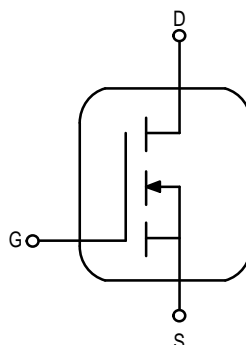


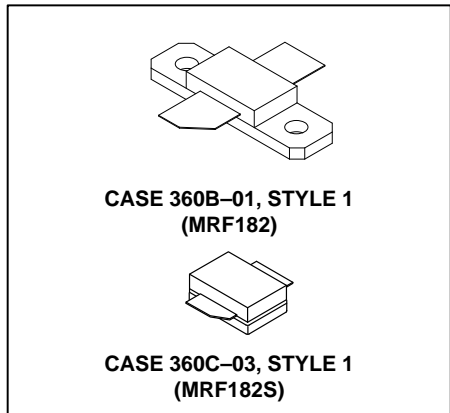
The RF MOSFET Line  
**RF Power**  
**Field Effect Transistors**  
N-Channel Enhancement-Mode Lateral  
MOSFETs

- High Gain, Rugged Device
- Broadband Performance from HF to 1 GHz
- Bottom Side Source Eliminates DC Isolators, Reducing Common Mode Inductances



**MRF182**  
**MRF182S**

**30 W, 1.0 GHz**  
**LATERAL N-CHANNEL**  
**BROADBAND**  
**RF POWER MOSFETs**



**MAXIMUM RATINGS**

| Rating   | Symbol    | Value        | Unit                     |
|--|-----------|--------------|--------------------------|
| Drain-Source Voltage   | $V_{DSS}$ | 65           | Vdc                      |
| Gate-Source Voltage  | $V_{GS}$  | $\pm 20$     | Vdc                      |
| Total Device Dissipation @ $T_C = 70^\circ\text{C}$<br>Derate above $70^\circ\text{C}$ | $P_D$     | 74<br>0.57   | W<br>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          | Max  | Unit                      |
|--------------------------------------|-----------------|------|---------------------------|
| Thermal Resistance, Junction to Case | $R_{\theta JC}$ | 1.75 | $^\circ\text{C}/\text{W}$ |

**ELECTRICAL CHARACTERISTICS** ( $T_C = 25^\circ\text{C}$  unless otherwise noted)

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

**OFF CHARACTERISTICS**

|   |               |    |   |   |                    |
|---|---------------|----|---|---|--------------------|
| Drain-Source Breakdown Voltage<br>( $V_{GS} = 0$ , $I_D = 1.0 \mu\text{A}_{dc}$ ) | $V_{(BR)DSS}$ | 65 | - | - | Vdc                |
| Zero Gate Voltage Drain Current<br>( $V_{DS} = 28 \text{ V}$ , $V_{GS} = 0$ )     | $I_{DSS}$     | -  | - | 1 | $\mu\text{A}_{dc}$ |
| Gate-Source Leakage Current<br>( $V_{GS} = 20 \text{ V}$ , $V_{DS} = 0$ )         | $I_{GSS}$     | -  | - | 1 | $\mu\text{A}_{dc}$ |

