RF2104

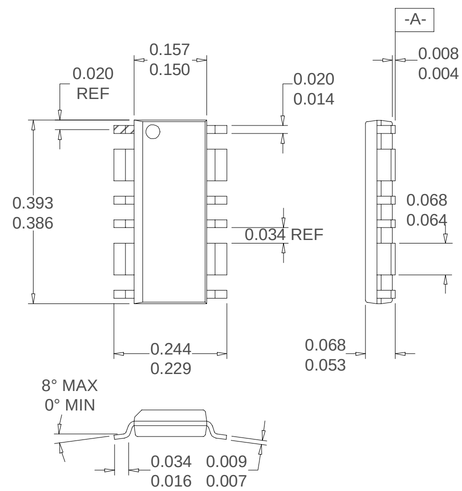
MEDIUM POWER AMPLIFIER

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

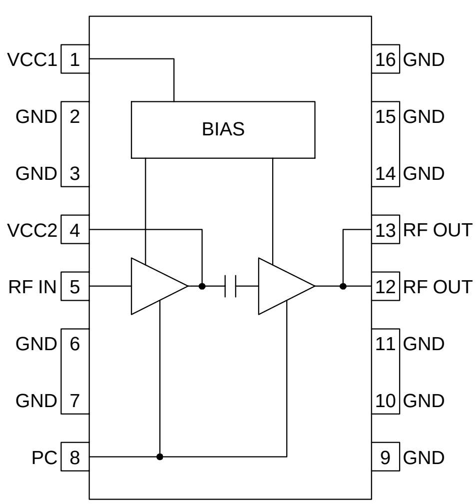
The RF2104 is a medium power amplifier IC. The device is manufactured on a low cost Silicon process, and has been designed for use as the final RF amplifier in UHF radio transmitters operating between 400MHz and 1000MHz. It may also be used as a driver amplifier in higher power applications. The device 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.



Package Style: CJ2BAT0

Optimum Technology Matching® Applied

- [x] Si BJT
- [ ] GaAs HBT
- [ ] GaAs MESFET
- [ ] Si Bi-CMOS
- [ ] SiGe HBT
- [ ] Si CMOS



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)

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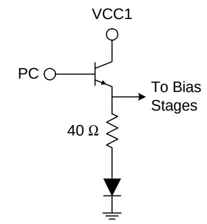
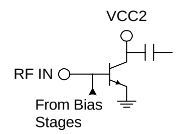
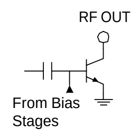
Absolute Maximum Ratings

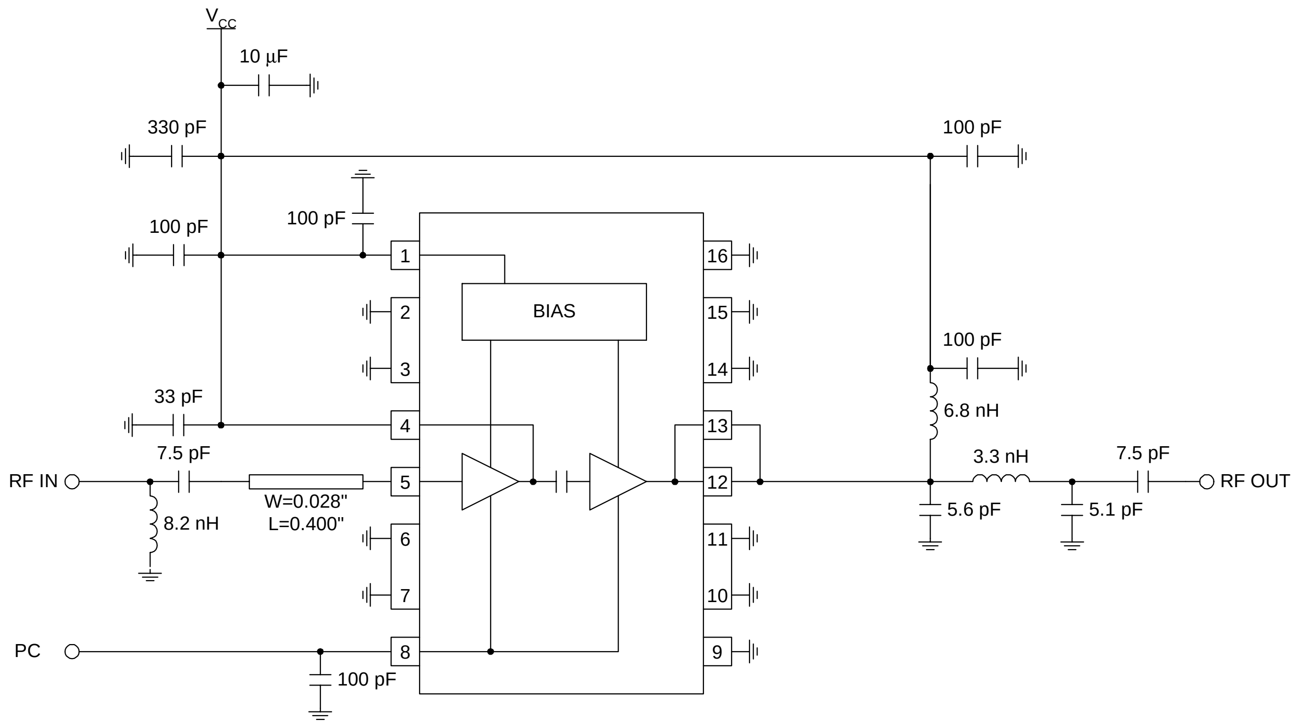
Parameter	Rating	Unit
Supply Voltage	-0.5 to +6.0	V_{DC}
Gain Control Voltage (V_{PC})	-0.5 to +3.0	V
DC Supply Current	500	mA
Input RF Power	+12	dBm
Output Load VSWR	20:1	
Operating Ambient Temperature	-40 to +85	°C
Storage Temperature	-40 to +150	°C

