![WNC Wistron NeWeb Corp. logo]
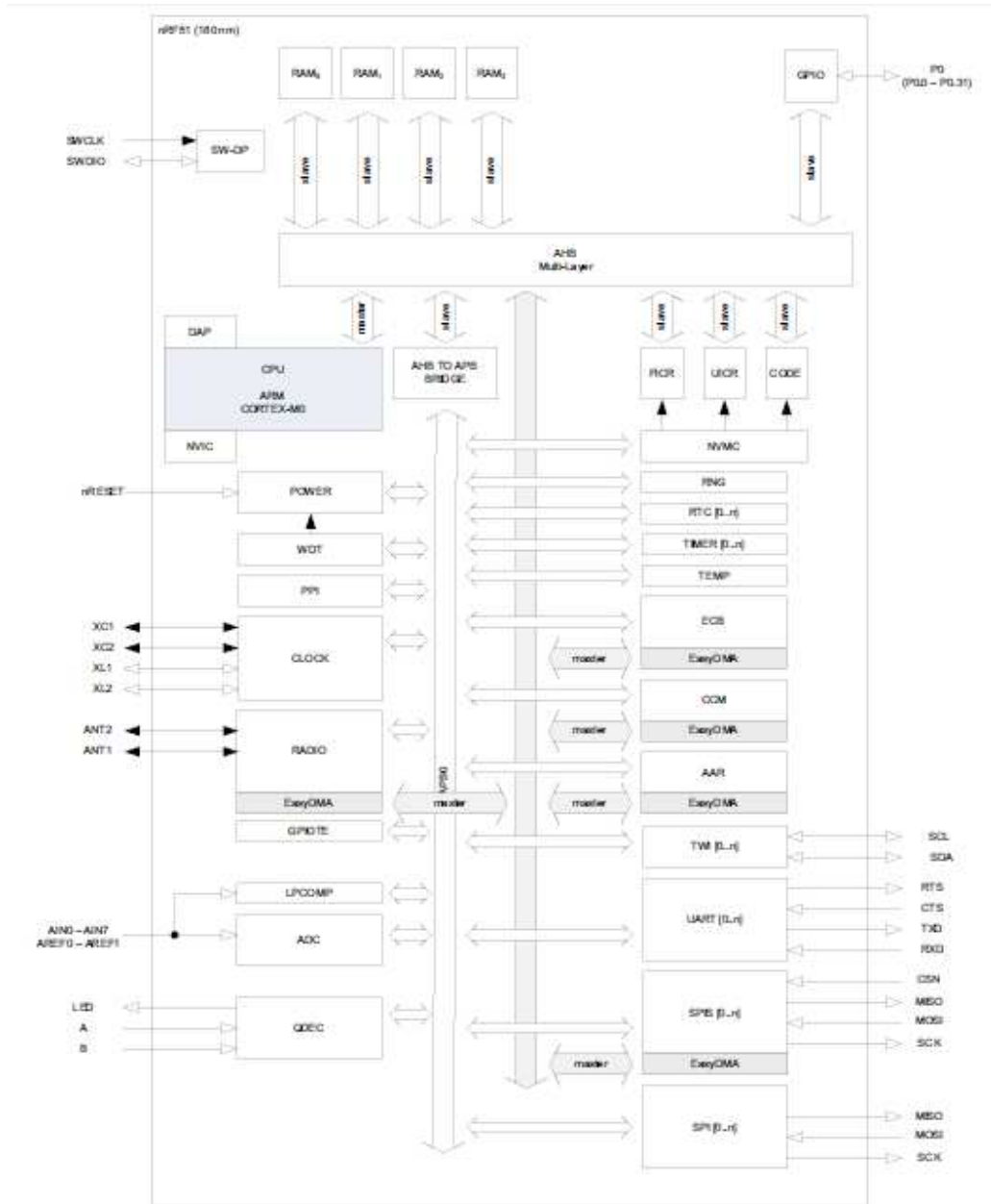
XRBH User Manual

(V0.2)

Model Name: **XRBH BLE MODULE**
Description: **BLE module compatible**

Revision History

Edition #	Reason for revision	Issue date
V0.1	Initial Document (Draft version)	2016/07/28
V0.2	Add FCC/NCC Label Compliance Statement	2016/07/29
V0.3	Delete Product Overview	2016/08/01

