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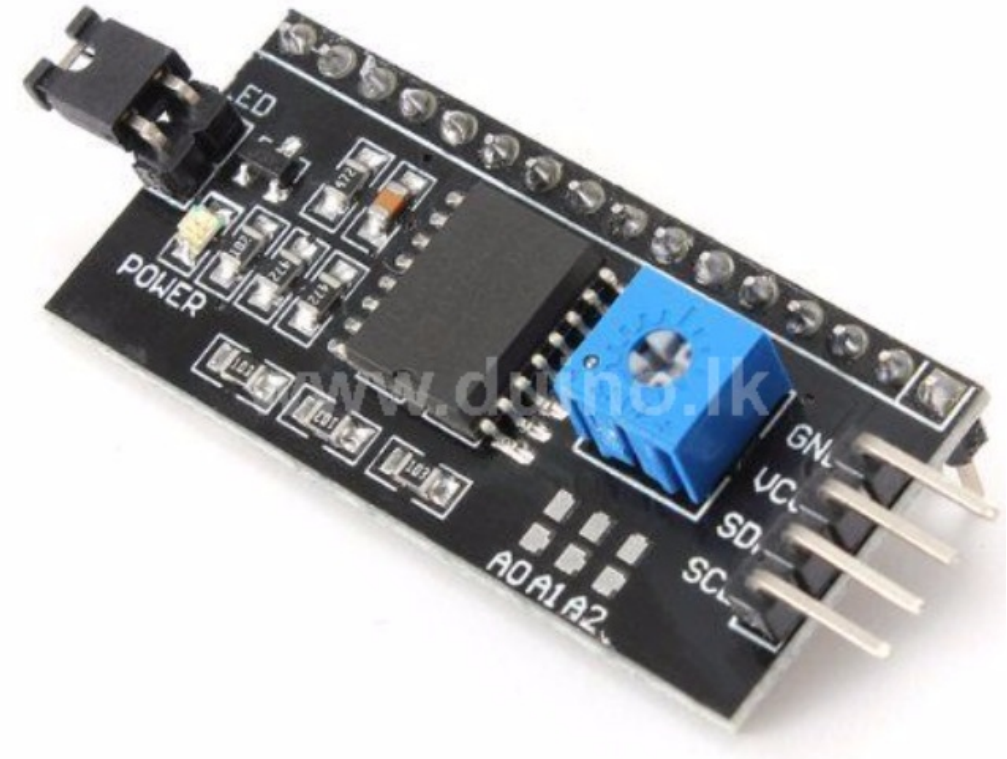
Duinolk

Duinolk YP02 TWI SPI Serial Interface Module



Specification

Features

General

- Chip: BL702C 8Mbit Flash embedded
- Module Size:16mm*20mm*3mm
- Bluetooth® Specification v5.0
- Zigbee 3.0, Base Device Behavior, Core Stack R21, Green Power
- 2.4 GHz RF transceiver
- Support BLE/Zigbee coexistence
- Standards Supported
- IEEE 802.15.4 MAC/PHY
- Bluetooth® Low Energy 1Mbps and 2Mbps
- Bluetooth® Long Range Coded 500Kbps and 125Kbps
- Integrated balun, PA/LNA

MCU Features

- 32-bit RISC CPU with FPU

- One RTC timer update to one year
- CPU frequency configurable from 1MHz to 144MHz
- JTAG development support
- XIP QSPI Flash/pSRAM with hardware encryption support
- 132KB RAM
- 192KB ROM
- 1Kb eFuse

Peripheral Interfaces

- USB2.0 Full-Speed interface
- GPIO * 12;
- UART * 2;
- IIC * 1;
- SPI * 1;
- EN * 1;
- PWM *5;
- 10-bit DAC * 1;
- 12-bit ADC*1
- PIR * 1;
- IR remote control interface
- Working temperature: -40℃-105℃

