

# RF Power Field Effect Transistors

## N-Channel Enhancement-Mode Lateral MOSFETs

Designed for GSM and EDGE base station applications with frequencies from 1800 to 2000 MHz. 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
- Capable of Handling 5:1 VSWR, @ 26 Vdc, 30 Watts CW Output Power

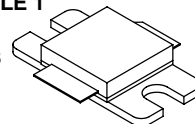
### Features

- Internally Matched for Ease of Use
- High Gain, High Efficiency and High Linearity
- Integrated ESD Protection
- Designed for Maximum Gain and Insertion Phase Flatness
- Low Gold Plating Thickness on Leads, 40µ" Nominal.
- RoHS Compliant
- in Tape and Reel. R3 Suffix = 250 Units per 32 mm, 13 inch Reel.

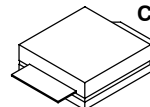
**MRF18030ALR3**  
**MRF18030ALSR3**

**1800-1880 MHz, 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**



**Table 1. Maximum Ratings**

| Rating                                                                | Symbol           | Value        | Unit      |
|-----------------------------------------------------------------------|------------------|--------------|-----------|
| Drain-Source Voltage                                                  | V <sub>DSS</sub> | -0.5, +65    | Vdc       |
| Gate-Source Voltage                                                   | V <sub>GS</sub>  | -0.5, +15    | Vdc       |
| Total Device Dissipation @ T <sub>C</sub> = 25°C<br>Derate above 25°C | P <sub>D</sub>   | 83.3<br>0.48 | W<br>W/°C |
| Storage Temperature Range                                             | T <sub>stg</sub> | - 65 to +150 | °C        |
| Case Operating Temperature                                            | T <sub>C</sub>   | 150          | °C        |
| Operating Junction Temperature                                        | T <sub>J</sub>   | 200          | °C        |

**Table 2. Thermal Characteristics**

| Characteristic                       | Symbol           | Value | Unit |
|--------------------------------------|------------------|-------|------|
| Thermal Resistance, Junction to Case | R <sub>θJC</sub> | 2.1   | °C/W |

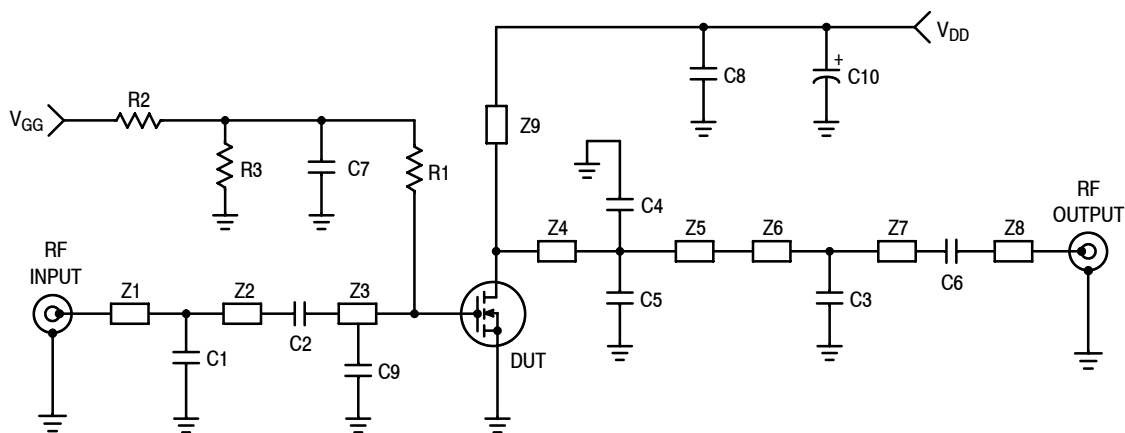
**Table 3. ESD Protection Characteristics**

