Adafruit's PCF8523 RTC Library Documentation

Release 1.0

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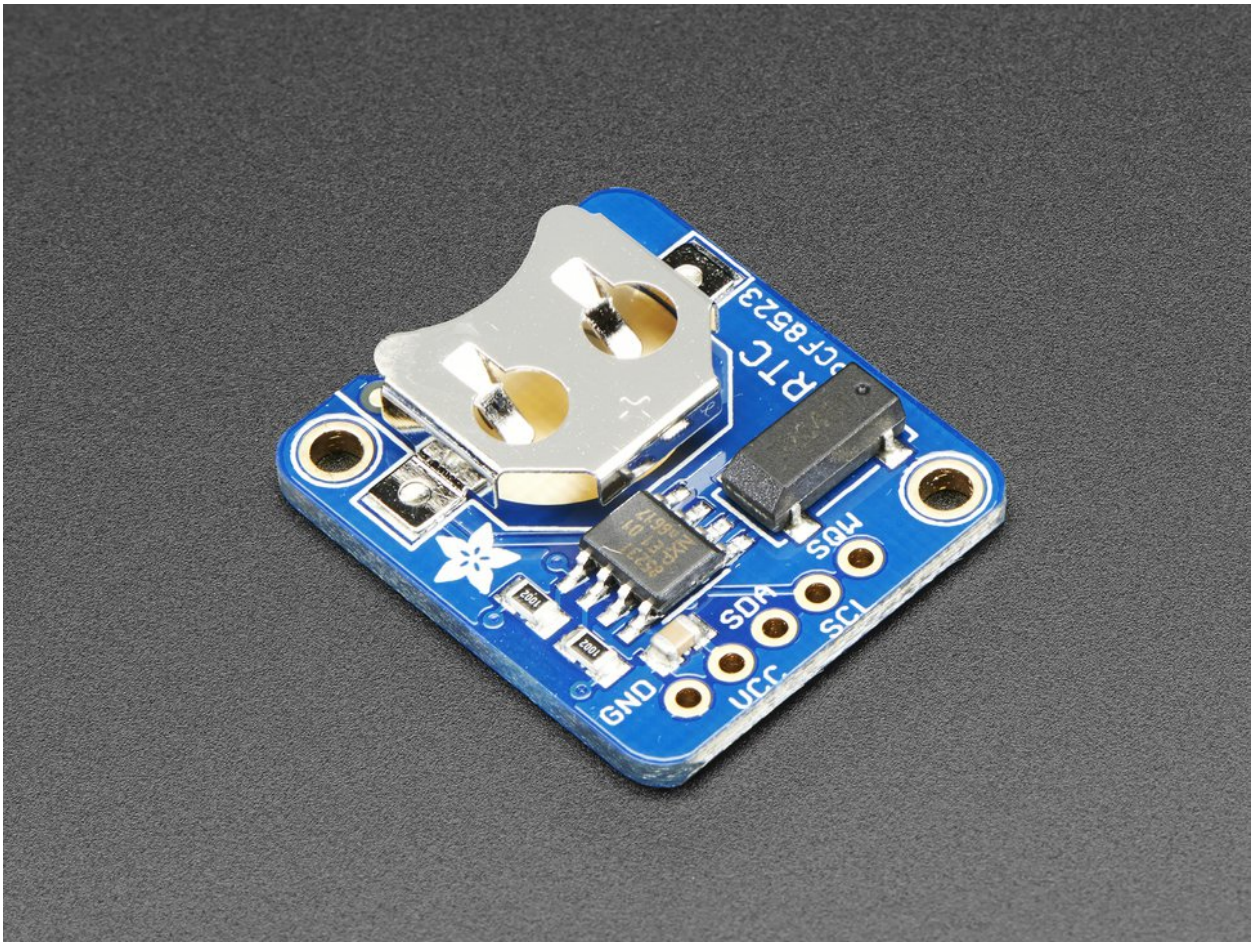
Contents

This is a great battery-backed real time clock (RTC) that allows your microcontroller project to keep track of time even if it is reprogrammed, or if the power is lost. Perfect for datalogging, clock-building, time stamping, timers and alarms, etc. Equipped with PCF8523 RTC - it can run from 3.3V or 5V power & logic!

