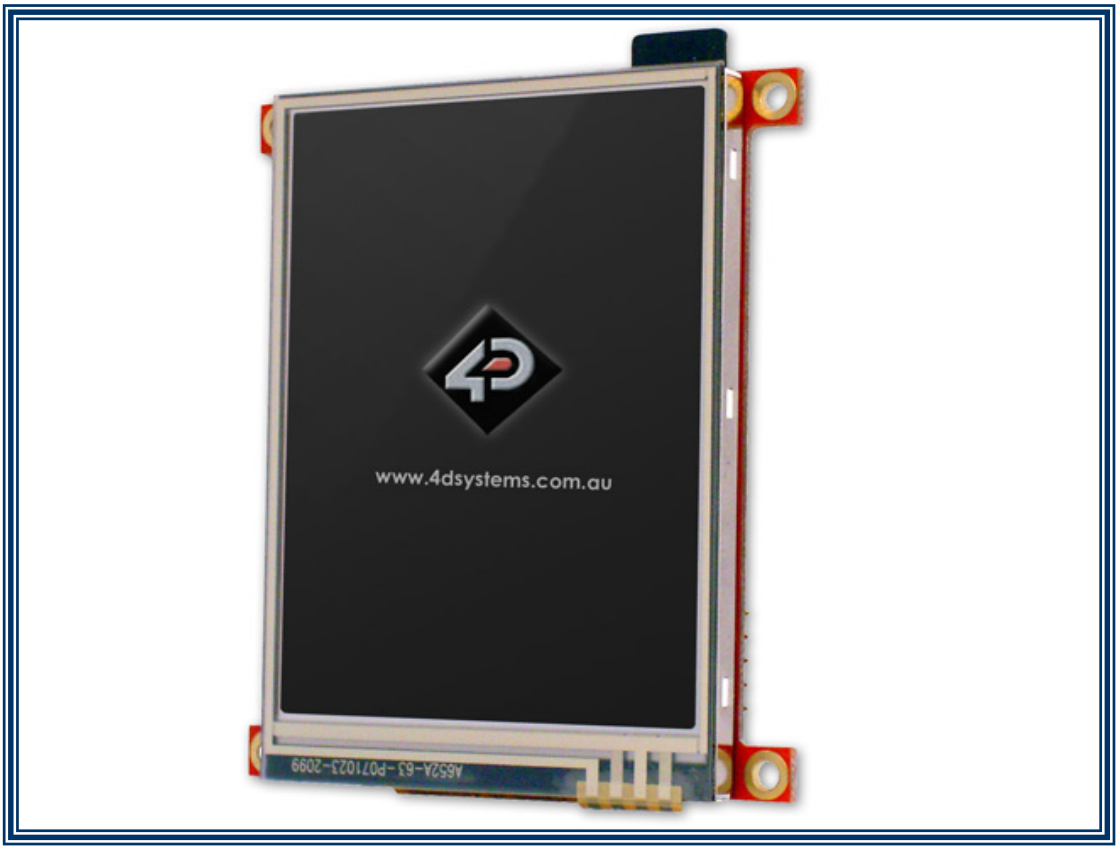
µLCD-32032-P1T

USERS MANUAL

(4DGL Platform Only)

Revision 1.1



4D Systems

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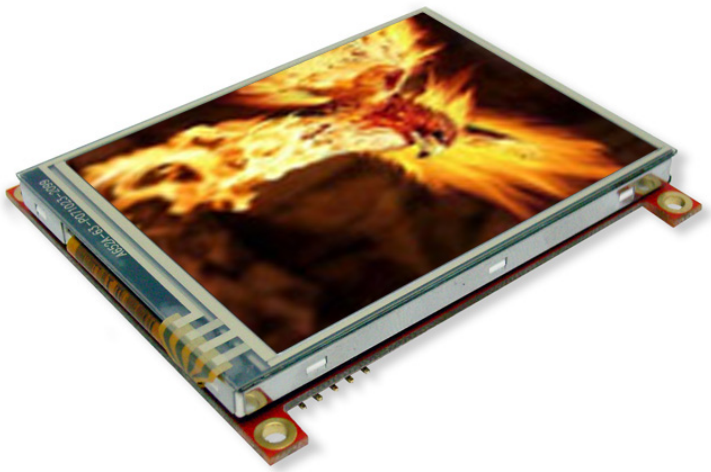
1 Introduction

The **µLCD-32032-P1T** is a 3.2" size cost effective all in one 'SMART' display module using the latest state of the art LCD TFT technology with an embedded **PICASO-GFX** graphics controller that delivers 'stand-alone' functionality to any project. The 'easy to learn and use' 4D Graphics Language (**4DGL**) with vast built in library functions will allow rapid application development.

4DGL is a graphics oriented programming language, allowing 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 PICASO-GFX processor embedded in the µLCD-32032-P1T module.

4DGL allows the user to take complete control of all available resources on that hardware platform such as the Serial Port, Graphics AMOLED Display, µSD memory card, I/O pins, etc. This eliminates the need for an external host controller/processor to drive the µLCD-32032-P1T module via serial commands. It provides the user complete control over the hardware module allowing them to quickly develop powerful applications.

