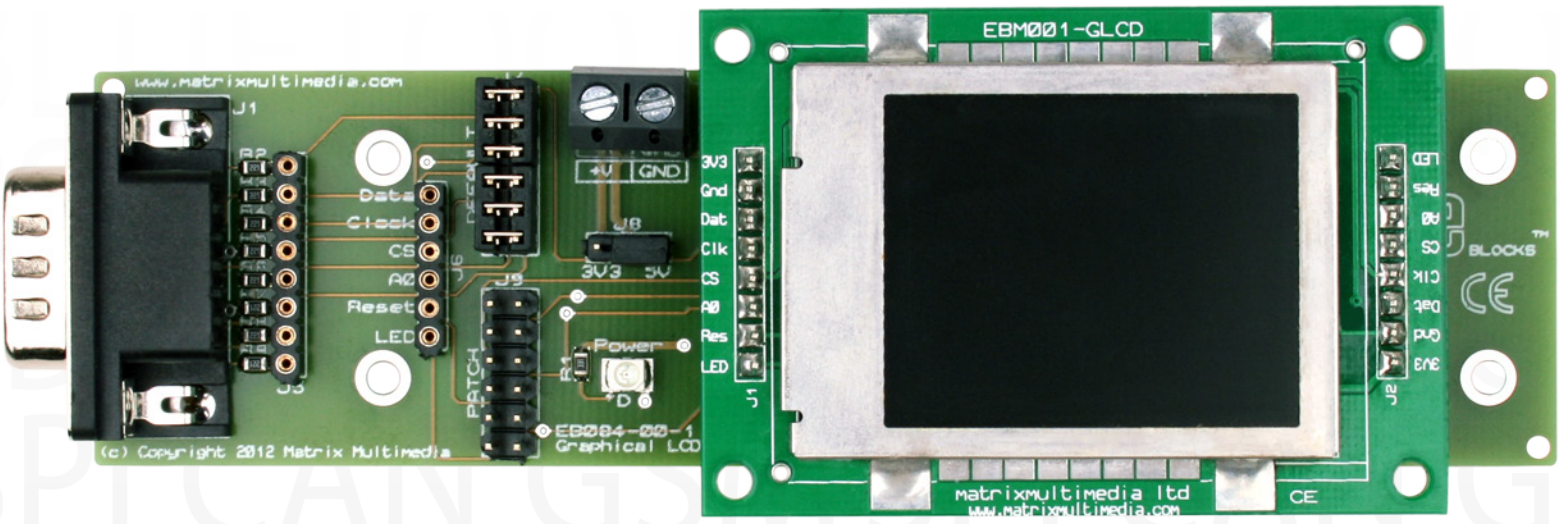
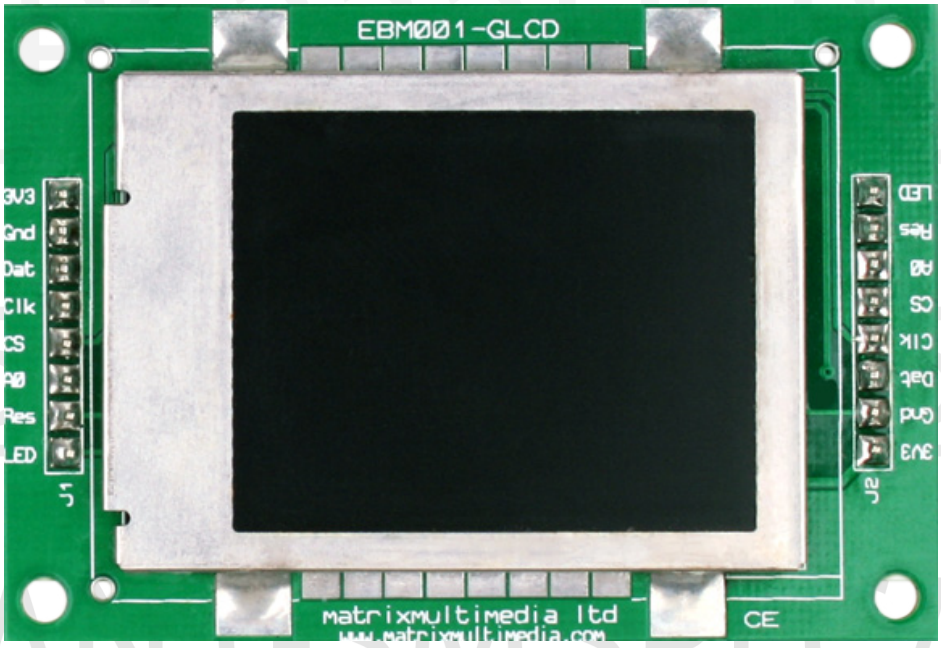
MATRIX

