



# RF Power Field Effect Transistors

## N-Channel Enhancement-Mode Lateral MOSFETs

Designed for broadband commercial and industrial applications with frequencies from 400 to 500 MHz. The high gain and broadband performance of these devices make them ideal for large-signal, common-source amplifier applications in 28-volt base station equipment.

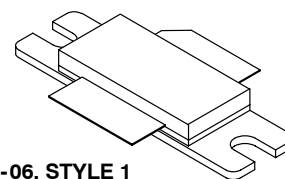
- Typical Single-Carrier N-CDMA Performance @ 465 MHz:  $V_{DD} = 28$  Volts,  $I_{DQ} = 1250$  mA,  $P_{out} = 28$  Watts Avg., IS-95 CDMA (Pilot, Sync, Paging, Traffic Codes 8 Through 13). Channel Bandwidth = 1.2288 MHz. PAR = 9.8 dB @ 0.01% Probability on CCDF.  
Power Gain — 21 dB  
Drain Efficiency — 30%  
ACPR @ 750 kHz Offset — -47.6 dBc in 30 kHz Bandwidth
- Capable of Handling 10:1 VSWR, @ 28 Vdc, 465 MHz, 140 Watts CW Output Power

### Features

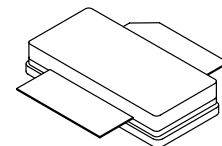
- Characterized with Series Equivalent Large-Signal Impedance Parameters
- Internally Matched for Ease of Use
- Qualified Up to a Maximum of 32  $V_{DD}$  Operation
- Integrated ESD Protection
- Lower Thermal Resistance Package
- Low Gold Plating Thickness on Leads, 40 $\mu$ m Nominal.
- RoHS Compliant
- In Tape and Reel. R3 Suffix = 250 Units per 56 mm, 13 inch Reel.

**MRF5S4140HR3**  
**MRF5S4140HSR3**

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



**CASE 465-06, STYLE 1**  
**NI-780**  
**MRF5S4140HR3**



**CASE 465A-06, STYLE 1**  
**NI-780S**  
**MRF5S4140HSR3**

**Table 1. Maximum Ratings**

| Rating                                                                                  | Symbol    | Value        | Unit                     |
|-----------------------------------------------------------------------------------------|-----------|--------------|--------------------------|
| Drain-Source Voltage                                                                    | $V_{DSS}$ | -0.5, +65    | Vdc                      |
| Gate-Source Voltage                                                                     | $V_{GS}$  | -0.5, +15    | Vdc                      |
| Total Device Dissipation @ $T_C = 25^\circ\text{C}$<br>Derate above 25 $^\circ\text{C}$ | $P_D$     | 427<br>2.4   | W<br>W/ $^\circ\text{C}$ |
| Storage Temperature Range                                                               | $T_{stg}$ | - 65 to +150 | $^\circ\text{C}$         |
| Case Operating Temperature                                                              | $T_C$     | 150          | $^\circ\text{C}$         |
| Operating Junction Temperature                                                          | $T_J$     | 200          | $^\circ\text{C}$         |

**Table 2. Thermal Characteristics**

| Characteristic                                                                                                                            | Symbol          | Value (1,2)  | Unit                      |
|-------------------------------------------------------------------------------------------------------------------------------------------|-----------------|--------------|---------------------------|
| Thermal Resistance, Junction to Case<br>Case Temperature 73 $^\circ\text{C}$ , 140 W CW<br>Case Temperature 74 $^\circ\text{C}$ , 28 W CW | $R_{\theta JC}$ | 0.41<br>0.47 | $^\circ\text{C}/\text{W}$ |

1. MTTF calculator available at <http://www.freescale.com/rf>. Select Tools/Software/Application Software/Calculators to access the MTTF calculators by product.
2. 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)    | 2 (Minimum)  |
| Machine Model (per EIA/JESD22-A115)   | A (Minimum)  |
| Charge Device Model (per JESD22-C101) | IV (Minimum) |

**Table 4. Electrical Characteristics** ( $T_C = 25^\circ\text{C}$  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>( $V_{DS} = 10\text{ Vdc}$ , $I_D = 400\ \mu\text{Adc}$ )                            | $V_{GS(th)}$ | 2   | 3   | 4   | Vdc |
| Gate Quiescent Voltage<br>( $V_{DS} = 28\text{ Vdc}$ , $I_D = 1250\text{ mAdc}$ , Measured in Functional Test) | $V_{GS(Q)}$  | 3   | 4   | 5   | Vdc |
| Drain-Source On-Voltage<br>( $V_{GS} = 10\text{ Vdc}$ , $I_D = 2.42\text{ Adc}$ )                              | $V_{DS(on)}$ | 0.1 | 0.2 | 0.3 | Vdc |
| Forward Transconductance<br>( $V_{DS} = 10\text{ Vdc}$ , $I_D = 3\text{ Adc}$ )                                | $g_{fs}$     | —   | 6.2 | —   | S   |

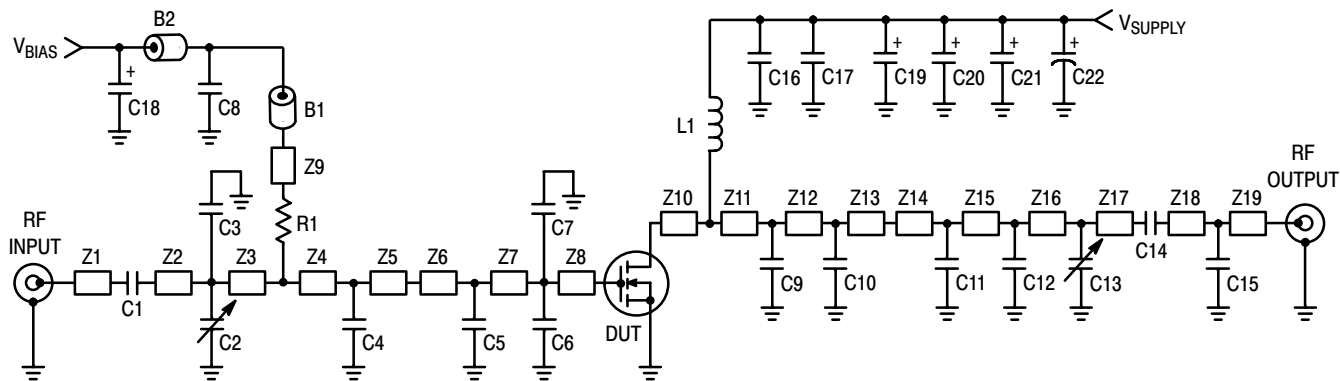
**Dynamic Characteristics** <sup>(1)</sup>

|                                                                                                                       |           |   |     |   |    |
|-----------------------------------------------------------------------------------------------------------------------|-----------|---|-----|---|----|
| Reverse Transfer Capacitance<br>( $V_{DS} = 28\text{ Vdc} \pm 30\text{ mV(rms)ac}$ @ 1 MHz, $V_{GS} = 0\text{ Vdc}$ ) | $C_{rss}$ | — | 2.3 | — | pF |
|-----------------------------------------------------------------------------------------------------------------------|-----------|---|-----|---|----|

**Functional Tests** (In Freescale Test Fixture, 50 ohm system)  $V_{DD} = 28\text{ Vdc}$ ,  $I_{DQ} = 1250\text{ mA}$ ,  $P_{out} = 28\text{ W Avg. N-CDMA}$ ,  $f = 465\text{ MHz}$ , Single-Carrier N-CDMA, 1.2288 MHz Channel Bandwidth Carrier. ACPR measured in 30 kHz Channel Bandwidth @  $\pm 750\text{ kHz}$  Offset. PAR = 9.8 dB @ 0.01% Probability on CCDF.

|                              |          |      |       |     |     |
|------------------------------|----------|------|-------|-----|-----|
| Power Gain                   | $G_{ps}$ | 20   | 21    | 23  | dB  |
| Drain Efficiency             | $\eta_D$ | 28.5 | 30    | —   | %   |
| Adjacent Channel Power Ratio | ACPR     | —    | -47.6 | -45 | dBc |
| Input Return Loss            | IRL      | —    | -14   | -9  | dB  |

1. Part internally input matched.



|     |                            |     |                                                  |
|-----|----------------------------|-----|--------------------------------------------------|
| Z1  | 0.402" x 0.080" Microstrip | Z11 | 0.125" x 0.220" Microstrip                       |
| Z2  | 1.266" x 0.080" Microstrip | Z12 | 0.324" x 0.220" Microstrip                       |
| Z3  | 0.211" x 0.220" Microstrip | Z13 | 0.050" x 0.220" Microstrip                       |
| Z4  | 0.139" x 0.220" Microstrip | Z14 | 0.171" x 0.080" Microstrip                       |
| Z5  | 0.239" x 0.220" Microstrip | Z15 | 0.377" x 0.080" Microstrip                       |
| Z6  | 0.040" x 0.640" Microstrip | Z16 | 0.358" x 0.080" Microstrip                       |
| Z7  | 0.080" x 0.640" Microstrip | Z17 | 0.361" x 0.080" Microstrip                       |
| Z8  | 0.276" x 0.640" Microstrip | Z18 | 0.131" x 0.080" Microstrip                       |
| Z9  | 1.000" x 0.226" Microstrip | Z19 | 0.277" x 0.080" Microstrip                       |
| Z10 | 0.498" x 0.630" Microstrip | PCB | Arlon GX-0300-55-22, 0.030", $\epsilon_r = 2.55$ |

