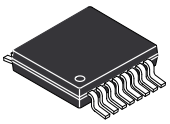
*Advance Information*

## The MRFIC Line

# 1.9 GHz GaAs Downconverter

**MRFIC1814**

**1.8 GHz LOW NOISE AMPLIFIER AND DOWNMIXER**

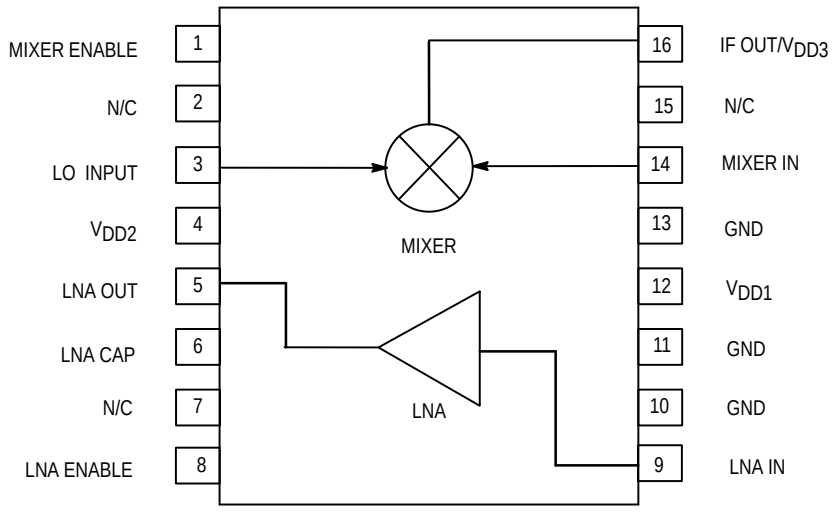


**CASE 948C–03**
**(TSSOP–16)**

Designed primarily for use in wireless Personal Communication Systems (PCS) applications such as Digital European Cordless Telephone (DECT), Japan's Personal Handy System (PHS), and the emerging North American systems. The MRFIC1814 includes a low noise amplifier and downmixer in a low-cost TSSOP–16 package. The integrated circuit requires minimal off-chip matching while allowing for the maximum in flexibility and efficiency. The mixer is optimized for low–side injection and offers reasonable intercept point as well as high efficiency with 9 dB of conversion gain. Image filtering is implemented off-chip to allow maximum flexibility. CMOS compatible ENABLE pins allow standby operation where the current drain is less than 0.1 mA.

Together with the rest of the MRFIC180X series, this GaAs IC family offers the complete transmit and receive functions, less LO and filters, needed for a typical 1.8 GHz cordless telephone.

- Usable Frequency Range = 1.8 to 2.0 GHz
- 17 dB Typ Gain, 2.5 dB Typ Noise Figure LNA
- 8 dB Typ Gain, 10 dB Typ Noise Figure Mixer
- –5.5 dBm Typ Mixer Input Intercept Point
- Simple LO/IF Off-chip Matching for Maximum Flexibility
- Low Power Consumption = 39 mW (Typ)
- Single Bias Supply = 2.7 to 4.5 Volts
- Low LO Power Requirement = – 5 dBm (Typ)
- Low Cost Surface Mount Plastic Package
- Order MRFIC1814R2 for Tape and Reel.
  R2 Suffix = 2,500 Units per 16 mm, 13 inch Reel.
- Device Marking = M1814




