

2.4GHz - 2.5GHz Low Noise Amplifier



The Intersil 2.4GHz PRISM™ chip set is a highly integrated five-chip solution for RF modems employing Direct Sequence Spread Spectrum (DSSS) signaling. The HFA3424 2.4GHz -

2.5GHz low noise amplifier is an optional chip that can be added to the five chips in the PRISM™ chip set. The HFA3424 offers increased sensitivity for systems targeting 802.11 specifications. (See Figure 1, the Typical Application Diagram.)

The Intersil HFA3424 PRISM™ is a high performance low noise amplifier in a low cost SOIC 8 lead surface mount plastic package. The HFA3424 employs a fully monolithic design which eliminates the need for external tuning networks. It can be biased using 3V or 5V supplies and has an option for biasing at higher currents for increased dynamic range.

The HFA3424 is ideally suited for use where low noise figure, high gain, high dynamic range and low power consumption required. Typical applications include receiver front ends in the Wireless Local Area Network (WLAN) and wireless data collection markets in the 2.4GHz Industrial, Scientific and Medical (ISM) band, as well as standard gain blocks, buffer amps, driver amps and IF amps in both fixed and portable systems.

Features

- Low Noise Figure 1.90dB
- High Gain 14dB
- Low Power Consumption 3V to 5V, 5mA
- High Dynamic Range
- DC Decoupled RF Input and Output
- No External RF Tuning Elements Necessary
- Low Cost SOIC 8 Lead Plastic Package

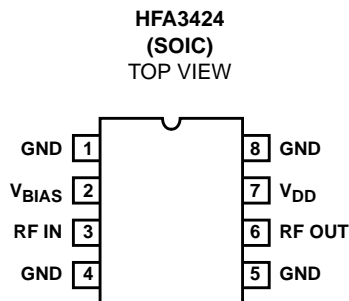
Applications

- Systems Targeting IEEE 802.11 Standard
- TDD Quadrature-Modulated Communication Systems
- Wireless Local Area Networks
- PCMCIA Wireless Transceivers
- ISM Systems
- TDMA Packet Protocol Radios
- PCS/Wireless PBX
- Wireless Local Loop

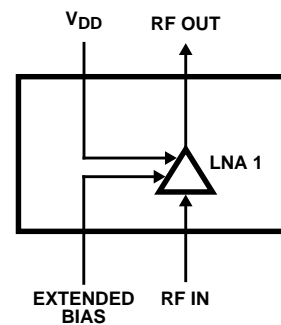
Ordering Information

| PART NUMBER | TEMP. RANGE (°C) | PACKAGE | PKG. NO. |
|-------------|------------------|---------------|----------|
| HFA3424IB | -40 to 85 | 8 Ld SOIC | M8.15 |
| HFA3424IB96 | -40 to 85 | Tape and Reel | |

