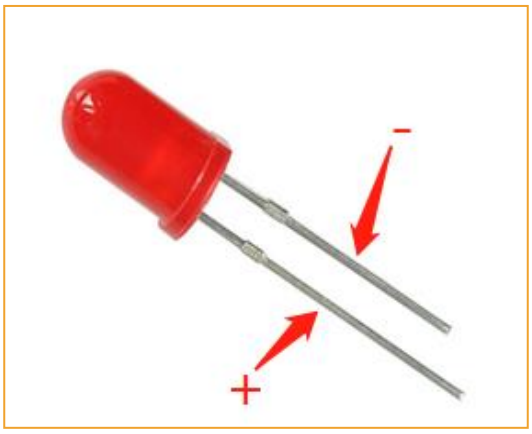
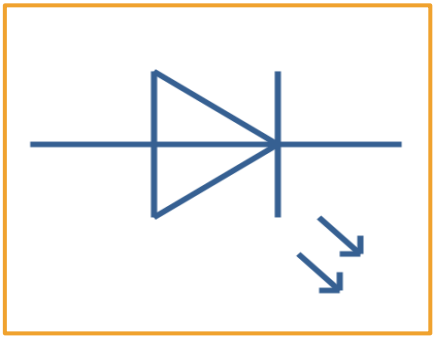
LED Running Light

Introduction

LED, short for light-emitting diode, is made by mixed compounds which are gallium (Ga), arsenic (AS), phosphorus (P). Phosphorus gallium arsenide diode glows red, gallium phosphide diode glows green, silicon carbide diode glows yellow.





Working Principle

The reverse breakdown voltage of light-emitting diode is 5v. Its positive volt-ampere characteristic curve is too steep, it must be in series with current limiting resistor so as to control the current flowing through the pipes when using it. Current limiting resistor R can be available through the following formula:

$$R = \frac{E - V_F}{I}$$

In the formula, E stands for power voltage, VF is forward voltage drop of LED， I shows the general working current of LED. The working voltage of light-emitting diodes are generally from 1.5 V to 2.0 V, the working current is usually 10 ~ 20 mA. So in the digital logic circuit of 5v, We can use 1KΩ resistor as a current limiting resistor.

