the IOT Controller

(USR-IOT1)
(USR-IOT2)

File version: V1.0.5

Jinan USR IOT Technology Limited. works on LAN and WAN and wireless for IOT and Serial to Ethernet Solutions, Ethernet, WIFI, GPRS, and Wireless modules, we can supply custom design for those usage, looking forward to cooperate with you.

Contents

1. Introduction

1.1. Overview

The USR-IOT1 is a central control unit for intelligent home. Hardware form is an core board and have many kinds of interfaces such as IO, PWM, self-definiable webpages, sensor device(not support for now), Serial to ethernet.

You can use common tcp or udp way to send control command, or use webpages to send data to uart or reveice data, handle IO etc.

Keywords:
IOT Ethernet IO webpage

1.2 Features

- Up to 24 channel configurable IO，3.3V TTL
- Up to 2 channel PWM
- 2 channel Serial to Ethernet Port, can set COM port and working mode independently, work
- Built-in webpages with language CN and EN
- Support user-defined webpages
- Support WEB IO
- Support WEB Uart
- Free setup softuare
- Support USR sensor node(USR-WSD, Modbus protocol)
- New Cortex-M3 kernel, industrial working temperature range, elaborate optimization LWIP protocol stack, stable and reliable.
- Serial port support RTS/CTS hardware flow control.
- Auto-MDI/MIDX function, discretionarily connect cross-over or direct network cable, automatic switching.
- Support TCP Server, TCP Client, UDP, UDP Server, HTTPD Client various of work modes.
- Support virtual serial work way, provide corresponding software.
- Serial port highest baud rate from 110bps to 1024000bps.
- 5V power input
- Support DHCP automatically access IP, can inquire the facility within network through the UDP broadcast protocol.
- Supply the protocol for VIP customers, can integrate parameter seting function to user software applications.
- Provide PC TCP/IP SOCKET programming example, VB, C++, Delphi, Android, IOS.
- Support parameter setting via web pages, can customize web pages for users.

- Can also set via UDP, provide the set up protocol and software source demo code.
- Reload pin, pull down when power on ca restore default Settings.
- RJ45 status indicator light, RJ45 interface built-in isolation transformer, 2 KV isolation.
- The global only MAC address bought from IEEE, the user can modify MAC address you wanted(in misc web pages).
- Support upgrade firmware via network.
- Support upgrade webpages via network
- Support IP and domain name at the same time
- Support up to 5 link from client when act as TCP Server, send and receive data with or no id.
- Can modify http server port for module built-in web pages.
- Support Keepalive.

1.2. Applications

- Fire and Security Panels
- Vending Machines
- Point of Sale Terminals
- Remote equipment management
- IT management services
- Access Control
- Industrial Control
- Home Automation
- Instrumentation
- Building Control
- Power Management

1.3. Order information

Type	Part Numbers	Electric interface
the IOT Core Controller	USR-IOT1	TTL

Diagram 1-1 Order information

List:
USR-IOT1 coreboard ------- 1

1.4. Electrical characteristics

DC Power Supply Voltage: DC 5V
Operating supply current : Max 200 MA, average 150mA
Operating Temperature: -25~75 ℃ (industry version)
Storage temperature: -40~85 °C

2. Quick use

2.1. Power on

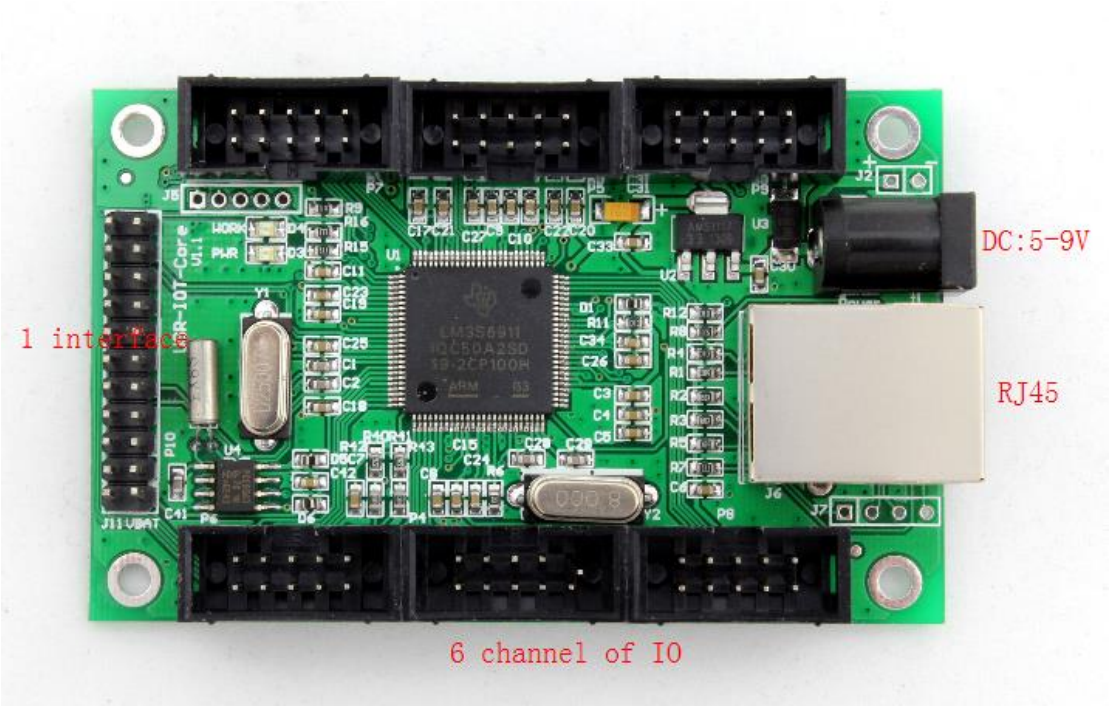


Diagram 2-1 hardware

Support IOT1 with DC5V adaptor(or 2.54 power connector, supply more than 150mA current), you will see the POWER LED(red) on and WORK LED(green) twinkle every 1 second, indicating that IOT1 device has work normally.

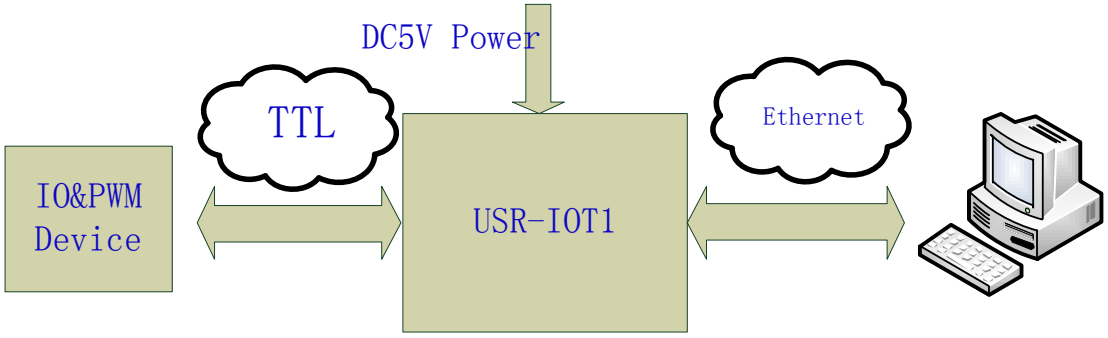


Diagram 2-2 connect

2.2. Connect and login in

Then, connect IOT1 with your computer using network cable, set your PC with static IP such as 192.168.0.10, Open brower and input 192.168.0.7 which is IOT1 default IP, then enter,we will

see:

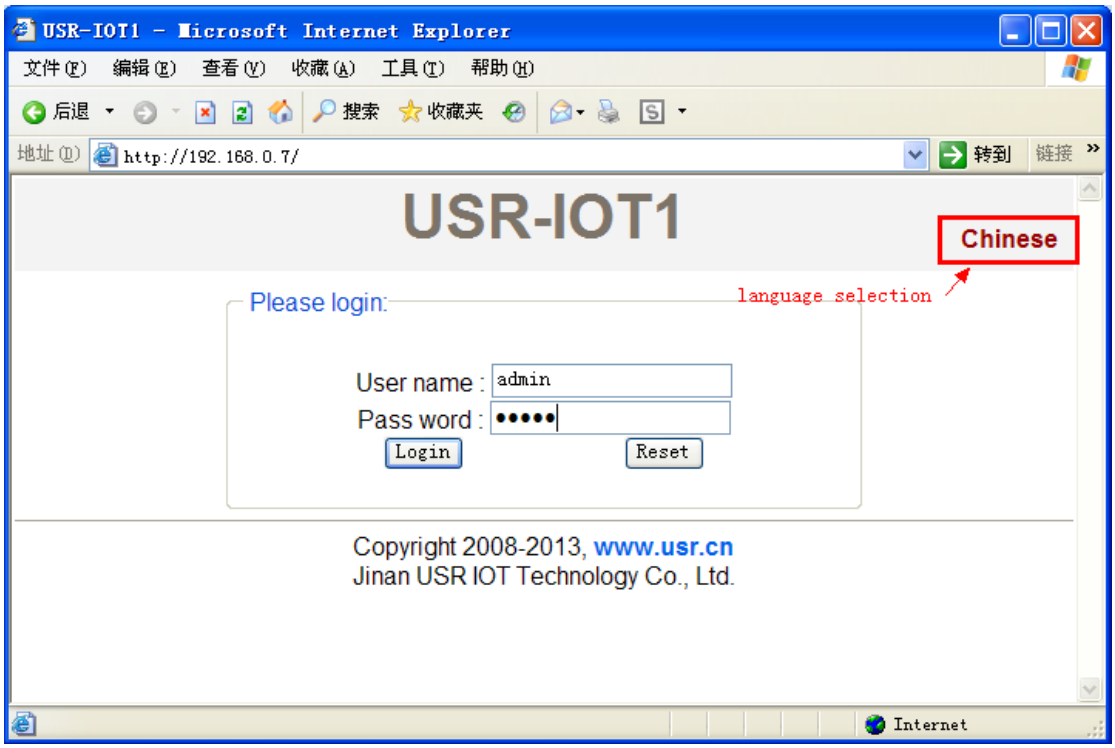


Diagram 2-3 login in page

Default user name: admin

Default pass word: admin

Click login, we will enter this page, shows status such as current IP and MAC address etc.

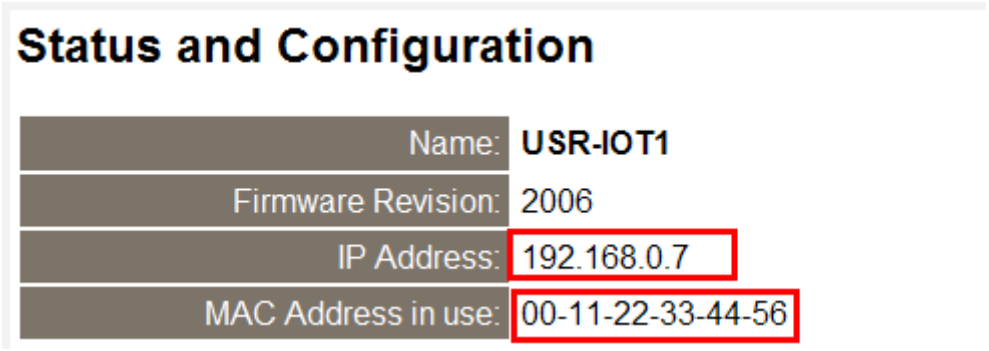


Diagram 2-4 current status

On the left is the page index

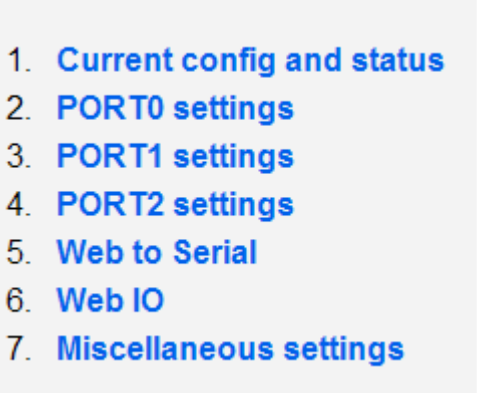


Diagram 2-5 page index

1) Current config and status
2) PORT0 settings: first serial to ethernet
3) PORT1 settings: second serial to ethernet
4) PORT2 settings: the IOT communication channel
5) Web to Serial: receive or send data from webpage
6) Web IO: config and use IO from webpage
7) Miscellaneous settings: including IP or module etc.

2.3. Use WEB IO

Click WEB IO on the left and open WEB IO page.

Diagram 2-6 WEB IO

Default IO configuration is 1 channel output and 1 channel output, check the IO pin table we can see the output pin is PE0 and input pin PE1. “GREEN” represent logic “1” and “RED” represent logic “0” .

Connect your IO devices such relay(with TTL interface) or key, click Output “1” will see the relay switch; the page will automatically refresh input status.

3. Paramters configuration

3.1. Web page

You can config IP, serial to ethernet, WEB IO or WEB Uart through webpages.