Figure 1. MRF5S4140HR3(SR3) Test Circuit Schematic — 460-470 MHz

Table 5. MRF5S4140HR3(SR3) Test Circuit Component Designations and Values — 460-470 MHz

| Part               | Description                               | Part Number       | Manufacturer     |
|--------------------|-------------------------------------------|-------------------|------------------|
| B1, B2             | Ferrite Beads, Short                      | 2743019447        | Fair-Rite        |
| C1, C14            | 120 pF Chip Capacitors                    | 100B121JP500X     | ATC              |
| C2, C13            | 0.8-8.0 pF Variable Capacitors, Gigatrim  | 27291SL           | Johanson         |
| C3                 | 18 pF Chip Capacitor                      | 100B180JP500X     | ATC              |
| C4                 | 30 pF Chip Capacitor                      | 100B300JP500X     | ATC              |
| C5                 | 24 pF Chip Capacitor                      | 100B240JP500X     | ATC              |
| C6, C7             | 13 pF Chip Capacitors                     | 100B130JP500X     | ATC              |
| C8                 | 0.02 $\mu$ F, 50 V Chip Capacitor         | 200B203MW50B      | ATC              |
| C9, C10            | 22 pF Chip Capacitors                     | 100B220JP500X     | ATC              |
| C11                | 1.0 pF Chip Capacitor                     | 100B1R0JP500X     | ATC              |
| C12                | 5.6 pF Chip Capacitor                     | 100B5R6JP500X     | ATC              |
| C15                | 1.5 pF Chip Capacitor                     | 100B1R5JP500X     | ATC              |
| C16                | 47 pF Chip Capacitor                      | 100B47JP500X      | ATC              |
| C17                | 0.56 $\mu$ F, 50 V Chip Capacitor         | C1825C564J5GAC    | Kemet            |
| C18, C19, C20, C21 | 10 $\mu$ F, 35 V Tantalum Chip Capacitors | T491D106K035AS    | Kemet            |
| C22                | 470 $\mu$ F, 63 V Electrolytic Capacitor  | SME63V471M12X25LL | United Chemi-Con |
| L1                 | 39 nH Inductor                            | 1812SMS-39N       | Coilcraft        |
| R1                 | 100 $\Omega$ , 1/4 W Chip Resistor (1210) |                   |                  |

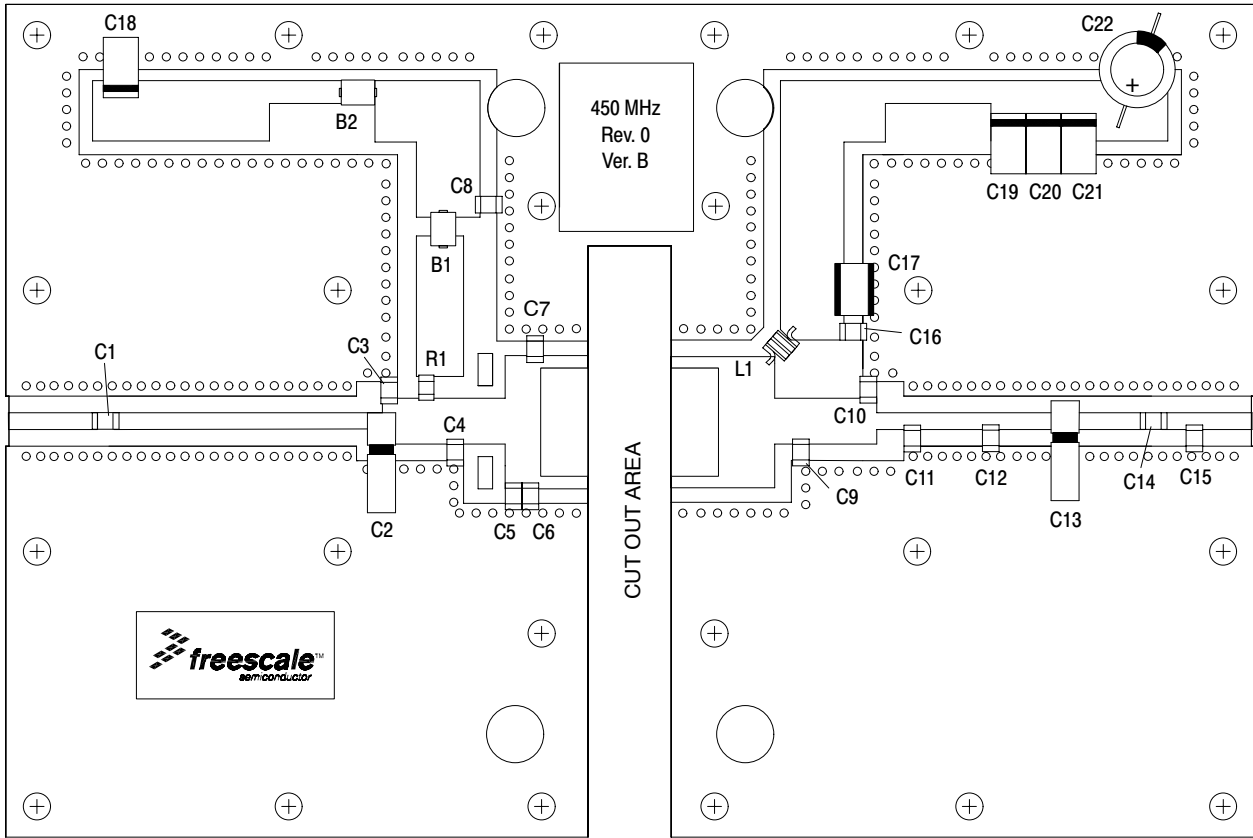


Figure 2. MRF5S4140HR3(SR3) Test Circuit Component Layout — 460-470 MHz

TYPICAL CHARACTERISTICS — 460-470 MHz

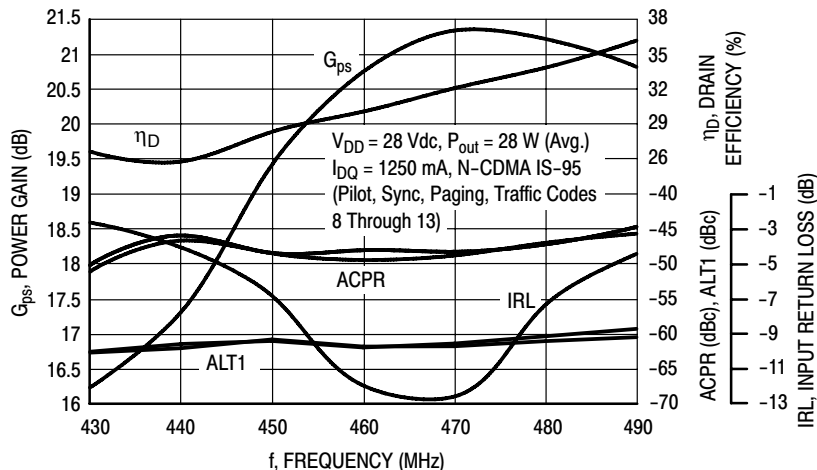


Figure 3. Single-Carrier N-CDMA Broadband Performance @  $P_{out} = 28$  Watts Avg.

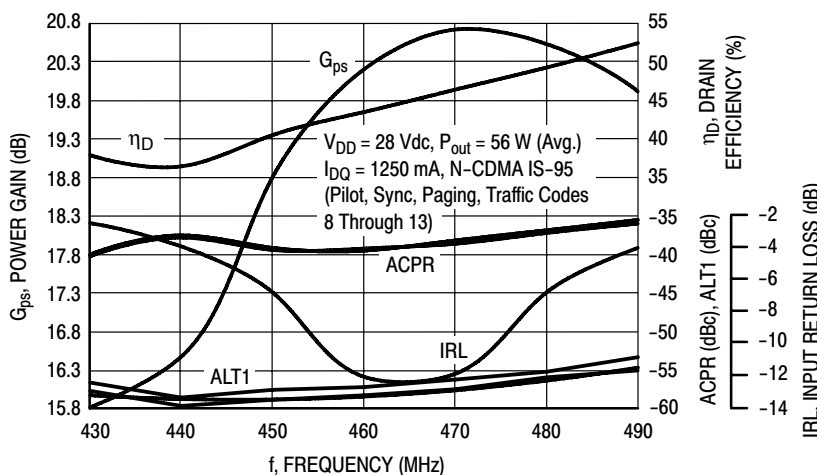


Figure 4. Single-Carrier N-CDMA Broadband Performance @  $P_{out} = 56$  Watts Avg.