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

**ELECTRICAL CHARACTERISTICS – continued** ( $T_C = 25^\circ\text{C}$  unless otherwise noted)

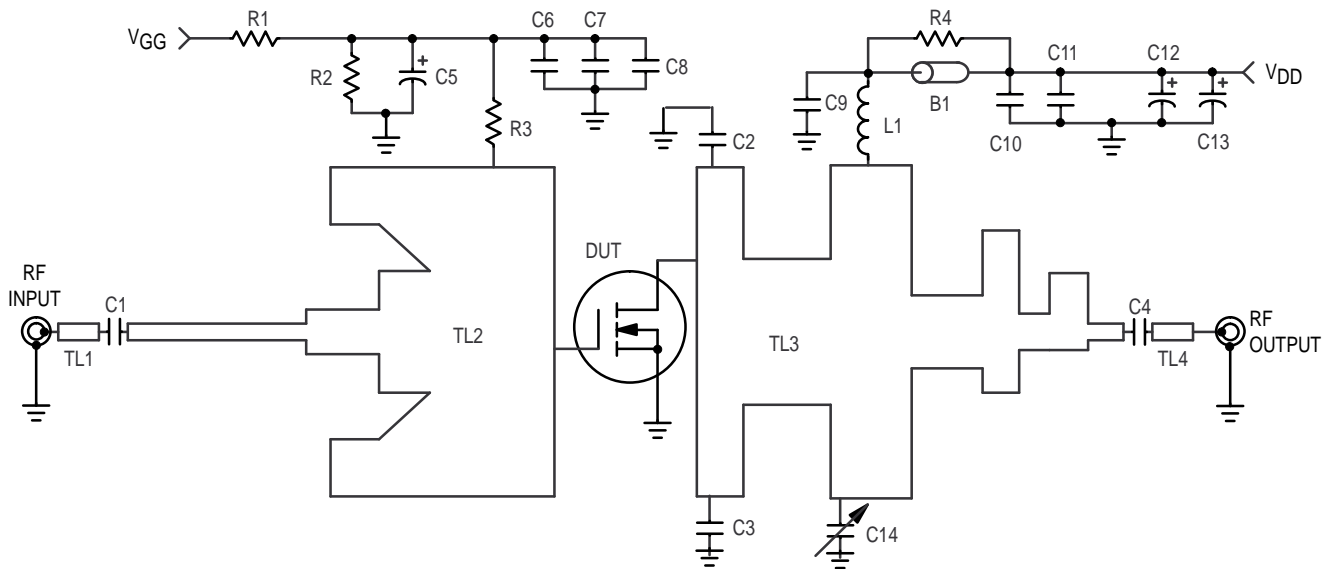
| Characteristic  | Symbol       | Min | Typ | Max | Unit |
|---|--------------|-----|-----|-----|------|
| <b>ON CHARACTERISTICS</b>   |              |     |     |     |      |
| Gate Threshold Voltage<br>( $V_{DS} = 10\text{ V}$ , $I_D = 100\ \mu\text{A}$ ) | $V_{GS(th)}$ | 2   | 3   | 4   | Vdc  |
| Gate Quiescent Voltage<br>( $V_{DS} = 28\text{ V}$ , $I_D = 50\text{ mA}$ )     | $V_{GS(Q)}$  | 3   | 4   | 5   | Vdc  |
| Drain–Source On–Voltage<br>( $V_{GS} = 10\text{ V}$ , $I_D = 3\text{ A}$ )      | $V_{DS(on)}$ | –   | 0.9 | 1.2 | Vdc  |
| Forward Transconductance<br>( $V_{DS} = 10\text{ V}$ , $I_D = 3\text{ A}$ )     | $g_{fs}$     | 1.6 | 1.8 | –   | S    |

**DYNAMIC CHARACTERISTICS**

|  |           |   |     |   |    |
|--|-----------|---|-----|---|----|
| Input Capacitance<br>( $V_{DS} = 28\text{ V}$ , $V_{GS} = 0$ , $f = 1\text{ MHz}$ )            | $C_{iss}$ | – | 56  | – | pF |
| Output Capacitance<br>( $V_{DS} = 28\text{ V}$ , $V_{GS} = 0$ , $f = 1\text{ MHz}$ )           | $C_{oss}$ | – | 28  | – | pF |
| Reverse Transfer Capacitance<br>( $V_{DS} = 28\text{ V}$ , $V_{GS} = 0$ , $f = 1\text{ MHz}$ ) | $C_{rss}$ | – | 2.5 | – | pF |

