



nRF51822 Wireless module

E77-2G4M04S

User Manual



This manual may change with the continuous improvement of the product. Please refer to the latest version of the instruction.

Chengdu Ebyte Electronic Technology Co., Ltd. reserves all rights of final interpretation and modification of this manual.

Introduction

E77-2G4M04S is a small Bluetooth module developed by Cdebyte that features ultra low power consumption. With dual antenna : PCB and IPX antenna of high performance. Based on originally imported IC nRF51822 from NORDIC , the module supports BLE 4.2 protocol. The IC is with ARM CORTEX M0 core ,and owns abundant peripheral resources such as UART, I2C, SPI, ADC, WDT, RTC, etc. All IOs of nRF51822 are led out for users' convenient development.

E77-2G4M04S is a hardware platform, not programmed , which requires users' secondary development. Please see more about nRF51822 on NORDIC official website. The module is with built-in 32.768KHz real-time clock crystal oscillator and 16MHz crystal oscillator, which can be programmed by users.

Contents

Introduction.....	1
Contents.....	1
1. Core Advantages.....	2
2. E77 Series.....	2
3. Technical Parameters.....	2
3.1 Parameter Description.....	3
4. Notes.....	3
5. Pin Definition.....	4
6. Development.....	5
7. Antenna Selection.....	6
8. Production Guidance.....	6
8.1 Reflow Temperature.....	6
8.2 Reflow Graph.....	6
9. FAQ.....	7
9.1 The communication distance is too close.....	7
9.2 The module can be damaged easily.....	7
10. Important Statement.....	7
11. About Us.....	7

1. Core Advantages

No.	Advantages	Note
1	ARM	Based on Cortex-M0, the chip is integrated with 32 bit processor.
2	CLOCK Crystals	With built-in 32.768KHz real-time Crystal Oscillator, can be used via programming.
3	Harmonic stray	The RF hardware design features small harmonic stray, which is qualified for various certification.
4	GPIO	All IO port are led out for secondary development.
5	Dual antenna	Users can choose PCB antenna or IPEX interface for external antenna.

2. E77 Series

Model	IC	Frequency Hz	TX power dBm	Distance km	Packaging	Antenna
E77-2G4M04S	nRF51822	2.4G	4	0.1 / 0.5	SMD	PCB/IPX
Other models of E77 series are coming soon.						

3. Technical Parameters

Model	IC	Size	Net WT	Operating temp.	Operating humidity	Storage temp.
E77-2G4M04S	nRF51822	17.5*28.7 mm	1.8 ± 0.1g	-40 ~ 85°C	10% ~ 90%	-40 ~ 125°C

Parameter	Min	Typ	Max	Unit
Transmitting current	13.0	14.0	15.4	mA
Receiving current	11.3	12.6	13.8	mA
Shutdown 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
Supply voltage	2.1	3.3	3.6	V
Communication level	2.1	3.3	3.6	V

