Level: Public Information

HY-254101 Bluetooth BLE v4.0 Module Specifications

(24 pin)

23 Nov. 2017

Version：V2.1

Version History

Version	Revision Date	Reviser	Reviewer	Revised Contents
V1.0	29/07/2015	WF	LYC	1st issue
V2.0	19/04/2016	WF	LYC	Changed pin description format.
V2.1	23/11/2017	WF	LYC	Added TTCIOTSDK logo & contact information.

CONTENTS

1.DESCRIPTION 1

1-1.APPLICATIONS: 1

1-2.KEY FEATURES: 1

2. WMD410A01SR6A0 (HY-254101) PCBA DIMENSION SIZE AND PICTURE 2

3.APPLICATION NOTE: 2

4.MODULE PIN DEFINITION AND DESCRIPTION OF INPUT AND OUTPUT PORTS 4

（4-1）HY-254101（PCB ANTENNA）PIN MAP 4

（4-2）PIN FUNCTION TABLE (NOT SHOWN IN THE I/O PIN FUNCTIONS ,PLEASE SEE 4

5. ELECTRICAL CHARACTERISTICS 7

5-1: GENERAL CHARACTERISTICS 7

5-2. ABSOLUTE MAXIMUM RATINGS 8

5-3. ESD RATINGS 8

5-4. RECOMMENDED OPERATING CONDITIONS 8

6. BLOCK DIAGRAM 9

7. FUNCTIONAL BLOCK DIAGRAM 9

8. WORKING MODE SCHEMATIC : 10

9. RECOMMEND REFLOW PROFILE(LEADLESS SOLDER CREAM: SN 96.5%, AG 3%, CU 0.5%) 10

10.CONTACT US 11

1.Description

HY-254101 Bluetooth low energy single mode module is a single mode device targeted for low power sensors and accessories.
HY-254101 offers all Bluetooth low energy features: radio, stack, profiles and application space for customer applications. The module also provides flexible hardware interfaces to connect sensors.
HY-254101 can be powered directly with a standard 3V coin cell batteries or pair of AAA batteries. in lowest power shutdown mode it consumes only 0.5 uA and will wake up in few microseconds.
HY-254101 transmission distance of 30 meter. (At face to face, free space, 1.2 Meter high from Ground for testing).
Bluetooth IC：TTC2541 6*6*0.9mm 40pin IC / use TI CC2541 IC chip

1-1.APPLICATIONS:

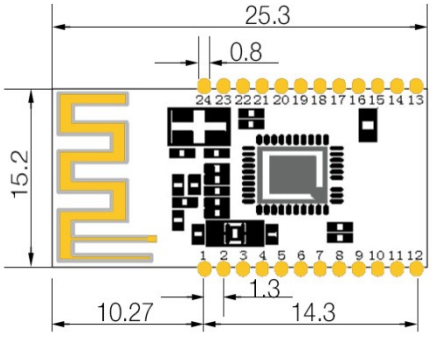
Heart rate sensors
Pedometers
Watches
Blood pressure and glucose meters
Weight scales
Key fobs
Households sensors and collector devices
Security tags
Wireless keys (keyless go)
Proximity sensors
HID keyboards and mice
Indoor GPS broadcasting devices

1-2.KEY FEATURES:

- Bluetooth BLE v.4.0 single mode compliant
- Supports master,slaveand master/slave modes
- Integrated Bluetooth low energy stack
- GAP, GATT, L2CAP, SMP Bluetooth low energy profiles
- Compliance: BQB BLE4.0, FCC, IC(Canada), CE ETSI RED…etc. worldwide RF Regulations.
- Transmit power :+0dBm typical
- Receiver sensitivity: -94dBm typical
- In-System-Programmable Flash 256KB SRAM 8KB
- Low current consumption :Shutdown. No clocks running, no retention: 0.5uA(Typical)

2. WMD410A01SR6A0 (HY-254101) PCBA dimension size and picture

(PCBA dimension size : 15.2*25.3*2.0 mm).



