RX-3302D/ RX-4303D/ RXF-4303D RF Receiver W/ Decoder

Manual

1. Introduction
RX-3302D is a radio frequency super-regenerative receiver module which can facilitate the OEM designers to design their 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.

There are the following versions:
1) RX-3302D /RX-4303D /RXF-4303D: For 2-button transmitters.
   There are versions as follows:
   RX-3302D: Super-regenerative, AM
   RX-4303D: Super-heterodyne, AM
   RXF-4303D: Super-heterodyne, FM

2) RX-3302D4 /RX-4303D3 /RXF-4303D4: For 2 or 4 button transmitters.
   There are 3 more pins than version which are:
   Pin # 9: VPP, for factory programming only. No connection is needed.
   Pin #10: D2, for button #3
   Pin #11: D3 , for button #4

   There are versions as follows:
   RX-3302D4: Super-regenerative, AM
   RX-4303D4: Super-heterodyne, AM
   RXF-4303D4: Super-heterodyne, FM

D means decoder.
For RX-3302D, RX-4303D and RXF-4303D, the decoder function has been implemented in the on-board microprocessor. Besides, the code learning has also been implemented. Thus it relieves the system’s design load on the remote control part totally.

There are rolling code and fixed code variations which will be explained later.
RX-3302D2 is an RF module with the following pin-outs and dimension:

+ Note that all the pin-outs #1 ~ #8; #12 ~ #13 are compatible with those of RX-3302R so that you can replace RX-3302R completely if the size allows.

<table>
<thead>
<tr>
<th>PIN</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>GND</td>
</tr>
<tr>
<td>2</td>
<td>Digital Output</td>
</tr>
<tr>
<td>3</td>
<td>VCC (5V DC)</td>
</tr>
<tr>
<td>4</td>
<td>Linear Output (For Testing)</td>
</tr>
<tr>
<td>5</td>
<td>Valid Time</td>
</tr>
<tr>
<td>6</td>
<td>D0</td>
</tr>
<tr>
<td>7</td>
<td>Learning Acknowledge</td>
</tr>
<tr>
<td>8</td>
<td>D1</td>
</tr>
<tr>
<td>12</td>
<td>ANT (Antenna)</td>
</tr>
<tr>
<td>13</td>
<td>GND</td>
</tr>
</tbody>
</table>

**Dimension of RX-3302D2:** 56.5 mm X 19.5 mm  
**Dimension of RX-3302R:** 53.5 mm X 18.0 mm  
**Dimension of RX(F)-4303D:** 60.2 mm X 22.8 mm
RX-3302D4/RX(F)-4303D4 is an RF module with the following pin-outs and dimension:

- PIN 1: GND
- PIN 2: Digital Output
- PIN 3: VCC (5V DC)
- PIN 4: Linear Output (For Testing)
- PIN 5: Valid Time, for 2A1 version, don’t care
  
  For 2Q1 version, this pin can be connected to a boozzer so that it can indicate if code learning is successful. This application will be very convenient if the control receiver unit is installed a hidden place.

- PIN 6: D0
- PIN 7: Learning Acknowledge
- PIN 8: D1
- PIN 9: VPP, for factory programming only, no connection
- PIN 10: D2
- PIN 11: D3
- PIN 12: ANT (Antenna)
- PIN 13: GND

**Dimension of RX-3302D4**: 56.5 mm X 19.5 mm

**Dimension of RX(F)-4303D4**: 60.2 mm X 22.8 mm
Comparison Table: (Versus our RX Series)

<table>
<thead>
<tr>
<th>Model</th>
<th>SR/ SH mode</th>
<th>POWER</th>
<th>CPU+ EEPROM</th>
<th>SENSITIVITY</th>
<th>POWER CONSUMPTION</th>
<th>Modulation</th>
</tr>
</thead>
<tbody>
<tr>
<td>RX-3302</td>
<td>SR</td>
<td>+5V DC</td>
<td>---</td>
<td>-102dBm</td>
<td>1.8mA</td>
<td>AM</td>
</tr>
<tr>
<td>RX-3302L</td>
<td>SR</td>
<td>+5V DC</td>
<td>---</td>
<td>-100dBm</td>
<td>0.33 mA</td>
<td>AM</td>
</tr>
<tr>
<td>RX-3304</td>
<td>SR</td>
<td>+5V DC</td>
<td>---</td>
<td>-100dBm</td>
<td>2.7mA</td>
<td>AM</td>
</tr>
<tr>
<td>RX-3302R/F</td>
<td>SR</td>
<td>+5V DC</td>
<td>YES</td>
<td>-105dBm</td>
<td>3.1mA</td>
<td>AM</td>
</tr>
<tr>
<td>RX-3302D</td>
<td>SR</td>
<td>+5V DC</td>
<td>YES</td>
<td>-105dBm</td>
<td>2.7mA</td>
<td>AM</td>
</tr>
<tr>
<td>RX-4303D</td>
<td>SH</td>
<td>+5V DC</td>
<td>---</td>
<td>-110dBm</td>
<td>5.1mA</td>
<td>AM</td>
</tr>
<tr>
<td>RXF-4303D</td>
<td>SH</td>
<td>+5V DC</td>
<td>YES</td>
<td>-110dBm</td>
<td>6.2mA</td>
<td>FM</td>
</tr>
</tbody>
</table>

