



DATASHEET

4D SYSTEMS *TURNING TECHNOLOGY INTO ART*

PICASO OGM

OEM Graphics Module

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PRELIMINARY

1. Description

The PICASO OGM (OEM Graphics Module) is a compact and low profile custom SMT mounted PCB module, designed specifically for the integration into OEM products, with minimal space requirements.

The OGM Module breaks out all of the General Purpose I/O (GPIO) that the PICASO Processor provides, along with providing a microSD Card connector for the storage of images/videos/files used by the processor, and a 40 way FPC connector to connect to existing 4D Systems' displays.

Driving the display and peripherals is the PICASO processor, a very capable and powerful chip which enables stand-alone functionality, programmed using the 4D Systems Workshop 4 IDE Software. The Workshop IDE enables graphic solutions to be constructed rapidly and with ease due to its design being solely for 4D's graphics processors.

The module has an array of features including PWM for Sound, Touch Detection, micro-SD memory storage, general purpose I/O, serial communications, an I2C interface and multiple millisecond resolution timers, amongst many more features.

The PICASO OGM Module is the perfect solution for integrating the PICASO Processor into new designs where space and cost is an issue, and provides all the resources the PICASO Processor has available.

The PICASO OGM Module is pin compatible in most ways with the larger and more powerful DIABLO16 OGM Module, allowing simple transfer/upgrade of existing designs. Please refer to the DIABLO16 OGM Module Datasheet for further information, and read about any caveats that may exist if upgrading from a PICASO OGM.

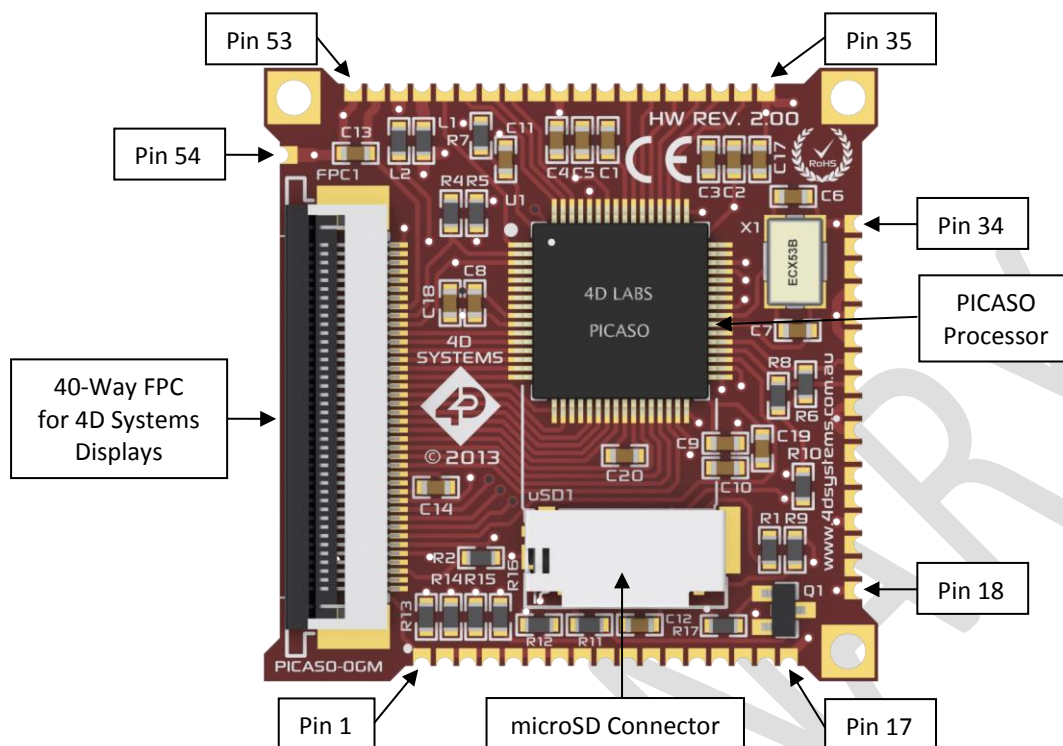
Anything that has been designed in the past to run on a PICASO Processor can theoretically run on this PICASO OGM Module. Please ensure you contact the 4D Systems' support team if unsure when designing with this PICASO OGM Module.

Please note, PICASO OGM Modules are designed for volume customers with volume orders only. Please contact the 4D Systems Sales Department for volume pricing.

2. Features

- OEM PICASO Module designed for integrators designing with 4D Systems PICASO processors/modules
- Offers 40 way FPC connection to existing 4D Systems display solutions, 2.4", 2.8", 3.2" and 3.2" Wide
- 4 wire Resistive Touch support is built in
- Powered by the 4D-Labs PICASO processor (also available as separate OEM IC)
- 14KB of flash memory for user code storage and 14KB of SRAM for user variables, or 14KB shared user code and program variables.
- 2 x Asynchronous hardware serial ports (COM0, COM1), TTL interface, with 300 to 600K baud.
- 1 x I²C interface (Master).
- 8 x 16 bit timers with 1 millisecond resolution.
- 13 x General Purpose I/O pins. Supports fast 8-bit parallel data transfer through Upper 8 bits.
- On-board micro-SD memory card connector for multimedia storage and data logging purposes. HC memory card support is also available for cards larger than 4GB.
- Micro-SD signals available externally if an external micro-SD card connector is preferred
- DOS compatible file access (FAT16 format) as well as low level access to card memory.
- Dedicated raw PWM Audio pin driven by WAV files from micro-SD card.
- Built in extensive 4DGL graphics and system library functions.
- Display full colour images, animations, icons and video clips on chosen 4D Systems display.
- Supports all available Windows fonts.
- 3.3V DC Input for the processor
- 5.0V DC input for the display backlight
- Module dimensions: 34.8 x 34.8 x 4.3mm, weighing ~ 5 grams.
- 3x alignment holes for module positioning, with 1.3mm pitch SMT pads for soldering of OGM module to host PCB or Baseboard.
- RoHS and CE Compliant.

3. Pin Configuration and Summary



| OGM Pin Outs | | | |
|--------------|--------|-----|---|
| Pin | Symbol | I/O | Description |
| 1 | FMARK | O | Frame Marker signal from LCD (Not connected to PICASO, direct from Display) |
| 2 | GND | P | Supply Ground |
| 3 | GND | P | Supply Ground |
| 4 | GND | P | Supply Ground |
| 5 | GND | P | Supply Ground |
| 6 | GND | P | Supply Ground |
| 7 | GND | P | Supply Ground |
| 8 | GND | P | Supply Ground |
| 9 | CD_POL | - | Card Detect signal direct from on-board microSD Card, not connected to PICASO. Simple switch side 1, can be connected as required. |
| 10 | CD_DET | - | Card Detect signal direct from on-board microSD Card, not connected to PICASO. Simple switch side 2, can be connected as required. |
| 11 | SD_CS | O | microSD Chip Select. SD memory card use only. Connect this pin to the Chip Enable (CS) signal of an external SD card connector if not using the on board. Using both on-board and external SD is not advised. |
| 12 | SD_SDO | O | microSD Serial Data Output. SD memory card use only. Connect this pin to the SPI Serial Data Out (SDO) signal of an external SD card connector if not using the on board. Using both on-board and external SD is not advised. |
| 13 | SD_SCK | O | microSD Serial Clock output. SD memory card use only. Connect this pin to the SPI Serial Clock (SCK) signal of an external SD card connector if not using the on board. Using both on-board and external SD is not advised. |
| 14 | SD_SDI | I | microSD Serial Data Input. SD memory card use only. Connect this pin to the SPI Serial Data In (SDI) signal of an external SD card connector if not using the on board. Using both on-board and external SD is not advised. |

Continued overleaf...

