Accelerating the RISC-V Revolution: Unleashing Custom Silicon with Revolutionary Design Platforms and Custom Accelerators

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July 18th, 2018
How did Instagram turn into a $1B acquisition with only 13 employees?*

Have you ever heard of a $1B hardware company with 13 employees?
Open-Source Technology

From techstacks.io
SiFive Silicon Cloud Services

**SiFive SCS**
(CPU Soft IPs, Subsystem Soft IPs, Prototype ASICs, Production ASICs)

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**Freedom Everywhere**

Low-power, 32-bit microcontrollers
- TSMC 180nm
- Digital and Analog peripherals
- Edge Computing (AI), Embedded, Smart IOT, Wearables

**Freedom Unleashed**

High-performance, 64-bit multi-core chips
- TSMC 28nm
- Cache coherent accelerator support
- High speed peripherals: PCIe Gen3, GbE, DDR3/4
- Datacenter Accelerators, Storage, SSD Controllers, Networking, Baseband

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3rd-Party DesignShare IP

Customer IP

Open-Source IP
Freedom Everywhere 32-bit Low-power microcontroller platform

- 320+ MHz SiFive E31 CPU
  - 16KB L1I$, 16KB Data Scratchpad
  - Hardware Multiply/Divide, Debug Module
- Multiple Power Domains
- Low-Power Standby
- Wide Range of Clock Inputs

Freedom E310, QFN48, manufactured in TSMC 180nm
HiFive1: Arduino-Compatible RISC-V Dev Board

- SiFive FE310-G000 (built in 180nm)
- Operating Voltage: 3.3 V and 1.8 V
- Input Voltage: 5 V USB or 7-12 VDC Jack
- IO Voltages: Both 3.3 V or 5 V supported
- Digital I/O Pins: 19
- PWM Pins: 9
- SPI Controllers/HW CS Pins: 1/3
- External Interrupt Pins: 19
- External Wakeup Pins: 1
- Flash Memory: 16 MB Quad SPI
- Host Interface (microUSB): Program, Debug, and Serial Communication

Order now at crowdsupply.com for $59
Freedom Unleashed 64-bit Multi-Core RISC-V Linux Platform

- 1.5+ GHz U54-MC SiFive CPU
  - 1x E51: 16KB L1I$, 8KB DTIM with ECC support
  - 4x U54: 32KB L1I$, 32KB L1D$ with ECC support
  - Single- and Double-precision floating-point support
  - 2MB Banked L2$ with directory-based cache-coherence & ECC support

- ChipLink
  - Serialized Chip-to-Chip Coherent TileLink Interconnect

- DDR3/4, GbE, Peripherals

Freedom U540, FCBGA, manufactured in TSMC 28nm
HiFive Unleashed: World’s First Multi-Core RISC-V Linux Dev Board

- SiFive FU540-C000 (built in 28nm)
- 8 GB 64-bit DDR4 with ECC
- Gigabit Ethernet Port
- 32 MB Quad SPI Flash
- MicroSD card for removable storage
- MicroUSB for debug and serial communication
- Digital GPIO pins
- FMC connector for future expansion with add-in cards

HiFive Unleashed bundles available at crowdsupply.com
FU540 Preliminary SPECINT2006 Comparison

- U54@1.5GHz, SiFive FU540-C000, HiFive Unleashed
- A53@1.2GHz, Allwinner R18, Pine A64 LTS
- A53@1.5GHz, RockChip OP1/RK3399, Samsung Chromebook Plus

Work in progress
HiFive Unleashed – Expansion Board

• Make a RISC-V PC!
• Built to expand the capabilities of the HiFive Unleashed board
• Board adds PCIe root port capability to the HiFive Unleashed board via CHIPLINK - **Create a RISC-V PC.**
  – Use it to add HDD’s, SSDs, audio cards, network adapters, and/or graphics cards
• USE CASES
  – Build a RISC-V PC
    • Add a PCIe/USB card for keyboard & mouse
    • Add a graphics card
    • Add an HDD
  – Use as a linux development workstation
  – Port your favorite packages or add RTL
    • 300K LE, low power PolarFire FPGA
Open-V: SiFive / ONCHIP Microcontroller based on Freedom Everywhere

- Based on open-source Freedom Everywhere platform
- 3.3mm x 2.6mm TSMC 180nm
- 2.7M transistors
- Collaboration between SiFive and ONCHIP Integrated Systems Research Group in Columbia
- SiFive provided E31 Core Complex and prototyping service
- ONCHIP provided >10 TSMC 180nm Analog IP
Democratizing Ideas: Submit Proposal for Your Own Freedom Chip!


- Do you have a great idea for a chip? Do you have an IP block, such as an accelerator, a co-processor?
- We are considering projects for SiFive partnership which could involve access to custom CPU IP, design support, and even help delivering working samples of your chip!
- Partners to be announced at First Annual RISC-V Summit, to be held Dec 3-6, 2018, Santa Clara.
India has adopted RISC-V as the national ISA!

- SiFive is rolling out a 6-City Tour throughout India to talk to the engineering and student community about RISC-V. ..... August 2018......

- Attend, learn, and kick start your next RISC-V product
- Pls. visit www.sifive.com for additional information
Join the RISC-V Revolution!

• HiFive Unleashed is an important milestone for RISC-V development
  • Important for software ecosystem development, education, and hardware prototyping

• For researchers and entrepreneurs
  • RISC-V is completing the innovation cycle of Research, Education, and Industry
  • You can afford a custom chip just for your application
  • Start customizing the SiFive Freedom platform
  • Innovate at both the hardware and software level

• Submit your proposal for your own Freedom chip today, let’s make it happen together

• Start today at www.sifive.com