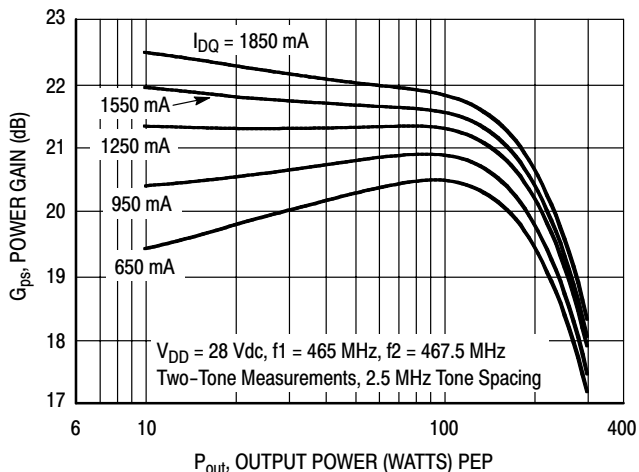


Figure 5. Two-Tone Power Gain versus Output Power

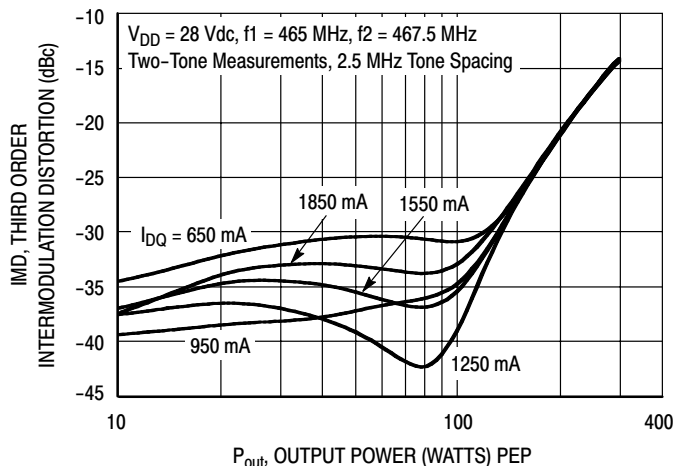
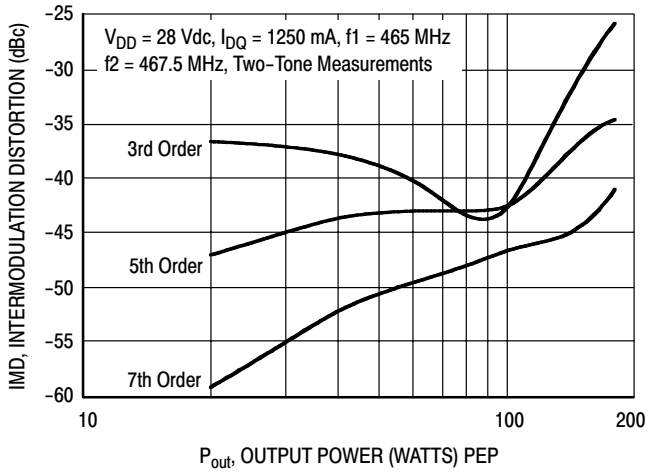
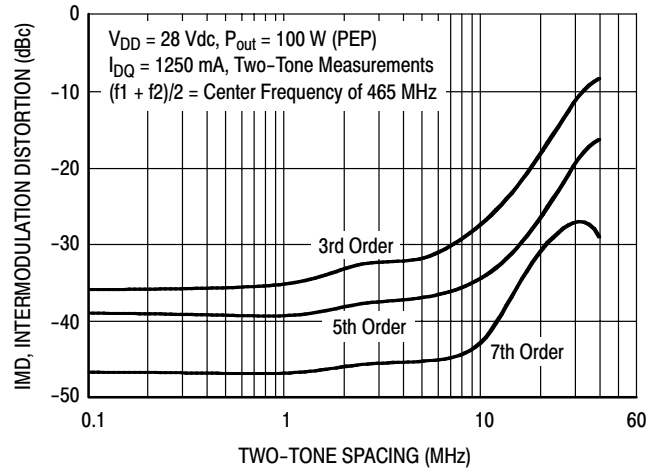


Figure 6. Third Order Intermodulation Distortion versus Output Power

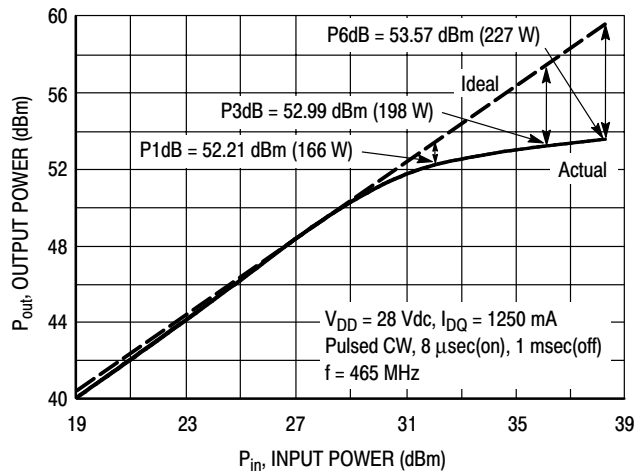
## TYPICAL CHARACTERISTICS — 460-470 MHz



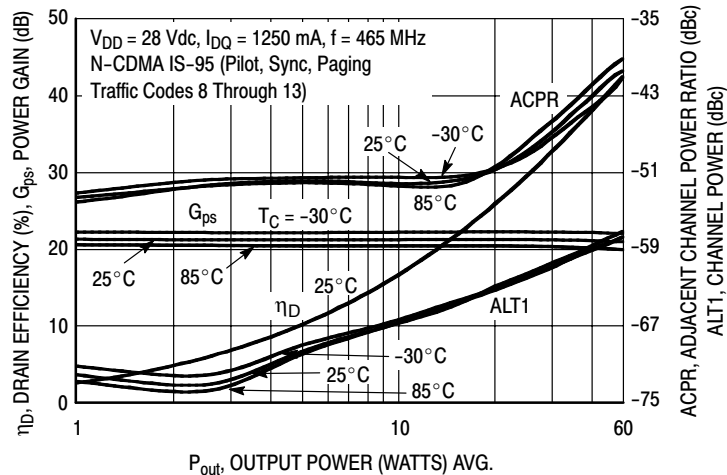
**Figure 7. Intermodulation Distortion Products versus Output Power**



**Figure 8. Intermodulation Distortion Products versus Tone Spacing**



**Figure 9. Pulse CW Output Power versus Input Power**



**Figure 10. Single-Carrier N-CDMA ACPR, ALT1, Power Gain and Drain Efficiency versus Output Power**

TYPICAL CHARACTERISTICS — 460-470 MHz

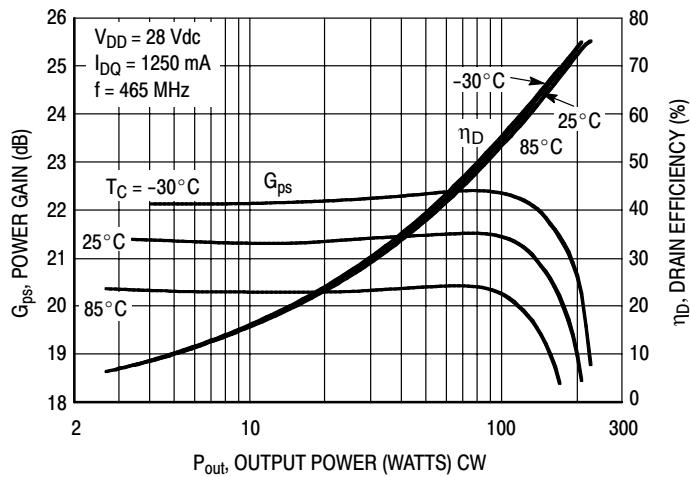


Figure 11. Power Gain and Drain Efficiency versus CW Output Power

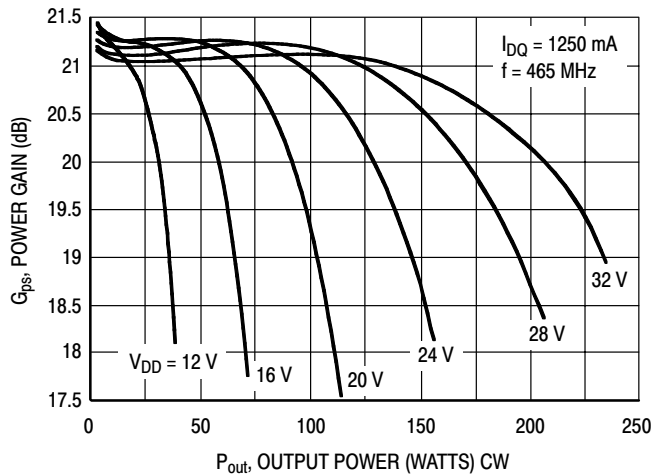
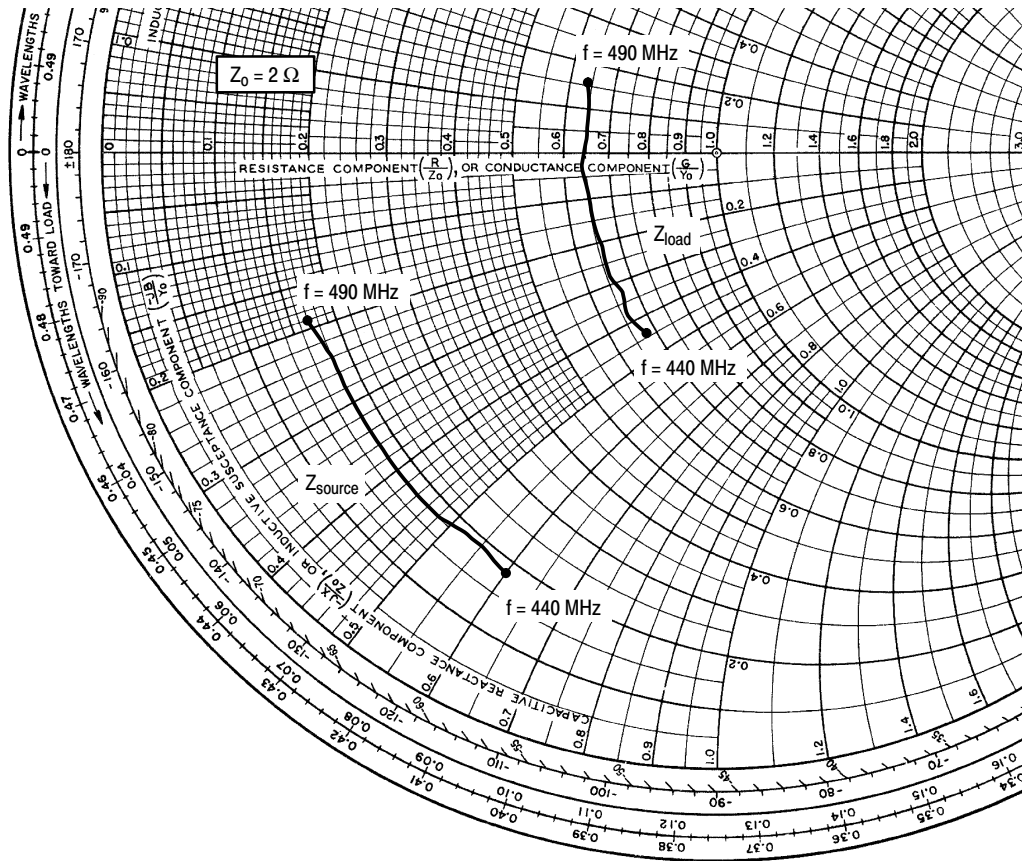