3.Application Note:

3-1.Attention to the electrostatic protection, prevent the soldering iron and the equipment grounding bad; And the workbench, working environment, packaging materials and from the human bodyTouch with static electricity, etc., destroy IC and software be fly; Manual welding module solder iron temperature, should pay attention to avoid the PCB copper stripping off;Soldering iron strictly Grounding requirements, eliminating iron power failure module;

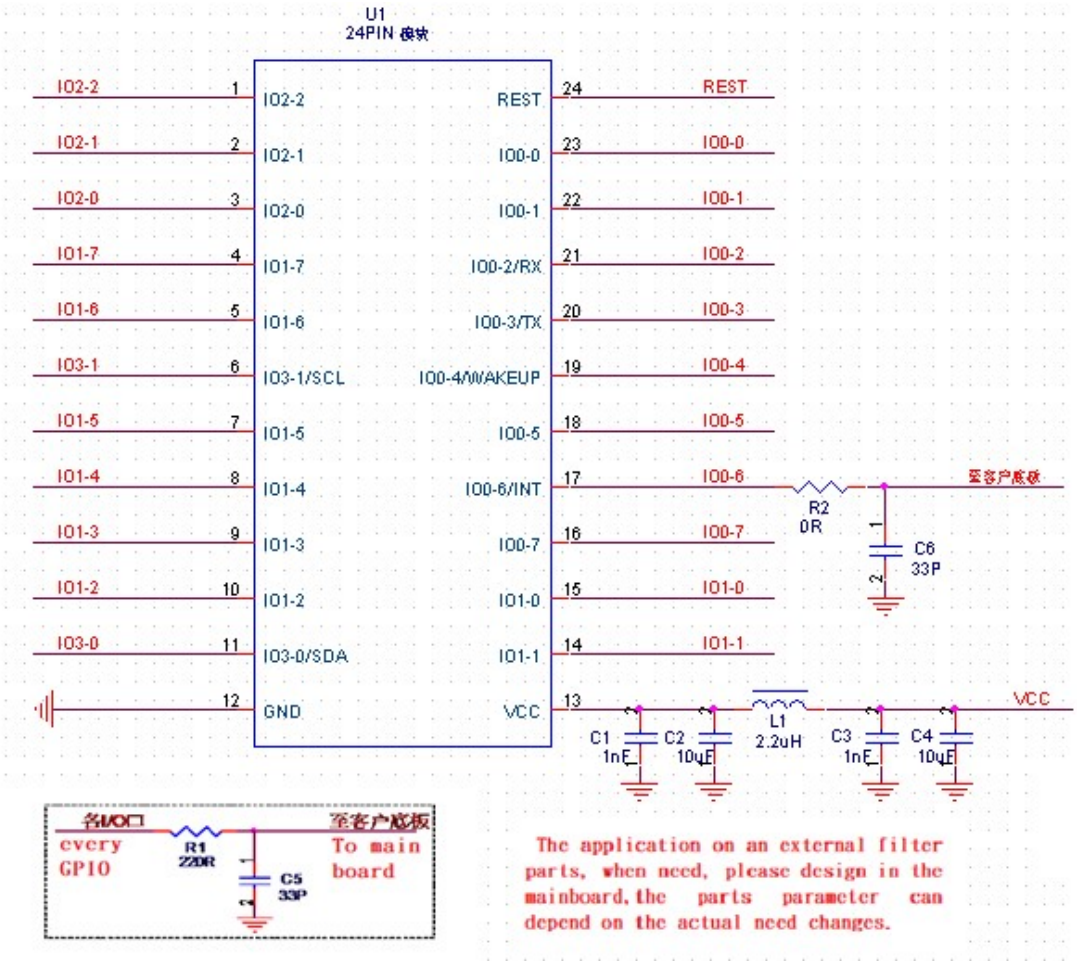
3-2.Attention to avoid the overall motherboard power supply circuit of bad welding connected to short circuit or open circuit, causing the Bluetooth chip, abnormal voltage,Thesoftwarewill fly and problems of IC was damaged.

