MARO_RF_BD1
(CHARISMA BOARD)

CONTENTS

What is a RF module?

A RF (Radio Frequency) module is a compact component used for wireless radio communication. In this case, radio frequency refers to a general electric wave and not only a radio broadcasting frequency. RF modules can be classified by frequency, modulation method, data, output strength, etc. RF modules are frequently used when precise wireless applications are necessary.

What is the MARO RF BD1(CHARISMA BOARD)?

The Charisma RF board converts RS232 serial data to RF data and vice versa. The Charisma board can easily be connected to equipment with a RS232 port. The Charisma board is designed to accept Radiometrix(www.radiometrix.co.uk) BiM, TX2, or RX2 modules. PC to PC communication is possible if both PCs have Charisma boards connected.

BiM-UHF

The BiM-418-F and BiM-433-F are miniature UHF radio modules capable of half duplex data transmissions at speeds up to 40 Kbit/s over distances of 30 meters in-building and 120 meters over open ground. Single 4.5V to 5.5V power supply is required.

	Frequency	Speed	Distnace	Radiated Power	Receive Sensitivity	Power	Whip Antenna
BiM-418-F	418.00 MHz	40K bps	30~120 m	-6 dBm	-107 dBm	4.5~5.5 V	16.5 cm
BiM-433-F	433.92 MHz	40K bps	30~120 m	-6 dBm	-107 dBm	4.5~5.5 V	15.5 cm

Table 1 BiM two-way RF module

Warning: Do not adjust the trimmer on the module. It controls the receive frequency and can only be correctly adjusted using an accurate RF signal generator.
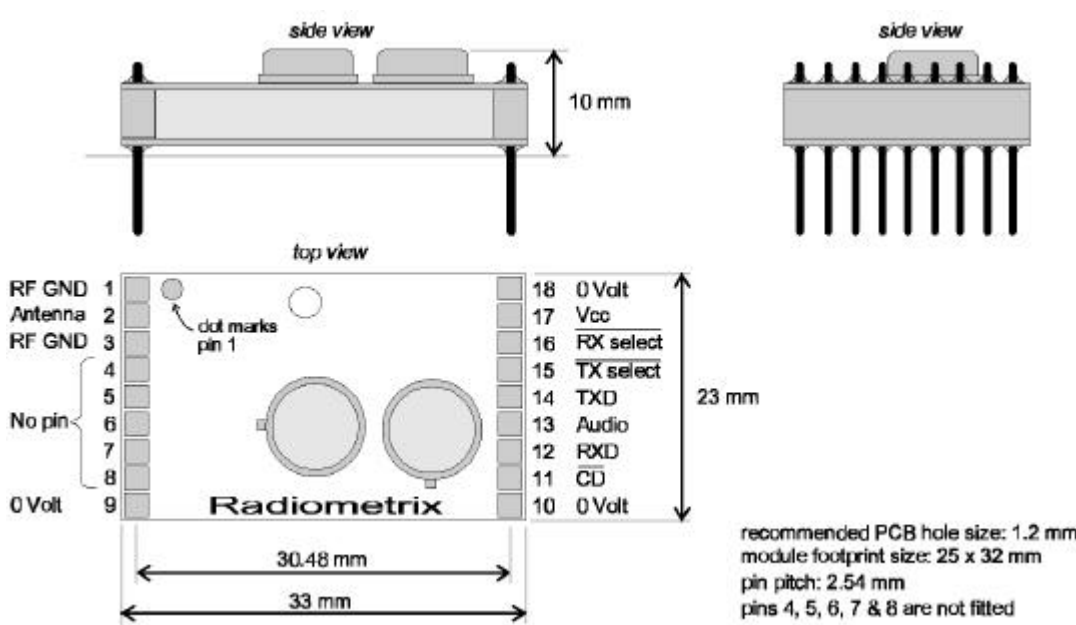

Figure 1 BiM module

TX2, RX2

The TX2 and RX2 data link modules are a miniature PCB mounting UHF radio transmitter and receiver pair which enable the simple implementation of a data link at up to 40 Kbit/s at distances up to 75 meters in-building and 300 meters open ground. 3.3V and 5V version are available.