NRF51822 Block Diagram

1

Specification

CATEGORIES	FEATURE	
Wireless Specificiation	Bluetooth®	V4.0 (Single Mode/Bluetooth Smart)
	Frequency	2.402 - 2.480 GHz
	Max Transmit Power	2dBm
	Receive Sensitivity	-93dBm (Low power mode)
	Whisper Mode	-30 dBm (Transmit)
	Link Budget	95 dB (@ 1 Mbps)
	Raw Data Rates	1 Mbps (over the air)
Host Interfaces	Total	14 lines – multi function
	UART	TX, RX
		Default 115200, N, ,8, 1
		From 1,200 to 115,200bps
	GPIOs	14
	SPI	3 lines
	I2C	2 lines
	ADC	6 lines (plus ADC reference)
Encryption	AES	128 bit using CCM encryption
Memory	Flash	256KB
	RAM	32KB
Physical	Dimensions	16.5mm x 12mm x 2.65mm
Clock Management	RF	32MHz crystal embedded
	RTC	32.768KHz crystal embedded
Environmental	Operating Temperature	-10° to +65° C
	Storage Temperature	-10 ˚C to +65 ˚C
Miscellaneous	Lead Free	Lead-free and RoHS compliant

Electrical characteristics

Low power mode

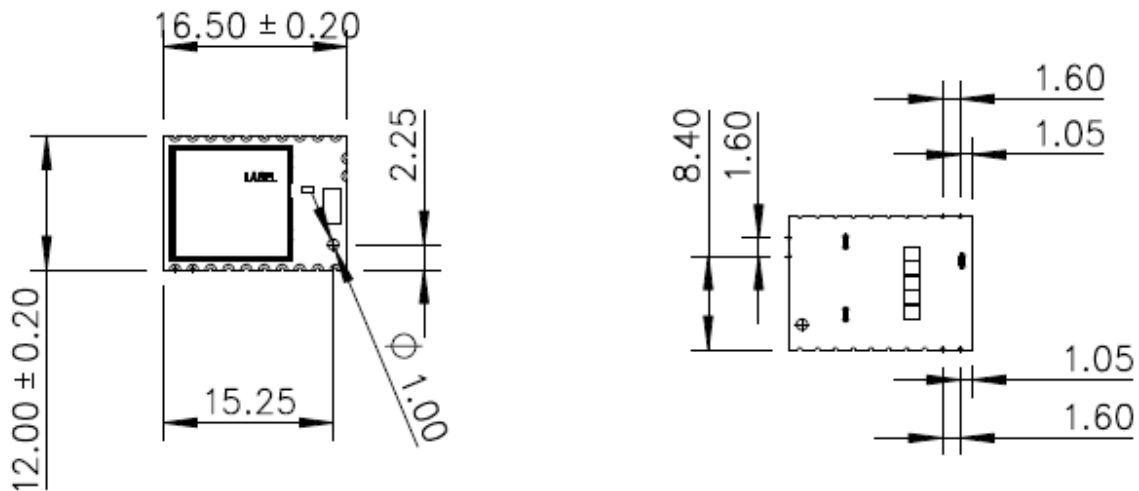| Symbol	Minimum	Typical	Maximum	Unit
VCC	1.8	1.8	1.8	V

LDO mode

Symbol	Minimum	Typical	Maximum	Unit
VCC	1.8	3	3.6	V

Power consumption

Symbol	Description	Typical	Unit
I_{OFF}	System off current consumption	0.6	uA
I_{IDLE}	3V ON, all blocks idle	2.6	uA

