AdafruitRGB$_{D}isplayLibraryDocumentation$

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Port of display drivers from https://github.com/adafruit/micropython-adafruit-rgb-display to Adafruit CircuitPython for use on Adafruit's SAMD21-based and other CircuitPython boards.

Note: This driver currently won't work on micropython.org firmware, instead you want the micropython-adafruit-rgb-display driver linked above!

This CircuitPython driver currently supports displays that use the following display-driver chips: HX8353, HX8357, ILI9341, S6D02A1, ST7789, SSD1331, SSD1351, and ST7735 (including variants ST7735R and ST7735S).

CHAPTER 1

Dependencies

This driver depends on:

- Adafruit CircuitPython
- Bus Device

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

For the Pillow Examples, you will need to be running CPython. This means using a Single Board Computer such as a Raspberry Pi or using a chip such as an FT232H on Linux, Window, or Mac. CircuitPython does not support PIL/pillow (python imaging library)!

For improved performance consider installing NumPy.

CHAPTER 2

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-rgb-display
```

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

```
sudo pip3 install adafruit-circuitpython-rgb-display
```

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-rgb-display
```

CHAPTER 3

Usage Example

3.1 2.2", 2.4", 2.8", 3.2" TFT

```
import time
import busio
import digitalio
from board import SCK, MOSI, MISO, D2, D3

from adafruit_rgb_display import color565
import adafruit_rgb_display.ili9341 as ili9341


# Configuration for CS and DC pins:
CS_PIN = D2
DC_PIN = D3

# Setup SPI bus using hardware SPI:
spi = busio.SPI(clock=SCK, MOSI=MOSI, MISO=MISO)

# Create the ILI9341 display:
display = ili9341.ILI9341(spi, cs=digitalio.DigitalInOut(CS_PIN),
                          dc=digitalio.DigitalInOut(DC_PIN))

# Main loop:
while True:
    # Clear the display
    display.fill(0)
    # Draw a red pixel in the center.
    display.pixel(120, 160, color565(255, 0, 0))
    # Pause 2 seconds.
    time.sleep(2)
    # Clear the screen blue.
    display.fill(color565(0, 0, 255))
    # Pause 2 seconds.
```

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```
    time.sleep(2)
```

3.2 1.14" TFT with Raspbery Pi 4

With 1.14" wiring, here is the working code:

```
import time
import busio
import digitalio
from board import SCK, MOSI, MISO, CE0, D24, D25

from adafruit_rgb_display import color565
from adafruit_rgb_display.st7789 import ST7789


# Configuration for CS and DC pins:
CS_PIN = CE0
DC_PIN = D25
RESET_PIN = D24
BAUDRATE = 24000000

# Setup SPI bus using hardware SPI:
spi = busio.SPI(clock=SCK, MOSI=MOSI, MISO=MISO)

# Create the ST7789 display:
display = ST7789(
    spi,
    rotation=90,
    width=135,
    height=240,
    x_offset=53,
    y_offset=40,
    baudrate=BAUDRATE,
    cs=digitalio.DigitalInOut(CS_PIN),
    dc=digitalio.DigitalInOut(DC_PIN),
    rst=digitalio.DigitalInOut(RESET_PIN))

# Main loop: same as above
while True:
    # Clear the display
    display.fill(0)
    # Draw a red pixel in the center.
    display.pixel(120, 160, color565(255, 0, 0))
    # Pause 2 seconds.
    time.sleep(2)
    # Clear the screen blue.
    display.fill(color565(0, 0, 255))
    # Pause 2 seconds.
    time.sleep(2)
```

CHAPTER 4

Contributing

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

CHAPTER 5

Documentation

For information on building library documentation, please check out this guide.

CHAPTER 6

Table of Contents

6.1 Simple test

Ensure your device works with this simple test.

Listing 1: examples/rgb_display_simpletest.py

```
# SPDX-FileCopyrightText: 2021 ladyada for Adafruit Industries
# SPDX-License-Identifier: MIT

# Quick test of TFT FeatherWing (ST7789) with Feather M0 or M4
# This will work even on a device running displayio
# Will fill the TFT black and put a red pixel in the center, wait 2 seconds,
# then fill the screen blue (with no pixel), wait 2 seconds, and repeat.
import time
import random
import digitalio
import board

from adafruit_rgb_display.rgb import color565
import adafruit_rgb_display.st7789 as st7789

