# RF2364

## 3V PCS LOW NOISE AMPLIFIER

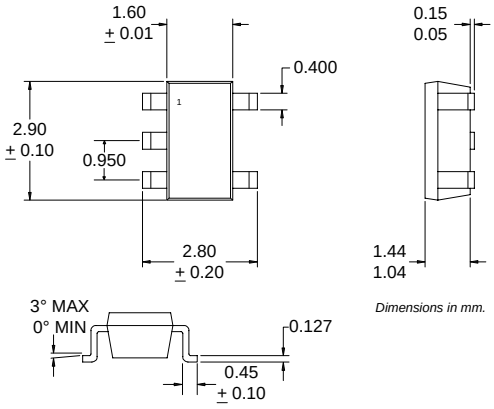


### Typical Applications

- CDMA PCS LNA
- TDMA PCS LNA
- W-CDMA/CDMA2000 LNA
- General Purpose Amplification
- Commercial and Consumer Systems

### Product Description

The RF2364 is a low noise amplifier with a high dynamic range designed for CDMA and TDMA PCS, as well as W-CDMA/CDMA2000 applications. The device functions as an outstanding front end low noise amplifier and the bias current can be set externally. The IC includes a power down feature used to completely turn-off the device and is featured in a standard SOT 5-lead plastic package.



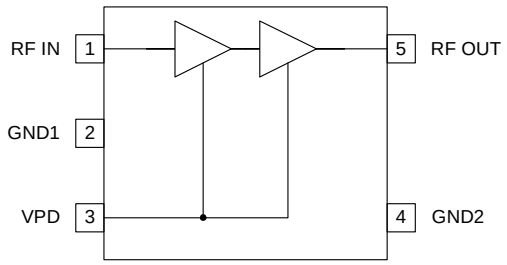

Optimum Technology Matching® Applied

- ☐ Si BJT
- ☑ GaAs HBT
- ☐ GaAs MESFET
- ☐ Si Bi-CMOS
- ☐ SiGe HBT
- ☐ Si CMOS

Package Style: SOT 5-Lead

### Features

- Low Noise and High Intercept Point
- 18dB Gain
- Power Down Control
- Single 3.0V Power Supply
- PCS and W-CDMA Band Operation
- 1.8GHz to 2.5GHz Operation




Functional Block Diagram

### Ordering Information

| | |
|---|---|
| RF2364 | 3V PCS Low Noise Amplifier |
| RF2364 PCBA | Fully Assembled Evaluation Board |

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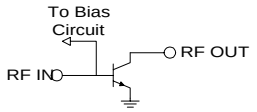
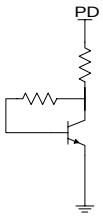
## Absolute Maximum Ratings

| Parameter | Rating | Unit |
|---|---|---|
| Supply Voltage | -0.5 to +8.0 | $V_{DC}$ |
| Input RF Level | +10 | dBm |
| Storage Temperature | -40 to +150 | °C |

**Caution!** ESD sensitive device.

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| Parameter | Specification | | | Unit | Condition |
|---|---|---|---|---|---|
| | Min. | Typ. | Max. | | |
| **Operating Range** | | | | | |
| Overall Frequency Range | 1930 | | 1990 | MHz | |
| Supply Voltage ($V_{CC}$) | 2.7 | 3.0 | 3.3 | V | |
| Power Down Voltage ($V_{PD}$) | 2.7 | | 2.9 | V | For normal operation |
| | | | 0.9 | V | For power down operation |
| Current Consumption | | 17.0 | 23.5 | mA | $V_{CC}$=3.0V, Values reflect $I_{CC}$+$I_{PD}$ |
| Power Down Current | | | 10 | µA | $V_{CC}$=3.0V, $V_{PD}$≤0.9V |
| Operating Ambient Temperature | -40 | | +85 | °C | |
| Input Impedance | | 50 | | Ω | |
| Output Impedance | | 50 | | Ω | |
| **Low Noise Amplifier Performance** | | | | | T=25°C |
| Power Gain | | 18 | 21 | dB | $V_{CC}$=3.0V, $I_{CC}$=17mA |
| Noise Figure | | 1.8 | | dB | |
| Input IP3 | | +5 | | dBm | $V_{CC}$=3.0V |
| Input VSWR | | | 2:1 | | |
| Output VSWR | | | 2:1 | | With external matching components. |
| Input P1dB | | -8.5 | | dBm | |