Pinout



Functional Block Diagram



Typical Application Diagram

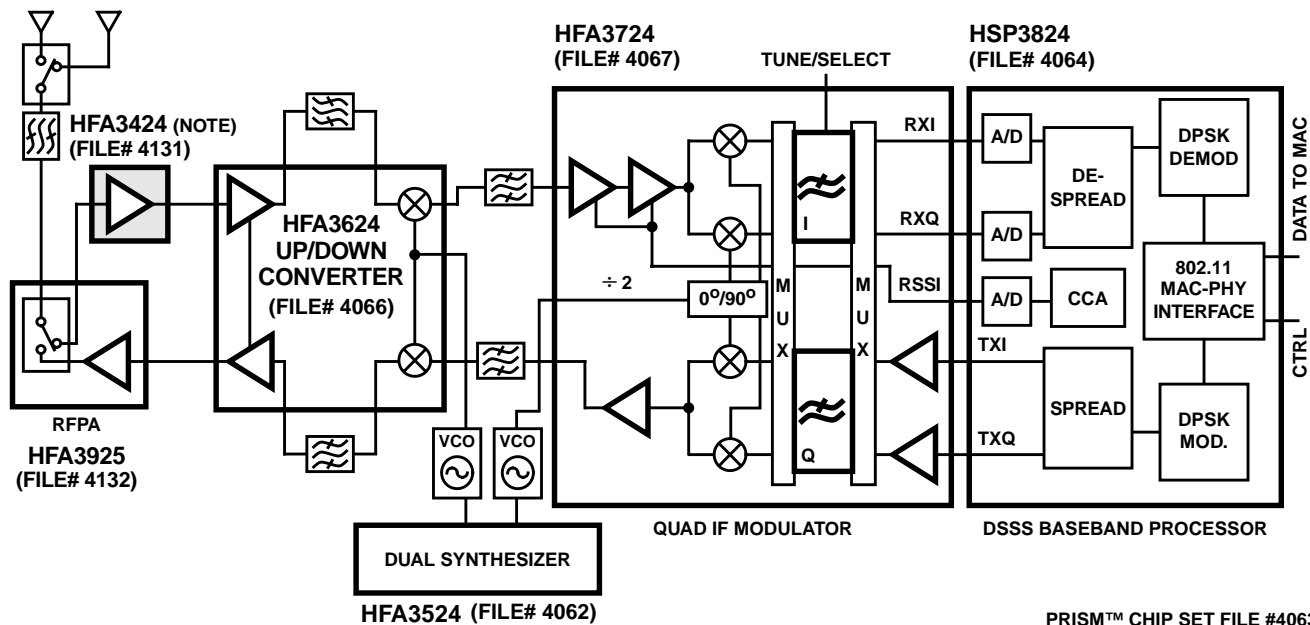


FIGURE 1. TYPICAL TRANSCEIVER AMPLIFIER APPLICATIONS CIRCUIT USING THE HFA3424

NOTE: Required for systems targeting 802.11 specifications.

For additional information on the PRISM™ chip set, call (407) 724-7800 to access Intersil' AnswerFAX system. When prompted, key in the four-digit document number (File #) of the datasheets you wish to receive.

The four-digit file numbers are shown in Typical Application Diagram, and correspond to the appropriate circuit.

Absolute Maximum Ratings

Supply Voltage, V_{DD} +10V_{DC}
 Input Power +17dBm
 Supply Current (Note 1) 30mA

Thermal Information

Thermal Resistance (Typical, Note 2) θ_{JA} (°C/W) 165
 SOIC Package
 Maximum Storage Temperature Range -65°C to 150°C
 Maximum Lead Temperature (Soldering 10s) 300°C
 (SOIC - Lead Tips Only)

Operating Conditions

Temperature Range -40°C to 85°C

CAUTION: Stresses above those listed in "Absolute Maximum Ratings" may cause permanent damage to the device. This is a stress only rating and operation of the device at these or any other conditions above those indicated in the operational sections of this specification is not implied.

NOTES:

1. Only if Pin 2 is used to increase current.
2. θ_{JA} is measured with the component mounted on an evaluation PC board in free air.

Electrical Specifications $T_A = 25^\circ\text{C}$, $Z_0 = 50\Omega$, $V_{DD} = +5\text{V}$, $P_{IN} = -30\text{dBm}$, $f = 2.45\text{GHz}$, $V_{BIAS} = \text{Open Circuit}$
 Unless Otherwise Specified

| PARAMETER | MIN | TYP | MAX | UNITS |
|--|-----|-------|------|-------|
| LNA Input Frequency Range | 2.4 | - | 2.5 | GHz |
| Gain | 12 | 14 | 16 | dB |
| Noise Figure | - | 1.90 | 2.30 | dB |
| Input VSWR | - | 1.5:1 | - | |
| Output VSWR | - | 1.5:1 | - | |
| Input Return Loss | - | -14.0 | - | dB |
| Output Return Loss | - | -14.0 | - | dB |
| Output 1dB Compression | - | 3 | - | dBm |
| Input IP ₃ | - | 1 | - | dBm |
| Reverse Isolation | - | 30 | - | dB |
| Supply Current at $V_{DD} = 5\text{V}$ | 3 | 5 | 7 | mA |
| Supply Range | 2.7 | - | 5.5 | V |

