RCR-XXX-HP

Low cost 315/418/433.92 MHz Super-Het
ASK/OOK Receiver

Typical Applications

- Remote Keyless Entry (RKE)
- Remote Lighting Controls
- On-Site Paging
- Asset Tracking
- Wireless Alarm and Security Systems
- Long Range RFID
- Automated Resource Management

Features

- Low Cost
- 150kHz receiving bandwidth
- 5V operation
- 4.5mA current drain
- No External Parts are required
- Small Size: 1.98” x 0.72”
- 4800 baud operation

Description

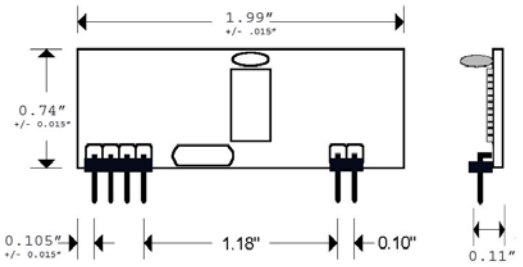
The RCR-XXX-HP is ideal for remote control applications where low cost and longer range are required. The receiver module requires no external RF components except for the antenna. It generates virtually no emissions, making FCC and ETSI approvals easy.
The super-heterodyne design exhibits exceptional sensitivity and selectivity. A SAW filter can be added to the antenna input to improve selectivity for applications that require robust performance.
The manufacturing-friendly SIP style package and low-cost make the
RCR-433-HP suitable for high volume applications.

Document Control

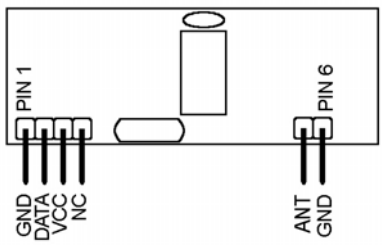
Created By	Steve Montgomery	5/21/01
Engineering Review		
Marketing Review		
Approved - Engineering		
Approved - Marketing		

Revision History

Revision	Author	Date	Description
1.0	SJM	5/21/01	Document Created
1.1	GWH	7/29/03	Updated.
1.2	SJM	11/22/04	Updated



Mechanical Drawing



Pinout Diagram

Notes:

1). When designing products with the module, the designer should account for tolerances in the dimensions of the circuit board.
2). Component location and spacing are subject to change. The designer should not place any components inside the footprint of the module.

Absolute Maximum Ratings

Rating	Value	Units
Power Supply and All Input Pins	-0.3 to +12	VDC
Storage Temperature	-50 to +100	°C
Soldering Temperature (10 sec)	350	°C

Electrical Characteristics

Characteristic	Symbol	Min	Typ	Max	Units	Notes
Operating Voltage	V_{cc}	4.5	5.0	5.5	VDC	None
Operating Current	I_{cc}	--	4.5	--	MA	None
Reception Bandwidth	BW_{rx}	--	150	--	KHz	None
Center Frequency	F_c	--	315	--	MHz	RCR-315-HP
	F_c	--	418	--	MHz	RCR-418-HP
	F_c	--	433.92	--	MHz	RCR-433-HP
Sensitivity	None	--	-109	--	dBm	None
Baud Rate – NRZ	None	1200	--	4800	bps	None
Baud Rate – PWM	None	120	--	2400	Bps	None
Audio Bandwidth	BW_{audio}	.15	--	2.8	KHz	None
Selectivity	None	TBD			TBD	TBD
Operating Temperature	T_{op}	-20	--	+70	°C	TBD

Pin Description

Pin	Name	Description
1	GND	Receiver Ground. Connect to ground plane.
2	DATA	Digital data output. This output is capable of driving one TTL or CMOS load. It is a CMOS compatible output.
3	V_{cc} (5v)	Provides operating voltage for the receiver. VCC should be bypassed with a .01μF ceramic capacitor and filtered with a 4.7μF tantalum capacitor. Noise on the power supply will degrade receiver sensitivity.
4	NC	Do Not Connect.
5	ANT	50 Ω antenna input.
6	GND	Receiver Ground. Connect to ground plane.

Theory of Operation

Super-Heterodyne AM Detection

The RCR-XXX-HP is a super-heterodyne AM receiver with a built-in data slicer. The incoming AM carrier is amplified and downconverted to an intermediate frequency (IF) of 10.7MHz. This IF is filtered using a ceramic bandpass filter with a 150kHz 3dB bandwidth.
The output of the IF filter is then amplified and demodulated using diode detector. The output of the diode detector is the demodulated AM envelope of the carrier. This signal is applied to the data slicer to generate the TTL/CMOS output.

Data Slicer

The data slicer converts the baseband analog signal from the diode detector to a CMOS/TTL compatible output. Because the data slicer is AC coupled to the audio output, there is a minimum data rate. AC coupling also limits the minimum and maximum pulse width. Typically, data is encoded on the transmit side using pulse-width modulation (PWM) or non-return-to zero (NRZ).
The most common source for NRZ data is from a UART embedded in a micro-controller. Applications that use NRZ data encoding typically involve microcontrollers. Refer to the RCR-XXX-HP designer's guide for more information on using NRZ data encoding.
The most common source for PWM data is from a remote control IC such as the HC-12E from Holtek.
Data is sent as a constant rate square-wave. The duty cycle of that square wave will generally be either 33% (a zero) or 66% (a one). The data slicer on the RCR-XXX-HP is optimized for use with PWM encoded data, though it will work with NRZ data if certain encoding rules are followed. The data slicer is designed to drive one(1) TTL or CMOS load. A buffer must be used if the data output is going to drive more than one TTL/CMOS load or if the load is a lower-impedence (<100K).

Power Supply

The RCR-XXX-HP is designed to operate from a 5V power supply. It is crucial that this power supply be very quiet. The power supply should be bypassed using a 0.01uF low-ESR ceramic capacitor and a 4.7μF tantalum capacitor. These capacitors should be placed as close to the power pins as possible. The RCR-XXX-HP is designed for continuous duty operation. From the time power is applied, it can take up to 100mSec for the data output to become valid.

Antenna Input

Pin 1 is a 50 ohm antenna input. It will support most antenna types, including printed antennas integrated directly onto the PCB.

If a trace is longer than 1/8th the wavelength of the frequency it is carrying, it should be a 50 ohm microstrip.

Ordering Information

PRODUCT	ORDER CODE
RCR-315-HP	RCR-315-HP
RCR-418-HP	RCR-418-HP
RCR-433-HP	RCR-433-HP

Radiotronix Inc.

207 Industrial Blvd.
Moore, OK 73044

(405) 794-7730
(405) 794-7477 (Fax)

www.radiotronix.com
sales@radiotronix.com