| Pin | Function | Description | Interface Schematic |
|---|---|---|---|
| 1 | RF IN | RF input pin. This pin is DC coupled and matched to 50Ω. |  |
| 2 | GND1 | Ground connection. Keep traces physically short and connect immediately to ground plane for best performance. | |
| 3 | VPD | For low noise amplifier applications, this pin is used to control the bias current. See plots for bias current settings. An external resistor (R1) can be used to set the bias current for any $V_{PD}$ voltage (See Application Note).<br>For driver amplifier applications, this is the Power Down pin for the IC. $V_{PD}$=2.8V ± 0.1V is required for proper operation. $V_{PD}$< 0.9V turns off the Part. External RF bypassing is required. The trace length between the pin and the bypass capacitors should be minimized. The ground side of the bypass capacitors should connect immediately to ground plane. Nominal current required for $V_{PD}$=2.8V is 2.0mA typical and 3.0mA Max (@ $V_{PD}$=2.9V). |  |
| 4 | GND2 | Ground connection. Keep traces physically short and connect immediately to ground plane for best performance. | |
| 5 | RF OUT | Amplifier Output pin. This pin is an open-collector output. It must be biased to either $V_{CC}$ or pin 4 through a choke or matching inductor. This pin is typically matched to 50Ω with a shunt bias/matching inductor and series blocking/matching capacitor. Refer to application schematics. | |

# Application Notes

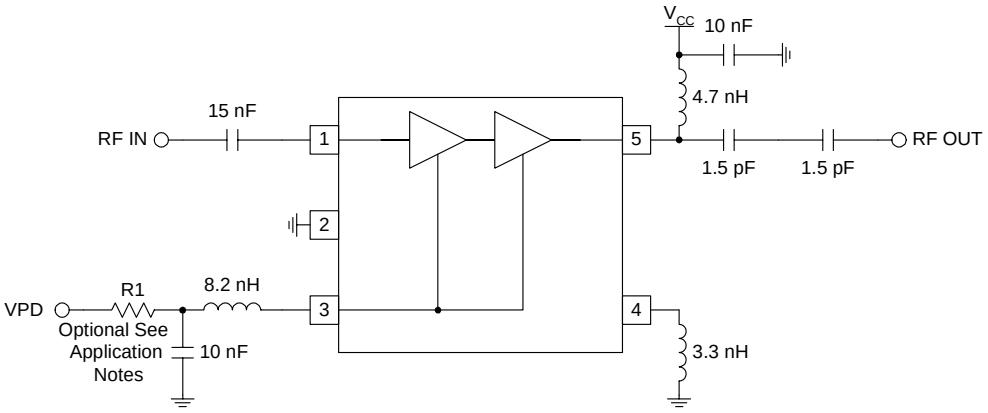
**Power Down Pin Resistor**

The Power Down pin (pin 3) of the RF2364 3V Low Noise Amplifier should be maintained at 2.7V to 2.9V for proper operation. This voltage range ensures the correct bias current will be present at the Power Down pin of the device. However, an external series resistor may be used to allow various operating voltages at this pin (see R1 in Application Schematics). The required value for this resistor may be roughly calculated by using the operating input voltage to the Power Down pin, the desired voltage at the device, and the typical current consumption for the Power Down pin, along with Ohms law.

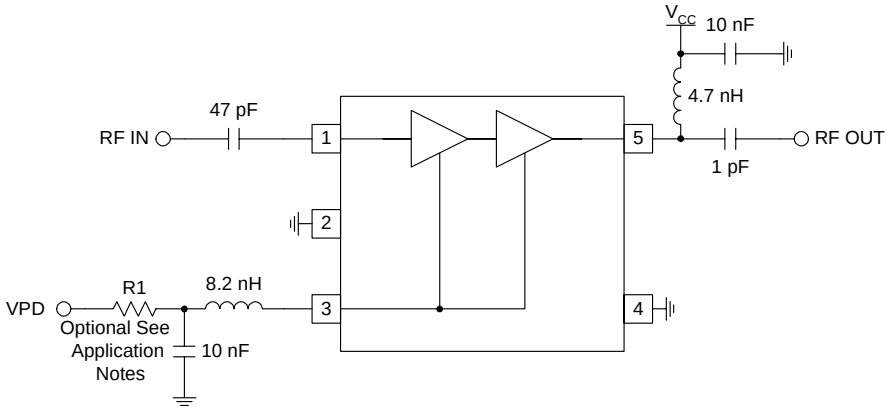
For example, assume the design will supply 3.3V to the Power Down pin of the device, but the biasing circuitry internal to the RF2364 requires 2.8V, and the power down bias current is known to typically be 5.5mA, then the required value from R1 would be found from:

$$\frac{3.3V - 2.8V}{5.5mA} = 90.9\Omega$$

## Application Schematic
## PCS Band

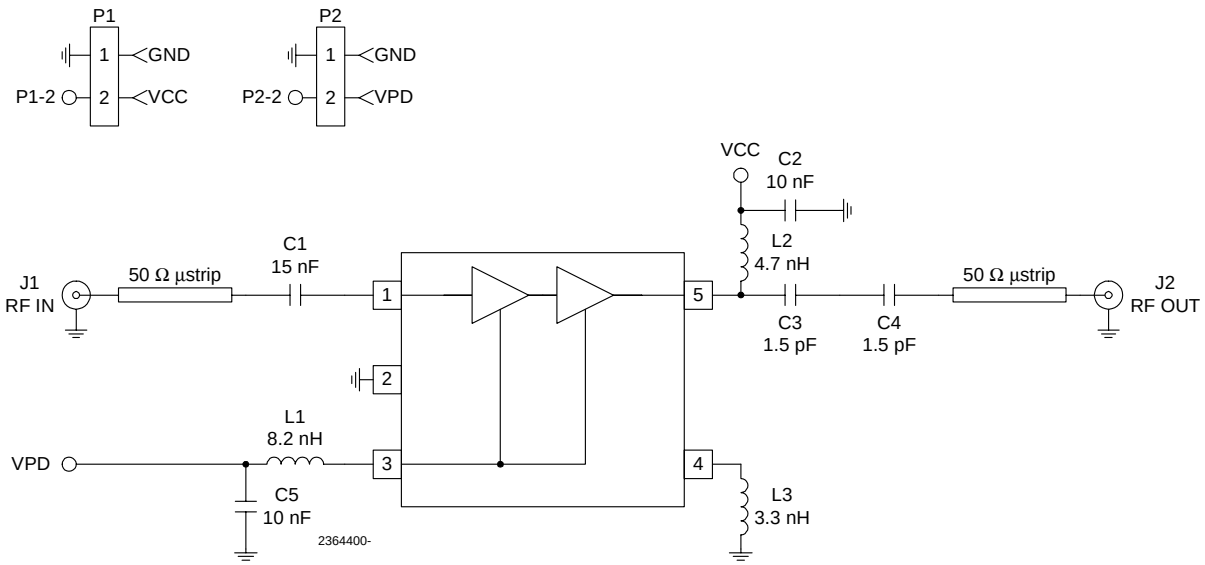



## Application Schematic
## W-CDMA Band



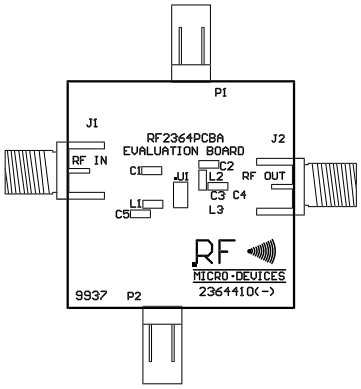
# Evaluation Board Schematic - PCS Band

(Download Bill of Materials from www.rfmd.com.)