3-3.When programming firm ware , the VDDS supply voltage must in DC 2.4~3.3V, To avoid programming has not completely, and abnormal status occur..

3-4. Use the module in the production and the transport process, please insure module's component protection, prevent the precision parts on the moduleDamaged (welding furnace exit and assembly, testing, delivery process, suggest using collision buffer material, not collide with each other)

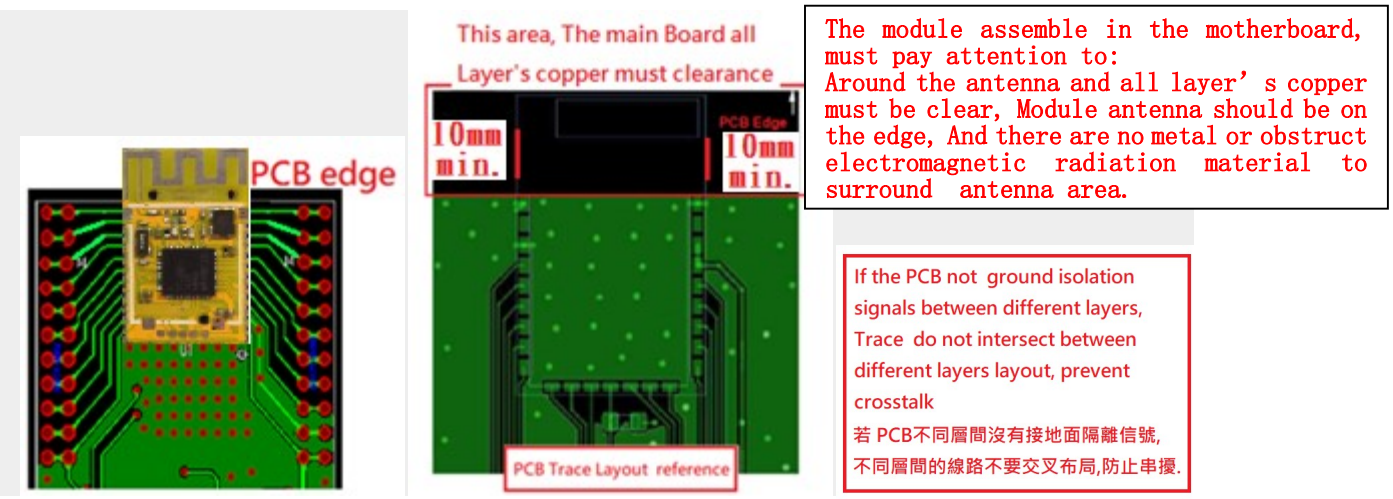
3-5. The module for the humidity sensitive components, if used in SMT reflow soldering operations, please strictly follow the IPC/JEDECJ - STD – 020 regulation, completes the drying dehumidifying , and for this module has second processing work after placed in the functional test environment, the humidity of the chip is no guarantee that in a certain ratio, the honored guest please understand;(The attention note show in below Fig.)

3-6. The diagram (show in below Fig.) of the module application on external filter parts, whenneed, please design in the mainboard, the parts parameter can depend on the actual need to changes.



