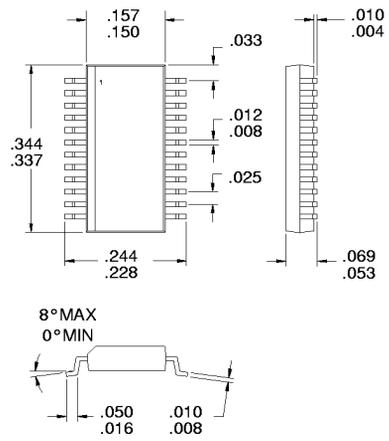


- ### Typical Applications
- Broadband PCS Receivers
 - CATV Set-top and Head-end Systems
 - High Data Rate Digital Systems
 - Portable Battery Powered Equipment
 - Dual Mode Digital/Analog Receivers
 - Wireless LAN Receivers

Product Description

The RF2604 is an extremely flexible IF subsystem suitable for use in a variety of radio receivers. It consists of four cascaded variable gain amplifiers and a fixed gain output buffer producing a total gain of 0dB to 90dB. The variable gain amplifiers can also be used in limiting mode to produce an 85dB limiting amplifier, and an on-chip RSSI circuit provides an accurate measure of received signal power. A bandgap reference voltage provides a constant 1.5V output. The device is manufactured on a high performance, low-cost Si Bipolar process and is packaged in a 24-lead plastic SSOP package.



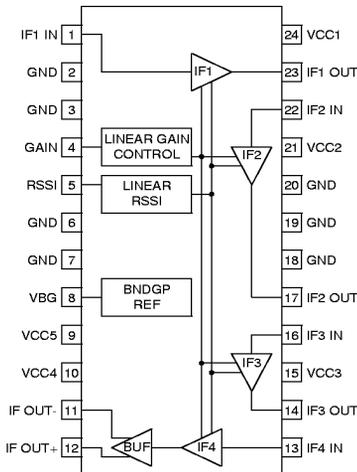
Optimum Technology Matching® Applied

- Si BJT GaAs HBT GaAs MESFET
- Si Bi-CMOS

Package Style: SSOP-24

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IF AMPLIFIERS

- ### Features
- 3V to 5V Single-supply Operation
 - Variable Gain 0dB to 90dB
 - Limiting Amplifier Mode with RSSI
 - 21 mA Current Consumption from 3.3V
 - 0V to 2V Analog Gain Control
 - 100kHz to 200MHz Operation



Functional Block Diagram

Ordering Information

RF2604	Linear IF Amplifier with AGC and RSSI
RF2604 PCBA	Fully Assembled Evaluation Board

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

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

RF2604

Absolute Maximum Ratings

Parameter	Rating	Unit
Supply Voltage	-0.5 to +6.5	V _{DC}
Input RF Level	+10	dBm
Ambient Operating Temperature	-40 to +85	°C
Storage Temperature	-55 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.		
Overall					T=25 °C, V _{CC} = 5.0V, Freq=50MHz
Frequency Range		0.1 to 200		MHz	3dB Bandwidth
Voltage Gain		0		dB	Minimum gain setting, differential output
Voltage Gain		90		dB	Maximum gain setting, differential output
Input IP ₃		+12		dBm	Minimum gain setting
Input P _{1dB}		>-5		dBm	Minimum gain setting
Noise Figure		5		dB	Maximum gain setting
Input Impedance		1500 1pF		Ω	IF1, IF2, IF3, IF4
Output Impedance		50		Ω	Buffer, single-ended, each output
Gain Control Voltage		2		V	Maximum gain setting
Gain Control Voltage		0.7		V	Minimum gain setting
Gain Control Nominal Slope		0.1		dB/mV	
RSSI Output Voltage		2.1		V	Maximum
RSSI Output Voltage		0.4		V	Minimum
RSSI Nominal Sensitivity		25		mV/dB	
Power Supply					
Operating Voltage		2.7 to 6.5		V	
Bandgap Voltage	1.45	1.50	1.55	V	V _{CC} =3.3V
Bandgap Voltage	1.50	1.55	1.60	V	V _{CC} =5.0V
Current Consumption	16	21	26	mA	V _{CC} =3.3V
Current Consumption	23	28	33	mA	V _{CC} =5.0V

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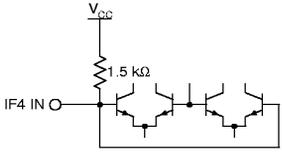
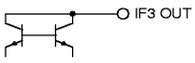
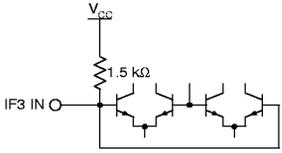
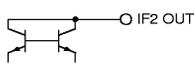
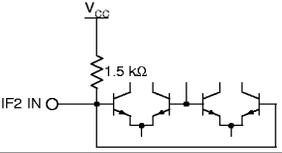
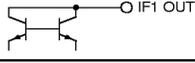
IF AMPLIFIERS

