



RF Power Field Effect Transistors

N-Channel Enhancement-Mode Lateral MOSFETs

Designed for GSM and GSM EDGE base station applications with frequencies from 1800 to 2000 MHz. Suitable for TDMA, CDMA and multicarrier amplifier applications. To be used in Class AB for PCN-PCS/cellular radio and WLL applications. Specified for GSM - GSM EDGE 1805-1880 MHz.

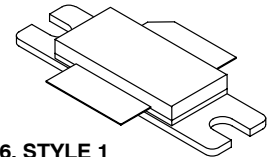
- GSM and GSM EDGE Performance, Full Frequency Band (1805-1880 MHz)
Power Gain - 15 dB (Typ) @ 85 Watts CW
Efficiency - 52% (Typ) @ 85 Watts CW
- Capable of Handling 5:1 VSWR, @ 26 Vdc, 1840 MHz, 85 Watts CW Output Power

Features

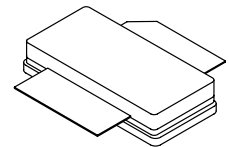
- Internally Matched for Ease of Use
- High Gain, High Efficiency and High Linearity
- Integrated ESD Protection
- Designed for Maximum Gain and Insertion Phase Flatness
- Excellent Thermal Stability
- Characterized with Series Equivalent Large-Signal Impedance Parameters
- Available with Low Gold Plating Thickness on Leads. L Suffix Indicates 40μ" Nominal.
- RoHS Compliant
- In Tape and Reel. R3 Suffix = 250 Units per 56 mm, 13 inch Reel.

MRF18085ALR3
MRF18085ALSR3

1805-1880 MHz, 85 W, 26 V
GSM/GSM EDGE
LATERAL N-CHANNEL
RF POWER MOSFETs



CASE 465-06, STYLE 1
NI-780
MRF18085ALR3



CASE 465A-06, STYLE 1
NI-780S
MRF18085ALSR3

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°C Derate above 25°C | P _D | 273 1.56 | W W/°C |
| Storage Temperature Range | T _{stg} | - 65 to +150 | °C |
| Case Operating Temperature | T _C | 150 | °C |
| Operating Junction Temperature | T _J | 200 | °C |

Table 2. Thermal Characteristics

| Characteristic | Symbol | Value (1) | Unit |
|--------------------------------------|------------------|-----------|------|
| Thermal Resistance, Junction to Case | R _{θJC} | 0.79 | °C/W |

Table 3. ESD Protection Characteristics

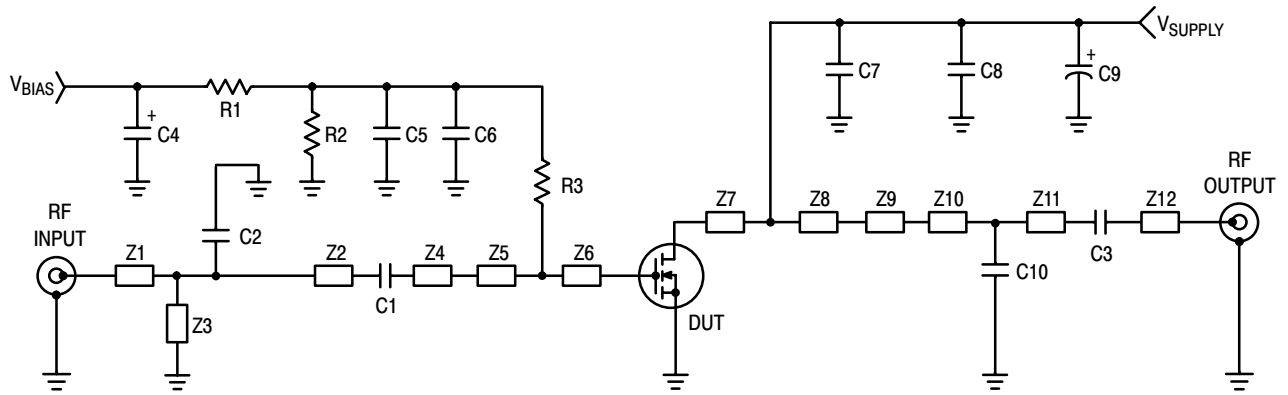
| Test Conditions | Class |
|------------------|--------------|
| Human Body Model | 1 (Minimum) |
| Machine Model | M3 (Minimum) |

