DATASHEET

4D SYSTEMS

TURNING TECHNOLOGY INTO ART

4Display Shields

4Display-Shield-96/128/160/144

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Please refer to the 4D Systems website for the latest Revision of this document

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1. Description

The 4Display-Shield provides an easy way of interfacing 4D Systems display modules to the Arduino-Duemilanove, the Arduino-Mega and many other Arduino compatible boards. The 4Display-Shields come in 4 models, featuring a 5 way multiswitch joystick and male headers that help connect the 4Display-Shield to the Arduino boards. The 5 position joystick is connected to the Arduino D2, D3, D4, D5 and D6 pins. The communication interface between the 4Display-Shield and the Arduino is via the Serial UART. Both the TX and RX signals are jumpered on the shield PCB so that the Arduino UART can be freed-up when it's being programmed.

The 4Display-Shield can be purchased in four models, featuring one of the following displays:

- µOLED-96-G2
- µOLED-128-G1 (or µOLED-128-G2)
- µOLED-160-G1 (or µOLED-160-G2)
- µLCD-144-G2

These feature packed display modules, coupled with a convenient Arduino Shield, makes an ideal platform for learning and experimenting with the 4D Systems display modules.

The 4Display-Shield is integrated with a full colour OLED or TFT LCD screen (model dependant), tiny yet poweful GOLDELOX graphics processors and a micro-SD connector which supports standard and high-capacity memory cards. The memory card can be used to store images, icons, video clips and data logging.

The 4D Systems display module on the 4Display-Shield can be programmed as a stand-alone controller, or as a serial slave to the Arduino. To change how the display module is programmed, simply download the 4D Systems Workshop 4 IDE software from the 4D systems website, www.4dsystems.com.au, and follow the on screen instructions.

When configured as a serial slave, the Arduino takes the role of the host controller. This allows you to develop your graphics applications using the Arduino development environment and software tools. The GOLDELOX processor has a rich set of serial commands built inside the chip and the commands are sent from the Arduino via the serial (UART) interface. All it takes is a few bytes of serial data from the Arduino and you can quickly and easily draw lines, circles, text and even display Images as well as play Video clips.

The following links (not affiliated to 4D Systems) may prove useful when configuring the 4Display-Shield as a serial slave:

http://embeddedcomputing.weebly.com/serial-lcd.html
http://jennylc.com/4d/
http://nicholasboka.com/?page_id=23
http://code.google.com/p/displayshield4d/
http://code.google.com/p/uoled-library/

When configured as a stand-alone processor, the 4Display-Shield becomes a stand-alone device and all display application code is written in the Workshop 4 IDE, using the 4DGL Language. Don't let the name scare you off, 4DGL is an easy to learn but a powerful high level language. It allows the developer to write applications in a high level syntax similar to popular languages such as BASIC, C and Pascal and run it directly on the GOLDELOX processor. If you can write Arduino code then you can certainly write 4DGL code. The display modules are stand-alone devices. It allows the user to take complete control of all available resources on the display module such as the Serial Port, the graphics display and the micro-SD memory card. Thus graphics intensive processes can be completely offloaded from the Arduino and run on the GOLDELOX processor, along with micro-SD card processes and access to the GOLDELOX I/O pins. It provides the user complete control over the display module allowing them to offload a lot of overhead from the host processor by creating the 'work horse' objects within the display module itself.

So, for a game of Tetris, rather than sending all the tetris graphics objects (tile blocks, borders, game score, etc etc), as serial graphics primitives, entire functions can be created in 4DGL and receive simple serial commands to control them. This also gives a neat division between the graphics functions and the game itself, allowing changes in the games appearance without altering the main Arduino game code, effectively allowing you to 'change skins' for the games appearance.

2. Features

- On-board micro-SD memory card adaptor for storing of icons, images, animations, etc. Supports standard and high capacity (HC-SD) memory cards.
- 5-Way multifunction Joystick switch directly connected to Arduino D2, D3, D4, D5 and D6 pins.
- Powered from the Arduino board, uses the 5V supply pin.
- RoHS Compliant.

4Display-Shield-96

- 4D Systems µOLED-96-G2 Display Module
- 96 x 64 resolution, 65K true to life colours, PMOLED screen.
- 0.96" diagonal size, Viewing Area: 20mm x 14mm.
- No back lighting with near 180° viewing angle.

