

Class 2 Bluetooth® Module



Features

- Fully qualified Bluetooth 2.1/2.0/1.2/1.1 module
- Bluetooth v2.0+EDR support
- Available with on board chip antenna (RN-42) and without antenna (RN-42-N)
- Postage stamp sized form factor, 13.4mm x 25.8 mm x 2mm (RN-42) and 13.4mm x 20 mm x 2 mm (RN-42-N)
- Low power (*26uA sleep, 3mA connected, 30mA transmit*)
- UART (SPP or HCI) and USB (HCI only) data connection interfaces.
- Sustained SPP data rates - 240Kbps (slave), 300Kbps (master)
- HCI data rates - 1.5Mbps sustained, 3.0Mbps burst in HCI mode
- Embedded Bluetooth stack profiles included (*requires no host stack*): GAP, SDP, RFCOMM and L2CAP protocols, with SPP and DUN profile support.
- Bluetooth SIG certified
- Castellated SMT pads for easy and reliable PCB mounting
- Certifications: FCC, ICS, CE
- Environmentally friendly, RoHS compliant

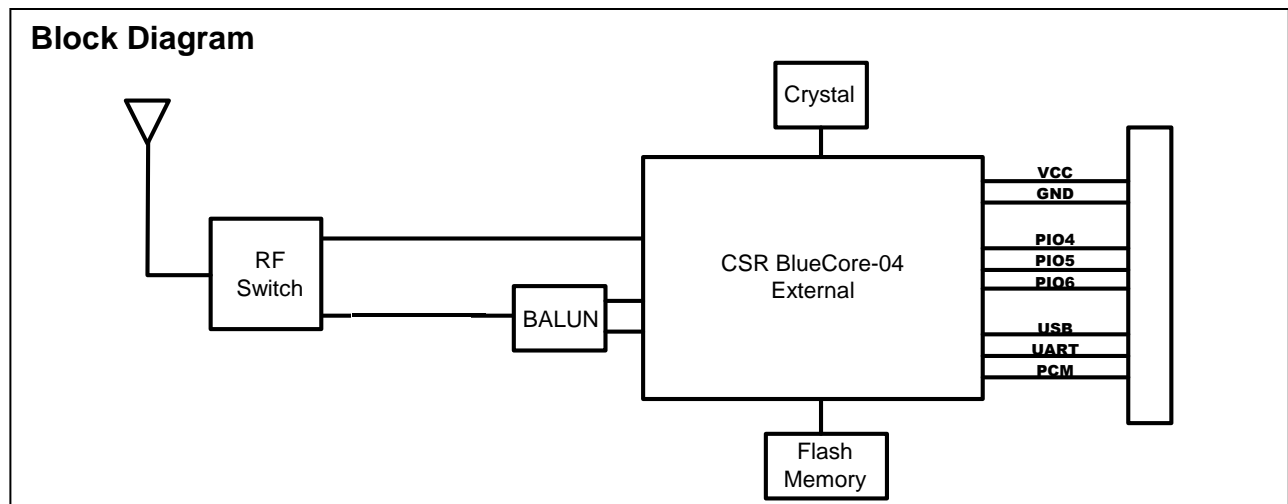
Applications

- Cable replacement
- Barcode scanners
- Measurement and monitoring systems
- Industrial sensors and controls
- Medical devices
- Barcode readers
- Computer accessories

Description

The RN42 is a small form factor, low power, highly economic Bluetooth radio for OEM's adding wireless capability to their products. The RN42 supports multiple interface protocols, is simple to design in and fully certified, making it a complete embedded Bluetooth solution. The RN 42 is functionally compatible with RN 41. With its high performance on chip antenna and support for Bluetooth® Enhanced Data Rate (EDR), the RN42 delivers up to 3 Mbps data rate for distances to 20M. The RN-42 also comes in a package with no antenna (RN-42-N). Useful when the application requires an external antenna, the RN-42-N is shorter in length and has RF pads to route the antenna signal.

