

## The RF MOSFET Line

# RF Power Field Effect Transistors

### N-Channel Enhancement-Mode Lateral MOSFETs

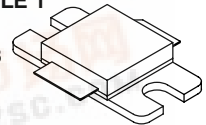
**MRF18030ALR3**  
**MRF18030ALSR3**

Designed for GSM and EDGE base station applications with frequencies from 1.8 to 2.0 GHz. Suitable for FM, TDMA, CDMA and multicarrier amplifier applications. Specified for GSM 1805 - 1880 MHz.

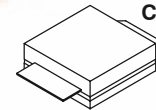
- Typical GSM Performance:  
Power Gain - 14 dB (Typ) @ 30 Watts  
Efficiency - 50% (Typ) @ 30 Watts
- Internally Matched, Controlled Q, for Ease of Use
- High Gain, High Efficiency and High Linearity
- Integrated ESD Protection
- Designed for Maximum Gain and Insertion Phase Flatness
- Capable of Handling 5:1 VSWR, @ 26 Vdc, 30 W Output Power
- Excellent Thermal Stability
- Low Gold Plating Thickness on Leads, 40μ" Nominal.
- in Tape and Reel. R3 Suffix = 250 Units per 32 mm, 13 inch Reel.

**1.8 - 1.88 GHz, 30 W, 26 V**  
**GSM/GSM EDGE**  
**LATERAL N-CHANNEL**  
**RF POWER MOSFETs**

**CASE 465E-04, STYLE 1**  
**NI-400**  
**MRF18030ALR3**



**CASE 465F-04, STYLE 1**  
**NI-400S**  
**MRF18030ALSR3**



#### MAXIMUM RATINGS

| Rating                                                                                 | Symbol    | Value        | Unit                               |
|----------------------------------------------------------------------------------------|-----------|--------------|------------------------------------|
| Drain-Source Voltage                                                                   | $V_{DS}$  | 65           | Vdc                                |
| Gate-Source Voltage                                                                    | $V_{GS}$  | -0.5, +15    | Vdc                                |
| Total Device Dissipation @ $T_C = 25^\circ\text{C}$<br>Derate above $25^\circ\text{C}$ | $P_D$     | 83.3<br>0.48 | Watts<br>$\text{W}/^\circ\text{C}$ |
| Storage Temperature Range                                                              | $T_{stg}$ | - 65 to +150 | $^\circ\text{C}$                   |
| Operating Junction Temperature                                                         | $T_J$     | 200          | $^\circ\text{C}$                   |

#### THERMAL CHARACTERISTICS

| Characteristic                       | Symbol          | Value | Unit                      |
|--------------------------------------|-----------------|-------|---------------------------|
| Thermal Resistance, Junction to Case | $R_{\theta JC}$ | 2.1   | $^\circ\text{C}/\text{W}$ |

#### ESD PROTECTION CHARACTERISTICS

| Test Conditions  | Class        |
|------------------|--------------|
| Human Body Model | 2 (Minimum)  |
| Machine Model    | M3 (Minimum) |

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

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## ELECTRICAL CHARACTERISTICS (T<sub>C</sub> = 25°C, 50 ohm system unless otherwise noted)

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

### OFF CHARACTERISTICS

|                                                                                        |                      |    |   |   |      |
|----------------------------------------------------------------------------------------|----------------------|----|---|---|------|
| Drain-Source Breakdown Voltage<br>(V <sub>GS</sub> = 0 Vdc, I <sub>D</sub> = 20 μAdc)  | V <sub>(BR)DSS</sub> | 65 | — | — | Vdc  |
| Zero Gate Voltage Drain Current<br>(V <sub>DS</sub> = 26 Vdc, V <sub>GS</sub> = 0 Vdc) | I <sub>DSS</sub>     | —  | — | 1 | μAdc |
| Gate-Source Leakage Current<br>(V <sub>GS</sub> = 5 Vdc, V <sub>DS</sub> = 0 Vdc)      | I <sub>GSS</sub>     | —  | — | 1 | μAdc |

