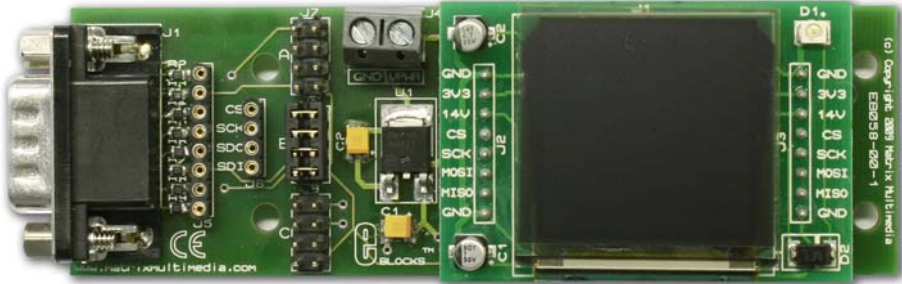
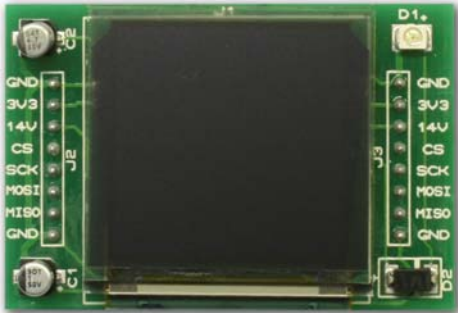


# OLED Graphical LCD Board Datasheet EB057-00-1 / EB058-00-1



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Appendix 1     Circuit diagram

## 1. About this document

This document concerns the following:

- E-blocks OLED Graphical LCD E-Block and module code EB058 version 1.
- E-blocks OLED Graphical LCD module code EB057 version 1.

The order code for the OLED Graphical LCD E-Block and module is EB058.  
The order code for the OLED Graphical LCD module is EB057.

### 1. *Trademarks and copyright*

PIC and PICmicro are registered trademarks of Arizona Microchip Inc.  
E-blocks is a trademark of Matrix Multimedia Limited.

### 2. *Other sources of information*

There are various other documents and sources that you may find useful:

#### **Getting started with E-Blocks.pdf**

This describes the E-blocks system and how it can be used to develop complete systems for learning electronics and for PICmicro programming.

#### **PPP Help file**

This describes the PPP software and its functionality. PPP software is used for transferring hex code to a PICmicro microcontroller.

#### **C and assembly strategies**

This is available as a free download from our web site.

### 3. *Disclaimer*

The information in this document is correct at the time of going to press. Matrix Multimedia reserves the right to change specifications from time to time. This product is for development purposes only and should not be used for any life-critical application.

### 4. *Technical support*

If you have any problems operating this product then please refer to the troubleshooting section of this document first. You will find the latest software updates, FAQs and other information on our web site: [www.matrixmultimedia.com](http://www.matrixmultimedia.com) . If you still have problems please email us at: [support@matrixmultimedia.co.uk](mailto:support@matrixmultimedia.co.uk).

## 2. General information

### 5. *Description*

This is a organic LED graphical LCD 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 128 pixels totaling at 16384 individually addressable pixels. There is also a maximum of 65,536 individual colours available for each pixel and a white backlight to provide maximum display visibility even in the dark. Internally it has enough memory to automatically refresh the screen and provide a constant 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 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.