4Display-Shield-128

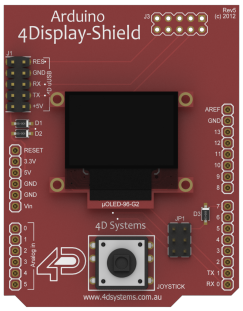
- 4D Systems µOLED-128-G1 (or µOLED-128-G2) Display Module
- 128 x 128 resolution, 65K true to life colours, PMOLED screen.
- 1.5" diagonal size, Viewing Area: 27mm x 27mm.
- No back lighting with near 180° viewing angle.

4Display-Shield-160

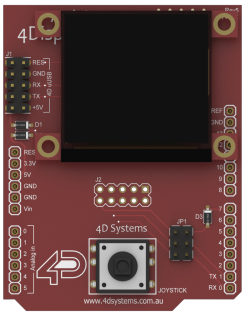
- 4D Systems µOLED-160-G1 (or µOLED-160-G2) Display Module
- 160 x 128 resolution, 65K true to life colours, PMOLED screen.
- 1.7" diagonal size, Viewing Area: 33.6mm x 27mm.
- No back lighting with near 180° viewing angle.

4Display-Shield-144

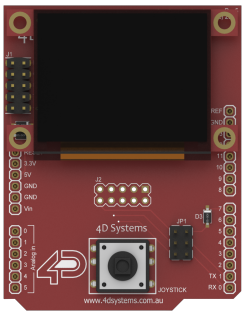
- 4D Systems µLCD-144-G2 Display Module
- 128 x 128 resolution, 65K true to life colours, LCD-TFT screen.
- 1.44" diagonal size, Viewing Area: 25.5mm x 26.5mm.
- LED back lighting with greater than 150° viewing angle.



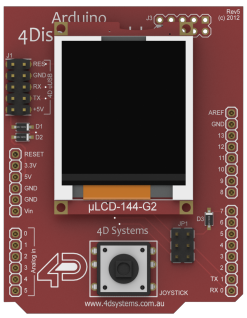
4Display-Shield-96 Arduino Shield



4Display-Shield-128 Arduino Shield



4Display-Shield-160 Arduino Shield



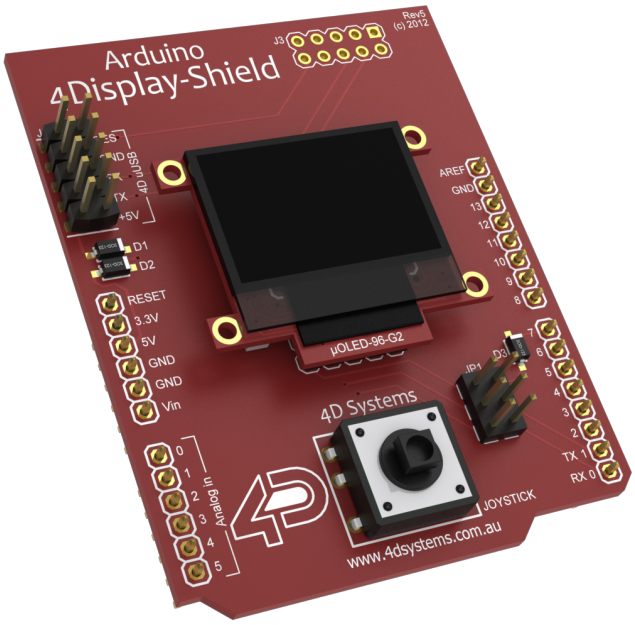
4Display-Shield-144 Arduino Shield

3. Hardware Description

3.1. 4Display-Shield-96 Arduino Shield – Featuring a 4D Systems µOLED-96-G2

The 4Display-Shield-96 is an Arduino Shield featuring a 4D Systems µOLED-96-G2 display module, and a joystick for a user interface.
The 4Display-Shield-96 provides a simple serial interface between the Arduino platform and the 4D Systems display, allowing rapid hardware prototyping and development.

Programming the 4Display-Shield-96 with the 4D Systems Workshop 4 Software is required to get started, and there the user can choose the programming environment to use.
Workshop 4 provides the user with 3 programming environments, to give the freedom of choice for how the display module will be configured.
Please refer to the Datasheet of the µOLED-96-G2 display module for further information, available from the 4D Systems website, www.4dsystems.com.au



The Designer environment of the 4D Systems Workshop 4 software, enables the full display power of the µOLED-96-G2 display module to be harnessed. This is where 4DGL logic is written in its natural form, and enables the user to make this 4Display-Shield into a controller, along with simply being a display to the Arduino. Please refer to the **"4DGL-Programmers-Reference-Manual.pdf"** and **"GOLDELOX-4DGL-Internal-Functions.pdf"** documents for more information on the 4DGL programming language.