### ON CHARACTERISTICS

|                                                                                 |                     |   |      |     |     |
|---------------------------------------------------------------------------------|---------------------|---|------|-----|-----|
| Gate Threshold Voltage<br>(V <sub>DS</sub> = 10 Vdc, I <sub>D</sub> = 100 μAdc) | V <sub>GS(th)</sub> | 2 | 3    | 4   | Vdc |
| Gate Quiescent Voltage<br>(V <sub>DS</sub> = 26 Vdc, I <sub>D</sub> = 250 mAdc) | V <sub>GS(Q)</sub>  | 2 | 3.9  | 4.5 | Vdc |
| Drain-Source On-Voltage<br>(V <sub>GS</sub> = 10 Vdc, I <sub>D</sub> = 1 Adc)   | V <sub>DS(on)</sub> | — | 0.29 | 0.4 | Vdc |
| Forward Transconductance<br>(V <sub>DS</sub> = 10 Vdc, I <sub>D</sub> = 1 Adc)  | g <sub>fs</sub>     | — | 2    | —   | S   |

### DYNAMIC CHARACTERISTICS

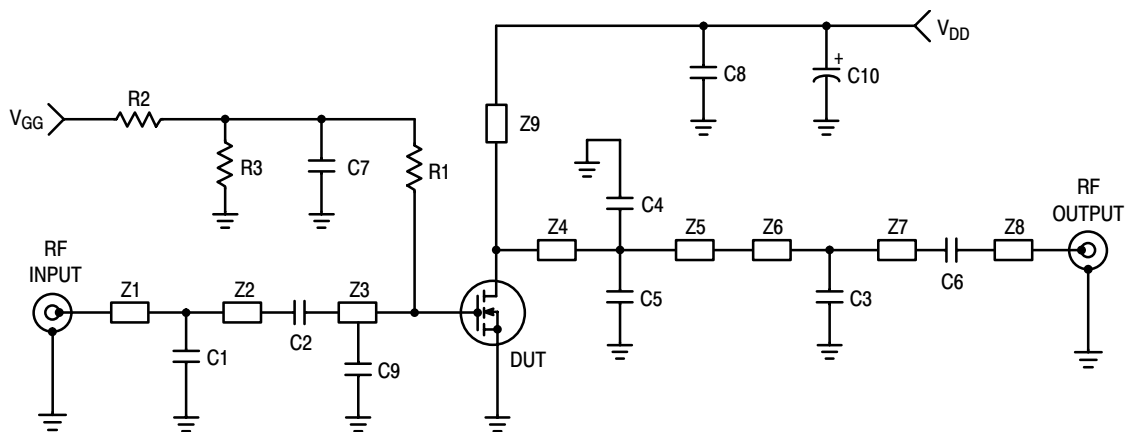
|                                                                                                                |                  |   |     |   |    |
|----------------------------------------------------------------------------------------------------------------|------------------|---|-----|---|----|
| Reverse Transfer Capacitance (1)<br>(V <sub>DS</sub> = 26 Vdc ± 30 mV(rms)ac @ 1 MHz, V <sub>GS</sub> = 0 Vdc) | C <sub>rss</sub> | — | 1.3 | — | pF |
|----------------------------------------------------------------------------------------------------------------|------------------|---|-----|---|----|

### FUNCTIONAL TESTS (In Motorola Test Fixture) (2)

|                                                                                                                                                                                |                  |                                                         |     |    |       |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------|---------------------------------------------------------|-----|----|-------|
| Output Power, 1 dB Compression Point<br>(V <sub>DD</sub> = 26 Vdc, I <sub>DQ</sub> = 250 mA, f = 1805 - 1880 MHz)                                                              | P <sub>1dB</sub> | 27                                                      | 30  | —  | Watts |
| Common-Source Amplifier Power Gain @ 30 W<br>(V <sub>DD</sub> = 26 Vdc, I <sub>DQ</sub> = 250 mA, f = 1805 - 1880 MHz)                                                         | G <sub>ps</sub>  | 13                                                      | 14  | —  | dB    |
| Drain Efficiency @ 30 W<br>(V <sub>DD</sub> = 26 Vdc, I <sub>DQ</sub> = 250 mA, f = 1805 - 1880 MHz)                                                                           | η                | 46.5                                                    | 50  | —  | %     |
| Input Return Loss @ 30 W<br>(V <sub>DD</sub> = 26 Vdc, I <sub>DQ</sub> = 250 mA, f = 1805 - 1880 MHz)                                                                          | IRL              | —                                                       | -12 | -9 | dB    |
| Output Mismatch Stress @ 30 W<br>(V <sub>DD</sub> = 26 Vdc, I <sub>DQ</sub> = 250 mA, f <sub>1</sub> = 1805 - 1880 MHz,<br>VSWR = 5:1, All Phase Angles at Frequency of Tests) | Ψ                | No Degradation In Output Power<br>Before and After Test |     |    |       |

- (1) Part is internally matched both on input and output.  
 (2) Device specifications obtained on a Production Test Fixture.

