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# **AdafruitTLC5947 Library Documentation**

***Release 1.0***

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CircuitPython module for the TLC5947 12-bit 24 channel LED PWM driver.



# CHAPTER 1

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## Dependencies

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This driver depends on:

- [Adafruit CircuitPython](#)

Please ensure all dependencies are available on the CircuitPython filesystem. This is easily achieved by downloading the [Adafruit library and driver bundle](#).





## CHAPTER 2

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### Usage Example

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See `examples/tlc5947_simpletest.py` for a demo of the usage.  
See `examples/tlc5947_chain.py` for a demo of chained driver usage.



## CHAPTER 3

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### Contributing

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Contributions are welcome! Please read our [Code of Conduct](#) before contributing to help this project stay welcoming.



## CHAPTER 4

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### Building locally

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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-tlc5947 --
↳library_location .
```

### 4.1 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.



## 5.1 Simple test

Ensure your device works with this simple test.

Listing 1: examples/tlc5947\_simpletest.py

```
1  # Simple demo of controlling the TLC5947 12-bit 24-channel PWM controller.
2  # Will update channel values to different PWM duty cycles.
3  # Author: Tony DiCola
4
5  import board
6  import busio
7  import digitalio
8
9  import adafruit_tlc5947
10
11 # Define pins connected to the TLC5947
12 SCK = board.SCK
13 MOSI = board.MOSI
14 LATCH = digitalio.DigitalInOut(board.D5)
15
16 # Initialize SPI bus.
17 spi = busio.SPI(clock=SCK, MOSI=MOSI)
18
19 # Initialize TLC5947
20 tlc5947 = adafruit_tlc5947.TLC5947(spi, LATCH)
21 # You can optionally disable auto_write which allows you to control when
22 # channel state is written to the chip. Normally auto_write is true and
23 # will automatically write out changes as soon as they happen to a channel, but
24 # if you need more control or atomic updates of multiple channels then disable
25 # and manually call write as shown below.
26 # tlc5947 = adafruit_tlc5947.TLC5947(spi, LATCH, auto_write=False)
27
```

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```

28 # There are two ways to channel channel PWM values. The first is by getting
29 # a PWMOut object that acts like the built-in PWMOut and can be used anywhere
30 # it is used in your code. Change the duty_cycle property to a 16-bit value
31 # (note this is NOT the 12-bit value supported by the chip natively) and the
32 # PWM channel will be updated.
33
34 # With an RGB LED hooked up to pins 0, 1, and 2, cycle the red, green, and
35 # blue pins up and down:
36
37 red = tlc5947.create_pwm_out(0)
38 green = tlc5947.create_pwm_out(1)
39 blue = tlc5947.create_pwm_out(2)
40
41 step = 10
42 start_pwm = 0
43 end_pwm = 32767 # 50% (32767, or half of the maximum 65535):
44
45 while True:
46     for pin in (red, green, blue):
47         # Brighten:
48         print("Brightening LED")
49         for pwm in range(start_pwm, end_pwm, step):
50             pin.duty_cycle = pwm
51
52         # Dim:
53         print("Dimming LED")
54         for pwm in range(end_pwm, start_pwm, 0 - step):
55             pin.duty_cycle = pwm
56
57 # Note if auto_write was disabled you need to call write on the parent to
58 # make sure the value is written (this is not common, if disabling auto_write
59 # you probably want to use the direct 12-bit raw access instead shown below).
60 #     tlc5947.write()
61
62 # The other way to read and write channels is directly with each channel 12-bit
63 # value and an item accessor syntax. Index into the TLC5947 with the channel
64 # number (0-23) and get or set its 12-bit value (0-4095).
65 # For example set channel 1 to 50% duty cycle.
66 #tlc5947[1] = 2048
67 # Or set channel 23 (first channel from the end) to 2/3 duty cycle.
68 #tlc5947[-1] = 2730
69 # Again be sure to call write if you disabled auto_write.
70 #tlc5947.write()

```

## 5.2 adafruit\_tlc5947

CircuitPython module for the TLC5947 12-bit 24 channel LED PWM driver. See examples/simpletest.py for a demo of the usage.

- Author(s): Tony DiCola, Walter Haschka

### 5.2.1 Implementation Notes

**Hardware:**



- Adafruit 24-Channel 12-bit PWM LED Driver - SPI Interface - TLC5947 (Product ID: 1429)

#### Software and Dependencies:

- Adafruit CircuitPython firmware for the ESP8622 and M0-based boards: <https://github.com/adafruit/circuitpython/releases>

**class** `adafruit_tlc5947.TLC5947` (*spi, latch, \*, auto\_write=True, num\_drivers=1*)

TLC5947 12-bit 24 channel LED PWM driver. Create an instance of this by passing in at least the following parameters:

##### Parameters

- **spi** – The SPI bus connected to the chip (only the SCK and MOSI lines are used, there is no MISO/input).
- **latch** – A DigitalInOut instance connected to the chip's latch line.

Optionally you can specify:

##### Parameters

- **auto\_write** – This is a boolean that defaults to True and will automatically write out all the channel values to the chip as soon as a single one is updated. If you set to False to disable then you MUST call write after every channel update or when you deem necessary to update the chip state.
- **num\_drivers** – This is an integer that defaults to 1. It stands for the number of chained LED driver boards (DOUT of one board has to be connected to DIN of the next). For each board added, 36 bytes of RAM memory will be taken. The channel numbers on the driver directly connected to the controller are 0 to 23, and for each driver add 24 to the port number printed. The more drivers are chained, the more viable it is to set auto\_write=False, and call write explicitly after updating all the channels.

**class** `PWMOut` (*tlc5947, channel*)

Internal PWMOut class that mimics the behavior of CircuitPython's PWMOut class but is associated with a channel on the TLC5947. You can get and set the instance's duty\_cycle property as a 16-bit PWM value (note there will be quantization errors as the TLC5947 is a 12-bit PWM chip, instead use the TLC5947 class item accessor notation for direct 12-bit raw PWM channel access). Note you cannot change the frequency as it is fixed by the TLC5947 to ~2.4-5.6 mhz.

##### duty\_cycle

Get and set the 16-bit PWM duty cycle value for this channel.

##### frequency

Frequency of the PWM channel, note you cannot change this and cannot read its exact value (it varies from 2.4-5.6 mhz, see the TLC5947 datasheet).

**create\_pwm\_out** (*channel*)

Create an instance of a PWMOut-like class that mimics the built-in CircuitPython PWMOut class but is associated with the TLC5947 channel that is specified. This PWMOut class has a duty\_cycle property which you can read and write with a 16-bit value to control the channel. Note there will be quantization error as the chip only supports 12-bit PWM, if this is problematic use the item accessor approach to update the raw 12-bit channel values.

**write** ()

Write out the current channel PWM values to the chip. This is only necessary to call if you disabled auto\_write in the initializer, otherwise write is automatically called on any channel update.



## CHAPTER 6

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### Indices and tables

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