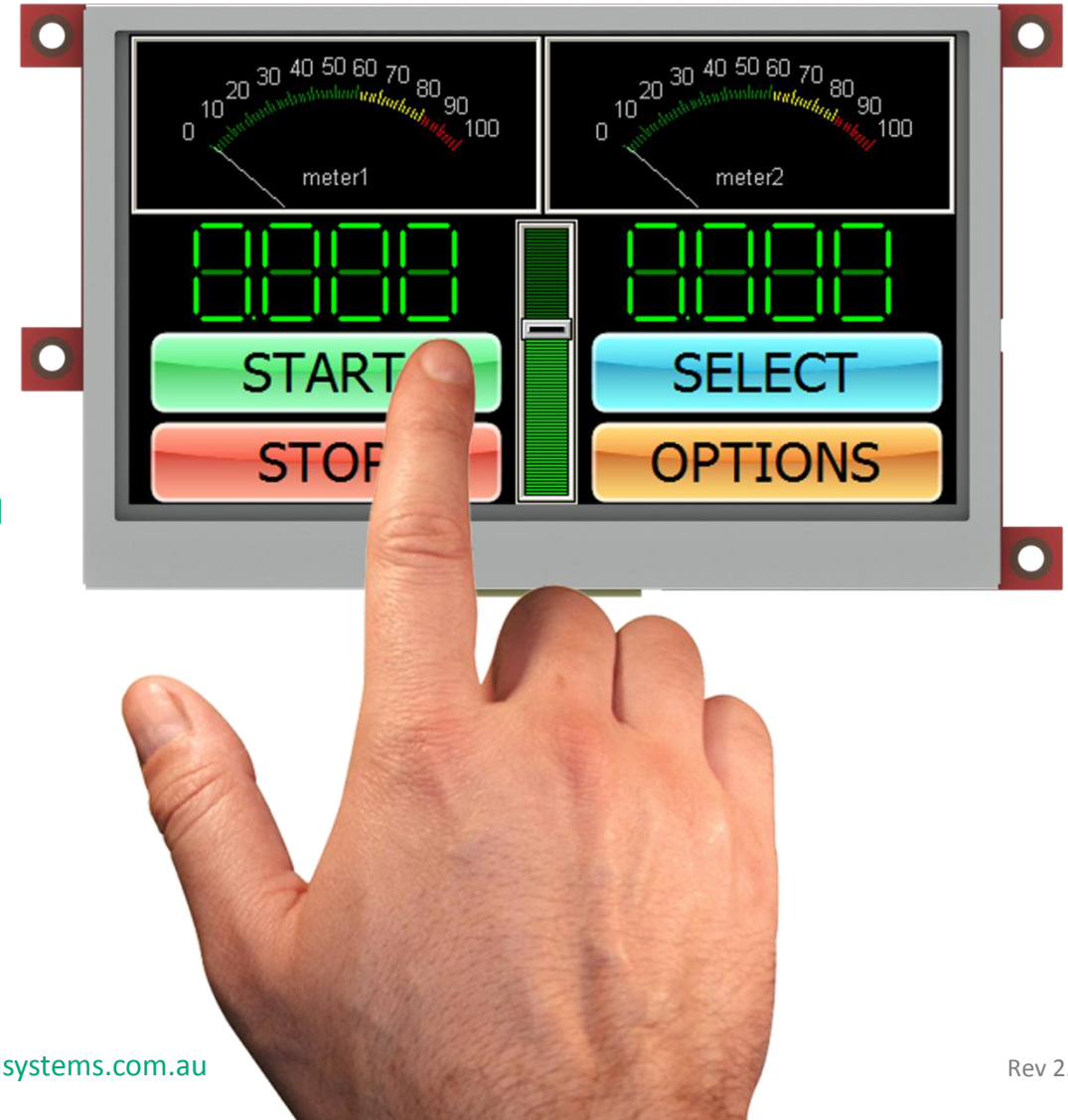
Product Brief

4DGL
Graphics Platform

µLCD43(GFX)

Intelligent 4.3’’ display module embedded with the PICASO-GFX2 processor



4D Systems

MESSAGE FROM THE CEO

To our valued customers,

Thank you for your interest in 4D Systems and the products we have to offer.

We are constantly looking for ways to improve our customer experience and it is hoped that a Product Brief such as this, can instil confidence in choosing 4D Systems as your supplier of superior embedded electronic products.

We invite you to showcase our latest release and thank you again for your continued support.

Atilla Aknar
Founder & CEO

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1. Overview of the µLCD43(GFX)

The **µLCD43(GFX)** is an intelligent graphics display that harnesses the power to deliver a diverse range of features in a single, compact cost effective unit. Embedded at the heart of the design is the **PICASO-GFX2** processor, which is driven by a highly optimised virtual core engine; EVE (Extensible Virtual Engine). An extensive range of hardware and software peripherals have been integrated into the design, to give the user freedom to adapt the module to suit almost any application. Features include; a **4.3'' TFT 480x272 touch screen** display, audio, micro-SD card connector, an expansion port along with a series of GPIO, I2C pins and serial comms. The µLCD43(GFX) serves as the perfect solution to be deployed at the forefront of any product design, requiring a brilliance of colour, animation or images on a 4.3'' widescreen display.

Users have the option between either a display module only, a 4-Wire Resistive Touch, or Capacitive Touch panel:

- **µLCD-43P(GFX)** – No Touch
- **µLCD-43PT(GFX)** – 4-Wire Resistive Touch (least sensitive; best used with stylus touch)
- **µLCD-43PCT(GFX)** – Capacitive Touch (most sensitive; best used with finger touch)

