Class 1 Bluetooth® Super Module

Features

- Bluetooth 2.1/2.0/1.2/1.1 and v2.0+EDR
- Embedded SPP/DUN stack support, no host or processor stacks required
- Small-form factor 24 Pin DIP package (0.1" pitch by 0.9" socket width)
- Accepts 4Vdc to 24Vdc power (RN-24)
- Hardware TTL, RS- 232 and RS-485 levels
- RS-485 signaling with auto-direction control (RN25 only)
- UART baud rate: 1200bps up to 921.6Kbps
- 9 General Purpose Input/Output Pins (4ma source/sink) controlled via remote commands
- 2 Channel 8 Bit AD converter (5Hz, 0-1.8VDC)
- LEDs indicate connection and RX/TX status
- On board antenna or external SMA jack
- Low power consumption (30mA connected,, <10mA sniff mode)
- Programmable over local UART and Bluetooth
- Simple ACSII command interface
- UART (SPP or HCI) and USB (HCI only) data connection interfaces
- Sustained SPP data rates - 240Kbps (slave), 300Kbps (master)
- Embedded Bluetooth stack profiles included (requires no host stack): GAP, SDP, RFCOMM and L2CAP protocols, with SPP and DUN profile support.

Applications

- Wireless RS232/RS485 cable replacement
- Remote equipment monitoring
- Scanners, GPS and measurement systems
- Industrial sensors and controls
- Medical devices

Description

The RN24 transforms your product's serial interface into a wireless connection. The RN24 is a Class 1 Bluetooth radio with auto-connect and connect on RX data features, enabling your product to transfer data up to 100M. The RN24 accepts a wide range of unregulated DC power. The DIP packaging with GPIO, UART interfaces and AD converter makes it the perfect prototyping module and allows products to have optional Bluetooth capability when the module is plugged in.

The RN-25 has the same powerful Bluetooth radio and simple ASCI command interface as the RN-24 but has a RS-485 hardware interface rather than RS-232.

Block Diagram
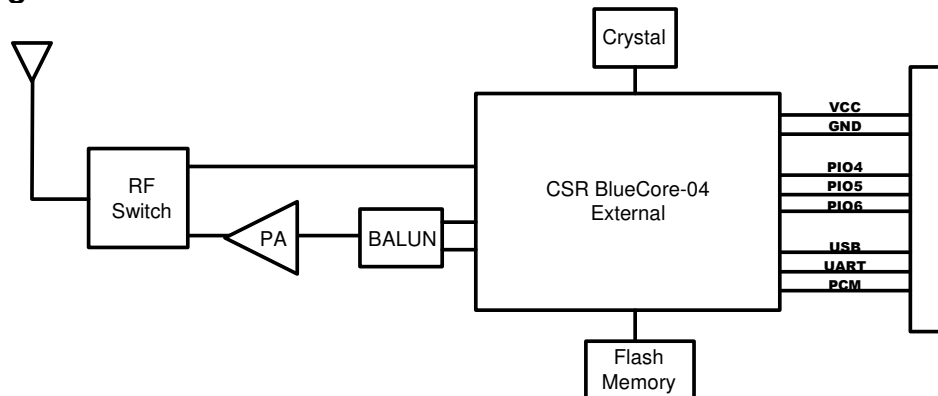
Overview

- UART baud rate speeds: 1200bps up to 921Kbps, non-standard baud rates can be programmed.
- Class 1 radio, 330' (100m) distance, 12dBm output transmitter, -80dBm typical receive sensitivity
- Frequency 2402 ~ 2480MHz,
- FHSS/GFSK modulation, 79 channels at 1MHz intervals
- Secure communications, 128 bit encryption
- Error correction for guaranteed packet delivery
- UART local and over-the-air RF configuration
- Auto-discovery/pairing requires no software configuration (instant cable replacement).
- Auto-connect master, IO pin (DTR) and character based trigger modes

Environmental Conditions

Parameter	Value
Temperature Range (Operating)	-40 ^{o}C ~ 85 ^{o}C
Temperature Range (Storage)	-40 ^{o}C ~ 85 ^{o}C
Relative Humidity (Operating)	≤90%
Relative Humidity (Storage)	≤90%

Electrical Characteristics

Power supply voltage RN24 WARNING – Only one source of power must be supplied.		3.3VDC nominal or 5-24VDC unregulated		
Parameter	Min	Typ.	Max.	Unit
Supply Voltage (DC) using pin 3	3.0	3.3	3.6	V
Supply Voltage (DC) using pin 12	5	-	24	V
RX Supply Current		35	60	mA
TX Supply Current		65	100	mA

NOTE: do not exceed 5 VDC on the RN-25 or permanent damage to the module will occur!