**Pin Connections and Functional Block Diagram**

**MAXIMUM RATINGS** ($T_A$ = 25°C unless otherwise noted)

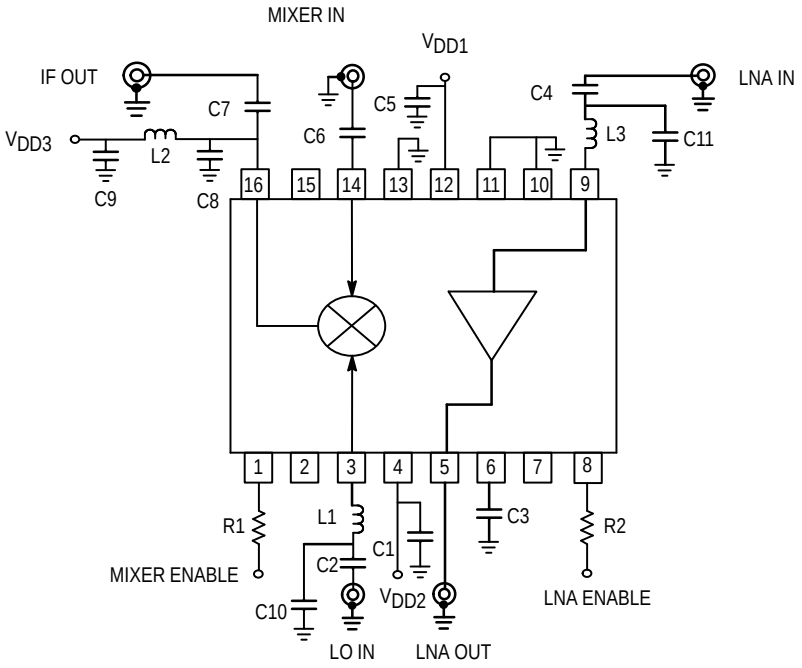
| Rating | Symbol | Limit | Unit |
|---|---|---|---|
| Supply Voltage | $V_{DD}$ | 5.5 | Vdc |
| LNA Input Power | $LNA_{in}$ | 10 | dBm |
| LO Input Power | $P_{LO}$ | 10 | dBm |
| Enable Voltage | ENABLE | 5.5 | Vdc |
| Storage Temperature Range | $T_{stg}$ | – 65 to +150 | °C |
| Operating Ambient Temperature | $T_A$ | – 30 to +85 | °C |

**RECOMMENDED OPERATING RANGES**

| Parameter | Symbol | Value | Unit |
|---|---|---|---|
| RF Input Frequency | $f_{RF}$ | 1.8 to 2.0 | GHz |
| Mixer LO Frequency | $f_{LO}$ | 1.5 to 1.8 | GHz |
| IF Output Frequency | $f_{IF}$ | 70 to 300 | MHz |
| Supply Voltage | $V_{DD}$ | 2.7 to 4.5 | Vdc |
| Enable Voltage, ON | MIXER, LNA ENABLE | 2.7 to $V_{DD}$ | Vdc |
| Enable Voltage, OFF | MIXER, LNA ENABLE | 0 to 0.2 | Vdc |

**ELECTRICAL CHARACTERISTICS** ($V_{DD}$ = 3 V, $T_A$ = 25°C, LO = 1.65 GHz @ – 5 dBm, RF = 1.9 GHz @ –30 dBm, MIXER & LNA ENABLE = 3 V)

| Characteristic | Min | Typ | Max | Unit |
|---|---|---|---|---|
| LNA Gain (LNA ENABLE = 3 V) | 14 | 17 | — | dB |
| LNA Gain (LNA ENABLE = 0 V) | — | –19 | — | dB |
| LNA Noise Figure | — | 2.5 | — | dB |
| LNA Input 3rd Order Intercept | — | –7 | — | dBm |
| LNA Output 1 dB Gain Compression Point | –6 | –3 | — | dBm |
| Mixer Conversion Gain (into 50 Ω) | 5 | 8 | — | dB |
| Mixer Noise Figure | — | 10 | — | dB |
| Mixer Input 3rd Order Intercept | — | –5 | — | dBm |
| Mixer Output 1 dB Gain Compression Point | –8.5 | –5.5 | — | dBm |
| Total Supply Current (ENABLE VOLTAGES = 3.0 V, LO off) | — | 10 | 17 | mA |
| Total Supply Current (ENABLE VOLTAGES = 3.0 V, LO on) | — | 13 | — | mA |
| Standby Mode Current (ENABLE VOLTAGES = 0 V, LO off) | — | 0.05 | 0.25 | mA |




| | | | |
|---|---|---|---|
| C1, C2, C4 | 15 pF | C11 | 1.6 pF |
| C3 | 3 pF | L1 | 4.7 nH |
| C5 | 30 pF | L2 | 10 nH |
| C6, C8 | 10 pF | L3 | 3.9 nH |
| C7 | 12 pF | R1, R2 | 10 kΩ |
| C9 | 560 pF | BOARD MATERIAL GLASS/EPOXY, $\varepsilon_r$ = 4.45, | |
| C10 | 3.6 pF | 0.018 INCH DIELECTRIC THICKNESS | |

