



nRF52832/nRF52810/nRF52840/nRF51822

Wireless Module

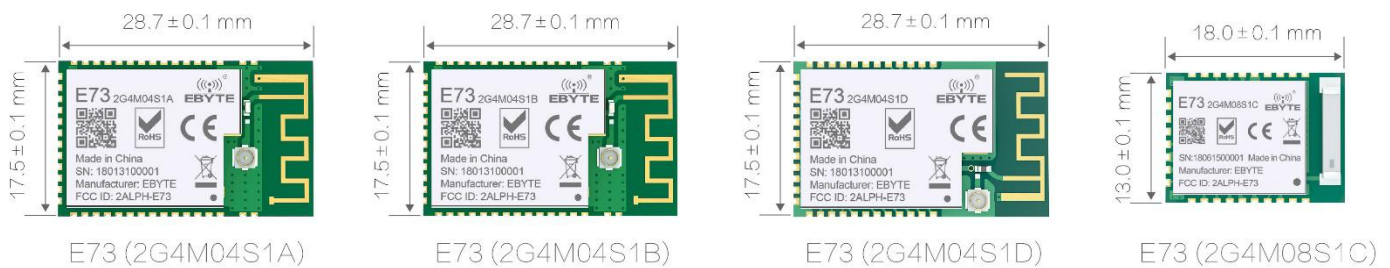
E73 Series

User Manual

This manual may be modified based on product upgrade, please refer to the latest version.
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Version	Date	Description	Issued by
1.00	2017/12/06	Initial version	huaa
1.10	2017/12/06	Name changed	huaa
1.20	2018/05/23	Content added	Huaa
1.30	2018/08/01	E73(2G4M08S1C) added	Huaa

Brief Introduction



E73 series are wireless Bluetooth modules designed by Chengdu Ebyte which feature small size, low power consumption, built in PCB antenna and IPX interface. E73 series adopt the originally imported RFIC nRF52832/ nRF52810/nRF52840 of NORDIC, supporting BLE 4.2 and BLE 5.0. The chip has high-performance ARM CORTEX-M4F kernel and other peripheral resources, such as UART, I2C, SPI, ADC, DMA, PWM etc. The module led out all the IO port of nRF52832/nRF52810 and most IO Port of nRF52840 for multilateral development. For more details, please refer to the datasheet of NORDIC. For E73 (2G4M04S1D), We used 16MHz high precision low temperature drift active crystal oscillator and other model used 32MHz crystal oscillator, which ensure its industrial characteristics and stability performance

Compared with Bluetooth 4.2, Bluetooth 5 has the following advantages: 2x air data bandwidth(2Mbps), The broadcasting capacity is increased(x8). Broadcasting extension makes the data length increase to 251 bytes which enables more effective data transmission in beacon applications. S112 applies S112 protocol stack which has been strictly tested and upgraded. It supports 196kB Flash/24kB RAM of nRF52810 SoCs. S112 protocol stack only take 100kB flash which means it saves enough space for massive low consumption Bluetooth applications and provides reliable support for upgrade for OTA applications.

E73 series are hardware platform without firmware, so users need to conduct a secondary development. This series have maximized the RF characteristics of chip. The built-in 32.768K real-time clock crystal oscillator can benefit users in programming(Note: E73(2G4M08S1C) did not built in the crystal oscillator.)

Model	Frequency	Transmitting power	Distance(PCB/IPX)	Packing	Antenna
E73 (2G4M04S1B)	2.4GHz	4dBm	100m	SMD	PCB/IPX
E73 (2G4M04S1A)	2.4GHz	4dBm	110m	SMD	PCB/IPX
E73 (2G4M04S1D)	2.4GHz	4dBm	110m	SMD	PCB/IPX
E73(2G4M08S1C)	2.4GHz	8dBm	120m	SMD	Ceramic antenna

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1. Technical Parameter

Model	IC	Antenna	Size	Net weight	Operating temperature	Operating humidity	Storage temperature
E73 (2G4M04S1B)	nRF52832-QFAA	PCB/IPX	17.5 * 28.7 mm	1.8±0.1g	-40 ~ 85°C	10% ~ 90%	-40 ~ 125°C
E73 (2G4M04S1A)	nRF52810-QFAA	PCB/IPX	17.5 * 28.7 mm	1.8±0.1g	-40 ~ 85°C	10% ~ 90%	-40 ~ 125°C
E73 (2G4M04S1D)	nRF51822	PCB/IPX	17.5 * 28.7 mm	1.8±0.1g	-40 ~ 85°C	10% ~ 90%	-40 ~ 125°C
E73(2G4M08S1C)	nRF52840-QIAAC0	Ceramic antenna	13*18*0.8mm	1.02±0.1g	-40 ~ 85°C	10% ~ 90%	-40 ~ 125°C

1.1. Internal resources

Model	IC	FLASH	RAM	Core
E73(2G4M04S1B)	nRF52832-QFAA/QFN48	512KB	64KB	ARM® Cortex™ -M4F
E73(2G4M04S1A)	nRF52810-QFAABB/QFN48	192KB	24KB	ARM Cortex® -M4
E73 (2G4M04S1D)	nRF51822-QFAA/QFN48	256KB	16KB	ARM® Cortex™ M0
E73(2G4M08S1C)	nRF52840-QIAAC0/ aQFN™ 73	1024KB	256KB	ARM® Cortex® -M4

1.2. E73 (2G4M04S1B)

Parameter	Min	Type	Max	Unit
Transmitting current	13	14	15	mA
Receiving current	4	5	6	mA
Turn-off current	1	2	3	μA
Transmitting power	3.8	4	4.3	dBm
Receiving sensitivity	-94	-95	-96	dBm
Recommended band	2379	2430	2496	MHz
Voltage supply	1.8	3.3	3.6	V
Communication level	1.8	3.3	3.6	V

1.3. E73 (2G4M04S1A)

Parameter	Min	Typ	Max	Unit
Transmitting current	17	18	20	mA
Receiving current	12	13	14	mA
Turn-off current	1	2	3	μA
Transmitting power	3.7	4	4.2	dBm
Receiving sensitivity	-94	-95	-96	dBm
Recommended band	2379	2430	2496	MHz
Voltage supply	1.8	3.3	3.6	V
Communication level	1.8	3.3	3.6	V

1.4. E73 (2G4M04S1D)

Parameter	Min	Typ	Max	Unit
Transmitting current	13.0	14.0	15.4	mA
Receiving current	11.3	12.6	13.8	mA
Turn-off current	0.5	1.0	2.5	μA
Transmitting power	3.6	4.0	4.5	dBm
Receiving sensitivity	-95.4	-96.0	-96.8	dBm
Recommended band	2379	2430	2496	MHz
Voltage supply	2.1	3.3	3.6	V
Communication level	2.1	3.3	3.6	V

