RF9902

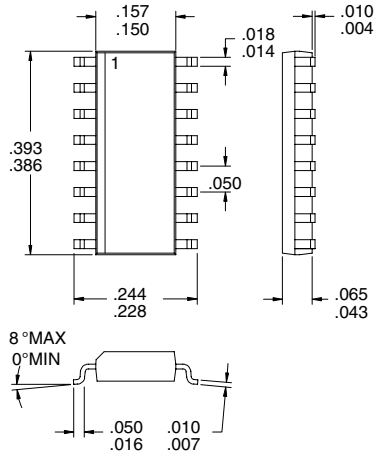
FSK RECEIVER

Typical Applications

- Handheld POS Terminals
- General Purpose 868 and 915MHz ISM Band Applications
- Digital Communication Systems
- Commercial and Consumer Systems

Product Description

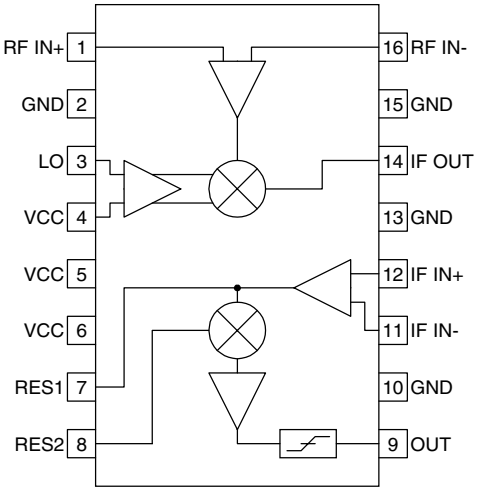
The RF9902 is a monolithic integrated circuit intended for use as a low-cost FSK receiver. The unit is provided in 16-lead plastic SOIC packaging, and is designed to operate with the RF9901 FSK transmitter. The two-chip set provides all functions necessary to implement a binary FSK transceiver for such applications as 868/915MHz ISM-band handheld terminals for POS, meter-reading, bar-code reading; as well as other digital applications such as SMR. The part contains the input amplifier, mixer, IF limiting amplifier, phase detector, and an output Schmitt trigger to generate the FSK digital signal. The part operates from a 3V to 5V supply with no negative voltage required.



Package Style: SOP-16

Optimum Technology Matching® Applied

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



Functional Block Diagram

Features

- Single 3V to 5V Supply
- Fully Integrated FSK Receiver
- Direct Binary FSK Demodulation
- CMOS / TTL Output Levels
- 400MHz to 930MHz Operation
- RF9901 Compatible

Ordering Information

RF9902	FSK Receiver
RF9902 PCBA	Fully Assembled Evaluation Board, 915MHz

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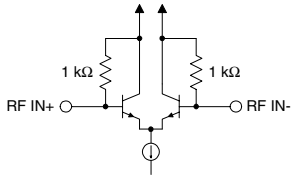
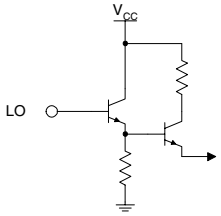
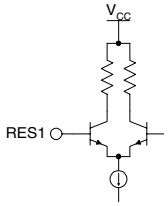
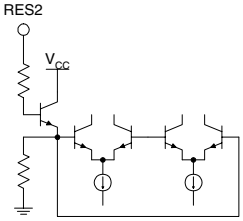
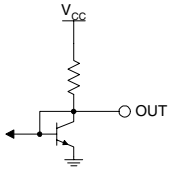
11 TRANSCEIVERS

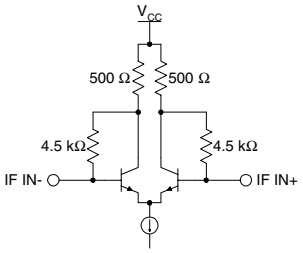
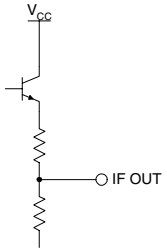
Absolute Maximum Ratings

Parameter	Rating	Unit
Supply Voltage (V_{DD})	-0.5 to +7.0	V_{DC}
Input RF Power	+12	dBm
Operating Ambient Temperature	-40 to +85	°C
Storage Temperature	-40 to +150	°C

