chipKIT TFT Library

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Contents

Chapter 1

chipKIT-TFT

Universal TFT and other display device library for the chipKIT and PIC32 based boards.

Chapter 2

Hierarchical Index

2.1 Class Hierarchy

This inheritance list is sorted roughly, but not completely, alphabetically:

Chapter 3

Class Index

3.1 Class List

Here are the classes, structs, unions and interfaces with brief descriptions:

Chapter 4

Class Documentation

4.1 __attribute__ Struct Reference

Public Member Functions

- union {
  uint16_t **value**
  } **__attribute__** ((packed))

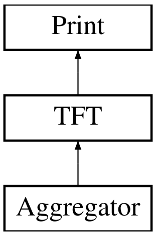
The documentation for this struct was generated from the following file:

- TFT.h

4.2 Aggregator Class Reference

```
#include <Aggregator.h>
```

Inheritance diagram for Aggregator:



Public Member Functions

- void fillScreen (uint16_t color)
- void setPixel (int16_t x, int16_t y, uint16_t color)
- void setRotation (uint8_t r)
- void invertDisplay (boolean i)
- void displayOn ()
- void displayOff ()
- void initializeDevice ()
- void addDisplay (TFT ∗d, int16_t x, int16_t y)

- void drawHorizontalLine (int16_t x, int16_t y, int16_t w, uint16_t c)
- void drawVerticalLine (int16_t x, int16_t y, int16_t h, uint16_t c)
- uint16_t getWidth ()
- uint16_t getHeight ()

Protected Attributes

- struct AggregatorList ∗ **_displays**
- uint16_t **_width**
- uint16_t **_height**

Additional Inherited Members

4.2.1 Detailed Description

The aggregator takes one or more physical screens and combines them into a single virtual display. Screens can occupy any location within the virtual display space and do not need to be contiguous.

4.2.2 Member Function Documentation

4.2.2.1 void Aggregator::addDisplay (TFT ∗ *d*, int16_t *x*, int16_t *y*)

Add a display

You add displays to the aggregator virtual display with this function. A display is passed as a pointer, along with the X/Y coordinates of the upper-left point of the screen in virtual display space.

Example:

```
agg.addDisplay(&tft, 0, 320);
```

4.2.2.2 void Aggregator::displayOff ( ) [inline], [virtual]

Turn off the display

Disable the video output of the display (if supported).

Example:

```
tft.displayOff();
```

Implements TFT.

4.2.2.3 void Aggregator::displayOn ( ) [inline], [virtual]

Turn on the display

Enable the video output of the display (if supported).

Example:

```
tft.displayOn();
```

Implements TFT.

4.2.2.4 void Aggregator::drawHorizontalLine (int16_t *x*, int16_t *y*, int16_t *w*, uint16_t *color*) [virtual]

Draw a horizontal line

A horizontal line of width (w) is drawn from point (x,y) in colour (color);
Example:

```
tft.drawHorizontalLine(10, 10, 50, Color::Blue);
```

Implements TFT.

4.2.2.5 void Aggregator::drawVerticalLine (int16_t *x*, int16_t *y*, int16_t *h*, uint16_t *color*) [virtual]

Draw a vertical line

A vertical line of height (h) is drawn from point (x,y) in colour (color);
Example:

```
tft.drawVerticalLine(10, 10, 50, Color::Blue);
```

Implements TFT.

4.2.2.6 void Aggregator::fillScreen (uint16_t *color*) [virtual]

Fill the screen with a colour

This function fills the entire screen with a solid colour.
Example:

```
tft.fillScreen(Color::Black);
```

Reimplemented from TFT.

4.2.2.7 uint16_t Aggregator::getHeight ( ) [inline], [virtual]

Get screen height

Returns the height (in pixels) of the screen.

Example:

int height = tft.getHeight();

Reimplemented from TFT.

4.2.2.8 uint16_t Aggregator::getWidth ( ) [inline], [virtual]

Get screen width

Returns the width (in pixels) of the screen.

Example:

int width = tft.getWidth();

Reimplemented from TFT.

4.2.2.9 void Aggregator::initializeDevice ( ) [virtual]

Initialize the display

The display is configured and made ready to work. This function *must* be called before anything can happen on the screen, and it *should* be called before any other function.

Example:

```
tft.initializeDevice();
```

Implements TFT.

4.2.2.10 void Aggregator::invertDisplay (boolean *i*) [virtual]

Invert the display colours

All colours become reversed. Black becomes white, red becomes cyan, etc.

Example:

```
tft.invertDisplay(true);
```

Implements TFT.

4.2.2.11 void Aggregator::setPixel (int16_t *x*, int16_t *y*, uint16_t *color*) [virtual]

Draw a pixel

A pixel, coloured (color) is drawn at (x,y).

Example:

```
tft.drawPixel(100, 100, Color::Green);
```

Implements TFT.

4.2.2.12 void Aggregator::setRotation (uint8_t *rotation*) [inline], [virtual]

Set screen rotation

This rotates the screen. Value is between 0 and 3, for 0°, 90°, 180° or 270°.

Example:

```
tft.setRotation(1);
```

Implements TFT.

The documentation for this class was generated from the following files:

- Aggregator.h
- Aggregator.cpp

4.3 AggregatorList Struct Reference

Public Attributes

- TFT ∗ **display**

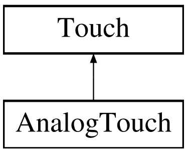
- int16_t **x**
- int16_t **y**
- struct AggregatorList ∗ **next**

The documentation for this struct was generated from the following file:

- Aggregator.h

4.4 AnalogTouch Class Reference

Inheritance diagram for AnalogTouch:



Public Member Functions

- **AnalogTouch** (uint8_t xl, uint8_t xr, uint8_t yu, uint8_t yd, uint16_t w, uint16_t h)
- void sample ()
- int **getSample** (uint8_t)
- uint16_t x ()
- uint16_t y ()
- boolean isPressed ()
- void initializeDevice ()
- void **scaleX** (float v)
- void **scaleY** (float v)
- void **offsetX** (int16_t v)
- void **offsetY** (int16_t v)
- uint16_t pressure ()
- void setRotation (uint8_t r)

Additional Inherited Members

4.4.1 Member Function Documentation

4.4.1.1 void AnalogTouch::initializeDevice ( ) [virtual]

Initialize the device

This configures and enables the touch screen device. It should be called before any other touch screen functions.

Implements Touch.

4.4.1.2 boolean AnalogTouch::isPressed ( ) [virtual]

Get pressed status

Returns true if the touch screen is pressed, false otherwise.

Implements Touch.

4.4.1.3 uint16_t AnalogTouch::pressure ( ) [virtual]

Calculate the touch pressure

For touch screens that can calculate how hard you are pressing them, this returns the pressure value. For others it returns 0.

Example:

```
int pressure = ts.pressure();
```

Reimplemented from Touch.

4.4.1.4 void AnalogTouch::sample ( ) [virtual]

Sample the touch screen

This performs a sampling of the touch screen to get the current coordinates and touch status. It should be called regularly to update the current touch screen data.

Implements Touch.

4.4.1.5 void AnalogTouch::setRotation (uint8_t *r*) [virtual]

Set rotation

This sets the screen orientation of the touch screen. It should be set to the same as the rotation used for the screen.

Reimplemented from Touch.

4.4.1.6 uint16_t AnalogTouch::x ( ) [virtual]

Get X coordinate

This returns the X coordinate of the current touch position.

Implements Touch.

4.4.1.7 uint16_t AnalogTouch::y ( ) [virtual]

Get Y coordinate

This returns the Y coordinate of the current touch position.

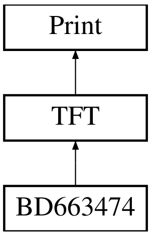
Implements Touch.

The documentation for this class was generated from the following files:

- AnalogTouch.h
- AnalogTouch.cpp

4.5 BD663474 Class Reference

Inheritance diagram for BD663474:



Public Member Functions

- **BD663474** (TFTCommunicator ∗comms)
- **BD663474** (TFTCommunicator &comms)
- void **setAddrWindow** (uint16_t x0, uint16_t y0, uint16_t x1, uint16_t y1)
- void fillScreen (uint16_t color)
- void setPixel (int16_t x, int16_t y, uint16_t color)
- void drawVerticalLine (int16_t x, int16_t y, int16_t h, uint16_t color)
- void drawHorizontalLine (int16_t x, int16_t y, int16_t w, uint16_t color)
- void fillRectangle (int16_t x, int16_t y, int16_t w, int16_t h, uint16_t color)
- void setRotation (uint8_t r)
- void invertDisplay (boolean i)
- void displayOn ()
- void displayOff ()
- void initializeDevice ()

Static Public Attributes

- static const uint16_t **Width** = 240
- static const uint16_t **Height** = 320

Additional Inherited Members

4.5.1 Member Function Documentation

4.5.1.1 void BD663474::displayOff ( ) [inline], [virtual]

Turn off the display

Disable the video output of the display (if supported).

Example:

```
tft.displayOff();
```

Implements TFT.

4.5.1.2 void BD663474::displayOn ( ) [inline], [virtual]

Turn on the display

Enable the video output of the display (if supported).

Example:

```
tft.displayOn();
```

Implements TFT.

4.5.1.3 void BD663474::drawHorizontalLine (int16_t *x,* int16_t *y,* int16_t *w,* uint16_t *color*) [virtual]

Draw a horizontal line

A horizontal line of width (w) is drawn from point (x,y) in colour (color);

Example:

```
tft.drawHorizontalLine(10, 10, 50, Color::Blue);
```

Implements TFT.

4.5.1.4 void BD663474::drawVerticalLine (int16_t *x,* int16_t *y,* int16_t *h,* uint16_t *color*) [virtual]

Draw a vertical line

A vertical line of height (h) is drawn from point (x,y) in colour (color);

Example:

```
tft.drawVerticalLine(10, 10, 50, Color::Blue);
```

Implements TFT.

4.5.1.5 void BD663474::fillRectangle (int16_t *x,* int16_t *y,* int16_t *w,* int16_t *h,* uint16_t *color*) [virtual]

Draw a rectangle

This function draws a filled rectangle on the screen. The upper-left corner of the rectangle is at (x, y), and it extends to the right and down for a distance of (w) and (h) pixels respectively. It is drawn in colour (color).

Example:

```
tft.fillRectangle(10, 10, 200, 300, Color::Blue);
```

It is expected that actual screen drivers will override this function with a high speed optimized function.

Reimplemented from TFT.

4.5.1.6 void BD663474::fillScreen (uint16_t *color*) [virtual]

Fill the screen with a colour

This function fills the entire screen with a solid colour.

Example:

```
tft.fillScreen(Color::Black);
```

Reimplemented from TFT.

4.5.1.7 void BD663474::initializeDevice ( ) [virtual]

Initialize the display

The display is configured and made ready to work. This function *must* be called before anything can happen on the screen, and it *should* be called before any other function.

Example:

```
tft.initializeDevice();
```

Implements TFT.

4.5.1.8 void BD663474::invertDisplay (boolean *i*) [virtual]

Invert the display colours

All colours become reversed. Black becomes white, red becomes cyan, etc.
Example:

```
tft.invertDisplay(true);
```

Implements TFT.

4.5.1.9 void BD663474::setPixel (int16_t *x,* int16_t *y,* uint16_t *color*) [virtual]

Draw a pixel

A pixel, coloured (color) is drawn at (x,y).
Example:

```
tft.drawPixel(100, 100, Color::Green);
```

Implements TFT.

4.5.1.10 void BD663474::setRotation (uint8_t *rotation*) [virtual]

Set screen rotation

This rotates the screen. Value is between 0 and 3, for 0°, 90°, 180° or 270°.
Example:

```
tft.setRotation(1);
```

Implements TFT.

The documentation for this class was generated from the following files:

- BD663474.h
- BD663474.cpp

4.6 BitmapFileHeader Struct Reference

Public Attributes

- uint16_t **bfType**
- uint32_t **bfSize**
- uint16_t **bfReserved1**
- uint16_t **bfReserved2**
- uint32_t **bfBitmapOffset**

The documentation for this struct was generated from the following file:

- BMP.h

4.7 BitmapInfoHeader Struct Reference

Public Attributes

- uint32_t **biSize**
- int32_t **biWidth**
- int32_t **biHeight**
- uint16_t **biPlanes**
- uint16_t **biBitCount**
- uint32_t **biCompression**
- uint32_t **biSizeImage**
- int32_t **biXPelsPerMeter**
- int32_t **biYPelsPerMeter**
- uint32_t **biClrUsed**
- uint32_t **biClrImportant**
- uint32_t **biMaskRed**
- uint32_t **biMaskGreen**
- uint32_t **biMaskBlue**
- uint32_t **biMaskAlpha**

The documentation for this struct was generated from the following file:

- BMP.h

4.8 BitmapPixel24 Struct Reference

Public Attributes

- uint8_t **b**
- uint8_t **g**
- uint8_t **r**

The documentation for this struct was generated from the following file:

- BMP.h

4.9 BitmapPixel32 Struct Reference

Public Member Functions

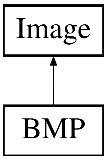
- union {
  uint32_t **value**
  } **__attribute__** ((packed))

The documentation for this struct was generated from the following file:

- BMP.h

4.10 BMP Class Reference

Inheritance diagram for BMP:



Public Member Functions

- **BMP** (const char ∗data)
- void **draw** (TFT ∗dev, int16_t x, int16_t y)
- void **draw** (TFT ∗dev, int16_t x, int16_t y, uint16_t t)
- void **drawTransformed** (TFT ∗dev, int16_t x, int16_t y, uint8_t transform)
- void **drawTransformed** (TFT ∗dev, int16_t x, int16_t y, uint8_t transform, uint16_t t)

Public Attributes

- const char ∗ **_data**
- const char ∗ **_image**
- struct BitmapFileHeader ∗ **_header**
- struct BitmapInfoHeader ∗ **_info**
- struct BitmapPixel32 ∗ **_palette**
- uint16_t **_paletteSize**

Additional Inherited Members

The documentation for this class was generated from the following files:

- BMP.h
- BMP.cpp

4.11 Color Class Reference

Static Public Attributes

- static const uint16_t **Snow** = RGB(255,250,250)
- static const uint16_t **GhostWhite** = RGB(248,248,255)
- static const uint16_t **WhiteSmoke** = RGB(245,245,245)
- static const uint16_t **Gainsboro** = RGB(220,220,220)
- static const uint16_t **FloralWhite** = RGB(255,250,240)
- static const uint16_t **OldLace** = RGB(253,245,230)
- static const uint16_t **Linen** = RGB(250,240,230)
- static const uint16_t **AntiqueWhite** = RGB(250,235,215)
- static const uint16_t **PapayaWhip** = RGB(255,239,213)
- static const uint16_t **BlanchedAlmond** = RGB(255,235,205)
- static const uint16_t **Bisque** = RGB(255,228,196)
- static const uint16_t **PeachPuff** = RGB(255,218,185)
- static const uint16_t **NavajoWhite** = RGB(255,222,173)

- static const uint16_t **Moccasin** = RGB(255,228,181)
- static const uint16_t **Cornsilk** = RGB(255,248,220)
- static const uint16_t **Ivory** = RGB(255,255,240)
- static const uint16_t **LemonChiffon** = RGB(255,250,205)
- static const uint16_t **Seashell** = RGB(255,245,238)
- static const uint16_t **Honeydew** = RGB(240,255,240)
- static const uint16_t **MintCream** = RGB(245,255,250)
- static const uint16_t **Azure** = RGB(240,255,255)
- static const uint16_t **AliceBlue** = RGB(240,248,255)
- static const uint16_t **Lavender** = RGB(230,230,250)
- static const uint16_t **LavenderBlush** = RGB(255,240,245)
- static const uint16_t **MistyRose** = RGB(255,228,225)
- static const uint16_t **White** = RGB(255,255,255)
- static const uint16_t **Black** = RGB(0, 0, 0)
- static const uint16_t **DarkSlateGray** = RGB(47, 79, 79)
- static const uint16_t **DimGray** = RGB(105,105,105)
- static const uint16_t **SlateGray** = RGB(112,128,144)
- static const uint16_t **LightSlateGray** = RGB(119,136,153)
- static const uint16_t **Gray** = RGB(190,190,190)
- static const uint16_t **LightGray** = RGB(211,211,211)
- static const uint16_t **MidnightBlue** = RGB(25, 25,112)
- static const uint16_t **Navy** = RGB(0, 0,128)
- static const uint16_t **NavyBlue** = RGB(0, 0,128)
- static const uint16_t **CornflowerBlue** = RGB(100,149,237)
- static const uint16_t **DarkSlateBlue** = RGB(72, 61,139)
- static const uint16_t **SlateBlue** = RGB(106, 90,205)
- static const uint16_t **MediumSlateBlue** = RGB(123,104,238)
- static const uint16_t **LightSlateBlue** = RGB(132,112,255)
- static const uint16_t **MediumBlue** = RGB(0, 0,205)
- static const uint16_t **RoyalBlue** = RGB(65,105,225)
- static const uint16_t **Blue** = RGB(0, 0,255)
- static const uint16_t **DodgerBlue** = RGB(30,144,255)
- static const uint16_t **DeepSkyBlue** = RGB(0,191,255)
- static const uint16_t **SkyBlue** = RGB(135,206,235)
- static const uint16_t **LightSkyBlue** = RGB(135,206,250)
- static const uint16_t **SteelBlue** = RGB(70,130,180)
- static const uint16_t **LightSteelBlue** = RGB(176,196,222)
- static const uint16_t **LightBlue** = RGB(173,216,230)
- static const uint16_t **PowderBlue** = RGB(176,224,230)
- static const uint16_t **PaleTurquoise** = RGB(175,238,238)
- static const uint16_t **DarkTurquoise** = RGB(0,206,209)
- static const uint16_t **MediumTurquoise** = RGB(72,209,204)
- static const uint16_t **Turquoise** = RGB(64,224,208)
- static const uint16_t **Cyan** = RGB(0,255,255)
- static const uint16_t **LightCyan** = RGB(224,255,255)
- static const uint16_t **CadetBlue** = RGB(95,158,160)
- static const uint16_t **MediumAquamarine** = RGB(102,205,170)
- static const uint16_t **Aquamarine** = RGB(127,255,212)
- static const uint16_t **DarkGreen** = RGB(0,100, 0)
- static const uint16_t **DarkOliveGreen** = RGB(85,107, 47)
- static const uint16_t **DarkSeaGreen** = RGB(143,188,143)
- static const uint16_t **SeaGreen** = RGB(46,139, 87)
- static const uint16_t **MediumSeaGreen** = RGB(60,179,113)
- static const uint16_t **LightSeaGreen** = RGB(32,178,170)
- static const uint16_t **PaleGreen** = RGB(152,251,152)

- static const uint16_t **SpringGreen** = RGB(0,255,127)
- static const uint16_t **LawnGreen** = RGB(124,252, 0)
- static const uint16_t **Green** = RGB(0,255, 0)
- static const uint16_t **Chartreuse** = RGB(127,255, 0)
- static const uint16_t **MediumSpringGreen** = RGB(0,250,154)
- static const uint16_t **GreenYellow** = RGB(173,255, 47)
- static const uint16_t **LimeGreen** = RGB(50,205, 50)
- static const uint16_t **YellowGreen** = RGB(154,205, 50)
- static const uint16_t **ForestGreen** = RGB(34,139, 34)
- static const uint16_t **OliveDrab** = RGB(107,142, 35)
- static const uint16_t **DarkKhaki** = RGB(189,183,107)
- static const uint16_t **Khaki** = RGB(240,230,140)
- static const uint16_t **PaleGoldenrod** = RGB(238,232,170)
- static const uint16_t **LightGoldenrodYellow** = RGB(250,250,210)
- static const uint16_t **LightYellow** = RGB(255,255,224)
- static const uint16_t **Yellow** = RGB(255,255, 0)
- static const uint16_t **Gold** = RGB(255,215, 0)
- static const uint16_t **LightGoldenrod** = RGB(238,221,130)
- static const uint16_t **Goldenrod** = RGB(218,165, 32)
- static const uint16_t **DarkGoldenrod** = RGB(184,134, 11)
- static const uint16_t **RosyBrown** = RGB(188,143,143)
- static const uint16_t **IndianRed** = RGB(205, 92, 92)
- static const uint16_t **SaddleBrown** = RGB(139, 69, 19)
- static const uint16_t **Sienna** = RGB(160, 82, 45)
- static const uint16_t **Peru** = RGB(205,133, 63)
- static const uint16_t **Burlywood** = RGB(222,184,135)
- static const uint16_t **Beige** = RGB(245,245,220)
- static const uint16_t **Wheat** = RGB(245,222,179)
- static const uint16_t **SandyBrown** = RGB(244,164, 96)
- static const uint16_t **Tan** = RGB(210,180,140)
- static const uint16_t **Chocolate** = RGB(210,105, 30)
- static const uint16_t **Firebrick** = RGB(178, 34, 34)
- static const uint16_t **Brown** = RGB(165, 42, 42)
- static const uint16_t **DarkSalmon** = RGB(233,150,122)
- static const uint16_t **Salmon** = RGB(250,128,114)
- static const uint16_t **LightSalmon** = RGB(255,160,122)
- static const uint16_t **Orange** = RGB(255,165, 0)
- static const uint16_t **DarkOrange** = RGB(255,140, 0)
- static const uint16_t **Coral** = RGB(255,127, 80)
- static const uint16_t **LightCoral** = RGB(240,128,128)
- static const uint16_t **Tomato** = RGB(255, 99, 71)
- static const uint16_t **OrangeRed** = RGB(255, 69, 0)
- static const uint16_t **Red** = RGB(255, 0, 0)
- static const uint16_t **HotPink** = RGB(255,105,180)
- static const uint16_t **DeepPink** = RGB(255, 20,147)
- static const uint16_t **Pink** = RGB(255,192,203)
- static const uint16_t **LightPink** = RGB(255,182,193)
- static const uint16_t **PaleVioletRed** = RGB(219,112,147)
- static const uint16_t **Maroon** = RGB(176, 48, 96)
- static const uint16_t **MediumVioletRed** = RGB(199, 21,133)
- static const uint16_t **VioletRed** = RGB(208, 32,144)
- static const uint16_t **Magenta** = RGB(255, 0,255)
- static const uint16_t **Violet** = RGB(238,130,238)
- static const uint16_t **Plum** = RGB(221,160,221)
- static const uint16_t **Orchid** = RGB(218,112,214)

- static const uint16_t **MediumOrchid** = RGB(186, 85,211)
- static const uint16_t **DarkOrchid** = RGB(153, 50,204)
- static const uint16_t **DarkViolet** = RGB(148, 0,211)
- static const uint16_t **BlueViolet** = RGB(138, 43,226)
- static const uint16_t **Purple** = RGB(160, 32,240)
- static const uint16_t **MediumPurple** = RGB(147,112,219)
- static const uint16_t **Thistle** = RGB(216,191,216)
- static const uint16_t **Gray0** = RGB(0, 0, 0)
- static const uint16_t **Gray1** = RGB(3, 3, 3)
- static const uint16_t **Gray2** = RGB(5, 5, 5)
- static const uint16_t **Gray3** = RGB(8, 8, 8)
- static const uint16_t **Gray4** = RGB(10, 10, 10)
- static const uint16_t **Gray5** = RGB(13, 13, 13)
- static const uint16_t **Gray6** = RGB(15, 15, 15)
- static const uint16_t **Gray7** = RGB(18, 18, 18)
- static const uint16_t **Gray8** = RGB(20, 20, 20)
- static const uint16_t **Gray9** = RGB(23, 23, 23)
- static const uint16_t **Gray10** = RGB(26, 26, 26)
- static const uint16_t **Gray11** = RGB(28, 28, 28)
- static const uint16_t **Gray12** = RGB(31, 31, 31)
- static const uint16_t **Gray13** = RGB(33, 33, 33)
- static const uint16_t **Gray14** = RGB(36, 36, 36)
- static const uint16_t **Gray15** = RGB(38, 38, 38)
- static const uint16_t **Gray16** = RGB(41, 41, 41)
- static const uint16_t **Gray17** = RGB(43, 43, 43)
- static const uint16_t **Gray18** = RGB(46, 46, 46)
- static const uint16_t **Gray19** = RGB(48, 48, 48)
- static const uint16_t **Gray20** = RGB(51, 51, 51)
- static const uint16_t **Gray21** = RGB(54, 54, 54)
- static const uint16_t **Gray22** = RGB(56, 56, 56)
- static const uint16_t **Gray23** = RGB(59, 59, 59)
- static const uint16_t **Gray24** = RGB(61, 61, 61)
- static const uint16_t **Gray25** = RGB(64, 64, 64)
- static const uint16_t **Gray26** = RGB(66, 66, 66)
- static const uint16_t **Gray27** = RGB(69, 69, 69)
- static const uint16_t **Gray28** = RGB(71, 71, 71)
- static const uint16_t **Gray29** = RGB(74, 74, 74)
- static const uint16_t **Gray30** = RGB(77, 77, 77)
- static const uint16_t **Gray31** = RGB(79, 79, 79)
- static const uint16_t **Gray32** = RGB(82, 82, 82)
- static const uint16_t **Gray33** = RGB(84, 84, 84)
- static const uint16_t **Gray34** = RGB(87, 87, 87)
- static const uint16_t **Gray35** = RGB(89, 89, 89)
- static const uint16_t **Gray36** = RGB(92, 92, 92)
- static const uint16_t **Gray37** = RGB(94, 94, 94)
- static const uint16_t **Gray38** = RGB(97, 97, 97)
- static const uint16_t **Gray39** = RGB(99, 99, 99)
- static const uint16_t **Gray40** = RGB(102,102,102)
- static const uint16_t **Gray41** = RGB(105,105,105)
- static const uint16_t **Gray42** = RGB(107,107,107)
- static const uint16_t **Gray43** = RGB(110,110,110)
- static const uint16_t **Gray44** = RGB(112,112,112)
- static const uint16_t **Gray45** = RGB(115,115,115)
- static const uint16_t **Gray46** = RGB(117,117,117)
- static const uint16_t **Gray47** = RGB(120,120,120)