	Frequency	Speed	Distance	Radiated Power	Receive Sensitivity	Power	Whip Antenna
TX2	418.00 MHz 433.92 MHz	40K bps	75~300 m	-6 dBm +9 dBm		4.0~6.0 V	16.5 cm 15.5 cm
RX2	418.00 MHz 433.92 MHz	40K bps	75~300 m		-100 dBm	4.0~6.0 V	16.5 cm 15.5 cm

Table 2 TX2, RX2 one-way RF module

Warning: • This table is for the 5V version.
- If 6V or greater is supplied, the radiated power increases, however, government regulatory permission is required.
- RX2 has two speed versions: -A(low speed, 14Kbit/s), -F(high speed, 40Kbit/s). This table refers to the -F version.
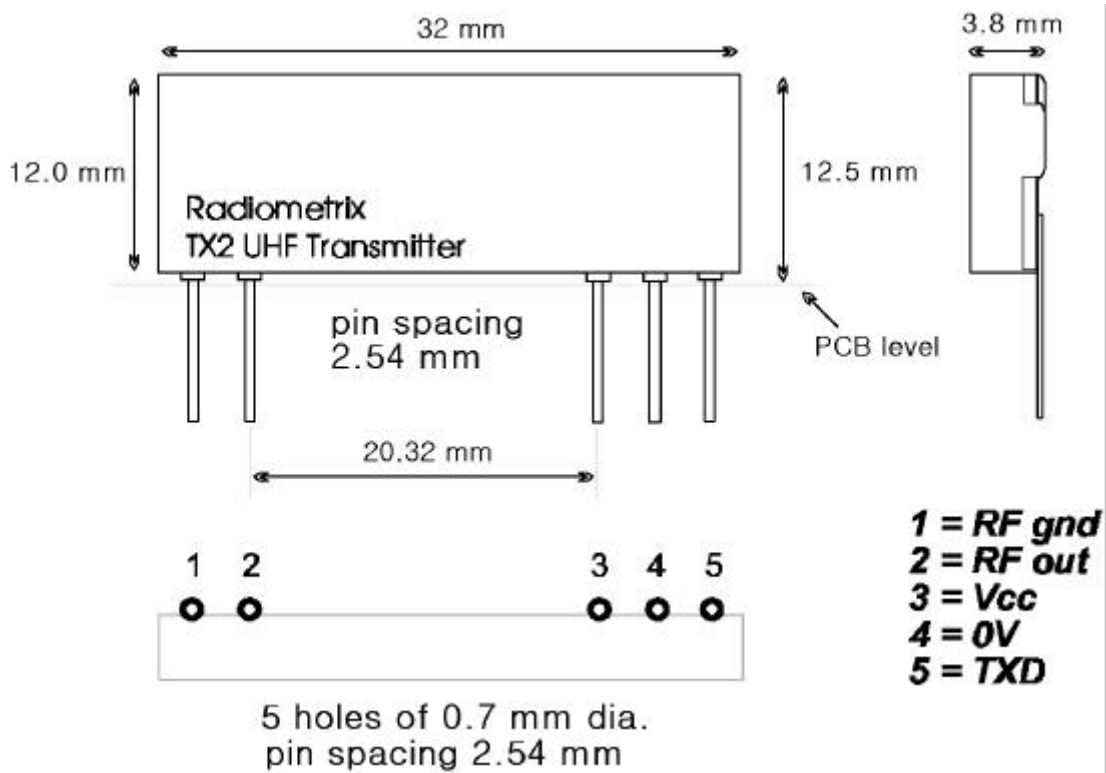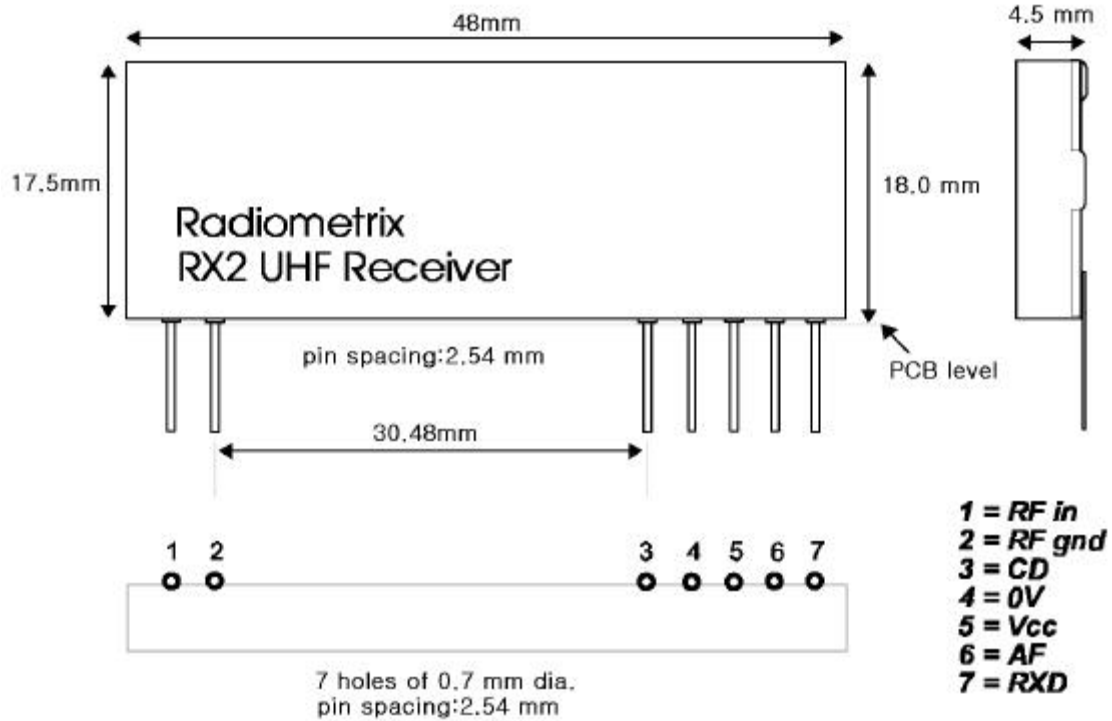

