0R5BT500XT | ATC                |
| C15              | 0.2 pF Chip Capacitor                            | ATC100B0R2BT500XT | ATC                |
| C16, C17         | 4.7 pF Chip Capacitors                           | ATC100B4R7BT500XT | ATC                |
| C18              | 2 pF Chip Capacitor                              | ATC100B2R0BT500XT | ATC                |
| C19              | 0.3 pF Chip Capacitor                            | ATC100B0R3BT500XT | ATC                |
| C20              | 0.1 pF Chip Capacitor                            | ATC100B0R2BT500XT | ATC                |
| R1               | 10 $\Omega$ , 1/4 W Chip Resistor                | CRCW120610R0FKEA  | Vishay             |
| R2, R3           | 10 k $\Omega$ , 1/4 W Chip Resistors             | CRCW12061002FKEA  | Vishay             |

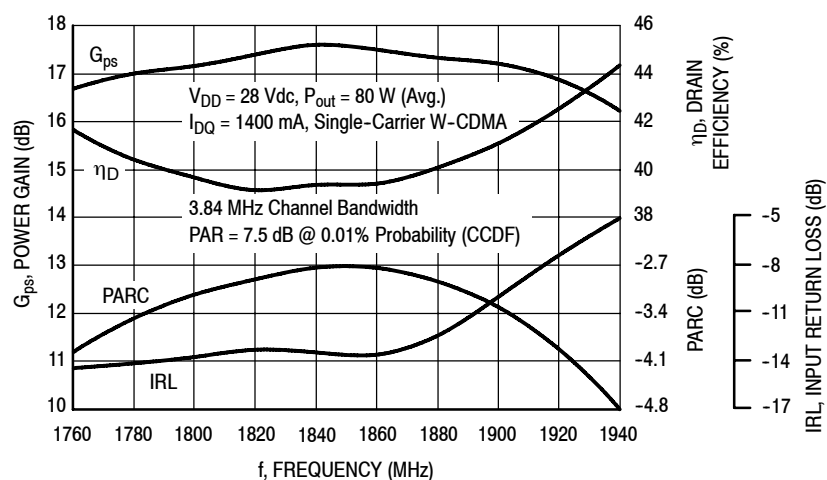


**Figure 4. MRF7S18170HSR3 Test Circuit Component Layout — NI-880S**

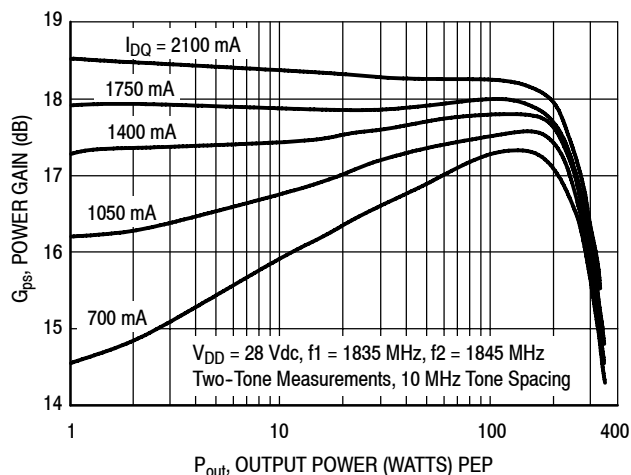
## TYPICAL CHARACTERISTICS



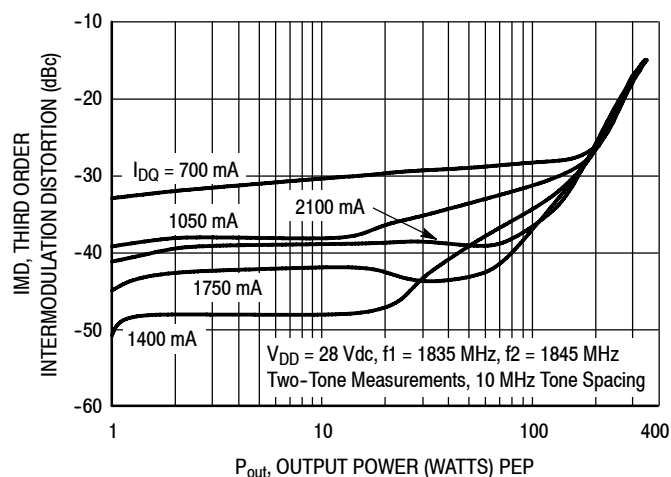
**Figure 5. Output Peak-to-Average Ratio Compression (PARC)  
Broadband Performance @  $P_{out} = 50$  Watts Avg.**



**Figure 6. Output Peak-to-Average Ratio Compression (PARC)  
Broadband Performance @  $P_{out} = 80$  Watts Avg.**



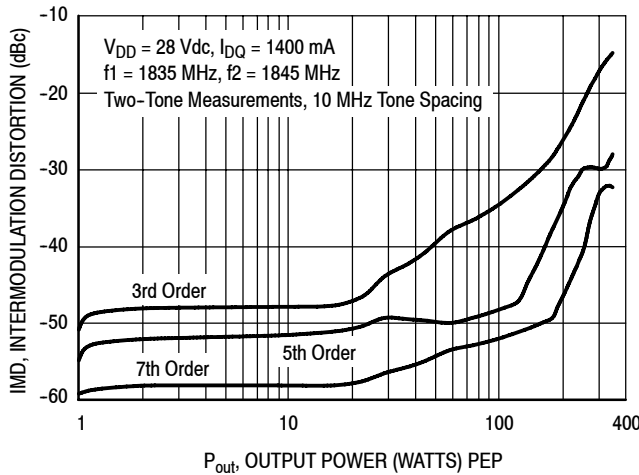
**Figure 7. Two-Tone Power Gain versus  
Output Power**