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|            |                                             |    |                                      |
|------------|---------------------------------------------|----|--------------------------------------|
| C1         | 1.8 pF, 100B Chip Capacitor                 | Z1 | 0.874" x 0.087" Microstrip           |
| C2         | 0.8 pF, 100B Chip Capacitor                 | Z2 | 1.094" x 0.087" Microstrip           |
| C3         | 1.0 pF, 100B Chip Capacitor                 | Z3 | 0.257" x 0.633" Microstrip           |
| C4, C5     | 1.2 pF, 100B Chip Capacitors                | Z4 | 0.189" x 0.394" Microstrip           |
| C6, C7, C8 | 8.2 pF, 100B Chip Capacitors                | Z5 | 0.335" x 0.394" Microstrip           |
| C9         | 0.3 pF, 100B Chip Capacitor                 | Z6 | 0.484" x 0.087" Microstrip           |
| C10        | 220 $\mu$ F, 63 V Electrolytic Capacitor    | Z7 | 0.877" x 0.087" Microstrip           |
| R1         | 1.0 k $\Omega$ , 1/8 W Chip Resistor (0805) | Z8 | 0.366" x 0.087" Microstrip           |
| R2, R3     | 10 k $\Omega$ , 1/8 W Chip Resistors (0805) | Z9 | $\approx$ 0.600" x 0.087" Microstrip |

Figure 1. 1805 - 1880 MHz Test Fixture Schematic

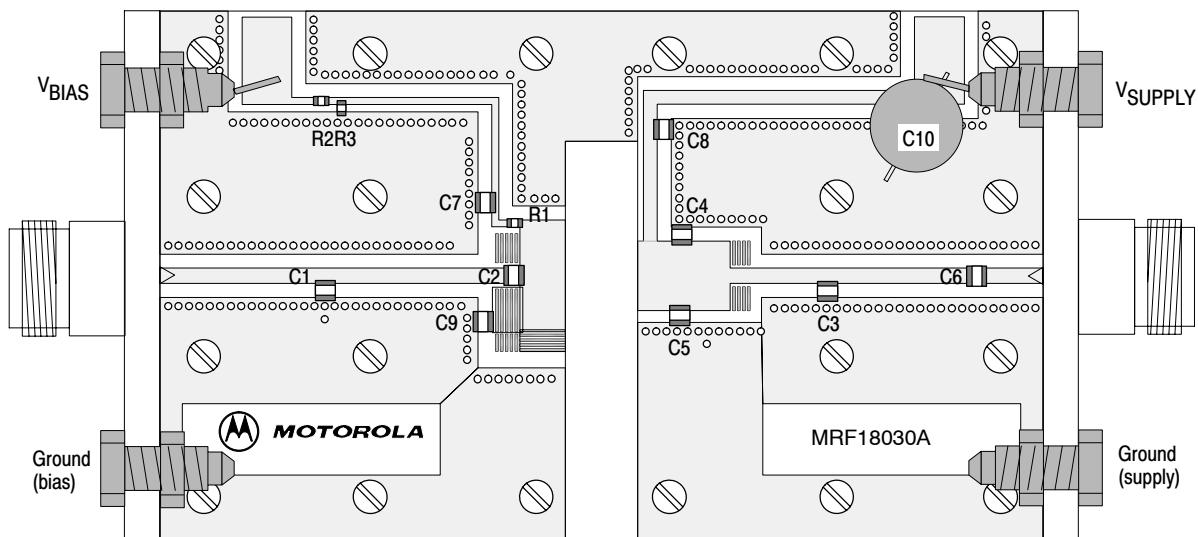
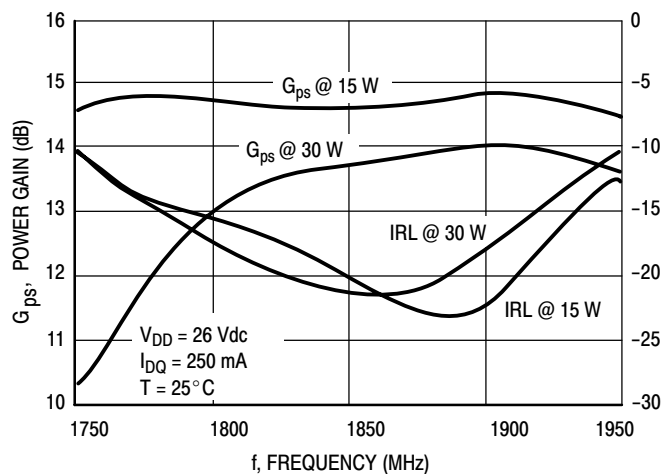