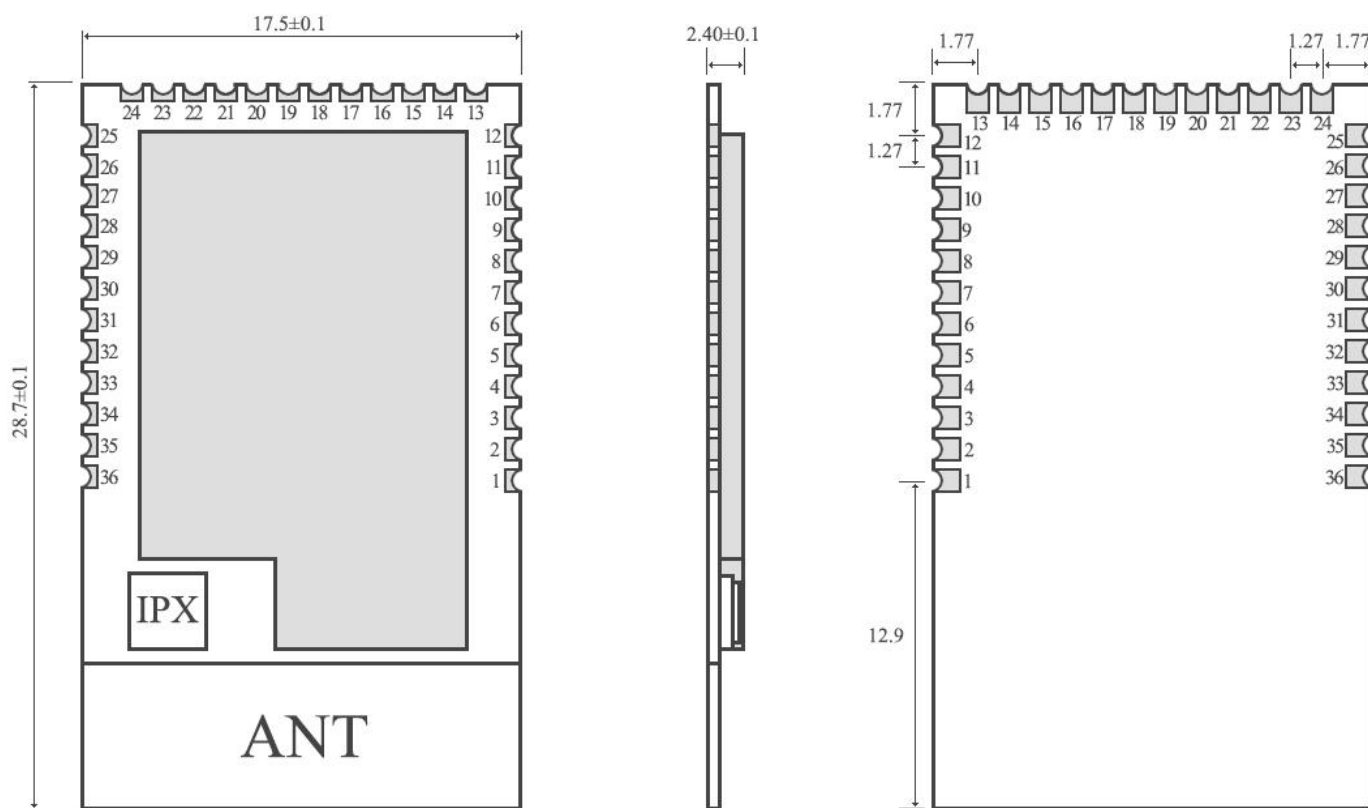
3.1 Parameter Description

- For designing the supply circuit for the modules, it' s recommended to keep at least 30% margin, which would be better for long term and stable work.
- The required current should be large enough when transmitting, but because the transmission time is short so the total consumption might be less.
- When external antenna is used, the difference of Impedance matching will affect the transmitting current.
- When module is on pure receiving status, the consumed current is called receiving current. If modules programmed the communication protocol already, the testing receiving current will be large.
- The pure receiving current usually is mA level. For μ A level, developer can conduct it via software.
- Shutdown current means the current that the CPU, RAM, clock and part register reservation consumed when the module is on ultra low power consumption state.
- Shutdown current usually is lower than the consumed current of module in empty load status.
- For the material itself has some error, so each LRS component contains $\pm 0.1\%$ error. Considering there' s multiple LRC components in the whole RF circuit, also there' s error accumulation, thus different modules can be different in transmitting current and receiving current.
- Lowering the transmitting power can reduce the power consumption in some way, but in some cases, it also decreases the efficiency of internal PA.