1. Refer to AN1955/D, *Thermal Measurement Methodology of RF Power Amplifiers*. Go to <http://www.freescale.com/rf>. Select Documentation/Application Notes - AN1955.

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

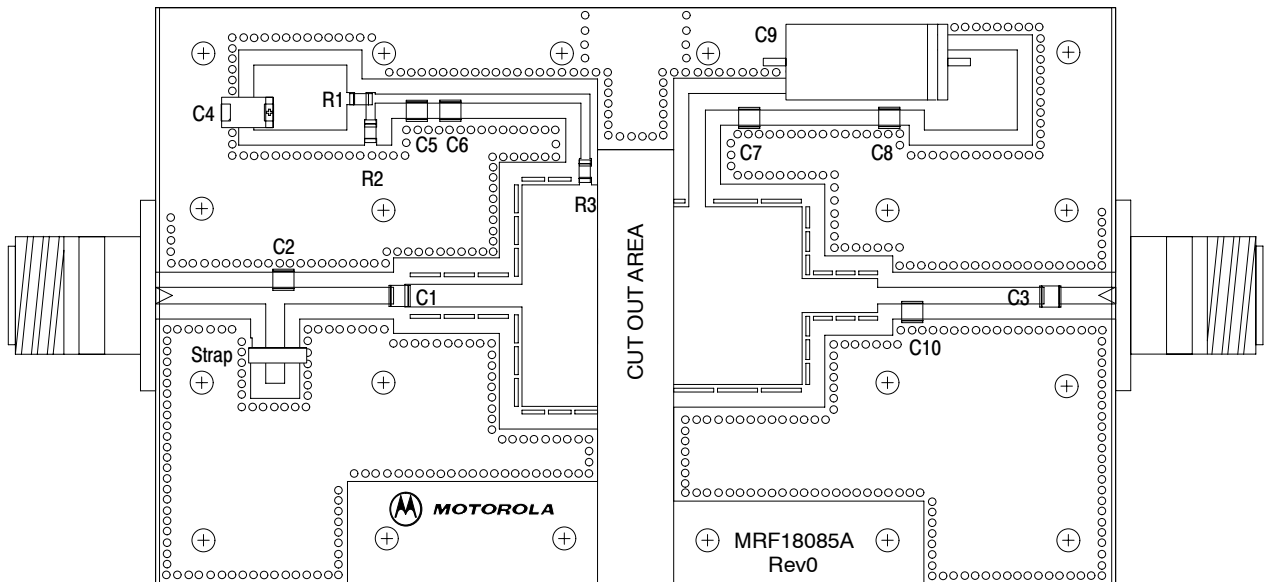
| Characteristic | Symbol | Min | Typ | Max | Unit |
|---|---------------|------|------|-----|-----------------|
| Off Characteristics | | | | | |
| Drain-Source Breakdown Voltage ($V_{GS} = 0\text{ Vdc}$, $I_D = 100\ \mu\text{Adc}$) | $V_{(BR)DSS}$ | 65 | — | — | Vdc |
| Zero Gate Voltage Drain Current ($V_{DS} = 26\text{ Vdc}$, $V_{GS} = 0\text{ Vdc}$) | I_{DSS} | — | — | 10 | μAdc |
| Gate-Source Leakage Current ($V_{GS} = 5\text{ Vdc}$, $V_{DS} = 0\text{ Vdc}$) | I_{GSS} | — | — | 1 | μAdc |
| On Characteristics | | | | | |
| Gate Threshold Voltage ($V_{DS} = 10\text{ Vdc}$, $I_D = 200\ \mu\text{Adc}$) | $V_{GS(th)}$ | 2 | — | 4 | Vdc |
| Gate Quiescent Voltage ($V_{DS} = 26\text{ Vdc}$, $I_D = 600\ \text{mAdc}$) | $V_{GS(Q)}$ | 2.5 | 3.9 | 4.5 | Vdc |
| Drain-Source On-Voltage ($V_{GS} = 10\text{ Vdc}$, $I_D = 2\text{ Adc}$) | $V_{DS(on)}$ | — | 0.15 | — | Vdc |
| Dynamic Characteristics | | | | | |
| Reverse Transfer Capacitance ⁽¹⁾ ($V_{DS} = 26\text{ Vdc}$, $V_{GS} = 0$, $f = 1\text{ MHz}$) | C_{rss} | — | 3.6 | — | pF |
| Functional Tests (In Freescale Test Fixture, 50 ohm system) | | | | | |
| Common-Source Amplifier Power Gain @ 85 W ⁽²⁾ ($V_{DD} = 26\text{ Vdc}$, $I_{DQ} = 800\ \text{mA}$, $f = 1805 - 1880\text{ MHz}$) | G_{ps} | 13.5 | 15 | — | dB |
| Drain Efficiency @ 85 W ⁽²⁾ ($V_{DD} = 26\text{ Vdc}$, $I_{DQ} = 800\ \text{mA}$, $f = 1805 - 1880\text{ MHz}$) | η | 48 | 52 | — | % |
| Input Return Loss @ 85 W ⁽²⁾ ($V_{DD} = 26\text{ Vdc}$, $I_{DQ} = 800\ \text{mA}$, $f = 1805 - 1880\text{ MHz}$) | IRL | — | -12 | -9 | dB |
| Power Output, 1 dB Compression Point ($V_{DD} = 26\text{ Vdc}$, $I_{DQ} = 800\ \text{mA}$, $f = 1805 - 1880\text{ MHz}$) | P1dB | 83 | 90 | — | Watts |