Applications

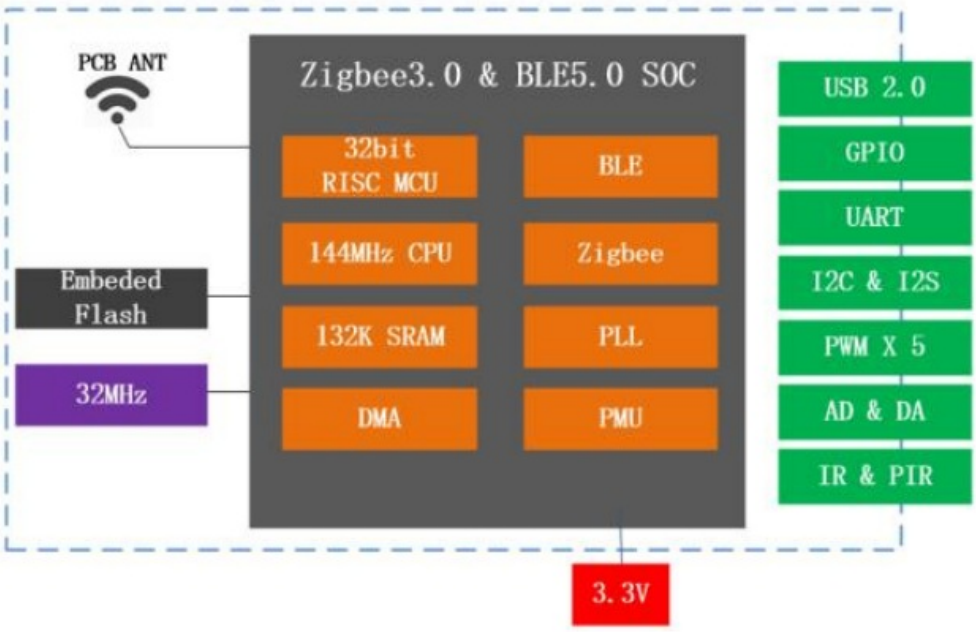
- Serial transparent transmission;
- Smart power plug/Smart LED light;
- Sensor networks;
- Industrial wireless control;

Module Type

Name	Antenna Type

YP02	PCB ANT

Module Structure



Update Record

Date	Version	Update
2024-9-2	V1.0	First released

Introduction

YP02 is highly integrated BLE and Zigbee combo module for IOT applications.
YP02’s wireless subsystem contains 2.4G radio, BLE + Zigbee baseband and MAC designs. Microcontroller subsystem contains 32-bit RISC CPU, high-speed cache and memories. Power Management Unit controls ultra-low-power modes. Moreover, varieties of security features are supported.
Peripheral interfaces include UART, PWM, USB, I2C, ADC, DAC and GPIOs.

