



Chipsmall Limited consists of a professional team with an average of over 10 year of expertise in the distribution of electronic components. Based in Hongkong, we have already established firm and mutual-benefit business relationships with customers from,Europe,America and south Asia,supplying obsolete and hard-to-find components to meet their specific needs.

With the principle of “Quality Parts,Customers Priority,Honest Operation,and Considerate Service”,our business mainly focus on the distribution of electronic components. Line cards we deal with include Microchip,ALPS,ROHM,Xilinx,Pulse,ON,Everlight and Freescale. Main products comprise IC,Modules,Potentiometer,IC Socket,Relay,Connector.Our parts cover such applications as commercial,industrial, and automotives areas.

We are looking forward to setting up business relationship with you and hope to provide you with the best service and solution. Let us make a better world for our industry!



## Contact us

Tel: +86-755-8981 8866 Fax: +86-755-8427 6832

Email & Skype: info@chipsmall.com Web: www.chipsmall.com

Address: A1208, Overseas Decoration Building, #122 Zhenhua RD., Futian, Shenzhen, China



## Bluetooth® 4.2 Low Energy Module

### Features

- Fully Qualified Bluetooth® Smart Module
- On-Board Bluetooth 4.2 Low Energy Stack
- ASCII Command Interface API over UART
- Scripting Engine for Hostless Operation
- Compact Form Factor – The RN4870/71 family comes in four different sizes from 6 mm x 8 mm to 12 mm x 22 mm:
  - RN4870: 12 mm x 22 mm
  - RN4871: 9 mm x 11.5 mm
  - RN4870U: 12 mm x 15 mm
  - RN4871U: 6 mm x 8 mm
- Beacon Private Service for Beacon Services
- UART Transparent Service for Serial Data Applications
- Remote Configuration Over The Air

### Operational

- Operating Voltage: 1.9V to 3.6V (3.3V typical)
- Temperature Range: -20°C to +70°C
- Supports UART
- Up to Three Pulse Width Modulation (PWM) Outputs

### RF/Analog Features

- ISM Band 2.402 to 2.480 GHz Operation
- Channels: 0-39
- RX Sensitivity: -90 dBm
- TX Power: 0 dBm
- RSSI Monitor

### MAC/Baseband/Higher Layer Features

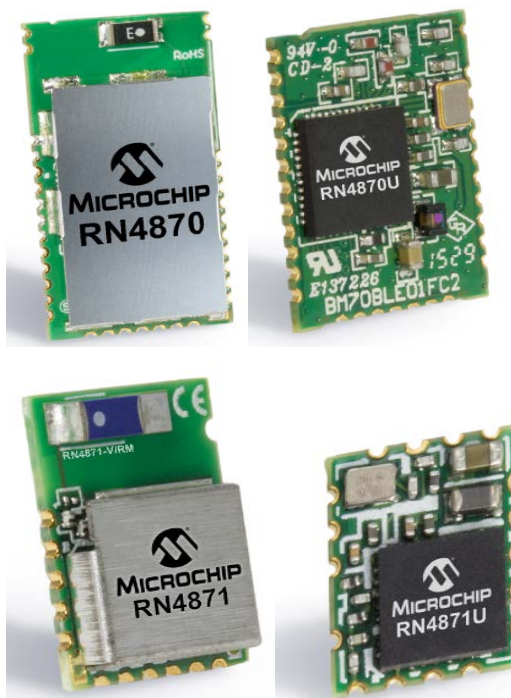
- Secure AES128 Encryption
- GAP, GATT, SM, L2CAP and Integrated Public Profiles
- Customer Can Create up to Five Public and Four Private Services
- Keyboard I/O Authentication
- Software Configurable Role as Peripheral or Central and Client or Server

### Antenna Options

- Ceramic Chip Antenna (RN4870/RN4871)
- External Antenna Connection via RF pad (RN4870U/RN4871U)

### Applications

- Health/Medical Devices
- Sports Activity/Fitness Meters
- Beacon Applications
- Internet of Things (IoT) Sensor Tag
- Remote Control
- Wearable Smart Devices and Accessories
- Smart Energy/Smart Home
- Industrial Control



### Description

The RN487x modules, based on Microchip's IS187x Bluetooth LE ICs, provide a complete solution to implement Bluetooth 4.2 Low Energy connectivity. These modules are interfaced via a two- or four-wire UART interface with Microchip's simple ASCII command set for easy integration into most applications. All products in the RN series can be dynamically configured by the host microcontroller with a few simple ASCII commands. The RN487x series also supports on-board scripting to automate basic operations without a host microcontroller. The RN4870 (12 mm x 22 mm) and RN4871 (9 mm x 11.5 mm) modules combine Microchip's Bluetooth LE Silicon with all necessary peripheral components and an on-board chip antenna to create an easy to use/drop-in solution. All modules in this series are Bluetooth SIG qualified. The RN4870 and RN4871 include FCC modular certification, as well as most other worldwide government regulatory approvals. For a listing of the latest certifications, go to [www.microchip.com/wireless](http://www.microchip.com/wireless). The RN4870U (12 mm x 15 mm) and RN4871U (6 mm x 8 mm) offer compact, flexible, unshielded options for designs that are extremely space constrained or need to remotely locate the antenna.

## Table of Contents

1.0	Device Overview .....	3
2.0	Specifications .....	9
3.0	Interface PINs.....	11
4.0	Physical Dimensions And Attributes .....	13
5.0	Application Reference Circuits .....	23
6.0	ASCII Command API.....	29
7.0	Supported Services .....	31
8.0	Antenna Characteristics .....	33
9.0	Timing Characteristics .....	35
10.0	Regulatory Approval .....	37
11.0	Ordering Information .....	43
	The Microchip Web Site .....	45
	Customer Change Notification Service .....	45
	Customer Support .....	45
	Product Identification System.....	46

## TO OUR VALUED CUSTOMERS

It is our intention to provide our valued customers with the best documentation possible to ensure successful use of your Microchip products. To this end, we will continue to improve our publications to better suit your needs. Our publications will be refined and enhanced as new volumes and updates are introduced.

If you have any questions or comments regarding this publication, please contact the Marketing Communications Department via E-mail at [docerrors@microchip.com](mailto:docerrors@microchip.com). We welcome your feedback.

### Most Current Data Sheet

To obtain the most up-to-date version of this data sheet, please register at our Worldwide Web site at:

<http://www.microchip.com>

You can determine the version of a data sheet by examining its literature number found on the bottom outside corner of any page. The last character of the literature number is the version number, (e.g., DS30000000A is version A of document DS30000000).

### Errata

An errata sheet, describing minor operational differences from the data sheet and recommended workarounds, may exist for current devices. As device/documentation issues become known to us, we will publish an errata sheet. The errata will specify the revision of silicon and revision of document to which it applies.

To determine if an errata sheet exists for a particular device, please check with one of the following:

- Microchip's Worldwide Web site; <http://www.microchip.com>
- Your local Microchip sales office (see last page)

When contacting a sales office, please specify which device, revision of silicon and data sheet (include literature number) you are using.

### Customer Notification System

Register on our web site at [www.microchip.com](http://www.microchip.com) to receive the most current information on all of our products.

## 1.0 DEVICE OVERVIEW

### 1.1 Overview

The RN4870/71 Bluetooth Low Energy (BLE) modules integrate Bluetooth 4.2 baseband controller, on-board Bluetooth stack, digital and analog I/O, and RF power amplifier into one solution.

Table 1-1 shows the various options for packaging and features available in the RN4870/71 family. Table 1-2 provides the description of the pin functions for all the modules in the RN4870/71 family. Figure 1-1 through Figure 1-4 show the pinout for the different modules.

**TABLE 1-1: RN4870/71 FAMILY**

Part Number <sup>(1)</sup>	Antenna On-Board	Shielding	Number of Pins	Dimensions
RN4870-V/RM118	Yes	Yes	33	12 mm x 22 mm
RN4870U-V/RM118	No	No	30	12 mm x 15 mm
RN4871-V/RM118	Yes	Yes	16	9 mm x 11.5 mm
RN4871U-V/RM118	No	No	17	6 mm x 8 mm

**Note 1:** The last three digits in P/N indicate firmware version. At the time of publication, the latest firmware version is 1.18. Ensure to check product webpage for latest part number and firmware version.

**TABLE 1-2: PIN DESCRIPTION**

RN4870U	RN4870	RN4871U	RN4871	Name	Type	Description
—	1	—	—	GND	Power	Ground reference
—	2	—	—	GND	Power	Ground reference
1	3	12	13	GND	Power	Ground reference
2	4	11	14	VBAT	Power	Positive supply input. Range: 1.9V~3.6V
—	—	10	—	BK_IN	Power	Buck power supply input Can be connected to the VBAT pin Connect to 10 $\mu$ F low ESR ceramic capacitor Voltage range: 1.9V to 3.6V
3	5	—	—	P2_2	D I/O	GPIO PWM1 Default: Input; pulled-high
4	6	—	—	VDD_IO	Power	VDD; power input Same input pin as VBAT Can be connected to the VBAT pin
5	7	—	—	VDD_IO	Power	VDD; power input Same input pin as VBAT Can be connected to the VBAT pin
6	8	—	—	ULPC_O	Power	1.2V ULPC LDO output Used for diagnostic purposes <i>Do not connect</i> to any pin or device For measurement, connect a bypass 1 $\mu$ F capacitor to ground
7	9	—	—	P2_3	D I/O	GPIO PWM2 Default: Input; pulled-high
8	10	—	—	BK_O	Power	1.55V Buck power supply output for diagnostic purpose <i>Do not connect</i>
—	—	13	6	P1_6	D I/O A O/p	GPIO
—	—	14	5	P1_7	D I/O A O/p	GPIO