Mechanical Dimension

2.65 ± 0.25

1.00 ± 0.10

Pin 20   Pin 11

Pin 22
Pin 21

Top

Pin 1   Pin 10

Bottom

PIN23
PIN24
PIN25
PIN26
PIN27
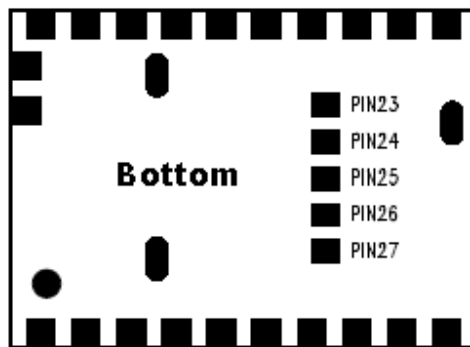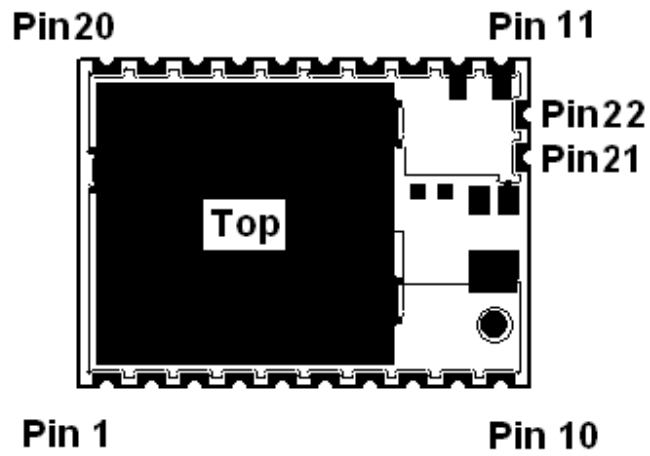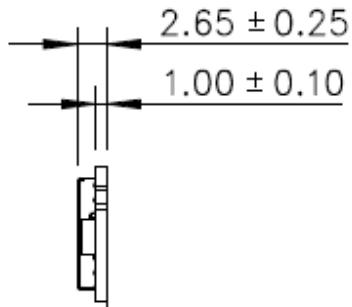
PIN Define

Pin number	Name	Function	Description
1	P0.02 AIN3	Digital I/O Analog input	General purpose I/O 2 ADC input 3
2	P0.01 AIN2	Digital I/O Analog input	General purpose I/O 1 ADC input 2
3	P0.03 AIN4	Digital I/O Analog input	General purpose I/O 3 ADC input 4
4	P0.05 AIN6	Digital I/O Analog input	General purpose I/O 5 UART RXD
5	P0.04 AIN5	Digital I/O Analog input	General purpose I/O 4 UART TXD
6	P0.10	Digital I/O	General purpose I/O 10
7	VDD	Power	Power input
8	DEC2	Power	Power supply decoupling
9	P0.06 AIN7 AREF1	Digital I/O Analog input Analog input	General purpose I/O 6 ADC input 7 ADC Reference voltage
10	P0.07	Digital I/O	General purpose I/O 7 TX_IRQ
11	GND	Ground	Ground
12	GND	Ground	Ground
13	SWDCLK	Digital input	HW debug port Flash programming I/O
14	nRESET SWDIO	Digital I/O	System reset (low active) HW debug port Flash programming I/O
15	P0.16	Digital I/O	General purpose I/O 16
16	P0.15	Digital I/O	General purpose I/O 15
17	P0.12	Digital I/O	General purpose I/O 12
18	P0.11	Digital I/O	General purpose I/O 11
19	P0.09	Digital I/O	General purpose I/O 9
20	P0.08	Digital I/O	General purpose I/O 8 BLE OTA mode, Low active

21	RF_OUT		RF output port for external antenna
22	GND	Ground	Ground
23	P0.18	Digital I/O	General purpose I/O 18
24	P0.20	Digital I/O	General purpose I/O 20
25	P0.17	Digital I/O	General purpose I/O 17
26	P0.19	Digital I/O	General purpose I/O 19
27	P0.14	Digital I/O	General purpose I/O 14

