HY-234001PC Bluetooth BLE 5.3 Module Specification

(16 pin)

Version：V1.0

30 Nov. 2022

Version	Revision Date	Reviser	Reviewer	Revised Contents
V1.0	30/11/2022	YDQ	LYC	1st issue

Table 1: Version History

CONTENTS

1. Description

HY-234001PC Bluetooth low energy module is a single mode device targeted for low power sensors and accessories.

HY-234001PC offer 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-234001PC can be powered directly with a standard 3V coin cell batteries or pair of AAA batteries. in lowest power shutdown mode it consumes only 0.15uA and will wake up in few microseconds.

HY-234001PC signal transmission distance, according to the overall product structure, components material, layout, antenna structure, placement and the surrounding environment etc, will change.

Bluetooth IC: CC2340R5 5*5*0.9mm QFN40

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
Smart home living device control & message transceiver.
Smart office device control & message transceiver.
Smart industrial device control and message transceiver.

1-2 KEY FEATURES

- Bluetooth v.5.3 single mode compliant
- Supports master, slave and master-slave multi-modes
- Integrated Bluetooth low energy stack
- GAP, GATT, L2CAP, SMP Bluetooth low energy profiles
- Ultralow current consumption
  1）Standby state: 0.7uA (RTC running and RAM/CPU maintaining, LFXT DCDC charging current setting: ipeak = 7)
  2）Shutdown state: 150nA (no clock running, no memory)
- Programmable ARM Cortex-M0+ processor for embedding full applications

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2. Product model Number: Hardware Model Description

2-1. (HY-234001PC with PCB Helix Antenna)/(Option: shield case or no shield case)

Part Number	Description
HY-234001PC	PCB Helix Antenna with shield case

2-2: HY-234001PC FCC ID &(IC ID TBD) Print Format on the Shield Case

Model:HY-234001PCPC
FCC ID:
IC :
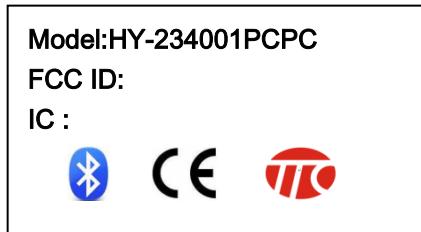
Word Type: Calibri

Direction: Horizon
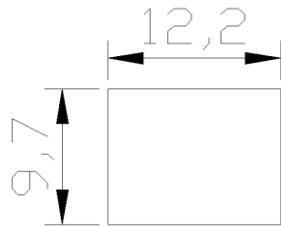
Shield Case Size

9.7*12.2*1.7mm ±0.1

3. PCBA Dimension Size and Picture

3.1. HY-234001PC (PCB Helix Antenna)

HY-234001PC (PCB Helix Antenna, with shield case). Dimension size(17.9*11.59*2.2/2.7 mm ±0.2mm)

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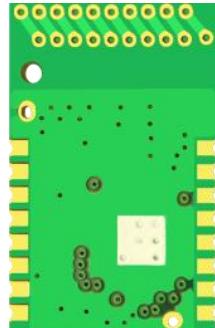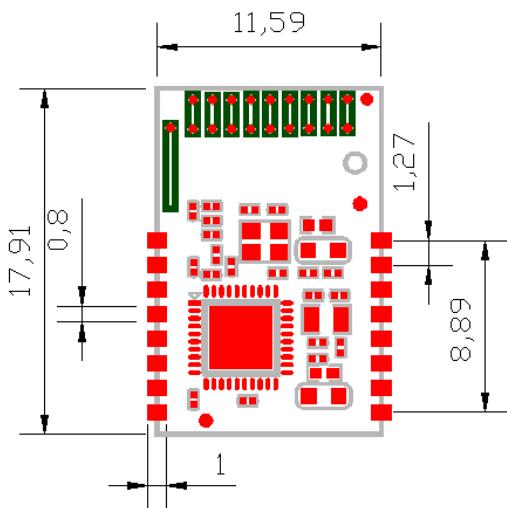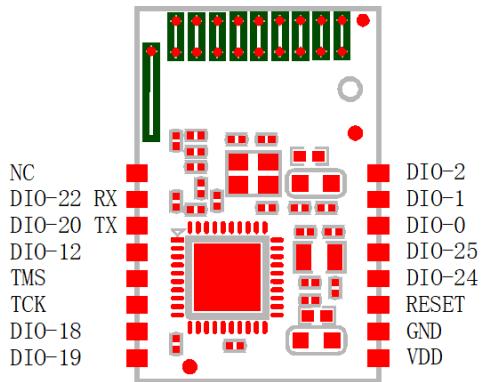
(4). Application Note:

4-1. 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 body Touch with static electricity, etc., destroy IC and software to be flied; Manual welding module solder iron temperature, should pay attention to avoid the PCB copper stripping off;Soldering iron strictly Grounding requirements, eliminating solder iron leak voltage and avoid supply power Vcc switch instant turn on/ turn off state ,generate high voltage,May be let the module to damaged;

4-2.Soldering iron front end to ground resistance under the 10 Ω,, and leakage voltage < 0.1 V; The environment and Personnel static voltage shall be within 0±100V. Anti-static labeling shall be show in the operation area.

4-3.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.

4-4.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.

4-5. Avoid supply voltage in (BOD Brown - Out Dectect) fall within the scope of electrical detection threshold (1.76 V ~ 1.78 V) occurred many times, (diagram below off electric Lock - up area) firmware may be locked.

Cause the Boot Code startup Code suspended, unable to connect to the JTAG protocol,;In case of this state is available use Reset pin action under 1.0 V, to remove this phenomenon;

The rechargeable batteries at charge-discharg status; In the application at the same time, to ensure the voltage setting of the protection system; And pay attention to the supply of power caused by the internal resistance and line impedance voltage drop; And make sure that

The equipment operating voltage from 2.0 V to 3.6 V, and ensure that the voltage slope faster than 0.5 V/ms (through BOD threshold).
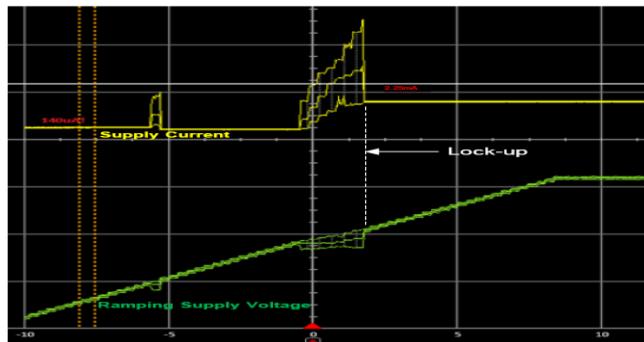
4-6. Use the module in the production and the transport process, please insure module's component protection, prevent the precision parts on the module Damaged (welding furnace exit and assembly, testing, delivery process, suggest using collision buffer material, not collide with each other)

4-7. The module is humidity sensitive components (MSD level 3), 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.)

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4-7. 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.
And pay attention to the increase and decrease ramping of supply voltage fast than 0.5v/ms;
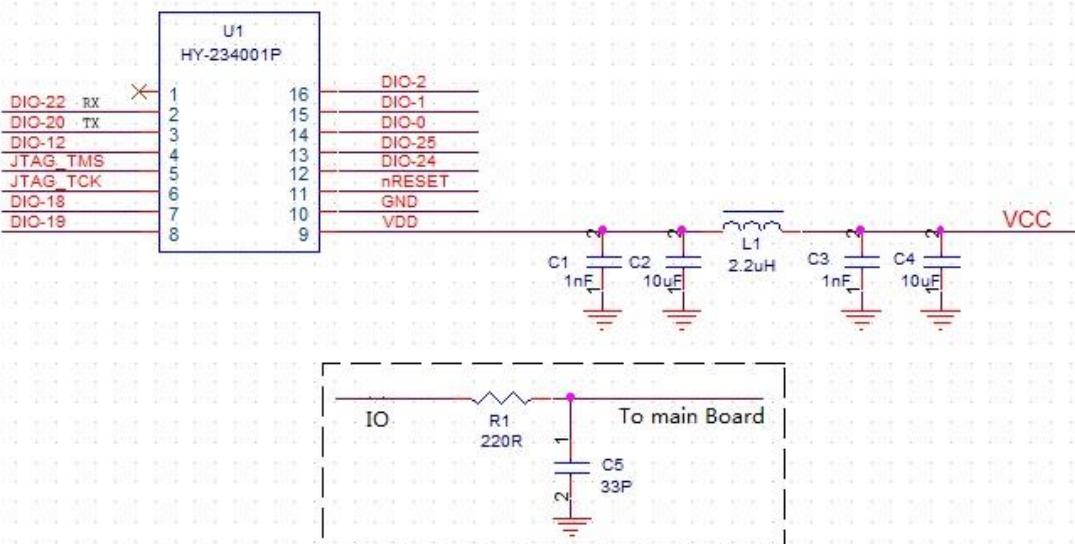
4-9. Assembly recommendation 1:Underneath the module antenna and RF circuit on the main board PCB copper need to clearance, and place close to the main board edge, as show in below Fig.
The antenna can't be near around metal parts and prevent material existence of electromagnetic radiation , Can affect the manipulation of the distance.

