

Micromite LCD Backpack V2

Construction Notes

Important:

Download the Micromite firmware and manuals from <http://geoffg.net/micromite.html#Downloads>

The Micromite User Manual describes how to program the firmware into the PIC32 microcontroller, how to connect the console and how to program the Micromite.

In particular read the section titled "LCD Displays" as that describes the type of LCD display used in the Micromite LCD Backpack.

This document only provides information specific to building the Micromite LCD Backpack.

Parts List

- 1 PCB, 50mm x 86mm
- 1 ILI9341 based LCD 320x240 pixels 2.8" diagonal measurement.
- 1 Mini USB socket Type B 90 Deg. Horizontal SMD Mount USB 2.0 (Altronics Part P1308).
- 1 SPST Momentary PCB Mount 4.3mm Tactile Switch.
- 1 Optional (for manual controlled backlight) 100Ω vertical mounting side adjust trimpot (Altronics R2579, Element14 9608044 or similar)
- 1 28-pin skinny DIP low profile IC socket
- 1 14-pin DIP low profile IC socket
- 1 4 pin 0.1" male header (CON1)
- 1 18 pin 0.1" male header (CON2)
- 1 14 pin 0.1" female header socket (CON3)
- 1 6 pin 0.1" right angle male header (CON4)
- 4 12mm untapped spacers
- 4 16mm long M3 machine screws and nuts.

Semiconductors

- 1 Microchip PIC32MX170F256B-50I/SP microcontroller. A PIC32MX170F256B-I/SP can also be used but will be limited to 40MHz
- 1 Microchip PIC16F1455-I/P microcontroller (14-pin DIP package). Also suitable are the PIC16LF1455-I/P, PIC16F1454-I/P or PIC16LF1454-I/P.
- 1 Microchip MCP1700-3302E/TO 3.3V linear regulator (TO-92 package).
- 1 3mm LED (Red)
- 1 Optional (for programmed controlled backlight) DMP2215L P-channel MOSFET, SOT-23 package
- 1 Optional (for programmed controlled backlight) 2N7002 N-channel MOSFET, SOT-23 package

Capacitors

- 3 100nF Monolithic
- 2 10μF 16V Tantalum
- 1 47μF 16V Tantalum

Resistors (0.25W 5%)

- 1 10KΩ
- 1 1KΩ
- 1 Optional (for programmed controlled backlight) 10KΩ
- 1 Optional (for programmed controlled backlight) 1KΩ

Communicating with the Micromite

First, the PIC16F1455 (the Microbridge chip) must be programmed with the Microbridge firmware. There are a number of ways that you can do this and they are described on the main Microbridge webpage (<http://geoffg.net/microbridge.html>).

You may also need to load a device driver on your computer, see the above website for the details.

Then, when you plug the USB cable into the Micromite LCD Backpack and your desktop/laptop computer a virtual serial port will be created. Note the number of that port and when you start your terminal emulator that number can be used to select the right communications port. You should set the serial port to 38400 baud, 1 stop bit and 8 data bits as that is the default used by the Micromite.

You can test that the communication is working by typing characters into your terminal emulator, the LED on the Micromite LCD Backpack should flash for each character.

Programming the PIC32

If you have a blank PIC32 chip this needs to be programmed with the Micromite firmware via the Microbridge.

This procedure is covered in detail in the Microbridge webpage (<http://geoffg.net/microbridge.html>) so the following is an abbreviated description. The first step is to get the Microbridge working as an USB/serial bridge as described above. With this working close the terminal emulator. This is important; the programming operation will fail if it is still open.

You need a Windows computer for the next step - run the program pic32prog (downloadable from <http://geoffg.net/microbridge.html>) in a DOS box with the command line:

```
pic32prog -d ascii:comxx yyyy.hex
```

Where xx is the COM port number created by Windows for the Microbridge and yyyy.hex is the file containing the latest Micromite firmware. For example, if your Microbridge was allocated the virtual serial port of COM6 and the file that you wanted to program was "Micromite_5.03.02.hex", the command line that you should use would be:

```
pic32prog -d ascii:com6 Micromite_5.03.02.hex
```

When you press enter the pic32prog program will automatically run through the programming sequence and then return to USB/serial mode. You can then launch your terminal emulator and when you press return you should see the Micromite command prompt (a greater than symbol '>').

Configuring the Micromite

To configure the Micromite for the LCD Backpack you should follow these steps.

All settings are automatically saved in non volatile memory and will be automatically applied on power up. So they only need to be applied once.

Connect to the console and enter the following line at the command prompt:

```
OPTION LCDPANEL ILI9341, L, 2, 23, 6
```

This tells the Micromite that the LCD panel is connected and what I/O pins are used for critical signals such as reset and device select.

You can test the display by entering the following at the command prompt:

```
GUI TEST LCDPANEL
```

This will cause the Micromite to draw a series of rapidly overlapping coloured circles on the display. Press any key on the console to return to the command prompt.

To configure the touch feature you should enter the following:

```
OPTION TOUCH 7, 15
```

Similar to configuring the LCD panel this command allocates the I/O pins for the touch controller and initialises it.

You do not have to run this command if your panel does not have a touch sensitive screen but you must use it if your LCD does have a touch facility – even though you will not be using touch in your program. This is because the touch chip select line could float causing the touch controller to respond to commands intended for the panel's ILI9341 controller. With the touch feature configured MMBasic will know to keep the touch chip select line inactive.

Calibrate the touch facility with the following command:

```
GUI CALIBRATE
```

This will cause MMBasic to draw a target at the top left hand corner of the screen. Using a pointy object press on the exact centre of the target. In this fashion the target will be displayed on all four corners of the display and the touch feature will be calibrated for the display.

You can now test the touch facility with the command:

```
GUI TEST TOUCH
```

This will clear the screen and when you touch it pixels will be illuminated at the touch point. Pressing any key will terminate the test.

Interfacing

The Micromite LCD Backpack interface connections are on CON2. This connector is designed so that it can be plugged into a solderless breadboard or connect to a third board mounted on the back on the backpack.

The silk screen on the PCB identifies each pin on the connector. The GND, 5V and 3.3V pins can be used to power external interface circuitry. The maximum current that can be drawn from the 3.3V pin is 150mA while the maximum 5V load will depend on your 5V supply. The RESET pin is normally at 3.3V pulled up by the 10K resistor and if you pull it low the Micromite will reset.

The other I/O pins connect directly to the Micromite and are marked with the Micromite pin number, refer to the Micromite User Manual for details of each pin.

Three of the pins on CON2 (pins 3, 14 and 25) are also connected to the colour LCD for communicating with the display using the SPI protocol. For this reason they cannot be used as general purpose I/O pins, however they can still be used by you for SPI communications if needed. The user manual describes how to use the SPI interface simultaneously with the LCD however, for normal operation, do not use pins 3, 14 and 25 for general I/O.