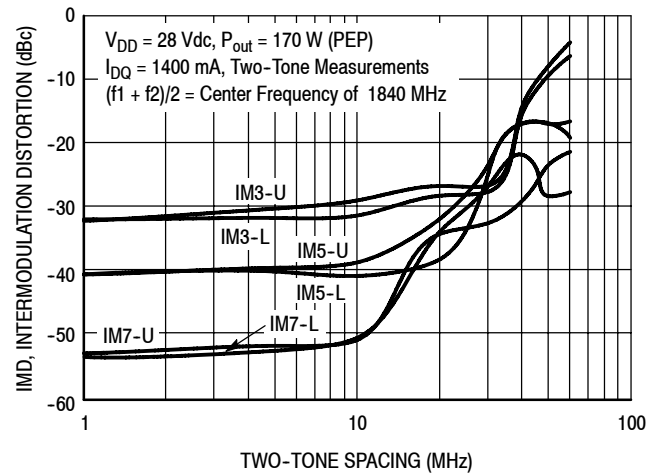
**Figure 8. Third Order Intermodulation Distortion  
versus Output Power**



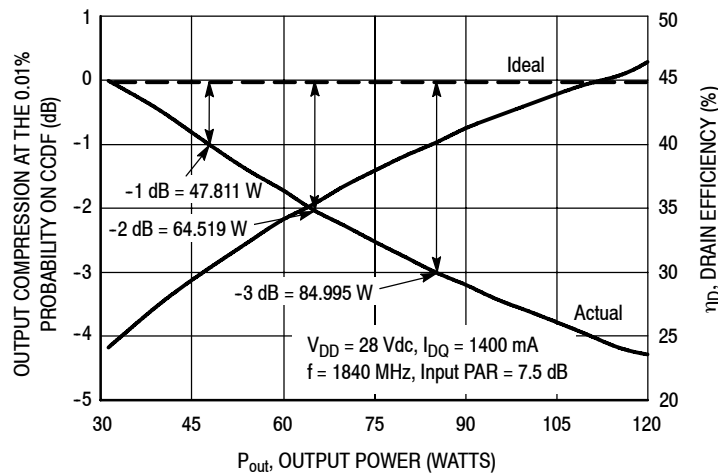
## TYPICAL CHARACTERISTICS



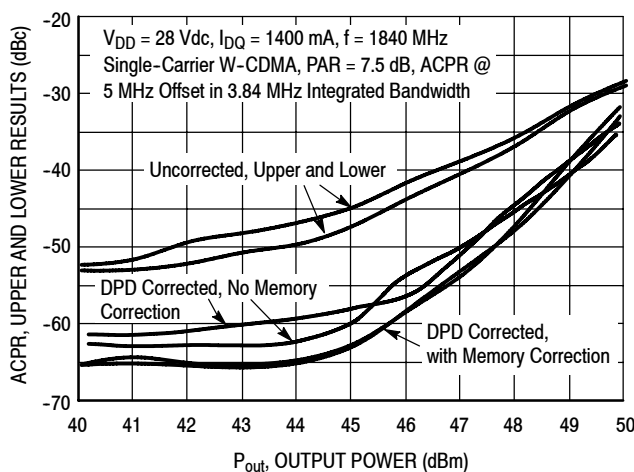
**Figure 9. Intermodulation Distortion Products versus Output Power**



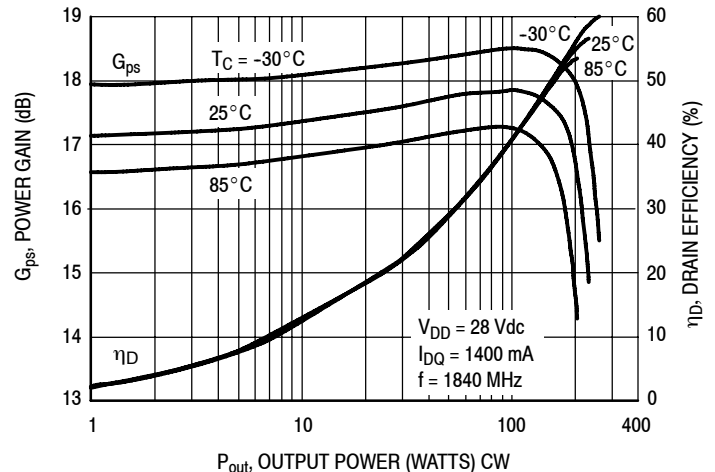
**Figure 10. Intermodulation Distortion Products versus Tone Spacing**