# RN4870/71

**TABLE 1-2: PIN DESCRIPTION (CONTINUED)**

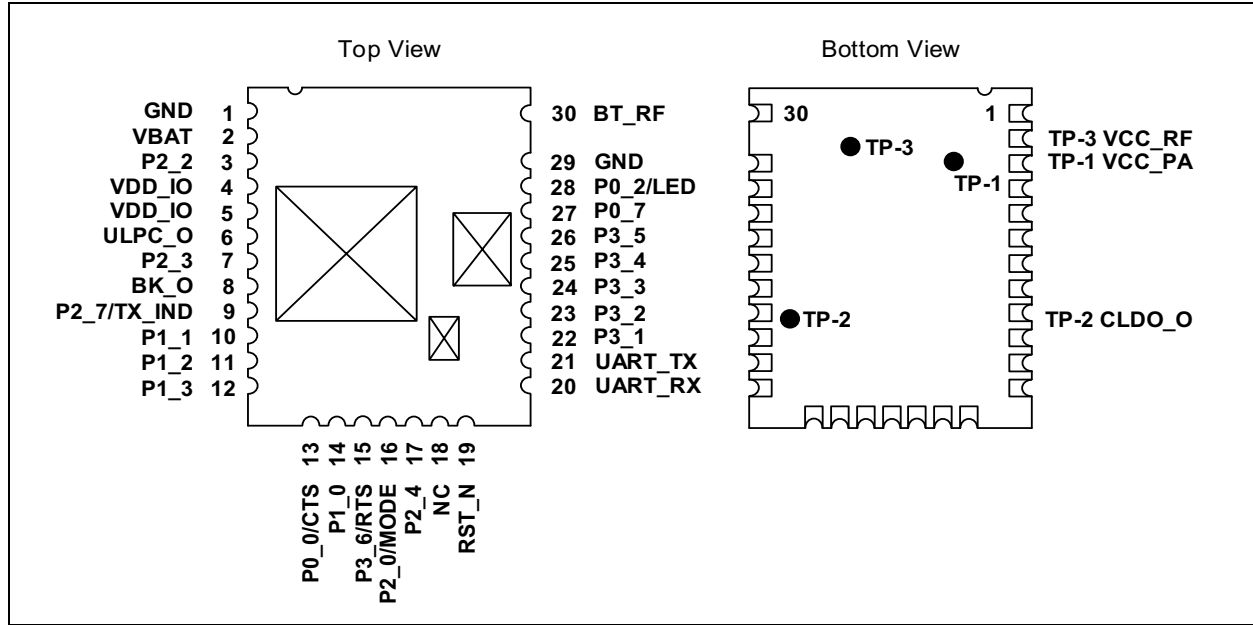
RN4870U	RN4870	RN4871U	RN4871	Name	Type	Description
9	11	15	15	P2_7	D I/O A I/p	GPIO; default: Input; pulled-high AD14 Configured as the TX_IND pin by default
10	12	—	—	P1_1	D I/O A I/p	GPIO; default: Input; pulled-high AD9 Configured as the BLEDK_STATUS1_IND pin by default
11	13	2	3	P1_2	D I/O A I/p	GPIO; default: Input; pulled-high AD10
12	14	3	4	P1_3	D I/O	GPIO; default: Input; pulled-high AD11
13	15	8	11	P0_0	D I/O	GPIO; default: Input; pulled-high AD0 Configured as the UART_CTS pin by default
14	16	—	—	P1_0	D I/O	GPIO; default: Input; pulled-high AD8 Configured as the BLEDK_STATUS2_IND pin by default
15	17	6	9	P3_6	D I/O	GPIO; default: Input; pulled-high PWM0 Configured as the UART_RTS pin by default
16	18	16	16	P2_0	D I/p	System configuration input; 1: Application mode 0: Test mode, for Flash update and EEPROM settings Default: Input; pulled-high
17	19	—	—	P2_4	D I/O	GPIO; default: Input; pulled-high
18	20	—	—	NC	—	No Connection
19	21	7	10	RST_N	D I/p	Module Reset; active-low; Internally pulled-high
20	22	5	7	UART_RX	D I/p	UART Data input
21	23	4	8	UART_TX	D O/p	UART Data output
22	24	—	—	P3_1	D I/O	GPIO; default: Input; pulled-high Configured as RSSI_IND pin by default
23	25	—	—	P3_2	D I/p	GPIO; default: Input; pulled-high Configured as the LINK_DROP pin by default
24	26	—	—	P3_3	D I/p	GPIO; default: Input; pulled-high Configured as the UART RX Indication pin by default
25	27	—	—	P3_4	D I/p	GPIO; default: Input; pulled-high Configured as the PAIRING_KEY pin by default
26	28	—	—	P3_5	D I/O A I/p	GPIO; default: Input; pulled-high LED1; provides indication whether the module is ON/OFF
27	29	—	—	P0_7	D I/O	GPIO; default: Input; pulled-high Configured to the LOW_BATTERY_INDICATOR pin by default
28	30	9	12	P0_2	D I/O	AD2 LED0: Provides indication whether the module is in ON/OFF mode
29	31	17	2	GND	Power	Ground Reference
—	32	—	—	GND	Power	Ground Reference

**TABLE 1-2: PIN DESCRIPTION (CONTINUED)**

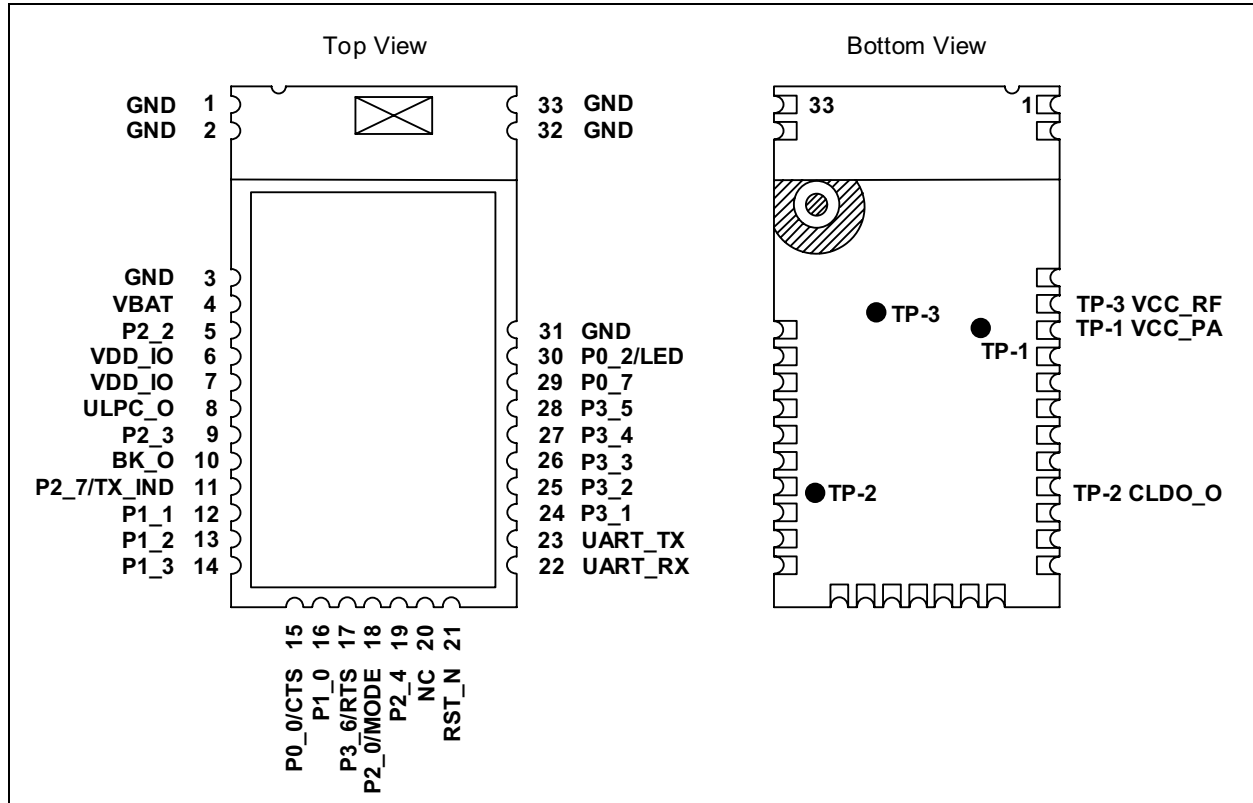
RN4870U	RN4870	RN4871U	RN4871	Name	Type	Description
30	—	1	1	BT_RF	A I/O	External Antenna connection (50 ohms)
—	33	—	—	GND	Power	Ground Reference

**Legend:** Pin Type Abbreviations: A = Analog D = Digital I/O = Input/Output I/p = Input O/p = Output

**FIGURE 1-1: PIN DIAGRAM - RN4870U**



**FIGURE 1-2: PIN DIAGRAM - RN4870**



# RN4870/71

FIGURE 1-3: PIN DIAGRAM - RN4871U

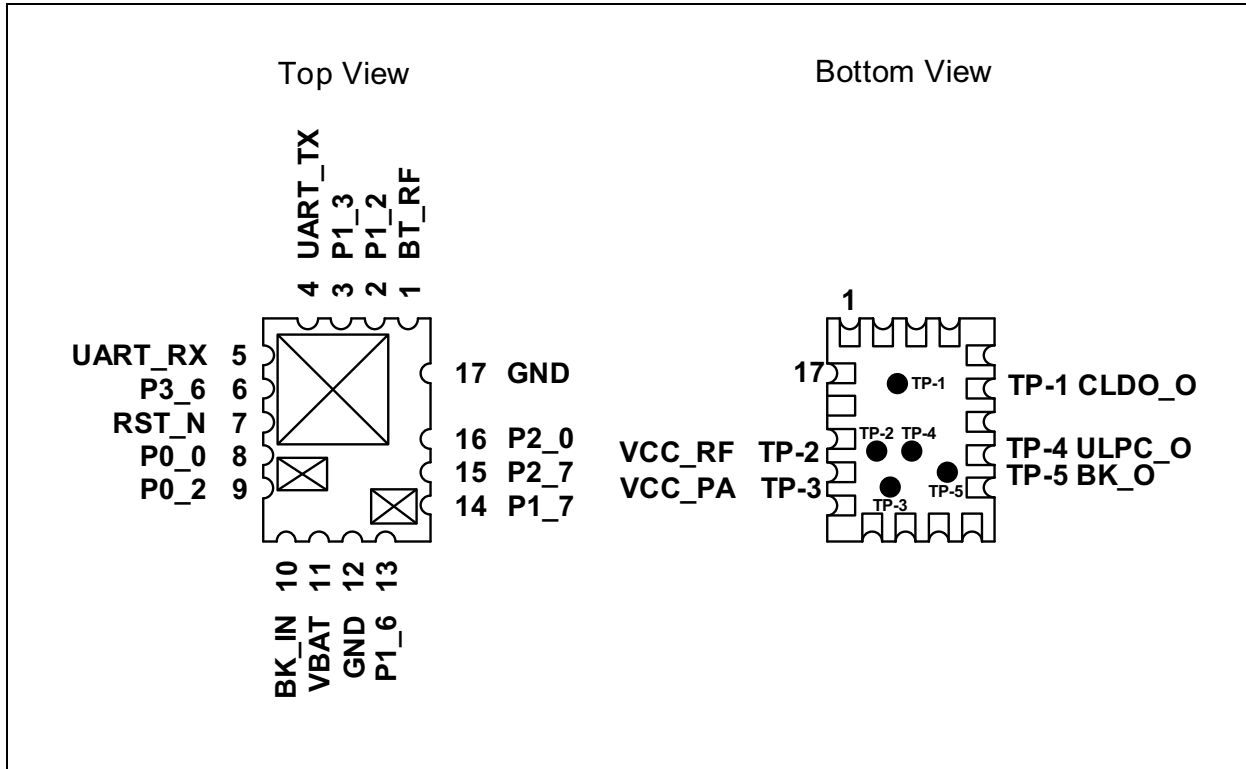
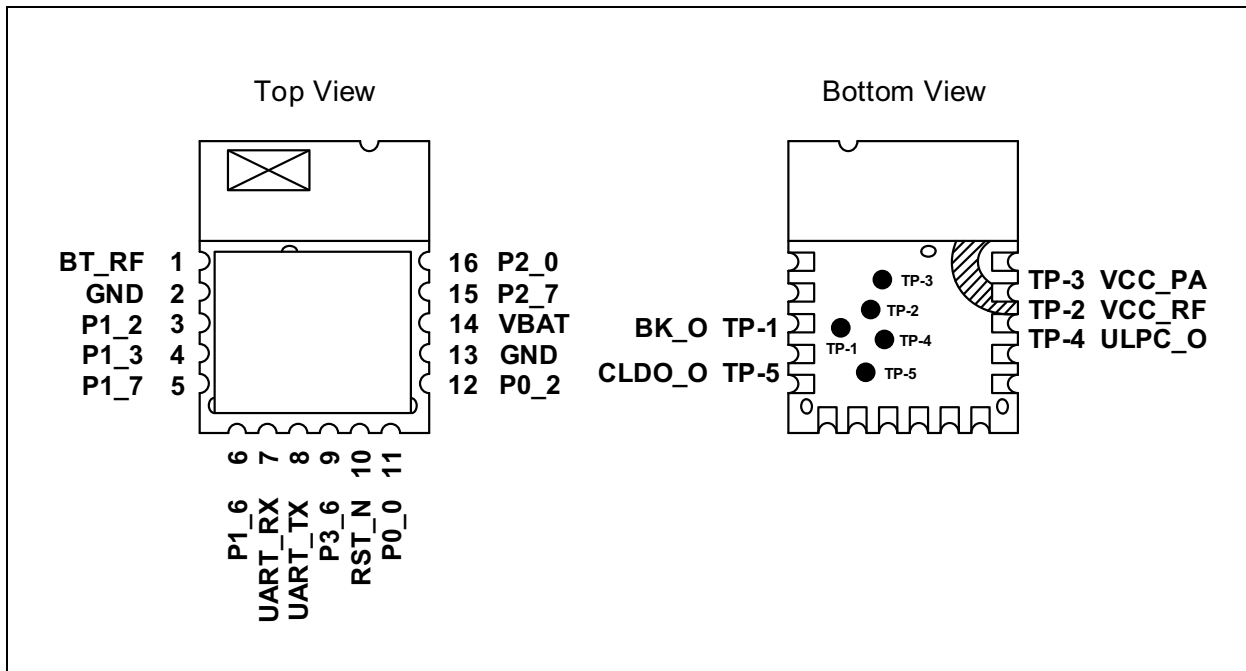


FIGURE 1-4: PIN DIAGRAM - RN4871



## 1.2 Module Configuration

The GPIO pins of the RN4870 and RN4871 modules can be configured to different functions using the ASCII command interface. [Table 1-3](#) shows the various pins in the RN4870/71 module that are available for configuration and their default configuration settings. [Table 1-4](#) provides details on each functions available.