4-9. 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. Assembly recommendation 1:Underneath the module antenna and RF circuit on the main board PCB copper need to clearance, and place close to the main board edge, as show in below Fig.
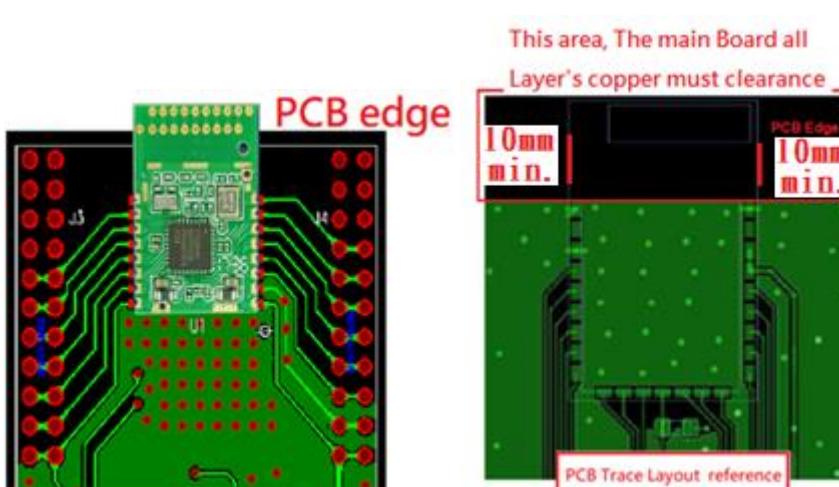
The module assemble in the motherboard, must pay attention to: Around the antenna and all layer's copper must be clear, Module antenna should be on the edge, And there are no metal or obstruct electromagnetic radiation material to surround antenna area.

If the PCB not ground isolation signals between different layers, Trace do not intersect between different layers layout, prevent crosstalk
若 PCB不同層間沒有接地面隔離信號, 不同層間的線路不要交叉布局,防止串擾.

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5. Pinout and GPIO Function Description

Pin No.	Name	Type	Function Description
1	NC	NC	Not connect
2	DIO_22	Digital or Analog I/O	GPIO, analog capability
3	DIO_20	Digital or Analog I/O	GPIO, analog capability
4	DIO_12	Digital I/O	GPIO, high-drive capability
5	DIO16_SWD IO JTAG TMSC	Digital I/O	GPIO, SWD interface: mode select or SWDIO, high-drive capability
6	DIO17_SWD CK JTAG TCKC	Digital I/O	GPIO, SWD interface: clock, high-drive capability
7	DIO_18	Digital I/O	GPIO, high-drive capability
8	DIO_19	Digital I/O	GPIO, high-drive capability
9	VDD	Power supply	+1.8V to +3.8V (Recommended 2.7~3.3V)
10	GND	Power GND	Ground
11	RESET_N	Digital input	Reset, active-low. Module have pull up.
12	DIO_24	Digital or Analog I/O	GPIO, Analog capability, high-drive capability
13	DIO_25	Digital or Analog I/O	GPIO, analog capability
14	DIO_0	Digital or Analog I/O	GPIO, analog capability
15	DIO_1	Digital or Analog I/O	GPIO, analog capability
16	DIO_2	Digital or Analog I/O	GPIO, analog capability

6. Electrical Characteristics

(Test condition: With Ta = 25 ℃, VDD =3.0V with internal DC-DC converter,

standardmeasure:1Mbps GFSK modulation ,FRF = 2440MHz Bluetooth Low energy mode.)