Figure 12. Power Gain versus Output Power



$V_{DD} = 28 \text{ Vdc}$ ,  $I_{DQ} = 1250 \text{ mA}$ ,  $P_{out} = 28 \text{ W Avg.}$

| f<br>MHz | $Z_{source}$<br>$\Omega$ | $Z_{load}$<br>$\Omega$ |
|----------|--------------------------|------------------------|
| 440      | $0.359 - j1.19$          | $1.35 - j0.870$        |
| 445      | $0.389 - j1.11$          | $1.31 - j0.743$        |
| 450      | $0.379 - j1.03$          | $1.34 - j0.641$        |
| 455      | $0.360 - j0.959$         | $1.32 - j0.539$        |
| 460      | $0.355 - j0.873$         | $1.31 - j0.420$        |
| 465      | $0.352 - j0.773$         | $1.30 - j0.274$        |
| 470      | $0.350 - j0.710$         | $1.29 - j0.173$        |
| 475      | $0.350 - j0.628$         | $1.28 - j0.044$        |
| 480      | $0.356 - j0.540$         | $1.29 + j0.090$        |
| 485      | $0.355 - j0.473$         | $1.29 + j0.195$        |
| 490      | $0.345 - j0.388$         | $1.28 + j0.313$        |

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

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

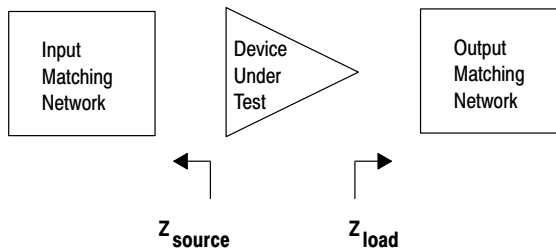
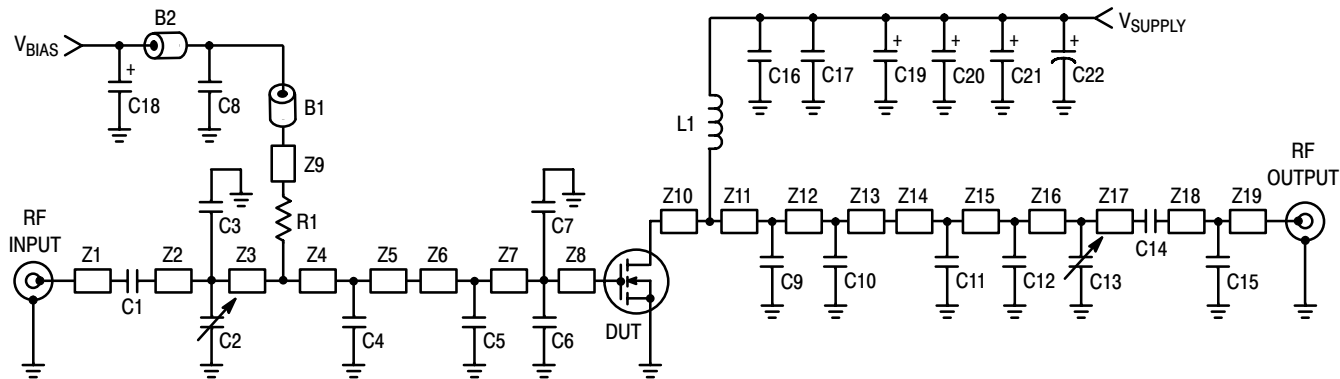


Figure 13. Series Equivalent Source and Load Impedance — 460-470 MHz





|     |                            |     |                                                  |
|-----|----------------------------|-----|--------------------------------------------------|
| Z1  | 0.402" x 0.080" Microstrip | Z11 | 0.125" x 0.220" Microstrip                       |
| Z2  | 1.266" x 0.080" Microstrip | Z12 | 0.324" x 0.220" Microstrip                       |
| Z3  | 0.211" x 0.220" Microstrip | Z13 | 0.050" x 0.220" Microstrip                       |
| Z4  | 0.139" x 0.220" Microstrip | Z14 | 0.171" x 0.080" Microstrip                       |
| Z5  | 0.239" x 0.220" Microstrip | Z15 | 0.377" x 0.080" Microstrip                       |
| Z6  | 0.040" x 0.640" Microstrip | Z16 | 0.358" x 0.080" Microstrip                       |
| Z7  | 0.080" x 0.640" Microstrip | Z17 | 0.361" x 0.080" Microstrip                       |
| Z8  | 0.276" x 0.640" Microstrip | Z18 | 0.131" x 0.080" Microstrip                       |
| Z9  | 1.000" x 0.226" Microstrip | Z19 | 0.277" x 0.080" Microstrip                       |
| Z10 | 0.498" x 0.630" Microstrip | PCB | Arlon GX-0300-55-22, 0.030", $\epsilon_r = 2.55$ |

Figure 14. MRF5S4140HR3(SR3) Test Circuit Schematic — 420-430 MHz

Table 6. MRF5S4140HR3(SR3) Test Circuit Component Designations and Values — 420-430 MHz

| Part               | Description                               | Part Number       | Manufacturer     |
|--------------------|-------------------------------------------|-------------------|------------------|
| B1, B2             | Ferrite Beads, Short                      | 2743019447        | Fair-Rite        |
| C1, C14            | 120 pF Chip Capacitors                    | 100B121JP500X     | ATC              |
| C2, C13            | 0.8-8.0 pF Variable Capacitors, Gigatrim  | 27291SL           | Johanson         |
| C3                 | 18 pF Chip Capacitor                      | 100B180JP500X     | ATC              |
| C4                 | 39 pF Chip Capacitor                      | 100B390JP500X     | ATC              |
| C5                 | 24 pF Chip Capacitor                      | 100B240JP500X     | ATC              |
| C6, C7             | 13 pF Chip Capacitors                     | 100B130JP500X     | ATC              |
| C8                 | 0.02 $\mu$ F, 50 V Chip Capacitor         | 200B203MW50B      | ATC              |
| C9, C10            | 22 pF Chip Capacitors                     | 100B220JP500X     | ATC              |
| C11                | 1.0 pF Chip Capacitor                     | 100B1R0JP500X     | ATC              |
| C12                | 5.6 pF Chip Capacitor                     | 100B5R6JP500X     | ATC              |
| C15                | 1.5 pF Chip Capacitor                     | 100B1R5JP500X     | ATC              |
| C16                | 47 pF Chip Capacitor                      | 100B47JP500X      | ATC              |
| C17                | 0.56 $\mu$ F, 50 V Chip Capacitor         | C1825C564J5GAC    | Kemet            |
| C18, C19, C20, C21 | 10 $\mu$ F, 35 V Tantalum Chip Capacitors | T491D106K035AS    | Kemet            |
| C22                | 470 $\mu$ F, 63 V Electrolytic Capacitor  | SME63V471M12X25LL | United Chemi-Con |
| L1                 | 39 nH Inductor                            | 1812SMS-39N       | Coilcraft        |
| R1                 | 100 $\Omega$ , 1/4 W Chip Resistor (1210) |                   |                  |