eBLOCKS®

TFT Graphical LCD Board





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About This Document

This document concerns the following:

E-blocks TFT Graphical LCD E-Block and module code EB084 version 1.
E-blocks TFT Graphical LCD module code EBM001 version 1.

The order code for the TFT Graphical LCD E-Block and module is EB084.
The order code for the TFT Graphical LCD module is EBM001.

1. Trademarks and copyright

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2. Disclaimer

The information provided within this document is correct at the time of going to press. Matrix TSL reserves the right to change specifications from time to time.

3. Testing this product

It is advisable to test the product upon receiving it to ensure it works correctly. Matrix provides test procedures for all E-blocks, which can be found in the Support section of the website.

4. Product support

If you require support for this product then please visit the Matrix website, which contains many learning resources for the E-blocks series. On our website you will find:

- How to get started with E-blocks - if you are new to E-blocks and wish to learn how to use them from the beginning there are resources available to help.
- Relevant software and hardware that allow you to use your E-blocks product better.
- Example files and programs.
- Ways to get technical support for your product, either via the forums or by contacting us directly.

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General Information

1. Description

This product features a TFT based graphical display designed for E-blocks, which allows a large amount of data to be displayed to help reduce development time or to increase productivity in projects. The display features 128 by 160 pixels totaling at 20480 individually addressable pixels. There is also a maximum of 65,536 individual colours available for each pixel and a controllable backlight to provide maximum display visibility even in the dark. Internally the display has enough memory to automatically refresh the screen and provide a constant non-flickering display. Only the pixels that need changing have to be written to the display, therefore decreasing write times and vastly improving refresh and animation performance.

A set of jumper links are included which allow the Graphical LCD Display E-block EB084 to easily be set for all PICmicro® microcontroller compatible devices. Combining this with the on board patch system makes this board compatible with numerous other devices. The E-block also features overvoltage protection which only supplies power to the display module if the E-block is powered and configured correctly.

The graphical LCD is also available as a standalone module with order code EBM001. This allows users to incorporate the module into their own designs using a simple breadboard and veroboard compatible 2.54mm pitch interface and minimal set of 4 to 6 I/O pins. The display comes fitted to the module circuit board and has an extra metal shield to help protect the display from damage. The display module also features 5V tolerant inputs, allowing you to control the module from a 5V or 3V3 system. Note that the module must be supplied with a 3V3 supply voltage. The SIL headers on the display module are mirrored allowing you to fit the display module either way on the E-block.

2. Features

- Adjustable backlight
- 128 x 160 Pixels at a 1:1 Ratio
- Crisp and clear display
- Up to 65,535 colours
- 3 or more programmable font sizes
- Up to 16 lines of text
- With up to 21 characters per line
- E-Blocks compatible
- Compatible with most I/O ports in the E-Block range (requires 4-6 I/O lines via D-type connector)
- Overvoltage protection
- 5V and 3V3 compatible