Figure 2 TX2

Figure 3 RX2

CHARISMA USER MANUAL

1. POWER SUPPLY

The Charisma board uses a single DC 5V power source. Power can be supplied via three methods:

- DC 5V to the JP7 port.
- 9V battery to the JP1 port.
- DC 6~12V adapter to the J1 port.

You must use only one of the above. If a DC adapter is used, and the LED D2 does not light, change the polarity of the plug. The Charisma board has a power cut-off diode, which prevents damage due to incorrect polarity. Refer to Figure 4 for the polarity of other power ports.
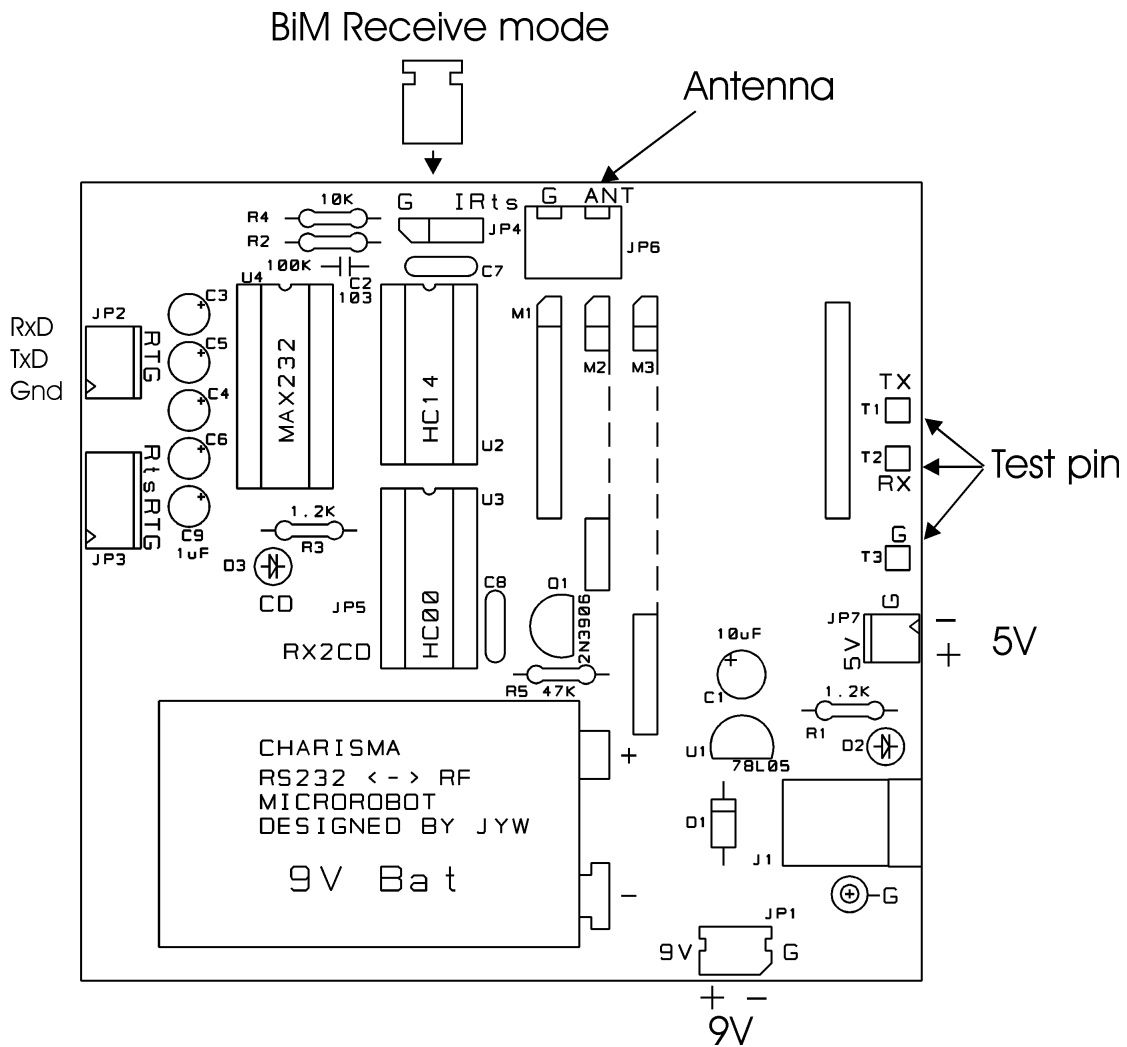
Figure 4 Silkscreen

Power	Port
5 V	JP7
6~12V adapter	J1
9V battery	JP1

Table 3 Power supply

Warning : Use only one method.

2. Antenna Connection

Refer to the RF module data sheets for proper antenna connection. If a whip antenna is desired,

connect it to the right side of the JP6 terminal block. Refer to previous tables for proper antenna length.

3. Module Attachment

Only one BiM, TX2, or RX2 can be used at a time.

BiM module uses the M1 socket.

TX2 module uses the M2 socket.

RX2 module uses the M3 socket.

Warning: All modules have polarity.

4. Mode setting(BiM module only)

BiM modules are two-way RF communication modules. To select transmission or reception mode, a software or hardware method can be used. The software method uses the RTS (No. 4 pin of the JP3) pin of the RS232 port. The hardware method uses a jumper block. Refer to Table 4.

Jumper Setting	Mode
1, 2	Reception
2, 3	Software Method
Empty	Transmission

Table 4 JP4 Jumper setting.

Note: JP4 has no relation to the TX2 or RX2 modules.

