RN4677

Bluetooth® 4.0 Dual Mode Module

Features

- Complete, fully certified, embedded 2.4 GHz Bluetooth® version 4.0 module
- Bluetooth Classic (BR/EDR) and Low Energy (LE)
- Bluetooth SIG certified
- On-board embedded Bluetooth stack
- Transparent UART mode for seamless serial data over Bluetooth Classic uses Serial Port Profile (SPP), and Bluetooth Low Energy uses Generic Attribute (GATT) Profile.
- Capability to open data connection in both Bluetooth Classic (Master) and Low Energy (Central) roles
- Easy to configure with ASCII commands, PC UI utility, or PIC® MCU driver library
- Firmware is upgradeable via UART
- Compact surface mount module: 22 x 12 x 2.4 mm
- Castellated surface mount pads for easy and reliable host PCB mounting
- Environmentally friendly, RoHS compliant
- Perfect for Portable Battery-Operated Devices
- Internal Battery Regulator Circuitry
- Worldwide regulatory certifications

Operational

- Single operating voltage: 3.2V to 4.3V
- Temperature range: -20°C to 70°C
- Simple, UART interface
- Integrated Crystal, Internal Voltage Regulator, and Matching Circuitry
- Multiple I/O pins for control and status

RF/Analog

- Frequency: 2.402 to 2.480 GHz
- Receive Sensitivity: -90 dBm (Classic); -92 dBm (LE)
- Power Output: 2 dBm (typical)

Data Throughput

- 50 kilobytes (Classic on Android)
- 8 kilobytes (LE on iOS7)

MAC/Baseband/Higher Layer

- Secure AES128 encryption
- GAP, SDP, SPP, and GATT profiles

Antenna

- Ceramic Chip Antenna (RN4677)
- External Antenna Connection via RF Pad (RN4677U)

Compliance

- Bluetooth SIG QDID: B021961
- Modular Certified for the United States (FCC) and Canada (IC)
- European R&TTE Directive Assessed Radio Module

General Description

The RN4677 is a fully certified Bluetooth version 4.0 (BR/EDR/LE) module, which enables the designers to easily add dual mode Bluetooth wireless capability to their products. Delivering local connectivity for the Internet of Things (IoT), the RN4677 bridges the product to Smart Phones and Tablets for convenient data transfer, control and access to cloud applications.

This Bluetooth SIG certified module provides a complete wireless solution with Bluetooth stack on-board, integrated antenna, and worldwide radio certifications in a compact surface mount package, 22 x 12 x 2.4 mm. It supports GAP, SDP, SPP, and GATT profiles. Data is transferred over the Bluetooth link by sending/receiving data via transparent UART mode, making it easy to integrate with any processor or Microcontroller with a UART interface. Configuration is made easy using a ASCII commands via UART. Windows® based GUI, or PIC MCU configuration driver are also used to access configuration settings over UART.

Applications

- Mobile Point of Sales (mPOS)
- LED lighting
- Wearables
- Digital Sports
- Fitness Devices
- Health Care/Medical
- Automotive Accessories
- Home Automation
- Remote Control Toys

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1.0   DEVICE OVERVIEW

The RN4677 is a complete, fully certified, embedded 2.4 GHz Bluetooth® version 4.0 (BR/EDR/LE) wireless module. It incorporates an on-board Bluetooth stack, cryptographic accelerator, power management subsystem, 2.4 GHz transceiver and RF power amplifier, see Figure 1-1. With the RN4677, designers can embed Bluetooth functionality rapidly into virtually any device.

The RN4677 provides cost and time-to-market savings as a self-contained module solution. The module has been designed to provide integrators with a simple Bluetooth solution that contains the following features:

• Ease of integration and programming
• Vastly reduced development time
• Minimum system cost
• Interoperability with Bluetooth hosts
• Maximum value in a range of applications.

The RN4677 can independently maintain a low-power wireless connection. Low-power usage and flexible power management maximize the module's lifetime in battery-operated devices. A wide operating temperature range enables use in indoor and outdoor environments (industrial temperature range).

The RN4677 module comes in two varieties. The RN4677 is a complete, fully regulatory certified module with integral ceramic chip antenna and shield. The RN4677U is a lower cost alternative with external antenna and no shield. The integrator is responsible for the antenna, antenna matching, and regulatory certifications.

The RN4677 is a small, compact, surface mount module with castellated pads for easy and reliable host PCB mounting. The module is compatible with standard pick-and-place equipment.

TABLE 1-1:   RN4677 MODULE FAMILY TYPES

Device	Antenna	Shield	Regulatory Certifications
RN4677	Integral ceramic chip	Yes	FCC, IC, CE
RN4677U	External	No	CE

FIGURE 1-1:   RN4677 BLOCK DIAGRAM
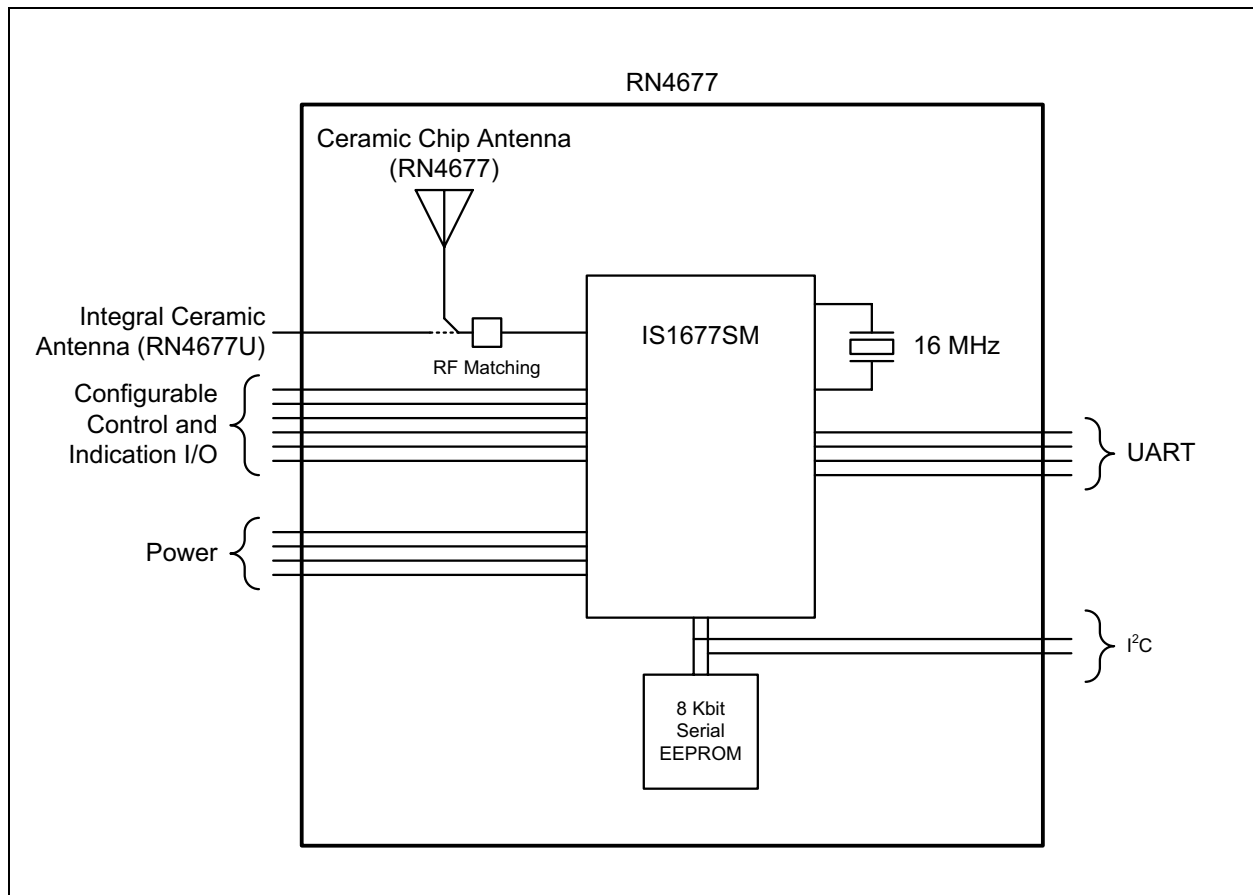
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1.1 Interface Description