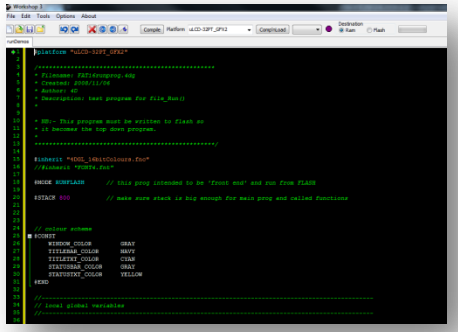
2. Getting Started

Essential items you'll need

01 4D Programming Cable

02 Windows Based PC

03 micro-SD Card & SD Adaptor



04 4D Workshop3 IDE Software Tool

3. Module Features

01 4.3'' TFT LCD Touch Screen

02 480x272 Resolution with 65K True to Life Colours

03 PICASO-GFX2 Processor

04 14KB FLASH Memory, 14KB RAM

05 2 x UART Serial ports

06 1 x I2C Bus

07 13 x GPIO

08 8 x 16 bit timer with 1ms resolution

09 2 x 5 Pin Serial Programming Interface

10 2 x 15 pin Header for Expansion

11 1.2W Audio Amplifier with Speaker

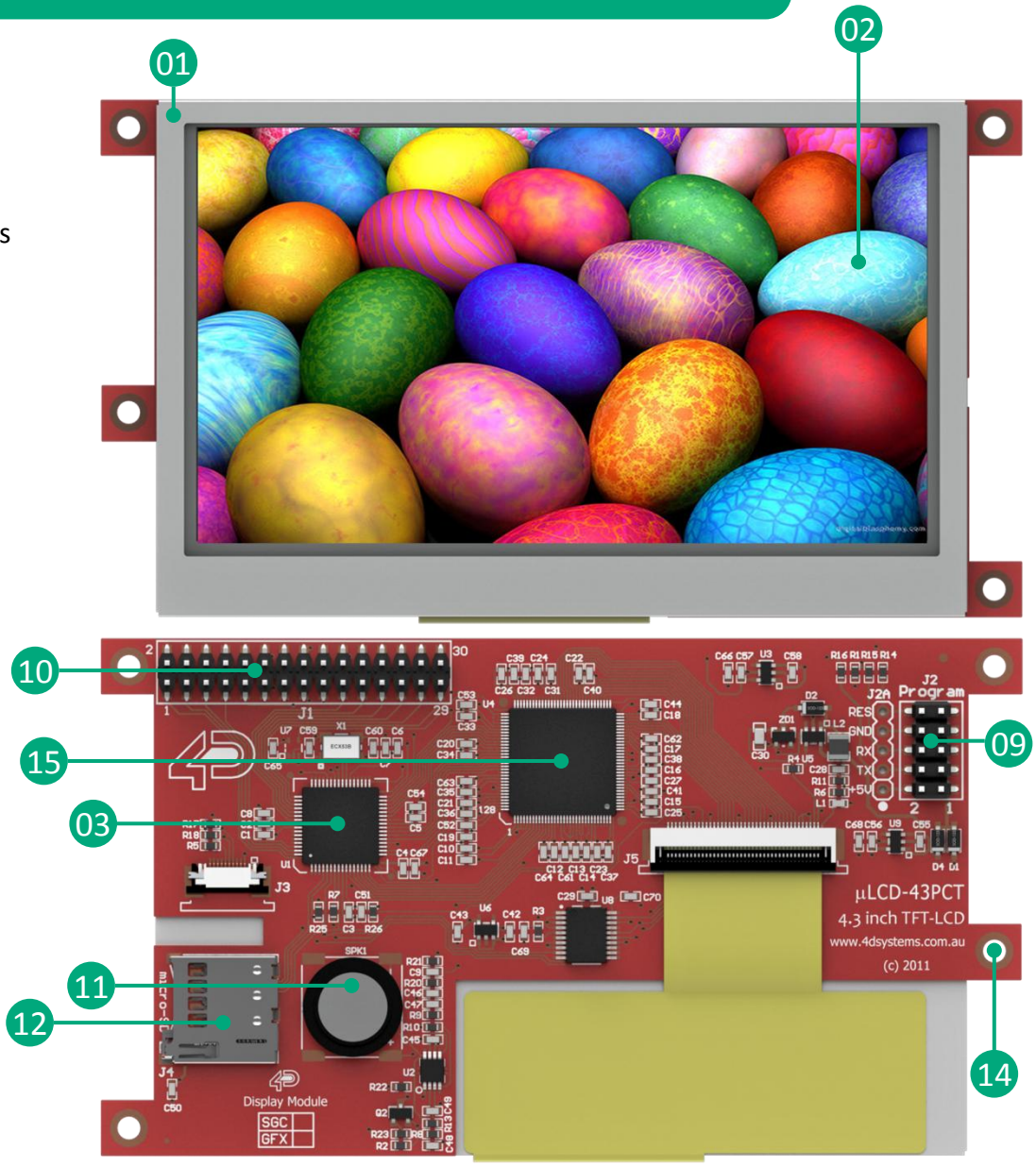
12 micro-SD Card Slot

13 DOS compatible file access (FAT16)

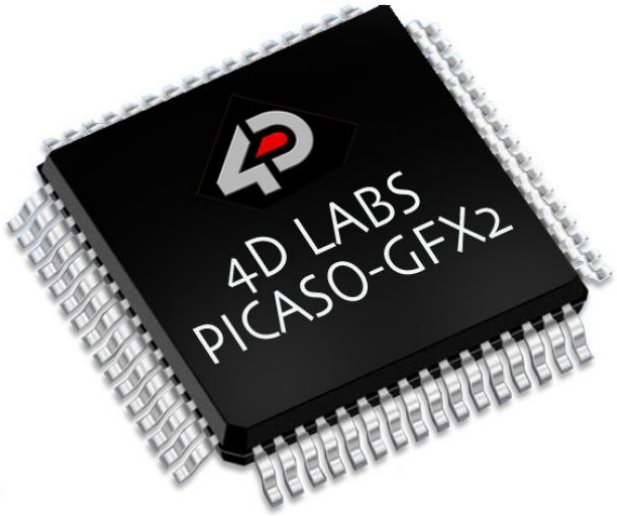
14 4 x Mounting tabs with 3mm holes

15 Solomon Display Driver IC

16 Light weight at only ~79g

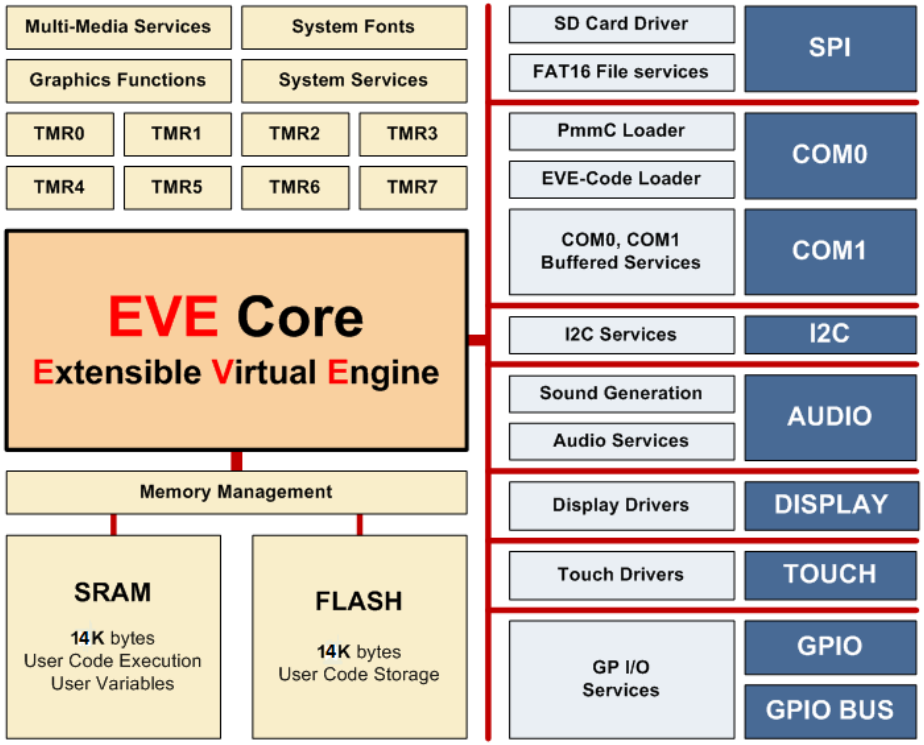


4. PICASO-GFX2 Processor



At the core of the **µLCD43(GFX)** design lies the **PICASO-GFX2** Processor. It has an array of dedicated graphics controls, supported by an ample supply of integrated peripherals

- 14KB FLASH
- 14KB RAM
- 13 x GPIO
- I2C Interface
- 2 x UART Ports
- 8x 16 bit timers with 1ms resolution
- Audio
- 4-Wire Resistive Touch Interface
- Display Control
- SPI Interface to micro-SD



5. 4DGL Language

The PICASO-GFX2 belongs to a family of processors powered by a highly optimised soft core virtual engine, **EVE** (Extensible Virtual Engine). EVE is a proprietary, high performance virtual processor with an extensive byte-code instruction set, optimised to execute compiled 4DGL programs. **4DGL** (4D Graphics Language) was specifically developed from ground up for the EVE engine core. It is a high level language which is easy to learn and simple to understand, yet powerful enough to tackle many embedded graphics applications.