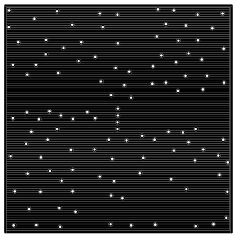


## Evaluation Board Layout
## Board Size 1” x 1”

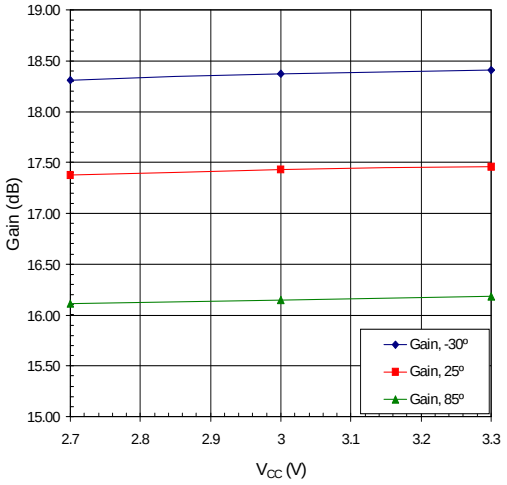
Board Thickness 0.031”; Board Material FR-4



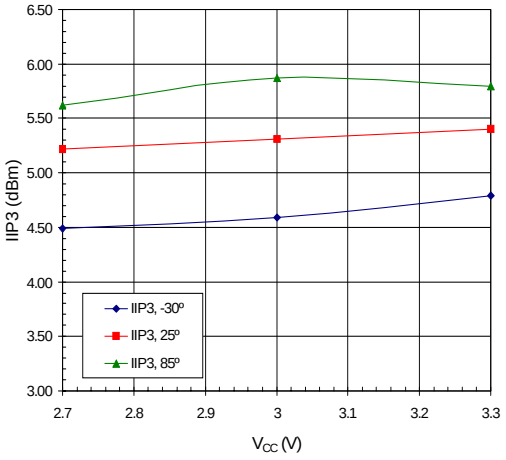


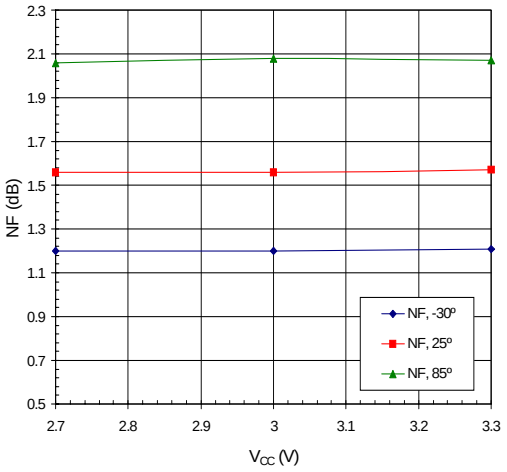
**Gain versus $V_{CC}$**
**$V_{PD}$=2.8V, Frequency=1960MHz**



