

Lesson 26 Real Time Clock Module

Introduction

In this lesson, you will learn how to use the DS3231, clock module that displays the year, month, day, hour, minute, second and week. Support is via a backup battery trickle charger, which can be used unless being connected to UNO R3 with only three data cables.

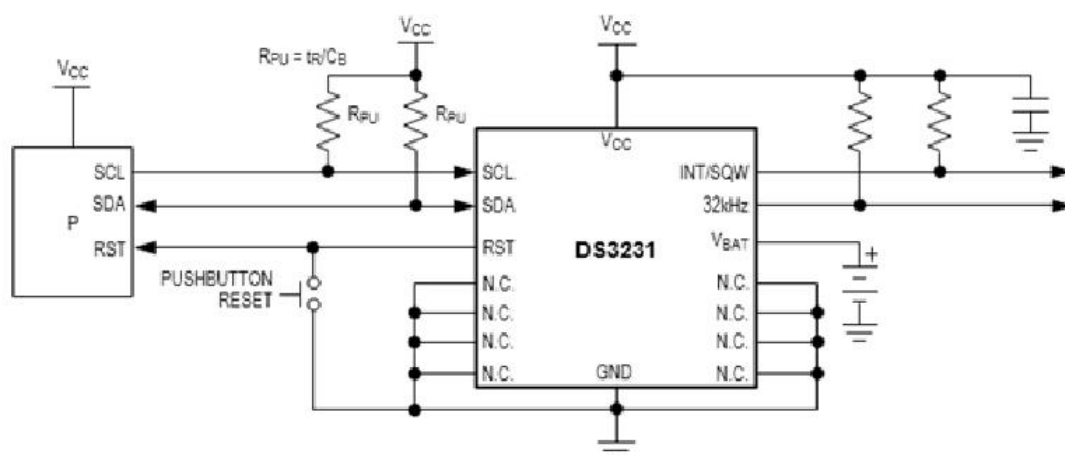
Hardware Required

- ✓ 1 * RexQualis UNO R3
- ✓ 1 * DS3231 RTC module
- ✓ 4 * F-M Jumper Wires

Principle

DS3231

The DS3231 is a simple time-keeping chip. It has an integrated battery, so the clock can continue keeping time even when unplugged.



The DS3231 is a low-cost, highly accurate Real Time Clock which can maintain hours, minutes and seconds, as well as, day, month and year information. Also, it has

automatic compensation for leap-years and for months with fewer than 31 days.

- Counts Hours, Minutes and Seconds
- Day of the Week, Day, Month and Year
- Automatic compensation for leap-years and for months with fewer than 31 days
- Operating voltage from 3.3 to 5V
- 3V Battery
- I2C Communication Protocol

The module can work on either 3.3 or 5 V which makes it suitable for many development platforms or microcontrollers. The battery input is 3V and a typical CR2032 3V battery can power the module and maintain the information for more than a year.

The module uses the I2C Communication Protocol which makes the connection to the Arduino Board very easy.

