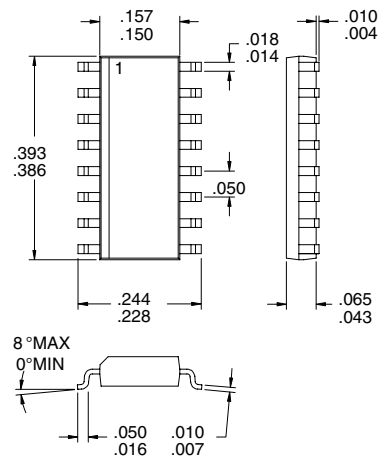


### Typical Applications

- 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.



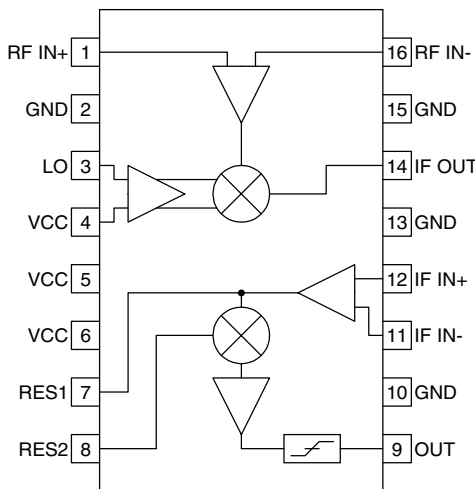
### Optimum Technology Matching® Applied

- |  |                                   |                                      |
|--|-----------------------------------|--------------------------------------|
| <input checked="" type="checkbox"/> Si BJT | <input type="checkbox"/> GaAs HBT | <input type="checkbox"/> GaAs MESFET |
| <input type="checkbox"/> Si Bi-CMOS        | <input type="checkbox"/> SiGe HBT | <input type="checkbox"/> Si CMOS     |

### Package Style: SOP-16

### Features

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



**Functional Block Diagram**

### Ordering Information

- |             |  |
|-------------|--|
| RF9902      | FSK Receiver                             |
| RF9902 PCBA | 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>

**RF9902****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	$^{\circ}C$
Storage Temperature	-40 to +150	$^{\circ}C$

**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).

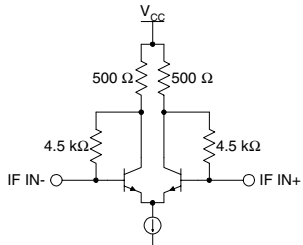
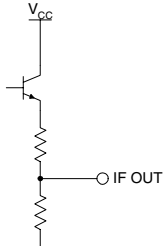
Parameter	Specification			Unit	Condition
	Min.	Typ.	Max.		
<b>Overall</b>					$T=25^{\circ}C, V_{CC}=+4.0V_{DC}$
RF Frequency		400 to 930		MHz	Lower IF frequencies may be used. However, the IF amplifier is AC coupled and the IF gain rolls off significantly at low frequencies.  For maximum sensitivity 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.
IF Frequency		3 to 30		MHz	
LO Frequency		270 to 960		MHz	
RF Gain		16		dB	
Overall Gain		108		dB	
Input IP3		-10		dBm	
Noise Figure		8			
Digital "0" Output Level			0.2	V	
Digital "1" Output Level	$V_{CC}-0.2$			V	
Polarity		"1"			
Output Source/Sink Current	1			mA	
Mixer Output Resistance		500		$\Omega$	
IF Input Resistance		500		$\Omega$	
<b>Power Supply</b>					
Voltage		3.0 to 5.0		V	
Current		25		mA	