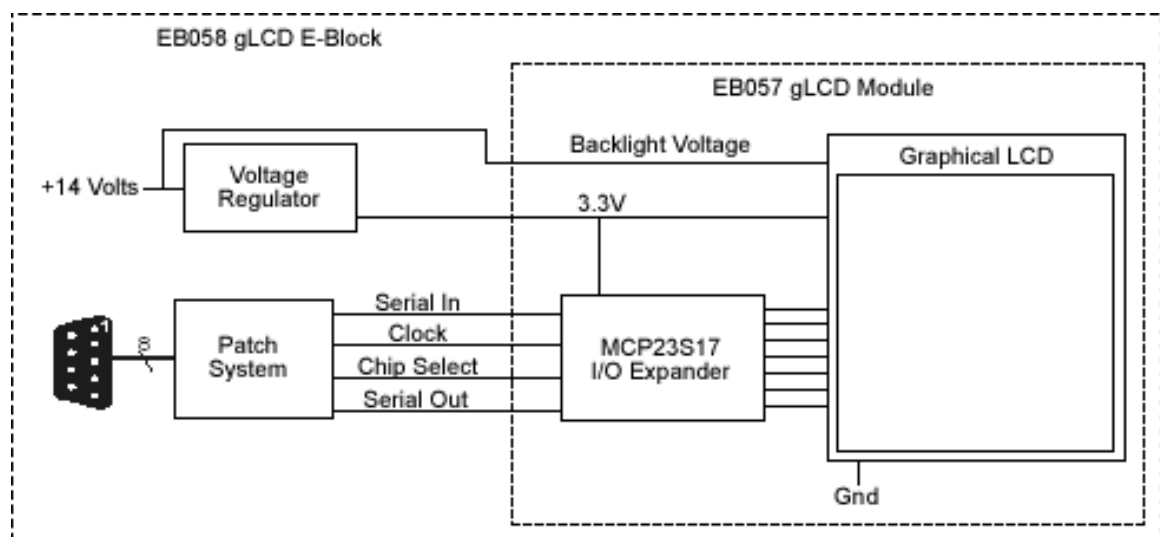
The LCD is connected using a MCP23S17 I/O SPI bus expander module that allows the LCD to be used by a microcontroller system using only 4 I/O pins. The SPI bus allows for very high speed communications which means that there is no real impact to the overall refresh rate of the display.

The graphical LCD is also available as a standalone module with order code EB057. 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 I/O pins. The display can even be unstuck from its chip to allow it to be fitted inside a window in a case.

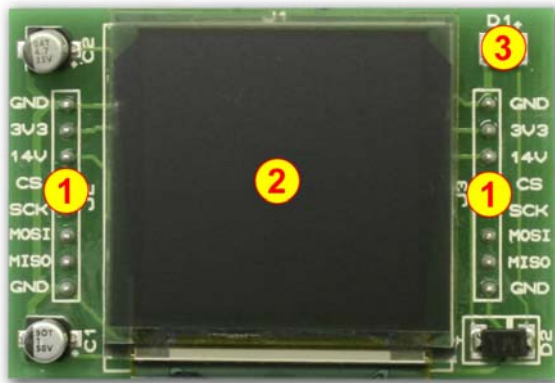
### 6. *Features*

- Backlit LCD Display
- 128 x 128 Pixels at a 1:1 Ratio
- Crisp and Clear OLED display technology
- 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 I/O lines via 9 way D-type connector)

### 7. *Block schematic*

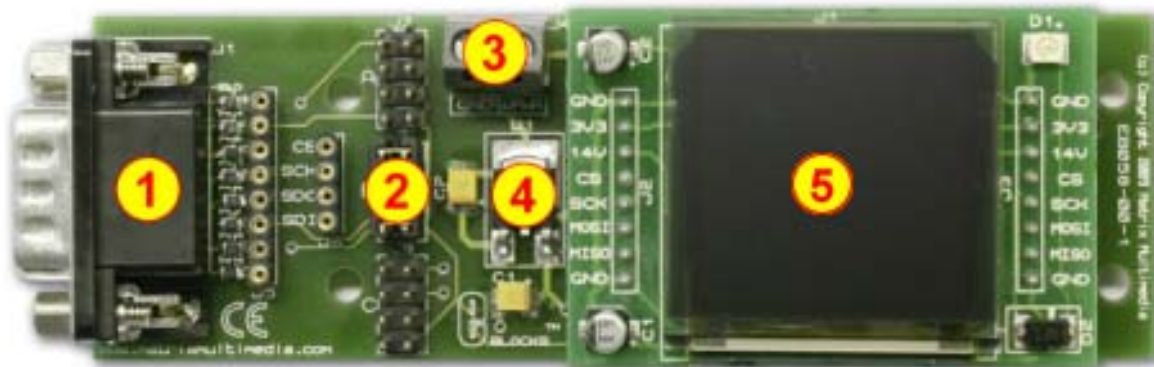


### 3. Board layout



EB057-74-1.jpg

- 1) SIL Pin Connections 2.54mm Pitch
- 2) 128 x 128 pixels LCD display
- 3) LCD power LED