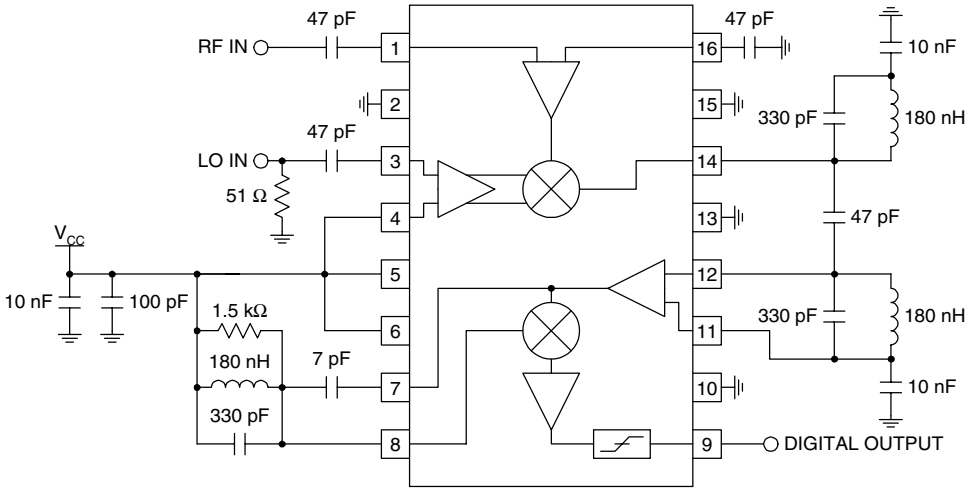
Caution! ESD sensitive device.

Parameter	Specification			Unit	Condition
	Min.	Typ.	Max.		
Overall					T=25°C, V_{CC}=+4.0V_{DC}
RF Frequency		400 to 930		MHz	
IF Frequency		3 to 30		MHz	Lower IF frequencies may be used. However, the IF amplifier is AC coupled and the IF gain rolls off significantly at low frequencies.
LO Frequency		270 to 960		MHz	
RF Gain		16		dB	
Overall Gain		108		dB	
Input IP3		-10		dBm	
Noise Figure		8			For maximum sensitivity applications, an external low noise amplifier with a gain of at least 10dB should be used. A noise image filter should be placed between the low noise amplifier and the RF9902's RF input.
Digital "0" Output Level			0.2	V	
Digital "1" Output Level	V_{CC}-0.2			V	
Polarity		"1"			$F_{IN}>F_{REF}$
Output Source/Sink Current	1			mA	
Mixer Output Resistance		500		Ω	
IF Input Resistance		500		Ω	
Power Supply					
Voltage		3.0 to 5.0		V	
Current		25		mA	

Pin	Function	Description	Interface Schematic
1	RF IN+	RF input. This port is internally biased but requires a DC blocking capacitor. The functionality of this pin and pin 16 may be interchanged.	
2	GND	Ground. This pin should be tied to the backside ground plane as close to the package as possible.	
3	LO	Local Oscillator input. This pin requires a DC blocking capacitor. The LO signal level should be between -6dBm and -3dBm for optimum performance.	
4	VCC	V_{CC}. This pin should be bypassed to ground as close to the package as possible using a chip capacitor.	
5	VCC	V_{CC}. This pin should be bypassed to ground as close to the package as possible using a chip capacitor.	
6	VCC	V_{CC}. This pin should be bypassed to ground as close to the package as possible using a chip capacitor.	
7	RES1	Provides the sampled IF signal phase shifted for the quadrature tank circuit connected to pin 8 using a capacitor. The value of the capacitor is typically 7pF for a 20MHz IF and will vary based upon the IF used.	
8	RES2	Quadrature tank circuit. The external resonator should be tied between this pin and V_{CC}. (V_{CC} is needed to DC bias the pin to the power voltage). The object of the tank circuit is to obtain a 90° phase shift between the ports of the demodulator at the center IF frequency. When at 90° the modulation comparator is near its threshold. It is the relative phase shift versus frequency which determines the modulation state of the signal. Ideally, the Q of the tank circuit should be such that the 3dB bandwidth is approximately equal to the modulated frequency shift of the carrier. Wider bandwidths are possible provided that the peak-to-peak phase shift is at least 45°.	
9	OUT	Digital output which indicates the modulation state of the carrier input. It is a logic signal, which when low, is equal to 0V plus a small offset (100mV). When high it indicates positive modulation and the voltage goes to within ~100mV of V_{CC}. The output circuit is a Schmitt Trigger to prevent "chatter" during transitions.	
10	GND	Ground. This pin should be tied to the backside ground plane as close to the package as possible.	

