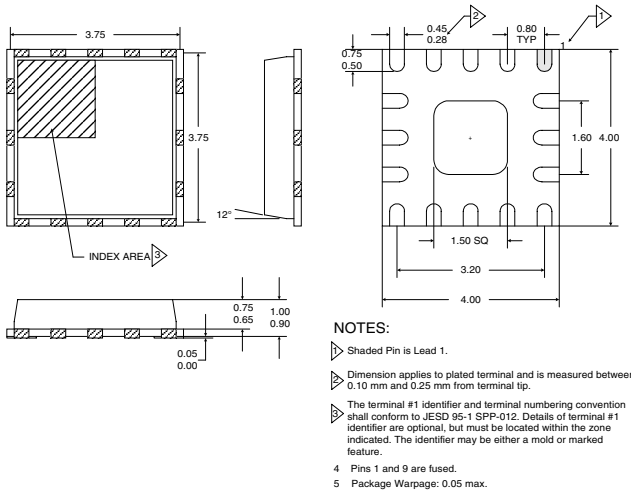
900MHZ ISM BAND 3.6V, 250MW AMP WITH ANALOG GAIN CONTROL

Typical Applications

- 3.6V Spread Spectrum Cordless Phones
- 902MHz to 928MHz ISM Band Systems
- Spread Spectrum Systems
- Commercial and Consumer Systems
- Portable Battery-Powered Equipment

Product Description

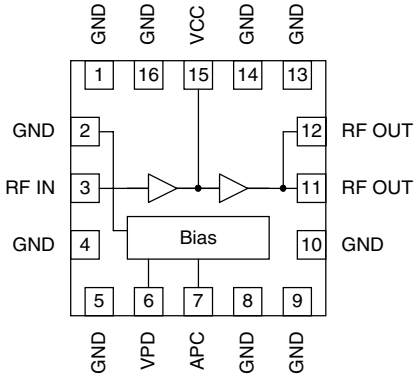
The RF2172 is a medium-power high efficiency amplifier IC targeting 3.6V handheld systems. The device is manufactured on an advanced Gallium Arsenide Heterojunction Bipolar Transistor (HBT) process, and has been designed for use as the final RF amplifier in frequency hopping/direct sequence spread spectrum cordless telephones or other applications in the 902MHz to 928MHz ISM band. The device is packaged in a compact 4mm x 4mm LCC. The device features analog gain control to optimize transmit power while maximizing battery life in portable equipment requiring up to 100mW transmit power at the antenna port.



Package Style: MLF16

Optimum Technology Matching® Applied

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



Functional Block Diagram

Features

- 24dBm Typical Output Power
- 0dB to 28dB Variable Gain with Analog Control
- 58% Efficiency at Max Output
- On-Board Power Down Mode
- 902MHz to 928MHz Operation

Ordering Information

RF2172	900MHz ISM Band 3.6V, 250mW Amp with Analog Gain Control
RF2172 PCBA	Fully Assembled Evaluation Board

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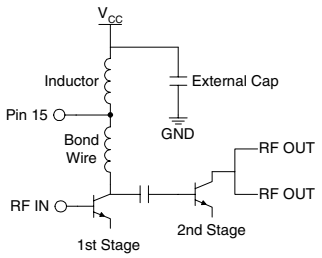
http://www.rfmd.com