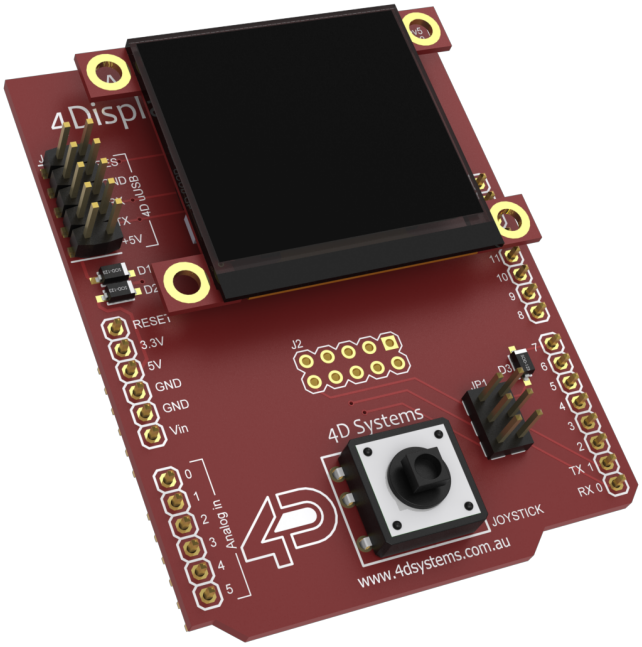
The ViSi environment enables a visual programming experience for the user to quickly create a display using drag-and-drop objects. The user can simply lay the objects on the display and generate 4DGL code automatically for those objects. The user then manipulates this code the 4DGL codespace to further configure based on the users application requirements. This environment allows the user to immediately see what the display will look like once programmed.

The Serial environment enables the display to turn into a slave serial display, allowing all development to be done in the Arduino IDE. Writing commands from the Arduino and sending them over the Serial port, will enable the user to draw primitives, text, play video, animations and much more. This is the most common environment used for Arduino users. Please refer to the ***"Workshop-4-IDE-User-Manual.pdf"*** documentation for futher information on the commands available.

3.2. 4Display-Shield-128 Arduino Shield – Featuring a 4D Systems µOLED-128-G2

The 4Display-Shield-128 is an Arduino Shield featuring a 4D Systems µOLED-128-G1 (or µOLED-128-G2) display module, and a joystick for a user interface.
The 4Display-Shield-128 provides a simple interface between the Arduino platform and the 4D Systems display, allowing rapid hardware prototyping and development.

Programming the 4Display-Shield-128 with the 4D Systems Workshop 4 Software is required to get started, and there the user can choose the programming environment to use.
Workshop 4 provides the user with 3 programming environments, to give the freedom of choice for how the display module will be configured.
Please refer to the Datasheet of the µOLED-128-G1/G2 display module for further information, available from the 4D Systems website, www.4dsystems.com.au



The Designer environment of the 4D Systems Workshop 4 software, enables the full display power of the µOLED-128-G1/G2 display module to be harnessed. This is where 4DGL logic is written in its natural form, and enables the user to make this 4Display-Shield into a controller, along with simply being a display to the Arduino. Please refer to the **"4DGL-Programmers-Reference-Manual.pdf"** and **"GOLDELOX-4DGL-Internal-Functions.pdf"** documents for more information on the 4DGL programming language.

The ViSi environment enables a visual programming experience for the user to quickly create a display using drag-and-drop objects. The user can simply lay the objects on the display and generate 4DGL code automatically for those objects. The user then manipulates this code the 4DGL codespace to further configure based on the users application requirements. This environment allows the user to immediately see what the display will look like once programmed.