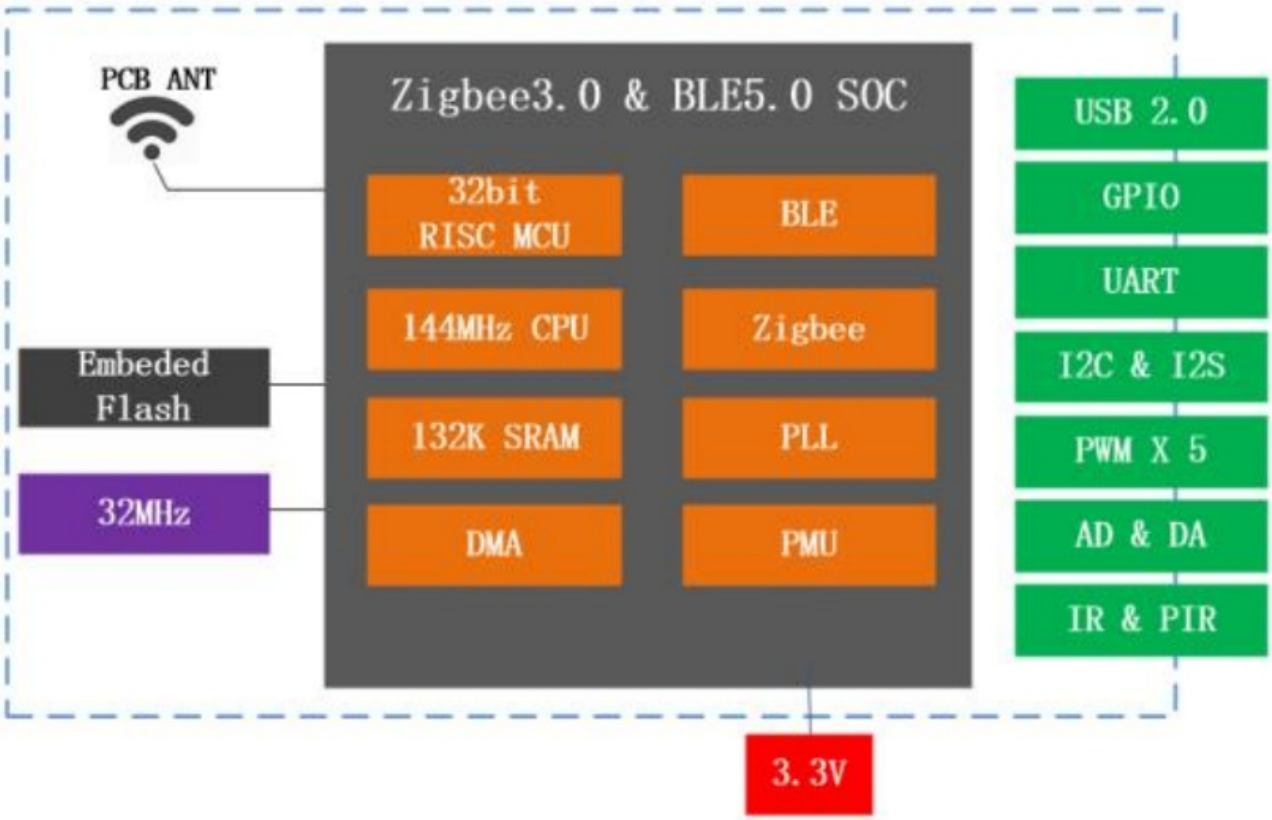


Fig.1.1 YP02 Module Structure

Technical parameters for YP02 are listed as follows.

Table 1.1 YP02 Parameters

Types	Items		Parameters	i
RF	Zigbee Sensitivity	-104 dBm@250Kbps		
	BLE Sensitivity	– 104 dBm @120Kbps		
		-100 dBm @500Kbps		
		-97 dBm @1Mbps		
		-94 dBm @2Mbps		
	TX Power	0-14 dBm		
	TX EVM	11%		

	Antenna	PCB antenna
Hardware	CPU	32-bit RISC CPU
	Interface	UART/GPIO/PWM
	Working voltage	2.5V ~ 3.6V
	Working current	3.5mA @RF only
		17mA @TX 10dBm
		45mA @TX 14dBm
	Working temperature	-40°C ~ 105°C
		-45°C ~ 135°C
	Shape	16mmx 20mmx 3mm
Software	Encryption type	AES 128/192/256
	Update firmware	UART Download
	Software develop	SDK