**Figure 11. Output Peak-to-Average Ratio Compression (PARC) versus Output Power**



**Figure 12. Digital Predistortion Correction versus ACPR and Output Power**



**Figure 13. Power Gain and Drain Efficiency versus CW Output Power**

MRF7S18170HR3 MRF7S18170HSR3

## TYPICAL CHARACTERISTICS

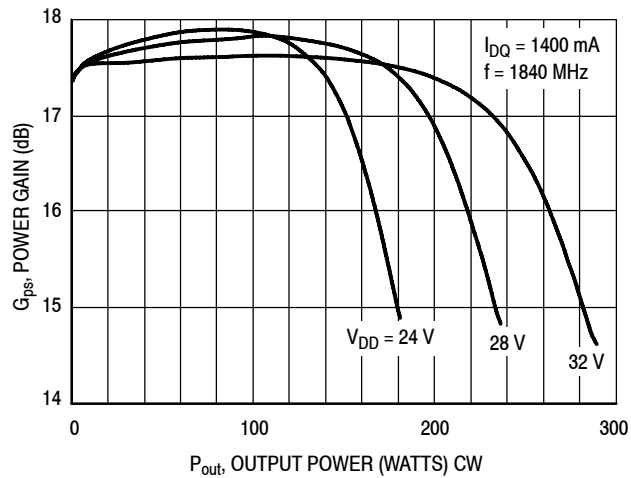


Figure 14. Power Gain versus Output Power

## W-CDMA TEST SIGNAL

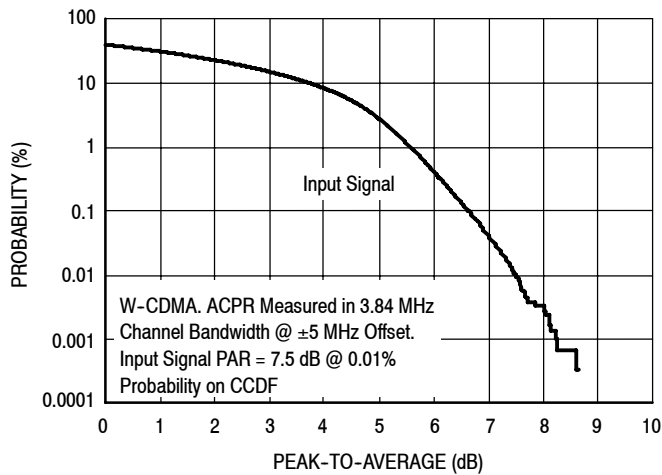


Figure 15. CCDF W-CDMA IQ Magnitude Clipping, Single-Carrier Test Signal

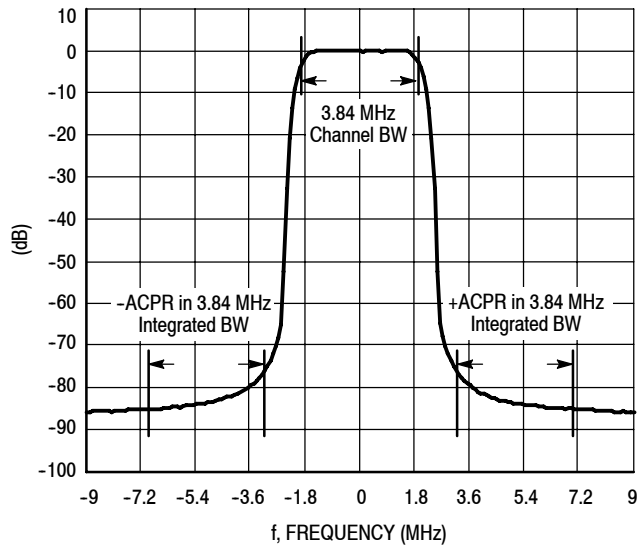
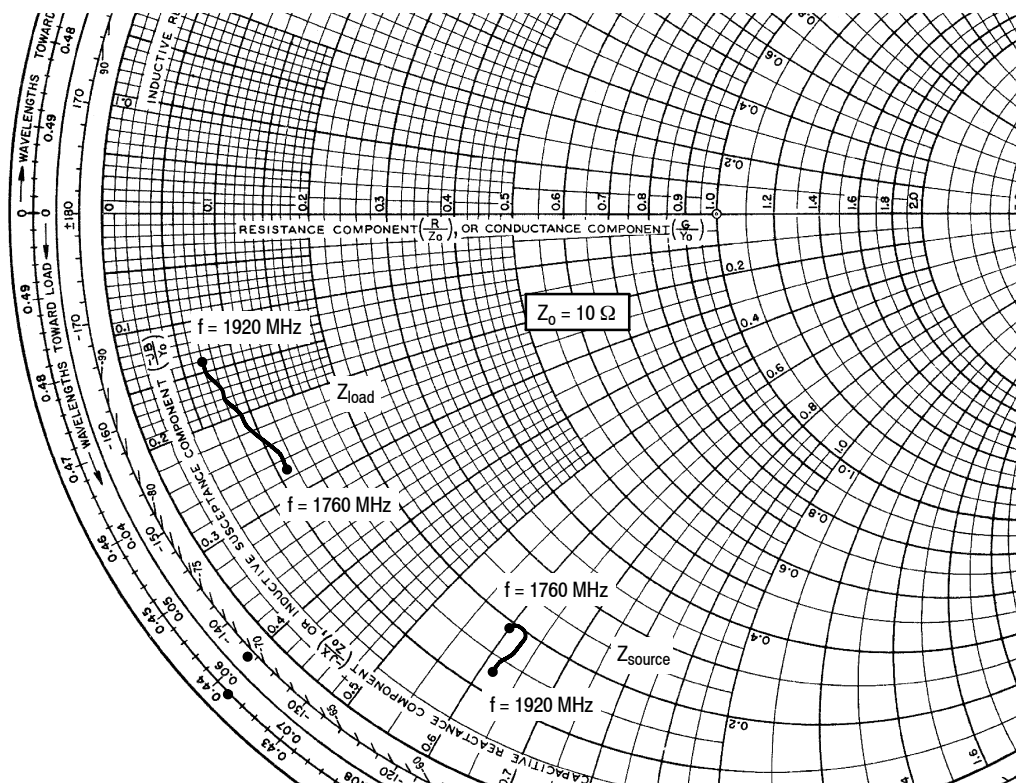