4. Notes

No.	Item	Notes
1	Static electricity	High frequency analog device features electrostatic sensitivity. Please avoid to contact with the electrical components.
2	Welding	Electric iron need to be grounded well. For mass production, producer need to wear the wired electrostatic Bracelet, which is grounded already.
3	Power supply	The quality of power supply has big impact on modules' performance. Please ensure the power supply has few ripple and avoid the power supply jitter frequently. π type filter is recommended. Ceramic capacitor/tantalum capacitors+inductance.
4	Ground electrode	It adopts single point grounding. It' s recommend to use 0Ω resistance or 10mH inductance, which is separated from other circuit reference ground.
5	Antenna	The installation structure of antenna can affect the modules' performance largely. So please ensure the antenna exposed and vertical upward. When modules is installed in the inside of the shell, users can adopt the high-quality antenna extension line to extend the antenna to the outside of shell. The antenna cannot be installed in the inside of metal shell, which causes transmission distance weakened greatly.
6	Interference	If there' s any other frequency module working, users need to plan the frequency rationally, adopt screen measures to decrease the impact of harmonic interference and intermodulation interference.
7	Crystal oscillator	If there' s crystal oscillator near the circuit board, please enlarge the straight distance between modules and crystal oscillator.


5. Pin Definition



Pin No.	Name	Direction	Usage
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 : voltage higher than 3.6V might cause permanent damage to module)
12	GND		Ground electrode, connected to the power reference ground.
13	GND		Ground electrode, connected to the power reference ground.
14	P0.02		0.9 V digital power decoupling regulator(See more in IC datasheet)
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	UART debugging and programming debugging/ MCU reset, low level enabled
32	SWDCLK	Input	Debugging and programming for UART CLOCK INPUT
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
★ please see more pin definition, software drive and communication protocol on NORDIC <i>nRF51822Datasheet</i> ★			

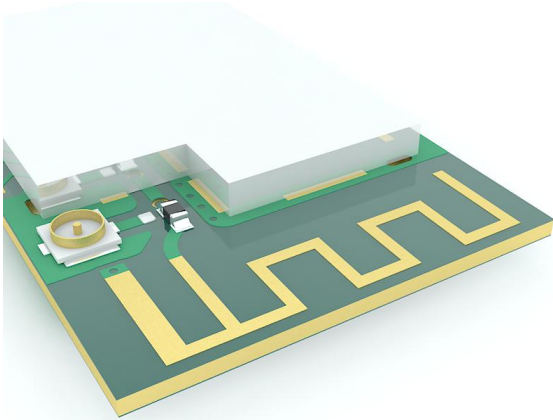
6. Development

No.	Keyword	Notes
1	Burning program	<p>1. With built-in RAM MCU, users can use J-LINK downloader to download program. UART or any other tools such as JTAG, ISP and ICP can not be used.</p> <p>2. There are two steps to burn program, for the protocol stack provided by NORDIC is not loaded in the program when in secondary development official tool nRFgo studio is needed to burn protocol stack, and next step is to burn hex of application code via nRFgo studio; Users can also use nRFgo studio to burn protocol stack first and next download via IAR or KEIL.</p> 
2	Mode	Module is in DC/DC mode by default (LDO or other mode can be customized)
3	Test board	Not available now.

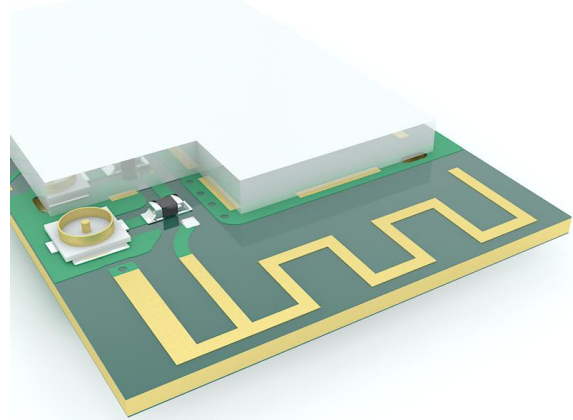
7. Antenna Selection

The default 0R resistance showed as below(left), it is PCB antenna..

If users need the IPEX as antenna interface, just change the 0R resistance as below(right).