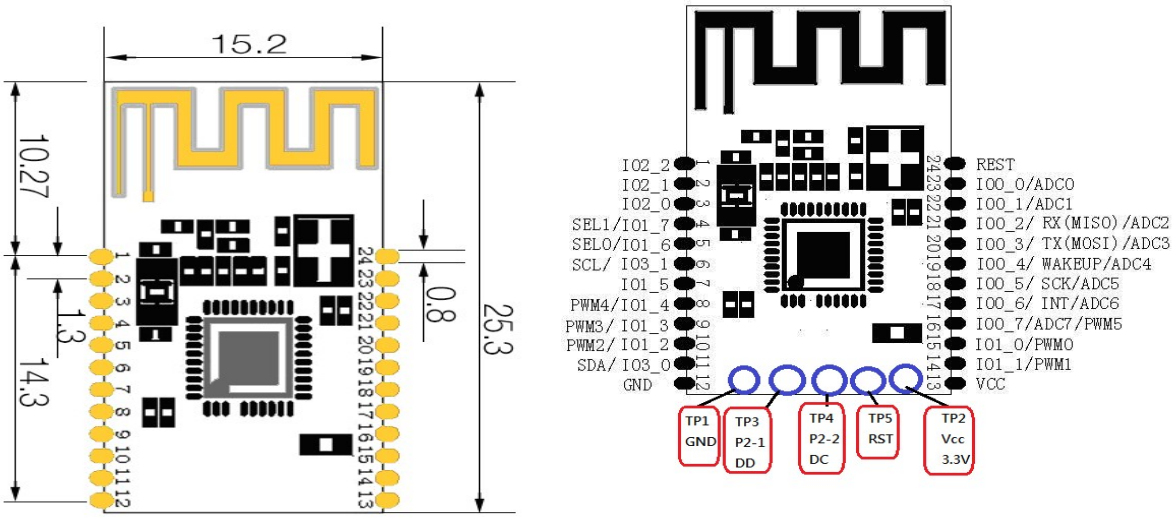
3-7.Assembly recommendation 1:Underneath the module antenna and RF circuit on themain board PCB copper need to clearance, and place close to the main board edge, as show in below Fig. The antenna can't be near around metal parts and prevent material existence of electromagnetic radiation , Can affect the manipulation of the distance

3-8 Assembly recommendation 2:Signal trace and power supply trace, don't cross layout, as show in below Fig.To avoid crosstalk, affect the receiving sensitivity.



4.Module pin definition and description of input and output ports

(4-1) HY-254101 (PCB Antenna) pin map



(4-2) Pin function table (Not shown in the I/O pin functions ,Please see

Table(4-3) input and output ports description)

Pin No.	Function	Function Description
1	IO2_2 / DC	Digital I/O port 2_2 / Debug clock
2	IO2_1 / DD	Digital I/O port 2_1 / Debug data
3	IO2_0	Digital I/O port 2_0
4	IO1_7 / SEL1	Digital I/O port 1_7 MCU communication mode select, See table(5-3) Communication protcol mode selection, I/O setting Table
5	IO1_6 / SEL0	Digital I/O port 1_6 MCU communication mode select, See table(5-3) Communication protcol mode selection, I/O setting Table
6	IO3_1 / I2C SCL	Digital I/O port 3_1 IIC serial Clock (SCL) can be used as I2C clock pin or digital I/O. Leave floating if not used. If grounded disable pull up
7	IO1_5	Digital I/O port 1_5
8	IO1_4 / PWM4	Digital I/O port 1_4 / PWM port 4

9	IO1_3 / PWM3	Digital I/O port 1_3 / PWM port 3
10	IO1_2 / PWM2	Digital I/O port 1_2 / PWM port 2
11	IO3_0 / I2C SDA	Digital I/O port 3_0 I2C serial Data (SDA) Can be used as I2C data pin or digital I/O. Leave floating if not used. If grounded disable pull up
12	GND	BLE module grounding pin
13	VCC	BLE module power supply pin, voltage range of 2.0 ~ 3.6V
14	IO1_1 / PWM1	Digital I/O port 1_1 20mA drive capability / PWM port 1
15	IO1_0 / PWM0	Digital I/O port 1_0 20mA drive capability / PWM port 0
16	IO0_7	Digital I/O port 0_7
	ADC7	ADC port 7
17	PWM5	PWM port 5
	IO0_6	Digital I/O port 0_6
18	INT	Interrupt output pin
	ADC 6	ADC port 6
	IO0_5	Digital I/O port 0_5
	SPI SCK	SPI Bus clock signal
19	ADC 5	ADC port
	IO0_4	Digital I/O port 0_4
20	WAKEUP	BLE wake up pin, Low/ wake up, High / BLE module automatically sleep
	ADC4	ADC port 4
	IO0_3	Digital I/O port 0_3
21	UART TX	UART Serial data bus output
	SPI MOSI	SPI Master Out , Slave input
	ADC3	ADC port 3
	IO0_2	Digital I/O port 0_2
	UART RX	UART Serial data bus input
	SPI MISO	SPI Master input , Slave output
22	ADC2	ADC port 2
	IO0_1 / ADC1	Digital I/O port 0_1 / ADC PORT 1
23	IO0_0 / ADC0	Digital I/O port 0_0 / ADC PORT 0
24	Reset	BLE hardware reset pin (Low: reset)