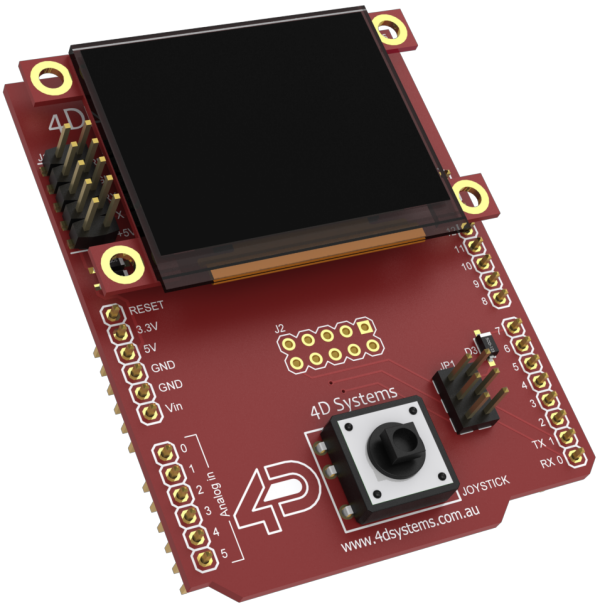
The Serial environment enables the display to turn into a slave serial display, allowing all development to be done in the Arduino IDE. Writing commands from the Arduino and sending them over the Serial port, will enable the user to draw primitives, text, play video, animations and much more. This is the most common environment used for Arduino users. Please refer to the ***"Workshop-4-IDE-User-Manual.pdf"*** documentation for futher information on the commands available.

Note: 4Display-Shield-128 modules will start shipping with µOLED-128-G2 instead of µOLED-128-G1 modules without warning or notice. No operational differences exist with respect to this Arduino Shield.

3.3. 4Display-Shield-160 Arduino Shield – Featuring a 4D Systems µOLED-160-G2

The 4Display-Shield-160 is an Arduino Shield featuring a 4D Systems µOLED-160-G1 (or µOLED-160-G2) display module, and a joystick for a user interface.
The 4Display-Shield-160 provides a simple interface between the Arduino platform and the 4D Systems display, allowing rapid hardware prototyping and development.

Programming the 4Display-Shield-160 with the 4D Systems Workshop 4 Software is required to get started, and there the user can choose the programming environment to use.
Workshop 4 provides the user with 3 programming environments, to give the freedom of choice for how the display module will be configured.
Please refer to the Datasheet of the µOLED-160-G1/G2 display module for further information, available from the 4D Systems website, www.4dsystems.com.au



The Designer environment of the 4D Systems Workshop 4 software, enables the full display power of the µOLED-160-G1/G2 display module to be harnessed. This is where 4DGL logic is written in its natural form, and enables the user to make this 4Display-Shield into a controller, along with simply being a display to the Arduino. Please refer to the **"4DGL-Programmers-Reference-Manual.pdf"** and **"GOLDELOX-4DGL-Internal-Functions.pdf"** documents for more information on the 4DGL programming language.

The ViSi environment enables a visual programming experience for the user to quickly create a display using drag-and-drop objects. The user can simply lay the objects on the display and generate 4DGL code automatically for those objects. The user then manipulates this code the 4DGL codespace to further configure based on the users application requirements. This environment allows the user to immediately see what the display will look like once programmed.

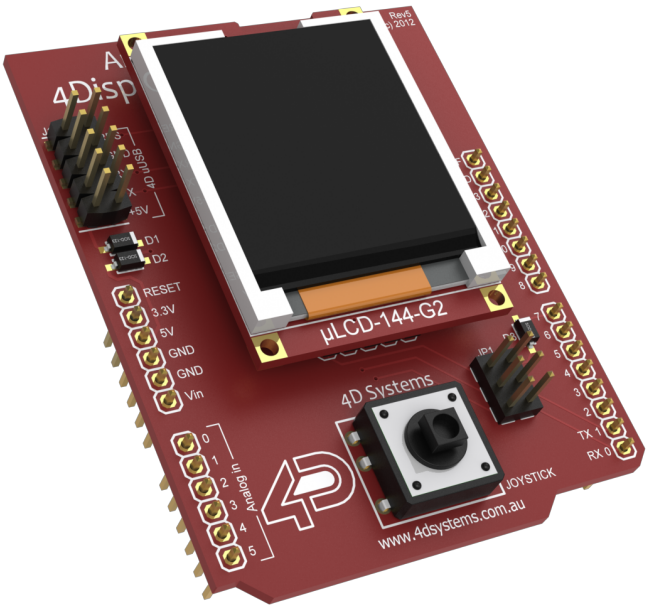
The Serial environment enables the display to turn into a slave serial display, allowing all development to be done in the Arduino IDE. Writing commands from the Arduino and sending them over the Serial port, will enable the user to draw primitives, text, play video, animations and much more. This is the most common environment used for Arduino users. Please refer to the ***"Workshop-4-IDE-User-Manual.pdf"*** documentation for futher information on the commands available.

Note: 4Display-Shield-160 modules will start shipping with µOLED-160-G2 instead of µOLED-160-G1 modules without warning or notice. No operational differences exist with respect to this Arduino Shield.