I = Input, O = Output, P = Power

| OGM Pin Outs (Continued) | | | |
|--------------------------|----------|-----|---|
| Pin | Symbol | I/O | Description |
| 15 | BACKLITE | I | Backlight control for external PWM or Digital Control. Please refer to Section 4.3 for information on how this can be controlled externally |
| 16 | DISPON | O | Backlight control from the PICASO, must be connected externally to the BACKLITE pin (Pin 15) in order for PICASO to control the backlight. |
| 17 | GND | P | Supply Ground |
| 18 | GND | P | Supply Ground |
| 19 | RX1 | I | Asynchronous serial port 1 receive pin. COM1 |
| 20 | TX1 | O | Asynchronous serial port 1 transmit pin. COM1 |
| 21 | GND | P | Supply Ground |
| 22 | RESET | I | Master Reset, Active Low (GND) |
| 23 | TX0 | O | Asynchronous serial port 0 transmit pin. COM0 |
| 24 | RX0 | I | Asynchronous serial port 0 receive pin. COM0 |
| 25 | GND | P | Supply Ground |
| 26 | GND | P | Supply Ground |
| 27 | I2C_SDA | I/O | I ² C Bidirectional Data |
| 28 | I2C_SCL | O | I ² C Clock Output |
| 29 | GND | P | Supply Ground |
| 30 | GND | P | Supply Ground |
| 31 | GND | P | Supply Ground |
| 32 | AUDENB | O | Audio Amplified Enable |
| 33 | AUDIO | O | Raw PWM Audio Output (requires external components) |
| 34 | GND | P | Supply Ground |
| 35 | GND | P | Supply Ground |
| 36 | BUS0 | I/O | IO Bus (BUS0..7) bit 0 |
| 37 | BUS1 | I/O | IO Bus (BUS0..7) bit 1 |
| 38 | BUS2 | I/O | IO Bus (BUS0..7) bit 2 |
| 39 | BUS3 | I/O | IO Bus (BUS0..7) bit 3 |
| 40 | BUS4 | I/O | IO Bus (BUS0..7) bit 4 |
| 41 | BUS5 | I/O | IO Bus (BUS0..7) bit 5 |
| 42 | BUS6 | I/O | IO Bus (BUS0..7) bit 6 |
| 43 | BUS7 | I/O | IO Bus (BUS0..7) bit 7 |
| 44 | GND | P | Supply Ground |
| 45 | IO5 | I/O | General Purpose Input/Output 5 Pin |
| 46 | IO4 | I/O | General Purpose Input/Output 4 Pin |
| 47 | IO3 | I/O | General Purpose Input/Output 3 Pin |
| 48 | IO2 | I/O | General Purpose Input/Output 2 Pin |
| 49 | IO1 | I/O | General Purpose Input/Output 1 Pin |
| 50 | RAW+3.3V | P | Supply Input +3.3VDC to +3.6VDC, +3.3VDC Nominal |
| 51 | GND | P | Supply Ground |
| 52 | RAW+VCC | P | Backlight Supply Input +3.3VDC to +5.5VDC, +5VDC Nominal |
| 53 | GND | P | Supply Ground |
| 54 | GND | P | Supply Ground |

I = Input, O = Output, P = Power

4. Hardware Interface - Pins

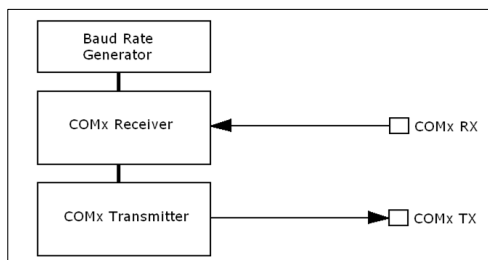
The PICASO OGM Module provides both a hardware and software interface. This section describes in detail the hardware interface pins of the device.

4.1. Serial Ports - COM0, COM1 UARTS

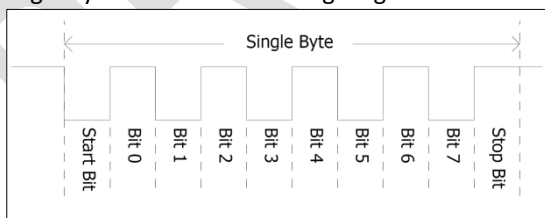
The OGM Module has two dedicated hardware Asynchronous Serial ports that can communicate with external serial devices. These are referred to as the COM0 and the COM1 serial ports.

The primary features are:

- Full-Duplex 8 bit data transmission and reception.
- Data format: 8 bits, No Parity, 1 Stop bit.
- Independent Baud rates from 300 baud up to 600K baud.
- Single byte transmits and receives or a fully buffered service. The buffered service feature runs in the background capturing and buffering serial data without the user application having to constantly poll any of the serial ports. This frees up the application to service other tasks.



A single byte serial transmission consists of the start bit, 8-bits of data followed by the stop bit. The start bit is always 0, while a stop bit is always 1. The LSB (Least Significant Bit, Bit 0) is sent out first following the start bit. Figure below shows a single byte transmission timing diagram.



COM0 is also the primary interface for 4DGL user program downloads and chip configuration (PmmC programming). Once the compiled 4DGL application program (EVE byte-code) is downloaded and the user code starts executing, the serial port is then available to the user application. Refer to Section 5. 'Firmware / PmmC Programming' for more details on this subject.

TX0 pin (Serial Transmit COM0):

Asynchronous Serial port COM0 transmit pin, TX0. Connect this pin to external serial device receive (Rx) signal. This pin is 5.0V tolerant.

RX0 pin (Serial Receive COM0):

Asynchronous Serial port COM0 receive pin, RX0. Connect this pin to external serial device transmit (Tx) signal. This pin is 5.0V tolerant.

TX1 pin (Serial Transmit COM1):

Asynchronous Serial port COM1 transmit pin, TX1. Connect this pin to external serial device receive (Rx) signal. This pin is 5.0V tolerant.

RX1 pin (Serial Receive COM1):

Asynchronous Serial port COM1 receive pin, RX1. Connect this pin to external serial device transmit (Tx) signal. This pin is 5.0V tolerant.

4.2. General Purpose I/O

There are 13 general purpose Input/Output (GPIO) pins available to the user. These are grouped as IO1..IO5 and BUS0..BUS7. Power-Up Reset default is all INPUTS.

The 5 I/O pins (IO1..IO5), provide flexibility of individual bit operations while the 8 pins (BUS0..BUS7), known as GPIO BUS, serve collectively for byte wise operations. The IO4 and IO5 also act as strobing signals to control the GPIO Bus. GPIO Bus can be read or written by strobing a low pulse (50ns duration or greater) the IO4/BUS_RD or IO5/BUS_WR for read or write respectively. For detailed usage refer to the separate document titled:

"PICASO-4DGL-Internal-Functions.pdf"

IO1-IO5 pins (5 x GPIO pins):

General purpose I/O pins. Each pin can be individually set for INPUT or an OUTPUT.

