

# ANTREX Electronics

## Electronic Components Sourcing Information

---

### Product Reference Information

|                      |                           |
|----------------------|---------------------------|
| <b>Part Number:</b>  | MRF6VP41KHSR7             |
| <b>Manufacturer:</b> | NXP USA Inc.              |
| <b>Package:</b>      | Please confirm with sales |
| <b>Availability:</b> | Please confirm with sales |

**Product Page:**

<https://antrexco.com/product/details/nxp-usa-inc/mrf6vp41khsr7.html>

**Request a Quote:**

[Submit RFQ for this part](#)



Scan for product page

### Contact Information

Email: [info@antrexco.com](mailto:info@antrexco.com)

WhatsApp: +86-186-8066-5326

Website: <https://antrexco.com>

### Quality & Trust

New & Original Components

Supplier verification and packaging condition review

CoC / RoHS / REACH documents available on request

Secure sourcing support for OEM / EMS projects

**Note:**

This PDF includes an ANTREX product reference cover page.

The original manufacturer datasheet follows from the next page.

# RF Power Field Effect Transistors

## N-Channel Enhancement-Mode Lateral MOSFETs

Designed for pulse and CW wideband applications with frequencies up to 500 MHz. Devices are unmatched and are suitable for use in industrial, medical and scientific applications.

- Typical Pulse Performance at 450 MHz:  $V_{DD} = 50$  Volts,  $I_{DQ} = 150$  mA,  $P_{out} = 1000$  Watts Peak (200 W Avg.), Pulse Width = 100  $\mu$ sec, Duty Cycle = 20%  
Power Gain — 20 dB  
Drain Efficiency — 64%
- Capable of Handling 10:1 VSWR @ 50 Vdc, 450 MHz, 1000 Watts Peak Power

### Features

- Characterized with Series Equivalent Large-Signal Impedance Parameters
- CW Operation Capability with Adequate Cooling
- Qualified Up to a Maximum of 50  $V_{DD}$  Operation
- Integrated ESD Protection
- Designed for Push-Pull Operation
- Greater Negative Gate-Source Voltage Range for Improved Class C Operation
- In Tape and Reel. R6 Suffix = 150 Units per 56 mm, 13 inch Reel. For R5 Tape and Reel option, see p. 17.

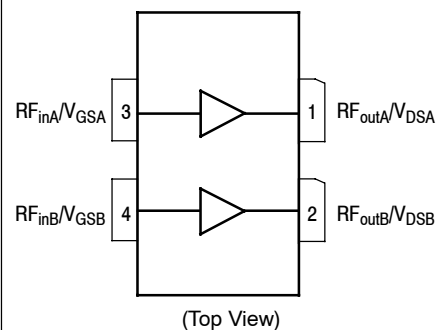
## MRF6VP41KHR6 MRF6VP41KHSR6

**10-500 MHz, 1000 W, 50 V  
LATERAL N-CHANNEL  
BROADBAND  
RF POWER MOSFETs**

**CASE 375D-05, STYLE 1  
NI-1230  
MRF6VP41KHR6**

**CASE 375E-04, STYLE 1  
NI-1230S  
MRF6VP41KHSR6**

**PARTS ARE PUSH-PULL**



**Figure 1. Pin Connections**

**Table 1. Maximum Ratings**

| Rating                                                       | Symbol    | Value       | Unit         |
|--------------------------------------------------------------|-----------|-------------|--------------|
| Drain-Source Voltage                                         | $V_{DSS}$ | -0.5, +110  | Vdc          |
| Gate-Source Voltage                                          | $V_{GS}$  | -6, +10     | Vdc          |
| Storage Temperature Range                                    | $T_{stg}$ | -65 to +150 | $^{\circ}$ C |
| Case Operating Temperature                                   | $T_C$     | 150         | $^{\circ}$ C |
| Operating Junction Temperature (1,2)                         | $T_J$     | 225         | $^{\circ}$ C |
| Total Device Dissipation @ $T_C = 25^{\circ}$ C, CW only (3) | $P_D$     | 1333        | 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 Fig. 12, Transient Thermal Impedance, for information to calculate value for pulsed operation.

**Table 2. Thermal Characteristics**

| Characteristic                                                                                                                           | Symbol          | Value (1,2) | Unit |
|------------------------------------------------------------------------------------------------------------------------------------------|-----------------|-------------|------|
| Thermal Impedance, Junction to Case<br>Pulse: Case Temperature 80°C, 1000 W Peak, 100 $\mu$ sec Pulse Width, 20% Duty Cycle, 450 MHz (3) | $Z_{\theta JC}$ | 0.03        | °C/W |
| Thermal Resistance, Junction to Case<br>CW: Case Temperature 84°C, 1000 W CW, 352.2 MHz                                                  | $R_{\theta JC}$ | 0.15        | °C/W |

**Table 3. ESD Protection Characteristics**

| Test Methodology                      | Class             |
|---------------------------------------|-------------------|
| Human Body Model (per JESD22-A114)    | 2, passes 2000 V  |
| Machine Model (per EIA/JESD22-A115)   | A, passes 125 V   |
| Charge Device Model (per JESD22-C101) | IV, passes 2000 V |

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

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

**Off Characteristics (4)**

|                                                                                                    |               |     |   |     |                 |
|----------------------------------------------------------------------------------------------------|---------------|-----|---|-----|-----------------|
| Gate-Source Leakage Current<br>( $V_{GS} = 5\text{ Vdc}$ , $V_{DS} = 0\text{ Vdc}$ )               | $I_{GSS}$     | —   | — | 10  | $\mu\text{Adc}$ |
| Drain-Source Breakdown Voltage<br>( $I_D = 300\text{ mA}$ , $V_{GS} = 0\text{ Vdc}$ )              | $V_{(BR)DSS}$ | 110 | — | —   | Vdc             |
| Zero Gate Voltage Drain Leakage Current<br>( $V_{DS} = 50\text{ Vdc}$ , $V_{GS} = 0\text{ Vdc}$ )  | $I_{DSS}$     | —   | — | 100 | $\mu\text{Adc}$ |
| Zero Gate Voltage Drain Leakage Current<br>( $V_{DS} = 100\text{ Vdc}$ , $V_{GS} = 0\text{ Vdc}$ ) | $I_{DSS}$     | —   | — | 5   | mA              |

**On Characteristics**

|                                                                                                                 |              |     |      |     |     |
|-----------------------------------------------------------------------------------------------------------------|--------------|-----|------|-----|-----|
| Gate Threshold Voltage (4)<br>( $V_{DS} = 10\text{ Vdc}$ , $I_D = 1600\text{ }\mu\text{Adc}$ )                  | $V_{GS(th)}$ | 1   | 1.68 | 3   | Vdc |
| Gate Quiescent Voltage (5)<br>( $V_{DD} = 50\text{ Vdc}$ , $I_D = 150\text{ mA}$ , Measured in Functional Test) | $V_{GS(Q)}$  | 1.5 | 2.2  | 3.5 | Vdc |
| Drain-Source On-Voltage (4)<br>( $V_{GS} = 10\text{ Vdc}$ , $I_D = 4\text{ Adc}$ )                              | $V_{DS(on)}$ | —   | 0.28 | —   | Vdc |

**Dynamic Characteristics (4)**

|                                                                                                                        |           |   |     |   |    |
|------------------------------------------------------------------------------------------------------------------------|-----------|---|-----|---|----|
| Reverse Transfer Capacitance<br>( $V_{DS} = 50\text{ Vdc} \pm 30\text{ mV(rms)}$ ac @ 1 MHz, $V_{GS} = 0\text{ Vdc}$ ) | $C_{rss}$ | — | 3.3 | — | pF |
| Output Capacitance<br>( $V_{DS} = 50\text{ Vdc} \pm 30\text{ mV(rms)}$ ac @ 1 MHz, $V_{GS} = 0\text{ Vdc}$ )           | $C_{oss}$ | — | 147 | — | pF |
| Input Capacitance<br>( $V_{DS} = 50\text{ Vdc}$ , $V_{GS} = 0\text{ Vdc} \pm 30\text{ mV(rms)}$ ac @ 1 MHz)            | $C_{iss}$ | — | 506 | — | pF |

**Functional Tests (5)** (In Freescale Test Fixture, 50 ohm system)  $V_{DD} = 50\text{ Vdc}$ ,  $I_{DQ} = 150\text{ mA}$ ,  $P_{out} = 1000\text{ W Peak}$  (200 W Avg.),  $f = 450\text{ MHz}$ , 100  $\mu$ sec Pulse Width, 20% Duty Cycle

|                   |          |    |     |    |    |
|-------------------|----------|----|-----|----|----|
| Power Gain        | $G_{ps}$ | 19 | 20  | 22 | dB |
| Drain Efficiency  | $\eta_D$ | 60 | 64  | —  | %  |
| Input Return Loss | IRL      | —  | -18 | -9 | dB |

1. MTTF calculator available at <http://www.freescale.com/rf>. Select Software & Tools/Development Tools/Calculators to access 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.
3. Refer to Fig. 12, Transient Thermal Impedance, for other pulsed conditions.
4. Each side of device measured separately.
5. Measurement made with device in push-pull configuration.