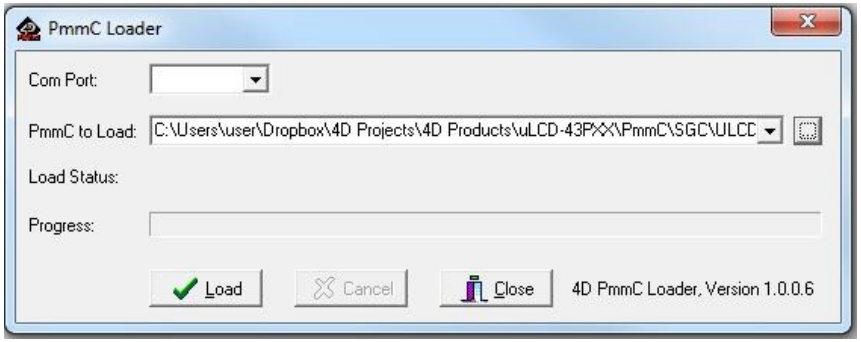
4DGL is a graphics oriented language allowing rapid application development. The syntax structure was designed using elements of popular languages such as C, Basic and Pascal. Programmers familiar with these languages will feel comfortable with 4DGL. It includes many familiar instructions such as IF..ELSE..ENDIF, WHILE..WEND, REPEAT..UNTIL, GOSUB..ENDSUB, GOTO, PRINT as well as some specialised instructions SERIN, SEROUT, GFX_LINE, GFX_CIRCLE and many more.

Connect a 4D Programming Cable to **COM0** to download your 4DGL application onto the µLCD43(GFX)


```
/************************************************
* Filename: simpledraw.4dg
* Created: 27/10/2011
* Updated 27/10/2011
* Author: 4D team
* Description: Touch Screen Example
* Example : Freehand Drawing
************************************************/

func main()
  var firstx, firsty, x, y, state;

  gfx_MoveTo(20,20);
  print("DRAW.....");

  touch_Set(TOUCH_ENABLE);                    // enable the touch screen

  repeat
    state := touch_Get(TOUCH_STATUS);           // look for any touch activity
    x := touch_Get(TOUCH_GETX);                 // grab the x
    y := touch_Get(TOUCH_GETY);                 // and the y coordinates of the touch
    if(state == TOUCH_PRESSED)                  // if there's a press
      firstx := x;
      firsty := y;
    endif


    if(state == TOUCH_MOVING)                   // if there's movement
       gfx_Line(firstx, firsty, x, y, LIGHTGREEN);    // draw lines between points
      firstx := x;
      firsty := y;
    endif
  forever                     // and we'll hang around doing it all day long

endfunc
```