Figure 1-2 shows the RN4677 pin diagram and Figure 1-3 shows the RN4677U. Table 1-2 describes the module's pins.
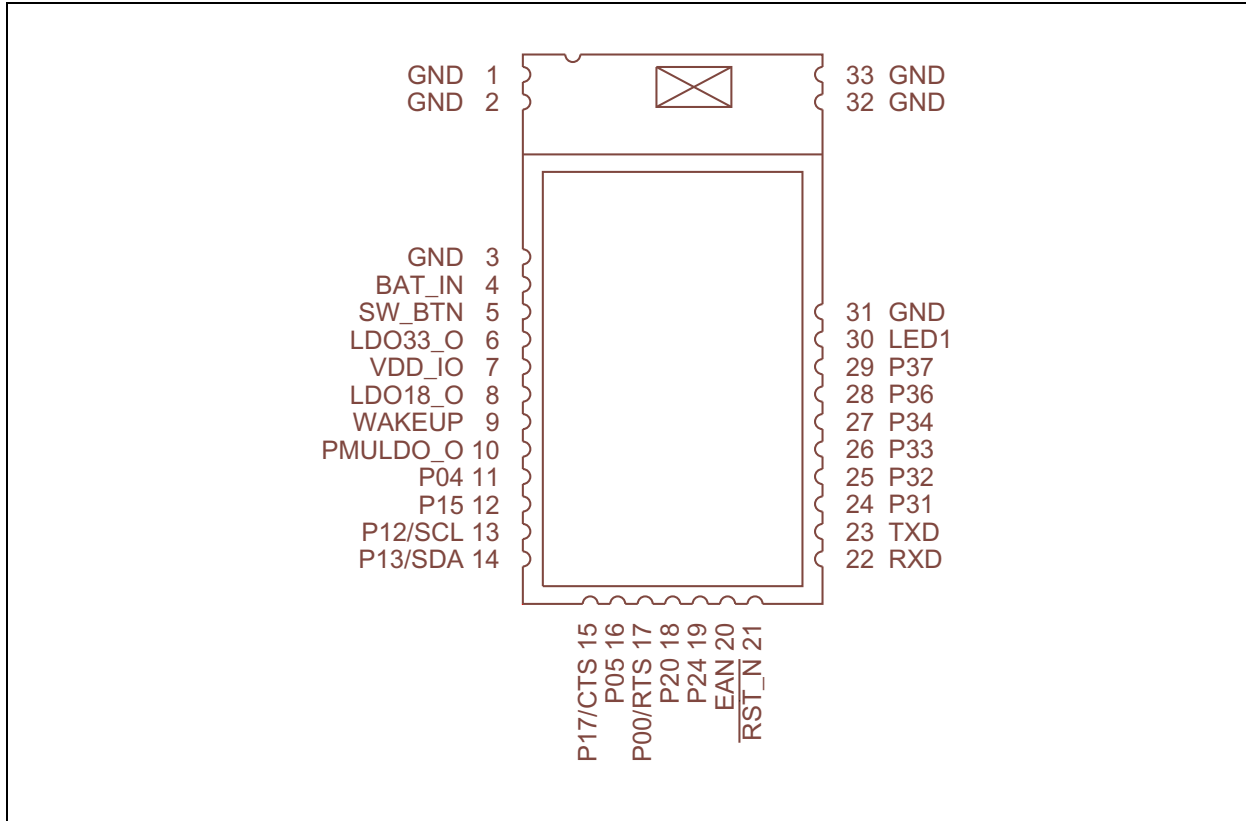
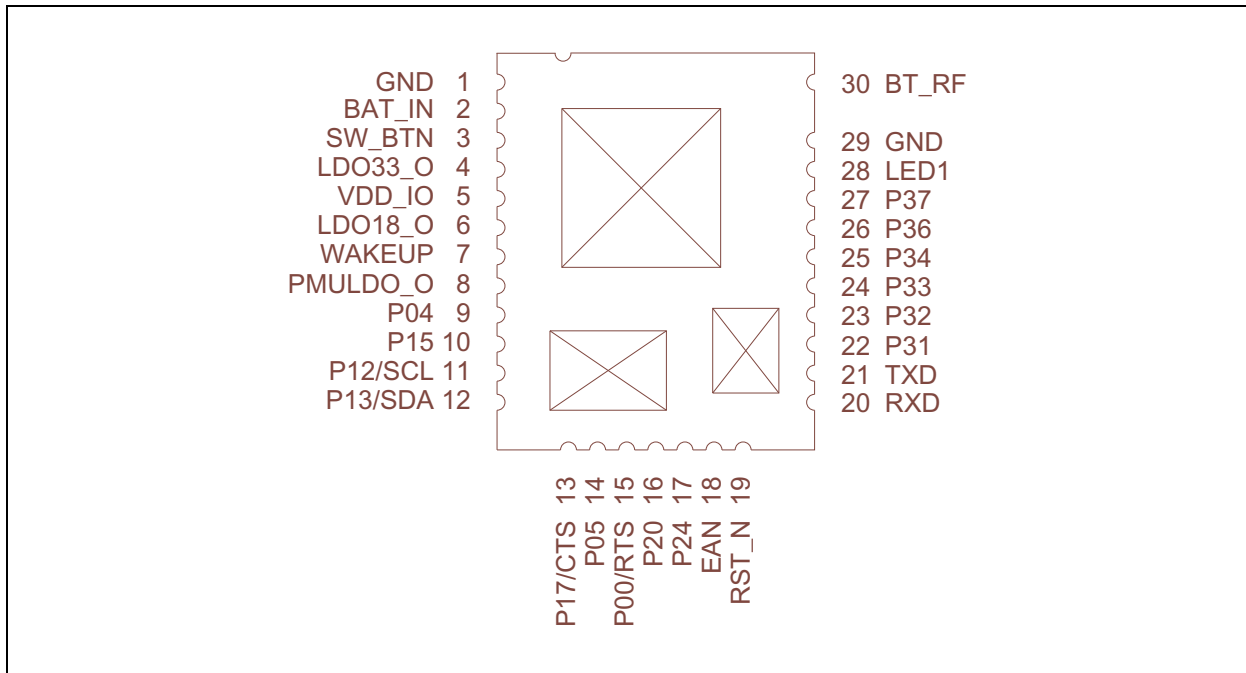**FIGURE 1-2:** **RN4677 PIN DIAGRAM**