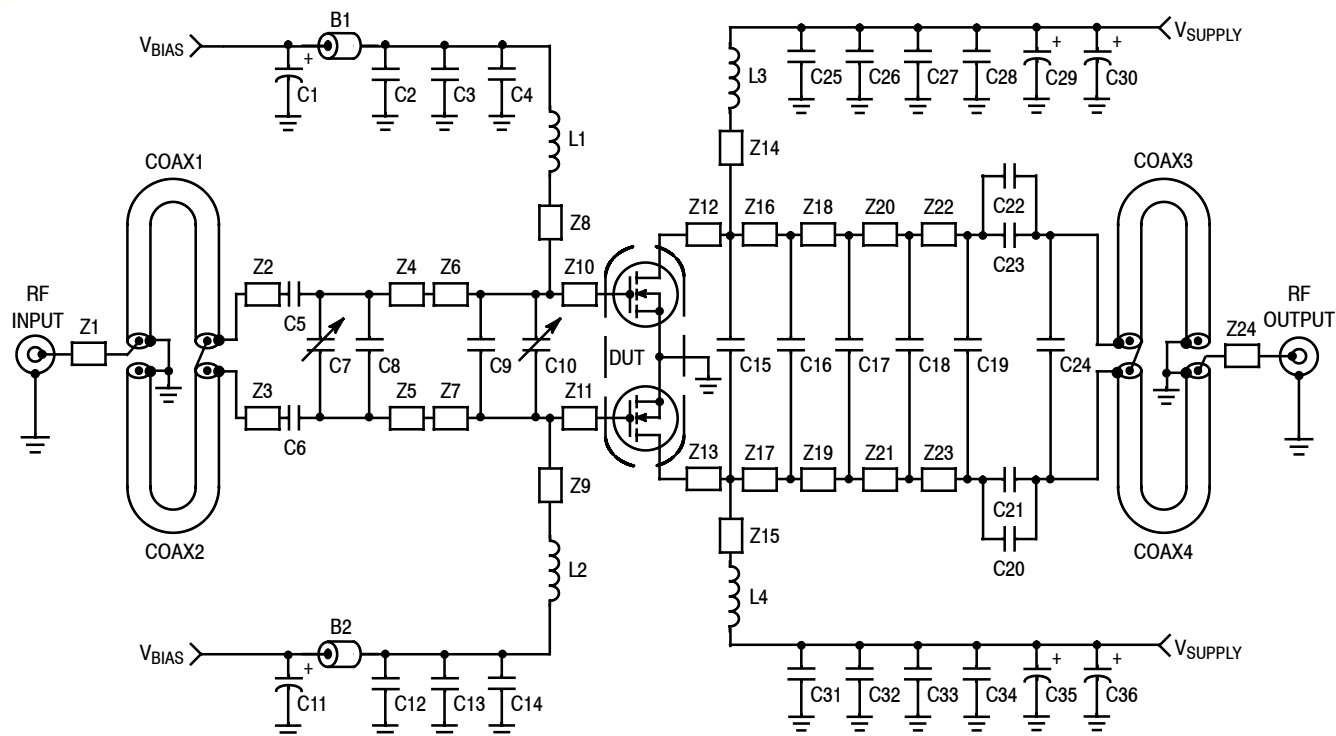
(continued)

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

| Characteristic                                                                                                                                                                 | Symbol   | Min | Typ   | Max | Unit |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|-----|-------|-----|------|
| <b>Typical Performance — 352.2 MHz</b> (In Freescale 352.2 MHz Test Fixture, 50 ohm system) $V_{DD} = 50\text{ Vdc}$ , $I_{DQ} = 150\text{ mA}$ , $P_{out} = 1000\text{ W CW}$ |          |     |       |     |      |
| Power Gain                                                                                                                                                                     | $G_{ps}$ | —   | 20.1  | —   | dB   |
| Drain Efficiency                                                                                                                                                               | $\eta_D$ | —   | 67    | —   | %    |
| Input Return Loss                                                                                                                                                              | IRL      | —   | -10.2 | —   | dB   |

**Typical Performance — 500 MHz** (In Freescale 500 MHz Test Fixture, 50 ohm system)  $V_{DD} = 50\text{ Vdc}$ ,  $I_{DQ} = 150\text{ mA}$ ,  $P_{out} = 1000\text{ W Peak}$  (200 W Avg.),  $f = 500\text{ MHz}$ , 100  $\mu\text{sec}$  Pulse Width, 20% Duty Cycle

|                   |          |   |      |   |    |
|-------------------|----------|---|------|---|----|
| Power Gain        | $G_{ps}$ | — | 19.5 | — | dB |
| Drain Efficiency  | $\eta_D$ | — | 66   | — | %  |
| Input Return Loss | IRL      | — | -23  | — | dB |



|          |                            |                                         |                                                            |
|----------|----------------------------|-----------------------------------------|------------------------------------------------------------|
| Z1       | 0.366" x 0.082" Microstrip | Z14*, Z15*                              | 0.764" x 0.150" Microstrip                                 |
| Z2*, Z3* | 0.170" x 0.100" Microstrip | Z16, Z17                                | 0.290" x 0.430" Microstrip                                 |
| Z4*, Z5* | 0.220" x 0.451" Microstrip | Z18, Z19                                | 0.100" x 0.430" Microstrip                                 |
| Z6, Z7   | 0.117" x 0.726" Microstrip | Z20, Z21, Z22, Z23                      | 0.080" x 0.430" Microstrip                                 |
| Z8*, Z9* | 0.792" x 0.058" Microstrip | Z24                                     | 0.257" x 0.215" Microstrip                                 |
| Z10, Z11 | 0.316" x 0.726" Microstrip | PCB                                     | Arlon CuClad 250GX-0300-55-22, 0.030", $\epsilon_r = 2.55$ |
| Z12, Z13 | 0.262" x 0.507" Microstrip | * Line length includes microstrip bends |                                                            |

**Figure 2. MRF6VP41KHR6(HSR6) Pulse Test Circuit Schematic — 450 MHz**

**Table 5. MRF6VP41KHR6(HSR6) Pulse Test Circuit Component Designations and Values — 450 MHz**

| Part                         | Description                                     | Part Number        | Manufacturer        |
|------------------------------|-------------------------------------------------|--------------------|---------------------|
| B1, B2                       | 47 $\Omega$ , 100 MHz Short Ferrite Beads       | 2743019447         | Fair-Rite           |
| C1, C11                      | 47 $\mu$ F, 50 V Electrolytic Capacitors        | 476KXM063M         | Illinois            |
| C2, C12, C28, C34            | 0.1 $\mu$ F Chip Capacitors                     | CDR33BX104AKYS     | Kemet               |
| C3, C13, C27, C33            | 220 nF, 50 V Chip Capacitors                    | C1812C224K5RAC     | Kemet               |
| C4, C14                      | 2.2 $\mu$ F, 50 V Chip Capacitors               | C1825C225J5RAC     | Kemet               |
| C5, C6, C8, C15              | 27 pF Chip Capacitors                           | ATC100B270JT500XT  | ATC                 |
| C7, C10                      | 0.8-8.0 pF Variable Capacitors                  | 27291SL            | Johanson Components |
| C9                           | 33 pF Chip Capacitor                            | ATC100B330JT500XT  | ATC                 |
| C16                          | 12 pF Chip Capacitor                            | ATC100B120JT500XT  | ATC                 |
| C17                          | 10 pF Chip Capacitor                            | ATC100B100JT500XT  | ATC                 |
| C18                          | 9.1 pF Chip Capacitor                           | ATC100B9R1CT500XT  | ATC                 |
| C19                          | 8.2 pF Chip Capacitor                           | ATC100B8R2CT500XT  | ATC                 |
| C20, C21, C22, C23, C25, C32 | 240 pF Chip Capacitors                          | ATC100B241JT200XT  | ATC                 |
| C24                          | 5.6 pF Chip Capacitor                           | ATC100B5R6CT500XT  | ATC                 |
| C26, C31                     | 2.2 $\mu$ F, 100 V Chip Capacitors              | 2225X7R225KT3AB    | ATC                 |
| C29, C30, C35, C36           | 330 $\mu$ F, 63 V Electrolytic Capacitors       | EMVY630GTR331MMH0S | Nippon Chemi-Con    |
| Coax1, 2, 3, 4               | 25 $\Omega$ Semi Rigid Coax, 2.2" Shield Length | UT-141C-25         | Micro-Coax          |
| L1, L2                       | 2.5 nH, 1 Turn Inductors                        | A01TKLC            | Coilcraft           |
| L3, L4                       | 43 nH, 10 Turn Inductors                        | B10TJLC            | Coilcraft           |