- static const uint16_t **Gray48** = RGB(122,122,122)
- static const uint16_t **Gray49** = RGB(125,125,125)
- static const uint16_t **Gray50** = RGB(127,127,127)
- static const uint16_t **Gray51** = RGB(130,130,130)
- static const uint16_t **Gray52** = RGB(133,133,133)
- static const uint16_t **Gray53** = RGB(135,135,135)
- static const uint16_t **Gray54** = RGB(138,138,138)
- static const uint16_t **Gray55** = RGB(140,140,140)
- static const uint16_t **Gray56** = RGB(143,143,143)
- static const uint16_t **Gray57** = RGB(145,145,145)
- static const uint16_t **Gray58** = RGB(148,148,148)
- static const uint16_t **Gray59** = RGB(150,150,150)
- static const uint16_t **Gray60** = RGB(153,153,153)
- static const uint16_t **Gray61** = RGB(156,156,156)
- static const uint16_t **Gray62** = RGB(158,158,158)
- static const uint16_t **Gray63** = RGB(161,161,161)
- static const uint16_t **Gray64** = RGB(163,163,163)
- static const uint16_t **Gray65** = RGB(166,166,166)
- static const uint16_t **Gray66** = RGB(168,168,168)
- static const uint16_t **Gray67** = RGB(171,171,171)
- static const uint16_t **Gray68** = RGB(173,173,173)
- static const uint16_t **Gray69** = RGB(176,176,176)
- static const uint16_t **Gray70** = RGB(179,179,179)
- static const uint16_t **Gray71** = RGB(181,181,181)
- static const uint16_t **Gray72** = RGB(184,184,184)
- static const uint16_t **Gray73** = RGB(186,186,186)
- static const uint16_t **Gray74** = RGB(189,189,189)
- static const uint16_t **Gray75** = RGB(191,191,191)
- static const uint16_t **Gray76** = RGB(194,194,194)
- static const uint16_t **Gray77** = RGB(196,196,196)
- static const uint16_t **Gray78** = RGB(199,199,199)
- static const uint16_t **Gray79** = RGB(201,201,201)
- static const uint16_t **Gray80** = RGB(204,204,204)
- static const uint16_t **Gray81** = RGB(207,207,207)
- static const uint16_t **Gray82** = RGB(209,209,209)
- static const uint16_t **Gray83** = RGB(212,212,212)
- static const uint16_t **Gray84** = RGB(214,214,214)
- static const uint16_t **Gray85** = RGB(217,217,217)
- static const uint16_t **Gray86** = RGB(219,219,219)
- static const uint16_t **Gray87** = RGB(222,222,222)
- static const uint16_t **Gray88** = RGB(224,224,224)
- static const uint16_t **Gray89** = RGB(227,227,227)
- static const uint16_t **Gray90** = RGB(229,229,229)
- static const uint16_t **Gray91** = RGB(232,232,232)
- static const uint16_t **Gray92** = RGB(235,235,235)
- static const uint16_t **Gray93** = RGB(237,237,237)
- static const uint16_t **Gray94** = RGB(240,240,240)
- static const uint16_t **Gray95** = RGB(242,242,242)
- static const uint16_t **Gray96** = RGB(245,245,245)
- static const uint16_t **Gray97** = RGB(247,247,247)
- static const uint16_t **Gray98** = RGB(250,250,250)
- static const uint16_t **Gray99** = RGB(252,252,252)
- static const uint16_t **Gray100** = RGB(255,255,255)
- static const uint16_t **DarkGray** = RGB(169,169,169)
- static const uint16_t **DarkBlue** = RGB(0 , 0,139)

- static const uint16_t **DarkCyan** = RGB(0 ,139,139)
- static const uint16_t **DarkMagenta** = RGB(139, 0,139)
- static const uint16_t **DarkRed** = RGB(139, 0, 0)
- static const uint16_t **LightGreen** = RGB(144,238,144)

The documentation for this class was generated from the following file:

- Color.h

4.12 coord Struct Reference

Public Attributes

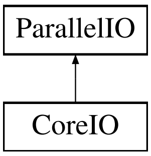
- uint16_t **x**
- uint16_t **y**

The documentation for this struct was generated from the following file:

- TFT.h

4.13 CoreIO Class Reference

Inheritance diagram for CoreIO:



Public Member Functions

- uint16_t **pins** ()
- void **digitalWrite** (uint16_t pin, uint8_t val)
- uint8_t **digitalRead** (uint16_t pin)
- void **pinMode** (uint16_t pin, uint8_t mode)
- void **startBuffer** ()
- void **endBuffer** ()

The documentation for this class was generated from the following file:

- CoreIO.h

4.14 DataBlock Class Reference

Public Member Functions

- **DataBlock** (uint32_t start, uint32_t len, DataStore ∗store)
- uint8_t **operator[]** (uint32_t a)
- void **set** (uint32_t a, uint8_t v)

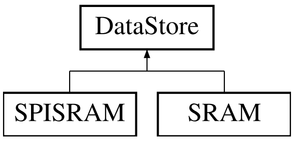
- uint8_t **get** (uint32_t a)

The documentation for this class was generated from the following files:

- DataStore.h
- DataStore.cpp

4.15 DataStore Class Reference

Inheritance diagram for DataStore:



Public Member Functions

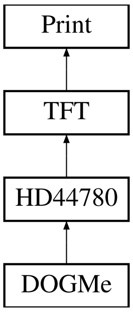
- virtual uint8_t **read8** (uint32_t addr)=0
- virtual uint16_t **read16** (uint32_t addr)=0
- virtual uint32_t **read32** (uint32_t addr)=0
- virtual void **read8** (uint32_t addr, uint8_t ∗data, uint32_t len)=0
- virtual void **read16** (uint32_t addr, uint16_t ∗data, uint32_t len)=0
- virtual void **read32** (uint32_t addr, uint32_t ∗data, uint32_t len)=0
- virtual void **write8** (uint32_t addr, uint8_t data)=0
- virtual void **write16** (uint32_t addr, uint16_t data)=0
- virtual void **write32** (uint32_t addr, uint32_t data)=0
- virtual void **write8** (uint32_t addr, uint8_t ∗data, uint32_t len)=0
- virtual void **write16** (uint32_t addr, uint16_t ∗data, uint32_t len)=0
- virtual void **write32** (uint32_t addr, uint32_t ∗data, uint32_t len)=0
- virtual void **setAll8** (uint8_t data)
- virtual void **setAll16** (uint16_t data)
- virtual void **setAll32** (uint32_t data)
- virtual void **initializeDevice** ()=0
- virtual uint32_t **size** ()=0
- DataBlock & **allocate** (uint32_t s)
- void **free** (DataBlock &b)

The documentation for this class was generated from the following files:

- DataStore.h
- DataStore.cpp

4.16 DOGMe Class Reference

Inheritance diagram for DOGMe:



Public Member Functions

- **DOGMe** (TFTCommunicator ∗comm, uint8_t w, uint8_t h)
- **DOGMe** (TFTCommunicator &comm, uint8_t w, uint8_t h)
- void initializeDevice ()
- void **table** (uint8_t tab)
- void **setBits** (uint8_t b)
- void **setLines** (uint8_t l)
- void **setFunction** ()
- void **setContrast** (uint8_t c)
- void **setBias** (uint8_t b)
- void **setFollower** (uint8_t f)
- void **singleHeight** ()
- void **doubleHeight** ()
- void **write** (uint8_t c)

Additional Inherited Members

4.16.1 Member Function Documentation

4.16.1.1 void DOGMe::initializeDevice ( ) [virtual]

Initialize the display

The display is configured and made ready to work. This function *must* be called before anything can happen on the screen, and it *should* be called before any other function.

Example:

```
tft.initializeDevice();
```

Implements TFT.

The documentation for this class was generated from the following files:

- DOGMe.h
- DOGMe.cpp

4.17 FontHeader Struct Reference

Public Attributes

- uint8_t **linesPerCharacter**

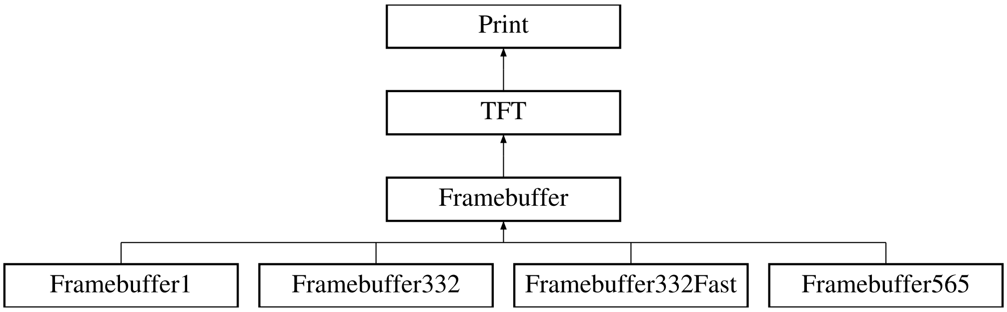
- uint8_t **bytesPerLine**
- uint8_t **startGlyph**
- uint8_t **endGlyph**
- uint8_t **bitsPerPixel**

The documentation for this struct was generated from the following file:

- TFT.h

4.18 Framebuffer Class Reference

Inheritance diagram for Framebuffer:



Public Member Functions

- **Framebuffer** (int16_t w, int16_t h, DataStore ∗b)
- virtual void setPixel (int16_t x, int16_t y, uint16_t c)
- virtual void drawVerticalLine (int16_t x, int16_t y, int16_t h, uint16_t color)
- virtual void drawHorizontalLine (int16_t x, int16_t y, int16_t w, uint16_t color)
- virtual void **fillRect** (int16_t x, int16_t y, int16_t w, int16_t h, uint16_t color)
- virtual void fillScreen (uint16_t)
- virtual void **setAntiAlias** (uint8_t aa)
- virtual void **copyRect** (int16_t dx, int16_t dy, int16_t sx, int16_t sy, uint16_t w, uint16_t h)
- virtual void **setColor** (uint8_t color, uint16_t rgb)
- virtual void **setColor** (uint8_t color, uint8_t r, uint8_t g, uint8_t b)
- virtual void **loadPalette** (const uint16_t ∗p)
- virtual void **loadPalette** (const uint8_t p[256][3])
- virtual void **loadPalette** (Framebuffer ∗fb)
- virtual uint16_t colorAt (int16_t x, int16_t y)
- virtual uint16_t bgColorAt (int16_t x, int16_t y)
- virtual void **getScanLine** (uint16_t y, uint16_t ∗data)
- virtual void **getScanLine** (uint16_t y, uint16_t x, uint16_t w, uint16_t ∗data)
- virtual struct sprite ∗ **addSprite** (const uint8_t ∗data, uint16_t w, uint16_t h, uint8_t t, uint8_t f)
- virtual void **removeSprite** (struct sprite ∗s)
- virtual void **moveTo** (struct sprite ∗s, int16_t x, int16_t y)
- virtual void **moveBy** (struct sprite ∗s, int16_t dx, int16_t dy)
- virtual struct sprite ∗ **spriteAt** (int16_t x, int16_t y)
- virtual void **animate** (struct sprite ∗s)
- virtual void **animatePingPong** (struct sprite ∗s)
- virtual struct sprite ∗ **collidesWith** (struct sprite ∗s)
- virtual struct sprite ∗ **firstSprite** ()
- virtual struct sprite ∗ **nextSprite** ()

- virtual int8_t **getSprite** (struct sprite ∗s, uint8_t n)
- virtual void **setSprite** (struct sprite ∗s, uint8_t n, int8_t v)
- virtual void initializeDevice ()
- virtual void displayOn ()
- virtual void displayOff ()
- virtual void invertDisplay (boolean i)
- virtual uint8_t **bufferRead** (uint32_t addr)
- virtual void **bufferWrite** (uint32_t addr, uint8_t value)
- virtual void setRotation (uint8_t rot)
- virtual uint16_t getWidth ()
- virtual uint16_t getHeight ()
- virtual uint8_t **getClosestColor** (uint16_t c)
- void **translateCoordinates** (int16_t ∗x, int16_t ∗y)
- virtual void **scroll** (int16_t dx, int16_t dy)
- virtual void **update** (TFT ∗tft)
- virtual void **update** (TFT ∗tft, int16_t x0, int16_t y0)
- virtual void **update** (TFT &tft)
- virtual void **update** (TFT &tft, int16_t x0, int16_t y0)

Public Attributes

- DataStore ∗ **buffer**
- uint16_t **palette** [256]
- struct sprite ∗ **sprites**
- struct sprite ∗ **selectedSprite**
- int32_t **_minX**
- int32_t **_minY**
- int32_t **_maxX**
- int32_t **_maxY**

Static Public Attributes

- static const uint8_t **MirrorH** = 0x01
- static const uint8_t **MirrorV** = 0x02
- static const uint8_t **Rotate180** = 0x03

Protected Attributes

- uint16_t **_masterWidth**
- uint16_t **_masterHeight**
- uint8_t **_antiAlias**

4.18.1 Member Function Documentation

4.18.1.1 uint16_t Framebuffer::bgColorAt (int16_t *x,* int16_t *y*) [virtual]

Get the raw colour at a location

Returns the base image colour at (x,y) before any further layers or post processing effects are performed. Example:

```
unsigned int color = tft.bgColorAt(100, 100);
```

Reimplemented from TFT.

Reimplemented in Framebuffer332, Framebuffer332Fast, and Framebuffer565.

4.18.1.2 uint16_t Framebuffer::colorAt (int16_t *x*, int16_t *y*) [virtual]

Get the colour at a location

Returns the colour at (x,y) as seen by the screen.
Example:

```
unsigned int color = tft.colorAt(100, 100);
```

Reimplemented from TFT.

Reimplemented in Framebuffer1, Framebuffer332, Framebuffer332Fast, and Framebuffer565.

4.18.1.3 virtual void Framebuffer::displayOff ( ) [inline], [virtual]

Turn off the display

Disable the video output of the display (if supported).
Example:

```
tft.displayOff();
```

Implements TFT.

4.18.1.4 virtual void Framebuffer::displayOn ( ) [inline], [virtual]

Turn on the display

Enable the video output of the display (if supported).
Example:

```
tft.displayOn();
```

Implements TFT.

4.18.1.5 void Framebuffer::drawHorizontalLine (int16_t *x*, int16_t *y*, int16_t *w*, uint16_t *color*) [virtual]

Draw a horizontal line

A horizontal line of width (w) is drawn from point (x,y) in colour (color);
Example:

```
tft.drawHorizontalLine(10, 10, 50, Color::Blue);
```

Implements TFT.

Reimplemented in Framebuffer332Fast.

4.18.1.6 void Framebuffer::drawVerticalLine (int16_t *x*, int16_t *y*, int16_t *h*, uint16_t *color*) [virtual]

Draw a vertical line

A vertical line of height (h) is drawn from point (x,y) in colour (color);
Example:

```
tft.drawVerticalLine(10, 10, 50, Color::Blue);
```

Implements TFT.

4.18.1.7 void Framebuffer::fillScreen (uint16_t *color*) [virtual]

Fill the screen with a colour

This function fills the entire screen with a solid colour.
Example:

```
tft.fillScreen(Color::Black);
```

Reimplemented from TFT.

Reimplemented in Framebuffer1, Framebuffer332, Framebuffer332Fast, and Framebuffer565.

4.18.1.8 uint16_t Framebuffer::getHeight ( ) [virtual]

Get screen height

Returns the height (in pixels) of the screen.

Example:

int height = tft.getHeight();

Reimplemented from TFT.

4.18.1.9 uint16_t Framebuffer::getWidth ( ) [virtual]

Get screen width

Returns the width (in pixels) of the screen.

Example:

int width = tft.getWidth();

Reimplemented from TFT.

4.18.1.10 void Framebuffer::initializeDevice ( ) [virtual]

Initialize the display

The display is configured and made ready to work. This function *must* be called before anything can happen on the screen, and it *should* be called before any other function.
Example:

```
tft.initializeDevice();
```

Implements TFT.

Reimplemented in Framebuffer1, Framebuffer332, Framebuffer332Fast, and Framebuffer565.

4.18.1.11 virtual void Framebuffer::invertDisplay (boolean *i*) [inline], [virtual]

Invert the display colours

All colours become reversed. Black becomes white, red becomes cyan, etc.
Example:

```
tft.invertDisplay(true);
```

Implements TFT.

4.18.1.12 void Framebuffer::setPixel (int16_t *x*, int16_t *y*, uint16_t *color*) [virtual]

Draw a pixel

A pixel, coloured (color) is drawn at (x,y).
Example:

```
tft.drawPixel(100, 100, Color::Green);
```

Implements TFT.

Reimplemented in Framebuffer1, Framebuffer332, Framebuffer332Fast, and Framebuffer565.

4.18.1.13 void Framebuffer::setRotation (uint8_t *rotation*) [virtual]

Set screen rotation

This rotates the screen. Value is between 0 and 3, for 0°, 90°, 180° or 270°.
Example:

```
tft.setRotation(1);
```

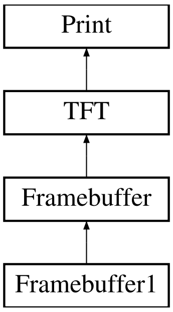
Implements TFT.

The documentation for this class was generated from the following files:

- Framebuffer.h
- Framebuffer.cpp

4.19 Framebuffer1 Class Reference

Inheritance diagram for Framebuffer1:



Public Member Functions

- **Framebuffer1** (int16_t w, int16_t h, DataStore ∗b)
- void fillScreen (uint16_t c)
- void setPixel (int16_t x, int16_t y, uint16_t c)
- void **setColor** (uint8_t color, uint16_t rgb)
- void **setColor** (uint8_t color, uint8_t r, uint8_t g, uint8_t b)
- void **loadPalette** (const uint16_t ∗p)
- void **loadPalette** (const uint8_t p[256][3])
- void **loadPalette** (Framebuffer ∗fb)
- uint16_t colorAt (int16_t x, int16_t y)
- void **getScanLine** (uint16_t y, uint16_t x, uint16_t w, uint16_t ∗data)
- void initializeDevice ()

Public Attributes

- uint16_t **palette** [2]

Additional Inherited Members

4.19.1 Member Function Documentation

4.19.1.1 uint16_t Framebuffer1::colorAt (int16_t *x*, int16_t *y*) [virtual]

Get the colour at a location

Returns the colour at (x,y) as seen by the screen.

Example:

```
unsigned int color = tft.colorAt(100, 100);
```

Reimplemented from Framebuffer.

4.19.1.2 void Framebuffer1::fillScreen (uint16_t *color*) [virtual]

Fill the screen with a colour

This function fills the entire screen with a solid colour.

Example:

```
tft.fillScreen(Color::Black);
```

Reimplemented from Framebuffer.

4.19.1.3 void Framebuffer1::initializeDevice ( ) [virtual]

Initialize the display

The display is configured and made ready to work. This function *must* be called before anything can happen on the screen, and it *should* be called before any other function.

Example:

```
tft.initializeDevice();
```

Reimplemented from Framebuffer.

4.19.1.4 void Framebuffer1::setPixel (int16_t *x,* int16_t *y,* uint16_t *color*) [virtual]

Draw a pixel

A pixel, coloured (color) is drawn at (x,y).
Example:

```
tft.drawPixel(100, 100, Color::Green);
```

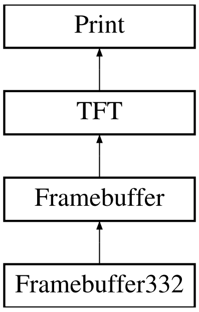
Reimplemented from Framebuffer.

The documentation for this class was generated from the following files:

- Framebuffer1.h
- Framebuffer1.cpp

4.20 Framebuffer332 Class Reference

Inheritance diagram for Framebuffer332:



Public Member Functions

- **Framebuffer332** (int16_t w, int16_t h, DataStore ∗b)
- void fillScreen (uint16_t c)
- void setPixel (int16_t x, int16_t y, uint16_t c)
- void **setColor** (uint8_t color, uint16_t rgb)
- void **setColor** (uint8_t color, uint8_t r, uint8_t g, uint8_t b)
- void **loadPalette** (const uint16_t ∗p)
- void **loadPalette** (const uint8_t p[256][3])
- void **loadPalette** (Framebuffer ∗fb)
- uint16_t colorAt (int16_t x, int16_t y)
- uint16_t bgColorAt (int16_t x, int16_t y)
- void **getScanLine** (uint16_t y, uint16_t x, uint16_t w, uint16_t ∗data)
- void initializeDevice ()
- void **update** (TFT ∗)
- void **update** (TFT ∗, int16_t x0, int16_t y0)

Additional Inherited Members

4.20.1 Member Function Documentation

4.20.1.1 uint16_t Framebuffer332::bgColorAt (int16_t *x,* int16_t *y*) [virtual]

Get the raw colour at a location

Returns the base image colour at (x,y) before any further layers or post processing effects are performed.
Example:

```
unsigned int color = tft.bgColorAt(100, 100);
```

Reimplemented from Framebuffer.

4.20.1.2 uint16_t Framebuffer332::colorAt (int16_t *x*, int16_t *y*) [virtual]

Get the colour at a location

Returns the colour at (x,y) as seen by the screen.
Example:

```
unsigned int color = tft.colorAt(100, 100);
```

Reimplemented from Framebuffer.

4.20.1.3 void Framebuffer332::fillScreen (uint16_t *color*) [virtual]

Fill the screen with a colour

This function fills the entire screen with a solid colour.
Example:

```
tft.fillScreen(Color::Black);
```

Reimplemented from Framebuffer.

4.20.1.4 void Framebuffer332::initializeDevice ( ) [virtual]

Initialize the display

The display is configured and made ready to work. This function *must* be called before anything can happen on the screen, and it *should* be called before any other function.
Example:

```
tft.initializeDevice();
```

Reimplemented from Framebuffer.

4.20.1.5 void Framebuffer332::setPixel (int16_t *x*, int16_t *y*, uint16_t *color*) [virtual]

Draw a pixel

A pixel, coloured (color) is drawn at (x,y).
Example:

```
tft.drawPixel(100, 100, Color::Green);
```

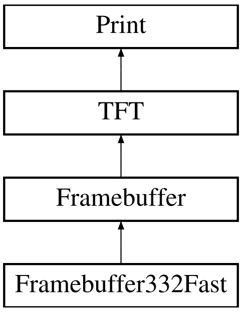
Reimplemented from Framebuffer.

The documentation for this class was generated from the following files:

- Framebuffer332.h
- Framebuffer332.cpp

4.21 Framebuffer332Fast Class Reference

Inheritance diagram for Framebuffer332Fast:



Public Member Functions

- **Framebuffer332Fast** (int16_t w, int16_t h, uint8_t ∗b)
- void fillScreen (uint16_t c)
- void setPixel (int16_t x, int16_t y, uint16_t c)
- void **setColor** (uint8_t color, uint16_t rgb)
- void **setColor** (uint8_t color, uint8_t r, uint8_t g, uint8_t b)
- void **loadPalette** (const uint16_t ∗p)
- void **loadPalette** (const uint8_t p[256][3])
- void **loadPalette** (Framebuffer ∗fb)
- uint16_t colorAt (int16_t x, int16_t y)
- uint16_t bgColorAt (int16_t x, int16_t y)
- void **getScanLine** (uint16_t y, uint16_t x, uint16_t w, uint16_t ∗data)
- void initializeDevice ()
- void drawHorizontalLine (int16_t x, int16_t y, int16_t w, uint16_t color)
- void **update** (TFT ∗tft)

Additional Inherited Members

4.21.1 Member Function Documentation

4.21.1.1 uint16_t Framebuffer332Fast::bgColorAt (int16_t *x*, int16_t *y*) [virtual]

Get the raw colour at a location

Returns the base image colour at (x,y) before any further layers or post processing effects are performed. Example:

```
unsigned int color = tft.bgColorAt(100, 100);
```

Reimplemented from Framebuffer.

4.21.1.2 uint16_t Framebuffer332Fast::colorAt (int16_t *x*, int16_t *y*) [virtual]

Get the colour at a location

Returns the colour at (x,y) as seen by the screen.

Example:

```
unsigned int color = tft.colorAt(100, 100);
```

Reimplemented from Framebuffer.

4.21.1.3 void Framebuffer332Fast::drawHorizontalLine (int16_t *x*, int16_t *y*, int16_t *w*, uint16_t *color*) [virtual]

Draw a horizontal line

A horizontal line of width (w) is drawn from point (x,y) in colour (color);

Example:

```
tft.drawHorizontalLine(10, 10, 50, Color::Blue);
```

Reimplemented from Framebuffer.