FIGURE 1-3: **RN4677U PIN DIAGRAM**

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TABLE 1-2:   PIN DESCRIPTION

RN4677 Pin	RN4677U Pin	Name	Type	Description
1	—	GND	Power	Ground reference
2	—	GND	Power	Ground reference
3	1	GND	Power	Ground reference
4	2	BAT_IN	Power	Battery input. Main positive supply input. Connect to 10 µF low ESR ceramic capacitor.
5	3	SW_BTN	DI	Software Button - H: Power On; L: Power Off. See **Section 1.6 "Software Button (SW_BTN)"**.
6	4	LDO33_O	Power	Internal 3.3V LDO regulator output. Connect to 10 µF low ESR ceramic capacitor.
7	5	VDD_IO	Power	I/O positive supply input. Ensure VDD_IO and MCU I/O voltages are compatible.
8	6	LDO18_O	Power	Internal 1.8V LDO regulator output. Connect to 10 µF low ESR ceramic capacitor.
9	7	WAKEUP	DI	Wakeup from shutdown mode (active-low; internal pull up)
10	8	PMULDO_O	Power	Power management unit output. Connect to 1 µF low ESR ceramic capacitor.
11	9	P04	DO	Status Indicator 2 (STATUS_IND_2). See **Section 1.5 "Status Indication I/O Pins"**.
12	10	P15	DO	Status Indicator 1 (STATUS_IND_1). See **Section 1.5 "Status Indication I/O Pins"**.
13	11	P12/SCL	DO	I^2C SCL (Do not connect)
14	12	P13/SDA	DIO	I^2C SDA (Do not connect)
15	13	P17/CTS	DIO	Configurable control or indication pin or UART CTS (input)
16	14	P05	DIO	Configurable control or indication pin
17	15	P00/RTS	DIO	Configurable control or indication pin or UART RTS (output)
18	16	P20	DI	System configuration (internal pull up). See **Section 1.10 "System Configuration"**.
19	17	P24	DI	System configuration (internal pull up). See **Section 1.10 "System Configuration"**.
20	18	EAN	DI	System configuration (internal pull down). See **Section 1.10 "System Configuration"**.
21	19	RST_N	DI	Module Reset (active-low; internal pull up). Apply a pulse of at least 63 ns.
22	20	RXD	DI	UART data input
23	21	TXD	DO	UART data output
24	22	P31	DIO	Configurable control or indication pin. If configured as input; internal pull up.
25	23	P32	DIO	Configurable control or indication pin. If configured as input; internal pull up.
26	24	P33	DIO	Configurable control or indication pin If configured as input; internal pull up.
27	25	P34	DIO	Configurable control or indication pin If configured as input; internal pull up.
28	26	P36	DIO	Do not connect
29	27	P37	DIO	Configurable control or indication pin (when configured as input: internal pull up)
30	28	LED1	DO	Status LED. See **Section 1.9 "Status LED (LED1)"**.

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TABLE 1-2:   PIN DESCRIPTION (CONTINUED)

RN4677 Pin	RN4677U Pin	Name	Type	Description
31	29	GND	Power	Ground reference
—	30	BT_RF	AIO	External antenna connection (50 Ohm)
32	—	GND	Power	Ground reference
33	—	GND	Power	Ground reference

Note: Pin type abbreviation: A = Analog, D = Digital, I = Input, O = Output.

1.2   Configuring the RN4677

Configuring the RN4677 features are performed using either RN-style ASCII command documented in the *"RN4677 Bluetooth® Low Energy Dual Mode Module User's Guide"*. Alternatively, it is possible to configure the RN4677 using the interface as described in **Section 2.2 "External Configuration and Programming"**, along with either external PC configuration utility (UI Tool or EEPROM Tool), or the PIC MCU configuration library. For more information, visit www.microchip.com/rn4677.

1.3   UART Interface

Figure 1-4 and Figure 1-5 show power and MCU interface examples.

The RN4677 UART pins TXD and RXD connect to the UART pins of the host MCU. It is highly recommended to use hardware flow control pins RTS and CTS. By default, the RN4677 hardware flow control is disabled and must be configured to become enabled. The UART Baud is configurable and the available signal rates are listed in Table 4-5.

1.4   Control and Indication I/O Pins

The configurable control and indication I/O pins are P00, P05, P17, P31, P32, P33, P34 and P37. The RN4677 uses control signal as the input, whereas indication signals are the output. Table 1-3 shows configurable I/O pin assignments to the control and indication signals.

Note: RTS is only assigned to P00 and CTS to P17.

TABLE 1-3:   CONFIGURATION AND INDICATION I/O ASSIGNMENTS

Pin Name	Default Configuration
P00	UART_RTS
P05	NO_USE
P17	UART_CTS
P31	INQUIRY_CONFIGURE
P32	LINK_DROP
P33	UART_RX_IND
P34	PAIRING_KEY
P37	LOW_BATTERY_IND

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1.5   Status Indication I/O Pins

I/O pins P15 and P04 are Status Indicator 1 and 2 signals, respectively, which both provide status indication to the MCU as shown in Table 1-4.

TABLE 1-4:   STATUS INDICATION

P04/STATUS_IND_2	P15/STATUS_IND_1	Indication
H	H	Power default/Shutdown state
H	L	Access state
L	H	Link state (no UART data being transmitted)
L	L	Link state (UART data being transmitted)

1.6   Software Button (SW_BTN)

The Software Button (SW_BTN) input pin powers the RN4677 on (high) or off (low).

1.7   WAKE UP (WAKEUP)

The Wake Up (WAKEUP) input pin wakes the RN4677 from shutdown mode (active-low).

1.8   RESET (RST_N)

The Reset (RST_N) input pin resets the RN4677 (active-low pulse for at least 63 ns).

1.9   Status LED (LED1)

The status LED (LED1) indicates:

• Standby
• Inquiry
• Link
• Link Back
• Low Battery
• Page

Each indication is a configurable flashing sequence. LED brightness can also be configured.

1.10   System Configuration

To turn RN4677 into operation modes, set configuration for I/O pins P20, P24 and EAN, see Table 1-5. Both P20 and P24 have internal pull ups, whereas EAN has internal pull down.

1.11   Power

Figure 1-4 shows an example power scheme using a 3.3V Low Dropout (LDO) regulator supplying 3.3 V to both the RN4677 (BAT_IN and VDD_IO) and MCU VDD. This power scheme ensures that RN4677 and MCU I/O voltages are compatible.