# Configuratoin for CS and DC pins (these are FeatherWing defaults on M0/M4):
cs_pin = digitalio.DigitalInOut(board.D5)
dc_pin = digitalio.DigitalInOut(board.D6)
reset_pin = digitalio.DigitalInOut(board.D9)

# Config for display baudrate (default max is 24mhz):
BAUDRATE = 24000000

# Setup SPI bus using hardware SPI:
spi = board.SPI()

# Create the ST7789 display:
```

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```
display = st7789.ST7789(spi, cs=cs_pin, dc=dc_pin, rst=reset_pin, baudrate=BAUDRATE)

# Main loop:
while True:
    # Fill the screen red, green, blue, then black:
    for color in ((255, 0, 0), (0, 255, 0), (0, 0, 255)):
        display.fill(color565(color))
    # Clear the display
    display.fill(0)
    # Draw a red pixel in the center.
    display.pixel(display.width // 2, display.height // 2, color565(255, 0, 0))
    # Pause 2 seconds.
    time.sleep(2)
    # Clear the screen a random color
    display.fill(
        color565(random.randint(0, 255), random.randint(0, 255), random.randint(0,␣
↪255))
    )
    # Pause 2 seconds.
    time.sleep(2)
```

Listing 2: examples/rgb_display_ili9341test.py

```
# SPDX-FileCopyrightText: 2021 ladyada for Adafruit Industries
# SPDX-License-Identifier: MIT

# Quick test of TFT FeatherWing (ILI9341) with Feather M0 or M4
# Will fill the TFT black and put a red pixel in the center, wait 2 seconds,
# then fill the screen blue (with no pixel), wait 2 seconds, and repeat.
import time
import random
import busio
import digitalio
import board

from adafruit_rgb_display.rgb import color565
import adafruit_rgb_display.ili9341 as ili9341


# Configuratoin for CS and DC pins (these are FeatherWing defaults on M0/M4):
cs_pin = digitalio.DigitalInOut(board.D9)
dc_pin = digitalio.DigitalInOut(board.D10)

# Config for display baudrate (default max is 24mhz):
BAUDRATE = 24000000

# Setup SPI bus using hardware SPI:
spi = busio.SPI(clock=board.SCK, MOSI=board.MOSI, MISO=board.MISO)

# Create the ILI9341 display:
display = ili9341.ILI9341(spi, cs=cs_pin, dc=dc_pin, baudrate=BAUDRATE)

# Main loop:
while True:
    # Fill the screen red, green, blue, then black:
    for color in ((255, 0, 0), (0, 255, 0), (0, 0, 255)):
```

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```
        display.fill(color565(color))
    # Clear the display
    display.fill(0)
    # Draw a red pixel in the center.
    display.pixel(display.width // 2, display.height // 2, color565(255, 0, 0))
    # Pause 2 seconds.
    time.sleep(2)
    # Clear the screen a random color
    display.fill(
        color565(random.randint(0, 255), random.randint(0, 255), random.randint(0,
↪255))
    )
    # Pause 2 seconds.
    time.sleep(2)
```

6.2 adafruit_rgb_display.rgb

Base class for all RGB Display devices

- Author(s): Radomir Dopieralski, Michael McWethy

class adafruit_rgb_display.rgb.**Display**(*width*, *height*, *rotation*)

Base class for all RGB display devices :param width: number of pixels wide :param height: number of pixels high

fill(*color=0*)

Fill the whole display with the specified color.

fill_rectangle(*x*, *y*, *width*, *height*, *color*)

Draw a rectangle at specified position with specified width and height, and fill it with the specified color.

hline(*x*, *y*, *width*, *color*)

Draw a horizontal line.

image(*img*, *rotation=None*, *x=0*, *y=0*)

Set buffer to value of Python Imaging Library image. The image should be in 1 bit mode and a size not exceeding the display size when drawn at the supplied origin.

init()

Run the initialization commands.

pixel(*x*, *y*, *color=None*)

Read or write a pixel at a given position.

rotation

Set the default rotation

vline(*x*, *y*, *height*, *color*)

Draw a vertical line.

class adafruit_rgb_display.rgb.**DisplaySPI**(*spi*, *dc*, *cs*, *rst=None*, *width=1*, *height=1*, *baudrate=12000000*, *polarity=0*, *phase=0*, ***, *x_offset=0*, *y_offset=0*, *rotation=0*)

Base class for SPI type devices

read(*command=None*, *count=0*)

SPI read from device with optional command

reset()
Reset the device

write(*command=None*, *data=None*)
SPI write to the device: commands and data

class adafruit_rgb_display.rgb.**DummyPin**
Can be used in place of a DigitalInOut() when you don't want to skip it.

deinit()
Dummy DigitalInOut deinit

direction
Dummy direction DigitalInOut property

pull
Dummy pull DigitalInOut property

switch_to_input(**args*, ***kwargs*)
Dummy switch_to_input method

switch_to_output(**args*, ***kwargs*)
Dummy switch_to_output method

value
Dummy value DigitalInOut property

adafruit_rgb_display.rgb.**color565**(*r*, *g=0*, *b=0*)
Convert red, green and blue values (0-255) into a 16-bit 565 encoding. As a convenience this is also available in the parent adafruit_rgb_display package namespace.

adafruit_rgb_display.rgb.**image_to_data**(*image*)
Generator function to convert a PIL image to 16-bit 565 RGB bytes.

6.3 adafruit_rgb_display.hx8353

A simple driver for the HX8353-based displays.

- Author(s): Radomir Dopieralski, Michael McWethy

class adafruit_rgb_display.hx8353.**HX8353**(*spi*, *dc*, *cs*, *rst=None*, *width=128*, *height=128*, *rotation=0*)
A simple driver for the HX8353-based displays.