Absolute Maximum Ratings

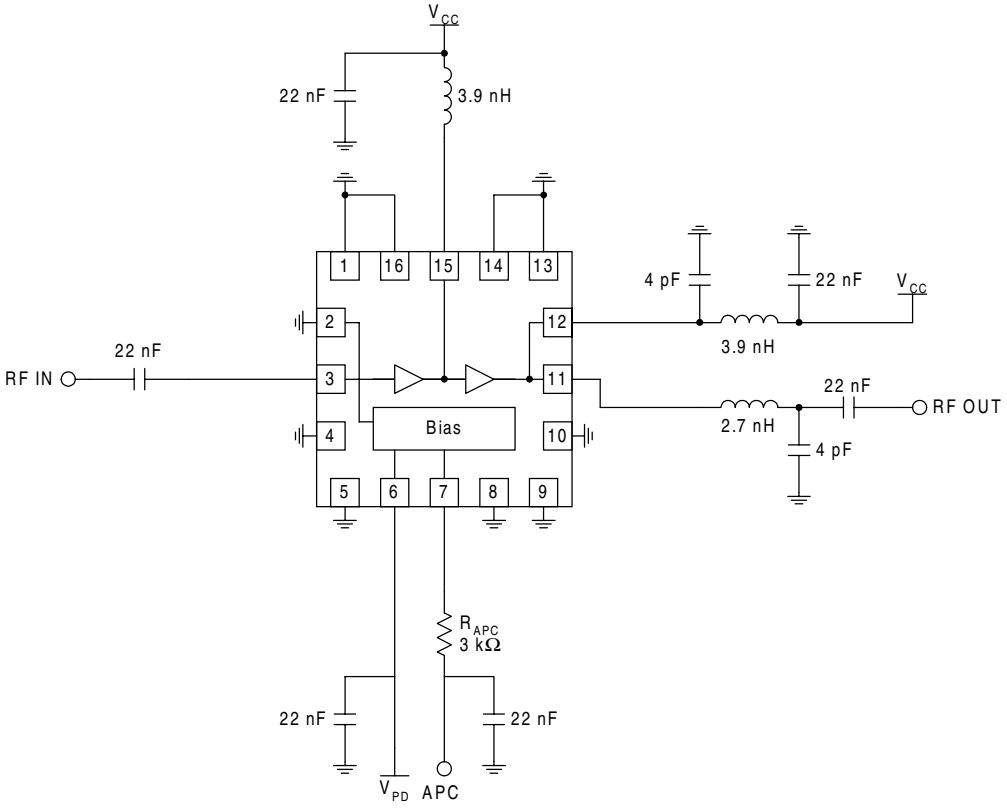
Parameter	Rating	Unit
Supply Voltage (RF off)	-0.5 to +6.0	V_{DC}
APC Voltage (V_{MODE})	-0.5 to +6.0	V_{DC}
Control Voltage (V_{PD})	-0.5 to +6.0	V_{DC}
Input RF Power	+10	dBm
Operating Case Temperature	-40 to +85	°C
Storage Temperature	-55 to +155	°C

Caution! ESD sensitive device.

Parameter	Specification			Unit	Condition
	Min.	Typ.	Max.		
Overall					T=25°C, V_{CC}=3.6V, V_{PD}=3.6V, V_{APC}=2.5V, Freq=902MHz to 928MHz, P_{IN}=-3.0dBm
Operating Frequency		902 to 928		MHz	
Usable Frequency Range		500 to 1000		MHz	
Maximum Output Power		+24.0		dBm	
Total Efficiency		58		%	
Forward Isolation		-35		dBm	
Second Harmonic		-40		dBc	With External Harmonic Trap
Third Harmonic		-40		dBc	
All other spurious		-50		dBc	
Input Impedance		50		Ω	
Input VSWR		1.8:1			Without Input Match
Output Load VSWR	<10:1				$0 \leq V_{APC} \leq 3.0$
	<6:1				$0 \leq V_{APC} \leq 3.6$
Output Load Impedance		20-j1.6		Ω	Without Second Harmonic Trap
Gain Control Voltage		0 to V_{CC}		V	
Gain Control Slope		20		dB/V	
Gain		0 to 28		dB	
Power Supply					
Power Supply Voltage		3.6		V	
Power Supply Current		145		mA	V_{CC}=3.6V, V_{APC}=3.6V, P_{IN}=-3dBm, V_{PD}=3.6
Idle Current		35		mA	V_{PD}=3.6V, V_{APC}=3.6V, RF $P_{IN} \leq$-30dBm

