RX-3302(L)/RX-4303 Manual

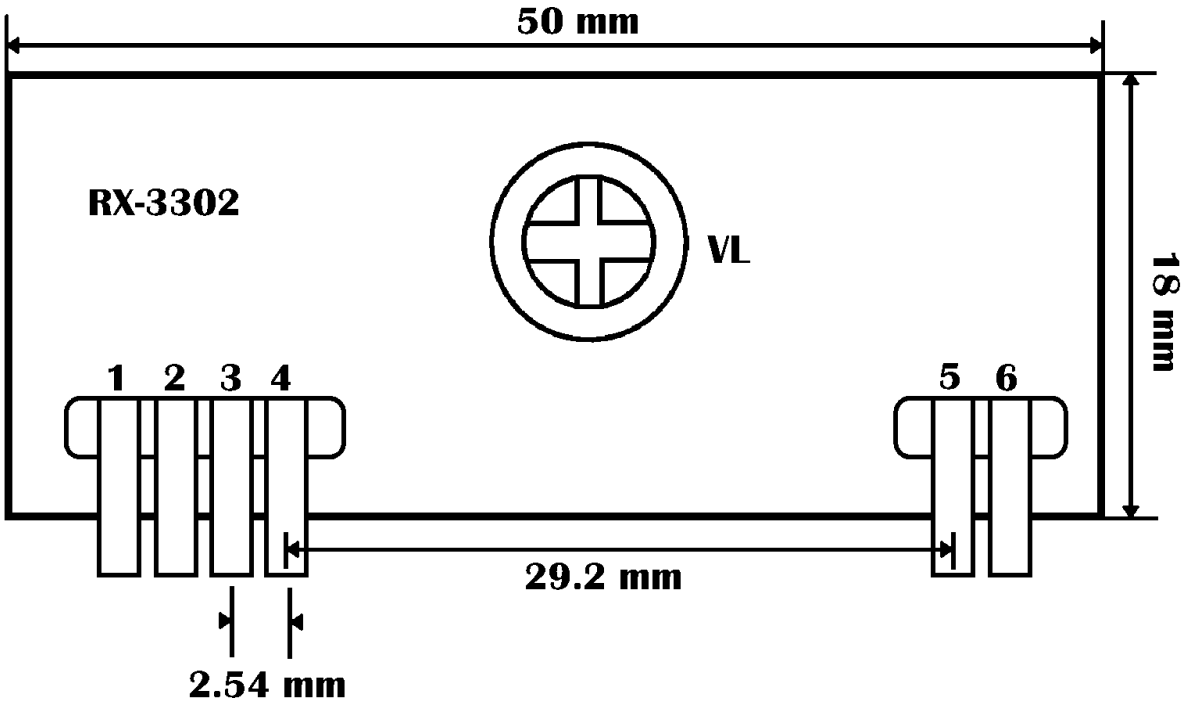
1. Introduction

This is the radio frequency receiver module which can facilitate the OEM designers to design their remote control applications in remote control in the quickest way. The circuit is designed with SMD components and the module size is small enough to be able to be fitted in almost any application.

★ Super-regenerative Version W/O Decoder (AM): RX-3302, RX-3302L, RX-4303

AM: Amplitude Modulation

■ **RX-3302(L)/RX-4303 receiver module has pin outs as follows:**



PIN 1 : GND PIN 2 : Digital Output
PIN 3 : VCC (5V DC) PIN 4 : Linear Output (For Testing)
PIN 5 : ANT (Antenna) PIN 6 : GND

- Comparison Table:

Model	SR/SH mode	POWER	Data Rate(bps)	SENSITIVITY dBm	POWER CONSUMP.(mA)	Modulation
RX-3301	SR	+5V DC	300~5K	-103	1.80	AM
RX-3302	SR	+5V DC	300~5K	-103	1.93	AM
RX-3302L	SR	+5V DC	300~5K	-98	0.33	AM
RX-3304	SR	+5V DC	300~5K	-100	2.70	AM
RX-3300	SH	+5V DC	300~3K	-100	5.00	AM
RX-4303 (Mitel)	SH	+5V DC	1K~2.5K	-110	4.40	AM
RX-4303 (Infineon)	SH	+5V DC	1K~2.5K	-110	4.65	AM
RXF-4303(Infineon)	SH	+5V DC	1K~2.5K	-100	5.76	FM