Recommend Land Pattern
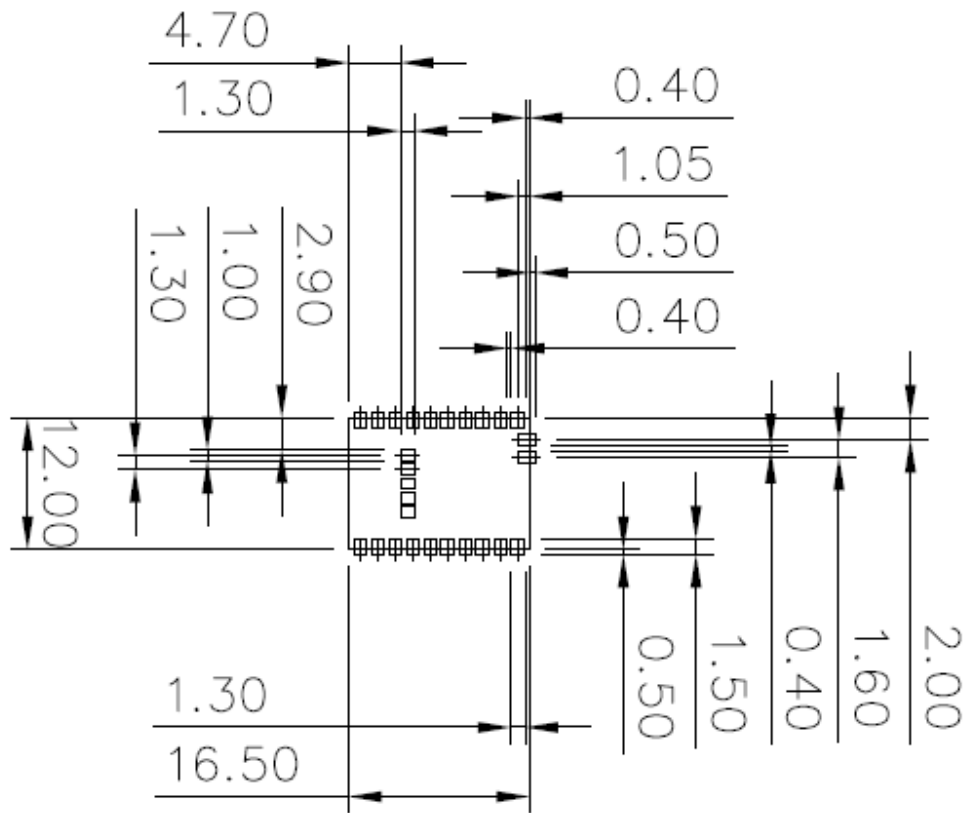
Antenna Type

Antenna Vendor	YAGEO
Antenna Type	CHIP ANTENNA
Antenna PN	ANT3216LL12R2400A

Antenna Specification

Test condition

Antenna position

Product

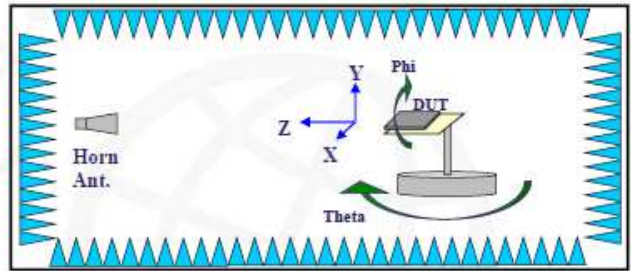Module thickness : 1mm

Back side:
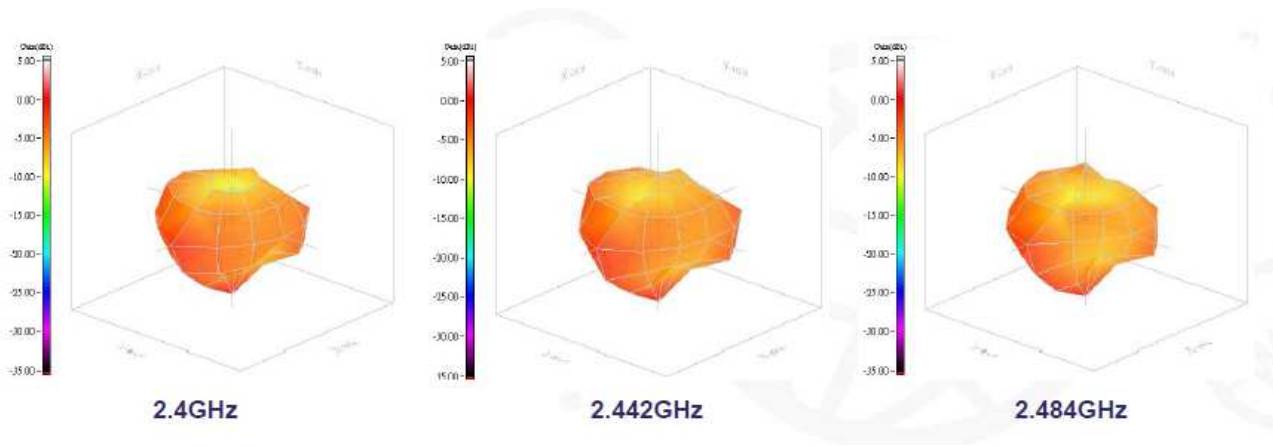Battery holder

[Direction Definition]

