# Adafruit IS31FL3731 Library Documentation

*Release 1.0*

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CircuitPython driver for the IS31FL3731 charlieplex IC.

This driver supports the following hardware:

- Adafruit 16x9 Charlieplexed PWM LED Matrix Driver - IS31FL3731
- Adafruit 15x7 CharliePlex LED Matrix Display FeatherWings
- Adafruit 16x8 CharliePlex LED Matrix Bonnets
- Pimoroni 17x7 Scroll pHAT HD
- Pimoroni 28x3 (r,g,b) Led Shim

# CHAPTER 1

# Dependencies

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

# 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-is31fl3731
```

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

```
sudo pip3 install adafruit-circuitpython-is31fl3731
```

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-is31fl3731
```

# CHAPTER 3

# Usage Example

Matrix:

```
import adafruit_is31fl3731
import board
import busio
with busio.I2C(board.SCL, board.SDA) as i2c:
    display = adafruit_is31fl3731.Matrix(i2c)
    display.fill(127)
```

Charlie Wing:

```
import adafruit_is31fl3731
import board
import busio
with busio.I2C(board.SCL, board.SDA) as i2c:
    display = adafruit_is31fl3731.CharlieWing(i2c)
    display.fill(127)

    # Turn off pixel 4,4, change its brightness and turn it back on
    display.pixel(4, 4, 0)    # Turn off.
    display.pixel(4, 4, 50)   # Low brightness (50)
    display.pixel(4, 4, 192)  # Higher brightness (192)
```

# 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

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## 6.1 Simple test

Ensure your device works with this simple test.

Listing 1: examples/is31fl3731_simpletest.py

```
import board
import busio
import adafruit_is31fl3731

i2c = busio.I2C(board.SCL, board.SDA)

# initialize display using Feather CharlieWing LED 15 x 7
display = adafruit_is31fl3731.CharlieWing(i2c)

# uncomment next line if you are using Adafruit 16x9 Charlieplexed PWM LED Matrix
# display = adafruit_is31fl3731.Matrix(i2c)

# uncomment next line if you are using Adafruit 16x8 Charlieplexed Bonnet
# display = adafruit_is31fl3731.CharlieBonnet(i2c)

# initial display using Pimoroni Scroll Phat HD LED 17 x 7
# display = adafruit_is31fl3731.ScrollPhatHD(i2c)

# draw a box on the display
# first draw the top and bottom edges
for x in range(display.width):
    display.pixel(x, 0, 50)
    display.pixel(x, display.height - 1, 50)
# now draw the left and right edges
for y in range(display.height):
    display.pixel(0, y, 50)
    display.pixel(display.width - 1, y, 50)
```

## 6.2 Other Examples

Listing 2: examples/is31fl3731_blink_example.py

```
import busio
import board
import adafruit_is31fl3731

i2c = busio.I2C(board.SCL, board.SDA)

# array pattern in bits; top row-> bottom row, 8 bits in each row
an_arrow = bytearray((0x08, 0x0C, 0xFE, 0xFF, 0xFE, 0x0C, 0x08, 0x00, 0x00))

# initial display using Feather CharlieWing LED 15 x 7
display = adafruit_is31fl3731.CharlieWing(i2c)
# uncomment next line if you are using Adafruit 16x9 Charlieplexed PWM LED Matrix
# display = adafruit_is31fl3731.Matrix(i2c)
# uncomment line if you are using Adafruit 16x9 Charlieplexed PWM LED Matrix
# display = adafruit_is31fl3731.CharlieBonnet(i2c)
# initial display using Pimoroni Scroll Phat HD LED 17 x 7
# display = adafruit_is31fl3731.ScrollPhatHD(i2c)

# first load the frame with the arrows; moves the an_arrow to the right in each
# frame
display.sleep(True)  # turn display off while updating blink bits
display.fill(0)
for y in range(display.height):
    row = an_arrow[y]
    for x in range(8):
        bit = 1 << (7 - x) & row
        if bit:
            display.pixel(x + 4, y, 50, blink=True)

display.blink(1000)  # ranges from 270 to 2159; smaller the number to faster blink
display.sleep(False)  # turn display on
```