**Figure 1. Applications Circuit Configuration for 250 MHz IF**

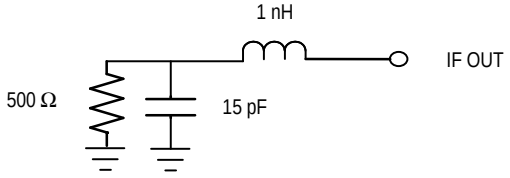
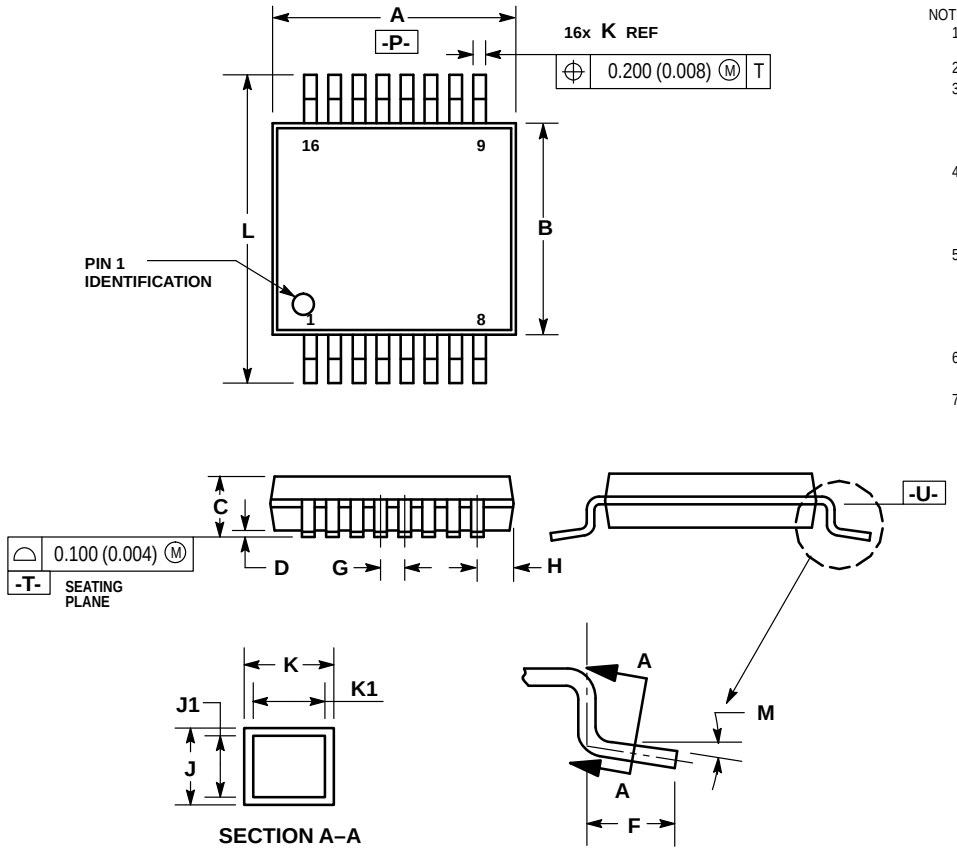



**Figure 2. Equivalent IF Output Circuit**

## PACKAGE DIMENSIONS




NOTES:
1. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
2. CONTROLLING DIMENSION: MILLIMETER.
3. DIMENSION A DOES NOT INCLUDE MOLD FLASH, PROTRUSIONS OR GATE BURRS. MOLD FLASH OR GATE BURRS SHALL NOT EXCEED 0.15 (0.006) PER SIDE.
4. DIMENSION B DOES NOT INCLUDE INTERLEAD FLASH OR PROTRUSION. INTERLEAD FLASH OR PROTRUSION SHALL NOT EXCEED 0.25 (0.010) PER SIDE.
5. DIMENSION K DOES NOT INCLUDE DAMBAR PROTRUSION. ALLOWABLE DAMBAR PROTRUSION SHALL BE 0.08 (0.003) TOTAL EXCESS OF THE K DIMENSION AT MAXIMUM MATERIAL CONDITION.
6. TERMINAL NUMBERS ARE SHOWN FOR REFERENCE ONLY.
7. DIMENSIONS A AND B ARE TO BE DETERMINED AT DATUM PLANE –U–.

| | MILLIMETERS | | INCHES | |
|---|---|---|---|---|
| DIM | MIN | MAX | MIN | MAX |
| A | —— | 5.10 | —— | 0.200 |
| B | 4.30 | 4.50 | 0.169 | 0.177 |
| C | —— | 1.20 | —— | 0047 |
| D | 0.05 | 0.25 | 0.002 | 0.010 |
| F | 0.45 | 0.55 | 0.018 | 0.022 |
| G | 0.65 BSC | | 0.026 BSC | |
| H | 0.22 | 0.23 | 0.009 | 0.010 |
| J | 0.09 | 0.24 | 0.004 | 0.009 |
| J1 | 0.09 | 0.18 | 0.004 | 0.007 |
| K | 0.16 | 0.32 | 0.006 | 0.013 |
| K1 | 0.16 | 0.26 | 0.006 | 0.010 |
| L | 6.30 | 6.50 | 0.248 | 0.256 |
| M | 0° | 10° | 0° | 10° |

**CASE 948C–03**
**ISSUE B**

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