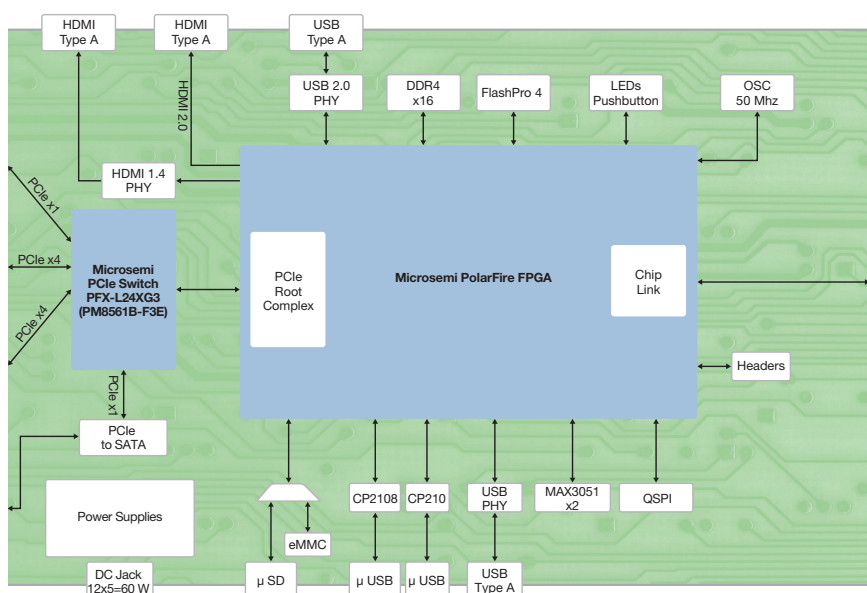# HiFive Unleashed Expansion Kit
Quickstart Guide

The HiFive Unleashed expansion kit is purpose-built to add PCIe root complex capability to the HiFive Unleashed board. Using these two boards together enables users to create a RISC-V PC that can be used for Linux ecosystem development. This board is shipped with a pre-configured bitstream enabling PCIe root port functionality.
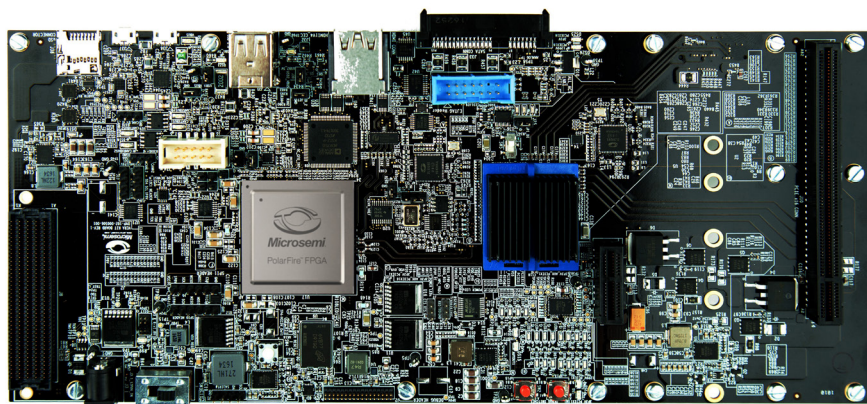
Kit Contents—HFU540-EXP

- HiFive Unleashed expansion board (1)
- USB-A to micro USB-B cable (1)
- 12 V, AC power adapter and cord (1)
- 1-Year Libero Gold software license ($995 value) (1)
- FlashPro4 programming dongle (1)

Block Diagram

Expansion Board

Hardware Features

- 300K LE PolarFire FPGA in an FCG1152 package (MPF300TS-1FCG1152EES)
- 24-lane PCIe switch
- eMMC Nand Flash, uSD card slot
- USB to Uart bridges
- 4 Gbit DDR4 x16
- PCI Express x1 card connector
- PCI Express x16 card connector with x4 lane support
- SPI Flash for FPGA remote updates, QSPI Flash connected to GPIO
- FMC connection to HFU540-4A00 kit
- SSD M.2 connector
- SATA connector

Getting Started

1. Make sure the SiFive HFU540-4A00 board has the correct application image. See SiFive's getting started guide at https://www.sifive.com/documentation/boards/hifive-unleashed/hifive-unleashed-getting-started-guide/.