Figure 1-5 shows an example power scheme using a 3.7V lithium-ion battery. The RN4677 has an internal 3.3V LDO regulator. Battery power is applied to BAT_IN pin. The regulated 3.3V output is on the LDO33_O pin. From the LDO33_O pin, voltage is routed to the VDD_IO pin and external circuitry including the MCU. This power scheme ensures that RN4677 and MCU I/O voltages are compatible.

CAUTION

The internal 3.3V LDO current source:
50 mA maximum.
Otherwise, damage to RN4677 PICtail may occur.

TABLE 1-5:   SYSTEM CONFIGURATION SETTINGS

P20	P24	EAN	Operational Mode
High	High	Low	Normal operation
Low	High	Low	Test (Write EEPROM)
Low	Low	High	Write Flash (Firmware programming)

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Figure 1-4 and Figure 1-5 show the recommended bypass capacitor location and values. Capacitors can be low ESR ceramic and must be placed closely to the RN4677 module.

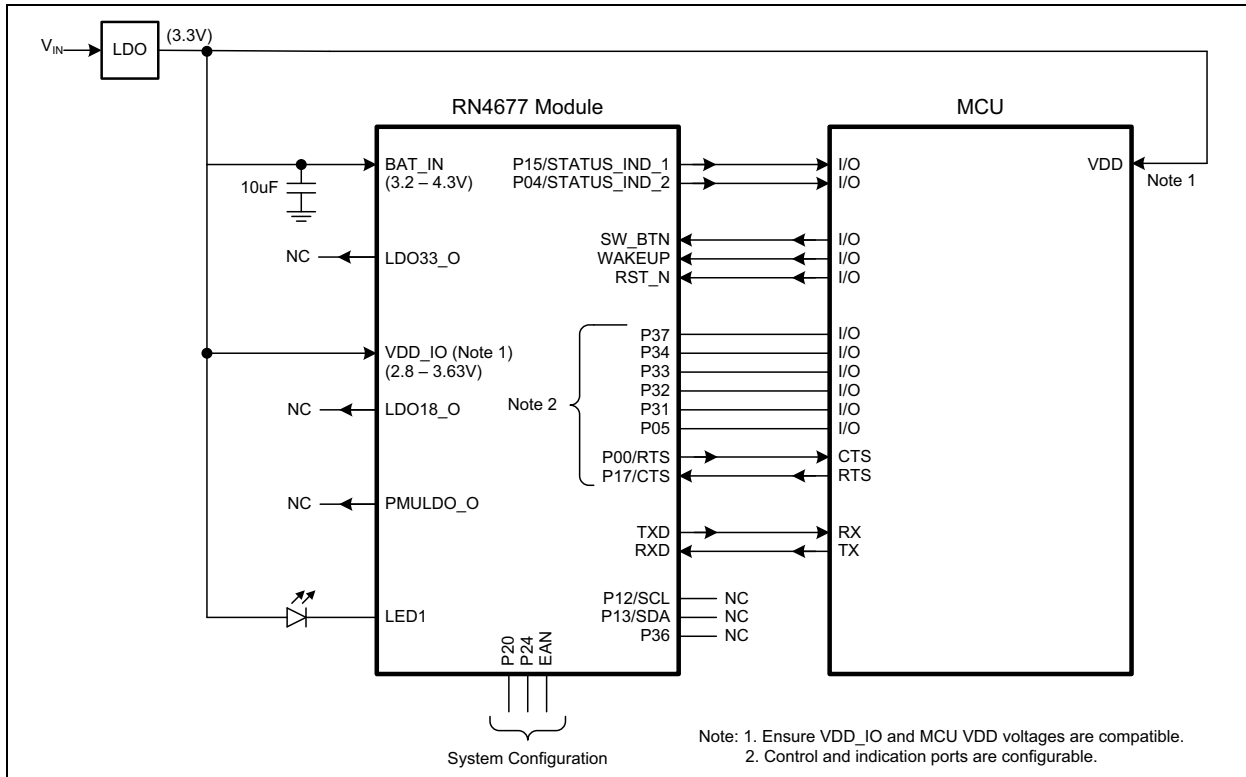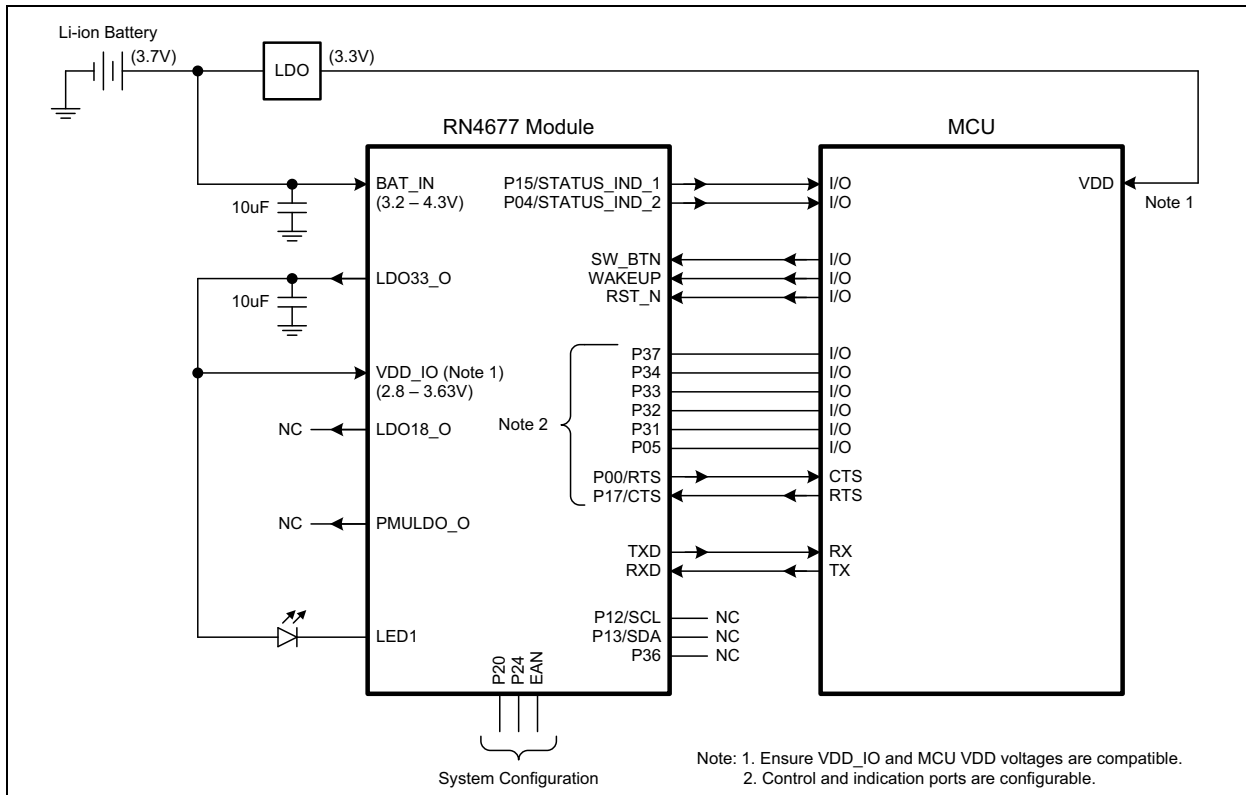**FIGURE 1-4:   RN4677 TO MCU INTERFACE EXAMPLE - LDO**