Caution! ESD sensitive device.

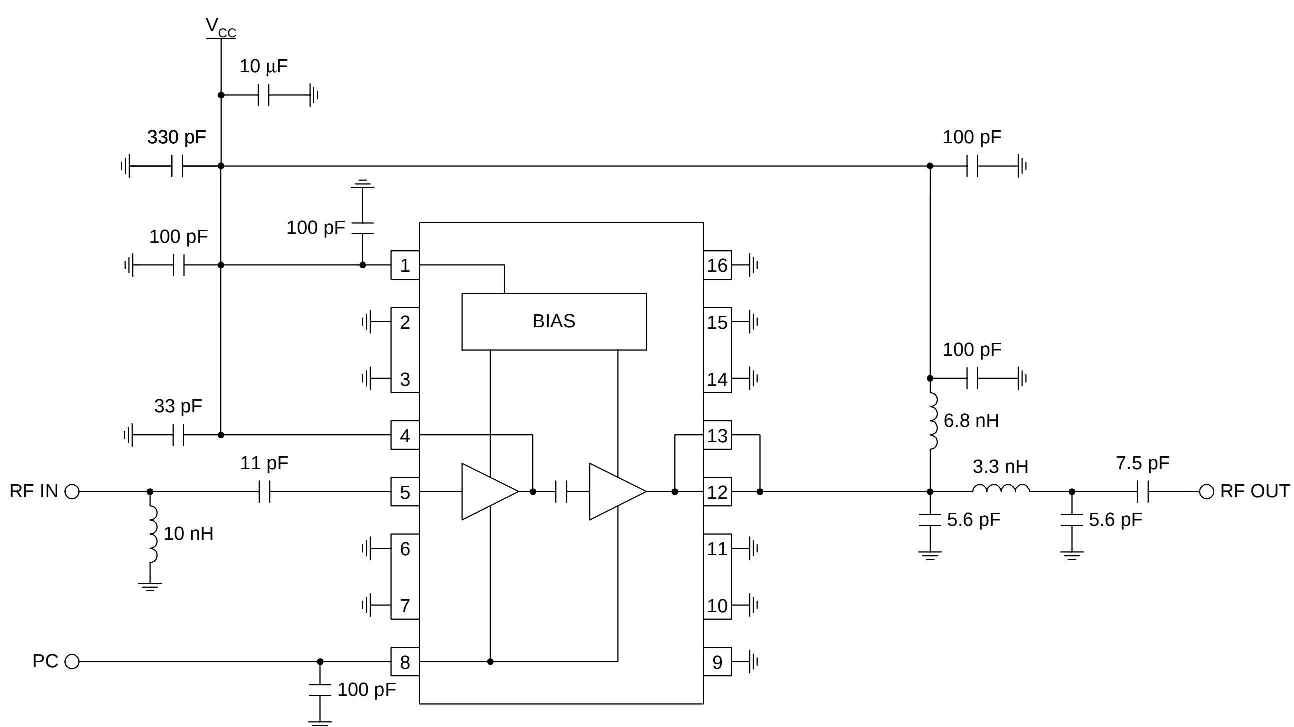
Parameter	Specification			Unit	Condition
	Min.	Typ.	Max.		
Overall					T=25°C, V_{CC}=3.6V, V_{PC}=2.5V, Z_{LOAD}=10Ω, P_{IN}=+6dBm, Freq=850MHz
Frequency Range		400 to 1000		MHz	
Bandwidth		150		MHz	With fixed matching network
Maximum Output Power		+27		dBm	V_{CC}=3.6V, P_{IN}=+6dBm
Maximum Output Power		+27		dBm	V_{CC}=3.0V, P_{IN}=+6dBm
Output Third Order Intercept		+36		dBm	V_{CC}=3.6V
Power Added Efficiency		40		%	V_{CC}=3.6V, P_{OUT}=+27dBm, P_{IN}=+6dBm
Small Signal Gain	24	25	28	dB	V_{CC}=3.6V, V_{PC}=+2.5V, Freq=850MHz
Gain Control Range		35	40	dB	V_{PC}=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
Power Supply					
Power Supply Voltage		2.7 to 3.6		V	
Power Supply Idle Current		250	300	mA	V_{PC}=2.5V
Total "OFF" Current Drain		1	10	μA	V_{PC}<0.25V_{DC}; No RF input power
Total "OFF" Current Drain		4		mA	V_{PC}<0.25V_{DC}; P_{IN}=+6dBm
Current into PC pin			1	mA	V_{PC}=2.5V
Current into PC pin		0		μA	V_{PC}=0V
Turn-on Time		<100		ns	V_{PC}=0V to V_{PC}=+2.5V_{DC}