IO4/BUS_RD pin (GPIO IO4 or BUS_RD pin):

General Purpose IO4 pin. Also used for BUS_RD signal to read and latch the data in to the parallel GPIO BUS0..BUS7.

IO5/BUS_WR pin (GPIO IO5 or BUS_WR pin):

General Purpose IO5 pin. Also used for BUS_WR signal to write and latch the data to the parallel GPIO BUS0..BUS7.

BUS0-BUS7 pins (GPIO 8-Bit Bus):

8-bit parallel General purpose I/O Bus.

Note: All GPIO pins are 5.0V tolerant.

4.3. System Pins

RAW+3.3V (Module Voltage Input)

Pin 50:

Module supply voltage input pin. This pin must be connected to a stable and regulated supply voltage in the range of 3.3 Volts to 3.6 Volts DC. Nominal operating voltage is 3.3 Volts. Anything less than 3.3V could result in SD card corruption/errors (brand/model dependant).

RAW+VCC (Backlight Voltage Input)

Pin 52:

Backlight supply voltage input pin. This pin must be connected to a stable and regulated supply voltage in the range of 3.3 Volts to 5.5 Volts DC. Nominal operating voltage is 5.0 Volts. This will ensure optimal backlight brightness.

GND (Module Ground)

Pins 2-8, 16-18, 21, 25-26, 29-31, 34-35, 44, 51, 53-54:

Device ground pins which are all joined on the OGM Module. These pins must be connected to ground.

Note: Not ALL are required to be connected, however where possible, connect as many as possible to GND.

RESET (Module Master Reset)

Pin 22:

Module Master Reset pin. An active low pulse of greater than 2 μ s will reset the module. Internally pulled up to 3.3V via a 10K resistor. Only use open collector type circuits to reset the device if an external reset is required.

AUDENB (Audio Enable Output)

Pin 32:

Output dedicated to enable or disable an external amplifier, where required.

AUDIO (Raw PWM Audio Output)

Pin 33:

This pin outputs a raw PWM from the PICASO Processor, designed to be connected to external components for filtering and amplification (where required). When used in conjunction with AUDENB this pin can be used to feed PWM signals to a filtering and amplifier, and the AUDENB can enable or disable the amplifier as required.

FMARK (Frame Mark Output)

Pin 1:

This pin is not connected to the PICASO Processor, it comes directly from the LCD and can be used if required, and is used to detect the start of a

Frame. If this is required, simply connect it externally to one of the GPIO pins, and use as required.

CD POL (SD Card Detect POL)

Pin 9:

This pin is side 1 of a simple switch located on the on-board microSD card connector. It is not connected to the PICASO Processor, and may be connected to external components or back onto one of the OGM GPIO pins as required. Used in conjunction with CD DET, if one is pulled up to 3.3V, and the other to a GPIO pin configured as an Input, then when a card is inserted the 3.3V will be detected on the GPIO Input, and an action can be undertaken, as required.

CD DET (SD Card Detect DET)

Pin 10:

This pin is side 2 of a simple switch located on the on-board microSD card connector. It is not connected to the PICASO Processor, and may be connected to external components or back onto one of the OGM GPIO pins as required. Used in conjunction with CD POL, if one is pulled up to 3.3V, and the other to a GPIO pin configured as an Input, then when a card is inserted the 3.3V will be detected on the GPIO Input, and an action can be undertaken, as required.

SD_CS (SD Card Chip Select)

Pin 11:

This is for SD memory card use only. Connect this pin to the Chip Enable (CS) signal of an external SD card connector if not using the on-board connector, providing flexibility for the end product. Using both on-board and external SD is not advised. Leave Open if external SD is N/A.

SD_SDO (SD Serial Data Output)

Pin 12:

This is for SD memory card use only. Connect this pin to the Serial Data Out (SDO) signal an external SD card connector if not using the on-board connector, providing flexibility for the end product. Using both on-board and external SD is not advised. Leave Open if external SD is N/A.

SD_SCK (SD Serial Clock Output)

Pin 13:

This is for SD memory card use only. Connect this pin to the Serial Data Clock (SCK) signal an external SD card connector if not using the on-board connector, providing flexibility for the end product. Using both on-board and external SD is not advised. Leave Open if external SD is N/A.

SD_SDI (SD Serial Data Input)**Pin 14:**

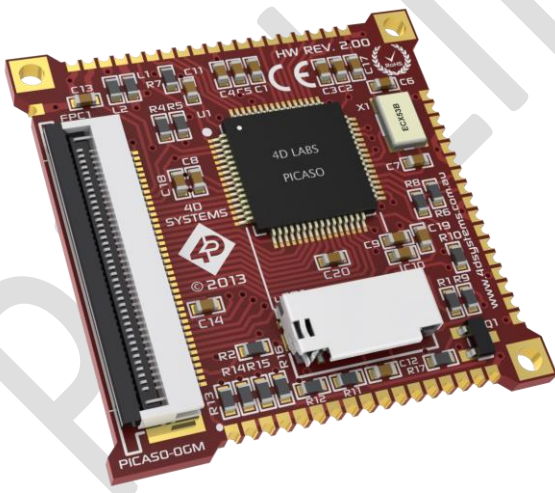
This is for SD memory card use only. Connect this pin to the Serial Data Input (SDI) signal of an external SD card connector if not using the on-board connector, providing flexibility for the end product. Using both on-board and external SD is not advised. Leave Open if external SD is N/A.

BACKLITE (External Display Backlight Control)**Pin 15:**

This pin allows external control of the backlight, to enable/disable/dim the backlight on the display. If an external PWM signal is connected to this pin, it can be used to drive the backlight and dim as required, or more simply a digital on/off signal to enable/disable as required.

DISPON (PICASO Display Backlight Control)**Pin 16:**

This is directly connected to the PICASO Processor and allows the PICASO to enable or disable the backlight on the display. The PICASO Processor is however unable to change the level of brightness on the display as it does not offer PWM functionality on this pin. In order to gain dimming control, the BACKLITE pin should be used with an external PWM signal. If PICASO backlight control is required, simply join BACKLITE (Pin 15) with DISPON (Pin 16) externally, allowing the PICASO to then control the backlight directly.



5. PmmC/Firmware Programming

The PICASO processor used in the PICASO OGM module is a custom graphics processor. All functionality including the high level commands are built into the chip. This chip level configuration is available as a Firmware/PmmC (Personality-module-micro-Code) file.

A PmmC file contains all of the low level micro-code information (analogy of that of a soft silicon) which define the characteristics and functionality of the device. The ability of programming the device with a PmmC file provides an extremely flexible method of customising as well as upgrading it with future enhancements.

A PmmC file can only be programmed into the device via its COM0 serial port.

The PmmC file is programmed into the device with the aid of Workshop 4, the 4D Systems IDE software (See Section 10). To provide a link between the PC and the ICSP interface, a specific 4D Programming Cable or Adaptor is required and is available from 4D Systems.

