

## DuinoMite MMBasic 3.X

This is an implementation of MMBasic version 3.X running on the DuinoMite series of boards from Olimex (<http://olimex.com>). It supports all the standard Maximite and advanced MMBasic features such as optional line numbers, user defined subroutines/functions and the full screen editor.

The main difference compared to the standard implementation of MMBasic on the Maximite is that I/O pins 8 to 10 and 19 and 20 are not supported. This is a restriction imposed by the hardware not MMBasic (see hardware considerations below).

All other features that are standard on the Maximite should work in this version. For documentation on MMBasic please refer to the "MMBasic Language Manual" included with this upgrade.

DuinoMite MMBasic supports two extra features of the hardware:

- The hardware UARTs COM3: and COM4:
- Pin 21 for measuring the battery voltage

MMBasic does not attempt to support any other special features of these boards. For support on using the DuinoMite series and documentation regarding their hardware configuration and features please visit the Olimex website.

To use the serial communications over USB feature on a Windows computer you need to download and install the Windows Serial Port Driver from <http://geoffg.net/maximite.html#Downloads>. For Macintosh users this should automatically work but you can find helpful notes at the same location.

To be notified of future upgrades please register at <http://geoffg.net/maximite.html>.

I hope that you have fun with MMBasic Ver 3.X

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## Upgrading to MMBasic 3.X

Loading new firmware is controlled by a boot loader. This is a small program which has the ability to reprogram the PIC32 program memory using data sent to it over the USB interface. It is located in a reserved section of the PIC32's program memory and is always there, regardless of what program is loaded into the main memory.

To upgrade you need a program running on your computer that will upload the new MMBasic to the boot loader running on the PIC32. This program is MPHidFlash and you can download the Windows, Macintosh or Linux version from: <http://code.google.com/p/mphidflash/>

To start the upgrade process you should hold down the boot load button while you apply power. Plug the USB cable from the DuinoMite into your computer and it should automatically recognise it and load the appropriate driver (called a HID driver). In Windows it will show up in Device Manager as a "Human Interface Device", "USB Input Device".

To upload the new firmware you should use the following command line:

```
mphidflash -v 15BA -p 0032 -n -write <filename>
```

Where <filename> is the name of the firmware upgrade file (it will have a .hex extension). Be careful to use the correct file as mphidflash will overwrite the boot loader if given the wrong file. The correct file should have a name like DuinoMite\_MMBasic\_Vx.xx.hex where x.xx represents the version number.

The -n option (skip verify) is required because, for some reason, the verify function in MPHidFlash does not work with MMBasic upgrades. The file will still be written correctly and you can test it by cycling the power and checking that MMBasic runs OK.

The complete cycle (erase and program) should take less than 60 seconds. As it runs MP HidFlash will first show "Erasing" then "Writing" followed by many dots as it writes each block of data to the PIC32.

Remove and re apply power (without holding down the boot load button) and the DuinoMite will start up running MMBasic 3.X.