1.5. E73(2G4M08S1C)

Parameter	Condition	Min	Typ	Max	Unit
Transmitting current	TX only run current (DC/DC, 3 V) P _{RF} = +8 dBm		17.05		mA
	TX only run current (DC/DC, 3 V) P _{RF} = +4 dBm		12.68		
	TX only run current (DC/DC, 5 V, REG0 out = 3.3 V) P _{RF} = 0dBm		7.25		
	TX only run current (DC/DC, 3 V) P _{RF} = 0 dBm		7.63		
Receiving current	RX only run current (DC/DC, 3 V) 1 Mbps / 1 Mbps BLE		7.71		mA
	RX only run current (DC/DC, 3 V) 2 Mbps / 2 Mbps BLE		8.27		
Transmitting power	-		7		dBm
Receiving sensitivity	-	-103 dBm@BLE 125kbps (long distance mode) 、 -95 dBm@BLE 1M			dBm
Recommended band	-	2360	2402	24500	MHz
Voltage supply	-	1.7	3.3	5.5	V
Communication level	-	0.7 X VDD		VDD	V

Note: The current is the current of the whole machine. 64 MHz CPU clock, 52 μA/MHz running from flash memory.

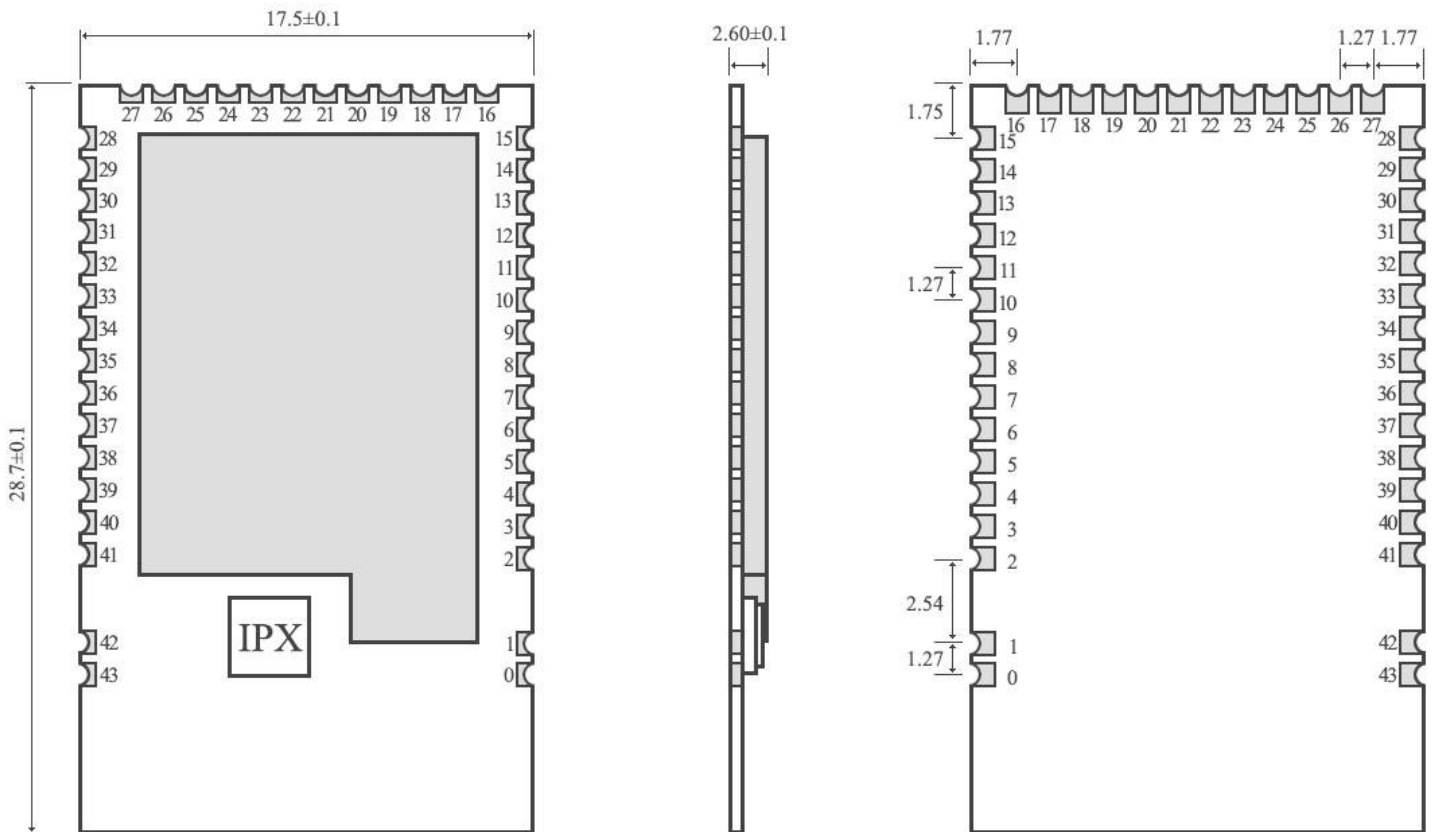
1.6. Parameter notes

- When designing current supply circuit, 30% margin is recommended to be remained so as to ensure long-term stable operation of the whole module.
- The current at the instant of transmitting may be high, but the total energy consumed may be lower due to very short transmitting time.
- When using external antenna, the impedance matching degree at different frequency points between antenna and module may affect the transmitting current at different levels.
- The current consumed when the RF chip is only working at receiving mode is called as receiving current. The tested receiving current may be higher for some RF chips with communication protocol or when the developers have loaded their own protocol to the whole module.
- The current at pure receiving mode is at mA level. To achieve μA level receiving current, the users need to manage it through firmware development.
- The turn-off current is always lower than the current consumed when the power supply source of the whole module is at no-load status.
- Each LRC component has ±0.1% error, and the error will accumulate since multiple LRC components are used in the whole RF circuit, and the transmitting current will be different at different modules.
- The power consumption can be lowered by lowering the transmitting power, but the efficiency of the internal PA will be decreased by lowering transmitting power due to various reasons