If the software method is used, use a 4-wire serial cable with the JP3 instead of the JP2.
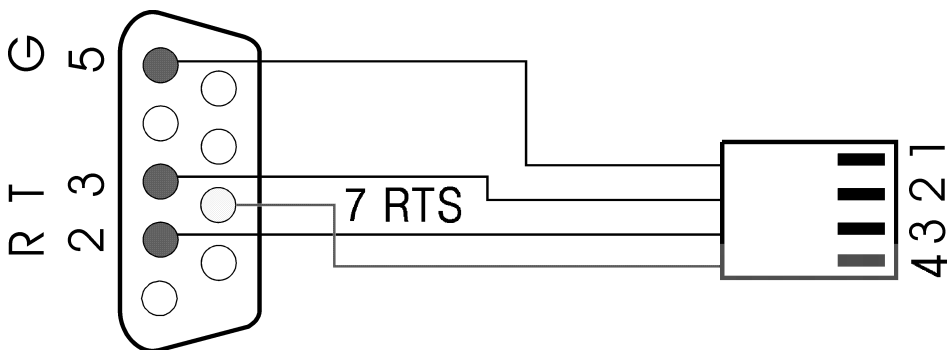

Figure 5 Serial Cable

5. TX2

Insert the TX2 module into the M2 socket. Ignore the JP4.

6. RX2

Insert the RX2 module into the M3 socket. Solder the JP5(SMD jumper) to make a connection. Ignore the JP4.

7. Others

● 418 MHz and 433 MHz are UHF(Ultra High Frequency).
● BiM and TX2 use SAW controlled FM transmission.
● BiM and RX2 are double conversion FM superhet receivers.
● BiM and TX2 or RX2 can communicate each other, when they use the same frequency.
● Basic constraints that any serial code must satisfy for reliable transfer.
  • **T(Pulse width time)**: 25us < T < 2ms
  • **Preamble(for RX settling)**: The AFC and data slicer in the receiver require at least 3ms of '10101010' preamble to be transmitted before the data at the RXD output may be considered reliable. Increasing this time to 5ms will give increased immunity to RF interference.
  • Mark/Space ratio: The data slicer in the receiver is optimized for data waveforms with 50:50 Mark:Space averaged over any 4ms period. The slicer will tolerate sustained asymmetry up to 30/70 (either way), however, this will result in increased pulse width distortion and decreased noise tolerance.

● Packet will be used for RF communication. A packet is a wrapping data with rule. This is a recommended packet format.

preamble more than 3ms	FFh	(FFh)	Start byte	(01h)	data bytes	CRC or Check Sum

Table 5 Packet example

Note:
  •Preamble can be made using series of 55h or AAh data.
    cf) 55h = 01010101B, AAh = 10101010B => 50:50 Mark:Space ratio.
  •FFh : To find start bit.
  •(FFh) : Optional.
  •Start byte : Your own start byte.
  •(01h) : Optional.
  •data bytes : Series of FFh or 00h might cause a problem. Because their Mark:Space ratio is not proper. 17h, 1Bh, 1Dh, 1Eh,...4Eh, 53h,...87h,8Bh..... values will be fine. Refer to the data sheet for more information.
  •CRC or Check Sum : Optional.
● There are several Charisma board RF communication program at www.microrobot.com or www.microrobotna.com.