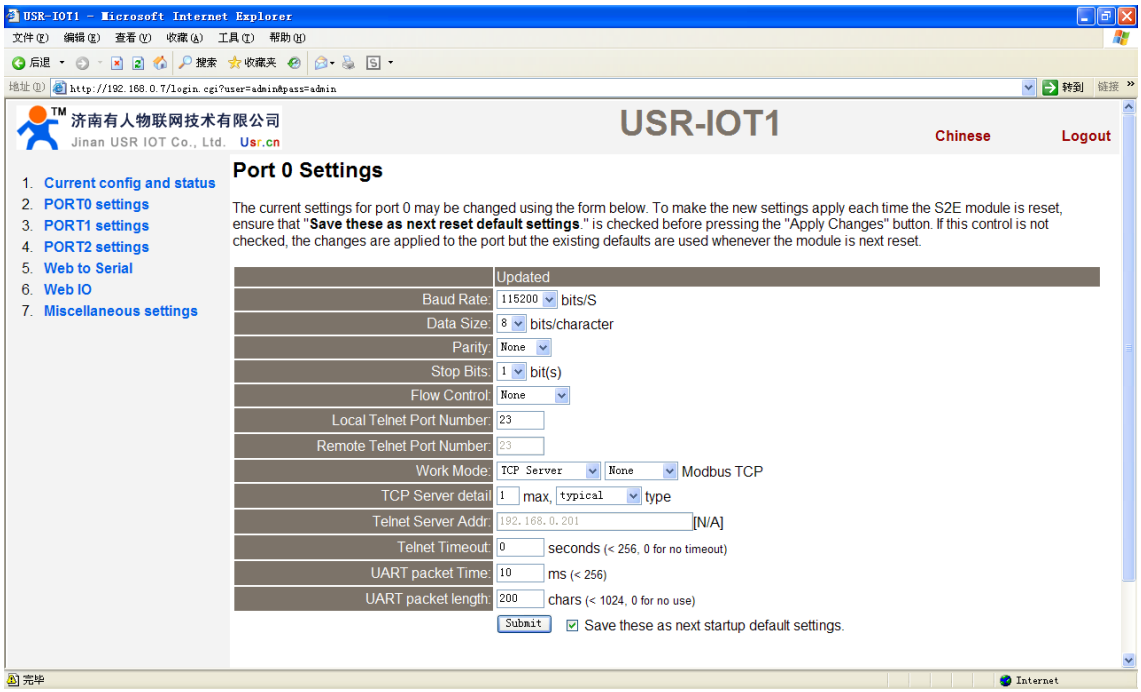


Diagram 3-1 config through webpage

3.2. Software

Downbelow is the Setup for USR-IOT1

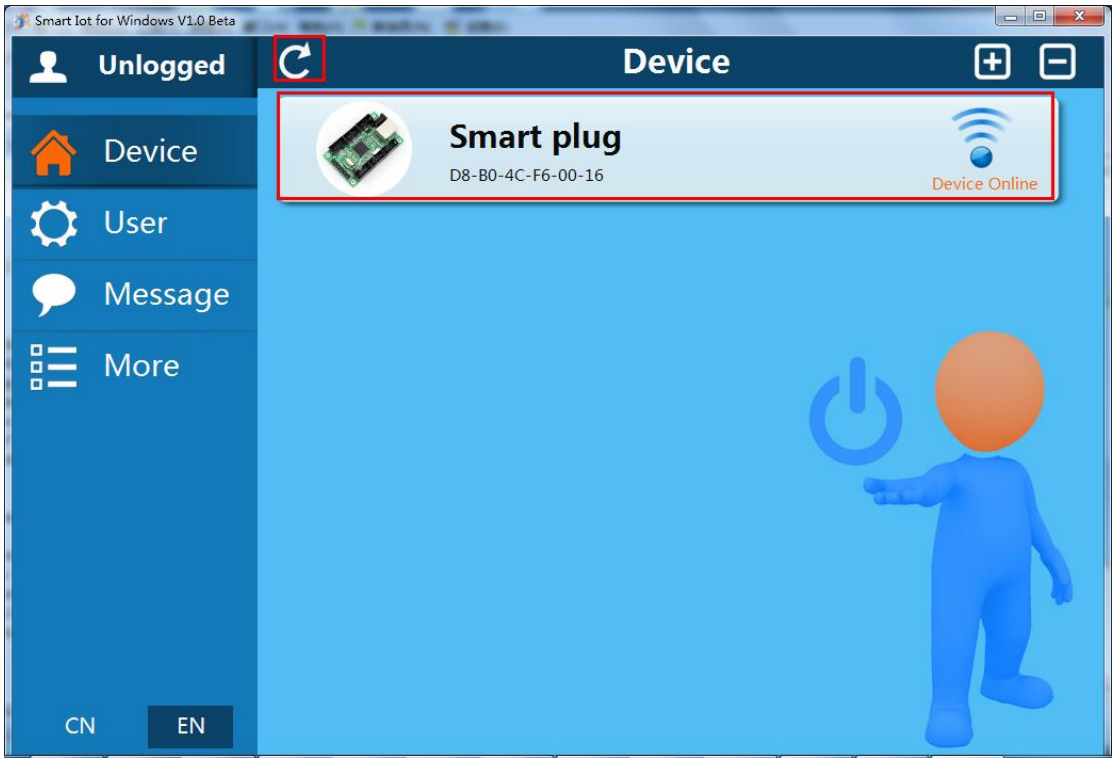
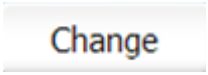


Diagram 3-2 Setup software

(1)Click  to search IOT device in local network

(2)Select device in search list, software will connect to device

(3)Click  and enter device configuration to config resources

(4)Click  to save current config

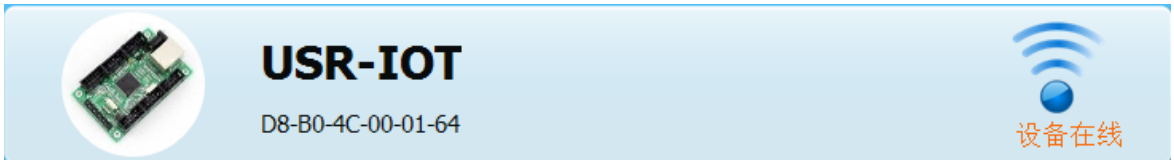


Diagram 3-3 connect device

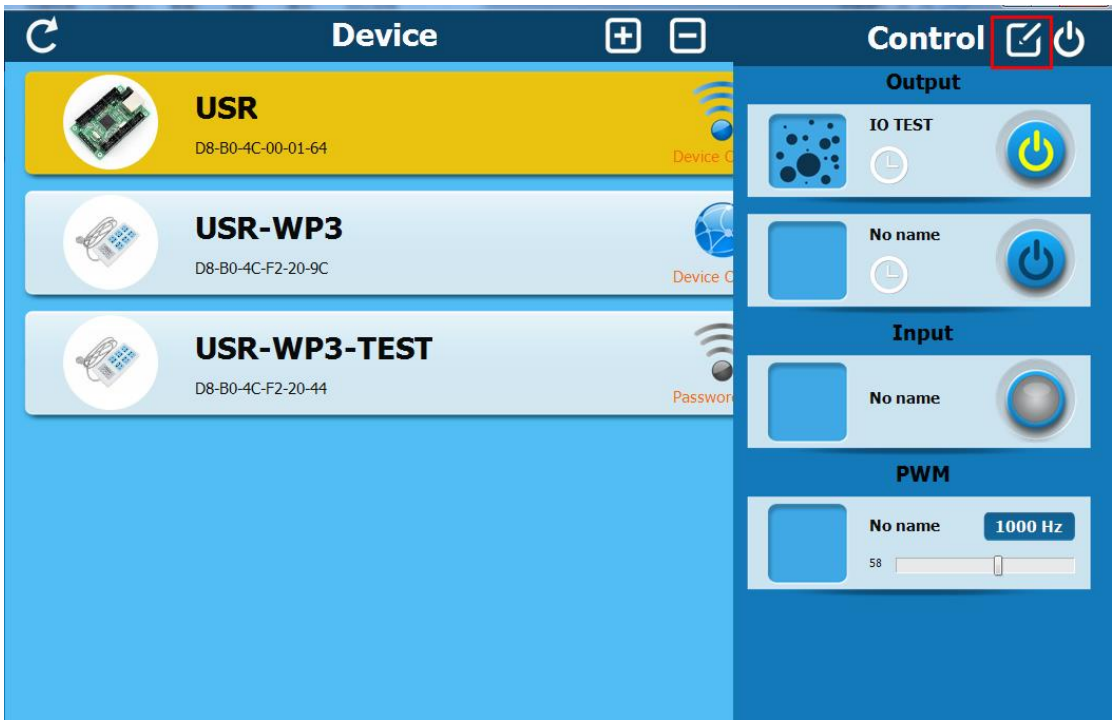


Diagram 3-4 IO resources

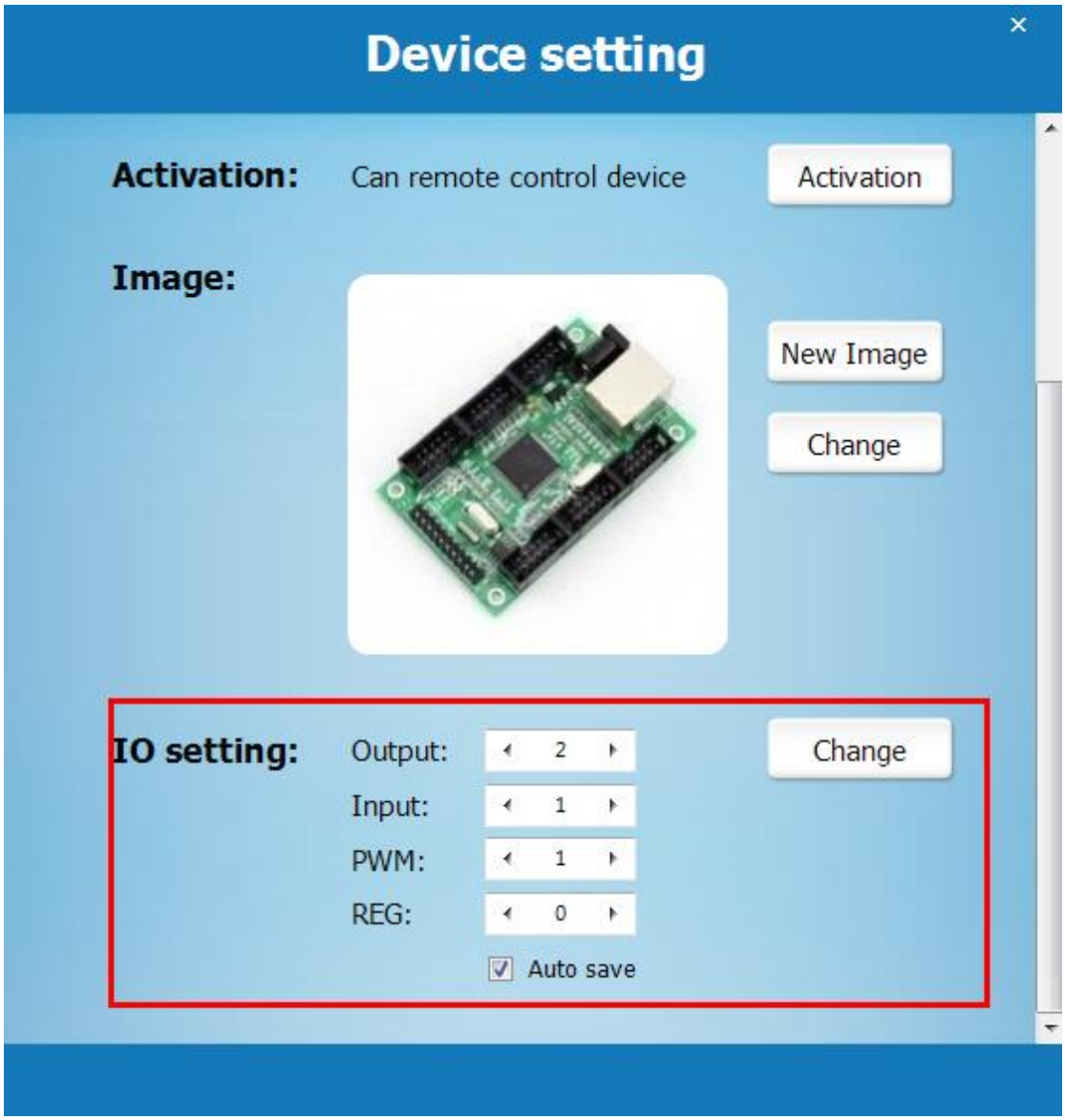


Diagram 3-5 Config resources

4. Function use

4.1. IO

The IO features

1) 3.3V TTL, All IO tolerate 5V
2) 8mA max pin drive current
3) Output timing Func

IO distribution:

When distribute IO, all output in front and input at end. Take for example, if we config 2 output and 1input, check **IO table**, we will see PE0 and PE1 was allocated as Output1 and Output2, PE2 was allocated as Input1.

4.1.1. WEB IO

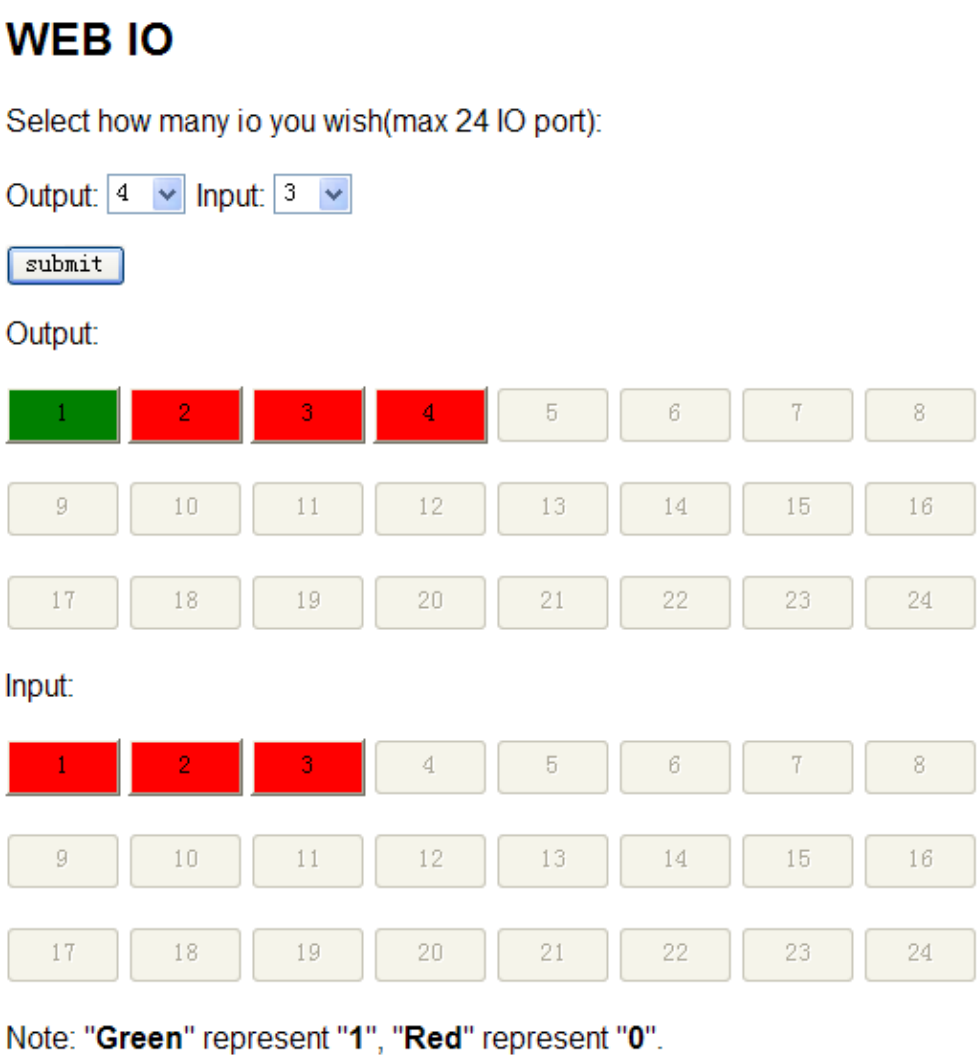
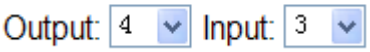


Diagram 4-1 WEB IO

After WEB IO page opened, the page will refresh all IO status every 2 seconds. “submit” input and output number 

,will save these config into IOT1 device, if you want to save Output status after next reset too, please use the software 

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4.1.2. Software IO

Diagram 4-2 2 Output and 1 Input

- The click on  will change the output io status
- When input status change, the  icon will display.
- The Output can be used as timing func, click  and will show the dialog.