FIGURE 1-5:   RN4677 TO MCU INTERFACE EXAMPLE - BATTERY

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1.12 Mounting Details

The RN4677 physical dimensions are shown in Figure 1-6, recommended host PCB footprint in Figure 1-7, and mounting suggestion in Figure 1-8. *No* top copper layer must be near the test pin area as shown in Figure 1-7. When laying out the host PCB, the areas under the antenna must *not* contain any top, inner layer, or bottom copper as shown in Figure 1-8. A low-impedance ground plane ensures best radio performance (best range; lowest noise). Figure 1-8 also shows a minimum ground plane area to the left and right of the module for best antenna performance. The ground plane can be extended beyond the minimum recommended, see Figure 1-7, as required for host PCB EMC noise reduction. For best range performance, keep all external metal away from the ceramic chip antenna at least 31 mm.

1.13 Soldering Recommendations

The RN4677 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.

FIGURE 1-6: **RN4677 MODULE DIMENSIONS**
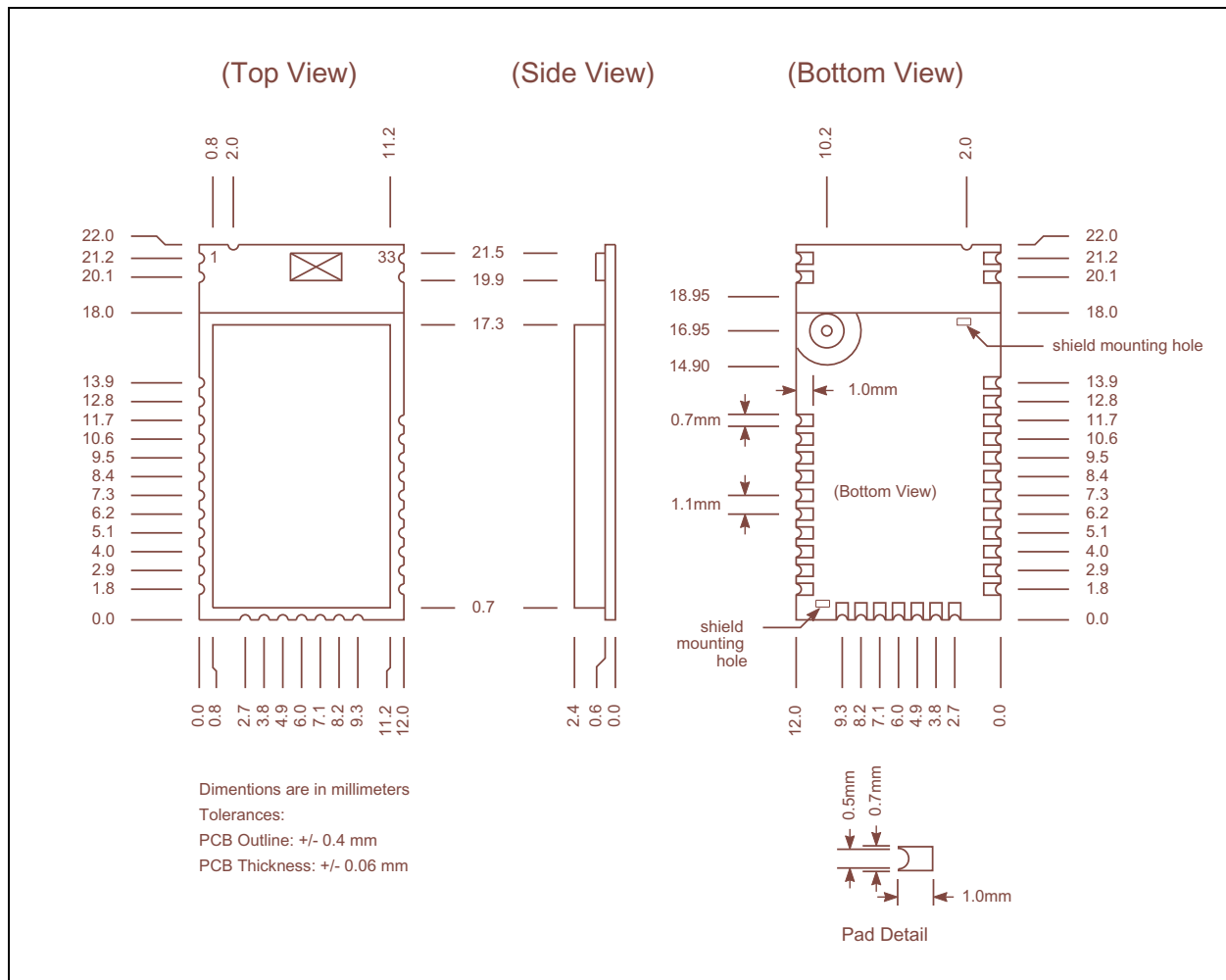
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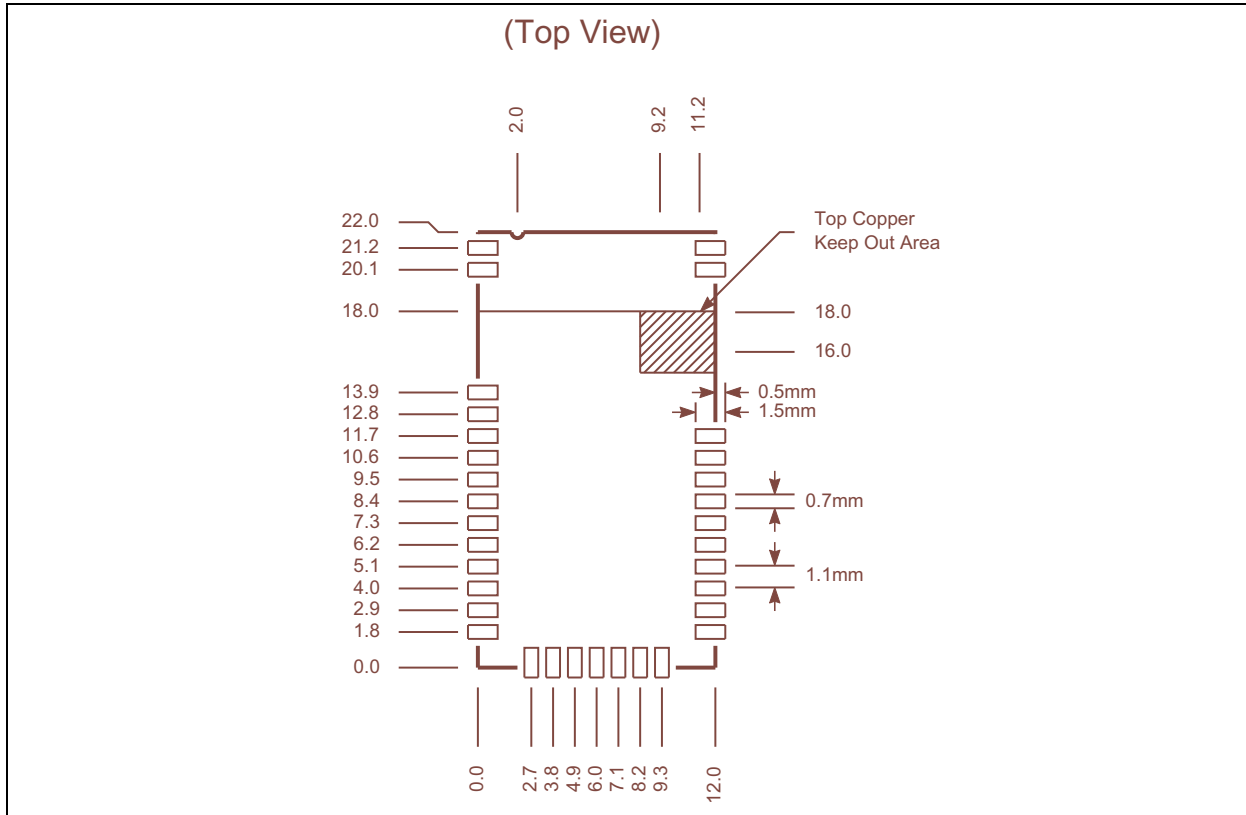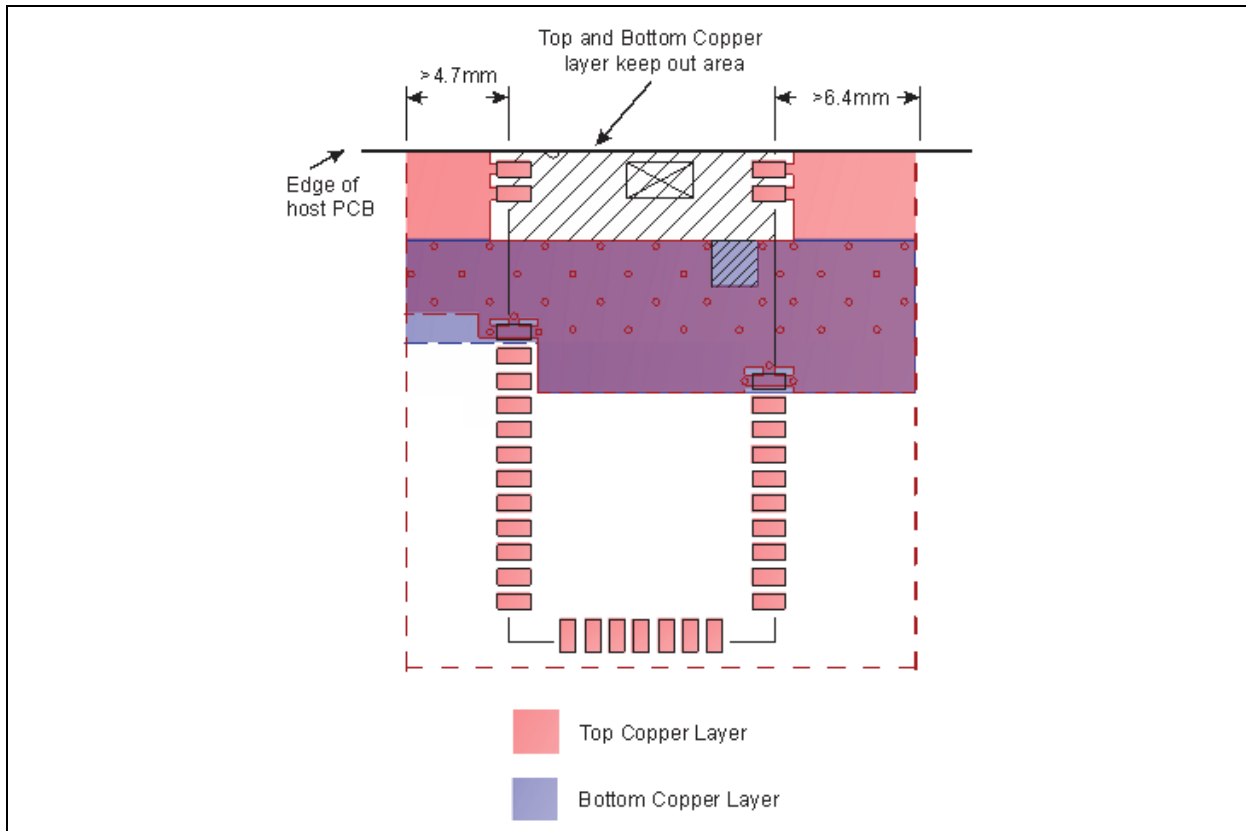**FIGURE 1-7:**   **RN4677 RECOMMENDED PCB FOOTPRINT**

