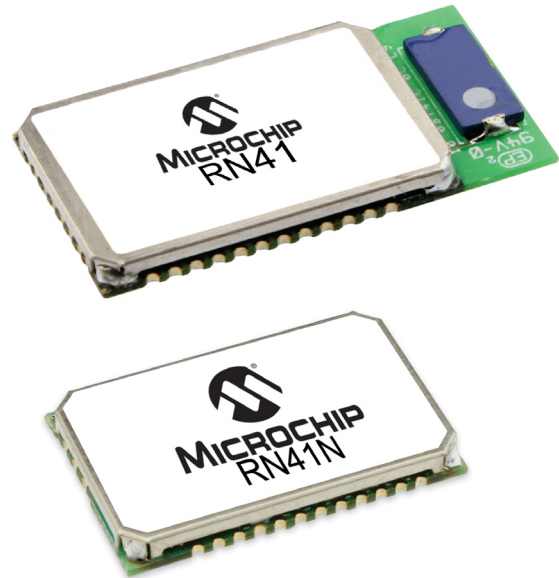

Class 1 Bluetooth® Module with EDR Support

Features

- Fully qualified Bluetooth® version 2.1 module, supports version 2.1 + Enhanced Data Rate (EDR)
- ASCII command interface over UART
- Postage-stamp sized form factor:
 - RN41: 13.4 x 25.8 x 2 mm
 - RN41N: 13.4 x 20 x 2 mm
- Low-power (30 mA connected, < 10 mA sniff mode)
- UART (SPP or HCI) and USB (HCI only) data connection interfaces
- Sustained SPP data rates: 240 Kbps (Peripheral mode), 300 Kbps (Central mode)
- HCI data rates: 1.5 Mbps sustained, 3.0 Mbps burst in HCI mode
- Embedded Bluetooth stack profiles include: GAP, SDP, RFCOMM, L2CAP protocols, with SPP, HID and DUN profile support (does not require any host stack).
- Bluetooth SIG qualified, end product listing
- Castellated SMT pads for easy and reliable PCB mounting
- Class 1 high-power amplifier with on-board ceramic chip antenna (RN41) or external antenna (RN41N)
- Compliance:
 - Modular Certified for the United States (FCC) and Canada (ISED)
 - European RED Assessed Radio Module
 - Australia/New Zealand/Korea/Taiwan/Japan
 - Bluetooth SIG QDID
- Integrated Crystal, Internal Voltage Regulator, Matching Circuitry, Power Amplifier, Low Noise, Memory Amplifier and PCB Antenna
- Easy Integration into Final Product - Minimize Product Development, Quicker Time to Market
- Compatible with Microchip Microcontroller Families (PIC16F, PIC18F, PIC24F/H, dsPIC33 and PIC32)
- Up to 100 meter range



Applications

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

RN41/RN41N

| RN41/RN41 MODULE VARIANTS ⁽¹⁾ | | | |
|------------------------------------------|--------------|------------------|----------------------------------------|
| Model | Antenna | Firmware | Description |
| RN41 | Ceramic Chip | 4.77, 6.15 | Class 1, 2.1+EDR, SPP profile |
| RN41HCI | Ceramic Chip | N/A | Class 1, 2.0+EDR, HCI over UART |
| RN41U | Ceramic Chip | N/A | Class 1, 2.0+EDR, HCI over USB |
| RN41HID | Ceramic Chip | 6.11 | Class 1, 2.1+EDR, HID and SPP profiles |
| RN41APL | Ceramic Chip | 5.36, 5.43, 5.45 | Class 1, 2.1+EDR, SPP & MFi profiles |
| RN41N | External | 4.77, 6.15 | Class 1, 2.1+EDR, SPP profile |
| RN41NAPL | External | 5.36, 5.43, 5.45 | Class 1, 2.1+EDR, SPP and MFi profiles |

Note: See Section 4.0 “Ordering Information” for customer part numbers. Information on firmware versions can be found on the RN41/RN41N product web page and the “*Bluetooth Data Module Command Reference and Advanced Information User’s Guide*”.

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RN41/RN41N

1.0 DEVICE OVERVIEW

The RN41/RN41N module is a small form factor, low-power, class 1 Bluetooth radio that is ideal for designers who want to add wireless capability to their products without spending significant time and money developing Bluetooth-specific hardware and software. The RN41/RN41N supports multiple interface protocols, is simple to design in and is fully certified, making it a complete embedded Bluetooth solution. With its high-performance, chip antenna (RN41) or external antenna (RN41N) and support for Bluetooth EDR, the RN41/RN41N delivers up to a 3-Mbps data rate for distances up to 100 meters.

1.1 MCU Interface

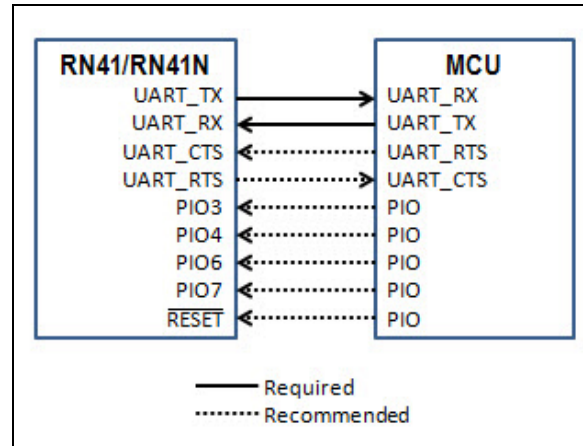
The RN41/RN41N module is managed through ASCII commands via the UART and/or PIO signals. A MCU (micro-controller-unit) or host processor sends commands to module to configure features, read status and manage Bluetooth data connections.

As shown in [Figure 1-1](#), the UART TX and RX are required to communicate with module and transfer data across Bluetooth SPP connection.

Connecting the hardware flow control lines CTS and RTS is highly recommended for applications that transmits a continuous stream of data.

The module can be configured locally via the UART or over-the-air. To support instant cable replacement, auto-discovery/pairing does not require software configuration. Additionally, the module supports auto-connect central, I/O pin (DTR) and character-based trigger modes.

FIGURE 1-1: RN41/RN41N TO MCU INTERFACE



[Table 1-1](#), [Table 1-2](#), [Table 1-3](#), [Table 1-4](#) and [Table 1-5](#) provide the module's environmental conditions, electrical characteristics, dimensions, radio characteristics and digital I/O characteristics.

1.2 ASCII Command and Data Interface

The “*Bluetooth Data Module Command Reference and Advanced Information User’s Guide*” provides a complete description of the ASCII command and data interface for the RN41/RN41N module.