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

**Table 4. Electrical Characteristics** ( $T_C = 25^\circ\text{C}$ , 50 ohm system unless otherwise noted)

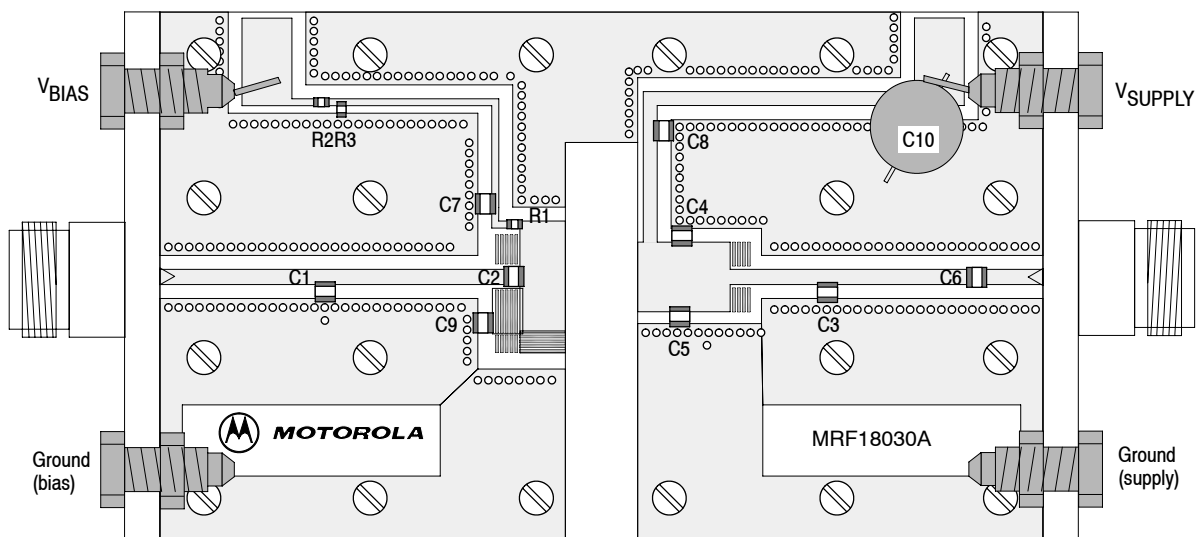
| Characteristic                                                                                                                       | Symbol        | Min  | Typ  | Max | Unit            |
|--------------------------------------------------------------------------------------------------------------------------------------|---------------|------|------|-----|-----------------|
| <b>Off Characteristics</b>                                                                                                           |               |      |      |     |                 |
| Drain-Source Breakdown Voltage<br>( $V_{GS} = 0\text{ Vdc}$ , $I_D = 20\text{ }\mu\text{Adc}$ )                                      | $V_{(BR)DSS}$ | 65   | —    | —   | Vdc             |
| Zero Gate Voltage Drain Current<br>( $V_{DS} = 26\text{ Vdc}$ , $V_{GS} = 0\text{ Vdc}$ )                                            | $I_{DSS}$     | —    | —    | 1   | $\mu\text{Adc}$ |
| Gate-Source Leakage Current<br>( $V_{GS} = 5\text{ Vdc}$ , $V_{DS} = 0\text{ Vdc}$ )                                                 | $I_{GSS}$     | —    | —    | 1   | $\mu\text{Adc}$ |
| <b>On Characteristics</b>                                                                                                            |               |      |      |     |                 |
| Gate Threshold Voltage<br>( $V_{DS} = 10\text{ Vdc}$ , $I_D = 100\text{ }\mu\text{Adc}$ )                                            | $V_{GS(th)}$  | 2    | 3    | 4   | Vdc             |
| Gate Quiescent Voltage<br>( $V_{DS} = 26\text{ Vdc}$ , $I_D = 250\text{ mAdc}$ )                                                     | $V_{GS(Q)}$   | 2    | 3.9  | 4.5 | Vdc             |
| Drain-Source On-Voltage<br>( $V_{GS} = 10\text{ Vdc}$ , $I_D = 1\text{ Adc}$ )                                                       | $V_{DS(on)}$  | —    | 0.29 | 0.4 | Vdc             |
| Forward Transconductance<br>( $V_{DS} = 10\text{ Vdc}$ , $I_D = 1\text{ Adc}$ )                                                      | $g_{fs}$      | —    | 2    | —   | S               |
| <b>Dynamic Characteristics</b>                                                                                                       |               |      |      |     |                 |
| Reverse Transfer Capacitance <sup>(1)</sup><br>( $V_{DS} = 26\text{ Vdc} \pm 30\text{ mV(rms)ac}$ @ 1 MHz, $V_{GS} = 0\text{ Vdc}$ ) | $C_{rss}$     | —    | 1.3  | —   | pF              |
| <b>Functional Tests</b> (In Freescale Test Fixture) <sup>(2)</sup>                                                                   |               |      |      |     |                 |
| Output Power, 1 dB Compression Point<br>( $V_{DD} = 26\text{ Vdc}$ , $I_{DQ} = 250\text{ mA}$ , $f = 1805 - 1880\text{ MHz}$ )       | P1dB          | 27   | 30   | —   | W               |
| Common-Source Amplifier Power Gain @ 30 W<br>( $V_{DD} = 26\text{ Vdc}$ , $I_{DQ} = 250\text{ mA}$ , $f = 1805 - 1880\text{ MHz}$ )  | $G_{ps}$      | 13   | 14   | —   | dB              |
| Drain Efficiency @ 30 W<br>( $V_{DD} = 26\text{ Vdc}$ , $I_{DQ} = 250\text{ mA}$ , $f = 1805 - 1880\text{ MHz}$ )                    | $\eta$        | 46.5 | 50   | —   | %               |
| Input Return Loss @ 30 W<br>( $V_{DD} = 26\text{ Vdc}$ , $I_{DQ} = 250\text{ mA}$ , $f = 1805 - 1880\text{ MHz}$ )                   | IRL           | —    | -12  | -9  | dB              |

