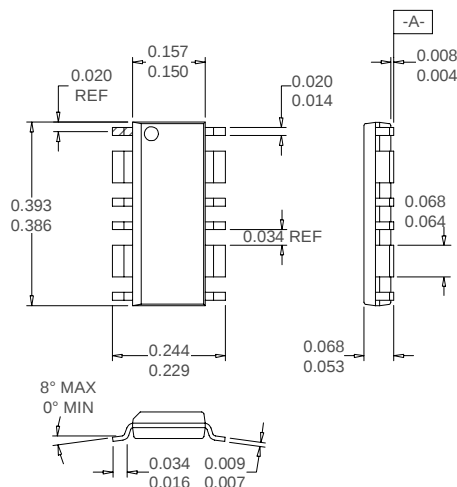


### Typical Applications

- 900MHz ISM Band Applications
- 400MHz Industrial Radios
- Driver for Higher Power Applications
- Portable Battery-Powered Equipment
- Commercial and Consumer Systems
- Base Station Equipment

### Product Description

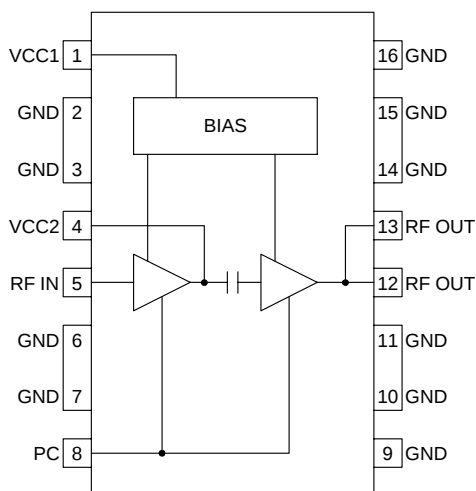
The RF2104 is a medium power amplifier IC. The device is manufactured on a low cost Silicon process, and has been designed for use as the final RF amplifier in UHF radio transmitters operating between 400MHz and 1000MHz. It may also be used as a driver amplifier in higher power applications. The device is packaged in a plastic quad-batwing 16-lead package, and is self-contained with the exception of the output matching network, power supply feed line, and bypass capacitors. It produces an output power level of up to 500mW (CW) at 3.6V. The device can be used in 3 cell battery applications. The maximum CW output at 3.6V is +27dBm. The unit has a total gain of 26dB, depending upon the output matching network.



### Optimum Technology Matching® Applied

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

Package Style: CJ2BAT0



Functional Block Diagram

### Features

- 400MHz to 1000MHz Operation
- Up to 500mW CW Output Power
- 26dB Small Signal Gain
- 40dB Gain Control Range
- Single 2.7V to 3.6V Supply
- 40% Efficiency

### Ordering Information

RF2104 Medium Power Amplifier  
 RF2104 PCBA-L Fully Assembled Evaluation Board (830MHz)  
 RF2104 PCBA-H Fully Assembled Evaluation Board (915MHz)

RF Micro Devices, Inc.  
 7625 Thorndike Road  
 Greensboro, NC 27409, USA

Tel (336) 664 1233  
 Fax (336) 664 0454  
<http://www.rfmd.com>

### Absolute Maximum Ratings

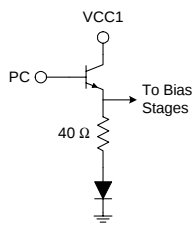
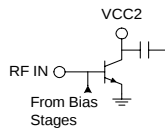
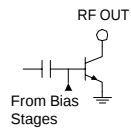
| Parameter                               | Rating       | Unit            |
|-----------------------------------------|--------------|-----------------|
| Supply Voltage                          | -0.5 to +6.0 | V <sub>DC</sub> |
| Gain Control Voltage (V <sub>PC</sub> ) | -0.5 to +3.0 | V               |
| DC Supply Current                       | 500          | mA              |
| Input RF Power                          | +12          | dBm             |
| Output Load VSWR                        | 20:1         |                 |
| Operating Ambient Temperature           | -40 to +85   | °C              |
| Storage Temperature                     | -40 to +150  | °C              |