The PCF8523 is simple and inexpensive but not a high precision device. It may lose or gain up to two seconds a day. For a high-precision, temperature compensated alternative, please check out the DS3231 precision RTC. If you need a DS1307 for compatibility reasons, check out our DS1307 RTC breakout.



CHAPTER 1

Dependencies

This driver depends on the Register and Bus Device libraries. Please ensure they are also available on the CircuitPython filesystem. This is easily achieved by downloading a library and driver bundle.

1.1 Installing from PyPI

On supported GNU/Linux systems like the Raspberry Pi, you can install the driver locally from PyPI. To install for current user:

```
pip3 install adafruit-circuitpython-pcf8523
```

To install system-wide (this may be required in some cases):

```
sudo pip3 install adafruit-circuitpython-pcf8523
```

To install in a virtual environment in your current project:

```
mkdir project-name && cd project-name
python3 -m venv .env
source .env/bin/activate
pip3 install adafruit-circuitpython-pcf8523
```

CHAPTER 2

Usage Notes

2.1 Basics

Of course, you must import the library to use it:

```
import busio
import adafruit_pcf8523
import time
```

All the Adafruit RTC libraries take an instantiated and active I2C object (from the `busio` library) as an argument to their constructor. The way to create an I2C object depends on the board you are using. For boards with labeled SCL and SDA pins, you can:

```
from board import *
```

You can also use pins defined by the onboard `microcontroller` through the `microcontroller.pin` module.

Now, to initialize the I2C bus:

```
i2c_bus = busio.I2C(SCL, SDA)
```

Once you have created the I2C interface object, you can use it to instantiate the RTC object:

```
rtc = adafruit_pcf8523.PCF8523(i2c_bus)
```

2.2 Date and time

To set the time, you need to set datetime‘ to a `time.struct_time` object:

```
rtc.datetime = time.struct_time((2017,1,9,15,6,0,0,9,-1))
```

After the RTC is set, you retrieve the time by reading the *datetime* attribute and access the standard attributes of a struct_time such as `tm_year`, `tm_hour` and `tm_min`.

```
t = rtc.datetime
print(t)
print(t.tm_hour, t.tm_min)
```

2.3 Alarm

To set the time, you need to set *alarm* to a tuple with a `time.struct_time` object and string representing the frequency such as "hourly":

```
rtc.alarm = (time.struct_time((2017,1,9,15,6,0,0,9,-1)), "daily")
```

After the RTC is set, you retrieve the alarm status by reading the *alarm_status* attribute. Once True, set it back to False to reset.

```
if rtc.alarm_status:
    print("wake up!")
    rtc.alarm_status = False
```

CHAPTER 3

Contributing

Contributions are welcome! Please read our Code of Conduct before contributing to help this project stay welcoming.

CHAPTER 4

Building locally

4.1 Zip release files

To build this library locally you'll need to install the circuitpython-build-tools package.

```
python3 -m venv .env
source .env/bin/activate
pip install circuitpython-build-tools
```

Once installed, make sure you are in the virtual environment:

```
source .env/bin/activate
```

Then run the build:

```
circuitpython-build-bundles --filename_prefix adafruit-circuitpython-pcf8523 --
↪library_location .
```

4.2 Sphinx documentation

Sphinx is used to build the documentation based on rST files and comments in the code. First, install dependencies (feel free to reuse the virtual environment from above):

```
python3 -m venv .env
source .env/bin/activate
pip install Sphinx sphinx-rtd-theme
```

Now, once you have the virtual environment activated:

```
cd docs
sphinx-build -E -W -b html . _build/html
```

This will output the documentation to `docs/_build/html`. Open the index.html in your browser to view them. It will also (due to -W) error out on any warning like Travis will. This is a good way to locally verify it will pass.

