

# The MRFIC Line

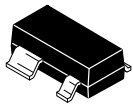
## General Purpose RF Cascode Amplifier

The MRFIC0916 is a cost-effective, high isolation cascode silicon monolithic amplifier in the industry standard SOT-143 surface mount package designed for general purpose RF applications. On chip bias circuitry sets the bias point while matching is accomplished off chip affording the maximum in application flexibility.

- Usable Frequency Range = 100 to 2500 MHz
- 18.5 dB typical gain at 850 MHz,  $V_{CC} = 2.7$  Volts
- 2.3 dBm typical Output Power at 1 dB Gain Compression at 850 MHz,  $V_{CC} = 2.7$  Volts
- 44 dB Typical Reverse Isolation at 850 MHz
- 5.6 mA Max Bias Current at  $V_{CC} = 2.7$  Volts
- 2.7 to 5 Volt Supply
- Available in Tape and Reel by Adding T1 Suffix to Part Number.  
T1 Suffix = 3,000 Units per 8 mm, 7 inch Reel.
- Device Marking = 16

**MRFIC0916**

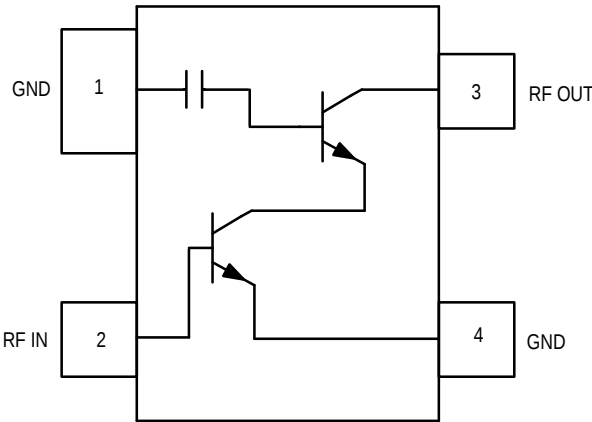
**SILICON GENERAL PURPOSE  
RF CASCODE AMPLIFIER**



**CASE 318A-05  
(SOT-143)**

**MAXIMUM RATINGS** ( $T_A = 25^\circ\text{C}$  unless otherwise noted)

| Rating                               | Symbol          | Limit        | Unit               |
|--------------------------------------|-----------------|--------------|--------------------|
| Supply Voltage                       | $V_{CC}$        | 6            | Vdc                |
| RF Input Power                       | $P_{RF}$        | 10           | dBm                |
| Power Dissipation                    | $P_{DIS}$       | 100          | mW                 |
| Supply Current                       | $I_{CC}$        | 20           | mA                 |
| Thermal Resistance, Junction to Case | $R_{\theta JC}$ | 250          | $^\circ\text{C/W}$ |
| Storage Temperature Range            | $T_{stg}$       | - 65 to +150 | $^\circ\text{C}$   |
| Operating Case Temperature           | $T_C$           | - 35 to +100 | $^\circ\text{C}$   |



**Pin Connections and Functional Block Diagram**

RECOMMENDED OPERATING RANGES

| Parameter      | Symbol   | Value       | Unit |
|----------------|----------|-------------|------|
| RF Frequency   | $f_{RF}$ | 100 to 2500 | MHz  |
| Supply Voltage | $V_{CC}$ | 2.7 to 5    | Vdc  |

ELECTRICAL CHARACTERISTICS ( $V_{CC} = 2.7\text{ V}$ ,  $T_A = 25^\circ\text{C}$ ,  $f_{RF} = 850\text{ MHz}$ , Tested in Circuit Shown in Figure 1)

| Characteristic                       | Min  | Typ  | Max  | Unit |
|--------------------------------------|------|------|------|------|
| Small Signal Gain                    | 16.5 | 18.5 | 20.5 | dB   |
| Noise Figure                         | —    | 1.9  | —    | dB   |
| Power Output at 1dB Gain Compression | 0    | 2.3  | —    | dBm  |
| Output 3rd Order Intercept Point     | —    | 11   | —    | dBm  |
| Reverse Isolation                    | —    | 44   | —    | dB   |
| Supply Current                       | 3.8  | 4.7  | 5.6  | mA   |

