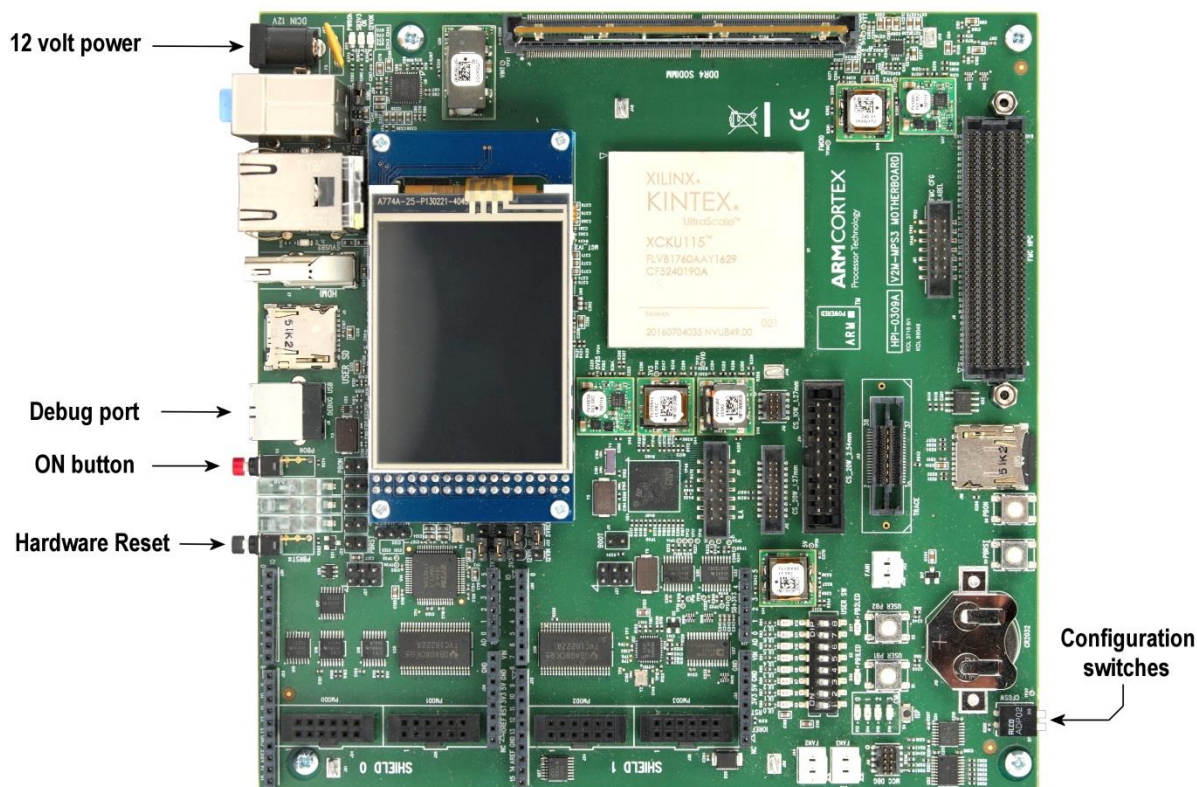


# Arm® MPS3 FPGA Prototyping Board

## Getting Started Guide

Figure 1 : MPS3 Board



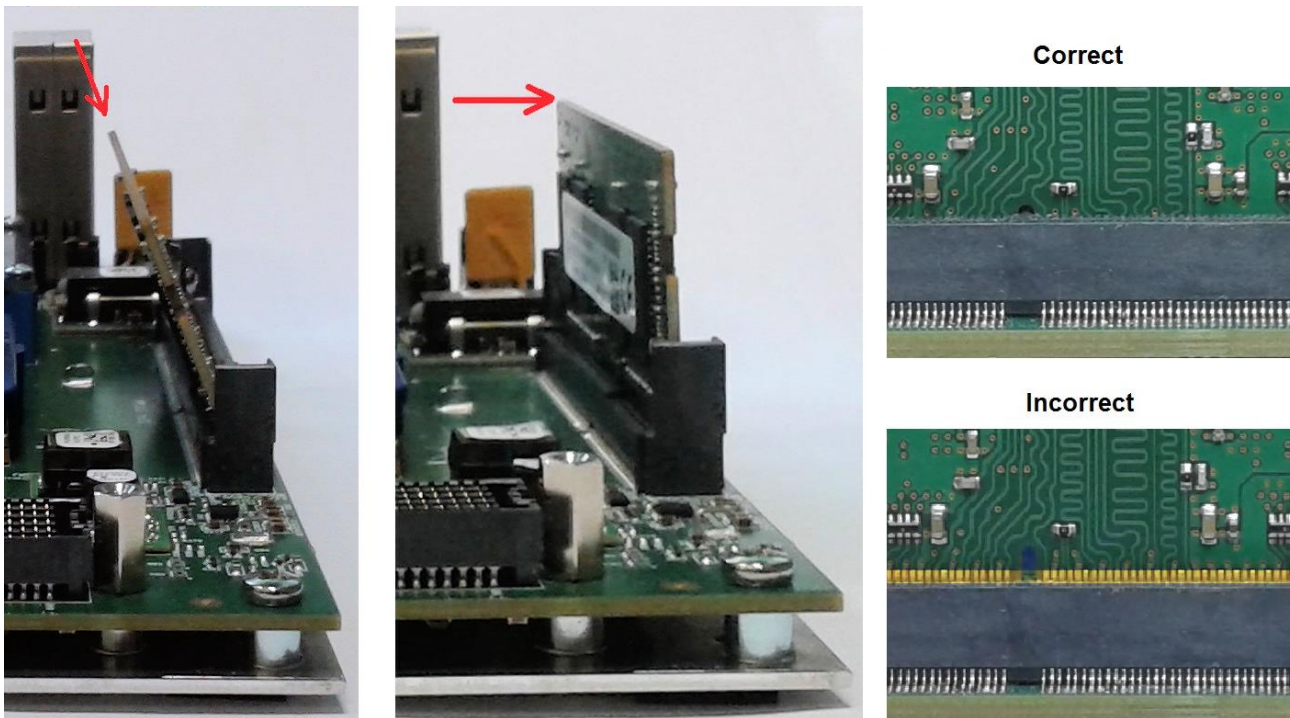
### Installing the memory module

The Arm MPS3 FPGA Prototyping Board is supplied with a SO-DIMM memory module. This module is not installed at the factory to reduce the possibility of it being damaged during transport. To install the memory module, begin by sliding it into the socket at an angle (as shown in Figure 2), oriented so that the slot in the edge-connector of the module aligns with the keying bar across the opening in the socket. Be sure to push it all the way in or else it will not make proper contact with the pins of the socket. Then move the module into the vertical position. It should engage with the catches at the ends of the socket, making an audible clicking noise as it does so.



Anti-static handling precautions should be taken while installing the memory module to avoid damaging the board or the module due to electrostatic discharge.

**Figure 2 : SODIMM memory module insertion**



## Power

The Arm MPS3 FPGA Prototyping Board requires 12-volt DC power. Connect the supplied 12-volt power adapter to the 12V power connector, shown in the top left corner of the Figure 1

## Starting up

The Arm MPS3 FPGA Prototyping Board is pre-loaded with a default factory image. To start the board up and load the default image, begin by ensuring that both configuration switches are in the UP position. Then press the red button, labelled "ON" in the Figure 1

## Shutting down

To shut down, press the Hardware Reset button. The board will enter standby mode.

## Soft reset

If the ON button is pressed while the board is running, a soft reset will be issued to the design programmed into the FPGA device.

## Serial console

The console is via serial-over-USB. When the USB debug port is connected to the windows host computer (using the supplied USB cable) while the board is running, the host computer will recognise the various USB devices on

the board and install the necessary drivers automatically. If the USB ports are not visible, then additional FTDI COM port drivers might have to be installed. For more information on accessing serial ports for MPS3 board visit :

<https://community.arm.com/oss-platforms/w/docs/589/accessing-mps3-serial-ports-in-windows-10>

The port numbers can vary from one host computer to another. In the Device Manager of a windows host machine this will be in a block of four consecutive numbers [n], such as COM[n], COM[n+1], COM[n+2] and COM[n+3]. The console is on COM[n] and the signalling parameters by default are 115200 baud, 8 bits, no parity, 1 stop bit, no flow control.

## Installing application notes

Application notes supplied by Arm for use on the board are provided in the form of a document with an accompanying bundle of files containing an FPGA image, configuration files, and (optionally) demonstration example software. The application note bundle includes a recovery directory which contains a complete set of configuration files for you to copy on to the board, replacing the files already on the board.