Choose PCB Antenna



Choose IPEX Antenna

8. Production Guidance

8.1 Reflow Temperature

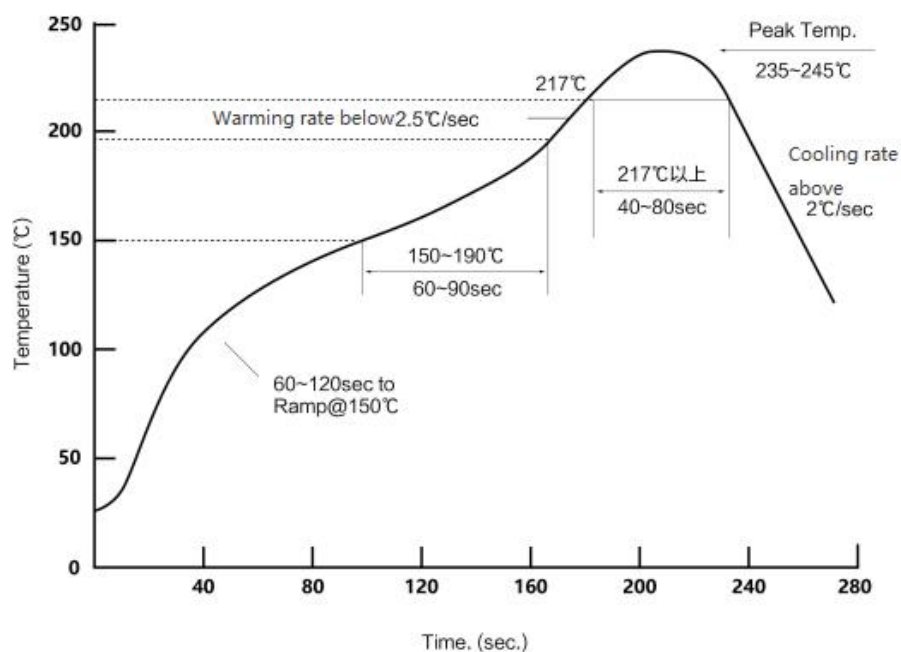
Preheating zone : Maximum temperature rise is 2.5°C/s ;

Insulation zone : temperature: 150~190°C , time: 60~90s , Maximum temperature rise is 2.5°C/s ;

Recirculation zone : Maximum temperature is 235~245°C , Above 217°C, the time will be 40~80s ;

Cooling zone : Maximum cooling is 4°C/s.

8.2 Reflow Graph



9. FAQ

9.1 The communication distance is too close

- When there' s straight Communication barrier, the communication distance will be reduced accordingly.
- Temperature, humidity and same frequency interference will increase the rate of communication packet loss.
- Ground absorption, reflected radio waves, and closing to ground will lead to poor test result.
- Sea water has a strong ability to absorb radio waves, so test near the sea is not recommended .
- If antennas surrounded by metal items or placed in metal shell, the signal will be weakened badly.
- Power register is set wrongly or air data rate too high.(The higher the air data rate, the closer the distance.
- In room temperature, the power voltage will be less than 2.5V. The lower the the power voltage, the smaller the power.
- The antenna is unmatched to the module or the quality of antenna.

9.2 The module can be damaged easily

- Please check the power supply, which should be 1.8v-3.8v. If the value exceeds that, the module will be damaged.
- Please check the stability of power supply. The voltage cannot be in fluctuations frequently.
- Please ensure all the installation operations are anti-static.
- Please ensure the humidity in the procedure of installation and operation should not be too high because some electrical parts are humidity sensitive device.
- Please do not use it in a too high or too low temperature environment if there' s no special requirement.

10. Important Statement

- Ebyte reserves the rights of final interpretation and revision for all the involved contents in this manual.
- With the continuous improvement of hardware and software, this manual may subject to change without notice. Please refer to the latest version.
- Users can follow the product news on our official website so as to gain the latest information.

11. About Us

Technical support: support@cdebyte.com

Documents and RF Setting download link: www.cdebyte.com/en/



Tel : +86-28-61399028

Fax : 028-64146160

Web : www.cdebyte.com/en/

Address : Innovation Center D347, 4# XI-XIN Road, Chengdu, Sichuan, China