(Top View)

FIGURE 1-8:   **RN4677 HOST PCB MOUNTING SUGGESTION**
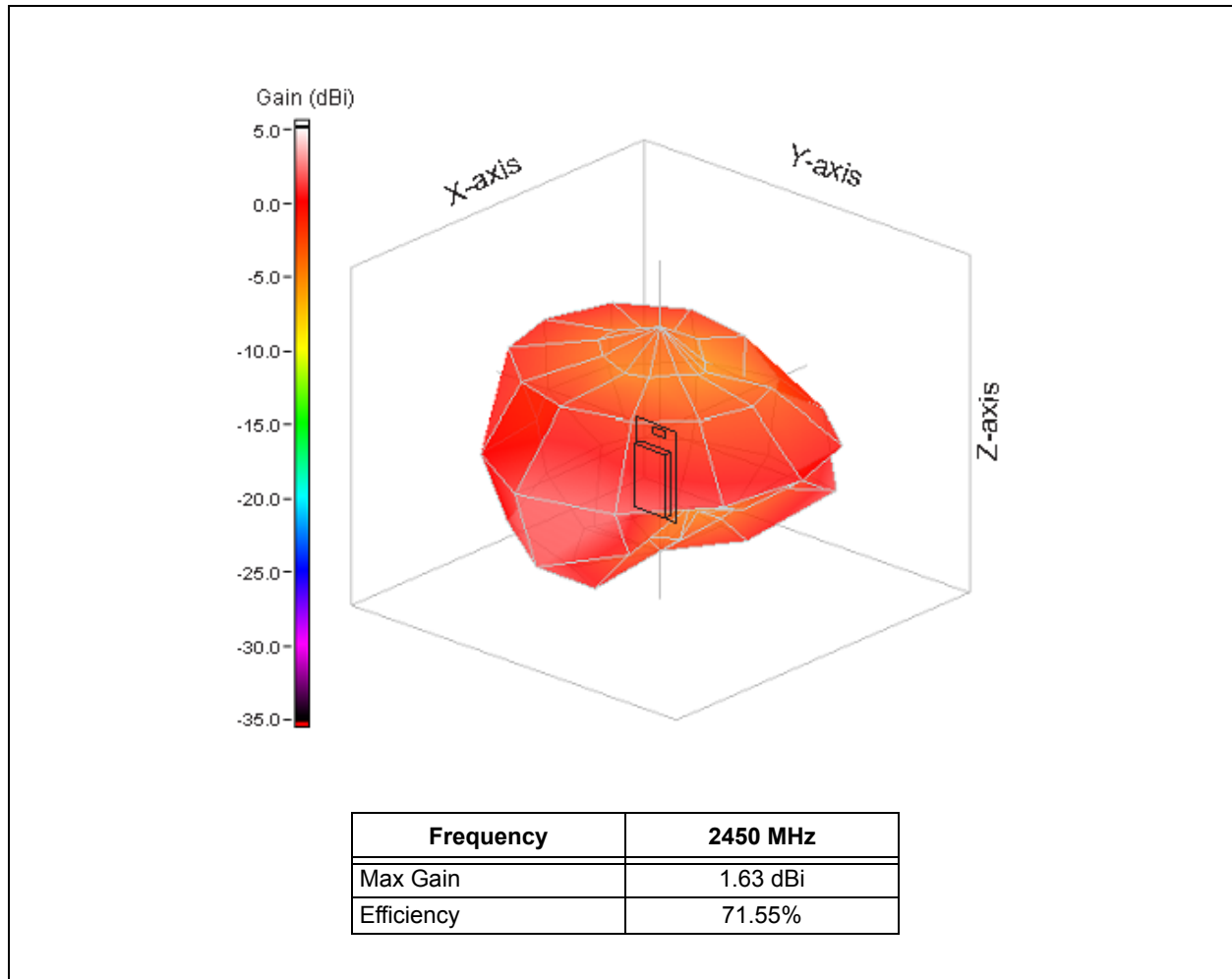
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2.0   APPLICATION INFORMATION