2. Update the PolarFire FPGA with the FPGA bitstream labeled **HFU540_EXP_Bitstream_r10101.stp** from https://www.microsemi.com/hifive-unleashed-expansion-board. Use the FlashPro4 programmer and the programming and debug software for PolarFire available for download at https://www.microsemi.com/document-portal/doc_download/1243247-download-programming-and-debug-polarfire-v2-1-for-windows. Launch the installed FlashPro software and create a new project. Click on **Configure Device** and browse to the FPGA bitstream you downloaded.

3. Push the HFU540-4A00 power button on, as indicated in the HiFive Unleashed getting started guide. Do not use the SiFive supplied power supply.

4. Connect the power supply to the Microsemi expansion board. It will power the SiFive board.

5. Slide the HFU540-EXP power switch (SW3) on. Boot messages should now appear on your console.

Jumper Settings

Switch	Ref Des	Section	Description	Definition	Default
1	SW3	Power switch	Sliding switch for 12 V input	**Open:** DC adaptor 12 V is not connected to the board power **Close:** DC adaptor 12 V is connected to board power supplies	Open
2	SW5	PCIe switch (Switchtec)	Selection of Normal/Boot Recovery mode for PCIe switch	**0:** Boot recovery mode **1:** Normal mode	1–2: Normal mode
3	J25	SATA controller	Between SPI Flash output to input of PCIe to SATA controller	**Open:** SPI flash o/p is not connected to PCIe to SATA controller **Close:** SPI flash o/p is connected to PCIe to SATA controller	Close
5	J31	USB instance 1	VBUS source selection (on-board 5 V/ USB connector)	**Open:** VBUS sourced by USB connector (Device mode) **Close:** On-board 5 V to USB CONN (Host mode)	Close
6	J27	USB instance 2	Configuring USB PHY (U60) as Host/ device	**Open:** USB3340 acts as device **Close:** USB3340 acts as host	Close
7	J30	USB instance 2	VBUS source selection (on-board 5 V/ USB connector)	**Open:** VBUS sourced by USB connector (Device mode) **Close:** On-board 5 V to USB CONN (Host mode)	Close
8	J21	SC-SPI	SC-SPI I/O configuration interface	**Open:** SC SPI acts as master **Close:** SC SPI acts as slave	Close
9	J22	JTAG	Weak pull down to JTAG TRSTB	**Open:** 1K pull down connected to TRSTB **Close:** 1K||100K pull down connected to TRSTB	Open
11	J4	FMC bank IO voltage	FMC VADJ voltage selection	**1–2:** VADJ is set to 3.3 V **3–4:** VADJ is set to 2.5 V **5–6:** VADJ is set to 1.8 V **7–8:** VADJ is set to 1.5 V **9–10:** VADJ is set to 1.2 V	5–6: VADJ is set to 1.8 V

Software and Licensing

Libero® SoC PolarFire design suite is required for designing with the PolarFire evaluation kit. The Libero® SoC PolarFire design suite offers high productivity with its comprehensive, easy-to-learn, easy-to-adopt development tools for designing with Microsemi's low power Flash FPGAs and SoC. The suite integrates industry standard Synopsys Synplify Pro® synthesis and Mentor Graphics ModelSim® simulation with best-in-class constraints management, and debug capabilities.

Download the latest Libero SoC PolarFire release at http://www.microsemi.com/products/fpga-soc/design-resources/design-software/libero-soc-polarfire#downloads

A Gold license is required to reprogram the Microsemi HiFive Unleashed expansion kit. The same procedure used for licensing the PolarFire evaluation kit can be used for this kit. A software ID letter enclosed with the kit contains the software ID and instructions on how to generate a Libero Gold license. For more information, see www.microsemi.com/products/fpga-soc/design-resources/dev-kits/polarfire/polarfire-eval-kit#licensing

Documentation and Support

Documentation and updated FPGA bitstreams for this board are available online at https://www.microsemi.com/hifive-unleashed-expansion-board

Technical support is available online at https://forums.sifive.com/c/hifive-unleashed

![Microsemi Power Matters.]

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