Using a non-4D programming interface could damage your display, and **void your Warranty.**

NOTE: The typical interface to a 4D Programming cable or adaptor is a vertical or horizontal 5-way 2.54mm pitch male pin header. The 4D Programming cables and adaptors provide a 5V supply which can be used to power up 4D products. The PICASO OGM Module however has no on board regulation of its own, so cannot be directly connected to a 4D Programming cable or adaptor without an off board regulator to provide a stable regulated 3.3V supply for the OGM Module. Once a suitable 3.3V supply is provided to the OGM Module, then the TX0, RX0 and RESET lines can be utilized to program the on board PICASO Processor as usual.

4D Systems has a BaseBoard to provide as an example of how the PICASO OGM Module can be connected to a host PCB, and how it can be powered and programmed using a 4D Programming Cable or Adaptor. Please contact 4D Systems Sales for more information. More information about this can be found in Section 8.2

6. Module Features

The PICASO OGM module is designed to accommodate most OEM applications. Some of the main features of the module are listed below.

6.1. PICASO Processor

The module is designed around the PICASO Graphics Controller from 4D-Labs.



The PICASO is a smart Controller and the interface to the TFT- LCD displays is almost plug-n-play.

All of the data and control signals are provided by the chip to interface directly to the display.

Powerful graphics, text, image, animation and countless more features are built right inside the chip.

The data sheet for the processor is available from the <http://www.4dsystems.com.au> website:

"PICASO-Processor-Datasheet-REVx.pdf"

6.2. Audio

Audio playback support in the PICASO Processor enables the PICASO OGM module to play audio WAV files stored in the micro-SD memory card. A raw PWM is output by the Processor (and OGM Module itself) which can then be filtered with a simple circuit, and amplified if required.

A simple instruction enables the user to play/pause/stop audio files while continuing the execution of the user application code, such as display updates, touch recognition, communications, etc. The audio system also allows real time pitch change of audio samples.

For a complete list of audio commands please refer to the separate document titled:

"PICASO-4DGL-Internal-Functions.pdf"

6.3. SD/SDHC Memory Cards

The module supports micro-SD memory cards via the on-board micro-SD connector. The memory card is used for all multimedia file retrieval such as images, animations and movie clips. The memory card can also be used as general purpose storage for data logging applications. Support is available for off the shelf micro-SD and high capacity HC memory cards (4GB and above).

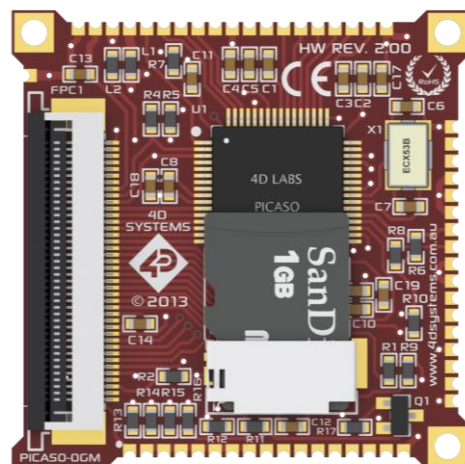
6.4. FAT16

The PICASO OGM Module uses off the shelf standard SDHC/SD/micro-SD memory cards with up to 2GB capacity usable with FAT16 formatting. For any FAT file related operations, before the memory card can be used it must first be formatted with FAT16 option. The formatting of the card can be done on any PC system with a card reader. Select the appropriate drive and choose the FAT16 (or just FAT in some systems) option when formatting. The card is now ready to be used in the PICASO based application.



The PICASO Processor also supports high capacity HC memory cards (4GB and above). The available capacity of SD-HC cards varies according to the way the card is partitioned and the commands used to access it.

The FAT partition is always first (if it exists) and can be up to the maximum size permitted by FAT16. Windows 7 will format FAT16 up to 4GB. Windows XP will format FAT16 up to 2GB and the Windows XP command prompt will format FAT16 up to 4GB.



7. Display Information

This section will outline some basic precautions when using 4D Systems' displays with the PICASO OGM Module, along with a list of compatible 4D Systems' displays available.

7.1. Display Precautions

Below are some general guidelines and precautions when using a 4D Systems display. The PICASO OGM Module itself does not include a display, however is compatible with 4D Systems 40 pin displays, 2.4", 2.8", 3.2" and 3.2" Wide.

- Avoid having to display the same image/object on the screen for lengthy periods of time. This will cause a burn-in which is a common problem with all types of display technologies. Blank the screen after a while or dim it very low by adjusting the contrast. Better still; implement a screen saver feature.
- Moisture and water can damage the display. Moisture on the surface of a powered display will cause the electrodes to corrode. Wipe off any moisture gently or let the display dry before usage.
- Dirt from fingerprint oil and fat can easily stain the surface of the display. Gently wipe off any stains with a soft lint-free cloth.
- The performance of the display will degrade under high temperature and humidity. Avoid such conditions when storing.
- Do not tamper with the display flex cable that is connected to the control board. This may affect the connection between the display and the driving circuitry and cause failure.
- Displays are susceptible to mechanical shock and any force exerted on the module may result in deformed zebra stripes, a cracked display cell and broken backlight
- Always use the mounting holes on the module's corner plates to mount the display.

7.2. Compatible Displays

The PICASO OGM Module is compatible with four displays currently offered by 4D Systems.

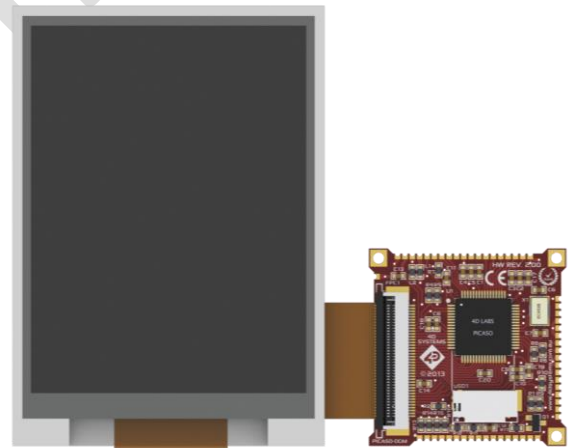
4DLCD-24QA – this is a 2.4" TFT LCD Display with a resolution of 240x320 and Resistive Touch. This is also available without Resistive Touch on special request.

4DLCD-28QA – this is a 2.8" TFT LCD Display with a resolution of 240x320 and Resistive Touch. This is also available without Resistive Touch on special request.

4DLCD-32QA – this is a 3.2" TFT LCD Display with a resolution of 240x320 and Resistive Touch. This is also available without Resistive Touch on special request.

4DLCD-32WA – this is a 3.2" Wide TFT LCD with a resolution of 240x400 and Resistive Touch. This is also available without Resistive Touch on special request.

More information on these 4D Systems' displays can be found on the 4D Systems website, and their associated product pages.