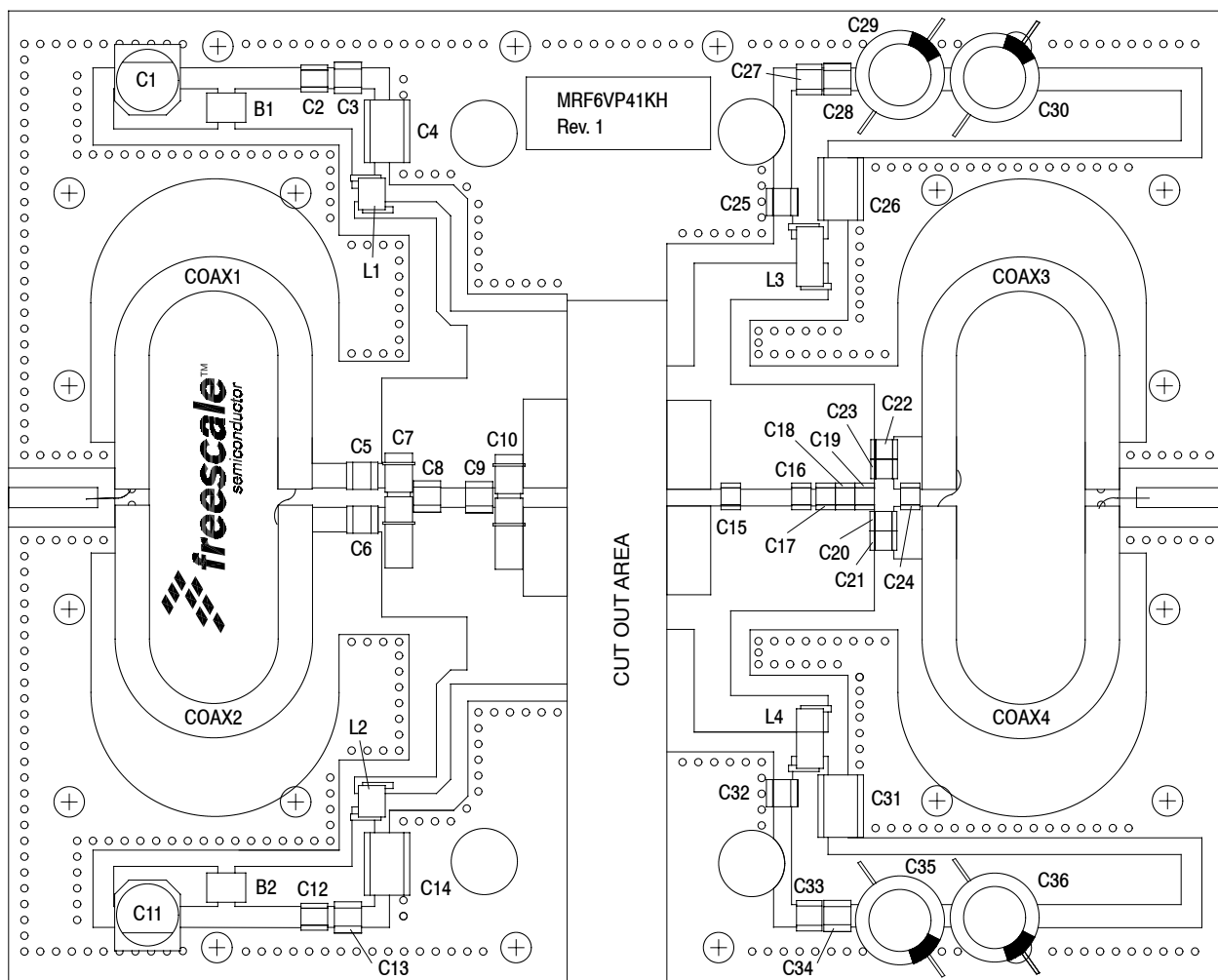
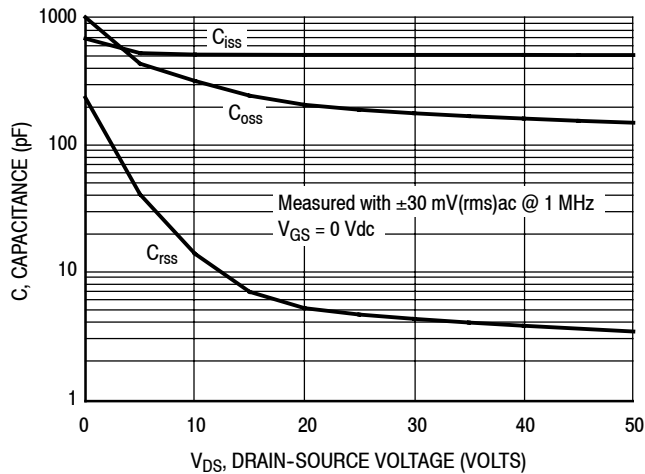


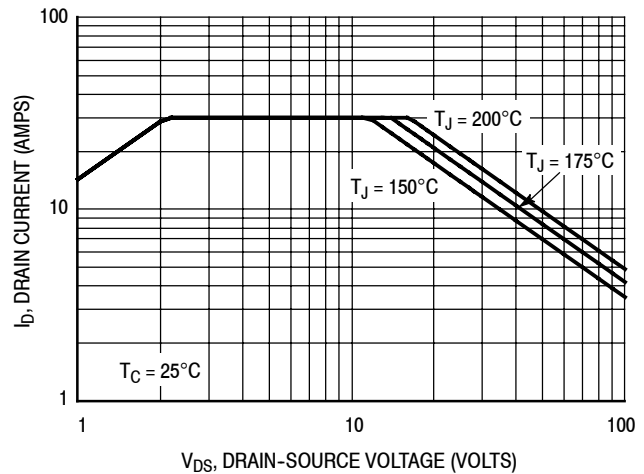
Figure 3. MRF6VP41KHR6(HSR6) Pulse Test Circuit Component Layout — 450 MHz

## TYPICAL CHARACTERISTICS



Note: Each side of device measured separately.

Figure 4. Capacitance versus Drain-Source Voltage



Note: Each side of device measured separately.