TABLE 1-1: 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% |
| Moisture Sensitivity Level | 3 |

TABLE 1-2: ELECTRICAL CHARACTERISTICS

| Parameter | Min. | Typ. | Max. | Units |
|-----------------------------------|------|------|------|-------|
| Supply Voltage (DC) | 3.0 | 3.3 | 3.6 | V |
| RX Supply Current | — | 35 | 60 | mA |
| TX Supply Current | — | 65 | 100 | mA |
| Average Power Consumption | | | | |
| Standby/Idle (Default Settings) | — | 25 | — | mA |
| Connected (Normal Mode) | — | 30 | — | mA |
| Connected (Low-Power Sniff) | — | 8 | — | mA |
| Standby/Idle (Deep Sleep Enabled) | 250 | 2.5 | — | mA |

TABLE 1-3: MODULE DIMENSIONS

| Parameter | RN41 | RN41N | Units |
|-----------|-----------------|---------------|-------|
| Size | 13.4 x 25.8 x 2 | 13.4 x 20 x 2 | mm |
| Weight | 0.045 | 0.040 | oz. |

TABLE 1-4: RADIO CHARACTERISTICS

| Parameter | Frequency (GHz) | Min. | Typ. | Max. | Bluetooth Specification | Units |
|---------------------------------------------|-----------------|------|------|------|-------------------------|-------|
| Sensitivity at 0.1% BER | 2.402 | — | -80 | -86 | ≤ -70 | dBm |
| | 2.441 | — | -80 | -86 | | dBm |
| | 2.480 | — | -80 | -86 | | dBm |
| RF Transmit Power ⁽¹⁾ RN41 | 2.402 | — | 16.3 | — | | dBm |
| | 2.441 | — | 17.0 | — | | dBm |
| | 2.480 | — | 18.4 | — | | dBm |
| RF Transmit Power ⁽¹⁾ RN41N | 2.402 | — | 11.9 | — | | dBm |
| | 2.441 | — | 10.9 | — | | dBm |
| | 2.480 | — | 9.9 | — | | dBm |
| Initial Carrier Frequency Tolerance | 2.402 | — | 5 | 75 | 75 | kHz |
| | 2.441 | — | 5 | 75 | | kHz |
| | 2.480 | — | 5 | 75 | | kHz |
| 20-dB Bandwidth for Modulated Carrier | — | — | 900 | 1000 | ≤ 1000 | kHz |
| Drift (Five Slots Packet) | — | — | 15 | — | 40 | kHz |
| Drift Rate | — | — | 13 | — | 20 | kHz |
| $\Delta f_{1\text{avg}}$ Maximum Modulation | 2.402 | 140 | 165 | 175 | > 140 | kHz |
| | 2.441 | 140 | 165 | 175 | | kHz |
| | 2.480 | 140 | 165 | 175 | | kHz |
| $\Delta f_{2\text{avg}}$ Minimum Modulation | 2.402 | 140 | 190 | — | 115 | kHz |
| | 2.441 | 140 | 190 | — | | kHz |
| | 2.480 | 140 | 190 | — | | kHz |

TABLE 1-5: DIGITAL I/O CHARACTERISTICS

| 3.0 V ≤ VDD ≤ 3.3 V | Min. | Typ. | Max. | Units |
|-------------------------------------------------------|-----------|------|-----------|-------|
| Input Logic Level Low | -0.4 | — | +0.8 | V |
| Input Logic Level High | 0.7 VDD | — | VDD + 0.4 | V |
| Output Logic Level Low | — | — | 0.2 | V |
| Output Logic Level High | VDD - 0.2 | — | — | V |
| All I/O pins (Except reset) Default to Weak Pull Down | +0.2 | +1.0 | +5.0 | μA |

RN41/RN41N

Figure 1-2 and Figure 1-3 show the modules' dimensions.

FIGURE 1-2: RN41 MODULE DIMENSIONS

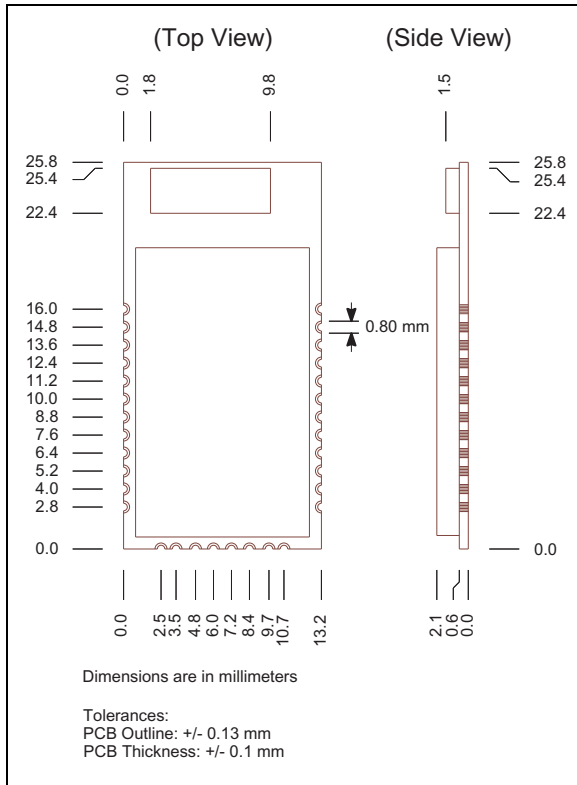


FIGURE 1-3: RN41N MODULE DIMENSIONS

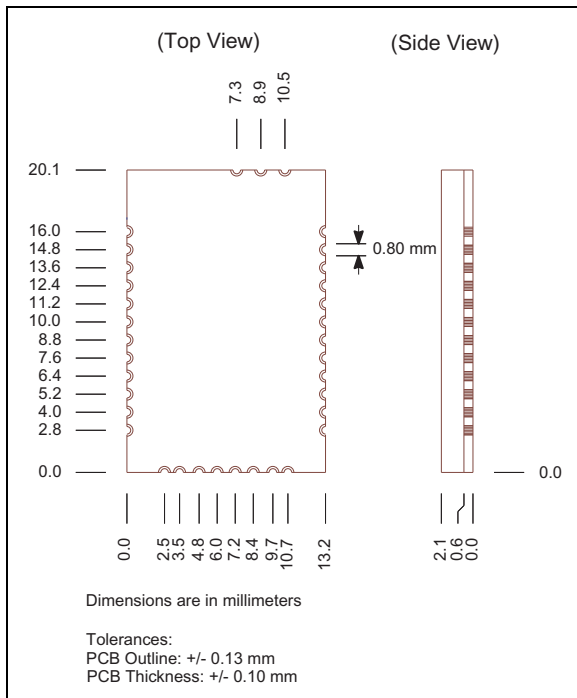


Figure 1-4 and Figure 1-5 show the pinout and Table 1-6 describes the module's pins.