EB058-74-1.jpg

- 1) 9-way downstream D-type connector
- 2) Patch System
- 3) +V power input terminals: 12 – 18V
- 4) 3.3V Regulation for level shifting
- 5) Integrated EB057 graphical LCD module

General Guide for EB058 Patch settings:

Pin	Jumper A	Jumper B	Jumper C
CS	0	0	Patch
CK	4	3	Patch
SDO	2	5	Patch
SDI	1	4	Patch
Chip Type	16F88	16F877A	Patch
Chip Type		16F19xx	Patch

## 4. Testing this product

The following program will test the circuit. The test file can be downloaded from [www.matrixmultimedia.com](http://www.matrixmultimedia.com).

### 1. System Setup

Multi-programmer board (EB006) with:

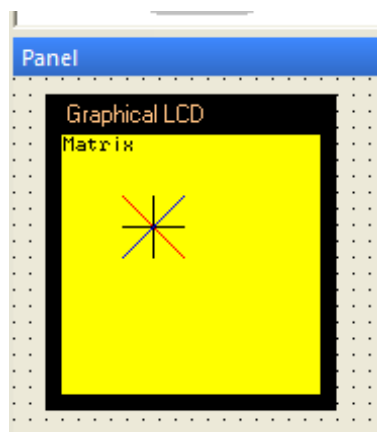
EB006 Options	Setting
Power supply	External, 14V
PICmicro device	16F877A
SW1 (Fast/Slow)	Don't care
SW2 (RC/Xtal)	Xtal
Xtal frequency	19.6608MHz
Port A	
Port B	
Port C	Graphical LCD board EB058
Port D	
Port E	
Test program	EB058TP.hex

EB058 Options	Setting
Patch system	B

### 2. Test Procedure for Graphical LCD E-Block

- 1) Wire power from +14V on the Multiprogrammer to VPWR on the EB058.
- 2) Configure system and board options as above.
- 3) Power up the Multiprogrammer from the power source.
- 4) Download EB058TP.hex to the 16F877A PICmicro®.
- 5) Press reset on the Multiprogrammer.
- 6) If the program is running correctly the Graphical LCD should display the following.
  1. Set the background to light blue.
  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



## 5. Circuit description EB057

The circuit as can be seen in the circuit diagrams below (See Appendix 1 – Circuit diagram), is made up of four sections: Connectors, Voltage regulation, SPI I/O expander 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. It is recommended that you use SPI hardware pins (SDI, SDO, SCK) to drive the Graphical LCD so as to maintain a high speed communication with the I/O expander circuitry.

### 2. *Voltage Regulation*

The EB057 module does not have any inbuilt voltage regulation 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 than 3.3V to enter the 3.3V pin of the EB057 may cause irreversible damage to the graphical display module.

### 3. *SPI I/O Expander*

The SPI output expander is a Microchip MCP23S17 device, which is used to control the 12 Graphical LCD control lines. The Flowcode component targets the MCP23S17 device and then uses bit-banging techniques to transfer commands and data onto the Graphical LCD. The SPI pins on your microcontroller device must be routed to the relevant pins on the EB057 to allow the Flowcode component to function correctly.

### 4. *3.3V operation*

The Graphical LCD E-Block is compatible with 3.3V and 5V systems. However the VPWR line must be between 12V and 18V to power the display's backlight. The I/O of the output expander chip is 5V and 3.3V tolerant.

**Note:** Allowing a voltage greater than 3.3V to enter the 3.3V pin of the EB057 may cause irreversible damage to the graphical display module.

## 6. Circuit description EB058

The circuit as can be seen in the circuit diagrams below (See Appendix 1 – Circuit diagram), is made up of four sections: Connectors, Voltage regulation, SPI I/O expander 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. Depending on which I/O pins are free you can configure the jumpers on the Graphical LCD E-Block to route access to the four control lines. (See section 3 for jumper guide). It is recommended that you use SPI hardware pins (SDI, SDO, SCK) to drive the Graphical LCD so as to maintain a high speed communication with the I/O expander circuitry.

The Patch System allows the user to route the four control lines to any 8 of the bits that they require. This allows great flexibility.