2. Mechanical Properties

2.1. E73 (2G4M04S1B)/E73 (2G4M04S1A)

2.1.1. Dimension



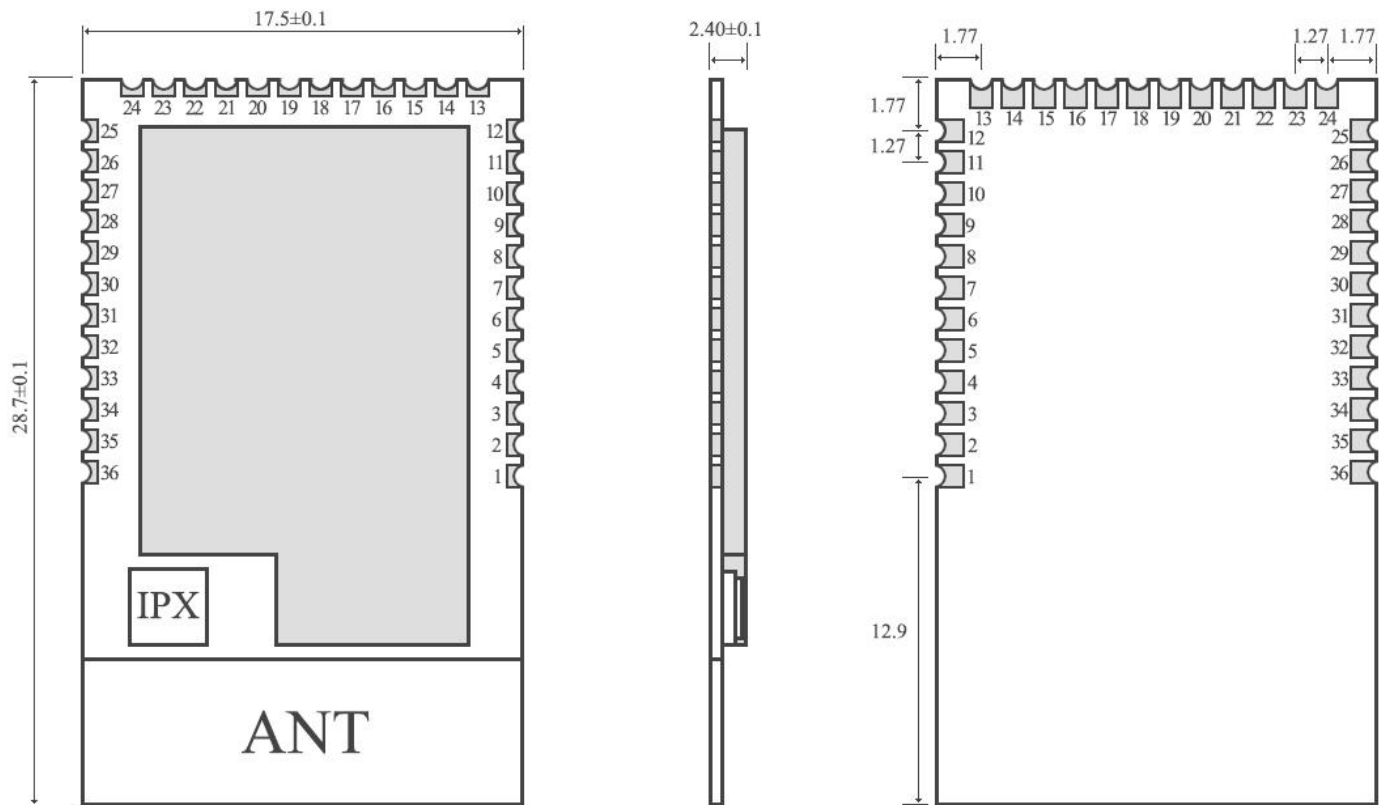
2.1.2. Pin Definition

No.	Pin item	Pin direction	Application
0	GND	Input	Ground electrode, connect to reference ground of power
1	GND	Input	Ground electrode, connect to reference ground of power
2	GND	Input	Ground electrode, connect to reference ground of power
3	DEC2		1.3 V Digital power supply decoupling controller
4	DEC3		Power supply decoupling
5	P0.25	Input/Output	MCU GPIO
6	P0.26	Input/Output	MCU GPIO
7	P0.27	Input/Output	MCU GPIO
8	P0.28	Input/Output	MCU GPIO
9	P0.29	Input/Output	MCU GPIO
10	P0.30	Input/Output	MCU GPIO

11	P0.31	Input/Output	MCU GPIO
12	DEC4		1.3 V Digital power supply decoupling controller Input from DC/DC regulator Output from 1.3 V LDO
13	DCC		DC/DC DC regulator output
14	DEC1		0.9 V Digital power supply decoupling controller
15	GND	Input	MCU GPIO
16	VCC	Input	Power supply 1.8 ~ 3.6V DC (Note: The voltage higher 3.6V is forbidden)
17	P0.02	Input/Output	MCU GPIO
18	P0.03	Input/Output	MCU GPIO
19	P0.04	Input/Output	MCU GPIO
20	P0.05	Input/Output	MCU GPIO
21	P0.06	Input/Output	MCU GPIO
22	P0.07	Input/Output	MCU GPIO
23	P0.08	Input/Output	MCU GPIO
24	P0.09	Input/Output	MCU GPIO
25	P0.10	Input/Output	MCU GPIO
26	P0.11	Input/Output	MCU GPIO
27	P0.12	Input/Output	MCU GPIO
28	P0.13	Input/Output	MCU GPIO
29	P0.14	Input/Output	MCU GPIO
30	P0.15	Input/Output	MCU GPIO
31	P0.16	Input/Output	MCU GPIO
32	P0.17	Input/Output	MCU GPIO
33	P0.18	Input/Output	MCU GPIO
34	P0.19	Input/Output	MCU GPIO
35	P0.20	Input/Output	MCU GPIO
36	P0.21	Input/Output/RST	MCU GPIO
37	SWDCLK	Input	Serial Line Debugging / Clock Input Debugging and Programming
38	SWDIO	Input	Serial line debugging and programming debugging
39	P0.22	Input/Output	MCU GPIO
40	P0.23	Input/Output	MCU GPIO
41	P0.24	Input/Output	MCU GPIO
42	GND	Input	Ground electrode, connect to power reference ground
43	GND	Input	Ground electrode, connect to power reference ground
★ For more details, please refer to 《nRF528XXDatasheet》 in NORDIC ★			

