

# OLED\_I2C

Multi-platform library for I<sup>2</sup>C 128x32 and 128x64 pixel SSD1306 OLEDs

## Manual

The logo for Rinky-Dink Electronics features the company name in a stylized, glowing cyan font with a 3D effect. The text is set against a background of a close-up photograph of a green printed circuit board (PCB) with various electronic components and traces visible.

Rinky-Dink Electronics

## Introduction:

This library has been made to make it easy to use 128x32 and 128x64 pixel OLED displays based on the SSD1306 controller chip with an Arduino, a chipKit, an ESP8266 or an ESP32.

This library will default to I<sup>2</sup>C Fast Mode (400 KHz) when using the hardware I<sup>2</sup>C interface.

Arduino and chipKit:

The library has not been tested in combination with the Wire library and I have no idea if they can share pins. **Do not send me any questions about this**. If you experience problems with pin-sharing you can move the displays SDA and SCL pins to any available pins on your development board. This library will in this case fall back to a software-based, TWI-/I<sup>2</sup>C-like protocol which will require exclusive access to the pins used.

ESP8266 and ESP32:

The library makes use of the Wire library and should be able to share pins with other devices that make use of the Wire library. This has not been tested and I cannot provide any support if it does not work.

Please note that ESP8266 support has only been tested on the Wemos/Lolin D1 Mini, and ESP32 support on the Heltec WiFi Kit 32.

If you are using a chipKit Uno32 or uC32 and you want to use the hardware I<sup>2</sup>C interface you must remember to set the JP6 and JP8 jumpers to the I<sup>2</sup>C position (closest to the analog pins).

### **IMPORTANT** *if upgrading from v1.xx of the library:*

The way the library allocates its display buffer memory has changed from v1.xx of the library. Due to this change it is highly recommended that you verify that the library was able to properly allocate the memory it needs for the display buffer.

`begin()` will return a boolean value indicating if it was a success or not. You should make sure you do not use the display if the allocation fails. Allocation may fail if there isn't enough free RAM when calling `begin()`.

The display buffer will require 512 bytes for 128x32 displays and 1024 bytes for 128x64 displays to be available. Make sure you leave enough unused RAM for the buffer in your sketch.

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You can always find the latest version of the library at <http://www.RinkyDinkElectronics.com/>

For version information, please refer to `version.txt`.

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## Defined Literals:

Display size
For use with begin()
SSD1306_128X32: 32
SSD1306_128X64: 64

Alignment
For use with print(), printNumI() and printNumF()
LEFT: 0
RIGHT: 9999
CENTER: 9998

Sleep Mode
For use with sleepMode()
SLEEP_ON: true
SLEEP_OFF: false

## Included Fonts:

TinyFont
 A 4x6 pixel font character set showing digits 0-9, uppercase and lowercase letters, and various symbols.
Character size: 4x6 pixels
Number of characters: 95

SmallFont
 A 6x8 pixel font character set showing digits 0-9, uppercase and lowercase letters, and various symbols.
Character size: 6x8 pixels
Number of characters: 95

MediumNumbers
 A 12x16 pixel font showing digits 0-9 and a dash.
Character size: 12x16 pixels
Number of characters: 13

BigNumbers
 A 14x24 pixel font showing digits 0-9 and a dash.
Character size: 14x24 pixels
Number of characters: 13

## Functions:

<b>OLED(Data, Clock, [Reset]);</b>	
The main class constructor.	
Parameters:	Data: Pin for Data transfer Clock: Pin for Clock signal Reset: Pin for Reset <b>&lt;optional&gt;</b>
Usage:	OLED myOLED(SDA, SCL); // Start an instance of the OLED class with the hardware TWI/I <sup>2</sup> C and no reset

<b>begin([display size]);</b>	
Initialize the display and screen buffer.	
Parameters:	display size: <b>&lt;optional&gt;</b> SSD1306_128X32 SSD1306_128X64 (this is the default size if no parameter is provided)
Returns:	<boolean> <b>true</b> if initialization was successful, otherwise <b>false</b>
Usage:	boolean success = myOLED.begin(SSD1306_128X64); // Initialize a 128x64 display
Notes:	This will reset (if a reset pin is used) and initialize the display for use. Initialization will fail if the library is unable to allocate enough memory for the screen buffer. It is recommended that you verify that it was a success and halt execution in case of a failure.

<b>setBrightness(value);</b>	
Set the brightness of the display.	
Parameters:	value: Specify a value to use for brightness (0-255)
Usage:	myOLED.setBrightness(207); // Sets the brightness to the default value of 207
Notes:	Note that the span of the adjustable brightness is quite small and might not be noticeable

<b>getDisplayHeight();</b>	
Get the height of the display in pixels.	
Parameters:	None
Returns:	<integer> Height of the display in pixels
Usage:	int y_pix = myOLED.getDisplayHeight(); // Get the height of the display in pixels

<b>rotateDisplay(value);</b>	
Set the rotation of the display to 0° or 180°.	
Parameters:	value: true - Rotate the output to the display 180° false - Disable display rotation
Usage:	myOLED.rotateDisplay(false); // Set normal (not rotated) display output
Notes:	Rotating the display will not affect anything already displayed on the display, only subsequent data sent to it.