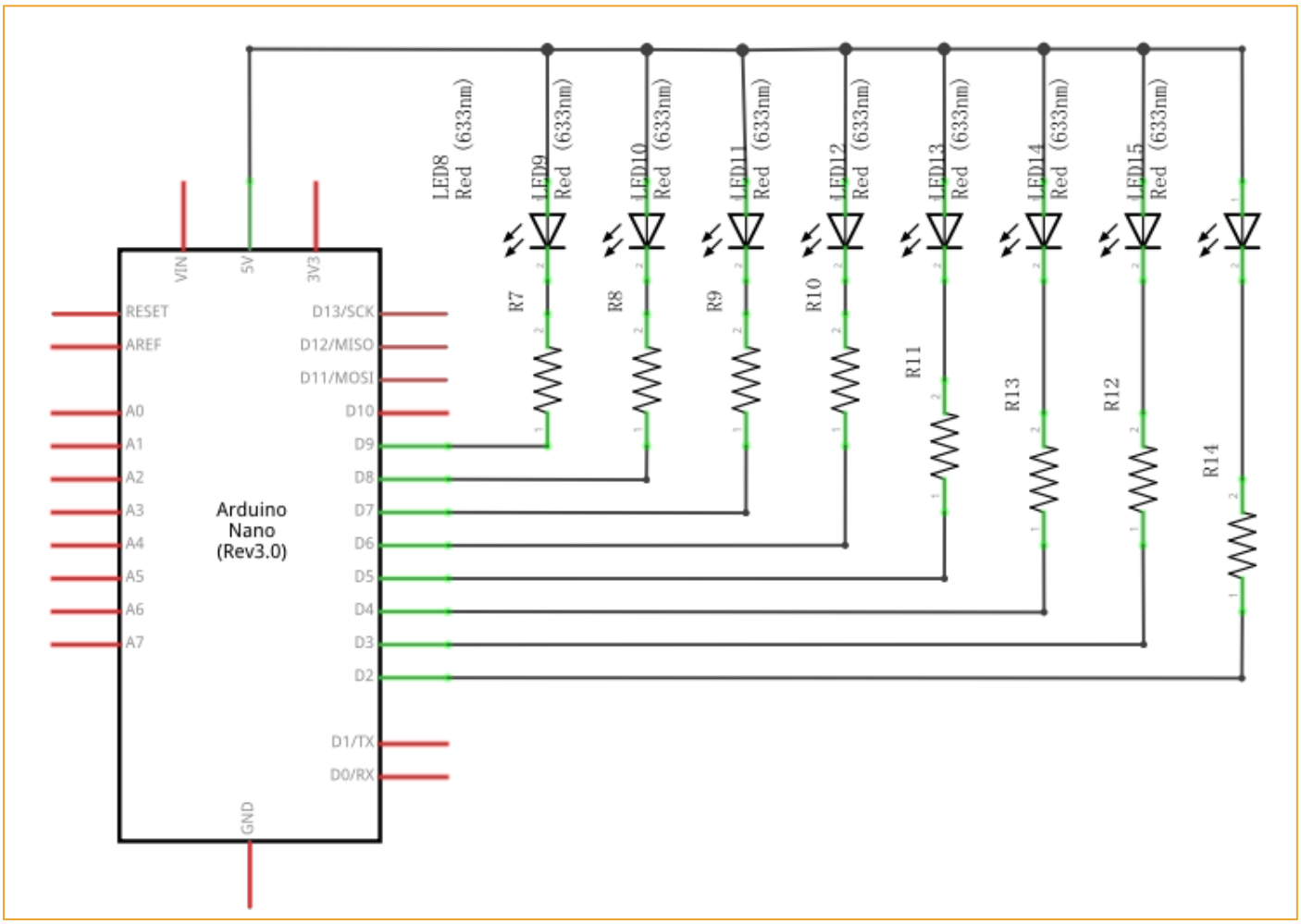
Experiment Purpose

What is a running light ? We heard of running mountain stream, running river , etc. Just as its name implies, making lights light up like running water. Our purpose is to achieve the effect of a single light glows from left to right, then all the lights glow from left to right and this cycle continues.