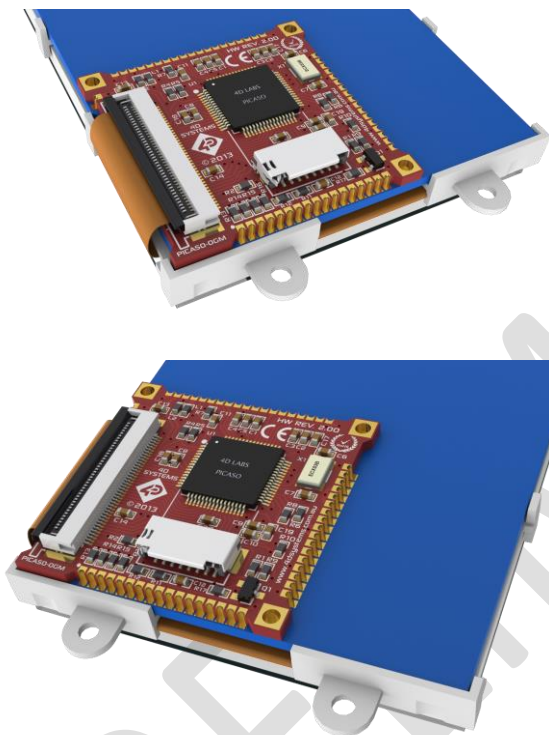


The PICASO OGM Module connected to a 4DLCD-32QA Display.

7.3. Custom Design solutions

The PICASO OGM Module is designed to be small and integrate easily into new product designs, to offer the full features of the PICASO Processor to the end product, while taking up a minimal amount of real estate on the host system.

An example of the PICASO OGM Module is illustrated below, showing its connection to a host PCB (shown in Blue), and the connection to a 4DLCD-32QA Display, and mounted on the plastic corner plates, which are also used in the microLCD Range of display modules, such as the uLCD-32PTU.



This is further illustrated using the 4D Systems BaseBoard, which can be seen in Section 8.2

8. Hardware Tools

The following hardware tools are required for full control of the PICASO OGM module.

8.1. 4D Programming Cable/Adaptor

The 4D Programming Cable and uUSB-PA5 Programming Adaptor are essential hardware tools to program, customise and test the PICASO Processor.

Either the 4D Programming Cable or the uUSB-PA5 Programming Adaptor can be used.

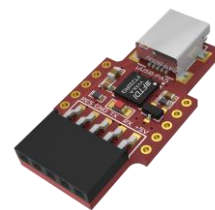
The 4D programming interfaces are used to program a new Firmware/PmmC and for downloading compiled 4DGL code into the processor. They even serve as an interface for communicating serial data to the PC.

The 4D Programming Cable and uUSB-PA5 Programming Adaptor are available from 4D Systems, www.4dsystems.com.au

Using a non-4D programming interface could damage your processor, and **void your Warranty.**



4D Programming Cable

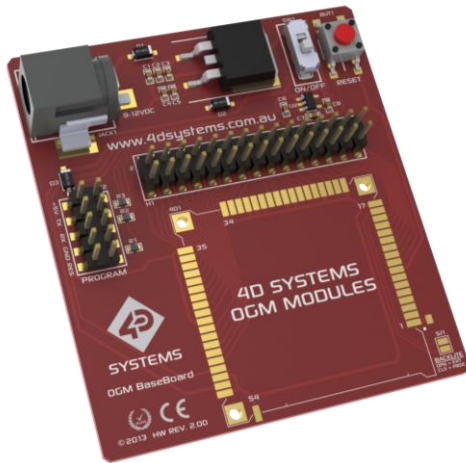


uUSB-PA5 Programming Adaptor

NOTE: The 4D Programming cables and adaptors provide a 5V supply which can be used to power up 4D products. The PICASO OGM Module however has no on board regulation of its own, so cannot be directly connected to a 4D Programming cable or adaptor without an off board regulator to provide a stable regulated 3.3V supply for the OGM Module. Once a suitable 3.3V supply is provided to the OGM Module, then the TX0, RX0 and RESET lines can be utilized to program the on board PICASO Processor as usual.

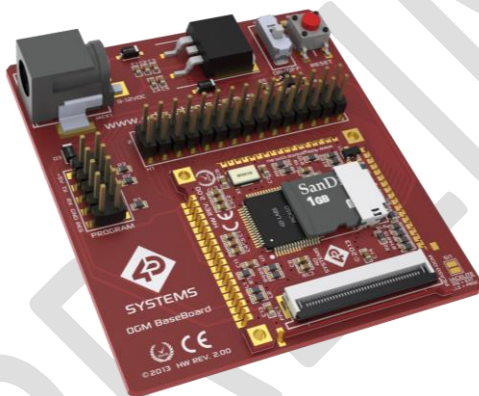
8.2. PICASO OGM Base Board

4D Systems has designed a BaseBoard for the OGM Module, which provides an evaluation type interface for the OGM Module, to enable it to be easily powered up, programmed and tested.

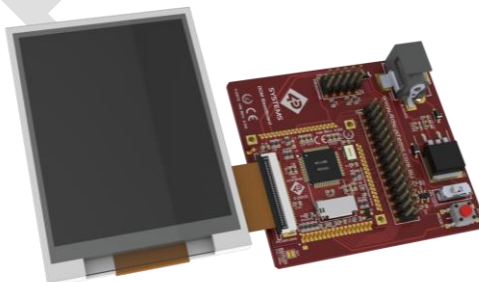


This evaluation board is called the OGM BaseBoard, and is available from the 4D Systems. Please discuss with the 4D Systems Sales team if a BaseBoard would assist with your development.

The PICASO OGM Module is required to be soldered into place on the OGM BaseBoard.



BaseBoard with PICASO OGM and 4DLCD-32QA



Please refer to the datasheet for the BaseBoard, available from the PICASO OGM Product Page.

9. 4DGL - Software Language

The PICASO OGM Module utilises the PICASO processor, which 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-machine 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, and the syntax structure was designed using elements of popular languages such as C, Basic, Pascal and others.

Programmers familiar with these languages will feel right at home 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.

For detailed information pertaining to the 4DGL language, please refer to the following documents:
"4DGL-Programmers-Reference-Manual.pdf"
"PICASO-4DGL-Internal-Functions.pdf"

To assist with the development of 4DGL applications, the Workshop 4 IDE combines a full-featured editor, a compiler, a linker and a downloader into a single PC-based application. It's all you need to code, test and run your applications.

4DGL is available to be written in two of the four environments offered by the Workshop 4 IDE, Designer and ViSi.

10. 4D Systems - Workshop 4 IDE

Workshop 4 is a comprehensive software IDE that provides an integrated software development platform for all of the 4D family of processors and modules. The IDE combines the Editor, Compiler, Linker and Down-Loader to develop complete 4DGL application code. All user application code is developed within the Workshop 4 IDE.



The Workshop 4 IDE supports multiple development environments for the user, to cater for different user requirements and skill level.

- The **Designer** environment enables the user to write 4DGL code in its natural form to program the OGM Module.
- A visual programming experience, suitably called **ViSi**, enables drag-and-drop type placement of objects to assist with 4DGL code generation and allows the user to visualise how the display will look while being developed.
- An advanced environment called **ViSi-Genie** doesn't require any 4DGL coding at all, it is all done automatically for you. Simply lay the display out with the objects you want, set the events to drive them and the code is written for you automatically. ViSi-Genie provides the latest rapid development experience from 4D Systems.
- A **Serial** environment is also provided to transform the OGM Module into a slave serial module, allowing the user to control the display from any host microcontroller or device with a serial port.