4.21.1.4 void Framebuffer332Fast::fillScreen (uint16_t *color*) [virtual]

Fill the screen with a colour

This function fills the entire screen with a solid colour.

Example:

```
tft.fillScreen(Color::Black);
```

Reimplemented from Framebuffer.

4.21.1.5 void Framebuffer332Fast::initializeDevice ( ) [virtual]

Initialize the display

The display is configured and made ready to work. This function *must* be called before anything can happen on the screen, and it *should* be called before any other function.

Example:

```
tft.initializeDevice();
```

Reimplemented from Framebuffer.

4.21.1.6 void Framebuffer332Fast::setPixel (int16_t *x*, int16_t *y*, uint16_t *color*) [virtual]

Draw a pixel

A pixel, coloured (color) is drawn at (x,y).

Example:

```
tft.drawPixel(100, 100, Color::Green);
```

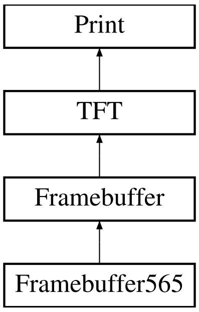
Reimplemented from Framebuffer.

The documentation for this class was generated from the following files:

- Framebuffer332Fast.h
- Framebuffer332Fast.cpp

4.22 Framebuffer565 Class Reference

Inheritance diagram for Framebuffer565:



Public Member Functions

- **Framebuffer565** (int16_t w, int16_t h, DataStore ∗b)
- void fillScreen (uint16_t c)
- void setPixel (int16_t x, int16_t y, uint16_t c)
- void **setColor** (uint8_t color, uint16_t rgb)
- void **setColor** (uint8_t color, uint8_t r, uint8_t g, uint8_t b)
- void **loadPalette** (const uint16_t ∗p)
- void **loadPalette** (const uint8_t p[256][3])
- void **loadPalette** (Framebuffer ∗fb)
- uint16_t colorAt (int16_t x, int16_t y)
- uint16_t bgColorAt (int16_t x, int16_t y)
- void **getScanLine** (uint16_t y, uint16_t x, uint16_t w, uint16_t ∗data)
- void initializeDevice ()

Additional Inherited Members

4.22.1 Member Function Documentation

4.22.1.1 uint16_t Framebuffer565::bgColorAt (int16_t *x*, int16_t *y*) [virtual]

Get the raw colour at a location

Returns the base image colour at (x,y) before any further layers or post processing effects are performed. Example:

```
unsigned int color = tft.bgColorAt(100, 100);
```

Reimplemented from Framebuffer.

4.22.1.2 uint16_t Framebuffer565::colorAt (int16_t *x*, int16_t *y*) [virtual]

Get the colour at a location

Returns the colour at (x,y) as seen by the screen.

Example:

```
unsigned int color = tft.colorAt(100, 100);
```

Reimplemented from Framebuffer.

4.22.1.3 void Framebuffer565::fillScreen (uint16_t *color*) [virtual]

Fill the screen with a colour

This function fills the entire screen with a solid colour.

Example:

```
tft.fillScreen(Color::Black);
```

Reimplemented from Framebuffer.

4.22.1.4 void Framebuffer565::initializeDevice ( ) [virtual]

Initialize the display

The display is configured and made ready to work. This function *must* be called before anything can happen on the screen, and it *should* be called before any other function.

Example:

```
tft.initializeDevice();
```

Reimplemented from Framebuffer.

4.22.1.5 void Framebuffer565::setPixel (int16_t *x*, int16_t *y*, uint16_t *color*) [virtual]

Draw a pixel

A pixel, coloured (color) is drawn at (x,y).

Example:

```
tft.drawPixel(100, 100, Color::Green);
```

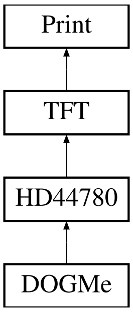
Reimplemented from Framebuffer.

The documentation for this class was generated from the following files:

- Framebuffer565.h
- Framebuffer565.cpp

4.23 HD44780 Class Reference

Inheritance diagram for HD44780:



Public Member Functions

- **HD44780** (TFTCommunicator ∗comm, uint8_t w, uint8_t h)
- **HD44780** (TFTCommunicator &comm, uint8_t w, uint8_t h)
- void fillScreen (uint16_t color)
- void setPixel (int16_t x, int16_t y, uint16_t color)
- void drawVerticalLine (int16_t x, int16_t y, int16_t h, uint16_t color)
- void drawHorizontalLine (int16_t x, int16_t y, int16_t w, uint16_t color)
- void fillRectangle (int16_t x, int16_t y, int16_t w, int16_t h, uint16_t color)
- void setRotation (uint8_t r)
- void invertDisplay (boolean i)
- void displayOn ()
- void displayOff ()
- void initializeDevice ()
- void **clearScreen** ()
- void **home** ()
- void **write** (char c)
- void **command** (uint8_t cmd)
- void **data** (uint8_t d)

Public Attributes

- uint8_t **_bits**
- boolean **_cursor**
- boolean **_blink**

Additional Inherited Members

4.23.1 Member Function Documentation

4.23.1.1 void HD44780::displayOff ( ) [virtual]

Turn off the display

Disable the video output of the display (if supported).
Example:

```
tft.displayOff();
```

Implements TFT.

4.23.1.2 void HD44780::displayOn ( ) [virtual]

Turn on the display

Enable the video output of the display (if supported).
Example:

```
tft.displayOn();
```

Implements TFT.

4.23.1.3 void HD44780::drawHorizontalLine (int16_t *x*, int16_t *y*, int16_t *w*, uint16_t *color*) [inline], [virtual]

Draw a horizontal line

A horizontal line of width (w) is drawn from point (x,y) in colour (color);
Example:

```
tft.drawHorizontalLine(10, 10, 50, Color::Blue);
```

Implements TFT.

4.23.1.4 void HD44780::drawVerticalLine (int16_t *x*, int16_t *y*, int16_t *h*, uint16_t *color*) [inline], [virtual]

Draw a vertical line

A vertical line of height (h) is drawn from point (x,y) in colour (color);
Example:

```
tft.drawVerticalLine(10, 10, 50, Color::Blue);
```

Implements TFT.

4.23.1.5 void HD44780::fillRectangle (int16_t *x*, int16_t *y*, int16_t *w*, int16_t *h*, uint16_t *color*) [inline], [virtual]

Draw a rectangle

This function draws a filled rectangle on the screen. The upper-left corner of the rectangle is at (x, y), and it extends to the right and down for a distance of (w) and (h) pixels respectively. It is drawn in colour (color).
Example:

```
tft.fillRectangle(10, 10, 200, 300, Color::Blue);
```

It is expected that actual screen drivers will override this function with a high speed optimized function.

Reimplemented from TFT.

4.23.1.6 void HD44780::fillScreen (uint16_t *color*) [virtual]

Fill the screen with a colour

This function fills the entire screen with a solid colour.
Example:

```
tft.fillScreen(Color::Black);
```

Reimplemented from TFT.

4.23.1.7 void HD44780::initializeDevice ( ) [virtual]

Initialize the display

The display is configured and made ready to work. This function *must* be called before anything can happen on the screen, and it *should* be called before any other function.

Example:

```
tft.initializeDevice();
```

Implements TFT.

4.23.1.8 void HD44780::invertDisplay (boolean *i*) [inline], [virtual]

Invert the display colours

All colours become reversed. Black becomes white, red becomes cyan, etc.

Example:

```
tft.invertDisplay(true);
```

Implements TFT.

4.23.1.9 void HD44780::setPixel (int16_t *x*, int16_t *y*, uint16_t *color*) [inline], [virtual]

Draw a pixel

A pixel, coloured (color) is drawn at (x,y).

Example:

```
tft.drawPixel(100, 100, Color::Green);
```

Implements TFT.

4.23.1.10 void HD44780::setRotation (uint8_t *rotation*) [inline], [virtual]

Set screen rotation

This rotates the screen. Value is between 0 and 3, for 0°, 90°, 180° or 270°.

Example:

```
tft.setRotation(1);
```

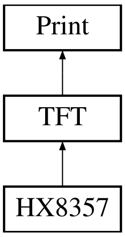
Implements TFT.

The documentation for this class was generated from the following files:

- HD44780.h
- HD44780.cpp

4.24 HX8357 Class Reference

Inheritance diagram for HX8357:



Public Member Functions

- **HX8357** (TFTCommunicator ∗comms)
- **HX8357** (TFTCommunicator &comms)
- void **setAddrWindow** (uint16_t x0, uint16_t y0, uint16_t x1, uint16_t y1)
- void fillScreen (uint16_t color)
- void setPixel (int16_t x, int16_t y, uint16_t color)
- void drawVerticalLine (int16_t x, int16_t y, int16_t h, uint16_t color)
- void drawHorizontalLine (int16_t x, int16_t y, int16_t w, uint16_t color)
- void fillRectangle (int16_t x, int16_t y, int16_t w, int16_t h, uint16_t color)
- void setRotation (uint8_t r)
- void invertDisplay (boolean i)
- void displayOn ()
- void displayOff ()
- void initializeDevice ()
- void openWindow (uint16_t x0, uint16_t y0, uint16_t x1, uint16_t y1)
- void windowData (uint16_t d)
- void windowData (uint16_t ∗d, uint32_t l)
- void closeWindow ()

Static Public Attributes

- static const uint16_t **Width** = 320
- static const uint16_t **Height** = 480

Protected Attributes

- uint8_t **colstart**
- uint8_t **rowstart**

Additional Inherited Members

4.24.1 Member Function Documentation

4.24.1.1 void HX8357::closeWindow ( ) [virtual]

Close the window

Close the currently opened window and return to normal drawing operations.

Example:

```
tft.closeWindow();
```

Reimplemented from TFT.

4.24.1.2 void HX8357::displayOff ( ) [virtual]

Turn off the display

Disable the video output of the display (if supported).

Example:

```
tft.displayOff();
```

Implements TFT.

4.24.1.3 void HX8357::displayOn ( ) [virtual]

Turn on the display

Enable the video output of the display (if supported).

Example:

```
tft.displayOn();
```

Implements TFT.

4.24.1.4 void HX8357::drawHorizontalLine (int16_t *x*, int16_t *y*, int16_t *w*, uint16_t *color*) [virtual]

Draw a horizontal line

A horizontal line of width (w) is drawn from point (x,y) in colour (color);

Example:

```
tft.drawHorizontalLine(10, 10, 50, Color::Blue);
```

Implements TFT.

4.24.1.5 void HX8357::drawVerticalLine (int16_t *x*, int16_t *y*, int16_t *h*, uint16_t *color*) [virtual]

Draw a vertical line

A vertical line of height (h) is drawn from point (x,y) in colour (color);

Example:

```
tft.drawVerticalLine(10, 10, 50, Color::Blue);
```

Implements TFT.

4.24.1.6 void HX8357::fillRectangle (int16_t *x*, int16_t *y*, int16_t *w*, int16_t *h*, uint16_t *color*) [virtual]

Draw a rectangle

This function draws a filled rectangle on the screen. The upper-left corner of the rectangle is at (x, y), and it extends to the right and down for a distance of (w) and (h) pixels respectively. It is drawn in colour (color).

Example:

```
tft.fillRectangle(10, 10, 200, 300, Color::Blue);
```

It is expected that actual screen drivers will override this function with a high speed optimized function.

Reimplemented from TFT.

4.24.1.7 void HX8357::fillScreen (uint16_t *color*) [virtual]

Fill the screen with a colour

This function fills the entire screen with a solid colour.
Example:

```
tft.fillScreen(Color::Black);
```

Reimplemented from TFT.

4.24.1.8 void HX8357::initializeDevice ( ) [virtual]

Initialize the display

The display is configured and made ready to work. This function *must* be called before anything can happen on the screen, and it *should* be called before any other function.
Example:

```
tft.initializeDevice();
```

Implements TFT.

4.24.1.9 void HX8357::invertDisplay (boolean *i*) [virtual]

Invert the display colours

All colours become reversed. Black becomes white, red becomes cyan, etc.
Example:

```
tft.invertDisplay(true);
```

Implements TFT.

4.24.1.10 void HX8357::openWindow (uint16_t *x0,* uint16_t *y0,* uint16_t *x1,* uint16_t *y1*) [virtual]

Open a window

Opens the rectangle defined by (x0,y0) to (x1,y1) as a raw data window.
Example:

```
tft.openWindow(0, 0, 100, 100);
```

Reimplemented from TFT.

4.24.1.11 void HX8357::setPixel (int16_t *x*, int16_t *y*, uint16_t *color*) [virtual]

Draw a pixel

A pixel, coloured (color) is drawn at (x,y).
Example:

```
tft.drawPixel(100, 100, Color::Green);
```

Implements TFT.

4.24.1.12 void HX8357::setRotation (uint8_t *rotation*) [virtual]

Set screen rotation

This rotates the screen. Value is between 0 and 3, for 0°, 90°, 180° or 270°.
Example:

```
tft.setRotation(1);
```

Implements TFT.

4.24.1.13 void HX8357::windowData (uint16_t *d*) [virtual]

Send pixel data to the window

Sends the raw pixel data for one pixel to the currently opened window.
Example:

```
tft.windowData(Color::Red);
```

Reimplemented from TFT.

4.24.1.14 void HX8357::windowData (uint16_t ∗ *d*, uint32_t *l*) [virtual]

Send a block of pixel data to the window

The array of pixel data (∗d) ans size (l) is dumped verbatim to the currently opened window.
Example:

```
tft.windowData(myData, 1000);
```

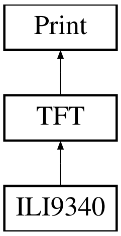
Reimplemented from TFT.

The documentation for this class was generated from the following files:

- HX8357.h
- HX8357.cpp

4.25 ILI9340 Class Reference

Inheritance diagram for ILI9340:



Public Member Functions

- **ILI9340** (TFTCommunicator ∗comms)
- **ILI9340** (TFTCommunicator &comms)
- void **setAddrWindow** (uint16_t x0, uint16_t y0, uint16_t x1, uint16_t y1)
- void fillScreen (uint16_t color)
- void setPixel (int16_t x, int16_t y, uint16_t color)
- void drawVerticalLine (int16_t x, int16_t y, int16_t h, uint16_t color)
- void drawHorizontalLine (int16_t x, int16_t y, int16_t w, uint16_t color)
- void fillRectangle (int16_t x, int16_t y, int16_t w, int16_t h, uint16_t color)
- void setRotation (uint8_t r)
- void invertDisplay (boolean i)
- void displayOn ()
- void displayOff ()
- void initializeDevice ()

Static Public Attributes

- static const uint16_t **Width** = 240
- static const uint16_t **Height** = 320

Additional Inherited Members

4.25.1 Member Function Documentation

4.25.1.1 void ILI9340::displayOff ( ) [inline], [virtual]

Turn off the display

Disable the video output of the display (if supported).

Example:

```
tft.displayOff();
```

Implements TFT.

4.25.1.2 void ILI9340::displayOn ( ) [inline], [virtual]

Turn on the display

Enable the video output of the display (if supported).

Example:

```
tft.displayOn();
```

Implements TFT.

4.25.1.3 void ILI9340::drawHorizontalLine (int16_t *x*, int16_t *y*, int16_t *w*, uint16_t *color*) [virtual]

Draw a horizontal line

A horizontal line of width (w) is drawn from point (x,y) in colour (color);
Example:

```
tft.drawHorizontalLine(10, 10, 50, Color::Blue);
```

Implements TFT.

4.25.1.4 void ILI9340::drawVerticalLine (int16_t *x*, int16_t *y*, int16_t *h*, uint16_t *color*) [virtual]

Draw a vertical line

A vertical line of height (h) is drawn from point (x,y) in colour (color);
Example:

```
tft.drawVerticalLine(10, 10, 50, Color::Blue);
```

Implements TFT.

4.25.1.5 void ILI9340::fillRectangle (int16_t *x*, int16_t *y*, int16_t *w*, int16_t *h*, uint16_t *color*) [virtual]

Draw a rectangle

This function draws a filled rectangle on the screen. The upper-left corner of the rectangle is at (x, y), and it extends to the right and down for a distance of (w) and (h) pixels respectively. It is drawn in colour (color).
Example:

```
tft.fillRectangle(10, 10, 200, 300, Color::Blue);
```

It is expected that actual screen drivers will override this function with a high speed optimized function.

Reimplemented from TFT.

4.25.1.6 void ILI9340::fillScreen (uint16_t *color*) [virtual]

Fill the screen with a colour

This function fills the entire screen with a solid colour.
Example:

```
tft.fillScreen(Color::Black);
```

Reimplemented from TFT.

4.25.1.7 void ILI9340::initializeDevice ( ) [virtual]

Initialize the display

The display is configured and made ready to work. This function *must* be called before anything can happen on the screen, and it *should* be called before any other function.
Example:

```
tft.initializeDevice();
```

Implements TFT.

4.25.1.8 void ILI9340::invertDisplay (boolean *i*) [virtual]

Invert the display colours

All colours become reversed. Black becomes white, red becomes cyan, etc.

Example:

```
tft.invertDisplay(true);
```

Implements TFT.

4.25.1.9 void ILI9340::setPixel (int16_t *x*, int16_t *y*, uint16_t *color*) [virtual]

Draw a pixel

A pixel, coloured (color) is drawn at (x,y).

Example:

```
tft.drawPixel(100, 100, Color::Green);
```

Implements TFT.

4.25.1.10 void ILI9340::setRotation (uint8_t *rotation*) [virtual]

Set screen rotation

This rotates the screen. Value is between 0 and 3, for 0°, 90°, 180° or 270°.

Example:

```
tft.setRotation(1);
```

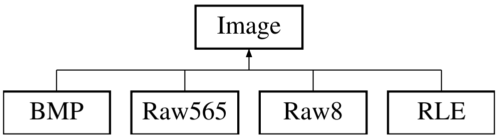
Implements TFT.

The documentation for this class was generated from the following files:

- ILI9340.h
- ILI9340.cpp

4.26 Image Class Reference

Inheritance diagram for Image:



Public Member Functions

- virtual uint16_t **getWidth** ()
- virtual uint16_t **getHeight** ()
- virtual void **draw** (TFT ∗dev, int16_t x, int16_t y)=0
- virtual void **draw** (TFT ∗dev, int16_t x, int16_t y, uint16_t t)=0
- virtual void **drawTransformed** (TFT ∗dev, int16_t x, int16_t y, uint8_t transform)=0
- virtual void **drawTransformed** (TFT ∗dev, int16_t x, int16_t y, uint8_t transform, uint16_t t)=0

Public Attributes

- uint16_t **_width**
- uint16_t **_height**

Static Public Attributes

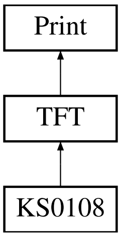
- static const uint8_t **MirrorH** = 0x01
- static const uint8_t **MirrorV** = 0x02
- static const uint8_t **Rotate180** = 0x03

The documentation for this class was generated from the following files:

- Image.h
- Image.cpp

4.27 KS0108 Class Reference

Inheritance diagram for KS0108:



Public Member Functions

- **KS0108** (TFTCommunicator ∗chip)
- **KS0108** (TFTCommunicator &chip)
- void **setAddrWindow** (uint8_t x0, uint8_t y0, uint8_t x1, uint8_t y1)
- void fillScreen (uint16_t color)
- void **doSetPixel** (int16_t x, int16_t y, uint16_t color)
- void setPixel (int16_t x, int16_t y, uint16_t color)
- void drawVerticalLine (int16_t x, int16_t y, int16_t h, uint16_t color)
- void drawHorizontalLine (int16_t x, int16_t y, int16_t w, uint16_t color)
- void fillRectangle (int16_t x, int16_t y, int16_t w, int16_t h, uint16_t color)
- void setRotation (uint8_t r)
- void invertDisplay (boolean i)
- void displayOn ()
- void displayOff ()
- void initializeDevice ()
- void **updateScreen** ()

Protected Member Functions

- void **streamCommands** (uint8_t ∗cmdlist)
- void **setPage** (uint8_t page)
- void **setY** (uint8_t y)

Protected Attributes

- uint8_t **colstart**
- uint8_t **rowstart**
- uint8_t **_variant**
- uint8_t **buffer** [64 ∗8]

Additional Inherited Members

4.27.1 Member Function Documentation

4.27.1.1 void KS0108::displayOff ( ) [inline], [virtual]

Turn off the display

Disable the video output of the display (if supported).
Example:

```
tft.displayOff();
```

Implements TFT.

4.27.1.2 void KS0108::displayOn ( ) [inline], [virtual]

Turn on the display

Enable the video output of the display (if supported).
Example:

```
tft.displayOn();
```

Implements TFT.

4.27.1.3 void KS0108::drawHorizontalLine (int16_t *x*, int16_t *y*, int16_t *w*, uint16_t *color*) [virtual]

Draw a horizontal line

A horizontal line of width (w) is drawn from point (x,y) in colour (color);
Example:

```
tft.drawHorizontalLine(10, 10, 50, Color::Blue);
```

Implements TFT.

4.27.1.4 void KS0108::drawVerticalLine (int16_t *x*, int16_t *y*, int16_t *h*, uint16_t *color*) [virtual]

Draw a vertical line

A vertical line of height (h) is drawn from point (x,y) in colour (color);
Example:

```
tft.drawVerticalLine(10, 10, 50, Color::Blue);
```

Implements TFT.

4.27.1.5 void KS0108::fillRectangle (int16_t *x*, int16_t *y*, int16_t *w*, int16_t *h*, uint16_t *color*) [virtual]

Draw a rectangle

This function draws a filled rectangle on the screen. The upper-left corner of the rectangle is at (x, y), and it extends to the right and down for a distance of (w) and (h) pixels respectively. It is drawn in colour (color).
Example:

```
tft.fillRectangle(10, 10, 200, 300, Color::Blue);
```

It is expected that actual screen drivers will override this function with a high speed optimized function.

Reimplemented from TFT.

4.27.1.6 void KS0108::fillScreen (uint16_t *color*) [virtual]

Fill the screen with a colour

This function fills the entire screen with a solid colour.
Example:

```
tft.fillScreen(Color::Black);
```

Reimplemented from TFT.

4.27.1.7 void KS0108::initializeDevice ( ) [virtual]

Initialize the display

The display is configured and made ready to work. This function *must* be called before anything can happen on the screen, and it *should* be called before any other function.
Example:

```
tft.initializeDevice();
```

Implements TFT.

4.27.1.8 void KS0108::invertDisplay (boolean *i*) [virtual]

Invert the display colours

All colours become reversed. Black becomes white, red becomes cyan, etc.
Example:

```
tft.invertDisplay(true);
```

Implements TFT.

4.27.1.9 void KS0108::setPixel (int16_t *x,* int16_t *y,* uint16_t *color*) [virtual]

Draw a pixel

A pixel, coloured (color) is drawn at (x,y).
Example:

```
tft.drawPixel(100, 100, Color::Green);
```

Implements TFT.

4.27.1.10 void KS0108::setRotation (uint8_t *rotation*) [inline], [virtual]

Set screen rotation

This rotates the screen. Value is between 0 and 3, for 0°, 90°, 180° or 270°.
Example:

```
tft.setRotation(1);
```

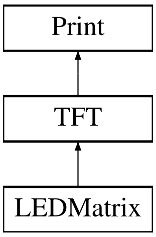
Implements TFT.

The documentation for this class was generated from the following files:

- KS0108.h
- KS0108.cpp

4.28 LEDMatrix Class Reference

Inheritance diagram for LEDMatrix:



Public Member Functions

- **LEDMatrix** (TFTCommunicator ∗row, TFTCommunicator ∗col)
- **LEDMatrix** (TFTCommunicator &row, TFTCommunicator &col)
- void fillScreen (uint16_t color)
- void setPixel (int16_t x, int16_t y, uint16_t color)
- void setRotation (uint8_t r)
- void invertDisplay (boolean i)
- void displayOn ()

- void displayOff ()
- void initializeDevice ()
- void **UpdateISR** ()

Static Public Attributes

- static const int16_t **Width** = 32
- static const int16_t **Height** = 32

Protected Attributes

- TFTCommunicator ∗ **_row**
- TFTCommunicator ∗ **_col**
- uint32_t **buffer** [32]
- uint8_t **currentRow**

Additional Inherited Members

4.28.1 Member Function Documentation

4.28.1.1 void LEDMatrix::displayOff ( ) [inline], [virtual]

Turn off the display

Disable the video output of the display (if supported).
Example:

```
tft.displayOff();
```

Implements TFT.

4.28.1.2 void LEDMatrix::displayOn ( ) [inline], [virtual]

Turn on the display

Enable the video output of the display (if supported).
Example:

```
tft.displayOn();
```

Implements TFT.

4.28.1.3 void LEDMatrix::fillScreen (uint16_t *color*) [virtual]

Fill the screen with a colour

This function fills the entire screen with a solid colour.
Example:

```
tft.fillScreen(Color::Black);
```

Reimplemented from TFT.

4.28.1.4 void LEDMatrix::initializeDevice ( ) [virtual]

Initialize the display

The display is configured and made ready to work. This function *must* be called before anything can happen on the screen, and it *should* be called before any other function.

Example:

```
tft.initializeDevice();
```

Implements TFT.

4.28.1.5 void LEDMatrix::invertDisplay (boolean *i*) [inline], [virtual]

Invert the display colours

All colours become reversed. Black becomes white, red becomes cyan, etc.

