



SiFive HiFive Unmatched Getting Started Guide

v1p4

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Release Information

Version	Date	Changes
v1p4	May 26, 2021	<ul style="list-style-type: none">• Updates to the Limitation of Liability section for EU compliance
v1p3	May 14, 2021	<ul style="list-style-type: none">• Added safety requirements and recommendations• Described steps needed to mount the board in a mini-ITX case• Described steps needed to replace the CR1220 battery• Reworked and improved the flow of the guide
v1p2	March 25, 2021	<ul style="list-style-type: none">• Add Creative Commons license
v1p1	January 5, 2021	<ul style="list-style-type: none">• Updated Boot Mode Select figure

Version	Date	Changes
		<ul style="list-style-type: none">• Changed minimum wattage of the power supply unit to be 150W
v1p0	December 14, 2020	<ul style="list-style-type: none">• Initial release

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1

Introduction

The HiFive Unmatched is a Linux development platform based on SiFive's Freedom U740 SoC. The platform features 64-bit DDR4, high-speed interconnects via PCIe Gen 3 x8 operating at 7.8 GB/s, Gigabit Ethernet and SuperSpeed+ USB (5Gbps).

IMPORTANT WARNING

The HiFive Unmatched Platform is intended for use by end users only, and solely for such end users to test and evaluate SiFive's services and products, including, but not limited to, SiFive's semiconductor components and software applications (the "Intended Use"). The Unmatched Platform may not be resold, redistributed, transferred or otherwise exploited.

Please note that the HiFive Unmatched Getting Started Guide may be modified from time to time and it is your responsibility to review the latest version at this link (www.sifive.com/go/hifive-unmatched-getting-started). You accept these terms by your continual use of the Unmatched Platform.

1.1 HiFive Unmatched Components Locator

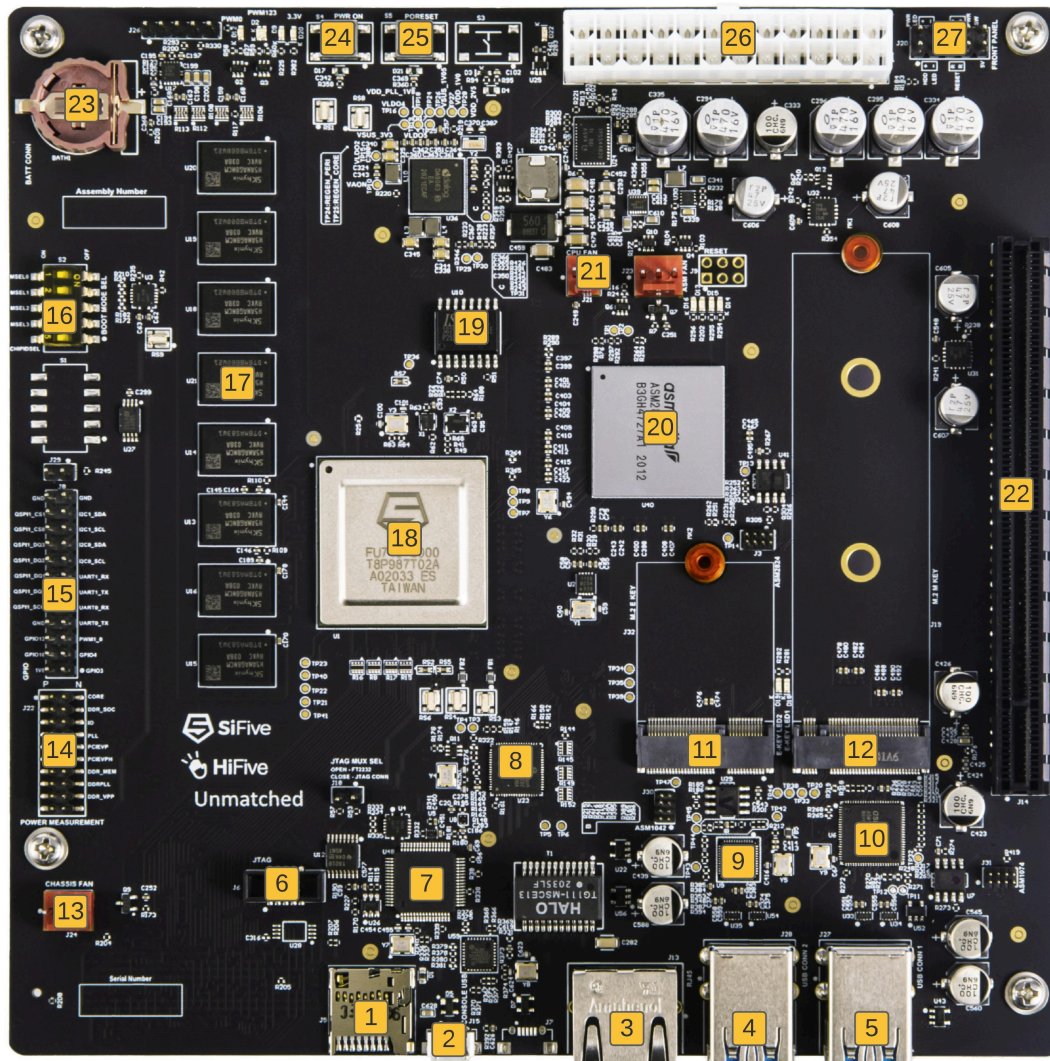


Figure 1: HiFive Unmatched Components Locator

Table 1: HiFive Unmatched Components

1	microSD Card Slot	14	Current Monitor
2	micro-USB Connector	15	GPIO Header
3	RJ45 Ethernet Connector	16	Boot Mode DIP Switch
4	x2 USB Type-A Connector	17	DDR4 Memories
5	x2 USB Type-A Connector	18	FU740 SoC
6	JTAG Header	19	32MB QSPI Flash
7	UART – USB Controller	20	PCIe Switch
8	Ethernet PHY	21	CPU Fan Header
9	PCIe - USB Bridge	22	x16 PCIe Connector
10	USB Hub	23	CR1220 Battery Connector
11	M.2 Key E Connector for WiFi/Bluetooth	24	Power Pushbutton
12	M.2 Key M Connector for NVMe SSD	25	Reset Pushbutton
13	Chassis Fan Header	26	ATX Power Connector
		27	Front Panel Connector

2

Important Safety Information

2.1 Warnings

- All power supplies used with the Unmatched Board must comply with the regulations and standards required by the country of use.
- The HiFive Unmatched must be operated in a well-ventilated environment.
- This product should only be used on a flat, non-conductive surface, and, at no point, should it be in contact with conductive objects.
- Connecting incompatible devices to the HiFive Unmatched may result in damage to the board.
- All accessories and peripherals used with the HiFive Unmatched must comply with the standards set by the country of use and must be labeled to ensure that safety requirements have been satisfied.
- All cables and connectors used with the HiFive Unmatched must be properly insulated in accordance with safety standards and requirements.

2.2 Safety Instructions

The following section provides requirements that must be observed to avoid malfunction and damaging of the HiFive Unmatched.

- Do not expose the board to water or moisture.
- Do not place the board on or near a conductive surface while in operation.
- Do not expose the board to heat and only use the board in an environment with an ambient temperature and airflow as described in this document.
- Avoid inflicting any mechanical or electrical damage to the printed circuit board, connectors and integrated circuits on the HiFive Unmatched.
- When the Unmatched board is powered, avoid touching, handling or moving the HiFive Unmatched.

- When handling the board, only grip the board from the corners to reduce the risk of damage by electrostatic discharge.