FIGURE 1-4: RN41 PIN DIAGRAM

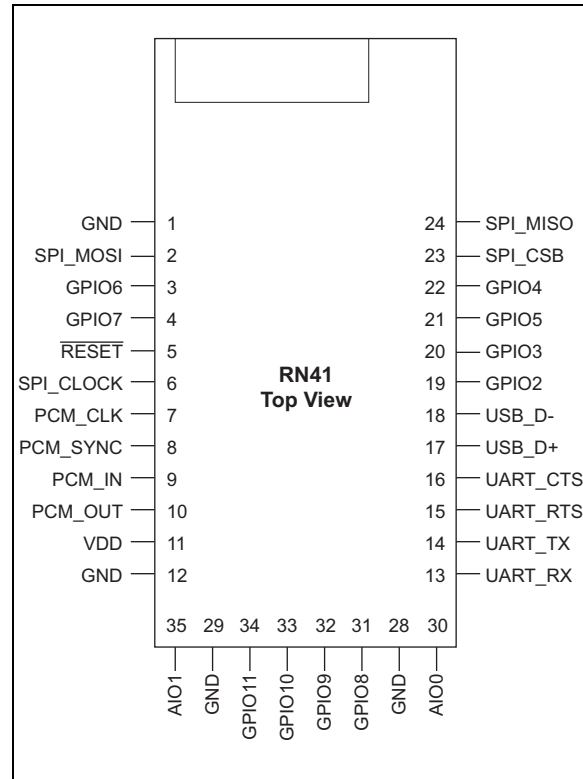


FIGURE 1-5: RN41N PIN DIAGRAM

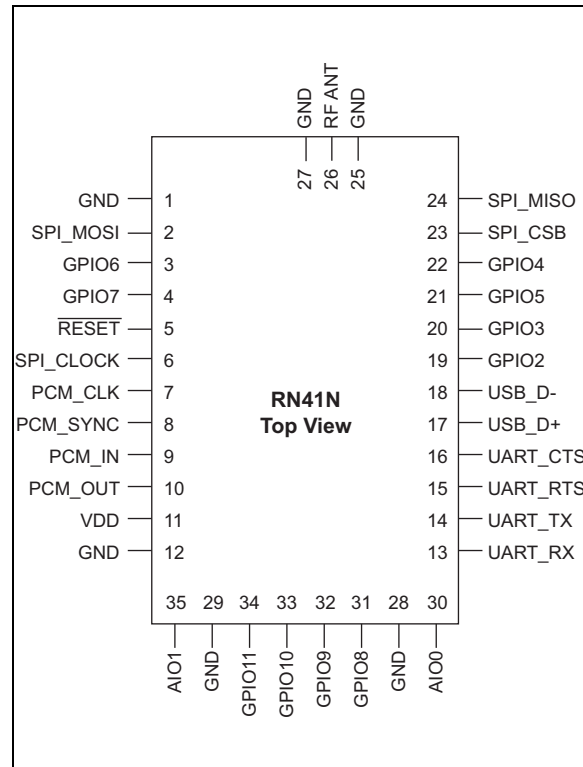


TABLE 1-6: PIN DESCRIPTION

| Pin | Symbol | Type | Description |
|-----|----------|-------|----------------------------------------------------------------------------------------------|
| 1 | GND | Power | Ground reference |
| 2 | SPI_MOSI | DI | (Optional) Factory diagnostic and test. See Section 2.8 “SPI Interface” . |
| 3 | GPIO6 | DIO | Set Bluetooth central (high = auto-central mode) |
| 4 | GPIO7 | DIO | Set baud rate (high = force 9,600, low = 115K or firmware setting) |
| 5 | RESET | DI | Active-low Reset |
| 6 | SPI_CLK | DI | (Optional) Factory diagnostic and test. See Section 2.8 “SPI Interface” . |
| 7 | PCM_CLK | DIO | (Do not connect) PCM interface ⁽¹⁾ |
| 8 | PCM_SYNC | DIO | (Do not connect) PCM interface ⁽¹⁾ |
| 9 | PCM_IN | DI | (Do not connect) PCM interface ⁽¹⁾ |
| 10 | PCM_OUT | DO | (Do not connect) PCM interface ⁽¹⁾ |
| 11 | VDD | Power | Positive Supply |
| 12 | GND | Power | Ground reference |
| 13 | UART_RX | DI | UART receive input |
| 14 | UART_TX | DO | UART transmit output |
| 15 | UART_RTS | DO | UART RTS, goes high to disable host transmitter |
| 16 | UART_CTS | DI | UART CTS, if set high, it disables transmitter |
| 17 | USB_D+ | DIO | USB port. 1.5K pullup activated when USB port is ready (~500 ms after reset). |
| 18 | USB_D- | DIO | USB port |
| 19 | GPIO2 | DIO | Status, high when connected, low otherwise. See Section 2.3 “Connection Status” . |
| 20 | GPIO3 | DIO | Auto discovery = high |
| 21 | GPIO5 | DIO | Status, toggles based on state, low on connect. See Section 2.3 “Connection Status” . |
| 22 | GPIO4 | DIO | Set factory defaults. See Section 2.2 “Factory Reset Using GPIO4” . |
| 23 | SPI_CSB | DI | (Optional) Factory diagnostic and test. See Section 2.8 “SPI Interface” . |
| 24 | SPI_MISO | DO | (Optional) Factory diagnostic and test. See Section 2.8 “SPI Interface” . |
| 25 | GND | Power | Ground reference (RN41N only) |
| 26 | RF ANT | AIO | Antenna, 50-Ohm impedance (RN41N only) |
| 27 | GND | Power | Ground reference (RN41N only) |
| 28 | GND | Power | Ground reference |
| 29 | GND | Power | Ground reference |
| 30 | AIO0 | AIO | (Not used) Optional analog input. |
| 31 | GPIO8 | DIO | UART TX/RX data activity |
| 32 | GPIO9 | DIO | I/O |
| 33 | GPIO10 | DIO | I/O (remote DTR signal) |
| 34 | GPIO11 | DIO | I/O (remote RTS signal) |
| 35 | AIO1 | AIO | (Not used) Optional analog input |

Note 1: Pin numbers 7 through 10 are reserved for future use.

RN41/RN41N

2.0 APPLICATION INFORMATION

The following sections provide information on designing with the RN41/RN41N module, including radio interference, factory reset, solder reflow profile, connection status and so on.

2.1 Reset Circuit

The RN41/RN41N contains a weak internal pull-up to VCC, and the reset polarity is active low. The module's reset pin has an optional Power-on Reset circuit with a delay, which is only 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 I/O is available to generate the reset once power is stable. If not, designers can use one of the many low-cost power supervisor chips available, such as the MCP809 or MCP102/121.

2.2 Factory Reset Using GPIO4

It is recommended to connect the GPIO4 pin to a switch, jumper, or resistor so it can be accessed. This pin can be used to reset the module to its factory default settings, which is critical in situations where the module has been misconfigured. To reset the module to the factory defaults, GPIO4 should be high on power-up and then toggle between low and high twice with a 1 second wait between the low-high transitions.

2.3 Connection Status

GPIO5 is available to drive an LED, and it blinks at various speeds to indicate status, see [Table 2-1](#). GPIO2 is an output that directly reflects the connection state as shown in [Table 2-2](#).

TABLE 2-1: GPIO5 STATUS

| GPIO5 Status | Description |
|-----------------|-----------------------------------------------------------|
| Toggle at 1 Hz | The module is discoverable and waiting for a connection. |
| Toggle at 10 Hz | The module is in command mode. |
| High | The module is connected to another device over Bluetooth. |

TABLE 2-2: GPIO2 STATUS

| GPIO2 Status | Description |
|--------------|-----------------------------------------------------------|
| High | The module is connected to another device over Bluetooth. |
| Low | The module is not connected over Bluetooth. |

2.4 Module Mounting Details

[Figure 2-1](#) and [Figure 2-2](#) show the recommended PCB footprint for the RN41 and RN41N, respectively. When laying out the carrier board for the RN41 module, the areas under the antenna and shielding connections should not have surface traces, ground planes, or exposed vias.

[Figure 2-3](#) and [Figure 2-4](#) show the recommended mounting details for the RN41 and RN41N, respectively. For optimal radio performance, the RN41 module's antenna end should protrude at least 31 mm beyond any metal enclosure.

[Figure 2-5](#) shows examples of good, bad and acceptable positioning of the RN41 on the host PCB.