**FUNCTIONAL CHARACTERISTICS**

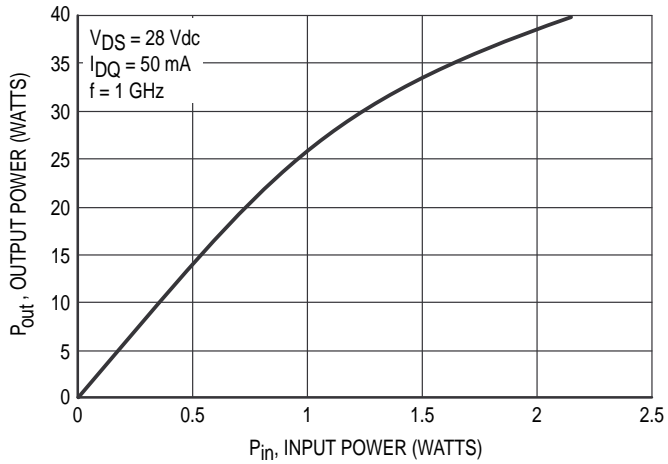
|  |           |                                |               |   |      |
|--|-----------|--------------------------------|---------------|---|------|
| Common Source Power Gain<br>( $V_{DD} = 28\text{ Vdc}$ , $P_{out} = 30\text{ W}$ , $I_{DQ} = 50\text{ mA}$ , $f = 945\text{ MHz}$ )                            | $G_{ps}$  | 11                             | 14            | – | dB   |
| Drain Efficiency<br>( $V_{DD} = 28\text{ Vdc}$ , $P_{out} = 30\text{ W}$ , $I_{DQ} = 50\text{ mA}$ , $f = 945\text{ MHz}$ )                                    | $\eta$    | 50                             | 60            | – | %    |
| Load Mismatch<br>( $V_{DD} = 28\text{ Vdc}$ , $P_{out} = 30\text{ W}$ , $I_{DQ} = 50\text{ mA}$ , $f = 945\text{ MHz}$ ,<br>Load VSWR 5:1 at All Phase Angles) | $\Psi$    | No Degradation in Output Power |               |   |      |
| Series Equivalent Input Impedance<br>( $V_{DD} = 28\text{ Vdc}$ , $P_{out} = 30\text{ W}$ , $I_{DQ} = 50\text{ mA}$ , $f = 960\text{ MHz}$ )                   | $Z_{in}$  | –                              | $0.81 + j1.6$ | – | ohms |
| Series Equivalent Output Impedance<br>( $V_{DD} = 28\text{ Vdc}$ , $P_{out} = 30\text{ W}$ , $I_{DQ} = 50\text{ mA}$ , $f = 960\text{ MHz}$ )                  | $Z_{out}$ | –                              | $2.15 - j1.7$ | – | ohms |



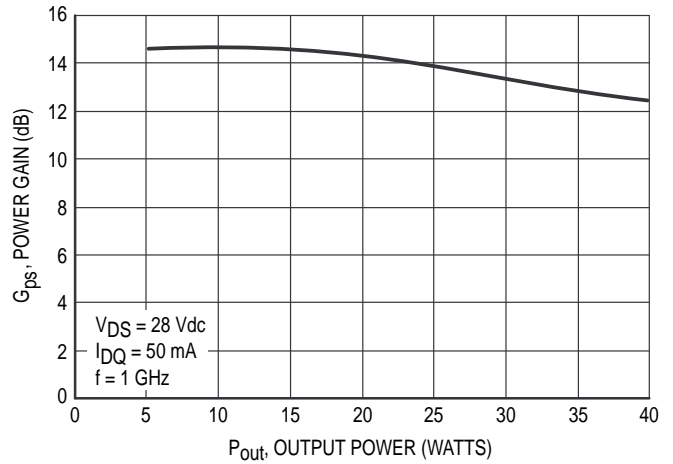
|                |  |           |   |
|----------------|--|-----------|---|
| B1             | Short RF Bead Fair Rite-274301944          | L1        | 5 Turns, 20 AWG, IDIA 0.126             |
| C1             | 18 pF Chip Capacitor                       | R1        | 10 k $\Omega$ , 1/4 W Resistor          |
| C2, C3, C6, C9 | 43 pF Chip Capacitor                       | R2        | 13 k $\Omega$ , 1/4 W Resistor          |
| C4             | 100 pF Chip Capacitor                      | R3        | 1.0 k $\Omega$ , 1/4 W Chip Resistor    |
| C5, C12        | 10 $\mu$ F, 50 Vdc Electrolytic Capacitor  | R4        | 4 x 39 $\Omega$ , 1/8 W Chip Resistor   |
| C7, C10        | 1000 pF Chip Capacitor                     | "TL1-TL4  | Microstrip Line See Photomaster         |
| C8, C11        | 0.1 $\mu$ F, 50 Vdc Chip Capacitor         | Ckt Board | 1/32" Glass Teflon, $\epsilon_r = 2.55$ |
| C13            | 250 $\mu$ F, 50 Vdc Electrolytic Capacitor |           | ARLON-GX-0300-55-22                     |
| C14            | 0.6-4.5 pF Variable Capacitor              |           |   |

