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# **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

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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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### Installing from PyPI

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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

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### Usage Example

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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

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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 5

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### Documentation

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For information on building library documentation, please check out [this guide](#).





## 6.1 Simple test

Ensure your device works with this simple test.

Listing 1: examples/is31fl3731\_simpletest.py

```
1  # SPDX-FileCopyrightText: 2021 ladyada for Adafruit Industries
2  # SPDX-License-Identifier: MIT
3
4  import board
5  import busio
6  import adafruit_is31fl3731
7
8  i2c = busio.I2C(board.SCL, board.SDA)
9
10 # initialize display using Feather CharlieWing LED 15 x 7
11 display = adafruit_is31fl3731.CharlieWing(i2c)
12
13 # uncomment next line if you are using Adafruit 16x9 Charlieplexed PWM LED Matrix
14 # display = adafruit_is31fl3731.Matrix(i2c)
15
16 # uncomment next line if you are using Adafruit 16x8 Charlieplexed Bonnet
17 # display = adafruit_is31fl3731.CharlieBonnet(i2c)
18
19 # initial display using Pimoroni Scroll Phat HD LED 17 x 7
20 # display = adafruit_is31fl3731.ScrollPhatHD(i2c)
21
22 # draw a box on the display
23 # first draw the top and bottom edges
24 for x in range(display.width):
25     display.pixel(x, 0, 50)
26     display.pixel(x, display.height - 1, 50)
27 # now draw the left and right edges
```

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```

28 for y in range(display.height):
29     display.pixel(0, y, 50)
30     display.pixel(display.width - 1, y, 50)

```

## 6.2 Other Examples

Listing 2: examples/is31fl3731\_blink\_example.py

```

1  # SPDX-FileCopyrightText: 2021 ladyada for Adafruit Industries
2  # SPDX-License-Identifier: MIT
3
4  import busio
5  import board
6  import adafruit_is31fl3731
7
8  i2c = busio.I2C(board.SCL, board.SDA)
9
10 # array pattern in bits; top row-> bottom row, 8 bits in each row
11 an_arrow = bytearray((0x08, 0x0C, 0xFE, 0xFF, 0xFE, 0x0C, 0x08, 0x00, 0x00))
12
13 # initial display using Feather CharlieWing LED 15 x 7
14 display = adafruit_is31fl3731.CharlieWing(i2c)
15 # uncomment next line if you are using Adafruit 16x9 Charlieplexed PWM LED Matrix
16 # display = adafruit_is31fl3731.Matrix(i2c)
17 # uncomment line if you are using Adafruit 16x9 Charlieplexed PWM LED Matrix
18 # display = adafruit_is31fl3731.CharlieBonnet(i2c)
19 # initial display using Pimoroni Scroll Phat HD LED 17 x 7
20 # display = adafruit_is31fl3731.ScrollPhatHD(i2c)
21
22 # first load the frame with the arrows; moves the an_arrow to the right in each
23 # frame
24 display.sleep(True) # turn display off while updating blink bits
25 display.fill(0)
26 for y in range(display.height):
27     row = an_arrow[y]
28     for x in range(8):
29         bit = 1 << (7 - x) & row
30         if bit:
31             display.pixel(x + 4, y, 50, blink=True)
32
33 display.blink(1000) # ranges from 270 to 2159; smaller the number to faster blink
34 display.sleep(False) # turn display on

```

Listing 3: examples/is31fl3731\_frame\_example.py

```

1  # SPDX-FileCopyrightText: 2021 ladyada for Adafruit Industries
2  # SPDX-License-Identifier: MIT
3
4  import time
5  import board
6  import busio
7  import adafruit_is31fl3731
8

```

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```

9  i2c = busio.I2C(board.SCL, board.SDA)
10
11  # arrow pattern in bits; top row-> bottom row, 8 bits in each row
12  arrow = bytearray((0x08, 0x0C, 0xFE, 0xFF, 0xFE, 0x0C, 0x08, 0x00, 0x00))
13
14  # initial display using Feather CharlieWing LED 15 x 7
15  display = adafruit_is31fl3731.CharlieWing(i2c)
16  # uncomment line if you are using Adafruit 16x9 Charlieplexed PWM LED Matrix
17  # display = adafruit_is31fl3731.Matrix(i2c)
18  # uncomment line if you are using Adafruit 16x9 Charlieplexed PWM LED Matrix
19  # display = adafruit_is31fl3731.CharlieBonnet(i2c)
20  # initial display using Pimoroni Scroll Phat HD LED 17 x 7
21  # display = adafruit_is31fl3731.ScrollPhatHD(i2c)
22
23
24  # first load the frame with the arrows; moves the arrow to the right in each
25  # frame
26  display.sleep(True) # turn display off while frames are updated
27  for frame in range(8):
28      display.frame(frame, show=False)
29      display.fill(0)
30      for y in range(display.height):
31          row = arrow[y]
32          for x in range(8):
33              bit = 1 << (7 - x) & row
34              # display the pixel into selected frame with varying intensity
35              if bit:
36                  display.pixel(x + frame, y, frame * 2 + 1)
37  display.sleep(False)
38  # now tell the display to show the frame one at time
39  while True:
40      for frame in range(8):
41          display.frame(frame)
42          time.sleep(0.1)