```
>>> import busio
>>> import digitalio
>>> import board
>>> from adafruit_rgb_display import color565
>>> import adafruit_rgb_display.hx8353 as hx8353
>>> spi = busio.SPI(clock=board.SCK, MOSI=board.MOSI, MISO=board.MISO)
>>> display = hx8353.HX8383(spi, cs=digitalio.DigitalInOut(board.GPIO0),
...     dc=digitalio.DigitalInOut(board.GPIO15))
>>> display.fill(0x7521)
>>> display.pixel(64, 64, 0)
```

6.4 adafruit_rgb_display.ili9341

A simple driver for the ILI9341/ILI9340-based displays.

- Author(s): Radomir Dopieralski, Michael McWethy

class adafruit_rgb_display.ili9341.**ILI9341**(*spi*, *dc*, *cs*, *rst=None*, *width=240*, *height=320*, *baudrate=16000000*, *polarity=0*, *phase=0*, *rotation=0*)

A simple driver for the ILI9341/ILI9340-based displays.

```
>>> import busio
>>> import digitalio
>>> import board
>>> from adafruit_rgb_display import color565
>>> import adafruit_rgb_display.ili9341 as ili9341
>>> spi = busio.SPI(clock=board.SCK, MOSI=board.MOSI, MISO=board.MISO)
>>> display = ili9341.ILI9341(spi, cs=digitalio.DigitalInOut(board.GPIO0),
...     dc=digitalio.DigitalInOut(board.GPIO15))
>>> display.fill(color565(0xff, 0x11, 0x22))
>>> display.pixel(120, 160, 0)
```

scroll(*dy=None*)

Scroll the display by delta y

6.5 adafruit_rgb_display.s6d02a1

A simple driver for the S6D02A1-based displays.

- Author(s): Radomir Dopieralski, Michael McWethy

class adafruit_rgb_display.s6d02a1.**S6D02A1**(*spi*, *dc*, *cs*, *rst=None*, *width=128*, *height=160*, *rotation=0*)

A simple driver for the S6D02A1-based displays.

```
>>> import busio
>>> import digitalio
>>> import board
>>> from adafruit_rgb_display import color565
>>> import adafruit_rgb_display.s6d02a1 as s6d02a1
>>> spi = busio.SPI(clock=board.SCK, MOSI=board.MOSI, MISO=board.MISO)
>>> display = s6d02a1.S6D02A1(spi, cs=digitalio.DigitalInOut(board.GPIO0),
...     dc=digitalio.DigitalInOut(board.GPIO15), rst=digitalio.DigitalInOut(board.
↪GPIO16))
>>> display.fill(0x7521)
>>> display.pixel(64, 64, 0)
```

6.6 adafruit_rgb_display.ssd1331

A simple driver for the SSD1331-based displays.

- Author(s): Radomir Dopieralski, Michael McWethy

class adafruit_rgb_display.ssd1331.**SSD1331**(*spi*, *dc*, *cs*, *rst=None*, *width=96*, *height=64*, *baudrate=16000000*, *polarity=0*, *phase=0*, ***, *rotation=0*)

A simple driver for the SSD1331-based displays.