Figure 16. Single-Carrier W-CDMA Spectrum



$V_{DD} = 28 \text{ Vdc}$ ,  $I_{DQ} = 1400 \text{ mA}$ ,  $P_{out} = 50 \text{ W Avg.}$

| f<br>MHz | $Z_{source}$<br>$\Omega$ | $Z_{load}$<br>$\Omega$ |
|----------|--------------------------|------------------------|
| 1760     | $1.93 - j6.00$           | $1.13 - j2.65$         |
| 1780     | $1.95 - j6.10$           | $1.05 - j2.45$         |
| 1800     | $1.99 - j6.18$           | $0.97 - j2.29$         |
| 1820     | $1.95 - j6.22$           | $0.90 - j2.12$         |
| 1840     | $1.85 - j6.30$           | $0.85 - j2.00$         |
| 1860     | $1.71 - j6.26$           | $0.81 - j1.84$         |
| 1880     | $1.55 - j6.25$           | $0.75 - j1.70$         |
| 1900     | $1.39 - j6.20$           | $0.70 - j1.54$         |
| 1920     | $1.23 - j6.15$           | $0.67 - j1.38$         |

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

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

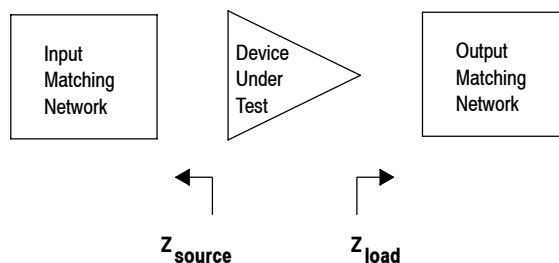
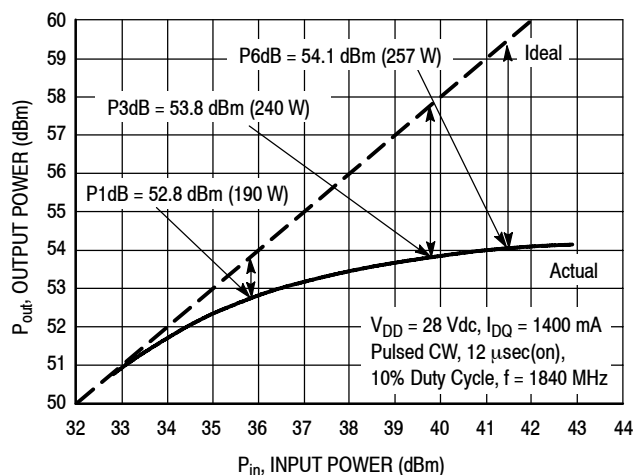


Figure 17. Series Equivalent Source and Load Impedance

## ALTERNATIVE PEAK TUNE LOAD PULL CHARACTERISTICS

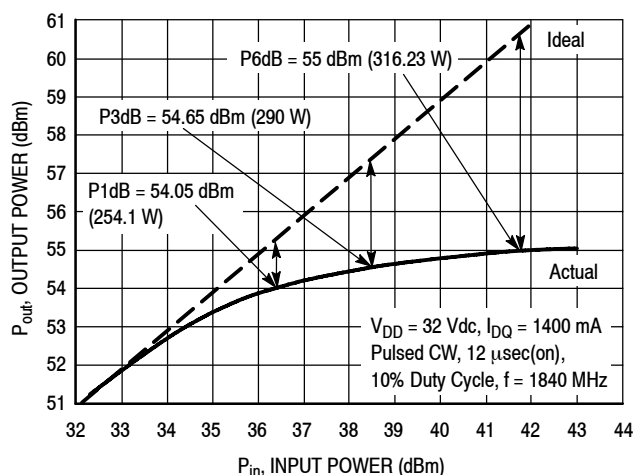


NOTE: Measured in a Peak Tuned Load Pull Fixture

Test Impedances per Compression Level

|     | $Z_{source}$<br>$\Omega$ | $Z_{load}$<br>$\Omega$ |
|-----|--------------------------|------------------------|
| 3dB | $1.23 - j7.91$           | $0.88 - j2.81$         |