Figure 5. DC Safe Operating Area

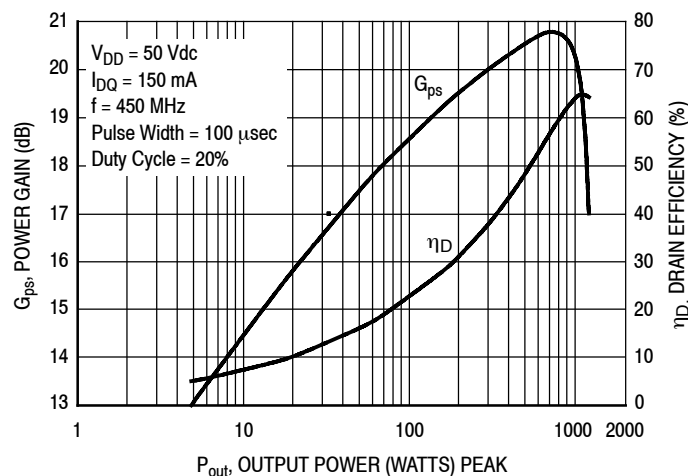


Figure 6. Power Gain and Drain Efficiency versus Output Power

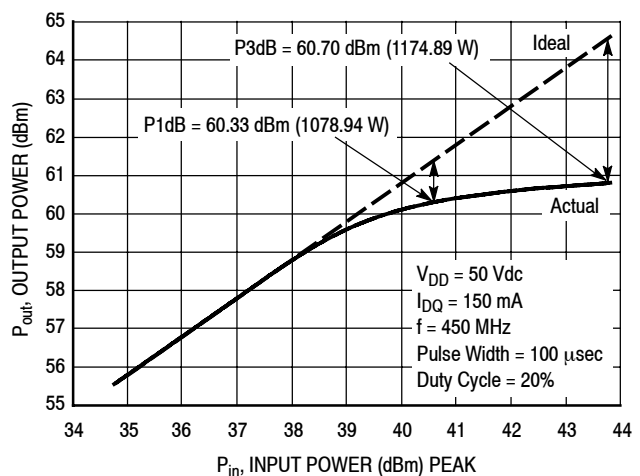


Figure 7. Output Power versus Input Power

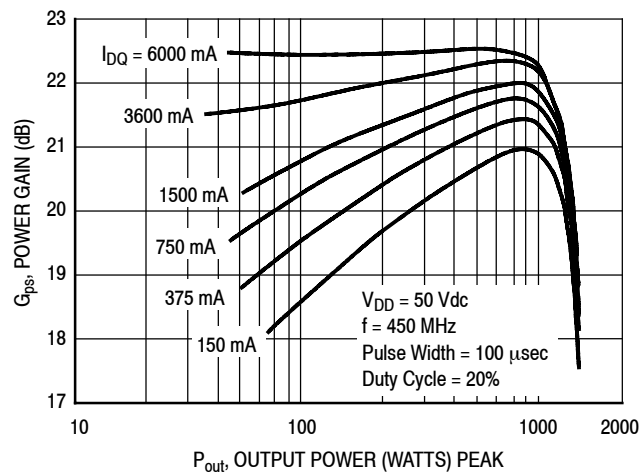


Figure 8. Power Gain versus Output Power

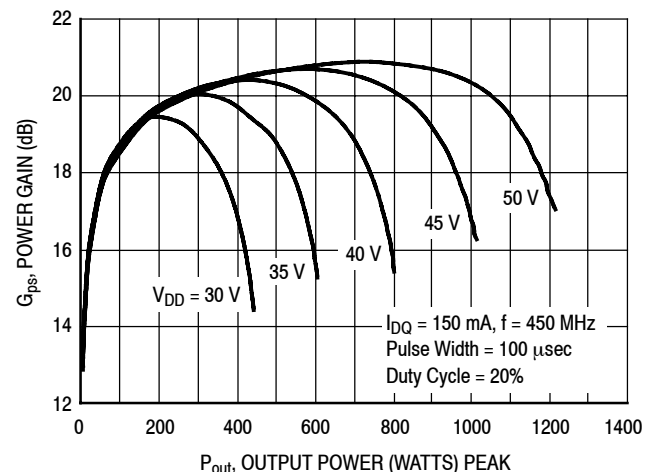


Figure 9. Power Gain versus Output Power

## TYPICAL CHARACTERISTICS

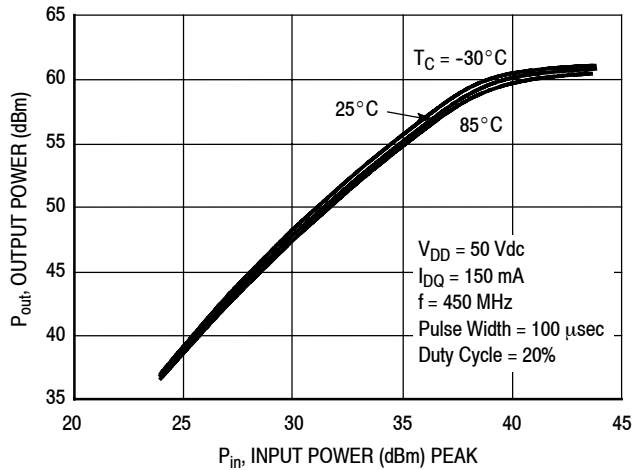


Figure 10. Output Power versus Input Power

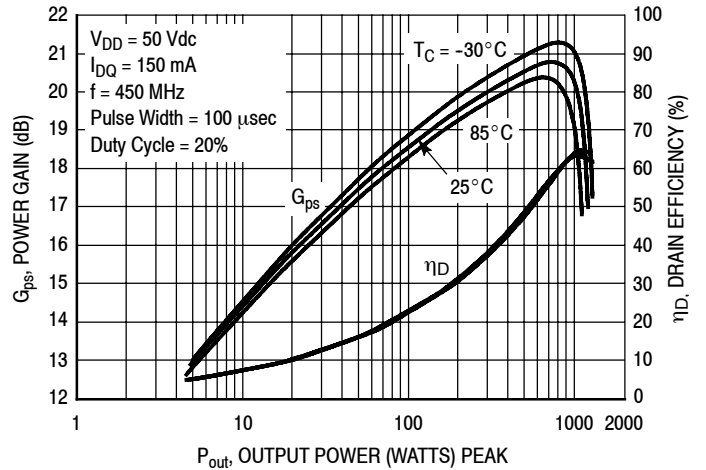


Figure 11. Power Gain and Drain Efficiency versus Output Power

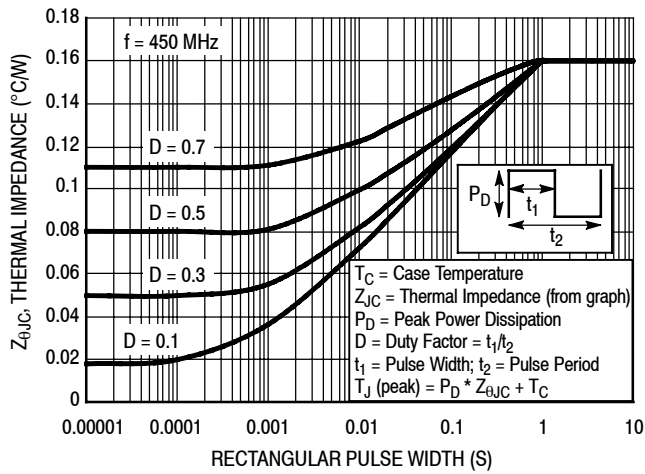
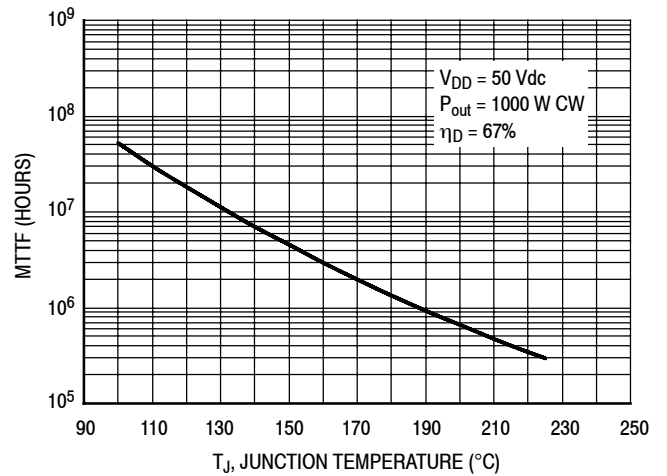


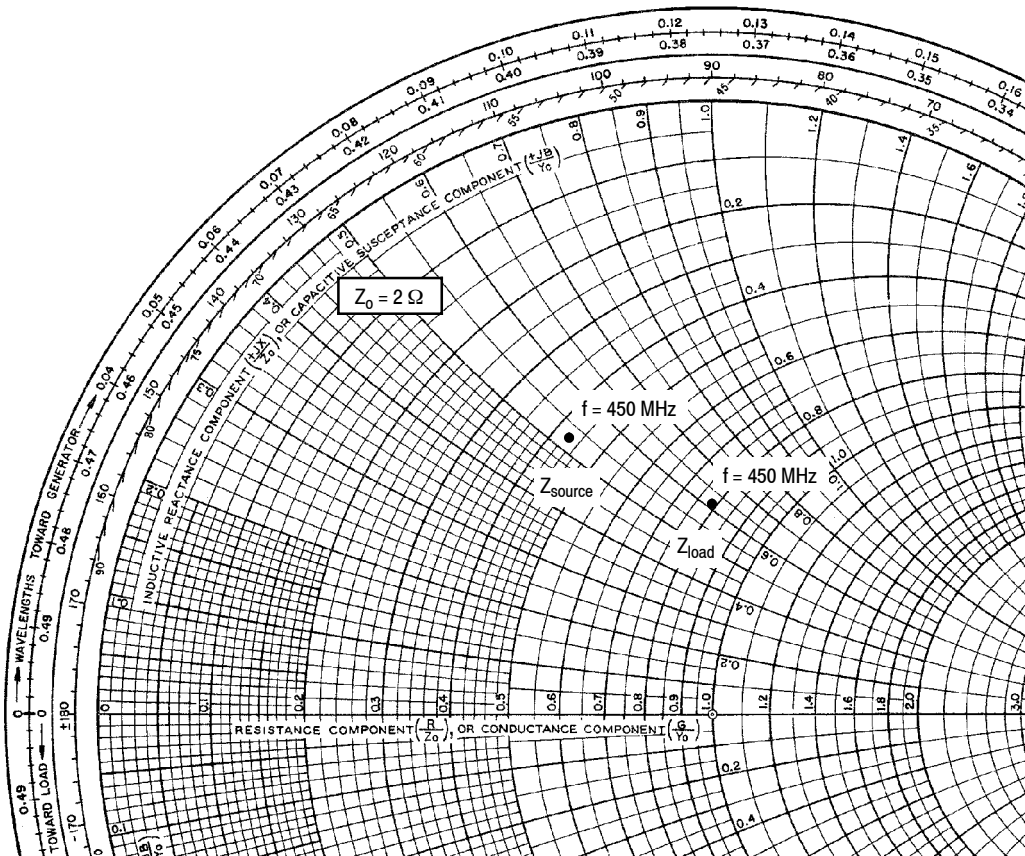
Figure 12. Transient Thermal Impedance



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

NOTE: For pulse applications or CW conditions, use the MTTF calculator referenced above.

Figure 13. MTTF versus Junction Temperature - CW



$V_{DD} = 50 \text{ Vdc}$ ,  $I_{DQ} = 150 \text{ mA}$ ,  $P_{out} = 1000 \text{ W Peak}$

| f<br>MHz | $Z_{source}$<br>$\Omega$ | $Z_{load}$<br>$\Omega$ |
|----------|--------------------------|------------------------|
| 450      | $0.86 + j1.06$           | $1.58 + j1.22$         |

$Z_{source}$  = Test circuit impedance as measured from gate to gate, balanced configuration.

$Z_{load}$  = Test circuit impedance as measured from drain to drain, balanced configuration.