Block Diagram



Overview

- Baud rate speeds: 1200bps up to 921Kbps, non-standard baud rates can be programmed.
- Class 2 radio, 60 feet (20meters) distance, 4dBm 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

Digital I/O Characteristics

| 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 logic 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 |

Environmental Conditions

| Parameter | Value |
|-------------------------------|----------------|
| Temperature Range (Operating) | -40 °C ~ 85 °C |
| Temperature Range (Storage) | -40 °C ~ 85 °C |
| Relative Humidity (Operating) | ≤90% |
| Relative Humidity (Storage) | ≤90% |

Electrical Characteristics

| Parameter | Min | Typ. | Max. | Unit |
|--|-----|------|------|------|
| Supply Voltage (DC) | 3.0 | 3.3 | 3.6 | V |
| Average power consumption | | | | |
| Radio ON* (Discovery or Inquiry window time) | | 40 | | mA |
| Connected Idle (No Sniff) | | 25 | | mA |
| Connected Idle (Sniff 100 milli secs) | | 12 | | mA |
| Connected with data transfer | 40 | 45 | 50 | mA |
| Deep Sleep Idle mode | | 26 | | uA |

* If in SLAVE mode there are bursts of radio ON time which vary with the windows. Depending on how you set the windows that determines your average current.

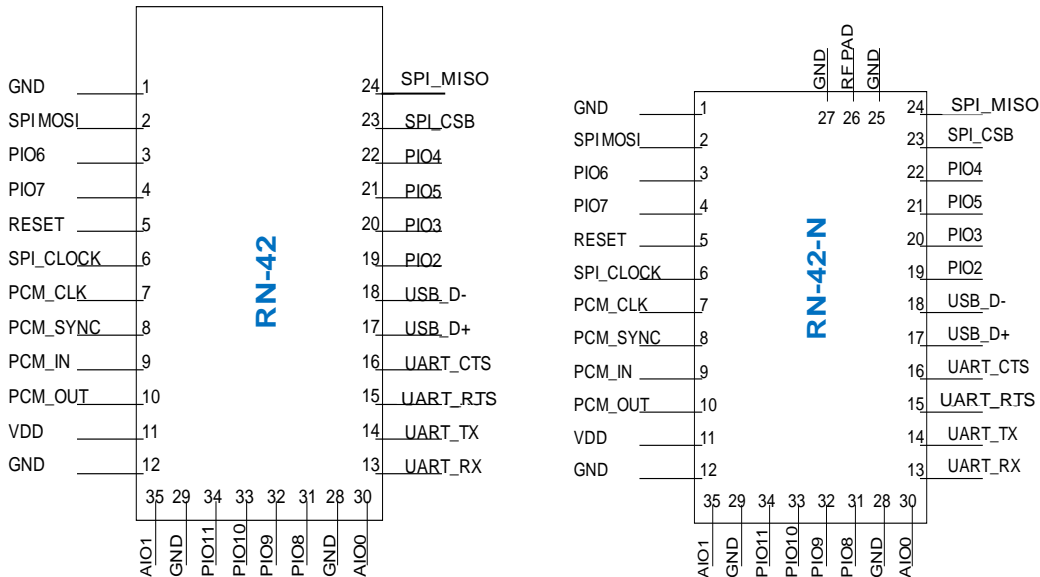
Radio Characteristics

| Parameter | Freq. (GHz) | Min | Typ | Max | Bluetooth Specification | Units |
|--------------------------------------|-------------|-----|-----|------|-------------------------|-------|
| Sensitivity @ 0.1%BER | 2.402 | - | -80 | -86 | ≤ -70 | dBm |
| | 2.441 | - | -80 | -86 | | dBm |
| | 2.480 | - | -80 | -86 | | dBm |
| RF Transmit Power | 2.402 | 0 | 2 | 4 | ≤ 4 | dBm |
| | 2.441 | 0 | 2 | 4 | | dBm |
| | 2.480 | 0 | 2 | 4 | | dBm |
| Initial Carrier Frequency Tolerance | 2.402 | - | 5 | 75 | 75 | kHz |
| | 2.441 | - | 5 | 75 | | kHz |
| | 2.480 | - | 5 | 75 | | kHz |
| 20dB bandwidth for modulated carrier | | - | 900 | 1000 | ≤ 1000 | kHz |
| Drift (Five slots packet) | | - | 15 | - | 40 | kHz |
| Drift Rate | | - | 13 | - | 20 | kHz |
| Δf _{1avg} Max Modulation | 2.402 | 140 | 165 | 175 | >140 | kHz |
| | 2.441 | 140 | 165 | 175 | | kHz |
| | 2.480 | 140 | 165 | 175 | | kHz |
| Δf _{2avg} Min Modulation | 2.402 | 140 | 190 | - | 115 | kHz |
| | 2.441 | 140 | 190 | - | | kHz |
| | 2.480 | 140 | 190 | - | | kHz |

