BLE010V2
(Based on CSR1010)

Bluetooth Modules

User's Manual

V2.3

TABLE OF CONTENTS

# 1 Introduction and Block Diagram

1.1 General Introduction

BLE010V2(CSR1010) is a Bluetooth 4.0 BLE modules which is a high performance, cost effective, low power. The Bluetooth Low Energy module provides a complete 2.4GHz Bluetooth system based on CSR1010 chip which is a single chip data transfer and baseband IC for Bluetooth 2.4GHz systems. This module is fully compliant to Bluetooth v4.0 BLE

1.2 Block Diagram
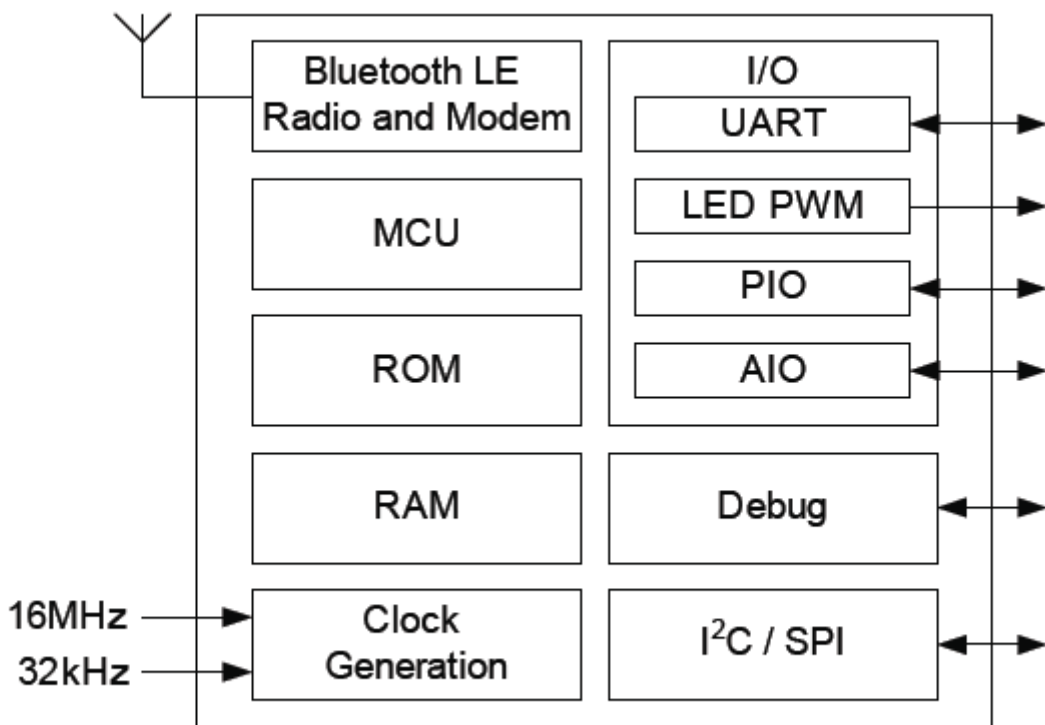
2 Main Features and Application
2.1 Key Feature

- Fully Qualified Bluetooth v4.1 System.
- 128KB memory, 64K RAM and 64K ROM
- 7.5dBm Bluetooth low energy max TX output power
- -92.5dBm Bluetooth low energy RX sensitivity
- Support for Bluetooth V4.1 specification host stack including ATT,GATT,SMP,L2CAP,GAP
- RSSI monitoring for proximity applications
- <600nA current consumption in dormant mode
- RoHS Compliant

2.2 Application

- Building an ecosystem using Bluetooth low energy
- Human Interface Devices(HID): keyboards, mice,touchpads,romote controls
- Sports and fitness sensors:heart rate, runner speed and cadence, cycle speed and cadence
- Health sensors: blood pressure, thermometer and glucose meters
- Mobile accessories: watches, proximity tags, alert tags and camera controls
- Smart home: heating control and lighting control
- Mesh application for Smart Home