**Figure 18. Pulsed CW Output Power versus Input Power**



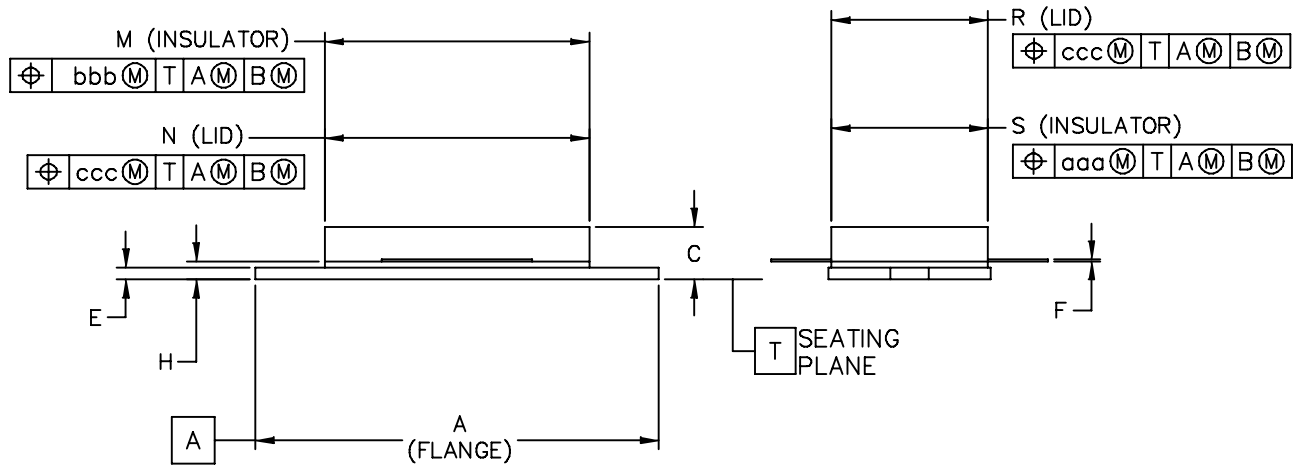
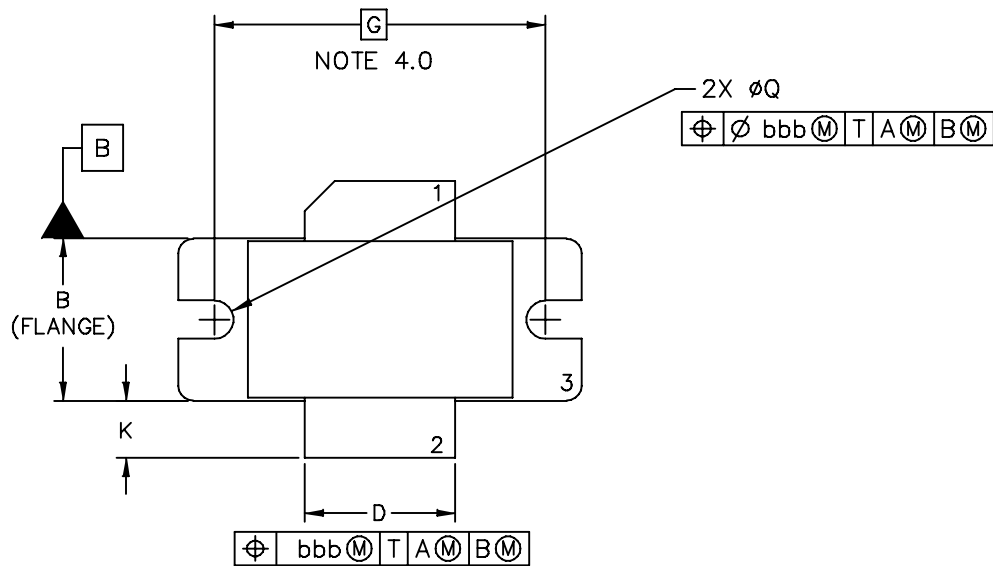
NOTE: Measured in a Peak Tuned Load Pull Fixture

Test Impedances per Compression Level

|      | $Z_{source}$<br>$\Omega$ | $Z_{load}$<br>$\Omega$ |
|------|--------------------------|------------------------|
| P3dB | $1.23 - j7.91$           | $1.03 - j2.65$         |

**Figure 19. Pulsed CW Output Power versus Input Power**

## PACKAGE DIMENSIONS



|                                                         |  |                    |                          |                            |             |
|---------------------------------------------------------|--|--------------------|--------------------------|----------------------------|-------------|
| © FREESCALE SEMICONDUCTOR, INC.<br>ALL RIGHTS RESERVED. |  | MECHANICAL OUTLINE |                          | PRINT VERSION NOT TO SCALE |             |
| TITLE:<br><br>NI-880                                    |  |                    | DOCUMENT NO: 98ARB18493C |                            | REV: E      |
|                                                         |  |                    | CASE NUMBER: 465B-03     |                            | 10 SEP 2007 |
|                                                         |  |                    | STANDARD: NON-JEDEC      |                            |             |

## NOTES:

1.0 DIMENSIONING AND TOLERANCING PER ANSI Y14.5M-1994.

2.0 CONTROLLING DIMENSION: INCH.

3.0 DIMENSION H IS MEASURED .030 (0.762) AWAY  
FROM PACKAGE BODY.4.0 RECOMMENDED BOLT CENTER DIMENSION OF 1.16 (29.57)  
BASED ON M3 SCREW.

