DATASHEET

4D SYSTEMS

TURNING TECHNOLOGY INTO ART

4D Raspberry Pi 2.2” SPI Shield

4DPi-22-SPI

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Contents

1. Description

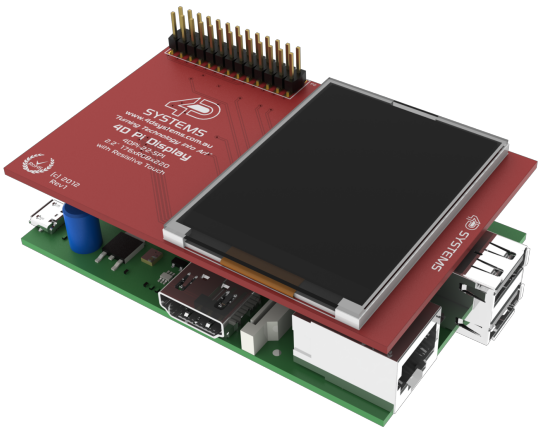
The 4DPi-22-SPI provides an easy way of connecting a display up to your Raspberry Pi project, and in a simple 'shield' format.

The shield features a 176 x 220 LCD-TFT display with a SPI interface to the Raspberry Pi, which includes a 4-wire resistive touch screen, with an I^2C resistive touch controller.

The communication interface between the 4DPi-22-SPI and the Raspberry Pi is a combination of the SPI bus, the I^2C bus, and 5 digital I/O.

The 4DPi-22-SPI also features a 4D Expansion Module Socket, which is I^2C based, used to connect small 4D System modules for the Raspberry Pi, such as a Real Time Clock (RTC). This is located on the bottom of the PCB.

Both the TX and RX signals are unused, so these can be used with other devices in your Raspberry Pi project.



4DPi-22-SPI Raspberry Pi Shield on a Raspberry Pi

2. Features

- Powered from the Raspberry Pi board, uses the 5V supply pin.
- 176 x 220 resolution, 262K true to life colours, LCD-TFT screen with SPI Interface, and resistive 4-wire touch screen.
- 2.2" diagonal size, Viewing Area: 49.4mm x 36.7mm.
- LED back lighting with greater than 150° viewing angle.
- 4D Expansion module for adding optional modules, such as a 4D Real Time Clock module.
- Male and Female connectors are provided, allowing a 'pass through' for all Raspberry Pi signals, so the signals are easily accessible even when this shield is connected to the Raspberry Pi.
- RoHS Compliant.

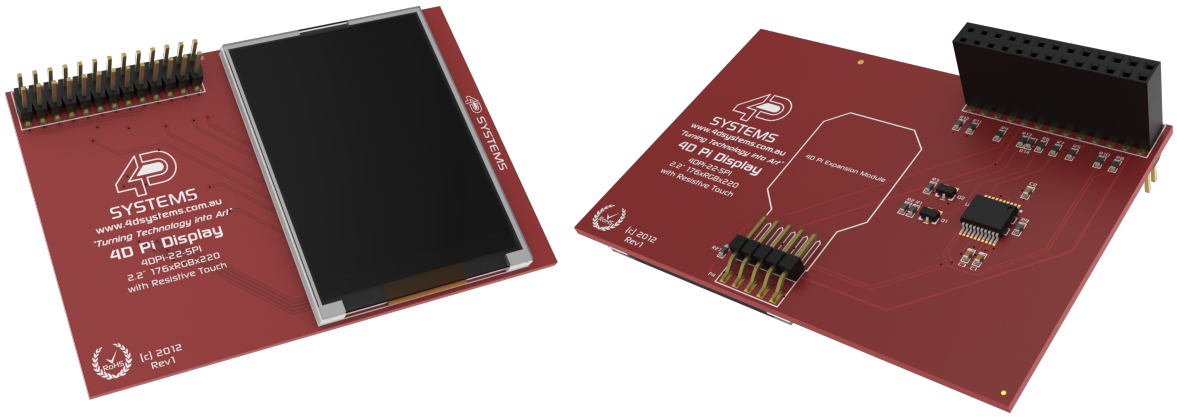
4DPi-22-SPI Underside

3. Hardware Description

3.1. 4DPi-22-SPI Raspberry Pi Shield

The 4DPi-22-SPI is a Raspberry Pi Shield featuring a 2.2" LCD-TFT display with resistive touch screen.
The 4DPi-22-SPI provides a SPI interface to the Raspberry Pi platform, allowing a fast communication bus to the Raspberry Pi. It also utilises the Raspberry Pi's I2C bus, and 5 digital I/O.

4D Systems has a simple library to get you started using this Shield, which includes an example sketch that demo's the key attributes of the library.