### 2. *Voltage Regulation*

The Voltage Regulator that is used is a LP2950 and is simply used to convert the 12 - 18V input supply to a 3.3V source to drive the 3.3V portions of the Graphical LCD and the I/O expander circuitry.

### 3. *SPI I/O Expander*

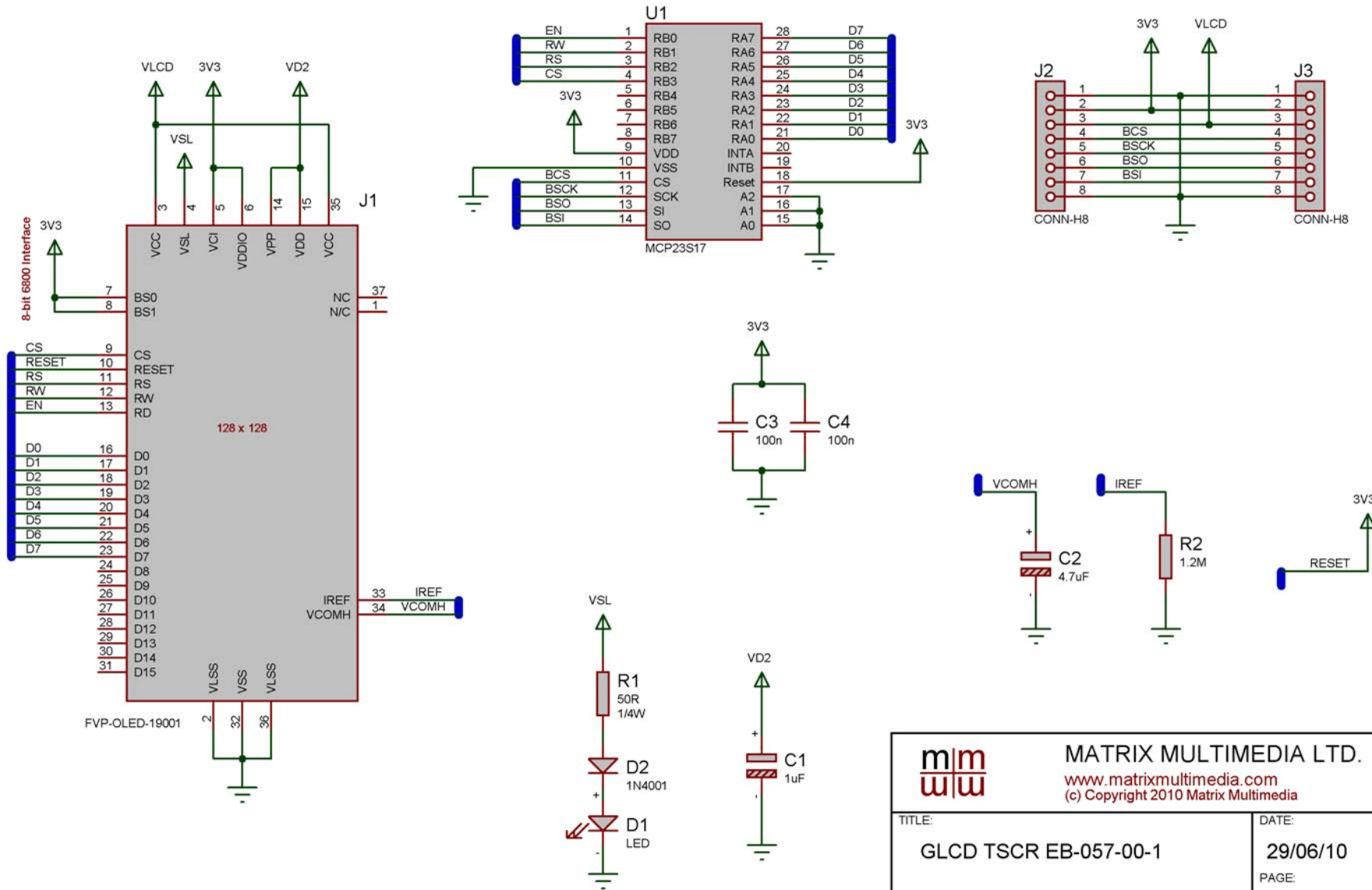
The SPI output expander is a Microchip MCP23S17 device, which is used to control the 12 Graphical LCD control lines. The Flowcode component targets the MCP23S17 device and then uses bit-banging techniques to transfer commands and data onto the Graphical LCD. The SPI pins on your microcontroller device must be routed to the relevant pins on the EB058 to allow the Flowcode component to function correctly.