3 Technical Specifications
3.1 General Specification

Number	Items	Description
1	Bluetooth Standard	Bluetooth v4.1 Standard
2	Chipset	CSR CSR1010
3	Dimension	19.5mm x 15mm x 2.0mm
4	Voltage	1.8V~4.4V
5	Temperature	-20～+70
6	Storage Temperature	-40～+85
7	Frequency Range	2402～2480MHz
8	Maximum RF Transmit Power	7.5dBm
9	Receive Sensitivity	-92.5dBm

3.2 Electrical Characteristics

3.21 Absolute Maximum Rating

Rating	Minimum	Maximum
Storage temperature	-40℃	+85℃
Supply Voltage:3V	1.8V	4.4V

3.22 Recommended Operating Conditions

Operating Condition	Minimum	Maximum
Operating temperature range	-20℃	+70℃
Supply voltage: VDD_BAT	+1.8V	+4.2V

3.23 Power Consumption

State	Description	Average Current	Remarks
Fast Advertisements	1. Switch on the Device 2. Wait for 5 s	380uA	Advertising Interval: 60 ms ▪ Measurement Time Duration: 20 s
Slow Advertisements	1. Switch on the device 2. Wait for 40 s	25uA	▪ Advertising Interval: 1.28 s ▪ Measurement Time Duration: 20 s
Connected Idle (Close UART)	1. Connect to the Host application 2. Wait for 60 s	14 µA	▪ Connection parameters: 500ms ▪ Measurement Time Duration: 60 s
Connected Active (Close UART)	1. Connect to the Host application 2. Wait for 60 s 3.APP transfer data to BT	26 µA	▪ Connection parameters: 500ms ▪ Measurement Time Duration: 60 s
disconnected	1.Disconnected the device 2. Wait for 90s	600nA	
Connected Idle (Open UART)	1. Connect to the Host application 2. Wait for 60 s	24uA	▪ Connection parameters: 500ms ▪ Measurement Time Duration: 60 s
Connected active APP→BT→MCU	1. Connect to the Host application 2. Wait for 60 s 3: APP transfer data to MCU	30uA	▪ Connection parameters: 500ms ▪ Measurement Time Duration: 60 s
Connected active MCU→BT→APP	1. Connect to the Host application 2. Wait for 60 s 3: MCU transfer data to APP	700~~900uA	▪ Connection parameters: 500ms ▪ Measurement Time Duration: 60 s
Connected active Two-way transfer	1. Connect to the Host application 2. Wait for 60 s 3: APP and MCU transfer data at the same time	1mA	▪ Connection parameters: 500ms ▪ Measurement Time Duration: 60 s

3.24 Connected distance

State	Distance	Connected time	Remarks
Fast Advertisements	<20meters	1S	
	>20meters	1~2S	
Slow Advertisements	<20meters	1~2S	
	>20meters	2~6S	
Connected state	<= 50meters		