Range Characteristics (Approximate range in office environment)

| Range | RN-42 |
|-------------------|---------|
| After One Wall | 55 feet |
| After Two Walls | 60 feet |
| After Three Walls | 36 feet |

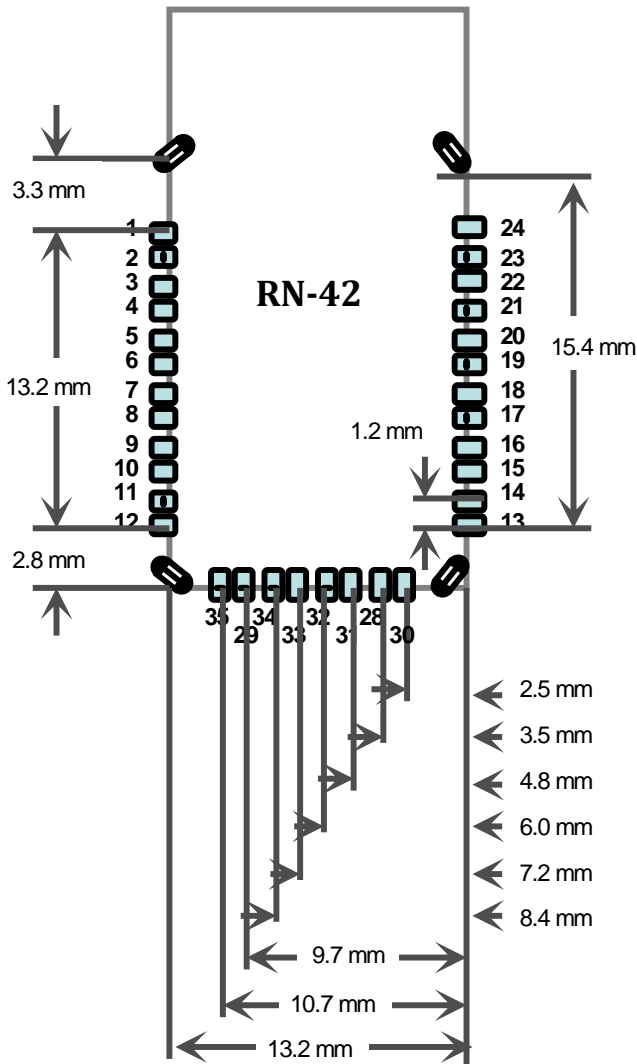
The above readings are approximate and may vary depending upon the RF environment. Bluetooth hops in a pseudo-random fashion over the 79 frequencies in the ISM band to adapt to the interference. Data throughput and range vary depending on the RF interference environment.

