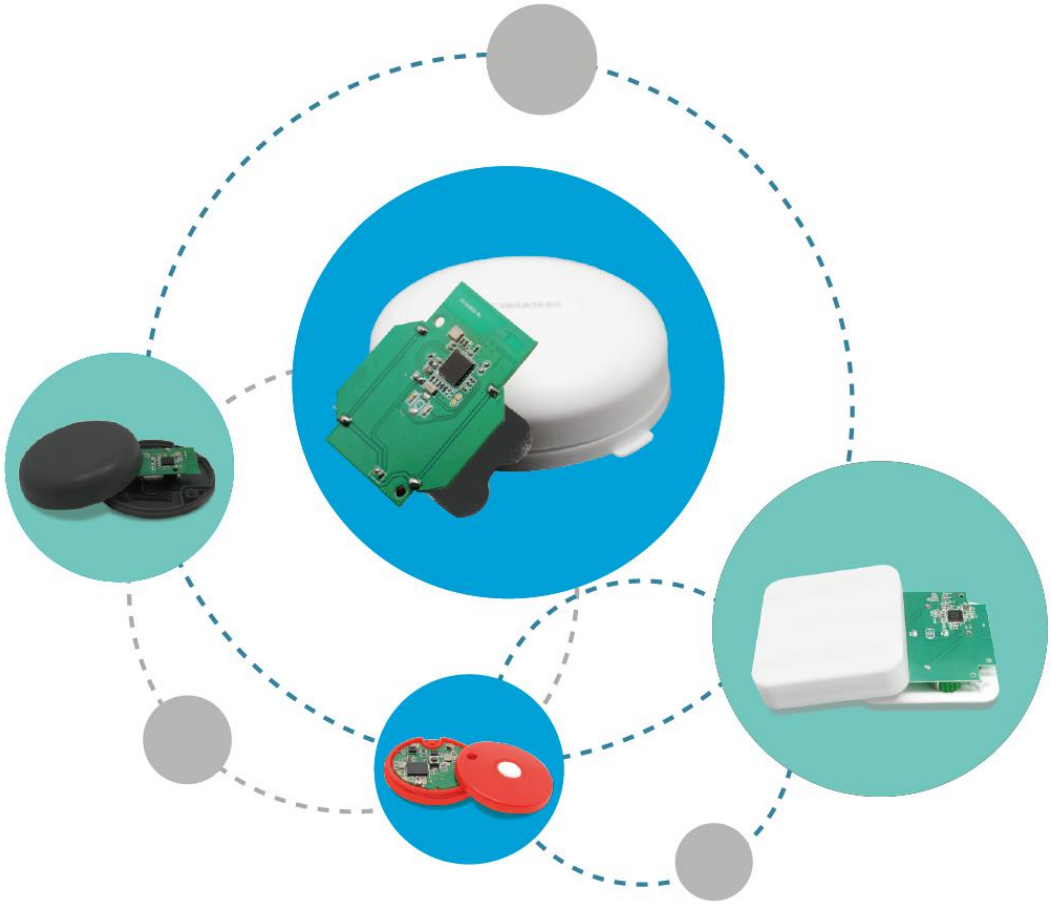
NRF52810-Beacon



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1. product description

1.1 Overview

nRF52810 beacon is a portable iBeacon tag with ultra low power chipset NRF52810 and BLE 5.0 technology . The nRF52810 SoC is a powerful, highly flexible ultra-low power multi-protocol SoC ideal for Bluetooth® low power, ANT and 2.4GHz ultra low power wireless applications. The nRF52810 SoC is built on a 32-bit ARM® CortexTM-M4F CPU with 192kB+24kB RAM. Our beacons are available in multiple series, including the nRF52810-B1 without sensors, the nRF52810-G1 with accelerometer, and the nRF52810-T1 with temperature and humidity sensors. The sensor's nRF52810-TG, as well as the large battery version (two 2477 batteries) nRF52810-X5.