**11**

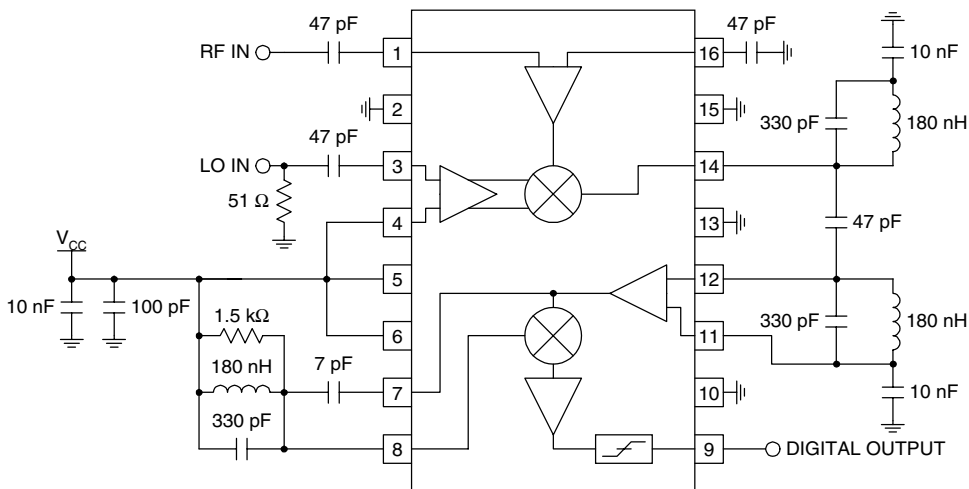
TRANSCIVERS

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 <sub>CC</sub> . This pin should be bypassed to ground as close to the package as possible using a chip capacitor.	
5	VCC	V <sub>CC</sub> . This pin should be bypassed to ground as close to the package as possible using a chip capacitor.	
6	VCC	V <sub>CC</sub> . 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 <sub>CC</sub> . (V <sub>CC</sub> 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 <sub>CC</sub> . 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.	

# RF9902

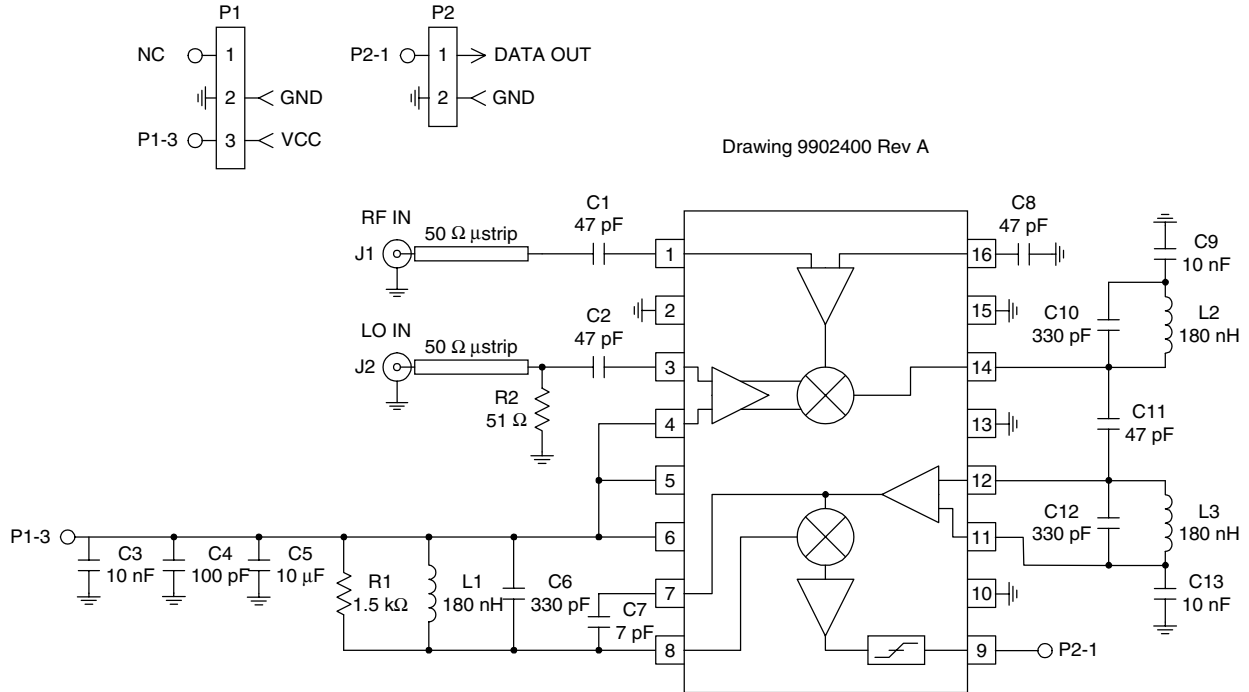
11	IF IN-	Complementary IF input from the IF filter. The input impedance is about 500Ω (each input). There may be a low impedance DC and high impedance AC path from pin 12 to this pin; or this pin and pin 12 may be a DC open. The DC from the mixer output must be blocked. This pin should be bypassed to 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

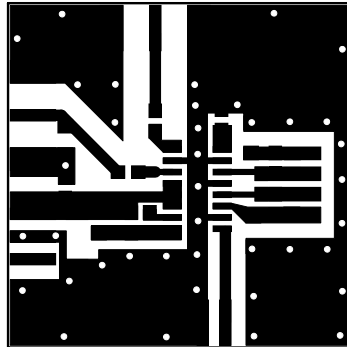
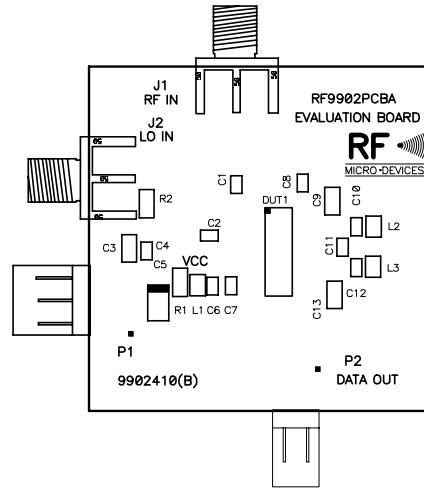
(Download [Bill of Materials](http://www.rfmd.com) from [www.rfmd.com](http://www.rfmd.com).)