Code interpretation

```
#include <DS3231.h>
```

```
#include <Wire.h>
```

```
DS3231 clock;
```

```
RTCDateTime dt;
```

```
void setup()
```

```
{
```

```
    Serial.begin(9600);
```

```
// Initialize DS3231
```

```
Serial.println("Initialize DS3231");;
```

```
clock.begin();
```

```
// Set sketch compiling time
```

```
clock.setDateTime(__DATE__, __TIME__);
```

```
// Set from UNIX timestamp
```

```
// clock.setDateTime(1376600448);
```

```
// Manual (YYYY, MM, DD, HH, II, SS
```

```
// clock.setDateTime(2016, 12, 9, 11, 46, 00);
```

```
}
```

```
void loop()
```

```
{
```

```
    dt = clock.getDateTime();
```

```
    Serial.print("Long number format:          ");
```

```
    Serial.println(clock.dateFormat("d-m-Y H:i:s", dt));
```

```
    Serial.print("Long format with month name: ");
```

```
    Serial.println(clock.dateFormat("d F Y H:i:s", dt));
```

```
    Serial.print("Short format witch 12h mode: ");
```

```
    Serial.println(clock.dateFormat("jS M y, h:ia", dt));
```

```
    Serial.print("Today is:                    ");
```

```

Serial.print(clock.dateFormat("l, z", dt));

Serial.println(" days of the year.");

Serial.print("Actual month has:          ");

Serial.print(clock.dateFormat("t", dt));

Serial.println(" days.");

Serial.print("Unixtime:                  ");

Serial.println(clock.dateFormat("U", dt));

Serial.println();

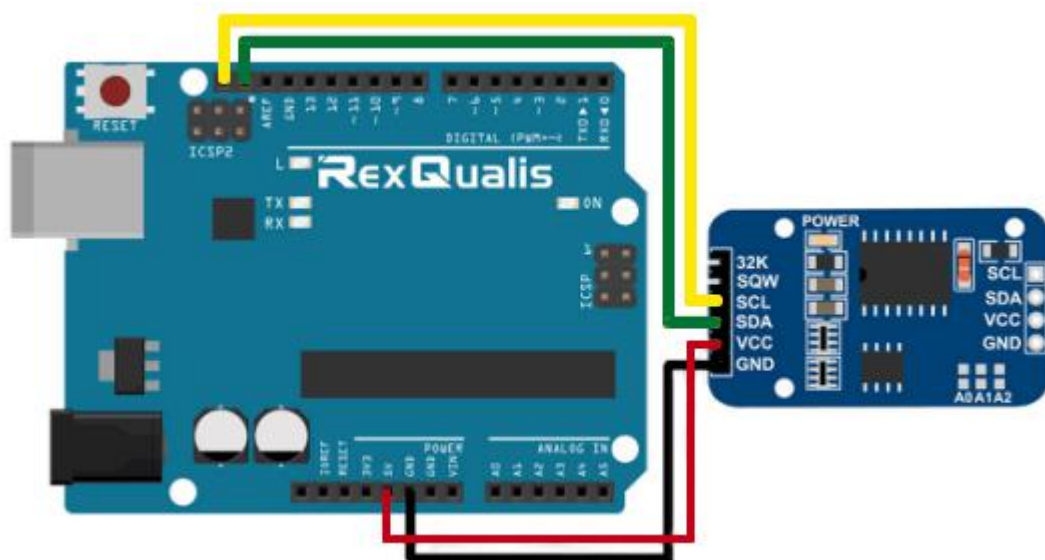
delay(4000);

}

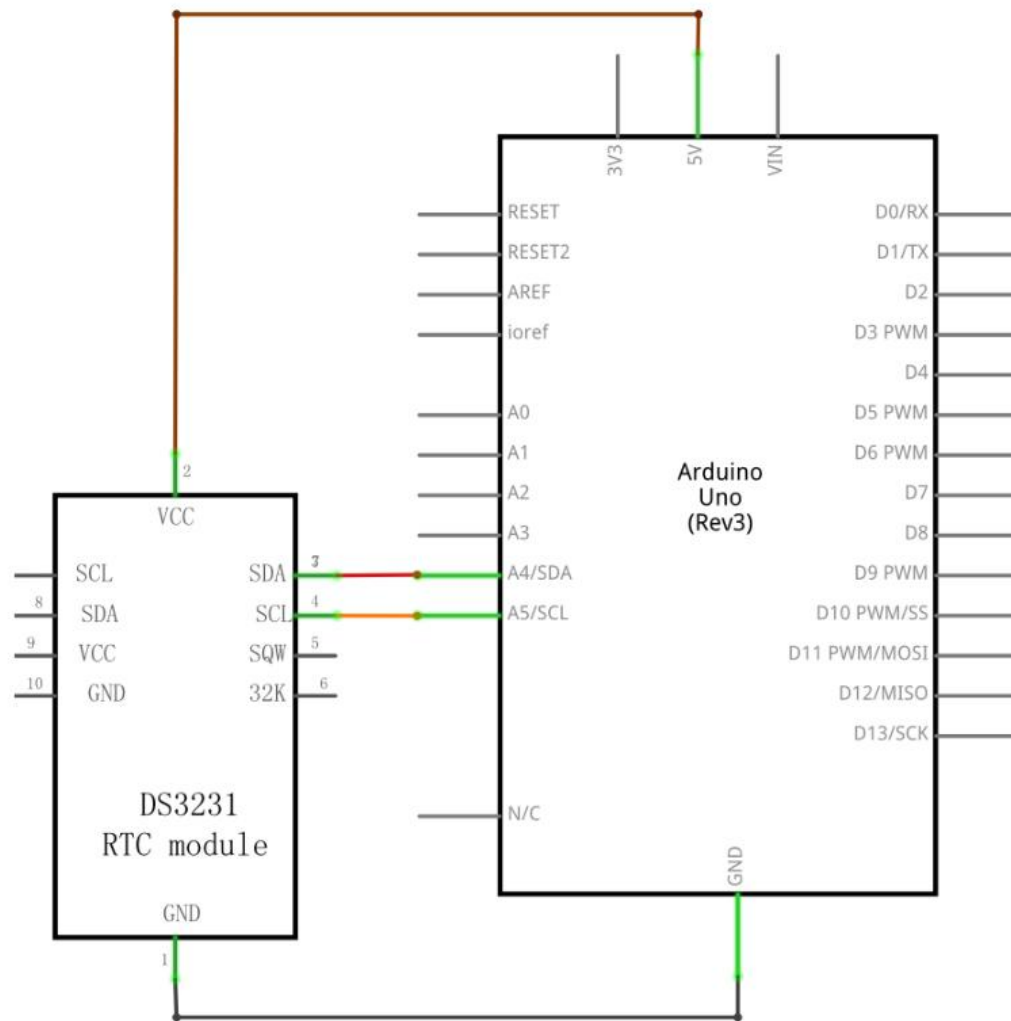
```