1. Part is internally matched both on input and output.
2. To meet application requirements, Freescale test fixtures have been designed to cover the full GSM1800 band, ensuring batch-to-batch consistency.



| | | | |
|----------------|---|-----|--|
| C1, C3, C6, C7 | 10 pF Chip Capacitors, ATC | Z4 | 0.610" x 0.118" Microstrip |
| C2 | 1.8 pF Chip Capacitor, ATC | Z5 | 0.331" x 1.153" Microstrip |
| C4 | 10 μ F, 35 V Tantalum Capacitor, AVX | Z6 | 0.063" x 1.153" Microstrip |
| C5, C8 | 1 nF Chip Capacitors, ATC | Z7 | 0.122" x 0.925" Microstrip |
| C9 | 220 μ F, 63 V Electrolytic Capacitor, Radial, Philips | Z8 | 0.547" x 0.925" Microstrip |
| C10 | 0.3 pF Chip Capacitor, ATC | Z9 | 0.394" x 0.177" Microstrip |
| R1, R2 | 10 k Ω , 1/4 W Chip Resistors (1206) | Z10 | 0.180" x 0.087" Microstrip |
| R3 | 1.0 k Ω , 1/4 W Chip Resistor (1206) | Z11 | 0.686" x 0.087" Microstrip |
| Z1 | 0.671" x 0.087" Microstrip | Z12 | 0.294" x 0.087" Microstrip |
| Z2 | 0.568" x 0.087" Microstrip | PCB | Taconic TLX8, 30 mils, $\epsilon_r = 2.55$ |
| Z3 | 0.500" x 0.098" Microstrip Shorted Stub | | |

Figure 1. 1805-1880 MHz Test Fixture Schematic



Freescale has begun the transition of marking Printed Circuit Boards (PCBs) with the Freescale Semiconductor signature/logo. PCBs may have either Motorola or Freescale 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