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+j0Ω 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.	

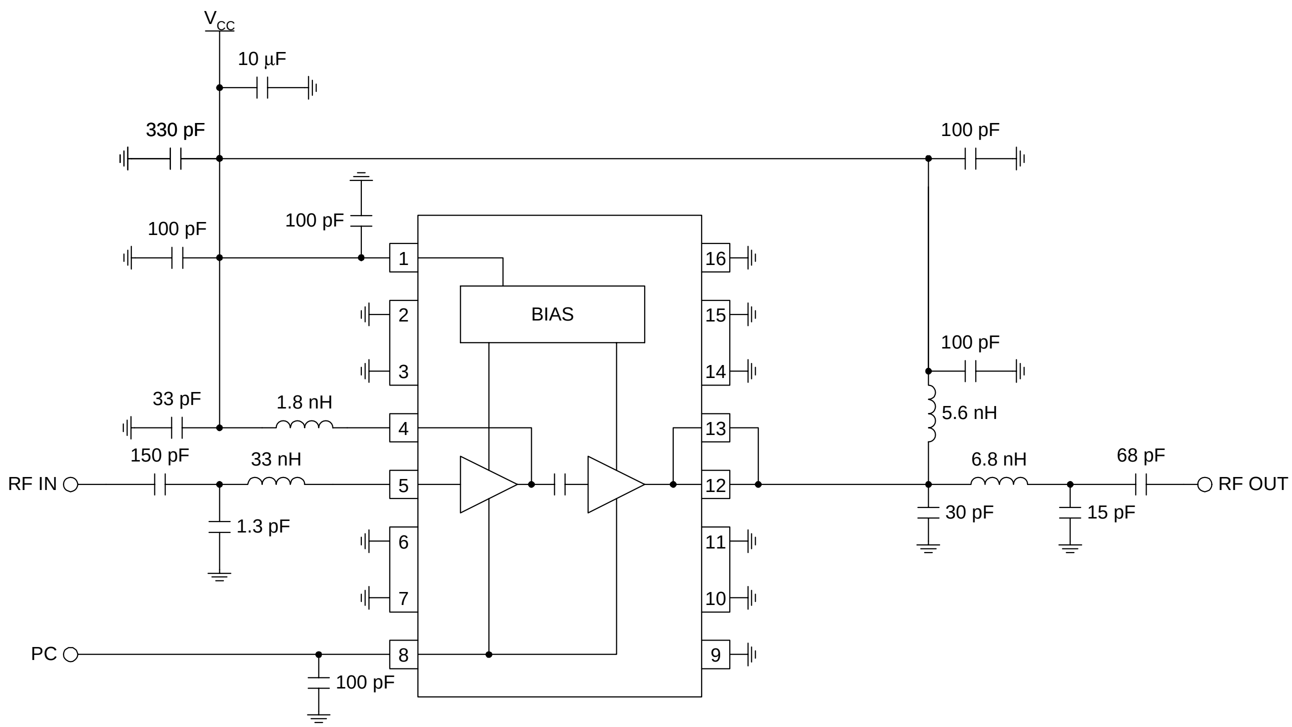
Application Schematic - 915MHz



Application Schematic - 830MHz

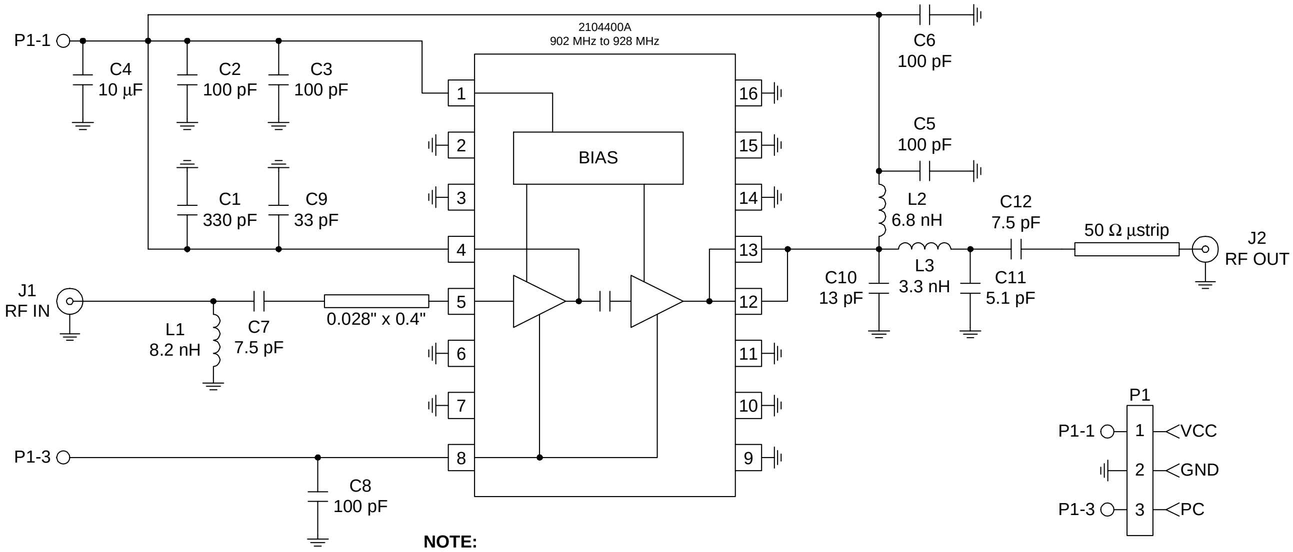