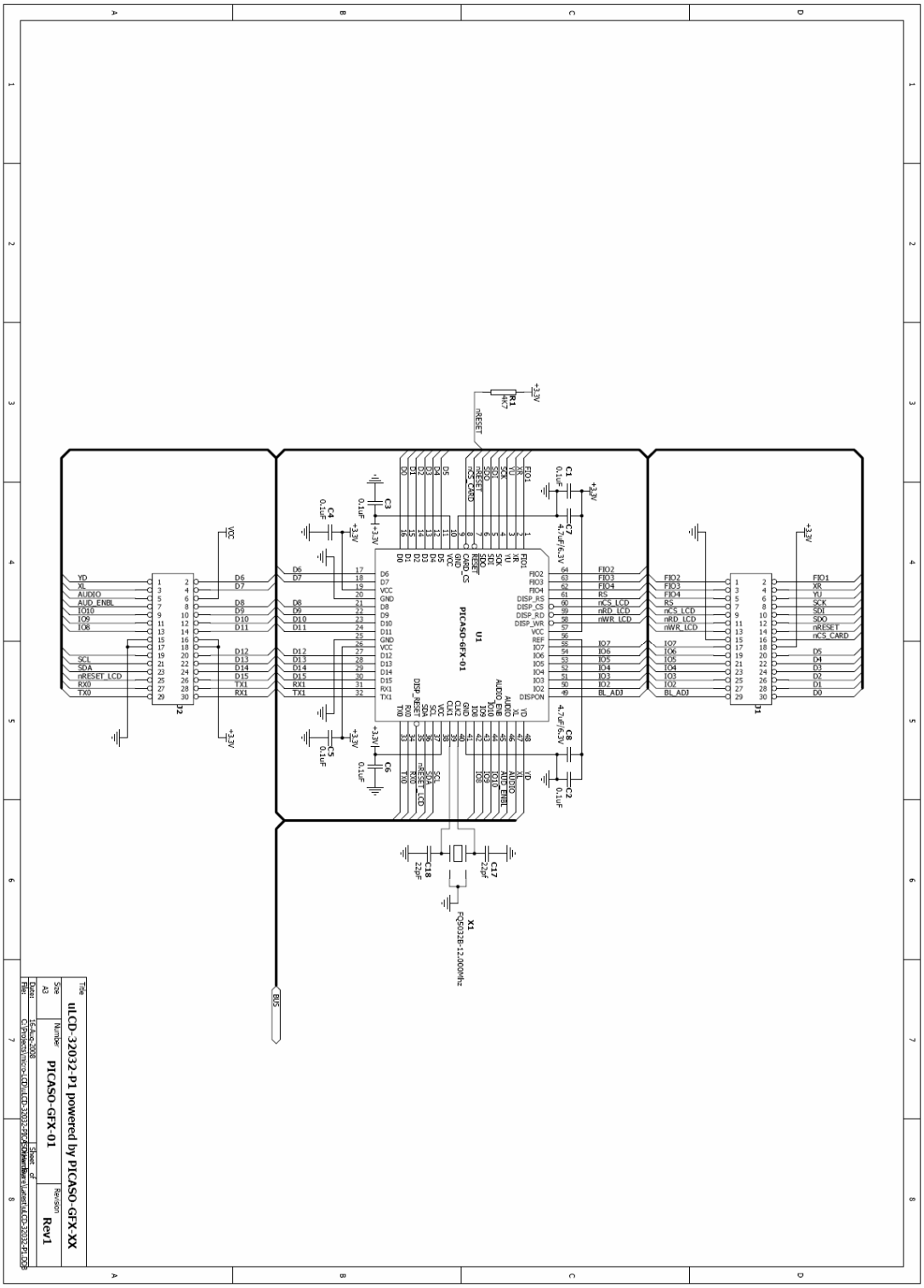


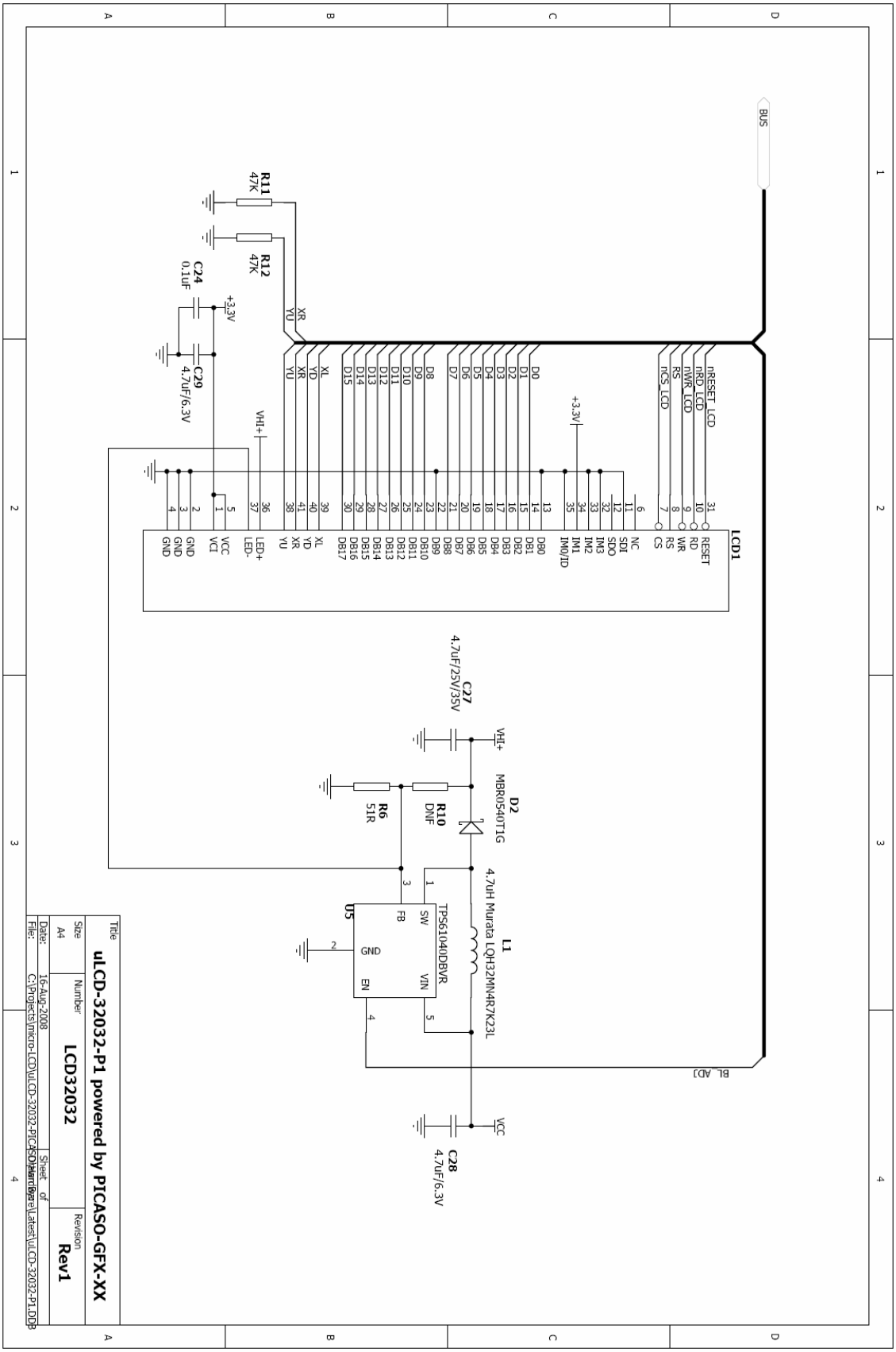
2 Features

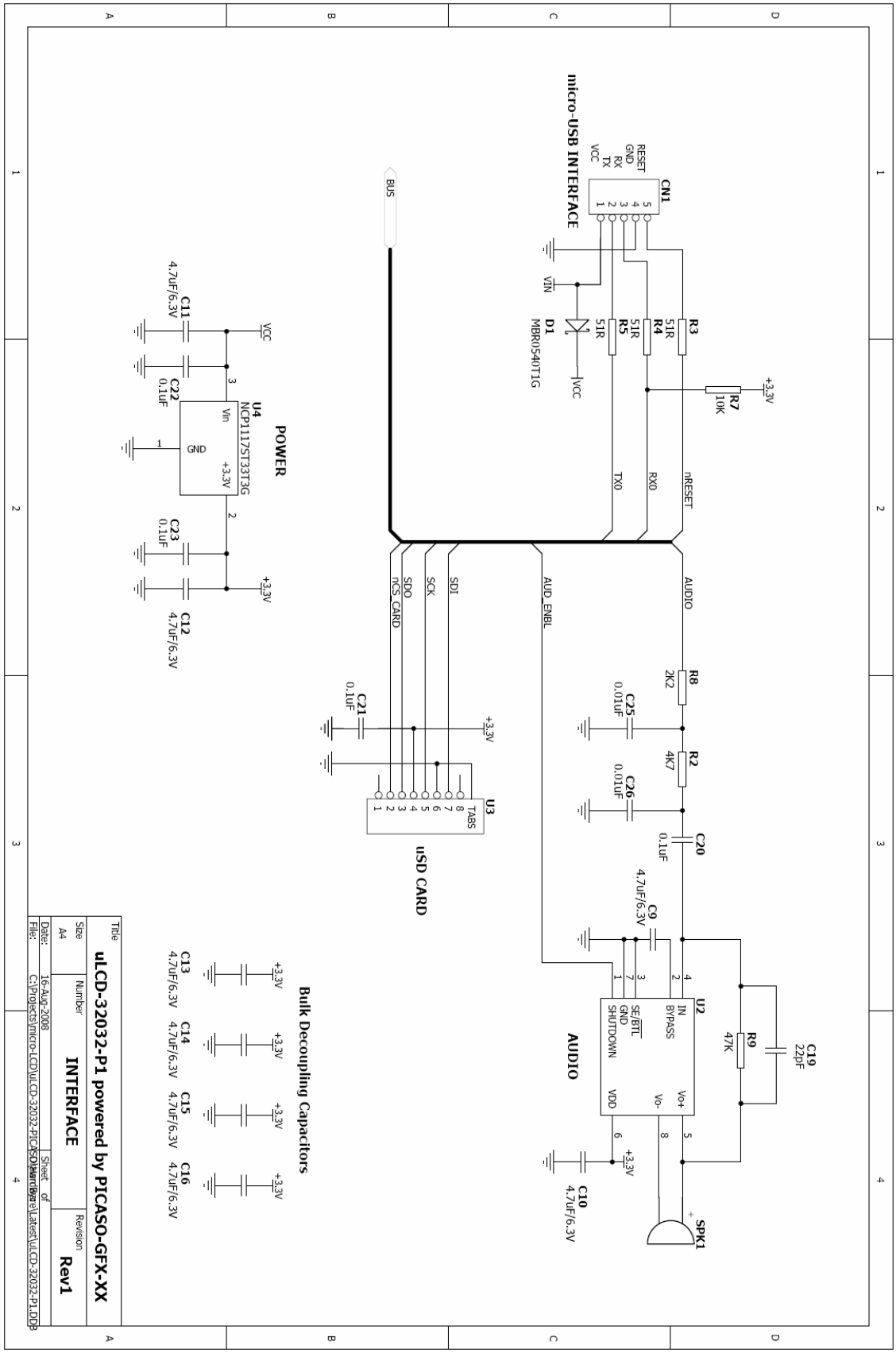
The **µLCD-32032-P1T** module is aimed at being integrated into a variety of different applications via a wealth of features designed to facilitate any given functionality quickly and cost effectively and thus reduce 'time to market'. These features are as follows:

- 3.2" QVGA 240 x **RGB** x 320 pixel resolution with 256, 65K or 262K true to life colours enhanced TFT screen.
- Wide viewing angle.
- Module size including PCB: 55.1 x 77.0 x 14.0mm.
- Display viewing area: 48.6 x 64.8mm
- Easy 5 pin user interface (VCC, TX, RX, GND, RESET) to any 4D micro-USB module such as the **µUSB-MB5** or the **µUSB-CE5**.
- Voltage supply from 4.5V to 5.5V, current @ 90mA nominal when using a 5.0V supply source.
- Onboard micro-SD (**µSD**) memory card adaptor with full FAT16 file support for storing and executing 4DGL programs, files, icons, images, animations, video clips and audio wave files. 64Mb to 2Gig µSD memory cards can be purchased separately.
- Powered by the fully integrated **PICASO-GFX** Graphics Processor (PICASO-GFX chip is also available for OEM volume users).
- Built in extensive 4DGL graphics and system library functions. For all available features and functions under the 4DGL programming language please visit the 4DGL web page http://www.4dsystems.com.au/developers/
- 2 x 30 pin headers for I/O expansion and future plug-in daughter boards.
- Audio amplifier with a tiny 8 Ohms speaker for sound generation and wave file playback.
- Mechanical support via 4 mounting tabs which can be snapped off.

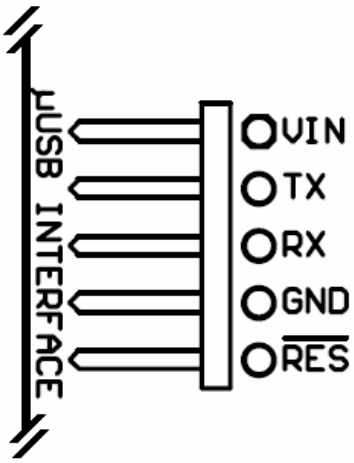
3 Circuit Diagram




BUS
LCD1
R11 47K
R12 47K
C24 0.1uF
C29 4.7uF/6.3V
C27 4.7uF/25V/35V
C28 4.7uF/6.3V
R6 51R
R10 DNF
D2 MBR0540T1G
L1 4.7uH Murata LQH32MN4R7K23L
U5 TPS61040DBVR
VHI+
VCC
+3.3V
BL_ADJ
uLCD-32032-P1 powered by PICASO-GFX-XX
LCD32032
Rev1