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



|            |                                             |    |                                      |
|------------|---------------------------------------------|----|--------------------------------------|
| 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 |

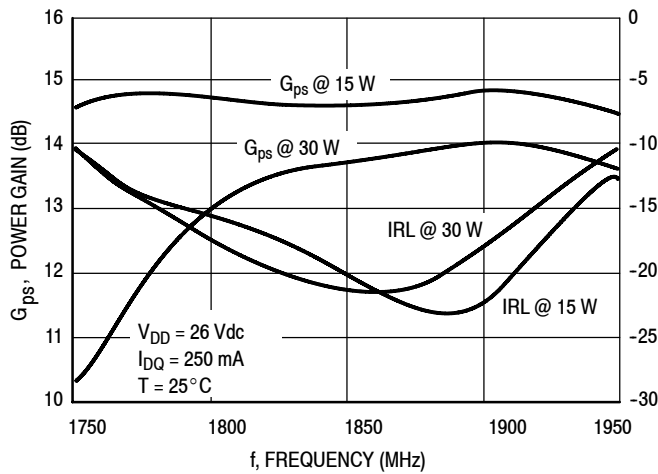
Figure 1. 1805 - 1880 MHz Test Fixture Schematic



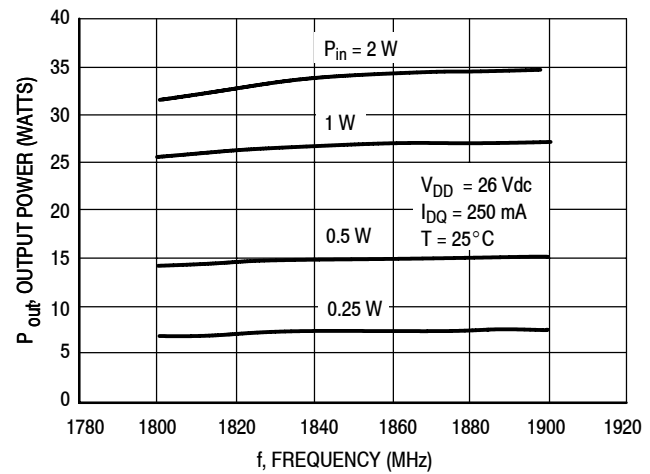
Freescall has begun the transition of marking Printed Circuit Boards (PCBs) with the Freescall Semiconductor signature/-logo. PCBs may have either Motorola or Freescall markings during the transition period. These changes will have no impact on form, fit or function of the current product.