**Figure 1. MRF182 Schematic**

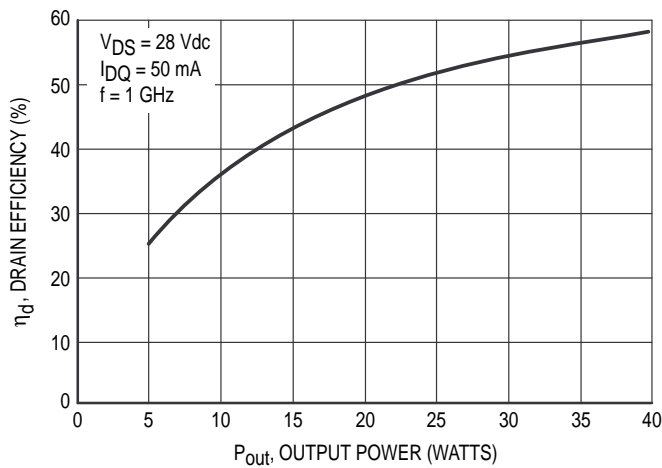
## TYPICAL CHARACTERISTICS



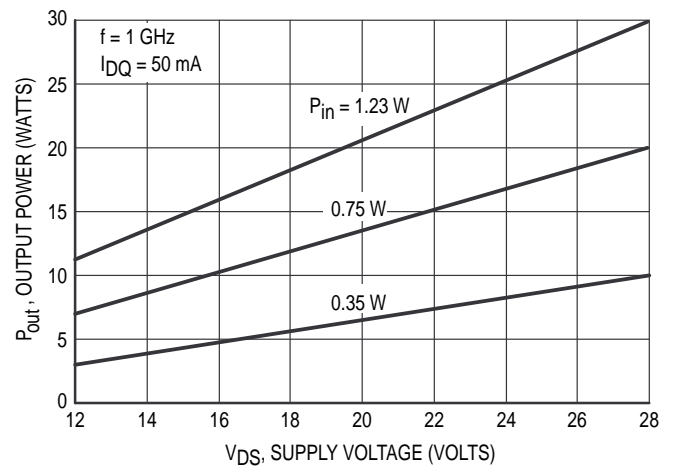
**Figure 2. Output Power versus Input Power at 1 GHz**



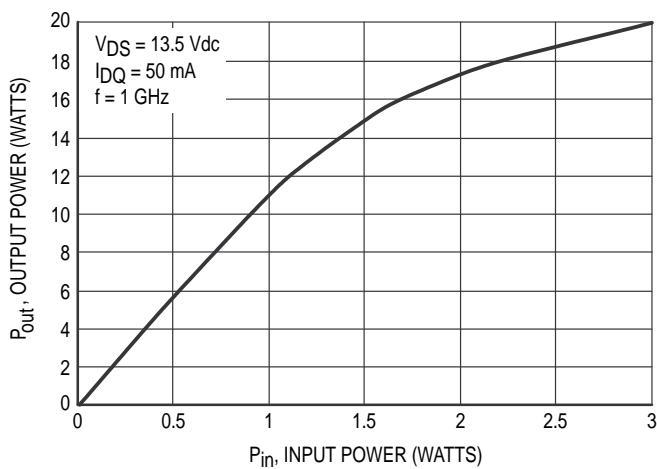
**Figure 3. Power Gain versus Output Power at 1 GHz**



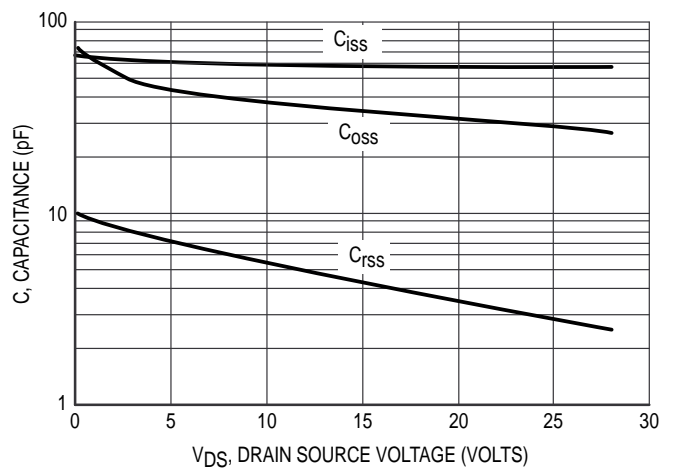
**Figure 4. Drain Efficiency versus Output Power at 1 GHz**



**Figure 5. Output Power versus Supply Voltage**



**Figure 6. Output Power versus Input Power**



**Figure 7. Capacitance versus Drain Source Voltage**

Table 1. Typical Common Source S-Parameters ( $V_{DS} = 13.5\text{ V}$ )