Horn Antenna
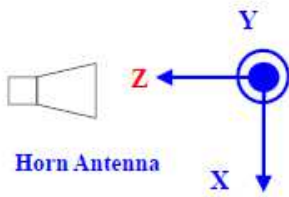
[Testing Environment]

Antenna	ANT3216LL11R2400A		
Frequency (GHz)	2.4	2.442	2.484
S11 (dB)	-12.6	-23.5	-10.3
Max. Gain (dBi)	0.25	0.41	0.16
Avg. Gain (dB)	-4.27	-4.23	-4.72
Efficiency (%)	37.41%	37.77	33.72%

3D Raidation Pattern

2.4GHz   2.442GHz   2.484GHz

FCC Compliance Statement

(1)	**FCC Label Compliance Statement:** **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.**
(2)	**FEDERAL COMMUNICATIONS COMMISSION INTERFERENCE 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.**
(3)	**End Product Labeling:** **This transmitter module is authorized only for use in device where the antenna may be installed such that 20 cm may be maintained between the antenna and users. The final end product must be labeled in a visible area with the following:** "**Contains FCC ID: NKR-XRBH**" . **The grantee's FCC ID can be used only when all FCC compliance requirements are met.**
(4)	**Radiation Exposure Statement** **This device is intended only for OEM integrators under the following conditions:** **1) The antenna must be installed such that 20 cm is maintained**

	between the antenna and users, and 2) The transmitter module may not be co-located with any other transmitter or antenna. As long as 2 conditions above are met, further transmitter test will not be required. However, the OEM integrator is still responsible for testing their end-product for any additional compliance requirements required with this module installed **IMPORTANT NOTE:** In the event that these conditions can not be met (for example certain laptop configurations or co-location with another transmitter), then the FCC authorization is no longer considered valid and the FCC ID can not be used on the final product. In these circumstances, the OEM integrator will be responsible for re-evaluating the end product (including the transmitter) and obtaining a separate FCC authorization.
(5)	**Radiation Exposure Statement:** 1) Any changes or modifications not expressly approved by the grantee of this device could void the user's authority to operate the equipment. 2) This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with minimum distance 20cm between the radiator & your body.
(6)	**Manual Information To the End User:** The OEM integrator has to be aware not to provide information to the end user regarding how to install or remove this RF module in the user's manual of the end product which integrates this module. The end user manual shall include all required regulatory information/warning as show in this manual

本產品符合低功率電波輻射性電機管理辦法

第十二條

※經型式認證合格之低功率射頻電機，非經許可，公司、商號或使用者均不得擅自變更頻率、加大功率或變更原設計之特性及功能。

第十四條

※低功率射頻電機之使用不得影響飛航安全及干擾合法通信；經發現有干擾現象時，應立即停用，並改善至無干擾時方得繼續使用。

-前項合法通信，指依電信法規定作業之無線電通信。

-低功率射頻電機須忍受合法通信或工業、科學及醫療用電波輻射性電機設備之干擾。

此模組若安裝於其他平台時，該平台標籤需標明：

此平台內建無線模組　　CCXXxxLPyyyZzW

Application Note

XRBH has embedded 32MHz crystal, which is difference to the Development Kit. In order to let 32MHz crystal works that you can enable it explicitly with the following code:

```
void Clock_settings_32_MHz_func(void)
{
    // Start 32 MHz crystal oscillator.
    NRF_CLOCK->XTALFREQ = 0x00;
  NRF_CLOCK->EVENTS_HFCLKSTARTED  = 0;
  NRF_CLOCK->TASKS_HFCLKSTART     = 1;

  // Wait for the external oscillator to start up.
  while (NRF_CLOCK->EVENTS_HFCLKSTARTED == 0)
  {
\     // Do nothing.
  }
}
```