FIGURE 2-1: RN41 RECOMMENDED PCB FOOTPRINT

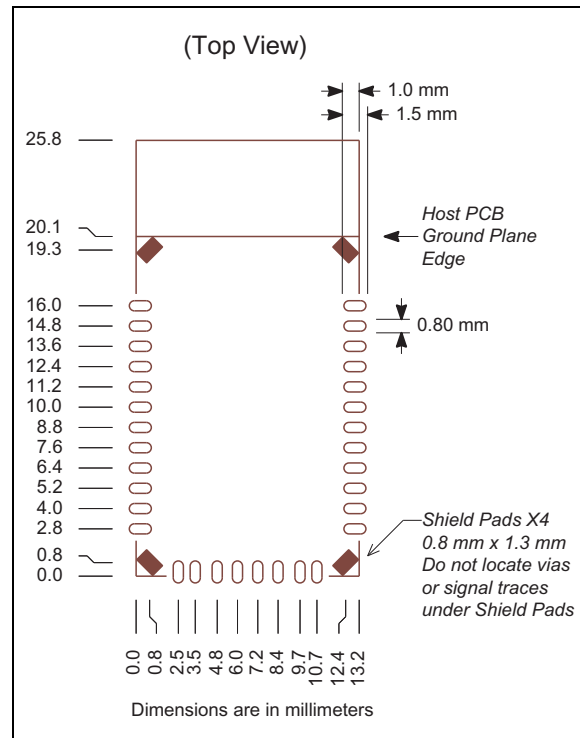


FIGURE 2-2: RN41N RECOMMENDED PCB FOOTPRINT

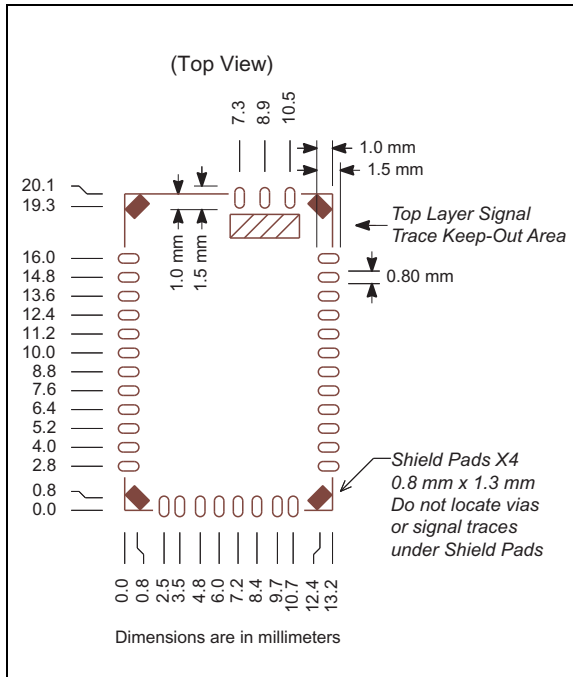


FIGURE 2-4: RN41N MODULE MOUNTING DETAILS

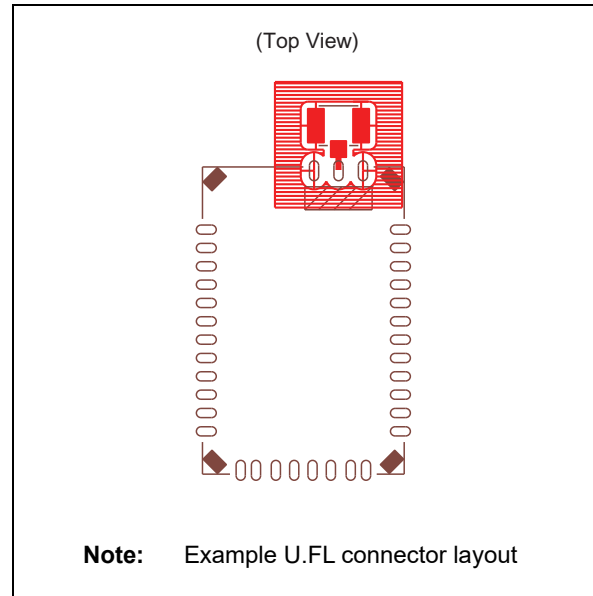
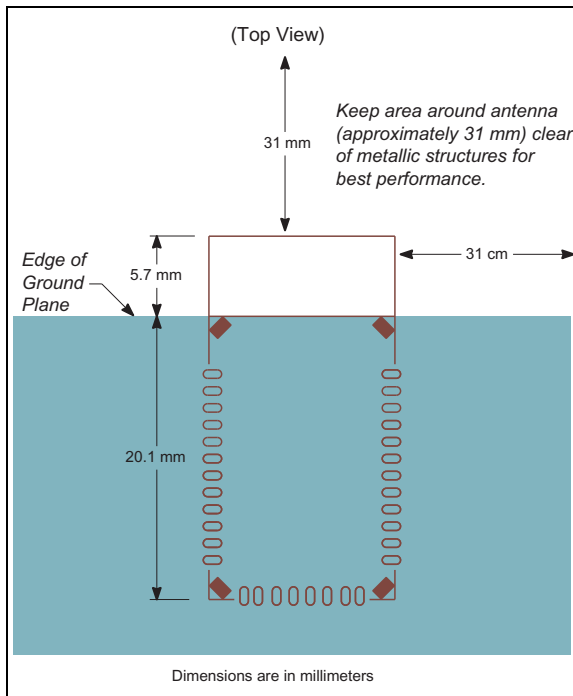
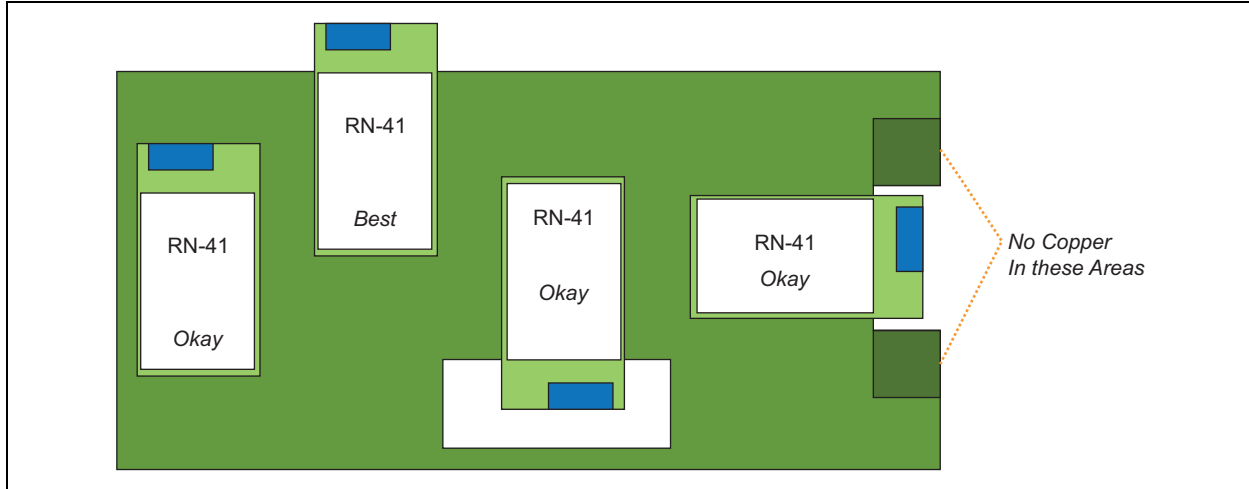


FIGURE 2-3: RN41 MODULE MOUNTING DETAILS



RN41/RN41N

FIGURE 2-5: RN41 HOST PCB EXAMPLE LAYOUT



2.5 External Antenna Types (RN41N)

The RN41N module's antenna pin (pin 25) provides a 50-ohm impedance to external antennas. Pin 25 can connect directly to a coaxial cable or to an antenna connector such as a U.FL or reverse polarity SMA.