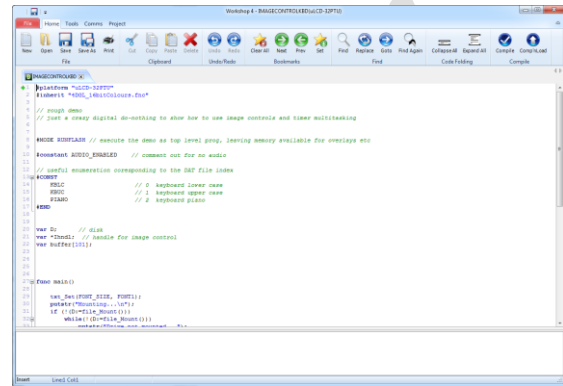
The Workshop 4 IDE is available from the 4D Systems website. www.4dsystems.com.au

For a comprehensive manual on the Workshop 4 IDE Software along with other documents, refer to the documentation from the 4D Systems website, on the Workshop 4 product page.

10.1. Workshop 4 – Designer Environment

Choose the Designer environment to write 4DGL code in its raw form.

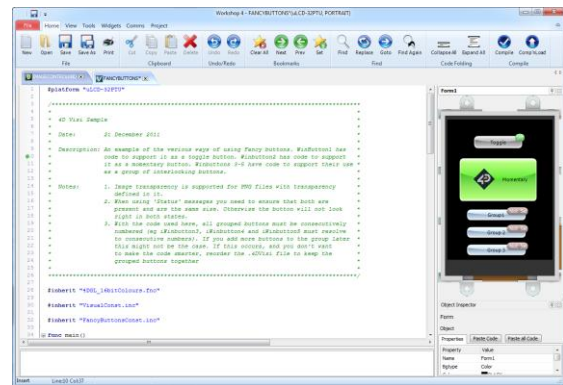
The Designer environment provides the user with a simple yet effective programming environment where pure 4DGL code can be written, compiled and downloaded to the OGM Module.



10.2. Workshop 4 – ViSi Environment

ViSi was designed to make the creation of graphical displays a more visual experience.

ViSi is a great software tool that allows the user to see the instant results of their desired graphical layout. Additionally, there is a selection of inbuilt dials, gauges and meters that can simply be placed onto the simulated module display. From here each object can have its properties edited, and at the click of a button all relevant 4DGL code associated with that object is produced in the user program. The user can then write 4DGL code around these objects to utilise them in the way they choose.



10.3. Workshop 4 – ViSi Genie Environment

ViSi Genie is a breakthrough in the way 4D Systems' graphic display modules are programmed. It is an environment like no other, a code-less programming environment that provides the user with a rapid visual experience, enabling a simple GUI application to be 'written' from scratch in literally seconds.

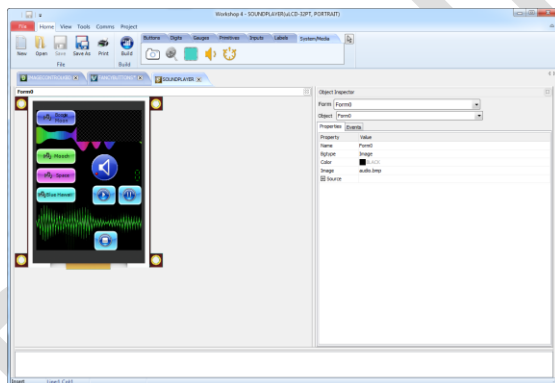
ViSi Genie does all the background coding, no 4DGL to learn, it does it all for you.

Pick and choose the relevant objects to place on the display, much like the ViSi Environment yet without having to write a single line of code. Each object has parameters which can be set, and configurable events to animate and drive other objects or communicate with external devices.

Simply place an object on the screen, position and size it to suit, set the parameters such as colour, range, text, and finally select the event you wish the object to be associated with, it is that simple.

In seconds you can transform a blank display into a fully animated GUI with moving sliders, animated press and release buttons, and much more. All without writing a single line of code!

ViSi Genie provides the user with a feature rich rapid development environment, second to none.



10.4. Workshop 4 – Serial Environment

The Serial environment in the Workshop 4 IDE provides the user the ability to transform the OGM Module into a slave serial graphics controller.

This enables the user to use their favourite microcontroller or serial device as the Host, without having to learn 4DGL or program in a separate IDE. Once the OGM Module is configured and downloaded to from the Serial Environment, simple graphic commands can be sent from the users host microcontroller to display primitives, images, sound or even video.

Refer to the **"Serial Command Set Reference Manual"** from the Workshop 4 product page on the 4D Systems website for a complete listing of all the supported serial commands

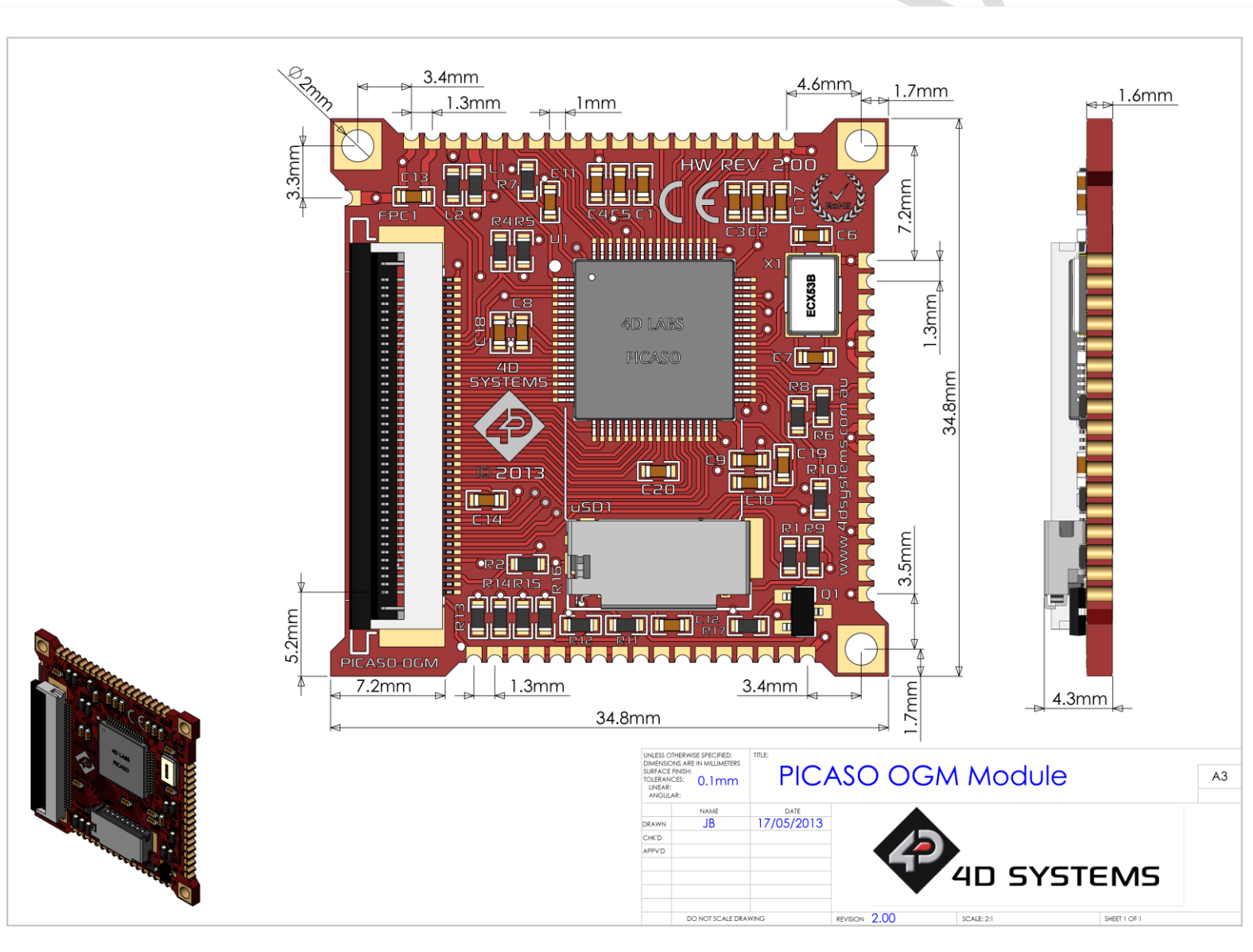
PICASO OGM Modules will come pre-programmed with whatever PmmC/firmware is required by the customer. Please contact the 4D Systems' Sales department to specify the requirements of your order.