2.3 Use of the Unmatched Platform

- Subject to your compliance with the Unmatched Getting Started Guide, SiFive grants you a non-assignable, non-transferable, non-sublicensable, revocable non-exclusive license to use the Unmatched Platform for the Intended Use.
- The Unmatched Board is designed and intended solely for the Intended Use (as set forth in the Introduction). Any resale, redistribution, transfer among end users or other exploitation of the Unmatched Platform, in whole or in part, is strictly prohibited. SiFive reserves the right to terminate an end user's access to the Unmatched Platform immediately if any unauthorized use is detected.
- Any use of the Unmatched Board in violation of the Intended Use or as set forth in this HiFive Unmatched Getting Started Guide without SiFive's express, written, prior authorization will result in termination of SiFive's limited warranty for the Unmatched Board. SiFive is not responsible for and the user is solely responsible for any harm, loss, damage, claim, liabilities, penalties, interest and expenses (including reasonable attorneys' fees) arising out of or related to user's noncompliance with this HiFive Unmatched Getting Started Guide.
- Except for right to use the Unmatched Platform for the Intended Use, nothing in this HiFive Unmatched Getting Started Guide is intended or will be deemed to grant any end user any rights under any intellectual property rights of SiFive, by implication, estoppel, or otherwise.
- You may need to download, use and update third-party software (including without limitation, the Linux applications) from time to time in order to use the Unmatched Platform. SiFive will not be liable for any losses, damages, claims, costs or expenses (including, without limitation, any attorney's fees) in relation to or arising from (i) any third-party products or services or (ii) your use of any third-party products or services. The inclusion of any link to a third-party website does not imply agreement with or endorsement by SiFive of the website, the statements on it, or their entities, products or services. SiFive has not reviewed the linked websites and is not responsible for the content or availability of any linked websites.
- The trademarks, logos and service marks ("Marks") displayed on the Unmatched Board and related materials are the property of SiFive or other parties. You may not use SiFive Marks or any confusingly similar mark as a trademark for your product or services, or use the trademark in any other manner that might cause confusion in the marketplace, including but not limited to in advertising, on auction sites, or on software or hardware.
- Lawful Use Only. The use of the Unmatched Platform is subject to all applicable local, state, national and international laws and regulations. Any attempt by any person to deliberately damage the Unmatched Platform is a violation of criminal and civil laws. SiFive reserves the right to seek damages from any such person to the fullest extent permitted by law.

3

Hardware

3.1 Packaged Components

The HiFive Unmatched Development Kit comes packaged with the following components:

1. The HiFive Unmatched Board
2. 32GB SD Card - pre-loaded with SiFive Freedom-U-SDK Linux Distribution (for **1** in Figure 1)
3. Mini-ITX compatible rear panel I/O shield
4. M.2 screw package which includes x4 Screws (M2.5 x 4 mm) and x4 Washers
5. Chassis mounting screw package which includes x4 Screws (M3 x 6 mm) and x4 Stand-Offs (M3 x 15 mm)
6. Cat5e ethernet cable (2m length) (connects to **3** in Figure 1)
7. USB Type A to micro-USB Type B Cable (1.5m length) (connects to **2** in Figure 1)
8. Index card with QR code link to the latest version of the HiFive Unmatched Getting Started Guide

3.2 Required Hardware

- **Mini-ITX Compatible Enclosure:**

For safety purposes, the HiFive Unmatched board must be housed within a mini-ITX enclosure which can accommodate chassis fan(s).

The setup must adhere to the following Operating Conditions:

Table 2: *HiFive Unmatched Operating Conditions*

Ambient Temperature	+5 °C (41 °F) to +45 °C (113 °F)
Humidity	93% Relative Humidity Non-Condensing
Airflow	Minimum 450 LFM (air direction across the board)

The Unmatched Board supports 3-Pin 12V DC Chassis Fan(s).

- **Power Supply Unit (PSU):**

ATX or SFX type PSU with a minimum 150 W rating and with a 24-pin Power output connector that complies with all the local regulatory and safety standards should be used for the Unmatched board. The selected PSU must be compatible with the selected enclosure to ensure it can be housed securely inside the enclosure.

Warning

SiFive is not responsible for any bodily injury or harm, any damage to the Unmatched Board, or any other personal harm or property damage caused by misuse, including without limitation the usage of a non-compliant PSU.

3.3 Optional Hardware

The Unmatched board provides expansion slots for the following hardware per user preference.

- **M.2 Key M Connector for NVMe SSD Module (2230, 2260, 2280)**
- **M.2 Key E Connector for Wi-Fi / Bluetooth Module (2230)**
- **PCIe x16 Slot for graphics cards or other I/O expansion cards (8-lanes useable)**
- **Human Interface Devices such as Keyboard and Mouse via the USB Type A Ports**
- **CR1220 Lithium 3V coin-cell battery for Real-Time Clock**

3.4 Qualified Vendor List

Following third-party components are being used and qualified by SiFive to work out of the box with the Unmatched board.

- **ATX Power Supply:**
 - FSP Flex Guru 250W PSU (Model: FSP250-50FGBBI(M))
 - FSP Dagger Pro 650 W PSU (Model: SDA2-650)
 - Antec HCG Gold Series 650 W PSU (Model: HCG650 Gold)
 - EVGA SuperNova G3 550W (P/N: 220-G3-0550-Y1)
- **PCIe Graphics Cards:**
 - AMD RX 500-Series
 - AMD Radeon HD 6000-Series
- **M.2 Key E Wi-Fi / Bluetooth Module and Antenna**
 - Intel® Wireless-AC 9260 (P/N: 9260.NGWG.NV)
 - Intel AX200 Wi-Fi 6 802.11ax/ac 2.4 GHz/5.0 GHz BT5.0 (Model: AX200NGW)
 - **HUYUN IPEX MHF4 Antenna Cable (P/N: 8541551175)**
- **M.2 Key M NVMe SSD Module**
 - Samsung 970 EVO Plus MZ-V7S250B/AM
 - Samsung 970 EVO Plus 500G MZ-V7S550B/AM
- **microSD Cards (Class 1)**
 - SanDisk 32GB Class 1 (A1) microSDHC
 - SanDisk Ultra 32 GB Class 1 (A1) microSDHC

Note

Class 2 microSD Cards (marked A2) as shown in Figure 2 have been known to cause errors and crashes when used on the Unmatched Board. Please avoid using any Class 2 microSD cards.

DISCLAIMER

SiFive will not be liable for any losses, damages, costs, expenses (including any attorney's fees) or claims that may arise from or in connection with the use of the Unmatched Board with any third-party products or services. Each end user assumes all risks associated with the use of the Unmatched Board with any third-party products or services. Please consult the relevant instructions and guidelines for the use of any third-party products or services as directed by the manufacturer and/or distributor of such products or services.



Figure 2: SanDisk A2 SD Card

4

Board Setup

Figure 3 shows the basic board setup required to use the Unmatched Board without any peripheral devices.

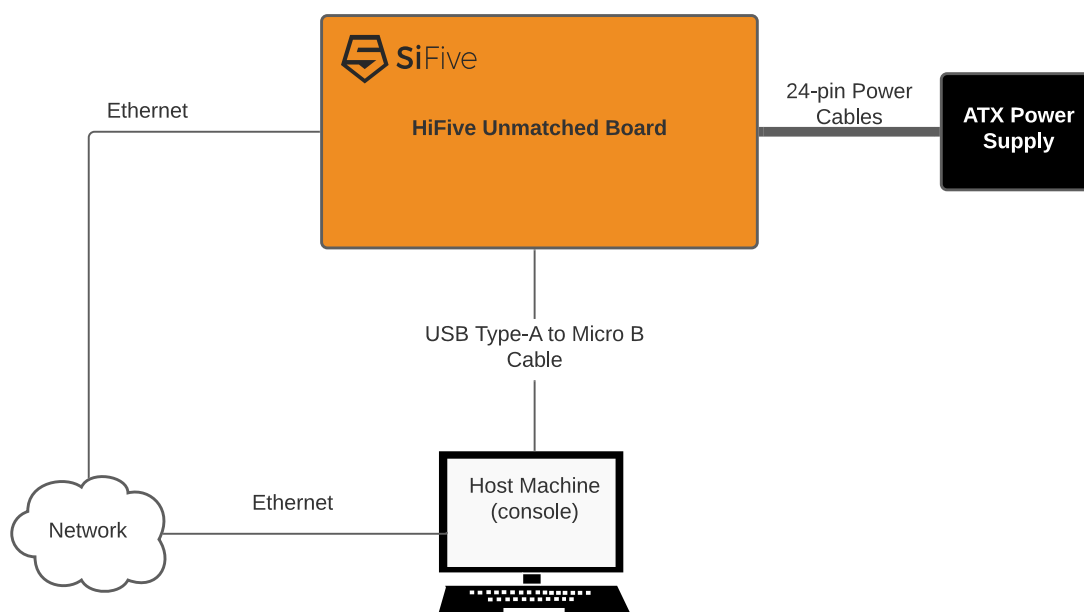


Figure 3: *HiFive Unmatched System Block Diagram*

4.1 Initial Visual Checks

Before using the board, please make sure the following 2 items are set up properly.