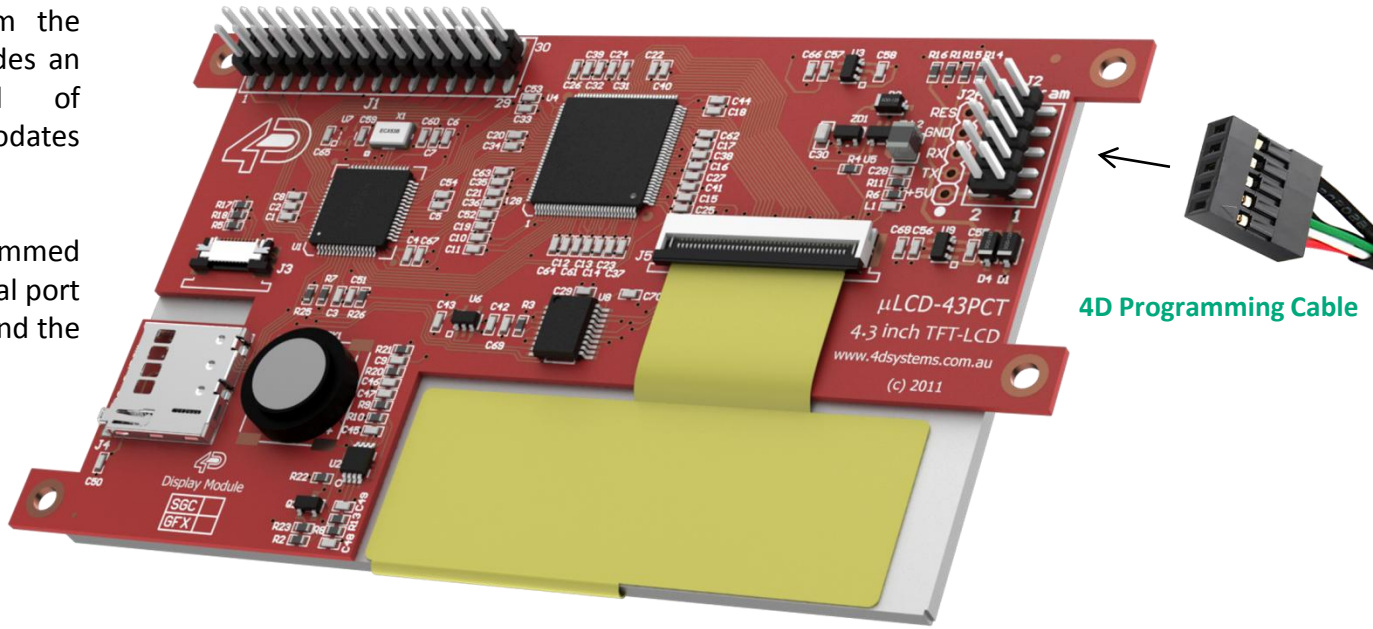
6. PmmC Programming

The **PICASO-GFX2** used in the **µLCD43(GFX)**, is a custom graphics controller. All functionality, including the high level commands are built into the chip. This chip level configuration is available as a **PmmC** (Personality-module-micro-Code) file.



A PmmC file contains all of the low level micro-code information, which defines the characteristics of the device. The ability to program the device with a PmmC file, provides an extremely flexible method of customisation, which accommodates for future upgrades.

A PmmC file can only be programmed into the device via its COM0 serial port using a 4D Programming Cable and the "PmmC Loader" Software Tool.



7. 4.3’’ TFT Display

The **µLCD43(GFX)** has a widescreen **4.3’’** TFT display at the forefront of the design, that exhibits the power and capabilities of the PICASO-GFX2 processor. Combining a resolution of **480x272** pixels with **65K** True to Life colours, the µLCD43(GFX) delivers an astounding plethora of colours, perfect for animations, slideshows and other multimedia presentations. Users have the option between a Non Touch display, a 4-Wire Resistive Touch, or Capacitive Touch panel:

- **µLCD-43P(GFX)** – Non Touch
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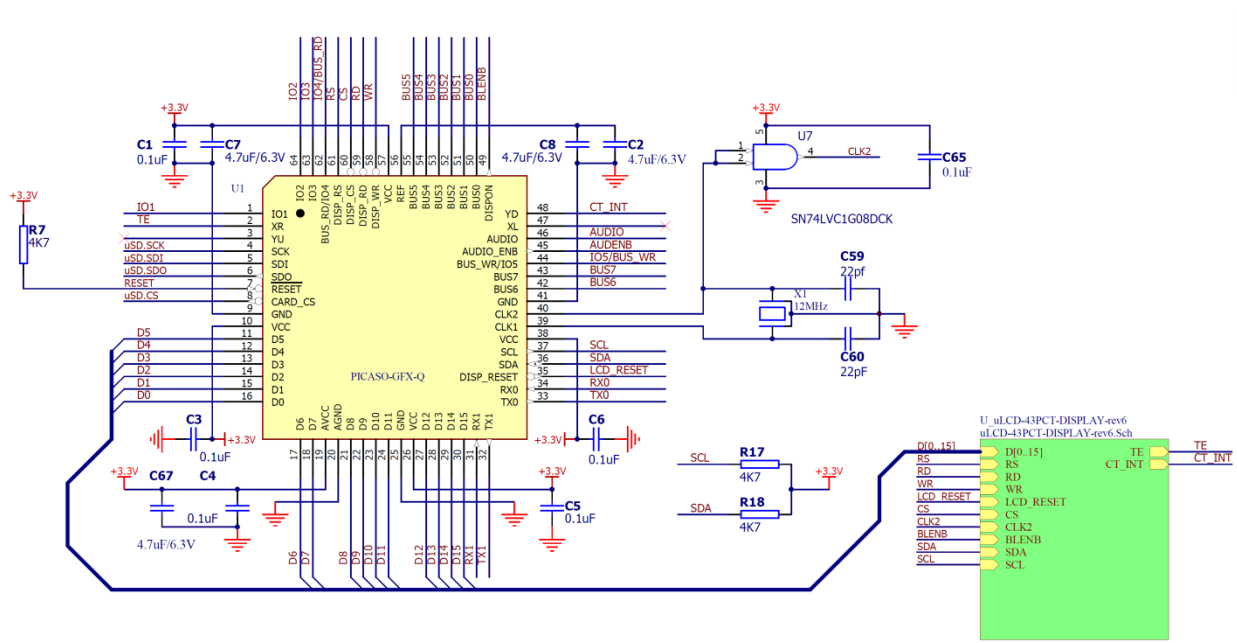
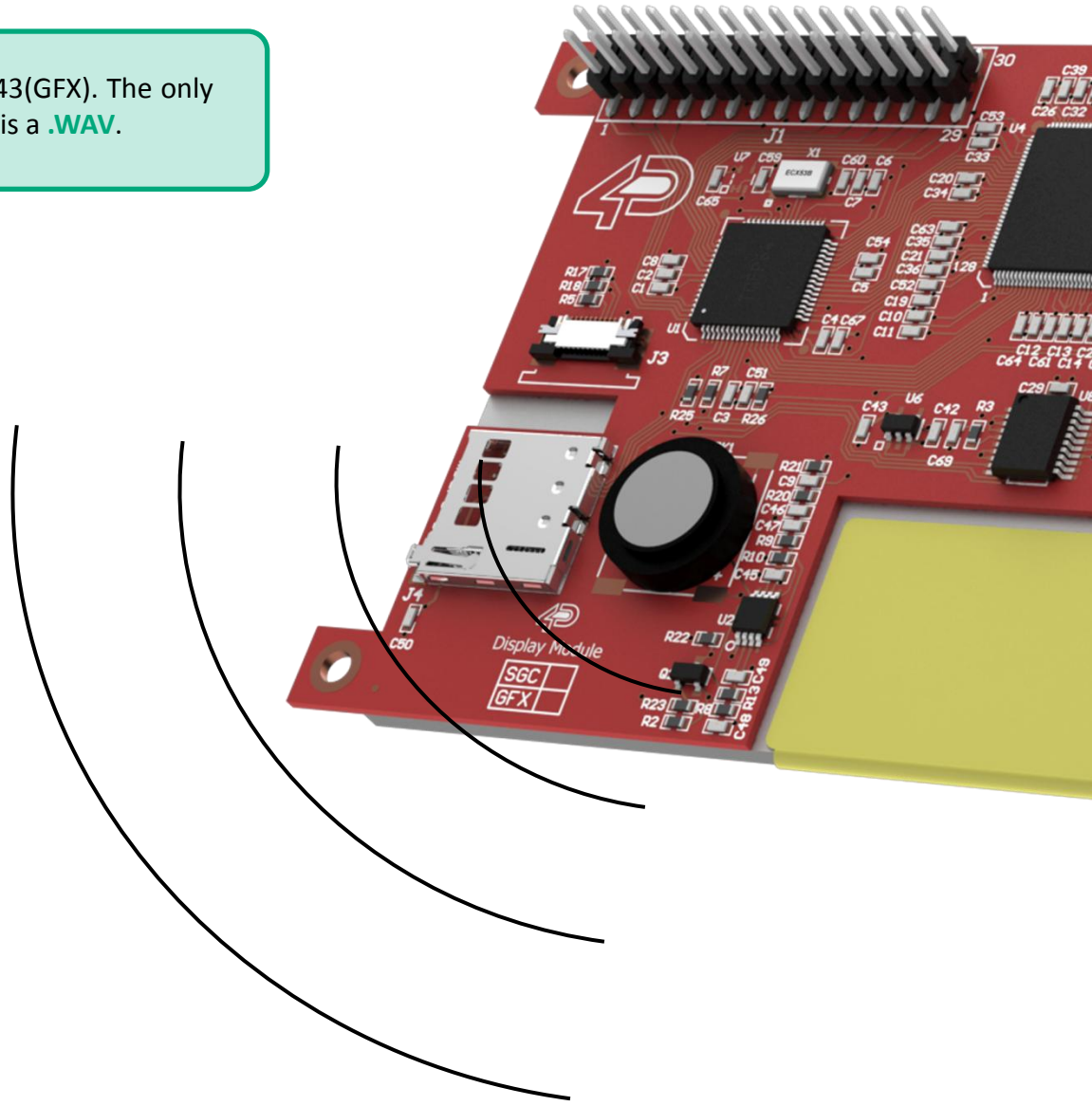