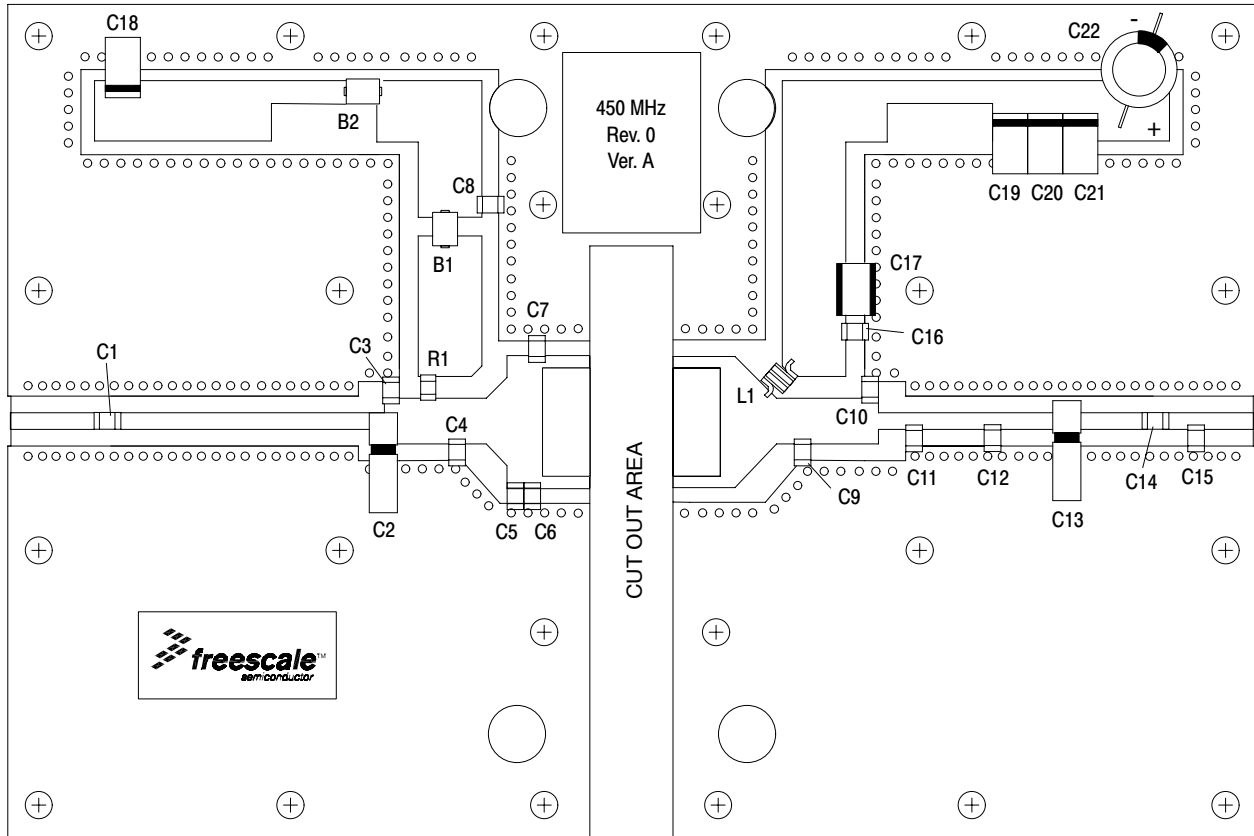
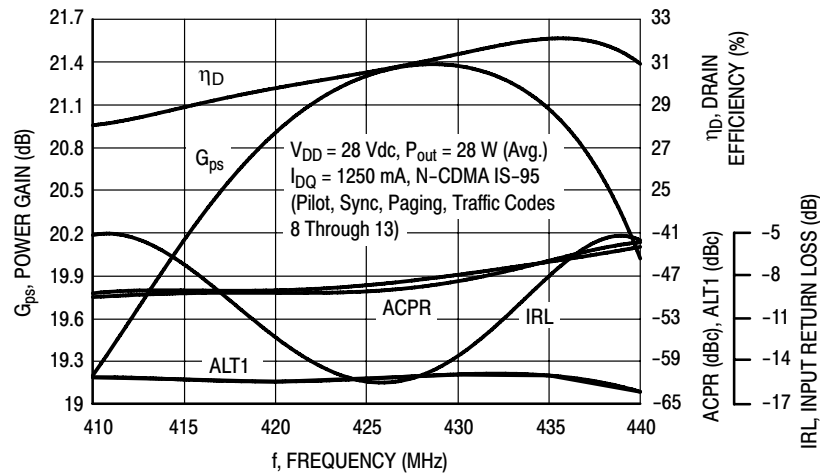
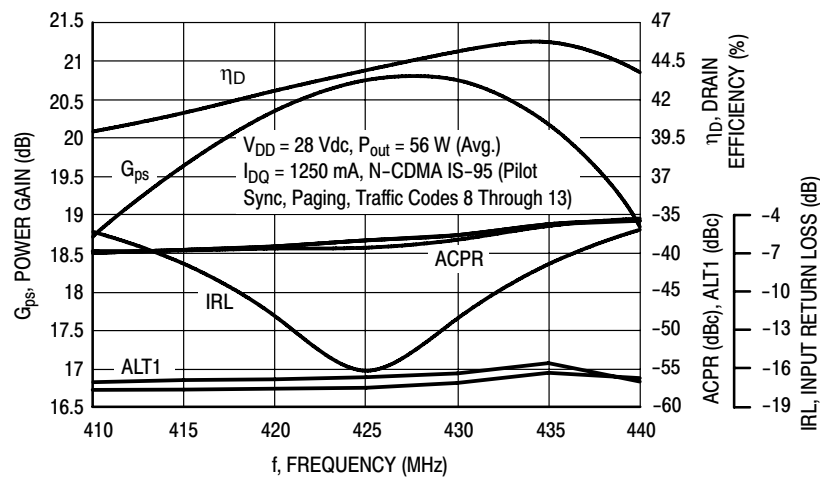


Figure 15. MRF5S4140HR3(SR3) Test Circuit Component Layout — 420-430 MHz

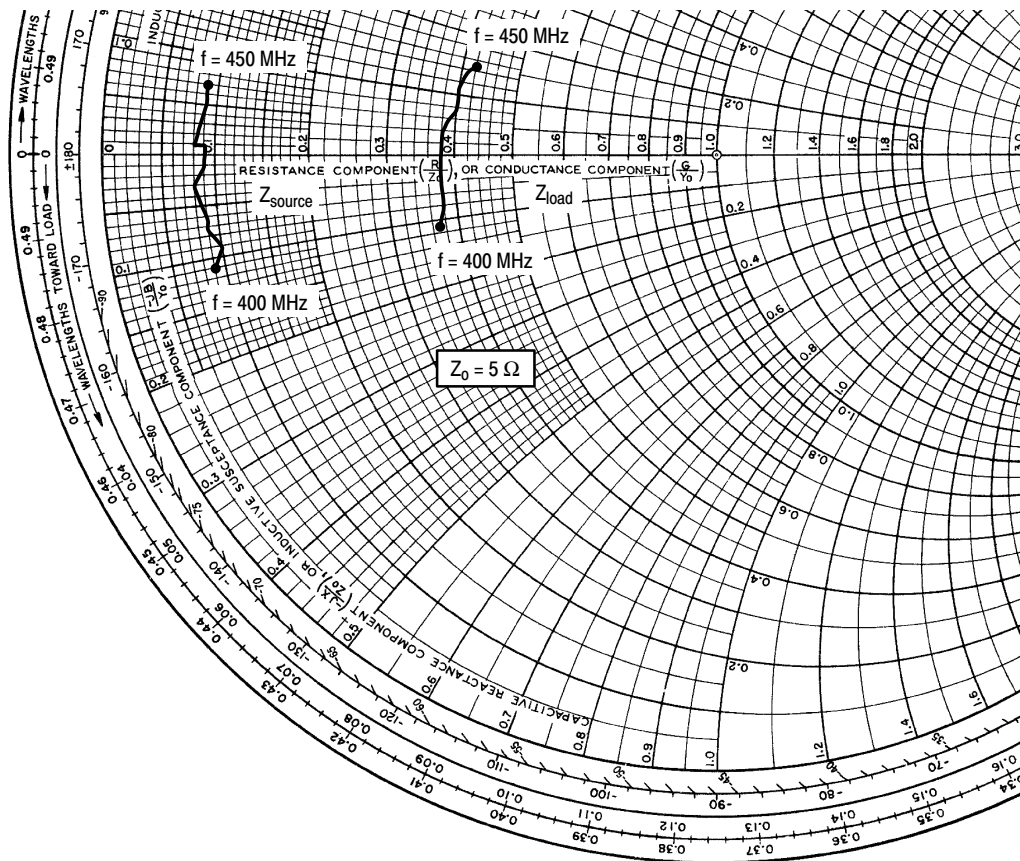
## TYPICAL CHARACTERISTICS — 420-430 MHz



**Figure 16. Single-Carrier N-CDMA Broadband Performance  
@  $P_{out} = 28$  Watts Avg.**



**Figure 17. Single-Carrier N-CDMA Broadband Performance  
@  $P_{out} = 56$  Watts Avg.**



$V_{DD} = 28 \text{ Vdc}$ ,  $I_{DQ} = 1250 \text{ mA}$ ,  $P_{out} = 28 \text{ W Avg.}$

| f<br>MHz | $Z_{source}$<br>$\Omega$ | $Z_{load}$<br>$\Omega$ |
|----------|--------------------------|------------------------|
| 400      | $0.454 - j0.530$         | $1.87 - j0.530$        |
| 405      | $0.476 - j0.435$         | $1.91 - j0.376$        |
| 410      | $0.430 - j0.360$         | $1.88 - j0.276$        |
| 415      | $0.455 - j0.281$         | $1.91 - j0.046$        |
| 420      | $0.419 - j0.153$         | $1.89 - j0.019$        |
| 425      | $0.421 - j0.135$         | $1.92 + j0.128$        |
| 430      | $0.435 - j0.032$         | $1.97 + j0.276$        |
| 435      | $0.426 + j0.048$         | $1.99 + j0.392$        |
| 440      | $0.407 + j0.044$         | $1.99 + j0.537$        |
| 445      | $0.429 + j0.262$         | $2.05 + j0.675$        |
| 450      | $0.452 + j0.341$         | $2.10 + j0.765$        |