<b>sleepMode(value);</b>	
Enable or disable sleep mode.	
Parameters:	value: SLEEP_ON - Enable sleep mode SLEEP_OFF - Disable sleep mode
Usage:	myOLED.sleepMode(SLEEP_ON); // Put the display in sleep mode
Notes:	Enabling and disabling sleep mode does not affect anything in display memory. The display will be blank while in sleep mode.

#### **update();**

Copy the screen buffer to the screen.

*This is the only command, except invert(), setBrightness() and sleepMode(), that will make anything happen on the physical screen. All other commands only modify the screen buffer.*

Parameters:       None

Usage:            myOLED.update(); // Copy the screen buffer to the screen

Notes:            Remember to call update() after you have updated the screen buffer.

#### **clrScr();**

Clear the screen buffer.

Parameters:       None

Usage:            myOLED.clrScr(); // Clear the screen buffer

#### **fillScr();**

Fill the screen buffer.

Parameters:       None

Usage:            myOLED.fillScr(); // Fill the screen buffer

#### **invert(mode);**

Set inversion of the display on or off.

Parameters:       mode: true - Invert the display  
                  false - Normal display

Usage:            myOLED.invert(true); // Set display inversion on

#### **setPixel(x, y);**

Turn on the specified pixel in the screen buffer.

Parameters:       x: x-coordinate of the pixel  
                  y: y-coordinate of the pixel

Usage:            myOLED.setPixel(0, 0); // Turn on the upper left pixel (in the screen buffer)

#### **clrPixel(x, y);**

Turn off the specified pixel in the screen buffer.

Parameters:       x: x-coordinate of the pixel  
                  y: y-coordinate of the pixel

Usage:            myOLED.clrPixel(0, 0); // Turn off the upper left pixel (in the screen buffer)

#### **invPixel(x, y);**

Invert the state of the specified pixel in the screen buffer.

Parameters:       x: x-coordinate of the pixel  
                  y: y-coordinate of the pixel

Usage:            myOLED.invPixel(0, 0); // Invert the upper left pixel (in the screen buffer)

#### **print(st, x, y);**

Print a string at the specified coordinates in the screen buffer.  
You can use the literals LEFT, CENTER and RIGHT as the x-coordinate to align the string on the screen.

Parameters:     st: the string to print  
                  x: x-coordinate of the upper, left corner of the first character  
                  y: y-coordinate of the upper, left corner of the first character

Usage:           myOLED.print("Hello World",CENTER,0); // Print "Hello World" centered at the top of the screen (in the screen buffer)

Notes:           The string can be either a char array or a String object

#### **printNumI(num, x, y[, length[, filler]]);**

Print an integer number at the specified coordinates in the screen buffer.  
You can use the literals LEFT, CENTER and RIGHT as the x-coordinate to align the string on the screen.

Parameters:     num: the value to print (-2,147,483,648 to 2,147,483,647) *INTEGERS ONLY*  
                  x: x-coordinate of the upper, left corner of the first digit/sign  
                  y: y-coordinate of the upper, left corner of the first digit/sign  
                  length: **<optional>**  
                          minimum number of digits/characters (including sign) to display  
                  filler: **<optional>**  
                          filler character to use to get the minimum length. The character will be inserted in front of the number, but after the sign. Default is ' ' (space).

Usage:           myOLED.print(num,CENTER,0); // Print the value of "num" centered at the top of the screen (in the screen buffer)

#### **printNumF(num, dec, x, y[, divider[, length[, filler]]]);**

Print a floating-point number at the specified coordinates in the screen buffer.  
You can use the literals LEFT, CENTER and RIGHT as the x-coordinate to align the string on the screen.  
**WARNING:** Floating point numbers are not exact, and may yield strange results when compared. Use at your own discretion.

Parameters:     num: the value to print (*See note*)  
                  dec: digits in the fractional part (1-5) *0 is not supported. Use printNumI() instead.*  
                  x: x-coordinate of the upper, left corner of the first digit/sign  
                  y: y-coordinate of the upper, left corner of the first digit/sign  
                  divider: **<Optional>**  
                          Single character to use as decimal point. Default is '.'  
                  length: **<optional>**  
                          minimum number of digits/characters (including sign) to display  
                  filler: **<optional>**  
                          filler character to use to get the minimum length. The character will be inserted in front of the number, but after the sign. Default is ' ' (space).

Usage:           myOLED.print(num, 3, CENTER,0); // Print the value of "num" with 3 fractional digits top centered (in the screen buffer)

Notes:           Supported range depends on the number of fractional digits used.  
                  Approx range is +/- 2\*(10^(9-dec))

#### **invertText(mode);**

Select if text printed with print(), printNumI() and printNumF() should be inverted.