PARTS LIST

Item	Quantity	Reference	Part
1	1	C1	10uF
2	1	C2	103
3	5	C3,C4,C5,C6,C9	1uF
4	2	C7,C8	104
5	1	D1	1N4001
6	2	D2,D3	LED
7	1	JP1	5267-2
8	1	JP2	5045-3
9	1	JP3	5045-4
10	1	JP4	3P PIN HEADER
11	1	JP5	SMD JUMPER2(NO REAL PART)
12	1	JP6	BR5001(TERMINAL BLOCK)
13	1	JP7	5045-2
14	1	J1	JACK 1
15	2	M1	9 x 1 PIN HEADER SOCKET
16	1	M2	2P SIP
	1		3P SIP
17	1	M3	2P SIP
	1		5P SIP
18	1	Q1	2N3906
19	2	R1,R3	1.2K Ohm
20	1	R2	100K Ohm
21	1	R4	10K Ohm
22	1	R5	47K Ohm
23	3	T1,T2,T3	TEST PIN
24	1	U1	78L05
25	1	U2	74HC14
26	1	U3	74HC00
27	1	U4	MAX232(or replacement)
28	1		JUMPER BLOCK
29	1		ANTENNA
30	4		RUBBER SUPPORTER
31	1		SERIAL CABLE(OPTIONAL)
32	1		PCB

U2E 74HC14 ITXD 11 10 9 U2D 74HC14 8 TXDC

T1 TEST — TXDC
T2 TEST — RXDC
T3 TEST

JP2
3 RXD
2 TXD
1
HEADER 3

C3 1uF
C4 1uF

U4
1 C1+   VCC 16 VCC
3 C1-   V+ 2
4 C2+   V- 6
5 C2-
11 T1_IN   T1_OUT 14 RXD
10 T2_IN   T2_OUT 7
12 R1_OUT   R1_IN 13 TXD
9 R2_OUT   R2_IN 8 RTS
MAX232