1.2 Application scenario

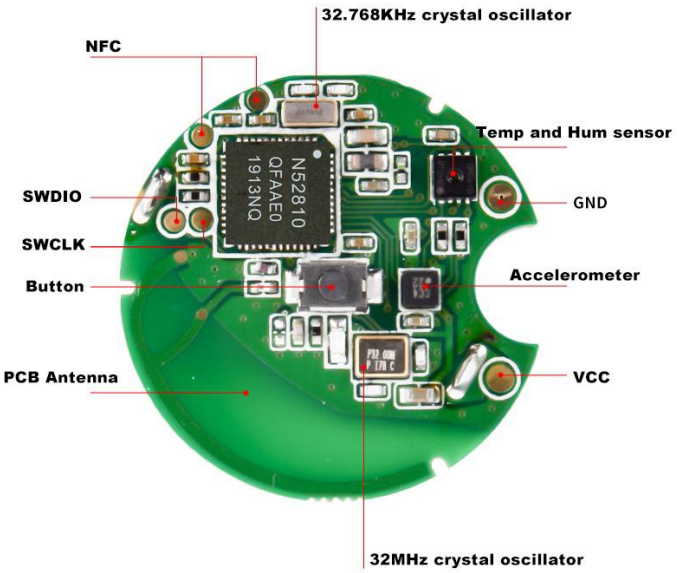
- Indoor Positioning
- Parking management
- Temperature and humidity monitoring
- Flow analysis
- Light detection
- Asset Management
- 2.4GHz Bluetooth Low Power System
- Home and building automation
- Sports and leisure equipment
- Consumer electronics
- Human interface device
- Health and medic

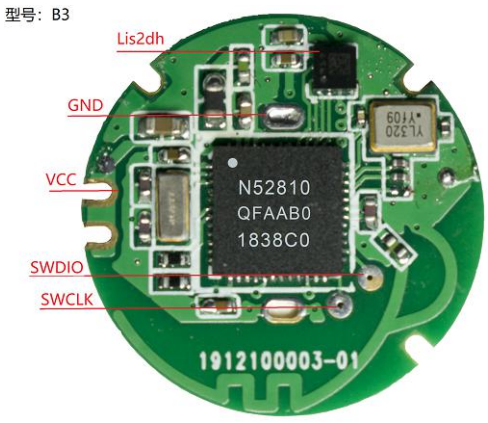
1.3 Technology parameter

Item	nRF52810	Item	nRF52810
Supply voltage	1.7 - 3.6v	Stand-by current	1.9uA
Frequency	2402-2480MHz	Transmission rate	1Mbps
Selectable Channel	40	Chip flash	192KB
Modulation	GFSK	Chip RAM	24KB
Output Power	-20dBm - +4dBm	OTA	√
Emission current (0dBm)	6mA	Antenna form	PCB antenna
Receiving sensitivity	-96dBm	Communication distance	>50m
Receiving current	4.6mA	Operating temperature	-20–75℃