Figure 2. 1805 - 1880 MHz Test Fixture Component Layout

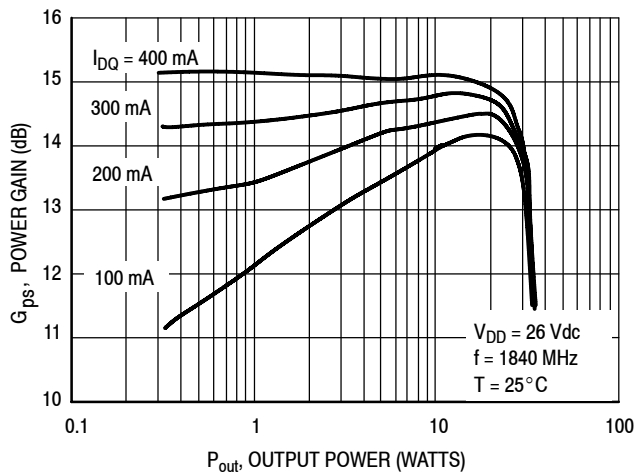
## TYPICAL CHARACTERISTICS



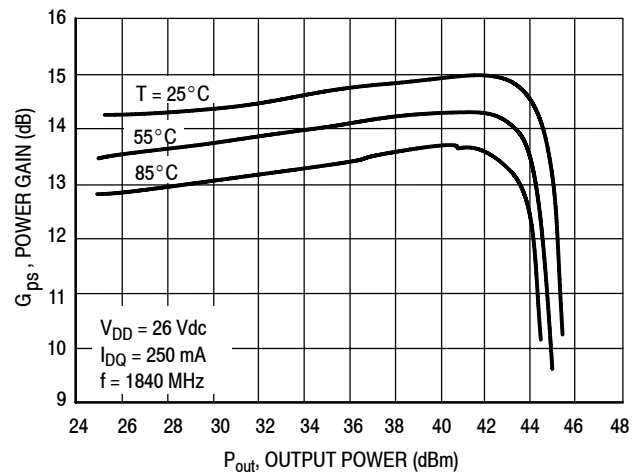
**Figure 3. Wideband Gain and IRL at 30 W and 15 W Output Power**



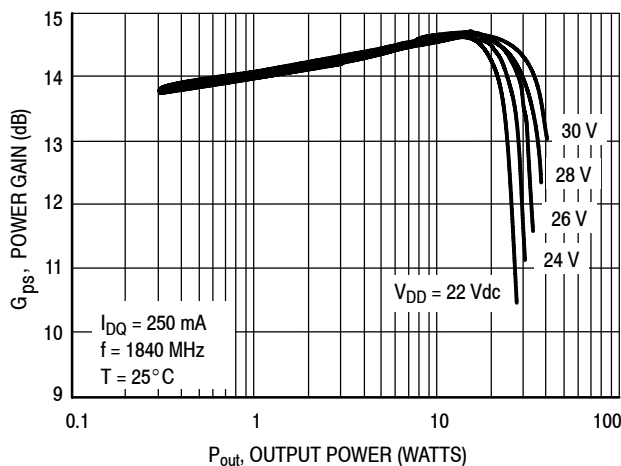
**Figure 4. Output Power versus Frequency**



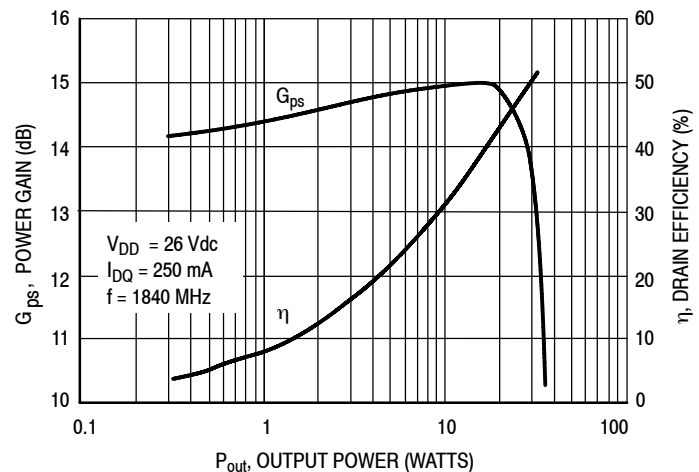
**Figure 5. Power Gain versus Output Power**