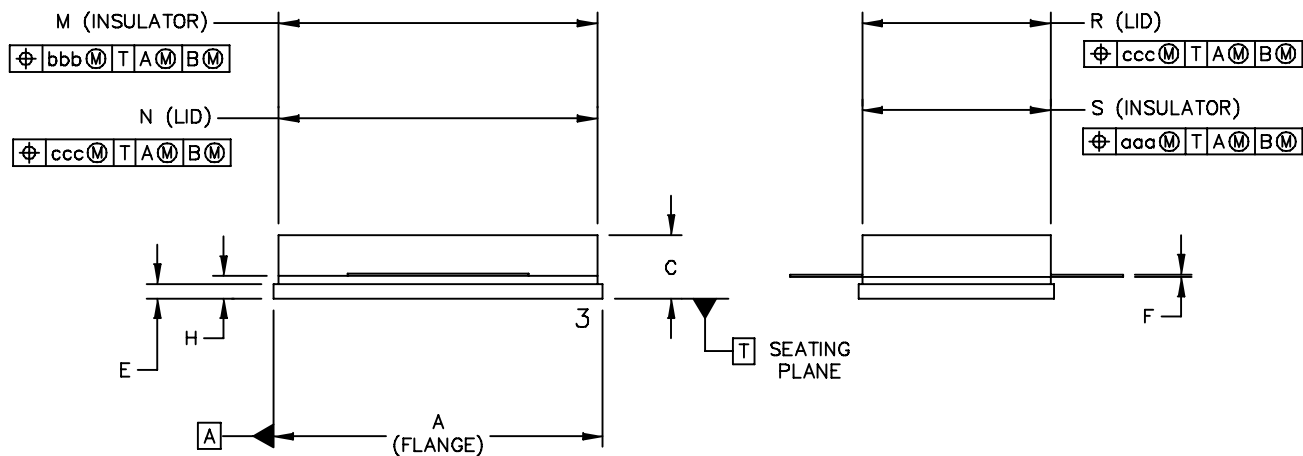
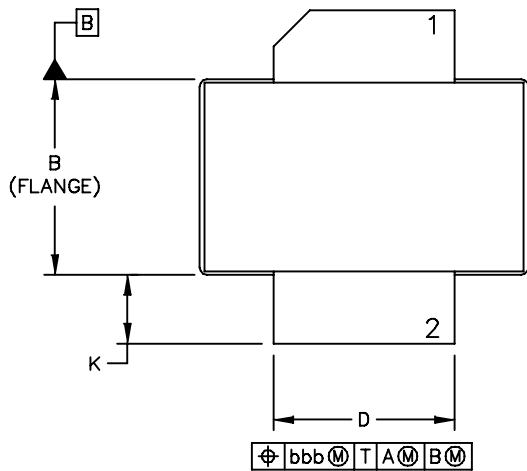
## STYLE 1:

PIN 1. DRAIN

2. GATE

3. SOURCE

| INCH                                                    |           |       | MILLIMETER         |       | DIM                      | INCH                       |      |      | MILLIMETER |             |      |
|---------------------------------------------------------|-----------|-------|--------------------|-------|--------------------------|----------------------------|------|------|------------|-------------|------|
| DIM                                                     | MIN       | MAX   | MIN                | MAX   |                          | MIN                        | MAX  | MIN  | MAX        |             |      |
| A                                                       | 1.335     | 1.345 | 33.91              | 34.16 | R                        | .515                       | —    | .525 | 13.1       | —           | 13.3 |
| B                                                       | .535      | .545  | 13.6               | 13.8  | S                        | .515                       | —    | .525 | 13.1       | —           | 13.3 |
| C                                                       | .147      | .200  | 3.73               | 5.08  | aaa                      | —                          | .007 | —    | —          | 0.178       | —    |
| D                                                       | .495      | .505  | 12.57              | 12.83 | bbb                      | —                          | .010 | —    | —          | 0.254       | —    |
| E                                                       | .035      | .045  | 0.89               | 1.14  | ccc                      | —                          | .015 | —    | —          | 0.381       | —    |
| F                                                       | .003      | .006  | 0.08               | 0.15  | —                        | —                          | —    | —    | —          | —           | —    |
| G                                                       | 1.100 BSC |       | 27.94 BSC          |       | —                        | —                          | —    | —    | —          | —           | —    |
| H                                                       | .057      | .067  | 1.45               | 1.7   | —                        | —                          | —    | —    | —          | —           | —    |
| K                                                       | .175      | .205  | 4.44               | 5.21  | —                        | —                          | —    | —    | —          | —           | —    |
| M                                                       | .872      | .888  | 22.15              | 22.55 | —                        | —                          | —    | —    | —          | —           | —    |
| N                                                       | .871      | .889  | 19.3               | 22.6  | —                        | —                          | —    | —    | —          | —           | —    |
| Q                                                       | ø.118     | ø.138 | ø3                 | ø3.51 | —                        | —                          | —    | —    | —          | —           | —    |
| © FREESCALE SEMICONDUCTOR, INC.<br>ALL RIGHTS RESERVED. |           |       | MECHANICAL OUTLINE |       |                          | PRINT VERSION NOT TO SCALE |      |      |            |             |      |
| TITLE:<br><br>NI—880                                    |           |       |                    |       | DOCUMENT NO: 98ARB18493C |                            |      |      |            | REV: E      |      |
|                                                         |           |       |                    |       | CASE NUMBER: 465B—03     |                            |      |      |            | 10 SEP 2007 |      |
|                                                         |           |       |                    |       | STANDARD: NON—JEDEC      |                            |      |      |            |             |      |



