

# 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 Mega 2560 with only three data cables.

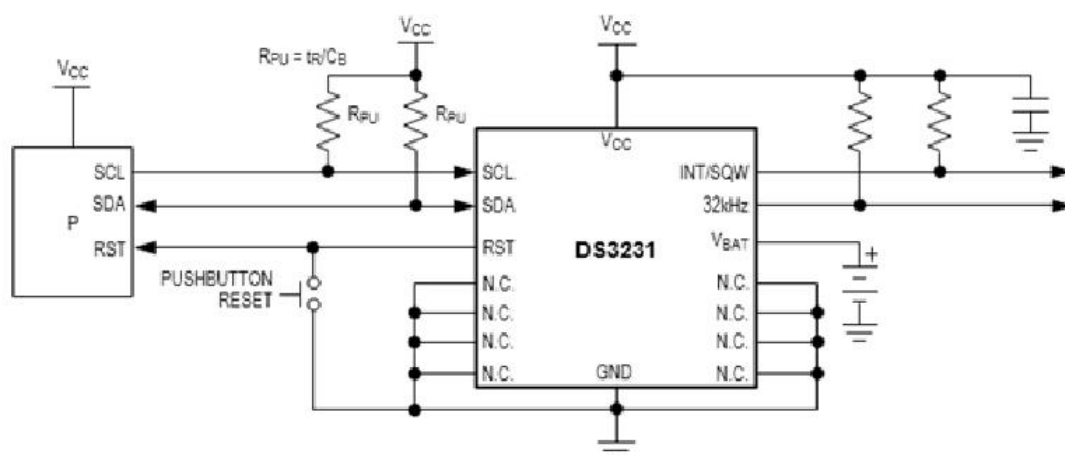
## Hardware Required

- ✓ 1 \* RexQualis Mega 2560
- ✓ 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();

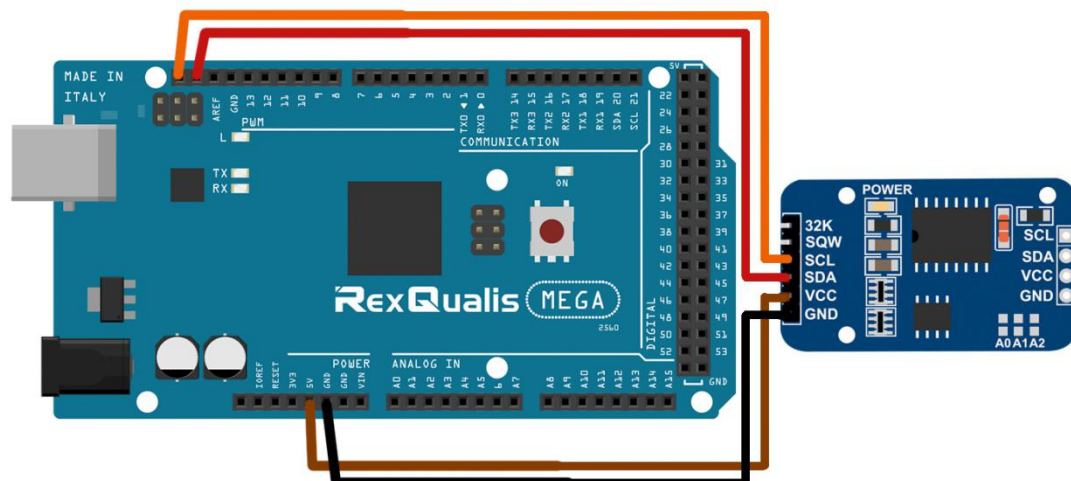
delay(4000);