8. Audio

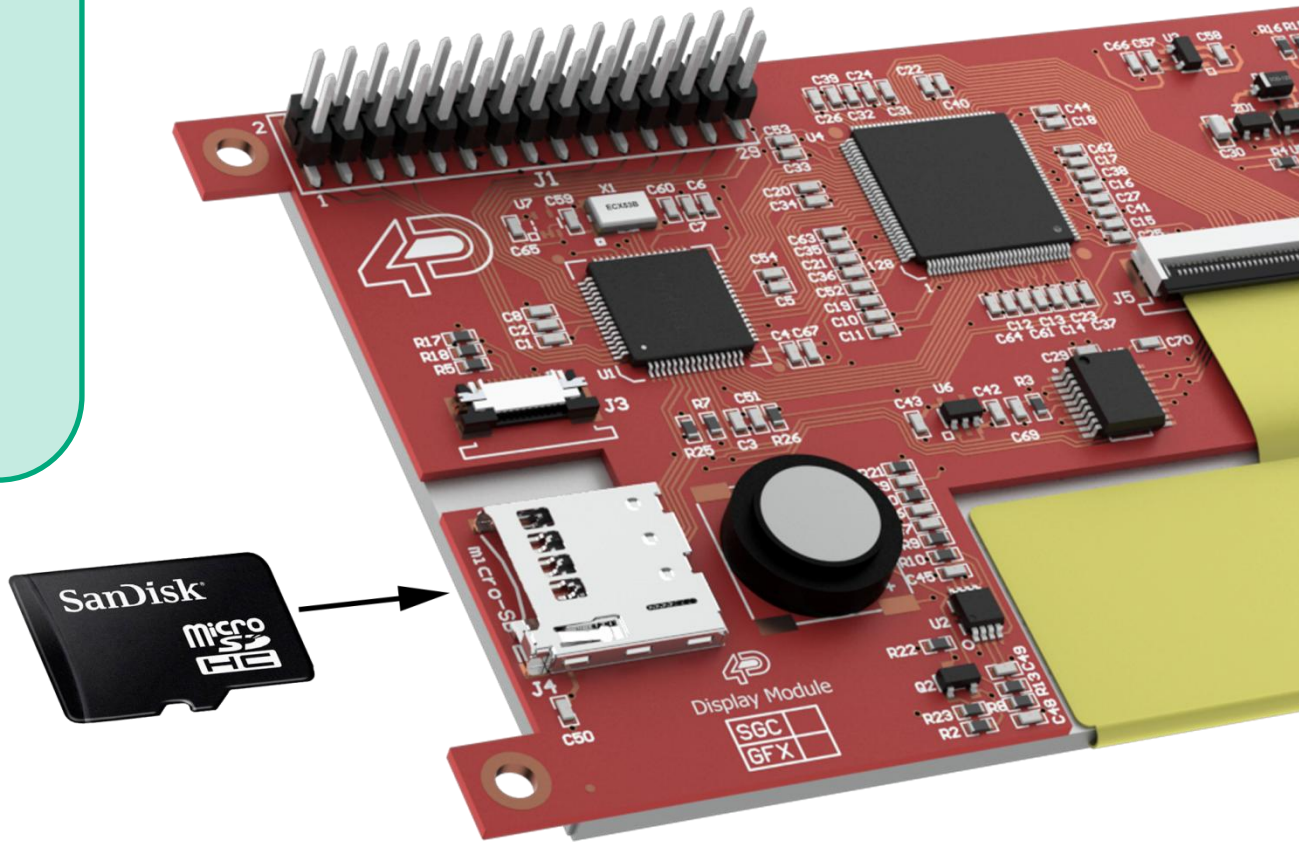
Not all file formats are compatible with the µLCD43(GFX). The only format available for playback on the µLCD43(GFX) is a **.WAV**.