4.1.1 Boot Mode Select DIP Switch

The Unmatched as shipped is configured to boot from the included SD Card. Please confirm the Boot Mode DIP Switch is set as per Figure 4 (MSEL[3:0] – [ON, OFF, ON, ON]).

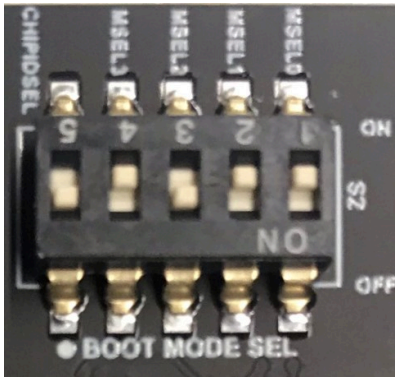


Figure 4: Boot Mode Select Configured To Boot From The SD Card

4.1.2 CPU Fan Connection

Please ensure the CPU Fan is connected as shown in Figure 5.

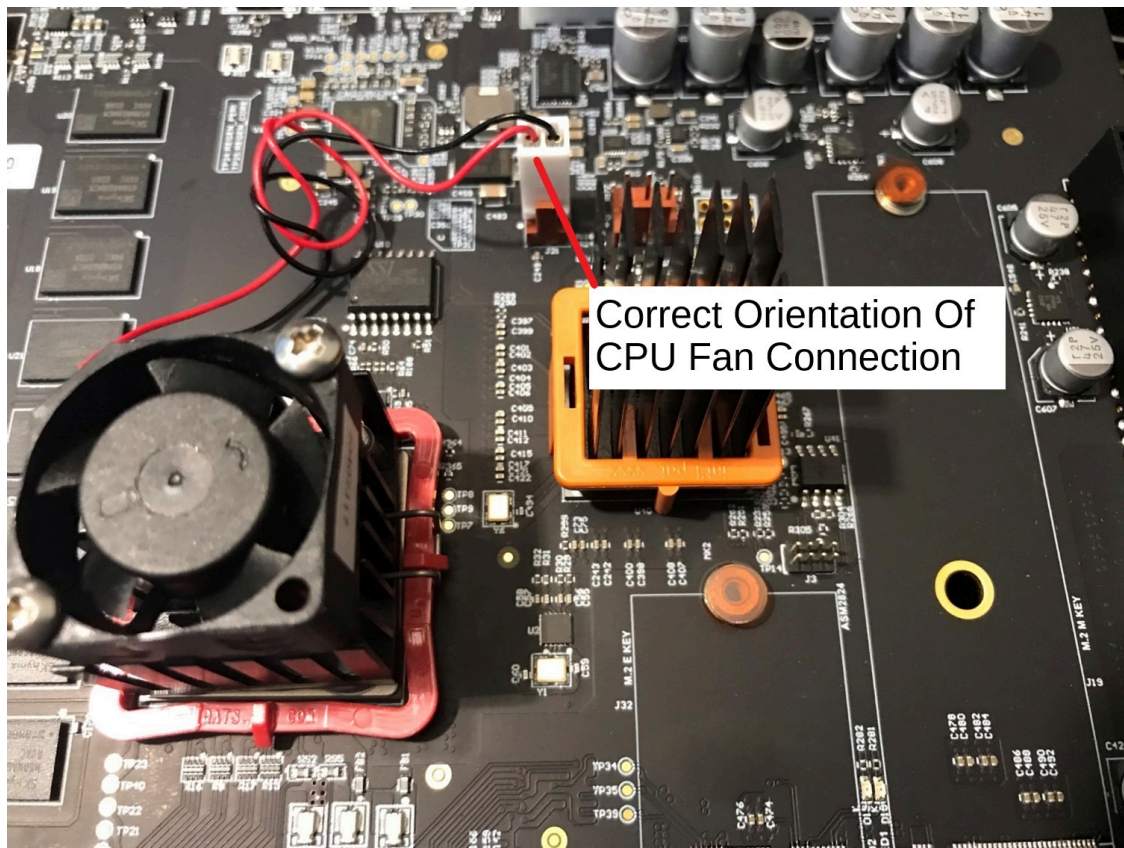


Figure 5: CPU Fan Connection

4.1.3 Installing the Unmatched Board Inside a Mini-ITX Compatible Enclosure

1. Please follow the guidelines provided by the manufacturer of the enclosure you have selected to use to properly install the PSU and the Unmatched Board inside the enclosure.

2. Use the provided I/O shield, and install it into the enclosure before installing the Unmatched Board.
3. The connector (**13** in Figure 1), shown in expanded view in Figure 6, should be used to connect the chassis fan.

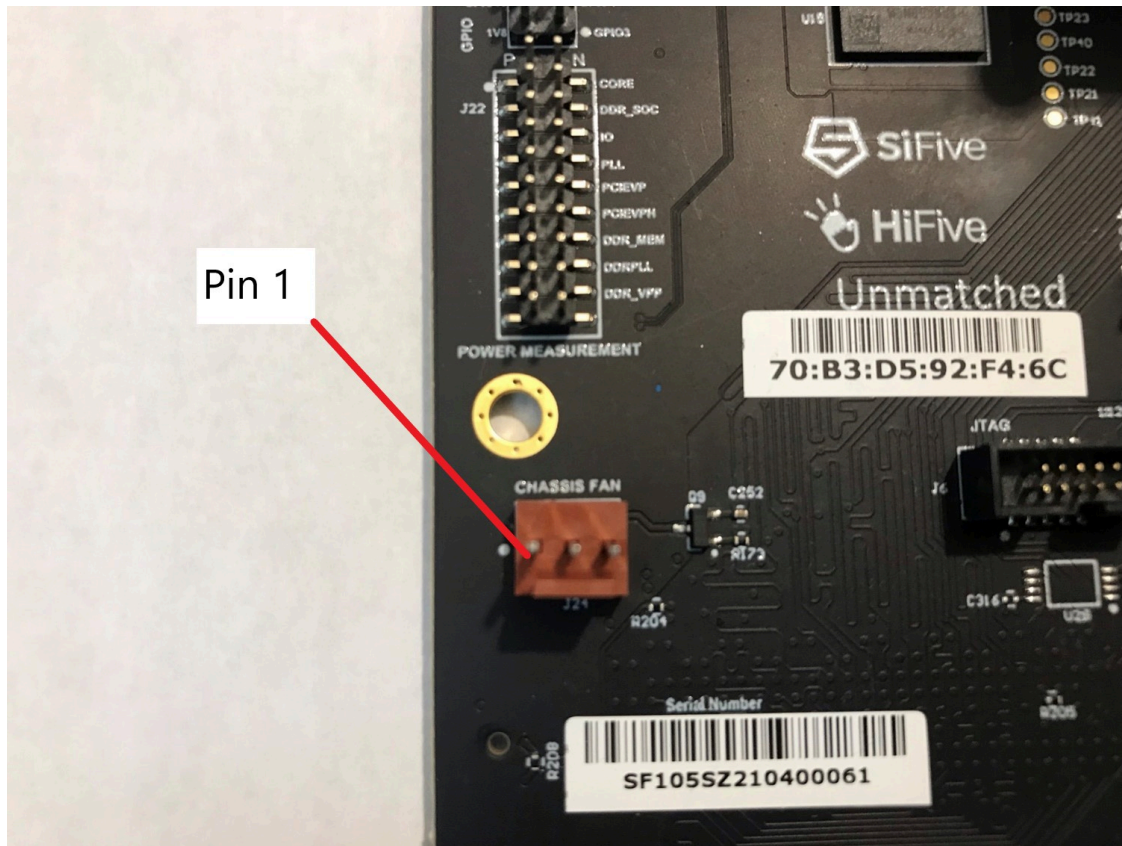


Figure 6: Chassis Fan Connector

The pin assignments for this connector are as follows:

Pin 1	Ground
Pin 2	12 V
Pin 3	Tach / No Connect on Unmatched Board

4. If an additional connection for the chassis fan is required, a 3-Pin connector located next to the CPU Fan connector can be used as shown in Figure 7 below.

