RN41/RN41N

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 (Slave mode), 300 Kbps (Master 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 (IC)
  - European R&TTE Directive 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

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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 1: 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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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 master, I/O pin (DTR), and character-based trigger modes.

FIGURE 1-1: RN41/RN41N TO MCU INTERFACE

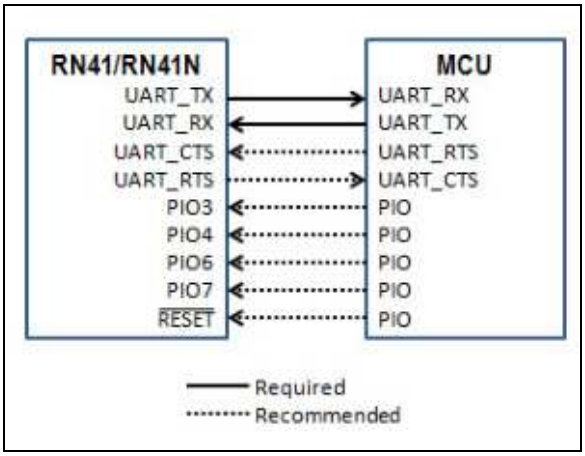


Table 1-1, Table 1-2, Table 1-3, Table 1-4, and Table 1-5 provide the module's environmental conditions, electrical characteristics, dimensions, radio characteristics, and digital I/O characteristics.

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^{o} C ~ 85^{o} C
Temperature Range (Storage)	-40^{o} C ~ 85^{o} C
Relative Humidity (Operating)	≤ 90%
Relative Humidity (Storage)	≤ 90%
Moisture Sensitivity Level	1

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

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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
$\Delta f1_{avg}$ Maximum Modulation	2.402	140	165	175	> 140	kHz
	2.441	140	165	175		kHz
	2.480	140	165	175		kHz
$\Delta f2_{avg}$ 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