6-1. Radio performance & current consumption

- ➢ Modulation Mode: GFSK
- ➢ Frequency range: 2402~2480MHZ (2.4GHz ISM band)
- ➢ Transmit power setting Range: -21 ~ +8 dBm typical (programmable by software) .
- ➢ The antenna feed point transmit power : +6 dBm typical. (TX set Max.output)
- ➢ The antenna feed point receiver sensitivity : -93 dBm typical. (PER <30.8%)
- ➢ Frequency drift specification :RF ± 60ppm , MCU clock 32.768KHz ± 350ppm.(Use X-Tal)

- ● Ultralow current consumption
  - ➢ RF TX：5mA(typical)（O/P Power setting :0dBm）
  - ➢ RF TX：<12mA(typical)（O/P Power setting :8dBm）
  - ➢ RF RX (high gain setting): 5.3 mA(typical)

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- ➢ Idle: 56uA (Supply Systems and RAM powered)
- ➢ Standby: 0.7uA (RTC running and RAM/CPU maintaining)
- ➢ Shutdown: 150 nA (No clocks running, no memory)

6-2. 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 6-4.

Rating	Min	Max	Unit
VDDS	-0.3	4.1	V
Other Terminal Voltages	VSS-0.3	VDDS+0.3	V
Storage Temperature	-40	+150	°C

6-3. ESD Ratings

			Value	Unit
V_{ESD} Electrostatic discharge	Human Body Model (HBM), according to ANSI / ESDA / JEDEC/JS001	All pins	±2500	V
	Charging device model (CDM), according to JESD22-C101	RF pins	±750	
		Non-RFpins	±750	

6-4. 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)	2.2	3.8	V
VDD(when flash programming)	2.4	3.6	V
Operating Temperature Range	-40	+125	°C

Note: (1).VDD power supply recommended voltage : 2.7~3.3V

(2).When programming firm ware , the VDD supply voltage must in DC 2.4~3.6V,

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.).

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6-5. GPIO DC Characteristics

Parameter	Test Condition	Typical	Unit
GPIO VOH at 10 mA load	high-drive GPIOs only, max drive setting	2.85	V
PIO VOL at 10 mA load	high-drive GPIOs only, max drive setting	0.15	V
GPIO VOH at 2 mA load	standard drive GPIOs	2.9	V
GPIO VOL at 2 mA load	standard drive GPIOs	0.1	V

6-6. Timing Requirements

| Description	MIN	MAX	UNIT
CONTROL INPUT CHARACTERISTICS			
RESET_N low duration	1		µs

（1） For button batteries, in the worst case, the battery equivalent source resistance will cause a voltage drop on the power supply. At this time, VDDS must use a 22µF input capacitor to strengthen the power supply capability to ensure compliance with the conversion rate.

（2） Applications using RCOSC_LF as sleep timer must also consider the drift in frequency caused by a change in temperature.

6-7. Switching Characteristics

Measured with Tc = 25°C, VDDS = 3.0 V, unless otherwise noted.

| Parameter	Test Condition	Min	Typical	Max	Unit
Wakeup and Timing					
Idle →Active	Flash disabled in idle mode		10		µs
Standby →Active	GLDO ON, min recharge current configuration		200		µs
Shutdown →Active	GLDO default charge current setting, VDDR capacitor fully discharged		2000		µs

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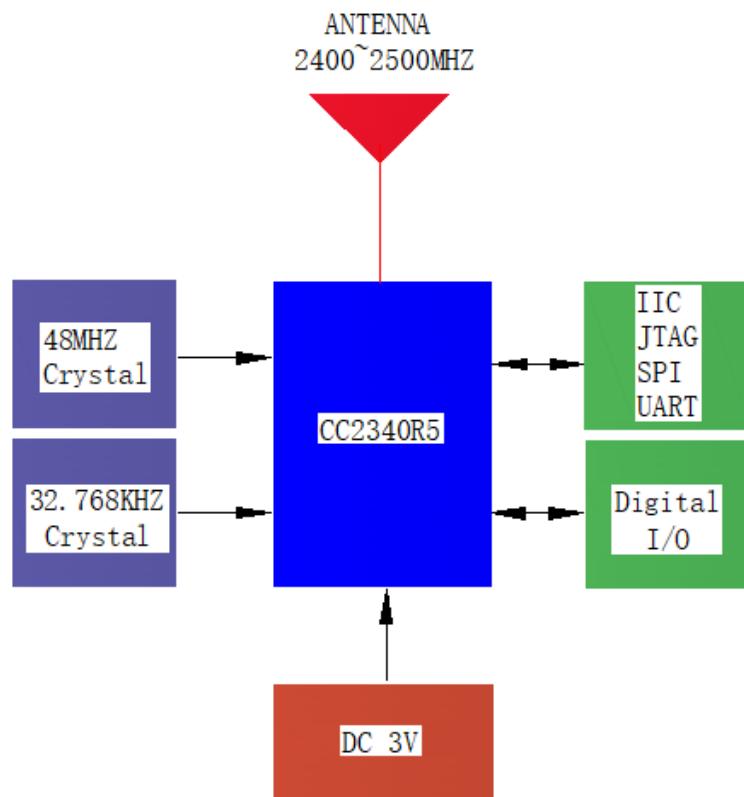
7. Block Diagram