4 Mechanical Dimensions and Electrical feature
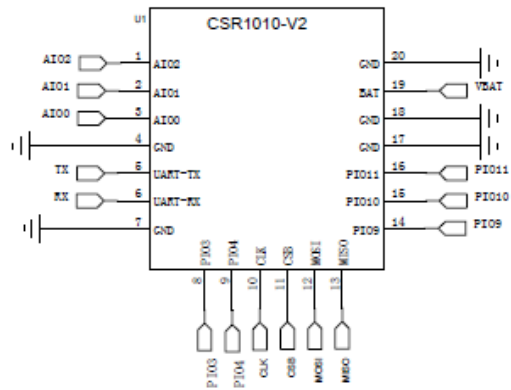## 4.1 BLE010V2(CSR1010) module outline:(mm)
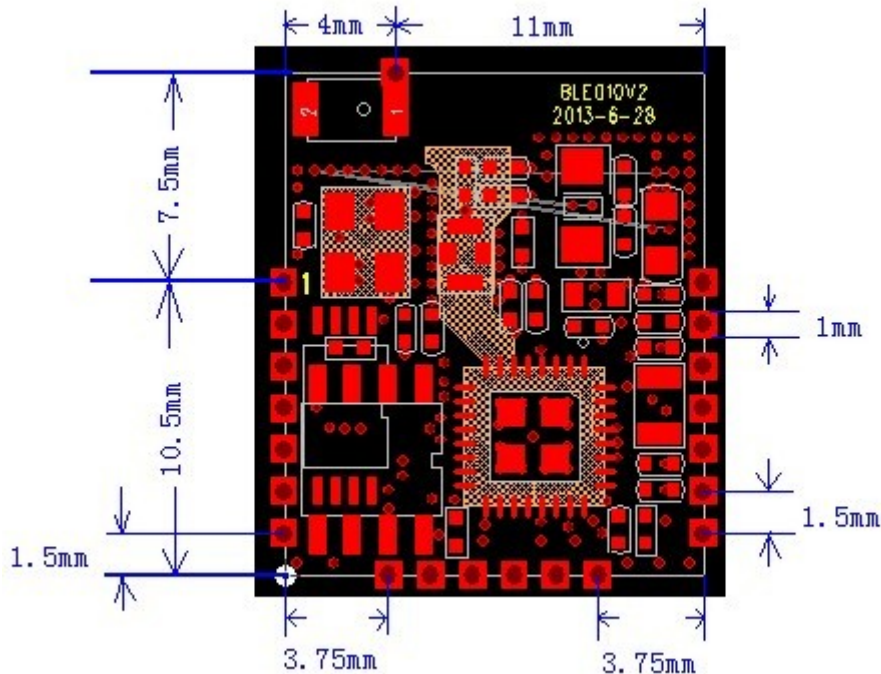
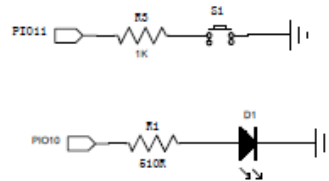## 4.2 Package dimensions