Listing 3: examples/is31fl3731_frame_example.py

```
import time
import board
import busio
import adafruit_is31fl3731

i2c = busio.I2C(board.SCL, board.SDA)

# arrow pattern in bits; top row-> bottom row, 8 bits in each row
arrow = bytearray((0x08, 0x0C, 0xFE, 0xFF, 0xFE, 0x0C, 0x08, 0x00, 0x00))

# initial display using Feather CharlieWing LED 15 x 7
display = adafruit_is31fl3731.CharlieWing(i2c)
# uncomment line if you are using Adafruit 16x9 Charlieplexed PWM LED Matrix
# display = adafruit_is31fl3731.Matrix(i2c)
# uncomment line if you are using Adafruit 16x9 Charlieplexed PWM LED Matrix
# display = adafruit_is31fl3731.CharlieBonnet(i2c)
# initial display using Pimoroni Scroll Phat HD LED 17 x 7
# display = adafruit_is31fl3731.ScrollPhatHD(i2c)
```

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```


# first load the frame with the arrows; moves the arrow to the right in each
# frame
display.sleep(True)  # turn display off while frames are updated
for frame in range(8):
    display.frame(frame, show=False)
    display.fill(0)
    for y in range(display.height):
        row = arrow[y]
        for x in range(8):
            bit = 1 << (7 - x) & row
            # display the pixel into selected frame with varying intensity
            if bit:
                display.pixel(x + frame, y, frame ** 2 + 1)
display.sleep(False)
# now tell the display to show the frame one at time
while True:
    for frame in range(8):
        display.frame(frame)
        time.sleep(0.1)
```

Listing 4: examples/is31fl3731_text_example.py

```
import board
import busio
import adafruit_framebuf
import adafruit_is31fl3731


i2c = busio.I2C(board.SCL, board.SDA)

# initial display using Feather CharlieWing LED 15 x 7
# display = adafruit_is31fl3731.CharlieWing(i2c)
# uncomment line if you are using Adafruit 16x9 Charlieplexed PWM LED Matrix
# display = adafruit_is31fl3731.Matrix(i2c)
# uncomment line if you are using Adafruit 16x9 Charlieplexed PWM LED Matrix
display = adafruit_is31fl3731.CharlieBonnet(i2c)
# initial display using Pimoroni Scroll Phat HD LED 17 x 7
# display = adafruit_is31fl3731.ScrollPhatHD(i2c)

text_to_show = "Adafruit!!"

# Create a framebuffer for our display
buf = bytearray(32)  # 2 bytes tall x 16 wide = 32 bytes (9 bits is 2 bytes)
fb = adafruit_framebuf.FrameBuffer(
    buf, display.width, display.height, adafruit_framebuf.MVLSB
)


frame = 0  # start with frame 0
while True:
    for i in range(len(text_to_show) * 9):
        fb.fill(0)
        fb.text(text_to_show, -i + display.width, 0, color=1)

```

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```
        # to improve the display flicker we can use two frame
        # fill the next frame with scrolling text, then
        # show it.
        display.frame(frame, show=False)
        # turn all LEDs off
        display.fill(0)
        for x in range(display.width):
            # using the FrameBuffer text result
            bite = buf[x]
            for y in range(display.height):
                bit = 1 << y & bite
                # if bit > 0 then set the pixel brightness
                if bit:
                    display.pixel(x, y, 50)

        # now that the frame is filled, show it.
        display.frame(frame, show=True)
        frame = 0 if frame else 1
```

Listing 5: examples/is31fl3731_wave_example.py

```
import board
import busio
import adafruit_is31fl3731

i2c = busio.I2C(board.SCL, board.SDA)

sweep = [
    1,
    2,
    3,
    4,
    6,
    8,
    10,
    15,
    20,
    30,
    40,
    60,
    60,
    40,
    30,
    20,
    15,
    10,
    8,
    6,
    4,
    3,
    2,
    1,
]

frame = 0

```

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```
# initialize display using Feather CharlieWing LED 15 x 7
display = adafruit_is31fl3731.CharlieWing(i2c)
# uncomment next line if you are using Adafruit 16x9 Charlieplexed PWM LED Matrix
# display = adafruit_is31fl3731.Matrix(i2c)
# uncomment next line if you are using Adafruit 16x8 Charlieplexed Bonnet
# display = adafruit_is31fl3731.CharlieBonnet(i2c)
# initial display using Pimoroni Scroll Phat HD LED 17 x 7
# display = adafruit_is31fl3731.ScrollPhatHD(i2c)