[Table 1-5](#) shows the status of the module as indicated by the Status 1 and Status 2 indication pins. [Table 1-6](#) shows the details of test pads that are present on the bottom side of the module, used for diagnostic purposes during testing. [Figure 1-5](#) shows all the key elements of the module.

**TABLE 1-3: CONFIGURABLE PINS AND DEFAULT FUNCTIONS IN THE RN4870 AND RN4871**

Pin Name	Available in		Default Function
	RN4870	RN4871	
P0_7	x	—	Low Battery Indication
P1_0	x	—	Status 2
P1_1	x	—	Status 1
P2_2	x	—	None
P2_4	x	—	None
P3_1	x	—	RSSI Indication
P3_2	x	—	Link Drop
P3_3	x	—	UART RX Indication
P3_4	x	—	Pairing Key
P3_5	x	—	None
P1_2	x	x	None
P1_3	x	x	None
P1_6	—	x	UART RX Indication
P1_7	—	x	None

**TABLE 1-4: CONFIGURABLE FUNCTIONS AND DESCRIPTIONS**

Function Name	Description
Low Battery Indication	Pin output goes low when the VDD is below a specified level. To set the threshold level, change the EEPROM settings.
Status 1	Use this indication pin along with the Status 2 pin to indicate the current status of the module. Refer to <a href="#">Table 1-5</a> for details of the status indication.
Status 2	Use this indication pin along with the Status 1 pin to indicate the current status of the module. Refer to <a href="#">Table 1-5</a> for details of the status indication.
RSSI Indication	Use this indication pin to indicate the quality of the link based on the RSSI level. If the RSSI level is lower than the specified threshold value, then the RSSI indication pin goes low. Set the threshold for the RSSI link quality in EEPROM.
Link Drop	Use this pin to force the module to drop the current BLE link with a peer device. Pulling the Link Drop pin low forces the connection to close. The pin needs to be pulled low for at least 10 ms.
UART RX Indication	Use this pin to enable communication with the UART when the module is in Low-Power mode. When <i>not</i> in Low-Power mode, the module runs on a 16 MHz clock. If Low-Power mode is enabled on the module by using command <code>SO, 1</code> , the module runs on a 32 kHz clock thus reducing power consumption. However, in Low-Power mode, the host MCU <i>cannot</i> communicate with the module via the UART since the UART is <i>not</i> operational. If the user intends to provide data or commands via UART in the Low-Power mode, then the UART RX INDICATION pin must be pulled low and the user needs to wait for at least five milliseconds before sending the data. Pulling the UART RX INDICATION pin low allows the module to operate the 16 MHz clock and to enable UART.



# RN4870/71

**TABLE 1-4: CONFIGURABLE FUNCTIONS AND DESCRIPTIONS (CONTINUED)**

Function Name	Description
Pairing Key	Use this pin to force the module to enter Standby mode. The pin must be pulled down for at least 160 ms.
RF Active Indication	Use this indication pin to indicate that the module is currently performing an active transmission and receiving BLE data.

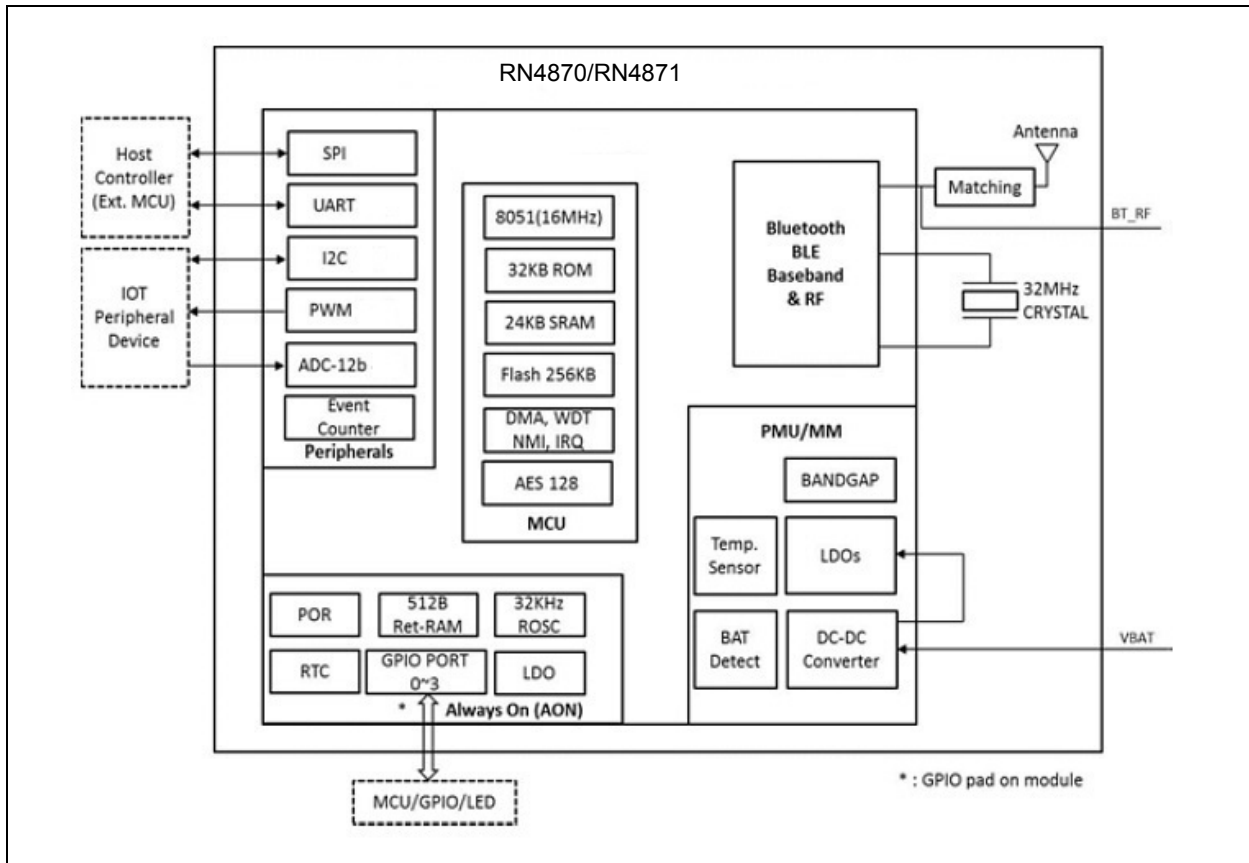
**TABLE 1-5: STATUS INDICATION PINS**

Status 1	Status 2	State
High	High	Power On
High	Low	Standby state
Low	Low	Connection established
Low	High	Data session open (Transparent UART)

**TABLE 1-6: TEST POINTS ON THE BOTTOM SIDE**

RN4870U	RN4870	RN4871U	RN4871	Symbol	Description
TP-1	TP-1	TP-3	TP-3	VCC_PA	1.55V RF PA LDO
TP-2	TP-2	TP-1	TP-5	CLDO_O	1.2V CLDO Output
TP-3	TP-3	TP-2	TP-2	VCC_RF	1.2V RF LDO Output
—	—	TP-4	TP-4	ULPC_O	1.2V ULPC LDO Output
—	—	TP-5	TP-1	BK_O	1.55V Buck Reg Output

**FIGURE 1-5: BLOCK DIAGRAM OF THE RN4870/71**



## 2.0 SPECIFICATIONS

Table 2-1 provides the general specifications for the module. Table 2-2 and Table 2-3 provide the electrical characteristics and the current consumption of the module.

**TABLE 2-1: GENERAL SPECIFICATIONS**

Specification	Description
Standard Compliance	Bluetooth 4.2
Frequency Band	2.402 to 2.480 GHz
Modulation Method	GFSK
Maximum Data Rate (Transparent UART)	10 kbps (iOS®9)
Antenna	Ceramic
Interface	UART, AIO, PIO
Operating Range	1.9V to 3.6V
Sensitivity	-90 dBm
RF TX Power	0 dBm
Operating Temperature Range	-20°C to +70°C
Storage Temperature Range	-65°C to +150°C
Operating Relative Humidity Range	10% to 90%
Storage Relative Humidity Range	10% to 90%
Moisture Sensitivity Level	2

**TABLE 2-2: ELECTRICAL CHARACTERISTICS**

Parameter	Min.	Typ.	Max.	Units
Supply Voltage (VDD)	1.9	—	3.6	V
I/O Supply Voltage (VDD_IO = VDD)	1.9	—	3.6	V
<b>I/O Voltage Levels</b>				
VIL Input Logic Levels Low	VSS	—	0.3 VDD	V
VIH Input Logic Levels High	0.7 VDD	—	VDD	V
VOL Output Logic Levels Low	VSS	—	0.2 VDD	V
VOH Output Logic Levels High	0.8 VDD	—	VDD	V
<b>Reset</b>				
VTH,RES Threshold Voltage	—	1.6	—	V
Reset Low Duration	63	—	—	ns
<b>Input and Tri-State Current with</b>				
Pull-Up Resistance	34	48	74	kΩ
Pull-Down Resistance	29	47	86	kΩ
Leakage Current	-1	—	1	μA
<b>ADC (Analog to Digital Converter)</b>				
Full Scale (BAT_IN)	0	3.0	3.6	V
Full Scale (AD0~AD15)	0	—	3.6	V
Conversion Time (ENOB 8-bit)	—	131	—	μs
Conversion Time (ENOB 10-bit)	—	387	—	μs
Operating Current	—	—	500	μA

# RN4870/71

**TABLE 2-3: CURRENT CONSUMPTION**

Parameter	Min.	Typ.	Max.	Units
<b>Supply Current</b>				
TX mode Peak Current at VDD = 3V, TX = 0 dBm, Buck mode	—	—	13	mA
RX mode Peak Current at VDD = 3V, Buck mode	—	—	13	mA
Link Static Current	—	60	—	μA
Standby Current	1.9	—	2.9	μA
Power-Saving	1	—	1.7	μA
<b>Temperature Sensor (PTS)</b>				
Temperature Range Detected	-20	—	+70	°C
Digital Output	1387	—	2448	—
Resolution	—	12	—	units/deg
Accuracy	-3	—	+3	°C
Conversion Time (ENOB 10-bit)	—	12.35	—	ms
Operating Current	—	—	200	μA