Typical Performance Curves

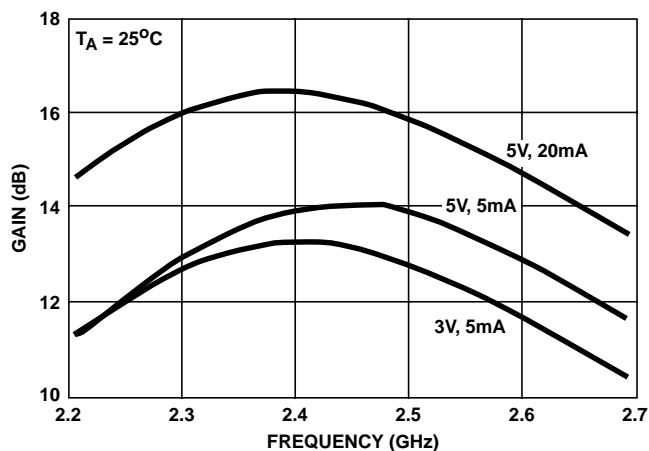


FIGURE 2. GAIN vs FREQUENCY

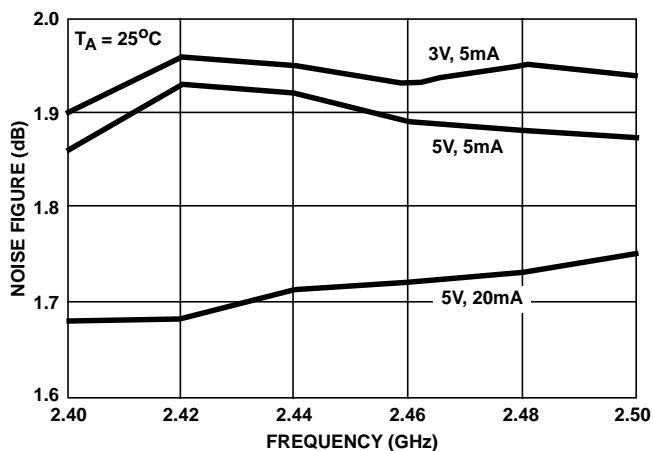


FIGURE 3. NOISE FIGURE vs FREQUENCY

Typical Performance Curves (Continued)