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

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

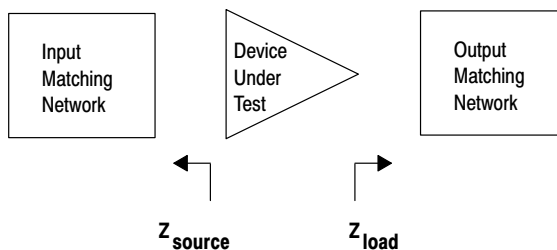
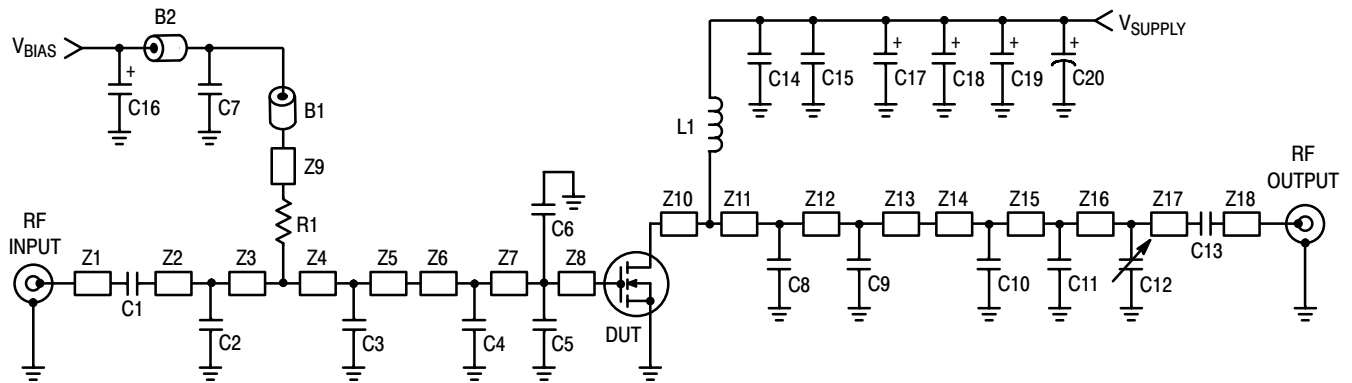


Figure 18. Series Equivalent Source and Load Impedance — 420-430 MHz



|     |                            |     |                                                  |
|-----|----------------------------|-----|--------------------------------------------------|
| Z1  | 0.402" x 0.080" Microstrip | Z11 | 0.125" x 0.220" Microstrip                       |
| Z2  | 1.266" x 0.080" Microstrip | Z12 | 0.324" x 0.220" Microstrip                       |
| Z3  | 0.211" x 0.220" Microstrip | Z13 | 0.050" x 0.220" Microstrip                       |
| Z4  | 0.139" x 0.220" Microstrip | Z14 | 0.171" x 0.080" Microstrip                       |
| Z5  | 0.239" x 0.220" Microstrip | Z15 | 0.377" x 0.080" Microstrip                       |
| Z6  | 0.040" x 0.640" Microstrip | Z16 | 0.358" x 0.080" Microstrip                       |
| Z7  | 0.080" x 0.640" Microstrip | Z17 | 0.361" x 0.080" Microstrip                       |
| Z8  | 0.276" x 0.640" Microstrip | Z18 | 0.408" x 0.080" Microstrip                       |
| Z9  | 1.000" x 0.226" Microstrip | PCB | Arlon GX-0300-55-22, 0.030", $\epsilon_r = 2.55$ |
| Z10 | 0.498" x 0.630" Microstrip |     |                                                  |

**Figure 19. MRF5S4140HR3(SR3) Test Circuit Schematic — 489-499 MHz**

**Table 7. MRF5S4140HR3(SR3) Test Circuit Component Designations and Values — 489-499 MHz**

| Part               | Description                               | Part Number       | Manufacturer     |
|--------------------|-------------------------------------------|-------------------|------------------|
| B1, B2             | Ferrite Beads, Short                      | 2743019447        | Fair-Rite        |
| C1, C13            | 120 pF Chip Capacitors                    | 100B121JP500X     | ATC              |
| C2                 | 18 pF Chip Capacitor                      | 100B180JP500X     | ATC              |
| C3, C4             | 24 pF Chip Capacitors                     | 100B240JP500X     | ATC              |
| C5, C6             | 13 pF Chip Capacitors                     | 100B130JP500X     | ATC              |
| C7                 | 0.02 $\mu$ F, 50 V Chip Capacitor         | 200B203MW50B      | ATC              |
| C8, C9             | 22 pF Chip Capacitors                     | 100B220JP500X     | ATC              |
| C10                | 1.0 pF Chip Capacitor                     | 100B1R0JP500X     | ATC              |
| C11                | 5.6 pF Chip Capacitor                     | 100B5R6JP500X     | ATC              |
| C12                | 0.8-8.0 pF Variable Capacitor, Gigatrim   | 27291SL           | Johanson         |
| C14                | 47 pF Chip Capacitor                      | 100B47JP500X      | ATC              |
| C15                | 0.56 $\mu$ F, 50 V Chip Capacitor         | C1825C564J5GAC    | Kemet            |
| C16, C17, C18, C19 | 10 $\mu$ F, 35 V Tantalum Capacitors      | T491D106K035AS    | Kemet            |
| C20                | 470 $\mu$ F, 63 V Electrolytic Capacitor  | SME63V471M12X25LL | United Chemi-Con |
| L1                 | 39 nH Inductor                            | 1812SMS-39N       | Coilcraft        |
| R1                 | 100 $\Omega$ , 1/4 W Chip Resistor (1210) |                   |                  |