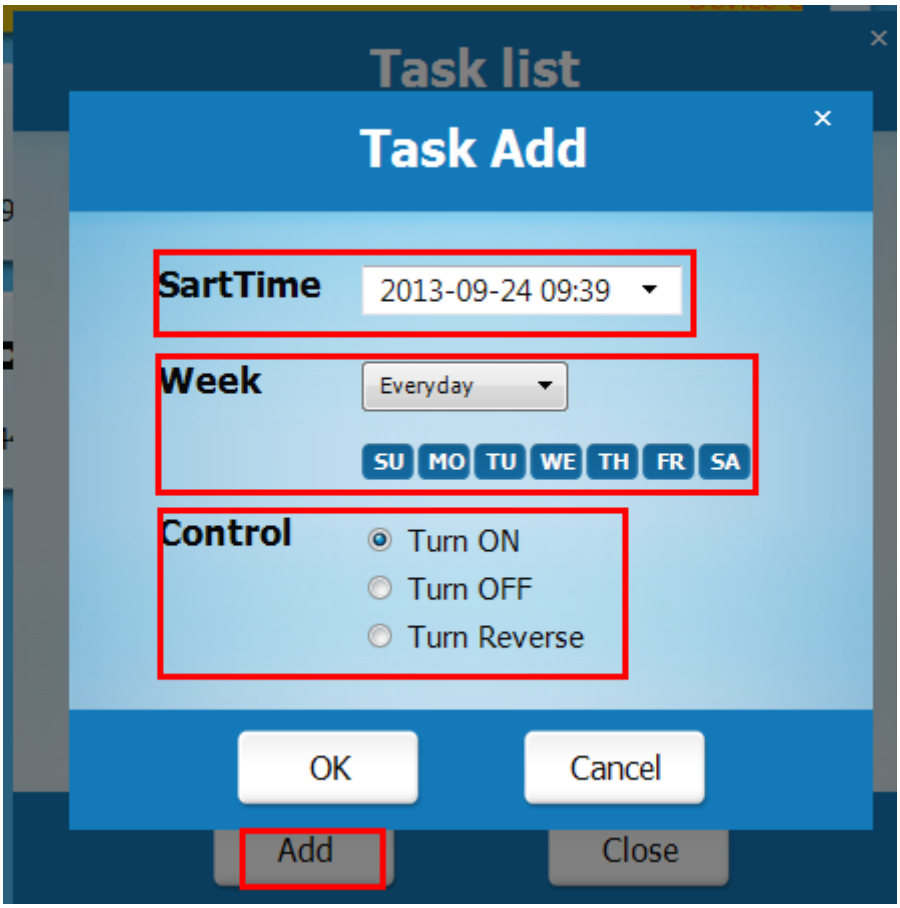


Diagram 4-3

There is an demo MV below:

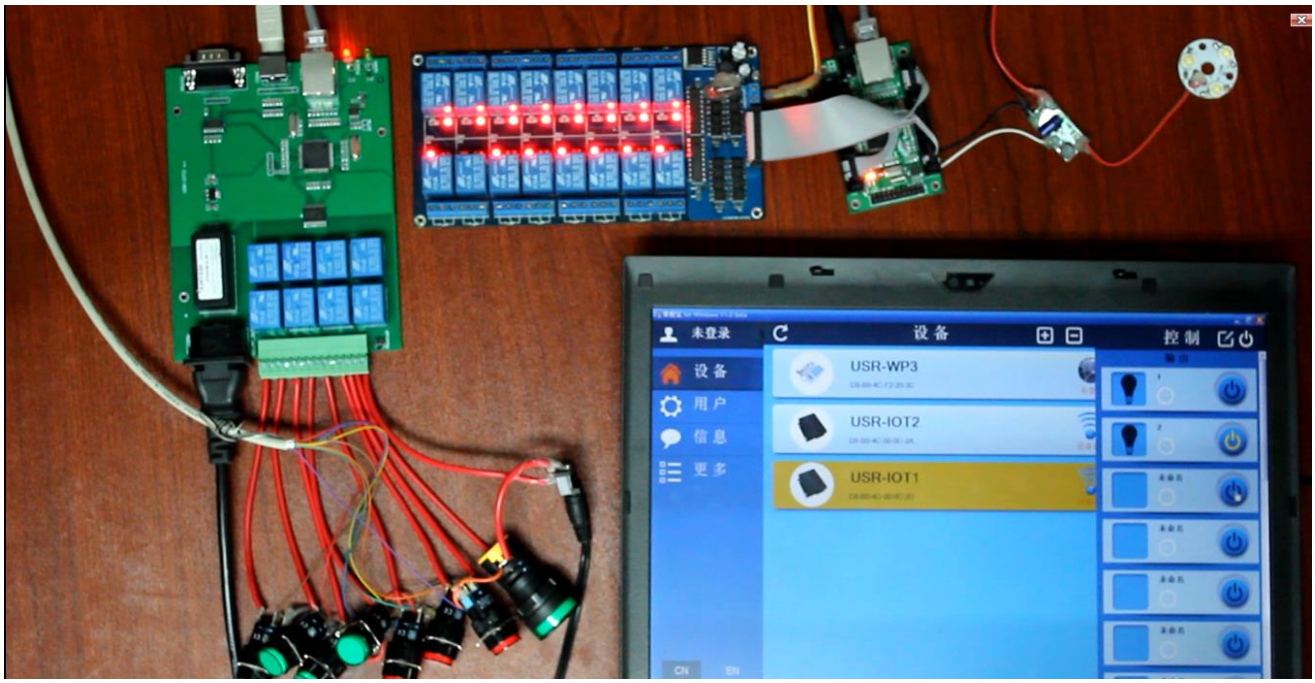


Diagram 4-4 MV

There is an MV at: **http://v.youku.com/v_show/id_XNjIxMzAxMDUy.html**

4.1.3. IO table

IO index	Pin name
1	PE0
2	PE1
3	PE2
4	PE3
5	PE4
6	PE7
7	PC5
8	PC6
9	PD0
10	PD1
11	PD4
12	PD5
13	PD6
14	PD7
15	PB2
16	PB3
17	PB4
18	PB5
19	PB6
20	PB7
21	PA4
22	PA5
23	PE5
24	PE6

Diagram 4-5 IO table

4.2. PWM

4.2.1. Software configuration

PWM can only be used through software, features are

1) Each channel’s frequency and duty cycle can be modified.
2) Frequency ranges from 800Hz ~ 100KHz, steps by 1Hz.

1. Pulse width can be changed online.
2. Up to 2 channels, must have same frequency, width can be different.

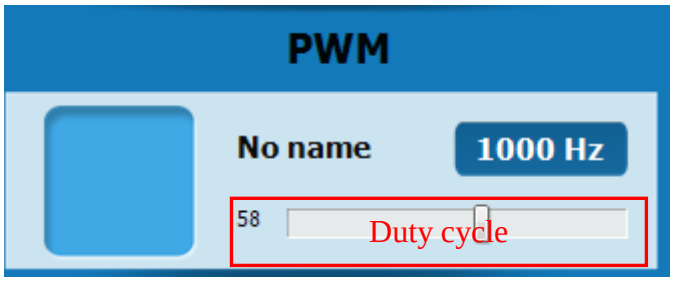
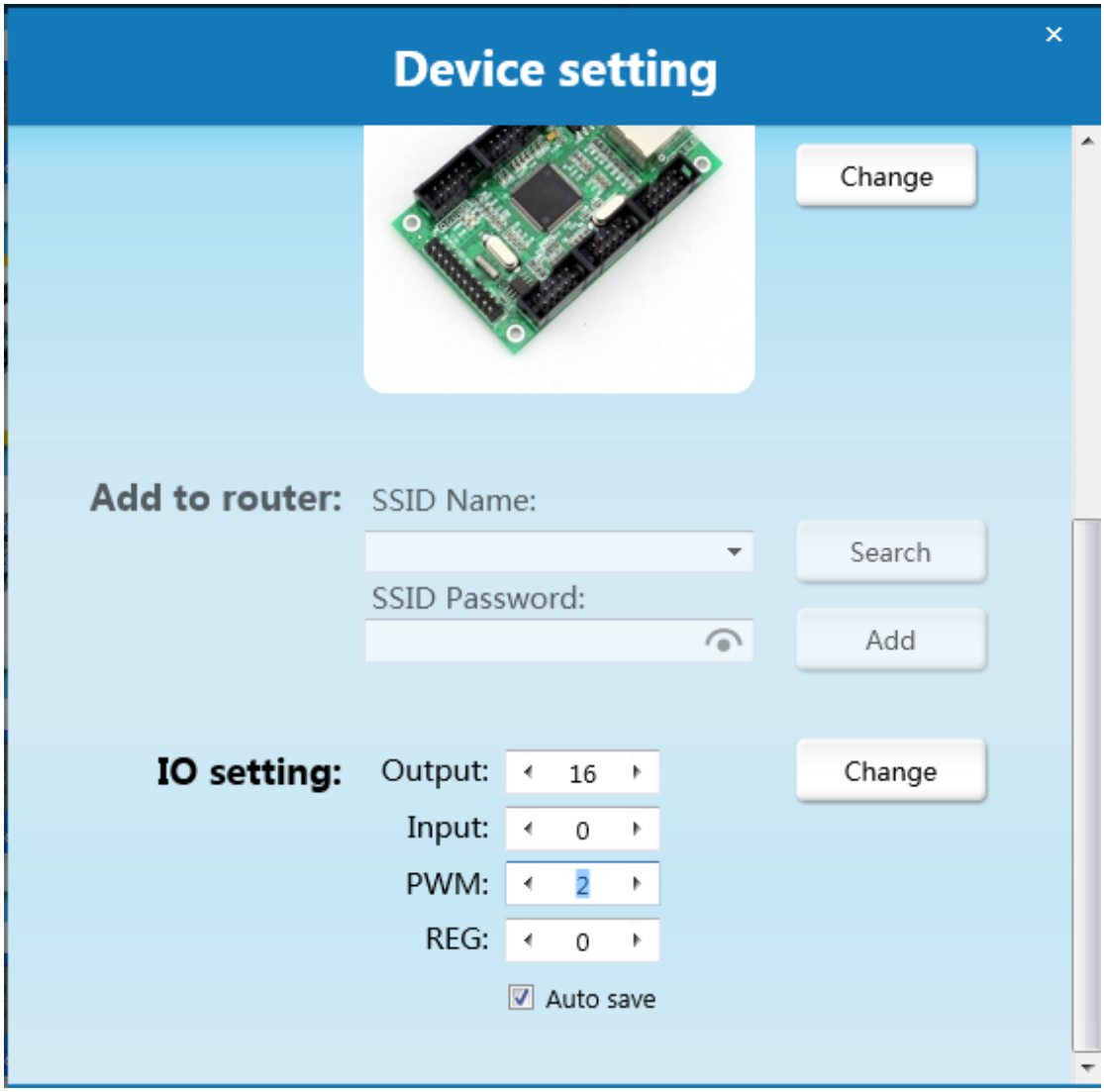


Diagram 4-6 PWM control

Default PWM number is 0. Users can change it in device setting dialogue.



There is an MV about IOT at: **http://v.youku.com/v_show/id_XNjIxMzAxMDUy.html**

4.2.2. PWM pin table

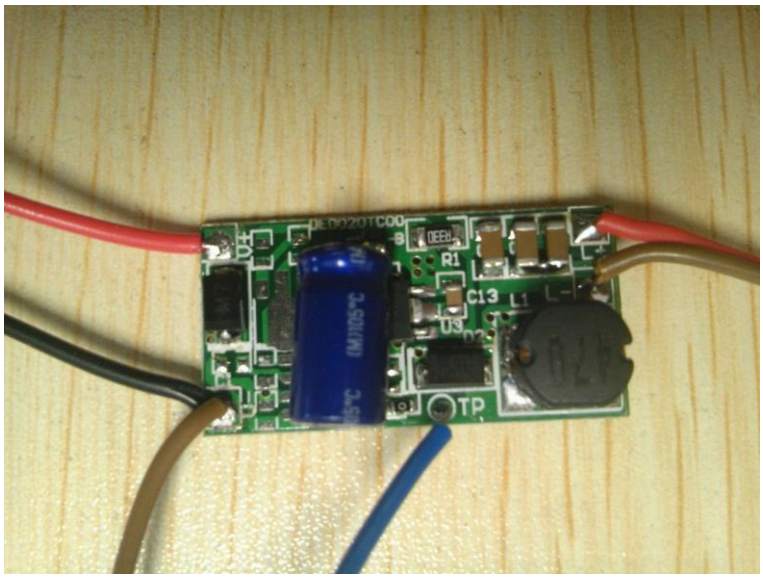
index	Pin name
PWM1	PC7
PWM2	PC4

4.2.3. Application (LED dimming)

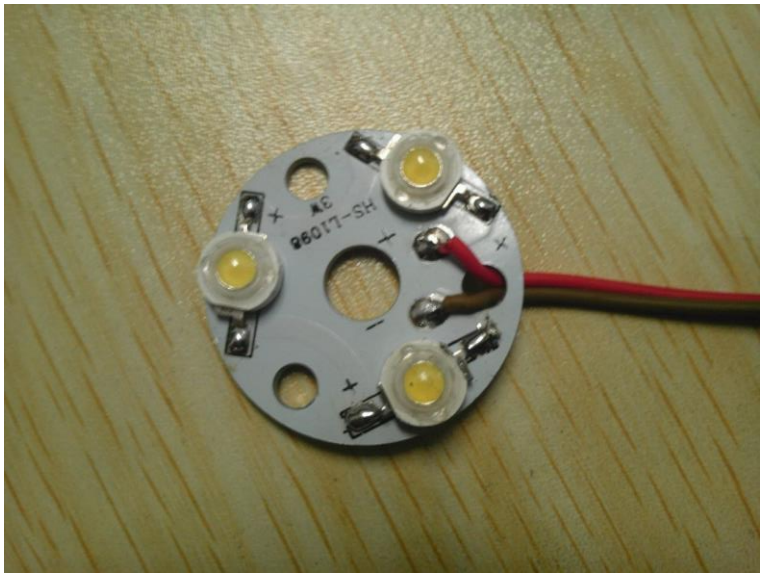
- Circuits configuration;