MDIF_BLE010V2
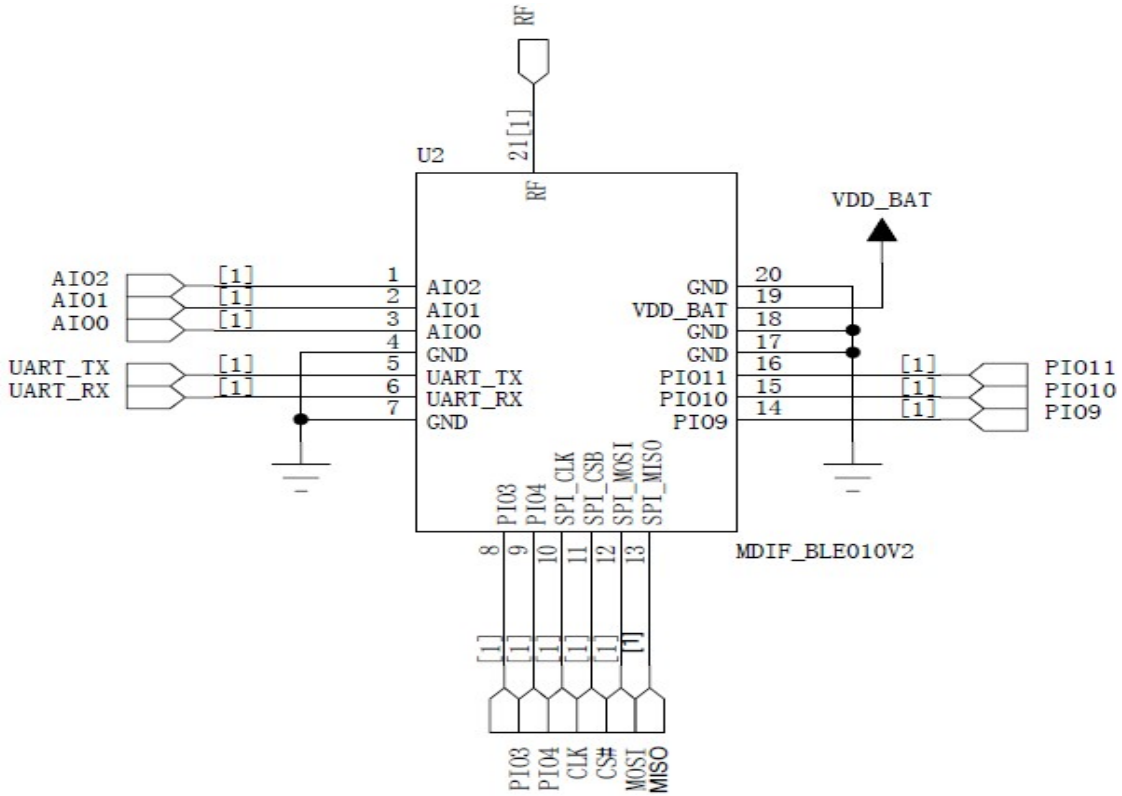
4.3 Pin Assignment

Pin No.	Name	Functions	Description
1	AIO0	Bidirectional analogue	Analogue programmable I/O line.
2	AIO1		
3	AIO2		
4	GND	VSS	Ground
5	UART_TX	Bidirectional with programmable strength internal pullup/down	UART TX
6	UART_RX		UART RX
7	GND	VSS	Ground
8	PIO3	Bidirectional	Programmable input / output line
9	PIO4	Bidirectional	Programmable input / output line
10	SPI_CLK	Bidirectional with programmable strength internal pullup/down	debug SPI CLK selected by SPI_PIO#. t
11	SPI_CS		debug SPI chip select (CS#) selected by SPI_PIO#.
12	SPI_MOSI		debug SPI MOSI selected by SPI_PIO#.
13	SPI_MISO		debug SPI MISO selected by SPI_PIO#.
14	PIO9	Bidirectional	Programmable input / output line
15	PIO10	Bidirectional	Programmable input / output line
16	PIO11	Bidirectional	Programmable input / output line
17	GND	VSS	Ground
18	GND	VSS	Ground
19	VDD_BAT	Power supply	Battery input and regulator enable (active high).
20	GND	VSS	Ground

5 Reference Design

蓝牙模块脚位图

U1 CSR1010-V2

Pin	Signal		Pin	Signal
1	AIO2		20	GND
2	AIO1		19	BAT (VBAT)
3	AIO0		18	GND
4	GND		17	GND
5	UART-TX (TX)		16	PIO11
6	UART-RX (RX)		15	PIO10
7	GND		14	PIO9

Pins 8–13: PIO3, PIO4, CLK, CSB, MOSI, MISO

按键和LED

PIO11 — R5 1K — S1

PIO10 — R1 510K — D1

SPI接口

MISO, CLK, MOSI, CSB, GND

R5 10K

注意：CSB要接地

UART接口

UART-TX — R4 0R — TX
UART-RX — R6 0R — RX
GND

电源，工作电压1.8-3.6V

BAT — VBAT
C1 104
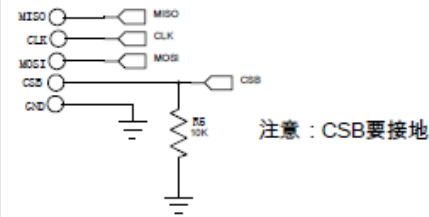
蜂鸣器驱动电路
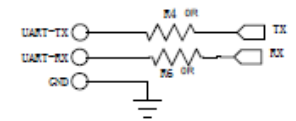
VBAT
C5 104
PIO9 — R2 1K — Q1 8050
IRF740028
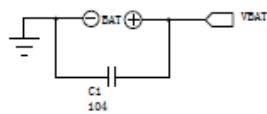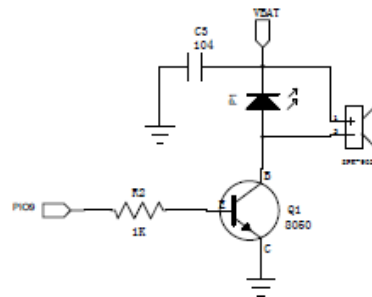
引脚介绍：

AIO:3个模拟信号输入输出口
　- 测量温度、湿度、流量、速度、液位、压力等多种模拟量，用来接外部传感器。
GPIO: 共有5个GPIO，用来控制LED，蜂鸣器
UART:数据透传的核心
　-主要和客户讨论波特率和传输数据字节（10Byte）
VBAT:供电范围 1.8-3.6V

6 NOTICE-----MOST IMPORTANCE!

This chapter contains important information for the safe and reliable use of the BLE010V2 module. Please read this chapter carefully before starting to use the BLE010V2 Module.