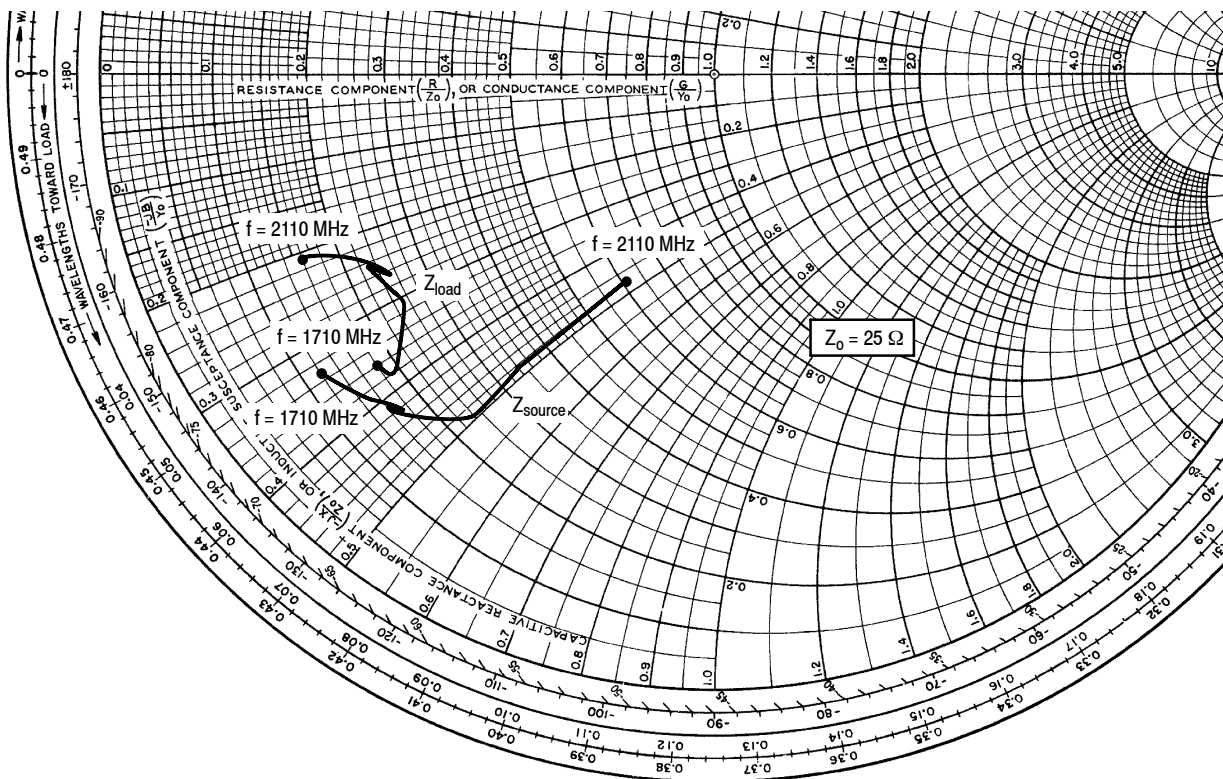
**Figure 6. Power Gain versus Output Power**



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



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



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

| f<br>MHz | $Z_{source}$<br>$\Omega$ | $Z_{load}$<br>$\Omega$ |
|----------|--------------------------|------------------------|
| 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     | $15.19 - j11.85$         | $3.82 - j5.33$         |