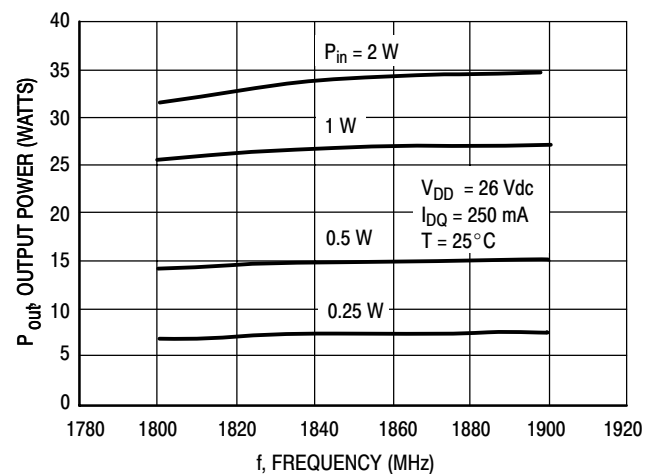
Figure 2. 1805 - 1880 MHz Test Fixture Component Layout

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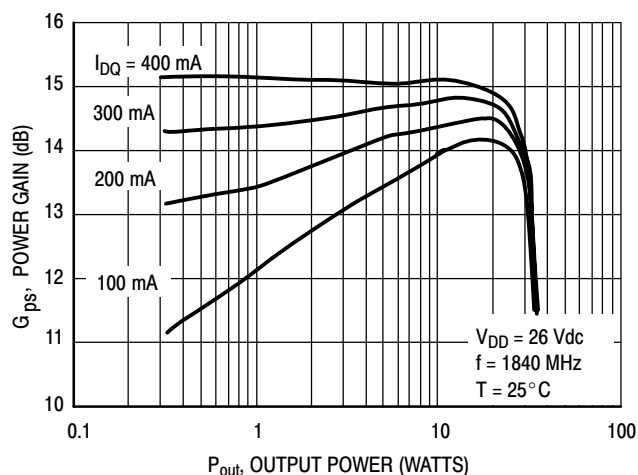
## TYPICAL CHARACTERISTICS



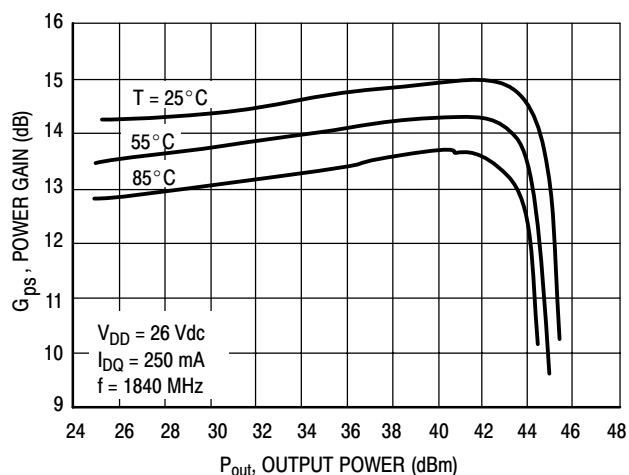
**Figure 3. Wideband Gain and IRL at 30 W and 15 W Output Power**



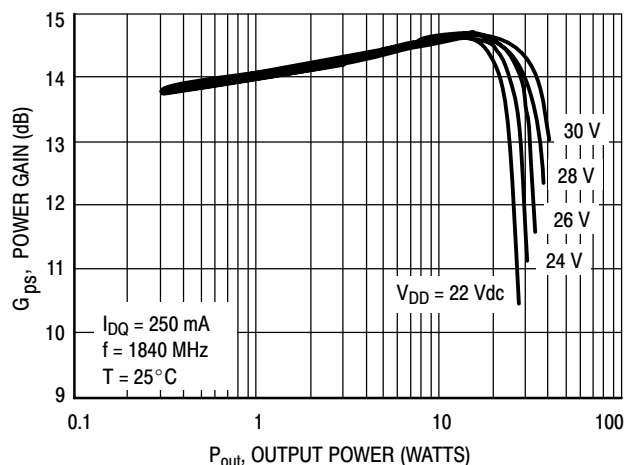
**Figure 4. Output Power versus Frequency**