# 8. Functional Block Diagram

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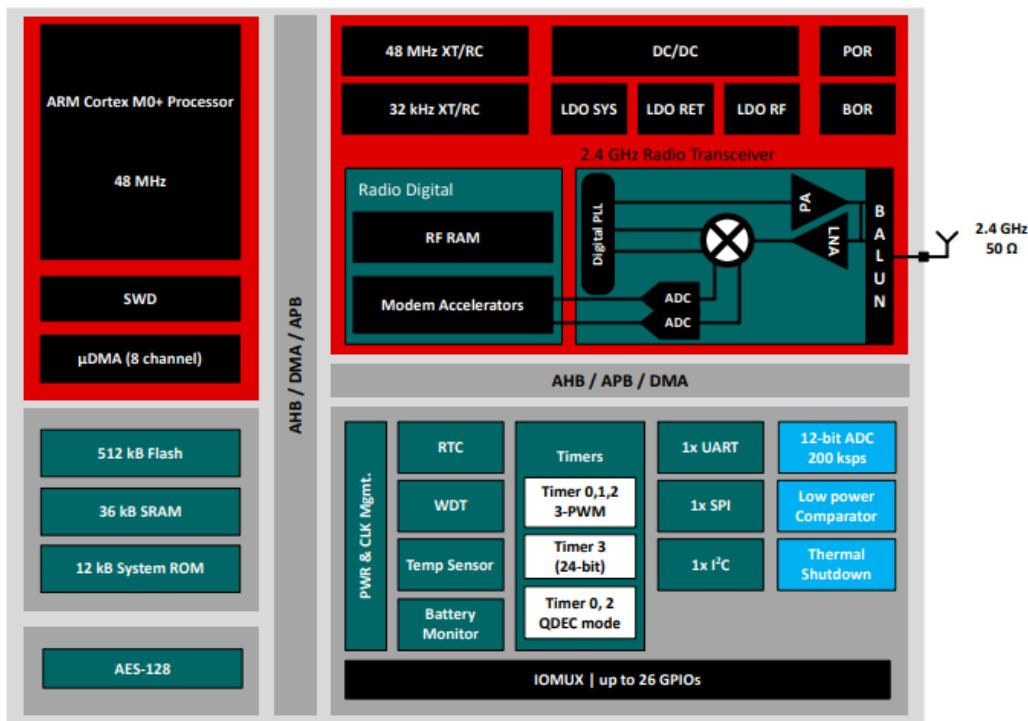
9. Working mode schematic
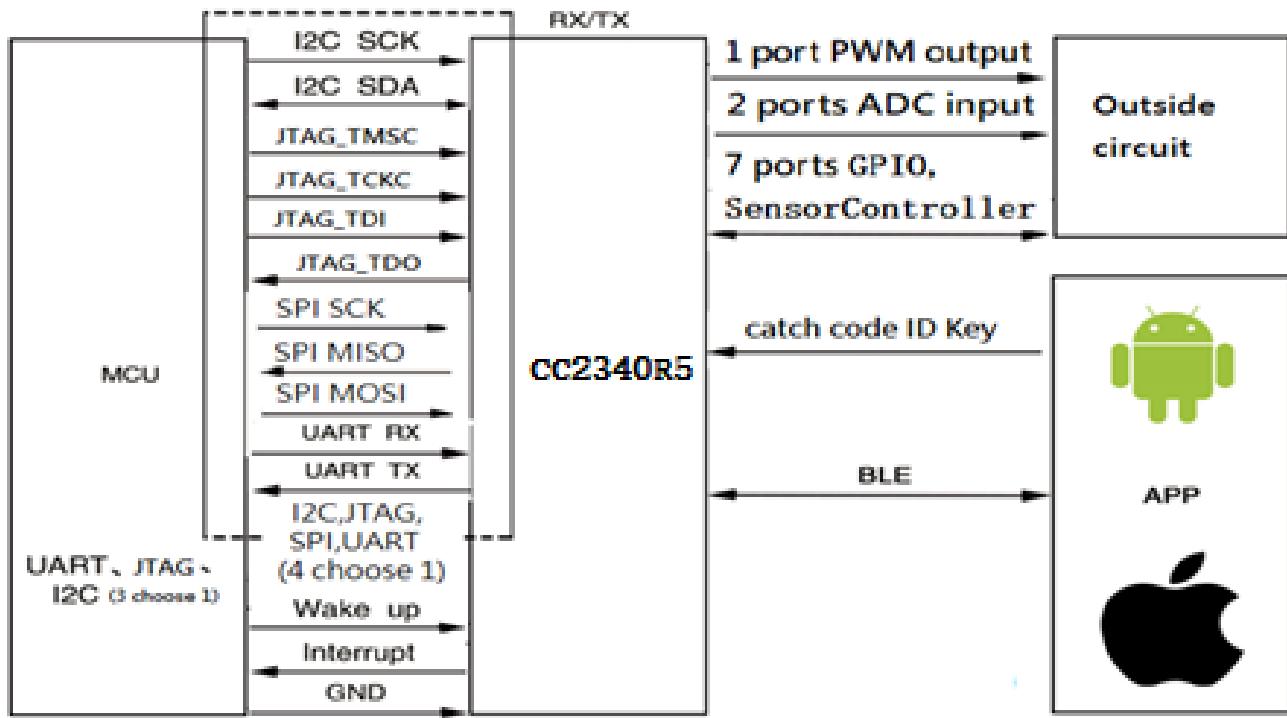
10. Recommend Reflow Profile(Leadless solder cream: Sn 96.5%, Ag 3%, Cu 0.5%)