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

FIGURE 1-2: RN41 MODULE DIMENSIONS

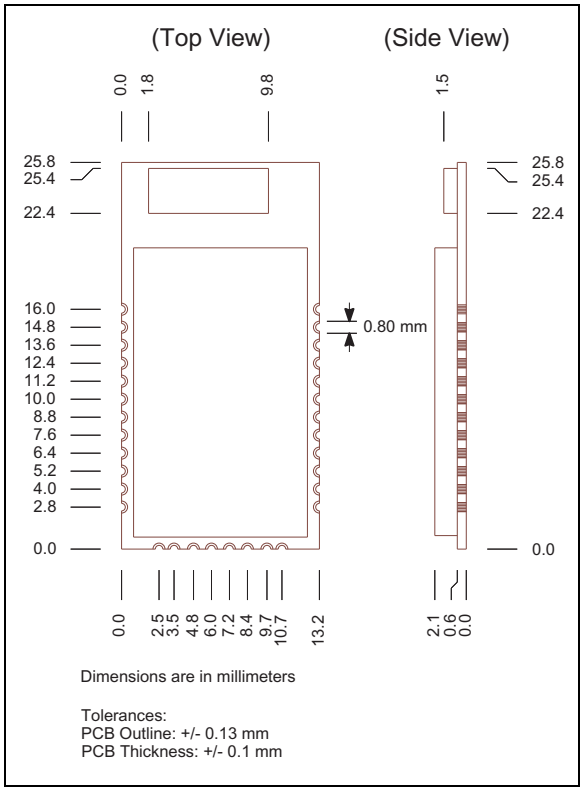


FIGURE 1-3: RN41N MODULE DIMENSIONS

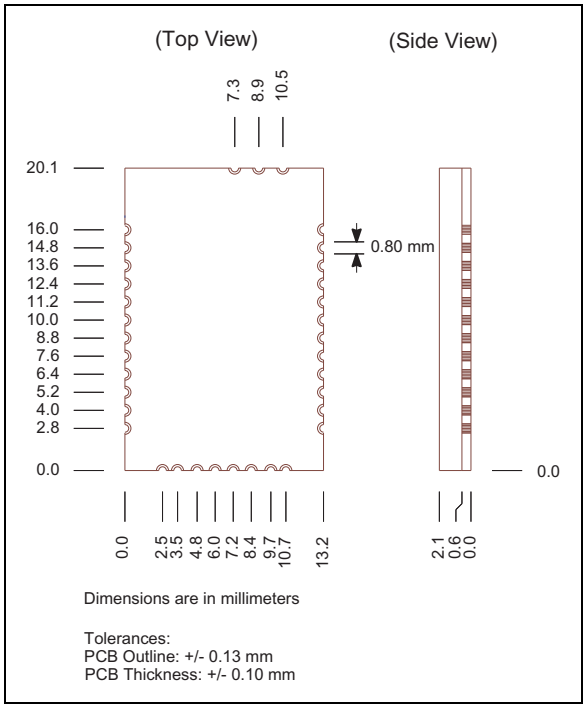


Figure 1-4 and Figure 1-5 show the pinout and Table 1-6 describes the module's pins.

FIGURE 1-4: RN41 PIN DIAGRAM

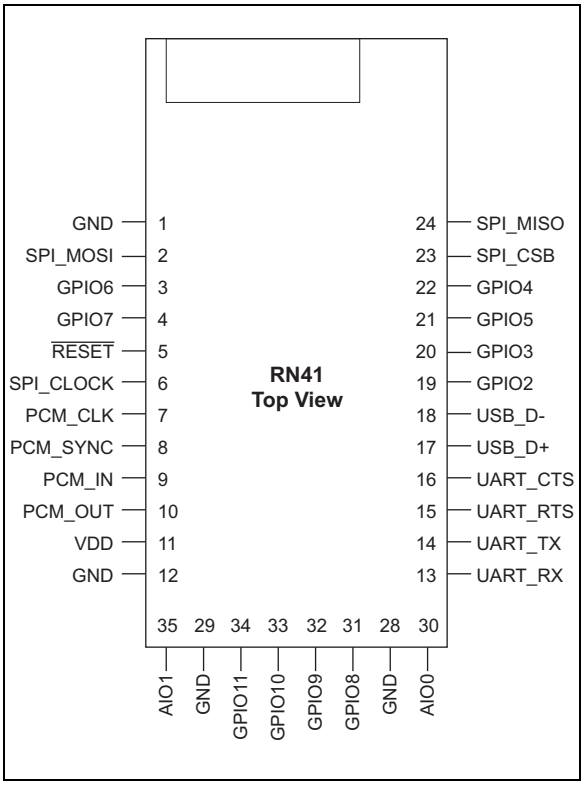
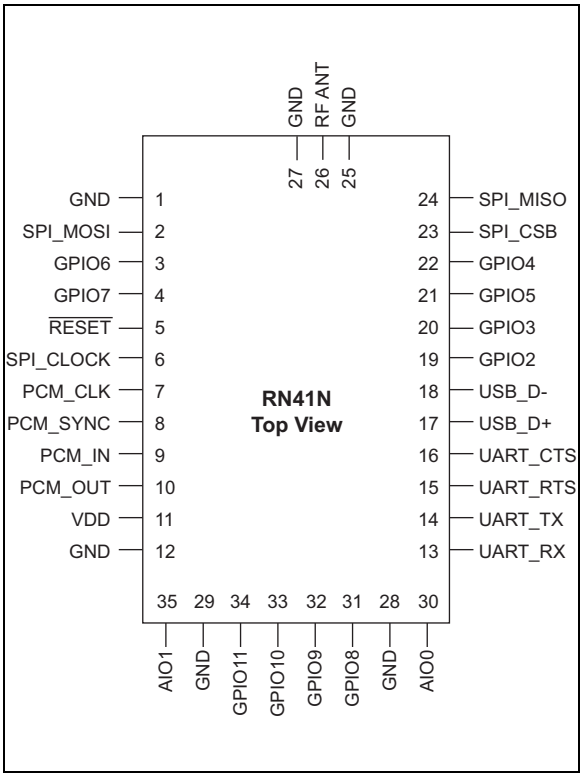


FIGURE 1-5: RN41N PIN DIAGRAM



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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 master (high = auto-master mode)
4	GPIO7	DIO	Set baud rate (high = force 9,600, low = 115K or firmware setting)
5	$\overline{\text{RESET}}$	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.