UNARY

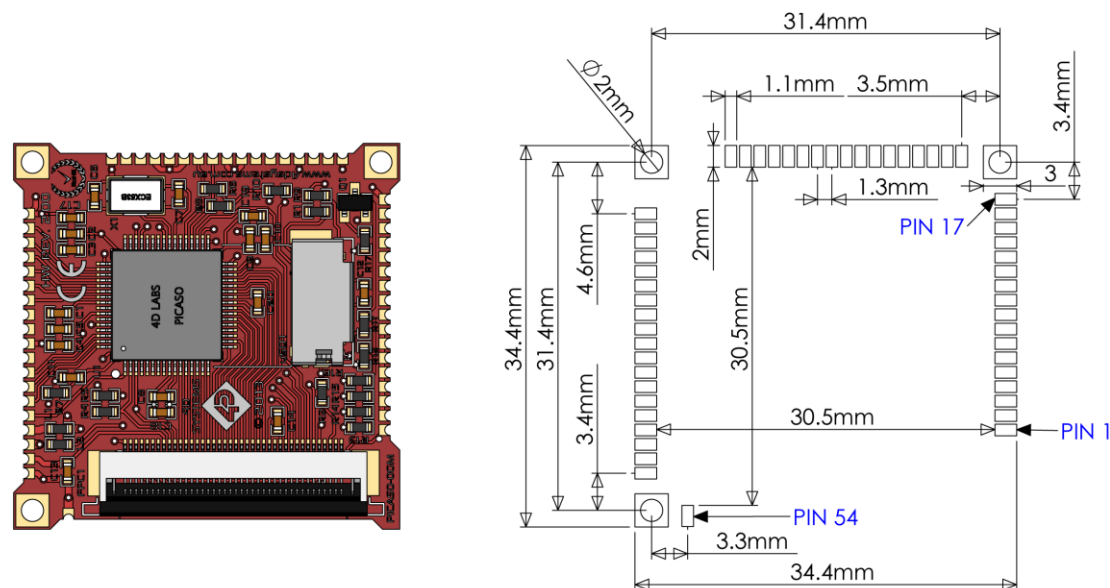
12. Scribble Box



13. Mechanical Details



14. Recommended PCB Footprint



UNLESS OTHERWISE SPECIFIED:
DIMENSIONS ARE IN MILLIMETERS
SURFACE FINISH:
TOLERANCES: 0.1mm
LINEAR:
ANGULAR:

TITLE:

PICASO OGM - PCB Footprint

A4

| | NAME | DATE |
|-------|------|------------|
| DRAWN | JB | 18/05/2013 |
| CHK'D | | |
| APP'D | | |
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4D SYSTEMS