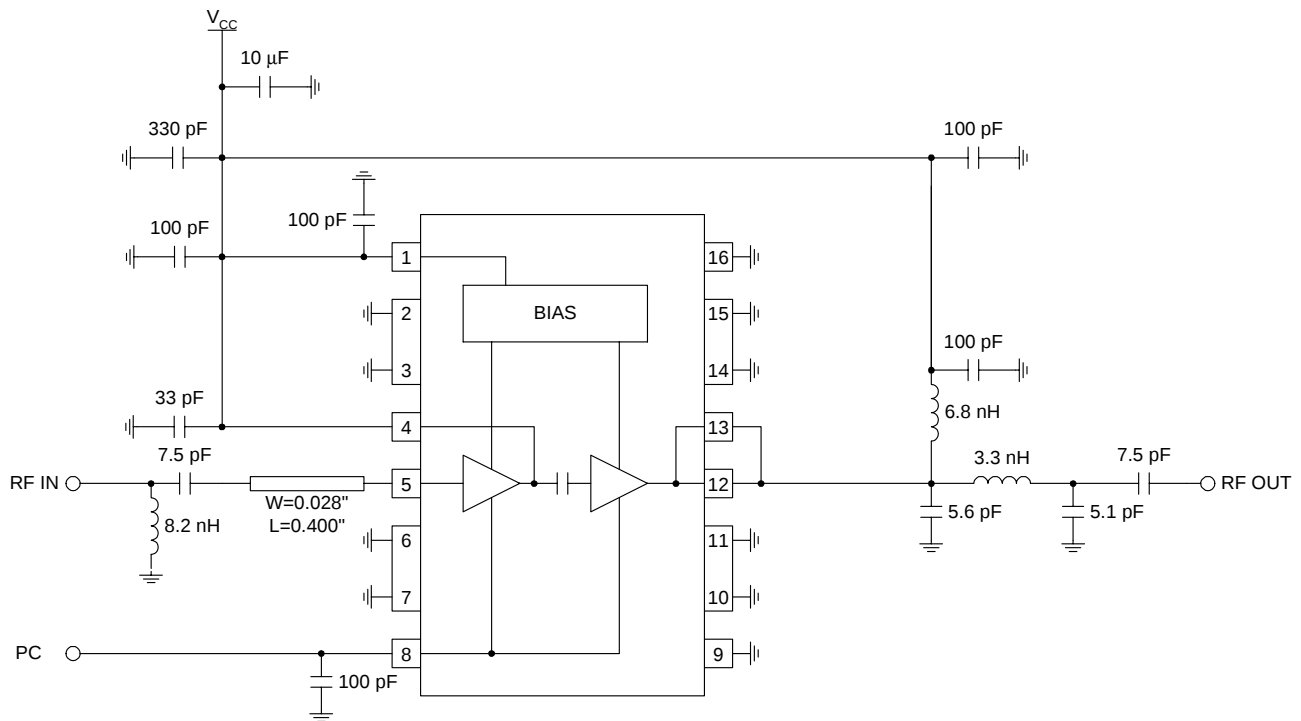
**Caution!** ESD sensitive device.

RF Micro Devices believes the furnished information is correct and accurate at the time of this printing. However, RF Micro Devices reserves the right to make changes to its products without notice. RF Micro Devices does not assume responsibility for the use of the described product(s).