Example:

```
tft.invertDisplay(true);
```

Implements TFT.

4.28.1.6 void LEDMatrix::setPixel (int16_t *x*, int16_t *y*, uint16_t *color*) [virtual]

Draw a pixel

A pixel, coloured (color) is drawn at (x,y).

Example:

```
tft.drawPixel(100, 100, Color::Green);
```

Implements TFT.

4.28.1.7 void LEDMatrix::setRotation (uint8_t *rotation*) [inline], [virtual]

Set screen rotation

This rotates the screen. Value is between 0 and 3, for 0°, 90°, 180° or 270°.

Example:

```
tft.setRotation(1);
```

Implements TFT.

The documentation for this class was generated from the following files:

- LEDMatrix.h
- LEDMatrix.cpp

4.29 MatrixISRList Struct Reference

Public Attributes

- LEDMatrix ∗ **matrix**

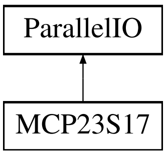
- struct MatrixISRList ∗ **next**

The documentation for this struct was generated from the following file:

- LEDMatrix.h

4.30 MCP23S17 Class Reference

Inheritance diagram for MCP23S17:



Public Member Functions

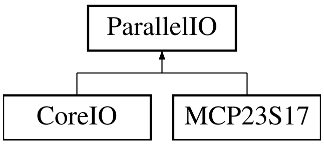
- **MCP23S17** (DSPI ∗spi, uint8_t cs, uint8_t addr)
- **MCP23S17** (DSPI &spi, uint8_t cs, uint8_t addr)
- void **pinMode** (uint16_t pin, uint8_t mode)
- void **digitalWrite** (uint16_t pin, uint8_t value)
- uint8_t **digitalRead** (uint16_t pin)
- uint16_t **pins** ()
- void **startBuffer** ()
- void **endBuffer** ()

The documentation for this class was generated from the following files:

- MCP23S17.h
- MCP23S17.cpp

4.31 ParallelIO Class Reference

Inheritance diagram for ParallelIO:



Public Member Functions

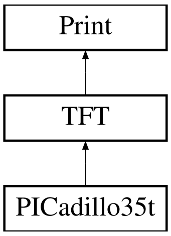
- virtual void **digitalWrite** (uint16_t pin, uint8_t value)=0
- virtual uint8_t **digitalRead** (uint16_t pin)=0
- virtual void **pinMode** (uint16_t pin, uint8_t mode)=0
- virtual uint16_t **pins** ()=0
- virtual void **startBuffer** ()=0
- virtual void **endBuffer** ()=0

The documentation for this class was generated from the following file:

- ParallelIO.h

4.32 PICadillo35t Class Reference

Inheritance diagram for PICadillo35t:



Public Member Functions

- void **loadCacheBlock** (int16_t x, int16_t y)
- void **flushCacheBlock** ()
- void **setAddrWindow** (uint16_t x0, uint16_t y0, uint16_t x1, uint16_t y1)
- void **setAddrWindowRead** (uint16_t x0, uint16_t y0, uint16_t x1, uint16_t y1)
- void fillScreen (uint16_t color)
- void setPixel (int16_t x, int16_t y, uint16_t color)
- void drawVerticalLine (int16_t x, int16_t y, int16_t h, uint16_t color)
- void drawHorizontalLine (int16_t x, int16_t y, int16_t w, uint16_t color)
- void fillRectangle (int16_t x, int16_t y, int16_t w, int16_t h, uint16_t color)
- void setRotation (uint8_t r)
- void invertDisplay (boolean i)
- void displayOn ()
- void displayOff ()
- uint16_t colorAt (int16_t x, int16_t y)
- void initializeDevice ()
- void openWindow (uint16_t x0, uint16_t y0, uint16_t x1, uint16_t y1)
- void windowData (uint16_t d)
- void windowData (uint16_t ∗d, uint32_t l)
- void closeWindow ()
- void **__attribute__** ((alwaysinline)) writeCommand(uint16_t)
- void **__attribute__** ((alwaysinline)) writeData(uint16_t)

Public Attributes

- uint16_t **_cacheData** [(1<< cacheDimension)∗(1<< cacheDimension)]
- uint8_t **_cacheState**
- int16_t **_cacheX**
- int16_t **_cacheY**
- uint8_t **_lastOp**

Static Public Attributes

- static const uint8_t **opWrite** = 0
- static const uint8_t **opRead** = 1
- static const uint8_t **cacheInvalid** = 0
- static const uint8_t **cacheClean** = 1
- static const uint8_t **cacheDirty** = 2
- static const uint8_t **cacheDimension** = 4
- static const uint16_t **Width** = 320
- static const uint16_t **Height** = 480

Protected Attributes

- uint8_t **colstart**
- uint8_t **rowstart**

4.32.1 Member Function Documentation

4.32.1.1 void PICadillo35t::closeWindow ( ) [virtual]

Close the window

Close the currently opened window and return to normal drawing operations.
Example:

```
tft.closeWindow();
```

Reimplemented from TFT.

4.32.1.2 uint16_t PICadillo35t::colorAt (int16_t *x*, int16_t *y*) [virtual]

Get the colour at a location

Returns the colour at (x,y) as seen by the screen.
Example:

```
unsigned int color = tft.colorAt(100, 100);
```

Reimplemented from TFT.

4.32.1.3 void PICadillo35t::displayOff ( ) [virtual]

Turn off the display

Disable the video output of the display (if supported).
Example:

```
tft.displayOff();
```

Implements TFT.

4.32.1.4 void PICadillo35t::displayOn ( ) [virtual]

Turn on the display

Enable the video output of the display (if supported).
Example:

```
tft.displayOn();
```

Implements TFT.

4.32.1.5 void PICadillo35t::drawHorizontalLine (int16_t *x*, int16_t *y*, int16_t *w*, uint16_t *color*) [virtual]

Draw a horizontal line

A horizontal line of width (w) is drawn from point (x,y) in colour (color);
Example:

```
tft.drawHorizontalLine(10, 10, 50, Color::Blue);
```

Implements TFT.

4.32.1.6 void PICadillo35t::drawVerticalLine (int16_t *x*, int16_t *y*, int16_t *h*, uint16_t *color*) [virtual]

Draw a vertical line

A vertical line of height (h) is drawn from point (x,y) in colour (color);
Example:

```
tft.drawVerticalLine(10, 10, 50, Color::Blue);
```

Implements TFT.

4.32.1.7 void PICadillo35t::fillRectangle (int16_t *x*, int16_t *y*, int16_t *w*, int16_t *h*, uint16_t *color*) [virtual]

Draw a rectangle

This function draws a filled rectangle on the screen. The upper-left corner of the rectangle is at (x, y), and it extends to the right and down for a distance of (w) and (h) pixels respectively. It is drawn in colour (color).
Example:

```
tft.fillRectangle(10, 10, 200, 300, Color::Blue);
```

It is expected that actual screen drivers will override this function with a high speed optimized function.

Reimplemented from TFT.

4.32.1.8 void PICadillo35t::fillScreen (uint16_t *color*) [virtual]

Fill the screen with a colour

This function fills the entire screen with a solid colour.
Example:

```
tft.fillScreen(Color::Black);
```

Reimplemented from TFT.

4.32.1.9 void PICadillo35t::initializeDevice ( ) [virtual]

Initialize the display

The display is configured and made ready to work. This function *must* be called before anything can happen on the screen, and it *should* be called before any other function.

Example:

```
tft.initializeDevice();
```

Implements TFT.

4.32.1.10 void PICadillo35t::invertDisplay (boolean *i*) [virtual]

Invert the display colours

All colours become reversed. Black becomes white, red becomes cyan, etc.

Example:

```
tft.invertDisplay(true);
```

Implements TFT.

4.32.1.11 void PICadillo35t::openWindow (uint16_t *x0*, uint16_t *y0*, uint16_t *x1*, uint16_t *y1*) [virtual]

Open a window

Opens the rectangle defined by (x0,y0) to (x1,y1) as a raw data window.

Example:

```
tft.openWindow(0, 0, 100, 100);
```

Reimplemented from TFT.

4.32.1.12 void PICadillo35t::setPixel (int16_t *x*, int16_t *y*, uint16_t *color*) [virtual]

Draw a pixel

A pixel, coloured (color) is drawn at (x,y).

Example:

```
tft.drawPixel(100, 100, Color::Green);
```

Implements TFT.

4.32.1.13 void PICadillo35t::setRotation (uint8_t *rotation*) [virtual]

Set screen rotation

This rotates the screen. Value is between 0 and 3, for 0°, 90°, 180° or 270°.
Example:

```
tft.setRotation(1);
```

Implements TFT.

4.32.1.14 void PICadillo35t::windowData (uint16_t *d*) [virtual]

Send pixel data to the window

Sends the raw pixel data for one pixel to the currently opened window.
Example:

```
tft.windowData(Color::Red);
```

Reimplemented from TFT.

4.32.1.15 void PICadillo35t::windowData (uint16_t ∗ *d,* uint32_t *l*) [virtual]

Send a block of pixel data to the window

The array of pixel data (∗d) ans size (l) is dumped verbatim to the currently opened window.
Example:

```
tft.windowData(myData, 1000);
```

Reimplemented from TFT.

The documentation for this class was generated from the following files:

- PICadillo35t.h
- PICadillo35t.cpp

4.33 point3d Struct Reference

Public Attributes

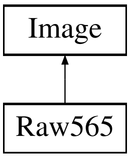
- float **x**
- float **y**
- float **z**

The documentation for this struct was generated from the following file:

- TFT.h

4.34 Raw565 Class Reference

Inheritance diagram for Raw565:



Public Member Functions

- **Raw565** (const uint16_t ∗data, uint16_t w, uint16_t h)
- void **draw** (TFT ∗dev, int16_t x, int16_t y)
- void **draw** (TFT ∗dev, int16_t x, int16_t y, uint16_t t)
- void **drawTransformed** (TFT ∗dev, int16_t x, int16_t y, uint8_t transform)
- void **drawTransformed** (TFT ∗dev, int16_t x, int16_t y, uint8_t transform, uint16_t t)

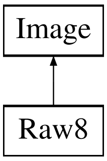
Additional Inherited Members

The documentation for this class was generated from the following files:

- Raw565.h
- Raw565.cpp

4.35 Raw8 Class Reference

Inheritance diagram for Raw8:



Public Member Functions

- **Raw8** (const uint8_t ∗data, uint16_t w, uint16_t h)
- void **draw** (TFT ∗dev, int16_t x, int16_t y)
- void **draw** (TFT ∗dev, int16_t x, int16_t y, uint16_t t)
- void **drawTransformed** (TFT ∗dev, int16_t x, int16_t y, uint8_t transform)
- void **drawTransformed** (TFT ∗dev, int16_t x, int16_t y, uint8_t transform, uint16_t t)

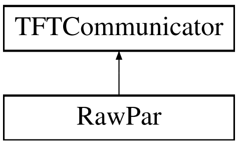
Additional Inherited Members

The documentation for this class was generated from the following files:

- Raw8.h
- Raw8.cpp

4.36 RawPar Class Reference

Inheritance diagram for RawPar:



Public Member Functions

- **RawPar** (uint8_t d0, uint8_t d1=255, uint8_t d2=255, uint8_t d3=255, uint8_t d4=255, uint8_t d5=255, uint8_t d6=255, uint8_t d7=255, uint8_t d8=255, uint8_t d9=255, uint8_t d10=255, uint8_t d11=255, uint8_t d12=255, uint8_t d13=255, uint8_t d14=255, uint8_t d15=255, uint8_t d16=255, uint8_t d17=255, uint8_t d18=255, uint8_t d19=255, uint8_t d20=255, uint8_t d21=255, uint8_t d22=255, uint8_t d23=255, uint8_t d24=255, uint8_t d25=255, uint8_t d26=255, uint8_t d27=255, uint8_t d28=255, uint8_t d29=255, uint8_t d30=255, uint8_t d31=255)
- void writeCommand8 (uint8_t command)
- void writeCommand16 (uint16_t command)
- void writeCommand32 (uint32_t command)
- void writeData8 (uint8_t data)
- void writeData16 (uint16_t data)
- void writeData32 (uint32_t data)
- void streamStart ()
- void streamEnd ()
- void streamCommand8 (uint8_t)
- void streamCommand16 (uint16_t)
- void streamCommand32 (uint32_t)
- void streamData8 (uint8_t)
- void streamData16 (uint16_t)
- void streamData32 (uint32_t)
- void **setBus** (uint32_t)
- uint8_t nativeWidth ()

4.36.1 Member Function Documentation

4.36.1.1 uint8_t RawPar::nativeWidth ( ) [virtual]

Returns the real physical width of the data channel

Implements TFTCommunicator.

4.36.1.2 void RawPar::streamCommand16 (uint16_t *data*) [virtual]

Send a 16-bit command through the stream

Implements TFTCommunicator.

4.36.1.3 void RawPar::streamCommand32 (uint32_t *data*) [virtual]

Send a 32-bit command through the stream

Implements TFTCommunicator.

4.36.1.4 void RawPar::streamCommand8 (uint8_t *data*) [virtual]

Send an 8-bit command through the stream

Implements TFTCommunicator.

4.36.1.5 void RawPar::streamData16 (uint16_t *data*) [virtual]

Send 16-bits of data through the stream

Implements TFTCommunicator.

4.36.1.6 void RawPar::streamData32 (uint32_t *data*) [virtual]

Send 32-bits of data through the stream

Implements TFTCommunicator.

4.36.1.7 void RawPar::streamData8 (uint8_t *data*) [virtual]

Send 8-bits of data through the stream

Implements TFTCommunicator.

4.36.1.8 void RawPar::streamEnd ( ) [virtual]

Close the currently open stream

Implements TFTCommunicator.

4.36.1.9 void RawPar::streamStart ( ) [virtual]

Open a stream to the device endpoint

Implements TFTCommunicator.

4.36.1.10 void RawPar::writeCommand16 (uint16_t *command*) [virtual]

Write a 16-bit command to the device

Implements TFTCommunicator.

4.36.1.11 void RawPar::writeCommand32 (uint32_t *command*) [virtual]

Write a 32-bit command to the device

Implements TFTCommunicator.

4.36.1.12 void RawPar::writeCommand8 (uint8_t *command*) [virtual]

Write an 8-bit command to the device

Implements TFTCommunicator.

4.36.1.13 void RawPar::writeData16 (uint16_t *data*) [virtual]

Write 16 bits of data to the device

Implements TFTCommunicator.

4.36.1.14 void RawPar::writeData32 (uint32_t *data*) [virtual]

Write 32 bits of data to the device

Implements TFTCommunicator.

4.36.1.15 void RawPar::writeData8 (uint8_t *data*) [virtual]

Write 8 bits of data to the device

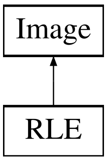
Implements TFTCommunicator.

The documentation for this class was generated from the following files:

- RawPar.h
- RawPar.cpp

4.37 RLE Class Reference

Inheritance diagram for RLE:



Public Member Functions

- **RLE** (const uint8_t ∗data)
- void **draw** (TFT ∗dev, int16_t x, int16_t y)
- void **draw** (TFT ∗dev, int16_t x, int16_t y, uint16_t t)
- void **drawTransformed** (TFT ∗dev, int16_t x, int16_t y, uint8_t transform)
- void **drawTransformed** (TFT ∗dev, int16_t x, int16_t y, uint8_t transform, uint16_t t)

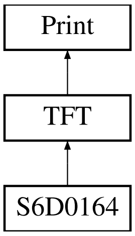
Additional Inherited Members

The documentation for this class was generated from the following files:

- RLE.h
- RLE.cpp

4.38 S6D0164 Class Reference

Inheritance diagram for S6D0164:



Public Member Functions

- **S6D0164** (TFTCommunicator ∗comms)
- **S6D0164** (TFTCommunicator &comms)
- void **setAddrWindow** (uint16_t x0, uint16_t y0, uint16_t x1, uint16_t y1)
- void fillScreen (uint16_t color)
- void setPixel (int16_t x, int16_t y, uint16_t color)
- void drawVerticalLine (int16_t x, int16_t y, int16_t h, uint16_t color)
- void drawHorizontalLine (int16_t x, int16_t y, int16_t w, uint16_t color)
- void fillRectangle (int16_t x, int16_t y, int16_t w, int16_t h, uint16_t color)
- void setRotation (uint8_t r)
- void invertDisplay (boolean i)
- void displayOn ()
- void displayOff ()
- void initializeDevice ()
- void openWindow (uint16_t x0, uint16_t y0, uint16_t x1, uint16_t y1)
- void windowData (uint16_t d)
- void windowData (uint16_t ∗d, uint32_t l)
- void closeWindow ()

Static Public Attributes

- static const uint16_t **Width** = 176
- static const uint16_t **Height** = 220

Additional Inherited Members

4.38.1 Member Function Documentation

4.38.1.1 void S6D0164::closeWindow ( ) [virtual]

Close the window

Close the currently opened window and return to normal drawing operations.
Example:

```
tft.closeWindow();
```

Reimplemented from TFT.

4.38.1.2 void S6D0164::displayOff ( ) [virtual]

Turn off the display

Disable the video output of the display (if supported).
Example:

```
tft.displayOff();
```

Implements TFT.

4.38.1.3 void S6D0164::displayOn ( ) [virtual]

Turn on the display

Enable the video output of the display (if supported).
Example:

```
tft.displayOn();
```

Implements TFT.

4.38.1.4 void S6D0164::drawHorizontalLine (int16_t *x*, int16_t *y*, int16_t *w*, uint16_t *color*) [virtual]

Draw a horizontal line

A horizontal line of width (w) is drawn from point (x,y) in colour (color);
Example:

```
tft.drawHorizontalLine(10, 10, 50, Color::Blue);
```

Implements TFT.

4.38.1.5 void S6D0164::drawVerticalLine (int16_t *x*, int16_t *y*, int16_t *h*, uint16_t *color*) [virtual]

Draw a vertical line

A vertical line of height (h) is drawn from point (x,y) in colour (color);
Example:

```
tft.drawVerticalLine(10, 10, 50, Color::Blue);
```

Implements TFT.

4.38.1.6 void S6D0164::fillRectangle (int16_t *x*, int16_t *y*, int16_t *w*, int16_t *h*, uint16_t *color*) [virtual]

Draw a rectangle

This function draws a filled rectangle on the screen. The upper-left corner of the rectangle is at (x, y), and it extends to the right and down for a distance of (w) and (h) pixels respectively. It is drawn in colour (color).
Example:

```
tft.fillRectangle(10, 10, 200, 300, Color::Blue);
```

It is expected that actual screen drivers will override this function with a high speed optimized function.

Reimplemented from TFT.

4.38.1.7 void S6D0164::fillScreen (uint16_t *color*) [virtual]

Fill the screen with a colour

This function fills the entire screen with a solid colour.

Example:

```
tft.fillScreen(Color::Black);
```

Reimplemented from TFT.

4.38.1.8 void S6D0164::initializeDevice ( ) [virtual]

Initialize the display

The display is configured and made ready to work. This function *must* be called before anything can happen on the screen, and it *should* be called before any other function.

Example:

```
tft.initializeDevice();
```

Implements TFT.

4.38.1.9 void S6D0164::invertDisplay (boolean *i*) [virtual]

Invert the display colours

All colours become reversed. Black becomes white, red becomes cyan, etc.

Example:

```
tft.invertDisplay(true);
```

Implements TFT.

4.38.1.10 void S6D0164::openWindow (uint16_t *x0,* uint16_t *y0,* uint16_t *x1,* uint16_t *y1*) [virtual]

Open a window

Opens the rectangle defined by (x0,y0) to (x1,y1) as a raw data window.

Example:

```
tft.openWindow(0, 0, 100, 100);
```

Reimplemented from TFT.

4.38.1.11 void S6D0164::setPixel (int16_t *x,* int16_t *y,* uint16_t *color*) [virtual]

Draw a pixel

A pixel, coloured (color) is drawn at (x,y).

Example:

```
tft.drawPixel(100, 100, Color::Green);
```

Implements TFT.

4.38.1.12 void S6D0164::setRotation (uint8_t *rotation*) [virtual]

Set screen rotation

This rotates the screen. Value is between 0 and 3, for 0°, 90°, 180° or 270°.
Example:

```
tft.setRotation(1);
```

Implements TFT.

4.38.1.13 void S6D0164::windowData (uint16_t *d*) [virtual]

Send pixel data to the window

Sends the raw pixel data for one pixel to the currently opened window.
Example:

```
tft.windowData(Color::Red);
```

Reimplemented from TFT.

4.38.1.14 void S6D0164::windowData (uint16_t ∗ *d,* uint32_t *l*) [virtual]

Send a block of pixel data to the window

The array of pixel data (∗d) ans size (l) is dumped verbatim to the currently opened window.
Example:

```
tft.windowData(myData, 1000);
```

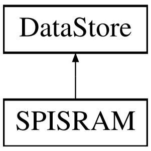
Reimplemented from TFT.

The documentation for this class was generated from the following files:

- S6D0164.h
- S6D0164.cpp

4.39 SPISRAM Class Reference

Inheritance diagram for SPISRAM:



Public Member Functions

- **SPISRAM** (DSPI ∗spi, uint8_t cs, uint32_t s)
- **SPISRAM** (DSPI &spi, uint8_t cs, uint32_t s)
- uint8_t **read8** (uint32_t address)
- uint16_t **read16** (uint32_t address)
- uint32_t **read32** (uint32_t address)
- void **read8** (uint32_t address, uint8_t ∗data, uint32_t len)
- void **read16** (uint32_t address, uint16_t ∗data, uint32_t len)
- void **read32** (uint32_t address, uint32_t ∗data, uint32_t len)
- void **write8** (uint32_t address, uint8_t data)
- void **write16** (uint32_t address, uint16_t data)
- void **write32** (uint32_t address, uint32_t data)
- void **write8** (uint32_t address, uint8_t ∗data, uint32_t len)
- void **write16** (uint32_t address, uint16_t ∗data, uint32_t len)
- void **write32** (uint32_t address, uint32_t ∗data, uint32_t len)
- void **setAll8** (uint8_t data)
- void **setAll16** (uint16_t data)
- void **setAll32** (uint32_t data)
- void **initializeDevice** ()
- uint32_t **size** ()

The documentation for this class was generated from the following files:

- SPISRAM.h
- SPISRAM.cpp

4.40 sprite Struct Reference

```
#include <Framebuffer.h>
```

Public Attributes

- int16_t xpos
- int16_t ypos
- uint16_t width
- uint16_t height
- uint8_t transparent
- int8_t frames
- int8_t currentframe
- int8_t animdir
- int8_t store [8]
- const uint8_t ∗ data
- struct sprite ∗ next

4.40.1 Detailed Description

A sprite is a small 8-bit indexed image overlaid on the screen at rendering time

4.40.2 Member Data Documentation

4.40.2.1 int8_t sprite::animdir

Direction the animation is running

4.40.2.2 int8_t sprite::currentframe

Currently displayed frame number

4.40.2.3 const uint8_t∗ sprite::data

Pointer to graphical data for sprite

4.40.2.4 int8_t sprite::frames

Number of frames in the sprite

4.40.2.5 uint16_t sprite::height

Height of the sprite

4.40.2.6 struct sprite∗ sprite::next

Pointer to next sprite in the list

4.40.2.7 int8_t sprite::store[8]

Internal data store for sprite specific information

4.40.2.8 uint8_t sprite::transparent

Transparent colour index

4.40.2.9 uint16_t sprite::width

Width of the sprite

4.40.2.10 int16_t sprite::xpos

X Position of the sprite

4.40.2.11 int16_t sprite::ypos

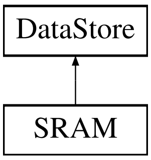
Y Position of the sprite

The documentation for this struct was generated from the following file:

- Framebuffer.h

4.41 SRAM Class Reference

Inheritance diagram for SRAM:



Public Member Functions

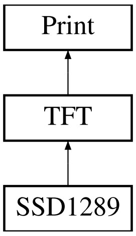
- **SRAM** (uint8_t ∗buf, uint32_t s)
- uint8_t **read8** (uint32_t address)
- uint16_t **read16** (uint32_t address)
- uint32_t **read32** (uint32_t address)
- void **read8** (uint32_t address, uint8_t ∗data, uint32_t len)
- void **read16** (uint32_t address, uint16_t ∗data, uint32_t len)
- void **read32** (uint32_t address, uint32_t ∗data, uint32_t len)
- void **write8** (uint32_t address, uint8_t data)
- void **write16** (uint32_t address, uint16_t data)
- void **write32** (uint32_t address, uint32_t data)
- void **write8** (uint32_t address, uint8_t ∗data, uint32_t len)
- void **write16** (uint32_t address, uint16_t ∗data, uint32_t len)
- void **write32** (uint32_t address, uint32_t ∗data, uint32_t len)
- void **setAll8** (uint8_t data)
- void **setAll16** (uint16_t data)
- void **setAll32** (uint32_t data)
- void **initializeDevice** ()
- uint32_t **size** ()

The documentation for this class was generated from the following files:

- SRAM.h
- SRAM.cpp

4.42 SSD1289 Class Reference

Inheritance diagram for SSD1289:



Public Member Functions

- **SSD1289** (TFTCommunicator ∗comms)
- **SSD1289** (TFTCommunicator &comms)
- void **setAddrWindow** (uint16_t x0, uint16_t y0, uint16_t x1, uint16_t y1)
- void fillScreen (uint16_t color)
- void setPixel (int16_t x, int16_t y, uint16_t color)
- void drawVerticalLine (int16_t x, int16_t y, int16_t h, uint16_t color)
- void drawHorizontalLine (int16_t x, int16_t y, int16_t w, uint16_t color)
- void fillRectangle (int16_t x, int16_t y, int16_t w, int16_t h, uint16_t color)
- void setRotation (uint8_t r)
- void invertDisplay (boolean i)
- void displayOn ()
- void displayOff ()
- void initializeDevice ()
- virtual void openWindow (uint16_t x0, uint16_t y0, uint16_t x1, uint16_t y1)
- virtual void windowData (uint16_t d)
- virtual void windowData (uint16_t ∗d, uint32_t l)
- virtual void closeWindow ()

Static Public Attributes

- static const uint16_t **Width** = 240
- static const uint16_t **Height** = 320

Additional Inherited Members

4.42.1 Member Function Documentation

4.42.1.1 void SSD1289::closeWindow ( ) [virtual]

Close the window

Close the currently opened window and return to normal drawing operations.