$I_D = 1.0\text{ A}$

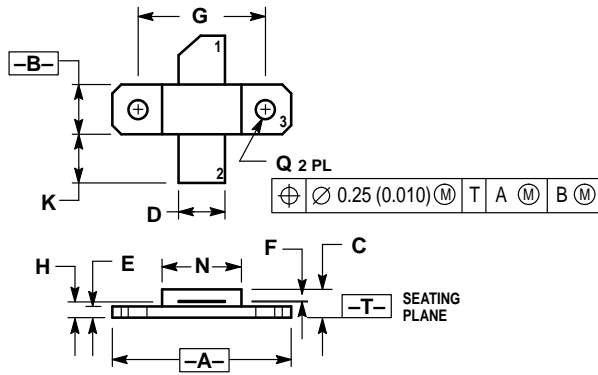
| f<br>MHz | S <sub>11</sub> |      | S <sub>21</sub> |     | S <sub>12</sub> |     | S <sub>22</sub> |      |
|----------|-----------------|------|-----------------|-----|-----------------|-----|-----------------|------|
|          | S <sub>11</sub> | ∠φ   | S <sub>21</sub> | ∠φ  | S <sub>12</sub> | ∠φ  | S <sub>22</sub> | ∠φ   |
| 20       | 0.933           | -131 | 40.81           | 112 | 0.021           | 22  | 0.664           | -138 |
| 30       | 0.922           | -148 | 29.31           | 104 | 0.022           | 15  | 0.700           | -151 |
| 40       | 0.892           | -156 | 22.19           | 99  | 0.022           | 10  | 0.718           | -158 |
| 50       | 0.877           | -161 | 17.91           | 95  | 0.023           | 7   | 0.725           | -162 |
| 60       | 0.870           | -164 | 14.67           | 92  | 0.023           | 4   | 0.732           | -164 |
| 70       | 0.863           | -166 | 12.57           | 90  | 0.022           | 2   | 0.735           | -166 |
| 80       | 0.860           | -168 | 11.00           | 89  | 0.022           | 1   | 0.738           | -168 |
| 90       | 0.860           | -169 | 9.79            | 87  | 0.022           | 0   | 0.740           | -169 |
| 100      | 0.859           | -170 | 8.79            | 86  | 0.022           | -1  | 0.741           | -169 |
| 150      | 0.859           | -173 | 5.78            | 80  | 0.022           | -7  | 0.750           | -172 |
| 200      | 0.862           | -175 | 4.29            | 74  | 0.022           | -11 | 0.759           | -172 |
| 250      | 0.868           | -176 | 3.38            | 69  | 0.021           | -14 | 0.770           | -173 |
| 300      | 0.880           | -177 | 2.77            | 65  | 0.020           | -17 | 0.780           | -173 |
| 350      | 0.877           | -177 | 2.32            | 61  | 0.020           | -19 | 0.793           | -173 |
| 400      | 0.882           | -178 | 1.98            | 56  | 0.019           | -22 | 0.808           | -173 |
| 450      | 0.892           | -179 | 1.72            | 52  | 0.018           | -24 | 0.816           | -173 |
| 500      | 0.899           | -180 | 1.51            | 49  | 0.017           | -26 | 0.828           | -174 |
| 550      | 0.898           | 180  | 1.33            | 45  | 0.017           | -27 | 0.838           | -174 |
| 600      | 0.907           | 179  | 1.19            | 42  | 0.016           | -28 | 0.849           | -175 |
| 650      | 0.914           | 179  | 1.07            | 38  | 0.015           | -28 | 0.859           | -175 |
| 700      | 0.916           | 177  | 0.95            | 35  | 0.014           | -25 | 0.867           | -176 |
| 750      | 0.920           | 177  | 0.88            | 34  | 0.015           | -26 | 0.874           | -176 |
| 800      | 0.924           | 176  | 0.80            | 30  | 0.015           | -27 | 0.884           | -177 |
| 850      | 0.929           | 175  | 0.74            | 27  | 0.015           | -33 | 0.891           | -178 |
| 900      | 0.929           | 174  | 0.68            | 25  | 0.013           | -38 | 0.897           | -178 |
| 950      | 0.933           | 173  | 0.63            | 22  | 0.011           | -39 | 0.905           | -179 |
| 1000     | 0.934           | 173  | 0.58            | 20  | 0.010           | -37 | 0.912           | -180 |
| 1050     | 0.930           | 172  | 0.54            | 17  | 0.009           | -33 | 0.918           | 180  |
| 1100     | 0.938           | 171  | 0.52            | 15  | 0.009           | -29 | 0.924           | 179  |
| 1150     | 0.933           | 170  | 0.48            | 13  | 0.008           | -28 | 0.929           | 178  |
| 1200     | 0.930           | 169  | 0.45            | 10  | 0.008           | -25 | 0.930           | 177  |
| 1250     | 0.939           | 168  | 0.42            | 8   | 0.007           | -23 | 0.935           | 177  |
| 1300     | 0.936           | 168  | 0.40            | 6   | 0.007           | -21 | 0.934           | 176  |
| 1350     | 0.933           | 167  | 0.38            | 4   | 0.006           | -19 | 0.936           | 175  |
| 1400     | 0.937           | 166  | 0.35            | 2   | 0.005           | -14 | 0.939           | 174  |
| 1450     | 0.937           | 165  | 0.33            | 0   | 0.005           | -5  | 0.934           | 174  |
| 1500     | 0.927           | 164  | 0.32            | -2  | 0.004           | 0   | 0.930           | 173  |