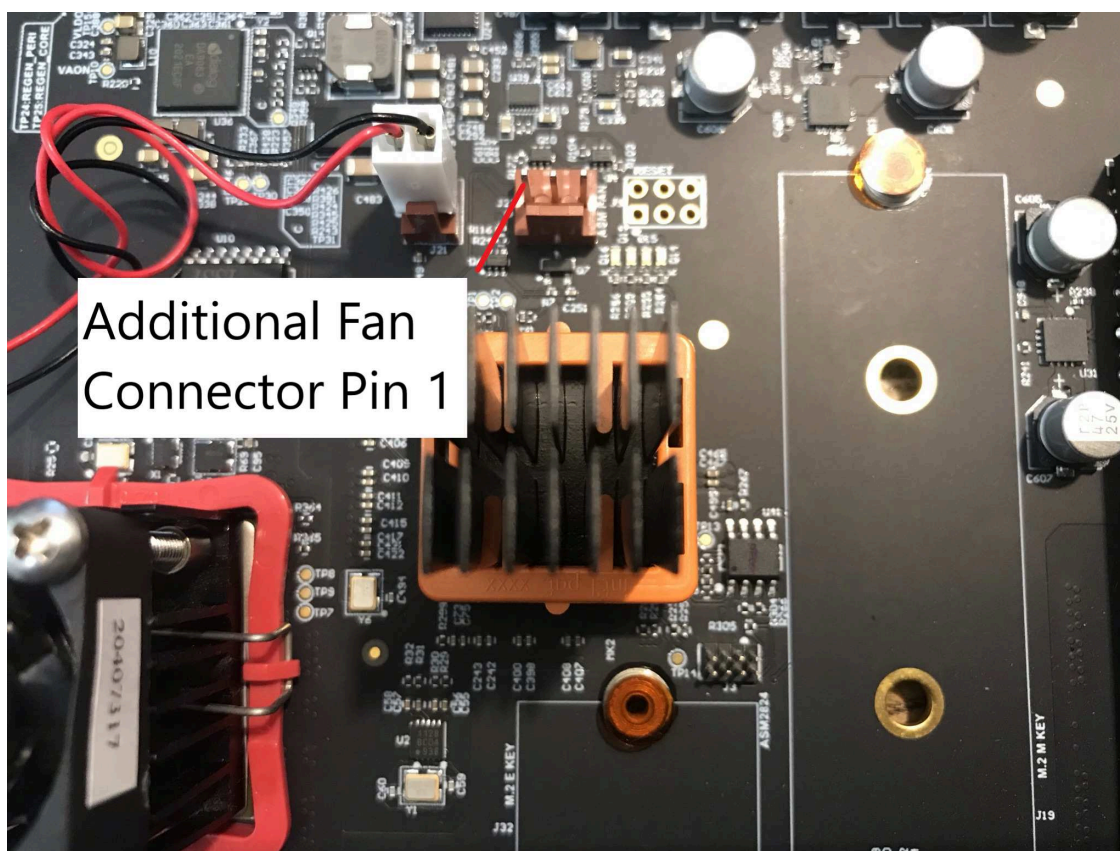


Figure 7: Additional Chassis Fan Connector

5. Connect the front panel header wires to the front panel connector (see **27** in Figure 1).

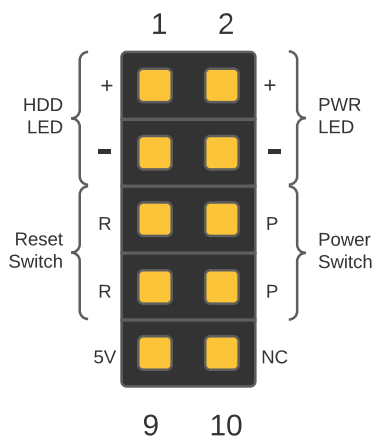


Figure 8: Front Panel Connector

Table 3: Front Panel Connections

1	HDD LED	2	Power LED
---	---------	---	-----------

Table 3: Front Panel Connections

3	HDD LED -	4	Power LED -
5	Reset Switch	6	Power Switch
7	Reset Switch	8	Power Switch
9	+5V	10	No connection

6. If the Real-Time Clock (RTC) feature is to be used, install a CR1220 3V Lithium coin-cell battery into the battery compartment shown in Figure 9.
 - Locate the CR1220 Battery Compartment (**23** in Figure 1).
 - Identify the Positive Side (indicated by +) and Negative side (indicated by -) on the battery; note that typically the coin-cell battery will have 1 flat side, which is always the positive side, and a rounded side, which is always the negative side.
 - When replacing a previously installed battery, remove the old battery from the socket by using a screwdriver to lift the battery from the latch holding the battery in place.
 - Insert the new battery into the compartment, ensuring that the positive side of the CR1220 is upwards. The battery may be able to be pushed directly into the space though, alternately, it may be easier to insert one edge first, with the battery oriented diagonally, and then swing the battery down into the rest of the compartment.

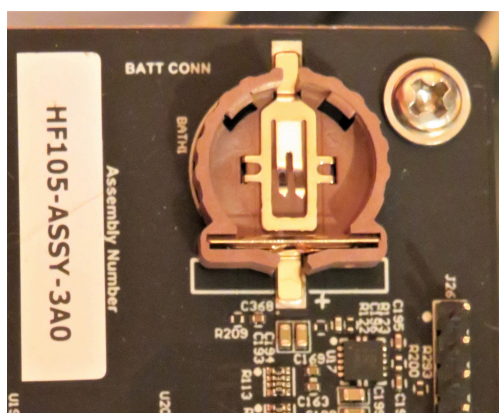


Figure 9: CR1220 Battery Connector

Warning

Keep new and used batteries away from children. Do not ingest battery. Please seek immediate medical attention if you think the battery might have been ingested or placed inside any part of the body. Please follow all the safety instructions and battery disposable instruction when replacing the battery provided by the battery vendor.

7. If used, install the PCIe Card on the PCI Connector, and secure it properly into the enclosure as per guidelines provided by the enclosure vendor.
8. Connect the ATX Power Supply 24-Pin connector to the ATX Header (**26** in Figure 1) on the Unmatched Board. Note that some Power Supply Units provide the 24-pin connections as 20-pin and separate 4-pin connectors; these need to be merged into a single 24-pin connection. The ATX Header is keyed so there is only one orientation for the Power Supply Connector to connect with the ATX Header. ATX Header connection for the split 20+4 pin connector is shown in Figure 10.