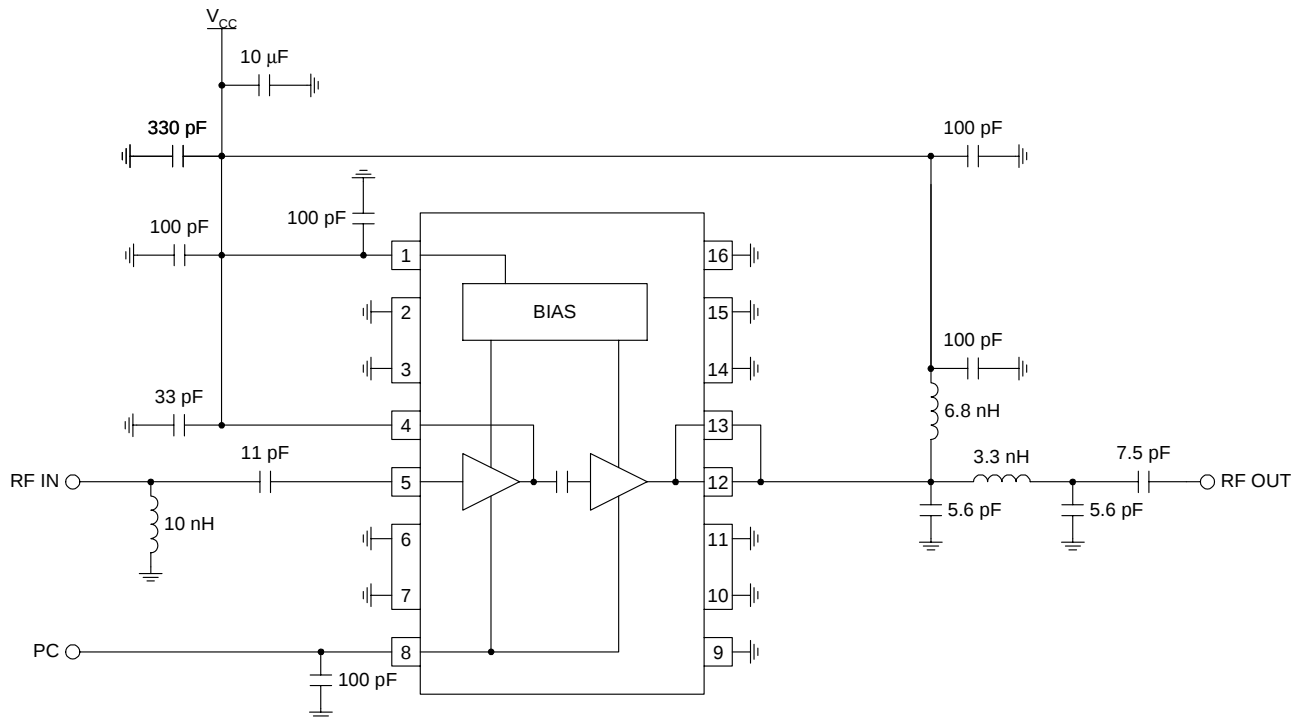
| Parameter                    | Specification |             |      | Unit | Condition                                                                                                         |
|------------------------------|---------------|-------------|------|------|-------------------------------------------------------------------------------------------------------------------|
|                              | Min.          | Typ.        | Max. |      |                                                                                                                   |
| <b>Overall</b>               |               |             |      |      | T=25°C, V <sub>CC</sub> =3.6V, V <sub>PC</sub> =2.5V, Z <sub>LOAD</sub> =10Ω, P <sub>IN</sub> =+6dBm, Freq=850MHz |
| Frequency Range              |               | 400 to 1000 |      | MHz  |                                                                                                                   |
| Bandwidth                    |               | 150         |      | MHz  | With fixed matching network                                                                                       |
| Maximum Output Power         |               | +27         |      | dBm  | V <sub>CC</sub> =3.6V, P <sub>IN</sub> =+6dBm                                                                     |
| Maximum Output Power         |               | +27         |      | dBm  | V <sub>CC</sub> =3.0V, P <sub>IN</sub> =+6dBm                                                                     |
| Output Third Order Intercept |               | +36         |      | dBm  | V <sub>CC</sub> =3.6V                                                                                             |
| Power Added Efficiency       |               | 40          |      | %    | V <sub>CC</sub> =3.6V, P <sub>OUT</sub> =+27dBm, P <sub>IN</sub> =+6dBm                                           |
| Small Signal Gain            | 24            | 25          | 28   | dB   | V <sub>CC</sub> =3.6V, V <sub>PC</sub> =+2.5V, Freq=850MHz                                                        |
| Gain Control Range           |               | 35          | 40   | dB   | V <sub>PC</sub> =0V to 2.5V                                                                                       |
| Second Harmonic              |               | -50         |      | dBc  | Without external second harmonic trap                                                                             |
| Third Harmonic               |               | -50         |      | dBc  |                                                                                                                   |
| Noise Figure                 |               | 5.5         | 7.0  | dB   |                                                                                                                   |
| Input Impedance              |               | 50          |      | Ω    |                                                                                                                   |
| Input Return Loss            |               | -20         | -15  | dB   | With external matching network; see application schematic                                                         |
| Input Return Loss            |               | -10         |      | dB   | Without external matching network                                                                                 |
| Output Impedance             |               | 50          |      | Ω    | Not matched for maximum output power                                                                              |
| Output Return Loss           |               | -13         |      | dB   | Without external matching network                                                                                 |
| Load Impedance               |               | 5+j0        |      | Ω    | Load Impedance for Optimal Power Match                                                                            |
| <b>Power Supply</b>          |               |             |      |      |                                                                                                                   |
| Power Supply Voltage         |               | 2.7 to 3.6  |      | V    |                                                                                                                   |
| Power Supply Idle Current    |               | 250         | 300  | mA   | V <sub>PC</sub> =2.5V                                                                                             |
| Total "OFF" Current Drain    |               | 1           | 10   | μA   | V <sub>PC</sub> <0.25V <sub>DC</sub> ; No RF input power                                                          |
| Total "OFF" Current Drain    |               | 4           |      | mA   | V <sub>PC</sub> <0.25V <sub>DC</sub> ; P <sub>IN</sub> =+6dBm                                                     |
| Current into PC pin          |               |             | 1    | mA   | V <sub>PC</sub> =2.5V                                                                                             |
| Current into PC pin          |               | 0           |      | μA   | V <sub>PC</sub> =0V                                                                                               |
| Turn-on Time                 |               | <100        |      | ns   | V <sub>PC</sub> =0V to V <sub>PC</sub> =+2.5V <sub>DC</sub>                                                       |