Example:

```
tft.closeWindow();
```

Reimplemented from TFT.

4.42.1.2 void SSD1289::displayOff ( ) [inline], [virtual]

Turn off the display

Disable the video output of the display (if supported).

Example:

```
tft.displayOff();
```

Implements TFT.

4.42.1.3 void SSD1289::displayOn ( ) [inline], [virtual]

Turn on the display

Enable the video output of the display (if supported).
Example:

```
tft.displayOn();
```

Implements TFT.

4.42.1.4 void SSD1289::drawHorizontalLine (int16_t *x*, int16_t *y*, int16_t *w*, uint16_t *color*) [virtual]

Draw a horizontal line

A horizontal line of width (w) is drawn from point (x,y) in colour (color);
Example:

```
tft.drawHorizontalLine(10, 10, 50, Color::Blue);
```

Implements TFT.

4.42.1.5 void SSD1289::drawVerticalLine (int16_t *x*, int16_t *y*, int16_t *h*, uint16_t *color*) [virtual]

Draw a vertical line

A vertical line of height (h) is drawn from point (x,y) in colour (color);
Example:

```
tft.drawVerticalLine(10, 10, 50, Color::Blue);
```

Implements TFT.

4.42.1.6 void SSD1289::fillRectangle (int16_t *x*, int16_t *y*, int16_t *w*, int16_t *h*, uint16_t *color*) [virtual]

Draw a rectangle

This function draws a filled rectangle on the screen. The upper-left corner of the rectangle is at (x, y), and it extends to the right and down for a distance of (w) and (h) pixels respectively. It is drawn in colour (color).
Example:

```
tft.fillRectangle(10, 10, 200, 300, Color::Blue);
```

It is expected that actual screen drivers will override this function with a high speed optimized function.

Reimplemented from TFT.

4.42.1.7 void SSD1289::fillScreen (uint16_t *color*) [virtual]

Fill the screen with a colour

This function fills the entire screen with a solid colour.
Example:

```
tft.fillScreen(Color::Black);
```

Reimplemented from TFT.

4.42.1.8 void SSD1289::initializeDevice ( ) [virtual]

Initialize the display

The display is configured and made ready to work. This function *must* be called before anything can happen on the screen, and it *should* be called before any other function.

Example:

```
tft.initializeDevice();
```

Implements TFT.

4.42.1.9 void SSD1289::invertDisplay (boolean *i*) [virtual]

Invert the display colours

All colours become reversed. Black becomes white, red becomes cyan, etc.

Example:

```
tft.invertDisplay(true);
```

Implements TFT.

4.42.1.10 void SSD1289::openWindow (uint16_t *x0*, uint16_t *y0*, uint16_t *x1*, uint16_t *y1*) [virtual]

Open a window

Opens the rectangle defined by (x0,y0) to (x1,y1) as a raw data window.

Example:

```
tft.openWindow(0, 0, 100, 100);
```

Reimplemented from TFT.

4.42.1.11 void SSD1289::setPixel (int16_t *x*, int16_t *y*, uint16_t *color*) [virtual]

Draw a pixel

A pixel, coloured (color) is drawn at (x,y).

Example:

```
tft.drawPixel(100, 100, Color::Green);
```

Implements TFT.

4.42.1.12 void SSD1289::setRotation (uint8_t *rotation*) [virtual]

Set screen rotation

This rotates the screen. Value is between 0 and 3, for 0°, 90°, 180° or 270°.
Example:

```
tft.setRotation(1);
```

Implements TFT.

4.42.1.13 void SSD1289::windowData (uint16_t *d*) [virtual]

Send pixel data to the window

Sends the raw pixel data for one pixel to the currently opened window.
Example:

```
tft.windowData(Color::Red);
```

Reimplemented from TFT.

4.42.1.14 void SSD1289::windowData (uint16_t ∗ *d,* uint32_t *l*) [virtual]

Send a block of pixel data to the window

The array of pixel data (∗d) ans size (l) is dumped verbatim to the currently opened window.
Example:

```
tft.windowData(myData, 1000);
```

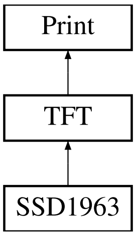
Reimplemented from TFT.

The documentation for this class was generated from the following files:

- SSD1289.h
- SSD1289.cpp

4.43 SSD1963 Class Reference

Inheritance diagram for SSD1963:



Public Member Functions

- **SSD1963** (TFTCommunicator ∗comms)
- **SSD1963** (TFTCommunicator &comms)
- void fillScreen (uint16_t color)
- void setPixel (int16_t x, int16_t y, uint16_t color)
- void drawVerticalLine (int16_t x, int16_t y, int16_t h, uint16_t color)
- void drawHorizontalLine (int16_t x, int16_t y, int16_t w, uint16_t color)
- void fillRectangle (int16_t x, int16_t y, int16_t w, int16_t h, uint16_t color)
- void setRotation (uint8_t r)
- void invertDisplay (boolean i)
- void displayOn ()
- void displayOff ()
- void initializeDevice ()

Static Public Attributes

- static const uint16_t Width = 800
- static const uint16_t Height = 480

Additional Inherited Members

4.43.1 Member Function Documentation

4.43.1.1 void SSD1963::displayOff ( ) `[inline], [virtual]`

Not currently implemented

Implements TFT.

4.43.1.2 void SSD1963::displayOn ( ) `[inline], [virtual]`

Not currently implemented

Implements TFT.

4.43.1.3 void SSD1963::drawHorizontalLine (int16_t *x*, int16_t *y*, int16_t *w*, uint16_t *color*) `[virtual]`

Draw a horizontal line

A horizontal line of width (w) is drawn from point (x,y) in colour (color);
Example:

```
tft.drawHorizontalLine(10, 10, 50, Color::Blue);
```

Implements TFT.

4.43.1.4 void SSD1963::drawVerticalLine (int16_t *x*, int16_t *y*, int16_t *h*, uint16_t *color*) `[virtual]`

Draw a vertical line

A vertical line of height (h) is drawn from point (x,y) in colour (color);
Example:

```
tft.drawVerticalLine(10, 10, 50, Color::Blue);
```

Implements TFT.

4.43.1.5 void SSD1963::fillRectangle (int16_t *x*, int16_t *y*, int16_t *w*, int16_t *h*, uint16_t *color*) [virtual]

Draw a rectangle

This function draws a filled rectangle on the screen. The upper-left corner of the rectangle is at (x, y), and it extends to the right and down for a distance of (w) and (h) pixels respectively. It is drawn in colour (color).
Example:

```
tft.fillRectangle(10, 10, 200, 300, Color::Blue);
```

It is expected that actual screen drivers will override this function with a high speed optimized function.

Reimplemented from TFT.

4.43.1.6 void SSD1963::fillScreen (uint16_t *color*) [virtual]

Fill the screen with a colour

This function fills the entire screen with a solid colour.
Example:

```
tft.fillScreen(Color::Black);
```

Reimplemented from TFT.

4.43.1.7 void SSD1963::initializeDevice ( ) [virtual]

Initialize the display

The display is configured and made ready to work. This function *must* be called before anything can happen on the screen, and it *should* be called before any other function.
Example:

```
tft.initializeDevice();
```

Implements TFT.

4.43.1.8 void SSD1963::invertDisplay (boolean *i*) [virtual]

Invert the display colours

All colours become reversed. Black becomes white, red becomes cyan, etc.
Example:

```
tft.invertDisplay(true);
```

Implements TFT.

4.43.1.9 void SSD1963::setPixel (int16_t *x*, int16_t *y*, uint16_t *color*) [virtual]

Draw a pixel

A pixel, coloured (color) is drawn at (x,y).
Example:

```
tft.drawPixel(100, 100, Color::Green);
```

Implements TFT.

4.43.1.10 void SSD1963::setRotation (uint8_t *rotation*) [virtual]

Set screen rotation

This rotates the screen. Value is between 0 and 3, for 0°, 90°, 180° or 270°.
Example:

```
tft.setRotation(1);
```

Implements TFT.

4.43.2 Member Data Documentation

4.43.2.1 const uint16_t SSD1963::Height = 480 [static]

The height of the screen is 480 pixels

4.43.2.2 const uint16_t SSD1963::Width = 800 [static]

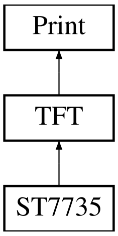
The width of the screen is 800 pixels

The documentation for this class was generated from the following files:

- SSD1963.h
- SSD1963.cpp

4.44 ST7735 Class Reference

Inheritance diagram for ST7735:



Public Member Functions

- void fillScreen (uint16_t color)
- void setPixel (int16_t x, int16_t y, uint16_t color)
- void drawVerticalLine (int16_t x, int16_t y, int16_t h, uint16_t color)
- void drawHorizontalLine (int16_t x, int16_t y, int16_t w, uint16_t color)
- void fillRectangle (int16_t x, int16_t y, int16_t w, int16_t h, uint16_t color)
- void setRotation (uint8_t r)
- void invertDisplay (boolean i)
- void displayOn ()
- void displayOff ()
- void initializeDevice ()

- ST7735 (TFTCommunicator ∗comms, uint8_t variant)
- **ST7735** (TFTCommunicator &comms, uint8_t variant)

Static Public Attributes

- static const uint8_t GreenTab = 0x00
- static const uint8_t RedTab = 0x01
- static const uint8_t BlackTab = 0x02
- static const uint8_t TypeB = 0x03
- static const uint8_t Width = 128
- static const uint8_t Height = 160

Additional Inherited Members

4.44.1 Constructor & Destructor Documentation

4.44.1.1 ST7735::ST7735 (**TFTCommunicator** ∗ *comms,* uint8_t *variant*) [inline]

The constructor takes an SPI compatible communicator class. Also, as there are multiple screens available with the same chip, each working slightly differently, a "variant" value must be provided:

- ST7736::GreenTab
- ST7736::RedTab
- ST7736::BlackTab
- ST7736::TypeB

4.44.2 Member Function Documentation

4.44.2.1 void ST7735::displayOff ( ) [inline], [virtual]

Turn off the display

Disable the video output of the display (if supported).

Example:

```
tft.displayOff();
```

Implements TFT.

4.44.2.2 void ST7735::displayOn ( ) [inline], [virtual]

Turn on the display

Enable the video output of the display (if supported).
Example:

```
tft.displayOn();
```

Implements TFT.

4.44.2.3 void ST7735::drawHorizontalLine (int16_t *x*, int16_t *y*, int16_t *w*, uint16_t *color*) [virtual]

Draw a horizontal line

A horizontal line of width (w) is drawn from point (x,y) in colour (color);
Example:

```
tft.drawHorizontalLine(10, 10, 50, Color::Blue);
```

Implements TFT.

4.44.2.4 void ST7735::drawVerticalLine (int16_t *x*, int16_t *y*, int16_t *h*, uint16_t *color*) [virtual]

Draw a vertical line

A vertical line of height (h) is drawn from point (x,y) in colour (color);
Example:

```
tft.drawVerticalLine(10, 10, 50, Color::Blue);
```

Implements TFT.

4.44.2.5 void ST7735::fillRectangle (int16_t *x*, int16_t *y*, int16_t *w*, int16_t *h*, uint16_t *color*) [virtual]

Draw a rectangle

This function draws a filled rectangle on the screen. The upper-left corner of the rectangle is at (x, y), and it extends to the right and down for a distance of (w) and (h) pixels respectively. It is drawn in colour (color).
Example:

```
tft.fillRectangle(10, 10, 200, 300, Color::Blue);
```

It is expected that actual screen drivers will override this function with a high speed optimized function.

Reimplemented from TFT.

4.44.2.6 void ST7735::fillScreen (uint16_t *color*) [virtual]

Fill the screen with a colour

This function fills the entire screen with a solid colour.
Example:

```
tft.fillScreen(Color::Black);
```

Reimplemented from TFT.

4.44.2.7 void ST7735::initializeDevice ( ) [virtual]

Initialize the display

The display is configured and made ready to work. This function *must* be called before anything can happen on the screen, and it *should* be called before any other function.

Example:

```
tft.initializeDevice();
```

Implements TFT.

4.44.2.8 void ST7735::invertDisplay (boolean *i*) [virtual]

Invert the display colours

All colours become reversed. Black becomes white, red becomes cyan, etc.

Example:

```
tft.invertDisplay(true);
```

Implements TFT.

4.44.2.9 void ST7735::setPixel (int16_t *x*, int16_t *y*, uint16_t *color*) [virtual]

Draw a pixel

A pixel, coloured (color) is drawn at (x,y).

Example:

```
tft.drawPixel(100, 100, Color::Green);
```

Implements TFT.

4.44.2.10 void ST7735::setRotation (uint8_t *rotation*) [virtual]

Set screen rotation

This rotates the screen. Value is between 0 and 3, for 0°, 90°, 180° or 270°.

Example:

```
tft.setRotation(1);
```

Implements TFT.

4.44.3 Member Data Documentation

4.44.3.1 const uint8_t ST7735::BlackTab = 0x02 [static]

Adafruit screen with a black tab

4.44.3.2 const uint8_t ST7735::GreenTab = 0x00 [static]

Adafruit screen with a green tab

4.44.3.3 const uint8_t ST7735::Height = 160 [static]

The native size of the screen is 160 pixels high

4.44.3.4 const uint8_t ST7735::RedTab = 0x01 [static]

Adafruit screen with a red tab

4.44.3.5 const uint8_t ST7735::TypeB = 0x03 [static]

Adafruit "Type B" screen

4.44.3.6 const uint8_t ST7735::Width = 128 [static]

The native size of the screen is 128 pixels wide

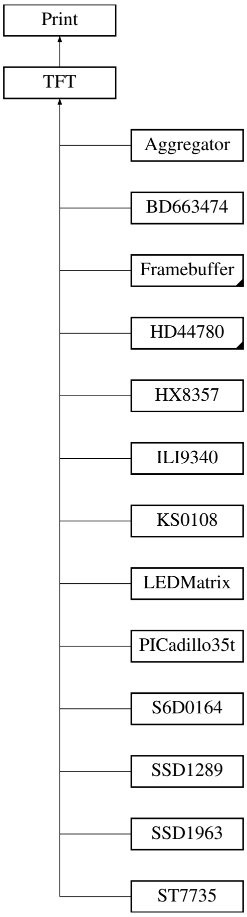
The documentation for this class was generated from the following files:

- ST7735.h
- ST7735.cpp

4.45 TFT Class Reference

```
#include <TFT.h>
```

Inheritance diagram for TFT:



Public Member Functions

- TFT ()
- TFT (TFTCommunicator ∗comms)
- TFT (TFTCommunicator &comms)
- virtual uint16_t getWidth ()
- virtual uint16_t getHeight ()

Drawing Functions

These functions draw pretty shapes on the screen.

- virtual void drawCircle (int16_t x0, int16_t y0, int16_t r, uint16_t color)
- virtual void fillCircle (int16_t x0, int16_t y0, int16_t r, uint16_t color)
- virtual void drawLine (int16_t x0, int16_t y0, int16_t x1, int16_t y1, uint16_t color)
- virtual void drawRectangle (int16_t x, int16_t y, int16_t w, int16_t h, uint16_t color)
- virtual void drawRoundRect (int16_t x, int16_t y, int16_t w, int16_t h, int16_t r, uint16_t color)
- virtual void fillRoundRect (int16_t x, int16_t y, int16_t w, int16_t h, int16_t r, uint16_t color)
- virtual void drawTriangle (int16_t x0, int16_t y0, int16_t x1, int16_t y1, int16_t x2, int16_t y2, uint16_t color)
- virtual void fillTriangle (int16_t x0, int16_t y0, int16_t x1, int16_t y1, int16_t x2, int16_t y2, uint16_t color)
- virtual void fillScreen (uint16_t color)
- virtual void fillRectangle (int16_t x, int16_t y, int16_t w, int16_t h, uint16_t color)

Image drawing

These routines are used for drawing basic bitmap images to the screen.

- virtual void drawBitmap (int16_t x, int16_t y, const uint8_t ∗bitmap, int16_t w, int16_t h, uint16_t color)
- virtual void drawRGB (int16_t x, int16_t y, const uint16_t ∗bitmap, int16_t w, int16_t h)

- virtual void drawRGBA (int16_t x, int16_t y, const uint16_t ∗bitmap, int16_t w, int16_t h, uint16_t trans)

Text handing functions

These are functions used for dealing with text and printing of strings to the screen.

- virtual void setCursor (int16_t x, int16_t y)
- virtual int16_t getCursorX ()
- virtual int16_t getCursorY ()
- virtual int16_t getCursor (boolean x)
- virtual void setTextColor (uint16_t c)
- virtual void setTextColor (uint16_t fg, uint16_t bg)
- virtual uint16_t getTextColor ()
- virtual void invertTextColor ()
- virtual void setTextWrap (boolean w)
- virtual void setFont (const uint8_t ∗f)
- virtual uint16_t stringWidth (char ∗text)
- virtual uint16_t stringHeight (char ∗text)
- void write (uint8_t c)
- uint8_t drawChar (int16_t x, int16_t y, unsigned char c, uint16_t color, uint16_t bg)
- void setFontScaleX (uint8_t sx)
- void setFontScaleY (uint8_t sy)

Colour handling

These functions are all related to manipulating colours in one way or another.

- virtual uint16_t color565 (uint8_t r, uint8_t g, uint8_t b)
- virtual uint16_t bgColorAt (int16_t x, int16_t y)
- virtual uint16_t colorAt (int16_t x, int16_t y)
- point3d rgb2xyz (uint16_t c)
- point3d xyz2lab (point3d c)
- float deltaE (point3d labA, point3d labB)
- uint32_t deltaOrth (uint16_t c1, uint16_t c2)
- uint32_t rgb2hsv (uint16_t rgb)
- uint16_t mix (uint16_t a, uint16_t b, uint8_t pct)

Pure virtual functions

These are all functions that must be implemented in a TFT driver in order for it to function.

- virtual void setRotation (uint8_t rotation)=0
- virtual void setPixel (int16_t x, int16_t y, uint16_t color)=0
- virtual void drawHorizontalLine (int16_t x, int16_t y, int16_t w, uint16_t color)=0
- virtual void drawVerticalLine (int16_t x, int16_t y, int16_t h, uint16_t color)=0
- virtual void initializeDevice ()=0
- virtual void displayOn ()=0
- virtual void displayOff ()=0
- virtual void invertDisplay (boolean i)=0

Window operations

The window system is what makes some of the fastest operations available.

- virtual void openWindow (uint16_t x0, uint16_t y0, uint16_t x1, uint16_t y1)
- virtual void windowData (uint16_t d)
- virtual void windowData (uint16_t ∗d, uint32_t l)
- virtual void closeWindow ()

Helper Functions

These are functions used by other functions to do their work. They may be useful in other situations as well, but they won't be as fully documented.

- void drawCircleHelper (int16_t x0, int16_t y0, int16_t r, uint8_t cornername, uint16_t color)
- void fillCircleHelper (int16_t x0, int16_t y0, int16_t r, uint8_t cornername, int16_t delta, uint16_t color)
- boolean **clipToScreen** (int16_t &x, int16_t &y, int16_t &w, int16_t &h)
- void fatalError (const char ∗title, const char ∗message)

Public Attributes

- TFTCommunicator ∗ _comm
- int16_t cursor_x
- int16_t cursor_y
- boolean wrap
- uint16_t textcolor
- uint16_t textbgcolor
- uint16_t _width
- uint16_t _height
- uint8_t rotation

Protected Attributes

- const uint8_t ∗ font
- uint8_t font_scale_x
- uint8_t font_scale_y

4.45.1 Detailed Description

The TFT class describes and controls all the TFT screens. It acts as a polymorphic parent class for the other screen drivers, and also contains the generic primative drawing routines.

It is expected that a TFT screen driver will override some functions from this class (some are pure virtual and must be overridden).

4.45.2 Constructor & Destructor Documentation

4.45.2.1 TFT::TFT ( )

The default constructor takes no parameters. It creates a blank TFT screen class with no communication abilities.

4.45.2.2 TFT::TFT (**TFTCommunicator** ∗ *comm*)

In general, when constructing a TFT screen, you just need to pass the communication object to it. This can be as a pointer, or as a reference.

4.45.2.3 TFT::TFT (**TFTCommunicator** & *comm*)

In general, when constructing a TFT screen, you just need to pass the communication object to it. This can be as a pointer, or as a reference.

4.45.3 Member Function Documentation

4.45.3.1 uint16_t TFT::bgColorAt (int16_t *x*, int16_t *y*) `[virtual]`

Get the raw colour at a location

Returns the base image colour at (x,y) before any further layers or post processing effects are performed.

Example:

```
unsigned int color = tft.bgColorAt(100, 100);
```

Reimplemented in Framebuffer, Framebuffer332, Framebuffer332Fast, and Framebuffer565.

4.45.3.2 void TFT::closeWindow ( ) [virtual]

Close the window

Close the currently opened window and return to normal drawing operations.
Example:

```
tft.closeWindow();
```

Reimplemented in PICadillo35t, S6D0164, HX8357, and SSD1289.

4.45.3.3 uint16_t TFT::color565 (uint8_t *r*, uint8_t *g*, uint8_t *b*) [virtual]

Convert RGB to 565 colour

This function takes an RGB triplet (r, g, b) and converts it into a 16-bit 565 colour.
Example:

```
unsigned int yellow = tft.color565(255, 255, 0);
```

4.45.3.4 uint16_t TFT::colorAt (int16_t *x*, int16_t *y*) [virtual]

Get the colour at a location

Returns the colour at (x,y) as seen by the screen.
Example:

```
unsigned int color = tft.colorAt(100, 100);
```

Reimplemented in Framebuffer, PICadillo35t, Framebuffer1, Framebuffer332, Framebuffer332Fast, and Framebuffer565.

4.45.3.5 float TFT::deltaE (point3d *labA*, point3d *labB*)

Calculate the DeltaE between two LAB colours

This function takes two LAB colours and calculates the difference (delta) between them.
Example:

```
float delta = tft.deltaE(colorA, colorB);
```

4.45.3.6 uint32_t TFT::deltaOrth (uint16_t *c1*, uint16_t *c2*)

Calculate the orthogonal difference between colours

Two RGB 565 colours are compared and the orthogonal distance between them (as HSV colours) is calculated.
Example:

```
unsigned long delta = tft.deltaOrth(Color::Yellow, Color::Orange);
```

4.45.3.7 virtual void TFT::displayOff ( ) [pure virtual]

Turn off the display

Disable the video output of the display (if supported).

Example:

```
tft.displayOff();
```

Implemented in SSD1963, Framebuffer, ST7735, PICadillo35t, HD44780, S6D0164, ILI9340, Aggregator, KS0108, BD663474, HX8357, SSD1289, and LEDMatrix.

4.45.3.8 virtual void TFT::displayOn ( ) [pure virtual]

Turn on the display

Enable the video output of the display (if supported).

Example:

```
tft.displayOn();
```

Implemented in SSD1963, Framebuffer, ST7735, PICadillo35t, HD44780, S6D0164, ILI9340, Aggregator, KS0108, BD663474, HX8357, SSD1289, and LEDMatrix.

4.45.3.9 void TFT::drawBitmap (int16_t *x*, int16_t *y*, const uint8_t * *bitmap*, int16_t *w*, int16_t *h*, uint16_t *color*) [virtual]

Draw a 1-bit bitmap image

A 1-bit bitmap image is a byte array where each byte represents 8 contiguous pixels. The image is rendered to the screen as naturally transparent, with set bits rendered in (color) and unset bits skipped. The image is rendered with the upper left corner at (x,y) and the image is (w,h) in size.

Example:

```
const byte letterA[] = {
    0b00000000,
    0b00111100,
    0b01000010,
    0b01000010,
    0b01111110,
    0b01000010,
    0b01000010,
    0b00000000};
tft.drawBitmap(100, 100, letterA, 8, 8, Color::Red);
```

4.45.3.10 uint8_t TFT::drawChar (int16_t *x*, int16_t *y*, unsigned char *c*, uint16_t *color*, uint16_t *bg*)

Draw a character

This is the heart of the text handling. It takes the current font, locates the right character (c) data, and renders it to the screen at the specified (x,y) location. It is drawn in colour (color), and the background is filled in (bg). If (bg) and (color) are equal then the background pixels are skipped.