Application Schematic - 420MHz



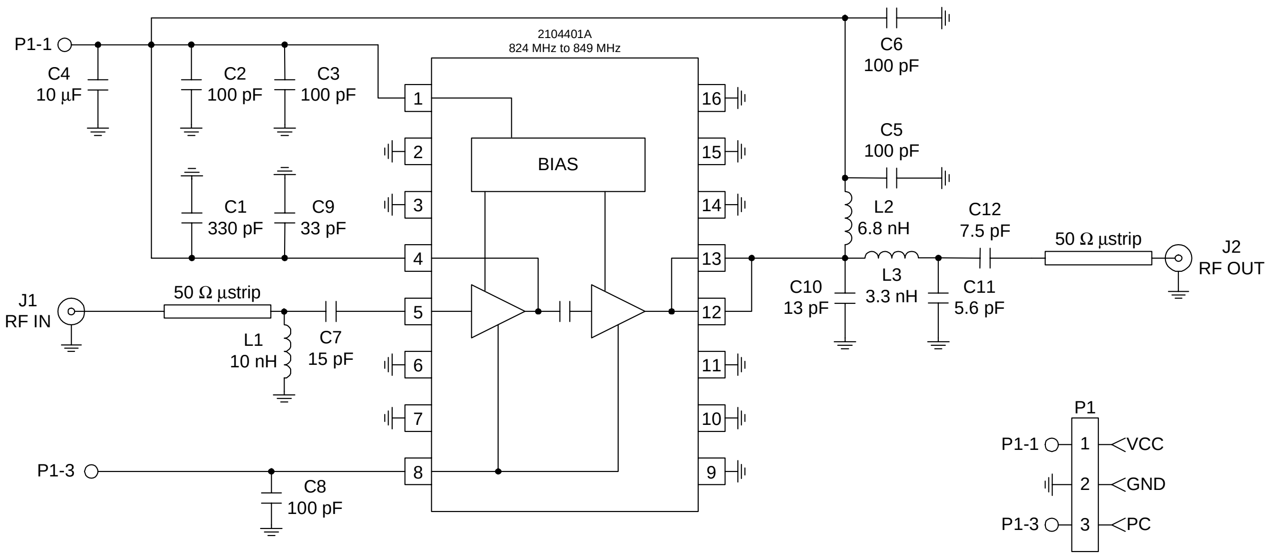
Evaluation Board Schematic - 915MHz

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

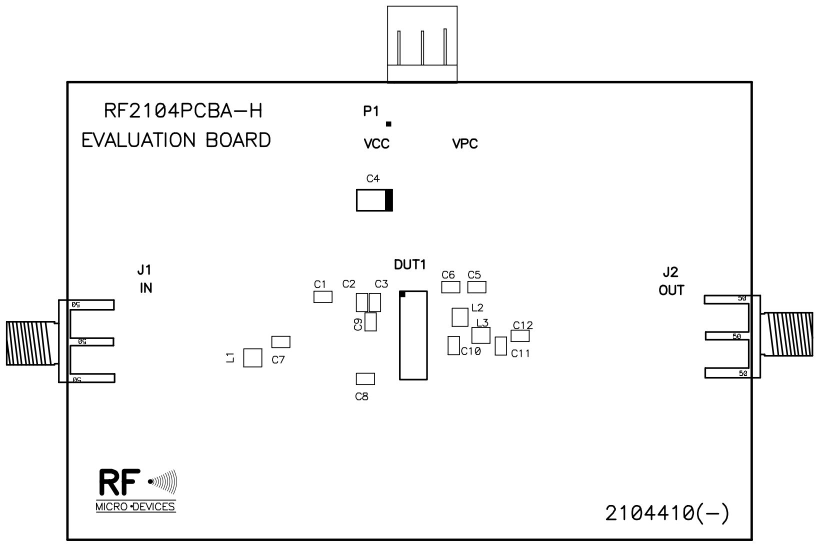


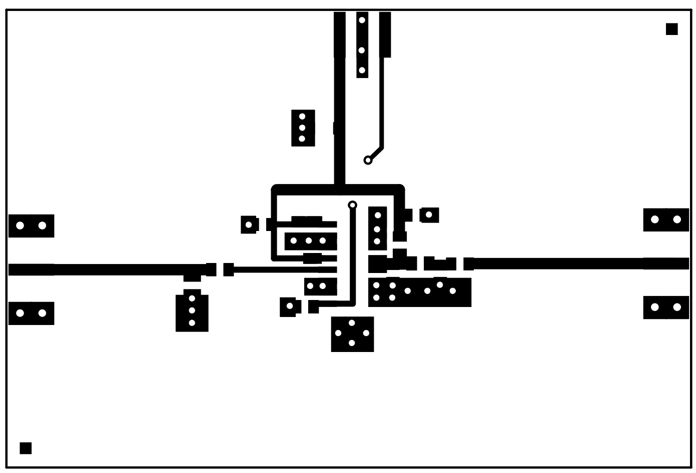
NOTE:
Efficiency is affected by actual position of C9 and C10;
C9 is mounted close to DUT and C10 mounted away from DUT.

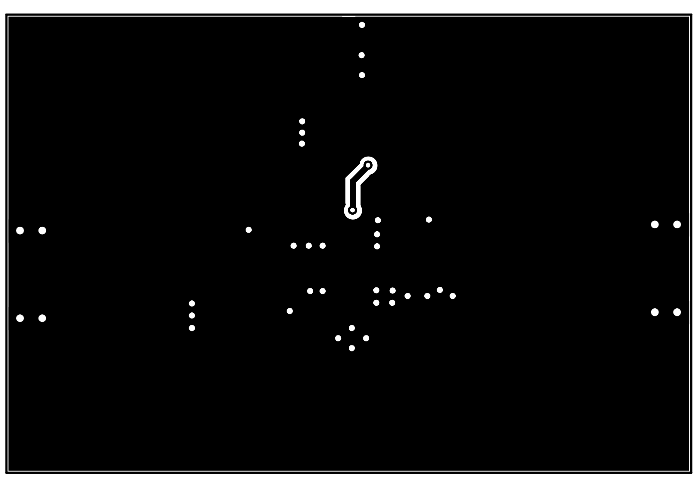
Evaluation Board Schematic - 830MHz



Evaluation Board Layout - 915MHz
3" x 2"







Evaluation Board Layout - 830MHz
3” x 2”