```

Listing 4: examples/is31fl3731\_text\_example.py

```

1  # SPDX-FileCopyrightText: 2021 ladyada for Adafruit Industries
2  # SPDX-License-Identifier: MIT
3
4  import board
5  import busio
6  import adafruit_framebuf
7  import adafruit_is31fl3731
8
9
10 i2c = busio.I2C(board.SCL, board.SDA)
11
12 # initial display using Feather CharlieWing LED 15 x 7
13 # display = adafruit_is31fl3731.CharlieWing(i2c)
14 # uncomment line if you are using Adafruit 16x9 Charlieplexed PWM LED Matrix
15 # display = adafruit_is31fl3731.Matrix(i2c)
16 # uncomment line if you are using Adafruit 16x9 Charlieplexed PWM LED Matrix
17 display = adafruit_is31fl3731.CharlieBonnet(i2c)
18 # initial display using Pimoroni Scroll Phat HD LED 17 x 7
19 # display = adafruit_is31fl3731.ScrollPhatHD(i2c)

```

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```

20
21 text_to_show = "Adafruit!!"
22
23 # Create a framebuffer for our display
24 buf = bytearray(32) # 2 bytes tall x 16 wide = 32 bytes (9 bits is 2 bytes)
25 fb = adafruit_framebuf.FrameBuffer(
26     buf, display.width, display.height, adafruit_framebuf.MVLSB
27 )
28
29
30 frame = 0 # start with frame 0
31 while True:
32     for i in range(len(text_to_show) * 9):
33         fb.fill(0)
34         fb.text(text_to_show, -i + display.width, 0, color=1)
35
36         # to improve the display flicker we can use two frame
37         # fill the next frame with scrolling text, then
38         # show it.
39         display.frame(frame, show=False)
40         # turn all LEDs off
41         display.fill(0)
42         for x in range(display.width):
43             # using the FrameBuffer text result
44             bite = buf[x]
45             for y in range(display.height):
46                 bit = 1 << y & bite
47                 # if bit > 0 then set the pixel brightness
48                 if bit:
49                     display.pixel(x, y, 50)
50
51         # now that the frame is filled, show it.
52         display.frame(frame, show=True)
53         frame = 0 if frame else 1

```

Listing 5: examples/is31fl3731\_wave\_example.py

```

1 # SPDX-FileCopyrightText: 2021 ladyada for Adafruit Industries
2 # SPDX-License-Identifier: MIT
3
4 import board
5 import busio
6 import adafruit_is31fl3731
7
8 i2c = busio.I2C(board.SCL, board.SDA)
9
10 sweep = [
11     1,
12     2,
13     3,
14     4,
15     6,
16     8,
17     10,
18     15,
19     20,

```

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```

20     30,
21     40,
22     60,
23     60,
24     40,
25     30,
26     20,
27     15,
28     10,
29     8,
30     6,
31     4,
32     3,
33     2,
34     1,
35 ]
36
37 frame = 0
38
39 # initialize display using Feather CharlieWing LED 15 x 7
40 display = adafruit_is31fl3731.CharlieWing(i2c)
41 # uncomment next line if you are using Adafruit 16x9 Charlieplexed PWM LED Matrix
42 # display = adafruit_is31fl3731.Matrix(i2c)
43 # uncomment next line if you are using Adafruit 16x8 Charlieplexed Bonnet
44 # display = adafruit_is31fl3731.CharlieBonnet(i2c)
45 # initial display using Pimoroni Scroll Phat HD LED 17 x 7
46 # display = adafruit_is31fl3731.ScrollPhatHD(i2c)
47
48 while True:
49     for incr in range(24):
50         # to reduce update flicker, use two frames
51         # make a frame active, don't show it yet
52         display.frame(frame, show=False)
53         # fill the display with the next frame
54         for x in range(display.width):
55             for y in range(display.height):
56                 display.pixel(x, y, sweep[(x + y + incr) % 24])
57         # show the next frame
58         display.frame(frame, show=True)
59         if frame:
60             frame = 0
61         else:
62             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*)

Calculate 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*)

Calculate 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*)

Calculate 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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