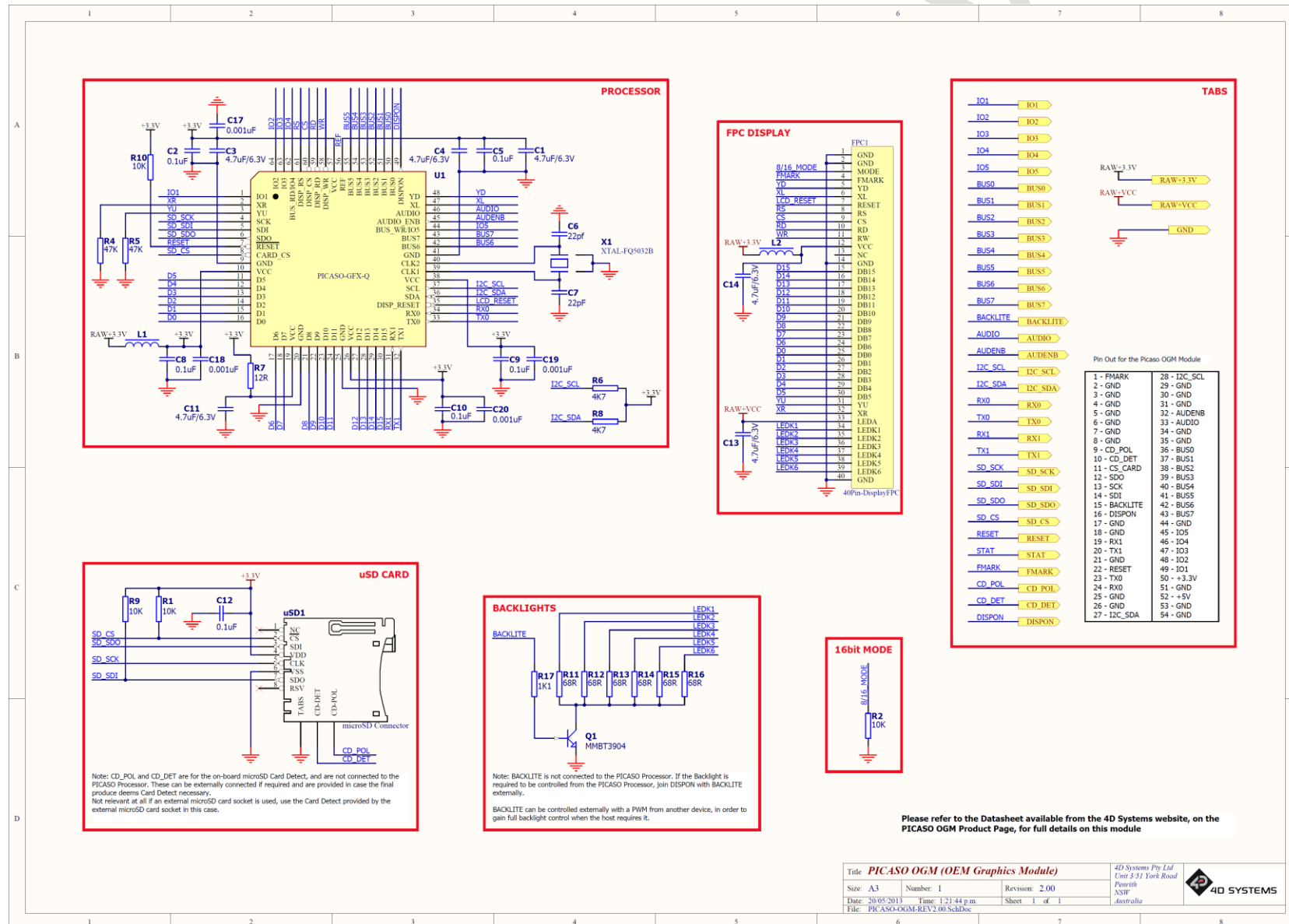
DO NOT SCALE DRAWING

REVISION 2.00

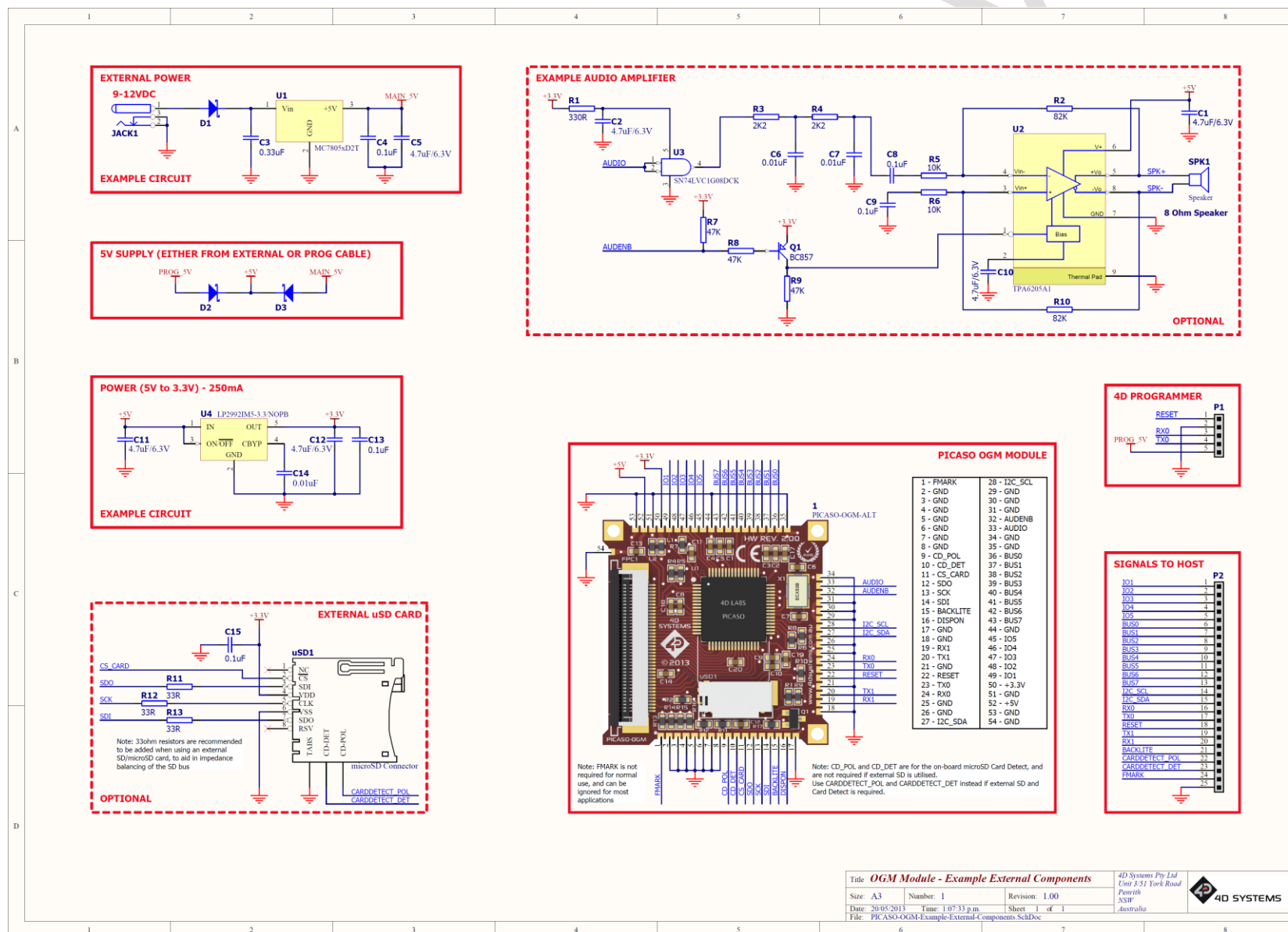
SCALE: 2:1

SHEET 1 OF 1

15. Schematic Diagram



16. Example External Components



17. Specifications and Ratings

| ABSOLUTE MAXIMUM RATINGS | |
|--|----------------|
| Operating ambient temperature | -15°C to +65°C |
| Storage temperature | -30°C to +70°C |
| Voltage on any digital input pin with respect to GND | -0.3V to 6.0V |
| Voltage on RAW+3.3V with respect to GND | -0.3V to 3.6V |
| Voltage on RAW+VCC with respect to GND | -0.3V to 5.5V |
| NOTE: Stresses above those listed here may cause permanent damage to the device. This is a stress rating only and functional operation of the device at those or any other conditions above those indicated in the recommended operation listings of this specification is not implied. Exposure to maximum rating conditions for extended periods may affect device reliability. | |

| RECOMMENDED OPERATING CONDITIONS | | | | | |
|----------------------------------|---|-----|-----|------|-------|
| Parameter | Conditions | Min | Typ | Max | Units |
| Supply Voltage (RAW+3.3V) | Stable Regulated external supply required | 3.3 | 3.3 | 3.6 | V |
| Backlight Supply (RAW+VCC) | Stable Regulated external supply required (3.3V results in dim backlight) | 3.3 | 5.0 | 5.5 | V |
| Operating Temperature | | -10 | -- | +60 | °C |
| Input Low Voltage (VIL) | 3.3V, all pins | 0 | -- | 0.2 | V |
| Input High Voltage (VIH) | 3.3V, non 5V tolerant pins | 0.8 | -- | 3.3 | V |
| Input High Voltage (VIH) | All GPIO pins, RX0 and TX0 pins | 0.8 | -- | 5.5 | V |
| Reset Pulse | External Open Collector | 2.0 | -- | -- | µs |
| Operational Delay | Power-Up or External Reset | 500 | -- | 3000 | ms |

| GLOBAL CHARACTERISTICS BASED ON OPERATING CONDITIONS | | | | | |
|--|--|-----|-------|-----|-------|
| Parameter | Conditions | Min | Typ | Max | Units |
| Supply Current (ICC) | 3.3V, heavily depends on screen usage conditions, sleep mode | -- | TBD | -- | mA |
| Output Low Voltage (VOL) | 3.3V, IOL = 3.4mA | -- | -- | 0.4 | V |
| Output High Voltage (VOH) | 3.3V, IOL = -2.0mA | 2.4 | -- | -- | V |
| Capacitive Loading | All pins | -- | -- | 50 | pF |
| Flash Memory Endurance | PICASO PmmC Programming | -- | 10000 | -- | E/W |

| ORDERING INFORMATION | |
|----------------------------------|--|
| Order Code: PICASO-OGM | |
| Packaging: Bulk Packaging | |

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