Power supply voltage RN25		5 VDC unregulated on pin12		
Parameter	Min	Typ.	Max.	Unit
Supply Voltage (DC) using pin 3	-	-	-	
Supply Voltage (DC) using pin 12	5	-	5	V
RX Supply Current		35	60	mA
TX Supply Current		65	100	mA

| Average power consumption	Min	Typ.	Max.	Unit
Standby/Idle (default settings)		25		mA
Connected (normal mode)		30	50	mA
Connected (low power Sniff)		8		mA
Standby/Idle (lowest power)	250uA	2.5		mA

Digital I/O Characteristics

WARNING: Take care not to exceed the voltage limits to the VCC, TTL SERIAL, and GPIO pins. 0 negative voltage or voltage exceeding 3.30 VDC can permanently damage the device!

- Use a 10KΩ series resistor on inputs
- GPIO sink current is 4mA max.
- Unused pins should float

| 2.7V ≤ VDD ≤ 3.0V	Min	Typ.	Max.	Unit
Input logic level LOW	-0.4	-	+0.8	V
Input logic level HIGH	0.7VDD	-	VDD+0.4	V
Output logc level LOW	-	-	0.2	V
Output logic level HIGH	VDD-0.2	-	-	V
All I/O's (except reset) default to weakpull down	+0.2	+1.0	+5.0	uA

The RN24 can drive either UART signals on the TTL pins 8-11 or RS232 pins 13-16. WARNING: Driving the TTL signals at RS232 levels can permanently damage the module. By default the module is configured to drive only the RS232 pins. To drive the TTL signals you must remove the resistor R7. R7 can be found on the bottom of the board, near the center.
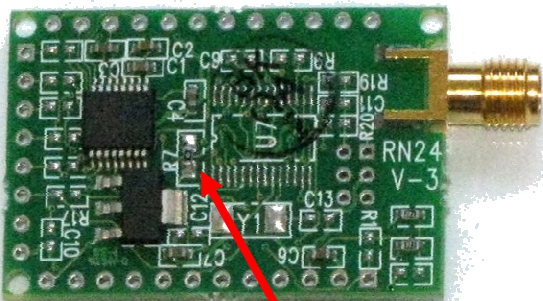
Remove R7 to enable the UART TTL signaling on pins 8-11. This disconnects pins 13-16 from the UART interface.
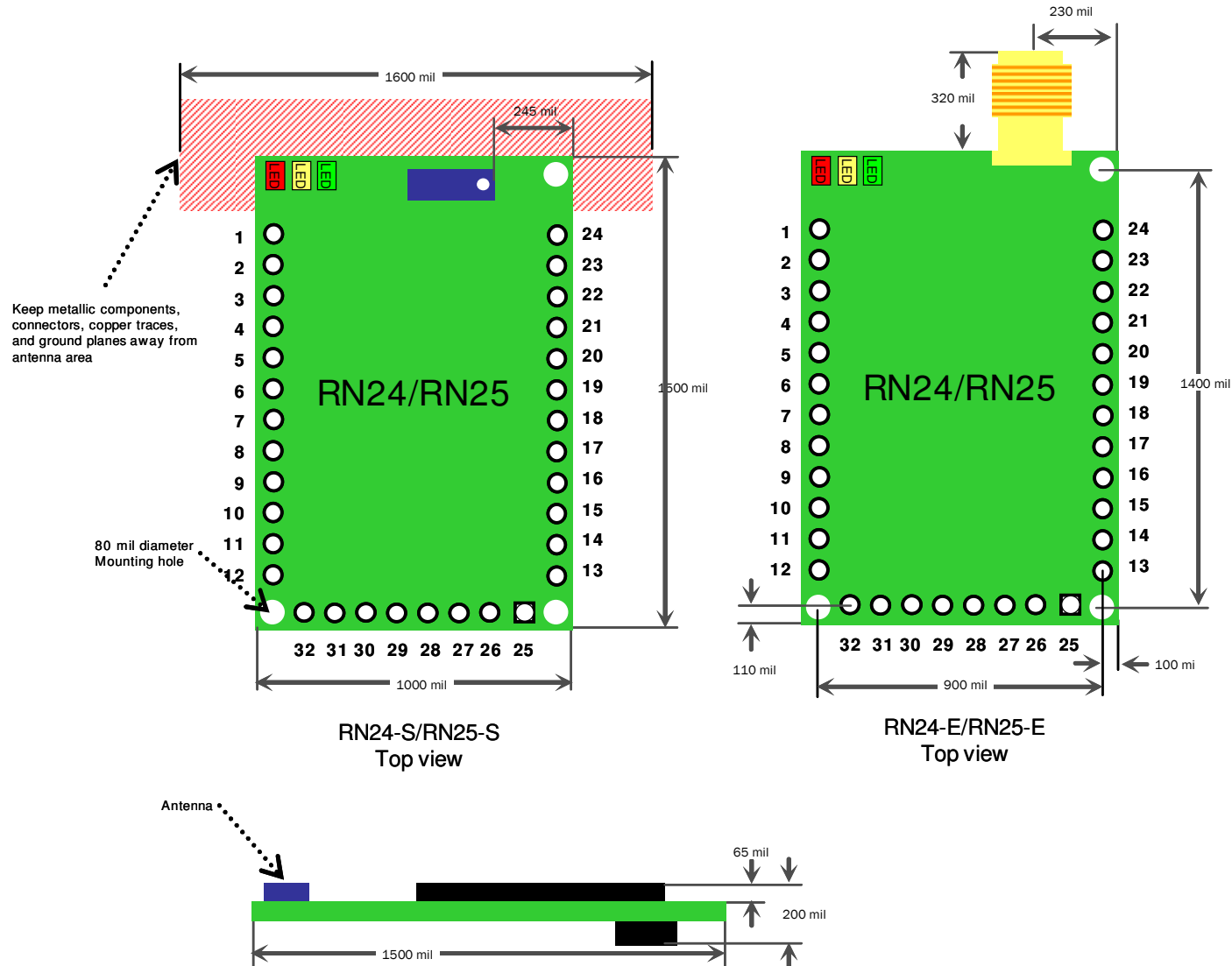
Pin Description