Pin	Function	Description	Interface Schematic
1	IF1 IN	IF1 amplifier input pin. This pin is NOT internally DC blocked. This pin may be connected to V_{CC} through a matching inductor or resistor. Otherwise, an external blocking capacitor should be supplied if a DC voltage, other than V_{CC} , is present on the device driving this input. In the Application Schematics, this input is matched to 50Ω to facilitate ease of connection to 50Ω test equipment. Note that the matching circuit also provides the required DC block.	
2	GND	Ground connection. Keep traces physically short and connect immediately to ground plane for best performance.	
3	GND	Same as pin 2.	
4	GAIN	Analog gain control pin. The DC voltage applied to this pin determines the gain of all four IF amplifiers. Minimum gain occurs when 0V is applied. Maximum gain occurs when approximately 2V is applied (for $V_{CC} = 5V$).	
5	RSSI	Received Signal Strength Indicator. The DC voltage at this pin is proportional to the level of signal (in dB) present in all four IF amplifiers.	
6	GND	Same as pin 2.	
7	GND	Same as pin 2.	
8	BG OUT	Band Gap voltage reference output. This voltage output is held constant over variations in supply voltage and operating temperature and may be used as a reference for other external circuitry. This pin should not be loaded such that the sourced current exceeds 1 mA. This pin should be bypassed with a large ($0.1\mu F$) capacitor.	
9	VCC5	Voltage supply for the internal band gap reference. The entire device will NOT operate if this pin is not connected to V_{CC} . This pin should be bypassed with a $0.1\mu F$ capacitor. Pins 9 and 10 may share a common bypass capacitor.	
10	VCC4	Voltage supply for the IF4 amplifier and Buffer amplifier. These amplifiers can be disabled by removing V_{CC} from this pin, and the other amplifiers, RSSI, and Gain Control circuits will still be operational. This pin should be bypassed with a $0.1\mu F$ capacitor. Pins 9 and 10 may share a common bypass capacitor.	
11	IF OUT+	Balanced output port. This is an emitter-follower output with an open emitter. DC resistance to ground must be provided by the load. If the load has DC present, a series DC blocking capacitor and a shunt loading resistor must be provided. The minimum recommended DC impedance to ground is 300Ω . The single-ended output impedance is $\sim 50\Omega$, and this output is capable of driving a 50Ω load.	
12	IF OUT-	Same as pin 11, except complementary output.	Same as pin 11.