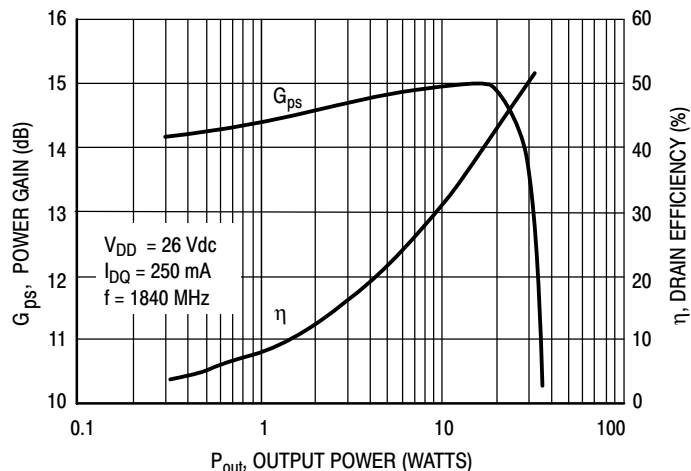
**Figure 5. Power Gain versus Output Power**



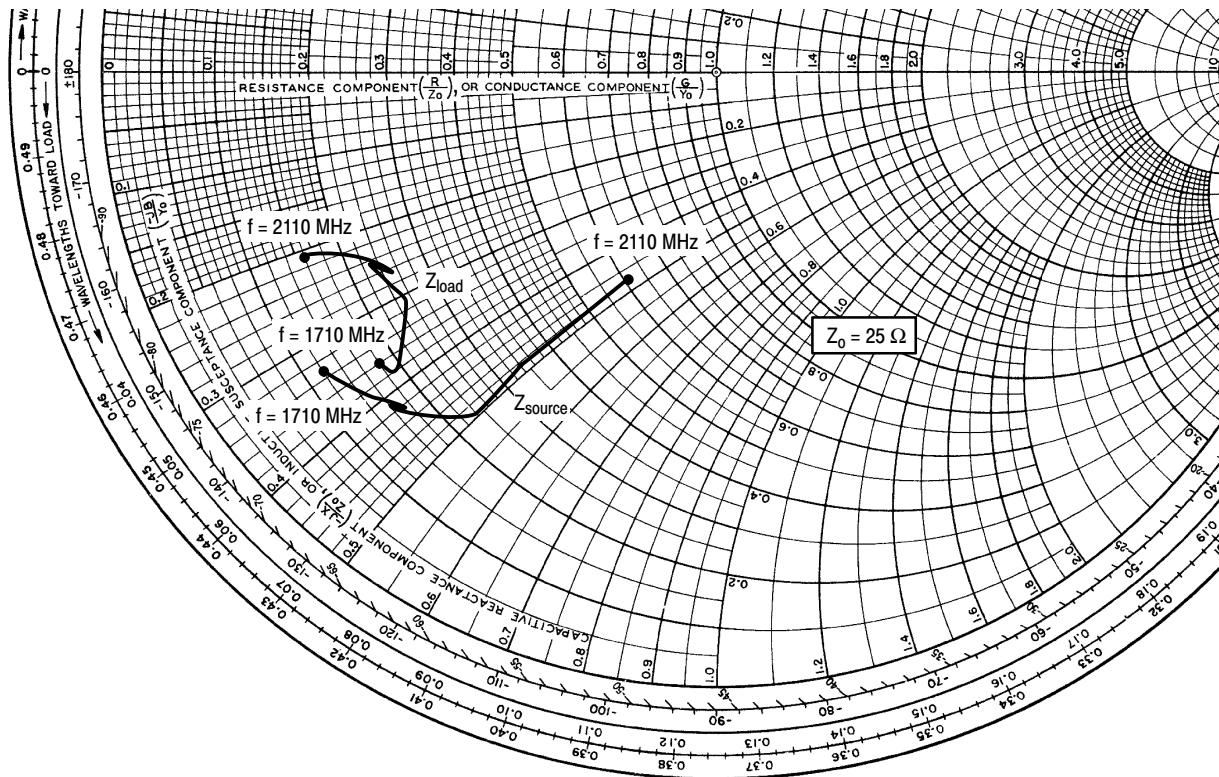
**Figure 6. Power Gain versus Output Power**