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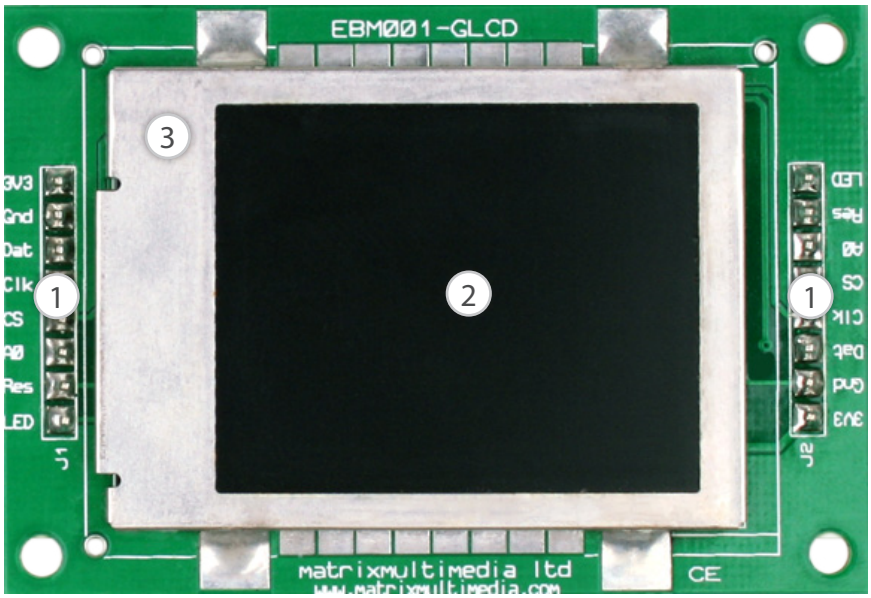
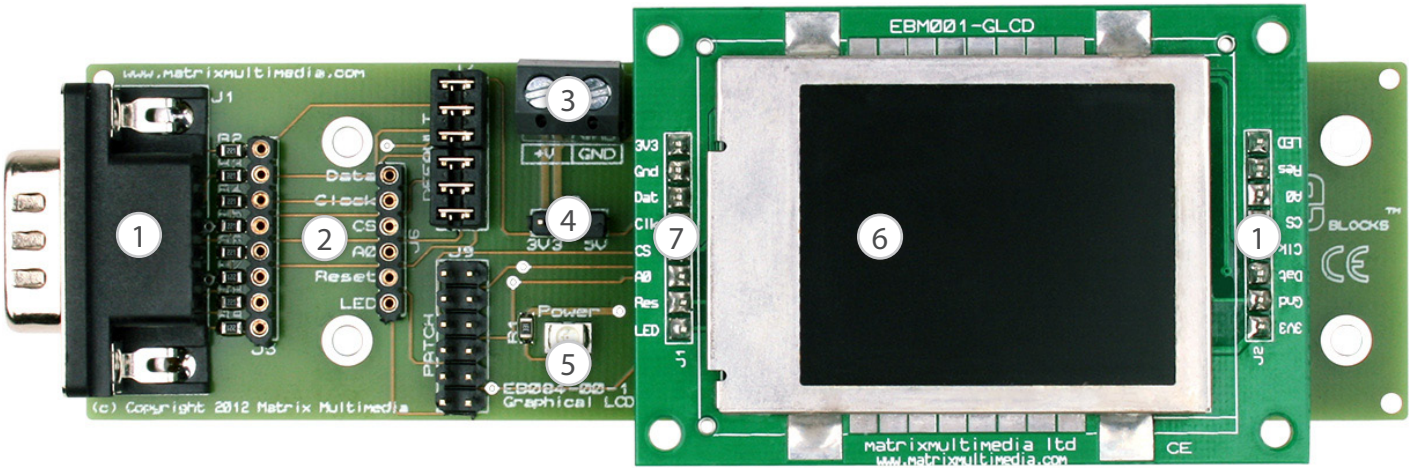
Board Layout



1. Mirrored SIL Pin Connections 2.54mm Pitch
2. 128 x 160 pixel TFT display
3. Metal protection case



1. 9-way downstream D-type connector
2. Patch System
3. +V power input terminals: 5V / 3V3
4. +V voltage selection jumper
5. Power check LED
6. 3V3 supply voltage regulation (Below EBM001)
7. Display module sockets

General Guide for EB084 Patch settings:

Pin	Jumper A	Jumper B
Data	0	Patch
Clock	1	Patch
CS	2	Patch
A0	3	Patch
Reset	4	Patch
LED	5	Patch

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Testing This Product

The following program will test the circuit. The test file can be downloaded from www.matrixtsl.com.