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 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 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

GPIO5 Status	Description
High	The module is connected to another device over Bluetooth.
Low	The module is not connected over Bluetooth.

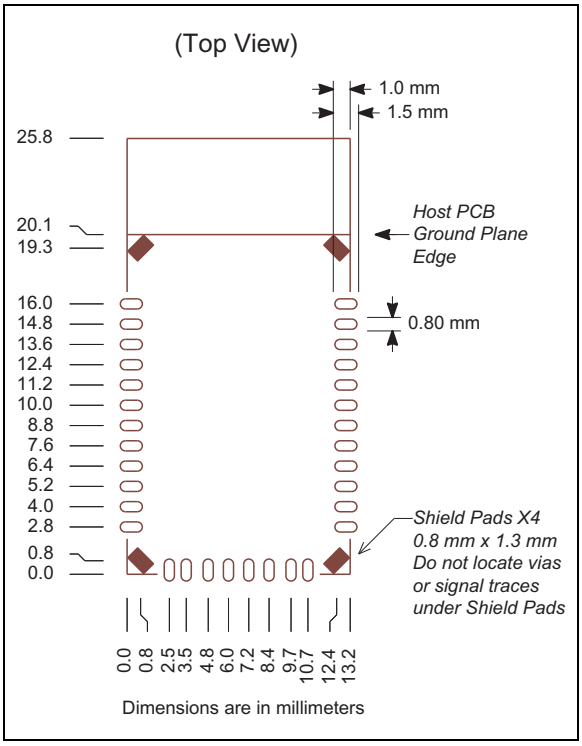
2.4 Module Mounting Details

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



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FIGURE 2-2: RN41N RECOMMENDED PCB FOOTPRINT