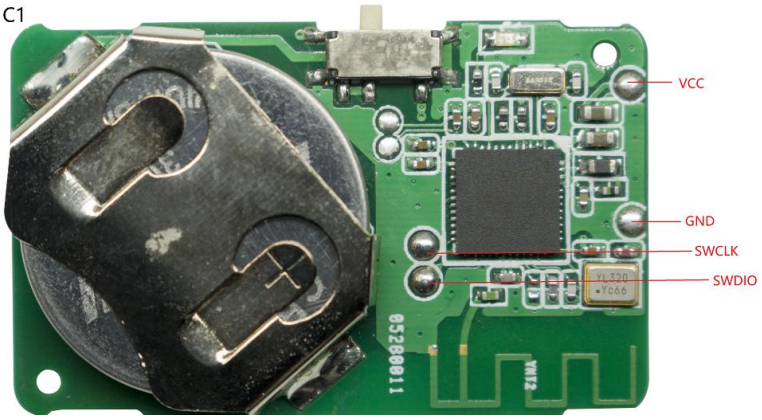
2. Module introduction

2.1 Module pin

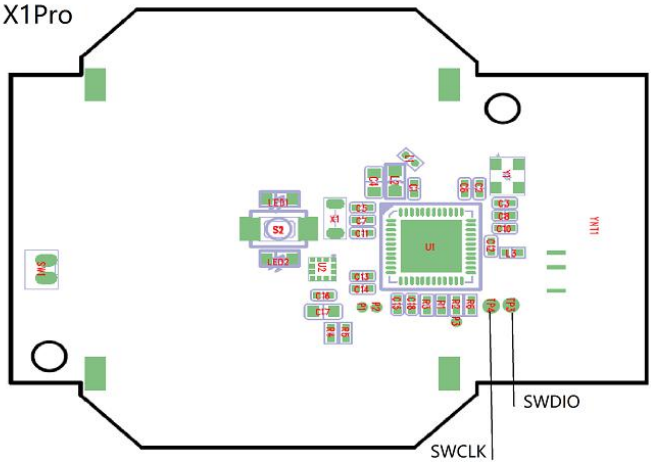


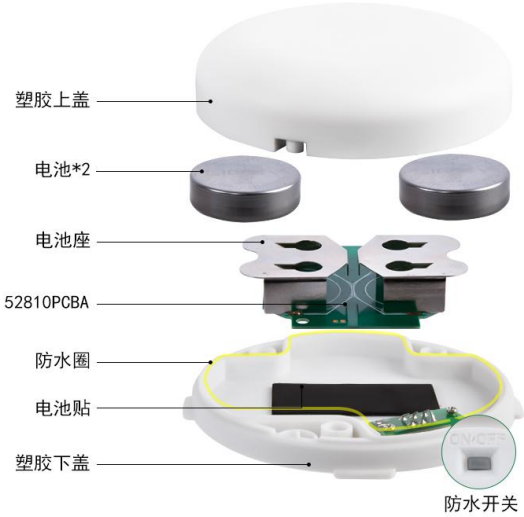


型号：C1



型号：X1Pro





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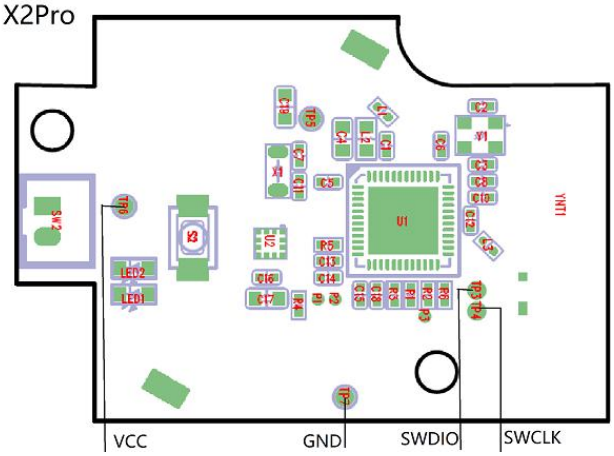

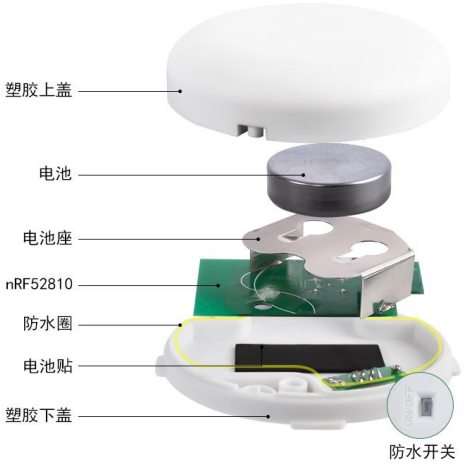

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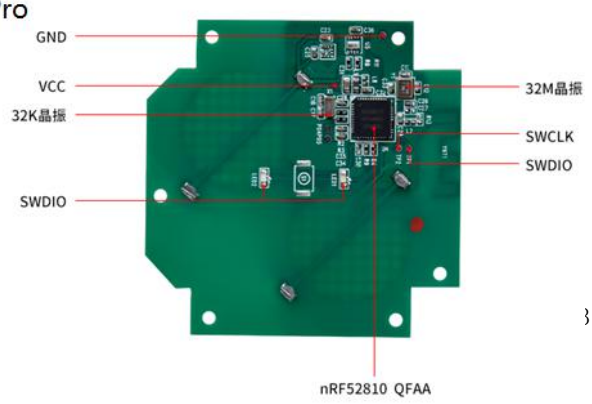
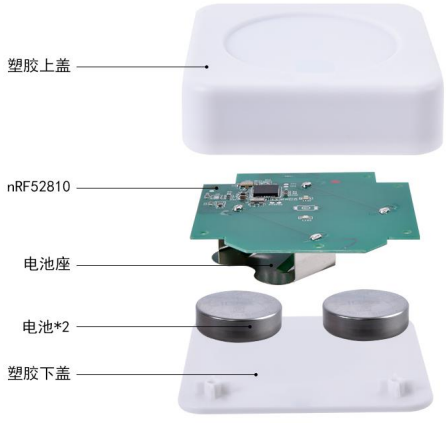




2.2 Module size

Part Number	A3	X1	X2 Pro	X4
Width/ Diameter	30mm	75mm	60mm	58mm
Thickness	10mm	26mm	18mm	16mm

3. Beacon usage

3.1 Beacon operation

Beacon can be used directly with power. If you need to modify the parameters, please download the RLbeacon tool on the App Store. Connect when needed，The default password is 123456.