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

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

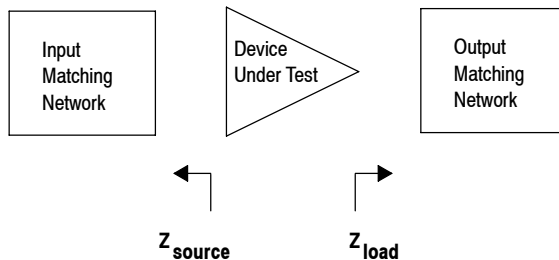


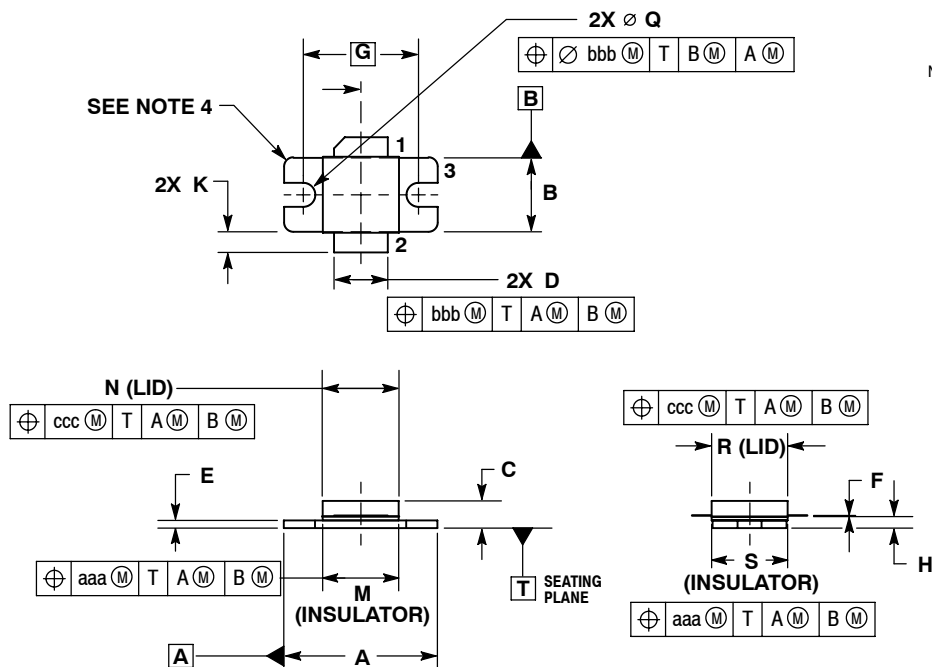
Figure 9. Series Equivalent Source and Load Impedance