2.2. E73 (2G4M04S1D)

2.2.1. Dimension

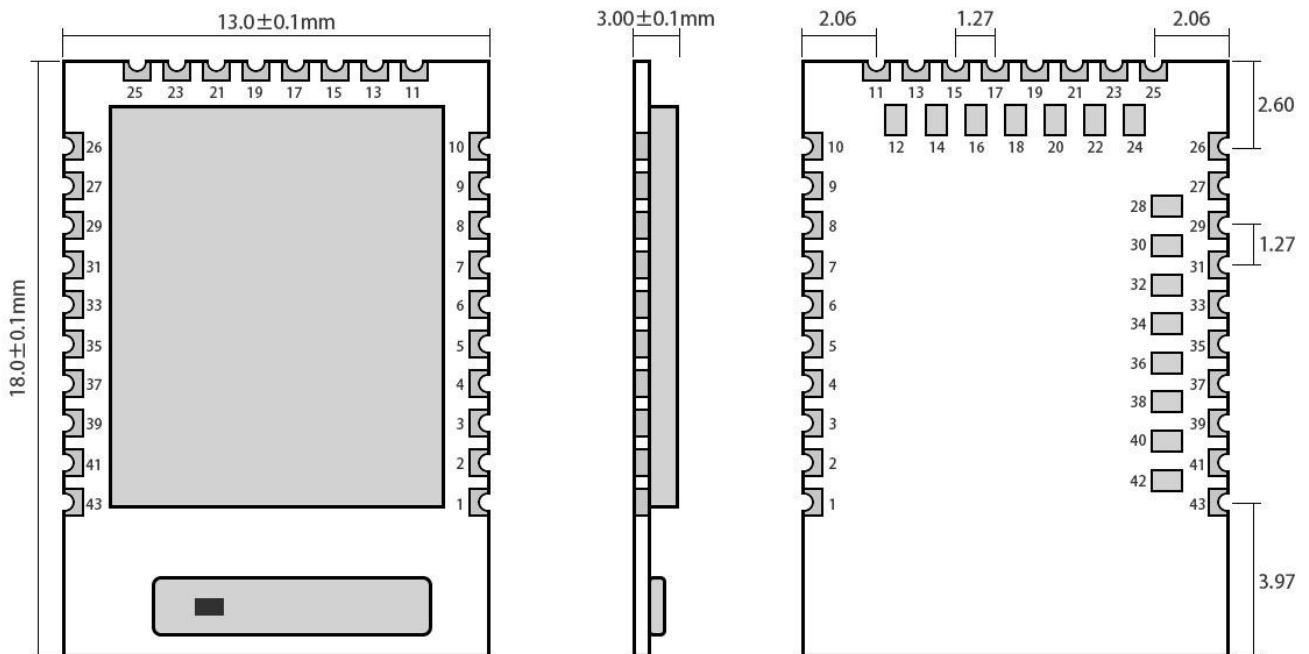


No.	Pin item	Pin direction	Application
1	P0.21	Input/Output	MCU GPIO
2	P0.22	Input/Output	MCU GPIO
3	P0.23	Input/Output	MCU GPIO
4	P0.24	Input/Output	MCU GPIO
5	P0.25	Input/Output	MCU GPIO
6	P0.28	Input/Output	MCU GPIO
7	P0.29	Input/Output	MCU GPIO
8	P0.30	Input/Output	MCU GPIO
9	P0.00	Input/Output	MCU GPIO
10	P0.01	Input/Output	MCU GPIO
11	VCC		Power supply 2.1 ~ 3.6V DC (Note: The voltage higher 3.6V is forbidden)
12	GND		Ground electrode, connect to power reference ground
13	GND		Ground electrode, connect to power reference ground
14	P0.02		0.9 V Digital power supply decoupling controller
15	P0.03	Input/Output	MCU GPIO
16	P0.04	Input/Output	MCU GPIO
17	P0.05	Input/Output	MCU GPIO
18	P0.06	Input/Output	MCU GPIO

19	P0.07	Input/Output	MCU GPIO
20	P0.08	Input/Output	MCU GPIO
21	P0.09	Input/Output	MCU GPIO
22	P0.10	Input/Output	MCU GPIO
23	P0.11	Input/Output	MCU GPIO
24	GND	Input/Output	MCU GPIO
25	GND	Input/Output	MCU GPIO
26	P0.12	Input/Output	MCU GPIO
27	P0.13	Input/Output	MCU GPIO
28	P0.14	Input/Output	MCU GPIO
29	P0.15	Input/Output	MCU GPIO
30	P0.16	Input/Output	MCU GPIO
31	SWDIO/ nRESET	Input	Serial line debugging and programming debugging / MCU reset, low level enable
32	SWDCLK	Input	Serial Line Debugging / Clock Input Debugging and Programming
33	P0.17	Input/Output	MCU GPIO
34	P0.18	Input/Output	MCU GPIO
35	P0.19	Input/Output	MCU GPIO
36	P0.20	Input/Output	MCU GPIO
★ For more details, please refer to 《nRF51822Datasheet》 in NORDIC ★			

2.3. E73(2G4M08S1C)

2.3.1 dimension




2.3.2 Pin definition

No.	Pin item	Pin direction	Application	No.
1	P1.11	-	Common I/O	-
2	P1.10	-	Common I/O	Low frequency I/O, standard drive
3	P0.03	P0.03/AIN1	Common I/O	Analog input 1, low frequency I/O, standard drive
4	AI4	P0.28/AIN4	Common I/O	Analog input 4
5	GND	-	-	Single ground line, connect to the power reference ground
6	P1.13	-	Common I/O	Low frequency I/O, standard drive
7	AI0	P0.02/AIN0	Common I/O	Analog input 0, low frequency I/O, standard drive
8	AI5	P0.29/AIN5	Common I/O	Analog input 5, low frequency I/O, standard drive
9	AI7	P0.31/AIN7	Common I/O	Analog input 7, low frequency I/O, standard drive
10	AI6	P0.30/AIN6	Common I/O	Analog input 6, low frequency I/O, standard drive
11	XL1	P0.00/XL1	Common I/O	Connect to 32.768 kHz crystal
12	P0.26	-	Common I/O	-
13	XL2	P0.01/XL2	Common I/O	Connect to 32.768 kHz crystal
14	P0.06	-	Common I/O	-
15	AI3	P0.05/AIN3	Common I/O	Analog input 3
16	P0.08	-	Common I/O	-
17	P1.09	-	Common I/O	-
18	AI2	P0.04/AIN2	Common I/O	Analog input 2
19	VDD	-	-	Power supply
20	P12	P0.12	Common I/O	-
21	GND	-	-	ground line, connect to the power reference ground
22	P0.07	-	Common I/O	-
23	VDH	VDDH	-	High-voltage power supply
24	GND	-	-	ground line, connect to the power reference ground
25	DCH	DCCH	-	DC/DC Converter output
26	RST	P0.18/RESET	Common I/O	QSPI/CSN/ external reset
27	VBS	VBUS	-	USB power supply, 5V input, used to USB3.3V voltage regulator
28	P15	P0.15	Common I/O	-
29	D-	-	-	USB D-
30	P17	P0.17	Common I/O	-
31	D+	-	-	USB D+
32	P0.20	-	Common I/O	-
33	P0.13	-	Common I/O	-
34	P0.22	-	Common I/O	QSPI
35	P0.24	-	Common I/O	QSPI
36	P1.00	-	Common I/O	-
37	SWD	SWDIO	-	Serial debug programming port data
38	P1.02	-	Common I/O	-
39	SWC	SWDCLK	-	Serial debug programming port clock
40	P1.04	-	Common I/O	Low frequency I/O, standard drive
41	NF1	P0.09/NFC1	Common I/O	NFC input
42	P1.06	-	Common I/O	Low frequency I/O, standard drive
43	NF2	P0.10/NFC2	Common I/O	NFC input