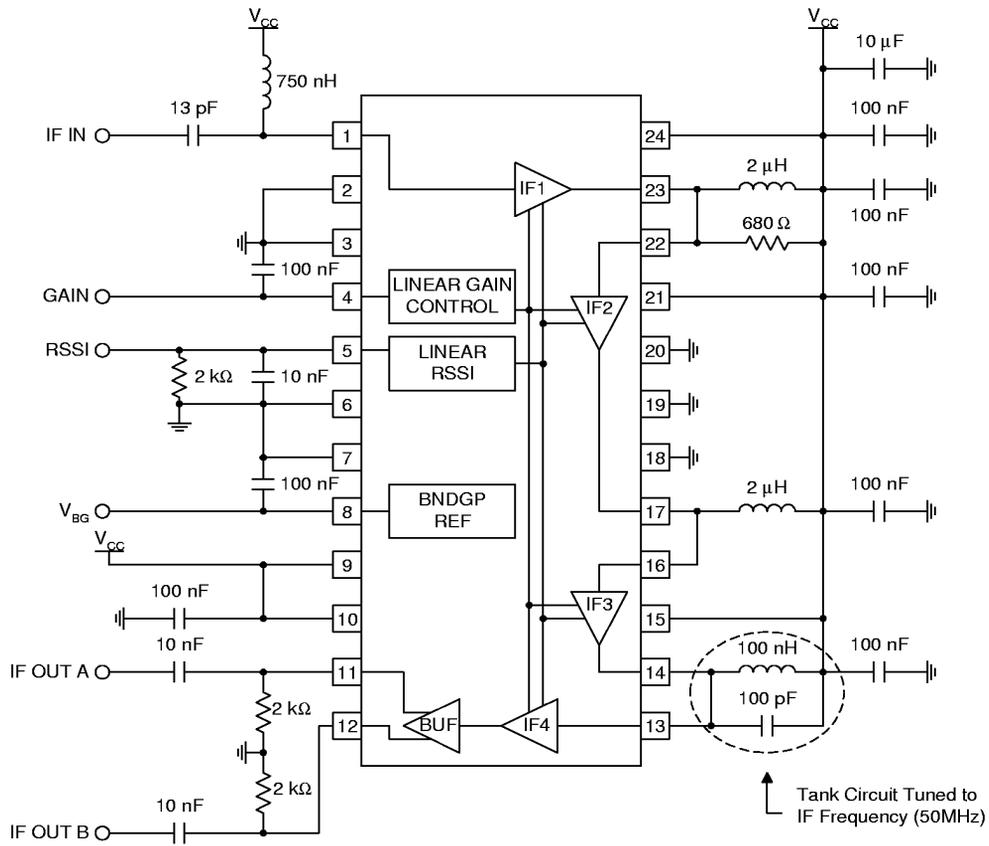
RF2604

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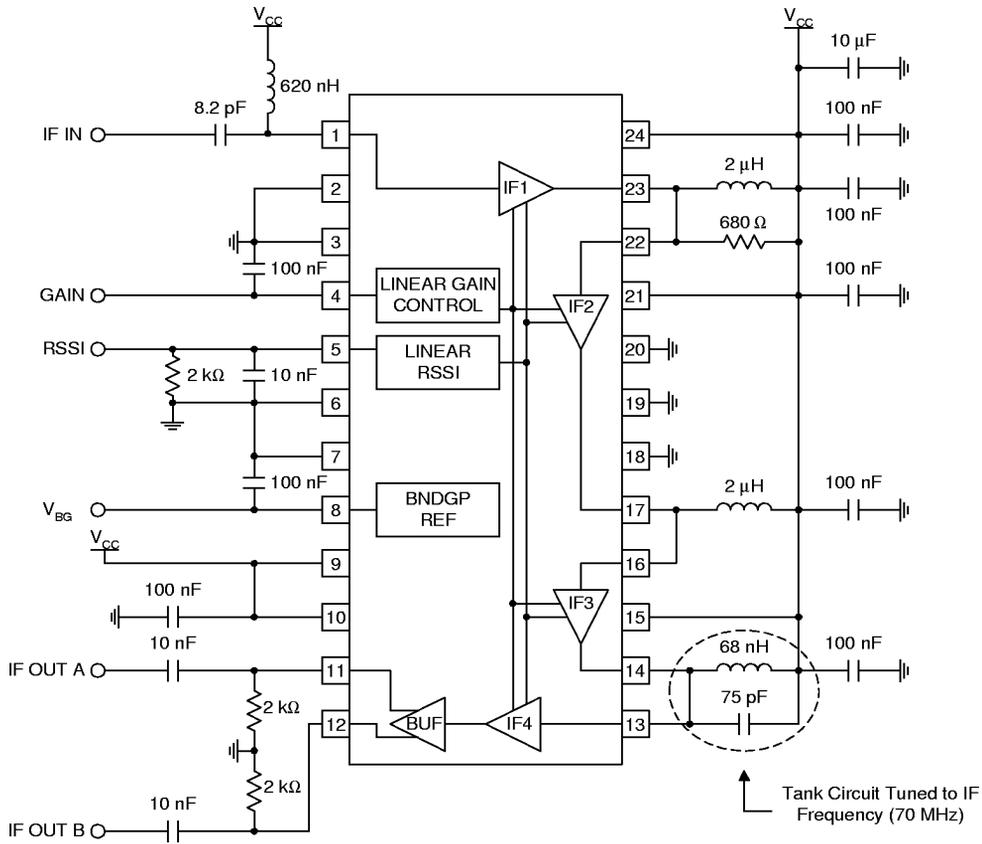
IF AMPLIFIERS

13	IF4 IN	IF4 amplifier input pin. This pin is NOT internally DC blocked. This pin may be DC connected to V_{CC} . Otherwise, an external blocking capacitor should be supplied if a DC voltage, other than V_{CC} , is present on the device driving this input.	
14	IF3 OUT	IF3 amplifier output pin. This is an open-collector output, and should be biased to V_{CC} with a choke inductor. A capacitor should be connected in parallel with the inductor to provide band-limiting filtering. The parallel tank should resonate at the IF center frequency, $\omega_{IF} = 1/(L \cdot C)^{0.5}$	
15	VCC3	Voltage supply for the IF3 amplifier. This amplifier can be disabled by removing V_{CC} from pins 15 and 14. The other amplifiers, RSSI, and Gain Control circuits will still be operational. This pin should be well bypassed.	
16	IF3 IN	IF3 amplifier input pin. This pin is NOT internally DC blocked. This pin may be DC connected to V_{CC} . Otherwise, an external blocking capacitor should be supplied if a DC voltage, other than V_{CC} , is present on the device driving this input.	
17	IF2 OUT	IF2 amplifier output pin. This is an open-collector output, and should be biased to V_{CC} with a choke inductor.	
18	GND	Same as pin 2.	
19	GND	Same as pin 2.	
20	GND	Same as pin 2.	
21	VCC2	Voltage supply for the IF2 amplifier. This amplifier can be disabled by removing V_{CC} from pins 21 and 17. The other amplifiers, RSSI, and Gain Control circuits will still be operational. This pin should be well bypassed.	
22	IF2 IN	IF2 amplifier input pin. This pin is NOT internally DC blocked. This pin may be DC connected to V_{CC} . Otherwise, an external blocking capacitor should be supplied if a DC voltage, other than V_{CC} , is present on the device driving this input.	
23	IF1 OUT	IF1 amplifier output pin. This is an open-collector output, and should be biased to V_{CC} with a choke inductor.	
24	VCC1	Voltage supply for the IF1 amplifier. This amplifier can be disabled by removing V_{CC} from pins 24 and 23. The other amplifiers, RSSI, and Gain Control circuits will still be operational. This pin should be well bypassed.	