**TABLE 2-4: CURRENT CONSUMPTION DURING VARIOUS APPLICATION MODES**

Test Mode	Test Condition <sup>(1)</sup>	Average Current Consumption	Remarks
Standby mode	Advertising Interval: 100 ms	0.23 mA	—
	Advertising Interval: 500 ms	0.077 mA	—
BLE Connected mode (no data exchange)	Connection Interval: 500 ms	0.08 mA	Module set in Transparent UART mode
Transparent UART enabled Data transmission in progress	Connection Interval: 18.75 ms	3.87 mA	TX data throughput: 9.863 kBps
	Connection Interval: 40 ms	2.77 mA	TX data throughput: 4.676 kBps
Transparent UART enabled Data being received	Connection Interval: 18.75 ms	3.06 mA (write with response)	Throughput: 4.956 kBps
		3.9 mA (write with reliable Burst Transmit)	Throughput: 9.382 kBps
	Connection Interval: 40 ms	2.14 mA (write with response)	Throughput: 2.494 kBps (write with response)
		3.03 mA (write with reliable Burst Transmit)	Throughput: 5.056 kBps
Shutdown mode	—	1.44 μA	—

**Note 1:** Test conditions: Input voltage: 3.3V; Test phone: iPhone6 with iOS 9.02 version

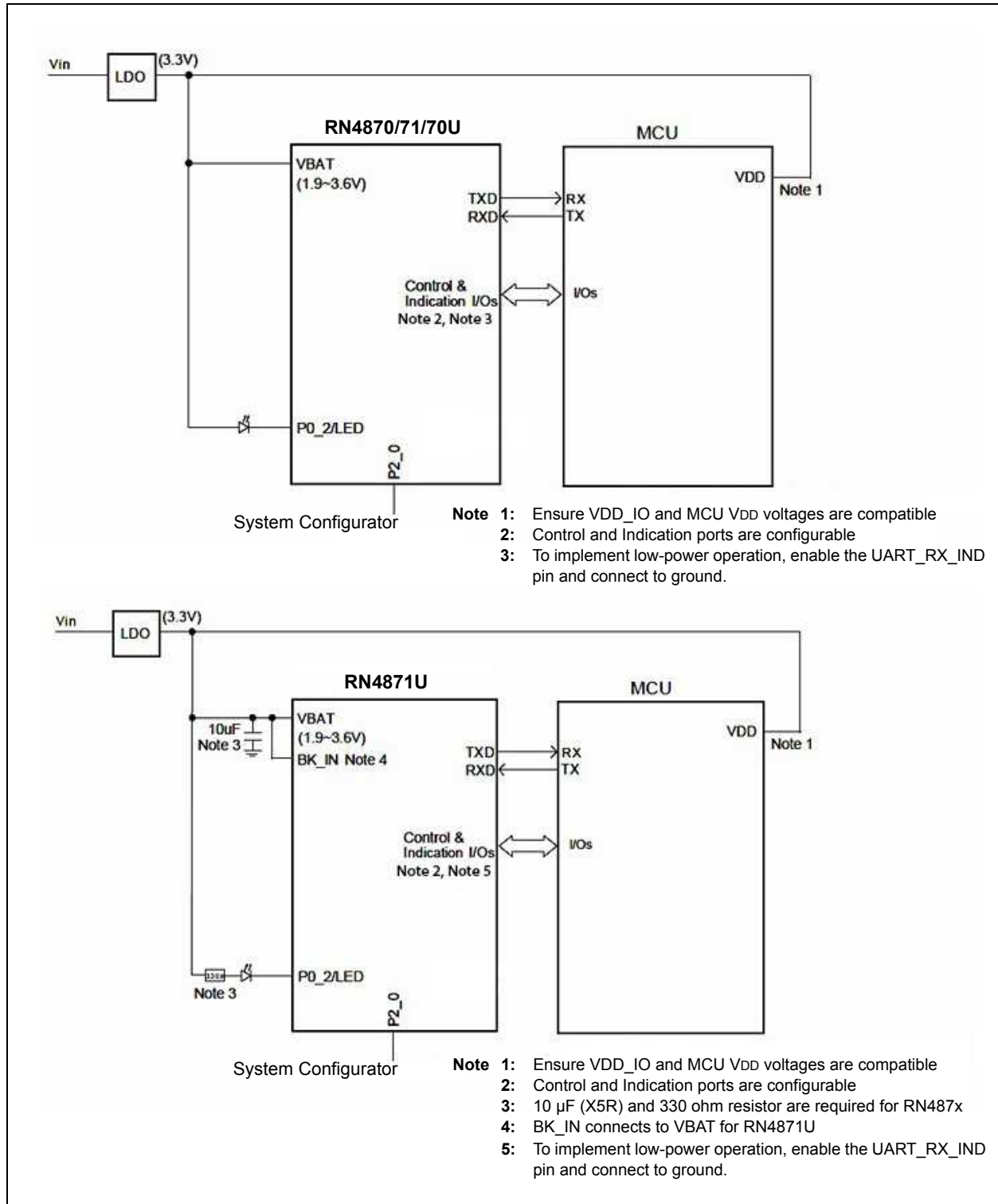
## 3.0 INTERFACE PINS

Figure 3-1 shows the power scheme using a 3.3V low-dropout regulator to the RN487x and a host MCU. This scheme ensures that the same voltage is used for both the module and the MCU.

Figure 3-1 also shows the basic UART connections to the host MCU.

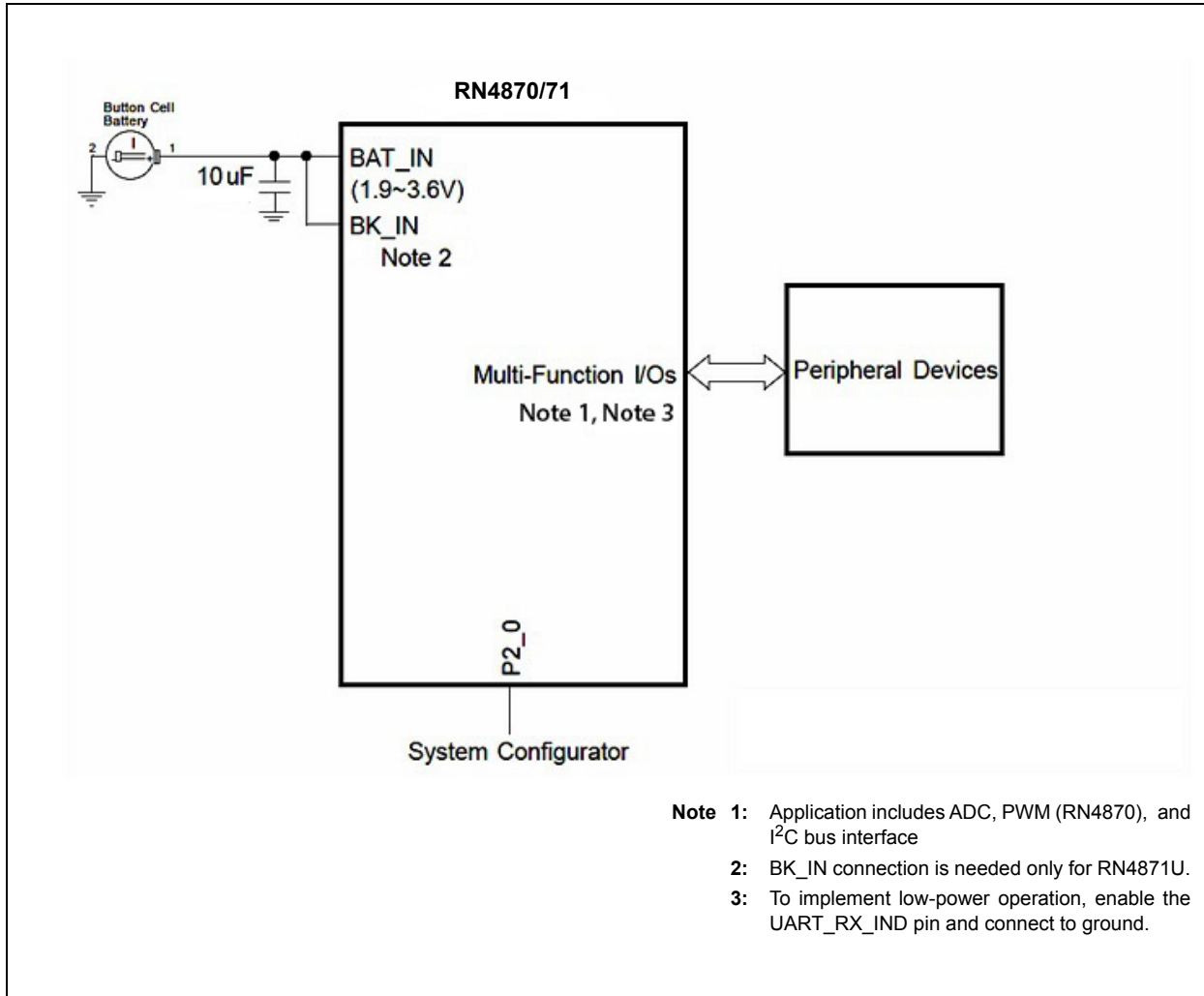
Figure 3-2 shows the recommended connections for running the RN4870/71 on coin cell battery.

**FIGURE 3-1: POWER SCHEME**



# RN4870/71

FIGURE 3-2: RN4870/71 COIN CELL POWER SCHEME



The Configuration pins on the RN4870 can also be configured through Windows<sup>®</sup>-based User Interface (UI) Configuration tool, BLEDK3.

## 4.0 PHYSICAL DIMENSIONS AND ATTRIBUTES

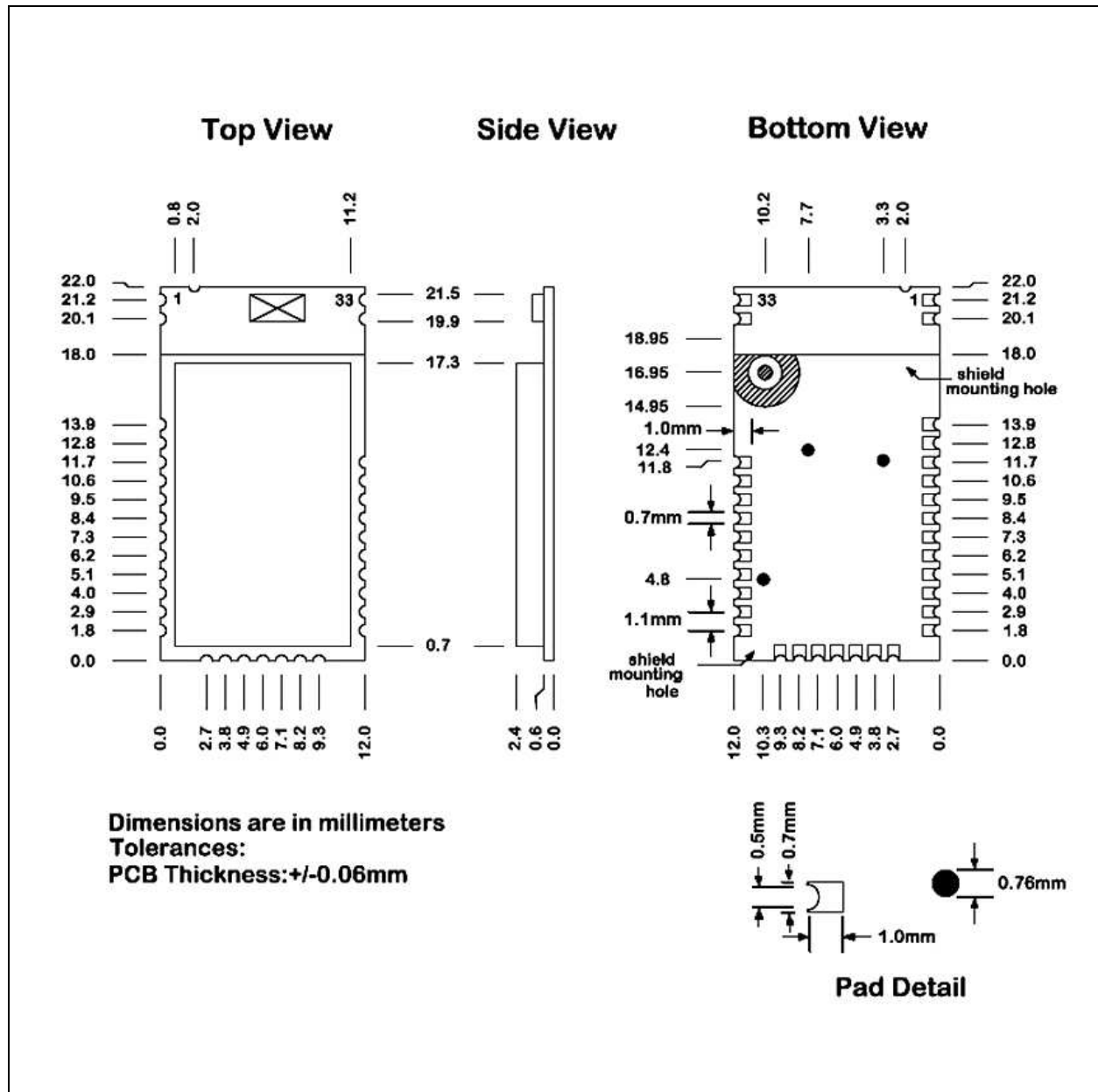
### 4.1 RN4870 Module

Figure 4-1 shows the physical dimensions of the RN4870 module. Figure 4-2 illustrates the recommended PCB layout, and Figure 4-3 shows the recommended mounting details.