USR-IOT1 ×1

PWM dimmer(output current:300mA) ×1



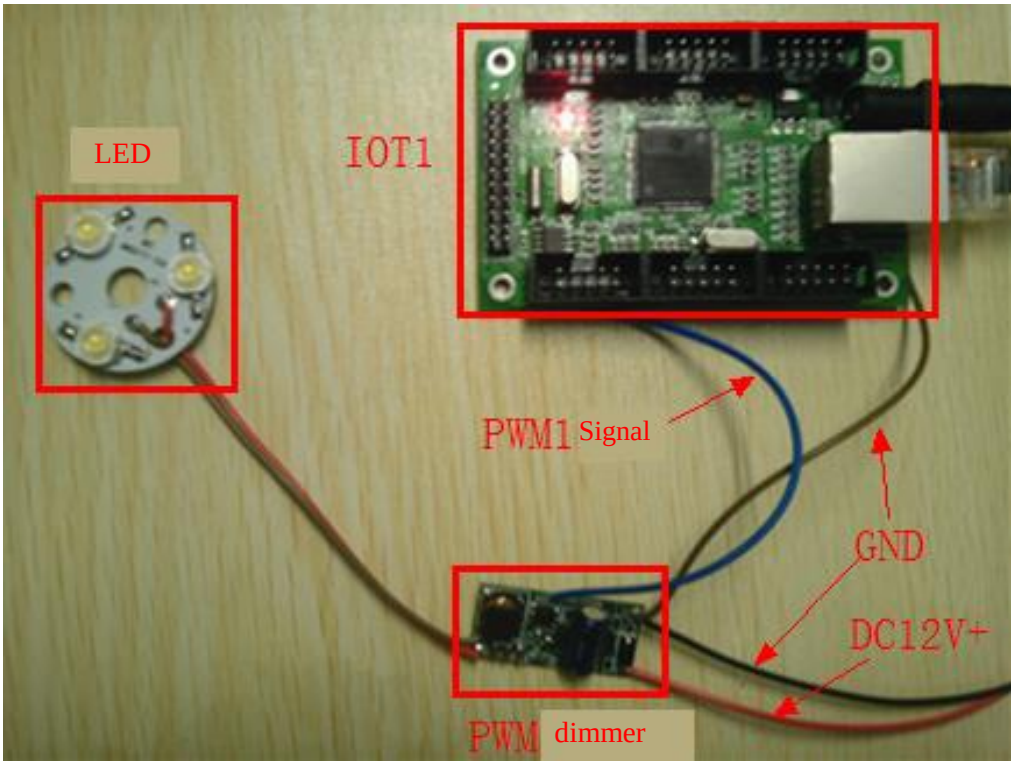
1Walt LED（work voltage：3.2V-3.6V work current：350mA）×3



- Connection

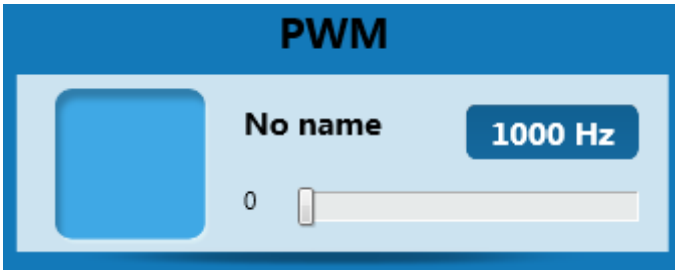
Supply IOT1 with DC 5V by power adater. Connect the IOT1 with your computer using

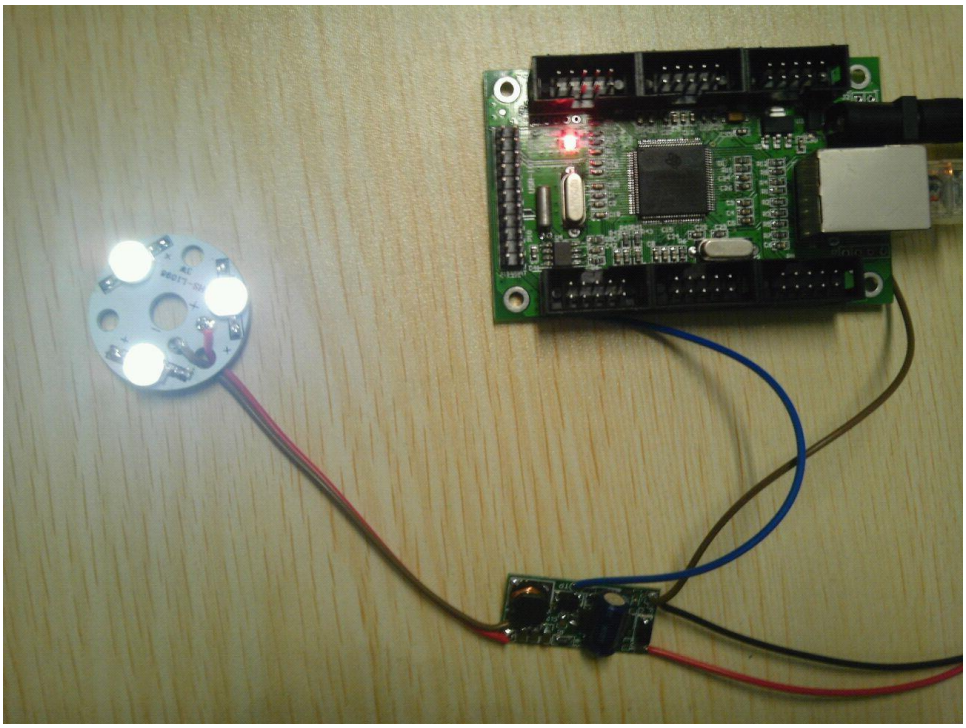
network cable。Supply PWM dimmer with DC 12V by power adapter, connect LED with output of dimmer. The PWM signal input connect to the pin PWM1 of IOT1, that is PC7, and IOT1 have common GND with dimmer.



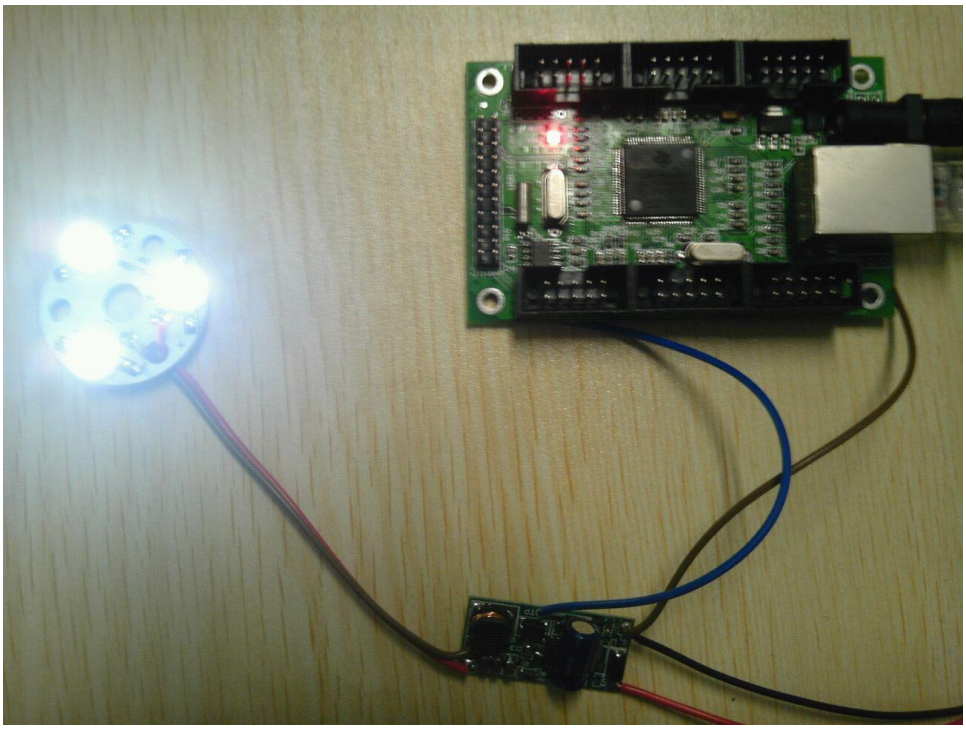
Open smart IOT software, configure IOT1 with one PWM channel, here we set 1KHz frequency for dimmer requirement.

Drag the progress bar of duty cycle from 0 to 100, you will find LED glow brighter.





5% duty cycle



50% duty cycle

4.3. webpage

With built-in webpage, 2 language can be selected. Customer can also develop webpage of WEB IO and WEB Uart.

Note:

1) **Current Webpage size is 93K Byte(bin file), maximum 133K Byte**
2) **All webpage is aquaired by mothods of HTTP GET!**

4.3.1. How to upgrade webpage

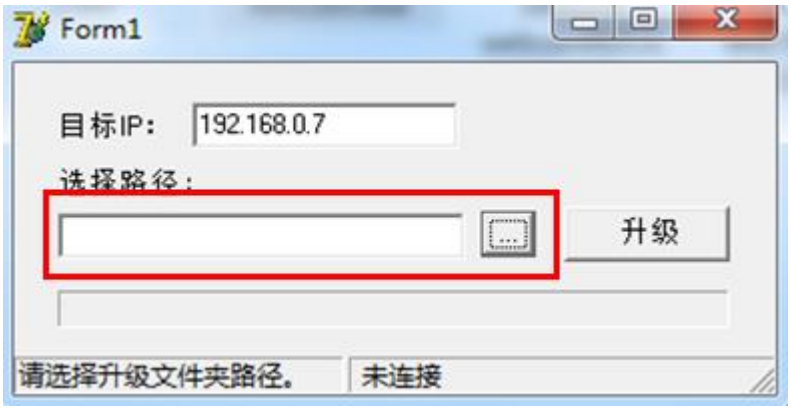


Diagram 4-7 upgrade webpage

There will be an dialog for update, select path for webpage folder(max 30 files, only WEB IO and WEB Uart can be modified)

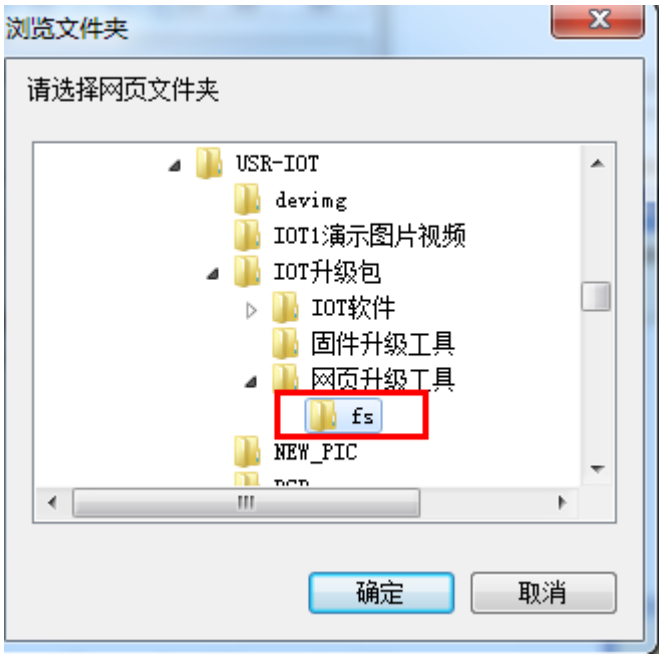


Diagram 4-8 update dialog

Note:

1) Max space for WEB IO and WEB Uart can not exceed 50KBytes

4.3.2. "/webio.shtml"

（cn page: "/webiocn.shtml"）

Form name	Form detail name	CGI	explaination	Data flow direction
"webio"	webio.outnum	webio.cgi	Max output number	<->
	webio.innum	webio.cgi	Max input number	<->
"data"	------	webiow.cgi	Toggle one output. server will toggle this output and return status of all IO including this one. （data>'1'&&data<'24'）	client -> server

Note：

1) If you want to refresh IO status, can send periodically(every 2 seconds) to server with"./webiow.cgi?data=0", because data is 0, so it won't change any pin status and can refresh status.
2) "Outnum" and "innum" was used to submit output and input max number or read it。
3) Use HttpRequest。

4.3.3. "/webiodata.shtml"

Form name	Form detail name	CGI	explaination	Data flow direction
"wiodat"	---	webiow.cgi	All current IO status	server -> client

注：

1) "wiodat" is the IO status which server send to client. Lower bit is the first IO, upper is the second ... This data is trigger by client send"./webiow.cgi?data=".
2) Use HttpRequest。

4.3.4. "/uart.shtml"

WEB to Uart webpage

Form name	Form detail name	CGI	explaination	Data flow direction
port	---	uartw.cgi	Comm port （0,1,2）	client -> server
type	---	uartw.cgi	Data type （0 for ascii;1 for hex）	client -> server
data	---	uartw.cgi	Data send to uart	client -> server

port	---	uartr.cgi	Comm port	client -> server
type	---	uartr.cgi	Data type（0 for ascii; 1 for hex）	client -> server
data	---	uartr.cgi	Data send to uart	client -> server

注：

1) Send to device uart： "./uartw.cgi?data=www.usr.cn&port=1&type=1"。
2) Read from device uart： "./uartr.cgi?clr=0&port=1&type=1"。
3) Type：1 for HEX；0 for ASCII

4.3.5. "/uartdata.shtml"

WEB to Uart: data read from uart

Form name	Form detail name	CGI	explaination	Data flow direction
"uartdata"	---	Uartw.cgi / uartr.cgi	Data read from uart	Server -> client