Pin Description


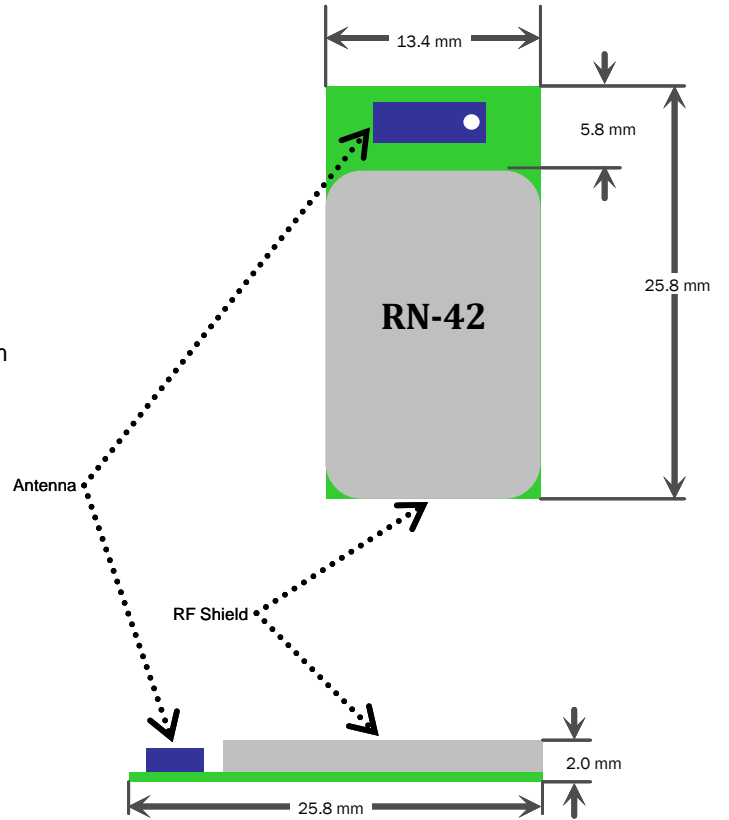
| Pin | Name | Description | Default | Voltage |
|-----|----------|---|----------------------------------|---------|
| 1 | GND | | | 0V |
| 2 | SPI MOSI | Programming only | No Connect | 3V |
| 3 | PIO6 | Set BT master (HIGH=auto-master mode) | Input to RN42with weak pulldown | 0V-3.3V |
| 4 | PIO7 | Set Baud rate (HIGH = force 9600, LOW = 115K or firmware setting) | Input to RN42 with weak pulldown | 0V-3.3V |
| 5 | RESET | Active LOW reset | Input to RN42 with 1K pullup | |
| 6 | SPI_CLK | Programming only | No Connect | |
| 7 | PCM_CLK | PCM interface | No Connect | |
| 8 | PCM_SYNC | PCM interface | No Connect | |
| 9 | PCM_IN | PCM interface | No Connect | |
| 10 | PCM_OUT | PCM interface | No Connect | |
| 11 | VDD | 3.3V regulated power input | | |
| 12 | GND | | | |
| 13 | UART_RX | UART receive Input | Input to RN42 | 0V-3.3V |
| 14 | UART_TX | UART transmit output | High level output from RN42 | 0V-3.3V |
| 15 | UART_RTS | UART RTS, goes HIGH to disable host transmitter | Low level output from RN42 | 0V-3.3V |
| 16 | UART_CTS | UART CTS, if set HIGH, disables transmitter | Low level input to RN42 | 0V-3.3V |
| 17 | USB_D+ | USB port | Pull up 1.5K when active | 0V-3.3V |
| 18 | USB_D- | USB port | | 0V-3.3V |
| 19 | PIO2 | Status, HIGH when connected, LOW otherwise | Output from RN42 | 0V-3.3V |
| 20 | PIO3 | Auto discovery = HIGH | Input to RN42 with weak pulldown | 0V-3.3V |
| 21 | PIO5 | Status, toggles based on state, LOW on connect | Output from RN42 | 0V-3.3V |
| 22 | PIO4 | Set factory defaults | Input to RN42 with weak pulldown | 0V-3.3V |
| 23 | SPI_CSB | Programming only | No Connect | |
| 24 | SPI_MISO | Programming only | No Connect | |
| 25 | GND | GND for RN42-N | | |
| 26 | RF Pad | RF Pad for RN42-N | | |
| 27 | GND | GND for RN42-N | | |
| 30 | AIO0 | Optional analog input | Not Used | |
| 31 | PIO8 | Status (RF data rx/tx) | Output from RN42 | 0V-3.3V |
| 32 | PIO9 | IO | Input to RN42 with weak pulldown | 0V-3.3V |
| 33 | PIO10 | IO (remote DTR signal) | Input to RN42 with weak pulldown | 0V-3.3V |
| 34 | PIO11 | IO (remote RTS signal) | Input to RN42 with weak pulldown | 0V-3.3V |
| 35 | AIO1 | Optional analog input | Not Used | |

RN-42 Module Dimensions

PCB LAYOUT
 PAD SIZE = 0.8 X 1.30 mm
 (TOP VIEW)