The configuration files are installed on the board via the USB debug port. When the debug port is connected to a Windows host computer the configuration memory will appear as a USB mass storage device normally under the label V2M\_MPS3 with the preinstalled configuration files on it.

If the USB mass storage device does not appear then you need to send the command `usb_on` over the serial console as shown below.

```
Cmd> usb_on
Enabling debug USB...
```

To install the new configuration files, proceed as follows:

1. Connect the debug port to the host computer and wait until the mass storage device is recognised.
2. Save copies of any files on the mass storage device that you wish to retain for future use.
3. Format the mass storage device, ideally FAT16, but FAT32 can also be used.
4. Copy the files from the Recovery directory to the mass storage device, preserving the directory structure. The directory level which contains the file `config.txt` should be in the root of the mass storage device.
5. Eject the mass storage device.
6. Press the ON button to boot up and configure the board with the new design.

## Installing executable software binaries

Software binaries are installed on the board via the USB debug port. A new or replacement binary is installed by copying it to the appropriate location in the configuration directory tree and then editing a text file to indicate the name of the new binary file. Specifically:

1. Connect the debug port to the host computer and wait until the mass storage device is recognised.
2. Place a copy of the software binary in the software directory of the USB mass storage device, for example:
 

```
<V2M_MPS3_drive>\SOFTWARE\memtest.axf
```
3. Edit the `images.txt` file, for example `<V2M_MPS3_drive>\MB\HBI0309B\AN524\images.txt`, to add an entry for the new software binary and comment out any previous entries. Below is a listing of the relevant part of `images.txt`.

TITLE: Arm MPS3 FPGA prototyping board Images Configuration File

```
[IMAGES]
TOTALIMAGES:1                      ;Number of Images (Max: 32)

IMAGE0ADDRESS: 0X0100000           ;Please select the required executable program
IMAGA0UPDATE: AUTO                 ;Image update:NONE/AUTO/FORCE
;IMAGE0FILE: \SOFTWARE\an524_st.axf ; - selftest uSD
;IMAGE0FILE: \SOFTWARE\an524_dm.axf ; - demo uSD
IMAGE0FILE: \SOFTWARE\memtest.axf  ;← add this new entry and comment out the old entries using "; "
```

#### 4. Reboot the board by either

- Pressing the Hardware reset button (PBRST) followed by the ON button (PBON)
- Sending the `reboot` command over the serial console.

It will load and run the new software binary.

## Installing a custom FPGA bitfile

If you have built your own FPGA bitfile, or if you have obtained one via a route other than an application note, it can be installed on the board by writing it to the correct location in the configuration directory tree. FPGA bitfiles have filename extension `.bit`, and should be written to the appropriate directory beneath MB on the mass storage device, for example:

```
<V2M_MPS3_drive>\MB\HBI0309B\CUSTOM\custom.bit
```

FPGA bitfiles have associated with them a configuration text file, for example `custom.txt` which specifies clock frequencies and such like. This file must correctly point to the FPGA bitfile:

```
[FPGAS]
TOTALFPGAS: 1                      ;Total Number of FPGAs
F0FILE: custom.bit                 ;FPGA0 Filename      ← edit this filename
F0MODE: FPGA                      ;FPGA0 Programming Mode
```

To keep things tidy, you may also change the name of the text file to match the name of the new FPGA bitfile, but you must then edit a file in the directory above, `V2M_MPS3_drive>\MB\HBI0309B\board.txt`, so that it points to the FPGA configuration text file.

```
[APPLICATION NOTE]                ;Please select the required processor
APPFILE: CUSTOM\custom.txt         ;My custom design    ← edit this path
```

## Hints and tips

All directory names on the board's configuration mass storage device must be in upper case. All file names must be in lower case and must conform to the 8.3 naming convention (that is, they must have a filename no longer than eight characters and an extension no longer than three characters, for example `filename.ext`).

## Where to go from here

- Visit the developer webpage:  
<https://www.arm.com/products/development-tools/development-boards/mps3>  
 and  
<https://developer.arm.com/documentation/100765/0000/Introduction/About-the-MPS3-board>
- Watch the online videos on the MPS3 board here :  
<https://community.arm.com/oss-platforms/w/docs/558/mps3-fpga-prototyping-system>