The PCB trace from pin 25 to the coaxial cable or connector should be less than 0.2 inches (5 mm) for minimum loss and the best impedance match. If the PCB trace is longer, it should be a 50-ohm impedance microstrip trace. Connect adjacent ground pins 24 and 26 to a low-impedance ground on the host PCB and the antenna connection. [Figure 2-4](#) gives example host PCB layout to a U.FL connector.

Modular certification of the RN41N module was performed with the external antenna types listed in [Table 2-3](#). Refer to **Section 3.0 “Regulatory Approval”** for specific regulatory requirements by country.

TABLE 2-3: TESTED EXTERNAL ANTENNA TYPES

| Type | Gain (dBi) |
|----------|------------|
| Monopole | 0.56 |
| Whip | 8 |
| Yagi | 15 |

2.6 HCI Mode

Microchip offers the Host Controller Interface (HCI) mode in addition to the standard operational mode of its Bluetooth modules (standard mode refers to the on-board stack running on the module).

In HCI mode, the on-board stack is bypassed and the module is put in a state that runs the Bluetooth baseband. The HCI provides a command reference interface to the baseband controller and the link manager, and provides access to the hardware status and control registers. This interface provides a uniform method for accessing the Bluetooth baseband capabilities.

In this mode, the Bluetooth stack is no longer on-board the module. It is offloaded to the interfacing host processor. The Bluetooth module is used as a radio, performing the lower level MAC functionalities, while the application stack runs on the host processor.

Using the module in HCI mode enables designers to implement profiles that are not natively supported on the Bluetooth module.

Note: HCI mode is only available by ordering part RN41HCI for UART interface; or RN41U for USB interface.

Microchip offers HCI mode in two hardware interfaces:

- HCI over UART (RN41HCI-I/RM)
- HCI over USB (RN41U-I/RM)

2.6.1 HCI OVER UART

In this mode, the hardware interface between the host processor and the Bluetooth module is the UART configured at 115.2 Kbps. You must interface the flow control signals between the host processor and the Bluetooth module for the HCI interface to work. Failure to do so can cause the host processor and the Bluetooth module to become out of sync and break the Bluetooth link.

2.6.2 HCI OVER USB

In this mode, the hardware interface between the host processor and the Bluetooth module is the USB. In this architecture, the Bluetooth module is the USB client and the host processor is the USB host.

Using the USB interface offers the advantage of a faster data link between the Bluetooth module and the host processor. With this architecture, it is possible to achieve Bluetooth's theoretical maximum throughput of 3 Mbps.

2.7 Soldering Recommendations

The RN41/RN41N wireless module was assembled using standard lead-free reflow profile IPC/JEDEC J-STD-020.

The module can be soldered to the host PCB using standard leaded and lead-free solder reflow profiles.

To avoid damaging the module, the following recommendations are given:

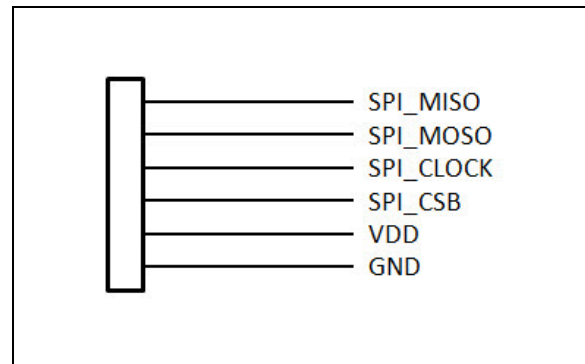
- Microchip Technology Application Note, "AN233 Solder Reflow Recommendation" (DS00233) provides solder reflow recommendations
- Do not exceed peak temperature (T_p) of 250 C°
- Refer to the solder paste data sheet for specific reflow profile recommendations
- Use no-clean flux solder paste
- Do not wash as moisture can be trapped under the shield
- Use only one flow. If the PCB requires multiple flows, apply the module on the final flow.

2.8 SPI Interface

The SPI Interface is primarily used for factory test and diagnostics. Although not required, the SPI interface is useful for restoring a corrupted flash image or enabling test modes required for certification testing.

When module is installed in a final product that requires European type approval, see **Section 3.3 "Europe"**, it is recommended that the SPI interface should be accessible via 6-pin header as shown in [Figure 2-6](#).

FIGURE 2-6: OPTIONAL SPI INTERFACE



2.9 Bluetooth SIG QDID

The RN41 has a QDID registered with the Bluetooth SIG. The manufacturer using the RN41 module in their end product can reference this QDID when filing an EPL (end product listing) to use Bluetooth® brand and logo. Please visit the Bluetooth SIG at www.bluetooth.org for more information.