Table 2. Typical Common Emitter S-Parameters ( $V_{DS} = 28\text{ V}$ )

$I_D = 1.0\text{ A}$

| f<br>MHz | S <sub>11</sub> |      | S <sub>21</sub> |     | S <sub>12</sub> |     | S <sub>22</sub> |      |
|----------|-----------------|------|-----------------|-----|-----------------|-----|-----------------|------|
|          | S <sub>11</sub> | ∠φ   | S <sub>21</sub> | ∠φ  | S <sub>12</sub> | ∠φ  | S <sub>22</sub> | ∠φ   |
| 20       | 0.964           | -99  | 54.39           | 129 | 0.014           | 39  | 0.429           | -108 |
| 30       | 0.949           | -121 | 43.46           | 118 | 0.017           | 28  | 0.478           | -125 |
| 40       | 0.909           | -134 | 34.35           | 109 | 0.018           | 20  | 0.520           | -137 |
| 50       | 0.884           | -142 | 28.27           | 103 | 0.018           | 15  | 0.540           | -144 |
| 60       | 0.875           | -148 | 23.38           | 98  | 0.019           | 11  | 0.553           | -149 |
| 70       | 0.862           | -152 | 20.10           | 95  | 0.019           | 8   | 0.562           | -152 |
| 80       | 0.861           | -156 | 17.64           | 92  | 0.019           | 5   | 0.569           | -154 |
| 90       | 0.858           | -158 | 15.72           | 90  | 0.019           | 3   | 0.575           | -156 |
| 100      | 0.858           | -160 | 14.11           | 88  | 0.019           | 1   | 0.580           | -157 |
| 150      | 0.856           | -166 | 9.26            | 79  | 0.018           | -7  | 0.606           | -160 |
| 200      | 0.862           | -169 | 6.80            | 71  | 0.018           | -12 | 0.633           | -161 |
| 250      | 0.871           | -171 | 5.29            | 65  | 0.017           | -16 | 0.661           | -161 |
| 300      | 0.882           | -173 | 4.27            | 59  | 0.016           | -21 | 0.690           | -162 |
| 350      | 0.883           | -174 | 3.52            | 54  | 0.015           | -23 | 0.718           | -162 |
| 400      | 0.895           | -175 | 2.97            | 49  | 0.014           | -26 | 0.747           | -163 |
| 450      | 0.904           | -176 | 2.54            | 45  | 0.013           | -28 | 0.767           | -164 |
| 500      | 0.911           | -177 | 2.20            | 41  | 0.012           | -30 | 0.789           | -165 |
| 550      | 0.911           | -178 | 1.90            | 37  | 0.011           | -30 | 0.807           | -166 |
| 600      | 0.923           | -179 | 1.69            | 33  | 0.010           | -30 | 0.825           | -167 |
| 650      | 0.929           | -180 | 1.50            | 30  | 0.009           | -29 | 0.841           | -168 |
| 700      | 0.929           | 179  | 1.32            | 26  | 0.009           | -22 | 0.855           | -169 |
| 750      | 0.933           | 178  | 1.21            | 24  | 0.010           | -22 | 0.865           | -170 |
| 800      | 0.938           | 177  | 1.09            | 21  | 0.009           | -20 | 0.877           | -171 |
| 850      | 0.942           | 176  | 1.00            | 18  | 0.010           | -31 | 0.886           | -172 |
| 900      | 0.942           | 175  | 0.92            | 16  | 0.008           | -37 | 0.894           | -173 |
| 950      | 0.947           | 174  | 0.84            | 13  | 0.006           | -38 | 0.904           | -174 |
| 1000     | 0.946           | 173  | 0.77            | 11  | 0.005           | -28 | 0.912           | -175 |
| 1050     | 0.943           | 172  | 0.72            | 8   | 0.005           | -18 | 0.919           | -176 |
| 1100     | 0.948           | 171  | 0.67            | 6   | 0.004           | -9  | 0.926           | -177 |
| 1150     | 0.945           | 171  | 0.62            | 4   | 0.005           | 0   | 0.932           | -178 |
| 1200     | 0.939           | 170  | 0.59            | 1   | 0.004           | 3   | 0.934           | -179 |
| 1250     | 0.949           | 169  | 0.54            | 0   | 0.005           | 12  | 0.940           | -180 |
| 1300     | 0.947           | 168  | 0.51            | -3  | 0.005           | 18  | 0.939           | 180  |
| 1350     | 0.944           | 167  | 0.48            | -4  | 0.005           | 22  | 0.941           | 179  |
| 1400     | 0.945           | 166  | 0.44            | -7  | 0.004           | 34  | 0.943           | 178  |
| 1450     | 0.944           | 165  | 0.42            | -9  | 0.005           | 45  | 0.940           | 177  |
| 1500     | 0.933           | 164  | 0.40            | -10 | 0.005           | 55  | 0.936           | 176  |