Ensure that there is *no* top copper layer near the test pin area, indicated by the shaded *keep out areas*, as shown in Figure 4-2. 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 4-3. A low-impedance ground plane ensures the best radio performance (best range; lowest noise). Figure 4-3 also shows a minimum ground plane area to the left and right side of the module for best antenna performance. The ground plane can be extended beyond the minimum recommended as required for host PCB EMC noise reduction. For best range performance, keep all external metal at least 30 mm away from the ceramic chip antenna.

FIGURE 4-1: RN4870 MODULE DIMENSIONS



# RN4870/71

FIGURE 4-2: RN4870 RECOMMENDED PCB FOOTPRINT

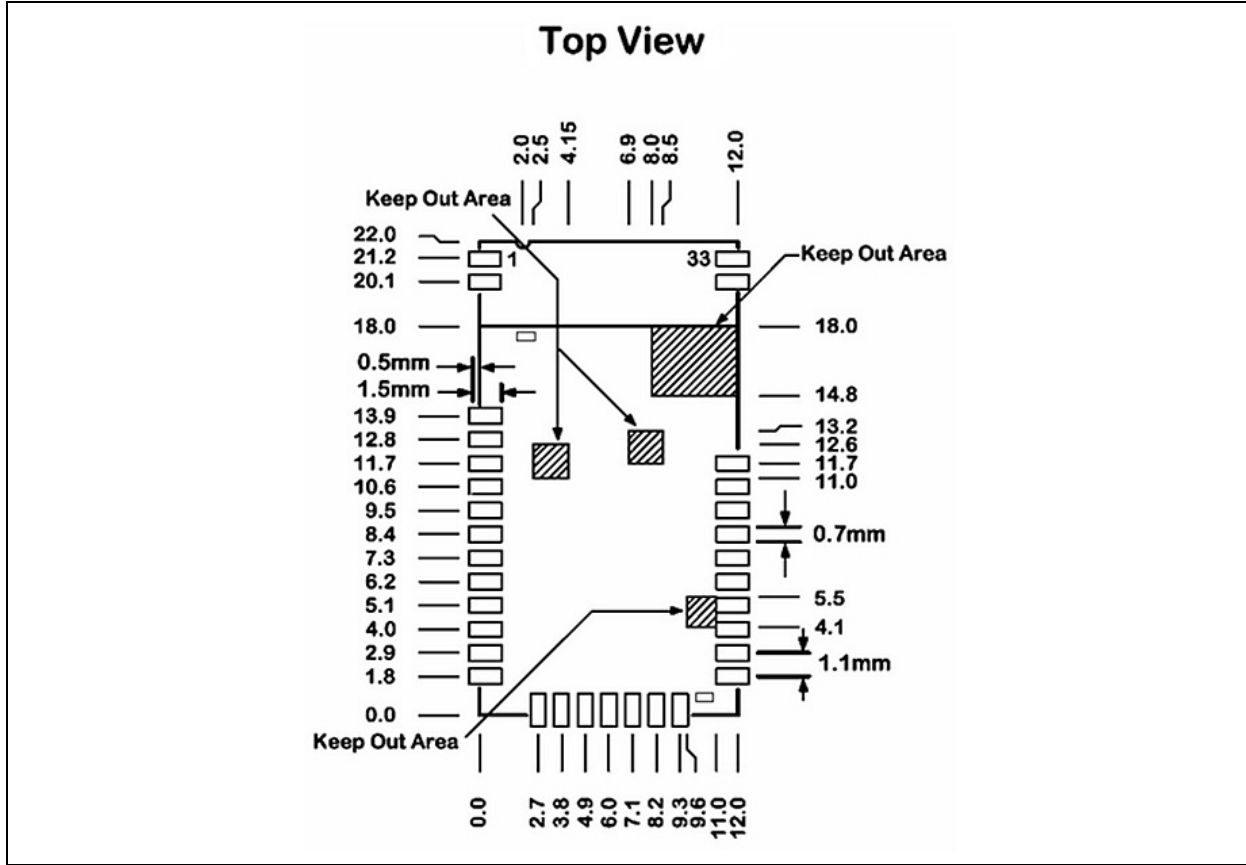
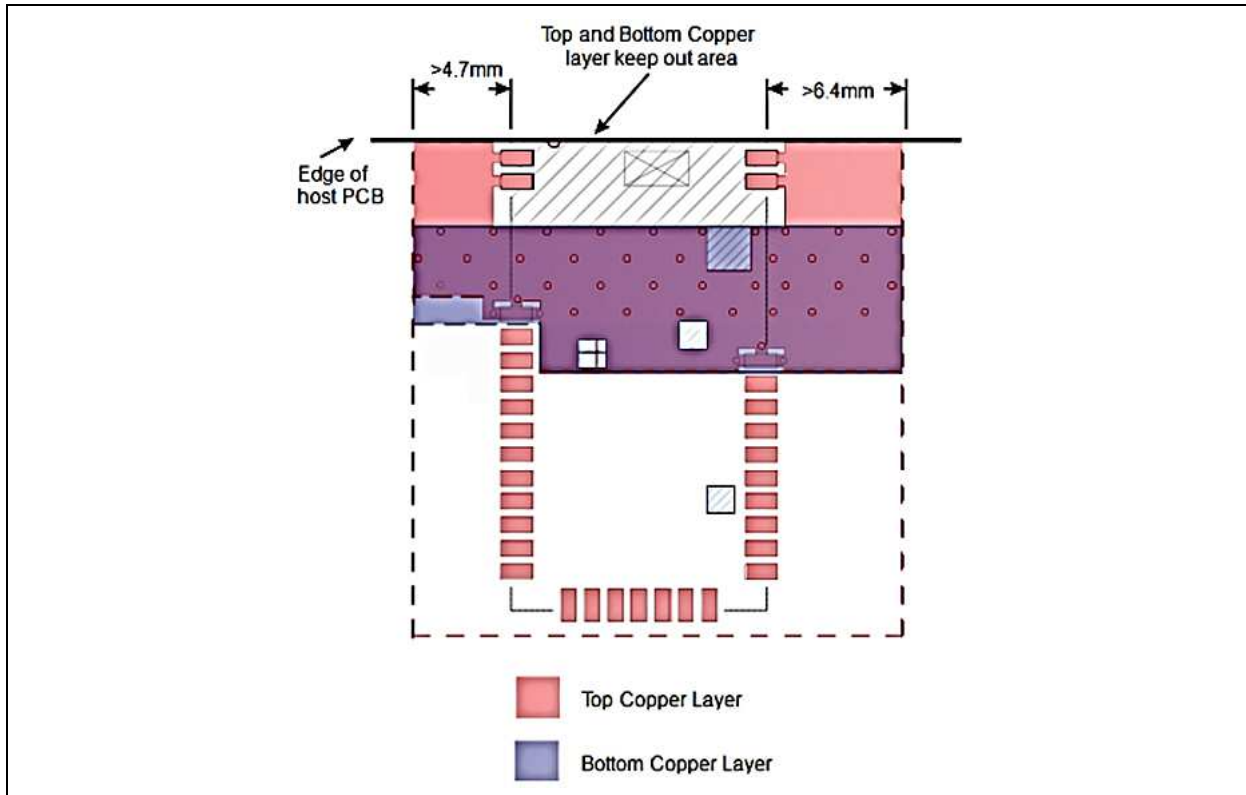


FIGURE 4-3: RECOMMENDED MOUNTING DETAILS



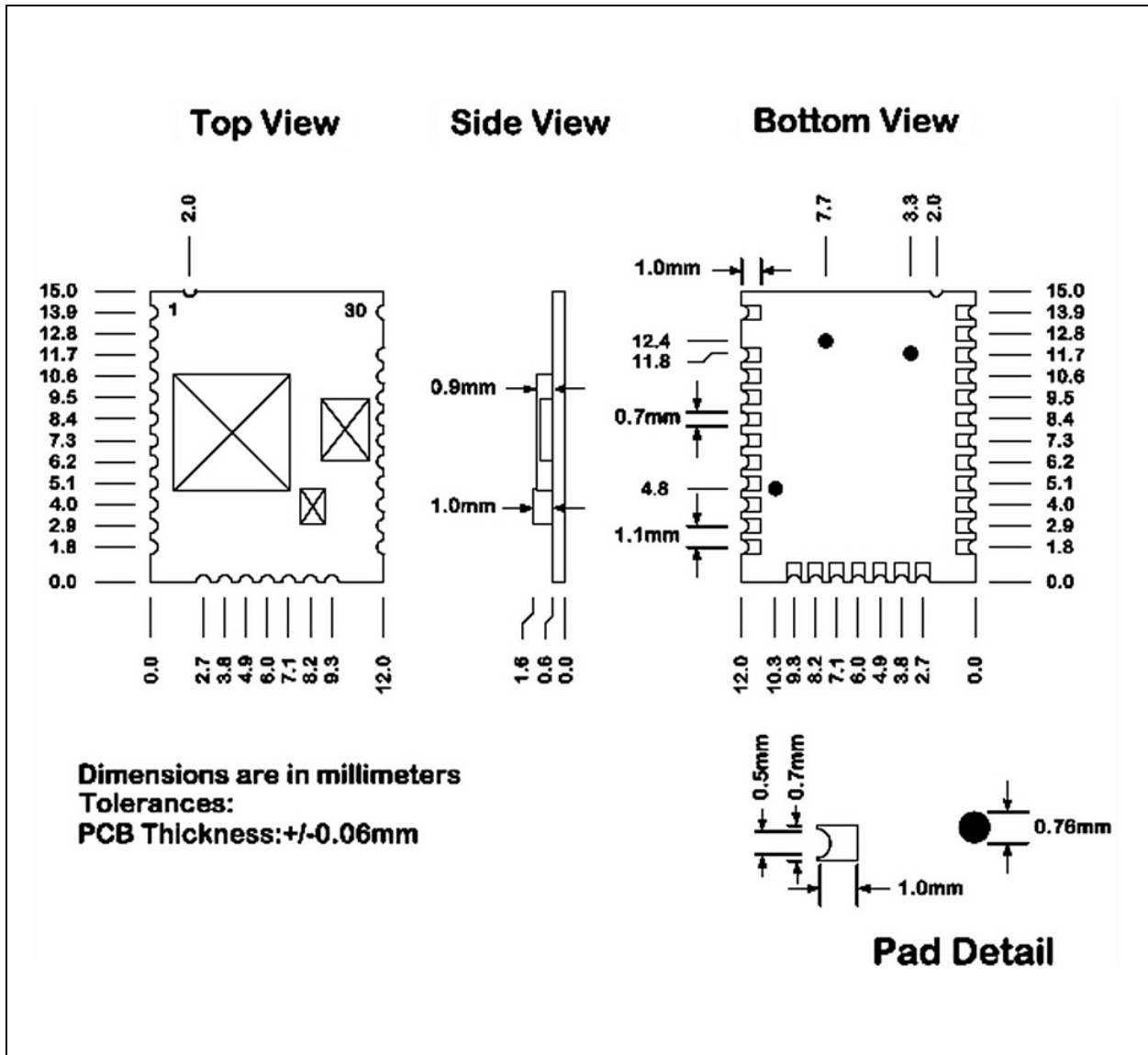
## 4.2 RN4870U Module

Figure 4-4 shows the physical dimensions of the RN4870U module. Figure 4-5 illustrates the recommended PCB layout, and Figure 4-6 shows the recommended mounting details.