Declaration ID: B013180

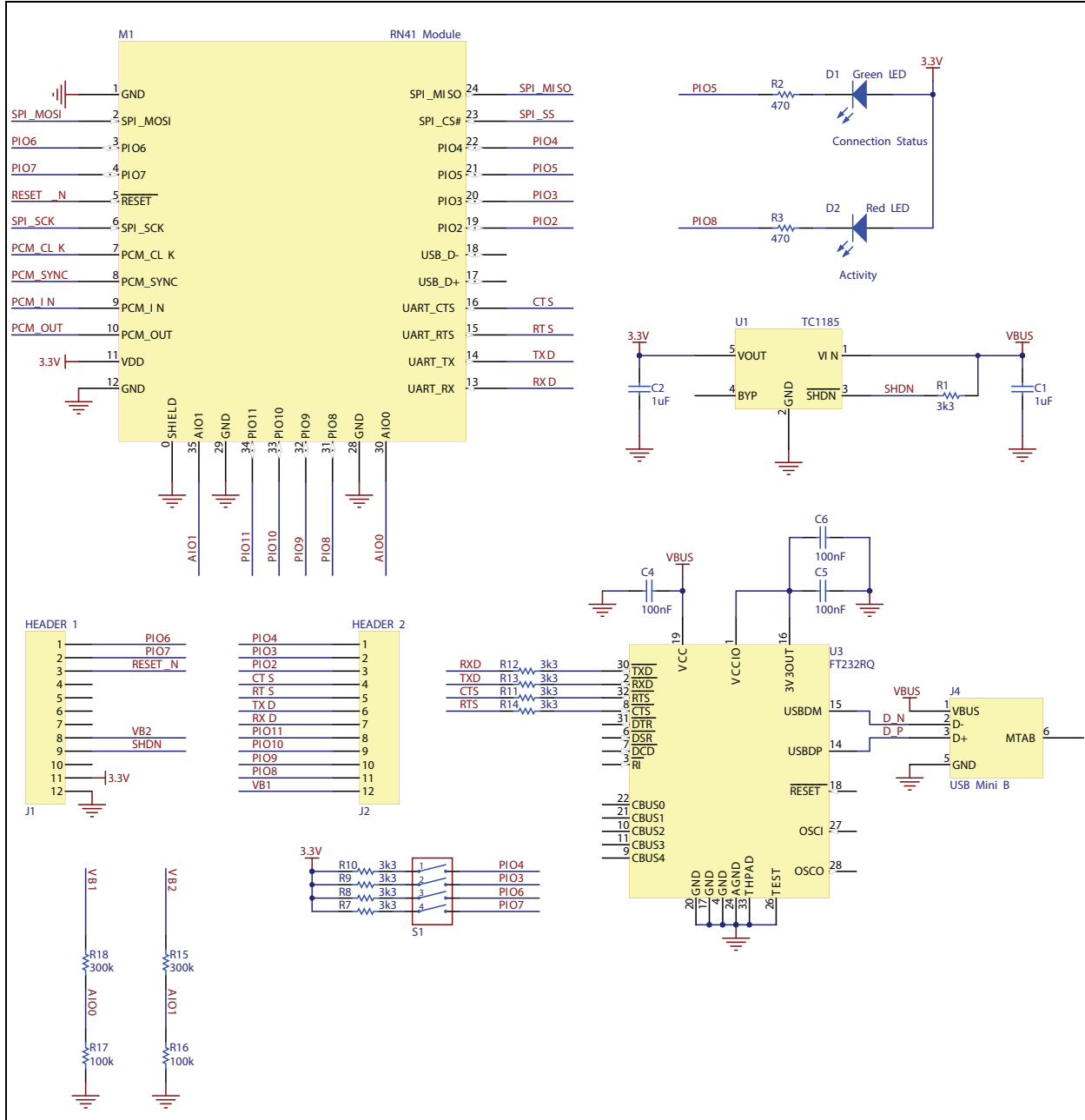
QDID: 7786

RN41/RN41N

2.10 Application Schematic

Figure 2-7 shows an example application circuit. This schematic is for the RN-41-EK development tool. Refer to Section 1.1 “MCU Interface” for details on how to connect RN41/RN41N to a microcontroller.

FIGURE 2-7: TYPICAL APPLICATION CIRCUIT



3.0 REGULATORY APPROVAL

This section outlines the regulatory information for the RN41/RN41N module for the following countries:

- United States
- Canada
- Europe
- Australia
- New Zealand

3.1 United States

The RN41/RN41N module has received Federal Communications Commission (FCC) CFR47 Telecommunications, Part 15 Subpart C “Intentional Radiators” modular approval in accordance with Part 15.212 Modular Transmitter approval. Modular approval allows the end user to integrate the RN41/RN41N module into a finished product without obtaining subsequent and separate FCC approvals for intentional radiation, provided no changes or modifications are made to the module circuitry. Changes or modifications could void the user’s authority to operate the equipment. The end user must comply with all of the instructions provided by the Grantee, which indicate installation and/or operating conditions necessary for compliance.

The finished product is required to comply with all applicable FCC equipment authorizations regulations, requirements and equipment functions not associated with the transmitter module portion. For example, compliance must be demonstrated to regulations for other transmitter components within the host product; to requirements for unintentional radiators (Part 15 Subpart B “Unintentional Radiators”), such as digital devices, computer peripherals, radio receivers, etc.; and to additional authorization requirements for the non-transmitter functions on the transmitter module (i.e., Verification, or Declaration of Conformity) (e.g., transmitter modules may also contain digital logic functions) as appropriate.

3.1.1 LABELING AND USER INFORMATION REQUIREMENTS

The RN41/RN41N module has been labeled with its own FCC ID number and if the FCC ID is not visible when the module is installed inside another device, then the outside of the finished product into which the module is installed must also display a label referring to the enclosed module. This exterior label can use wording as follows:

RN41:
Contains Transmitter Module FCC ID: T9JRN41-3

or

Contains FCC ID: T9JRN41-3

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference and (2) this device must accept any interference received, including interference that may cause undesired operation

RN41N:
Contains Transmitter Module FCC ID: OA3-RN41N

or

Contains FCC ID: OA3-RN41N

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference and (2) this device must accept any interference received, including interference that may cause undesired operation

RN41/RN41N

A user's manual for the product should include the following statement:

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

Additional information on labeling and user information requirements for Part 15 devices can be found in KDB Publication 784748 available at the FCC Office of Engineering and Technology (OET) Laboratory Division Knowledge Database (KDB) <https://apps.fcc.gov/oetcf/kdb/index.cfm>.

3.1.2 RF EXPOSURE

All transmitters regulated by FCC must comply with RF exposure requirements. KDB 447498 General RF Exposure Guidance provides guidance in determining whether proposed or existing transmitting facilities, operations or devices comply with limits for human exposure to Radio Frequency (RF) fields adopted by the Federal Communications Commission (FCC).

From the RN41 FCC Grant: Modular Approval. Power Output listed is conducted. The antenna(s) used for this device must be installed to provide a separation distance of at least 20 cm from all persons and must not be co-located or operating in conjunction with any other antenna or transmitter. This grant is valid only when the device is sold to OEM integrators and the OEM integrators are instructed to ensure that the end user has no manual instructions to remove or install the device. End users and installers must be provided with antenna installation instructions and transmitter operating conditions for satisfying RF Exposure compliance.

From the RN41N FCC Grant: Modular Approval. Power Output listed is conducted. The antenna(s) used for this device must be installed to provide a separation distance of at least 20 cm from all persons and must not be co-located or operating in conjunction with any other antenna or transmitter. This grant is valid only when the device is sold to OEM integrators and the OEM integrators are instructed to ensure that the end user has no manual instructions to remove or install the device. End users and installers must be provided with antenna installation instructions and transmitter operating conditions for satisfying RF Exposure compliance.

If the RN41/RN41N module is used in a portable application (i.e., the antenna is less than 20 cm from persons during operation), the integrator is responsible for performing Specific Absorption Rate (SAR) testing in accordance with the guidance in KDB 447498.

3.1.3 APPROVED EXTERNAL ANTENNA TYPES

To maintain modular approval in the United States, only the antenna types that have been tested shall be used. It is permissible to use different antenna manufacturer provided the same antenna type and antenna gain (equal to or less than) is used.

Testing of the RN41N module was performed with the antenna types listed in [Table 2-3](#).

3.1.4 HELPFUL WEB SITES

Federal Communications Commission (FCC): <http://www.fcc.gov>

FCC Office of Engineering and Technology (OET) Laboratory Division Knowledge Database (KDB): <https://apps.fcc.gov/oetcf/kdb/index.cfm>.

3.2 Canada

The RN41/RN41N module has been certified for use in Canada under Innovation, Science and Economic Development Canada (ISED, formerly Industry Canada) Radio Standards Specification (RSS) RSS-210 and RSSGen. Modular approval permits the installation of a module in a host device without the need to recertify the device.

3.2.1 LABELING AND USER INFORMATION REQUIREMENTS

Labeling Requirements for the Host Device (from RSP-100, Issue 12, Section 5): The host device shall be properly labeled to identify the module within the host device.

