ILI9488 3.5" Display

The ILI9488 3.5" display makes a nice alternative to the smaller ILI9341 displays that are supported as standard in the Micromite. It is larger (3.5") and has many more pixels (480 x 320) and it is perfect for when you need a larger screen size without having to move to the SSD1963 based displays supported by the Micromite Plus.

This display uses an SPI interface and has the following basic specifications:

- A 3.5 inch display
- Resolution of 480 x 320 pixels and a colour depth of 262K/65K
- A ILI9488 controller with a SPI serial interface

This display can be found on eBay and AliExpress for US$10 to US$20. Search for ILI9488 on these sites and purchase a panel that matches the illustration on the right. The Micromite was tested with this varient so, if you wish to guarantee success make sure your display matches the photographs.

This display is supported via a loadable display driver written by Peter Mather. This requires about 6K of program memory and acts exactly the same as the built in LCD panel drivers so all the graphic commands built into MMBasic will work with it.

Connections

The following table lists the connections required between the LCD display board and the Micromite:

ILI9341 Display	Description	28-pin Micromite	44-pin Micromite	Micromite Plus 64-pin version	Micromite Plus 100-pin version
T_IRQ	Touch Interrupt	Configurable			
T_DO	Touch Data Out (MISO)	Pin 14	Pin 41	Pin 47	Pin 11
T_DIN	Touch Data In (MOSI)	Pin 3	Pin 20	Pin 5	Pin 12
T_CS	Touch Chip Select	Configurable			
T_CLK	Touch SPI Clock	Pin 25	Pin 14	Pin 4	Pin 10
SDO (MISO)	Display Data Out (MISO)	Do NOT connect			
LED	Power supply for the backlight (see below)				
SCK	Display SPI Clock	Pin 25	Pin 14	Pin 4	Pin 10
SDI (MOSI)	Display Data In (MOSI)	Pin 3	Pin 20	Pin 5	Pin 12
D/C	Display Data/Command Control	Configurable			
RESET	Display Reset (when pulled low)	Configurable			
CS	Display Chip Select	Configurable			
GND	Ground				
VCC	5V supply				

Note: Be careful to ground yourself when handling the display as the controller is sensitive to static discharge and can easily be destroyed.

Where a Micromite connection is listed as "configurable" the specific pin should be specified in the configuration of the CFunction display driver (see below).

Due to an anomaly with how the ILI9488 controller works the pin marked SDO (MISO) should NOT be connected. If it is connected it will interfere with the touch function. If you are plugging a ILI9488 display into the Micromite LCD Backpack this pin should be removed with a side cutter.

The backlight power (the LED connection) should be supplied from the main 5V supply via a current limiting resistor. The value of this resistor can be varied to reduce the power consumption or to provide a brighter display. The panel also has a limiting resister built in so the LED pin can be simply connected to the 5V supply for a bright display.

In the standard 28 and 44-pin Micromites the SPI based display controller shares the Micromite's SPI interface with the touch controller and the BASIC program running on the Micromite. Sharing the SPI channel is essentially transparent to the BASIC program – see the description of the SPI communications function in Appendix D for an explanation of how to do this. This is not a factor with the Micromite Plus as it uses a second SPI bus to communicate with the display and touch controllers.

Configuring the Display Driver

There are two different display drivers. One for the standard 28 and 44-pin Micromite and another for the Micromite Plus. Both are configured and work the same.

You need to locate the correct driver and open it in a text editor. At the start there is the following text:

```
Sub MM.Startup
   ILI9488 D/C, RESET, CS, OR
End Sub
```

You need to replace the configuration parameters (D/C, RESET, CS and OR) with numbers to suit your configuration:

D/C is the pin that you have chosen for the Display Data/Command Control
RESET is the pin that you have selected for the Display Reset
CS is the pin that you have selected for the Display Chip Select
OR is the orientation (1 = landscape, 2 = portrait, 3 = reverse landscape, 4 = reverse portrait).

For example, if you have plugged the display into a Micromite LCD Backpack you would configure the driver as: ILI9488 2, 23, 6, 1

Loading the Display Driver

To add the driver to MMBasic you load the device driver into the Micromite using the AUTOSAVE or XMODEM commands. Then cycle the power – this will cause MMBasic to load the driver and you should see the message "ILI9488 driver loaded" at startup on the console.

You can test the display by entering GUI TEST LCDPANEL at the command prompt and you should see a series of coloured circles being rapidly drawn on top of each other.

If you are happy with the operation of the driver (ie, GUI TEST LCDPANEL works as expected) you can then run the command LIBRARY SAVE at the command prompt. This will transfer the driver (and any other routines in program memory) to a part of flash memory where they will be available to MMBasic but they will not show when the LIST command is used and will not be deleted when a program is loaded or NEW is used.

Restart the Micromite again and, for all intents and purposes, the driver is part of MMBasic. You can load, edit, run and delete programs as per normal and the driver will remain in memory. The only way that it can be removed is with the LIBRARY DELETE command or if the Micromite is reset to its original default configuration as described in the User Manual.

Notes:

o The above test may not work if the touch controller has not been configured (ie, the touch Chip Select pin is floating). In this case configure the touch controller (see the Micromite User Manual) and then retry GUI TEST LCDPANEL.
o The CPU speed must be 20 MHz or greater.