Experimental Procedures

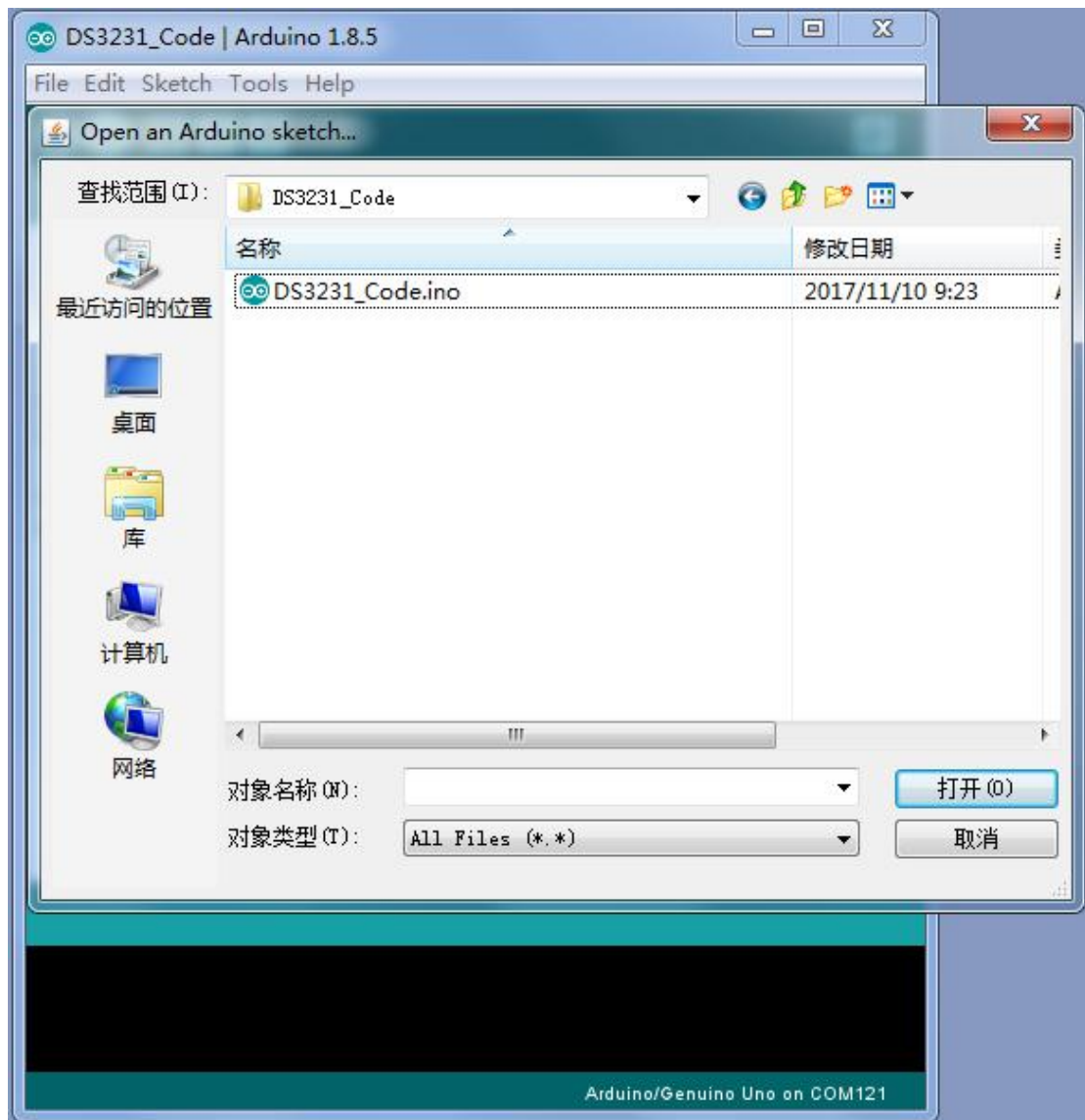
Step 1: Build the circuit



Schematic Diagram

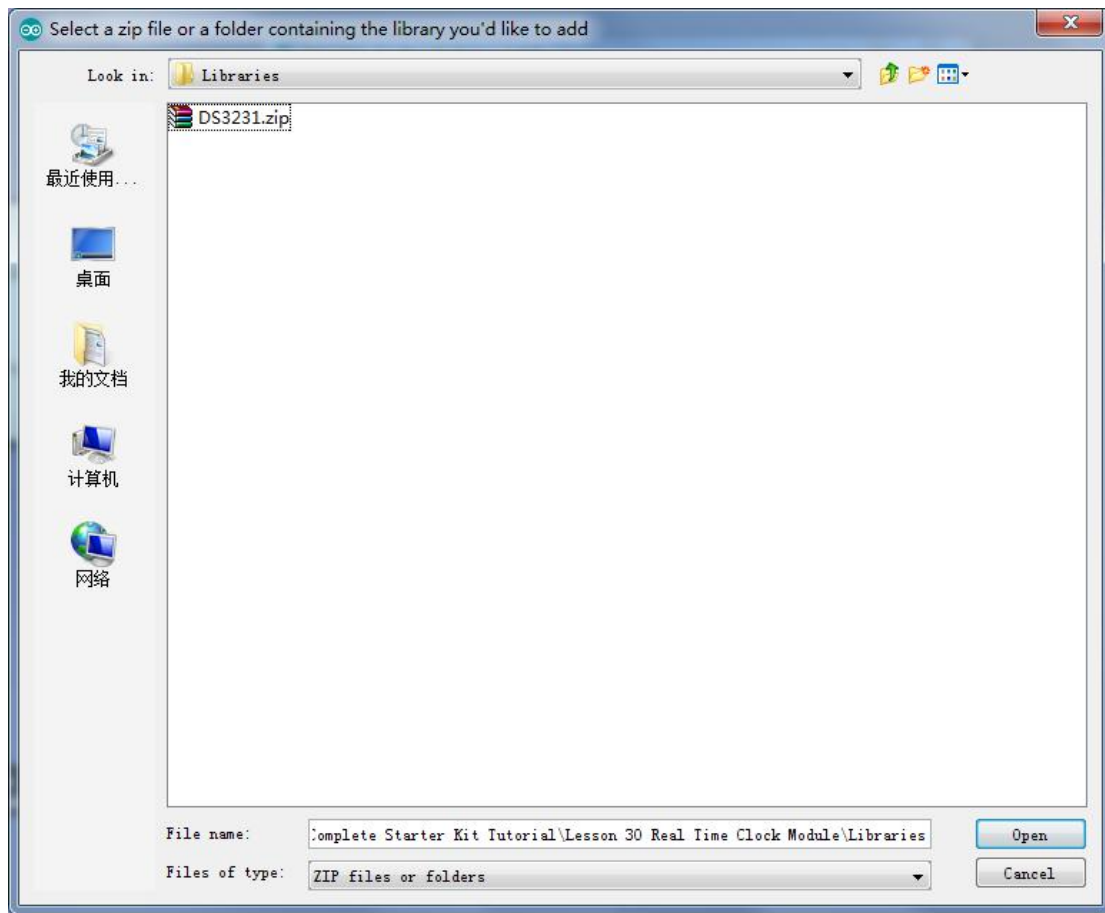


Step 2:Open the code:DS3231_Code



Step 3: Attach Arduino UNO R3 board to your computer via USB cable and check that the 'Board Type' and 'Serial Port' are set correctly.