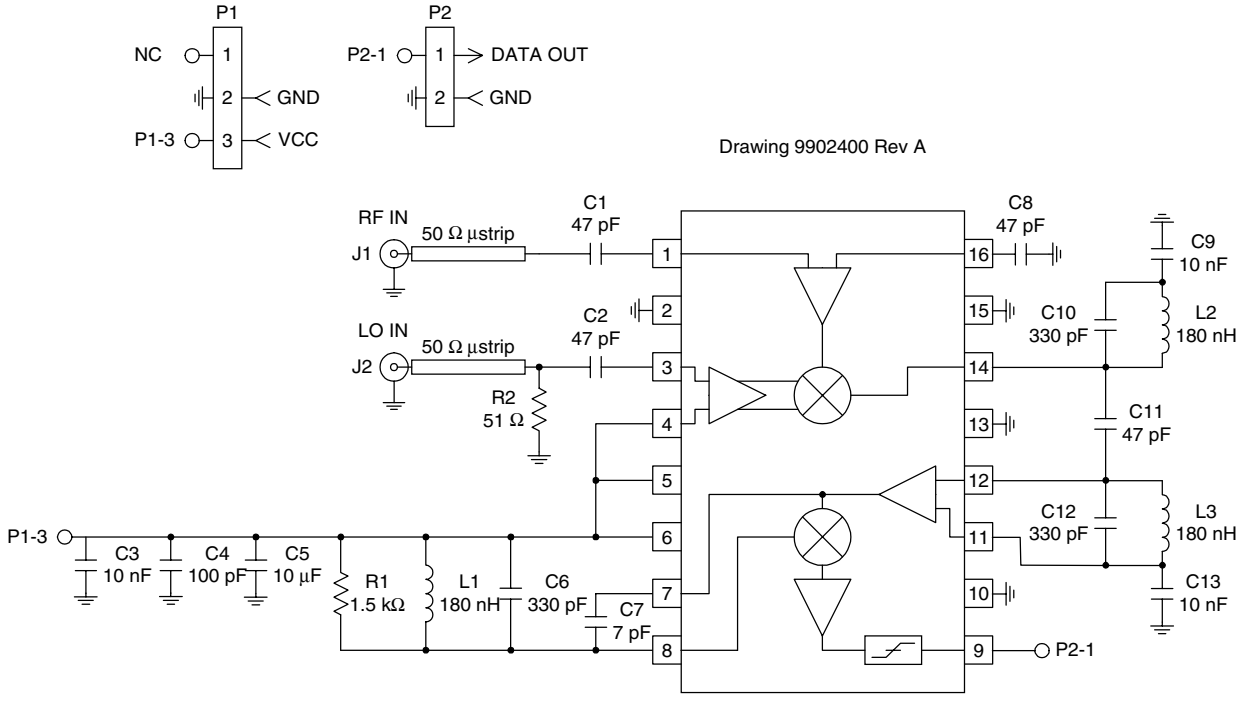
11	**IF IN-**	Complementary IF input from the IF filter. The input impedance is about 500Ω (each input). There may be a low impedance DC and high impedance AC path from pin 12 to this pin; or this pin and pin 12 may be a DC open. The DC from the mixer output must be blocked. This pin should be bypassed to ground near the package with a chip capacitor whose reactance is low at the IF frequency.	
12	**IF IN+**	IF input from the IF filter. The input impedance is about 500Ω (each input). There may be a low impedance DC and high impedance AC path from this pin to pin 11; or pin 11 and this pin may be a DC open. The DC from the mixer output must be blocked. Pin 11 should be bypassed to ground near the package with a chip capacitor whose reactance is low at the IF frequency.	See pin 11.
13	**GND**	Ground. This pin should be tied to the backside ground plane as close to the package as possible.	
14	**IF OUT**	Mixer output. This pin cannot be resistively (DC) loaded. A coupling capacitor or filter which has a high DC resistance should be connected to this pin. The circuitry around pin 12 and this pin is dependent on the filter type used. If a ceramic filter is used (open circuit DC path), this pin is tied to the input of the filter and the output is connected to pin 12. Pin 11 is then bypassed to ground with a chip capacitor near the package. The IF response is peaked at about 20MHz. The gain is sufficiently high, however, that an IF of 3MHz to 30MHz may be used with good results.	
15	**GND**	Ground. This pin should be tied to the backside ground plane as close to the package as possible.	
16	**RF IN-**	Out-of-phase RF input. This pin should be AC grounded as close to the package as possible using a chip capacitor. The functionality of this pin and pin 1 may be interchanged.	See pin 1.

Application Schematic



Evaluation Board Schematic

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



Note: Component Values for 20 MHz IF Frequency.

Evaluation Board Layout