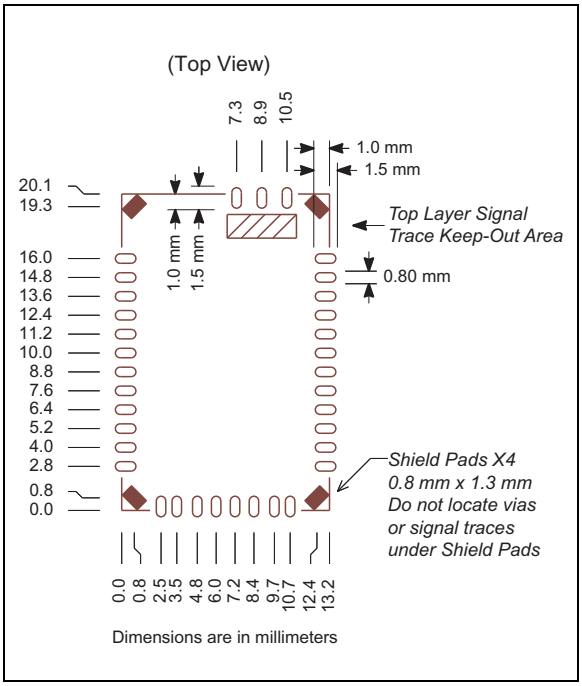


FIGURE 2-3: RN41 MODULE MOUNTING DETAILS

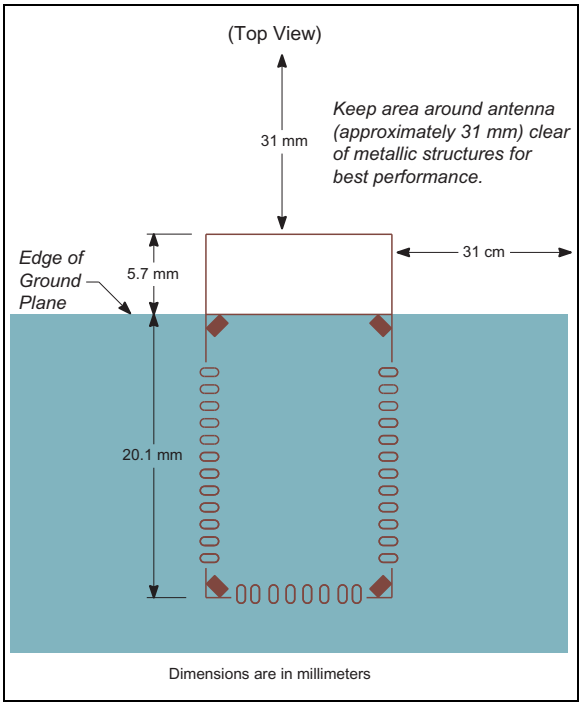
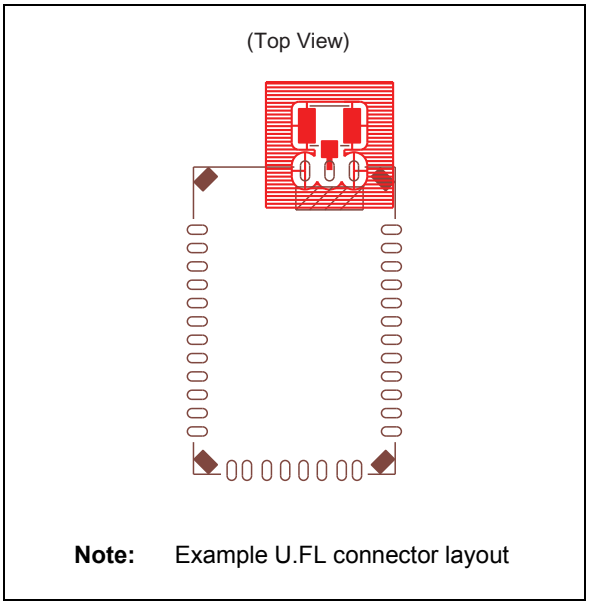
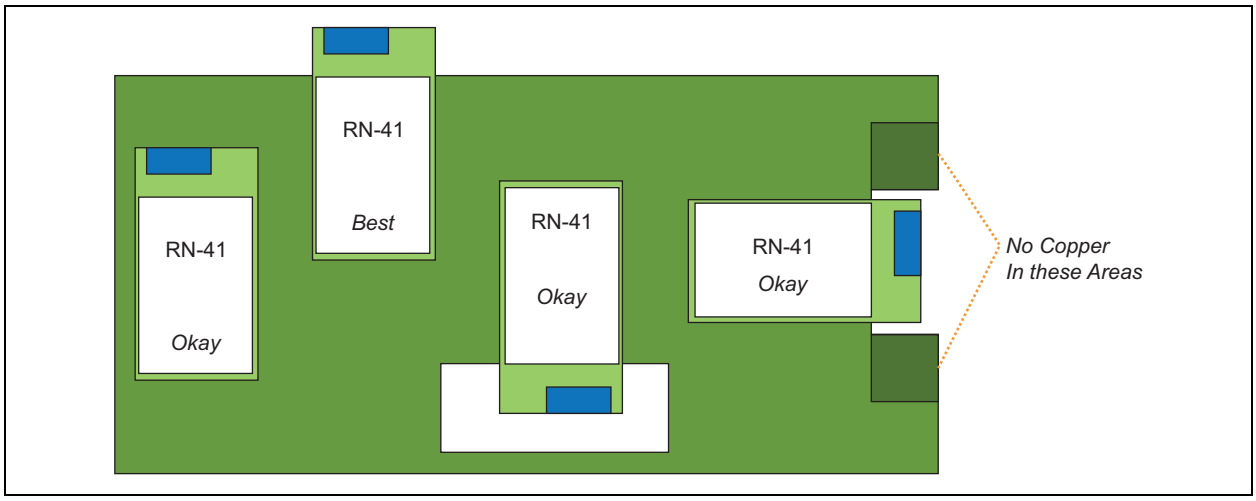


FIGURE 2-4: RN41N MODULE MOUNTING DETAILS



Note: Example U.FL connector layout

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.