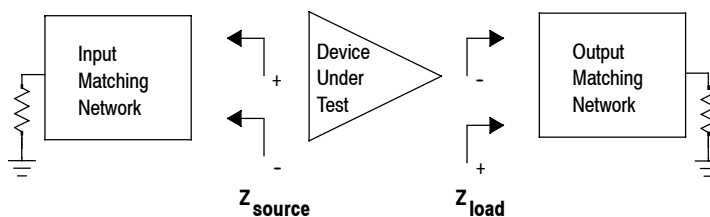


Figure 14. Series Equivalent Source and Load Impedance — 450 MHz

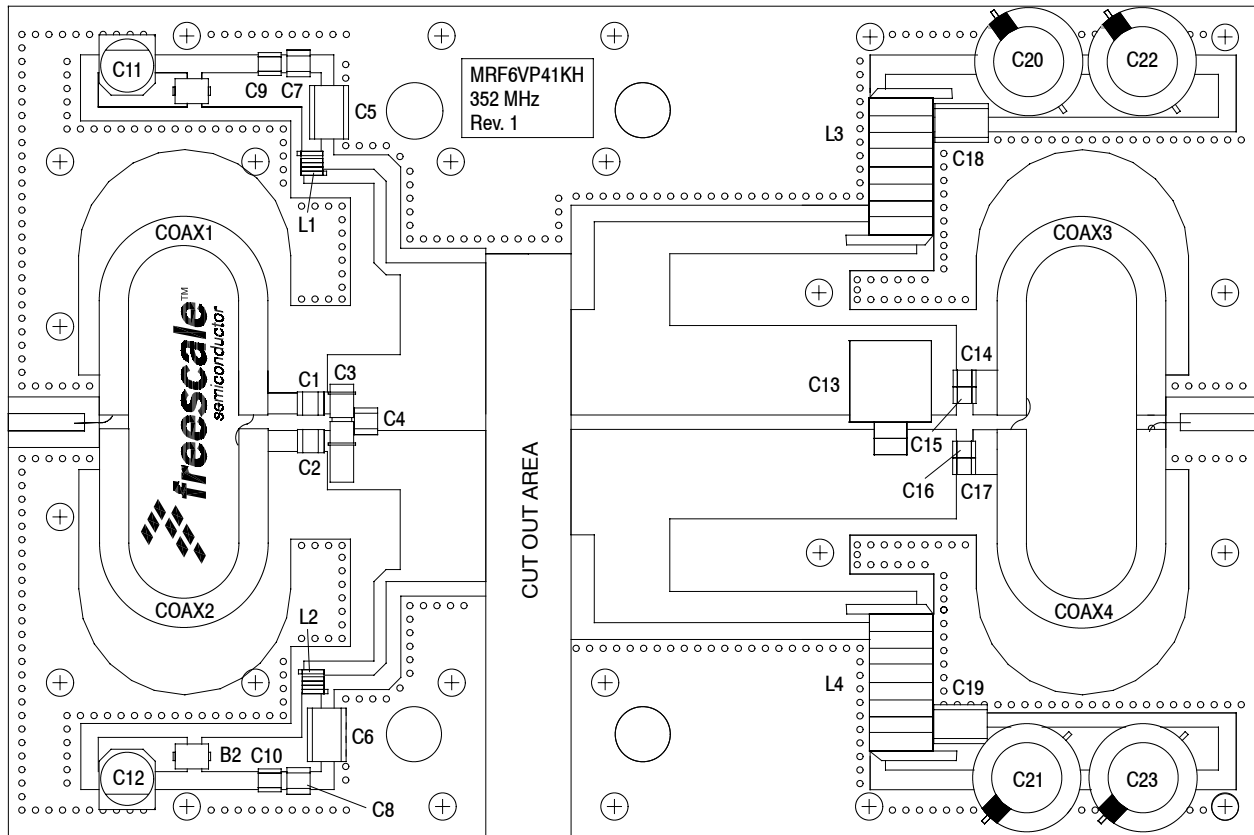
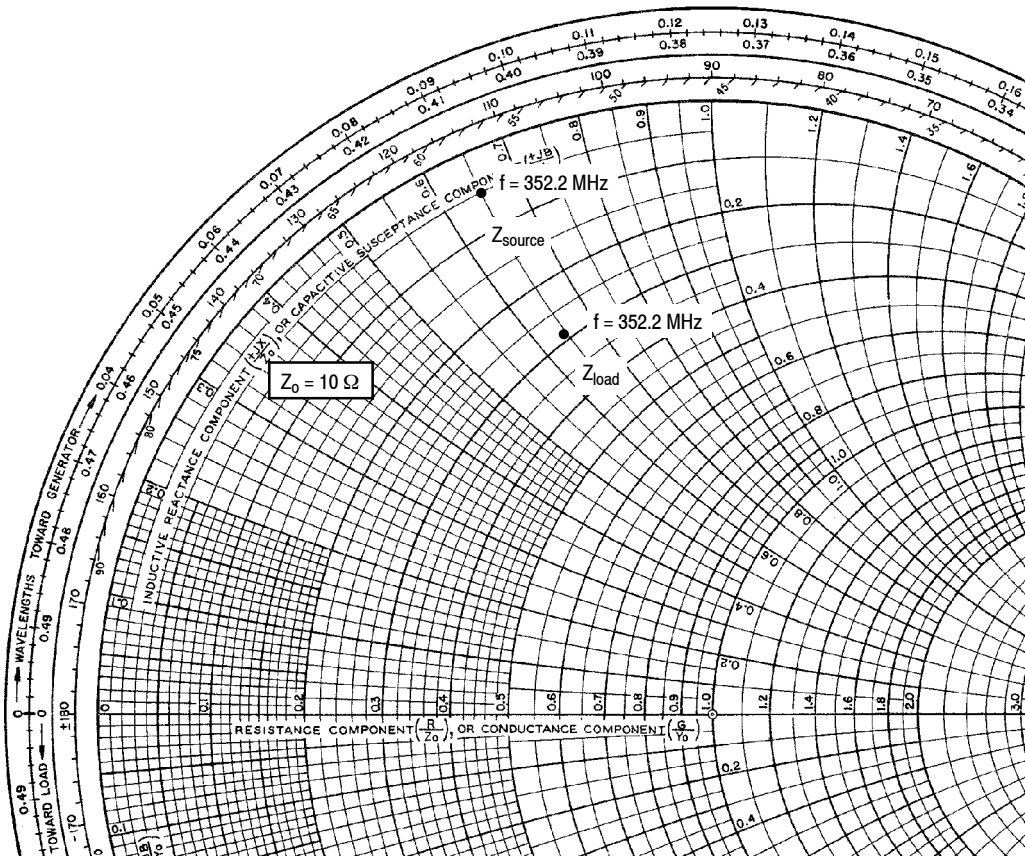


Figure 15. MRF6VP41KHR6(HSR6) Test Circuit Component Layout — 352.2 MHz

Table 6. MRF6VP41KHR6(HSR6) Test Circuit Component Designations and Values — 352.2 MHz

| Part               | Description                                                | Part Number         | Manufacturer           |
|--------------------|------------------------------------------------------------|---------------------|------------------------|
| B1, B2             | 47 $\Omega$ , 100 MHz Short Ferrite Beads                  | 2743019447          | Fair-Rite              |
| C1, C2             | 27 pF Chip Capacitors                                      | ATC100B270JT500XT   | ATC                    |
| C3                 | 0.8–8.0 pF Variable Capacitor, Gigatrim                    | 27291SL             | Johanson               |
| C4                 | 75 pF Chip Capacitor                                       | ATC100B750JT500XT   | ATC                    |
| C5, C6             | 2.2 $\mu$ F Chip Capacitors                                | C1825C225J5RAC      | Kemet                  |
| C7, C8             | 220 nF Chip Capacitors                                     | C1812C224J5RAC      | Kemet                  |
| C9, C10            | 0.1 $\mu$ F Chip Capacitors                                | CDR33BX104AKYS      | AVX                    |
| C11, C12           | 47 $\mu$ F, 50 V Electrolytic Capacitors                   | 476KXM050M          | Illinois Cap           |
| C13                | 36 pF 500 V Chip Capacitor                                 | MCM01-009ED360J-F   | CDE                    |
| C14, C15, C16, C17 | 240 pF Chip Capacitors                                     | ATC100B241JT200XT   | ATC                    |
| C18, C19           | 2.2 $\mu$ F Chip Capacitors                                | G2225X7R225KT3AB    | ATC                    |
| C20, C21, C22, C23 | 470 $\mu$ F, 63 V Electrolytic Capacitors                  | MCRH63V477M13X21-RH | Multicomp              |
| Coax1, 2, 3, 4     | 25 $\Omega$ Semi Rigid Coax, 2.2" Shield Length            | UT141-25            | Precision Tube Company |
| L1, L2             | 2.5 nH Inductors                                           | A01T                | Coilcraft              |
| L3, L4             | 10 Turn #16 AWG ID=0.160" Inductors, Hand Wound            | Copper Wire         | Freescle               |
| PCB                | Arlon CuClad 250GX-0300-55-22, 0.030", $\epsilon_r = 2.55$ | DS2655              | DS Electronics         |



$V_{DD} = 50 \text{ Vdc}$ ,  $I_{DQ} = 150 \text{ mA}$ ,  $P_{out} = 1000 \text{ W CW}$

| f<br>MHz | $Z_{source}$<br>$\Omega$ | $Z_{load}$<br>$\Omega$ |
|----------|--------------------------|------------------------|
| 352.2    | $0.5 + j6.5$             | $2.9 + j6.35$          |

$Z_{source}$  = Test circuit impedance as measured from gate to gate, balanced configuration.

$Z_{load}$  = Test circuit impedance as measured from drain to drain, balanced configuration.

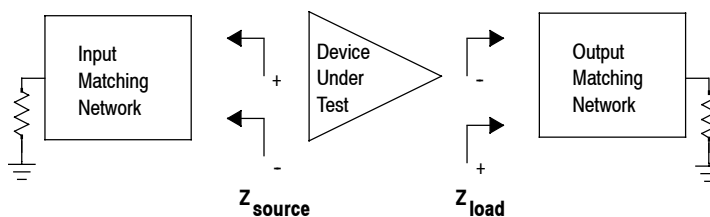
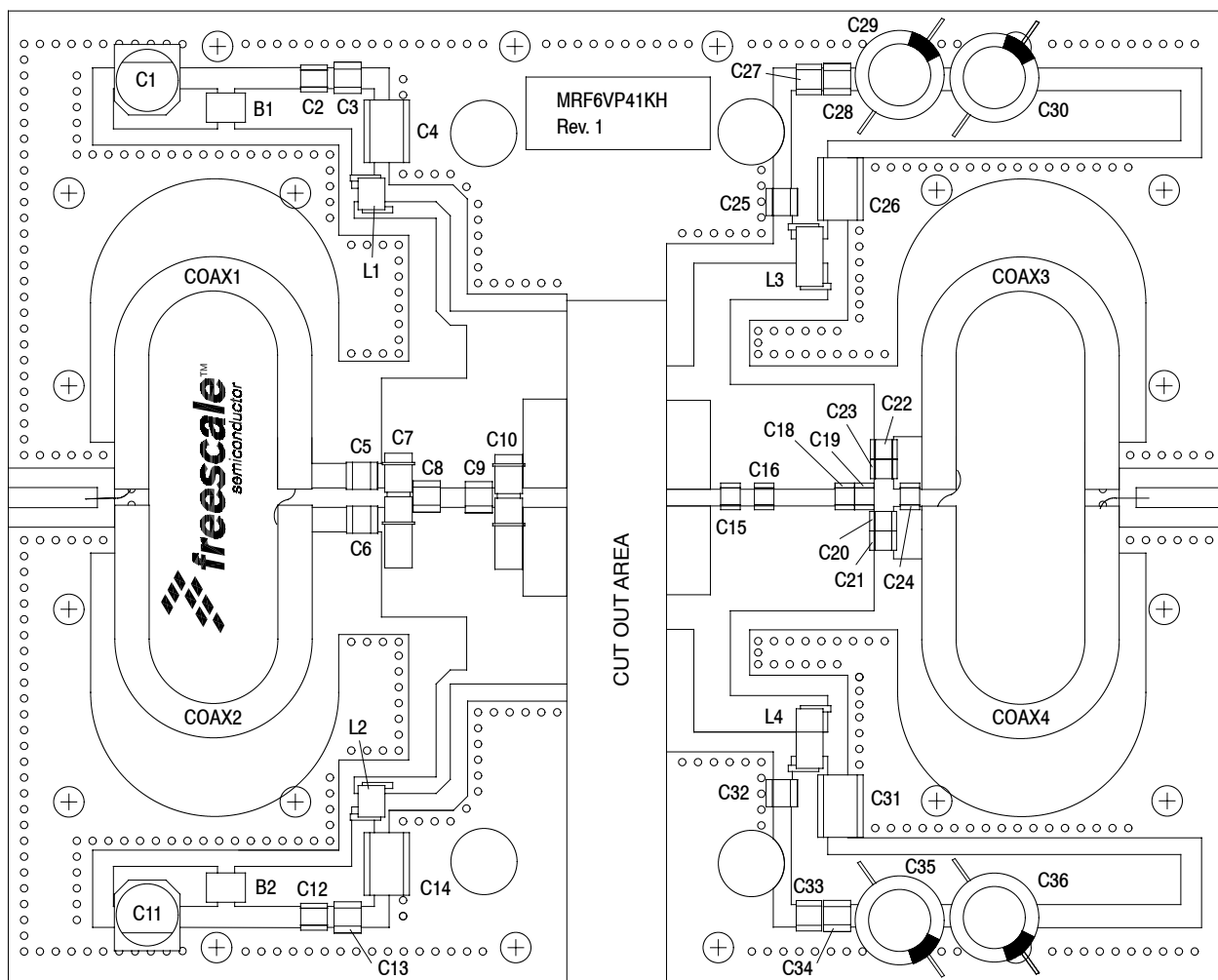