### 4. *3.3V operation*

The Graphical LCD E-Block is compatible with 3.3V and 5V systems. However the VPWR line must be between 12V and 18V to power the display's backlight. The I/O of the output expander chip is 5V and 3.3V tolerant.

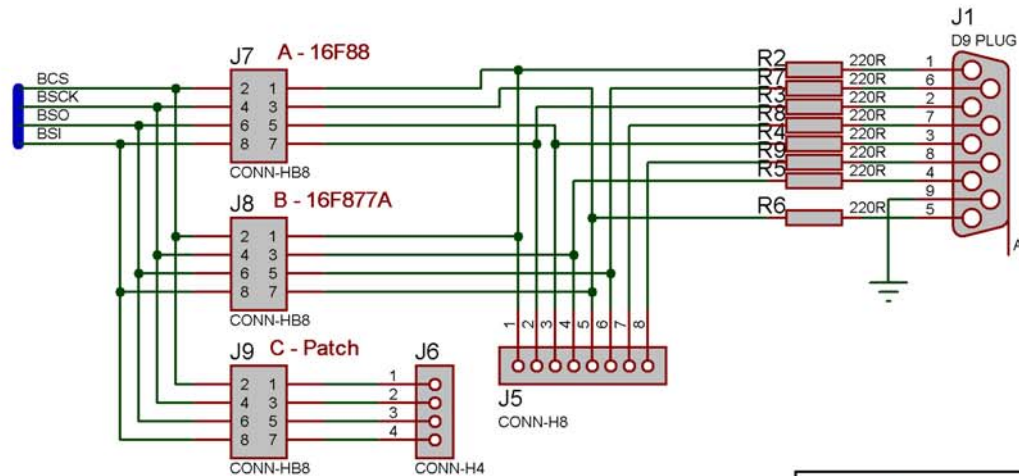
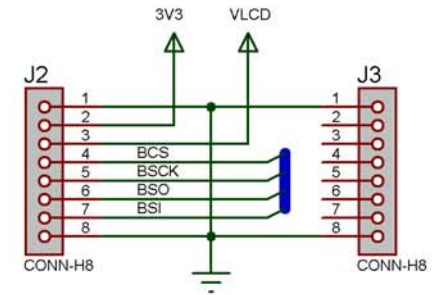
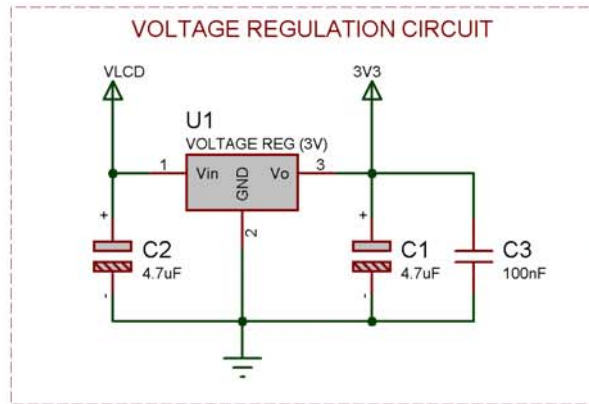
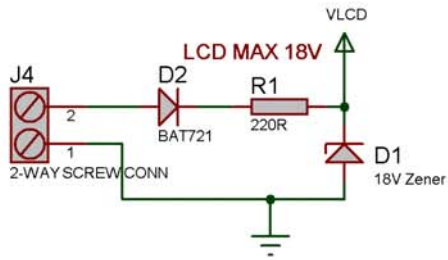


Appendix 1 – Circuit diagram



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GLCD TSCR EB-057-00-1	29/06/10
BY: Ben Rowland	PAGE:
REV:	1/1

Appendix 1 – Circuit diagram



- |       |      |
|-------|------|
| L1 →  | F1 → |
| LABEL | FEET |
| B1 →  | F2 → |
| BAG   | FEET |
| F4 →  | F3 → |
| FEET  | FEET |

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