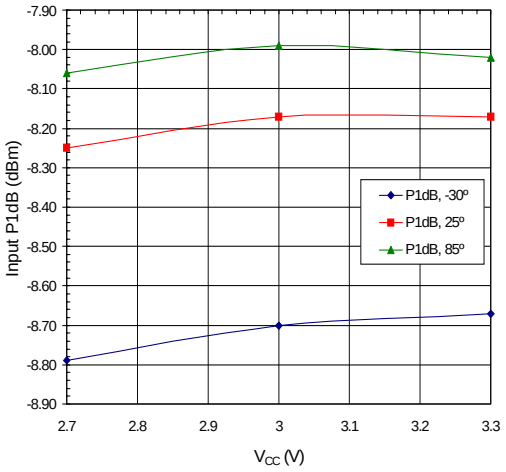

**IIP3 versus $V_{CC}$**
**$V_{PD}$=2.8V, Frequency=1960MHz**



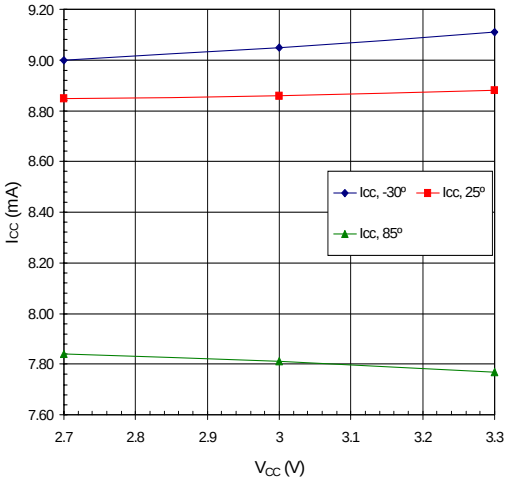

**Noise Figure versus $V_{CC}$**
**$V_{PD}$=2.8V, Frequency=1960MHz**



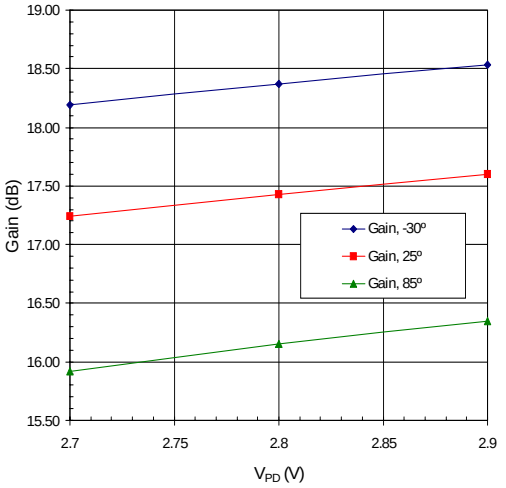

**Input P1dB versus $V_{CC}$**
**$V_{PD}$=2.8V, Frequency=1960MHz**



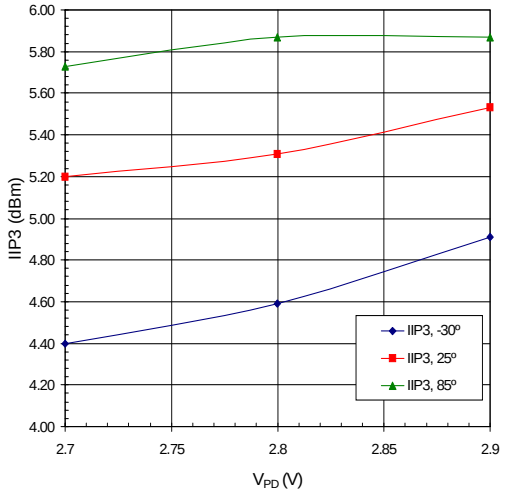

**$I_{CC}$ versus $V_{CC}$**
**$V_{PD}$=2.8V, Frequency=1960MHz**



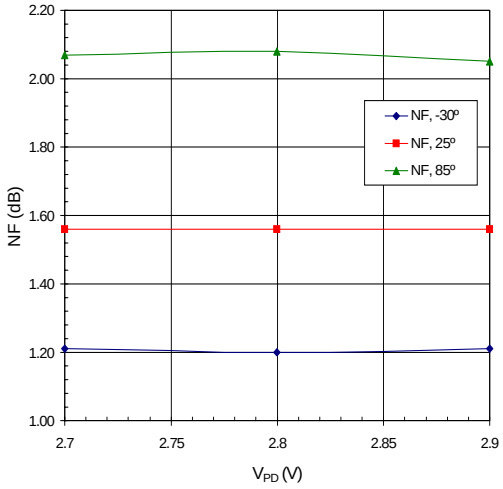

**Gain versus $V_{PD}$**
**$V_{CC}$=3.0V, Frequency=1960MHz**



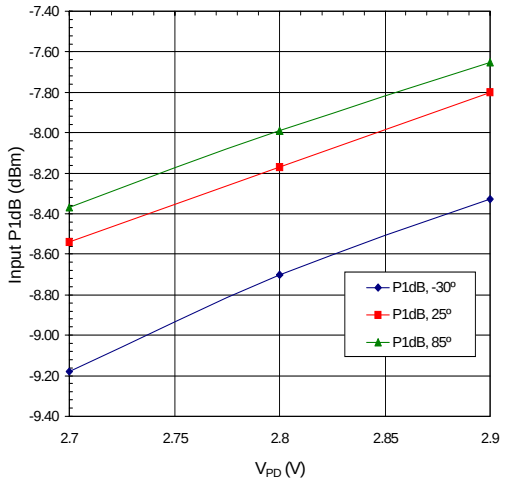
**IIP3 versus $V_{PD}$**
**$V_{CC}$=3.0V, Frequency=1960MHz**