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})	150°C	
-Temperature Max (Ts_{max})	200°C	
-Time (min to max)(ts)	60-180 seconds	
$Ts_{max}$to T_{-L} -Ramp-up Rate	3°C/second max	
Time maintained above -Temperature (T_L)	217°C	
-Time (t_L)	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	

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Reflow Curve Classification
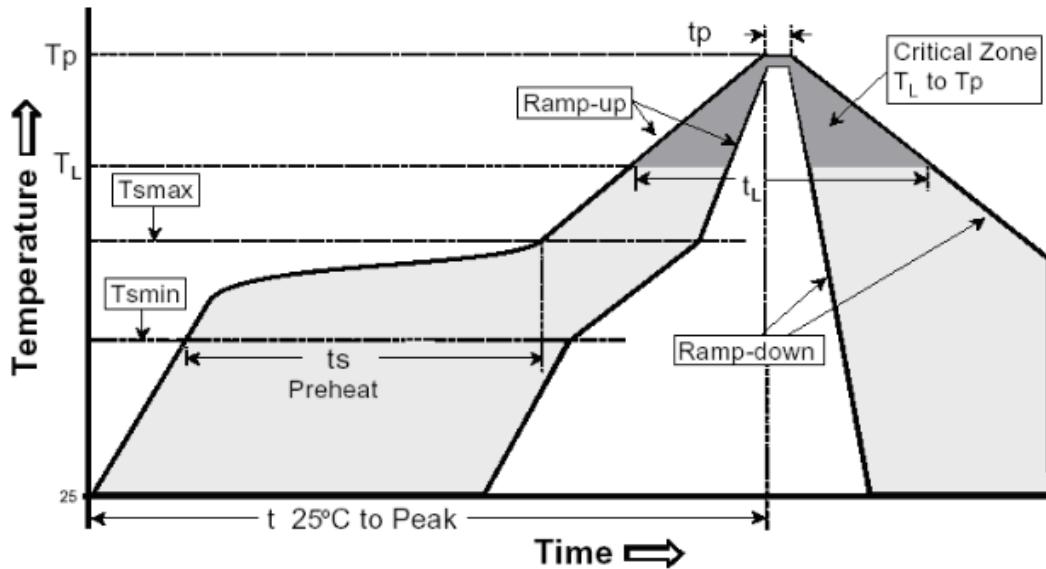
11. Contact Us

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