Note:
SR: Super-Regenerative  SH: Super-Heterodyne
AM: Amplitude  Modulation

2. Functionality Difference:

There are 2 major application types involved:
2.1 For rolling code application:

RX-3302D/RX(F)-4303D
RX-3302D or RX(F)-4303D includes the decoder CPU (PIC16C505) and the EEPROM (93C46 or 93C56 or 93C66 or 93LC76 or 93LC86) on board. The code learning has been built in.
The main microprocessor can be programmed transparently without caring about the code learning and the rolling code.

For RX-3302D, there are following models for rolling code (2A1):

For 2-button rolling code transmitters (A1 type):
★ RX-3302D2-15 (for 15 users, W / 93C46)
★ RX-3302D2-63 (for 63 users, W / 93C66)
★ RX-3302D2-127 (for 127 users, W / 93LC76).
★ RX-3302D2-255 (for 255 users, W / 93LC86).

Above two models work with only 2-button rolling code transmitters (A1) from Automicro.
For 2 or 4-button rolling code transmitters (A1 type):
   TX-4311R, TX-4312R, TX-4313R
   ★ RX-3302D4-15 (for 15 users, W / 93C46).
   ★ RX-3302D4-31 (for 31 users, W / 93C56).
   ★ RX-3302D4-63 (for 63 users, W / 93C66).
   ★ RX-3302D4-127 (for 127 users, W / 93LC76).
   ★ RX-3302D4-255 (for 255 users, W / 93LC86).

All AM rolling code transmitters with 2~4 buttons from Automic with A1 label can work with RX-3302D.

For RX-4303D, there are 4 models for AM rolling code (2A1) receivers:

For 2-button FM rolling code transmitters (A1 type) : TX-3315S
   ★ RX-4303D2-15 (for 15 users, W / 93C46)
   ★ RX-4303D2-63 (for 63 users, W / 93C66)
   ★ RX-4303D2-127 (for 127 users, W / 93LC76).
   ★ RX-4303D2-255 (for 255 users, W / 93LC86).

Above models work with only 2-button rolling code SAW AM transmitters (A1) from Automic.

For 2 or 4-button AM rolling code transmitters (A1 type): TX-4312RS
   ★ RX-4303D4-15 (for 15 users, W / 93C46)
   ★ RX-4303D4-63 (for 63 users, W / 93C66)
   ★ RX-4303D4-127 (for 127 users, W / 93LC76).
   ★ RX-4303D4-255 (for 255 users, W / 93LC86).

For RXF-4303D2, there are 4 models for FM rolling code (2A1) receivers:

For 2-button FM rolling code transmitters (A1 type) : TXF-3313R
   ★ RXF-4303D2-15 (for 15 users, W / 93C46)
   ★ RXF-4303D2-63 (for 63 users, W / 93C66)
   ★ RXF-4303D2-127 (for 127 users, W / 93LC76).
   ★ RXF-4303D2-255 (for 255 users, W / 93LC86).

For 2 or 4-button FM rolling code transmitters (A1 type):
   TXF-3313R, TXF-4311R
   ★ RX-4303D4-15 (for 15 users, W / 93C46)
   ★ RX-4303D4-63 (for 63 users, W / 93C66)
   ★ RX-4303D4-127 (for 127 users, W / 93LC76).
   ★ RX-4303D4-255 (for 255 users, W / 93LC86).
Frequency Bandwidth
RX-3302D: 434MHz, LRC, 4MHz Bandwidth.
RX-4303D: 433.92MHz, SAW, 0.5MHz Bandwidth.
RXF-4303D: 433.92MHz, SAW, 0.6MHz Bandwidth.

Programming the Main Microprocessor and RX-3302D/RX(F)-4303D:
1. For rolling code:

Using TX-3315 (S) / TX-3312R / TX(F)-3313R / TX-3316R (W / HCS-200 or HCS-301 from Microchip, programmed with our version A1) with two buttons but 3 commands available.