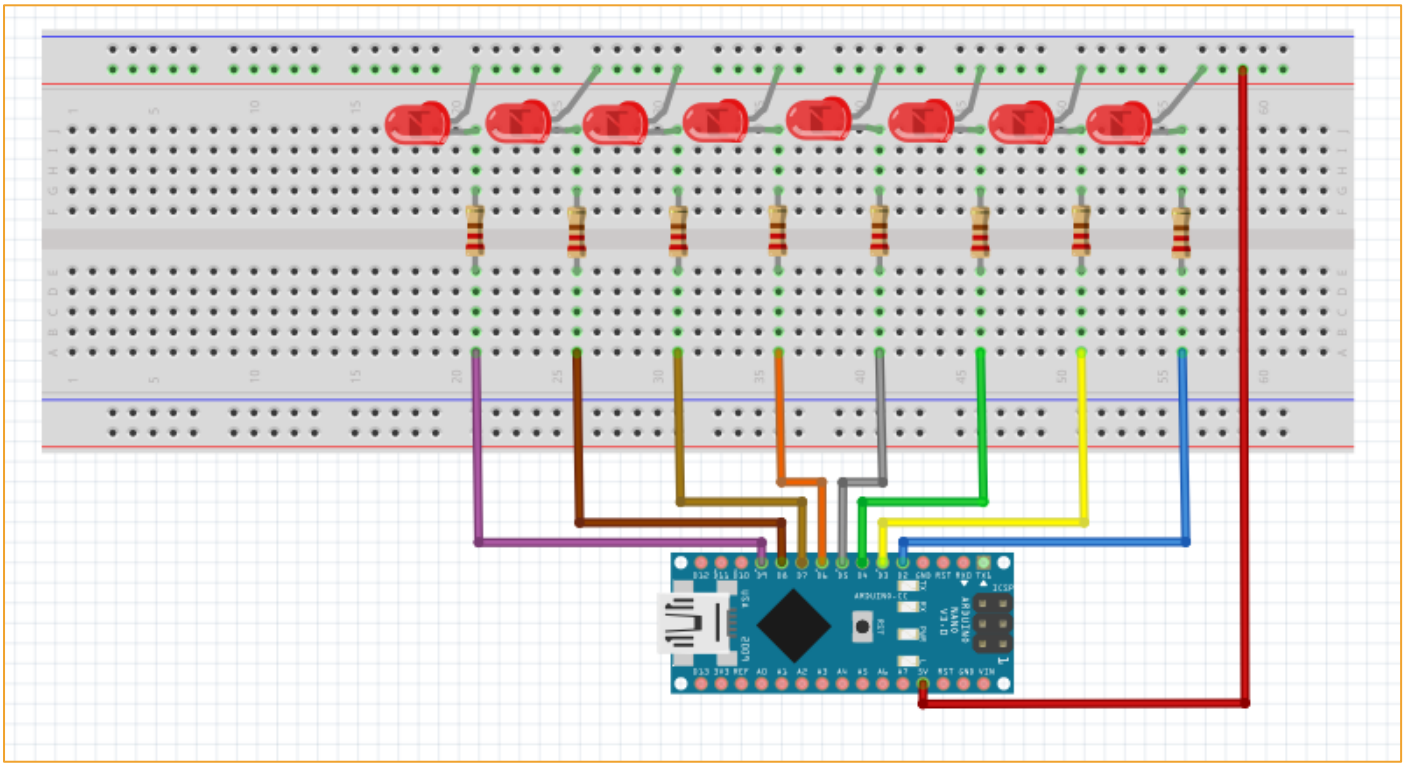
Component List

- Arduino Nano mainboard
- Breadboard
- USB cable
- LED * 8
- 1k Resistors * 8
- Several wires

Schematic Diagram



Wiring of Circuit



Program Principle

Firstly, we set number 2-9 pin at high level, namely the initial state of all LED is putting out, and then switch the number 9 pin at low level, so the far left LED lights up. After delaying 500ms, we put number 8-2 pins for the low level and the other pins keep high level, so that the first round each LED is on for 500ms. In the second round, we set number 9 pin as low level, the first LED lights up, then put all LEDs at low level from left to right, now all the lights glow, and this cycle continues. Its effect looks like "running water". If you want to make the led flashing fast, you can reduce the delay time, but if the delay time is too short, it looks like all LEDs have been lit all the time in our eye ; If you want the LEDs slowly flashing, you can increase the delay time, but if time delays too long, you may fail to see the flickering effect.

Code:

```
int led_array[8] = {2, 3, 4, 5, 6, 7, 8 , 9 };
int flash_speed = 500;

/* flash led form left to right one by one */
void led_flash(void)
{
    int i;
    for(i = 0; i < 8; i++ )
    {
        digitalWrite(led_array[i],LOW);
        delay(flash_speed);
        digitalWrite(led_array[i],HIGH);
    }
}

/* turn on all led form left to right */
void led_turn_on(void)
{
    int i;
    for (i = 0; i < 8; i++ )
    {
        digitalWrite(led_array[i],LOW);
        delay(flash_speed);
    }
}

/* turn off all led  */
void led_turn_off(void)
{
    int i;
    for (i = 0; i < 8; i++ ) {
        digitalWrite(led_array[i],HIGH);
        delay(flash_speed);
    }
}
```

```
void setup()
{
  // put your setup code here, to run once:
    int i;
    Serial.begin(115200);
    for (i = 0; i < 8; i++ ) {
        pinMode(led_array[i],OUTPUT);
        digitalWrite(led_array[i],HIGH);
       // set led control pin defalut HIGH turn off all LED
    }
}
```

Experiment Result

Do you see the result or not? Surprise? What are you waiting for? Please hurry to make a heart-shaped running light for your girlfriend.