while True:
    for incr in range(24):
        # to reduce update flicker, use two frames
        # make a frame active, don't show it yet
        display.frame(frame, show=False)
        # fill the display with the next frame
        for x in range(display.width):
            for y in range(display.height):
                display.pixel(x, y, sweep[(x + y + incr) % 24])
        # show the next frame
        display.frame(frame, show=True)
        if frame:
            frame = 0
        else:
            frame = 1
```

## 6.3 adafruit_is31fl3731

CircuitPython driver for the IS31FL3731 charlieplex IC.

- Author(s): Tony DiCola, Melissa LeBlanc-Williams

### 6.3.1 Implementation Notes

**Hardware:**

- Adafruit 16x9 Charlieplexed PWM LED Matrix Driver - IS31FL3731
- Adafruit 15x7 CharliePlex LED Matrix Display FeatherWings

**Software and Dependencies:**

- Adafruit CircuitPython firmware (2.2.0+) for the ESP8622 and M0-based boards: https://github.com/adafruit/circuitpython/releases

**class** adafruit_is31fl3731.**CharlieBonnet**(*i2c*, *address=116*)

Supports the Charlieplexed bonnet

**static pixel_addr**(*x*, *y*)

Calulate the offset into the device array for x,y pixel

**class** adafruit_is31fl3731.**CharlieWing**(*i2c*, *address=116*)

Supports the Charlieplexed feather wing

**static pixel_addr**(*x*, *y*)

Calulate the offset into the device array for x,y pixel

**class** adafruit_is31fl3731.**LedShim**(*i2c*, *address=117*)

Supports the LED SHIM by Pimoroni

**static pixel_addr**(*x*, *y*)

Translate an x,y coordinate to a pixel index.

**pixelrgb**(*x*, *r*, *g*, *b*, *blink=None*, *frame=None*)

Blink or brightness for x-pixel

**Parameters**

- **x** – horizontal pixel position
- **r** – red brightness value 0->255
- **g** – green brightness value 0->255
- **b** – blue brightness value 0->255
- **blink** – True to blink
- **frame** – the frame to set the pixel

**class** adafruit_is31fl3731.**Matrix**(*i2c*, *address=116*)

The Matrix class support the main function for driving the 16x9 matrix Display

**Parameters**

- **i2c_device** (*i2c_device*) – the connected i2c bus i2c_device
- **address** – the device address; defaults to 0x74

**audio_play**(*sample_rate*, *audio_gain=0*, *agc_enable=False*, *agc_fast=False*)

Controls the audio play feature

**audio_sync**(*value=None*)

Set the audio sync feature register

**autoplay**(*delay=0*, *loops=0*, *frames=0*)

Start autoplay

**Parameters**

- **delay** – in ms
- **loops** – number of loops - 0->7
- **frames** – number of frames: 0->7

**blink**(*rate=None*)

Updates the blink register

**fade**(*fade_in=None*, *fade_out=None*, *pause=0*)

Start and stop the fade feature. If both fade_in and fade_out are None (the default), the breath feature is used for fading. if fade_in is None, then fade_in = fade_out. If fade_out is None, then fade_out = fade_in

**Parameters**

- **fade_in** – positive number; 0->100
- **fade-out** – positive number; 0->100
- **pause** – breath register 2 pause value

**fill**(*color=None*, *blink=None*, *frame=None*)

Fill the display with a brightness level

**Parameters**

- **color** – brightness 0->255
- **blink** – True if blinking is required
- **frame** – which frame to fill 0->7

**frame** (*frame=None*, *show=True*)
Set the current frame

**Parameters**

- **frame** – frame number; 0-7 or None. If None function returns current frame
- **show** – True to show the frame; False to not show.

**image** (*img*, *blink=None*, *frame=None*)
Set buffer to value of Python Imaging Library image. The image should be in 8-bit mode (L) and a size equal to the display size.

**Parameters**

- **img** – Python Imaging Library image
- **blink** – True to blink
- **frame** – the frame to set the image

**pixel** (*x*, *y*, *color=None*, *blink=None*, *frame=None*)
Blink or brightness for x-, y-pixel

**Parameters**

- **x** – horizontal pixel position
- **y** – vertical pixel position
- **color** – brightness value 0->255
- **blink** – True to blink
- **frame** – the frame to set the pixel

**static pixel_addr** (*x*, *y*)
Calulate the offset into the device array for x,y pixel

**reset** ()
Kill the display for 10MS

**sleep** (*value*)
Set the Software Shutdown Register bit

**Parameters** **value** – True to set software shutdown bit; False unset

**class** adafruit_is31fl3731.**ScrollPhatHD** (*i2c*, *address=116*)
Supports the Scroll pHAT HD by Pimoroni

**static pixel_addr** (*x*, *y*)
Translate an x,y coordinate to a pixel index.

CHAPTER 7

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