Pin Function Description (The module following collectively "BLE"):

a. UART: serial bus, the default baud rate 9600bps, a single packet transmission is less than 17 bytes, package transmission intervals greater than 20ms.

b. SPI: SPI bus interface, support for less than 2M / S data transmission rate, a single packet transmission is less than 17 bytes, package transmission intervals greater than 20ms.

c. IIC: IIC bus interface, support more than 22K / S, less than 400K / S data transmission rate, a single packet transmission is less than 8 bytes, package transmission intervals greater than 20ms.

d. MOSI: Master output, Slave input.

e. MISO: Master input, Slave output.

f. SCK: SPI bus clock signal.

g. SDA: IIC data.

h. SCL: IIC clock.

i. WAKEUP: BLE wake up pin, Low _wake up, High/ BLE module automatically sleep.

j. SEL0 & SEL1: MCU and BLE communication mode selection pin. Specific details, see "(4-3) communication protocol mode selection, I/O setting table ".

k. RESET: BLE hardware reset pin, Low level reset.

l. VCC: BLE module power supply pin voltage range DC 2.0~3.6V.

m. GND: BLE module ground pin.

(4-3) .Communication protocol mode selection, I/O setting Table

No.	Channel Select PIN status		Communication interface state			Remark
	SEL1	SEL0	UART	SPI	IIC	
1	0	0	OK	X	X	1.Command mode Please contact the Vendor. 2.Description: 0 is Low,1 is high
2	0	1	0K	X	X	
3	1	0	X	OK	X	
4	1	1	X	X	OK	
5	X	X	OK	X	X	

UART mode：SEL1=0,SEL0=0 or SEL1=0, SEL0=1 or SEL0,SEL1 floating.

SPI mode： SEL1=1,SEL0=0 IIC mode： SEL1=1,SEL0=1

Table (4-4) : Input and output ports Description

Input / output Register pin No.								
I/O Port register	7	6	5	4	3	2	1	0
IO_0	16	17	18	19	20	21	22	23
IO_1	4	5	7	8	9	10	14	15

IO_2	NC	NC	NC	NC	NC	1	2	3
IO_3	NC	NC	NC	NC	NC	NC	6	11

Note：BITx=0，Low level out ; BITx=1 High level out

Direction Register pin No.								
Direction Register	7	6	5	4	3	2	1	0
DIR0	16	17	18	19	20	21	22	23
DIR1	4	5	7	8	9	10	14	15
DIR2	NC	NC	NC	NC	NC	1	2	3
DIR3	NC	NC	NC	NC	NC	NC	6	11

Note: BITx = 0 is corresponds port input , BITx = 1 is corresponds port output .

PWM port pin No.					
PWM5	PWM4	PWM3	PWM2	PWM1	PWM0
16	8	9	10	14	15

ADC port pin No.							
ADC7	ADC6	ADC5	ADC4	ADC3	ADC2	ADC1	ADC0
16	17	18	19	20	21	22	23

Note: The Blue Numbers of the corresponding port pin No. applications of all kinds, For example:IO0/bit0 or ADC0 pin is corresponding module pin No.23

5. Electrical Characteristics

5-1: General Characteristics

(With Ta = 25 ℃, VDD = 3.0V, standard measure:1Mbps , 250KHz GFSK modulation , Bluetooth Low energy mode.)