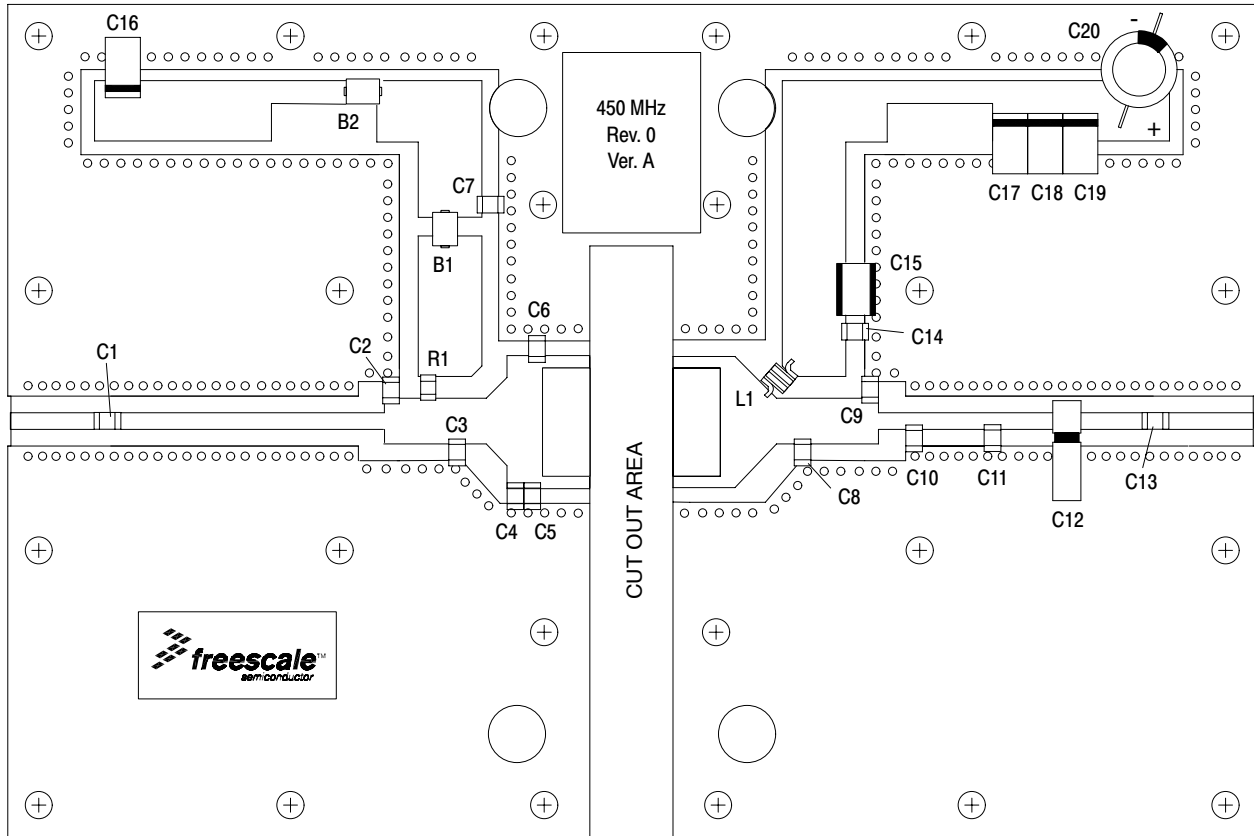


Figure 20. MRF5S4140HR3(SR3) Test Circuit Component Layout — 489-499 MHz

TYPICAL CHARACTERISTICS — 489-499 MHz

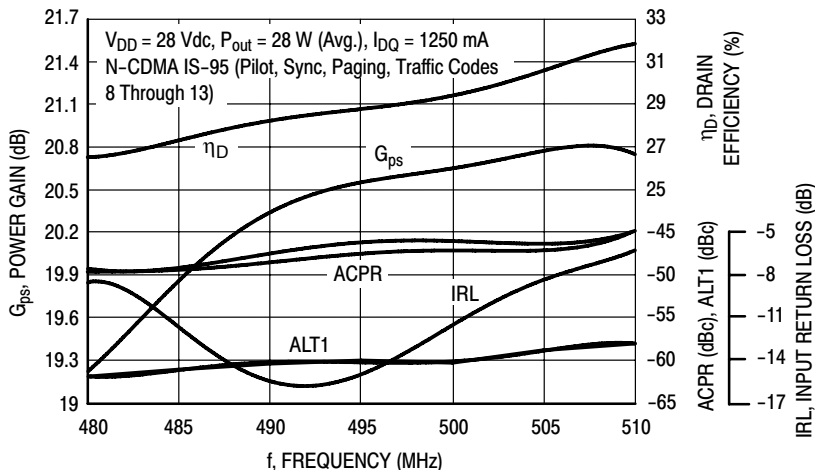


Figure 21. Single-Carrier N-CDMA Broadband Performance @  $P_{out} = 28$  Watts Avg.

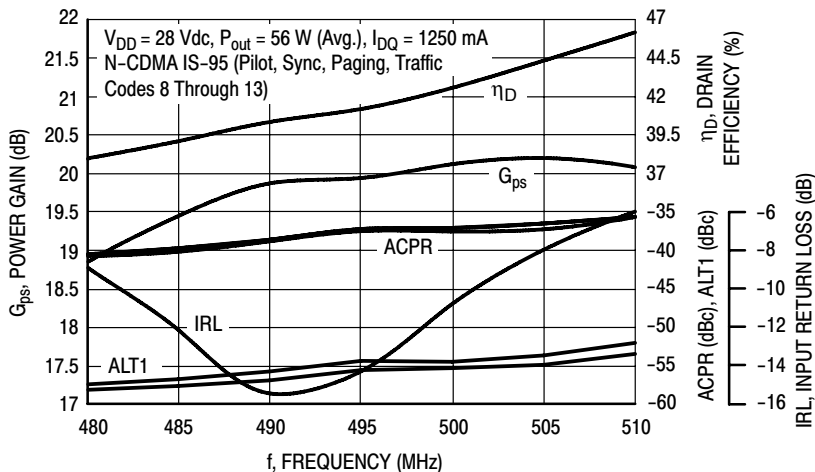
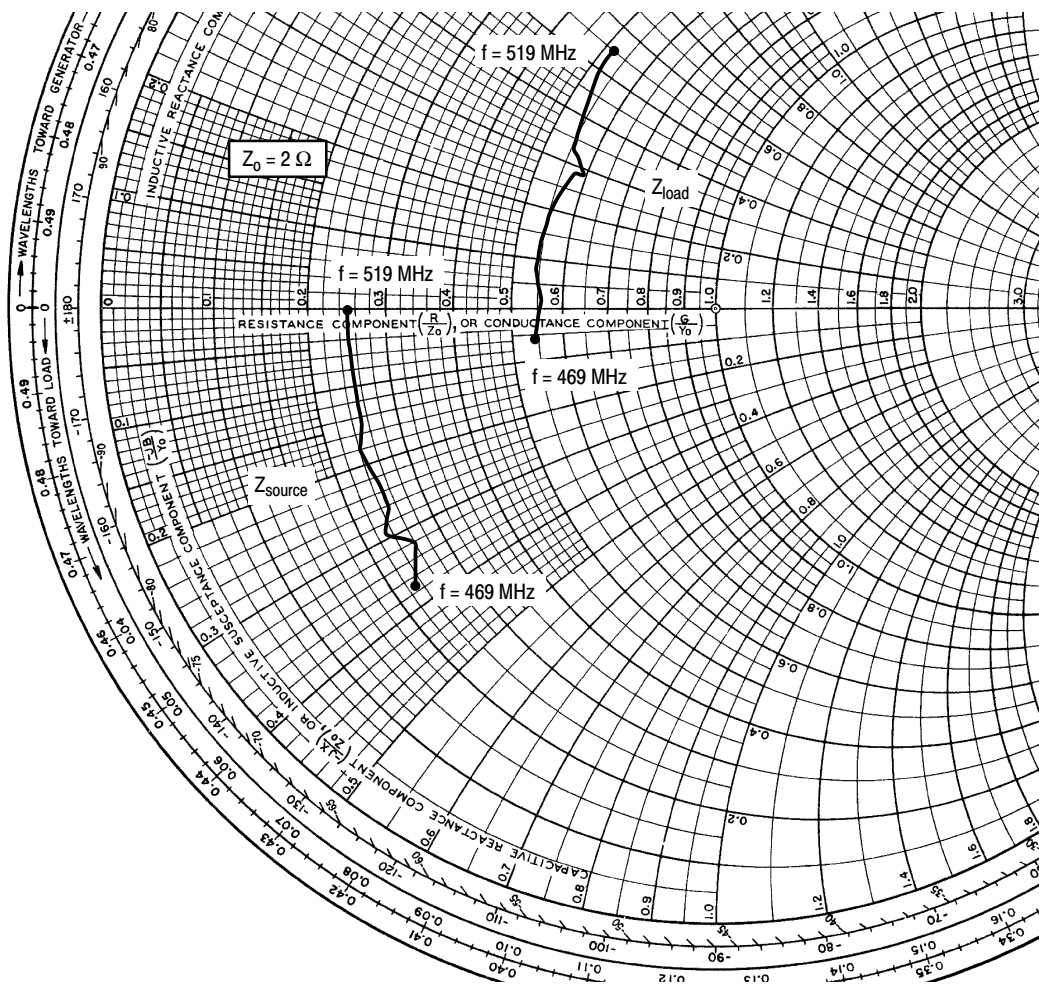


Figure 22. Single-Carrier N-CDMA Broadband Performance @  $P_{out} = 56$  Watts Avg.



$V_{DD} = 28 \text{ Vdc}$ ,  $I_{DQ} = 1250 \text{ mA}$ ,  $P_{out} = 28 \text{ W Avg.}$

| f<br>MHz | $Z_{source}$<br>$\Omega$ | $Z_{load}$<br>$\Omega$ |
|----------|--------------------------|------------------------|
| 469      | $0.454 - j0.742$         | $1.08 - j0.129$        |
| 474      | $0.510 - j0.637$         | $1.12 + j0.043$        |
| 479      | $0.467 - j0.581$         | $1.07 + j0.160$        |
| 484      | $0.495 - j0.513$         | $1.09 + j0.294$        |
| 489      | $0.495 - j0.457$         | $1.12 + j0.430$        |
| 494      | $0.478 - j0.360$         | $1.16 + j0.573$        |
| 499      | $0.505 - j0.295$         | $1.18 + j0.586$        |
| 504      | $0.502 - j0.249$         | $1.11 + j0.653$        |
| 509      | $0.502 - j0.048$         | $1.07 + j0.810$        |
| 514      | $0.499 + j0.002$         | $1.03 + j1.01$         |
| 519      | $0.502 + j0.003$         | $1.03 + j1.10$         |

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

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

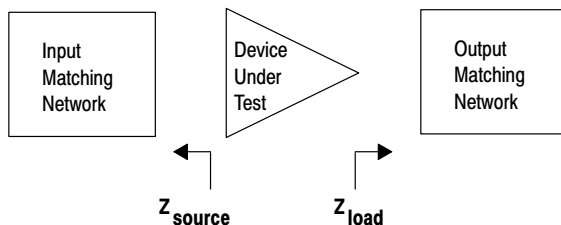
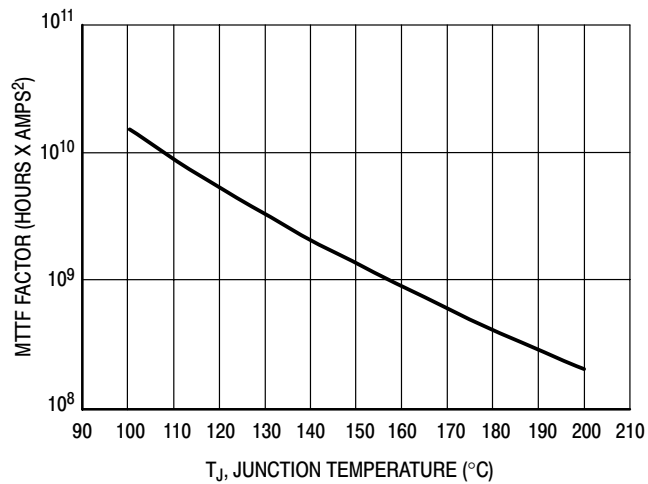