|                                                         |  |                          |  |                            |  |
|---------------------------------------------------------|--|--------------------------|--|----------------------------|--|
| © FREESCALE SEMICONDUCTOR, INC.<br>ALL RIGHTS RESERVED. |  | MECHANICAL OUTLINE       |  | PRINT VERSION NOT TO SCALE |  |
| TITLE:<br><br>NI-880S                                   |  | DOCUMENT NO: 98ARB18660C |  | REV: D                     |  |
|                                                         |  | CASE NUMBER: 465C-02     |  | 09 JUN 2005                |  |
|                                                         |  | STANDARD: NON-JEDEC      |  |                            |  |

NOTES:

1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M–1994.
2. CONTROLLING DIMENSION: INCH.
3. DIMENSION H IS MEASURED .030 (0.762) AWAY FROM PACKAGE BODY.

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

| DIM | INCH |        | MILLIMETER |         | DIM | INCH   |     | MILLIMETER |     |
|-----|------|--------|------------|---------|-----|--------|-----|------------|-----|
|     | MIN  | MAX    | MIN        | MAX     |     | MIN    | MAX | MIN        | MAX |
| A   | .905 | – .915 | 22.99      | – 23.24 | aaa | – .007 | –   | – 0.178    | –   |
| B   | .535 | – .545 | 13.6       | – 13.8  | bbb | – .010 | –   | – 0.254    | –   |
| C   | .147 | – .200 | 3.73       | – 5.08  | ccc | – .015 | –   | – 0.381    | –   |
| D   | .495 | – .505 | 12.57      | – 12.83 | –   | –      | –   | –          | –   |
| E   | .035 | – .045 | 0.89       | – 1.14  | –   | –      | –   | –          | –   |
| F   | .003 | – .006 | 0.08       | – 0.15  | –   | –      | –   | –          | –   |
| H   | .057 | – .067 | 1.45       | – 1.7   | –   | –      | –   | –          | –   |
| K   | .170 | – .210 | 4.32       | – 5.33  | –   | –      | –   | –          | –   |
| M   | .872 | – .888 | 22.15      | – 22.55 | –   | –      | –   | –          | –   |
| N   | .871 | – .889 | 19.3       | – 22.6  | –   | –      | –   | –          | –   |
| R   | .515 | – .525 | 13.1       | – 13.3  | –   | –      | –   | –          | –   |
| S   | .515 | – .525 | 13.1       | – 13.3  | –   | –      | –   | –          | –   |

|                                                         |  |                          |                            |             |
|---------------------------------------------------------|--|--------------------------|----------------------------|-------------|
| © FREESCALE SEMICONDUCTOR, INC.<br>ALL RIGHTS RESERVED. |  | MECHANICAL OUTLINE       | PRINT VERSION NOT TO SCALE |             |
| TITLE:<br><br>NI–880S                                   |  | DOCUMENT NO: 98ARB18660C |                            | REV: D      |
|                                                         |  | CASE NUMBER: 465C–02     |                            | 09 JUN 2005 |
|                                                         |  | STANDARD: NON–JEDEC      |                            |             |



## PRODUCT DOCUMENTATION AND SOFTWARE

Refer to the following documents and software 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

### Software

- Electromigration MTTF Calculator
- RF High Power Model

For Software, do a Part Number search at <http://www.freescale.com>, and select the "Part Number" link. Go to the Software & Tools tab on the part's Product Summary page to download the respective tool.

## R5 TAPE AND REEL OPTION

R5 Suffix = 50 Units, 56 mm Tape Width, 13 inch Reel.

The R5 tape and reel option for MRF7S18170H and MRF7S18170HS parts will be available for 2 years after release of MRF7S18170H and MRF7S18170HS. Freescale Semiconductor, Inc. reserves the right to limit the quantities that will be delivered in the R5 tape and reel option. At the end of the 2 year period customers who have purchased these devices in the R5 tape and reel option will be offered MRF7S18170H and MRF7S18170HS in the R3 tape and reel option.

## REVISION HISTORY

The following table summarizes revisions to this document.