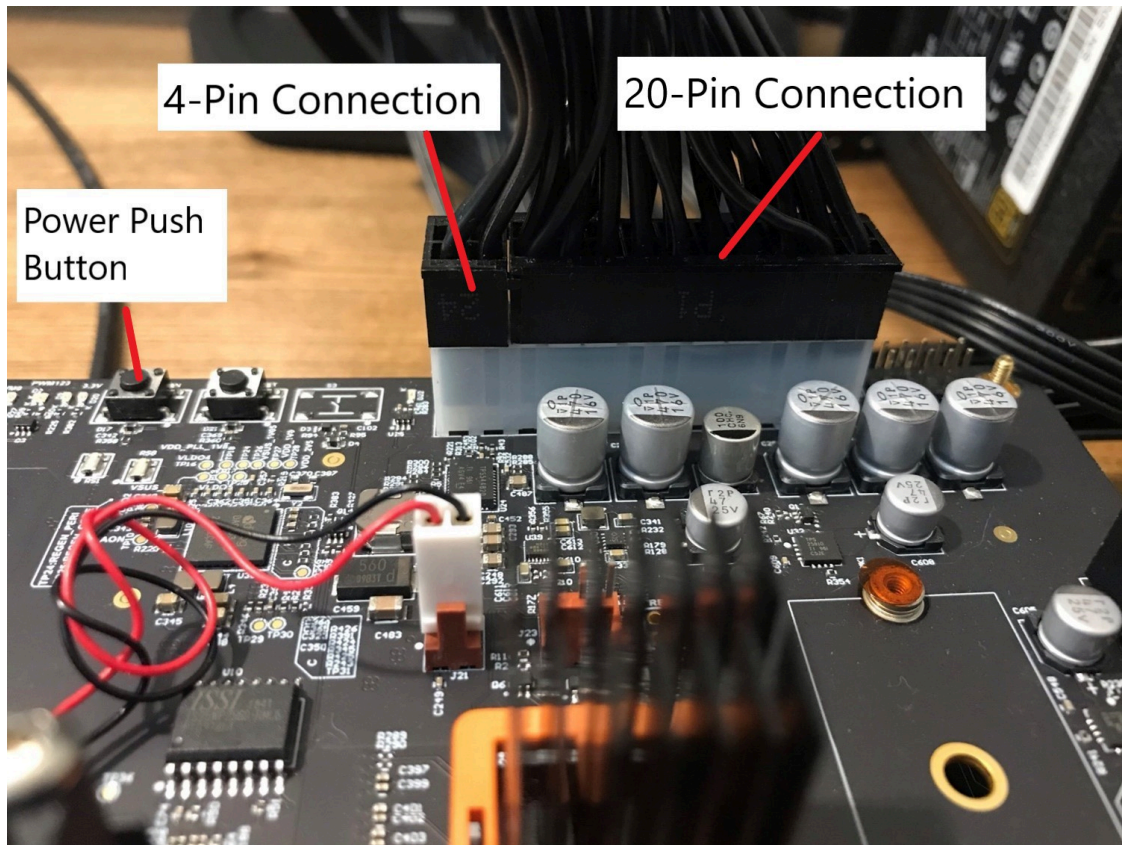


Figure 10: ATX Power Connection

4.2 Testing the Setup

Before the enclosure is closed, it is recommended to verify that all the connections are secured, and that the board is powering on properly.

Power On the board by depressing and releasing the Power Push Button. The board should power on with the CPU Fan running and 3 Green LEDs turning on as seen in Figure 11. This indicates that the board is properly powered and that all required internal supplies are up.

In addition, the Chassis Fan should also start running by default without any software control. The fan header supplies a constant 12V supply via the power pin.

Figure 11 points to 2 PWM driven LEDs which are configured by software. During power-up, these may come up in an uninitialized state which should be ignored when checking the board without the SD Card inserted.

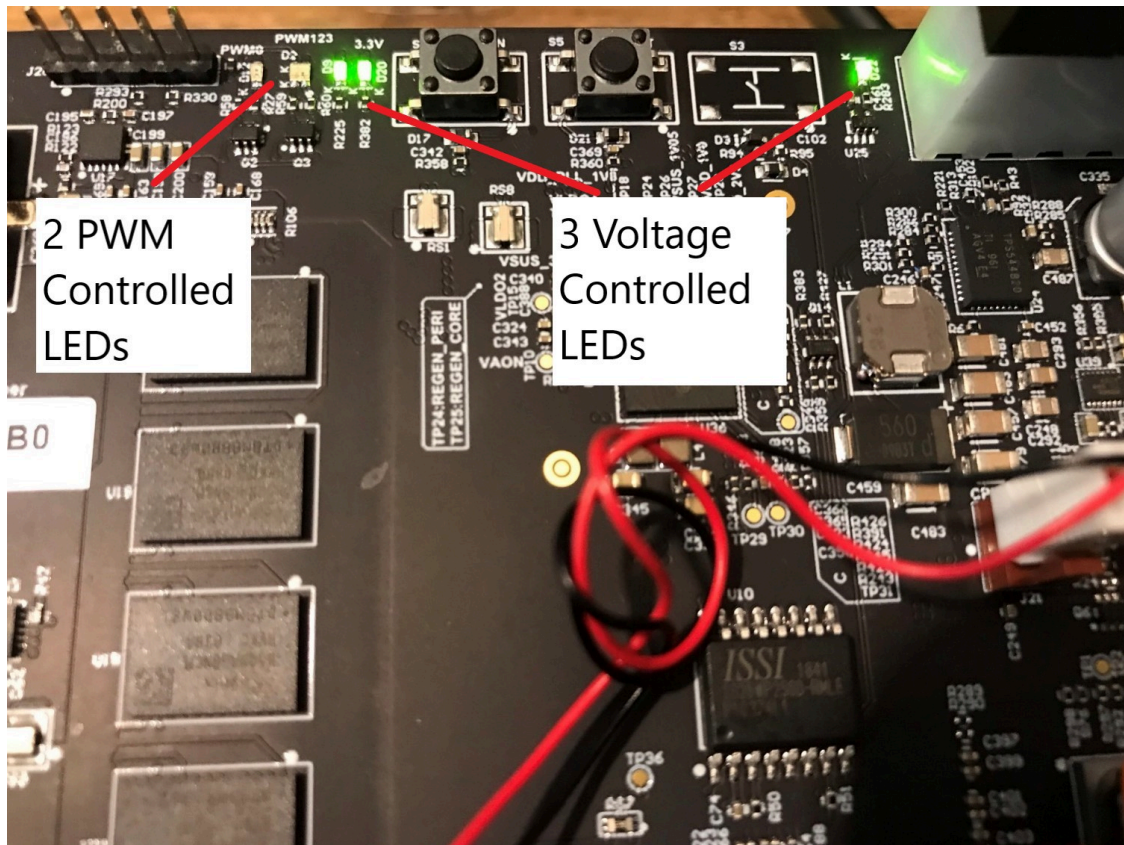


Figure 11: PWM Controlled LEDs

To power down the board, depress the Power Push Button until power is cut off. To verify this, observe the 3 LEDs turning off and CPU fan halting.

Additionally, check that the Power On and Off test functions via the Power On Button on the enclosure front panel.

Close the enclosure securely after the Power On and Off Check. The HiFive Unmatched board is now ready to boot Linux.

5

Boot and Run

We will use the included SD Card to verify the SiFive Freedom-U-SDK boots and runs properly on the Unmatched board, but first we need to set up the Console Terminal Window on a host computer to monitor the boot messages and verify that the board has booted properly.

5.1 Setting Up Console (USB to Serial) Terminal Window

To monitor the boot process, it is required that the included micro-USB cable is plugged into the Unmatched Board on the Console Port (marked on the I/O Shield) and the Type-A connector of the cable is connected to any available USB 2.0 port of the host computer. Note that the micro-USB interface is powered from the host computer. There is no need to power on the Unmatched Board when setting up the host computer for the Console Terminal Window.

The Console Output to a host computer is displayed using a USB to Serial Port emulator with the following options for the Serial Port Configuration:

- Speed (Baud Rate): 115200
- Data Bits: 8
- Stop Bits: 0
- Parity: None
- Flow Control: None

The FTDI 2232H Serial / JTAG to USB controller is used to communicate with the host computer. When the micro-USB cable is plugged into the host computer, in most cases, the host computer Operating System (OS) detects the FTDI device and automatically installs the appropriate device drivers to communicate with the device. However, there may be situations when this is not automatic, and these drivers need to be installed manually. For manual installation, please consult the FTDI Support Website for the Device Drivers and Instructions for OS specific installations.