Note：

1) Read data from uart

5. Hardware interface

5.1. USR-IOT1

5.1.1. Hardware size

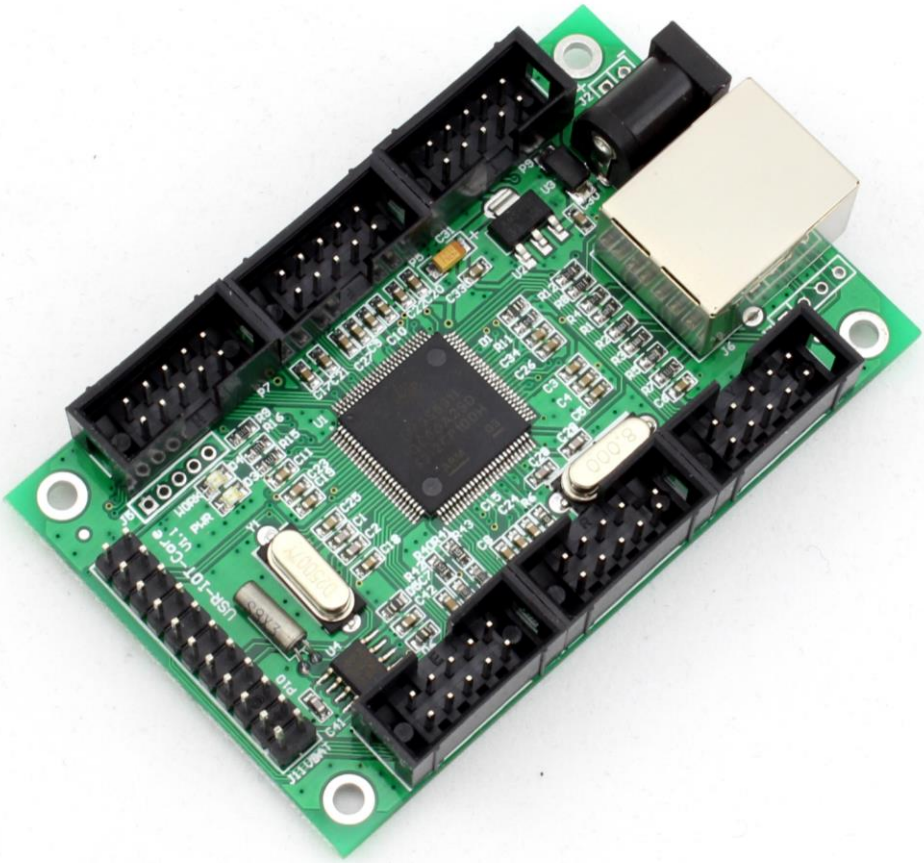


Diagram 5-1 USR-IOT1 view from top

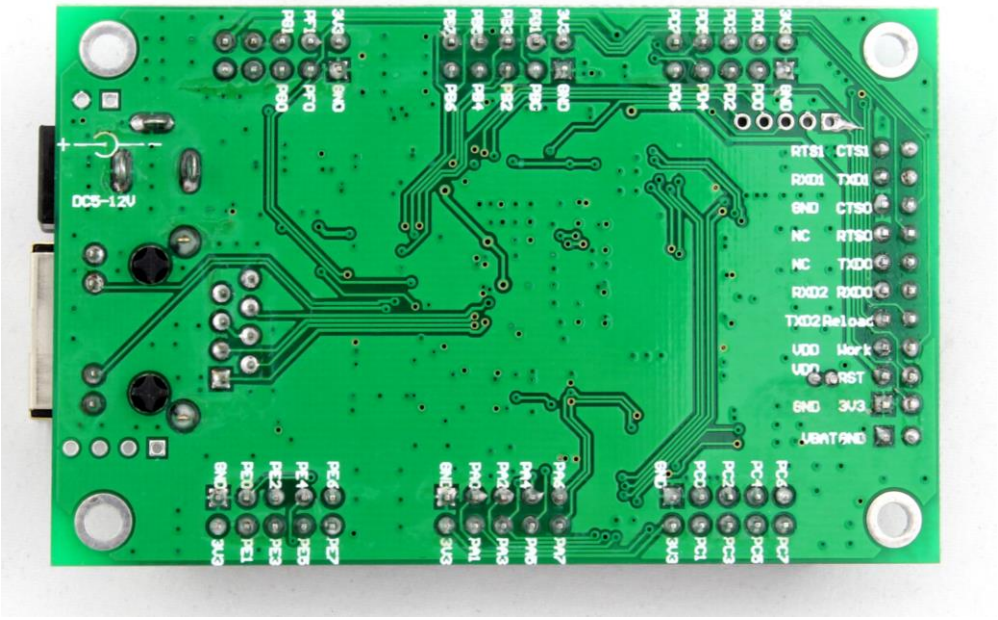
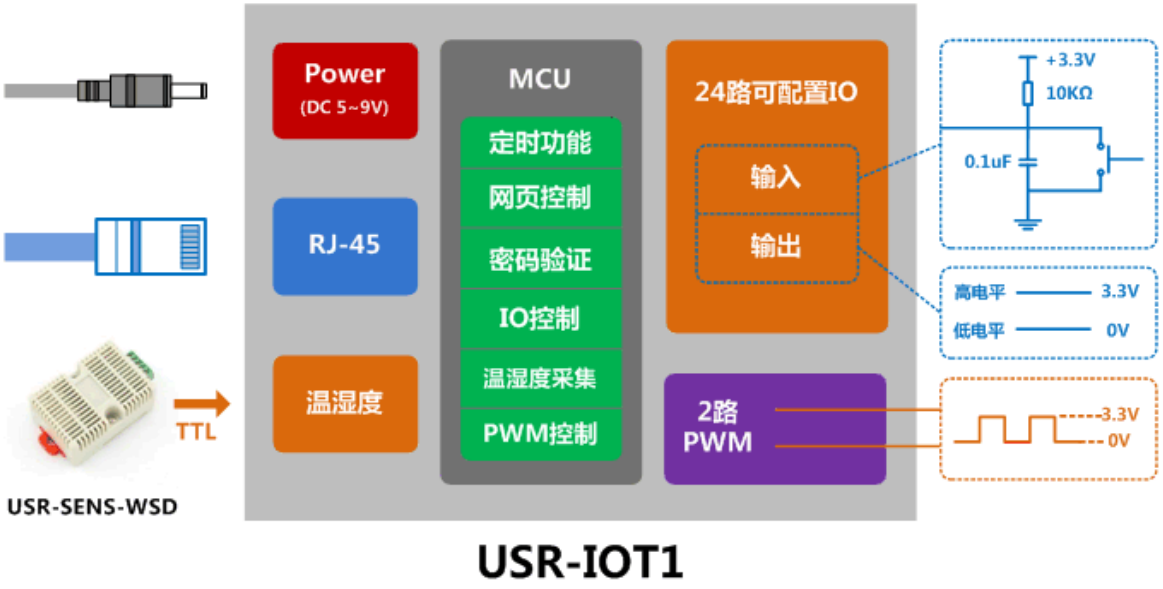


Diagram 5-2 USR-IOT1 view from bottom

1) Mechanical size: module(L×W×H)82×50×18(mm) including RJ45 and connectors
2) PCB size: (L×W)80×50(mm)
3) 5V power input, DC5V plug and 2.54*2 power connectors
4) 2.54 mm connectors， small size, easier for embedded uses



USR-IOT1

5.1.2. Power

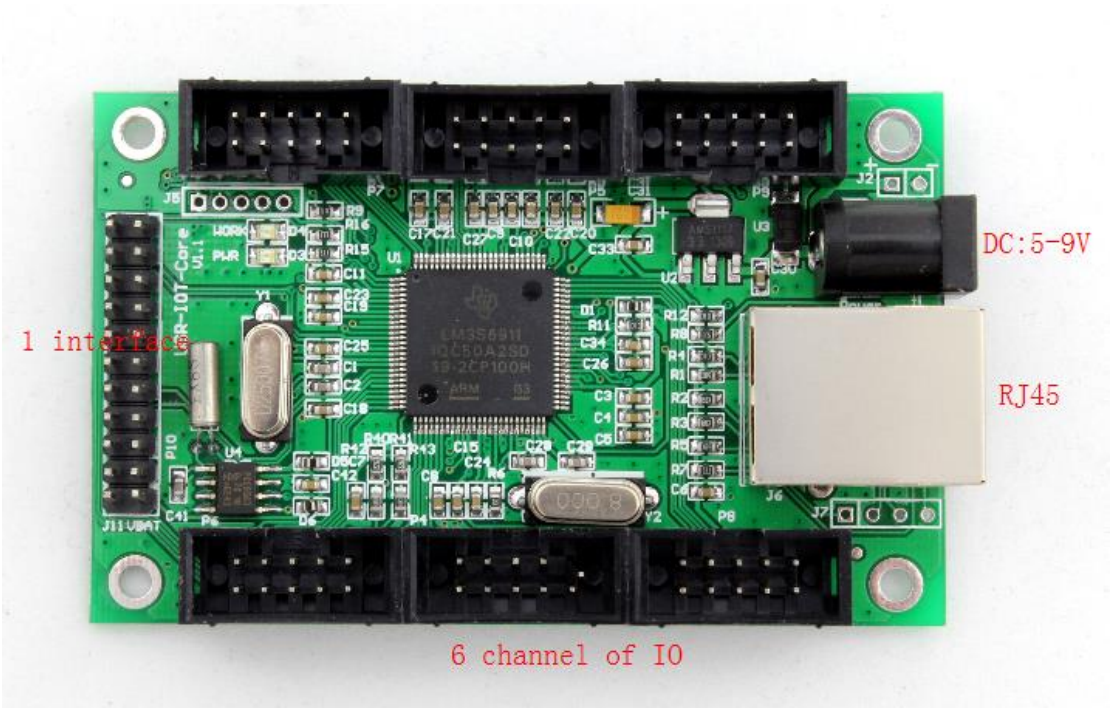


Diagram 5-3 power interfaces

Power please use DC 5V adaptor or 2.54 power connectors.

5.1.3. Battery interfaces

Battery interfaces for RTC, voltages range from 1.5V~3.3V。

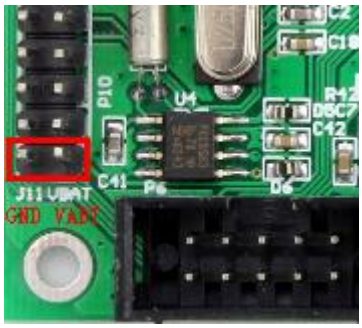


Diagram 5-4 battery interface

Note：

1) RTC function not available yet!

5.1.4. Connectors（6）

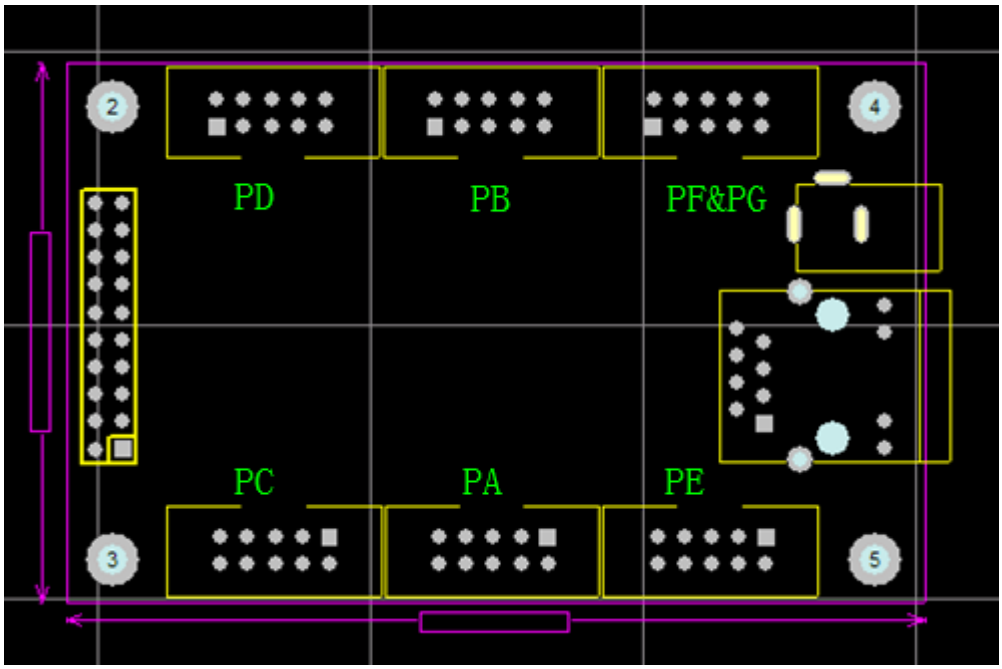


Diagram 5-5 PCB brief

Each of the connectors show below：

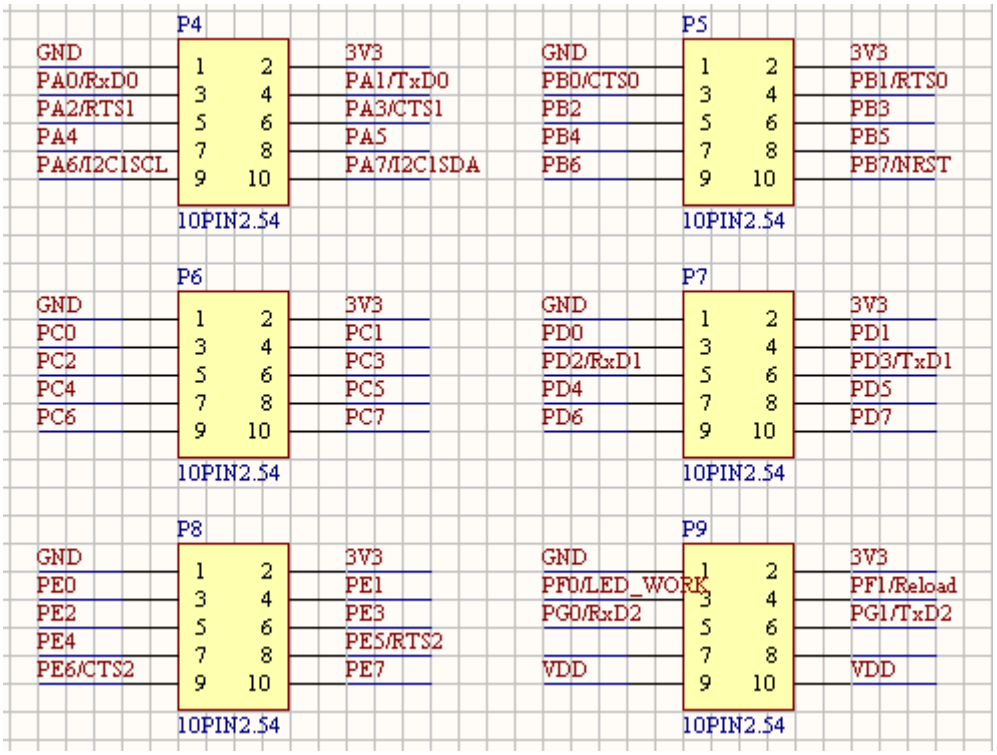


Diagram 5-6 6 channel of IO

Including PA-PG, for every connector, pin1 is GND, pin 2 is 3.3V, is shown on the other side of board.

