Lesson 5   Test the green led module

Table

1.What do you need to prepare

| Components	Quantity	Picture	Remark
USB cable	1		
Green LED module	1		Not included in this kit,you need prepared by yourself
Dupon wire			

Control board	1	
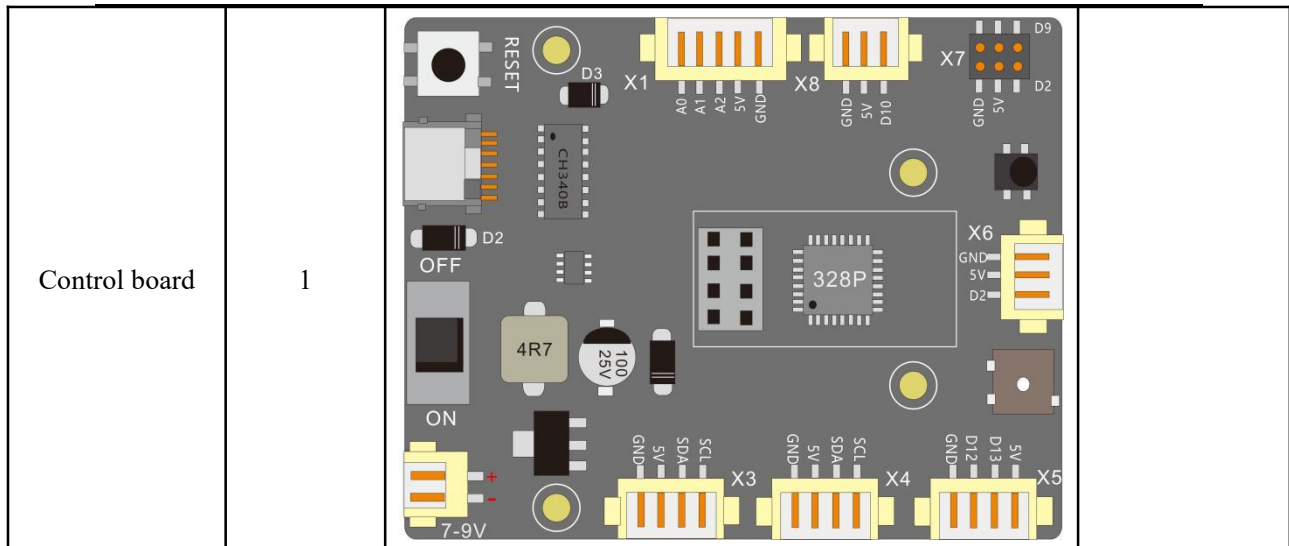
2.Knowledge and principle

An LED is a type of diode. All diodes only work if current is flowing in the correct direction and have two Poles. An LED will only work (light up) if the longer pin (+) of LED is connected to the positive output from a power source and the shorter pin is connected to the negative (-). Negative output is also referred to as Ground (GND). This type of component is known as "Polar" (think One-Way Street).

All common 2 lead diodes are the same in this respect. Diodes work only if the voltage of its positive electrode is higher than its negative electrode and there is a narrow range of operating voltage for most all common diodes of 1.9 and 3.4V. If you use much more than 3.3V the LED will be damaged and burn out.

| LED	Voltage	Maximum Current	Recommended current
Red	1.9~2.2V	20mA	10mA
Green	2.9~3.4V	10mA	5mA
Blue	2.9~3.4V	10mA	5mA
Volt ampere characteristics conform to diode			

The green LED module schematic diagram as below:

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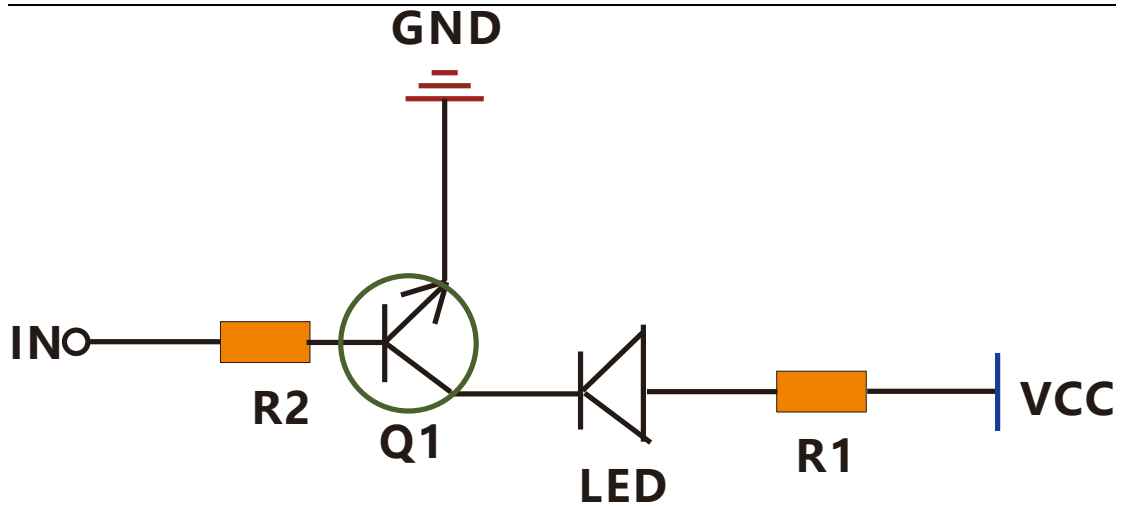
Q1 is a NPN type triode. When a high level signal input to the IN pin, Q1 is switched on and the LED is lit. When the NPN type triode is used in the switching state, most of the emitter is grounded, the collector is connected to a high level, and the base is connected to the control signal. The key point is the voltage between the b pole (base) and the e stage (emitter), for NPN triode, as long as the b pole voltage is higher than 0.7V above the e stage, the triode can be smoothly switched on between the e stage and the c stage.

3.Wiring

Using the 3 pin Dupon wires to connect the green led module with the X8 connector on the control board. As the power is relatively small when the LED is working, only the USB cable power supply can be connected, and the external 18650 battery power supply is not required. Wiring connections are as follows:
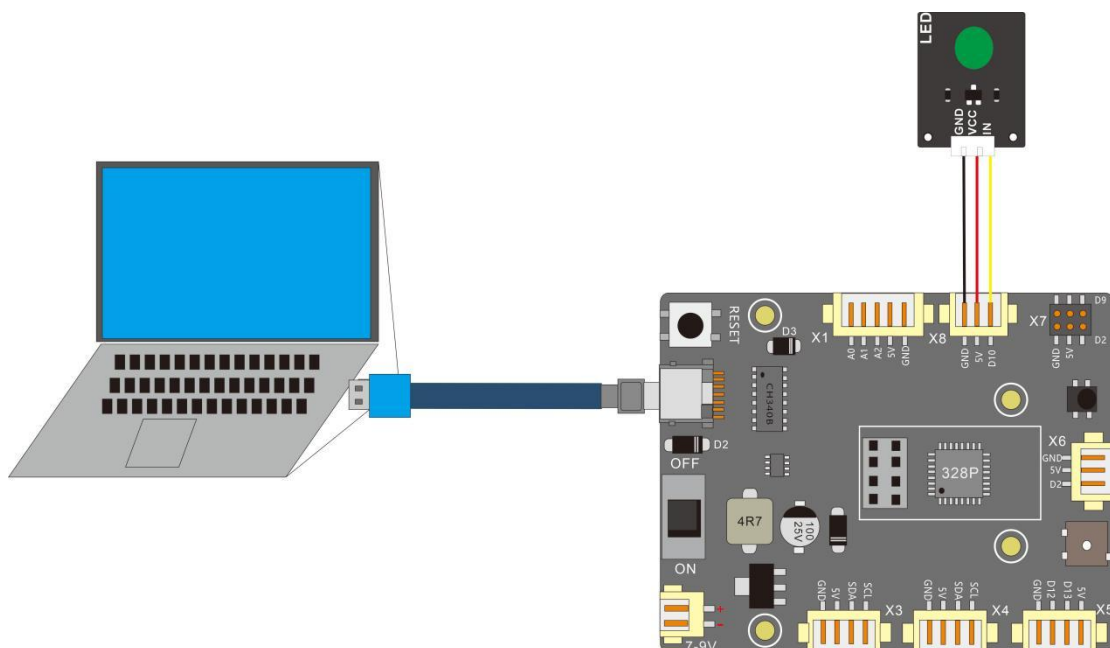
Connect the Green LED module to the control board	
LED Module	Control board X8 Connector
IN	D5
VCC	5V
GND	GND