**Figure 7. Power Gain versus Output Power**



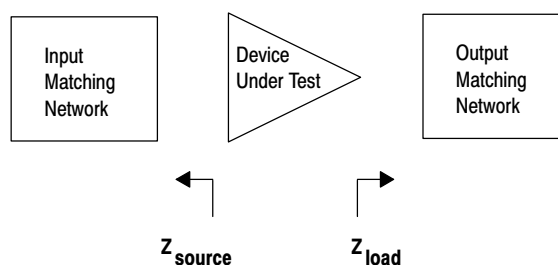
**Figure 8. Power Gain and Efficiency versus Output Power**

**Freescale Semiconductor, Inc.** $V_{DD} = 26 \text{ V}, I_{DQ} = 250 \text{ mA}, P_{out} = 30 \text{ W (CW)}$ 

| f<br>MHz | Z <sub>source</sub><br>Ω | Z <sub>load</sub><br>Ω |
|----------|--------------------------|------------------------|
| 1710     | 2.92 - j8.24             | 4.18 - j9.06           |
| 1785     | 3.84 - j9.75             | 4.59 - j9.46           |
| 1805     | 4.15 - j10.38            | 4.98 - j9.06           |
| 1840     | 4.04 - j10.22            | 6.10 - j7.63           |
| 1880     | 6.12 - j12.29            | 5.83 - j6.89           |
| 1960     | 6.20 - j12.29            | 5.55 - j6.33           |
| 1990     | 8.61 - j12.10            | 5.93 - j6.66           |
| 2110     | 15.19 - j11.85           | 3.82 - j5.33           |