C5 1uF
C6 1uF

IRXD
ITXD
IRTS

JP3
4 RTS
3 RXD
2 TXD
1
HEADER 4

ANTENNA

JP6
2 RF
1
HEADER 2

VCC
R4 10K

IRTS
JP4 JUMPER_3
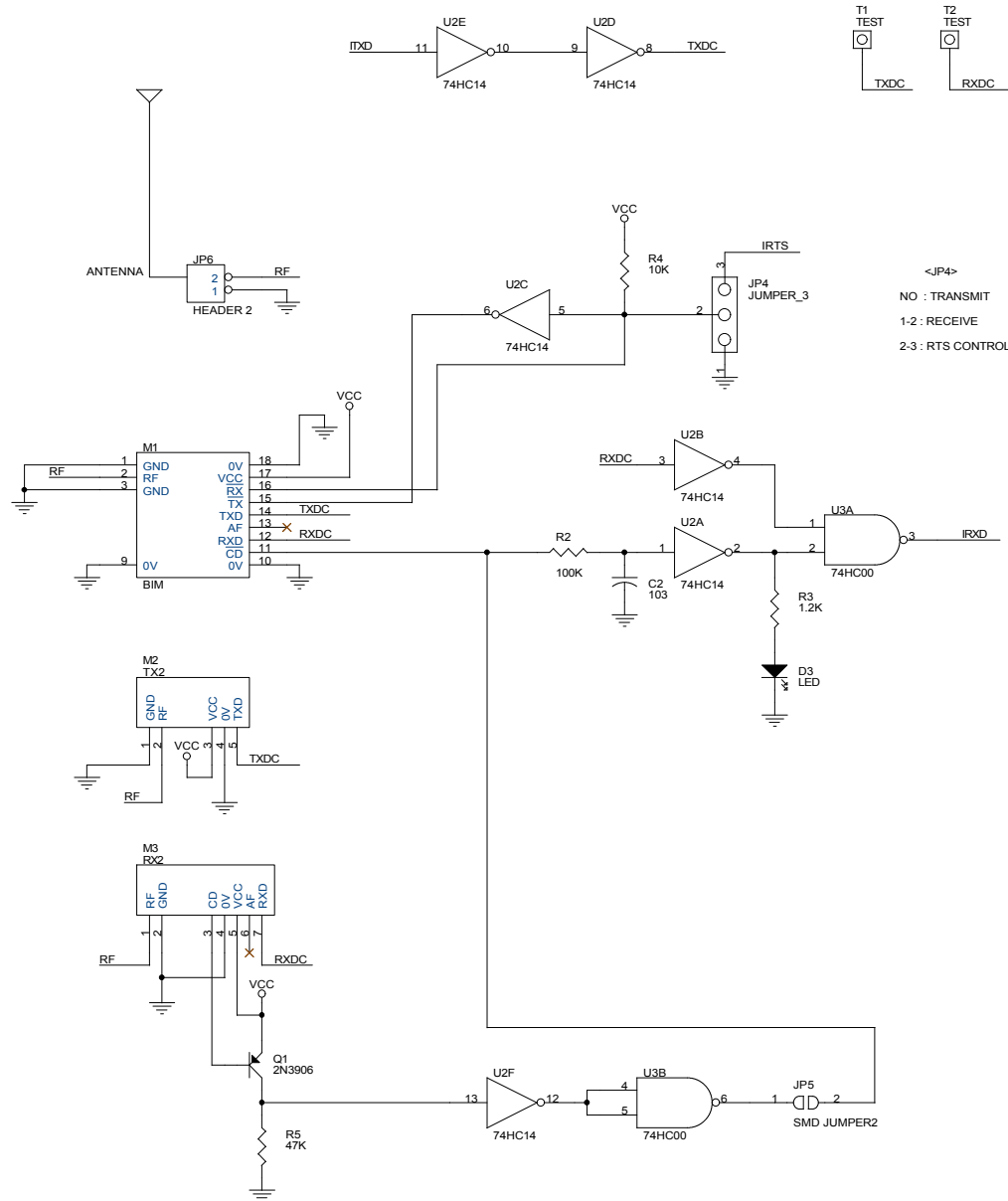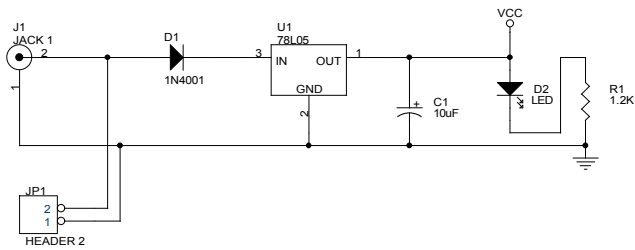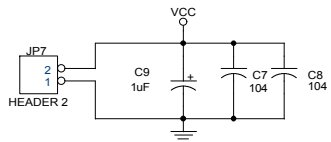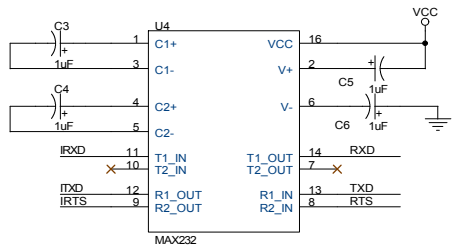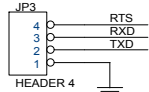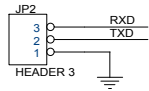
<JP4>
NO : TRANSMIT
1-2 : RECEIVE
2-3 : RTS CONTROL

U2C 74HC14
6 5

M1
1 GND   0V 18
2 RF   VCC 17
3 GND   RX 16
            TX 15
            TXD 14 TXDC
            AF 13
            RXD 12 RXDC
            CD 11
9 0V   0V 10
BIM

RXDC 3 U2B 74HC14 4

U2A 74HC14
R2 100K
1 2
C2 103
U3A 74HC00
1
2 3 IRXD

R3 1.2K
D3 LED

M2 TX2
GND RF   VCC 0V TXD
1 2   3 4 5
VCC   TXDC
RF

VCC
JP7
2
1
HEADER 2
C9 1uF
C7 104
C8 104

M3 RX2
RF GND   CD 0V VCC AF RXD
1 2   3 4 5 6 7
RF   RXDC
VCC

Q1 2N3906
R5 47K

U2F 74HC14
13 12
U3B 74HC00
4
5 6
JP5 SMD JUMPER2
1 2

J1 JACK 1
D1 1N4001
U1 78L05
IN OUT
GND
VCC
C1 10uF
D2 LED
R1 1.2K

JP1
2
1
HEADER 2

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