Note:

1) **not every pin can be used as IO or PWM, please check IO table or PWM pin table before use them.**

2) PF and PG only have pin 0 and pin 1

5.1.5. Universal interfaces（1）

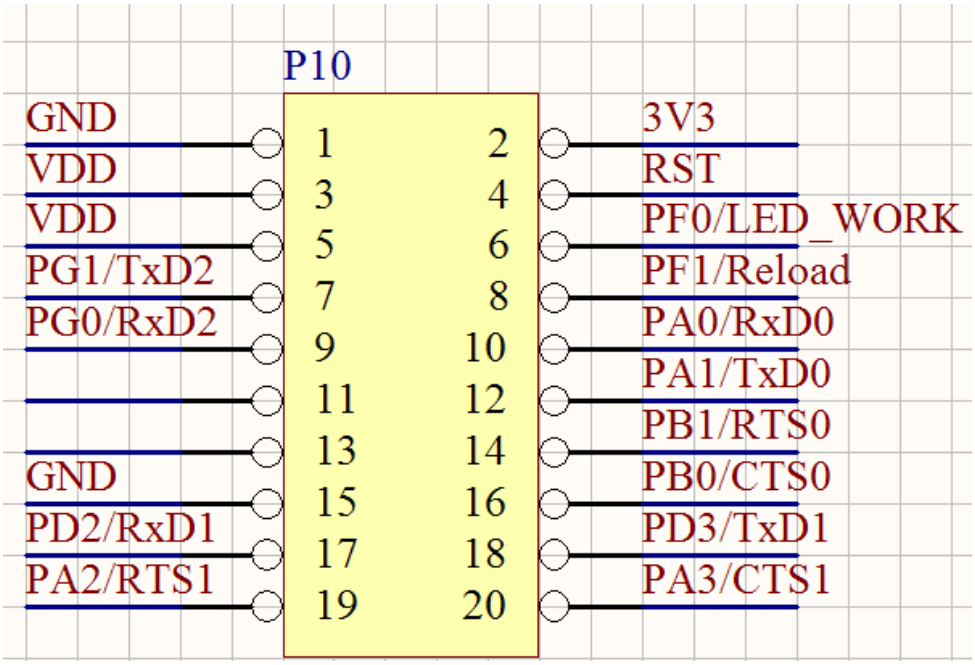


Diagram 5-7 universal interface

Including 3 UART（uart2 can not be used as serial to ethernet,），and LED_WORK、Reload、RST etc.。

Note:

1) Interfaces compatible for APC220 wireless module（software not available yet!）
2) VDD（DC5V, outside power supply）and 3V3(DC3.3V) .

5.1.6. Indicating LED

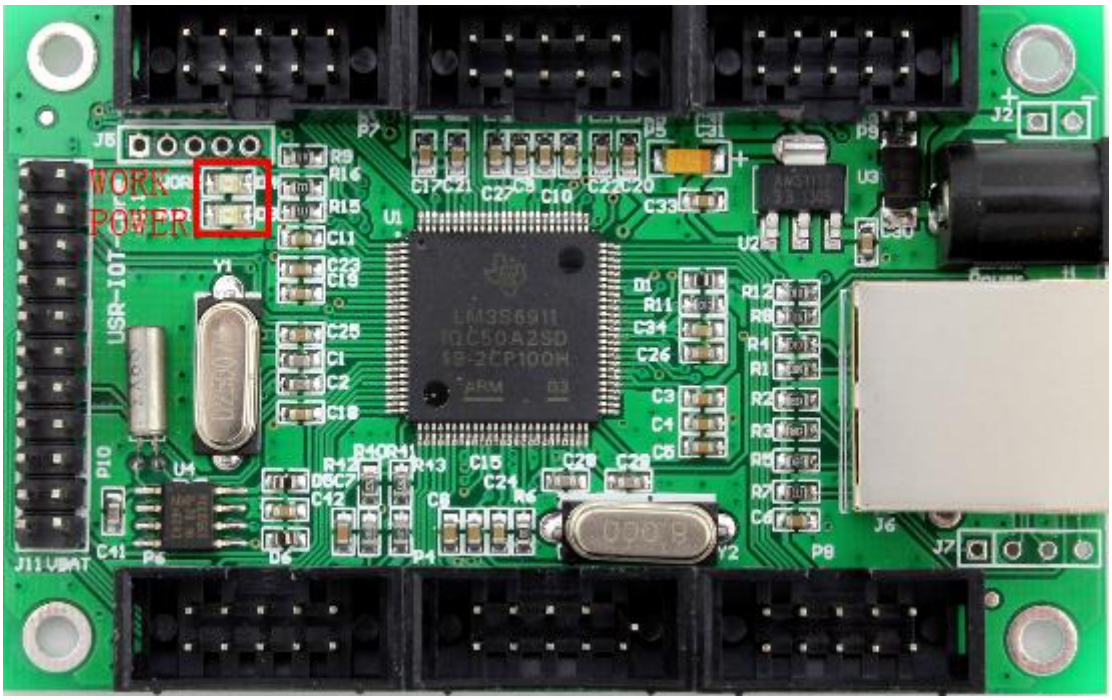


Diagram 5-8 Indicating LED

Note:

1) WORK(GREEN): twinkle every 1 seconds
2) POWER(RED): On after power supply is feed
3) RJ45: GREEN on, indicating network connected physically; YELLOW on, indicating that data flow

5.1.7. RJ45 interface

Internet access port connection, module network interface is 10 M / 100 M adaptive, support AUTO MDI/MDIX, can discretionarily connect cross-over or direct network cable. That is to say, you can use direct cable to connect with computer or test.

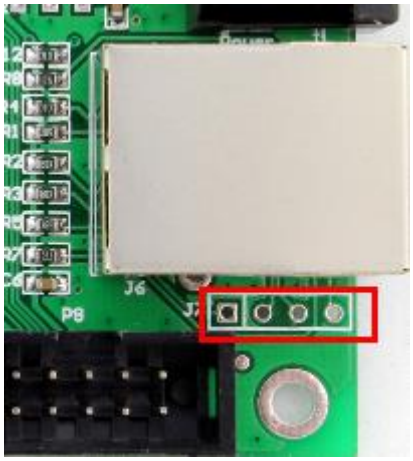


Diagram 5-9 4 Pin(default NC)

Pin	Name	Description

1	TX+	Transceiver Data+
2	TX-	Transceiver Data-
3	RX+	Receive Data+
4	n/c	Not connected
5	n/c	Not connected
6	RX-	Receive Data-
7	n/c	Not connected
8	n/c	Not connected

Diagram 5-10 RJ45 interface

Note:

1) Default 4 Pin is not connected.

5.1.8. Reload

Pull Reload pin down and power on, then free it, device will be factory settings.

Default settings main parameters as follows

Address type： static IP

Static IP Address： 192.168.0.7

User name： admin

password： admin

Module name： USR-IOT1

Using web pages can also restore default settings.