| Pin | Function | Description                                                                                                                                                                                                                                                                                                                              | Interface Schematic                                                                   |
|-----|----------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|
| 1   | VCC1     | Power supply for the bias circuits. This pin draws current proportional to $V_{PC}$ . When $V_{PC}$ is 2.5V the maximum current is about 30mA. When $V_{PC}$ goes down to 0V the current also goes down to 0mA.                                                                                                                          |    |
| 2   | GND      | Ground connection. For best performance, keep traces physically short and connect immediately to ground plane. A via hole under each ground pin to the ground plane is recommended.                                                                                                                                                      |                                                                                       |
| 3   | GND      | Same as pin 2.                                                                                                                                                                                                                                                                                                                           |                                                                                       |
| 4   | VCC2     | Power supply for the driver stage and interstage matching. An external decoupling capacitor is required. The electrical length between the pin and this capacitor affects the gain. See the application schematic for recommended line length for optimum gain. For operation at frequencies below 600MHz a series inductor is required. |    |
| 5   | RF IN    | 50Ω RF input. DC voltages are present at this pin, and an external blocking capacitor is required when connecting this pin to a DC path to ground. For optimum impedance matching, a shunt inductor to ground is recommended; see the application schematic for details.                                                                 | See pin 4 schematic.                                                                  |
| 6   | GND      | Same as pin 2.                                                                                                                                                                                                                                                                                                                           |                                                                                       |
| 7   | GND      | Same as pin 2.                                                                                                                                                                                                                                                                                                                           |                                                                                       |
| 8   | PC       | Power control pin. A DC voltage between 0V and 3.0V can be applied to control the gain. When no gain control is required this pin should be connected to a fixed voltage between 2.5V and 3.0V. This pin draws some current proportional to $V_{PC}$ . When $V_{PC}$ is 2.5V the maximum current into this pin is about 1mA.             | See pin 1 schematic.                                                                  |
| 9   | GND      | Same as pin 2.                                                                                                                                                                                                                                                                                                                           |                                                                                       |
| 10  | GND      | Same as pin 2.                                                                                                                                                                                                                                                                                                                           |                                                                                       |
| 11  | GND      | Same as pin 2.                                                                                                                                                                                                                                                                                                                           |                                                                                       |
| 12  | RF OUT   | RF output. The power supply for the output stage also needs to be supplied to this pin through the external matching circuit. The load impedance to this pin should be $5+j0\Omega$ for maximum output power.                                                                                                                            |  |
| 13  | RF OUT   | Same as pin 12.                                                                                                                                                                                                                                                                                                                          | See pin 12 schematic.                                                                 |
| 14  | GND      | Same as pin 2.                                                                                                                                                                                                                                                                                                                           |                                                                                       |
| 15  | GND      | Same as pin 2.                                                                                                                                                                                                                                                                                                                           |                                                                                       |
| 16  | GND      | Same as pin 2.                                                                                                                                                                                                                                                                                                                           |                                                                                       |