Notes:
SR: Super-Regenerative SH: Super-Heterodyne
AM: Amplitude Modulation FM: Frequency Modulation

Note: RX-3302 is small in size, and its power consumption is only 1.93mA. This receiver module is very stable, more than 1 million units have been available in the market up to now. With –103 dBm of sensitivity and with 1.93 mA of power consumption, it is one of the most popular receiver module in the world.

2. Functionality Difference:

There are 2 major application types involved:

2.1 For fixed code application:

Above rf module does not include the decoder IC, thus you have to either add the decoder IC in your circuit or implement the decoder software in microprocessor by yourself. If you use the fixed code transmitters from us, then there are the following choices for your design:

A. Without using the decoder IC:
If the decoder IC is not used, then you have to program your CPU to emulate the decoder function. In this approach, an EEPROM is strongly recommended so that the system's important parameters can be stored even after power off.

On the PCB layout of your control board, be very careful in the following point so that no data loss can happen:
During PCB layout stage, be sure that the ground of the CPU and the external reset IC and the nonvolatile EEPROM should go to one common point first and then go to the power ground. Keep the ground line as short as possible. It is important to test if data loss happens using power noise simulator before starting the mass production. Note that transmitter codes are normally stored in the non-volatile EEPROM memory. If power loss happens, then this means that the transmitter codes are lost from the memory and the user has to relearn the transmitter again. This is the key check point before approving a design.

B. Decoder IC is used:
1) For 2-button transmitter using the encoder IC PT2262 or PT2260, then the decoder IC PT2272A-M2 (momentary type) or PT2272A-L2 (latch type) is needed.
2) For the 4-button transmitter using IC PT2262 or PT2260, then the decoder IC PT2272-M4 (momentary type) or PT2272-L4 (latch type) is needed.

Either approach will aid you to make our following fixed code transmitters available for your choice:
1) TX-3312-2 series: Based on PT-2262, 2-button (LC design) There are 3 different types for the cases.
2) TX-3312S-2: Based on PT2260-R2, 2-button (SAW design) There are 3 different types for the cases.
2) TX-3313-2: Based on PT-2262, 2-button (LC design)
3) TX-3314-2 series: Based on PT-2260-R2, 2-button (LC design) There are 4 different types for the cases.
4) TX-3314S-2 series: Based on PT-2260-R2, 2-button (SAW design) There are 4 different types for the cases.
5) TX-3316-2 series: Based on PR-2260-R2, 2-button (LC design) There are 3 different types for the cases.
6) TX-4301-2 series: Based on PT-2262, 2-button (SAW design) There are two types for the PCB circuit, one with DIP switch for code adjustment.
7) TX-4311-4: Based on PT-2262, 4-button (LC design)
8) TX-4314-4: Based on PT-2262, 4-button (LC design)
9) TX-4311S-4: Based on PT-2262, 4-button (SAW design)
10) TX-4314S-4: Based on PT-2262, 4-button (SAW design)
11) TX-4312-4 series: Based on PT2260-R4, 4-button (LC design) There are 2 different types for the cases.

If you prefer a simpler approach without involving the decoder function, then you can select our other receivers with decoder function built in as follows:
1) RX-3302D2(2C1): AM+SR, W/2-button decoder
2) RX-3302D4(4C1): AM+SR, W/4-button decoder
3) RX-4303D2(2C1): AM+SH, W/2-button decoder
4) RX-4303D4(4C1): AM+SH, W/4-button decoder
5) RXF-4303D2(2C1): FM+SH, W/2-button decoder
6) RXF-4303D4(4C1): FM+SH, W/4-button decoder

Notes:
AM: Amplitude Modulation, or ASK(Amplitude Shift Key)
FM: Frequency Modulation, or FSK(Frequency Shift Key)
SR: Super-Regenerative SH: Super-Heterodyne