Audio support provided on the **µLCD43(GFX)**, is supplied by the PICASO-GFX2 processor, an onboard audio amplifier and 8Ω speaker. This is undertaken via a **PWM** signal (pulse-width-modulated) that ensures a better sound quality, with a volume range of 8 to 127. A simple instruction empowers the user to execute the audio files, which can be carried out simultaneously with other instructions.



9. micro-SD Card Slot

A **micro-SD** card slot is mounted on the rear right hand side of the µLCD43(GFX). This provides the user with expandable memory space, suitable for all multimedia file retrieval; such as images, animations and movie clips, as well as data logging applications. FAT16 file formats are supported with the **micro-SD** card interface, which communicates with the PICASO-GFX2 via its dedicated SPI port

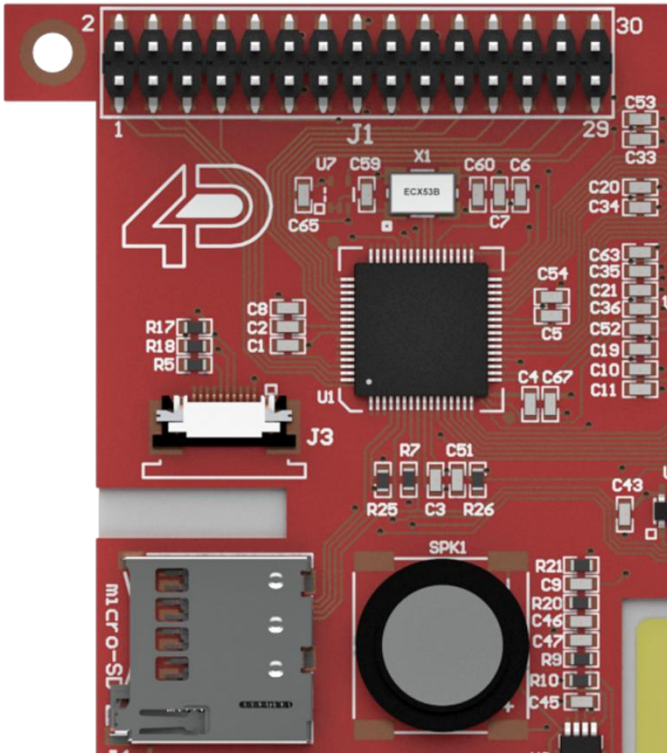


10. Expansion Port

PIN	SYMBOL	I/O	DESCRIPTION
1	IO1	I/O	General Purpose Input Output 1
3	IO2	I/O	General Purpose Input Output 2
4	SCL	O	I2C Clock Output
5	IO3	I/O	General Purpose Input Output 3
6	SDA	I/O	I2C Bi-directional Data
7	IO4/BUS_RD	I/O	General Purpose Input Output 4/Bus Read
9	IO5/BUS_WR	I/O	General Purpose Input Output 5/Bus Write
11	GND	P	Supply Ground
12	VCC	P	Main Voltage Supply; Positive Input pin 4.5V to 5.5V (Nominal 5.0V)
13	GND	P	Supply Ground
15	BUS7	I/O	IO Bus Bit 7 (BUS0..7)
16	RESET	I	Master RESET. Pull this pin low for 2.0µs or longer to Reset the module
17	BUS6	I/O	IO Bus Bit 6 (BUS0..7)
19	BUS5	I/O	IO Bus Bit 5 (BUS0..7)
20	3.3V	P	Regulated 3.3V Output, maximum current output 400mA
21	BUS4	I/O	IO Bus Bit 4 (BUS0..7)
23	BUS3	I/O	IO Bus Bit 3 (BUS0..7)
24	RX0	I	Asynchronous Serial Port 0 Receive Pin (COM0 Rx)
25	BUS2	I/O	IO Bus Bit 2 (BUS0..7)
26	TX0	O	Asynchronous Serial Port 0 Transmit Pin (COM0 Tx)
27	BUS1	I/O	IO Bus Bit 1 (BUS0..7)
28	TX1	O	Asynchronous Serial Port 1 Transmit Pin (COM1 Tx)
29	BUS0	I/O	IO Bus Bit 0 (BUS0..7)
30	RX1	I	Asynchronous Serial Port 1 Receive Pin (COM1 Rx)
NC	NC	--	Unconnected Pins: 2, 8, 10, 14, 18, 22