Interface Definition

YP02 module interface definition is shown as below

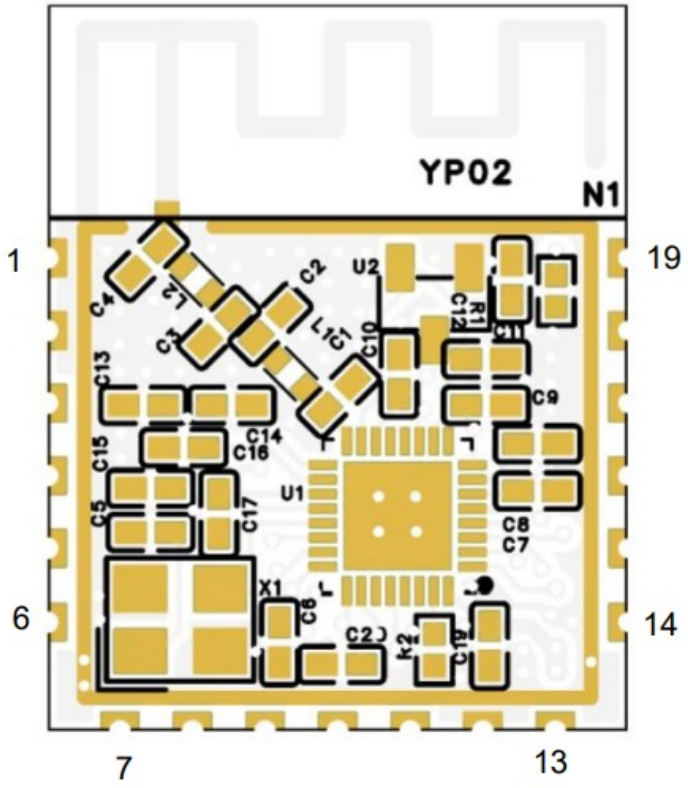


Fig.2.1 YP02 Pin Definition

Working mode and pins function are shown in Table 2.1.

Table.2.1 Working mode

Mode	D28
UART Download Mode	High
Flash Boot Mode	LOW(default)

Table.2.2 Pins Function Definition

Num.	Pin Name	Type	Function
1.2.12	GND	P	Power ground

3.7	TXD0	I/O	GPIO14 , SS, SCL, ADC_ CH5, I 2 S_ DIO, PWM_ CH4
4	RXD0	I/O	GPIO15 , SCLK, SDA, ADC_ CH1, I 2 S_ DIO, PWM_ CH 0

5	D17	I/O	GPIO17 , MISO/ MOSI, SDA,I 2 S_ FS, PWM_ CH2, DA C
6	D28	I/O	GPIO28 , MISO/ MOSI, SCL,I 2 S_ BCLK, PWM_ CH3
8	D23	I/O	GPIO23,SCLK, I2S_DI, SPI,SDA,PWM_CH3,IRTX
9	D25	I/O	GPIO25 , MISO/ MOSI,SDA,I 2 S_ FS,PWM_ CH0
10	D1	I/O	GPIO1,MISO/MOSI,SDA,I2S_FS,PWM_CH1
11	D2	I/O	GPIO2, MISO/MOSI,SCL,I2S_DIO,PWM_CH2
13	VCC		Power, 3.3V
14		I/O	GPIO0, MISO/MOSI,SCL,I2S BCLK,PWM CH0

15	D9	I/O	GPIO9, MISO/ MOSI, SDA,I 2 S_ FS, PWM_ CH4, ADC _ CH7
16	D7	I/O	USB_DP,SCLK,SDA,PWM_CH2,ADC_CH6
17	D8	I/O	USB_DM, MISO/MOSI,SCL,PWM_CH3,ADC_CH0
18	VUSB	P	USB power
19	EN	I/O	Chip enable; Built-in Pull-up

Size and Layout

Shape for YP02 can be shown as follows.