Numbering/Naming of the Raspberry Pi pins in this document are done using the Rev1.0 Signal Names. A full listing of the various methods of naming can be found on this website, http://elinux.org/RPi_BCM2835_GPIOs

- The shield utilises the SPI bus connected to the Raspberry Pi, which are MOSI pin **SPI_MOSI**, MISO pin **SPI_MISO** and SCK pin **SPI_SCLK**.
- The display on the 4DPi-22-SPI requires an SPI Select pin, which is on pin **SPI_CE0_N**.
- The display utilises an RS pin for selecting if data is written or if a command is written the display, utilising pin **GPIO_GEN1**.
- There is also a display Reset pin which utilises pin **GPIO_GEN3**.
- The control of the LCD Backlight is done with pin **GPIO_GEN2**, which can have PWM applied to it if desired to adjust the brightness of the display.
- The 4D Pi Expansion Module utilises the I2C bus, **SDA0** and **SCL0**, shared with the Resistive Touch Controller. There is also an additional GPIO pin **GPIO_GEN4** reserved for an output from the Expansion Module. In the case of the RTC, this is an alarm indicator.
- The 4-wire Resistive Touch utilises the I2C bus, **SDA0** and **SCL0**, shared with the 4D Pi Expansion Module, but also utilises pin **GPIO_GEN0** to drive an interrupt for touch events.

4. Library Overview

4.1. Library Functions

The following are functions made available to the Raspberry Pi using the 4D Systems Library. Please see the website to download this library, www.4dsystems.com.au

begin()
Initialise the display

---

clear()
Clears the display

---

invert(flag)
Inverts the display.
Parameters:
Flag = true to invert, false for normal.

---

setBacklight(flag)
Turns the backlight on or off.
Parameters:
flag = true for on, false for off.

---

setDisplay(flag)
Turns the display on or off.
Parameters:
flag = true for on, false for off.

---

setOrientation(orientation)
Sets the orientation of the display.
Parameters:
orientation = 0 Portrait, 1 Right Rotated Landscape, 2 Reverse Portrait, 3 Left Rotated Landscape.

---

uint16_t getOrientation()
Gets the current orientation of the display.
Returns:
0 = Portrait
1 = Right Rotated Landscape
2 = Reverse Portrait
3 = Left Rotated Landscape.

---

uint16_t fontX()
Gets the font size, x-axis.
Returns:
Horizontal size of current font, in pixels

---

uint16_t fontY()
Gets the font size, y-axis.
Returns:
Vertical size of current font, in pixels

---

uint16_t maxX()
Gets the size of the screen, x-axis.
Returns:
Horozontal size of the screen, in pixels.
Note: 128 means 128 pixels and thus 0..127 coordinates (decimal)

---

uint16_t maxY()
Gets the size of the screen, y-axis.
Returns:
Vertical size of the screen, in pixels.
Note: 160 means 160 pixels and thus 0..159 coordinates (decimal)

---

circle(x0, y0, radius, colour)
Draws a circle from x0, y0 center with specified radius and colour.
Parameters:
x0 = x-axis centre
y0 = y-axis centre
radius = radius of circle in pixels
colour = 16 bit colour

---

solidCircle(x0, y0, radius, colour)
Draws a solid circle from x0, y0 center with specified radius and colour.
Parameters:
x0 = x-axis centre
y0 = y-axis centre
radius = radius of circle in pixels
colour = 16 bit colour

---

setBackGroundColour(colour)
Sets the background colour of the display, default is Black.
Parameters:
colour = 16 bit colour

---

line(x1, y1, x2, y2, colour)
Draws a line from x1, y1 to x2, y2 with specified colour.
Parameters:
x1 = x-axis start pixel
y1 = y-axis start pixel
x2 = x-axis end pixel
y2 = y-axis end pixel
colour = 16 bit colour

---

rectangle(x1, y1, x2, y2, colour)
Draws a rectangle from x1, y1 to x2, y2 with specified colour.
Parameters:
x1 = x-axis start pixel
y1 = y-axis start pixel
x2 = x-axis end pixel
y2 = y-axis end pixel
colour = 16 bit colour

---

solidRectangle(x1, y1, x2, y2, colour)
Draws a solid rectangle from x1, y1 to x2, y2 with specified colour.
Parameters:
x1 = x-axis start pixel
y1 = y-axis start pixel
x2 = x-axis end pixel
y2 = y-axis end pixel
colour = 16 bit colour

---

point(x1, y1, colour)
Draws a pixel at from x1, y1 with specified colour.
Parameters:
x1 = x-axis pixel
y1 = y-axis pixel
colour = 16 bit colour

---

text(x0, y0, string, textColour, backColour, x-multiplier, y-multiplier)
Draw ASCII Text at the pixel coordinates with set colours and size.
Parameters:
x0 = x-axis pixel
y0 = y-axis pixel
string = text string
textColour = 16 bit colour of Text
backColour = 16 bit colour of background
x-multiplier = multiplier of x-axis text (default=1)
y-multiplier = multiplier of y-axis text (default=1)

---

boolean getTouch(x, y)
Gets touch activity and coordinates.
Parameters:
x = x-axis coordinate
y = y-axis coordinate
Note: x and y coordinates are consistent with the orientation
Returns:
true = pressed
false = otherwise