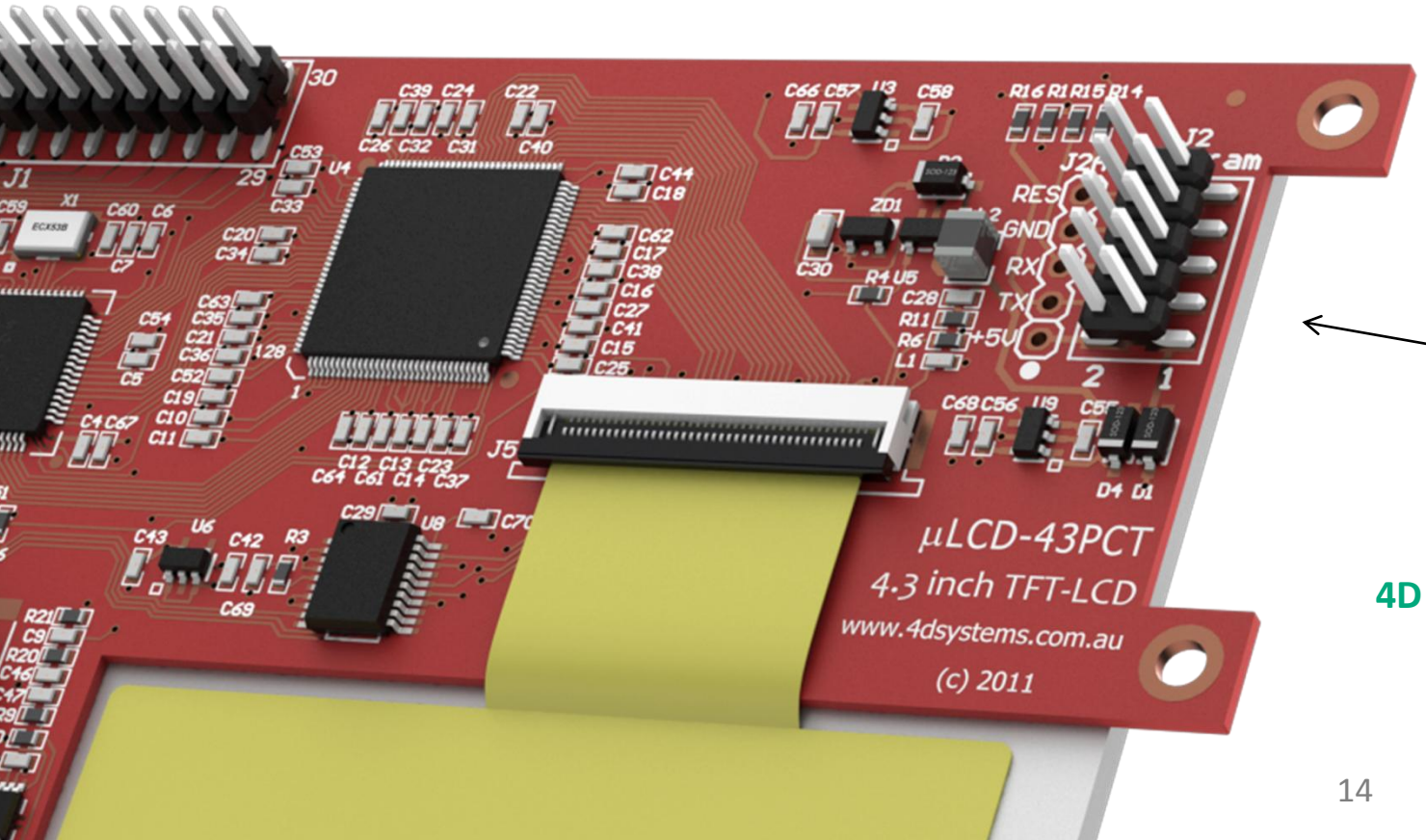
I: Input, O: Output, A: Analogue, P: Power

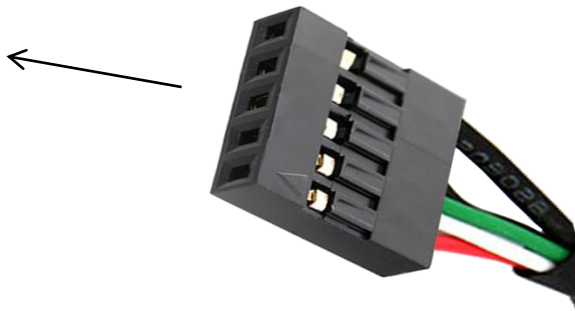
J1 – Expansion Port



11. Powering Your Device

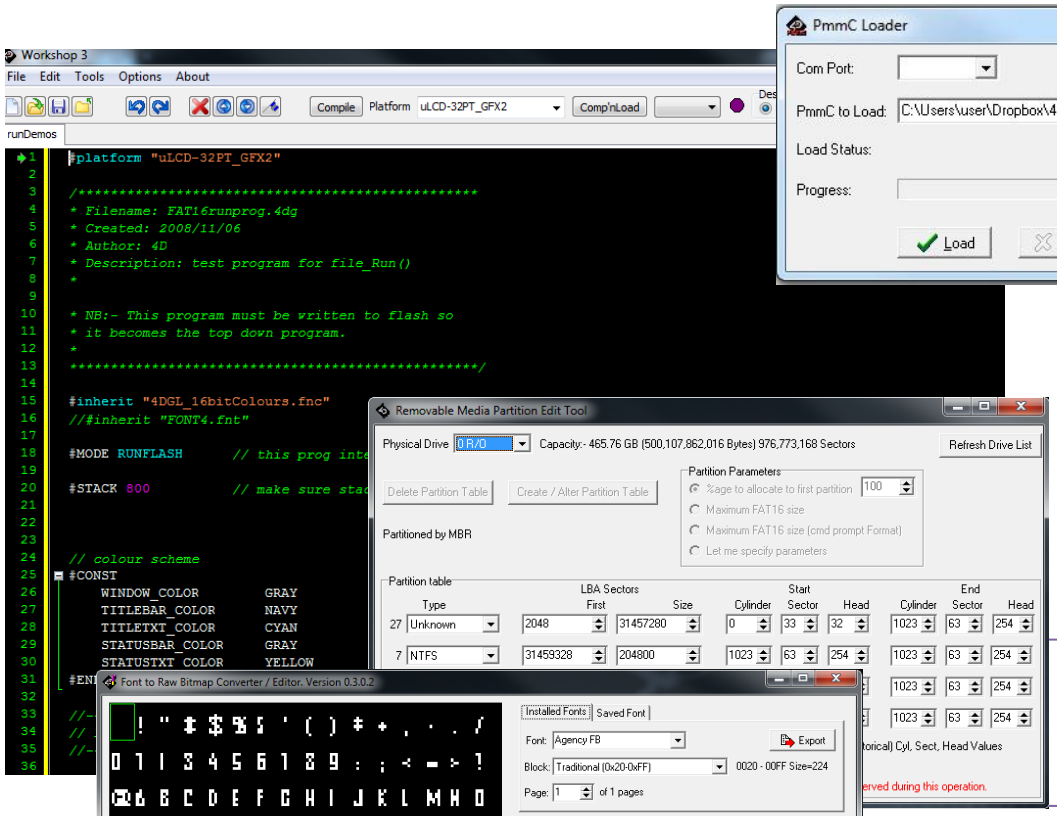
Powering the **µLCD43(GFX)** is as simple as connecting to a PC via a 4D Programming Cable. Alternatively, power can be supplied by a regulated 5V DC source.