4.Upload the code and test
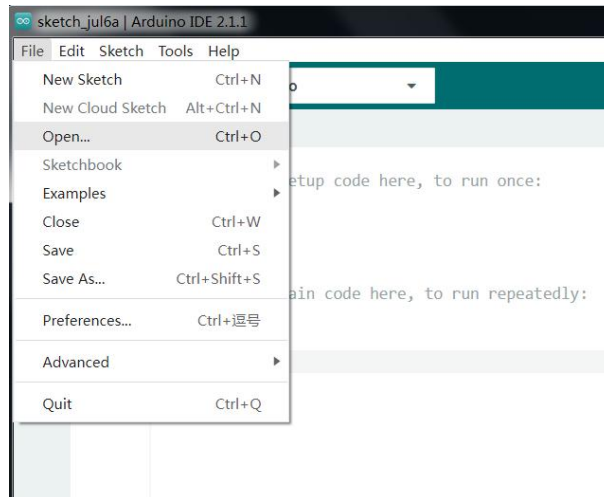
The code used in this lesson is placed in the folder：
" E:\CKK0019-main\Tutorial\sketches"

Double-click the Arduino IDE shortcut on the desktop to open it.

3_1_light_led

Click "File"---"open"

Select the code named 3_1_light_led in the folder：
E:\CKK0019-main\Tutorial\sketches\3_1_light_led
Click"open"， Open the program interface as follows

```
#define LED 10

void setup() {
  pinMode(LED,OUTPUT);
}

void loop() {
digitalWrite(LED, HIGH);//turn on green LED
delay(1000);
digitalWrite(LED,LOW);//turn off green LED
delay(1000);
}
```

Click the comple button, "Done compiling" appears after the code compiling successfully.

Click the upload button, "Done uploading" appears after the code uploading successfully.

After the code is uploaded successfully,You can see that the two green modules turn on and off the green light in one second cycle.

Code   3_1_light_led.ino

```
#define LED 10

void setup() {
  pinMode(LED,OUTPUT);
}

void loop() {
digitalWrite(LED，HIGH);//turn on green LED
delay(1000);
digitalWrite(LED,LOW);//turn off green LED
delay(1000);
}
```

3_2_breathing_light

Select the code named 3_1_light_led in the folder：
E:\CKK0019-main\Tutorial\sketches\3_2_breathing_light
Click"open"，   Open the program interface as follows:

3_2_breathing_light.ino

```
1   /*************************************************
2
3    * This code applies to cokoino smart robot car kit
4    * Through this link you can download the source code:
5    * https://github.com/Cokoino/CKK0019
6    * Company web site:
7    * http://cokoino.com/
8
9    *************************************************/
10   #define LED 10
11
12   int PWM_data;
13   void setup() {
14     pinMode(LED,OUTPUT);
15   }
16
17   void loop()
18   {
19   for(PWM_data=0;PWM_data<=255;PWM_data++){
20     analogWrite(LED,PWM_data);  // PWM
21     delay(10);
22     }
23   for(PWM_data=255;PWM_data>=0;PWM_data--){
24     analogWrite(LED,PWM_data);
25     delay(10);
26     }
27   }
28
```

Click the comple button , "Done compiling" appears after the code compiling successfully

 Click the upload button , "Done uploading" appears after the code uploading successfully.

After the code is uploaded successfully, You can see that the green light of both modules gradually brightens and then gradually darkens again, in a sequence of cycles

Code   3_2_breathing_light.ino

```
#define LED 10

int PWM_data;
void setup() {
  pinMode(LED,OUTPUT);
}

void loop()
{
for(PWM_data=0;PWM_data<=255;PWM_data++){
```

```
  analogWrite(LED,PWM_data);   // PWM
  delay(10);
  }
for(PWM_data=255;PWM_data>=0;PWM_data--){
  analogWrite(LED,PWM_data);
  delay(10);
  }
}
```

5.Any questions and suggestions are welcome

THANK YOU for participating in this learning experience!

If you find any errors, omissions or you have suggestions and/or questions about this lesson, please feel free to contact us:

cokoino@outlook.com

We will make every effort to make changes and correct errors as soon as feasibly possible and publish a revised version.

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