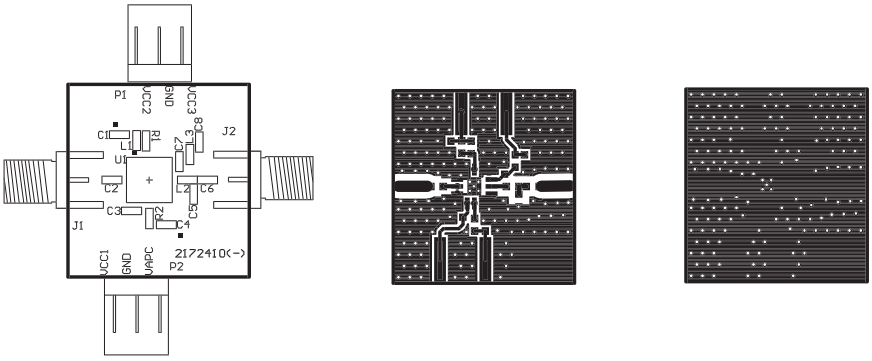
Pin	Function	Description	Interface Schematic
1	GND	Ground connection. Keep traces physically short and connect immediately to the ground plane for best performance.	
2	GND	Ground connection for the driver stage. Keep traces physically short and connect immediately to the ground plane for best performance.	
3	RF IN	RF input. This is a 50Ω input. No external matching is needed. An external DC blocking capacitor is required if this port is connected to a DC path to ground or a DC voltage.	See pin 15.
4	GND	See Pin 1.	
5	GND	See Pin 1.	
6	VPD	Power down pin. when this pin is 0V, the device will be in power down mode, dissipating minimum DC power. This pin also serves as the VCC supply pin for the bias circuitry. VPD should be at the supply voltage when the part is not in power down mode.	
7	APC	Analog power control. Output power varies as a function of the voltage on this pin. See graph. This pin can be driven with a voltage between 0 and VCC. Series Resistor determines dynamic range of power control. See plot "P_{OUT} versus Gain Control versus Gain Control Resistor".	
8	GND	See Pin 1.	
9	GND	See Pin 1.	
10	GND	See Pin 1.	
11	RF OUT	RF output. An external matching network is required to provide the optimum load impedance at this pin.	See pin 15.
12	RF OUT	RF output and power supply for the output stage. Bias voltage for the output stage is provided through this pin. A shunt cap resonating with the bond wire inductance at $2xf_0$ can also be used at this pin to provide a second harmonic trap.	See pin 15.
13	GND	See Pin 1.	
14	GND	See Pin 1.	
15	VCC	Power supply for driver stage and interstage matching. This pin forms the shunt inductance needed for proper tuning of the interstage. Refer to the application schematic for the proper configuration. Note: Position and value of the components are important.	
16	GND	See Pin 1.	
Pkg Base	GND	Ground connection for the output stage. This pad should be connected to the groundplane by vias directly under the device. A short path is required to obtain optimum performance, as well as provide a good thermal path to the PCB for maximum heat dissipation.	

Application Schematic

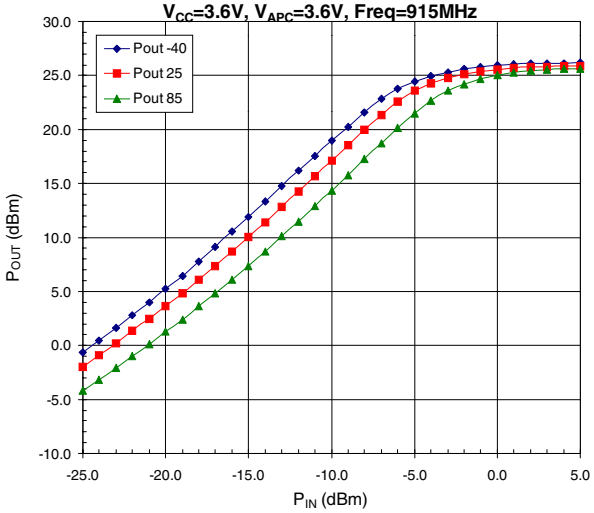


Evaluation Board Layout
Board Size 0.800" x 0.850"