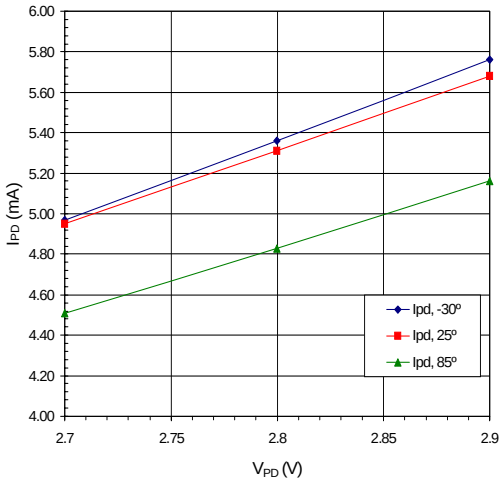

**Noise Figure versus $V_{PD}$**
**$V_{CC}$=3.0V, Frequency=1960MHz**



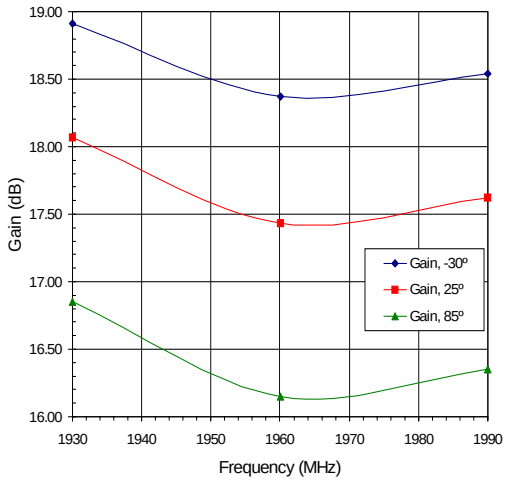

**P1dB versus $V_{PD}$**
**$V_{CC}$=3.0V, Frequency=1960MHz**



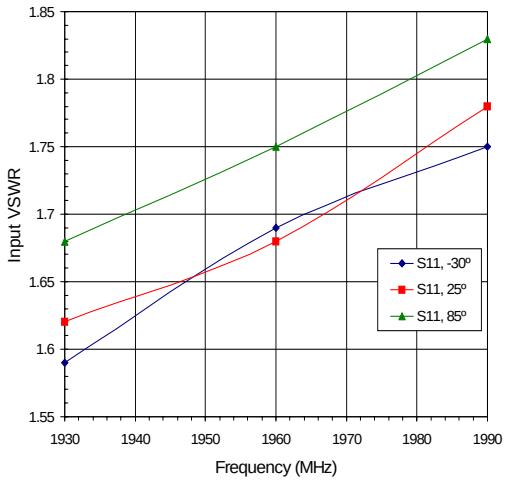

**$I_{PD}$ versus $V_{PD}$**
**$V_{CC}$=3.0V, Frequency=1960MHz**

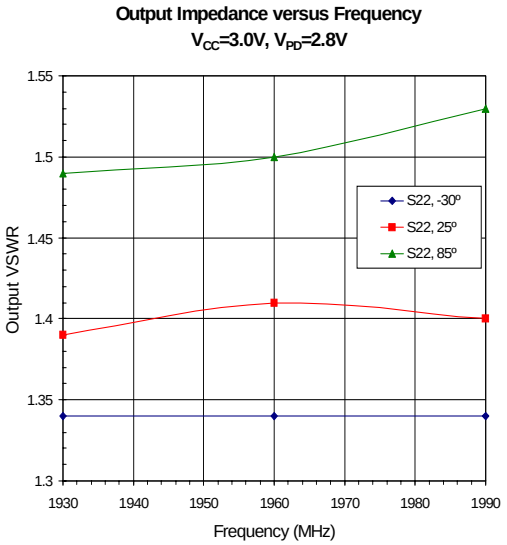



**Gain versus Frequency**
**$V_{CC}$=3.0V, $V_{PD}$=2.8V**




**Input Impedance versus Frequency**
**$V_{CC}$=3.0V, $V_{PD}$=2.8V**




Output Impedance versus Frequency
$V_{CC}$=3.0V, $V_{PD}$=2.8V
1.55
1.5
1.45
1.4
1.35
1.3
Output VSWR
1930
1940
1950
1960
1970
1980
1990
Frequency (MHz)
S22, -30º
S22, 25º
S22, 85º