1. Modulation Mode: GFSK;
2. Frequency range: 2402~2480MHZ (2.4G ISM band);
3. Transmit power setting Range: -20 ~ +0 dBm typical (differential mode o/p point characteristics ; programmable by software)
4. Operating ambient temperature range: -40 ℃ ~ + 125 ℃;
5. The storage temperature range: -40 ℃ ~ + 85 ℃;
6. The power supply voltage: 2.0 ~ 3.6VDC;
7. Receiver sensitivity: - 94dBm typical(direct test from IC RF out differential mode o/p point characteristics)
8. Receiving mode current (high gain setting): 20.02 mA (typical);

9. Transmit mode current (at 0dBm output setting): 18.2 mA (typical);
10. MCU law active current (only 32MHz operation of X-tal OSC): 6.7 mA (typ);
11. Power mode 1: The current consumption: (under MCU standby mode,
    the wake-up time = 4uS); I= 270uA (Typical);
12. Power mode 2: THE current consumption in sleep mode.
    timer activate / enable, wake-up time can by the programming software setting): I = 1uA (typ);
13. Power mode 3: The current consumption :(Low power deep sleep mode,
    via the hardware initiative wake): I = 0.5uA(Typical);

5-2. Absolute Maximum Ratings

Note: These are absolute maximum ratings beyond which the module can be permanently damaged, these are not Maximum operating conditions, the maximum recommended operating conditions are in the table 6.

Rating	Min	Max	Unit
VDDS	-0.3	3.9	V
Other Terminal Voltages	VSS-0.3	VDDS+0.3	V
Storage Temperature	-40	+125	°C

5-3. ESD Ratings

			Value	Unit
V_{ESD}Electrostatic discharge	Human body model (HBM), per ANSI/ESDA/JEDECJS001	All pins	±2000	V
	Charged device model (CDM), per JESD22-C101	RF pins	±750	
		Non-RFpins	±750	

5-4. Recommended Operating Conditions

Supply voltage noise should be less than 10mVpp. Excessive noise at the supply voltage will reduce the RF performance.

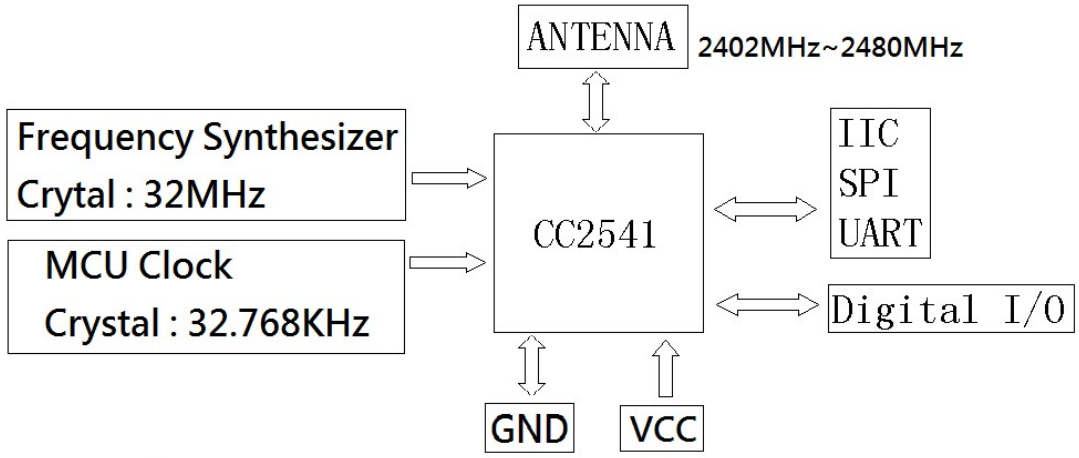
Rating	Min	Max	Unit
VDD (when BlueTooth Active)	2.0	3.6	V
VDD(when flash programming)	2.4	3.3	V
Operating Temperature Range	-40	+85	°C

Note: (1).VDD power supply recommended voltage : 2.7~3.3V
(2).When programming firm ware , the VDD supply voltage must in DC 2.4~3.3V,