Figure 16. Series Equivalent Source and Load Impedance — 352.2 MHz



C17 not used in MRF6VP41KHR6(HSR6) 500 MHz application.

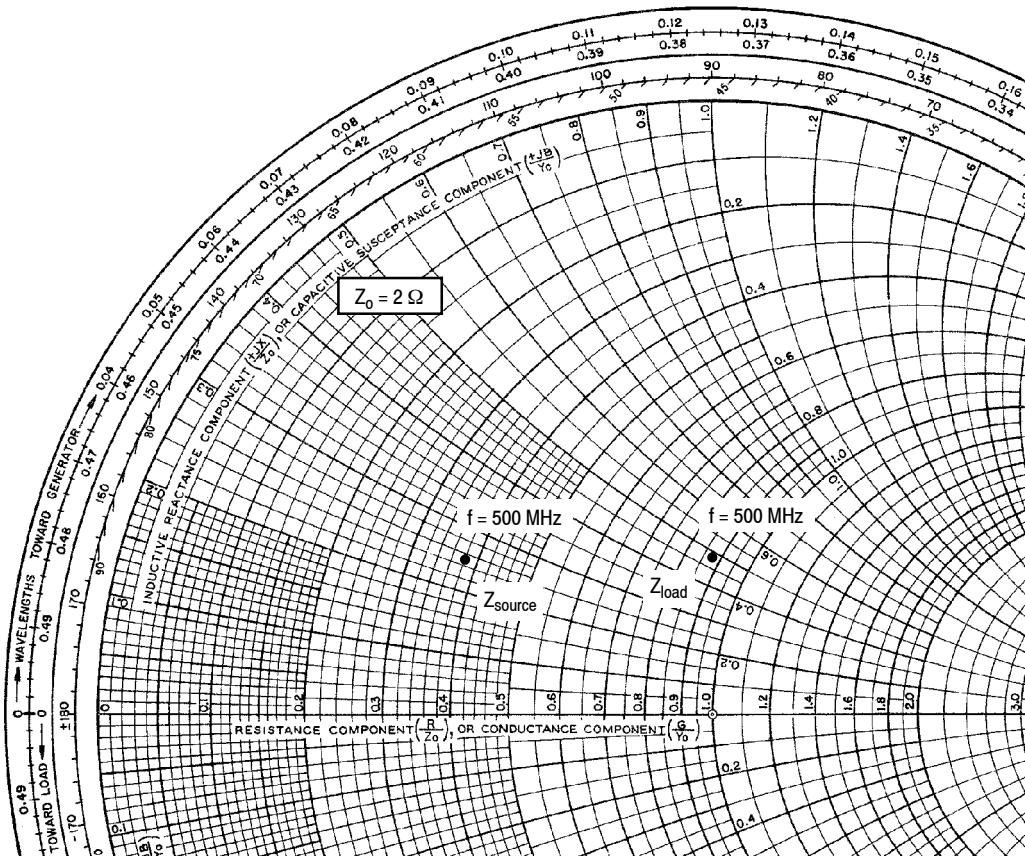
**Figure 17. MRF6VP41KHR6(HSR6) Test Circuit Component Layout — 500 MHz**

**Table 7. MRF6VP41KHR6(HSR6) Test Circuit Component Designations and Values — 500 MHz**

| Part                         | Description                                     | Part Number         | Manufacturer        |
|------------------------------|-------------------------------------------------|---------------------|---------------------|
| B1, B2                       | 47 $\Omega$ , 100 MHz Short Ferrite Beads       | 2743019447          | Fair-Rite           |
| C1, C11                      | 47 $\mu$ F, 50 V Electrolytic Capacitors        | 476KXM063M          | Illinois            |
| C2, C12, C28, C34            | 0.1 $\mu$ F Chip Capacitors                     | CDR33BX104AKYS      | Kemet               |
| C3, C13, C27, C33            | 220 nF, 50 V Chip Capacitors                    | C1812C224K5RAC      | Kemet               |
| C4, C14                      | 2.2 $\mu$ F, 50 V Chip Capacitors               | C1825C225J5RAC      | Kemet               |
| C5, C6, C15                  | 27 pF Chip Capacitors                           | ATC100B270JT500XT   | ATC                 |
| C7, C10                      | 0.8–8.0 pF Variable Capacitors                  | 27291SL             | Johanson Components |
| C8                           | 13 pF Chip Capacitor                            | ATC100B120JT500XT   | ATC                 |
| C9                           | 33 pF Chip Capacitor                            | ATC100B330JT500XT   | ATC                 |
| C18                          | 9.1 pF Chip Capacitor                           | ATC100B9R1CT500XT   | ATC                 |
| C16, C19                     | 8.2 pF Chip Capacitors                          | ATC100B8R2CT500XT   | ATC                 |
| C20, C21, C22, C23, C25, C32 | 240 pF Chip Capacitors                          | ATC100B241JT200XT   | ATC                 |
| C24                          | 5.6 pF Chip Capacitor                           | ATC100B5R6CT500XT   | ATC                 |
| C26, C31                     | 2.2 $\mu$ F, 100 V Chip Capacitors              | 2225X7R225KT3AB     | ATC                 |
| C29, C30, C35, C36           | 330 $\mu$ F, 63 V Electrolytic Capacitors       | MCRH63V337M13X21-RH | Multicomp           |
| Coax1, 2, 3, 4               | 25 $\Omega$ Semi Rigid Coax, 2.2" Shield Length | UT-141C-25          | Micro-Coax          |
| L1, L2                       | 2.5 nH, 1 Turn Inductors                        | A01TKLC             | Coilcraft           |
| L3, L4                       | 43 nH, 10 Turn Inductors                        | B10TJLC             | Coilcraft           |

C17 not used in MRF6VP41KHR6(HSR6) 500 MHz application.

**MRF6VP41KHR6 MRF6VP41KHSR6**



$V_{DD} = 50$  Vdc,  $I_{DQ} = 150$  mA,  $P_{out} = 1000$  W Peak

| f<br>MHz | $Z_{source}$<br>$\Omega$ | $Z_{load}$<br>$\Omega$ |
|----------|--------------------------|------------------------|
| 500      | $0.75 + j0.5$            | $1.73 + j0.95$         |

$Z_{source}$  = Test circuit impedance as measured from gate to gate, balanced configuration.

$Z_{load}$  = Test circuit impedance as measured from drain to drain, balanced configuration.