6.1 General information

Bluetooth technology, is in fact a kind of short distance wireless communication technology, can effectively simplify the palmtop computer, notebook computer and mobile phone, Mobile Phone and other mobile communication between communication terminal equipment, but also can successfully simplify the equipment and communication between the Internet, so that these modern communications equipment and Internet data transmission between rapidly became more efficient, to widen the road for wireless communication.

6.2 Electrostatic Discharge (ESD)

The following Electrostatic Discharge (ESD) precautions are recommended:
· Protective outer garments.
· Handle device in ESD safeguarded work area.
· Transport device in ESD shielded containers.
· Monitor and test all ESD protection equipment.n

6.3 Antenna Design

注意：

7.4mm   22.0mm
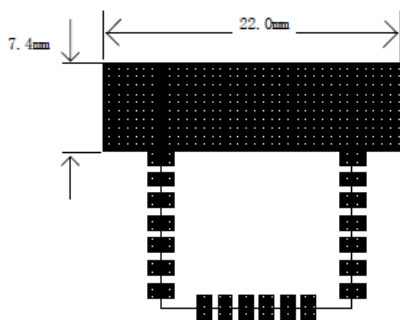
如图中标注所示的位置区域为此模块天线需避空的区域，
不能有影响天线信号的东西，如：电池，屏蔽罩等金属。
还有就是在贴模块的主PCB上此区域不能覆铜，尤其是模块的左边
区域要尽可能的避空，因为天线接收和发射信号端的方向是靠左的。
设计时最好将模块的天线部分靠近主PCB板的边缘处，
这样就可以尽可能的减小对天线信号的影响以免致产品距离太近。

7 AT Command Set

If BLE010V2 module has the AT command settings:

		BLE010　AT Command		
Command Format	Power Down Prote-ction	Specification	Returned Value	Descriptions
ASCII: ^AT-Nxxxxx^ Hex: 5E 41 54 2D 4E ***5E	YES	xxxxx is the Bluetooth name of the device ^ is the end mark	Applied successfully: OK Applied failed: ERP	
ASCII: ^AT-MAC Hex: 5E 41 54 2D 4D 41 43	NO	Read the MAC Address of the device	Applied successfully: MAC Data Applied failed: ERP	If setting successfully then return the MAC like: 20 2A 32 34 32 34
ASCII: ^AT-STATER Hex: 5E 41 54 2D 53 54 41 54 45 52	NO	Read the state of the device	Applied successfully: STATER Applied failed: ERP	STATER1: Fast broadcast STATER2: Slow b roadcast STATER3: Linked STATER5: un-linked and ready to answer the link request
ASCII: ^AT-STATEW01 Hex: 5E 41 54 2D 53 54 41 54 45 57 30 31	NO	Set the state of the device	Applied successfully: OK Applied failed: ERP	01 to broadcast state: Make the device go into the broadcast state without matter the current work state
ASCII: ^AT-RATEXXXXXX Hex: 5E 41 54 2D 52 41 54 45 ******	YES	Set the UART speed	Applied successfully: UART speed Applied failed: ERP	AT-RATE002400：2400 AT-RATE115200：115200 Support speed： 2400，9600，19200 38400 115200 230400

Remark:
1. AT Command will be available when the UART open.
2. ^AT-Nxxxxx^ and ^AT-STATEW01 will reset Bluetooth device and make Bluetooth on the broadcast state.
3. Please use ASCII or hexadecimal number format send AT commands