Device List **Device Information** **Password input**

3.2 Beacon interface description

Service UUID：00001803-494c-4f47-4943-544543480000

Description	UUID	Attribute	Length
mobile->ibeacon	00001805-494c-4f47-4943-544543480000	write	20(Max)
ibeacon->mobile	00001804-494c-4f47-4943-544543480000	notify	20(Max)

Num	APP Command	Return	Description
1	Modify name： 0x11+name(length<=8)	0x11	longest 10byte
2	Modify UUID： 0x12+16byte UUID	0x12+16byte UUID	Total 16byte uuid
3	Read UUID：0x13	0x13+16byte UUID	
4	Modify Major,Minor， battPower： 0x14+Major+Minor+Batt Power	0x14+Major+Minor +BattPower	major：2byte Minor：2byte BattPower：1byte
5	Read Major,Minor, BattPowe: 0x15	0x15+Major+Minor +BattPower	
6	Modify the broadcast interval： 0x16+adv(1byte)	0x16+1byte	Broadcast interval is in ms The actual broadcast interval is 40*adv(ms)
7	Modify transmit power： 0x17+power(1byte)	0x17+1yte	Power(1-9 default:7) Refer to the table below
8	Modify password 0x18+passcode（6byte）	0x18+passcode（6byte）	passcode：must be 6byte

APP modify the transmit power

	nRF52810	In Response data format
1	-20dBm	01
2	-16dBm	02
3	-12dBm	03
4	-8dBm	04
5	-4dBm	05
6	0dBm	06
7	3dBm	07
8	4Bm	08
9		

3.3 Beacon LED and button description

（1）LED will flash 3 times when beacon is powered on.

（2）In power on state,the button is turned on for 3 seconds, the LED light flashes once, and the beacon is turned off. In power off state, the button is turned on for 3 seconds LED flashes 3 times, and the beacon is turned on.

4. Beacon data format

4.1 Broadcast data format

Position	0	1	2	3	4	5	6	7	8	9-24	25-26	27-28	29
Data	0x02	0x01	0x06	0x1A	0xFF	0x4C	0x00	0x02	0x15	uuid	major	minor	rssi at 1m

4.2 Response data format

Position	0	1	2-length	length+1	length+2	length+3	length+4
Data	Name length	0x09	Name	0x13	0x16	0x18	0x03
Position	length+5 - length+8	length+9 - length+12					
Data	Temperature and humidity data	Acceleration data					

Position	0	1	2 - length	length+1	length+2	length+3	length+4	length+5 - length+10
Data	Name length	0x09	Name	0x11	0x16	0x03	0x18	Mac address
Position	length+11 - length+12	length+13 - length+14	Length +15	length+16 - length+17	length +18			
Data	major	minor	Transmit power	Broadcast interval	Battery power			

Remarks：

1. The scan response packet has two parts: the first part is the name and sensor data; the second part is the basic information of the beacon, including mac, major, minor and other information. These two pieces of information are broadcast in turn.
2. If the beacon does not have a sensor, then there is only a portion of the data in the scan response packet.
3. If the beacon has only one sensor, only the corresponding sensor data is scanned in the

response packet, and the other sensor data is 0.

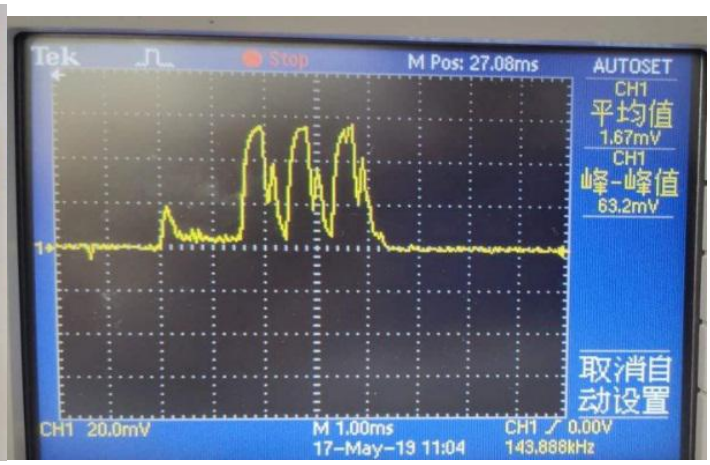
4. Temperature and humidity data: temperature integer (1byte) + temperature decimal (1byte) + humidity integer (1byte) + humidity decimal (1byte)
5. Three-axis data: three-axis (x/y/z) sign bit (1 is a negative number, 0 is an integer 1 byte), three-axis (x/y/z) integer bits (1 byte), three axes (x/y/z) The first digit after the decimal point (1byte), the third digit after the decimal point (x/y/z) (1byte).