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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 slave 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 Mpbs.

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:

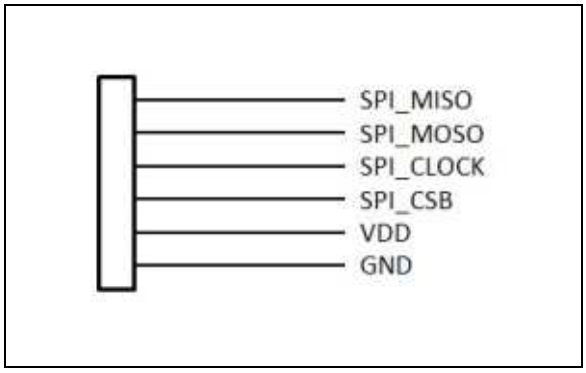
- Microchip Technology Application Note," *AN233 Solder Reflow Recommendation*" (DS00233) provides solder reflow recommendations
- Do not exceed peak temperature (T_p) of 250 C°
- Refer to the solder paste data sheet for specific reflow profile recommendations
- Use no-clean flux solder paste
- Do not 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.

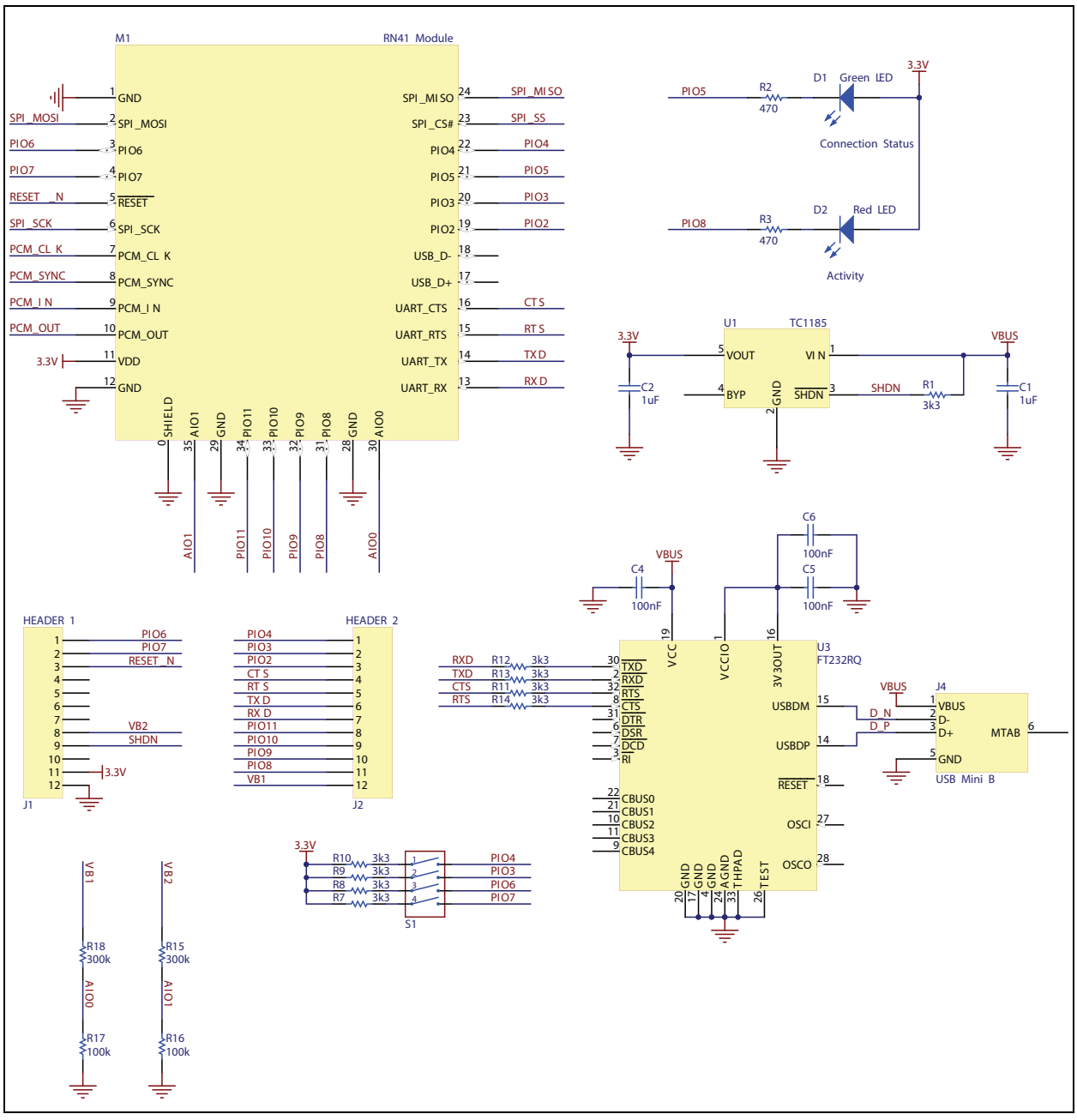
Declaration ID: B013180

QDID: 7786

2.10 Application Schematic

Figure 2-7 shows a 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



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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

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 Industry Canada (IC) 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 Section 3.2.1, RSS-Gen, Issue 3, December 2010): The host device shall be properly labeled to identify the module within the host device.

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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 7.1.3 RSS-Gen, Issue 3, December 2010): 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 complies with Industry Canada license-exempt RSS standard(s). Operation is subject to the following two conditions: (1) this device may not cause interference, and (2) this device must accept any interference, including interference that may cause undesired operation of the device.

Le présent appareil est conforme aux CNR d'Industrie 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, et (2) l'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

Transmitter Antenna (from Section 7.1.2 RSS-Gen, Issue 3, December 2010): User manuals for transmitters shall display the following notice in a conspicuous location:

Under Industry Canada regulations, this radio transmitter may only operate using an antenna of a type and maximum (or lesser) gain approved for the transmitter by Industry Canada. To reduce potential radio interference to other users, the antenna type and its gain should be so chosen that the equivalent isotropically radiated power (e.i.r.p.) is not more than that necessary for successful communication.

Conformément à la réglementation d'Industrie Canada, le présent émetteur radio peut fonctionner avec une antenne d'un type et d'un gain maximal (ou inférieur) approuvé pour l'émetteur par Industrie Canada. Dans le but de réduire les risques de brouillage radioélectrique à l'intention des autres utilisateurs, il faut choisir le type d'antenne et son gain de sorte que la puissance isotrope rayonnée équivalente (p.i.r.e.) ne dépasse pas l'intensité nécessaire à l'établissement d'une communication satisfaisante.

The above notice may be affixed to the device instead of displayed in the user manual.

3.2.2 RF EXPOSURE

All transmitters regulated by IC 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.

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/RN41N module is an R&TTE Directive assessed radio module that is CE marked and has been manufactured and tested with the intention of being integrated into a final product.

The RN41/RN41N module has been tested to R&TTE Directive 1999/5/EC Essential Requirements for Health and Safety (Article (3.1(a)), Electromagnetic Compatibility (EMC) (Article 3.1(b)), and Radio (Article 3.2) and are summarized in Table 3-1: European Compliance Testing. A Notified Body Opinion has also been issued. All test reports are available on the RN41/RN41N product web page at http://www.microchip.com.

The R&TTE Compliance Association provides guidance on modular devices in document **Technical Guidance Note 01** available at http://www.rtteca.com/html/download_area.htm.