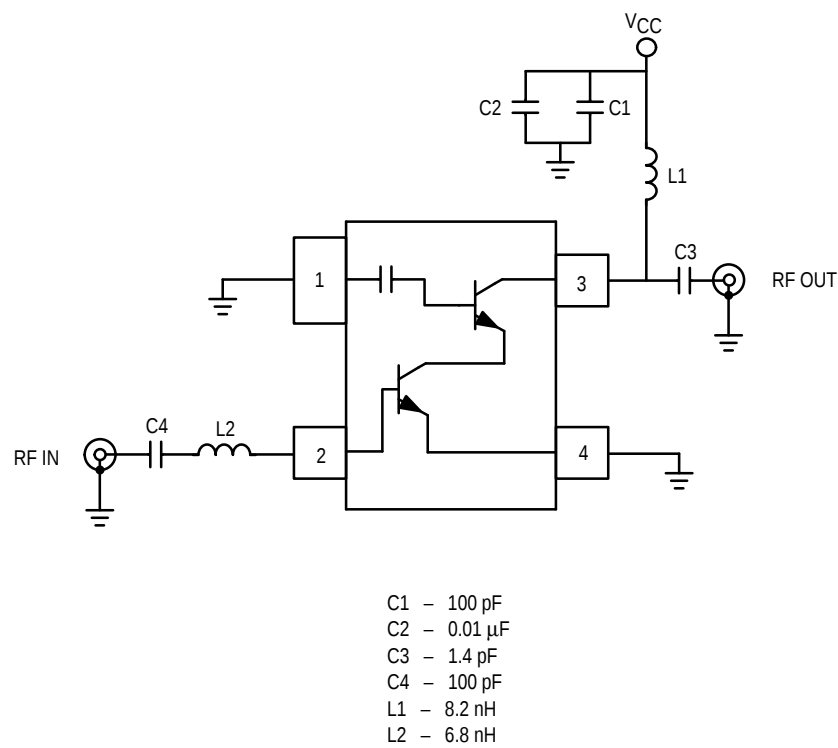


Figure 1. 850 MHz Applications Circuit Configuration

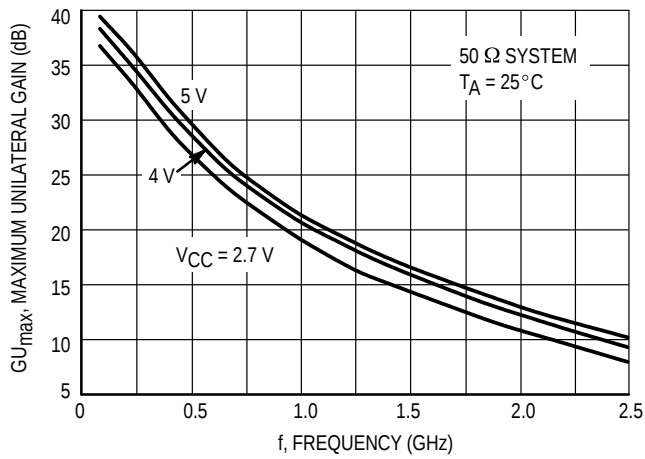


Figure 2.  $GU_{max}$  versus Frequency

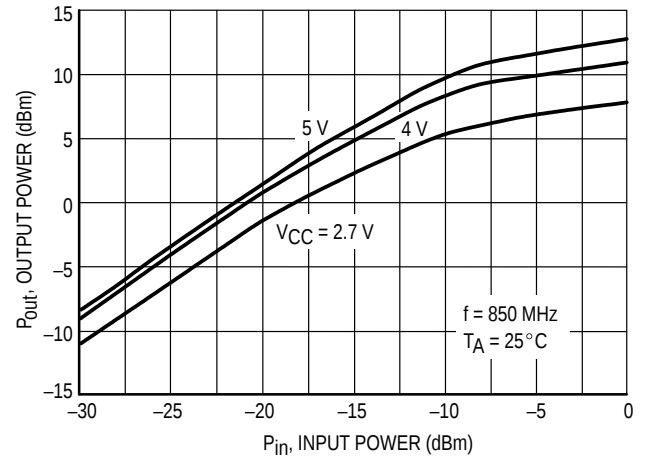


Figure 3. Output Power versus Input Power

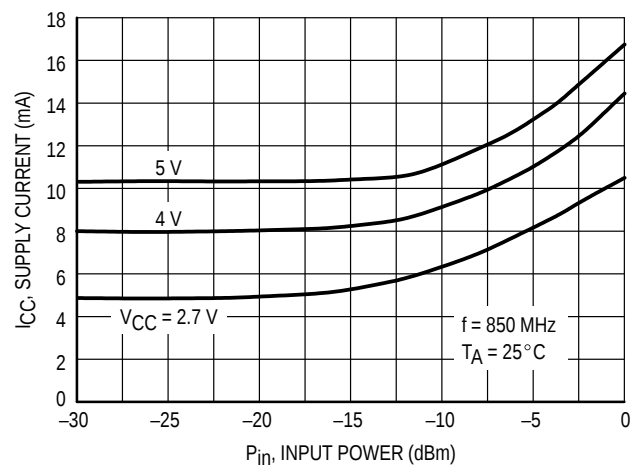


Figure 4. Supply Current versus Input Power

| 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    |
| 100        | 0.806           | -17.01  | 12.03           | 162.32 | 0.001           | -0.14  | 0.956           | -4.69  |
| 200        | 0.765           | -33.28  | 11.18           | 145.74 | 0.001           | 71.58  | 0.948           | -8.69  |
| 300        | 0.713           | -47.99  | 10.18           | 130.99 | 0.002           | 69.67  | 0.945           | -13.23 |
| 400        | 0.652           | -61.35  | 9.06            | 118.01 | 0.003           | 64.61  | 0.930           | -17.35 |
| 500        | 0.574           | -70.94  | 8.06            | 106.50 | 0.003           | 62.93  | 0.904           | -20.85 |
| 600        | 0.533           | -81.00  | 7.09            | 96.50  | 0.003           | 61.94  | 0.891           | -24.71 |
| 700        | 0.493           | -89.33  | 6.36            | 87.60  | 0.003           | 63.16  | 0.875           | -28.18 |
| 800        | 0.469           | -97.65  | 5.62            | 79.57  | 0.003           | 66.33  | 0.857           | -31.89 |
| 900        | 0.432           | -103.64 | 5.16            | 72.38  | 0.002           | 80.79  | 0.845           | -35.21 |
| 1000       | 0.409           | -110.68 | 4.70            | 65.39  | 0.002           | 100.33 | 0.831           | -38.86 |
| 1100       | 0.396           | -116.17 | 4.29            | 58.75  | 0.002           | 127.72 | 0.815           | -42.52 |