3.4. 4Display-Shield-144 Arduino Shield – Featuring a 4D Systems µLCD-144-G2

The 4Display-Shield-144 is an Arduino Shield featuring a 4D Systems µLCD-144-G2 display module, and a joystick for a user interface.
The 4Display-Shield-144 provides a simple interface between the Arduino platform and the 4D Systems display, allowing rapid hardware prototyping and development.

Programming the 4Display-Shield-144 with the 4D Systems Workshop 4 Software is required to get started, and there the user can choose the programming environment to use.
Workshop 4 provides the user with 3 programming environments, to give the freedom of choice for how the display module will be configured.
Please refer to the Datasheet of the µLCD-144-G2 display module for further information, available from the 4D Systems website, www.4dsystems.com.au



The Designer environment of the 4D Systems Workshop 4 software, enables the full display power of the µLCD-144-G2 display module to be harnessed. This is where 4DGL logic is written in its natural form, and enables the user to make this 4Display-Shield into a controller, along with simply being a display to the Arduino. Please refer to the **"4DGL-Programmers-Reference-Manual.pdf"** and **"GOLDELOX-4DGL-Internal-Functions.pdf"** documents for more information on the 4DGL programming language.

The ViSi environment enables a visual programming experience for the user to quickly create a display using drag-and-drop objects. The user can simply lay the objects on the display and generate 4DGL code automatically for those objects. The user then manipulates this code the 4DGL codespace to further configure based on the users application requirements. This environment allows the user to immediately see what the display will look like once programmed.

The Serial environment enables the display to turn into a slave serial display, allowing all development to be done in the Arduino IDE. Writing commands from the Arduino and sending them over the Serial port, will enable the user to draw primitives, text, play video, animations and much more. This is the most common environment used for Arduino users. Please refer to the ***"Workshop-4-IDE-User-Manual.pdf"*** documentation for futher information on the commands available.

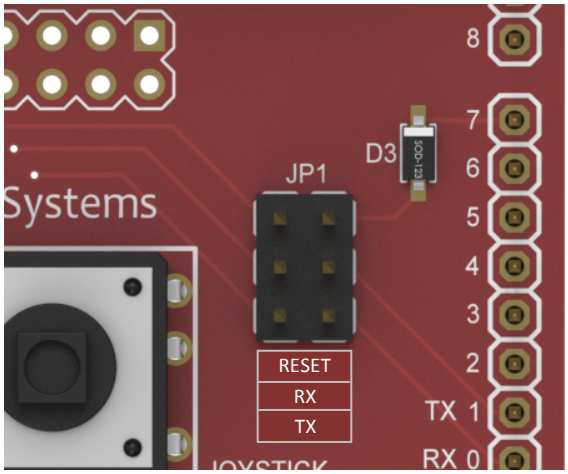
3.5. Jumper Settings

On the 4Display-Shield there is a 2x3 way jumper header (JP1), used to enable or disable the RX, TX and RESET lines between the Arduino and the display module.

When the shunt is connected between the two relevant pins, the feature of that configuration point is enabled. When disconnected, the feature is disabled.

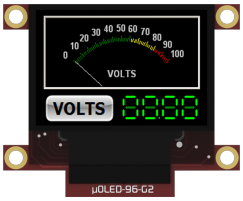
- **RESET** – when the two pins are joined with the shunt, RESET is connected between the display module and Digital Pin D7 of the Arduino.
- **RX** – when the two pins are joined with the shunt, RX0 is from the display module is connected to the Arduino TX pin
- **TX** – when the two pins are joined with the shunt, TX0 is from the display module is connected to the Arduino RX pin

Disconnection of these jumpers will be required when programming the display module or the Arduino, as they share the same serial bus for both communications and for their individual programming.