```
import busio
import digitalio
import board
from adafruit_rgb_display import color565
import adafruit_rgb_display.ssd1331 as ssd1331
spi = busio.SPI(clock=board.SCK, MOSI=board.MOSI, MISO=board.MISO)
display = ssd1331.SSD1331(spi, cs=digitalio.DigitalInOut(board.GPIO0),
                          dc=digitalio.DigitalInOut(board.GPIO15),
                          rst=digitalio.DigitalInOut(board.GPIO16))

display.fill(0x7521)
display.pixel(32, 32, 0)
```

write(*command=None*, *data=None*)
write procedure specific to SSD1331

6.7 adafruit_rgb_display.ssd1351

A simple driver for the SSD1351-based displays.

- Author(s): Radomir Dopieralski, Michael McWethy

class adafruit_rgb_display.ssd1351.**SSD1351**(*spi*, *dc*, *cs*, *rst=None*, *width=128*, *height=128*, *baudrate=16000000*, *polarity=0*, *phase=0*, ***, *x_offset=0*, *y_offset=0*, *rotation=0*)
A simple driver for the SSD1351-based displays.

```
>>> import busio
>>> import digitalio
>>> import board
>>> from adafruit_rgb_display import color565
>>> import adafruit_rgb_display.ssd1351 as ssd1351
>>> spi = busio.SPI(clock=board.SCK, MOSI=board.MOSI, MISO=board.MISO)
>>> display = ssd1351.SSD1351(spi, cs=digitalio.DigitalInOut(board.GPIO0),
...     dc=digitalio.DigitalInOut(board.GPIO15), rst=digitalio.DigitalInOut(board.
↪GPIO16))
>>> display.fill(0x7521)
>>> display.pixel(32, 32, 0)
```

6.8 adafruit_rgb_display.st7735

A simple driver for the ST7735-based displays.

- Author(s): Radomir Dopieralski, Michael McWethy

class adafruit_rgb_display.st7735.**ST7735**(*spi*, *dc*, *cs*, *rst=None*, *width=128*, *height=128*, *baudrate=16000000*, *polarity=0*, *phase=0*, ***, *x_offset=0*, *y_offset=0*, *rotation=0*)
A simple driver for the ST7735-based displays.

```
>>> import busio
>>> import digitalio
>>> import board
>>> from adafruit_rgb_display import color565
```

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```
>>> import adafruit_rgb_display.st7735 as st7735
>>> spi = busio.SPI(clock=board.SCK, MOSI=board.MOSI, MISO=board.MISO)
>>> display = st7735.ST7735(spi, cs=digitalio.DigitalInOut(board.GPIO0),
...     dc=digitalio.DigitalInOut(board.GPIO15), rst=digitalio.DigitalInOut(board.
↪GPIO16))
>>> display.fill(0x7521)
>>> display.pixel(64, 64, 0)
```

class adafruit_rgb_display.st7735.**ST7735R**(*spi*, *dc*, *cs*, *rst=None*, *width=128*, *height=160*, *baudrate=16000000*, *polarity=0*, *phase=0*, ***, *x_offset=0*, *y_offset=0*, *rotation=0*, *bgr=False*)

A simple driver for the ST7735R-based displays.

init()

Run the initialization commands.

class adafruit_rgb_display.st7735.**ST7735S**(*spi*, *dc*, *cs*, *bl*, *rst=None*, *width=128*, *height=160*, *baudrate=16000000*, *polarity=0*, *phase=0*, ***, *x_offset=2*, *y_offset=1*, *rotation=0*)

A simple driver for the ST7735S-based displays.

6.9 adafruit_rgb_display.st7789

A simple driver for the ST7789-based displays.

- Author(s): Melissa LeBlanc-Williams

class adafruit_rgb_display.st7789.**ST7789**(*spi*, *dc*, *cs*, *rst=None*, *width=240*, *height=320*, *baudrate=16000000*, *polarity=0*, *phase=0*, ***, *x_offset=0*, *y_offset=0*, *rotation=0*)

A simple driver for the ST7789-based displays.

```
>>> import busio
>>> import digitalio
>>> import board
>>> from adafruit_rgb_display import color565
>>> import adafruit_rgb_display.st7789 as st7789
>>> spi = busio.SPI(clock=board.SCK, MOSI=board.MOSI, MISO=board.MISO)
>>> display = st7789.ST7789(spi, cs=digitalio.DigitalInOut(board.GPIO0),
...     dc=digitalio.DigitalInOut(board.GPIO15), rst=digitalio.DigitalInOut(board.
↪GPIO16))
>>> display.fill(0x7521)
>>> display.pixel(64, 64, 0)
```

init()

Run the initialization commands.

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