<table>
<thead>
<tr>
<th></th>
<th>VT</th>
<th>D0</th>
<th>D1</th>
</tr>
</thead>
<tbody>
<tr>
<td>When button #1 is being pressed</td>
<td>Don’t Care</td>
<td>HIGH</td>
<td>LOW</td>
</tr>
<tr>
<td>When button #2 is being pressed</td>
<td>Don’t Care</td>
<td>LOW</td>
<td>HIGH</td>
</tr>
<tr>
<td>When button #1 &amp; #2 are being pressed</td>
<td>Don’t Care</td>
<td>HIGH</td>
<td>HIGH</td>
</tr>
</tbody>
</table>

D0 and D1 will become HIGH as long as the proper button is being pressed, i.e., D0 will be HIGH if button #1 is being pressed and D1 will be HIGH if button #2 is being pressed. VT will be HIGH as long as any of D0 or D1 is HIGH, but VT can be ignored by the programming.

Programming the Main Microprocessor using RX-3302D /RX(F)-4303D and TX(F)-4311R / TX-4313R /TX-4312R(S) (W / HCS-301 from Microchip, programmed with version A1) of 4-button transmitter, there are extra seven double-button commands available in addition to four single-button commands.

<table>
<thead>
<tr>
<th></th>
<th>VT</th>
<th>D0</th>
<th>D1</th>
<th>D2</th>
<th>D3</th>
</tr>
</thead>
<tbody>
<tr>
<td>When button #1 is being pressed</td>
<td>Don’t Care</td>
<td>HIGH</td>
<td>LOW</td>
<td>LOW</td>
<td>LOW</td>
</tr>
<tr>
<td>When button #2 is being pressed</td>
<td>Don’t Care</td>
<td>LOW</td>
<td>HIGH</td>
<td>LOW</td>
<td>LOW</td>
</tr>
<tr>
<td>When button #3 is being pressed</td>
<td>Don’t Care</td>
<td>LOW</td>
<td>LOW</td>
<td>HIGH</td>
<td>LOW</td>
</tr>
<tr>
<td>When button #4 is being pressed</td>
<td>Don’t Care</td>
<td>LOW</td>
<td>LOW</td>
<td>LOW</td>
<td>HIGH</td>
</tr>
<tr>
<td>When button #1 and #2 are being pressed</td>
<td>Don’t Care</td>
<td>HIGH</td>
<td>HIGH</td>
<td>LOW</td>
<td>LOW</td>
</tr>
<tr>
<td>When button #1 and #3 are being pressed</td>
<td>Don’t Care</td>
<td>HIGH</td>
<td>LOW</td>
<td>HIGH</td>
<td>LOW</td>
</tr>
<tr>
<td>When button #1 and #4 are being pressed</td>
<td>Don’t Care</td>
<td>HIGH</td>
<td>LOW</td>
<td>LOW</td>
<td>HIGH</td>
</tr>
<tr>
<td>When button #2 and #3 are being pressed</td>
<td>Don’t Care</td>
<td>LOW</td>
<td>HIGH</td>
<td>HIGH</td>
<td>LOW</td>
</tr>
<tr>
<td>----------------------------------------</td>
<td>------------</td>
<td>------</td>
<td>------</td>
<td>------</td>
<td>------</td>
</tr>
<tr>
<td>When button #2 and #4 are being pressed</td>
<td>Don’t Care</td>
<td>LOW</td>
<td>HIGH</td>
<td>LOW</td>
<td>HIGH</td>
</tr>
<tr>
<td>When button #3 and #4 are being pressed</td>
<td>Don’t Care</td>
<td>LOW</td>
<td>LOW</td>
<td>HIGH</td>
<td>HIGH</td>
</tr>
</tbody>
</table>

Each D0, D1, D2 or D3 will become HIGH as long as the proper button is being pressed. VT will be HIGH as long as any of D0 or D1 or D2 or D3 is HIGH, but VT can be ignored by the programming.

+ Notes:
For our rolling code transmitters, we have the following labels on the encoders (HCS200 or HCS300 or HCS301):
★ A1: For RX-3302R/D, RX(F)-4303D, CS-04R2, CS-04R4, CS-281, CS-28, CS-20CR
★ B1: For CS-04R, CS-04G, CS-06

**Learning Mode (For RX-3302D/RX(F)-4303D):**
The LA (Learning Acknowledge) pin will be at HIGH normally and acts as an input. If this pin is put to LOW temporarily by a tact switch, then it remains at LOW and becomes an output for 15 only seconds during which a transmitter code can be learned if button #1 of any of our applicable transmitters is pressed. After 15 seconds of period expires, then this pin restores to HIGH again.