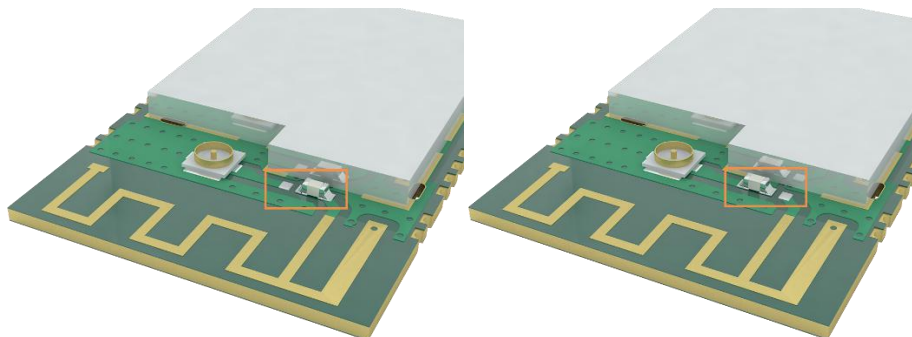
★ For more details, please refer to 《nRF52840Datasheet》 in NORDIC ★

3. Development and Application

No.	Item	Notes
1	Burn Firmware	<p>1.The module is embedded with ARM MCU. For program downloading, please use the J-LINK downloader. Any other serial port or JTAG、ISP、ICP are unavailable to download.</p> <p>2.There are two ways to download the program. The protocol stack of NORDIC is not programmed yet, so users need to use the official nRFgo studio of NORDIC to program the protocol stack first, then program the hex of application code. Or, to program the protocol stack of NORDIC first and download via the IAR or KEIL. Website of tool download: http://www.nordicsemi.com/eng/Products/Bluetooth-low-energy/nRF52832/(language)/eng-GB</p> 
2	Testing Board	Testing board is not available.

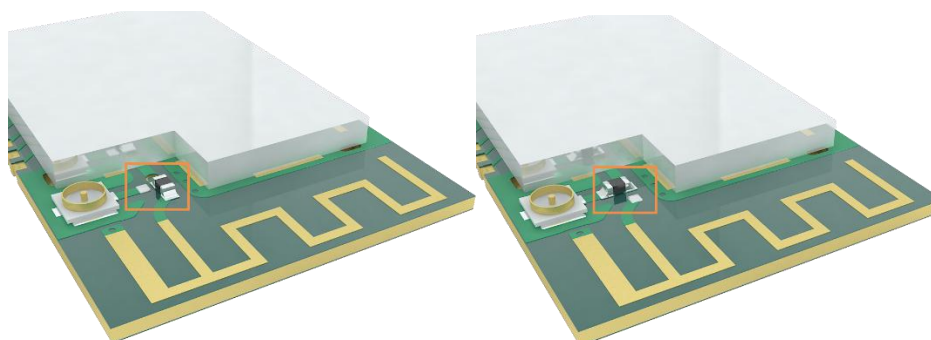
4. Antenna Type

4.1. E73 (2G4M04S1A)/E73 (2G4M04S1B)



The default 0R resistance welding as shown above(left), antenna type is PCB. If users need to change it to IPEX, pls make the 0R resistance as show above(right)

4.2. E73 (2G4M04S1D)



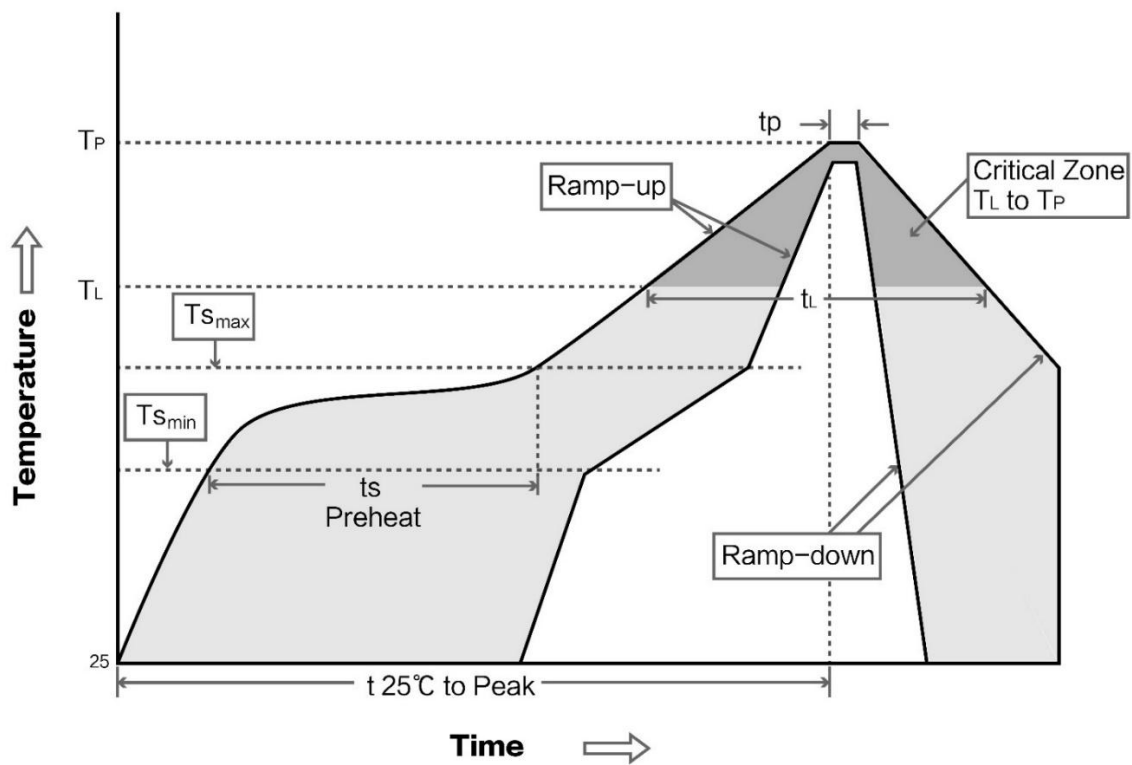
The default 0R resistance welding as shown above(left), antenna type is PCB. If users need to change it to IPEX, pls make the 0R resistance as show above(right)