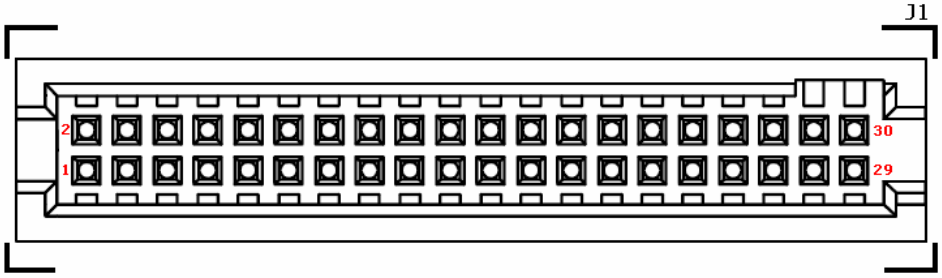

micro-USB INTERFACE
CN1
RESET
GND
RX
TX
VCC
VIN
D1
MBR0540T1G
R3
R4
R5
51R
R7
10K
+3.3V
VCC
BUS
TX0
RX0
nRESET
AUDIO
AUD_ENBL
SDI
SCK
SDO
nCS_CARD
POWER
U4
NCP1117ST33T3G
Vin
GND
+3.3V
C11
4.7uF/6.3V
C22
0.1uF
C23
0.1uF
C12
4.7uF/6.3V
C21
0.1uF
U3
TABS
uSD CARD
R8
2K2
R2
4K7
C25
0.01uF
C26
0.01uF
C20
0.1uF
C9
4.7uF/6.3V
U2
IN
BYPASS
SE/BTL
GND
SHUTDOWN
VDD
Vo+
Vo-
AUDIO
R9
47K
C19
22pF
C10
4.7uF/6.3V
SPK1
Bulk Decoupling Capacitors
C13
4.7uF/6.3V
C14
4.7uF/6.3V
C15
4.7uF/6.3V
C16
4.7uF/6.3V
Title
uLCD-32032-P1 powered by PICASO-GFX-XX
Size
A4
Number
INTERFACE
Revision
Rev1
Date:
16-Aug-2008
Sheet of
File:
C:\Projects\micro-LCD\uLCD-32032-P1C\SCHlatest\uLCD-32032-P1.DDB

4 User Interface Pin Description

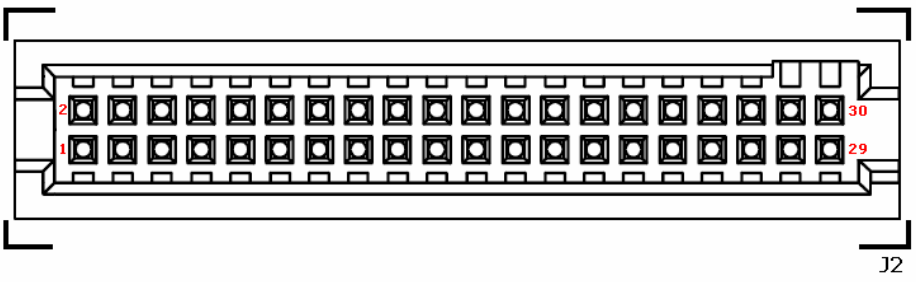
Power, Serial and micro-USB Interface			
Pin	**Function**	**Description**	
1	VIN	Main Power Supply input 4.5Volts to 5.5Volts. Nominal @ 5Volts.	
2	TX	Serial Transmit Pin (Data Out), COM0 TX. CMOS levels 0V to 3.3V	
3	RX	Serial Receive Pin (Data In), COM0 RX. CMOS levels 0V to VIN.	
4	GND	Ground.	
5	RES	External RESET signal for the module and PICASO chip. Pull this pin Low for 20µsec or longer to Reset the module. Not required for normal usage.	

5 Expansion Ports Pin Description

EXPANSION PORT J1 (for future 4D add-on modules)		
Pin	**Label**	**Description**
1	FIO2	Factory IO2 pin. (Reserved, do not use).
2	FIO1	Factory IO1 pin. (Reserved, do not use).
3	FIO3	Factory IO3 pin. (Reserved, do not use).
4	XR	4-Wire resistive touch screen right signal. (Reserved, do not use).
5	FIO4	Factory IO4 pin. (Reserved, do not use).
6	YU	4-Wire resistive touch screen top signal. (Reserved, do not use).
7	RS	Display register select signal. (Reserved, do not use).
8	SCK	SPI serial clock output for external SD card use only.
9	nCS_LCD	DISPLAY chip select signal. (Reserved, do not use).
10	SDI	SPI serial data input for external SD card use only.
11	nRD_LCD	DISPLAY read strobe signal. (Reserved, do not use).
12	SDO	SPI serial data output for external SD card use only.
13	nWR_LCD	DISPLAY write strobe signal. (Reserved, do not use).
14	nRESET	Master RESET. Pull this pin Low for 20µsec or longer to Reset the module.
15	GND	Ground.
16	nCS_CARD	SD memory card chip select for external SD card use only.
17	IO7	General Purpose Input Output 7 pin.
18	3.3V	Regulated 3.3 Volts output, available current max 400mA.
19	IO6	General Purpose Input Output 6 pin.
20	D5	DISPLAY data bus bit 5. (Reserved, do not use).
21	IO5	General Purpose Input Output 5 pin.
22	D4	DISPLAY data bus bit 4. (Reserved, do not use).
23	IO4	General Purpose Input Output 4 pin.
24	D3	DISPLAY data bus bit 3. (Reserved, do not use).
25	IO3	General Purpose Input Output 3 pin.
26	D2	DISPLAY data bus bit 2. (Reserved, do not use).
27	IO2	General Purpose Input Output 2 pin.
28	D1	DISPLAY data bus bit 1. (Reserved, do not use).
29	BL_ADJ	DISPLAY Backlight enable signal. (Reserved, do not use).
30	D0	DISPLAY data bus bit 0. (Reserved, do not use).