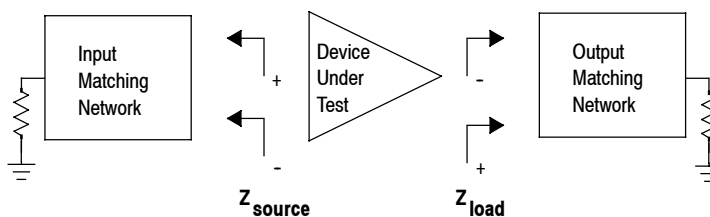
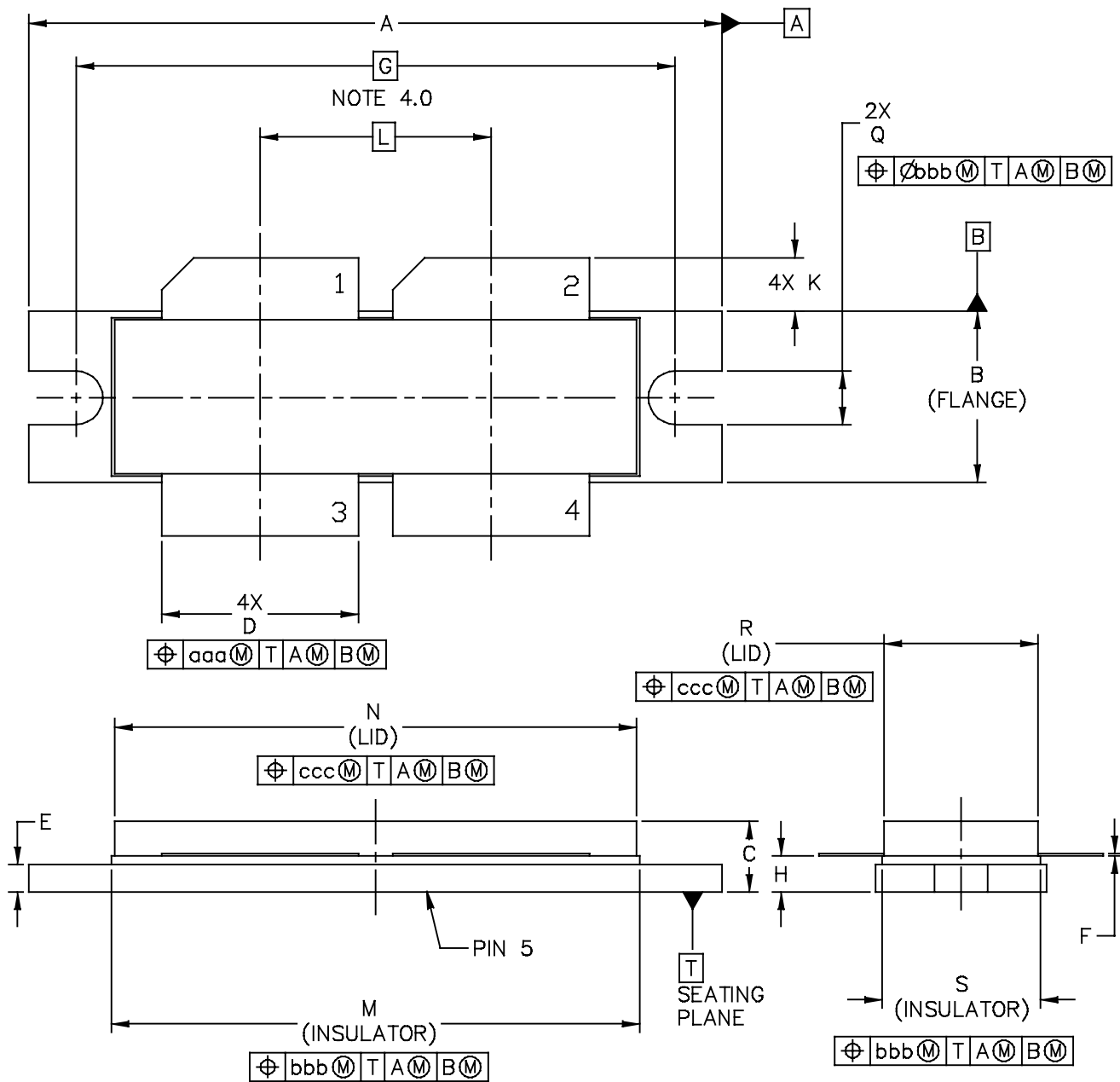


Figure 18. Series Equivalent Source and Load Impedance — 500 MHz

# PACKAGE DIMENSIONS



|                                                         |  |                    |                          |                            |             |
|---------------------------------------------------------|--|--------------------|--------------------------|----------------------------|-------------|
| © FREESCALE SEMICONDUCTOR, INC.<br>ALL RIGHTS RESERVED. |  | MECHANICAL OUTLINE |                          | PRINT VERSION NOT TO SCALE |             |
| TITLE:<br><br>NI-1230                                   |  |                    | DOCUMENT NO: 98ASB16977C |                            | REV: E      |
|                                                         |  |                    | CASE NUMBER: 375D-05     |                            | 31 MAR 2005 |
|                                                         |  |                    | STANDARD: NON-JEDEC      |                            |             |

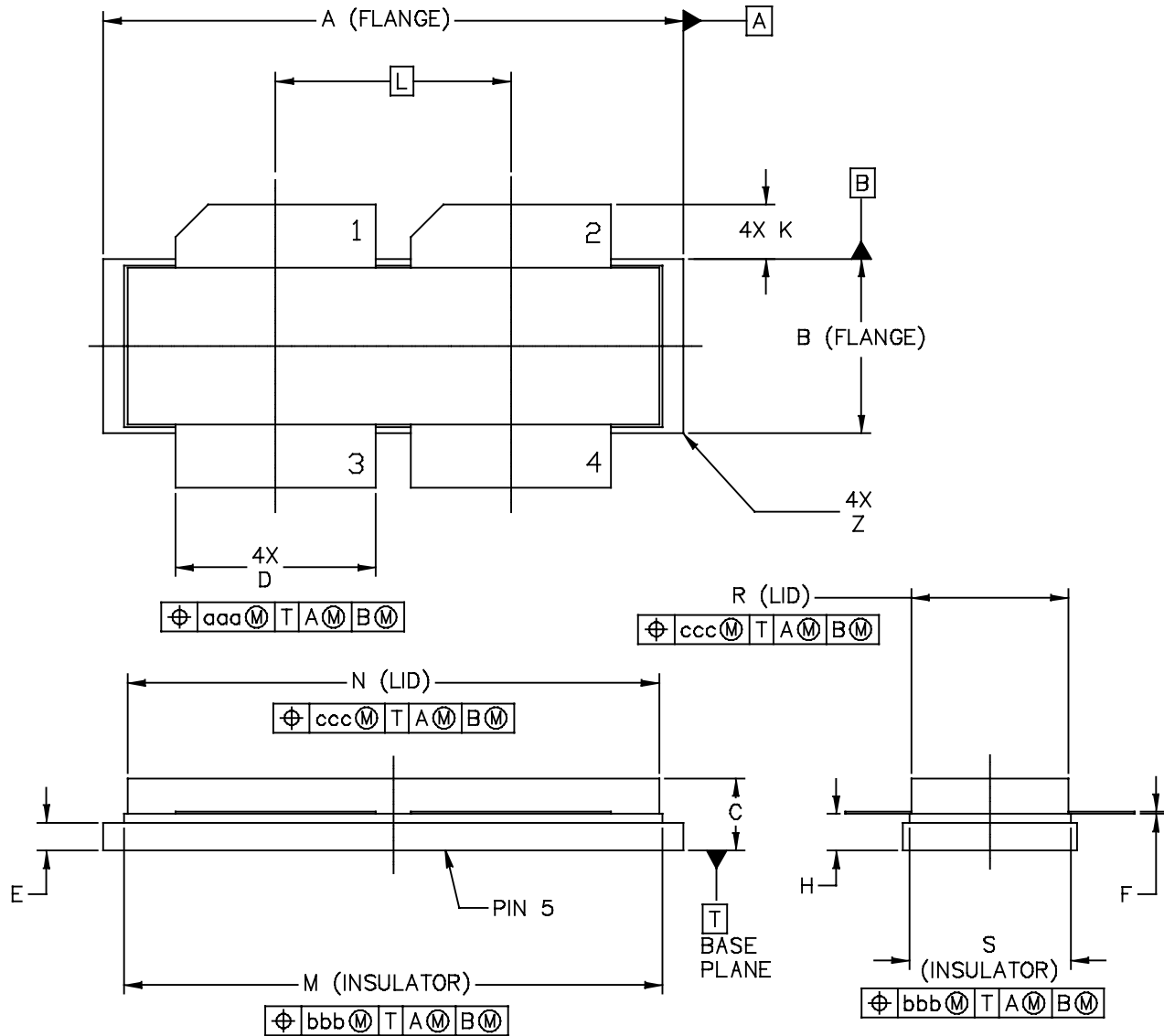
# NOTES:

- 1.0 INTERPRET DIMENSIONS AND TOLERANCES PER ASME 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 1.52 (38.61) BASED ON M3 SCREW.

## STYLE 1:

- PIN 1 - DRAIN
- 2 - DRAIN
- 3 - GATE
- 4 - GATE
- 5 - SOURCE

| INCH                                                    |           |       | MILLIMETER         |       | INCH                     |                            |       | MILLIMETER  |       |
|---------------------------------------------------------|-----------|-------|--------------------|-------|--------------------------|----------------------------|-------|-------------|-------|
| DIM                                                     | MIN       | MAX   | MIN                | MAX   | DIM                      | MIN                        | MAX   | MIN         | MAX   |
| A                                                       | 1.615     | 1.625 | 41.02              | 41.28 | N                        | 1.218                      | 1.242 | 30.94       | 31.55 |
| B                                                       | .395      | .405  | 10.03              | 10.29 | Q                        | .120                       | .130  | 3.05        | 3.3   |
| C                                                       | .150      | .200  | 3.81               | 5.08  | R                        | .355                       | .365  | 9.01        | 9.27  |
| D                                                       | .455      | .465  | 11.56              | 11.81 | S                        | .365                       | .375  | 9.27        | 9.53  |
| E                                                       | .062      | .066  | 1.57               | 1.68  |                          |                            |       |             |       |
| F                                                       | .004      | .007  | 0.1                | 0.18  |                          |                            |       |             |       |
| G                                                       | 1.400 BSC |       | 35.56 BSC          |       | aaa                      | .013                       |       | 0.33        |       |
| H                                                       | .082      | .090  | 2.08               | 2.29  | bbb                      | .010                       |       | 0.25        |       |
| K                                                       | .117      | .137  | 2.97               | 3.48  | ccc                      | .020                       |       | 0.51        |       |
| L                                                       | .540 BSC  |       | 13.72 BSC          |       |                          |                            |       |             |       |
| M                                                       | 1.219     | 1.241 | 30.96              | 31.52 |                          |                            |       |             |       |
| © FREESCALE SEMICONDUCTOR, INC.<br>ALL RIGHTS RESERVED. |           |       | MECHANICAL OUTLINE |       |                          | PRINT VERSION NOT TO SCALE |       |             |       |
| TITLE:<br><br>NI-1230                                   |           |       |                    |       | DOCUMENT NO: 98ASB16977C |                            |       | REV: E      |       |
|                                                         |           |       |                    |       | CASE NUMBER: 375D-05     |                            |       | 31 MAR 2005 |       |
|                                                         |           |       |                    |       | STANDARD: NON-JEDEC      |                            |       |             |       |



|                                                         |  |                    |                          |                            |             |
|---------------------------------------------------------|--|--------------------|--------------------------|----------------------------|-------------|
| © FREESCALE SEMICONDUCTOR, INC.<br>ALL RIGHTS RESERVED. |  | MECHANICAL OUTLINE |                          | PRINT VERSION NOT TO SCALE |             |
| TITLE:<br><br>NI-1230S                                  |  |                    | DOCUMENT NO: 98ARB18247C |                            | REV: F      |
|                                                         |  |                    | CASE NUMBER: 375E-04     |                            | 05 AUG 2005 |
|                                                         |  |                    | STANDARD: NON-JEDEC      |                            |             |