Installation Guides:

<https://ftdichip.com/document/installation-guides/>

5.2 Starting the Console (USB to Serial) Terminal Window

5.2.1 Host Computer Running macOS or Linux

In the macOS Terminal Window, execute the following:

```
sudo screen -L /dev/tty.usbserial-*01 115200
```

In the Linux Terminal Window, execute the following:

```
sudo screen -L /dev/serial/by-path/*-port0 115200
```

Note that, the “-L” flag in the command enables logging of the outputs displayed on the terminal window. The logfile by default is named “screenlog.0” and created or appended to an existing file in the user’s working directory. The logging is optional; however, it is useful in the event that there is an error or crash during boot or normal operation as the logfile can be useful for SiFive to identify the source of the error or crash.

Alternate to the “screen” command on macOS or Linux, user can use “minicom” or “picocom” applications if available.

5.2.2 Host Computer Running Windows

On Windows, users will require a third-party SSH Client capable of emulating UART Terminal Window such as PuTTY which can be downloaded from the link below:

<https://www.chiark.greenend.org.uk/~sgtatham/putty/latest.html>

When the micro-USB cable is connected to the host computer, Windows automatically detects the new device and recognizes it as a USB-to-Serial port which shows up in the Windows Device Manager as follows:

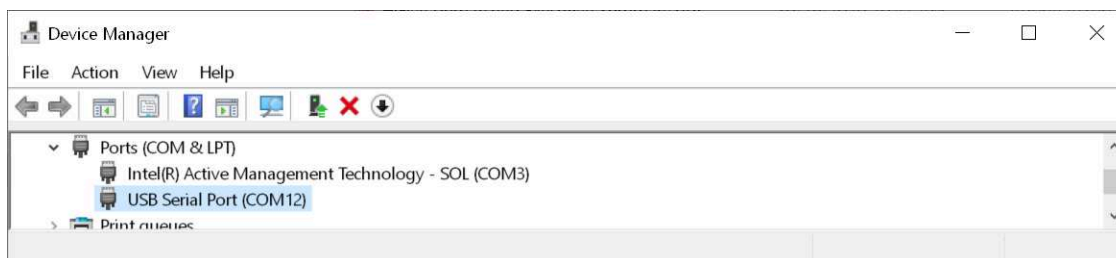


Figure 12: Device Manager COM Ports

Note, the assigned COM Port Number will vary from USB port to port on the host. In most cases, you will notice 2 USB Serial Ports for the FTDI device. In this situation, choose the one

with the higher COM Port number, as this is the port communicating with the UART signals on the Unmatched Board.

Verify that the selected port has the correct drivers installed and Windows has recognized the FTDI device on the Unmatched Board by completing the following steps.

Right click on the "USB Serial Port" and select "Properties" from the dropdown menu. This should display the following, as shown in Figure 13. Note that "Manufacturer: FTDI" is expected.

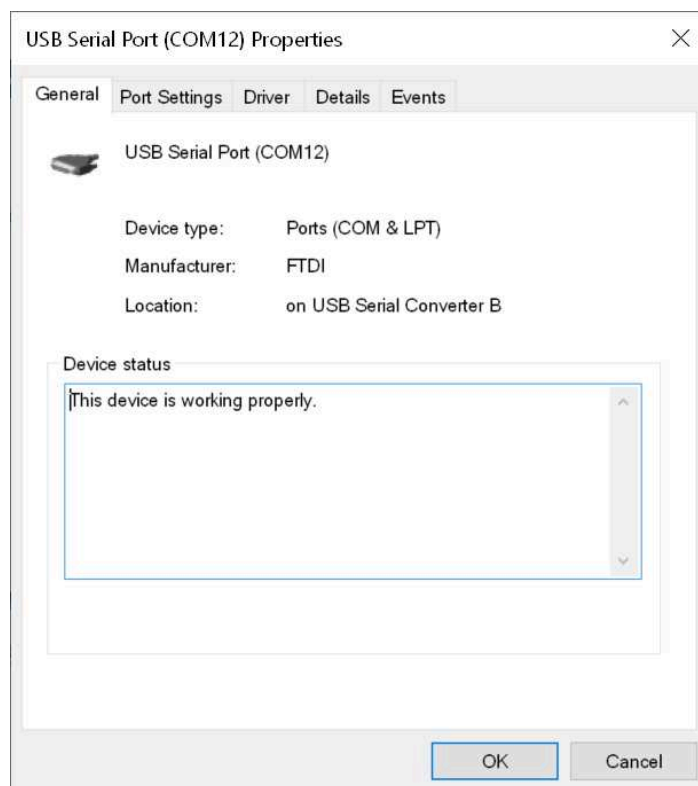


Figure 13: Serial Port Properties

To view console output, launch PuTTY and configure the application as a UART Terminal Windows as follows:

1. Select "Serial" connection type
2. Select Serial line for the COM port the HiFive Unmatched board is connected to as shown in the Device Manager
3. Select Speed of 115200
4. Click the "Open" button