1. System Setup

Multi-programmer board (EB006) with:

EB006 Options	Setting
Power Supply	External, 14V
PICmicro Device	16F877A
SW1 (Fast/Slow)	Fast
SW2 (RC/Xtal)	Xtal
Xtal Frequency	19.6608MHz
Port A	
Port B	GLCD Board EB084
Port C	
Port D	
Port E	
Test Program	EB084TP.hex

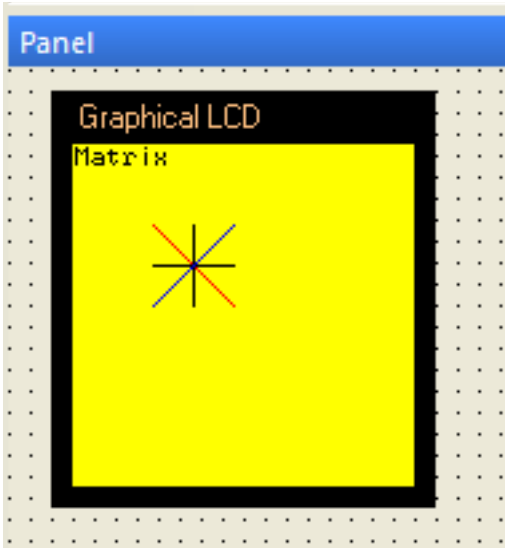
EB084 Options	Setting
Patch system	A

2. Test Procedure for Graphical LCD E-Block

1) Wire power from +V on the Multiprogrammer to +V on the EB084.
2) Ensure voltage jumper is set to 5V on the EB084.
3) Configure system and board options as above.
4) Power up the Multiprogrammer from the power source.
5) Download EB084TP.hex to the 16F877A PICmicro®.
6) Press reset on the Multiprogrammer.
7) If the program is running correctly the Graphical LCD should display the following.

1. Set the background to light yellow.
2. Draw the word Matrix with black writing
3. Draw a star made out of a black cross, a red line and a blue line.

This test procedure tests the complete functionality of the board.



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Circuit Description

EB084

The circuit (as can be seen in the circuit diagrams below), is made up of three sections: Connectors, Overvoltage protection and 3.3V operation.

1. Connectors

The design of this product is to enable you to use it with many standard microcontroller devices. This is achieved by identifying the microcontroller that you are using and which input / output pins are available. The reset and LED connections are not required for the display to function, the reset signal allows the display to be reset and the LED signal allows the backlight to be dimmed or switched off.

2. Overvoltage Protection

The EBM001 module has inbuilt voltage protections for the I/O signals but not for the supply voltage so care should be taken to ensure that the input voltage on the 3.3V pin does not exceed 3.3V.

Note: Allowing a voltage greater then 3.3V to enter the 3.3V pin of the EBM001 will likely cause irreversible damage to the graphical display module.

3. 3.3V operation

The Graphical LCD E-Block is compatible with 3.3V and 5V systems. Ensure that the Voltage selection jumper matches the voltage of your microcontroller system. If in doubt then use the 5V setting and see if the LED lights. The I/O of the EBM001 module is 5V and 3.3V tolerant.
Note: Allowing a voltage greater then 3.3V to enter the 3.3V pin of the EBM001 will likely cause irreversible damage to the graphical display module.

EBM001

The circuit (as can be seen in the circuit diagrams below), is made up of three sections: Connectors, Voltage regulation and reset / backlight operation.

1. Connectors

The design of this product is to enable you to use it with many standard microcontroller devices. This is achieved by identifying the microcontroller that you are using and which input / output pins are available. The connectors are mirrored allowing you to connect the display module in either orientation. The connector pins are all on a 2.54mm pitch allowing you to use the display module with prototyping technologies such as breadboards or veroboards.

2. Voltage Regulation

The I/O signal voltage can be anywhere between 3V3 and 5V but the voltage supplied to the 3V3 pin must not exceed 3V3. There is also a diode on the display module which prevents any damage due to reverse polarity.