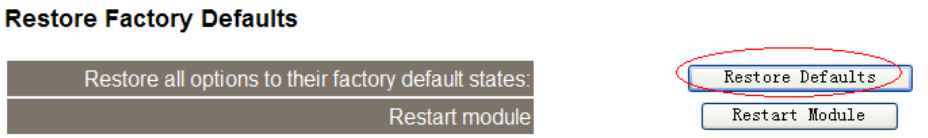


Diagram 5-11 restore defaults through web pages

5.2. USR-IOT1 V2

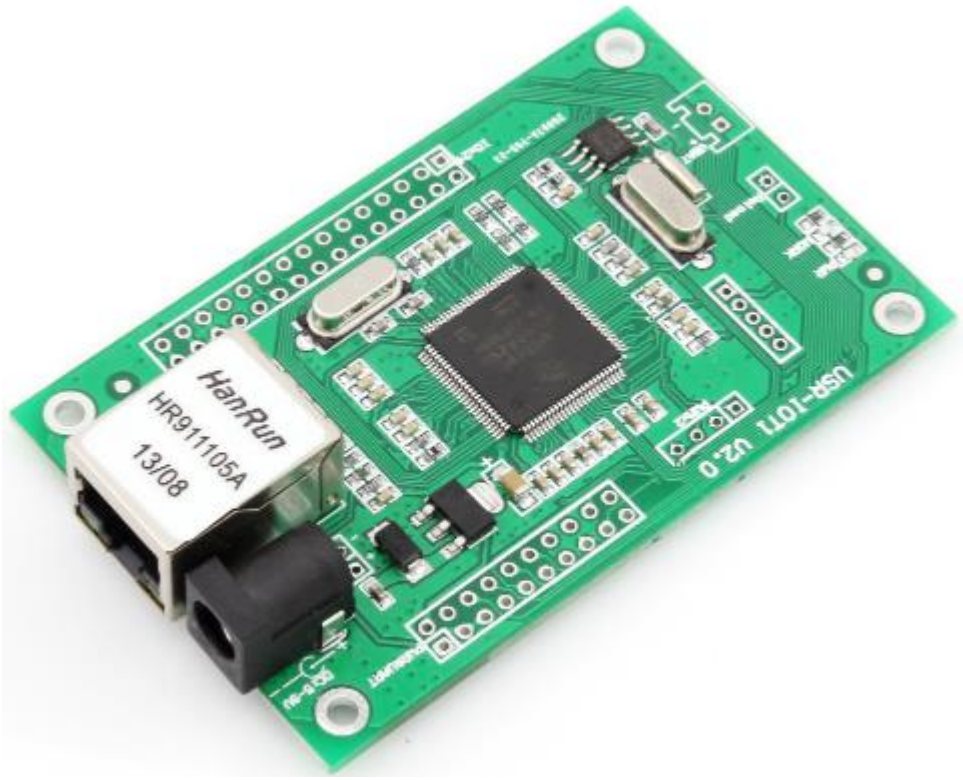


Diagram 5-12 USR-IOT1 V2

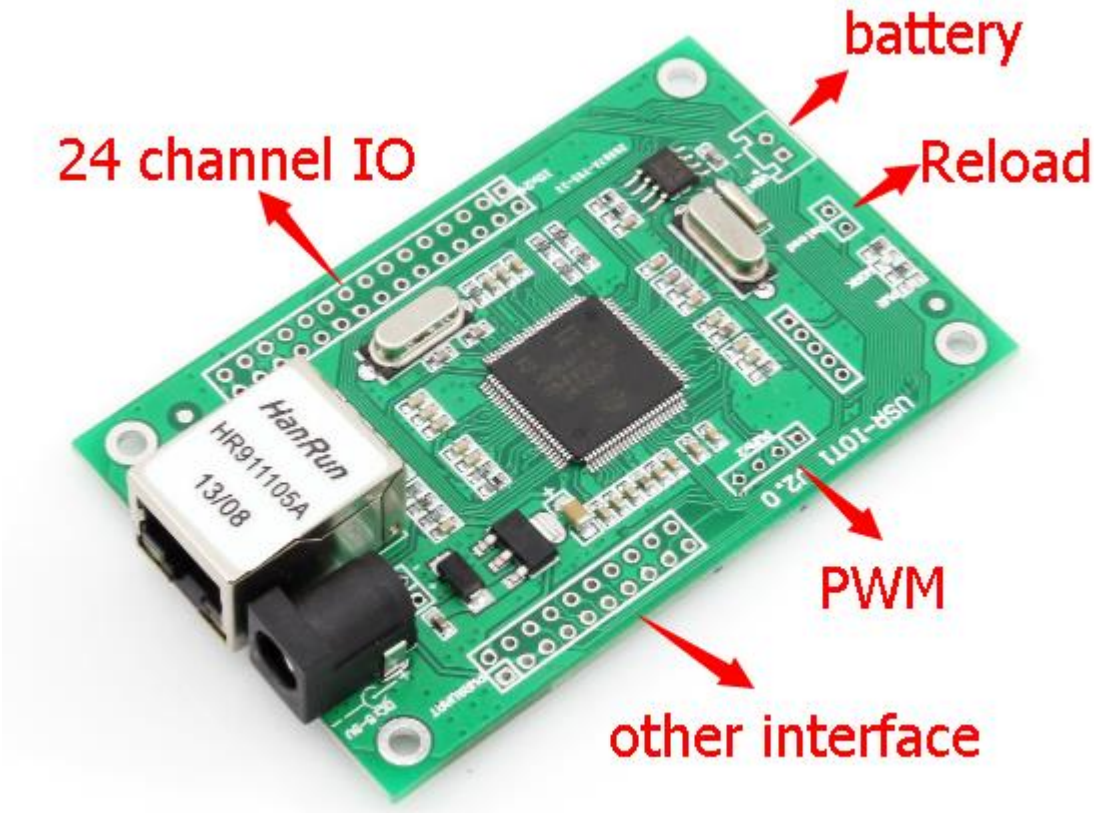


Diagram 5-13 Interfaces

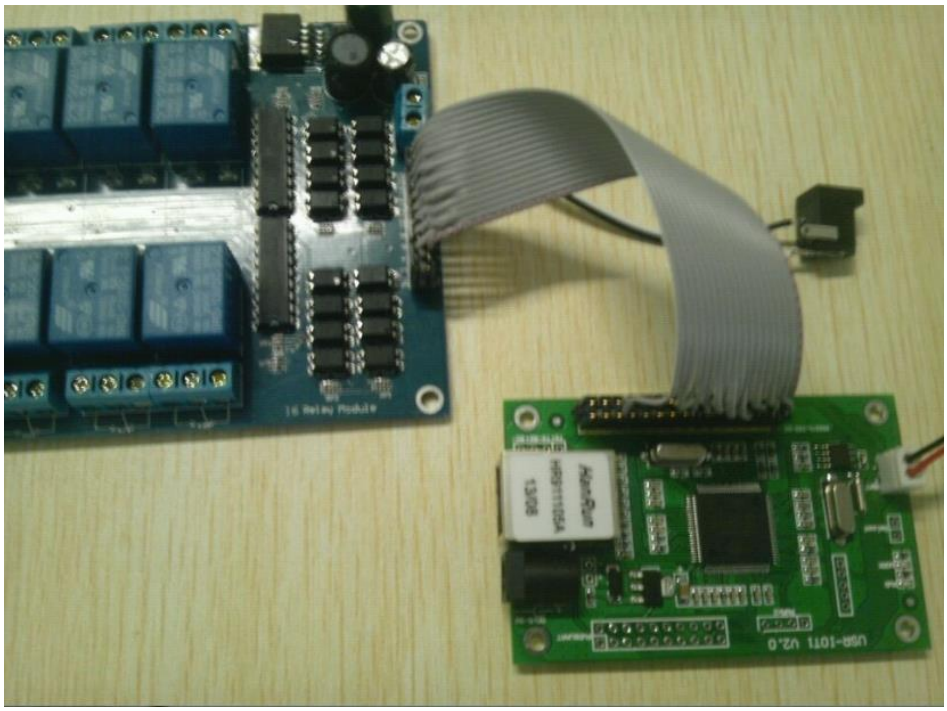


Diagram 5-14 Connection with V2

The other functions is same with USR-IOT1 V1

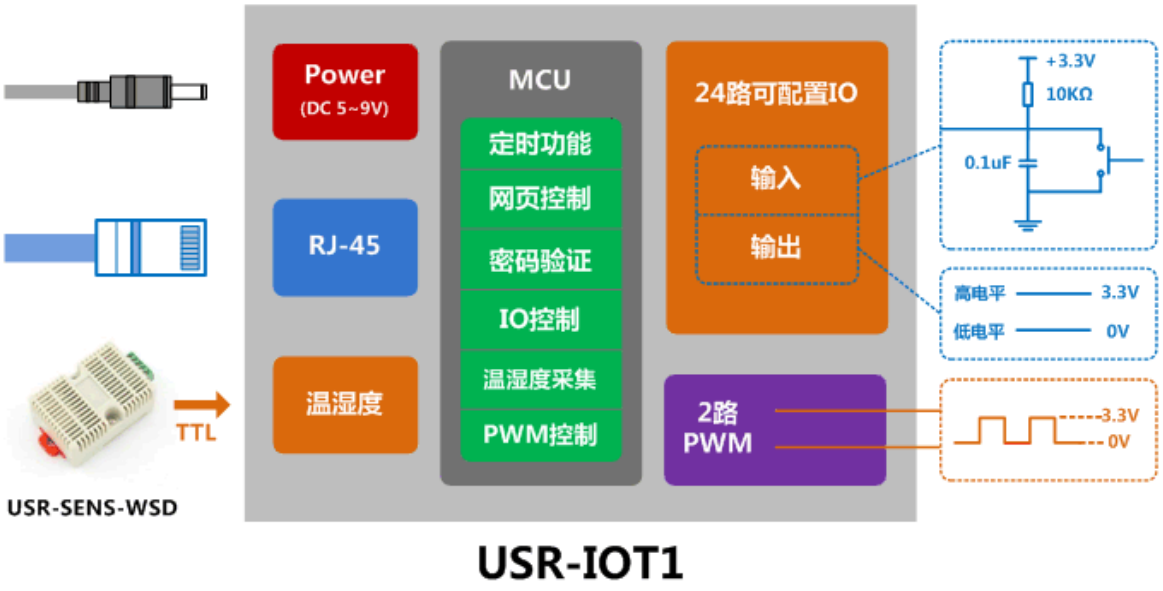


Diagram 5-15 Connection diagram

5.3. USR-IOT2

5.3.1. Hardware characteristic

Diagram 5-16 USR-IOT2 with shell

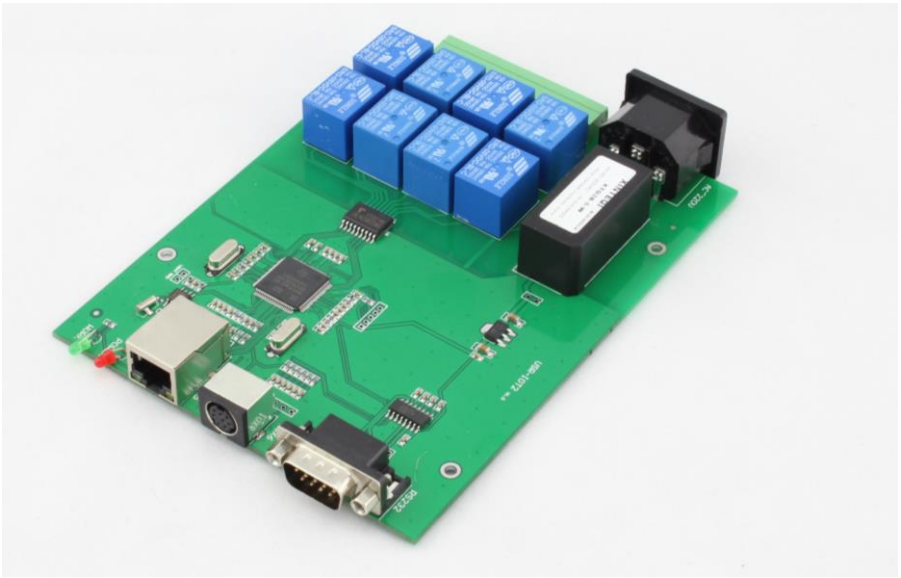


Diagram 5-17 USR-IOT2 without shell

1) Mechanical parameters: device size (L×W×H): 160×115×25(mm) with shell
2) PCB size(L×W): 150×115(mm)

3) Power supply: AC220V plug or DC5V, 2.54-2
4) 8 relay out
5) 6 key input
6) 1 RS232, serial to ethernet transparent.

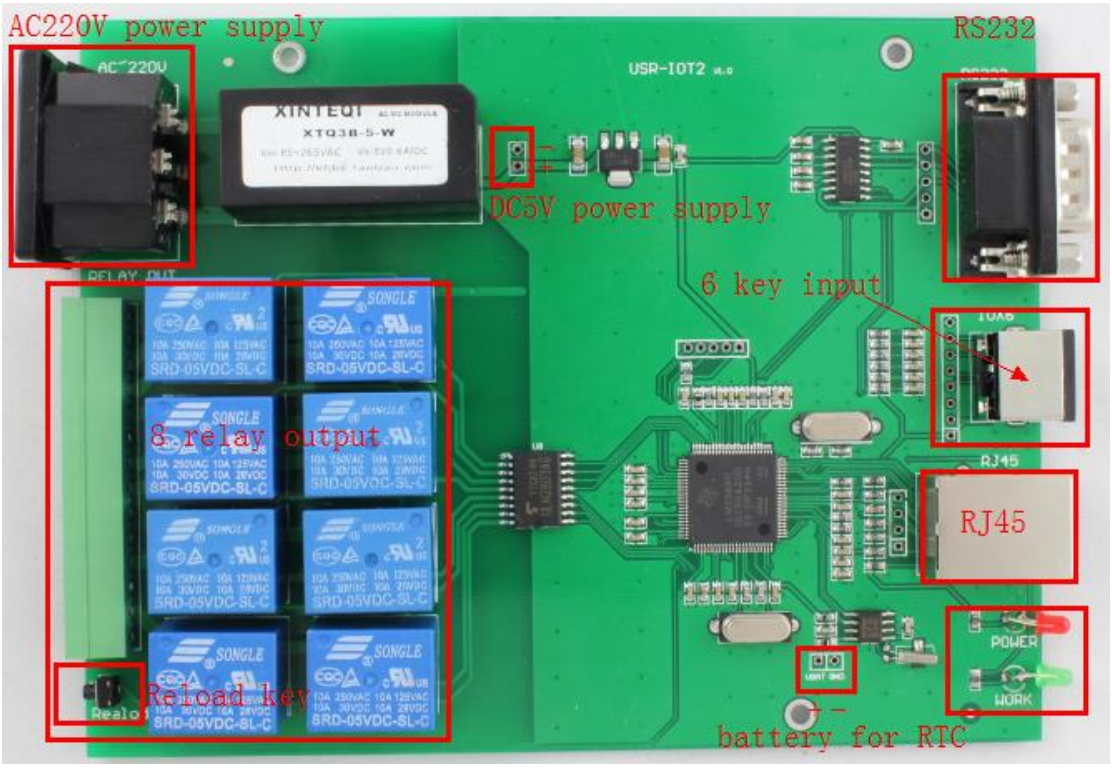


Diagram 5-18 hardware interface

5.3.2. Power supply

2 kind of power supply, only 1 should be choosen.

- Default use AC220V plug.
- You can also choose DC5V, 2.54-2 pin.

Please see 错误!未找到引用源。 .

5.3.3. Battery interface for RTC

With battery interface for RTC, the battery voltage ranges from 1.5V to 3.3V.

5.3.4. Relay output（8 channel）

Relay paramters will be 10A 250VAC， 10A 30VDC。

Output used 3.81-14 terminal , the pin close to AC220V plug is index 1, the other side is 14.

index	name	description

1	OUT_1	Channel 1 open
2	OUT_1’	Channel 1 close
3	OUT_2	Channel 2 open
4	OUT_2’	Channel 2 close
5	OUT_3	Channel 3 open
6	OUT_3’	Channel 3 close
7	OUT_4	Channel 4 open
8	OUT_4’	Channel 4 close
9	OUT_5	Channel 5 open
10	OUT_5’	Channel 5 close
11	OUT_6	Channel 6 open
12	OUT_7	Channel 7 open
13	OUT_8	Channel 8 open
14	REF	Reference

Diagram 5-19 Relay interface description

5.3.5. Key Input（6 channel contactor）

Contactor input, means user don’t need to apply outside voltage signal, key will do.

The key can be used between every key input and GND. Hardware form is 8 pin S-Terminal, including 6 key, +3.3 and GND.

Diagram 5-20 one side of device

S-Terminal pin description:

index	name	description
1	+3.3V	3.3V power +

2	KEY1	Key inpuyt 1
3	KEY2	Key inpuyt 2
4	KEY3	Key inpuyt 3
5	KEY4	Key inpuyt 4
6	KEY5	Key inpuyt 5
7	KEY6	Key inpuyt 6
8	GND	GND

Diagram 5-21 S-Terminal pin description

5.3.6. Indicator

Indicator position please see Diagram 5-20 one side of device.

index	name	description
1	POWER（red）	power
2	WORK（green）	When work, blink every 1 seconds
3	LINK（green）	When net cable connected, on
4	DATA（yellow）	When data arrived or send, blink

Diagram 5-22 Indicator description

5.3.7. RJ45

10 / 100M ethernet controller, with built-in ethernet transformer and 10kV electromagnetic isolation.

Ethernet interface with Link and Data indicator, RJ45 position please see Diagram 5-20 one side of device.

5.3.8. Reload parameters

Press Reload key, then er-power the device, keep it pressed for over 1 second, then release it, the device parameters will be restored.

Factory parameters will be:

- Static IP: 192.168.0.7
- Submask: 255.255.255.0

- Gateway: 192.168.0.1

Resources: 8 channel output, 6 channel input, 0 channel PWM, 0 channel register.

5.4. USR-IOTprotocol sample

5.4.1. Note

USR-IOT1 and IOT2 does not support command 0x07 0x08 0x09.

5.4.2. Read resource quantity

TCP send：55 AA 00 02 00 7E 80
TCP receive：AA 55 00 07 00 FE 10 00 00 00 00 15

5.4.3. Read all output status

TCP send：55 AA 00 02 00 0A 0C
TCP receive：AA 55 00 05 00 8A 00 00 00 8F

1.1.1. Read resources name

TCP send：55 AA 00 02 00 63 65
TCP receive：AA 55 00 D4 00 E3 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
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00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
00 00 00 00 B7

5.4.4. Read PWM pulse width and fre

TCP send：55 AA 00 02 00 24 26
TCP receive：AA 55 00 08 00 A4 05 03 20 3C 00 00 10

5.4.5. Single output set

TCP send：55 AA 00 03 00 02 01 06
TCP receive：AA 55 00 04 00 82 01 01 88

5.4.6. Single output clear

TCP send：55 AA 00 03 00 01 01 05
TCP receive：AA 55 00 04 00 81 01 00 86

5.4.7. All output set

TCP send：55 AA 00 02 00 05 07
TCP receive：AA 55 00 03 00 85 01 89

5.4.8. All output clear

TCP send：55 AA 00 02 00 04 06
TCP receive：AA 55 00 03 00 84 00 87

5.4.9. Config resources quantity

TCP send：55 AA 00 06 00 72 08 06 01 00 87
TCP receive：AA 55 00 07 00 F2 08 06 01 00 00 08

5.4.10. Save current config

TCP send：55 AA 00 02 00 7A 7C
TCP receive：AA 55 00 02 00 FA FC

5.4.11. Set time

TCP send：55 AA 00 06 00 54 53 66 17 DA 04
TCP receive：AA 55 00 07 00 D4 01 53 66 17 DA 86
Set time：2014-05-04 10:35:06

5.4.12. Read time from device

TCP send：55 AA 00 02 00 53 55
TCP receive：AA 55 00 06 00 D3 53 66 17 EF 98
Read time：2014-05-04 10:35:27

5.4.13. Modify device name

TCP send：55 AA 00 12 00 74 4D 79 20 64 65 76 69 63 65 00 00 00 00 00 00 00 DC
TCP receive：AA 55 00 12 00 F4 4D 79 20 64 65 76 69 63 65 00 00 00 00 00 00 00 5C

6. Specific functions

6.1. Keepalive

When connect is established and idle, device will send serval empty packet to see if this link is still active, if not, link will be closed and reconnect.

6.2. Hardware flow control

RS232 interface support hardware flowcontrol（RTS/CTS）

Pin name	Description	IO type	Operater
RTS	Request to Send	O	module
CTS	Clear to Send	I	Outside device(PC)

Diagram 6-1 Pin description

When RTS = 0, enable the other side to send, at this time, TTL is 0 volt, RS232 is -3V ~ -15V;

When CTS = 0, represent module is enabled to send, at this time, TTL is 0 volt, and RS232 is -3V ~ -15V;

When the logic is reverse, represent that disable the other side to send or was disabled the module to send.

When connect with PC's RS232 interface, we can use the serial cable(cross).