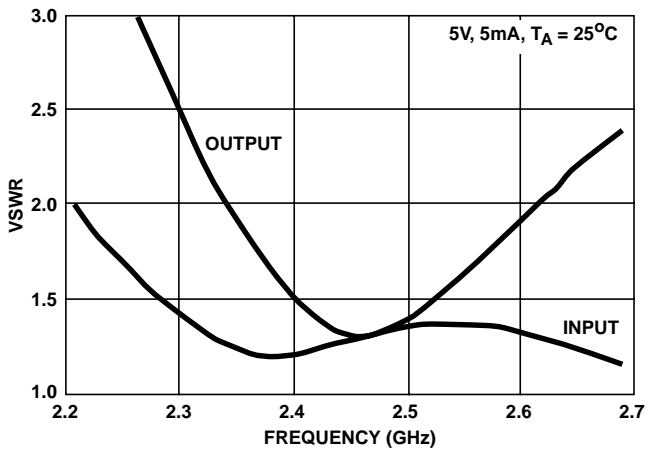


FIGURE 4. VSWR vs FREQUENCY

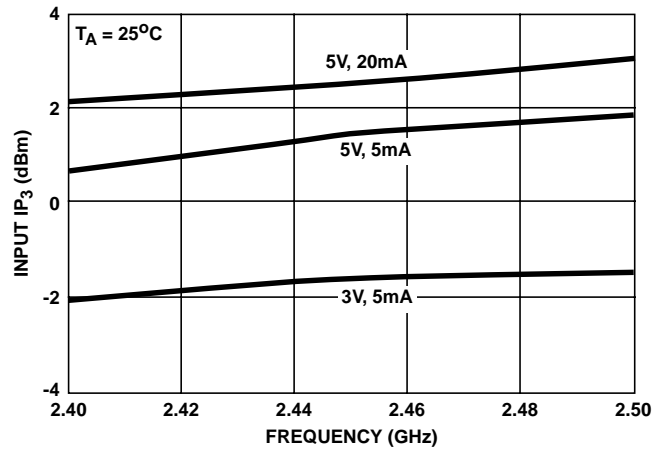


FIGURE 5. INPUT IP_3 vs FREQUENCY

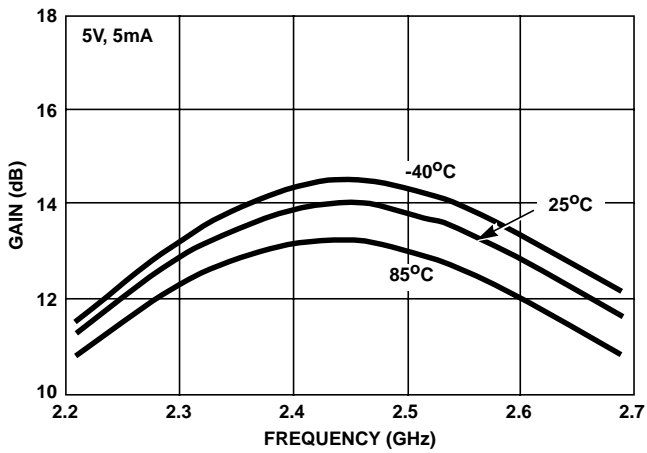


FIGURE 6. GAIN vs FREQUENCY

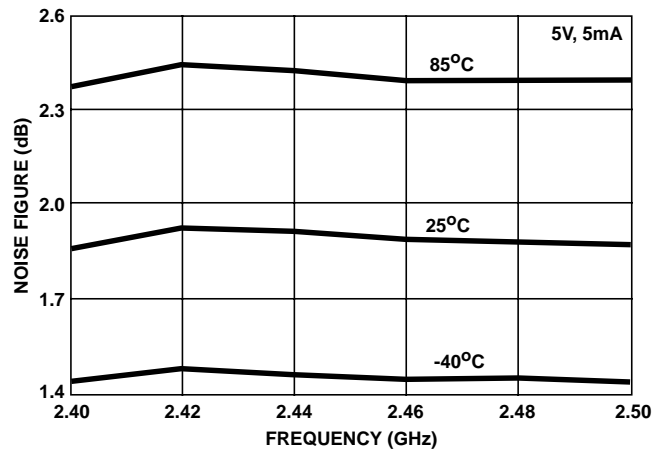


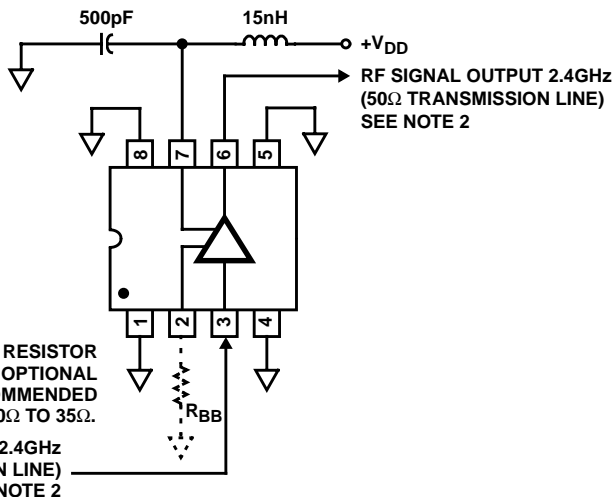
FIGURE 7. NOISE FIGURE vs FREQUENCY

Typical Application Circuit

| V _{BIAS} (PIN 2) | |
|---------------------------|----------------------|
| NORMAL BIAS | EXTENDED BIAS |
| Open | 30Ω To 35Ω To Ground |

PIN 2 ALLOWS FOR AN EXTERNAL RESISTOR R_{BB} TO BE USED TO GROUND FOR AN OPTIONAL 20mA CURRENT OPERATION. RECOMMENDED VALUES FOR THE CHIP RESISTOR ARE 30Ω TO 35Ω.

RF SIGNAL INPUT 2.4GHz (50Ω TRANSMISSION LINE) SEE NOTE 2



NOTE:

- 3. No DC blocking capacitor required on LNA input or output transmission lines.

FIGURE 8. REFERENCE APPLICATION/TEST DESIGN SETUP SCHEMATIC: LOW NOISE AMPLIFIER

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