NOTE: The Power can be applied to either pin 12, or pin 3, but **NOT** both. If pin 12 is powered then Pin 3 can be used as a 3.3V regulated supply output up to 200mA.

RN24/RN25

Top view
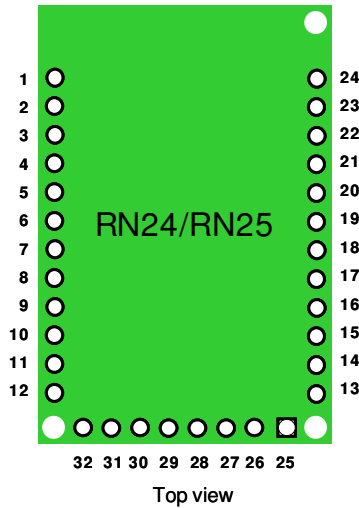
Pin	Name	Description	Default
1	RESET	Active HIGH	Has 1K pulldown
2	GND		
3	VCC	3.3VDC power	Mutually exclusive with Pin 12
4	SPI_CS	Programming Only	No Connect
5	SPI_CK	Programming Only	No Connect
6	SPI_MO	Programming Only	No Connect
7	SPI_MI	Programming Only	No Connect
8	CTS	Input, if set HIGH disables transmitter	TTL input
9	TX	Transmit, output from the module	TTL output
10	RTS	Output, goes HIGH to disable host transmitter	TTL output
11	RX	Receive, input to the module	TTL input
12	VDD	RN-24 : 5-24V unregulated DC power RN-25 : 5 V unregulated DC power	Mutually exclusive with Pin 3
13	UART_TX	UART Transmit, output from the module	RS-232 level signaling
14	UART_RX	UART Receive, input to the module	RS-232 level signaling
15	UART_RTS	Output, goes HIGH to disable host transmitter	RS-232 level signaling
16	UART_CTS	Input, if set HIGH disables module transmitter	RS-232 level signaling
17	GPIO-7	Default baud rate, HIGH = 9600, LOW = 115K	Input to RN24, default = LOW
18	GPIO-6	Enable auto master mode = HIGH	Input to RN24, default = LOW
19	GPIO-4	Restore factory defaults	Set HIGH then toggle for 5 msec. 3 times
20	GPIO-3	Enable instant cable mode = HIGH	Input to module, default = LOW
21	GPIO-2	Connection status, connected=HIGH	Output from module
22	RS-485 D+	RS485 signaling **(Only on RN25)**	(Auto direction detect)
23	RS-485 D-	RS485 signaling **(Only on RN25)**	(Auto direction detect)
24	GND	Ground	
25	GPIO-11		
26	GPIO-8	Controls red LED	
27	GPIO-9	Controls yellow LED	
28	GPIO-10		
29	AD1	Optional analog input 0-1.8V	Requires special firmware
30	AD2	Optional analog input 0-1.8V	Requires special firmware
31	NC		
32	GND	Ground	