Note:	To maintain conformance to the testing listed in Table 3-1, 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 of the R&TTE Directive.

3.3.1 LABELING AND USER INFORMATION REQUIREMENTS

The label on the final product which contains the RN41/RN41N module must follow CE marking requirements. The "*R&TTE Compliance Association Technical Guidance Note 01"* provides guidance on final product CE marking.

3.3.2 ANTENNA REQUIREMENTS

From R&TTE Compliance Association document **Technical Guidance Note 01**:

> Provided the integrator installing an assessed radio module with an integral or specific antenna and installed in conformance with the radio module manufacturer's installation instructions requires no further evaluation under Article 3.2 of the R&TTE Directive and does not require further involvement of an R&TTE Directive Notified Body for the final product. [Section 2.2.4]

The European Compliance Testing listed in Table 3-2 was performed using the antenna types listed in Table 2-3.

3.3.3 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 Office (ERO) at: http://www.ero.dk/.

Additional helpful web sites are:

- Radio and Telecommunications Terminal Equipment (R&TTE): http://ec.europa.eu/enterprise/rtte/index_en.htm
- European Conference of Postal and Telecommunications Administrations (CEPT): http://www.cept.org/
- European Telecommunications Standards Institute (ETSI): http://www.etsi.org
- European Radio Communications Office (ERO): http://www.ero.dk/
- The Radio and Telecommunications Terminal Equipment Compliance Association (R&TTE CA): http://www.rtteca.com/

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TABLE 3-1: RN41 EUROPEAN COMPLIANCE TESTING

Certification	Standards	Article	Laboratory	Report Number	Date
Safety	EN 60950-1:2006+A11:2009+A1:2010+A12:2011	[3.1(a)]	Worldwide Testing Services (Taiwan) Co., Ltd.	W6R21301-13005-L	2013-05-23
Health	EN 62479:2010			W6R21301-13005-62479	2013-10-03
EMC	EN 301 489-1 V1.9.2 (2011-09)	[3.1(b)]		W6R21301-13005-E-16	2013-09-09
	EN 301 489-17 V2.2.1 (2012-09)				
Radio	EN 300 328 V1.8.1 (2012-06)	(3.2)		W6R21301-13005-T-45	2013-10-03
Notified Body Opinion	CE0681	—	Eurofins Product Service GmbH	U9M-1305-2867-C-V01	2013-10-16

TABLE 3-2: RN41N EUROPEAN COMPLIANCE TESTING

Certification	Standards	Article	Laboratory	Report Number	Date
Safety	EN 60950-1:2006+A11:2009+A1:2010+A12:2011	(3.1a)	Integrity EnE lab Inc.	IL121010950	2012-10-22
Health	EN 62311:2008		Worldwide Testing Services (Taiwan) Co., Ltd.	W6M21209-12744-62311	2012-11-12
EMC	EN 301 489-1 V1.9.2 (2011-09)	(3.1b)		W6M21209-12744-E-16	2012-11-12
	EN 301 489-17 V2.2.1 (2012-09)				
Radio	EN 300 328 V1.7.1 (2006-10)	(3.2)		W6M21209-12744-T-45	2012-11-12
Notified Body Opinion	CE0681	—	Eurofins Product Service GmbH	U9M-1211-2432-C	2012-11-23

3.4 Australia

The Australia radio regulations do not provide a modular approval policy similar to the United States (FCC) and Canada (IC). 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 3-2 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 (IC). 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-oflicence/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 3-2 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/.

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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 drectly.

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.

NOTES:

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APPENDIX A: REVISION HISTORY

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.

NOTES:

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- Technical Support

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Technical support is available through the web site at: http://microchip.com/support

NOTES:

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PRODUCT IDENTIFICATION SYSTEM

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

PART NO.	I	RM	XXX
Device	Temperature Range	Package	Firmware Revision Number

Device:	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
Temperature Range:	I =	-40°C to +85°C
Package: *	RM =	Radio Module

*All package offerings are Pb Free (Lead Free)

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

NOTES:

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