Example:

```
tft.drawChar(30, 30, 'Q', Color::Red, Color::Blue);
```

4.45.3.11 void TFT::drawCircle (int16_t *x0,* int16_t *y0,* int16_t *r,* uint16_t *color*) [virtual]

Draw a circle

This function draws the outline of a circle. Its center is at (x0, y0), it has radis (r) and is drawn in colour (color).
Example:

```
tft.drawCircle(50, 50, 20, Color::Red);
```

4.45.3.12 void TFT::drawCircleHelper (int16_t *x0,* int16_t *y0,* int16_t *r,* uint8_t *cornername,* uint16_t *color*)

This is a helper function. It is used to draw portions of a circle.

4.45.3.13 virtual void TFT::drawHorizontalLine (int16_t *x,* int16_t *y,* int16_t *w,* uint16_t *color*) [pure virtual]

Draw a horizontal line

A horizontal line of width (w) is drawn from point (x,y) in colour (color);
Example:

```
tft.drawHorizontalLine(10, 10, 50, Color::Blue);
```

Implemented in SSD1963, Framebuffer, ST7735, PICadillo35t, Aggregator, HD44780, S6D0164, ILI9340, Framebuffer332Fast, KS0108, BD663474, HX8357, and SSD1289.

4.45.3.14 void TFT::drawLine (int16_t *x0,* int16_t *y0,* int16_t *x1,* int16_t *y1,* uint16_t *color*) [virtual]

Draw a straight line

This function uses Bresenham's algorithm to draw a straight line. The line starts at coordinates (x0, y0) and extends to coordinates (x1, y1). The line is drawn in color (color).
Example:

```
tft.drawLine(10, 10, 40, 60, Color::Green);
```

4.45.3.15 void TFT::drawRectangle (int16_t *x,* int16_t *y,* int16_t *w,* int16_t *h,* uint16_t *color*) [virtual]

Draw a rectangle

This function uses accelerated line drawing routines if available. It draws a rectangle on the screen. The upper-left corner of the rectangle is at (x, y), and it extends to the right and down for a distance of (w) and (h) pixels respectively. It is drawn in colour (color).
Example:

```
tft.drawRectangle(10, 10, 200, 300, Color::Blue);
```

4.45.3.16 void TFT::drawRGB (int16_t *x,* int16_t *y,* const uint16_t ∗ *bitmap,* int16_t *w,* int16_t *h*) [virtual]

Draw an RGB (565) image

A 565 raw RGB image is rendered to the screen at (x,y). The image data is stored as an array of 16-bit values, and is (w,h) pixels in size.

Example:

tft.drawRGB(10, 30, myImage, 16, 16);

4.45.3.17 void TFT::drawRGBA (int16_t *x,* int16_t *y,* const uint16_t ∗ *bitmap,* int16_t *w,* int16_t *h,* uint16_t *trans*) [virtual]

Draw a transparent RGB (565) image

A 565 raw RGB image is rendered to the screen at (x,y). The image data is stored as an array of 16-bit values, and is (w,h) pixels in size. Any pixels with colour (trans) are skipped.

Example:

tft.drawRGBA(10, 30, myImage, 16, 16, Color::Black);

4.45.3.18 void TFT::drawRoundRect (int16_t *x,* int16_t *y,* int16_t *w,* int16_t *h,* int16_t *r,* uint16_t *color*) [virtual]

Draw a rounded rectangle

A rounded rectangle is a normal rectangle but with the corners rounded off. It is drawn with the upper-left corner at (x,y) and a width of (w) and height of (h). The corners are rounded off at a radius of (r) pixels, and it is drawn in colour (color).

Example:

```
tft.drawRoundRect(10, 10, 100, 50, 4, Color::Yellow);
```

4.45.3.19 void TFT::drawTriangle (int16_t *x0,* int16_t *y0,* int16_t *x1,* int16_t *y1,* int16_t *x2,* int16_t *y2,* uint16_t *color*) [virtual]

Draw a triangle

A simple three lines joined together to form a triangle. The three points of the triangle are defined as (x0, y0), (x1, y1) and (x2, y2). It is drawn in colour (color).

Example:

```
tft.drawTriangle(40, 10, 60, 30, 20, 30, Color::Cyan);
```

4.45.3.20 virtual void TFT::drawVerticalLine (int16_t *x,* int16_t *y,* int16_t *h,* uint16_t *color*) [pure virtual]

Draw a vertical line

A vertical line of height (h) is drawn from point (x,y) in colour (color);

Example:

```
tft.drawVerticalLine(10, 10, 50, Color::Blue);
```

Implemented in SSD1963, Framebuffer, ST7735, PICadillo35t, Aggregator, HD44780, S6D0164, ILI9340, KS0108, BD663474, HX8357, and SSD1289.

4.45.3.21 void TFT::fatalError (const char ∗ *title,* const char ∗ *message*)

Display a fatal error

Used internally by various functions and libraries to display a fatal error message. This is an error that cannot be recovered from, so the program stops here.
Example:

```
tft.fatalError("MEMORY ERROR", "Unable to allocate space for objects");
```

4.45.3.22 void TFT::fillCircle (int16_t *x0*, int16_t *y0*, int16_t *radius*, uint16_t *color*) [virtual]

Draw a filled circle

This function draws a filled circle. It is highly optimised to get the maximum possible speed out of it.

Like the drawCircle function it centers the circle at (x0, y0), has radius (radius) and is drawn in (color).
Example:

```
tft.fillCircle(50, 50, 20, Color::Red);
```

4.45.3.23 void TFT::fillCircleHelper (int16_t *x0*, int16_t *y0*, int16_t *r*, uint8_t *cornername*, int16_t *delta*, uint16_t *color*)

This is a helper function. It is used to draw segments of a filled circle.

4.45.3.24 void TFT::fillRectangle (int16_t *x*, int16_t *y*, int16_t *w*, int16_t *h*, uint16_t *color*) [virtual]

Draw a rectangle

This function draws a filled rectangle on the screen. The upper-left corner of the rectangle is at (x, y), and it extends to the right and down for a distance of (w) and (h) pixels respectively. It is drawn in colour (color).
Example:

```
tft.fillRectangle(10, 10, 200, 300, Color::Blue);
```

It is expected that actual screen drivers will override this function with a high speed optimized function.

Reimplemented in SSD1963, ST7735, PICadillo35t, HD44780, S6D0164, ILI9340, KS0108, BD663474, HX8357, and SSD1289.

4.45.3.25 void TFT::fillRoundRect (int16_t *x*, int16_t *y*, int16_t *w*, int16_t *h*, int16_t *r*, uint16_t *color*) [virtual]

Draw a filled rounded rectangle

A rounded rectangle is a normal rectangle but with the corners rounded off. It is drawn with the upper-left corner at (x,y) and a width of (w) and height of (h). The corners are rounded off at a radius of (r) pixels, and it is drawn (and filled) in colour (color).
Example:

```
tft.fillRoundRect(10, 10, 100, 50, 4, Color::Yellow);
```

4.45.3.26 void TFT::fillScreen (uint16_t *color*) [virtual]

Fill the screen with a colour

This function fills the entire screen with a solid colour.

Example:

```
tft.fillScreen(Color::Black);
```

Reimplemented in SSD1963, Framebuffer, ST7735, PICadillo35t, HD44780, Aggregator, S6D0164, ILI9340, KS0108, BD663474, HX8357, SSD1289, LEDMatrix, Framebuffer1, Framebuffer332, Framebuffer332Fast, and Framebuffer565.

4.45.3.27 void TFT::fillTriangle (int16_t *x0,* int16_t *y0,* int16_t *x1,* int16_t *y1,* int16_t *x2,* int16_t *y2,* uint16_t *color*) [virtual]

Draw a filled triangle

A simple three lines joined together to form a triangle. The three points of the triangle are defined as (x0, y0), (x1, y1) and (x2, y2). It is drawn in colour (color).

Example:

```
tft.fillTriangle(40, 10, 60, 30, 20, 30, Color::Cyan);
```

4.45.3.28 int16_t TFT::getCursor (boolean *x*) [virtual]

Get Text Cursor

Returns the ether the current X or Y position of the text cursor. A parameter of `true` requests the X coordinate, otherwise the Y coordinate is returned.

Example:

```
int x = tft.getCursor(true);
int y = tft.getCursor(false);
```

4.45.3.29 int16_t TFT::getCursorX ( ) [virtual]

Get X Cursor

Returns the current X position of the text cursor.

Example:

```
int x = tft.getCursorX();
```

4.45.3.30 int16_t TFT::getCursorY ( ) [virtual]

Get Y Cursor

Returns the current Y position of the text cursor.

Example:

```
int y = tft.getCursorY();
```

4.45.3.31 virtual uint16_t TFT::getHeight ( ) [inline], [virtual]

Get screen height

Returns the height (in pixels) of the screen.

Example:

int height = tft.getHeight();

Reimplemented in Framebuffer, and Aggregator.

4.45.3.32 uint16_t TFT::getTextColor ( ) [virtual]

Get the current foreground colour

Returns the currently selected foreground colour.

Example:

```
unsigned int color = tft.getTextColor();
```

4.45.3.33 virtual uint16_t TFT::getWidth ( ) [inline], [virtual]

Get screen width

Returns the width (in pixels) of the screen.

Example:

int width = tft.getWidth();

Reimplemented in Framebuffer, and Aggregator.

4.45.3.34 virtual void TFT::initializeDevice ( ) [pure virtual]

Initialize the display

The display is configured and made ready to work. This function *must* be called before anything can happen on the screen, and it *should* be called before any other function.

Example:

```
tft.initializeDevice();
```

Implemented in SSD1963, Framebuffer, ST7735, PICadillo35t, HD44780, S6D0164, ILI9340, Aggregator, KS0108, BD663474, HX8357, SSD1289, Framebuffer1, Framebuffer332, Framebuffer332Fast, Framebuffer565, LEDMatrix, and DOGMe.

4.45.3.35 virtual void TFT::invertDisplay (boolean *i*) [pure virtual]

Invert the display colours

All colours become reversed. Black becomes white, red becomes cyan, etc.

Example:

```
tft.invertDisplay(true);
```

Implemented in SSD1963, Framebuffer, ST7735, PICadillo35t, HD44780, S6D0164, ILI9340, Aggregator, KS0108, BD663474, HX8357, SSD1289, and LEDMatrix.

4.45.3.36 void TFT::invertTextColor ( ) [virtual]

Invert the text colours

The foreground becomes the background, and the background becomes the foreground.
Example:

```
tft.invertTextColor();
```

4.45.3.37 uint16_t TFT::mix (uint16_t *a,* uint16_t *b,* uint8_t *pct*)

Mix two colours together

Returns a new colour that is the mixing of the two provided colours.
Example:

```
unsigned int yellow = tft.mix(Color::Red, Color::Green);
```

4.45.3.38 void TFT::openWindow (uint16_t *x0,* uint16_t *y0,* uint16_t *x1,* uint16_t *y1*) [virtual]

Open a window

Opens the rectangle defined by (x0,y0) to (x1,y1) as a raw data window.
Example:

```
tft.openWindow(0, 0, 100, 100);
```

Reimplemented in PICadillo35t, S6D0164, HX8357, and SSD1289.

4.45.3.39 uint32_t TFT::rgb2hsv (uint16_t *rgb*)

Convert a 565 RGB colour to HSV

Calculate the HSV values for a 565 16-bit RGB colour.
Example:

```
unsigned long hsv = tft.rgb2hsv(Color::Green);
```

4.45.3.40 point3d TFT::rgb2xyz (uint16_t *rgb*)

Get the 3D colour space of a colour

This function converts a 565 colour into a 3D coordinate in RGB colour space (X, Y, Z).
Example:

```
point3d color = tft.rgb2xyz(Color::Cyan);
```

4.45.3.41 void TFT::setCursor (int16_t *x*, int16_t *y*) [virtual]

Set the text cursor

All future printing will happen from the pixel (x,y).
Example:

```
tft.setCursor(0, 100);
```

4.45.3.42 void TFT::setFont (const uint8_t * *f*) [virtual]

Set the current font

The current font is set to the font provided. A font is a byte array of data with metric information embedded in it.
Example:

```
tft.setFont(Fonts::Ubuntu12);
```

4.45.3.43 void TFT::setFontScaleX (uint8_t *sx*)

Set the X scale of the font

A font can be stretched in either of the X or Y coordinates to make it bigger than normal.
Example:

```
tft.setFontScaleX(2);
```

4.45.3.44 void TFT::setFontScaleY (uint8_t *sy*)

Set the Y scale of the font

A font can be stretched in either of the X or Y coordinates to make it bigger than normal.
Example:

```
tft.setFontScaleY(2);
```

4.45.3.45 virtual void TFT::setPixel (int16_t *x*, int16_t *y*, uint16_t *color*) [pure virtual]

Draw a pixel

A pixel, coloured (color) is drawn at (x,y).
Example:

```
tft.drawPixel(100, 100, Color::Green);
```

Implemented in SSD1963, Framebuffer, ST7735, PICadillo35t, HD44780, Aggregator, S6D0164, ILI9340, KS0108, BD663474, HX8357, SSD1289, LEDMatrix, Framebuffer1, Framebuffer332, Framebuffer332Fast, and Framebuffer565.

4.45.3.46 virtual void TFT::setRotation (uint8_t *rotation*) [pure virtual]

Set screen rotation

This rotates the screen. Value is between 0 and 3, for 0°, 90°, 180° or 270°.

Example:

```
tft.setRotation(1);
```

Implemented in SSD1963, Framebuffer, ST7735, PICadillo35t, HD44780, S6D0164, ILI9340, Aggregator, KS0108, BD663474, HX8357, SSD1289, and LEDMatrix.

4.45.3.47 void TFT::setTextColor (uint16_t *c*) [virtual]

Set the text foreground colour

Sets the foreground colour of all future printing to (c).

Example:

```
tft.setTextColor(Color::Magenta);
```

4.45.3.48 void TFT::setTextColor (uint16_t *fg,* uint16_t *bg*) [virtual]

Sets both foreground and background colour

Sets both the foreground and the background colours of all future printing. If the foreground and background colours match the background will be transparent.

Example:

```
tft.setTextColor(Color::Red, Color::Blue);
```

4.45.3.49 void TFT::setTextWrap (boolean *w*) [virtual]

Enable or disable text wrapping

With text wrapping enabled, when text reaches the right-hand edge of the screen it wraps around back to the left on the next line down. This function alows you to enable (true) or disable (false) this functionality. By default text wrapping is enabled.

Example:

```
tft.setTextWrap(false);
```

4.45.3.50 uint16_t TFT::stringHeight (char ∗ *text*) [virtual]

Calculate the height of a string

As fonts are all fixed height, this just returns the height of the currently selected font in pixels.

Example:

```
int height = stringHeight("The quick brown fox jumped over the lazy dog");
```

4.45.3.51 uint16_t TFT::stringWidth (char ∗ *text*) [virtual]

Calculate the width of a string

The total width of a string of characters is calculated by examining the width of each character using the current font in turn and accumulating the total width.

Example:

```
int width = tft.stringWidth("The quick brown fox jumped over the lazy dog");
```

4.45.3.52 void TFT::windowData (uint16_t *d*) [virtual]

Send pixel data to the window

Sends the raw pixel data for one pixel to the currently opened window.

Example:

```
tft.windowData(Color::Red);
```

Reimplemented in PICadillo35t, S6D0164, HX8357, and SSD1289.

4.45.3.53 void TFT::windowData (uint16_t ∗ *d,* uint32_t *l*) [virtual]

Send a block of pixel data to the window

The array of pixel data (∗d) ans size (l) is dumped verbatim to the currently opened window.

Example:

```
tft.windowData(myData, 1000);
```

Reimplemented in PICadillo35t, S6D0164, HX8357, and SSD1289.

4.45.3.54 void TFT::write (uint8_t *c*)

Write a character to the screen

This writes a single character to the screen at the current cursor position. It is used by (among other things) the print routines for rendering strings.

Example:

```
tft.write('Q');
```

4.45.3.55 point3d TFT::xyz2lab (point3d *xyz*)

Convert a 3D colour space point to LAB

Calculate the LAB colour space value of a 3D point in RGB colour space.

Example:

```
point3d labcolor = tft.xyz2lab(color3d);
```

4.45.4 Member Data Documentation

4.45.4.1 TFTCommunicator* TFT::_comm

The device used to communicate with the TFT screen

4.45.4.2 uint16_t TFT::_height

Height of the TFT screen

4.45.4.3 uint16_t TFT::_width

Width of the TFT screen

4.45.4.4 int16_t TFT::cursor_x

The text cursor X position

4.45.4.5 int16_t TFT::cursor_y

The text cursor Y position

4.45.4.6 const uint8_t* TFT::font [protected]

A pointer to the currently selected font table

4.45.4.7 uint8_t TFT::font_scale_x [protected]

The current X scaling factor of the font

4.45.4.8 uint8_t TFT::font_scale_y [protected]

The current Y scaling factor of the font

4.45.4.9 uint8_t TFT::rotation

Current rotation

4.45.4.10 uint16_t TFT::textbgcolor

Text background colour

4.45.4.11 uint16_t TFT::textcolor

Text foreground colour

4.45.4.12 boolean TFT::wrap

Whether or not text wrapping is enabled

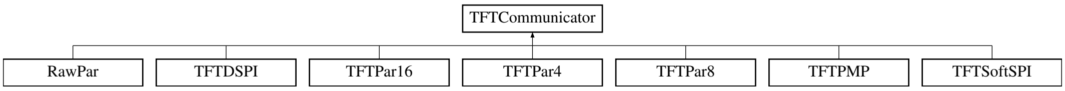
The documentation for this class was generated from the following files:

- TFT.h
- TFT.cpp

4.46 TFTCommunicator Class Reference

```
#include <TFTCommunicator.h>
```

Inheritance diagram for TFTCommunicator:



Public Member Functions

Single functions

Functions to read and write single commands or items of data

- virtual uint8_t readCommand8 ()=0
- virtual uint16_t readCommand16 ()=0
- virtual uint32_t readCommand32 ()=0
- virtual void writeCommand8 (uint8_t command)=0
- virtual void writeCommand16 (uint16_t command)=0
- virtual void writeCommand32 (uint32_t command)=0
- virtual uint8_t readData8 ()=0
- virtual uint16_t readData16 ()=0
- virtual uint32_t readData32 ()=0
- virtual void writeData8 (uint8_t data)=0
- virtual void writeData16 (uint16_t data)=0
- virtual void writeData32 (uint32_t data)=0

Streaming functions

Functions to read and write streams of mixed data and commands

- virtual void streamStart ()=0
- virtual void streamEnd ()=0
- virtual void streamCommand8 (uint8_t data)=0
- virtual void streamCommand16 (uint16_t data)=0
- virtual void streamCommand32 (uint32_t data)=0
- virtual uint8_t streamCommand8 ()=0
- virtual uint16_t streamCommand16 ()=0
- virtual uint32_t streamCommand32 ()=0
- virtual void streamData8 (uint8_t data)=0
- virtual void streamData16 (uint16_t data)=0
- virtual void streamData32 (uint32_t data)=0
- virtual uint8_t streamData8 ()=0
- virtual uint16_t streamData16 ()=0
- virtual uint32_t streamData32 ()=0

Block data functions

Functions to write large blocks of data

- virtual void blockData (uint8_t ∗data, uint32_t len)=0
- virtual void blockData (uint16_t ∗data, uint32_t len)=0
- virtual void blockData (uint32_t ∗data, uint32_t len)=0

Device control functions

Functions to manage the device

- virtual void initializeDevice ()=0
- virtual uint8_t nativeWidth ()=0

4.46.1 Detailed Description

A TFTCommunicator device forms the bridge between the TFT class and the physical screen.

4.46.2 Member Function Documentation

4.46.2.1 virtual void TFTCommunicator::blockData (uint8_t ∗ *data,* uint32_t *len*) `[pure virtual]`

Transfer a block of 8-bit data to the device

Implemented in TFTPar16, TFTPar8, TFTDSPI, TFTSoftSPI, and TFTPMP.

4.46.2.2 virtual void TFTCommunicator::blockData (uint16_t ∗ *data,* uint32_t *len*) `[pure virtual]`

Transfer a block of 16-bit data to the device

Implemented in TFTPar16, TFTPar8, TFTDSPI, TFTSoftSPI, and TFTPMP.

4.46.2.3 virtual void TFTCommunicator::blockData (uint32_t ∗ *data,* uint32_t *len*) `[pure virtual]`

Transfer a block of 32-bit data to the device

Implemented in TFTPar16, TFTPar8, TFTDSPI, TFTSoftSPI, and TFTPMP.

4.46.2.4 virtual void TFTCommunicator::initializeDevice ( ) `[pure virtual]`

Initialize the communication device

Implemented in TFTPar16, TFTPar8, TFTSoftSPI, TFTPMP, and TFTDSPI.

4.46.2.5 virtual uint8_t TFTCommunicator::nativeWidth ( ) `[pure virtual]`

Returns the real physical width of the data channel

Implemented in TFTPar16, TFTSoftSPI, TFTPar8, TFTDSPI, TFTPMP, TFTPar4, and RawPar.

4.46.2.6 virtual uint16_t TFTCommunicator::readCommand16 ( ) `[pure virtual]`

Read a 16-bit command from the device

Implemented in TFTPar16, TFTPar8, TFTSoftSPI, TFTDSPI, and TFTPMP.

4.46.2.7 virtual uint32_t TFTCommunicator::readCommand32 ( ) `[pure virtual]`

Read a 32-bit command from the device

Implemented in TFTPar16, TFTPar8, TFTSoftSPI, TFTDSPI, and TFTPMP.

4.46.2.8 virtual uint8_t TFTCommunicator::readCommand8 ( ) [pure virtual]

Read an 8-bit command from the device

Implemented in TFTPar16, TFTPar8, TFTSoftSPI, TFTDSPI, and TFTPMP.

4.46.2.9 virtual uint16_t TFTCommunicator::readData16 ( ) [pure virtual]

Read 16 bits of data from the device

Implemented in TFTPar16, TFTPar8, TFTSoftSPI, TFTDSPI, and TFTPMP.

4.46.2.10 virtual uint32_t TFTCommunicator::readData32 ( ) [pure virtual]

Read 32 bits of data from the device

Implemented in TFTPar16, TFTPar8, TFTSoftSPI, TFTDSPI, and TFTPMP.

4.46.2.11 virtual uint8_t TFTCommunicator::readData8 ( ) [pure virtual]

Read 8 bits of data from the device

Implemented in TFTPar16, TFTPar8, TFTSoftSPI, TFTDSPI, and TFTPMP.

4.46.2.12 virtual void TFTCommunicator::streamCommand16 (uint16_t *data*) [pure virtual]

Send a 16-bit command through the stream

Implemented in TFTPar16, TFTDSPI, TFTPMP, TFTSoftSPI, TFTPar4, TFTPar8, and RawPar.

4.46.2.13 virtual uint16_t TFTCommunicator::streamCommand16 ( ) [pure virtual]

Read a 16-bit command through the stream

Implemented in TFTPar16, TFTSoftSPI, TFTDSPI, TFTPar8, and TFTPMP.

4.46.2.14 virtual void TFTCommunicator::streamCommand32 (uint32_t *data*) [pure virtual]

Send a 32-bit command through the stream

Implemented in TFTPar16, TFTDSPI, TFTPMP, TFTSoftSPI, TFTPar4, TFTPar8, and RawPar.

4.46.2.15 virtual uint32_t TFTCommunicator::streamCommand32 ( ) [pure virtual]

Read a 32-bit command through the stream

Implemented in TFTPar16, TFTSoftSPI, TFTDSPI, TFTPar8, and TFTPMP.

4.46.2.16 virtual void TFTCommunicator::streamCommand8 (uint8_t *data*) [pure virtual]

Send an 8-bit command through the stream

Implemented in TFTPar16, TFTDSPI, TFTPMP, TFTSoftSPI, TFTPar4, TFTPar8, and RawPar.

4.46.2.17 virtual uint8_t TFTCommunicator::streamCommand8 ( ) [pure virtual]

Read an 8-bit command through the stream

Implemented in TFTPar16, TFTSoftSPI, TFTDSPI, TFTPar8, and TFTPMP.

4.46.2.18 virtual void TFTCommunicator::streamData16 (uint16_t *data*) [pure virtual]

Send 16-bits of data through the stream

Implemented in TFTPar16, TFTDSPI, TFTPMP, TFTSoftSPI, TFTPar4, TFTPar8, and RawPar.

4.46.2.19 virtual uint16_t TFTCommunicator::streamData16 ( ) [pure virtual]

Read 16 bits of data through the stream

Implemented in TFTPar16, TFTDSPI, TFTSoftSPI, TFTPar8, and TFTPMP.

4.46.2.20 virtual void TFTCommunicator::streamData32 (uint32_t *data*) [pure virtual]

Send 32-bits of data through the stream

Implemented in TFTPar16, TFTDSPI, TFTPMP, TFTSoftSPI, TFTPar4, TFTPar8, and RawPar.

4.46.2.21 virtual uint32_t TFTCommunicator::streamData32 ( ) [pure virtual]

Read 32 bits of data through the stream

Implemented in TFTPar16, TFTDSPI, TFTSoftSPI, TFTPar8, and TFTPMP.