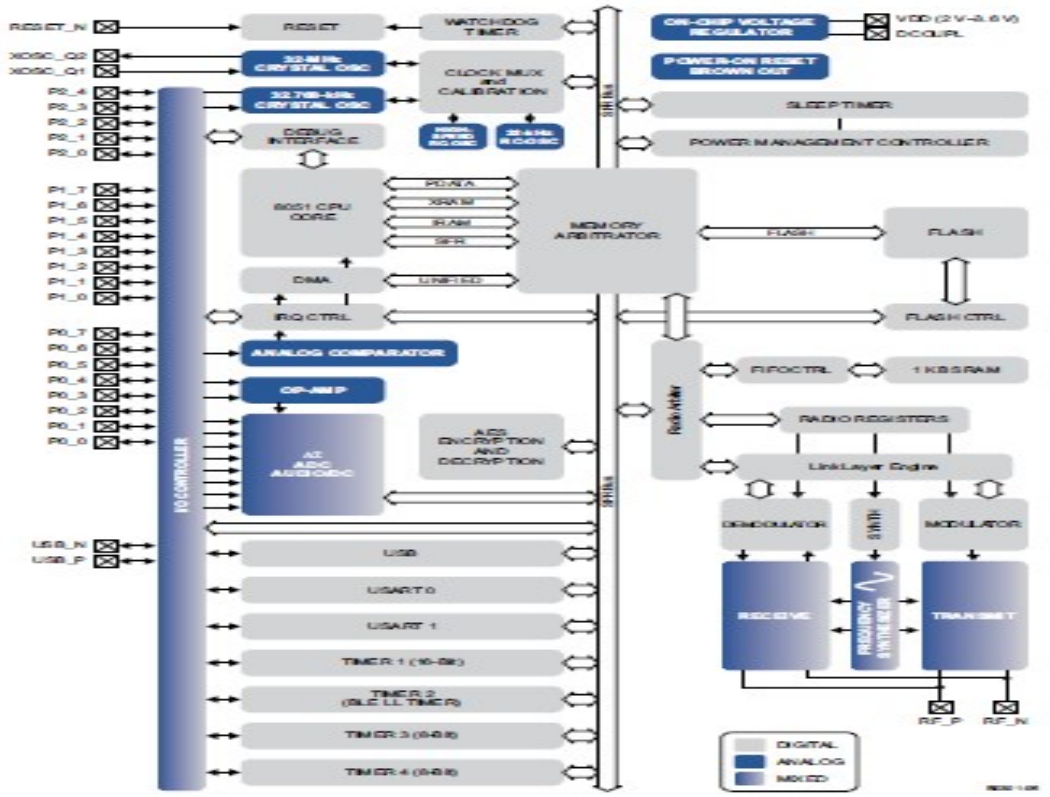
To avoid programming has not completely, or abnormal status occur..

(3).For smaller coin cell batteries, with high worst-case end-of-life equivalent source resistance, a 22-μF VDDS input capacitor must be used to ensure compliance with this slew rate(6-6 timing req.).