| 1200       | 0.383           | -122.20 | 3.91            | 52.55  | 0.003           | 152.57 | 0.799           | -45.77 |
| 1300       | 0.373           | -126.00 | 3.66            | 46.34  | 0.004           | 164.39 | 0.789           | -49.49 |
| 1400       | 0.369           | -131.29 | 3.38            | 40.61  | 0.006           | 169.63 | 0.776           | -53.23 |
| 1500       | 0.366           | -134.46 | 3.14            | 35.29  | 0.008           | 172.81 | 0.762           | -56.86 |
| 1600       | 0.366           | -140.07 | 2.93            | 29.63  | 0.011           | 172.47 | 0.751           | -60.74 |
| 1700       | 0.364           | -143.07 | 2.75            | 23.86  | 0.013           | 172.79 | 0.738           | -64.66 |
| 1800       | 0.368           | -147.48 | 2.58            | 18.42  | 0.016           | 171.54 | 0.727           | -68.29 |
| 1900       | 0.377           | -148.91 | 2.42            | 13.15  | 0.020           | 170.15 | 0.719           | -72.29 |
| 2000       | 0.381           | -153.42 | 2.27            | 7.58   | 0.023           | 167.89 | 0.707           | -76.58 |
| 2100       | 0.394           | -155.23 | 2.15            | 2.46   | 0.027           | 165.86 | 0.695           | -80.50 |
| 2200       | 0.396           | -158.91 | 2.03            | -3.00  | 0.032           | 163.46 | 0.685           | -84.85 |
| 2300       | 0.416           | -160.43 | 1.90            | -8.32  | 0.037           | 161.00 | 0.672           | -88.93 |
| 2400       | 0.424           | -162.98 | 1.81            | -13.30 | 0.042           | 158.00 | 0.662           | -93.38 |
| 2500       | 0.434           | -166.35 | 1.68            | -18.45 | 0.047           | 155.58 | 0.654           | -97.89 |

