Grove - RTC User Manual

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Wiki: http://www.seeedstudio.com/wiki/index.php?title=Twig_-_RTC

Bazaar: http://www.seeedstudio.com/depot/Grove-RTC-p-758.html

Document Revision History

Revision	Date	Author	Description
1.0	Sep 23, 2015	Jiankai.li	Create file

Contents

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1. Introduction

The RTC module is based on the clock chip DS1307, which supports the I2C protocol. It utilizes a Lithium cell battery (CR1225). The clock/calendar provides seconds, minutes, hours, day, date, month, and year. The end of the month date is automatically adjusted for months with fewer than 31 days, including corrections for leap years. The clock operates in either the 24-hour or 12-hour format with AM/PM indicator. And it is valid up to 2100. In order to gain a robust performance, you must put a 3-Volt CR1225 lithium cell in the battery-holder. If you use the primary power only, the module may not work normally, because the crystal may not oscillate.

Previous Version: V0.9b

Note: The battery is not included.

2. Specification

- PCB Size: 2.0cm*4.0cm
- Interface: 2.0mm pitch pin header
- IO Structure: SCL,SDA,VCC,GND
- ROHS: YES
- VCC：4.5~5.5V
- Logic High Level Input ： 2.2~VCC+0.3 V
- Logic Low Level Input ： -0.3~+0.8 V
- Battery Voltage：2.0~3.5 V

3. Demonstration

3.1 With Arduino

The following sketch demonstrates a simple application of setting the time and reading it out.

- Connect the module to the I2C Interface of Grove- Base Shield.
- Plug Grove- Base Shield into Arduino.
- Connect Arduino to PC via a USB cable.
- Download the library File:RTC Library
- Unzip it into the libraries file of Arduino IDE by the path: ..\arduino-1.0\libraries.
- Open the code directly by the path:File -> Example ->RTC->SetTimeAndDisplay.

```
#include <Wire.h>
#include "DS1307.h"

DS1307 clock;//define a object of DS1307 class
void setup()
{
    Serial.begin(9600);
    clock.begin();
    clock.fillByYMD(2013,1,19);//Jan 19,2013
    clock.fillByHMS(15,28,30);//15:28 30"
    clock.fillDayOfWeek(SAT);//Saturday
    clock.setTime();//write time to the RTC chip
}
void loop()
{
    printTime();
}
/*Function: Display time on the serial monitor*/
void printTime()
{
    clock.getTime();
    Serial.print(clock.hour, DEC);
    Serial.print(":");
    Serial.print(clock.minute, DEC);
    Serial.print(":");
    Serial.print(clock.second, DEC);
    Serial.print("    ");
    Serial.print(clock.month, DEC);
```

```
    Serial.print("/");
    Serial.print(clock.dayOfMonth, DEC);
    Serial.print("/");
    Serial.print(clock.year+2000, DEC);
    Serial.print(" ");
    Serial.print(clock.dayOfMonth);
    Serial.print("*");
    switch (clock.dayOfWeek)// Friendly printout the weekday
    {
        case MON:
          Serial.print("MON");
          break;
        case TUE:
          Serial.print("TUE");
          break;
        case WED:
          Serial.print("WED");
          break;
        case THU:
          Serial.print("THU");
          break;
        case FRI:
          Serial.print("FRI");
          break;
        case SAT:
          Serial.print("SAT");
          break;
        case SUN:
          Serial.print("SUN");
          break;
    }
    Serial.println(" ");
}
```

- Set the time. Put function arguments change to current date/time. The attention should be paid to the arguments format.

```
clock.fillByYMD(2013,1,19);//Jan 19,2013
    clock.fillByHMS(15,28,30);//15:28 30"
    clock.fillDayOfWeek(SAT);//Saturday
```

- Upload the code.
- Open the serial monitor to see the result.

The output time is changing like the clock.

3.2 With Raspberry Pi

1. You should have got a raspberry pi and a grovepi or grovepi+.

2. You should have completed configuring the development enviroment, otherwise follow here.

3. Connection.

- Plug the sensor to grovepi socket i2c-x(1~3) by using a grove cable.

4. Navigate to the demos' directory:

```
cd yourpath/GrovePi/Software/Python/
```

- To see the code

```
nano grove_i2c_rtc.py   # "Ctrl+x" to exit #
import time
import grovepi

# Connect the Grove Real Time Clock to any I2C port eg. I2C-1
# Can be found at I2C address 0x68
# SCL, SDA, VCC, GND

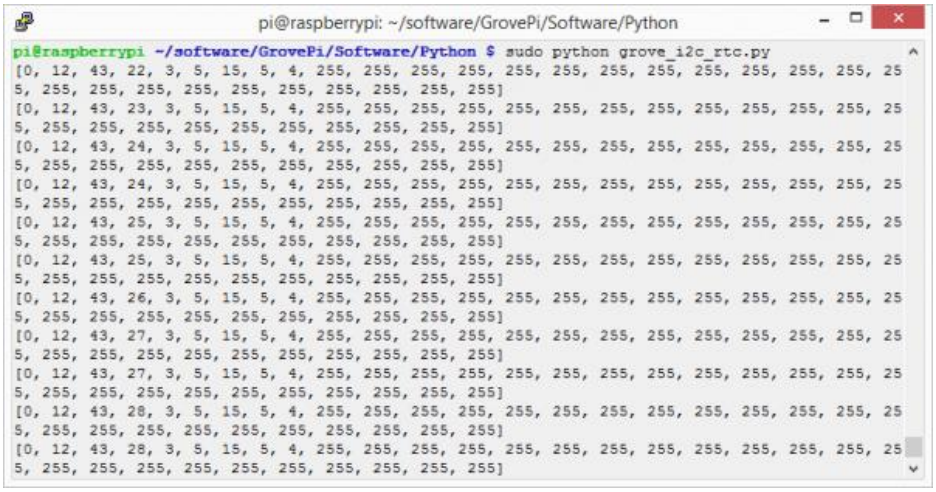
while True:
    try:
        print grovepi.rtc_getTime()
        time.sleep(.5)

    except IOError:
        print "Error"
```