Module Dimensions

Keep metallic components, connectors, copper traces, and ground planes away from antenna area

80 mil diameter Mounting hole

1600 mil

245 mil

1500 mil

1000 mil

RN24/RN25

1 24
2 23
3 22
4 21
5 20
6 19
7 18
8 17
9 16
10 15
11 14
12 13

32 31 30 29 28 27 26 25

RN24-S/RN25-S
Top view

230 mil

320 mil

1400 mil

110 mil

100 mil

900 mil

RN24/RN25

1 24
2 23
3 22
4 21
5 20
6 19
7 18
8 17
9 16
10 15
11 14
12 13

32 31 30 29 28 27 26 25

RN24-E/RN25-E
Top view

Antenna

65 mil

200 mil

1500 mil

Connect with 24 pin DIP (through-hole) 0.1" pitch and 0.9" wide socket
Single row mating sockets use:
Digikey P/N: ED7012-ND (female)
ED7512-ND (male)

Design Concerns

1. **Reset circuit**.   RN-24 contains a 1k pulldown, the polarity of reset is ACTIVE HIGH.
   A power on reset circuit with delay is OPTIONAL on the reset pin of the module. It should only be required if the input power supply has a very slow ramp, or tends to bounce or have instability on power up. Often a microcontroller or embedded CPU IO is available to generate reset once power is stable

2. **Factory reset PIO4.**   It is a good idea to connect this pin to a switch, or jumper, or resistor, so it can be accessed.   This pin can be used to reset the module to FACTORY DEFAULTS and is often critical in situations where the module has been mis-configured.

3. **Connection status.** PIO2 is an output which directly reflects the connection state, it goes HIGH when connected, and LOW otherwise.

4. **RS485 support.** Must supply 5V on pin 12 if using the RS485 interface. ***Do not exceed 5VDC or permanent damage to the module will occur!***

    RS-485 signaling with auto-direction control is ONLY supported on PCB rev 4 and later. Treat pins 22 and 23 as no connect on previous PCB boards.

5. **Using SPI bus for flash upgrade.** While not required, this bus is very useful for configuring advanced parameters of the Bluetooth modules, and is required for upgrading the firmware on modules. The suggested ref-design shows a 6pin header which can be implemented to gain access to this bus. A minimum-mode version could just use the SPI signals (4pins) and pickup ground and VCC from elsewhere on the design.

6. **Minimizing Radio interference.**   When integrating the RN24 DIP module with on board chip antenna besure the area around the chip antenna end of RN24-S module protrudes at least 5mm from the PCB and any metal enclosure. If this is not possible use the RN24-E.

7. **Soldering Reflow Profile.**
   • Lead-Free Solder Reflow
   • Temp: 230 degree C , 30-40 seconds, Peak 250 degree C maximum.
   • Preheat temp: 165 +- 15 degree C, 90 to 120 seconds.
   • Time: Single Pass, One Time

8. **Connecting to the GPIO.** Placing 3.3Vdc into the PIO's while they are set as outputs will permanently damage the radio. The failure mode is short across GND and VCC. Use a 10KO resistor is series or a 10KO pull up resistor for input and output PIO's respectively.
   • Make sure to connect a common ground when using the external TX, RX inputs on the 0 – 3.3Vdc
   • For a 3 wire DB-9 interface (tx, rx, gnd only) connect/short CTS to RTS, Factory default is hardware flow control enabled CTS and RTS connected.
   • When using a 5.0Vdc Input, PIO's require a 10K ohm series resistor. PIO's are 0-3.3Vdc not 5 volt tolerant.

Compliance Information

   • FCC Certified, FCC ID T9J-RN24, IC number6514A-RN24
   • Environmentally friendly RoHS compliant

Ordering Information

Part Number	Description
RN-24-S	With chip antenna
RN-24-E	With SMA jack
RN-25-S	RS485 signaling with chip antenna
RN-25-E	RS485 signaling with SMA jack
RN-SMA-S	1" external antenna "Stuby"
RN-SMA-4	4" high performance antenna
For other configurations, contact Roving Networks directly.	

Visit http://www.rovingnetworks.com for current pricing and a list of distributors carrying our products.