A low-impedance ground plane ensures the best radio performance (best range; lowest noise). Pin 30 (BT\_RF) is a 50 ohm connection that can be connected

to an external antenna such as a PCB trace antenna, a component (chip) antenna, or through a host PCB 50 ohm micro-strip trace. This trace can be extended to include passive parts for antenna attenuation padding, impedance matching, or to provide test posts. It is recommended that the micro-strip trace to be as short as possible for minimum loss and best impedance matching. If the micro-strip trace is longer, a 50 ohm impedance is recommended.

**FIGURE 4-4: RN4870U MODULE DIMENSIONS**





# RN4870/71

FIGURE 4-5: RN4870U RECOMMENDED PCB FOOTPRINT

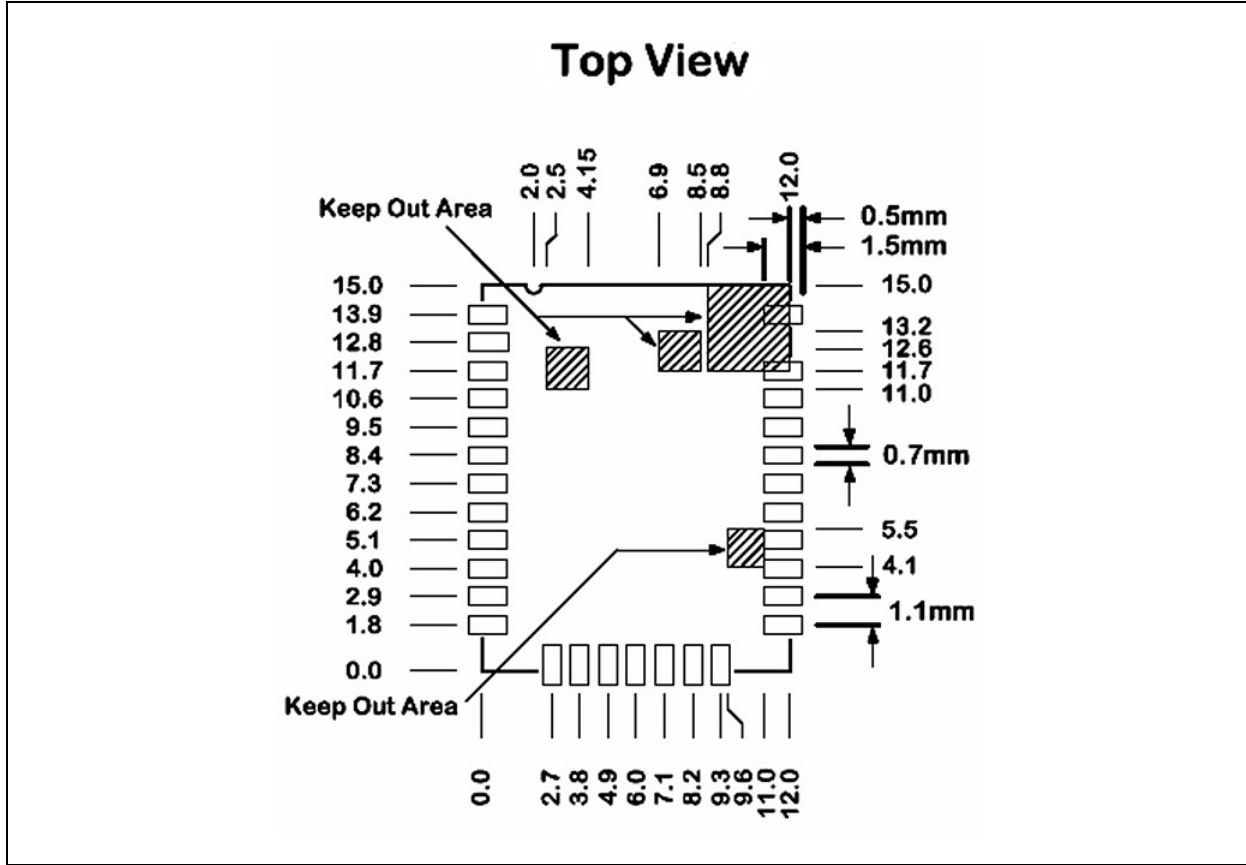
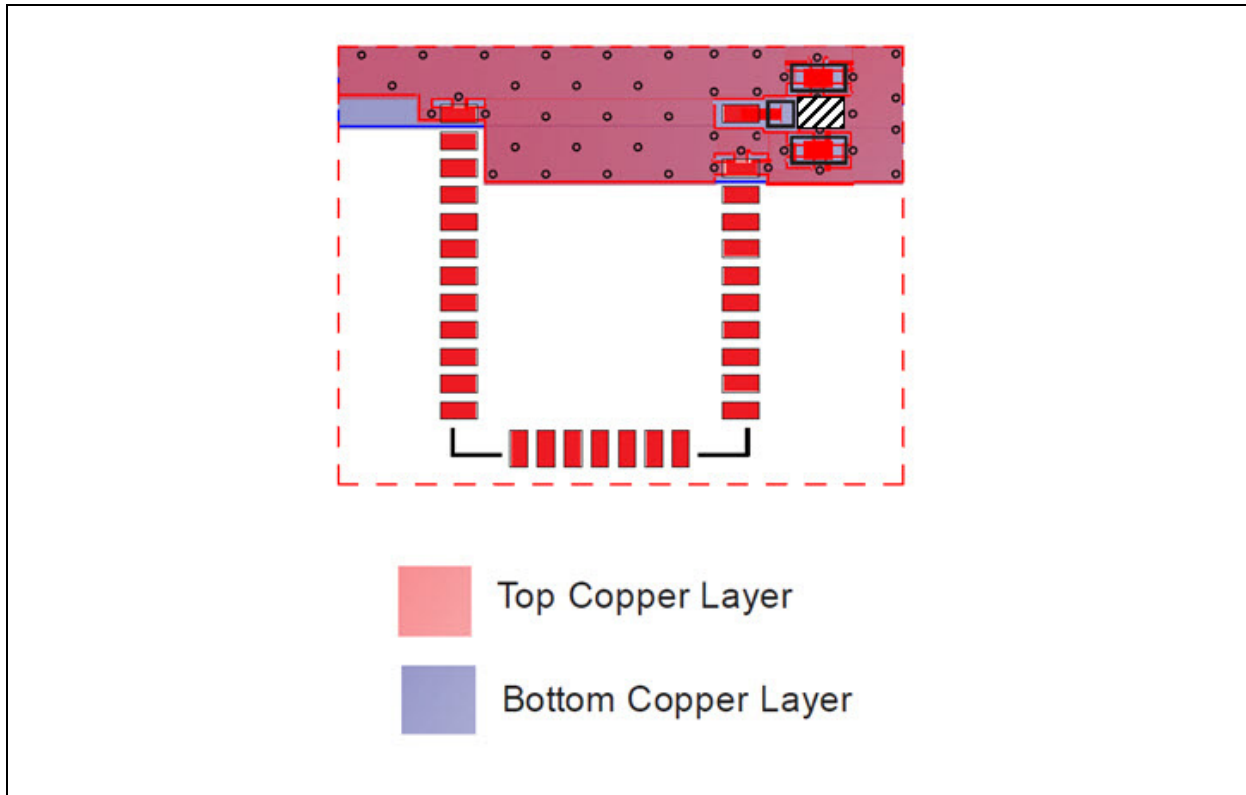


FIGURE 4-6: RN4870U RECOMMENDED PCB MOUNTING



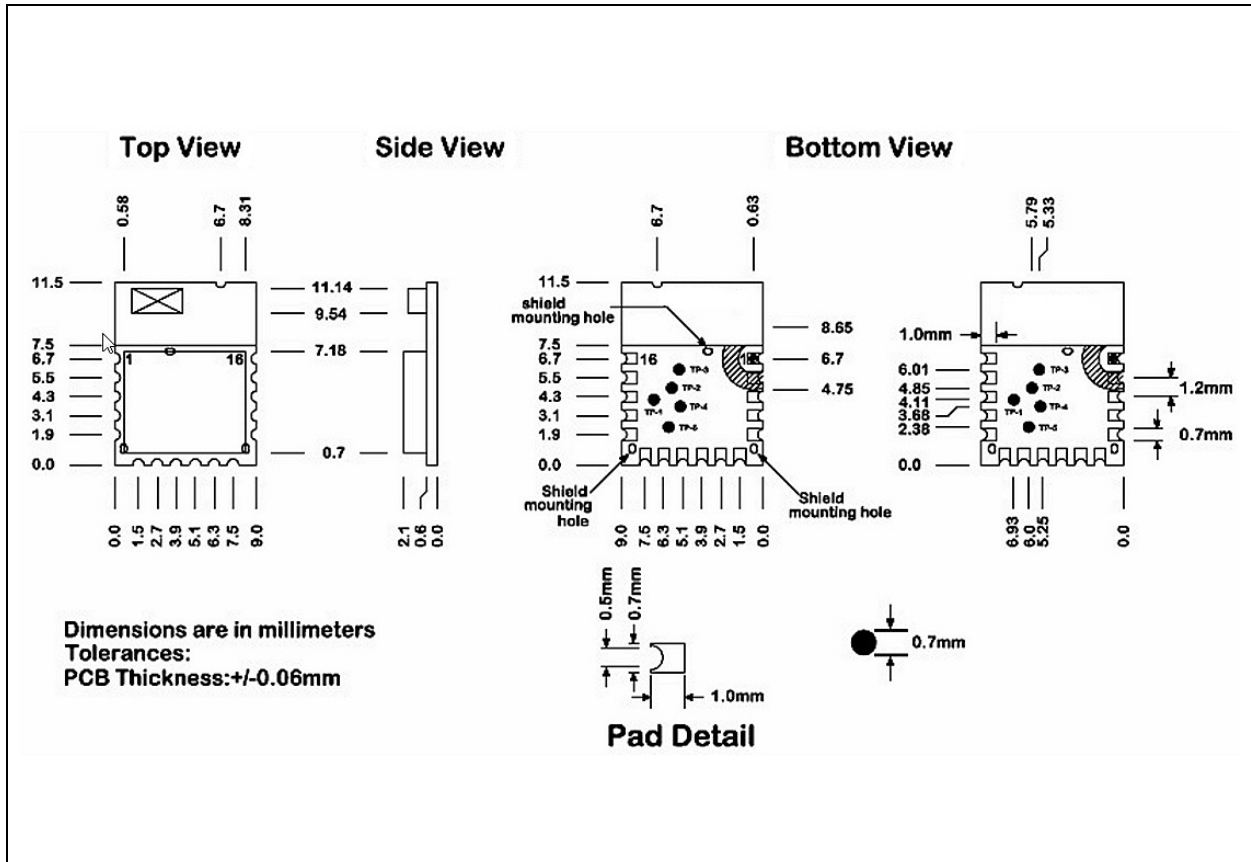
## 4.3 RN4871 Module

Figure 4-7 shows the physical dimensions of the RN4871 module. Figure 4-8 illustrates the recommended PCB layout, and Figure 4-9 shows the recommended mounting details.