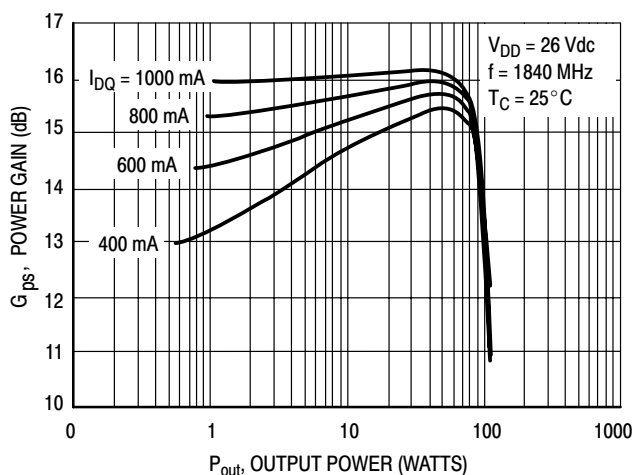


Figure 3. Power Gain versus Output Power

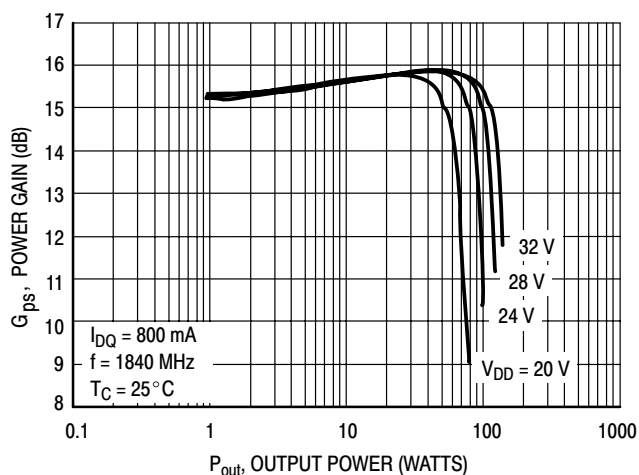


Figure 4. Power Gain versus Output Power