8 Recommended Reflow Temperature Profile

The module must go through 125C baking for at least 9 hours before SMT AND IRreflow process.
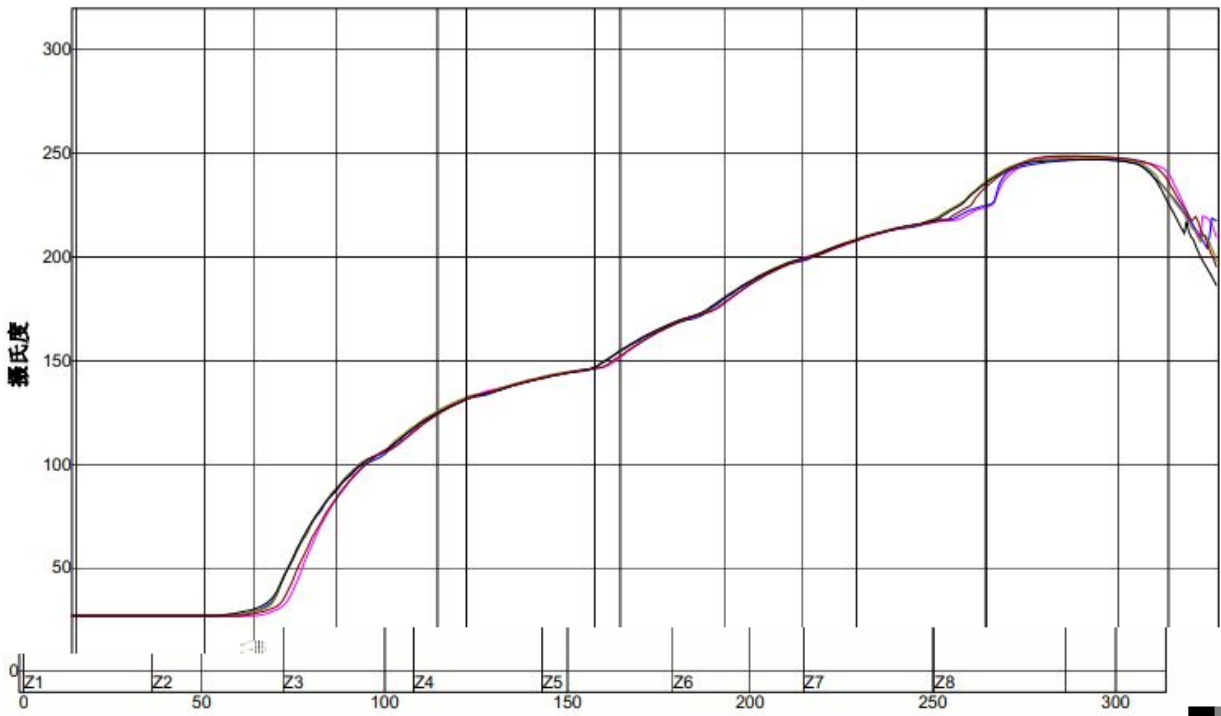
PWI= 82%		最高上升斜率		最高下降斜率		恒温时间150至217C		回流时间 /217C		最高温度		总共 时间 /217C	
2		2.58	72%	-1.36	82%	87.43	-9%	72.59	42%	248.61	72%	72.59	42%
3		2.38	58%	-1.45	77%	89.27	-2%	73.13	44%	247.17	43%	73.13	44%
4		2.45	63%	-1.76	62%	87.96	-7%	71.91	40%	248.17	63%	71.91	40%
5		2.39	59%	-2.09	45%	87.88	-7%	68.87	30%	247.17	43%	68.87	30%
6		2.50	67%	-1.85	57%	87.88	-7%	72.15	41%	248.90	78%	72.15	41%
温差		0.20		0.73		1.84		4.26		1.73		4.26	

9 Related recommended

● Full metal shell will greatly shorten the Bluetooth transmission distance

● Bluetooth antenna below PCB plate not coppe

10 Document History

Revision	Date	History
V1.0	2013-3-20	First release
V2.0	2013-6-30	Re-Design ANT
V2.1	2013-11-25	Re-Set the PINs Design
V2.2	2014-6-30	Add AT command
V2.3	2015-2-10	Renew the AT command set