5. Production Guidance

5.1. Reflow Soldering Temperature

Profile Feature	Curve feature	Sn-Pb Assembly	Pb-Free Assembly
Solder Paste	Solder paste	Sn63/Pb37	Sn96.5/Ag3/Cu0.5
Preheat Temperature min (T _{smin})	Minimum preheating temperature	100°C	150°C
Preheat temperature max (T _{smax})	Maximum preheating temperature	150°C	200°C
Preheat Time (T _{smin} to T _{smax})(t _s)	Preheating time	60-120 sec	60-120 sec
Average ramp-up rate(T _{smax} to T _p)	Average rising rate	3°C/second max	3°C/second max
Liquidous Temperature (TL)	Liquid phase temperature	183°C	217°C
Time (t _L) Maintained Above (TL)	Time above liquidus	60-90 sec	30-90 sec
Peak temperature (T _p)	Peak temperature	220-235°C	230-250°C
Average ramp-down rate (T _p to T _{smax})	Average descent rate	6°C/second max	6°C/second max
Time 25°C to peak temperature	Time of 25 ° C to peak temperature	6 minutes max	8 minutes max

5.2. Reflow Soldering Curve



6. FAQ

6.1. Communication range is too short

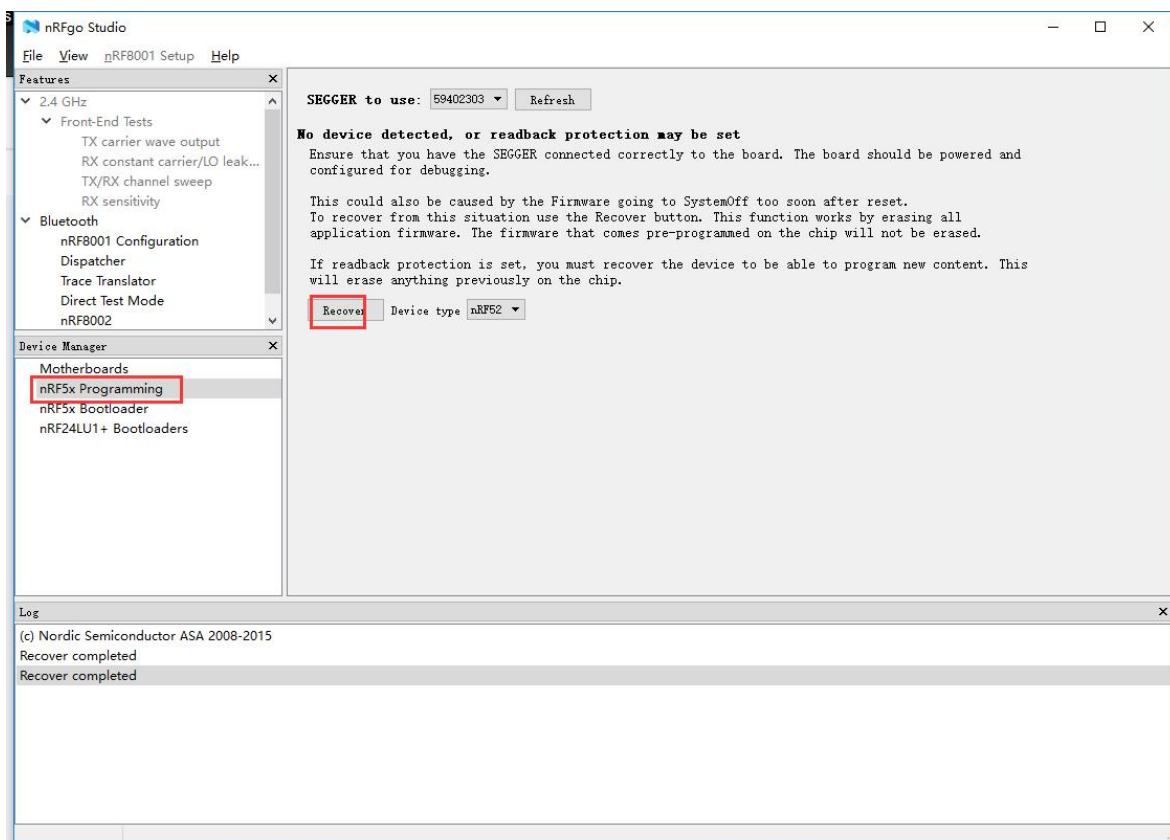
- The communication distance will be affected when obstacle exists.
- Data lose rate will be affected by temperature, humidity and co-channel interference.
- The ground will absorb and reflect wireless radio wave, so the performance will be poor when testing near ground.
- Sea water has great ability in absorbing wireless radio wave, so performance will be poor when testing near the sea.
- The signal will be affected when the antenna is near metal object or put in a metal case.
- Power register was set incorrectly, air data rate is set as too high (the higher the air data rate, the shorter the distance).
- When the power supply at room temperature is lower than the recommended low voltage, the lower the voltage is, the lower the transmitting power is.
- Due to antenna quality or poor matching between antenna and module.

6.2. Module is easy to damage

- Please check the power supply and ensure it is within the recommended range. Voltage higher than the peak will lead to a permanent damage to the module.
- Please check the stability of power supply and ensure the voltage not to fluctuate too much.
- Please make sure anti-static measures are taken when installing and using, high frequency devices have electrostatic susceptibility.
- Please ensure the humidity is within limited range for some parts are sensitive to humidity.
- Please avoid using modules under too high or too low temperature.