MRF18030ALR3 MRF18030ALSR3

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## PACKAGE DIMENSIONS

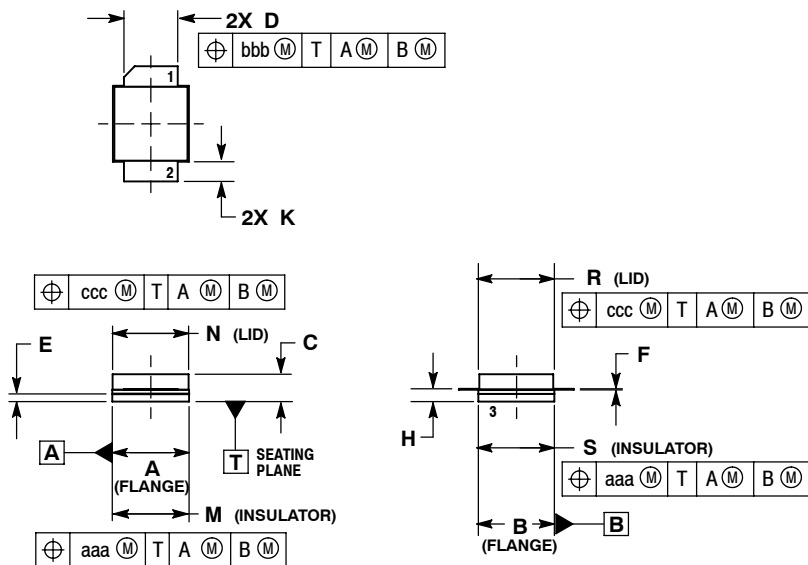


- NOTES:
1. CONTROLLING DIMENSION: INCH.
  2. INTERPRET DIMENSIONS AND TOLERANCES PER ASME Y14.5M, 1994.
  3. DIMENSION H IS MEASURED 0.030 (0.762) AWAY FROM PACKAGE BODY.
  4. INFORMATION ONLY: CORNER BREAK (4X) TO BE .060±.005 (1.52±0.13) RADIUS OR .06±.005 (1.52±0.13) x 45° CHAMFER.

| DIM | INCHES   |        | MILLIMETERS |       |
|-----|----------|--------|-------------|-------|
|     | MIN      | MAX    | MIN         | MAX   |
| A   | .795     | .805   | 20.19       | 20.44 |
| B   | .380     | .390   | 9.65        | 9.9   |
| C   | .125     | .163   | 3.17        | 4.14  |
| D   | .275     | .285   | 6.98        | 7.24  |
| E   | .035     | .045   | 0.89        | 1.14  |
| F   | .004     | .006   | 0.10        | 0.15  |
| G   | .600 BSC |        | 15.24 BSC   |       |
| H   | .057     | .067   | 1.45        | 1.7   |
| K   | .092     | .122   | 2.33        | 3.1   |
| M   | .395     | .405   | 10          | 10.3  |
| N   | .395     | .405   | 10          | 10.3  |
| Q   | Ø .120   | Ø .130 | Ø 3.05      | Ø 3.3 |
| R   | .395     | .405   | 10          | 10.3  |
| S   | .395     | .405   | 10          | 10.3  |
| aaa | .005 BSC |        | 0.127 BSC   |       |
| bbb | .010 BSC |        | 0.254 BSC   |       |
| ccc | .015 BSC |        | 0.381 BSC   |       |

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

CASE 465E-04  
ISSUE F  
NI-400  
MRF18030ALR3



- NOTES:
1. CONTROLLING DIMENSION: INCH.
  2. INTERPRET DIMENSIONS AND TOLERANCES PER ASME Y14.5M-1994.
  3. DIMENSION H IS MEASURED 0.030 (0.762) AWAY FROM PACKAGE BODY.

| DIM | INCHES   |      | MILLIMETERS |       |
|-----|----------|------|-------------|-------|
|     | MIN      | MAX  | MIN         | MAX   |
| A   | .395     | .405 | 10.03       | 10.29 |
| B   | .395     | .405 | 10.03       | 10.29 |
| C   | .125     | .163 | 3.18        | 4.14  |
| D   | .275     | .285 | 6.98        | 7.24  |
| E   | .035     | .045 | 0.89        | 1.14  |
| F   | .004     | .006 | 0.10        | 0.15  |
| H   | .057     | .067 | 1.45        | 1.70  |
| K   | .092     | .122 | 2.34        | 3.10  |
| M   | .395     | .405 | 10.03       | 10.29 |
| N   | .395     | .405 | 10.03       | 10.29 |
| R   | .395     | .405 | 10.03       | 10.29 |
| S   | .395     | .405 | 10.03       | 10.29 |
| aaa | .005 REF |      | 0.127 REF   |       |
| bbb | .010 REF |      | 0.254 REF   |       |
| ccc | .015 REF |      | 0.381 REF   |       |

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

CASE 465F-04  
ISSUE E  
NI-400S  
MRF18030ALSR3

MRF18030ALR3 MRF18030ALSR3

## REVISION HISTORY

The following table summarizes revisions to this document.

| Revision | Date      | Description                                                                                                                                                                                                                   |
|----------|-----------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 8        | Dec. 2010 | <ul style="list-style-type: none"> <li>MRF18030A Rev. 8 data sheet archived. Data sheet split due to change in part life cycle. See MRF18030A-1 Rev. 9 for MRF18030ALR3 and MRF18030A-2 Rev. 10 for MRF18030ALSR3.</li> </ul> |

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