2.2 For rolling code application:

If you want to use the rolling code transmitters from us, then you have to program the CPU to emulate the decoder and handle the rolling code algorithm.
You can program the CPU so that our 2-button transmitters (version A1) such as TX-3312R, TX-3313R, TX-3315(S), TXF-3315, TX-3316R and TXF-3313R which use HCS-200 as its encoder can have three channels as follows:

- After decoding, if the function code is $2H_X$, then it is signal from button #1.
- After decoding, if the function code is $4H_X$, then it is signal from button #2.
- After decoding, if the function code is $6H_X$, then it is signal from button #1 and button #2.

For 4-button rolling code transmitters (version A1) such as TX-4311R(S), TX-4312R(S), TX-4313R(S), TX-4314R(S) or TXF-4311R which use HCS301 as its encoder, you can have more than 4 channels as follows:

- After decoding, if the function code is $2H_X$, then it is signal from button #1.
- After decoding, if the function code is $4H_X$, then it is signal from button #2.
- After decoding, if the function code is $8H_X$, then it is signal from button #3.
- After decoding, if the function code is $1H_X$, then it is signal from button #4.

Note that you must check with our sales people for the encryption key we have implemented in our A1 version so that your decoder software can match with our A1 transmitters.

■ Frequency Difference

There are the following choices currently from us:

Models	Frequency	Osc./LC	Bandwidth
RX-3300	434MHz	LC	8 MHz
RX-3302	434 MHz	LC	12 MHz
RX-3302L	434 MHz	LC	12 MHz
RX-3304	434 MHz	LC	12 MHz
RX(F)-4303	433.92 MHz	Crystal	600 KHz
RX-4301	433.92MHz	Crystal	3MHz

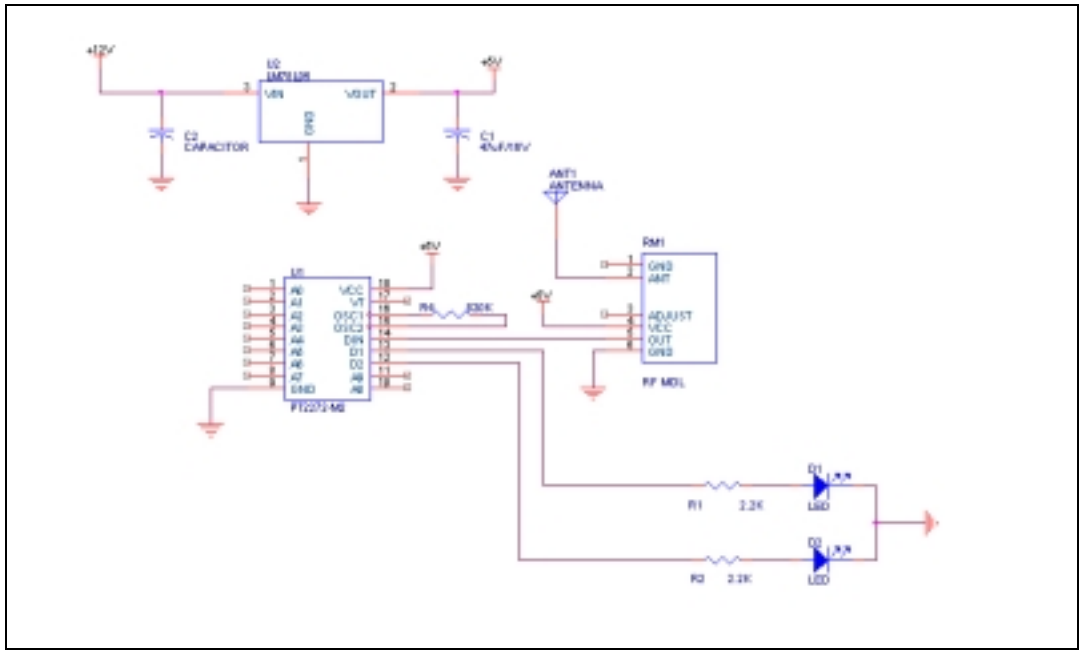
Notes:

1. RX-3302 is recommended to match with only the LC transmitters.
2. Bandwidth is measured at –20dBm.

3. APPLICATIONS

- ■ Automotive remote entry systems
- ■ Automotive alarm systems
- ■ Gate and garage door openers
- ■ Electronic door locks
- ■ Burglar alarm systems

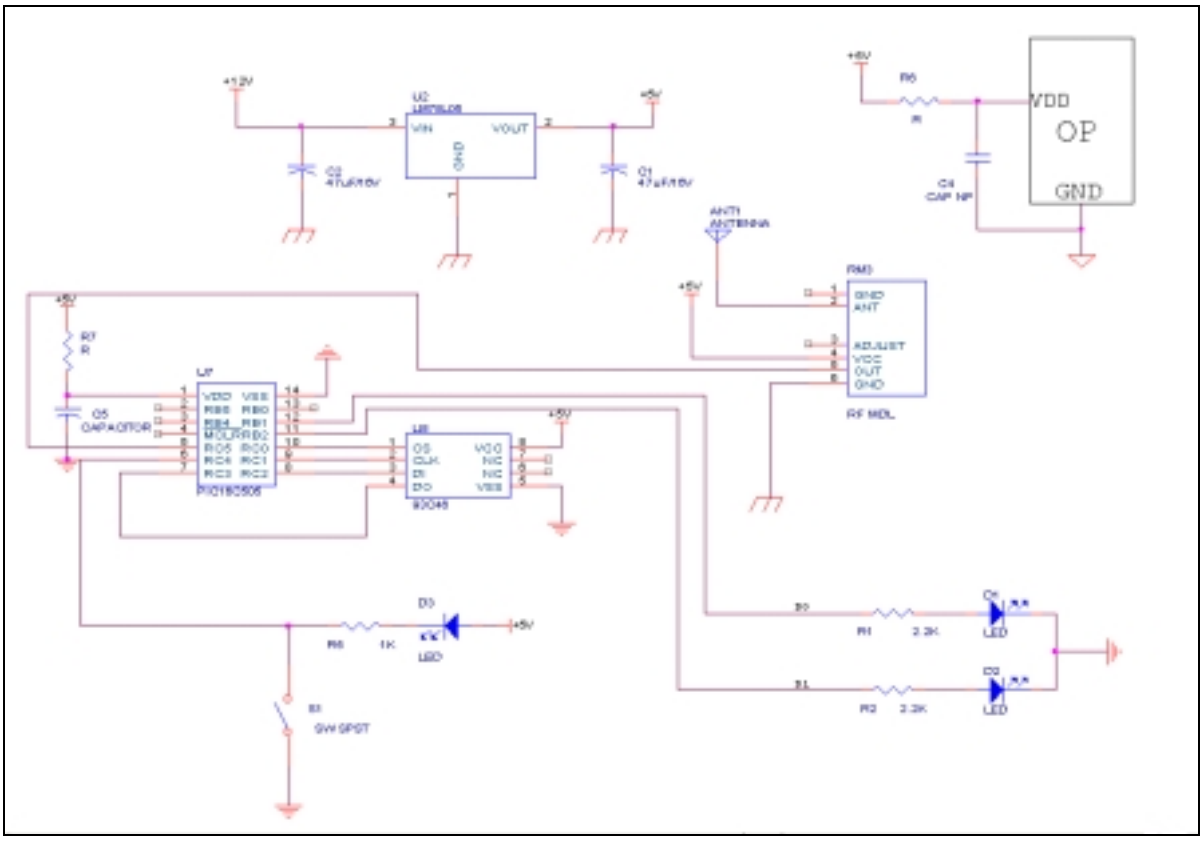
4. Simple Application Board Circuit (Using Fixed Code Decoder)



Application notes:

1. **The power circuit for VCC (5V DC) is recommended to use regulator such as 78L05 and a big capacitor at least 47uF to be used so that ripple noise can be reduced.**
2. **RF MDL stands for receiver modules such as RX-3301, RX-3302, RX(F)-4303.**
3. **For PCB layout, ground of RF MDL to the power ground should be as short as possible.**
4. **LED-1 will be lit on while button #1 is being pressed and LED-2 will be lit on while button #2 is being pressed.**
5. **There is Design Kit for this receiver module from us.**

5. Simple Application Board Circuit (Using Software Decoder)



Application notes:

1. **The power circuit for VCC (5V DC) is recommended to use regulator such as 78L05 and a big capacitor at least 47uF to be used so that ripple noise can be reduced.**
2. **PIC16C505 is a microprocessor from Microchip. 93C46 is an EEPROM for storing system parameters and transmitter codes.**
   RF MDL stands for receiver modules such as RX-3301, RX-3302, RX(F)-4303.
3. **If the microprocessor is working with high speed crystal, then super-heterodyne receiver such as RX-4303 or RXF-4303 is recommended because the radiation and interference is too high.**
4. **For PCB layout, ground of receiver module(RF MDL) should be connected directly to power ground. In between, no other grounds can join in. The receiver module is analog and it is very sensitive and prone to interference. The ground of the microprocessor or operation amplifier (OP) should go a separate path to power ground.**
   Note that there are three different ground symbols on the diagrams.
5. **For PCB layout, ground path from RF MDL to the power ground should be as short as possible.**
6. **LED-3 is to be used together with the code learning switch S1.**
7. **LED-1 is to be lit on while button #1 is being pressed and LED-2 will be lit on while button #2 is being pressed.**
8. **There are Design Kit for this module from us.**

6. Noise Immunization

This RF receiver is sensitive to RF noise in the passband because the desired transmitter signals are at very low power levels. Some common noise sources are microprocessors, brush-type motors and high-speed logic circuits. If the rise time and fall time of the clock in a microprocessor are fast enough to produce harmonics in the frequency range of the receiver input and the harmonics fall within the passband of the receiver, then special care must be taken to reduce the level of the harmonic at the antenna port of the receiver.
Based on above analysis, the following actions have to be taken:

A. Microprocessor choice:
Choose those microprocessors which has lowest rise time and lowest fall time, if available.
B. Brush-type motor choice:
Choose those brush-type motors which has spark suppression built in or better not to use such type of motors.
C. Logic circuits choice:
High speed logic circuits generates noise similar to microprocessors. Thus better to choose those circuits with the lowest rise time and the lowest fall time, if available.
D. Place the receiver and its antenna as far from the noise source as possible.
E. During PCB layout, keep line lengths at a minimum that carry high speed logic signals or supply brush type motors. Such lines work like antennas that radiate the unwanted noise.
F. If possible, enclose the noise source in a grounded metal box and use RF-decoupling on the input/output lines.
G. It is advisable to use separate voltage regulator for the RF receiver. If the same voltage regulator has to be used for cost purpose, then a decoupler circuit is recommended so that high frequency noise can be screened.
H. The ground path from the receiver module should go directly to the power ground, in between, no other ground paths can join in, otherwise, noise will be introduced in and receiver function will be greatly influenced.

7. Recommended Antenna

Suitable antennas are suitable to the success of low-power wireless application. There are some key points on applying the antennas:
A, Antenna should be placed on the outside of the product. And try to place the antenna on the top of the product.
B. Antenna can’t be placed inside a metal case because of its shielding effect.
C. Antenna design involves expensive test equipments such as vector network analyzer and calibrated test antenna. Unless you have access to these equipments, the use to an antenna consultant is recommended.
D. In most indoor locations, dead spots can be found where reception is difficult. These dead spots are due to multiple transmission paths existing between two points because of reflections off metal objects such as steel beams or metal doors. They happen when the path lengths effectively differs by an odd half-wavelength. This explains the phenomenon when you find that at some locations the reception effect is very poor, but beyond that the reception becomes normal.
E. 50-Ohm antenna is recommended for the best matching.
F. For 434MHz application, antenna length = 17 cm.