Figure 23. Series Equivalent Source and Load Impedance — 489-499 MHz



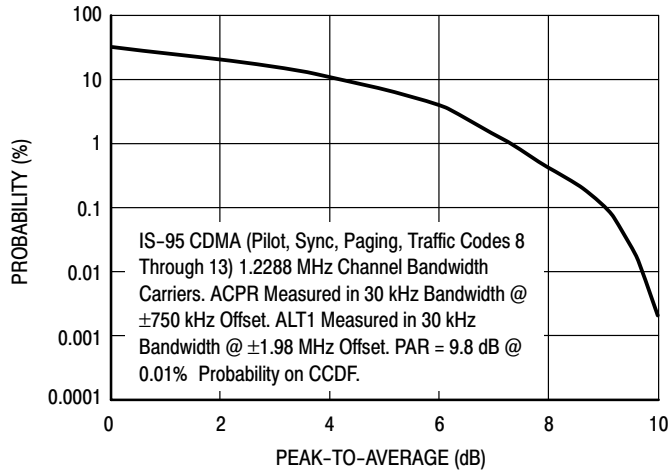
## TYPICAL CHARACTERISTICS



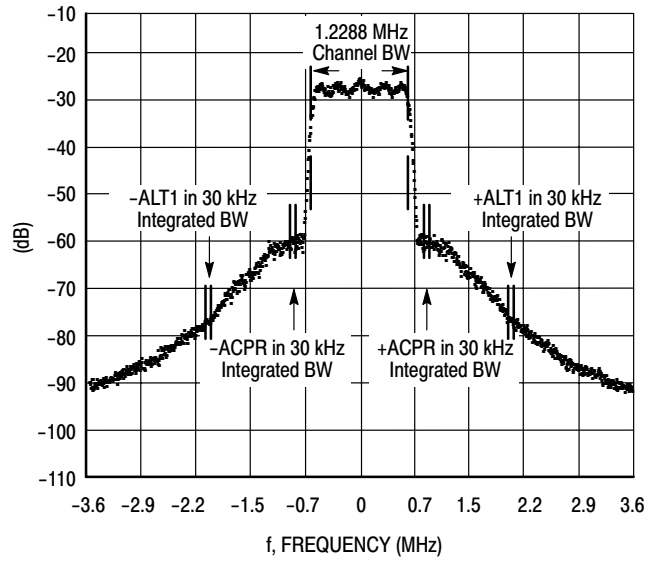
This above graph displays calculated MTTF in hours x ampere<sup>2</sup> drain current. Life tests at elevated temperatures have correlated to better than  $\pm 10\%$  of the theoretical prediction for metal failure. Divide MTTF factor by  $I_D^2$  for MTTF in a particular application.

**Figure 24. MTTF Factor versus Junction Temperature**

## N-CDMA TEST SIGNAL

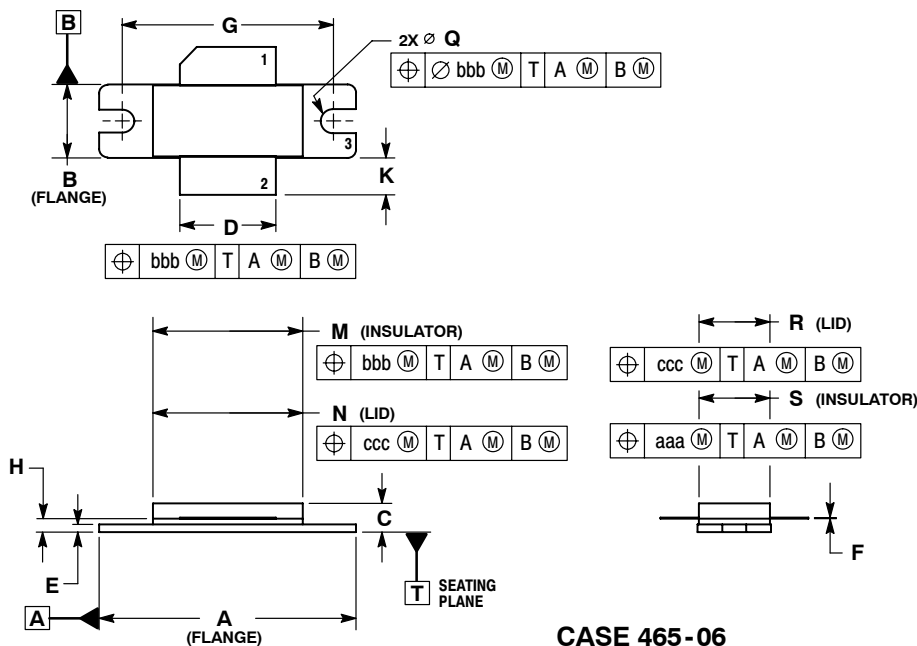


**Figure 25. Single-Carrier CCDF N-CDMA**



**Figure 26. Single-Carrier N-CDMA Spectrum**

## PACKAGE DIMENSIONS

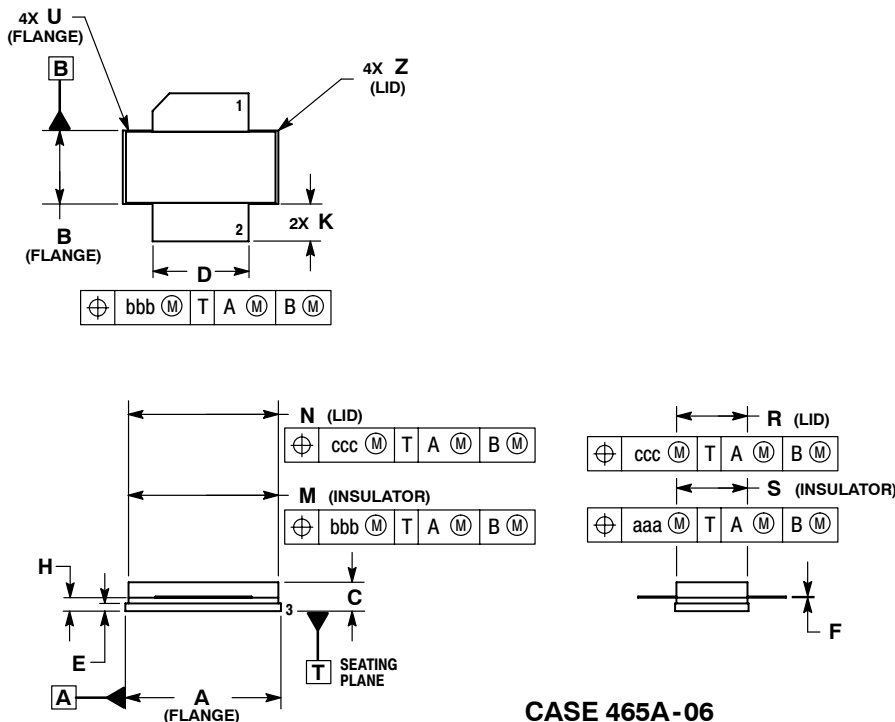


- NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M-1994.
  2. CONTROLLING DIMENSION: INCH.
  3. DELETED
  4. DIMENSION H IS MEASURED 0.030 (0.762) AWAY FROM PACKAGE BODY.

| DIM | INCHES    |       | MILLIMETERS |       |
|-----|-----------|-------|-------------|-------|
|     | MIN       | MAX   | MIN         | MAX   |
| A   | 1.335     | 1.345 | 33.91       | 34.16 |
| B   | 0.380     | 0.390 | 9.65        | 9.91  |
| C   | 0.125     | 0.170 | 3.18        | 4.32  |
| 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   | 0.774     | 0.786 | 19.66       | 19.96 |
| N   | 0.772     | 0.788 | 19.60       | 20.00 |
| Q   | Ø.118     | Ø.138 | Ø3.00       | Ø3.51 |
| R   | 0.365     | 0.375 | 9.27        | 9.53  |
| S   | 0.365     | 0.375 | 9.27        | 9.52  |
| aaa | 0.005 REF |       | 0.127 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 465-06  
 ISSUE G  
 NI-780  
 MRF5S4140HR3**



- NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M-1994.
  2. CONTROLLING DIMENSION: INCH.
  3. DELETED
  4. DIMENSION H IS MEASURED 0.030 (0.762) AWAY FROM PACKAGE BODY.

| DIM | INCHES    |       | MILLIMETERS |       |
|-----|-----------|-------|-------------|-------|
|     | MIN       | MAX   | MIN         | MAX   |
| A   | 0.805     | 0.815 | 20.45       | 20.70 |
| B   | 0.380     | 0.390 | 9.65        | 9.91  |
| C   | 0.125     | 0.170 | 3.18        | 4.32  |
| 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   | 0.774     | 0.786 | 19.61       | 20.02 |
| N   | 0.772     | 0.788 | 19.61       | 20.02 |
| R   | 0.365     | 0.375 | 9.27        | 9.53  |
| S   | 0.365     | 0.375 | 9.27        | 9.52  |
| U   | ---       | 0.040 | ---         | 1.02  |
| Z   | ---       | 0.030 | ---         | 0.76  |
| aaa | 0.005 REF |       | 0.127 REF   |       |
| bbb | 0.010 REF |       | 0.254 REF   |       |
| ccc | 0.015 REF |       | 0.381 REF   |       |

- STYLE 1:  
 PIN 1. DRAIN  
 2. GATE  
 5. SOURCE

**CASE 465A-06  
 ISSUE H  
 NI-780S  
 MRF5S4140HSR3**

**MRF5S4140HR3 MRF5S4140HSR3**

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