Ensure that there is *no* top copper layer near the test pin area, indicated by the shaded *keep out areas*, as shown in Figure 4-8. 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 4-9. A low-impedance ground plane ensures the best radio performance (best range; lowest noise). Figure 4-9 also shows a space area around antenna section for best antenna performance. The ground plane can be extended beyond the minimum recommended as required for host PCB EMC noise reduction. For best range performance, keep all external metal at least 30 mm away from the ceramic chip antenna.

**FIGURE 4-7: RN4871 MODULE DIMENSIONS**



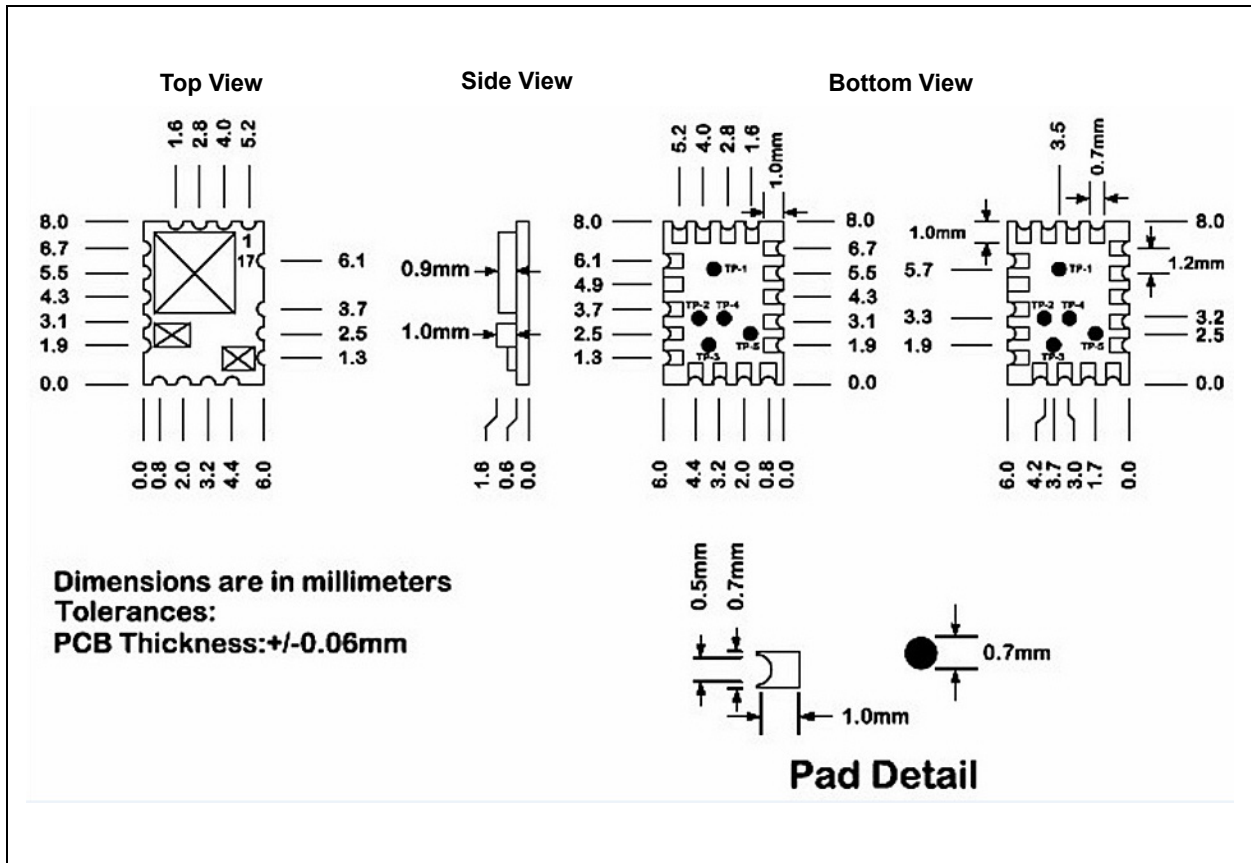


## 4.4 RN4871U Module

Figure 4-10 shows the physical dimensions of the RN4871U module. Figure 4-11 illustrates the recommended PCB layout. It is highly recommended to layout the host PCB as suggested in Figure 4-12. Figure 4-13 shows the recommended placement for the module on the host PCB board. For optimal transmission and reception sensitivity, place the module at the edge of the board.

A low-impedance ground plane ensures the best radio performance (best range; lowest noise). Pin 1 (BT\_RF) is a 50 ohm connection that can be connected to an external antenna such as a PCB trace antenna, a component (chip) antenna, or through a host PCB 50 ohm micro-strip trace. This trace can be extended to include passive parts for antenna attenuation padding, impedance matching, or to provide test posts. It is recommended that the micro-strip trace to be as short as possible for minimum loss and best impedance matching. If the micro-strip trace is longer, a 50 ohm impedance is recommended.

FIGURE 4-10: RN4871U MODULE DIMENSIONS



# RN4870/71

FIGURE 4-11: RN4871U RECOMMENDED PCB FOOTPRINT

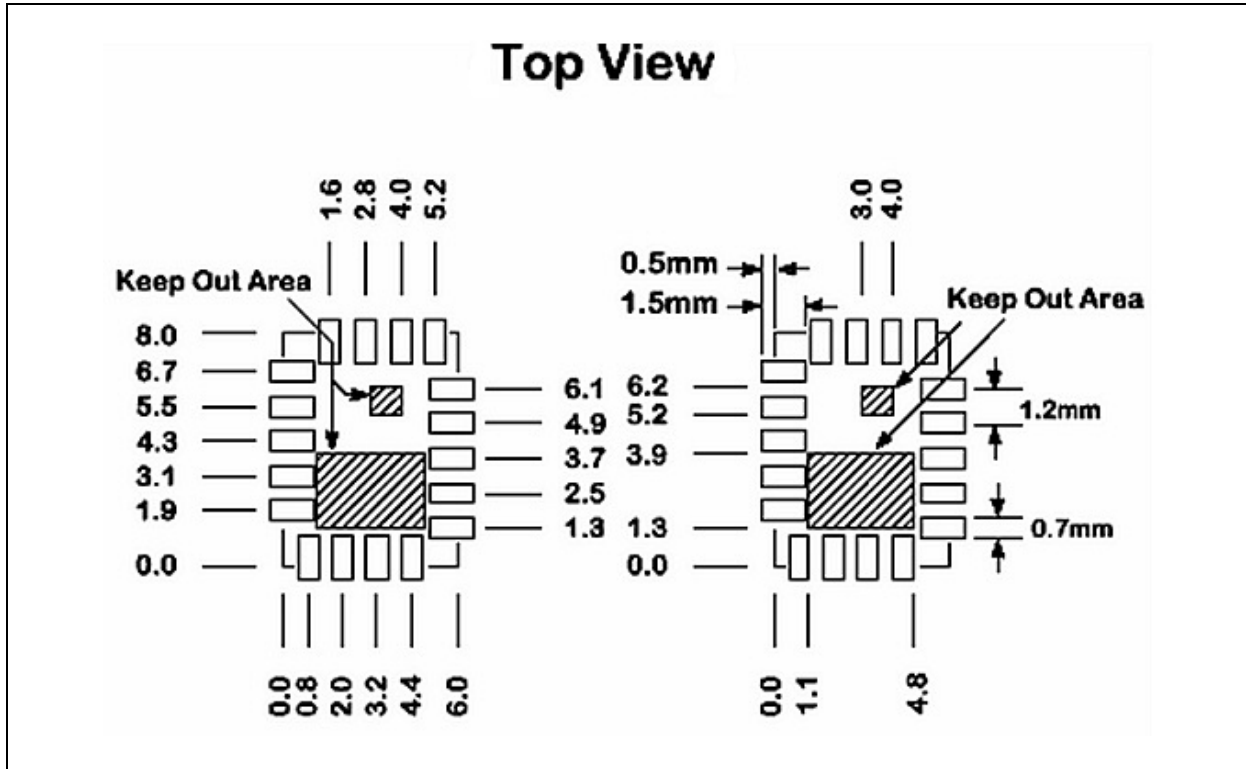
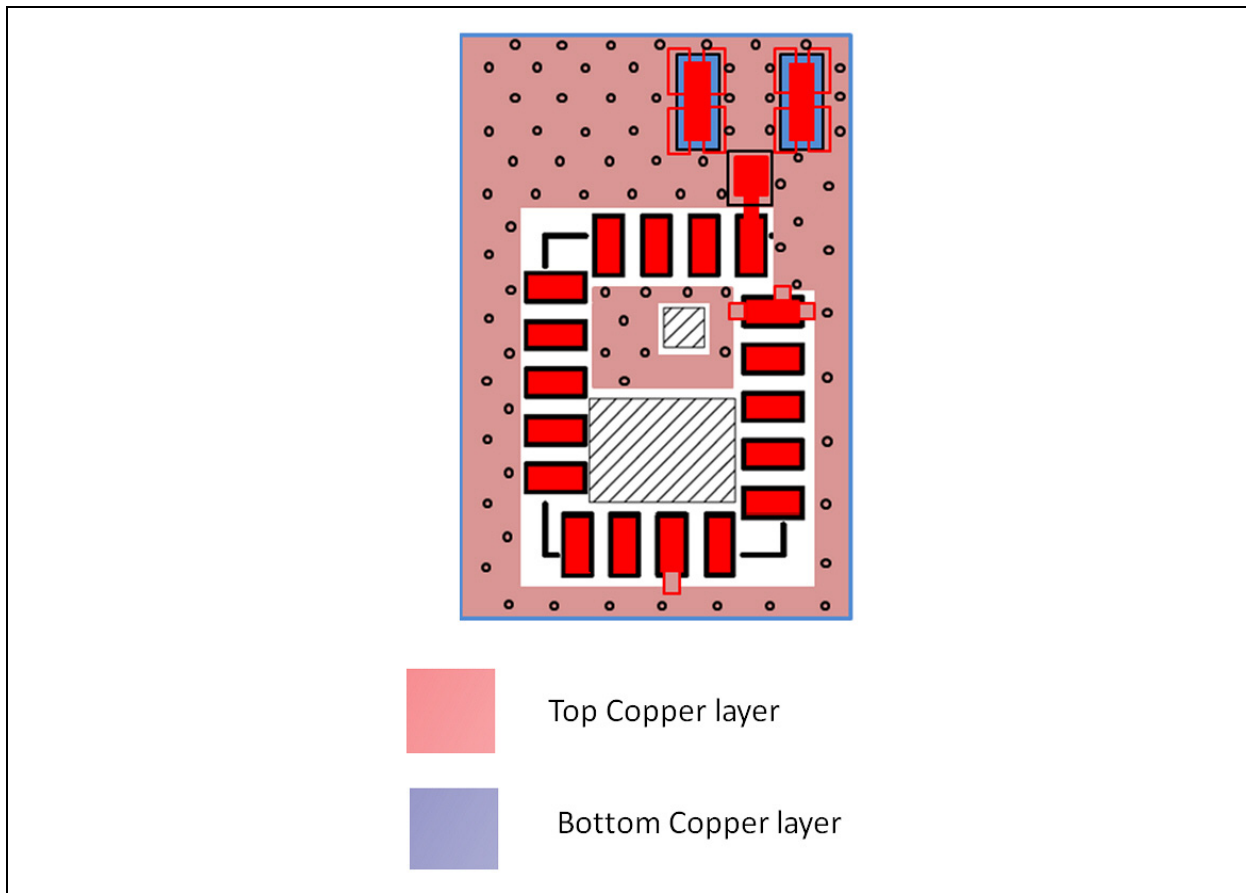
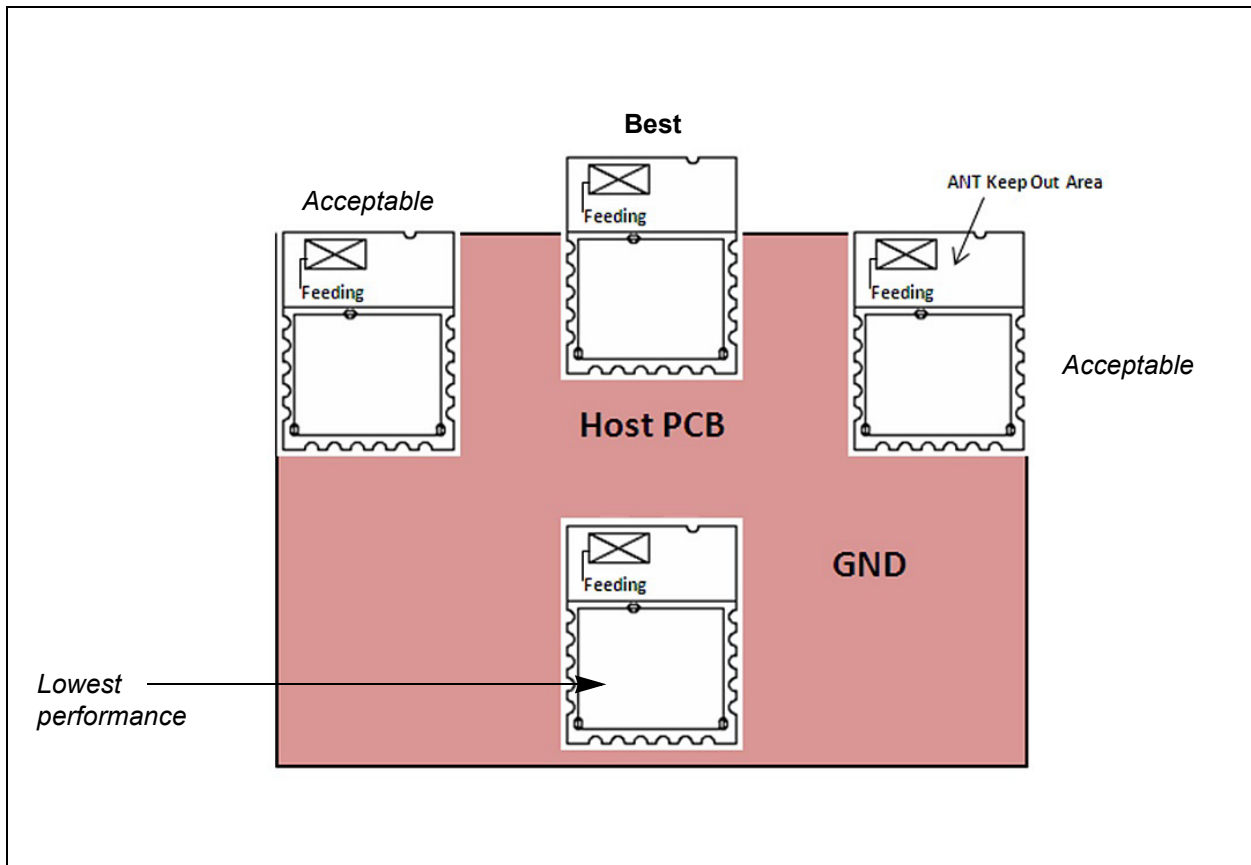