5. Beacon power consumption

Broadcast current test method: Beacon broadcasts a 10 ohm resistor in series, and connects the oscilloscope to the voltage across the resistor.
Static current test method: Connect the beacon in series with a multimeter to check the current.

5.1 nRF52810 power consumption

Sensorless power consumption：



Power consumption：

Quiescent Current：1.9uA

Broadcast current：6mA

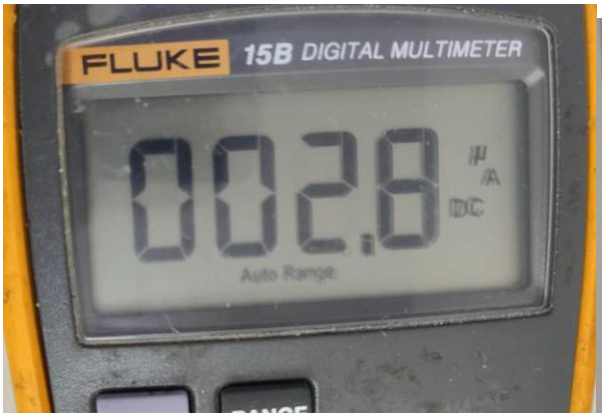
Broadcast time：5ms

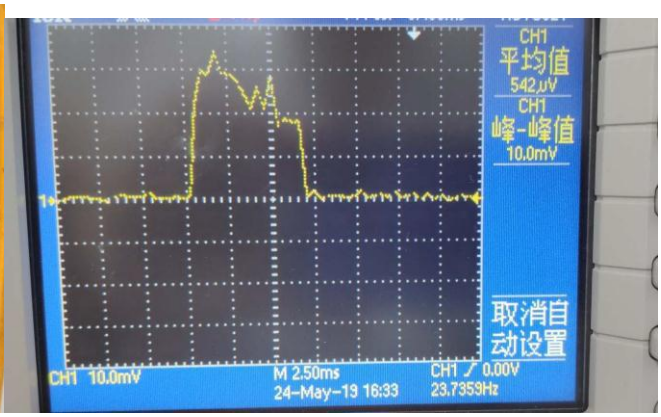
Broadcast interval：1000ms

Average current $= \frac{1.9\text{uA}*995\text{ms}+6\text{mA}*5\text{ms}}{1000\text{ms}} = 0.0318905\text{mA}$

Use time of 2032 battery $= \frac{200\text{mA}\cdot h}{0.0318905\text{mA}} \approx 6271h$

Two sensors work simultaneously：





Power consumption：

Quiescent Current：2.8uA

Broadcast current：6mA

Broadcast time：5ms

Broadcast interval：1000ms

Sensor operating current：3mA

Sensor working time：7.5ms

Timer operating current：1mA

Timer working time：2.5ms

Average current = $\frac{2.8uA*985ms+6mA*5ms+3mA*7.5ms+1mA*2.5ms}{1000ms} = 0.057758mA$

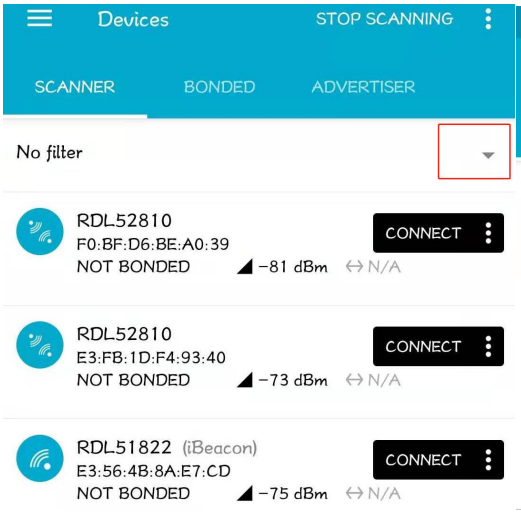
Use time of 2032 battery = $\frac{200mA\cdot h}{0.057758mA} \approx 346$