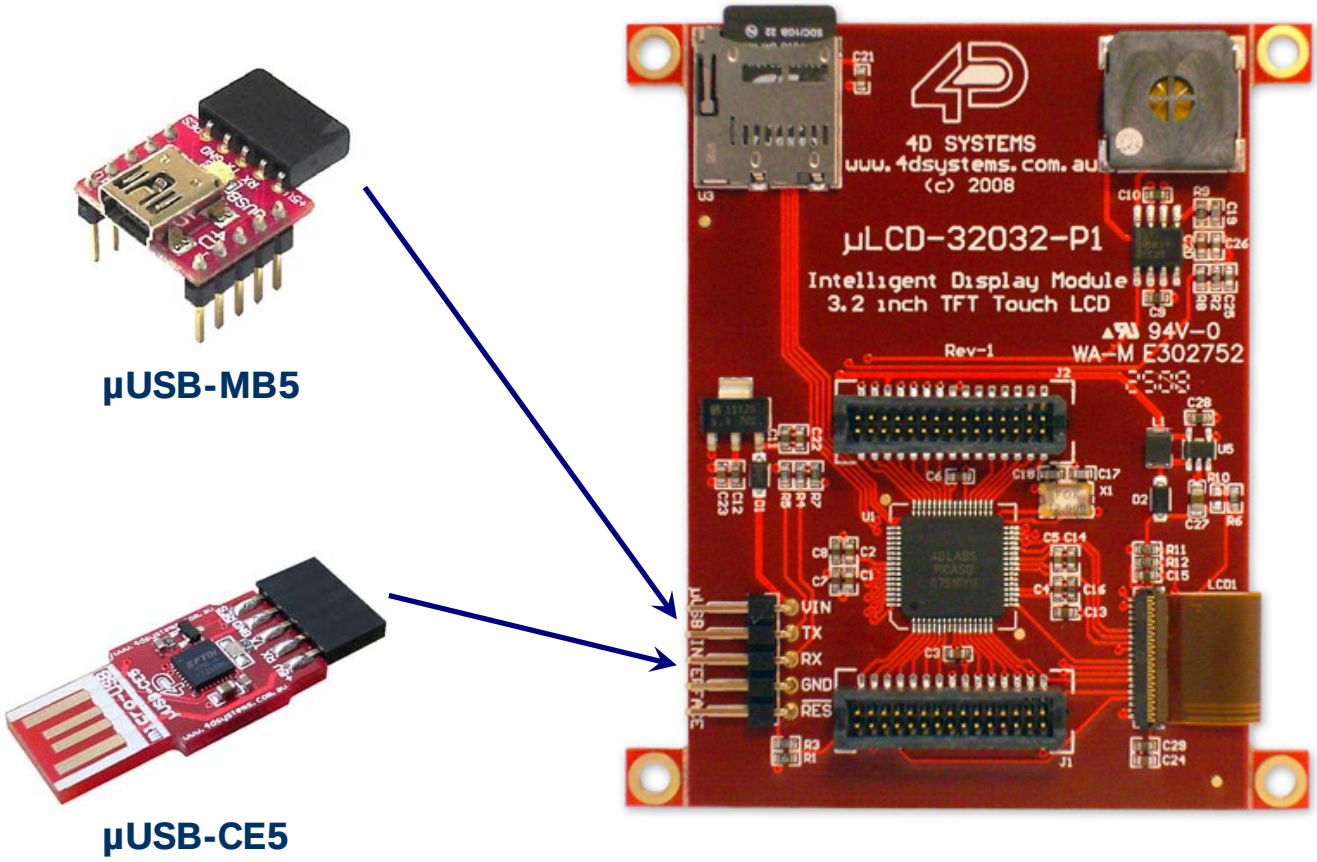
EXPANSION PORT J2 (for future 4D add-on modules)		
Pin	**Label**	**Description**
1	YD	4-Wire resistive touch screen bottom signal. (Reserved, do not use).
2	D6	DISPLAY data bus bit 6. (Reserved, do not use).
3	XL	4-Wire resistive touch screen left signal. (Reserved, do not use).
4	D7	DISPLAY data bus bit 7. (Reserved, do not use).
5	AUDIO	Pulse width modulated Audio output from PICASO. This pin is also input to the onboard audio amplifier.
6	VCC	Main Power Supply input 4.5Volts to 5.5Volts. Nominal @ 5Volts.
7	AUDIO_ENBL	Logic Low will enable the audio amplifier, logic High will disable it.
8	D8	DISPLAY data bus bit 8. (Reserved, do not use).
9	IO10	General Purpose Input Output 10 pin.
10	D9	DISPLAY data bus bit 9. (Reserved, do not use).
11	IO9	General Purpose Input Output 9 pin.
12	D10	DISPLAY data bus bit 10. (Reserved, do not use).
13	IO8	General Purpose Input Output 8 pin.
14	D11	DISPLAY data bus bit 11. (Reserved, do not use).
15	GND	Ground.
16	3.3V	Regulated 3.3 Volts output, available current max 400mA.
17	GND	Ground.
18	3.3V	Regulated 3.3 Volts output, available current max 400mA.
19	N.C.	No Connect.
20	D12	DISPLAY data bus bit 12. (Reserved, do not use).
21	SCL	I2C clock output.
22	D13	DISPLAY data bus bit 13. (Reserved, do not use).
23	SDA	I2C bi-directional data.
24	D14	DISPLAY data bus bit 14. (Reserved, do not use).
25	nRESET_LCD	DISPLAY Reset signal. (Reserved, do not use).
26	D15	DISPLAY data bus bit 15. (Reserved, do not use).
27	RX0	Asynchronous serial port 0 receive pin. COM0 Rx.
28	TX1	Asynchronous serial port 1 transmit pin. COM1 Tx.
29	TX0	Asynchronous serial port 0 transmit pin. COM0 Tx.
30	RX1	Asynchronous serial port 1 receive pin. COM1 Rx.