**Table 1. Scattering Parameters (V<sub>CC</sub> = 2.7 V, 50 Ω System)**

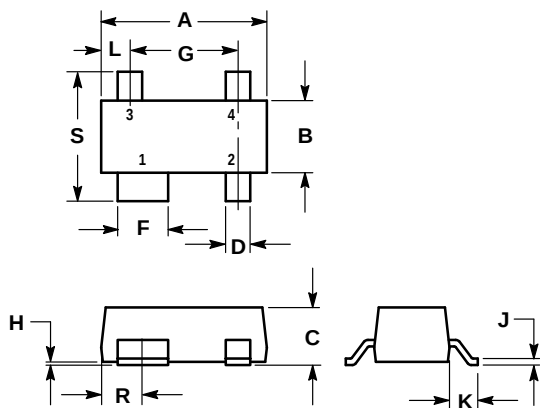
| f<br>(MHz) | S <sub>11</sub> |         | S <sub>21</sub> |        | S <sub>12</sub> |        | S <sub>22</sub> |        |
|------------|-----------------|---------|-----------------|--------|-----------------|--------|-----------------|--------|
|            | S <sub>11</sub> | ∠ φ     | S <sub>21</sub> | ∠ φ    | S <sub>12</sub> | ∠ φ    | S <sub>22</sub> | ∠ φ    |
| 100        | 0.744           | -17.43  | 16.979          | 160.38 | 0.001           | -2.89  | 0.955           | -4.40  |
| 200        | 0.691           | -33.58  | 15.442          | 142.46 | 0.001           | 83.36  | 0.950           | -8.33  |
| 300        | 0.627           | -47.53  | 13.633          | 127.28 | 0.002           | 76.39  | 0.946           | -12.79 |
| 400        | 0.558           | -59.50  | 11.851          | 114.52 | 0.002           | 70.12  | 0.931           | -16.75 |
| 500        | 0.482           | -67.02  | 10.284          | 103.51 | 0.002           | 67.02  | 0.907           | -20.11 |
| 600        | 0.440           | -75.50  | 8.957           | 94.12  | 0.002           | 66.00  | 0.895           | -23.85 |
| 700        | 0.401           | -81.87  | 7.930           | 85.95  | 0.002           | 68.71  | 0.880           | -27.22 |
| 800        | 0.377           | -88.89  | 7.003           | 78.57  | 0.002           | 73.50  | 0.863           | -30.83 |
| 900        | 0.348           | -93.11  | 6.348           | 71.96  | 0.002           | 90.55  | 0.852           | -34.06 |
| 1000       | 0.328           | -98.88  | 5.747           | 65.59  | 0.002           | 113.74 | 0.838           | -37.62 |
| 1100       | 0.317           | -103.27 | 5.223           | 59.57  | 0.002           | 146.45 | 0.822           | -41.18 |
| 1200       | 0.306           | -108.54 | 4.765           | 53.98  | 0.003           | 165.49 | 0.808           | -44.34 |
| 1300       | 0.301           | -111.30 | 4.425           | 48.39  | 0.004           | 175.51 | 0.798           | -47.95 |
| 1400       | 0.297           | -116.30 | 4.082           | 43.18  | 0.006           | 177.46 | 0.785           | -51.59 |
| 1500       | 0.298           | -118.89 | 3.790           | 38.32  | 0.008           | 179.45 | 0.771           | -55.11 |
| 1600       | 0.298           | -124.58 | 3.531           | 33.13  | 0.011           | 178.69 | 0.760           | -58.88 |
| 1700       | 0.301           | -127.19 | 3.300           | 28.02  | 0.014           | 178.02 | 0.748           | -62.66 |
| 1800       | 0.305           | -131.73 | 3.093           | 23.10  | 0.016           | 176.25 | 0.737           | -66.16 |
| 1900       | 0.319           | -133.16 | 2.901           | 18.34  | 0.020           | 174.44 | 0.729           | -70.03 |
| 2000       | 0.324           | -137.94 | 2.724           | 13.33  | 0.023           | 172.03 | 0.717           | -74.16 |
| 2100       | 0.339           | -140.09 | 2.575           | 8.67   | 0.027           | 169.82 | 0.706           | -77.92 |
| 2200       | 0.342           | -143.98 | 2.434           | 3.79   | 0.032           | 166.99 | 0.696           | -82.07 |
| 2300       | 0.367           | -146.00 | 2.278           | -0.98  | 0.036           | 164.37 | 0.684           | -86.04 |
| 2400       | 0.375           | -148.75 | 2.166           | -5.56  | 0.042           | 161.35 | 0.674           | -90.25 |
| 2500       | 0.387           | -152.75 | 2.020           | -10.12 | 0.046           | 158.69 | 0.666           | -94.64 |