6.Upgrade

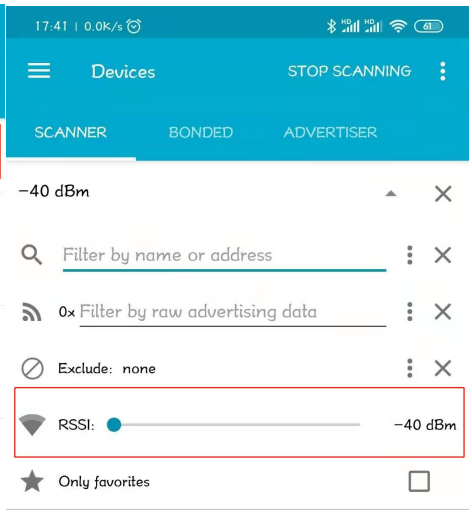
nRF52810 supports over-the-air upgrades. When the beacon encounters an error, it can be upgraded to restore the default settings or update the firmware (provided the beacon can also broadcast). Upgrade requires an upgrade package (please ask for customer service and explain which beacon) and upgrade software (our app does not have an integrated upgrade function, so use Nordic's official software to upgrade).

6.1 Please download the upgrade software: nrf connect, Android and ios support. This tutorial uses the Android system as a tutorial.

6.2 Open nrf connect, click on the location marked in Figure 6.2-1 and set the RSSI as shown in Figure 6.2-2. Click on the location marked in 6.2-1 to close the setting.

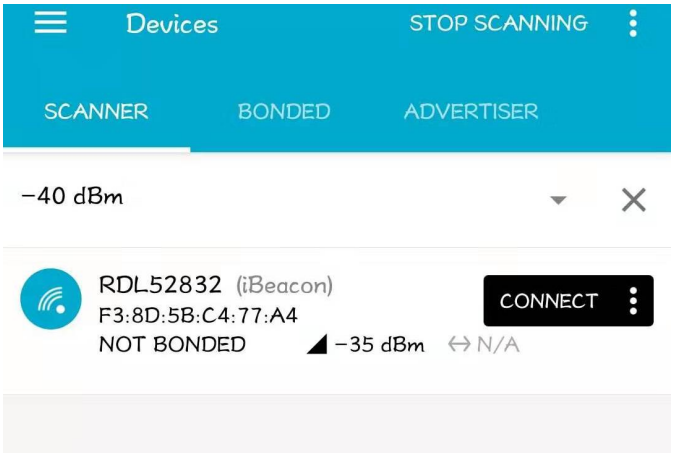


6.2- 1



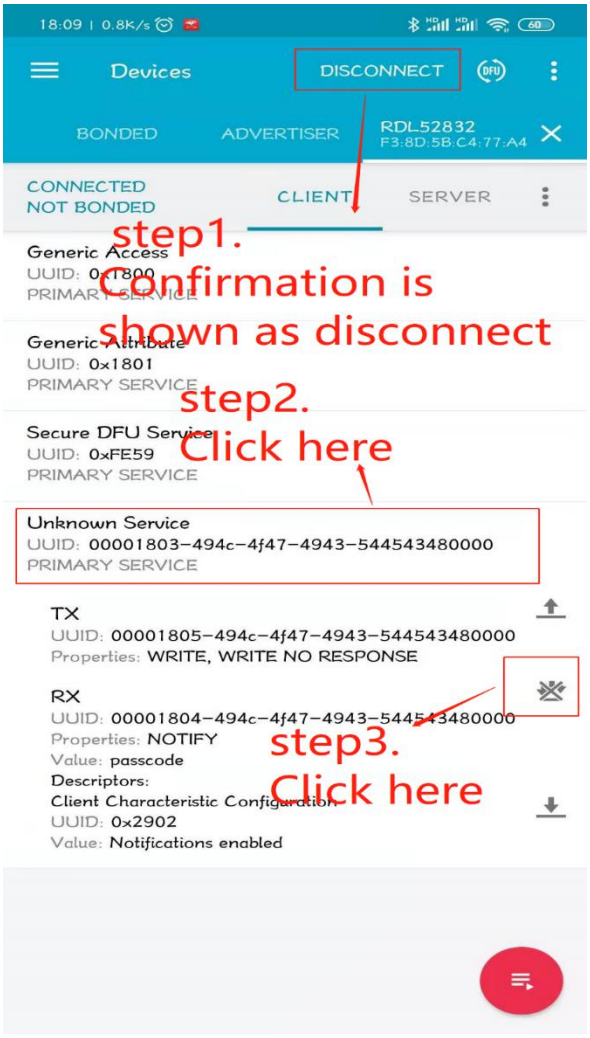
6.2- 2

6.3 Keep the beacon close to the phone, keep other beacons away from the phone (too many beacons are easily interfered by the phone), and click on SCAN in the upper right corner of the app to start searching for beacons. If you can't find the beacon, you can set the RSSI to -50 or -60 in the previous step, so that the phone can only search for one beacon.