3. Reset and backlight

The Graphical LCD module has optional signals to allow the display to be reset by pulling the reset signal low. There is also a signal to control the LED backlight, which is on by default. Pulling the LED signal low will switch off the backlight. Toggling the LED signal on and off at high speed using a PWM style output will allow the backlight brightness to be controlled.

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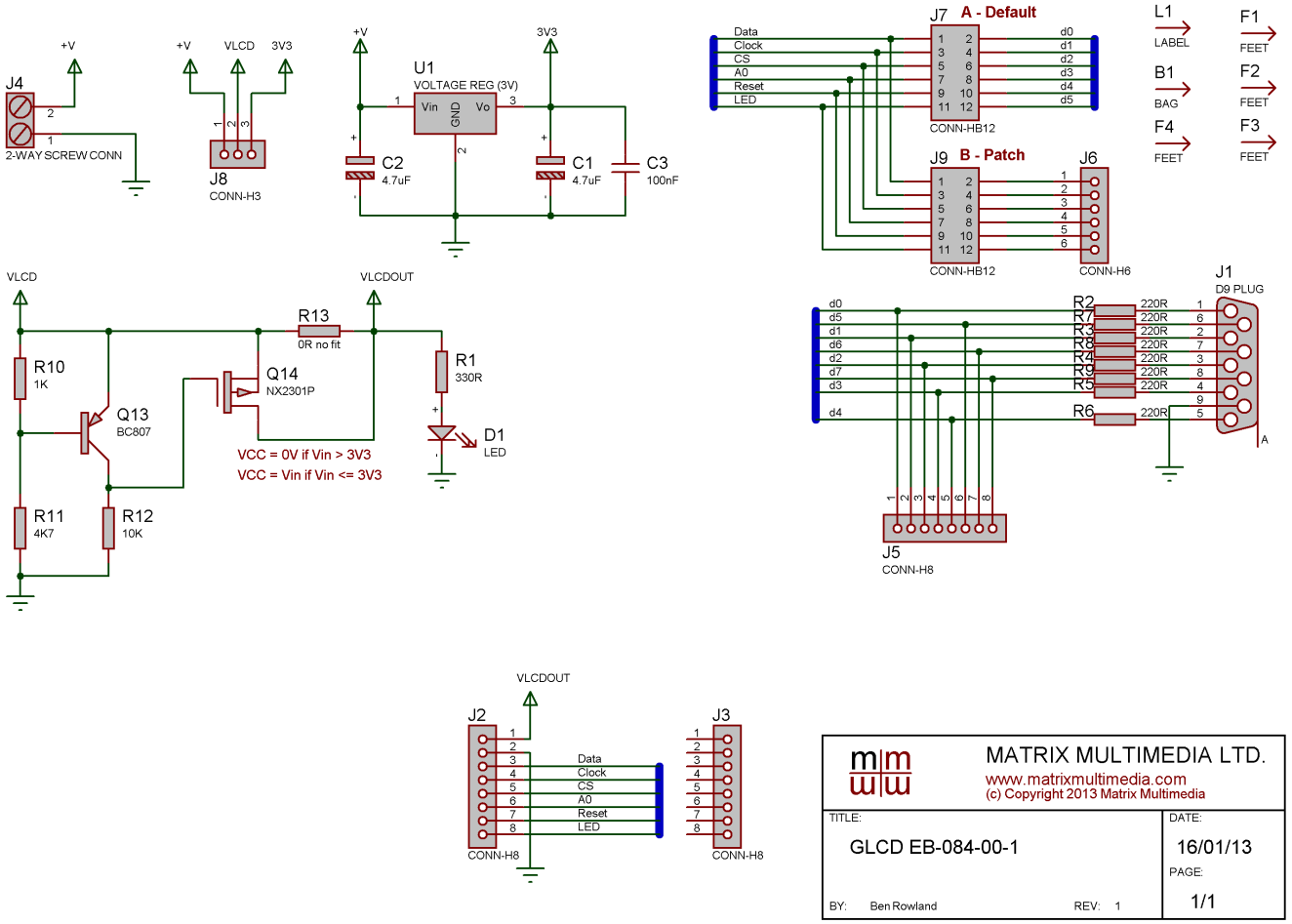
Circuit Diagram EB084