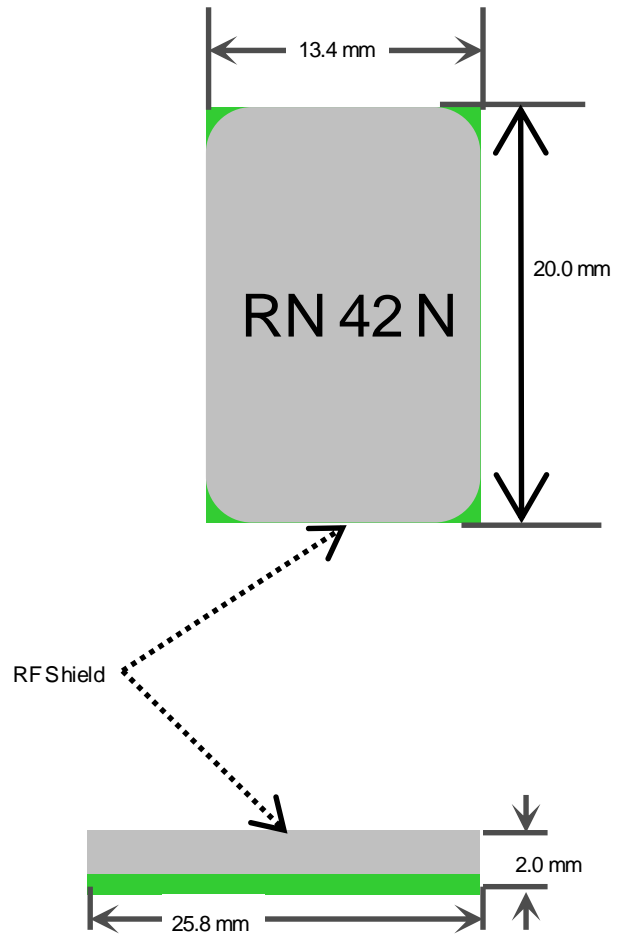
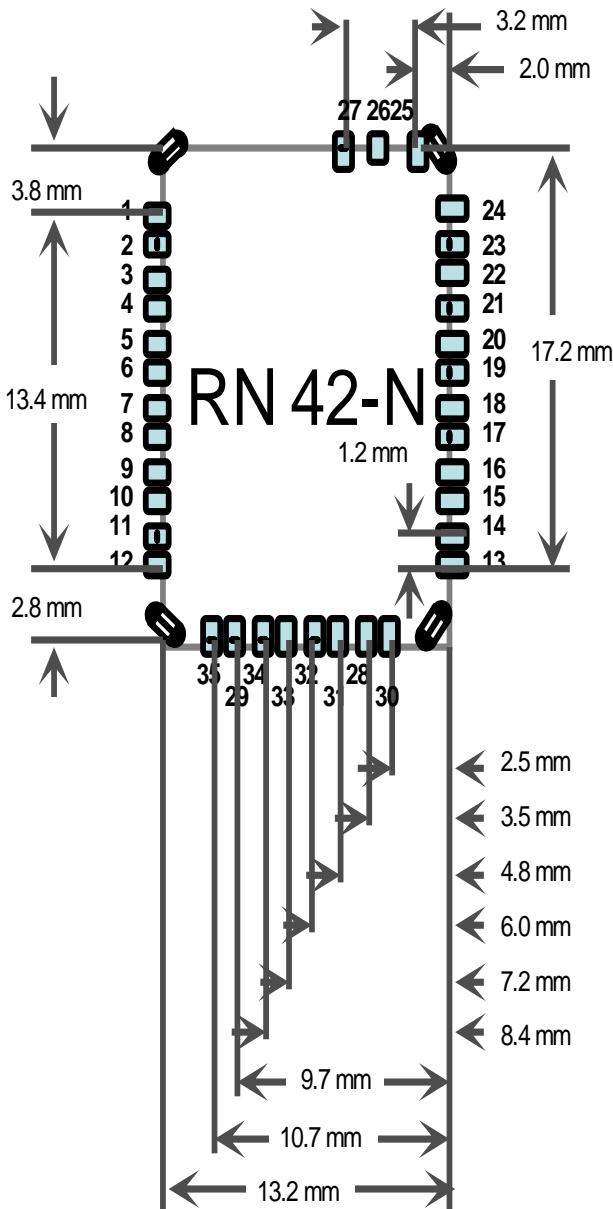
MODULE DIMENSIONS