+ Note that only button #1 can be used for code learning.
If 15 seconds of period is not long enough for learning all the transmitters, then the 2nd or the 3rd cycle of learning can be done until all the transmitters (up to 15 or 31 or 63 or 127 or 225 depending on which model of RX-3302D) is learned.

If you want to erase all the transmitters learned, then please put the LA (Learning Acknowledge) pin to LOW for more than 10 seconds, then all the prior codes learned will be erased completely.

Note that if the same transmitter is learned twice, it will be treated as only one transmitter without wasting any of the memory slot.

Regarding synchronization between RX-3302D/RX-4303D and each rolling-code transmitter, if more than 16 times that the receiver has not received the signals transmitted from each rolling-code transmitter, then the receiver needs one extra signal from the transmitter for synchronization.
Note that there are the following software versions for the rolling code models:

1. 2A1
2. 2B3: Pressing two buttons of any transmitter learned earlier for more than 4 seconds, then the system will enter transmitter code learning mode.
3. 2B4: This version can use pin #5 (VT) instead of pin #7 (LA) for indicating the code learning process. Pin #5 can be connected to a boozer via a transistor so that it can facilitate the code learning process as follows:

   3.1 Press the learn button, then the boozer beeps once indicating that 15 seconds of code learning process starts.
   3.2 Press any unlearned transmitter will beep the boozer as long as the button is being pressed.
   3.3 Up to 15 transmitters can be learned in one or more learning cycles for the 15-user version.
   3.4 If more than 15 transmitters are learned, then FIFO happens which means that the 16th learned transmitter will replace the first transmitter learned.
   3.5 When 15 seconds of learning cycle ends, the boozer will beep twice.
   3.6 You can delete all the codes learned earlier by pressing the learning button for more than 8.3 seconds and the boozer will beep three times.
   3.7 You can press both buttons of any transmitter learned earlier for more than 4 seconds, then the system will enter the transmitter code learning cycle.

2.2 For fixed code application:

For RX-3302D with fixed code version, there are 5 models for either 2-button or 4-button transmitters:

For 2-button transmitters (2C1):
- RX-3302D4-15 (2C1): 15 users
- RX-3302D4-31 (2C1): 31 users
- RX-3302D4-63 (2C1): 63 users
- RX-3302D4-127 (2C1): 127 users
- RX-3302D4-255 (2C1): 255 users

For 4-button transmitters (4C1):
- RX-3302D4-15 (4C1): 15 users
- RX-3302D4-31 (4C1): 31 users
- RX-3302D4-63 (4C1): 63 users
- RX-3302D4-127 (4C1): 127 users
- RX-3302D4-255 (4C1): 255 users

All the 2-button fixed code transmitters \(3^{10}\) code combination from Automicro can work with RX-3302D (2C1 series). All the 4-button transmitters from Automicro can work with RX-3302D (4C1 series).
3. RX-3302D/ RX(F)-4303D Features

- Using Microchip hopping technology
- Work with HCS series of encoders
- Support two-button, 3 functions or 4-button, 11 functions transmitters.
- Unique key generation algorithm for every customer.
- No user programming required for the rolling code.
- Up to 15 / 31 / 63 / 127 / 255 transmitters can be learned.
- On-chip 4 Mhz RC oscillator.
- 16C505 SMD

4. APPLICATIONS

- Automotive remote entry systems
- Automotive alarm systems
- Automotive immobilizer
- Gate and garage door openers
- Electronic door locks
- Identity tokens
- Burglar alarm systems

5. Descriptions

In RX-3302D(2A1), the built-in 16C505 is a code hopping decoder designed for secure Remote Keyless Entry (RKE) systems. The RX-3302D utilizes the patented Microchip code hopping system and high security learning mechanisms to make this a canned solution when used with our rolling-code transmitters to implement a unidirectional remote control keyless entry system.

The key generation algorithm is programmed into the 16C505 decoder in protected mode and can not be read out of the device. Transmitter keys and synchronization counter are stored in its external EEPROM (93C46 or 93C56 or 93C66 or 93LC76 or 93LC86).

The RX-3302D operates over a range of 5.0 ~ 5.5 V. The decoder employs automatic baud rate. The decoder contains sophisticated error checking algorithm to ensure only valid codes are accepted and correct information are written into its external EEPROM.
7. Simple Application Board (Optional)

Application notes:

1. The power circuit for VCC is recommended to use regulator such as 78L05 and a capacitor at least 47uF to be used so that ripple can be reduced.
2. If the microprocessor is working with high speed crystal, then RX-4303 or RX-4303D is recommended because the radiation is too strong.