FIGURE 4-12: RN4871U RECOMMENDED PCB MOUNTING



**FIGURE 4-13: RECOMMENDATIONS FOR THE PLACEMENT OF THE MODULE ON THE HOST PCB BOARD**



## 4.5 Soldering Recommendations

The RN4870/71 Bluetooth modules are 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.

# RN4870/71

---

NOTES:

## 5.0 APPLICATION REFERENCE CIRCUITS

### 5.1 External Configuration and Programming

The RN4870/71 modules can be configured and firmware programmed using an external configuration and programming tool. [Figure 5-1](#) shows the mandatory connections required between the module and the external programming header. It is recommended to include these pin connections on the host PCB for development. For accessing the various configuration and indication pins, use [Table 1-2](#), [Table 1-3](#), [Table 1-4](#) and [Table 1-5](#).

### 5.2 Reference Circuit

[Figure 5-2](#) through [Figure 5-5](#) show the reference circuits for various modules under the RN4870/71 family. In the circuits, the power input range is 1.9V ~ 3.6V. A battery reverse protection circuit is recommended in case a battery power input is used. Note that the VDD\_IO is the same as the power input. In case of a LED connection, the power input must be greater than 3.0V. For the RN4870U, an RF antenna matching circuit must also be included as shown in [Figure 5-3](#).

**FIGURE 5-1: EXTERNAL PROGRAMMING HEADER CONFIGURATIONS**

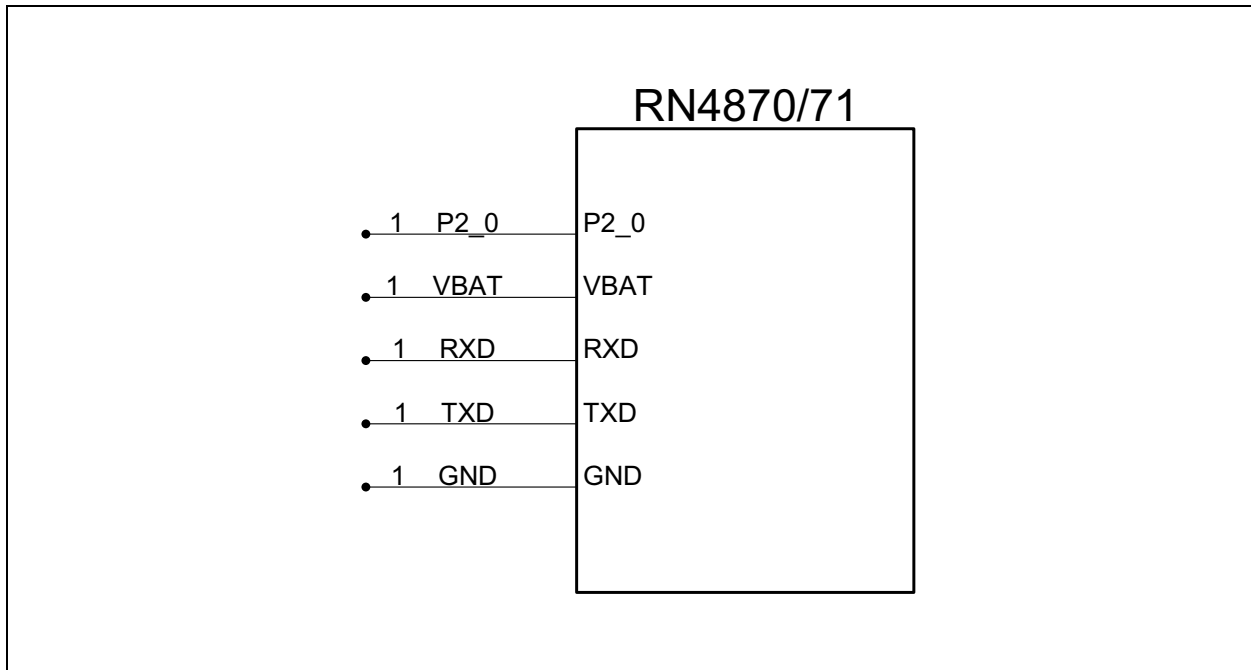
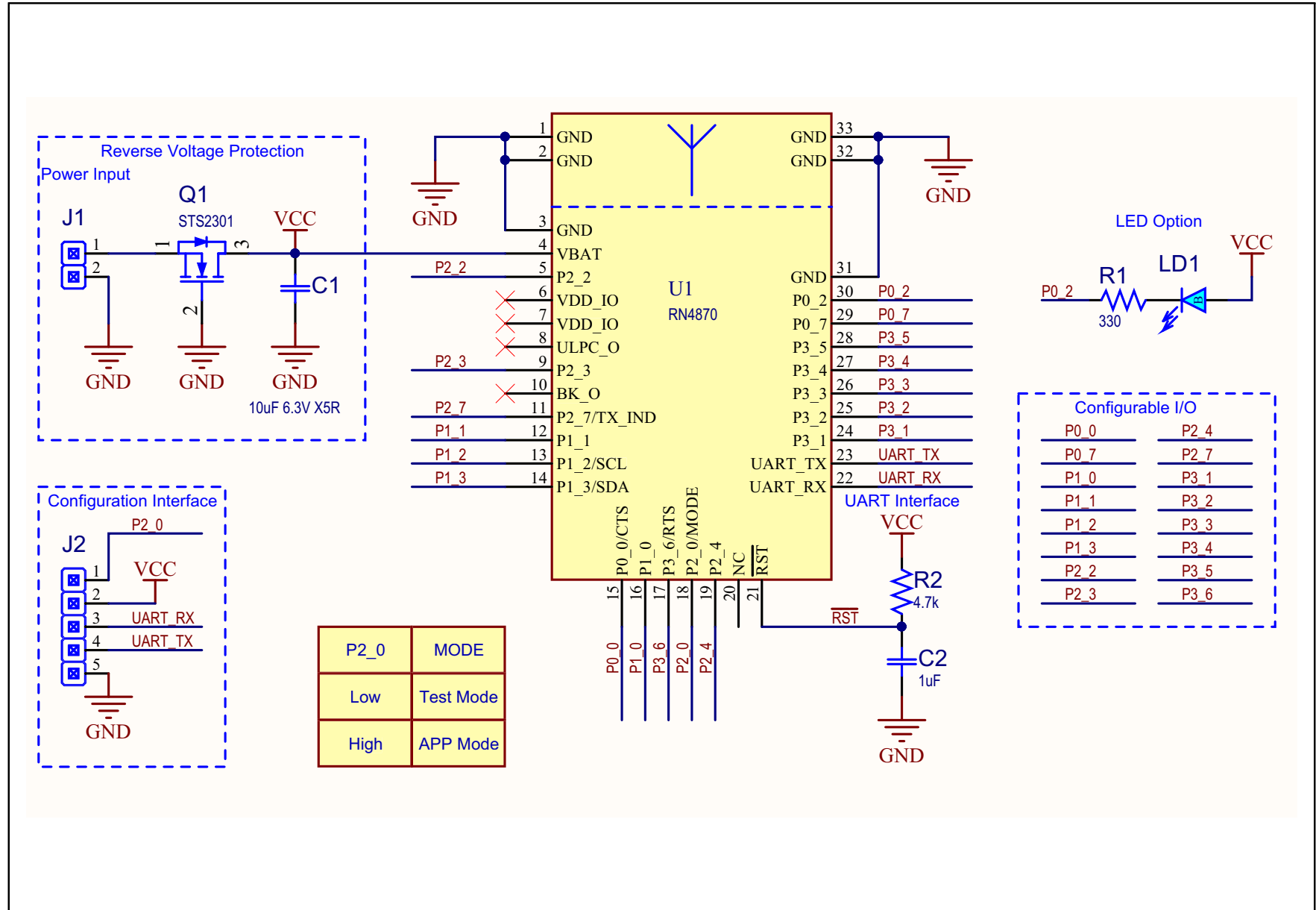




FIGURE 5-2: RN4870 REFERENCE CIRCUIT



**FIGURE 5-3: RN4870U REFERENCE CIRCUIT**