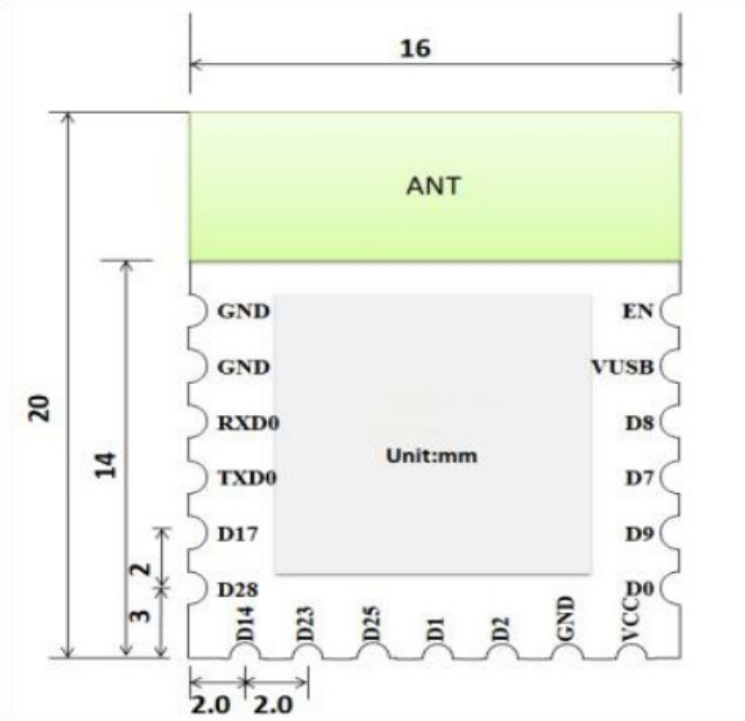


Fig.3.1 Shape for YP02

(b) Side View

ig.3.2 Size for YP02

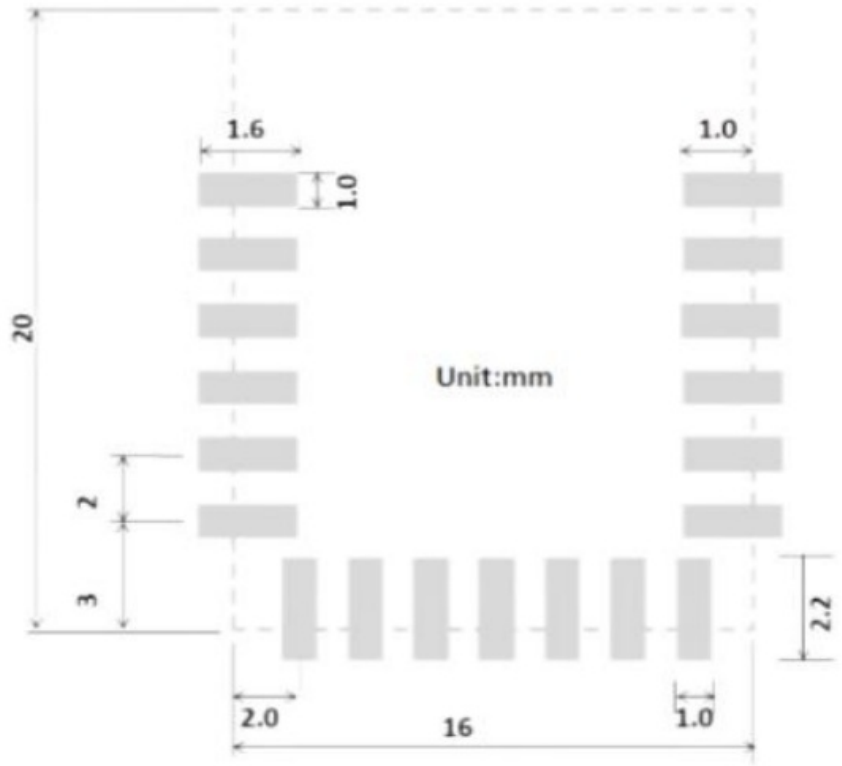


Fig.3.3 PCB Layout for YP02

Electrical Characteristics

Table 4.1 Electrical Characteristics

Parameters		Condition	Min	Classical	Max	Unit
Store Temperature		–	-40	Normal	125	℃
Sold Temperature		IPC/JEDEC J-STD-020	–	–	260	℃
Working Voltage		–	2.5	3.3	3.6	V
I/O	VIL/VIH	–	-/2.0	–	0.8/-	V
	VOL/VOH	–	-/2.4	–	0.4/-	

Electrostatic release quantity (Human model)	TAMB=25℃	–	–	2	KV
Electrostatic release quantity (Human model)	TAMB=25℃	–	–	0.5	KV

Power Consumption

Table 5.1 Power Consumption

Parameters	Min			Unit
RX only	–		–	mA
TX 0dbm	–		–	mA
TX 10dbm	–	17	–	mA
TX 14dbm	–	45	–	mA
Run in RAM @RC32M 144MHz	–	8.44	–	mA
Run in RAM @RC32M 32MHz	–	3.36	–	mA
Run in FLASH @RC32M 144MHz	–	7.72	–	mA
Run in FLASH @RC32M 32MHz	–	3.39	–	
Hibernate Mode	–	1.2	–	
Shut Down	–	0.1	0	uA

RF Characteristics

The data in the following Table are gotten when voltage is 3.3V in the indoor temperature environment.