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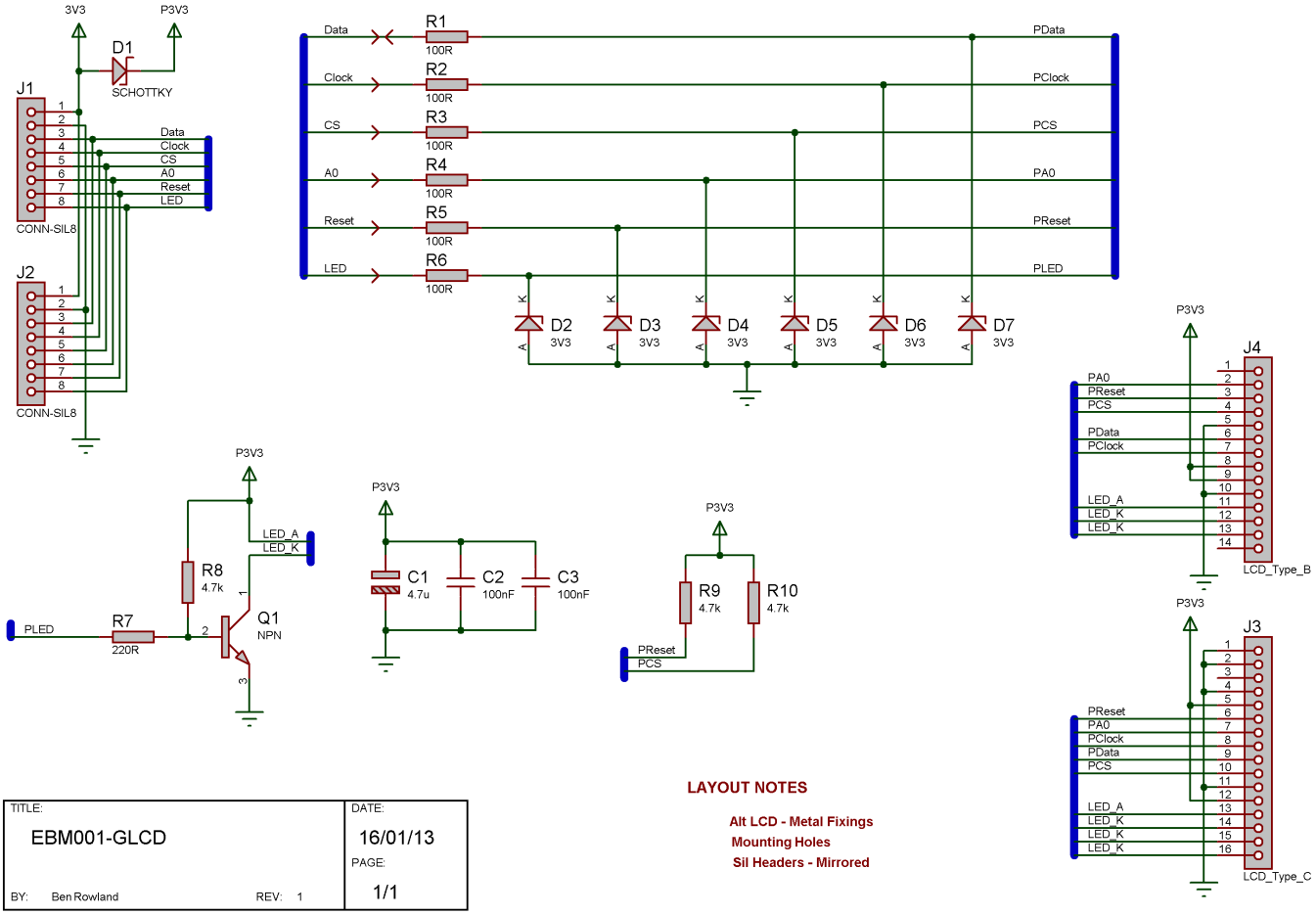
Circuit Diagram EBM001



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