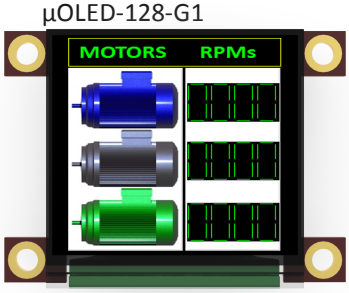


4. Related Products

µOLED-96-G2



µOLED-128-G1



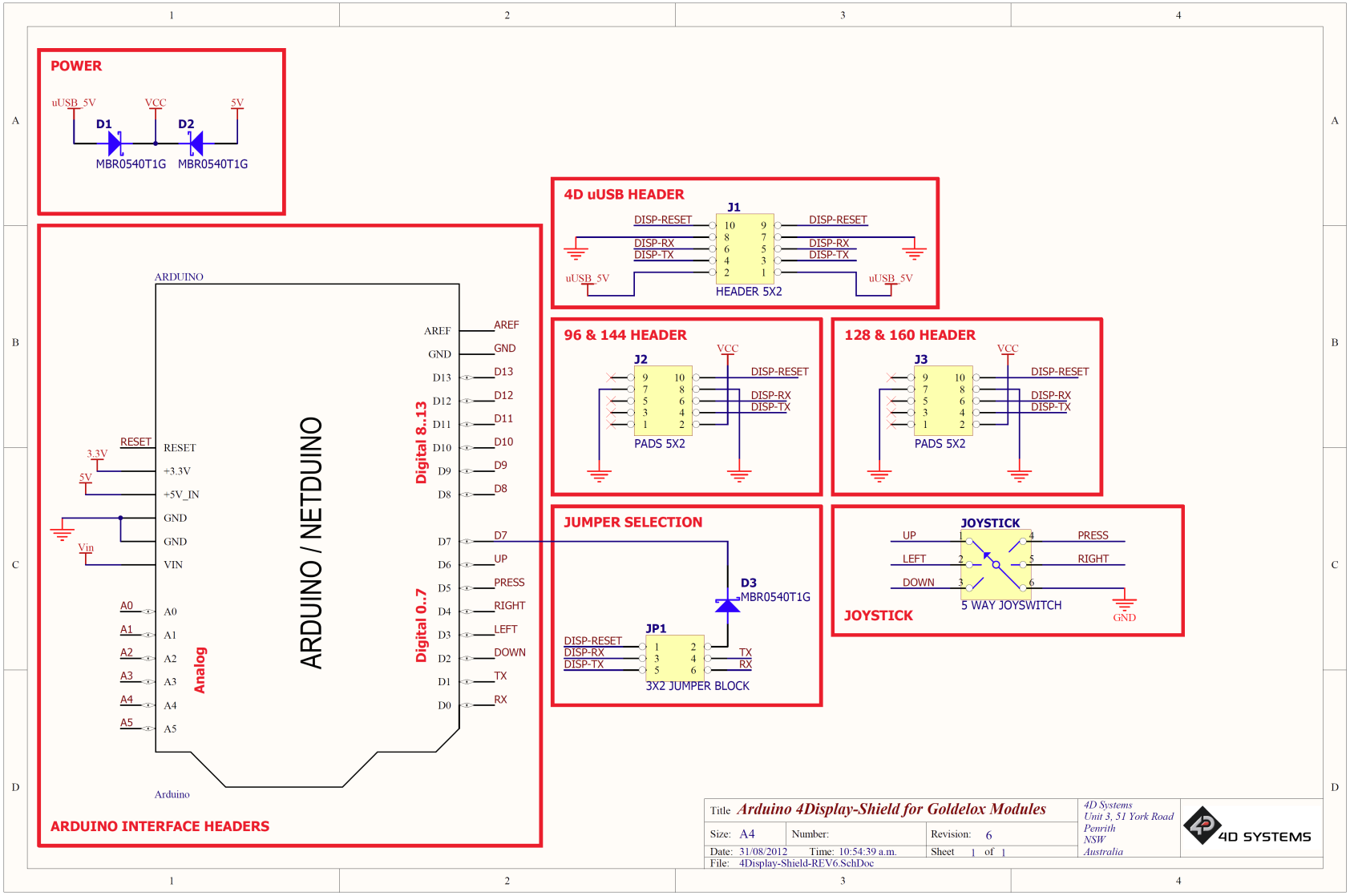
µOLED-128-G2

µOLED-160-G1

µOLED-160-G2

µLCD-144-G2

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
Input Low Voltage (VIL)	All pins	GND	--	0.8VCC	V
Input High Voltage (VIH)	All pins	2.0VCC	--	VCC	V
Reset Pulse (tRP)	External Open Collector	5.0	--	--	ms

For further specifications, specific to the actual display module, please refer to the 4D Systems website for further information, www.4dsystems.com.au

ORDERING INFORMATION
Order Codes: • 4Display-Shield-96 • 4Display-Shield-128 • 4Display-Shield-160 • 4Display-Shield-144 **Package:** 105mm x 65mm x 30mm **Packaging:** Module sealed in antistatic foam padded 4D Systems Box

7. Legal Notice

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8. Contact Information

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For Sales Support: sales@4dsystems.com.au

Website: www.4dsystems.com.au

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