5. Run the demo.

```
sudo python grove_i2c_rtc.py
```

6. Result



7. Use this demo to show the time in common.

```
'''
/*
 * Grove-RTC.py
 * Demo for Raspberry Pi
 *
 * Copyright (c) 2014 seeed technology inc.
 * Website    : www.seeed.cc
 * Author     : Lambor
 * Create Time: Nov 2014
 * Change Log :
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```
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 */
'''
#!/usr/bin/python
import time
import smbus


bus = smbus.SMBus(1)    # 0 = /dev/i2c-0 (port I2C0), 1 = /dev/i2c-1 (port I2C1)

class DS1307():
    def __init__(self):
        self.MON = 1
        self.TUE = 2
        self.WED = 3
        self.THU = 4
        self.FRI = 5
        self.SAT = 6
        self.SUN = 7
        self.DS1307_I2C_ADDRESS = 0x68

        print 'begin'

    def decToBcd(self, val):
        return ( (val/10*16) + (val%10) )

    def bcdToDec(self,  val):
        return ( (val/16*10) + (val%16) )

    def begin(self, news):
        print news

    def startClock(self):
        bus.write_byte(self.DS1307_I2C_ADDRESS, 0x00)
        self.second = bus.read_byte(self.DS1307_I2C_ADDRESS) & 0x7f
        bus.write_byte_data(self.DS1307_I2C_ADDRESS, 0x00, self.second)

        print 'startClock..'

    def stopClock(self):
        bus.write_byte(self.DS1307_I2C_ADDRESS, 0x00)
        self.second = bus.read_byte(self.DS1307_I2C_ADDRESS) | 0x80
        bus.write_byte_data(self.DS1307_I2C_ADDRESS, 0x00, self.second)
```

```
        print 'stopClock..'

    def setTime(self):
        data = [self.decToBcd(self.second), self.decToBcd(self.minute), \
                self.decToBcd(self.hour), self.decToBcd(self.dayOfWeek), \
                self.decToBcd(self.dayOfMonth), self.decToBcd(self.month), \
                self.decToBcd(self.year)]

        bus.write_byte(self.DS1307_I2C_ADDRESS, 0x00)
        bus.write_i2c_block_data(self.DS1307_I2C_ADDRESS,0x00,data)

        print 'setTime..'

    def getTime(self):
        bus.write_byte(self.DS1307_I2C_ADDRESS, 0x00)
        data = bus.read_i2c_block_data(self.DS1307_I2C_ADDRESS,0x00)
        #A few of these need masks because certain bits are control bits
        self.second = self.bcdToDec(data[0] & 0x7f)
        self.minute = self.bcdToDec(data[1])
        self.hour = self.bcdToDec(data[2] & 0x3f)  #Need to change this if 12 hour am/pm
        self.dayOfWeek = self.bcdToDec(data[3])
        self.dayOfMonth = self.bcdToDec(data[4])
        self.month = self.bcdToDec(data[5])
        self.year = self.bcdToDec(data[6])

        print 'getTime..'

    def fillByHMS(self, _hour,  _minute,  _second):
        self.hour = _hour
        self.minute = _minute
        self.second = _second

        print 'fillByHMS..'

    def fillByYMD(self, _year,  _month,  _day):
        self.year = _year - 2000
        self.month = _month;
        self.dayOfMonth = _day

        print 'fillByYMD..'

    def fillDayOfWeek(self,  _dow):
        self.dayOfWeek = _dow
```

```
        print 'fillDayOfWeek..'

if __name__ == "__main__":
    clock = DS1307()
    clock.fillByYMD(2015,3,5)
    clock.fillByHMS(12,42,30)
    clock.fillDayOfWeek(clock.THU)
    clock.setTime()
    while True:
        clock.getTime()
        print clock.hour, ":", clock.minute, ":", \
                clock.second, " ", clock.dayOfMonth, "/", \
                clock.month, "/", clock.year," ", "weekday", \
                ":", clock.dayOfWeek
        time.sleep(1)
```

8. Create grove_rtc.py and copy codes above.

9. Run the code.

```
sudo python grove_rtc.py
```

10. Result

4. Resources

- Real Time Clock Eagle File.zip
- github repository for RTC
- DS1307 datasheet

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