The Industry Canada certification label of a module shall be clearly visible at all times when installed in the host device, otherwise the host device must be labeled to display the Industry Canada certification number of the module, preceded by the words "Contains transmitter module", or the word "Contains", or similar wording expressing the same meaning, as follows:

RN-41:

Contains transmitter module IC: 6514A-RN413

RN-41N:

Contains transmitter module IC: 7693A-RN41N

User Manual Notice for License-Exempt Radio Apparatus (from Section 8.4 RSS-Gen, Issue 5, March 2019): User manuals for license-exempt radio apparatus shall contain the following or equivalent notice in a conspicuous location in the user manual or alternatively on the device or both:

This device contains license-exempt transmitter(s)/ receiver(s) that comply with Innovation, Science and Economic Development Canada's license-exempt RSS(s). Operation is subject to the following two conditions:

1. This device may not cause interference;
2. This device must accept any interference, including interference that may cause undesired operation of the device.

L'émetteur/récepteur exempt de licence contenu dans le présent appareil est conforme aux CNR d'Innovation, Sciences et Développement économique Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes:

1. L'appareil ne doit pas produire de brouillage;
2. L'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

Transmitter Antenna (From Section 6.8 RSS-GEN, Issue 5, March 2019): User manuals, for transmitters shall display the following notice in a conspicuous location:

This radio transmitter [IC: 6514A-RN413 and IC: 7693A-RN41N] has been approved by Innovation, Science and Economic Development Canada to operate with the antenna types listed below, with the maximum permissible gain indicated. Antenna types not included in this list that have a gain greater than the maximum gain indicated for any type listed are strictly prohibited for use with this device.

Le présent émetteur radio [IC: 6514A-RN413 and IC: 7693A-RN41N] a été approuvé par Innovation, Sciences et Développement économique Canada pour fonctionner avec les types d'antenne énumérés cidessous et ayant un gain admissible maximal. Les types d'antenne non inclus dans cette liste, et dont le gain est supérieur au gain maximal indiqué pour tout type figurant sur la liste, sont strictement interdits pour l'exploitation de l'émetteur.

Immediately following the above notice, the manufacturer shall provide a list of all antenna types approved for use with the transmitter, indicating the maximum permissible antenna gain (in dBi) and required impedance for each.

3.2.2 RF EXPOSURE

All transmitters regulated by ISED must comply with RF exposure requirements listed in RSS-102 - Radio Frequency (RF) Exposure Compliance of Radiocommunication Apparatus (All Frequency Bands).

3.2.3 APPROVED EXTERNAL ANTENNA TYPES

Transmitter Antenna (from Section 7.1.2 RSS-Gen, Issue 3, December 2010):

The RN41N module can only be sold or operated with antennas with which it was approved. Transmitter may be approved with multiple antenna types. An antenna type comprises antennas having similar in-band and out-of-band radiation patterns. Testing shall be performed using the highest gain antenna of each combination of transmitter and antenna type for which approval is being sought, with the transmitter output power set at the maximum level. Any antenna of the same type having equal or lesser gain as an antenna that had been successfully tested with the transmitter, will also be considered approved with the transmitter, and may be used and marketed with the transmitter.

When a measurement at the antenna connector is used to determine RF output power, the effective gain of the device's antenna shall be stated, based on measurement or on data from the antenna manufacturer. For transmitters of output power greater than 10 milliwatts, the total antenna gain shall be added to the measured RF output power to demonstrate compliance to the specified radiated power limits.

RN41/RN41N

Approved external antenna types for the RN41N module are listed in [Table 2-3](#).

3.2.4 HELPFUL WEB SITES

Industry Canada: <http://www.ic.gc.ca/>

3.3 Europe

The RN41/41N module is Radio Equipment Directive (RED) assessed, CE marked and have been manufactured and tested with the intention of being integrated into a final product.

The RN41/41N module has been tested to RED 2014/53/EU Essential Requirements mentioned in the following European Compliance table.

TABLE 3-1: EUROPEAN COMPLIANCE

| Certification | Standards | Article |
|--------------------------------------|---------------|---------|
| Safety | EN 62368 | 3.1a |
| Health | EN 62311 | |
| Electro Magnetic Compatibility (EMC) | EN 301 489-1 | 3.1b |
| | EN 301 489-17 | |
| Radio | EN300 328 | 3.2 |

The ETSI provides guidance on modular devices in “*Guide to the application of harmonised standards covering Article 3.1b and Article 3.2 of the Directive 2014/53/EU RED to multi-radio and combined radio and non-radio equipment*” document available at http://www.etsi.org/deliver/etsi_eg/203300_203399/203367/01.01.01_60/eg_203367v010101p.pdf.

Note: To maintain conformance to the standards listed in the preceding European Compliance table, the module shall be installed in accordance with the installation instructions in this data sheet and shall not be modified. When integrating a radio module into a completed product, the integrator becomes the manufacturer of the final product and is therefore responsible for demonstrating compliance of the final product with the essential requirements against the RED.

3.3.1 LABELING AND USER INFORMATION REQUIREMENTS

The label on the final product which contains the RN41/41N module must follow CE marking requirements.

3.3.2 CONFORMITY ASSESSMENT

From ETSI Guidance Note EG 203367, section 6.1 Non-radio products are combined with a radio product:

If the manufacturer of the combined equipment installs the radio product in a host non-radio product in equivalent assessment conditions (i.e. host equivalent to the

one used for the assessment of the radio product) and according to the installation instructions for the radio product, then no additional assessment of the combined equipment against article 3.2 of the RED is required.

3.3.2.1 SIMPLIFIED EU DECLARATION OF CONFORMITY

Hereby, Microchip Technology Inc. declares that the radio equipment type RN41/41N is in compliance with Directive 2014/53/EU.

The full text of the EU declaration of conformity for this product is available at

<https://www.microchip.com/wwwproducts/en/RN41>

(available under *Documents > Certifications*).

3.3.3 APPROVED EXTERNAL ANTENNAS

For RN41N, the approval is received using the antenna shown in [Table 2-3](#).

3.3.4 HELPFUL WEB SITES

A document that can be used as a starting point in understanding the use of Short Range Devices (SRD) in Europe is the European Radio Communications Committee (ERC) Recommendation 70-03 E, which can be downloaded from the European Radio Communications Committee (ECC) at: <http://www.ecodocdb.dk/>.

Additional helpful web sites are:

- Radio Equipment Directive (2014/53/EU): https://ec.europa.eu/growth/single-market/european-standards/harmonised-standards/red_en
- European Conference of Postal and Telecommunications Administrations (CEPT): <http://www.cept.org>
- European Telecommunications Standards Institute (ETSI): <http://www.etsi.org>

The Radio Equipment Directive Compliance Association (REDCA): <http://www.redca.eu/>

3.4 Australia

The Australia radio regulations do not provide a modular approval policy similar to the United States (FCC) and Canada (ISED). However, RN41/RN41N module RF transmitter test reports can be used in part to demonstrate compliance in accordance with ACMA Radio communications “Short Range Devices” Standard 2004 (The Short Range Devices standard calls up the AS/NZS 4268:2008 industry standard). The RN41/RN41N module test reports can be used as part of the product certification and compliance folder. For more information on the RF transmitter test reports, contact Microchip Technology Australia sales office.

To meet overall Australian final product compliance, the developer must construct a compliance folder containing all relevant compliance test reports e.g. RF, EMC, electrical safety and DoC (Declaration of Conformity) etc. It is the responsibility of the integrator to know what is required in the compliance folder for ACMA compliance. All test reports are available on the RN41/RN41N product web page at <http://www.microchip.com>. For more information on Australia compliance, refer to the Australian Communications and Media Authority web site <http://www.acma.gov.au/>.