---

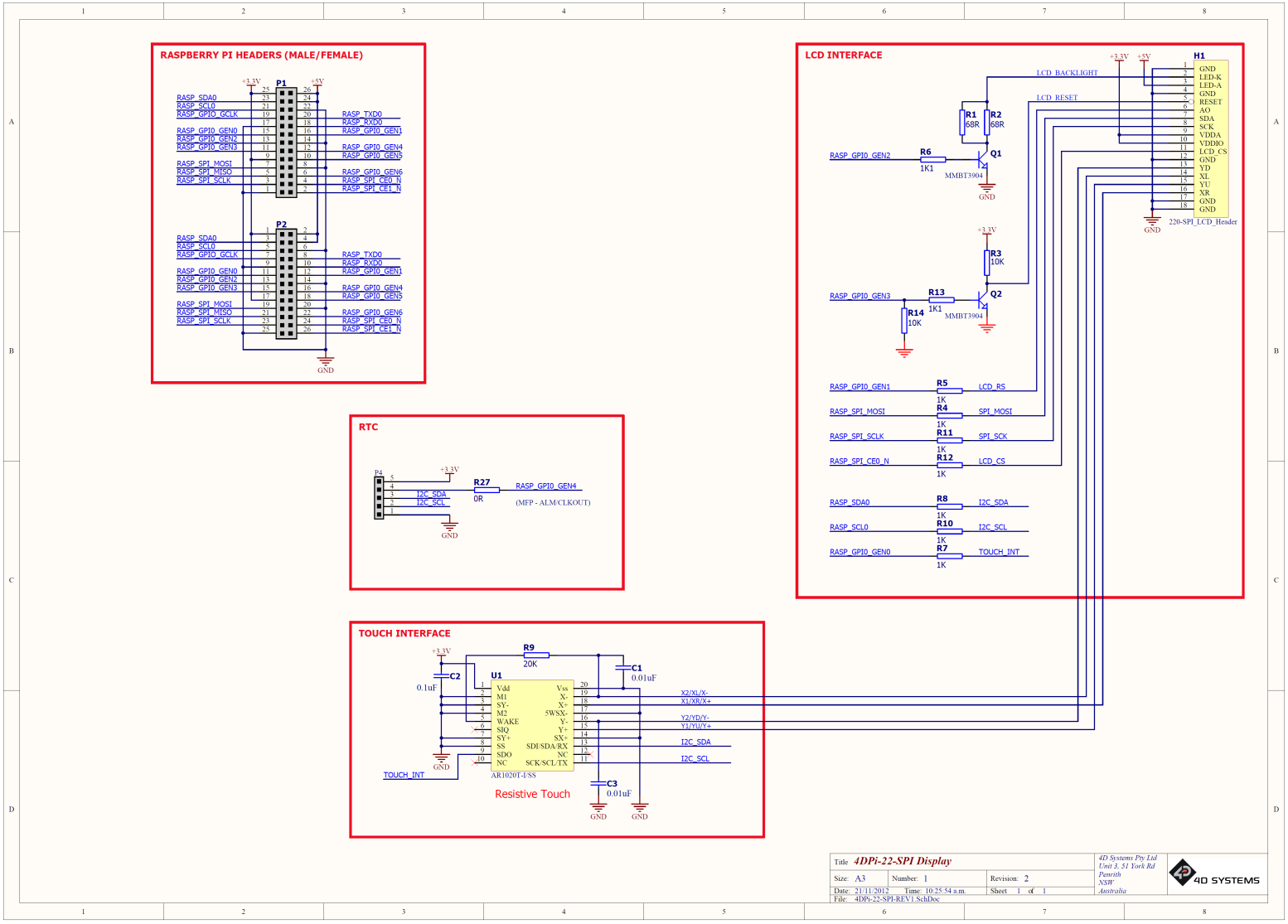
uint16_t setColour(red, green, blue)
Calculates the 16-bit colour from 8-bit Red-Green-Blue components
Parameters:
red = 0x00..0xff Red Component
green = 0x00..0xff Green Component
blue = 0x00..0xff Blue Component
Returns:
16 bit colour

---

splitcolour(rgb, red, green, blue)
Calculate the 8-bit Red-Green-Blue components from a 16-bit colour
Parameters:
rgb = 16-bit colour
red = 0x00..0xff Red Component
green = 0x00..0xff Green Component
blue = 0x00..0xff Blue Component

Please refer to the actual library for more detail regarding these functions, available for download from the 4D Systems website, www.4dsystems.com.au

5. Schematic Design



6. Specifications and Ratings

RECOMMENDED OPERATING CONDITIONS					
Parameter	**Conditions**	**Min**	**Typ**	**Max**	**Units**
Supply Voltage (VCC)		4.5	--	5.5	V
Operating Temperature		-10	--	+65	°C

ORDERING INFORMATION

Order Codes:

- 4DPi-22-SPI

Package: 105mm x 65mm x 30mm

Packaging: Module sealed in antistatic foam padded 4D Systems Box

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