RN-42-N Module Dimensions

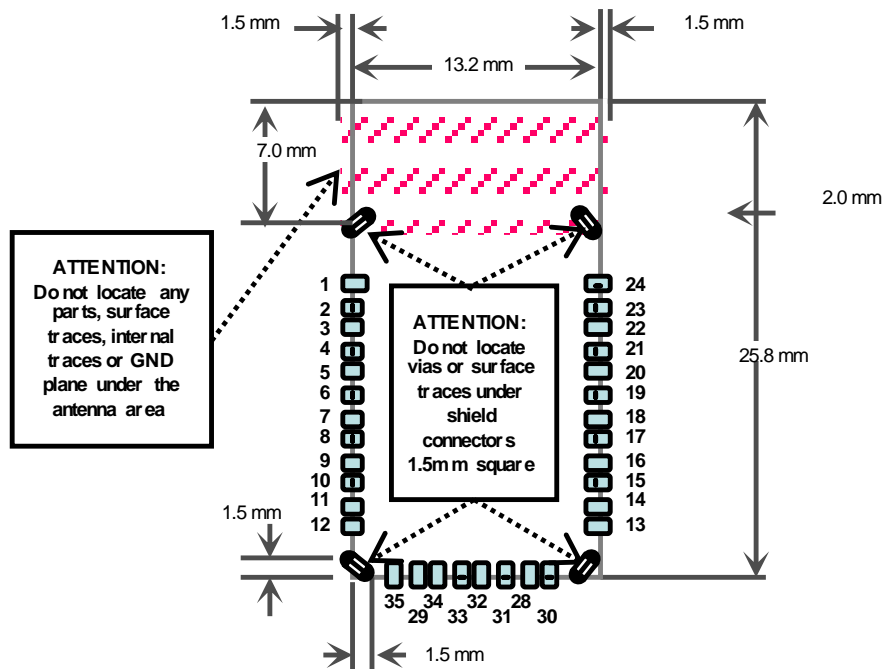
PCB LAYOUT
PAD SIZE = 0.8 X 1.30 mm
(TOP VIEW)

MODULE DIMENSIONS

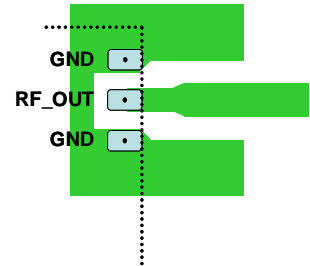


Design Concerns

1. **Reset circuit.** RN-42 contains a weak pullup to VCC, the polarity of reset on the RN42 is ACTIVE LOW. 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. If not, there are many low cost power supervisor chips available, such as MCP809, MCP102/121, and Torex XC61F.
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. To set Factory defaults start HIGH, then toggle two times.
3. **Connection status.** PIO5 is available to drive an LED, and blinks at various speeds to indicate status. PIO2 is an output which directly reflects the connection state, it goes HIGH when connected, and LOW otherwise.
4. **HCI mode.** The RN42 module must be loaded with special firmware to run in HCI mode. When in HCI mode the standard SPP/DUN applications are disabled.
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 laying out the carrier board for the RN42 module the areas under the antenna and shielding connections should not have surface traces, GND planes, or exposed vias. (See diagram to right) For optimal radio performance the antenna end of RN42 module should protrude 5mm past any metal enclosure.



7. Antenna Design. The pattern from the rf_out terminal pad should be designed with 50ohms impedance and traced with straight lines. (see diagram to the right) The rf_out signal line should not run under or near the RN21 module. The GND plane should be on the side of the PCB which the module is mounted. The GND should be reinforced with through-hole connections and other means to stabilize the electric potential.



8. 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

Compliance Information

| Category | Country | Standard |
|---------------|---|-------------------------------------|
| Radio | USA | FCC Part 15 Subpart B: 2008 Class B |
| | | FCC CRF Title 47 Part 15 Subpart C |
| | FCC ID: | T9J-RN42 |
| | | |
| | EUROPE | ETSI EN 301 489-1 V1.8.1 |
| | | ETSI EN 301 489-17 V2.1.1 |
| | | ETSI EN 300 328 V1.7.1 |
| | | |
| | CANADA | IC RSS-210 low power comm. device |
| | Certification Number: 6514A-RN42 | |
| EMC | USA | FCC CFR47 Part 15 subclass B |
| | EUROPE | EN 55022 Class B radiated |
| | | EN61000-4-2 ESD immunity |
| | | EN61000-4-3 radiated field |
| | | EN61000-4-6 RF immunity |
| | | EN61000-4-8 power magnetic immunity |
| Bluetooth | BQB LISTED | B014867- SPP and DUN profiles |
| Environmental | RoHS | RoHS compliant |

Ordering Information

| Part Number | Description |
|---|--|
| RN-42 | Standard Application firmware (SPP/DUN Master and Slave) |
| RN-42-H | HCI firmware (HCI over H4 UART) |
| RN-42-U | USB firmware (HCI over USB port, slave device at 12Mbps rate) |
| RN-42-N | No Antenna, Standard Application firmware (SPP/DUN Master and Slave) |
| For other configurations, contact Roving Networks directly. | |

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