CHAPTER 5

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5.1 Demo

Listing 1: examples/pcf8523_simpletest.py

```
# Simple demo of reading and writing the time for the PCF8523 real-time clock.
# Change the if False to if True below to set the time, otherwise it will just
# print the current date and time every second.  Notice also comments to adjust
# for working with hardware vs. software I2C.

import time
import board
# For hardware I2C (M0 boards) use this line:
import busio as io
# Or for software I2C (ESP8266) use this line instead:
#import bitbangio as io

import adafruit_pcf8523

# Change to the appropriate I2C clock & data pins here!
i2c_bus = io.I2C(board.SCL, board.SDA)

# Create the RTC instance:
rtc = adafruit_pcf8523.PCF8523(i2c_bus)

# Lookup table for names of days (nicer printing).
days = ("Sunday", "Monday", "Tuesday", "Wednesday", "Thursday", "Friday", "Saturday")


#pylint: disable-msg=bad-whitespace
#pylint: disable-msg=using-constant-test
if False:   # change to True if you want to set the time!
    #                     year, mon, date, hour, min, sec, wday, yday, isdst
    t = time.struct_time((2017,  10,   29,   10,  31,  0,    0,   -1,    -1))
```

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```
    # you must set year, mon, date, hour, min, sec and weekday
    # yearday is not supported, isdst can be set but we don't do anything with it at this time
    print("Setting time to:", t)     # uncomment for debugging
    rtc.datetime = t
    print()
#pylint: enable-msg=using-constant-test
#pylint: enable-msg=bad-whitespace

# Main loop:
while True:
    t = rtc.datetime
    #print(t)     # uncomment for debugging
    print("The date is {} {}/{}/{}".format(days[int(t.tm_wday)], t.tm_mday, t.tm_mon, t.tm_year))
    print("The time is {}:{:02}:{:02}".format(t.tm_hour, t.tm_min, t.tm_sec))
    time.sleep(1) # wait a second
```

5.2 adafruit_pcf8523 - PCF8523 Real Time Clock module

This library supports the use of the PCF8523-based RTC in CircuitPython. It contains a base RTC class used by all Adafruit RTC libraries. This base class is inherited by the chip-specific subclasses.

Functions are included for reading and writing registers and manipulating datetime objects.

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5.2.1 Implementation Notes

Hardware:

- Adafruit Adalogger FeatherWing - RTC + SD Add-on (Product ID: 2922)
- Adafruit PCF8523 RTC breakout (Product ID: 3295)

Software and Dependencies:

- Adafruit CircuitPython firmware: https://github.com/adafruit/circuitpython/releases
- Adafruit's Register library: https://github.com/adafruit/Adafruit_CircuitPython_Register
- Adafruit's Bus Device library: https://github.com/adafruit/Adafruit_CircuitPython_BusDevice

Notes:

1. Milliseconds are not supported by this RTC.
2. Datasheet: http://cache.nxp.com/documents/data_sheet/PCF8523.pdf

class adafruit_pcf8523.**PCF8523**(*i2c_bus*)

Interface to the PCF8523 RTC.

alarm

Alarm time for the first alarm.

alarm_interrupt

True if the interrupt pin will output when alarm is alarming.

alarm_status
True if alarm is alarming. Set to False to reset.

battery_low
True if the battery is low and should be replaced.

datetime
Gets the current date and time or sets the current date and time then starts the clock.

datetime_register
Current date and time.

lost_power
True if the device has lost power since the time was set.

power_management
Power management state that dictates battery switchover, power sources and low battery detection. Defaults to BATTERY_SWITCHOVER_OFF (0b000).

CHAPTER 6

Indices and tables

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