| Revision | Date      | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|----------|-----------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 0        | Oct. 2006 | <ul style="list-style-type: none"><li>• Initial Release of Data Sheet</li></ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| 1        | Dec. 2008 | <ul style="list-style-type: none"><li>• Corrected <math>V_{DS}</math> to <math>V_{DD}</math> in the RF test condition voltage callout for <math>V_{GS(Q)}</math>, On Characteristics table, p. 2</li><li>• Updated Typical Performance table to provide better definition of characterization attributes, p. 3</li><li>• Corrected Z7 from 1.110" to 0.120" in Z list, Fig. 1, Test Circuit Schematic – NI-880, p. 4</li><li>• Updated Part Numbers in Tables 5, 6, Component Designations and Values, to latest RoHS compliant part numbers, p. 4, 6</li><li>• Corrected Z7 from 1.110" to 0.117" in Z list, Fig. 3, Test Circuit Schematic – NI-880S, p. 6</li><li>• Adjusted scale for Fig. 10, Intermodulation Distortion Products versus Tone Spacing, to show wider dynamic range, p. 9</li><li>• Replaced Fig. 15, MTTF versus Junction Temperature, with updated graph; removed Amps<sup>2</sup> and listed operating characteristics and location of MTTF calculator for device, p. 10</li><li>• Updated Fig. 16, CCDF W-CDMA 3GPP, Test Model 1, 64 PDCH, 50% Clipping, Single-Carrier Test Signal, to show input signal only, p. 10</li></ul> |
| 2        | Mar. 2011 | <ul style="list-style-type: none"><li>• Modified data sheet to reflect RF Test Reduction described in Product and Process Change Notification number, PCN13628, p. 1, 2</li><li>• Fig. 15, MTTF versus Junction Temperature removed, p. 10. Refer to the device's MTTF Calculator available at <a href="http://freescale.com/RFpower">freescale.com/RFpower</a>. Go to Design Resources &gt; Software and Tools.</li><li>• Fig. 16, CCDF W-CDMA IQ Magnitude Clipping, Single-Carrier Test Signal and Fig. 17, Single-Carrier W-CDMA Spectrum updated to show the undistorted input test signal, p. 10 (renumbered as Figs. 15 and 16 respectively after Fig. 15 removed)</li><li>• Added Electromigration MTTF Calculator and RF High Power Model availability to Product Software, p. 17</li></ul>                                                                                                                                                                                                                                                                                                                                                     |

## ***How to Reach Us:***

### **Home Page:**

[www.freescale.com](http://www.freescale.com)

### **Web Support:**

<http://www.freescale.com/support>

### **USA/Europe or Locations Not Listed:**

Freescale Semiconductor, Inc.  
Technical Information Center, EL516  
2100 East Elliot Road  
Tempe, Arizona 85284  
1-800-521-6274 or +1-480-768-2130  
[www.freescale.com/support](http://www.freescale.com/support)

### **Europe, Middle East, and Africa:**

Freescale Halbleiter Deutschland GmbH  
Technical Information Center  
Schatzbogen 7  
81829 Muenchen, Germany  
+44 1296 380 456 (English)  
+46 8 52200080 (English)  
+49 89 92103 559 (German)  
+33 1 69 35 48 48 (French)  
[www.freescale.com/support](http://www.freescale.com/support)

### **Japan:**

Freescale Semiconductor Japan Ltd.  
Headquarters  
ARCO Tower 15F  
1-8-1, Shimo-Meguro, Meguro-ku,  
Tokyo 153-0064  
Japan  
0120 191014 or +81 3 5437 9125  
[support.japan@freescale.com](mailto:support.japan@freescale.com)

### **Asia/Pacific:**

Freescale Semiconductor China Ltd.  
Exchange Building 23F  
No. 118 Jianguo Road  
Chaoyang District  
Beijing 100022  
China  
+86 10 5879 8000  
[support.asia@freescale.com](mailto:support.asia@freescale.com)

### **For Literature Requests Only:**

Freescale Semiconductor Literature Distribution Center  
1-800-441-2447 or +1-303-675-2140  
Fax: +1-303-675-2150  
[LDCForFreescaleSemiconductor@hibbertgroup.com](mailto:LDCForFreescaleSemiconductor@hibbertgroup.com)

Information in this document is provided solely to enable system and software implementers to use Freescale Semiconductor products. There are no express or implied copyright licenses granted hereunder to design or fabricate any integrated circuits or integrated circuits based on the information in this document.

Freescale Semiconductor reserves the right to make changes without further notice to any products herein. Freescale Semiconductor makes no warranty, representation or guarantee regarding the suitability of its products for any particular purpose, nor does Freescale Semiconductor assume any liability arising out of the application or use of any product or circuit, and specifically disclaims any and all liability, including without limitation consequential or incidental damages. "Typical" parameters that may be provided in Freescale Semiconductor data sheets and/or specifications can and do vary in different applications and actual performance may vary over time. All operating parameters, including "Typicals", must be validated for each customer application by customer's technical experts. Freescale Semiconductor does not convey any license under its patent rights nor the rights of others. Freescale Semiconductor products are not designed, intended, or authorized for use as components in systems intended for surgical implant into the body, or other applications intended to support or sustain life, or for any other application in which the failure of the Freescale Semiconductor product could create a situation where personal injury or death may occur. Should Buyer purchase or use Freescale Semiconductor products for any such unintended or unauthorized application, Buyer shall indemnify and hold Freescale Semiconductor and its officers, employees, subsidiaries, affiliates, and distributors harmless against all claims, costs, damages, and expenses, and reasonable attorney fees arising out of, directly or indirectly, any claim of personal injury or death associated with such unintended or unauthorized use, even if such claim alleges that Freescale Semiconductor was negligent regarding the design or manufacture of the part.

Freescale™ and the Freescale logo are trademarks of Freescale Semiconductor, Inc. All other product or service names are the property of their respective owners.

© Freescale Semiconductor, Inc. 2006, 2008, 2011. All rights reserved.