## PACKAGE DIMENSIONS

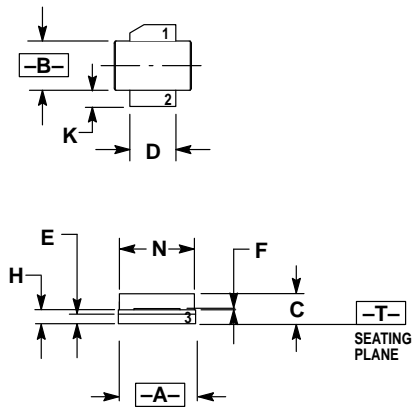


- NOTES:  
 1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.  
 2. CONTROLLING DIMENSION: INCH.

| DIM | INCHES    |       | MILLIMETERS |       |
|-----|-----------|-------|-------------|-------|
|     | MIN       | MAX   | MIN         | MAX   |
| A   | 0.790     | 0.810 | 20.07       | 20.57 |
| B   | 0.220     | 0.240 | 5.59        | 6.09  |
| C   | 0.125     | 0.175 | 3.18        | 4.45  |
| D   | 0.205     | 0.225 | 5.21        | 5.71  |
| E   | 0.050     | 0.070 | 1.27        | 1.77  |
| F   | 0.004     | 0.006 | 0.11        | 0.15  |
| G   | 0.562 BSC |       | 14.27 BSC   |       |
| H   | 0.070     | 0.090 | 1.78        | 2.29  |
| K   | 0.215     | 0.255 | 5.47        | 6.47  |
| N   | 0.350     | 0.370 | 8.89        | 9.39  |
| Q   | 0.120     | 0.140 | 3.05        | 3.55  |

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

**CASE 360B-01  
 ISSUE O  
 (MRF182)**




- NOTES:  
 1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.  
 2. CONTROLLING DIMENSION: INCH.

| DIM | INCHES |       | MILLIMETERS |      |
|-----|--------|-------|-------------|------|
|     | MIN    | MAX   | MIN         | MAX  |
| A   | 0.370  | 0.390 | 9.40        | 9.91 |
| B   | 0.220  | 0.240 | 5.59        | 6.09 |
| C   | 0.105  | 0.155 | 2.67        | 3.94 |
| D   | 0.205  | 0.225 | 5.21        | 5.71 |
| E   | 0.035  | 0.045 | 0.89        | 1.14 |
| F   | 0.004  | 0.006 | 0.11        | 0.15 |
| H   | 0.057  | 0.067 | 1.45        | 1.70 |
| K   | 0.085  | 0.115 | 2.16        | 2.92 |
| N   | 0.350  | 0.370 | 8.89        | 9.39 |

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

**CASE 360C-03  
 ISSUE B  
 (MRF182S)**

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