3.4.1 EXTERNAL ANTENNA REQUIREMENTS

The compliance testing listed in [Table 3-1](#) was performed using the antenna types listed in [Table 2-3](#).

3.4.2 HELPFUL WEB SITES

The Australian Communications and Media Authority: www.acma.gov.au/.

3.5 New Zealand

The New Zealand radio regulations do not provide a modular approval policy similar to the United States (FCC) and Canada (ISED). However, RN41/RN41N module RF transmitter test reports can be used in part to demonstrate compliance against the New Zealand “General User Radio License for Short Range Devices”. New Zealand Radio communications (Radio Standards) Notice 2010 calls up the AS / NZS 4268:2008 industry standard. The RN41/RN41N module test reports can be used as part of the product certification and compliance folder. All test reports are available on the RN41/RN41N product web page at <http://www.microchip.com>. For more information on the RF transmitter test reports, contact Microchip Technology sales office.

Information on the New Zealand short range devices license can be found in the following web links:

<http://www.rsm.govt.nz/cms/licensees/types-of-licence/general-user-licences/short-range-devices>

and

<http://www.rsm.govt.nz/cms/policy-and-planning/spectrum-policy-overview/legislation/gazette-notices/product-compliance/radiocommunications-radiostandards-notice-2010>.

To meet overall New Zealand final product compliance, the developer must construct a compliance folder containing all relevant compliance test reports e.g. RF, EMC, electrical safety and DoC (Declaration of Conformity) etc. It is the responsibility of the developer to know what is required in the compliance folder for New Zealand Radio communications. For more information on New Zealand compliance, refer to the web site <http://www.rsm.govt.nz/>.

3.5.1 EXTERNAL ANTENNA REQUIREMENTS

The compliance testing listed in [Table 3-1](#) was performed using the antenna types listed in [Table 2-3](#).

3.5.2 HELPFUL WEB SITES

Radio Spectrum Ministry of Economic Development: <http://www.rsm.govt.nz/>.

RN41/RN41N

4.0 ORDERING INFORMATION

Table 4-1 provides ordering information for the RN41/RN41N module.

TABLE 4-1: ORDERING INFORMATION

| Part Number ⁽¹⁾ | Firmware ⁽²⁾ | Description |
|----------------------------|-------------------------|----------------------------------------|
| RN41-I/RM | Latest Production | Class 1, 2.1+EDR, SPP profile |
| RN41-I/RM615 | 6.15 | Class 1, 2.1+EDR, SPP profile |
| RN41-I/RM477 | 4.77 | Class 1, 2.1+EDR, SPP profile |
| RN41HCI-I/RM | N/A | Class 1, 2.0+EDR, HCI over UART |
| RN41U-I/RM | N/A | Class 1, 2.0+EDR, HCI over USB |
| RN41HID-I/RM | 6.11 | Class 1, 2.1+EDR, HID and SPP profiles |
| RN41APL-I/RM | Latest Production | Class 1, 2.1+EDR, SPP and MFi profiles |
| RN41APL-I/RM545 | 5.45 | Class 1, 2.1+EDR, SPP and MFi profiles |
| RN41APL-I/RM543 | 5.43 | Class 1, 2.1+EDR, SPP and MFi profiles |
| RN41N-I/RM | Latest Production | Class 1, 2.1+EDR, SPP profile |
| RN41N-I/RM615 | 6.15 | Class 1, 2.1+EDR, SPP profile |
| RN41N-I/RM477 | 4.77 | Class 1, 2.1+EDR, SPP profile |
| RN41NAPL-I/RM | Latest Production | Class 1, 2.1+EDR, SPP and MFi profiles |
| RN41NAPL-I/RM545 | 5.45 | Class 1, 2.1+EDR, SPP and MFi profiles |
| RN41NAPL-I/RM543 | 5.43 | Class 1, 2.1+EDR, SPP and MFi profiles |

Note 1: For other configurations, contact Microchip directly.

- 2:** When ordering the standard part number (customer part number without firmware version), the customer will receive the latest firmware version depending on production date and availability. It is highly recommended to order part number by specific firmware version to ensure receiving consistent firmware version. Information on firmware versions can be found on the RN41/RN41N product web page and the *“Bluetooth Data Module Command Reference and Advanced Information User’s Guide”*.

Go to <http://www.microchip.com> for current pricing and a list of distributors carrying Microchip products.

RN41/RN41N

NOTES:

APPENDIX A: REVISION HISTORY

Revision B (March 2021)

- Updated [Section 3.2.1 “Labeling and User Information Requirements”](#) and [Section 3.3 “Europe”](#)
- Updated with the new terminologies. For more details, see the below note.

Note: *Microchip is aware that some terminologies used in the technical documents and existing software codes of this product are outdated and unsuitable. This document may use these new terminologies, which may or may not reflect on the source codes, software GUIs, and the documents referenced within this document. The following table shows the relevant terminology changes made in this document.*

TABLE 1: TERMINOLOGY RELATED CHANGES

| Old Terminology | New Terminology | Description |
|-----------------|-----------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Master | Central | <ul style="list-style-type: none">• Section “Features” updated with the new terminology• Section 1.1 “MCU Interface” updated with the new terminology• Table 1-6 is updated with the new terminology |
| Slave | Peripheral | Section “Features” updated with the new terminology |
| Slave | Client | Section 2.6.2 “HCI over USB” updated with the new terminology |

Revision A (August 2014)

This is the initial released version of the document in the Microchip format. This replaces Roving Networks RN41/RN41N Data Sheet.

RN41/RN41N

NOTES:

PRODUCT IDENTIFICATION SYSTEM

To order or obtain information, e.g., on pricing or delivery, refer to the factory or the listed sales office.

| <u>PART NO.</u> | ↓ | <u>RM</u> | <u>XXX</u> | |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------|---------------------------------------------------------|--------------------------|--|
| Device | Temperature Range | Package | Firmware Revision Number | |
| <p>Device:</p> <p>RN41 : UART, Ceramic Chip Antenna RN41N : UART, External Antenna RN41HCI: HCI over UART, Ceramic Chip Antenna RN41U : HCI over USB, Ceramic Chip Antenna RN41APL: SPP and MFi profiles, Ceramic Chip Antenna</p> <p>Temperature Range: I = -40°C to +85°C</p> <p>Package: * RM = Radio Module</p> <p style="text-align: center;">*All package offerings are Pb Free (Lead Free)</p> | | | | |
| Examples: | | | | |
| a) | RN41-I/RM: | Ceramic Chip Antenna Latest production firmware version | | |
| b) | RN41-I/RM615: | Ceramic Chip Antenna Firmware version 6.15 | | |
| c) | RN41-I/RM477: | Ceramic Chip Antenna Firmware version 4.77 | | |
| d) | RN41APL-I/RM: | Ceramic Chip Antenna Latest production firmware version | | |
| e) | RN41APL-I/RM543: | Ceramic Chip Antenna firmware version 5.43 | | |
| f) | RN41HCI-I/RM: | Ceramic Chip Antenna HCI over UART | | |

RN41/RN41N

NOTES:

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- Technical Support

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NOTES:

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