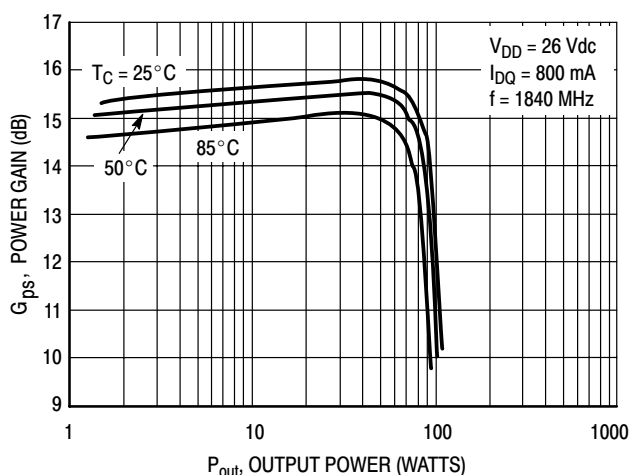


Figure 5. Power Gain versus Output Power

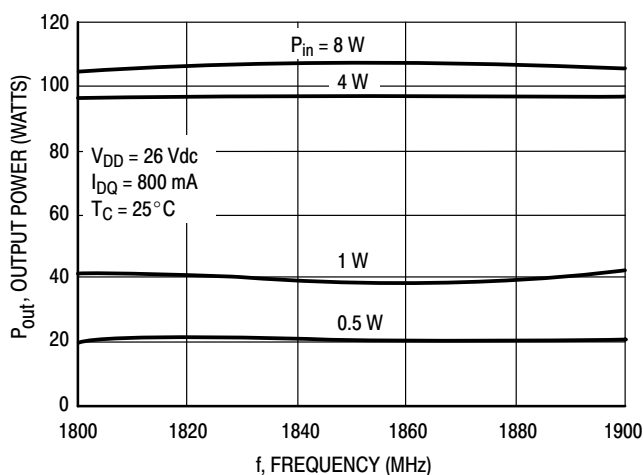


Figure 6. Output Power versus Frequency