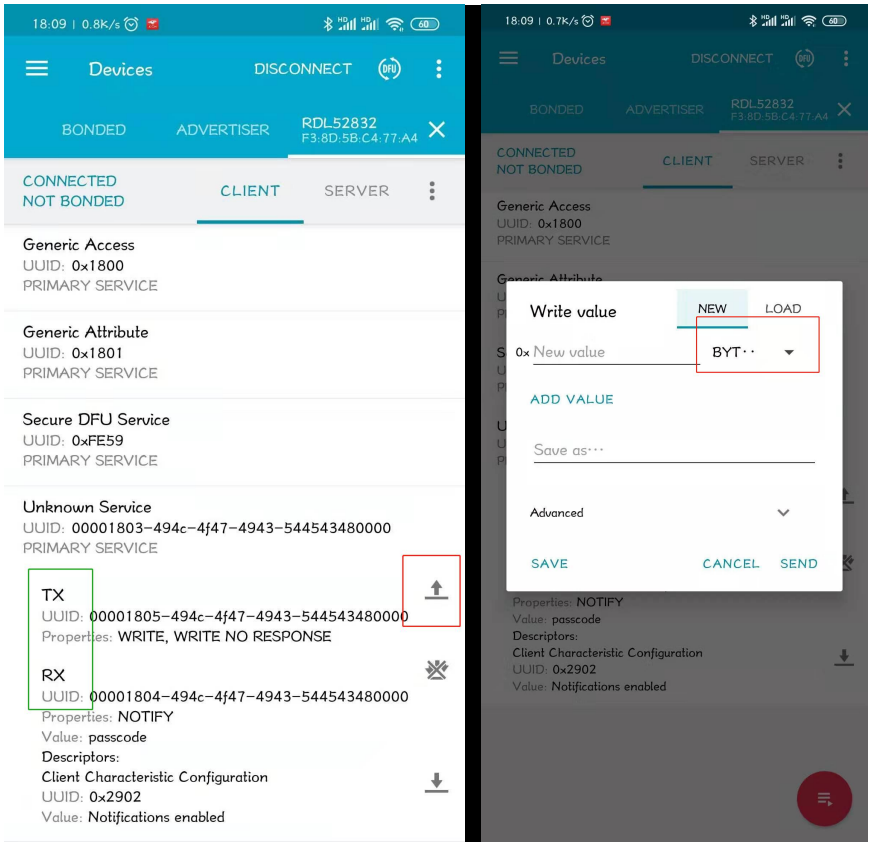
6.3- 1

6.4 Click CONNECT to connect to the beacon. After connecting the beacon, you need to enter the password quickly. Otherwise, the connection will be automatically disconnected after the timeout. When the upper right corner is displayed as DISCONNECT, the connection is successful. When the upper right corner is displayed as CONNECT, it is disconnected.