Table 6.1 RF Characteristics

Parameters	Min	Classical	Max	Unite
TX				
TX Power	0	0	14	dBm
TX EVM	–	11	13	%
Sensibility				
Zigbee @250Kbps	–	-104	–	dBm
BLE @125Kbps	–	-104	–	dBm
BLE @500Kbps	–	-100	–	dBm
BLE @1Mbps	–	-97	–	dBm
BLE @2Mbps	–	-94	–	dBm

Recommended Sold Temperature Curve

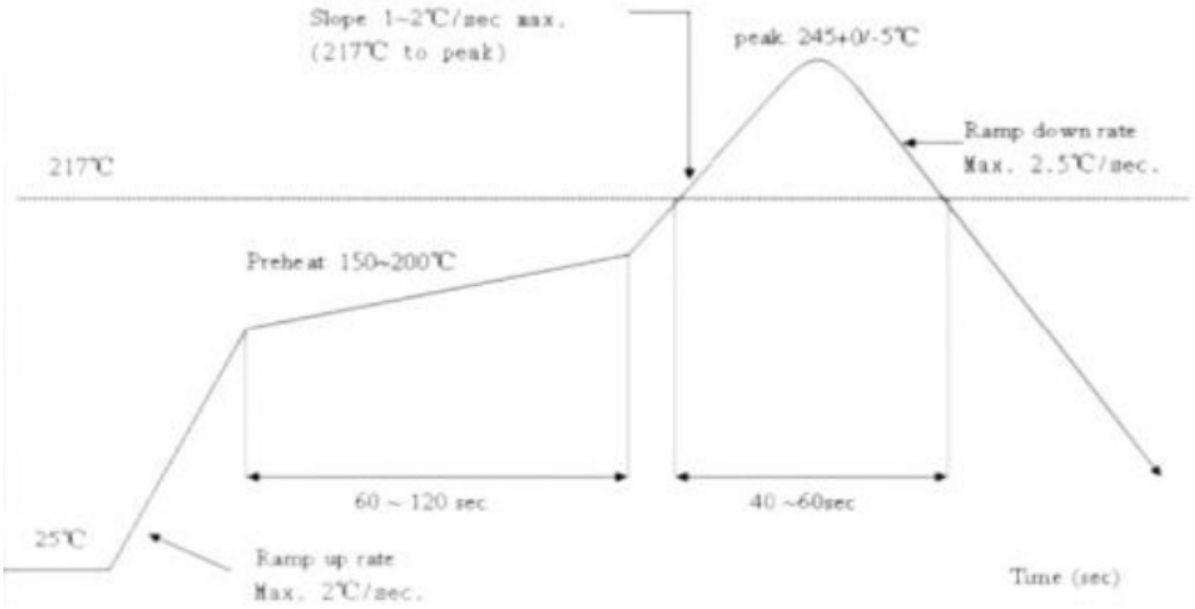


图 7. 1 Temperature Curve when Sold

Minimum User System

This module can work just at 3.3V working voltage:

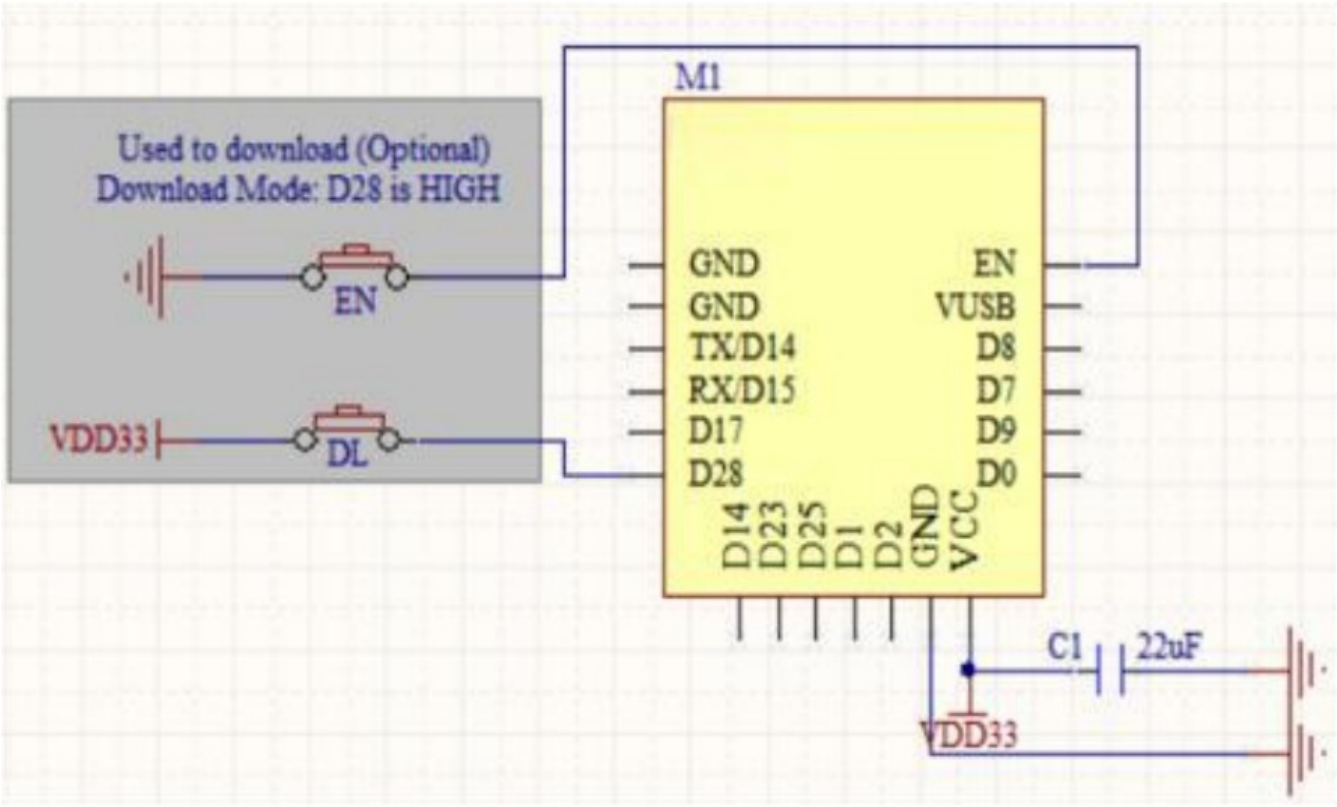


Fig.8.1 Minimum system

Note

1. The working voltage for module is DC 3.3V;
2. The max current from IO of this module is 12mA;
3. Zigbee module is at download mode: D28 are High level, then module reset to power on;
4. Zigbee module is connected to RXD of the other MCU, and TXD is connected to RXD of the other MCU.

The Recommended PCB Design

YP02 module can be sold on PCB board directly. For the high RF performance for the device, please notice the placement of the module. There are three ways to use the module for RF Module with PCB antenna.

Solution 1: optical solution. The RF module is placed on the side of the board, and the antennas are all exposed, and there is no metal material around the antenna, including wires, metal casings, weight plates, and the like.
Solution 2: sub-optical solution. The RF module is placed on the side of the board, and the antenna below is hollowed out. There is a gap of not less than 5 mm reserved with the PCB, and there is no metal material around the antenna, including wires, metal casings, weight plates, and the like.
Solution 3: The RF module is placed on the side of the board, and the PCB area under the antenna is empty, and copper cannot be laid.

