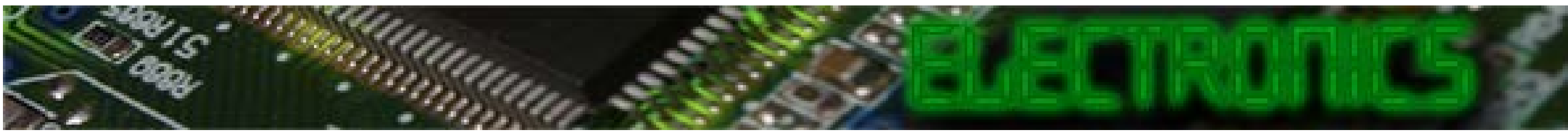
UTFT

Arduino and chipKit Universal TFT display library

Manual



PREFACE:

This library is the continuation of my ITDB02_Graph, ITDB02_Graph16 and RGB_GLCD libraries for Arduino and chipKit. As the number of supported display modules and controllers started to increase I felt it was time to make a single, universal library as it will be much easier to maintain in the future.

Basic functionality of this library was origianlly based on the demo-code provided by ITead studio (for the ITDB02 modules) and NKC Electronics (for the RGB GLCD module/shield).

This library supports a number of 8bit, 16bit and serial graphic displays, and will work with both Arduino and chipKit boards. For a full list of tested display modules and controllers, see the document **UTFT_Supported_display_modules_&_controllers.pdf**.

When using 8bit and 16bit display modules there are some requirements you must adhere to. These requirements can be found in the document **UTFT_Requirements.pdf**.
There are no special requirements when using serial displays.

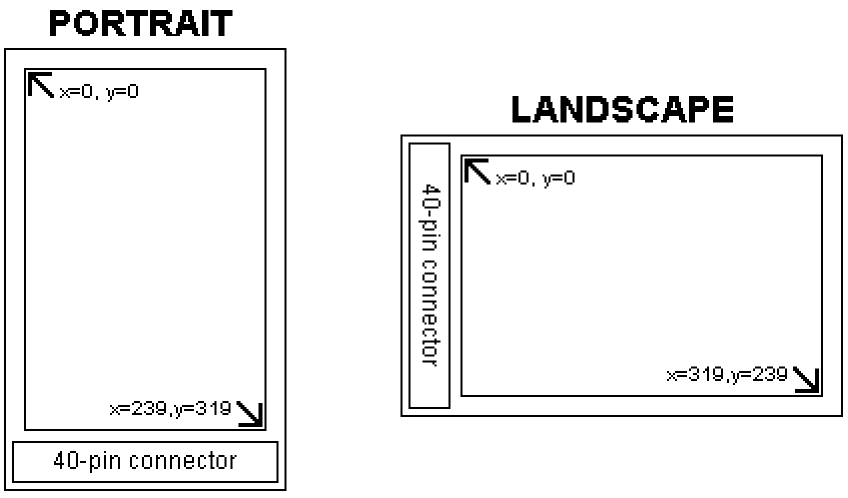
You can always find the latest version of the library at
http://electronics.henningkarlsen.com/

If you make any modifications or improvements to the code, I would appreciate that you share the code with me so that I might include it in the next release. I can be contacted through **http://electronics.henningkarlsen.com/contact.php**.

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

Since most people have only one or possibly two different display modules a lot of memory has been wasted to keep support for many unneeded controller chips.
As of v1.1 you now have the option to easily remove this unneeded code from the library. By disabling the controllers you don't need you can reduce the memory footprint of the library by several Kb.
For more information, please refer to **memorysaver.h**.

DISPLAY ORIENTATION:



DEFINED LITERALS:

Alignment

For use with print(), printNumI() and printNumF()

```
     LEFT:  0
    RIGHT:  9999
   CENTER:  9998
```

Orientation

For use with InitLCD()

```
 PORTRAIT:  0
LANDSCAPE:  1
```

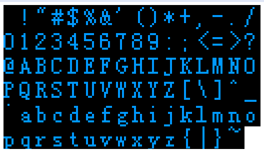
Display model

For use with UTFT()

Please see **UTFT_Supported_display_modules_&_controllers.pdf**

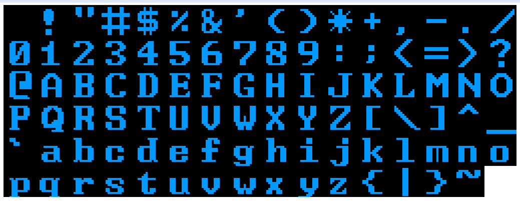
INCLUDED FONTS:

SmallFont



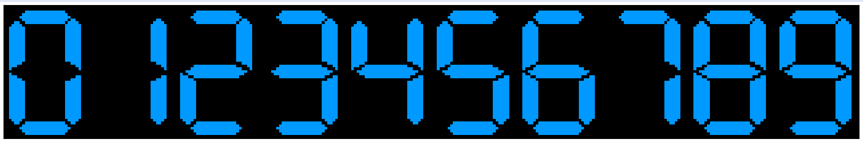
```
       Charactersize:  8x12 pixels
Number of characters:  95
```

BigFont



```
       Charactersize:  16x16 pixels
Number of characters:  95
```

SevenSegNumFont



```
       Charactersize:  32x50 pixels
Number of characters:  10
```

FUNCTIONS:

UTFT(Model, RS, WR, CS, RST);

The main class constructor when using 8bit or 16bit display modules.

Parameters:
```
Model:  See the separate document for the supported display modules
RS:     Pin for Register Select
WR:     Pin for Write
CS:     Pin for Chip Select
RST:    Pin for Reset
```

Usage:
```
UTFT myGLCD(ITDB32S,19,18,17,16); // Start an instance of the UTFT class
```

UTFT(Model, SDA, SCL, CS, RST[, RS]);

The main class constructor when using serial display modules.

Parameters:
```
Model:  See the separate document for the supported display modules
SDA:    Pin for Serial Data
SCL:    Pin for Serial Clock
CS:     Pin for Chip Select
RST:    Pin for Reset
RS:     <optional> Only used for 5pin serial modules
        Pin for Register Select
```

Usage:
```
UTFT myGLCD(ITDB18SP,11,10,9,12,8); // Start an instance of the UTFT class
```

InitLCD([orientation]);

Initialize the LCD and set display orientation.

Parameters:
```
Orientation: <optional>
             PORTRAIT
             LANDSCAPE (default)
```

Usage:
```
myGLCD.initLCD(); // Initialize the display
```

Notes: This will reset color to white with black background. Font size will be reset to FONT_SMALL.

clrScr();

Clear the screen. The background-color will be set to black.

Parameters: None

Usage:
```
myGLCD.clrScr(); // Clear the screen
```

fillScr(r, g, b);

Fill the screen with a specified color.

Parameters:
```
r: Red component of an RGB value (0-255)
g: Green component of an RGB value (0-255)
b: Blue component of an RGB value (0-255)
```

Usage:
```
myGLCD.fillScr(255,127,0); // Fill the screen with orange
```

setColor(r, g, b);

Set the color to use for all draw*, fill* and print commands.

Parameters:
```
r: Red component of an RGB value (0-255)
g: Green component of an RGB value (0-255)
b: Blue component of an RGB value (0-255)
```

Usage:
```
myGLCD.setColor(0,255,255); // Set the color to cyan
```

setBackColor(r, g, b);

Set the background color to use for all print commands.

Parameters:
```
r: Red component of an RGB value (0-255)
g: Green component of an RGB value (0-255)
b: Blue component of an RGB value (0-255)
```

Usage:
```
myGLCD.setBackColor(255,255,255); // Set the background color to white
```

drawPixel(x, y);

Draw a single pixel.

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

Usage:	`myGLCD.drawPixel(119,159); // Draw a single pixel`

drawLine(x1, y1, x2, y2);

Draw a line between two points.

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:	`myGLCD.drawLine(0,0,239,319); // Draw a diagonal line`

drawRect(x1, y1, x2, y2);

Draw a rectangle between two points.

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:	`myGLCD.drawRect(119,159,239,319); // Draw a rectangle`

drawRoundRect(x1, y1, x2, y2);

Draw a rectangle with slightly rounded corners between two points. 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:	`myGLCD.drawRoundRect(0,0,119,159); // Draw a rounded rectangle`

fillRect(x1, y1, x2, y2);

Draw a filled rectangle between two points.

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:	`myGLCD.fillRect(119,0,239,159); // Draw a filled rectangle`

fillRoundRect(x1, y1, x2, y2);

Draw a filled rectangle with slightly rounded corners between two points. 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:	`myGLCD.fillRoundRect(0,159,119,319); // Draw a filled, rounded rectangle`

drawCircle(x, y, radius);

Draw a circle with a specified radius.