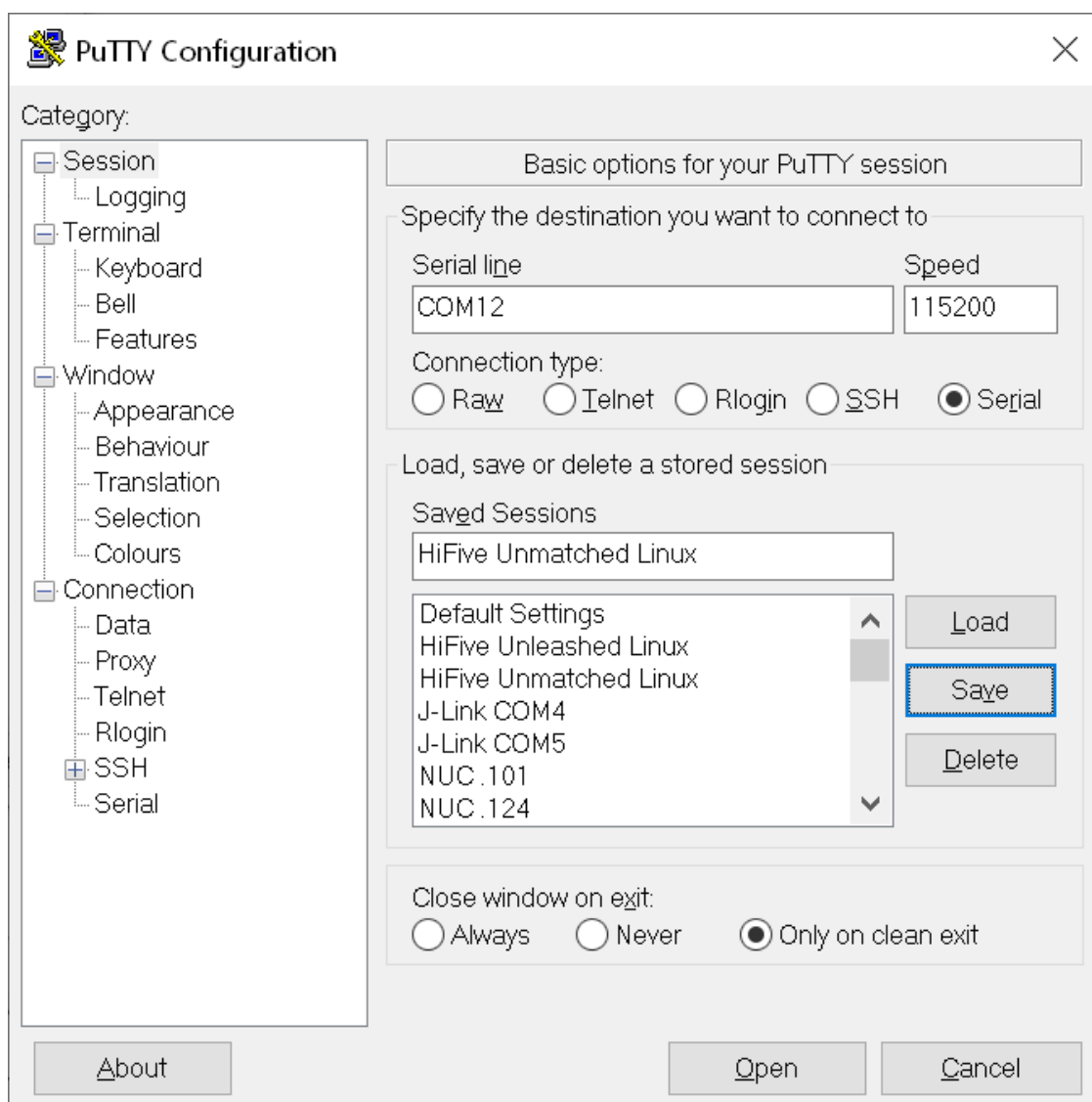


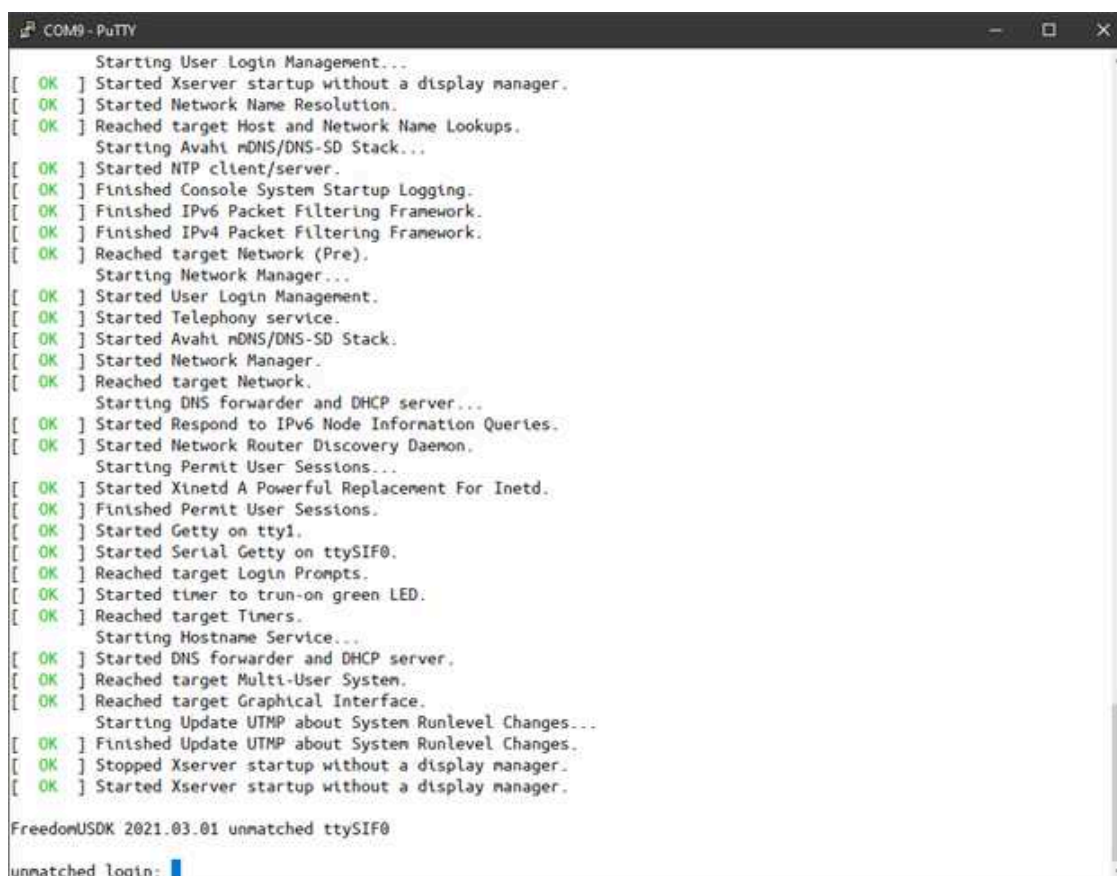
Figure 14: PuTTY Configuration

5.3 Software Boot

To boot the pre-packaged software shipped with the HiFive Unmatched board, follow the steps below:

1. Insert the included SD Card into the SD Card slot which should be visible through the I/O Shield.
2. Make sure the Console Terminal Window is open and has an active connection with the Unmatched Board.
3. Power On the board via the Power On button on the enclosure Front Panel.

As the Unmatched is booting, boot messages are output to the Console Terminal Window. When booted properly, the following login prompt will show the following:



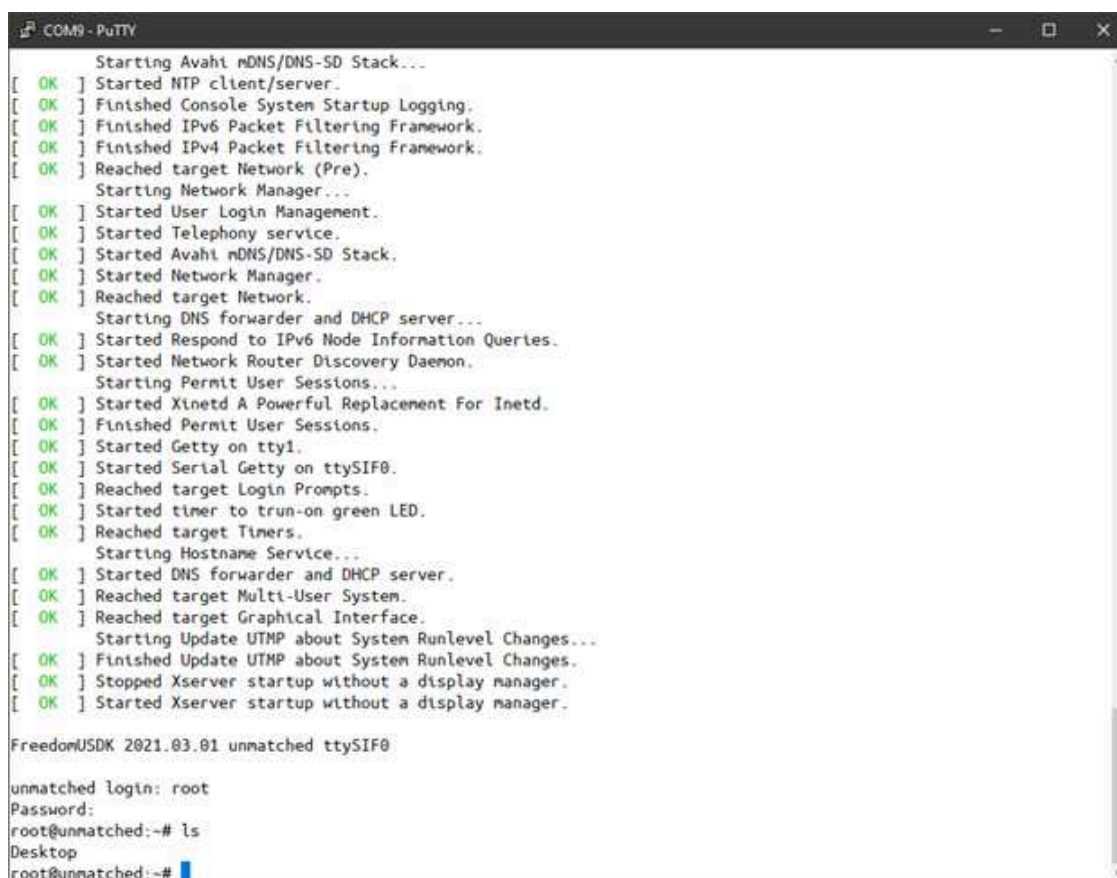
```
COM9 - PuTTY
Starting User Login Management...
[ OK ] Started Xserver startup without a display manager.
[ OK ] Started Network Name Resolution.
[ OK ] Reached target Host and Network Name Lookups.
Starting Avahi mDNS/DNS-SD Stack...
[ OK ] Started NTP client/server.
[ OK ] Finished Console System Startup Logging.
[ OK ] Finished IPv6 Packet Filtering Framework.
[ OK ] Finished IPv4 Packet Filtering Framework.
[ OK ] Reached target Network (Pre).
Starting Network Manager...
[ OK ] Started User Login Management.
[ OK ] Started Telephony service.
[ OK ] Started Avahi mDNS/DNS-SD Stack.
[ OK ] Started Network Manager.
[ OK ] Reached target Network.
Starting DNS forwarder and DHCP server...
[ OK ] Started Respond to IPv6 Node Information Queries.
[ OK ] Started Network Router Discovery Daemon.
Starting Permit User Sessions...
[ OK ] Started Xinetd A Powerful Replacement For Inetd.
[ OK ] Finished Permit User Sessions.
[ OK ] Started Getty on tty1.
[ OK ] Started Serial Getty on ttySIF0.
[ OK ] Reached target Login Prompts.
[ OK ] Started timer to turn-on green LED.
[ OK ] Reached target Timers.
Starting Hostname Service...
[ OK ] Started DNS forwarder and DHCP server.
[ OK ] Reached target Multi-User System.
[ OK ] Reached target Graphical Interface.
Starting Update UTMF about System Runlevel Changes...
[ OK ] Finished Update UTMF about System Runlevel Changes.
[ OK ] Stopped Xserver startup without a display manager.
[ OK ] Started Xserver startup without a display manager.

FreedomUSDK 2021.03.01 unmatched ttySIF0
unmatched login: 
```