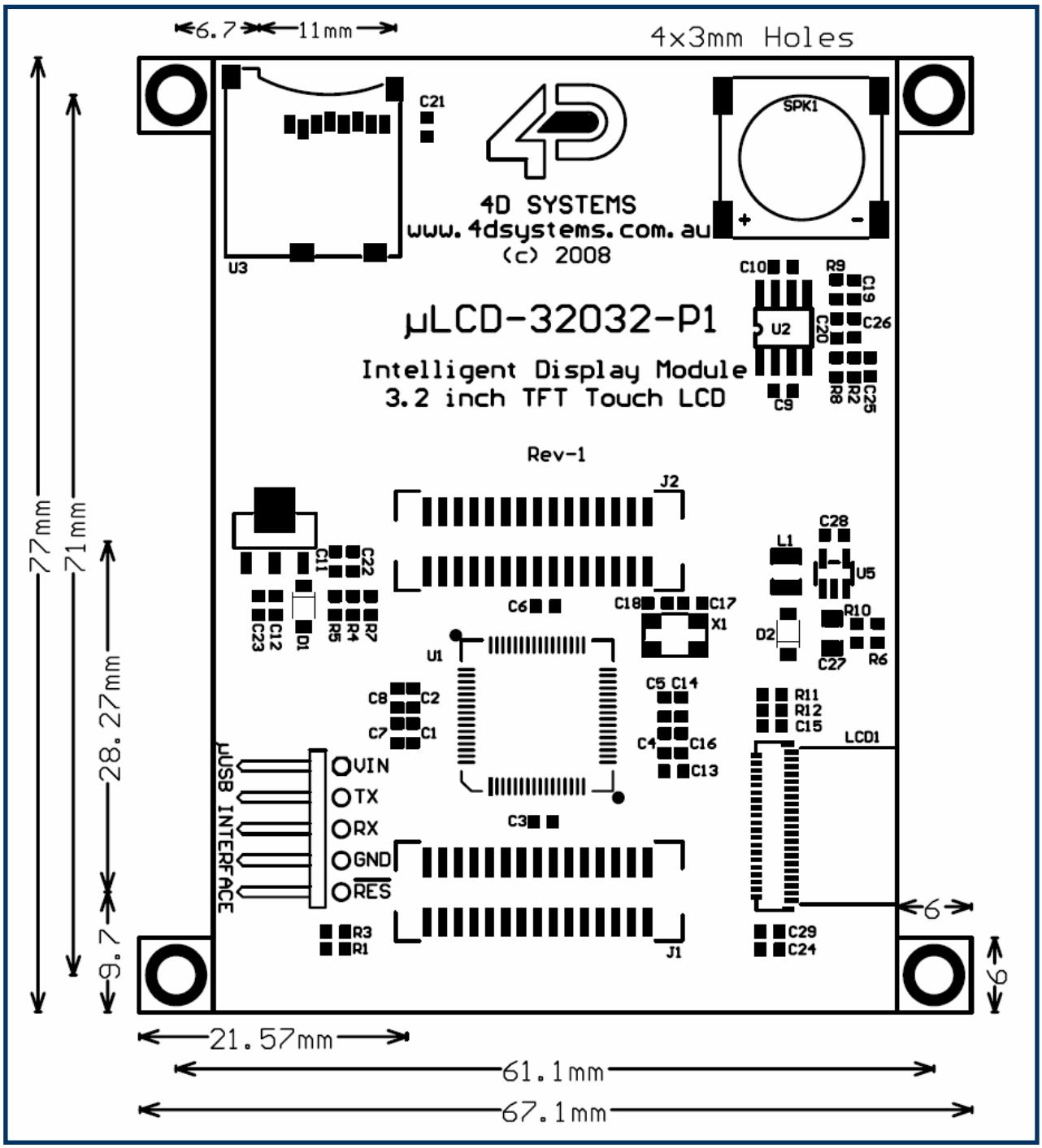
6 USB to Serial Interface - microUSB

The µLCD-32032-P1T module is required to be interfaced to a PC for uploading the PICASO-GFX chip with user application **4DGL** code. Using a standard USB cable and any one of the 4D Systems micro-USB modules (**µUSB-MB5** or **µUSB-CE5**) as shown below, a PC to µLCD-32032-P1T connection can be achieved simply.