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

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



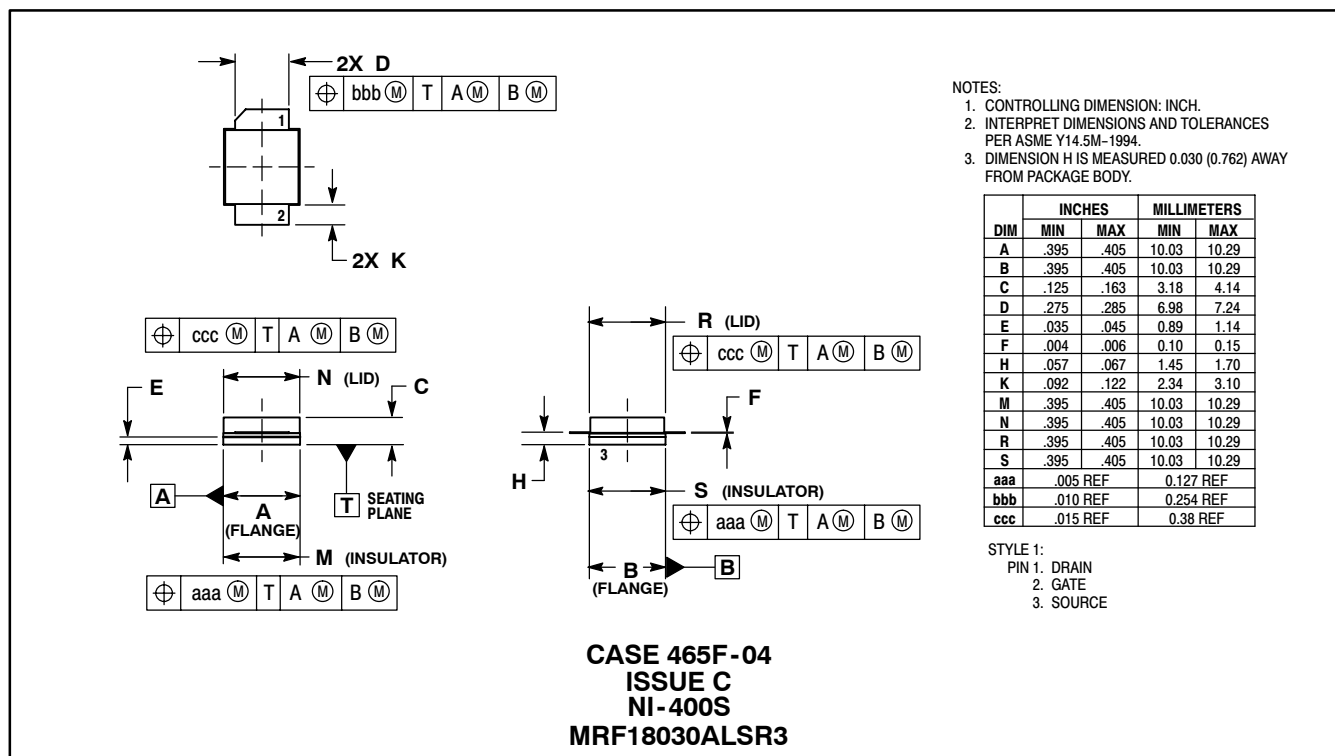
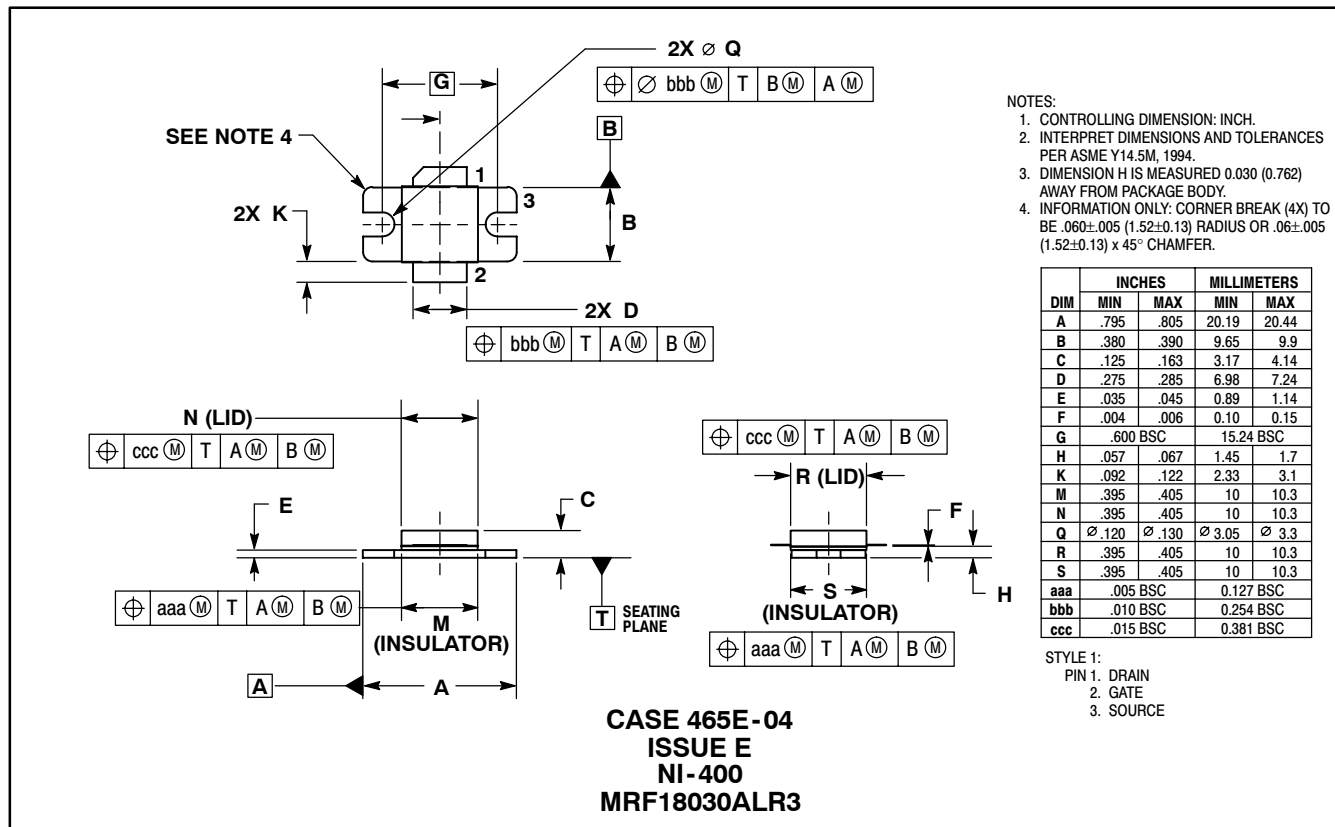
### Figure 9. Series Equivalent Source and Load Impedance

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**NOTES**

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## PACKAGE DIMENSIONS



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