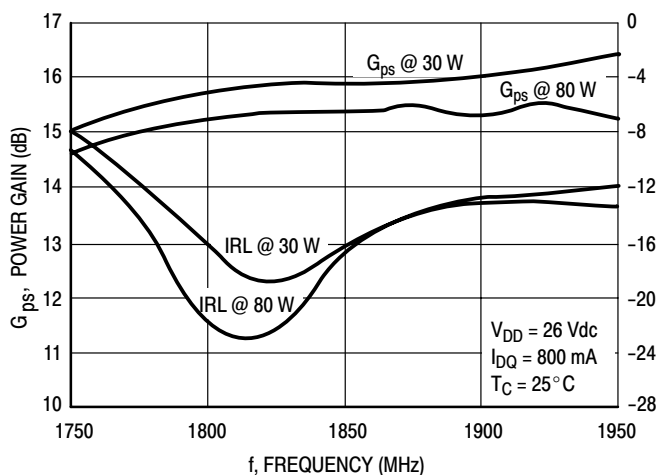


Figure 7. Power Gain versus Frequency

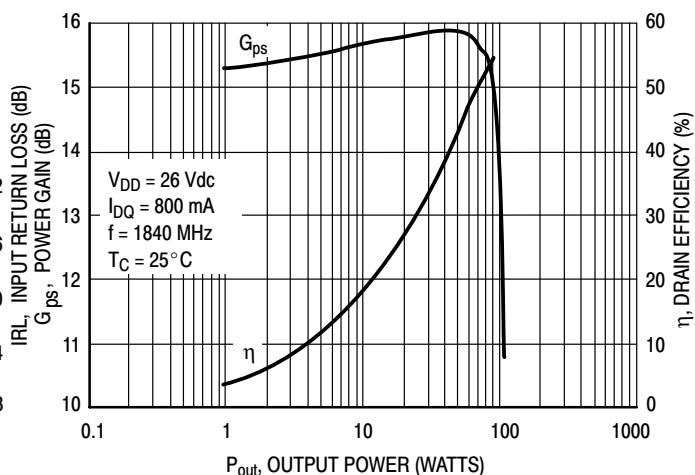
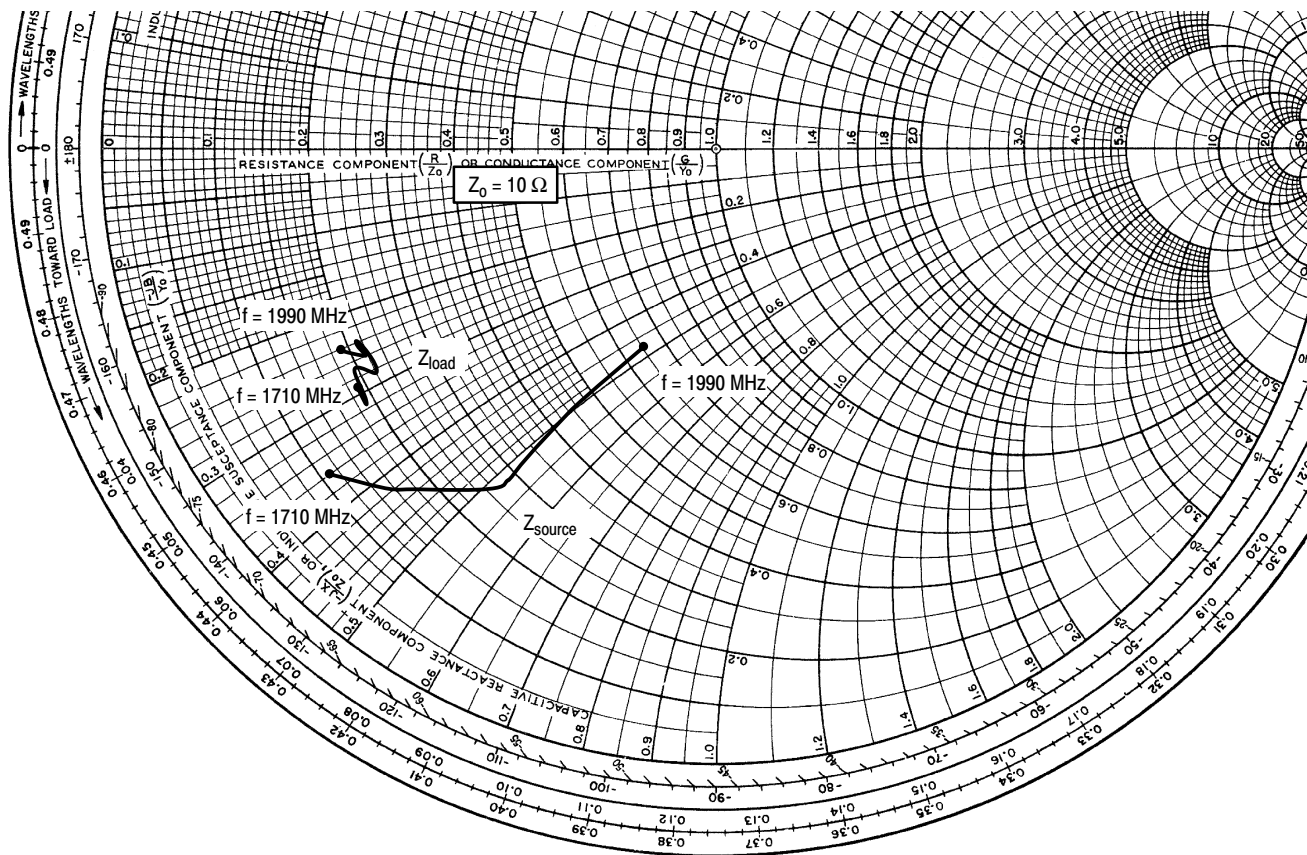