}

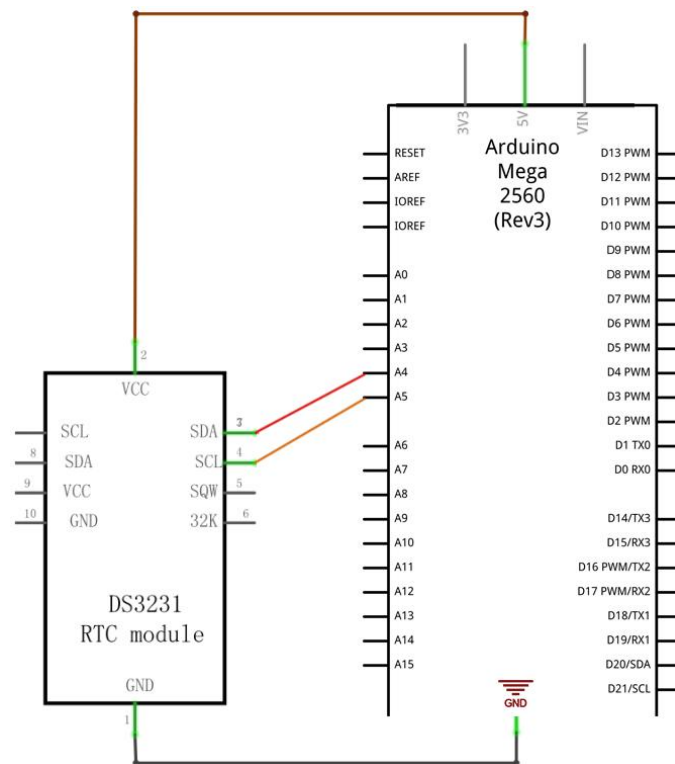
```

## Experimental Procedures

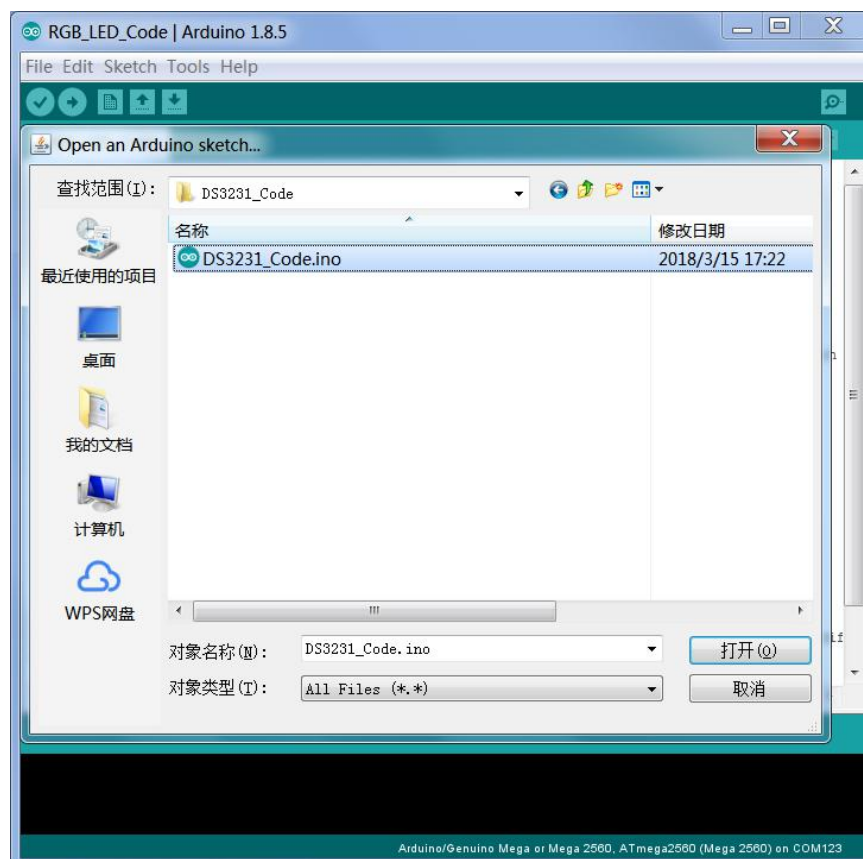
### Step 1: Build the circuit



## Schematic Diagram

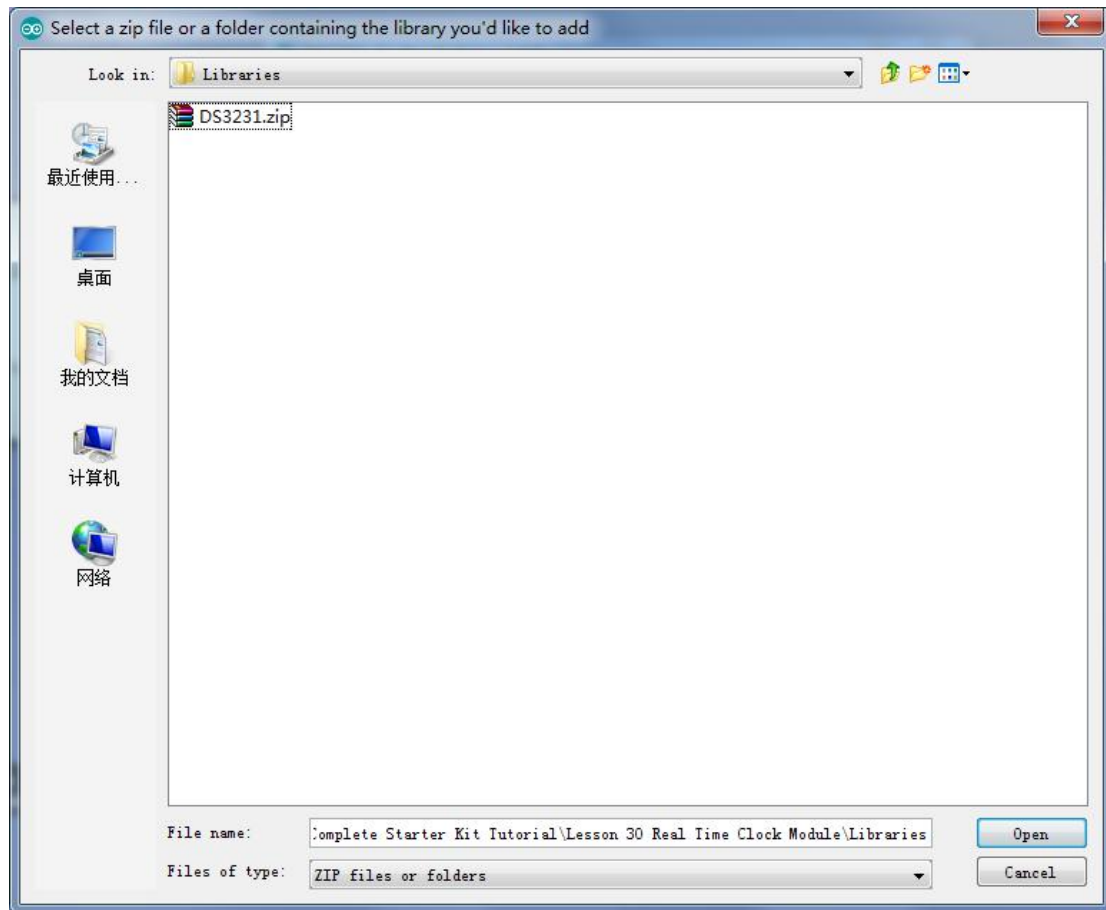


## Step 2: Open the code: DS3231\_Code



**Step 3: Attach Arduino Mega 2560 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 Mega 2560 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)