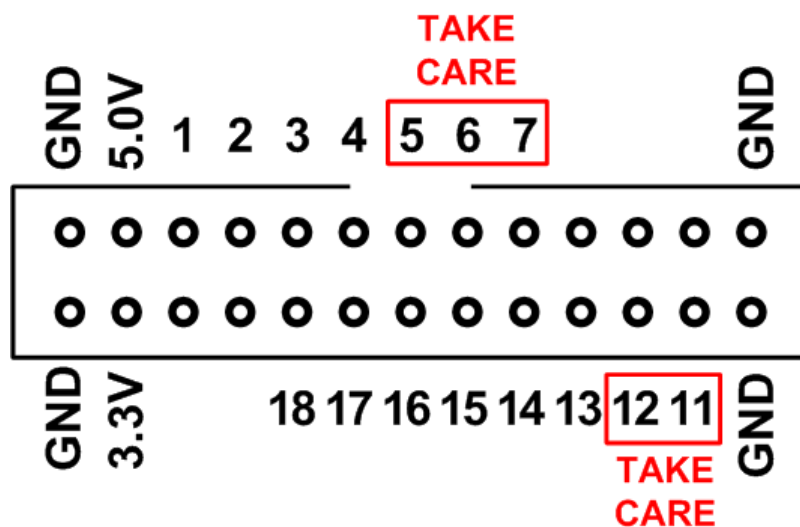
## Hardware Considerations

I have been asked why DuinoMite MMBasic 3.X does not support the full number I/O pins claimed for this board. Unfortunately the only way you can use all of the claimed I/O pins is by giving up the use of the micro SD card, the video output (both VGA and composite) and other features. For all the pins to operate as both input and outputs (same as on the Maximite) you would also need to modify the board by removing components and/or cutting tracks.

I believe that very few people would want to go to these lengths and so I have only implemented the I/O pins that can work without confusing tradeoffs or by disabling important features. In summary, when running on the DuinoMite, MMBasic 3.X supports:

- Ten I/O pins that work normally (as on the Maximite). These are 1 to 4 and 13 to 18.
- Five additional I/O pins (5, 6, 7, 11 and 12) where you should take care and consult the circuit schematic before using them. There are extra components attached to these pins and these could interfere with their use as I/O pins (particularly as inputs).

In summary the supported I/O pins are as follows (external view of the 26 pin IDC connector):



The following points should be noted when using MMBasic 3.X on the DuinoMite:

- Due to the hardware design of the DuinoMite you must have a VGA cable plugged in at power up otherwise MMBasic will configure itself for composite video (50 chars wide). This will affect the full screen editor if you are using it over USB as it will then also run within the confines of a composite video screen.

### Analogue Inputs

- Pins 1, 2, 3 and 4 can be used as analogue inputs.
- Pins 5 to 10 do not work as analogue inputs (as they do on the Maximite).
- Pin 21 is a virtual pin number which can be used as an input to measure the battery voltage. ie, PRINT PIN(21) 'SETPIN is not required.

## Digital Input/Output

- Pins 1 to 4 support 3V digital input/output (same as the Maximite).
- Pins 5, 6, 7, 11 and 12 are 5V tolerant and support digital input/output with open collector output but may have other components connected to them (check the schematics).
- Pins 13 to 18 are 5V tolerant and support digital input/output with open collector output (same as the Maximite).
- Pins 8 to 10 and 19 and 20 are not supported.

## Counting Inputs

- Pins 5, 6 and 7 support frequency, period or counting measurement.
- Pins 11 to 14 do not support these functions (as they do on the Maximite).

## Serial Communications

- COM1: is a software UART (19200 baud max) and is on pin 15 (Rx) and 16 (Tx). If flow control is specified pin 17 is RTS (receive flow control) and pin 18 CTS (transmit control).
- COM2: is a software UART (19200 baud max) and is on pins 13 (Rx) and 14 (Tx).
- COM3: is the hardware UART (460800 baud max) on the DuinoMite UEXT connector.
- COM4: is a second hardware UART (460800 baud max) and it appears either on the RS232 connector (Mega version) or pins 11 (Rx) and 12 (Tx) on the other boards.
- Within MMBasic the syntax for using the hardware UARTs is exactly the same as for other ports (ie, OPEN "COM3:38400" AS #1).
- The baud rate for COM1 and COM2 must be 300, 600, 1200, 2400, 4800, 9600 or 19200. The baud rate for COM3 and COM4 can be any value from 300 to 460800.

## SPI and 1-Wire Communications

- The SPI() and 1-Wire function operates as normal (refer to the MMBasic Language Manual).
- Hardware SPI is not supported on the UEXT connector because it would conflict with the use of the SD card.

## I<sup>2</sup>C Communications

- I<sup>2</sup>C is on the UEXT connector and simultaneously available on I/O pins 5 (SDA) and 6 (SCL).
- You do not need external pullup resistors as these are included on the board. However, these resistors also interfere with the use of pins 5 and 6 as normal I/O pins.