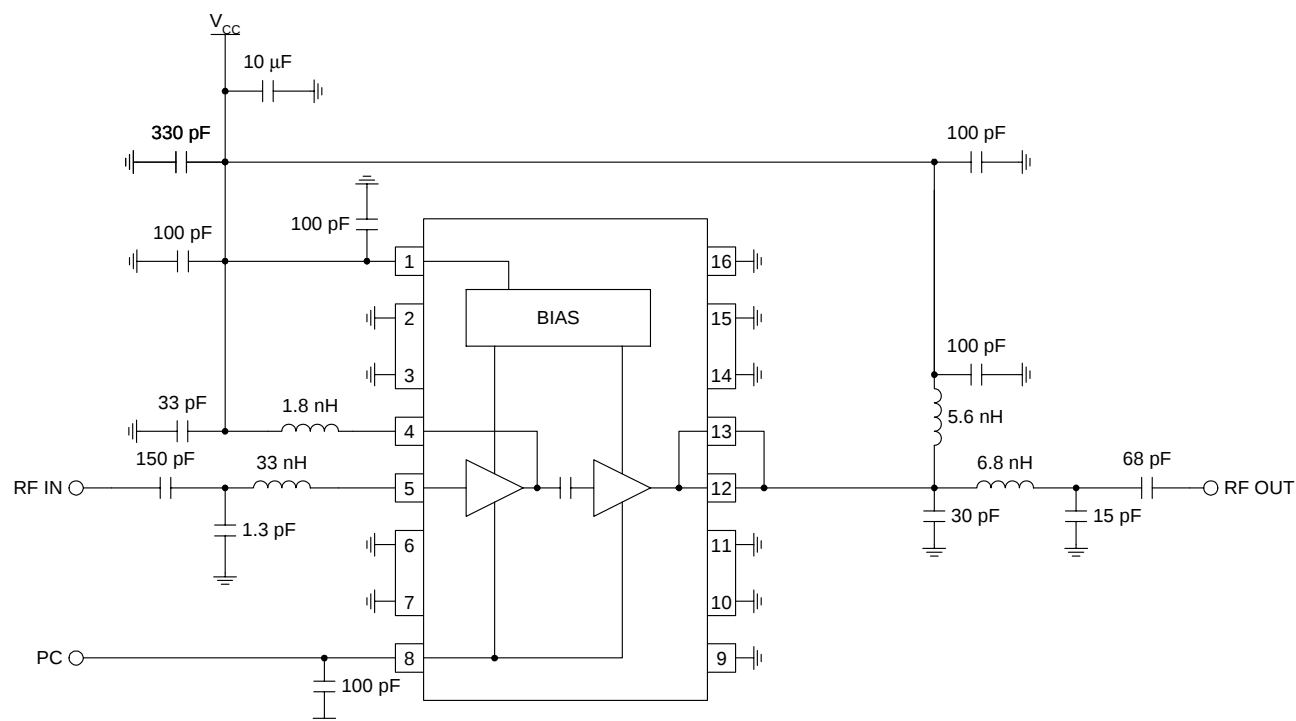
## Application Schematic - 915 MHz



## Application Schematic - 830 MHz

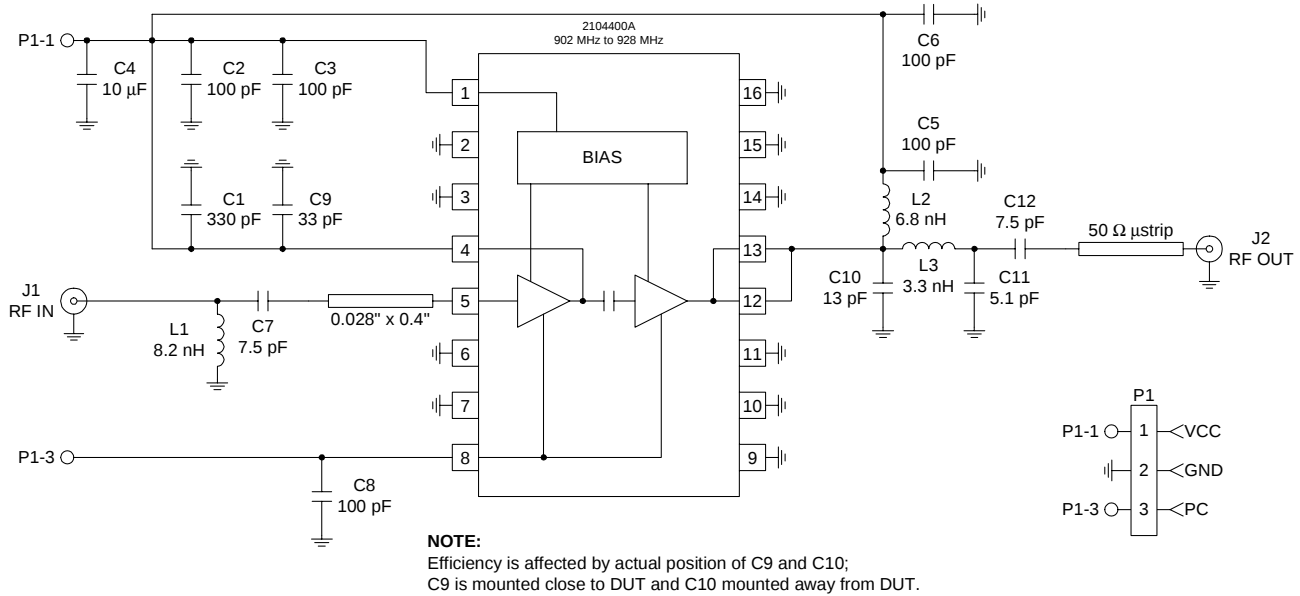


## Application Schematic - 420MHz

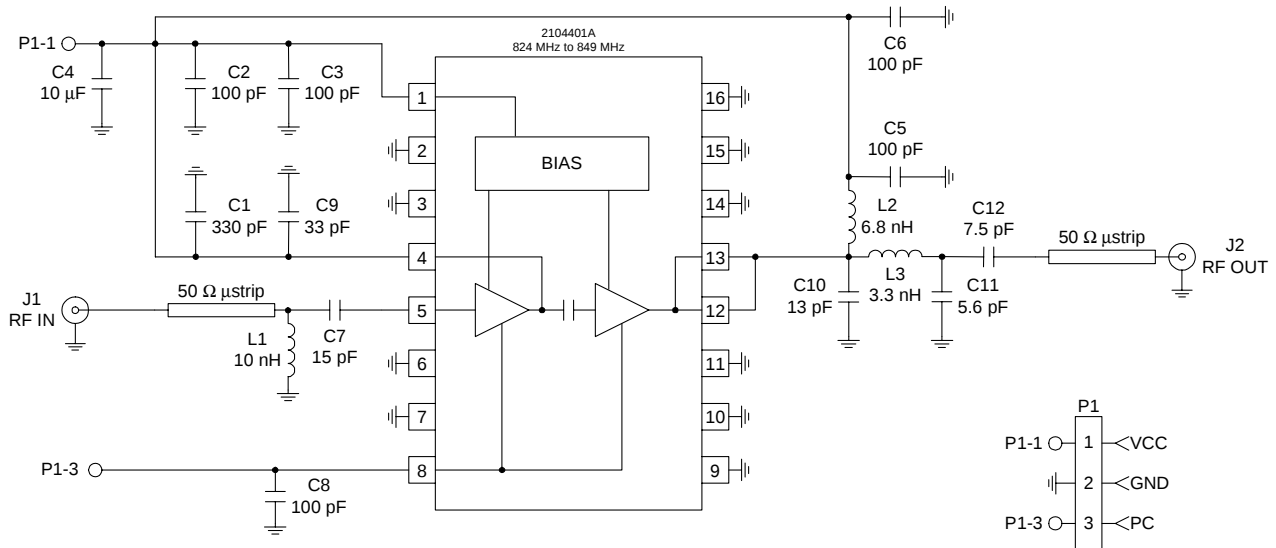