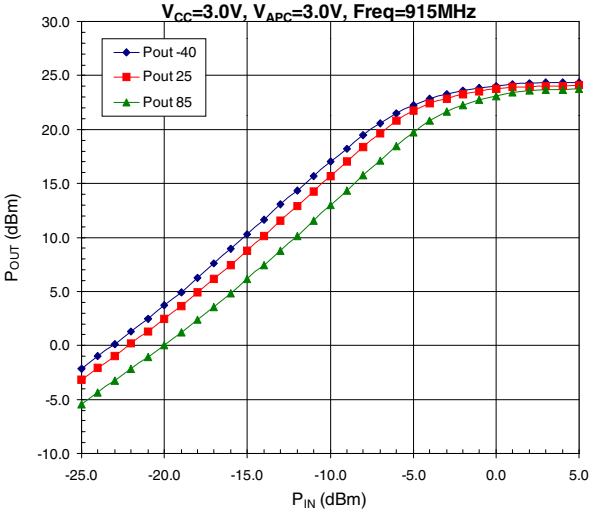
Board Thickness 0.031", Board Material FR-4



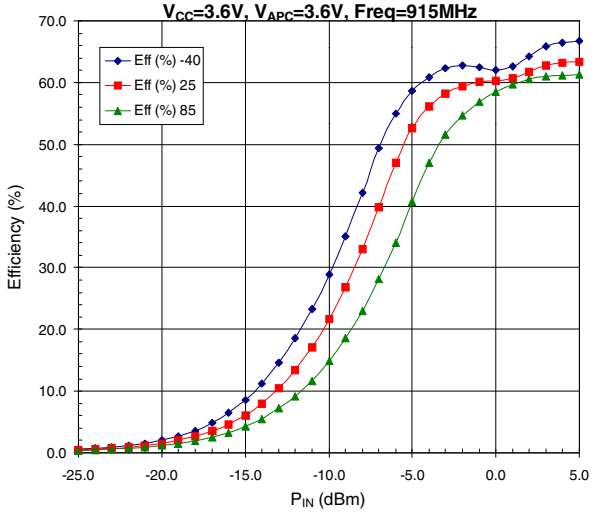
P_{OUT} versus P_{IN}
V_{CC}=3.6V, V_{APC}=3.6V, Freq=915MHz



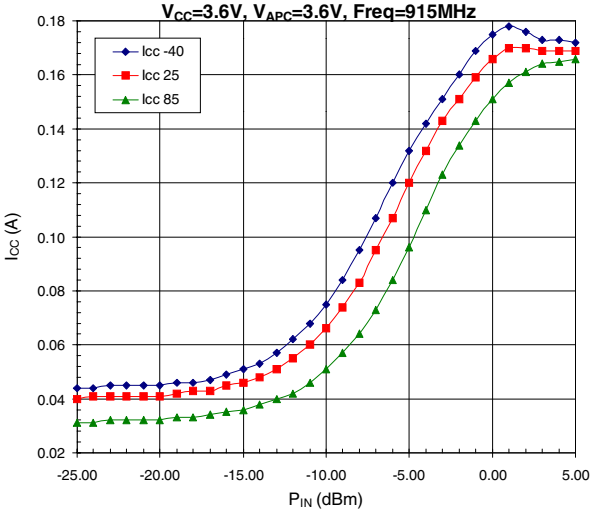
P_{OUT} versus P_{IN}
V_{CC}=3.0V, V_{APC}=3.0V, Freq=915MHz



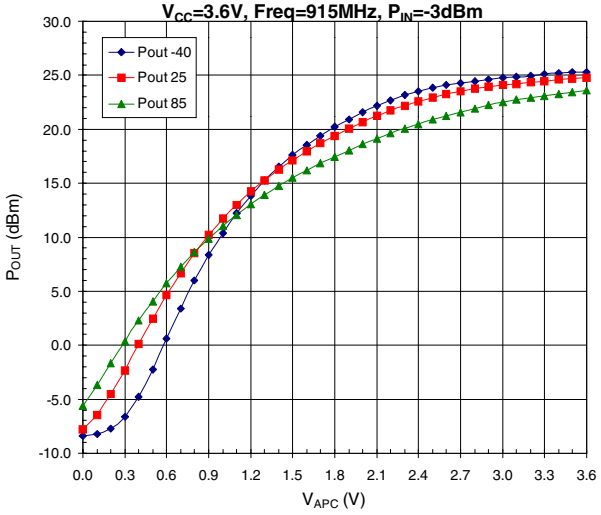
Efficiency versus P_{IN}
V_{CC}=3.6V, V_{APC}=3.6V, Freq=915MHz