Step 4: Load the Library: DS3231



Step 5: Upload the code to the RexQualis UNO R3 board.

Step 6: Open the Serial Monitor, then you can see the data as blow:

(How to use the Serial Monitor is introduced in details in Lesson0 Preface)

```

/dev/cu.usbmodem1421 (Arduino/Genuino Uno)

Long format with month name: 10 March 2018 16:12:42
Short format witch 12h mode: 10th Mar 18, 04:12pm
Today is: Saturday, 68 days of the year.
Actual month has: 31 days.
Unixtime: 1520694762

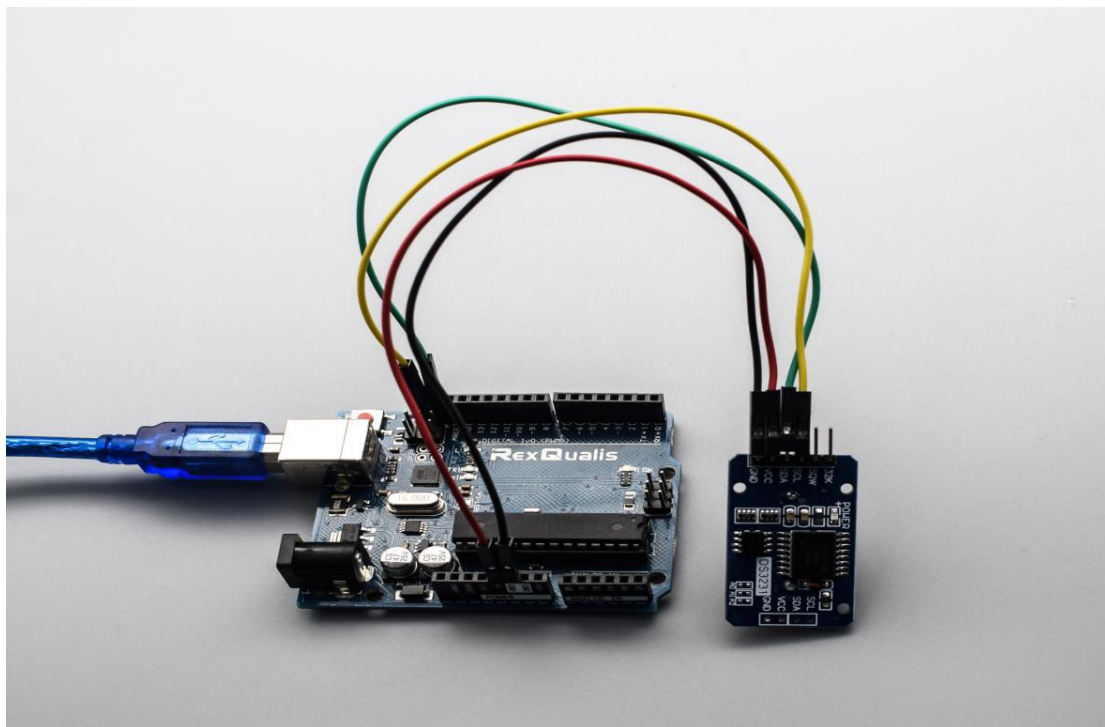
Long number format: 10-03-2018 16:12:46
Long format with month name: 10 March 2018 16:12:46
Short format witch 12h mode: 10th Mar 18, 04:12pm
Today is: Saturday, 68 days of the year.
Actual month has: 31 days.
Unixtime: 1520694766

Long number format: 10-03-2018 16:12:50
Long format with month name: 10 March 2018 16:12:50
Short format witch 12h mode: 10th Mar 18, 04:12pm
Today is: Saturday, 68 days of the year.
Actual month has: 31 days.
Unixtime: 1520694770

Long number format: 10-03-2018 16:12:55
Long format with month name: 10 March 2018 16:12:55
Short format witch 12h mode: 10th Mar 18, 04:12pm
Today is: Saturday, 68 days of the year.
Actual month has: 31 days.
Unixtime: 1520694775

```

☒ Autoscroll No line ending 9600 baud Clear output



You can see the video of the experiment results on YouTube:

<https://youtu.be/SZmThKiSrIM>

If it isn't working, make sure you have assembled the circuit correctly, verified and uploaded the code to your board. For how to upload the code and install the library, check Lesson 0 Preface.