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:	`myGLCD.drawCircle(119,159,20); // Draw a circle with a radius of 20 pixels`

fillCircle(x, y, radius);

Draw a filled circle with a specified radius.

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:	`myGLCD.fillCircle(119,159,10); // Draw a filled circle with a radius of 10 pixels`

print(st, x, y[, deg]);

Print a string at the specified coordinates. An optional background color can be specified. Default background is black.
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 deg: **<optional>** Degrees to rotate text (0-359). Text will be rotated around the upper left corner.
Usage:	`myGLCD.print(“Hello, World!”,CENTER,0); // Print “Hello, World!”`
Notes:	CENTER and RIGHT will not calculate the coordinates correctly when rotating text. 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. An optional background color can be specified. Default background is black.
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:	`myGLCD.print(num,CENTER,0); // Print the value of “num”`

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

Print a floating-point number at the specified coordinates. An optional background color can be specified. Default background is black.
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:	`myGLCD.print(num, 3, CENTER,0); // Print the value of “num” with 3 fractional digits`
Notes:	Supported range depends on the number of fractional digits used. Approx range is +/- 2*(10^(9-dec))

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:	`myGLCD.setFont(BigFont); // Select the font called BigFont`
Notes:	You must declare the font-array as an external or include it in your sketch.

drawBitmap (x, y, sx, sy, data[, scale]);

Draw a bitmap on the screen.

Parameters:	x: x-coordinate of the upper, left corner of the bitmap
	y: y-coordinate of the upper, left corner of the bitmap
	sx: width of the bitmap in pixels
	sy: height of the bitmap in pixels
	data: array containing the bitmap-data
	scale: **<optional>**
	Scaling factor. Each pixel in the bitmap will be drawn as <scale>x<scale> pixels on screen.
Usage:	`myGLCD.drawBitmap(0, 0, 32, 32, bitmap); // Draw a 32x32 pixel bitmap`
Notes:	You can use the online-tool *“ImageConverter 565”* or *“ImageConverter565.exe”* in the Tools-folder to convert pictures into compatible arrays. The online-tool can be found on my website.
	Requires that you *#include <avr/pgmspace.h>* when using an Arduino.

drawBitmap (x, y, sx, sy, data, deg, rox, roy);

Draw a bitmap on the screen with rotation.

Parameters:	x: x-coordinate of the upper, left corner of the bitmap
	y: y-coordinate of the upper, left corner of the bitmap
	sx: width of the bitmap in pixels
	sy: height of the bitmap in pixels
	data: array containing the bitmap-data
	deg: Degrees to rotate bitmap (0-359)
	rox: x-coordinate of the pixel to use as rotational center relative to bitmaps upper left corner
	roy: y-coordinate of the pixel to use as rotational center relative to bitmaps upper left corner
Usage:	`myGLCD.drawBitmap(50, 50, 32, 32, bitmap, 45, 16, 16); // Draw a bitmap rotated 45 degrees around its center`
Notes:	You can use the online-tool *“ImageConverter 565”* or *“ImageConverter565.exe”* in the Tools-folder to convert pictures into compatible arrays. The online-tool can be found on my website.
	Requires that you *#include <avr/pgmspace.h>* when using an Arduino.

lcdOff();

Turn off the LCD. No commands will be executed until a lcdOn(); is sent.

Parameters:	None
Usage:	`myGLCD.lcdOff(); // Turn off the lcd`
Notes:	This function is currently only supported on PCF8833-based displays

lcdOn();

Turn on the LCD after issuing a lcdOff()-command.

Parameters:	None
Usage:	`myGLCD.lcdOn(); // Turn on the lcd`
Notes:	This function is currently only supported on PCF8833-based displays

setContrast(c);

Set the contrast of the display.

Parameters:	c: Contrast-level (0-64)
Usage:	`myGLCD.setContrast(64); // Set contrast to full (default)`
Notes:	This function is currently only supported on PCF8833-based displays

getDisplayXSize();

Get the width of the screen in the current orientation.

Parameters:	None
Returns:	Width of the screen in the current orientation in pixels
Usage:	`Xsize = myGLCD.getDisplayXSize(); // Get the width`

getDisplayYSize();

Get the height of the screen in the current orientation.

Parameters:	None
Returns:	Height of the screen in the current orientation in pixels
Usage:	`Ysize = myGLCD.getDisplayYSize(); // Get the height`