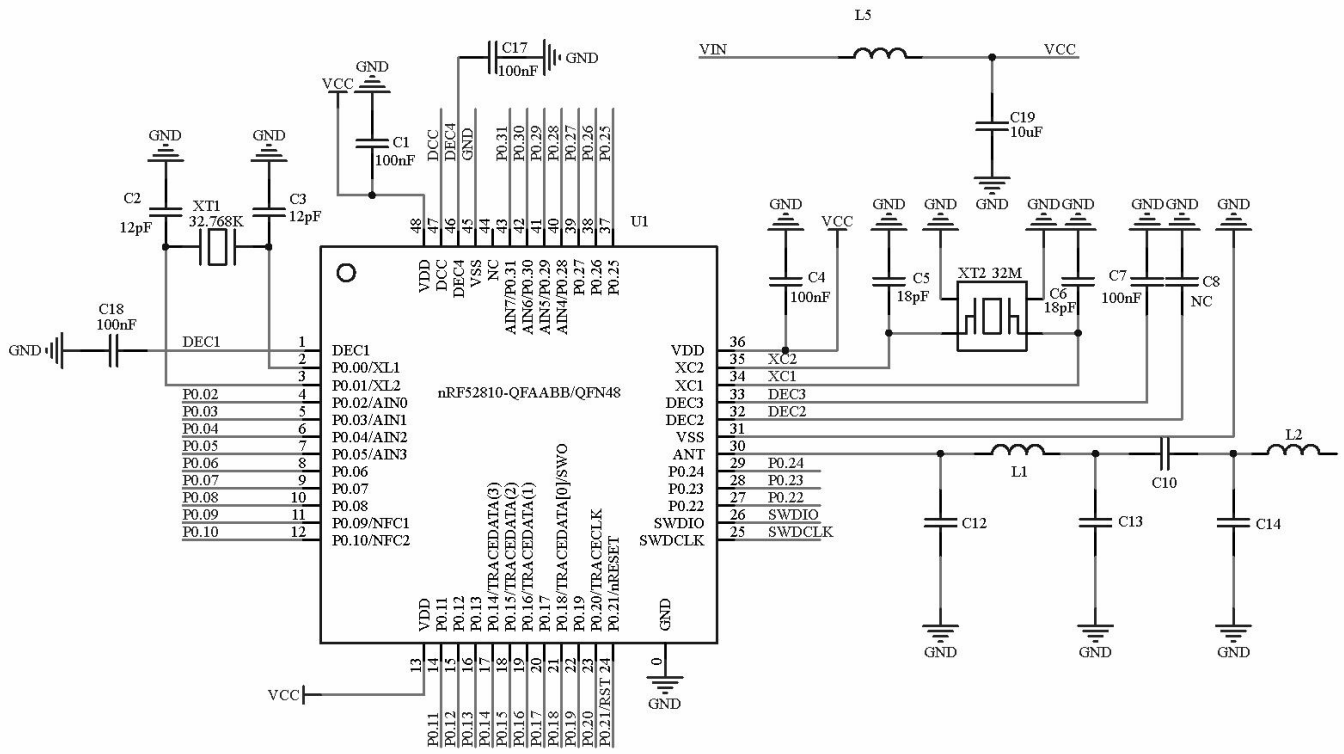
6.3. Burn firmware

- Because of the bad compatibility of nRFgo Studio, We'd like to recommend users to choose J-LINK-V8 or above version for programming.
- About the issue that the old module can be programmed while the new one cannot, it's because we added the read-write protection in the production of new module. Users need to connect it correctly and then use the official nRFgo Studio to recover (Jlink supports official nRFgo Studio), as below:

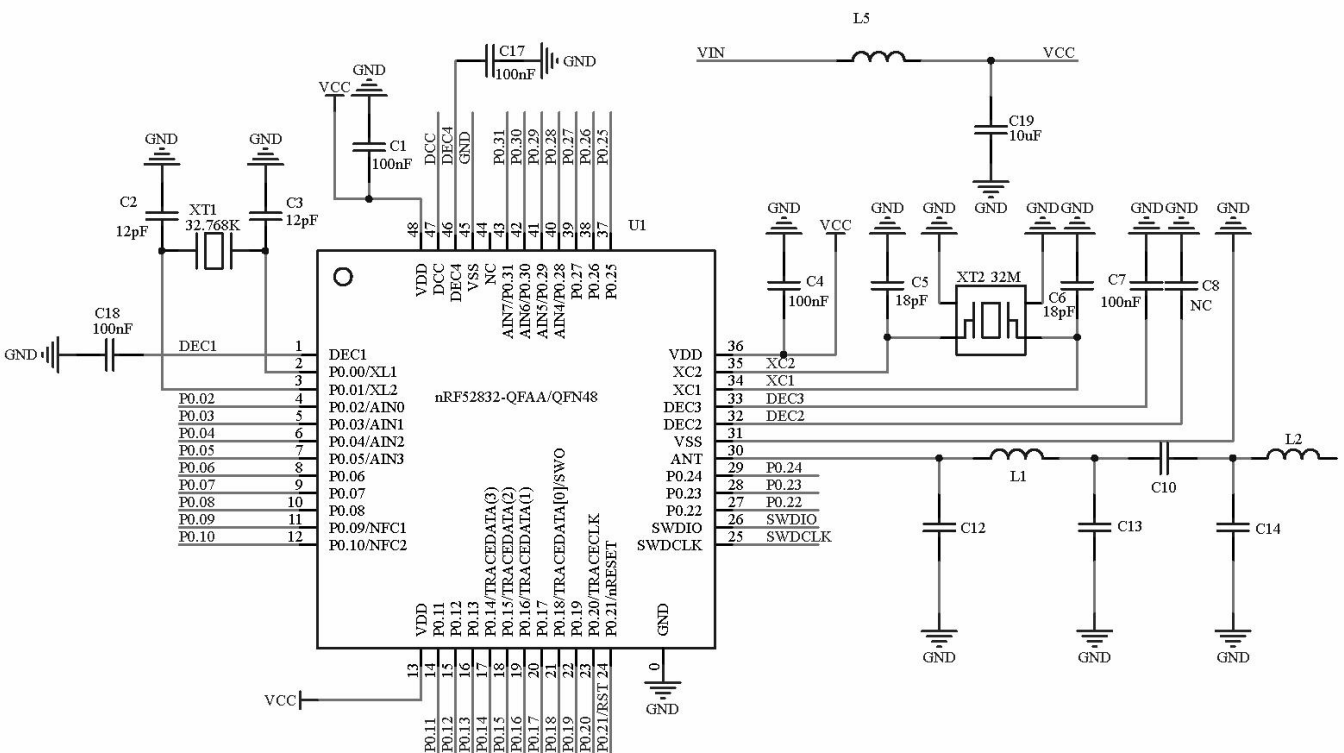


7. Schematic Diagram

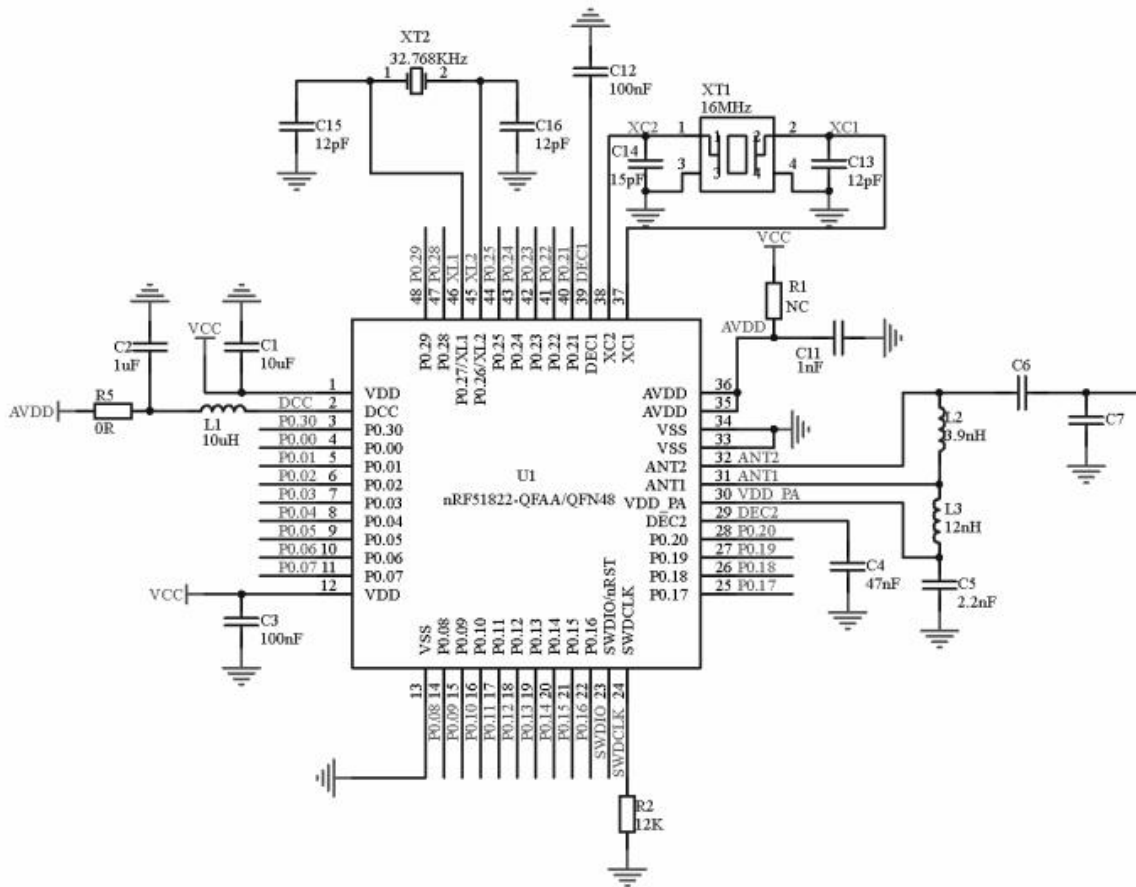
7.1. E73 (2G4M04S1A)



7.2. E73 (2G4M04S1B)



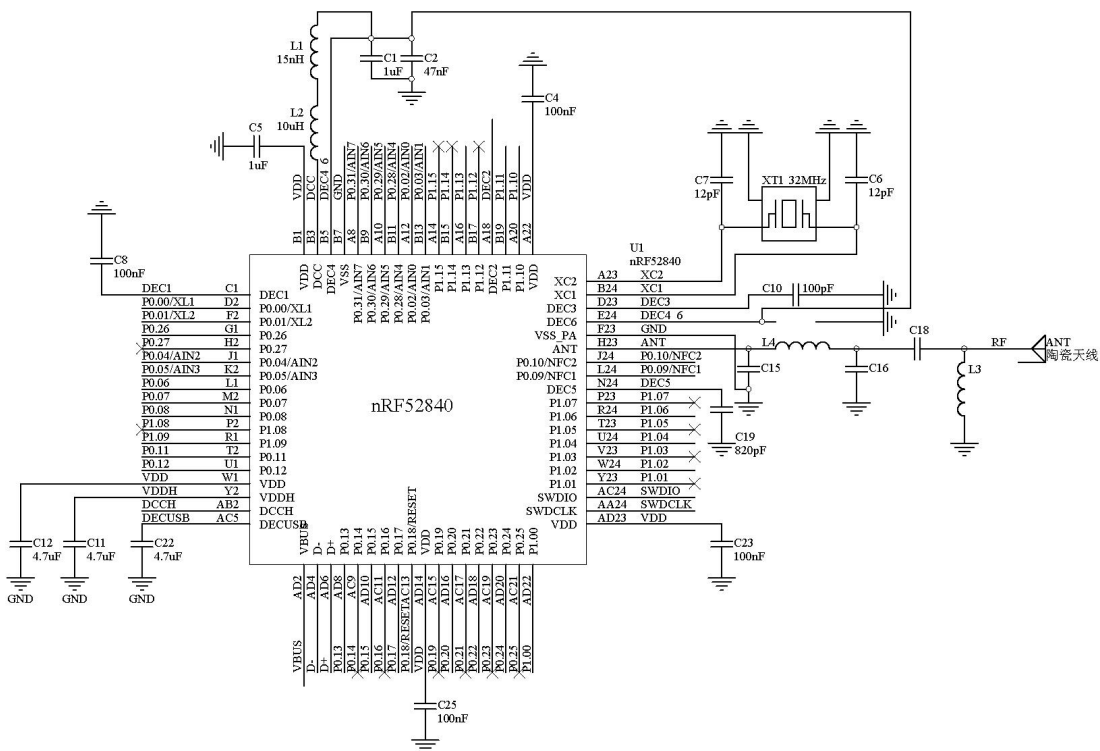
7.3. E73 (2G4M04S1D)



E73(2G4M04S1D)

Note: DC/DC as the default. Mass customization available for LDO mode.

7.4. E73 (2G4M08S1C)



Note: DC/DC as the default. Mass customization available for LDO mode.. Power supply is 17-5.5V.

Modules led out VDD, VDDH, DCCH pin, Please refer to the official manual for power supply.

Power supply mode:

normal voltage mode: 1.7-3.6V. VDD=VDDH= Power supply, DCCH is floating, see more details in official manual.

high voltage mode: 2.5-5.5V. DCCH=VDD (DCCH and VDD are connected via **10uH ±20%/ 80mA** inductance) , VDDH= Power supply, see more details in official manual.

8. Important Notes

- All rights to interpret and modify this manual belong to Ebyte.
- This manual will be updated based on the upgrade of firmware and hardware, please refer to the latest version.
- Please refer to our website for new product information.

9. About Us

Technical support: support@cdebyte.com

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