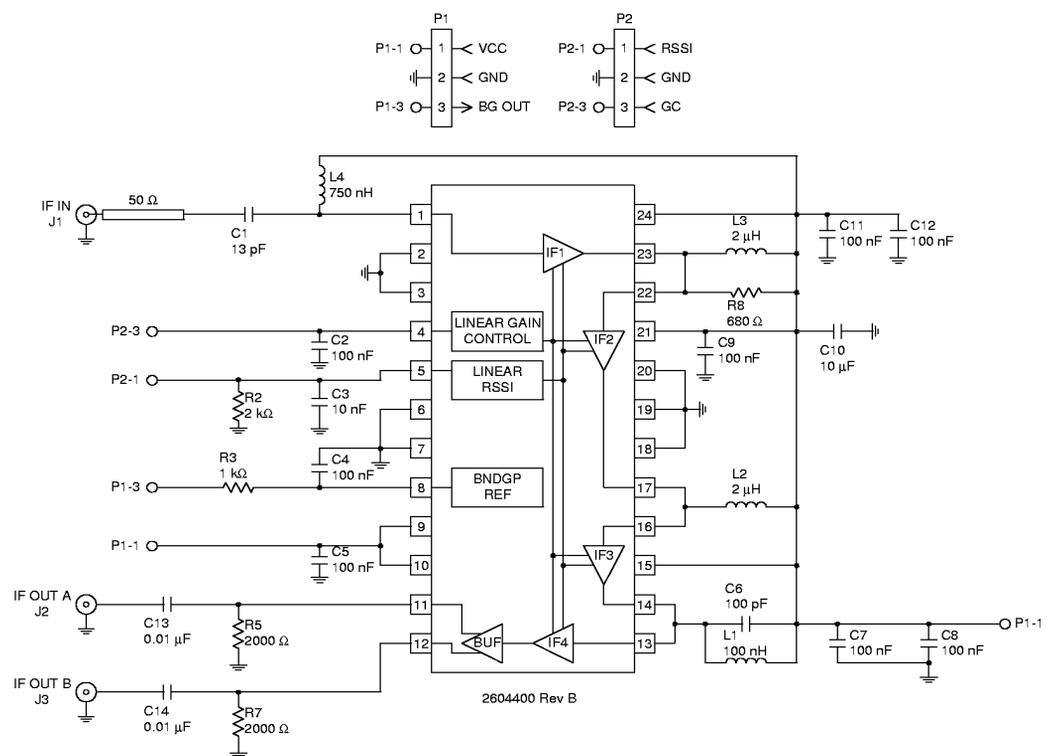
50MHz IF Application Schematic



70MHz IF Application Schematic



50MHz IF Evaluation Board Schematic



Bill of Materials RF2604PCBA

Used on: 2604410B.PCB

Item No.	Qty	Type	Value	Ref Designator
RF2604	1	QSOP-24	RF2604	DUT1
40003	1	Resistor, 1206	51	R1
40006	2	Resistor, 1206	1.5K	R4,R6
40012	1	Resistor, 1206	1K	R3
40014	2	Resistor, 1206	200	R5,R7
40016	1	Resistor, 1206	681	R8
40017	1	Resistor, 1206	2K	R2
42001	8	Capacitor, 1206	0.1uF	C2,C4,C5,C7,C8,C9,C11,C12
42011	1	Capacitor, 0805	100pF	C6
42015	1	Capacitor, 0805	330PF	C1
42024	1	Capacitor, 1206	0.01uF	C3
44001	1	Inductor, 0805CS-101XKBC	100nH	L1
44014	2	Inductor, 1008LS-222XKBB	2.2uH	L2,L3
46001	2	Connector, Panduit	MPSS100-3C	P1,P2
46003	3	Connector, SMA, EFJohnson	142-0701-881	J1,J2,J3
420008	1	Capacitor, TANT. SMT	10uF	C10

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IF AMPLIFIERS

Evaluation Board Layout