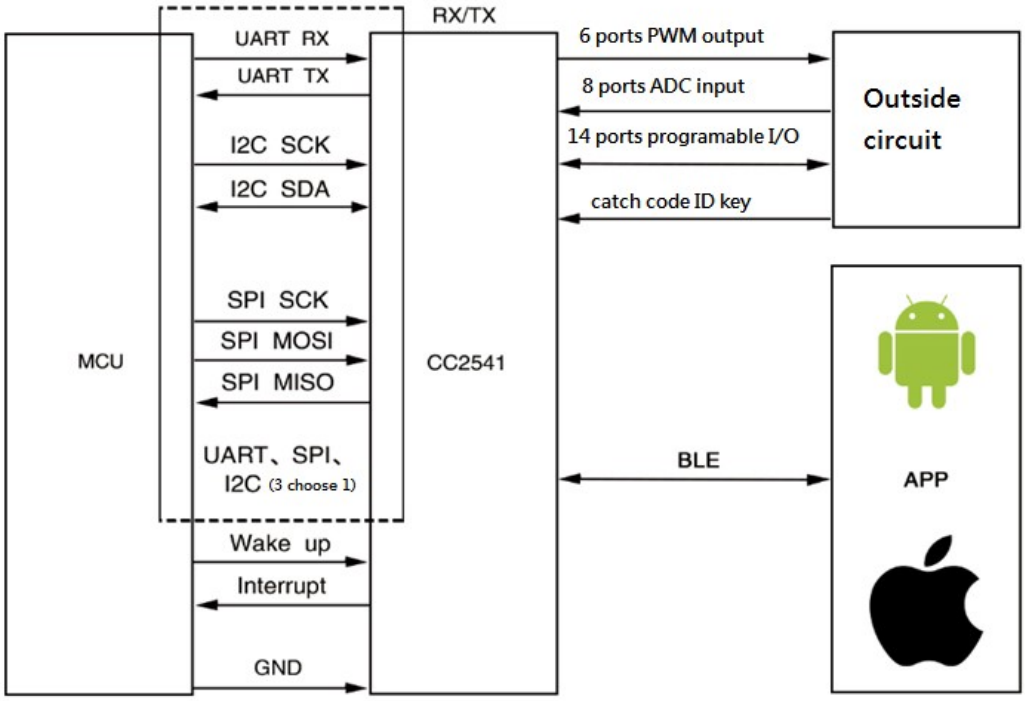
6. Block Diagram



7. Functional Block Diagram



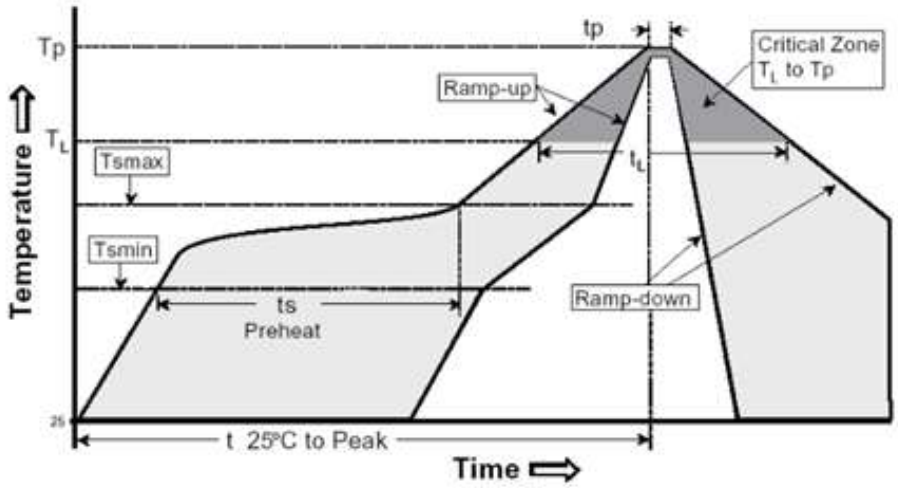
8. Working mode schematic :



9. Recommend Reflow Profile(Leadless solder cream: Sn 96.5%, Ag 3%, Cu 0.5%)

Profile Feature	Pb-Free Assembly	
	Large Body	Small Body
Average ramp-up rate(T_L to T_P)	3°C/second max	
Preheat-Temperature Min (Ts_{min}) -Temperature Max (Ts_{max}) -Time (min to max)(ts)	150°C 200°C 60-180 seconds	
$Ts_{max}$to T_L-Ramp-up Rate	3°C/second max	
Time maintained above-Temperature (T_L) -Time (t_L)	217°C 60-150 seconds	
Peak Temperature (T_P)	245 +0/-5°C	250 +0/-5°C
Time within 5°C of actualPeakTemperature (t_p)	10-30 seconds	20-40 seconds
Ramp-down Rate	6°C/second max	
Time 25°C to PeakTemperature	8 minutes max	

Reflow Curve Classification



10.Contact Us

ShenZhenShengRun Technology Co.,Ltd.
Phone : +86-755-86233846 Fax:+86-755-82970906
Official Website : www.tuner168.com
Alibaba Website : http://shop1439435278127.1688.com
E-mail: marketing@tuner168.com
Address: Room 602,B Block of Longjing Jingu Hi-tech Pioneer Park, Longzhu 4th Road, Xili Town, Nanshan District, Shenzhen, Guangdong, China.