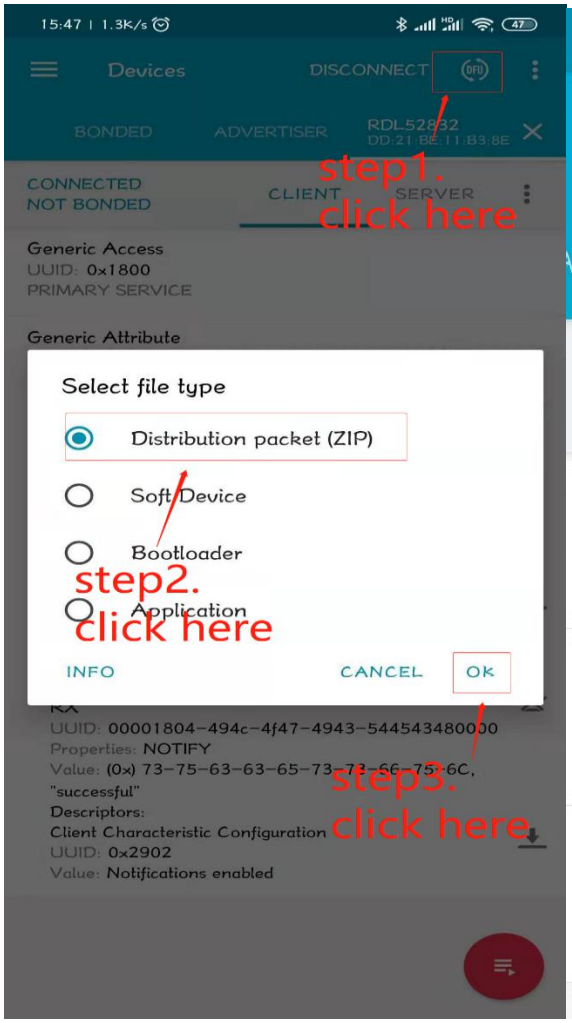
6.4- 1

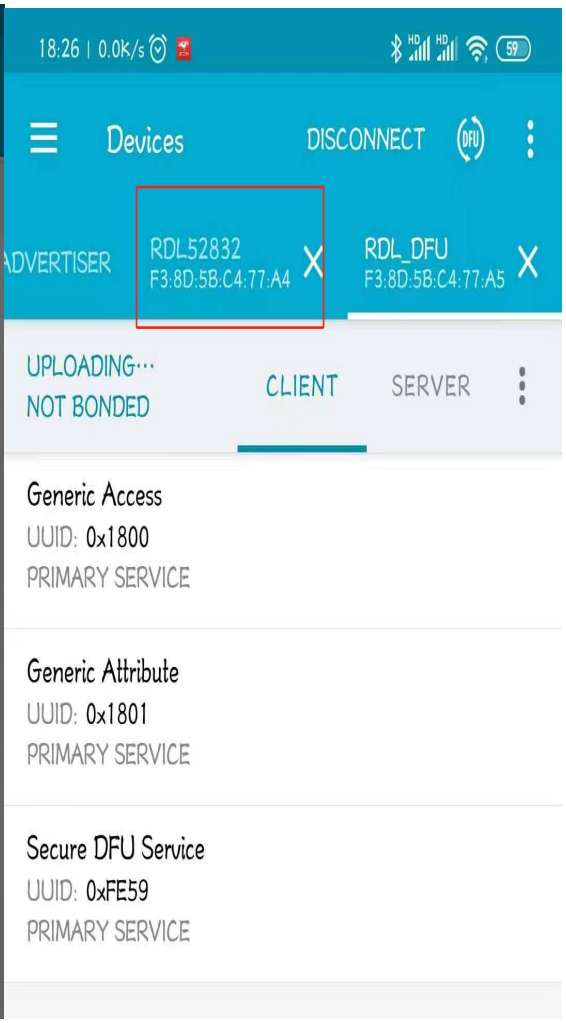
6.5 The green part TX RX in Figure 6.5-1 will be displayed after setting, otherwise it will be displayed as Unknown Service, so this part of the difference is irrelevant. Click on the red part of Figure 6.5-1 to pop up the password input box. Click on the location in the 6.5-2 marker and select TEXT in the pop-up box. Then enter the password in the horizontal line on the left and click SEND in the lower right corner of the pop-up box to send it.



6.5- 1 6.5- 2

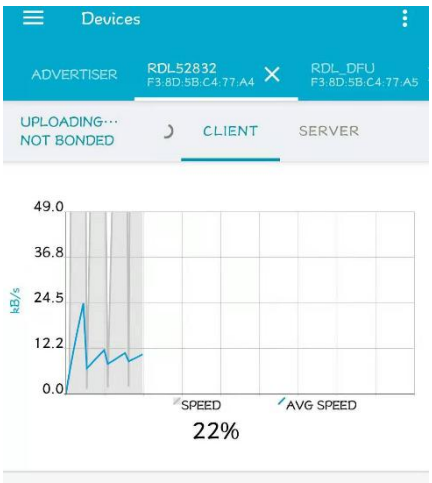
6.6 After entering the password, the most important thing is to upgrade. Click on the location in Figure 6.6-1, select Distribution packet (ZIP), then click OK to select the upgrade package in the file manager. At this point, the APP will automatically enter the upgrade page, as shown in Figure 6.6-2. If you need to check the progress of the upgrade, click on the location of 6.6-2, the original name of the beacon will be displayed here.





6.6- 1 6.6- 2

6.7 When the upgrade progresses to 100% and then displays as disconnected, it indicates that the upgrade is successful. You can directly disconnect the beacon. You cannot disconnect the beacon during the upgrade process, or the beacon is powered off. If the upgrade progress does not occur, then the wrong upgrade package may be selected. Please retry the upgrade operation.



https://www.nordicsemi.com/-/media/Software-and-other-downloads/SDKs/nRF5/Binaries/nRF5SDK15209412b96.zip

FCC Warning

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.

Any Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

Note: 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.

The device has been evaluated to meet general RF exposure requirement. The device can be used in portable exposure condition without restriction.