The micro-USB interface is also used for **PmmC** (Personality module micro Code) uploads. The PmmC allows the latest Operating System and **4DVM** (4D Virtual Machine) upgrades for the PICASO-GFX chip. The micro-USB module (optional extra), simply connects to the µLCD-32032-P1T module and captures the USB data and converts it into serial CMOS level (0 to 3.3V) data. The micro-USB modules and drivers are available from your local 4D distributor. This is an optional extra product and is not included with the module.



7 Mechanical Details



The module footprint is **55.1**mm x **77.0**mm x **14.0**mm (excluding tabs).

8 Specifications and Ratings

Symbol	Characteristic	Min	Typ	Max	Units
V_{IN}	Supply voltage	4.5	5.0	5.5	Volts
I	Current	70	90	100	mA
T_{OP}	Operating temperature	-10	--	60	deg C
T_{STO}	Storage temperature	-20	--	70	deg C
T_{PU}	Power-up delay	900	1000	1100	msec
V_{TX}	TX pin Voltage Out	0.4	3.0	3.3	Volts
V_{RX}	RX pin Voltage In	0	2.4	Vin	Volts
V_{IOIL}	Input Low Voltage on any I/O pin	0	--	0.7	Volts
V_{IOIH}	Input High Voltage on any I/O pin	2.6	--	3.3	Volts
V_{IOOL}	Output Low Voltage on any I/O pin	0	--	0.4	Volts
V_{IOOH}	Output High Voltage on any I/O pin	2.6	--	3.3	Volts
LT_{FP}	Life Time Touch Panel Finger Press	1,000,000	--	--	Cycles
LT_{PS}	Life Time Touch Panel Pen Slide	100,000	--	--	Cycles
B	Brightness	250	300	--	Cd/m2
VA_H	Viewing Angle - Horizontal	70	75	--	degrees
VA_V	Viewing Angle - Vertical	67	72	--	degrees
T_{RES}	Response Time	--	25	30	msec
CR	Contrast Ratio	400:1	500:1	-	-
LT_{BL}	Backlight LED Life Time @I_{LED} = 20ma	30,000	40,000	--	hours

9 Available Models and Order Codes

- **µLCD-32032-P1T :**
  - Diagonal : 3.2”
  - Screen Outline : 55.14 x 75.3 mm
  - Active Area: 48.6 x 64.8 mm
  - 4 Wire Resistive Touch Panel

10 Related Products and Tools

- **µUSB-MB5**
  - micro-USB module, USB to Serial Bridge, Silabs CP2102
  - Standard USB miniB connector
  - 10 pin header provides the following signals:
    - 5V, 3.3V, GND, Tx, Rx, Suspend,
    - DTR, CTS, RTS, GND
  - 5 Volts supply @ 500mA, 3.3 Volts supply @ 100mA
  - Additional flow control signals, DTR, CTS, RTS
  - Available with an additional 5 pin header for the µOLED interface
    www.4dsystems.com.au/prod.php?id=18

- **µUSB-CE5**
  - micro-USB module, USB to Serial Bridge, FTDI Chipset
  - Plugs directly into USB port
  - 5 pin header provides the following signals:
    - 5V, Rx, Tx, GND, Reset
  - 5 Volts supply @ 500mA
    www.4dsystems.com.au/prod.php?id=19

- **PmmC File for the µLCD-32032-P1T module**
  The latest PmmC system files for the modules can be downloaded from the individual product pages at:
  www.4dsystems.com.au/products.php

- **PmmC Loader PC Software Tool (free download)**
  Latest version of **PmmC-Loader** software tool can be downloaded from:
  www.4dsystems.com.au/downloads/PmmC-Loader/Software/Windows/
  and the User Guide can be found here:
  www.4dsystems.com.au/downloads/PmmC-Loader/Docs/Pdf/

- **4DGL Workshop (free download)**
  This is the IDE plus editor plus compiler for all 4DGL user applications. Everything is provided in a single package to write, compile and download 4DGL application code into the **µLCD-32032-P1T** module.
  www.4dsystems.com.au/developers

- **4D Graphics Composer (free download)**
  The GC allows downloading of images/animations/movie clips into the micro-SD memory card which can then be recalled and used within 4DGL user application code.
  www.4dsystems.com.au/downloads/Graphics_Composer/

PROPRIETORY INFORMATION

DISCLAIMER OF WARRANTIES & LIMITATION OF LIABILITY

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The foregoing remedy shall be subject to buyer's written notification of defect and return of the defective product within ninety (90) days of purchase. The foregoing remedy does not apply to products that have been subjected to misuse (including without limitation static discharge), neglect, accident or modification, or to products that have been soldered or altered during assembly, or are otherwise not capable of being tested, or if damage occurs as a result of the failure of buyer to follow specific instructions.

In no event shall 4D Systems be liable to the buyer or to any third party for any indirect, incidental, special, consequential, punitive or exemplary damages (including without limitation lost profits, lost savings, or loss of business opportunity) arising out of or relating to any product or service provided or to be provided by 4D Systems, or the use or inability to use the same, even if 4D Systems has been advised of the possibility of such damages.