Then, login using the following credentials:

- Unmatched login: root
- Password: sifive

Upon successful boot and login, the Console Terminal Window will show the following:



```

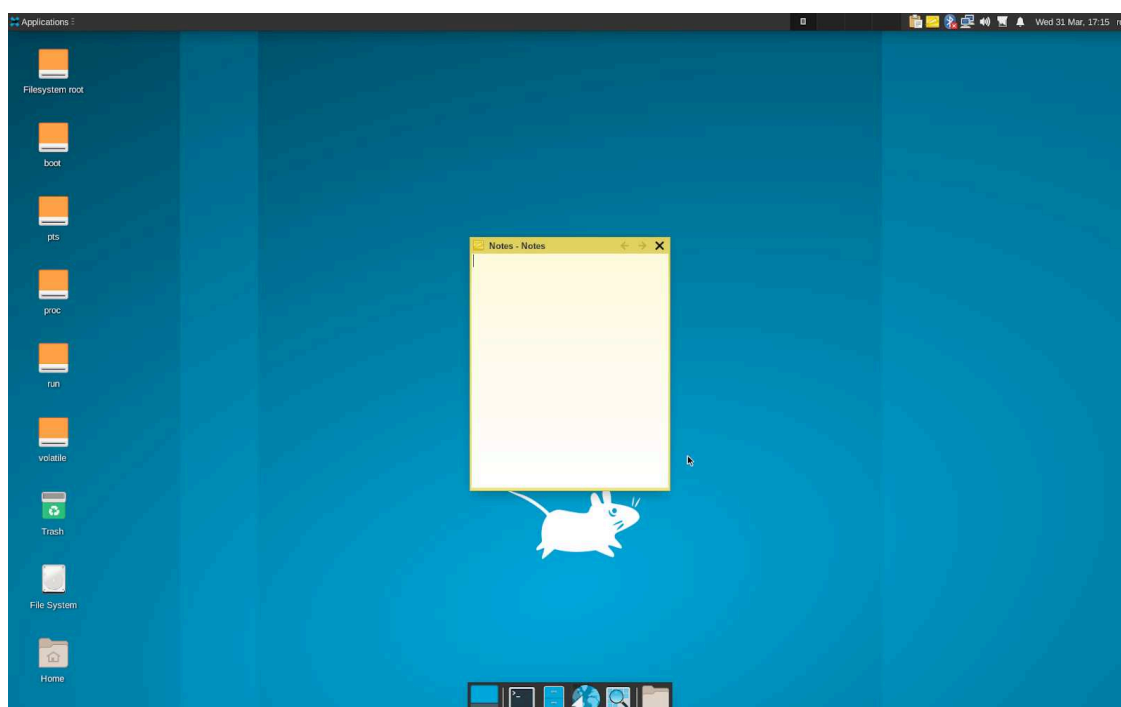
COM9 - PuTTY
Starting Avahi mDNS/DNS-SD Stack...
[ OK ] Started NTP client/server.
[ OK ] Finished Console System Startup Logging.
[ OK ] Finished IPv6 Packet Filtering Framework.
[ OK ] Finished IPv4 Packet Filtering Framework.
[ OK ] Reached target Network (Pre).
Starting Network Manager...
[ OK ] Started User Login Management.
[ OK ] Started Telephony service.
[ OK ] Started Avahi mDNS/DNS-SD Stack.
[ OK ] Started Network Manager.
[ OK ] Reached target Network.
Starting DNS forwarder and DHCP server...
[ OK ] Started Respond to IPv6 Node Information Queries.
[ OK ] Started Network Router Discovery Daemon.
Starting Permit User Sessions...
[ OK ] Started Xinetd A Powerful Replacement For Inetd.
[ OK ] Finished Permit User Sessions.
[ OK ] Started Getty on tty1.
[ OK ] Started Serial Getty on ttySIF0.
[ OK ] Reached target Login Prompts.
[ OK ] Started timer to turn-on green LED.
[ OK ] Reached target Timers.
Starting Hostname Service...
[ OK ] Started DNS forwarder and DHCP server.
[ OK ] Reached target Multi-User System.
[ OK ] Reached target Graphical Interface.
Starting Update UTPP about System Runlevel Changes...
[ OK ] Finished Update UTPP about System Runlevel Changes.
[ OK ] Stopped Xserver startup without a display manager.
[ OK ] Started Xserver startup without a display manager.

FreedomUSDK 2021.03.01 unmatched ttySIF0

unmatched login: root
Password:
root@unmatched:~# ls
Desktop
root@unmatched:~#

```

If a PCIe Graphics Card is used and a monitor is connected to the card, the Desktop will appear as shown in the following picture:



5.4 Updating HiFive Unmatched Software

The software included on the microSD card that is packaged with HiFive Unmatched is frequently updated. To ensure that the HiFive Unmatched system software has crucial updates and the most recent suite of features, please monitor the following link for updates:

<https://github.com/sifive/freedom-u-sdk/releases>

The README on this page describes the flow for flashing the SD card with the latest disk image.

6

Support for HiFive Unmatched

Join the SiFive forums to ask questions and receive support for the HiFive Unmatched development board:

<https://forums.sifive.com/c/hifive-unmatched/16>

For supplemental information about HiFive Unmatched and the latest versions of the supporting documentation, visit:

<https://www.sifive.com>

For direct questions, contact your SiFive representative.

7

Limitation of Liability

SIFIVE WARRANTS THAT FOR A PERIOD OF 12 MONTHS FROM THE DATE THAT THE UNMATCHED BOARD IS RECEIVED, THE UNMATCHED BOARD WILL BE FREE OF DEFECTS IN MATERIALS AND WORKMANSHIP UNDER NORMAL USE. EXCEPT FOR THE FOREGOING, THE UNMATCHED PLATFORM IS PROVIDED "AS IS." TO THE EXTENT LEGALLY PERMITTED BY APPLICABLE LAWS, SIFIVE HEREBY DISCLAIMS ALL WARRANTIES, WHETHER EXPRESS, IMPLIED OR STATUTORY, INCLUDING BUT NOT LIMITED TO ANY IMPLIED WARRANTY OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE, TITLE OR NONINFRINGEMENT, OR ANY WARRANTY OTHERWISE ARISING OUT OF ANY PROPOSAL, SPECIFICATION, SAMPLE, COURSE OF DEALING, USAGE OR TRADE PRACTICE.

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