Figure 8. Power Gain and Efficiency versus Output Power



$V_{DD} = 26 \text{ V}$, $I_{DQ} = 800 \text{ mA}$, $P_{out} = 85 \text{ W CW}$

| f MHz | Z_{source} Ω | Z_{load} Ω |
|----------|--------------------------|------------------------|
| 1710 | 1.13 - j3.62 | 1.79 - j2.88 |
| 1785 | 1.61 - j4.23 | 1.82 - j3.15 |
| 1805 | 1.69 - j4.34 | 1.90 - j2.66 |
| 1880 | 2.83 - j5.25 | 2.09 - j2.77 |
| 1930 | 3.00 - j5.18 | 2.01 - j2.44 |
| 1960 | 4.39 - j4.97 | 2.01 - j2.57 |
| 1990 | 6.59 - j4.74 | 1.79 - j2.37 |

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

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

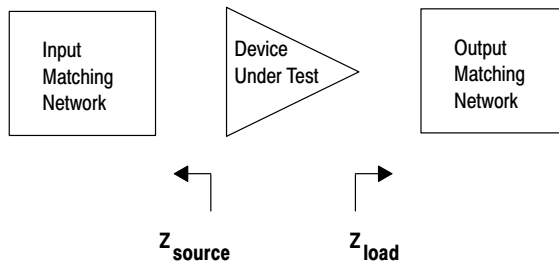
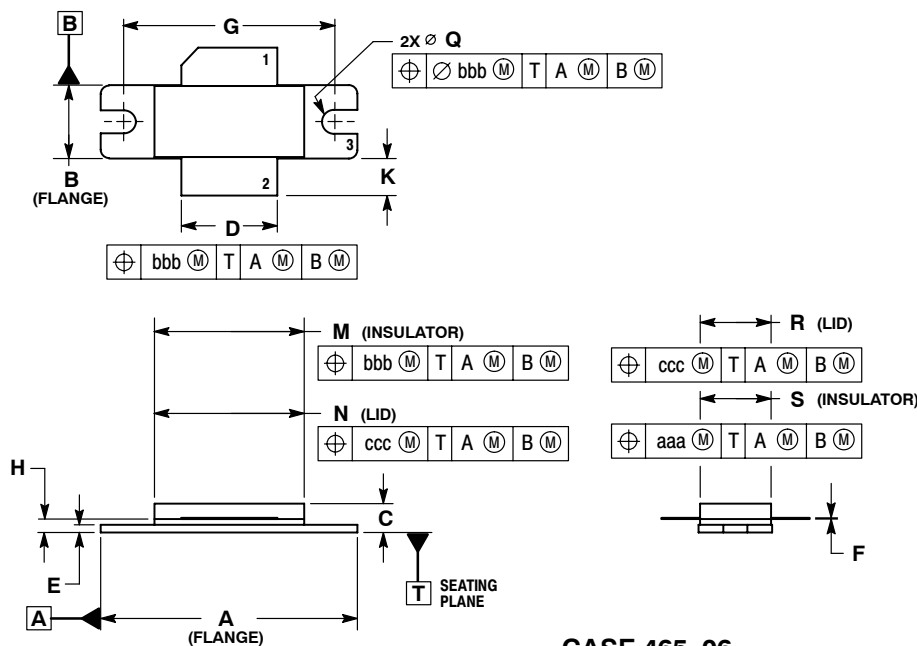


Figure 9. Series Equivalent Source and Load Impedance

NOTES

PACKAGE DIMENSIONS

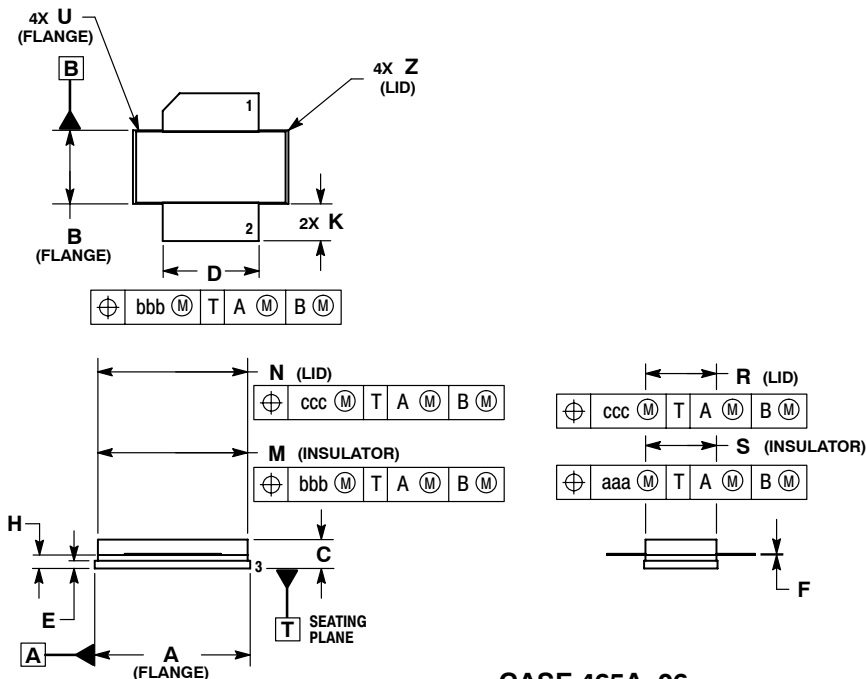


- NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M-1994.
 2. CONTROLLING DIMENSION: INCH.
 3. DELETED
 4. DIMENSION H IS MEASURED 0.030 (0.762) AWAY FROM PACKAGE BODY.

| 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 | ∅.118 | ∅.138 | ∅.300 | ∅.351 |
| 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
 MRF18085ALR3**



- 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
 MRF18085ALSR3**

MRF18085ALR3 MRF18085ALSR3

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