NOTES:

1. INTERPRET DIMENSIONS AND TOLERANCES  
PER ASME Y14.5M-1994.
2. CONTROLLING DIMENSION: INCH
3. DIMENSION H IS MEASURED .030  
AWAY FROM PACKAGE BODY

STYLE 1:

- PIN 1 - DRAIN
- 2 - DRAIN
- 3 - GATE
- 4 - GATE
- 5 - SOURCE

| DIM                                                     | INCHES   |       | MILLIMETERS        |       | DIM                      | INCHES                     |      | MILLIMETERS |      |
|---------------------------------------------------------|----------|-------|--------------------|-------|--------------------------|----------------------------|------|-------------|------|
|                                                         | MIN      | MAX   | MIN                | MAX   |                          | MIN                        | MAX  | MIN         | MAX  |
| A                                                       | 1.265    | 1.275 | 32.13              | 32.38 | R                        | .355                       | .365 | 9.01        | 9.27 |
| B                                                       | .395     | .405  | 10.03              | 10.29 | S                        | .365                       | .375 | 9.27        | 9.53 |
| C                                                       | .150     | .200  | 3.81               | 5.08  | Z                        | ---                        | .040 | ---         | 1.02 |
| D                                                       | .455     | .465  | 11.56              | 11.81 |                          |                            |      |             |      |
| E                                                       | .062     | .066  | 1.57               | 1.68  | aaa                      | .013                       |      | 0.33        |      |
| F                                                       | .004     | .007  | 0.1                | 0.18  | bbb                      | .010                       |      | 0.25        |      |
| H                                                       | .082     | .090  | 2.08               | 2.29  | ccc                      | .020                       |      | 0.51        |      |
| K                                                       | .117     | .137  | 2.97               | 3.48  |                          |                            |      |             |      |
| L                                                       | .540 BSC |       | 13.72 BSC          |       |                          |                            |      |             |      |
| M                                                       | 1.219    | 1.241 | 30.96              | 31.52 |                          |                            |      |             |      |
| N                                                       | 1.218    | 1.242 | 30.94              | 31.55 |                          |                            |      |             |      |
| © FREESCALE SEMICONDUCTOR, INC.<br>ALL RIGHTS RESERVED. |          |       | MECHANICAL OUTLINE |       |                          | PRINT VERSION NOT TO SCALE |      |             |      |
| TITLE:<br><br>NI-1230S                                  |          |       |                    |       | DOCUMENT NO: 98ARB18247C |                            |      | REV: F      |      |
|                                                         |          |       |                    |       | CASE NUMBER: 375E-04     |                            |      | 05 AUG 2005 |      |
|                                                         |          |       |                    |       | STANDARD: NON-JEDEC      |                            |      |             |      |

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 MRF6VP41KH and MRF6VP41KHS parts will be available for 2 years after release of MRF6VP41KH and MRF6VP41KHS. 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 MRF6VP41KH and MRF6VP41KHS in the R6 tape and reel option.

## REVISION HISTORY

The following table summarizes revisions to this document.

| Revision | Date       | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|----------|------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 0        | Jan. 2008  | <ul style="list-style-type: none"> <li>• Initial Release of Data Sheet</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| 1        | Apr. 2008  | <ul style="list-style-type: none"> <li>• Added Fig. 12, Maximum Transient Thermal Impedance, p. 6</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| 2        | Sept. 2008 | <ul style="list-style-type: none"> <li>• Added Note to Fig. 4, Capacitance versus Drain-Source Voltage, to denote that each side of device is measured separately, p. 5</li> <li>• Updated Fig. 5, DC Safe Operating Area, to clarify that measurement is on a per-side basis, p. 5</li> <li>• Corrected Fig. 13, MTTF versus Junction Temperature, to reflect the correct die size and increased the MTTF factor accordingly, p. 6</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                         |
| 3        | Nov. 2008  | <ul style="list-style-type: none"> <li>• Added CW operation capability bullet to Features section, p. 1</li> <li>• Added CW operation to Maximum Ratings table, p. 1</li> <li>• Added CW thermal data to Thermal Characteristics table, p. 2</li> <li>• Fig. 14, Series Equivalent Source and Load Impedance, corrected <math>Z_{\text{source}}</math> copy to read “Test circuit impedance as measured from gate to gate, balanced configuration” and <math>Z_{\text{load}}</math> copy to read “Test circuit impedance as measured from drain to drain, balanced configuration”; replaced impedance diagram to show push-pull test conditions, p. 7</li> </ul>                                                                                                                                                                       |
| 4        | Mar. 2009  | <ul style="list-style-type: none"> <li>• CW rating limits updated from 1176 W to 1107 W and 5.5 W/°C to 4.6 W/°C to reflect recent remeasured data, Max Ratings table, p. 1</li> <li>• CW Thermal Characteristics changed from 81°C to 48°C and 0.16 °C/W to 0.15 °C/W using data from the most recent 352.2 MHz CW application circuit, p. 2</li> <li>• Added Typical Performances table for 352.2 MHz and 500 MHz applications, p. 3</li> <li>• Added Fig. 14, MTTF versus Junction Temperature – CW, p. 7</li> <li>• Added Figs. 16 and 18, Test Circuit Component Layout – 352.2 MHz and 500 MHz, and Tables 6 and 7, Test Circuit Component Designations and Values – 352.2 MHz and 500 MHz, p. 9, 11</li> <li>• Added Figs. 17 and 19, Series Equivalent Source and Load Impedance – 352.2 MHz and 500 MHz, p. 10, 12</li> </ul> |

(continued)

## REVISION HISTORY (cont.)

| Revision | Date      | Description                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|----------|-----------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 5        | Apr. 2010 | <ul style="list-style-type: none"> <li>Operating Junction Temperature increased from 200°C to 225°C in Maximum Ratings table and related "Continuous use at maximum temperature will affect MTTF" footnote added, p. 1</li> <li>Added Electromigration MTTF Calculator and RF High Power Model availability to Product Software, p. 17</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| 6        | Apr. 2012 | <ul style="list-style-type: none"> <li>Table 1, Maximum Ratings, CW Operation: changed CW rating from an RF based value to a maximum power dissipated value – CW Operation @ <math>T_C = 25^\circ\text{C}</math>, 1107 W changed to Total Device Dissipation @ <math>T_C = 25^\circ\text{C}</math>, CW only, 1333 watts. Value change to 1333 watts applies only to devices with a date code of QQ1218 or newer. Refer to PCN15074, p. 1</li> <li>Table 2, Thermal Characteristics, Thermal Resistance, Junction to Case: 2.4 mil wire configuration thermal testing resulted in a case temperature change from 48°C to 84°C, p. 2</li> <li>Table 3, ESD Protection Characteristics: added the device's ESD passing level as applicable to each ESD class, p. 2</li> <li>Modified figure titles and/or graph axes labels to clarify application use, p. 4-7</li> <li>Fig. 12, Transient Thermal Impedance: graph updated to show correct CW operation, p. 7</li> <li>Fig. 13, MTTF versus Junction Temperature – Pulsed removed, p. 7. 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. 14, MTTF versus Junction Temperature – CW: MTTF end temperature on graph changed to match maximum operating junction temperature, p. 7 (renumbered as Fig. 13 after Fig. 13, MTTF versus Junction Temperature – Pulsed removed)</li> </ul> |

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

**Home Page:**  
freescale.com

**Web Support:**  
freescale.com/support

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

Freescale reserves the right to make changes without further notice to any products herein. Freescale makes no warranty, representation, or guarantee regarding the suitability of its products for any particular purpose, nor does Freescale 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 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 does not convey any license under its patent rights nor the rights of others. Freescale sells products pursuant to standard terms and conditions of sale, which can be found at the following address: <http://www.reg.net/v2/webservices/Freescale/Docs/TermsandConditions.htm>.

Freescale, the Freescale logo, Altivec, C-5, CodeTest, CodeWarrior, ColdFire, C-Ware, Energy Efficient Solutions logo, Kinetis, mobileGT, PowerQUICC, Processor Expert, QorIQ, Qorivva, StarCore, Symphony, and VortiQa are trademarks of Freescale Semiconductor, Inc., Reg. U.S. Pat. & Tm. Off. Airfast, BeeKit, BeeStack, ColdFire+, CoreNet, Flexis, MagniV, MXC, Platform in a Package, QorIQ Qonverge, QUICC Engine, Ready Play, SafeAssure, SMARTMOS, TurboLink, Vybrid, and Xtrinsic are trademarks of Freescale Semiconductor, Inc. All other product or service names are the property of their respective owners.

© 2008-2010, 2012 Freescale Semiconductor, Inc.