**Table 2. Scattering Parameters (V<sub>CC</sub> = 4 V, 50 Ω System)**

| 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    |
| 100        | 0.707           | -17.56  | 20.04           | 159.03 | 0.001           | -7.95   | 0.954           | -4.25  |
| 200        | 0.648           | -33.40  | 17.93           | 140.29 | 0.001           | 86.24   | 0.950           | -8.15  |
| 300        | 0.579           | -46.60  | 15.53           | 124.94 | 0.002           | 78.79   | 0.946           | -12.54 |
| 400        | 0.509           | -57.44  | 13.31           | 112.38 | 0.002           | 72.27   | 0.931           | -16.42 |
| 500        | 0.438           | -63.51  | 11.40           | 101.70 | 0.002           | 69.34   | 0.908           | -19.68 |
| 600        | 0.397           | -70.90  | 9.87            | 92.70  | 0.002           | 69.55   | 0.896           | -23.35 |
| 700        | 0.363           | -76.05  | 8.69            | 84.92  | 0.002           | 71.59   | 0.882           | -26.64 |
| 800        | 0.340           | -82.18  | 7.67            | 77.89  | 0.002           | 79.44   | 0.865           | -30.20 |
| 900        | 0.316           | -85.44  | 6.91            | 71.60  | 0.002           | 95.59   | 0.855           | -33.36 |
| 1000       | 0.298           | -90.52  | 6.24            | 65.56  | 0.001           | 121.55  | 0.841           | -36.86 |
| 1100       | 0.290           | -94.44  | 5.67            | 59.82  | 0.002           | 152.13  | 0.826           | -40.37 |
| 1200       | 0.280           | -99.17  | 5.17            | 54.53  | 0.003           | 169.84  | 0.811           | -43.48 |
| 1300       | 0.277           | -101.65 | 4.79            | 49.25  | 0.005           | 177.80  | 0.802           | -47.02 |
| 1400       | 0.274           | -106.49 | 4.42            | 44.27  | 0.006           | -179.84 | 0.790           | -50.59 |
| 1500       | 0.278           | -109.07 | 4.10            | 39.65  | 0.008           | -179.19 | 0.776           | -54.04 |
| 1600       | 0.276           | -114.88 | 3.82            | 34.68  | 0.011           | -179.68 | 0.765           | -57.73 |
| 1700       | 0.281           | -117.46 | 3.56            | 29.88  | 0.013           | 179.47  | 0.753           | -61.43 |
| 1800       | 0.285           | -122.11 | 3.34            | 25.21  | 0.016           | 177.73  | 0.742           | -64.85 |
| 1900       | 0.300           | -123.94 | 3.14            | 20.70  | 0.019           | 175.80  | 0.734           | -68.66 |
| 2000       | 0.305           | -128.93 | 2.95            | 15.91  | 0.023           | 173.47  | 0.723           | -72.71 |
| 2100       | 0.322           | -131.48 | 2.78            | 11.50  | 0.027           | 171.04  | 0.712           | -76.37 |
| 2200       | 0.324           | -135.50 | 2.63            | 6.84   | 0.031           | 168.25  | 0.703           | -80.42 |
| 2300       | 0.351           | -138.04 | 2.47            | 2.33   | 0.036           | 165.47  | 0.691           | -84.31 |
| 2400       | 0.358           | -140.88 | 2.34            | -2.05  | 0.041           | 162.71  | 0.681           | -88.42 |
| 2500       | 0.371           | -145.28 | 2.19            | -6.40  | 0.046           | 160.19  | 0.674           | -92.74 |

**Table 3. Scattering Parameters (V<sub>CC</sub> = 5 V, 50 Ω System)**

PACKAGE DIMENSIONS



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

| DIM | MILLIMETERS |      | INCHES |       |
|-----|-------------|------|--------|-------|
|     | MIN         | MAX  | MIN    | MAX   |
| A   | 2.80        | 3.04 | 0.110  | 0.120 |
| B   | 1.20        | 1.39 | 0.047  | 0.055 |
| C   | 0.84        | 1.14 | 0.033  | 0.045 |
| D   | 0.39        | 0.50 | 0.015  | 0.020 |
| F   | 0.79        | 0.93 | 0.031  | 0.037 |
| G   | 1.78        | 2.03 | 0.070  | 0.080 |
| H   | 0.013       | 0.10 | 0.0005 | 0.004 |
| J   | 0.08        | 0.15 | 0.003  | 0.006 |
| K   | 0.46        | 0.60 | 0.018  | 0.024 |
| L   | 0.445       | 0.60 | 0.0175 | 0.024 |
| R   | 0.72        | 0.83 | 0.028  | 0.033 |
| S   | 2.11        | 2.48 | 0.083  | 0.098 |

CASE 318A-05  
ISSUE R

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