Note: Component Values for 20 MHz IF Frequency.

# RF9902

## Evaluation Board Layout



SUNSTAR 商斯达实业集团是集研发、生产、工程、销售、代理经销、技术咨询、信息服务等为一体的高科技企业，是专业高科技电子产品生产厂家，是具有 10 多年历史的专业电子元器件供应商，是中国最早和最大的仓储式连锁规模经营大型综合电子零部件代理分销商之一，是一家专业代理和分销世界各大品牌 IC 芯片和电子元器件的连锁经营综合性国际公司，专业经营进口、国产名厂名牌电子元件，型号、种类齐全。在香港、北京、深圳、上海、西安、成都等全国主要电子市场设有直属分公司和产品展示展销窗口门市部专卖店及代理分销商，已在全国范围内建成强大统一的供货和代理分销网络。我们专业代理经销、开发生产电子元器件、集成电路、传感器、微波光电元器件、工控机/DOC/DOM 电子盘、专用电路、单片机开发、MCU/DSP/ARM/FPGA 软件硬件、二极管、三极管、模块等，是您可靠的一站式现货配套供应商、方案提供商、部件功能模块开发配套商。商斯达实业公司拥有庞大的资料库，有数位毕业于著名高校——有中国电子工业摇篮之称的西安电子科技大学（西军电）并长期从事国防尖端科技研究的高级工程师为您精挑细选、量身订做各种高科技电子元器件，并解决各种技术问题。

微波光电部专业代理经销高频、微波、光纤、光电元器件、组件、部件、模块、整机；电磁兼容元器件、材料、设备；微波 CAD、EDA 软件、开发测试仿真工具；微波、光纤仪器仪表。欢迎国外高科技微波、光纤厂商将优秀产品介绍到中国、共同开拓市场。长期大量现货专业批发高频、微波、卫星、光纤、电视、CATV 器件：晶振、VCO、连接器、PIN 开关、变容二极管、开关二极管、低噪晶体管、功率电阻及电容、放大器、功率管、MMIC、混频器、耦合器、功分器、振荡器、合成器、衰减器、滤波器、隔离器、环行器、移相器、调制解调器；光电子器件和组件：红外发射管、红外接收管、光电开关、光敏管、发光二极管和发光二极管组件、半导体激光二极管和激光器组件、光电探测器和光接收组件、光发射接收模块、光纤激光器和光放大器、光调制器、光开关、DWDM 用光发射和接收器件、用户接入系统光收发器件与模块、光纤连接器、光纤跳线/尾纤、光衰减器、光纤适配器、光隔离器、光耦合器、光环行器、光复用器/转换器；无线收发芯片和模组、蓝牙芯片和模组。

更多产品请看本公司产品专用销售网站：

商斯达中国传感器科技信息网：<http://www.sensor-ic.com/>

商斯达工控安防网：<http://www.pc-ps.net/>

商斯达电子元器件网：<http://www.sunstare.com/>

商斯达微波光电产品网：[HTTP://www.rfoe.net/](http://www.rfoe.net/)

商斯达消费电子产品网：<http://www.icasic.com/>

商斯达实业科技产品网：<http://www.sunstars.cn/> 微波元器件销售热线：

地址：深圳市福田区福华路福庆街鸿图大厦 1602 室

电话：0755-82884100 83397033 83396822 83398585

传真：0755-83376182 (0) 13823648918 MSN: SUNS8888@hotmail.com

邮编：518033 E-mail:szss20@163.com QQ: 195847376

深圳赛格展销部：深圳华强北路赛格电子市场 2583 号 电话：0755-83665529 25059422

技术支持：0755-83394033 13501568376

欢迎索取免费详细资料、设计指南和光盘；产品凡多，未能尽录，欢迎来电查询。

北京分公司：北京海淀区知春路 132 号中发电子大厦 3097 号

TEL: 010-81159046 82615020 13501189838 FAX: 010-62543996

上海分公司：上海市北京东路 668 号上海赛格电子市场 D125 号

TEL: 021-28311762 56703037 13701955389 FAX: 021-56703037

西安分公司：西安高新开发区 20 所(中国电子科技集团导航技术研究所)

西安劳动南路 88 号电子商城二楼 D23 号

TEL: 029-81022619 13072977981 FAX:029-88789382