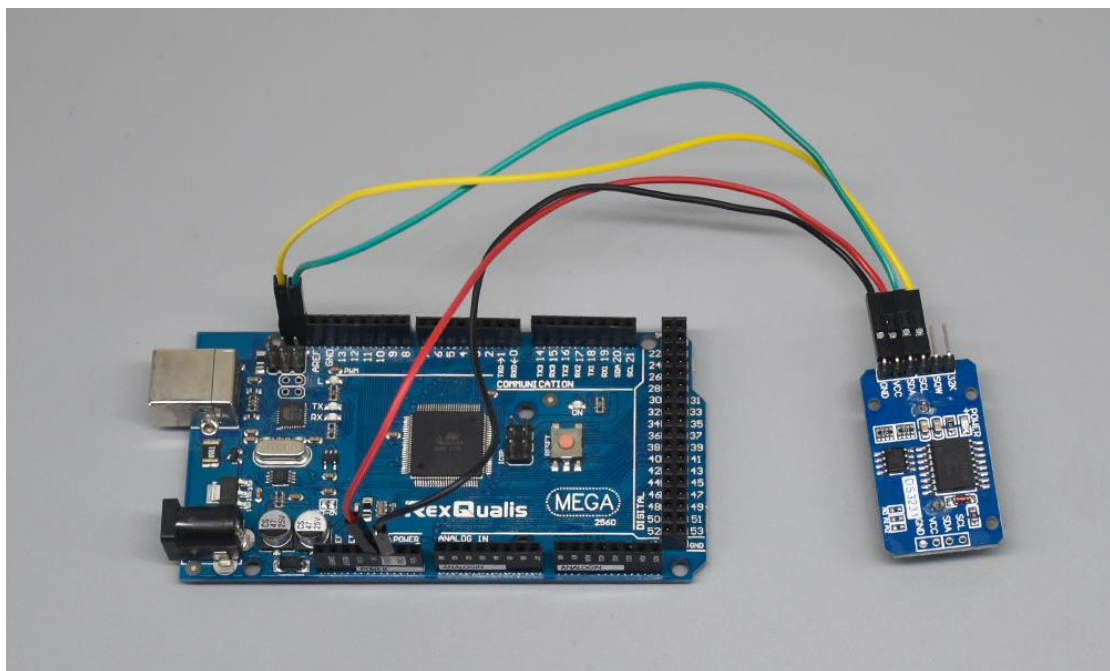
Long format with month name: 10 March 2018 16:12:42
Short format witch 12h mode: 10th Mar 18, 04:12pm
Today is: Saturday, 68 days of the year.
Actual month has: 31 days.
Unixtime: 1520694762

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/Tgh4MAuF3Co>

**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.**