Peripheral Design Suggestion
YP02 module is already integrated into high-speed GPIO and Peripheral interface, which may be generated the switch noise. If there is a high request for the power consumption and EMI characteristics, it is suggested to connect a serial 10~100 ohm resistance, which can suppress overshoot when switching power supply, and can smooth signal. At the sametime, it also can prevent electrostatic discharge (ESD).

The others information

- FCC ID : 2BOSO-YP02

- IC ID : 33844-YP02
- HVIN : YP02

FCC Statement

FCC standards: FCC CFR Title 47 Part 15 Subpart C Section 15.247

PCB antenna with antenna gain 1dBi

- A: This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions:
  1. This device may not cause harmful interference, and
  2. This device must accept any interference received, including interference that may cause undesired operation.
- B: Any Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.
- C: Note: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:
  - Reorient or relocate the receiving antenna.
  - Increase the separation between the equipment and receiver.
  - Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
  - Consult the dealer or an experienced radio/TV technician for help.

FCC Radiation Exposure Statement

The modular can be installed or integrated in mobile or fix devices . This modular cannot be installed in any portable device if without further certification such as C2PC with

SAR. This modular complies with FCC
RF radiation exposure limits set forth for an uncontrolled environment. This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter. This modular must be installed and operated with a minimum distance of 20 cm between the radiator and user body.

If the FCC identification number is not visible when the module is installed inside another device, then the outside of the device into which the module is installed must also display a label referring to the enclosed module. This exterior label can use wording such as the following: “Contains Transmitter Module FCC ID: 2BOSO-YP02 Or Contains FCC ID: 2BOSO-YP02”
The devices must be installed and used in strict accordance with the manufacturer’s instructions as described in the user documentation that comes with the product.
Any company of the host device which install this modular with modular approval should perform the test of radiated & conducted emission and spurious emission,etc. according to FCC part15B Class B requirement, Only if the test result comply with FCC part 15B Class B requirement then the host can be sold legally.
When the module is installed inside another device, the user manual of the host must contain above

Paragraphs A, B, and C warning statements.

IC STATEMENT
A: This device contains licence-exempt transmitter(s)/receiver(s) that comply with Innovation, Science and Economic Development Canada’s licence-exempt RSS(s). Operation is subject to the following two conditions:

1. This device may not cause interference.
2. This device must accept any interference, including interference that may cause undesired operation of the device

IC Radiation Exposure Statement
This modular complies with IC RF radiation exposure limits set forth for an uncontrolled environment. This transmitter must not be co-located or operating in conjunction with any other & antenna or transmitter. This modular must be installed and operated with a

minimum distance of 20 cm between the radiator and user body.

If the IC number is not visible when the module is installed inside another device, then the outside of the device into which the module is installed must also display a label referring to the enclosed module. This exterior label can use wording such as the following: “Contains IC: 33844-YP02” when the module is installed inside another device, the user manual of this device must contain Above paragraph A&B warning statements .

The devices must be installed and used In strict accordance with the manufacturer’s instructions as described in the user documentation that comes with the product.

FAQ

- **Q: What are the working voltage and current for YP02?**
  A: The working voltage is 2.5V to 3.6V, and the working current is 3.5mA @ RF only.
- **Q: What are the sensitivity and TX power of YP02?**
  A: Zigbee sensitivity is -104 dBm @250Kbps, BLE sensitivity ranges from -104 dBm to -94 dBm at different RF rates. TX power is from 0 to 14 dBm.
- **Q: What are the main applications of YP02?**
  A: YP02 is suitable for serial transparent transmission, smart power plug/LED light control, sensor networks, and industrial wireless control.

Documents / Resources

	Duinolk YP02 TWI SPI Serial Interface Module [pdf] User Manual YP02, 2BOSO-YP02, 2BOSOYP02, YP02 TWI SPI Serial Interface Module, YP02 TWI, SPI Serial Interface Module, Interface Module, Module

References

- User Manual

2BOSO-YP02, 2BOSOYP02, Duinolk, Interface Module, Module, SPI Serial Interface Module, YP02, YP02 TWI, YP02 TWI SPI Serial Interface Module

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