6.3. User MAC address

User MAC address default is 6 bytes of 0xff， that is: FF-FF-FF-FF-FF-FF,

If defaults， use the factory MAC address such as: ac- cf-23-20-fe-3d;

If not, user MAC address will take effect.

When modify this address, insert '-' between bytes, or insert nothing. Click 'Update Settings' to save parameters, reset to take effect.

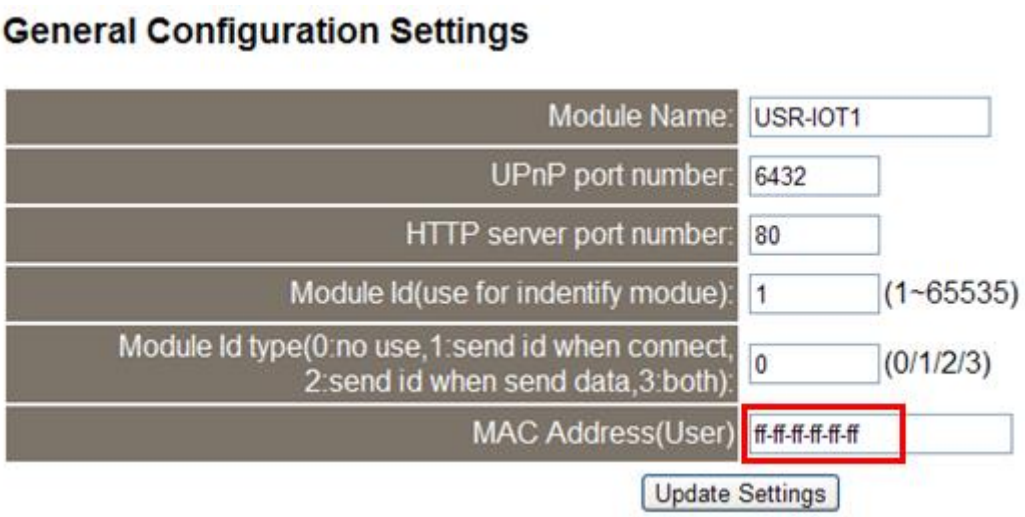

Diagram 6-2 user MAC address

In Current config and status, can see the currently MAC address in use. Diagram below is using the factory MAC.

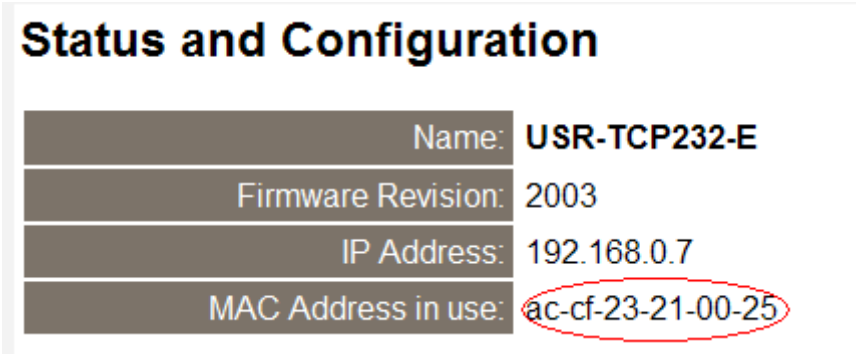

Diagram 6-3 currently MAC in use

6.4. Telnet Timeout

Telnet timeout default not use, value 0, see diagram below.

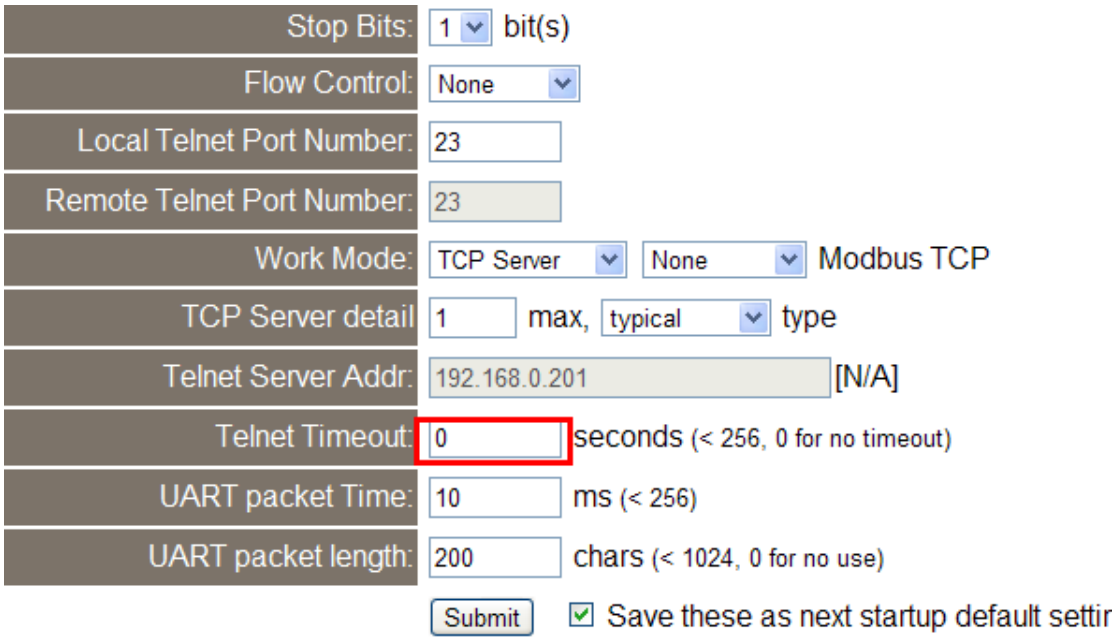

Diagram 6-4 Telnet Timeout

Telnet timeout represent no data timeout, 0 not use, max 255 (seconds).

After connection is established, no data last for timneout seconds, module will disconnect and reconnect.

When TCP Server mode, the module will disconnect with client, release resources, and waiting for new connection, clear time count;

When TCP CLient mode, the module will disconnect with server and reconnect.

Telnet timeout represent no signal reconnect timeout (seconds)。

6.5. Firmware update

Use search and config software 

to update firmware, only once for one time, can not cross network segment.

1. Search and select one module

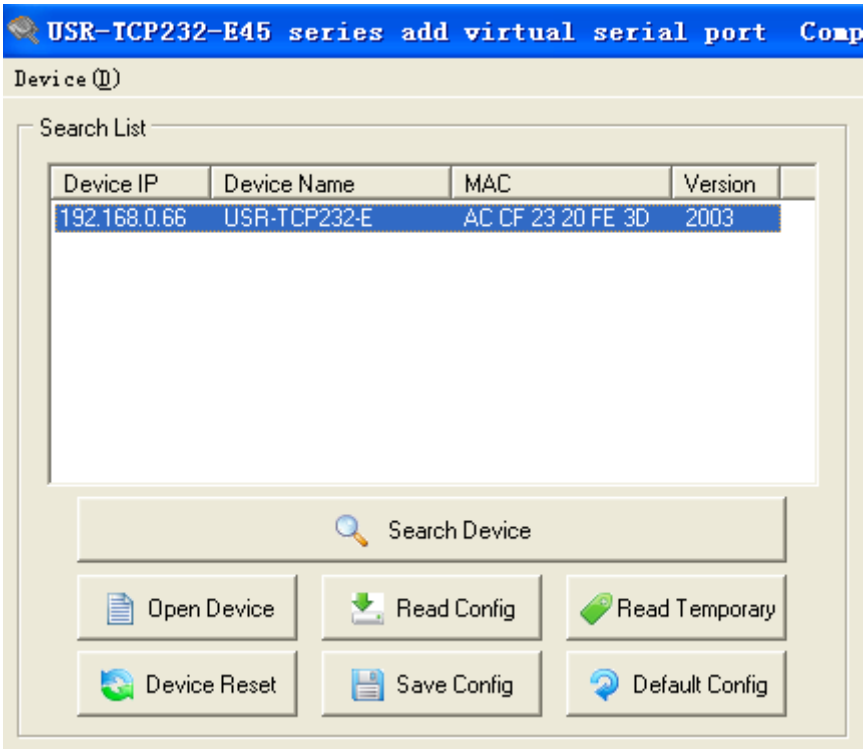

Diagram 6-5 search and select

2. 'Device' -> firmware update

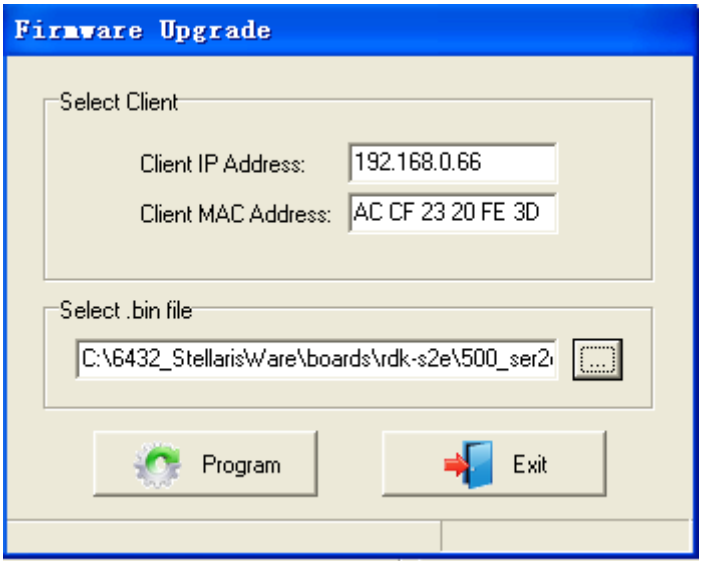

Diagram 6-6 firmware update

Click 

to start update progress.

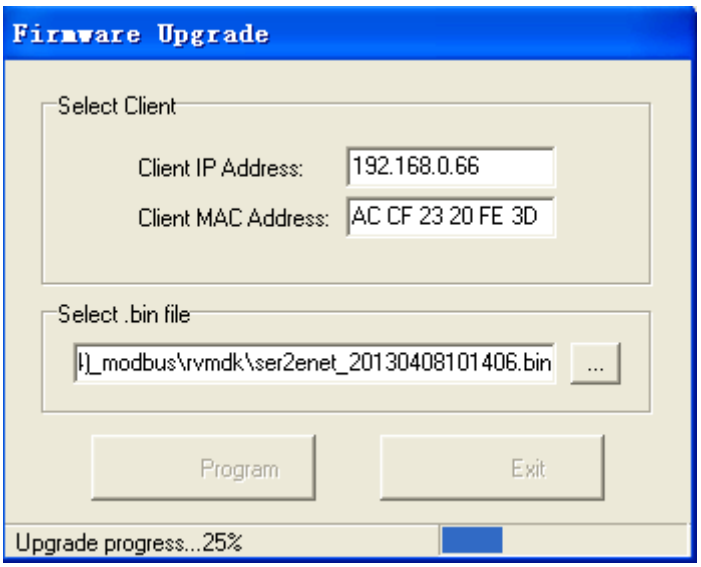

Diagram 6-7 in update progress

3. Update success, click exit.

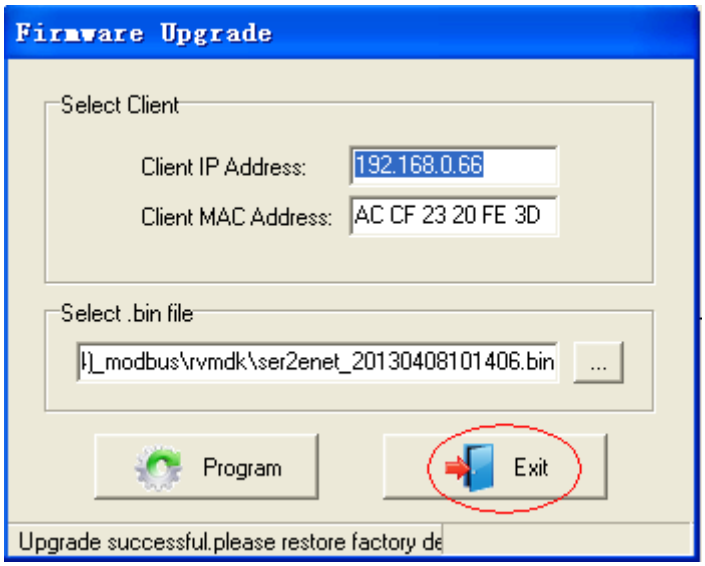

Diagram 6-8 success

Note. After update, if can not search module, restore to factory will fix this problem.

7. Common questions

7.1. Work across network segment

If your device's IP is 192.168.0.7, and remote PC's IP is 192.168.1.7, we need to config.

Subnet mask of TCP232 device, PC, and router to 255.255.0.0, if not ,the TCP232 module will not communicate normally.

7.2. Ping is OK but can not open web pages

Some possible causes

1. Module is set a static ip and conflicts with another ethernet device.
2. Cross network and false subnet mask .
3. HTTP server port is modified(default 80).

Solutions:

1. Set another static or use DHCP.
2. Set correct subnet mask.
3. Set this port to 80 or open web page with correct port.

7.3. After firm update, can not open web page

Reload this module back to factory settings.

7.4. When connection established, server received serval chars

Possible causes.

1) Module id type is not 0.

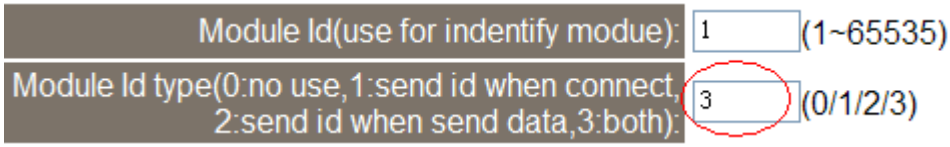

Diagram 7-1 Module id type

Solutions.

1) Module id type set 0.

7.5. Every serval seconds, module reconnect

Telnet Timeout was set to none 0 value.

Solutions

1) Give Telnet Timeout 0 or send data before timeout.

8. Contact us

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Address: 1-523, Huizhan Guoji Cheng, Gaoxin Qu, Jinan, Shandong, China

Tel: 86-531-55507297 86-531-88826739-803

Web: http://en.usr.cn Skype: lisausr

Email: sales@usr.cn tec@usr.cn

9. Modified history

1) V1.0 file established
2) V1.0.2 add IOT2 information
3) V1.0.3 modify the IO pin table
4) V1.0.4 modify the IO table PC2\3 to PE5 / 6
5) V1.0.6 add PWM application