4.46.2.22 virtual void TFTCommunicator::streamData8 (uint8_t *data*) [pure virtual]

Send 8-bits of data through the stream

Implemented in TFTPar16, TFTDSPI, TFTPMP, TFTSoftSPI, TFTPar4, TFTPar8, and RawPar.

4.46.2.23 virtual uint8_t TFTCommunicator::streamData8 ( ) [pure virtual]

Read 8 bits of data through the stream

Implemented in TFTPar16, TFTDSPI, TFTSoftSPI, TFTPar8, and TFTPMP.

4.46.2.24 virtual void TFTCommunicator::streamEnd ( ) [pure virtual]

Close the currently open stream

Implemented in TFTPar16, TFTDSPI, TFTSoftSPI, TFTPMP, TFTPar4, TFTPar8, and RawPar.

4.46.2.25 virtual void TFTCommunicator::streamStart ( ) [pure virtual]

Open a stream to the device endpoint

Implemented in TFTPar16, TFTDSPI, TFTSoftSPI, TFTPMP, TFTPar4, TFTPar8, and RawPar.

4.46.2.26 virtual void TFTCommunicator::writeCommand16 (uint16_t *command*) [pure virtual]

Write a 16-bit command to the device

Implemented in TFTPar16, TFTDSPI, TFTPMP, TFTSoftSPI, TFTPar4, TFTPar8, and RawPar.

4.46.2.27 virtual void TFTCommunicator::writeCommand32 (uint32_t *command*) [pure virtual]

Write a 32-bit command to the device

Implemented in TFTPar16, TFTDSPI, TFTPMP, TFTSoftSPI, TFTPar4, TFTPar8, and RawPar.

4.46.2.28 virtual void TFTCommunicator::writeCommand8 (uint8_t *command*) [pure virtual]

Write an 8-bit command to the device

Implemented in TFTPar16, TFTDSPI, TFTPMP, TFTSoftSPI, TFTPar4, TFTPar8, and RawPar.

4.46.2.29 virtual void TFTCommunicator::writeData16 (uint16_t *data*) [pure virtual]

Write 16 bits of data to the device

Implemented in TFTPar16, TFTDSPI, TFTPMP, TFTSoftSPI, TFTPar4, TFTPar8, and RawPar.

4.46.2.30 virtual void TFTCommunicator::writeData32 (uint32_t *data*) [pure virtual]

Write 32 bits of data to the device

Implemented in TFTPar16, TFTDSPI, TFTPMP, TFTSoftSPI, TFTPar4, TFTPar8, and RawPar.

4.46.2.31 virtual void TFTCommunicator::writeData8 (uint8_t *data*) [pure virtual]

Write 8 bits of data to the device

Implemented in TFTPar16, TFTDSPI, TFTPMP, TFTSoftSPI, TFTPar4, TFTPar8, and RawPar.

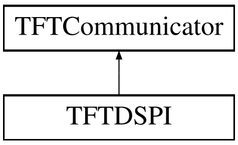
The documentation for this class was generated from the following file:

- TFTCommunicator.h

4.47 TFTDSPI Class Reference

```
#include <TFTDSPI.h>
```

Inheritance diagram for TFTDSPI:



Public Member Functions

- void initializeDevice ()

- uint8_t readCommand8 ()
- uint16_t readCommand16 ()
- uint32_t readCommand32 ()
- uint8_t readData8 ()
- uint16_t readData16 ()
- uint32_t readData32 ()
- void writeCommand8 (uint8_t command)
- void writeCommand16 (uint16_t command)
- void writeCommand32 (uint32_t command)
- void writeData8 (uint8_t data)
- void writeData16 (uint16_t data)
- void writeData32 (uint32_t data)
- void streamStart ()
- void streamEnd ()
- void streamCommand8 (uint8_t)
- void streamCommand16 (uint16_t)
- void streamCommand32 (uint32_t)
- uint8_t streamCommand8 ()
- uint16_t streamCommand16 ()
- uint32_t streamCommand32 ()
- void streamData8 (uint8_t)
- void streamData16 (uint16_t)
- void streamData32 (uint32_t)
- uint8_t streamData8 ()
- uint16_t streamData16 ()
- uint32_t streamData32 ()
- uint8_t nativeWidth ()
- void blockData (uint8_t ∗data, uint32_t len)
- void blockData (uint16_t ∗data, uint32_t len)
- void blockData (uint32_t ∗data, uint32_t len)

- TFTDSPI (DSPI ∗spi, uint8_t cs, uint8_t dc=255, uint32_t sp=40000000UL)
- **TFTDSPI** (DSPI &spi, uint8_t cs, uint8_t dc=255, uint32_t sp=40000000UL)

4.47.1 Detailed Description

The TFTDSPI class creates a new SPI interface using the chipKIT DSPI library.

4.47.2 Constructor & Destructor Documentation

4.47.2.1 TFTDSPI::TFTDSPI (DSPI ∗ *spi*, uint8_t *cs*, uint8_t *dc* = `255`, uint32_t *sp* = `40000000UL`) `[inline]`

Construct a new SPI communication object. Pass either a pointer or reference to a DSPI object, a Chip Select pin, a Data/Command pin and (optionally) a communication speed.

Example:

```
DSPI0 spi;
TFTDSPI mySPI(spi, 10, 8);
```

4.47.3 Member Function Documentation

4.47.3.1 void TFTDSPI::blockData (uint8_t ∗ *data*, uint32_t *len*) `[virtual]`

Transfer a block of 8-bit data to the device

Implements TFTCommunicator.

4.47.3.2 void TFTDSPI::blockData (uint16_t * *data*, uint32_t *len*) [virtual]

Transfer a block of 16-bit data to the device

Implements TFTCommunicator.

4.47.3.3 void TFTDSPI::blockData (uint32_t * *data*, uint32_t *len*) [virtual]

Transfer a block of 32-bit data to the device

Implements TFTCommunicator.

4.47.3.4 void TFTDSPI::initializeDevice ( ) [virtual]

Initialize the communication device

Implements TFTCommunicator.

4.47.3.5 uint8_t TFTDSPI::nativeWidth ( ) [inline], [virtual]

Returns the real physical width of the data channel

Implements TFTCommunicator.

4.47.3.6 uint16_t TFTDSPI::readCommand16 ( ) [virtual]

Read a 16-bit command from the device

Implements TFTCommunicator.

4.47.3.7 uint32_t TFTDSPI::readCommand32 ( ) [virtual]

Read a 32-bit command from the device

Implements TFTCommunicator.

4.47.3.8 uint8_t TFTDSPI::readCommand8 ( ) [virtual]

Read an 8-bit command from the device

Implements TFTCommunicator.

4.47.3.9 uint16_t TFTDSPI::readData16 ( ) [virtual]

Read 16 bits of data from the device

Implements TFTCommunicator.

4.47.3.10 uint32_t TFTDSPI::readData32 ( ) [virtual]

Read 32 bits of data from the device

Implements TFTCommunicator.

4.47.3.11 uint8_t TFTDSPI::readData8 ( ) [virtual]

Read 8 bits of data from the device

Implements TFTCommunicator.

4.47.3.12 void TFTDSPI::streamCommand16 (uint16_t *data*) [virtual]

Send a 16-bit command through the stream

Implements TFTCommunicator.

4.47.3.13 uint16_t TFTDSPI::streamCommand16 ( ) [virtual]

Read a 16-bit command through the stream

Implements TFTCommunicator.

4.47.3.14 void TFTDSPI::streamCommand32 (uint32_t *data*) [virtual]

Send a 32-bit command through the stream

Implements TFTCommunicator.

4.47.3.15 uint32_t TFTDSPI::streamCommand32 ( ) [virtual]

Read a 32-bit command through the stream

Implements TFTCommunicator.

4.47.3.16 void TFTDSPI::streamCommand8 (uint8_t *data*) [virtual]

Send an 8-bit command through the stream

Implements TFTCommunicator.

4.47.3.17 uint8_t TFTDSPI::streamCommand8 ( ) [virtual]

Read an 8-bit command through the stream

Implements TFTCommunicator.

4.47.3.18 void TFTDSPI::streamData16 (uint16_t *data*) [virtual]

Send 16-bits of data through the stream

Implements TFTCommunicator.

4.47.3.19 uint16_t TFTDSPI::streamData16 ( ) [virtual]

Read 16 bits of data through the stream

Implements TFTCommunicator.

4.47.3.20 void TFTDSPI::streamData32 (uint32_t *data*) [virtual]

Send 32-bits of data through the stream

Implements TFTCommunicator.

4.47.3.21 uint32_t TFTDSPI::streamData32 ( ) [virtual]

Read 32 bits of data through the stream

Implements TFTCommunicator.

4.47.3.22 void TFTDSPI::streamData8 (uint8_t *data*) [virtual]

Send 8-bits of data through the stream

Implements TFTCommunicator.

4.47.3.23 uint8_t TFTDSPI::streamData8 ( ) [virtual]

Read 8 bits of data through the stream

Implements TFTCommunicator.

4.47.3.24 void TFTDSPI::streamEnd ( ) [virtual]

Close the currently open stream

Implements TFTCommunicator.

4.47.3.25 void TFTDSPI::streamStart ( ) [virtual]

Open a stream to the device endpoint

Implements TFTCommunicator.

4.47.3.26 void TFTDSPI::writeCommand16 (uint16_t *command*) [virtual]

Write a 16-bit command to the device

Implements TFTCommunicator.

4.47.3.27 void TFTDSPI::writeCommand32 (uint32_t *command*) [virtual]

Write a 32-bit command to the device

Implements TFTCommunicator.

4.47.3.28 void TFTDSPI::writeCommand8 (uint8_t *command*) [virtual]

Write an 8-bit command to the device

Implements TFTCommunicator.

4.47.3.29 void TFTDSPI::writeData16 (uint16_t *data*) `[virtual]`

Write 16 bits of data to the device

Implements TFTCommunicator.

4.47.3.30 void TFTDSPI::writeData32 (uint32_t *data*) `[virtual]`

Write 32 bits of data to the device

Implements TFTCommunicator.

4.47.3.31 void TFTDSPI::writeData8 (uint8_t *data*) `[virtual]`

Write 8 bits of data to the device

Implements TFTCommunicator.

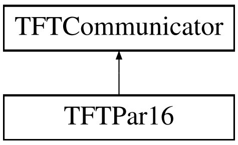
The documentation for this class was generated from the following file:

- TFTDSPI.h

4.48 TFTPar16 Class Reference

`#include <TFTPar16.h>`

Inheritance diagram for TFTPar16:



Public Member Functions

- TFTPar16 (uint8_t cs, uint8_t dc, uint8_t clk, uint8_t d0, uint8_t d1, uint8_t d2, uint8_t d3, uint8_t d4, uint8_t d5, uint8_t d6, uint8_t d7, uint8_t d8, uint8_t d9, uint8_t d10, uint8_t d11, uint8_t d12, uint8_t d13, uint8_t d14, uint8_t d15)
- TFTPar16 (const uint8_t ∗profile)
- void writeCommand8 (uint8_t command)
- void writeCommand16 (uint16_t command)
- void writeCommand32 (uint32_t command)
- void writeData8 (uint8_t data)
- void writeData16 (uint16_t data)
- void writeData32 (uint32_t data)
- void streamStart ()
- void streamEnd ()
- void streamCommand8 (uint8_t)
- void streamCommand16 (uint16_t)
- void streamCommand32 (uint32_t)
- void streamData8 (uint8_t)
- void streamData16 (uint16_t)
- void streamData32 (uint32_t)
- uint8_t streamCommand8 ()

- uint16_t streamCommand16 ()
- uint32_t streamCommand32 ()
- uint8_t streamData8 ()
- uint16_t streamData16 ()
- uint32_t streamData32 ()
- uint8_t readCommand8 ()
- uint16_t readCommand16 ()
- uint32_t readCommand32 ()
- uint8_t readData8 ()
- uint16_t readData16 ()
- uint32_t readData32 ()
- uint8_t nativeWidth ()
- void initializeDevice ()
- void blockData (uint8_t ∗d, uint32_t)
- void blockData (uint16_t ∗d, uint32_t)
- void blockData (uint32_t ∗d, uint32_t)

Static Public Attributes

- static const uint8_t IteadAdapter []

4.48.1 Detailed Description

The TFTPar16 class creates a full 16-bit parallel interface to a TFT device

4.48.2 Constructor & Destructor Documentation

4.48.2.1 TFTPar16::TFTPar16 (uint8_t *cs,* uint8_t *dc,* uint8_t *clk,* uint8_t *d0,* uint8_t *d1,* uint8_t *d2,* uint8_t *d3,* uint8_t *d4,* uint8_t *d5,* uint8_t *d6,* uint8_t *d7,* uint8_t *d8,* uint8_t *d9,* uint8_t *d10,* uint8_t *d11,* uint8_t *d12,* uint8_t *d13,* uint8_t *d14,* uint8_t *d15*) [inline]

Construct a new 16-bit parallel device using individual pins

4.48.2.2 TFTPar16::TFTPar16 (const uint8_t ∗ *profile*) [inline]

Construct a new 16-bit parallel device using a pre-programmed profile

4.48.3 Member Function Documentation

4.48.3.1 void TFTPar16::blockData (uint8_t ∗ *data,* uint32_t *len*) [virtual]

Transfer a block of 8-bit data to the device

Implements TFTCommunicator.

4.48.3.2 void TFTPar16::blockData (uint16_t ∗ *data,* uint32_t *len*) [virtual]

Transfer a block of 16-bit data to the device

Implements TFTCommunicator.

4.48.3.3 void TFTPar16::blockData (uint32_t * *data*, uint32_t *len*) [virtual]

Transfer a block of 32-bit data to the device

Implements TFTCommunicator.

4.48.3.4 void TFTPar16::initializeDevice ( ) [inline], [virtual]

Initialize the communication device

Implements TFTCommunicator.

4.48.3.5 uint8_t TFTPar16::nativeWidth ( ) [inline], [virtual]

Returns the real physical width of the data channel

Implements TFTCommunicator.

4.48.3.6 uint16_t TFTPar16::readCommand16 ( ) [inline], [virtual]

Read a 16-bit command from the device

Implements TFTCommunicator.

4.48.3.7 uint32_t TFTPar16::readCommand32 ( ) [inline], [virtual]

Read a 32-bit command from the device

Implements TFTCommunicator.

4.48.3.8 uint8_t TFTPar16::readCommand8 ( ) [inline], [virtual]

Read an 8-bit command from the device

Implements TFTCommunicator.

4.48.3.9 uint16_t TFTPar16::readData16 ( ) [inline], [virtual]

Read 16 bits of data from the device

Implements TFTCommunicator.

4.48.3.10 uint32_t TFTPar16::readData32 ( ) [inline], [virtual]

Read 32 bits of data from the device

Implements TFTCommunicator.

4.48.3.11 uint8_t TFTPar16::readData8 ( ) [inline], [virtual]

Read 8 bits of data from the device

Implements TFTCommunicator.

4.48.3.12 void TFTPar16::streamCommand16 (uint16_t *data*) [virtual]

Send a 16-bit command through the stream

Implements TFTCommunicator.

4.48.3.13 uint16_t TFTPar16::streamCommand16 ( ) [inline], [virtual]

Read a 16-bit command through the stream

Implements TFTCommunicator.

4.48.3.14 void TFTPar16::streamCommand32 (uint32_t *data*) [virtual]

Send a 32-bit command through the stream

Implements TFTCommunicator.

4.48.3.15 uint32_t TFTPar16::streamCommand32 ( ) [inline], [virtual]

Read a 32-bit command through the stream

Implements TFTCommunicator.

4.48.3.16 void TFTPar16::streamCommand8 (uint8_t *data*) [virtual]

Send an 8-bit command through the stream

Implements TFTCommunicator.

4.48.3.17 uint8_t TFTPar16::streamCommand8 ( ) [inline], [virtual]

Read an 8-bit command through the stream

Implements TFTCommunicator.

4.48.3.18 void TFTPar16::streamData16 (uint16_t *data*) [virtual]

Send 16-bits of data through the stream

Implements TFTCommunicator.

4.48.3.19 uint16_t TFTPar16::streamData16 ( ) [inline], [virtual]

Read 16 bits of data through the stream

Implements TFTCommunicator.

4.48.3.20 void TFTPar16::streamData32 (uint32_t *data*) [virtual]

Send 32-bits of data through the stream

Implements TFTCommunicator.

4.48.3.21 uint32_t TFTPar16::streamData32 ( ) [inline], [virtual]

Read 32 bits of data through the stream

Implements TFTCommunicator.

4.48.3.22 void TFTPar16::streamData8 (uint8_t *data*) [virtual]

Send 8-bits of data through the stream

Implements TFTCommunicator.

4.48.3.23 uint8_t TFTPar16::streamData8 ( ) [inline], [virtual]

Read 8 bits of data through the stream

Implements TFTCommunicator.

4.48.3.24 void TFTPar16::streamEnd ( ) [virtual]

Close the currently open stream

Implements TFTCommunicator.

4.48.3.25 void TFTPar16::streamStart ( ) [virtual]

Open a stream to the device endpoint

Implements TFTCommunicator.

4.48.3.26 void TFTPar16::writeCommand16 (uint16_t *command*) [virtual]

Write a 16-bit command to the device

Implements TFTCommunicator.

4.48.3.27 void TFTPar16::writeCommand32 (uint32_t *command*) [virtual]

Write a 32-bit command to the device

Implements TFTCommunicator.

4.48.3.28 void TFTPar16::writeCommand8 (uint8_t *command*) [virtual]

Write an 8-bit command to the device

Implements TFTCommunicator.

4.48.3.29 void TFTPar16::writeData16 (uint16_t *data*) [virtual]

Write 16 bits of data to the device

Implements TFTCommunicator.

4.48.3.30 void TFTPar16::writeData32 (uint32_t *data*) [virtual]

Write 32 bits of data to the device

Implements TFTCommunicator.

4.48.3.31 void TFTPar16::writeData8 (uint8_t *data*) [virtual]

Write 8 bits of data to the device

Implements TFTCommunicator.

4.48.4 Member Data Documentation

4.48.4.1 const uint8_t TFTPar16::IteadAdapter [static]

Initial value:

```
= {
0, 1, 2,
3, 4, 5, 6, 7, 8, 9, 10,
11, 12, 13, 14, 15, 16, 17, 18
}
```

Interface profile for the ITead Studios Arduino Mega TFT Interface Adapter

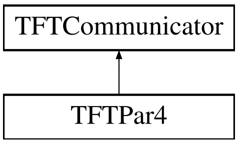
The documentation for this class was generated from the following files:

- TFTPar16.h
- TFTPar16.cpp

4.49 TFTPar4 Class Reference

#include <TFTPar4.h>

Inheritance diagram for TFTPar4:



Public Member Functions

- TFTPar4 (uint8_t dc, uint8_t clk, uint8_t d0, uint8_t d1, uint8_t d2, uint8_t d3)
- TFTPar4 (uint8_t cs, uint8_t dc, uint8_t clk, uint8_t d0, uint8_t d1, uint8_t d2, uint8_t d3)
- void writeCommand8 (uint8_t command)
- void writeCommand16 (uint16_t command)
- void writeCommand32 (uint32_t command)
- void writeData8 (uint8_t data)
- void writeData16 (uint16_t data)
- void writeData32 (uint32_t data)
- void streamStart ()
- void streamEnd ()

- void streamCommand8 (uint8_t)
- void streamCommand16 (uint16_t)
- void streamCommand32 (uint32_t)
- void streamData8 (uint8_t)
- void streamData16 (uint16_t)
- void streamData32 (uint32_t)
- uint8_t nativeWidth ()

4.49.1 Detailed Description

The TFTPar4 class creates a new 4-bit interface compatible with popular text only LCD screens

4.49.2 Constructor & Destructor Documentation

4.49.2.1 TFTPar4::TFTPar4 (uint8_t *dc,* uint8_t *clk,* uint8_t *d0,* uint8_t *d1,* uint8_t *d2,* uint8_t *d3*)

Create a new TFTPar4 object

This creates a new 4-bit TFT interface, including the Data/Command (dc) pin, Clock (clk) (sometimes called E) and data bits d0 - d3.

4.49.2.2 TFTPar4::TFTPar4 (uint8_t *cs,* uint8_t *dc,* uint8_t *clk,* uint8_t *d0,* uint8_t *d1,* uint8_t *d2,* uint8_t *d3*)

Create a new TFTPar4 object

This creates a new 4-bit full TFT interface, including the Chip Select (cs) pin, Data/Command (dc) pin, Clock (clk) (sometimes called E) and data bits d0 - d3.

4.49.3 Member Function Documentation

4.49.3.1 uint8_t TFTPar4::nativeWidth ( ) `[inline]`, `[virtual]`

Returns the real physical width of the data channel

Implements TFTCommunicator.

4.49.3.2 void TFTPar4::streamCommand16 (uint16_t *data*) `[virtual]`

Send a 16-bit command through the stream

Implements TFTCommunicator.

4.49.3.3 void TFTPar4::streamCommand32 (uint32_t *data*) `[virtual]`

Send a 32-bit command through the stream

Implements TFTCommunicator.

4.49.3.4 void TFTPar4::streamCommand8 (uint8_t *data*) `[virtual]`

Send an 8-bit command through the stream

Implements TFTCommunicator.

4.49.3.5 void TFTPar4::streamData16 (uint16_t *data*) [virtual]

Send 16-bits of data through the stream

Implements TFTCommunicator.

4.49.3.6 void TFTPar4::streamData32 (uint32_t *data*) [virtual]

Send 32-bits of data through the stream

Implements TFTCommunicator.

4.49.3.7 void TFTPar4::streamData8 (uint8_t *data*) [virtual]

Send 8-bits of data through the stream

Implements TFTCommunicator.

4.49.3.8 void TFTPar4::streamEnd ( ) [virtual]

Close the currently open stream

Implements TFTCommunicator.

4.49.3.9 void TFTPar4::streamStart ( ) [virtual]

Open a stream to the device endpoint

Implements TFTCommunicator.

4.49.3.10 void TFTPar4::writeCommand16 (uint16_t *command*) [virtual]

Write a 16-bit command to the device

Implements TFTCommunicator.

4.49.3.11 void TFTPar4::writeCommand32 (uint32_t *command*) [virtual]

Write a 32-bit command to the device

Implements TFTCommunicator.

4.49.3.12 void TFTPar4::writeCommand8 (uint8_t *command*) [virtual]

Write an 8-bit command to the device

Implements TFTCommunicator.

4.49.3.13 void TFTPar4::writeData16 (uint16_t *data*) [virtual]

Write 16 bits of data to the device

Implements TFTCommunicator.

4.49.3.14 void TFTPar4::writeData32 (uint32_t *data*) [virtual]

Write 32 bits of data to the device

Implements TFTCommunicator.

4.49.3.15 void TFTPar4::writeData8 (uint8_t *data*) [virtual]

Write 8 bits of data to the device

Implements TFTCommunicator.

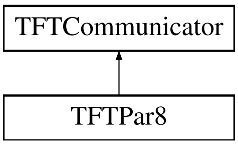
The documentation for this class was generated from the following files:

- TFTPar4.h
- TFTPar4.cpp

4.50 TFTPar8 Class Reference

```
#include <TFTPar8.h>
```

Inheritance diagram for TFTPar8:



Public Member Functions

- TFTPar8 (ParallelIO ∗dev, uint8_t cs, uint8_t dc, uint8_t clk, uint8_t d0, uint8_t d1, uint8_t d2, uint8_t d3, uint8_t d4, uint8_t d5, uint8_t d6, uint8_t d7)
- void writeCommand8 (uint8_t command)
- void writeCommand16 (uint16_t command)
- void writeCommand32 (uint32_t command)
- void writeData8 (uint8_t data)
- void writeData16 (uint16_t data)
- void writeData32 (uint32_t data)
- void streamStart ()
- void streamEnd ()
- void streamCommand8 (uint8_t)
- void streamCommand16 (uint16_t)
- void streamCommand32 (uint32_t)
- void streamData8 (uint8_t)
- void streamData16 (uint16_t)
- void streamData32 (uint32_t)
- uint8_t streamCommand8 ()
- uint16_t streamCommand16 ()
- uint32_t streamCommand32 ()
- uint8_t streamData8 ()
- uint16_t streamData16 ()
- uint32_t streamData32 ()
- uint8_t readCommand8 ()

- uint16_t readCommand16 ()
- uint32_t readCommand32 ()
- uint8_t readData8 ()
- uint16_t readData16 ()
- uint32_t readData32 ()
- uint8_t nativeWidth ()
- void initializeDevice ()
- void blockData (uint8_t ∗d, uint32_t)
- void blockData (uint16_t ∗d, uint32_t)
- void blockData (uint32_t ∗d, uint32_t)

4.50.1 Detailed Description

The TFTPar8 class defines an 8-bit parallel interface incorporating the normal TFT control signals.

4.50.2 Constructor & Destructor Documentation

4.50.2.1 TFTPar8::TFTPar8 (ParallelIO ∗ *dev,* uint8_t *cs,* uint8_t *dc,* uint8_t *clk,* uint8_t *d0,* uint8_t *d1,* uint8_t *d2,* uint8_t *d3,* uint8_t *d4,* uint8_t *d5,* uint8_t *d6,* uint8_t *d7*)

Construct a new TFTPar8 device

This class constructor creates a new 8-bit parallel interface. It requires a ParallelIO device pointer (∗dev) to access the IO pins. Also required are the Chip Select (cs), Data/Command (dc) Clock (clk) and data pins 0-7 (d0-d7); Example:

```
TFTPar8 pardev(&core, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10 11);
```

4.50.3 Member Function Documentation

4.50.3.1 void TFTPar8::blockData (uint8_t ∗ *data,* uint32_t *len*) [virtual]

Transfer a block of 8-bit data to the device

Implements TFTCommunicator.