2.1   RN4677 Ceramic Chip Antenna

The RN4677 module contains an integral ceramic chip antenna. The antenna performance on the module is shown in Figure 2-1.

FIGURE 2-1:   RN4677 ANTENNA RADIATION PATTERN

Frequency	2450 MHz
Max Gain	1.63 dBi
Efficiency	71.55%

2.2 External Configuration and Programming

To configure the RN4677 module and program the firmware, use the external configuration and programming tool available from Microchip. Figure 2-2 shows the connections between the RN4677 and header J1, a standard 8-pin 0.100" (2.54 mm) spaced header. It is recommended to include this header on the host PCB for development.

Configuration and firmware programming modes are entered according to the system configuration I/O pins as described in Table 1-5.

FIGURE 2-2:   EXTERNAL PROGRAMMING HEADER CONNECTIONS
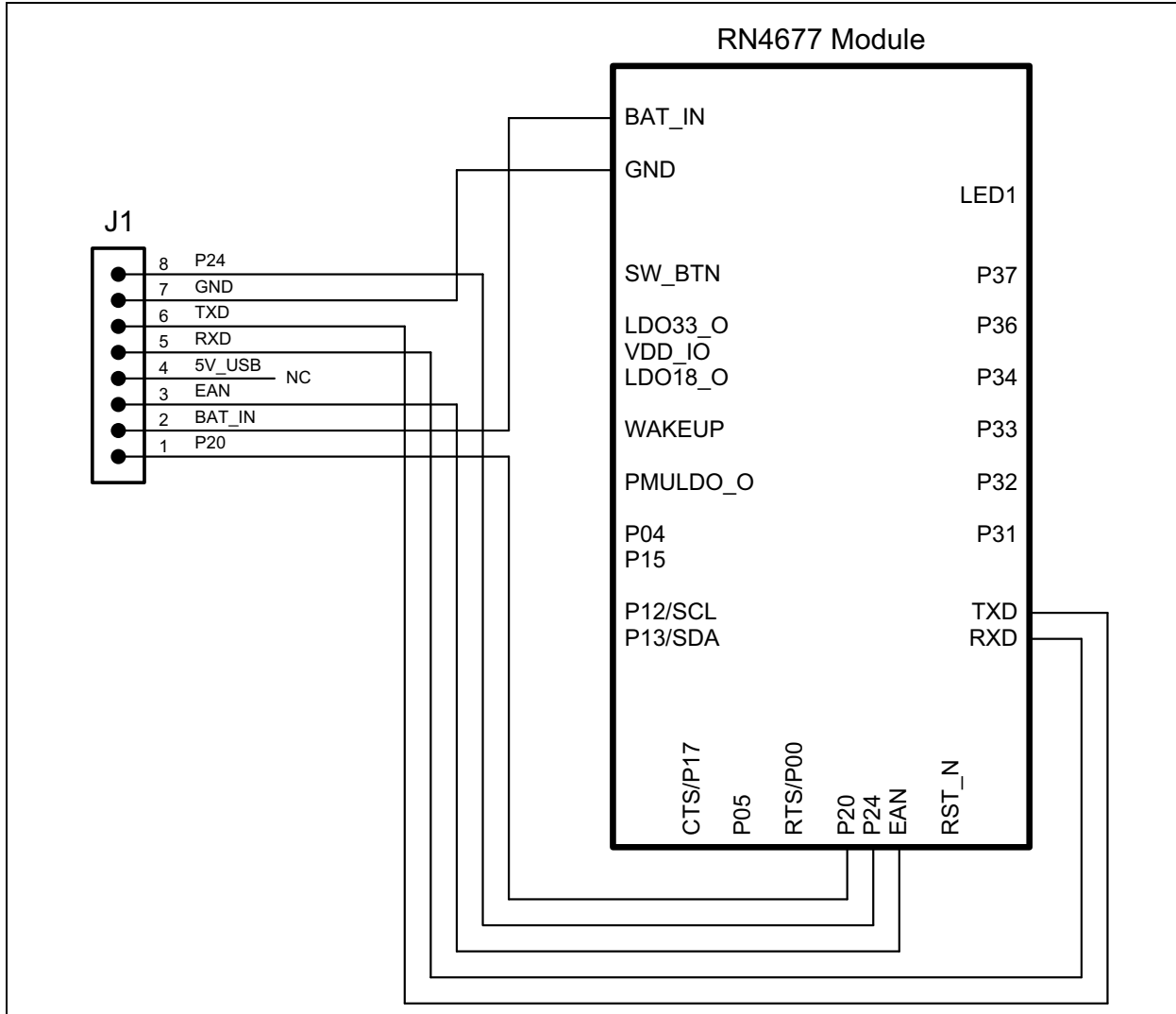
3.0 REGULATORY APPROVAL

This section outlines the regulatory information for the RN4677 module for the following countries:

• United States
• Canada
• Europe

3.1 United States

The RN4677 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 RN4677 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 RN4677 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:

> Contains Transmitter Module FCC ID: A8TBM77SPPSYC2A
>
> *or*
>
> Contains FCC ID: A8TBM77SPPSYC2A
>
> 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 finished 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 RN4677 FCC Grant: Output power listed is conducted. This grant is valid only when the module is sold to OEM integrators and must be installed by the OEM or OEM integrators. This transmitter is restricted for use with the specific antenna(s) tested in this application for Certification and must not be co-located or operating in conjunction with any other antenna or transmitters within a host device, except in accordance with FCC multi-transmitter product procedures.