Parameters:     mode: true - Invert the text  
                      false - Normal text

Usage:           myOLED.invertText(true); // Turn on inverted printing

Notes:           SetFont() will turn off inverted printing

#### **setFont(fontname);**

Select font to use with print(), printNumI() and printNumF().

Parameters:     fontname: Name of the array containing the font you wish to use

Usage:           myOLED.setFont(SmallFont); // Select the font called SmallFont

Notes:           You must declare the font-array as an external or include it in your sketch.

#### **drawLine(x1, y1, x2, y2);**

Draw a line between two points in the screen buffer.

Parameters:     x1: x-coordinate of the start-point  
                  y1: y-coordinate of the start-point  
                  x2: x-coordinate of the end-point  
                  y2: y-coordinate of the end-point

Usage:           myOLED.drawLine(0,0,127,63); // Draw a line from the upper left to the lower right corner

#### **clrLine(x1, y1, x2, y2);**

Clear a line between two points in the screen buffer.

Parameters:     x1: x-coordinate of the start-point  
                  y1: y-coordinate of the start-point  
                  x2: x-coordinate of the end-point  
                  y2: y-coordinate of the end-point

Usage:           myOLED.clrLine(0,0,127,63); // Clear a line from the upper left to the lower right corner

#### **drawRect(x1, y1, x2, y2);**

Draw a rectangle between two points in the screen buffer.

Parameters:     x1: x-coordinate of the start-corner  
                  y1: y-coordinate of the start-corner  
                  x2: x-coordinate of the end-corner  
                  y2: y-coordinate of the end-corner

Usage:           myOLED.drawRect(64,32,127,63); // Draw a rectangle in the lower right corner of the screen

#### **clrRect(x1, y1, x2, y2);**

Clear a rectangle between two points in the screen buffer.

Parameters:     x1: x-coordinate of the start-corner  
                  y1: y-coordinate of the start-corner  
                  x2: x-coordinate of the end-corner  
                  y2: y-coordinate of the end-corner

Usage:           myOLED.clrRect(64,32,127,63); // Clear a rectangle in the lower right corner of the screen

#### **drawRoundRect(x1, y1, x2, y2);**

Draw a rectangle with slightly rounded corners between two points in the screen buffer.  
The minimum size is 5 pixels in both directions. If a smaller size is requested the rectangle will not be drawn.

Parameters:     x1: x-coordinate of the start-corner  
                  y1: y-coordinate of the start-corner  
                  x2: x-coordinate of the end-corner  
                  y2: y-coordinate of the end-corner

Usage:           myOLED.drawRoundRect(0,0,63,31); // Draw a rounded rectangle in the upper left corner of the screen

#### **clrRoundRect(x1, y1, x2, y2);**

Clear a rectangle with slightly rounded corners between two points in the screen buffer.  
The minimum size is 5 pixels in both directions. If a smaller size is requested the rectangle will not be drawn/cleared.

Parameters:     x1: x-coordinate of the start-corner  
                  y1: y-coordinate of the start-corner  
                  x2: x-coordinate of the end-corner  
                  y2: y-coordinate of the end-corner

Usage:           myOLED.clrRoundRect(0,0,63,31); // Clear a rounded rectangle in the upper left corner of the screen

#### **drawCircle(x, y, radius);**

Draw a circle with a specified radius in the screen buffer.

Parameters:     x:         x-coordinate of the center of the circle  
                  y:         y-coordinate of the center of the circle  
                  radius: radius of the circle in pixels

Usage:           myOLED.drawCircle(63,31,20); // Draw a circle in the middle of the screen with a radius of 20 pixels

#### **clrCircle(x, y, radius);**

Clear a circle with a specified radius in the screen buffer.

Parameters:     x:         x-coordinate of the center of the circle  
                  y:         y-coordinate of the center of the circle  
                  radius: radius of the circle in pixels

Usage:           myOLED.clrCircle(63,31,20); // Clear a circle in the middle of the screen with a radius of 20 pixels

### `drawBitmap(x, y, data, sx, sy);`

Draw a bitmap in the screen buffer.

Parameters:     x:       x-coordinate of the upper, left corner of the bitmap  
                  y:       y-coordinate of the upper, left corner of the bitmap  
                  data:     array containing the bitmap-data  
                  sx:       width of the bitmap in pixels  
                  sy:       height of the bitmap in pixels

Usage:  
`myOLED.drawBitmap(0, 0, bitmap, 32, 32); // Draw a 32x32 pixel bitmap in the upper left corner`

Notes:  
You can use the online-tool "*ImageConverter Mono*" to convert pictures into compatible arrays.  
The online-tool can be found on the Rinky-Dink Electronics website.  
Requires that you `#include <avr/pgmspace.h>` when using an Arduino other than Arduino Due.  
While the bitmap data *MUST* be a multiple of 8 pixels high you do not need to display all the rows.  
Example: If the bitmap is 24 pixels high and you specify `sy=20` only the upper 20 rows will be displayed.