4.50.3.2 void TFTPar8::blockData (uint16_t ∗ *data,* uint32_t *len*) [virtual]

Transfer a block of 16-bit data to the device

Implements TFTCommunicator.

4.50.3.3 void TFTPar8::blockData (uint32_t ∗ *data,* uint32_t *len*) [virtual]

Transfer a block of 32-bit data to the device

Implements TFTCommunicator.

4.50.3.4 void TFTPar8::initializeDevice ( ) [inline], [virtual]

Initialize the communication device

Implements TFTCommunicator.

4.50.3.5 uint8_t TFTPar8::nativeWidth ( ) [inline], [virtual]

Returns the real physical width of the data channel

Implements TFTCommunicator.

4.50.3.6 uint16_t TFTPar8::readCommand16 ( ) [inline], [virtual]

Read a 16-bit command from the device

Implements TFTCommunicator.

4.50.3.7 uint32_t TFTPar8::readCommand32 ( ) [inline], [virtual]

Read a 32-bit command from the device

Implements TFTCommunicator.

4.50.3.8 uint8_t TFTPar8::readCommand8 ( ) [inline], [virtual]

Read an 8-bit command from the device

Implements TFTCommunicator.

4.50.3.9 uint16_t TFTPar8::readData16 ( ) [inline], [virtual]

Read 16 bits of data from the device

Implements TFTCommunicator.

4.50.3.10 uint32_t TFTPar8::readData32 ( ) [inline], [virtual]

Read 32 bits of data from the device

Implements TFTCommunicator.

4.50.3.11 uint8_t TFTPar8::readData8 ( ) [inline], [virtual]

Read 8 bits of data from the device

Implements TFTCommunicator.

4.50.3.12 void TFTPar8::streamCommand16 (uint16_t *data*) [virtual]

Send a 16-bit command through the stream

Implements TFTCommunicator.

4.50.3.13 uint16_t TFTPar8::streamCommand16 ( ) [inline], [virtual]

Read a 16-bit command through the stream

Implements TFTCommunicator.

4.50.3.14 void TFTPar8::streamCommand32 (uint32_t *data*) [virtual]

Send a 32-bit command through the stream

Implements TFTCommunicator.

4.50.3.15 uint32_t TFTPar8::streamCommand32 ( ) [inline], [virtual]

Read a 32-bit command through the stream

Implements TFTCommunicator.

4.50.3.16 void TFTPar8::streamCommand8 (uint8_t *data*) [virtual]

Send an 8-bit command through the stream

Implements TFTCommunicator.

4.50.3.17 uint8_t TFTPar8::streamCommand8 ( ) [inline], [virtual]

Read an 8-bit command through the stream

Implements TFTCommunicator.

4.50.3.18 void TFTPar8::streamData16 (uint16_t *data*) [virtual]

Send 16-bits of data through the stream

Implements TFTCommunicator.

4.50.3.19 uint16_t TFTPar8::streamData16 ( ) [inline], [virtual]

Read 16 bits of data through the stream

Implements TFTCommunicator.

4.50.3.20 void TFTPar8::streamData32 (uint32_t *data*) [virtual]

Send 32-bits of data through the stream

Implements TFTCommunicator.

4.50.3.21 uint32_t TFTPar8::streamData32 ( ) [inline], [virtual]

Read 32 bits of data through the stream

Implements TFTCommunicator.

4.50.3.22 void TFTPar8::streamData8 (uint8_t *data*) [virtual]

Send 8-bits of data through the stream

Implements TFTCommunicator.

4.50.3.23 uint8_t TFTPar8::streamData8 ( ) [inline], [virtual]

Read 8 bits of data through the stream

Implements TFTCommunicator.

4.50.3.24 void TFTPar8::streamEnd ( ) [virtual]

Close the currently open stream

Implements TFTCommunicator.

4.50.3.25 void TFTPar8::streamStart ( ) [virtual]

Open a stream to the device endpoint

Implements TFTCommunicator.

4.50.3.26 void TFTPar8::writeCommand16 (uint16_t *command*) [virtual]

Write a 16-bit command to the device

Implements TFTCommunicator.

4.50.3.27 void TFTPar8::writeCommand32 (uint32_t *command*) [virtual]

Write a 32-bit command to the device

Implements TFTCommunicator.

4.50.3.28 void TFTPar8::writeCommand8 (uint8_t *command*) [virtual]

Write an 8-bit command to the device

Implements TFTCommunicator.

4.50.3.29 void TFTPar8::writeData16 (uint16_t *data*) [virtual]

Write 16 bits of data to the device

Implements TFTCommunicator.

4.50.3.30 void TFTPar8::writeData32 (uint32_t *data*) [virtual]

Write 32 bits of data to the device

Implements TFTCommunicator.

4.50.3.31 void TFTPar8::writeData8 (uint8_t *data*) [virtual]

Write 8 bits of data to the device

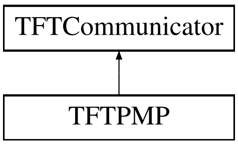
Implements TFTCommunicator.

The documentation for this class was generated from the following files:

- TFTPar8.h
- TFTPar8.cpp

4.51 TFTPMP Class Reference

Inheritance diagram for TFTPMP:



Public Member Functions

- uint8_t readCommand8 ()
- uint16_t readCommand16 ()
- uint32_t readCommand32 ()
- uint8_t readData8 ()
- uint16_t readData16 ()
- uint32_t readData32 ()
- void writeCommand8 (uint8_t command)
- void writeCommand16 (uint16_t command)
- void writeCommand32 (uint32_t command)
- void writeData8 (uint8_t data)
- void writeData16 (uint16_t data)
- void writeData32 (uint32_t data)
- void streamStart ()
- void streamEnd ()
- uint8_t streamCommand8 ()
- uint16_t streamCommand16 ()
- uint32_t streamCommand32 ()
- uint8_t streamData8 ()
- uint16_t streamData16 ()
- uint32_t streamData32 ()
- void streamCommand8 (uint8_t)
- void streamCommand16 (uint16_t)
- void streamCommand32 (uint32_t)
- void streamData8 (uint8_t)
- void streamData16 (uint16_t)
- void streamData32 (uint32_t)
- void blockData (uint8_t ∗, uint32_t)
- void blockData (uint16_t ∗, uint32_t)
- void blockData (uint32_t ∗, uint32_t)
- uint8_t nativeWidth ()
- void initializeDevice ()

4.51.1 Member Function Documentation

4.51.1.1 void TFTPMP::blockData (uint8_t ∗ *data*, uint32_t *len*) [inline], [virtual]

Transfer a block of 8-bit data to the device

Implements TFTCommunicator.

4.51.1.2 void TFTPMP::blockData (uint16_t ∗ *data*, uint32_t *len*) [inline], [virtual]

Transfer a block of 16-bit data to the device

Implements TFTCommunicator.

4.51.1.3 void TFTPMP::blockData (uint32_t ∗ *data*, uint32_t *len*) [inline], [virtual]

Transfer a block of 32-bit data to the device

Implements TFTCommunicator.

4.51.1.4 void TFTPMP::initializeDevice ( ) [virtual]

Initialize the communication device

Implements TFTCommunicator.

4.51.1.5 uint8_t TFTPMP::nativeWidth ( ) [inline], [virtual]

Returns the real physical width of the data channel

Implements TFTCommunicator.

4.51.1.6 uint16_t TFTPMP::readCommand16 ( ) [inline], [virtual]

Read a 16-bit command from the device

Implements TFTCommunicator.

4.51.1.7 uint32_t TFTPMP::readCommand32 ( ) [inline], [virtual]

Read a 32-bit command from the device

Implements TFTCommunicator.

4.51.1.8 uint8_t TFTPMP::readCommand8 ( ) [inline], [virtual]

Read an 8-bit command from the device

Implements TFTCommunicator.

4.51.1.9 uint16_t TFTPMP::readData16 ( ) [inline], [virtual]

Read 16 bits of data from the device

Implements TFTCommunicator.

4.51.1.10 uint32_t TFTPMP::readData32 ( ) [inline], [virtual]

Read 32 bits of data from the device

Implements TFTCommunicator.

4.51.1.11 uint8_t TFTPMP::readData8 ( ) [inline], [virtual]

Read 8 bits of data from the device

Implements TFTCommunicator.

4.51.1.12 uint16_t TFTPMP::streamCommand16 ( ) [inline], [virtual]

Read a 16-bit command through the stream

Implements TFTCommunicator.

4.51.1.13 void TFTPMP::streamCommand16 (uint16_t *data*) [inline], [virtual]

Send a 16-bit command through the stream

Implements TFTCommunicator.

4.51.1.14 uint32_t TFTPMP::streamCommand32 ( ) [inline], [virtual]

Read a 32-bit command through the stream

Implements TFTCommunicator.

4.51.1.15 void TFTPMP::streamCommand32 (uint32_t *data*) [inline], [virtual]

Send a 32-bit command through the stream

Implements TFTCommunicator.

4.51.1.16 uint8_t TFTPMP::streamCommand8 ( ) [inline], [virtual]

Read an 8-bit command through the stream

Implements TFTCommunicator.

4.51.1.17 void TFTPMP::streamCommand8 (uint8_t *data*) [inline], [virtual]

Send an 8-bit command through the stream

Implements TFTCommunicator.

4.51.1.18 uint16_t TFTPMP::streamData16 ( ) [inline], [virtual]

Read 16 bits of data through the stream

Implements TFTCommunicator.

4.51.1.19 void TFTPMP::streamData16 (uint16_t *data*) [inline], [virtual]

Send 16-bits of data through the stream

Implements TFTCommunicator.

4.51.1.20 uint32_t TFTPMP::streamData32 ( ) [inline], [virtual]

Read 32 bits of data through the stream

Implements TFTCommunicator.

4.51.1.21 void TFTPMP::streamData32 (uint32_t *data*) [inline], [virtual]

Send 32-bits of data through the stream

Implements TFTCommunicator.

4.51.1.22 uint8_t TFTPMP::streamData8 ( ) [inline], [virtual]

Read 8 bits of data through the stream

Implements TFTCommunicator.

4.51.1.23 void TFTPMP::streamData8 (uint8_t *data*) [inline], [virtual]

Send 8-bits of data through the stream

Implements TFTCommunicator.

4.51.1.24 void TFTPMP::streamEnd ( ) [inline], [virtual]

Close the currently open stream

Implements TFTCommunicator.

4.51.1.25 void TFTPMP::streamStart ( ) [inline], [virtual]

Open a stream to the device endpoint

Implements TFTCommunicator.

4.51.1.26 void TFTPMP::writeCommand16 (uint16_t *command*) [inline], [virtual]

Write a 16-bit command to the device

Implements TFTCommunicator.

4.51.1.27 void TFTPMP::writeCommand32 (uint32_t *command*) [inline], [virtual]

Write a 32-bit command to the device

Implements TFTCommunicator.

4.51.1.28 void TFTPMP::writeCommand8 (uint8_t *command*) [inline], [virtual]

Write an 8-bit command to the device

Implements TFTCommunicator.

4.51.1.29 void TFTPMP::writeData16 (uint16_t *data*) [inline], [virtual]

Write 16 bits of data to the device

Implements TFTCommunicator.

4.51.1.30 void TFTPMP::writeData32 (uint32_t *data*) [inline], [virtual]

Write 32 bits of data to the device

Implements TFTCommunicator.

4.51.1.31 void TFTPMP::writeData8 (uint8_t *data*) [inline], [virtual]

Write 8 bits of data to the device

Implements TFTCommunicator.

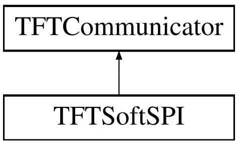
The documentation for this class was generated from the following files:

- TFTPMP.h
- TFTPMP.cpp

4.52 TFTSoftSPI Class Reference

```
#include <TFTSoftSPI.h>
```

Inheritance diagram for TFTSoftSPI:



Public Member Functions

- TFTSoftSPI (uint8_t sdo, uint8_t sck, uint8_t cs, uint8_t dc)
- void writeCommand8 (uint8_t command)
- void writeCommand16 (uint16_t command)
- void writeCommand32 (uint32_t command)
- void writeData8 (uint8_t data)
- void writeData16 (uint16_t data)
- void writeData32 (uint32_t data)
- uint8_t readCommand8 ()
- uint16_t readCommand16 ()
- uint32_t readCommand32 ()
- uint8_t readData8 ()
- uint16_t readData16 ()
- uint32_t readData32 ()
- void streamStart ()
- void streamEnd ()
- void streamCommand8 (uint8_t)
- void streamCommand16 (uint16_t)
- void streamCommand32 (uint32_t)

- void streamData8 (uint8_t)
- void streamData16 (uint16_t)
- void streamData32 (uint32_t)
- uint8_t streamCommand8 ()
- uint16_t streamCommand16 ()
- uint32_t streamCommand32 ()
- uint8_t streamData8 ()
- uint16_t streamData16 ()
- uint32_t streamData32 ()
- void blockData (uint8_t ∗d, uint32_t c)
- void blockData (uint16_t ∗d, uint32_t c)
- void blockData (uint32_t ∗d, uint32_t c)
- void initializeDevice ()
- uint8_t nativeWidth ()

4.52.1 Detailed Description

The TFTSoftSPI communicator creates an SPI channel on any IO pins. Not as fast as hardware SPI, but allows extra flexibility.

4.52.2 Constructor & Destructor Documentation

4.52.2.1 TFTSoftSPI::TFTSoftSPI (uint8_t *sdo,* uint8_t *sck,* uint8_t *cs,* uint8_t *dc*)

Create a new software SPI communicator

This constructor takes 4 IO pins and creates a uni-directional (write-only) software SPI channel. The pins required are Serial Data Out (sdo), Serial Clock (sck), Chip Select (cs) and Data/Command (dc).

Example:

```
TFTSoftSPI mySPI(4, 5, 6, 7);
```

4.52.3 Member Function Documentation

4.52.3.1 void TFTSoftSPI::blockData (uint8_t ∗ *data,* uint32_t *len*) [inline], [virtual]

Transfer a block of 8-bit data to the device

Implements TFTCommunicator.

4.52.3.2 void TFTSoftSPI::blockData (uint16_t ∗ *data,* uint32_t *len*) [inline], [virtual]

Transfer a block of 16-bit data to the device

Implements TFTCommunicator.

4.52.3.3 void TFTSoftSPI::blockData (uint32_t ∗ *data,* uint32_t *len*) [inline], [virtual]

Transfer a block of 32-bit data to the device

Implements TFTCommunicator.

4.52.3.4 void TFTSoftSPI::initializeDevice ( ) [inline], [virtual]

Initialize the communication device

Implements TFTCommunicator.

4.52.3.5 uint8_t TFTSoftSPI::nativeWidth ( ) [inline], [virtual]

Returns the real physical width of the data channel

Implements TFTCommunicator.

4.52.3.6 uint16_t TFTSoftSPI::readCommand16 ( ) [inline], [virtual]

Read a 16-bit command from the device

Implements TFTCommunicator.

4.52.3.7 uint32_t TFTSoftSPI::readCommand32 ( ) [inline], [virtual]

Read a 32-bit command from the device

Implements TFTCommunicator.

4.52.3.8 uint8_t TFTSoftSPI::readCommand8 ( ) [inline], [virtual]

Read an 8-bit command from the device

Implements TFTCommunicator.

4.52.3.9 uint16_t TFTSoftSPI::readData16 ( ) [inline], [virtual]

Read 16 bits of data from the device

Implements TFTCommunicator.

4.52.3.10 uint32_t TFTSoftSPI::readData32 ( ) [inline], [virtual]

Read 32 bits of data from the device

Implements TFTCommunicator.

4.52.3.11 uint8_t TFTSoftSPI::readData8 ( ) [inline], [virtual]

Read 8 bits of data from the device

Implements TFTCommunicator.

4.52.3.12 void TFTSoftSPI::streamCommand16 (uint16_t *data*) [virtual]

Send a 16-bit command through the stream

Implements TFTCommunicator.

4.52.3.13 uint16_t TFTSoftSPI::streamCommand16 ( ) [inline], [virtual]

Read a 16-bit command through the stream

Implements TFTCommunicator.

4.52.3.14 void TFTSoftSPI::streamCommand32 (uint32_t *data*) [virtual]

Send a 32-bit command through the stream

Implements TFTCommunicator.

4.52.3.15 uint32_t TFTSoftSPI::streamCommand32 ( ) [inline], [virtual]

Read a 32-bit command through the stream

Implements TFTCommunicator.

4.52.3.16 void TFTSoftSPI::streamCommand8 (uint8_t *data*) [virtual]

Send an 8-bit command through the stream

Implements TFTCommunicator.

4.52.3.17 uint8_t TFTSoftSPI::streamCommand8 ( ) [inline], [virtual]

Read an 8-bit command through the stream

Implements TFTCommunicator.

4.52.3.18 void TFTSoftSPI::streamData16 (uint16_t *data*) [virtual]

Send 16-bits of data through the stream

Implements TFTCommunicator.

4.52.3.19 uint16_t TFTSoftSPI::streamData16 ( ) [inline], [virtual]

Read 16 bits of data through the stream

Implements TFTCommunicator.

4.52.3.20 void TFTSoftSPI::streamData32 (uint32_t *data*) [virtual]

Send 32-bits of data through the stream

Implements TFTCommunicator.

4.52.3.21 uint32_t TFTSoftSPI::streamData32 ( ) [inline], [virtual]

Read 32 bits of data through the stream

Implements TFTCommunicator.

4.52.3.22 void TFTSoftSPI::streamData8 (uint8_t *data*) [virtual]

Send 8-bits of data through the stream

Implements TFTCommunicator.

4.52.3.23 uint8_t TFTSoftSPI::streamData8 ( ) [inline], [virtual]

Read 8 bits of data through the stream

Implements TFTCommunicator.

4.52.3.24 void TFTSoftSPI::streamEnd ( ) [virtual]

Close the currently open stream

Implements TFTCommunicator.

4.52.3.25 void TFTSoftSPI::streamStart ( ) [virtual]

Open a stream to the device endpoint

Implements TFTCommunicator.

4.52.3.26 void TFTSoftSPI::writeCommand16 (uint16_t *command*) [virtual]

Write a 16-bit command to the device

Implements TFTCommunicator.

4.52.3.27 void TFTSoftSPI::writeCommand32 (uint32_t *command*) [virtual]

Write a 32-bit command to the device

Implements TFTCommunicator.

4.52.3.28 void TFTSoftSPI::writeCommand8 (uint8_t *command*) [virtual]

Write an 8-bit command to the device

Implements TFTCommunicator.

4.52.3.29 void TFTSoftSPI::writeData16 (uint16_t *data*) [virtual]

Write 16 bits of data to the device

Implements TFTCommunicator.

4.52.3.30 void TFTSoftSPI::writeData32 (uint32_t *data*) [virtual]

Write 32 bits of data to the device

Implements TFTCommunicator.

4.52.3.31 void TFTSoftSPI::writeData8 (uint8_t *data*) [virtual]

Write 8 bits of data to the device

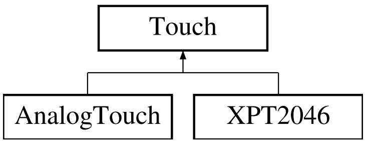
Implements TFTCommunicator.

The documentation for this class was generated from the following files:

- TFTSoftSPI.h
- TFTSoftSPI.cpp

4.53 Touch Class Reference

Inheritance diagram for Touch:



Public Member Functions

- Touch (TFTCommunicator ∗comm, uint16_t w, uint16_t h)
- Touch (TFTCommunicator &comm, uint16_t w, uint16_t h)
- Touch (uint16_t w, uint16_t h)
- virtual void initializeDevice ()=0
- virtual uint16_t x ()=0
- virtual uint16_t y ()=0
- virtual boolean isPressed ()=0
- virtual uint16_t pressure ()
- virtual void setRotation (uint8_t r)
- virtual void sample ()=0

Protected Attributes

- TFTCommunicator ∗ _comm
- uint16_t _width
- uint16_t _height

4.53.1 Constructor & Destructor Documentation

4.53.1.1 Touch::Touch (TFTCommunicator ∗ *comm*, uint16_t *w*, uint16_t *h*) [inline]

Create a new touch screen object

This takes a pointer to a communication device, and the width and height of the touch screen.

4.53.1.2 Touch::Touch (TFTCommunicator & *comm*, uint16_t *w*, uint16_t *h*) [inline]

Create a new touch screen object

This takes a reference to a communication device, and the width and height of the touch screen.

4.53.1.3 Touch::Touch (uint16_t *w*, uint16_t *h*) [inline]

Create a new touch screen object

This creates a new controller-less touch device.

4.53.2 Member Function Documentation

4.53.2.1 virtual void Touch::initializeDevice ( ) [pure virtual]

Initialize the device

This configures and enables the touch screen device. It should be called before any other touch screen functions.

Implemented in XPT2046, and AnalogTouch.

4.53.2.2 virtual boolean Touch::isPressed ( ) [pure virtual]

Get pressed status

Returns true if the touch screen is pressed, false otherwise.

Implemented in XPT2046, and AnalogTouch.

4.53.2.3 virtual uint16_t Touch::pressure ( ) [inline], [virtual]

Calculate the touch pressure

For touch screens that can calculate how hard you are pressing them, this returns the pressure value. For others it returns 0.

Example:

```
int pressure = ts.pressure();
```

Reimplemented in AnalogTouch.

4.53.2.4 virtual void Touch::sample ( ) [pure virtual]

Sample the touch screen

This performs a sampling of the touch screen to get the current coordinates and touch status. It should be called regularly to update the current touch screen data.

Implemented in XPT2046, and AnalogTouch.

4.53.2.5 virtual void Touch::setRotation (uint8_t *r*) [virtual]

Set rotation

This sets the screen orientation of the touch screen. It should be set to the same as the rotation used for the screen.

Reimplemented in XPT2046, and AnalogTouch.

4.53.2.6 virtual uint16_t Touch::x ( ) [pure virtual]

Get X coordinate

This returns the X coordinate of the current touch position.

Implemented in XPT2046, and AnalogTouch.

4.53.2.7 virtual uint16_t Touch::y ( ) [pure virtual]

Get Y coordinate

This returns the Y coordinate of the current touch position.

Implemented in XPT2046, and AnalogTouch.

4.53.3 Member Data Documentation

4.53.3.1 TFTCommunicator∗ Touch::_comm [protected]

The communication device used to communicate with the touch screen controller (if any)

4.53.3.2 uint16_t Touch::_height [protected]

The height of the touch screen in pixels

4.53.3.3 uint16_t Touch::_width [protected]

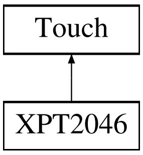
The width of the toush screen in pixels

The documentation for this class was generated from the following file:

- Touch.h

4.54 XPT2046 Class Reference

Inheritance diagram for XPT2046:



Public Member Functions

- void sample ()
- uint16_t x ()
- uint16_t y ()
- boolean isPressed ()
- void initializeDevice ()
- void setRotation (uint8_t r)

- XPT2046 (TFTCommunicator ∗comm, uint16_t w, uint16_t h)
- **XPT2046** (TFTCommunicator &comm, uint16_t w, uint16_t h)

Additional Inherited Members

4.54.1 Constructor & Destructor Documentation

4.54.1.1 XPT2046::XPT2046 (**TFTCommunicator** ∗ *comm*, uint16_t *w*, uint16_t *h*) [inline]

Create a new **XPT2046** object

This creates a new XPT2046 touchscreen object. It requires an SPI compatible TFTCommunicator driver to be passed either as a pointer or as a reference. It also requires the width and height (natural orientation) of the touch screen.

Example:

```
XPT2046 ts(spiDev, 240, 320);
```

4.54.2 Member Function Documentation

4.54.2.1 void XPT2046::initializeDevice ( ) [virtual]

Initialize the device

This configures and enables the touch screen device. It should be called before any other touch screen functions.

Implements Touch.

4.54.2.2 boolean XPT2046::isPressed ( ) [virtual]

Get pressed status

Returns true if the touch screen is pressed, false otherwise.

Implements Touch.

4.54.2.3 void XPT2046::sample ( ) [virtual]

Sample the touch screen

This performs a sampling of the touch screen to get the current coordinates and touch status. It should be called regularly to update the current touch screen data.

Implements Touch.

4.54.2.4 void XPT2046::setRotation (uint8_t *r*) [virtual]

Set rotation

This sets the screen orientation of the touch screen. It should be set to the same as the rotation used for the screen.

Reimplemented from Touch.

4.54.2.5 uint16_t XPT2046::x ( ) [virtual]

Get X coordinate

This returns the X coordinate of the current touch position.

Implements Touch.

4.54.2.6 uint16_t XPT2046::y ( ) [virtual]

Get Y coordinate

This returns the Y coordinate of the current touch position.

Implements Touch.

The documentation for this class was generated from the following files:

- XPT2046.h
- XPT2046.cpp

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