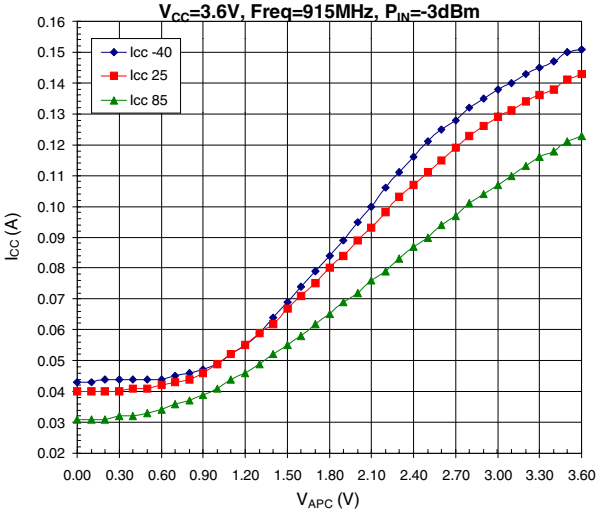
ICC versus P_{IN}
V_{CC}=3.6V, V_{APC}=3.6V, Freq=915MHz



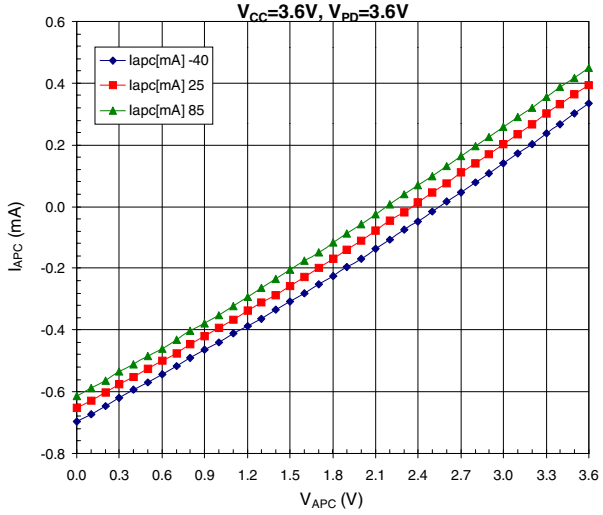
POUT versus V_{APC}
V_{CC}=3.6V, Freq=915MHz, P_{IN}=-3dBm



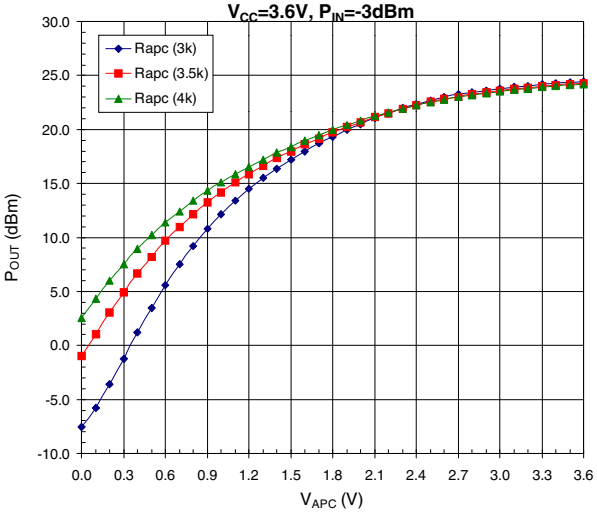
ICC versus V_{APC}
V_{CC}=3.6V, Freq=915MHz, P_{IN}=-3dBm



I_{APC} versus V_{APC}
V_{CC}=3.6V, V_{PD}=3.6V



P_{OUT} versus Gain Control versus R_{APC}
V_{CC}=3.6V, P_{IN}=-3dBm



P_{OUT} versus P_{IN} versus R_{APC}
V_{CC}=3.6V, V_{APC}=3.6V