## Evaluation Board Schematic - 915 MHz

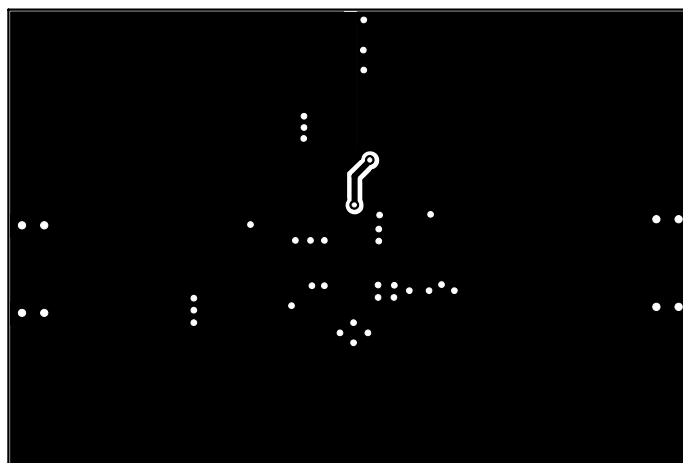
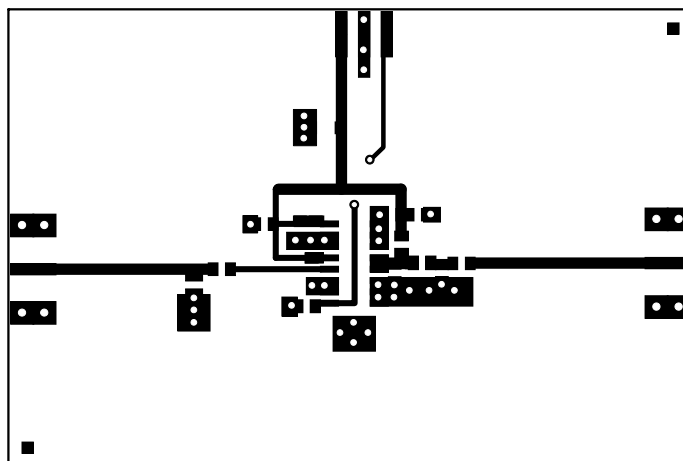
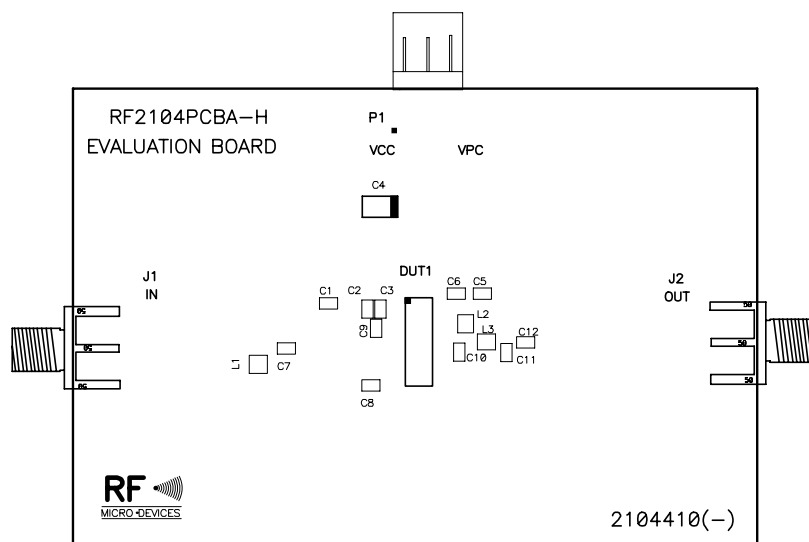
(Download [Bill of Materials](http://www.rfmd.com) from [www.rfmd.com](http://www.rfmd.com).)



## Evaluation Board Schematic - 830 MHz



## Evaluation Board Layout - 915MHz 3" x 2"



## Evaluation Board Layout - 830MHz 3" x 2"