3.1.3 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 RN4677 module has been certified for use in Canada under Industry Canada (IC) Radio Standards Specification (RSS) RSS-210 and RSS-Gen. 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.

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:

Contains transmitter module
IC: 12246A-BM77SPPSYC2.

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.

User manuals for transmitters equipped with detachable antennas shall also contain the following notice in a conspicuous location:

This radio transmitter (identify the device by certification number, or model number if Category II) has been approved by Industry Canada to operate with the antenna types listed below with the maximum permissible gain and required antenna impedance for each antenna type indicated. Antenna types not included in this list, having a gain greater than the maximum gain indicated for that type, are strictly prohibited for use with this device.

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.

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 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 RN4677U 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.

3.2.4 HELPFUL WEB SITES

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

3.3 Europe

The RN4677 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 RN4677 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 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: European Compliance Testing, 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 RN4677 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 EXTERNAL 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 3-1 was performed using the integral ceramic chip antenna.

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/sectors/rtte/regulatory-framework/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/

TABLE 3-1: EUROPEAN COMPLIANCE TESTING

Certification	Standards	Article	Laboratory	Report Number	Date
Safety	EN 60950-1:2006 +A11:2009+A1:2010+A12:2011	[3.1(a)]	TUV Rheinland	10049470 001	2015-01-09
Health	EN 62479:2010, A.3.			10047932 001 (FHSS-BT) 10047939 001 (DTS)	2014-09-17
EMC	EN 301 489-1 V1.9.2	[3.1(b)]		10046663 001	2015-01-12
	EN 301 489-17 V 2.2.1				
Radio	EN 300 328 V1.8.1	(3.2)		10047932 001 (FHSS-BT) 10047939 001 (DTS)	2014-09-17
Notified Body Opinion	CE 0197		TUV Rheinland	10048878 001	2015-02-05

Advance Information

4.0   ELECTRICAL CHARACTERISTICS

Table 4-1 and Table 4-2 show the environmental conditions and the electrical characteristics of the module. Table 4-3 and Table 4-4 provide the supply consumption of the module.

TABLE 4-1:   ENVIRONMENTAL CONDITIONS

Parameter	Value
Temperature Range (Operating)	-20°C to 70°C
Temperature Range (Storage)	-30°C to 85°C
Relative Humidity (Operating)	10% to 90%
Relative Humidity (Storage)	10% to 90%
Moisture Sensitivity Level	2

TABLE 4-2:   ELECTRICAL CHARACTERISTICS

Parameter	Min.	Typ.	Max.	Units
Supply Voltage (BAT_IN)	3.2	—	4.3	V
I/O Supply Voltage (VDD_IO)	2.8	3.3	3.63	V
I/O Voltage Levels				
VIL Input Logic Levels Low	-0.3	—	0.8	V
VIH Input Logic Levels High	2.0	—	3.6	V
VOL Output Logic Levels Low		—	0.4	V
VOH Output Logic Levels High	2.4	—	—	V
RESET				
V_{TH} Threshold Voltage	—	1.6	—	V
Input and Tri-State Current				
Pull-up Resistor	—	65	—	KOhm
Leakage Current	-10	—	10	µA
Supply Current				
TX mode	—	—	70	mA
RX mode	—	—	70	mA

TABLE 4-3:   SUPPLY CONSUMPTION-CLASSIC[1]

Parameter	Current (avg.)	Units	Notes
Standby mode	2.543	mA	—
Deep Power-Down mode	0.343	mA	—
Connected + Sniff, Master (No data)	0.858	mA	No data was transmitted Sniff interval = 500 ms
Connected + Sniff, Slave (No data)	0.864	mA	No data was transmitted Sniff interval = 500 ms
Data, Master	23.03	mA	Data transmitted at 115200 bps; block size = 500
Data, Slave	25.597	mA	Data transmitted at 115200 bps; block size = 500

Note 1:   Classic BR/EDR, RX_IND Function Enabled

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TABLE 4-4: **SUPPLY CONSUMPTION-LOW ENERGY[1]**

Parameter	Current (avg.)	Units	Notes
Standby mode (Discoverable and Connectable mode)	1.237	mA	LE fast advertising interval = 160 ms, standby at 0 ~ 30 sec
Standby mode (Discoverable and Connectable mode)	0.765	mA	LE Reduced Power advertising interval = 961 ms, standby after 30 sec
Deep Power-Down mode	0.348	mA	—
Connected (No data), connection interval = 500 ms	0.679	mA	No data was transmitted connection interval = 500 ms, latency = 2
Connected (Transfer data), connection interval = 500 ms	13.073	mA	Connection interval = 500 ms, latency = 2
Connected (No data), connection interval = 20 ms	1.648	mA	No data was transmitted connection interval = 20 ms, latency = 2
Connected (Transfer data), connection interval = 20 ms	18.581	mA	Connection interval = 20 ms, latency = 2

Note 1: Low Energy, RX_IND Function Enabled

Table 4-5 shows the UART Baud.

TABLE 4-5: **UART BAUD**

Baud	Crystal Frequency (MHz)	Actual Baud	Error Rate (%)
921600	16	941176	2.12
460800	16	457143	-0.79
307200	16	307692	0.16
230400	16	231884	0.64
115200	16	117647	2.1
57600	16	57145	-0.97
38400	16	38462	0.16
28800	16	28623	-0.62
19200	16	19231	0.16
14400	16	14480	0.55
9600	16	9615	0.16
4800	16	4808	0.16
2400	16	2399	-0.03

5.0   ORDERING INFORMATION

Table 5-1 provides ordering information for the RN4677 module.

TABLE 5-1:   ORDERING INFORMATION

Part Number	Description
RN4677-V/RM	Bluetooth® 4.0 Dual Mode, Class 2, Surface Mount module with integral antenna, with shield
RN4677U-V/RM	Bluetooth® 4.0 Dual Mode, Class 2, Surface Mount module, external antenna, no shield
RN-4677-PICtail	PICtail™/PICtail Plus Daughter Board for 8, 16, 32-bit PIC® MCU Explorer Development Board

   Note: For custom applications, contact Microchip representative.

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 (May 2015)

This is the initial release of this document.

NOTES:

THE MICROCHIP WEB SITE

Microchip provides online support via our WWW site at www.microchip.com. This web site is used as a means to make files and information easily available to customers. Accessible by using your favorite Internet browser, the web site contains the following information:

- **Product Support** – Data sheets and errata, application notes and sample programs, design resources, user's guides and hardware support documents, latest software releases and archived software
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Technical support is available through the web site at: http://microchip.com/support

NOTES:

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**	**Examples:**
				RN4677-V/RM

Device:	RN4677:	Integral Ceramic Chip Antenna
	RN4677U	External Antenna Connection
Temperature Range:	V =	-20°C to +70°C
Package:	RM =	Radio Module

NOTES:

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• Microchip products meet the specification contained in their particular Microchip Data Sheet.

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