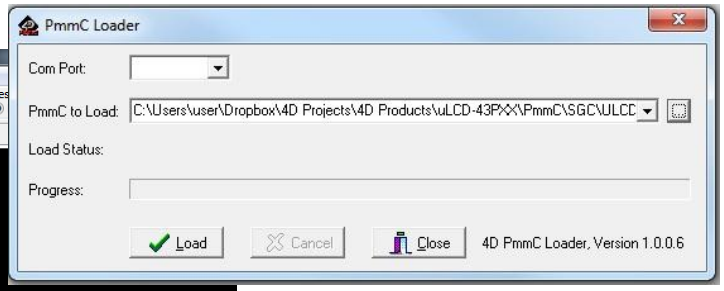


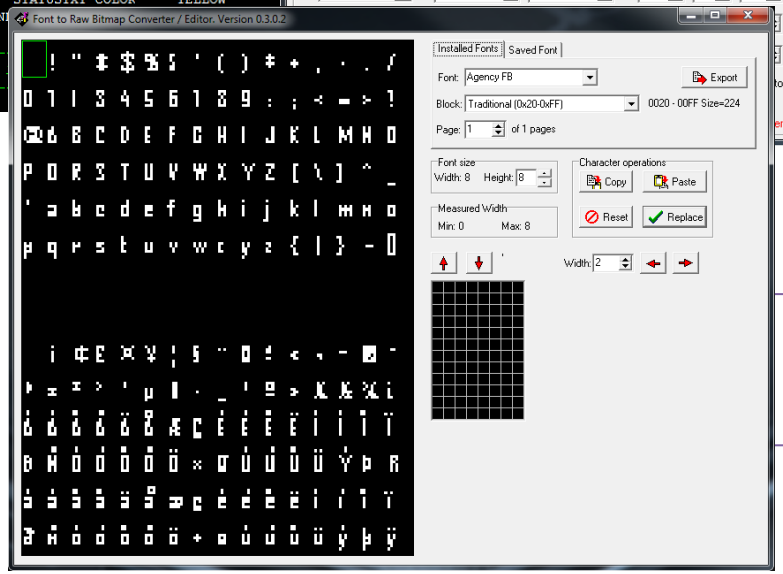


4D Programming Cable

12. Software Tools







An array of free **Software Tools** are available from the 4D Systems website at www.4dsystems.com.au. Each Tool serves a different function and will only be relevant based on both product and application. It is essential that the **4D Workshop3 IDE** is installed, which includes;

- 4D Editor
- 4D Compiler
- PmmC Loader
- Graphics Composer

PmmC Loader: Is required for updating the latest PmmC file

Graphics Composer: Is required for converting multimedia files into 4D format.

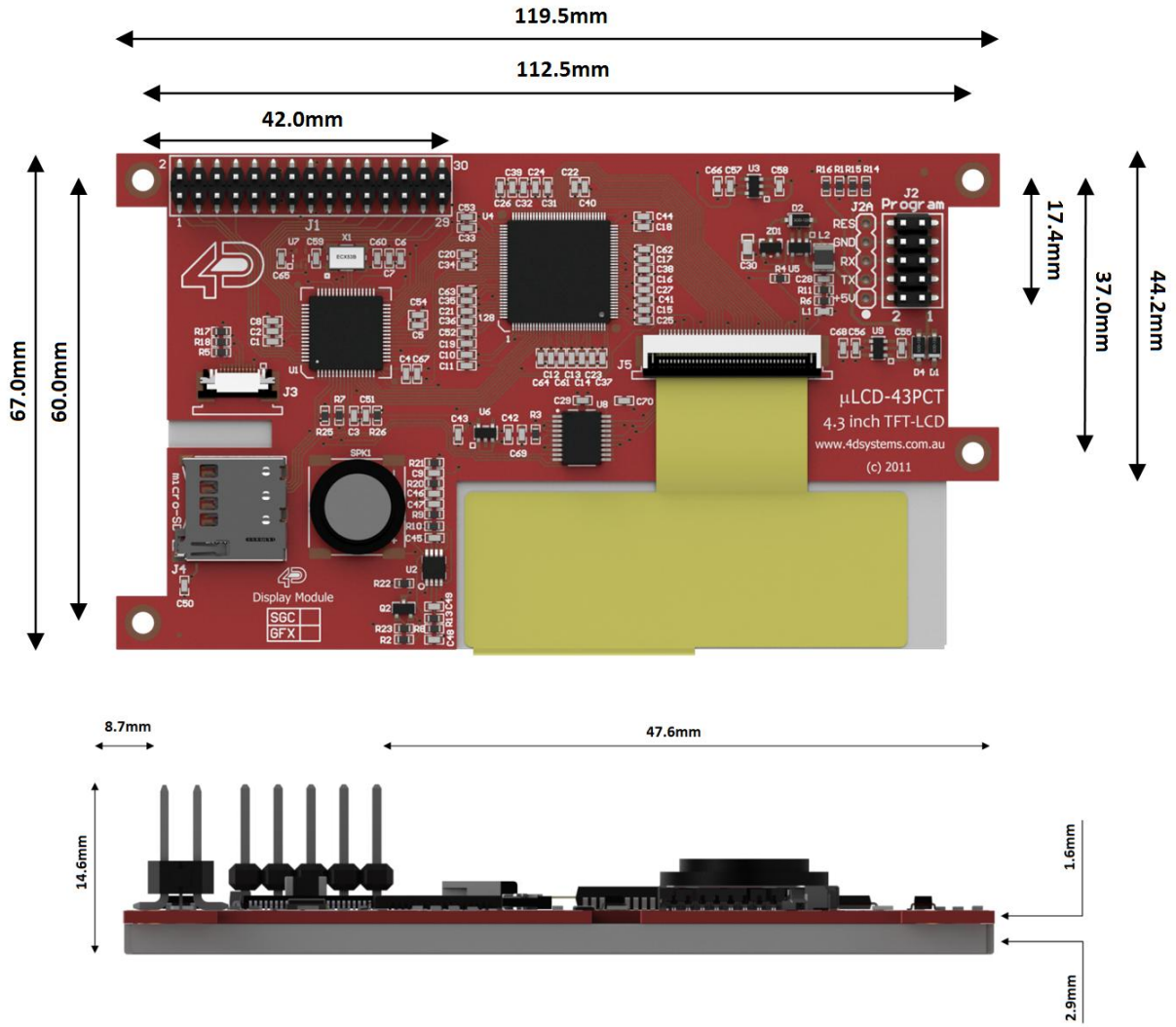
FONT Tool: Is required for modifying any font styles to a custom font set

RMPET Tool: Is required for partitioning a micro-SD card into FAT and RAW components

13. Mechanical Dimensions

Weight

~79g



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